

# SHOP MANUAL

Bombardier Snowmobiles



*1986*



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## SAFETY NOTICE

This manual has been prepared as a guide to correctly service and repair the Bombardier snowmobiles.

This edition was primarily published to be used by snowmobile mechanics who are already familiar with all service procedures relating to Bombardier made snowmobiles.

Please note that the instructions will apply only if proper hand tools and special service tools are used.

This shop manual uses technical terms which may be slightly different from the ones used in parts catalogue.

The content of Bombardier Inc. Recreational Product Shop Manual depicts parts and/or procedures applicable to the particular product at its time of manufacture. It does not include dealer modifications, whether authorized or not by Bombardier, after manufacturing the product.

In addition, the sole purpose of the illustrations/photographs throughout the manual, is to assist identification of the general configuration of the parts. They are not to be interpreted as technical drawings or exact replicas of the parts.

The use of Bombardier parts is most strongly recommended when considering replacement of any component. Dealer and/or distributor assistance should be sought in case of doubt.

Torque wrench tightening specifications must be strictly adhered by. Locking devices (ex.: tab lock, nylon lock) must be installed or replaced by new ones, where specified. If the efficiency of a locking device is impaired, it must be renewed.

This manual emphasizes particular information denoted by the wording and symbols;

◆ **WARNING:** Identifies an instruction which, if not followed, could cause personal injury.

▼ **CAUTION:** Denotes an instruction which, if not followed, could severely damage vehicle components.

○ **NOTE:** Indicates supplementary information needed to fully complete an instruction.

Although the mere reading of such information does not eliminate the hazard, your understanding of the information will promote its correct use.

This information relates to the preparation and use of Bombardier snowmobiles and has been utilized safely and effectively by Bombardier Inc.. However, Bombardier Inc. disclaims liability for all damages and/or injuries resulting from the improper use of the contents. We strongly recommend that any services be carried out and/or verified by a highly skilled professional mechanic. It is understood that certain modifications may render use of the vehicle illegal under existing federal, provincial and state regulations.

# 1986 BOMBARDIER SNOWMOBILES SHOP MANUAL

## INTRODUCTION

This Shop Manual covers the following Bombardier made 1986 snowmobiles.

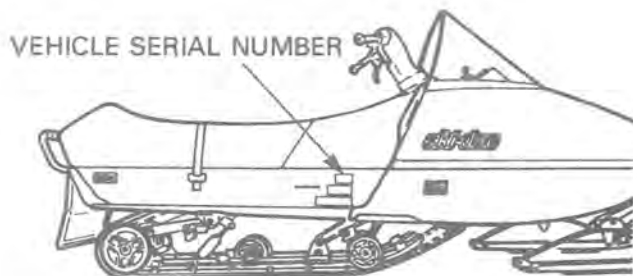
### MODELS

### MODEL NUMBER

ELAN 250	3043
CITATION LS	3210
CITATION LSE	3211
TUNDRA	3212
TUNDRA LT	3213
SKANDIC 377	3214
SKANDIC 377 R	3215
SAFARI 377	3615
SAFARI 377 E	3616
SAFARI 447	3617
SAFARI GRAND LUXE LC	3618
FORMULA SP	3619
FORMULA MX	3725
FORMULA MX (High altitude)	3727
FORMULA PLUS	3726
ALPINE 503	3342

Furthermore, each vehicle has its particular vehicle serial number.

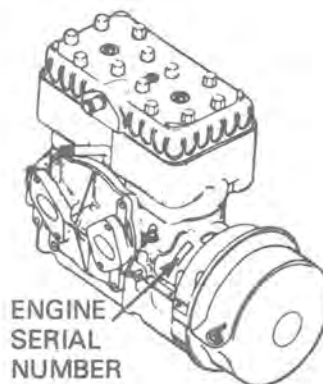
Serial number:      0000                      00001  
                                 |                                      |  
                                 model number                      vehicle serial  
                                    number



A000000001

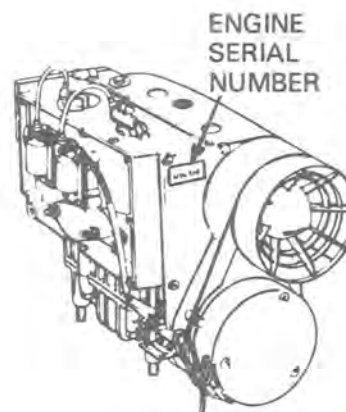
The engine also has a serial number.

### Liquid cooled engines



A000002017

### Fan cooled engines

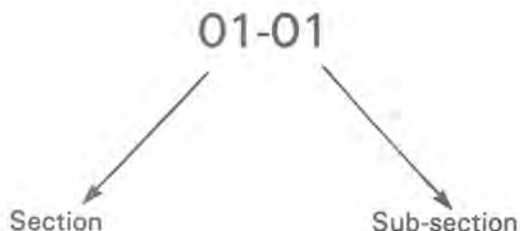


A000002018

## DEFINITION OF NUMBERING SYSTEMS

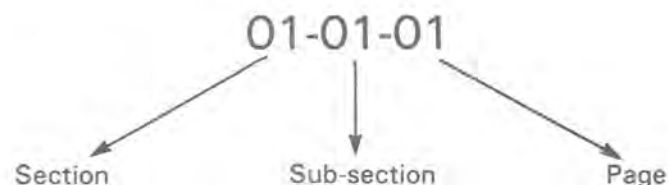
### Sections and sub-sections system

The manual makes use of a 2-part digital numbering system (i.e. 01-01), in which the first digit represents the section, the second digit the sub-section.



## Pages system

The numerotation at the bottom of each page assists the user in page location.



## ARRANGEMENT OF THE MANUAL

The manual is divided into ten (10) major sections:

- 01 Tools
- 02 Engine
- 03 Transmission
- 04 Electrical
- 05 Suspension
- 06 Steering and skis
- 07 Hood and frame
- 08 Piping, wiring harness and cable routing
- 09 Technical data
- 10 Warranty

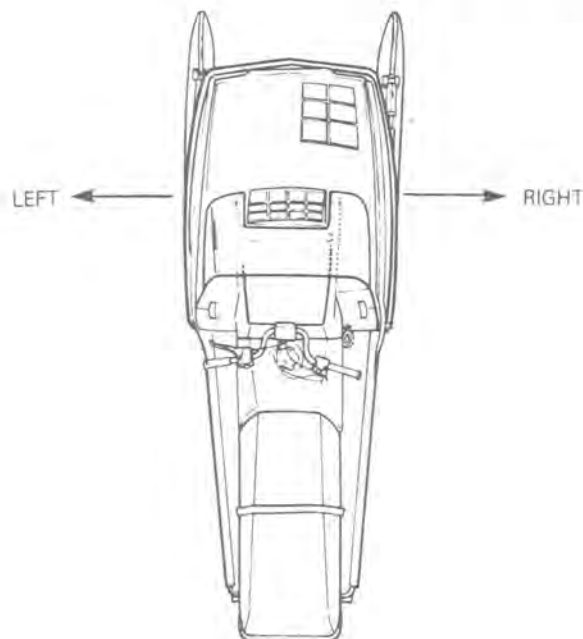
Each section is divided in various sub-sections, and again, each sub-section has one or more division.

### EX.: 02 ENGINE

#### 04 Engine type 447

- Cooling system
- Magneto
- Etc.

The use of "Right" and "Left" indications in the text, always refers to driving position (when sitting on vehicle).



A0000000002

## GENERAL

The information, illustrations and component/system descriptions contained in this manual are correct at time of publication. Bombardier Inc. however, maintains a policy of continuous improvement of its products without imposing upon itself any obligation to install them on products previously manufactured.

Bombardier Inc. reserves the right at any time to discontinue or change specifications, designs, features, models or equipment without incurring obligation.

## ILLUSTRATIONS & PROCEDURES

An exploded view is conveniently located at the beginning of each section and is meant to assist the user in identifying parts and components.

This Shop Manual uses technical terms which may be slightly different from the ones of the parts catalog.

**When ordering parts always refer to the parts catalogue.**

The illustrations show the typical construction of the different assemblies and, in all cases, may not reproduce the full detail or exact shape of the parts shown, however, they represent parts which have the same or a similar function.

When something special applies (such as adjustment, etc.), bold numbers are used for specific parts and referred to in the text.

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## **1986 BOMBARDIER SNOWMOBILES SHOP MANUAL**

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Pay attention to torque specifications. Some of these are in lbf•in instead of lbf•ft.

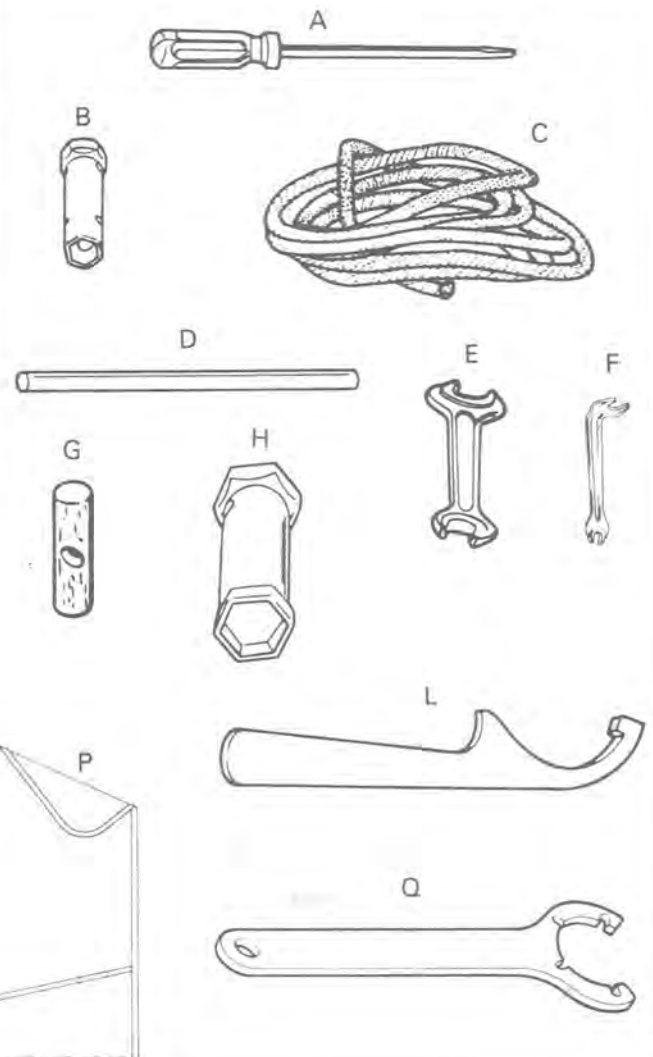
As many of the procedures in this manual are interrelated, we suggest, that before undertaking any task, you read and thoroughly understand the entire section or sub-section in which the procedure is contained.

A number of procedures throughout the book require the use of special tools. Where a special tool is indicated, refer to section 01. Before commencing any procedure, be sure that you have on hand all the tools required, or approved equivalents.

This manual is published by the  
Technical Publications  
Bombardier Inc.  
Valcourt, Quebec, Canada

# BASIC TOOLS

- A. Screwdriver
- B. Socket 10/13 mm
- C. Starter rope
- D. Socket wrench handle
- E. Open end wrench 10/13 mm
- F. Angular wrench 10/13 mm
- G. Starter grip
- H. Socket 21/26 mm (long)
- I. Extension bar
- J. Suspension adjustment key (cam)
- K. Extension socket
- L. Suspension adjustment key (shock absorber)
- M. Socket 11/13 mm
- N. Socket 21/26 mm (short)
- O. Emergency starter clip
- P. Tool bag
- Q. Spring collar adjustment key ("PRS" suspension)



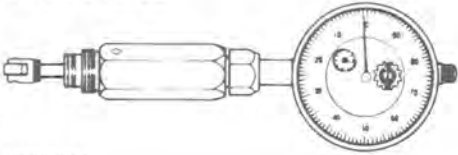

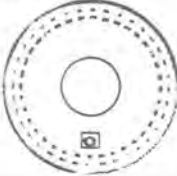



A001001016

1986 MODELS	APPLICABLE TOOLS
Elan	A, B, C, D, F, H, P
Citation LS/LSE, Tundra/LT	A, B, C, D, E, H, O, P
Skandic 377/R	A, B, C, D, E, G, H, J, P
Safari 377/E, 447	A, B, C, D, E, G, H, J, P
Formula SP, Safari GL	A, B, C, D, E, G, J, L, N, P
Formula MX, Plus	A, B, C, D, E, N, P, Q
Alpine	A, B, C, D, E, H, I, K, M, P



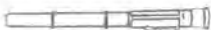
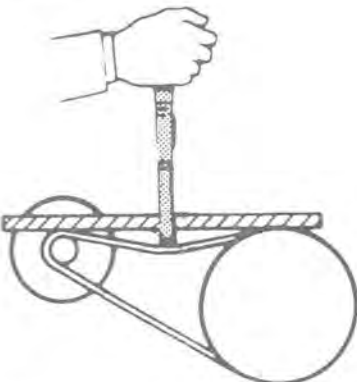


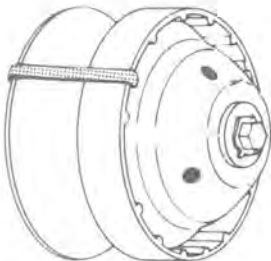


## 1986 SERVICE TOOLS

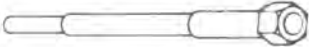
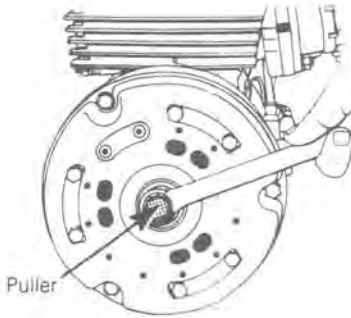

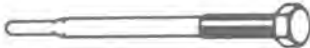

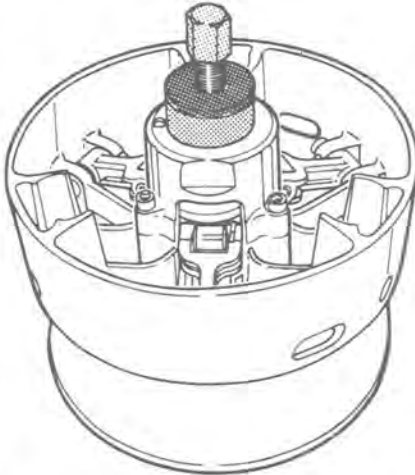
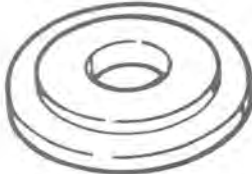
SERVICE TOOL	PURPOSE	APPLICATION
<p>Dial indicator (T.D.C. gauge) 414 1047 00</p>  <p>A000002001</p>	<p>Engine timing, to determine T.D.C.</p>  <p>A000002002</p>	<p>All engine types</p>
<p>Degree wheel 414 352 900</p>  <p>A000002025</p>	<p>To mark timing position of rotary valve</p>	<p>462, 467, 532, &amp; 537 engines</p>
<p>Circuit tester (continuity light) 414 0122 00</p>  <p>A000002003</p>	<p>Engine timing (static) Continuity tests</p>	<p>All engine types</p>
<p>Bombardier ignition tester 419 0033 00</p>  <p>A000002004</p>	<p>Engine electrical components tests</p>	<p>All engine types</p>
<p>Nippondenso electronic ignition tester 419 008 400</p>  <p>A000002050</p>	<p>Engine ignition system components tests</p>	<ul style="list-style-type: none"> <li>- All Nippondenso electronic ignition systems</li> <li>- (All engine types except 247)</li> </ul>

## Section 01 TOOLS

### Sub-section 02 (SERVICE PRODUCTS)




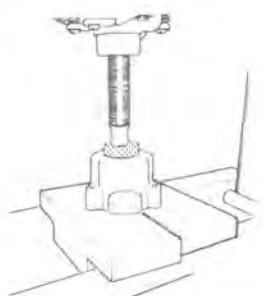
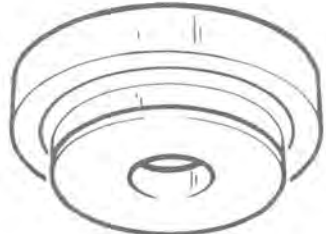
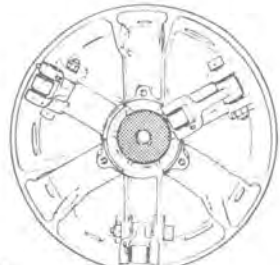
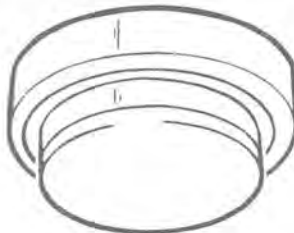
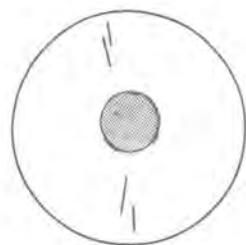
SERVICE TOOL	PURPOSE	APPLICATION
<p>Belt tension tester 414 3482 00</p>  <p>A000002007</p>	<p>To adjust belt deflection and tension to specifications</p>  <p>A000003008</p>	<p>All models</p>
<p>Mikuni tool kit 404 1120 00</p>  <p>A000001087</p>	<p>To ease disassembly and assembly procedures of Mikuni carburetor</p>	<p>All models</p>
<p>Drive pulley retainer 529 0017 00</p>  <p>A000002005</p>	<p>For retaining of governor cup</p>  <p>A000002006</p>	<p>Round shaft drive pulley</p>

**Section 01 TOOLS**  
**Sub-section 02 (SERVICE TOOLS)**


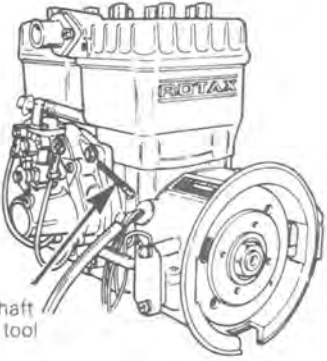

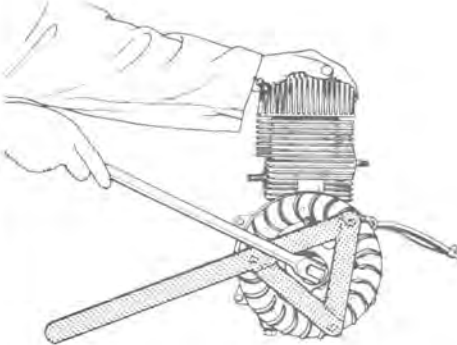

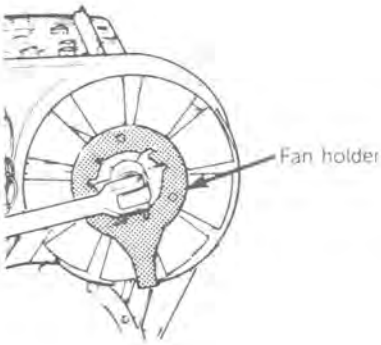
SERVICE TOOL	PURPOSE	APPLICATION
<p>Drive pulley puller</p> <p>Standard threads 529 0021 00</p>  <p>A000002008</p>	<p>To remove drive pulley from crankshaft</p>  <p>Puller</p>	<p>Taper crankshaft end engines</p>
<p>Metric threads 529 0048 00</p> <p>529 0028 00</p>  <p>A000002009</p>		
<p>Metric threads 420 476 030</p>  <p>A016001007</p>	<p>A000002010</p>	<p>TRA clutch</p>
<p>Spacer 529 0054 00</p>  <p>A016001004</p>	<p>Use with drive pulley puller P/N 420 476 030 to remove spring cover</p> 	<p>TRA clutch</p>
<p>Cover 529 0056 00</p>  <p>A016001005</p>		

## Section 01 TOOLS

### Sub-section 02 (SERVICE TOOLS)


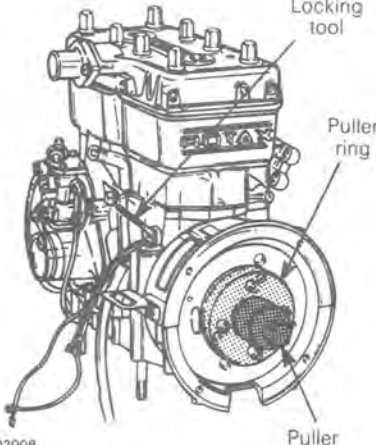
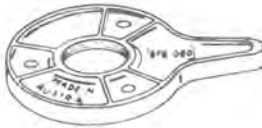
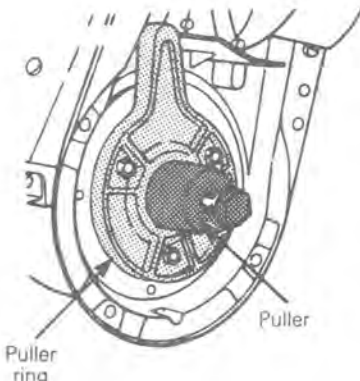

SERVICE TOOL	PURPOSE	APPLICATION
<p>Fork 529 0055 00</p>  <p>A016001001</p>	<p>To maintain slider shoes at removal and assembly</p>  <p>A016001002</p>	TRA clutch
<p>Flare tool cover 529 0059 00</p>  <p>A016001012</p>	<p>To flare spring cover kahrlon bushing</p>  <p>A016003006</p>	TRA clutch
<p>Outer flare tool 529 0060 00</p>  <p>A016001008</p>	<p>To flare inner half flange kahrlon bushing</p>  <p>A016001011</p>	TRA clutch
<p>Inner flare tool 529 0061 00</p>  <p>A016001009</p>	 <p>A016001010</p>	

**Section 01 TOOLS**  
Sub-section 02 (SERVICE TOOLS)

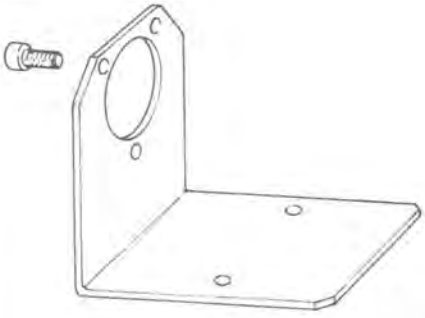
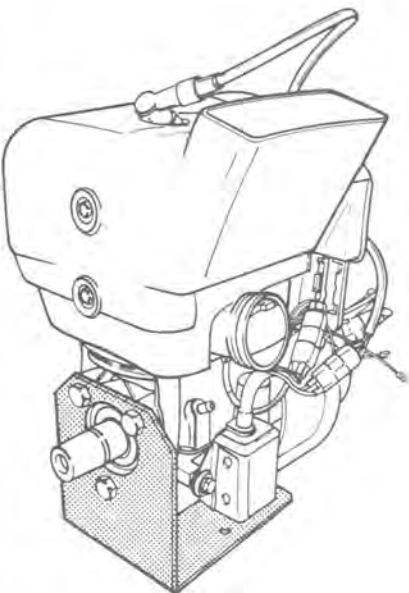

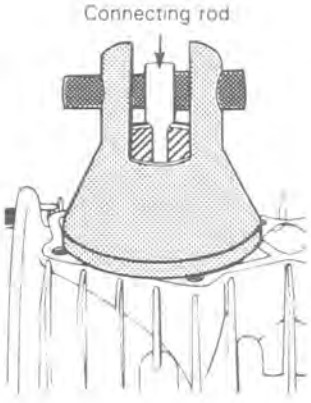
SERVICE TOOL	PURPOSE	APPLICATION
<p>Crankshaft locking tool 420 876 640</p>  <p>A000002038</p>	<p>To lock crankshaft when removing drive pulley or flywheel</p>  <p>Crankshaft locking tool A000002040</p>	<p>All engine types</p>
<p>Magneto housing holder 420 976 550</p>  <p>A000002011</p>	 <p>A000002012</p>	<p>247 engine type</p>
<p>Fan holder</p> <p>503 engine                      420 876 355</p> <p>253, 377 &amp; 447                420 876 357</p> <p>engines</p>  <p>A000002026</p>	 <p>Fan holder A000002027</p>	<p>Axial fan cooled engine types</p>

## Section 01 TOOLS

### Sub-section 02 (SERVICE TOOLS)



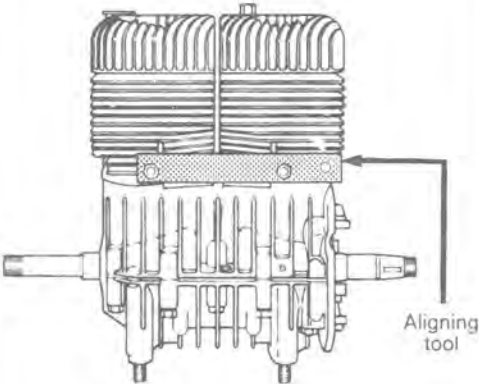
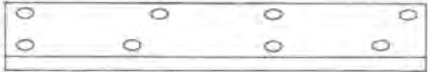
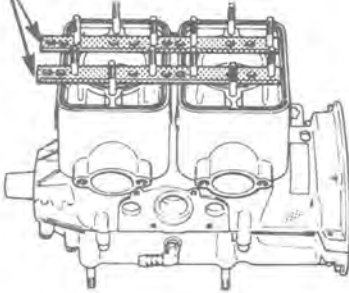
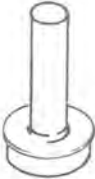
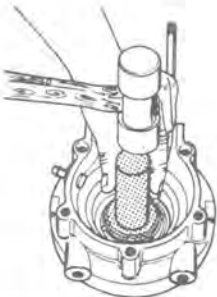
SERVICE TOOL	PURPOSE	APPLICATION
<p>Magneto puller ring 420 876 655</p>  <p>A000002044</p>	<p>Used with crankshaft locking tool &amp; magneto puller to remove flywheel</p>  <p>A013002008</p>	<p>All engine types except 247</p>
<p>Magneto puller ring 420 876 080</p>  <p>A000002044</p>	<p>Used with magneto puller to remove flywheel</p> 	<p>All engine types</p>
<p>Magneto puller</p> <p>247 engine                      420 976 235 253,377,447,462 467,503,532,537              420 876 065 engines</p>  <p>A000002046</p>	<p>A000002045</p>	

**Section 01 TOOLS**  
**Sub-section 02 (SERVICE TOOLS)**

SERVICE TOOL	PURPOSE	APPLICATION
<p>Mounting support  420 876 630  Screw M10 x 16 mm  420 841 660</p>  <p>A002001002</p>	<p>To hold engine</p>  <p>A003002001</p>	<p>253 engine type</p>
<p>Connecting rod holder  420 977 900</p>  <p>A000002023</p>	<p>Connecting rod</p>  <p>A000002024</p>	<p>247 engine type</p>


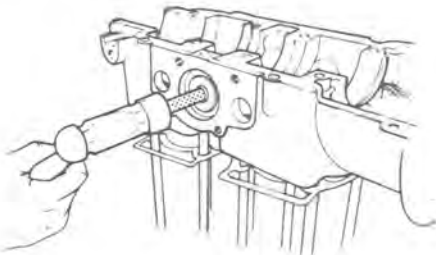

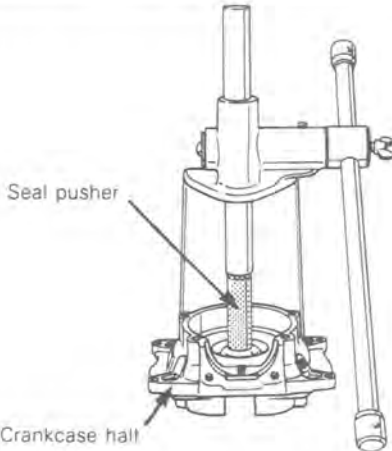

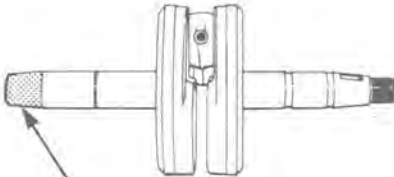

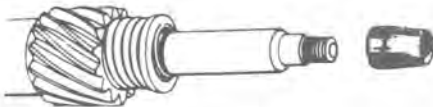
## Section 01 TOOLS

### Sub-section 02 (SERVICE TOOLS)

SERVICE TOOL	PURPOSE	APPLICATION
<p>Cylinder aligning tools</p> <p>377,447,503 engines 420 876 171</p> <p>,462 engine 420 876 175</p> <p>467,532,537 engines 420 876 570</p>  <p>A000002019</p> <p>Screw M8 x 25 mm 377,503 engines 420 240 275</p>  <p>A000002020</p>	<p>To align cylinders</p>  <p>A000002021</p>	<p>Twin cylinder engines</p>
<p>Exhaust flange aligning tool</p> <p>467,537 engines 420 876 900</p>  <p>A000002018</p>	<p>Aligning tool</p>  <p>A000002022</p>	
<p>Polyamid ring pusher</p> <p>420 276 930</p>  <p>A000002035</p>	<p>To install polyamid ring in crankcase</p>  <p>A000002036</p>	<p>247 engine type</p>


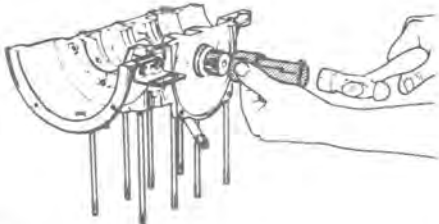

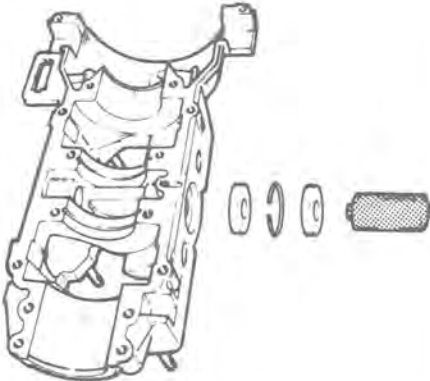

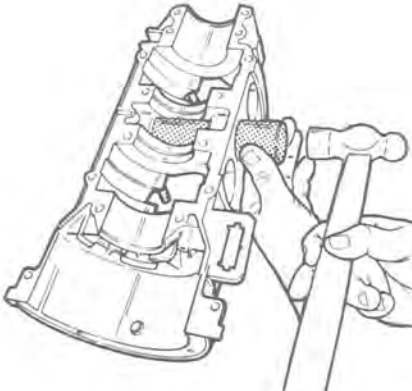


**Section 01 TOOLS**  
Sub-section 02 (SERVICE TOOLS)

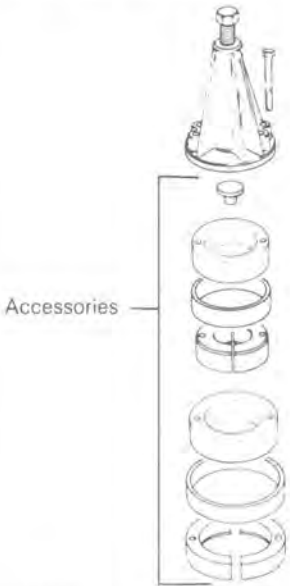
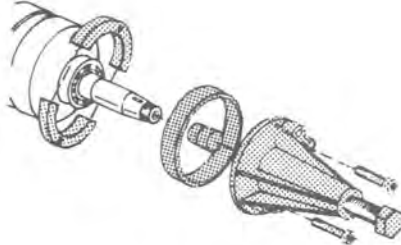
SERVICE TOOL	PURPOSE	APPLICATION
Rotary valve shaft pusher 420 876 610  A000002015	 A000002016	462,467,532 & 537 engine types
Engine seal pusher 420 977 920  A000002031	 A000002032	247 engine type
Seal sleeve PTO 420 977 910 MAG 420 276 900  A000002013	To avoid seal damage during crankshaft installation  A000002014	247 engine type
Seal sleeve 420 876 490  A000002013	To avoid seal damage during rotary valve shaft installation  A015002016	462,467,532 & 537 engine types

## Section 01 TOOLS

### Sub-section 02 (SERVICE TOOLS)

SERVICE TOOL	PURPOSE	APPLICATION
<p>Rotary valve seal pusher 420 876 605</p>  <p>A000002034</p>	<p>To install seal and rotary valve shaft</p>  <p>A015002016</p>	<p>462,467,532 &amp; 537 engine types</p>
<p>Seal pusher 420 876 510</p>  <p>A000002033</p>	<p>To install water pump seals</p>  <p>A015002014</p>	<p>462,467,532 &amp; 537 engine types</p>
<p>Bearing pusher 420 876 500</p>  <p>A000001091</p>	<p>To install water pump bearing</p>  <p>A013002028</p>	<p>462,467,532 &amp; 537 engine types</p>

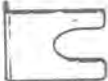
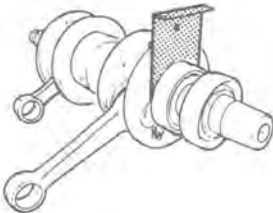

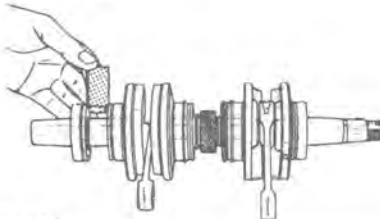

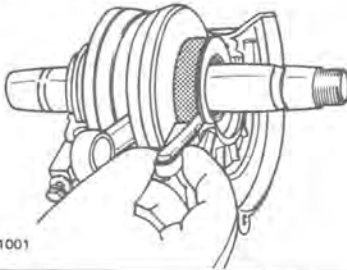


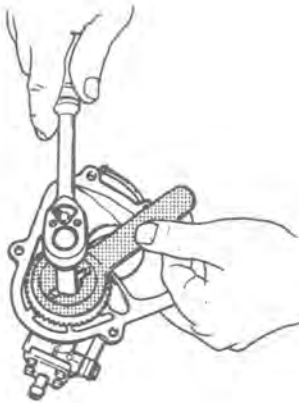
**Section 01 TOOLS**  
Sub-section 02 (SERVICE TOOLS)

SERVICE TOOL	PURPOSE	APPLICATION
Puller assembly 420 876 296 With 145 mm screw   Accessories	 A000002017	All engine types

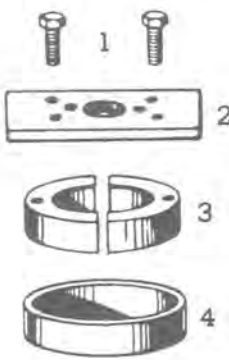
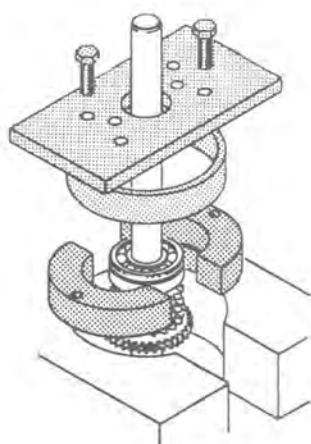
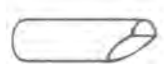
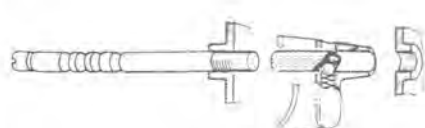
PULLER ASSEMBLY COMPONENT	P/N	APPLICABLE TO ENGINE TYPES								
		247	253	377	447	462	467	503	532	537
Screw M16 x 145	420 940 755	x	x	x	x	x	x	x	x	x
PULLER ASSEMBLY ACCESSORIES	P/N									
Screw M8 x 70 (2)	420 841 200		x	x	x	x	x	x	x	x
Screw M8 x 40 (2)	420 840 680	x				x	x		x	x
Crankshaft protector PTO	420 876 550		x	x	x				x	
Crankshaft protector PTO	420 876 552					x	x	x		x
Crankshaft protector MAG	420 876 557		x				x		x	x
Crankshaft protector MAG	420 876 555			x	x	x		x		
Protection cap 18 mm MAG	420 976 890	x								
Protection cap 22 mm MAG	420 876 402		x	x	x	x	x	x	x	x
Distance ring	420 876 560		x	x	x	x	x	x	x	x
Distance ring	420 876 565			x	x			x		
Distance ring	420 876 567						x		x	x
Puller ring	420 977 480	x	x	x	x	x	x	x	x	x
Puller ring	420 977 490			x	x		x	x	x	x
Half ring ass'y	420 276 020	x	x	x	x	x	x	x	x	x
Half ring ass'y	420 977 470			x	x		x	x	x	x

## Section 01 TOOLS

### Sub-section 02 (SERVICE TOOLS)


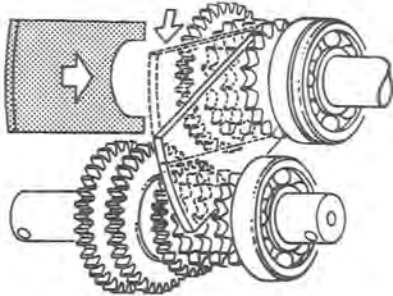
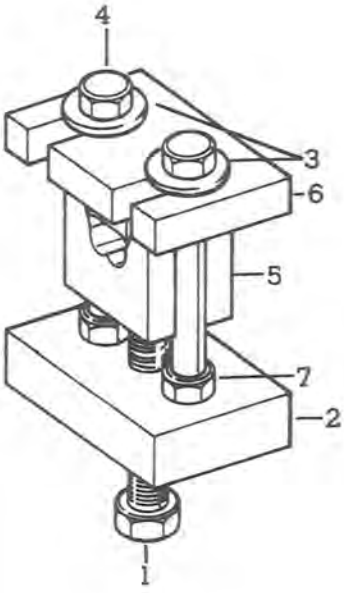
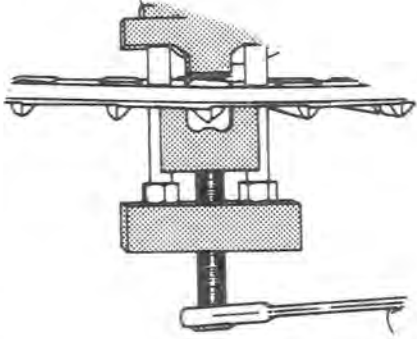
SERVICE TOOL	PURPOSE	APPLICATION
<p>Crankshaft feeler gauge 420 876 620</p>  <p>A000002037</p>	<p>On PTO side</p>  <p>A000002038</p>	<p>PTO: 377,447 &amp; 503 engines</p>
<p>Distance gauge 420 876 820</p>  <p>A000002052</p>	<p>To position crankshaft bearings, P.T.O. side</p>  <p>A013002004</p>	<p>462 engine type</p>
<p>Bearing simulator 420 876 155</p>  <p>A000002053</p>	<p>To adjust crankshaft end-play</p>  <p>A002001001</p>	<p>253 engine type</p>
<p>Injection pump gear holder 253,377,447 engines 420 876 690</p>  <p>A000002041</p> <p>462,467,532 &amp; 537 engines 420 277 900</p>  <p>A000002042</p>	 <p>A000002043</p>	<p>All oil injection engines</p>

**Section 01 TOOLS**  
Sub-section 02 (SERVICE TOOLS)


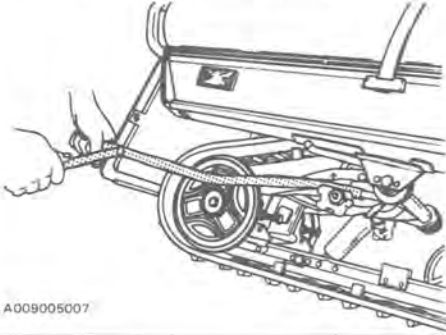


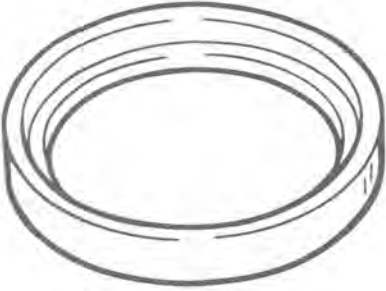

SERVICE TOOL	PURPOSE	APPLICATION
<p>3 speeds transmission bearings extractor</p>  <p>A000002047</p>	<p>To remove the bearings from the drive shaft and the lay shaft</p> <p>1- screw M8 x 25 (2) 420 240 275</p> <p>2- plate 420 977 700</p> <p>3- half ring (2) 420 876 330</p> <p>4- ring 420 977 480</p>  <p>A017003006</p>	<p>Alpine 3 speeds transmission</p>
<p>Transmission ball mounting pin 420 476 020</p>  <p>A000002048</p>	<p>Transmission cover index rod ball installation</p>  <p>A017003011</p>	<p>Alpine 3 speeds transmission</p>

## Section 01 TOOLS

### Sub-section 02 (SERVICE TOOLS)

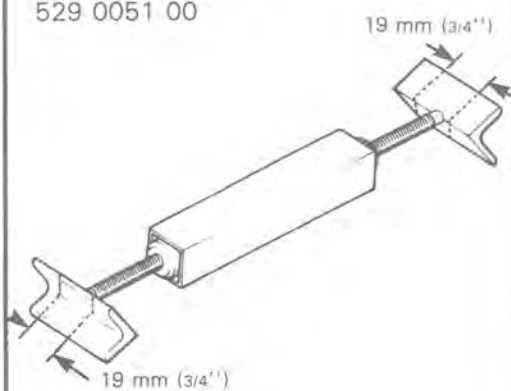
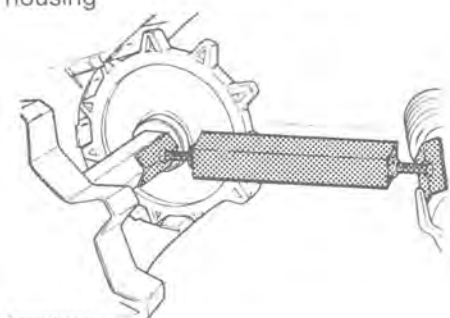

SERVICE TOOL	PURPOSE	APPLICATION
<p>Alignment tool 420 476 010</p>  <p>A00002049</p>	<p>Drive shaft and layshaft sprocket alignment</p>  <p>A017003009</p>	<p>Alpine 3 speeds transmission</p>
<p>Clip-O-Matic 529 004 500</p>  <p>A000002051</p>	<p>For track inserts installation</p> <ul style="list-style-type: none"> <li>1- screw 5/16 - 11 x 6'' 529 003 900</li> <li>2- pressure plate 529 004 400</li> <li>3- washer (2) 391 302 900</li> <li>4- hexagonal screw (2) 1/2 - 20 x 6'' 391 717 200</li> <li>5- bending block no. 1 (wide cleats) 529 004 100 bending block no. 2 (narrow cleats) 529 004 200 bending block no. 3 (Moto-Ski cleats up to 1975) 520 004 300</li> <li>6- male block 529 004 000</li> <li>7- hexagonal nut (2) 389 804 000</li> </ul>  <p>A001005006</p>	<p>All types of track</p>

**Section 01 TOOLS**  
Sub-section 02 (SERVICE TOOLS)

SERVICE TOOL	PURPOSE	APPLICATION
<p>Spring installer</p>  <p>A000002054</p>	<p>To install suspension springs</p>  <p>A009005007</p>	<p>All torque reaction slide suspensions except Citation LS/E and Formula MX-Plus</p>
<p>Spring remover 414 5796 00</p>  <p>A015001001</p>	<p>To remove spring from shock absorber</p>  <p>A014005025</p>	<p>Formula SP, MX, Plus, &amp; Safari GL</p>
<p>Spring adaptor 529 0057 00</p>  <p>A014001003</p>	<p>Used with spring remover to remove spring from shock absorber</p>  <p>A014005024</p>	<p>Formula SP &amp; Safari GL</p>





## Section 01 TOOLS

### Sub-section 02 (SERVICE TOOLS)

SERVICE TOOL	PURPOSE	APPLICATION
<p>Drive axle holder 529 0051 00</p>  <p>19 mm (3/4")</p> <p>19 mm (3/4")</p> <p>000002055</p>	<p>To hold drive axle during installation or removal of chaincase and/or end bearing housing</p>  <p>A004003002</p>	<p>All torque reaction slide suspensions except Formula MX-Plus.</p> <p> <b>NOTE:</b> For proper fitting on Citation LS/E reduce ends width to 19 mm (3/4").</p>









## SERVICE PRODUCTS







SERVICE PRODUCT	PURPOSE	APPLICATION
<p>Loctite sealant kit 413 7026 00 contains:  PST Pipe Sealant with Teflon (50 ml) 413 7023 00  Gasket Eliminator 515 (50 ml) 413 7027 00  Retaining Compound RC/601 (10 ml) 413 7031 00  Threadlocker 242 (10 ml) 413 7030 00  Threadlocker 271 (10 ml) 413 7029 00  Super Bonder 495 (3-gram tube) 413 7032 00</p>  <p>A000001061</p>	<p>For threadlocking, threadsealing, gasketing, bonding and retaining applications on engines, pulleys and fasteners etc.</p>	
<p>Lock'n seal (242) blue medium strength 24 ml 413 7025 00</p>  <p>A000001062</p>	<p>A medium-strength adhesive for threadlocking and threadsealing. Vibration-proof nuts, bolts and screws</p>	<p>General purpose, nuts, bolts screws  Magneto ring nut, crank-case studs, etc.</p>
<p>Lock'n seal (271) red high strength 6 ml 747 020 000</p>  <p>A000001063</p>	<p>Hi-strength threadlocking threadsealing adhesive for large parts.</p>	<p>Fasteners and studs under 1" dia.</p>
<p>Molykote G-n paste 2.8 oz 413 7037 00</p>  <p>A000001064</p>	<p>A balanced blend of molybdenum disulfide and other lubricating solids to handle extreme pressure. Reduces frictional force and surface damage. Provides excellent protection against fretting wear Temperature range from -100°F to 750°F (-73°C to 399°C)</p>	<p>For rewind starter locking spring. (Not to be used on rewind springs as it does not stay on when dried)</p>

## Section 01 TOOLS

### Sub-section 03 (SERVICE PRODUCTS)

SERVICE PRODUCT	PURPOSE	APPLICATION
<p>G.E. Versilube G341 M 8 oz 413 7040 00</p>  <p>A000001065</p>	<p>This General Electric silicone lubricant is highly resistant to oxidation, shear and heat decomposition - and will provide excellent lubrication over long intervals of no maintenance under temperatures from -73°C to 240°C such conditions. Lubricates under (-100°F to 400°F)</p>	<p>Used to lubricate manual starter rewinding spring. (not to be used on rewind starter locking makes it run out)</p>
<p>Primer crankcase sealant (spray) 6 oz 413 7024 00</p>  <p>A000001066</p>	<p>Very fast cure primer. Primer NF provides fixturing in only 15-30 seconds with full cure in 4 hours or less. On part life is 30 minutes and parts should be assembled as soon as possible after adhesive is applied.</p>	<p>Mainly used when assembling engine crankcases</p>
<p>Chisel gasket remover (spray) 300 g 413 7045 00</p>  <p>A000001067</p>	<p>Creates a foaming action that lifts gaskets off in minutes</p>	<p>Mainly used to remove gasket residues from any metal surface</p>
<p>Antiseize lubricant 413 7010 00</p>  <p>A000001068</p>	<p>Protects moving and stationary parts against high temperature seizing. Prevents rust and corrosion on parts exposed to high heat.</p>	<p>Unpainted surfaces of drive pulley countershaft.</p>
<p>Silicone dielectric grease 3 oz 413 7017 00</p>  <p>A000001069</p>	<p>Special dielectric grease that prevents moisture and corrosion build-up in electric connections.</p>	<p>On all electric connections. High tension coil. Spark plug connections. Connector housings, etc.</p>
<p>Grease tube LMZ no 1 400 g 498 0281 00</p>  <p>A000001070</p>	<p>Multi purpose Lithium based grease containing zinc monoxide which makes it a good conductor for heat &amp; electricity.</p>	<p>Mainly used between regulators or rectifiers and upper column to transfer the heat build-up and to assure a good ground.</p>

**Section 01 TOOLS**  
**Sub-section 03 (SERVICE PRODUCTS)**


SERVICE PRODUCT	PURPOSE	APPLICATION
Clutch lube 4 oz 413 8007 00  A000001071	Special low temperature metallic lubricant for clutch shafts only.	For roller round shaft drive pulleys.
Injection oil 413 8015 00  A000001072	High quality lubricant with good resistance to high operating temperatures. Low foaming action.	Rotary valve lubricant.
Chaincase oil 200 ml 413 8019 00  A000001073	Specially formulated oil for chain and roller lubrication. Assures proper lubrication at low temperatures.	Chaincase lubricant on all models.
Blizzard oil 496 0135 00 - 500 ml  A000001074	Specially formulated oil that meets lubrication requirements of the Bombardier-Rotax engine.	All models.
Injection oil 496 013 300 - 1 litre 496 013 400 - 4 litres  A000001075	This oil will flow at -40°C (-40°F). Compounded of base oils and additives, specially selected to provide outstanding lubrication, engine cleanliness and minimum spark plugs fouling.  Fully efficient for: <b>INJECTION, PRE-MIX, ROTARY VALVE.</b>	All engine types.
Grease tube SPHEEROL MULTI EP 400g 413 7056 00  A000001076	Multi-purpose lithium based grease. It is an antifriction, anticorrosion and water resistant bearing grease for use through temperatures between -50°F to 225°F (-45°C to 107°C).	For idler bearings, ski legs, leaf spring cushion pads, seal interior lips, rear hub bearings, bogie wheels, countershaft bearings, etc...

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## Section 01 TOOLS

### Sub-section 03 (SERVICE PRODUCTS)

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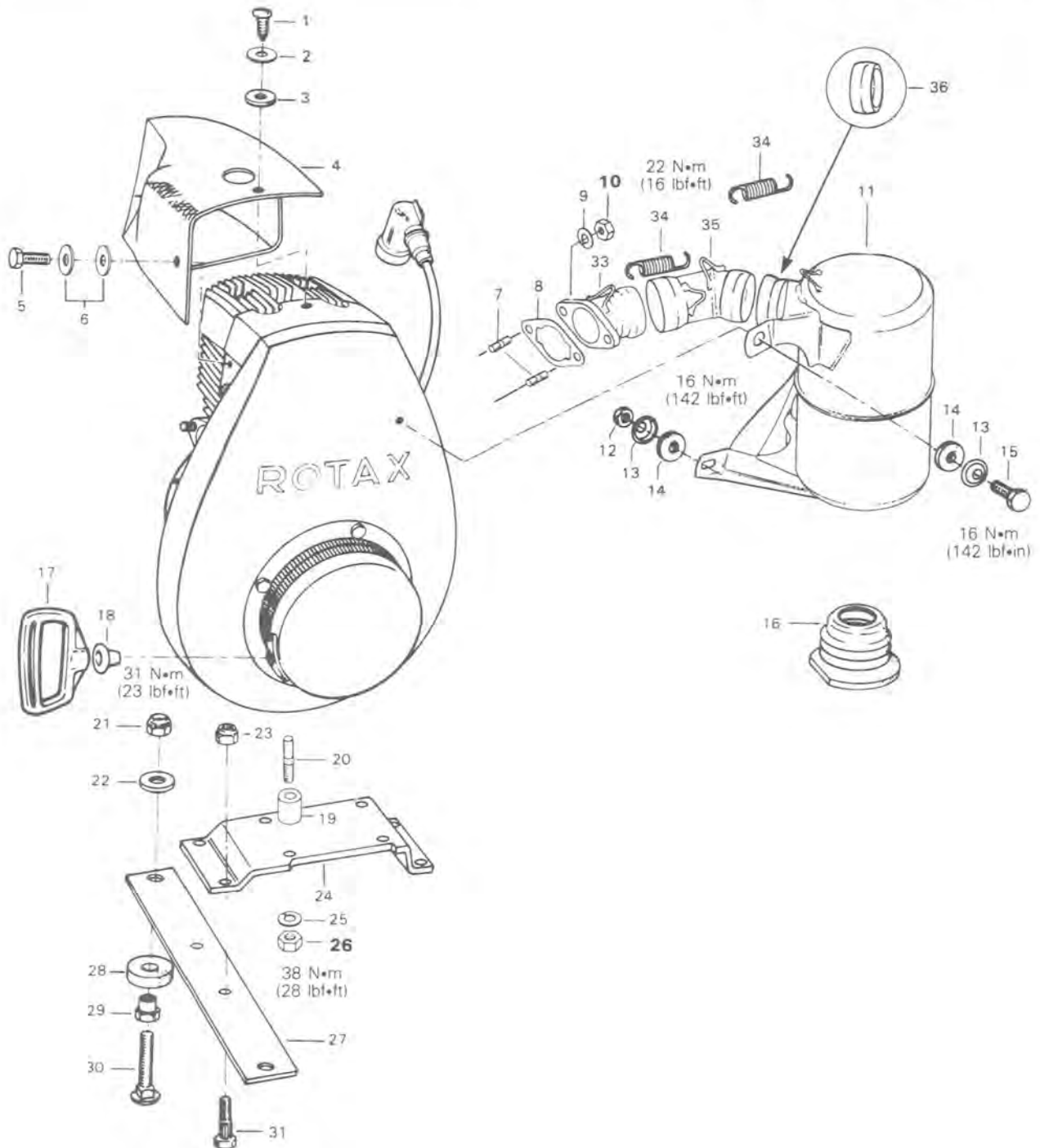
SERVICE PRODUCT	PURPOSE	APPLICATION
<p>Primer for gasket eliminator 413 7053 00</p> 	<p><b>General purpose primer.</b> Primer N assures fixturing of parts in 15-30 minutes and full cure in 12 hours or less. On part life is 30 days, but it is recommended that parts be joined within 10 minutes after adhesive is applied over primer.</p>	<p>Mainly used when assembling engine and transmission crankcases.</p>

A000001077

## 247 ENGINE TYPE

### ENGINE REMOVAL & INSTALLATION

Engine support and muffler



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## Section 02 ENGINE

### Sub-section 01 (247 ENGINE TYPE)

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- |                             |                                  |
|-----------------------------|----------------------------------|
| 1. Metal screw 5 x 5/8 (2)  | 19. Distance sleeve 22 mm (4)    |
| 2. Washer (2)               | 20. Stud M10 x 42 (4)            |
| 3. Rubber spacer (2)        | 21. Elastic stop nut 3/8-24 (4)  |
| 4. Air duct                 | 22. Washer (4)                   |
| 5. Hexagonal screw 1/4 x 20 | 23. Elastic stop nut 5/16-24 (4) |
| 6. Washer                   | 24. Engine support               |
| 7. Stud M8 x 19 (2)         | 25. Lock washer 10 mm (4)        |
| 8. Muffler gasket           | 26. Hexagonal nut 10 mm (4)      |
| 9. Lock washer 8 mm (2)     | 27. Cross support (2)            |
| 10. Hexagonal nut 8 mm (2)  | 28. Vibration damper (4)         |
| 11. Muffler                 | 29. Threaded spacer (4)          |
| 12. Hexagonal nut 8 mm      | 30. Carriage bolt 3/8-24 (4)     |
| 13. Retainer washer (2)     | 31. Knurled screw 5/16-24 (4)    |
| 14. Rubber washer           | 32. Rotax engine 247             |
| 15. Hexagonal screw M8 x 25 | 33. Exhaust socket               |
| 16. Exhaust grommet         | 34. Spring (4)                   |
| 17. Starter grip            | 35. Connecting tube              |
| 18. Rubber buffer           | 36. Muffler female ball joint    |
- 

## REMOVAL FROM VEHICLE

Remove or disconnect the following then lift engine from vehicle.

- Console
- Pulley guard
- Drive belt
- Muffler
- Primer hose
- Decompressor cable
- Throttle cable
- Fuel lines
- Electrical connectors
- Separate steering column support at upper column
- Engine mount nuts

## ENGINE SUPPORT AND MUFFLER DISASSEMBLY & ASSEMBLY

### 10,23,26, Manifold nuts, engine support nuts & engine mount nuts

Torque the manifold nuts to 22 N•m (16 lbf•ft).

Torque the engine support nuts to 31 N•m (23 lbf•ft).

Torque the engine mount nuts to 38 N•m (28 lbf•ft).

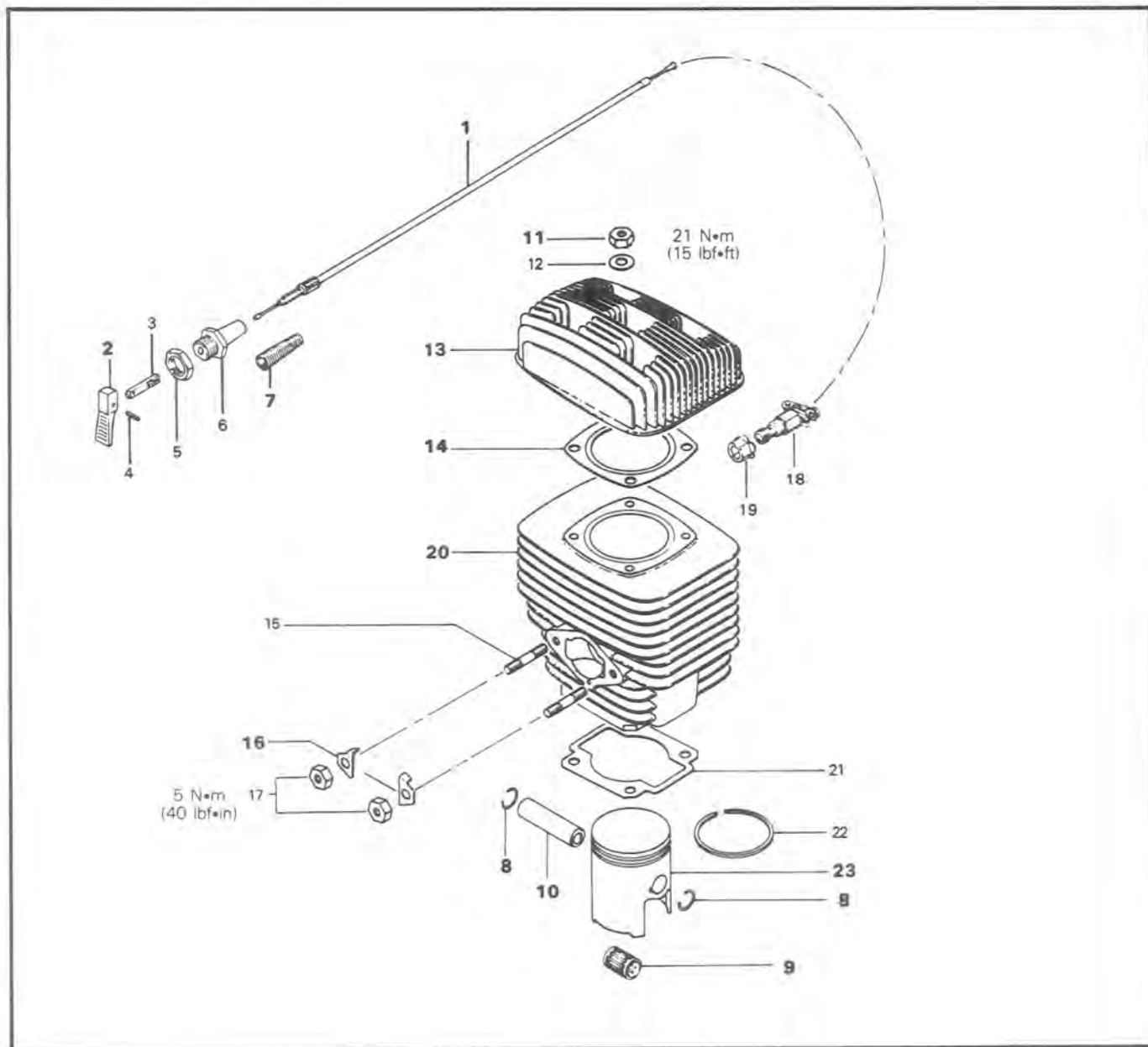
## INSTALLATION ON VEHICLE

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

- Check tightness of engine mount nuts, and drive pulley bolt.
- After throttle cable installation, check maximum throttle slide opening.
- Check pulley alignment and drive belt tension.

**Section 02 ENGINE**  
**Sub-section 01 (247 ENGINE TYPE)**

**TOP END**



1. Decompressor cable
2. Decompressor lever
3. Switch rod
4. Dowel tube
5. Cap nut M18 x 1.5
6. Switch housing
7. Spring
8. Circlip (2)
9. Needle bearing
10. Gudgeon pin
11. Nut 8 mm (4)
12. Washer 8,4 mm (4)

13. Cylinder head
14. Head gasket
15. Stud M8 x 19,5 (2)
16. Tab lock (2)
17. Nut 8 mm (2)
18. Decompressor
19. Locking sleeve
20. Cylinder
21. Flange gasket
22. Rectangular ring (2)
23. Piston

## Section 02 ENGINE

### Sub-section 01 (247 ENGINE TYPE)

## CLEANING

Discard all gaskets.

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

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

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

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

## DISASSEMBLY

### 8,10,23, Piston, circlips & gudgeon pin

Place a clean cloth over crankcase, then with a pointed tool inserted in piston notch, remove circlip from piston. Drive the gudgeon pin out of piston using a suitable drive punch and hammer.

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

## INSPECTION

The inspection of the engine top end must include the following measurements:

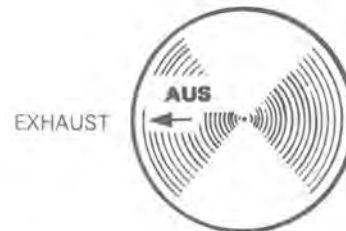
MEASUREMENTS	TOLERANCES		
	FITTING NEW PARTS (MIN.)	(MAX.)	WEAR LIMIT
Cylinder taper	N.A.	N.A.	.08 mm (.0031")
Cylinder out of round	N.A.	N.A.	.05 mm (.0020")
Cylinder/piston clearance	.065 mm (.0026")	.20 mm (.0079")	.20 mm (.0079")
Ring/piston groove clearance	.04 mm (.002")	.20 mm (.0079")	.20 mm (.0079")
Ring end gap	.20 mm (.0079")	.35 mm (.0138")	1.0 mm (.0394")

○ **NOTE:** For the measurement procedures, refer to "Engine dimensions measurement", section 02-10.

## ASSEMBLY

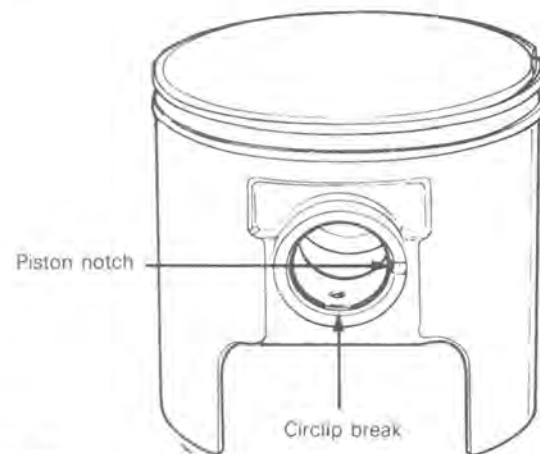
### 8,23, Piston & circlips

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



A001002001

To minimize the effect of acceleration forces on circlip, install each circlip so the circlip break is at 6 o'clock as illustrated. Remove any burrs on piston caused through circlip installation with very fine emery cloth.



A001002002

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

### 20, Cylinder

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

### 11,13, Nuts & cylinder head

Position cylinder head on cylinder with fins in line with crankshaft center line. Cross torque retaining nuts to 21 N•m (15 lbf•ft).

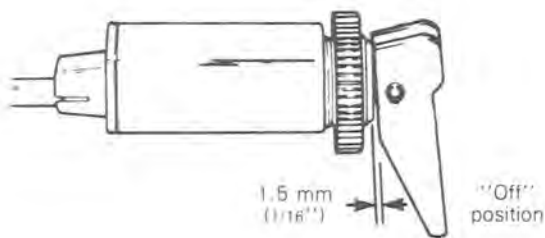


## 16, Tab lock

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

## 1,2, Decompressor cable & lever

To adjust: From "Off" position, pull lever to feel a light resistance. A gap of 1.5 mm (1/16") is required.



A002002011

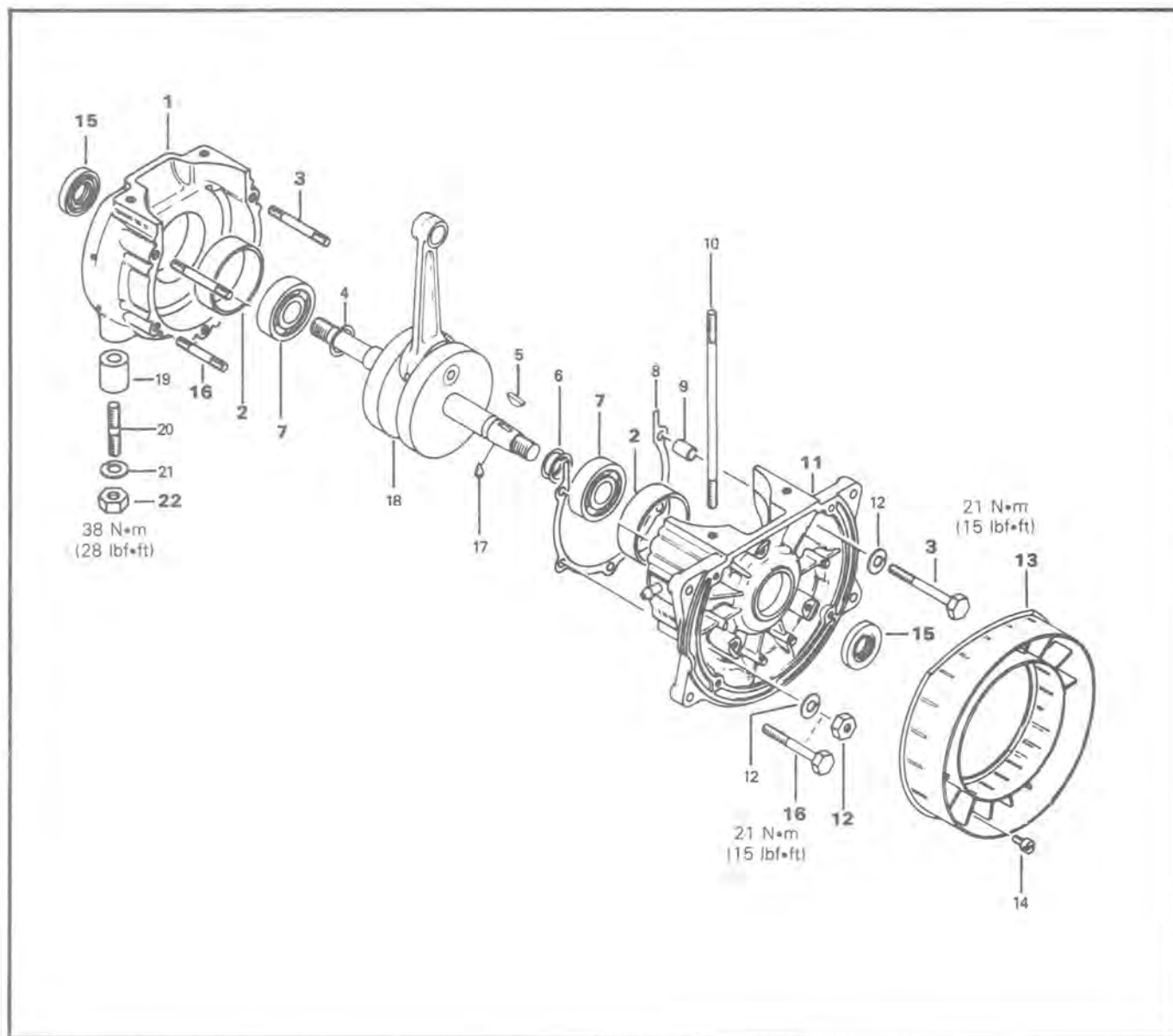
## 7, Spring

Remove spring then turn adjustment sleeve clockwise to increase free-play or counterclockwise to reduce. Re-install spring.

## Section 02 ENGINE

### Sub-section 01 (247 ENGINE TYPE)

#### BOTTOM END



- 1. Crankcase half (P.T.O. side)
- 2. Polyamid ring (2)
- 3. Stud M8 x 56 (crankcase with studs) (2)  
Hexagonal cap screw M8 x 64 (crankcase with screws) (2)
- 4. Shim 1.0 mm
- 5. Woodruff key 5 x 6,5
- 6. Shim 0,1, 0,2, 0,3, 0,5, 1,0 mm
- 7. Ball bearing 6305 (2)
- 8. Crankcase gasket
- 9. Dowel tube 10 mm x 15 (2)
- 10. Stud M8 x 171 (4)
- 11. Crankcase half (mag side)
- 12. Lock washer 8 mm (5)  
Hexagonal nut 8 mm (crankcase with studs) (5)

- 13. Labyrinth ring
- 14. Slotted head screw M6 x 10 (4)
- 15. Seal (2)
- 16. Stud M8 x 46 (crankcase with studs) (3)  
Hexagonal cap screw M8 x 55 (crankcase with screws) (3)
- 17. Loctite 242
- 18. Crankshaft
- 19. Distance sleeve 22 mm (4)
- 20. Stud M10 x 42 (4)
- 21. Lock washer 10 mm (4)
- 22. Hexagonal nut 10 mm (4)

## CLEANING

Discard all oil seals and gaskets.

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

## DISASSEMBLY

### General

To remove drive pulley, refer to "Drive pulley", section 03-03.

To remove magneto, refer to "Magneto" in this section.

### 1,11, Crankcase halves

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

### 2, Polyamid rings

Do not remove polyamid rings unless necessary.

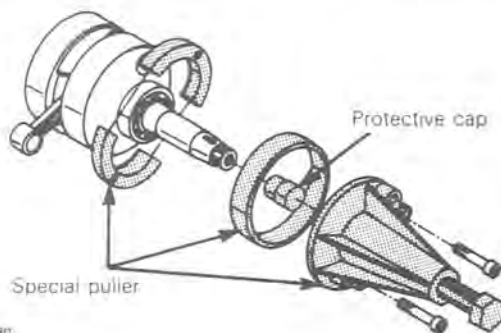
To remove, heat slightly with a butane torch then pry out using a screwdriver.

### 15, Seals

To remove seals, push from outside the crankcase towards the inside.

### 7, Ball bearings

To remove bearings from crankshaft use a protective cap and special puller as illustrated. (See Tools Section).



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## INSPECTION

The inspection of the engine bottom end must include the following measurements:

MEASUREMENTS	TOLERANCES		
	FITTING NEW PARTS (MIN.) (MAX.)		WEAR LIMIT
Crankshaft deflection	N.A.	N.A.	10 mm (.0039")
Connecting rod big end axial play	.20 mm (.0079")	.53 mm (.0208")	1.0 mm (.0394")
Crankshaft end play	.20 mm (.0079")	.40 mm (.0158")	N A.

○ **NOTE:** For the measurement procedures, refer to "Engine dimensions measurement", section 02-10.

## ASSEMBLY

### 7, Bearings

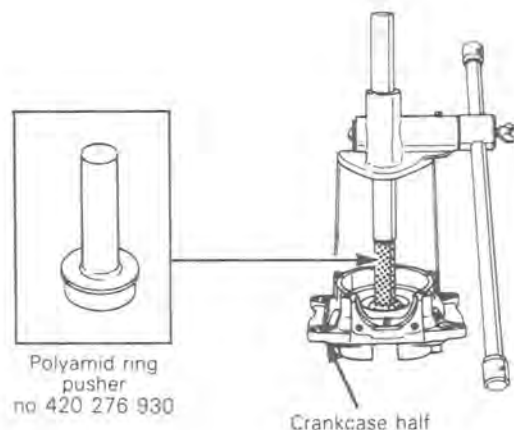
Prior to installation, place bearings into an oil container and heat the oil to 100°C (210°F) for 5 to 10 min. This will expand bearings and ease installation.

Install bearings with groove outward

○ **NOTE:** Crankshaft end-play requires adjustment only when crankshaft and/or crankcase is replaced. Prior to magneto side bearing installation, determine crankshaft end-play and install required shim(s) on crankshaft extension. For the crankshaft end-play adjustment procedure, refer to "Engine dimension measurement", section 02-10.

### 2, Polyamid rings

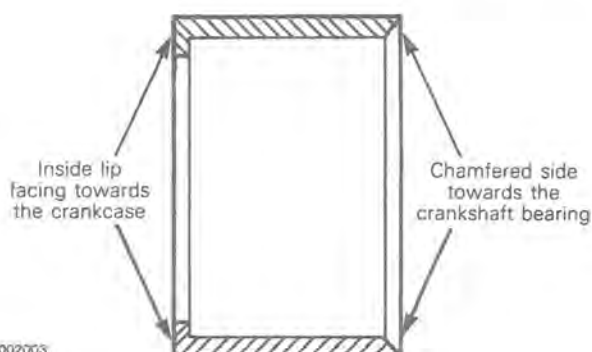
To install polyamid ring, apply oil on outside diameter then use a suitable pusher.



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## Section 02 ENGINE

### Sub-section 01 (247 ENGINE TYPE)



#### 15, Seals

To install new seal into crankcase use an appropriate oil seal pusher as illustrated. (See Tools Section),

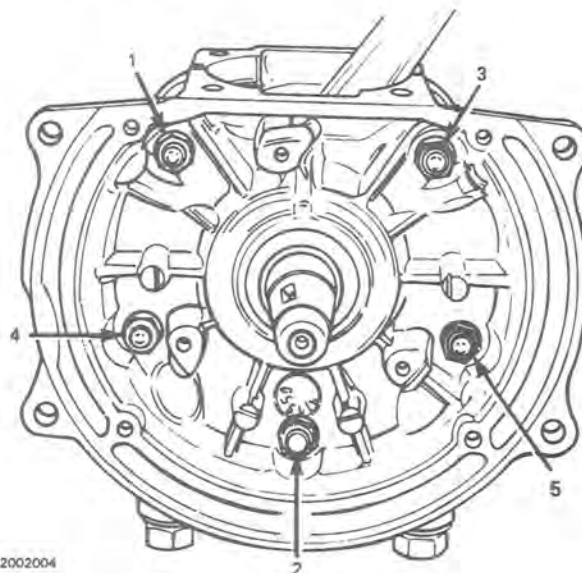


Also, prior to crankcase adjoining, install a protector sleeve on each crankshaft extension to prevent oil seal damage (See Tool Section). Apply a light coat of lithium grease on seal lip. Spray some new injection oil on all moving parts of the crankshaft.

**CAUTION:** To ensure appropriate crankshaft bearing lubrication, seal outer surface must be pressed on seal crankcase shoulder.

#### 3,12,16, Studs or bolts & nuts

Torque the nuts or bolts to 21 N•m (15 lbf•ft) following illustrated sequence.



#### 22, Engine mount nuts

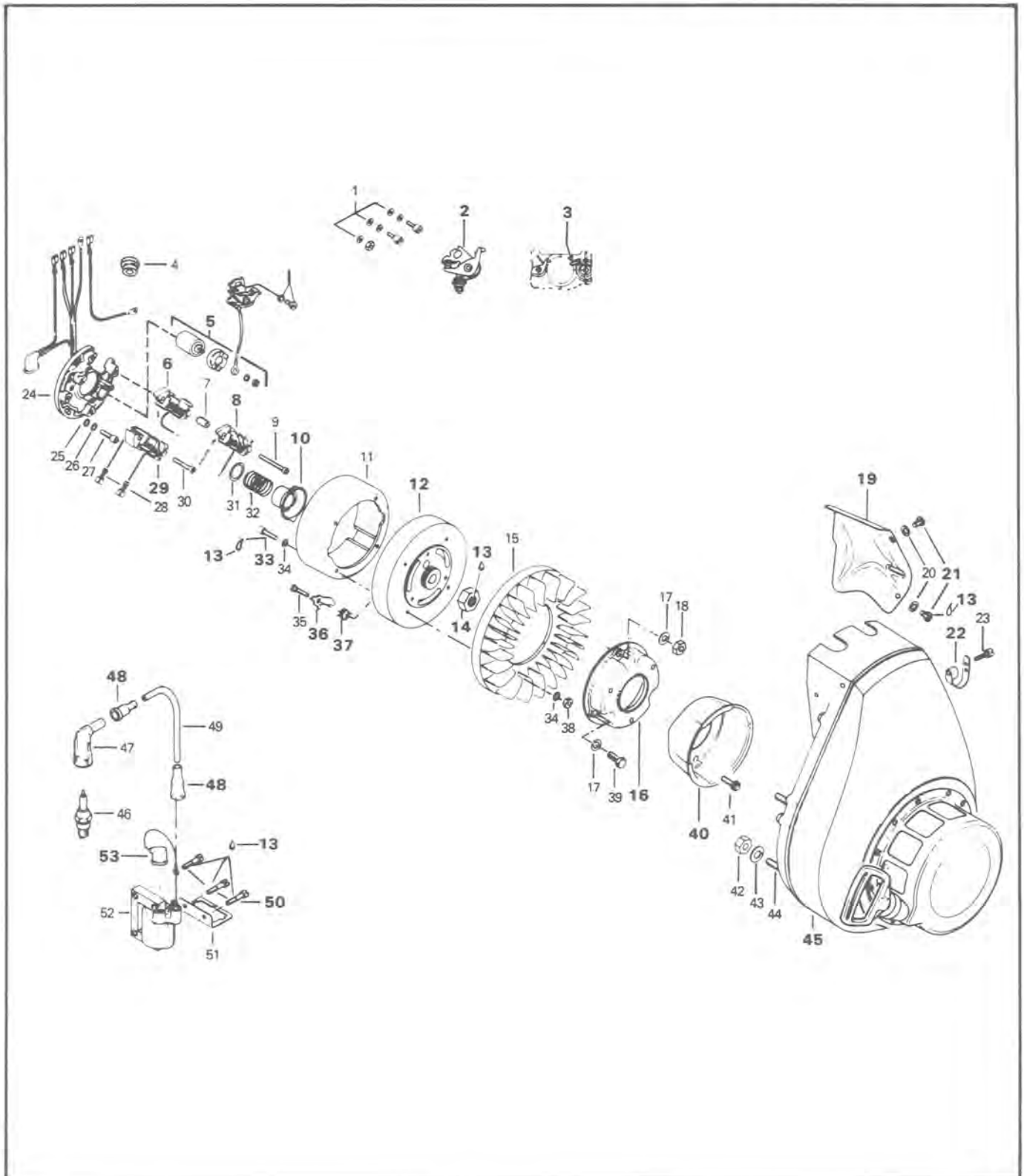
Torque the engine mount nuts to 38 N•m (28 lbf•ft).

#### 13, Labyrinth ring

Position labyrinth ring with bevelled side on top.

To install magneto, refer to "Magneto" in this section.

**MAGNETO & COOLING SYSTEM**



## Section 02 ENGINE

### Sub-section 01 (247 ENGINE TYPE)

1. Magneto parts set
2. Contact breaker set
3. Lubricating wick
4. Grommet
5. Condensor assembly
6. Generator coil with cable
7. Distance sleeve 11 mm (2)
8. Brake light coil with cable
9. Phillips head screw M5 x 32 (2)
10. Breaker cam
11. Magneto ring
12. Magneto housing
13. Loctite 242
14. Hexagonal nut 18 mm x 1.5
15. Fan
16. Pulley spacer
17. Lock washer 6 mm (3)
18. Hexagonal nut M6
19. Air deflector
20. Spring washer B5 (2)
21. Slotted head screw M5 x 8 (2)
22. Cable clamp
23. Slotted head screw M3 x 16
24. Armature plate
25. Washer 5.5 mm (3)
26. Lock washer 5 mm (3)
27. Hexagonal cap screw M5 x 18 (3)
28. Female connector 6.3 (5)
29. Lighting coil with 2 cables
30. Phillips head screw M5 x 28 (2)
31. Cam spring washer
32. Breaker cam spring
33. Hexagonal cap screw M6 x 22 (4)
34. Lockwasher 6 mm (8)
35. Bearing screw M6
36. Centrifugal weight
37. Centrifugal weight spring
38. Hexagonal nut M6 (4)
39. Hexagonal screw M6 x 20 (2)
40. Starting pulley
41. Hexagonal self-tapping screw (3)
42. Hexagonal nut 8 mm (4)
43. Lock washer 8 mm (4)
44. Stud M8 x 23 (3)  
Stud M8 x 34
45. Fan cowl
46. Spark plug
47. Spark plug protector
48. Protection cap (2)
49. Ignition cable 360 mm
50. Slotted head screw M5 x 22 (3)
51. Junction box bracket
52. Ignition coil
53. Mass cable
54. Protector cap

## CLEANING

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

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

## DISASSEMBLY

To gain access to magneto assembly, remove:

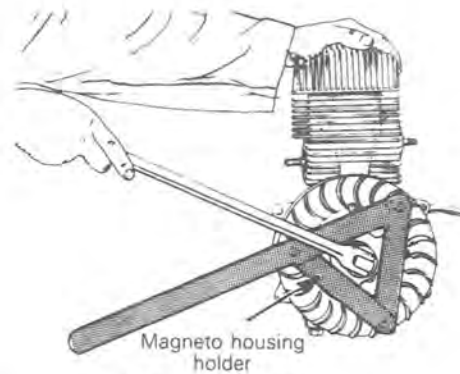
- muffler
- upper column
- air duct
- air deflector
- spark plug cable clamp
- fan cowl
- starting pulley
- pulley spacer

**NOTE:** Before disassembling magneto, indexing marks should be located to facilitate reassembly.

### 14. Magneto retaining nut

To remove magneto retaining nut:

- Lock crankshaft with magneto housing holder (service tool) as illustrated.
- Remove magneto retaining nut.



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P/N: 420 976 550

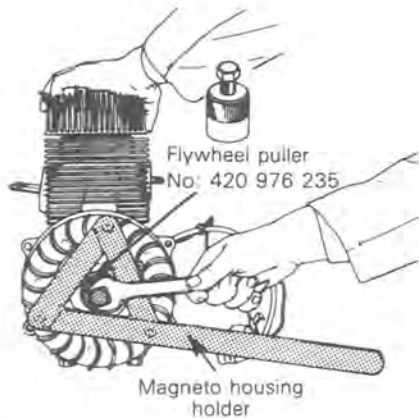
**NOTE:** It should be noted that to correctly remove a Loctite locked fastener it is first necessary to tap on the fastener to break Loctite bond. This will eliminate the possibility of thread breakage.

If magneto housing holder is not available, crankshaft can be locked with the following procedure:

- With engine cold, remove spark plug.
- Bring piston at top dead center position.
- Rotate magneto 45° counterclockwise.
- Insert enough starter rope into cylinder to fill it completely.
- Remove magneto retaining nut.

## 12, Magneto housing

To remove magneto housing (flywheel): use flywheel puller (service tool) and magneto housing holder (service tool) as illustrated.



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

## REPAIR

### 5, Condensor

To replace a condensor:

- Unscrew condensor nut and remove both black leads.
- Drive the condensor out of the armature plate using a suitable pusher.
- To reinstall, reverse procedure.

### 2,3, Contact breaker & lubricating wick

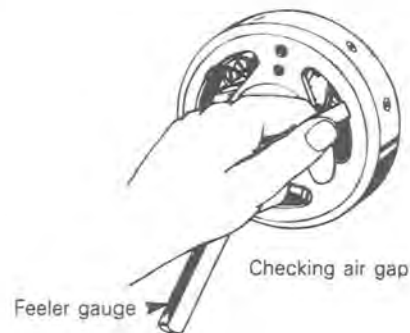
When replacing contact breaker,

- apply a light coat of grease on lubricating wick
- clean breaker points with acetone, alcohol or ether.

### 6,8,29, Generator coil, brake light coil & lighting coil

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

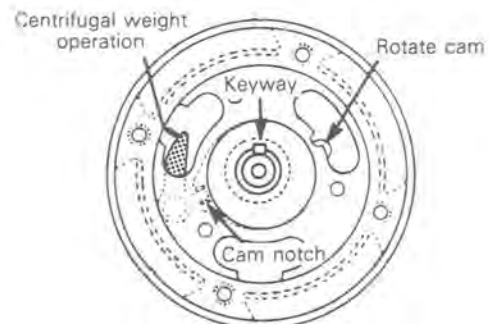
To check air gap, insert a feeler gauge of 0.25-0.38 mm (.010"-.015") between magnet and coil ends. If necessary to adjust, slacken retaining screws and relocate coil.



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## ASSEMBLY

- Clean crankshaft extension (taper).
- Apply Loctite 242 (blue, medium strength).
- Position magneto on crankshaft with the keyway and the cam notch indexed as illustrated:



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### 10,36, Breaker cam & centrifugal weight

Rotate breaker cam to check centrifugal weight operation.

### 37, Centrifugal weight spring

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

### 13,21,33,50, Loctite 242, air deflector screws, magneto ring screws & junction box screws

At assembly of air deflector, magneto and junction box, apply Loctite 242 on screw threads.

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## **Section 02 ENGINE**

### **Sub-section 01 (247 ENGINE TYPE)**

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#### **13,14, Loctite 242 & magneto housing nut**

At assembly, thoroughly clean threads and apply "Loctite 242", then torque retaining nut to 85 N•m (63 lbf•ft).

#### **48,53, Protection cap & mass cable**

At reassembly coat all electric connections with silicone dielectric grease to prevent corrosion or moisture from penetrating. (P/N 413 7017 00).

▼ **CAUTION:** Do not use silicone "sealant", this product will corrode contacts.

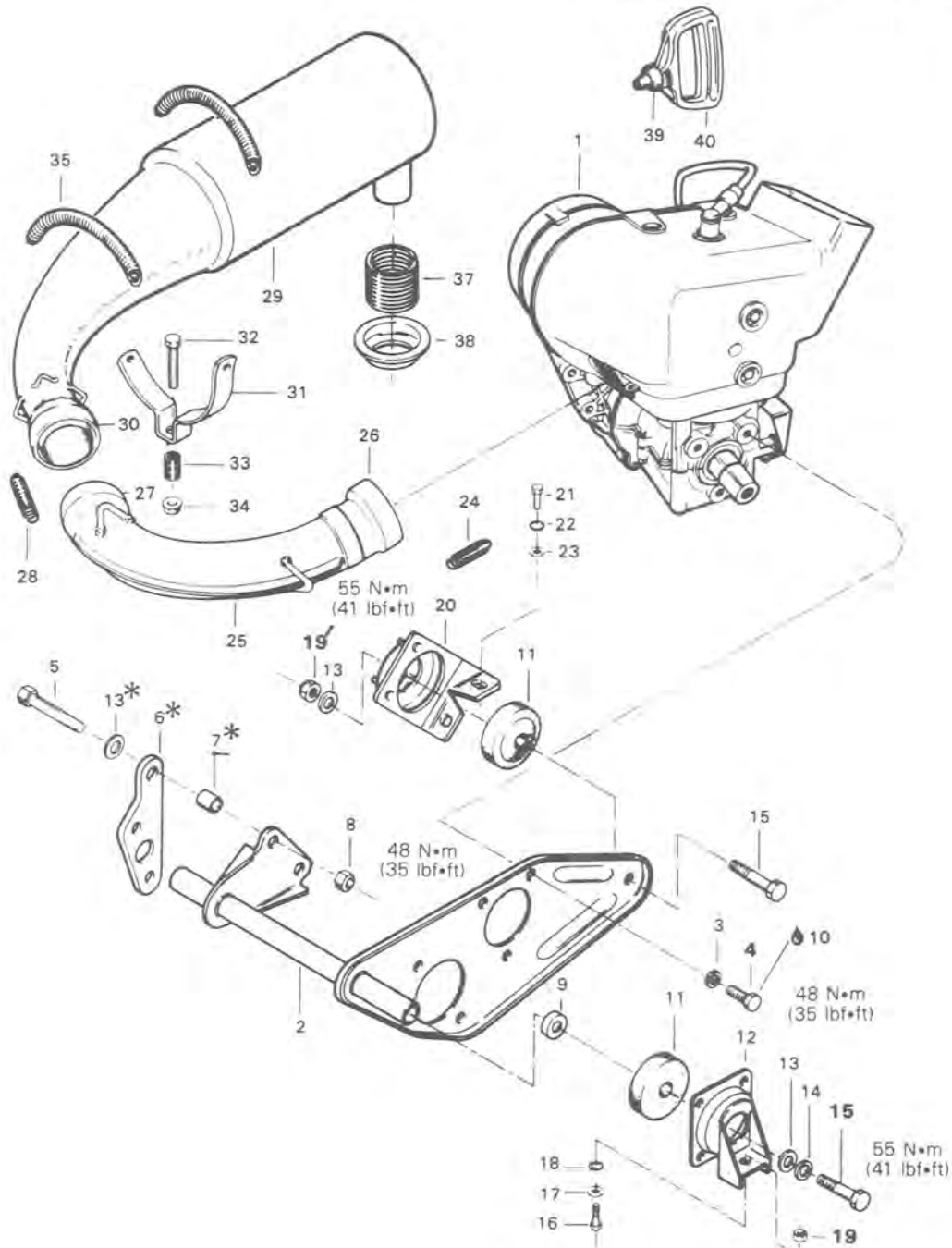
For ignition timing refer to section 04-02.



## 253 ENGINE TYPE

### ENGINE REMOVAL & INSTALLATION

Citation LS/LSE, Tundra, Tundra LT




Parts in illustration marked with \* are used on electric model only.

## Section 02 ENGINE

### Sub-section 02 (253 ENGINE TYPE)


- |   |   |
|---|---|
| 1. Rotax engine 253                       | 21. Hexagonal head cap screw M8 x 20 (3)    |
| 2. Engine bracket                         | 22. Lock washer 8 mm (3)                    |
| 3. Lock washer 10 mm (3)                  | 23. Flat washer 8.4 mm (3)                  |
| 4. Hexagonal head cap screw M10 x 20 (3)  | 24. Spring                                  |
| 5. Hexagonal head cap screw M10 x 35 (2)  | 25. Front shell                             |
| * Hexagonal head cap screw M10 x 45 (2)   | 26. Female ball joint                       |
| *6. Electric starter support              | 27. Male ball joint                         |
| *7. Spacer                                | 28. Spring (2)                              |
| 8. Hexagonal elastic stop nut 10 mm (2)   | 29. Muffler                                 |
| 9. Cup (2)                                | 30. Female ball joint                       |
| 10. Loctite 242 (blue)                    | 31. Muffler support                         |
| 11. Mounting rubber (3)                   | 32. Hexagonal head cap screw M6 x 45        |
| 12. Front support (2)                     | 33. Spring                                  |
| 13. Washer (4)                            | 34. Hexagonal flanged elastic stop nut 6 mm |
| 14. Lock washer 10 mm (2)                 | 35. Spring                                  |
| 15. Hexagonal head cap screw M10 x 40 (3) | 36. Spring                                  |
| 16. Hexagonal head cap screw M10 x 25 (2) | 37. Spring                                  |
| 17. Washer (2)                            | 38. Exhaust grommet                         |
| 18. Internal tooth lock washer (2)        | 39. Rubber stopper                          |
| 19. Hexagonal elastic stop nut 10 mm (3)  | 40. Starter grip                            |
| 20. Rear support                          |   |

 **NOTE:** Parts marked with \* are used on electric model only.

## REMOVAL FROM VEHICLE

Remove or disconnect the following then lift engine from vehicle:

- battery ground cable, (if applicable),
- pulley guard, chaincase support, drive belt and drive pulley (refer to section 03-03)
- pulsation line
- starter cable (if applicable)

 **WARNING:** Before disconnecting any electrical wire in starter system always first disconnect the battery cable.

- muffler
- hood retaining cable
- oil injection pump cable
- electrical connectors
- clamp retaining carburetor on engine
- rewind starter cable
- engine mount screws (3)

### 4,8,15,19, Engine mount screw & nut

Torque both screws **15** of front engine bracket and nut **19** of rear support to 55 N•m (41 lbf•ft).

Torque screws **4** and nuts **8** to 48 N•m (35 lbf•ft).

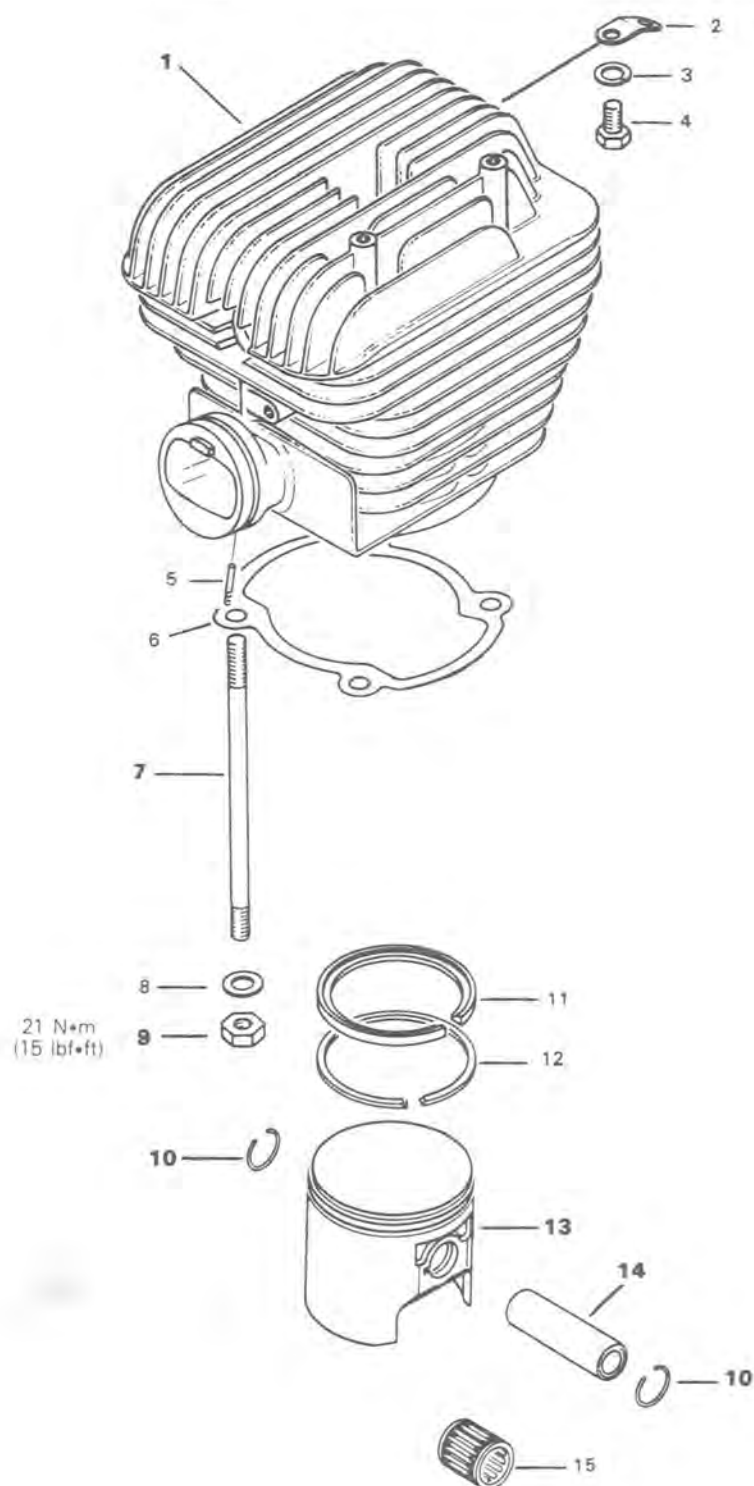
## INSTALLATION ON VEHICLE

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

- Check tightness of engine mounting supports screws.
- Check pulley alignment and drive belt tension.
- Check throttle cable condition.

**Section 02 ENGINE**  
Sub-section 02 (253 ENGINE TYPE)

**TOP END**



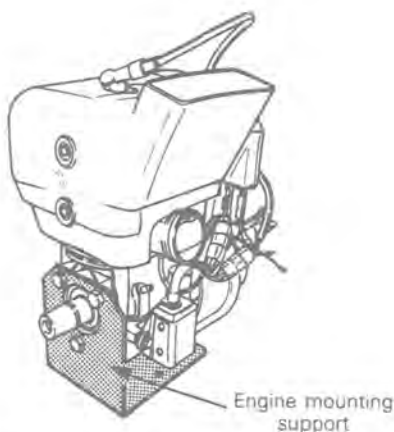
## Section 02 ENGINE

### Sub-section 02 (253 ENGINE TYPE)

1. Headcylinder
2. Spring bracket
3. Lock washer 6 mm
4. Screw M6 x 12
5. Injection fitting
6. Head cylinder gasket
7. Stud M8 x 158.5 (4)
8. Lock washer 8.4 mm (4)

9. Nut M8 (4)
10. Circlip (2)
11. Semi-trapez ring
12. Rectangular ring
13. Piston
14. Gudgeon pin
15. Needle bearing

Use engine mounting support (P/N 420 876 640) to hold engine while working on it.



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**NOTE:** This engine is designed with a headcylinder unit and its mounting nuts are underneath crankcase.

### CLEANING

Discard all gaskets.

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

Scrape off carbon formation from cylinder exhaust port, headcylinder 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 grooves with a groove cleaner tool, or with a piece of broken ring.

### DISASSEMBLY

#### 10,13,14, Piston, gudgeon pin & circlips

Place a clean cloth over crankcase to prevent circlips from falling into crankcase. With a pointed tool inserted in piston notch, remove circlips from piston.

Drive the gudgeon pin out of piston using a suitable drive punch and hammer.

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

### INSPECTION

The inspection of the engine top end must include the following measurements:

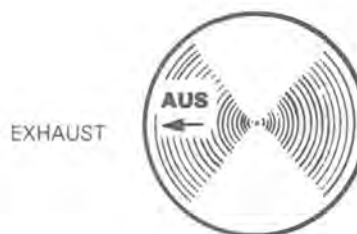
MEASUREMENTS	TOLERANCES		WEAR LIMIT
	FITTING NEW PARTS (MIN.)	(MAX.)	
Cylinder taper	.03 mm (.0012")	.07 mm (.0028")	N.A.
Cylinder out of round	N.A.	N.A.	.10 mm (.0039")
Cylinder/piston clearance	.08 mm (.0031")	.10 mm (.0039")	.20 mm (.0079")
Ring/piston groove clearance	.04 mm (.0016")	.11 mm (.0043")	.20 mm (.0079")
Ring end gap	.20 mm (.0079")	.35 mm (.0138")	1.0 mm (.0394")

**NOTE:** For the measurement procedures, refer to "Engine dimensions measurement", section 02-10.

### ASSEMBLY

#### 10,13, Piston & circlips

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



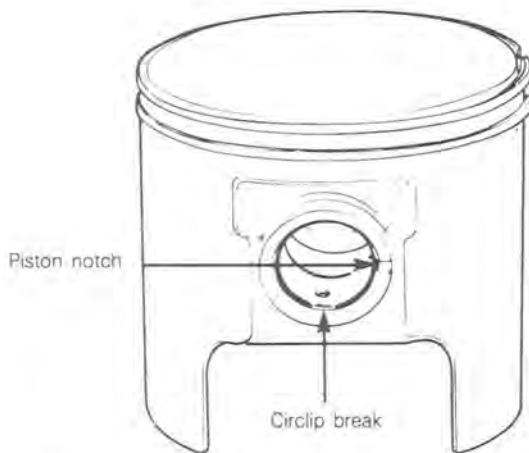
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## Section 02 ENGINE

### Sub-section 02 (253 ENGINE TYPE)

Spare parts pistons and cylinders are identified with a green or red dot, it is important to match the piston with the cylinder of the same color.

To minimize the effect of acceleration forces on circlip, install each circlip so the circlip break is at 6 o'clock as illustrated. Remove any burrs on piston caused through circlip installation with very fine emery cloth.



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

#### 1, Headcylinder

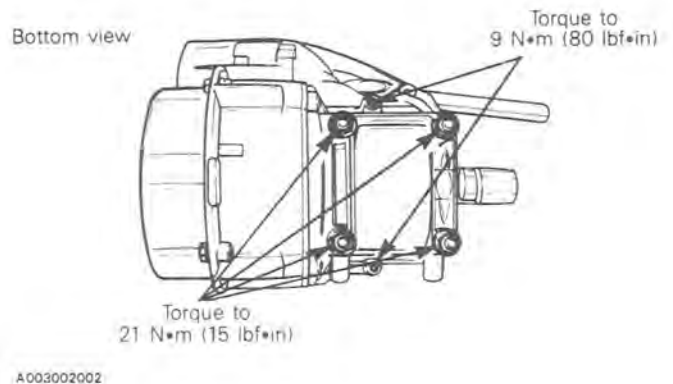
- Before inserting piston in headcylinder, lubricate it with new injection oil or equivalent.
- Remove spark plug.
- Install headcylinder, then rotate crankshaft to position headcylinder.

#### 7, Studs

The longer threaded end must be screwed into the headcylinder.

#### 9, Nuts

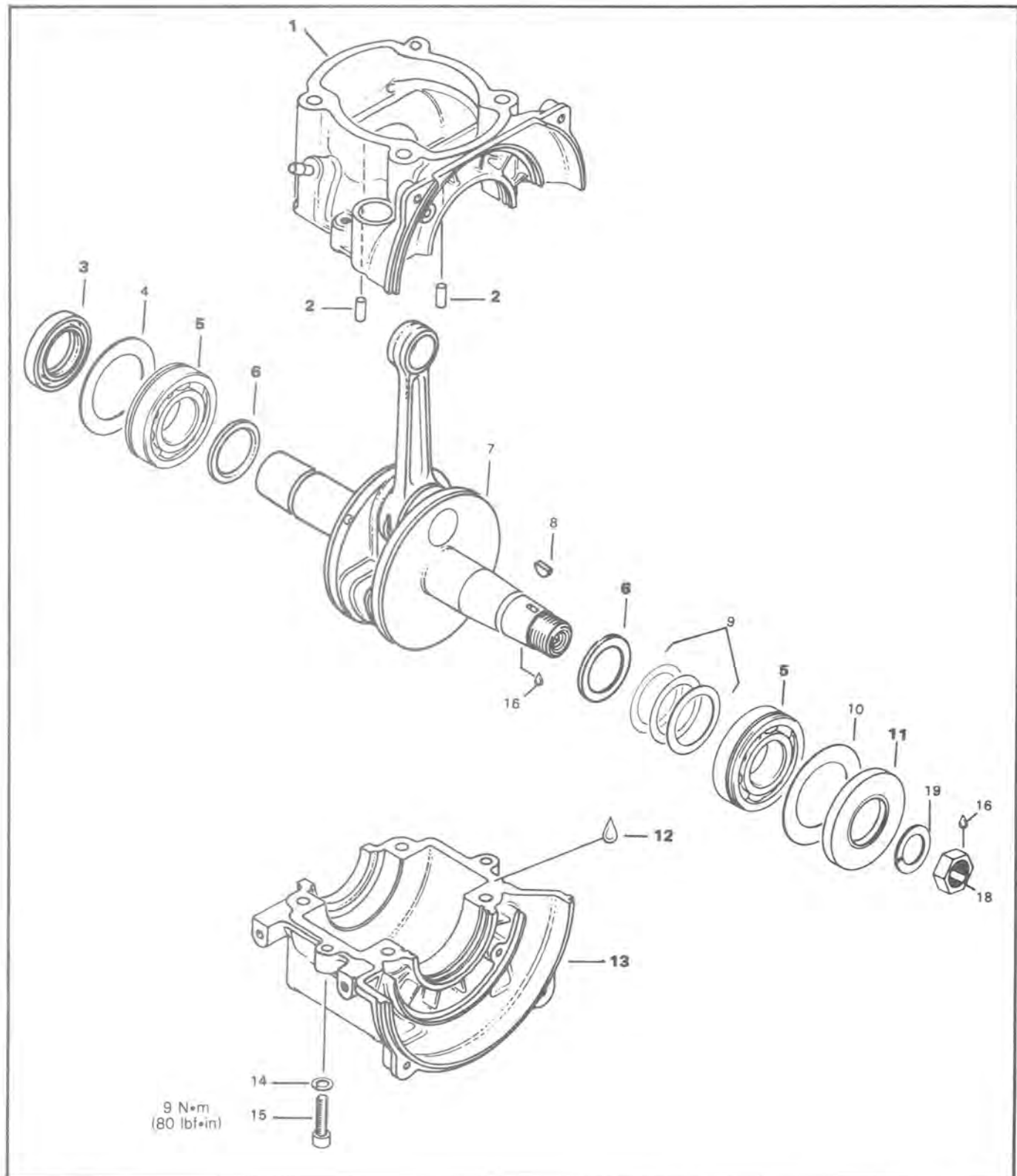
- Cross torque headcylinder nuts to 21 N•m (15 lbf•ft).
- Retorque both crankcase screws to 9 N•m (80 lbf•in).



## Section 02 ENGINE

### Sub-section 02 (253 ENGINE TYPE)

#### BOTTOM END



## Section 02 ENGINE

### Sub-section 02 (253 ENGINE TYPE)

1. Upper crankcase
2. Rubber plug (2)
3. Oil seal P.T.O. side
4. Shim
5. Ball bearing 6206 (2)
6. Distance ring (2)
7. Crankshaft
8. Woodruff key
9. Shim (as required)

10. Bearing retainer
11. Oil seal mag. side
12. Loctite 515
13. Lower crankcase
14. Lock washer M6 (2)
15. Screw M6 x 30 (2)
16. Loctite 242 (blue, medium strength)
17. Lock washer 22 mm
18. Nut M22

## CLEANING

Discard all seals, gaskets and O-rings.

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

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

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

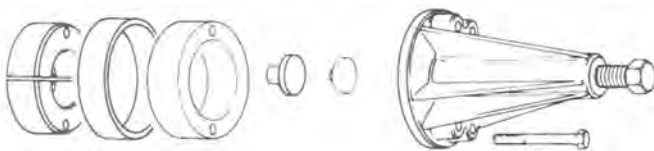
## DISASSEMBLY

### General

To remove magneto, refer to "Magneto" in this section.

### 5, P.T.O. side bearing & MAG. side bearing

To remove bearings from crankshaft use a protective cap and special puller, as illustrated. (See Tools section).



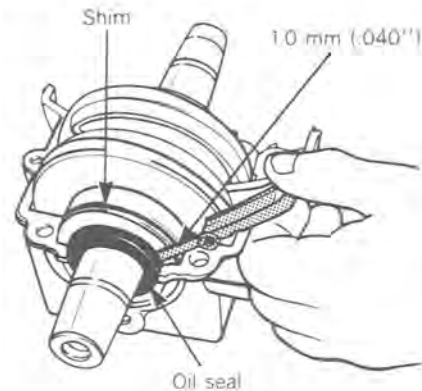
A000002059

### 3,11, Oil seal

At seal assembly, apply a light coat of lithium grease on seal lips.

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

When installing plain seals (seal without locating ring or without spacing legs), ensure to maintain the specified gap between shim/bearing retainer and the seal.



A003002003

### 2, Rubber plug

Prior to installing the crankshaft, make sure both rubber plugs are into upper crankcase holes.

### 1,12,13, Upper crankcase, lower crankcase & Loctite

Crankcase halves are factory matched and therefore, are not interchangeable as single halves.

Prior to joining of crankcase halves, spray new injection oil on all the moving parts of the crankshaft.

Apply Loctite 515 (P/N 413 7027 00) on mating surfaces.

**NOTE:** Prior to applying Loctite 515 it is possible to use primer N (P/N 413 7053 00) or primer NF (P/N 413 7024 00). It increases cure speed and gap filling capability. Refer to supplier instructions.

Position the crankcase halves together, rotate crankshaft 2 or 3 turns, then evenly tighten crankcase screws. Torque them to 9 N•m (80 lbf•in).

## Section 02 ENGINE

### Sub-section 02 (253 ENGINE TYPE)



A003002002

Refer to "Top end" section to complete the assembly.

## INSPECTION

The inspection of the engine bottom end must include the following measurements:

MEASUREMENTS	TOLERANCES		
	FITTING NEW PARTS (MIN.)	(MAX.)	WEAR LIMIT
Crankshaft deflection	N.A.	N.A.	.08 mm (.0032")
Connecting rod big end axial play	.20 mm (.0078")	.53 mm (.0208")	1.0 mm (.0394")
Crankshaft end play	0.1 - 0.4 mm (.004" - .016")		

NOTE: For the measurement procedures, refer to "Engine dimensions measurement", section 02-10.

## ASSEMBLY

### General

CAUTION: Before engine reassembly, make sure there is no axial pressure on crankshaft and that the crankshaft end-play is properly adjusted.

### Crankshaft end-play adjustment

Refer to "Engine dimensions and measurement", section 02-10 for the procedures.

### 6, Distance ring

At installation, always locate its inner radius against counterweight radius. Make sure it does not slip between the counterweight and the bearing.

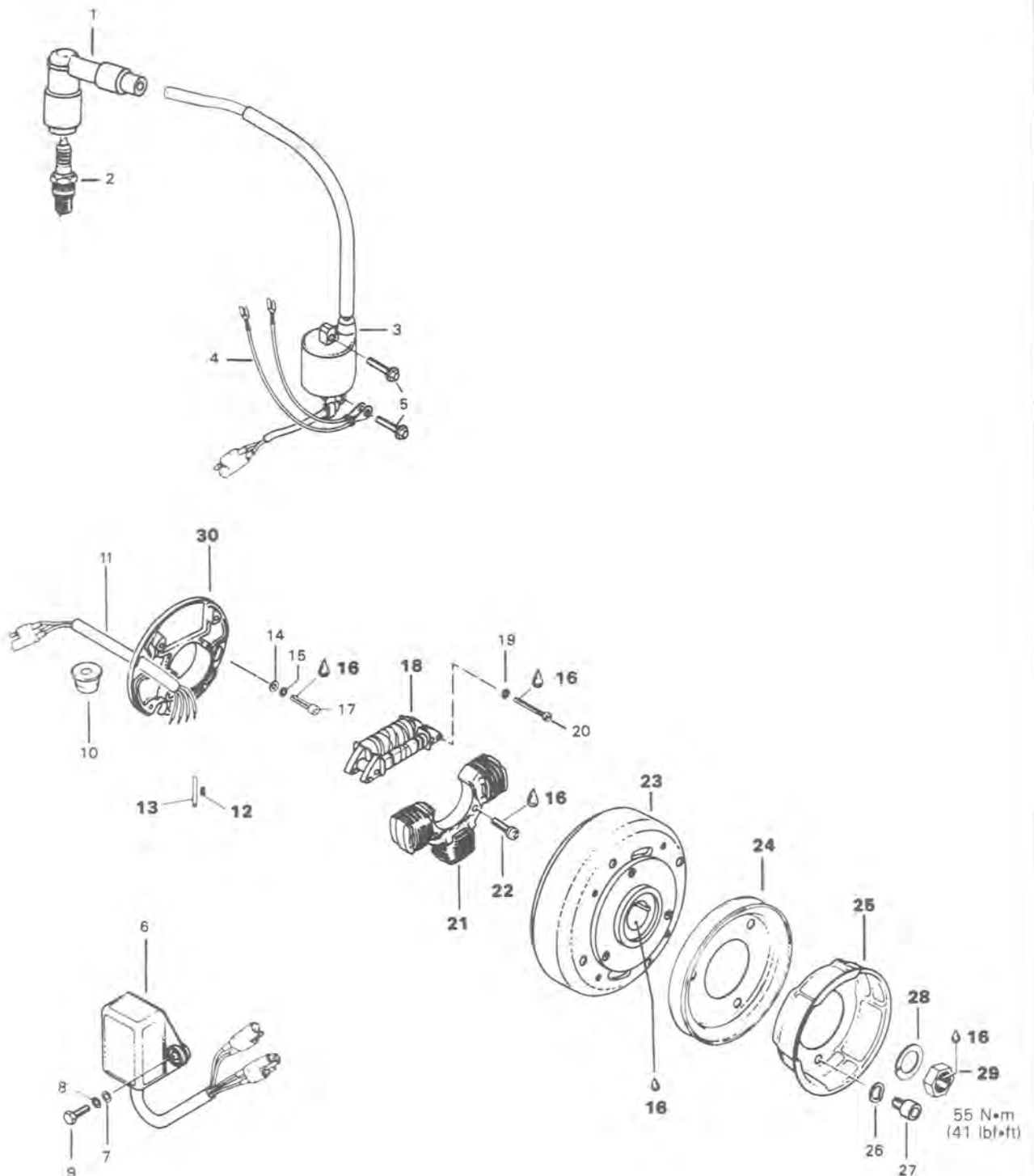
### 5, Crankshaft ball bearing

Prior to installation, place bearings into an oil container filled with oil heated to 100°C (210°F). This will expand bearings and ease installation. Install outer race groove outward.



**Section 02 ENGINE**  
Sub-section 02 (253 ENGINE TYPE)

**MAGNETO**



## Section 02 ENGINE

### Sub-section 02 (253 ENGINE TYPE)

1. Spark plug protector
2. Spark plug
3. Ignition coil
4. Ground wire (2)
5. Tapite screw M5 x 20 (2)
6. Amplifier box
7. Washer 6 mm (2)
8. Lock washer 6 mm (2)
9. Screw M6 x 20 (2)
10. Wiring grommet
11. Wire ass'y
12. Splice connector (6)
13. Protector tube (6)
14. Washer 5.5 mm (2)
15. Lock washer 5 mm (2)

16. Loctite 242 (blue, medium strength)
17. Screw M5 x 18 (2)
18. Generating coil
19. Lock washer 5 mm (2)
20. Screw M5 x 35 (2)
21. Lighting coil
22. Screw M6 x 25 (2)
23. Magneto flywheel
24. V-belt pulley
25. Starting pulley
26. Lock washer 8 mm (3)
27. Screw M8 x 12 (3)
28. Lock washer 22 mm
29. Nut M22
30. Armature plate

## CLEANING

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

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

## DISASSEMBLY

### 24,25,29, V-belt pulley, starting pulley, nut

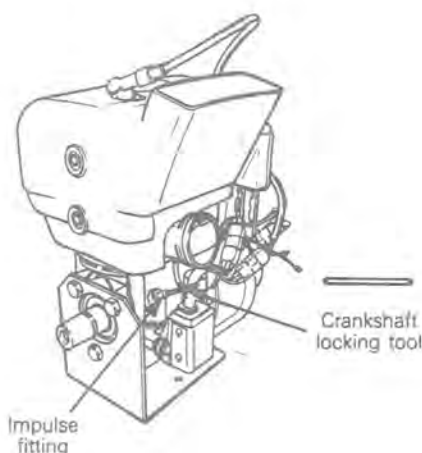
To gain access to magneto assembly, remove:

- injection oil line
- rewind starter
- starting and v-belt pulleys

**NOTE:** Before disassembling magneto plate, indexing marks should be located to facilitate reassembly.

To remove magneto flywheel retaining nut:

- lock crankshaft with crankshaft locking tool (P/N 420 876 640).



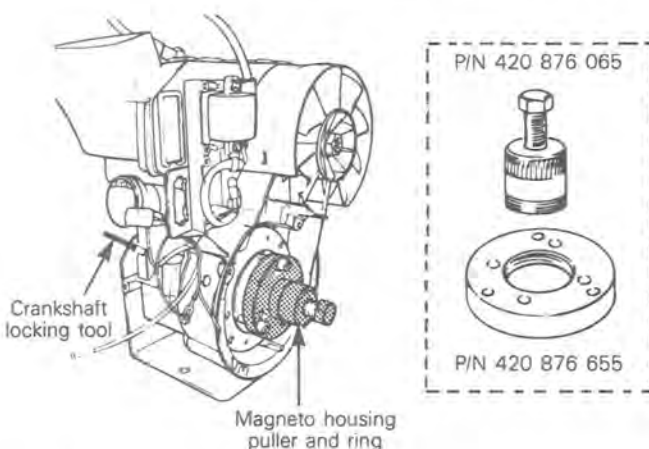
A003002005

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

### 23, Magneto flywheel

To remove:

- unscrew magneto retaining nut.



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**NOTE:** For the above procedure, the locking type puller can be used without crankshaft locking tool.



A000001082

## Section 02 ENGINE

### Sub-section 02 (253 ENGINE TYPE)

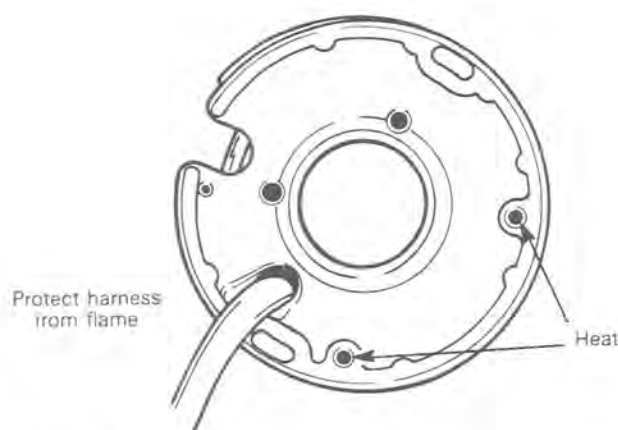
- tighten puller bolt and at same time, tap on bolt head using a hammer to release magneto from its taper.

## REPAIR

### 18, Generating coil

To replace generating coil:

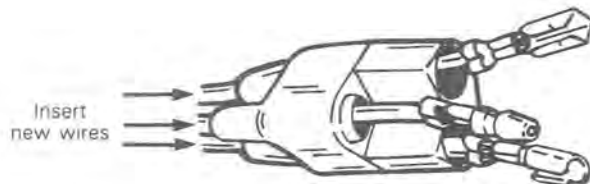
- Heat the armature plate to 93°C (200°F) around the screw holes to break the Loctite bond.



A001002003

#### CAUTION: Protect harness from flame.

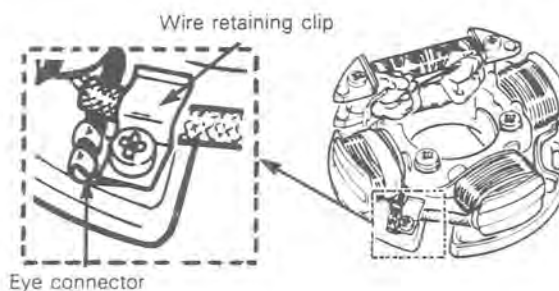
- Remove screws (use Phillips no. 2 or suitable flat screw driver).
- Cut the four wires as close as possible to the coil body.
- To pass new coil wires in harness, tape the old wires to the end of new wires and pull them through the harness protector tube.
- Insert the new wires into the old connector housing and install connectors.



A001002004

#### CAUTION: Replace the old wires in the connector with the same color coded new wires.

- Install a new receptacle connector to the black/yellow striped wire.
- To install the ground connector of the armature plate, tape the new black lead to the old one and pull it under the lighting coil with the old wire.
- Solder an eye connector to the lead and fasten it under the wire retaining clip.



A001002005

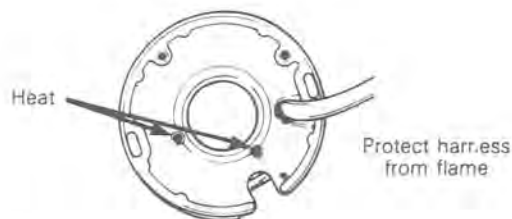
- To install the new coil on the armature plate, remove the shipping nuts from the coil and apply Loctite 242 (blue, medium strength) to screws before assembly.

#### CAUTION: Before reinstalling the magneto, remove the loose epoxy from harness.

### 12,13,21,22, Protector tubes, splice connectors, lighting coil & screws

To replace lighting coil:

- Heat the armature plate to 93°C (200°F) around the screw holes to break the Loctite bond.



A001002003

#### CAUTION: Protect harness from flame.

- Remove screws (use Phillips no. 3 screwdriver).
- Remove the wire retaining clip from armature plate.
- Pull out protector tubes and unsolder the splice connectors.

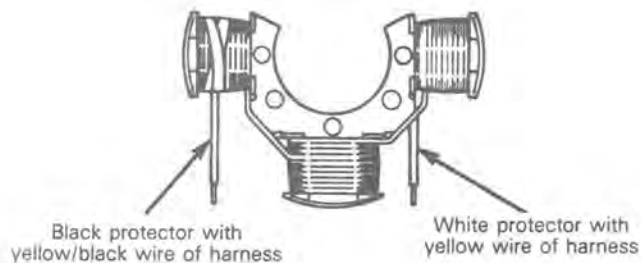
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## Section 02 ENGINE

### Sub-section 02 (253 ENGINE TYPE)

---

- Solder the yellow wire in the harness to the white tube protected wire of the coil.
- Solder the yellow/black striped wire in the harness to the black tube protected wire of the coil.



AD01002006

- Position protector tubes over connections.
- Prior to assembly, apply Loctite 242 (blue, medium strength) on the lighting coil screws.
- Fasten retaining clip onto protector tubes.

▼ **CAUTION:** Before reinstalling magneto, remove the loose epoxy from harness.

## ASSEMBLY

### 23,28,29,30, Armature plate, magneto flywheel, lock washer & nut

Position the armature plate on the crankcase aligning the marks on both parts.

Clean crankshaft extension taper.

Apply Loctite 242 (blue, medium strength) on taper.

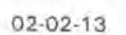
Position key magneto flywheel and lock washer on crankshaft.

- Clean nut threads and apply Loctite 242 (blue, medium strength) before tightening nut to 85 N•m (63 lbf•ft).
- At reassembly coat all electric connections with silicone dielectric grease P/N 413 7017 00 grease to prevent corrosion or moisture penetration.

▼ **CAUTION:** Do not use silicone "sealant", this product will corrode contacts.

○ **NOTE:** For ignition timing procedure refer to "Ignition timing" section 04-02.

## COOLING SYSTEM



## Section 02 ENGINE

### Sub-section 02 (253 ENGINE TYPE)

1. Fan housing
2. Snap ring
3. Shim (2)
4. Bearing 6203 (2)
5. Fan shaft
6. Woodruff key
7. Spacer
8. Pulley half
9. Shim 0.5 mm
10. Fan
11. Lock washer 16 mm
12. Nut M16

13. V-belt
14. Lock washer 6 mm (4)
15. Screw M6 x 30 (4)
16. Fan cover
17. Cylinder cowl
18. Taptite screw M16 x 16
19. Rubber washer (4)
20. Cowl cover (4)
21. Lock washer 6 mm (4)
22. Screw M6 x 12 (3)
23. Screw M6 x 16

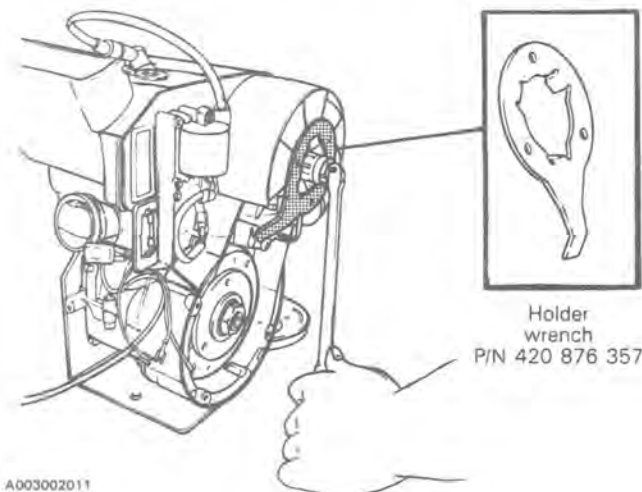
## CLEANING

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

## DISASSEMBLY & ASSEMBLY

### 12, Fan nut

To remove or install fan pulley retaining nut, lock fan pulley with special holder wrench P/N 420 876 357. At assembly, torque nut to 55 N•m (41 lbf•ft).



A003002011

### 9,13, Shims & V-belt

Fan belt deflection must be 9.5 mm (3/8'') when applying a force of 50 N (11 lbf). To adjust, install or remove shim(s) between pulley halves. Install excess shim(s) between fan and lock washer.

Use belt tension tester P/N 414 3482 00 to check deflection.



A000002007

### 1,4, Ball bearing & fan housing

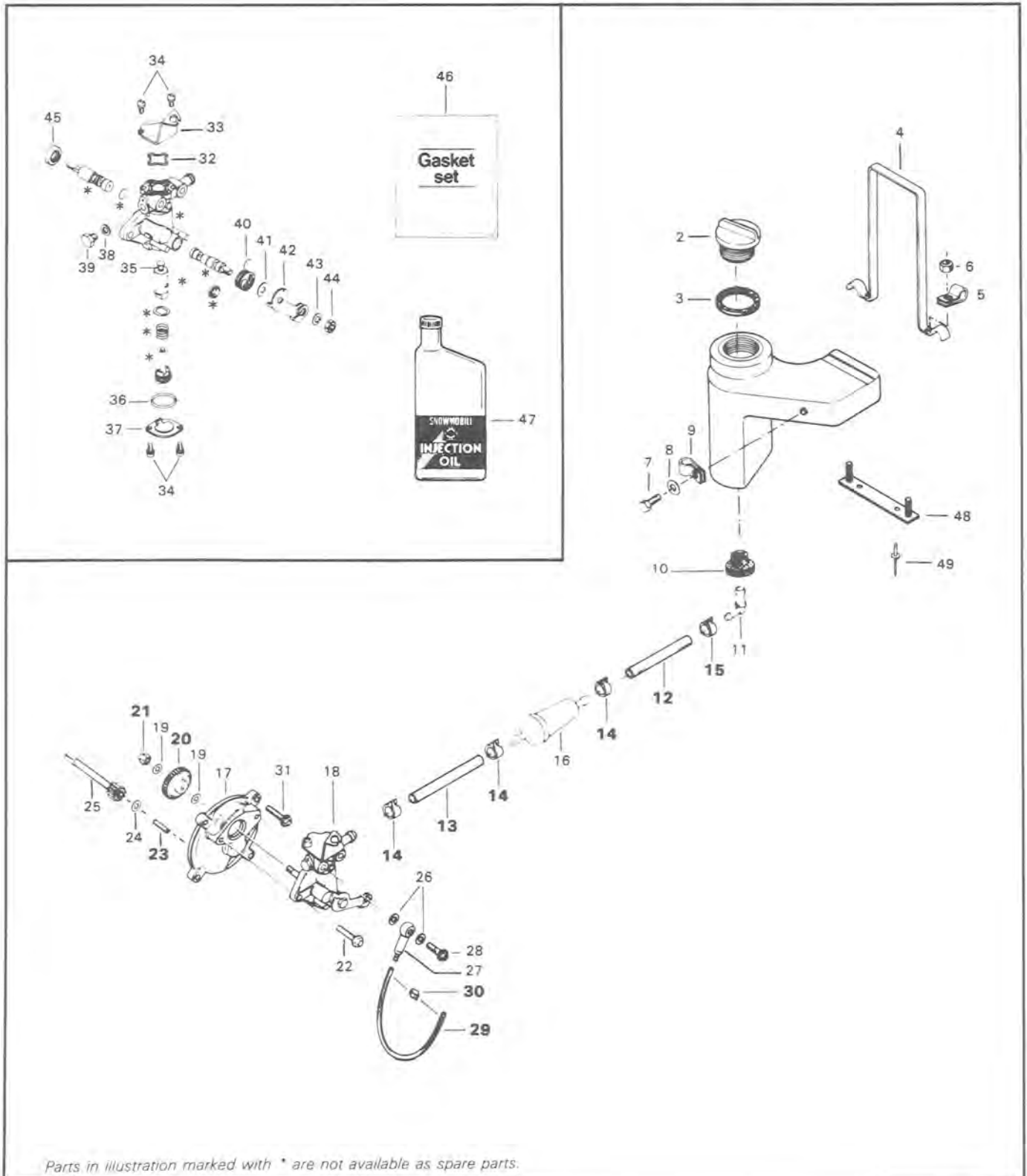
It is first necessary to heat bearing housing to 65°C (150°F) to remove or install bearing.

### 15,18,23, Upper fan cowl screws & fan housing screws

At assembly, apply a light coat of Loctite 242 on threads. It should be noted that to correctly remove a Loctite locked screw, it is first necessary to slightly tap on head screw to break Loctite bond. The screw can then be removed. This will eliminate the possibility of screw breakage.

**WARNING:** If fan protector is removed, always reinstall after servicing.

## OIL INJECTION PUMP & RESERVOIR



## Section 02 ENGINE

### Sub-section 02 (253 ENGINE TYPE)

1. Injection oil tank
2. Oil tank cap
3. O-ring
4. Retainer clip
5. Clip
6. Hexagonal flanged elastic stop nut 6 mm (2)
7. Screw
8. Washer
9. Clip
10. Grommet
11. Male connector
12. Oil line 2" (50 mm)
13. Oil line 3" (75 mm)
14. Spring clip (3)
15. Spring clip
16. Filter
17. Oil pump mounting flange
18. Oil pump
19. Washer 6.2 (2)
20. Oil pump gear 27 teeth
21. Lock nut 6 mm
22. Taptite screw M5 x 16 (2)
23. Needle roller B4 x 17.8
24. Washer 4.3
25. 9 teeth gear
26. Oil banjo gasket (2)
27. Banjo
28. Banjo bolt
29. Oil line 13" (330 mm)
30. Clamp (2)
31. Taptite screw M5 x 20 (4)
32. O-ring
33. Plate
34. Screw with lock washer (4)
35. Retainer
36. O-ring
37. Cam casing plate
38. Washer
39. Hexagonal head cap screw
40. Spring
41. Washer
42. Lever
43. Lock washer 6 mm
44. Hexagonal nut 6 mm
45. Seal
46. Gasket set
47. Injection oil (1 liter)
48. Retainer plate (underneath frame)
49. Rivet (2)

## CLEANING

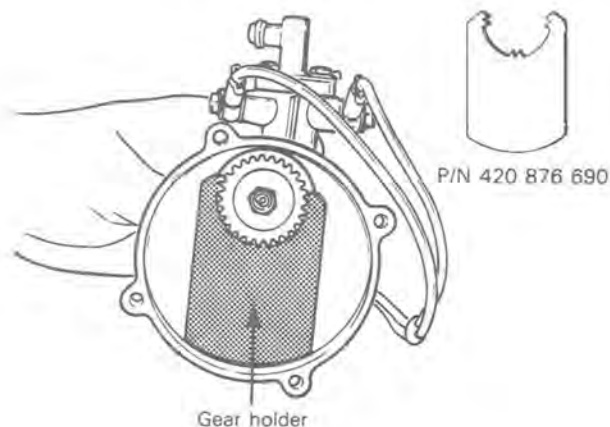
Clean all metal components in a non-ferrous metal cleaner.

## DISASSEMBLY

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

### 20,21, Gear retaining nut & oil pump gear

To remove gear retaining nut, first extract the needle roller with pliers then lock gear in place using no. 420 876 690 tool.



## ASSEMBLY

### 20, Oil pump gear

At gear assembly, apply a light coat of grease on gear teeth.

### 23, Needle roller

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

### 14,15,30, Spring clips & clamp

Always check for spring clip and clamp tightness.

### 12,13,29, Oil lines

▼ **CAUTION:** On electric start models, it is recommended to install black rubber oil lines (P/N 414 2867 00) that will not be altered by battery fumes.

## ADJUSTMENT

Prior to adjusting the pump, make sure all carburetor adjustments are completed.



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## Section 02 ENGINE

### Sub-section 02 (253 ENGINE TYPE)

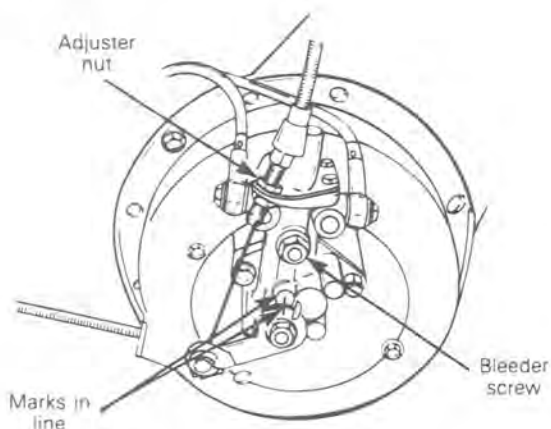
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#### To synchronize pump with carburetor:

Eliminate the throttle cable free-play by pressing the throttle lever until a light resistance is felt, then hold in place. The aligning marks on the pump casting and on the lever must align. If not, loosen the adjuster nut and adjust accordingly.

Retighten the adjuster nut.

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



A001002008

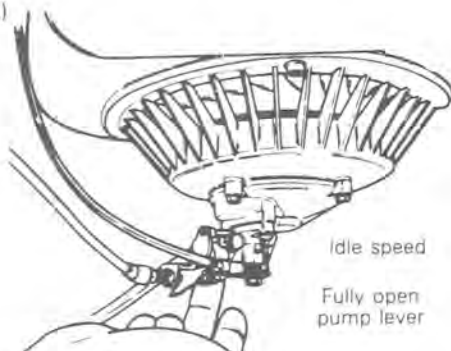
#### To bleed oil lines:

All oil lines should be full of oil. If required, bleed the main oil line (between tank and pump) by loosening the bleeder screw until all air has escaped from the line.

Make sure the tank is sufficiently filled.

Check the small oil lines (between pump and intake manifold). If required, fill the lines by running the engine at idle speed while holding the pump lever in fully open position.

(TYPICAL)



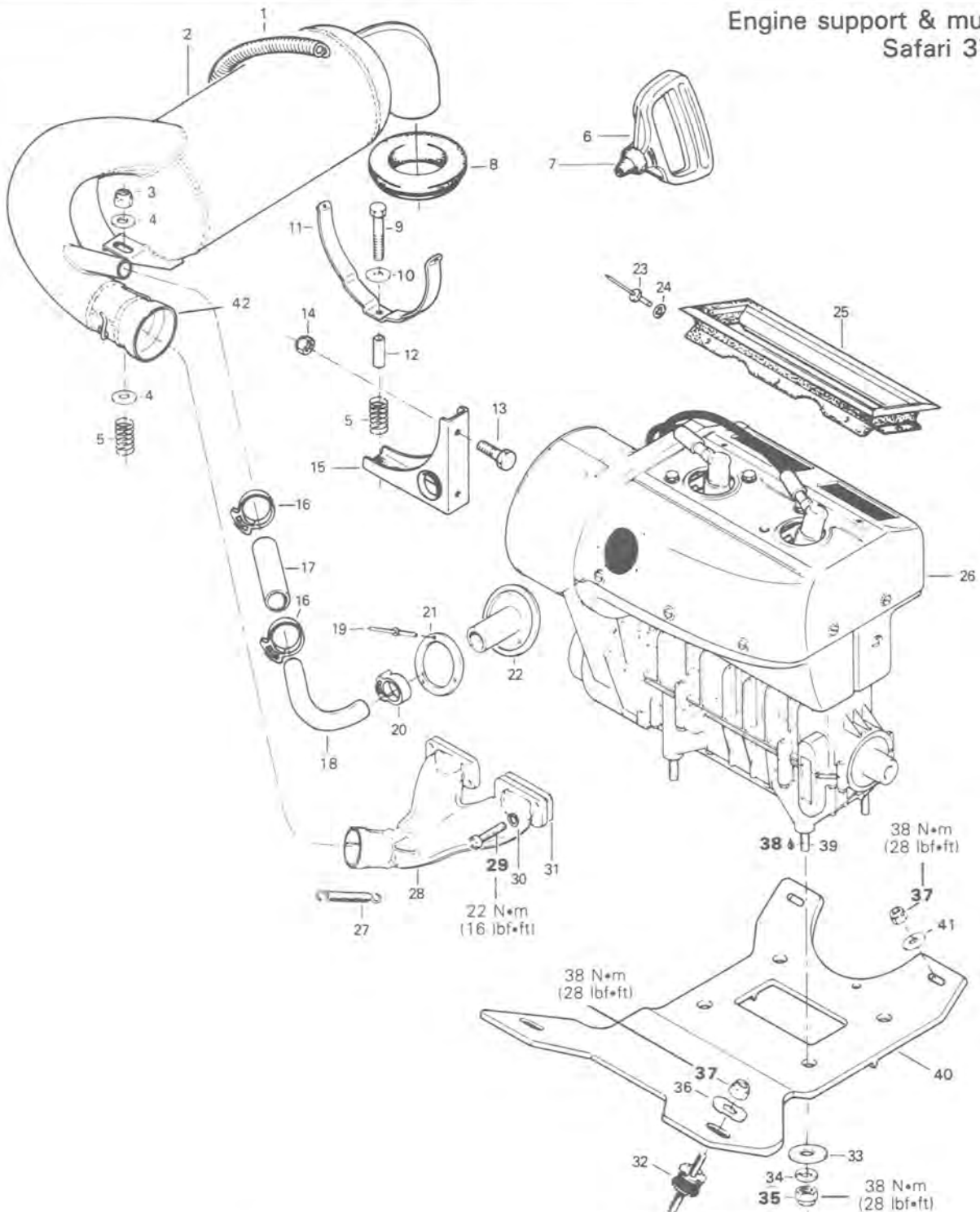
A001002009



# 377 ENGINE TYPE

## ENGINE REMOVAL & INSTALLATION

Engine support & muffler  
Safari 377/E



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## Section 02 ENGINE

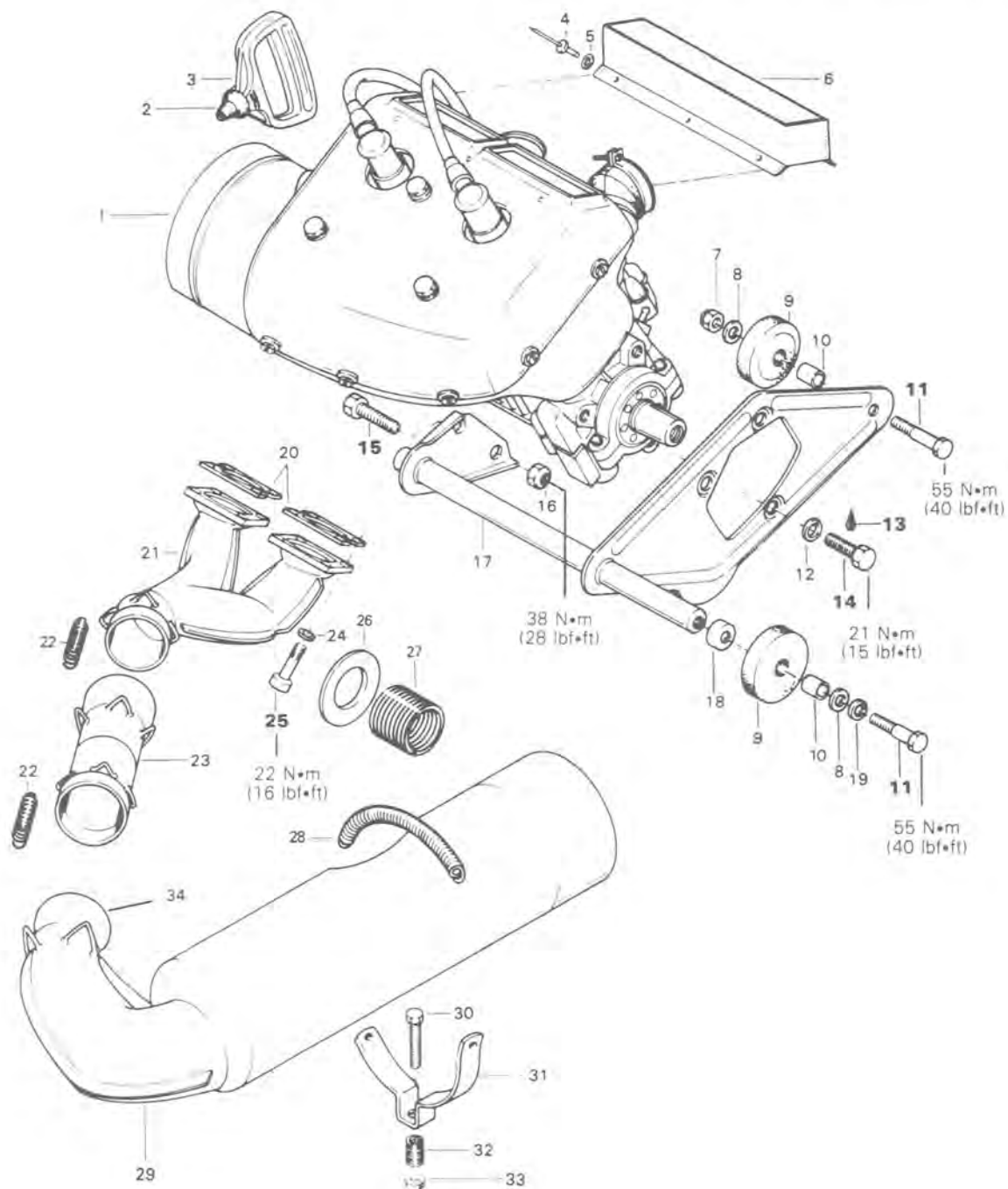
### Sub-section 03 (377 ENGINE TYPE)

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- |                               |                                    |
|-------------------------------|------------------------------------|
| 1. Spring                     | 22. Connector                      |
| 2. Muffler                    | 23. Rivet (6)                      |
| 3. Elastic stop nut M8 x 1.25 | 24. Washer (6)                     |
| 4. Washer 8.4 mm (2)          | 25. Air duct                       |
| 5. Spring (2)                 | 26. Rotax engine 377               |
| 6. Starter grip               | 27. Spring (2)                     |
| 7. Rubber buffer              | 28. Exhaust manifold               |
| 8. Exhaust washer             | 29. Allen screw M8 x 30 (4)        |
| 9. Cap screw M6 x 20          | 30. Lock washer 8 mm (4)           |
| 10. Washer 6 mm               | 31. Gasket (4)                     |
| 11. Muffler attachment        | 32. Rubber mount (4)               |
| 12. Bushing                   | 33. Washer 10.5 mm (4)             |
| 13. Cap screw M6 x 16 (2)     | 34. Lock washer 10 mm (4)          |
| 14. Elastic stop nut (2)      | 35. Hexagonal nut 10 mm (4)        |
| 15. Muffler support           | 36. Internal tooth cup washer (2)  |
| 16. Plastic clamp (2)         | 37. Elastic stop nut M10 x 1.5 (4) |
| 17. Hose                      | 38. Loctite 242                    |
| 18. Elbow                     | 39. Stud M10 x 25 (4)              |
| 19. Rivet (3)                 | 40. Engine support                 |
| 20. Plastic clamp             | 41. Washer (2)                     |
| 21. Connector ring            | 42. Female ball joint              |
-

## ENGINE REMOVAL & INSTALLATION

Engine support & muffler  
Skandic 377, Skandic 377R



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## Section 02 ENGINE

### Sub-section 03 (377 ENGINE TYPE)

---


- |                                |                             |
|--------------------------------|-----------------------------|
| 1. Engine Rotax 377            | 18. Cup (2)                 |
| 2. Rubber buffer               | 19. Lock washer 10 mm (2)   |
| 3. Starter grip                | 20. Gasket (4)              |
| 4. Rivet (6)                   | 21. Exhaust manifold        |
| 5. Washer (6)                  | 22. Spring (6)              |
| 6. Air duct                    | 23. Connector               |
| 7. Elastic stop nut 10 mm      | 24. Lock washer 8 mm (4)    |
| 8. Washer 10.5 mm (3)          | 25. Allen screw M8 x 30 (4) |
| 9. Rubber mount (3)            | 26. Exhaust washer          |
| 10. Bushing (3)                | 27. Spring                  |
| 11. Cap screw M10 x 45 (3)     | 28. Spring (2)              |
| 12. Lock washer 10 mm (3)      | 29. Muffler                 |
| 13. Loctite 242                | 30. Cap screw M6 x 40       |
| 14. Cap screw M10 x 25 (3)     | 31. Muffler support         |
| 15. Cap screw M10 x 35 (2)     | 32. Spring                  |
| 16. Elastic stop nut 10 mm (2) | 33. Elastic stop nut 6 mm   |
| 17. Engine bracket             | 34. Female ball joint       |
- 

## REMOVAL FROM VEHICLE

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

### Safari 377/E

- Pulley guard, drive belt, drive pulley
- Exhaust manifold
- Elbow tube on cylinder cowl
- Clamp between carburetor and intake manifold
- Oil injection pump cable
- Oil lines
- Pulsation line
- Hood retaining cable
- Rewind starter cable

 **WARNING:** Before disconnecting any electrical wire in starter system always first disconnect the battery cable.

- Wiring harness
- Engine stud nuts (under engine support)

### Skandic 377 & Skandic 377R

- Pulley guard, drive belt, drive pulley
- Exhaust manifold
  - Clamp between carburetor and intake manifold
  - Pulsation line
  - Rewind starter cable
  - Wiring harness
  - Hood retaining cable
  - Engine support bolts

## ENGINE SUPPORT & MUFFLER ASSEMBLY

### Safari 377/E

**29,35,37,38, Manifold bolts, engine stud nuts, engine support nuts & Loctite 242**

Apply Loctite 242 on the engine stud nuts then torque to 38 N•m (28 lbf•ft).

Torque the engine support to 38 N•m (28 lbf•ft).

Torque the exhaust manifold bolts to 22 N•m (16 lbf•ft).

### Skandic 377 & Skandic 377R

**11,13,14,15,25, Engine support bolts, Loctite, engine to engine support bolts & exhaust manifold bolts**

Apply Loctite 242 on the engine to engine support screw then torque to 21 N•m (15 lbf•in).

Torque the engine to engine support, bolts and nuts to 38 N•m (28 lbf•ft).

Torque the engine support bolts to 55 N•m (40 lbf•ft).

Torque the exhaust manifold bolts to 22 N•m (16 lbf•ft).

## INSTALLATION ON VEHICLE

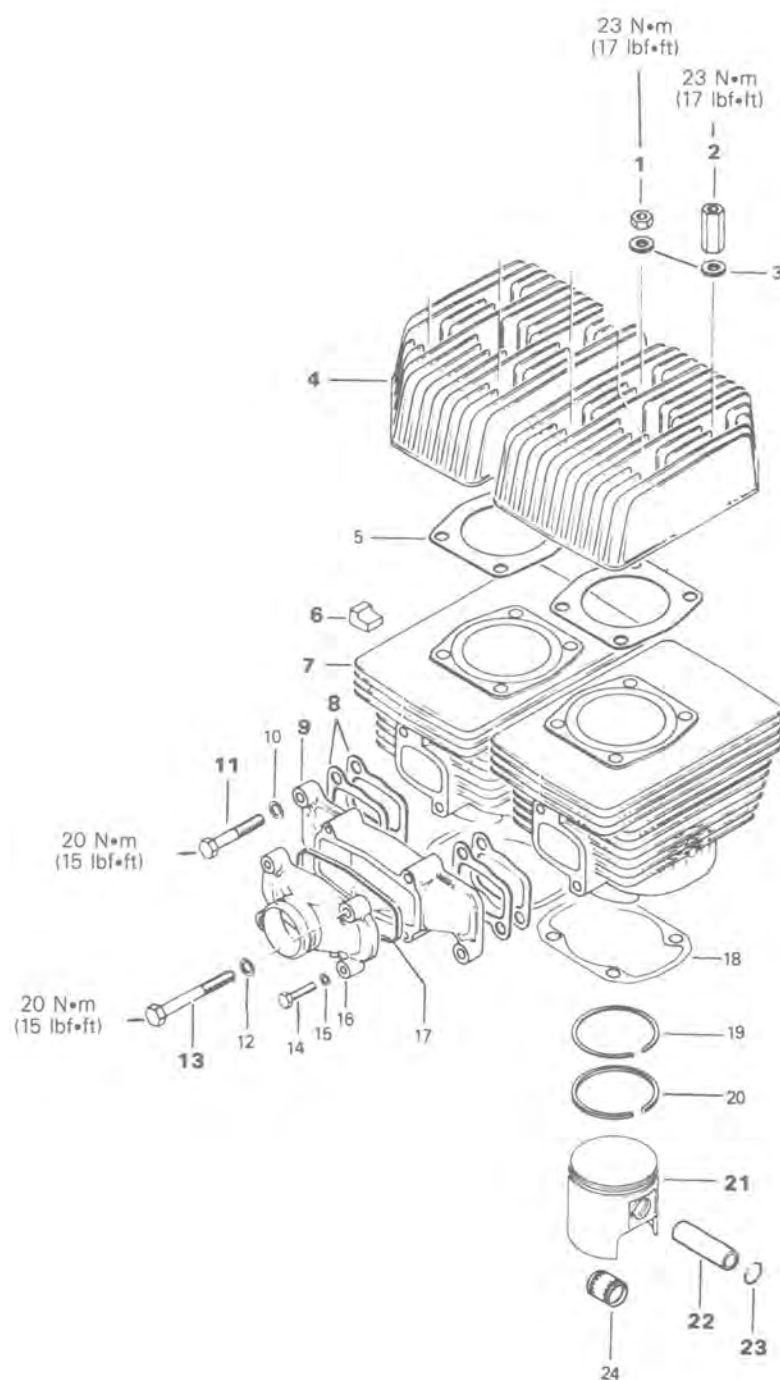
To install engine on vehicle, reverse removal procedure.  
However, pay attention to the following:

- Check tightness of engine mount nuts.
- Verify throttle cable condition then after throttle cable installation, check maximum throttle slide opening.
- Check pulley alignment and drive belt tension.

## Section 02 ENGINE

### Sub-section 03 (377 ENGINE TYPE)

#### TOP END





## Section 02 ENGINE

### Sub-section 03 (377 ENGINE TYPE)

1. Hex. nut M8 (5)
2. Distance nut M8 x 27,5 (3)
3. Washer (8)
4. Cylinder head (2)
5. Gasket, cylinder head (2)
6. Noise damper (1)
7. Cylinder (2)
8. Gasket, intake manifold (4)
9. Intake manifold (1)
10. Lock washer 8 mm (2)
11. Hex. screw M8 x 40 (2)
12. Lock washer 8 mm (2)


13. Hex. screw M8 x 74 (2)
14. Hex. screw M6 x 25 (2)
15. Lock washer 6 mm (2)
16. Intake cover (1)
17. Rubber ring (1)
18. Gasket, cylinder flange (2)
19. Semi-trapez ring (2)
20. Rectangular ring (2)
21. Piston (2)
22. Gudgeon pin (2)
23. Circlip (4)
24. Needle cage (2)

## CLEANING

Discard all gaskets.

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

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

 **NOTE:** The letters "AUS" (over 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

### 21,22,23, Piston, gudgeon pin & circlips

Place a clean cloth over crankcase to prevent circlips from falling into crankcase. Then with a pointed tool inserted in piston notch, remove circlips from piston.


Drive the gudgeon pin out of piston using a suitable drive punch and hammer.

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

## INSPECTION

The inspection of the engine top end must include the following measurements:

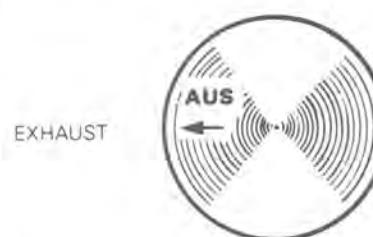
MEASUREMENTS	TOLERANCES		
	FITTING NEW PARTS (MIN.)	(MAX.)	WEAR LIMIT D'USURE
Cylinder taper	N.A.	N.A.	.08 mm (.0031")
Cylinder out of round	N.A.	N.A.	.05 mm (.0020")
Cylinder/piston clearance	.08 mm (.0031")	10 mm (.0039")	.20 mm (.0079")
Ring/Piston groove clearance	.04 mm (.0016")	.11 mm (.0043")	.20 mm (.0079")
Ring end gap	.20 mm (.0079")	.35 mm (.0138")	1.0 mm (.0394")

 **NOTE:** For the measurement procedures, refer to "Engine dimensions measurement", section 02-10.

## ASSEMBLY

### 21,23, Pistons & circlips

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



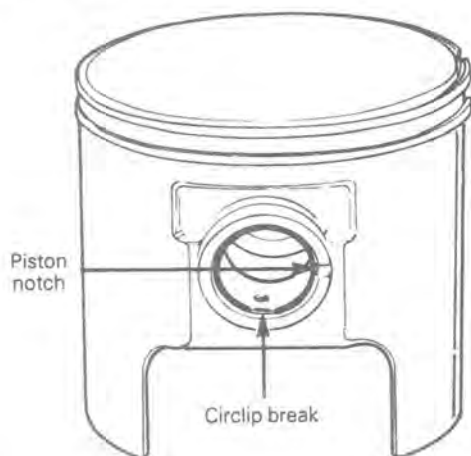
A001002001

## Section 02 ENGINE

### Sub-section 03 (377 ENGINE TYPE)

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

Remove any burrs on piston caused through circlip installation using very fine emery cloth.



A001002002

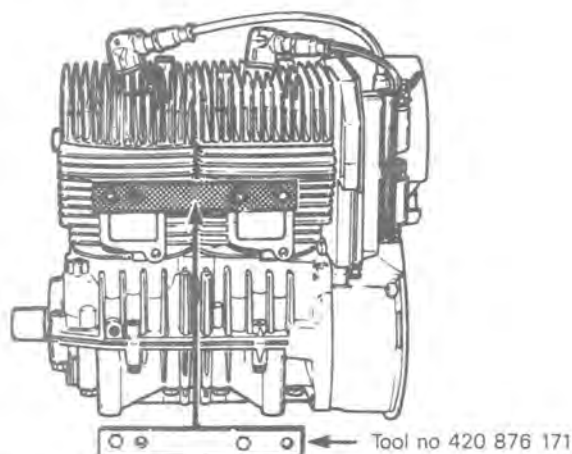
**CAUTION:** Circlips must not move freely in the groove after installation. If so, replace them.

#### 7. Cylinder

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

#### 4,7, Cylinder heads & cylinders

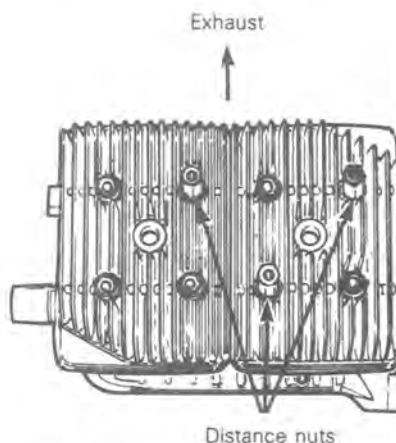
At cylinder and/or cylinder head installation, use (P/N 420 876 171) aligning tool to secure sealing of intake manifold and exhaust (see Tools section), before tightening cylinder head nuts.



A009002001

#### 1,2, Nuts & distance nuts

Position nuts and distance nuts as illustrated.

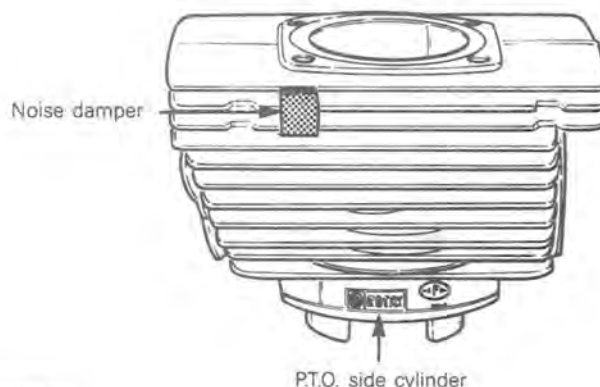


A008002002

Cross torque cylinder head nuts to 23 N•m (17 lbf•ft) torque each cylinder head individually.

#### 6, Damper

Position noise damper as shown below.



A008002003

Install armature plate, fan housing and then air deflector.

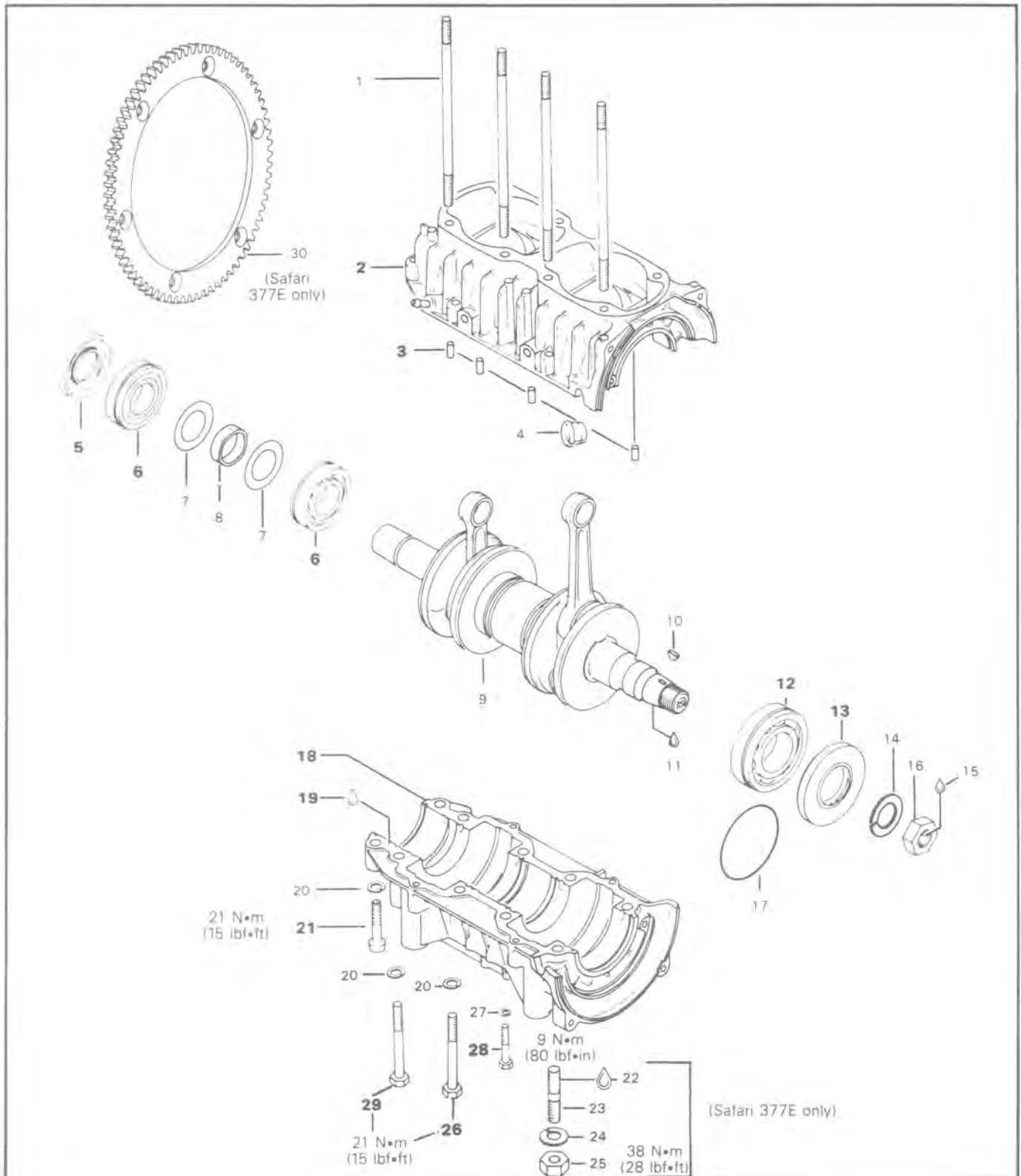
#### 8, Gasket

Install a gasket on each side of the air deflector.

#### 9,11,13, Intake manifold & screws

Install intake manifold with identifications marks towards cylinder head and torque the four manifold screws to 22 N•m (16 lbf•ft)

**BOTTOM END**



## Section 02 ENGINE

### Sub-section 03 (377 ENGINE TYPE)

1. Stud M8 x 173 (8)
2. Upper crankcase
3. Rubber plug (5)
4. Cable grommet
5. Oil seal P.T.O. side
6. Ball bearing 6206 (2)
7. Shim (2)
8. Spacer
9. Crankshaft
10. Woodruff key 3 x 3,7
11. Loctite 242
12. Ball bearing 6207
13. Oil seal, magneto side
14. Lock washer 22 mm
15. Loctite 242

16. Hex. Nut 22 x 1,5
17. O-ring
18. Lower crankcase
19. Loctite 515
20. Lock washer 8 mm (10)
21. Cyl. screw M8 x 45 (2)
22. Loctite 242
23. Stud M10 x 25 (4)
24. Lock washer 10 mm (4)
25. Hex. nut M10 (4)
26. Hex. screw M8 x 70 (8)
27. Lock washer 6 mm (8)
28. Hex. screw M6 x 40 (4)
29. Hex. screw M8 x 75 (2)
30. Ring gear

## CLEANING

Discard all seals, gaskets and O-rings.

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

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

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

## DISASSEMBLY

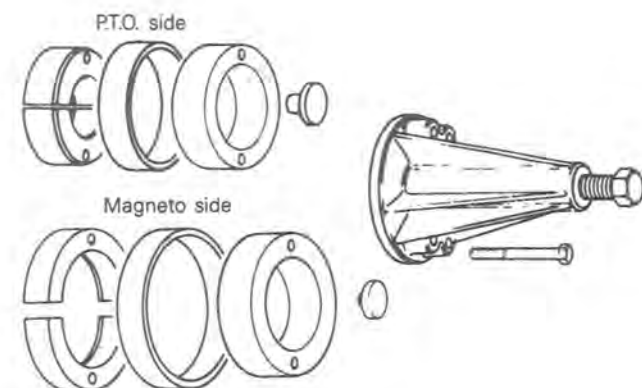
### General

To remove drive pulley, refer to "Drive pulley", section 03-03.

To remove magneto, refer to "Magneto" in this section.

### 6,12, P.T.O. side bearing & mag. side bearing

To remove bearings from crankshaft, use a protective cap and a special puller, as illustrated. (See Tools section).



A000002017

## INSPECTION

The inspection of the engine bottom end must include the following measurements:

MEASUREMENTS	TOLERANCES		WEAR LIMIT
	FITTING NEW PARTS (MIN.)	(MAX.)	
Crankshaft deflection	N.A.	N.A.	.08 mm (.0031")
Connecting rod big end axial play	.20 mm (.0079")	.53 mm (.0208")	1.0 mm (.0394")

**NOTE:** For the measurement procedures, refer to "Engine Dimensions Measurement", section 02-10.

## ASSEMBLY

### 6,12, P.T.O. side bearing & mag. side bearing

Prior to installation, place bearings into an oil container filled with oil heated to 100°C (210°F). This will expand bearings and ease installation. Install bearings with groove as per exploded view.

Bearings are pressed on crankshaft until they rest against radius. This radius maintains the gap needed for bearing lubrication.

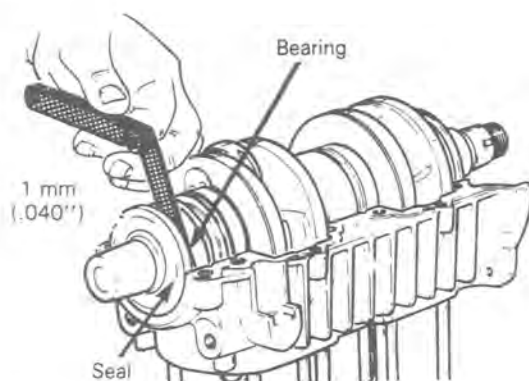
## Section 02 ENGINE

### Sub-section 03 (377 ENGINE TYPE)

#### 5,13, Oil seal P.T.O. side & oil seal mag. side

At seal installation, apply a light coat of lithium grease on inside diameter lip of seals.

For bearing lubrication purpose, a gap of 1.0 mm (.040") must be maintained between seals and bearings. When installing plain seals (without locating ring or without spacing legs), ensure to maintain the specified gap as illustrated.



A009002004

#### 3, Rubber plug

Prior to installing the crankshaft, make sure both rubber plugs are into upper crankcase holes.

#### 2,18,19, Upper crankcase, lower crankcase & Loctite

Crankcase halves are factory matched and therefore, are not interchangeable as single halves.

Prior to joining crankcase halves, spray clean injection oil on all crankshaft moving parts.

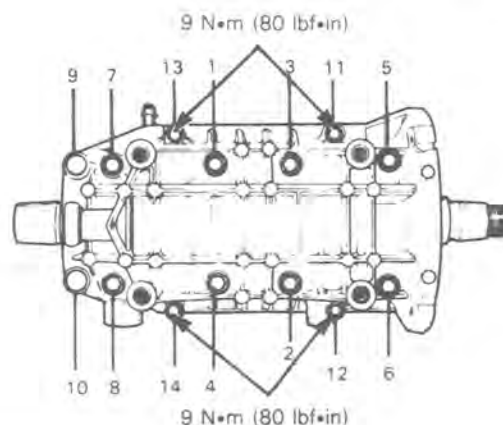
**NOTE:** Prior to applying Loctite 515 it is possible to use primer N (P/N 413 7053 00) or primer NF (P/N 413 7020 00). This increases cure speed and gap filling capability. Refer to supplier instructions.

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

Torque bolts to proper torque in the following illustrated sequence.

Follow sequence shown

All the other bolts are torque to 21 N•m (15 lbf•ft)



A009002005

#### 21,26,29, Screws M8 x 45, M8 x 70, M8 x 75

The bigger screws have to be torqued to 21 N•m (15 lbf•ft). Locate them as per exploded view.

#### 28, Screws M6 x 40

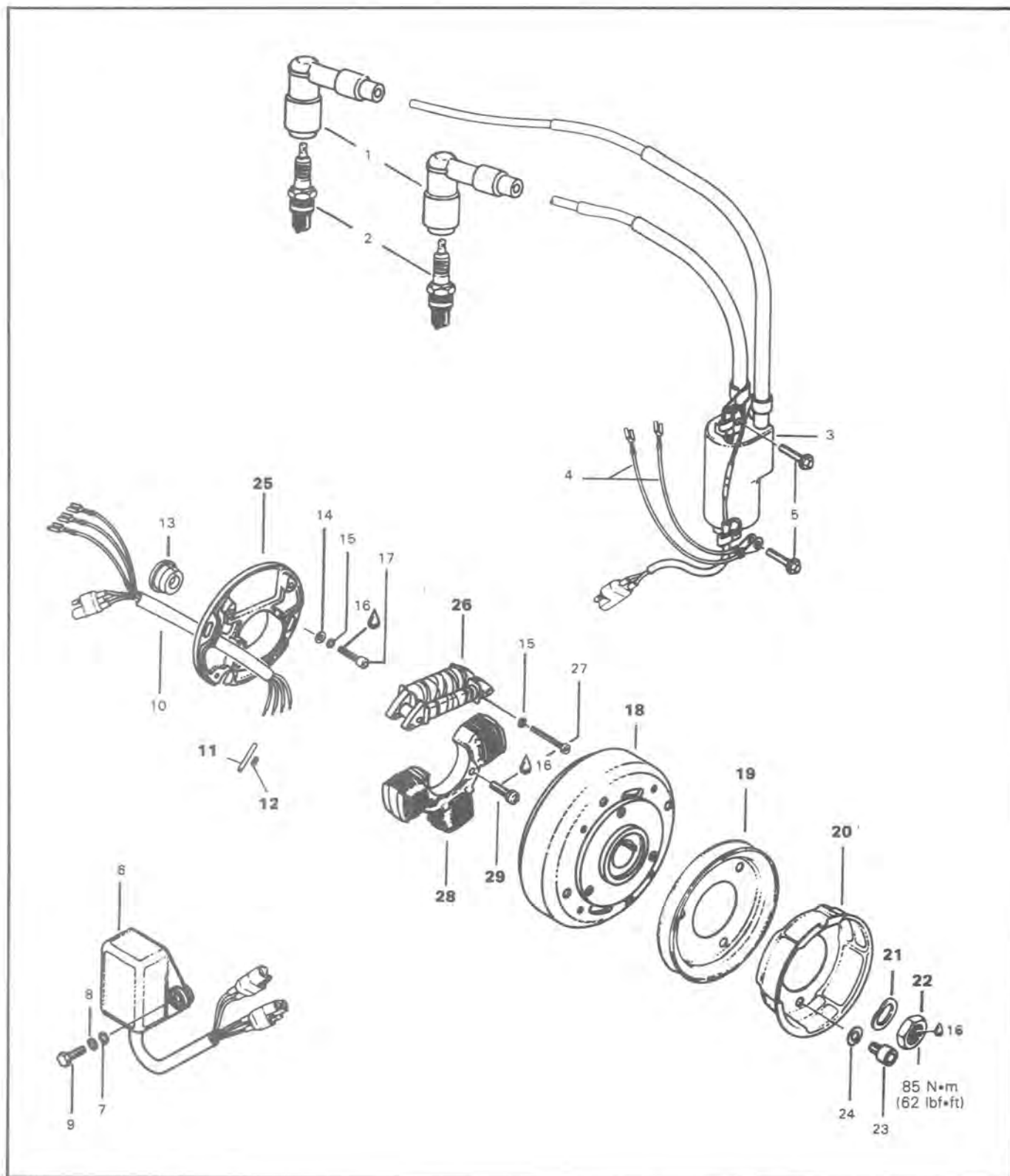
The smaller screws have to be torqued to 9 N•m (80 lbf•in).

To install magneto, refer to "Magneto" in this section.

## Section 02 ENGINE

### Sub-section 03 (377 ENGINE TYPE)

## MAGNETO



## Section 02 ENGINE

### Sub-section 03 (377 ENGINE TYPE)

- |                             |                                |
|-----------------------------|--------------------------------|
| 1. Spark plug protector (2) | 16. Loctite 242                |
| 2. Spark plug (2)           | 17. Allen screw M5 x 18 (2)    |
| 3. Ignition coil            | 18. Magneto flywheel           |
| 4. Ground wire (2)          | 19. V-belt pulley              |
| 5. Tapite screw M6 x 25 (2) | 20. Starting pulley            |
| 6. Amplifier box            | 21. Lock washer 22 mm          |
| 7. Washer 6,4 mm (2)        | 22. Hex. nut 22 x 1,5          |
| 8. Lock washer 6 mm (2)     | 23. Screw M8 x 12 (3)          |
| 9. Hex. screw M6 x 20 (2)   | 24. Lock washer 8 mm (3)       |
| 10. Wire ass'y              | 25. Armature plate             |
| 11. Protection hose (6)     | 26. Coil kit, primary          |
| 12. Splice connector (6)    | 27. Combined screw M5 x 35 (2) |
| 13. Cable grommet           | 28. Lighting coil              |
| 14. Washer 5.5 mm (2)       | 29. Phillips screw M6 x 25 (2) |
| 15. Lock washer 5 mm (4)    |                                |

## CLEANING

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

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

## DISASSEMBLY

### 19,20,22, V-belt pulley, starting pulley, nut

To gain access to magneto assembly, remove:

- injection oil line (Safari)
- rewind starter
- starting and V-belt pulleys

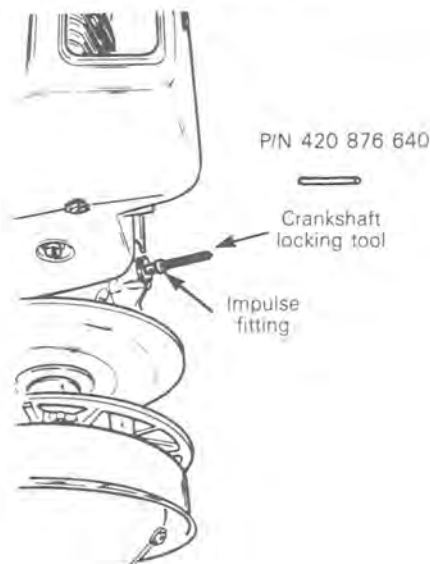
○ **NOTE:** Before disassembling magneto plate, indexing marks should be located to facilitate reassembly.

To remove magneto flywheel retaining nut:

- lock crankshaft with crankshaft locking tool (P/N 420 876 640) as illustrated (magneto side piston must be at top dead center);

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

- remove magneto retaining nut.





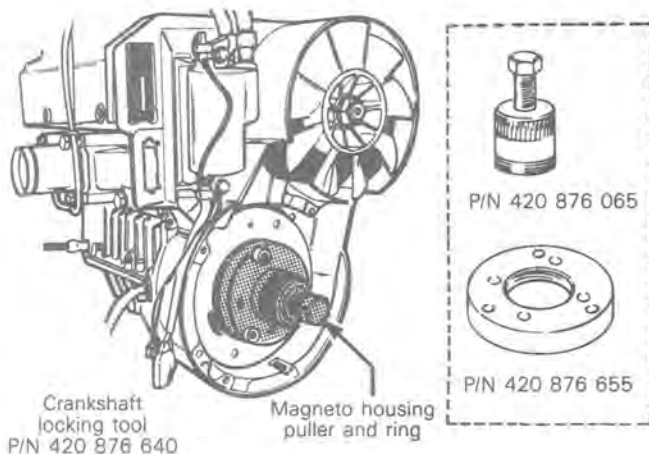
## Section 02 ENGINE

### Sub-section 03 (377 ENGINE TYPE)

#### 18, Magneto flywheel

To remove magneto housing (flywheel):

- lock crankshaft with crankshaft locking tool (service tool) and adjust magneto housing puller and puller ring (service tool) as illustrated.



A009002007

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

○ **NOTE:** For the above procedure, the locking type puller can be used without crankshaft locking tool.



P/N 420 876 065



P/N 420 876 080

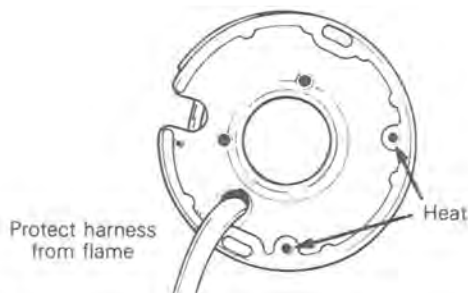
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## REPAIR

#### 26, Generating coil

To replace generating coil:

- Heat the armature plate to 93°C (200°F) around the screw holes to break the Loctite bond.



A001002003

▼ **CAUTION:** Protect harness from flame.

- Remove screws (use Phillips no. 2 or suitable flat screw driver).
- Cut the four wires as close as possible to the coil body.
- To pass new coil wires in harness, tape the old wires to the end of new wires and pull them through the harness protector tube.
- Insert the new wires into the old connector housing and install connectors.



A001002004

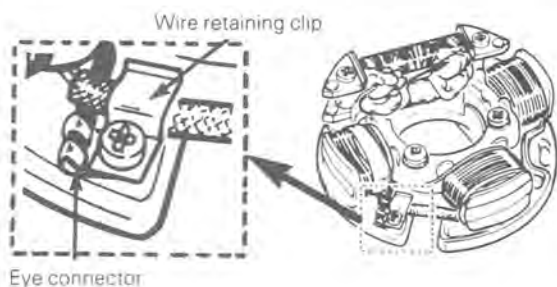


## Section 02 ENGINE

### Sub-section 03 (377 ENGINE TYPE)

▼ **CAUTION:** Replace the old wires in the connector with the same color coded new wires.

- Install a new receptacle connector to the black/yellow striped wire.
- To install the ground connector of the armature plate, tape the new black lead to the old one and pull it under the lighting coil with the oil wire.
- Solder an eye connector to the lead and fasten it under the wire retaining clip.



A001002005

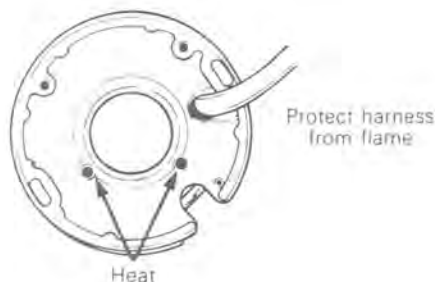
- To install the new coil on the armature plate, remove the shipping nuts from the coil and apply Loctite 242 (blue, medium strength) to screws before assembly.

▼ **CAUTION:** Before reinstalling the magneto, remove the loose epoxy from harness.

#### 11,12,28,29, Protector tubes, splice connectors, lighting coil & screws

To replace lighting coil:

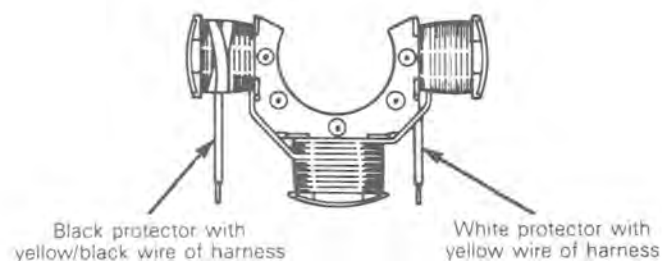
- Heat the armature plate to 93°C (200°F) around the screw holes to break the Loctite bond.



A001002003

▼ **CAUTION:** Protect harness from flame.

- Remove screws (use Phillips no. 3 screwdriver).
- Remove the wire retaining clip from armature plate.
- Pull out protector tubes and unsolder the splice connectors.
- Solder the yellow wire in the harness to the white tube protected wire of the coil.
- Solder the yellow/black striped wire in the harness to the black tube protected wire of the coil.



A001002006

- Position protector tubes over connections.
- Prior to assembly, apply Loctite 242 (blue, medium strength) on the lighting coil screws.
- Fasten retaining clip onto protector tubes.

▼ **CAUTION:** Before reinstalling magneto, remove the loose epoxy from harness.

---

## Section 02 ENGINE

### Sub-section 03 (377 ENGINE TYPE)

---

#### ASSEMBLY

18,21,22,25, Armature plate, magneto flywheel, lock washer & nut

Position the armature plate on the crankcase aligning the marks on both parts.

Clean crankshaft extension taper.

Apply Loctite 242 (blue, medium strength) on taper.

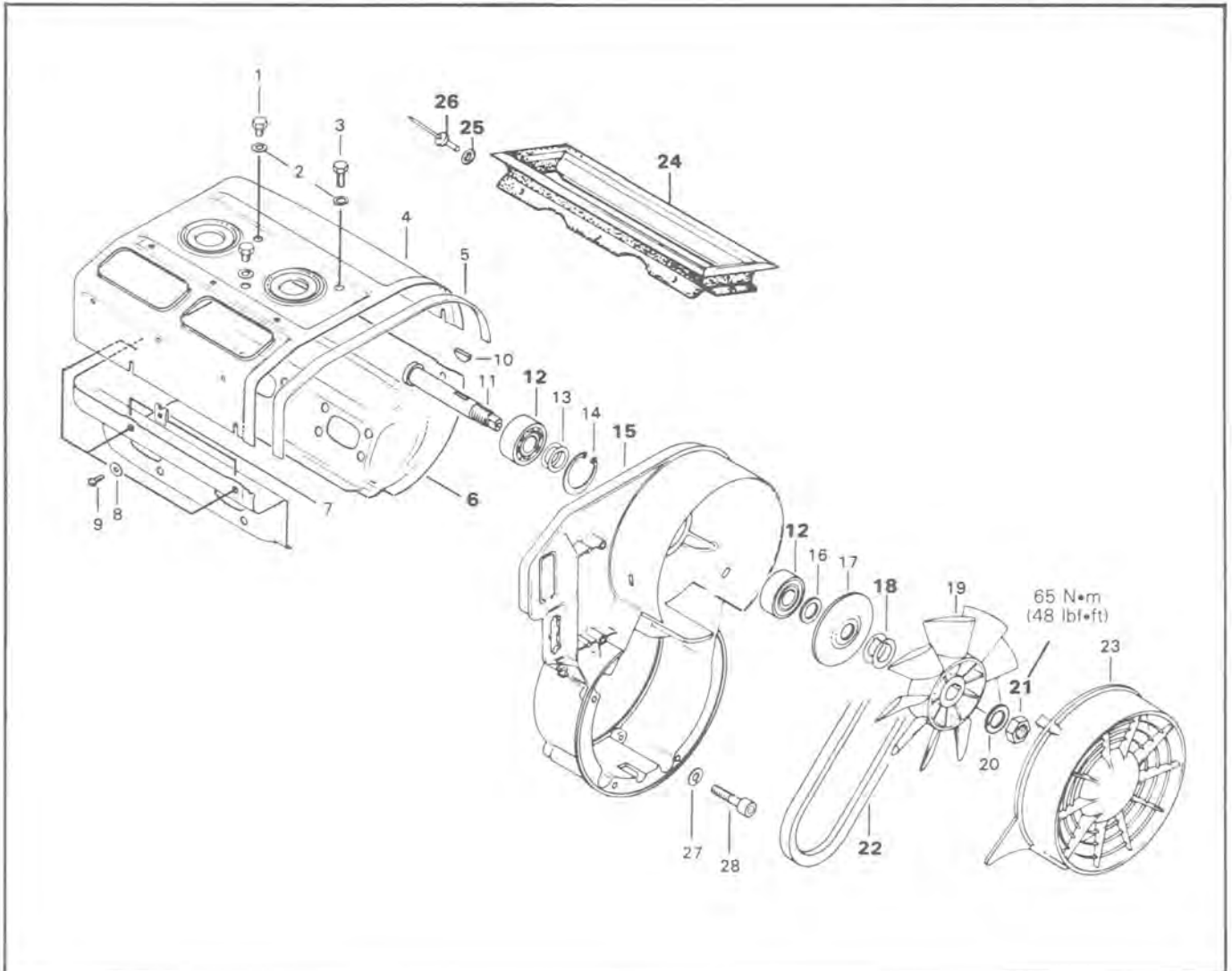
Position key, magneto flywheel and lock washer on crankshaft.

- Clean nut threads and apply Loctite 242 (blue, medium strength) before tightening nut to 85 N•m (63 lbf•ft).
- At reassembly coat all electric connections with silicone dielectric grease P/N 413 7017 00 grease to prevent corrosion or moisture penetration.

▼ **CAUTION:** Do not use silicone "sealant", this product will corrode contacts.

○ **NOTE:** For ignition timing procedure refer to "Ignition timing section 04-02."

**COOLING SYSTEM**



1. Hex. screw M8 x 9 (2)
2. Lock washer 8 mm (3)
3. Hex. screw M8 x 16
4. Cylinder head cowl
5. Sealing strip
6. Cylinder cowl
7. Spring nut 4,8 (6)
8. Washer (6)
9. Screw 8 x 16 (6)
10. Woodruff key 3 x 5
11. Fan shaft
12. Ball bearing 6203 (2)
13. Shim (2)
14. Circlip

15. Fan housing
16. Distance sleeve
17. Pulley half
18. Shim 0,5 mm
19. Fan
20. Lock washer 16 mm
21. Hex. nut M16 x 1,5
22. V-belt
23. Fan cover
24. Air duct
25. Washer
26. Rivet (closed end)
27. Lock washer 6 mm (4)
28. Allen screw M6 x 30 (4)

## Section 02 ENGINE

### Sub-section 03 (377 ENGINE TYPE)

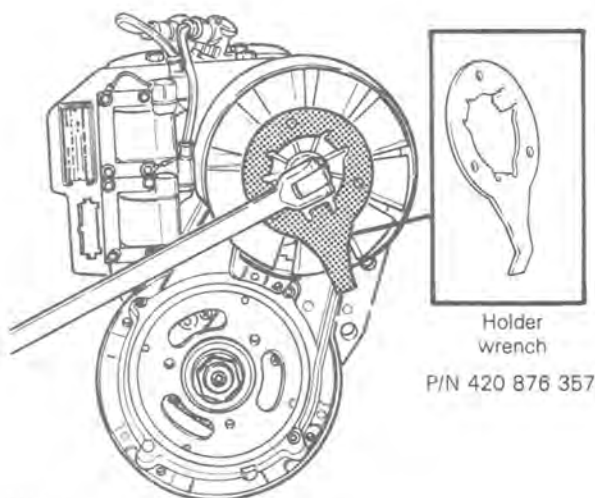
#### CLEANING

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

#### DISASSEMBLY & ASSEMBLY

##### 21, Fan nut

To remove or install fan pulley retaining nut, lock fan pulley with special holder wrench P/N 420 876 357. At assembly, torque nut to 65 N•m (48 lbf•ft).



A009002008

##### 18,22, Shims & V-belt

Fan belt deflection must be 9.5 mm (3/8") when applying a force of 50 N (11 lbf). To adjust, install or remove shim(s) between pulley halves. Install excess shim(s) between fan and lock washer.

Use belt tension tester P/N 414 3482 00 to check deflection.



A009002007

##### 12,15, Ball bearing & fan housing

It is first necessary to heat bearing housing to 65°C (150°F) to remove or install bearing.

##### 24,25,26, Air duct, washer & rivet (closed end)

Air duct can be removed by drilling out rivets.

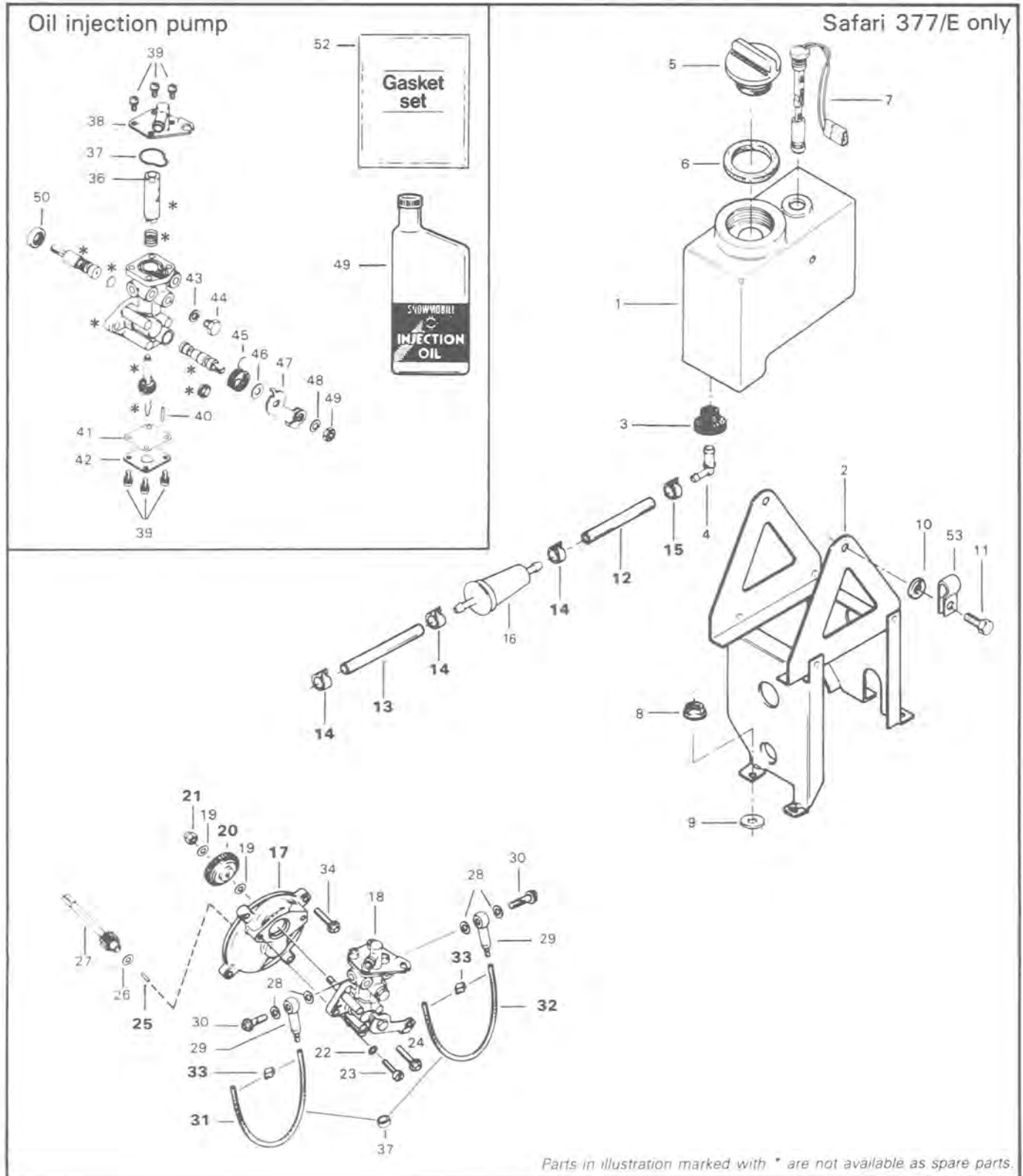
▼ **CAUTION:** At reassembly, use only closed end rivets to avoid rivet ends from falling into magne-

##### 6, Cylinder cowl

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

◆ **WARNING:** If fan protector is removed, always reinstall after servicing.

## OIL INJECTION PUMP & RESERVOIR



## Section 02 ENGINE

### Sub-section 03 (377 ENGINE TYPE)

1. Injection oil tank
2. Oil reservoir support
3. Grommet
4. Male connector
5. Oil tank cap
6. Gasket
7. Oil level sensor
8. Elastic stop nut M5 x 0.8 (4)
9. Rubber washer (4)
10. Lock washer 6 mm (2)
11. Screw M6 x 16 (2)
12. Oil line 38 mm
13. Oil line 102 mm
14. Spring clip (3)
15. Spring clip (1)
16. Filter
17. Oil pump mounting flange
18. Oil pump
19. Washer 6,2 mm (2)
20. Oil pump gear 27 teeth
21. Lock nut 6 mm
22. Lock washer 5 mm (2)
23. Screw M5 x 16 (2)
24. Tapite screw M5 x 16 (2)
25. Needle roll
26. Washer 4,3
27. Gear 9 teeth
28. Banjo oil gasket (4)
29. Banjo (2)
30. Banjo bolt (2)
31. Oil line 325 mm
32. Oil line 325 mm
33. Clamp (4)
34. Tapite screw M5 x 16 (4)
35. Rubber ring
36. Retainer
37. O-ring
38. Plate
39. Screw with lock washer (8)
40. Stop pin
41. Gasket
42. Plate
43. Washer
44. Hex. screw M6 x 7
45. Spring
46. Washer
47. Lever
48. Lock washer 6 mm
49. Nut 6 mm
50. Seal
51. Gasket set
52. Injection oil
53. Clip

## CLEANING

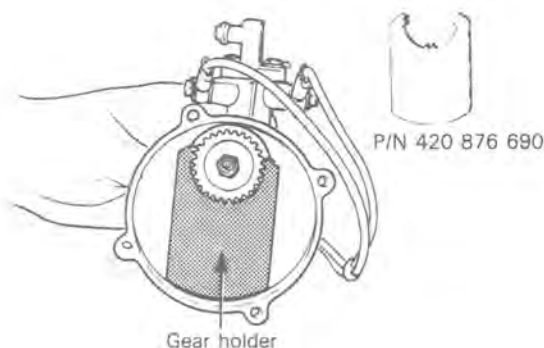
Clean all metal components in a non-ferrous metal cleaner.

## DISASSEMBLY

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

### 20,21,25, Oil pump gear, lock nut 6 mm & needle roll

To remove retaining nut, first extract the needle roll with pliers then lock gear in place using no 420 876 690 tool.



A003002009

## ASSEMBLY

### 20, Oil pump gear

At gear assembly, apply a light coat of grease on gear teeth.

### 25, Needle roll

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

### 14,15,33, Spring clips & clamps

Always check for spring clips and clamps tightness.

### 12,13,31,32, Oil lines

▼ **CAUTION:** On electric start models, it is recommended to install black rubber oil lines (P/N 414 2867 00) that will not be altered by battery fumes.

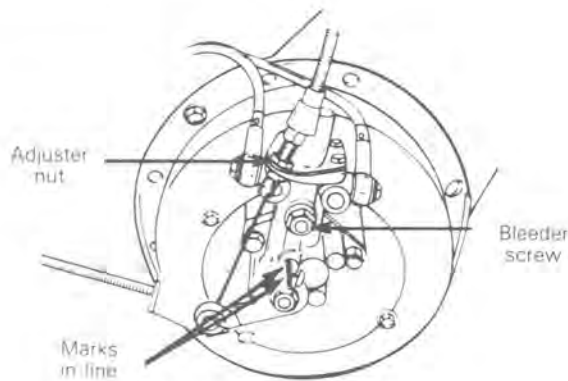
## ADJUSTMENT

Prior to adjusting the pump, make sure all carburetor adjustments are completed.

To synchronize pump with carburetor:

Eliminate the throttle cable free-play by pressing the throttle lever until a light resistance is felt, then hold in place. The aligning marks on the pump casting and on the lever must align. If not, loosen the adjuster nut and adjust accordingly.

Retighten the adjuster nut.



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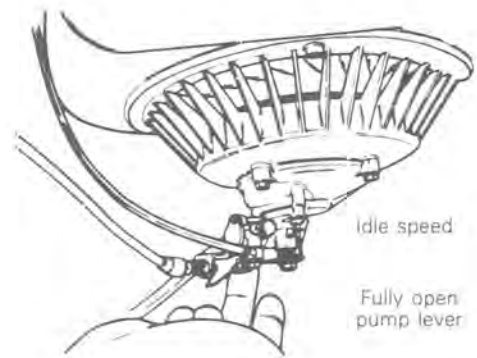
To bleed oil lines:

All oil lines should be full of oil. If required, bleed the main oil line (between tank and pump) by loosening the bleeder screw until all air has escaped from the line.

Make sure the tank is sufficiently filled.

Check the small oil lines (between pump and intake manifold). If required, fill the lines by running the engine at idle speed while holding the pump lever in fully open position.

(TYPICAL)



A001002009

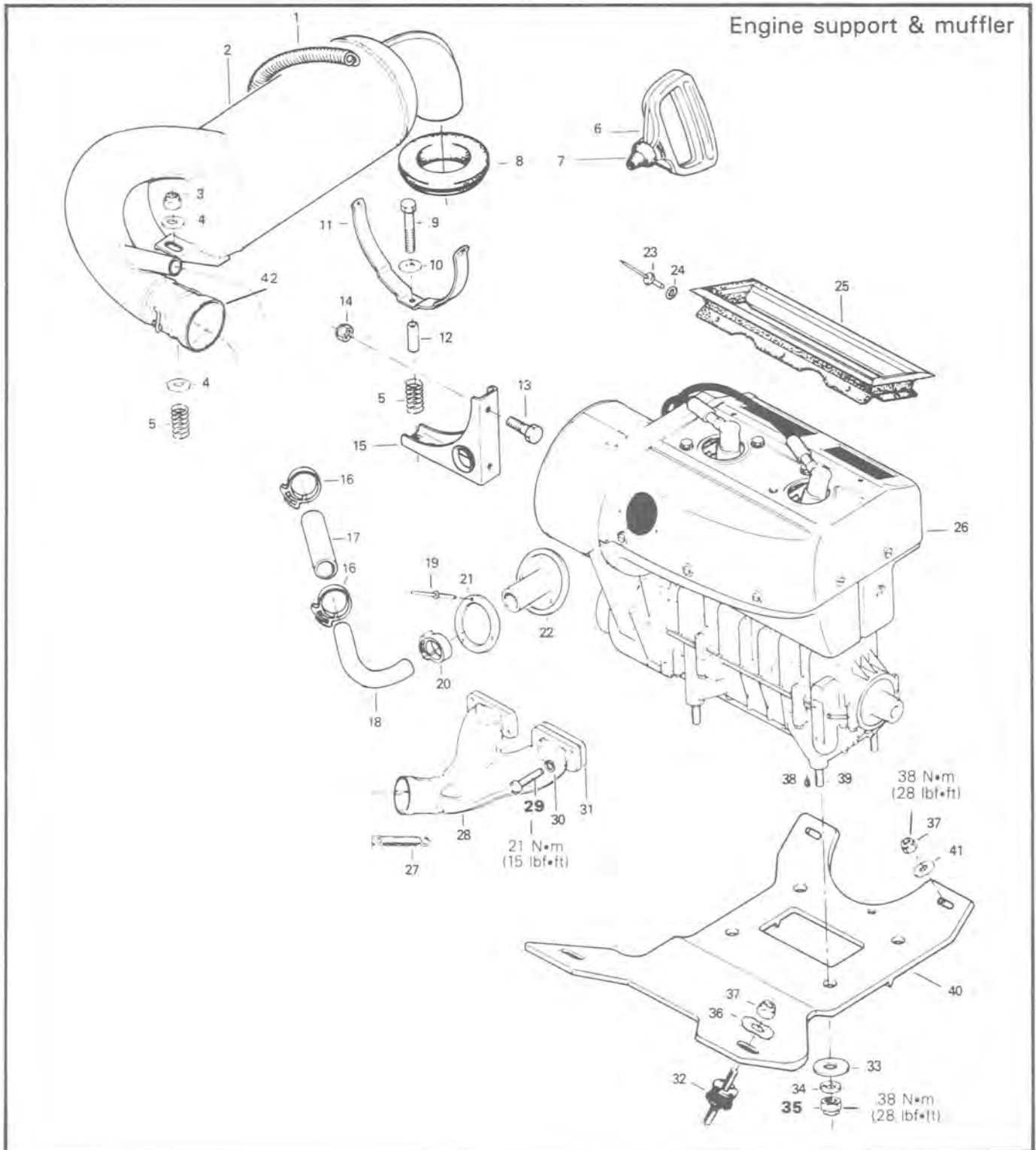
**WARNING:** Ensure not to operate carburetor throttle mechanism. Secure the rear of the vehicle on a stand.





## 447 ENGINE TYPE

### ENGINE REMOVAL & INSTALLATION



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## Section 02 ENGINE

### Sub-section 04 (447 ENGINE TYPE)

---

1. Spring
2. Muffler
3. Elastic stop nut M8
4. Washer 8.4 mm (2)
5. Spring (2)
6. Starter grip
7. Rubber buffer
8. Exhaust washer
9. Cap screw M6 x 20
10. Washer 6 mm
11. Muffler attachment
12. Bushing
13. Cap screw M6 x 16 (2)
14. Elastic stop nut (2)
15. Muffler support
16. Plastic clamp (2)
17. Hose
18. Elbow
19. Rivet (3)
20. Plastic clamp
21. Connector ring

22. Connector
23. Rivet (6)
24. Washer (6)
25. Air duct
26. Motor ass'y
27. Spring (2)
28. Exhaust manifold
29. Allen screw M8 x 30 (4)
30. Lock washer 8 mm (4)
31. Gasket (4)
32. Rubber mount (4)
33. Washer 10.5 mm (4)
34. Lock washer 10 mm (4)
35. Hexagonal nut 10 mm (4)
36. Internal tooth cup washer (2)
37. Elastic stop nut M10 (4)
38. Loctite 242
39. Stud M10 x 25 (4)
40. Engine support
41. Washer (2)
42. Female ball joint

---

## REMOVAL FROM VEHICLE

Remove or disconnect the following then lift engine out of vehicle.

- Pulley guard, drive belt, drive pulley.
- Exhaust manifold.
- Elbow tube on cylinder head cowl.
- Clamp between carburetor and intake manifold.
- Oil injection pump cable.
- Oil lines.
- Pulsation line.
- Hood retaining cable.
- Rewind starter cable.
- Wiring harness.
- Engine support nuts under engine support.

### 29,35, Engine support nuts & manifold bolts

Torque the engine support nuts to 38 N•m (28 lbf•ft).

Torque the manifold bolts to 21 N•m (15 lbf•ft).

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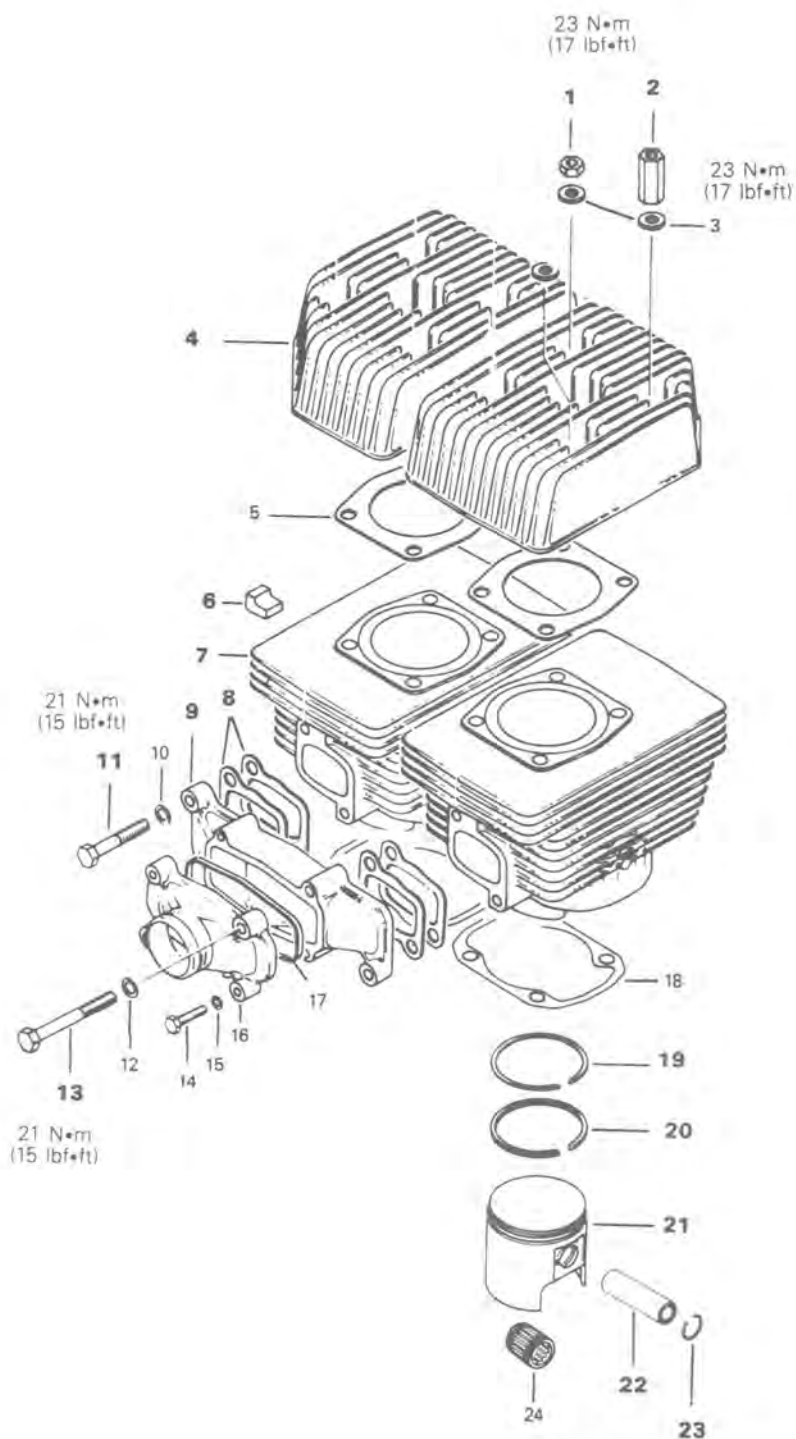
## INSTALLATION ON VEHICLE

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

- Check tightness of engine mount nuts.
- After throttle cable installation, check maximum throttle slide opening.
- Check pulley alignment and drive belt tension.

**Section 02 ENGINE**  
**Sub-section 04 (447 ENGINE TYPE)**

**TOP END**



## Section 02 ENGINE

### Sub-section 04 (447 ENGINE TYPE)

1. Hexagonal nut M8 (5)
2. Distance nut M8 x 27.5 (3)
3. Cone sleeve (8)
4. Cylinder head (2)
5. Gasket, cylinder head (2)
6. Support damper (1)
7. Cylinder with sleeve (2)
8. Gasket, intake manifold (4)
9. Intake manifold (1)
10. Lock washer 8 mm (2)
11. Hexagonal screw M8 x 40 (2)
12. Lock washer 8 mm (2)


13. Hexagonal screw M8 x 74 (2)
14. Hexagonal screw M6 x 25 (2)
15. Lock washer 6 mm (2)
16. Intake cover
17. Rubber ring
18. Gasket, cylinder flange (2)
19. Semi-trapez ring (2)
20. Rectangular ring (2)
21. Piston (2)
22. Gudgeon pin (2)
23. Circlip (4)
24. Needle cage (2)

## CLEANING

Discard all gaskets.

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

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

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


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

## DISASSEMBLY

### 21,22,23, Piston, circlip & gudgeon pin

Place a clean cloth over crankcase to prevent circlips from falling into crankcase. Then with a pointed tool inserted in piston notch, remove circlips from piston.


Drive the gudgeon pin out of piston using a suitable drive punch and hammer.

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

## INSPECTION

The inspection of the engine top end must include the following measurements:

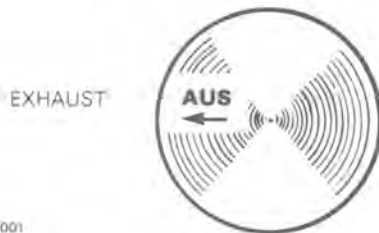
MEASUREMENTS	TOLERANCES		
	FITTING NEW PARTS (MIN.)	(MAX.)	WEAR LIMIT
Cylinder taper	N.A.	N.A.	.08 mm (.0031")
Cylinder out of round	N.A.	N.A.	.05 mm (.0020")
Cylinder/piston clearance	.08 mm (.0031")	.10 mm (.0039")	.20 mm (.0079")
Ring/piston groove clearance	.04 mm (.0016")	.11 mm (.0043")	.20 mm (.0079")
Ring end gap	.20 mm (.0079")	.35 mm (.0138")	1.0 mm (.0394")

 **NOTE:** For the measurement procedures, refer to "Engine dimensions measurement", section 02-10.

## ASSEMBLY

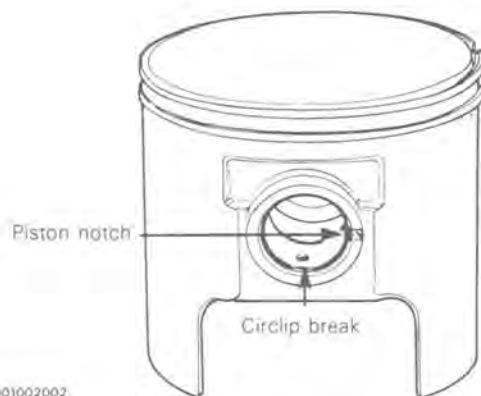
### 21,23, Pistons & circlips

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



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

Remove any burrs on piston caused through circlip installation with very fine emery cloth.



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

### 19,20, Semi-trapez & rectangular rings

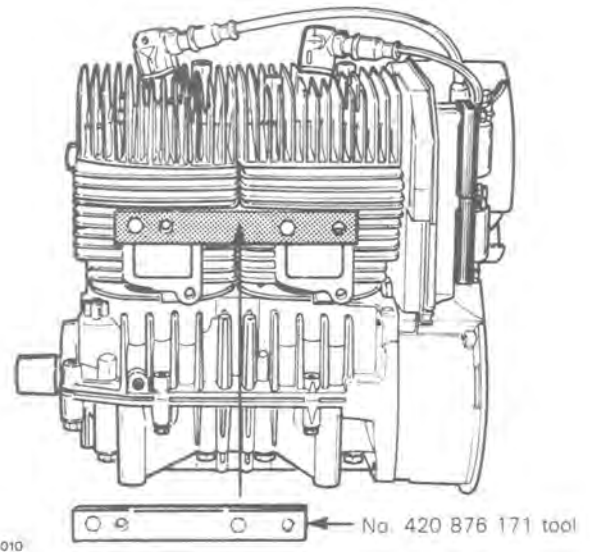
Check piston rings position.

### 7, Cylinder

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

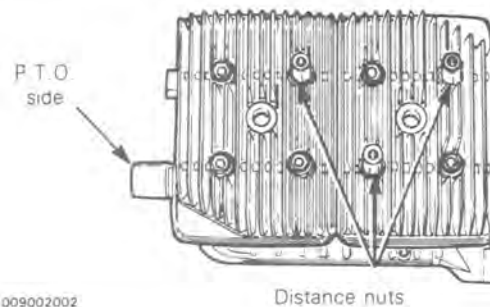
### 4,7, Cylinder head & cylinder

At cylinder and/or cylinder head installation, use P/N 420 876 171 aligning tool to secure sealing of intake manifold and exhaust (See Tools section), before tightening cylinder head nuts.



### 1,2, Nuts & distance nuts

Position nuts and distance nuts as illustrated.



Cross torque cylinder head nuts to 23 N•m (17 lbf•ft), torque each cylinder head individually.

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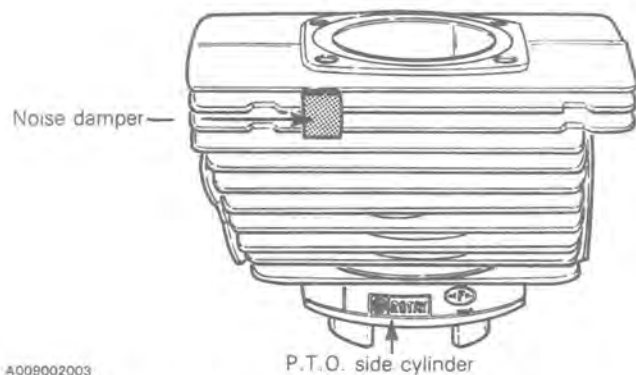
## Section 02 ENGINE

### Sub-section 04 (447 ENGINE TYPE)

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#### 6, Damper

Position noise damper as per following illustration.



Install armature plate, fan housing and then air deflector.

#### 8, Gasket

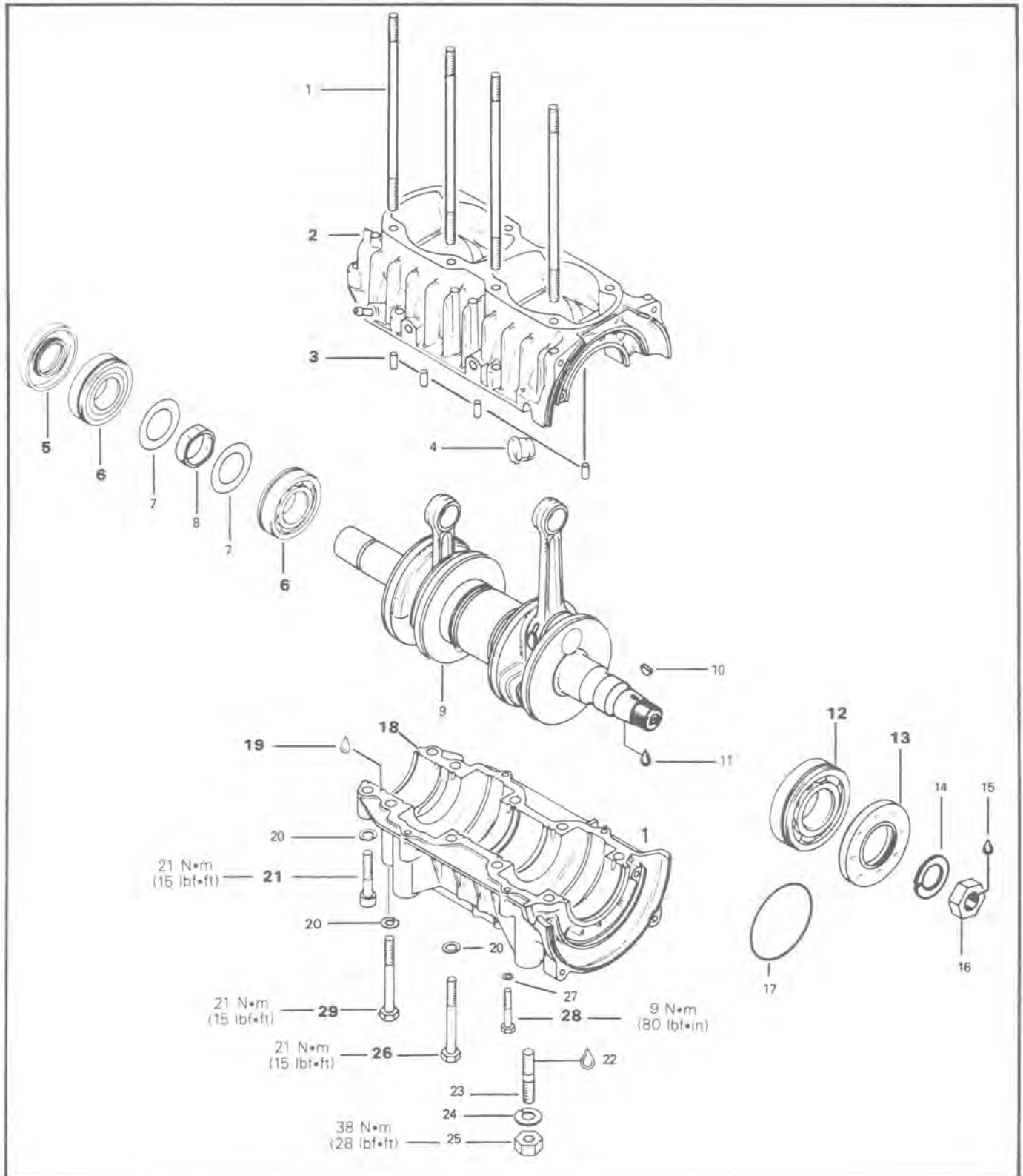
Install a gasket on each side of the air deflector.

#### 9,11,13, Intake manifold, screws M8 x 40 & M8 x 74

Install intake manifold with identifications marks towards cylinder head and torque the four manifold screws to 21 N•m (15 lbf•ft).

**Section 02 ENGINE**  
Sub-section 04 (447 ENGINE TYPE)

**BOTTOM END**



## Section 02 ENGINE

### Sub-section 04 (447 ENGINE TYPE)

1. Stud M8 x 173 (8)
2. Upper crankcase
3. Rubber plug (5)
4. Cable grommet
5. Oil seal P.T.O. side
6. Ball bearing 6206 (2)
7. Shim (2)
8. Spacer
9. Crankshaft
10. Woodruff key 3 x 3.7
11. Loctite 242
12. Ball bearing 6207
13. Oil seal, magneto side
14. Lock washer 22 mm
15. Loctite 242

16. Hexagonal nut 22 x 1.5
17. O-ring
18. Lower crankcase
19. Loctite 515
20. Lock washer 8 mm (10)
21. Cylinder screw M8 x 45 (2)
22. Loctite 242
23. Stud M10 x 25 (4)
24. Lock washer 10 mm (4)
25. Hexagonal nut M10 (4)
26. Hexagonal screw M8 x 70 (6)
27. Lock washer 6 mm (4)
28. Hexagonal screw M6 x 40 (4)
29. Hexagonal screw M8 x 75 (2)

## CLEANING

Discard all seals, gaskets, and O-rings.

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

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

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

## DISASSEMBLY

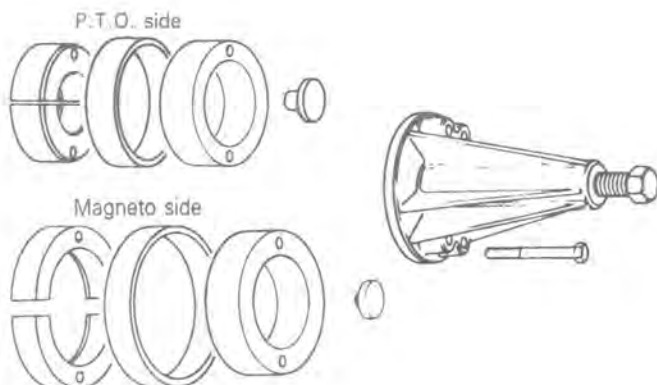
### General

To remove drive pulley, refer to "Drive pulley", section 03-03.

To remove magneto, refer to "Magneto" in this section.

### 6,12, P.T.O. side bearing & mag side bearing

To remove bearings from crankshaft use a protective cap and special puller, as illustrated. (See Tools section).



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## INSPECTION

The inspection of the engine bottom end must include the following measurements:

MEASUREMENTS	TOLERANCES		WEAR LIMIT
	FITTING NEW PARTS (MIN.)	(MAX.)	
Crankshaft deflection	N.A.	N.A.	.08 mm (.0032")
Connecting rod big end axial play	.20 mm (.0079")	.53 mm (.0208")	1.0 mm (.0394")

**NOTE:** For the measurement procedures, refer to "Engine dimensions measurement", section 02-10.

## ASSEMBLY

### 6,12, Bearing P.T.O. side & bearing magneto side

Prior to installation, place bearings into an oil container and heat the oil to 100°C (210°F).

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

Bearings are pressed on crankshaft until they rest against radius. This radius maintains the gap needed for bearing lubrication.



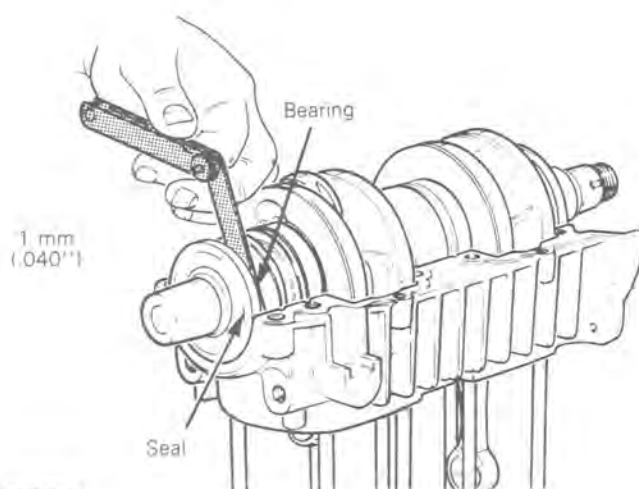
## Section 02 ENGINE

### Sub-section 04 (447 ENGINE TYPE)

#### 5,13, Oil seal P.T.O. side & oil seal magneto side

At seal installation, apply a light coat of lithium grease on inside diameter lip of seals.

For bearings lubrication purpose, a gap of 1.0 mm (.040") must be maintained between seals and bearings. When installing plain seals (without locating ring or without spacing legs), ensure to maintain the specified gap as illustrated.



A009002004

#### 3, Rubber plug

Prior to installing the crankshaft, make sure both rubber plugs are into upper crankcase holes.

#### 2,18,19, Upper crankcase, lower crankcase & Loctite

Crankcase halves are factory matched and therefore, are not interchangeable as single halves.

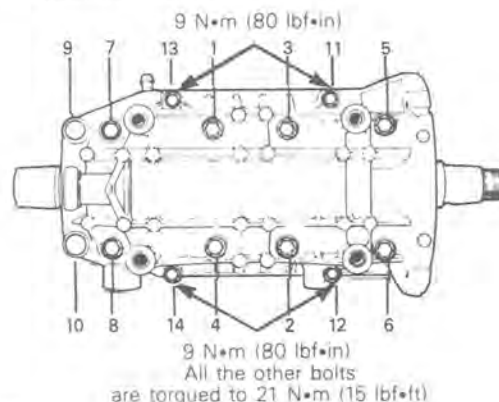
Prior to joining of crankcase halves, spray some new injection oil on all the moving parts of the crankshaft.

**NOTE:** Prior to apply Loctite 515 it is possible to use primer N (P/N 413 7053 00) or primer NF (P/N 413 7024 00). It increases cure speed and gap filling capability. Refer to supplier instructions.

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

Torque bolts to proper torque following illustrated sequence.

Follow sequence shown.



A009002005

#### 21,26,29, Screw M8 x 45, M8 x 70 & M8 x 75

The bigger screws have to be torque to 21 N•m (15 lbf•ft). Locate them as per exploded view.

#### 28, Screw M6 x 40

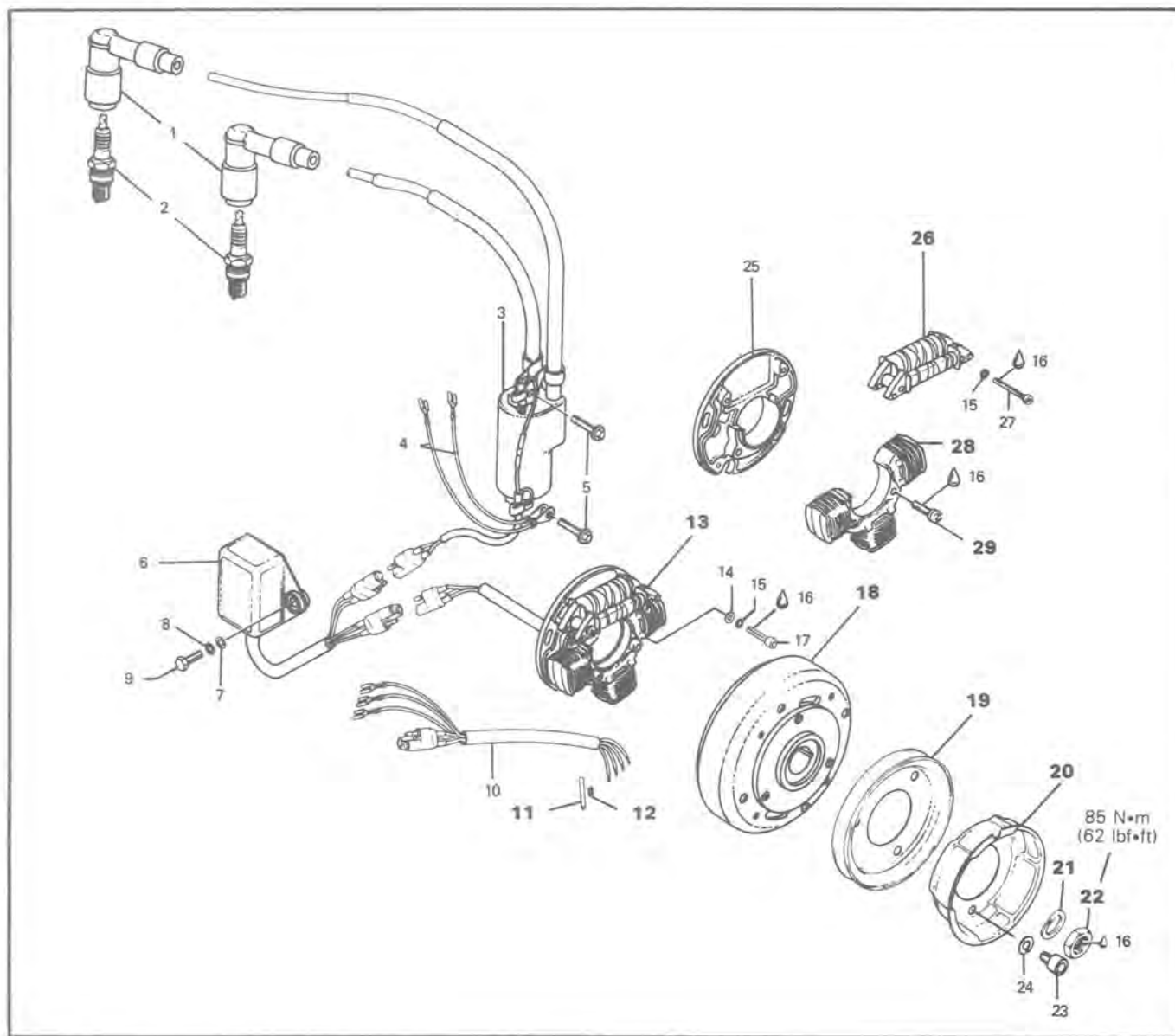
The smaller screws have to be torque to 9 N•m (80 lbf•in).

To install magneto, refer to "Magneto" in this section.

## Section 02 ENGINE

### Sub-section 04 (447 ENGINE TYPE)

## MAGNETO



1. Spark plug protector (2)
2. Spark plug (2)
3. Ignition coil
4. Ground wire (2)
5. Taptite screw M6 x 25 (2)
6. Amplifier box
7. Washer 6.4 mm (2)
8. Lock washer 6 mm (2)
9. Hexagonal screw M6 x 20 (2)
10. Wire ass'y
11. Protection hose (6)
12. Splice connector (6)
13. Armature plate ass'y
14. Washer 5.5 mm (2)
15. Lock washer 5 mm (4)

16. Loctite 242
17. Allen screw M5 x 18 (2)
18. Magneto flywheel
19. V-belt pulley
20. Starting pulley
21. Lock washer 22 mm
22. Hexagonal nut 22 x 1.5
23. Screw M8 x 12 (3)
24. Lock washer 8 mm (3)
25. Armature plate
26. Coil kit, primary
27. Combined screw M5 x 35 (2)
28. Lighting coil
29. Phillips screw M6 x 25 (2)

## Section 02 ENGINE

### Sub-section 04 (447 ENGINE TYPE)

## CLEANING

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

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

## DISASSEMBLY

### 19,20,22, V-belt pulley, starting pulley, & nut

To gain access to magneto assembly, remove:

- injection oil line
- rewind starter
- starting and v-belt pulley

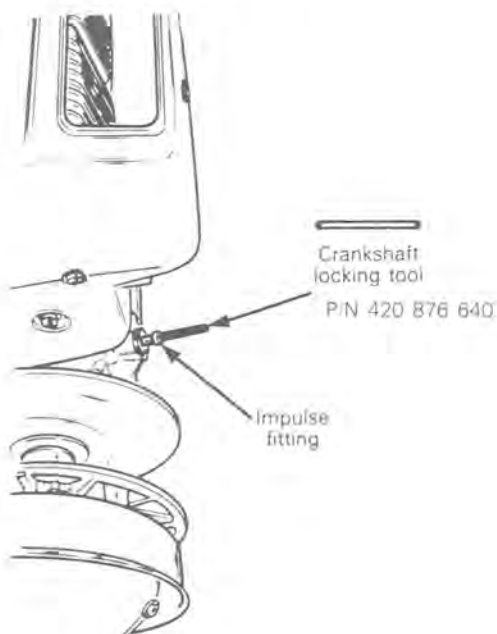
○ **NOTE:** Before disassembling magneto plate, indexing marks should be located to facilitate reassembly.

To remove magneto flywheel retaining nut:

- lock crankshaft with crankshaft locking tool (P/N 420 876 640) as illustrated (magneto side piston must be at top dead center).

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

- remove magneto retaining nut.

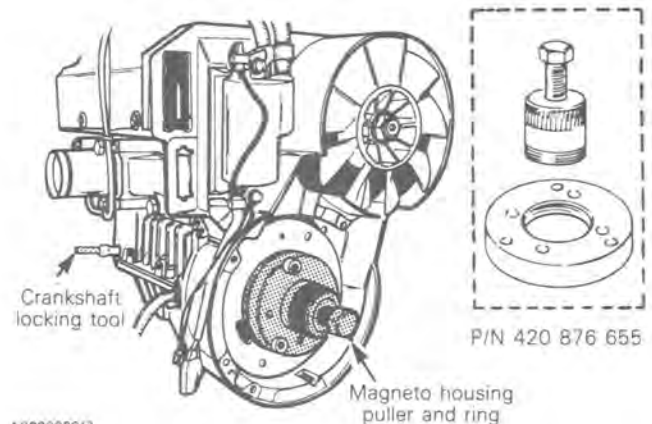


A009002011

### 18, Magneto flywheel

To remove magneto housing (flywheel):

- lock crankshaft with crankshaft locking tool (service tool) and adjust magneto housing puller and puller ring (service tool) as illustrated.



A009002012

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

○ **NOTE:** For the above procedure, the locking type puller can be used without crankshaft locking tool.



P/N 420 876 065



P/N 420 876 080

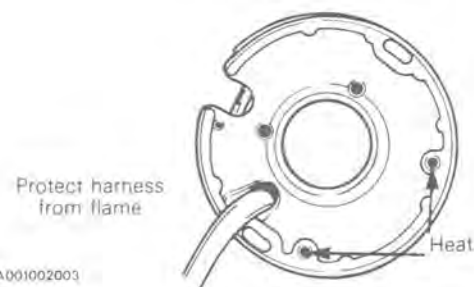
A009002083

## REPAIR

### 26, Generating coil

To replace generating coil:

- Heat the armature plate around the screw holes to break the Loctite bond 93°C (200°F).



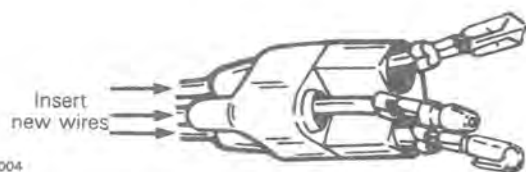
A001002003

▼ **CAUTION:** Protect harness from flame.

## Section 02 ENGINE

### Sub-section 04 (447 ENGINE TYPE)

- Remove screws (use Phillips no. 2 or suitable flat screw driver).
- Cut the four wires as close as possible to the coil body.
- To pass new coil wires in harness, tape the old wires to the end of new wires and pull them through the harness protector tube.
- Insert the new wires into the old connector housing and install connectors.

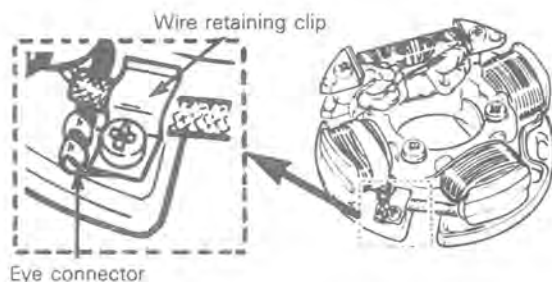


A001002004

▼ **CAUTION:** Replace the old wires in the connector with the same color coded new wires.

- Install a new receptacle connector to the black/yellow striped wire.
- To install the ground connector of the armature plate, tape the new black lead to the old one and pull it under the lighting coil with the old wire.

Solder and eye connector to the lead and fasten it under the wire retaining clip.



A001002005

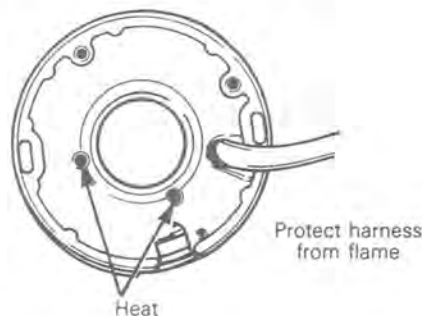
- To install the new coil on the armature plate, remove the shipping nuts from the coil and apply Loctite 242 (blue, medium strength) to screws before assembly.

▼ **CAUTION:** Before reinstalling the magneto, remove the loose epoxy from harness.

### 11,12,28,29, Protector tube, splice connector lighting coil & screw

To replace lighting coil:

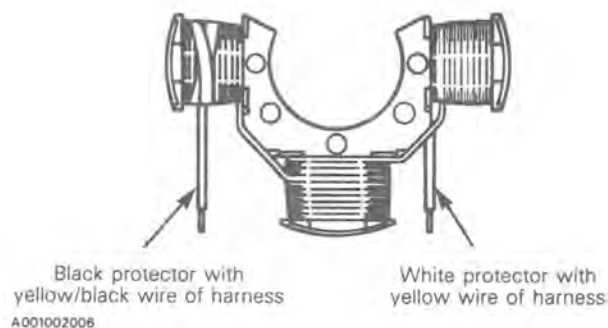
- Heat the armature plate around the screw holes to break the Loctite bond 93°C (200°F).



A001002003

▼ **CAUTION:** Protect harness from flame.

- Remove screws (use Phillips no. 3 screwdriver).
- Remove the wire retaining clip from armature plate.
- Pull out protector tubes and unsolder the splice connectors.
- Solder the yellow wire in the harness to the white tube protected wire of the coil.
- Solder the yellow/black striped wire in the harness to the black tube protected wire of the coil.



A001002006

- Position protector tubes over connections.
- Prior to assembly, apply Loctite 242 (blue, medium strength) on the lighting coil screws.
- Fasten retaining clip onto protector tubes.

▼ **CAUTION:** Before reinstalling magneto, remove the loose epoxy from harness.

## ASSEMBLY

### 13,18,21,22, Armature plate, magneto flywheel, lock washer & nut

Position the armature plate on the crankcase aligning the marks on both parts.

Clean crankshaft extension taper.

Apply Loctite 242 (blue, medium strength) on taper.

Position key, magneto flywheel and lock washer on crankshaft.

Clean nut threads and apply Loctite 242 (blue, medium strength) before tightening nut to 85 N•m (63 lbf•ft).

At reassembly coat all electric connections with silicone dielectric grease to prevent corrosion or moisture penetration.



**CAUTION:** Do not use silicone sealant, this product will corrode contacts.

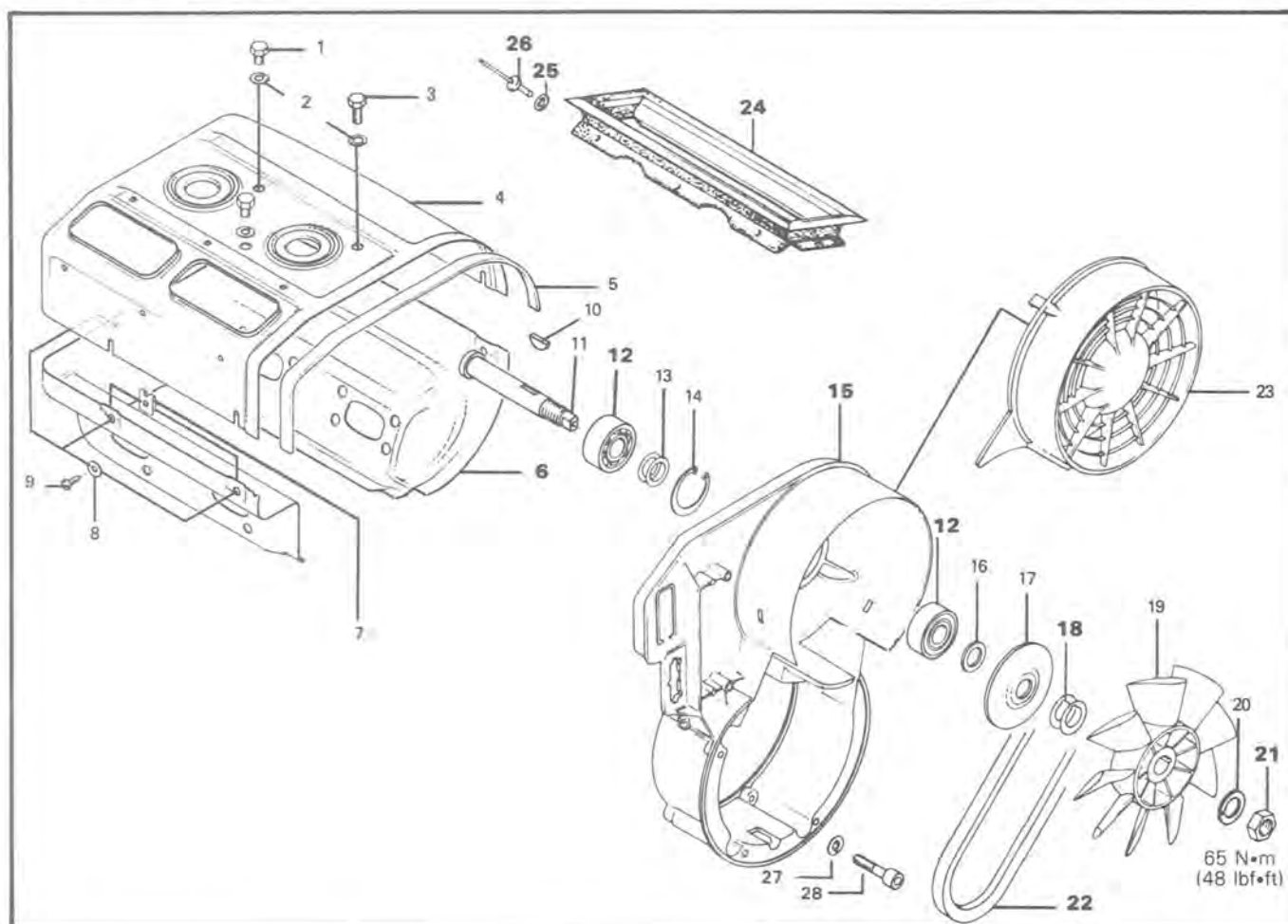


**NOTE:** For ignition timing procedure refer to "Ignition timing" section 04-02.

## Section 02 ENGINE

### Sub-section 04 (447 ENGINE TYPE)

## COOLING SYSTEM



1. Hexagonal screw M8 x 9 (2)
2. Lock washer 8 mm (3)
3. Hexagonal screw M8 x 16
4. Cylinder head cowl
5. Sealing strip
6. Cylinder cowl
7. Spring nut 4.8 (6)
8. Washer (6)
9. Screw 8 x 16 (6)
10. Woodruff key 3 x 5
11. Fan shaft
12. Ball bearing 6203 (2)
13. Shim (2)
14. Circlip

15. Fan housing
16. Distance sleeve
17. Pulley half
18. Shim 0.5 mm
19. Fan
20. Lock washer 16 mm
21. Hexagonal nut M16
22. V-belt
23. Fan cover
24. Air duct
25. Washer
26. Rivet (closed end)
27. Lock washer 6 mm (4)
28. Allen screw M6 x 30 (4)

65 N•m  
(48 lbf•ft)

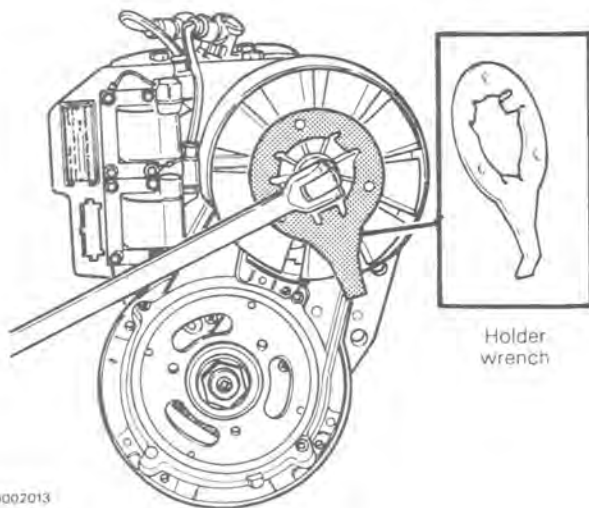
## CLEANING

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

## DISASSEMBLY & ASSEMBLY

### 21, Fan nut

To remove or install fan pulley retaining nut, lock fan pulley with special holder wrench P/N 420 876 357. At assembly, torque nut to 65 N•m (48 lbf•ft).



A009002013

### 18,22, Shim & V-belt

Fan belt deflection must be 9.5 mm (3/8") when applying a force of 50 N (11 lbf). To adjust, install or remove shim(s) between pulley halves. Install excess shim(s) between fan and lock washer.

Use belt tension tester P/N 414 3482 00 to check deflection.



A000002007

### 12,15, Ball bearing & fan housing

It is first necessary to heat bearing housing to 65°C (150°F) to remove or install bearing.

### 24,25,26, Air duct, washer & rivet (closed end)

Air duct can be removed by drilling out rivets.

▼ **CAUTION:** At reassembly, use only closed end rivets to avoid rivet ends from falling into magne-

### 6, Cylinder cowl

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

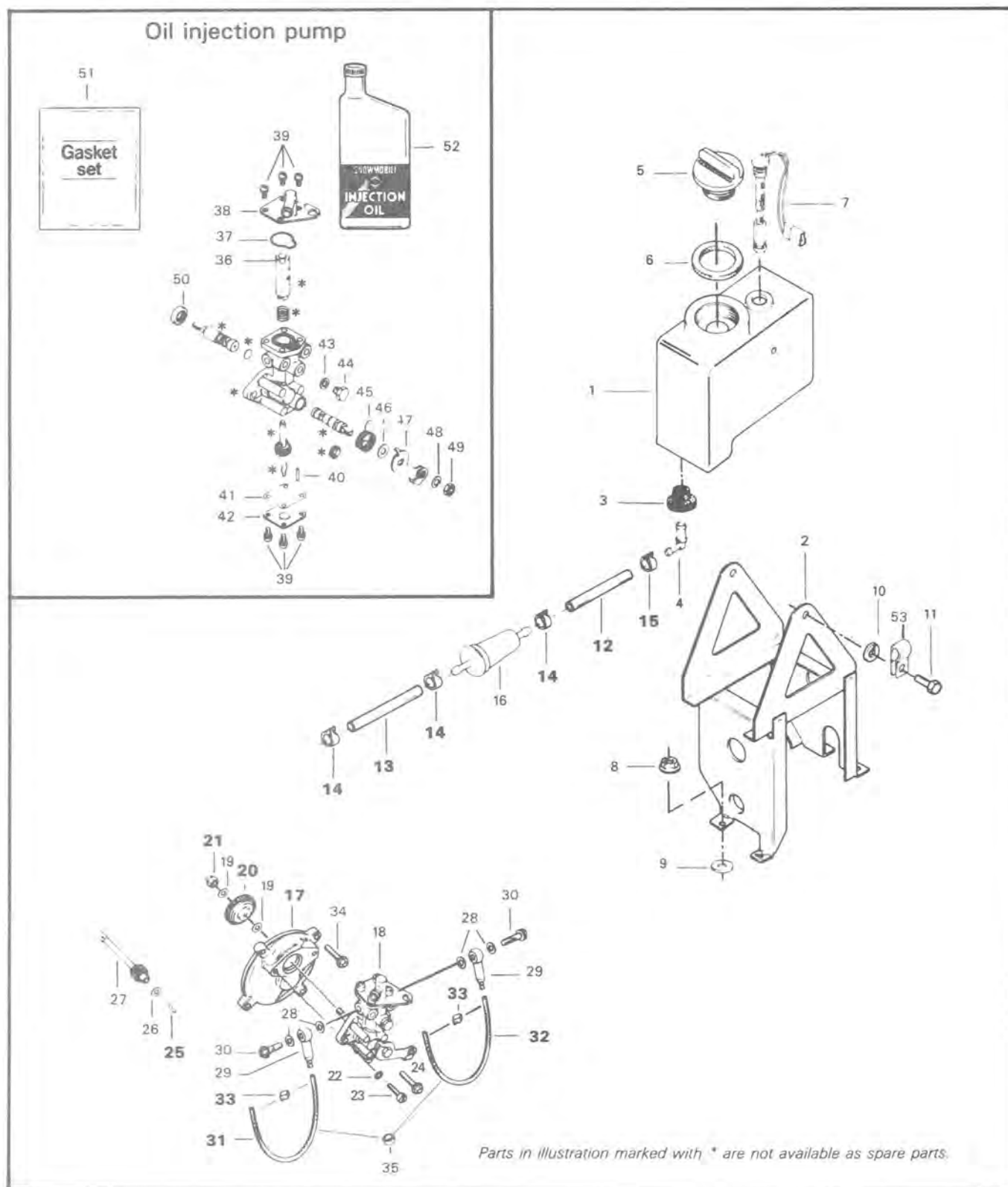
◆ **WARNING:** If fan protector is removed, always reinstall after servicing.



## Section 02 ENGINE

### Sub-section 04 (447 ENGINE TYPE)

## OIL INJECTION PUMP & RESERVOIR





## Section 02 ENGINE

### Sub-section 04 (447 ENGINE TYPE)

1. Injection oil tank
2. Oil reservoir support
3. Grommet
4. Male connector
5. Oil tank cap
6. Gasket
7. Oil level sensor
8. Elastic stop nut M5 x 0.8 (4)
9. Rubber washer (4)
10. Lock washer 6 mm (2)
11. Screw M6 x 12 (2)
12. Oil line (38 mm)
13. Oil line (102 mm)
14. Spring clip (3)
15. Spring clip
16. Filter
17. Oil pump mounting flange
18. Oil pump
19. Washer 6.2 mm (2)
20. Oil pump gear 27 teeth
21. Lock nut 6 mm
22. Lock washer 5 mm (2)
23. Screw M5 x 16 (2)
24. Taptite screw M5 x 16 (2)
25. Needle roll
26. Washer 4,3
27. Gear 9 teeth
28. Banjo oil gasket (4)
29. Banjo (2)
30. Banjo bolt (2)
31. Oil line 325 mm
32. Oil line 325 mm
33. Clamp (4)
34. Taptite screw M5 x 16 (4)
35. Rubber ring
36. Retainer
37. O-ring
38. Plate
39. Screw with lock washer (8)
40. Stop pin
41. Gasket
42. Plate
43. Washer
44. Hexagonal screw M6 x 7
45. Spring
46. Washer
47. Lever
48. Lock washer 6 mm
49. Nut 6 mm
50. Seal
51. Gasket set
52. Oil injection
53. Clip

## ASSEMBLY

### 20, Oil pump gear

At gear assembly, apply a light coat of grease on gear teeth.

### 25, Needle roll

The needle roll must be engage as deep as possible in the pump mounting flange.


### 14, 15, 33, Spring clip & clamp

Always check for spring clips and clamps tightness.

## CLEANING

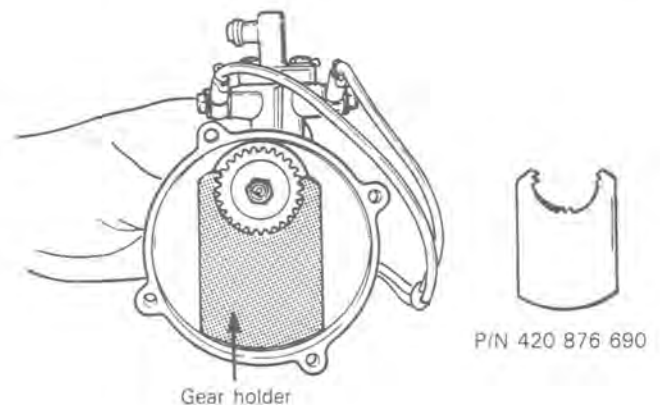
Clean all metal components in a non-ferrous metal cleaner.

## DISASSEMBLY

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

### 20,21,25, Oil pump gear, lock nut & needle roll

To remove retaining nut, extract the needle roll with pliers and lock gear in place using no 420 876 690 tool.



A003002014

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## Section 02 ENGINE

### Sub-section 04 (447 ENGINE TYPE)

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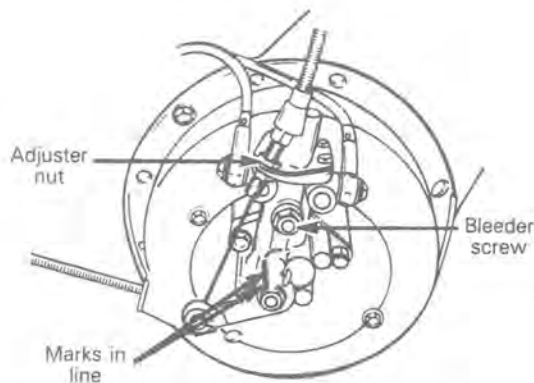
#### ADJUSTMENT

Prior to adjusting the pump, make sure all carburetor adjustments are completed.

##### To synchronize pump with carburetor:

Eliminate the throttle cable free-play by pressing the throttle lever until a light resistance is felt, then hold in place. The aligning marks on the pump casting and on the lever must align. If not, loosen the adjuster nut and adjust accordingly.

Retighten the adjuster nut.



A001002008

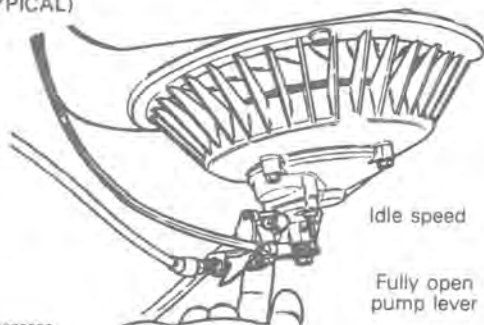
##### To bleed oil lines:

All oil lines should be full of oil. If required, bleed the main oil line (between tank and pump) by loosening the bleeder screw until all air has escaped from the line.

Make sure the tank is sufficiently filled.

Check the small oil lines (between pump and intake manifold). If required, fill the lines by running the engine at idle speed while holding the pump lever in fully open position.

(TYPICAL)

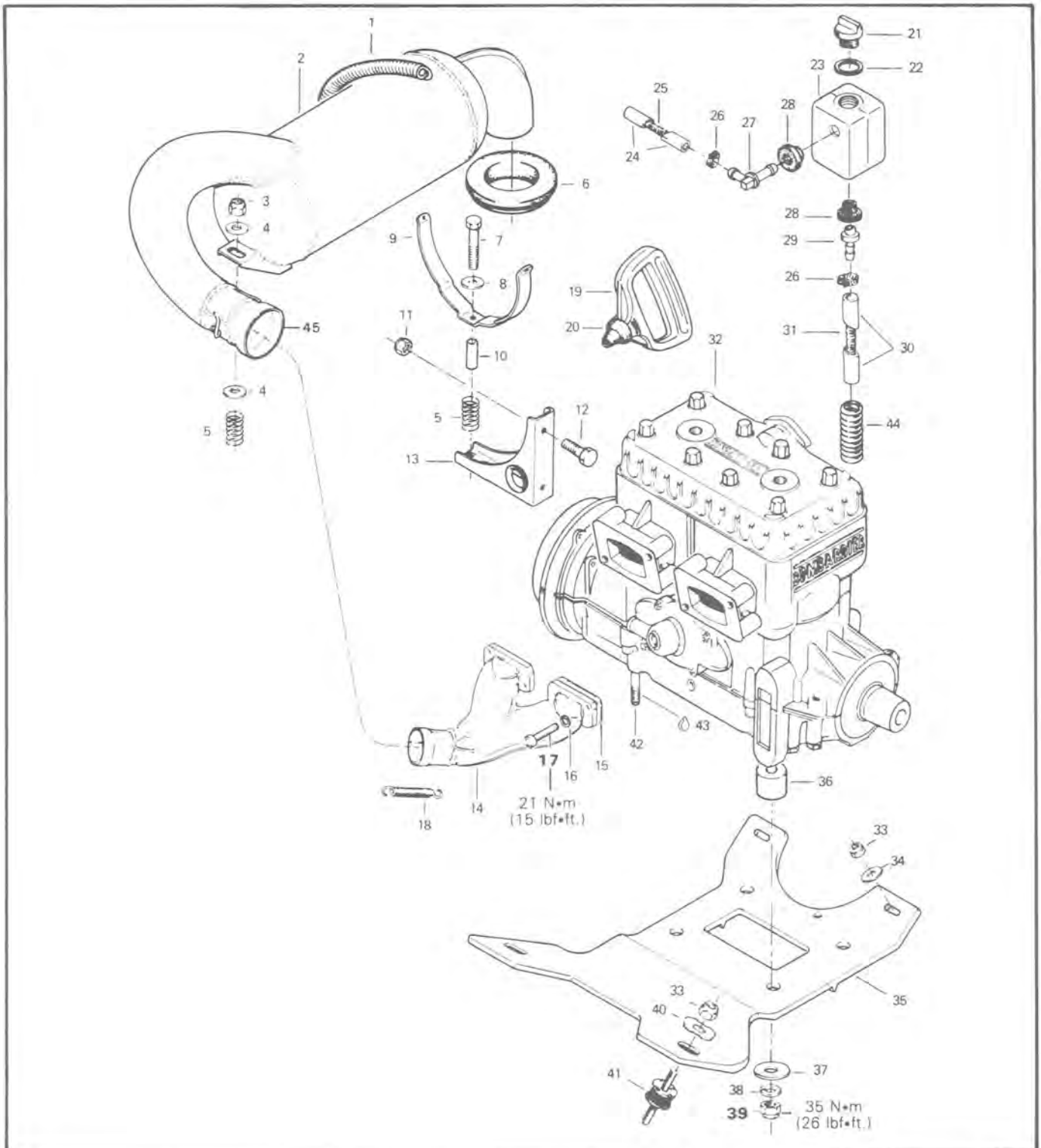


A001002009

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

## 462 ENGINE TYPE

### ENGINE REMOVAL & INSTALLATION



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## Section 02 ENGINE

### Sub-section 05 (462 ENGINE TYPE)

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- |                               |                                    |
|-------------------------------|------------------------------------|
| 1. Muffler                    | 24. Oil line                       |
| 2. Spring                     | 25. Spring                         |
| 3. Elastic stop nut M8        | 26. Gear clamp (4)                 |
| 4. Washer 8,4 mm (2)          | 27. Elbow male connector           |
| 5. Spring (2)                 | 28. Grommet (2)                    |
| 6. Exhaust washer             | 29. Male connector                 |
| 7. Hex. screw M6 x 20         | 30. Oil line                       |
| 8. Washer 6 mm                | 31. Spring                         |
| 9. Muffler attachment         | 32. Engine Rotax 462               |
| 10. Bushing                   | 33. Elastic stop nut M10 x 1,5 (4) |
| 11. Elastic stop nut 6 mm (2) | 34. Washer (2)                     |
| 12. Hex. screw M6 x 16 (2)    | 35. Engine support                 |
| 13. Muffler support           | 36. Distance sleeve 15 mm (4)      |
| 14. Exhaust manifold          | 37. Washer 10,5 mm                 |
| 15. Gasket (2)                | 38. Lock washer 10 mm (4)          |
| 16. Lock washer 8 mm (4)      | 39. Nut 10 mm (4)                  |
| 17. Allen screw M8 x 25 (4)   | 40. Internal tooth cup washer (2)  |
| 18. Spring (2)                | 41. Rubber mount (4)               |
| 19. Starter grip              | 42. Stud M10 x 42 (4)              |
| 20. Rubber buffer             | 43. Loctite 242                    |
| 21. Cap                       | 44. Grip 394 mm (16.5")            |
| 22. Sealing ring              | 45. Female ball joint              |
| 23. Rotary valve oil tank     |                                    |
- 

## REMOVAL FROM VEHICLE

Disconnect or remove the following from vehicle:

- coolant hose (drain cooling system first),
- exhaust manifold,
- oil injection hose,
- oil injection cable,
- wiring harness,
- rewind starter cable,
- pulsation hose,
- rotary valve lubrication hose,
- pulley guard,
- belt,
- clutch,
- engine support nut (under engine support),
- clamp between carburetor and intake manifold.

## ENGINE SUPPORT & MUFFLER DISASSEMBLY & ASSEMBLY

### 17,39, Manifold bolts & engine nuts

Torque the engine support nuts (under engine support) to 35 N•m (26 lbf•ft).

Torque the manifold bolts to 21 N•m (15 lbf•ft).

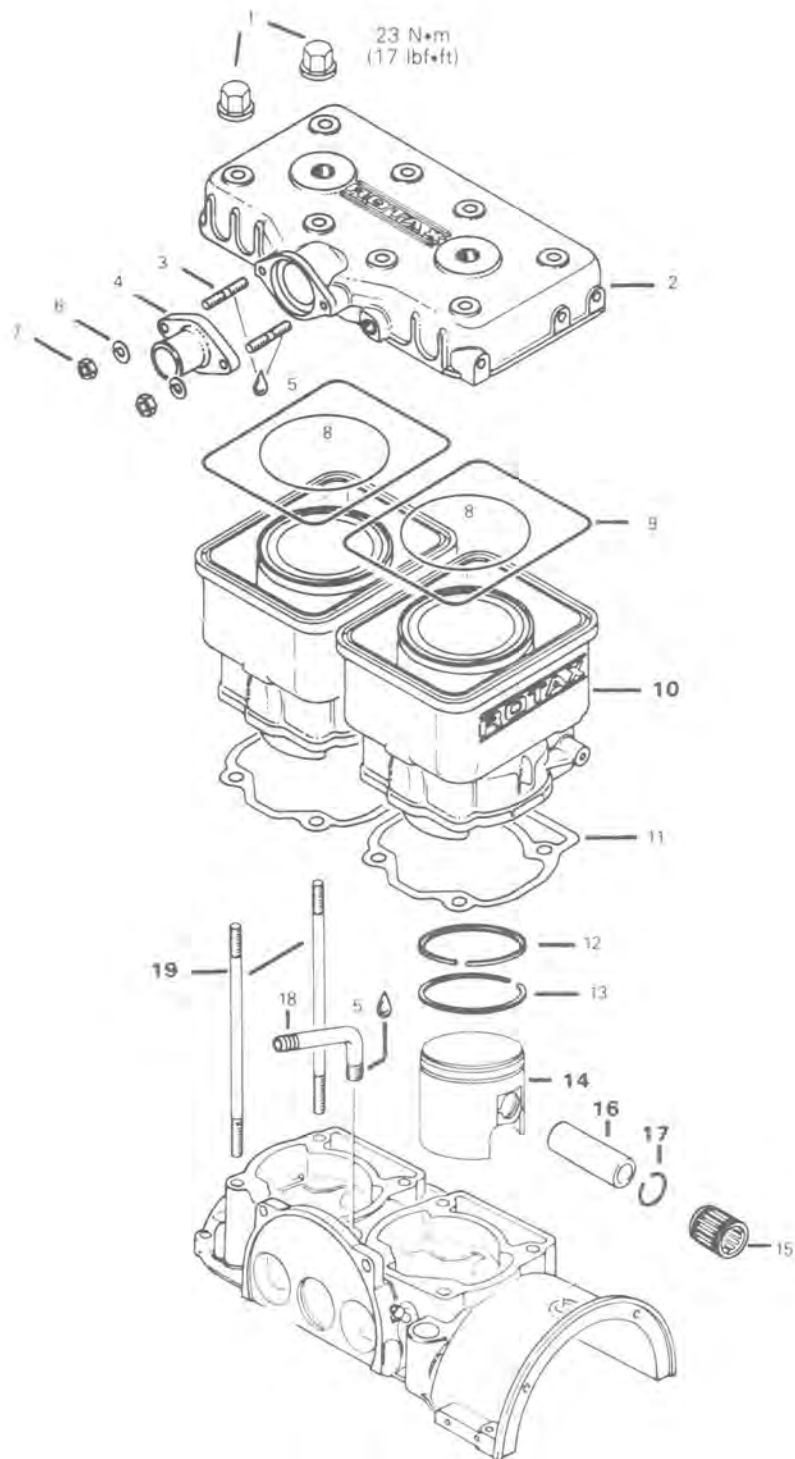
## INSTALLATION ON VEHICLE

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

- Check tightness of engine mount nuts.
- Verify throttle cable condition then after throttle cable installation, check carburetor maximum throttle slide opening and oil pump adjustment.
- Check pulley alignment and drive belt tension.

**Section 02 ENGINE**  
Sub-section 05 (462 ENGINE TYPE )

**TOP END**



## Section 02 ENGINE

### Sub-section 05 (462 ENGINE TYPE)

1. Cap nut M8 x (8)
2. Cylinder head
3. Stud M6 x 25 (2)
4. Coolant outlet socket
5. Loctite 242 blue (medium strength)
6. Lock washer 6 mm (2)
7. Nut M6 (2)
8. Gasket (O-ring) (2)
9. Gasket (O-ring) (2)
10. Cylinder (2)

11. Cylinder/crankcase gasket (2)
12. L-ring
13. Rectangular-ring
14. Piston
15. Needle bearing
16. Gudgeon pin
17. Circlip (4)
18. Angular tube, oil inlet
19. Cylinder stud M8 x 175 (8)

## CLEANING

Discard all gaskets.

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

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



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

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

## DISASSEMBLY

### 14,16,17, Piston, gudgeon pin & circlip

Place a clean cloth over crankcase to prevent circlips from falling into crankcase, then with a pointed tool inserted in piston notch, remove circlips from piston.

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



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

## INSPECTION

The inspection of the engine top end must include the following measurements:

MEASUREMENTS	TOLERANCES		
	FITTING NEW PARTS (MIN.)	(MAX.)	WEAR LIMIT
Cylinder taper	N.A.	N.A.	.08 mm (.0031")
Cylinder out of round	N.A.	N.A.	.05 mm (.0020")
Cylinder/piston clearance	.08 mm (.0031")	.10 mm (.0039")	.20 mm (.0079")
Ring/piston groove clearance	.04 mm (.0016")	.11 mm (.0043")	.20 mm (.0079")
Ring end gap	.20 mm (.0079")	.35 mm (.0138")	1.0 mm (.0394")



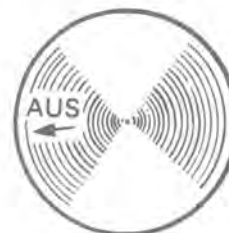
**NOTE:** For the measurement procedures, refer to "Engine dimensions measurement", section 02-10.

## ASSEMBLY

### 14, Piston

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

EXHAUST



A001002001

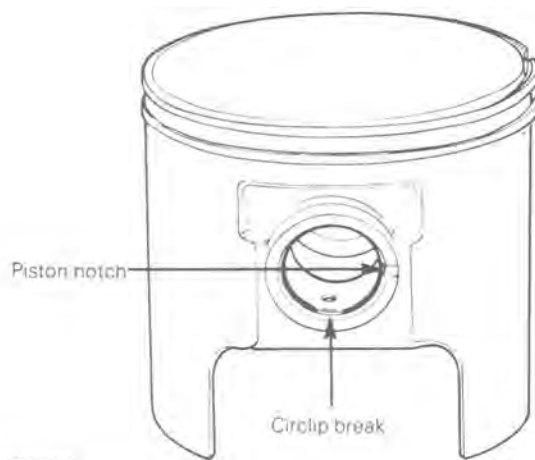
### 17, Circlip

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

Using very fine emery cloth, remove any burrs on piston caused through circlip installation.

## Section 02 ENGINE

### Sub-section 05 (462 ENGINE TYPE )



A001002001

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

#### 10, Cylinder

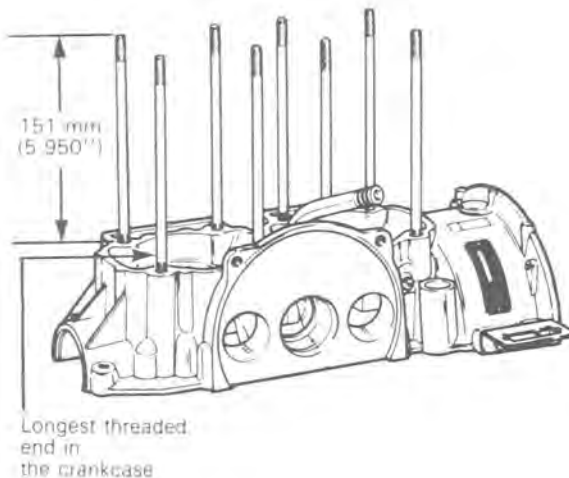
Before inserting piston in cylinder, lubricate the cylinder with new injection oil or equivalent.

Cylinders are identical; they can be interchanged as long as the pistons are matched to their own cylinder.

Spare parts pistons and cylinders are identified with a green or red dot, it is important to match piston and cylinder with the same color.

#### 19, Cylinder studs

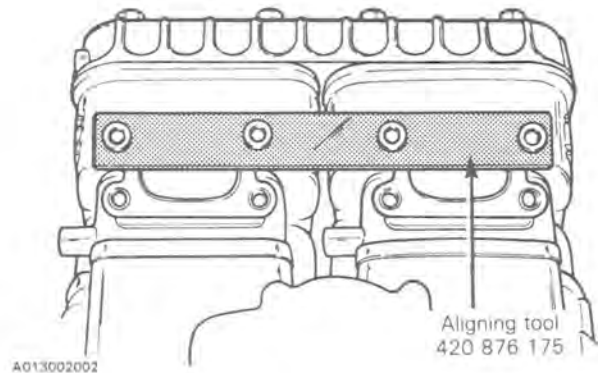
Because of cap nuts, cylinder studs have to be screwed into the crankcase so that they do not protrude by more than 151 mm (5.950"). Longest threaded part should be in the crankcase.



A013002001

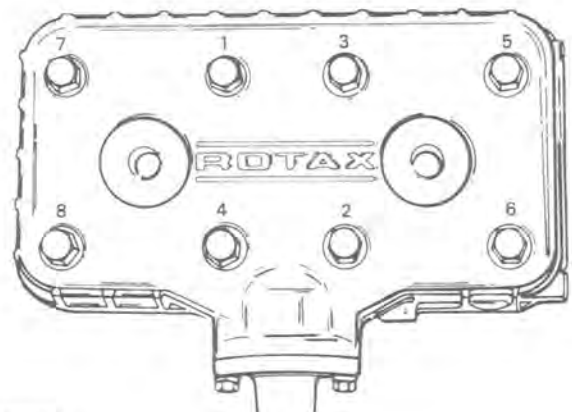
#### 10, Cylinder

When reassembling the cylinders to the crankcase, it is important to have them properly aligned so that the cylinder head holes will match up with the studs. A special tool (as per illustration) can be used to align the cylinders.



A013002002

Torque cylinder head nuts to 23 N•m (17 lbf•ft) following illustrated sequence.

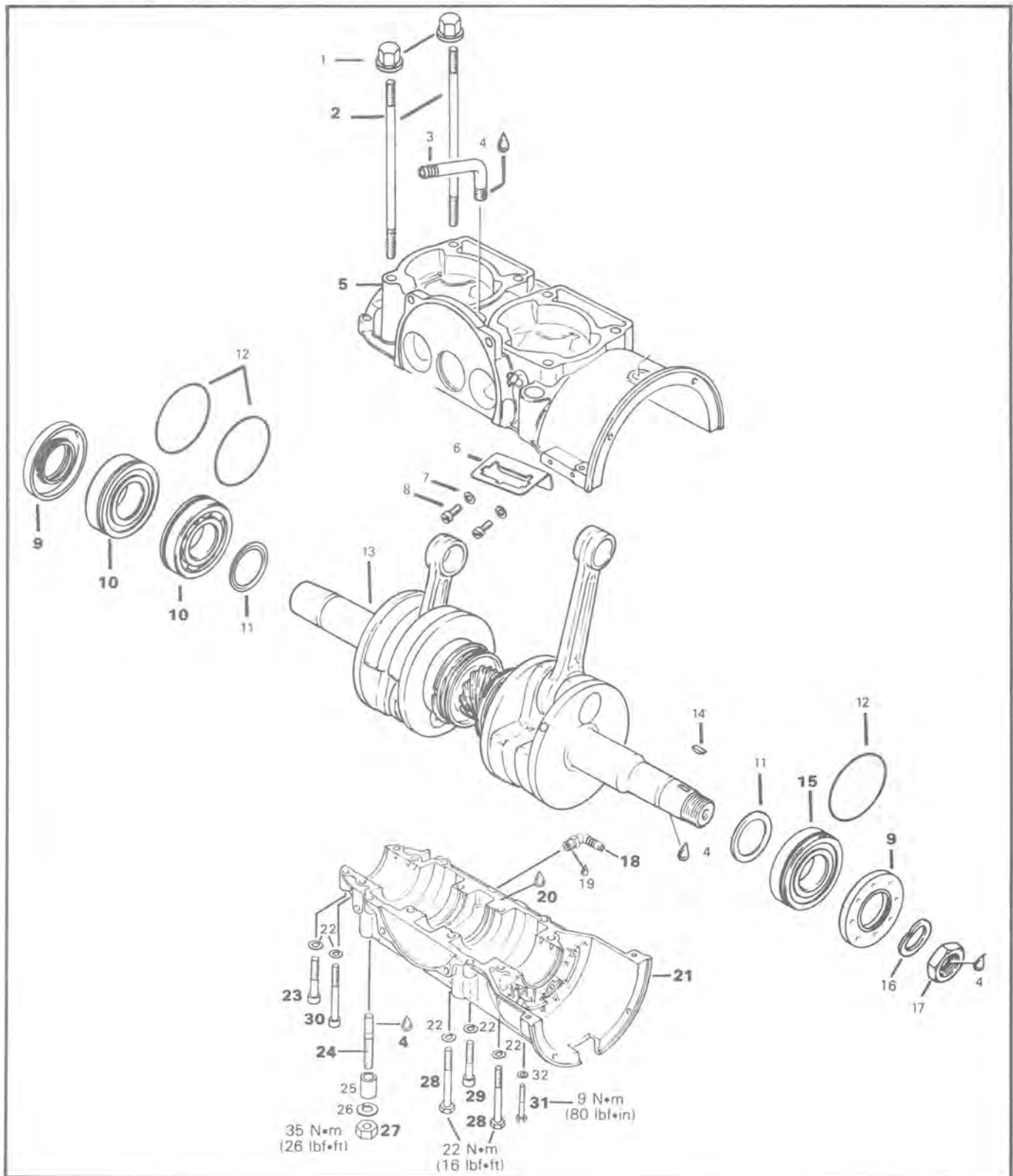


A013002003

## Section 02 ENGINE

### Sub-section 05 (462 ENGINE TYPE)

## BOTTOM END





## Section 02 ENGINE

### Sub-section 05 (462 ENGINE TYPE)

1. Cap nut M8 (8)
2. Stud M8 x 175 (8)
3. Angular tube, oil inlet
4. Loctite 242
5. Crankcase upper half
6. Junction box bracket
7. Lock washer 5 mm (2)
8. Cyl. screw M5 x 12 (2)
9. Oil seal (2)
10. Ball bearing (2)
11. Distance ring (2)
12. O-ring (3)
13. Crankshaft
14. Woodruff key 3 x 3.7
15. Ball bearing (1)
16. Lock washer 22 mm

17. Hex. nut M22 x 1.5
18. Angular tube, oil outlet
19. Loctite 271
20. Loctite 515
21. Crankcase lower half
22. Lock washer 8 mm (14)
23. Cyl. screw M8 x 45 (2)
24. Stud M10 x 42 (4)
25. Distance sleeve 15 mm (4)
26. Lock washer 10 mm (4)
27. Hex. nut M10 (4)
28. Hex. screw M8 x 70 (6)
29. Cyl. screw M8 x 40 (4)
30. Cyl. screw M8 x 75 mm (2)
31. Hex. screw M6 x 35 (2)
32. Lock washer 6 mm (2)

## CLEANING

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

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

## DISASSEMBLY

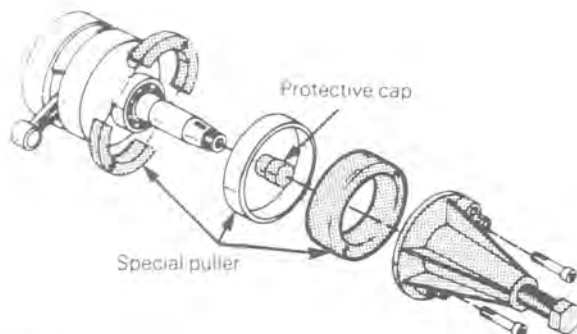
### General

To remove drive pulley, refer to "Drive pulley", section 03-03.

To remove magneto, refer to "Magneto" in this section.

### 10,15, Ball bearings

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



A000001082

## INSPECTION

The inspection of the engine bottom end must include the following measurements:

MEASUREMENTS	TOLERANCES	
	FITTING NEW PARTS (MIN.)	WEAR LIMIT (MAX.)
Crankshaft deflection	N.A.	N.A.
Connecting rod big end axial play	.20 mm (.0079")	.53 mm (.0208")
		1.00 mm (.0394")

**NOTE:** For the measurement procedures, refer to "Engine dimensions measurement", section 02-10.

## ASSEMBLY

### 10,15, Ball bearings

Prior to installation, place bearings into an oil container filled with oil previously heated to 100°C (210°F). This will expand bearing and ease installation. Then put the distance rings on each side of the crankshaft, flat side of the inner diameter against the bearing and round side against the counterweight.

Install the bearings being careful not to mix them. The two bearings on the PTO side have more clearance between the balls and the bearing cage and also have a plastic cage.

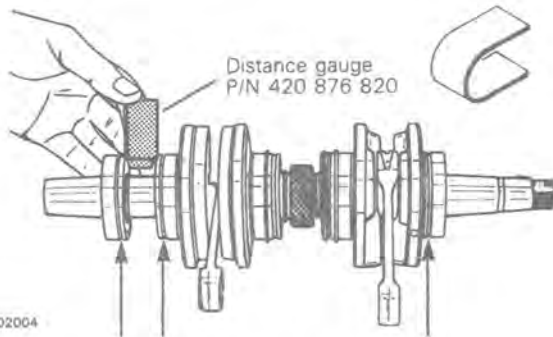
Make sure that the distance ring does not move between the counter-weight and the bearing on each side of the crankshaft.

Use the distance gauge (P/N 420 876 820) to adjust the position of the second bearing on PTO side. See illustration.

## Section 02 ENGINE

### Sub-section 05 (462 ENGINE TYPE)

Install the bearings with oil seal groove as per the following illustration:



A013002004

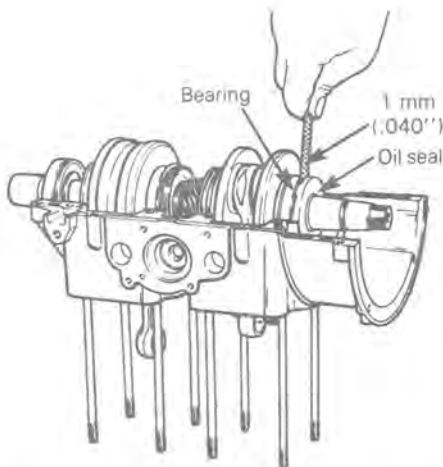
**CAUTION:** Do not mix up the bearings. The two bearings on PTO side have more clearance between the balls and the bearing cage and also have a plastic cage.

#### 9, Oil seal

At seal assembly, apply a light coat of lithium grease on seal lips.

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

When installing plain seals (seal without locating ring or without spacing legs), ensure to maintain the specified gap as illustrated.



A013002005

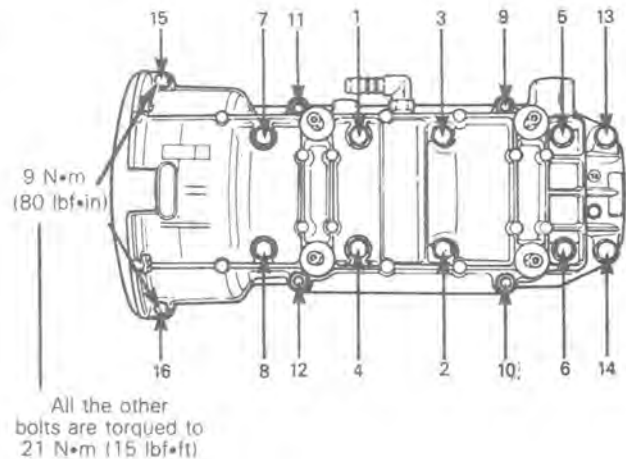
#### 5,20,21, Crankcase halves & Loctite

Crankcase halves are factory matched and therefore, are not interchangeable or available as single halves. Prior to joining of crankcase halves, spray some new injection oil (or equivalent) on all the moving parts of the crankshaft. Then apply a light coat of Loctite 515 (413 7027 00) on mating surfaces.

**NOTE:** Prior to applying Loctite 515 it is possible to use primer N (P/N 413 7053 00) or primer NF (P/N 413 7024 00). This increases cure speed and gap filling capability. Refer to supplier instructions.

**CAUTION:** Before joining of crankcase halves be sure that crankshaft rotary valve gear is well engaged with rotary valve shaft gear.

Position the crankcase halves together and torque bolts by hand, then install armature plate (tighten) on magneto side to correctly align the crankcase halves. Torque bolts to proper torque following illustrated sequence.



A013002006

**NOTE:** Torque the two smaller bolts (6 mm) on magneto side to 9 N•m (80 lbf•in).

#### 23,28,29,30, Hexagonal screws & Allen bolts M8

Torque the M8 screws to 21 N•m (15 lbf•ft). Install them to proper location as per exploded view.

#### 31, Hexagonal screws M6 × 35

Torque the M6 screws to 9 N•m (80 lbf•in).

#### 24, Stud

At assembly on crankcase, apply Loctite 242 on threads.

**27, Hexagonal nut**

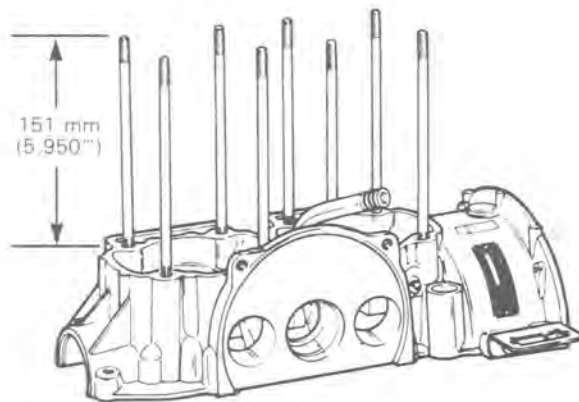
Torque to 35 N•m (26 lbf•ft).

**18, Angular tube & oil outlet**

Apply Loctite 271 on threads prior to assembly.

**2, Stud**

Because of cap nuts, cylinder studs have to be screwed into the crankcase so that they do not exceed further than 151 mm (5.950''). Longest threaded end should be in the crankcase.

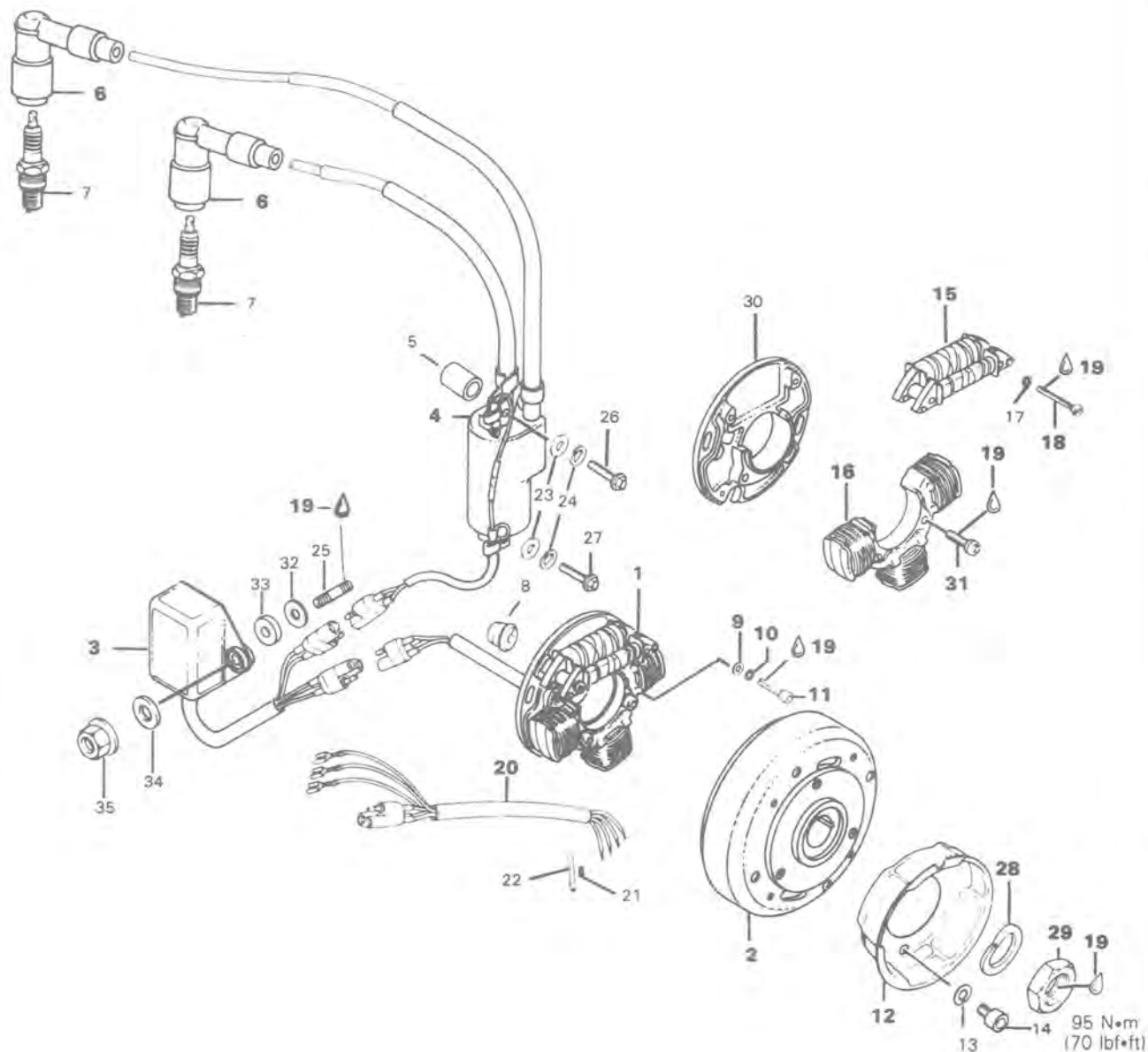


A013002001

## Section 02 ENGINE

### Sub-section 05 (462 ENGINE TYPE)

## MAGNETO



## Section 02 ENGINE

### Sub-section 05 (462 ENGINE TYPE)

1. Armature plate ass'y
2. Magneto flywheel ass'y
3. C.D. Box
4. Ignition coil
5. Distance sleeve (2)
6. Spark plug protector ass'y (2)
7. Spark plug (2)
8. Cable grommet
9. Washer 5.5 mm (2)
10. Lock washer 5 mm (2)
11. Allen screw M5 × 18 (2)
12. Starting pulley (1)
13. Lock washer 8 mm (3)
14. Hex. screw M8 × 16 (3)
15. Generating coil
16. Lighting coil
17. Lock washer 5 mm (2)
18. Screw M5 × 35 (2)
19. Loctite 242
20. Wire ass'y
21. Cable terminal (6)
22. Protection tube (6)
23. Washer 6 mm (2)
24. Lock washer 6 mm (2)
25. Stud M6 × 25 (2)
26. Allen screw M6 × 50 (1)
27. Allen screw M6 × 45 (1)
28. Lock washer 22 mm
29. Hex. nut M22 × 1.5
30. Armature plate
31. Combined screw M6 × 25 (2)
32. Washer 6.2 mm (2)
33. Rubber washer (2)
34. Washer 6.4 mm (2)
35. Elastic stop nut M6 (2)

## CLEANING

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

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

## DISASSEMBLY

To gain access to magneto assembly, remove:

- muffler,
- rewind starter,
- starting pulley.

○ **NOTE:** Before disassembling magneto plate, indexing marks should be located to facilitate reassembly.

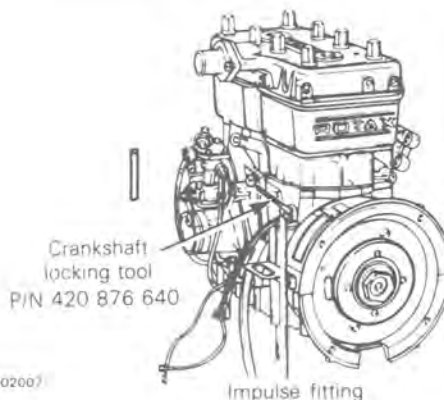
### 29, Hexagonal nut

To remove magneto flywheel retaining nut:

- lock crankshaft with crankshaft locking tool (service tool) as illustrated (magneto side piston must be at top dead center);

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

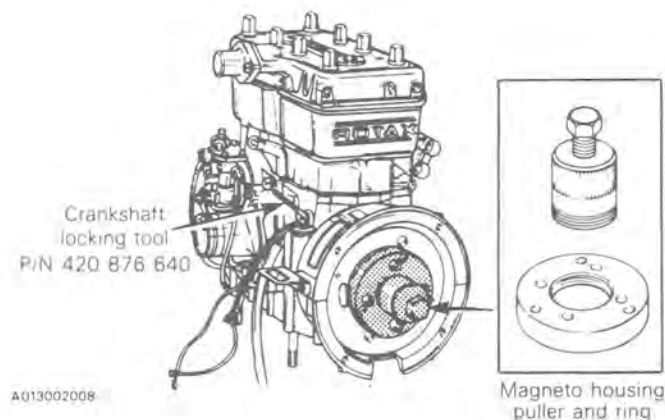
- remove magneto retaining nut.



### 2, Magneto flywheel assembly

To remove magneto housing (flywheel):

- lock crankshaft with crankshaft locking tool (service tool) as illustrated;
- adjust magneto housing puller and puller ring as illustrated;



## Section 02 ENGINE

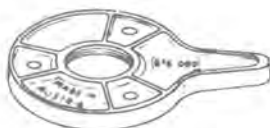
### Sub-section 05 (462 ENGINE TYPE)

NOTE: For the above procedure, the locking type puller can be used without crankshaft locking tool.



P/N 420 876 065

A000001083



P/N 420 876 080

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

### 1, Armature plate assembly

To remove the armature plate:

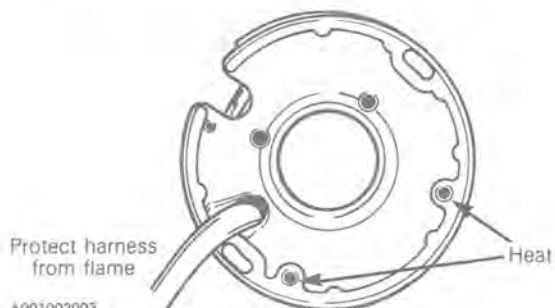
- Remove Allen screws.
- Take off the grommet from crankcase.
- Pull out the armature, being careful when passing the connectors through the crankcase.

## REPAIR

### 15, Generating coil

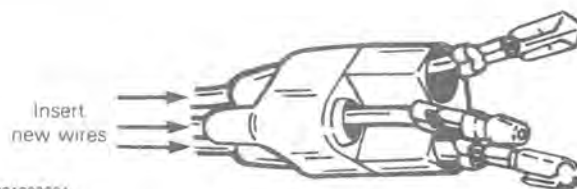
To replace generating coil:

- Heat the armature plate to 93°C (200°F) around the screw holes to break the Loctite bond.



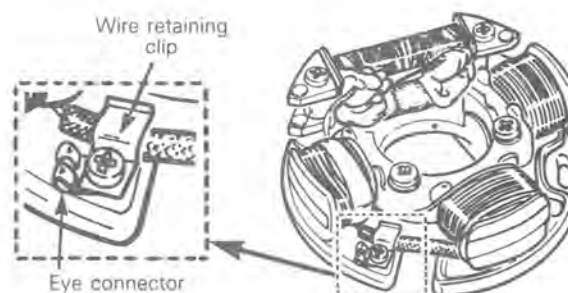
CAUTION: Protect harness from flame.

- Remove screws (use Phillips no. 2 or suitable flat screw driver).
- Cut the four wires as close as possible to the coil body.
- To pass new coil wires in harness, tape the old wires to the end of new wires and pull them through the harness protector tube.
- Insert the new wires into the old connector housing and install connectors.



CAUTION: Replace the old wires in the connector with the same color coded new wires.

- Install a new receptacle connector to the black/yellow striped wire.
- To install the ground connector of the armature plate, tape the new black lead to the old one and pull it under the lighting coil with the old wire.
- Solder an eye connector to the lead and fasten it under the wire retaining clip.



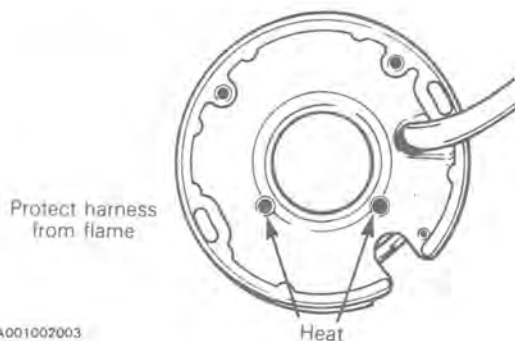
### 18,19, Generating coil screw & Loctite 242

To install the new coil on the armature plate, remove the shipping nuts from the coil and apply Loctite 242 (blue, medium strength) to screws before assembly.

CAUTION: Before reinstalling the magneto, remove the loose epoxy from harness.

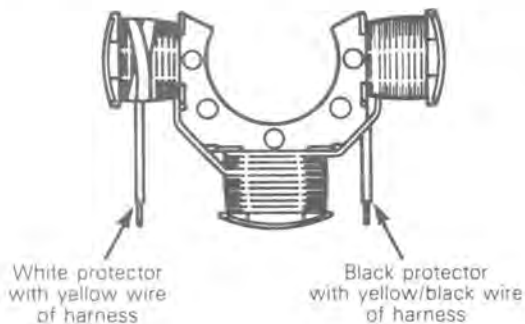
To replace lighting coil:

- Heat the armature plate to 93°C (200°F) around the screw holes to break the Loctite bond.



CAUTION: Protect harness from flame.

- Remove screws (use Phillips no. 3 screwdriver).
- Remove the wire retaining clip from armature plate.
- Pull out protector tubes and unsolder the splice connectors.
- Solder the yellow wire in the harness to the white tube protected wire of the coil.
- Solder the yellow/black striped wire in the harness to the black tube protected wire of the coil.



A001002006

## 22, Protector tube

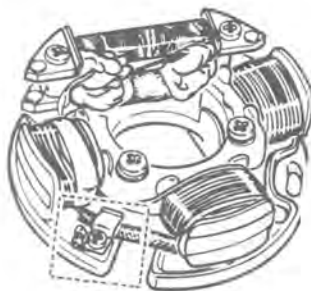
Position protector tubes over connections.

## 19,31, Loctite 242 & lighting coil screws

Prior to assembly, apply Loctite 242 (blue, medium strength).

- Fasten retaining clip onto protector tubes.

The ground terminal from generating coil must be fastened under this clip.



A001002005

**CAUTION:** Before reinstalling magneto, remove the loose epoxy from harness.

## 1,9,10,11,19, Armature plate, lock washers, washers, Loctite 242 & screws

Position the armature plate on the crankcase aligning the marks on both parts.

Put a drop of Loctite 242 on screw threads and tighten.

Clean crankshaft extension (taper).

Apply Loctite 242 on taper.

## 2,19,28,29, Loctite 242, flywheel, lock washer & nut

Position woodruff key, magneto flywheel, lock washer on crankshaft.

Clean nut threads and apply Loctite 242 (blue, medium strength) before tightening nut to 95 N•m (70 lbf-ft).

At reassembly coat all electric connections with silicone dielectric grease to prevent corrosion or moisture penetration.

**CAUTION:** Do not use silicone sealant, this product will corrode contacts.

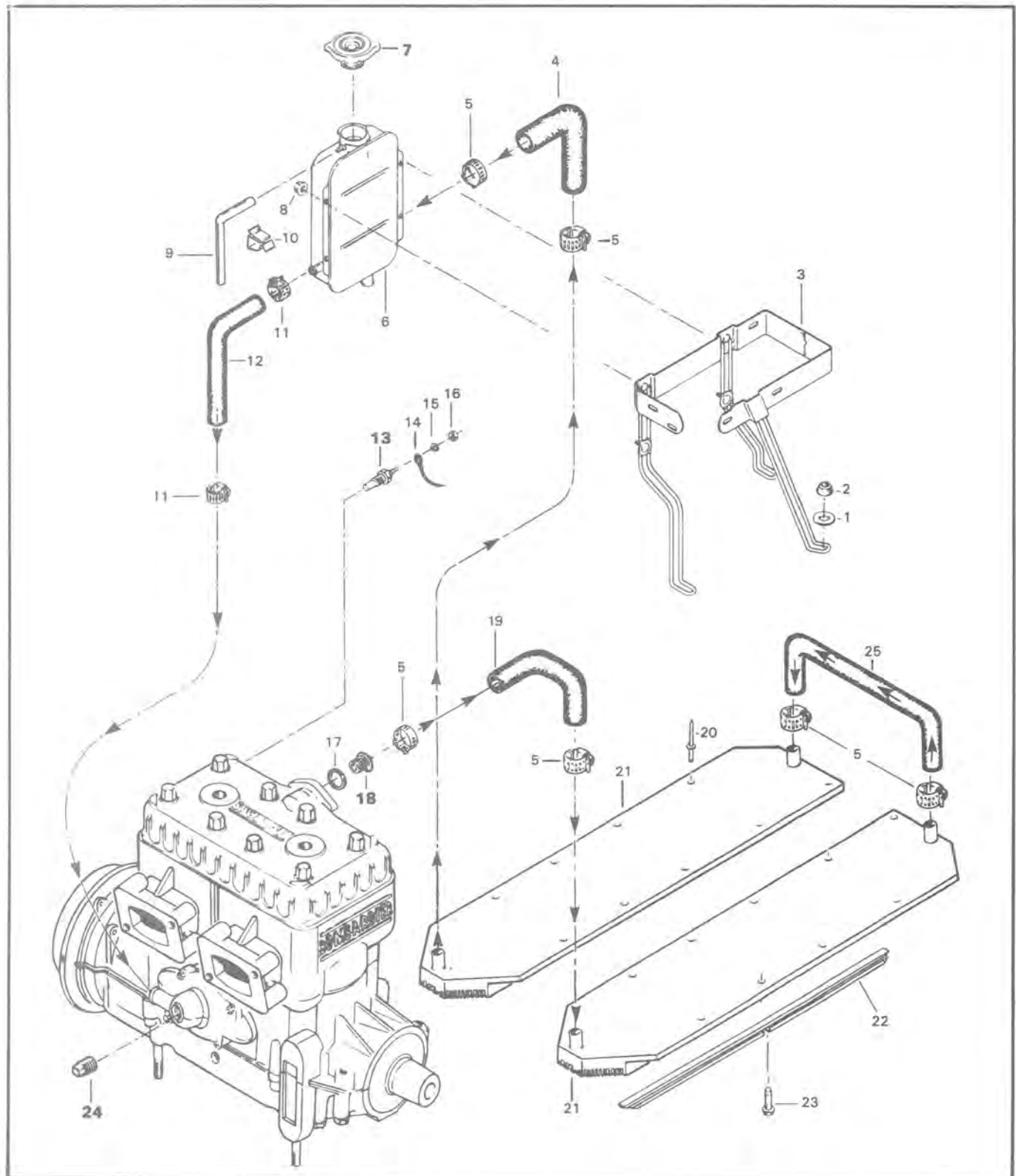
**NOTE:** For ignition timing procedure refer to "Ignition timing", section 04-02.



## Section 02 ENGINE

### Sub-section 05 (462 ENGINE TYPE)

## COOLING SYSTEM





## Section 02 ENGINE

### Sub-section 05 (462 ENGINE TYPE)

1. Washer 6.2 mm (3)
2. Elastic stop nut M5 (3)
3. Tank support
4. Hose
5. Clamp (6)
6. Coolant tank
7. Pressure cap
8. Elastic stop nut M5 (4)
9. Overflow hose 292 mm
10. Clip
11. Clamp (2)
12. Hose 419 mm
13. Sender

14. Sender wire
15. Lock washer
16. Hex. nut
17. Grommet
18. Thermostat
19. Hose
20. Rivet (40)
21. Radiator (2)
22. Radiator protector (2)
23. Taptite screw M5 x 15 (2)
24. Plug
25. U-hose

## INSPECTION

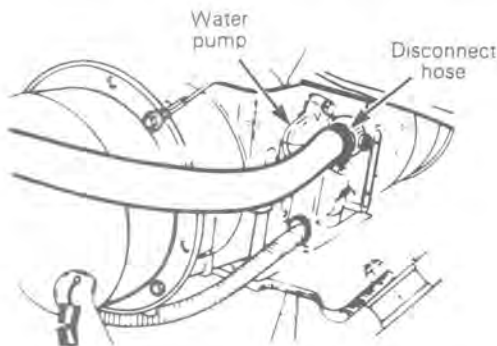
Check general condition of hoses and clamp tightness.

## DRAINING THE SYSTEM

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

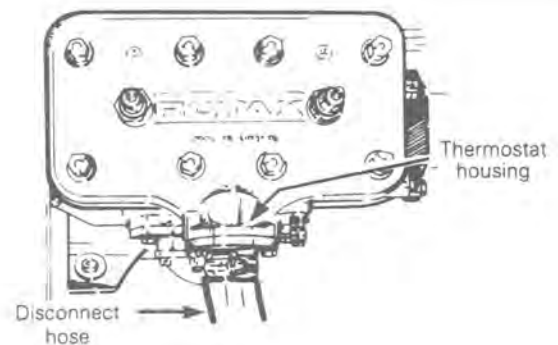
To drain cooling system:

- Use a length of hose long enough to drain coolant into a container lower than engine.
- Remove the engine coolant hose from water pump.



A013002009

- Connect "drain hose" onto water pump.
- Put both hoses into the container.
- Remove coolant tank cap and lift the rear of the vehicle to drain the heat exchangers.
- When the coolant level is low enough, remove the hose from thermostat housing.



A013002010

## DISASSEMBLY & ASSEMBLY

### 13,24, Plug, sender

Apply Loctite pipe thread sealant to avoid leaks.

### 7, Pressure cap

Check that the cap pressurizes the system. If not, install a new 90 kPa (13 lb/in<sup>2</sup>). (Do not exceed 90 kPa (13 lb/in<sup>2</sup>).

### 18, Thermostat

To check thermostat, put it in water and heat water. Thermostat should open when water temperature reaches 43° C (110° F).

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## Section 02 ENGINE

### Sub-section 05 (462 ENGINE TYPE)

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#### REFILLING THE SYSTEM

Capacity:

Approximately 5 liters

(1.1 Imp. gal.) (1.3 U.S. gal.)

60% antifreeze + 40% water

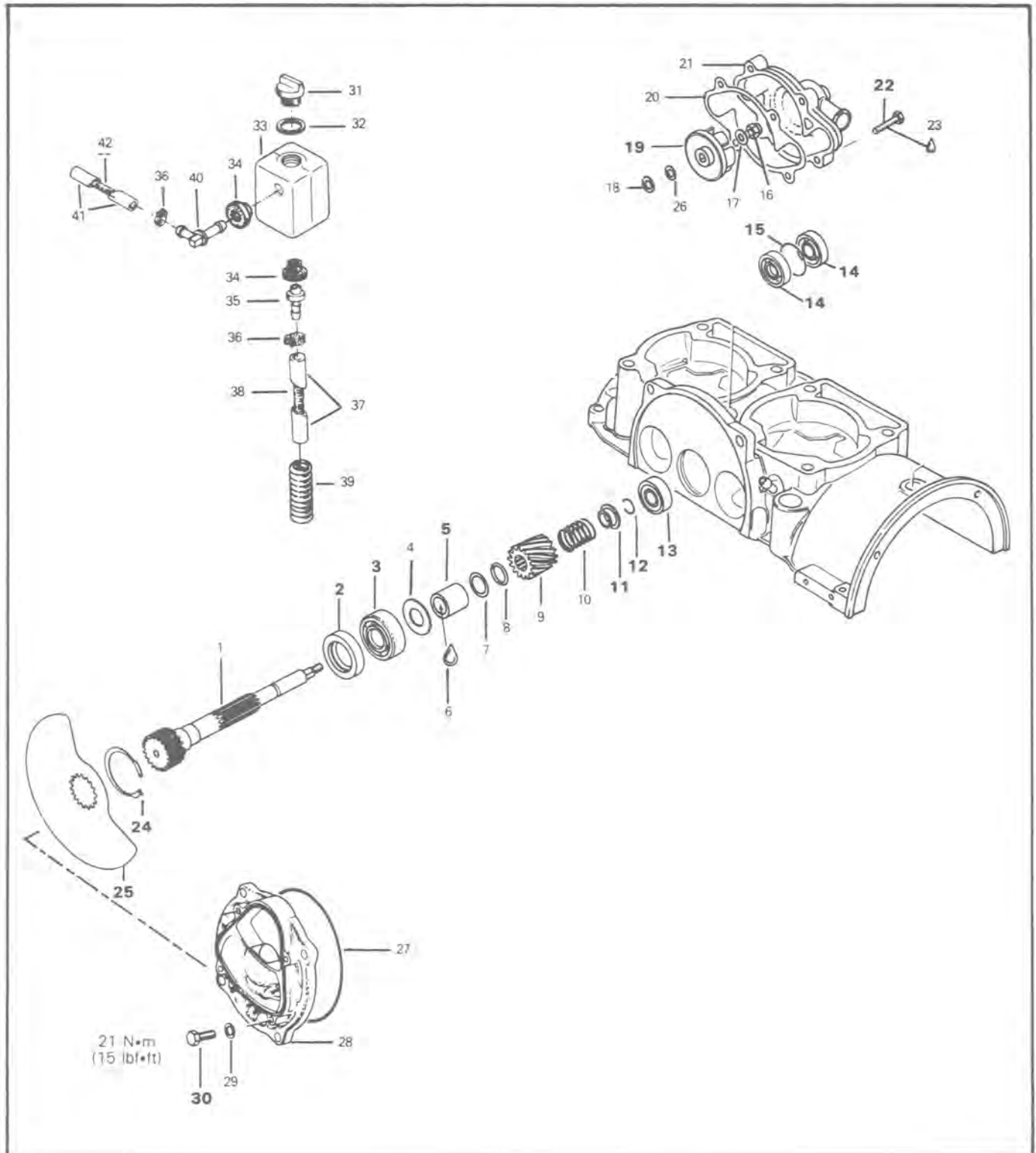
 **CAUTION:** To prevent rust formation or freezing always replenish the system with 60% antifreeze and 40% water.

Pure antifreeze without water produces premature freezing. Always use ethylene-glycol antifreeze containing corrosion inhibitors specifically recommended for aluminum engines.

To refill cooling system:

- Remove "drain hose" and reinstall initial one.
- Place rear of vehicle on the ground.
- Refill coolant tank slowly until coolant overfills at thermostat housing.
- Reinstall hose at thermostat housing.
- Continue to pour coolant in the tank until level reaches 25 mm (1 in) below filler neck.
- With the coolant tank cap still removed, start engine and let it warm to reach its normal operating temperature and thermostat open. Allow it to run a few minutes more.
- Stop engine and check coolant level. Refill as required then put back the cap.

**ROTARY VALVE, COOLANT PUMP & OIL RESERVOIR**



## Section 02 ENGINE

### Sub-section 05 (462 ENGINE TYPE)

1. Shaft, rotary valve
2. Oil seal
3. Ball bearing
4. Shim 0.5 mm
5. Distance sleeve 24.5 mm
6. Loctite 271
7. Shim 0.5 mm
8. O-ring
9. Sprocket 14 teeth
10. Spring
11. Spring holder cup
12. Circlip
13. Ball bearing
14. Oil seal (2)
15. Distance ring
16. Lock nut M6
17. Washer 6.4 mm
18. Washer 8 mm
19. Impeller, coolant pump
20. Gasket
21. Housing, coolant pump
22. Hex. screw M6 x 25 (4)
23. Loctite 242
24. Locking ring
25. Rotary valve
26. Friction washer
27. O-ring
28. Cover
29. Lock washer 8 mm (4)
30. Hex. screw M8 x 20 (4)
31. Cap
32. Sealing ring
33. Rotary valve oil tank
34. Grommet (2)
35. Male connector
36. Gear clamp
37. Oil line
38. Spring
39. Oil line housing
40. Elbow male connector
41. Oil line
42. Spring

## CLEANING

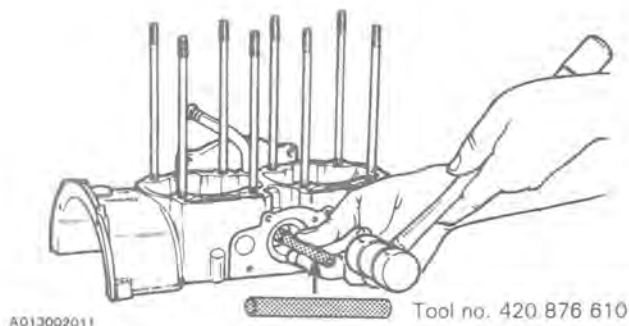
Discard all seals and O-rings.

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

## DISASSEMBLY & ASSEMBLY

### 19,24, Coolant pump impeller & circlip

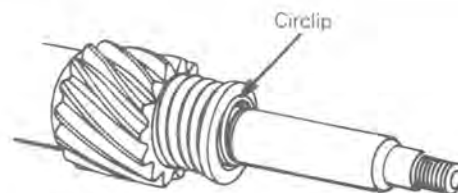
To remove rotary valve shaft assembly from crankcase, first remove coolant pump impeller and circlip. Using the suitable pusher (P/N 420 876 610) and a fiber hammer, push shaft assembly.



**CAUTION:** To prevent damage to the end of the rotary valve shaft, use pusher (tool P/N 420 876 610).

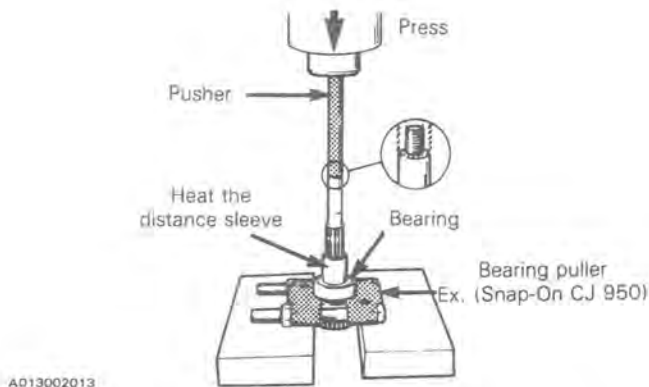
### 11,12, Spring holder cup & circlip

If it is necessary to disassemble components of rotary valve shaft assembly, compress spring retaining cup in order to remove circlip.



### 5, Distance sleeve

To remove the distance sleeve use a bearing puller (Ex: Snap-on no. CJ 950) and pusher (P/N 420 876 610). Heat the distance sleeve. Proceed as illustrated:



**CAUTION:** Ensure that the rotary valve shaft is perfectly perpendicular with the press tip or damage will occur.

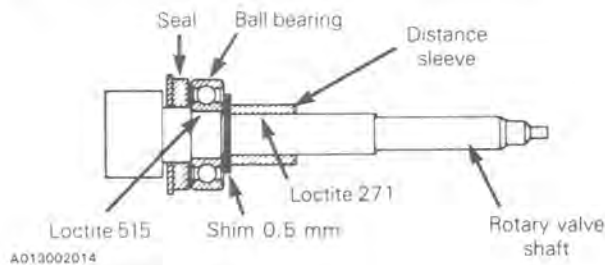
Clean rotary valve shaft and inside of distance sleeve. At assembly apply Loctite 271 inside distance sleeve.

## Section 02 ENGINE

### Sub-section 05 (462 ENGINE TYPE)

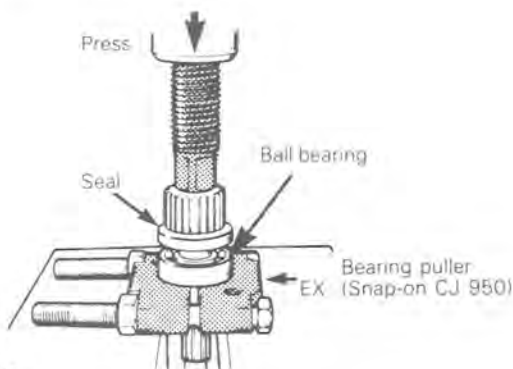
#### 2, Oil seal

At assembly apply lithium grease on seal lips.



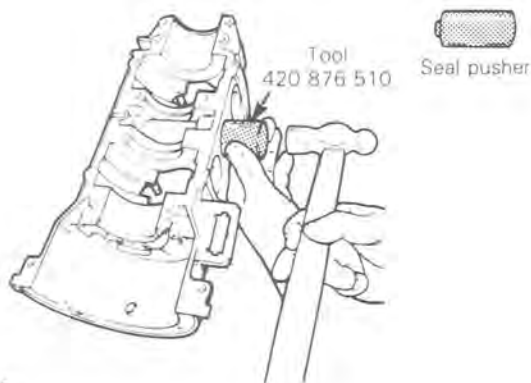
#### 3, Ball bearing

Install ball bearing as illustrated.



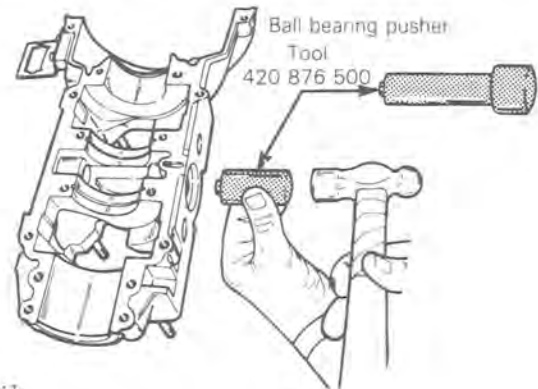
#### 13,14,15, Ball bearing, oil seal & distance ring

To remove seals and bearing:



#### 13, Ball bearing

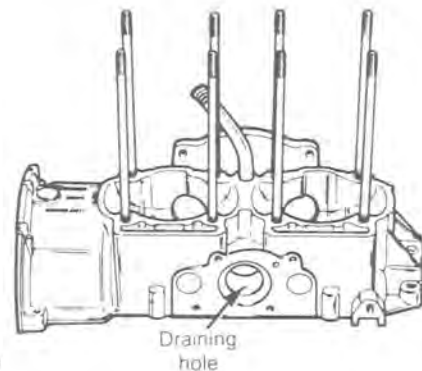
To install ball bearing.



**NOTE:** Ball bearing 13 shielded side must be facing crankshaft

#### 14,15, Oil seal & distance ring

To install seals proceed as follows:



Apply lithium grease on seal lips.

First seal sits on bearing outer ring. Align the distance ring with the opening in line with crankcase draining hole. The second seal sits on the distance ring.

The spring side of the seals must face toward crankshaft.

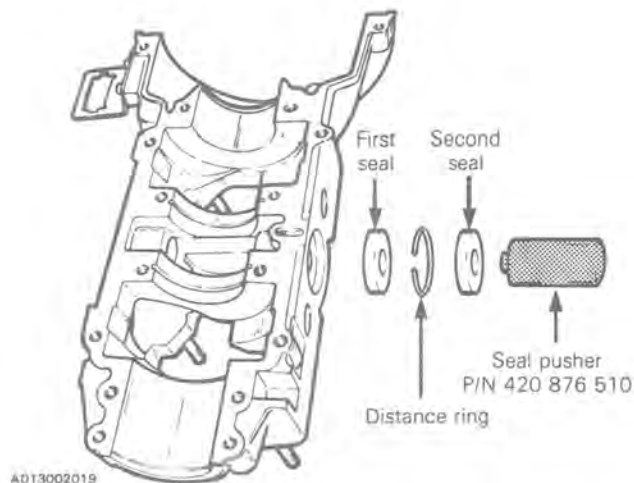
**NOTE:** 35% of the distance between first and second seals must be filled with lithium grease or equivalent.

**NOTE:** The draining hole is used to detect seal malfunction. If you notice oil and/or coolant at the exit of the drain hole, this means that oil seal and/or coolant seal leaks.

## Section 02 ENGINE

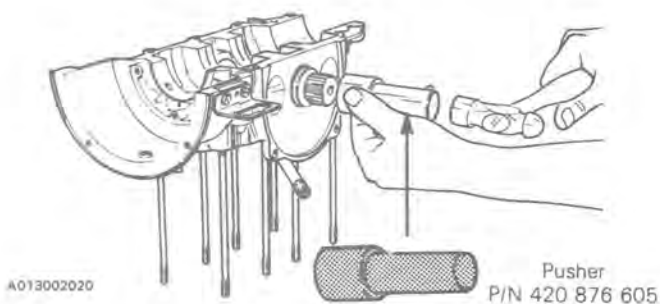
### Sub-section 05 (462 ENGINE TYPE)

**CAUTION:** Failure to position the seals as specified may cause the seal spring to be corroded by coolant. Severe damage will occur if this notice is disregarded.



**NOTE:** After installation of seals check if the bearing is correctly positioned (use pusher P/N 420 876 500).

To install rotary valve shaft proceed as follows, using suitable pusher (P/N 420 876 605):

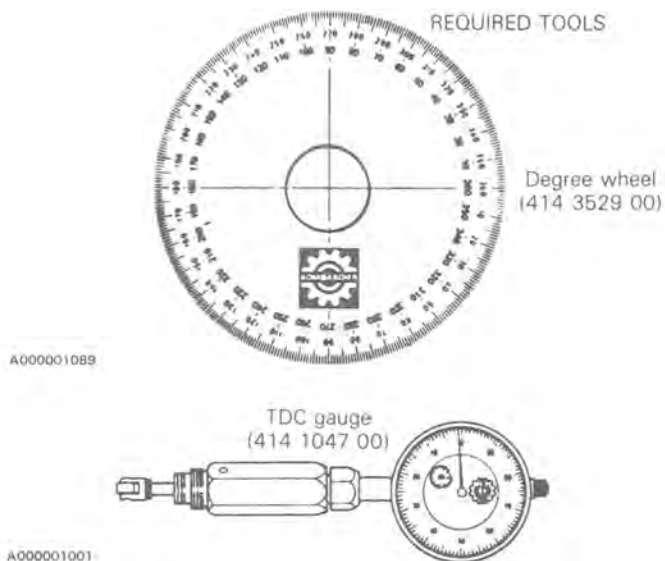


#### 22, Hexagonal screw

Apply Loctite 242 on threads.

#### 25, Rotary valve

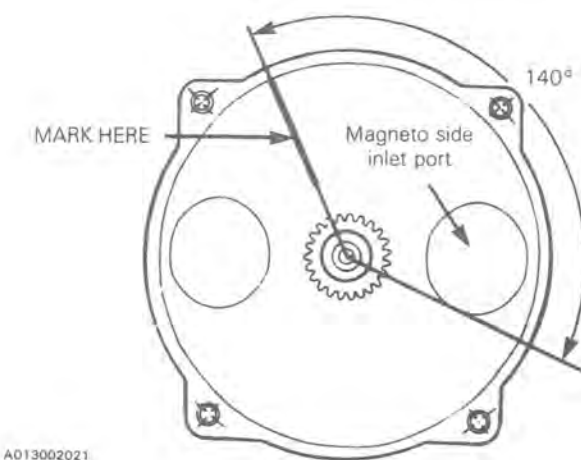
Rotary valve adjustment when replacing crankcases having no timing marks.



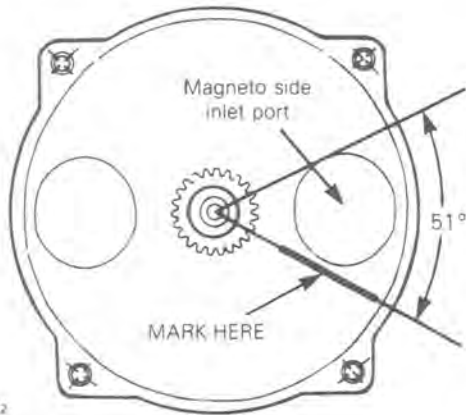
ENGINE TYPE	TIMING MARKS opening, closing
462	140°, 51°

For example: 140° opening  
51° closing

Using angle finder, mark crankcase at 140° from bottom edge of magneto side inlet port.



From **top** edge of magneto side inlet port, mark crankcase at  $51^{\circ}$ .

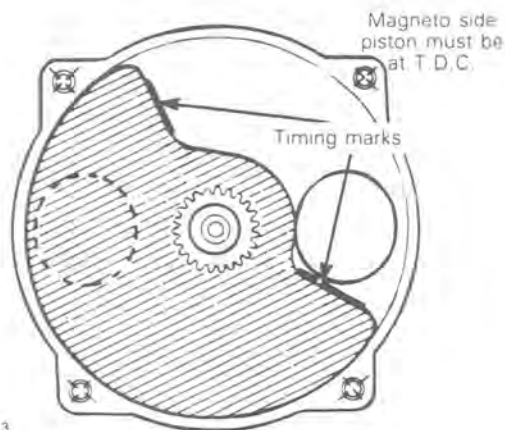


A013002022

To correctly install the rotary valve disc proceed as follows:

- Turning crankshaft counterclockwise, (drive pulley side) bring magneto side piston to Top Dead Center using a T.D.C. gauge or crankshaft locking tool P/N 420 876 640.
- Position the rotary valve disc on gear with edges as close as possible to the marks.

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



A013002023

Spray some injection oil on rotary valve before closing rotary valve cover

### 30, Screw M8 × 20

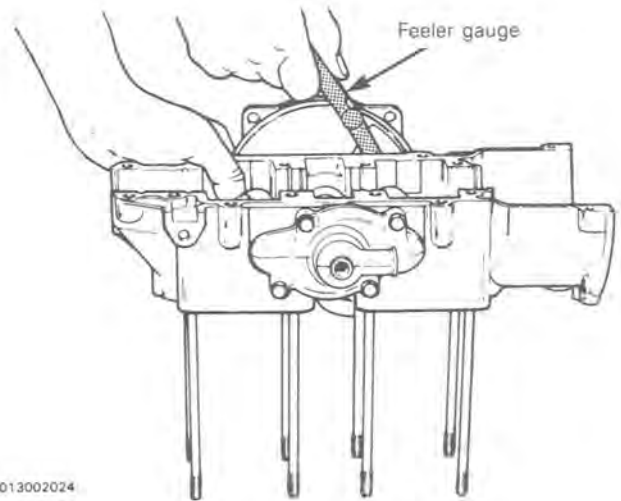
Torque the four cover screws to 21 N•m (15 lbf•ft).

## INSPECTION

### 25,28, Rotary valve, rotary valve cover

A gap of .27 - .48 mm (0.011" - 0.019") must be maintained between the rotary valve and the crankcase.

To measure this gap use a feeler gauge inserted between rotary valve and upper crankcase with rotary valve cover in place, **without its O-ring**. Check the most surface possible. Follow the same procedure with the lower crankcase.

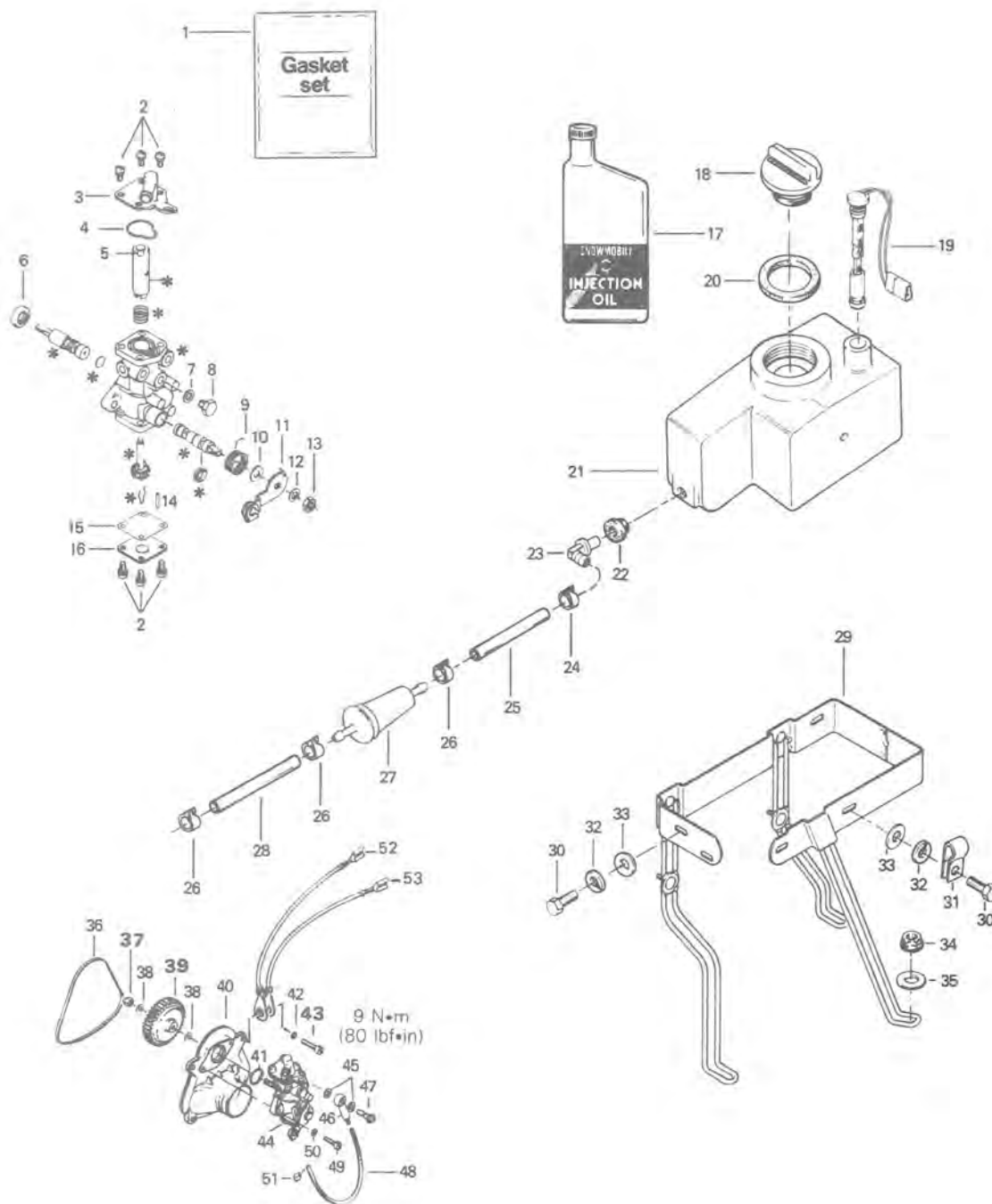


A013002024

## Section 02 ENGINE

### Sub-section 05 (462 ENGINE TYPE)

## OIL INJECTION PUMP & RESERVOIR



Parts in illustration marked with \* are not available as spare parts.



## Section 02 ENGINE

### Sub-section 05 (462 ENGINE TYPE)

1. Gasket set
2. Screw with lock washer (8)
3. Plate
4. O-ring
5. Retainer
6. Seal
7. Washer
8. Hex. screw M6 x 7
9. Spring
10. Washer
11. Lever
12. Lock washer 6 mm
13. Nut 6 mm
14. Stop pin
15. Gasket
16. Cam casing plate
17. Oil injection
18. Oil tank cap
19. Oil level sensor
20. Gasket
21. Injection oil tank
22. Grommet
23. Male connector
24. Spring clip
25. Hose 60.2 mm
26. Spring clip (3)
27. Filter
28. Hose 79.2 mm
29. Support
30. Hex. screw M6 x 12 (5)
31. Clip
32. Lock washer 6 mm (5)
33. Washer 6.4 mm (5)
34. Elastic stop nut M5 (3)
35. Washer 6.2 mm (2)
36. Rubber ring
37. Nut 6 mm
38. Washer 6.2 mm (2)
39. Oil pump gear 44 teeth
40. Oil pump mounting flange
41. O-ring
42. Lock washer 6 mm (4)
43. Screw M6 x 20 (4)
44. Oil pump
45. Oil banjo gasket (4)
46. Banjo (2)
47. Banjo bolt M6 x 16 (2)
48. Oil line 170 mm
49. Screw M5 x 16 (2)
50. Lock washer 5 mm (2)
51. Clamp (4)
52. Ground wire
53. Ground wire

## CLEANING

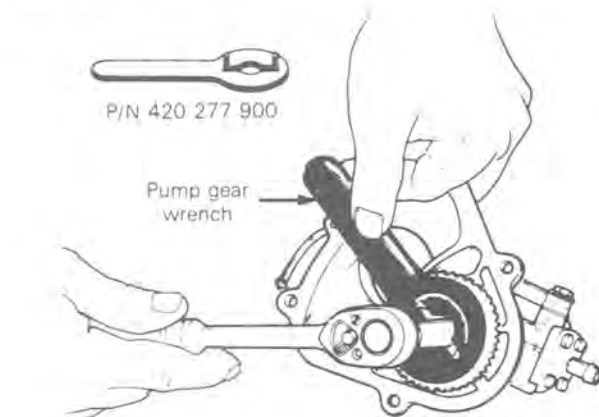
Discard all seals and O-rings. Clean all metal components in a non-ferrous metal cleaner.

## DISASSEMBLY

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

### 37,39, Lock nut & oil pump gear

To remove retaining nut, lock gear using no. 420 277 900 tool.



A000002043

## ASSEMBLY

### 43, Hexagonal screw

Torque to 9 N•m (80 lbf•in).

## ADJUSTMENT

Always perform carburetor adjustment prior to oil injection pump adjustment.

### To synchronize pump with carburetor:

Eliminate the throttle cable free-play by pressing the throttle lever until a light resistance is felt, then hold in place. The aligning marks on the pump casting and on the lever must align. If not, loosen the adjuster nut and adjust accordingly. Tighten the lock nut.

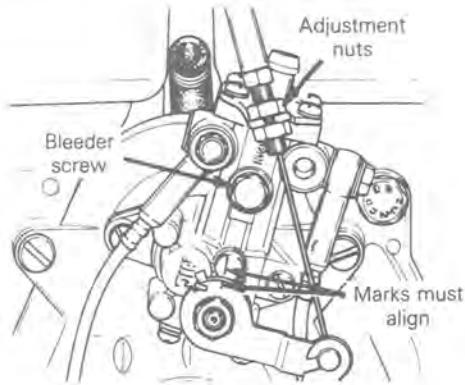
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## Section 02 ENGINE

### Sub-section 05 (462 ENGINE TYPE)

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#### Injection pump cable adjustment



A013002025

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

#### To bleed oil lines:

All oil lines should be full of oil. To bleed the main oil line (between tank and pump), loosen the bleeder screw (do not start engine) and let the air escape until oil starts to flow out.

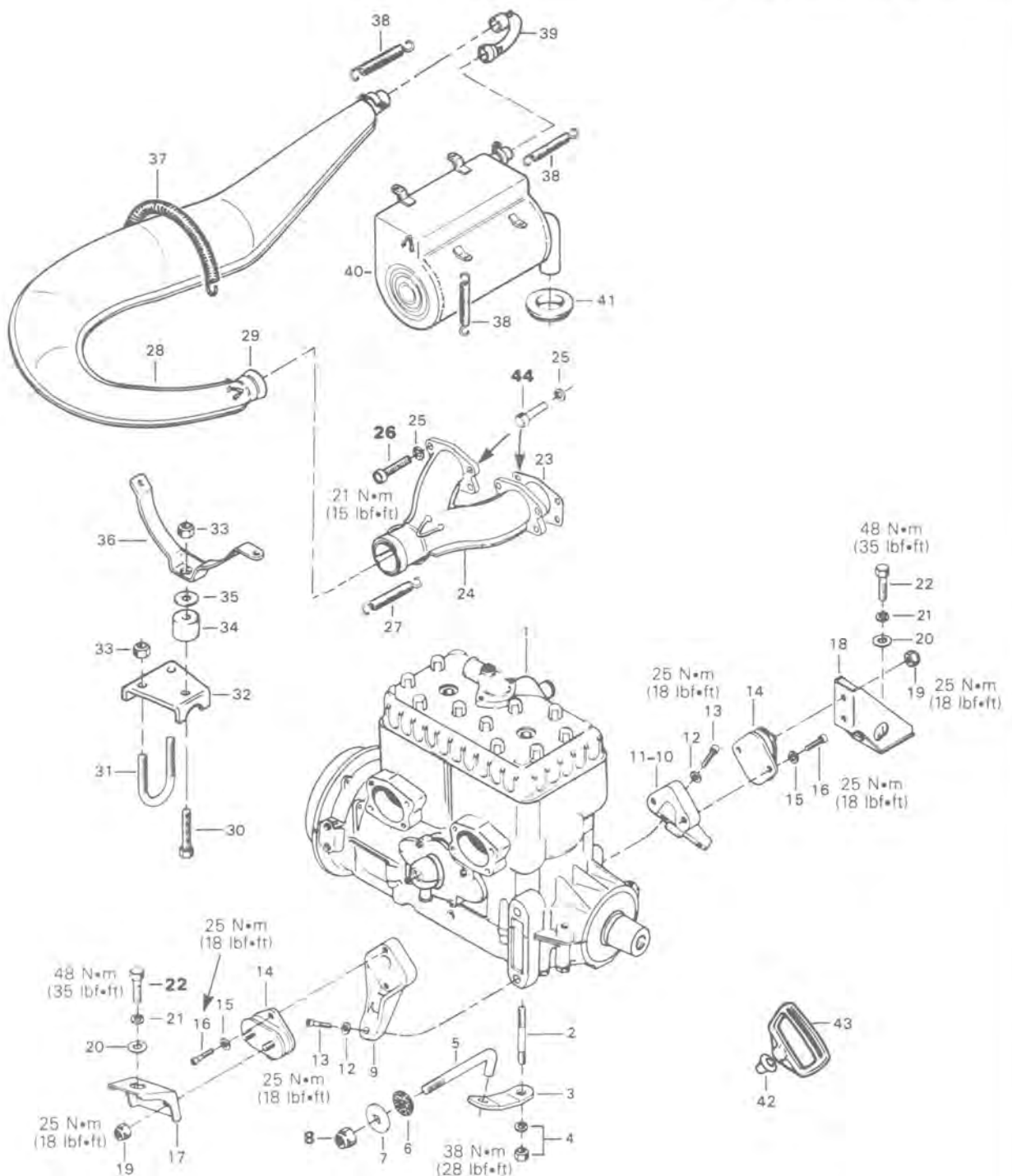
#### Make sure tank has enough oil

To bleed the small injection lines, start the engine and let it run at idle speed. Move injection pump lever to fully open position until lines are full of oil.

## 467 ENGINE TYPE

### ENGINE REMOVAL & INSTALLATION

Engine supports & muffler



---

## Section 02 ENGINE

### Sub-section 06 (467 ENGINE TYPE)

---

- |   |   |
|---|---|
| 1. "467" engine                               | 23. Gasket (2)                                |
| 2. Stud M10 x 18/18                           | 24. Exhaust manifold                          |
| 3. Clamp                                      | 25. Lock washer 8 mm                          |
| 4. Hexagonal elastic stop nut M10             | 26. Cylindrical screw M8 x 30 (6)             |
| 5. Support                                    | 27. Spring                                    |
| 6. Rubber washer                              | 28. Single exhaust pipe                       |
| 7. Washer                                     | 29. Female ball joint                         |
| 8. Hexagonal elastic stop nut M10             | 30. Hexagonal head capscrew M6 x 30           |
| 9. Front support (2)                          | 31. U bracket                                 |
| 10. Right rear support                        | 32. Pipe bracket                              |
| 11. Left rear support                         | 33. Flanged elastic hexagonal stop nut M6 (3) |
| 12. Lock washer 8 mm (8)                      | 34. Rubber spacer                             |
| 13. Allen Screw M8 x 25 (8)                   | 35. Asbestos washer                           |
| 14. Bounding rubber mount (4)                 | 36. Exhaust pipe support                      |
| 15. Lock washer 8 mm (8)                      | 37. Spring                                    |
| 16. Allen screw M8 x 20 (8)                   | 38. Spring (6)                                |
| 17. Front support (2)                         | 39. Tail pipe                                 |
| 18. Rear support (2)                          | 40. Muffler                                   |
| 19. Flanged hexagonal elastic stop nut M8 (8) | 41. Exhaust grommet                           |
| 20. Lock washer (4)                           | 42. Rubber buffer                             |
| 21. Spring lock washer 10 mm (4)              | 43. Starter grip                              |
| 22. Hexagonal head cap screw M10 x 20 (4)     | 44. Cap screw M8 x 30 (2)                     |
- 

## REMOVAL FROM VEHICLE

Disconnect or remove the following from vehicles:

- Air silencer.
- Pulley guard and drive belt.
- Throttle cable from carburetors and oil injection pump.
- Fuel lines, pulsation line and primer tubes.
- Ignition coil and rotary valve reservoir
- Electrical connectors and wires.
- Single tuned pipe.
- Rewind starter.
- Engine torque rod nut (item #8).
- Drain the cooling system and disconnect hoses from the engine (see "Cooling system" in this section).
- 4 screws retaining engine supports on frame.

## ENGINE SUPPORTS & AND MUFFLER DISASSEMBLY & ASSEMBLY

### 22,26,44, Engine support screw & manifold screw

Torque the engine supports screws to 48 N•m (35 lbf•ft).

Torque the manifold screws to 21 N•m (15 lbf•ft).

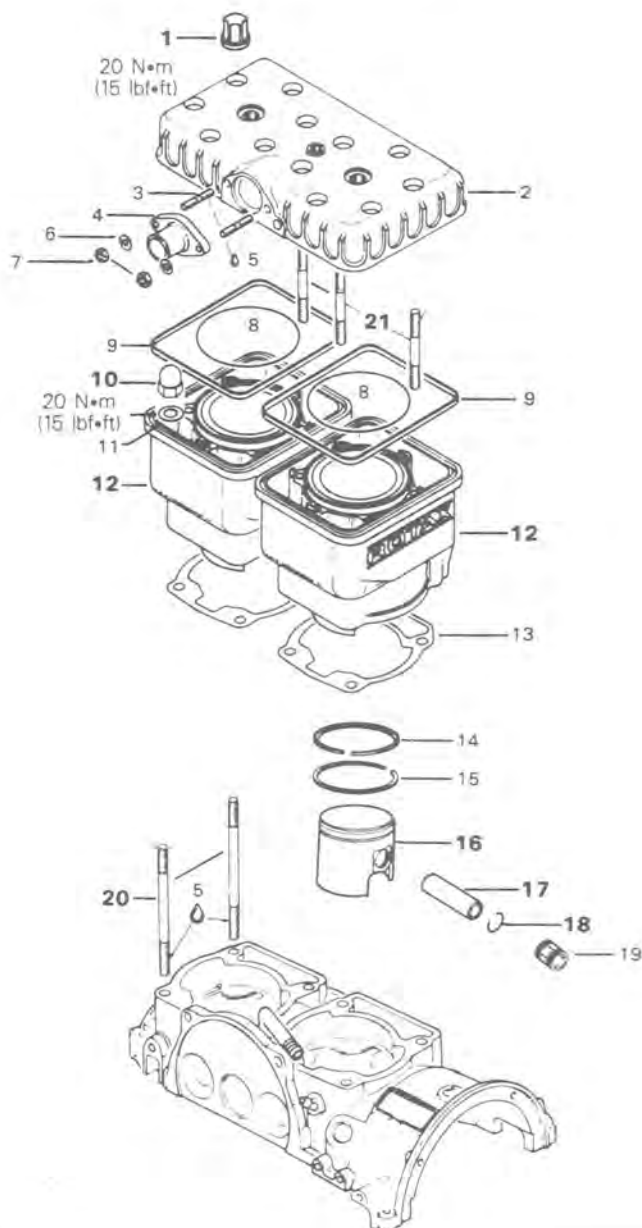
## INSTALLATION ON VEHICLE

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

- Check tightness of engine rubber mounts screws and supports nuts. Torque to 25 N•m (18 lbf•ft).
- After throttle cable installation, check carburetor maximum throttle opening and oil injection pump adjustment.
- Check pulley alignment and drive belt tension.

▼ **CAUTION:** A red dot is printed on one carburetor and on oil pump mounting flange. Match the marked carburetor to the side marked on the oil pump mounting flange (magneto side). This is required because of the different jettings.

**TOP END**



- 1. Cap nut M8 (12)
- 2. Cylinder head
- 3. Stud M6 x 15 (2)
- 4. Coolant outlet collar
- 5. Loctite 242 blue (medium strength)
- 6. Lock washer 6 mm (2)
- 7. Nut M6 (2)
- 8. Gasket (O-ring) (2)
- 9. Gasket (2)
- 10. Cap nut M8 (8)
- 11. Flat washer 8.4 (8)

- 12. Cylinder (2)
- 13. Cylinder/crankcase gasket (2)
- 14. L-ring
- 15. Rectangular-ring
- 16. Piston
- 17. Gudgeon pin
- 18. Circlip (4)
- 19. Needle bearing
- 20. Cylinder stud M8 x 79 (8)
- 21. Stud (head) M8 x 50 (2)

## Section 02 ENGINE


### Sub-section 06 (467 ENGINE TYPE)

## 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 grooves with a groove cleaner tool, or with a piece of broken ring.

## DISASSEMBLY

### 16,17,18, Piston, gudgeon pin & circlips


Place a clean cloth over crankcase then with a pointed tool inserted in piston notch, remove circlip from piston. Drive the gudgeon pin out of piston using a suitable drive punch and hammer.

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

## INSPECTION

The inspection of the engine top end must include the following measurements:

MEASUREMENTS	TOLERANCES		
	FITTING NEW PARTS (MIN.)	(MAX.)	WEAR LIMIT
Cylinder taper	N.A.	N.A.	.08 mm (.0031")
Cylinder out of round	N.A.	N.A.	.05 mm (.0020")
Cylinder/piston clearance	.08 mm (.0031")	.10 mm (.0039")	.20 mm (.0079")
Ring/piston groove clearance	.04 mm (.0016")	.11 mm (.0043")	.20 mm (.0079")
Ring end gap	.20 mm (.0079")	.35 mm (.0138")	1.0 mm (.0394")

 **NOTE:** For the measurement procedures, refer to "Engine dimensions measurement", section 02-10.

## ASSEMBLY


### 16, Piston

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

EXHAUST




A001002001

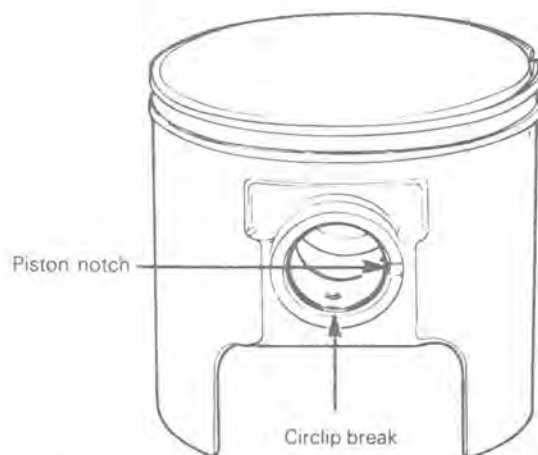
 **NOTE:** Spare parts pistons and cylinders are identified with a green or red dot, it is important to match the piston with the cylinder of the same color.

### 18, Circlip

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

Using very fine emery cloth, remove any burrs on piston caused through circlip installation.

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



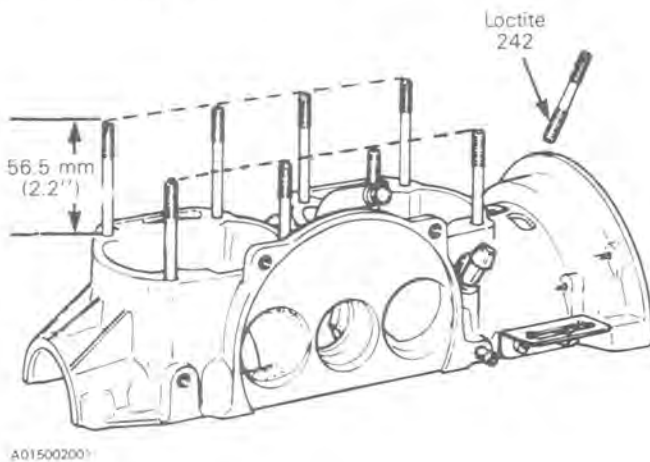
A001002002

## Section 02 ENGINE

### Sub-section 06 (467 ENGINE TYPE)

#### 20, Crankcase studs

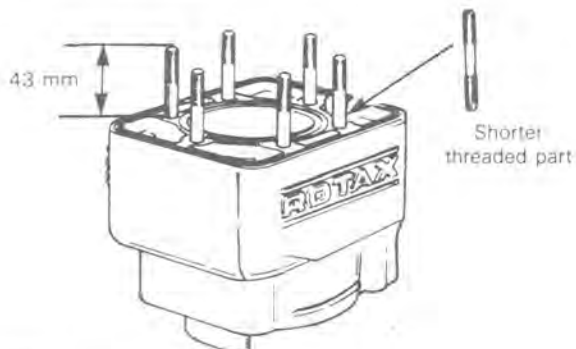
Because of cap nuts, cylinder studs have to be screwed into the crankcase so that they do not protrude by more than 56.5 mm (2.2'').



Apply Loctite 242 (blue, medium strength) on the threaded end of the studs going into the crankcase.

#### 12,21, Cylinder & cylinder head stud

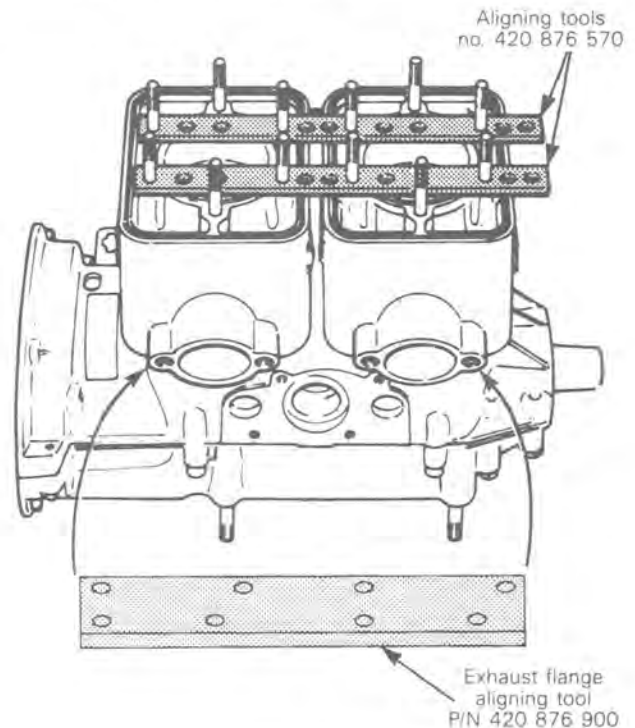
Because of cap nuts, cylinder head studs have to be screwed into the cylinder so that they do not protrude by more than 43 mm (1.700''). If it is not possible to obtain this length, add a washer between cylinder head and cap nut. Shorter threaded part of stud should be screwed into cylinder.



#### 10,12, Crankcase/cylinder nuts & cylinders

When reassembling the cylinders to the crankcase, it is important to have them properly aligned so that the cylinder head holes will match up with the studs. A special tool (as per illustration) (or cylinder head itself) can be

used to align the cylinders. Prior to torquing crankcase cylinder nuts, install tool P/N 420 876 900 (or exhaust manifold itself) to properly align exhaust flanges.

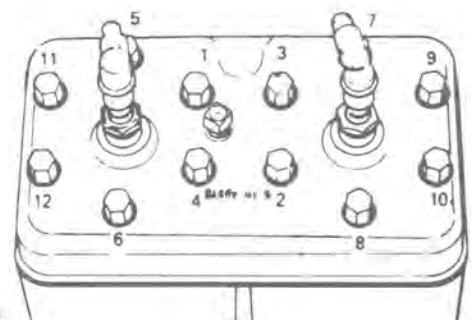


A015002011

Cross torque cylinder nuts to 20 N•m (15 lbf•ft).

#### 1, Cylinder head nut

Torque cylinder head nuts to 20 N•m (15 lbf•ft) following illustrated sequence.

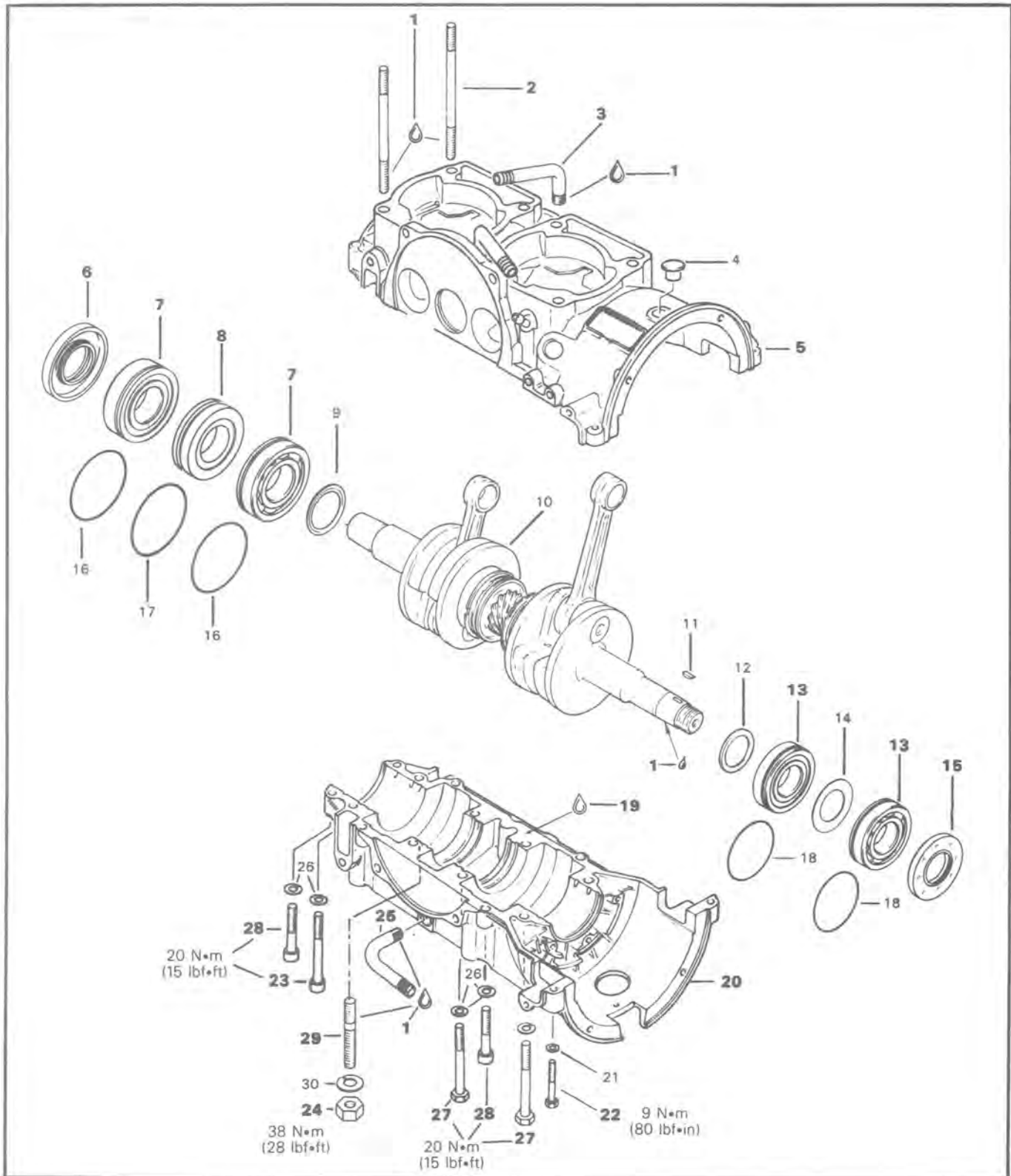




## Section 02 ENGINE

### Sub-section 06 (467 ENGINE TYPE)

#### BOTTOM END





## Section 02 ENGINE

### Sub-section 06 (467 ENGINE TYPE)

1. Loctite 242
2. Stud M8 x 79 (8)
3. Angular tube, oil inlet
4. Plug
5. Crankcase upper half
6. Seal
7. Ball bearing 6207 (2)
8. Labyrinth sleeve
9. Distance ring
10. Crankshaft
11. Woodruff key 3 x 3,7
12. Distance ring
13. Ball bearing 6206 (2)
14. Shim 1 mm
15. Seal

16. O-ring (2)
17. O-ring
18. O-ring (2)
19. Loctite 515
20. Crankcase lower half
21. Lock washer 6 mm (2)
22. Hex. screw M6 x 35 (2)
23. Cylinder screw M8 x 75 (2)
24. Hexagonal nut M10
25. Angular tube, oil outlet
26. Lock washer 8 mm (10)
27. Hex. screw M8 x 65 (6)
28. Cyl. screw M8 x 45 (6)
29. Stud M10 x 42
30. Lock washer 10 mm

## CLEANING

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

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

## DISASSEMBLY

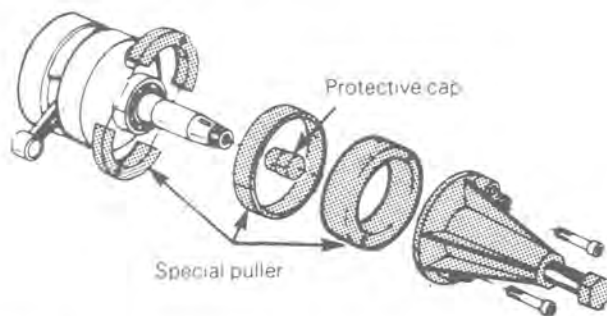
### General

To remove drive pulley, refer to "Drive Pulley", section 03-03.

To remove magneto, refer to "Magneto" in this section.

### 7,13, Crankshaft bearings

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



A000001052

## INSPECTION

The inspection of the engine bottom end must include the following measurements:

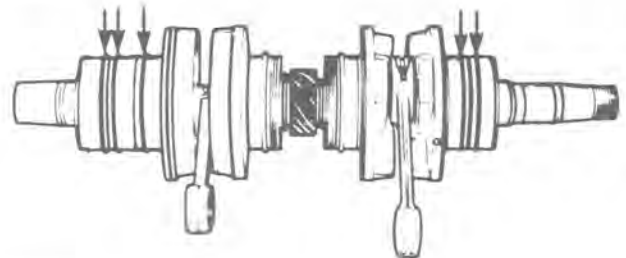
MEASUREMENTS	TOLERANCES	
	FITTING NEW PARTS (MIN.)	WEAR LIMIT (MAX.)
Crankshaft deflection	N.A.	N.A.
Connecting rod big end axial play	40 mm (.0157")	.73 mm (.0287")
		1.2 mm (.0468")

**NOTE:** For the measurement procedures, refer to "Engine Dimensions Measurement", section 02-10.

## ASSEMBLY

### 7,8,13, Crankshaft bearings & labyrinth sleeve

Prior to installation, place bearings into an oil container filled with oil previously heated to 100°C (210°F). This will expand bearing and ease installation. Install bearings and labyrinth sleeve with groove as per the following illustration.



A015002005

## Section 02 ENGINE

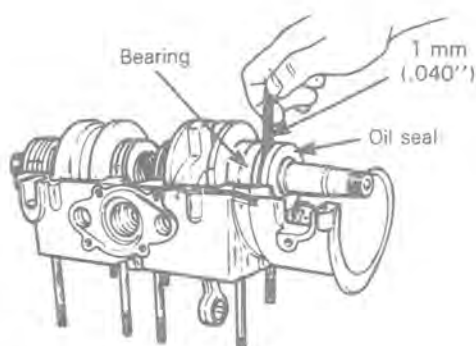
### Sub-section 06 (467 ENGINE TYPE)

#### 6,15, Seals

At seal assembly, apply a light coat of lithium grease on seal lips.

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

When installing plain seals (seal without locating ring or without spacing legs), ensure to maintain the specified gap as illustrated. For seals with spacing legs, install them against the bearing.



A015002007

#### 5,19,20, Upper crankcase, Loctite 515 & lower crankcase

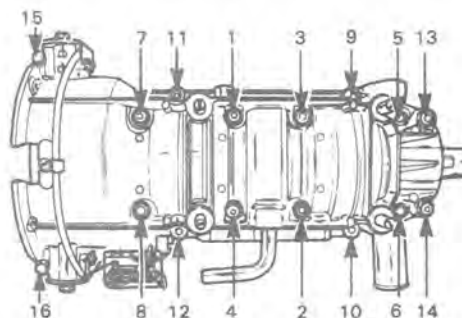
Crankcase halves are factory matched and therefore, are not interchangeable or available as single halves. Prior to joining of crankcase halves, apply a light coat of Loctite 515 (P/N 413 7027 00) on mating surfaces.

**NOTE:** Prior to applying Loctite 515 it is possible to use primer N (P/N 413 7053 00) or primer NF (P/N 413 7024 00). It increases cure speed and gap filling capability. Refer to supplier instructions.

**CAUTION:** Before joining of crankcase halves be sure that crankshaft rotary valve gear is well engaged with rotary valve shaft gear.

Position the crankcase halves together and torque bolts by hand, then install armature plate (tighten) on magneto side to correctly align crankcase halves. Torque bolts as specified following illustrated sequence.

Follow sequence shown  
1 to 14 – 20 N•m (15 lbf•ft)  
15 and 16 – 9 N•m (80 lbf•in)



A015002006

**NOTE:** Torque the two smaller bolts (15 and 16) on magneto side to 9 N•m (80 lbf•in).

#### 1,3,25, Loctite 242, angular tubes (oil inlet & oil outlet)

Apply Loctite 242 on threads prior to assembling angular tubes.

#### 23,27,28, Crankcase M8 screws

Torque the crankcase M8 screws to 20 N•m (15 lbf•ft). Install them as per exploded view.

#### 22, Crankcase M6 screws

Torque the crankcase M6 screws to 9 N•m (80 lbf•in).

#### 1,29, Loctite 242 & crankcase stud

At assembly on crankcase, apply Loctite 242 on stud threads.

#### 24, Crankcase/engine bracket nut

Torque the crankcase/engine bracket nut to 38 N•m (28 lbf•ft).

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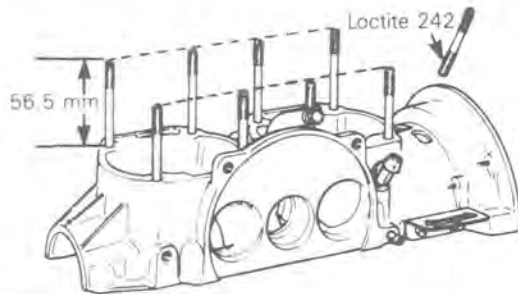
## Section 02 ENGINE

### Sub-section 06 (467 ENGINE TYPE)

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#### 1,2, Loctite 242 & upper crankcase studs

Because of cap nuts, cylinder studs have to be screwed into the crankcase so that they do not exceed further than 56.5 mm (2.22").



A015002001

Apply Loctite 242 on the threaded end of the studs going into the crankcase.

To install magneto, refer to "Magneto" in this section.

## Sub-section 06 (467 ENGINE TYPE)

1. Armature plate
2. Generating coil
3. Lock washer 5 mm (2)
4. Cylindrical slotted head screw M5 x 35 (2)
5. Lighting coil
6. Screw M6 x 25 (2)
7. Loctite 242 (blue, medium strength)
8. Harness
9. Splice connector (2)
10. Protector tube (6)
11. Flywheel
12. Starting pulley
13. Lock washer 8 mm (3)
14. Hexagonal screw M8 x 16 (3)
15. Washer 5.5 mm (2)

16. Lock washer 5 mm (2)
17. Allen screw M5 x 18 (2)
18. Cable grommet
19. Lock washer 22 mm
20. Hexagonal nut 22 x 1,5 mm
21. C.D. box
22. Flat washer 6.4 mm (2)
23. Flanged elastic hexagonal stop nut M6 (2)
24. Ignition coil
25. Hexagonal screw M6 x 85 (2)
26. Lock washer 6 mm (2)
27. Spacer (2)
28. Isolator
29. Spark plug protector (2)
30. Spark plug (2)

## Section 02 ENGINE

### Sub-section 06 (467 ENGINE TYPE)

#### CLEANING

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

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

#### DISASSEMBLY

To gain access to magneto assembly, remove:

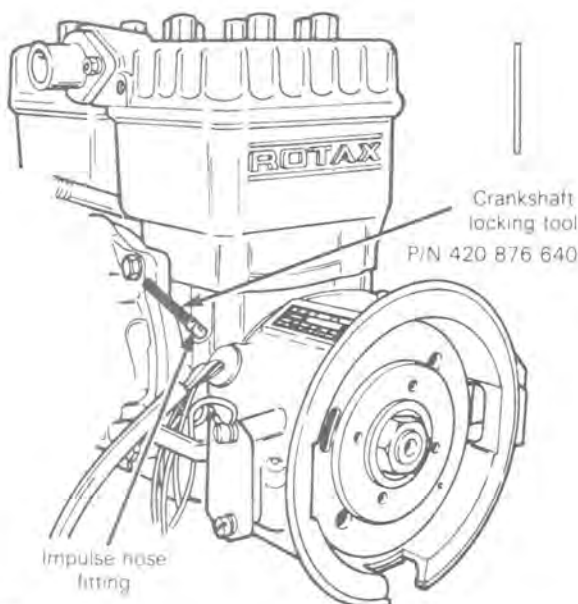
- Muffler
- rewind starter
- starting pulley.

○ **NOTE:** Before disassembling magneto plate, indexing marks should be located to facilitate reassembly.

#### 20, Flywheel retaining nut

To remove magneto flywheel retaining nut:

- Lock crankshaft with crankshaft locking tool (service tool) as illustrated (magneto side piston must be at top dead center)
- remove magneto retaining nut.



A015002008

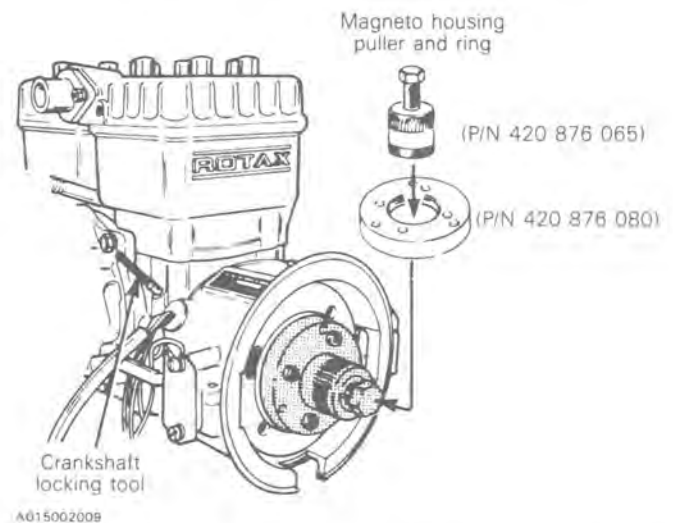
○ **NOTE:** It should be noted that to correctly remove a Loctite locked fastener it is first necessary to tap on the fastener to break "Loctite" bond. This will eliminate the possibility of thread breakage.

#### 11, Flywheel

To remove magneto housing (flywheel):

lock crankshaft with crankshaft locking tool (service tool) as illustrated;

adjust magneto housing puller and puller ring as illustrated;



○ **NOTE:** For the above procedure, the locking type puller can be used without crankshaft locking tool.



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

## Section 02 ENGINE

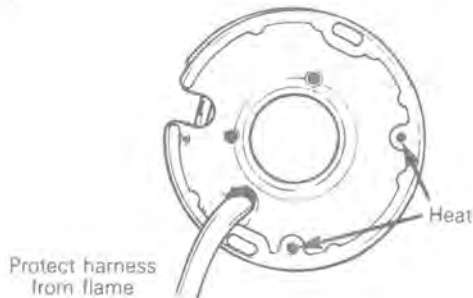
### Sub-section 06 (467 ENGINE TYPE)

## REPAIR

### 2, Generating coil

To replace generating coil:

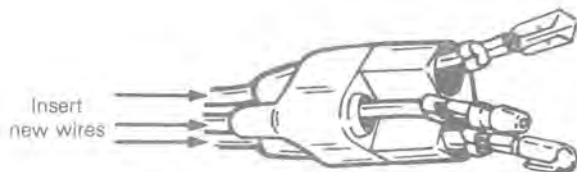
- Heat the armature plate around the screw holes to break the Loctite bond 93°C (200°F).



A001002003

#### CAUTION: Protect harness from flame.

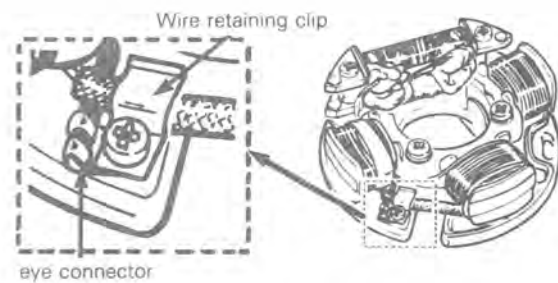
- Remove screws (use Phillips no. 2 or suitable flat screw driver).
- Cut the four wires as close as possible to the coil body.
- To pass new coil wires in harness, tape the old wires to the end of new wires and pull them through the harness protector tube.
- Insert the new wires into the old connector housing and install connectors.



A001002004

#### CAUTION: Replace the old wires in the connector with the same color coded new wires.

- Install a new receptacle connector to the black/yellow striped wire.
- To install the ground connector to the armature plate, tape the new black lead to the old one and pull it under the lighting coil with the old wire.
- Solder an eye connector to the lead and fasten it under the wire retaining clip.



A001002005

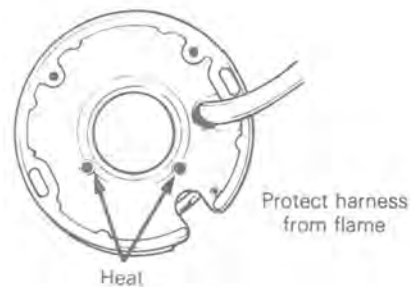
### 4,7, Generating coil screw & Loctite 242

To install the new coil on the armature plate, remove the shipping nuts from the new coil and apply Loctite 242 (blue, medium strength) to screws before assembly.

#### CAUTION: Before reinstalling the magneto, remove the loose epoxy from harness.

To replace lighting coil:

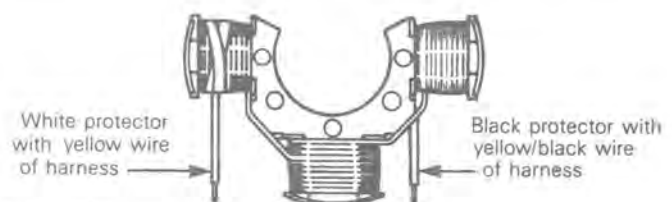
- Heat the armature plate around the screw holes to break the Loctite bond 93°C (200°F).



A001002003

#### CAUTION: Protect harness from flame.

- Remove screws (use Phillips no. 3 screwdriver).
- Remove the wire retaining clip from armature plate.
- Pull out protector tubes and unsolder the splice connectors.
- Solder the yellow wire in the harness to the white tube protected wire of the coil.
- Solder the yellow/black striped wire in the harness to the black tube protected wire of the coil.



A001002006

### 10, Protector tube

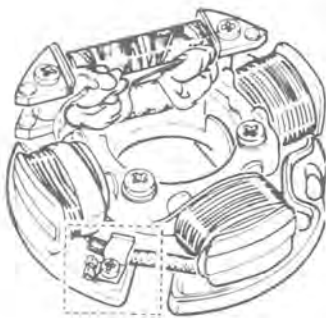
Position protector tubes over connections.

### 6,7, Loctite 242 & lighting coil screws

Prior to assembly, apply Loctite 242 (blue, medium strength).

— Fasten retaining clip onto protector tubes.

The ground terminal from generating coil must be fastened under this clip.



A001002005

▼ **CAUTION:** Before reinstalling magneto remove the loose epoxy from harness.

## ASSEMBLY

### 1,7,15,16,17, Armature plate, Loctite 242, washers, lock washers & screws

Position the armature plate on the crankcase, aligning the marks on both parts.

Put a drop of Loctite 242 on screw threads and tighten.

Clean crankshaft extension (taper).

Apply Loctite 242 on taper.

### 7,11,19,20, Loctite 242, flywheel, lock washer & nut

Position woodruff key, magneto flywheel, lock washer on crankshaft.

Clean nut threads and apply Loctite 242 (blue, medium strength) before tightening nut to 95 N•m (70 lbf•ft).

At reassembly coat all electric connections with silicone dielectric grease to prevent corrosion or moisture penetration.

▼ **CAUTION:** Do not use silicone "sealant", this product will corrode contacts.

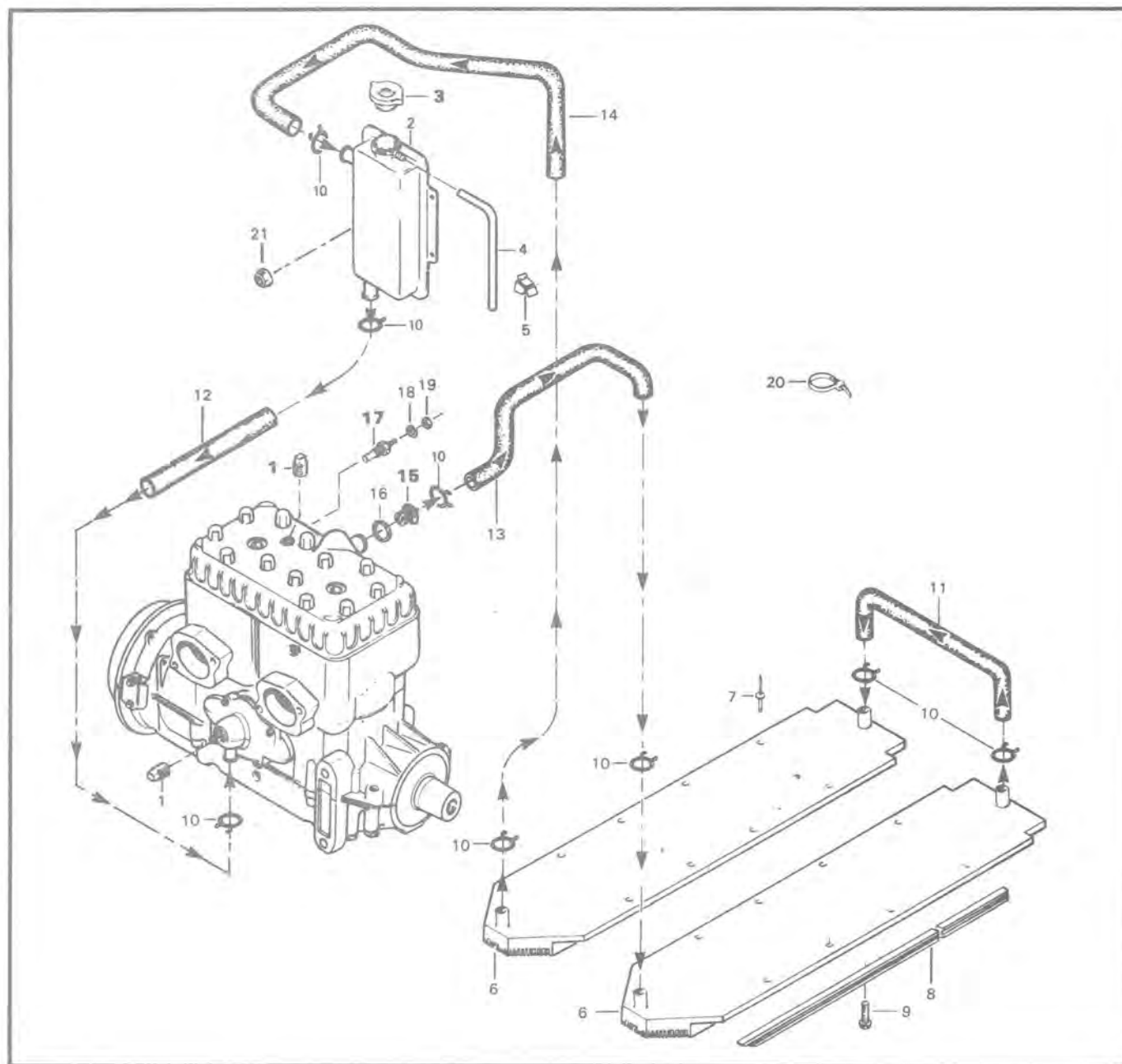
○ **NOTE:** For ignition timing procedure refer to "Ignition Timing" section 04-02.



## Section 02 ENGINE

### Sub-section 06 (467 ENGINE TYPE)

## COOLING SYSTEM



- 1. Plug
- 2. Coolant tank
- 3. Pressure cap
- 4. Overflow hose 20" (510 mm)
- 5. Clip
- 6. Radiator (2)
- 7. Rivet
- 8. Radiator protector (2)
- 9. Hexagonal taptite washer head screw M5 x 15 (2)
- 10. Hose clamp (8)
- 11. U-Hose

- 12. Engine inlet hose
- 13. Radiator inlet hose
- 14. Radiator outlet hose
- 15. Thermostat
- 16. Sealing ring
- 17. Sender
- 18. Lock washer
- 19. Hexagonal nut
- 20. Tie rap
- 21. Nut (2)



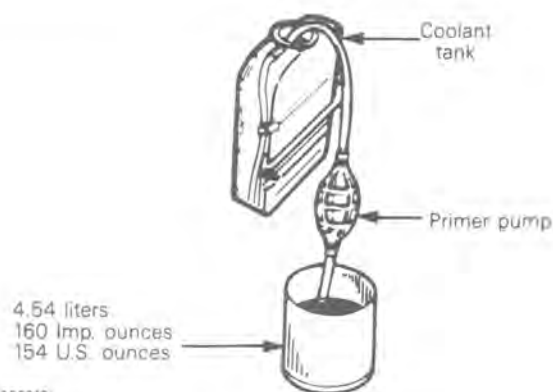
## INSPECTION

Check general condition of hoses and clamp tightness.

## DRAINING THE SYSTEM

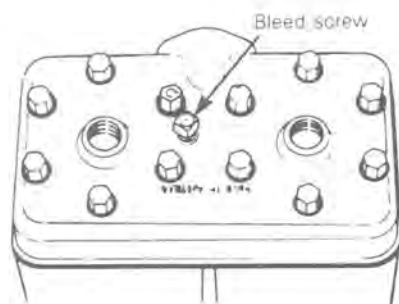
◆ **WARNING:** Never drain or refill the cooling system when engine is hot.

To drain the cooling system, siphon the coolant mixture from the coolant tank, using a primer pump and a length of plastic hose and steel tubing inserted as deep as possible into the lower hose of the tank.



A015002010

When the coolant level is low enough, remove the engine bleed screw and lift the rear of vehicle to drain the heat exchangers.



A015002011

## DISASSEMBLY & ASSEMBLY

### 1,17, Plug & sender

Apply thread sealant on sender and plug to avoid leaks.

### 3, Pressure cap

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

### 15, Thermostat

To check thermostat, put in water and heat water. Thermostat should open when water temperature reaches 37°C (98°F).

Install the hole in thermostat on top of the housing.

## REFILLING THE SYSTEM

### Capacity:

Approximately 4.2 liters  
(148 Imp. oz.) (142 U.S. oz.)  
60% antifreeze + 40% water

▼ **CAUTION:** To prevent rust formation or freezing condition, always replenish the system with 60% antifreeze and 40% water. Pure antifreeze without water produces premature freezing. Always use ethylene glycol antifreeze containing corrosion inhibitors specifically recommended for aluminum engines.

To refill cooling system:

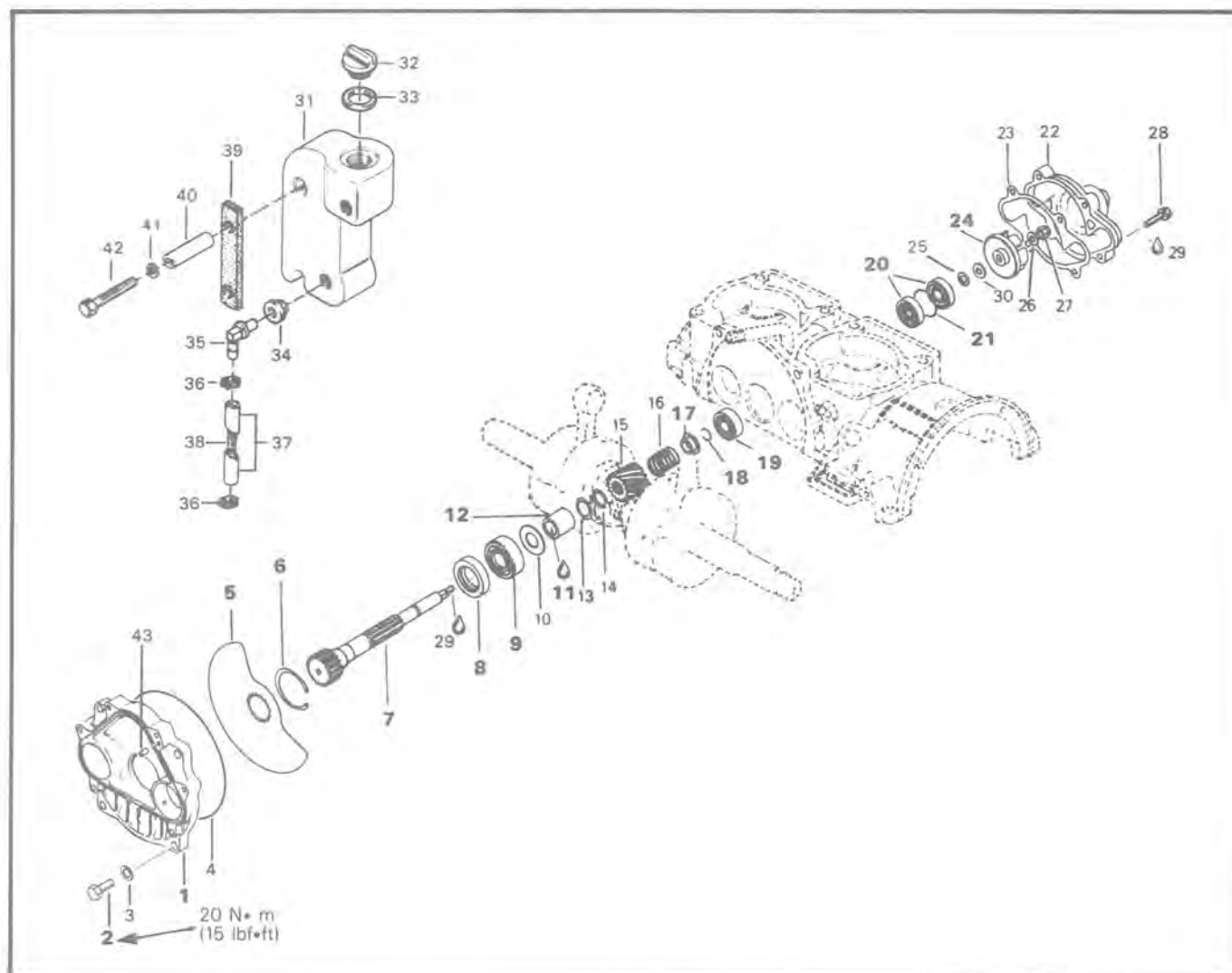
- Put back the rear of vehicle on the ground.
- Refill coolant tank slowly until coolant overfills at bleed hole.
- Reinstall bleed screw.
- Continue to pour coolant in the tank until level reaches 25 mm (1") below filler neck.
- With the coolant tank cap still removed, start engine and let it warm up to reach its normal operating temperature and thermostat open. Allow it running a few minutes more.
- Stop engine and check coolant level. Refill as required then put back the cap.

◆ **WARNING:** Before removing the cap place a cloth over the coolant tank and release the cap to the first step to release the pressure. Loss of fluid and possibility of severe burns could occur if this notice is disregarded.

## Section 02 ENGINE

### Sub-section 06 (467 ENGINE TYPE)

## ROTARY VALVE, COOLANT PUMP & RESERVOIR



- 1. Rotary valve cover
- 2. Bolt M8 × 20 (4)
- 3. Lock washer 8 mm (4)
- 4. O-ring
- 5. Rotary valve
- 6. Circlip
- 7. Rotary valve shaft
- 8. Seal
- 9. Bearing 6203
- 10. Shim 0.5 mm
- 11. Loctite 271
- 12. Distance sleeve 24.5 mm
- 13. Shim 0.5 mm
- 14. O-ring
- 15. Gear
- 16. Spring
- 17. Spring retaining cup
- 18. Circlip
- 19. Bearing 6201
- 20. Seal (2)
- 21. Distance ring
- 22. Pump housing

- 23. Gasket
- 24. Pump impeller
- 25. Washer 8.1 mm
- 26. Washer 6.4 mm
- 27. Nut M6
- 28. Bolt M6 × 25 (4)
- 29. Loctite 242
- 30. Friction washer
- 31. Rotary valve oil tank
- 32. Oil tank cap
- 33. O-ring
- 34. Isolating washer (2)
- 35. Elbow connector (2)
- 36. Hose clamp (4)
- 37. Oil line 7.75" (196 mm) (2)
- 38. Spring (2)
- 39. Isolator
- 40. Spacer (2)
- 41. Lock washer 6 mm
- 42. Hexagonal screw M6 × 85 (2)
- 43. Pin

## CLEANING

Discard all seals and O-rings.

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

## DISASSEMBLY AND ASSEMBLY

### 6,24, Pump impeller & circlip

To remove rotary valve shaft assembly from crankcase, first remove coolant pump impeller and circlip. Using the suitable pusher (P/N 420 876 610) and a fiber hammer, push shaft assembly.

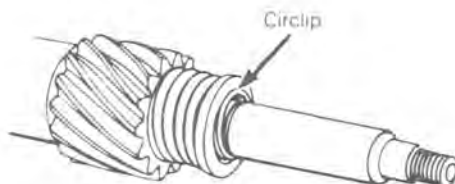


A015002012

**CAUTION:** To prevent damage to the end of the rotary valve shaft, use pusher (tool P/N 420 876 610).

### 17,18, Spring retaining cup & circlip

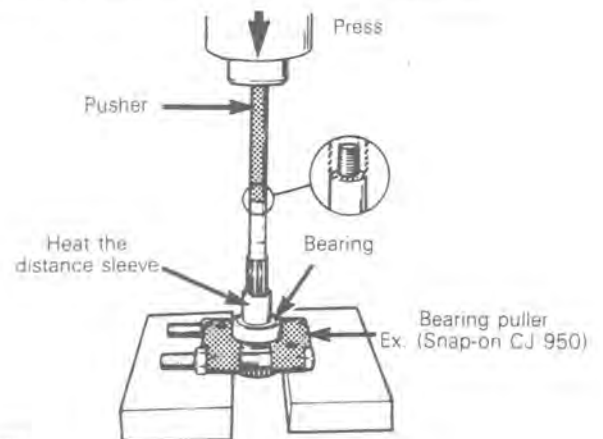
If it is necessary to disassemble components of rotary valve shaft assembly, compress spring retaining cup in order to remove circlip.



A013002012

### 11,12, Distance sleeve & Loctite 271

To remove the distance sleeve use a bearing puller (Ex: Snap-on no. CJ 950) and pusher (P/N 420 876 610) as illustrated. Heat the distance sleeve to break the Loctite bond 93°C (200°F) and proceed as illustrated



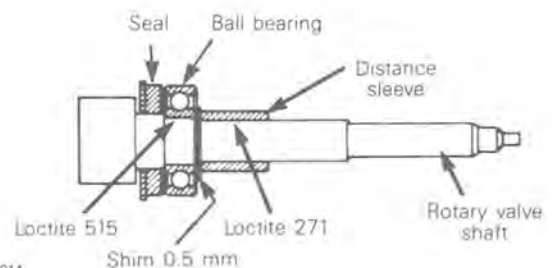
A013002013

**CAUTION:** Ensure that the rotary valve shaft is perfectly perpendicular with the press tip or damage will occur.

Clean rotary valve shaft and inside of distance sleeve. At assembly apply Loctite 271 inside of distance sleeve.

### 7,8, Rotary valve shaft & seal

At assembly apply lithium grease on seal lips. Position the seal with shielded portion towards rotary valve.



A013002014

### 7,9, Rotary valve shaft & bearing 6203

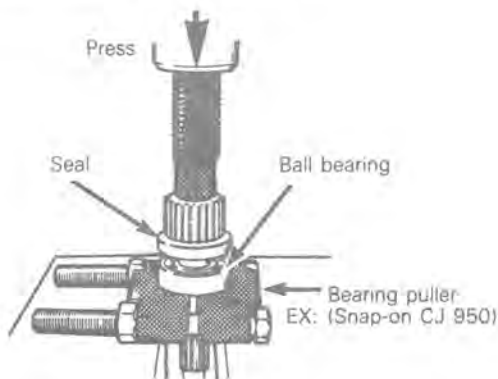
At assembly, apply crankcase sealant Loctite 515 on bearing and rotary valve shaft mating surfaces.

**CAUTION:** Don't put any Loctite on bearing balls.

## Section 02 ENGINE

### Sub-section 06 (467 ENGINE TYPE)

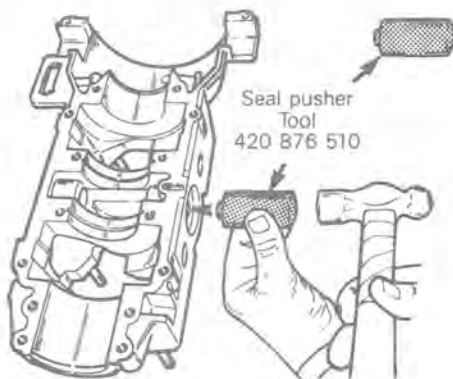
Install ball bearing as illustrated.



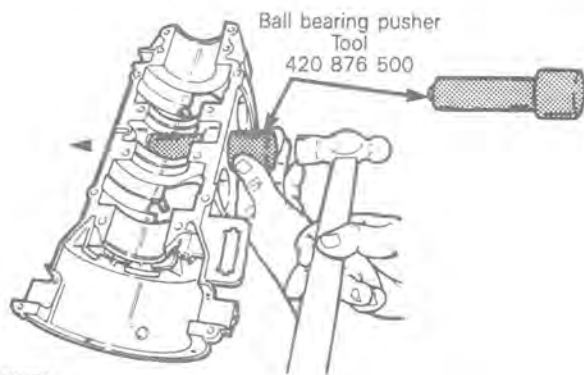
A013002015

#### 19,20,21, Bearing 6201, seal & distance ring

To remove bearing 6201 (the smallest one), seals and distance ring use pusher (P/N 420 876 510).



To install ball bearing 6201 use ball bearing pusher (P/N 420 876 500).

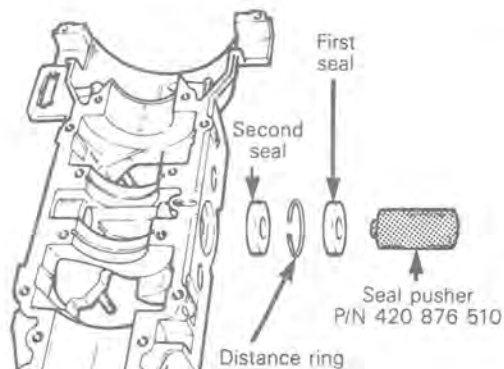


A013002028

NOTE: Ball bearing shielded side must be facing rotary valve.

#### 20,21, Seals & distance ring

To install seals on water pump side proceed as follows:

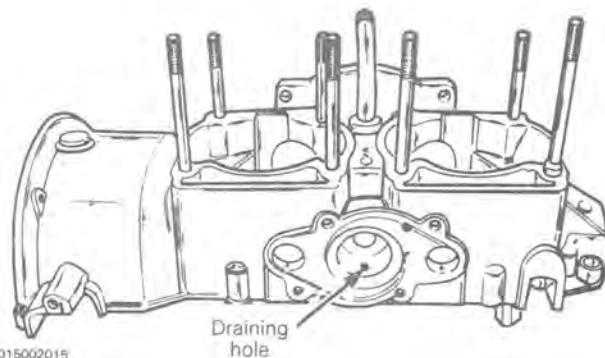


A015002014

Apply some lithium grease or equivalent on seal lips. Position all seals with shielded portion towards water pump using pusher (P/N 420 876 510). Align distance ring opening with crankcase draining hole (see note and illustration). Push seals and distance ring assembly against bearing.

NOTE: 35% of the distance between first and second seals must be filled with lithium grease or equivalent.

NOTE: The draining hole is used to detect seal malfunctions. If you notice oil, or coolant at the exit of the draining hole, this mean that oil seal or coolant seal leaks.



A015002015

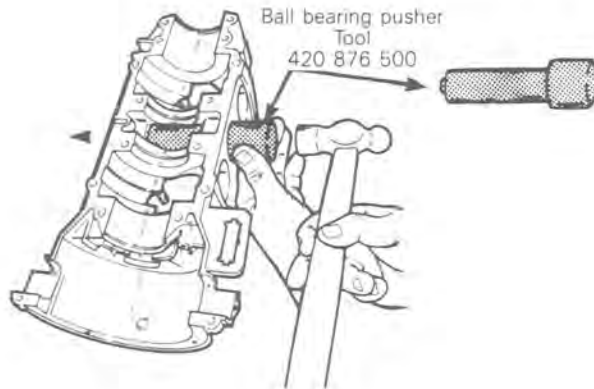
CAUTION: Failure to position the seals as specified may provoke the seal spring to be corroded by coolant. Severe damages will occur if these notices are disregarded.

## Section 02 ENGINE

### Sub-section 06 (467 ENGINE TYPE)

#### 19,20,21, Bearing 6201, seals & distance ring

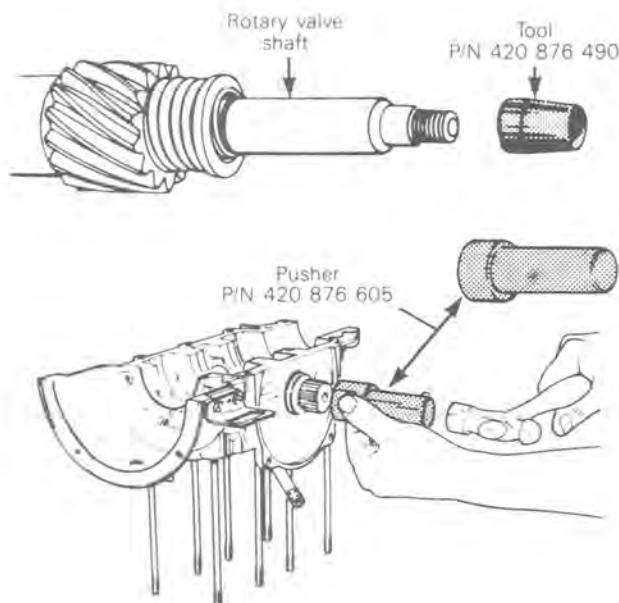
NOTE: After seals installation, check if the water pump end bearing is correctly positioned (use pusher P/N 420 876 500).



#### 7, Rotary valve shaft

To install rotary valve shaft proceed as follow with the suitable tools:

- Pusher P/N 420 876 600.
- Water pump seal sleeve P/N 420 876 490.



A015002010

#### 22,23, Pump housing bolts & Loctite 242

Apply Loctite 242 on bolt thread.

#### 5, Rotary valve

Installation on genuine crankcase with mark (ridge)

REQUIRED TOOL  
Crankshaft locking tool  
P/N 420 876 640

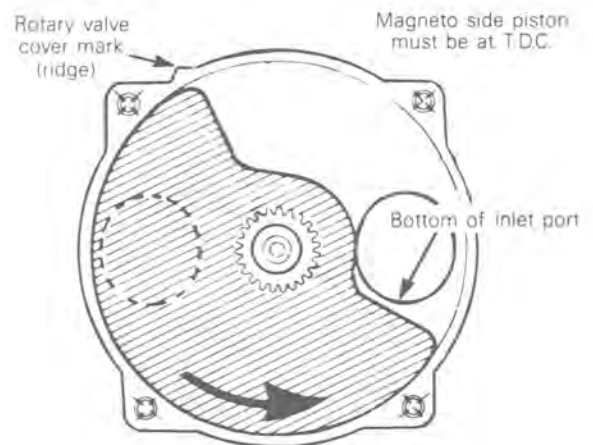


A000001039

To correctly install the rotary valve, proceed as follows:

- Turning crankshaft counterclockwise, (drive pulley side) bring magneto side piston close to Top Dead Center. Insert crankshaft locking tool while turning crankshaft. When the crankshaft stops it will be the right position.
- Position the rotary valve on gear in such a way that its closing edge will be as close as possible to the bottom of the magneto side inlet port, and its opening edge in line with the mark (ridge) on the upper left side of the rotary valve cover.

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



A013002028

## Section 02 ENGINE

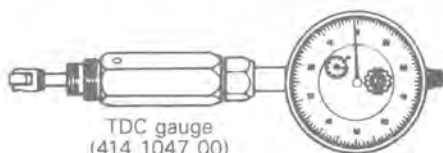
### Sub-section 06 (467 ENGINE TYPE)

#### Installation on spare crankcase without mark (ridge)

##### REQUIRED TOOLS



Degree wheel  
(414 3529 00)



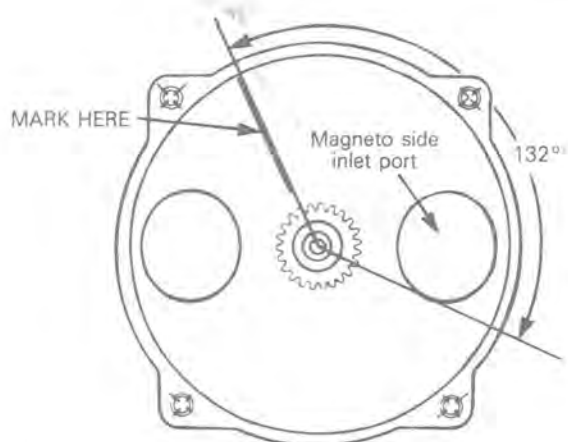
TDC gauge  
(414 1047 00)

A000001086

ENGINE TYPE	TIMING MARKS opening, closing
467	132°, 52°

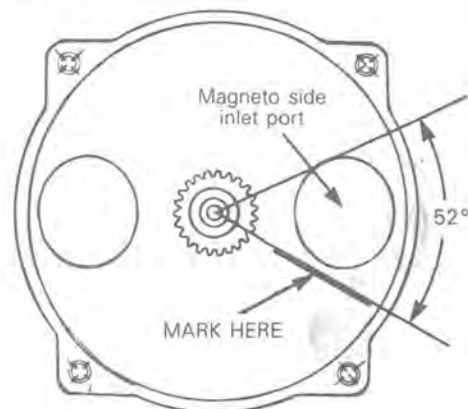
For example: 132° opening  
52° closing

Using angle finder, mark crankcase at 132° from bottom edge of magneto side inlet port.



A013002021

From top edge of magneto side inlet port, mark crankcase at 52°.

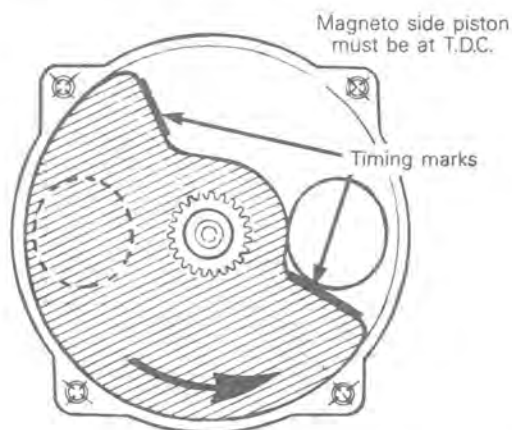


A013002027

To correctly install the rotary valve disc proceed as follows:

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

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



A013002029

Spray some injection oil on rotary valve before closing the rotary valve cover.

#### 2, Rotary valve cover bolts

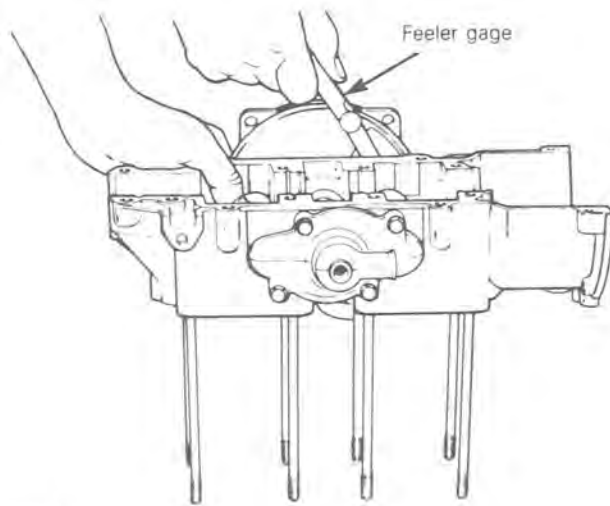
The rotary valve cover bolts must be torque to 20 N•m (15 lbf•ft).

## INSPECTION

### 1,5, Rotary valve cover & rotary valve

A gap of 0.27 - 0.48 mm (.011" - .019") must be maintained between the rotary valve and the crankcase.

To measure this gap use a feeler gage inserted between rotary valve and upper crankcase with the rotary valve cover in place **without it's O-ring**. Check the more surface as possible. Follow the same procedure for the lower crankcase.



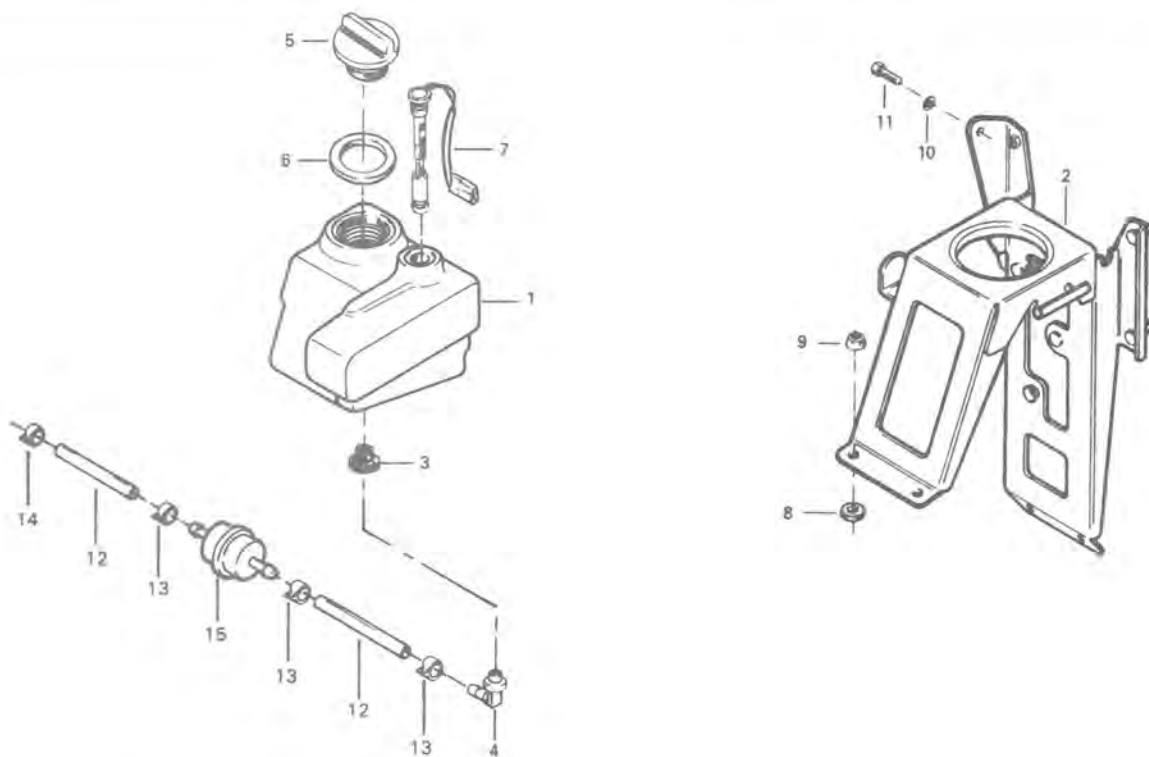
A013002024



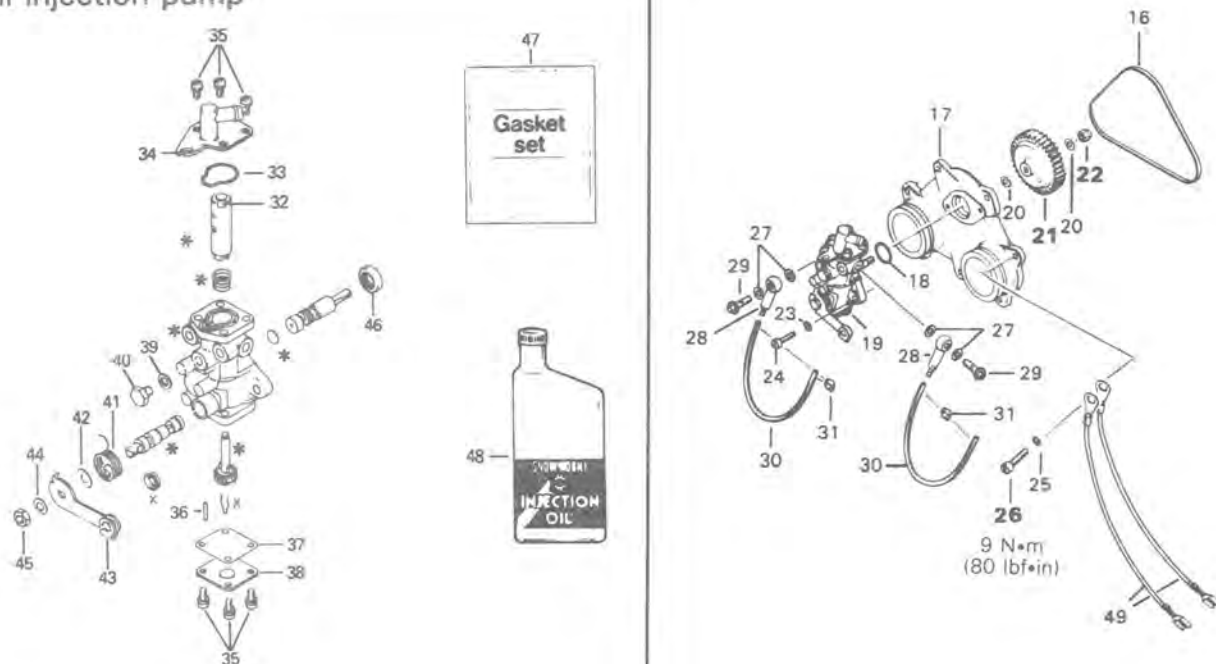
## Section 02 ENGINE

### Sub-section 06 (467 ENGINE TYPE)

## OIL INJECTION PUMP AND RESERVOIR



### Oil injection pump



Parts in illustration marked with \* are not available as spare parts.



## Section 02 ENGINE


### Sub-section 06 (467 ENGINE TYPE)

- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1. Injection oil tank</li> <li>2. Support</li> <li>3. Grommet</li> <li>4. Male connector</li> <li>5. Oil tank cap</li> <li>6. Gasket</li> <li>7. Oil level sensor</li> <li>8. Rubber spacer (4)</li> <li>9. Flanged hexagonal elastic stop nut M6 (4)</li> <li>10. Lock washer 6 mm (2)</li> <li>11. Hexagonal head cap screw M6 x 12 (2)</li> <li>12. Oil line 8" (200 mm)</li> <li>13. Spring clip (3)</li> <li>14. Spring clip</li> <li>15. Filter</li> <li>16. Rubber ring</li> <li>17. Oil pump mounting flange</li> <li>18. O-ring</li> <li>19. Oil pump</li> <li>20. Washer 6.2 mm (2)</li> <li>21. Oil pump gear 44 teeth</li> <li>22. Lock nut 6 mm</li> <li>23. Lock washer 5 mm (2)</li> <li>24. Cylindrical slotted screw M5 x 16 (2)</li> <li>25. Lock washer 6 mm (7)</li> </ol> | <ol style="list-style-type: none"> <li>26. Cylindrical slotted screw M6 x 20 (7)</li> <li>27. Oil banjo gasket (4)</li> <li>28. Banjo (2)</li> <li>29. Banjo bolt M6 x 16 (2)</li> <li>30. Oil line 170 mm (2)</li> <li>31. Clamp (4)</li> <li>32. Retainer</li> <li>33. O-ring</li> <li>34. Plate</li> <li>35. Screw with lock washer (8)</li> <li>36. Stop pin</li> <li>37. Gasket</li> <li>38. Cam casing plate</li> <li>39. Washer</li> <li>40. Hexagonal head screw M6 x 7</li> <li>41. Spring</li> <li>42. Washer</li> <li>43. Lever</li> <li>44. Lock washer 6 mm</li> <li>45. Hexagonal nut 6 mm</li> <li>46. Seal</li> <li>47. Gasket set</li> <li>48. Injection oil (1 liter)</li> <li>49. Ground cable ass'y</li> </ol> |
|---|--|

## CLEANING

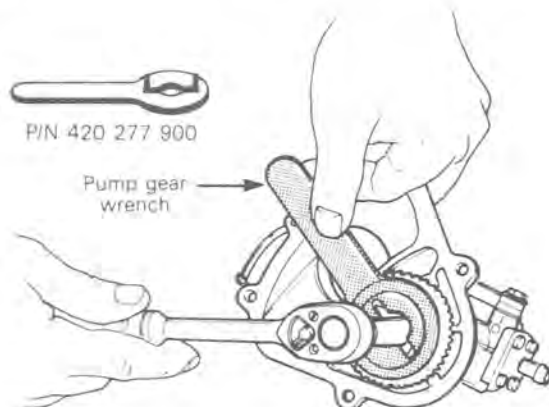
Discard all seals and O-rings. Clean all metal components in a non-ferrous metal cleaner.

## DISASSEMBLY

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

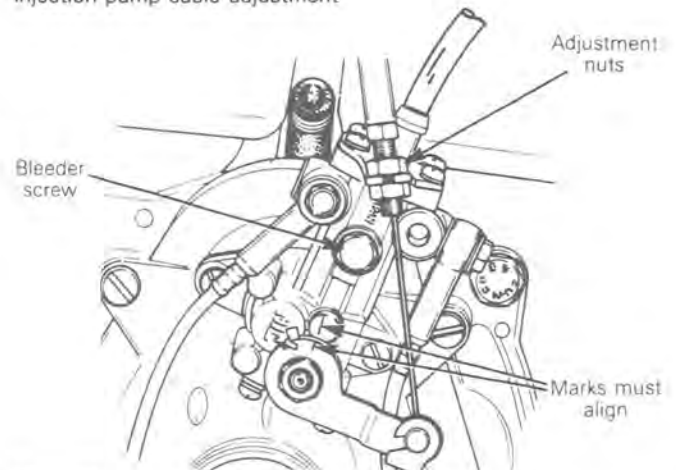
### 21,22, Oil pump gear & lock nut

To remove retaining nut, lock gear using no. 420 277 900 tool.




A000002043

### Injection pump cable adjustment



A013002025

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

### To bleed oil lines:

All oil lines should be full of oil. To bleed the main oil line (between tank and pump), loosen the bleeder screw (do not start engine) and let the air escape until oil starts to flow out.

### Make sure tank has enough oil

To bleed the small oil injection lines, start the engine and let it run at idle speed. Move injection pump lever to fully open position until lines are full of oil.

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## Section 02 ENGINE

### Sub-section 06 (467 ENGINE TYPE)

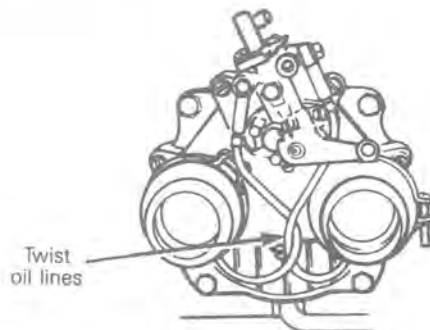
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#### ASSEMBLY

##### 26, Screw

Torque to 9 N•m (80 lbf•in).

▼ **CAUTION:** Whenever oil injection lines are removed, always make the routing as shown. This is important to avoid friction with the steering column.



A015002017

#### ADJUSTMENT

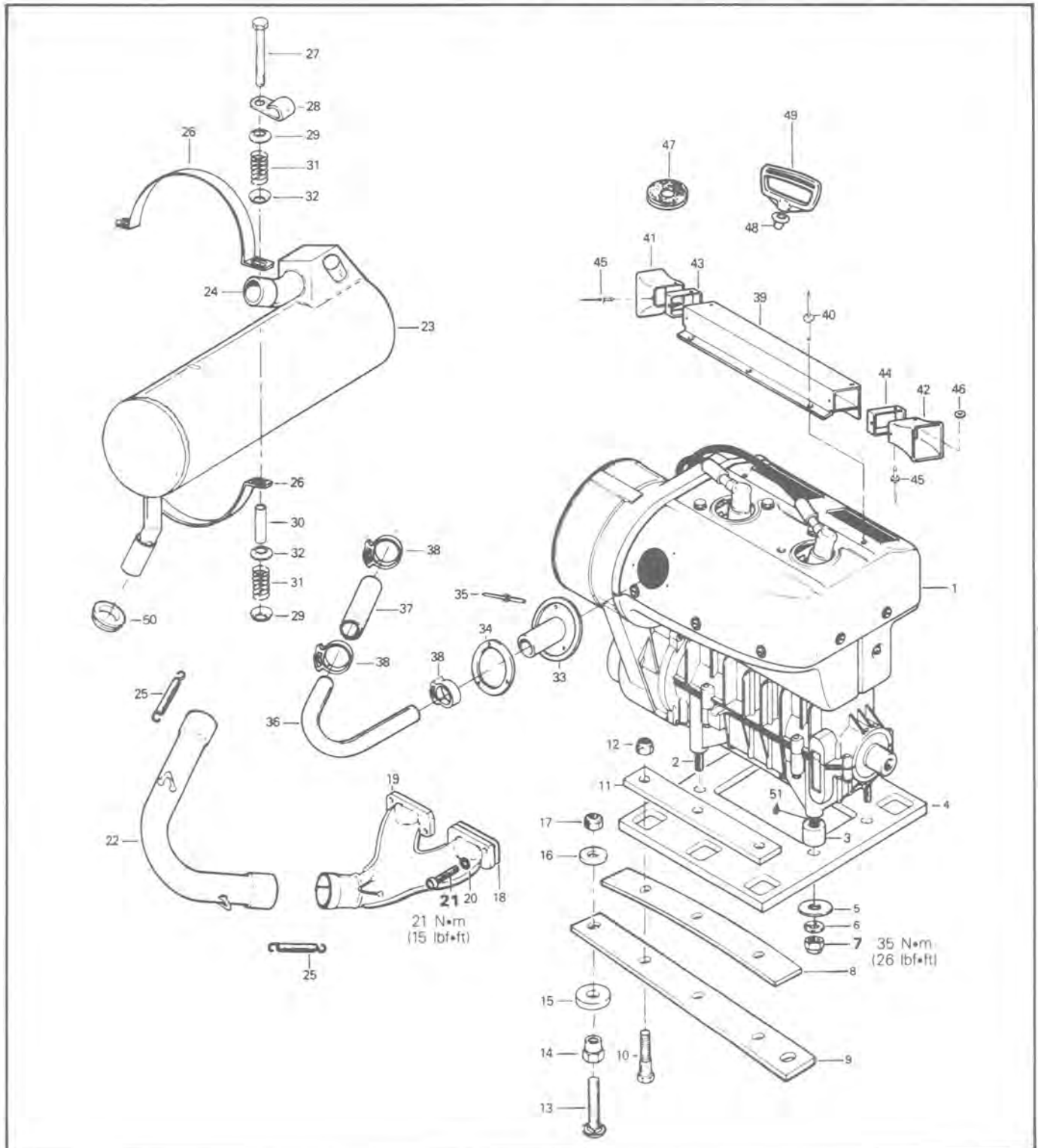
Always perform carburetor adjustment prior to oil injection pump adjustment.

##### To synchronize pump with carburetor:

Eliminate the throttle cable free-play by pressing the throttle lever until a light resistance is felt, then hold in place. The aligning marks on the pump casting and on the lever must align. If not, loosen the adjuster nut and adjust accordingly. Tighten the lock nut.

# 503 ENGINE TYPE

## ENGINE REMOVAL & INSTALLATION



---

## Section 02 ENGINE

### Sub-section 07 (503 ENGINE TYPE)

---

- |  |  |
|--|--|
| 1. Engine Rotax type 503               | 27. Hexagonal head cap screw 5/16-18 x 3 1/4 |
| 2. Stud M10 x 45                       | 28. Clip                                     |
| 3. Distance sleeve                     | 29. Cup                                      |
| 4. Engine bracket                      | 30. Bushing                                  |
| 5. Flat washer 10.5 mm x 21 x 2        | 31. Spring                                   |
| 6. Lock washer 10 mm                   | 32. Cup                                      |
| 7. Hexagonal nut 10 mm                 | 33. Connector                                |
| 8. Leaf spring                         | 34. Connector ring                           |
| 9. Cross support                       | 35. Rivet                                    |
| 10. Knurled screw                      | 36. Elbow                                    |
| 11. Retainer plate                     | 37. Hose 4" (102 mm)                         |
| 12. Hexagonal elastic stop nut 5/16-24 | 38. Clamp                                    |
| 13. Carriage bolt 3/8-24 x 1 1/2       | 39. Air duct                                 |
| 14. Threaded spacer bushing            | 40. Rivet                                    |
| 15. Insulator rubber                   | 41. R.H. outlet duct                         |
| 16. Flat washer 25/64 x 7/8 x .090     | 42. L.H. outlet duct                         |
| 17. Hexagonal elastic stop nut 3/8-24  | 43. R.H. retainer clamp                      |
| 18. Gasket                             | 44. L.H. retainer clamp                      |
| 19. Exhaust manifold                   | 45. Rivet                                    |
| 20. Lock washer 8                      | 46. Flat washer                              |
| 21. Allen screw M8 x 30                | 47. Spark plug grommet                       |
| 22. Connector pipe                     | 48. Rubber buffer                            |
| 23. Muffler                            | 49. Starter grip                             |
| 24. Muffler female ball joint          | 50. Exhaust grommet                          |
| 25. Spring                             | 51. Loctite 242 (blue, medium strength)      |
| 26. Muffler clamp                      |  |
- 

## REMOVAL FROM VEHICLE

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

- pulley guard, drive belt,
- muffler,
- clamp between intake manifold and carburator,

Disconnect **negative** cable (ground) from battery, then disconnect electrical connections leading to engine.

- remove steering shaft,
- transmission rod,
- speed cable on speedo,
- brake cable on caliper,
- throttle cable from carburetor and handlebar,
- console,
- upper column,
- engine mount nuts.

## ENGINE SUPPORT & MUFFLER DISASSEMBLY & ASSEMBLY

### 7,21, Crankcase/engine bracket nuts & exhaust manifold bolts

Torque the crankcase/engine bracket nut to 35 N•m (26 lbf•ft).

Torque the exhaust manifold bolt to 21 N•m (15 lbf•ft).

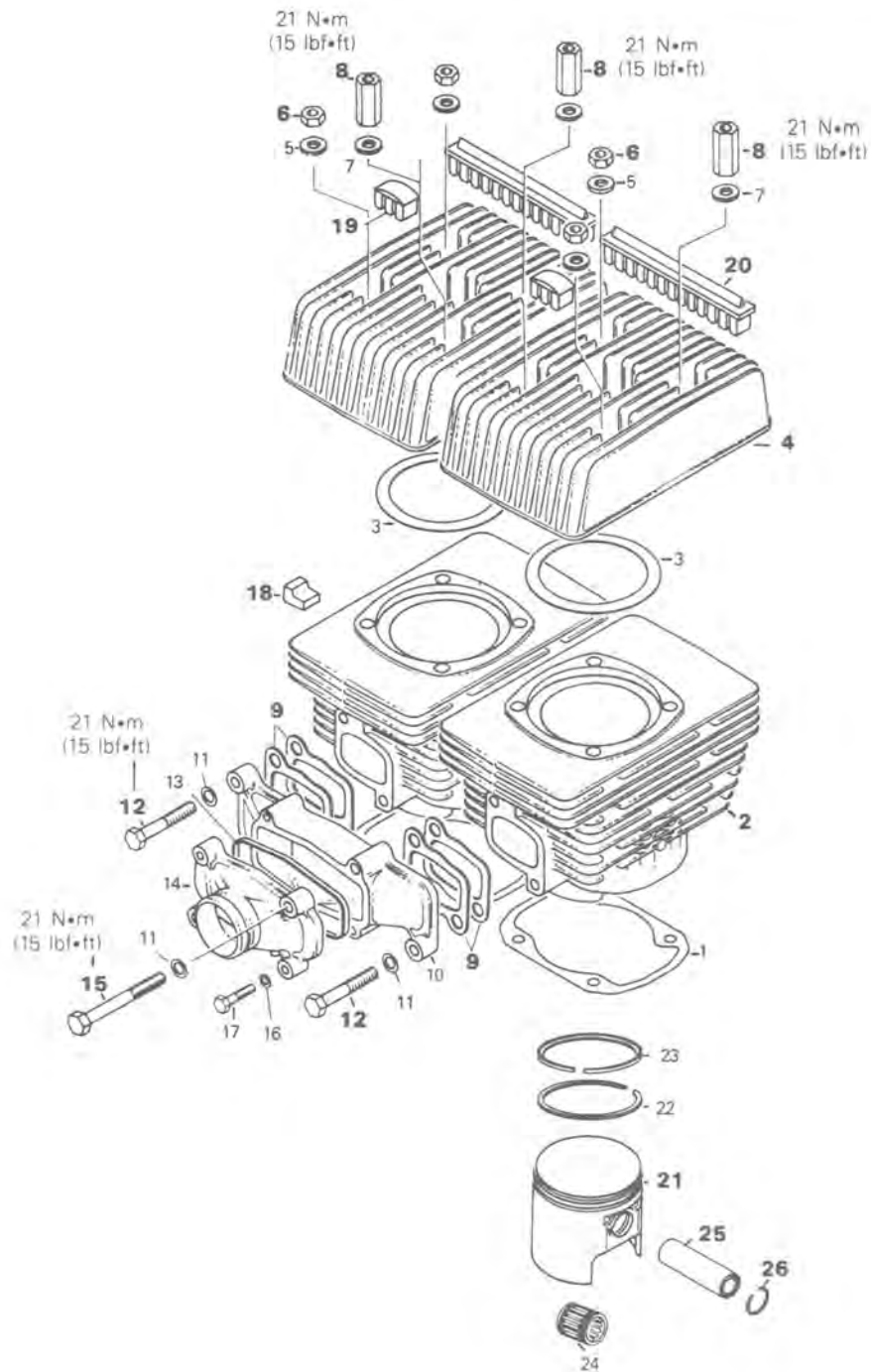
## INSTALLATION ON VEHICLE

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

- Check tightness of engine mount nuts.
- After throttle cables installation, check carburetor maximum throttle slide opening.
- Check pulley alignment and drive belt tension.

**Section 02 ENGINE**  
**Sub-section 07 (503 ENGINE TYPE)**

**TOP END**



## Section 02 ENGINE

### Sub-section 07 (503 ENGINE TYPE)

1. Cylinder flange gasket (2)
2. Cylinder (2)
3. Cylinder head gasket (2)
4. Cylinder head (2)
5. Washer 8.4 mm (4)
6. Hexagonal nut 8 mm (4)
7. Washer 8.4 mm (4)
8. Distance nut 8 x 37 mm (4)
9. Intake manifold gasket (4)
10. Intake manifold
11. Lock washer 8 mm (4)
12. Hexagonal bolt M8 x 40 mm (2)
13. O-ring


14. Intake manifold cover
15. Hexagonal bolt M8 x 64 mm (2)
16. Lock washer 6 mm (2)
17. Hexagonal bolt M6 x 30 mm (2)
18. Noise damper
19. Noise damper (short) (4)
20. Noise damper (long) (4)
21. Piston (2)
22. Rectangular ring (2)
23. Semi-trapez ring (2)
24. Needle bearing (2)
25. Gudgeon pin (2)
26. Circlip (4)

## CLEANING

Discard all gaskets.

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

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

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


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

## DISASSEMBLY

### 21,25,26, Piston, gudgeon pin & circlips

Place a clean cloth over crankcase to prevent circlips from falling into crankcase. Then with a pointed tool inserted in piston notch, remove circlip from piston.


Drive the gudgeon pin out of piston using a suitable drive punch and hammer.

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

## INSPECTION

The inspection of the engine top end must include the following measurements:

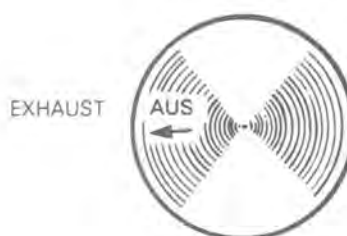
MEASUREMENTS	TOLERANCES		WEAR LIMIT
	FITTING NEW PARTS (MIN.)	(MAX.)	
Cylinder taper	N.A.	N.A.	.08 mm (.0031")
Cylinder out of round	N.A.	N.A.	.05 mm (.0020")
Cylinder/piston clearance	.07 mm (.0028")	.09 mm (.0035")	.20 mm (.0079")
Ring/piston groove clearance	.04 mm (.0016")	.11 mm (.0043")	.20 mm (.0079")
Ring end gap	.20 mm (.0079")	.35 mm (.0138")	1.0 mm (.0394")

 **NOTE:** For the measurement procedures, refer to "Engine dimensions measurement", section 02-10.

## ASSEMBLY

### 21,26, Pistons & circlips

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



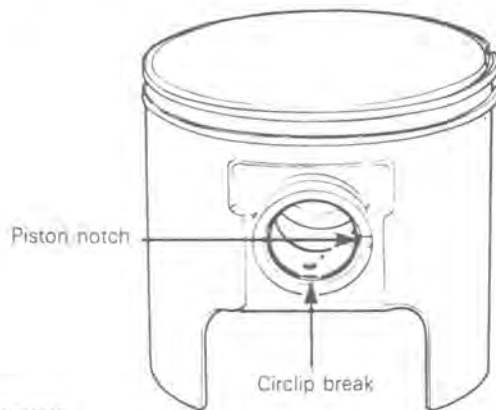
A001002001

## Section 02 ENGINE

### Sub-section 07 (503 ENGINE TYPE)

**NOTE:** Spare parts pistons and cylinders are identified with a green or red dot, it is important to match the piston with the cylinder of the same color. To minimize the effect of acceleration forces on circlip, install each circlip so the circlip break is at 6 o'clock as illustrated.

Remove any burrs from piston caused through circlip installation using very fine emery cloth.



A001002002

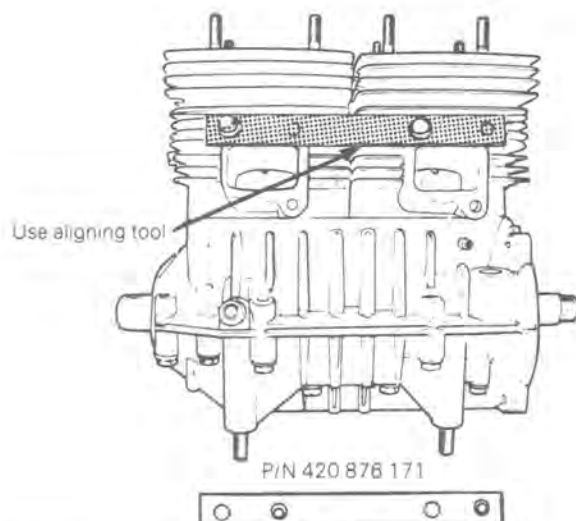
**CAUTION:** Circlips must not move freely in the groove after installation. If so, replace them.

#### 2,21, Cylinders & pistons

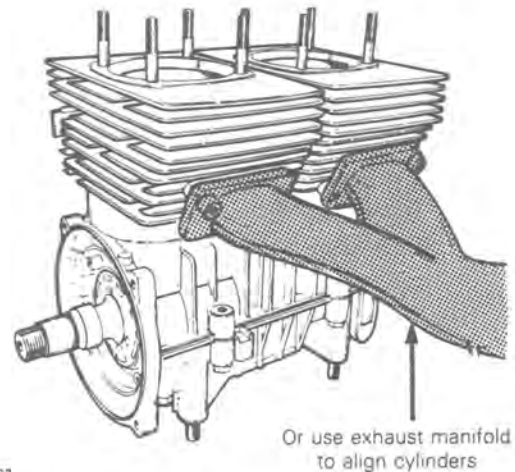
Before inserting piston in cylinder, lubricate the cylinder with new injection oil or equivalent.

#### 2,4, Cylinders & cylinder heads

At cylinder and/or cylinder head installation, use P/N 420 876 171 aligning tool (or exhaust manifold) to ensure sealing of intake manifold and exhaust (See Tools Section), before tightening cylinder head nuts.



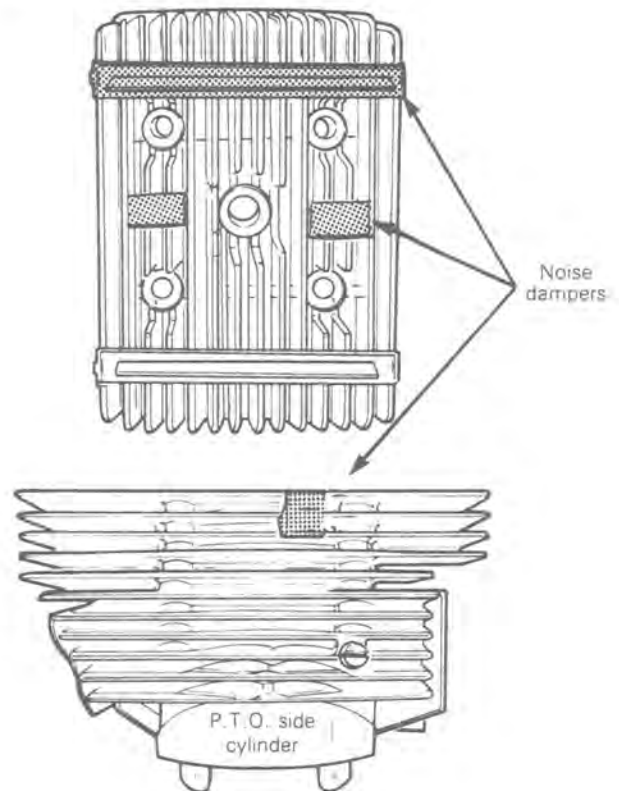
A017002001



A017002002

#### 18,19,20, Noise dampers

For proper position of noise dampers, refer to the following illustrations.



A017002003

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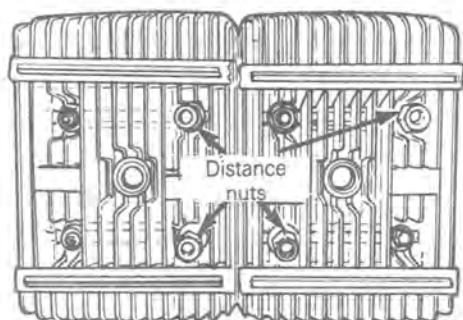
## Section 02 ENGINE

### Sub-section 07 (503 ENGINE TYPE)

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#### 6,8, Nuts & distance nuts

Position nuts and distance nuts as illustrated.



A017002006

Cross torque cylinder head nuts to 21 N•m (15 lbf•ft);  
torque each cylinder head individually.

Install armature plate, fan housing and then air deflector.

#### 9, Intake manifold gaskets

Install a gasket on each side of the air deflector.

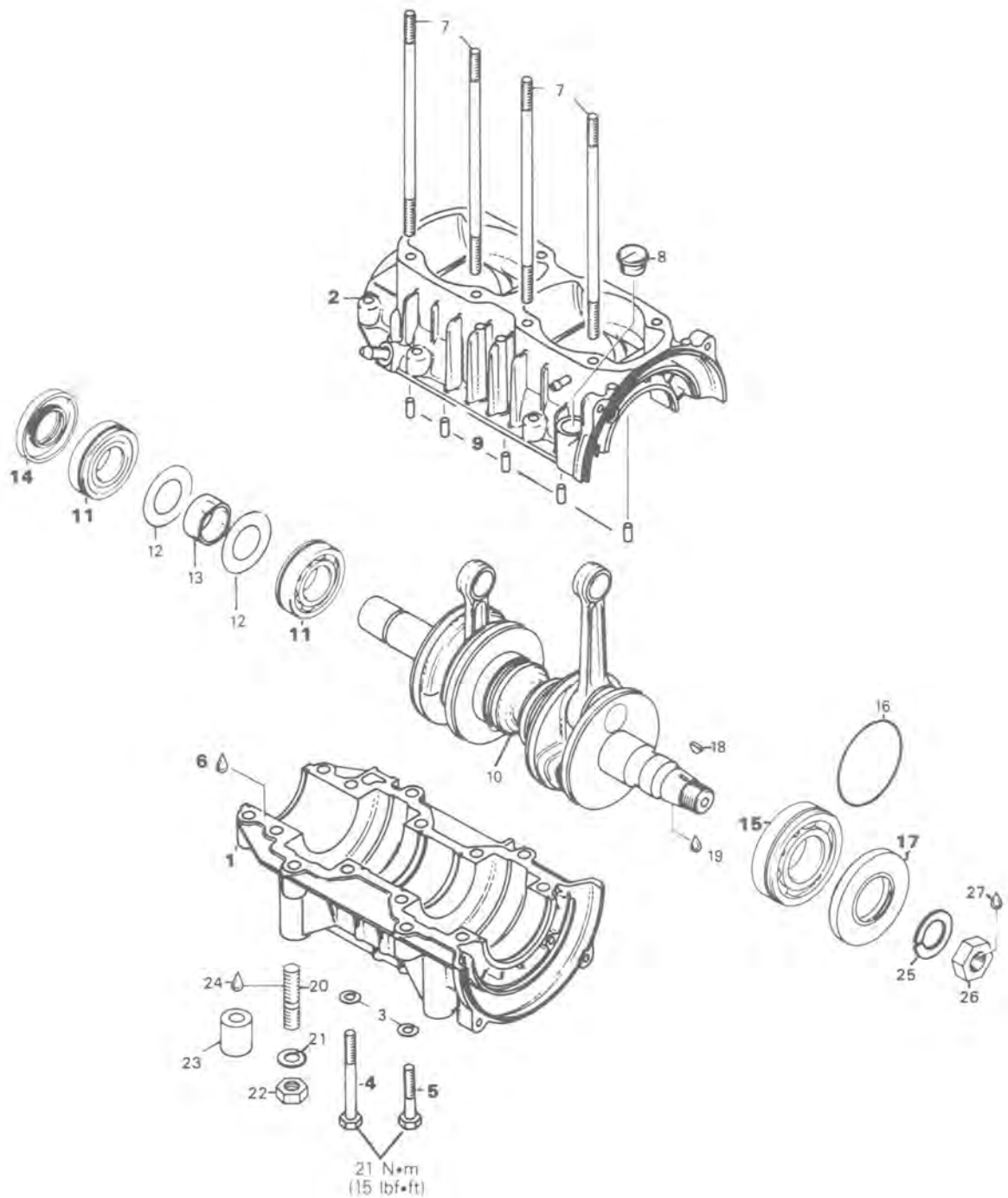
#### 12,15, Intake manifold bolts

Torque intake manifold bolts to 21 N•m (15 lbf•ft).



**Section 02 ENGINE**  
Sub-section 07 (503 ENGINE TYPE)

**BOTTOM END**



## Section 02 ENGINE

### Sub-section 07 (503 ENGINE TYPE)

1. Crankcase lower half
2. Crankcase upper half
3. Lock washer 8 mm (14)
4. Screw M8 x 70 (6)
5. Screw M8 x 45 (8)
6. Loctite 515
7. Stud M8 x 173 (8)
8. Cable grommet
9. Rubber plug (5)
10. Crankshaft
11. Ball bearing 6206 (2)
12. Shim 1 mm (2)
13. Spacer
14. Seal P.T.O. side

15. Ball bearing 6207
16. O-ring
17. Seal mag side
18. Woodruff key
19. Loctite 242
20. Stud M10 x 42 (4)
21. Lock washer 10 mm (4)
22. Hexagonal nut M10 (4)
23. Distance sleeve (4)
24. Loctite 242 (blue)
25. Lock washer 22 mm
26. Hexagonal nut 22 x 1.5
27. Loctite 242

## CLEANING

Discard all seals, gaskets and O-rings.

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

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

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

## DISASSEMBLY

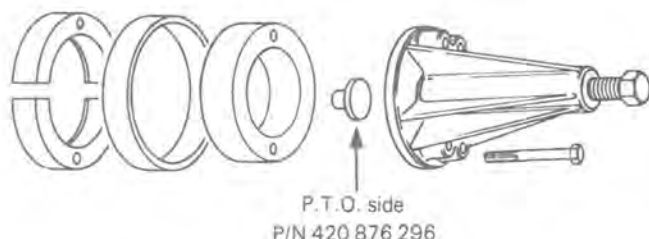
### General

To remove drive pulley, refer to "Drive pulley", section 03-03.

To remove magneto, refer to "Magneto" in this section.

### 11,15, P.T.O. side bearings & mag. side bearing

To remove ball bearings from crankshaft, use a special puller (see Tools).



## INSPECTION

The inspection of the engine bottom end must include the following measurements:

MEASUREMENTS	TOLERANCES	
	FITTING NEW PARTS (MIN.)	WEAR LIMIT (MAX.)
Crankshaft deflection	N.A.	N.A.
Connecting rod big end axial play	.20 mm (.0079")	.53 mm (.0208")
		1.0 mm (.0394")

**NOTE:** For the measurement procedures, refer to "Engines dimensions measurement", section 02-10.

## ASSEMBLY

### 11,15, P.T.O. side bearings & mag. side bearing

Prior to installation, place bearings into an oil container filled with oil heated to 100°C (212°F).

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

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

### 14,17, Oil seals

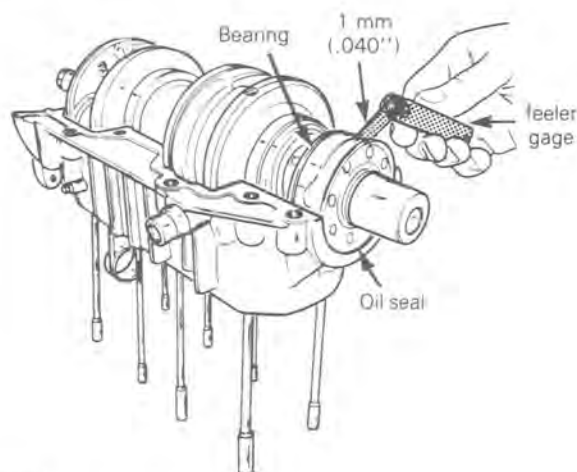
At seal assembly, apply a light coat of lithium grease on seal lip.

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

## Section 02 ENGINE

### Sub-section 07 (503 ENGINE TYPE)

When installing plain seals (seal without locating ring or without spacing legs), ensure to maintain the specified gap as illustrated.



A017002007

#### 9, Rubber plug

Prior to installing the crankshaft, make sure both rubber plugs are into upper crankcase holes.

#### 1,2, Lower and upper crankcase

Crankcase halves are factory matched and therefore, are not interchangeable as single halves.

#### 6, Loctite 515

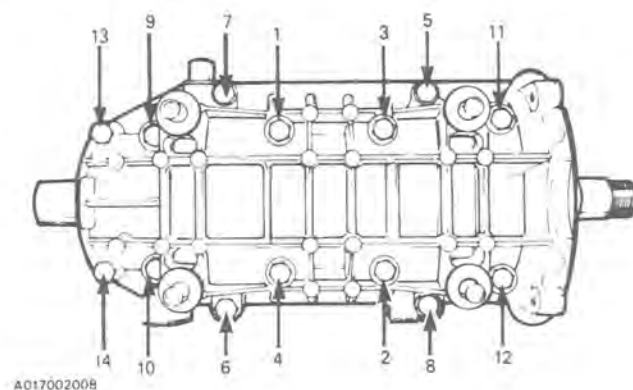
Prior to joining of crankcase halves spray some new injection oil (or equivalent) on all moving parts of the crankshaft. Then apply Loctite 515 (413 7027 00) on crankcases mating surfaces.

**NOTE:** Prior to apply Loctite 515 it is possible to use primer N (P/N 413 7053 00) or primer NF (P/N 413 7024 00). It increases cure speed and gap filling capability. Refer to supplier instructions.

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

#### 4,5, Crankcases bolts

Torque bolts to 21 N•m (15 lbf•ft) following illustrated sequence.

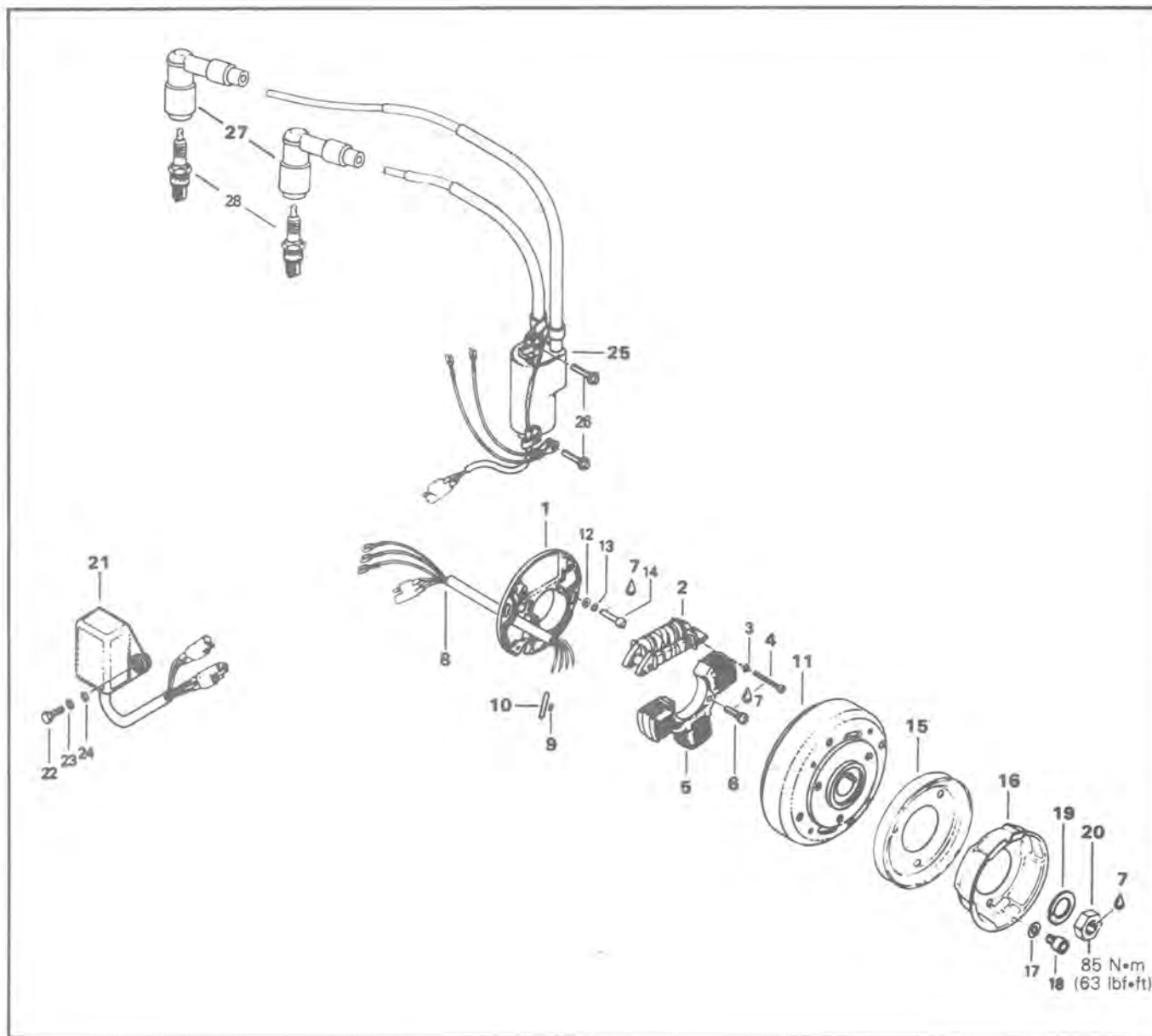


To install magneto, refer to "Magneto" in this section.

## Section 02 ENGINE

### Sub-section 07 (503 ENGINE TYPE)

## MAGNETO



1. Armature plate
2. Generating coil
3. Lock washer 5 mm (2)
4. Cylindrical slotted head screw M5 x 35 (2)
5. Lighting coil
6. Screw M6 x 25 (2)
7. Loctite 242 (blue, medium strength)
8. Harness
9. Splice connector (6)
10. Protector tube
11. Flywheel
12. Washer 5.5 mm (2)
13. Lock washer 5 mm (2)
14. Allen screw M5 x 18 (2)

15. V-belt pulley
16. Starting pulley
17. Lock washer 8 mm (3)
18. Allen screw M8 x 12 (3)
19. Lock washer 22 mm
20. Hexagonal nut 22 x 1.5 mm
21. C.D. box
22. Hexagonal screw M6 x 20 mm (2)
23. Lock washer 6 mm (2)
24. Washer 6.4 mm (2)
25. Ignition coil
26. Hexagonal head tapite screw M5 x 25 (2)
27. Spark plug protector (2)
28. Spark plug (2)

## CLEANING

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

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

## DISASSEMBLY

### 15,16, V-belt pulley and starting pulley

To gain access to magneto assembly, remove:

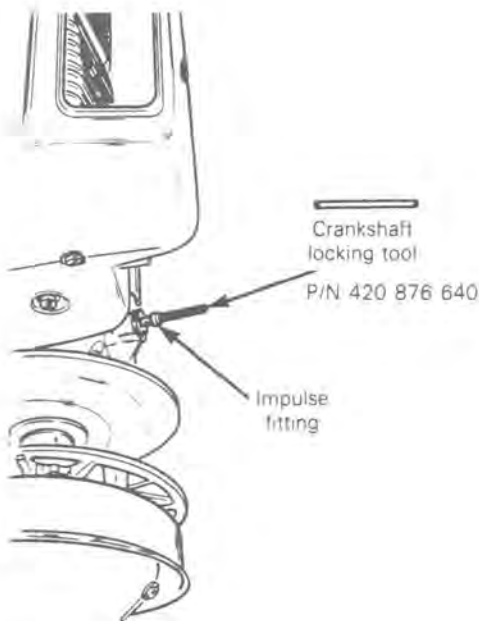
- rewind starter;
- starting and V-belt pulleys.

○ **NOTE:** Before disassembling magneto plate, indexing marks should be located to facilitate reassembly.

### 20, Flywheel retaining nut

To remove magneto flywheel retaining nut:

- lock crankshaft with crankshaft locking tool (P/N 420 876 640) as illustrated (magneto side piston must be at top dead center);
- remove magneto retaining nut.

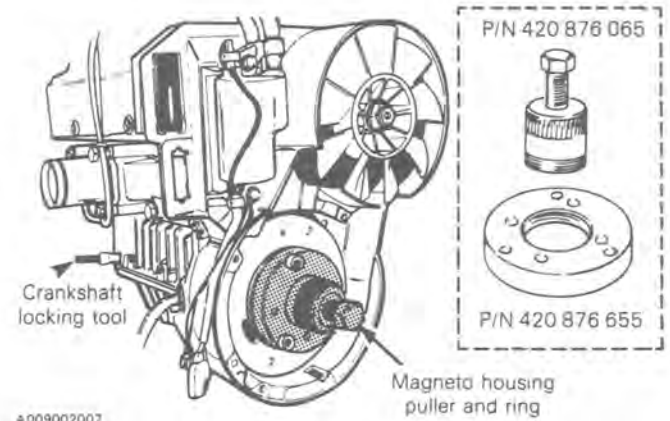


○ **NOTE:** It should be noted that to correctly remove a Loctite locked fastener it is first necessary to tap on the fastener to break Loctite bond. This will eliminate the possibility of thread breakage.

### 11, Magneto housing flywheel

To remove magneto housing (flywheel):

- lock crankshaft with crankshaft locking tool (service tool) and adjust magneto housing puller and puller ring (service tool) as illustrated;



○ **NOTE:** For the above procedure, the locking type puller can be used without crankshaft locking tool.



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

## REPAIR

### 2, Generating coil

To replace generating coil:

- Heat the armature plate to 93°C (200°F) around the screw holes to break the Loctite bond.

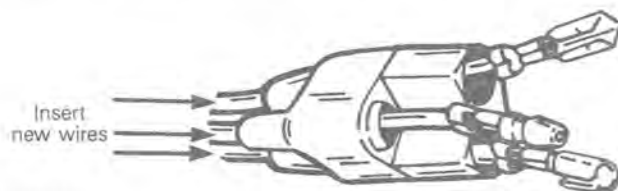


## Section 02 ENGINE

### Sub-section 07 (503 ENGINE TYPE)

#### ▼ CAUTION: Protect harness from flame.

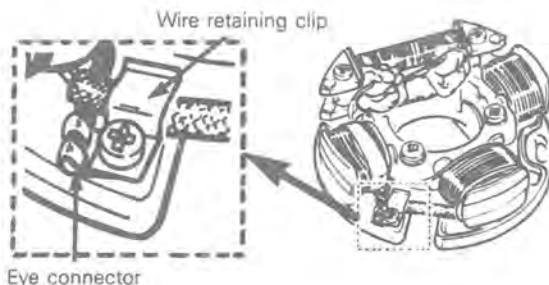
- Remove screws (use Phillips no. 2 or suitable flat screw driver).
- Cut the four wires as close as possible to the coil body.
- To pass new coil wires in harness, tape the old wires to the end of new wires and pull them through the harness protector tube.
- Insert the new wires into the old connector housing and install connectors.



A001002004

#### ▼ CAUTION: Replace the old wires in the connector with the same color coded new wires.

- Install a new receptacle connector to the black/yellow striped wire.
- To install the ground connector of the armature plate, tape the new black lead to the old one and pull it under the lighting coil with the old wire.
- Solder an eye connector to the lead and fasten it under the wire retaining clip.



A001002005

#### 4,7, Generating coil screws & Loctite 242

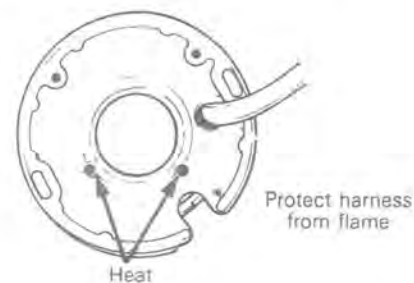
- To install the new coil on the armature plate, remove the shipping nuts from the coil and apply Loctite 242 (blue, medium strength) to screws before assembly.

#### ▼ CAUTION: Before reinstalling the magneto, remove the loose epoxy from harness.

#### 5, Lighting coil

To replace lighting coil:

- Heat the armature plate to 93°C (200°F) around the screw holes to break the Loctite bond.



A001002003

#### ▼ CAUTION: Protect harness from flame.

- Remove screws (use Phillips no. 3 screwdriver).
- Remove the wire retaining clip from armature plate.

#### 9,10, Splice connectors and protector tube

- Pull out protector tubes and unsolder the splice connectors.
- Solder the yellow wire in the harness to the white tube protected wire of the coil.
- Solder the yellow/black striped wire in the harness to the black tube protected wire of the coil.



A001002006

- Position protector tubes over connections.

#### 6,7, Lighting coil screws & Loctite 242

Prior to assembly, apply Loctite 242 (blue, medium strength) on lighting coil screws.

- Fasten retaining clip onto protector tubes.

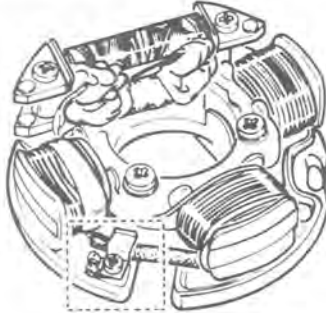
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## Section 02 ENGINE

### Sub-section 07 (503 ENGINE TYPE)

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The ground terminal from generating coil must be fastened under this clip.



A001002005

▼ **CAUTION:** Before reinstalling magneto, remove the loose epoxy from harness.

## ASSEMBLY

### 1, Armature plate

Position armature plate on crankcase, aligning marks on both parts.

### 7, Loctite 242

Clean crankshaft extension taper.

Apply Loctite 242 (blue medium strength) on taper.

### 11,19, Flywheel, lockwasher 22 mm, woodruff key

Position woodruff key, magneto flywheel and lockwasher on crankshaft.

### 7,20, Loctite 242 & nut

Clean nut threads and apply Loctite 242 (blue, medium strength) before tightening nut to 85 N•m (63 lbf•ft).

### 8,21,25,27, Harness, C.D. Box, ignition coil & spark plug protectors

At reassembly coat all electric connections with silicone dielectric grease to prevent corrosion or moisture penetration.

▼ **CAUTION:** Do not use silicone "sealant", this product will corrode contacts.

○ **NOTE:** For ignition timing procedure refer to "Ignition timing" section 04-02.



## Sub-section 07 (503 ENGINE TYPE)

Exploded view diagram of a power window motor assembly. The diagram shows the motor housing, gear train, and window regulator components. The torque specification for the final assembly step is 65 N·m (48 lbf·ft).

1. Fan housing
2. Locking ring
3. Shim 1.0 mm (2)
4. Ball bearing (2)
5. Fan shaft
6. Woodruff key 3 x 5
7. Distance sleeve
8. Pulley half
9. Shim 0.5 mm
10. Pulley half
11. Fan
12. Lock washer 16
13. Hexagonal nut 16 x 1.5
14. V-Belt
15. Fan cover
16. Cylinder cowl, lower half, exhaust side
17. Cylinder cowl, lower half, carburetor side
18. Taptite screw M6 x 12
19. Spring nut V4.8 (8)
20. Cylinder cowl, upper half
21. Sealing strip 440 mm
22. Lock washer 8 (4)
23. Hexagonal screw M8 x 16 (4)
24. Washer 4 x 15.8 (8)
25. Screw B4.8 x 16 (8)
26. Lock washer 6 (4)
27. Cylindrical screw M6 x 30 (4)
28. Air duct
29. R.H. retainer-clamp
30. R.H. outlet duct
31. L.H. retainer clamp
32. L.H. outlet duct
33. River
34. Spark plug cover (2)



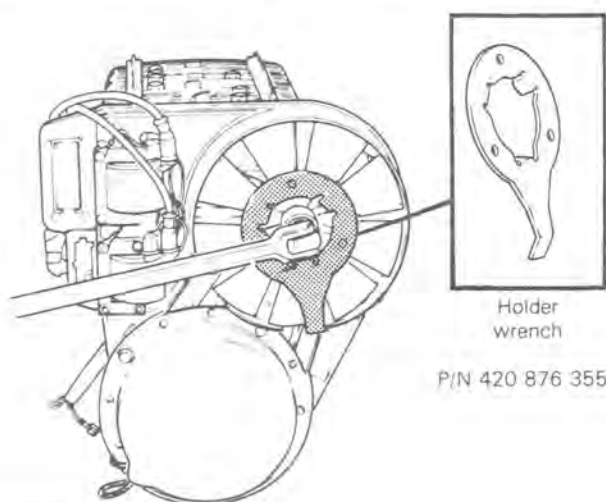
## CLEANING

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

## DISASSEMBLY & ASSEMBLY

### 13, Fan retaining nut

To remove or install fan pulley retaining nut, lock fan pulley with special holder wrench. (Use tool P/N 420 876 355). At assembly, torque not to 65 N•m (48 lbf•ft).



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### 9,14, Shim & V-belt

Fan belt deflection must be 8.5 mm (11/32") when applying a force of 50 N (11 lbf). To adjust, install or remove shim(s) between pulley halves. Install excess shim(s) between fan and lock washer.

Use belt tension tester P/N 414 3482 00 to check deflection.



A000002007

### 1,4, Fan housing & bearings

It is first necessary to heat bearing housing to 65°C (150°F) to remove or install bearing.

### 23,27, Upper fan cowl screws & fan housing screws

At assembly, apply a light coat of Loctite 242 on threads. It should be noted that to correctly remove a Loctite locked screw, it is first necessary to slightly tap on head screw to break Loctite bond. The screw can then be removed. This will eliminate the possibility of screw breakage.

### 16,17, Cylinder cowl

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

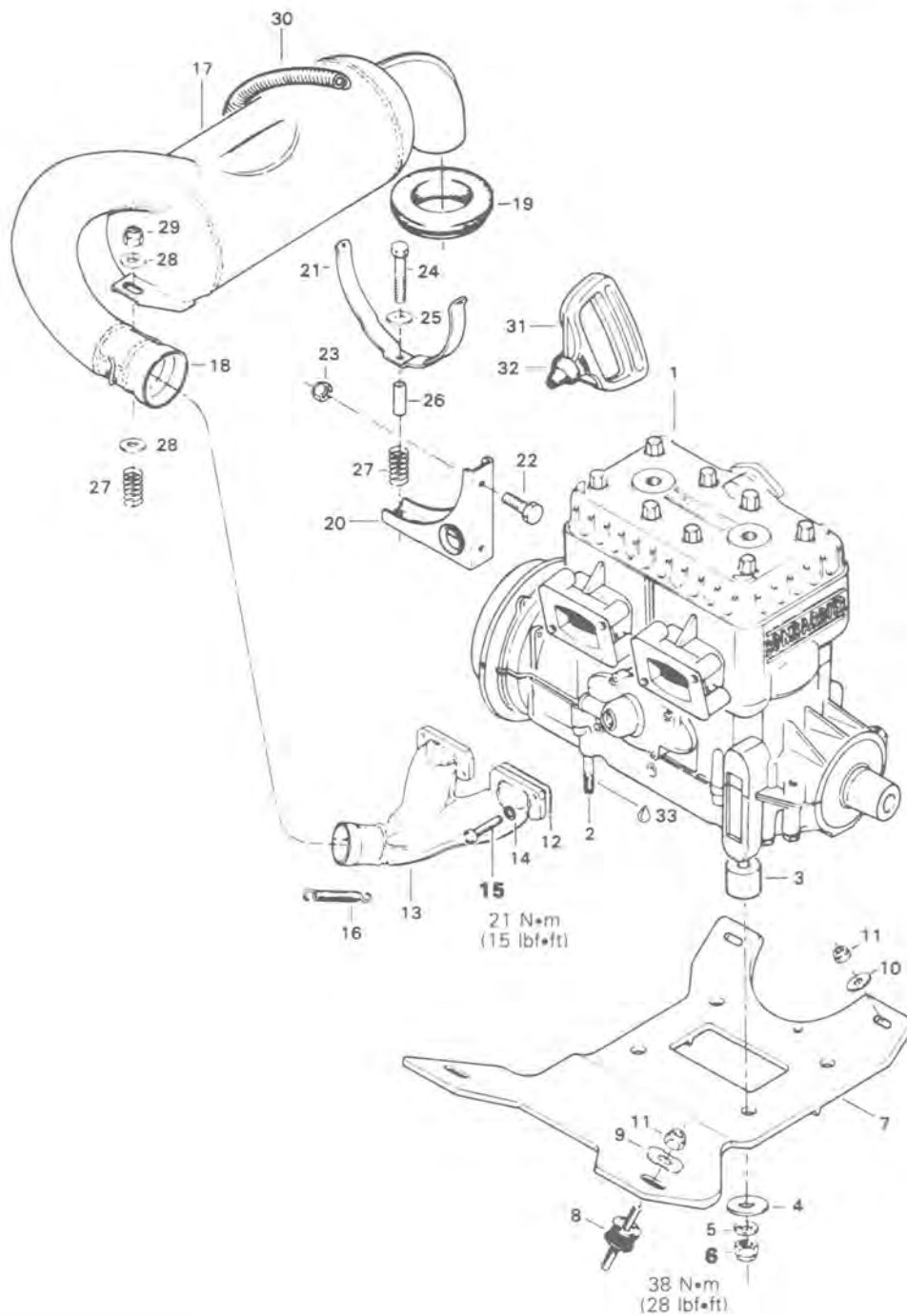
◆ **WARNING:** If fan protector is removed, always reinstall after servicing.



## 532 ENGINE TYPE

### ENGINE REMOVAL & INSTALLATION

Engine support & muffler



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## Section 02 ENGINE

### Sub-section 08 (532 ENGINE TYPE)

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- |  |   |
|--|---|
| 1. Engine                                    | 18. Female ball joint                           |
| 2. Stud M10 x 52 (4)                         | 19. Exhaust washer                              |
| 3. Distance sleeve 22 mm (4)                 | 20. Muffler support                             |
| 4. Flat washer 10.5 mm x 21 x 2 (4)          | 21. Muffler attachment                          |
| 5. Lock washer 10 mm (4)                     | 22. Hexagonal head cap screw M6 x 16 (2)        |
| 6. Hexagonal nut 10 mm (4)                   | 23. Hexagonal elastic flanged stop nut 6 mm (2) |
| 7. Engine bracket                            | 24. Hexagonal head cap screw M6 x 20            |
| 8. Rubber mount (4)                          | 25. Flat washer 6 x 20                          |
| 9. Internal tooth cup washer (2)             | 26. Bushing                                     |
| 10. Washer                                   | 27. Spring (2)                                  |
| 11. Hexagonal elastic stop nut M10 x 1.5 (4) | 28. Flat washer 8.4 x 25 x 1.6 (2)              |
| 12. Gasket (2)                               | 29. Hexagonal elastic stop nut M8 x 1.25        |
| 13. Exhaust manifold                         | 30. Spring                                      |
| 14. Lock washer 8 mm (4)                     | 31. Starter grip                                |
| 15. Cylindrical screw M8 x 30 (4)            | 32. Rubber grip                                 |
| 16. Spring (3)                               | 33. Loctite 242 (blue)                          |
| 17. Muffler                                  |   |
- 

## REMOVAL FROM VEHICLE

Disconnect or remove the following from vehicle:

- Battery cables and starter wires (see "Battery" section 04-04).
- Pulley guard and drive belt
- Clamp between carburetor and intake manifold
- Pulsation lines
- Muffler
- Electric wires
- Drain the cooling system and disconnect hoses at engine
- Rotary valve oil reservoir
- Disconnect rewind starter and cab retainer cable at engine

## ENGINE SUPPORT & MUFFLER ASSEMBLY

### 6, 15, Crankcase/engine support nuts & exhaust socket allen screws

Torque the crankcase to engine nuts to 38 N•m (28 lbf•ft).

Torque the exhaust socket Allen screws to 21 N•m (15 lbf•ft).

## INSTALLATION ON VEHICLE

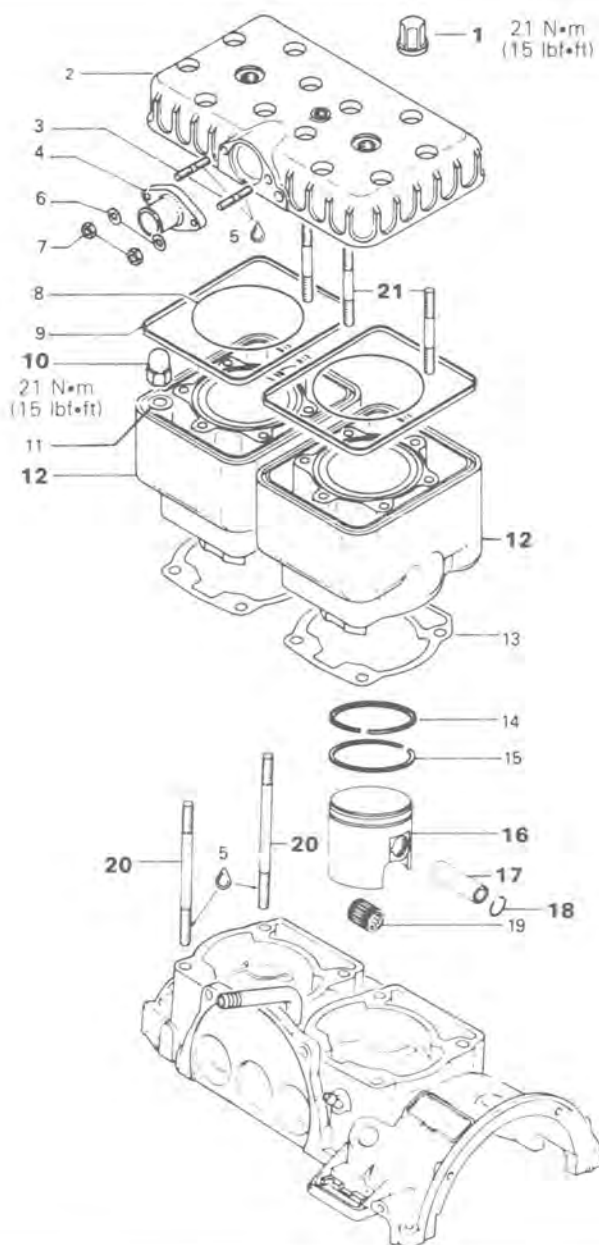
To install on vehicle, reverse removal procedure. However, pay attention to the following:

Check tightness of engine mount nuts.

Check pulley alignment and drive belt tension.

**Section 02 ENGINE**  
**Sub-section 08 (532 ENGINE TYPE)**

**TOP END**



1. Cap nut M8 (12)
2. Cylinder head
3. Stud M6 x 15 (2)
4. Coolant outlet collar
5. Loctite 242 blue (medium strength)
6. Lock washer 6 mm (2)
7. Nut M6 (2)
8. Gasket (O-ring) (2)
9. Gasket (2)
10. Cap nut M8 (8)
11. Flat washer 8.4 (8)

12. Cylinder (2)
13. Cylinder/crankcase gasket (2)
14. L-ring
15. "Rectangular" ring
16. Piston
17. Gudgeon pin
18. Circlip (4)
19. Needle bearing
20. Cylinder stud M8 x 79 (8)
21. Stud (thread) M8 x 50 (12)

## Section 02 ENGINE

### Sub-section 08 (532 ENGINE TYPE)

## 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 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

### 16,17,18, Piston, gudgeon pin & circlips

Place a clean cloth over crankcase then with a pointed tool inserted in piston notch, remove circlip from piston. Drive the gudgeon pin out of piston using a suitable drive punch and hammer.

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

## INSPECTION

The inspection of the engine top end must include the following measurements:

MEASUREMENTS	TOLERANCES		
	FITTING NEW PARTS (MIN.)	(MAX.)	WEAR LIMIT
Cylinder taper	N.A.	N.A.	.08 mm (.0031")
Cylinder out of round	N.A.	N.A.	.05 mm (.0020")
Cylinder/piston clearance	.07 mm (.0028")	.09 mm (.0035")	.20 mm (.0079")
Ring/piston groove clearance	.04 mm (.0016")	.11 mm (.0039")	.20 mm (.0079")
Ring end gap	.20 mm (.0079")	.35 mm (.0138")	1.0 mm (.0394")

○ **NOTE:** For the measurement procedures, refer to "Engine dimensions measurement", section 02-10.

## ASSEMBLY

### 16, Piston

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



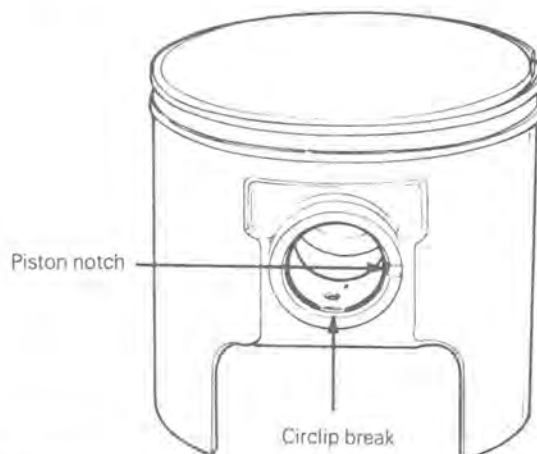
A001002001

○ **NOTE:** Spare parts pistons and cylinders are identified with a green or red dot, it is important to match the piston with the cylinder of the same color.

### 18, Circlip

To minimize the effect of acceleration forces on circlip, install each circlip so the circlip break is at 6 o'clock as illustrated. Using very fine emery cloth, remove any burrs on piston caused through circlip installation.

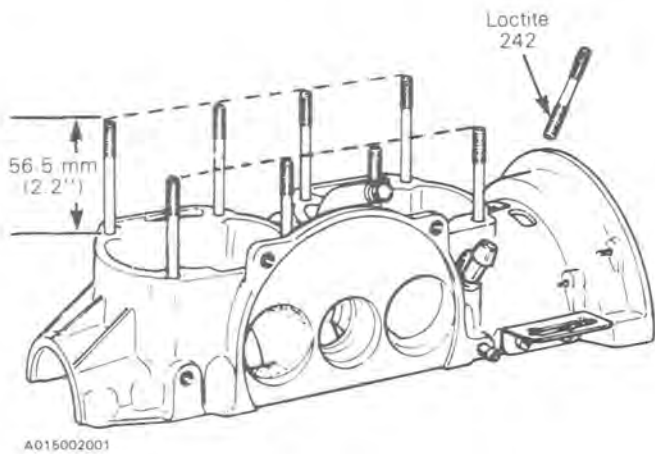
▼ **CAUTION:** Circlips must not move freely after installation if so, replace them.



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## 20, Crankcase studs

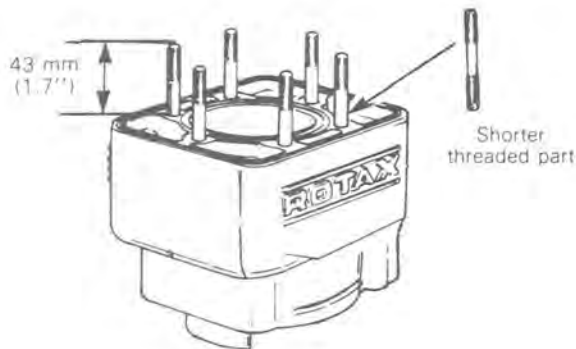
Because of cap nuts, cylinder studs have to be screwed into the crankcase so that they do not protrude by more than 56.5 mm (2.2").



Apply "Loctite 242" blue medium strength on the threaded end of the studs going into the crankcase.

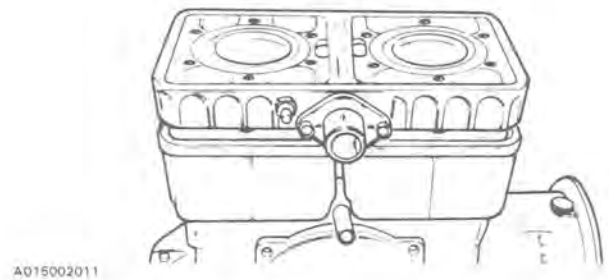
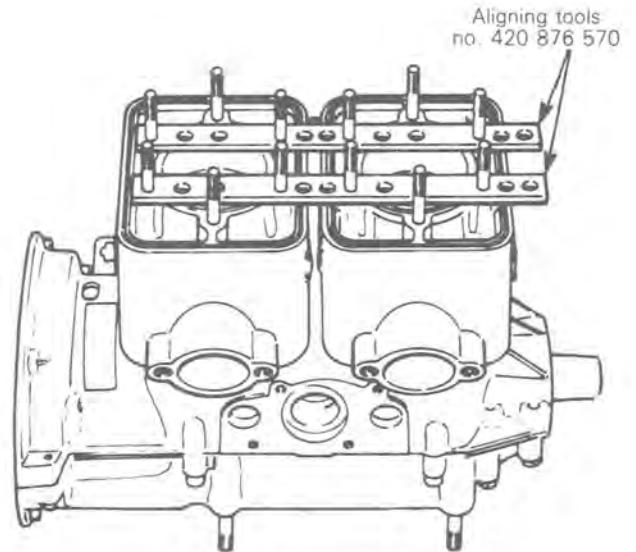
## 12,21, Cylinder & cylinder head stud

Because of cap nuts, cylinder head studs have to be screwed into the cylinder so that they do not protrude by more than 43 mm (1.700"). If it is not possible to obtain this length, add a washer between cylinder head and cap nut. Shorter threaded part of stud should be screwed into cylinder.



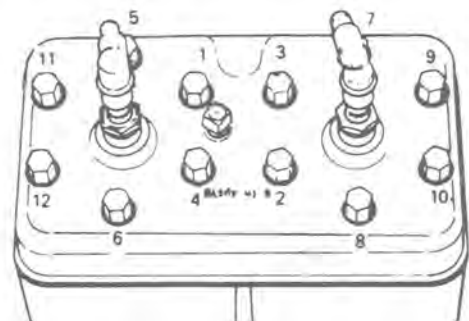
## 10,12, Crankcase/cylinder nuts & cylinders

When reassembling the cylinders to the crankcase, it is important to have them properly aligned so that the cylinder head holes will match up with the studs. A special tool (as per illustration) (or cylinder head itself) can be used to align the cylinders. Cross torque cylinder nuts to 21 N•m (15 lbf•ft).



## 1, Cylinder head nut

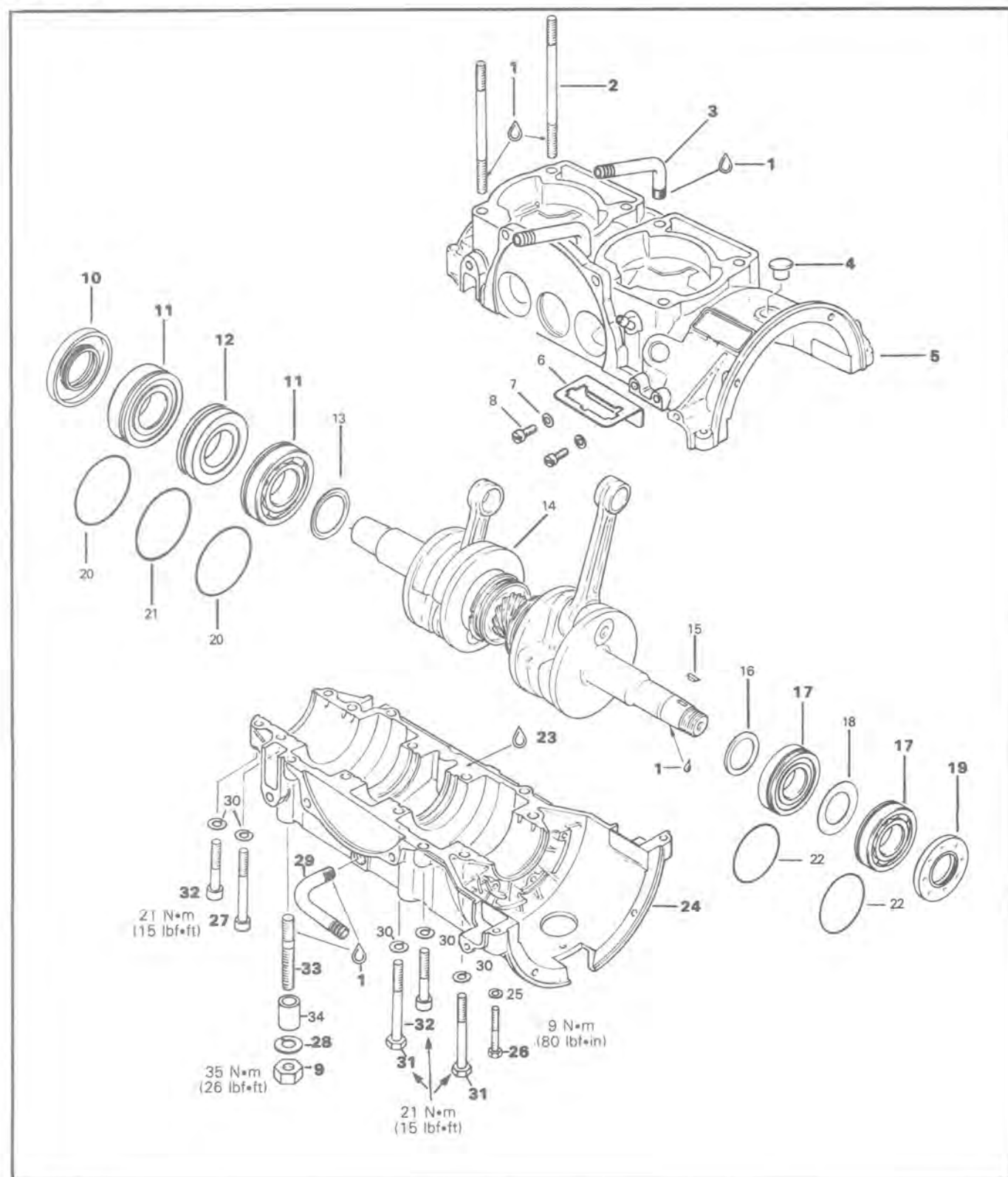
Torque cylinder head nuts to 21 N•m (15 lbf•ft) following illustrated sequence.



## Section 02 ENGINE

### Sub-section 08 (532 ENGINE TYPE)

## BOTTOM END





## Section 02 ENGINE

### Sub-section 08 (532 ENGINE TYPE)

1. Loctite 242
2. Stud M8 x 79 (8)
3. Angular tube, oil inlet
4. Plug
5. Crankcase upper half
6. Block connector bracket
7. Lock washer 7 mm (2)
8. Cyl. slotted head screw M5 x 12 (2)
9. Hex. nut M10 (4)
10. Seal
11. Ball bearing 6207 (2)
12. Labyrinth sleeve
13. Distance ring
14. Crankshaft
15. Woodruff key 3 x 3,7
16. Distance ring
17. Ball bearing 6206 (2)

18. Shim 1 mm
19. Seal
20. O-ring (2)
21. O-ring
22. O-ring (2)
23. Loctite 515
24. Crankcase lower half
25. Lock washer 6 mm (2)
26. Hex. screw M6 x 35 (2)
27. Cyl. screw M8 x 75 (2)
28. Lock washer 10 mm (4)
29. Angular tube, oil outlet
30. Lock washer 8 mm (14)
31. Hex. screw M8 x 65 (6)
32. Cyl. screw M8 x 45 (6)
33. Stud M10 x 42 (4)
34. Distance sleeve (4)

## CLEANING

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

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

## DISASSEMBLY

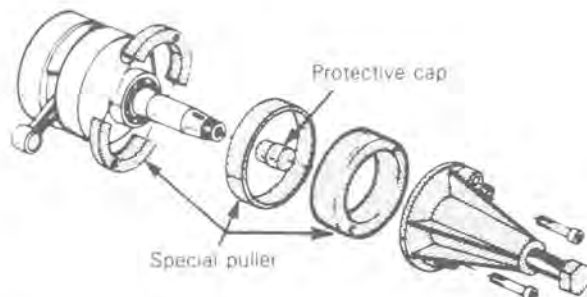
### General

To remove drive pulley refer to "Drive pulley", section 03-03.

To remove magneto, refer to "Magneto" in this section.

### 11, 17, Crankshaft bearings

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



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## INSPECTION

The inspection of the engine bottom end must include the following measurements:

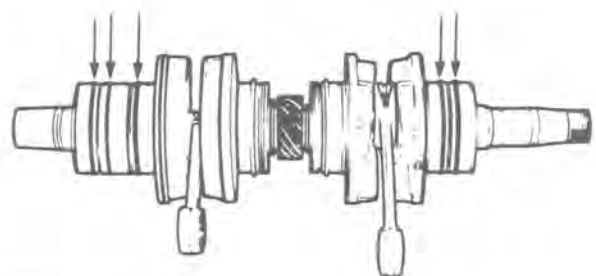
MEASUREMENTS	TOLERANCES		WEAR LIMIT
	FITTING NEW PARTS (MIN.)	(MAX.)	
Crankshaft deflection	N.A.	N.A.	.08 mm (.0032")
Connecting rod big end axial play	.40 mm (.0157")	.73 mm (.0287")	1.2 mm (.0468")

**NOTE:** For the measurement procedures, refer to "Engine dimensions measurement", section 02-10.

## ASSEMBLY

### 11,12,17, Crankshaft bearings & labyrinth sleeve

Prior to installation, place bearings into an oil container and heat the oil to 100°C (210°F). This will expand bearing and ease installation. Install bearings and labyrinth sleeve with groove as per the following illustration.



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## Section 02 ENGINE

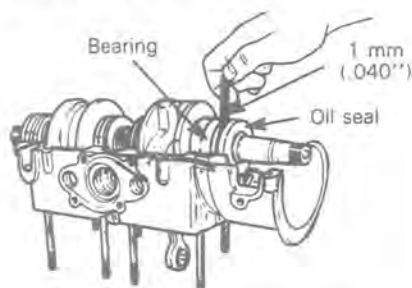
### Sub-section 08 (532 ENGINE TYPE)

#### 10,19, Seals

At seal assembly, apply a light coat of lithium grease on seal lips. For bearing lubrication purpose, a gap of 1.0 mm (.040") must be maintained between seals and bearings.

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

When installing plain seals (seal without locating ring or without spacing legs), ensure to maintain the specified gap as illustrated. For seals with spacing legs, install them against the bearing.



A015002007

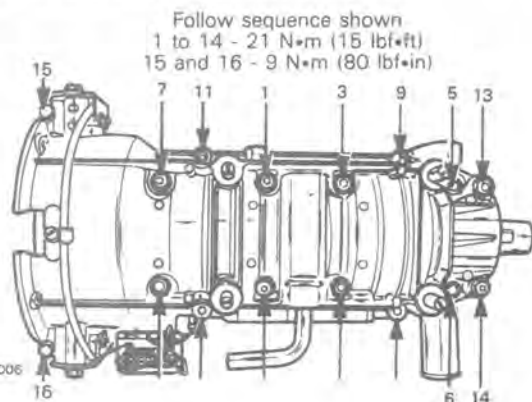
#### 5,23,24, Upper crankcase, loctite 515 & lower crankcase

Crankcase halves are factory matched and therefore, are not interchangeable or available as single halves. Prior to joining of crankcase halves, apply a light coat of Loctite 515 (413 7027 00) on mating surfaces.

NOTE: Prior to applying Loctite 515 it is possible to use primer N (P/N 413 7053 00) or primer NF (P/N 413 7024 00). It increases cure speed and gap filling capability. Refer to supplier instructions.

CAUTION: Before joining crankcase halves be sure that crankshaft rotary valve gear is well engaged with rotary valve shaft gear.

Position the crankcase halves together and torque bolts by hand then install armature plate (tighten) on magneto side to correctly align crankcase halves. Torque bolts as specified following illustrated sequence.



A015002006

NOTE: Torque the two smaller bolts (15 and 16) on magneto side to 9 N•m (80 lbf•in).

#### 1,3,8,29, Loctite 242, angular tubes (oil inlet & oil outlet) & screws

Apply Loctite 242 on threads prior to assembly angular tubes and block connector bracket screws.

#### 27,31,32, Crankcase M8 Screws

Torque the crankcase M8 screws to 21 N•m (15 lbf•ft). Install them as per exploded view.

#### 26, Crankcase M6 screws

Torque the crankcase M6 screws to 9 N•m (80 lbf•in).

#### 1,33, Loctite 242 & crankcase stud

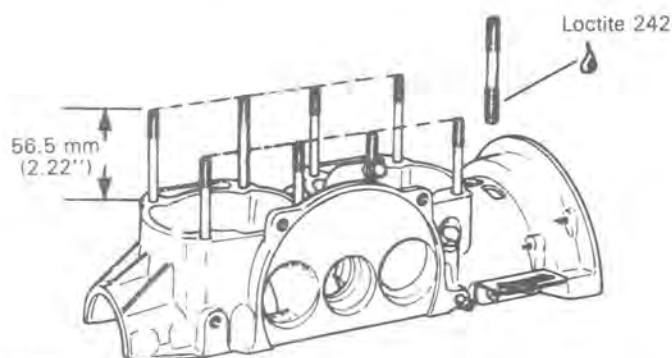
At assembly on crankcase, apply Loctite 242 on stud threads.

#### 9, Crankcase/engine bracket nut

Torque the crankcase/engine bracket nut to 35 N•m (26 lbf•ft).

#### 1,2, Loctite 242, & upper crankcase studs

Because of cap nuts, cylinder studs have to be screwed into the crankcase so that they do not exceed further than 56.5 mm (2.22").

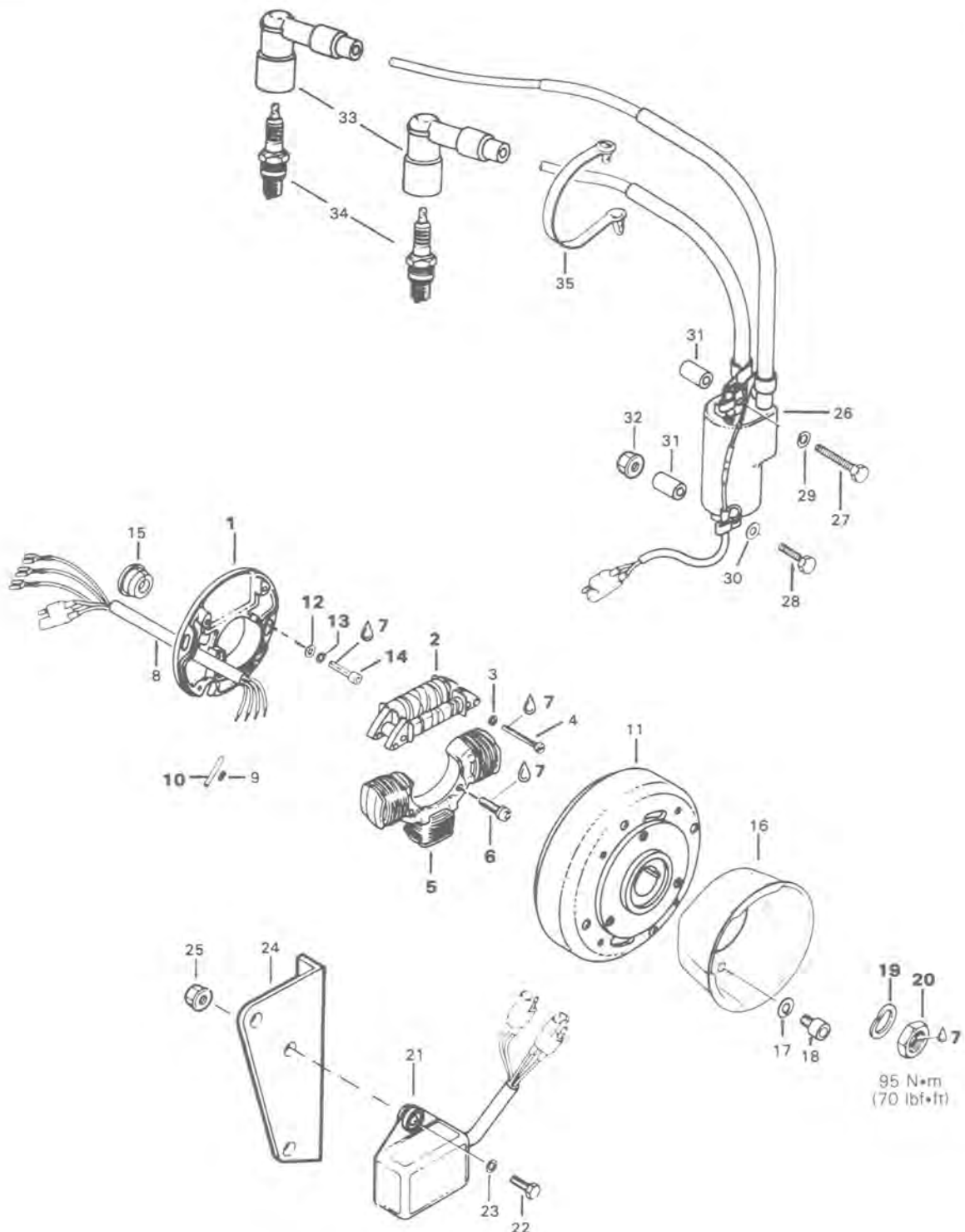


A015002001

Apply Loctite 242 on the threaded end of the studs going into the crankcase.

To install magneto, refer to "Magneto" in this section.

## MAGNETO



## Section 02 ENGINE

### Sub-section 08 (532 ENGINE TYPE)

1. Armature plate
2. Generation coil
3. Lock washer 5 mm (2)
4. Cylindrical slotted head screw M5 x 35 (2)
5. Lighting coil
6. Screw M6 x 25 (2)
7. Loctite 242 (blue, medium strength)
8. Harness
9. Splice connector (16)
10. Protector tube (6)
11. Flywheel
12. Washer 5.5 mm (2)
13. Lock washer 5 mm (2)
14. Allen screw M5 x 18 (2)
15. Cable grommet
16. Starting pulley
17. Lock washer 8 mm (3)
18. Allen screw M8 x 16 (3)

19. Lock washer 22 mm
20. Hexagonal nut 22 x 1.5 mm
21. C.D. box
22. Hexagonal screw M6 x 20 (2)
23. Flat washer (2)
24. Coil support
25. Hexagonal elastic flanged stop nut M6 (2)
26. Ignition coil
27. Hexagonal screw M6 x 50
28. Hexagonal screw M6 x 45
29. Lock washer 6 mm (2)
30. Flat washer 6.4 mm (2)
31. Bushing (2)
32. Hexagonal elastic flanged stop nut M6
33. Spark plug protector (2)
34. Spark plug (2)
35. Cable clip

## CLEANING

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

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

## DISASSEMBLY

To gain access to magneto assembly, remove:

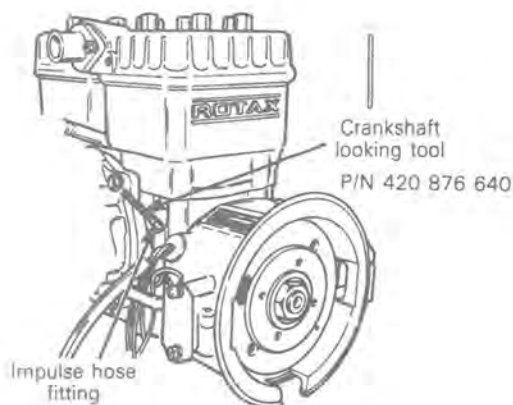
- muffler (if applicable)
- rewind starter
- starting pulley

○ **NOTE:** Before disassembling magneto plate, indexing marks should be located to facilitate reassembly.

### 20, Flywheel retaining nut

To remove magneto flywheel retaining nut:

- lock crankshaft with crankshaft locking tool (service tool) as illustrated
- remove magneto retaining nut.

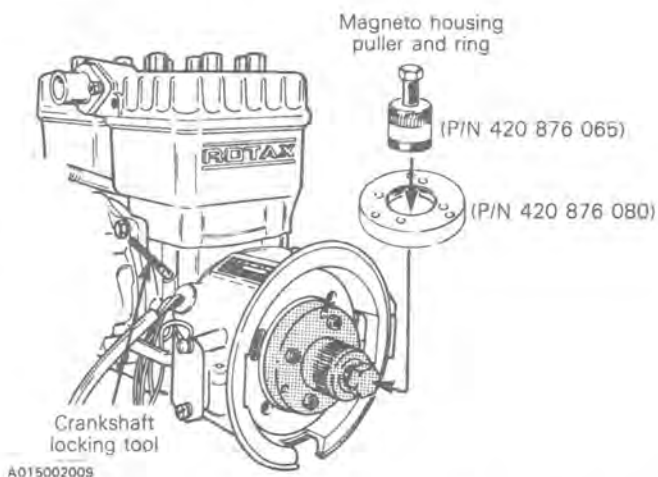


○ **NOTE:** It should be noted that to correctly remove a Loctite locked fastener it is first necessary to tap on the fastener to break the Loctite bond. This will eliminate the possibility of thread breakage.

### 11, Flywheel

To remove magneto housing (flywheel):

- lock crankshaft with crankshaft locking tool (service tool) as illustrated;
- adjust magneto housing puller and puller ring as illustrated;



○ **NOTE:** For the above procedure, the locking type puller can be used without crankshaft locking tool.



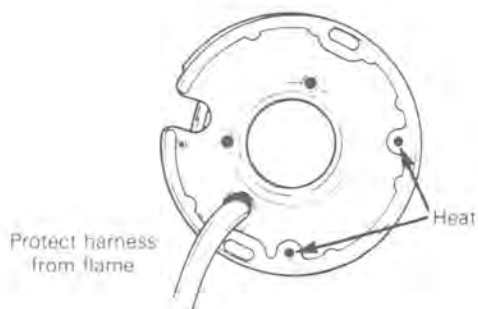
- tighten puller bolt and at same time, tap on bolt head using a hammer to release magneto from its taper.

## REPAIR

### 2, Generating coil

To replace generating coil:

- heat the armature plate around the screw holes to break the Loctite bond 93°C (200°F).



A001002003

#### CAUTION: Protect harness from flame.

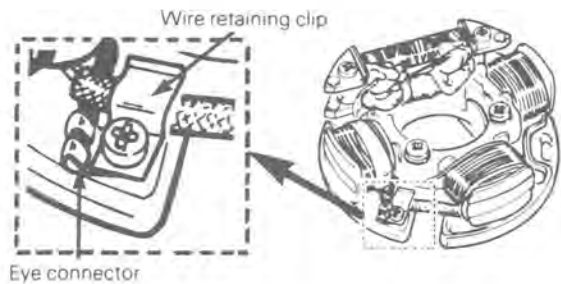
- Remove screws (use Phillips no. 2 or suitable flat screwdriver)
- Cut the four wires as close as possible to the coil body.
- To pass new coil wires in harness, tape the old wires to the end of new wires and pull them through the harness protector tube.
- Insert the new wires into the old connector housing and install connectors.



A001002054

#### CAUTION: Replace the old wires in the connector with the same color coded new wires.

- Install a new receptacle connector to the black/yellow striped wire.
- To install the ground connector to the armature plate, tape the new black lead to the old one and pull it under the lighting coil with the old wire.
- Solder an eye connector to the lead and fasten it under the wire retaining clip.



A001002005

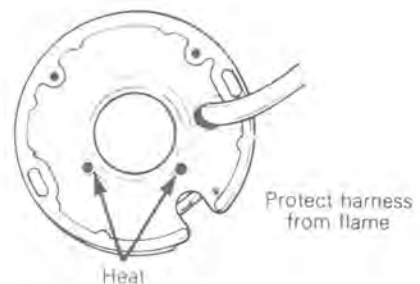
### 5,7, Generating coil screw & Loctite 242

To install the new coil on the armature plate, remove the shipping nuts from the new coil and apply Loctite 242 (blue, medium strength) to screws before assembly.

#### CAUTION: Before reinstalling the magneto, remove the loose epoxy from harness.

To replace lighting coil:

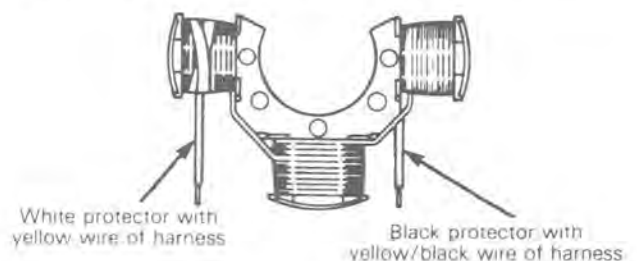
- Heat the armature plate around the screw holes to break the Loctite bond 93°C (200°F).



A001002003

#### CAUTION: Protect harness from flame.

- Remove screws (use Phillips no. 3 screwdriver).
- Remove the wire retaining clip from armature plate.
- Pull out protector tubes and unsolder the splice connectors.
- Solder the yellow wire in the harness to the white tube protected wire of the coil.
- Solder the yellow/black striped wire in the harness to the black tube protected wire of the coil.



A001002006

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## Section 02 ENGINE

### Sub-section 08 (532 ENGINE TYPE)

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#### 10, Protector tube

Position protector tubes over connections.

#### 6,7, Loctite 242 & lighting coil screws

Prior to assembly, apply Loctite 242 (blue, medium strength).

— Fasten retaining clip onto protector tubes.

The ground terminal from generating coil must be fastened under this clip.



A001002005

▼ **CAUTION:** Before reinstalling magneto remove the loose epoxy from harness.

#### ASSEMBLY

#### 1,7,12,13,14, Armature plate, Loctite 242, washers, lock washers & screws

Position the armature plate on the crankcase, aligning the marks on both parts.

Put a drop of Loctite 242 on screw threads and tighten.

Clean crankshaft extension (taper).

Apply Loctite 242 on taper.

#### 7,11,19,20, Loctite 242, flywheel, lock washer & nut

Position woodruff key, magneto flywheel, lock washer on crankshaft.

Clean nut threads and apply Loctite 242 (blue, medium strength) before tightening nut to 95 N•m (70 lbf•ft).

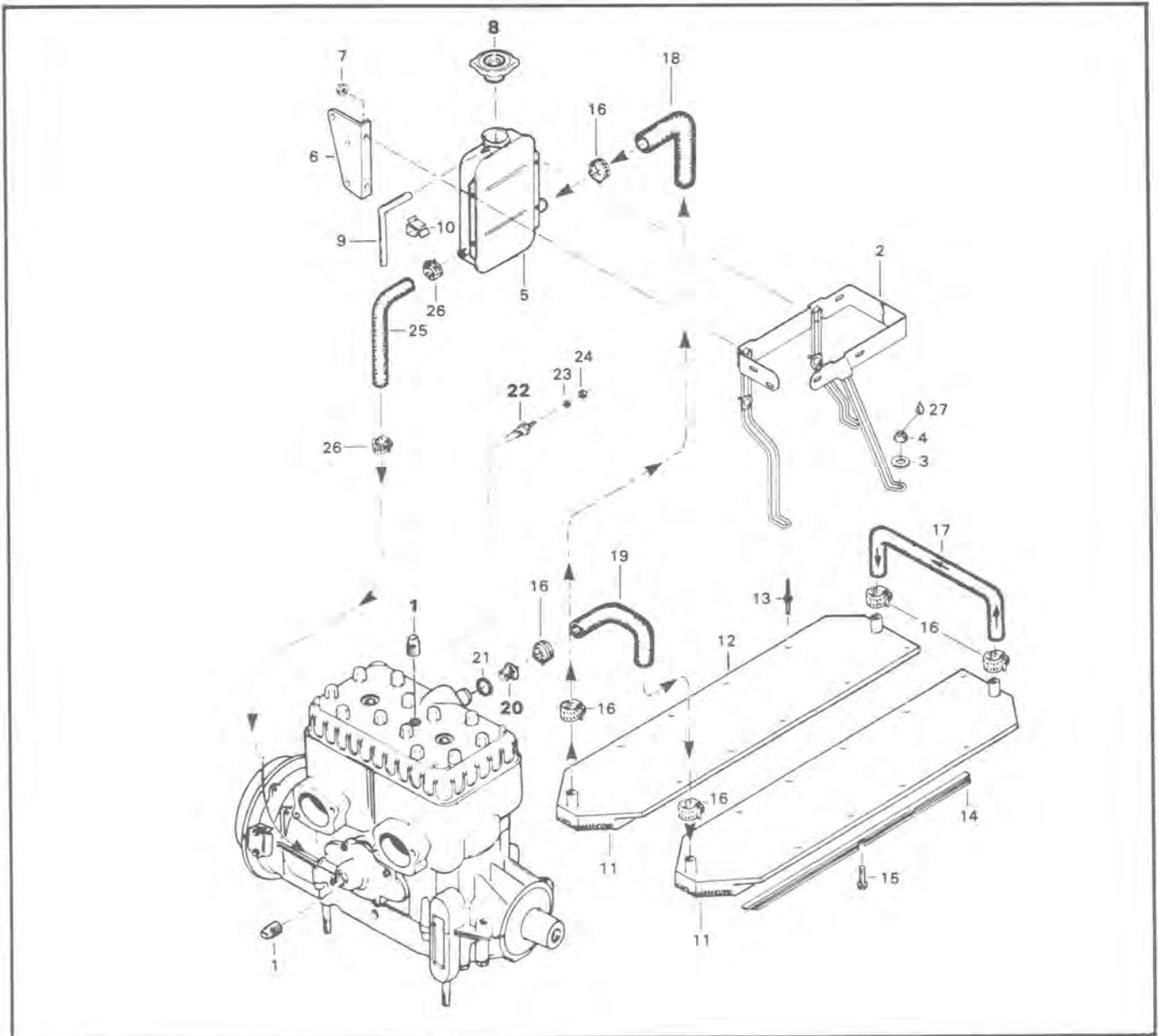
At reassembly coat all electric connections with silicone dielectric grease (P/N 413 7017 00) to prevent corrosion or moisture penetration.

▼ **CAUTION:** Do not use silicone "sealant", this product will corrode contacts.

○ **NOTE:** For ignition timing procedure refer to "Ignition timing" section 04-02.



**COOLING SYSTEM**



1. Plug (2)
2. Tank support
3. Flat washer 6.2 mm (3)
4. Hexagonal elastic stop nut M5 x 0.80 (3)
5. Coolant tank
6. Coil support
7. Hexagonal elastic flanged stop nut M5 x 0.80 (4)
8. Pressure cap
9. Overflow hose
10. Clip
11. R.H. radiator
12. L.H. radiator
13. Rivet (40)
14. Radiator protector (2)

15. Hexagonal taptite washer head screw M5 x 15 (2)
16. Clamp (6)
17. U-hose
18. Hose
19. Hose
20. Thermostat
21. Grommet
22. Sender
23. Lock washer
24. Hexagonal nut
25. Hose
26. Clamp (2)
27. Loctite 271 (red, high strength)

## Section 02 ENGINE

### Sub-section 08 (532 ENGINE TYPE)

#### INSPECTION

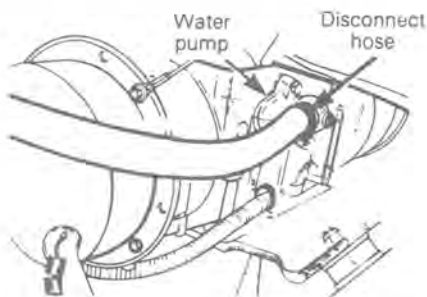
Check general condition of hoses and clamp tightness.

#### DRAINING THE SYSTEM

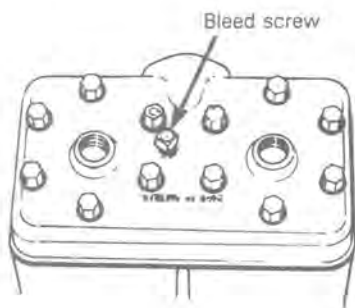
◆ **WARNING:** Never drain or refill the cooling system when engine is hot.

To drain cooling system:

- Use a length of hose long enough to drain coolant into a container lower than engine.
- Remove the engine coolant hose from water pump.
- Connect "drain hose" onto water pump.
- Put both hose ends into the container.
- Remove coolant tank cap and lift the rear of the vehicle to drain the heat exchangers.
- Remove the engine bleed screw (plug).



A013002009



A015002011

#### DISASSEMBLY & ASSEMBLY

##### 1,22, Plug & sender

Apply thread sealant on sender and plug to avoid leaks.

##### 8, Pressure cap

Check if the cap pressurizes the system. If not, install a new cap. Do not exceed 90 kPa (13 lb/in<sup>2</sup>) of pressure.

##### 20, Thermostat

To check thermostat, put it in water and heat water. Thermostat should open when water temperature reaches 43°C (110°F).

Install the thermostat with its hole on top of the housing.

#### REFILLING THE SYSTEM

Capacity:

Approximately 5 liters

(1.1 Imp. gal.) (1.3 U.S. gal.)

60% antifreeze + 40% water

▼ **CAUTION:** To prevent rust formation or freezing condition, always replenish the system with 60% antifreeze and 40% water. Pure antifreeze without water produces premature freezing. Always use ethylene/glycol antifreeze containing corrosion inhibitors specifically recommended for aluminum engines.

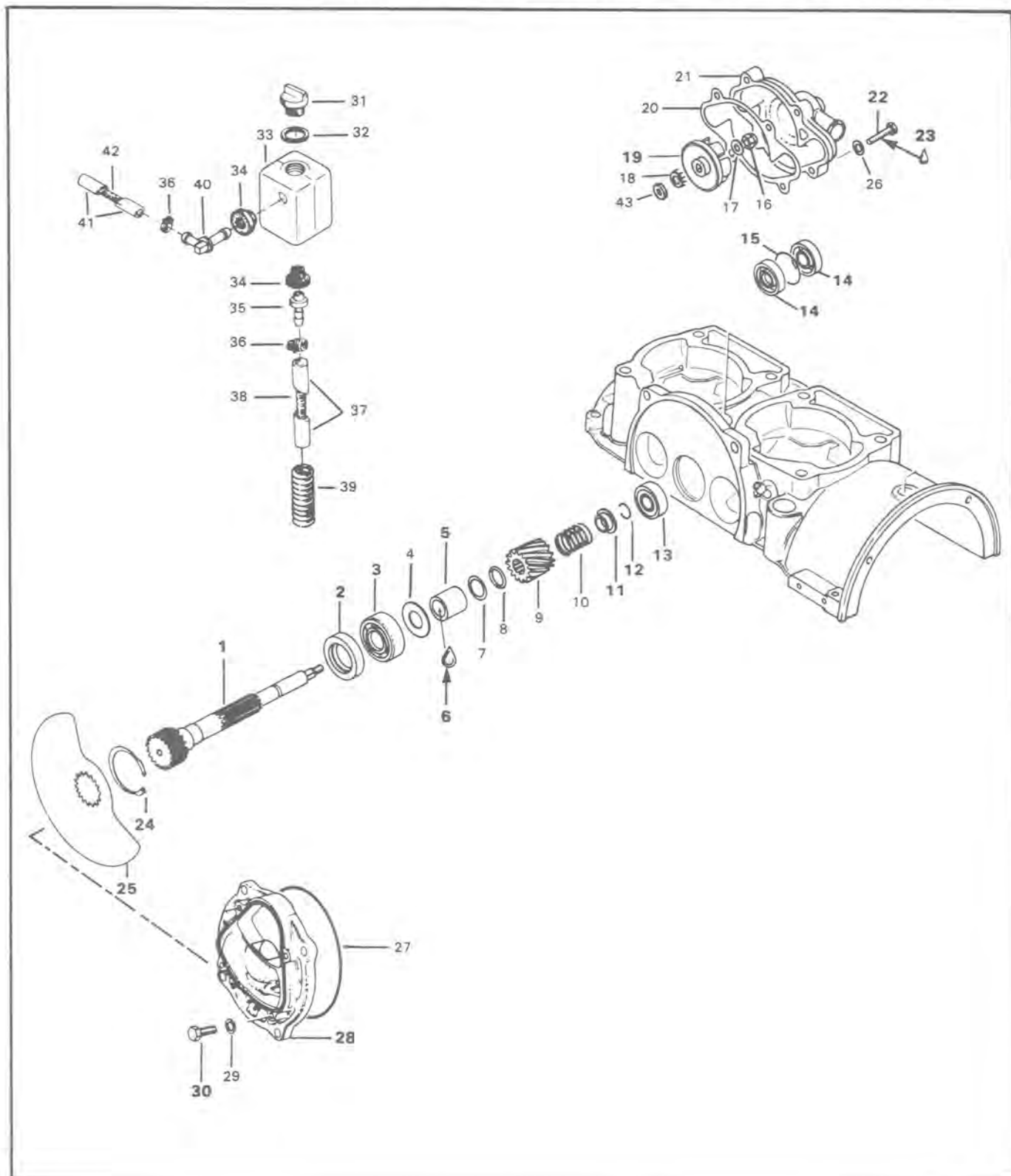
To refill cooling system:

- Remove "drain hose" and reinstall initial one.
- Put back the rear of vehicle on the ground.
- Refill coolant tank slowly until coolant overfills at bleed hole.
- Reinstall bleed screw.
- Continue to pour coolant in the tank until level reaches 25 mm (1") below filler neck.
- With the coolant tank cap still removed, start engine and let it warm to its normal operating temperature until thermostat opens. Allow it to run a few minutes more.
- Stop engine and check coolant level. Refill as required then put back the cap.

◆ **WARNING:** Always unscrew cap to the first step with a cloth to release pressure, before removing it.



**ROTARY VALVE, COOLANT PUMP & OIL RESERVOIR**



## Section 02 ENGINE

### Sub-section 08 (532 ENGINE TYPE)

1. Shaft, rotary valve
2. Oil seal
3. Ball bearing 6203
4. Shim 0,5 mm
5. Distance sleeve 24,3 mm
6. Loctite 271
7. Shim 0,5 mm
8. O-ring
9. Sprocket 14 t
10. Spring
11. Spring holder cup
12. Circlip
13. Ball bearing 6201
14. Oil seal (2)
15. Distance ring
16. Lock nut M6
17. Washer 6.4 mm
18. Friction washer
19. Impeller, coolant pump
20. Gasket
21. Housing, coolant pump
22. Hex. screw M6 x 25 (4)

23. Loctite 242
24. Locking ring
25. Rotary valve
26. Gasket ring 6 mm (4)
27. O-ring
28. Cover
29. Lock washer 8 mm (4)
30. Hex.screw M8 x 20 (4)
31. Cap
32. Sealing ring
33. Rotary valve oil tank
34. Grommet (2)
35. Male connector
36. Gear clamp
37. Oil line
38. Spring
39. Oil line housing
40. Elbow male connector
41. Oil line
42. Spring
43. Washer 8.1 mm

## CLEANING

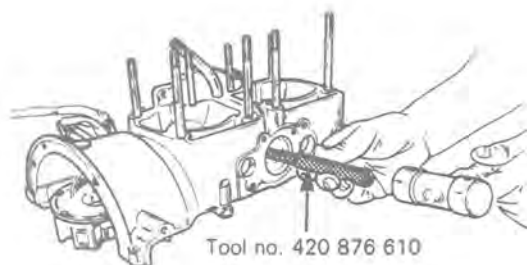
Discard all seals and O-rings.

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

## DISASSEMBLY & ASSEMBLY

### 19,24, Pump impeller & circlip

To remove rotary valve shaft assembly from crankcase, first remove coolant pump impeller and circlip. Using the suitable pusher (P/N 420 876 610) and a fiber hammer, push shaft assembly.

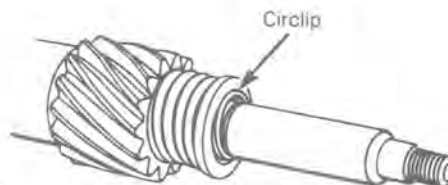


A015002012

**CAUTION:** To prevent damage to the end of the rotary valve shaft, use pusher (tool P/N 420 876 610).

### 11,12, Spring retaining cup & circlip

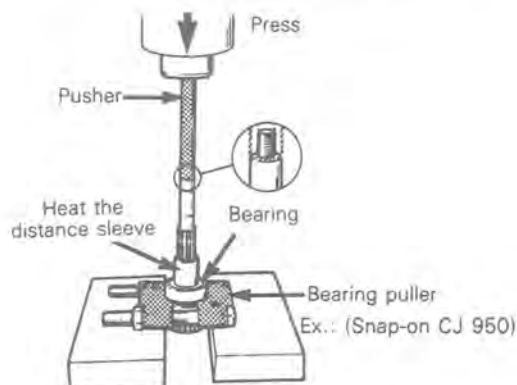
If it is necessary to disassemble components of rotary valve shaft assembly, compress spring retaining cup in order to remove circlip.



A013002012

### 5,6, Distance sleeve & Loctite 271

To remove the distance sleeve use a bearing puller (ex.: Snap-On no. CJ 950) and pusher (P/N 420 876 610) as illustrated. Heat the distance sleeve to break the Loctite bond 93°C (200°F) and proceed as illustrated.



A013002013

**CAUTION:** Ensure that the rotary valve shaft is perfectly perpendicular with the press tip or damage will occur.

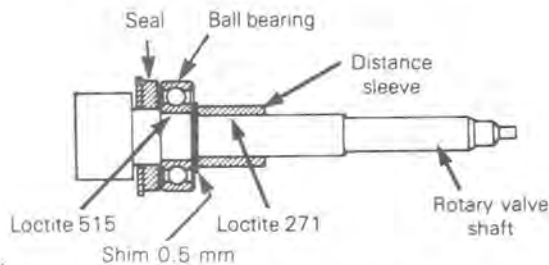
Clean rotary valve shaft and inside of distance sleeve. At assembly apply Loctite 271 inside of distance sleeve.

## Section 02 ENGINE

### Sub-section 08 (532 ENGINE TYPE)

#### 1,2, Rotary valve shaft & seal

At assembly apply lithium grease on seal lips. Position the seal with shielded portion towards rotary valve.



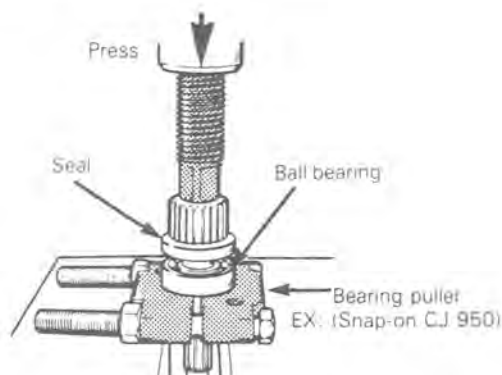
A013002014

#### 1,3, Rotary valve shaft & bearing 6203

At assembly apply crankcase sealant Loctite 515 on bearing and rotary valve shaft mating surfaces.

**CAUTION:** Make sure Loctite doesn't come in contact with bearing balls.

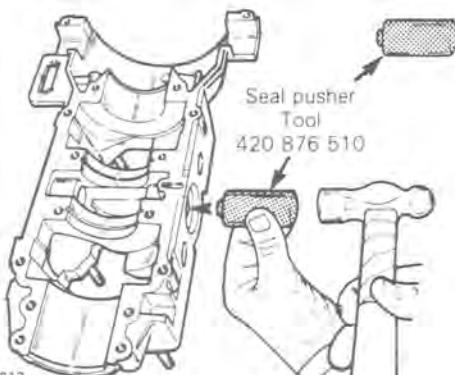
Install ball bearing as illustrated.



A013002015

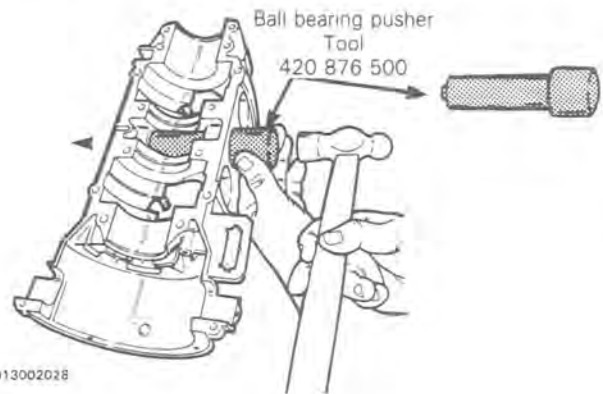
#### 13,14,15, Bearing 6201, seal & distance ring

To remove bearing 6201 (the smallest one), seals and distance ring use pusher (P/N 420 876 510).



A015002013

To install ball bearing 6201 use ball bearing pusher (P/N 420 876 500).

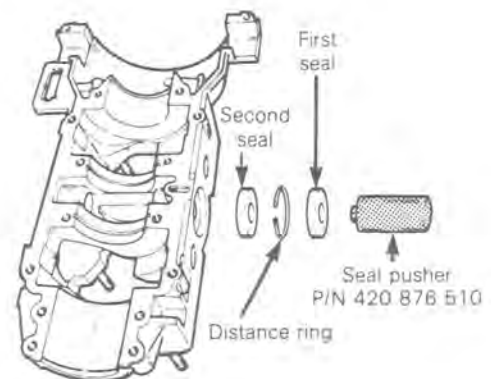


A013002028

**NOTE:** Ball bearing shielded must be facing rotary valve.

#### 14,15, Seals & distance ring

To install seals on water pump side proceed as follows:



A015002014

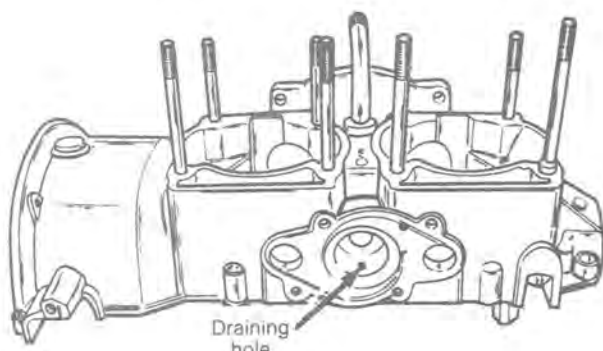
Apply lithium grease or equivalent on seal lips. Position all seals with shielded portion towards water pump using pusher (P/N 420 876 510). Align distance ring opening with crankcase draining hole (see note and illustration). Push seals and distance ring assembly against bearing.

**NOTE:** 35% of the distance between first and second seals must be filled with lithium grease or equivalent.

**NOTE:** The draining hole is used to detect seal malfunction. If oil or coolant is noticed at the exit of the draining hole, this means that oil seal or coolant seal leaks.

## Section 02 ENGINE

### Sub-section 08 (532 ENGINE TYPE)

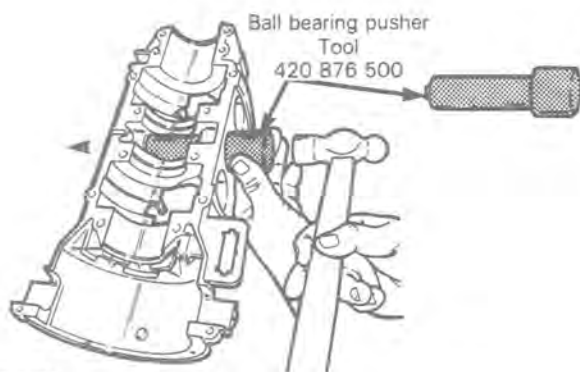


A015002015

▼ **CAUTION:** Failure to position the seals as specified may cause the seal spring to be corroded by coolant. Severe damage will occur if this notice is disregarded.

#### 13,14,15, Bearing 6201, seals & distance ring

○ **NOTE:** After seals installation, check if the water pump end bearing is correctly positioned (use pusher P/N 420 876 500).

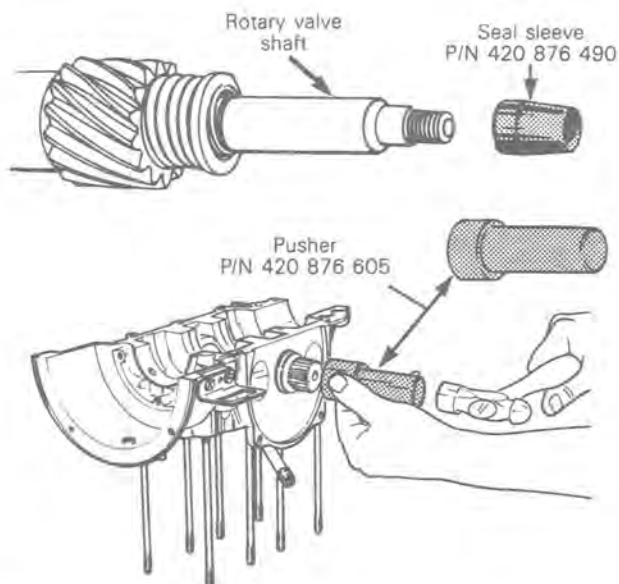


A013002028

#### 1, Rotary valve shaft

To install rotary valve shaft proceed as follows with the suitable tools:

- pusher P/N 420 876 605
- water pump seal sleeve P/N 420 876 490.



A015002018

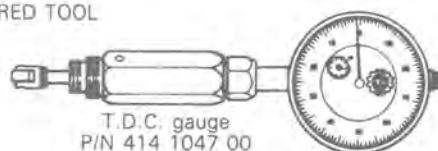
#### 22,23, Pump housing bolts & Loctite 242

Apply Loctite 242 on bolts thread.

#### 25, Rotary valve

Installation on genuine crankcase with mark (ridge).

##### REQUIRED TOOL



A000001001

To correctly install the rotary valve, proceed as follows:

- Turning crankshaft counterclockwise, (drive pulley side) bring magneto side to top dead center using a T.D.C. gauge.

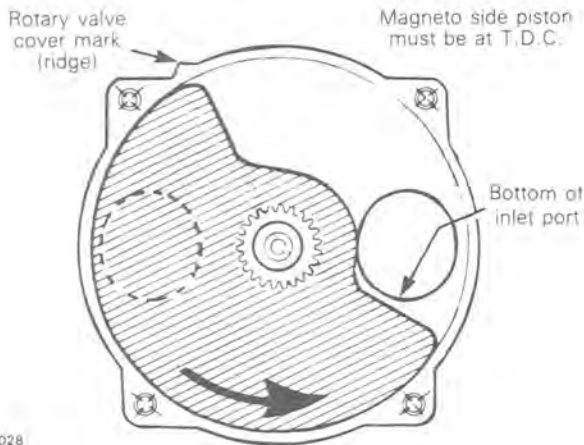
○ **NOTE:** Do not use crankshaft locking tool to find out mag. Side top dead center. It will not give the right position.

- Position the rotary valve on gear in such a way that its closing edge will be as close as possible to the **bottom** of the magneto side inlet port, and its opening edge in line with the mark (ridge) on the upper left side of the rotary valve cover.

## Section 02 ENGINE

### Sub-section 08 (532 ENGINE TYPE)

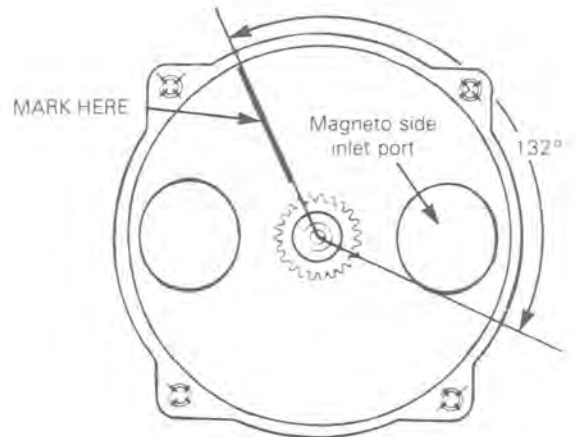
**NOTE:** The rotary valve is asymmetrical, therefore at assembly try positioning each side of it on gear to determine best installation.



A013002028

Installation on spare crankcase without mark (ridge).

Using angle finder, mark crankcase at  $132^\circ$  from bottom edge of magneto side inlet port.



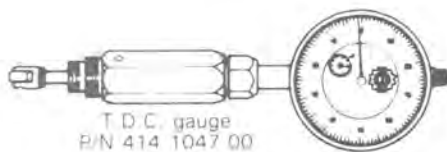
A013002021

From top edge of magneto side inlet port, mark crankcase at  $52^\circ$ .

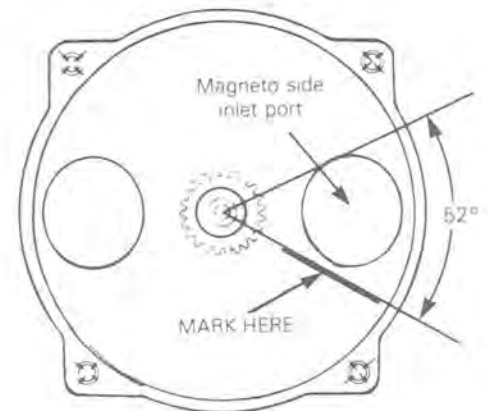
#### REQUIRED TOOLS



Degree wheel  
(414 3529 00)



A000001086



A013002022

To correctly install the rotary valve disc proceed as follows:

- Turning crankshaft counterclockwise, (drive pulley side) bring magneto side to top dead center using a T.D.C. gauge.
- Position the rotary valve disc on gear to have edges as close as possible to the marks.

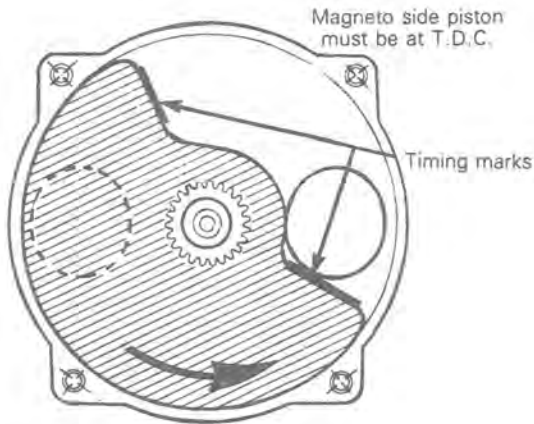
ENGINE TYPE	TIMING MARKS opening, closing
532	$132^\circ$ , $52^\circ$

For example:  $132^\circ$  opening  
 $52^\circ$  closing

## Section 02 ENGINE

### Sub-section 08 (532 ENGINE TYPE)

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



A013002029

Spray injection oil on rotary valve before closing the rotary valve cover.

#### 30, Rotary valve cover bolts

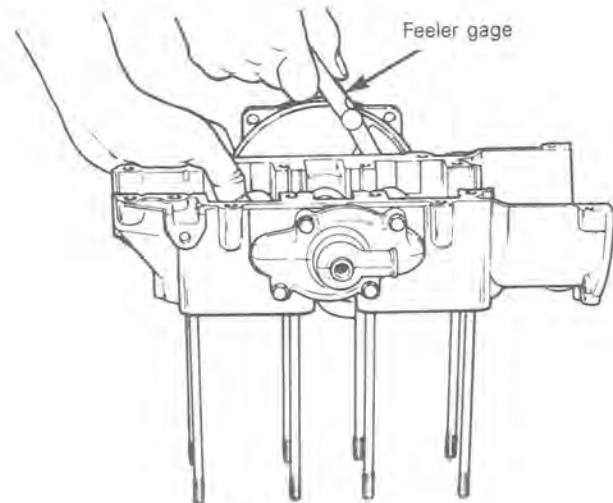
The rotary valve cover bolts must be torque to 20 N•m (15 lbf•ft).

## INSPECTION

### 25,28, Rotary valve cover & rotary valve

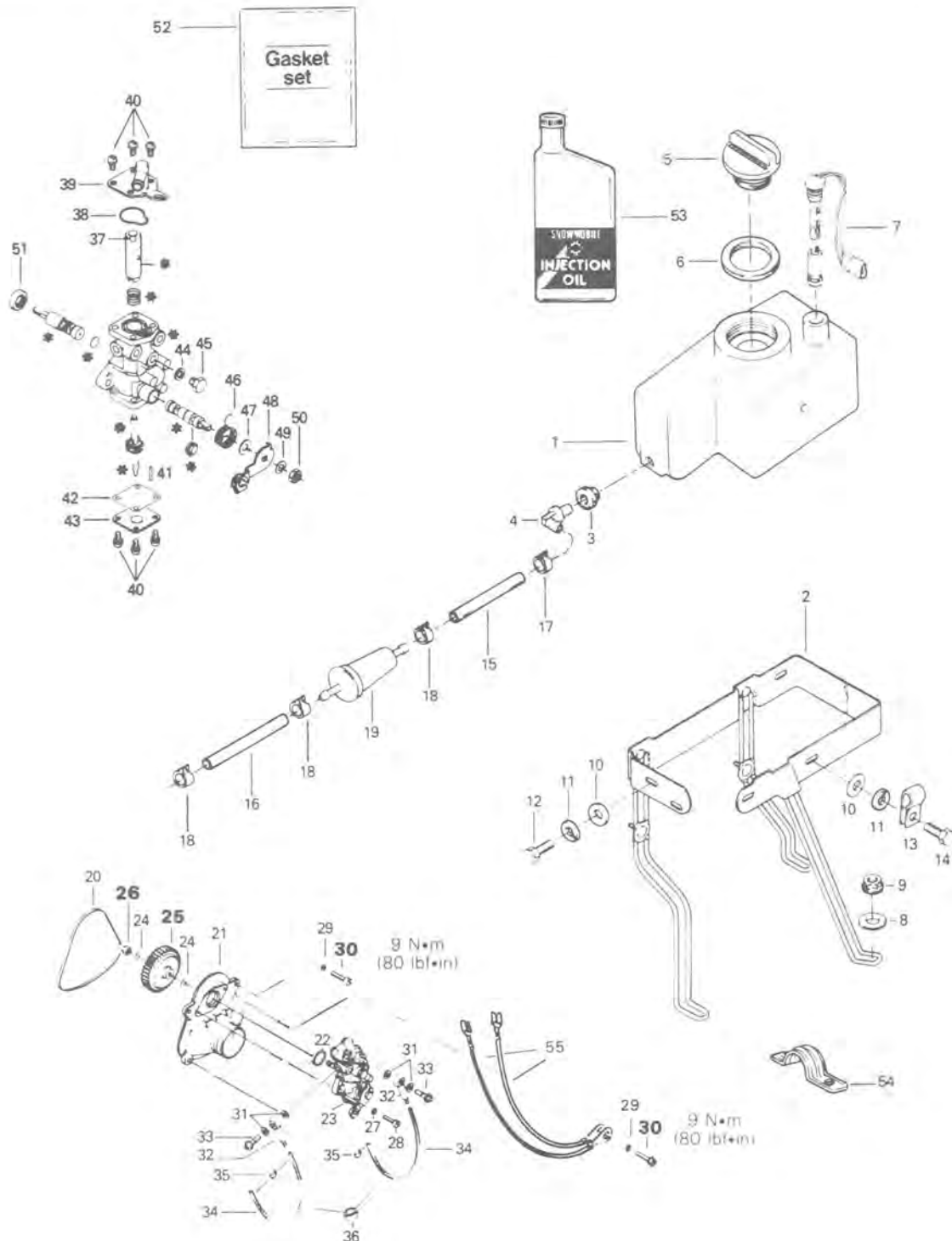
A gap of 0.27 - 0.48 mm (.011 - .019") must be maintained between the rotary valve and the crankcase.

To measure this gap use a feeler gage inserted between rotary valve and upper crankcase with the rotary valve cover in place **without it's O-ring**. Check the more surface as possible. Follow the same procedure for the lower crankcase.



A013002024

## OIL INJECTION PUMP & RESERVOIR



Parts in illustration marked with \* are not available as spare parts



## Section 02 ENGINE

### Sub-section 08 (532 ENGINE TYPE)

1. Injection oil tank
2. Support
3. Grommet
4. Male connector
5. Oil tank cap
6. Gasket
7. Oil level sensor
8. Flat washer 6.2 mm (3)
9. Hexagonal elastic stop nut M5 x 0.80 (3)
10. Flat washer 6.4 mm (4)
11. Lock washer 6 mm (4)
12. Hexagonal head cap screw M6 x 12 (3)
13. Clip
14. Hexagonal head cap screw M6 x 16
15. Oil line 60 mm
16. Oil line 73 mm
17. Spring clip
18. Spring clip (3)
19. Filter
20. Rubber ring
21. Oil pump mounting flange
22. O-ring
23. Oil pump
24. Washer 6.2 (2)
25. Oil pump gear 44 teeth
26. Lock nut 6 mm
27. Lock washer 5 (2)
28. Cylindrical slotted screw M5 x 16 (2)
29. Lock washer 6 mm (4)
30. Cylindrical slotted screw M6 x 20 (4)
31. Oil banjo gasket (4)
32. Banjo (2)
33. Banjo bolt M6 x 16 (2)
34. Oil line 170 mm (2)
35. Clamp (4)
36. Rubber ring (2)
37. Retainer
38. O-ring
39. Plate
40. Screw with lock washer (8)
41. Stop pin
42. Gasket
43. Cam casing plate
44. Washer
45. Hexagonal head screw M6 x 7
46. Spring
47. Washer
48. Lever
49. Lock washer 6
50. Hexagonal nut 6 mm
51. Seal
52. Gasket set
53. Injection oil
54. Clip
55. Ground cable ass'y

## CLEANING

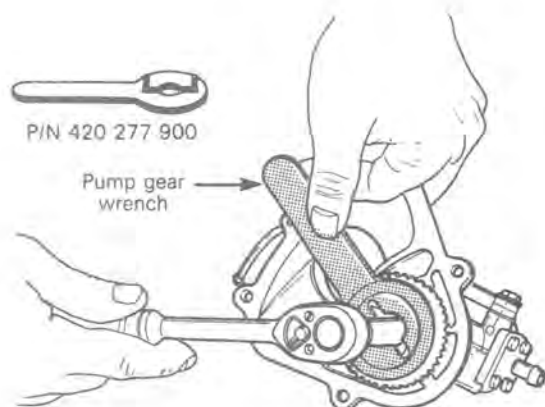
Discard all seals and O-rings. Clean all metal components in a non-ferrous metal cleaner.

## DISASSEMBLY

NOTE: Some oil pump parts are not available as gle parts.

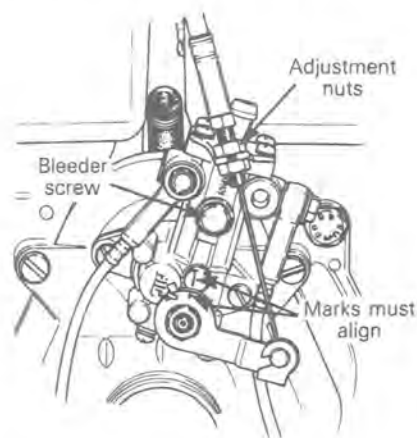
### 25,26, Oil pump gear & lock nut

To remove retaining nut, lock gear using no 420 277 900 tool.



A000002043

### Injection pump cable adjustment



A013002005

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

### To bleed oil lines:

All oil lines should be full of oil. To bleed the main oil line (between tank and pump), loosen the bleeder screw (do not start engine) and let the air escape until oil starts to flow out.



### **Make sure tank has enough oil**

To bleed the small injection oil lines, start the engine and let it run at idle speed. Move injection pump lever to fully open position until lines are full of oil.

## **ASSEMBLY**

### **30, Screw**

Torque to 9 N•m (80 lbf•in).

## **ADJUSTMENT**

Always perform carburetor adjustment prior to oil injection pump adjustment.

### **To synchronize pump with carburetor:**

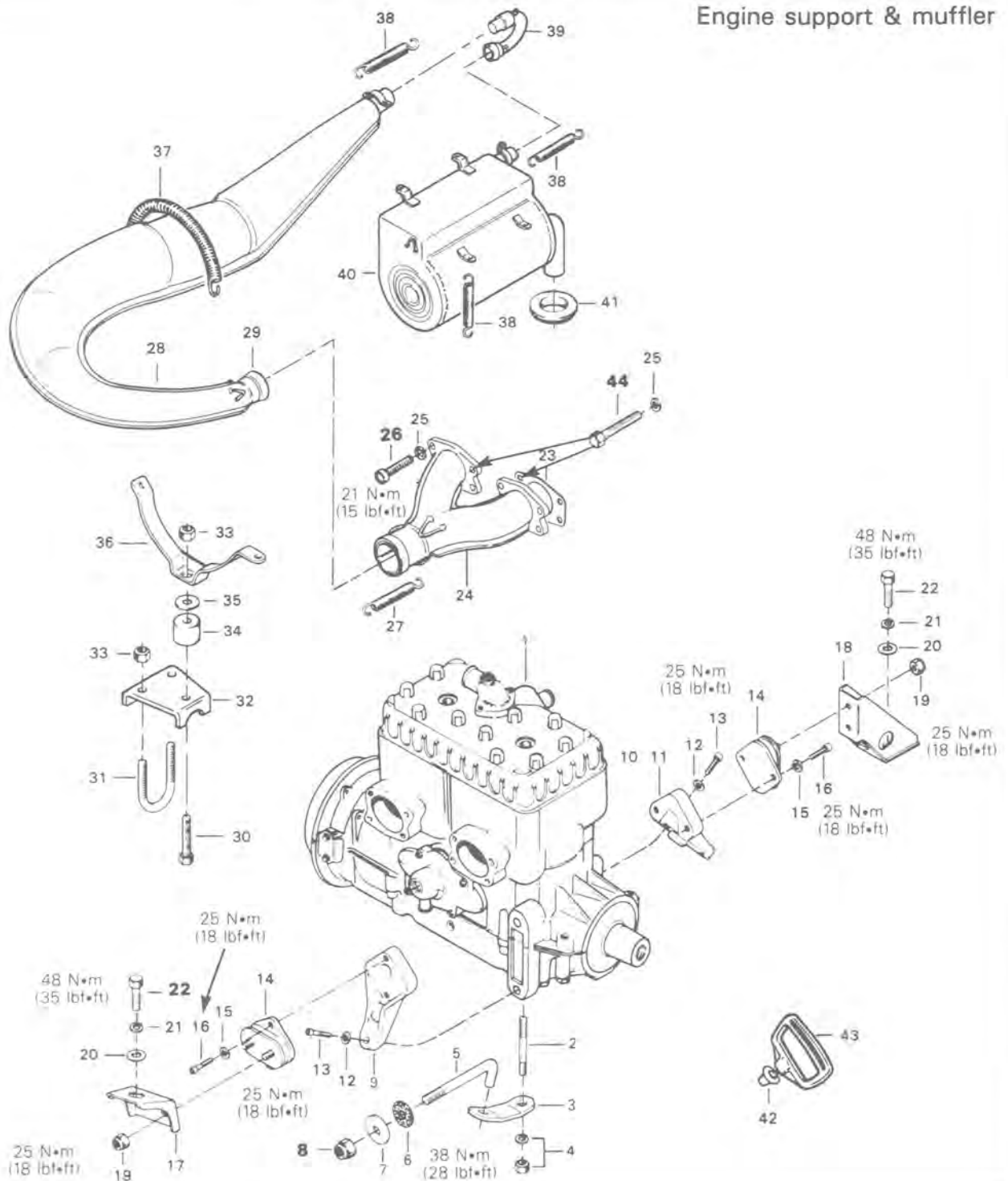
Eliminate the throttle cable free-play by pressing the throttle lever until a light resistance is felt then hold in place. The aligning marks on the pump casting and on the lever must align. If not, loosen the adjuster nut and adjust accordingly. Tighten the lock nut.



## 537 ENGINE TYPE

### ENGINE REMOVAL & INSTALLATION

Engine support & muffler



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## Section 02 ENGINE

### Sub-section 09 (537 ENGINE TYPE)

---

- |   |   |
|---|---|
| 1. 537 engine                                 | 23. Gasket (2)                                |
| 2. Stud M10 x 18/18                           | 24. Exhaust manifold                          |
| 3. Clamp                                      | 25. Lock washer 8 mm                          |
| 4. Hexagonal elastic stop nut M10             | 26. Cylindrical screw M8 x 30 (6)             |
| 5. Support                                    | 27. Spring                                    |
| 6. Rubber washer                              | 28. Single exhaust pipe                       |
| 7. Washer                                     | 29. Female ball joint                         |
| 8. Hexagonal elastic stop nut M10             | 30. Hexagonal head cap screw M6 x 30          |
| 9. Front support (2)                          | 31. U-bracket                                 |
| 10. Right rear support                        | 32. Pipe bracket                              |
| 11. Left rear support                         | 33. Flanged elastic hexagonal stop nut M6 (3) |
| 12. Lock washer 8 mm (8)                      | 34. Rubber spacer                             |
| 13. Allen screw M8 x 25 (8)                   | 35. Asbestos washer                           |
| 14. Bounding rubber mount (4)                 | 36. Exhaust pipe support                      |
| 15. Lock washer 8 mm (8)                      | 37. Spring                                    |
| 16. Allen screw M8 x 20 (8)                   | 38. Spring (6)                                |
| 17. Front support (2)                         | 39. Tail pipe                                 |
| 18. Rear support (2)                          | 40. Muffler                                   |
| 19. Flanged hexagonal elastic stop nut M8 (8) | 41. Exhaust grommet                           |
| 20. Lock washer (4)                           | 42. Rubber buffer                             |
| 21. Spring lock washer 10 mm (4)              | 43. Starter grip                              |
| 22. Hexagonal head cap screw M10 x 20 (4)     | 44. Cap screw M8 x 30 (2)                     |
- 

## REMOVAL FROM VEHICLE

Disconnect or remove the following from vehicle:

- air silencer
- pulley guard and drive belt
- throttle cable from carburetors, oil injection pump
- fuel lines, pulsation line and primer tubes
- ignition coil and rotary valve reservoir
- electrical connectors and wires
- single tuned pipe
- rewind starter
- engine torque rod nut (item #8)
- drain the cooling system and disconnect hoses from the engine (see "cooling system" in this section)
- 4 screws retaining engine supports on frame.

## ENGINE SUPPORT & MUFFLER DISASSEMBLY & ASSEMBLY

### 22,26, Engine support screw & manifold screw

Torque the engine support screws to 48 N•m (35 lbf•ft).

Torque manifold screws to 21 N•m (15 lbf•ft).

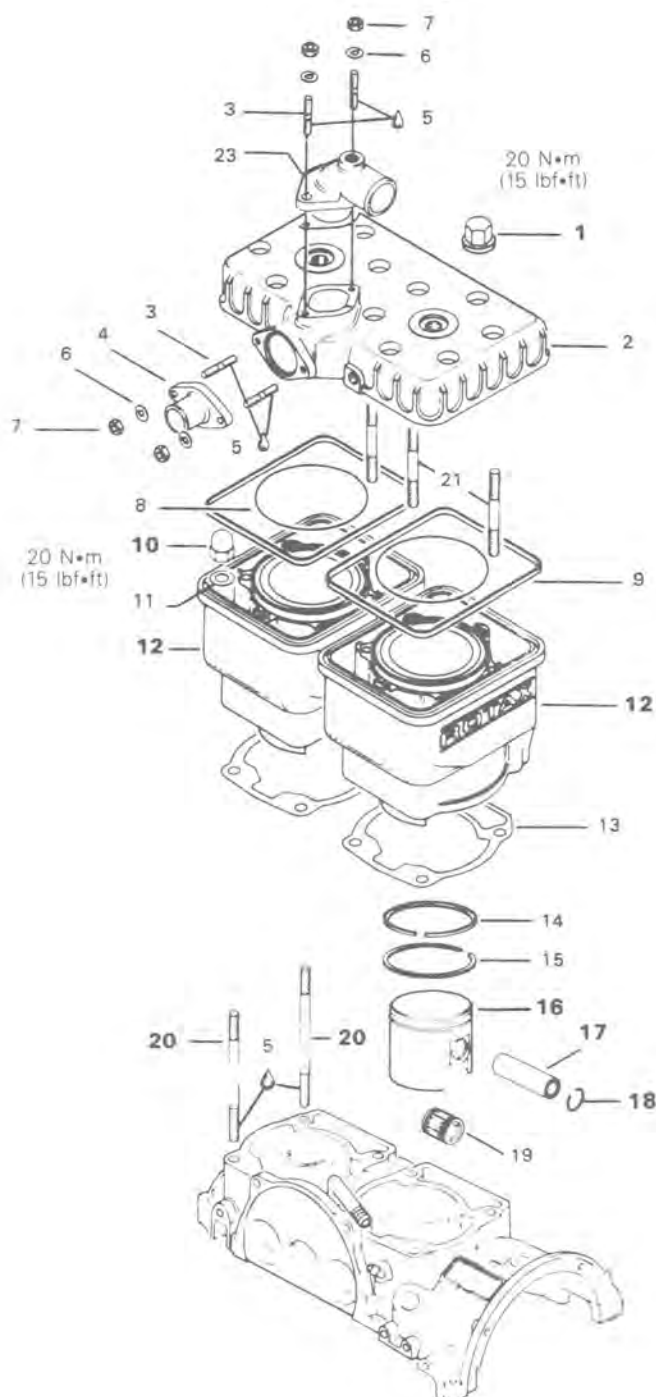
## INSTALLATION ON VEHICLE

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

- Check tightness of engine rubber mounts screws and support nuts. Torque to 25 N•m (18 lbf•ft).
- Verify throttle cable condition then after throttle cable installation, check carburetor maximum throttle opening and oil injection pump adjustment.
- Check pulley alignment and drive belt tension.

▼ **CAUTION:** A red dot is printed on one carburetor and on oil pump mounting flange. Match the marked carburetor to the marked side of the oil pump mounting flange (magneto side). This procedure is required because of the different jettings.

**TOP END**



## Section 02 ENGINE

### Sub-section 09 (537 ENGINE TYPE)

1. Cap nut M8 (12)
2. Cylinder head
3. Stud M6 x 15 (2)
4. Coolant outlet collar
5. Loctite 242 blue (medium strength)
6. Lock washer 6 mm (4)
7. Nut M6 (4)
8. Gasket (O ring) (2)
9. Gasket (2)
10. Cap nut M8 (8)
11. Flat washer 8.4 (8)
12. Cylinder (2)


13. Cylinder/crankcase gasket (2)
14. L-ring
15. Rectangular-ring
16. Piston
17. Gudgeon pin
18. Circlip (4)
19. Needle bearing
20. Cylinder stud M8 x 79 (8)
21. Stud (head) M8 x 50 (12)
22. Gasket
23. Water outlet socket

## 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 grooves with a groove cleaner tool, or with a piece of broken ring.

## DISASSEMBLY

### 16,17,18, Piston, gudgeon pin & circlips


Place a clean cloth over crankcase then with a pointed tool inserted in piston notch, remove circlip from piston. Drive the gudgeon pin out of piston using a suitable drive punch and hammer.

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

## INSPECTION

The inspection of the engine top end must include the following measurements:

MEASUREMENTS	TOLERANCES		WEAR LIMIT
	FITTING NEW PARTS (MIN.)	(MAX.)	
Cylinder taper	N.A.	N.A.	.08 mm (.0031")
Cylinder out of round	N.A.	N.A.	.05 mm (.0020")
Cylinder/piston clearance	.11 mm (.0043")	.13 mm (.0051")	.20 mm (.0079")
Ring/piston groove clearance	.04 mm (.0016")	.10 mm (.0039")	.20 mm (.0079")
Ring end gap	.20 mm (.0079")	.35 mm (.0138")	1.0 mm (.0394")

 **NOTE:** For the measurement procedures, refer to "Engine dimensions measurement", section 02-10.

## ASSEMBLY

### 16, Piston

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



A001002001

## Section 02 ENGINE

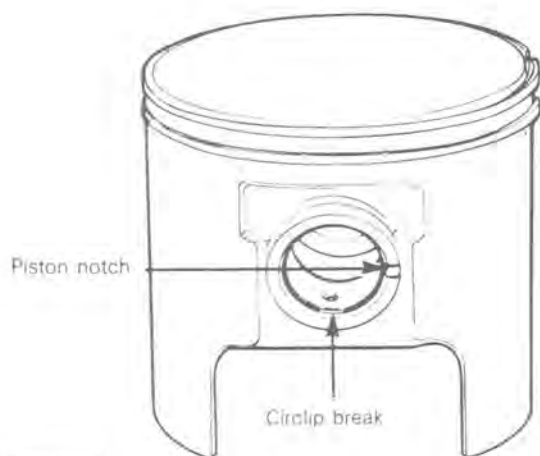
### Sub-section 09 (537 ENGINE TYPE)

○ **NOTE:** Spare parts pistons and cylinders are identified with a green or red dot, it is important to match the piston with the cylinder of the same color.

#### 18, Circlip

To minimize the effect of acceleration forces on circlip, install each circlip so the circlip break is at 6 o'clock as illustrated. Using very fine emery cloth, remove any burrs on piston caused through circlip installation.

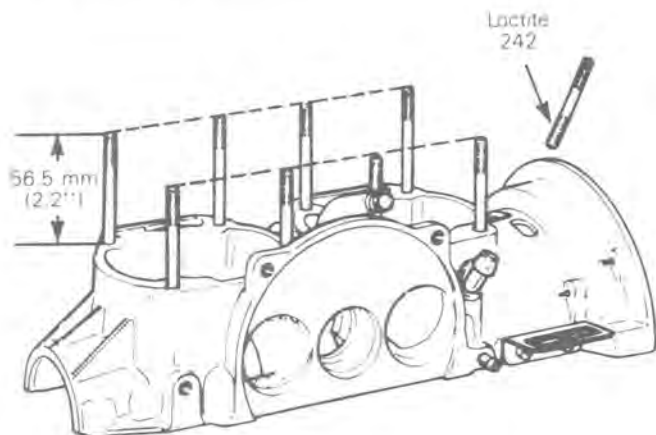
▼ **CAUTION:** Circlips must not move freely after installation if so, replace them.



A001002002

#### 20, Crankcase studs

Because of cap nuts, cylinder studs have to be screwed into the crankcase so that they do not protrude by more than 56.5 mm (2.2'').

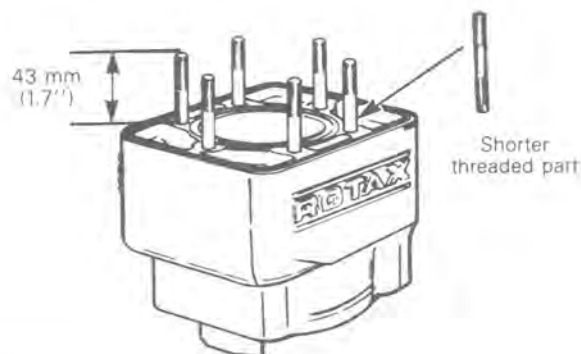


A015002001

Apply Loctite 242 blue medium strength on the threaded end of the studs going into the crankcase.

#### 12,21, Cylinder & cylinder head stud

Because of cap nuts, cylinder head studs have to be screwed into the cylinder so that they do not protrude by more than 43 mm (1.700''). If it is not possible to obtain this length, add a washer between cylinder head and cap nut. Shorter threaded part of stud should be screwed into cylinder.



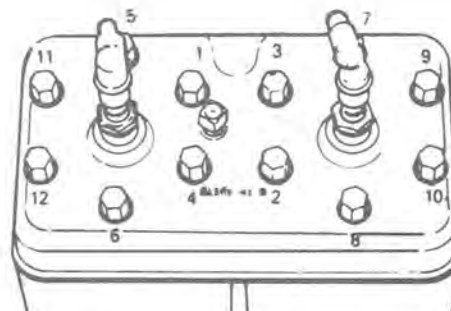
A015002018

## Section 02 ENGINE

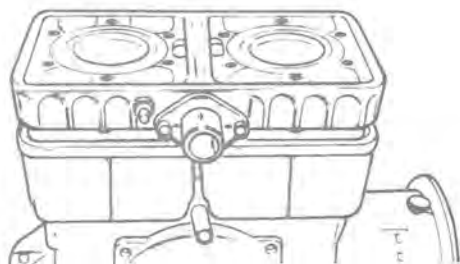
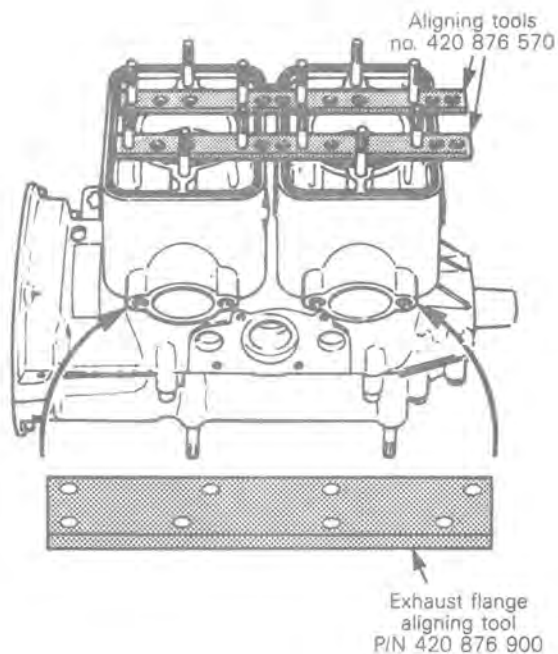
### Sub-section 09 (537 ENGINE TYPE)

#### 10,12, Crankcase/cylinder nuts & cylinders

When reassembling the cylinders to the crankcase, it is important to have them properly aligned so that the cylinder head holes will match up with the studs. A special tool (as per illustration) (or cylinder head itself) can be used to align the cylinders. Prior to torquing crankcase cylinder nuts, install tool P/N 420 876 900 (or exhaust manifold itself) to properly align exhaust flanges.



A015002004



A015002011

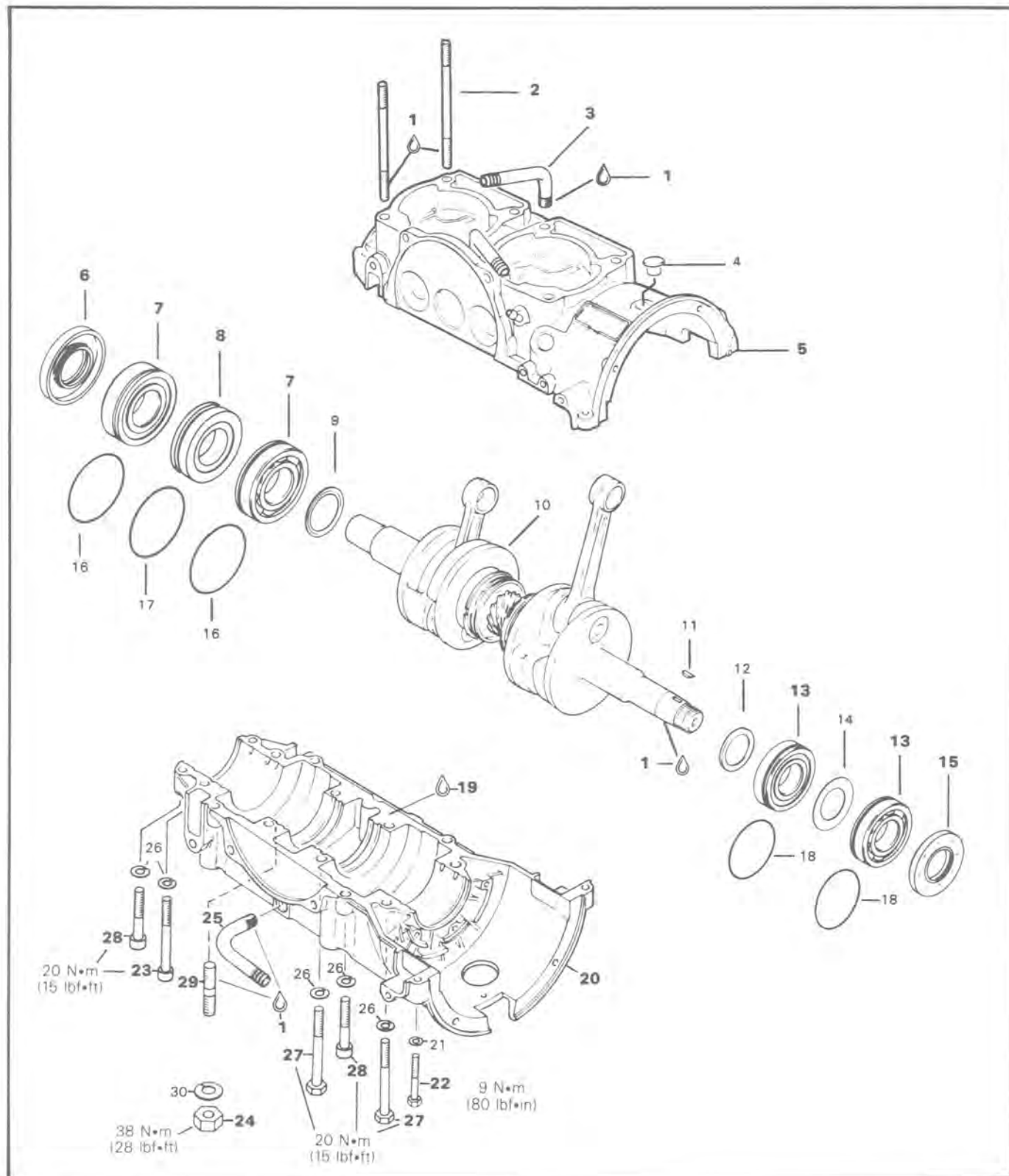
Cross torque cylinder nuts to 20 N•m (15 lbf•ft).

#### 1, Cylinder head nut

Torque cylinder head nuts to 20 N•m (15 lbf•ft) following illustrated sequence.



**BOTTOM END**



## Section 02 ENGINE

### Sub-section 09 (537 ENGINE TYPE)

1. Loctite 242
2. Stud M8 x 79 (8)
3. Angular tube, oil inlet
4. Plug
5. Crankcase upper half
6. Seal
7. Ball bearing 6207 (2)
8. Labyrinth sleeve
9. Distance ring
10. Crankshaft
11. Woodruff key 3 x 3,7
12. Distance ring
13. Ball bearing 6206 (2)
14. Shim 1 mm
15. Seal

16. O-ring (2)
17. O-ring
18. O-ring (2)
19. Loctite 515
20. Crankcase lower half
21. Lock washer 6 mm (2)
22. Hex. screw M6 x 35 (2)
23. Cylinder screw M8 x 75 (2)
24. Hexagonal nut M10
25. Angular tube, oil outlet
26. Lock washer 8 mm (14)
27. Hex. screw M8 x 65 (6)
28. Cyl. screw M8 x 45 (6)
29. Stud M10 x 42
30. Lock washer 10 mm

## CLEANING

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

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

## DISASSEMBLY

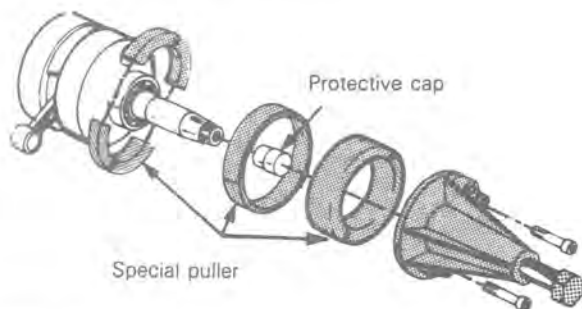
### General

To remove drive pulley refer to "Drive pulley", section 03-03.

To remove magneto, refer to "Magneto" in this section.

### 7, 13, Crankshaft bearings

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



A000001082

## INSPECTION

The inspection of the engine bottom end must include the following measurements:

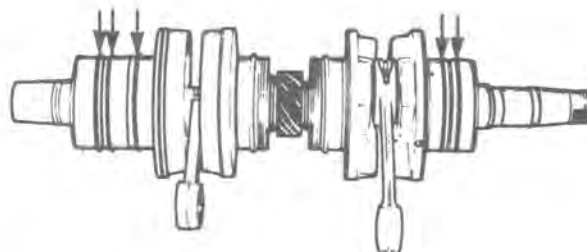
MEASUREMENTS	TOLERANCES		WEAR LIMIT
	FITTING NEW PARTS (MIN.)	(MAX.)	
Crankshaft deflection	N.A.	N.A.	.08 mm (.0032")
Connecting rod big end axial play	.40 mm (.0157")	.73 mm (.0287")	1.2 mm (.0468")

○ **NOTE:** For the measurement procedures, refer to "Engine dimensions measurement", section 02-10.

## ASSEMBLY

### 7,8,13, Crankshaft bearings & labyrinth sleeve

Prior to installation, place bearings into an oil container filled with oil previously heated to 100°C (210°F). This will expand bearing and ease installation. Install bearings and labyrinth sleeve with groove as per the following illustration.



A015002005

## Section 02 ENGINE

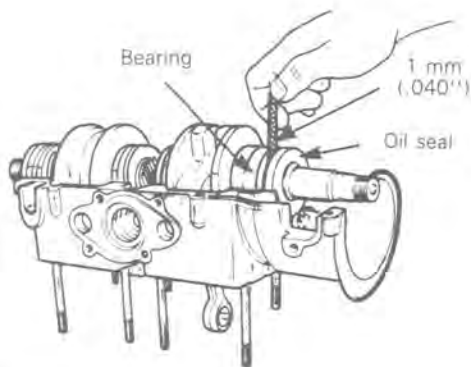
### Sub-section 09 (537 ENGINE TYPE)

#### 6,15, Seals

At seal assembly, apply a light coat of lithium grease on seal lips.

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

When installing plain seals (seal without locating ring or without spacing legs), ensure to maintain the specified gap as illustrated. For seals with spacing legs, install them against the bearing.



A015002007

#### 5,19,20, Upper crankcase, Loctite 515 & lower crankcase

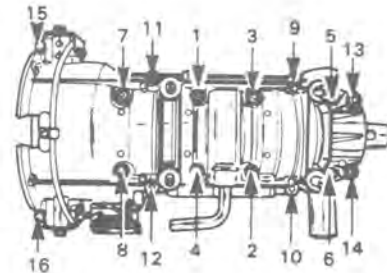
Crankcase halves are factory matched and therefore, are not interchangeable or available as single halves. Prior to joining of crankcase halves, apply a light coat of Loctite 515 (P/N 413 7027 00) on mating surfaces.

**NOTE:** Prior applying Loctite 515 it is possible to use primer N (P/N 413 7053 00) or primer NF (P/N 413 7024 00). It increases cure speed and gap filling capability. Refer to supplier instructions.

**CAUTION:** Before joining crankcase halves be sure that crankshaft rotary valve gear is well engaged with rotary valve shaft gear.

Position the crankcase halves together and torque bolts by hand then install armature plate (tighten) on magneto side to correctly align crankcase halves. Torque bolts as specified following illustrated sequence.

Follow sequence shown  
1 to 14 - 20 N•m (15 lbf•ft)  
15 and 16 - 9 N•m (80 lbf•in)



A015002006

**NOTE:** Torque the two smaller bolts (15 and 16) on magneto side to 9 N•m (80 lbf•in).

#### 1,3,25, Loctite 242, angular tubes (oil inlet & oil outlet) & cover screws

Apply Loctite 242 on threads prior to assembly angular tubes.

#### 23,27,28, Crankcase M8 Screws

Torque the crankcase M8 screws to 20 N•m (15 lbf•ft). Install them as per exploded view.

#### 22, Crankcase M6 screws

Torque the crankcase M6 screws to 9 N•m (80 lbf•in).

#### 1,29, Loctite 242 & crankcase stud

At assembly on crankcase, apply Loctite 242 on stud threads.

#### 24, Crankcase/engine bracket nut

Torque the crankcase/engine bracket nut to 38 N•m (28 lbf•ft).

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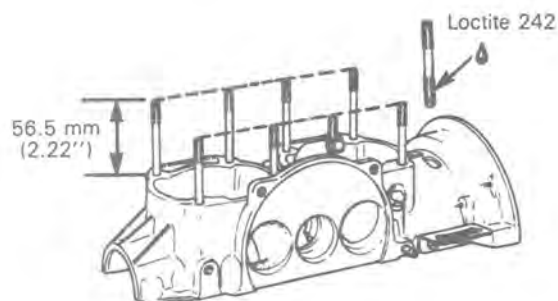
## Section 02 ENGINE

### Sub-section 09 (537 ENGINE TYPE)

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#### 1,2, Loctite 242 & upper crankcase studs

Because of cap nuts, cylinder studs have to be screwed into the crankcase so that they do not protrude by more than 56.6 mm (2.2").

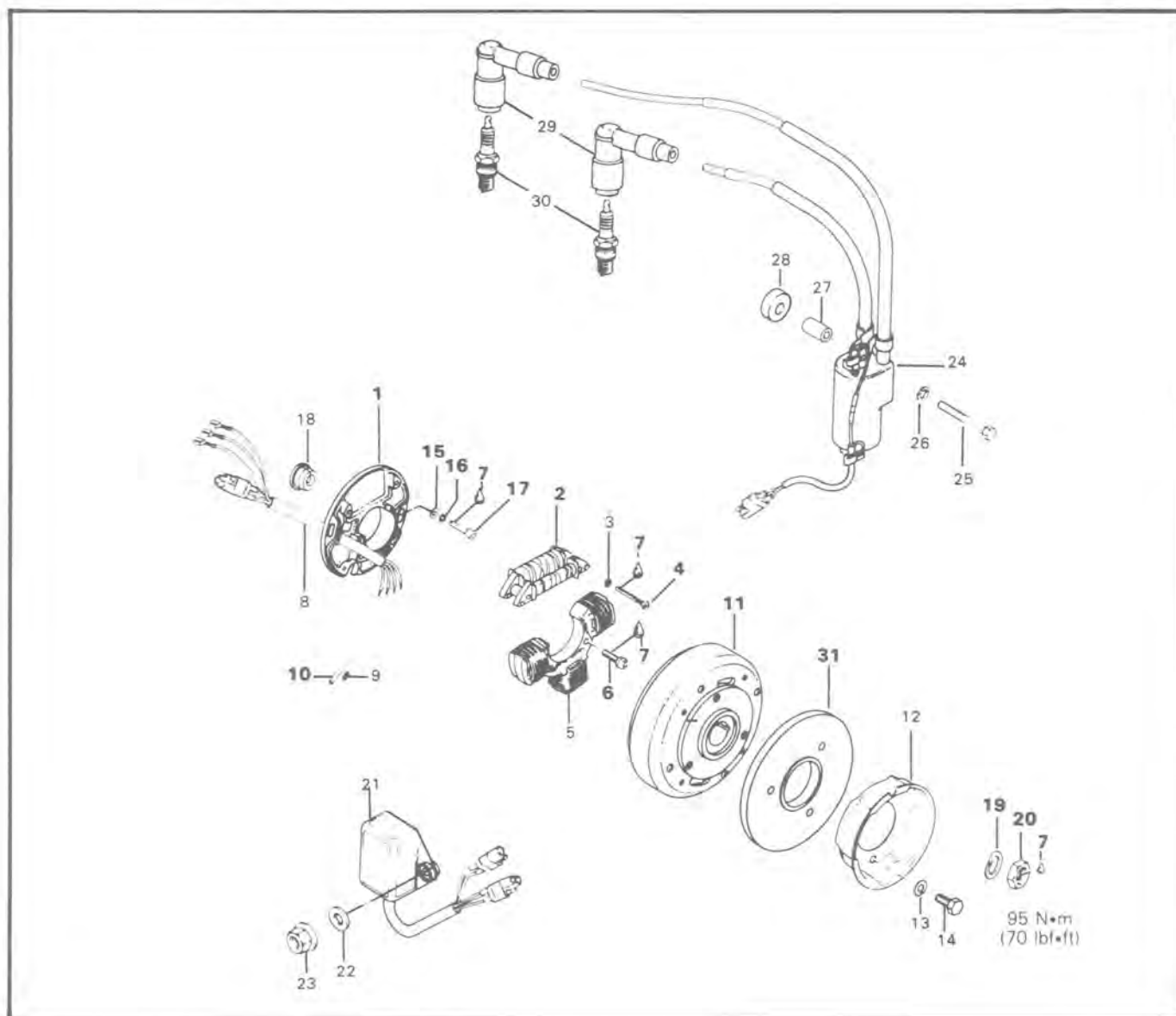


A015002001

Apply Loctite 242 on the threaded end of the studs going into the crankcase.

To install magneto, refer to "Magneto" in this section.

# MAGNETO



- |   |   |
|---|---|
| 1. Armature plate                             | 17. Allen screw M5 x 18 (2)                   |
| 2. Generation coil                            | 18. Cable grommet                             |
| 3. Lock washer 5 mm (2)                       | 19. Lock washer 22 mm                         |
| 4. Cylindrical slotted head screw M5 x 35 (2) | 20. Hexagonal nut 22 x 1.5 mm                 |
| 5. Lighting coil                              | 21. C.D. box                                  |
| 6. Screw M6 x 25 (2)                          | 22. Flat washer 6,4 mm (2)                    |
| 7. Loctite 242 (blue, medium strength)        | 23. Flanged elastic hexagonal stop nut M6 (2) |
| 8. Harness                                    | 24. Ignition coil                             |
| 9. Splice connector (6)                       | 25. Hexagonal screw M6 x 85 (2)               |
| 10. Protector tube (6)                        | 26. Lock washer 6 mm (2)                      |
| 11. Flywheel                                  | 27. Spacer (2)                                |
| 12. Starting pulley                           | 28. Insulator                                 |
| 13. Lock washer 8 mm (3)                      | 29. Spark plug protector (2)                  |
| 14. Hexagonal screw M8 x 16 (3)               | 30. Spark plug (2)                            |
| 15. Washer 5,5 mm                             | 31. Flywheel counterweight                    |
| 16. Lock washer 5 mm (2)                      |   |

## Section 02 ENGINE

### Sub-section 09 (537 ENGINE TYPE)

#### CLEANING

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

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

#### DISASSEMBLY

To gain access to magneto assembly, remove:

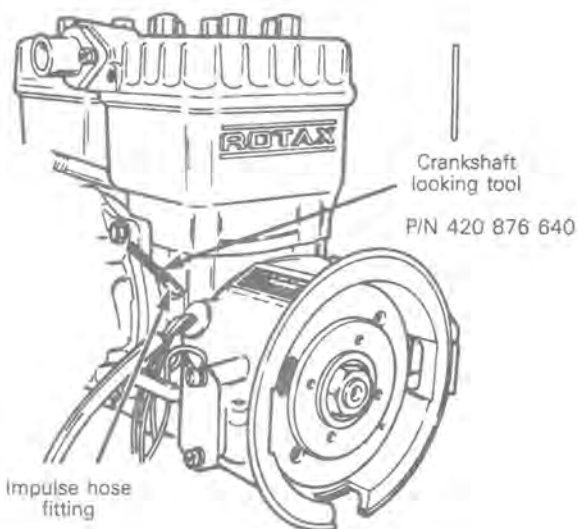
- muffler
- rewind starter
- starting pulley

○ **NOTE:** Before disassembling magneto plate, indexing marks should be located to facilitate reassembly.

#### 20, Flywheel retaining nut

To remove magneto flywheel retaining nut:

- lock crankshaft with crankshaft locking tool (service tool) as illustrated;
- remove magneto retaining nut.



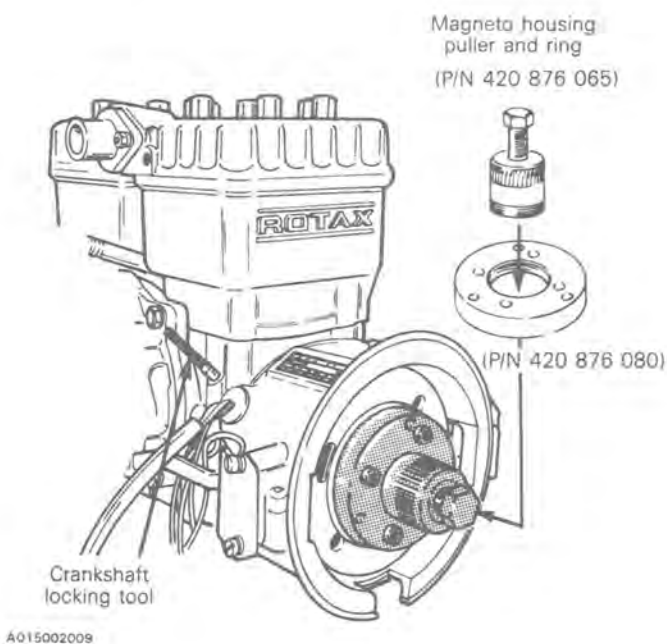
A015002008

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

#### 11, Flywheel

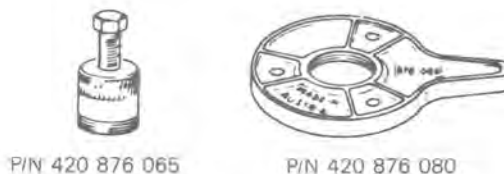
To remove magneto housing (flywheel):

- lock crankshaft with crankshaft locking tool (service tool) as illustrated;
- adjust magneto housing puller and puller ring as illustrated;



A015002009

○ **NOTE:** For the above procedure, the locking type puller can be used without crankshaft locking tool.



A000001083

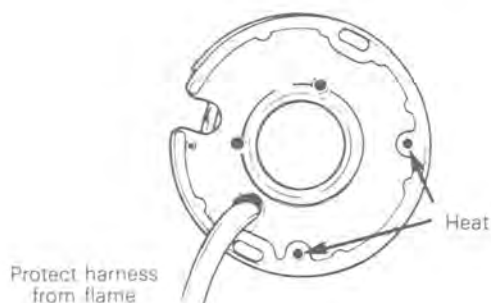
- tighten puller bolt and at same time, tap on bolt head using a hammer to release magneto from its taper.

## REPAIR

### 2, Generating coil

To replace generating coil:

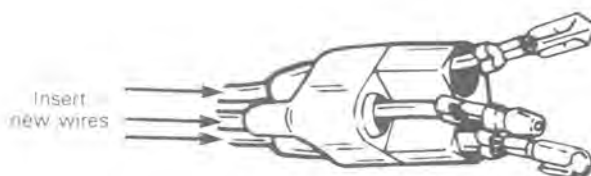
- heat the armature plate around the screw holes to break the Loctite bond 93°C (200°F).



A001002003

▼ **CAUTION:** Protect harness from flame.

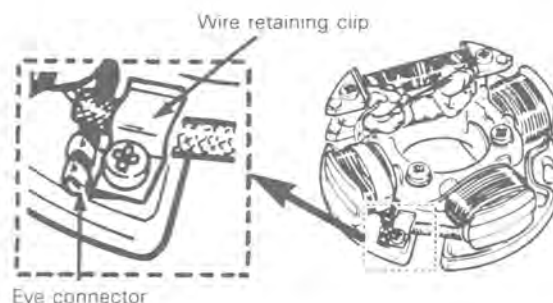
- Remove screws (use Phillips no. 2 or suitable flat screw driver).
- Cut the four wires as close as possible to the coil body.
- To pass new coil wires in harness, tape the old wires to the end of new wires and pull them through the harness protector tube.
- Insert the new wires into the old connector housing and install connectors.



A001002004

▼ **CAUTION:** Replace the old wires in the connector with the same color coded new wires.

- Install a new receptacle connector to the black/yellow striped wire.
- To install the ground connector to the armature plate, tape the new black lead to the old one and pull it under the lighting coil with the old wire.
- Solder an eye connector to the lead and fasten it under the wire retaining clip.



A001002005

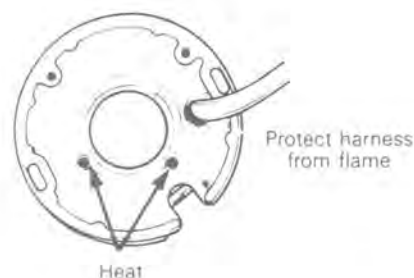
### 4,7, Generating coil screw & Loctite 242

To install the new coil on the armature plate, remove the shipping nuts from the new coil and apply Loctite 242 (blue, medium strength) to screws before assembly.

▼ **CAUTION:** Before reinstalling the magneto, remove the loose epoxy from harness.

To replace lighting coil:

- Heat the armature plate around the screw holes to break the Loctite bond 93°C (200°F).



A001002003

▼ **CAUTION:** Protect harness from flame.

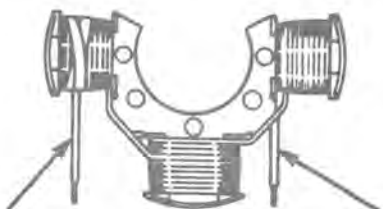
- Remove screws (use Phillips no. 3 screwdriver).
- Remove the wire retaining clip from armature plate.
- Pull out protector tubes and unsolder the splice connectors.



## Section 02 ENGINE

### Sub-section 09 (537 ENGINE TYPE)

- Solder the yellow wire in the harness to the white tube protected wire of the coil.
- Solder the yellow/black striped wire in the harness to the black tube protected wire of the coil.



White protector with  
yellow wire of harness

Black protector with  
yellow/black wire of harness

A001002006

#### 10, Protector tube

Position protector tubes over connections.

#### 6,7, Loctite 242 & lighting coil screws

Prior to assembly, apply Loctite 242 (blue, medium strength).

- Fasten retaining clip onto protector tubes.

The ground terminal from generating coil must be fastened under this clip.



A001002005

**CAUTION:** Before reinstalling magneto remove the loose epoxy from harness.

## ASSEMBLY

#### 1,7,15,16,17, Armature plate, Loctite 242, washers, lock washers & screws

Position the armature plate on the crankcase, aligning the marks on both parts.

Put a drop of Loctite 242 on screw threads and tighten.

Clean crankshaft extension (taper).

Apply Loctite 242 on taper.

#### 7,11,19,20, Loctite 242, flywheel, lock washer & nut

Position woodruff key, magneto flywheel, lock washer on crankshaft.

Clean nut threads and apply Loctite 242 (blue, medium strength) before tightening nut to 95 N•m (70 lbf•ft).

At reassembly coat all electric connections with silicone dielectric grease (P/N 413 7017 00) to prevent corrosion or moisture penetration.

**CAUTION:** Do not use silicone "sealant", this product will corrode contacts.

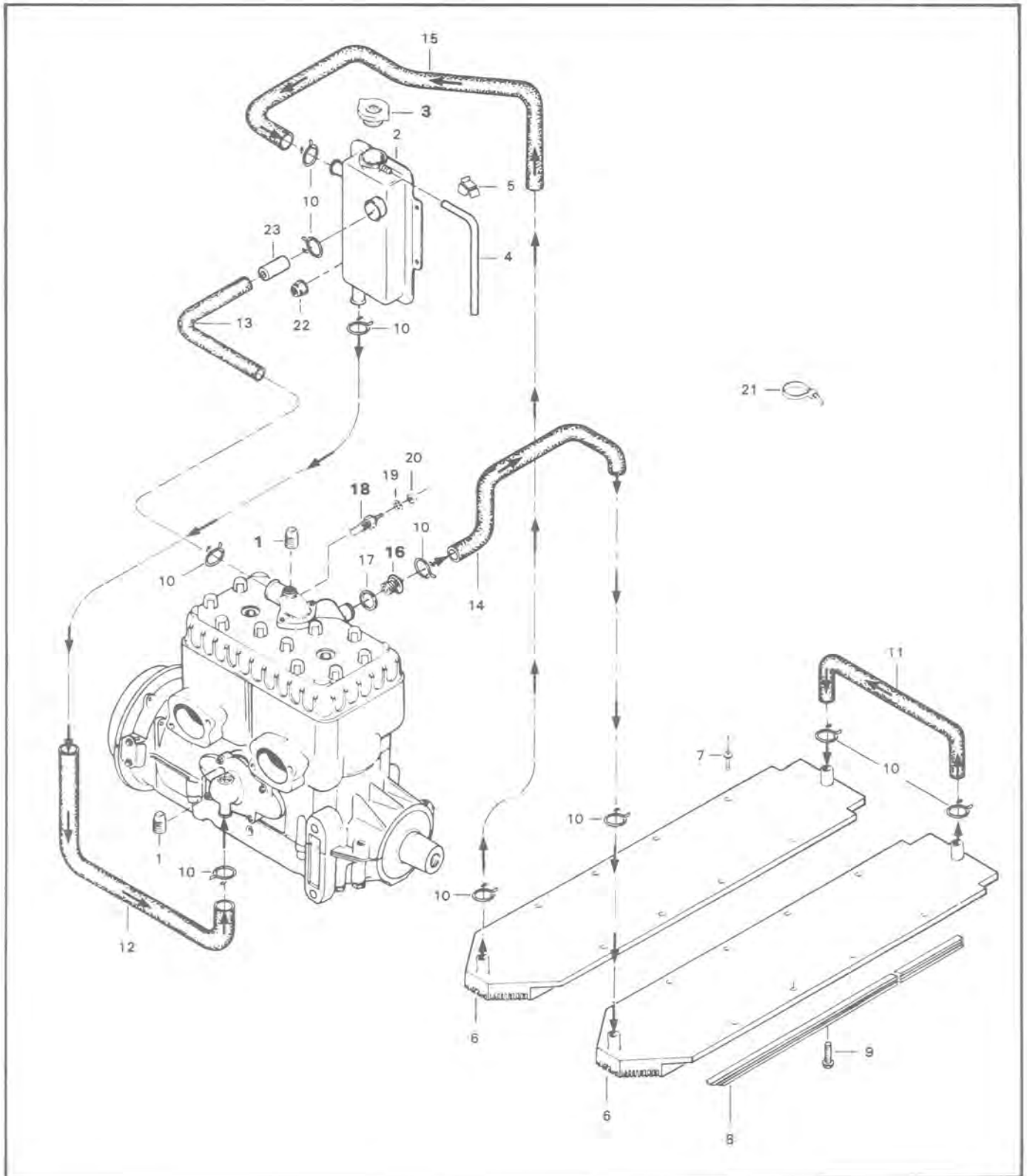
#### 31, Flywheel counterweight

Whenever reassembling counterweight on flywheel, align marks from both parts.

**NOTE:** For ignition timing procedure refer to "Ignition timing", section 04-02.



**COOLING SYSTEM**



## Section 02 ENGINE

### Sub-section 09 (537 ENGINE TYPE)

1. Plug
2. Coolant tank
3. Pressure cap
4. Overflow hose 20" (510 mm)
5. Clip
6. Radiator (2)
7. Rivet
8. Radiator protector (2)
9. Hexagonal laplute washer head screw M5 x 15 (2)
10. Hose clamp (10)
11. U-hose
12. Engine inlet hose

13. Engine outlet hose
14. Radiator inlet hose
15. Radiator outlet hose
16. Thermostat
17. Sealing ring
18. Sender
19. Lock washer
20. Hexagonal nut
21. Tie rap
22. Nut (2)
23. Flow reducer

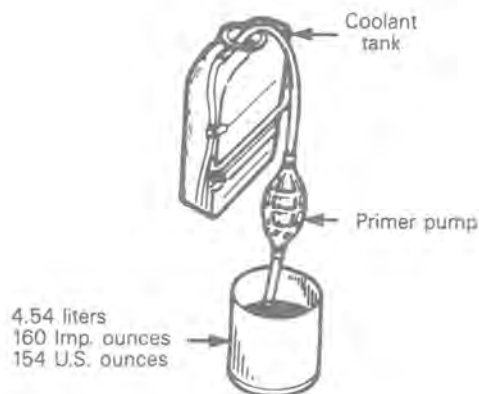
## INSPECTION

Check general condition of hoses and clamp tightness.

## DRAINING THE SYSTEM

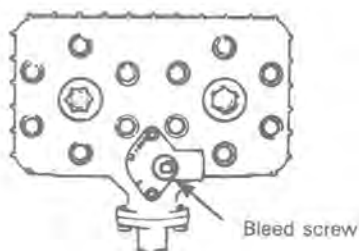
**WARNING:** Never drain or refill the cooling system when engine is hot.

To drain the cooling system, siphon the coolant mixture from the coolant tank, using a primer pump and length of plastic hose and steel tubing inserted as deep as possible into the lower hose of the tank.



A015002010

When the coolant level is low enough, remove the engine bleed screw and lift the rear of vehicle to drain the heat exchangers.



A018002001

02-09-16

## DISASSEMBLY & ASSEMBLY

### 1,18, Plug & sender

Apply thread sealant on sender and plug to avoid leaks.

### 3, Pressure cap

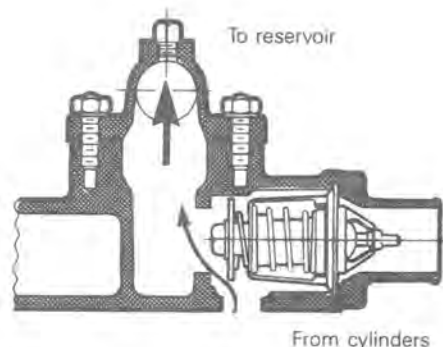
Check if the cap pressurizes the system. If not, install a new 90 kPa (13 PSI cap), do not exceed 90 kPa (13 PSI) of pressure.

### 16, Thermostat

To check thermostat, put it in water and heat the water. Thermostat should open when water temperature reaches 42°C (107.6°F).

This thermostat is a "double action type".

A- Its function is to give a faster warm up of the engine by provoking a circuit; water pump - engine - reservoir. This is done by closing the heat exchanger circuit.



CLOSED THERMOSTAT,  
COLD ENGINE

A016002002

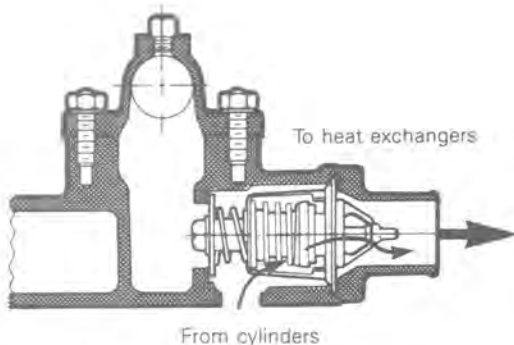
## Section 02 ENGINE

### Sub-section 09 (537 ENGINE TYPE)

B- When the liquid is warmed to 42°C (107.6°F), the thermostat opens the circuit, water pump - engine-heat exchangers - reservoir to keep the liquid at the desired temperature. (See the diagram to the exploded view).

— Stop engine and check coolant level. Refill as required then put back the cap.

◆ **WARNING:** Before removing the cap place a cloth over the coolant tank and release the cap to the first step to release the pressure. Loss of fluid and possibility of severe burns could occur if this notice is disregarded.



OPEN THERMOSTAT, WARM ENGINE

A016002D03

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

## REFILLING THE SYSTEM

Capacity:

Approximately 4.2 liters

(148 Imp. oz) (142 U.S. oz)

60% antifreeze + 40% water

▼ **CAUTION:** To prevent rust formation of freezing condition, always replenish the system with 60% antifreeze and 40% water. Pure antifreeze without water produces premature freezing. Always use ethylen-glycol antifreeze containing corrosion inhibitors specifically recommended for aluminum engines.

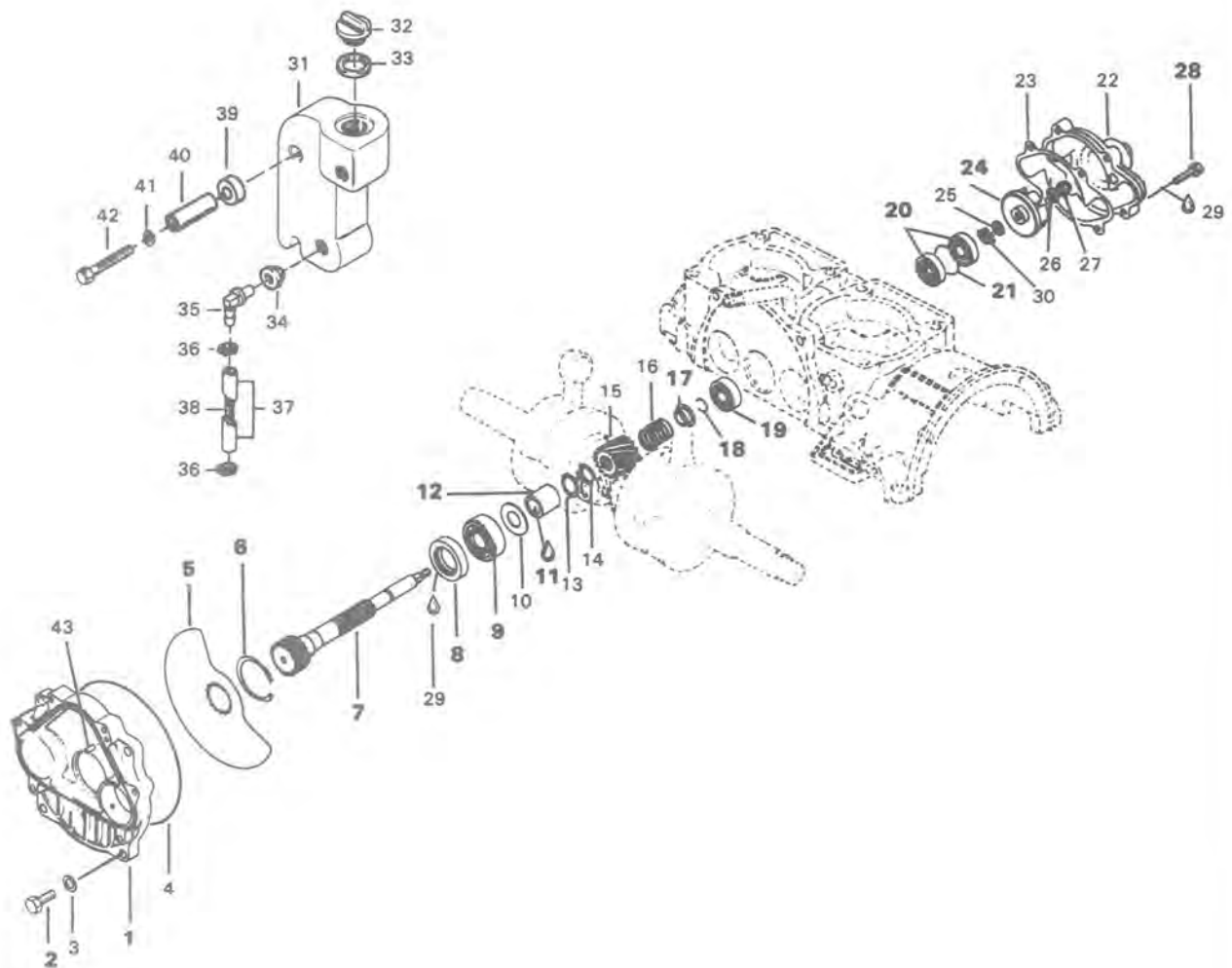
To refill cooling system:

- Put back the rear of vehicle on the ground.
- Refill coolant tank slowly until coolant overfills at bleed hole.
- Reinstall bleed screw.
- Continue to pour coolant in the tank until level reaches 25 mm (1") below filler neck.
- With the coolant tank cap still removed, start engine and let it warm to reach its normal operating temperature and thermostat opens. Allow it running a few minutes more.

## Section 02 ENGINE

### Sub-section 09 (537 ENGINE TYPE)

## ROTARY VALVE, COOLANT PUMP & RESERVOIR



20 N•m  
(15 lbf•ft)

## Section 02 ENGINE

### Sub-section 09 (537 ENGINE TYPE)

1. Rotary valve cover
2. Bolt M8 x 20 (4)
3. Lock washer 8 mm (4)
4. O-ring
5. Rotary valve
6. Circlip
7. Rotary valve shaft
8. Seal
9. Bearing 6203
10. Shim 0.5 mm
11. Loctite 271
12. Distance sleeve 24.5 mm
13. Shim 0.5 mm
14. O-ring
15. Gear
16. Spring
17. Spring retaining cup
18. Circlip
19. Bearing 6201
20. Seal (2)
21. Distance ring
22. Pump housing

23. Gasket
24. Pump impeller
25. Washer 8.1 mm
26. Washer 6.4 mm
27. Nut M6
28. Bolt M6 x 25 (4)
29. Loctite 242
30. Friction washer
31. Rotary valve oil tank
32. Oil tank cap
33. O-ring
34. Isolating washer (2)
35. Elbow connector (2)
36. Hose clamp (4)
37. Oil line 7.75" (196 mm) (2)
38. Spring (2)
39. Isolator
40. Spacer (2)
41. Lock washer 6 mm (2)
42. Hexagonal screw M6 x 85 (2)
43. Pin

## CLEANING

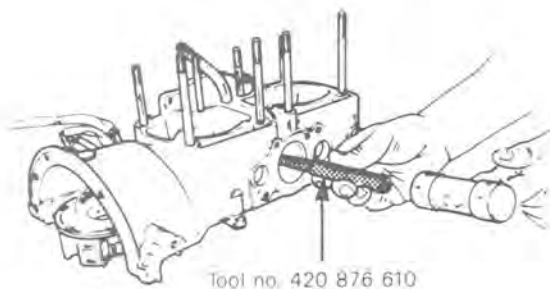
Discard all seals and O-rings.

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

## DISASSEMBLY & ASSEMBLY

### 6,24, Pump impeller & circlip

To remove rotary valve shaft assembly from crankcase, first remove coolant pump impeller and circlip. Using the suitable pusher (P/N 420 876 610) and a fiber hammer, push shaft assembly.

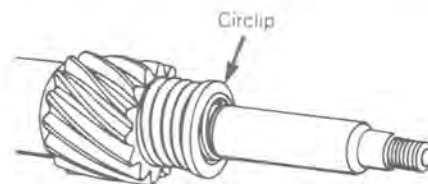


A015002012

**CAUTION:** To prevent damage to the end of the rotary valve shaft, use pusher (tool P/N 420 876 610).

### 17,18, Spring retaining cup & circlip

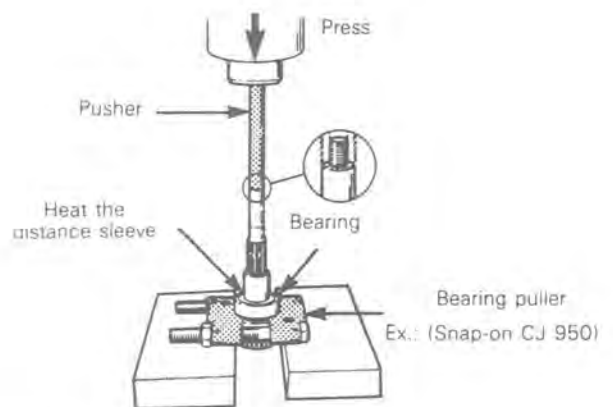
If it is necessary to disassemble components of rotary valve shaft assembly, compress spring retaining cup in order to remove circlip.



A013002012

### 11,12, Distance sleeve & Loctite 271

To remove the distance sleeve use a bearing puller (ex.: Snap-On no. CJ 950) and pusher (P/N 420 876 610) as illustrated. Heat the distance sleeve to break the Loctite bond 93°C (200°F) and proceed as illustrated.



A013002013

## Section 02 ENGINE

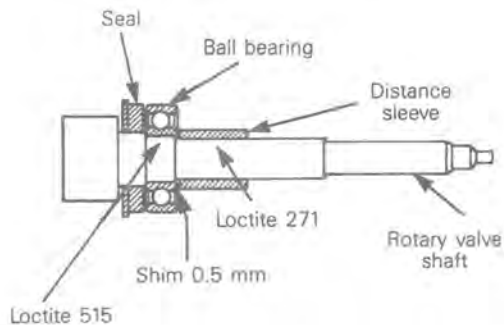
### Sub-section 09 (537 ENGINE TYPE)

▼ **CAUTION:** Ensure that the rotary valve shaft is perfectly perpendicular with the press tip or damage will occur.

Clean rotary valve shaft and inside of distance sleeve. At assembly apply Loctite 271 inside of distance sleeve.

#### 7,8, Rotary valve shaft & seal

At assembly apply lithium grease on seal lips. Position the seal with shield portion towards rotary valve.



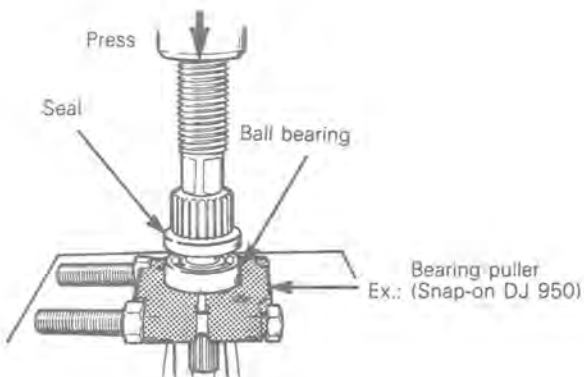
A013002014

#### 7,9, Rotary valve shaft & bearing 6203

At assembly apply crankcase sealant Loctite 515 on bearing and rotary valve shaft mating surfaces.

▼ **CAUTION:** Don't put any Loctite on bearing balls.

Install ball bearing as illustrated.



A013002015

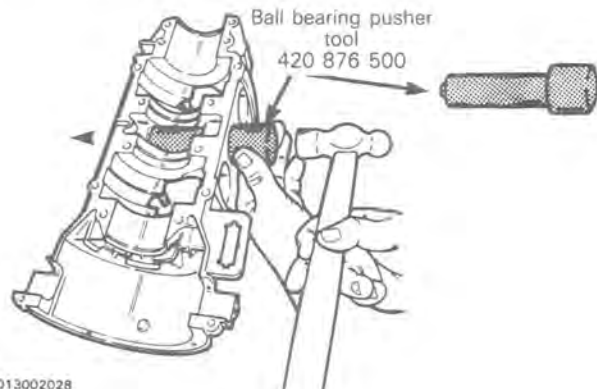
#### 19,20,21, Bearing 6201, seal & distance ring

To remove bearing 6201 (the smallest one), seals and distance ring use pusher (P/N 420 876 510).



A015002013

To install ball bearing 6201 use ball bearing pusher (P/N 420 876 500).

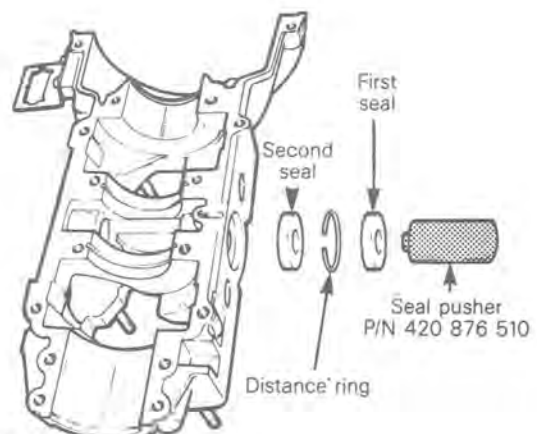


A013002028

○ **NOTE:** Ball bearing shielded must be facing rotary valve.

#### 20,21, Seals & distance ring

To install seals on water pump side proceed as follows:



A015002014

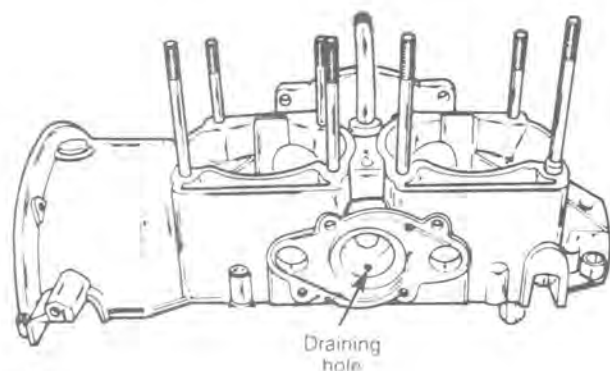
## Section 02 ENGINE

### Sub-section 09 (537 ENGINE TYPE)

Apply some lithium grease or equivalent on seal lips. Position all seals with shielded portion towards water pump using pusher (P/N 420 876 510). Align distance ring opening with crankcase draining hole (see note and illustration). Push seals and distance ring assembly against bearing.

○ **NOTE:** 35% of the distance between first and second seals must be filled with lithium grease or equivalent.

○ **NOTE:** The draining hole is used to detect seal malfunction. If you notice oil, or coolant at the exit of the draining hole, this means that oil seal or coolant seal leaks.

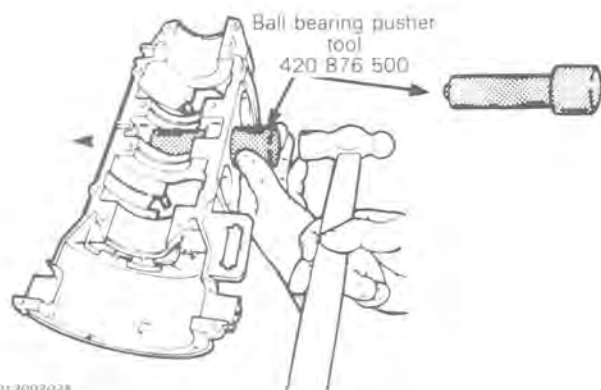


A015002015

▼ **CAUTION:** Failure to position the seals as specified may cause the seal spring to be corroded by coolant. Severe damage may occur if these notices are disregarded.

#### 19,20,21, Bearing 6201, seals & distance ring

○ **NOTE:** After seals installation, check if the water pump end bearing is correctly positioned (use pusher P/N 420 876 500).

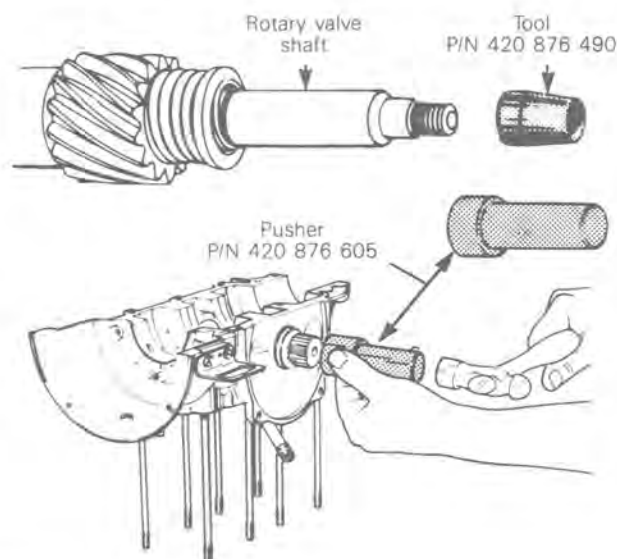


A013002028

#### 7, Rotary valve shaft

To install rotary valve shaft proceed as follows with the suitable tools:

- pusher P/N 420 876 600
- water pump seal sleeve P/N 420 876 490.



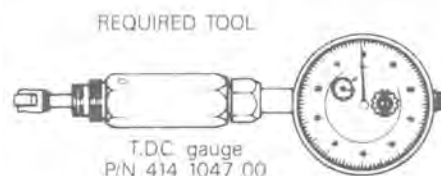
A015002016

#### 22,23, Pump housing bolts & Loctite 242

Apply Loctite 242 on bolts thread.

#### 5, Rotary valve

Installation on genuine crankcase with mark (ridge)



A000001001

To correctly install the rotary valve, proceed as follows:

- Turning crankshaft counter-clockwise, (drive pulley side) bring mageto side to top dead center using a T.D.C. gauge.

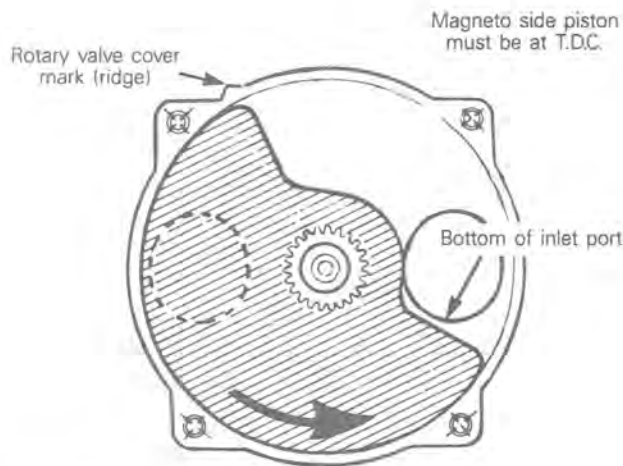
○ **NOTE:** Do not use crankshaft locking tool to find out mageto side top dead center. It will not give the right position.



Section 02 ENGINE  
Sub-section 09 (537 ENGINE TYPE)

— Position the rotary valve on gear in such a way that its closing edge will be as close as possible to the **bottom** of the magneto side inlet port, and its opening edge in line with the mark (ridge) on the upper left side of the rotary valve cover.

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



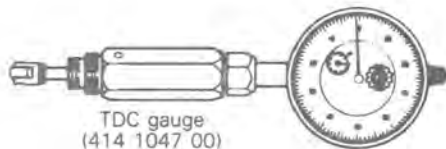
A013002020

Installation on spare crankcase without mark (ridge).

REQUIRED TOOLS



Degree wheel  
(414 3529 00)



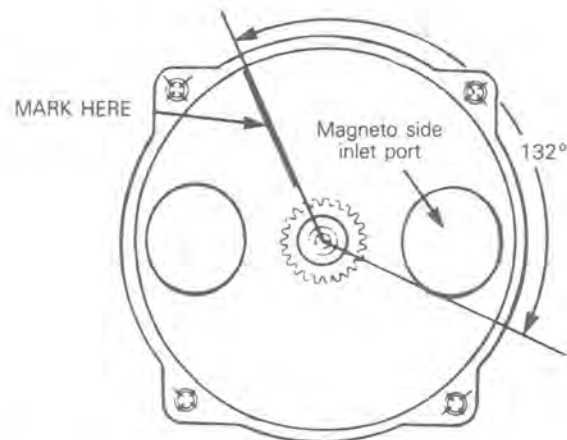
TDC gauge  
(414 1047 00)

A000001080

ENGINE TYPE	TIMING MARKS	
	opening	closing
532	132°	52°

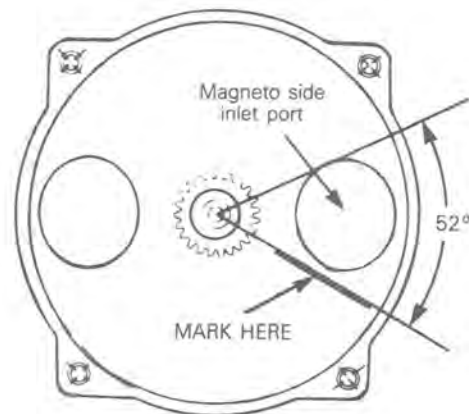
For example: 132° opening  
52° closing

Using angle finder, mark crankcase at 132° from **bottom** edge of magneto side inlet port.



A013002021

From **top** edge of magneto side inlet port, mark crankcase at 52°.



A013002022



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## Section 02 ENGINE

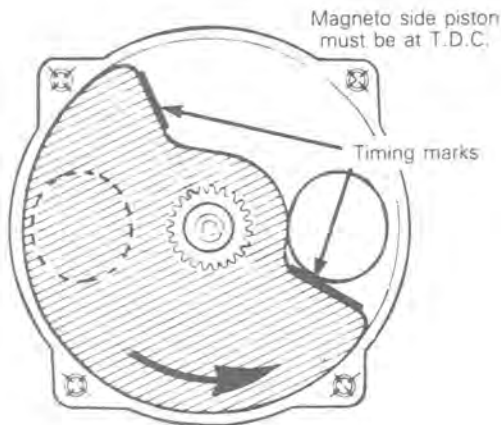
### Sub-section 09 (537 ENGINE TYPE)

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To correctly install the rotary valve disc proceed as follows:

- Turning crankshaft counterclockwise, (drive pulley side) bring magneto side piston to top dead center using a T.D.C. gauge.
- Position the rotary valve disc on gear to have edges as close as possible to the marks.

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



A013002023

Spray some injection oil on rotary valve before closing the rotary valve cover.

## 2, Rotary valve cover bolts

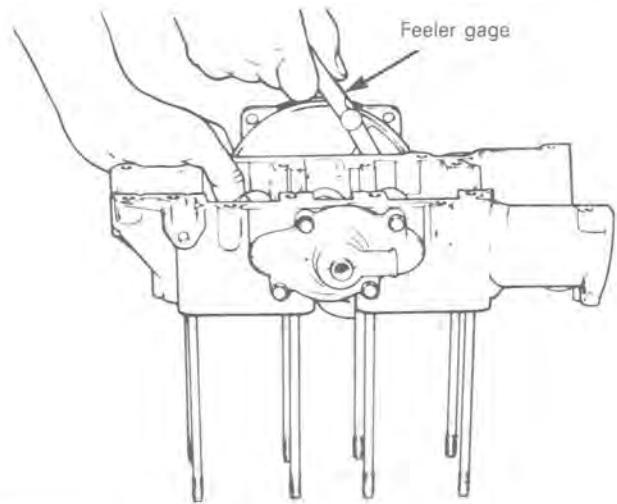
The rotary valve cover bolts must be torque to 20 N•m (15 lbf•ft).

## INSPECTION

### 1,5, Rotary valve cover & rotary valve

A gap of 0.27 - 0.48 mm (.011 - .019'') must be maintained between the rotary valve and the crankcase.

To measure this gap use a feeler gage inserted between rotary valve and upper crankcase with the rotary valve cover in place **without it's O-ring**. Check as much surface as possible. Follow the same procedure for the lower crankcase.



A013002024

## Sub-section 09 (537 ENGINE TYPE)

This diagram shows the exploded view of a fuel system assembly. The main components are numbered as follows:

- 1: Fuel tank
- 2: Fuel filter housing
- 3: Fuel filter
- 4: Fuel line fitting
- 5: Fuel cap
- 6: Fuel cap gasket
- 7: Fuel cap lock
- 8: Fuel filter housing gasket
- 9: Fuel filter housing cap
- 10: Fuel filter housing cap gasket
- 11: Fuel filter housing cap lock
- 12: Fuel line
- 13: Fuel line fitting
- 14: Fuel line end fitting
- 15: Fuel filter element

Oil injection pump

47  
Gasket set

48  
INJECTION OIL

9 N·m  
(80 lbf·in)

Parts in illustration marked with \* are not available as spare parts.

## Section 02 ENGINE

### Sub-section 09 (537 ENGINE TYPE)

1. Injection oil tank
2. Support
3. Grommet
4. Male connector
5. Oil tank cap
6. Gasket
7. Oil level sensor
8. Rubber spacer (4)
9. Flanged hexagonal elastic stop nut M6 (4)
10. Lock washer 6 mm (2)
11. Hexagonal head cap screw M6 x 12 (2)
12. Oil line 8" (200 mm)
13. Spring clip (3)
14. Spring clip
15. Filter
16. Rubber ring
17. Oil pump mounting flange
18. O-ring
19. Oil pump
20. Washer 6,2 (2)
21. Oil pump gear 44 teeth
22. Lock nut 6 mm
23. Lock washer 5 (2)
24. Cylindrical slotted screw M5 x 16 (2)
25. Lock washer 6 mm (7)

26. Cylindrical slotted screw M6 x 20 (7)
27. Oil banjo gasket (4)
28. Banjo (2)
29. Banjo bolt M6 x 16 (2)
30. Oil line 170 mm (2)
31. Clamp (4)
32. Retainer
33. O-ring
34. Plate
35. Screw with lock washer (8)
36. Stop pin
37. Gasket
38. Cam casing plate
39. Washer
40. Hexagonal head screw M6 x 7
41. Spring
42. Washer
43. Lever
44. Lock washer 6
45. Hexagonal nut 6 mm
46. Seal
47. Gasket set
48. Injection oil (1 liter)
49. Ground cable ass'y

## CLEANING

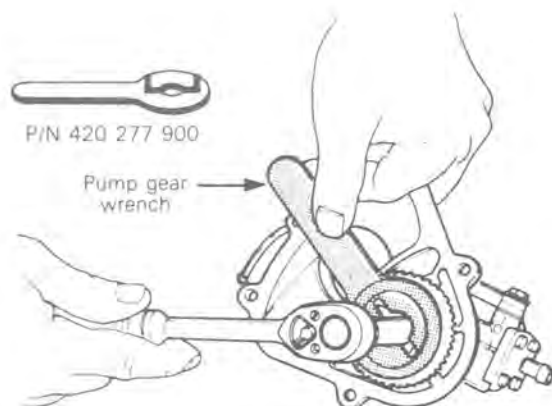
Discard all seals and O-rings. Clean metal components in a non-ferrous metal cleaner.

## DISASSEMBLY

NOTE: Some oil pump parts are not available in single parts.

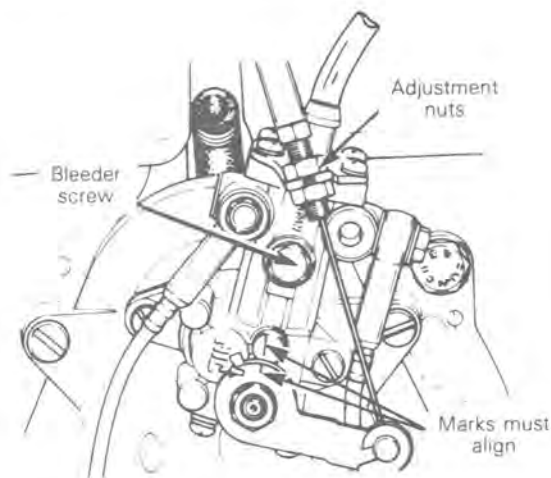
### 21,22, Oil pump gear & lock nut

To remove retaining nut, lock gear using no. 420 277 900 tool



A000002043

## INJECTION PUMP CABLE ADJUSTMENT



A013002005

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

### To bleed oil lines:

All oil lines should be full of oil to bleed the main oil line (between tank and pump), loosen the bleeder screw (do not start engine) and let the air escape until oil starts to flow out.

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## Section 02 ENGINE

### Sub-section 09 (537 ENGINE TYPE)

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#### Make sure tank has enough oil

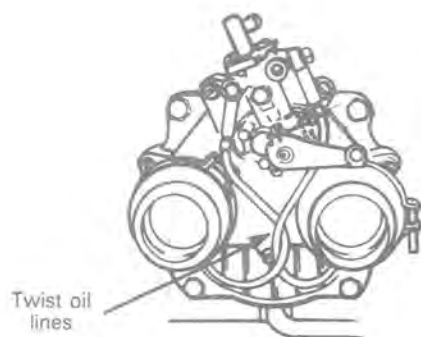
To bleed the small injection lines, start the engine and let it run at idle speed. Move injection pump lever to fully open position until lines are full of oil.

## ASSEMBLY

### 26, Screw

Torque to 9 N•m (80 lbf•in).

▼ **CAUTION:** Whenever oil injection lines are removed, always make the routing as shown. This is important to avoid friction with the steering column.



A015002017

## ADJUSTMENT

Always perform carburetor adjustment prior to oil injection pump adjustment.

#### To synchronize pump with carburetor:

Eliminate the throttle cable free-play by pressing the throttle lever until a light resistance is felt then hold in place. The aligning marks on the pump casting and on the lever must align. If not, loosen the adjuster nut and adjust accordingly. Tighten the lock nut.

# ENGINE DIMENSIONS MEASUREMENT

This section cover all 1986 engine types: 247, 253,377,447,462,467,503,532,537

## CYLINDER TAPER

### 253 Engine type

Not applicable.

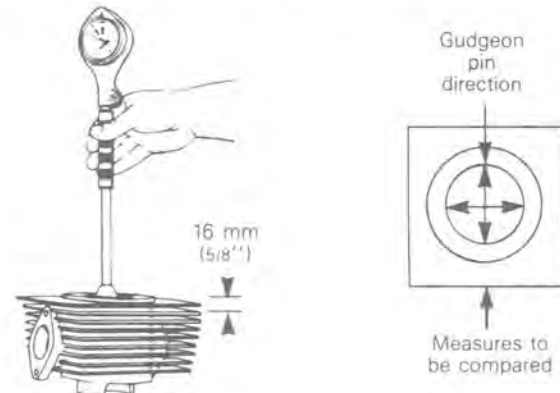
### ALL OTHERS 1986 ENGINES

**MAXIMUM: 0.08 mm (.003")**

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

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

Measuring 16 mm (5/8") 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.

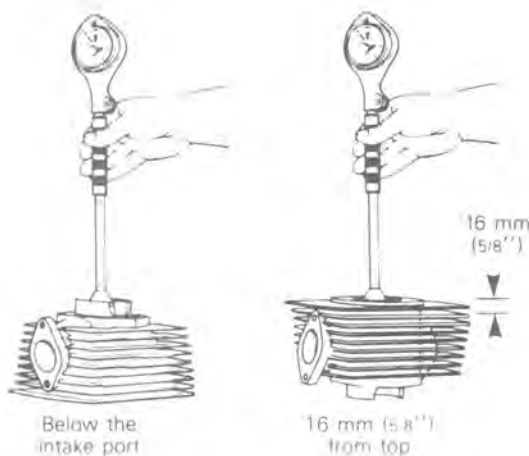


A001002021

**NOTE:** For the 253 engine type, insert the cylinder gauge from the bottom of the head cylinder and slide it up to 16 mm (5/8") from top. Compare the measurements at this position.

## CYLINDER/PISTON CLEARANCE

ENGINE TYPE	NEW PARTS MINIMUM — MAXIMUM	WEAR LIMIT
247	0.065 mm — N.A. (.0026" — N.A.)	0.20 mm (.008")
253 377 447 462 467	0.08 — 0.10 mm (.0031 — .0039")	
503 532	0.07 — 0.09 mm (.0028 — .0035")	
537	0.11 — 0.13 mm (.0043 — .0051")	



A001002016

## CYLINDER OUT OF ROUND

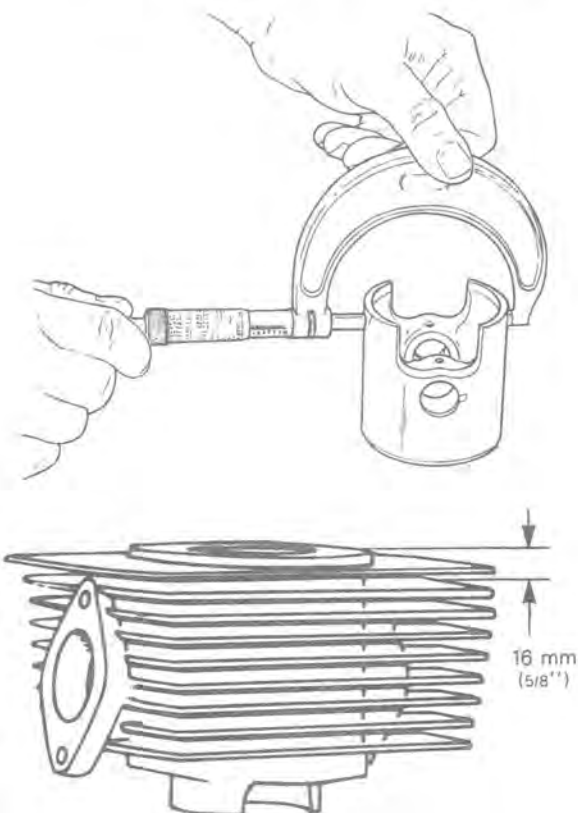
ENGINE TYPE	MAXIMUM
253	0.10 mm (.004")
All other 1986 engines	0.05 mm (.002")

## Section 02 ENGINE

### Sub-section 10 (ENGINE DIMENSIONS MEASUREMENT)

#### Measurement

To determine piston to wall clearance, the piston should be measured right under the axis hole and the cylinder should be measured 16 mm (5/8'') below its top edge.



A001002024

○ **NOTE:** For the 253 engine type, insert the cylinder gauge from the bottom of the head cylinder and slide it up to 16 mm (5/8'') from top.

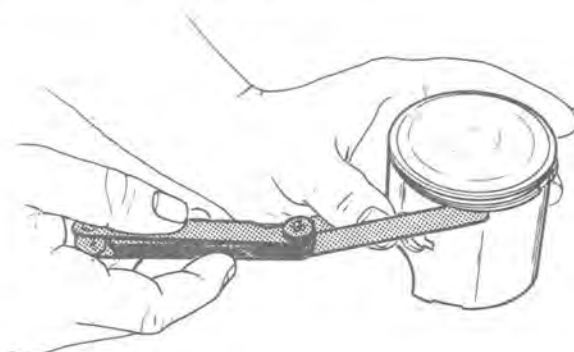
The difference between these two measurements should be within specified tolerance.

#### RING/PISTON GROOVE CLEARANCE

ENGINE TYPE	NEW PARTS MIN. — MAX.	WEAR LIMIT
All 1986 engines	0.04 — 0.11 mm (.002 — .004'')	0.20 mm (.008'')

Using a feeler gauge check clearance between rectangular ring and groove. If clearance exceeds specified tolerance, replace piston.

○ **NOTE:** Ring/piston groove clearance can be measured only on rectangular ring.



A001002025

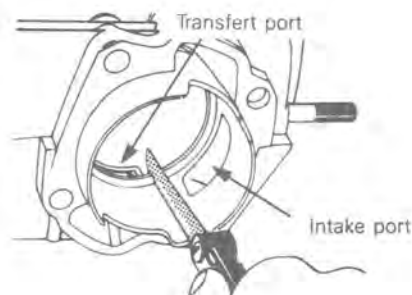
#### RING END GAP

ENGINE TYPE	NEW RING MINIMUM—MAXIMUM	WEAR LIMIT
All 1986 engines	0.20 — 0.35 mm (.008 — .014'')	1.0 mm (.039'')

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

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

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

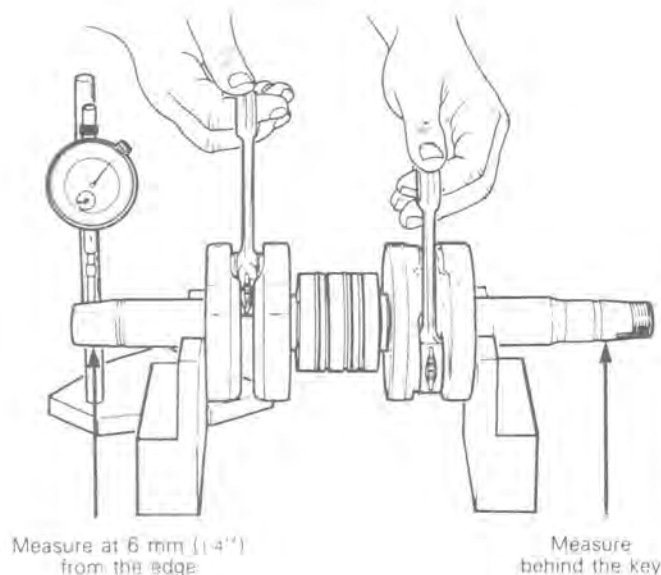


A001002026

## CRANKSHAFT DEFLECTION

ENGINE TYPE	MAXIMUM
247	0.10 mm (0.0039")
All other 1986 engines	0.08 mm (0.0031")

Turn crankshaft on "V" shaped blocks; using a dial indicator measure deflection on each side as illustrated. If deflection exceeds specified tolerance, the crankshaft should be repaired or replaced.

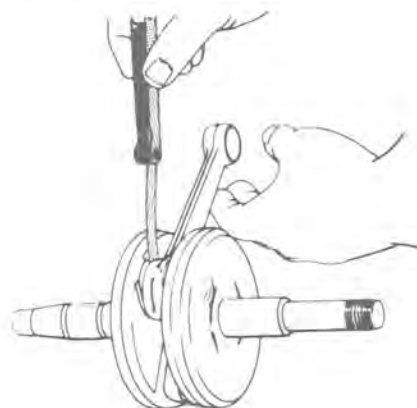


A001002027

## CONNECTING ROD BIG END AXIAL PLAY

ENGINE TYPE	NEW PARTS MIN. — MAX.	WEAR LIMIT
247,253,377, 447,462,503	0.20 — 0.53 mm (.008 — .021")	1.00 mm (.039")
467,532,537	0.40 — 0.73 mm (.016 — .029")	1.20 mm (.047")

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



A001002028

## CRANKSHAFT END-PLAY

### 247 ENGINE TYPE

ENGINE TYPE	MINIMUM	MAXIMUM
247	0.20 mm (.008")	0.40 mm (.016")

### Adjustment

Crankshaft end-play is adjusted with shims located between crankshaft and magneto side bearing.

**CAUTION:** Always install end-play adjustment shims on the magneto side between bearing and crankshaft counterweight.

The following is required for the adjustment procedure:

- adjustment shims (refer to parts catalog)
- thicknesses available: - 0.10 mm (.004")
- 0.20 mm (.008")
- 0.30 mm (.012")
- 0.50 mm (.020")
- 1.00 mm (.040")

- micrometer
- vernier



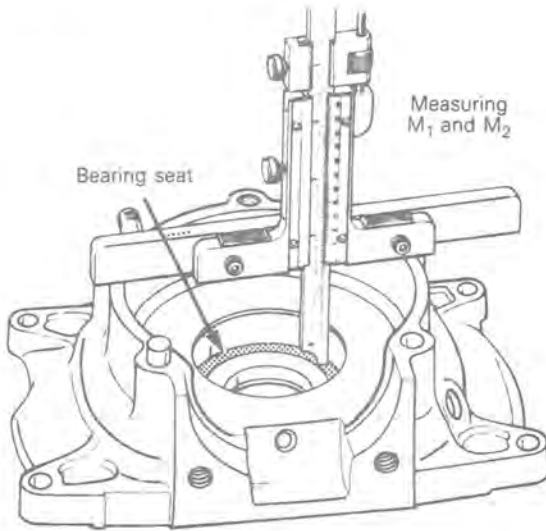
## Section 02 ENGINE

### Sub-section 10 (ENGINE DIMENSIONS MEASUREMENT)

Total shim thickness needed for the end-play adjustment is determined with the following procedure:

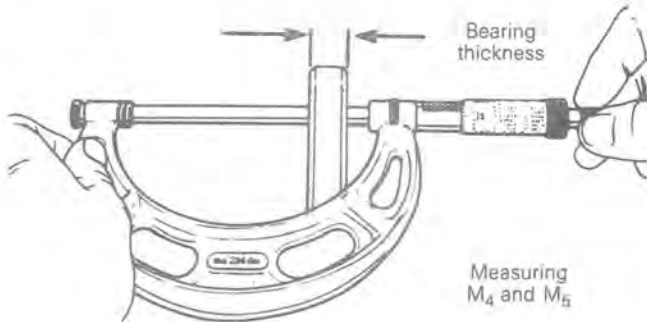
- a) Measure crankcase halves as illustrated ( $M_1$  and  $M_2$ ).

A standard compressed crankcase gasket will have a 0.30 mm (.012") thickness ( $M_3$ ). Add these measurements to obtain dimension "A".



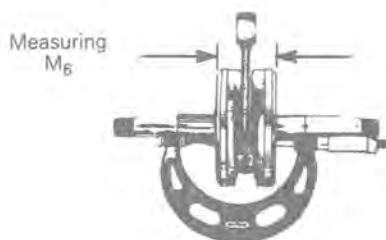
A001002029

- b) Measure the thickness of each ball bearing ( $M_4$  and  $M_5$ ).



A001002030

- c) Measure distance between bearing shoulders on crankshaft ( $M_6$ ).



A001002031

- d) Measure the distance ring and adjustment shims thickness ( $M_7$  and  $M_8$ ). Add these measurements to obtain dimension "B".

- e) From dimension A, subtract dimension B.

The result is the actual crankshaft end-play that must be within specification.

If the result is over specification, add adjustment shim(s) to reach this specification.

If the result is under specification, remove adjustment shim(s) to reach this specification.

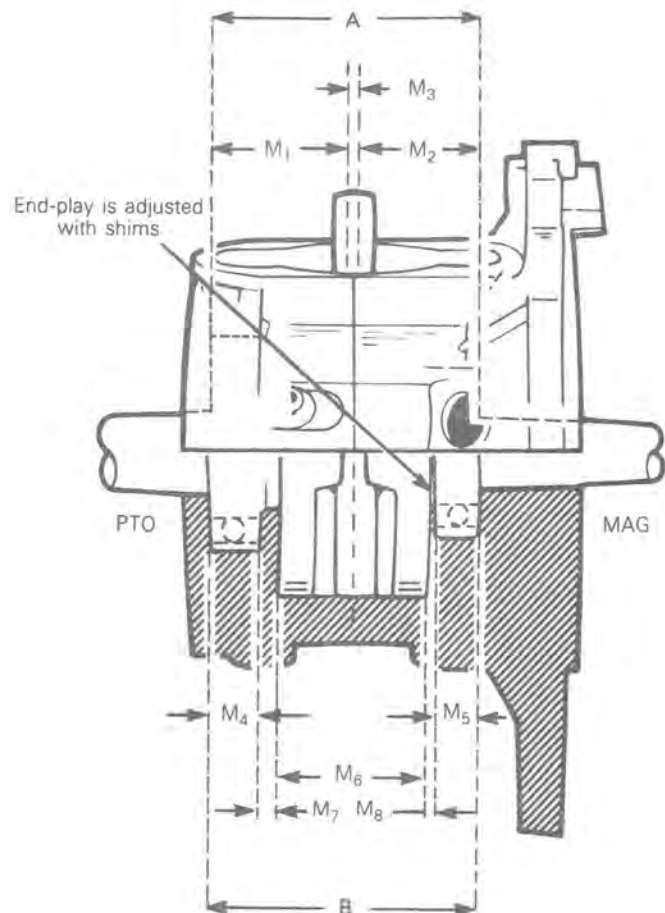
To summarize

$$A = M_1 + M_2 + M_3$$

$$B = M_4 + M_5 + M_6 + M_7 + M_8$$

A-B = actual end-play that must be within specification.

$M_8$  is the dimension that must be adjusted to obtain the specified crankshaft end-play.



A001002032



## Section 02 ENGINE

### Sub-section 10 (ENGINE DIMENSIONS MEASUREMENT)

#### 253 engine type

ENGINE TYPE	MINIMUM	MAXIMUM
253	0.1 mm (.004")	0.4 mm (.016")

#### Adjustment

Refer to illustrations related to the text.

 **NOTE:** End-play adjustment is required only when crankcase and/or crankshaft are replaced.

Crankshaft end-play is adjusted with shim(s) located between distance ring and bearing on MAG side.

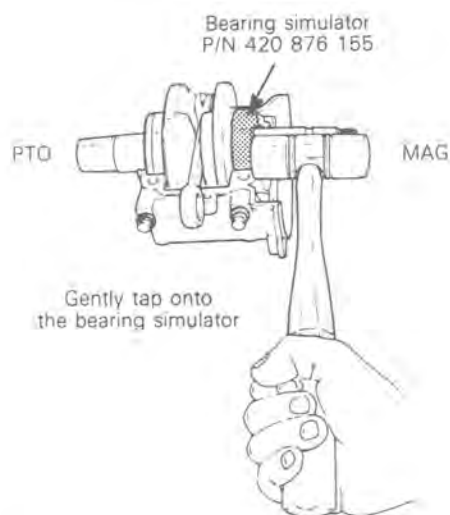
The following is required for the adjustment procedure:

- a feeler gauge
- adjustment shims (refer to parts catalog)
  - Thickness available: - 0.10 mm (.004")
  - 0.20 mm (.008")
  - 0.30 mm (.012")
  - 0.50 mm (.020")

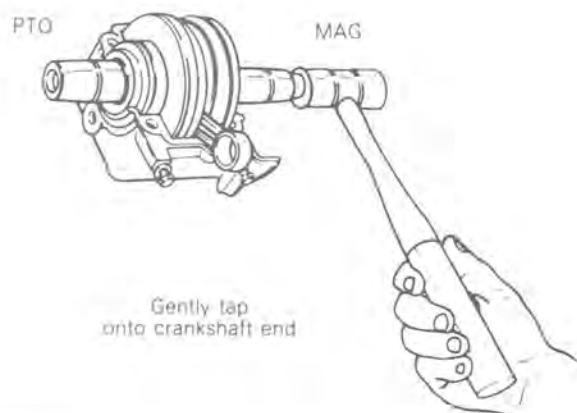
- bearing simulator P/N 420 876 155

Total shim thickness needed for the end-play adjustment is determined by the following procedures:

- Distance ring and crankshaft bearing must be in place on PTO side.
- Install the distance ring and the bearing simulator onto crankshaft MAG side.
- Position the crankshaft into the lower half crankcase with the shim on PTO side.
- Using a plastic hammer, gently tap the crankshaft end then the bearing simulator to take all the slack.



A001002046

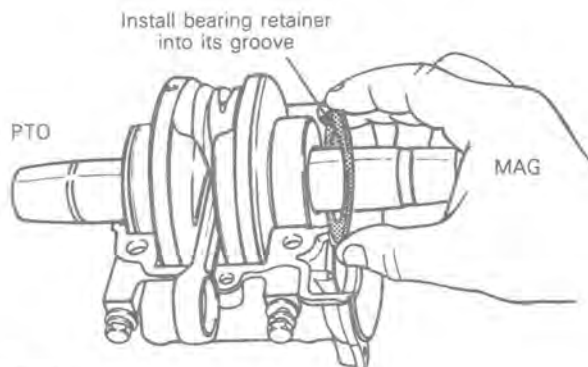


A001002045

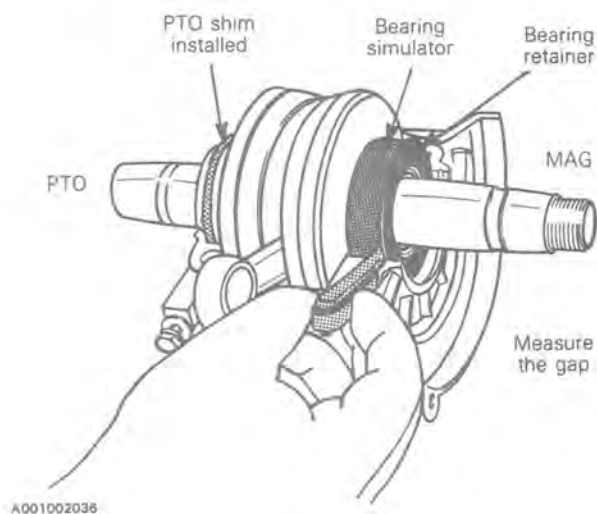
## Section 02 ENGINE

### Sub-section 10 (ENGINE DIMENSIONS MEASUREMENT)

- Install the bearing retainer into its groove on MAG side.



- Measure the gap between the bearing retainer and the bearing simulator close to the crankcase half.



- This gap is the actual crankshaft end-play. Add shim(s) to reach the specified end-play by repeating the procedures.
- Install MAG side bearing. Refer to 253 engine type section 02-02, Bottom end portion.

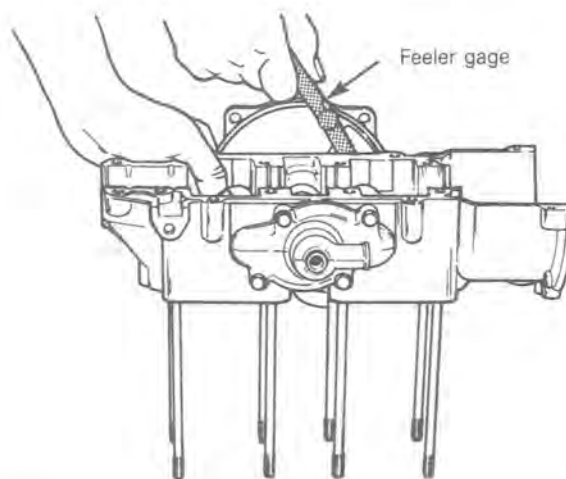
#### 377,447,462,467,503,532,537 engine types

These engine types do not have end-play adjustment.

### CRANKCASE/ROTARY VALVE GAP

ENGINE TYPE	MINIMUM	MAXIMUM
All 1986 liquid cooled	0.27 mm (0.011")	0.48 mm (0.019")

To measure this gap use a feeler gage inserted between rotary valve and upper crankcase with the rotary valve cover in place **without its O-ring**. Check the most surface as possible. Follow the same procedure with the lower crankcase.



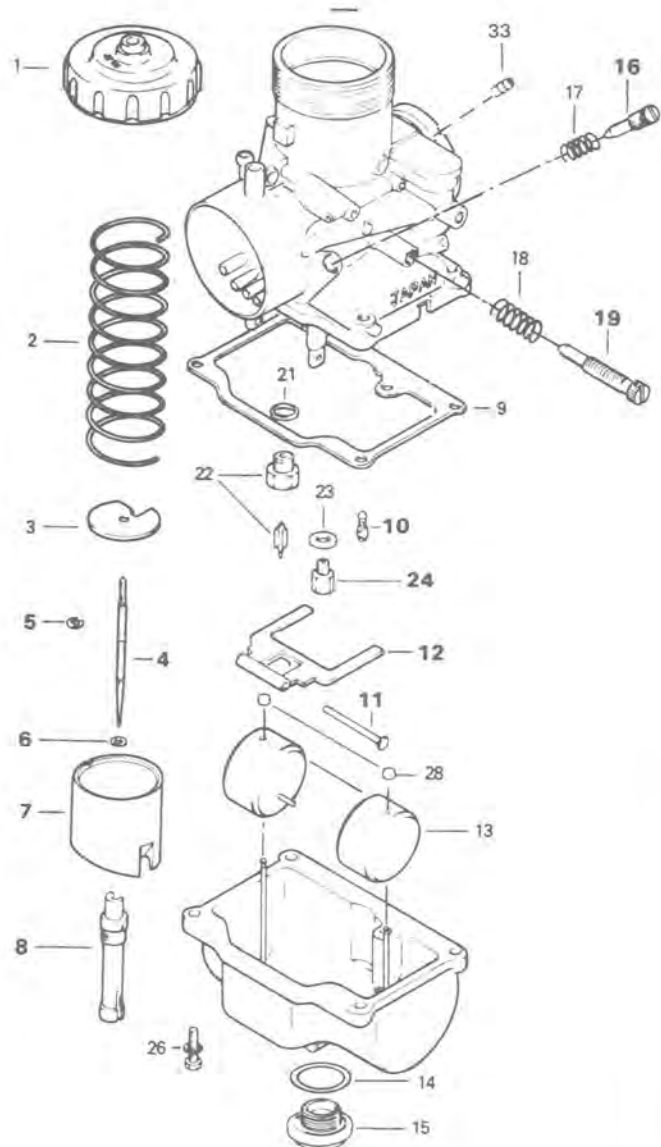
# CARBURETOR & FUEL PUMP

## MIKUNI CARBURETOR

List of engines with their respective carburetor

ENGINE TYPE	MIKUNI NO.
247	VM 28-242
253	VM 34-319
377, 377 E Safari	VM 34-309
377, 377 R Skandic	VM 34-276
447	VM 34-310
462	VM 34-334
467 Formula MX <sup>1</sup>	MAG. VM 34-353 PTO VM 34-352
467 Formula MX (3727 model)	MAG. VM 34-356 PTO VM 34-355
503	VM 34-297
532	VM 34-312
537	MAG. VM 40-30 PTO VM 40-29

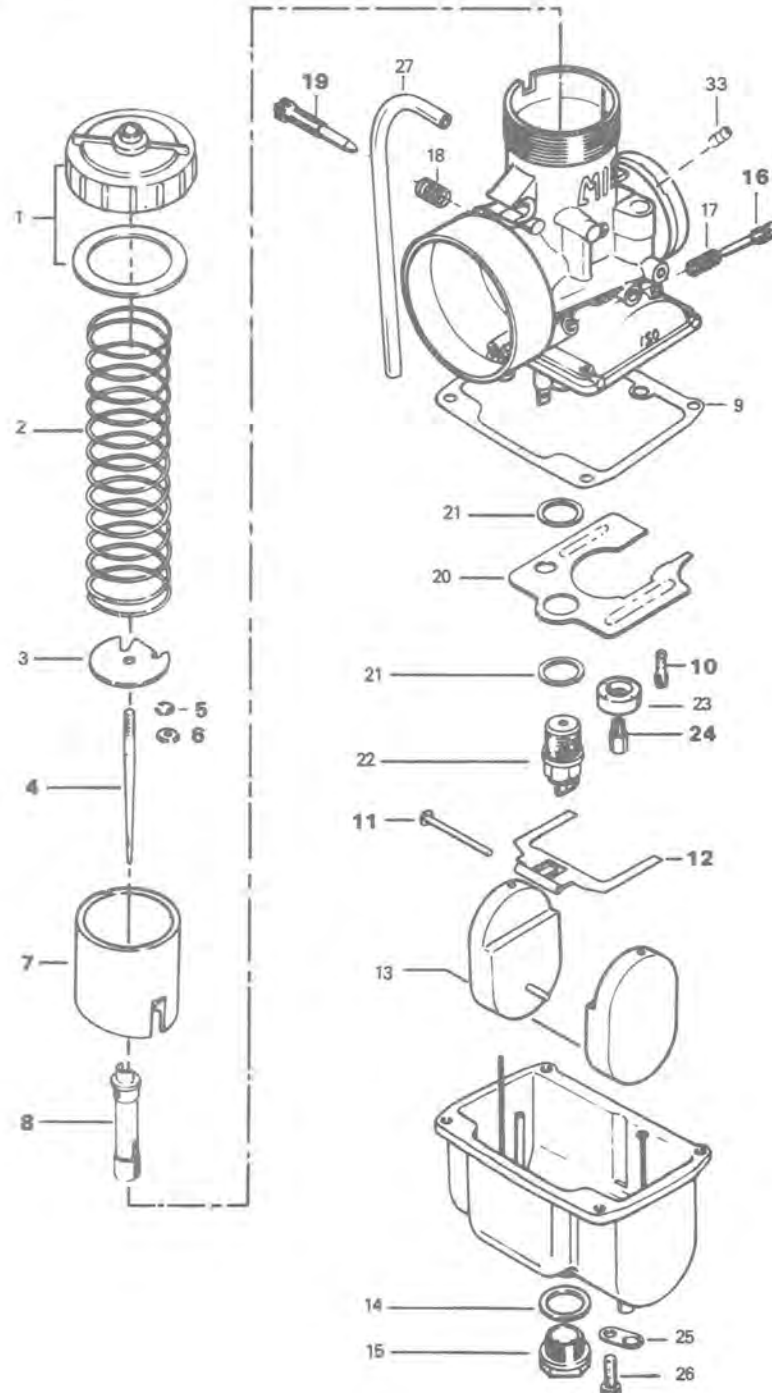
Carburetor VM 28-242



## Section 02 ENGINE

### Sub-section 11 (CARBURETOR & FUEL PUMP)

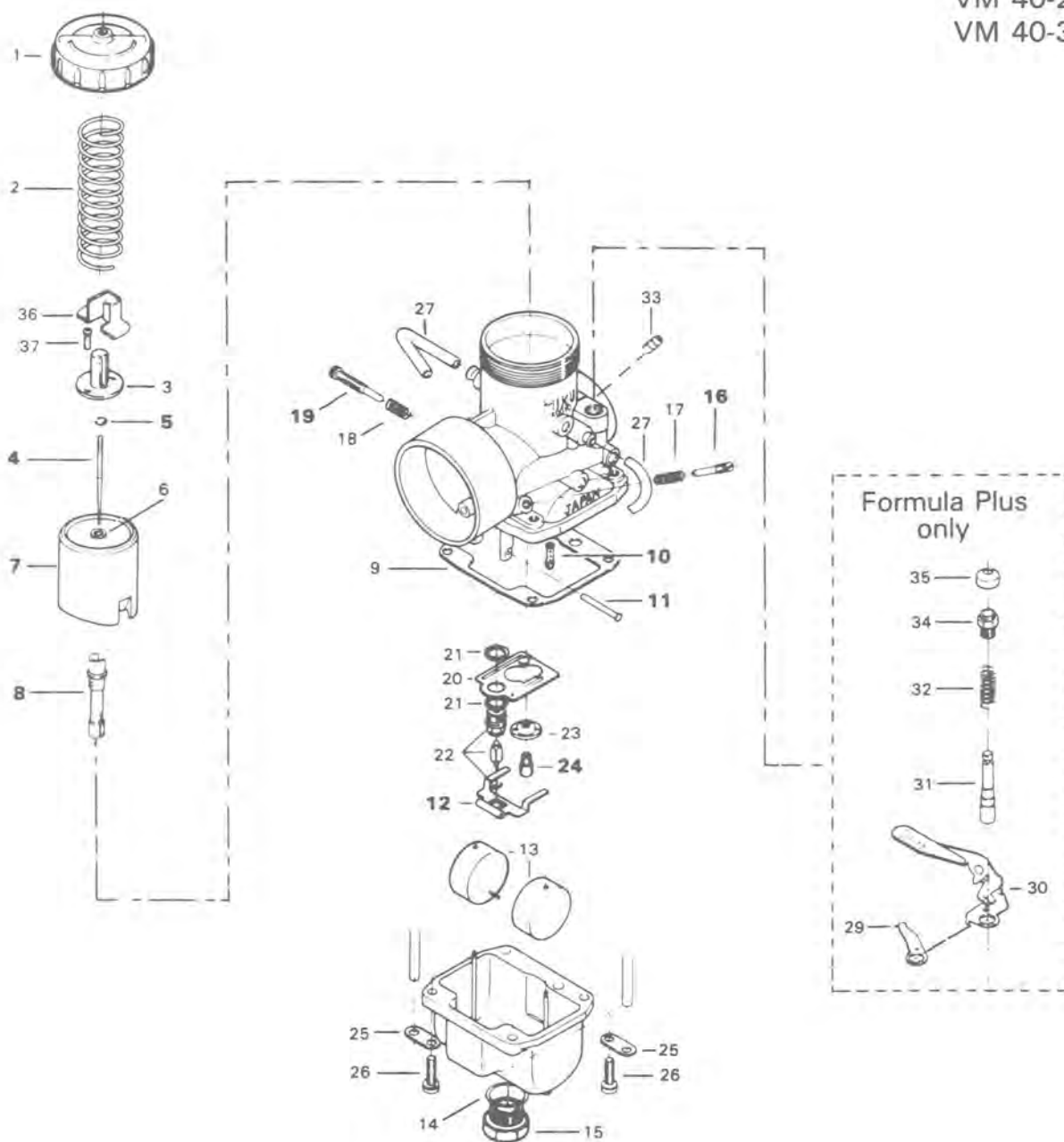
Carburetors VM 34-276  
VM 34-297  
VM 34-309  
VM 34-310  
VM 34-312



## Section 02 ENGINE

### Sub-section 11 (CARBURETOR & FUEL PUMP)

Carburetors VM 34-319  
 VM 34-334  
 VM 34-352  
 VM 34-353  
 VM 34-355  
 VM 34-356  
 VM 40-29  
 VM 40-30



## Section 02 ENGINE

### Sub-section 11 (CARBURETOR & FUEL PUMP)

1. Cover
2. Spring (throttle valve)
3. Needle retainer plate
4. Needle
5. Circlip
6. Packing (on some models)
7. Throttle slide
8. Needle jet
9. Gasket
10. Pilot jet
11. Float arm pin
12. Float arm
13. Float
14. O-ring
15. Plug screw
16. Idle air screw
17. Spring
18. Spring (throttle stop screw)
19. Throttle stop screw
20. Baffle plate
21. Washer
22. Needle valve
23. Baffle ring
24. Main jet
25. Tube retainer plate
26. Screw and lock washer
27. Vent tube
28. Cap
29. Spring plate
30. Choke lever
31. Starting piston
32. Spring
33. Nipple
34. Plunger cap
35. Rubber cap
36. Throttle cable retainer
37. Screw

## REMOVAL

Remove air silencer box, fuel inlet line and primer line. Unscrew carburetor cover then pull out throttle slide ass'y from carburetor.

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

Disconnect throttle cable ass'y from carburetor, hand-lebar and as necessary, oil injection pump.

Untighten rubber flange clamp then remove carburetor from engine.

## CLEANING & INSPECTION

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

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.

Check throttle slide for wear. Replace as necessary.

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

## DISASSEMBLY & ASSEMBLY

**NOTE:** To ease the Mikuni carburetor disassembly and assembly procedures it is recommended to use a special tool kit available under P/N 404 1120 00.



A000001087

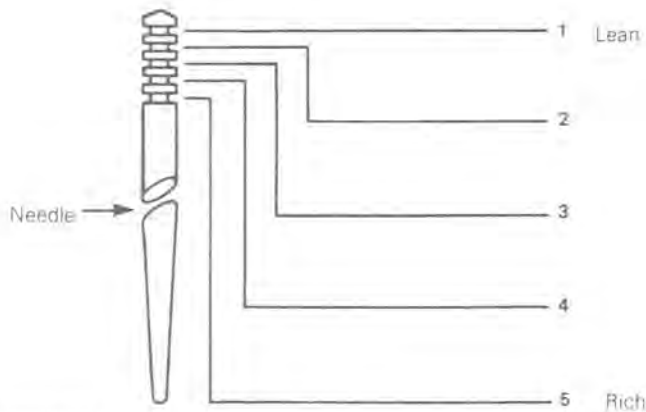
### 4,5, Needle, circlip

The position of the needle in the throttle slide is adjustable by means of an E-clip inserted into one 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 position of the clip from the top of the needle.

Example:

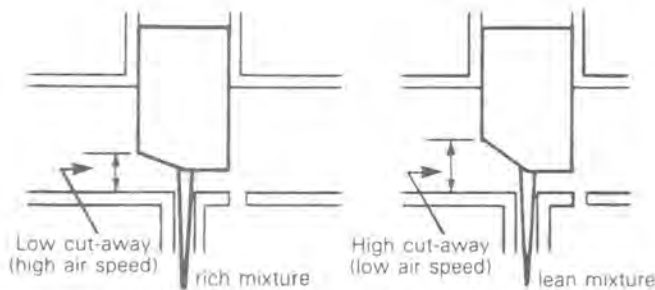
Needle identification 6DH4-3 Position of the E-clip from top



A000001088

## 7, Throttle slide

The size of the throttle slide cut-away affects the fuel mixture between 1/8 to 1/2 throttle opening. A certain amount of richness is needed for that particular range because this is where the transition from the low speed to the high speed circuit takes place.



A000002001

## 24, Main jet

The main jet installed in the carburetor is suitable for a wide range of temperature (-30° to 5°C/-20° to 40°F) at sea level. However, different jetting is available. Always check spark plug tip color to find out correct jetting.

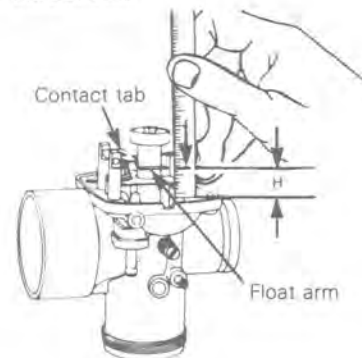
## MIKUNI CARBURETOR FLOAT LEVEL ADJUSTMENT

### 11,12, Float arm pin & float arm

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

- Remove float chamber and gasket from carburetor.
- With carburetor chamber upside-down, measure height "H" between float chamber flange rib and top edge of float arm.

Ex.: VM 36 carburetor



A000002002

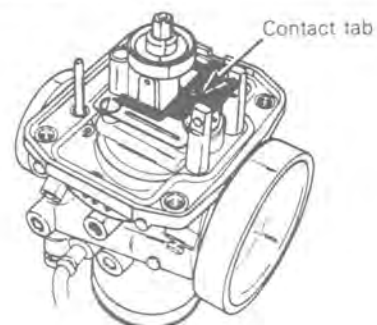
Float arm height dimensions:

CARBURETOR DIMENSION	VM 28	VM 34	VM 40
H (inch)	.59 ≈ .66	.86 ≈ .94	.67 ≈ .75
(mm)	15 ≈ 17	22 ≈ 24	17 ≈ 19

NOTE: As a general rule, the float arm must be parallel with the flange rib.

To adjust height "H":

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



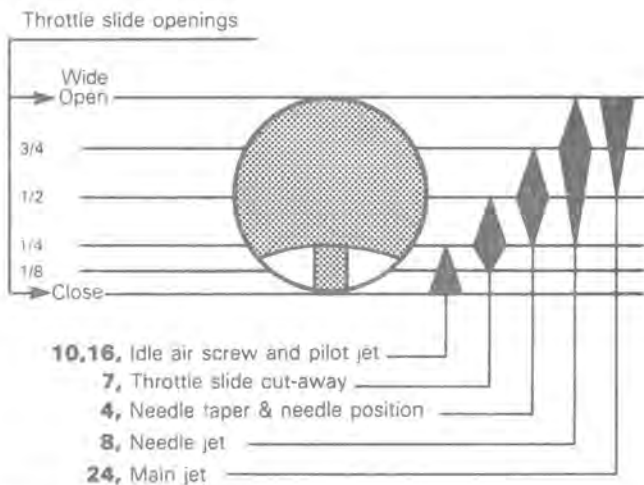
A000002003



## Section 02 ENGINE

### Sub-section 11 (CARBURETOR & FUEL PUMP)

The illustration below shows which part of the carburetor begins to function at different throttle slide openings.



A000002004

NOTE: For fine tuning refer to section 09, "Technical data" and to section 04-03, "Spark plug".

NOTE: For high altitude regions, the "High Altitude Technical Data" booklet (P/N 480 1208 00) gives information about the carburetor tuning according to altitude.

## INSTALLATION

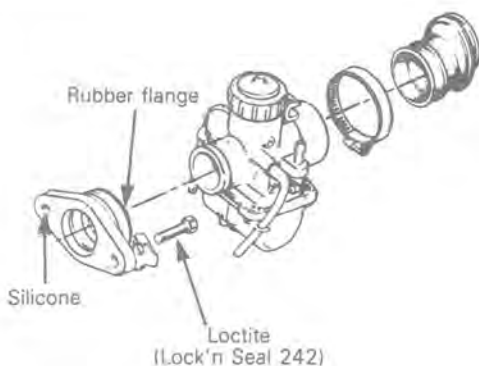
To install carburetor on engine, inverse removal procedure.

However, pay attention to the following:

Inspect throttle cable and housing prior to installation.

Apply a thin layer of silicone sealant between carburetor rubber flange and intake cover on engine.

Apply Loctite Lock'n Seal 242 on bolts retaining flange to intake cover.

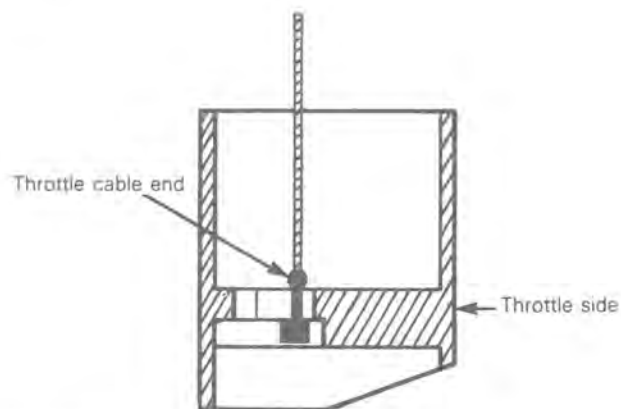


A000002005

On all models except Elan, Alpine, Formula MX/Plus, make sure to insert tab into the notch to assemble the carburetor adaptor with the engine, or the carburetor or the air silencer.

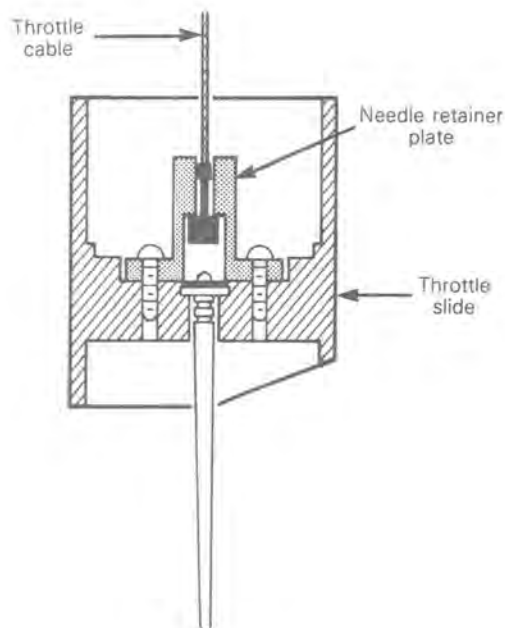
**CAUTION:** The rubber flange must be checked for cracks and/or damage. At assembly, the flange must be perfectly matched with the air intake manifold or severe engine damage will occur.

When installing throttle cable end in throttle slide, hook up cable by using the stopper at the extremity of the cable.



A000002006

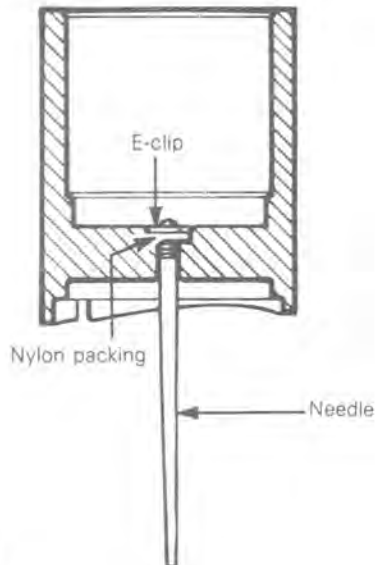
Some carburetors are equipped with a center post retaining device. On this system the throttle cable is hooked into the needle retainer plate.



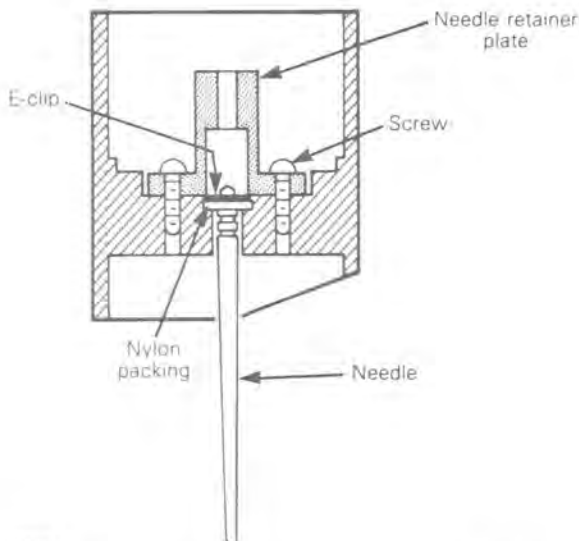
A000002007



#### 4,6, Needle, nylon packing



A000002008



A000002009

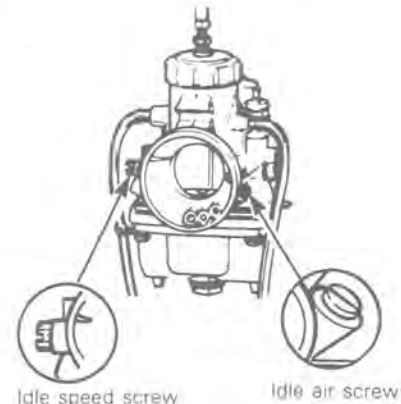
Make sure the nylon packing is installed on all applicable throttle slides.

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

○ **NOTE:** With carburetors equipped with the center post retaining device, remove the needle retainer plate (remove both screws) to withdraw the needle.

## CARBURETOR ADJUSTMENTS

(TYPICAL)



A000002010

### 16, Air screw adjustment

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

(Refer to section 09 "Technical data" for the specifications).

### 7, Throttle slide adjustment

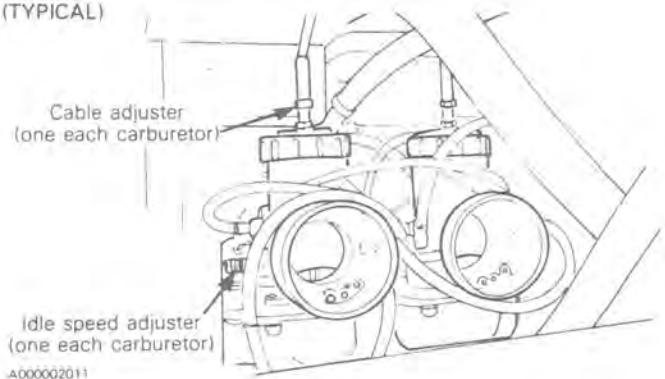
◆ **WARNING:** Ensure the engine is turned **OFF**, prior to the throttle slide adjustment.

For maximum performance, correct carburetor throttle slide adjustment is critical.

The following method should be used with engine turned off:

- Remove the air intake silencer.
- Back off the idle speed screw completely.

(TYPICAL)



A000002011

Turn the idle-speed screw clockwise until it contacts the throttle slide then continue turning two (2) additional turns. On twin carburetor models, repeat on the other one. This will ensure identical throttle slide idle setting.

## Section 02 ENGINE

### Sub-section 11 (CARBURETOR & FUEL PUMP)

Tighten carburetor cover with the throttle cable adjuster jam nut unlocked, press the throttle lever against the handle grip.

All models except Citation LS/LSE, Tundra, Tundra LT

By turning the cable adjuster, adjust the carburetor slide cut away so that it is flush with the top of the carburetor outlet bore.

#### Citation LS/LSE, Tundra, Tundra LT:

Throttle slide cut-away must be 1.5 mm (1/16") lower than the top of carburetor outlet bore.

Tighten the cable adjuster jam nut.

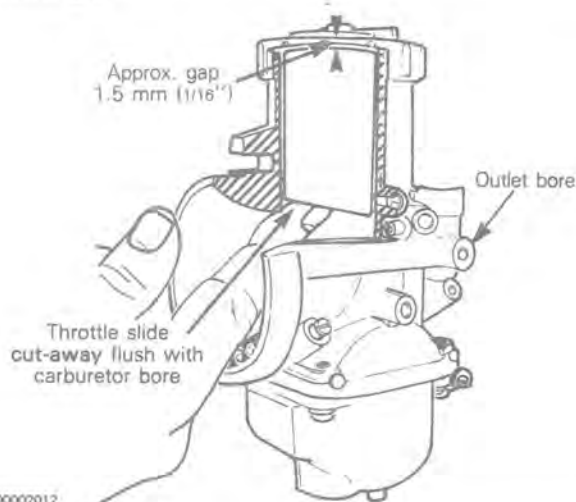
Repeat for the other carburetor.

▼ **CAUTION:** On twin carburetor models, make sure both carburetors start to operate simultaneously.

◆ **WARNING:** It is important that the throttle slide adjustment be performed to ensure proper functioning of throttle mechanism.

▼ **CAUTION:** On twin carburetor models with rotary valve (Formula MX, Formula Plus) do not interchange carburetors, the jetting is different on each side.

Once carburetor adjustment is performed, check that with the throttle lever fully depressed, there is a free play of 1/16") between the cover(s) and throttle slide. Readjust accordingly.



A000002012

◆ **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.

Recheck carburetor synchronization.

▼ **CAUTION:** On oil injection models, the oil injection pump adjustment must be checked each time carburetor is adjusted.

#### 19, Idle speed final adjustment

Back off idle speed screw then turn clockwise until it contacts the throttle slide then continue turning two (2) additional turns.

This will provide a preliminary idle speed setting. Start engine and allow it to warm then adjust idle speed to specifications by turning idle speed screw clockwise or counterclockwise.

(Refer to section 09 "Technical data" for the specifications).

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

**MIKUNI FUEL PUMP**

FIG. (A)  
Single outlet pump

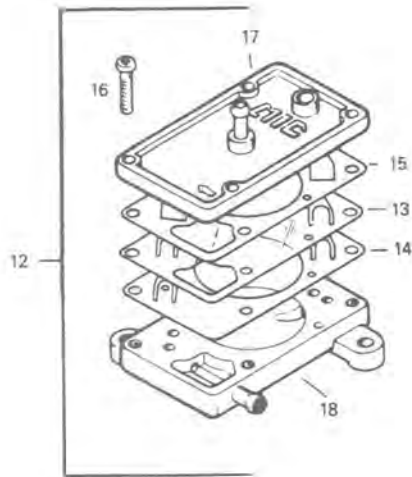
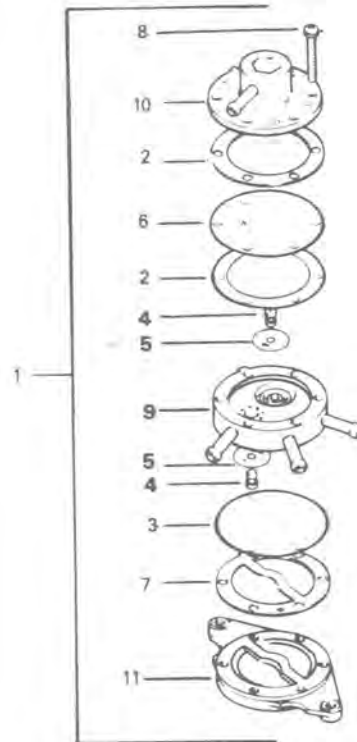


FIG. (B)  
Twin outlet pump



## Section 02 ENGINE

### Sub-section 11 (CARBURETOR & FUEL PUMP)

1. Fuel pump assembly
2. Packing
3. Diaphragm
4. Grommet
5. Valve
6. Diaphragm
7. Packing (cap)
8. Screw
9. Pump body

10. Pulse chamber
11. Cover
12. Fuel pump assembly
13. Diaphragm
14. Membrane
15. Packing (cap)
16. Screw
17. Cover
18. Pulse chamber

## REMOVAL

- Disconnect fuel inlet line at fuel pump then secure fuel line to steering support so that the open end is located higher than the fuel tank.
- Disconnect fuel outlet line(s).
- Disconnect pulsation line.
- Remove screws (or nuts if applicable) securing fuel pump.

FIG. (A)

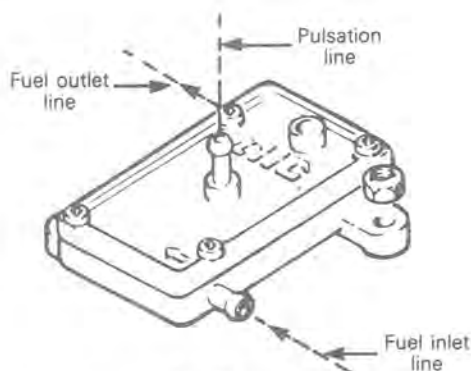
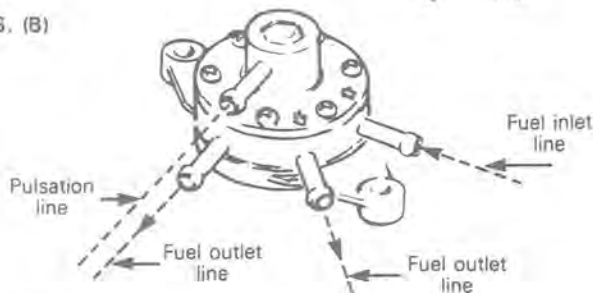


FIG. (B)



A000002013

## DISASSEMBLY & ASSEMBLY

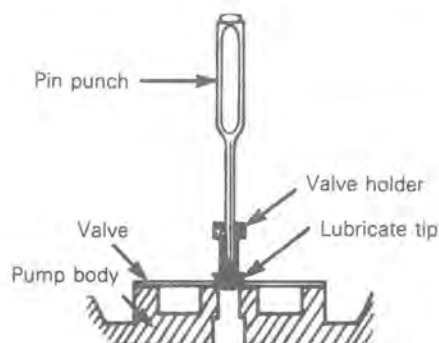
4,5,9, Grommet, valve, pump body  
(twin outlet pump only)

Do not disassemble valve unless replacement is indicated.

To install a new valve, proceed as follows:

- Place new valve flat on its seat.

- Insert a 3/32" pin punch inside valve holder and lubricate tip of holder with a drop of oil.
- Push holder into pump body as illustrated.



A000002016

## CLEANING & 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 or imperfections. Replace as needed.

Check fuel pump valves operation as follows:

Connect a length of clean plastic tubing to the inlet nipple and alternately apply pressure and vacuum with the mouth. 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 release under vacuum.

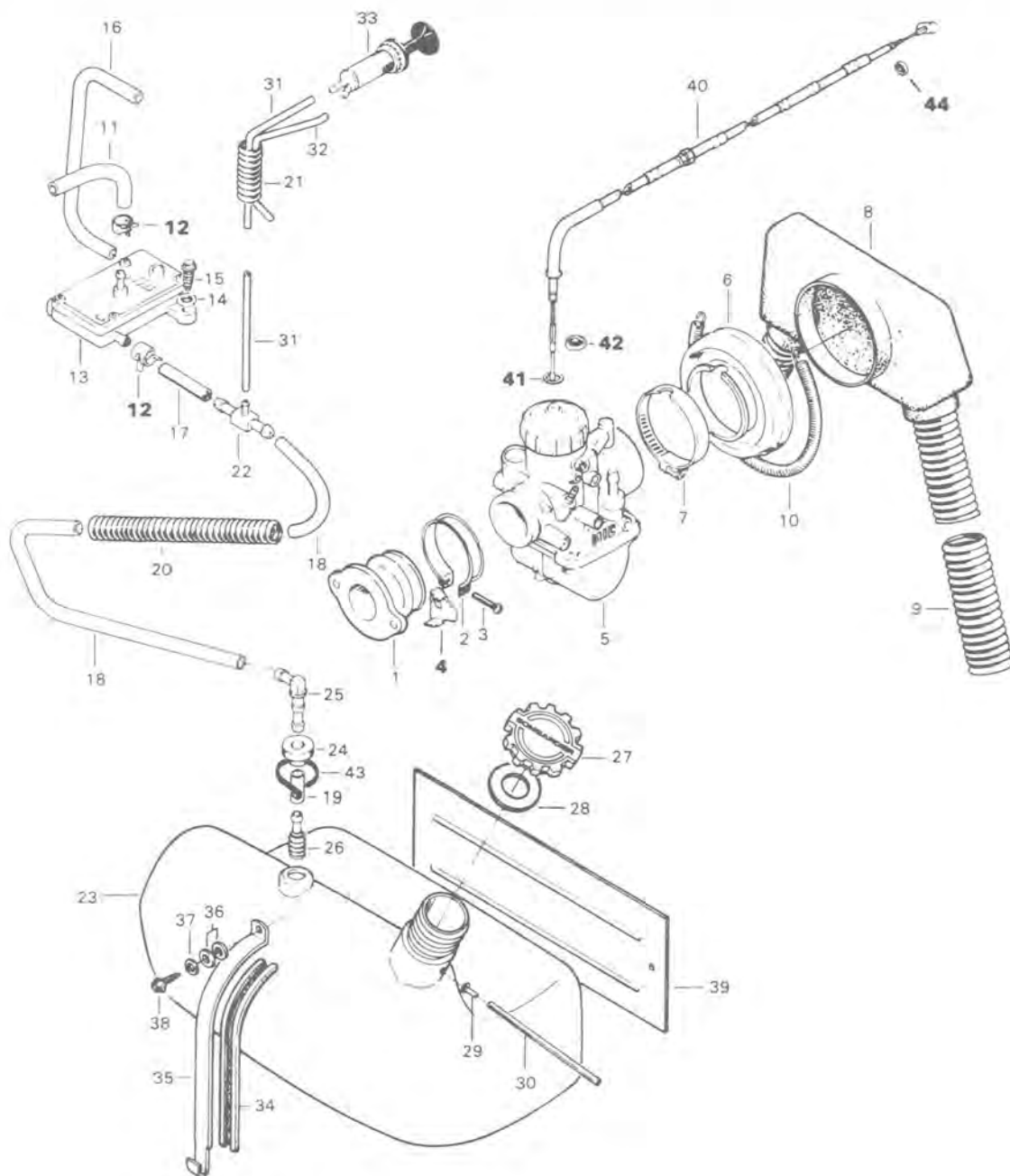
**NOTE:** On model fitted with two outlets, plug one outlet with finger while checking outlet valve.

## INSTALLATION

To install, inverse removal procedure.

# AIR INTAKE SILENCER & FUEL TANK

ELAN



## Section 02 ENGINE

### Sub-section 12 (AIR INTAKE SILENCER & FUEL TANK)

1. Carburetor adaptor
2. Clamp
3. Screw
4. Tab lock (2)
5. Carburetor VM28-242
6. Adaptor
7. Clamp
8. Air intake box
9. Tube (2)
10. Spring
11. Impulse hose 7 1/4" (184 mm)
12. Spring clip (2)
13. Fuel pump
14. Internal tooth lock washer 1/4" (2)
15. Hexagonal washer head metal screw 12 x 3/4" (2)
16. Fuel line 17" (332 mm)
17. Fuel line 1 1/2" (38 mm)
18. Fuel line 36 1/2" (927 mm)
19. Fuel line 14" (356 mm)
20. Isolating line 29 1/2" (750 mm)
21. Isolating line 4" (102 mm)
22. Tee
23. Fuel tank
24. Grommet
25. Male connector
26. Fuel filter
27. Fuel tank cap
28. Gasket
29. Air vent fitting
30. Air vent tube 27" (586 mm)
31. Primer tube 18 1/2" (470 mm)
32. Primer tube 7" (178 mm)
33. Primer valve
34. Protector strip 9" (229 mm)
35. Retainer strip
36. Rubber spacer (2)
37. Flat washer 7/32" x 5/8" x .060"
38. Hexagonal washer head self tapping screw 12 x 1"
39. Heat shield
40. Throttle cable & housing
41. O-ring
42. Retaining ring
43. Tie wrap
44. Circlip

#### 4, Tab lock

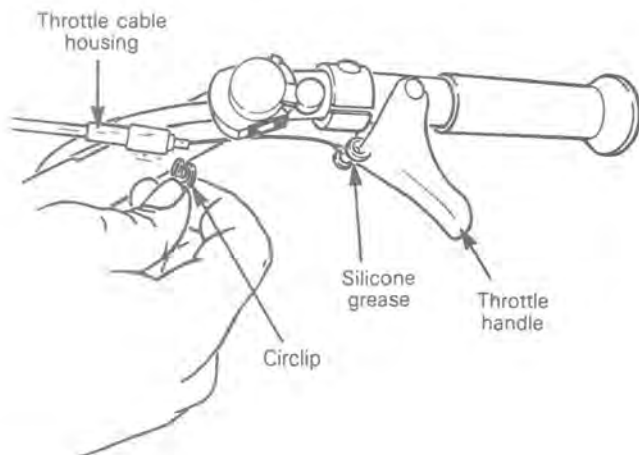
Always bend tab lock over screws and replace if worn.

#### 12, Spring clips

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

#### 44, Circlip

Put silicone grease (P/N 413 7017 00) around cable barrel. Locate circlip as per illustration.

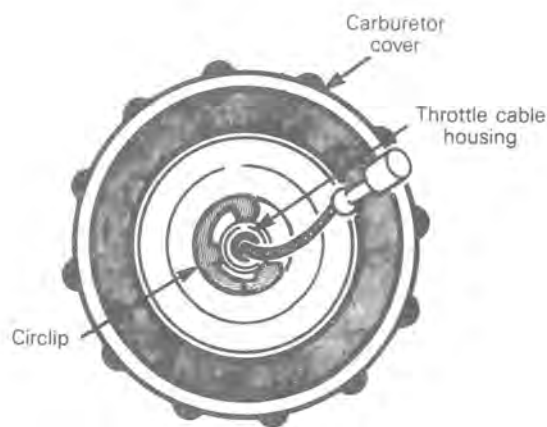


A002002012

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

#### 41,42, O-ring & retaining ring

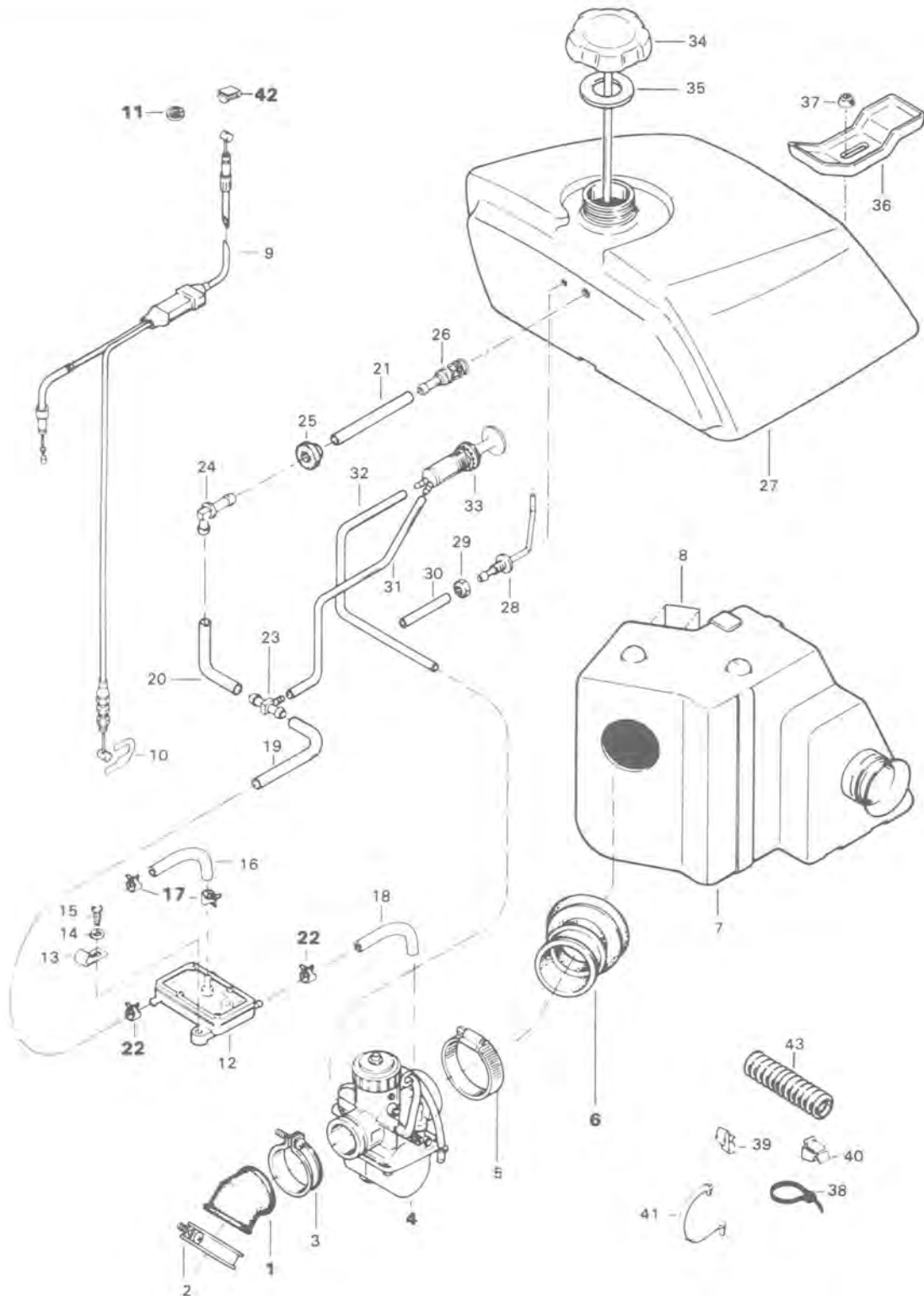
Locate O-ring outside of carburetor cover and retaining ring inside.



A002002013

**Section 02 ENGINE**  
Sub-section 12 (AIR INTAKE SILENCER & FUEL TANK)

**CITATION LS, LSE, TUNDRA, TUNDRA LT**





## Section 02 ENGINE

### Sub-section 12 (AIR INTAKE SILENCER & FUEL TANK)

1. Rubber flange
2. Collar
3. Clamp
4. Carburetor VM 34-319
5. Clamp
6. Intake adaptor
7. Air silencer
8. Warning label
9. Throttle cable & housing
10. Tab lock
11. Circlip
12. Fuel pump
13. Clip (2)
14. Internal tooth lock washer 1/4" (2)
15. Hexagonal washer head self-tapping screw 1/2" x 3/4" (2)
16. Impulse hose 9" (228 mm)
17. Spring clip (2)
18. Fuel line 15" (380 mm)
19. Fuel line 9.5" (241 mm)
20. Fuel line 18" (457 mm)
21. Fuel line 14" (356 mm)
22. Spring clip
23. Tee
24. Male connector
25. Grommet
26. Fuel filter
27. Fuel tank
28. Air vent fitting
29. Hexagonal nut 5/16"-18
30. Air vent tube 55" (1398 mm)
31. Primer tube 16" (406 mm)
32. Primer tube 19" (483 mm)
33. Primer valve
34. Fuel tank cap
35. Gasket
36. Retainer (2)
37. Hexagonal flanged elastic stop nut 6 mm (4)
38. Tie rap
39. Clip
40. Clip
41. Cable clip
42. Retainer
43. Tubing

#### 17,22, Spring clips

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

#### 1,4,6, Rubber flange, carburetor & intake adaptor

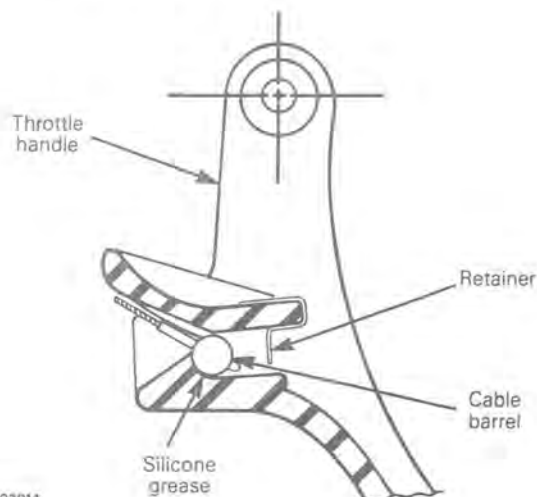
Always insert engine and carburetor tabs into rubber flange notches.

▼ **CAUTION:** Disregarding indexation might cause severe engine damage.

#### 42, Retainer

Put silicone grease (P/N 413 7017 00) around cable barrel.

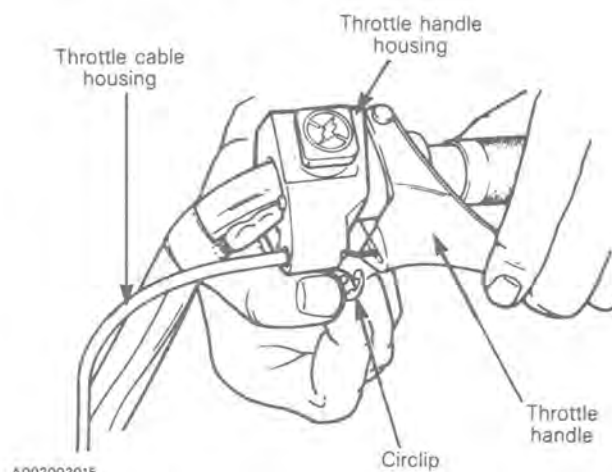
The retainer must be pushed on the throttle handle tab until it sits properly.



A002002014

#### 11, Circlip

Locate as per illustration.



A002002015

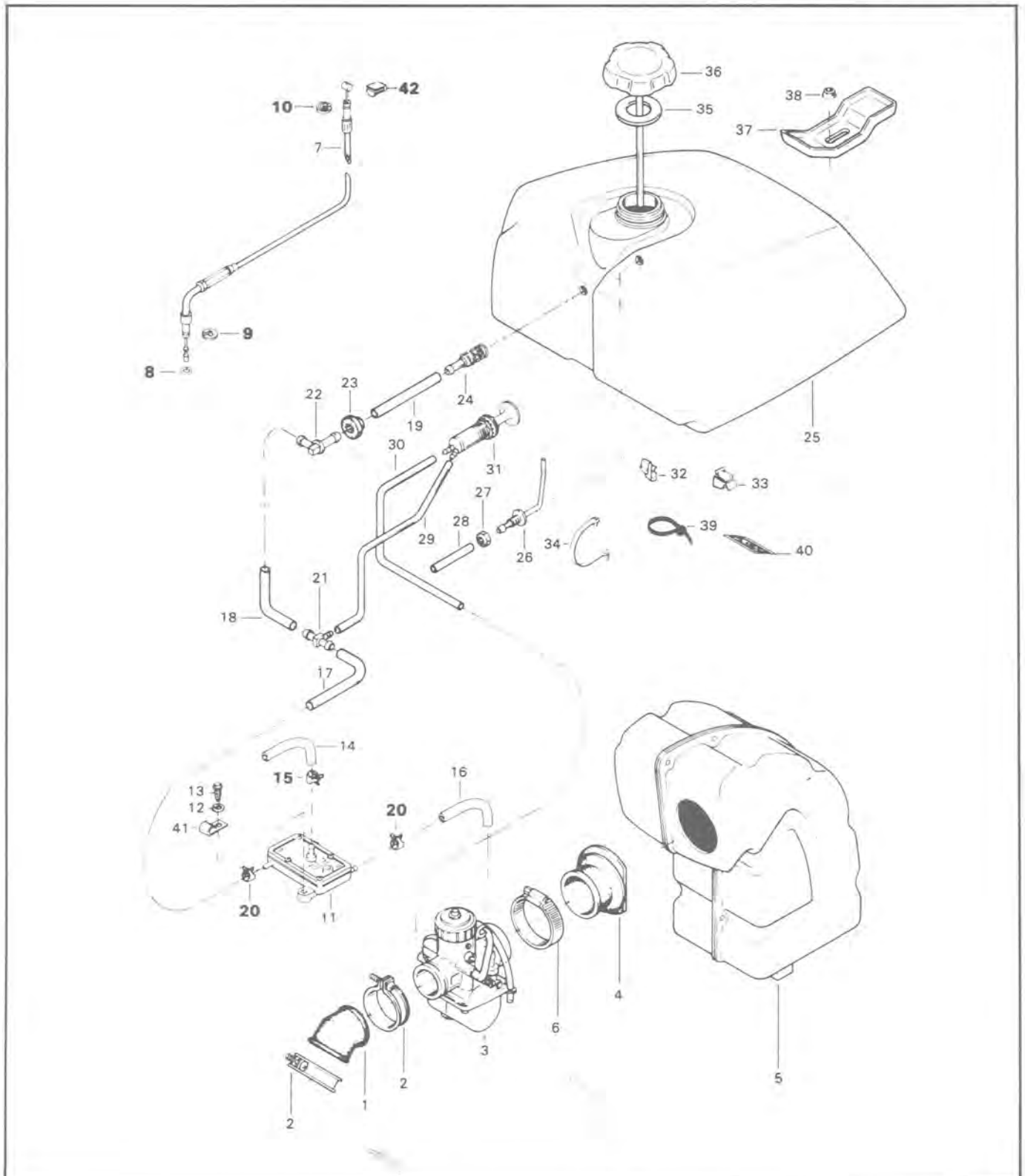
◆ **WARNING:** If this procedure is disregarded, throttle might be half-open at normally closed position and the engine will speed up when starting.



## Section 02 ENGINE

### Sub-section 12 (AIR INTAKE SILENCER & FUEL TANK)

#### SKANDIC, SKANDIC-R



## Section 02 ENGINE

### Sub-section 12 (AIR INTAKE SILENCER & FUEL TANK)

1. Rubber flange
2. Clamp (2)
3. Carburetor VM 34-276
4. Adaptor
5. Air silencer
6. Clamp
7. Throttle cable & housing
8. O-ring
9. Retaining ring
10. Circlip
11. Fuel pump
12. Internal tooth lock washer 1/4" (2)
13. Hexagonal washer head self-tapping screw M6 x 1 x 20 (2)
14. Impulse hose 11" (280 mm)
15. Spring clip
16. Fuel line 20" (508 mm)
17. Fuel line 20" (508 mm)
18. Fuel line 15" (380 mm)
19. Fuel line 14" (356 mm)
20. Spring clip (2)
21. Tee

22. Male connector
23. Grommet
24. Fuel filter
25. Fuel tank
26. Air vent fitting
27. Hexagonal nut 5/16"-18
28. Air vent tube
29. Primer tube 7" (178 mm)
30. Primer tube 20" (508 mm)
31. Primer valve
32. Clip
33. Clip
34. Cable clip
35. Gasket
36. Cap
37. Retainer
38. Hexagonal flanged elastic stop nut 6 mm (2)
39. Tie rap
40. Warning label
41. Clip
42. Retainer

#### 15,20, Spring clips

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

#### 1,3,4, Rubber flange, carburetor & adaptor

Always insert engine tab into rubber flange notch.

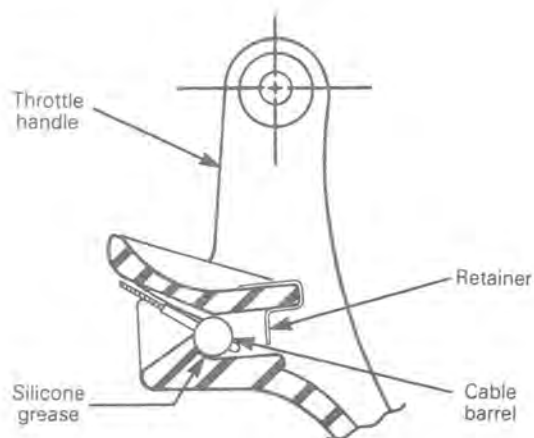
Always install air intake adaptor in such away that its flat edge will be vertical and located at the left hand side.

**CAUTION:** Disregarding indexation might cause severe engine damage.

#### 42, Retainer

Put silicone grease (P/N 413 7017 00) around cable barrel.

The retainer must be pushed on the throttle handle tab until it sits properly.

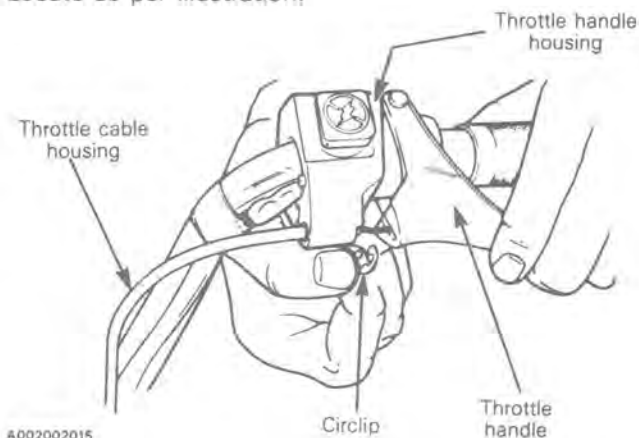


A002002014

02-12-6

#### 10, Circlip

Locate as per illustration:

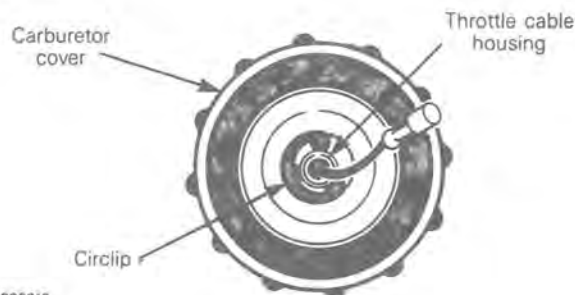


A002002015

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

#### 8,9, O-ring & retaining ring

Locate O-ring outside of carburetor cover and retaining ring inside.

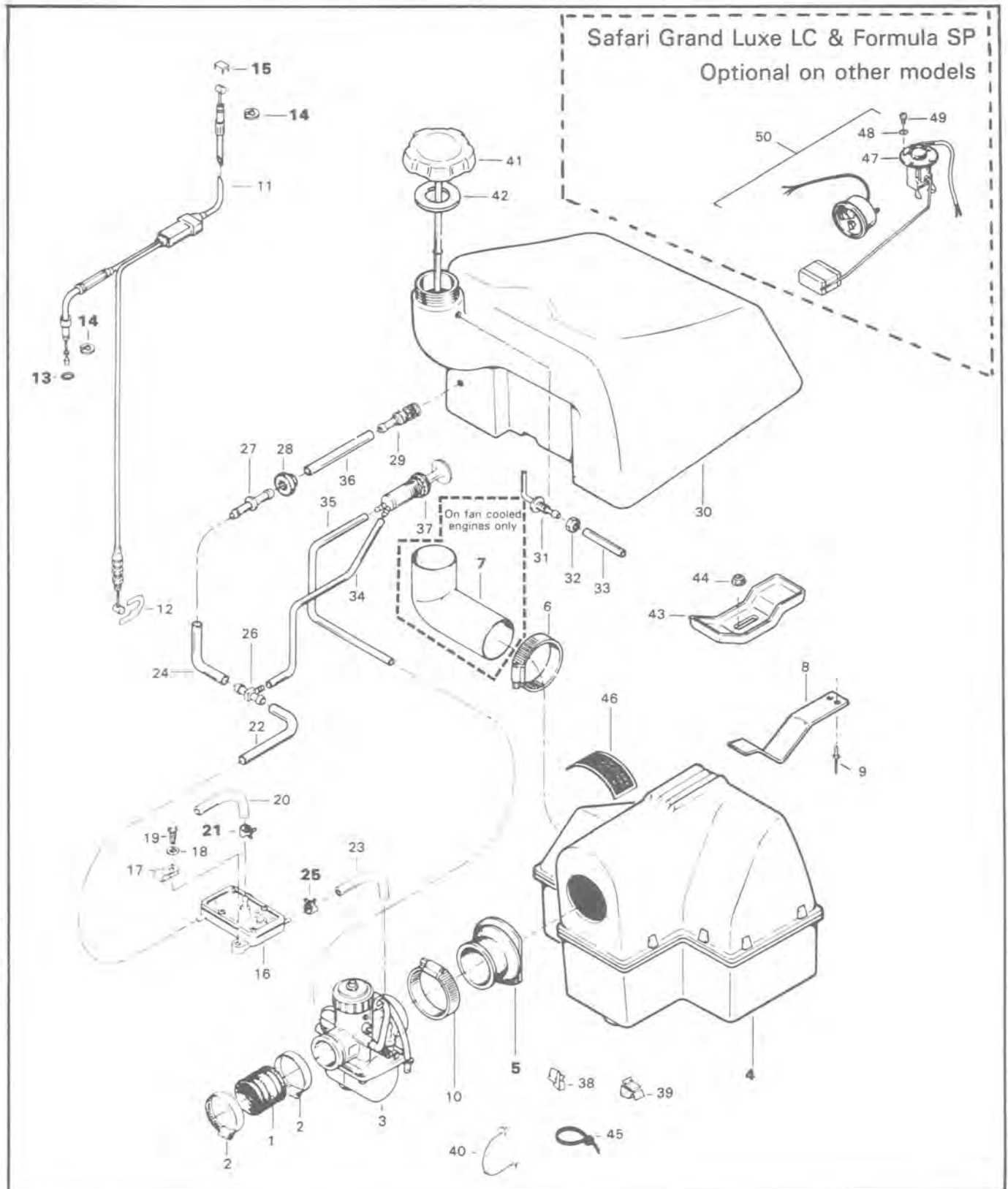


A002002013

## Section 02 ENGINE

### Sub-section 12 (AIR INTAKE SILENCER & FUEL TANK)

#### SAFARI 377,377E,447, GRAND LUXE LC & FORMULA SP



## Section 02 ENGINE

### Sub-section 12 (AIR INTAKE SILENCER & FUEL TANK)

1. Rubber flange
2. Clamp (2)
3. Carburetor
4. Air silencer
5. Adaptor
6. Clamp
7. Elbow
8. Air silencer support
9. Rivet (2)
10. Clamp
11. Throttle cable & housing
12. Tab lock
13. O-ring
14. Circlip
15. Tab lock
16. Fuel pump
17. Clip
18. Internal tooth lock washer 1/4" (2)
19. Hexagonal washer head self-tapping screw 12 x 3/4" (2)
20. Impulse hose
21. Spring clip (2)
22. Fuel line
23. Fuel line
24. Fuel line 6.5" (177 mm)
25. Spring clip
26. Tee
27. Male connector
28. Grommet
29. Fuel filter
30. Fuel tank
31. Air vent fitting
32. Hexagonal nut 5/16"-18
33. Air vent tube 65" (1665 mm)
34. Primer tube 7.0" (177 mm)
35. Primer tube 16.5" (419 mm)
36. Fuel line 17"
37. Primer valve
38. Clip
39. Clip
40. Cable clip
41. Cap
42. Gasket
43. Retainer (2)
44. Hexagonal flanged elastic stop nut 6 mm (4)
45. Tie rap
46. Warning label
47. Fuel level sensor
48. External tooth lock washer 5 mm (5)
49. Cylindrical Phillips head screw M5 x 14 (5)
50. Fuel level sensor kit with dial indicator

#### 21,25, Spring clips

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

#### 7, Elbow

The air box elbow must be maintain upward in any condition on fan cooled engines only.

#### 4,5, Air silencer, adaptor

Always insert tab of adaptor into notch of air silencer.

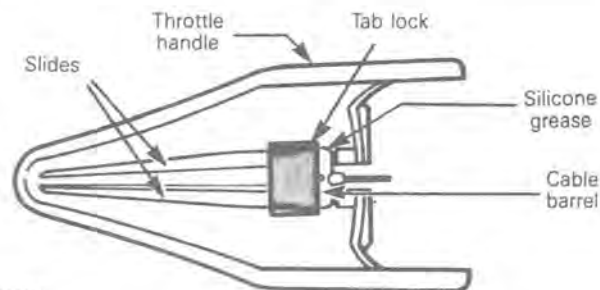


**CAUTION:** Disregarding indexation might cause severe engine damage.

#### 15, Tab lock

Put silicone grease (P/N 413 7017 00) around cable barrel.

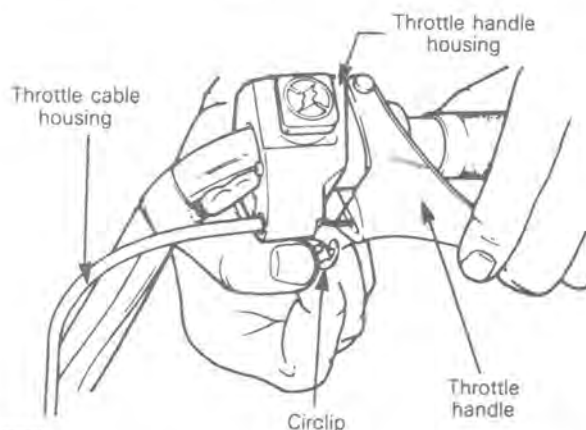
The tab lock must be pushed on the throttle handle slides until it blocks the cable barrel opening of the throttle handle.



A002002015

#### 14, Circlip

Locate as per illustration.

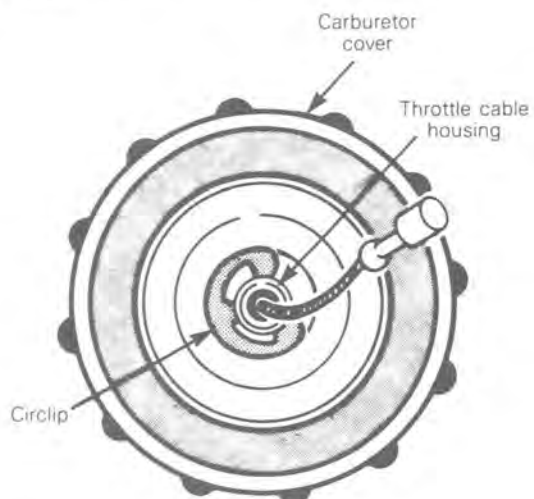


A002002015

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

### 13,14, O-ring & retaining ring

Locate O-ring outside of carburetor cover and retaining ring inside.

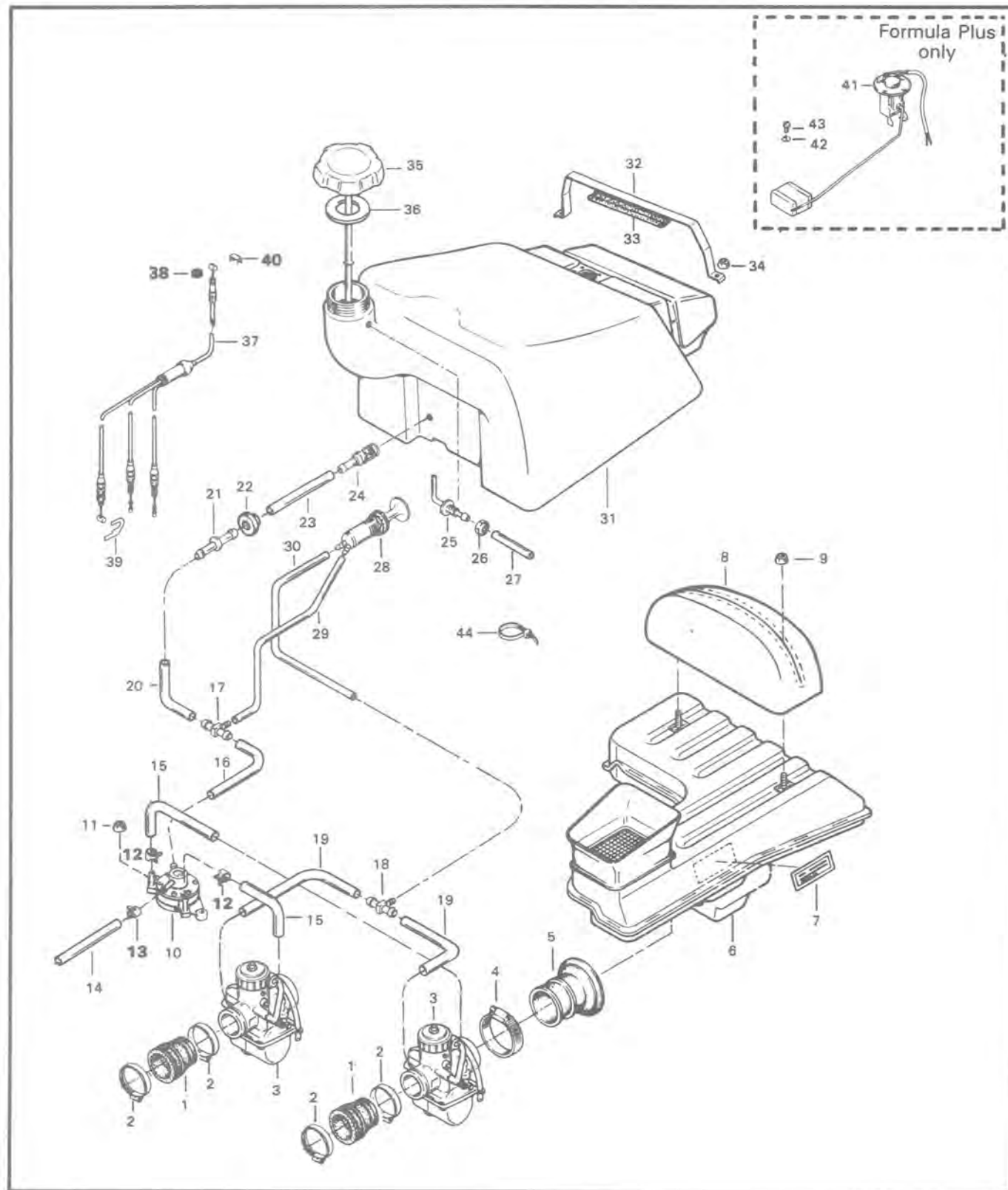


A002002012

## Section 02 ENGINE

### Sub-section 12 (AIR INTAKE SILENCER & FUEL TANK)

#### FORMULA MX, FORMULA PLUS



## Section 02 ENGINE

### Sub-section 12 (AIR INTAKE SILENCER & FUEL TANK)

1. Rubber flange (2)
2. Clamp (4)
3. Carburetor (2)
4. Clamp (2)
5. Intake adaptor (2)
6. Air silencer
7. Warning label
8. Tool bag
9. Hexagonal flanged elastic stop nut M5 (2)
10. Fuel pump
11. Hexagonal flanged elastic stop nut M6 (2)
12. Spring clip (4)
13. Spring clip (2)
14. Impulse hose 11'' (279 mm)
15. Fuel line 13'' (330 mm) (2)
16. Fuel line 10'' (254 mm)
17. Tee
18. Tee
19. Fuel line 5'' (127 mm) (2)
20. Fuel line 5'' (127 mm)
21. Male connector
22. Grommet
23. Fuel line 12'' (304 mm)
24. Fuel filter
25. Air vent fitting
26. Hexagonal nut 5/16-18
27. Air vent tube 70'' (1778 mm)
28. Primer valve
29. Fuel line 12''
30. Fuel line 24''
31. Fuel tank
32. Fuel tank bracket
33. Protector strip 15''
34. Flanged hexagonal elastic stop nut (2)
35. Cap
36. Gasket
37. Throttle cable & housing
38. Circlip
39. Oil pump clip
40. Tab lock
41. Fuel level sensor
42. External tooth lock washer 5 mm (5)
43. Cylindrical Phillips head screw M5 x 14 (5)
44. Tie rap

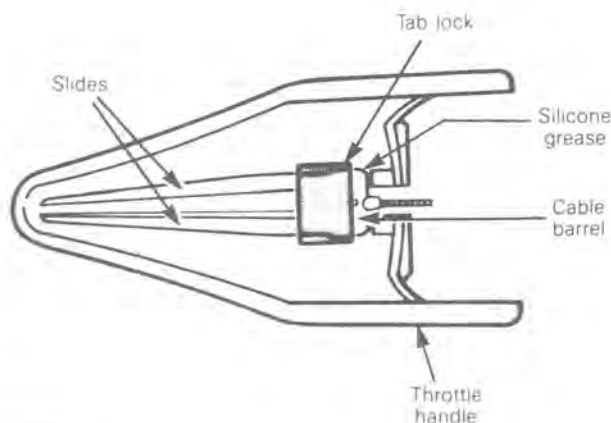
#### 12,13, Spring clips

Always reposition spring clips after any repair to prevent leaks.

#### 40, Tab lock

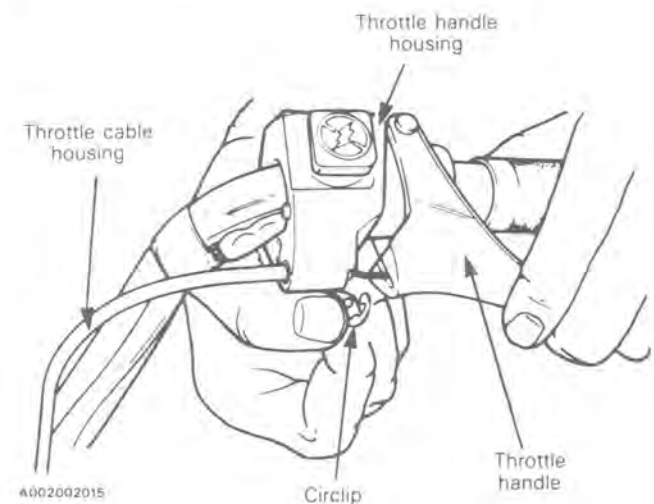
Put silicone grease (P/N 413 7017 00) around cable barrel.

The tab lock must be pushed on the throttle handle slides until it blocks the cable barrel opening of the throttle handle.



#### 38, Circlip

Locate as per illustration.

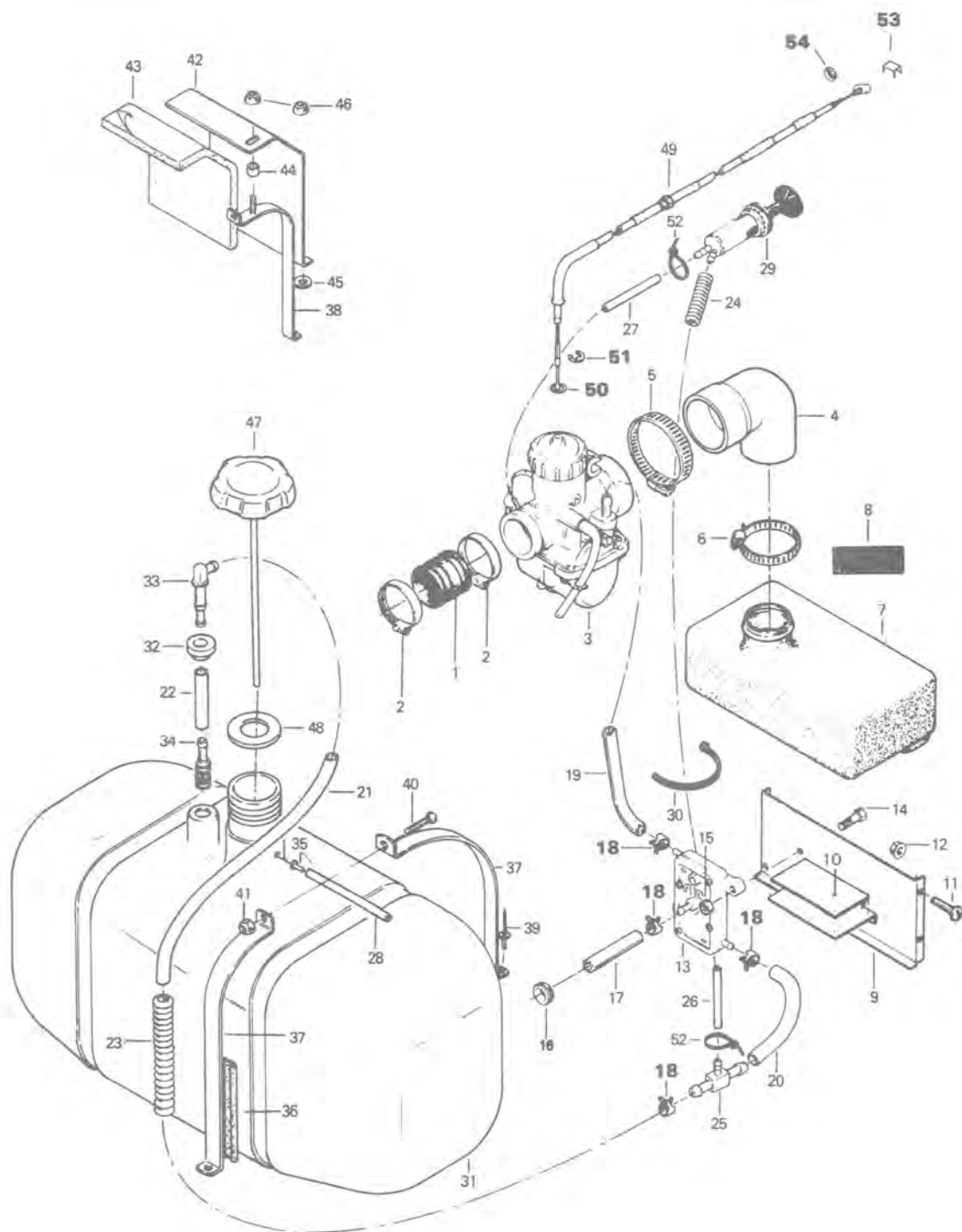


**WARNING:** If this procedure is disregarded, throttle might be half-open at normally closed position and the engine will speed up when starting.

## Section 02 ENGINE

### Sub-section 12 (AIR INTAKE SILENCER & FUEL TANK)

#### ALPINE



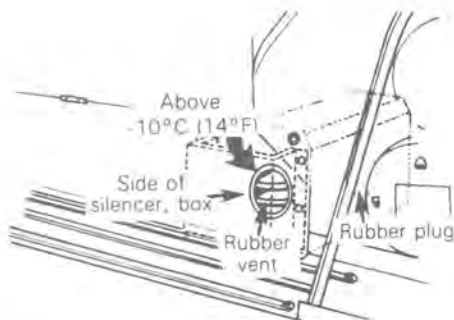


1. Carburetor adaptor
2. Clamp (2)
3. Carburetor VM34-297
4. Air intake elbow
5. Gear clamp
6. Hose clamp
7. Air intake
8. Warning label
9. Baffle
10. Foam for baffle
11. Pan slotted head machine screw 1/4"-20 x 3/4" (4)
12. Hexagonal flanged elastic stop nut 1/4"-20 (4)
13. Fuel pump
14. Hexagonal head cap screw 1/4"-20 x 3/4" (2)
15. Hexagonal elastic stop nut 1/4"-20 (2)
16. Grommet
17. Impulse hose 16" (407 mm)
18. Spring clip (4)
19. Fuel line 26" (661 mm)
20. Fuel line 15" (381 mm)
21. Fuel line 49 5" (1258 mm)
22. Fuel line 17" (432 mm)
23. Isolating line 34" (864 mm)
24. Isolating line 10" (254 mm)
25. Tee (primer valve)
26. Primer tube 22" (559 mm)
27. Primer tube 14" (356 mm)
28. Air vent tube 57.5" (1461 mm)
29. Primer valve
30. Tie wrap
31. Fuel tank
32. Grommet
33. Male connector
34. Fuel filter
35. Air vent fitting
36. Protector strip 4 x 9" (229 mm)
37. Retainer strip (3)
38. Retainer strip
39. Rivet (4)
40. Round slotted head machine screw 10-24 x 3" (2)
41. Hexagonal elastic stop nut 10-24 (2)
42. Tank deflector
43. Foam
44. Rubber spacer
45. Rubber washer (2)
46. Hexagonal flanged elastic stop nut 1/4"-20 (3)
47. Fuel tank cap
48. Gasket
49. Throttle cable & housing
50. O-ring
51. Retainer ring
52. Tie rap
53. Tab lock
54. Circlip

#### 18, Spring clips

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

When operating the vehicle in temperature exceeding -10°C (14°F), the rubber plug must block the engine side orifice and the rubber vent must be positioned on the side of the silencer box to allow cold air circulation.



A017002009

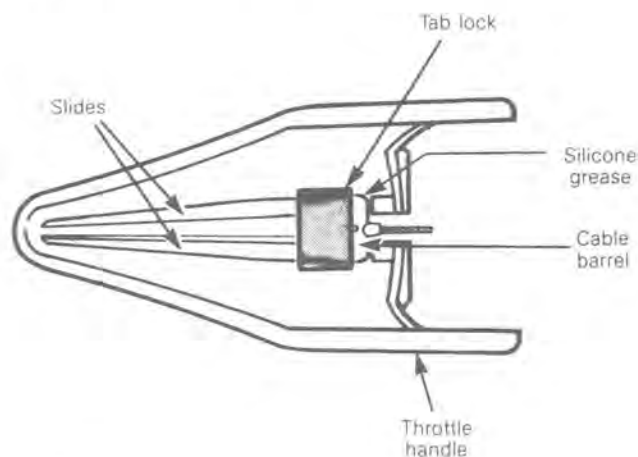
In temperature below -10°C (14°F) and/or powder snow, the rubber plug must block the entry of fresh air on the side of the silencer box and the rubber vent must allow the warm air being emitted from the engine to be directed over the carburetor.

**CAUTION:** Observe temperature changes and locate plugs accordingly. Incorrect location of plugs may cause carburetor ice-up or engine overheating.

#### 53, Tab lock

Put silicone grease (P/N 413 7017 00) around cable barrel.

The tab lock must be pushed on the throttle handle slides until it blocks the cable barrel opening of the throttle handle.



A002002016

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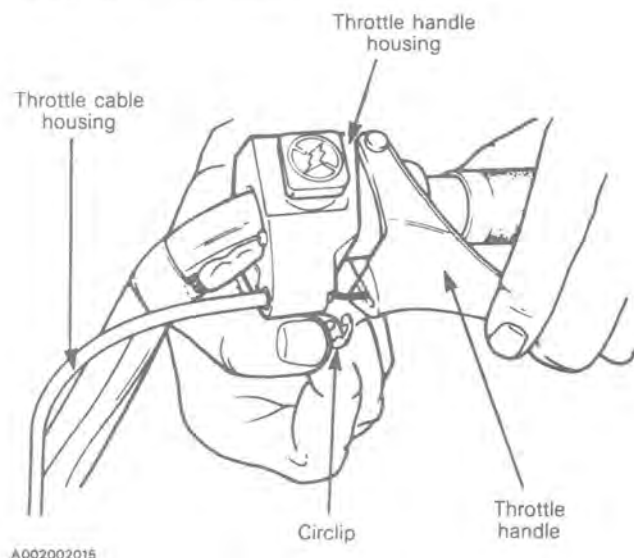
## Section 02 ENGINE

### Sub-section 12 (AIR INTAKE SILENCER & FUEL TANK)

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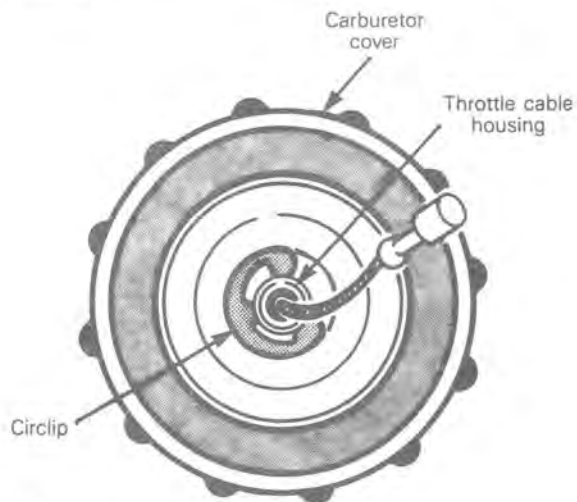
#### 54, Circlip

Locate as per illustration.



#### 50,51, O-ring & retaining ring

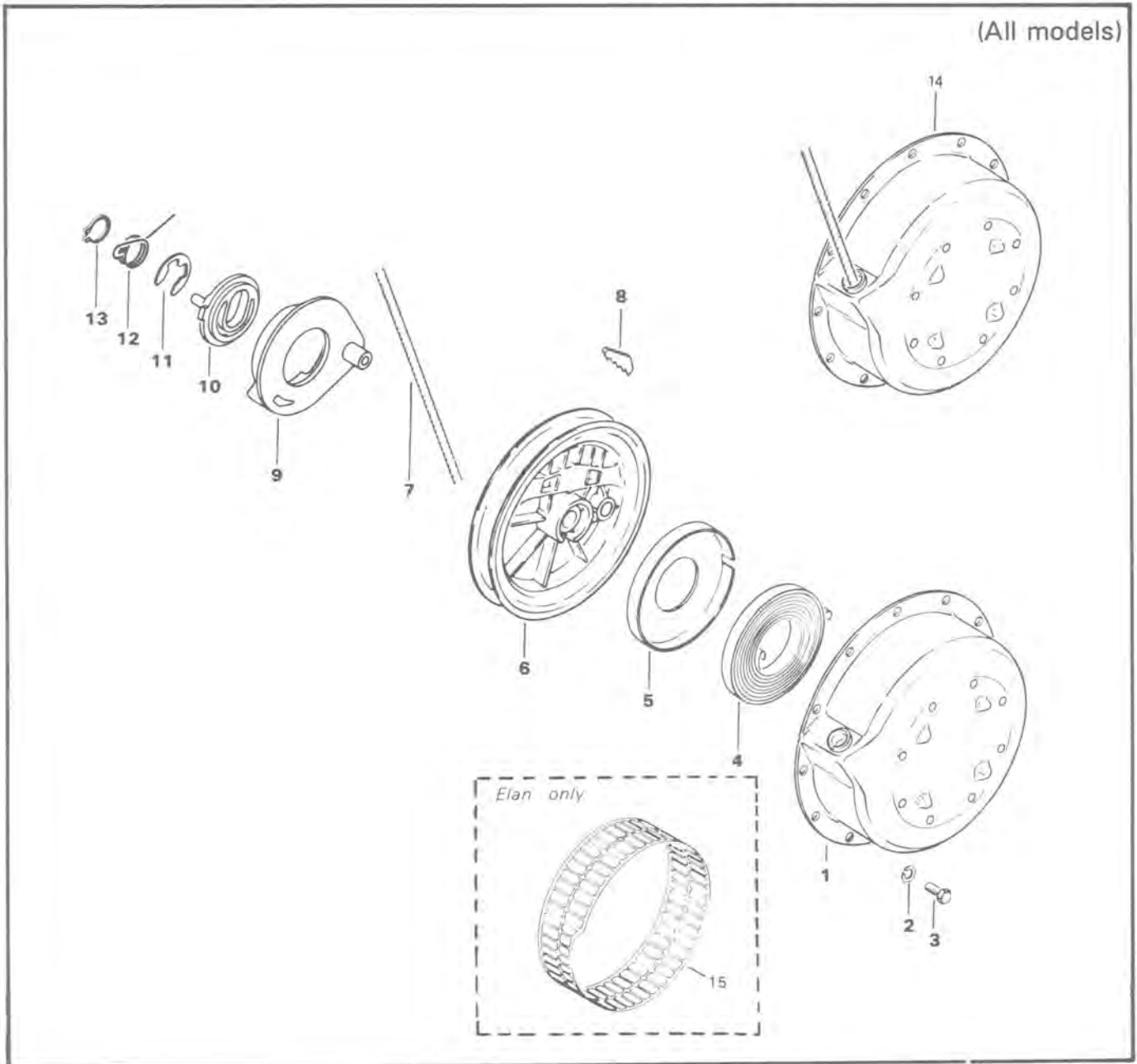
Locate O-ring outside of carburetor cover and retaining ring inside.



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

## REWIND STARTER

(All models)



- 1. Starter housing
- 2. Lock washer
- 3. Screw M6 x 14
- 4. Rewind spring
- 5. Spring guide
- 6. Rope sheave
- 7. Starter rope
- 8. Key

- 9. Pawl
- 10. Pawl lock
- 11. Circlip
- 12. Lock spring
- 13. Lock ring
- 14. Starter ass'y
- 15. Protection sieve (Elan only)

## Section 02 ENGINE

### Sub-section 13 (REWIND STARTER)

#### REMOVAL

##### 1,2,3, Starter housing, lock washers & screws

Remove screws and washers securing rewind starter to engine then remove rewind starter.

○ **NOTE:** On some models the hood requires supporting before removing starter housing. (The retaining cable is attached to one of the rewind starter attaching bolts).

On fan cooled models with oil injection pump remove pump from rewind starter cover.

#### DISASSEMBLY

To remove rope from rewind starter mechanism:

##### 9,10,11,12,13, Pawl, pawl lock, circlip, lock spring & lock ring

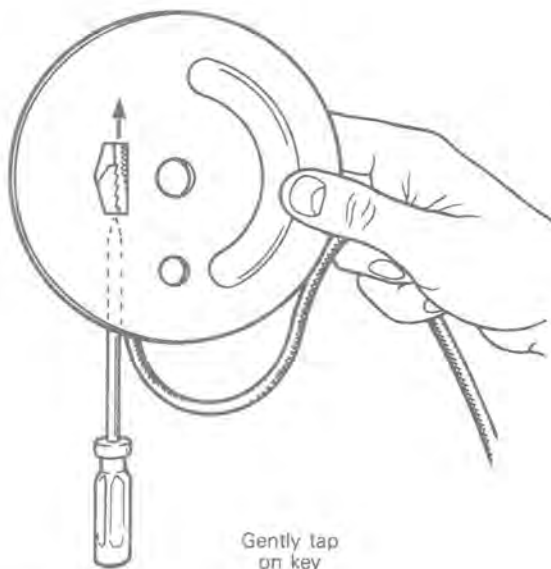
— First remove lock ring, lock spring, circlip, pawl lock and pawl.

##### 1,6, Starter housing & rope sheave

— Remove sheave from starter housing.

##### 7,8, Starter rope & key

— Disengage key and pull out rope.



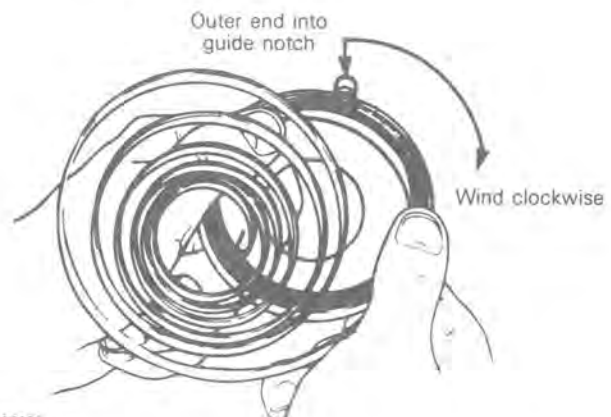
A001002038

#### ASSEMBLY

##### 4,5, Rewind spring & spring guide

At assembly, position spring outer end into spring guide notch then wind the spring clockwise into guide.

◆ **WARNING:** Since the spring is tightly wound inside the guide it may fly out when the guide is handled. Always handle with care.

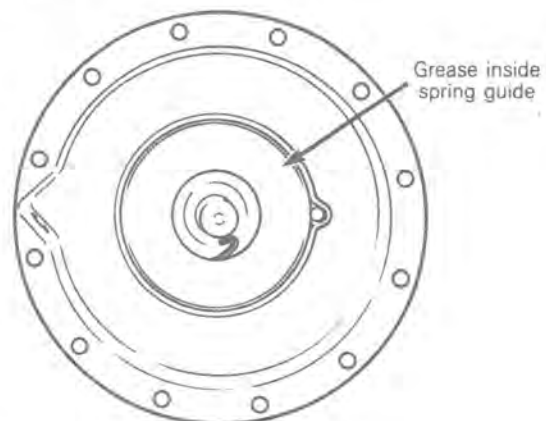


A001002039

▼ **CAUTION:** It is of the utmost importance that the rewind starter spring(s) be lubricated periodically using specific lubricants. Otherwise, rewind starter components life will be shortened and/or rewind starter will not operate properly under very cold temperatures.

Lubricate spring assembly with low temperature grease "G.E. Versilube G 341 M" (P/N 413 7040 00) and position into starter housing as illustrated.

▼ **CAUTION:** This lubricant must not be used on rewind starter locking spring as it does not stay on under vibration.



A00100240

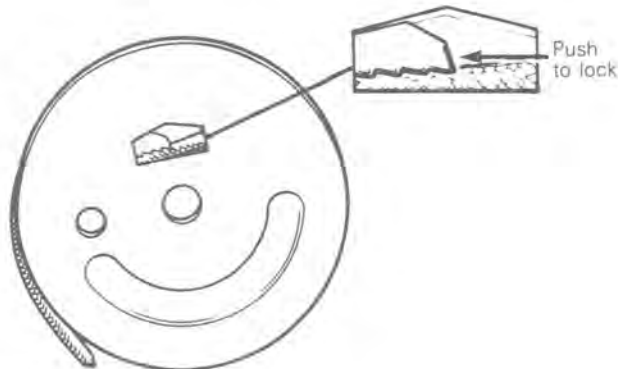
▼ **CAUTION:** The use of standard multi-purpose grease could result in rewind starter malfunction.

## Section 02 ENGINE

### Sub-section 13 (REWIND STARTER)

#### 6,7,8, Rope sheave, starter rope & key

To install a new rope: insert rope into sheave orifice and lock it with the key as illustrated.



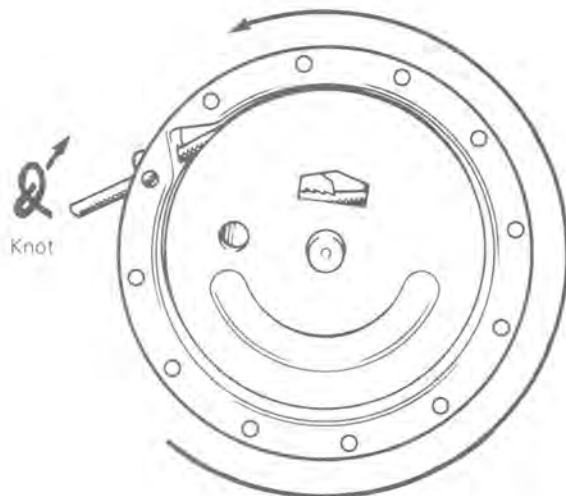
A001002041

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 spring hook.

Rotate the sheave counterclockwise until rope end is accessible through starter housing orifice.

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



1 turn preload will give  
7 turns of tension when fully extended

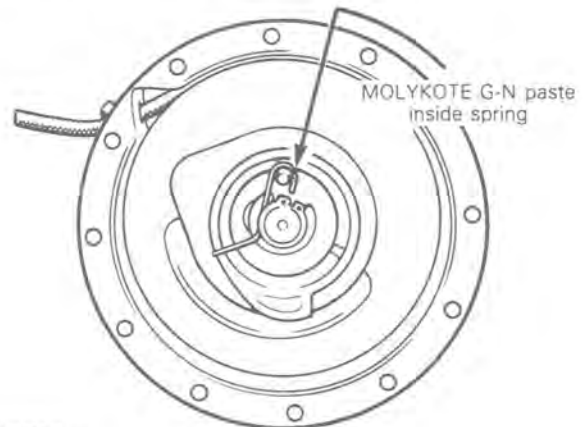
A001002012

#### 9,10,11, Pawl, pawl lock & circlip

Position pawl, pawl lock and circlip.

#### 12, Lock spring

Install lock spring and lubricate with MOLYKOTE G-N paste P/N 413 7037 00.



A001002043

Install lock ring.

**CAUTION:** This lubricant must not be used on rewind springs as it does not stay on when dry.

#### INSTALLATION

On fan cooled models with oil injection pump, reinstall oil pump on rewind starter assembly.

Reinstall rewind starter assembly on engine.

**NOTE:** If applicable, connect hood retaining cable to rewind starter retainer bolt.

Prior to installing starter grip on new rope, it is first necessary to fuse the rope end with a lit match. Pass rope through rubber buffer and starter grip, and tie a knot in the rope end. Fuse the knot with a lit match then turn the knot end down and pull the starter grip over the knot.



A001002044



## PULLEY GUARD

### DISASSEMBLY & ASSEMBLY

○ NOTE: For additional information (ex.: exploded view) refer to the 1986 correspondent parts catalog.

◆ WARNING: Engine should be running only when belt guard and/or pulley guard are well secured in place.

### INSPECTION

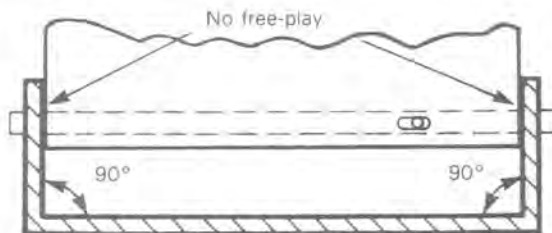
#### All models

Check pulley guard mounting bosses, clips and retainers for wear.

#### Elan & Alpine models

Check the spring loaded retaining pin for free operation. Replace any damaged parts.

Prior to installation, ensure that pulley guard and frame bracket are 90° with frame.



A000003001

◆ WARNING: No lateral free-play should exist between drive pulley guard and frame bracket.

#### Safari 377, 447, Grand Luxe LC, Formula SP

Make sure the spring wire support is well inserted in pulley guard grommet.

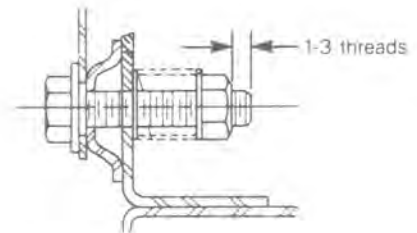
○ NOTE: Pulley guards are purposely made slightly oversize to maintain tension on their clips and retainers preventing undue noise and vibration. It is important that this tension be maintained when re-assembling.

### ADJUSTMENT

#### Elan & Alpine only

The length of the uncompressed retaining pin spring should not be less than 47 mm (1 7/8").

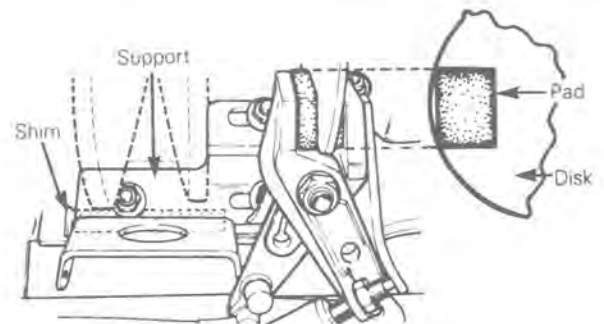
An uncompressed front guard spring should not be less than 20 mm (13/16"). When assembling adjust length as illustrated below.



A000003002

#### Skandic models

When replacing the belt guard and brake support bracket, the support bracket must be leveled to ensure full contact of brake pad on disk. Use shims as illustrated below.



A007003001





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**Section 03 TRANSMISSION****Sub-section 02 (DRIVE BELT)**

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## DRIVE BELT

### APPLICATION CHART (1986 MODELS)

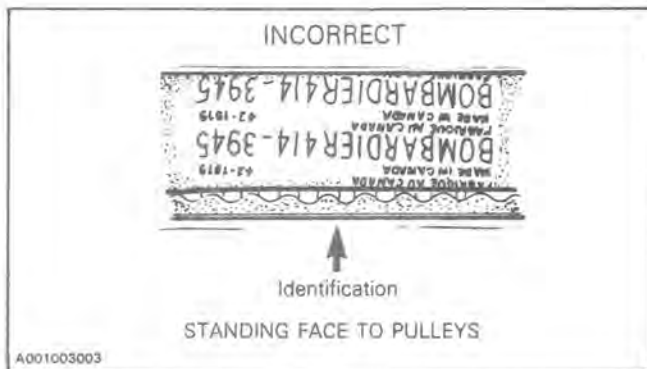
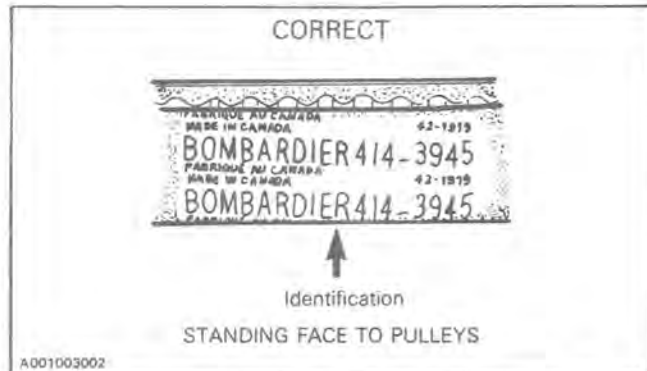
MODEL	NUMBER	MAX. WIDTH (NEW)	MIN. WIDTH (WEAR LIMIT)
ELAN	570 0411 00	30 mm (1 3/16")	27 mm (1 1/16")
CITATION LS, LSE SKANDIC SKANDIC R TUNDRA TUNDRA LT	414 3758 00	33.3 mm (1 5/16")	30 mm (1 3/16")
ALPINE SAFARI (all) FORMULA SP FORMULA MX	414 5233 00	35 mm (1 3/8")	32 mm (1 1/4")
FORMULA PLUS	414 5823 00	35 mm (1 3/8")	32 mm (1 1/4")

## Section 03 TRANSMISSION

### Sub-section 02 (DRIVE BELT)

#### ROTATION DIRECTION

The maximum drive belt life span is obtained when the belt has the proper rotation direction.



NOTE: For used drive belt, mark and reinstall in the same rotation direction.

#### REMOVAL & INSTALLATION

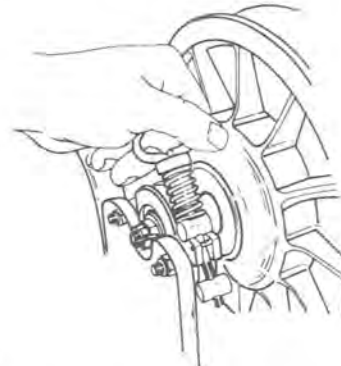
CAUTION: Do not force or use tools to pry the belt into place, as this could cut or break the cords in the belt.

WARNING: Do not operate snowmobile without drive belt or its guard installed. Serious bodily injury could occur.

Tilt cab and remove pulley or belt guard.

#### Skandic models

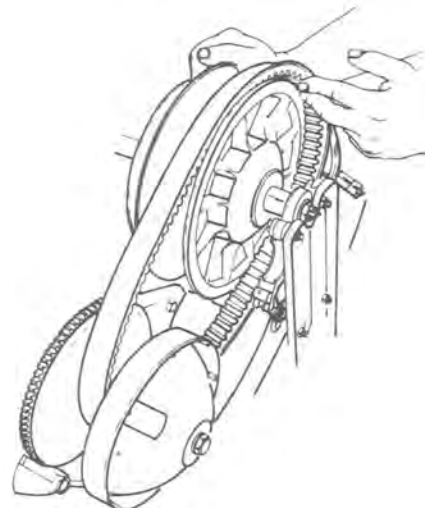
Loosen the countershaft bearing retaining screw and open the bearing cage.



Open the driven pulley by twisting and pushing the sliding half. Hold in fully open position.



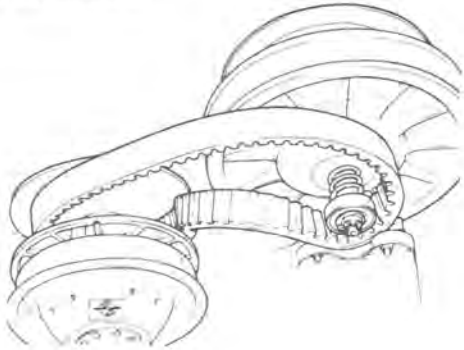
NOTE: To easily open driven pulley, use a 3 mm Allen key to screw one of the three Allen screws. Slip the belt over the top edge of the fixed half.



## Section 03 TRANSMISSION

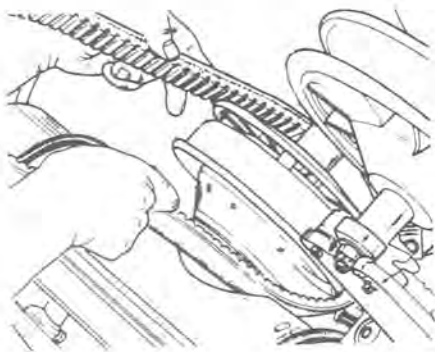
### Sub-section 02 (DRIVE BELT)

Lift the countershaft upward approx. 50 mm (2 in) and slip the belt between the shaft and the bearing cage to remove completely.



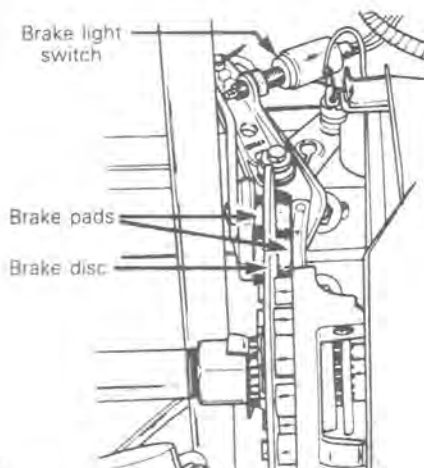
A007003022

**NOTE:** It may be necessary to loosen the brake adjustment in order to easily lift the countershaft. Slip the belt out from the drive pulley.



A007003023

**WARNING:** After drive belt installation, always check that the brake disc is correctly installed between the brake pads and that the brake is well adjusted. Check brake light operation.



A007003018

To install the drive belt, reverse the procedure.

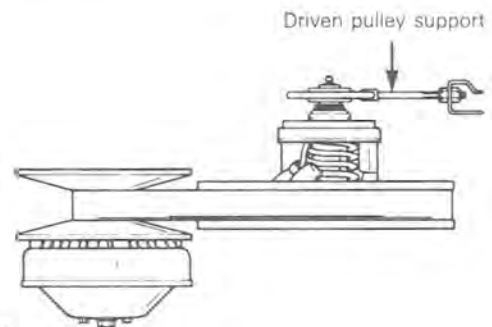
**CAUTION:** Once belt is installed, be sure to secure the countershaft bearing by closing the bearing cage and firmly tightening the retaining screw.

**NOTE:** Loosen the Allen screw previously tightened to release pressure. Then, turn clockwise until a slight resistance is felt against sliding pulley to obtain an equal pressure on each Allen screw.

**NOTE:** The top of the drive belt must be flush with the driven pulley edge. Equally screw or unscrew the three Allen screws to obtain this specific adjustment.

Citation LS, LSE, Tundra, Tundra LT, Skandic R, Safari (all) & Formula SP

Unlock and raise the driven pulley support.



A004003006

Open the driven pulley by twisting and pushing the sliding half. Hold in fully open position.



A007003020

**NOTE:** To easily open driven pulley, on Skandic R only, use a 3 mm Allen key to tighten one of the three Allen screws.

## Section 03 TRANSMISSION

### Sub-section 02 (DRIVE BELT)

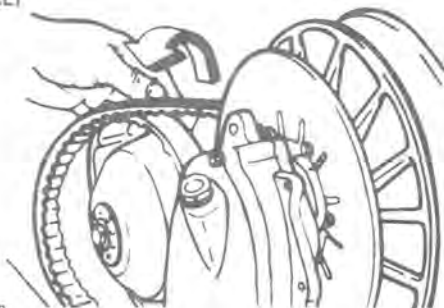
Slip slackened belt over the top edge of the sliding half.



A004003008

Slip the belt out from the drive pulley and remove completely from vehicle.

(TYPICAL)



A004003009

To install the drive belt, reverse the procedure.

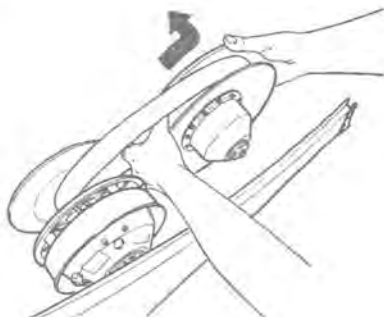
NOTE: On Skandic R only, loosen Allen screw previously tightened to release pressure then, turn clockwise until a slight resistance is felt against sliding pulley to obtain an equal pressure on each Allen screw.

NOTE: The top of the drive belt must be flush with the driven pulley edge. Equally screw or unscrew the three Allen screws to obtain this specific adjustment.

#### Elan, Formula MX & Plus

Open the driven pulley by twisting and pushing the sliding half. Hold in fully open position.

(TYPICAL)

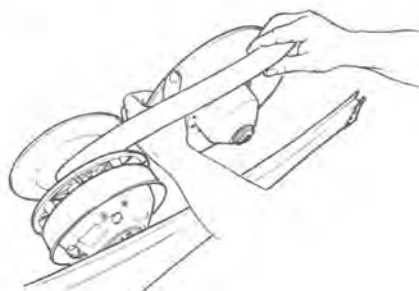


A002003015

NOTE: To easily open driven pulley, on Formula MX & Plus only, use a 3 mm Allen key to screw one of the three Allen screws.

Slip the belt over the top edge of the fixed half.

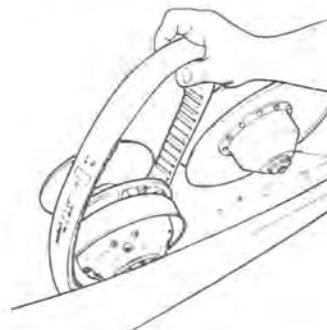
(TYPICAL)



A002003016

Slip the belt out from the drive pulley and remove it completely from the vehicle.

(TYPICAL)



A002003017

To install the drive belt reverse procedure.

NOTE: Loosen Allen screw previously tightened to release pressure then, turn clockwise until a slight resistance is felt against sliding pulley to obtain an equal pressure on each Allen screws.

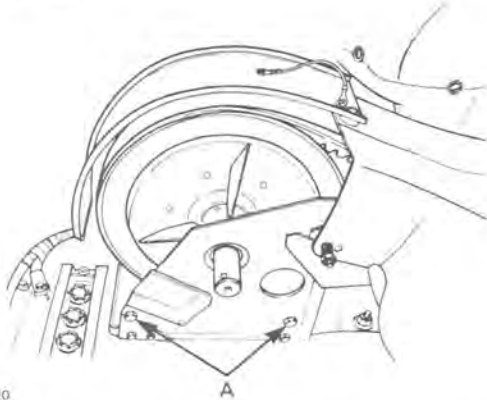
NOTE: The top of the drive belt must be flush with the driven pulley edge. Equally screw or unscrew the three Allen screws to obtain this specific adjustment.

## Section 03 TRANSMISSION

### Sub-section 02 (DRIVE BELT)

#### Alpine model

1. Remove hood, belt guard and pulley guard.
2. Remove the two bolts (A) holding bearing support to the frame.



A007003020

3. Pivot the bearing support assembly half a turn.
4. Open the driven pulley by twisting and pushing the sliding half.
5. Hold in open position.
6. Slip the belt over the top edge of the fixed half.
7. Slip the belt out from the drive pulley.
8. Remove from vehicle by passing it under the driven pulley and bearing support.

To install drive belt reverse the procedure.

#### DRIVE BELT DEFLECTION MEASUREMENT

- NOTE: The drive belt deflection measurement must be performed each time a new drive belt is installed.
- NOTE: To obtain an accurate drive belt deflection measurement, it is suggested to allow a break-in period of 50 km (30 miles) to the drive belt.

Before checking the belt deflection, ensure vehicle has its proper belt number and correct belt width. (Refer to the application chart, at the beginning of this sub-section.)

To obtain maximum vehicle performance, the belt tension must be adjusted to 6.8 kg (15 pounds) with a deflection of:

CITATION LS/LSE TUNDRA TUNDRA LT	30.2 - 38.1 mm (1 3/16" - 1 1/2")
FORMULA MX FORMULA PLUS	25.4 - 31.8 mm (1" - 1 1/4")
ELAN, ALPINE, ALL SKANDIC, ALL SAFARI, FORMULA SP	32 mm (1 1/4")

#### To check tension

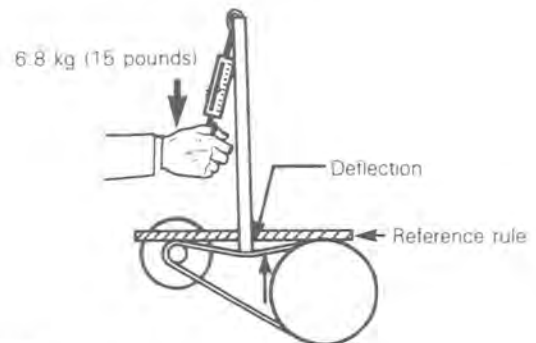
Position a reference rule on drive belt.

Wooden stick and fish scale method:



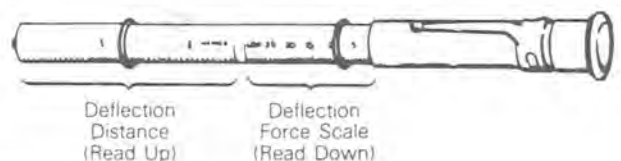
A000003005

Apply a 6.8 kg (15 pounds) pressure on drive belt. Deflection must be within specifications.



A000003006

Using the belt tension tester P/N 414 3482 00 (service tool).

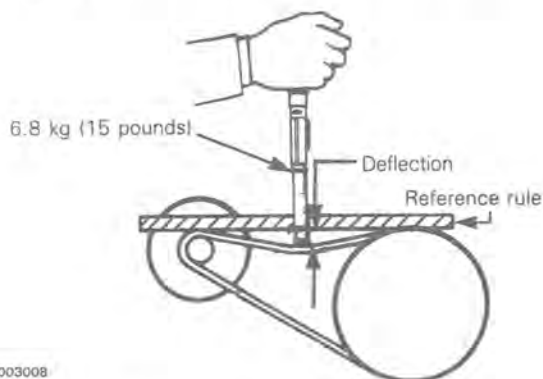


A000003007

## Section 03 TRANSMISSION

### Sub-section 02 (DRIVE BELT)

1. Slide lower O-ring of deflection distance scale to specified measure.
2. Slide upper O-ring to zero pound on the deflection force scale.
3. Apply pressure until lower O-ring is flush with edge of rule.
4. Read deflection force on the upper scale (at top edge of O-ring). Reading of 6.8 kg (15 pounds) should be obtained.

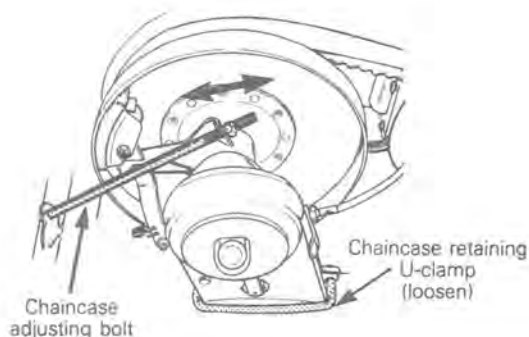


A000003008

## DEFLECTION ADJUSTMENT

### Elan model

Drive belt deflection is adjusted by moving chaincase. To do so, loosen the chaincase retaining U-clamp and screw or unscrew the chaincase adjusting bolt.



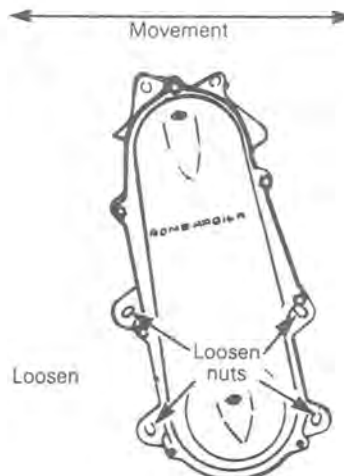
A002003018

Adjust pulley distance according to specification (see pulley distance & alignment section 03-05) and measure drive belt deflection. Readjust pulley distance if required then tighten retaining U-clamp.

### Citation LS, LSE, Tundra, Tundra LT all Safari & Formula SP

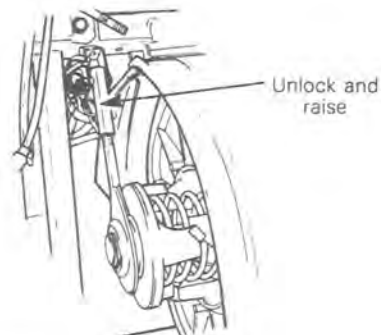
Drive belt deflection is adjusted by moving chaincase.

(TYPICAL)



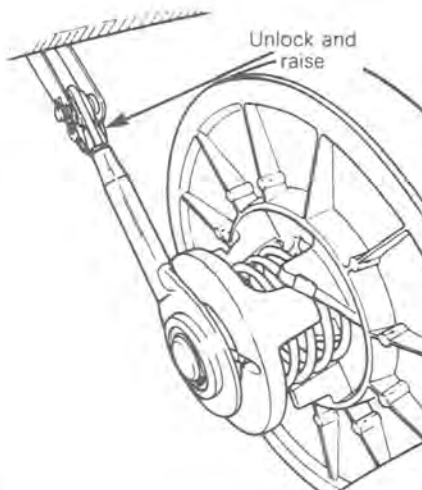
To do so, loosen the 4 chaincase retaining nuts, unlock and raise pulley support.

### Citation LS/LSE & Tundra (all)



A004003005

### All Safari & Formula SP



A009003009

## Section 03 TRANSMISSION

### Sub-section 02 (DRIVE BELT)

Adjust pulley distance according to specification (see pulley distance & alignment section 03-05) and measure drive belt deflection. Readjust pulley distance if required, then tighten the 4 nuts, adjust pulley support and lock it.

#### Skandic, Skandic R, Formula MX & Plus

Adjust pulley distance according to specification (see pulley distance & alignment section 03-05).

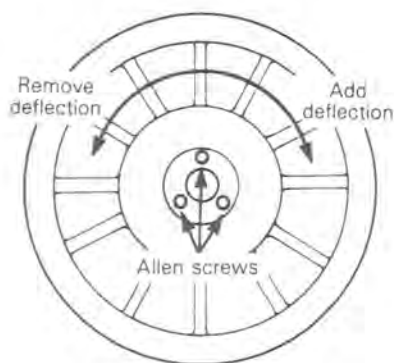
Final drive belt deflection is adjusted with 3 Allen screws located on the outer face of the driven (fixed half) pulley.

Adjust belt deflection: :

**To add deflection**, equally turn clockwise 3 Allen screws.

**To remove deflection**, equally turn counter-clockwise 3 Allen screws.

○ **NOTE:** Turn Allen screws 1/4 turn at a time.

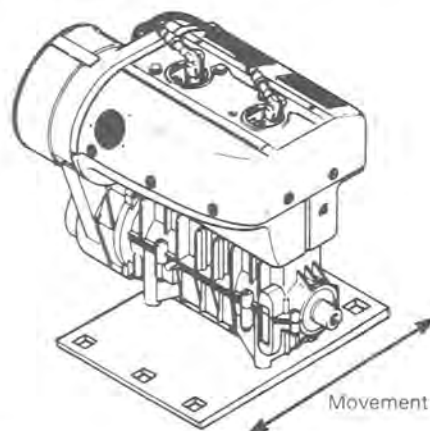


A008003007

○ **NOTE:** The top of the drive belt must be flush with the driven pulley edge. Equally screw or unscrew the three Allen screws to obtain this specific adjustment.

#### Alpine model

Drive belt deflection is adjusted by moving engine support. To do so, loosen engine support nuts and move engine as required.



A017003016


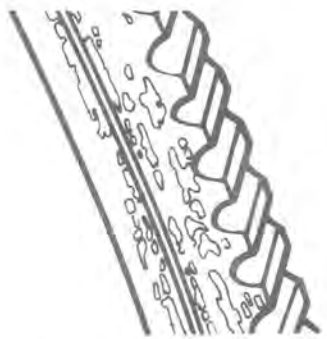
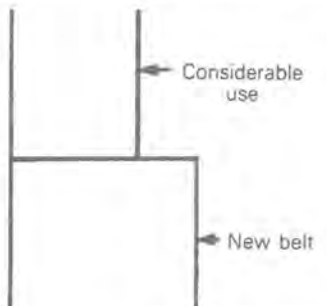
Adjust pulley distance according to specification (see pulley distance & alignment section 03-05) and measure drive belt deflection. Readjust pulley distance if required.



## Section 03 TRANSMISSION

### Sub-section 02 (DRIVE BELT)

#### TROUBLE SHOOTING

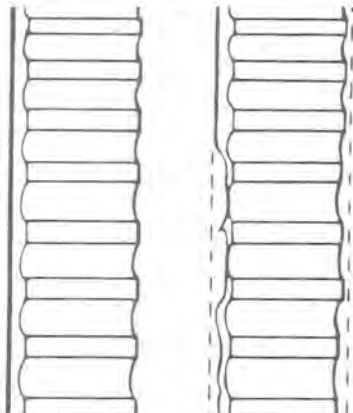
1. Uneven belt wear on one side only.		
 A000003009	<b>CAUSE</b> <ul style="list-style-type: none"><li>a) Loose engine mount</li><li>b) Pulley misalignment.</li><li>c) Rough or scratched pulley surfaces.</li></ul>	<b>REMEDY</b> <ul style="list-style-type: none"><li>a) Tighten engine mount nuts equally.</li><li>b) Align pulleys.</li><li>c) Repair or replace pulley half.</li></ul>
2. Belt glazed excessively or having baked appearance.		
 A000003010	<b>CAUSE</b> <p>Excessive slippage caused by:</p> <ul style="list-style-type: none"><li>a) Insufficient pressure on belt sides.</li><li>b) Rusted drive or driven pulley shafts.</li><li>c) Oil on pulley surfaces.</li><li>d) Incorrect centrifugal governor.</li></ul>	<b>REMEDY</b> <ul style="list-style-type: none"><li>a) Check drive pulley for worn or missing flyweights/rollers.</li><li>b) Clean shaft with steel wool and lubricate with low temperature grease. (If applicable).</li><li>c) Clean pulley surfaces with fine emery cloth and clean cloth.</li><li>d) Install correct governor.</li></ul>
3. Belt worn excessively in top width.		
 A000003011	<b>CAUSE</b> <ul style="list-style-type: none"><li>a) Excessive slippage due to irregular outward actuation movement of drive pulley.</li><li>b) Rough or scratched pulley surfaces.</li><li>c) Improper belt angle.</li><li>d) Considerable use.</li></ul>	<b>REMEDY</b> <ul style="list-style-type: none"><li>a) Carry out inspection.</li><li>b) Repair or replace pulley.</li><li>c) Using unspecified type of belt. Replace belt with correct Bombardier belt</li><li>d) Replace belt if 3 mm (1/8'') less than recommended width (see Technical Data).</li></ul>




## Section 03 TRANSMISSION

### Sub-section 02 (DRIVE BELT)

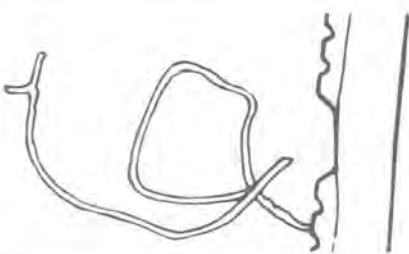
#### 4. Belt worn narrow in one section.

 <p>A000003012</p>	<b>CAUSE</b>  Excessive slippage in drive pulley caused by: a) Frozen or too tight track  b) Drive pulley not functioning properly c) Engine idle speed too high d) Incorrect belt length  e) Incorrect pulley distance	<b>REMEDY</b>  a) Liberate track from ice or check track tension and alignment. b) Repair or replace drive pulley. c) Reduce engine R.P.M. d) Using unspecified type of belt. Replace belt with correct Bombardier belt. e) Readjust to specifications.
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#### 5. Belt sides worn concave.

 <p>A000003013</p>	<b>CAUSE</b>  a) Rough or scratched pulley surfaces. b) Unspecified type of belt.	<b>REMEDY</b>  a) Repair or replace. b) Replace belt with correct Bombardier belt
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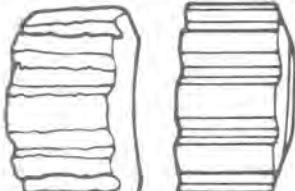
#### 6. Belt desintegration.

 <p>A000003014</p>	<b>CAUSE</b>  a) Excessive belt speed.  b) Oil on pulley surfaces.	<b>REMEDY</b>  a) Using unspecified type of belt. Replace belt with proper type of belt. b) Clean pulley surfaces with fine emery cloth and lubricate with low temperature grease. (If applicable).
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#### 7. Belt edge cord breakage.

 <p>A000003015</p>	<b>CAUSE</b>  a) Pulley misalignment.	<b>REMEDY</b>  a) Align pulleys.
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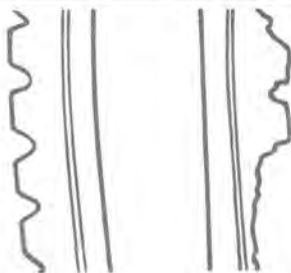
#### 8. Flex cracks between cogs.

 <p>A000003016</p>	<b>CAUSE</b>  a) Considerable use, belt wearing out.	<b>REMEDY</b>  a) Replace belt
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## Section 03 TRANSMISSION

### Sub-section 02 (DRIVE BELT)

#### 9. Sheared cogs, compression section fracture or torn.



A000003017

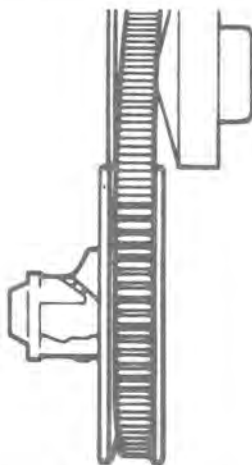
##### CAUSE

- a) Improper belt installation.
- b) Belt rubbing stationary object on pulleys.
- c) Violent engagement of drive pulley.

##### REMEDY

- a) Refer to Installation section.
- b) Check drive components.
- c) Grease (if applicable), replace spring or drive pulley.

#### 10. Belt "Flip-Over" at high speed.



A000003018

##### CAUSE

- a) Pulley misalignment.
- b) Using unspecified type of belt.

##### REMEDY

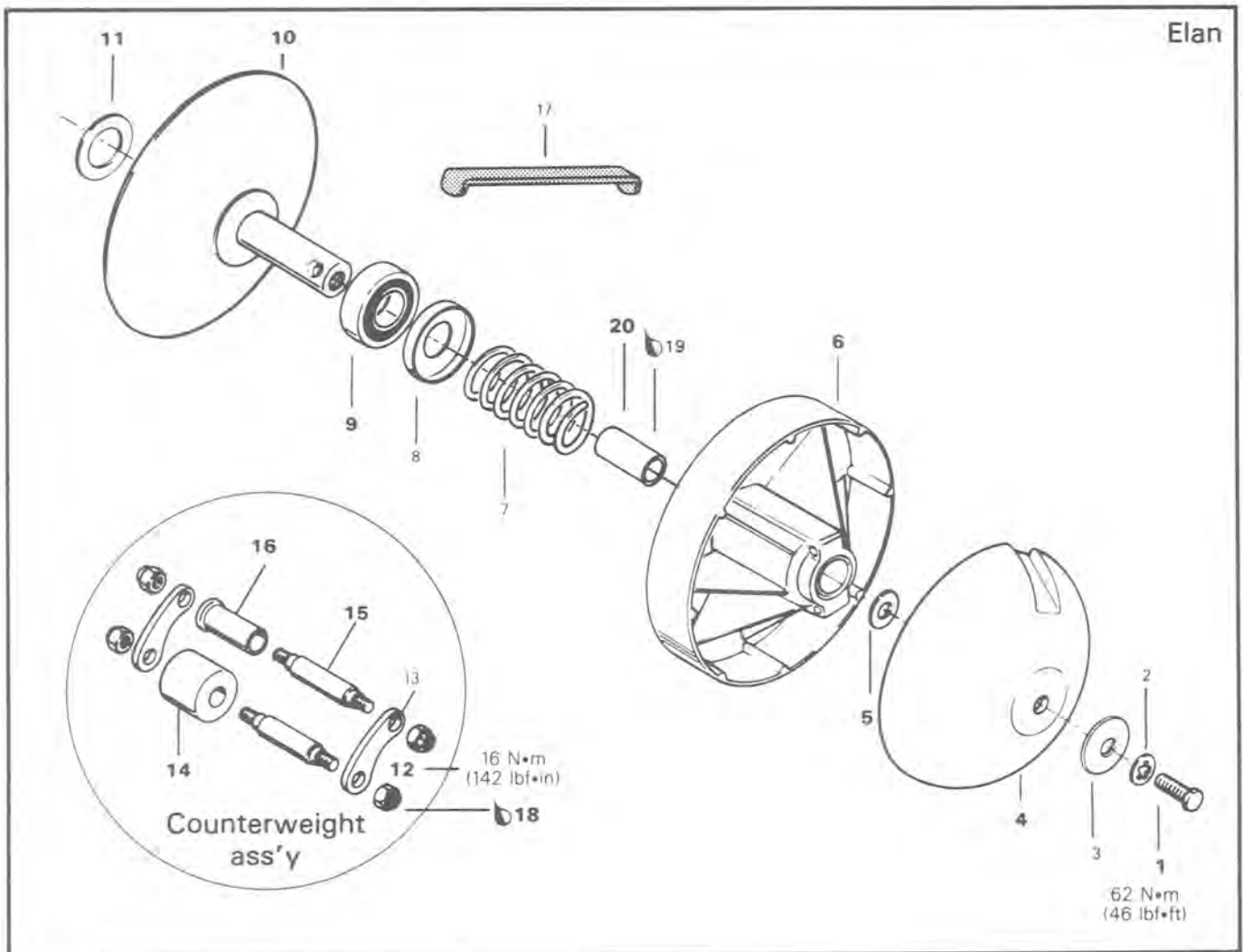
- a) Align pulleys.
- b) Replace belt with correct Bombardier belt.

# DRIVE PULLEY

## ROLLER ROUND SHAFT TYPE

### LUBRICATION FREE

Elan



1. Cap screw
2. Lock washer
3. Washer
4. Governor cup
5. Shim
6. Outer half
7. Spring
8. Spring seat
9. Bearing
10. Inner half

11. Shim
12. Nut
13. Counterweight
14. Roller
15. Shouldered pin
16. Shouldered bushing
17. Drive pulley retainer P/N 529 0017 00
18. Loctite 242
19. Loctite 601
20. Kahlron bushing

## Section 03 TRANSMISSION

### Sub-section 03 (DRIVE PULLEY)

◆ **WARNING:** Drive pulley repairs that include any disassembly or assembly procedures must be performed by an authorized Bombardier dealer, or other such qualified person. Sub-component installation and assembly tolerances require strict adherence to procedures detailed.

## REMOVAL

### 1,4,6, Outer half & governor cup

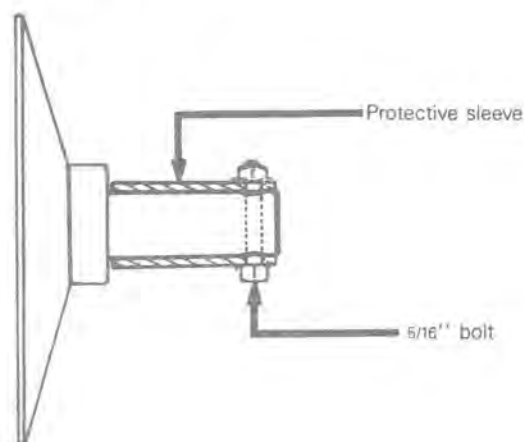
With engine cold, remove spark plug then bring P.T.O. (Power Take Off) piston at T.D.C. (Top Dead Center) position.

Rotate drive pulley 45° clockwise then insert enough starter rope into cylinder to fill it completely.

◆ **WARNING:** Spring pressure can force assembly apart; therefore, it is imperative that the governor cup be held firmly during governor retaining blot removal. Use drive pulley retainer P/N 529 0017 00.

### 10, Inner half

To remove the inner half, slide a length of steel pipe over shaft. Attach with a 5/16" nut and bolt, as illustrated. The inner half can then be removed with a pipe wrench. (Unscrew counterclockwise).



A002003001

## DISASSEMBLY

▼ **CAUTION:** Do not disassemble counterweights unless replacement is necessary.

### 9,10, Bearing & Inner half

To disassemble bearing from inner half, use a suitable bearing puller.

## CLEANING

### 6,10, Inner & outer half

Clean pulley faces and shaft with fine steel wool and dry cloth. Clean outer half bushing with clean dry cloth.

## INSPECTION

Drive pulley should be inspected annually.

### 6,10, Inner & outer half

Check outer half for excessive lateral play and inner half shaft for scratches.

### 14, Roller

Check for roundness of external diameter.

▼ **CAUTION:** Ensure rollers are in good condition. Replace as required.

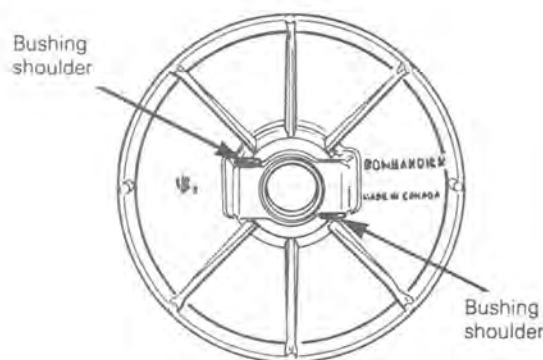
### 16, Shouldered bushing

Check for wear.

## ASSEMBLY

### 6,16, Shouldered bushings

Shouldered bushings must be assembled in outer half as per illustration.



A002003002

### 6,20, Outer half & kahrlon bushing

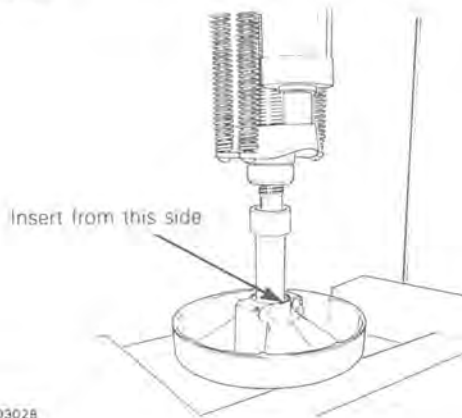
Use a suitable pusher to remove the old bushing. Clean outer half with ethyl alcohol.

▼ **CAUTION:** Bushing must be bonded with Loctite 601 to prevent displacement in outer half.

## Section 03 TRANSMISSION

### Sub-section 03 (DRIVE PULLEY)

Apply Loctite 601 outside of bushing then insert into its housing from the shown side. (So that using housing chamfer).



A002003028

Push until bushing comes flush with its housing.

#### 12,13,14,15, Counterweight ass'y

Apply Loctite 242 or equivalent on threads then torque nuts to 16 N•m (142 lbf•in).

▼ **CAUTION:** Counterweights and rollers must move easily after installation.

#### 9,10, Bearing & inner half

To assemble bearing on inner half, press on bearing inner race with a suitable pusher.

## INSTALLATION

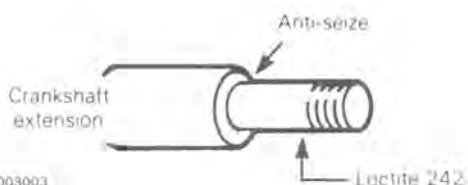
#### 11, Shim (alignment)

This shim is used to obtain correct pulley alignment, refer to section 03-05.

#### 10, Inner half

To install the inner half, lock crankshaft in position as explained in removal procedure. Make sure crankshaft is rotated 45° **counterclockwise** from T.D.C. position and that cylinder is completely filled with a starter rope.

Clean crankshaft extension and apply anti-seize on the unthreaded portion and Loctite 242 or equivalent on threads, (as illustrated) then install inner half on extension.



A002003003

To tighten inner half, use a protective sleeve as shown in the removal procedure.

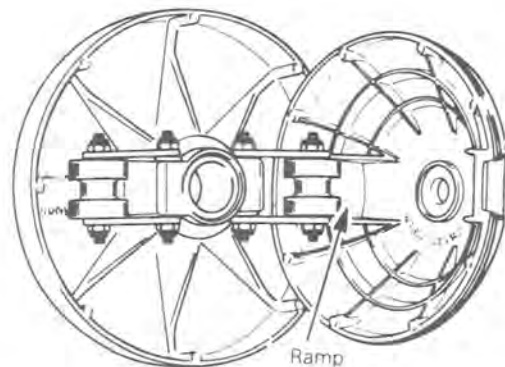
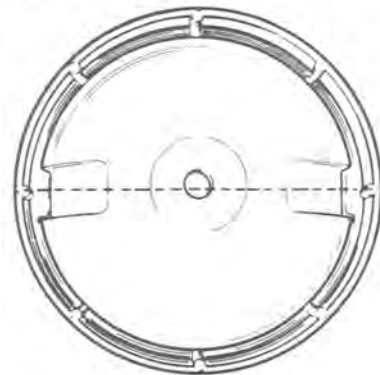
#### 5, Shim (neutral)

This shim is used to obtain a neutral function of the drive pulley when engine is idling: use a required, maximum of two (2). Refer to ADJUSTMENT.

#### 1,4,6, Cap screw, governor cup, outer half

Install governor cup correctly as per illustration making sure that the rollers are sliding on their ramp.

▼ **CAUTION:** Ensure rollers are in good condition. Replace as required.



A002003005

Position the cap screw and torque to 62 N•m (46 lbf•ft).

Install drive belt, pulley guard and close cab. Accelerate vehicle and bring at intermediate speed then at the same time apply brake. Repeat 2 or 3 times. Stop engine and retorqué cap screw.

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## Section 03 TRANSMISSION

### Sub-section 03 (DRIVE PULLEY)

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## ADJUSTMENT

### 11, Shim (alignment)

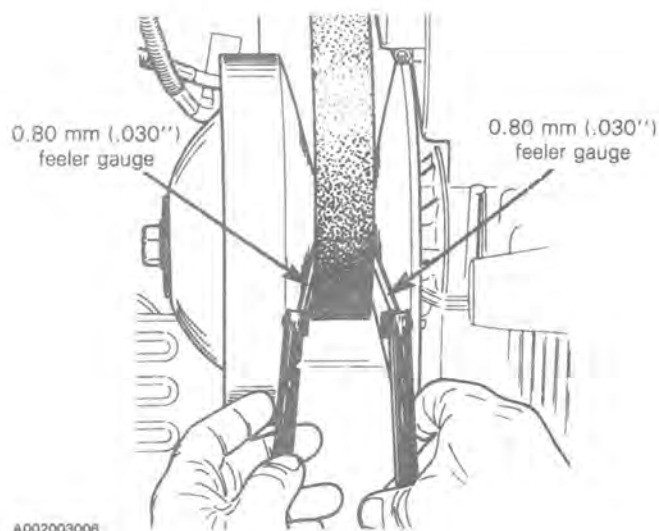
For pulley alignment procedure, refer to section 03-05.

### 5, Shim (neutral)

For neutral adjustment, proceed as indicated below.

◆ **WARNING:** Shim(s) (5) is(are) used to obtain a neutral function of the drive pulley when engine is idling. Proceed as follows when retaining bolt is torqued:

With a new drive belt installed, it should be possible to insert a minimum of 0.80 mm (.030'') thick feeler gauge on each side of the drive belt simultaneously pushing drive belt to sit on bearing.

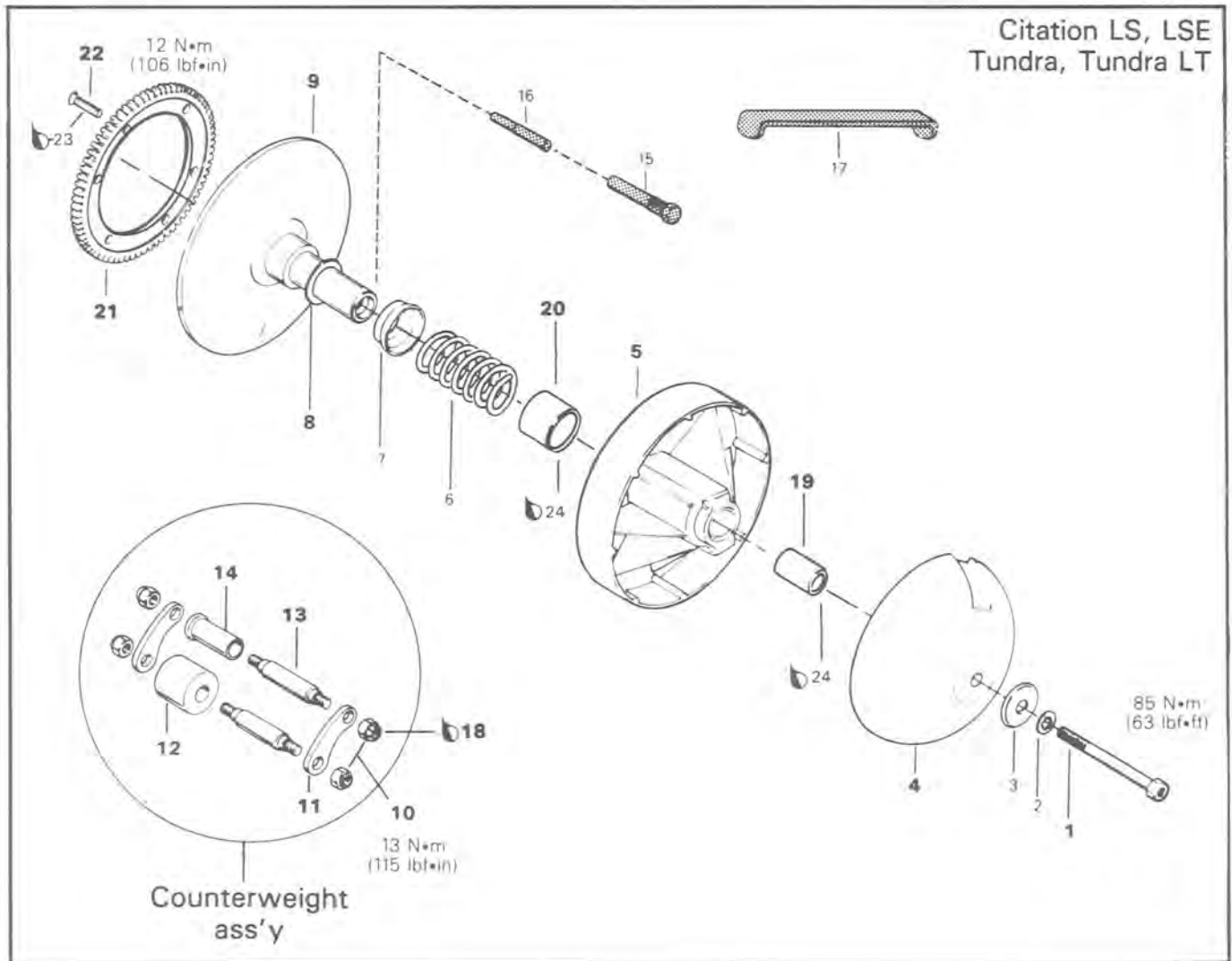


Shims located between governor cup and drive pulley shaft will help in obtaining correct adjustment. Do not use more than two (2) shims.

**Section 03 TRANSMISSION**  
**Sub-section 03 (DRIVE PULLEY)**

**ROUND SHAFT (TAPER) TYPE**  
**LUBRICATION FREE**

Citation LS, LSE  
Tundra, Tundra LT



- 1 Cap screw
- 2 Lock washer
- 3 Spacer
- 4 Governor cup
- 5 Outer half
- 6 Spring
- 7 Spring seat
- 8 Shim
- 9 Inner half
- 10 Nut
- 11 Lever
- 12 Roller

- 13 Shouldered pin
- 14 Shouldered bushing
- 15 Puller P/N 529 0028 00
- 16 Puller pin P/N 529 0048 00
- 17 Drive pulley retainer P/N 529 0017 00
- 18 Loctite 242
- 19 Kahrlon bushing (small)
- 20 Kahrlon bushing (large)
- 21 Starter ring gear (electric starting)
- 22 Self locking screw (electric starting)
- 23 Loctite 271 (electric starting)
- 24 Loctite 601



## Section 03 TRANSMISSION

### Sub-section 03 (DRIVE PULLEY)

▼ **CAUTION:** This model is equipped with drive pulley of metric dimensions.

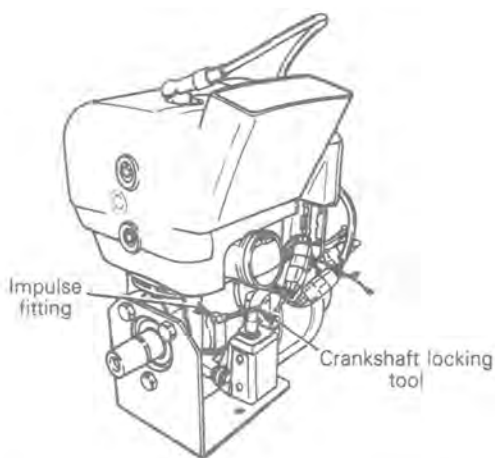
◆ **WARNING:** Drive pulley repairs that include any disassembly or assembly procedures must be performed by an authorized Bombardier dealer, or other such qualified person. Sub-component installation and assembly tolerances require strict adherence to procedures details.

## REMOVAL

### 1,4,5, Cap screw, outer half & governor cup

Lock the crankshaft by using one of the following method:  
Insert the crankshaft locking tool P/N 420 876 640 into the impulse hole of the engine. Slowly rotate the crankshaft until it locks into position.

▼ **CAUTION:** Do not use any type of pin other than the tool P/N 420 876 640.



A003002005

Or:

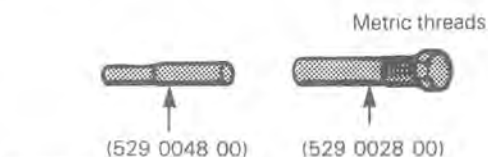
Remove spark plug(s) then bring P.T.O. piston at T.D.C. position.

Rotate drive pulley 45° clockwise then insert enough starter rope into cylinder to fill it completely.

◆ **WARNING:** Spring pressure can force assembly apart; therefore, it is imperative that the governor cup be held firmly during governor retaining bolt removal. Use drive pulley retainer P/N 529 0052 00.

### 9, Inner half

If it is necessary to remove inner half, use drive pulley puller no. 529 0028 00, 529 0048 00.



A000001009

▼ **CAUTION:** This pulley has metric threads. Do not use standard thread puller.

To block engine crankshaft:

Remove starter rope blocking piston, the reblock piston after having turned 45° counterclockwise from T.D.C. position; or install crankshaft locking tool.

To remove inner half:

Install puller in pulley shaft. Tighten, at the same time knock slightly on puller head to disengage pulley from engine crankshaft.

## DISASSEMBLY

▼ **CAUTION:** Do not disassemble counterweights unless replacement is necessary.

## CLEANING

### 5,9, Inner & outer half

Clean pulley faces and shaft with fine steel wool and dry cloth. Clean outer half bushing with clean dry cloth.

### 9, Inner half & crankshaft

Using cleaner such as acetone, clean crankshaft tapered end and the taper inside the inner half of the drive pulley.

◆ **WARNING:** This procedure must be performed in a well ventilated area.

▼ **CAUTION:** Avoid contact between crankshaft seal and acetone because damage may occur.



## INSPECTION

Drive pulley should be inspected annually.

### 5,9, Inner & outer half

Check outer half for excessive lateral play and inner half shaft for scratches.

▼ **CAUTION:** Ensure rollers are in good condition. Replace as required.

### 12, Nylon roller

Check for roundness of external diameter.

### 14, Shouldered bushing

Check for any wear. Replace as required.

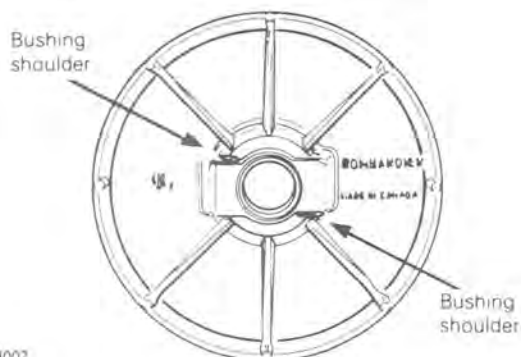
## ASSEMBLY

### 21,22, Starter ring gear, self locking screw

Apply Loctite 271 on threads and head countersink then torque to 12 N•m (106 lbf•in).

### 14, Shouldered bushing

Shouldered pin bushings must be installed in outer half as per illustration.



A002003002

### 5,20, Outer half & kahrlon bushing

Using a gouge chisel (semi-circular) or a suitable pusher, remove the large bushing.



A003003009

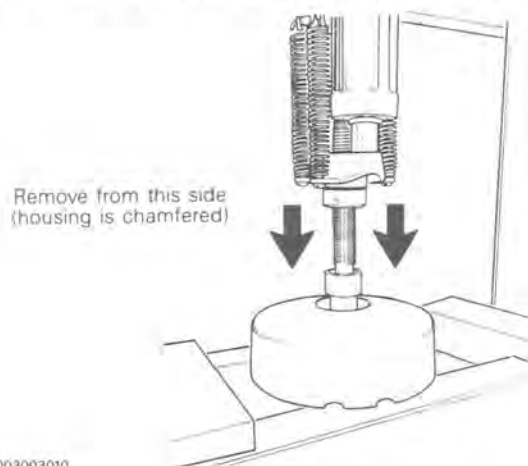
Clean outer half with ethyl alcohol.

▼ **CAUTION:** Bushing must be bonded with Loctite 601 to prevent displacement in outer half.

Apply Loctite 601 outside of bushing then insert until it comes flush with housing edge.

### 5,19, Outer half & kahrlon bushing

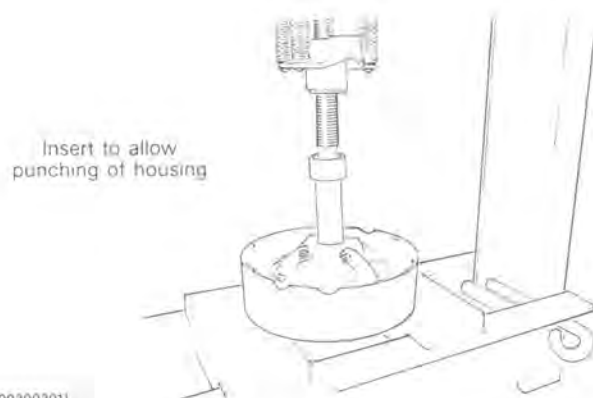
Use a suitable pusher to remove the old bushing as shown. Clean outer half with ethyl alcohol.



A003003010

▼ **CAUTION:** Bushing must be bonded with Loctite 601 then punched to prevent displacement in outer half.

Apply Loctite 601 outside of bushing then insert into its housing (from the shown side). To allow punching of housing.

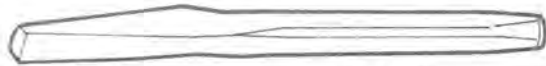


A003003011

## Section 03 TRANSMISSION

### Sub-section 03 (DRIVE PULLEY)

Using a gouge chisel (semi-circular) such as snap on part no. PPC 12 A, punch over the existing marks.



Gouge chisel  
(semi-circular)

A003003012



Punch over  
existing marks

A003003013

#### 10,11,12,13, Counterweight ass'y

Apply Loctite 242 or equivalent on nut threads then torque nuts to 13 N•m (115 lbf•in).

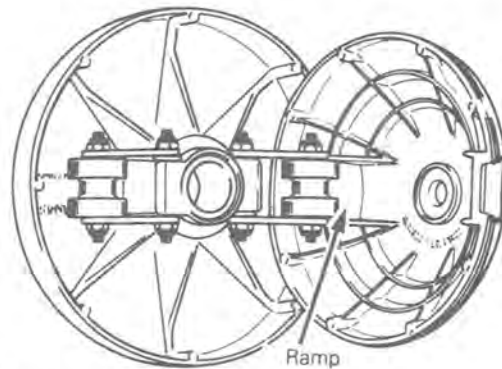
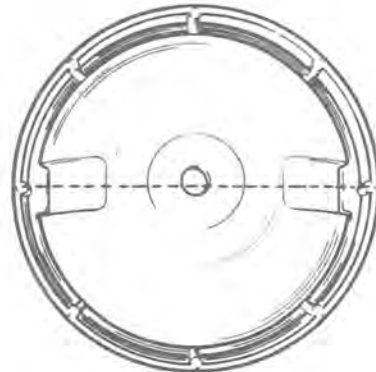
▼ **CAUTION:** Counterweights and rollers must move easily after installation.

#### INSTALLATION

Lock crankshaft in position as explained in removal procedure. Make sure crankshaft is rotated 45° **counter-clockwise** from T.D.C. position and that cylinder is completely filled with a starter rope.

Install governor cup correctly as per illustration making sure that the rollers are sliding on their ramp.

▼ **CAUTION:** Ensure rollers are in good condition. Replace as required.



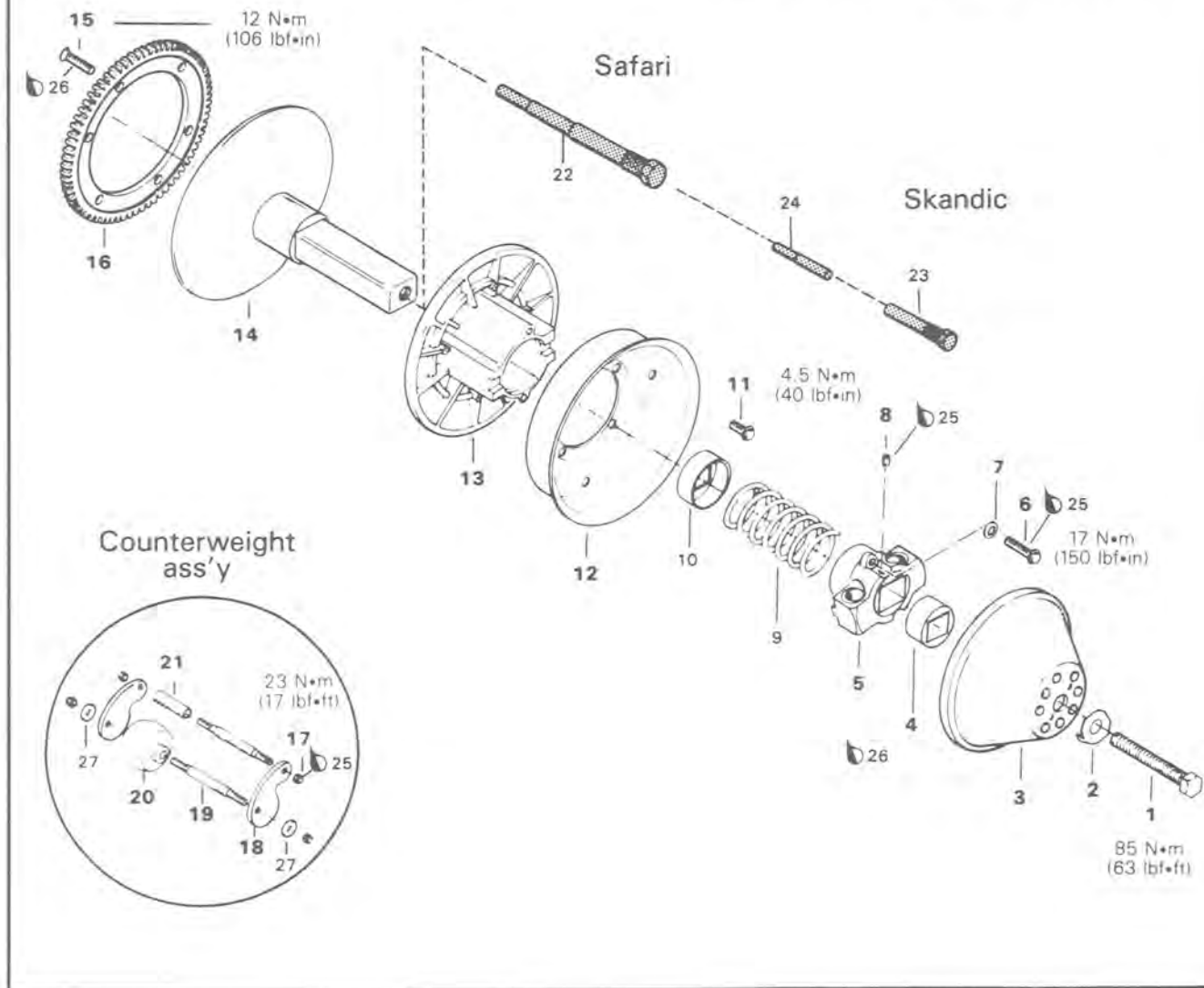
Ramp

A002003005

Position the cap screw and torque to 85 N•m (63 lbf•ft). Install drive belt, pulley guard and close cab. Accelerate vehicle and bring at intermediate speed then at the same time apply brake. Repeat 2 or 3 times. Stop engine and retorque cap screw.

## ROLLER SQUARE SHAFT WITH DURALON BUSHING

Skandic 377/R, Safari 377/377E/447



1. Cap screw
2. Lock tab
3. Governor cup
4. "Duralon" bushing
5. Hub plug
6. Cap screw
7. Internal tooth lock washer
8. Allen setscrew
9. Spring
10. Spring seat
11. Cap screw
12. Guard
13. Outer half
14. Inner half

15. Self locking screw (electric starting)
16. Starter gear (electric starting)
17. Nut
18. Counterweight
19. Shouldered pin
20. Roller
21. Bushing
22. Puller P/N 529 0021 00 (Safari)
23. Puller P/N 529 0028 00 (Skandic)
24. Puller pin P/N 529 0030 00 (Skandic)
25. Loctite 242
26. Loctite 271
27. Washer

## Section 03 TRANSMISSION

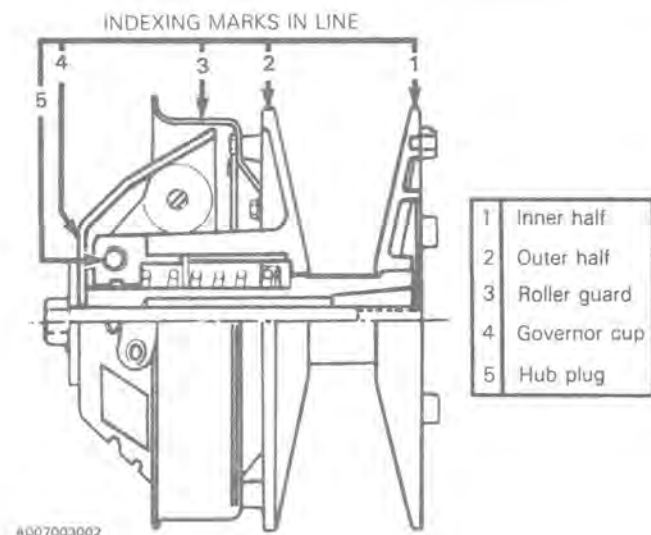
### Sub-section 03 (DRIVE PULLEY)

**WARNING:** Drive pulley repairs that include any disassembly or assembly procedures must be performed by an authorized Bombardier dealer, or other such qualified person. Sub-component installation and assembly tolerances require strict adherence to procedures detailed.

## REMOVAL

**NOTE:** Some pulley components are marked to insure proper assembly, thereby maintaining optimum balancement.

If components lack such marks, marking should be done manually before disassembly, as per illustration.



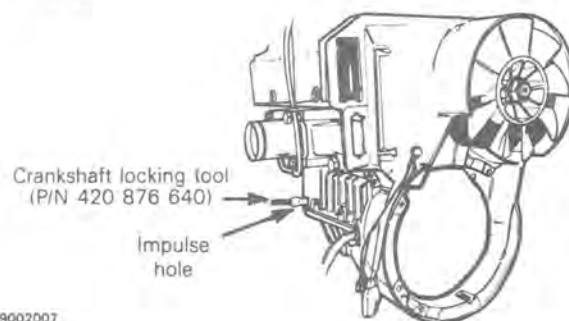
### 1,3,13, Outer half & governor cup

Lock the crankshaft by using one of the following method:

Insert the crankshaft locking tool P/N 420 876 640 into the impulse hole of the engine. Slowly rotate the crankshaft until it locks into position.

**CAUTION:** Do not use any type of pin other than the tool P/N 420 876 640.

(TYPICAL)



Or:

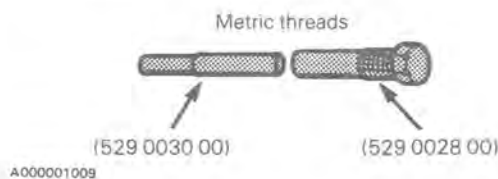
Remove spark plug(s) then bring P.T.O. piston at T.D.C. position.

Rotate drive pulley 45° clockwise then insert enough starter rope into cylinder to fill it completely.

Remove the cap screw.

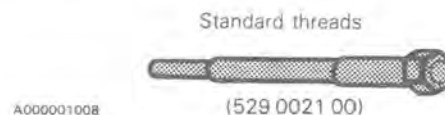
### 14, Inner half

To remove inner half on Skandic models, use metric threads puller:



**CAUTION:** Skandic model pulley has metric threads. Do not use standard threads puller.

On Safari models, use standard threads puller:



To block engine crankshaft:

Remove starter rope blocking piston, then reblock piston after having turned 45° counterclockwise from T.D.C. position; or install crankshaft locking tool.

To remove inner half:

Install puller in pulley shaft then tighten, at the same time knock slightly on puller head to disengage pulley from engine crankshaft.

## Section 03 TRANSMISSION

### Sub-section 03 (DRIVE PULLEY)

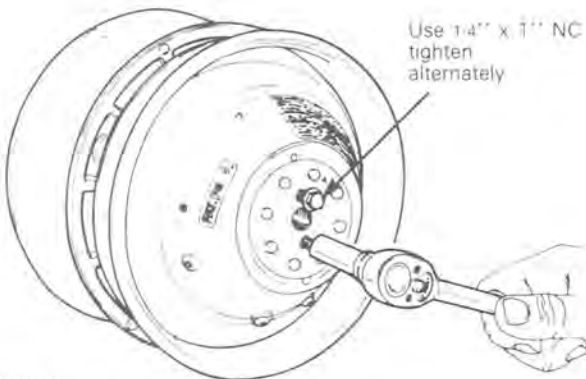
## DISASSEMBLY

NOTE: Some screws of the drive pulley have Loctite on their threads, it is advisable to use a tool such as an impact to break the Loctite bond before attempting to unscrew.

### 3,13, Outer half assembly & governor cup

CAUTION: Do not tap on the governor cup.

The governor cup can be easily removed by inserting two (2) 1/4" x 1" NC bolts and tightening alternately until cup pulls out.



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### 5,6,7, Hub plug

The hub plug is pushed by the clutch spring pressure. At disassembly, hold hub plug firmly against outer half until the two (2) bolts are completely removed. This will prevent damage of the outer half threads.

### 4,5,8, "Duralon" bushing

To disassembly "Duralon" bushing from hub plug, remove set screw and use a suitable pusher and hammer or press.

CAUTION: Do not disassemble counterweights unless replacement is necessary.

## CLEANING

### 13,14, Inner & outer half

Inside of outer half should be cleaned with a clean cloth. The square shaft can be cleaned with fine steel wool and a clean cloth.

### 14, Inner half & crankshaft

Using cleaner such as acetone, clean crankshaft tapered end and the taper inside the fixed half of the drive pulley.

WARNING: This procedure must be performed in a well ventilated area.

CAUTION: Avoid contact between crankshaft seal and acetone because damage may occur.

## INSPECTION

Drive pulley should be inspected annually.

### 20, Roller

Check for roundness of external diameter.

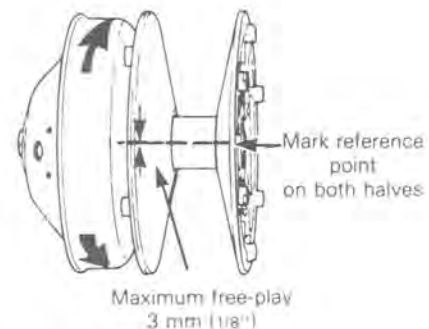
CAUTION: Ensure rollers are in good condition. Replace as required.

### 21, Shouldered bushing

Check for wear.

### 4, "Duralon" bushing

Inspect "the Duralon" bushing condition by checking the free-play of the sliding half pulley. This is achieved by restraining the inner half and checking if the sliding half moves in the direction of the arrows more than 3 mm (1/8").



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## ASSEMBLY

### 15,16, Starter ring gear (electric starting)

Apply Loctite 271 or equivalent on threads and head countersink then torque the screws to 12 N•m (106 lbf•in).

### 11,12, Guard

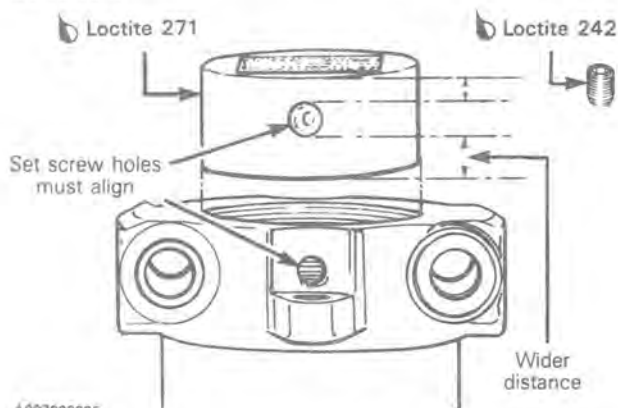
Torque to 4.5 N•m (40 lbf•in)

## Section 03 TRANSMISSION

### Sub-section 03 (DRIVE PULLEY)

#### 4,5,8, "Duralon" bushing

To install "Duralon" bushing on hub plug, use suitable pusher and hammer or press. Install bushing as per illustration.

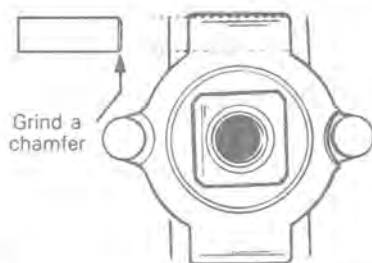


Apply Loctite 271 on "Duralon" bushing. Do not fill set screw holes with loctite.

Apply Loctite 242 on set screw threads, then tighten screw slightly until it then rests against bottom of "Duralon" bushing hole.

#### 5,21, Bushing

Gently grind a small chamfer at one end to ease bushing assembly and push into hub plug as illustrated,



#### 17,18,19,20,21,25,27, Counterweight ass'y & Loctite 242

Make sure to install washers as shown in exploded view.

Apply Loctite 242 on threads and torque to 14 N•m (10 lbf•ft).

CAUTION: Counterweights and rollers must move easily after installation.

CAUTION: Be careful when installing outer half assembly on square shaft of drive pulley to avoid scratches on "Duralon" bushing caused by square shaft edge.

#### 5,6,7,13, Hub plug

Apply Loctite 242 on threads of bolts then torque to 17 N•m (150 lbf•in).

## INSTALLATION

Clean crankshaft extension using fine steel wool and a clean cloth.

CAUTION: When installing drive pulley on engine, reference mark on inner half, outer half, roller guard and governor cup must be in line.

#### 13,14, Inner & outer half

Lock crankshaft in position as explained in removal procedure. Make sure crankshaft is rotated 45° counter-clockwise from T.D.C. position and that cylinder is completely filled with a starter rope or use crankshaft locking tool.

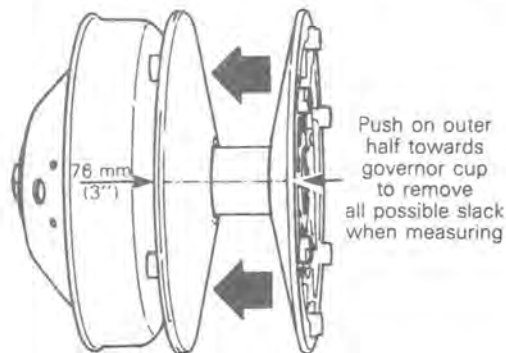
Install inner half on crankshaft extension then position outer half assembly on inner half square shaft.

CAUTION: Be careful when installing outer half assembly on square shaft of drive pulley to avoid scratches on "Duralon" bushing caused by square shaft edge.

#### 1,2,3, Governor cup

Install governor cup making sure that the shaft end rests in governor cup seating. Position cap screw with a new locking tab then torque to 85 N•m (63 lbf•ft).

CAUTION: Incorrect seating of shaft end in governor cup can cause crankshaft bending. When pulley is completely assembled always measure distance of both pulley halves to make sure that the pulley is properly installed. Distance must be 76 mm (3").



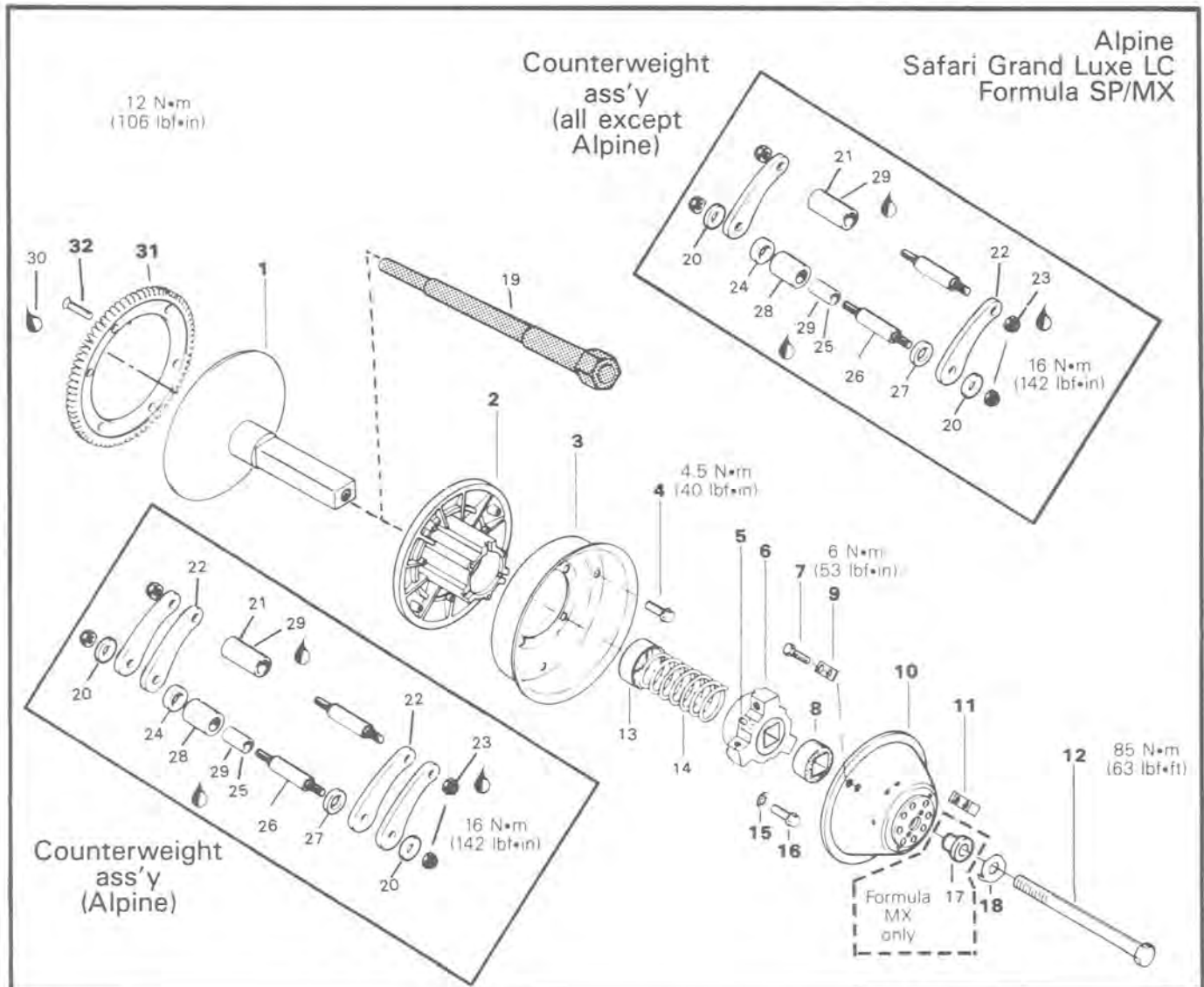
#### 2, Lock tab

Install drive belt, pulley guard and close cab. Accelerate vehicle and bring at intermediate speed then at the same time apply brake. Repeat 2 or 3 times. Stop engine and retorque cap screw. Bend one side of locking tab over a flat of cap screw head.



**Section 03 TRANSMISSION**  
**Sub-section 03 (DRIVE PULLEY)**

**SQUARE SHAFT WITH THREE COUNTERWEIGHT ASSEMBLIES**



1. Inner half
2. Outer half
3. Clutch roller guard
4. Cap screw
5. Allen setscrew
6. Hub plug
7. Cap screw
8. "Duralon" bushing
9. Tab lock
10. Governor cup
11. Ramp
12. Capscrew
13. Spring seat
14. Spring
15. Internal tooth lock washer
16. Cap screw

17. Shouldered washer (Formula MX only)
18. Tab washer
19. Pulley P/N 529 0021 00
20. Washer (Alpine and Formula MX only)
21. Bushing (long)
22. Counterweight
23. Nut
24. Nylon washer 5.1 mm (.200") thickness
25. Bushing (short)
26. Shouldered pin
27. Nylon washer 3.3 mm (.130") thickness
28. Roller
29. Loctite 242
30. Loctite 271
31. Ring gear (electric starting)  
Balancing ring (Formula SP only)

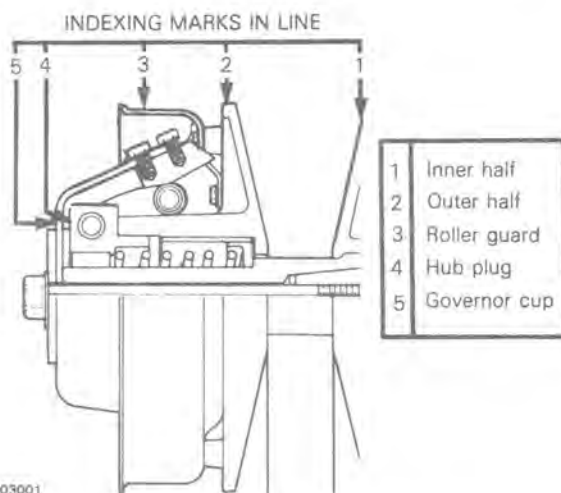
## Section 03 TRANSMISSION

### Sub-section 03 (DRIVE PULLEY)

**WARNING:** Drive pulley repairs that include any disassembly or assembly procedures must be performed by an authorized Bombardier dealer, or other such qualified person. Sub-component installation and assembly tolerances require strict adherence to procedures detailed.

## REMOVAL

Some pulley components are marked to insure proper assembly, thereby maintaining optimum balance. If components lack such marks, marking should be done manually before disassembly, as per illustration.



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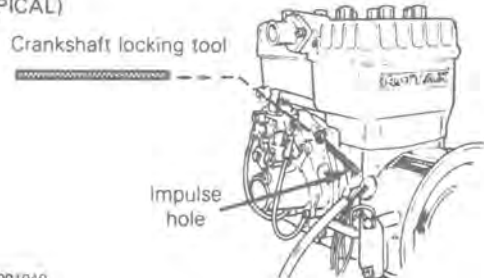
### 2,10,12, Outer half & governor cup

— Lock the crankshaft by using one of the following method:

Insert the crankshaft locking tool P/N 420 876 640 into the impulse hole of the engine. Slowly rotate the crankshaft until it locks into position.

**CAUTION:** Do not use any type of pin other than the tool P/N 420 876 640.

(TYPICAL)



A000001040

Or:

Remove spark plug(s) then bring P.T.O. piston at T.D.C. position.

Rotate drive pulley 45° clockwise then insert enough starter rope into cylinder to fill it completely.

— Remove the cap screw.

### 1, Inner half

If it is necessary to remove inner half, use drive pulley puller P/N 529 0021 00.

**CAUTION:** This pulley has standard threads. Do not use metric threads puller.



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(529 0021 00)

To block engine crankshaft:

Remove starter rope blocking piston, then reblock piston after having turned 45° **counterclockwise** from T.D.C. position; or install crankshaft locking tool.

To remove inner half:

Install puller in pulley shaft then tighten, at the same time knock slightly on puller head to disengage pulley from engine crankshaft.

## DISASSEMBLY

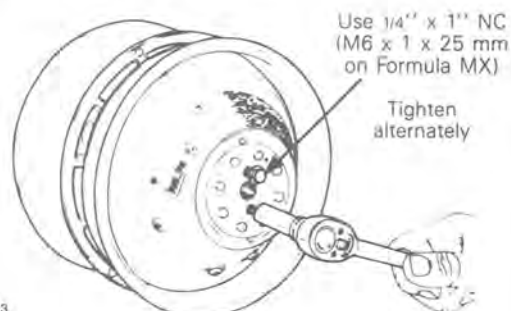
**NOTE:** Some bolts of the drive pulley have Loctite on their threads, it is advisable to break the Loctite seal before attempting to unscrew.

### 2,10, Outer half assembly & governor cup

**CAUTION:** Do not tap on the governor cup.

The governor cup can be easily removed by inserting two (2) 1/4" x 1" NC except on Formula MX bolts and tightening alternately until cup pulls out.

**CAUTION:** On Formula MX, use metric screws M6 x 1 x 25 mm.



A007003003



## Section 03 TRANSMISSION

### Sub-section 03 (DRIVE PULLEY)

#### 6,15,16, Hub plug

The hub plug is pushed by the clutch spring pressure. At disassembly, hold hub plug firmly against outer half until the three (3) bolts are completely removed. This will prevent damage of the outer half threads.

#### 5,8, "Duralon" bushing

To disassemble "Duralon" bushing from hub plug, use a suitable pusher and hammer or press.

▼ **CAUTION:** Do not disassemble counterweights unless replacement is necessary.

### CLEANING

#### 1,2, Inner & Outer half

Inside of outer half should be cleaned with a clean cloth. The square shaft can be cleaned with fine steel wool and a clean cloth.

#### 1, Inner half & crankshaft

Using cleaner such as acetone, clean crankshaft tapered end and the taper inside the fixed half of the drive pulley.

◆ **WARNING:** This procedure must be performed in a well ventilated area.

▼ **CAUTION:** Avoid contact between acetone and crankshaft seal because damage may occur.

### INSPECTION

Drive pulley should be inspected annually.

#### 25, Roller

Check for roundness of external diameter.

▼ **CAUTION:** Ensure rollers are in good condition. Replace as required.

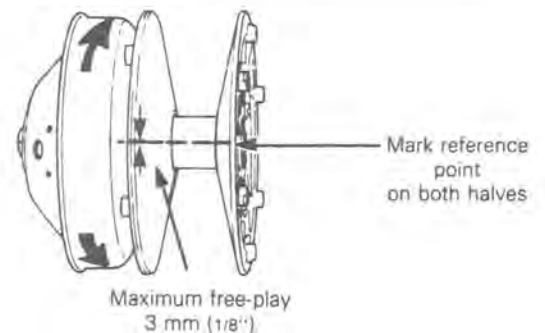
#### 21, Shouldered pin bushing

Check for wear.

Install new one with Loctite 242.

#### 8, "Duralon" bushing

Inspect the "Duralon" bushing condition by checking the free-play of the sliding half pulley. This is achieved by restraining the inner half and checking if the sliding half move in the direction of the arrows more than 3 mm (1/8").



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▼ **CAUTION:** Ensure rollers are in good condition. Replace as required.

### ASSEMBLY

#### 31,32, Starter ring gear, self locking screw

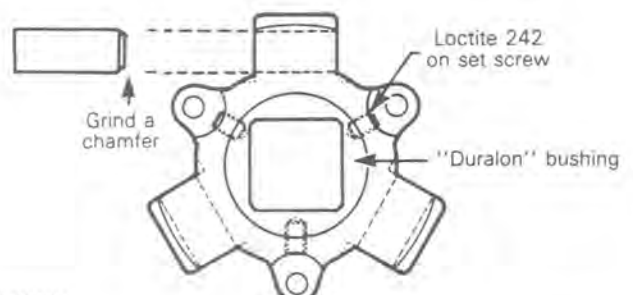
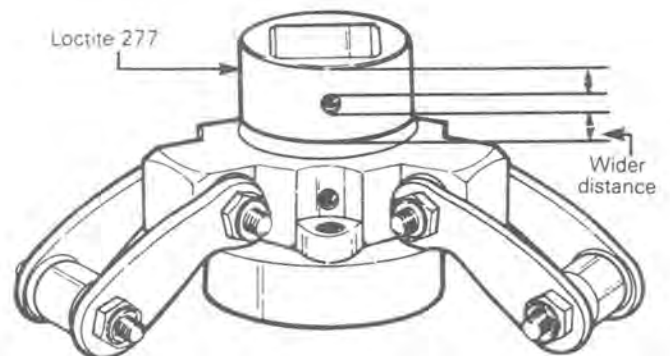
Apply Loctite 271 on threads and head countersink then torque to 12 N•m (106 lbf•in).

#### 3,4, Guard

Torque to 4.5 N•m (40 lbf•in).

#### 5,6,8, "Duralon" bushing

To install or remove "Duralon" bushing from hub plug, use suitable pusher and hammer or press. Install bushing as per illustration.



A015003002

## Section 03 TRANSMISSION

### Sub-section 03 (DRIVE PULLEY)

Apply Loctite 271 on "Duralon" bushing. Do not fill set screw holes with Loctite.

Apply Loctite 242 on set screw threads, then tighten until screw slightly rests against bottom of "Duralon" bushing hole.

#### 21,29, Bushings & Loctite 242

Gently grind a small chamfer at one end to ease bushing assembly. Apply Loctite 242 outside of bushing then push into hub plug as illustrated above.

#### 25,28,29, Bushings, Rollers & Loctite 242

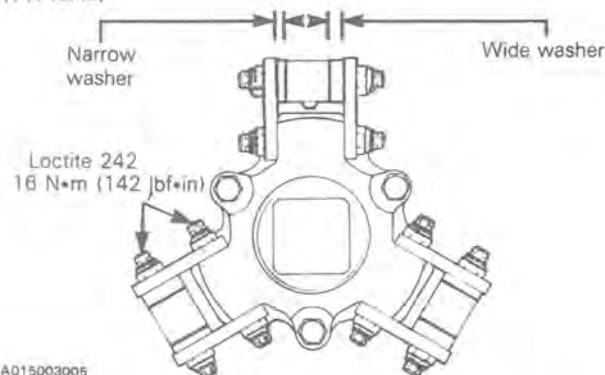
At assembly, apply Loctite 242 outside of bushing then push into roller.

#### 21 to 27, Counterweight ass'y

Rollers and nylon washers must move freely; install them as per illustration.

**CAUTION:** Counterweights and rollers must move easily after installation.

(TYPICAL)

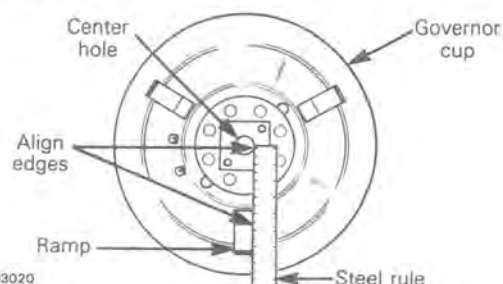


Apply Loctite 242 on shouldered pin threads and torque to 16 N•m (142 lbf•in).

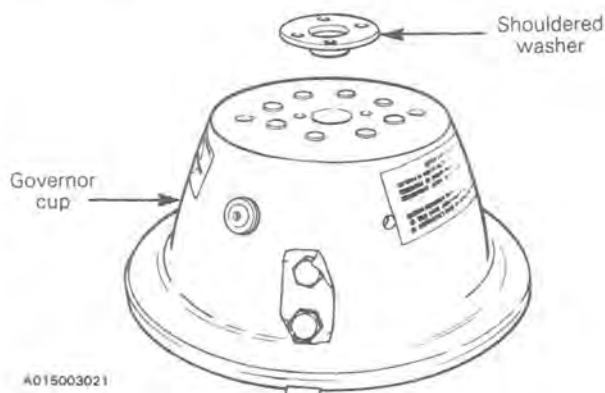
#### 7,9,11, Ramps

Assemble ramps in governor cup and tighten cap screws finger tight only to allow adjusting of the ramps.

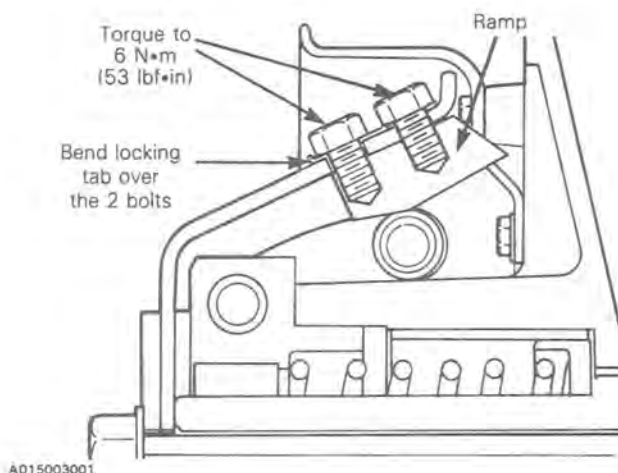
Using a suitable straight edge tool such as a 15 cm (6'') steel rule, align edges of ramps with the governor cup center hole edge.



**NOTE:** On Formula MX models the shouldered washer 17 must be in position in governor cup because the ramps must be aligned with the edge of the shouldered washer center hole. See illustration.



Torque cap screws as per illustration and check that ramps are still aligned, bend locking tab over bolts.



## INSTALLATION

Clean crankshaft extension using fine steel wool and a clean cloth.

**CAUTION:** When installing drive pulley on engine, reference mark on inner half, outer half, hub plug and governor cup must be in line.

#### 1,2, Inner & outer half

Lock crankshaft in position as explained in removal procedure. Make sure crankshaft is rotated 45° counter-clockwise from T.D.C. position and that cylinder is completely filled with a starter rope or use crankshaft locking tool.

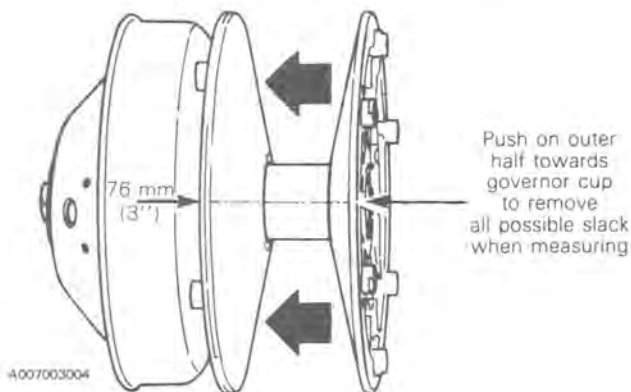
Install inner half on crankshaft extension then position outer half assembly on fixed half square shaft.

▼ **CAUTION:** Be careful when installing outer half assembly on square shaft of drive pulley to avoid scratches on "Duralon" bushing caused by square shaft edge.

### 10, Governor cup

Install governor cup making sure that the shaft end rests in governor cup seating. Position cap screw with a new locking tab then torque to 85 N•m (63 lbf•ft).

▼ **CAUTION:** Incorrect seating of shaft end in governor cup can cause crankshaft bending. When pulley is completely assembled always measure distance of both pulley halves to make sure that the pulley is properly installed. Distance must be 76 mm (3").



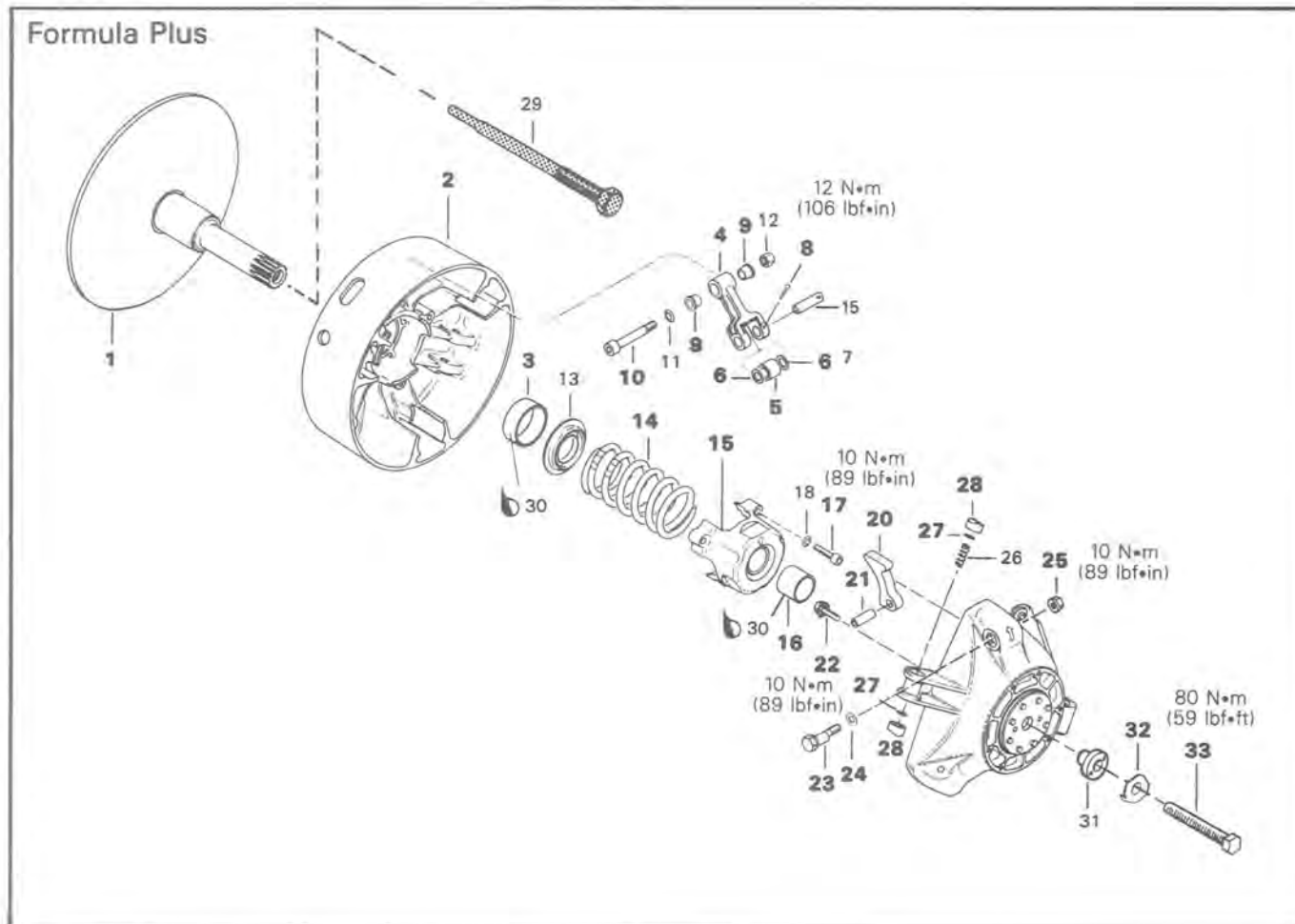
### 18, Lock tab

Install drive belt, pulley guard and close cab. Accelerate vehicle, bring at intermediate speed, then at the same time apply brake. Repeat 2 or 3 times. Stop engine and retorque cap screw. Bend one side of locking tab over a flat of cap screw head.

## Section 03 TRANSMISSION

### Sub-section 03 (DRIVE PULLEY)

## TRA CLUTCH



1. Inner half ass'y
2. Outer half ass'y
3. Kahlron bushing (outer half)
4. Lever ass'y (3)
5. Roller ass'y (3)
6. Thrust washer 9,5/15/1,2 (6)
7. Pin (3)
8. Cotter pin 2,5 x 22 (3)
9. Flange bushing (6)
10. Fitting bolt M7 x 8 x 51 (3)
11. Friction-washer (3)
12. Locking-nut M7 (3)
13. Spring seat
14. Spring
15. Spring cover ass'y
16. Kahlron bushing (spring cover)
17. Cylinder screw M6 x 40 (3)

18. Friction-washer (3)
19. Governor cup ass'y
20. Ramp (3)
21. Dowel tube 8 x 24 (3)
22. Hex.-locking screw M6 x 20 (6)
23. Calibration screw (3)
24. Washer 6,0/12/1 (3)
25. Locking-nut M6 (3)
26. Spring (slider shoe) (3)
27. O-ring 11,1-1,6 (3)
28. Slider shoe (3)
29. Inner half puller
30. Loctite 601
31. Flanged washer
32. Tab washer
33. Cap screw

## Section 03 TRANSMISSION

### Sub-section 03 (DRIVE PULLEY)

○ NOTE: TRA clutch stands for Total Range Adjustable clutch.

◆ WARNING: Drive pulley repairs that include any disassembly or assembly procedures must be performed by an authorized Bombardier dealer, or other such qualified person. Sub-component installation and assembly tolerances require strict adherence to procedures details.

## REMOVAL

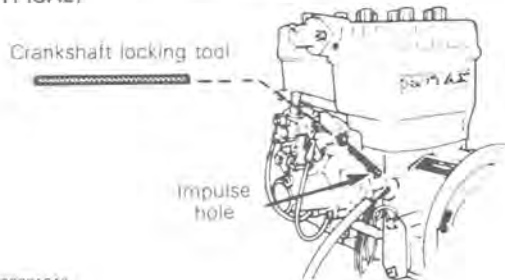
### 33, Cap screw

— Lock the crankshaft by using one of the following method:

Insert the crankshaft locking tool P/N 420 876 640 into the impulse hole of the engine. Slowly rotate the crankshaft until it locks into position.

▼ CAUTION: Do not use any type of pin other than the tool P/N 420 876 640.

(TYPICAL)



Or:

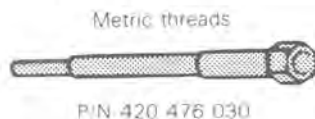
Remove spark plug(s) then bring P.T.O. piston at T.D.C. position.

Rotate drive pulley 45° clockwise then insert enough starter rope into cylinder to fill it completely.

— Remove the cap screw.

To remove from engine, use puller P/N 420 476 030.

▼ CAUTION: This pulley has metric threads. Do not use standard threads puller.



To block engine crankshaft:

Remove starter rope blocking piston, then reblock piston after having turned 45° counterclockwise from T.D.C. position; or install crankshaft locking tool

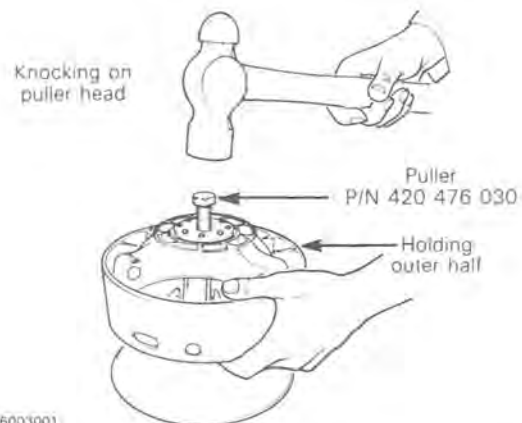
To remove drive pulley ass'y

Install puller in pulley shaft then tighten, at the same time knock slightly on puller head to disengage pulley from engine crankshaft.

### 1,2, Inner & outer half

▼ CAUTION: Do not tap on governor cup.

Screw puller into inner half shaft about 13 mm (1/2"). Raise drive pulley and hold it by the outer half while knocking on puller head to disengage inner half.

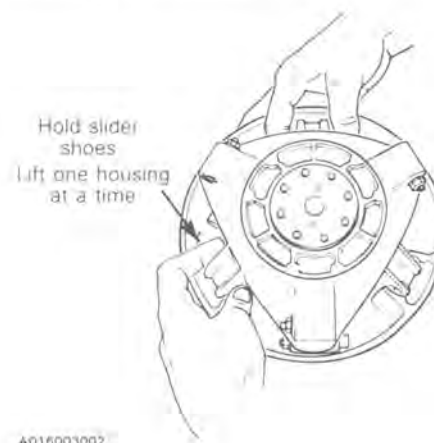


○ NOTE: No components marking is required before disassembling this drive pulley since it has factory mark and arrows as indexing reference.

### 19,28, Governor cup, slider shoe

Carefully lift it until slider shoes come at their highest position into guides.

Hold a slider shoe set then carefully lift its housing and remove them. Proceed the same way for other housings lifting one at a time.



## Section 03 TRANSMISSION

### Sub-section 03 (DRIVE PULLEY)

#### 15, Spring cover ass'y

It is pushed by clutch spring pressure.

Assemble inner half with outer half and use the following tools to remove spring cover.

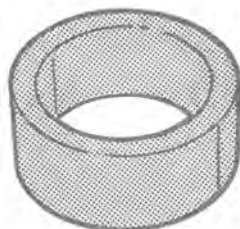
◆ **WARNING:** Clutch spring is very strong. Never attempt to remove spring cover without the recommended tools:

Puller P/N 420 476 030



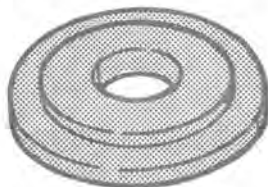
A018001007

Spacer P/N 529 0054 00



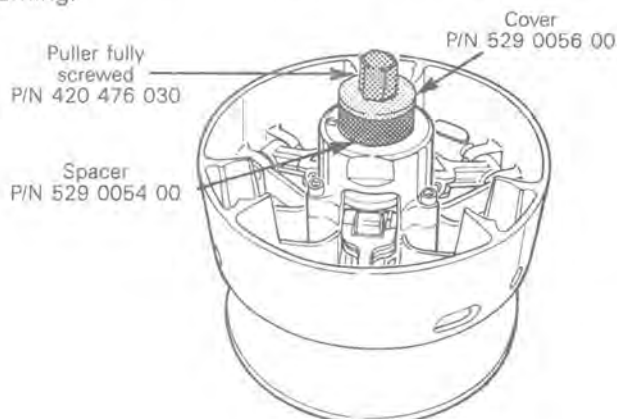
A018001004

Cover P/N 529 0056 00



A016001005

Install tools as shown making sure puller is fully screwed. Remove 3 Allen screws retaining spring cover then unscrew puller while holding inner half to prevent from turning.



A016001006

03-03-20

#### CLEANING

##### 1,2, Inner & outer half

Inside of outer half should be cleaned with a clean cloth. The round shaft can be cleaned with fine steel wool and a clean cloth.

##### 1, Inner half & crankshaft

Using cleaner such as acetone, clean crankshaft tapered end and the taper inside the fixed half of the drive pulley.

◆ **WARNING:** This procedure must be performed in a well ventilated area.

▼ **CAUTION:** Avoid contact between acetone and crankshaft seal because damage may occur.

#### INSPECTION

Drive pulley should be inspected annually.

##### 5, Roller

Check for roundness of external diameter. Replace as required.

▼ **CAUTION:** Ensure rollers are in good condition. Replace as required.

##### 6,9, Thrust washer, flange bushing

Check for wear. Replace as required.

##### 27,28, O-ring, slider shoe

Check if o-rings are cracked, cut or crushed. Replace as required.

Check slider shoes for wear. Replace if groove is not apparent on top.

##### 1,19, Inner half & governor cup

Inspect splines and free play between both parts. Replace if required.

##### 3,16, Outer half & spring cover kahrlon bushings

Visually inspect kahrlon coating. Replace if worn.

#### OUTER HALF BUSHING REPLACEMENT

Use a suitable pusher to remove the old bushing. Clean outer half with ethyl alcohol.

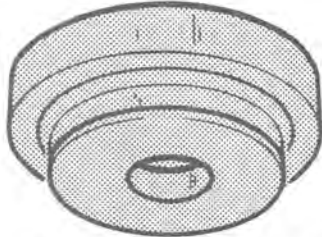
▼ **CAUTION:** Bushing must be bonded with Loctite 601 then flared to prevent displacement in outer half.



## Section 03 TRANSMISSION

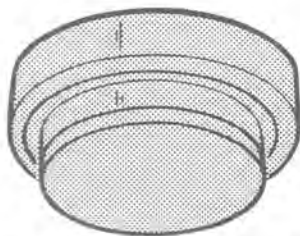
### Sub-section 03 (DRIVE PULLEY)

To flare bushing, use following tools:



A016001008

Outer flare tool P/N 529 0060 00

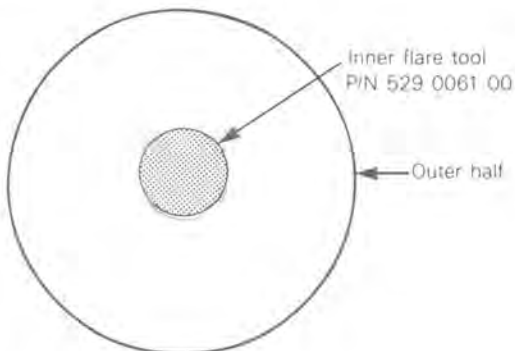


A016001009

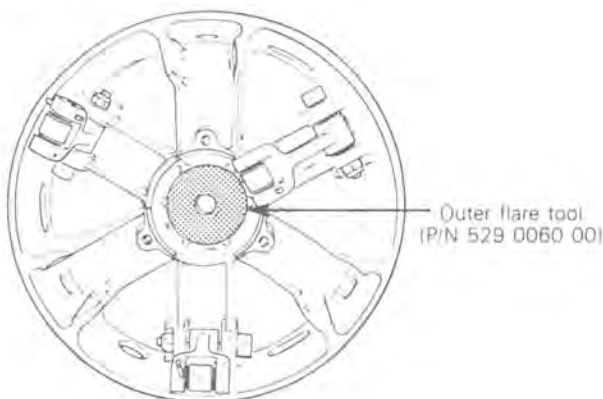
Inner flare tool P/N 520 0061 00

Apply Loctite 601 outside of bushing then insert into its housing making sure there is the same distance both sides.

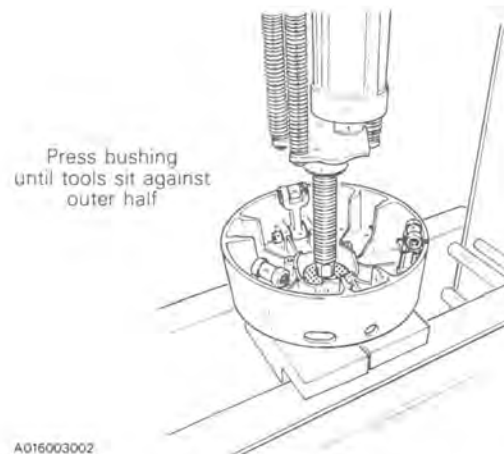
Place flaring tools each side of outer half then use a press to flare the bushing



A016001010

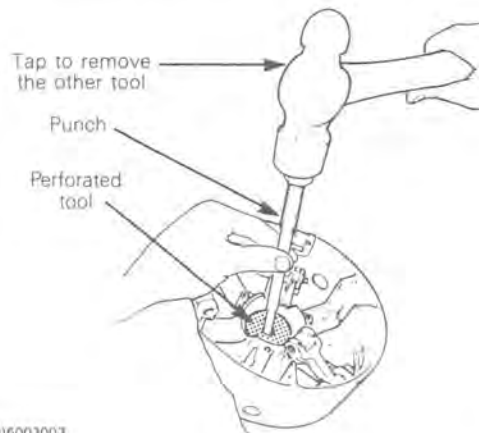


A016001011



A016003002

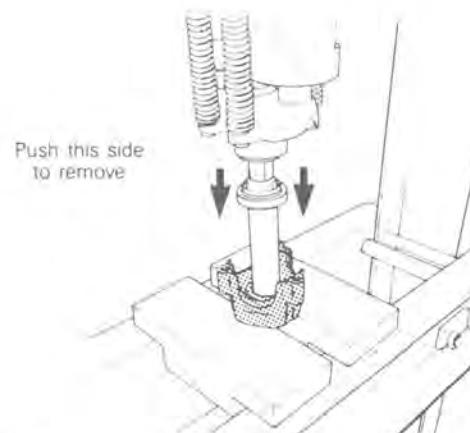
To remove tools from outer half, insert a suitable punch through the perforated tool and tap to release the other thus making room to remove itself.



A016003003

#### SPRING COVER BUSHING REPLACEMENT

Use a suitable pusher to remove old bushing. Push bushing as shown due to the flared side.



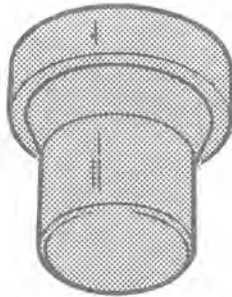
A016003004

## Section 03 TRANSMISSION

### Sub-section 03 (DRIVE PULLEY)

**CAUTION:** Bushing must be bonded with Loctite 601 then flared to prevent displacement in spring cover.

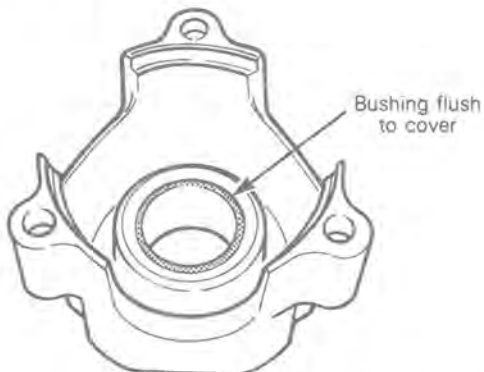
To flare bushing, use following tool:



A016001012

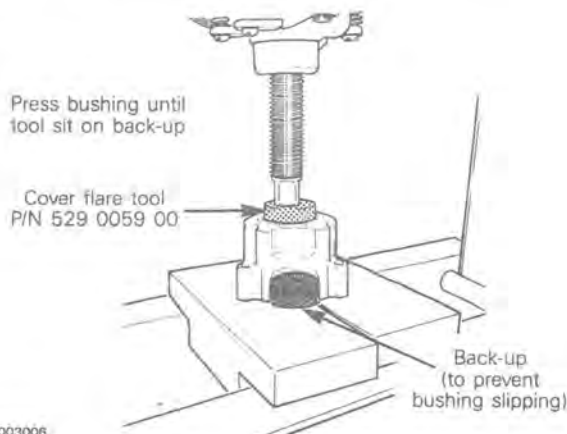
Cover flare tool P/N 529 0059 00

Apply Loctite 601 outside of bushing then insert flush to spring cover (spring side).



A016003005

Place a metal piece to prevent bushing to slip when it will be flared. Use a press to flare the bushing.



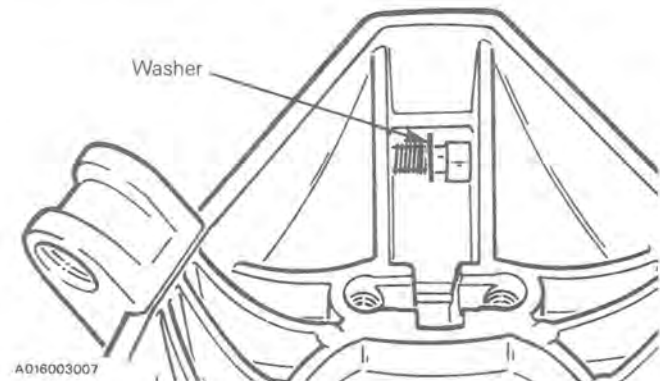
A016003006

## ASSEMBLY

**NOTE:** This drive pulley is lubrication free. Do not lubricate any component.

### 23,24,25, Calibration screw, washer & locking nut

When installing calibration screw, make sure to install washer as shown.

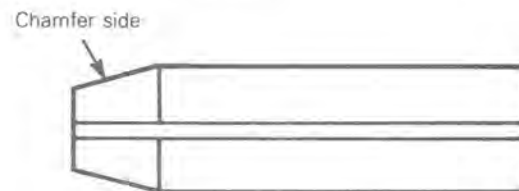


A016003007

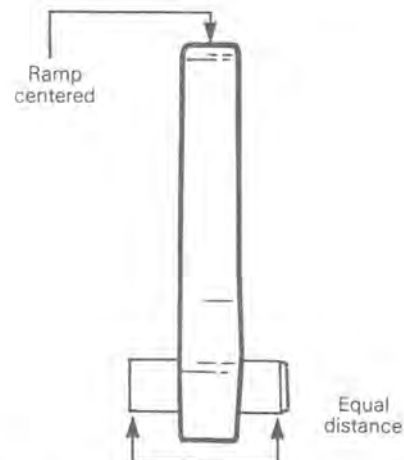
Torque locking nut to 10 N•m (89 lbf•in).

### 20,21,22, Ramp, dowel tube & screw

Insert dowel tube from chamfered side. Make sure ramp is centered on dowel tube.



A016003008



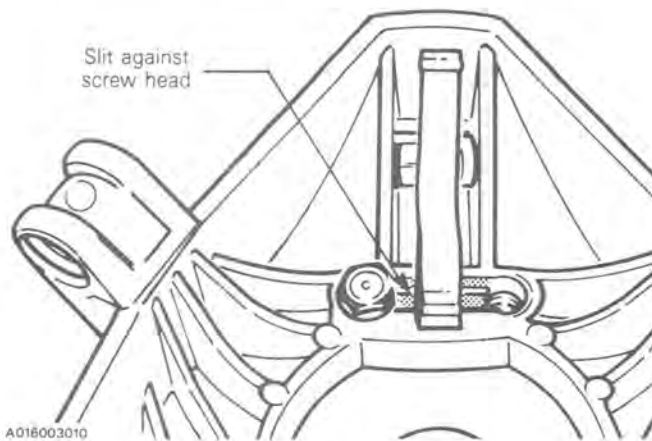
A016003009

**CAUTION:** Dowel tube slit must be installed against screw head to block properly and prevent from turning.



## Section 03 TRANSMISSION

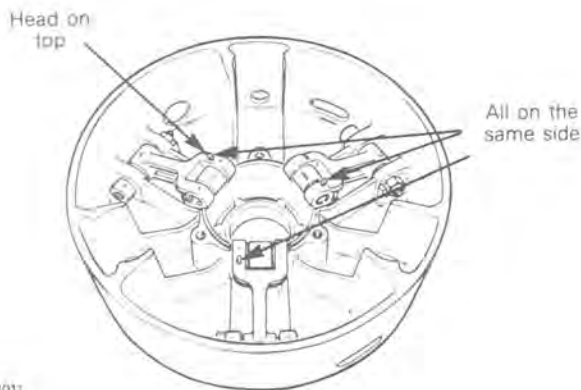
### Sub-section 03 (DRIVE PULLEY)



Torque screws to 10 N•m (89 lbf•in)

#### 4,8,10,12, Lever ass'y, cotter pin, screw & nut

Always install lever assemblies so that cotter pins are at the shown side. Besides install cotter pin head on top when lever is sat at bottom of outer half. Bend cotter pin ends to sit perfectly against lever.



▼ **CAUTION:** Lever assemblies must be installed so that cotter pins are on the same side.

Torque nuts to 12 N•m (106 lbf•in)

▼ **CAUTION:** Lever ass'y and rollers must move easily after installation.

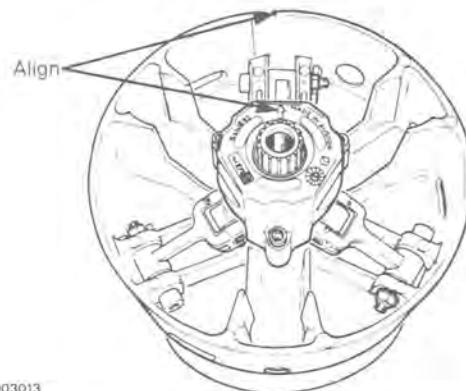
#### 2,14,15, Outer half, spring, spring cover & screw

To install spring cover, use same special tools used for removal.

Assemble inner and outer half. Install special tools then manually push on puller while turning to engage threads into inner half shaft.



Fully screw puller while holding inner half. Lift outer half against spring cover and align spring cover arrow with outer half mark.

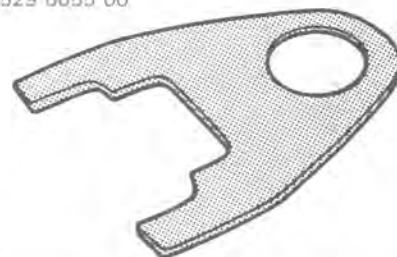


Torque screws to 10 N•m (89 lbf•in).

#### 2,19,28, Outer half, governor cup & slider shoe

To install governor cup, use following tool:

Fork P/N 529 0055 00



Insert spring and slider shoes into governor cup so that groove in each slider shoe is vertical to properly slide in guides.

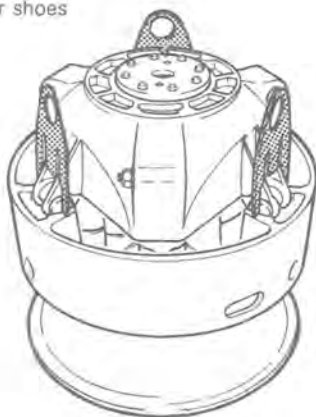
## Section 03 TRANSMISSION

### Sub-section 03 (DRIVE PULLEY)

▼ **CAUTION:** Make sure O-rings are installed on slider shoes and their grooves are positioned vertically.

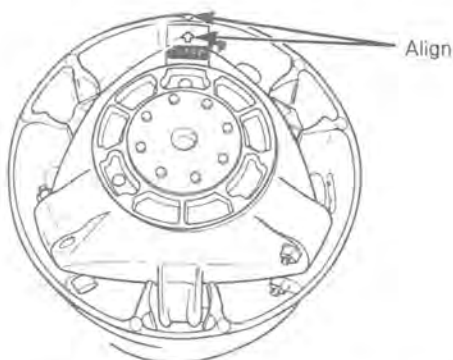
Install fork P/N 529 0055 00 into slider shoe grooves to maintain them for governor cup installation. Proceed on 3 set of slider shoes. Carefully slide governor cup into outer half.

Fork P/N 529 0055 00  
maintaining slider shoes



A018001002

Make sure to align governor cup arrow with outer half mark.



A018003014

Remove forks and push governor cup so that its splines engage with inner half shaft splines.

▼ **CAUTION:** Make sure splines of both parts are fully engaged.

## INSTALLATION

Clean crankshaft extension using fine steel wool and a clean cloth.

### Drive pulley ass'y

Lock crankshaft in position as explained in removal procedure. Make sure crankshaft is rotated 45° **counter-clockwise** from T.D.C. position and that cylinder is completely filled with a starter rope or use crankshaft locking tool.

Install drive pulley ass'y on crankshaft extension. Position flanged washer, a new tab washer and cap screw then torque to 80 N•m (59 lbf•ft).

### 32, Tab washer

Install drive belt pulley guard and close cab. Accelerate vehicle, bring at intermediate speed, then at the same time apply brake. Repeat 2 or 3 times. Stop engine and retorque cap screw. Bend one side of tab washer over a flat of cap screw head.

### Drive pulley adjustment

A drive pulley is factory calibrated to transmit engine maximum power at predefined RPM. Factors such as ambient temperature, altitude or surface condition may vary this critical engine RPM thus affecting snowmobile efficiency.

This adjustable drive pulley allows setting maximum engine RPM in vehicle to maintain the maximum power.

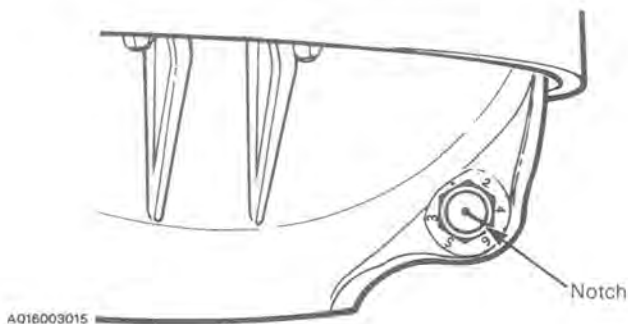
Calibration screws should be adjusted so that actual maximum engine RPM in vehicle matches with the maximum horsepower RPM given in Bombardier snowmobile specifications.

○ **NOTE:** The adjustment has an effect on high RPM only.

To adjust, modify ramp end position by turning calibration screws.

### 19,23,25, Governor cup, calibration screw & locking nut

Calibration screw has a notch on top of its head.

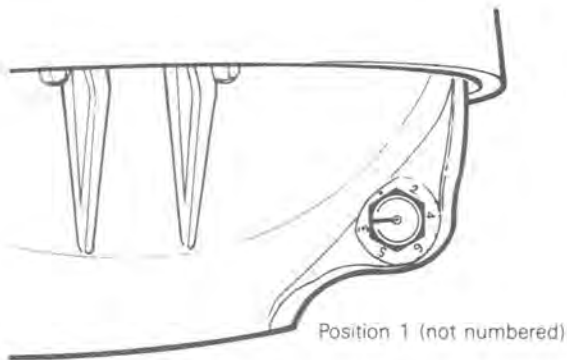


A018003015

Governor cup has 6 positions numbered 2 to 6. Note that in position 1 the number is replaced by a dot (due to its location on casting).

## Section 03 TRANSMISSION

### Sub-section 03 (DRIVE PULLEY)



A016003016

Each number modify maximum engine RPM by about 200 RPM **number 3 represent the factory set-up**, so that lower numbers decrease engine RPM in steps of 200 RPM and upper numbers increase it in steps of 200 RPM.

#### EXAMPLE:

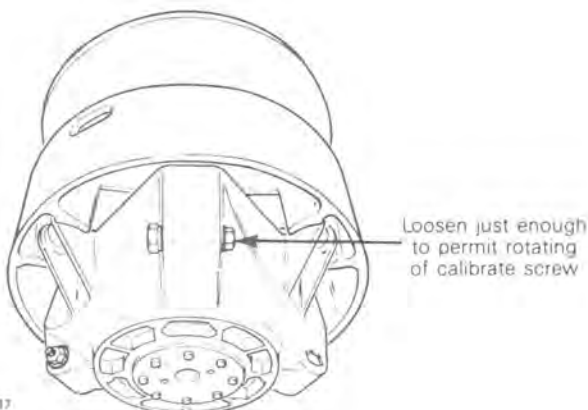
Calibration screw is set at position 4 and is changed to position 6. So engine RPM is increased of 400 RPM.

#### To adjust:

Just loosen locking nut enough to pull calibration screw **partially** out and adjust to desired position. Do not completely remove the locking nut. Torque locking nuts to 10 N•m (89 lbf•in).

▼ **CAUTION:** Do not completely remove calibration screw so its washer inside will fall.

▼ **CAUTION:** Always adjust all 3 calibration screws and make sure they are all set at the same number.

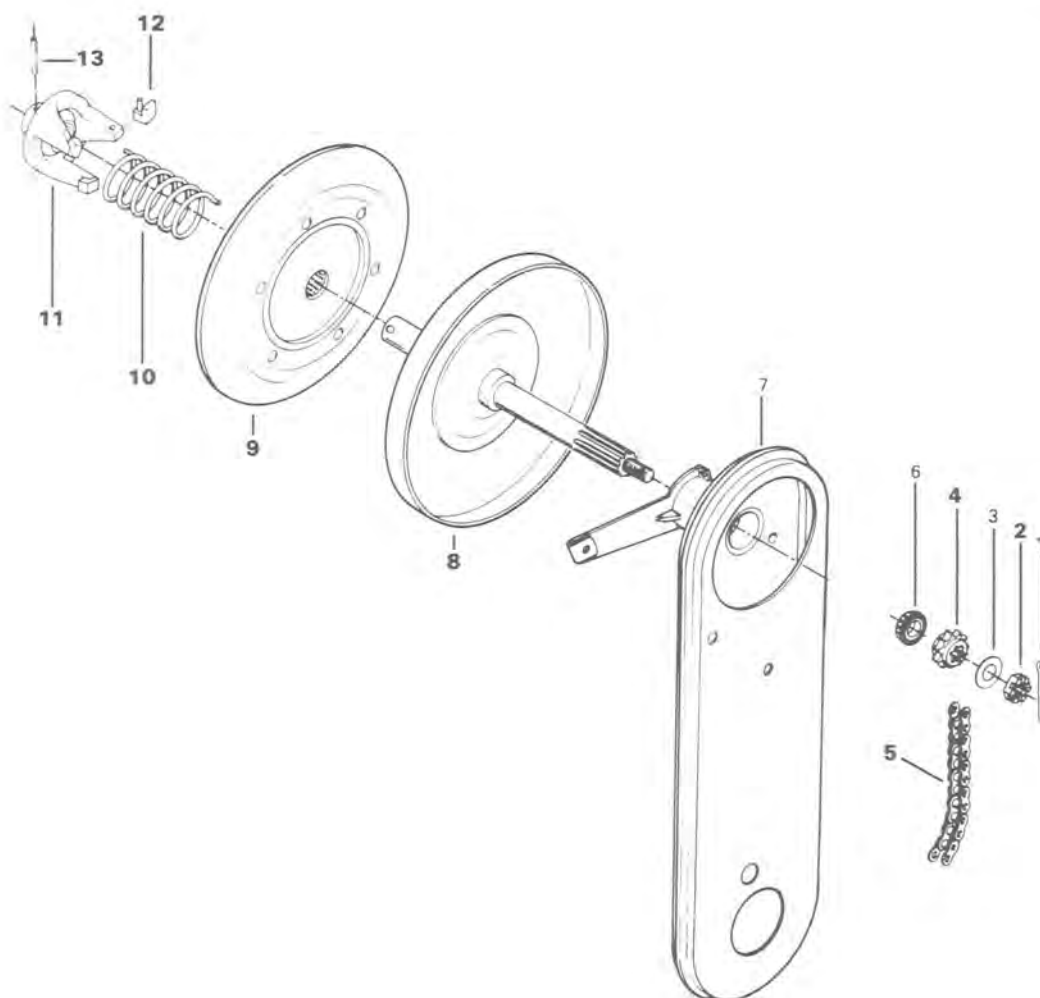


A016003017



## DRIVEN PULLEY

Elan



- 1. Cotter pin
- 2. Castellated nut
- 3. Spring washer
- 4. Sprocket
- 5. Driving chain
- 6. Bearing cone
- 7. Chaincase

- 8. Fixed half
- 9. Sliding half
- 10. Release spring
- 11. Outer cam
- 12. Cam slider shoe (3)
- 13. Roll pin

## Section 03 TRANSMISSION

### Sub-section 04 (DRIVEN PULLEY)

#### DISASSEMBLY

##### 11, 13, Roll pin & outer cam

Use a pin punch to remove roll pin from the outer cam.

#### REMOVAL

##### Pulley guard & drive belt

Remove.

##### Steering column bolts

Slacken.

##### 5, Drive chain

Release tension.

##### 1,2, Cotter pin & castellated nut

Remove from pulley shaft.

##### 5, Drive chain

Attach to frame to prevent from falling inside chaincase.

##### Driven pulley assembly

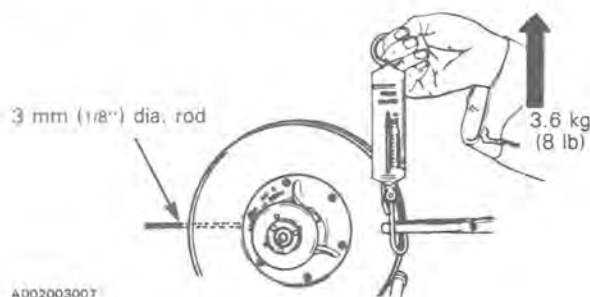
Pull toward engine and remove from vehicle.

#### INSPECTION

##### 10, Spring

##### Spring torsional pre-load

In order to measure driven pulley spring torsional preload, pulley halves must be separated. To do this, insert length of 3 mm (1/8") dia. rod between the halves. Check tension using a fish scale positioned 90° with pulley axle.

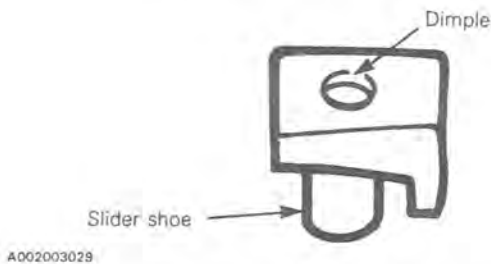


Spring pre-load should be 3.6 kg (8 lb).

To correct pre-load see ADJUSTMENT.

##### 12, Cam slider shoe

Slider shoe must be replaced when dimple in the working surface is barely visible or worn to less than 3/4 of its original depth. See illustration.



To expose slider shoe working surface, turn sliding half by hand so that the pulley cam moves away from slider shoes.

**WARNING:** Make sure that the engine cannot be started when performing the above operation.

#### ASSEMBLY

Assemble driven pulley by reversing disassembly procedure.

##### 12, Cam slider shoe

When replacing slider shoes, always install a new set (3 shoes) to maintain equal pressure on the cam.

#### INSTALLATION

Reinstall the driven pulley on vehicle by reversing the removal procedure.

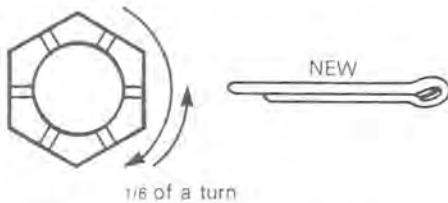
##### 4,5, Sprocket & chain

With drive chain tension released, hold upper sprocket and chain in position then insert assembled driven pulley shaft through chaincase and sprocket.

## 2, Castellated nut

Install spring washer and castellated nut.

Tighten castellated nut fully then back off nut 1/6 of a turn.



A002003008

1/6 of a turn

▼ **CAUTION:** It is important that nut is backed off or damage may occur due to a burnt or seized bearing.

▼ **CAUTION:** Drive pulley alignment must always be checked whenever pulleys have been removed, replaced or disassembled. For pulley alignment procedure refer to section 03-05.

## 1, Cotter pin

Lock assembly in position with a new cotter pin.

## 5, Drive chain

Apply chain tension.

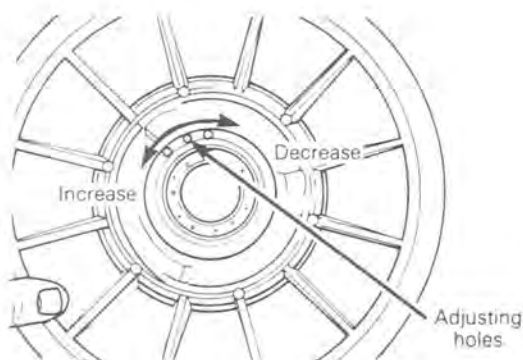
## ADJUSTMENT

### 10, Spring

#### Spring torsional pre-load

Spring torsional pre-load should be 3.6 kg (8 lb).

To correct spring pre-load relocate spring end in sliding pulley half, moving it clockwise to decrease the pre-load or counterclockwise to increase it.



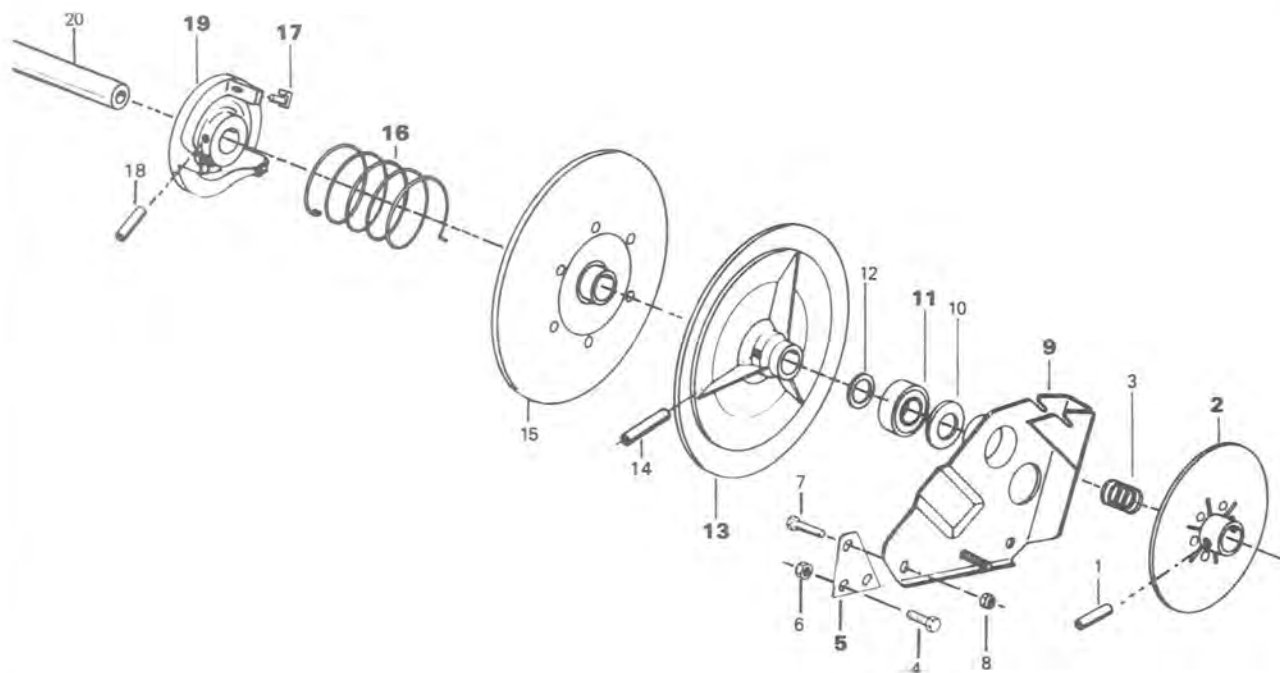
A007003012

○ **NOTE:** Always recheck torsional spring pre-load after adjusting.

## Section 03 TRANSMISSION

### Sub-section 04 (DRIVEN PULLEY)

Alpine



1. Roll pin
2. Brake disc
3. Spring
4. Cap screw 1/4 - 20
5. Support bracket
6. Elastic stop nut 1/4 - 20
7. Cap screw 5/16 - 18 x 3/4
8. Elastic stop nut 5/16 - 18
9. Bearing support
10. Shim

11. Bearing
12. Spacer
13. Fixed half
14. Roll pin
15. Sliding half
16. Spring
17. Slider shoe (3)
18. Roll pin
19. Outer cam
20. Transmission input shaft



## REMOVAL

Driven pulley can be removed from the transmission shaft using the following procedure:

### Pulley guard & drive belt

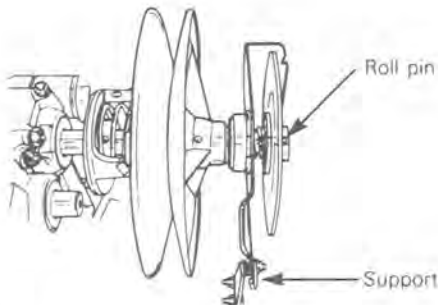
Remove from vehicle.

### Brake caliper assembly

Remove from bearing support.

### 2,9, Disc & support

Position a suitable support under the drive shaft then punch the roll pin out of the shaft.



A0017003002

The transmission shaft support is removed with the disc. Disengage support from bearing by tapping on its inner side.

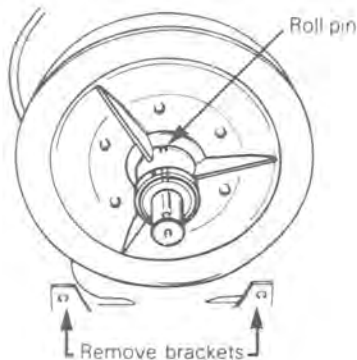
Pull disc and support out of the shaft.

### 11, Bearing

Use a suitable bearing puller.

### 5,13 Fixed half & support brackets

Remove the two support brackets. Push the roll pin out of the shaft and remove the fixed half.



A017003003

### 19, Outer cam

With sliding half and spring removed, push the roll pin out of the shaft and remove the outer cam.

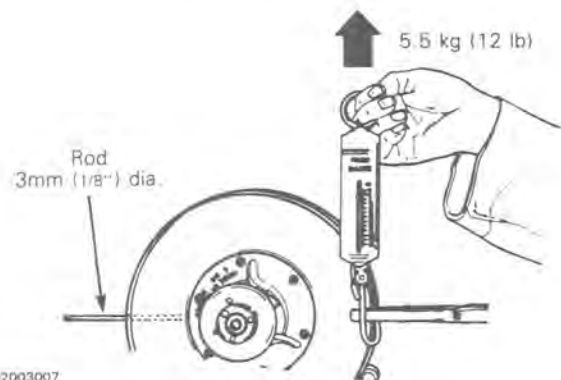
NOTE: If necessary, heat hub of fixed pulley and outer cam to facilitate removal.

## INSPECTION

### 16, Spring

#### Spring torsional pre-load

In order to measure driven pulley spring tension, the pulley halves must be separated. To do this, insert a length of 3 mm (1/8") dia. rod between the halves. Check tension using a fish scale positioned 90° with pulley axle. Spring tension pre-load should be 5.5 kg (12 lb).

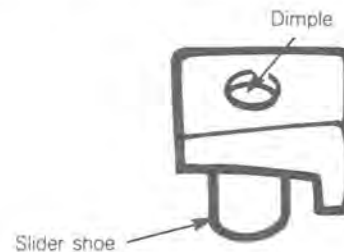


A002003007

To correct, see ADJUSTMENT.

### 17, Cam slider shoe

Slider shoe must be replaced when dimple in the working surface is barely visible or worn to less than 3/4 of it's original depth. See illustration.



A002003029

To expose slider shoe working surface, turn sliding half by hand so that the pulley cam moves away from slider shoes.

WARNING: Make sure that the engine cannot be started when performing the above operation.

---

## Section 03 TRANSMISSION

### Sub-section 04 (DRIVEN PULLEY)

---

## ASSEMBLY

### 17, Cam slider shoe

When replacing slider shoes, always install a new set (3 shoes) to maintain equal pressure on the cam.

## INSTALLATION

To install driven pulley, bearing, support and disc, reverse removal procedure.

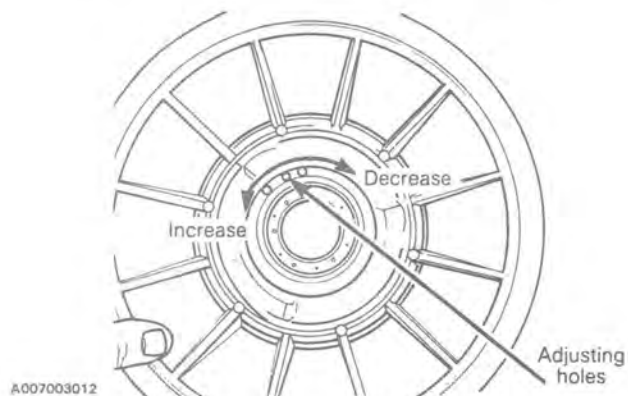
▼ **CAUTION:** Drive pulley alignment should always be checked whenever pulleys have been removed, replaced or disassembled. For pulley alignment procedure refer to section 03-05.

## ADJUSTMENT

### 16, Spring

#### Spring torsional pre-load

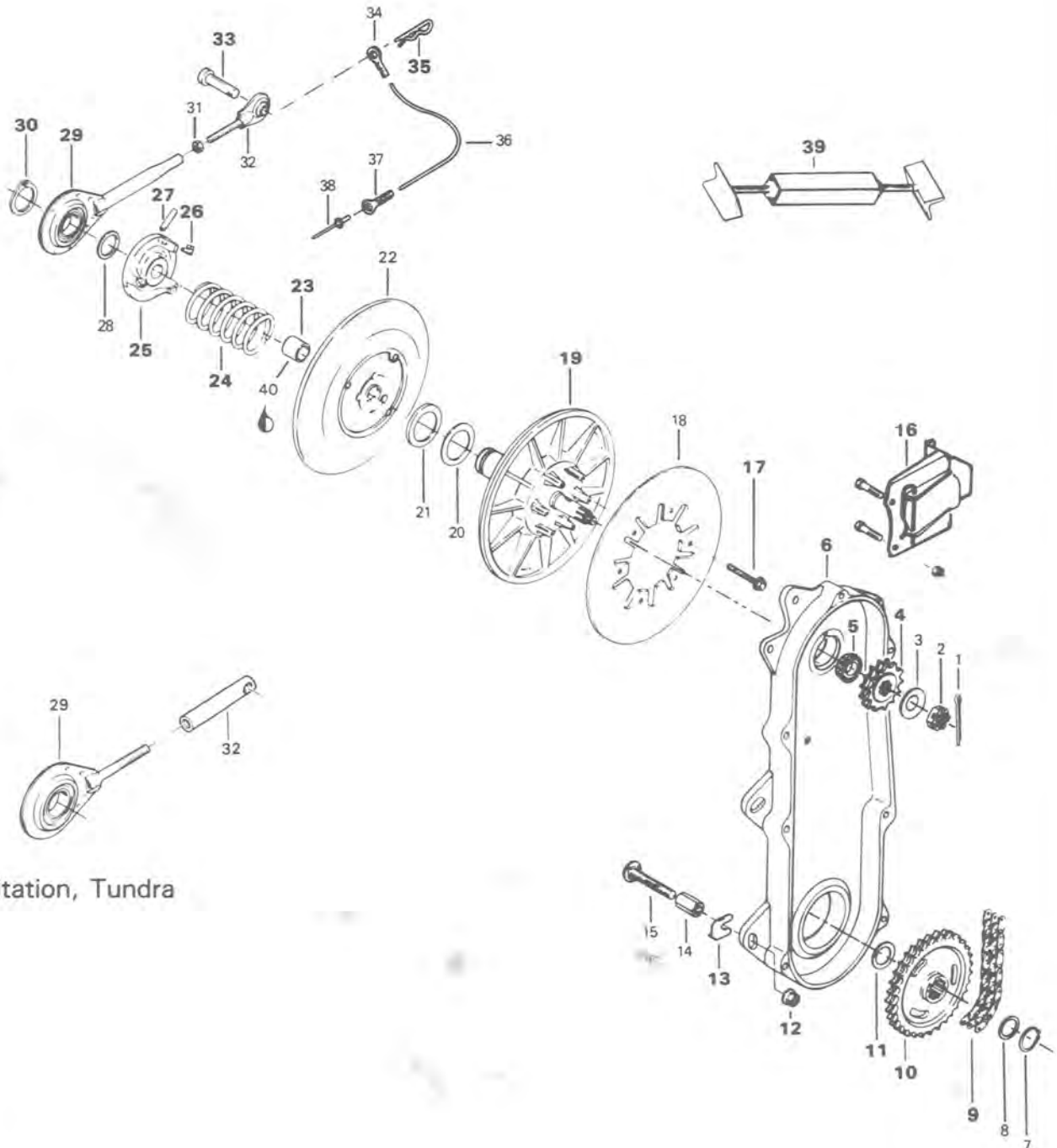
To adjust spring pre-load, relocate spring end in sliding pulley half, moving it clockwise to decrease the pre-load or counterclockwise to increase it.



○ **NOTE:** Always recheck torsional pre-load after adjusting.

**Section 03 TRANSMISSION**  
**Sub-section 04 (DRIVEN PULLEY)**

Citation LS/E, Tundra/LT, Safari, Formula SP



Citation, Tundra

## Section 03 TRANSMISSION

### Sub-section 04 (DRIVEN PULLEY)

1. Cotter pin
2. Castellated nut
3. Spring washer
4. Sprocket
5. Bearing cone
6. Chaincase
7. Snap ring
8. Spacer (thin)
9. Chain
10. Sprocket
11. Spacer (thick)
12. Elastic flanged stop nut M8 x 1.25 (4)
13. Shim
14. Threaded spacer
15. Carriage bolt M8 x 1.25 x 55 (4)
16. Brake ass'y
17. Taptite screw M6 x 16 (6)
18. Brake disc
19. Fixed half
20. Shim

21. Shim
22. Sliding half
23. Bushing
24. Spring
25. Outer cam
26. Slider shoe (3)
27. Roll pin
28. Spacer
29. Support
30. Snap ring
31. Nut
32. Threaded attachment
33. Clevis pin
34. Ring terminal
35. Hair pin
36. Wire
37. Ring terminal
38. Rivet
39. Drive axle holder
40. Loctite 601

## REMOVAL

To remove driven pulley from vehicle, chaincase and driven pulley must be removed as an assembly. Follow this procedure:

### Pulley guard & drive belt

Remove from vehicle.

### 16, Brake caliper

Remove from chaincase.

### 29,33,35, Countershaft support

To disconnect from support clamp, remove hair pin and clevis pin.

### 6, Chaincase

Open and drain oil.

### 4,9,10, Sprockets & chain

Remove lower sprocket snap ring. Remove cotter pin and upper sprocket castellated nut.

Remove sprockets and chain.

### 5,11, Bearing & spacer

Remove from chaincase.

### 12,13, Retaining nuts & shims

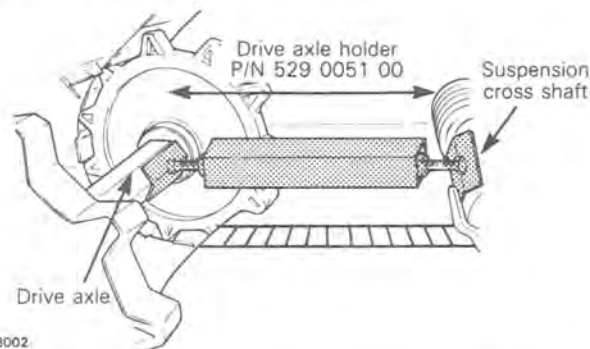
Remove the four chaincase retaining nuts and save aligning shims for installation.

## Drive axle seal

Push towards drive axle sprocket.

### 39, Drive axle holder

Remove tension exerted by the track on the drive axle using drive axle holder as illustrated.



**NOTE:** To insert the drive axle holder on Citation and Tundra, reduce ends to 19 mm (3/4") wide.

## Chaincase & pulley assembly

Pull out of vehicle.

## DISASSEMBLY

### Driven pulley & chaincase

To disassemble driven pulley from chaincase, press pulley shaft out of chaincase or knock with a plastic hammer.

### 29,30, Snap ring & support

Remove snap ring and slide support out of pulley shaft.

### 25,27, Roll pin & outer cam

Remove roll pin and slide outer cam out of pulley shaft.

### 23, Sliding half bushing

To disassemble a worn bushing, use a press and a suitable pusher.



A007003005

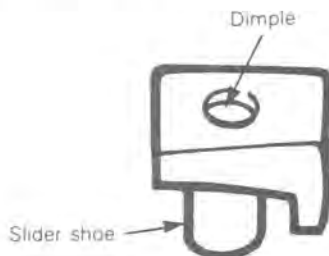
## INSPECTION

### 23, Sliding half bushing

Check sliding half bushing for wear, replace bushing if necessary.

### 26, Slider shoe

Slider shoe must be replaced when dimple in the working surface is barely visible or worn to less than 3/4 of it's original depth. See illustration.



A002003009

To expose slider shoe working surface, turn sliding half by hand so that the pulley cam moves away from slider shoes:

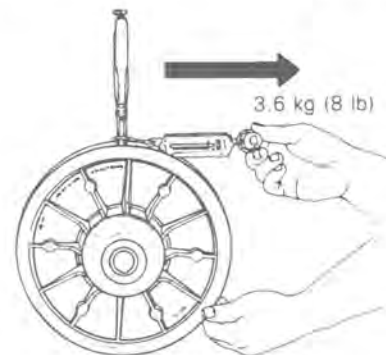
**WARNING:** Make sure that the engine cannot be started when performing the above operation.

### 24, Spring

#### Spring torsional pre-load.

Check pre-load using a fish scale positioned at 90° with the pulley axle.

The spring pre-load should be: 3.6 kg (8 lb).



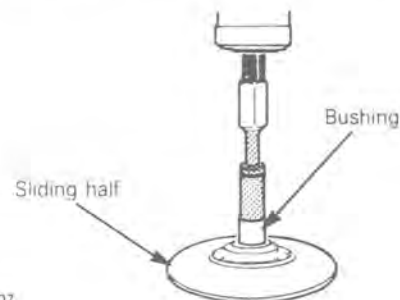
A007003006

To correct, refer to ADJUSTMENT.

## ASSEMBLY

### 23, Sliding half bushing

Assemble a new bushing using a press and a suitable pusher. Secure with Loctite 601 and stake with a center punch on both flanges (6 points per side).



A007003007

### Driven pulley & chaincase

Assemble by reversing the disassembly procedure. Replace chaincase seals and gasket.

---

## Section 03 TRANSMISSION

### Sub-section 04 (DRIVEN PULLEY)

---

#### 19, Fixed half shaft

▼ **CAUTION:** Always apply anti-seize compound on the pulley shaft before final pulley installation (Loctite anti-seize lubricant P/N 413 7010 00).

#### 26, Cam slider shoe

When replacing slider shoes, always install a new set (3 shoes) to maintain equal pressure on the cam.

## INSTALLATION

### Driven pulley & chaincase

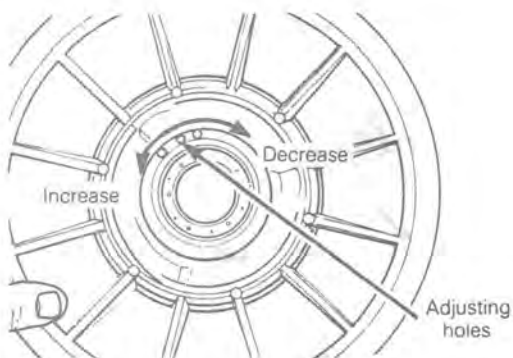
Reinstall by reversing the removal procedure.

## ADJUSTMENT

#### 24, Spring

Spring torsional pre-load.

To adjust spring pre-load relocate spring end in sliding pulley, moving it clockwise to decrease the pre-load and counter-clockwise to increase it.



A007003012

○ **NOTE:** Always recheck torsional pre-load after adjusting.

### Track tension & alignment

Refer to section 05-05.

### Drive belt deflection

Refer to section 03-02.

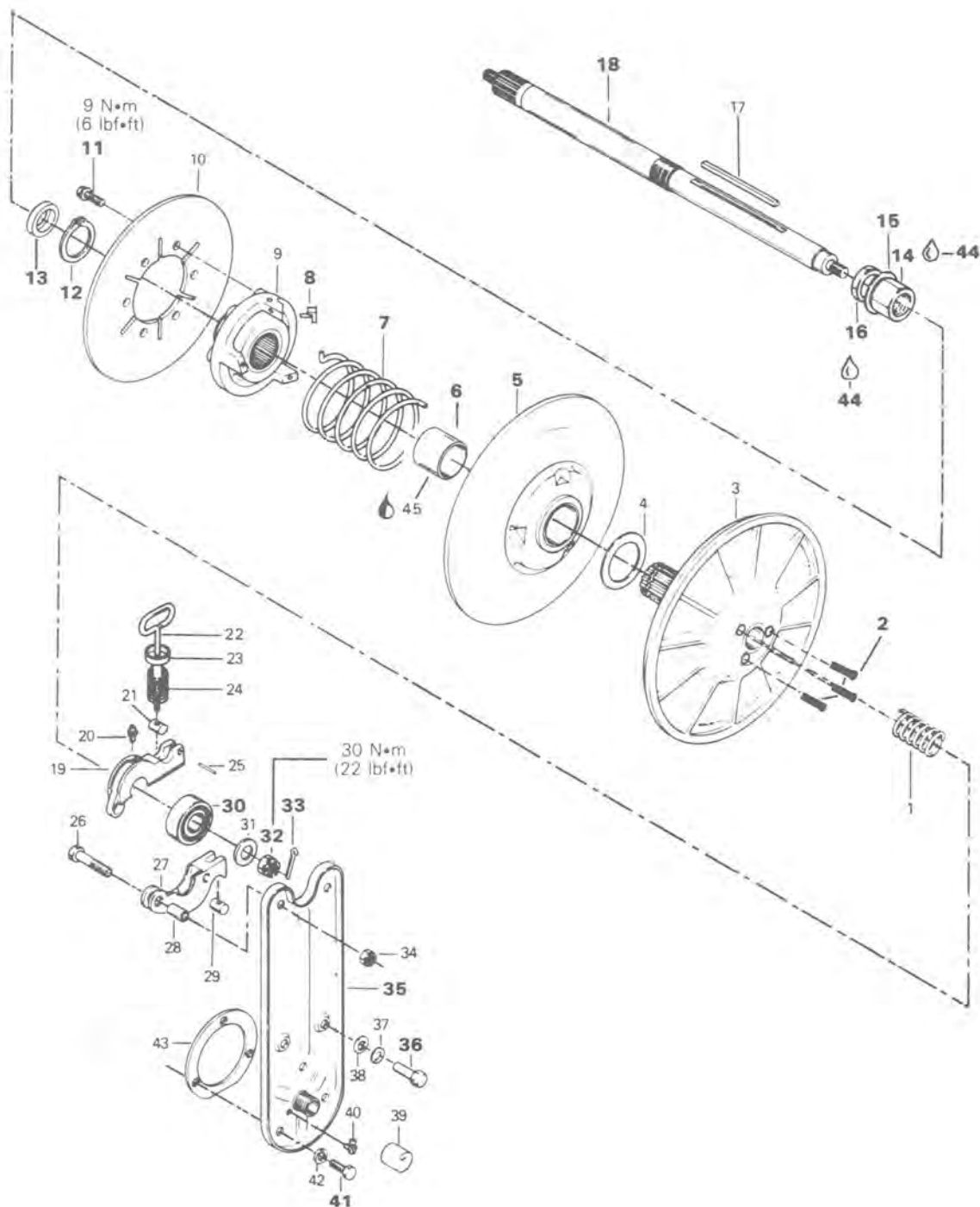
### Chaincase

Refill chaincase with 200 ml (7 fl oz) of Bombardier chaincase oil.

▼ **CAUTION:** Drive pulley alignment should always be checked whenever pulleys have been removed, replaced or disassembled. For pulley alignment procedure see section 03-05.

**Section 03 TRANSMISSION**  
**Sub-section 04 (DRIVEN PULLEY)**

Skandic



## Section 03 TRANSMISSION

### Sub-section 04 (DRIVEN PULLEY)

1. Spring
2. Allen set screw (3)
3. Fixed half
4. Thrust washer
5. Sliding half
6. Bushing
7. Spring
8. Slider shoe (3)
9. Outer cam
10. Brake disc
11. Taptite screw (6)
12. Snap ring
13. Thrust washer
14. Adjuster nut
15. Lock tab
16. Jam nut
17. Key
18. Countershaft
19. Bearing housing (upper half)
20. Grease fitting
21. Barrel
22. Eye bolt
23. Bushing
24. Spring
25. Roll pin
26. Cap screw M8 x 35 (2)
27. Bearing housing (lower half)
28. Bushing
29. Barrel
30. Bearing
31. Special washer
32. Castellated nut 14 mm
33. Cotter pin
34. Stop nut 8 mm (2)
35. Support
36. Cap screw M8 x 1,25 x 16 (2)
37. Lock washer 8 mm (2)
38. Flat washer 8.4 x 25 x 1.6 mm (2)
39. Plug
40. Grease fitting
41. Cap screw M6 x 16 (3)
42. Lock washer 6 mm (3)
43. Retainer flange
44. Loctite 271
45. Loctite 601

## REMOVAL

To remove driven pulley assembly, countershaft support must be tilted toward front of vehicle. Proceed as follows:

### Pulley guard & drive belt

Remove from vehicle.

### 30, Bearing

To remove from countershaft, use a suitable bearing puller.

### 35,36,41, Support & screws

Remove support screws and drive axle screws. Tilt support forward.

### Driven pulley assembly

Remove from vehicle.

## DISASSEMBLY

### 12, Snap ring

**WARNING:** The driven pulley cam is spring loaded. Hold in place when removing the snap ring.



A007003004

### 5, Sliding half bushing

To remove a worn bushing push out using a press.



A007003005

## INSPECTION

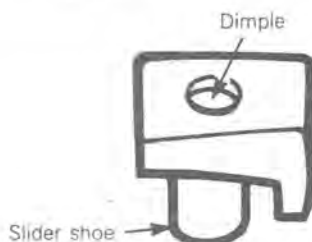
### 6, Sliding half bushing

Check sliding half bushing wear, replace bushing if wear is excessive.



## 8, Slider shoe

Slider shoe must be replaced when dimple in the working surface is barely visible or worn to less than 3/4 of it's original depth. See illustration.



A002003029

To expose slider shoe working surface, turn sliding half by hand so that the pulley cam moves away from slider shoes:

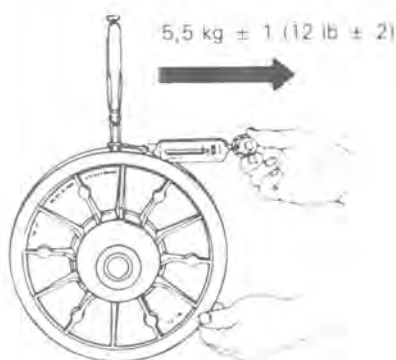
**WARNING:** Make sure that the engine cannot be started when performing the above operation.

## 7, Spring

### Spring torsional pre-load

Check pre-load using a fish scale positioned at 90° with the pulley axle.

The spring pre-load should be: 5,5 kg  $\pm$  1 (12 lb  $\pm$  2)



A007003006

To correct, refer to ADJUSTMENT.

## ASSEMBLY

## 6, Sliding half bushing

Install a new bushing using a press and a suitable pusher. Secure with Loctite 601 and stake with a center punch on both flanges (6 points per side).



A007003007

## 11, Brake disc cap screws

Torque to 9 N•m (80 lbf•in)

## 8, Cam slider shoe

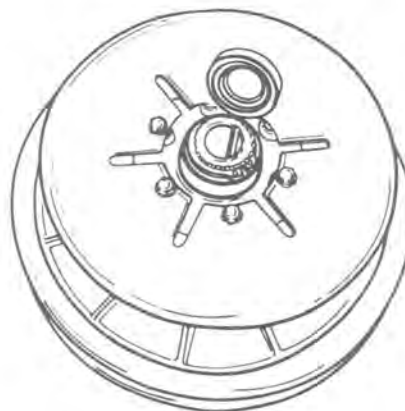
When replacing slider shoes, always install a new set (3 shoes) to maintain equal pressure on the cam.

## INSTALLATION

Reinstall the driven pulley on countershaft by reversing the removal procedure.

## 13, Thrust washer

Must be installed as illustrated on the end of fixed half hub to provide thrust area for the pulley snap ring.



A007003008

## 18, Countershaft

Always apply anti-seize compound (Loctite anti-seize lubricant P/N 413 7010 00) on unpainted surface of countershaft.

## 30, Bearing

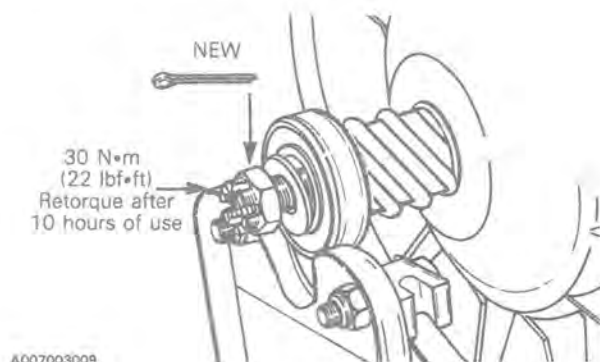
Press on inner race with suitable pusher.

## Section 03 TRANSMISSION

### Sub-section 04 (DRIVEN PULLEY)

#### 32, Nut

Torque to 30 N•m (22 lbf•ft).



A007003009

#### 33, Cotter pin

Reinstall a new cotter pin.

**CAUTION:** Drive pulley alignment should always be checked whenever pulleys have been removed, replaced or disassembled. For pulley alignment procedure see section 03-05.

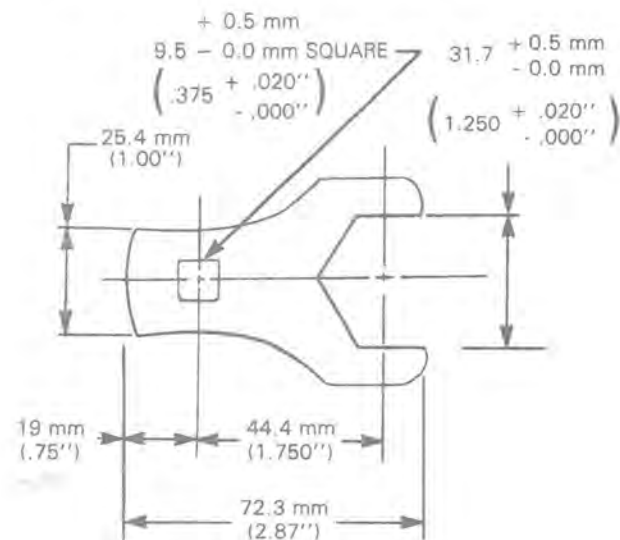
#### 14,16,44, Adjuster nut, jam nut & Loctite 271

Apply Loctite 271 or equivalent on threads of both nuts.

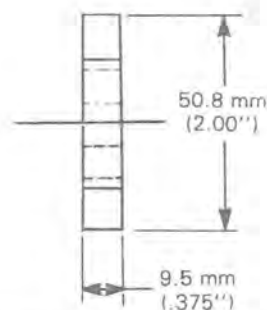
Torque jam nut to 60-70 N•m (45-52 lbf•ft).

To torque the jam nut, it is necessary to make the following tool or use a Snap On crowfoot wrench no. FC-40.

Torque to: 60-70 N•m (45-52 lbf•ft).



A007003010



Material: Steel bar 9.5 mm (3/8") thickness cold rolled.

**NOTE:** For an accurate torque wrench reading one must use the following formulas:

$$\frac{\text{Torque wrench length cm(in)}}{\text{Torque wrench length + 4.44 cm (1.750 in)}} = \text{Correction factor}$$

$$\frac{\text{Torque wrench reading}}{\text{Correction factor}} = \text{Real reading}$$

Ex.:

Torque wrench length: 25.4 cm (10 in.)  
Torque wrench reading: 60 N•m (45 lbf•ft).

**Correction factor**

$$\frac{25.4 \text{ cm (10 in)}}{25.4 \text{ cm (10 in)} + 4.44 \text{ cm (1.750 in)}} = 0.85$$

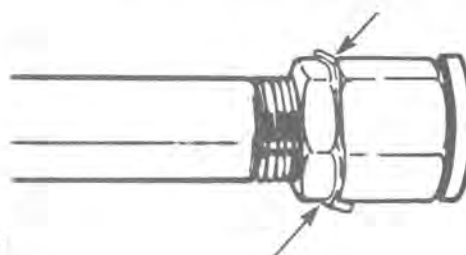
**Real reading**

$$\frac{60 \text{ N•m (45 lbf•ft)}}{0.85} = 70 \text{ N•m (52 lbf•ft)}$$

**NOTE:** Snap-on crowfoot wrench no. FC-40 center to center distance is 30 mm (1.187").

#### 15, Lock tab

Make sure the lock tab is properly folded over each nut.



A007003011

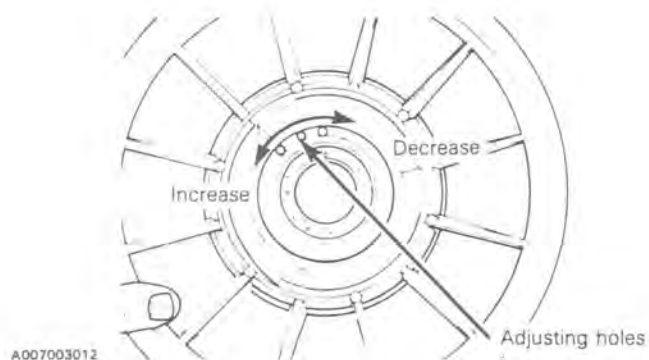
▼ **CAUTION:** Do not bend lock tab more than twice.  
If necessary, install a new one (P/N 504 0480 00).

## ADJUSTMENT

### 7, Spring

#### Spring torsional pre-load

To adjust spring pre-load relocate spring end in pulley, moving it clockwise to decrease the pre-load or counter-clockwise to increase it.



○ **NOTE:** Always recheck torsional pre-load after adjusting.

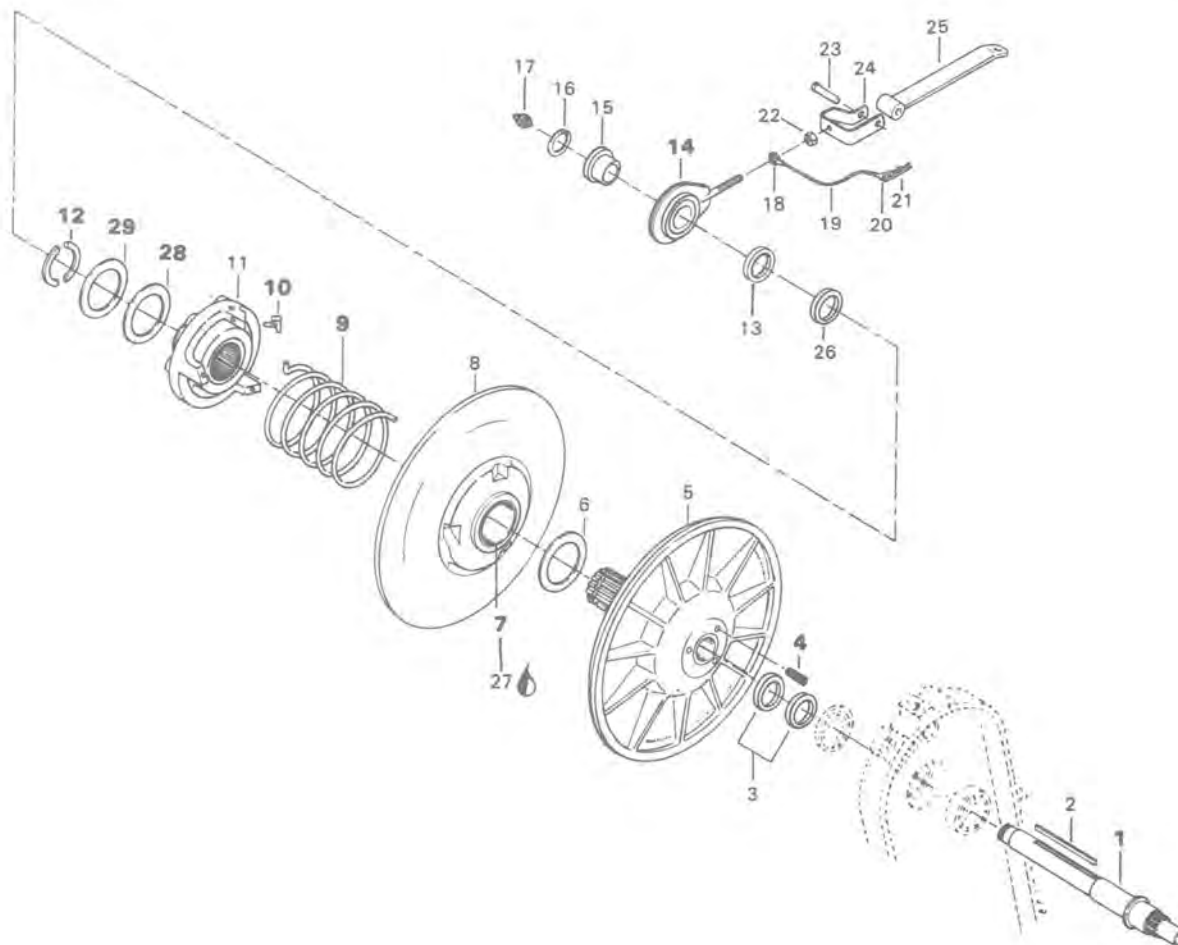
### 2, Belt deflection set screws

At assembly, the Allen screws must be set in accordance with the drive belt deflection specification (see section 03, sub-section 02 Drive Belt).

## Section 03 TRANSMISSION

### Sub-section 04 (DRIVEN PULLEY)

Skandic 377 R



1. Countershaft
2. Key
3. Shims (2)
4. Allen set screw M6 x 20 (3)
5. Fixed half
6. Thrust washer
7. Bushing
8. Sliding half
9. Spring
10. Slider shoe (3)
11. Outer cam
12. Retaining half washer (2)
13. Spacer
14. Support
15. Flanged ring

16. Snap ring
17. Grease fitting
18. Ring terminal
19. Wire 102 mm
20. Ring terminal
21. Hair pin
22. Nut M8 x 1.25 x 6
23. Clevis pin
24. Support bracket
25. Support clamp
26. Shim (as required)
27. Loctite 601
28. Spacer 1 mm (as required)
29. Spacer 3 mm (as required)

## REMOVAL

To remove driven pulley assembly; carburetor, air silencer and steering column must be removed in the following sequence:

### Pulley guard & drive belt

Remove from vehicle.

### Air silencer

Remove from vehicle.

### Carburetor

Disconnect carburetor rubber coupling at engine and move aside.

### Steering column

Disconnect steering column upper and lower attaching bracket. Move steering to the foremost right.

○ **NOTE:** To obtain maximum steering movement, turn skis full right prior to removal of steering column.

### 14, Support

Disconnect countershaft support from support clamp. Remove circlip and using a suitable puller, remove countershaft support.

### Driven pulley assembly

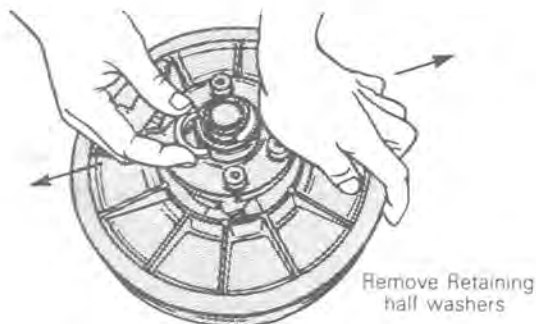
Remove from countershaft.

## DISASSEMBLY

### 12,28,29, Spacers, retaining half washers

Push outer cam and remove the retaining half washers.

◆ **WARNING:** Driven pulley cam is spring loaded. Hold it in place when removing the retaining half washers.



A007003013

Remove spacers and save for reinstallation, see "Cam slider shoe adjustment".

## INSPECTION

### 7, Sliding half bushing

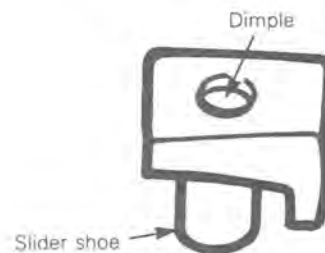
Check sliding half bushing wear, replace bushing if wear is excessive.

To disassemble a worn bushing, use a press and a suitable pusher.



### 10, Slider shoe

Slider shoe must be replaced when dimple in the working surface is barely visible or worn to less than 3/4 of it's original depth. See illustration.



To expose slider shoe working surface, turn sliding half by hand so that the pulley cam moves away from slider shoes.

◆ **WARNING:** Make sure that the engine cannot be started when performing the above operation.

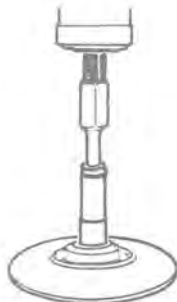
## Section 03 TRANSMISSION

### Sub-section 04 (DRIVEN PULLEY)

## ASSEMBLY

### 7, Sliding half bushing

Assemble a new bushing using a press and a suitable pusher. Secure with Loctite 601 and stake with a center punch on both flanges (6 points per side).



A007003007

### 10, Cam slider shoe

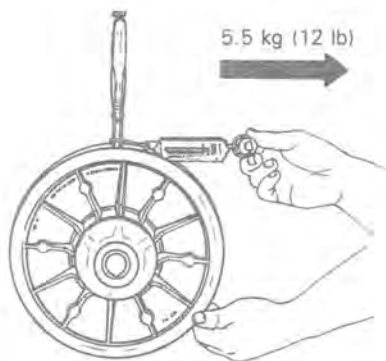
When replacing slider shoes, always install a new set (3 shoes) to maintain equal pressure on the cam.

### 9, Spring

#### Spring torsional pre-load

Check pre-load using a fish scale positioned at 90° with the pulley axle.

The spring pre-load should be: 5.5 kg (12 lb).



A007003008

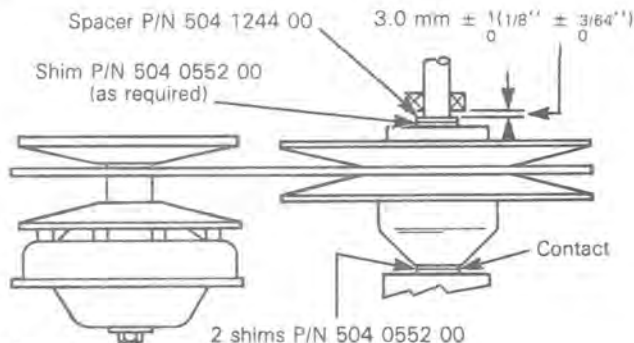
To correct, refer to ADJUSTMENT.

## INSTALLATION

Reinstall the pulley on the countershaft by reversing the removal procedure.

Check end play of driven pulley on countershaft by pushing pulley towards chaincase so that shims, P/N 504 0552 00, are in contact with shoulder on countershaft. Measure end play between the sliding pulley support end and shim(s). See illustration.

○ **NOTE:** Pulley alignment bar, see section 03-05, must be inserted between driven pulley halves before measuring end play.



A008003019

▼ **CAUTION:** Pulley alignment should always be checked when ever pulleys have been removed, replaced or disassembled. For pulley alignment procedure see section 03-05.

### 1, Countershaft

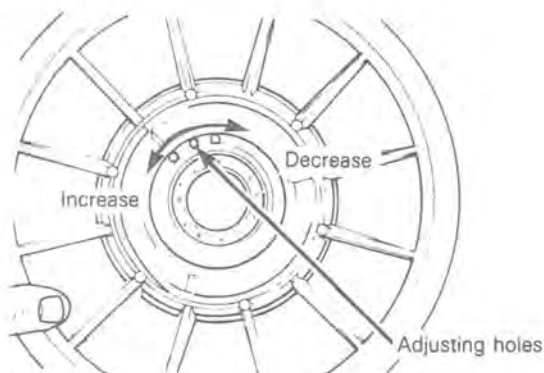
▼ **CAUTION:** Always apply anti-seize compound on the countershaft before final pulley installation (Loctite anti-seize lubricant P/N 413 7010 00).

## ADJUSTMENT

### 9, Spring

#### Spring torsional pre-load

To adjust spring pre-load relocate spring end in sliding pulley, moving it clockwise to decrease the pre-load or counterclockwise to increase it.



A007003012

○ **NOTE:** Always recheck torsional pre-load after adjusting.

#### **4, Drive belt deflection adjustment set screws**

At assembly, the Allen screws must be set in accordance with the drive belt deflection specification (see section 03, sub-section 02 Drive Belt).

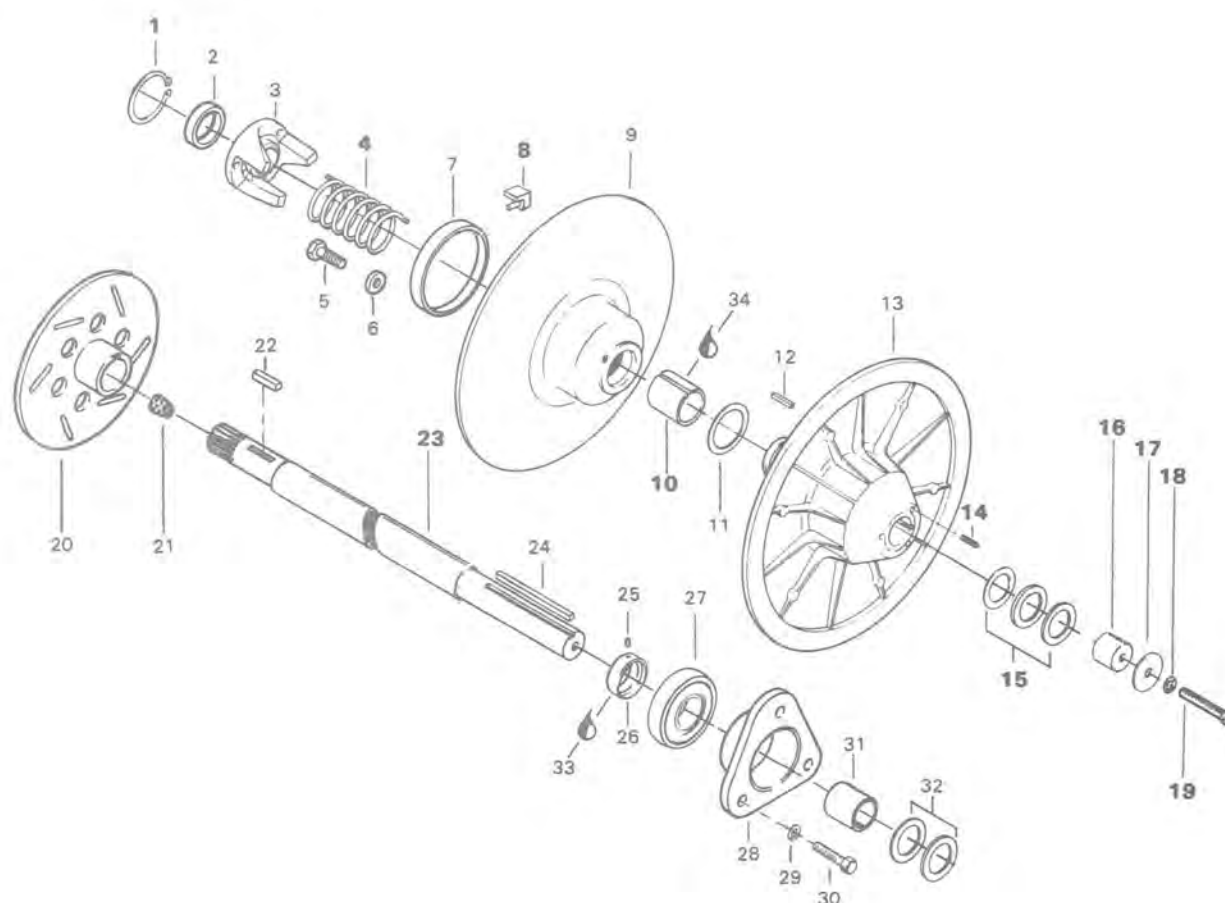
#### **10,28,29, Slider shoe, spacers**

When reassembling outer cam, always check that the slider shoes fully contact the sliding pulley cam. If the slider shoes exceed the edge of the sliding pulley cam or are inlying more than 1.0 mm (.039"), correct the situation by adding or removing spacers of 1 mm or 3 mm, as required, between the outer cam and the retaining half washers.

## Section 03 TRANSMISSION

### Sub-section 04 (DRIVEN PULLEY)

Formula MX, Formula Plus



1. Snap ring
2. Shim (MX only)
3. Outer cam
4. Spring
5. Screw
6. Flat washer
7. Bushing
8. Slider shoe
9. Sliding half
10. Bushing
11. Thrust washer
12. Key (cam)
13. Fixed half
14. Set screw (3)
15. Shim (as required)
16. Extension
17. Washer

18. Lock washer 8 mm
19. Screw M8 x 55 (M8 x 65 PLUS only)
20. Brake disc
21. Cork
22. key
23. Countershaft
24. Key (pulley ass'y)
25. Allen screw
26. Collar
27. Bearing
28. Outer housing
29. Lock washer 8 mm
30. Cap screw
31. Shim
32. Shim (2)
33. Loctite 242
34. Loctite 601



## REMOVAL

**15,16,17,18,19, Shim, extension, washer, lock washer & screw**

Remove the cap screw, pull the driven pulley from the countershaft.

## DISASSEMBLY

### 1, Snap ring

Remove snap ring to disassemble the outer cam and the two pulley halves. (On MX models remove shim).

**WARNING:** Driven pulley cam is spring loaded, hold firmly while removing snap ring.

## INSPECTION

### 10, Sliding half bushing

Check bushing for wear, replace if necessary.

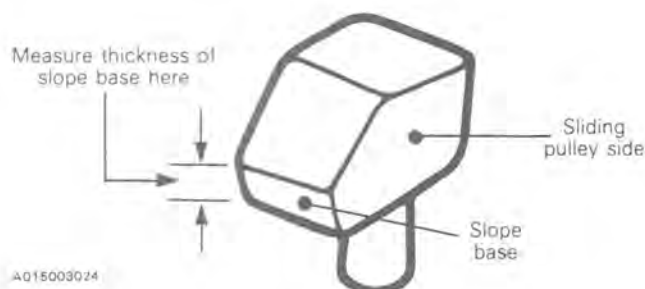
To disassemble a worn bushing, use a press and a suitable pusher.



A007003008

### 8, Slider shoes

Check cam slider shoes for wear. Replace when inside edge of cam slider shoe slope base is worn to 1mm (.039'') or less.



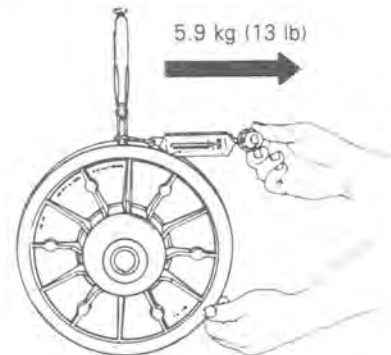
A015003024

### 4, Spring

#### Spring torsional pre-load

Check pre-load using a fish scale positioned at 90° with the pulley axle.

The spring pre-load should be: 5.9 kg (13 lb).



A007003006

To correct, refer to ADJUSTMENT.

## ASSEMBLY

### 10, Sliding half bushing

Assemble a new bushing using a press and a suitable pusher. Secure with Loctite 601 only.



A007003007

### 8, Cam slider shoe

When replacing slider shoes, always install a new set (3 shoes) to maintain equal pressure on the cam.

## Section 03 TRANSMISSION

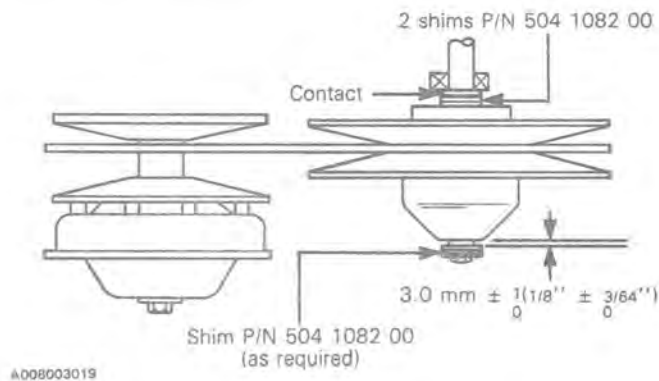
### Sub-section 04 (DRIVEN PULLEY)

## INSTALLATION

Reinstall the pulley on the countershaft by reversing the removal procedure.

Check end play of driven pulley on countershaft by pushing pulley towards outer housing so that the two (2) shims, P/N 504 1082 00, contact it. Measure end play at the mounting screw end between shim(s) and pulley. See illustration.

○ **NOTE:** Pulley alignment bar, see section 03-05, must be inserted between driven pulley halves before measuring end play.



▼ **CAUTION:** Pulley alignment should always be checked whenever pulleys have been removed, replaced or disassembled. For pulley alignment procedure see section 03-05.

## 23, Countershaft

▼ **CAUTION:** Always apply anti-seize compound on the countershaft before final pulley installation (Loctite anti-seize lubricant P/N 413 7010 00).

## 19, Pulley retaining screw

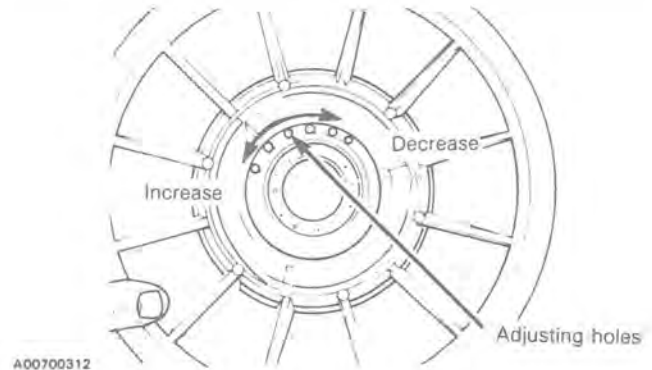
Torque to 25 N•m (18 lbf•ft).

## ADJUSTMENT

### 4, Spring

#### Spring torsional pre-load

To adjust spring pre-load relocate spring end in sliding pulley, moving it clockwise to decrease the pre-load or counterclockwise to increase it.



○ **NOTE:** Always recheck torsional pre-load after adjusting.

## 14, Drive belt deflection adjustment set screws

At assembly, the Allen screws must be set in accordance with the drive belt deflection specification (see section 03, sub-section 02 Drive belt).

## PULLEY DISTANCE & ALIGNMENT

### GENERAL

The pulley distance we will refer to, in this section, is the space separating the drive and driven pulley outside diameters ("Z" measure).

This basic distance is provided as an assembly guide and indicates the dimensions between which satisfactory belt deflection will be obtained.

Both pulley distance adjustment and pulley alignment must be carried out to ensure the highest efficiency of the transmission system. Furthermore, optimum drive belt operation and minimal wear will be obtained only with proper pulley alignment.

◆ **WARNING:** Failure to correctly perform pulley alignment may cause the vehicle to creep forward at idle.

The pulley distance refers to "Z" measure

All pulley alignment specifications refer to:

X = Distance between straight edge and drive pulley inner half on driven pulley side.

Y = Distance between straight edge and drive pulley inner half edge on the opposite side.

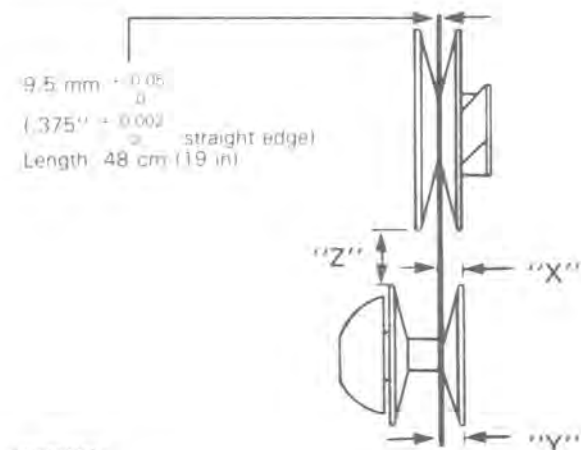
### GENERAL PROCEDURE

Remove belt guard and drive belt.

By turning and pushing the sliding pulley, open the driven pulley. Insert a straight edge,  $9.5 \text{ mm} + \frac{0.05}{0}$  (.375"  $\pm \frac{0.002}{0}$ ) square, into the opened driven pulley.

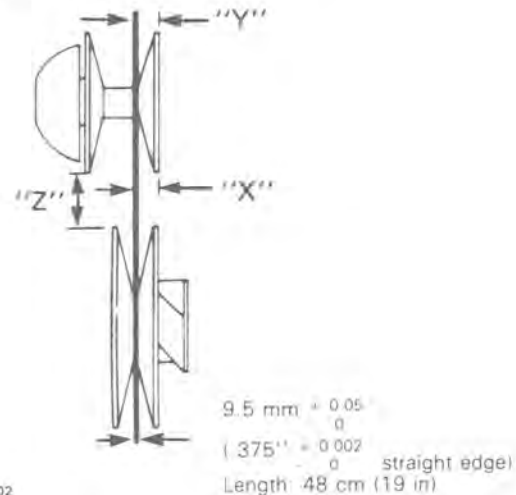
○ **NOTE:** Always measure distances X & Y from the farther straight edge side (including its thickness) to the inner half edge on the engine side

### ELAN



A000003002

### ALL OTHERS



A000003002

On all models except Elan, the distance Y **must** exceed distance X to compensate for the twist due to the drive pulley torque.

### Drive belt deflection

○ **NOTE:** When pulley distance and alignment are adjusted to specifications, adjust drive belt deflection in accordance with section 03-02.

### After adjustment checks

▼ **CAUTION:** This section deals mainly with adjustment procedures. For complete assembly requirements, refer to the proper ENGINE or TRANSMISSION installation section.

## Section 03 TRANSMISSION

### Sub-section 05 (PULLEY DISTANCE & ALIGNMENT)

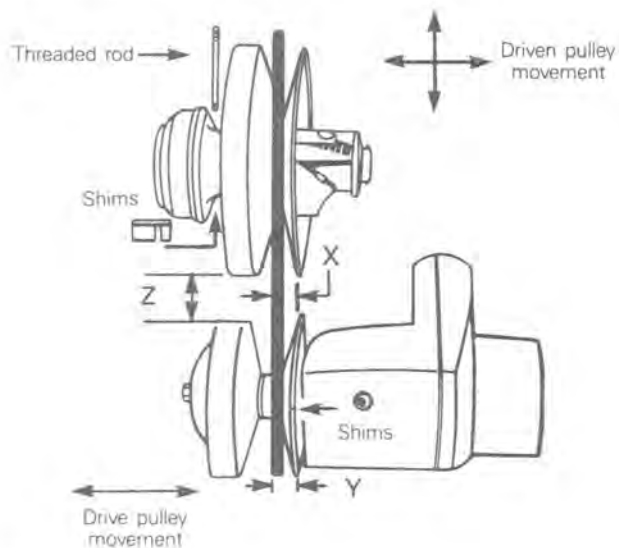
#### PULLEY ALIGNMENT SPECIFICATIONS CHART:

MODEL	Z	X	Y
	mm (in)		
Elan	$44.45 + 0$ - 1.5 (1 3/4 + 0 ) - 1/16	$34.5 \pm 0.40$ (1 23/64 $\pm$ 1/64)	May exceed "X" up to 1.5 (1/16) May be smaller than "X" up to 0.75 (1/32)
Alpine	$44.45 + 0$ - 1.5 (1 3/4 + 0 ) - 1/16	$34.5 \pm 0.40$ (1 23/64 $\pm$ 1/64)	Must exceed "X" from 0.4 (1/64) to 2.0 (5/64)
Citation LS, Tundra, Tundra LT	$36.6 + 1.5$ - 0 (1 7/16 + 1/16) - 0	$34.03 \pm 0.38$ (1 11/32 $\pm$ 1/64)	Must exceed "X" from 0.75 (1/32) to 1.5 (1/16)
Citation LSE	$36.6 + 1.5$ - 0 (1 7/16 + 1/16) - 0	Including ring gear measurement	
		$45.3 \pm 0.38$ (1 25/32 $\pm$ 1/64)	Must exceed "X" from 0.75 (1/32) to 1.5 (1/16)
Skandic 377/377R	$41.3 + 3.17$ - 0 (1 5/8 + 1/8) - 0	$34.03 \pm 0.81$ (1 11/32 $\pm$ 1/32)	Must exceed "X" from 1.5 (1/16)
Safari 377/E, 447, GL LC, Formula SP	$36.6 + 1.5$ - 0 (1 7/16 + 1/16) - 0	$34.5 \pm 0.4$ (1 23/64 $\pm$ 1/64)	Must exceed "X" from 0.75 (1/32) to 1.5 (1/16)
Formula MX	$35 + 3$ - 0 (1 3/8 + 1/8) - 0	$33.00 \pm 0.75$ (1 19/64 $\pm$ 1/32)	Must exceed "X" from 0.75 (1/32) to 1.5 (1/16)
Formula PLUS	$26.5 + 1$ - 0 (1 3/64 + 3/64) - 0	$37 \pm 0.5$ (1 29/64 $\pm$ 1/64)	Must exceed "X" from 0.75 (1/32) to 1.5 (1/16)

## Section 03 TRANSMISSION

### Sub-section 05 (PULLEY DISTANCE & ALIGNMENT)

#### ELAN 250



A002003009

#### Pulley distance specification

$$Z = 44.45 \text{ mm} \pm \frac{0.0}{1.5} \left( 1 \frac{3}{4}'' \pm \frac{0}{1/16}'' \right)$$

#### Pulley distance adjustment method

With the threaded rod and nut located between chaincase and frame, shift chaincase to obtain the specified distance.

#### Pulley alignment specification

$$X = 34.5 \text{ mm} \pm 0.40 \left( 1 \frac{23}{64}'' \pm \frac{1}{64}'' \right)$$

Y may exceed X up to 1.5 mm (1/16").

Y may be smaller than X up to .75 mm (1/32").

#### Pulley alignment methods

##### Drive pulley alignment:

If drive pulley is too far in, remove drive pulley and add shim(s) on crankshaft. Shim P/N 504 1115 00.

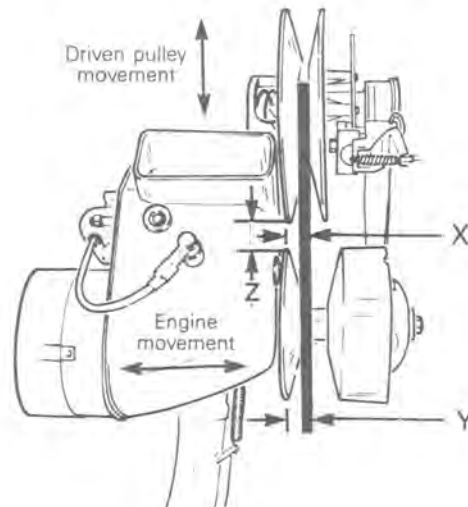
**CAUTION:** Never use more than 5 shims on crankshaft.

**WARNING:** Always torque drive pulley bolt within specifications. (See section 03-03).

##### Driven pulley alignment:

If driven pulley is too far in, add shim(s) between frame and chaincase. Shim P/N 504 0504 00, 0.81 mm (.032") thickness.

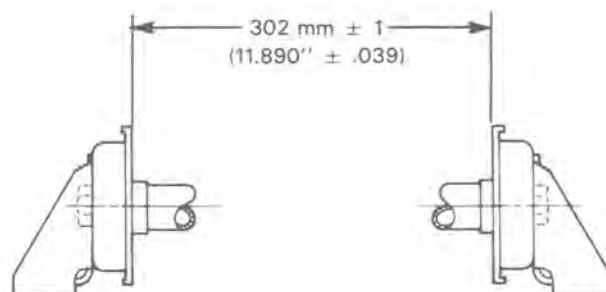
#### CITATION LS/E, TUNDRA, TUNDRA LT



A004003003

**CAUTION:** The rear suspension must be mounted on the vehicle and track tension and alignment must be done to provide the right frame width.

**NOTE:** Before checking pulley alignment, the distance between the two (2) front engine support must equal 302 mm  $\pm$  1 (11.890"  $\pm$  .039).



A003003014

#### Pulley distance specification

$$36.6 \text{ mm} \pm \frac{1.5}{0} \left( 1 \frac{7}{16}'' \pm \frac{1/16}{0}'' \right)$$

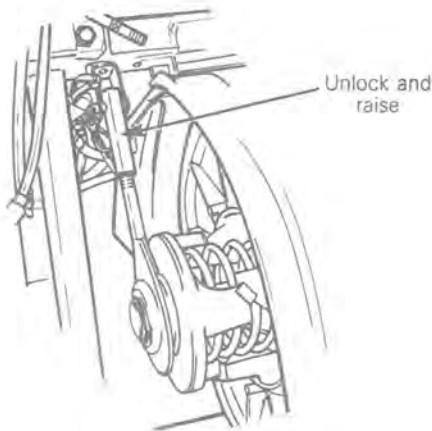
## Section 03 TRANSMISSION

### Sub-section 05 (PULLEY DISTANCE & ALIGNMENT)

#### Pulley distance adjustment method

Slack the four (4) chaincase retaining bolts, unlock and raise pulley support.

Move chaincase to obtain specific adjustment and adjust driven pulley support accordingly.



A0034003005

#### Pulley alignment specification

Citation LS, Tundra, Tundra LT

$X = 34.03 \text{ mm} \pm .38 (1 \frac{11}{32}'' \pm 1/64'')$

Citation LSE

As space between inner half and ring gear is very small, given measure includes ring gear.

$X = 45.30 \text{ mm} \pm 0.38 (1 \frac{25}{32}'' \pm 1/64'')$

Citation LS, Citation LSE, Tundra, Tundra LT

Y must exceed X from 0.75 mm to 1.5 mm ( $1/32''$  to  $1/16''$ )

#### Pulley alignment method

##### Engine movement

Slacken the support retaining bolts and move the engine to obtain specified pulley alignment.

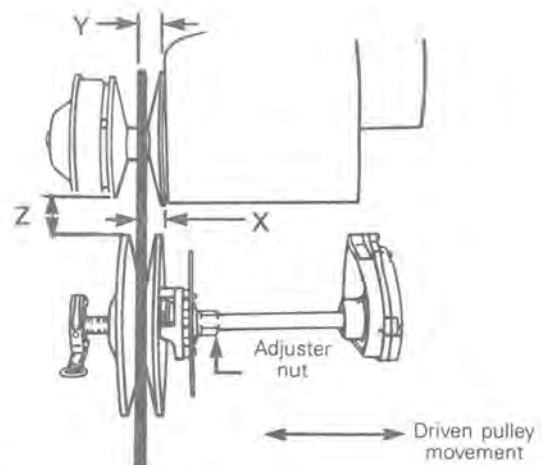
**CAUTION:** Always check the distance between the front engine supports. Distance must equal  $302 \text{ mm} \pm 1 (11.890'' \pm .039)$ .

##### Driven pulley movement:

Shims can be mounted between chaincase and frame. Shim P/N 504 0398 00, 0.53 (.021) thickness.

On citation LSE only shim P/N 504 0565 00, 0.5 mm (.020'') thick is available for bottom bolts.

#### SKANDIC 377



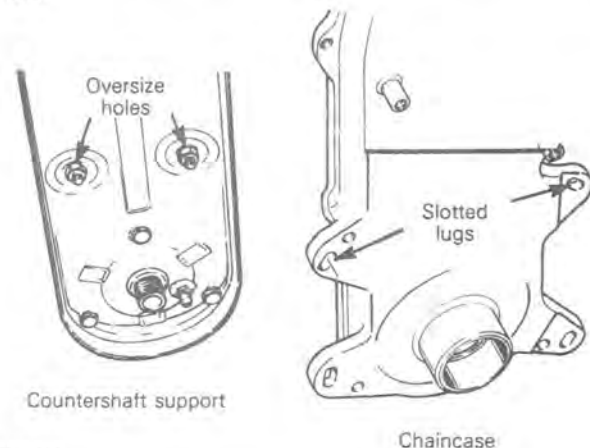
A007003004

#### Pulley distance specification

$Z = 41.3 \text{ mm} \begin{matrix} + 3.17 \\ - 0 \end{matrix} (1 \frac{5}{8}'' \begin{matrix} + 1/8 \\ - 0 \end{matrix})$

#### Pulley distance adjustment method

Oversize holes on countershaft support and slotted lugs on chaincase casting allow movement of the countershaft.



A007003015

Move countershaft to obtain specified distance between pulleys.

#### Pulley alignment specification

$X = 34.03 \text{ mm} \pm 0.81 (1 \frac{11}{32}'' \pm 1/32)$

Y must exceed X up to 1.5 mm ( $1/16''$ ).

## Section 03 TRANSMISSION

### Sub-section 05 (PULLEY DISTANCE & ALIGNMENT)

#### Pulley alignment method

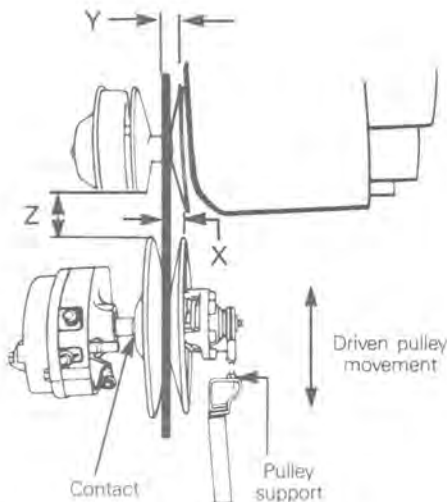
##### Driven pulley alignment:

An adjuster nut and a spring are mounted on the countershaft to align the driven pulley.

NOTE: Countershaft support and/or chaincase may be displaced to obtain specified dimensions

For proper tightening of the adjuster and jam nuts, refer to "Driven Pulley", section 03-04.

#### SKANDIC 377R



A0080030001

NOTE: For proper measuring, driven pulley must be pushed toward transmission.

##### Pulley distance specification

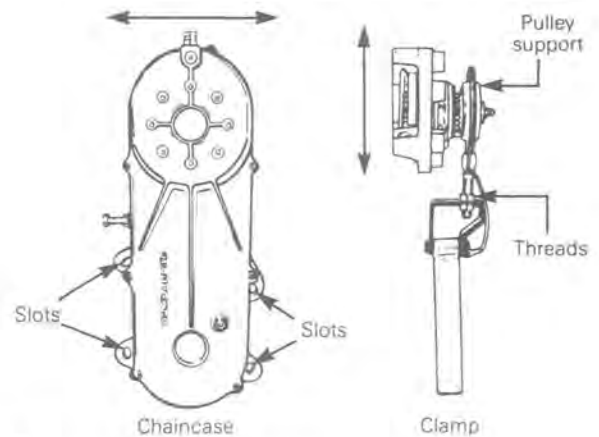
$$Z = 41.3 \text{ mm} \pm \frac{3.17}{0} \left( 1 \frac{5}{8}'' \pm \frac{1}{8}'' \right)$$

##### Pulley distance adjustment method

Slotted lugs on transmission casting allow movement of the transmission. Pulley support has a threaded rod.

##### Adjustment:

Unlock and raise pulley support, move transmission until specified pulley distance is obtained and adjust support accordingly.



A008003002

##### Pulley alignment specification

$$X = 34.03 \text{ mm} \pm 0.81 \left( 1 \frac{11}{32}'' \pm \frac{1}{32}'' \right)$$

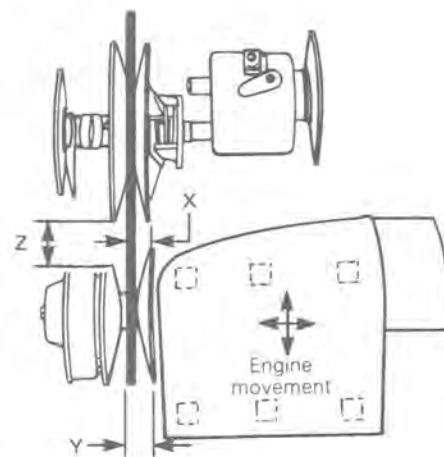
Y must exceed X up to 1.5 mm (1/16'')

##### Pulley alignment method

##### Driven pulley movement:

Shims can be mounted between chaincase and frame. Shim P/N 504 0398 00, 0.53 mm (.021'') thickness.

#### ALPINE



A017003004

##### Pulley distance specification

$$Z = 44.45 \text{ mm} \pm \frac{0}{15} \left( 1 \frac{3}{4}'' \pm \frac{0}{16}'' \right)$$

##### Pulley distance adjustment method

Engine mounting bracket is provided with slotted holes. Move engine to obtain specified distance between pulleys.



## Section 03 TRANSMISSION

### Sub-section 05 (PULLEY DISTANCE & ALIGNMENT)

#### Pulley alignment specification

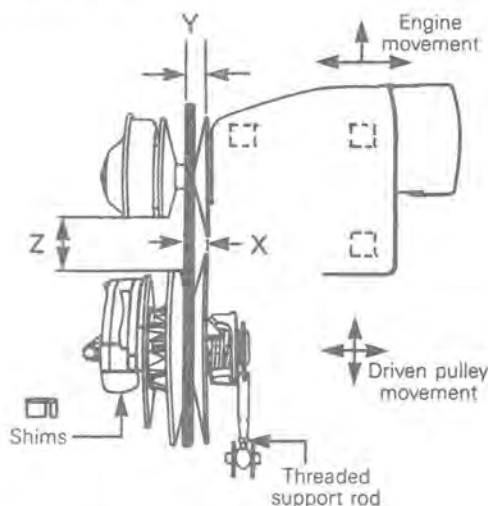
$X = 34.5 \text{ mm} \pm 0.40$  (1 23/64"  $\pm$  1/64").

Y must exceed X from 0.4 mm to 2.0 mm (1/64"  $\pm$  5/64").

#### Pulley alignment method

Move engine to obtain the specified pulley alignment.

#### SAFARI 377/E, 447, GL LC FORMULA SP



A009003001

#### Pulley distance specification

$Z = 36.6 \text{ mm} \pm \frac{1.5}{0}$  (1 7/16"  $\pm$  1/16")

#### Pulley distance adjustment method

Slotted lugs on chaincase casting allow movement of the chaincase. Pulley support has a threaded rod.

##### Adjustment:

Loosen the lock nut on the threaded support rod.

Slacken the four nuts on the chaincase. Screw or unscrew the support rod until specified pulley distance is obtained.

#### Pulley alignment specification

$X = 34.5 \text{ mm} \pm 0.4$  (1 23/64  $\pm$  1/64)

Y must exceed X from 0.75 mm to 1.5 mm (1/32"  $\pm$  1/16")

#### Pulley alignment method

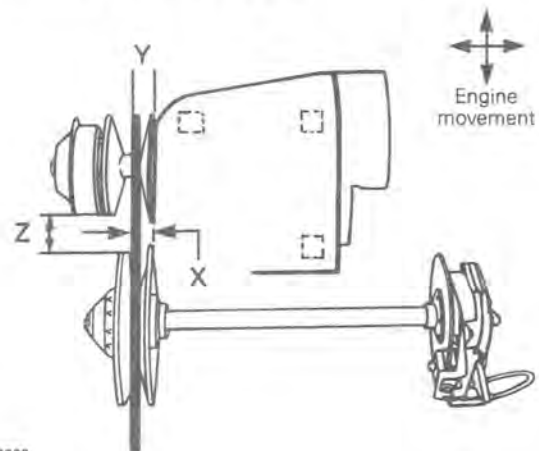
##### Engine movement:

Engine mounting bracket has slotted holes. Slide engine bracket on mounting studs to obtain specified pulley alignment.

##### Driven pulley movement:

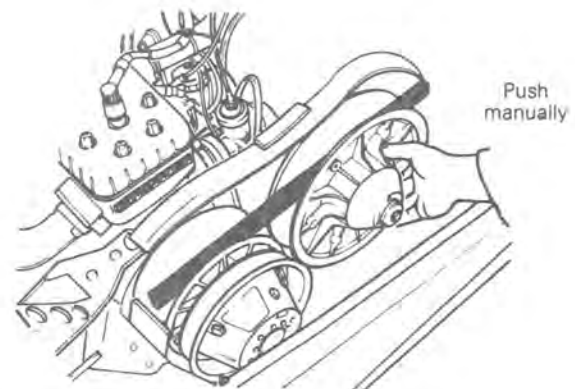
Shims can be mounted between chaincase and frame. Shim P/N 504 0398 00, 0.53 mm (.021") thickness.

#### FORMULA MX, PLUS



A015003002

NOTE: For proper measuring, driven pulley must be pushed toward disc brake.




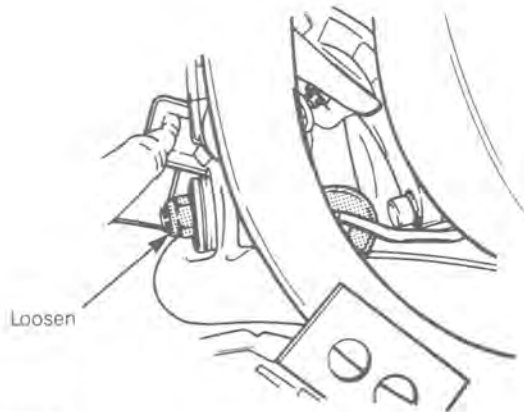
A015003006



## Section 03 TRANSMISSION

### Sub-section 05 (PULLEY DISTANCE & ALIGNMENT)

 **NOTE:** If proper adjustment is unattainable, torque rod may be the source of trouble. Loosen torque rod nut and try again.



A00B003006

#### Pulley distance specification

##### Formula MX

$$Z = 35 \text{ mm} \pm \frac{3}{0} (1 \frac{3}{8}'' \pm \frac{1}{8}'')$$

##### Formula Plus

$$Z = 26.5 \text{ mm} \pm \frac{1}{0} (1 \frac{3}{64}'' \pm \frac{3}{64}'')$$

#### Pulley distance adjustment method

##### Engine movement:

The engine bracket has slotted mounting holes. Move engine to obtain specified distance between pulleys.

#### Pulley alignment specification

##### Formula MX:

$$X = 33.00 \text{ mm} \pm 0.75 (1 \frac{19}{64}'' \pm \frac{1}{32}'')$$


##### Formula PLUS

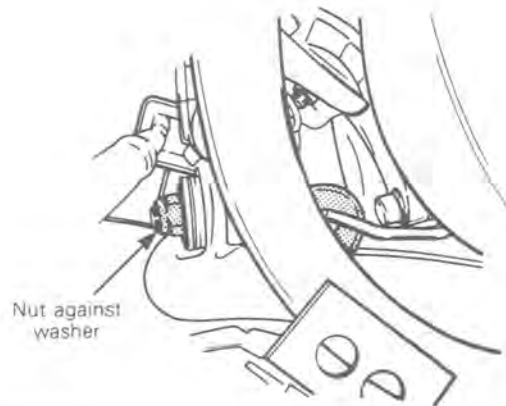
$$X = 37 \text{ mm} \pm 0.5 (1 \frac{29}{64}'' \pm \frac{1}{64}'')$$

Y must exceed X from 0.75 mm (1/32'') to 1.5 mm (1/16'').

#### Pulley alignment method

Loosen the four bolts retaining engine bracket to the frame. Position engine to obtain the specified alignment.

 **NOTE:** After adjustment, just tighten torque rod nut so it sits against washer. Do not over tighten, it will disalign pulleys.



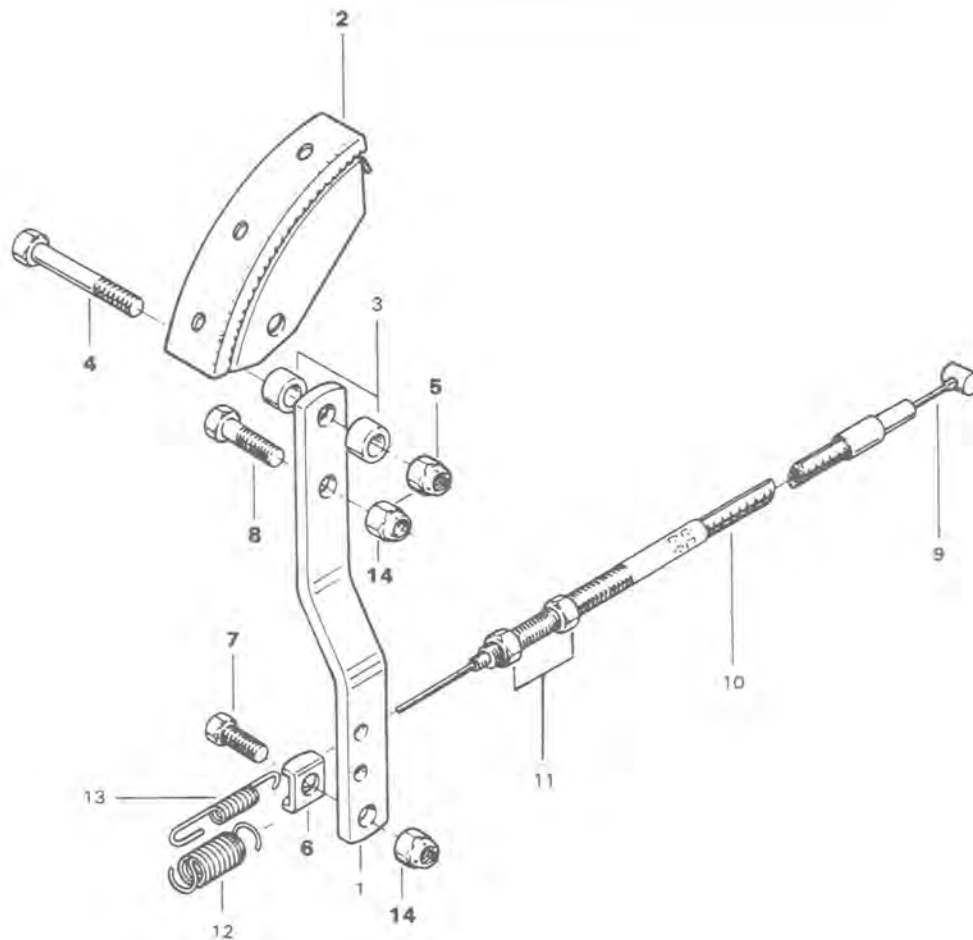
A00B003006



# BRAKE

## DRUM BRAKE

Elan



- 1. Brake lever
- 2. Brake shoe
- 3. Spacer (2)
- 4. Shoe retaining bolt 1/4-20 x 1 1/4 (1)
- 5. Shoe retaining nut 1/4-20 (1)
- 6. Cable bracket
- 7. Cap screw 1/4-20 x 3/4 (1)

- 8. Cap screw 1/4-20 x 7/8 (1)
- 9. Brake cable
- 10. Cable housing
- 11. Nut (adjusting) 5/16-24 (2)
- 12. Spring (brake lever)
- 13. Spring (brake light switch)
- 14. Stop nut 1/4-20 (2)

## Section 03 TRANSMISSION

### Sub-section 06 (BRAKE)

#### INSPECTION

##### 2, Brake shoe

Check brake lining for wear. Replace if worn to 3 mm (1/8") or less above the rivets.

○ **NOTE:** If traces of oil are found on lining and/or pulley, check chaincase seal for leaks or incorrect installation. Replace or repair as needed. Wipe all traces of oil on pulley and **replace** brake shoe.

#### INSTALLATION

##### 4,5, Shoe retaining bolt & nut

When torquing shoe retaining nut, shoe must be allowed to pivot when slight pressure is applied.

##### 8,14, Lever retaining bolt & nut

When attaching brake lever assembly to chaincase bracket, tighten nut until all side play is eliminated and brake lever can still pivot freely.

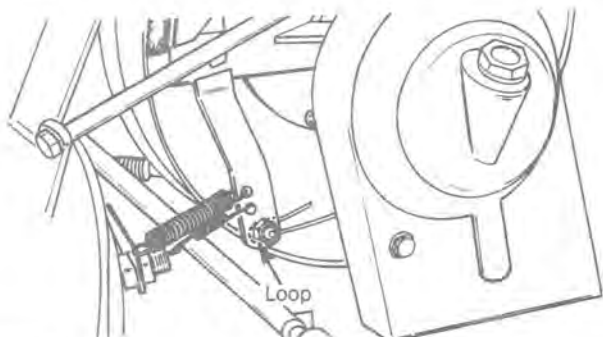
#### LUBRICATION

○ **NOTE:** Lubricate all moving metal parts of brake with light machine oil.

◆ **WARNING:** Avoid getting oil on brake shoe. Do not lubricate or apply anti-rust or anti-freeze solution in cable.

##### 6,7,14, Cable retaining bracket, bolt & nut

Brake cable must form a loop around the bolt so that the cable may be firmly pinched between the bolt head and the bracket.



A002003025

○ **NOTE:** When replacing brake cable, adjust the length of the loop so that the cable adjusting nuts are halfway on their threads. This will allow for adequate final adjustment.

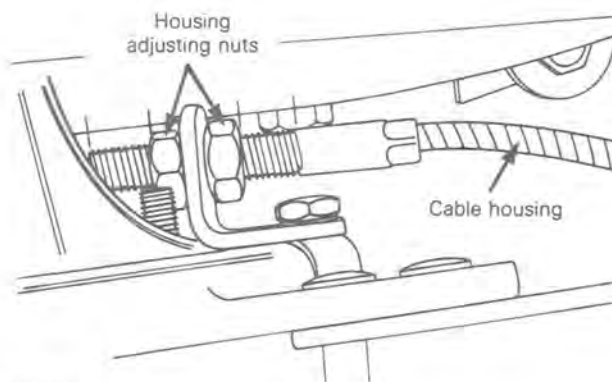
#### ADJUSTMENT

##### Brake lever control

Adjust so that brake applies fully when lever is 25 mm (1") from handlebar grip.

○ **NOTE:** Prior to cable installation, make sure cable housing adjusting nuts are located halfway on adjuster threads.

If a final adjustment is indicated, use housing adjusting nuts.



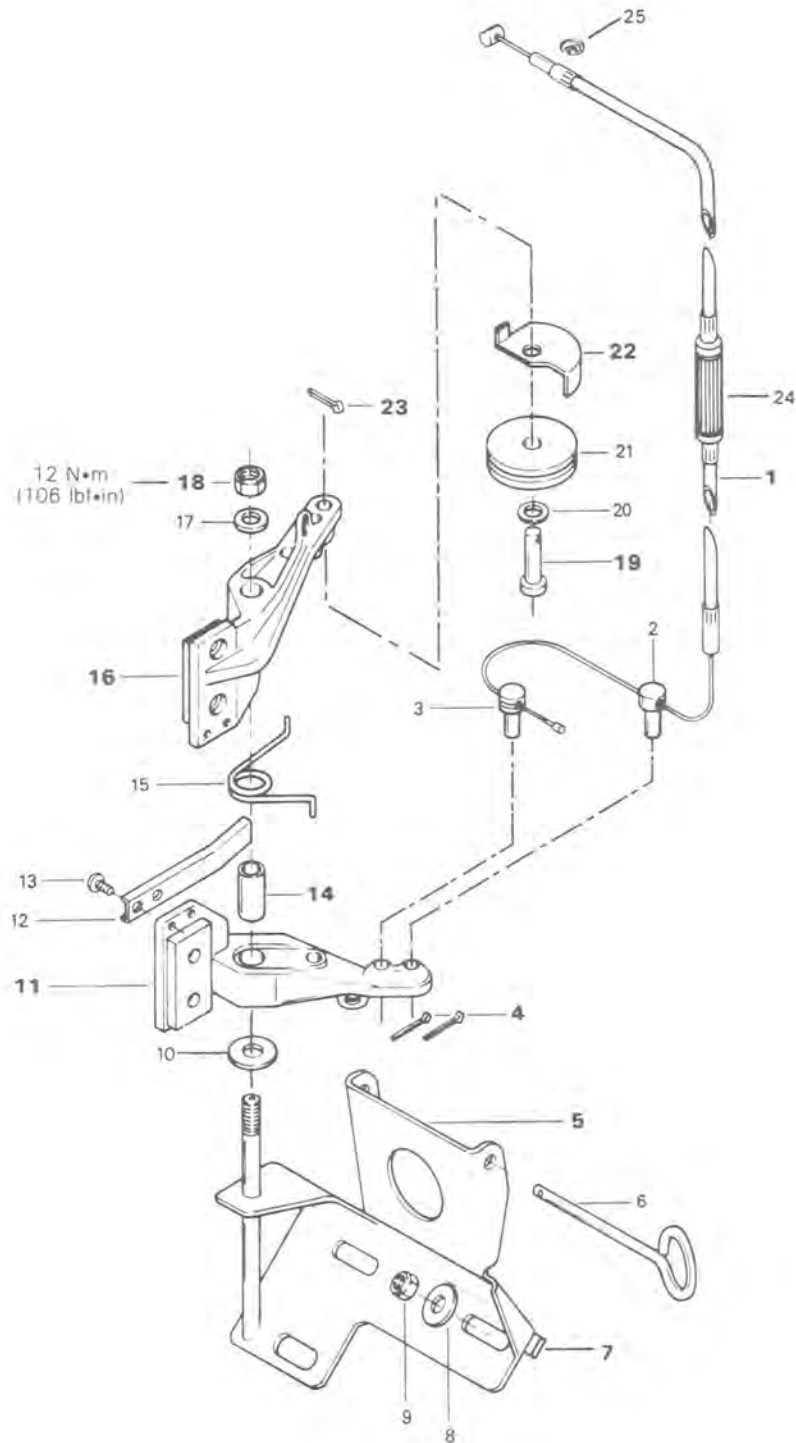
A002003010

##### Brake light operation

Check brake light operation. If necessary, loosen brake light switch lock nuts and adjust.

**DISC BRAKE**

Skandic 377



## Section 03 TRANSMISSION

### Sub-section 06 (BRAKE)

1. Cable
2. Ferrule (cable housing)
3. Ferrule (cable)
4. Cotter pin (2)
5. Brake mounting bracket
6. Pin
7. Shim (as required)
8. Flat washer 8 mm (3)
9. Elastic stop nut 8 mm (3)
10. Flat washer 10 mm (1)
11. Brake lever and pad
12. Brake switch bracket
13. Tapite screw M4 x 8 (2)

14. Bushing
15. Release spring
16. Brake lever and pad
17. Flat washer 10 mm (1)
18. Elastic stop nut 10 mm (1)
19. Pulley shaft
20. Spring washer (1)
21. Pulley
22. Stop plate
23. Cotter pin (1)
24. Adjusting sleeve
25. Circlip

## REMOVAL

### Brake assembly

Disconnect brake light switch at connector and remove brake retainer nut, then pull out brake assembly, light switch and cable. Disconnect and remove brake cable.

◆ **WARNING:** Always readjust the brake light switch after removing the brake assembly.

## INSPECTION

### 11, 16, Brake pads

Measure the thickness of the brake pads. if less than 3 mm (1/8") the pad and lever assembly should be replaced.

▼ **CAUTION:** Brake pads **MUST** always be replaced in **PAIRS**.

### 14, Bushing

Inspect for excessive wear.

### 1, Cable

Inspect for frayed braids.

### Brake disc

Check for scoring or cracking replace as required.

▼ **CAUTION:** Brake disc should never be machined.

## ASSEMBLY

### 4,23, Cotter pin

Always reinstall new cotter pins.

### 19, Pulley shaft

Install in outer hole of brake lever.

### 22, Stop plate

Make sure the guard lock tab is inserted in the brake lever hole.

### 18, Elastic stop nut

Torque to 12 N•m (106 lbf•in).

## INSTALLATION

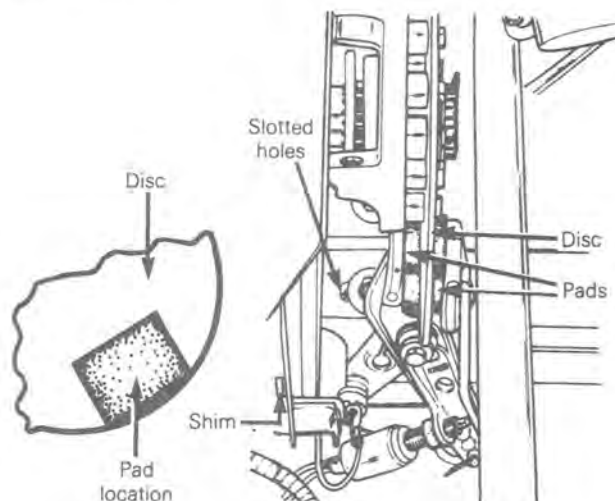
Reverse the removal procedure paying particular attention to the following:

◆ **WARNING:** Avoid getting oil on brake pads. Do not lubricate or apply anti-rust or anti-freeze solution in cable.

### 5,7, Brake mounting bracket & shim

Use shim(s) P/N 507 0174 00 (.8 mm/.032" thickness) to position caliper bracket so as to ensure maximum pad friction area on disc.

Use mounting bracket slotted holes to align caliper assembly so that the brake disk is centered between the brake pads.



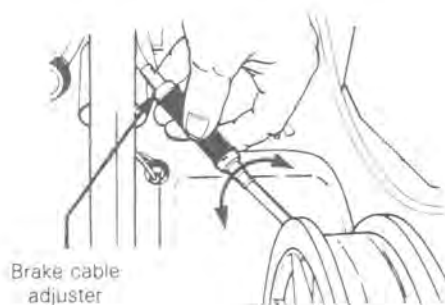
A007003016

## ADJUSTMENT

### Control lever travel

Brake should apply fully while the brake control lever is approximately 13 mm (1/2") from the handlebar grip.

If adjustment is required, turn the brake cable adjuster counterclockwise until the brake disc can no longer turn then back off the adjuster approximately 1 1/2 turns. Recheck brake operation.



A007003017

### Brake Light switch

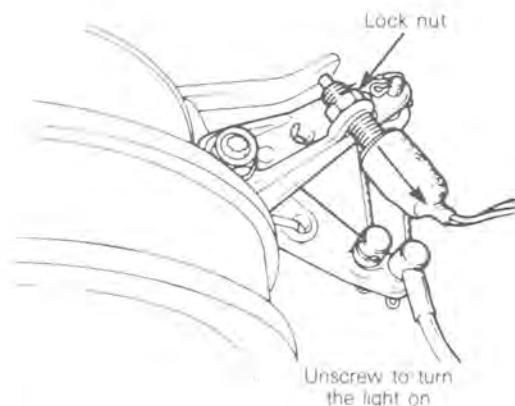
◆ **WARNING:** Whenever the brake is readjusted, the brake light switch operation must also be checked and adjusted.

To check operation:

Pull the brake lever to hold the pads on the disc. Check that a light resistance is felt while rotating the driven pulley. This is the position where the switch should have lit the brake light.

To adjust:

- Loosen the brake switch lock nut.
- Holding the brake lever at the lit position, unscrew the switch to turn the light on or screw it in to turn it off.



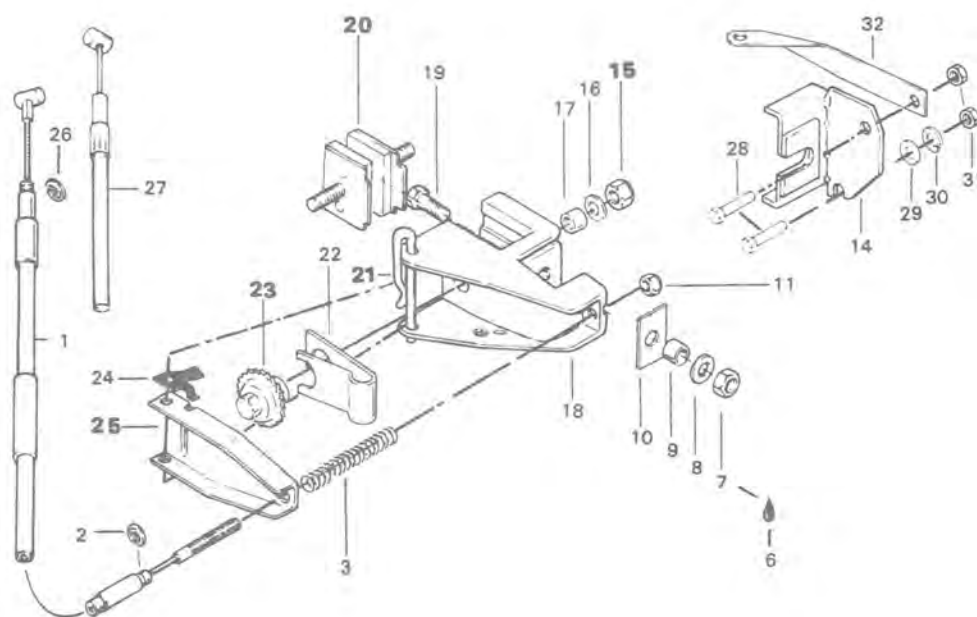
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## Section 03 TRANSMISSION

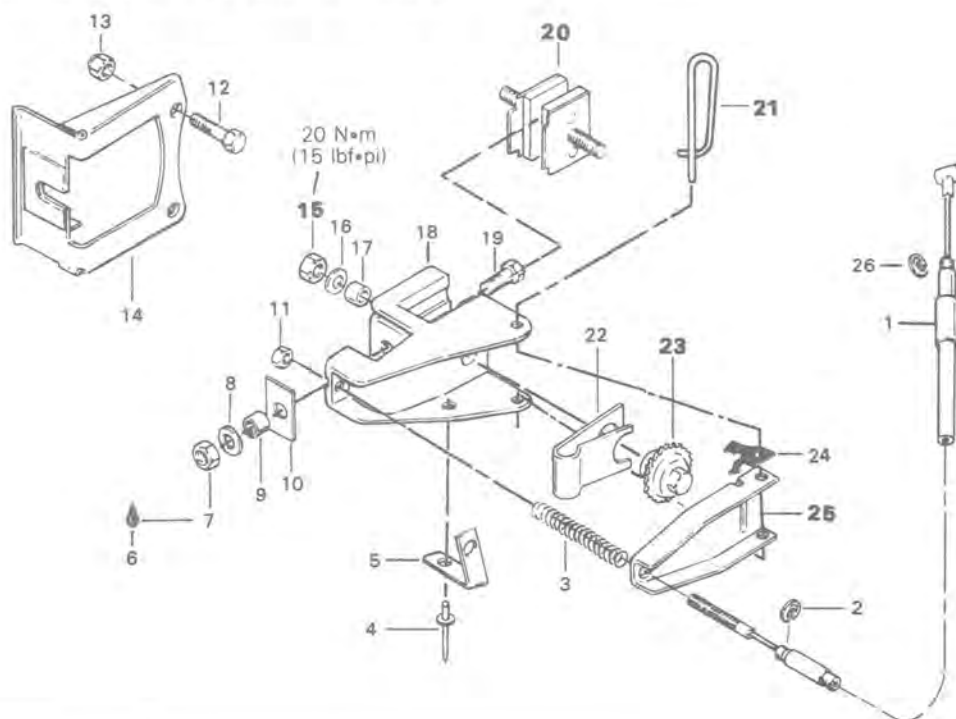
### Sub-section 06 (BRAKE)

## SELF ADJUSTING DISC BRAKE

Alpine



Citation LS/E, Tundra/LT, Safari, Formula SP





## Section 03 TRANSMISSION

### Sub-section 06 (BRAKE)

1. Cable (brake)
2. Circlip
3. Release spring
4. Rivet (Citation/Tundra only)
5. Stop light switch support (Citation/Tundra only)
6. Loctite 242
7. Eslock nut 5/16 - 18 (1)
8. Washer (1)
9. Bushing (1)
10. Spacer (1)
11. Elastic stop nut 10 - 24 (1)
12. Bolt M7 x 25 (2) (M6 x 20 Citation/Tundra) (2)
13. Elastic stop nut M7 (2) (M6 Citation/Tundra) (2)
14. Brake mounting bracket
15. Elastic stop nut 3/8 - 16
16. Flat washer 3/8 x 7/8 x .060"

17. Bushing
18. Caliper
19. Cap screw 5/16 - 18 x 3/4
20. Pads (2)
21. Pin
22. Release spring
23. Ratchet wheel
24. Ratchet spring
25. Lever (brake)
26. Circlip
27. Parking brake cable
28. Cap screw 5/16-18 x 3/4 (2)
29. Flat washer 5/16 x 3/4 x .060" (2)
30. Lock washer
31. Elastic stop nut 5/16-18 (2)

### 23, Ratchet wheel

▼ **CAUTION:** Similar ratchet wheels on caliper type disc brakes may have metric or standard threads. Identify using the following illustrations:

#### Standard thread ratchet wheel



A009003002

Hexagonal bolt head with groove.

#### Metric thread ratchet wheel



A009003003

Hexagonal head with round head base

## REMOVAL

### Caliper assembly

To remove, disconnect brake cable. On CITATION/TUN-  
DRA models, disconnect brake light switch at connector.

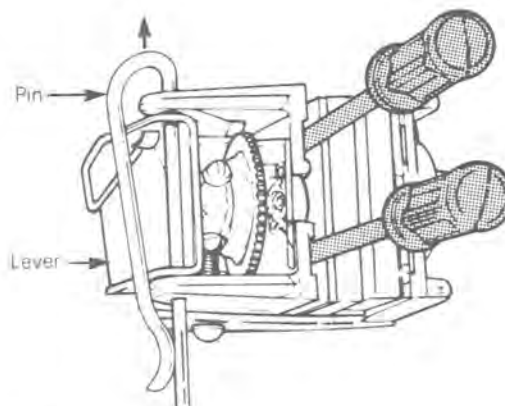
Remove nuts and/or bolts securing brake support to  
chancase.

Slide brake caliper ass'y from brake support.

## DISASSEMBLY

### 21,25, Pin & lever

To ease disassembly, activate lever and wedge two (2)  
screwdriver blades between caliper and brake pad to re-  
lease lever tension.



A009003004

## CLEANING

Clean all metal components in a general purpose solvent.  
Thoroughly dry all components before assembling.

## INSPECTION

### 20, Brake pad thickness

Measure thickness of brake pads. If less than 3 mm  
(1/8"), the pads should be replaced.

▼ **CAUTION:** Brake pads must **ALWAYS** be re-  
placed in **PAIRS**.

## Section 03 TRANSMISSION

### Sub-section 06 (BRAKE)

#### Brake disc

Check for scoring or cracking replace as required.

▼ **CAUTION:** Brake disc should never be machined.

## ASSEMBLY

### 23, Ratchet wheel

Apply low temperature grease on threads and spring seat prior to installation. Fully tighten then back off 1/2 turn.

### 15, Elastic stop nut

Torque to 20 N•m (15 lbf•ft).

## INSTALLATION

◆ **WARNING:** Avoid getting oil on brake pads. Do not lubricate or apply anti-rust or anti-freeze solution in cable.

#### Caliper assembly

Slide caliper ass'y onto its support then secure support to vehicle.

Activate brake lever by hand until ratchet click is no longer heard.

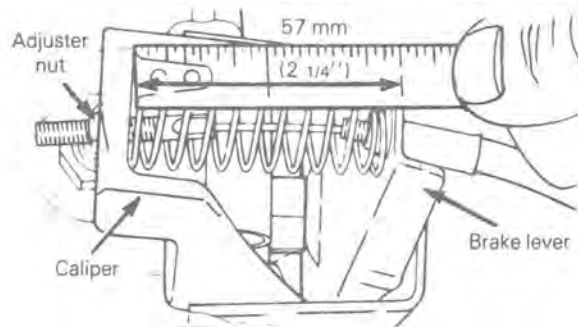
Secure brake cable housing to brake lever with the cir-clip on the inner side of the lever.

Slide spring over cable then attach cable to housing with adjuster nut.

## ADJUSTMENT

#### Brake control lever

Using adjuster nut, adjust until there is no free-play between the brake control lever and its housing and there is a gap of 57 mm  $\pm$  3 (2 1/4"  $\pm$  1/8") between the brake lever and caliper.



A009003005

○ **NOTE:** On Citation/Tundra models, it may be necessary to change brake light switch support position to obtain recommended gap between brake lever and caliper.

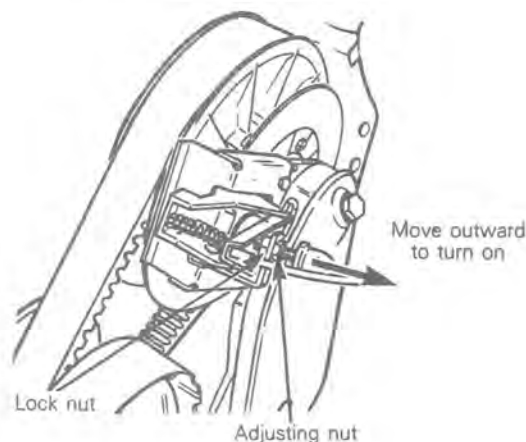
#### Brake light switch (Citation/Tundra models)

To check operation:

Pull the brake lever to hold the pads on the disc. Check that a light resistance is felt while rotating the driven pulley. This is the position where the switch should have turned the brake light on.

To adjust:

- Loosen the brake switch lock nut while restraining the other one.
- By turning adjusting nut, move switch outward to turn light on or inward to turn it off.



A003003005

**Brake Light Switch (Alpine, Safari, Formula SP)**

On these models the brake light switch is mounted on the handlebar assembly and is not adjustable.

**Parking Brake (Alpine Only)**

Make sure service brake is correctly adjusted.

Turn parking brake adjustment nut until just contacts the brake lever.

▼ **CAUTION:** A dragging parking brake will over-heat the brake pads causing brake fade and premature pad wear.

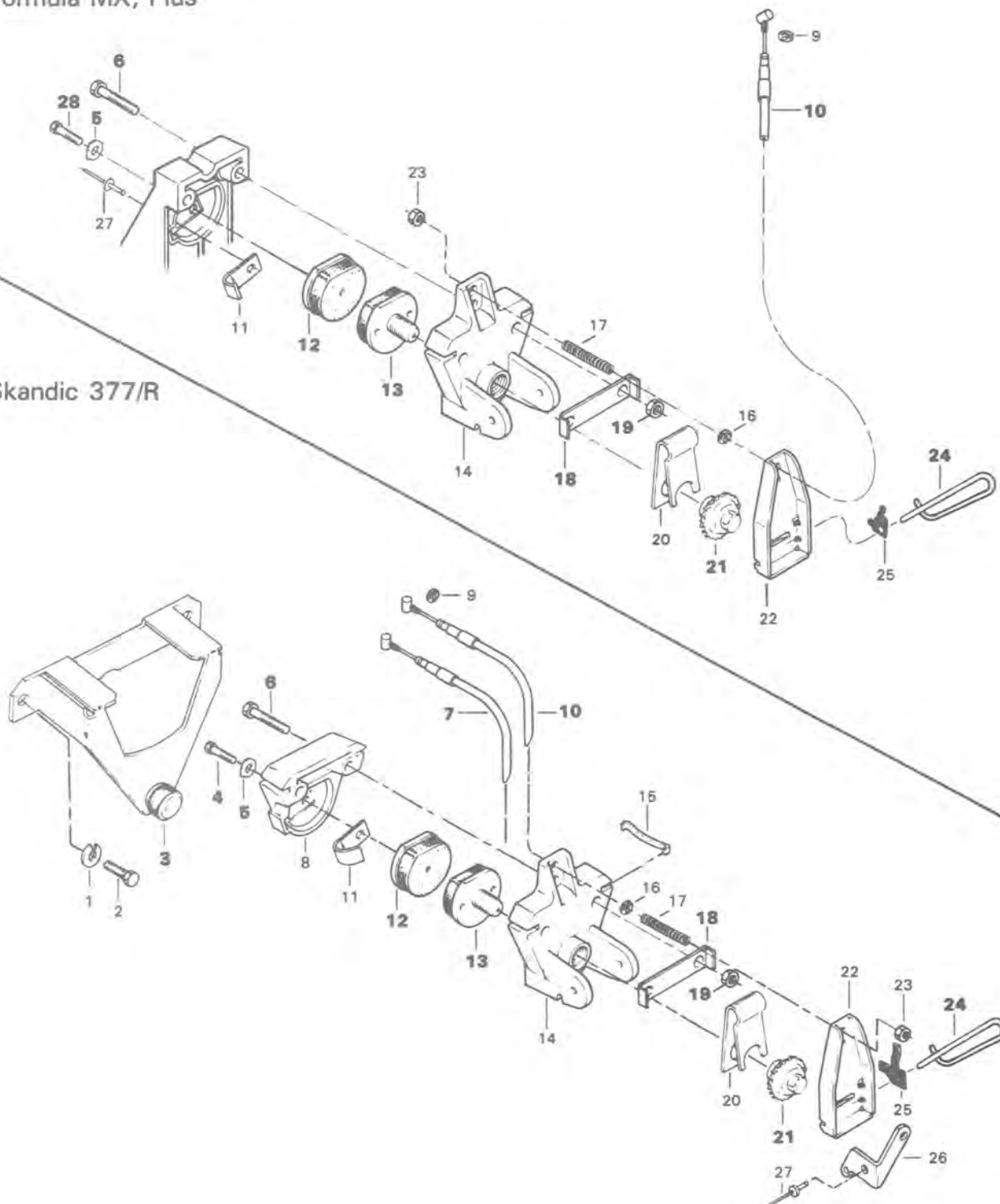
## Section 03 TRANSMISSION

### Sub-section 06 (BRAKE)

## SELF ADJUSTING DISC BRAKE

Formula MX, Plus

Skandic 377/R



1. Lock washer M8 (2)
2. Cap screw M8 x 1.25 x 16 (2)
3. Brake support
4. Cap screw M5 x .80 x 12 (1)
5. Lock tab
6. Cap screw M8 x 1.25 x 50 (2)
7. Parking brake cable and housing
8. Inner caliper half
9. Circlip
10. Service brake cable and housing
11. Brake lining wear warning tab
12. Inner shoe (fixed)
13. Outer shoe (sliding)
14. Outer caliper half

15. Caliper support spring
16. Circlip
17. Spring
18. Lock tab
19. Elastic stop nut M8 x 1.25 (2)
20. Release spring
21. Ratchet wheel
22. Brake lever
23. Elastic stop nut 10-24 (1)
24. Pin
25. Pawl
26. Stop light switch support
27. Rivet
28. Cap screw M5 x 16 (1)

## RATCHET WHEEL

▼ **CAUTION:** Similar ratchet wheels on caliper type disc brakes may have metric or standard threads. Identify using the following illustrations:

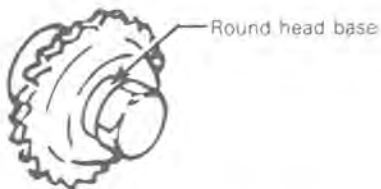
### Standard thread ratchet wheel



A009003002

Hexagonal bolt head with groove.

### Metric thread ratchet wheel



A009003003

Hexagonal head with round head base.

## REMOVAL

### Brake assembly

The split caliper type brake must be removed from vehicle as an assembly. Proceed as follows.

### Skandic R

#### 3, Brake support

Remove support bolts and slide assembly from disc.

#### 7, 10, Brake cables

Disconnect from brake lever.

#### Speedometer cable

Disconnect from angle drive.

Pull brake assembly out of vehicle.

### Formula MX, Plus

Remove air silencer assembly.

Remove injection oil, rotary valve oil and coolant tank reservoirs.

Remove tank support.

#### 6, 18, 19, Bolt, lock tab & nut

Unfold lock tab and unscrew the two nuts. Remove bolts and caliper ass'y from the disc. Disconnect brake cable

### Brake disc

### Skandic R

For removal refer to section 05-08.

### Formula MX, Plus

Remove tail pipe.

Refer to section 03-07 and remove chaincase cover.

Unbolt countershaft from upper sprocket.

## Section 03 TRANSMISSION

### Sub-section 06 (BRAKE)

Remove air silencer, pulley guard, drive belt and driven pulley see section 03-04.

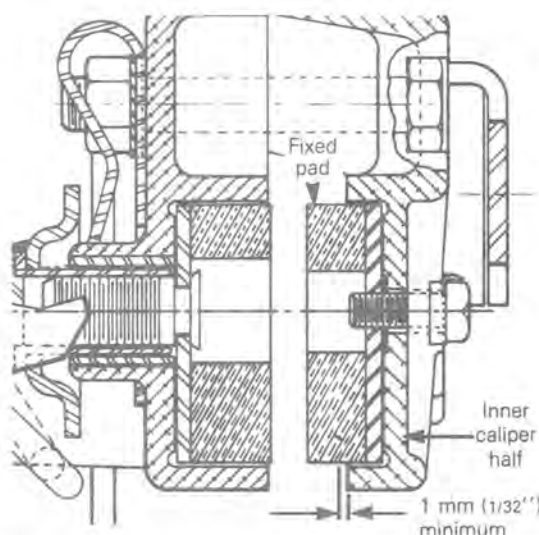
Unbolt countershaft bearing housing (3 bolts).

Pull countershaft to remove brake disc.

## INSPECTION

### 12, 13, Brake pad thickness

Replace brake pads when fixed shoe projects 1 mm (1/32") or less from inner caliper half.



AD15003003

### Brake disc

Check for scoring or cracking replace as required.

▼ **CAUTION:** Brake disc should never be machined.

## ASSEMBLY

### 21, Ratchet wheel

Apply low temperature grease on threads and spring seat prior to installation. Fully tighten then back off 1/2 turn.

### 4,5,28, Inner shoe bolt & lock tab

Tighten bolt to 1.5 N•m (13 lbf•in) and secure with lock tab. (Loctite 271 on Formula MX and Plus).

### 18,19, Caliper ass'y nut & lock tab

With the release spring in position, slide the lock tab between the spring inner faces and secure the two caliper halves with nuts. Torque nuts to 24 N•m (18 lbf•ft). Caliper half side slots must align.

Bend lock tab over flat surface of nuts.

### 24, Pin

Must be assembled from the pawl side and locked in the caliper casting recess to prevent rotation.

## INSTALLATION

To install brake assembly, reverse removal procedure paying attention to the following:

◆ **WARNING:** Avoid getting oil on brake pads. Do not lubricate or apply anti-rust or anti-freeze solution in cables.

### Brake disc (Formula MX, Plus)

○ **NOTE:** The brake disc must "float" on countershaft for efficient operation of brakes.

Make sure brake disc key is inserted correctly in countershaft.

Lubricate countershaft with WD-40 and check that disc "floats" freely on it.

### Countershaft bearing adjustment

If bearing has been replaced or removed adjust as follows:

Install shaft in vehicle. Bolt to upper sprocket and close chaincase see section 03-07.

Make sure shaft is properly aligned and tighten the three (3) bearing housing bolts.

Pull shaft towards driven pulley.

Slide collar towards bearing and turn, by hand, to engage the eccentric. This should require about a quarter turn.

Turn collar in direction of shaft rotation until collar and inner race lock together.

Insert a punch in collar hole and strike sharply in the direction of shaft rotation to lock firmly.

Use Loctite 242 on set screw.

○ NOTE: Reverse the above for removal.

#### Caliper assembly

Slide caliper ass'y with springs onto its support then secure support to vehicle. (Skandic R).

Activate lever by hand until ratchet click is no longer heard.

Secure brake cable housing to brake lever, slide spring over cable then attach cable to housing with adjuster nut.

▼ CAUTION: On Formula MX and Plus models, the rotary valve oil lines and the cooling system must be refilled and serviced according to procedure in section 02-09. Chaincase oil level should be checked.

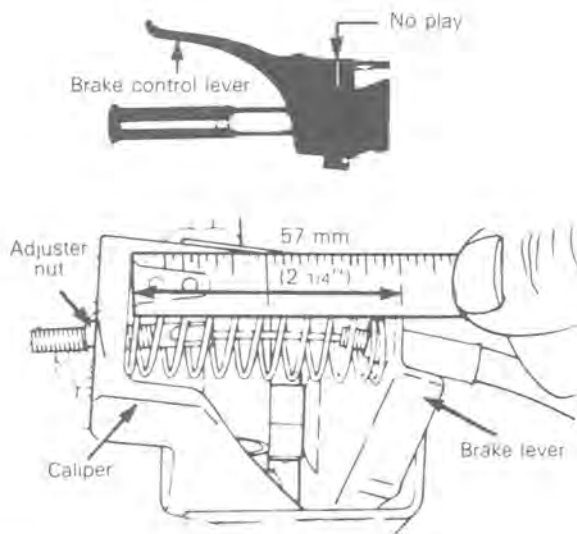
#### 7,10, Brake cables (Skandic R)

The service brake cable must be installed in the lever upper hole.

### ADJUSTMENT

#### Brake control lever

Using adjuster nut, adjust until there is no free-play between the brake control lever and its housing and there is a gap of 57 mm  $\pm$  3 (2 1/4  $\pm$  1/8") between the brake lever and caliper.



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#### Parking brake (Skandic R)

Make sure service brake is correctly adjusted.

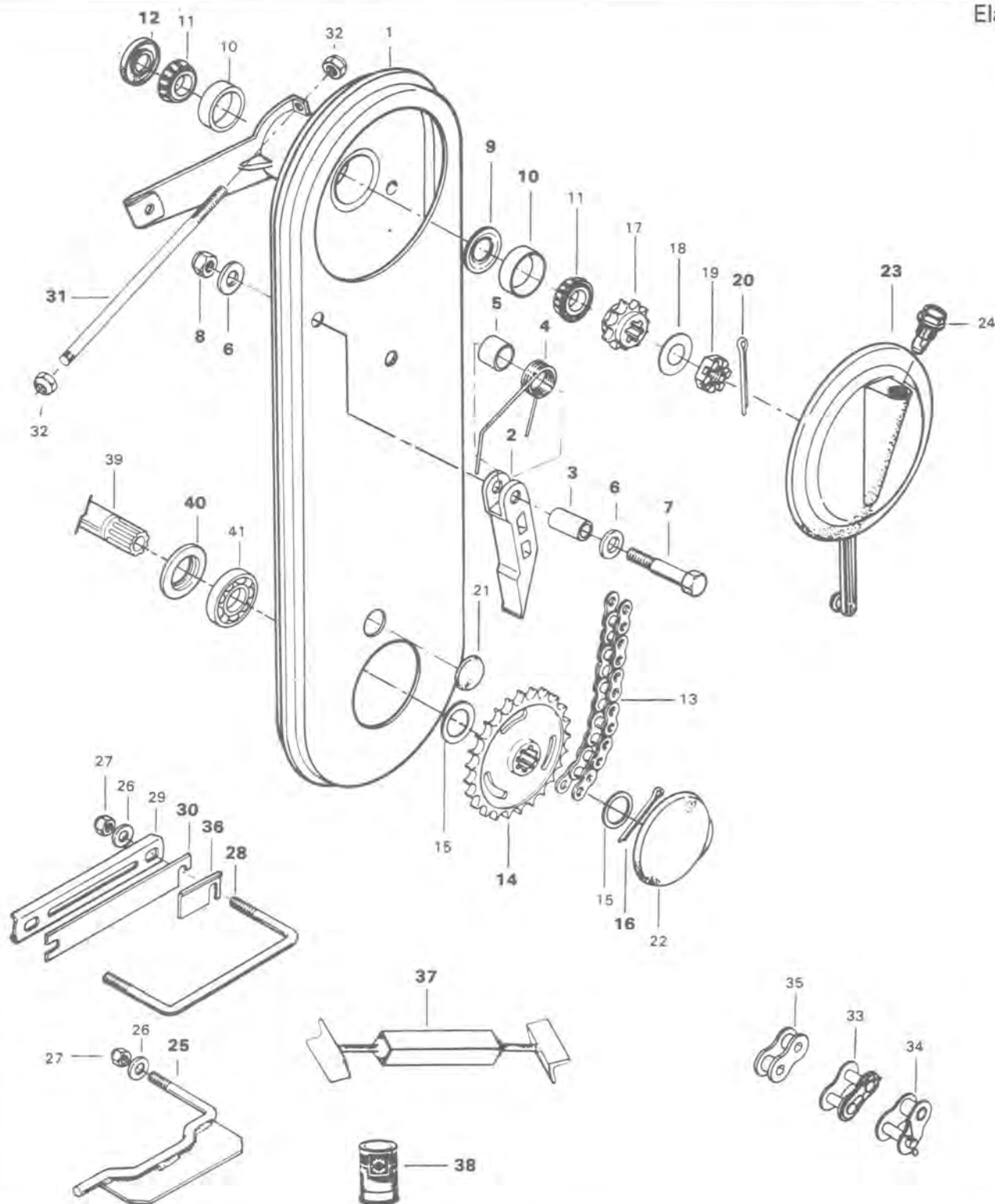
Turn parking brake adjustment nut until it just contacts the brake lever.

▼ CAUTION: A dragging parking brake will over-heat the brake pads causing brake fade and premature pad wear.





## CHAINCASE



## Section 03 TRANSMISSION

### Sub-section 07 (CHAINCASE)

1. Chaincase
2. Chain tensioner
3. Bushing
4. Spring
5. Spacer
6. Fiber washer (2)
7. Hexagonal cap screw 1/4-20 x T 3/4
8. Elastic stop nut 1/4-20
9. Oil deflector
10. Bearing cup (2)
11. Bearing cone (2)
12. Seal
13. Chain
14. Sprocket 25 teeth
15. Spacer (2)
16. Cotter pin
17. Sprocket 10 teeth
18. Washer
19. Castellated nut 1/2-20
20. Cotter pin
21. Chain case oil level plug
22. Access plug
23. Inspection cover
24. Breather
25. Bracket
26. Flat washer (3)
27. Elastic stop nut 5/16-18 (3)
28. U-clamp
29. Spacer plate
30. Shim (as required)
31. Threaded rod
32. Elastic stop nut 5/16-18 (2)
33. Connecting link
34. Cranked link single, 1/2" pitch single\*
35. Inner link, 1/2" pitch single\*
36. Shim (as required)
37. Drive axle holder
38. Chaincase oil 200 ml (7 oz)
39. Drive axle
40. Lower oil seal
41. Bearing

\*Use as required when chain length must be modified.

## REMOVAL

### Chaincase & driven pulley assembly

Chaincase and driven pulley is removed from vehicle as a complete assembly. Proceed as follows:

Remove tool box, pulley guard and drive belt.

### 2 to 8, 23, Tensioner assembly

Remove access plug (upper) and hold tensioner assembly. Remove chain tensioner bolt, elastic stop nut and fiber washers. Remove tensioner assembly from chaincase.

### 38,40, Chaincase oil & lower oil seal

Pry lower oil seal from chaincase and drain oil.

### Brake cable

Disconnect from chaincase.

### 16, Lower sprocket cotter pin

Pry out lower access plug, remove cotter pin and spacer.

### 31, Threaded rod

Disconnect from chaincase.

### 28,25, U-clamp and bracket

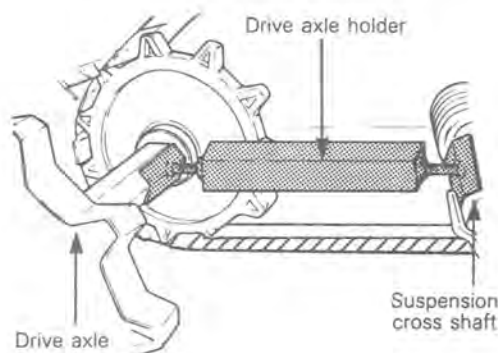
From the inner side of the frame, remove the nut securing chaincase lower bracket and remove bracket. Remove the nuts, washers and u-clamp holding the chaincase to frame.

### 30,36, Shims

Remove and save for installation.

### 37, Drive axle holder

Release track tension or use drive axle holder P/N 529 0051 00.



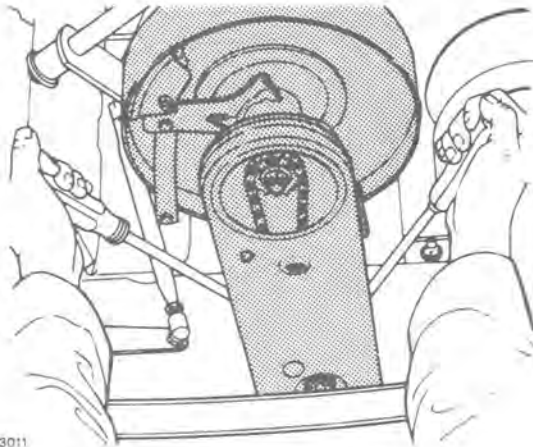
A004003002

## Section 03 TRANSMISSION

### Sub-section 07 (CHAINCASE)

#### Chaincase & driven pulley assembly

Using two (2) large screwdrivers inserted between chaincase and frame, pry complete assembly from vehicle.



A002003011

#### DISASSEMBLY

Disassemble driven pulley from chaincase. Refer to Driven pulley section 03-04.

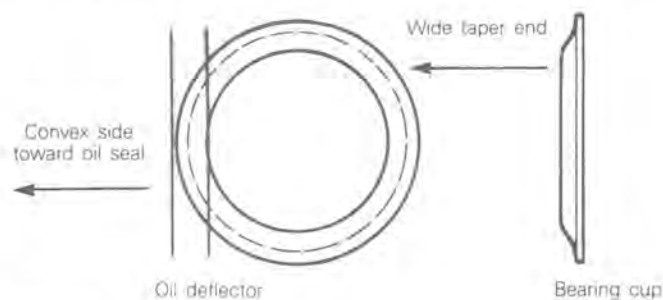
#### INSPECTION

Visually inspect chain for cracked, damaged or missing link rollers. Check for defective bearing cones, bearing cups and oil deflector. Inspect sprockets and chain tensioner assembly for wear.

#### ASSEMBLY

##### 9,10, Oil deflector & bearing cup

Position oil deflector ring then sit bearing cup in chaincase aperture. Cup must be seated so that wide taper end is facing oil deflector.



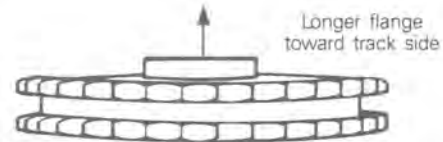
A002003012

##### 12, Oil seal

Using an appropriate pusher, press new oil seal into chaincase hub. Oil seal must sit flush with case hub edge.

##### 14, Sprocket

Place lower sprocket with longer flange toward track side of chaincase. (For proper sprocket and chain use, see Technical Data.)



A002003013

#### INSTALLATION

To install chaincase driven pulley assembly, reverse removal procedure paying special attention to the following.

##### 20,16, Cotter pins

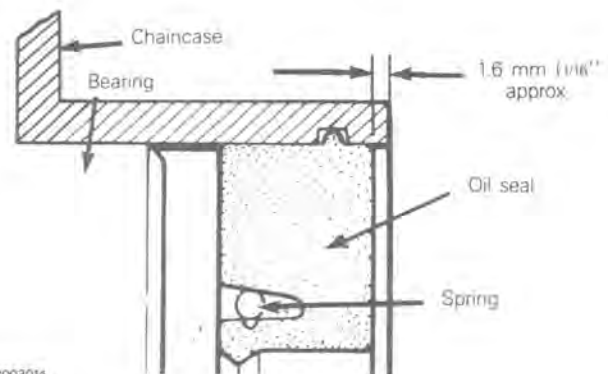
Install new cotter pins.

**CAUTION:** When removing a cotter pin always replace with a new one.

##### 40, Lower oil seal

Install new oil seal into chaincase flange as shown.

**NOTE:** A gap of approximately 1.6 mm (1/16") should exist between the end of chaincase flange and oil seal.



A002003014

##### 38, Chaincase oil

Fill with 200 ml (7 oz) of chaincase oil.

Pour Bombardier chaincase oil, P/N 413 8019 00, into chaincase until level is 13 mm (1/2") below chaincase oil level plug.

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## **Section 03 TRANSMISSION**

### **Sub-section 07 (CHAINCASE)**

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#### **ADJUSTMENT**

##### **Pulley alignment**

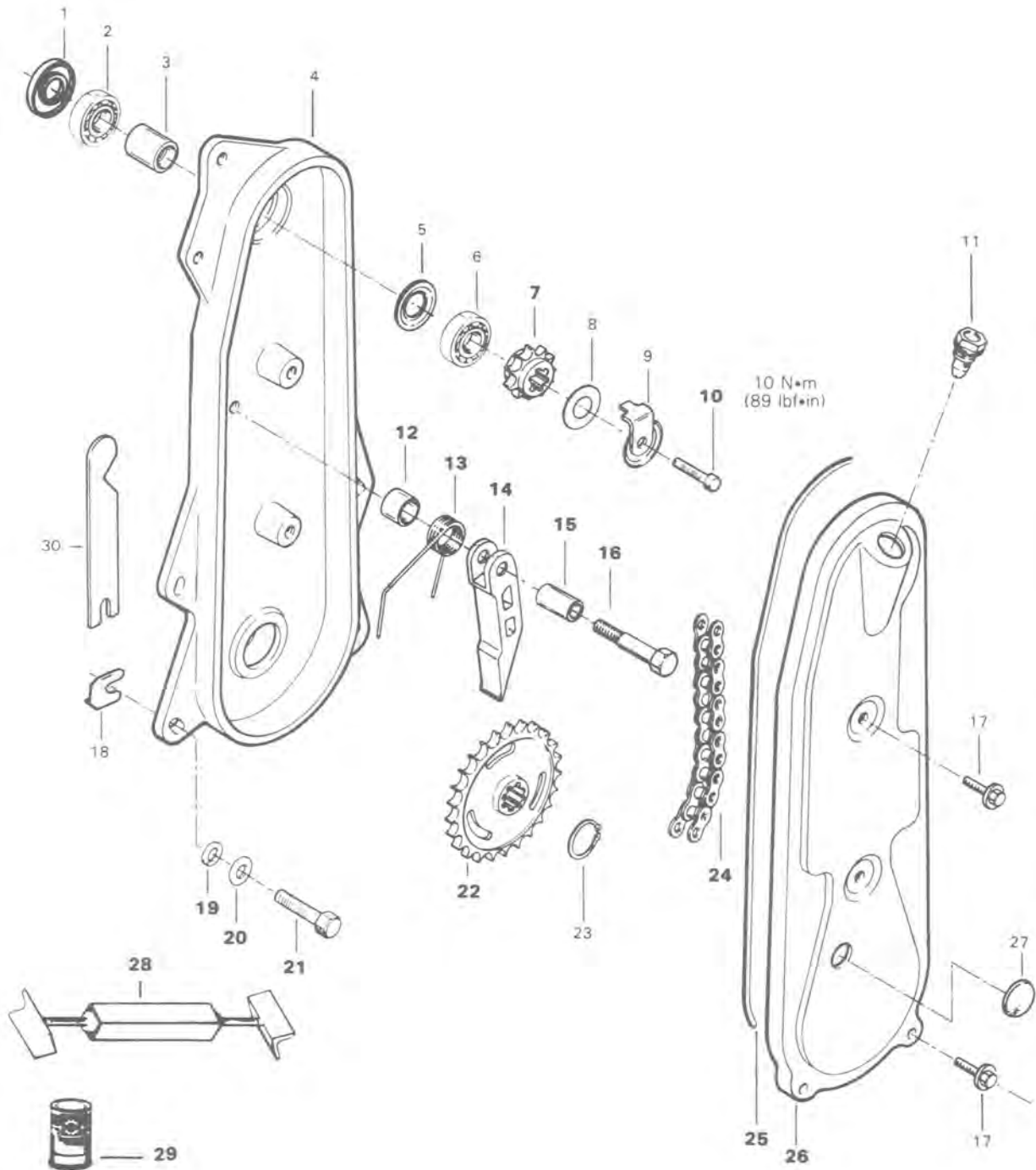
Refer to "Pulley distance and alignment" sub-section 05.

##### **Brake operation & brake light**

Refer to "Brake" sub-section 06.

**Section 03 TRANSMISSION**  
Sub-section 07 (CHAINCASE)

Citation LS/LSE, Tundra, Tundra LT



## Section 03 TRANSMISSION

### Sub-section 07 (CHAINCASE)

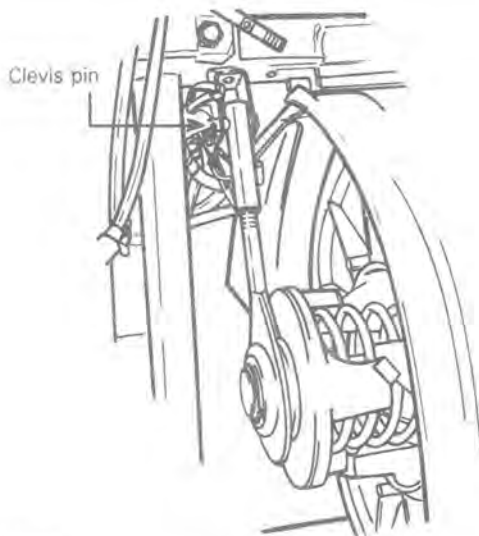
1. Oil seal
2. Ball bearing
3. Spacer
4. Chaincase
5. Oil retainer ring
6. Ball bearing
7. Single sprocket
8. Washer
9. Lock tab
10. Cap screw M6 x 1 x 20
11. Breather
12. Spacer
13. Spring
14. Chain tensioner
15. Bushing

16. Cap screw M6 x 1 x 40
17. Taprite screw M6 x 1 x 16 (4)
18. Shim (as required)
19. Flat washer 8.4 mm (except Citation LSE)
20. Lock washer 8 mm
21. Cap screw M8 x 1.25 x 25
22. Single sprocket
23. Circlip
24. Driving chain
25. Gasket
26. Chaincase cover
27. Chaincase oil level plug
28. Drive axle holder
29. Chaincase oil 200 ml (7 oz)
30. Shim (Citation LSE only) (as required)

## REMOVAL

Chaincase and driven pulley can be removed from the vehicle as an assembly.

Remove clevis pin from the bracket.



A004003010

○ **NOTE:** On Citation LSE disconnect and remove battery from its rack.

▼ **CAUTION:** Be careful not to ground positive terminal with the chassis. Always disconnect black negative cable first.

### 26, Chaincase cover

Remove and drain oil.

### Drive axle oil seal

Pry out from chaincase.

### 7,22,24,12 to 16, Sprockets, chain & tensioner assembly

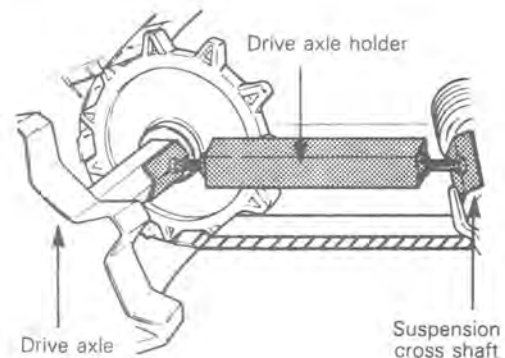
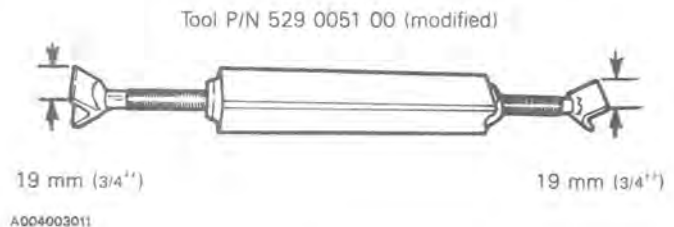
Unscrew the bolt on the upper sprocket and remove circlip on the bottom one. Remove chain tensioner assembly, then simultaneously remove chain and both sprockets.

### 19,20,21, Washers & cap screws

Remove cap screws securing chaincase to frame.

### 28, Drive axle holder

Remove track tension on drive axle using tool P/N 529 0051 00 (reduce tool ends to 19 mm (3/4") wide) and pull chaincase out of the vehicle.



A004003002

## INSPECTION

Visually inspect the chain for cracked, damaged or missing link rollers. Check for defective bearings, sprockets and worn chain tensioner components.

## INSTALLATION

Reverse removal procedure. Pay particular attention to the following:

### 10, Cap screw

Torque to 10 N•m (89 lbf•in).

### 25, Gasket

Grease new gasket with petroleum jelly, or other suitable product, and install making sure gasket does not shift from it's correct position. Tighten bolts evenly.

○ **NOTE:** Bottom pan has an emboss below chaincase housing to ease installation.

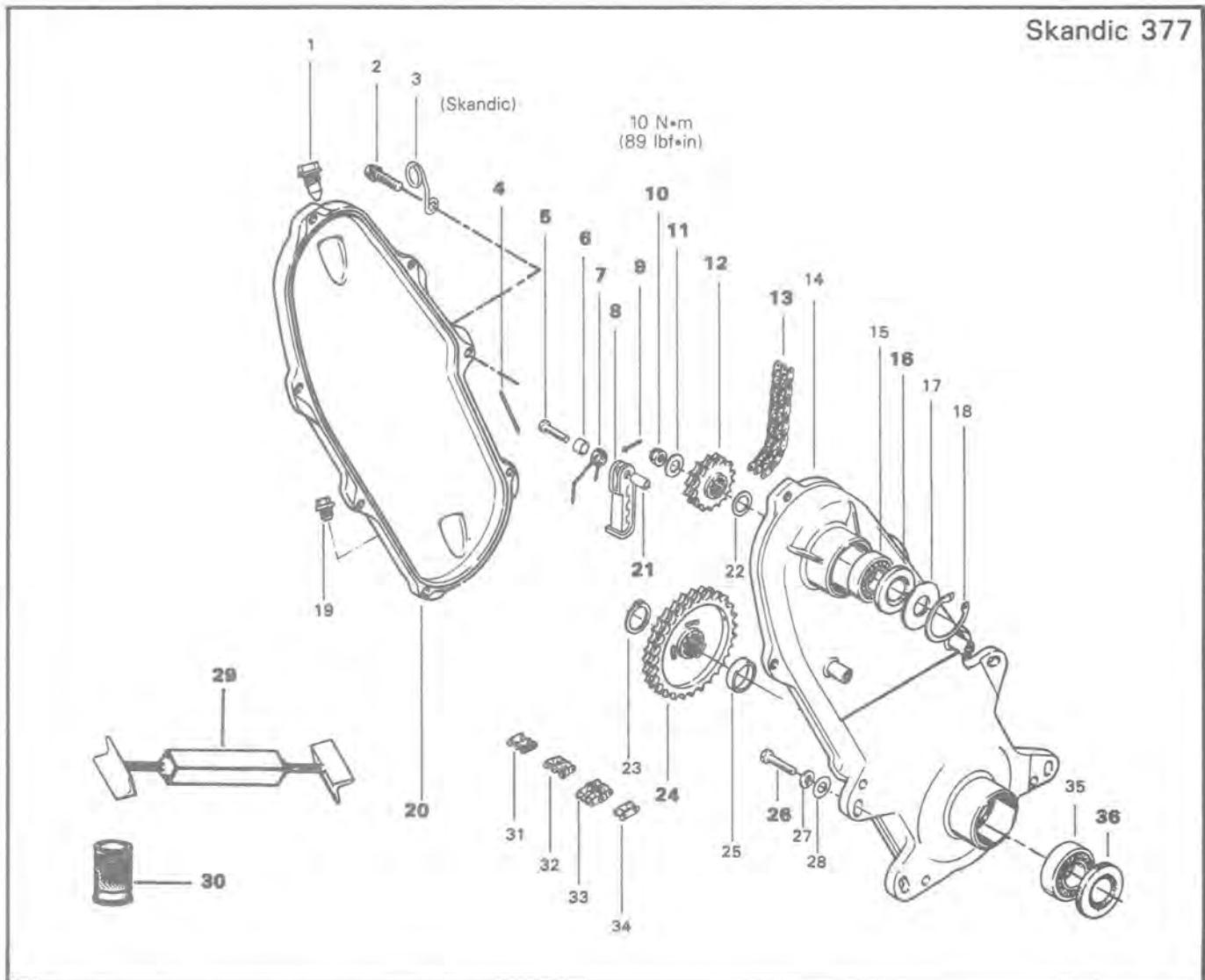
### 29, Chaincase oil

Refill with chaincase oil (200 ml/7 fl.oz.). Oil should be level with the bottom of chaincase oil level plug.

## Section 03 TRANSMISSION

### Sub-section 07 (CHAINCASE)

Skandic 377



**NOTE:** Skandic 377R is equipped with a gearbox.  
See section 03-08 for more details.

- |                             |   |
|-----------------------------|---|
| 1. Breather                 | 19. Oil level cap plug                        |
| 2. Washer head tapite screw | 20. Chaincase cover                           |
| 3. Rope guide               | 21. Bushing                                   |
| 4. O-ring                   | 22. Spacer                                    |
| 5. Cap screw                | 23. Snap ring                                 |
| 6. Spacer                   | 24. Sprocket                                  |
| 7. Spring                   | 25. Spacer                                    |
| 8. Chain tensioner          | 26. Cap screw M8 x 25                         |
| 9. Cotter pin               | 27. Lock washer 8 mm                          |
| 10. Castellated nut         | 28. Flat washer 8 mm                          |
| 11. Spring washer           | 29. Drive axle holder                         |
| 12. Sprocket                | 30. Chaincase oil 200 ml (7 oz)               |
| 13. Driving chain           | 31. Connecting link single, 3/8" pitch double |
| 14. Chaincase               | 32. Cranked link single, 3/8" pitch double    |
| 15. Bearing                 | 33. Cranked link double, 3/8" pitch double    |
| 16. Seal                    | 34. Inner link, 3/8" pitch double             |
| 17. Stopper spacer          | 35. Drive axle bearing                        |
| 18. Snap ring               | 36. Drive axle oil seal                       |



## REMOVAL

To remove chaincase from vehicle, proceed as follows:

### 20, Chaincase cover

Remove and drain oil.

### 36, Drive axle oil seal

Pry out from chaincase.

### 5,6,7,8,12,13,21,24, Tensioner assembly, sprockets & chain

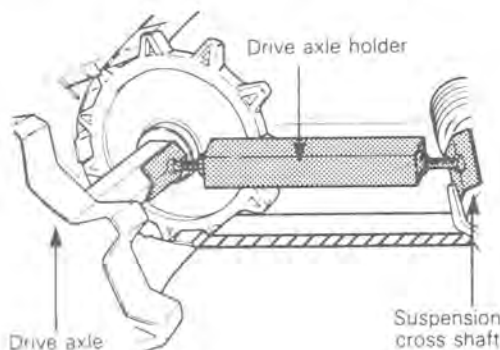
Remove from chaincase.

### 26, Chaincase retaining bolts

Remove bolts and nuts securing chaincase to frame.

### 29, Drive axle holder

Remove track tension on drive axle using tool P/N 529 0051 00 and pull chaincase out of vehicle.



A004003002

## INSPECTION

Visually inspect the chain for cracked, damaged or missing link rollers. Check for worn bearings, sprockets and chain tensioner components.

## INSTALLATION

Reverse removal procedure. Pay particular attention to the following:

### 10,11, Castellated nut & spring washer

Install spring washer and torque nut to 10 N•m (89 lbf•in).

### 9, Cotter pin

Install a new cotter pin.

▼ **CAUTION:** When removing a cotter pin always replace with a new one.

### 4,16,36, O-ring & drive axle oil seal

Replace chaincase o-ring and drive axle oil seal when reassembling a chaincase.

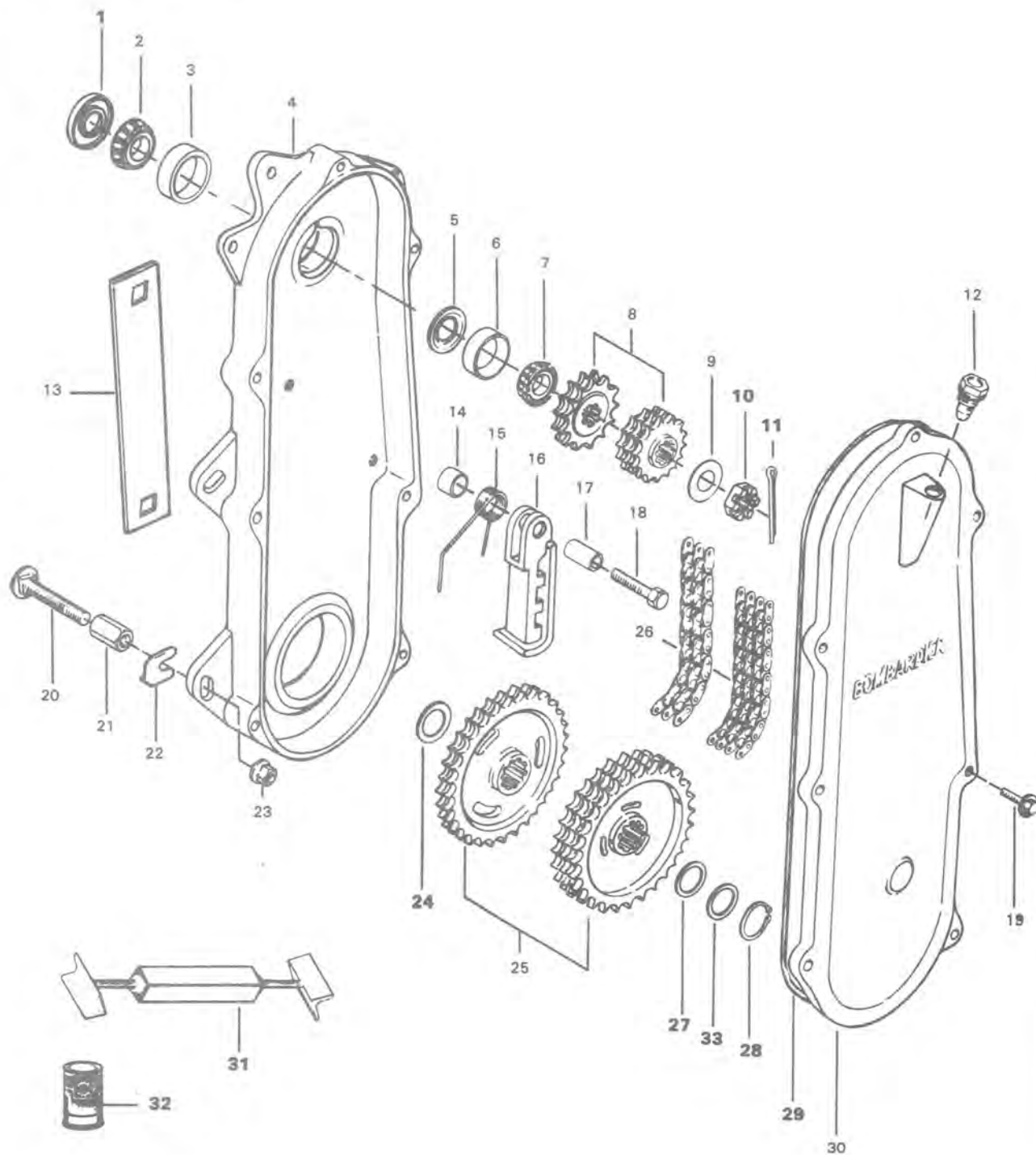
### 30, Chaincase oil

Refill with chaincase oil (200 ml/7 fl.oz.). Oil should be level with bottom of oil level cap plug orifice.

## Section 03 TRANSMISSION

### Sub-section 07 (CHAINCASE)

Safari (all), Formula SP



## Section 03 TRANSMISSION

### Sub-section 07 (CHAINCASE)

1. Oil seal
2. Bearing cone
3. Bearing cup
4. Chaincase
5. Oil deflector
6. Bearing cup
7. Bearing cone
8. Upper sprocket
9. Spring washer
10. Castellated nut
11. Cotter pin
12. Breather
13. Reinforcement
14. Spacer (2)
15. Spring (2)
16. Chain tensioner (2)
17. Bushing (2)

18. Screw (2)
19. Taptite screw M6 x 30 (7)
20. Carriage bolt M8 x 1.25 x 55 (4)
21. Threaded spacer (4)
22. Shim (as required)
23. Elastic stop nut M8 x 1.25 (4)
24. Spacer (thicker) (3) (G.L. models = 1)
25. Lower sprocket
26. Drive chain
27. Spacer (thinner) (3) (G.L. models = 1)
28. Snap ring
29. O-ring
30. Chaincase cover
31. Drive axle holder
32. Chaincase oil 200 ml (7 oz)
33. Special spacer (1) (GL only)

## REMOVAL

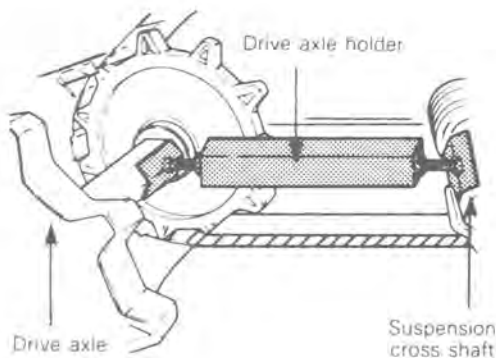
Chaincase and driven pulley can be removed from vehicle as an assembly. Refer to section 03-04 for Driven pulley removal, from vehicle, procedure.

## DISASSEMBLY

To disassemble chaincase from driven pulley, press pulley shaft out of chaincase or knock with a plastic hammer.

### 31, Drive axle holder

Remove track tension on drive axle using tool P/N 529 0051 00 and pull chaincase out of vehicle.



A004003002

## INSPECTION

Visually inspect the chain for cracked, damaged or missing link rollers. Check for worn or defective bearings, sprockets and tensioner components.

## INSTALLATION

Reverse removal procedure and pay attention to the following:

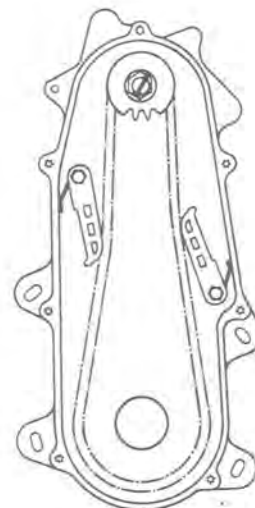
### 24,27,33, Spacers

Install the thicker spacer on the chaincase side of the sprocket.

**CAUTION:** Amount of spacers used is critical and varies from one model to the other, if in doubt refer to illustration parts list for each particular model.

### 14,15,16,17,18, Chain tensioners

See illustration for proper positioning of chain tensioners in chaincase.



A009003015

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## Section 03 TRANSMISSION

### Sub-section 07 (CHAINCASE)

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#### 10, Castellated nut

Tighten nut sufficiently to seat bearings, then loosen nut 1/4 turn and torque to 15 N•m (133 lbf•in).

#### 1,11,29, Seals, cotter pin & gasket

Install a new cotter pin and replace seals and gasket.

▼ **CAUTION:** When removing a cotter pin always replace with a new one.

#### 28, Snap ring

▼ **CAUTION:** It is of the utmost importance to install the snap ring otherwise damage to the chaincase components may occur.

#### 32, Chaincase oil

Using the spark plug socket, remove the filler cap, then using a rigid wire as a "dipstick" check oil level. The oil level on the "dipstick" should be 50-65 mm (2" to 2 1/2"). Replenish as necessary using Bombardier chaincase oil (P/N 413 8019 00 - 200 ml).



A009003011

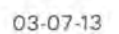
○ **NOTE:** The chaincase oil capacity is approximately 200 ml (7 oz).

## ADJUSTMENT

### Pulley alignment

For pulley distance and adjustment, refer to section 03-05.

## Formula MX, Formula PLUS



## Section 03 TRANSMISSION

### Sub-section 07 (CHAINCASE)


- |                               |                               |
|-------------------------------|-------------------------------|
| 1. Shim (2)                   | 18. Retaining ring            |
| 2. Tensioner shaft            | 19. Oil seal                  |
| 3. Roller                     | 20. Taptite screw M6 x 30 (4) |
| 4. Needle bearing             | 21. O-ring gasket             |
| 5. Brass washer               | 22. Snap ring                 |
| 6. Tensioner adjustment screw | 23. Sprocket                  |
| 7. Hair pin                   | 24. Shim (1)                  |
| 8. Chain tensioner            | 25. Drive chain               |
| 9. O-ring                     | 26. Cap screw M10 x 45 (2)    |
| 10. Chaincase cover           | 27. Spring lock washer (2)    |
| 11. Cotter pin                | 28. Flat washer 10.5 mm (2)   |
| 12. Castellated nut           | 29. Cap screw M10 x 20 (3)    |
| 13. Washer                    | 30. Brass washer (3)          |
| 14. Sprocket                  | 31. Loctite 242               |
| 15. Shim (1)                  | 32. Filler cap/dipstick       |
| 16. Chaincase                 | 33. Drive axle bearing        |
| 17. Ball bearing              | 34. Drive axle oil seal       |

## REMOVAL

 **NOTE:** Release track tension before attempting to remove chaincase.

To remove chaincase proceed as follows:

Remove tuned exhaust pipe and muffler.

 **WARNING:** Never remove exhaust components when engine is hot.

### 6,7,8, Adjusting screw, hair pin & chain tensioner

Remove hair pin. Release drive chain tension by unscrewing tensioner adjustment screw.

### 10,20, Chaincase cover & screws

Drain oil by removing chaincase cover.

### 11,12,13,14,15,22,23,24,25, Sprockets & drive chain

Remove cotter pin, nut, washer retaining upper sprocket and circlip retaining lower sprocket. Pull sprockets and drive chain simultaneously. Remove shims.

### 26,27,28,29,30, Cap screw & washers

Remove cap screws (5). Three (3) cap screws are behind the lower sprocket location.

### Caliper retaining bolts and nuts

Unscrew two (2) nuts securing caliper to chaincase. Remove the two (2) bolts.

### 34, Drive axle oil seal

Pry out from chaincase.

Pull chaincase from drive axle and countershaft.

## INSPECTION

Visually inspect the chain for cracked, damaged or missing links. Check for worn or defective bearings sprockets and chain tensioner components.

## INSTALLATION

Reverse removal procedure and pay attention to the following: Replace oil seals, gaskets and O-rings.

### 19, Oil seal

Using an appropriate pusher, press the oil seal into chaincase hub. Oil seal must fit flush with the case hub edge.


### 14,23, Sprockets

Position the sprockets with the writing facing the chaincase cover.

### 12, Upper sprocket castellated nut

Torque to 53 N•m (39 lbf•ft).

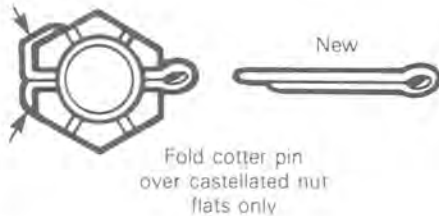
Install new cotter pin in the position shown.

 **CAUTION:** When removing a cotter pin always replace with a new one.

## Section 03 TRANSMISSION

### Sub-section 07 (CHAINCASE)

▼ **CAUTION:** Cotter pin will rub on chaincase housing if installed otherwise.



A002003008

#### 22, Snap ring

▼ **CAUTION:** It is of the utmost importance to install the snap ring otherwise damage to the chaincase components may occur.

#### Drive chain adjustment

#### 9, O-ring

Replace o-ring on tensioner adjustment screw. Fully tighten tensioner adjustment screw **by hand**, then back off only far enough for hair pin to engage in locking hole.

This initial adjustment should provide 3-5 mm (1/8-13/64'') free-play when measured at the outer circumference of the brake disk.

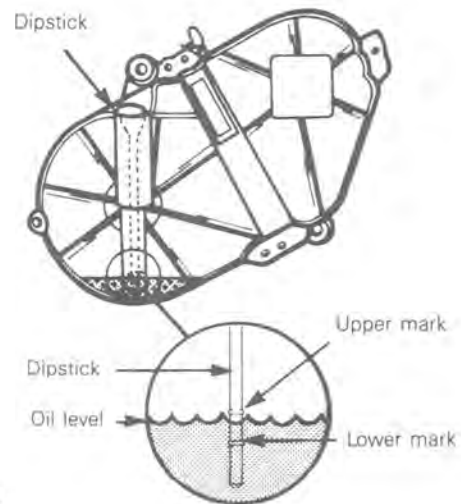
▼ **CAUTION:** Free-play must not exceed 5 mm (13/64''), re-adjust if necessary.

#### 35, Chaincase oil

Fill chaincase with Bombardier chaincase oil, P/N 413 8019 00, only.

Do not exceed upper mark on dipstick.

Chaincase contains about 256 ml (9 fl.oz) of oil.



A015003011

○ **NOTE:** Chaincase must be in it's proper position when checking oil level.

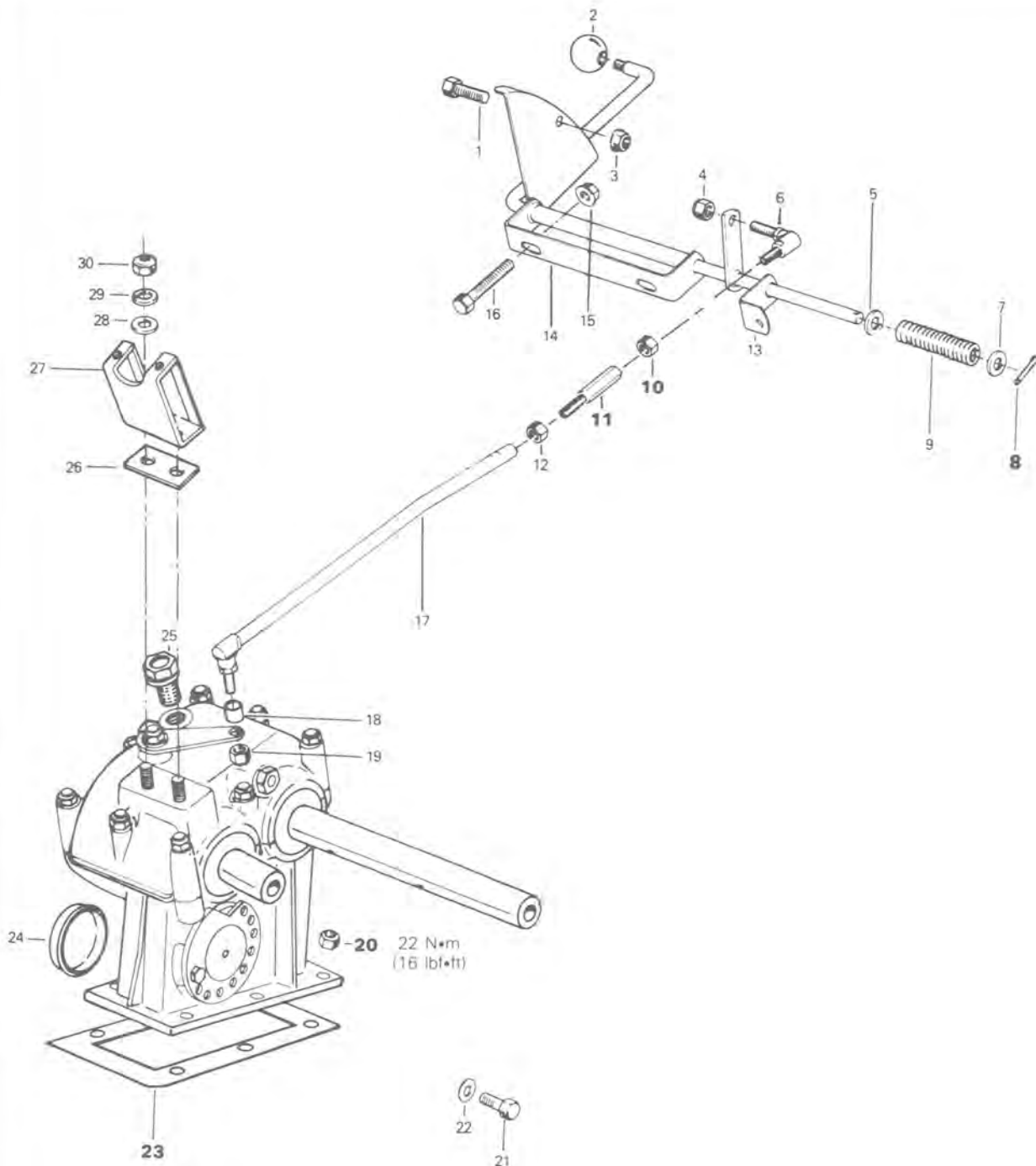




## GEARBOX

### 3 SPEEDS GEARBOX (SHIFTER MECHANISM)

Alpine



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## Section 03 TRANSMISSION

### Sub-section 08 (GEARBOX)

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- |                                   |                              |
|-----------------------------------|------------------------------|
| 1. Cap screw 1/4-20 x 3/4         | 16. Bolt 1/4-20 x 1 1/4      |
| 2. Handle                         | 17. Transmission rod         |
| 3. Elastic stop nut 1/4-20        | 18. Spacer                   |
| 4. Elastic stop nut 3/8 x 24      | 19. Elastic stop nut 3/8-24  |
| 5. Flat washer                    | 20. Elastic stop nut 5/16-24 |
| 6. Tie rod end (R.H.)             | 21. Drain plug               |
| 7. Flat washer                    | 22. Flat washer              |
| 8. Cotter pin                     | 23. Gasket                   |
| 9. Spring                         | 24. Rubber cover             |
| 10. Jam nut 3/8-24 (R.H. threads) | 25. Breather                 |
| 11. Turnbuckle                    | 26. Spacer                   |
| 12. Jam nut 3/8-24 (L.H. threads) | 27. Steering bracket         |
| 13. Bracket                       | 28. Flat washer              |
| 14. Transmission lever            | 29. Lock washer              |
| 15. Elastic stop nut 1/4 x 20     | 30. Nut M10                  |
- 

## INSTALLATION

At assembly, pay attention to the following.

### 23, Gasket

Ensure the gasket is properly positioned.

### 20, Gearbox retaining nuts

Torque to 22 N•m (16 lbf•ft).

### 8, Cotter pin

Reinstall a new cotter pin.

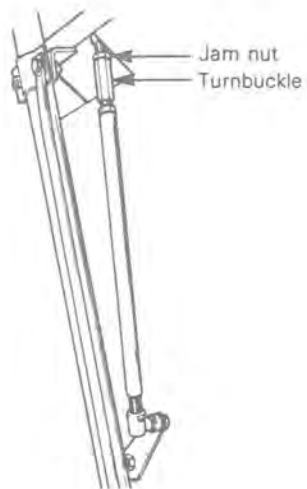
## ADJUSTMENT

### 10,11, Turnbuckle

With gearbox lever properly engaged in gear, adjust so that shifter lever fits correctly in corresponding gear groove.

To adjust, loosen jam nut and adjust turnbuckle as required.

Retighten jam nut.



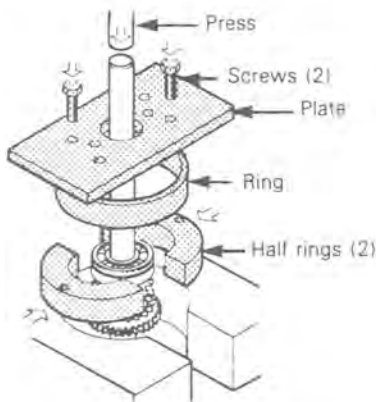
## DISASSEMBLY

### 32,48, Bearings

Use the following tools and proceed as follows:

Remove the bearings from the drive shaft using the following tools:

- 1 hydraulic press
- 2 ring halves (P/N 420 876 330)
- 1 ring (P/N 420 977 480)
- 1 plate (P/N 420 977 700)
- 2 hexagonal screws M8 x 25 (P/N 420 240 275)



A017003006

Remove the circlip, the distance ring, the shim, the shift sprocket (19 th), the needle bearings, the distance sleeve, the washer and the shift sprocket (23 th) from shaft.

## CLEANING

### 8,63, Transmission housing and cover

Clean mating surfaces of Loctite residue.

## INSPECTION

Visually inspect the components for damage or wear.

## ASSEMBLY

NOTE: Apply a small amount of motor oil (SAE 30) to the components before assembly.

### 38, Layshaft and components

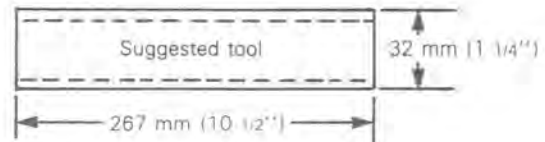
Reinstall the layshaft components on the layshaft.

Compensate the distance on the layshaft up to a clearance of 0.1 to 0.3 mm (.003 to .011'') and assemble.

### 45, Drive shaft and components

To reinstall the drive shaft components on the drive shaft, proceed as follows:

- Install the driven pulley shaft side bearing **32** on the shaft using the following suggested tool:
- cylindrical steel tube.



Material: cylindrical steel tube  
 32 mm (1 1/4'') O.D.  
 26.8 mm (1.055'') I.D.

A017003007

- Install the circlip over the bearing.
- Install the remaining components.
- Install the other shaft end bearing with shim(s) as required using the above mentioned tool.
- Available shims:

25.5/34/0.2 (P/N 420 944 470)  
 25.5/34/0.3 (P/N 420 944 471)  
 25.5/34/0.5 (P/N 420 944 472)

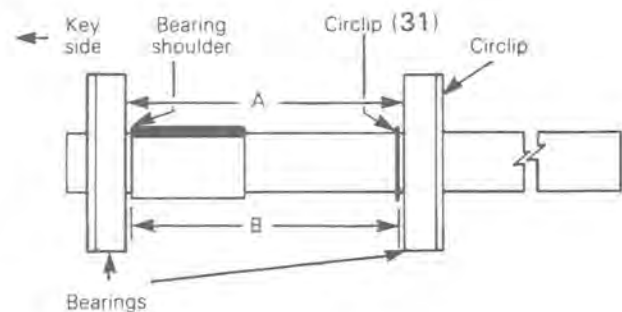
## Drive shaft clearance

Place ball bearings with circlips mounted in the transmission housing and measure (A) distance between the bearings.

Measure (B) distance on drive shaft between the circlip **31** and the shaft bearing shoulder (key side).

The difference between measures A and B should be 0.1 ± 0.3 mm (0.003 ± .011'').

Refer to the following illustration.



$$A-B = 0.1 \pm 0.3 \text{ mm (0.003} \pm .011'')$$

A017003008

## Section 03 TRANSMISSION

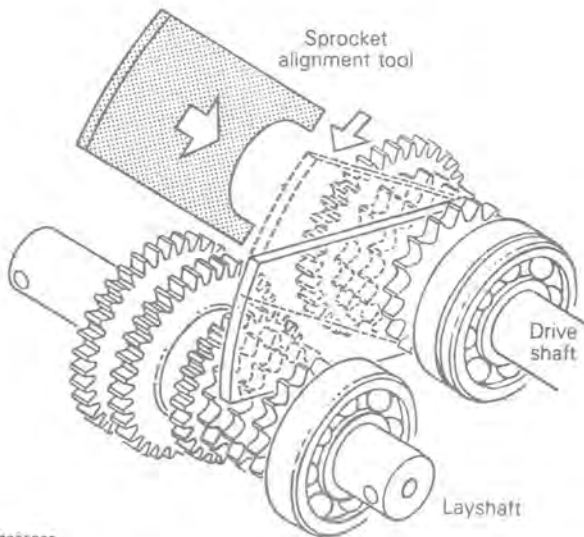
### Sub-section 08 (GEARBOX)

To obtain the proper drive shaft clearance it may be necessary to add or remove shim(s) between the key side bearing and the shaft bearing shoulder.

#### 28,38, Sprocket alignment

Verify sprocket alignment using the alignment tool (P/N 420 476 010). Proceed as follows:

- Set alignment tool on shift sprocket 19 th (28) and turn it into the corresponding layshaft and tensioner sprockets as illustrated.



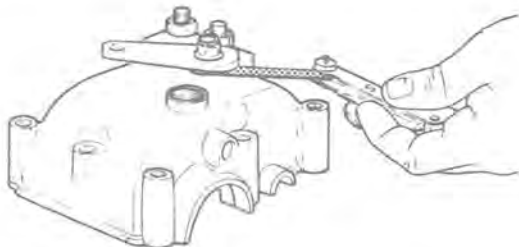
A017003009

If necessary readjust clearance by transferring shim(s) on drive shaft to the opposite side.

▼ **CAUTION:** Ensure the drive shaft and layshaft gears align with the tensioner gear and that all clearances are respected.

#### 14, Gear change lever shims

Lubricate gear change shaft and compensate clearance with shims (required end play 0.3 mm (.011'')). Set 1 shim 0.3 mm on inner side and as many as required on outer side under gear change lever, leaving 0.3 mm (.011'') play.

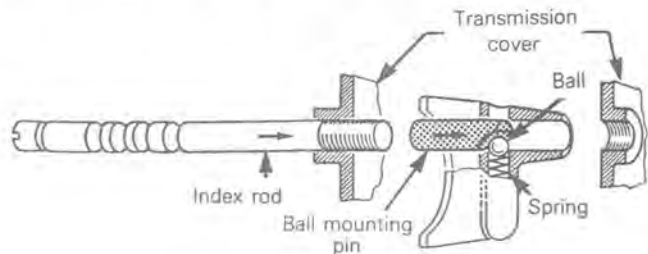


A017003010

▼ **CAUTION:** The finger of the gear change shaft must not block the gear change fork.

#### 17,18,20, Gear change fork & components

Mount gear change fork and index rod with index spring and ball. To do this, press ball and index spring into the bore of gear change using a ball mounting pin P/N 420 476 020 then the ball mounting pin is pushed through with the index rod and the index rod is screwed in.



A017003011

#### 6,7, Index rod lock nut

Apply Loctite 242 to nut and torque to 23 N•m (17 lbf•ft).

#### 37, Chain

○ **NOTE:** If a master link is required, install it in order to have the locking clip facing the driven pulley side with its closed end towards the rotary motion direction when in "FORWARD" position.

#### 8,63, Housing and cover

Set the shift sprocket 23 teeth (46) to reverse position.

Apply Loctite 515 (P/N 413 7027 00) to the transmission housing mating surface and reinstall the transmission cover. Torque the retaining nuts in a criss-cross sequence to: 27 N•m (20 lbf•ft).

▼ **CAUTION:** Before cover installation, ensure that the shifter arm and the 23 teeth 46 shift sprocket are in REVERSE position.

## INSTALLATION

### Gearbox assembly

Position gasket on frame studs and place lower sprocket in drive chain. Secure gearbox to frame.

- Set the shifter lever in REVERSE.
- Install the shifter rod to the shifter lever.

### Drive axles & seals

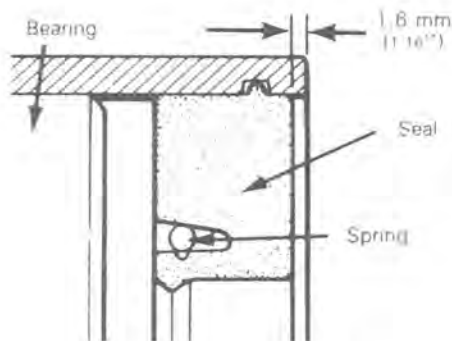
▼ **CAUTION:** Check condition of drive axle seals; replace if necessary.

From the left side of vehicle, place the drive axle within the track. Push the end bearing side of axle through the orifice in left side of frame, then push the splined end of axle into gearbox lower sprocket. Install opposite drive axle.

Press each end bearing housing into frame and over axle bearing. Secure housings to frame.

Install seals.

○ **NOTE:** A gap of approximately 1.6 mm (1/16") should exist between the end of bearing housing and seal.



A017003012

Install rear axle and bogie wheel sets to their original position. Then elastic bands. Refer to section 05-01.

### 68, Chaincase oil

Fill gear box with 450 ml (16 Imp. ounces) of Bombardier chaincase oil.

## Adjustments

### 3, Gear change lever

Set the gear change lever to NEUTRAL position, turn driven pulley clockwise and adjust shifter arm position using the adjuster screw located at the R.H. transmission cover portion. This will ensure the transmission is perfectly adjusted.

### Chain tension

Rotate the tensioner axle 57 to obtain 6 mm (1/4") maximum drive chain deflection.

### Pulley alignment

Refer to section 03-05.

### Track tension & alignment

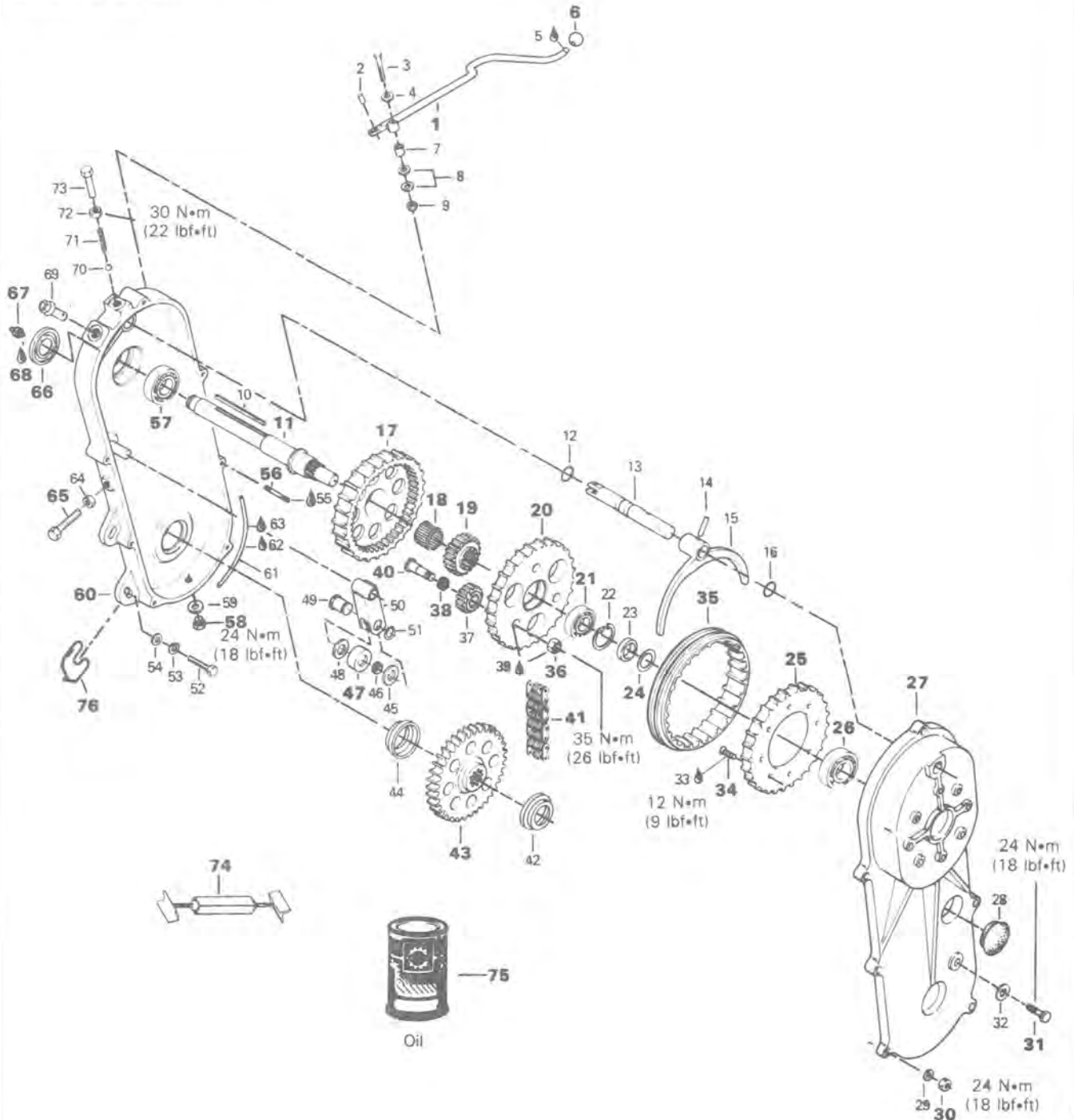
Refer to section 05-08.

## Section 03 TRANSMISSION

### Sub-section 08 (GEARBOX)

## 2 SPEEDS GEARBOX

Skandic 377R



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## Section 03 TRANSMISSION

### Sub-section 08 (GEARBOX)

---

- |  |                                    |
|--|------------------------------------|
| 1. Transmission lever                    | 39. Loctite 242                    |
| 2. Pin                                   | 40. Planet wheel shaft             |
| 3. Cap screw M6 x 1 x 40                 | 41. Chain 92 links                 |
| 4. Washer 6.2 x 20 x 2                   | 42. Flanged ring                   |
| 5. Loctite 242 (blue)                    | 43. Sprocket 40 teeth              |
| 6. Handle                                | 44. Flanged ring                   |
| 7. Spacer                                | 45. Spacer                         |
| 8. Washer 6.2 x 20 x 2                   | 46. Needle bearing                 |
| 9. Flanged elastic stop nut M6 x 1       | 47. Tensioner roller               |
| 10. Key                                  | 48. Spacer                         |
| 11. Countershaft                         | 49. Tensioner shaft                |
| 12. O-ring                               | 50. Tensioner                      |
| 13. Fork shaft                           | 51. Snap ring                      |
| 14. Pin                                  | 52. Cap screw M8 x 1.25 x 25       |
| 15. Fork                                 | 53. Lock washer 8 mm               |
| 16. O-ring                               | 54. Washer 8.4 x 17 x 1.6          |
| 17. Planetary ring gear                  | 55. Loctite 242                    |
| 18. Needle bearing                       | 56. Stud                           |
| 19. Sun gear                             | 57. Ball bearing                   |
| 20. Planet carrier                       | 58. Drain plug M8 x 1.25 x 12      |
| 21. Ball bearing                         | 59. Brass washer                   |
| 22. Snap ring                            | 60. Transmission case              |
| 23. Spacer                               | 61. O-ring                         |
| 24. Shim                                 | 62. Loctite 515                    |
| 25. Blocking wheel (reverse driving hub) | 63. Locquic primer-N-              |
| 26. Ball bearing                         | 64. Nut M10 x 1.5                  |
| 27. Transmission cover                   | 65. Chain tension adjustment screw |
| 28. Rubber cap                           | 66. Seal                           |
| 29. Lock washer 8 mm                     | 67. Grease fitting                 |
| 30. Nut M8 x 1.25                        | 68. Loctite 242                    |
| 31. Cap screw M8 x 1.25 x 12             | 69. Breather plug                  |
| 32. Brass washer                         | 70. Ball #8                        |
| 33. Loctite 242                          | 71. Spring                         |
| 34. Flat head screw 5/8"                 | 72. Lock nut M12 x 1.75            |
| 35. Planetary connecting sleeve          | 73. Screw M12 x 1.75 x 25          |
| 36. Nut M10 x 1.5                        | 74. Drive axle holder              |
| 37. Planet wheel                         | 75. Chaincase oil 450 ml (16 oz)   |
| 38. Needle bearing                       | 76. Shim                           |

---

## REMOVAL

Gear box and driven pulley can be removed from vehicle as an assembly. Proceed as follows.

### Pulley guard & drive belt

Remove from vehicle.

### 58, Drain plug

Remove and drain oil from gear box (450 ml/16 oz).

### 1, Transmission lever

Disconnect from fork shaft.

### Countershaft support

Disconnect from support clamp by removing hair pin and clevis pin.

### 65, Chain tension

Remove chain tension and remove transmission cover

### 19,20,35, Carrier ass'y, connecting sleeve & sun gear

Pull out of countershaft.

### 17,41,43, Ring gear, chain & sprocket

Pull out of transmission case.

### Drive axle oil seal

Push seal towards axle sprocket.

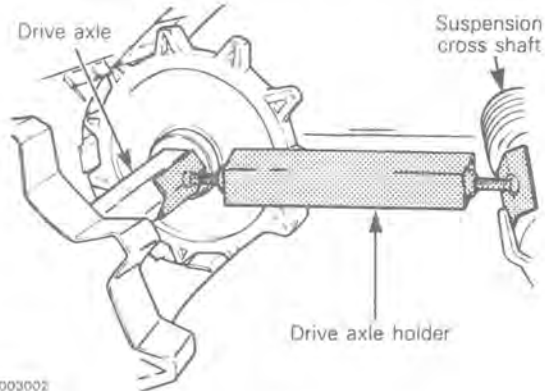


## Section 03 TRANSMISSION

### Sub-section 08 (GEARBOX)

#### 74, Drive axle holder

Hold drive axle with tool P/N 529 0051 00.



A004003002

#### Transmission case & driven pulley ass'y

Pull out of vehicle.

### DISASSEMBLY

#### Driven pulley

Remove snap ring, support assembly, driven pulley and key from countershaft.

#### 66, Seal

Remove seal from transmission case.

#### 11, Countershaft

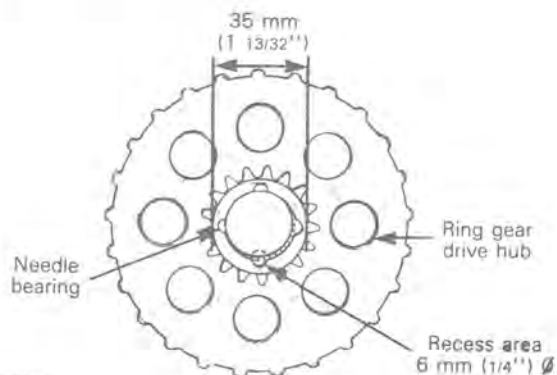
Press countershaft out of transmission case.

#### 57, Ball bearing (case)

Press countershaft out of bearing.

#### 18, Needle bearing (ring gear)

Use a suitable pusher and press bearing out of ring gear through bearing access recess.



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03-08-10

#### 36, Planet wheels and components

Loctite mounted shaft nut may require heat for disassembly. For easier disassembly heat up to 150°C (300°F).

To remove bearing from planet wheels, use a press and a suitable pusher (15.96 mm (5/8'') Ø max.).

#### 21, Planet carrier bearing

Remove snap ring and use a suitable pusher to press bearing out of carrier.

#### 25, Blocking wheel (reverse driving hub)

Loctite mounted screws may require heat for disassembly. For easier disassembly heat up to 150°C (300°F).

### CLEANING

#### 27,60, Transmission cover & case

Remove Loctite residue from cover and case mating surfaces.

### INSPECTION

Visually inspect the components for excessive wear and damage.

### ASSEMBLY

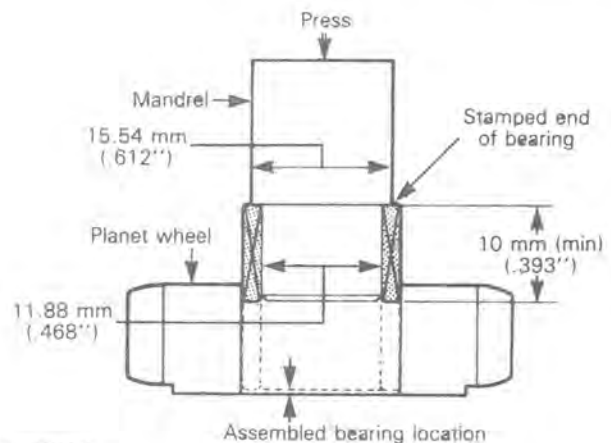
#### 25,34, Blocking wheel (reverse driving hub)

Apply Loctite 242 on screw threads, and torque to 12 N•m (9 lbf•ft).

#### 38,40, Planet wheel & needle bearing

The bearing is press fitted into the planet wheel and must be pushed down only from its stamped end.

**CAUTION:** Never pound the bearing into its housing with a hammer or other impact tool, even in conjunction with the proper assembly mandrel.



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○ **NOTE:** Assembled bearing must not project out of planet wheel.

### 20,36, Carrier assembly

Apply Loctite 242 in planet wheel shaft bores. With planet wheel installed on shaft, press shaft into carrier bore.

Apply Loctite 242 on shaft threads.

Install and torque nut to 35 N•m (26 lbf•ft).

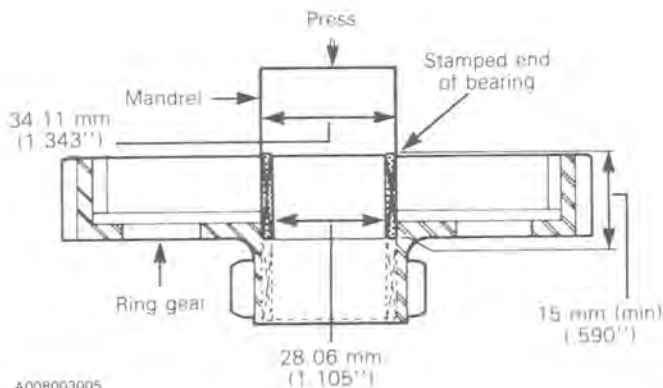
### 21, Planet carrier bearing

With a suitable pusher, press bearing into carrier bore and lock in place with snap ring.

### 18, Ring gear needle bearing

The bearing is press fitted into the ring gear and must be pushed down only from its stamped end.

▼ **CAUTION:** Never pound the bearing into its housing with a hammer or other impact tool, even in conjunction with the proper assembly mandrel.



### 26, Cover bearing

With a suitable pusher, press bearing into cover.

### 57, Case bearing

With a suitable pusher, press bearing on countershaft.

### 11, Countershaft

Press countershaft with the assembled ball bearing into the transmission case bore.

### 56, Studs

Assemble studs in transmission case with Loctite 242 and torque to 5 N•m (44 lbf•in).

### 6, Transmission lever handle

Put Loctite 242 on handle threads.

### 47, Tensioner ass'y

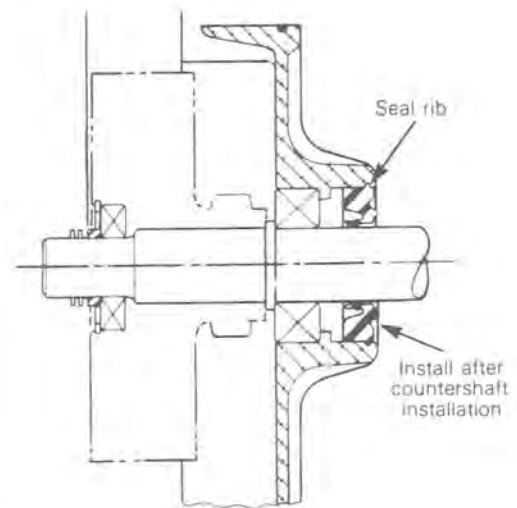
Ensure that roller turns freely.

### 67, Grease fitting

At grease fitting assembly, apply Loctite 242 on grease fitting threads.

### 66, Seal (countershaft)

Install seal in transmission case so that the seal rib is seated in the bore groove.



### Driven pulley assembly

Coat countershaft with antiseize compound and assemble driven pulley and support.

## INSTALLATION

Reverse removal procedure, paying particular attention to the following.

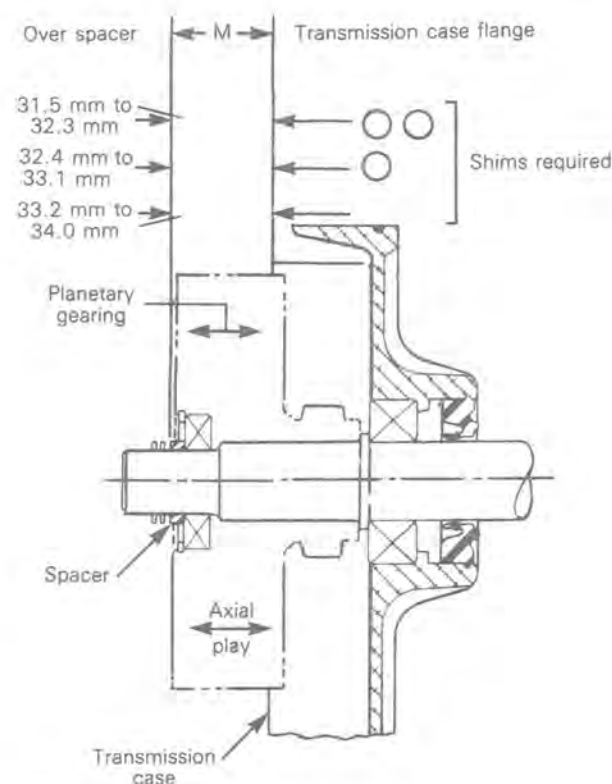
### 24, Shim (axial play)

The planetary gearing axial free-play must be controlled with shim. To determine shim thickness, measure distance "M" from transmission case flange to spacer. In accordance with the following table, select the proper amount of shims.

## Section 03 TRANSMISSION

### Sub-section 08 (GEARBOX)

M		REQUIRED SHIMS
FROM	TO	
31.5 mm (1.240")	32.3 mm (1.271")	2
32.4 mm (1.275")	33.1 mm (1.303")	1
33.2 mm (1.304")	34.0 mm (1.339")	0



A008003013

NOTE: Planet carrier bearing must be assembled in carrier and locked with snap ring. Spacer must be installed on countershaft.

#### 27,60, Transmission cover & case

To properly seal the transmission, proceed as follows:

- Apply "Locquic Primer N" on both case and cover flanges and in the cover o-ring groove. Allow 5 minutes to dry.
- Put Loctite 515 in the o-ring cover groove, install o-ring and install cover to case.

— Install cover lock washer and nuts and torque to 24 N•m (18 lbf•ft).

NOTE: Cover must be installed within ten minutes of LOCTITE application.

NOTE: Allow a drying period of two (2) hours before refilling with oil.

#### 75, Oil

Refill with 450 ml (16 oz) of fresh chaincase oil.

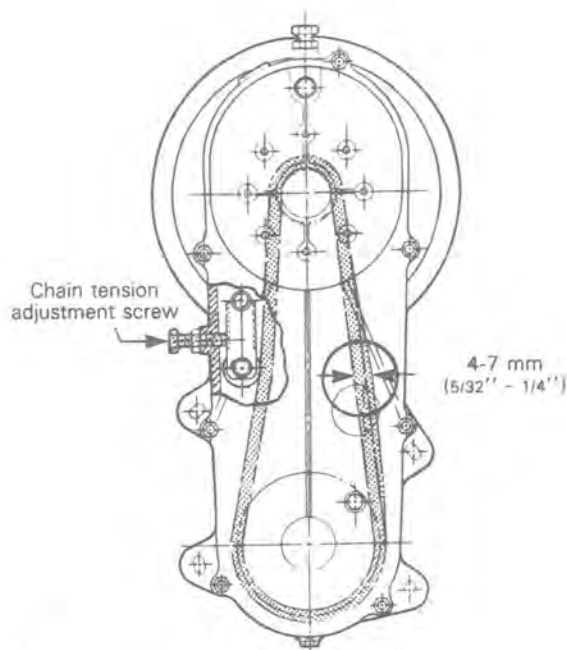
#### 31, Oil level plug

Torque to 24 N•m (18 lbf•ft).

### ADJUSTMENT

#### 65, Chain tension

Turn adjustment screw until 4-7 mm (5/32" - 1/4") chain deflection is obtained. Torque lock nut to 30 N•m (22 lbf•ft).



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#### Pulley distance

Refer to section 03-05.

## DRIVE CHAIN

### GENERAL

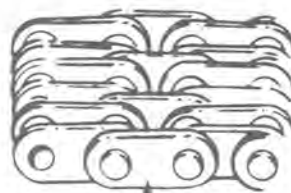
There are four (4) types of the Bombardier drive chains:  
For proper use refer to Technical Data.



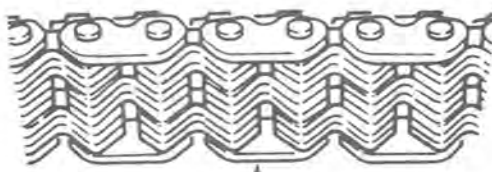
1/2" SINGLE



3/8" DOUBLE



3/8" TRIPLE



3/8" Silent chain

A000003026

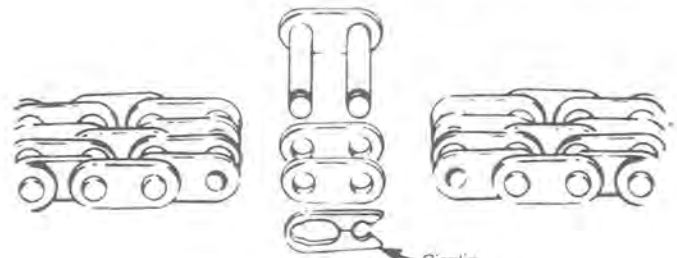
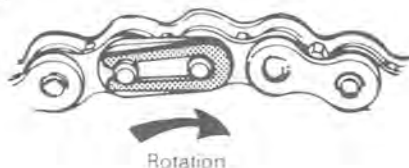
NOTE: No work (separation, lengthening) can be done on the silent chain type.

There are two (2) variations of chains: detachable and endless.

### CHAIN ATTACHMENT

When joining chain ends, the open end of the circlip must be on opposite side of chain rotation. The circlip should also be facing the outer side of chaincase.

(TYPICAL)



CONNECTING LINK 3/8" DOUBLE



1/2" SINGLE

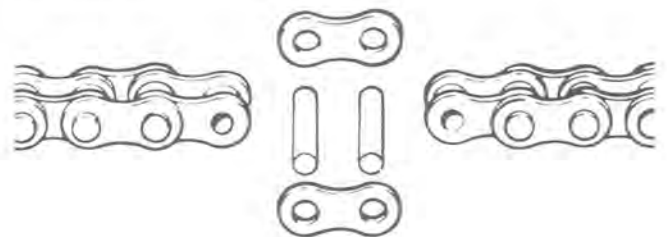


3/8" TRIPLE

A000003021

### CHAIN SEPARATION

When separating an endless chain, always use a chain bearing pin extractor. Also, make sure to remove one complete link.



1/2" SINGLE LINK



3/8" TRIPLE LINK



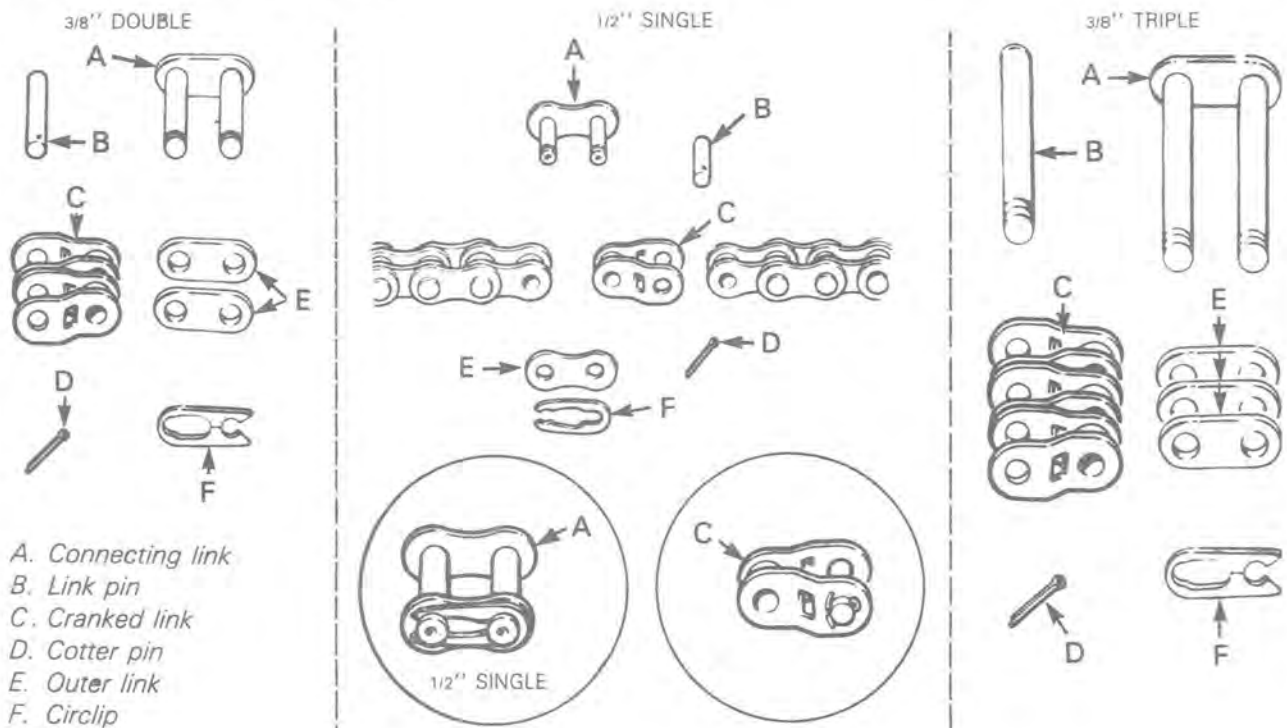
3/8" DOUBLE LINK

A000003022

## Section 03 TRANSMISSION

### Sub-section 09 (DRIVE CHAIN)

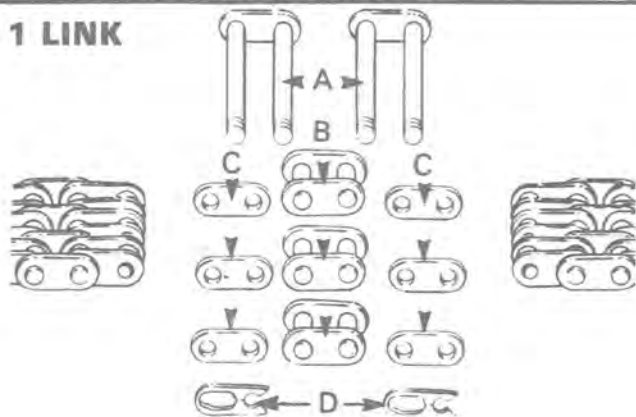
#### LENGTHENING 1/2 LINK



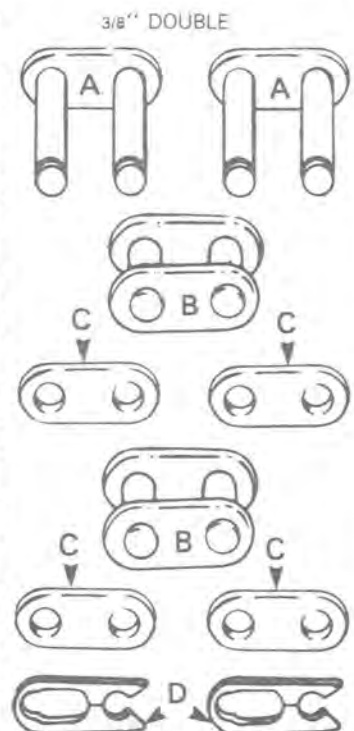
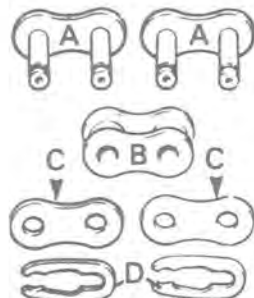
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#### LENGTHENING 1 LINK

3/8" TRIPLE



1/2" SINGLE

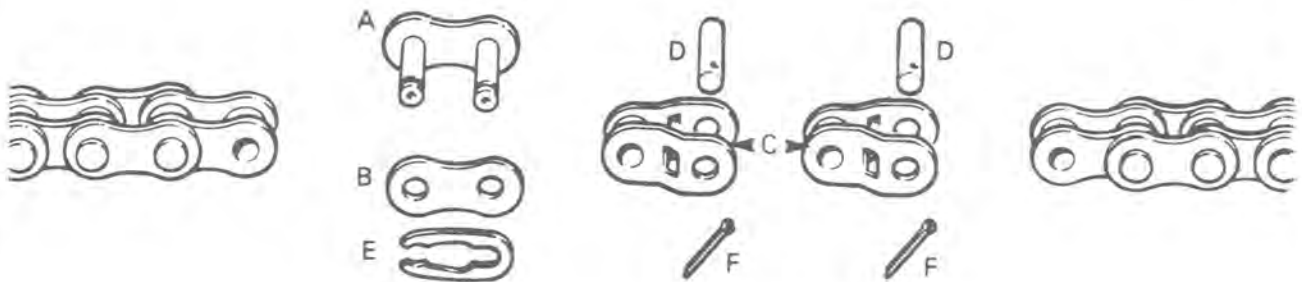


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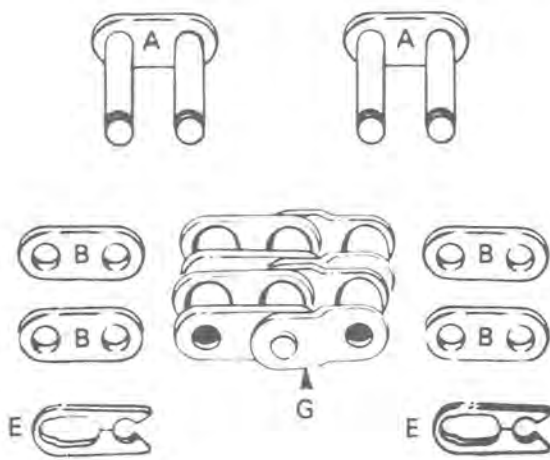
**Section 03 TRANSMISSION**  
**Sub-section 09 (DRIVE CHAIN)**

**LENGTHENING 1 1/2 LINK**

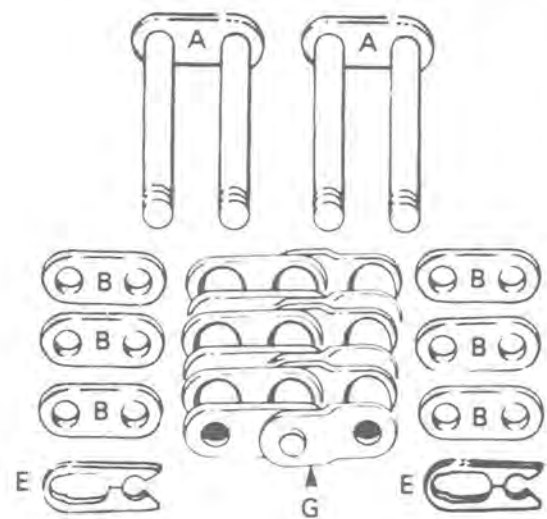
1/2" SINGLE



3/8" DOUBLE



3/8" TRIPLE



- A. Connecting link
- B. Outer link
- C. Cranked link
- D. Link pin
- E. Circlip
- F. Cotter pin
- G. Double cranked link

AD00003025



## ELECTRIC CHARTS

MODEL	CHART PAGE	HEADLAMP (watt)	TAILLIGHT (watt)	ELECTRICAL SYSTEM OUTPUT (watt)
Elan	04-01-2	60/60	5/21	75/23
Citation LSE	04-01-3			160
Tundra/LT, Citation LS	04-01-4			
Skandic 377	04-01-5			
Skandic 377R	04-01-6			
Safari 377,447	04-01-7			
Safari 377E	04-01-8			
Safari Grand Luxe LC	04-01-9			
Formula SP	04-01-10	60/55		
Formula MX	04-01-10	60/55		
Formula Plus	04-01-10	60/60		
Alpine	04-01-11	60/55		
		60/60		

### CHART CODES

#### Wiring colour code

First colour of a wire is the main colour, second colour is the stripe.

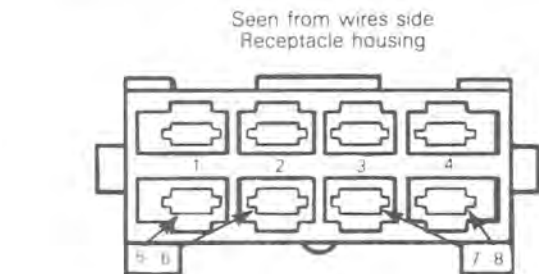
Example: YL/BK is a yellow wire with a black stripe.

ABREVIATION OF COLOUR USED IN THIS SECTION:

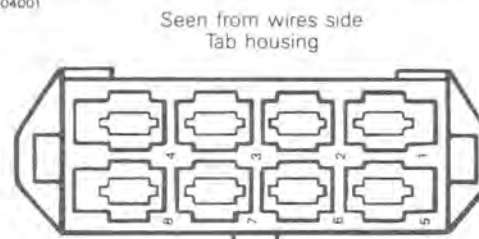
COLOUR CODES			
BK — BLACK	GN — GREEN		
WH — WHITE	GY — GREY		
RD — RED	VI — VIOLET		
BL — BLUE	OR — ORANGE		
YL — YELLOW	BR — BROWN		

#### Connector position code

Numbers are printed at the back of the connector housings. They correspond to the numbers on the connectors of the electrical chart.



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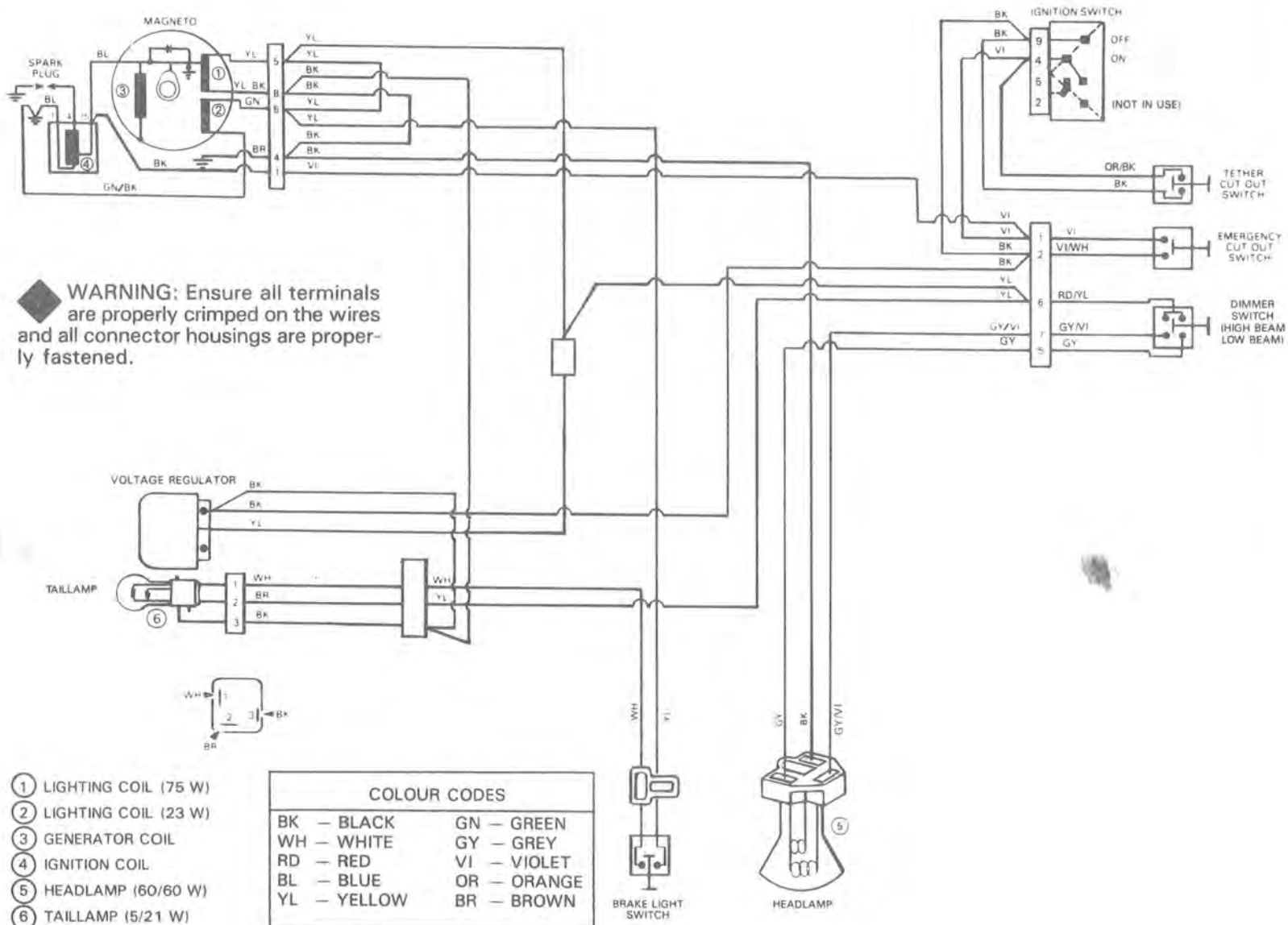
A000004002

**NOTE:** Normally 18 GA wires are used. Sometimes 16 GA is used and it is noted with an \* beside colour codes of chart.

## Elan

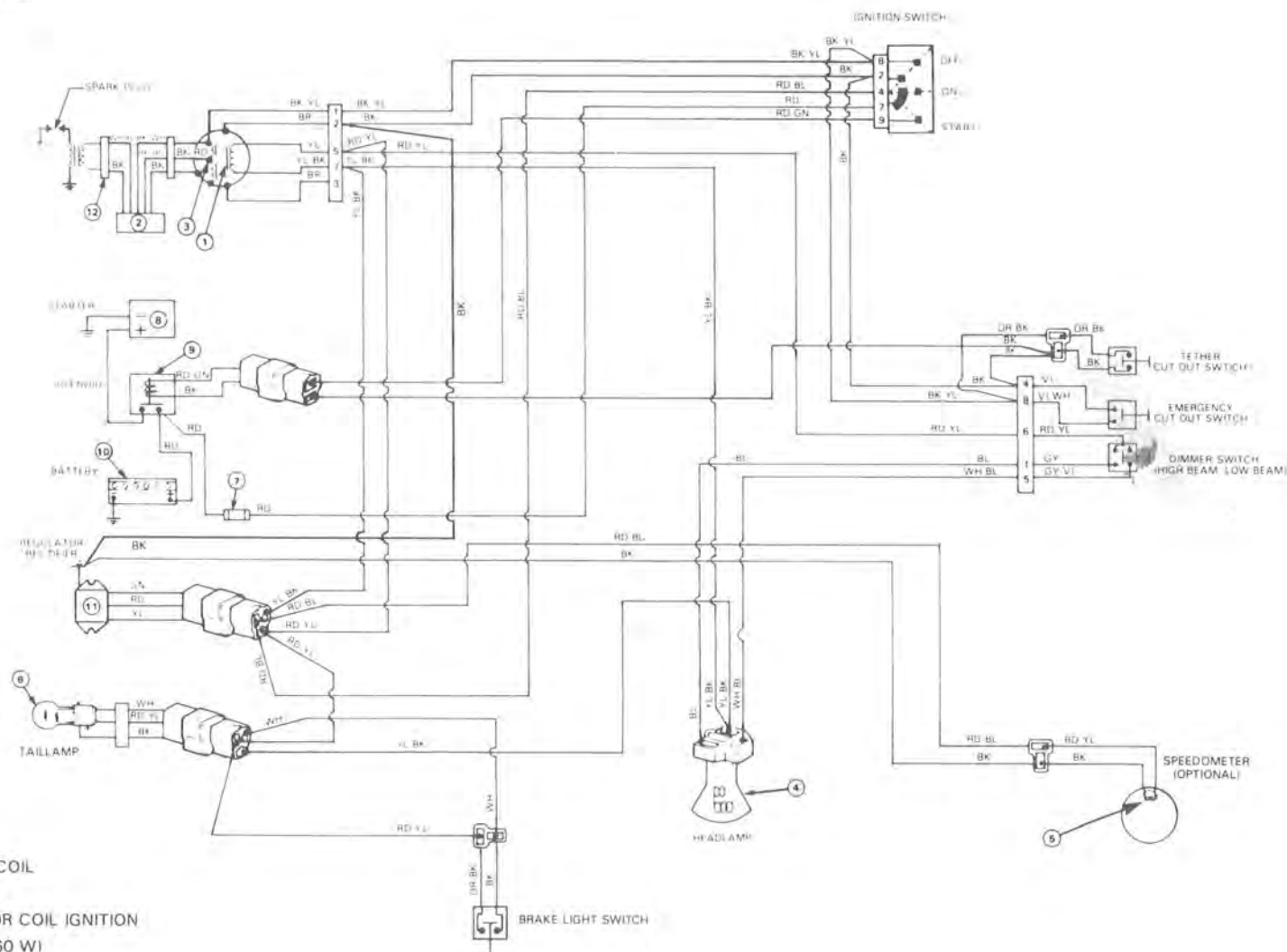
# Section 04 ELECTRICAL

## Sub-section 01 (ELECTRIC CHARTS)





# Citation LSE



- ① LIGHTING COIL
- ② AMPLIFIER
- ③ GENERATOR COIL IGNITION
- ④ BULB (60/60 W)
- ⑤ BULB (5 W)
- ⑥ REAR BULB (5-21 W)
- ⑦ FUSE (30 A)
- ⑧ STARTER
- ⑨ SOLENOID
- ⑩ BATTERY (24 A)
- ⑪ REGULATOR RECTIFIER
- ⑫ IGNITION COIL

◆ **WARNING:** Ensure all terminals are properly crimped on the wires and all connector housings are properly fastened.

## COLOUR CODES

BK - BLACK	GN - GREEN
WH - WHITE	GY - GREY
RD - RED	VI - VIOLET
BL - BLUE	OR - ORANGE
YL - YELLOW	BR - BROWN

The diagram illustrates the electrical system for a motorcycle, showing the following components and their connections:

- Spark Plug:** Connected to the ignition coil.
- Ignition Switch:** Controls the ignition system. It has positions for OFF, ON, and (NOT IN USE).
- Voltage Regulator:** Regulates the voltage output of the generator.
- Tail Lamp:** Provides rear lighting.
- Brake Light Switch:** Activates the tail lamp when the brake is applied.
- Head Lamp:** Provides front lighting.
- Speedometer (Optional):** Measures the vehicle's speed.
- Other Components:** Tether Cut-Out Switch, Emergency Cut-Out Switch, and Dimmer Switch (High Beam/Low Beam).

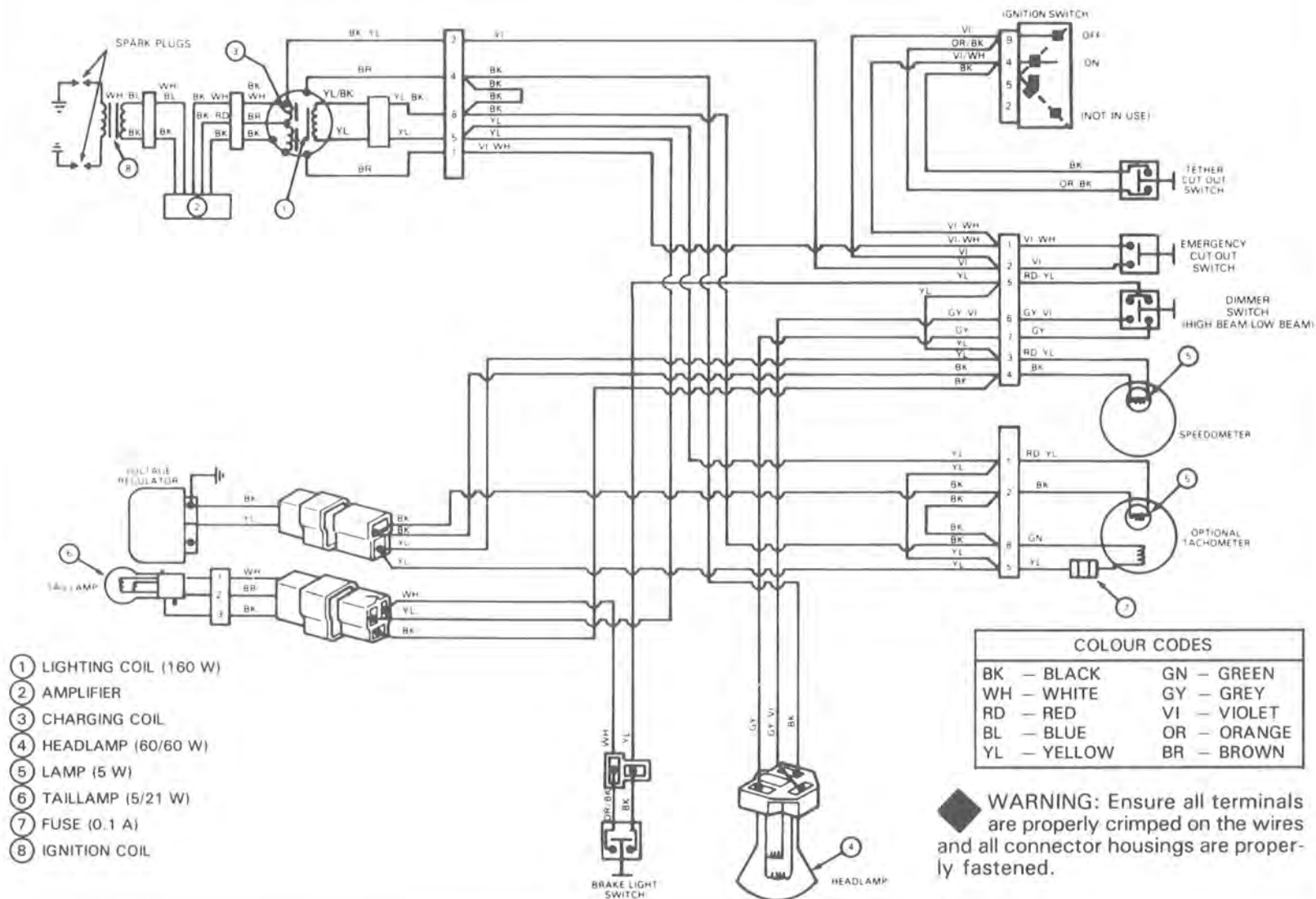
The diagram uses color-coded wires to identify the connections between components. The Ignition Switch is shown with positions for OFF, ON, and (NOT IN USE). The Tether Cut-Out Switch, Emergency Cut-Out Switch, and Dimmer Switch are also shown with their respective positions.

- 1 LIGHTING COIL
- 2 AMPLIFIER
- 3 GENERATOR COIL
- 4 HEADLAMP (60/60 W)
- 5 LIGHT (5 W)
- 6 REAR LAMP (5-21 W)
- 7 VOLTAGE REGULATOR
- 8 IGNITION COIL

**WARNING:** Ensure all terminals are properly crimped on the wires and all connector housings are properly fastened.

COLOUR CODES	
BK — BLACK	GN — GREEN
WH — WHITE	GY — GREY
RD — RED	VI — VIOLET
BL — BLUE	OR — ORANGE
YL — YELLOW	BR — BROWN

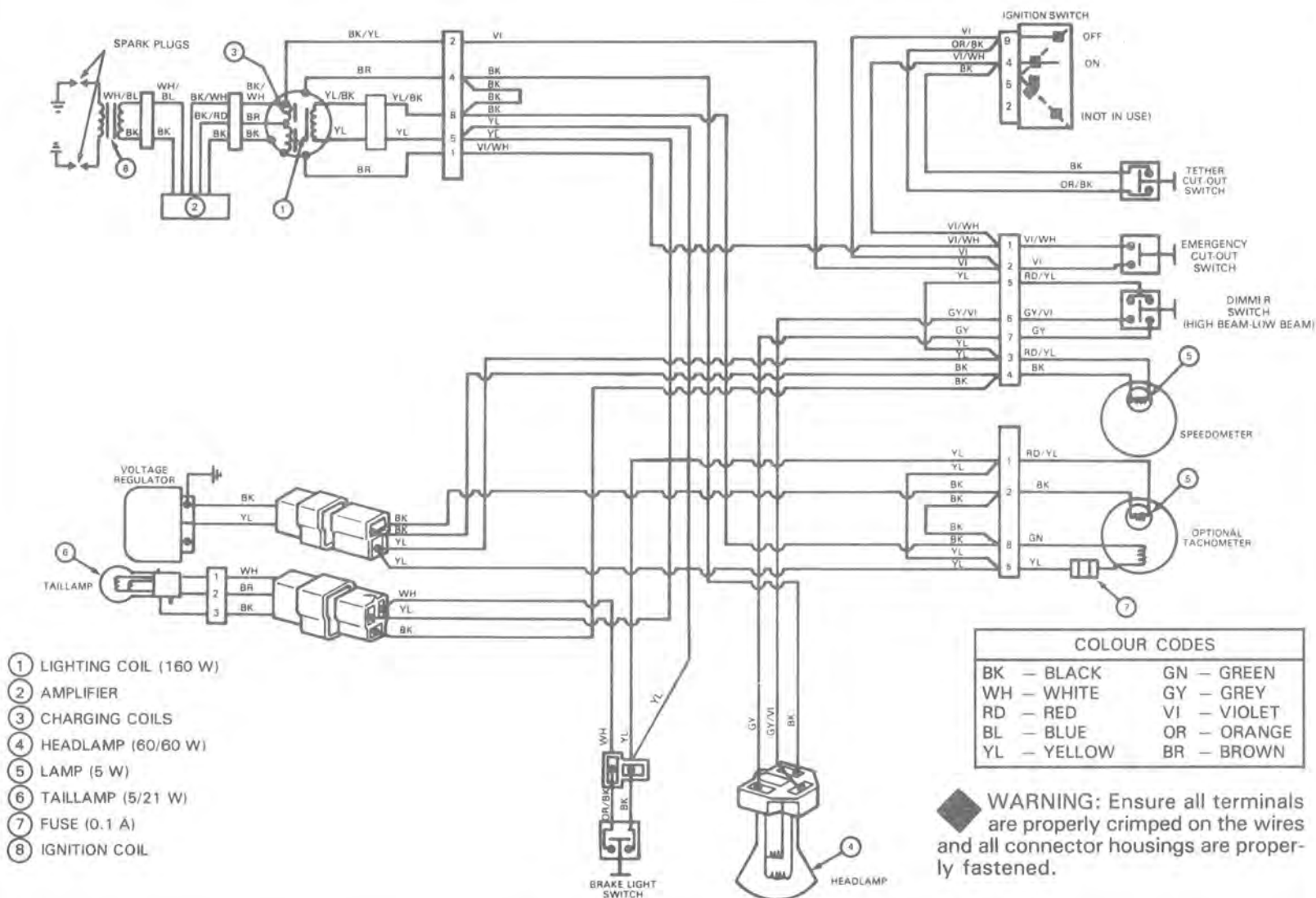
# Skandic 377



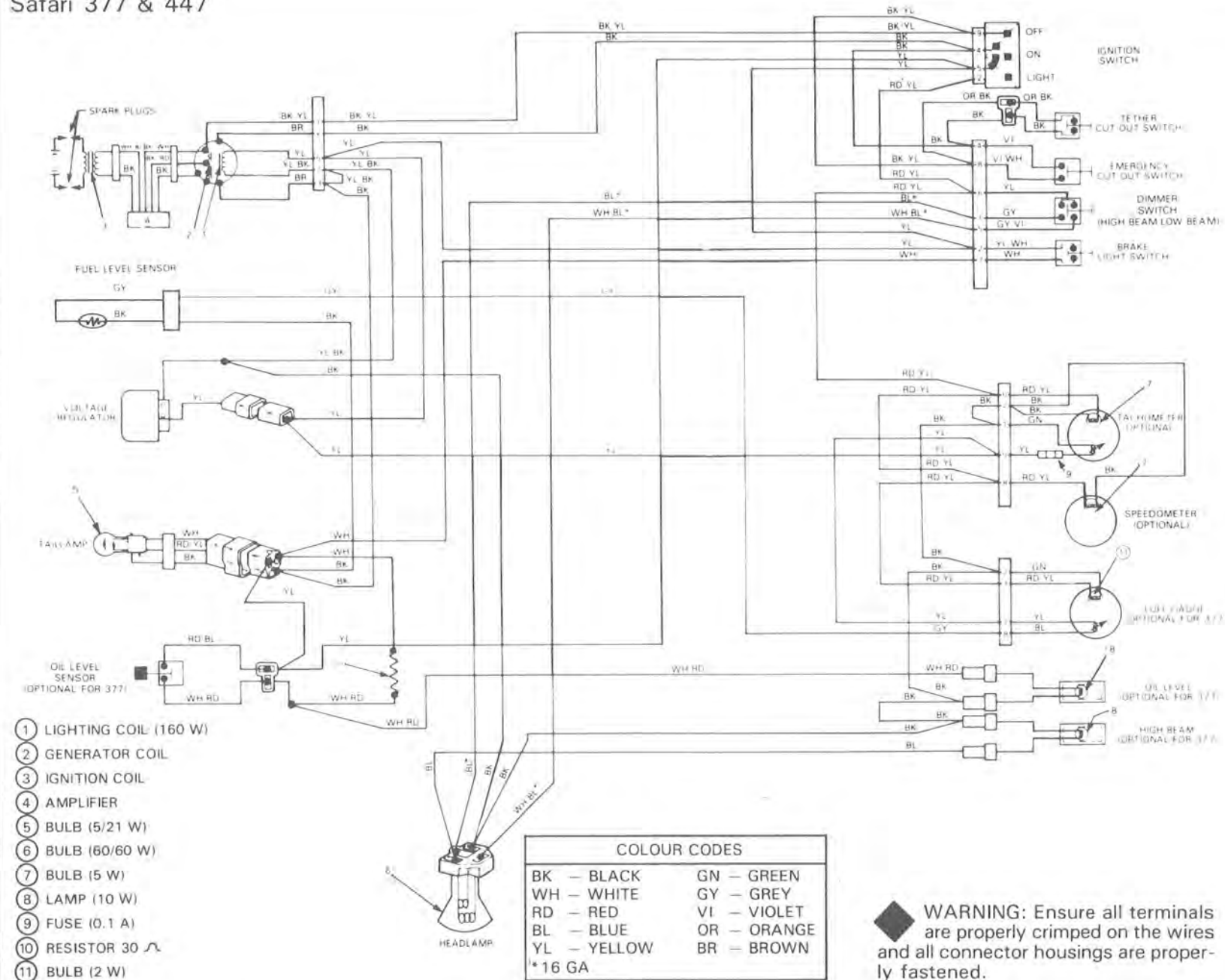
## Skandic 377/R

# Section 04 ELECTRICAL

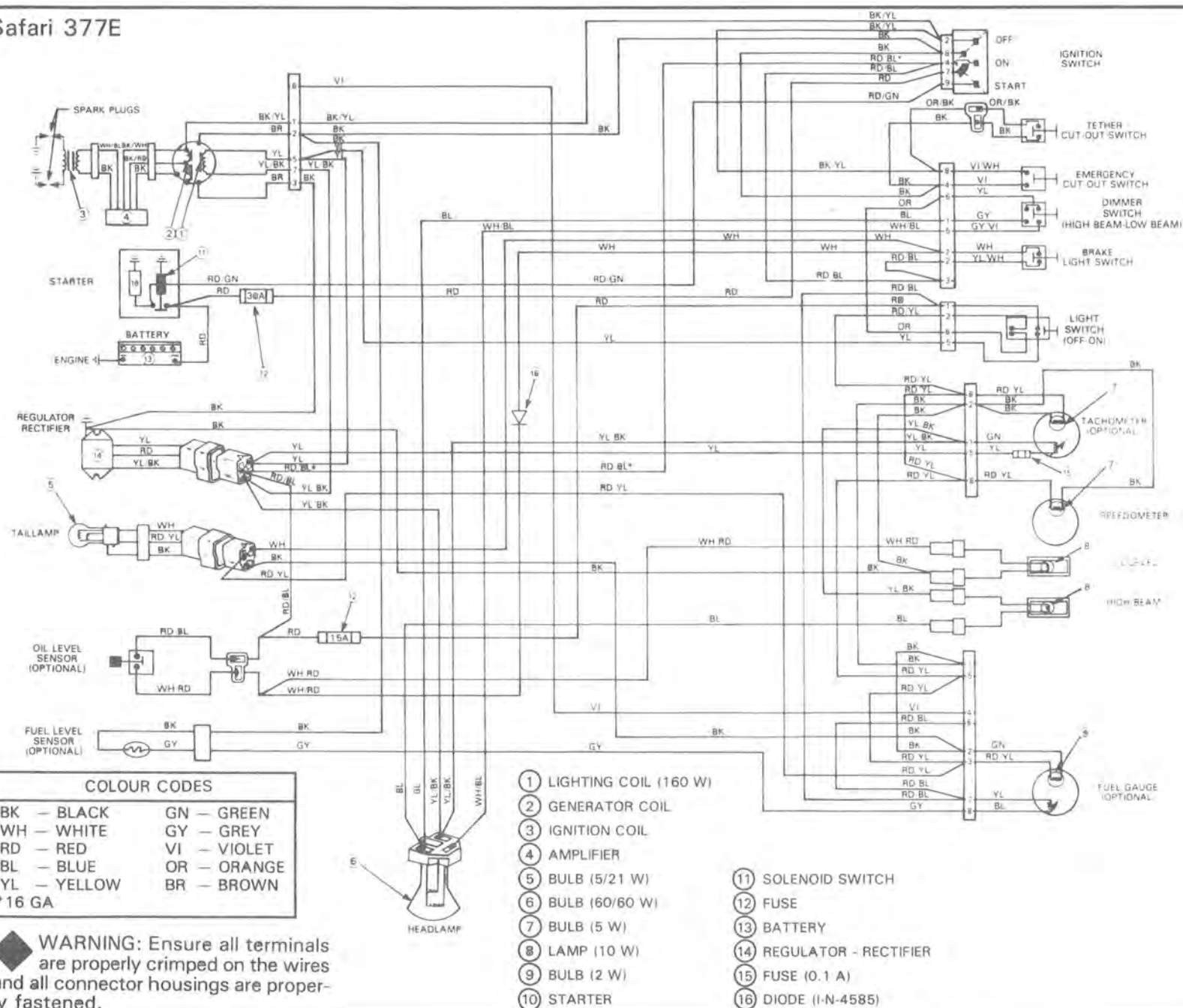
## Sub-section 01 (ELECTRIC CHARTS)



# Safari 377 & 447



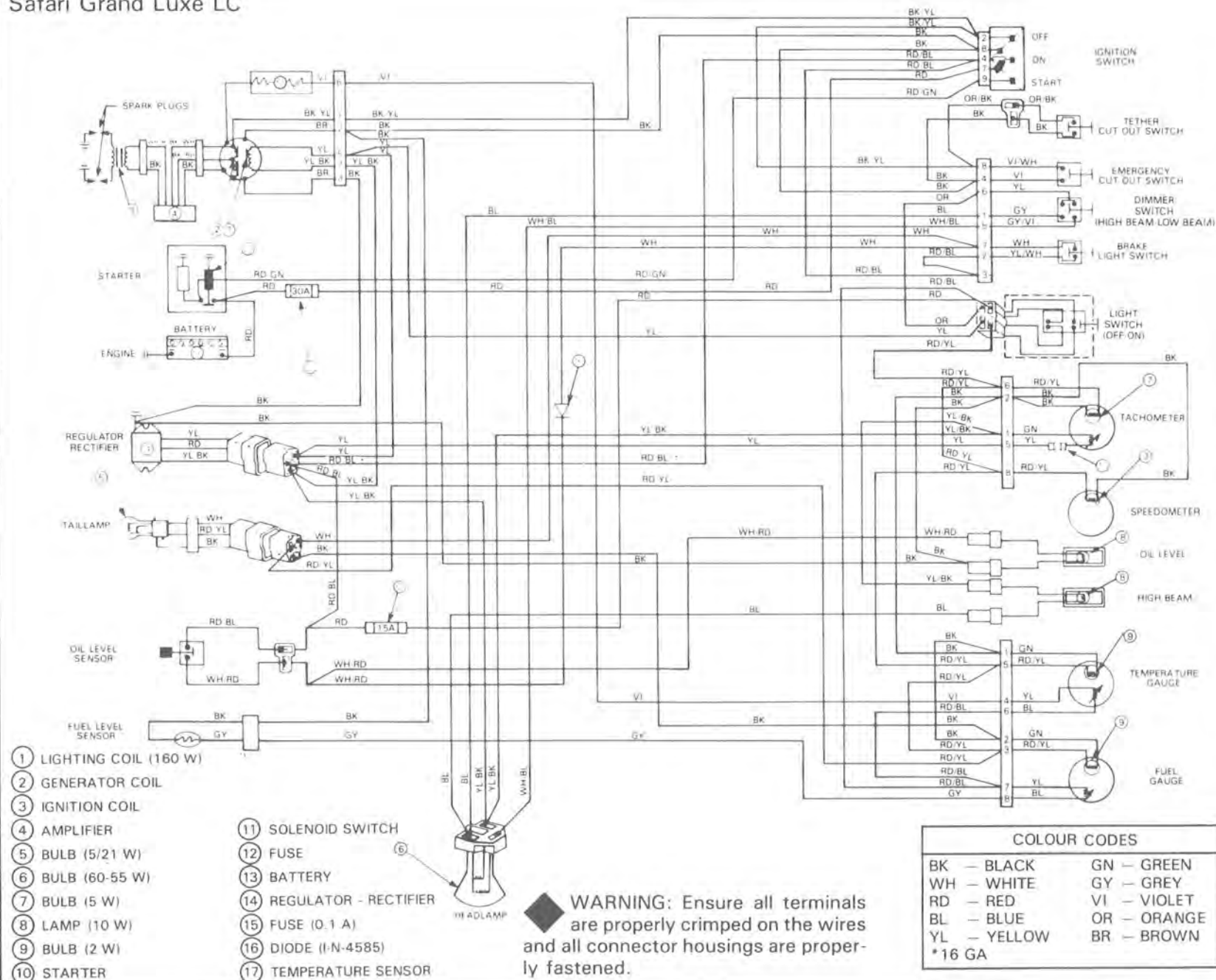
## Safari 377E



## Section 04 ELECTRICAL

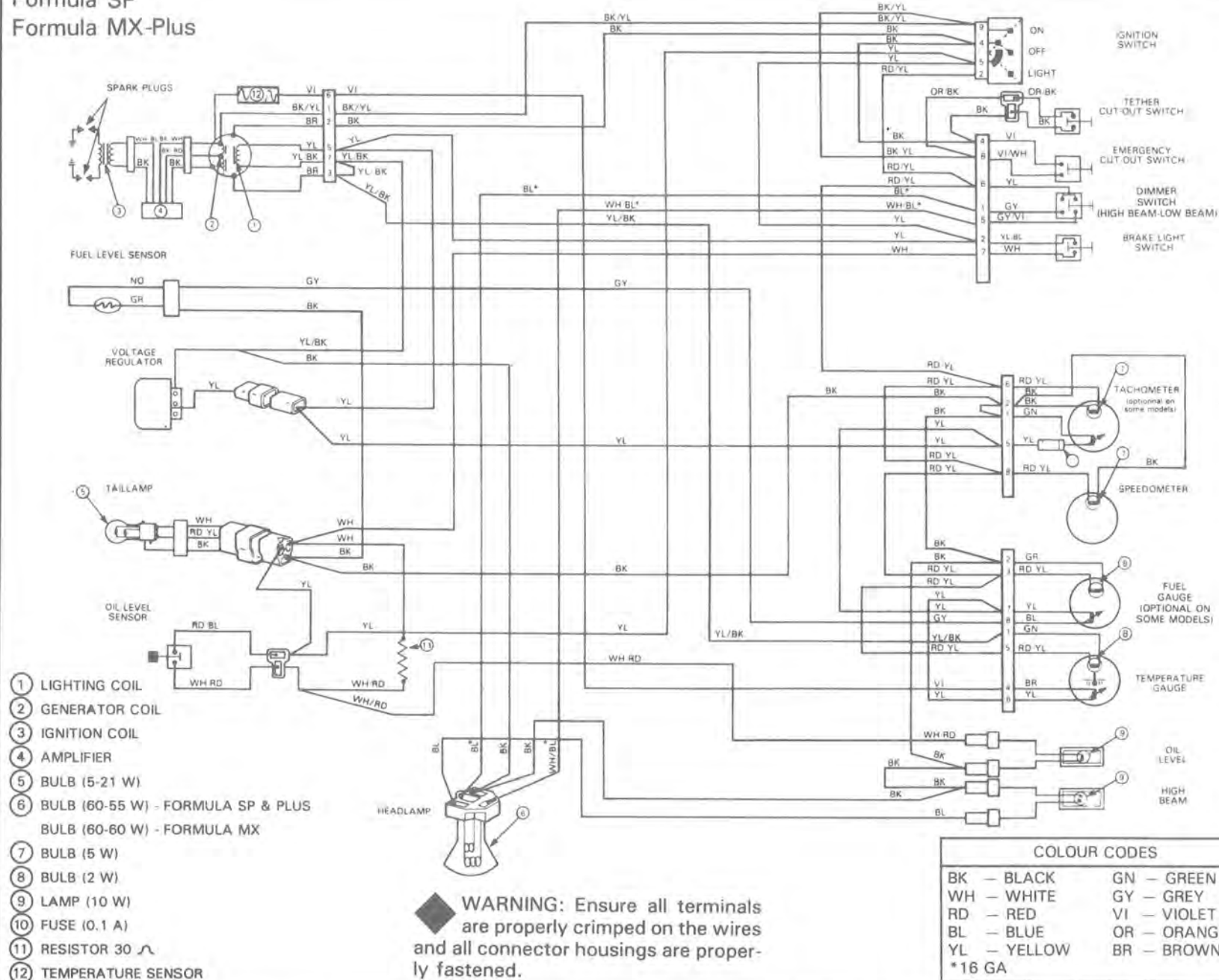
### Sub-section 01 (ELECTRIC CHARTS)

# Safari Grand Luxe LC



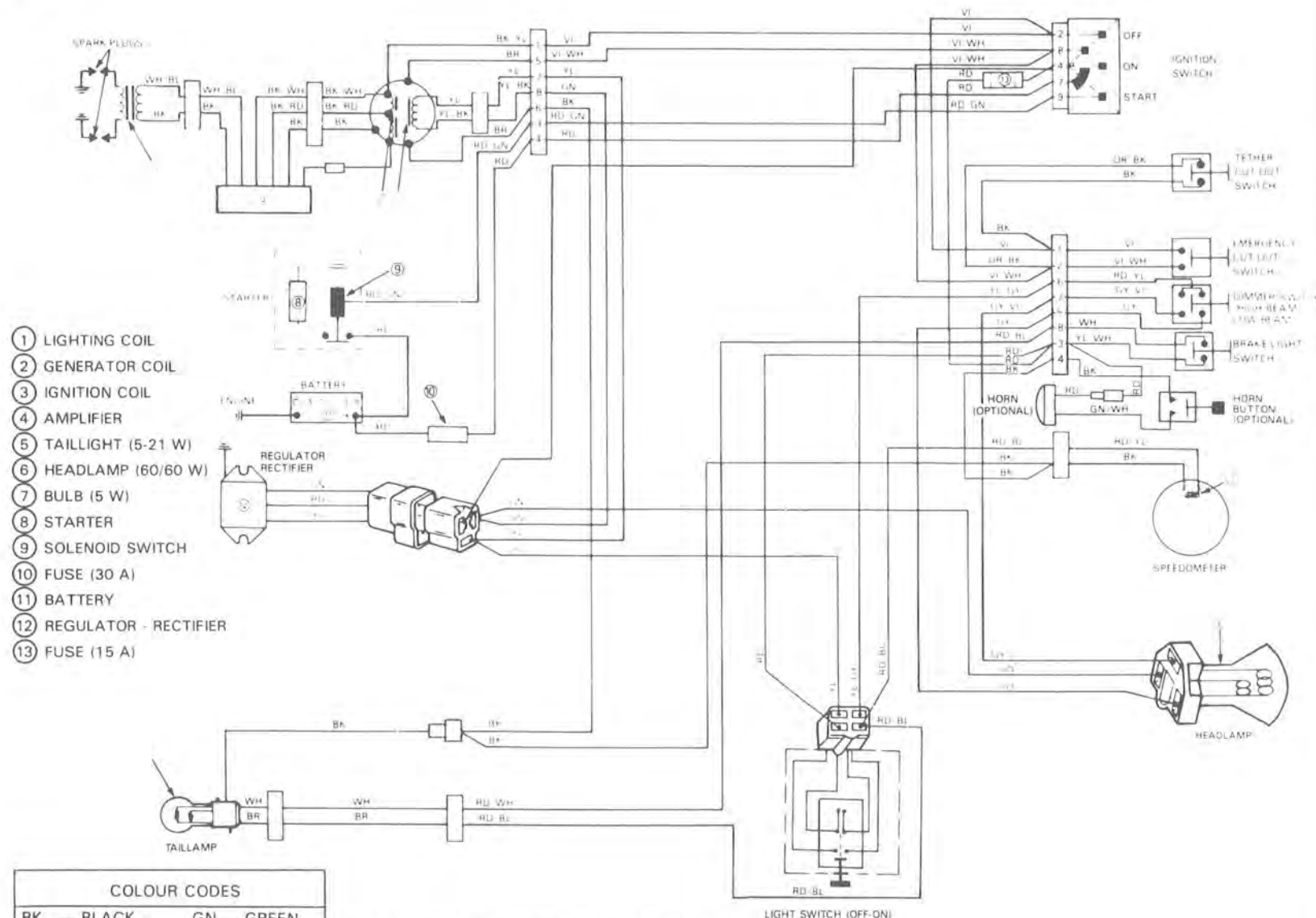


# Formula SP Formula MX-Plus





# Alpine



**WARNING:** Ensure all terminals are properly crimped on the wires and all connector housings are properly fastened.



## IGNITION TIMING

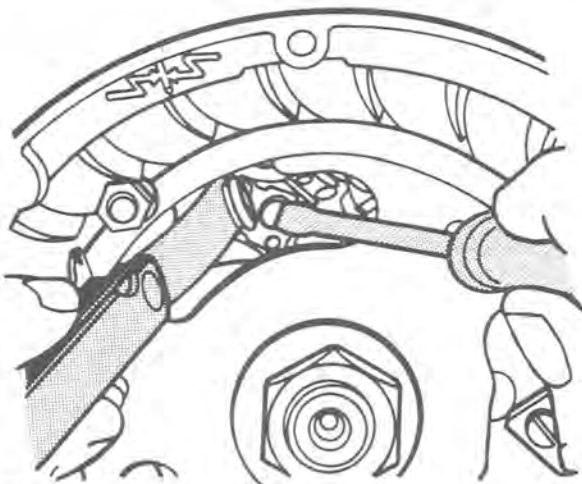
### BREAKER POINTS IGNITION SYSTEMS

#### 247 ENGINE TYPE

Two methods are detailed in this section; the first using the **timing marks**, stamped on the engine, the second using a **Top Dead Center gauge**.

##### Timing marks procedure

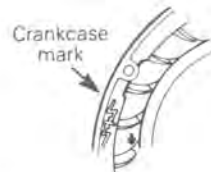
1. Disconnect spark plug wire and remove spark plug.
2. Remove rewind starter assembly from engine then remove the starting pulley from magneto ring.
3. Rotate flywheel until breaker points, visible through magneto ring opening, are fully opened. Adjust points gap to 0.35-0.40 mm (0.014-0.016") using a feeler gauge and a screwdriver as illustrated.



○ **NOTE:** Breaker points gap may change upon tightening. Always recheck after tightening.

4. Disconnect junction block at engine then connect one lead of a timing instrument (ex: flashlight type P/N 414 0122 00) to the blue wire leading from engine. Connect other to ground (metallic portion of the engine).
5. Turn timing instrument ON and rotate flywheel until timing marks align. Slacken the three (3) armature plate retaining screws then rotate armature plate until timing instrument fluctuates.

Retighten retaining screws at this position.



Too early:  
Turn armature  
plate clockwise



Too late:  
Turn armature  
plate counter-clockwise

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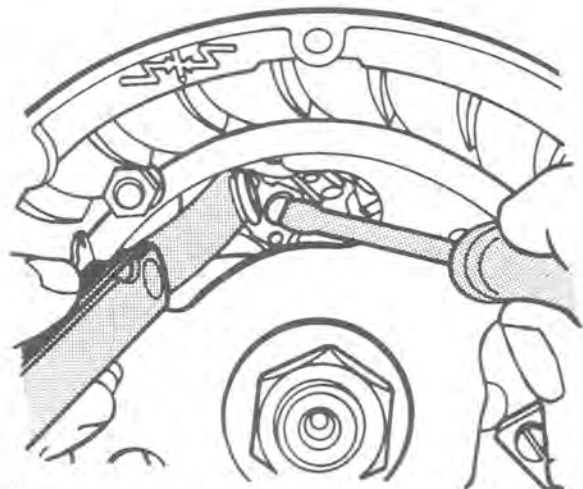
○ **NOTE:** The arrow (embossed on the fan) indicates the timing fin.

○ **NOTE:** Ignition timing may change upon tightening. Always recheck after tightening.

##### Top dead center gauge procedure

1. Disconnect spark plug wire and remove spark plug.
2. Remove rewind starter assembly from engine then remove the starting pulley from magneto ring.
3. Rotate flywheel until breaker points, visible through magneto ring opening, are fully open. Adjust points gap to 0.35-0.40 mm (0.014-0.016") using a feeler gauge and a screwdriver as illustrated.

○ **NOTE:** Breaker point gap may change upon tightening. Always recheck after tightening.

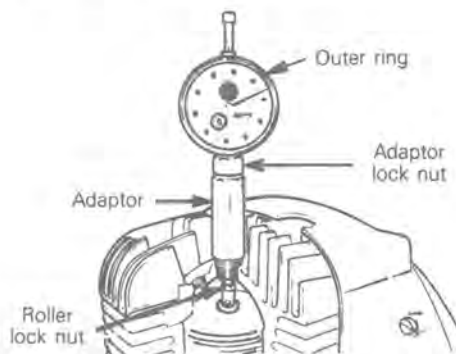


A002004001

## Section 04 ELECTRICAL

### Sub-section 02 (IGNITION TIMING)

4. Disconnect junction block at engine then connect one lead of a timing instrument (flashlight type P/N 414 0122 00) to the blue wire coming from engine. Connect other to ground (metallic portion of the engine).
5. Install and adjust T.D.C. gauge on engine as follows:
  - Rotate flywheel clockwise until piston is just before top dead center.
  - With gauge in adaptor, adjust roller so that it is parallel with dial face. Tighten roller lock nut.



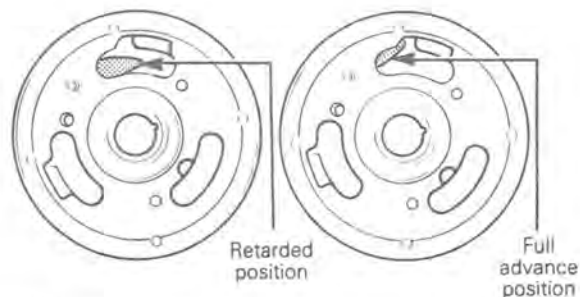
A002004003

- Loosen adaptor lock nut then holding gauge with dial face toward magneto, screw adaptor in spark plug hole.
  - Slide gauge far enough into adaptor to obtain a reading then finger tighten adaptor lock nut.
  - Rotate flywheel until piston is at Top Dead Center.
  - Unlock outer ring of dial and turn it until "O" on dial aligns with pointer.
  - Lock outer ring in position.
6. Slacken the three (3) armature plate retaining screws and turn timing instrument ON.
  7. Rotate flywheel counter-clockwise until piston is at:  
 DIRECT TIMING:  $3.98 \pm 0.25$  mm BTDC  
 ( $0.157 \pm .010''$ )

BTDC: Before top dead center.

Slightly rotate armature plate until timing instrument switch off. Retighten retaining screws.

**NOTE:** For 247 engine type, hold advance mechanism centrifugal lever in full advance position (toward magneto rim) to perform dynamic timing.



A002004004

**NOTE:** Ignition timing may change upon tightening. Always recheck after tightening.

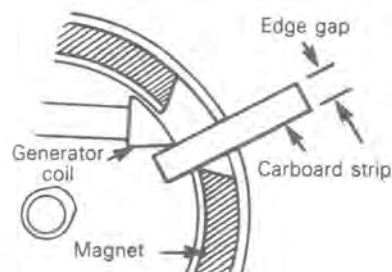
#### Edge gap verification

By following either of the two procedures herein mentioned the edge gap will automatically be adjusted. However, if the edge gap is to be verified, proceed as follows:

From timing marks, rotate flywheel clockwise 1/4 of a turn (for 247 engine type hold advance mechanism centrifugal weight in full advance position toward magneto rim to perform dynamic edge gap verification), then slowly turn flywheel back counter-clockwise until timing instrument fluctuates.

At this point check the distance between generator coil end and magnet (edge gap), with a cardboard strip of appropriate width.

ENGINE TYPE	DYNAMIC EDGE GAP
247	20.50 - 23.50 mm (0.807" - 0.925")



A002004005

If edge gap is more or less than specified, the problem lies with engine internal components (crankshaft out of alignment, broken Woodruff key, loose breaker cam, etc.); corrective measures should be applied.

## ELECTRONIC IGNITION SYSTEMS — NIPPONDENSO

### ALL ENGINES WITH NIPPONDENSO ELECTRONIC IGNITION SYSTEM

This section is mainly divided in two parts, the first one using a top dead center gauge to **check the flywheel timing mark**. The second one using a stroboscopic timing light to **verify ignition timing**.

#### Checking flywheel timing mark

1. Disconnect spark plug wire(s) and remove spark plug(s).

○ **NOTE:** On 503 engine type, remove fan cover.

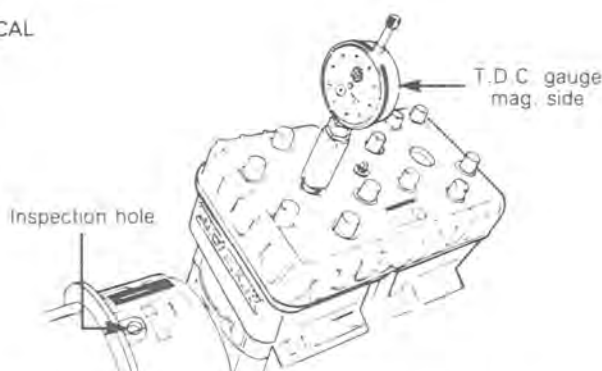
◆ **WARNING:** Ensure the engine is cold before fan cover removal.

2. Remove inspection plug on crankcase (except 503 engine type).

3. Install and adjust T.D.C. gauge on engine as follows:

○ **NOTE:** On twin cylinder engines, install it on magneto side. The following procedure will report to this side.

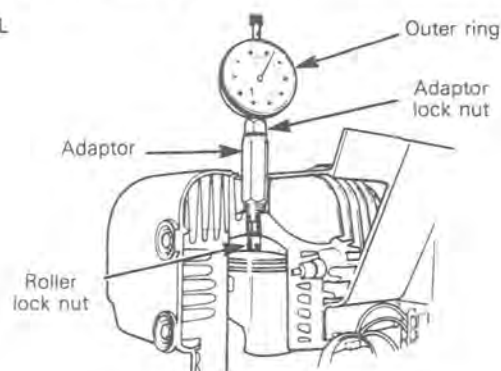
TYPICAL



A000004001

- Rotate flywheel clockwise until piston is just before top dead center
- With gauge in adaptor, adjust roller so that it is parallel with dial face. Tighten roller lock nut.

TYPICAL



A003004001

- Loosen adaptor lock nut then holding gauge with dial face toward magneto, screw adaptor in spark plug hole.
  - Slide gauge far enough into adaptor to obtain a reading then finger tighten adaptor lock nut.
  - Rotate flywheel clockwise until piston is at top dead center.
  - Unlock outer ring of dial and turn it until "O" on dial aligns with pointer.
  - Lock outer ring in position.
4. From this point, rotate flywheel back 1/4 turn then rotate it clockwise to reach the specified position:

ENGINE TYPE	DIRECT TIMING (ADVANCE)*	
	mm	(in)
253, 377	2.31	(.091)
447	1.88	(.074)
462, 532, 537	1.75	(.069)
467	2.50	(.098)
503	2.29	(0.090)

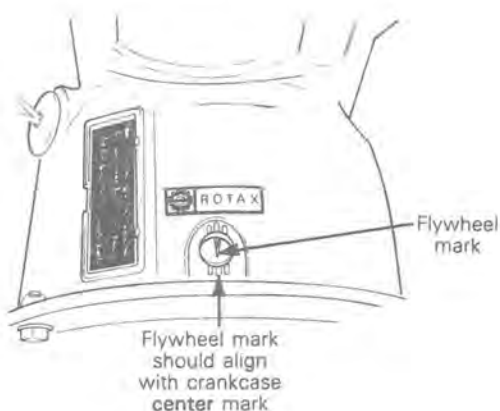
\*B.T.D.C. = Before top dead center

## Section 04 ELECTRICAL

### Sub-section 02 (IGNITION TIMING)

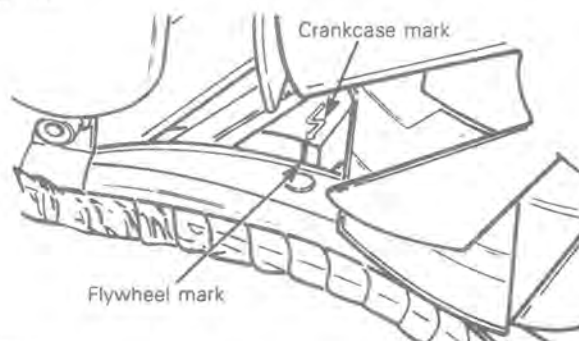
5. Look through inspection hole and check if flywheel mark align with center mark on crankcase. (except on 503 type).

All engines except 503 type.



**503 engine type:** Look through the fan and check if the flywheel and the crankcase marks align.

503 TYPE



If marks do not align, scribe a new one onto flywheel facing center mark on crankcase (except on 503 type which has an arrow on crankcase).

This new mark becomes the reference when using stroboscopic timing light.

**CAUTION:** Timing marks verification cannot be used as a timing procedure, therefore, always check the timing (using a stroboscopic timing light) at 6000 R.P.M. after the marks have been checked.

#### Checking ignition timing

**NOTE:** To perform this procedure we strongly recommend a stroboscopic timing light which is able to exceed 6000 R.P.M. such as:

SNAP-ON MT 212

ELECTRO-SPECIALTY, model 978.

The ignition components are affected by temperature variation, therefore, timing must be checked when engine is cold, after MAXIMUM 20 seconds idling.

1. Connect timing light pick-up to the spark plug lead (mag side on twin cylinder engines). Connect a tachometer to the yellow and yellow/black wires of magneto.

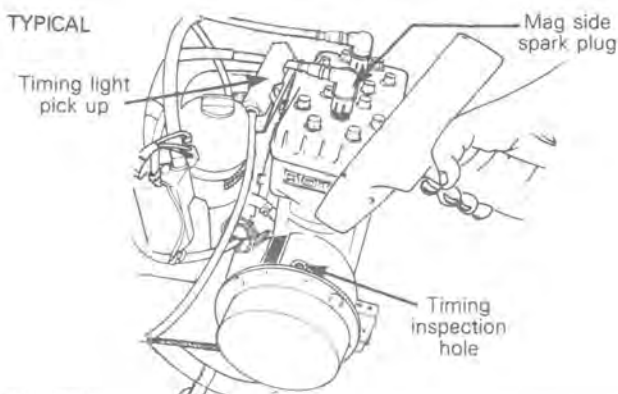
**NOTE:** Use a separate battery to supply timing light (except on electric starting models).

**WARNING:** Place ski tips against a wall, raise rear of vehicle on a stand so that track does not contact the ground. Make sure no one passes behind the vehicle while engine is running. Keep clear of track and other moving parts.

**NOTE:** Turn headlamp "ON" when checking the timing.

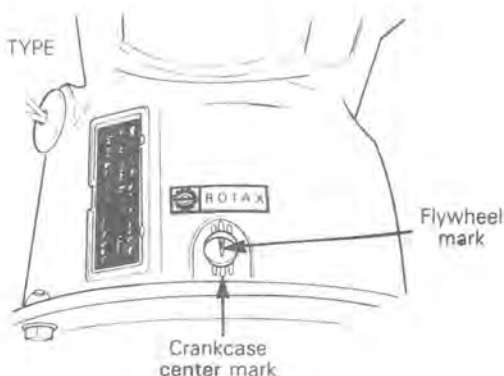
2. Start the engine and point timing light straight in line with the crankcase timing mark. Bring engine to 6000 R.P.M. for a brief instant.

TYPICAL



3. Look through inspection hole (except on 503 type) and check if flywheel mark aligns with crankcase center mark.

TYPICAL  
except 503 TYPE



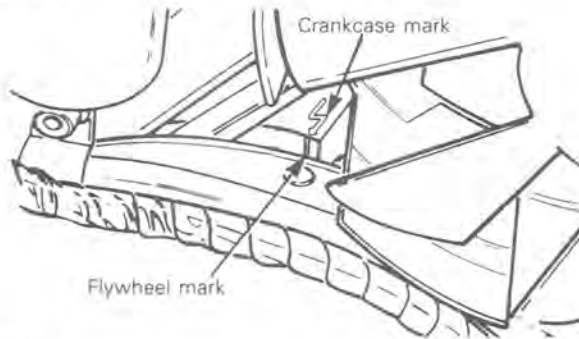


## Section 04 ELECTRICAL

### Sub-section 02 (IGNITION TIMING)

**503 engine type:** Look through the fan and check if the flywheel and the crankcase marks align.

503 TYPE



A017004001

If flywheel mark (or reference one previously scribed) align with **center** mark on crankcase (except on 503 type which has an arrow on crankcase), timing is correct.

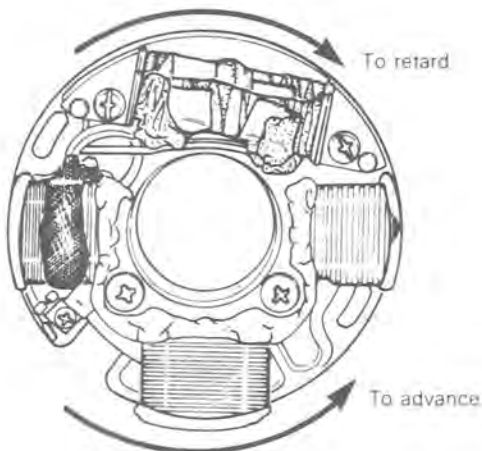
**NOTE:** All engines except 503 type: Center mark shows ideal position. Other marks show a tolerance range of  $\pm 2^\circ$ .

If timing adjustment is required, rewind starter and starter pulley have to be removed. For removal procedure, refer to magneto into specific engine section.

#### IGNITION TIMING ADJUSTMENT

Timing is performed by moving armature plate, clockwise to retard, counter-clockwise to advance.

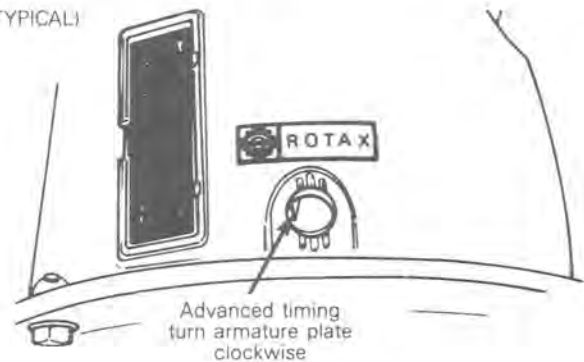
TYPICAL



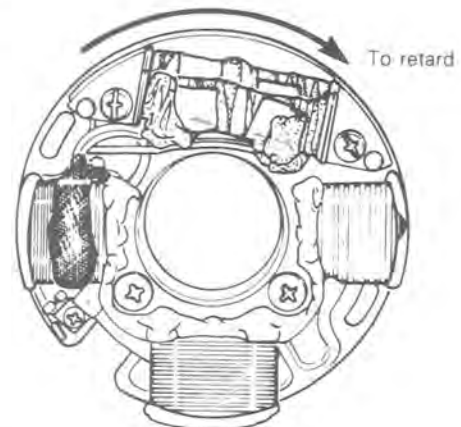
A017004002

When flywheel mark is on left side of crankcase mark, it indicates advanced timing.

(TYPICAL)



A000004005



A017004002

When flywheel mark is on left side of crankcase mark, it indicates retarded timing.

To adjust, loosen both armature plate retaining screws and lightly rotate armature plate in proper direction. Refer to the difference between flywheel mark and crankcase **center** mark to determine the amount of rotation.

Tighten armature plate retaining screws.

**CAUTION:** Make sure armature plate screws are well secured.

Reinstall removed parts.

Recheck ignition timing (make sure engine is cold).





## SPARK PLUGS

○ **NOTE:** The 1986 Bombardier snowmobiles are using three (3) spark plug brands, Bosch, Nippon-denso and NGK spark plugs.

### BOSCH SPARK PLUG TYPE

Elan

### SPARK PLUG NUMBERING SYSTEM

Bosch has introduced a new numbering code for its complete line of spark plugs. The new code is shorter, therefore easier to use. The following charts will assist you in making the change-over easily and effectively.

**IMPORTANT:** The new code has a different heat range identification system.

High number —————> hot plug

Low number —————> cold plug

### 1986 CROSS REFERENCE CHART

List of Bosch spark plugs used on 1986 Bombardier snowmobiles.

New number	Old number
M 7 A	M 175 T 1

## Section 04 ELECTRICAL SYSTEM

### Sub-section 03 (SPARK PLUGS)

#### EXPLANATION OLD SYSTEM

##### Example:

- M** For Marine Engines, resistant to seawater
- P** Electrode with Platinum Tips
- S** Silver Center Electrode
- X** Wide-Gap Electrodes — .060"
- X4** Wide-Gap Electrodes — .044"
- X6** Wide-Gap Electrodes — .060"

##### Thread Reach

- ER** Shielded, water-proof; built-in burn-off resistor
- M** Plugs for 2-cycle engines
- P** Electrodes of precious metals
- R** Suppressor resistor, 5000 ohms, built-in
- S** Silver ground electrode
- T** Standard type
- Z** Semicovered front electrode

##### Heat Range

- A** SAE conical seat
- AK** Miniplug with tapered seat
- B** SAE connector dimensions, for 7 mm dia. cable
- C** SAE connector dimensions, for 5 mm dia. cable
- D** Glide-air-gap spark plug with conical seat
- E** Surface gap (C.D. ignition)
- G** Glide-air-gap spark plug with control electrode
- K** Mini-plug with special connector
- KA** Mini-plug
- V** Booster gap

##### Thread

- M** M 18 x 1.5
- U** M 10 x 1
- W** M 14 x 1.25
- X** M 12 x 1.25
- Z** 7/8"-18 SAE

#### EXPLANATION NEW SYSTEM

##### Example:

- C** Copper core center electrode
- X** wide gap .044" (1.1 mm)
- Y** wide gap .060" (1.5 mm)

- 0**
- 1** special
- 2** shell or
- 3** electrode
- 4** designs
- 5**

##### Thread Reach

- A** Thread reach .460" standard electrode
- B** Thread reach .460" extended tip electrode
- C** Thread reach 3/4" regular electrode
- D** Thread reach 3/4" extended tip
- E** Thread reach 3/8" regular electrode
- F** Thread reach 3/8" extended tip electrode
- H** Thread reach 3/4" extra extended tip
- L** Extra extended tip
- P** Platinum electrode
- S** Silver electrode

##### Heat Range

- B** SAE connector for 7 mm diameter cable
- C** SAE connector for 5 mm diameter cable
- E** Surface gap
- R** Resistor
- S** Mini-plug

##### Thread

- D** 18 mm thread diameter tapered seat
- F** 14 mm thread diameter 5/8" hex.
- H** 14 mm thread diameter tapered seat
- M** 18 mm thread diameter
- W** 14 mm thread diameter

## **NGK SPARK PLUG TYPE**

All models except Elan

### **SPARK PLUG NUMBERING SYSTEM**

Bombardier is using the NGK spark plug type on most of the 1986 snowmobile models.

The heat range identification system is:

High number —————> cold plug

Low number —————> hot plug

### **1986 CROSS REFERENCE CHART**

List of NGK spark plugs used on 1986 Bombardier snowmobiles.

BR7ES  
BR8ES  
BR9ES  
BR10ES

## Section 04 ELECTRICAL SYSTEM

### Sub-section 03 (SPARK PLUGS)

## DESIGN SYMBOLS USED IN NGK SPARK PLUGS

First letter prefix for thread and hexagon size

Second & third letter prefix for construction feature, except single prefix

Heat rating number

First letter suffix for thread: reach

Second letter suffix for construction feature, etc.

Letter	Thread size	Hexagon size	Letter	Construction feature	Heat rating number	Letter	Thread reach	Letter	Construction feature, etc.
A	18 mm	25.4 mm	B	Hexagon size 20.6 mm	2		12.0 mm (thread dia. 18 mm)	A	Specials
B	14 mm	20.6 mm	C	Hexagon size 16.0 mm	4		9.5 mm (thread dia. 14 mm)	B	Special plug for Honda vehicles
C	10 mm	16.0 mm	G	Hexagon size 23.8 mm	5		22.5 mm (thread dia. PF 1/2" - 14 mm)	C	Competition type
D	12 mm	18.0 mm	L	Compact type (SHORTY)	6		18.0 mm (thread dia. 7/8" - 18 mm)	G	Racing plugs, center electrode of nickel alloy
F	7/8" - 18	23.8 mm	M	Compact type (BANTAM)	7		11.2 mm	GV	Racing plugs, center electrode of precious metal
G	PF 1/2" - 14	23.8 mm	P	Projected insulator nose type	8		12.7 mm (Racing type 12.5 mm)	N	Racing plugs, nickel electrode
			R	Resistor type	9		19.0 mm (Racing type 18.0 mm)	P	Racing plugs, platinum ground electrode
			S	Shielded type	10		Conical seat type	R	Shielded resistor plugs
			U	Surface discharge type	11		A - F 10.9 mm	S	Copper core center electrode (Super)
					12		B - F 11.2 mm	V	Center electrode of precious metal
					13		BM - F 7.8 mm	W	Tungsten electrode
					14		BE - F 17.5 mm	X	Series gap plugs
								Y	V-Grooved center electrode

(\*Standard regulation is drawn here. There also exist a few extraordinary symbols.)



## **NIPPONDENSO (ND) SPARK PLUG TYPE**

Citation LS/LSE, Tundra/LT

### **SPARK PLUG NUMBERING SYSTEM**

The heat range identification system is:

High number —————→ cold plug  
Low number —————→ hot plug

The sales symbol is composed of a "Heat Range" number, together with prefix and suffix letters, to indicate major features of the plug design. Each letter has a definite meaning as shown on reset page.

### **SPARK GAP**

inch	.020	.024	.028	.032	.035	.040	.044	.050	.060	.080
mm	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.3	1.5	2.0

## **1986 CROSS REFERENCE CHART**

List of Nippondenso spark plugs used on 1986 Bombardier snowmobiles.

W 24 ESR-U

## Section 04 ELECTRICAL SYSTEM

### Sub-section 03 (SPARK PLUGS)

## DESIGN SYMBOLS USED IN NIPPONDENSO SPARK PLUGS

### • THREAD REACH

A,B,E: 19.0 mm (3/4")  
F: 12.7 mm (1/2")  
L: 11.2 mm (7/16")  
None: 12.0 mm (15/32") ...18 mm Thread  
None: 9.5 mm (3/8") .....14 mm Thread

### • HEAT RANGE

HOT \_\_\_\_\_ COLD  
9 14 16 20 22 24 25 27 29 31 34 37

### • THREAD AND HEX

Letter	Seat	Thread size	Hex
M		18 mm	25.4 mm
L		18 mm	22.0 mm
MA	Taper seat	18 mm	20.6 mm
T	Taper seat	14 mm	16.0 mm
W		14 mm	10.6 mm
WA	Taper seat	14 mm	16.0 mm
X		12 mm	18.0 mm
U		10 mm	16.0 mm
J		14 mm	20.6 mm
SF		14 mm	20.6 mm

### • SPECIAL DESIGN

Letter	Description	Example
A	Dual ground electrodes	W22EA
B	Triple ground electrodes	W22EB
D	4 ground electrodes	W27EDR14
LM	Compact type (for Lawn Mower Engines)	W14LM-U
M	Compact type	W20M-U
N	Racing type (Nickel ground electrode)	W27EN
Pt	Racing type (Platinum ground electrode)	W27EPt
P	Projected type	W16EP-U
R	Resistor type	W16EPR-U
S	Regular type-copper cored center electrode	W24ES-U
T	Dual ground electrodes (for Toyota)	W20ET-S
X	Extra projected type	W16EX-U

### • SPECIAL DESIGN

Letter	Description	Example
-GU	Gold palladium with U electrode	W24ES-GU
-U	With U-grooved ground electrode	X24ES-U
-V	Fine center electrode	X24ES-V
-S	Special type for MITSUBISHI	W20EP-S11
-L	Special type: *For Honda CVCC Engines *Extra projected type for mopeds	W20ES-L W1FP-L

### • WIDE GAP

9: 0.9 mm (.035")  
10: 1.0 mm (.040")  
11: 1.1 mm (.044")  
13: 1.3 mm (.050")  
15: 1.5 mm (.060")

**W 16 E X -U 11**

## Section 04 ELECTRICAL SYSTEM

### Sub-section 03 (SPARK PLUGS)

#### DISASSEMBLY

First unscrew the spark plug one turn.

Clean the spark plug and cylinder head with pressurize air then completely unscrew.

#### HEAT RANGE

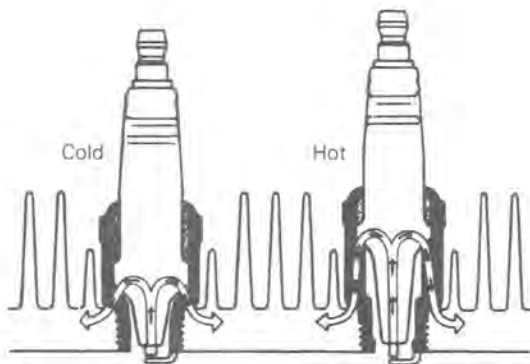
The proper operating temperature or heat range of the spark plugs is determined by the spark plug's ability to dissipate the heat generated by combustion.

The longer the heat path between the electrode tip to the plug shell, the hotter the spark plug operating temperature will be — and inversely, the shorter the heat path, the colder the operating temperature will be.

A "cold" type plug has a relatively short insulator nose and transfers heat very rapidly into the cylinder head.

Such a plug is used in heavy duty or continuous high speed operation to avoid overheating.

The "hot" type plug has a longer insulator nose and transfers heat more slowly away from its firing end. It runs hotter and burns off combustion deposits which might tend to foul the plug during prolonged idle or low speed operation.



A000004009

**CAUTION:** Severe engine damage might occur if a wrong heat range plug is used:

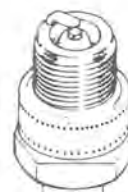
A too "hot" plug will result in overheating and pre-ignition, etc.

A too "cold" plug will result in fouling (shorting the spark plug) or may create carbon build up which can heat up red-hot and cause pre-ignition or detonation.

#### FOULING

Fouling of the spark plug is indicated by irregular running of the engine, decreased engine speed due to misfiring, reduced performance, and increased fuel consumption. This is due to a loss of compression. Other possible causes are: prolonged idling, running the engine with the choke on (Formula Plus only), or running on a too rich mixture due to a faulty carburetor adjustment or incorrect fuel and/or fuel mixing. The plug face of a fouled spark plug has either a dry coating of soot or an oily, glossy coating given by an excess either of oil or of oil with soot. Such coatings form a conductive connection between the center electrode and ground.

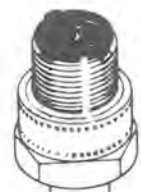
#### SPARK PLUG ANALYSIS



Overheated  
(light grey)



Normal  
(brownish)



Fouled  
(black)

A000004010

The plug face (and piston dome) reveals the condition of the engine, operating condition, method of driving and fuel mixture. For this reason it is advisable to inspect the spark plug at regular intervals, examining the plug face (i.e. the part of the plug projecting into the combustion chamber) and the piston dome.

#### SPARK PLUG INSTALLATION

Prior to installation make sure that contact surfaces of the cylinder head and spark plug are free of grime.

1. Using a wire feeler gauge, set electrode gap.
2. Apply a light coat of graphite grease over the spark plug threads to prevent possible seizure.

## Section 04 ELECTRICAL SYSTEM

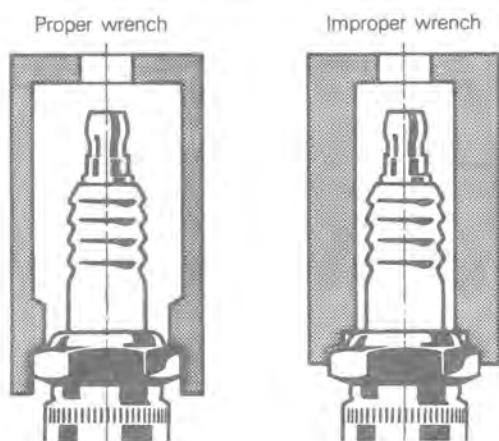
### Sub-section 03 (SPARK PLUGS)

3. Hand screw spark plug into cylinder head and tighten with a torque wrench:

Bosch - "M" plug (18 mm) 37 N•m (27 lbf•ft)

NGK - "B" plug (14 mm) 27 N•m (20 lbf•ft)

Nippondenso - "W" plug (14 mm) 27 N•m (20 lbf•ft).



A000004011

Use a proper wrench to tighten the spark plug.

### SPARK PLUG CHART

Models	Engine type	Spark plugs
Elan	247	Bosch M175T1 (M7A)
Citation LS, LSE	253	NGK BR9ES ND W24ESR-U
Tundra/LT	253	NGK BR9ES ND W24ESR-U
Skandic 377/R	377	NGK BR8ES
Safari 377/E	377	NGK BR9ES
Safari 447	447	NGK BR9ES
Safari Grand Luxe LC	532	NGK BR8ES
Formula SP	462	NGK BR8ES
Formula MX	467	NGK BR10ES
Formula Plus	537	NGK BR9ES
Alpine	503	NGK BR7ES



# BATTERY

## REMOVAL

◆ **WARNING:** When disconnecting battery cables, always remove the black negative cable first then the positive cable (red).

## CLEANING

Clean the battery casing, vent caps, cables and battery posts using a solution of baking soda and water.

▼ **CAUTION:** Do not allow cleaning solution to enter battery interior since it will destroy the electrolyte.

Remove corrosion from battery cable terminals and battery posts using a firm copper brush.

## INSPECTION

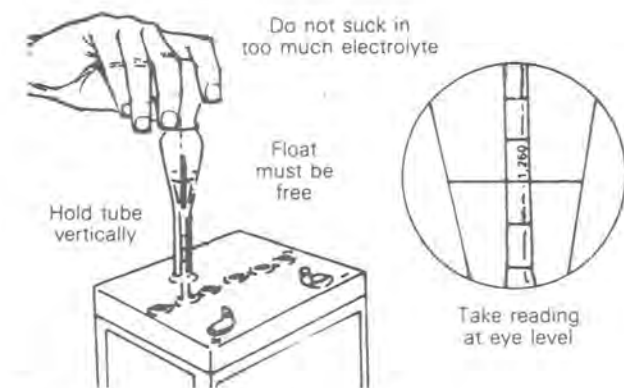
Visually inspect battery casing for cracks or other possible damage. If casing is damaged, replace battery.

Inspect battery posts for security of mounting.

Inspect for cracked or damaged battery caps, replace defective caps.

◆ **WARNING:** Some battery caps do not have vent holes. If so, make sure that overflow tube is unobstructed.

## HYDROMETER TEST



A000004012

A hydrometer measures the state of charge of a battery in terms of specific gravity. Most hydrometers give a true reading at 27°C (80°F).

In order to obtain correct readings, adjust the initial reading by adding .004 points to the hydrometer readings for each 5.5°C (10°F) above 27°C (80°F) and by **subtracting** .004 points for every 5.5°C (10°F) below 27°C (80°F).

THIS CHART WILL BE USEFUL TO FIND THE CORRECT READING.

	°C	°F			
At	38	100	add	.008	to the reading
	32	90	"	.004	" " "
	27	80			correct reading
	21	70	subtract	.004	from the reading
	16	60	"	.008	" " "
	10	50	"	.012	" " "
	4	40	"	.016	" " "
	-1	30	"	.020	" " "
	-7	20	"	.024	" " "
	-12	10	"	.028	" " "
	-18	0	"	.032	" " "
	-23	-10	"	.036	" " "
	-29	-20	"	.040	" " "
	-34	-30	"	.044	" " "
	-40	-40	"	.048	" " "

### EXAMPLE NO 1

Temperature below 27°C (80°F)  
 Hydrometer Reading 1.250  
 Acid temperature -7°C (20°F)  
 Subtract .024 Sp. Gr.  
 Corrected Sp. Gr. is 1.226

### EXAMPLE NO 2

Temperature above 27°C (80°F)  
 Hydrometer Reading 1.235  
 Acid temperature 38°C (100°F)  
 Add .008 Sp. Gr.  
 Corrected Sp. Gr. is 1.243

▼ **CAUTION:** Do not install a partially charged battery on a snowmobile since the casing may crack at freezing temperature. The following chart shows the freezing point of the electrolyte in relation to the state of charge of the battery.

## Section 04 ELECTRICAL

### Sub-Section 04 (BATTERY)

Temperature-Corrected Specific Gravity	Battery state of Charge	Freezing Point of Electrolyte
1.260	Fully Charged	-59°C (74°F)
1.230	3/4 charged	-40°C (-40°F)
1.200	1/2 charged	-27°C (-16°F)
1.170	1/4 charged	-18°C (0°F)
1.110	Discharged	-7°C (+19°F)

## BATTERY STORAGE

Disconnect and remove battery from the vehicle.

Check electrolyte level in each cell, add distilled water as required.

▼ **CAUTION: Do not overfill.**

The battery must always be stored in fully charged conditions. If required, recharge until specific gravity of 1.260 is obtained.

▼ **CAUTION: Battery electrolyte must not exceed 50°C (122°F).**

Clean battery terminals and cable connections using a copper brush. Apply a light coat of dielectric grease (P/N 413 7017 00) or petroleum jelly on terminals.

Clean battery casing and vent caps using a solution of baking soda and water. (Do not allow cleaning solution to enter battery, otherwise it will destroy the electrolyte). Rinse battery with clear water and dry well using a clean cloth.

Store battery on a wooden shelf in a cool dry place. Such conditions reduce self-discharging and keep fluid evaporation to a minimum.

During the storage period, recheck electrolyte level and specific gravity readings at least every forty (40) days. As necessary, keep the battery "Topped up" and near full charge as possible (trickle charge).

## ACTIVATION OF NEW BATTERY

A new battery is factory fresh dry charged. For storage purposes, it is fitted with a temporary sealing tube.

Do not remove the sealing tube or loosen battery caps unless activation is desired.

In case of accidental premature removal of caps or sealing tube, battery should be given a full charge.

Perform the following at pre-delivery operations and anytime you have to install a new battery.

1. Remove the sealing tube from the vent elbow. Install overflow tube included in the battery kit.

◆ **WARNING: Failure to remove the sealing tube could result in an explosion.**

2. Remove caps and fill battery to the UPPER LEVEL line with electrolyte (specific gravity: 1.260 at 20°C (68°F)).

3. Allow the battery to stand for 30 minutes MINIMUM so that electrolyte can dissolve.

4. Readjust the electrolyte level to UPPER LEVEL.

5. Charge battery at a charging rate of 2.0 amperes for 10 to 20 hours.

▼ **CAUTION: If charging rate raises higher than 2.4 amps reduce it immediately.**

▼ **CAUTION: If cell temperature rises higher than 50°C (122°F) discontinue charging temporarily or reduce the charging rate.**

6. After charging, allow the gas bubbles to escape by lightly shaking the battery by hand. Let it settle for 1 hour.

7. Readjust electrolyte level to UPPER LEVEL.

8. Reinstall the caps and wipe off any electrolyte spilt on battery using baking soda and water solution.

◆ **WARNING: Overflow tube must be free and open. A kinked or bent tube will restrict ventilation and create gas accumulation that could result in an explosion.**

○ **NOTE: It is recommended to verify the battery state once a month. If necessary readjust the battery at fully charged condition.**

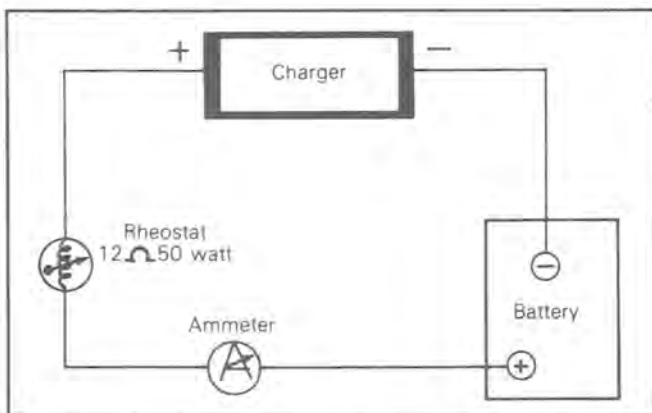
## BATTERY CHARGING EQUIPMENT

The battery charger must have an adjustable charging rate. Variable adjustment is preferred, but a unit which can be adjusted in small increments is acceptable.

The battery charger must be equipped with an ammeter capable of accurately measuring current of less than one ampere.

If the present charger is not adjustable to the proper current values, a rheostat can be connected in series with the battery to provide adjustment. 12 Ohm, 50 watt rheostats, such as OHMITE - 0314 or MALLORY 50K 12P, are available from electronic parts supply shops and they are suitable for use with most chargers if the peak current is held below 2 amps.

If you need an accurate ammeter, we recommend the use of: SHURITE - 5202 (0 to 3 amps) or - 5203 (0 to 5 amps) available from electronic parts supply shops.



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For a service application and a permanent installation, both ammeter and rheostat can be built into a small box adjacent to your charger.

**CAUTION:** Adequate ventilation **MUST** be provided to cool the rheostat.

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## Section 04 ELECTRICAL

### Sub-Section 04 (BATTERY)

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#### INSTALLATION OF BATTERY

Install battery, connect positive cable (red) then negative cable (black).

Coat battery posts with petroleum jelly then slide protective cap over positive post.

Connect one end of vent tube to battery vent elbow and insert the other end in bottom pan hole.

▼ **CAUTION:** Ensure that neither the positive or the negative cables touch the muffler (if applicable).

#### TROUBLE SHOOTING:

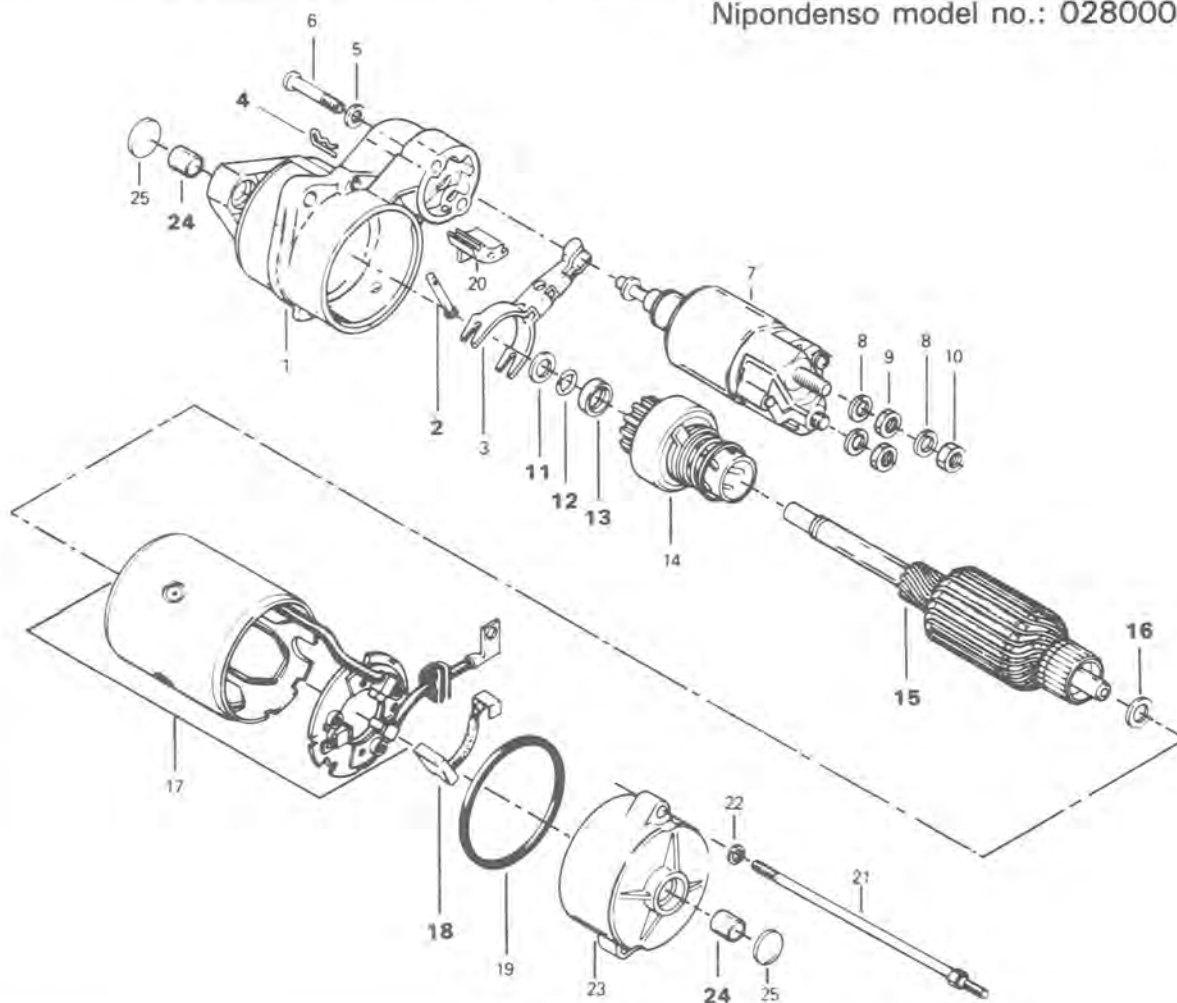
Symptom	Cause	Remedy
Discharged or weak battery	<ul style="list-style-type: none"><li>*1. Faulty rectifier</li><li>2. Faulty charging coil</li><li>3. Loose or bad ground connections</li><li>4. Battery poles and/or cable terminals oxidized</li><li>5. Faulty battery (cracked casing, damaged or loose posts)</li></ul>	<ul style="list-style-type: none"><li>1. Replace rectifier</li><li>2. Replace charging coil</li><li>3. Tighten cable terminals</li><li>4. Clean battery posts and cable terminals</li><li>5. Replace battery</li></ul>

\*To test the charging system, disconnect positive cable at the battery, install an ammeter between cable and battery post. If the reading indicates that the charging system operates normally, check items 2, 3 and 4.

# ELECTRIC STARTER

**SAFARI 377E, SAFARI GRAND LUXE LC & ALPINE**

Nipondenso model no.: 028000-6690



- 1. Drive housing assembly
- 2. Drive lever set pin
- 3. Pinion drive lever
- 4. Snap pin
- 5. Lock washer
- 6. Magnetic switch screw
- 7. Magnetic switch
- 8. Lock washer 8 mm
- 9. Hexagonal nut 8 mm
- 10. Hexagonal nut 8 mm
- 11. Shim
- 12. Snap ring
- 13. Clutch stop collar

- 14. Clutch
- 15. Armature
- 16. Washer
- 17. Yoke
- 18. Brush
- 19. Rubber packing
- 20. Rubber seal
- 21. Through bolt
- 22. Lock washer
- 23. End frame
- 24. Bushing
- 25. Bushing cover

## Section 04 ELECTRICAL

### Sub-section 05 (ELECTRIC STARTER)

## REMOVAL

Disconnect black cable ground connection from battery. Disconnect the red battery cable and the red/green wire from the solenoid switch. Remove starter.

## DISASSEMBLY & ASSEMBLY

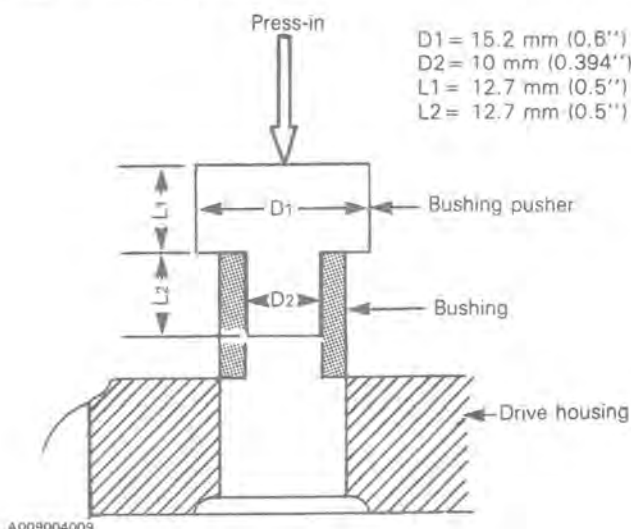
**CAUTION:** To carry out some of the following procedures, it is necessary that special equipment be available. If you do not possess such equipment, either replace the damaged components or have the parts overhauled in a workshop equipped with proper tooling.

### 24, Bushings

Check the wear on bushings by measuring the amount of radial play between the armature shaft and the bushings.

The radial play should not exceed 0.20 mm (0.008"). If excessive, replace the bushing. To replace a bushing, press out the old one and press in a new one with a bushing pusher. The correct size of the bushing pusher to use is given in the illustration below.

**NOTE:** It may be required to ream the new bushing to obtain proper fit.



### 2,4, Drive lever set pin & snap pin

To pull out the armature with overrunning clutch assembly and the drive lever from the drive housing, remove the hair pin and pull out the drive lever set pin.

### 11,15,16, Shims, armature & washer

Note the number and the position of the washers and shims located at both ends of the armature. An end play of 0.050 to 0.35 mm (0.002 — 0.014") should exist between armature and end housing.

04-05-2

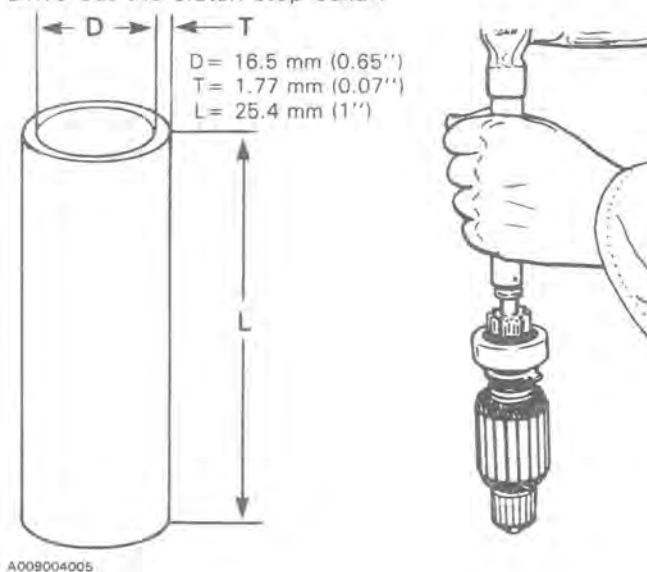
### 12,13, Snap ring & clutch stop collar

To remove the clutch stop collar from the armature, make a tool similar to the illustration below.

First push the clutch stop collar towards the clutch.

Take off snap ring.

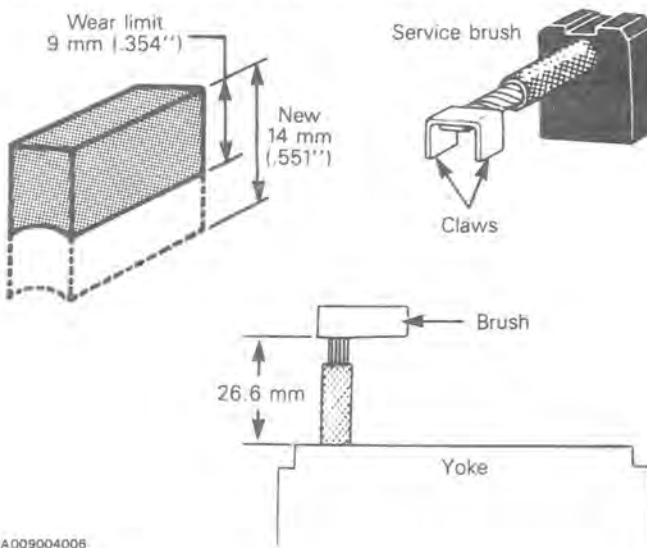
Drive out the clutch stop collar.



### 18, Brushes

Check the brushes length, if less than 9 mm (0.350"), replace the brushes. (A new brush is 14 mm (.550" long).

To replace a brush, cut off the old brush from the yoke and insert the remaining brush lead on the yoke between the claws of the new brush. Solder it in place. Cover the soldered portion with the tube on the new brush lead. Standard brush lead length is 26.6 mm (1.05").

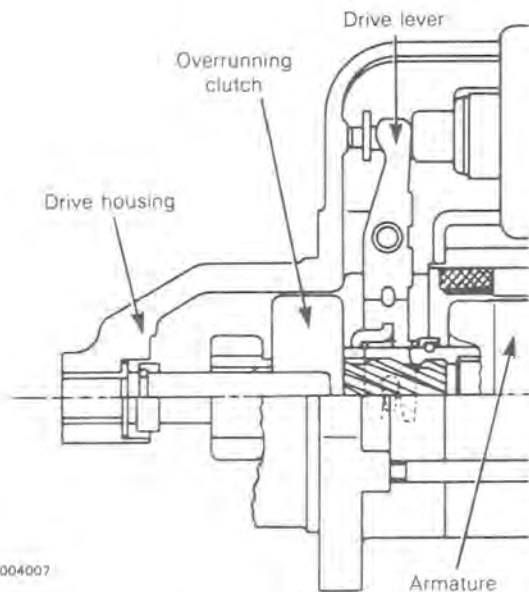




For assembly, follow the disassembly procedure in the reverse order, paying attention to the following.

Coat the sliding surfaces and moving portions of the armature splines, overrunning clutch, bushings and the solenoid switch plunger with multipurpose grease (water, climate and cold resistant).

Reinstall the drive lever as illustrated below.



When reassembling the yoke to the drive housing align the embossment on the yoke with the notch pin on the drive housing.

When reassembling the brush holder to the yoke align the embossment on the brush holder with the notch on the yoke.

○ **NOTE:** Make sure to reinstall the same number of shims on the armature at the place noted during disassembly.

When reassembling the commutator end frame to the brush holder align the notch on the commutator end frame with the pilot embossment on the brush holder.

## CLEANING

▼ **CAUTION:** Armature starter yoke ass'y and drive unit assembly must not be immersed in cleaning solvent.

Clean brushes and holders with a clean cloth soaked in solvent. Brushes must be dried thoroughly with a clean cloth.

Blow brush holders clean using compressed air.

Remove dirt, oil or grease from commutator using a clean cloth soaked in suitable solvent. Dry well using a clean, dry cloth.

Clean engine starter gear teeth and drive unit (clutch).

○ **NOTE:** Bearing bushing of the drive unit must not be cleaned with grease dissolving agents.

Immerse all metal components in cleaning solution. Dry using a clean, dry cloth.

## INSPECTION

### Armature

○ **NOTE:** An ohmmeter may be used for the following testing procedures, except for the one concerning the shorted windings in the armature.

Check the commutator for roughness, burnt or scored surface. If necessary, turn the commutator in a lathe, enough to remove grime only.

Check the commutator out-of-round condition with V Blocks and an indicator. If the commutator out-of-round is more than 0.40 mm (.016"), the commutator should be turned on a lathe.

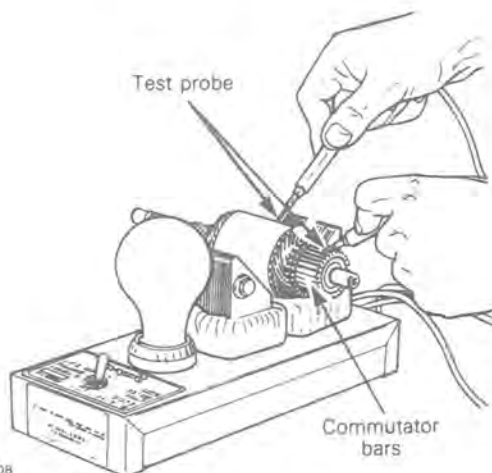
Check the commutator for mica depth. If the depth is less than 0.20 mm (0.008"), undercut the mica. Be sure that no burrs are left and no copper dust remains between the segments after the undercutting operation is completed.

## Section 04 ELECTRICAL

### Sub-section 05 (ELECTRIC STARTER)

#### Test for ground circuit in the armature:

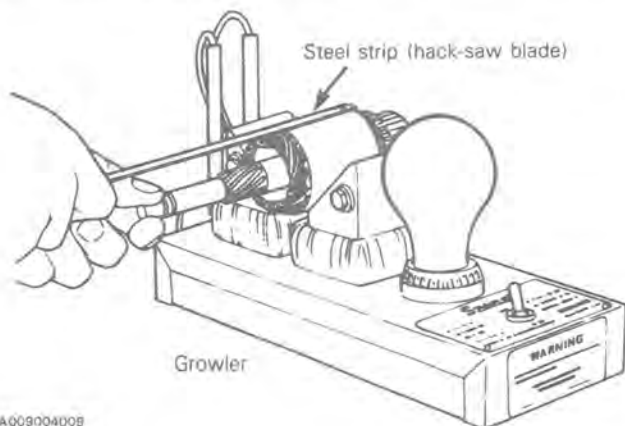
Use growler test probes. Check between armature core and the commutator bars. If growler lamp turns on, bars are grounded.



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#### Test armature for shorted winding:

Use growler test probes. When the armature is rotated in the growler with a steel strip (hack-saw blade) held above it, the strip will vibrate over that area of the armature which has short circuited.



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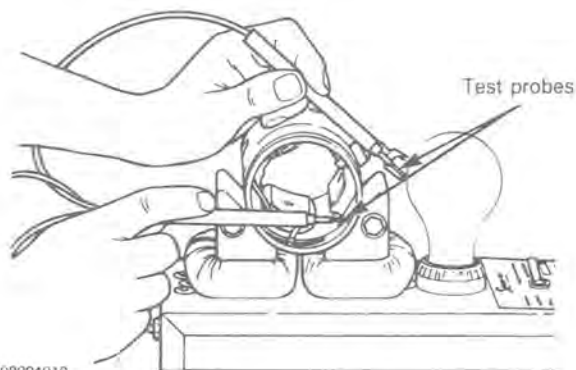
#### Test the armature for open circuit:

Use growler test probes. Place one test probe on a commutator bar and the other test probe on the neighboring bar. Repeat this operation for all bars, moving one test probe at a time. If the growler lamp does not turn on, the armature circuit between these two (2) bars has an open circuit. The armature should be replaced or repaired; open circuits most often occur at the commutator riser where coils are soldered. (Burnt commutator bars are usually an indication of an open-circuited armature coil.)

#### Field windings and brushes

##### Test the field winding for open circuit:

Use growler test probes. Place one test probe on the negative brush and the other test probe on the yoke. If growler lamp does not turn on, the field winding has an open-circuit. The yoke has to be repaired or replaced.



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Check the dynamic brake winding for open circuit by placing one test probe on the positive brush and the other probe on the negative brush.

If growler lamp does not turn on, the winding circuit is open-circuit and the yoke has to be repaired or replaced.

#### Brush holder

Check the brush holder for insulation performance using growler test probes. Place one test probe on the insulated brush holder and the other test probe on the brush holder plate. If the growler lamp turns on, the brush holder has poor insulation and has to be repaired or replaced.

Check the brush spring tension with a spring scale. This should be done by placing the brush holder into position in the armature with brushes resting on the commutator. The tension reading should be made when the spring has just come off the brush.

The spring tension should be from 850.5 — 1162.3 grams (30-41 oz).

#### Overrunning clutch

The pinion of the overrunning clutch should turn smoothly in the clockwise direction, and should not slip in a counterclockwise direction with the armature fixed. If defective, replace.

Check the pinion teeth for wear and damage. If defective, replace.



## INSTALLATION

Make sure that starter and engine mating surfaces are free of grime. Serious trouble may arise if starter is not properly aligned.

Install starter.

Connect the red battery cable and the red wire to the large terminal of the solenoid. Connect red/green wire to small terminal of solenoid.

Connect black cable to battery.

## TROUBLE SHOOTING

Causes of troubles are not necessarily in the starting system (starter) but may be due to a faulty battery, switches, electrical cables and/or connections. Trouble may also be attributed to a malfunctioning of the ignition system and/or fuel system. The following trouble-shooting table is limited to the starting system.

**WARNING:** Short-circuiting the electric starter is always a danger, therefore disconnect the ground cable at the battery before carrying out any kind of maintenance on the starting system. Do not place tools on battery.

SYMPTOM	CAUSE	REMEDY
Starter does not turn.	Poor contact of starter switch contact points.	Repair or replace switch.
Starter turns; but does not crank the engine.	Burnt or poor contact of solenoid switch contact disc.	Replace solenoid switch.
	Open circuit of solenoid switch pull-in winding.	Replace solenoid switch.
	Open circuit of solenoid switch hold-in winding.	Replace solenoid switch.
	Poor contact of brush	Straighten commutator and brush.
	Burnt out commutator	Turn commutator in lathe.
	Commutator mica too high	Undercut mica.
	Shorted field coil. (028000-6690 starter model only)	Repair or replace yoke.
	Shorted armature.	Repair or replace armature.
	Weak brush spring tension.	Replace spring.
	Weak magnet (128000-1670 starter model only)	Replace yoke assembly.
	Worn bushings.	Replace bushings.
	Weak battery	Recharge battery.
	Shorted battery cell(s)	Replace battery.
	Poor contact of battery terminal(s)	Clean and tighten terminal(s).
	Open circuit between starter switch and solenoid switch.	Repair.
	Poor battery ground cable connection.	Clean and tighten.

## Section 04 ELECTRICAL

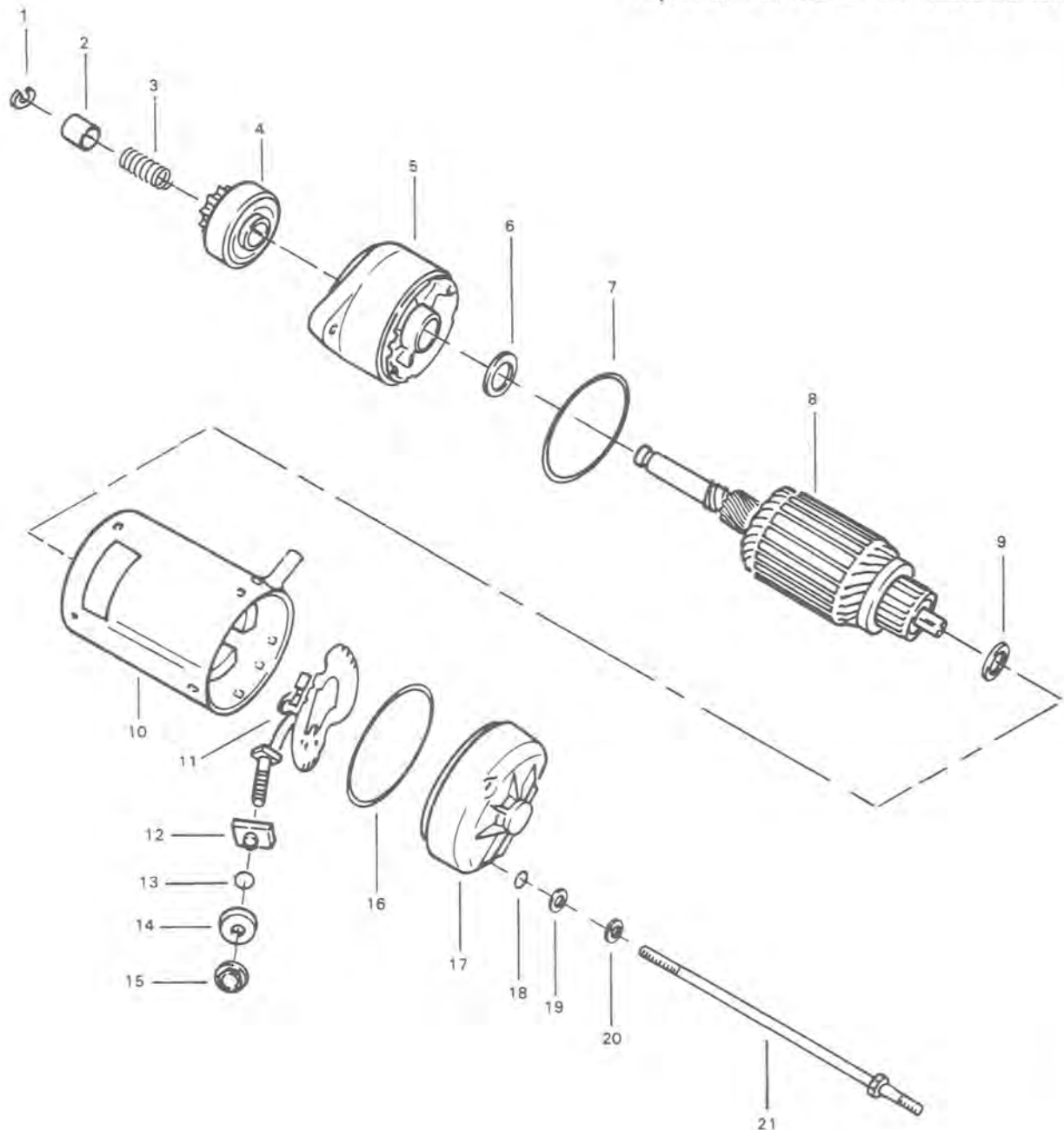
### Sub-section 05 (ELECTRIC STARTER)

SYMPTOM	CAUSE	REMEDY
Starter turns, but overrunning clutch pinion does not mesh with ring gear.	Worn clutch pinion gear.	Replace clutch.
	Defective clutch.	Replace clutch.
	Poor movement of clutch on splines.	Clean and correct.
	Worn clutch bushing.	Replace clutch.
	Worn starter bushing(s).	Replace bushing(s).
	Worn ring gear.	Replace ring gear.
Starter motor keeps running.	Shorted solenoid switch winding(s).	Replace solenoid switch.
	Melted solenoid switch contacts.	Replace solenoid switch.
	Starter switch returns poorly.	Replace ignition switch.

**Section 04 ELECTRICAL**  
Sub-section 05 (ELECTRIC STARTER)

**CITATION LSE**

Nipondenso model no 128000-1670



## Section 04 ELECTRICAL

### Sub-section 05 (ELECTRIC STARTER)

1. Snap ring
2. Pinion stop nut
3. Compression coil spring
4. Clutch assembly
5. Housing assembly
6. Shim
7. O-ring
8. Armature assembly
9. Washer
10. Yoke assembly
11. Brush holder

12. Internal insulator
13. O-ring
14. External insulator
15. Nut
16. O-ring
17. End frame
18. O-ring
19. Washer
20. Wave washer
21. Through bolt

## REMOVAL

Disconnect black cable ground connection from battery.  
Disconnect red starter cable from starter.  
Remove starter.

## DISASSEMBLY & ASSEMBLY

▼ **CAUTION:** To carry out some of the following procedures, it is necessary that special equipment be available. If such equipment is not available, either replace the damaged components or have the parts overhauled in a workshop equipped with proper tooling.

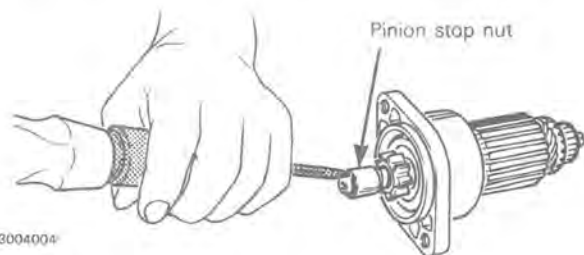
### 10,11,17,21, Yoke, brushes holder, end frame & through bolts

Remove the two through bolts by unscrewing the nut then separate end frame from yoke assembly. Remove armature assembly from yoke assembly.

Brushes holder can be removed from end frame by unscrewing nut retaining terminal.

### 1,2,3, Snap ring, pinion stop nut & spring

Tap the pinion stop nut using a screwdriver. Remove snap ring. Disassemble pinion stop nut and spring.



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### 4,5,6,8, Clutch ass'y, housing, shim and armature

Turn assembly counterclockwise to remove it from armature assembly.

Pull housing assembly from armature.

04-05-8

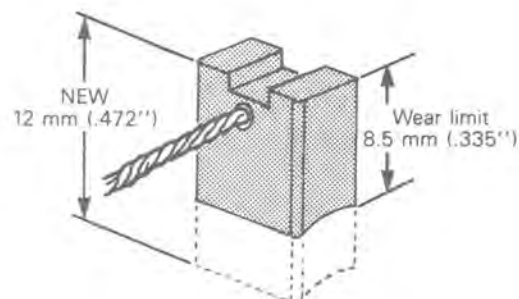
## CLEANING

Refer to electric starter, model no. 028000-6690 for cleaning procedure.

## INSPECTION

### Brushes

Measure the brush length, if less than 8.5 mm (.335"), replace them. (A new brush is 12 mm (.472") long).



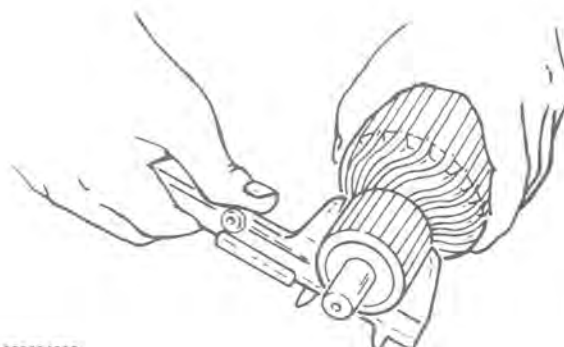
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### Armature

Refer to the armature inspection procedure; model no. 028000-6690 except for the following.

## MEASUREMENT OF COMMUTATOR OUTER DIAMETER

Service limit: 30.7 mm. If worn, replace the armature.



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## REASSEMBLY

Reverse the order of disassembly to reassemble the starter. However, attention should be paid to the following operations.

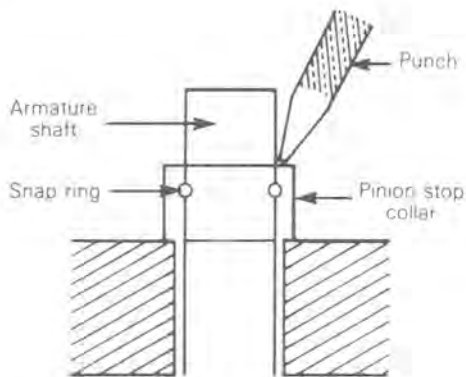
## LUBRICATION

Before reassembling, apply 10W-30 engine oil on moving parts. (Shaft, bearing etc.).

### 1,2, Snap ring & pinion stop nut

After placing the stop collar on the armature shaft, fit the snap ring into the armature shaft, then make sure that snap ring fits correctly.

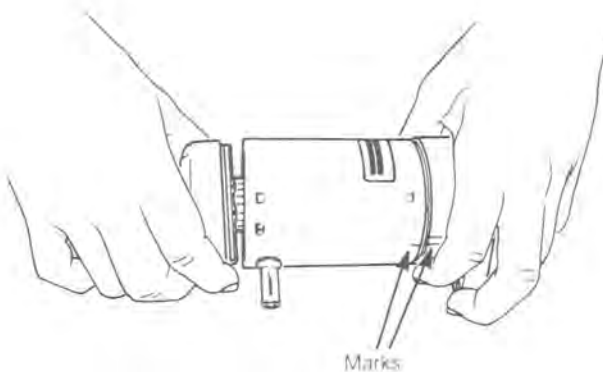
Tap the pinion to slide the stop collar onto the snap ring. Using a punch, secure the stop collar by punching it in two or three places.



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### 5,10, Housing & yoke ass'y

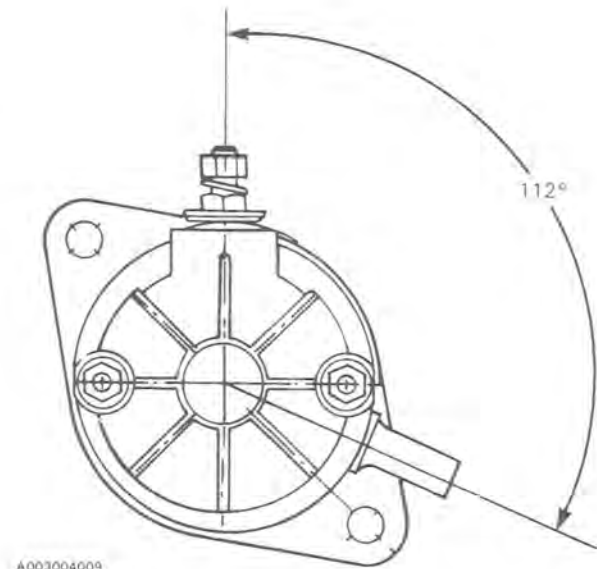
Be sure that the marks align.



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### 10,17, Yoke ass'y & end frame

The vent tube must make an angle of  $112^\circ$  with the electric connector.

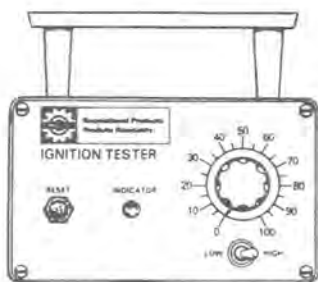


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## TESTING PROCEDURE

### BOMBARDIER IGNITION TESTER



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#### GENERAL

The Bombardier Ignition tester is an electrical energy measuring device capable of measuring the peak energy output of a coil.

The tester is of solid state construction and performs as a comparator. The correct value of energy output is indicated in each test and is then compared with the value taken from the engine being tested.

The energy output is verified by means of a 0-100 scale on the tester. The greater the energy output, the greater value indication on the scale. The indication is in the form of an incandescent lamp that lights when the scale knob is set at the position corresponding to the energy output.

The tester has two input ranges selected by a toggle switch. The **LOW** range is sensitive to AC or DC voltages from 0.5 to 27 volts. The **HIGH** range is sensitive to AC or DC voltages of from approximately 75 to 500 volts.

#### TEST CONDITION

**All tests are performed on the vehicle at cranking speed.**

Vigorous cranking against compression causes the fly-wheel to snap over, raising the output higher than by cranking without compression, therefore, do not remove spark plug.

**Test values listed are taken against compression.**

Always crank vigorously as in actual starting.

Read all instructions **thoroughly** and as you become familiar with this test instrument it will be possible to test a complete ignition system in a matter of minutes. Always proceed in the following order:

1. Connect tester **P** and **N** clip leads as illustrated.
2. Follow test procedure sequence.

3. After every test that lights the indicator lamp, **reset** the indicator circuit by depressing the reset button.

#### ANALYSIS OF TEST RESULTS

##### Indicator lamp lights at specific setting

Output is as specified. Test results should repeat three times. If readings do not repeat, output is erratic and cause should be investigated (loose connections or components, etc.).

##### Indicator lamp lights at lower setting

This indicates that the output is less than that designed to operate in a satisfactory manner. However, before coming to the conclusion of a faulty condition be certain that correct engine cranking conditions were met before condemning the ignition.

##### Indicator lamp does not light

One component is defective. Proceed as instructed to find defective component.

##### Intermittent ignition problems

In dealing with intermittent problems there is no easy diagnosis. For example, problems that occur only at normal engine operating temperature have to be tested under similar conditions.

In most cases of temperature and/or vibration failure, only parts replacement can solve the problem as most of these failures return to normal when engine is not running.

##### Double trouble

There is always the possibility of more than one faulty part. If after a component has been replaced the problem still persists, carefully repeat the complete test procedure to find the other faulty part.

## Section 04 ELECTRICAL

### Sub-section 06 (TESTING PROCEDURE)

## ANALYSER TEST AND MAINTENANCE

A test simulator is provided with each tester as a means to test the lamp, detector circuit, and batteries.

### High scale test

- Place switch in **HIGH** position. Plug the simulator into an electric outlet (115 VAC) for ten seconds.

▼ **CAUTION:** After charging, do not touch plug terminals while pressing test button. A mild shock will result.

- Remove the simulator from the outlet, and connect the "P" and "N" leads from the tester to the simulator as indicated on the button of the simulator.
- Set the tester dial to 50, or below. Depress the button of the simulator. The indicator lamp on the tester should light.

○ **NOTE:** For each test performed by the simulator, it must be recharged.

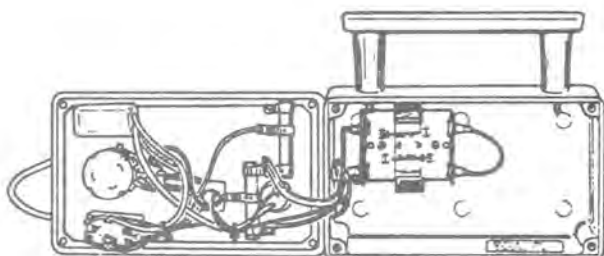
### Low scale test

- Place switch in **LOW** position.
- Set tester dial to 50, or below.
- Connect **N** lead to negative terminal of 12 volt battery. Connect **P** lead to positive terminal of 12 volt battery: indicator lamp should light.

If lamp does not light, check tester batteries. If they are installed correctly and are good, check the clip leads for faulty connections. If no fault can be found, refer to the warranty statement for instructions for sending the tester back to Electro-Specialties, Inc.

### Battery replacement

- Remove the four (4) screws securing cover to case.
- Carefully lift cover.
- Replace batteries with size "C" Alkaline batteries. Be sure to observe polarity markings on battery holder or lamp will not light.



A00004015

- Carefully install cover on case being certain that no wires are pinched between cover and case. Secure cover.

○ **NOTE:** Weak batteries will not impair tester operation or calibration. The light will glow dim.

The ignition tester may give false readings if the rivets on the back cover come in contact with metal.

### Indicator knob alignment

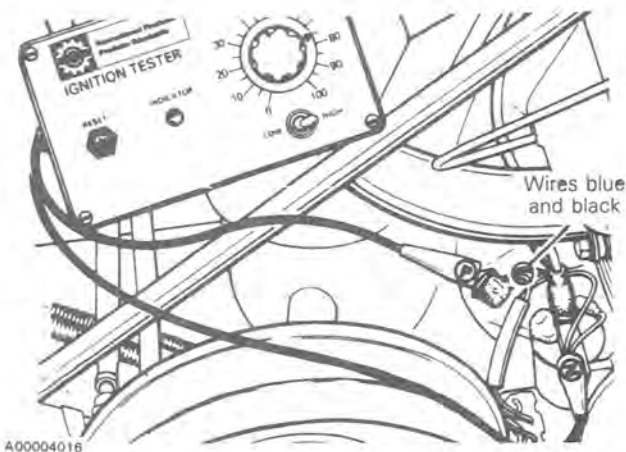
Check indicator knob alignment by turning knob fully clockwise. The white mark on the knob must align with no. 100 on the scale. If the marks does not line up with the no. 100, loosen the knob set screw, line the mark on the knob with no. 100, and tighten the set screw. Re-check alignment.

○ **NOTE:** If after adjustment, the knob is turned fully counter-clockwise and it does not exactly align with the 0, it is of no consequence.

## ONE CYLINDER ENGINES (247 ENGINE TYPE)

### 1. Generator coil output

- Disconnect blue and black wires from terminal (15) of ignition coil.
- Attach tester **P** lead to **blue** and **black** wires previously disconnected. Connect tester **N** lead to a good engine ground.



- Set tester dial and switch as follows:

Engine type	Switch position	Dial
247	HIGH	75



## Section 04 ELECTRICAL

### Sub-section 06 (TESTING PROCEDURE)

4) Turn ignition key to ON position, disable emergency cut-out button circuit and tether cut-out switch and then crank engine.

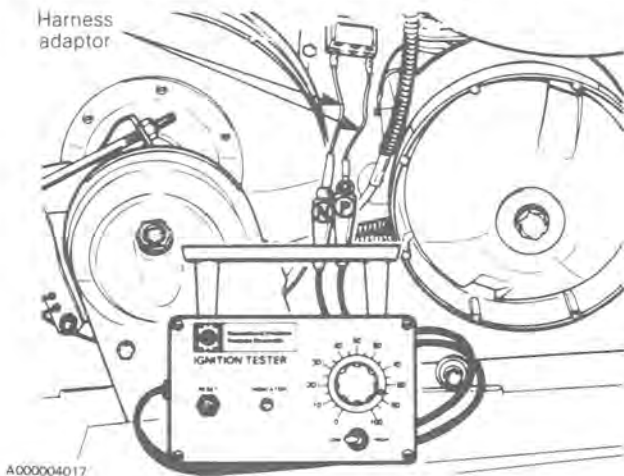
- a) **Indicator lamp lights:** Coil output is up to specifications. Repeat test at least three (3) times to verify reading and check for consistency.
- b) **Indicator lamp does not light:** Coil output is below specifications. This could be caused by a faulty coil or breaker points. Check breaker points condition and adjustment, and correct as necessary. Repeat test. If lamp still does not light the coil is defective and should be replaced.

#### 2. Lighting coils output (247 engine type)

○ **NOTE:** There are two independent coils; main (large) coil wires are yellow and yellow/black while brake light coil (small) wires are green and green/black.

- 1) Disconnect wiring harness junction block at engine.
- 2) Connect tester leads as illustrated using two (2) harness adaptors.

large coil: yellow and yellow/black wires  
small coil: green and green/black (or ground) wires



3) Set tester dial and switch as follows:

Engine type	Switch position	Dial
247	LOW	85

4) Crank engine.

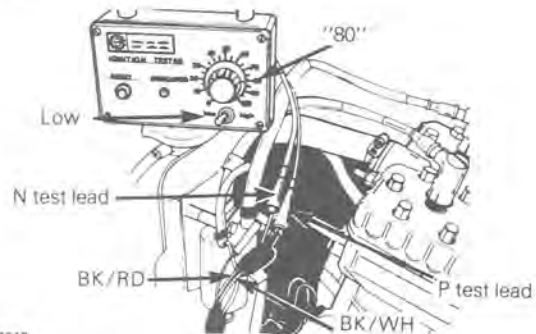
- a) **Indicator lamp lights:** Coil output is up to specifications. Repeat test at least three (3) times to verify reading and consistency.
- b) **Indicator lamp does not light:** Coil is faulty.

#### 253,377,447,462,467,503,532,537, CDI SYSTEMS VERIFICATION

##### 1. High speed charging coil

- 1) Disconnect wire connectors from C.D.I. electronic box harness at engine.
- 2) Connect tester P test lead to **black/white** wire and connect tester N test lead to **black/red** wire at the magneto harness.

(TYPICAL)



A000004018

3) Set tester switch and dial as follows:

ENGINE TYPE	SWITCH POSITION	DIAL
253,377,447, 462,467, 503,532,537	«LOW»	80

4) Turn ignition key to ON position, set cut-out switch and tether cut-out switch to OFF position and then crank engine.

◆ **WARNING:** To prevent powerful electric shocks while cranking engine do not touch any component related to electronic ignition system (ignition coil, high tension wire, wire harness, etc.).

- a) **Indicator lamp lights:** Coil output is up to specifications. Repeat at least three (3) times to verify reading and consistency.
- b) **Indicator lamp does not light:** The problem is a faulty high speed charging coil.

◆ **WARNING:** Do not touch tester P lead clip while cranking the engine. Also make sure that tester leads do not touch any metallic object.

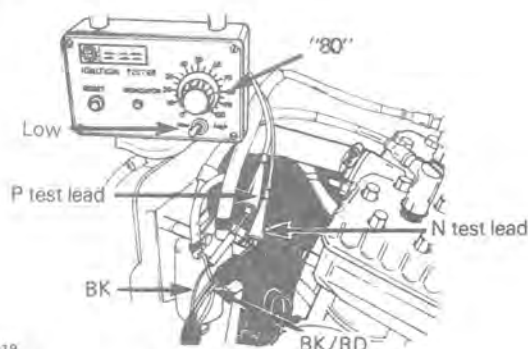
## Section 04 ELECTRICAL

### Sub-section 06 (TESTING PROCEDURE)

#### 2. Low speed charging coil

- 1) Disconnect wire connectors from C.D.I. electronic box harness to engine.
- 2) At the magneto harness, connect tester **P** test lead to **Black** wire and connect tester **N** test lead to **black/red** wire.

(TYPICAL)



- 3) Set tester switch and dial as follows:

Engine type	Switch position	Dial
253,377,447	LOW	80
462,467,503		
532,537		

- 4) Turn ignition switch to ON position, set cut-out switch and tether cut-out switch to OFF position and then crank engine.

**WARNING:** To prevent powerful electric shocks while cranking engine, do not touch any electronic ignition components (ignition coil, high tension wire, wire harness, etc.).

- a) **Indicator lamp lights:** Low speed charging coil is up to specifications. Repeat test at least three (3) times to verify reading and check for consistency.
- b) **Indicator lamp does not light:** Low speed charging coil is faulty.

#### 3. Lighting coil

- 1) Disconnect wiring harness junction block at engine.
- 2) Connect tester **P** test lead to **yellow/black** wire and connect **N** test lead to **yellow** wire.
- 3) Set tester and dial as follows:

ENGINE TYPE	SWITCH POSITION	DIAL
253,377,447, 462,467,503, 532,537	«LOW»	70

- 4) Crank engine.
  - a) **Indicator lamp lights:** Lighting coil output is up to specifications. Repeat test at least three (3) times to verify reading and consistency.
  - b) **Indicator lamp does not light:** Lighting coil is faulty.

## C.D.I. PARTS INSPECTION PROCEDURE

Disconnect the connectors of the C.D.I. electronic box, ignition coil and junction block at engine. Check the resistance or continuity between each terminals with an ohmmeter and refer to the following:

PART NAME		WIRE COLOR	RESISTANCE	BOMBARDIER IGNITION TESTER SETTING	REMARKS
MAGNETO	High speed charging coil	BK/WH with BK/RD	2.8-4.2 $\Omega$	Low 80	If the reading is: $\circ \Omega$ short circuit $\infty \Omega$ open circuit
	Low speed charging coil	BK with BK/RD	120-180 $\Omega$	Low 80	
	Lighting coil	YL/BK with YL	0.21-0.31 $\Omega$	Low 70	
IGNITION COIL	Primary	BK with WH/BL	0.23-0.43 $\Omega$	N.A.	
	Secondary winding	High tension wire with high tension wire (spark plug protector removed)	2.45-4.55 K $\Omega$	N.A.	
	Insulation	WH/BL with core	$\infty \Omega$	N.A.	
		WH/BL with high tension wire	$\infty \Omega$	N.A.	

N.A.: Not applicable

## BOMBARDIER CDI CHECKER



A000004020

### GENERAL

The Bombardier CDI checker is a feature for the verification of the **NIPPONDENSO** CDI systems. This checker combines the function of all test equipments into one checker, and it tests all NIPPONDENSO systems under actual operating conditions with one set of connections. All test results are digitized and will show on the LED level indicator which is calibrated from 0 to 9. You can diagnose the CDI system by comparing the test results with the diagnostic chart.

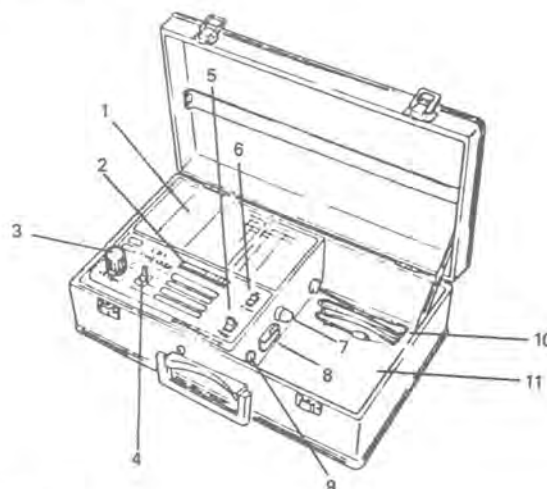
**NOTE:** The Bombardier CDI checker is only applicable to the Nippondenso CDI systems used on the Bombardier recreational products.

### SPECIFICATION AND CONSTRUCTION

#### Specification

Power source:	AC 115 volts/60 Hz
Power consumption:	Less than 50 watts
Ambient temperature:	-10° C to 40° C (for usage) -30° C to 60° C (for storage)
Dimensions:	370 (H) x 230 (W) x 120 (D)
Weight:	Approx. 4.0 kg
Standard accessories:	Test wire harness A, B and C grounding wire

#### Construction



A000004020

1. Diagnostic chart
2. LED level indicator
3. Selector
4. HI & LO switch
5. START & RESET switch
6. Power switch
7. Fuse box
8. Test wire harness connector
9. Grounding wire connector
10. Power cord
11. Accessories box

#### Precautions & safety

- a) Do not give a shock to the checker.
- b) Never touch the connector terminals when the power switch is on position.
- c) Before connecting the test wire harness, be sure that the engine is stopped.
- d) Use the checker under the specified temperature (-10° C to 40° C).
- e) Connect the power cord to the recognized power source. (AC 115 volts/60Hz).
- f) When spark test, do not touch the high-tension cable. A mild shock will result. Hold high-tension cable by an insulator.

**Section 04 ELECTRICAL**  
Sub-section 06 (TESTING PROCEDURE)

Test items

CODE NUMBER	IGNITION TYPE	ENGINE TYPE	TEST ITEM
2	4-5P (Harness B)	253,377,447,462 467,503,532,537	Generator coil Control unit diode Control unit spark test

This checker tests the following items:

TEST		CHECK POINT	APPLICABLE	
			CODE NO.	IGNITION TYPE
Generator coil test	HI	Output of high speed	1,2	4-4P 4-5P
	LO	Output of high and low speed generator coil	1,2	4-4P 4-5P
Control unit test		Output of control test	1,2	4-4P 4-5P
Control unit diode test		Check of control diode in control unit	2	4-5P
Spark test		Check of ignition spark	1,2	4-4P 4-5P

## Section 04 ELECTRICAL

### Sub-section 06 (TESTING PROCEDURE)

#### Generator coil test (HI and LO)

This test is performed on the vehicle at cranking speed. The two generator coils are called high and low speed generator coils. The checker indicated the output of these coils by switching HI and LO positions as follows.

HI: Output of high speed generator coil.

LO: Output of high and low speed generator coil.

Analysis of this test is diagnosed by its level.

#### Control unit test

The CDI checker inputs alternative current into the control unit instead of the generator coil.

The output of the control unit will be indicated on the LED level indicator. Analysis of this test is diagnosed by its level.

#### Control unit diode test (for 4-5P ignition type, 253,377,447,462,467,503,532,537)

The control unit includes the diode which controls the output of the generator coil according to the engine speed. This checker can diagnose this diode. The result will be indicated on the LED level indicator.

#### Spark test

Using an ignition coil equipped on the vehicle, this tester can cause the spark across the high-tension wire and engine body.



**NOTE:** This checker cannot check the lighting coil output.

For lighting coil test, refer to the Bombardier ignition tester procedure.

#### BEFORE TESTING

To prevent engine from starting and erroneous indication on the LED level indicator, remove the spark plug(s).

**CAUTION:** To prevent dust or foreign matter from being introduced inside the cylinder(s) when cranking the engine, install a clean rag over the cylinder head.

Connect the power cord to the power source (115 volts AC/60Hz).

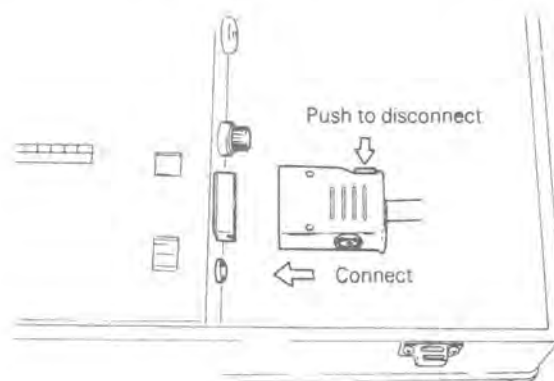
**CAUTION:** To prevent any damage to the checker, do not try other power source than the above mentioned one and ensure that the checker is installed on a plane surface, away from vehicle vibrations.

#### CONNECTION OF TEST WIRE HARNESS

- a) Choose the right test wire harness according to the following.

CODE NO.	IGNITION TYPE	ENGINE TYPE	TEST WIRE HARNESS
2	4-5P	253,377,447, 462,467,503, 532,537	B

- b) Connect the test wire harness to the checker aligning the arrow marks.



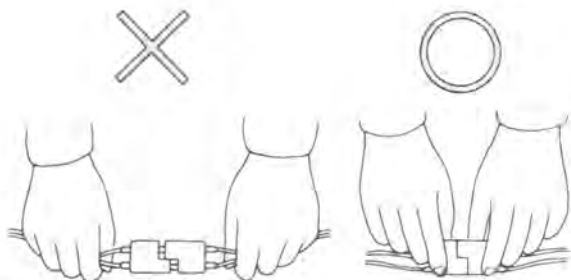
A000004021

## Section 04 ELECTRICAL

### Sub-section 06 (TESTING PROCEDURE)

c) Disconnect the connectors of magneto and control unit.

**CAUTION:** Never pull the wire harness to disconnect.



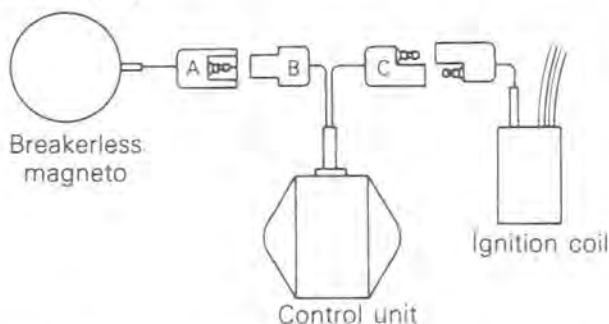
A000004022

d) Securely connect the connectors of test wire harness according to the connectors letters on the following figures.

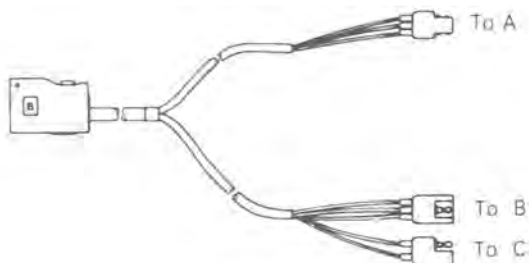
**CAUTION:** When connecting, be sure that the test wire harness does not interfere with moving part of engine.

**4-5P ignition type engine (253,377,447,462, 467,503,532,537)**

(Vehicle wiring)



(Test wire harness "B")



A000004023

**NOTE:** The harness "A" supplied in the kit is applicable to the 84's 462 engine type equipped with a 4-4 P ignition type (140 W). It is also applicable to older engines type 354 and 454 equipped with a Nippondenso CDI system.

The harness "C" is only applicable to the Can-Am 504 engine type.

### TEST

a) Turn the power switch on. Then one LED or two LED's will light to indicate the checker is operating. Reset the indication circuit by depressing the reset switch, the one LED will remain to indicate the checker is operating.

**NOTE:** After every test when the LED level indicator holds its indication a few minutes, reset the indication circuit by depressing the reset switch.

b) Set the selector to the desired position.

c) Perform each test.

**NOTE:** When cranking the manual starter type engine, perform it repeatedly.

d) If the test results are over or lower than the limit, see "Analysis of test".

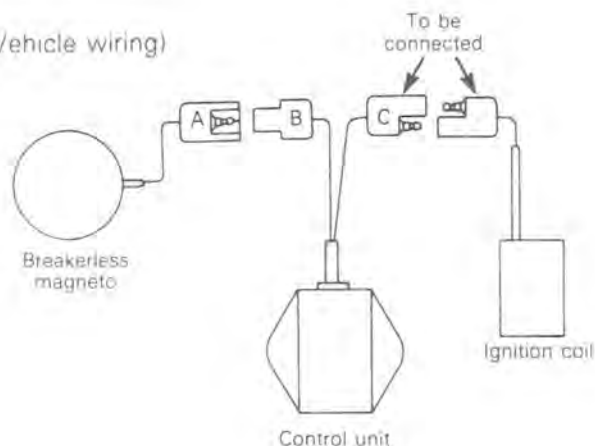
**NOTE:** Test results should be repeated two or three times. If reading does not repeat, output is erratic and cause should be investigated. (Loose connection of components, etc.).

### Spark test

a) Before performing this test, ensure that the control unit and the control unit diode (if applicable) have been checked.

b) Disconnect the checker from the connector of the control unit output side (originally connected to the ignition coil).

(Vehicle wiring)



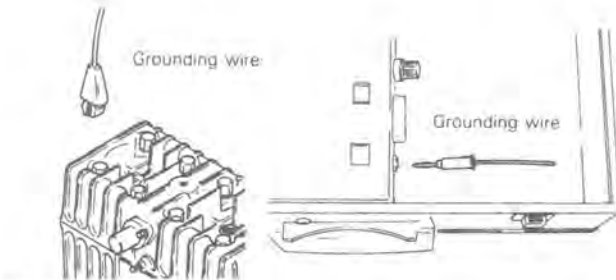
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## Section 04 ELECTRICAL

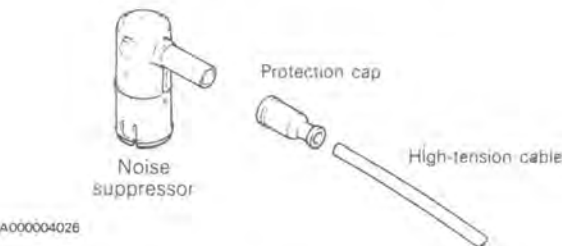
### Sub-section 06 (TESTING PROCEDURE)

- c) Connect the ignition coil connectors to the control unit connectors.
- d) Connect the grounding wire to the checker and to a bare surface of the engine.



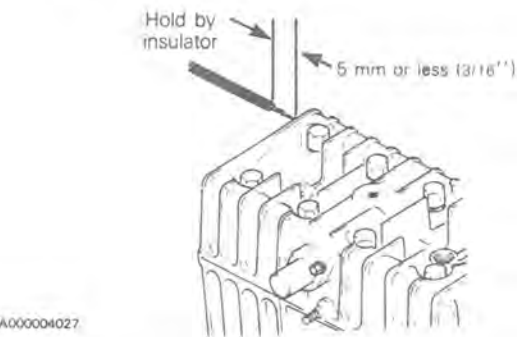
A000004025

- e) Set the selector to CONTROL UNIT position.
- f) Remove the noise suppressor and the protection cap from the end of high-tension wire.



A000004026

- g) Keep the distance 5 mm (3/16") or less between bare surface of the engine and end of high-tension cable and depress the START SWITCH. Then spark will take place between them.



A000004027

**WARNING:** Do not touch the high tension wire while doing the procedure. Hold high tension wire with an insulator.

#### Generator coil test

- a) This test should be performed at both HI & LO switch positions. Switch LO position and set the selector to GENERATOR COIL position.
- b) Crank the engine and read the LED level indicator. Reading should be:
  - for 4-4P: from 2 to 8
  - for 4-5P: from 2 to 8
- c) Switch to HI position and repeat procedure. Reading should be:
  - for 4-4P: from 3 to 8
  - for 4-5P: from 2 to 8

#### Control unit test

- a) To perform this test, switch can be at LO or HI position.
- b) Set the selector to CONTROL UNIT position.
- c) Depress START switch for **5 seconds** minimum and read LED level indicator. Reading should be:
  - for 4-4P: from 4 to 5
  - for 4-5P: from 4 to 5

#### Control unit diode test

**NOTE:** This test is applicable **only** to 4-5P ignition systems.

- a) Set the selector to CONTROL UNIT DIODE position. Then, four or five LED's will light. If four or five LED's do not light, check the power source and that the selector and switches are positioned correctly.
- b) Depress the START switch and read LED level indicator. Reading should be:
  - for 4-5P only: from 6 to 8



**Section 04 ELECTRICAL**  
Sub-section 06 (TESTING PROCEDURE)

## ANALYSIS OF TEST RESULT

After every test, perform the diagnosis comparing with the diagnostic chart as shown in below.

CODE NO.	IGNITION TYPE	CHECK PART	LEVEL INDICATOR										HARNESS	ENGINE TYPE
			0	1	2	3	4	5	6	7	8	9		
2	4-5P	Generator coil	HI										B	253,377,447, 462,467,503, 532,537
			LO											
		Control unit												
		Control unit diode												
			0	1	2	3	4	5	6	7	8	9		

If the reading of the LED level indicator is higher or lower than the correct value (OK zone), refer to "Analysis of test result" as described hereafter.

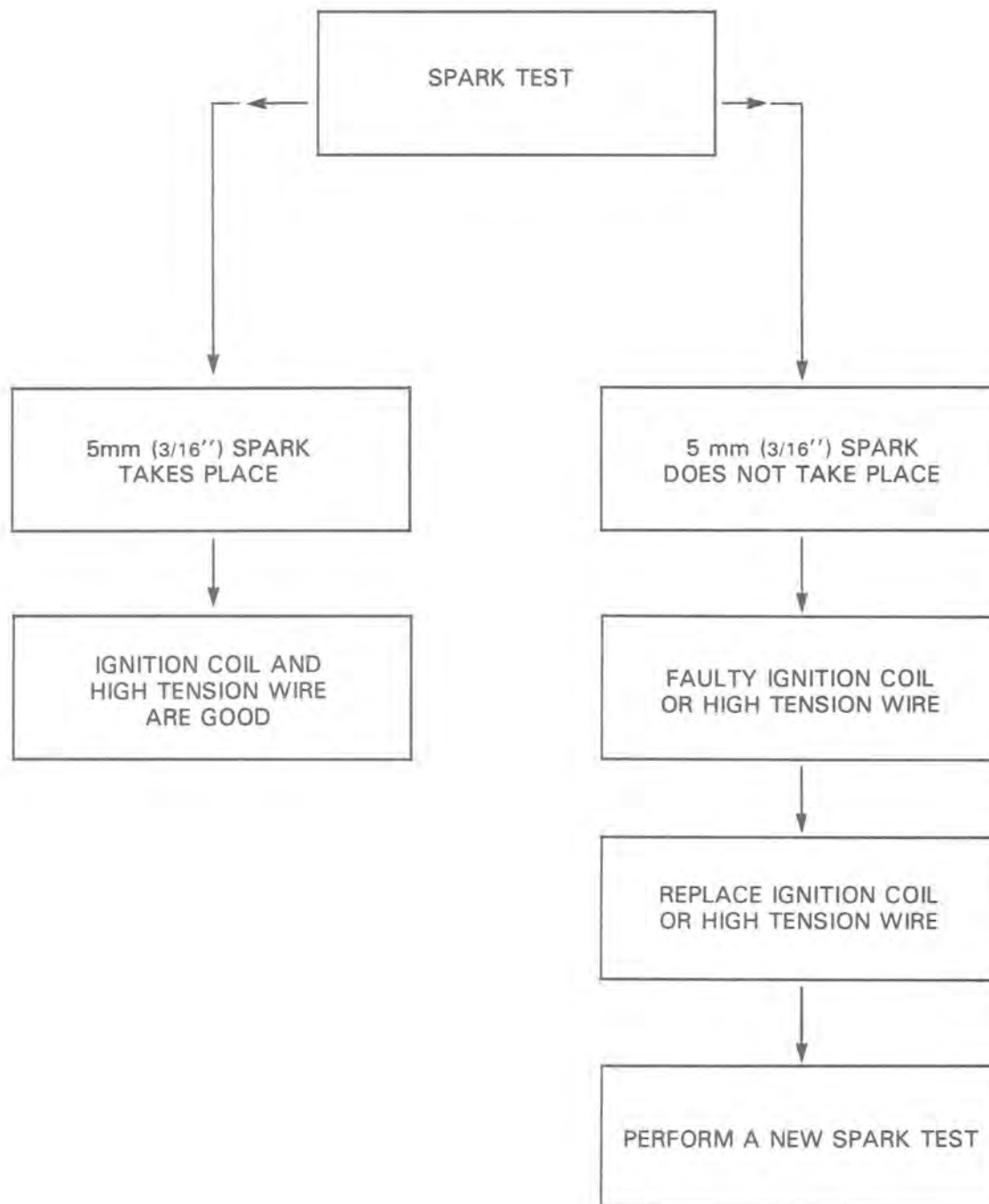
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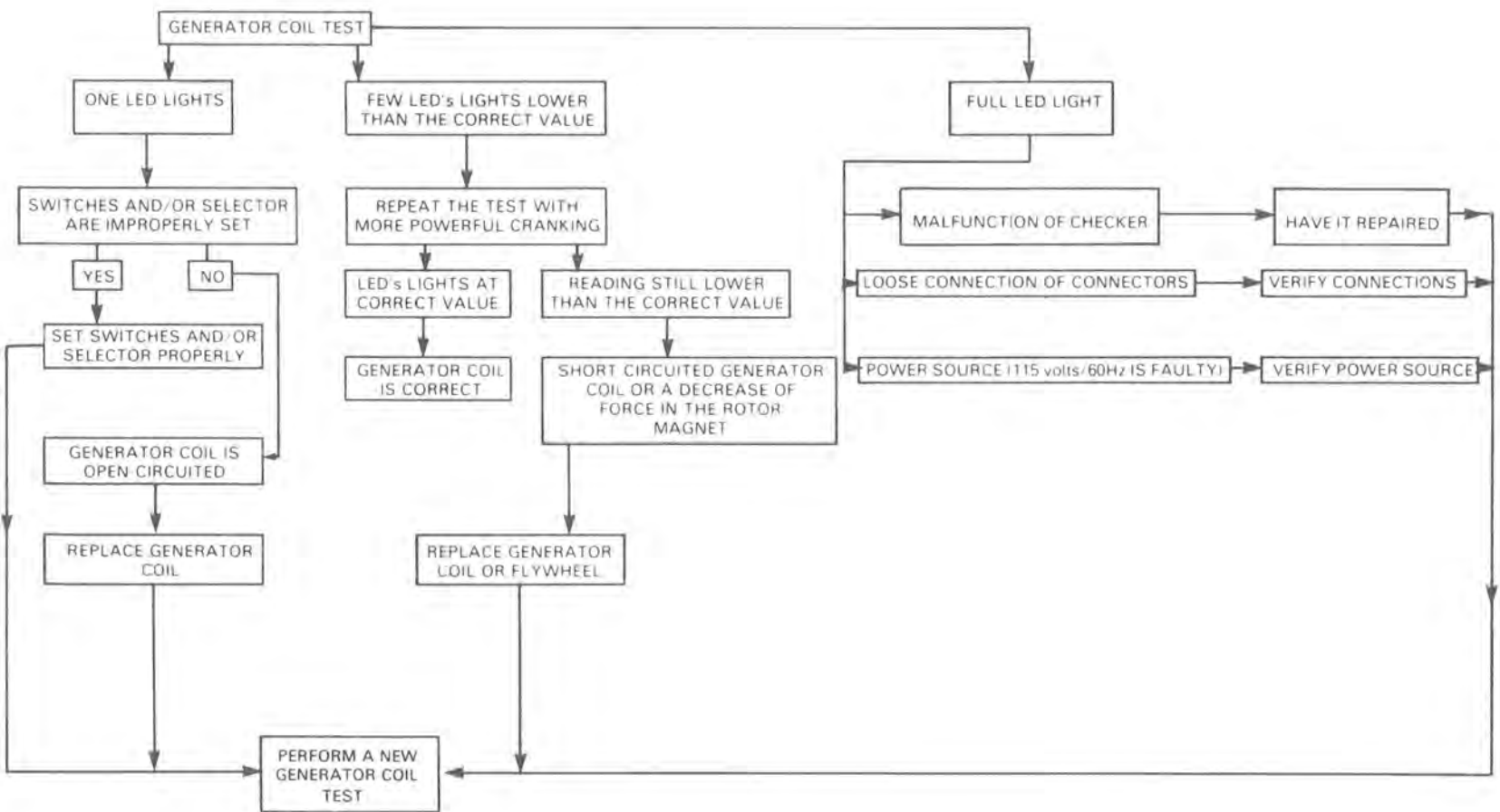
## Section 04 ELECTRICAL

### Sub-section 06 (TESTING PROCEDURE)

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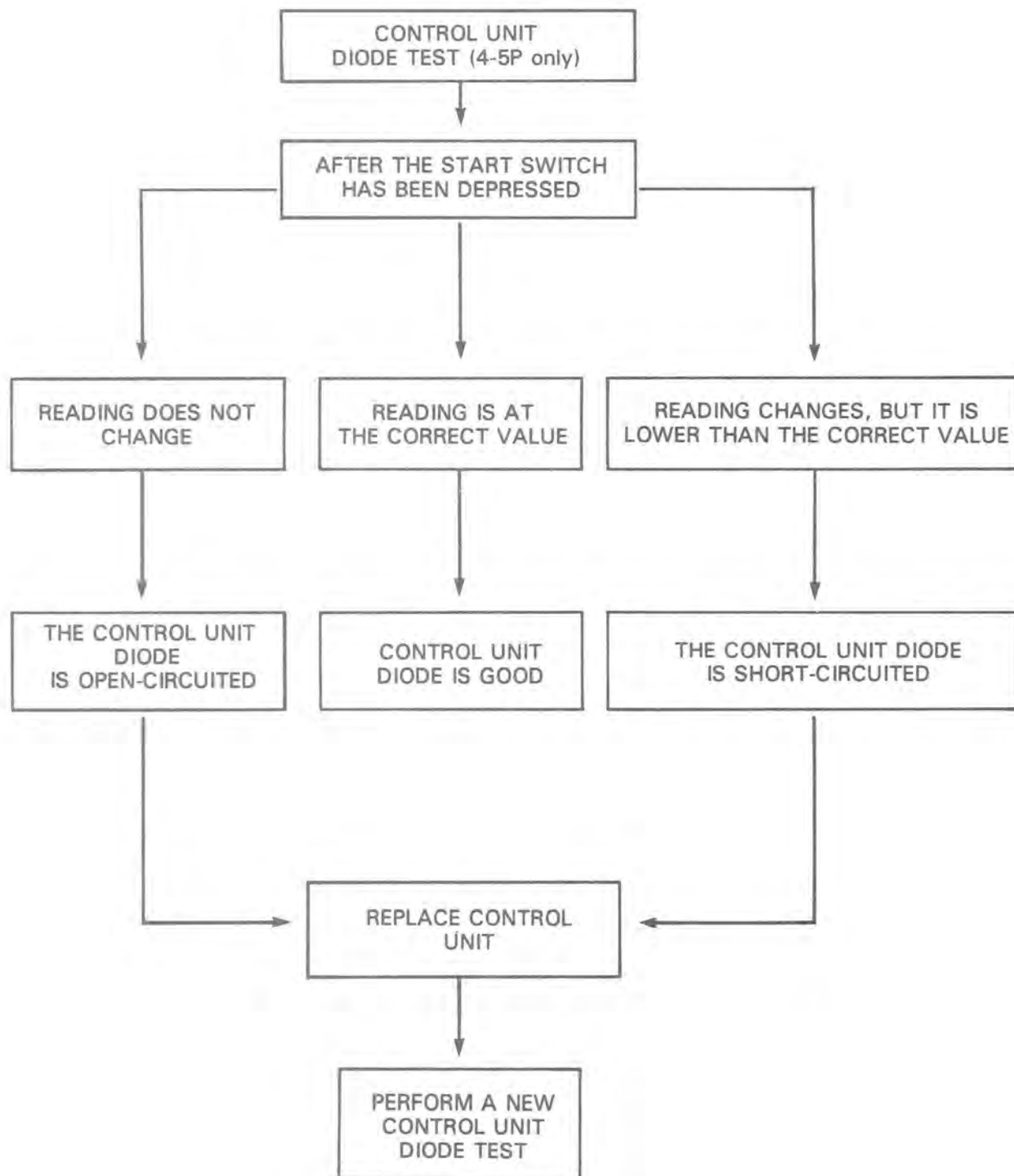
#### TROUBLE SHOOTING CHART — NIPPONDENSO CDI SYSTEMS





## Section 04 ELECTRICAL

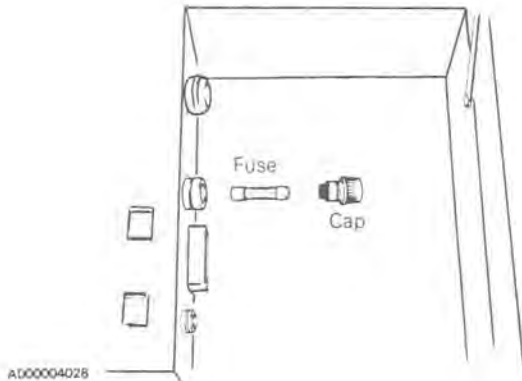
### Sub-section 06 (TESTING PROCEDURE)



## FUSE REPLACEMENT

If no LED lights, check fuse provided in checker.

- a) Unscrew the cap.
- b) Replace the fuse with new one (1 amps Midget glass tube type,  $\varnothing$  6.4 x 30 mm) if necessary.



## REPAIR AND AFTER-CARE SERVICE

In the event of a failure or fault calling for repair, contact Nippondenso Canada Ltd. It is strictly prohibited that the user should disassemble the instrument. Be aware that some semiconductors may be damaged even by static electricity stored in the human body.

Also, contact Nippondenso Canada Ltd, for the supply of accessories.

Nippondenso Canada Ltd.  
4500 Sheppard Avenue East, Unit 29  
Agincourt, Ontario  
Canada (M1S 3R6)

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## Section 04 ELECTRICAL

### Sub-section 06 (TESTING PROCEDURE)

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## VOLTAGE REGULATOR INSPECTION

A faulty voltage regulator is often responsible of frequent burned bulbs.

### TESTING PROCEDURE

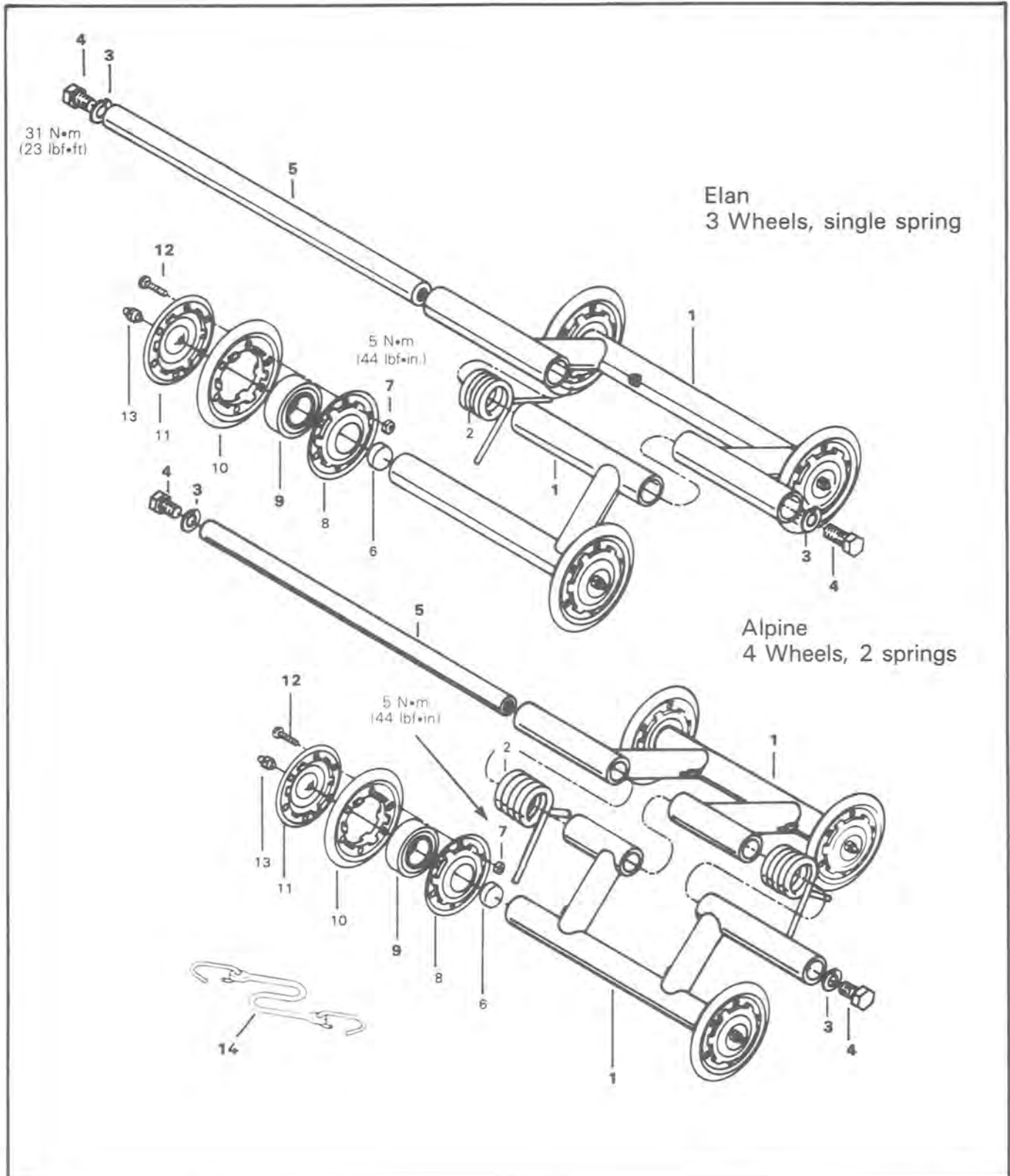
- The regulator ground must be checked to ensure the circuit is complete. If necessary, connect a good ground wire from the regulator to the engine.
- Check the regulator with a voltmeter.
- The lighting system must be turned on
- Connect the red wire of the voltmeter to the low beam white/blue wire at the bulb connector.
- Connect the black wire of the voltmeter to a good ground.
- Lift the rear of vehicle and support with a mechanical stand.
- Start the engine at an idle without opening the throttle.

◆ **WARNING:** Ensure the track is free of particles which might be thrown out while track is rotating. Keep hands, tools, feet and clothing clear of track. Ensure no-one is standing in close proximity to the vehicle.

- Slowly open the throttle and accelerate the engine to increase the RPM.
- If the meter reads over 15 volts, the regulator is defective and must be replaced.

▼ **CAUTION:** Do not increase the RPM so the voltage raise above 15 V, the bulb will burn.

## BOGIE WHEELS



## Section 05 SUSPENSION

### Sub-section 01 (BOGIE WHEELS)

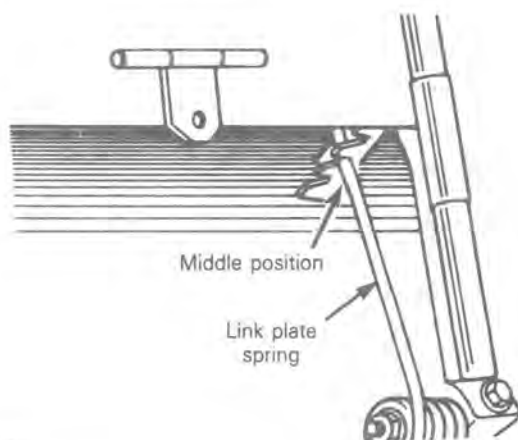
1. Wheel support
2. Spring
3. Lock washer (cross shaft)
4. Cap screw (cross shaft)
5. Cross shaft
6. Grease cap
7. Nut (flange)

8. Inner flange
9. Bearing
10. Wheel tire
11. Outer flange
12. Bolt (flange)
13. Grease fitting
14. Elastic band (Alpine)

## REMOVAL

Raise and block rear of vehicle off the ground.

Release track tension by unlocking the link plate springs using an appropriate tool.

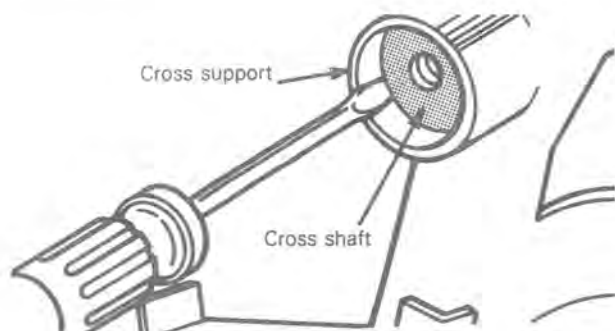


A002005001

### 3,4,5, Lock washers, cap screws & cross shafts

Starting at center bogie wheel set, remove bolts and lock washers securing cross shaft to frame.

**NOTE:** To prevent the cross shaft from rotating within the cross support, wedge a screwdriver blade between the cross shaft and cross support.



A002005002

Remove bogie wheel set.

**NOTE:** Since spring diameter may vary depending upon actual installation location, it is important to identify the installation of each bogie wheel set. Observe this position when reinstalling sets.

Repeat operation for remaining bogie wheel sets.

## DISASSEMBLY & ASSEMBLY

### 1, Wheel support

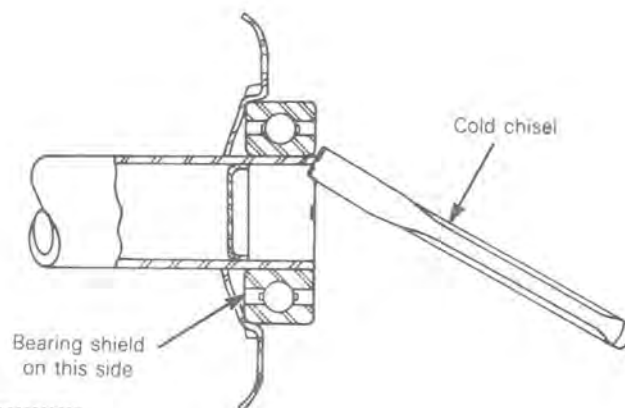
Heat spring anchor on wheel support before attempting to open or close anchor.

### 5, Cross shafts

Clean then lubricate cross shaft with low temperature grease (P/N 413 7044 00) before installation.

### 1,9, Wheel support & bearing

Always pull or push bearing by inner race. When installing bearing on wheel support, position bearing shield towards inner flange, then press down until bearing is sitting flush with support end. Then notch (3 notches) wheel support with a cold chisel to secure the bearing in place.



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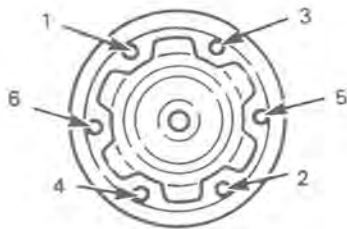


## Section 05 SUSPENSION

### Sub-section 01 (BOGIE WHEELS)

#### 7,12, Flanges nuts & bolts

Bogie wheels are factory riveted. When separation is necessary, remove rivets securing wheel tire and flanges using a 3/16" dia. drill. Secure flanges and tire using bolts (1/4-20 x 3/4") and nuts tighten in the following sequence to 5 N•m (44 lbf•in).



Torque sequence

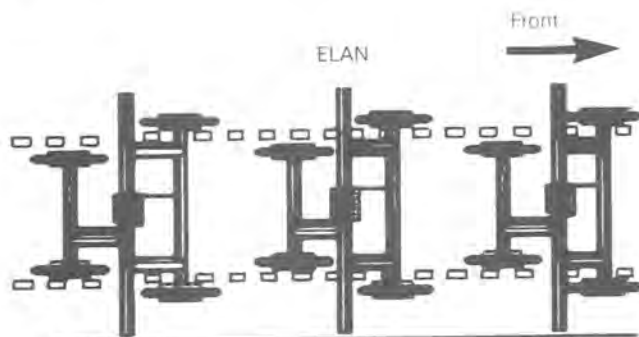
A002005004

## INSTALLATION

#### 3,4,5, Lock washers, capscrews & cross shafts

With rear of vehicle supported off the ground, position front bogie wheel set in location and secure to frame using lock washers and capscrews. Secure rear set then remaining set(s) to frame.

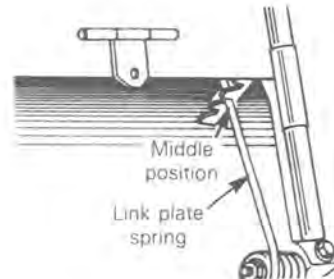
NOTE: On Elan models, put the wider portion of bogie wheel to the front direction of vehicle.



A002005005

Using an appropriate tool, apply track tension by hooking the link plate springs into the anchors.

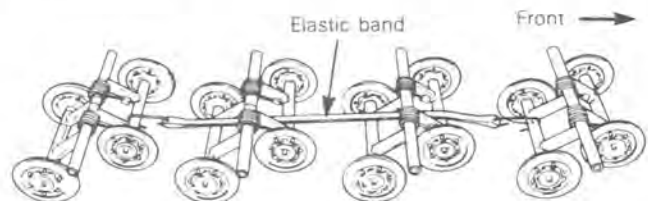
NOTE: If applicable, place spring ends in middle position of the 3 position slotted anchor.



A002005001

#### 1,14, Wheel support & elastic band

On Alpine models it is necessary to place an elastic band between rear tube of front bogie and front tube of rear bogie. This will prevent center bogies from tipping up.



A017005001

Lubricate each bogie wheel until new grease appears at joint. Wipe off excess grease (grease N/P 413 7056 00).

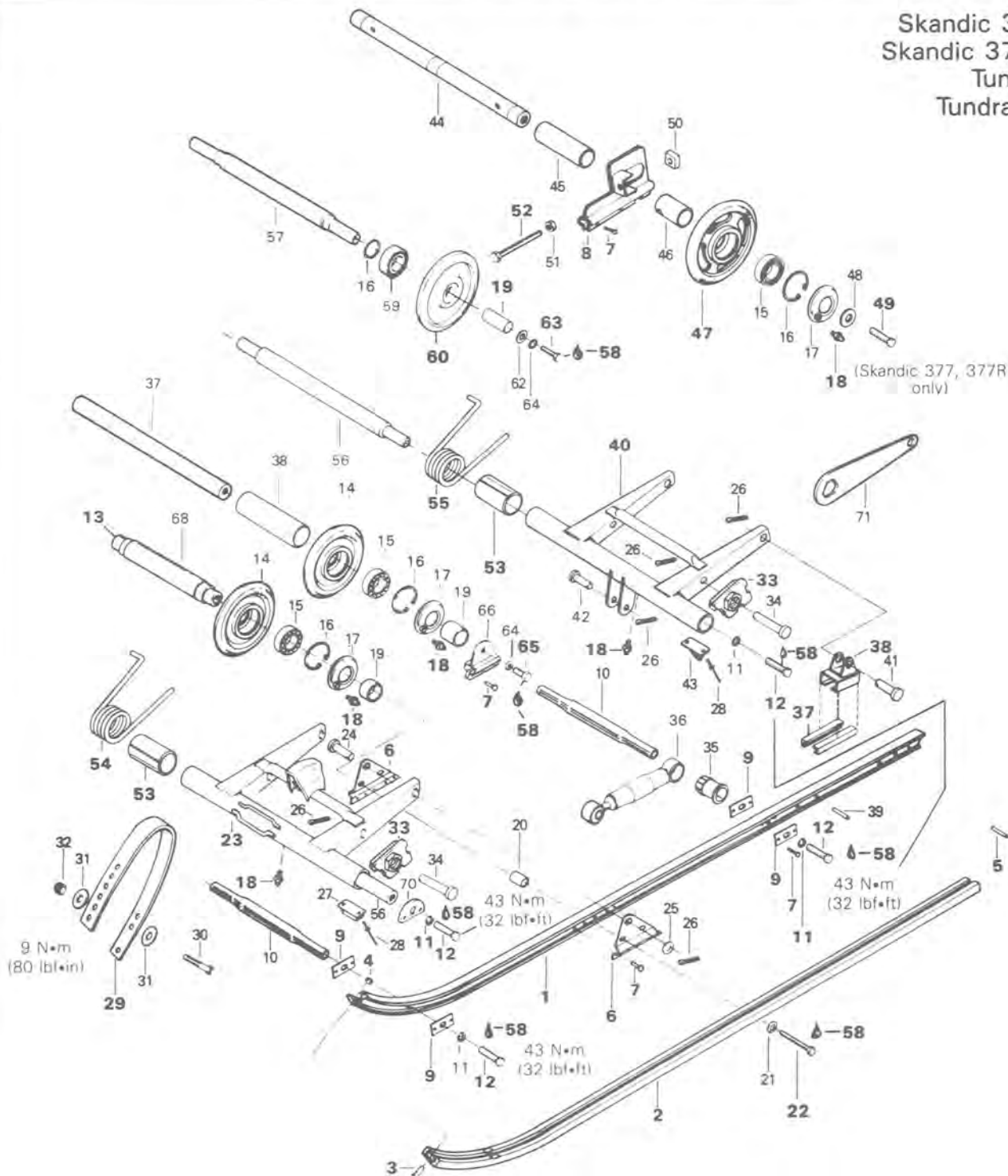
NOTE: To adjust the track tension and alignment refer to section 05-08.



## SLIDE SUSPENSION

### "TORQUE REACTION" TYPE SUSPENSION

Skandic 377  
Skandic 377R  
Tundra  
Tundra LT




## Section 05 SUSPENSION

### Sub-section 02 (SLIDE SUSPENSION)

1. Runner
2. Slider shoe
3. Screw
4. Stop nut
5. Spirol pin
6. Front arm bracket
7. Rivet
8. Adjustment plate
9. Reinforcement bracket
10. Tube
11. Lock washer
12. Screw
13. Front idler shaft
14. Idler wheel
15. Bearing
16. Retainer ring
17. Cap (Skandic 377, 377R only)
18. Grease fitting
19. Spacer
20. Spacer
21. Lock washer
22. Screw
23. Front arm
24. Clevis pin
25. Flat washer
26. Cotter pin
27. Rubber stopper
28. Rivet
29. Stopper strap
30. Screw
31. Washer
32. Stop nut
33. Adjustment cam
34. Clevis pin
35. Bushing
36. Shock absorber
37. Slider pad
38. Sliding support
39. Spirol pin
40. Rear arm
41. Clevis pin
42. Clevis pin
43. Rubber stopper
44. Rear axle
45. Spacer
46. Spacer
47. Idler wheel
48. Washer
49. Screw
50. Square nut
51. Nut
52. Adjustment screw
53. Bushing
54. Front spring
55. Rear spring
56. Cross shaft
57. Upper idler shaft
58. Loctite 242
59. Bearing
60. Idler wheel
61. Flat washer
62. Lock washer
63. Screw
64. Lock washer
65. Screw
66. Wheel support
67. Center idler shaft
68. Spacer tube
69. Bushing
70. Washer
71. Suspension adjustment wrench

## REMOVAL

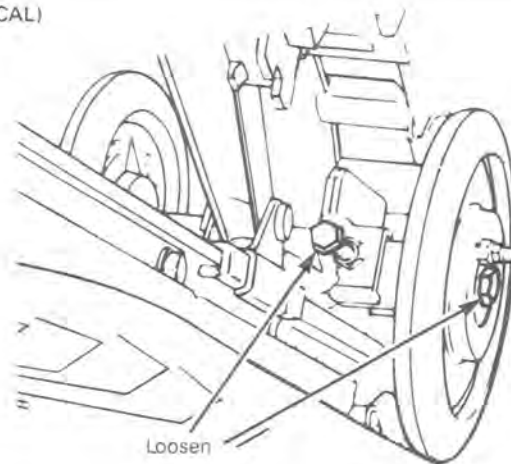
 **NOTE:** To prevent cross shaft screws assembled with Loctite from turning while unscrewing, proceed as follow:

- Loosen one screw then retighten.
- Remove the other screw.
- Remove the first one.

### 49,52, Screw & adjustment screw

Release track tension by loosening wheel retaining screw and adjustment screw located on inner side of rear idler wheel.

(TYPICAL)



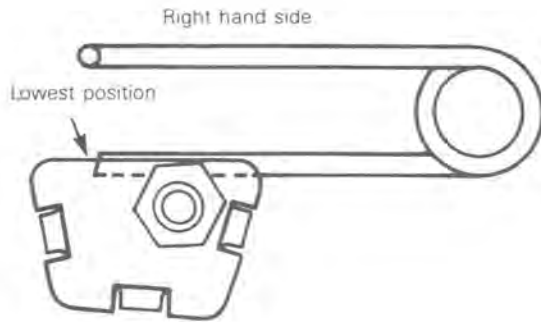
A009005001

### 33, Adjustment cams

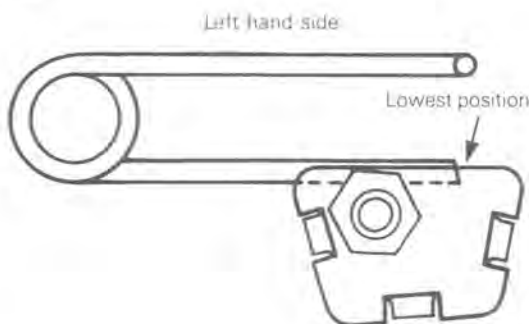
Position the adjustment cams (front and rear) at the lowest position.

## Section 05 SUSPENSION

### Sub-section 02 (SLIDE SUSPENSION)



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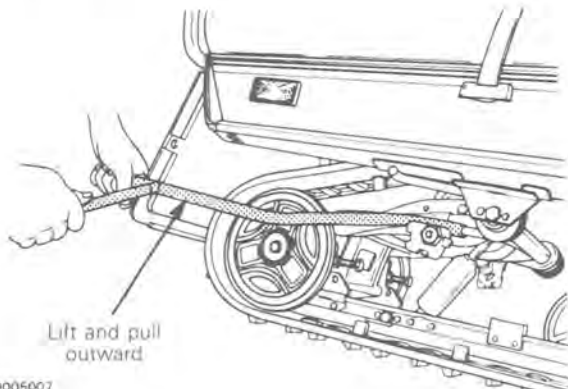


A007005001

 **NOTE:** Use spring installer P/N 529 0050 00 to remove and install suspension springs.



A000002054



A009005007

#### 55, Rear springs

Unhook rear springs.

#### 60,63, Upper idler wheel & screw

Remove both screws then upper idler wheel set.

#### 12,40, Screws & rear arm

Remove both screws securing rear arm to frame.

Plug vent holes in chaincase filler cap and oil injection reservoir cap with a wire to prevent leaks.

Using appropriate equipment, lift rear of vehicle.

#### 54, Front springs

Unhook front springs.

#### 12,23, Screws & front arm

Remove both screws securing front arm to frame.

### DISASSEMBLY & ASSEMBLY

#### 29, Stopper strap

Inspect strap for wear or cracks, bolt and nut for tightness. If loose, inspect hole for deformation. Replace as required. Make sure it is attached through the 2nd hole from its end. Torque nut to 9 N•m (80 lbf•in).



A000005018

#### 1,2,3,4,5, Runners, slider shoes, screws, stop nuts & spirol pins

To replace a worn slider shoe, remove the rear spirol pin, the front screw and stop nut then slide the shoe rearwards out of the runner.

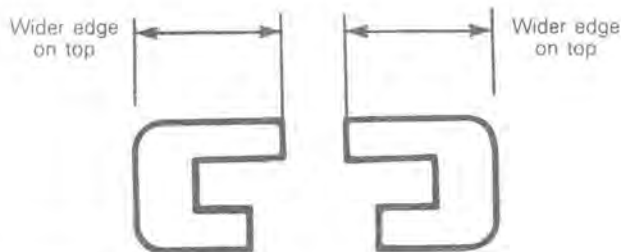
 **CAUTION:** Slider shoes must always be replaced in pair.

## Section 05 SUSPENSION

### Sub-section 02 (SLIDE SUSPENSION)

#### 37, Slider pad

Install the wider edge on top (each side of the runner.).



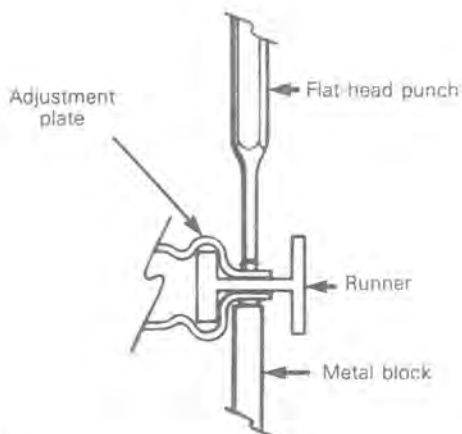
A003005002

**CAUTION:** Make sure slider pads are well installed. Check sliding action when sliding supports are installed.

#### 7,8, Rivets & adjustment plates

To remove the rivets securing the adjustment plate on the front arm supports, cut-off the rivet heads using a cold chisel.

At assembly, position the rivet head on a suitable metal block and hold the assembly firmly in place. With a flat head punch and hammer secure the rivet in place.



A007005002

#### 7,9, Rivets & reinforcement bracket

To remove rivet use a 3/16" dia. drill. At assembly secure reinforcement bracket to runner with two (2) 10-32 x 1/2" bolts and nuts.

#### 6,13, Front arm bracket & front idler shaft

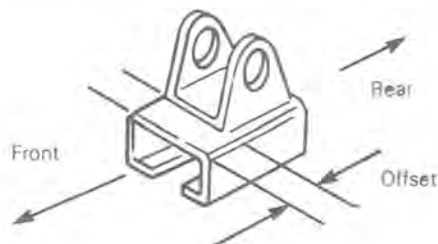
The front idler shaft must be positioned in the front hole of the front arm bracket.



A007005003

#### 37, Sliding support

Sliding support must be installed with offset toward front.



A007005005

#### 12,22,58,63,65, Screws & Loctite 242

Clean all screw threads. Prior to assembling, apply low temperature grease (P/N 413 7044 00) on cross shafts and Loctite 242 or equivalent on threads.

#### 53,54,55, Bushings, front & rear springs

Prior to assembly, identify front and rear springs. Make sure to insert nylon bushings inside springs.

## Section 05 SUSPENSION

### Sub-section 02 (SLIDE SUSPENSION)

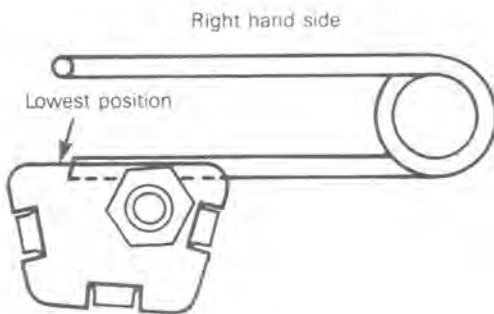
Spring location	Model	Color
Front	Tundra Tundra LT Skandic 377 Skandic 377R	Midnight blue
Rear	Tundra Tundra LT	Violet
	Skandic 377 Skandic 377R	Orange

## INSTALLATION

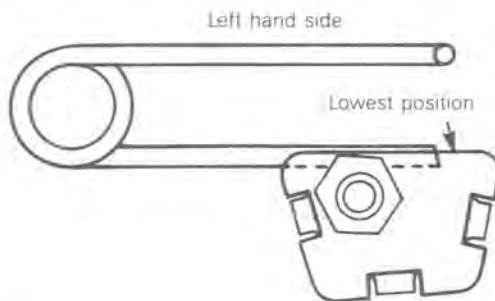
### Preparation

#### 33, Adjustment cams

At assembly, position the adjustment cams at the lowest position.



A007005004



A007005001

#### 47, Rear idler wheels

Unscrew adjustment screws as far as possible to push the rear axle forward.

### Installation

Lift the rear of vehicle, install front portion of suspension into frame.

(TYPICAL)



Installing front portion of suspension

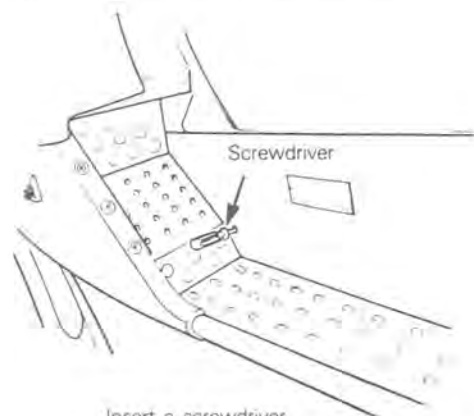
A003005007

#### 12,23,56, Screw, front arm & cross shaft

Insert a screwdriver into one side of frame to maintain cross shaft when installing screw into hole of other side. Do not tighten.

Replace the screwdriver by the right screw.

(TYPICAL)



Insert a screwdriver on one side to maintain cross shaft

A003005008

## Section 05 SUSPENSION

### Sub-section 02 (SLIDE SUSPENSION)

#### 12,40,56, Screw, rear arm & cross shaft

Lower the vehicle to install screws into rear cross shaft.

— Reposition vehicle on ground.

Remove chaincase and oil injection reservoir vent hole wires.

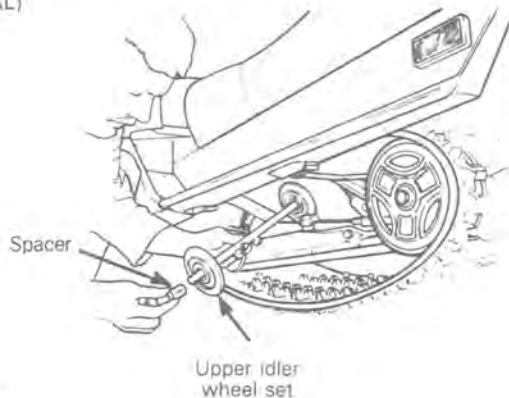
#### 12, Screw

Torque four suspension retaining screws to 43 N•m (32 lbf•ft).

#### 19,60,63, Upper idler wheel, spacer & screw

Reinstall upper idler wheels set. Make sure to install spacers on shaft ends.

(TYPICAL)



A003005010

#### 54,55 Front & rear springs

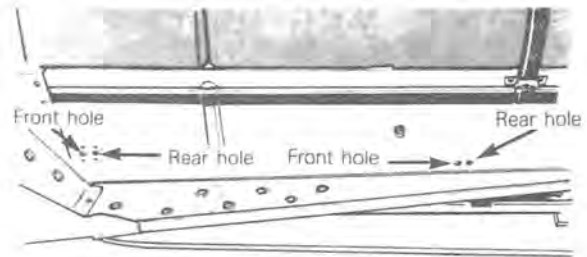
Make sure adjustment cams are at the lowest position, install springs.

○ **NOTE:** The holes in the frame provide the possibility of locating the suspension arms for easier track tension adjustment (13 mm (1/2) clearance). It means that if the slide suspension adjustment screws are at the maximum adjustment and the suspension arms are at the front holes in the frame, it is possible to move the suspension arms at the rear holes and obtain greater track tension adjustment.

▼ **CAUTION:** Ensure that suspension arms are at the same position on each side of the frame to avoid any damage to the suspension system and to the track.

▼ **CAUTION:** Ensure that front and rear suspension arms are at the same position on each end (front, rear) of the frame to avoid any damage to the suspension system and to the track.

(TYPICAL)



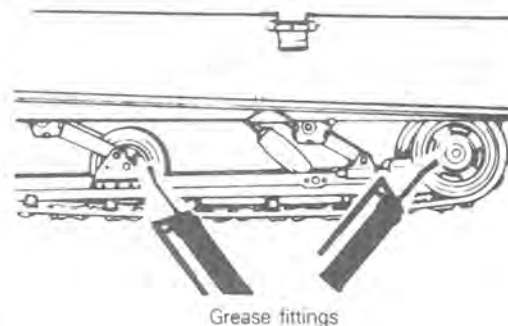
A007005011

○ **NOTE:** To adjust the track tension and alignment refer to section 05-08.

#### 18, Grease fittings (Skandic 377, 377R only)

If necessary, lubricate the idler wheels and swing arms at grease fittings until grease appears at joints. Use low temperature grease only (P/N 413 7056 00).

(TYPICAL)



A007005012

## RIDE ADJUSTMENT

### Adjustment cams

The front adjustment cams are used for snow condition, and the rear for driver's weight. The front adjustment cams should be positioned at the highest elevation for deep snow conditions. A lower elevation is preferred when negotiating icy snow.



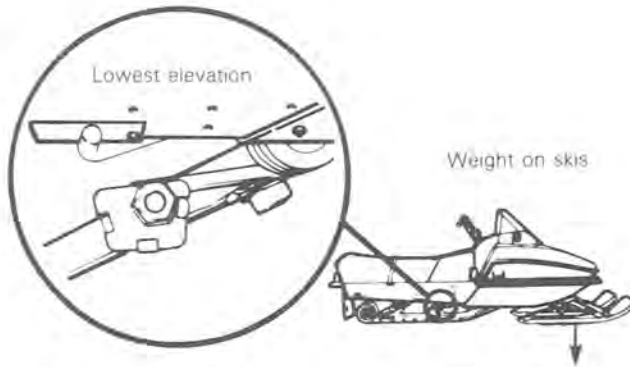
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## Section 05 SUSPENSION

### Sub-section 02 (SLIDE SUSPENSION)

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The rear adjustment blocks should be adjusted to rider preference.



A007005013

▼ **CAUTION:** Always turn left side adjustment cams in a clockwise direction, the right side cams in a counterclockwise direction. Left and right adjustment cams of each adjustment (front and rear), must always be set at the same elevation.

#### Stopper strap

The function of the suspension stopper strap is to control the transfer of vehicle weight during acceleration. The longer the belt, the more the weight will be transferred to the track to provide a better traction. The shorter the belt, the lesser the weight transferred to the track, thus maintaining a more positive direction. Adjusting holes on the stopper strap allow to adjust it according to drivers' requirements, field and/or snow conditions.

For normal use locate bolt through 2nd hole from strap end.

◆ **WARNING:** Always torque the nut to 9 N•m (80 lbf•ft).



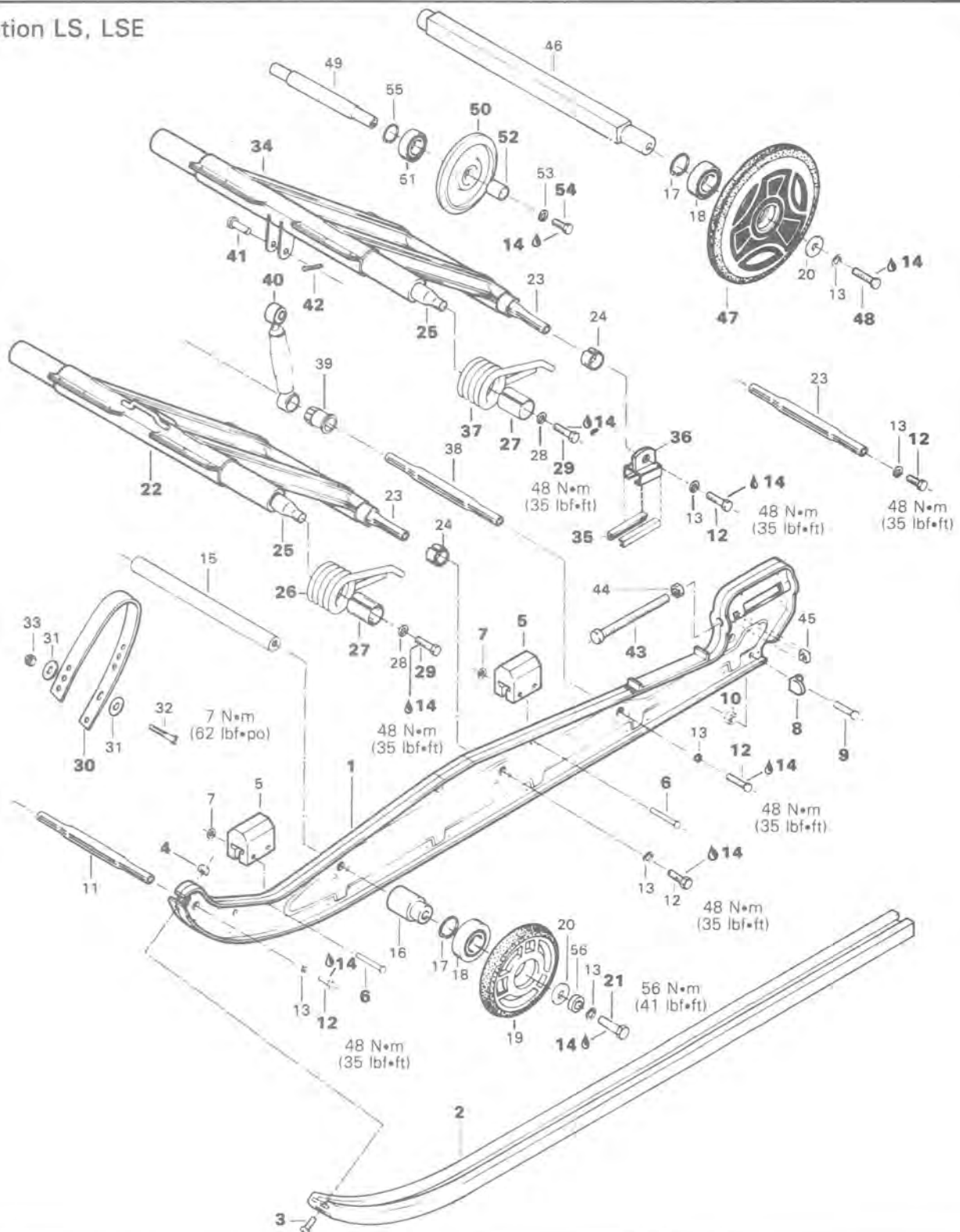
A000005018

## Section 05 SUSPENSION

### Sub-section 02 (SLIDE SUSPENSION)

#### "TORQUE REACTION" TYPE SUSPENSION

Citation LS, LSE




## Section 05 SUSPENSION

### Sub-section 02 (SLIDE SUSPENSION)

1. Runner (2)
2. Slider shoe (2)
3. Screw M5 x 20 (2)
4. Stop nut M5 (2)
5. Rubber stopper (4)
6. Rivet (4)
7. Push nut (4)
8. Stopper (2)
9. Screw M5 x 12 (2)
10. Stop nut M5 (2)
11. Lower front cross shaft
12. Screw M10 x 25 (10)
13. Lock washer 10 mm (14)
14. Loctite 242
15. Front idler shaft
16. Idler wheel shaft (2)
17. Snap ring (4)
18. Ball bearing (4)
19. Idler wheel 135 mm (2)
20. Flat washer 10 mm (4)
21. Screw M10 x 90 (2)
22. Front arm
23. Lower cross shaft (3)
24. Bushing (4)
25. Upper cross shaft (2)
26. Front spring (2)
27. Bushing (4)
28. Lock washer 10 mm (4)
29. Screw M10 x 35 (4)
30. Stopper strap
31. Flat washer (2)
32. Screw M8 x 35
33. Stop nut M8
34. Rear arm
35. Slider pad (2)
36. Sliding support (2)
37. Rear spring (2)
38. Shock absorber cross shaft
39. Bushing
40. Shock absorber
41. Clevis pin
42. Cotter pin
43. Adjustment screw M10 x 75 (2)
44. Stop nut M10 (2)
45. Square nut M10 (2)
46. Rear axle
47. Idler wheel 190 mm (2)
48. Screw (2)
49. Upper cross shaft
50. Idler wheel (2)
51. Ball bearing (2)
52. Spacer (2)
53. Lock washer (2)
54. Screw M8 x 25 (2)
55. Snap ring (2)
56. Flat washer 10.5 mm


## REMOVAL

 **NOTE:** To prevent cross shaft screws assembled with Loctite from turning while unscrewing, proceed as follow:

- Loosen one screw then retighten.
- Remove the other screw.
- Remove the first one

### 43, Adjustment screws

Release track tension by loosening adjustment screws located on inner side of rear idler wheels.

 **NOTE:** It is not required to loosen rear axle screws



A003005001

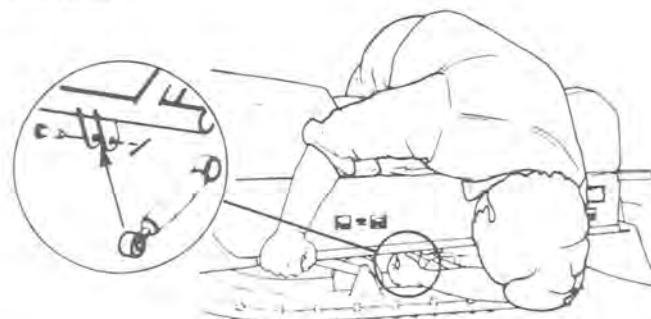
### 50,54, Upper idler wheel & screw

Remove both screws then upper idler wheels set.

### 40,41,42, Shock absorber, clevis pin & cotter pin

Apply downward pressure on the frame. Remove the cotter pin locking the shock absorber clevis pin and detach the shock absorber by removing the clevis pin.

(TYPICAL)



A007005009

## Section 05 SUSPENSION

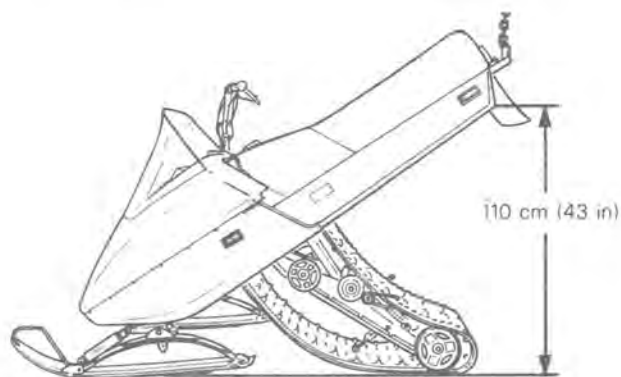
### Sub-section 02 (SLIDE SUSPENSION)

#### 29,34, Rear arm & screws

Remove both screws securing rear arm to frame.

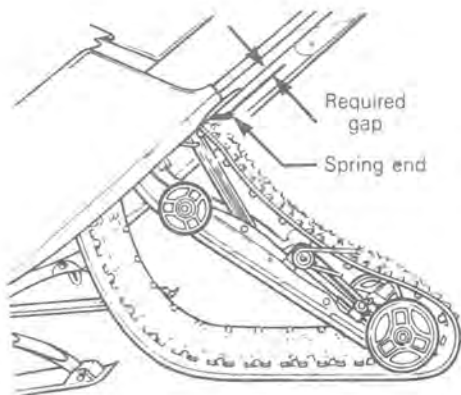
Plug vent holes in chaincase filler cap and oil injection reservoir cap with a wire to prevent leaks.

Using appropriate equipment, lift rear of vehicle at least 110 cm (43 in).



A003005013

Check that there is a gap between springs end and the frame. Thus no pressure acts on the suspension.



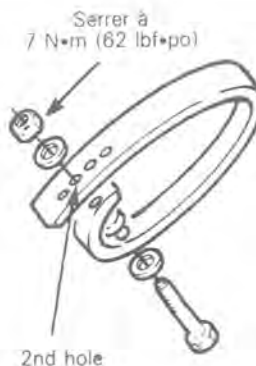
A003005006

Remove both screws securing the front arm to frame.

## DISASSEMBLY & ASSEMBLY

#### 30, Stopper strap

Inspect strap for wear or cracks, bolt and nut for tightness. If loose, inspect hole for deformation. Replace as required. Make sure it is attached through the 2nd hole from its end. Torque nut to 7 N•m (62 lbf•in).



A000005018

#### 1,2,3,4,8,9,10, Runners, slider shoes, stoppers, screws & stop nuts

To replace a worn slider shoe, remove the stopper fasteners, the front screw and stop nut then slide the shoe rearwards out of the runner.

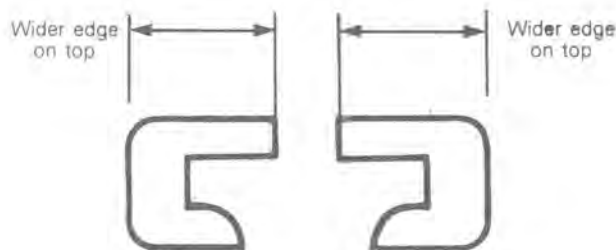
**CAUTION:** Slider shoes must always be replaced in pair.

#### 5,6,7, Rubber stoppers, rivets & push nuts

Pry off push nut with a screwdriver to remove. To install, press push nut while retaining rivet.

#### 35, Slider pad

Install the wider edge on top (each side of the runner).



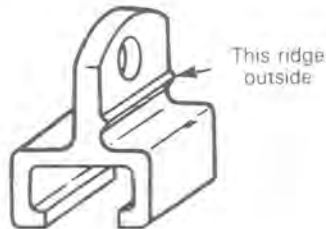
A003005062

## Section 05 SUSPENSION

### Sub-section 02 (SLIDE SUSPENSION)

#### 36, Sliding support

Must be installed with identification ridge outside.



A003005003

#### 12,14,21,29,48,54, Screws & Loctite 242

Clean all screw threads. Prior to assembling, apply low temperature grease (P/N 413 7044 00) on cross shafts and Loctite 242 or equivalent on threads.

#### 26,27,37, Bushings, front & rear springs

Prior to assembly, identify springs location. Make sure to insert nylon bushing inside springs.

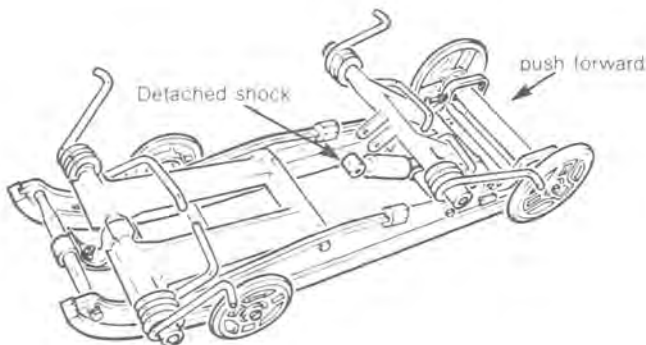
Front springs: Midnight blue

Rear springs: Black

## INSTALLATION

### Preparation

Prepare the suspension ass'y as shown. Make sure the shock absorber is detached.



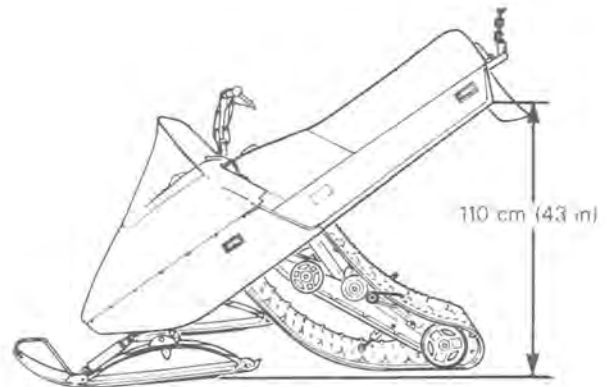
A003005004

#### 47, Rear idler wheels

Unscrew adjustment screws as far as possible to push the rear axle forward.

### Installation

Lift the rear of vehicle at least 110 cm (43 in).



A003005013

Install front portion of suspension into frame.



Installing front portion  
of suspension

A003005007

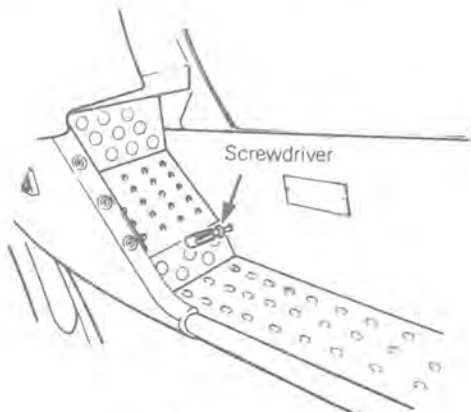
#### 22,25,29, Front arm, cross shaft & screw

Insert a screwdriver into one side of frame to maintain cross shaft when installing screw into hole of other side. Do not tighten.

## Section 05 SUSPENSION

### Sub-section 02 (SLIDE SUSPENSION)

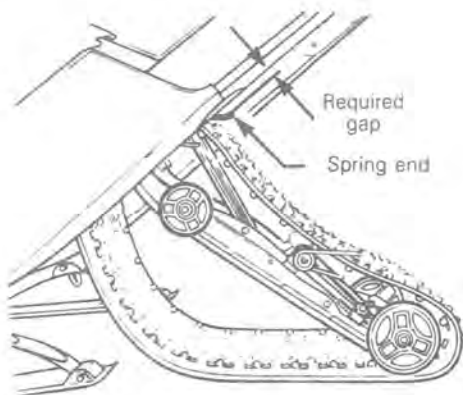
Replace the screwdriver by the right screw.



Insert a screwdriver  
on one side to  
maintain cross shaft

A003005008

**NOTE:** For an easy installation, a gap should exist between the spring end and the frame. Thus no pressure acts on the suspension.



A003005008

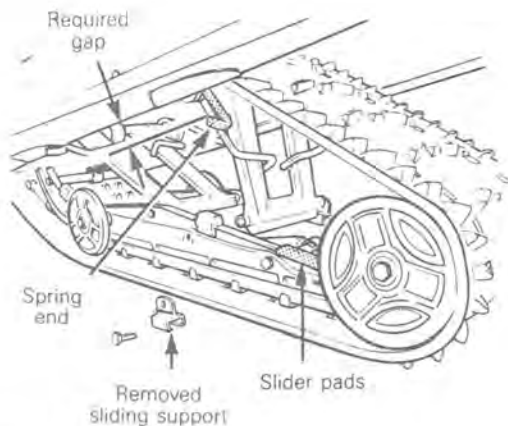
#### 12,34,36, Screw, rear arm & sliding support

Remove screw and sliding support from one side only. Withdraw rear arm from runners.

#### 25,29,34, Cross shaft, screw & rear arm

Attach rear arm to frame. Do not tighten screws.

- Let down rear of vehicle just enough to keep a gap between rear spring end and bottom of frame when rear arm is close to slider pads.



A003005009

#### 12,36, Screw & sliding support

Slide rear arm side with sliding support over slider pads. Re-install removed sliding support and screw. Torque screw to 48 N•m (35 lbf•ft).

**CAUTION:** Make sure slider pads **35** are well installed. Check sliding action when sliding supports are installed.

- Reposition vehicle on ground.
- Remove chaincase and oil injection reservoir vent hole wires.

#### 29, Screw

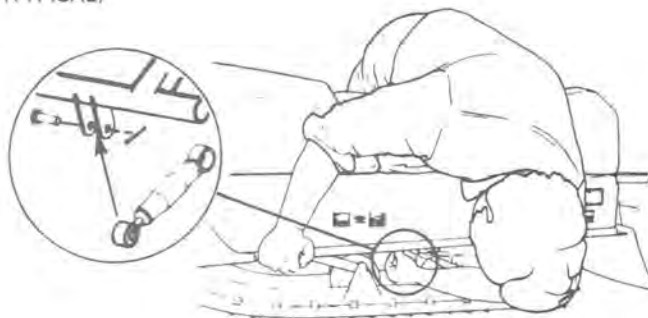
Torque four suspension retaining screws to 48 N•m (35 lbf•ft).

#### 40,41,42, Shock absorber, clevis pin & cotter pin

Apply downward pressure on the frame.

Secure the extended shock with clevis pin and a new cotter pin.

(TYPICAL)



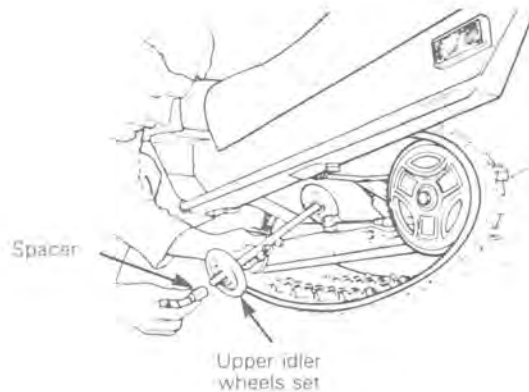
A007005009

## Section 05 SUSPENSION

### Sub-section 02 (SLIDE SUSPENSION)

#### 50,52,54, Upper idler wheel, spacer & screw

Reinstall upper idler wheels set. Make sure to install spacers on shaft ends.



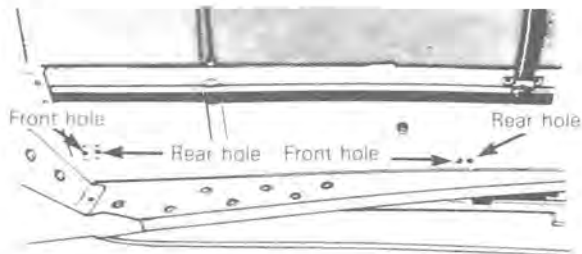
A003005010

**NOTE:** The holes in the frame provide the possibility of locating the suspension arms for easier track tension adjustment (13 mm (1/2'') clearance). It means that if the slide suspension adjustment screws are at the maximum adjustment and the suspension arms are at the front holes in the frame it is possible to move the suspension arms at the rear holes and obtain greater track tension adjustment.

**CAUTION:** Ensure that suspension arms are at the same position on each side of the frame to avoid any damage to the suspension system and to the track.

**CAUTION:** Ensure that front and rear suspension arms are at the same position on each end (front, rear) of the frame to avoid any damage to the suspension system and to the track.

(TYPICAL)



A007005011

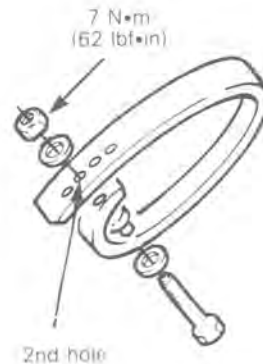
**NOTE:** To adjust the track tension and alignment, refer to section 05-08.

#### Stopper strap

The function of the suspension stopper strap is to control the transfer of vehicle weight during acceleration. The longer the belt, the more the weight will be transferred to the track to provide a better traction. The shorter the belt, the lesser the weight transferred to the track, thus maintaining a more positive direction. Adjusting holes on the stopper strap allow to adjust it according to drivers' requirements, field and/or snow conditions.

For normal use locate bolt through 2nd hole from strap end.

**WARNING:** Always torque the nut to 7 N•m (62 lbf•ft).



A000005018





## TRS 6 SUSPENSION

This exploded view diagram illustrates the assembly of a vehicle chassis. The main components shown include the front and rear frames (1, 2), suspension arms (3, 4), steering knuckles (5, 6), wheels (7, 8), and various suspension and steering components (9-28). The diagram uses numbered callouts to identify individual parts and includes torque specifications for several key assembly points:


- 10 N•m (89 lbf•in) for the steering knuckle nut (37).
- 44 N•m (32 lbf•ft) for the wheel hub nut (21), the rear suspension arm nut (49), and the front suspension arm nut (48).
- 41 N•m (30 lbf•ft) for the steering knuckle nut (33) and the rear suspension arm nut (46).

## Section 05 SUSPENSION

### Sub-section 03 (TRS 6 SUSPENSION)

1. Runner (2)
2. Slider shoe (2)
3. Cylinder slotted head machine screw M5 x 20 (2)
4. Hexagonal elastic stop nut M5 (2)
5. Spirol pin (2)
6. Front wheel support (2)
7. Reinforcement strip (2)
8. Rivet (36)
9. Front arm support (2)
10. Wheel support (2)
11. R.H. adjustment plate  
L.H. adjustment plate
12. Rubber stopper (4)
13. Rivet (8)
14. Push nut (8)
15. Cross shaft
16. Spacer tube
17. Snap ring (2)
18. Ball bearing (2)
19. Idler wheel
20. Grease fitting (2)
21. Hexagonal head cap screw M10 x 35 (2)
22. Lower front cross shaft
23. Front arm
24. Grease fitting (2)
25. Hexagonal head cap screw M10 x 35 (2)
26. R.H. adjustment cam (2)  
L.H. adjustment cam (2)
27. Flat washer (4)
28. Cotter pin (4)
29. Upper front cross shaft
30. R.H. front spring  
L.H. front spring
31. Bushing (4)
32. Lock washer 10 (4)
33. Hexagonal head cap screw M10 x 35 (4)
34. Stopper strap
35. Hexagonal head cap screw M8 x 45
36. Washer (2)
37. Hexagonal elastic stop nut 8 mm
38. Center axle
39. Snap ring (2)
40. Ball bearing (2)
41. Idler wheel (2)
42. Washer (2)
43. Spacer tube (2)
44. Hexagonal head cap screw M10 x 35 (2)
45. Swaged tube
46. Shock absorber
47. Auto-lock bushing
48. Reinforcement bracket (4)
49. Hexagonal head cap screw M10 x 35 (2)
50. Clevis pin
51. Cotter pin
52. Pivot arm
53. Pivot shaft (2)
54. Hexagonal head cap screw M8 x 20 (4)
55. Lock washer 8 mm (4)
56. Rear arm
57. Grease fitting
58. Idler shaft
59. Snap ring (2)
60. Ball bearing (2)
61. Idler wheel (2)
62. Spacer (2)
63. Lock washer 8 mm (2)
64. Hexagonal head cap screw M8 x 25 (2)
65. Rear cross shaft
66. Bushing (2)
67. Rear R.H. spring  
Rear L.H. spring
68. Rear axle
69. Spacer tube
70. Spacer tube (2)
71. Snap ring
72. Ball bearing (2)
73. Idler wheel
74. Washer (2)
75. Hexagonal head cap screw M10 x 35 (2)
76. Square nut (2)
77. Hexagonal nut M10 (2)
78. Hexagonal adjustment screw M10 x 110 (2)
79. Hexagonal wrench (cam adjustment)
80. Loctite 242

## REMOVAL

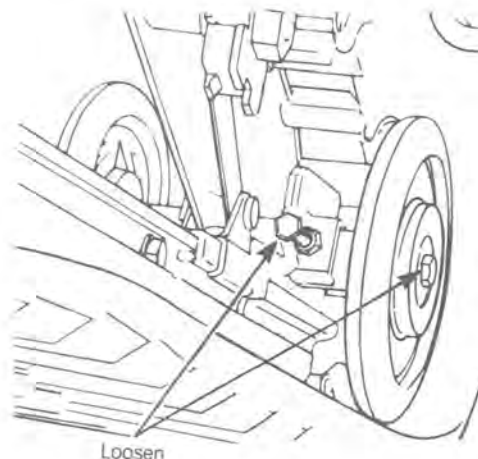
 **NOTE:** To prevent cross shaft screws assembled with loctite from turning while unscrewing, proceed as follow:

- Loosen one screw then retighten.
- Remove the other screw.
- Remove the first one.

### 75,78 Screw, adjustment screw

Release track tension by loosening wheel retaining screws and adjustment screws located on inner side of rear idler wheels.

(TYPICAL)



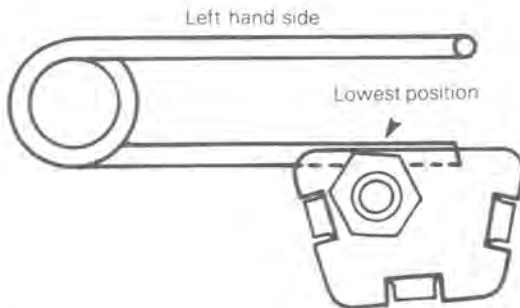
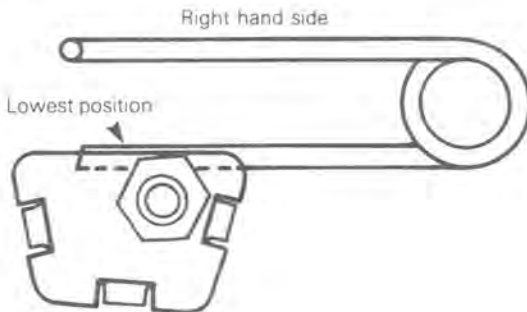
A009005001

## Section 05 SUSPENSION

### Sub-section 03 (TRS 6 SUSPENSION)

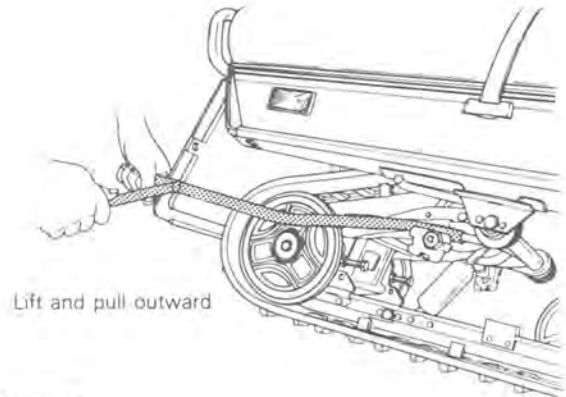
#### 26, Adjustment cams

Position the adjustment cams (front and rear) at the lowest position.



A007005001

NOTE: Use spring installer P/N 529 0050 00 to remove and install suspension springs.



#### 67, Rear springs

Unhook rear springs

#### 33,56 Screws & rear arm

Remove both screws securing rear arm to frame.  
Plug vent holes in chaincase filler cap and oil injection reservoir cap with a wire to prevent leaks.  
Using appropriate equipment, lift rear of vehicle.

#### 30, Front springs

Unhook front springs.

#### 23,33 Screws & front arm

Remove both screws securing the front arm to frame.

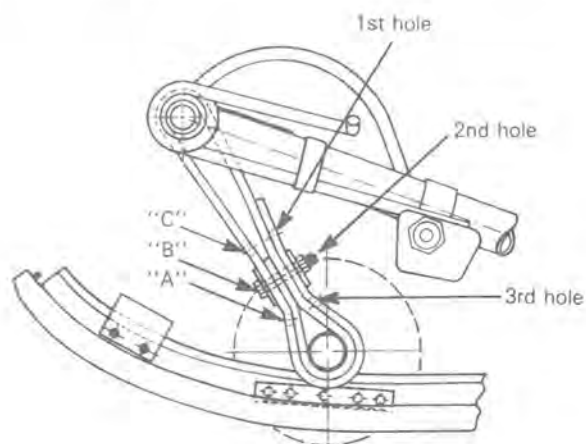
## Section 05 SUSPENSION

### Sub-section 03 (TRS 6 SUSPENSION)

## DISASSEMBLY & ASSEMBLY

### 34, Stopper strap

Inspect strap for wear or cracks, bolt and nut for tightness. If loose, inspect hole for deformation. Replace as required. Make sure it is attached through the 2nd hole from the end and its corresponding hole "B" torque nut to 10 N•m (89 lbf•in).



A009005008

### 1,2,3,4,5, Runners, slider shoes, screws, stop nuts & spirol pins

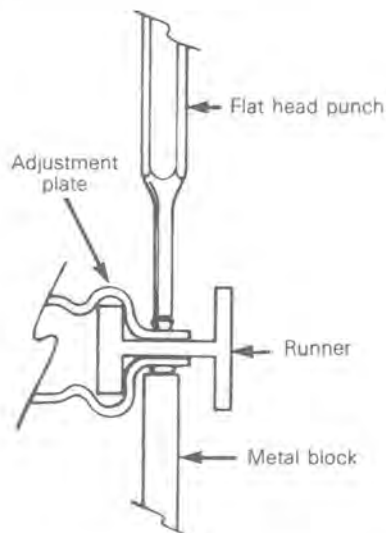
To replace a worn slider shoe, remove the rear spirol pin, the front screw and stop nut then slide the shoe rearwards out of the runner.

**CAUTION:** Slider shoes must always be replaced in pairs.

### 8,11, Rivets & adjustment plates

To remove the rivets securing the adjustment plate on the front arm supports, cut off the rivet heads using a cold chisel.

At assembly, position the rivet head outside of the runner on a suitable metal block and hold the assembly firmly in place. With a flat head punch and hammer secure the rivet in place.



A007005002

### 7,8,48, Reinforcement strips, rivets & reinforcement bracket

To remove rivet use a 3/16" dia. drill. At assembly, secure reinforcement brackets to runner with two (2) 10-32 x 1/2" bolts and nuts, and five (5) bolts and nuts for the reinforcement strips. Position bolt head outside of the runner.

### 46,50,51, Shock absorber, clevis pin & cotter pin

If removed, install clevis pin head on right hand side of vehicle to make future shock removal easier.

### 21,25,33,44,49,54,64,80, Screws, & Loctite 242

Clean all screw threads. Prior to assembly, apply low temperature grease (P/N 413 7056 00) on cross shafts and Loctite 242 or equivalent on threads.

### 30,31,67, Bushings, front & rear springs

Prior to assembly, identify front and rear springs. Make sure to insert nylon bushings inside springs

## Section 05 SUSPENSION

### Sub-section 03 (TRS 6 SUSPENSION)

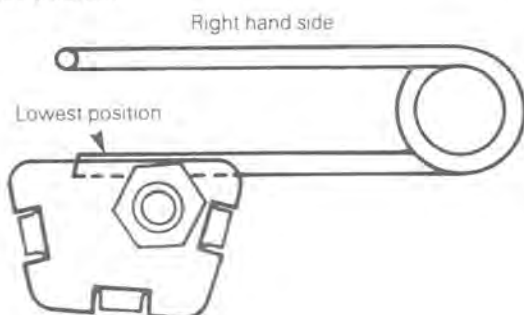
Spring location	Model	Color
Front	Safari 377/377E, 447	Orange
Rear	Safari 377/377E	Purple
	Safari 447	Gold

## INSTALLATION

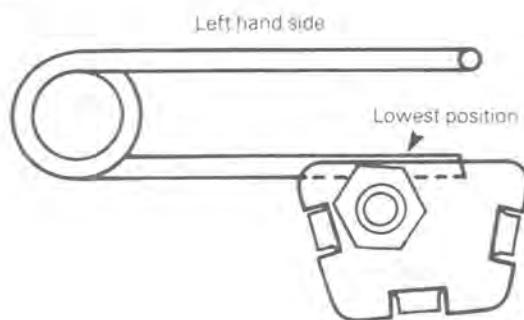
### Preparation

#### 26, Adjustment cams

- At assembly, position the adjustment cams at the lowest position.



A007005004



A007005001

#### 73, Rear idler wheels

- Unscrew adjustment screws as far as possible to push the rear axle forward.

### Installation

Lift the rear of vehicle. Install front portion of suspension into frame.

(TYPICAL)

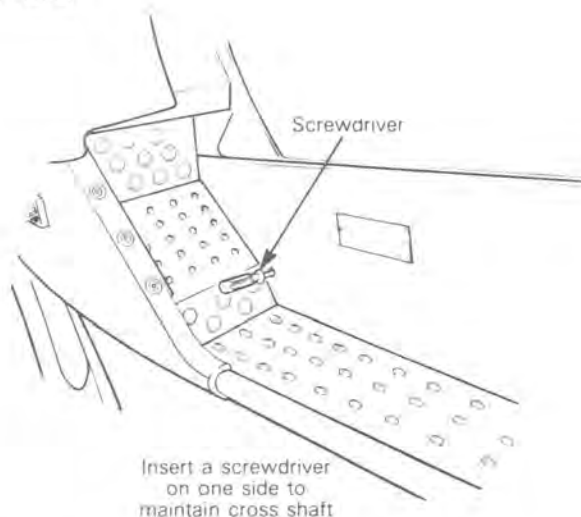


A003005007

#### 23,29,33, Screw, front arm & cross shaft

- Insert a screwdriver into one side of frame to maintain cross shaft when installing screw into hole of other side. Do not tighten.

(TYPICAL)



A003005008

## Section 05 SUSPENSION

### Sub-section 03 (TRS 6 SUSPENSION)

#### 33,56,65, Screw, rear arm & cross shaft

- Lower the vehicle to install screws into rear cross shaft.
- Reposition vehicle on ground
- Remove chaincase and oil injection reservoir vent hole wires.

#### 33, Screw

Torque four suspension retaining screws to 41 N•m (30 lbf•ft).

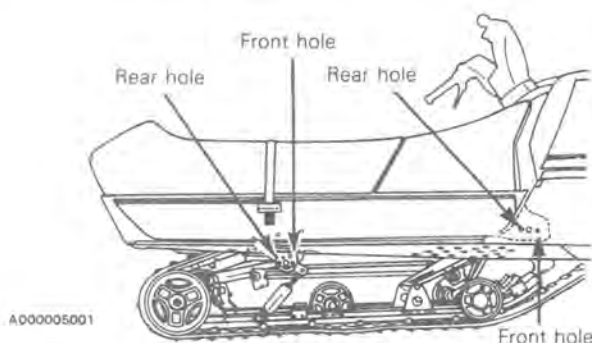
#### 30,67, Front & rear springs

Make sure adjustment cam are at the lowest position. Install springs with tool P/N 529 005 00

○ **NOTE:** The holes in the frame provide the possibility of locating the suspension arms for easier track tension adjustment (13 mm (1/2") clearance). It means that if the slide suspension adjustment screws are at the maximum adjustment and the suspension arms are at the front holes in the frame, it is possible to move the suspension arms at the rear holes and obtain greater track tension adjustment.

▼ **CAUTION:** Ensure that suspension arms are at the same position on each side of the frame to avoid any damage to the suspension system and to the track.

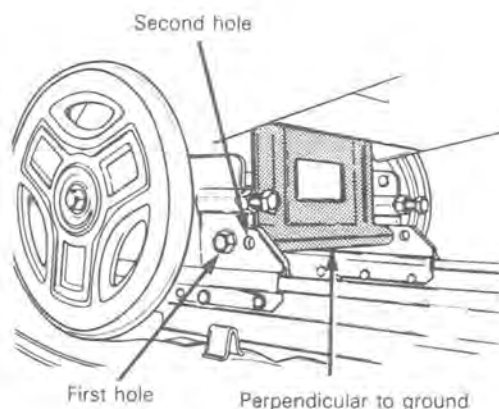
▼ **CAUTION:** Ensure that front and rear suspension arms are at the same position on each end (front, rear) of the frame to avoid any damage to the suspension system and to the track.



○ **NOTE:** The front adjustment holes in the frame (near footrest) are not completely drilled. To relocate the front and rear arms, drill these holes to 10 mm (3/8").

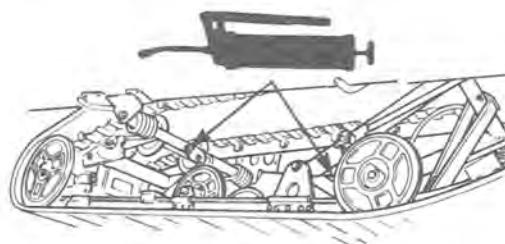
#### 11,52, Adjustment plate & pivot arm

When repositioning front and rear suspension arms ensure that the pivot arm is as perpendicular as possible by locating it in the first or second holes of the adjustment plate.



#### 24,57, Grease fittings

Lubricate front and rear arms at grease fittings until grease appears at joints. Use low temperature grease only (P/N 413 7056 00).



○ **NOTE:** To adjust the track tension and alignment, refer to section 05-08.

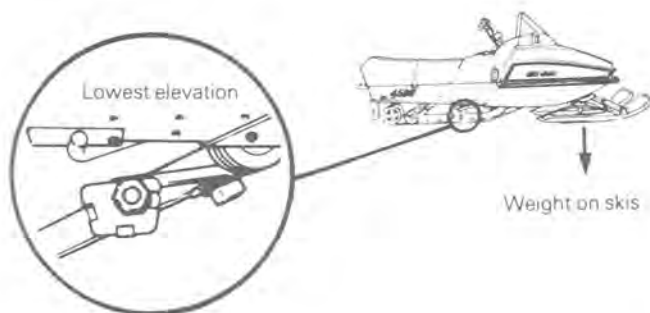
## RIDE ADJUSTMENT

### Adjustment cams

The front adjustment cams are used for snow condition, and the rear for driver's weight. The front adjustment cams should be positioned at the highest elevation for deep snow conditions. A lower elevation is preferred when negotiating icy snow.

The rear adjuster blocks should be adjusted to rider preference.

(TYPICAL)



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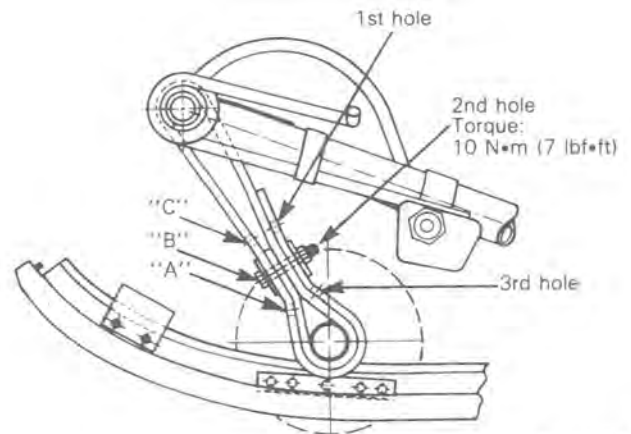
**CAUTION:** Always turn left side adjustment cams in a clockwise direction, the right side cams in a counter-clockwise direction. Left and right adjustment cams of each adjustment (front and rear), must always be set at the same elevation.

### Stopper strap

The function of the suspension stopper strap is to control the transfer of vehicle weight during acceleration. The longer the belt, the more the weight will be transferred to the track to provide a better traction. The shorter the belt, the lesser the weight transferred to the track, thus maintaining a more positive direction. Adjusting holes on the stopper strap allow to adjust it according to drivers' requirements, field and or snow conditions.

For normal use bolt through 2nd hole and its corresponding hole "B".

HOLE NO.	CORRESPONDING HOLE
1	"A"
2	"B"
3	"C"



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**WARNING:** Always torque the nut to 10 N•m (7 lbf•ft).

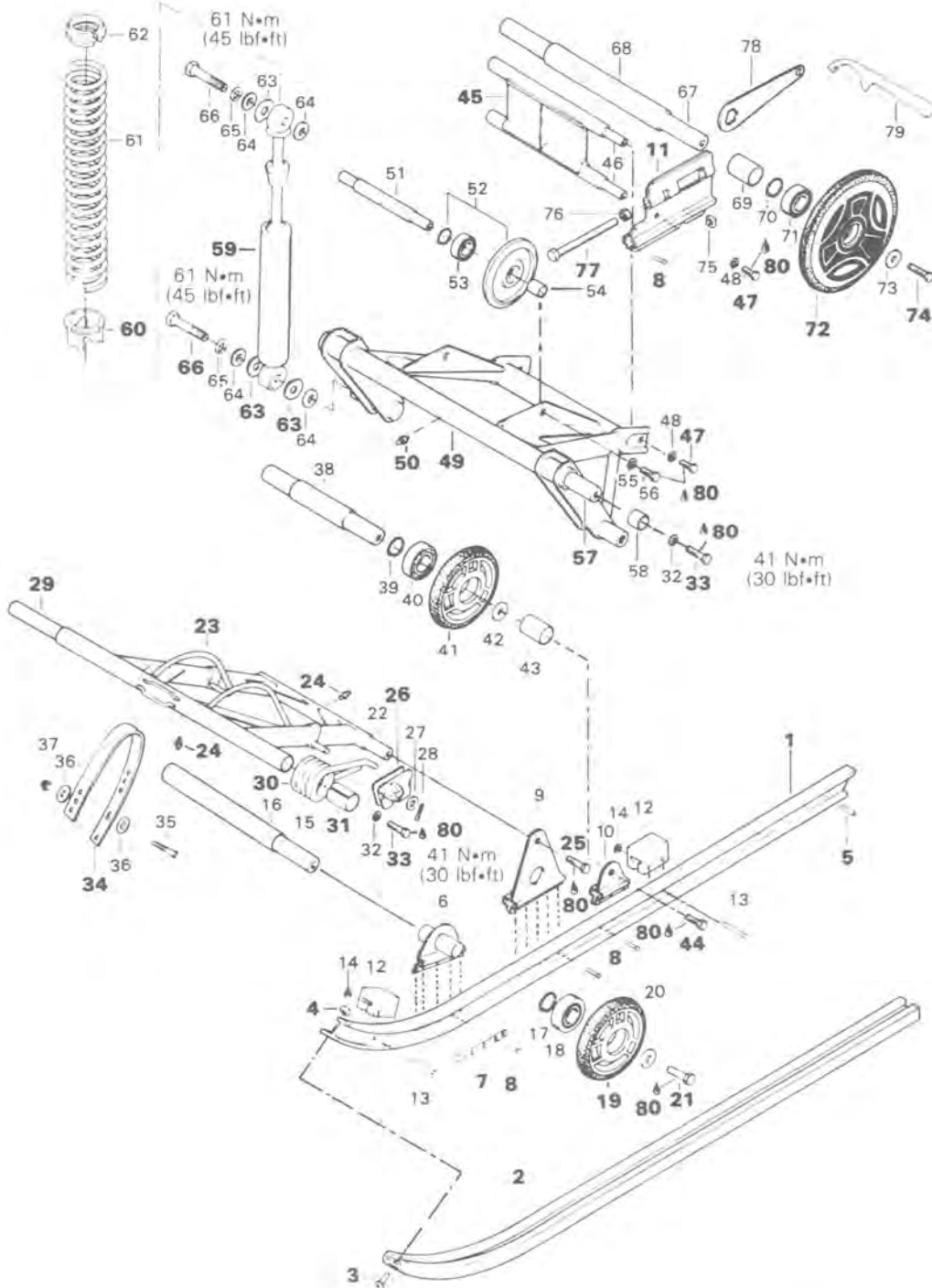




# SP SUSPENSION

## SP SUSPENSION

Formula SP  
Safari GL




## Section 05 SUSPENSION

### Sub-section 04 (SP SUSPENSION)

1. Runner (2)
2. Slider Shoe (2)
3. Cylindrical slotted head machine screw m5 x .8 x 20 (2)
4. Hexagonal elastic stop nut M5 x .80
5. Spirol pin (2)
6. Front wheel support (2)
7. Reinforcement strip (2)
8. Rivet (32)
9. Front arm support (2)
10. Wheel support (2)
11. R.H. adjustment plate - L.H. adjustment plate
12. Rubber stopper (4)
13. Rivet
14. Push nut (8)
15. Cross shaft
16. Spacer tube
17. Circlip (2)
18. Ball bearing (2)
19. Idler (2)
20. Washer (2)
21. Hexagonal head cap screw M10 x 35 (2)
22. Front cross shaft
23. Front arm
24. Grease fitting (2)
25. Hexagonal head cap screw M10 x 35 (2)
26. R.H. adjustment cam - L.H. adjustment cam
27. Flat washer 13/32 x 59/64 x .060 (2)
28. Cotter pin (2)
29. Front cross shaft
30. R.H. front spring - L.H. front spring
31. Bushing (2)
32. Spring Lock washer M10 (4)
33. Hexagonal head cap screw M10 x 1.50 x 35 (4)
34. Stopper strap
35. Hexagonal head cap screw M8 x 45
36. Washer (2)
37. Hexagonal elastic stop nut 8 mm
38. Center axle
39. Circlip (2)
40. Ball bearing (2)
41. Idler (2)
42. Washer (2)
43. Spacer tube (2)
44. Hexagonal head screw M10 x 35 (2)
45. Pivot arm
46. Pivot shaft (2)
47. Hexagonal head cap screw M8 x 20 (4)
48. Lock washer M8 (4)
49. Rear arm
50. Grease fitting
51. Idler shaft
52. Idler (with snap ring) (2)
53. Ball bearing (2)
54. Spacer (2)
55. Lock washer 8 mm (2)
56. Hexagonal head cap screw M8 x 1.25 x 25 (2)
57. Rear cross shaft
58. Bushing (2)
59. Damper (2)
60. Adjuster ring (2)
61. Spring (2)
62. Spring collar (2)
63. Washer (6)
64. Flat washer 13/32 x 7/8 (8)
65. Lock washer 3/8 (4)
66. Hexagonal head cap screw 3/8-24 x 1 3/4" (4)
67. Rear axle
68. Spacer tube
69. Spacer tube
70. Circlip (2)
71. Ball bearing (2)
72. Idler (2)
73. Washer (2)
74. Hexagonal head cap screw M10 x 35 (2)
75. Square nut M10 x 1.5 x 17 x 8 (2)
76. Hexagonal nut M10 x 1.5 (2)
77. Hexagonal adjustment screw M10 x 1.5 x 110 (2)
78. Hexagonal wrench (adjustment cam)
79. Adjustment wrench (shock spring)
80. Loctite 242 (blue, medium strength)

## REMOVAL

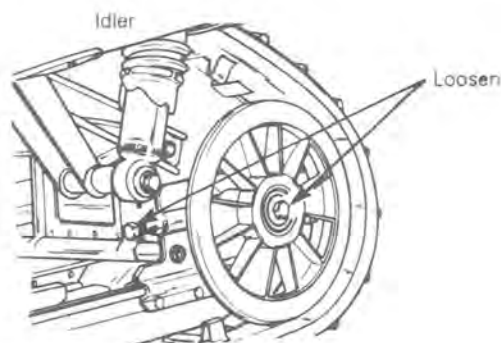
 **NOTE:** To prevent cross shaft screws, assembly with loctite from turning while unscrewing, proceed as follow:

- Loosen one screw then retighten.
- Remove the other one.
- Remove the first one.

### 74,77, Adjustment screw

Release track tension by loosening wheel retaining screws and adjustment screws located on inner side of rear idler wheels.

(TYPICAL)



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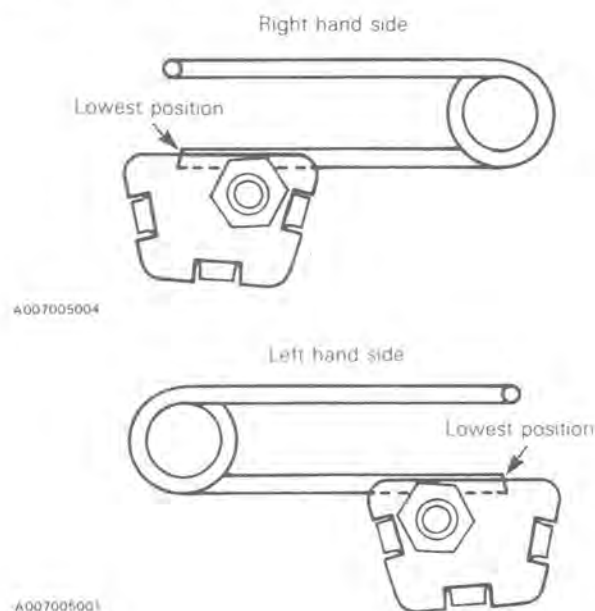
## Section 05 SUSPENSION

### Sub-section 04 (SP SUSPENSION)

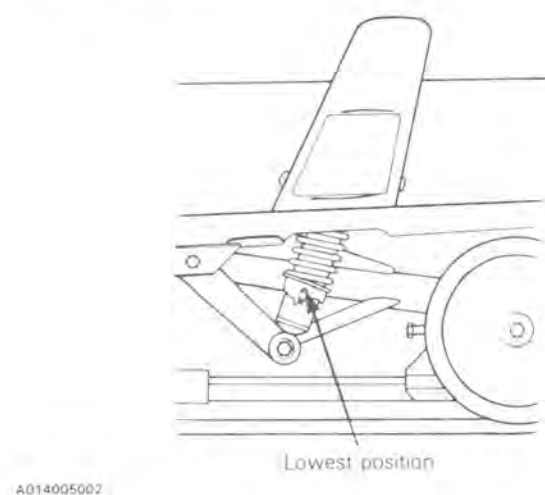
#### 26,60, Adjustment cam & adjuster ring


Position at the lowest position.

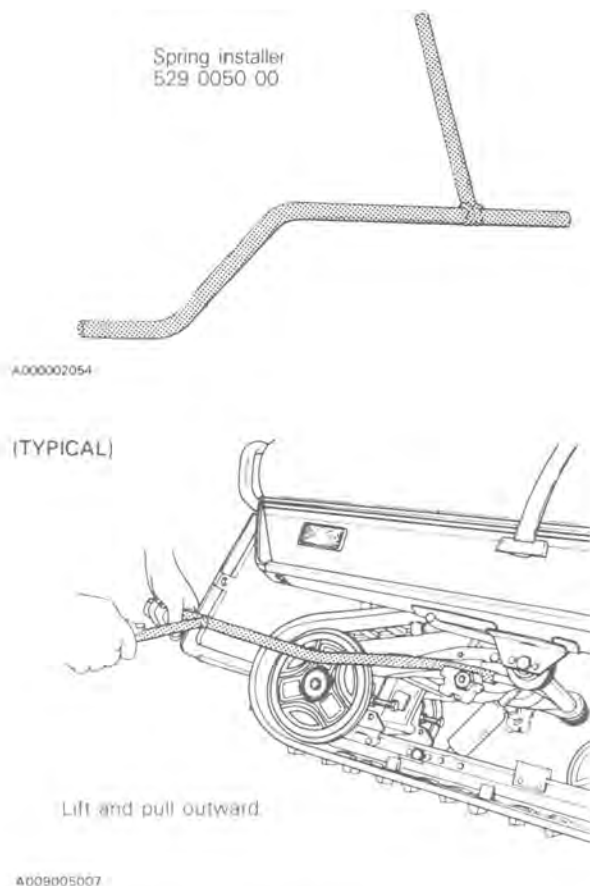
##### Front adjustment



##### Rear adjustment



 **NOTE:** For the next steps, use spring installer P/N 529 0050 00 to remove and install from suspension springs.



#### 66, Shock absorber screw

Remove the two lower shock absorber screws.

#### 33,49, Screws & rear arm

Remove both screws securing the rear arm to frame.  
Plug vent holes in chaincase filler cap and oil injection reservoir cap with a wire to prevent leaks.  
Using the appropriate equipment, lift the rear of vehicle.

#### 30, Front springs

Unhook front springs.

#### 23,33, Screws & front arm

Remove both screws securing the front arm to frame.

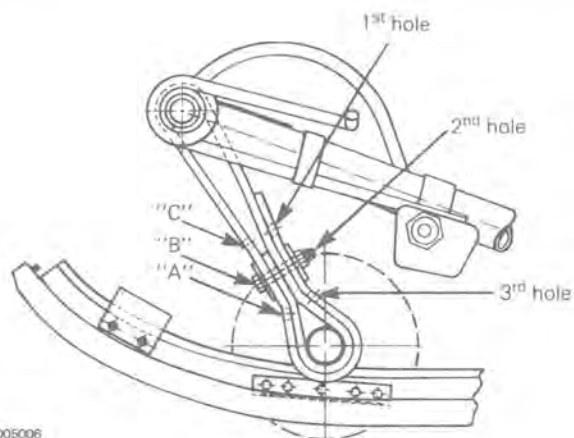
## Section 05 SUSPENSION

### Sub-section 04 (SP SUSPENSION)

## DISASSEMBLY & ASSEMBLY

### 34, Stopper strap

Inspect strap for wear or cracks, bolt and nut for tightness. If loose, inspect hole for deformation. Replace as required. Make sure it is attached through the 2nd hole from the end and its corresponding hole "B". Torque nut to 10 N•m (89 lbf•in).



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### 1,2,3,4,5, Runners, slider shoes, screws, stop nuts & spirol pins

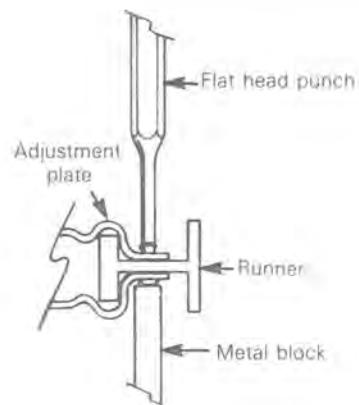
To replace a worn slider shoe, remove the rear spirol pin, the front screw and stop nut then slide the shoe rearwards out of the runner.

**CAUTION:** Slider shoes must always be replaced in pair.

### 8,11, Rivet & adjustment plates

To remove the rivets securing the adjustment plate on the front arm supports, cut off the rivet heads using a cold chisel.

At assembly, position the rivet head outside of the runner, on a suitable metal block and hold the assembly firmly in place. With a flat head punch and hammer secure the rivet in place.



A007005002

### 7,8, Reinforcement strips & rivets

To remove rivet use a 3/16" dia drill. At assembly, secure reinforcement strips to runner with five (5) bolts and nuts. Position bolt head outside of the runner.

### 21,25,33,44,47,80, Screws & loctite 242

Clean all screw threads. Prior to assembling, apply low temperature grease (P/N 413 7044 00) on cross shaft and Loctite 242 or equivalent on threads.

### 30,31, Bushings & front springs

Make sure to insert nylon bushing inside springs.

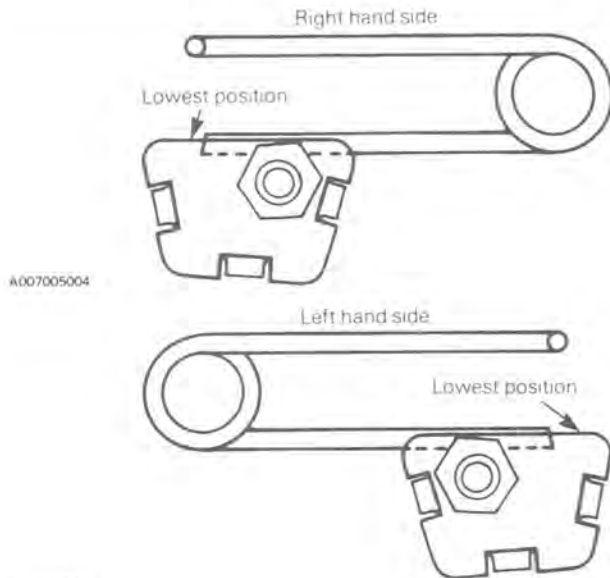
## INSTALLATION

### Preparation

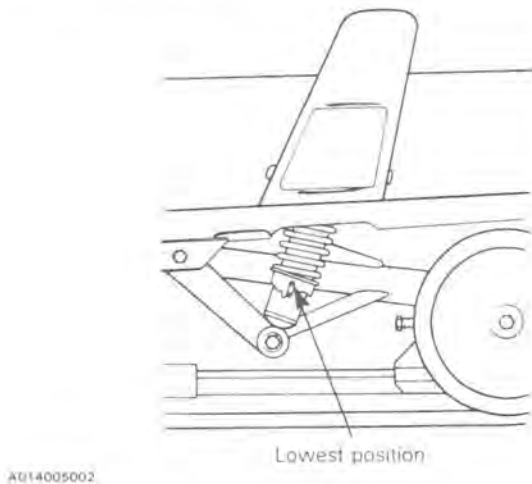
### 30,60, Adjustment cam & adjuster ring

At assembly, position the adjustment at the lowest.

## Front adjustment



## Rear adjustment



## 72, Rear idler wheels

Unscrew adjustment screws as far as possible to push the rear axle forward.

## INSTALLATION

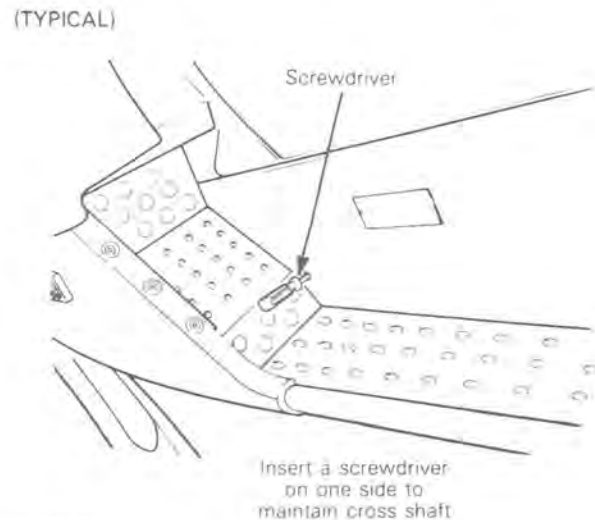
Lift the rear of vehicle. Install front portion of suspension into frame.



## 23,29,33, Screw, front arm & cross shaft

Insert a screwdriver into one side frame to maintain cross shaft when installing screw into hole of other side. Do not tighten.

Replace the screwdriver by the right screw.



## 33,49,57, Screw, rear arm & cross shaft

Lower the vehicle in such a way to install screws into rear cross shaft.

Reposition vehicle on ground.

Remove chaincase and oil injection reservoir vent hole wires.

## Section 05 SUSPENSION

### Sub-section 04 (SP SUSPENSION)

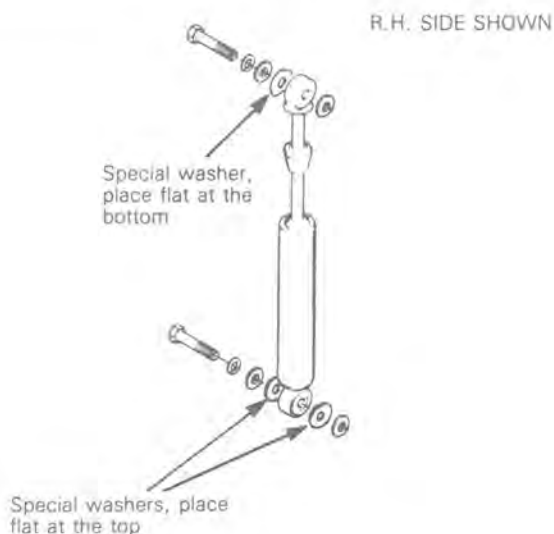
#### 33, Screw

Torque four suspension retaining screws to 41 N•m (30 lbf•ft).

#### 49,59,63,66, Rear arm, shock absorber, special washer & screw

Secure shock absorbers to rear arm, torque screws to 61 N•m (45 lbf•ft).

◆ **WARNING:** Ensure to install the special washer as illustrated or the shock absorber rubber bushing may slip out of their shock eye.



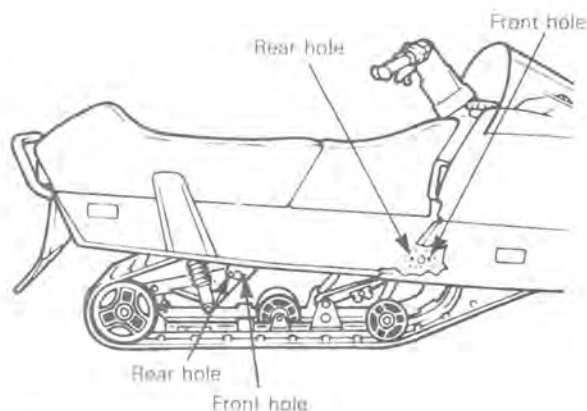
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#### 30, Front springs

Make sure adjustment cam are at the lowest position. Install springs with tool P/N 529 0050 00.

○ **NOTE:** To adjust the track tension and alignment, refer to section 05-08.

○ **NOTE:** If no more adjustment is available from adjustment screws, it is possible to move back both suspension arms if they are actually located in front or center hole. Drill a new hole (dia. 10.5 mm (13/32")) through the frame, behind the existing hole, using front plate hole as guide.

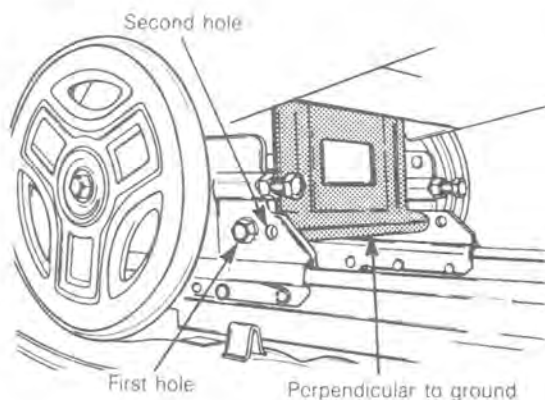


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▼ **CAUTION:** Ensure that suspension arms are at the same position on each side of the frame and that they are at the same position on each end (front, rear) of the frame to avoid any damage to the suspension system and to the track.

#### 11,45, Adjustment plate & pivot arm

When repositioning front and rear suspension arms: ensure that the pivot arm is as perpendicular as possible by locating it in the first or second holes of the adjustment plate.



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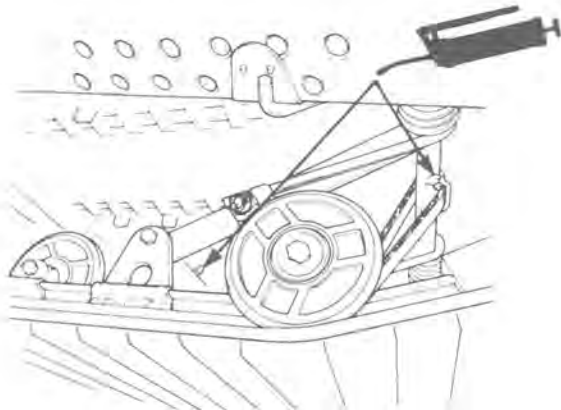
## Section 05 SUSPENSION

### Sub-section 04 (SP SUSPENSION)

#### 24,50, Grease fittings

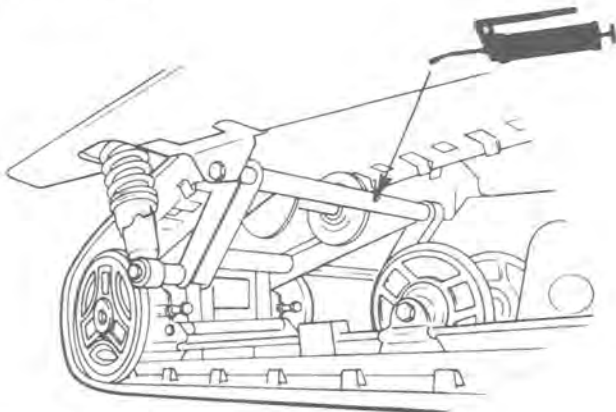
Lubricate front and rear arms at grease fittings until grease appears at joints. Use low temperature grease only (P/N 413 7056 00).

#### Front section



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#### Rear section

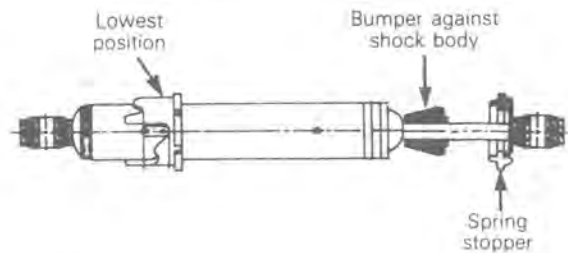


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## SHOCK ABSORBER SPRINGS REPLACEMENT

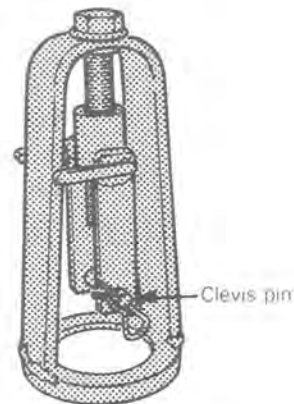
To replace a shock spring proceed as follows:

- Before attempting to compress the shock spring, push the rubber bumper on the piston shaft against the shock body and place the adjuster ring at its lowest position.



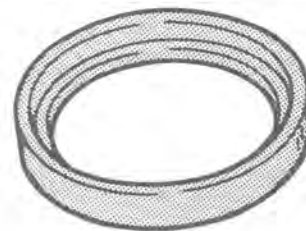
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- Use shock spring remover P/N 414 5796 00.



A015005023

- Use spring adaptor P/N 529 0057 00.



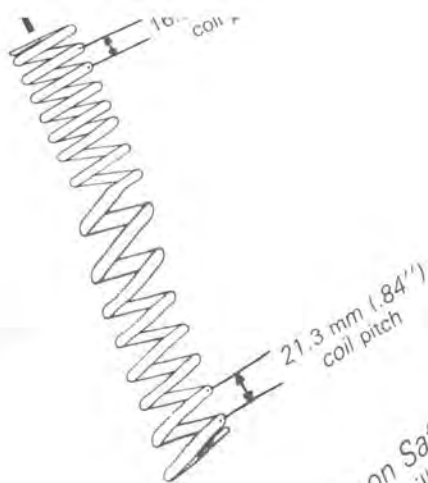
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the



a spring.  
ough the shock eye and secure  
pin.  
crew until the spring stopper can

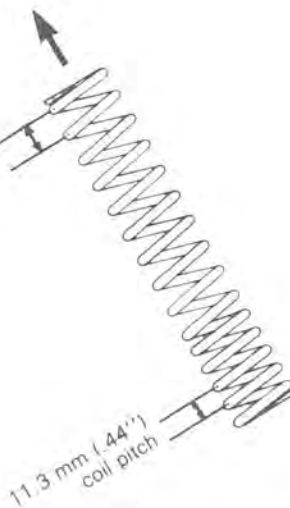


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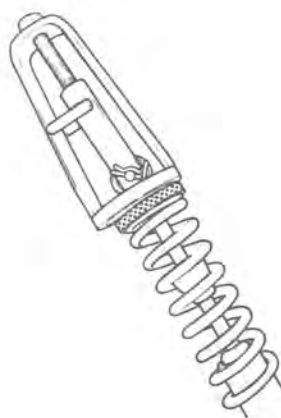
**NOTE:** The standard spring on Safari GL has different coil pitch at each end (see illustration). So, it is recommended to position the lower coil pitch end (11.3 mm (.44")) at the bottom of shock absorber.

This end at the top of shock absorber

22.4 mm (.88") coil pitch



A014005010



A014005024

To install the spring, reverse the procedure.

**NOTE:** Prior to assembling the spring, place the adjuster ring at its lowest position.

**NOTE:** The standard spring on Formula SP has different coil pitch at each end (see illustration). So, it is recommended to position the lower coil pitch end (16.0 mm (.63")) at the top of shock absorber.



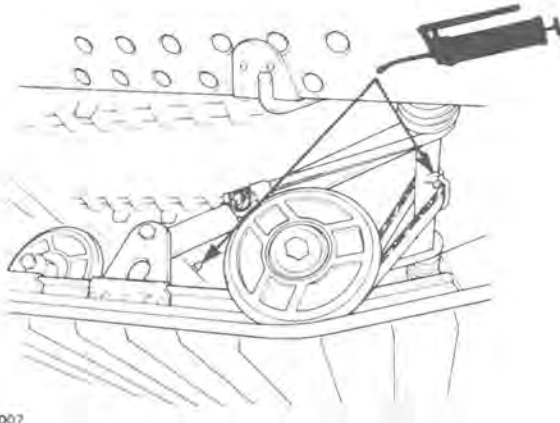
## Section 05 SUSPENSION

### Sub-section 04 (SP SUSPENSION)

#### 24,50, Grease fittings

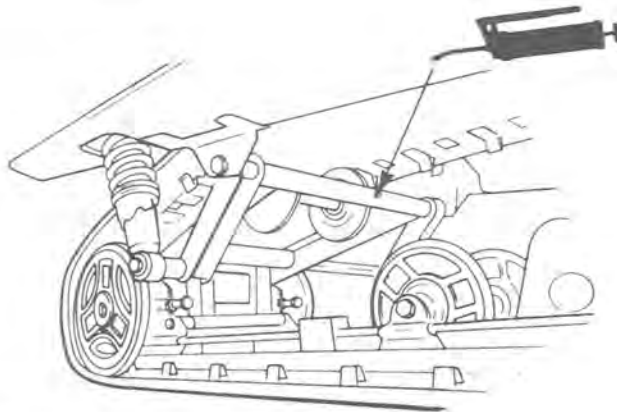
Lubricate front and rear arms at grease fittings until grease appears at joints. Use low temperature grease only (P/N 413 7056 00).

#### Front section



A014005007

#### Rear section

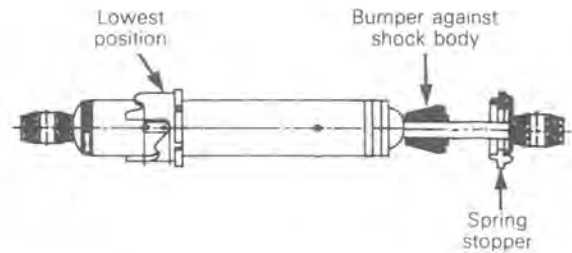


A014005008

## SHOCK ABSORBER SPRINGS REPLACEMENT

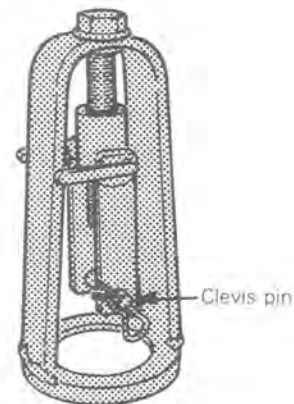
To replace a shock spring proceed as follows:

- Before attempting to compress the shock spring, push the rubber bumper on the piston shaft against the shock body and place the adjuster ring at its lowest position.



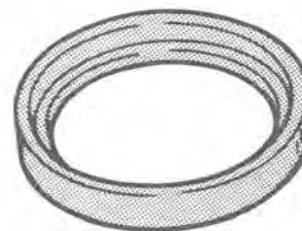
A015005027

- Use shock spring remover P/N 414 5796 00.



A015005023

- Use spring adaptor P/N 529 0057 00.

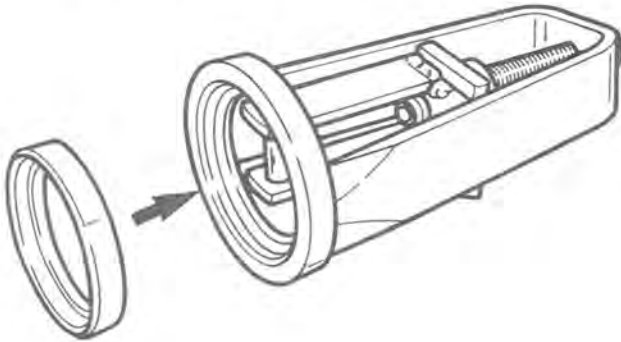


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## Section 05 SUSPENSION

### Sub-section 04 (SP SUSPENSION)

- Insert the spring adaptor at the bottom of the spring remover.



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- Install them over the spring.
- Insert clevis pin through the shock eye and secure it with the hair pin.
- Tighten the screw until the spring stopper can be removed

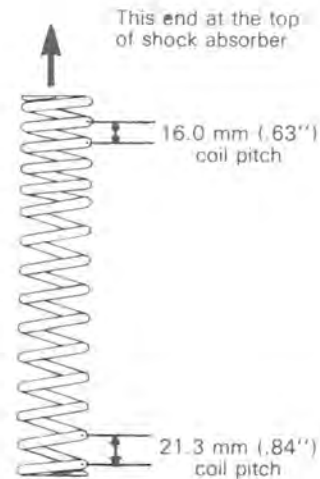


A014005024

- To install the spring, reverse the procedure.

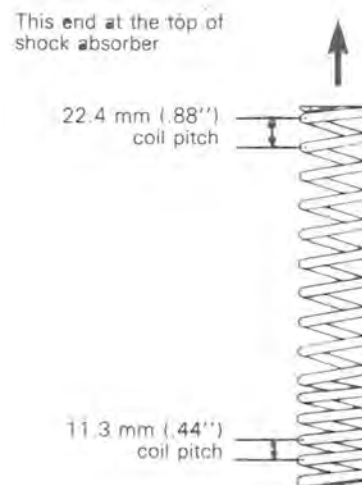
○ **NOTE:** Prior to assembling the spring, place the adjuster ring at its lowest position.

○ **NOTE:** The standard spring on Formula SP has different coil pitch at each end (see illustration). So, it is recommended to position the lower coil pitch end (16.0 mm (.63'')) at the top of shock absorber.



A014005010

○ **NOTE:** The standard spring on Safari GL has different coil pitch at each end (see illustration). So, it is recommended to position the lower coil pitch end (11.3 mm (.44'')) at the bottom of shock absorber.



A014005010

## SHOCK ABSORBER SERVICING

The shocks may be checked by partially creating the operating position. To do this, secure the proper shock end in a vise using the shock eye as a clamping point.



A014005011

▼ **CAUTION:** Do not clamp directly on shock body.

Compress and extend each shock by hand at various speeds and compare the resistance of one shock to the other.

○ **NOTE:** Obtain a known good shock for comparison purposes and keep in mind that the rebound resistance (extending the shock) is normally stronger than the compression resistance.

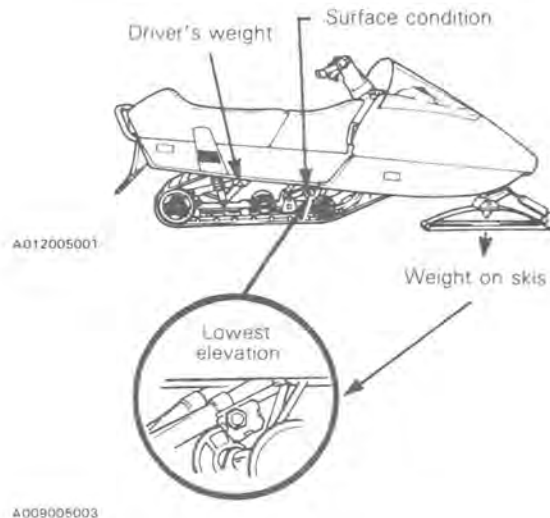
Pay attention to the following conditions that will denote a defective shock:

- A skip or a hang back when reversing stroke at mid travel.
- Seizing or binding condition except at extreme end of either stroke.
- Oil leakage.
- A gurgling noise, after completing one full compression and extension stroke.
- Renew if any defaults are present.

## RIDE ADJUSTMENT

### Front adjustment cams

The front adjustment cams are used for snow condition, and the rear for driver's weight. The front adjustment cams should be positioned at the highest elevation for deep snow conditions. A lower elevation is preferred when negotiating icy snow.



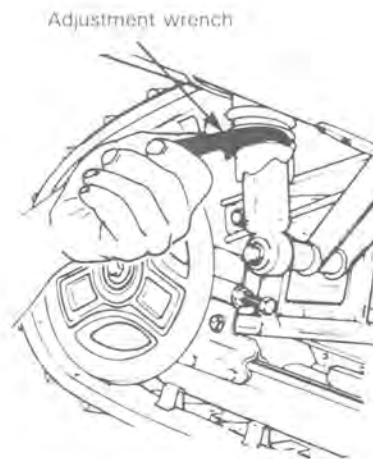
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A009005003

▼ **CAUTION:** Always turn left side adjustment cams, in a clockwise direction, the right side cams in a counterclockwise direction. Left and right adjustment cams must always be set at the same position.

### Rear adjuster cams

The rear adjuster cams should be adjusted to rider preference. The rear suspension may be adjusted by turning the shock absorber adjuster cam with the adjustment wrench.



A014005013

1st position: for rider weight for 0 to 68 kg (0 to 150 lb).

2nd position: for rider weight of 68 to 82 kg (150 to 180 lb).

3rd position: for rider weight of 84 kg (180 lb) and higher.

## Section 05 SUSPENSION

### Sub-section 04 (SP SUSPENSION)

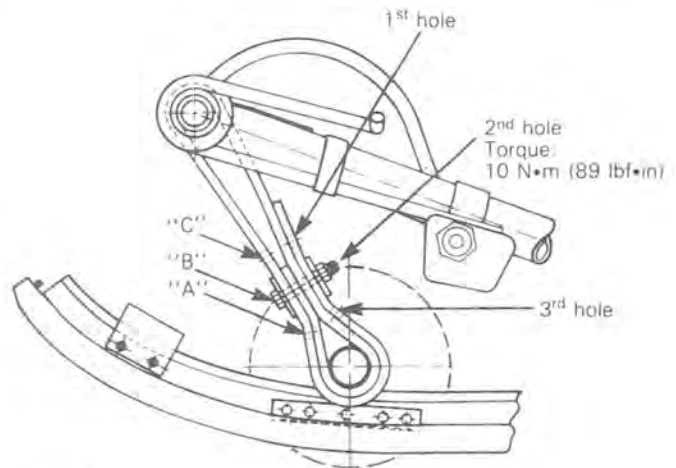
**CAUTION:** Left and right adjuster cam must always be set at the same position.

#### Stopper strap

The function of the suspension stopper strap is to control the transfer of vehicle weight during acceleration. The longer the belt, the more the weight will be transferred to the track to provide a better traction. The shorter the belt, the lesser the weight will be transferred to the track, thus maintaining a more positive direction. Adjusting holes on the stopper strap allow to adjust it according to drivers' requirements, field and/or snow conditions.

For normal use locate bolt through 2nd hole and its corresponding hole "B".

Hole No.	Corresponding hole
1	"A"
2	"B"
3	"C"



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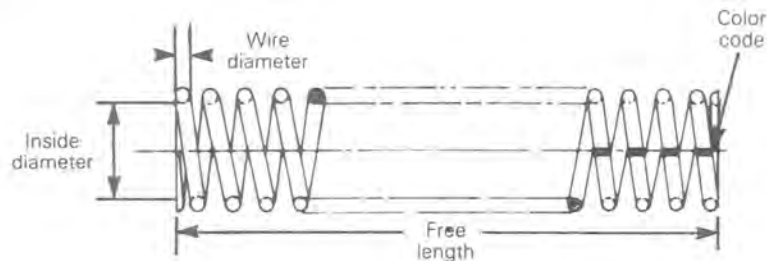
**WARNING:** Always torque the nut to 10 N•m (89 lbf•in).

## SPECIFICATIONS

### Shock springs specifications

PART NUMBER	NUMBER OF COILS	FREE LENGTH ± 3 mm (.12")	SPRING RATE ± 0.7 N/mm (41 lbf/in)	INSIDE DIAMETER	WIRE DIAMETER ± 0.05 mm (.002")	COMPRES. LENGTH	COLOR CODE
503 0694 00 Standard on Formula SP	15.6	290 mm (11.42")	19.3/28.0 N/mm (110/160 lbf/in)	38.4 mm (1.51")	7.14 mm (.281")	109.0 mm (4.29")	Green/yellow
503 0696 00 Optional on Formula SP	13	289 mm (11.39")	16.6 N/mm (95 lbf/in)	38.4 mm (1.51")	6.65 mm (.262")	83.8 mm (3.30")	Green/blue
503 0988 00 Standard on Safari GL Optional on Formula SP	18	286.3 (11.27)	21.7/47.3 N/mm (120/270 lbf/in)	38.1 mm (1.50")	7.9 mm (.311")	120.6 mm (4.75")	Orange/blue

#### Spring description

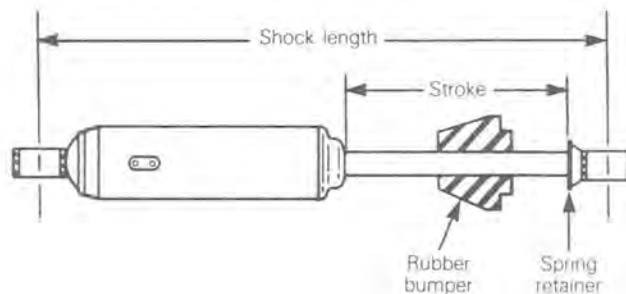


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### Shock absorber specifications

Part number	Full stroke	Length collapsed		Length extended
		At bumper contact	At spring retainer contact	
414 5843 00	132.1 mm (5.20")	268.7 mm (10.58")	241.8 mm (9.52")	369.8 mm (14.56")

### Shock description



A015005017

### OPTIONAL PARTS INSTALLATION

Lift the rear of the vehicle until the track is "off" the ground.

Proceed one side at a time, when a side is finished continue with the other one. Follow this procedure for each side:

Remove the shock covers.

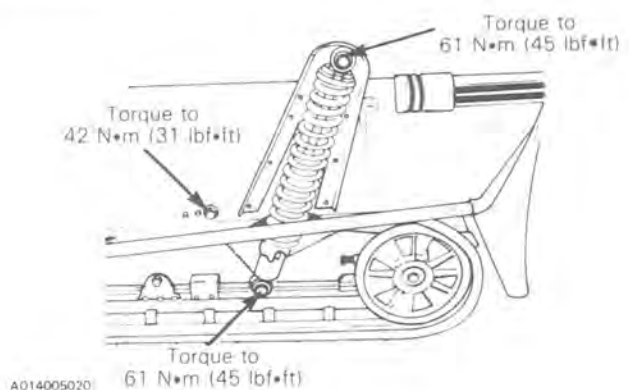
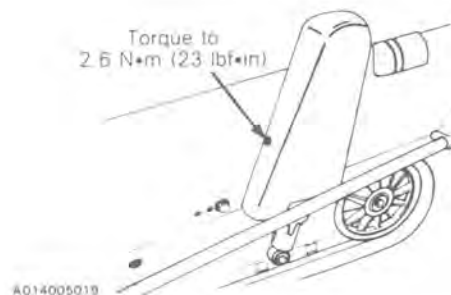
Remove the shock assembly.

Remove the spring from the shock.

Install optional spring.

Install the shock assembly on vehicle, torque the retainer bolts to 61 N•m (45 lbf•ft). Refer to illustration.

Install the shock cover and torque the retainer screws to 2.6 N•m (23 lbf•in). Refer to illustration.



**NOTE:** To adjust the track tension and alignment, refer to section 05-08.



## REAR PRS SUSPENSION\*

05-05-1

## Section 05 SUSPENSION


### Sub-section 05 (PRS SUSPENSION)

1. Runner (2)
2. Slider shoe (2)
3. Hexagonal head cap screw M6 x 20 (2)
4. Flat washer (2)
5. Hexagonal elastic stop nut M6 (2)
6. Hexagonal head cap screw (4)
7. Spring lock washer 10 mm (12)
8. Washer (4)
9. Idler wheel (4)
10. Ball bearing 6205 (6)
11. Retaining ring (6)
12. Hexagonal head cap screw M6 x 20 (6)
13. Housing (2)
14. Hexagonal flanged elastic stop nut M6 (6)
15. Front axle
16. Front shackles
17. Grease fitting (3)
18. Front swing arm
19. Grease fitting
20. Hexagonal head cap screw M8 x 55 (2)
21. Spacer (2)
22. Hexagonal elastic stop nut M8 (2)
23. Long welded screw
24. Front swing arm axle
25. Hexagonal elastic stop nut M10 (2)
26. Front arm
27. Grease fitting (2)
28. Front arm upper axle
29. R.H. retainer plate  
L.H. retainer plate
30. Hexagonal head cap screw M10 x 35 (6)
31. Hexagonal head cap screw M8 x 16 (4)
32. Spring lock washer M8 (4)
33. Flat washer 8,4 mm (4)
34. Front arm lower axle
35. Flat washer 10,5 mm
36. Short welded screw
37. Center shock body
38. Spring stopper
39. Shock spring
40. Thrust washer (2)
41. Adjuster ring
42. Hexagonal head cap screw M10 x 45 (4)
43. Spacer (4)
44. Bushing (12)
45. Hexagonal elastic stop nut M10 (4)
46. Limiter screw
47. Flat washer 13 mm (3)
48. Spring
49. Bushing
50. Stopper
51. Hexagonal elastic stop nut M12
52. Retainer pin
53. Cotter pin
54. Center axle
55. Washer (2)
56. Spacer (2)
57. Rear shackle
58. Grease fitting (2)
59. Rear shackle lower axle
60. Rear arm
61. Grease fitting
62. Rear shackle upper axle
63. Cup (2)
64. Hexagonal head cap screw M10 x 25 (2)
65. Cross pivot
66. Flat washer 10,5 mm (4)
67. Spring lock washer 10 mm (4)
68. Hexagonal head cap screw M10 x 35 (2)
69. Axle
70. Idler wheel and circlip (2)
71. Ball bearing (2)
72. Spacer (2)
73. Lock washer 8 mm (2)
74. Hexagonal head cap screw M8 x 25 (2)
75. Rear shock body (2)
76. Spring stopper (2)
77. Rear shock spring (2)
78. Thrust washer (4)
79. Adjuster ring (2)
80. Hexagonal head cap screw M10 x 25 (2)
81. Spacer (2)
82. Rear shock pivot
83. Inner spacer
84. Rear axle
85. Outer spacer (2)
86. Idler wheel (2)
87. Rubber stopper (2)
88. Rivet (4)
89. Push nut (4)
90. Tensioner stopper (2)
91. Hexagonal elastic stop nut M10 (2)
92. Hexagonal adjustment screw M10 x 85 (2)
93. Hexagonal nut M10 (2)
94. Loctite 271 (red, high strength)
95. Washer (2)
96. Washer (2)
97. Adjustment key
98. Protector (2)
99. Protector (2)
100. Hexagonal cap screw M5 x 25 (2)
101. Washer (2)
102. Flanged hexagonal elastic stop nut M5 (2)

 **NOTE:** Most components may be replaced without entirely removing suspension system such as:

- Idler wheels
- Shock absorbers
- Runner & runner shoe
- Rear arm

## REMOVAL

 **NOTE:** To prevent cross shaft screws assembled with Loctite from turning while unscrewing proceed as follow:

- Loosen one screw then retighten.
- Remove the other screw.
- Remove the first one.

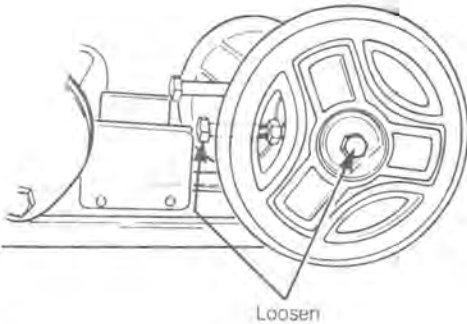
## 6,92, Adjustment screw

Release track tension by loosening wheel retaining screws and adjustment screws on inner side of rear idler wheels.



## Section 05 SUSPENSION

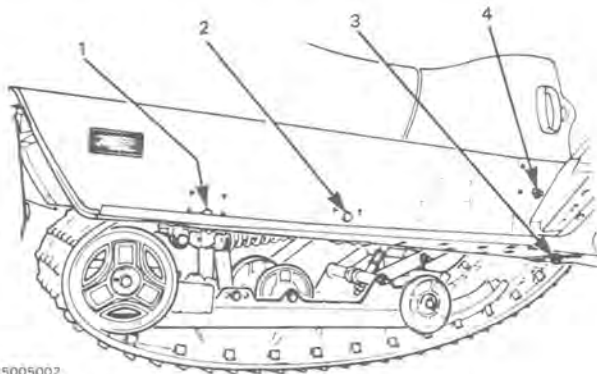
### Sub-section 05 (PRS SUSPENSION)



A015005001

#### 29,31,60,68,80,82, Screws, retainer plate, rear arm & rear shock pivot

- Plug vent holes in chaincase filler cap and oil injection reservoir cap with a wire to prevent leaks.
- Using the appropriate equipment, lift the rear of vehicle.
- Remove screws (4 on each side) following this sequence.



A015005002

- Remove suspension system from vehicle.

### DISASSEMBLY & ASSEMBLY

#### 2,3,5, Screw, nut, & slider shoe

To replace a worn slider shoe, remove the screw and nut. Slide the shoe rearward out of the runner.

▼ **CAUTION:** Slider shoes must always be replaced in pair.

#### 37,42,44,45,46,51, Center shock, screw, bushing, nut, limiter screw & nut

To remove shock:

- Loosen nut **51** from limiter screw **46** until free-play is felt.
- Unscrew shock screws and nuts.
- Inspect shock nylon bushings **44** condition.

#### 16,18,20,22,23,25,26,36,51, Front shackles, screw, nut, front swing arm & front arm

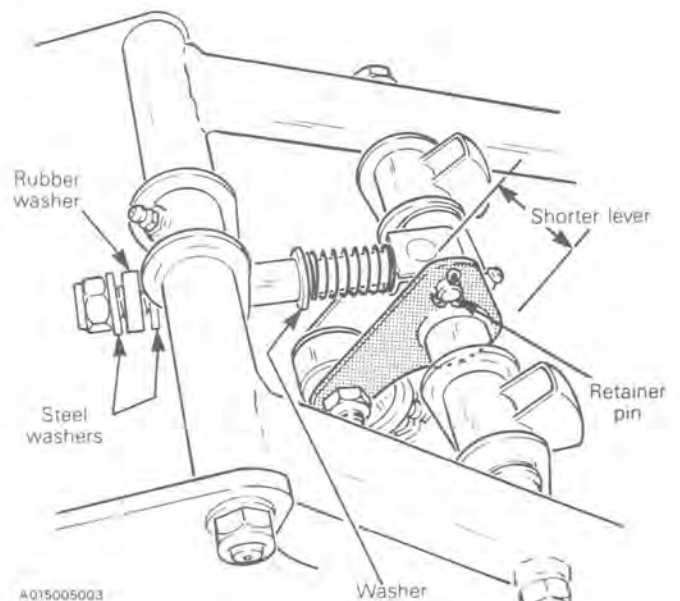
To remove:

- Unscrew screws **20** and nuts **22** from both shackles.
- Remove nut **51** from limiter screw.
- Unscrew front swing arm nut **25** then pull the bolt **23** out.
- Unscrew front arm nut **25** then pull the bolt **36** out.

At assembly, reverse the procedure. However, pay attention to the following:

- Correctly position the longer bolt at the front arm pivot point and retainer pin into the shorter lever hole. Install washers, spring and bushing as shown.

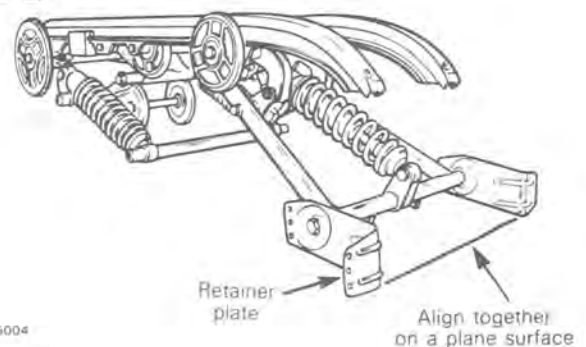
(TYPICAL)



A015005003

- Position both retainer plates at the same angle to fit properly in the frame.

(TYPICAL)



A015005004

## Section 05 SUSPENSION

### Sub-section 05 (PRS SUSPENSION)

#### 13,14, Housing & nut

Always torque nuts to 10 N•m (89 lbf•in).

#### 6,9,10,11,30,70,71,74,86, Screw, idler wheel, snap ring & bearing

To remove a bearing from an idler wheel:

- Unscrew retaining screw.
- Pull the idler wheel outward. Using a puller or by striking with a piece of wood and a hammer.
- Remove the snap ring then the bearing.

At assembly reverse the procedure.

○ **NOTE:** To remove the front idler wheels cross shaft, the runner must be removed (the cross shaft is shouldered).

#### 42,44,45,57,69,75,80,81, Screw, bushing, nut, rear shackle, rear arm, rear shock & spacer

To remove rear shock:

- Withdraw spacer from shock pivot.
- Unscrew bolt and nut.
- Inspect shock nylon bushings **44** condition.

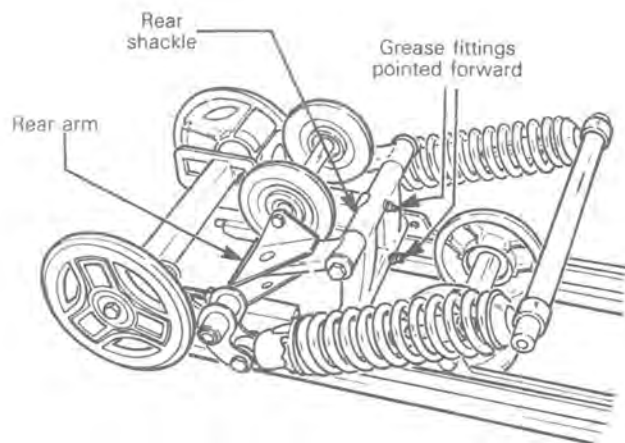
At assembly reverse the procedure.

If rear arm and/or rear shackle have been removed, make sure to reposition them properly:

- Position the grease fittings pointed forward on the rear shackle.
- See illustration to properly position the rear arm.

▼ **CAUTION:** Make sure installing washer **96** each end of the rear shackle lower axle.

(TYPICAL)



A015005005

#### 6,83,84,85, Screw, inner spacer, rear axle & outer spacer

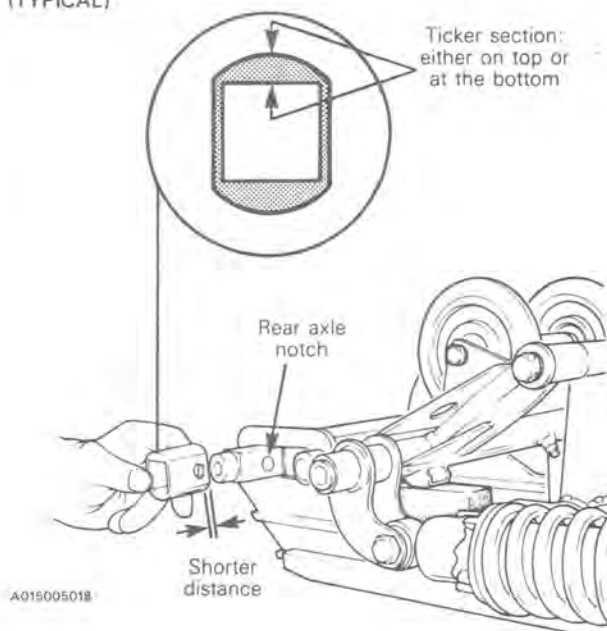
To remove:

- Unscrew retaining screw.
- Pull idler wheel.
- Remove the runner to take the rear axle off.

At assembly, reverse the procedure. However pay attention to the following:

- Position inner and outer spacer as shown.

(TYPICAL)



A015005018

▼ **CAUTION:** It is important to properly position the inner and outer spacers. Disregarding this notice might cause rear axle failure.

- Position notch on rear axle forward.
- Position hole in outer spacer forward and inward onto the rear axle.

#### 6,30,64,68,74,80,94, Screws & Loctite 271

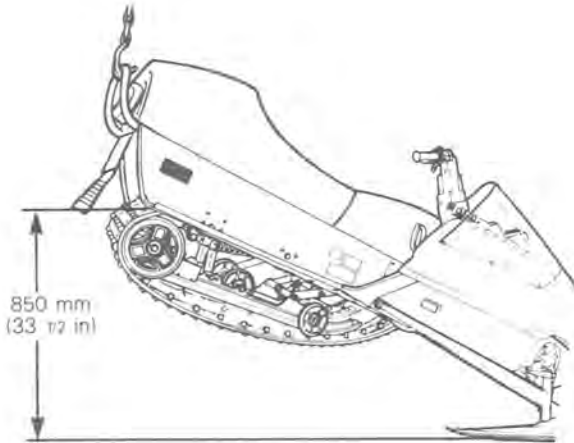
Clean all screw threads. Prior to assembly, apply low temperature grease (P/N 413 7056 00) on cross shafts and Loctite 271 or equivalent on threads.

## Section 05 SUSPENSION

### Sub-section 05 (PRS SUSPENSION)

#### INSTALLATION

- Lift the rear of vehicle off the ground about 850 mm (33 1/2").



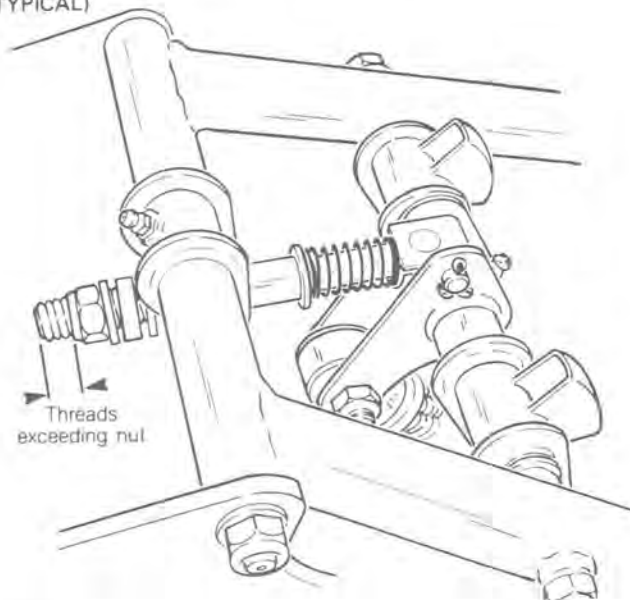
A015005001

#### 46,51, Limiter screw & nut

- Screw nut until the desired number of threads exceed it.

SNOW CONDITION	THREADS EXCEEDING NUT
Deep snow or hill climbing	3
Hard surface	11

(TYPICAL)

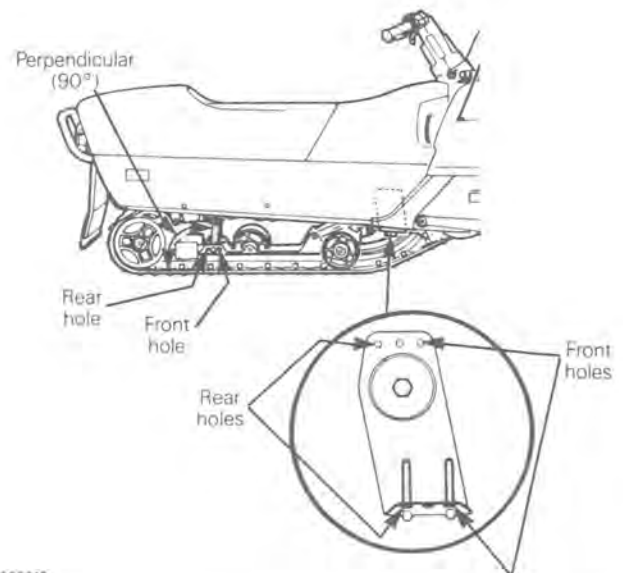


A015005003

#### 84, Rear axle

- Unscrew track tension adjustment screws allowing the rear axle to be placed in its most forward position.
- There are 3 holes on the side and 3 holes underneath to fix retainer plate to the frame.
- There are 3 holes to fix runner to the rear shackle.

Usually the suspension is fixed on the vehicle at the center hole (rear shackle & retainer plate). Select the proper hole to compensate track length variation.



A015005010

To move suspension backward: Fix screws into **front** holes of the retainer plate (on side & underneath) and **front** hole of the runner. To move forward; move them into rear holes.

**NOTE:** Make sure to maintain rear shackle perpendicular (90°) to the ground, change its position if required.

**CAUTION:** Make sure the retainer plate is secured at the same position on side and underneath holes, also on each side of the frame. In addition, rear shackle must be at the same position on each side of the runner.

## Section 05 SUSPENSION

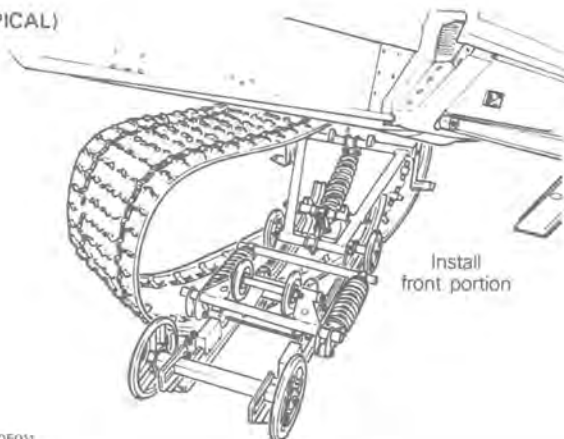
### Sub-section 05 (PRS SUSPENSION)

#### INSTALLATION INTO FRAME

The rear of vehicle raised approximately to 850 mm (33 1/2"),

- Enter the front portion of the suspension into front portion of track, raise it to its highest position under drive axle.

(TYPICAL)



A015005011

- Slide the rear portion of suspension into rear portion of track.

#### 29,31, Retainer plate & screw

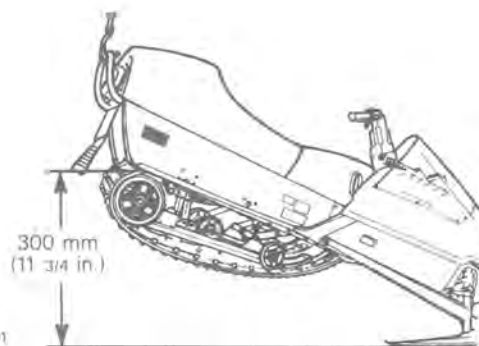
Refer to illustration to see screw installation sequence. Raise front arm and align retainer plate holes with ones in frame. Install screws and washers, do not tighten.

#### 80,81,82, Rear shock pivot, spacer & screw

Install the spacer at each end of the shock pivot then lower the vehicle just enough to align the shock pivot with holes in frame. Install the shorter screws (M10 x 25 mm) and washers. Do not tighten.

#### 60,68, Rear arm & screw

Lower the rear of vehicle to approximately 300 mm (11 3/4 in) allowing the rear arm to swing into the frame and aligning holes. Install screws and washers.

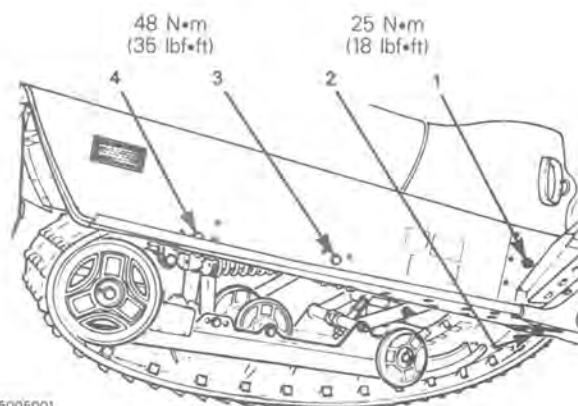


A015005001

Torque screws to these valves (see illustration).

SCREW LOCATION	DESCRIPTION	TORQUE TO
Retainer plate (side and underneath)	M8 x 25 mm	25 N•m (18 lbf•ft)
Shock pivot	M10 x 25 mm	48 N•m (35 lbf•ft)
Rear arm	M10 x 35 mm	48 N•m (35 lbf•ft)

Suspension system installation sequence:



A015005001

#### 17,19,27,58,61, Grease fittings

Lubricate until grease appears at joint using low temperature grease (P/N 413 7056 00):

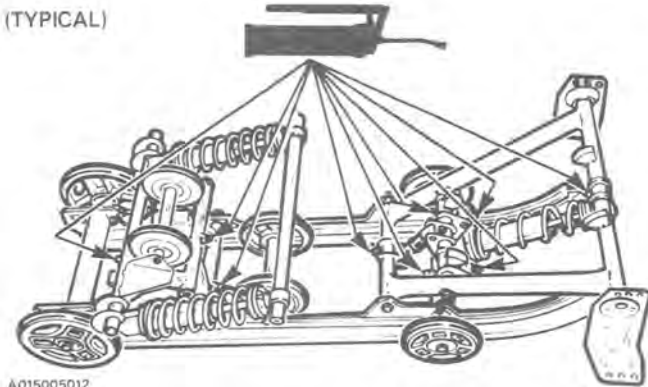
- Front arm: upper and lower axle.
- Front swing arm: upper and lower axle.
- Front shackles.
- Rear arm: upper and lower axle.
- Rear shackle.

## Section 05 SUSPENSION

### Sub-section 05 (PRS SUSPENSION)

NOTE: There are 9 lubrication points.

(TYPICAL)



A015005012

NOTE: To adjust the track tension and alignment, refer to section 05-08.

#### 6,84, Screw & rear axle

After track adjustment, torque rear axle screws to 48 N•m (35 lbf•ft).

Reposition vehicle on ground.

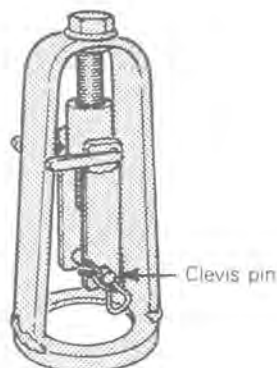
Remove chaincase and oil injection reservoir vent hole wires.

### SHOCK ABSORBER SPRING REPLACEMENT

WARNING: Do not attempt to dismantle a shock absorber spring without using the proper spring compressor.

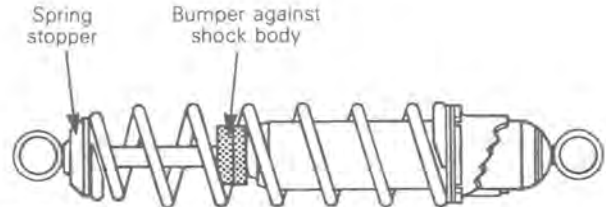
#### 38,39,76,77, Spring stopper & spring

Use spring remover P/N 414 5796 00.



A015005023

NOTE: Before attempting to compress the shock spring, push the rubber bumper on the piston shaft against the shock body and place the adjuster ring at its lowest position.

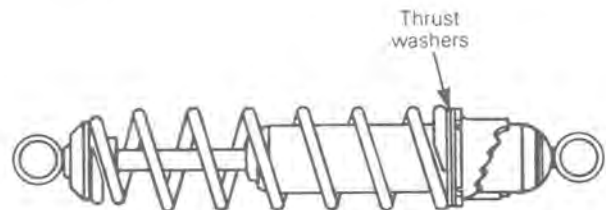


A015005024

Install the shock spring remover over the spring. Insert clevis pin through the shock eye and secure it with the hair pin.

Tighten the bolt until the spring stopper can be removed.

NOTE: When reinstalling a spring, make sure both thrust washers are between the spring and the adjuster ring. They are required to ease cam twisting. Apply a light coat of grease between them. Place the adjuster ring at its lowest position.



A015005013

### SHOCK ABSORBER SERVICING

Secure the shock body end in a vise.



A015005011

CAUTION: Do not clamp directly on shock body.

Examine each shock for leaks. Extend and compress the piston several times over its entire stroke checking that it moves smoothly and with uniform resistance.

Pay attention to the following conditions that will denote a faulty shock:



## Section 05 SUSPENSION

### Sub-section 05 (PRS SUSPENSION)

- A skip or a hang back when reversing stroke at mid travel.
- Seizing or binding condition except at extreme end of either stroke.
- Oil leakage.
- A gurgling noise, after completing one full compression and extension stroke.

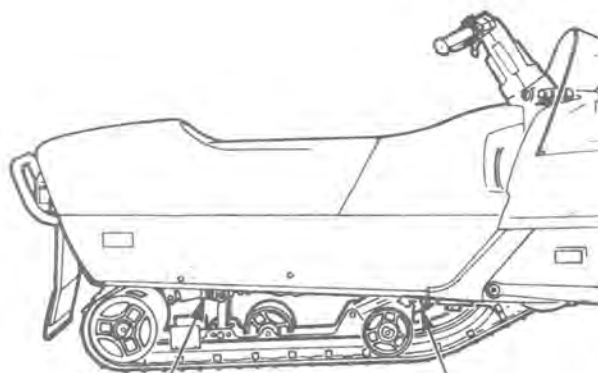
Renew if any faults are present.

## REAR SUSPENSION ADJUSTMENT

### 41,79, Adjuster ring

The rear suspension has 2 preload adjustments:

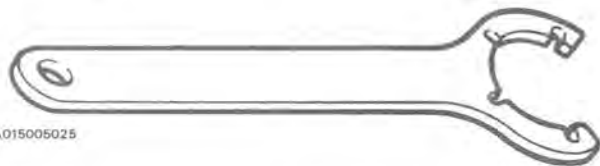
- The center shock spring for surface condition.
- The rear shock springs (twin shocks) for driver's weight.



A015005004

The shock absorber preload is adjusted by turning the adjuster ring.

### 97, Adjustment key



A015005025

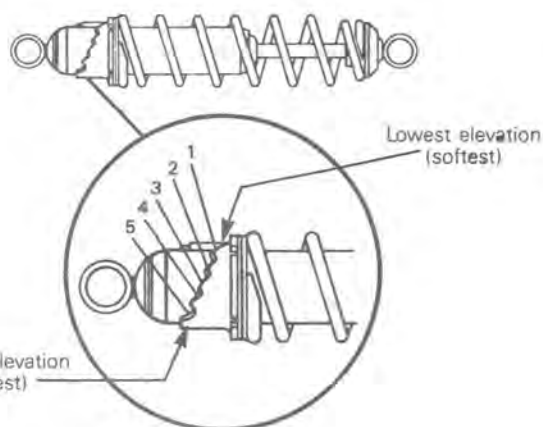
Use adjustment key to adjust shock spring preload.  
Spray some WD 40 between spring and spring collar.

**CAUTION:** There must be two thrust washers between spring and spring collar. If any is missing, replace it P/N 503 0887 00) before attempting to adjust spring collar.

The central shock of the rear suspension should be removed to adjust spring collar.

Each shock absorber has a 5 position ring located at the bottom of the shock. If a stiffer or softer action is desired, the spring preload may be increased or decreased by adjusting the ring.

Fit the key on the shock spring collar and turn clockwise for stiffest or counterclockwise for softest.



A015005015

### Center spring

When the center spring ring is at the lowest elevation more weight is distributed on the skis.

At the highest position the weight is transferred from the skis to the track.

Depending the snow condition these positions are recommended:

SNOW CONDITION	CAM POSITION
Deep snow or hill climbing	1-2-3
Hard surface	4-5

### Rear shock springs

Driver's weight kg (lb)		Cam position
FROM	UP TO	
—	64 (140)	1
69 (140)	73 (160)	2
73 (160)	82 (180)	3
82 (180)	—	4-5

## Section 05 SUSPENSION

### Sub-section 05 (PRS SUSPENSION)

▼ **CAUTION:** Left and right adjuster ring must always be set at the same position.

○ **NOTE:** Softer "optional" shock springs are available for shocks absorbers. (See shock spring tables).

Center shock spring P/N 503 0904 00.

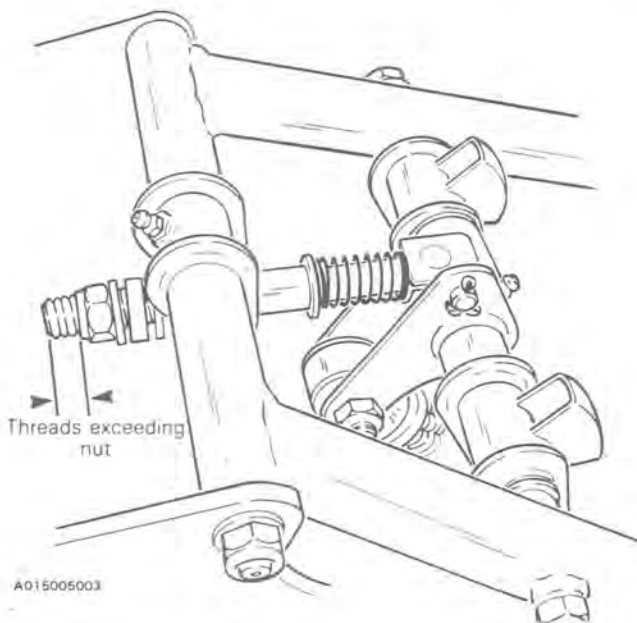
Rear shock spring P/N 509 0903 00.

#### 46, Limiter screw

The function of the suspension limiter screw is to control the transfer of vehicle weight during acceleration. The shorter the screw threads exceed nut, the more the weight will be transferred to the track to provide a better traction. The longer the screw threads exceed nut, the lesser the weight will be transferred to the track, thus maintaining a more positive direction. Limiter screw allows to adjust weight transfer according to driver's requirement, field and/or snow conditions.

As a guideline here are the preferred positions:

SNOW CONDITION	THREADS EXCEEDING NUT
Deep snow or hill climbing	3
Hard surface	11



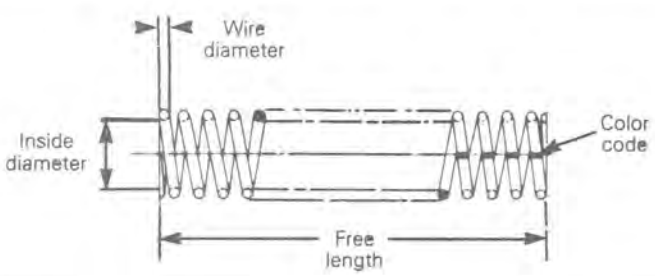
## Section 05 SUSPENSION

### Sub-section 05 (PRS SUSPENSION)

**CAUTION:** Optional parts are calibrated to operate together. Failure to follow this recommendation may affect handling of the vehicle.

## SPECIFICATIONS

### Shock spring specifications\*

Location	Center (standard)	Rear (standard)	Center (optional)	Rear (optional)
Part number	414 5591 00	503 0804 00	503 0904 00	503 0903 00
Number of coils	12.6	15.3	15	15.6
Free length $\pm 3 \text{ mm } (\pm .12'')$	241.3 mm (9.50'')			247.6 mm (9.75'')
Spring rate $\pm 1.8 \text{ N/mm } (\pm 10 \text{ lb/in})$	45.5 N/mm (260 lbf/in)	35.0 N/mm (200 lbf/in)	24.5 N/mm (140 lbf/in)	28.0 N/mm (160 lbf/in)
Inside diameter (big end)	$46.7 \begin{smallmatrix} +0.8 \\ -0 \end{smallmatrix} \text{ mm}$ $(1.84 \begin{smallmatrix} +.03'' \\ -0 \end{smallmatrix})$			
Wire diameter $\pm 0.05 \text{ mm } (\pm .002'')$	9.19 mm (.362'')		8.25 mm (.325'')	8.71 mm (.343'')
Compressed length	107.7 mm (4.24'')	131.8 mm (5.19'')	116.3 mm (4.58'')	128.3 mm (5.05'')
Color code	Blue-blue	Green-green	Orange-orange	Yellow-yellow
Spring description	 <p>The diagram illustrates a coiled shock spring. It labels the 'Wire diameter' as the thickness of the spring wire. The 'Inside diameter' is the distance between the innermost coils. The 'Free length' is the total length of the spring when it is not under any load. A 'Color code' is indicated by an arrow pointing to a specific coil on the spring.</p> <p>A014005014</p>			

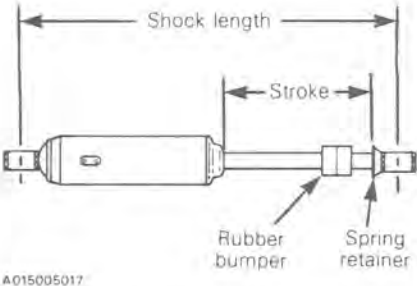
\*For front shock springs specifications, refer to section 06-02.



## Section 05 SUSPENSION

### Sub-section 05 (PRS SUSPENSION)

#### Shock absorber specifications\*

Location		Center	Rear
Part number		414 5570 00	414 5356 00
Full stroke		91.4 mm (3.60'')	113.4 mm (4.46'')
Length collapsed	At bumper contact	248 mm (9.76'')	238 mm (9.37'')
	At spring retainer contact	222.6 mm (8.76'')	212.6 mm (8.37'')
Length extended		314 mm (12.36'')	326 mm (12.83'')
Shock description			

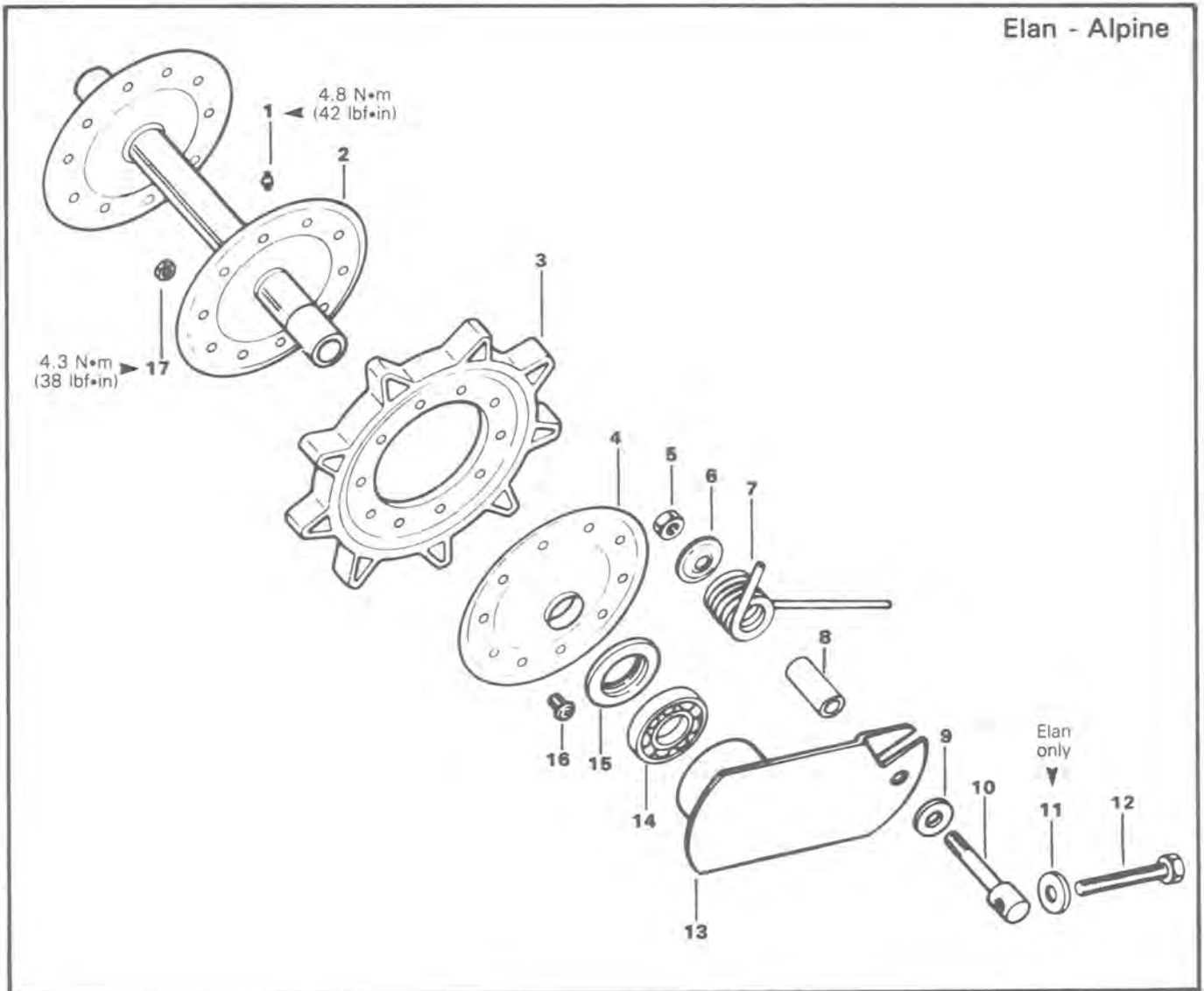
\*For front shock absorber specifications, refer to section 06-02.

**CAUTION:** The center shock is different from the rear ones and must not be interchanged. Make sure they are properly positioned. Refer to the length, the center one is longer (about 12 mm (15/32'')) when fully extended. Also note that the part number for each shock is stamped on shock body.



## REAR AXLE

Elan - Alpine



- 1. Grease fitting
- 2. Rear axle
- 3. Sprocket
- 4. Mobile flange
- 5. Lock nut
- 6. Retainer washer
- 7. Link plate spring
- 8. Sleeve
- 9. Hardened washer

- 10. Eye bolt
- 11. Washer (Elan only)
- 12. Adjuster bolt
- 13. Link palte
- 14. Bearing
- 15. Seal
- 16. Bolt (flange)
- 17. Nut (flange)

## Section 05 SUSPENSION

### Sub-section 06 (REAR AXLE)

#### REMOVAL

Lift and block rear of vehicle off the ground.

#### 7, Link plate spring

Using an appropriate tool, unlock link plate springs.

#### 5,6, Retainer washer & lock nut

Remove the link plate spring lock nuts and retainer washers.

#### 8,9,10,11,12, Eye bolt, hardened washer, adjuster bolt, washer (Elan) & sleeve

Remove track adjuster bolts, eye bolts, hardened washers and adjuster sleeves.

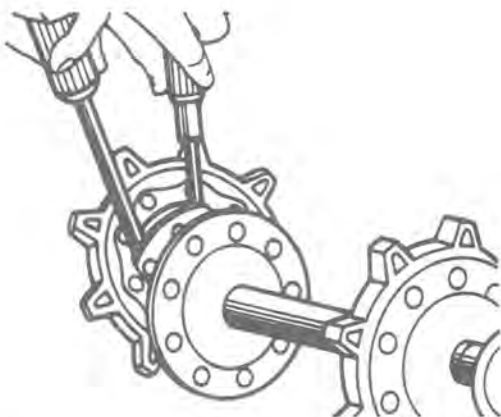
Withdraw rear axle from vehicle.

#### DISASSEMBLY & ASSEMBLY

#### 3, Sprocket

Sprockets are factory riveted (on Elan only). When separation is necessary, remove rivets securing idler with a 1/4 dia. drill.

To remove sprocket without removing bearing, apply liquid soap or petroleum jelly on sprocket bead and flange then with two (2) screwdrivers (round bars), pass the sprocket over flange. Reverse change-over procedure to install sprockets.

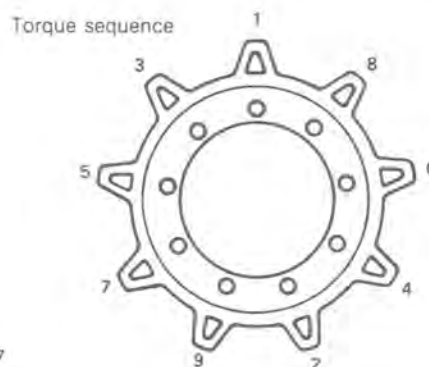


A002005006

#### 2,3,4,16,17, Rear axle, sprocket, mobile flange bolt & nut

At assembly on the Elan, replace rivets using screws 1/4-20 x 3/4" with elastic stop nuts.

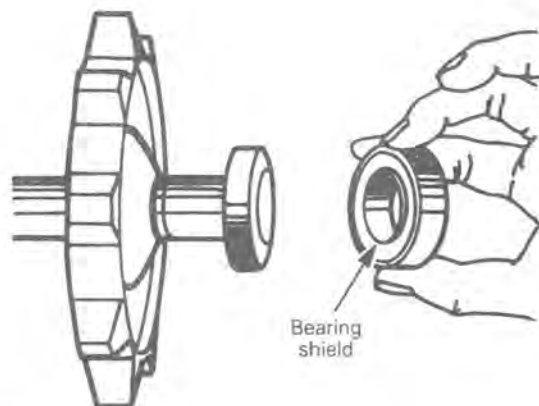
Secure idler wheels and flanges using bolts and nuts tightened in the following sequence to 4.3 N•m (38 lbf•in).



A002005007

#### 14, Bearing

Always pull or push the bearing by inner race. Install bearing with shield facing the sprocket.



A002005008

### **13,15, Link plate & seal**

When assembling, always position a new seal. When inserting seals into link plate, seal lip must sit correctly in groove of link plate. After lubricating the rear axle, ensure that seals remain in position.

## **INSTALLATION**

### **2, Rear axle**

With rear of vehicle off the ground, position the rear axle within the track.

### **8,9,10, Eye bolt, hardened washer & sleeve**

Install sleeves, hardened washers and eye bolts.

### **12, Adjuster bolt**

Partially screw-in the track adjuster bolts.

### **5,6, Retainer washer & lock nut**

Install retainer washers and partially tighten the link plate spring lock nuts.

Carry out track tension and alignment.

○ **NOTE:** To adjust the track tension and alignment, refer to section 05-08.

### **7, Link plate spring**

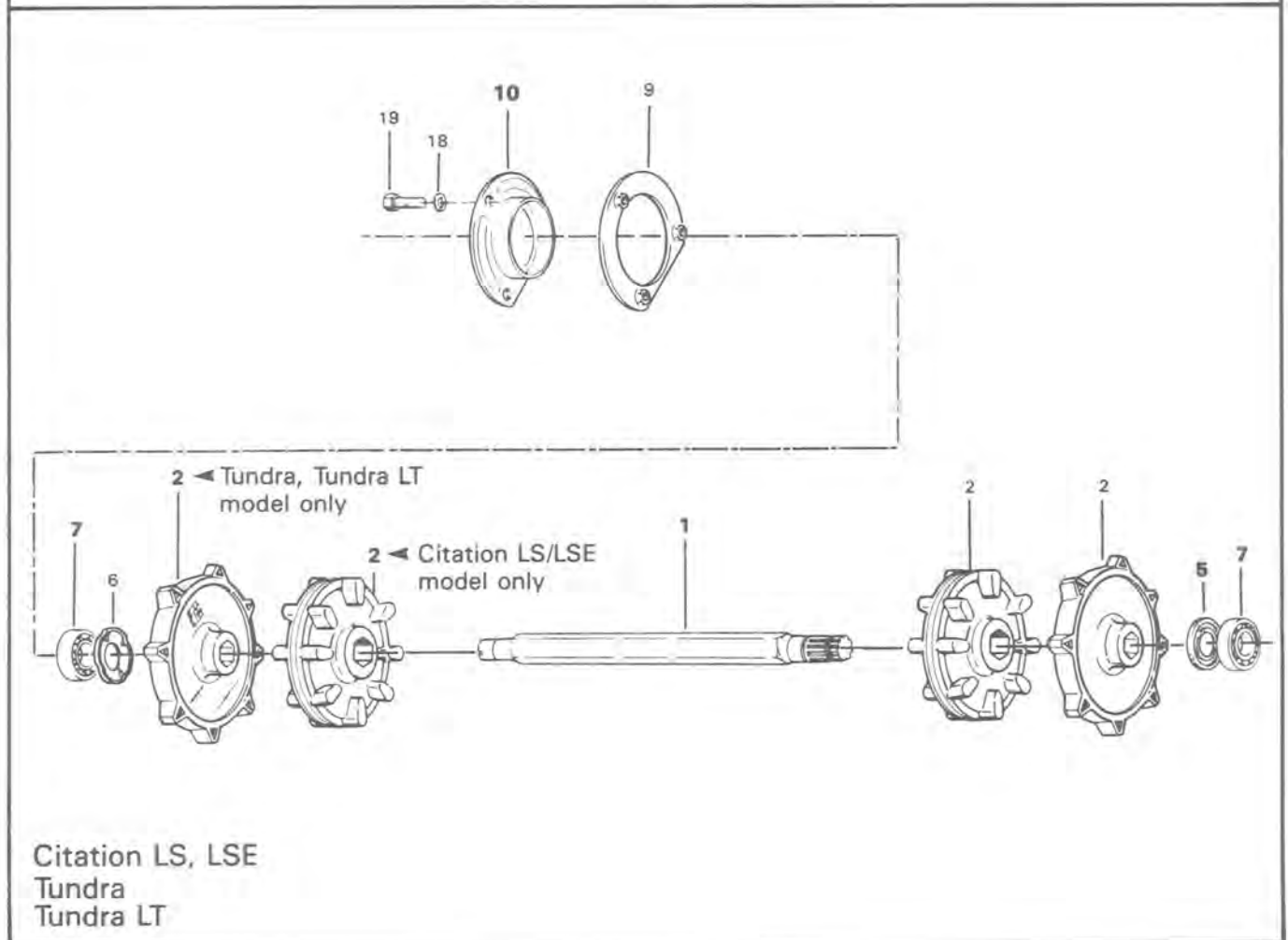
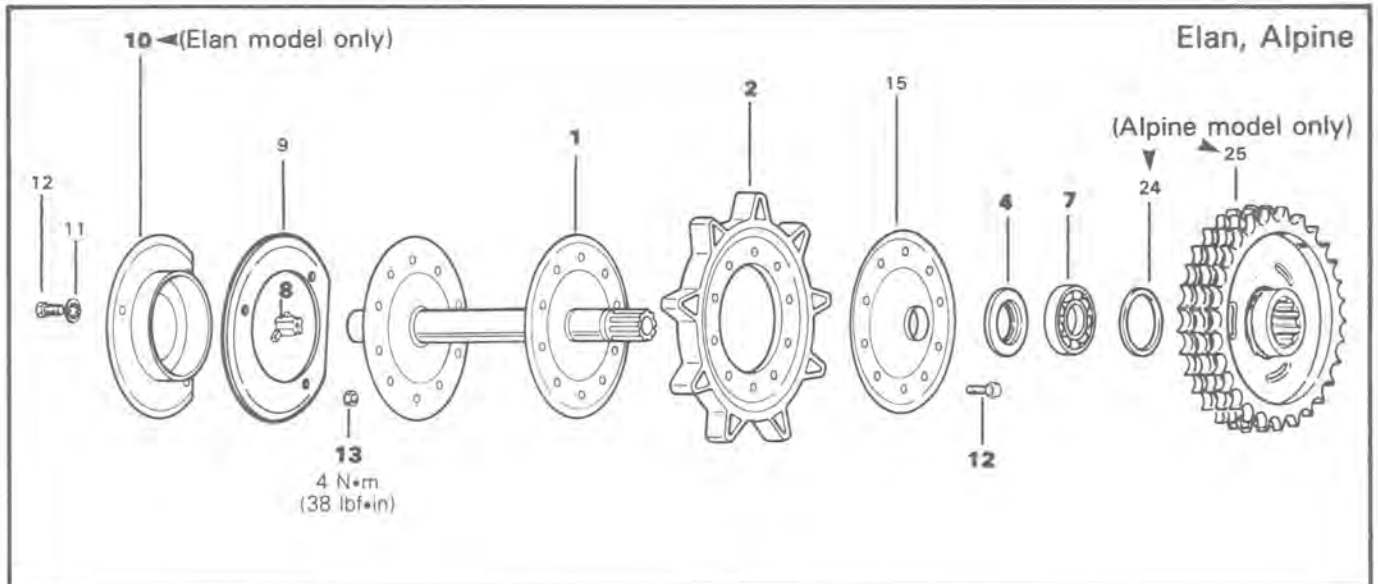
Hook the link plate springs. If applicable, hook springs into middle position of 3 position anchors.

### **1, Grease fitting**

If necessary, lubricate idler wheels at grease fittings until grease appears at joints. Use low temperature grease only (P/N 413 7056 00).



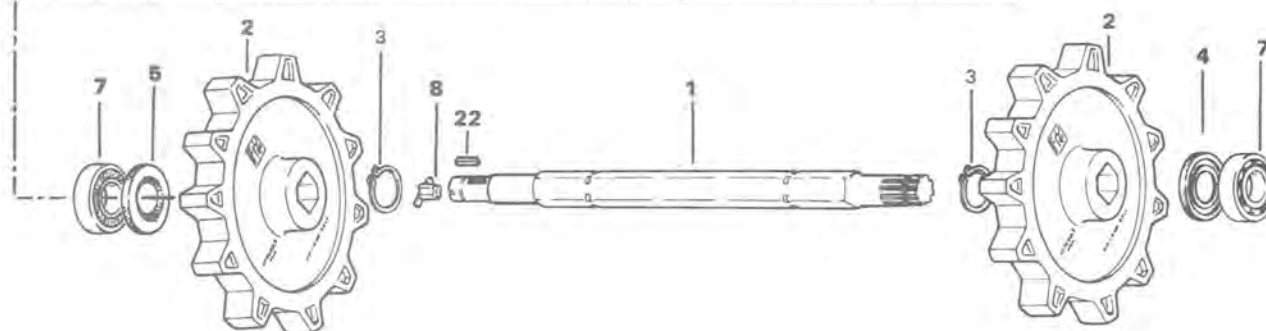
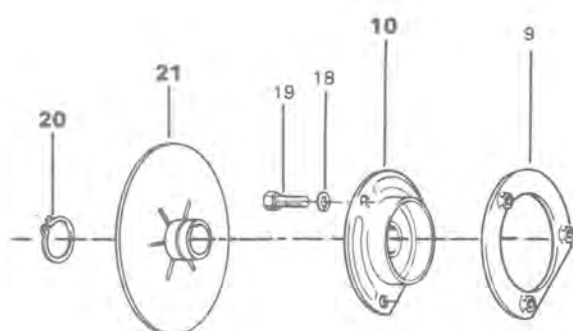
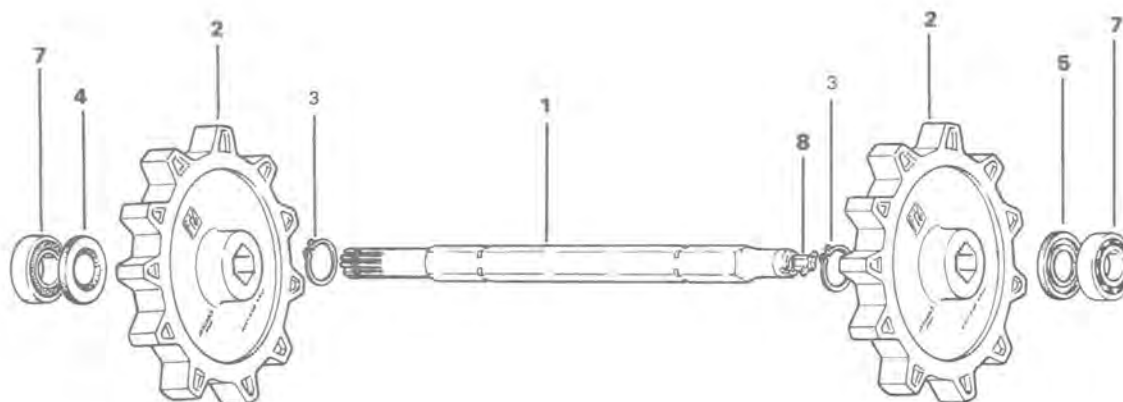
# DRIVE AXLE



## Section 05 SUSPENSION

### Sub-section 07 (DRIVE AXLE)

Skandic

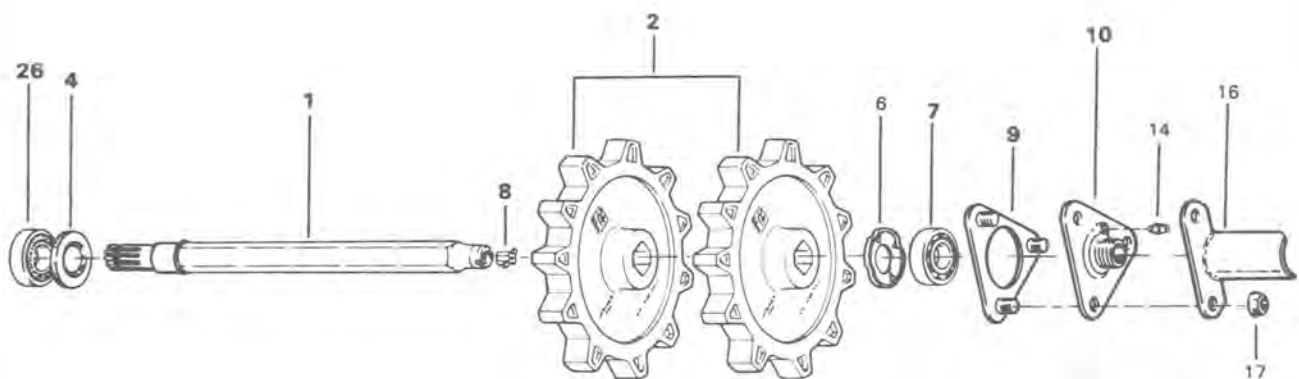
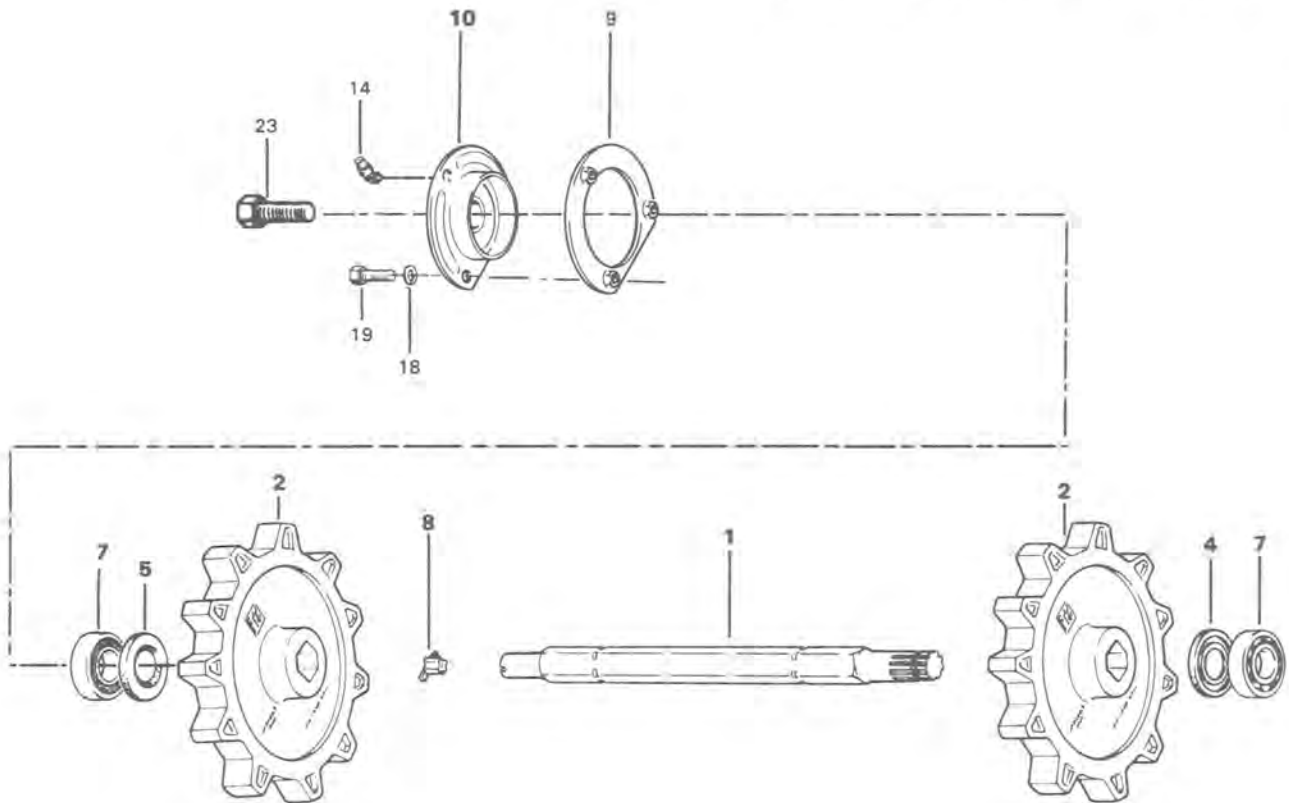


Skandic "R"



**Section 05 SUSPENSION**  
**Sub-section 07 (DRIVE AXLE)**

Formula SP  
Safari 377, 377E, 447, Grand Luxe



Formula MX, Plus

## Section 05 SUSPENSION

### Sub-section 07 (DRIVE AXLE)

1. Drive axle
2. Sprocket
3. Circlip
4. Seal
5. Seal
6. Seal retainer
7. Bearing
8. Speedo drive insert
9. Retainer ring
10. End bearing housing
11. Lock washer 5/16"
12. Hexagonal head cap screw 1/4"-20 x 3/4"
13. Hexagonal flanged elastic stop nut 1/4"-20

14. Grease fitting
15. Mobile flange
16. Cable protector
17. Hexagonal flanged elastic stop nut M8
18. Lock washer 6 mm
19. Hexagonal head cap screw M6 x 16
20. Circlip
21. Brake disc
22. Key
23. Screw M12 x 10 (Safari 377 only)
24. Spacer
25. Sprocket
26. Bearing

## REMOVAL

Drain oil from chaincase or gear box. Remove chaincase cover. Release drive chain tension (if applicable).

Raise and block rear of vehicle off ground.

Remove suspension. (See section 05).

### 4,5,10, Seals & bearing housing

Pry oil seals from chaincase and end bearing housing (if applicable).

Remove end bearing housing and unlock drive axle end sprocket (single track models).

NOTE: If applicable, remove battery and its seat. If vehicle is equipped with a speedometer, remove angle drive unit and coupling cable.

### 20,21,22, Circlip, brake disc & key

On Skandic "R" models, remove brake caliper, circlip, brake disc and key before removing end bearing housing.

### 1,2, Drive axle & sprockets

Release drive sprockets teeth from track notches, at the same time, pulling the drive axle towards the end bearing housing side of frame.

Remove drive axle from vehicle. If applicable, pull out shim located between bearing and lower chaincase sprocket.

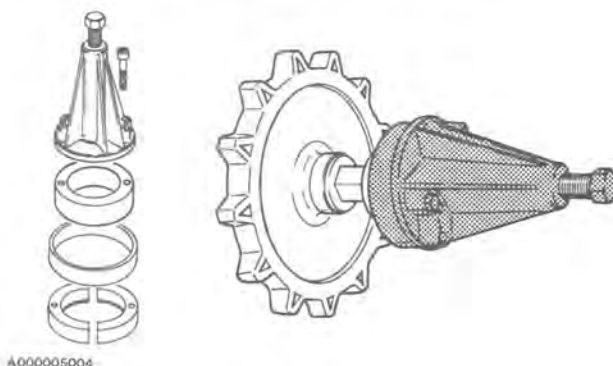
## DISASSEMBLY

### 8, Speedo drive insert

Remove speedo drive insert (if applicable).

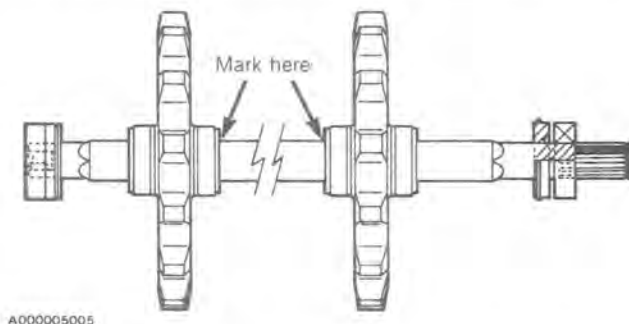
### 7,26, Bearings

To remove bearings, use puller assembly, ring and half rings as illustrated. (Refer to tools section).



### 2, Sprockets

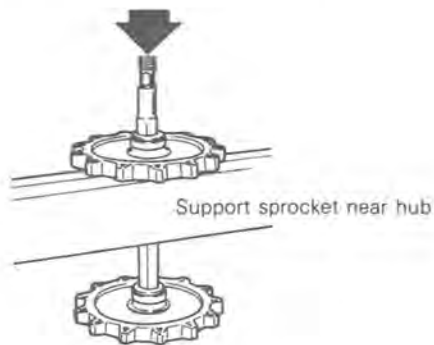
When replacing sprockets, make a reference mark on the axle to facilitate positioning of the new sprockets.



To remove, press fit sprockets (drive axle without flange), use a press and a suitable support as illustrated.

## Section 05 SUSPENSION

### Sub-section 07 (DRIVE AXLE)



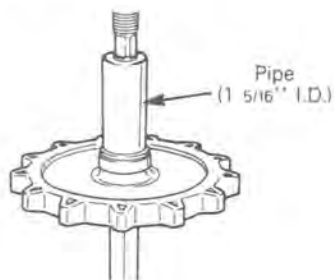
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NOTE: 1986 models have two different axle-sprocket press fits. Ensure to replace ring reinforced sprockets with the same type.

## ASSEMBLY

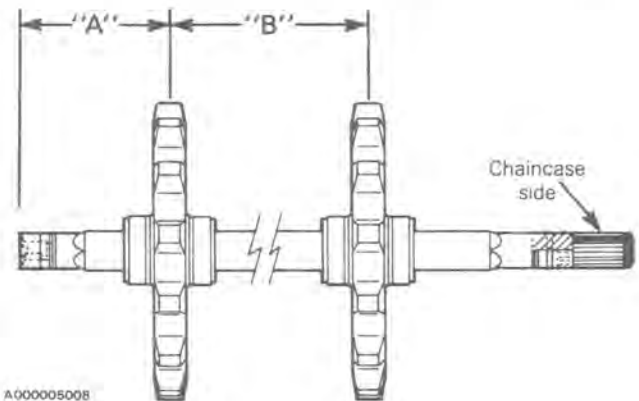
### 1,2, Drive axle & sprocket

To assemble press fit sprockets, use a press and a pipe (1 5/16" I.D.) as illustrated. Sprockets must be assembled with the following dimensions.



A000005007

CAUTION: On Skandic only; a new sprocket (P/N 414 4793 00) has been introduced on mid-series vehicle with a smaller root diameter than those previously used. Therefore, always replace them in pairs if changed on the first series or on previous vehicle. Note that the part number is molded on the sprocket side.



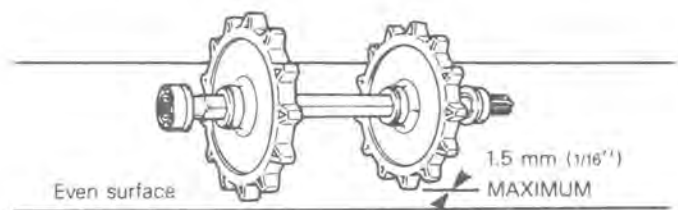
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APPLICABLE MODELS	"A" mm (in)	"B" mm (in)
Citation LS, LSE	135 (5 5/16)	138 (5 7/16)
Tundra, Tundra LT	83 (3 17/64)	242 (9 17/32)
Skandic	91.7 (3 39/64)	242 (9 17/32)
Skandic R	146 (5 3/4)	242 (9 17/32)
Safari 377	113 (4 29/64)	225.5 (8 7/8)
Safari 377 E, 447, Grand Luxe, Formula SP	104.5 (4 7/64)	242 (9 17/32)
Formula MX	114.5 (4 1/2)	226 (8 57/64)
Formula Plus	106.5 (4 3/16)	242 (9 17/32)

Ensure to align indexing marks on each sprocket before assembling the second sprocket.

The maximum synchronization tolerance for the sprockets is 1.5 mm (1/16").

To check this tolerance, place axle assembly on a plane surface and measure the gap between sprocket teeth and surface.



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CAUTION: The same sprocket must not be pressed twice on the axle. If synchronization is found to be defective, use a new sprocket.

## Section 05 SUSPENSION

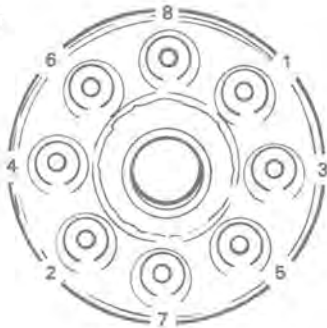
### Sub-section 07 (DRIVE AXLE)

#### 12,13, Cap screws & elastic stop nut

On Elan and Alpine, tightening torque for axle flanges is 4 N•m (38 lbf•in).

When reassembling, install a new nut or apply Loctite (or equivalent) on old threads. Tighten in the following sequence.

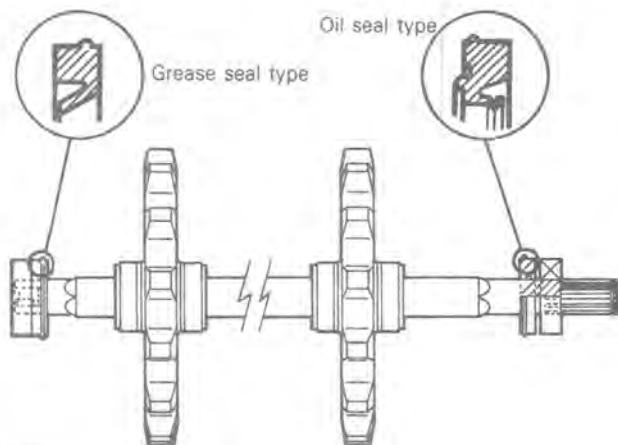
Torque sequence



A000005011

#### 1,4,5, Drive axle & seal

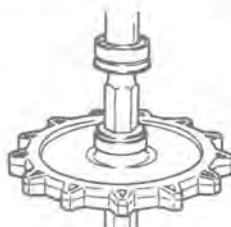
When assembling drive axle, always position a new seal on each end of drive axle (if applicable). The seal lip must face sprocket as illustrated.



A000005012

#### 7,26, Bearings

Always push bearing by inner race.

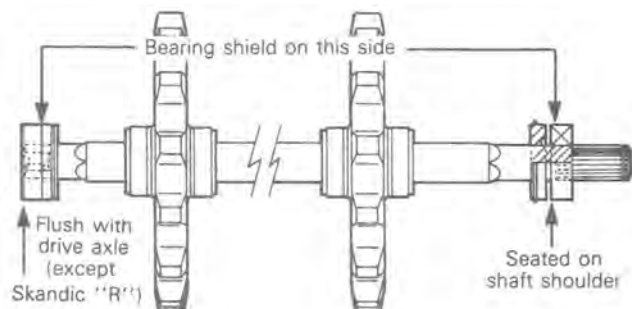


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05-07-6

The bearing on the splined side of axle must be pushed until it is seated on shaft shoulder. The end bearing housing bearing must be flush with end of drive axle. Each bearing must have its shield facing the sprocket.

**NOTE:** On Skandic "R" model, the two bearings on drive axle must be seated against shaft shoulder. The completely sealed bearing must be install on disc brake side.



A000005015

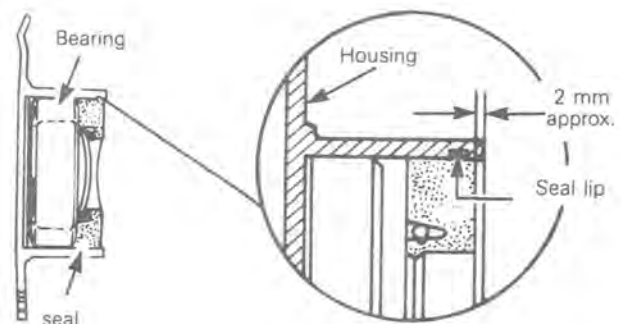
## INSTALLATION

### 8, Speedo drive insert

If the drive axle to be installed is a new part and the vehicle is equipped with a speedometer, a correct size speedometer drive insert must be installed into the axle end. Ensure that insert is flush with end of axle.

Position drive axle assembly into location. Install shim(s) between bearing and lower chaincase sprocket. Install end bearing housing.

Install chaincase and position seals, making sure that a gap of approximately 2 mm (1/16") exists between end of bearing housing and each seal.



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## **Section 05 SUSPENSION**

### **Sub-section 07 (DRIVE AXLE)**

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Lock drive axle sprocket with a new cotter pin (Elan model) or circlip (other single track models).

Reinstall the chaincase cover.

Refill with chaincase oil. (See technical data, section 09).

Install the suspension. Apply track tension and carry out track alignment procedure. (See section 05-08).




# TRACK

## TRACK TYPE APPLICATION

Refer to the "Technical Data" section 09.

## INSPECTION

Visually inspect track for cuts and abnormal wear. Inspect track for broken rods. If damage is evident or rods are broken, replace track. Inspect track for damaged or missing inserts. Replace damaged insert(s).

 **WARNING: Do not operate a snowmobile with a cut, torn or damaged track.**

## REMOVAL

### Elan

Remove the following items:

- Tool box
- Chaincase access plug
- Drive axle cotter pin and washer
- Suspension
- Rear axle
- The two drive axle seals
- End bearing housing
- Drive axle
- Track

### Skandic, Skandic "R"

Remove the following items:

- Pulley guard and drive belt
- Air silencer
- Chaincase cover, sprockets and chain
- Suspension
- Brake caliper (Skandic "R")
- Circlip (Skandic "R")
- Brake disc (Skandic "R")
- Key (Skandic "R")
- Drive axle shaft bearing housing (left side)
- Drive axle (outwards from left side)
- Upper center idler(s) assembly
- Track

### Formula MX, Plus

Remove the following items:

- Speedometer cable and protector
- Muffler
- Chaincase cover, sprockets and chain
- Suspension
- Drive axle seal
- End bearing housing
- Drive axle (toward end bearing housing)
- Track

### Alpine

Remove the following items:

- Release the chain tensioner of the transmission chain
- Bogie wheels
- Rear axle(s) assembly(ies)
- Drain the transmission oil
- Drive axle seal(s)
- End bearing(s) housing
- Drive axle(s) (outwards from end bearing(s) housing)
- Track(s)

### Formula SP, Safari 377, 377E, 447 Grand Luxe LC

Remove the following items:

- Speedometer cable
- Battery and battery support (if so equipped)
- Chaincase cover, sprockets and chain
- Suspension
- Two drive axle seals
- Drive axle (outwards from end bearing housing)
- Track

## Section 05 SUSPENSION

### Sub-section 08 (TRACK)

#### Citation LS, LSE, Tundra, Tundra LT

Remove the following items:

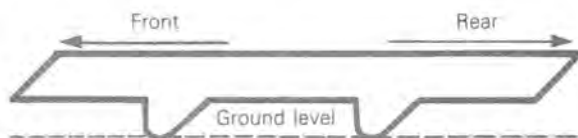
- Battery (if so equipped)
- Chaincase cover, sprockets, chain
- Muffler
- Upper center idler ass'y
- Suspension
- End bearing housing
- Both drive axle seals
- Drive axle (outwards from end bearing housing)
- Track

### INSTALLATION

#### All models:

Reverse the removal procedure.

○ **NOTE:** When installing the track, ensure the right angle of bearing surface of the track rib is facing the front of vehicle.



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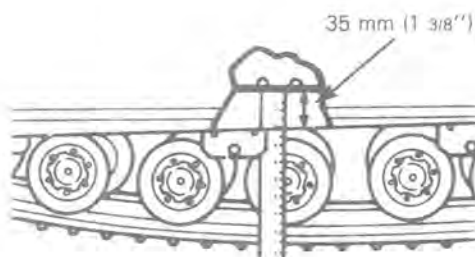
#### Track tension & alignment

Track tension and alignment are inter-related. Do not adjust one without checking the other. Track tension procedure must be carried out prior to track alignment.

▼ **CAUTION:** Each item must be installed following the specific procedure detailed in this manual.

#### Tension (bogie wheel), Elan

With rear of vehicle blocked off the ground, check the track tension at middle set of bogie wheels: 35 mm (1 3/8") between top inside edge of track and bottom of foot board.



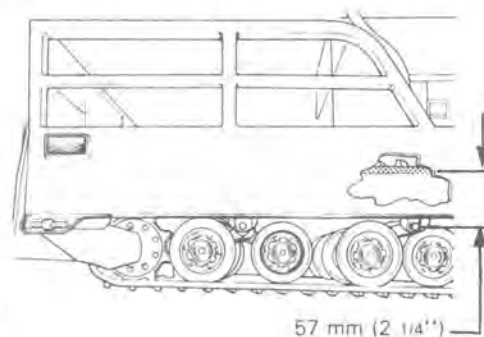
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If applicable, ensure that the link plate springs are in the middle position of the 3 position slotted anchors.

To correct track tension, loosen link plate spring lock nuts on inner side of link plate springs. Turn adjuster bolts clockwise to tighten track or counterclockwise to slacken.

#### Tension (bogie wheel), Alpine

With rear of vehicle blocked off the ground, check the tension of each track: 57 mm (2 1/4") between top inside edge and bolt of center wheel set retaining bolt.



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To correct track tension, loosen link plate spring lock nuts on inner side of link plate springs. Turn adjuster bolts clockwise to tighten track or counterclockwise to slacken.

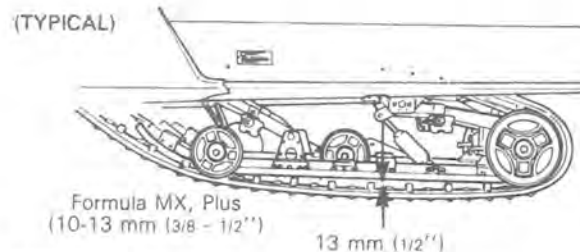
Tighten link plate spring lock nuts.

▼ **CAUTION:** Too much or too little tension will result in power loss and excessive stress on suspension components.

○ **NOTE:** If the track tension is too loose, the track will have a tendency to thump.

#### Tension (for all slide suspension models)

Lift the rear of vehicle and support with a mechanical stand. Allow the slide to extend normally. Check the gap 13 mm (1/2") (10-13 mm (3/8" - 1/2")) on Formula MX Plus between the slider shoe and the bottom inside of the track.



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▼ **CAUTION:** Too much or too little tension will result in power loss and excessive stress on suspension components.

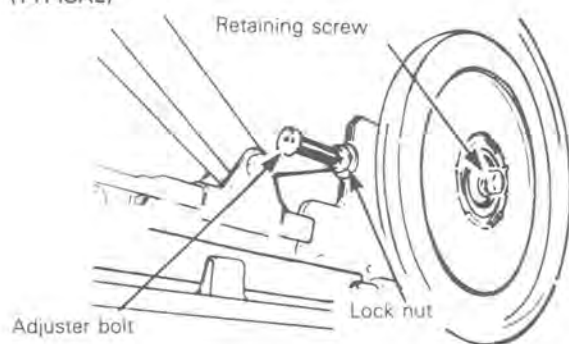


## Section 05 SUSPENSION

### Sub-section 08 (TRACK)

To adjust loosen the rear idler wheel retaining screw (not required on Citation LS, LSE, models) and the adjuster bolt lock nut; then loosen or tighten the adjuster bolts located on the inner side of the rear idler wheels.

(TYPICAL)



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NOTE: If the track tension is too loose, the track will have a tendency to thump.

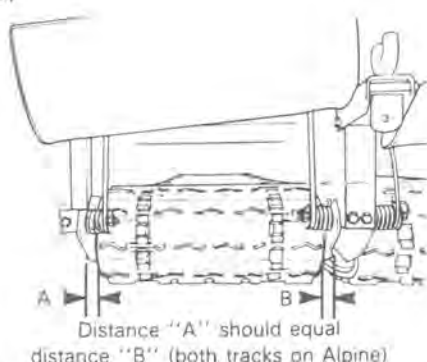
#### Alignment (bogie wheel all models)

With rear of vehicle supported off the ground, start engine and allow the track to rotate **slowly**.

Check if track is well centered and turns evenly on rear sprockets. Distance between edge of track and link plate must be equal on both sides. (If applicable, ensure link plate springs are in the middle position of the 3 position slotted anchors).

**WARNING:** Before checking track alignment, ensure that the track is free of all particles which could be thrown out while track is rotating. Keep hands, feet, tools and clothing clear of track.

(TYPICAL)



A002005015

Rotate track slowly and recheck alignment and tension. To correct alignment, loosen link plate spring lock nut on side where track is closest to the link plate.

Turn track adjuster bolt on same side, clockwise until track re-aligns.

Tighten link plate spring lock nut.

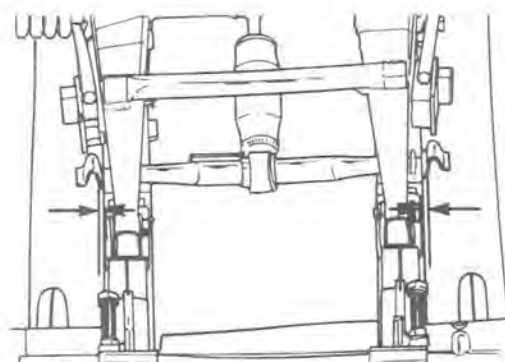
#### Alignment (slide suspension all models)

With rear of vehicle supported off the ground, start engine and allow the track to rotate **slowly**.

Check that track is well centered and turns evenly. To correct, stop engine then loosen the lock nuts and tighten the adjuster bolt on side where guides are farthest to slide. Tighten lock nuts and recheck alignment.

NOTE: On the Formula MX, Plus, torque retaining screw to 48 N•m (35 lbf•ft) after adjustment.

(TYPICAL)



A001005005

**WARNING:** Before checking track alignment, ensure that the track is free of all particles which could be thrown out while track is rotating. Keep hands, tools, feet and clothing clear of track.

#### TRACK INSERT INSTALLATION

Using #529 004 500 tool (with two standard jigs)

Tilt vehicle on its side to expose the track notches then place insert into position.

NOTE: Keep the same actual pitch between cleat guides.

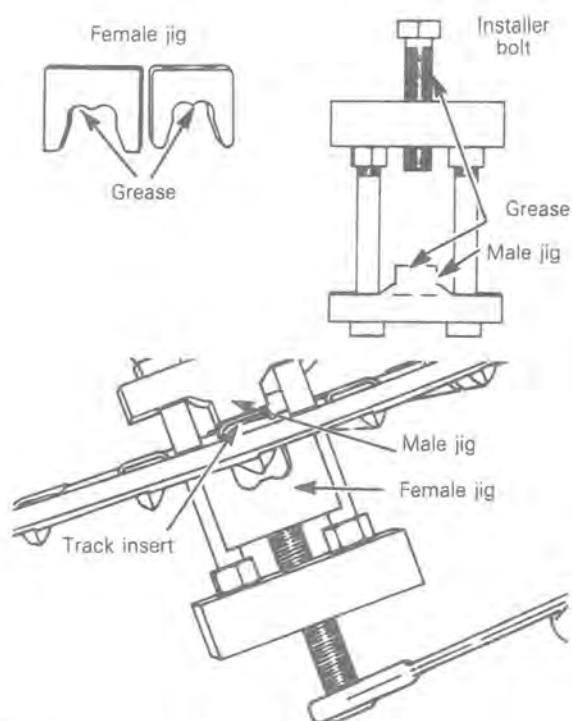
## Section 05 SUSPENSION

### Sub-section 08 (TRACK)

Place the track insert installer into track notches and position male jig on top of track insert.

Tighten installer bolt until track insert is locked in place.

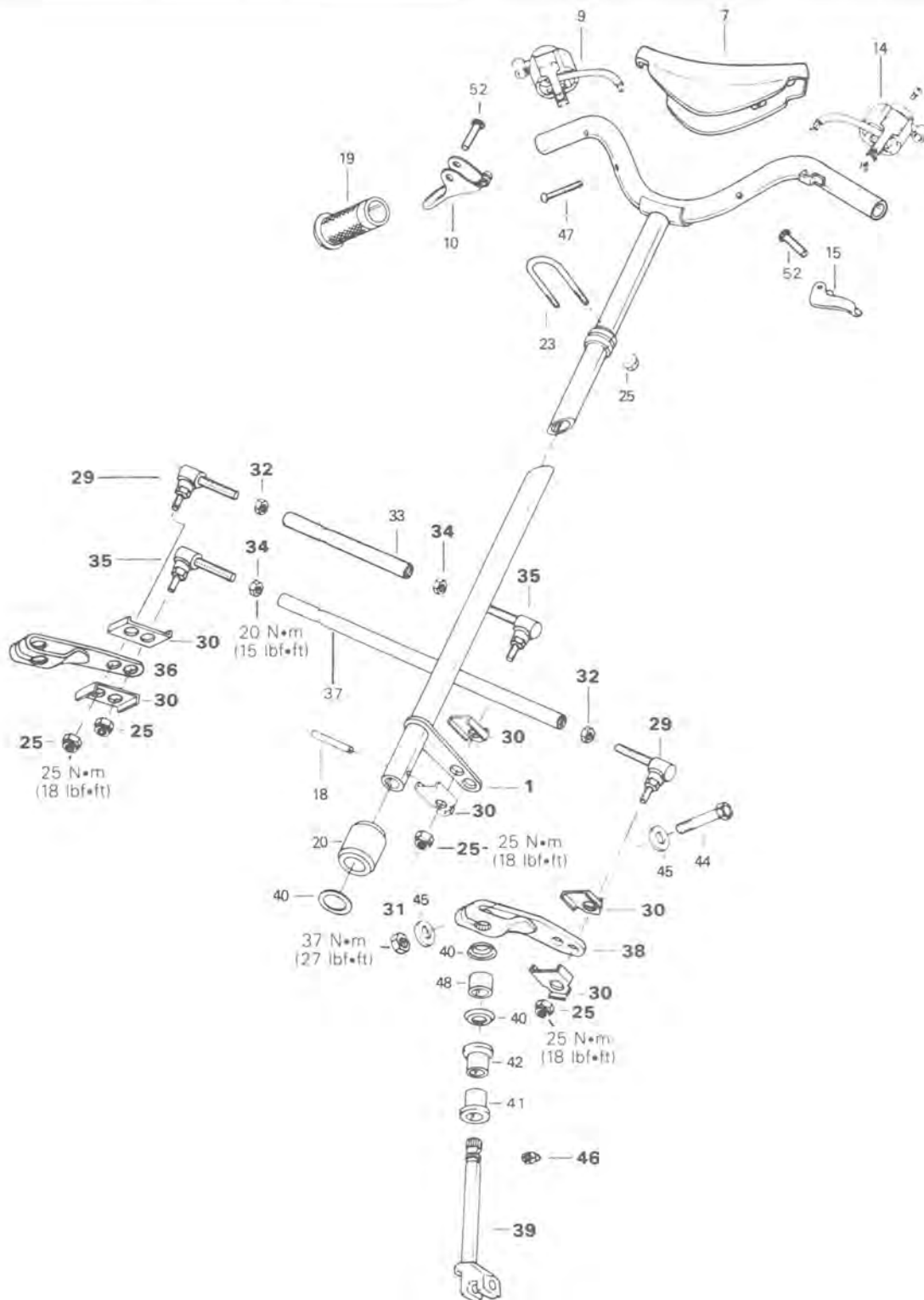
▼ **CAUTION:** To prevent damages and for an easier operation of the tool, apply grease on male jig, female jig and to the installer bolt threads.



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# STEERING SYSTEM

Elan

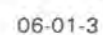


### Sub-section 01 (STEERING SYSTEM)

Tundra LT



Skandic  
Skandic R



### Sub-section 01 (STEERING SYSTEM)

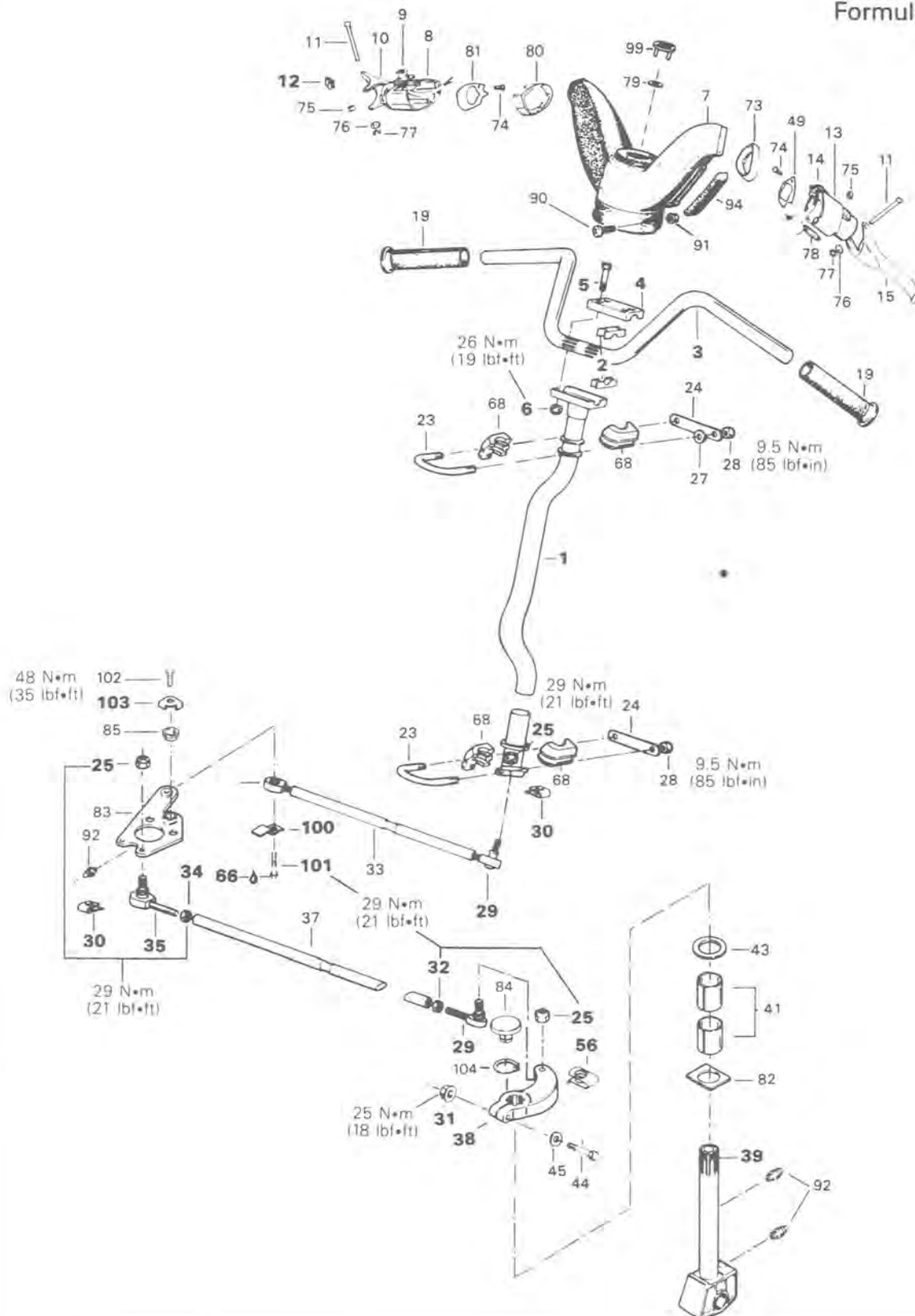
This diagram illustrates the assembly of a motorcycle engine and transmission. The components are numbered 1 through 92, and the assembly sequence is indicated by arrows. Key torque specifications are provided for several bolts:

- 9.5 N•m (85 lbf•in) for bolts 25 and 28.
- 25 N•m (18 lbf•ft) for bolts 29, 30, and 70.
- 20 N•m (15 lbf•ft) for bolt 32.
- 42 N•m (31 lbf•ft) for bolt 44.

The assembly process involves installing the cylinder head (7) and piston (8) into the crankcase (1), followed by the crankshaft (3) and connecting rod (4). The transmission shaft (19) is then installed, and the various gears and shafts (23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92) are assembled in sequence. The final assembly is secured with the specified torque values.

**Section 06 STEERING/SKIS**  
**Sub-section 01 (STEERING SYSTEM)**

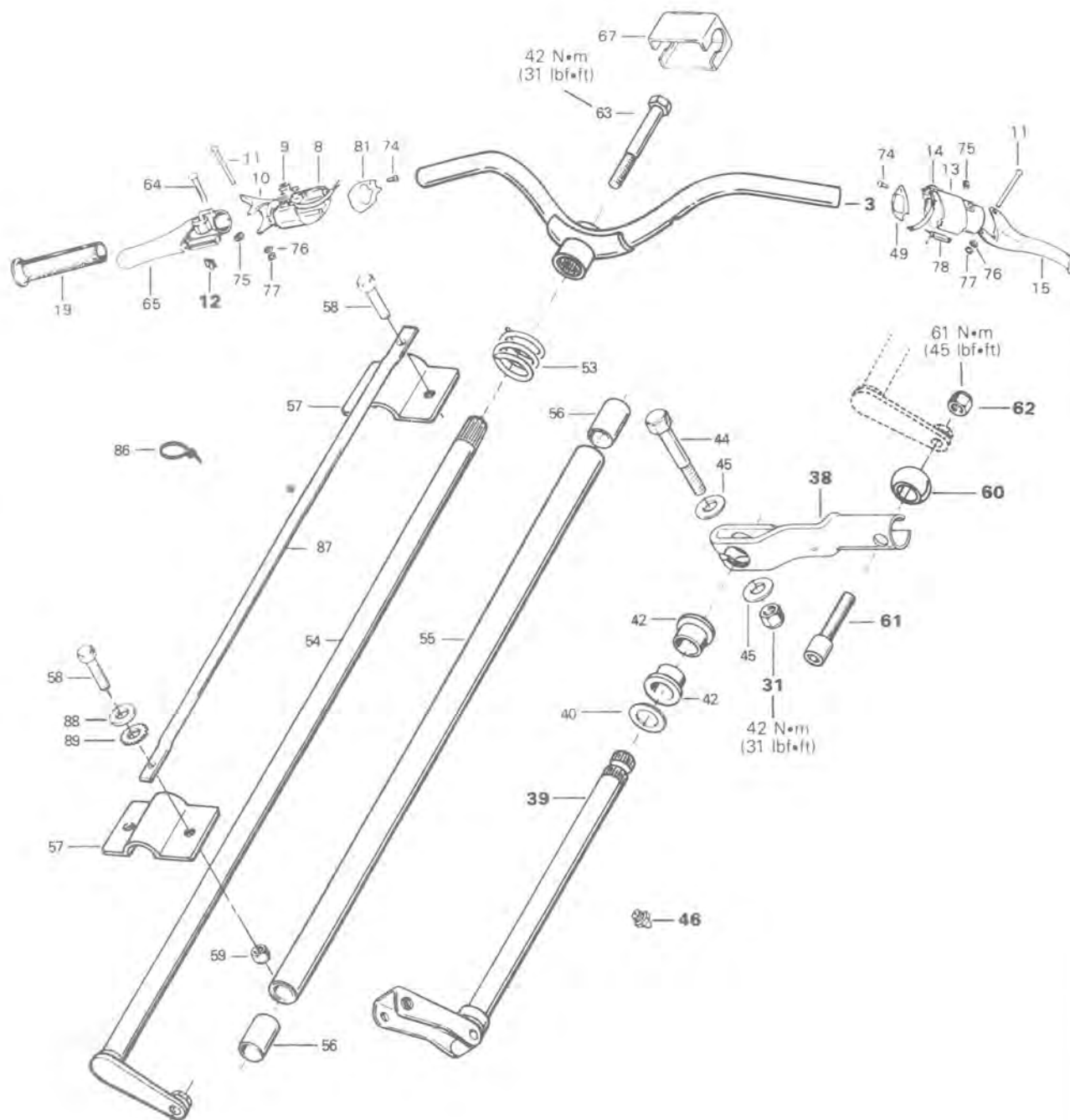
Formula MX, Plus



## Section 06 STEERING/SKIS

### Sub-section 01 (STEERING SYSTEM)

Alpine





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## Section 06 STEERING/SKIS

### Sub-section 01 (STEERING SYSTEM)

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- |                             |                                |
|-----------------------------|--------------------------------|
| 1. Steering column          | 54. Steering shaft (main)      |
| 2. Handlebar support        | 55. Steering housing           |
| 3. Handlebar                | 56. Bushing                    |
| 4. Steering clamp           | 57. Retainer bracket           |
| 5. Cap screw                | 58. Bolt                       |
| 6. Elastic stop nut         | 59. Nut                        |
| 7. Steering pad             | 60. Ball bushing               |
| 8. Throttle handle housing  | 61. Allen bolt                 |
| 9. Emergency cut-out switch | 62. Nut                        |
| 10. Throttle handle         | 63. Cap screw                  |
| 11. Pin                     | 64. Rivet                      |
| 12. Retainer                | 65. Parking handle             |
| 13. Brake handle housing    | 66. Loctite 271                |
| 14. Dimmer switch           | 67. Steering cover             |
| 15. Brake handle            | 68. Bushing                    |
| 16. Pin                     | 69. Flat washer 8,4 x 25       |
| 17. Push nut                | 70. Cap screw                  |
| 18. Spirol pin              | 71. Spring washer              |
| 19. Grip                    | 72. Washer 7/8"                |
| 20. Lower bushing           | 73. Brake adaptor              |
| 21. Upper bushing           | 74. Self tapping screw         |
| 22. Retainer bracket        | 75. Set screw                  |
| 23. U-clamp                 | 76. Washer                     |
| 24. Lock tab                | 77. Circlip                    |
| 25. Elastic Stop Nut        | 78. Brake light switch         |
| 26. Retainer bracket        | 79. Push nut                   |
| 27. Flat washer             | 80. Throttle adaptor           |
| 28. Elastic stop nut        | 81. Throttle cover             |
| 29. Ball joint L.H.         | 82. Brass washer               |
| 30. Lock tab                | 83. Pivot arm                  |
| 31. Elastic stop nut        | 84. Cap                        |
| 32. Jam nut L.H.            | 85. Flange                     |
| 33. Tie rod                 | 86. Tie rap                    |
| 34. Jam nut R.H.            | 87. Retainer brace             |
| 35. Ball joint R.H.         | 88. Flat washer                |
| 36. Steering arm            | 89. External tooth lockwasher  |
| 37. Tie rod                 | 90. Bolt                       |
| 38. Steering arm            | 91. Nut                        |
| 39. Ski leg                 | 92. Grease fitting             |
| 40. Washer                  | 93. Driven pulley holder clamp |
| 41. Bushing                 | 94. Clip                       |
| 42. Bushing                 | 95. Plate                      |
| 43. Shim                    | 96. Retainer bracket           |
| 44. Cap screw               | 97. Screw                      |
| 45. Flat washer             | 98. Clip                       |
| 46. Grease fitting          | 99. Bombardier decal           |
| 47. Screw                   | 100. Screw stopper             |
| 48. Rubber spacer           | 101. Screw                     |
| 49. Housing cap             | 102. Screw                     |
| 50. Screw                   | 103. Screw stopper             |
| 51. Steering arm extension  | 104. Snap ring                 |
| 52. Rivet                   | 105. Lock tab                  |
| 53. Spring                  |                                |

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## INSPECTION

Check skis and runner shoes for wear, replace as necessary. (See section 06-02.)

### 36,38,39, Steering arms & ski legs

Make sure steering arm and ski leg splines interlock.

◆ **WARNING:** All parts having worn splines have to be changed by new ones.

Check general condition of steering system.

Check general condition of steering system components for wear and replace if necessary.

## DISASSEMBLY & ASSEMBLY

### 19, Grips

Grips can be removed and installed without any damage by injecting compressed air into the handlebar.


## Section 06 STEERING/SKIS

### Sub-section 01 (STEERING SYSTEM)

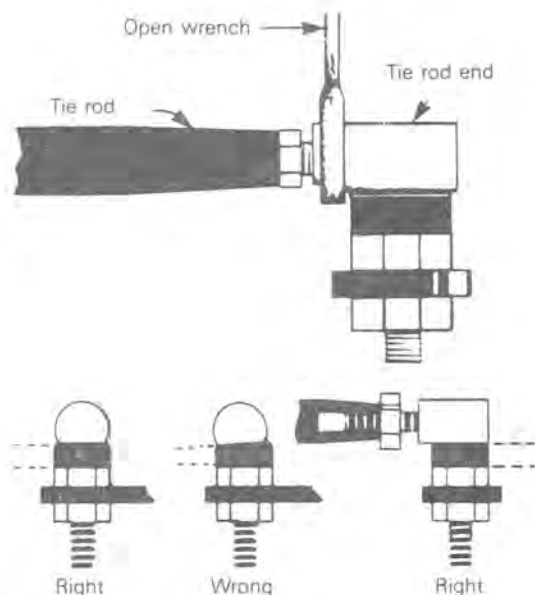
Another way to install grips consists in soaking them in soapy water (detergent for dishes) and in pushing them onto the handlebar with a soft hammer.

#### 29,35, Ball joints

Inspect ball joint ends for wear or looseness, if excessive, replace.

 **NOTE:** Screw the longest threaded end of ball joint into the tie rod, ensure that half of the total number of threads are inserted into the tie rod.

The cut-off section of the tie rod end must run parallel with the horizontal line of the steering arm when assembled on vehicle. The tie rod end should be restrained when tightening tie rod end lock nut. For torque specifications see illustrations.



A001006001

#### 30,56,100,103,105, Lock tabs & screw stoppers

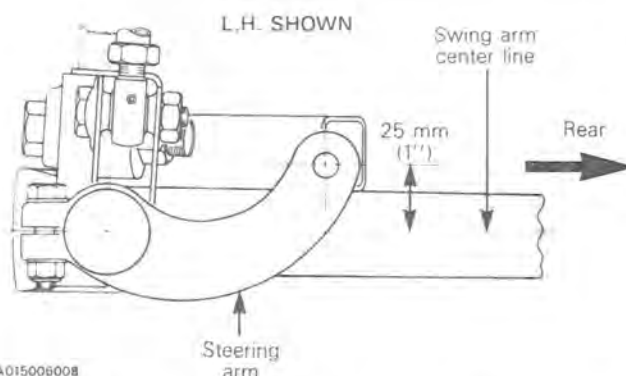
When assembling components, always position new lock tabs and screw stoppers.

#### 36,38, Steering arms

The steering arm angles should be equal on both sides when skis are parallel with vehicle.

#### Formula MX & Plus

The center of the hole where the ball joint is fixed should be 25 mm (1") inside of the swing arm center line.



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#### 25,30,100,105, Ball joint nuts, lock tabs & screw stopper

Tighten ball joint nuts to specified torque (see illustration) and bend lock tabs over nuts.

#### 25,30,31, Steering arm nuts & lock tabs

Tighten steering arm nuts to specified torque (see illustration) and bend lock tabs over nuts.

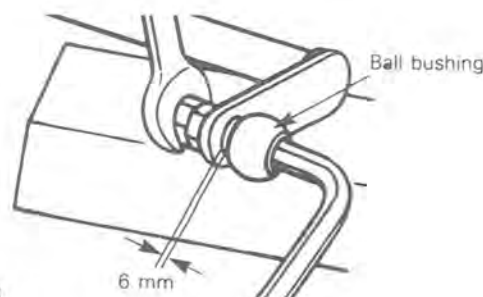
#### 66,100,101, Screw stopper, screw & Loctite 271 (Formula MX, Plus only)

In order to remove the screw, heat to 93°C (200°F) to break the Loctite bond. At assembly, clean all threads and apply a drop of Loctite 271. Torque screw to 29 N•m (21 lbf•ft). Bend tab of screw stopper over a flat of screw head.

#### Alpine

#### 60,61,62, Ball bushing, Allen bolt & nut

Affix the ball bushing to steering shaft using appropriate Allen head bolt. Tighten bolt until there is approximately 6 mm (1/4") free-play existing between ball bushing and steering shaft.



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Torque nut to 61 N•m (45 lbf•ft)

## ADJUSTABLE HANDLEBAR

### 1,3, Steering column & handlebar

If applicable, remove the steering clamp and nuts holding the handlebar to the steering column. Tighten nuts to the specified torque (see illustration).

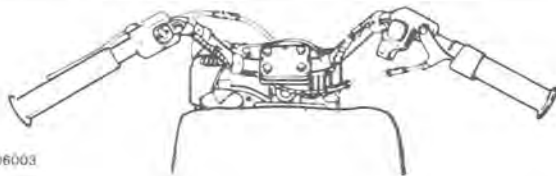
### 2,4,5,6, Handlebar support, steering clamp, bolts & nuts

Install the four (4) handlebar support, steering clamp, the four (4) screws and nuts to the column, as illustrated. See applicable illustration for each model.

Adjust the steering handle to the desired position.

Lock the handle in place by tightening the four (4) nuts to 26 N•m (19 lbf•ft).

▼ **CAUTION:** Tighten the nuts equally in a criss-cross sequence and ensure there is an equal gap on each side of the clamps.



◆ **WARNING:** Do not adjust the handlebar too high to avoid contact between the brake lever and windshield when turning.

◆ **WARNING:** Make sure that the steering pad and all controls are properly fixed to their normal location on the handlebar.

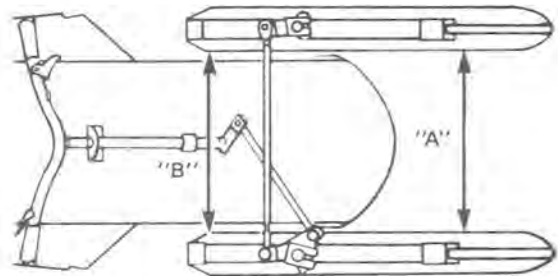
▼ **CAUTION:** Plastic alloy components such as fuel tank, levers, console, etc. can be cleaned using mild detergents or isopropyl alcohol. Do not use strong soaps, degreasing solvents, abrasive cleaners, paint thinners, etc.

## STEERING ADJUSTMENT (SKIS)

### Definitions

#### Toe-out:

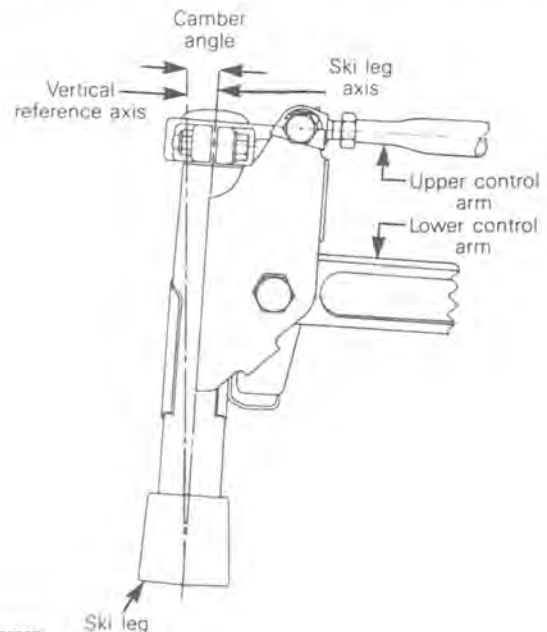
A difference measurement between front and rear edges of skis as viewed from top side of suspension system. It is adjustable on all models except Alpine.



There is a toe-out when "A" is greater than "B"

#### Camber:

A specific inward or outward tilt angle of ski leg compared to a vertical line when viewing vehicle from front. It is adjustable on the "PRS" suspension system only.



### Adjustments

#### Alpine

### 38,39, Steering arm & ski leg

When assembling steering arm and ski leg the handlebar must be horizontal with the ski in line with the vehicle.

### TOE-OUT (ALL MODELS EXCEPT ALPINE, FORMULA MX & PLUS)

Skis should have a toe-out of 3 mm (1/8"). When they are in straight-ahead position. If adjustment is required, proceed as follow:

## Section 06 STEERING/SKIS

### Sub-section 01 (STEERING SYSTEM)

#### 32,34, Tie rods jam nuts

Loosen the jam nuts locking the tie rod(s) in place. Turn tie rod(s) manually until alignment is correct. Torque jam nuts as specified in the applicable illustration.

**IMPORTANT:** Close front of skis manually to take all slack from steering mechanism.

#### All models (except Alpine, Formula MX & Formula Plus)

Check that handlebar is horizontal when skis are in straight-ahead position. To adjust:

- Loosen shorter tie rod jam nuts.
- Turn tie rod manually until handlebar is horizontal.
- Torque jam nuts as specified in the applicable illustration.

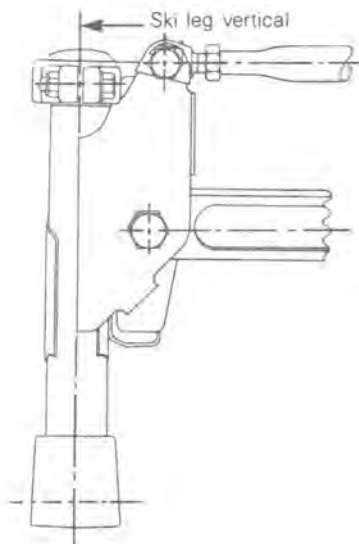
#### Adjustments on Formula MX & Plus

Adjustments should be performed following this sequence:

- Set camber angle.
- Check for horizontal handlebar.
- Set toe-out.

#### CAMBER

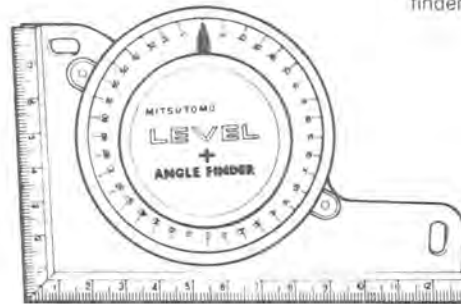
- Ski leg camber must be set to  $0^\circ \pm 0,5^\circ$  (that means ski leg housing must be vertical).



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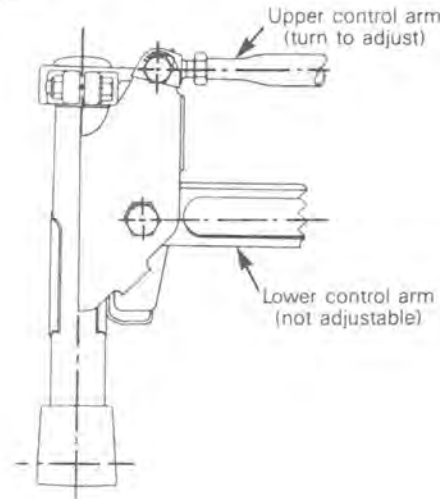
- Camber angle is measured using an angle finder available from automotive parts supplier.

Angle  
finder



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- Adjustment is performed by varying length of upper control arm.

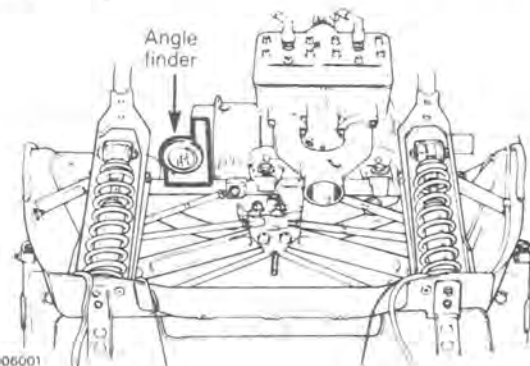


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#### Procedure

**NOTE:** Same adjustments are required on both sides of vehicle.

- Using the appropriate equipment, raise and block the vehicle so that the skis are about 25 mm (1") from the ground. The camber angle must be measured when the suspension is fully extended.
- Make sure the vehicle is leveled by placing the angle finder on the main horizontal frame member in front of the engine.

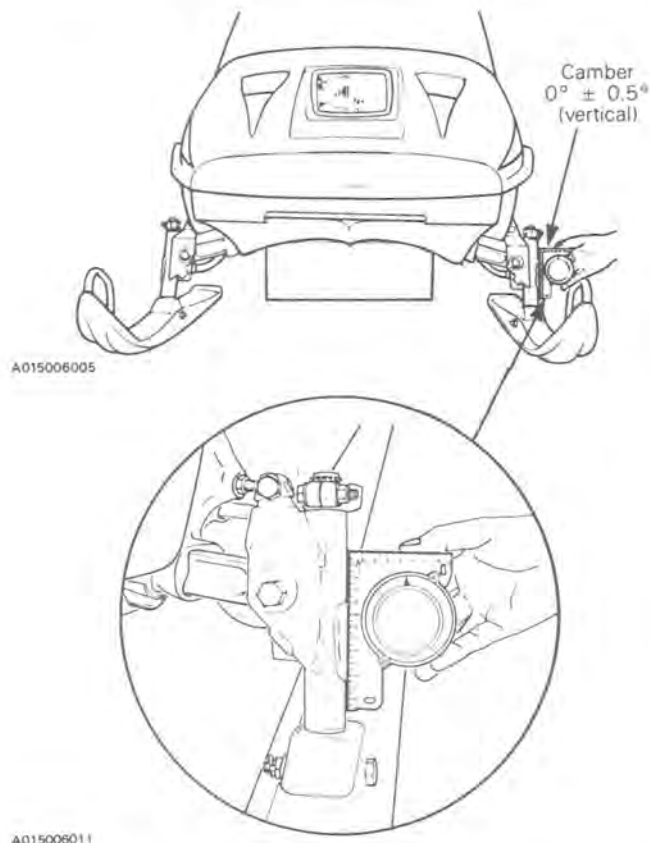


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## Section 06 STEERING/SKIS

### Sub-section 01 (STEERING SYSTEM)

- Place angle finder outside of ski leg housing.



- Loosen both upper control arm jam nuts and adjust its length to obtain a vertical ski leg ( $0^\circ \pm 0.5^\circ$ ). Torque jam nuts to 29 N•m (21 lbf•ft).
- Lower vehicle to ground.

### HANDLEBAR & TOE OUT

Check that handlebar is horizontal when skis are in straight-ahead position. Adjustment is performed by adjusting length of left and right tie rods **37**.

◆ **WARNING:** Do not attempt to adjust length of shortest tie rod **33** (connecting to main tube) since both ball joints are welded to tie rod and are not adjustable.

#### Procedure

- Loosen jam nuts **32 & 34** of both tie rods **37**.
- Turn manually tie rod on one side to shorten its length.
- Lengthen the other one by turning exactly the same amount so that toe-out is not changed.

- Close front of skis manually to take all slack from steering mechanism.
- Skis should have a toe-out of 3 mm (1/8") when they are in straight-ahead position.

◆ **WARNING:** Never lengthen a tie rod so that threaded portion of ball joints exceeds 17 mm (11/16") outside tie rod. To avoid this, vary length of other tie rod.

- Torque jam nuts **32 & 34** to 29 N•m (21 lbf•ft).

### LUBRICATION

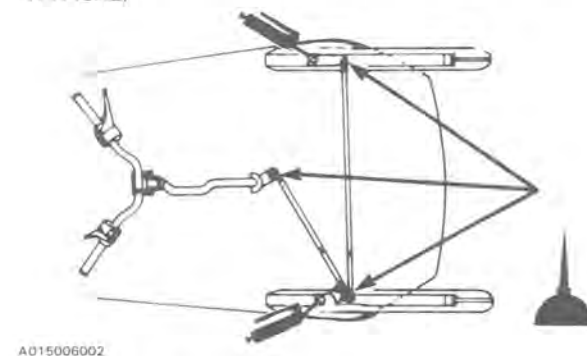
◆ **WARNING:** Do not lubricate throttle and/or brake cable and housings, and spring coupler bolts.

#### 46,92, Ski leg & grease fittings

Using low temperature grease only (P/N 413 7056 00).

Lubricate the ski legs at grease fittings until new grease appears at joints. Lubricate tie rod end ball joints.

(TYPICAL)



#### Formula MX & Plus

Lubricate regularly, every month or 800 km (500 mi.).

Penetrating lubricant is recommended on ball joints and moving parts.

Example:

- chain lube from Bardahl (BCS 362 dry)
- WD-40

Other grease fittings require low temperature grease (P/N 413 7056 00) injected with a grease gun.

The following symbols will be used to show what type of lubricant should be used at the suitable locations.

## Section 06 STEERING/SKIS

### Sub-section 01 (STEERING SYSTEM)

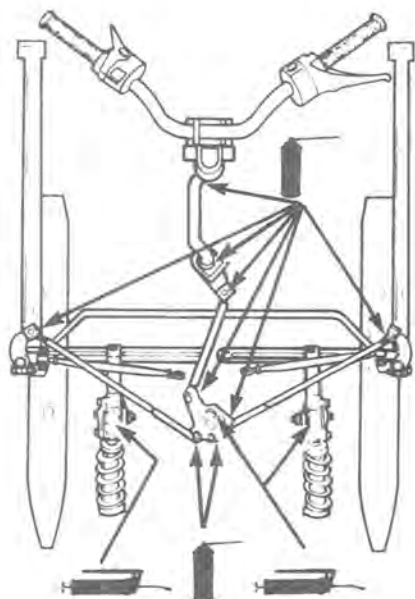


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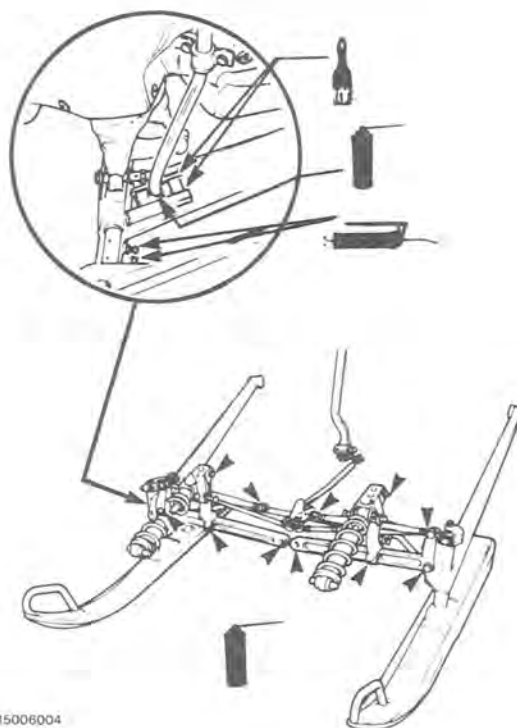
Lubricate:

- Steering column.
- Upper and lower control arms drop link and tie rod ends.
- Grease ski legs, ski pivots and idler arm.
- Coat stabilizer sliders with grease and oil their ball joints.

NOTE: There are 33 lubrication points.



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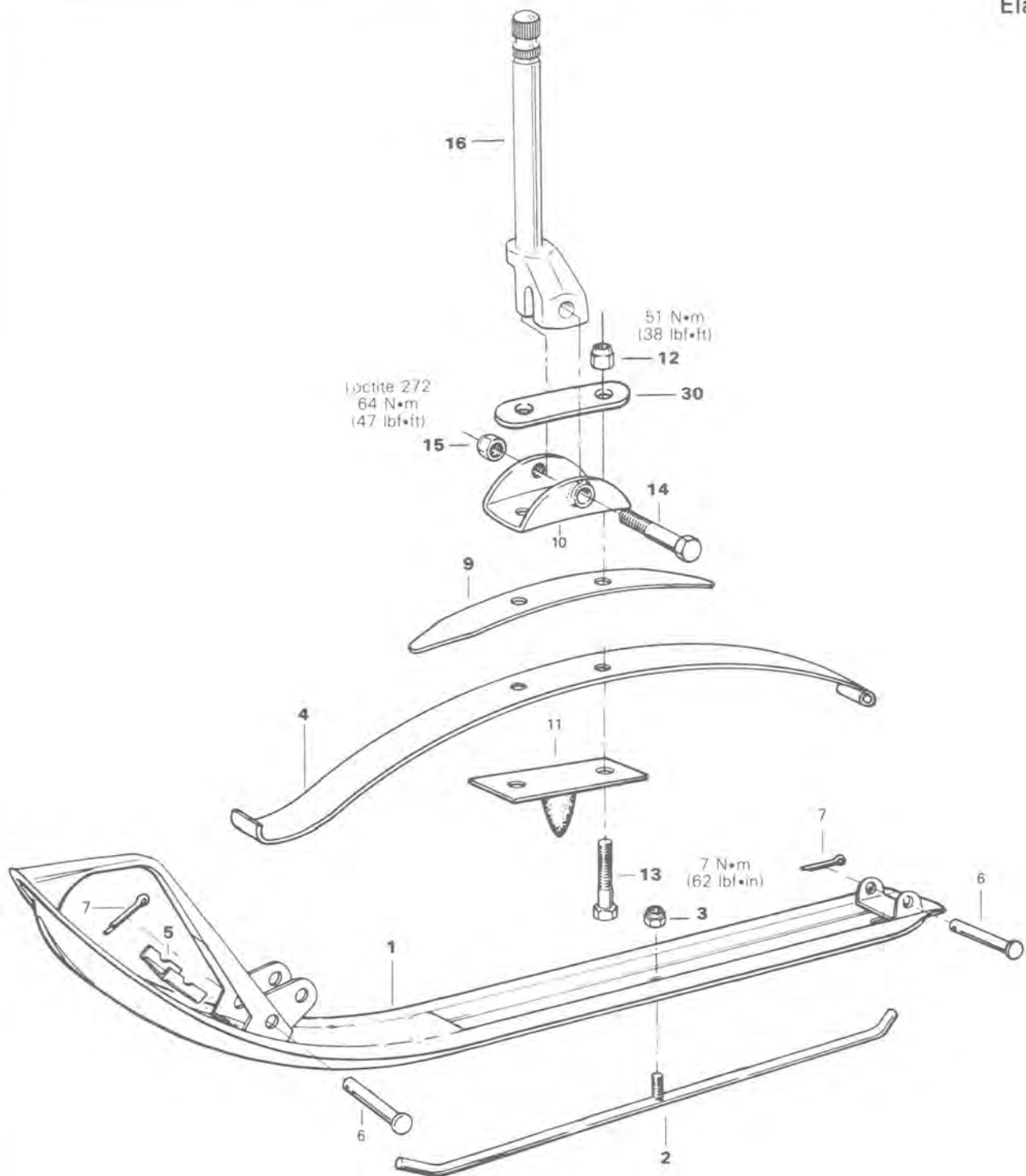


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## SKI SYSTEM

### LEAF SPRING SUSPENSION

Elan

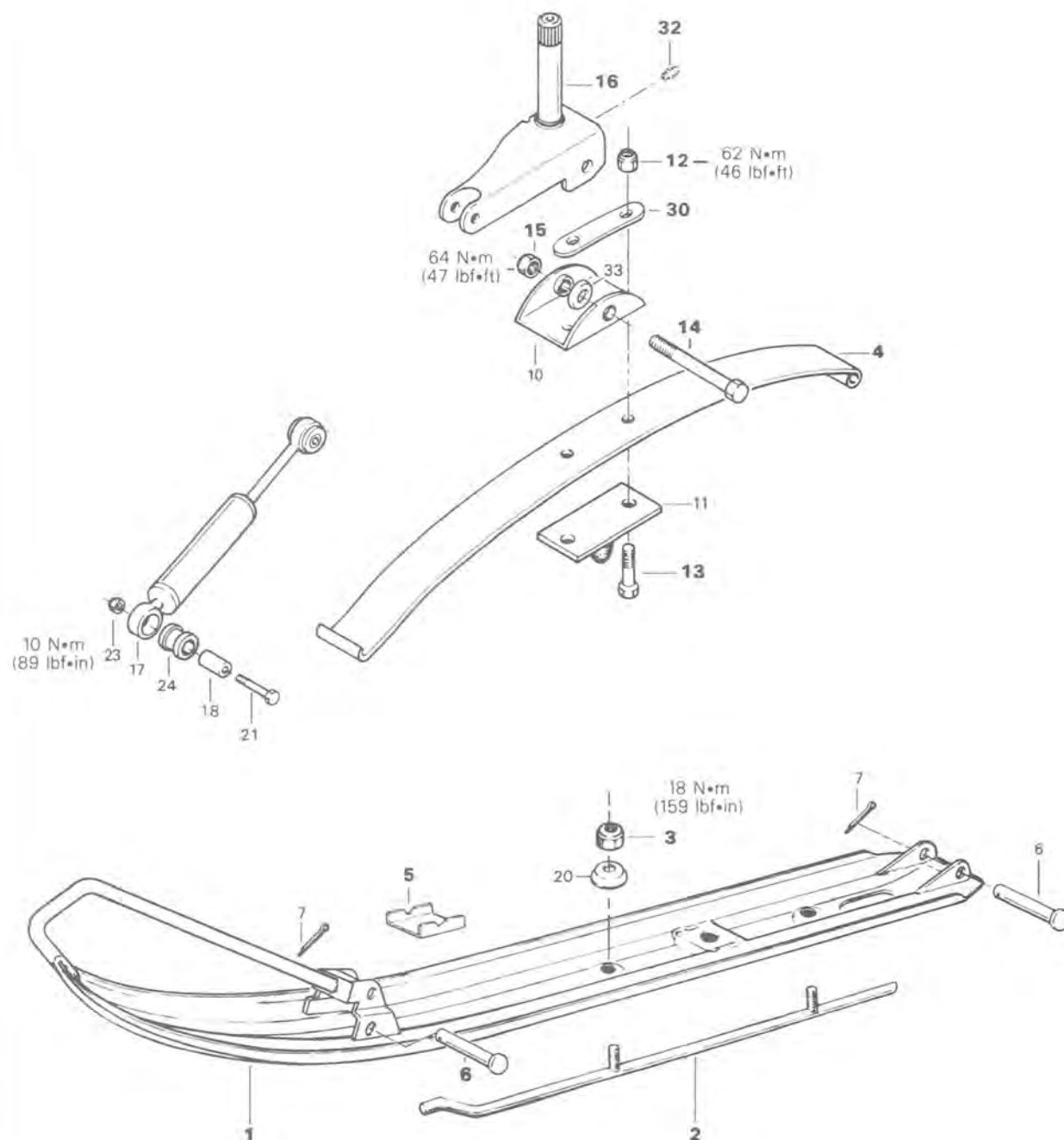




## Section 06 STEERING/SKIS

### Sub-section 02 (SKI SYSTEM)

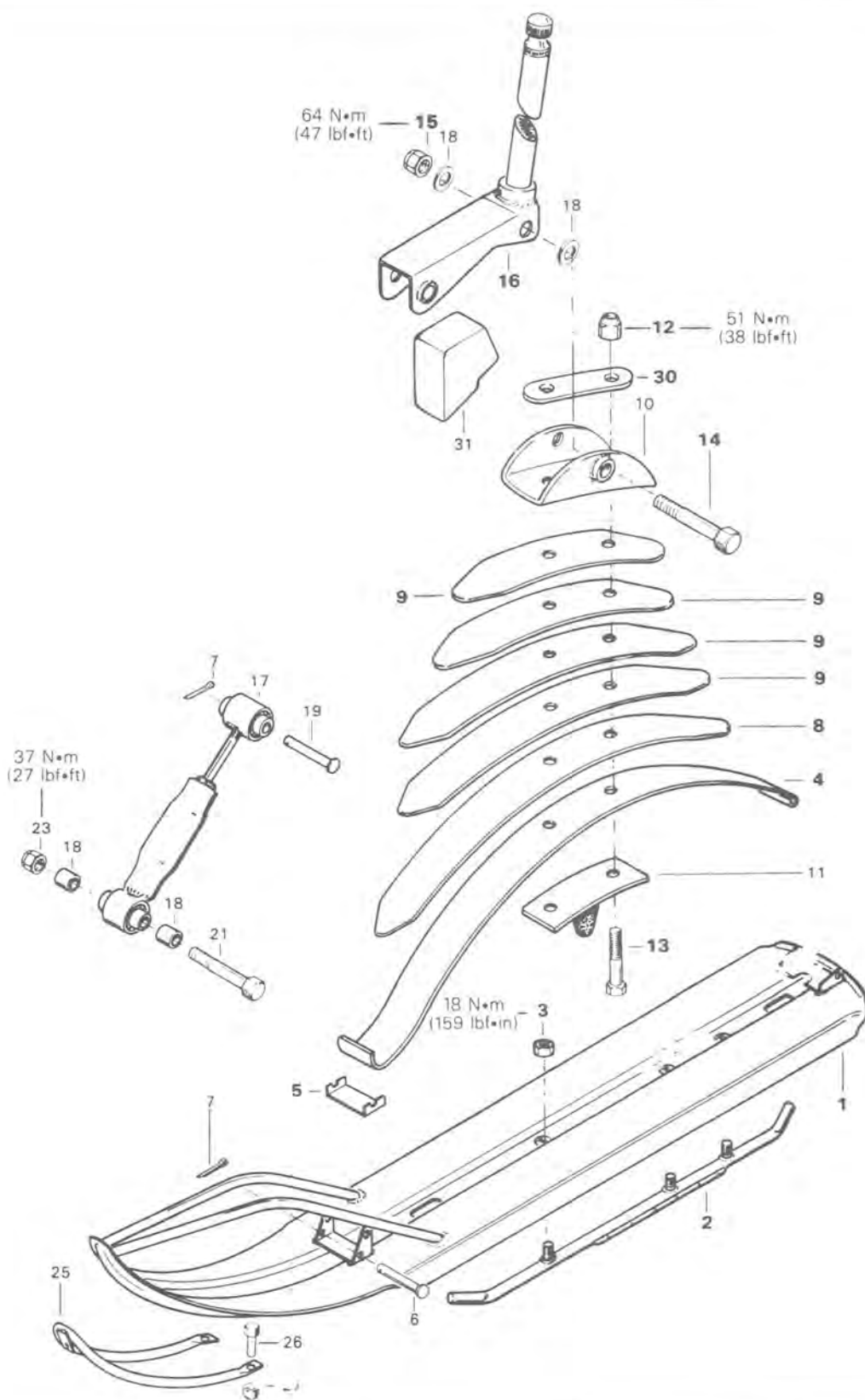
Citation LS/LSE, Formula SP  
Safari 377, 377E, 447, Grand Luxe  
Skandic, Skandic "R", Tundra, Tundra LT





### Sub-section 02 (SKI SYSTEM)

Alpine



## Section 06 STEERING/SKIS

### Sub-section 02 (SKI SYSTEM)

- |                          |                    |
|--------------------------|--------------------|
| 1. Ski                   | 18. Spacer         |
| 2. Runner shoe           | 19. Retainer pin   |
| 3. Nut                   | 20. Cup            |
| 4. Main spring leaf      | 21. Bolt           |
| 5. Spring slider cushion | 22. Washer         |
| 6. Retainer pin          | 23. Nut            |
| 7. Cotter pin            | 24. Rubber bushing |
| 8. Auxiliary spring leaf | 25. Protector tube |
| 9. Auxiliary spring leaf | 26. Screw          |
| 10. Spring leaf coupler  | 27. Nut            |
| 11. Rebound stopper      | 28. Rubber bumper  |
| 12. Nut                  | 29. Rivet          |
| 13. Bolt                 | 30. Tab lock       |
| 14. Bolt                 | 31. Ski bumper     |
| 15. Nut                  | 32. Grease fitting |
| 16. Ski leg              | 33. Friction cup   |
| 17. Shock                |                    |

## INSPECTION

### 1,2, Skis & runner shoes

Check skis and runner shoes for wear, replace as necessary.

### 16, Ski leg

Make sure steering arm and ski leg splines interlock.

◆ **WARNING:** All parts having worn splines have to be changed by new ones.

Check general condition of steering system components for wear and replace if necessary.

## DISASSEMBLY & ASSEMBLY

### 2, Runner shoes

◆ **WARNING:** Observe caution while prying or removing steel runner shoes from ski slots as the shoes are under tension. Check that ski runner shoes are not worn more than half of their original thickness.

Replace runner shoes when half worn.

### 3, Runner shoe nuts

On Elan vehicle, torque to 7 N•m (62 lbf•in). On all other vehicles, torque to 18 N•m (159 lbf•in).

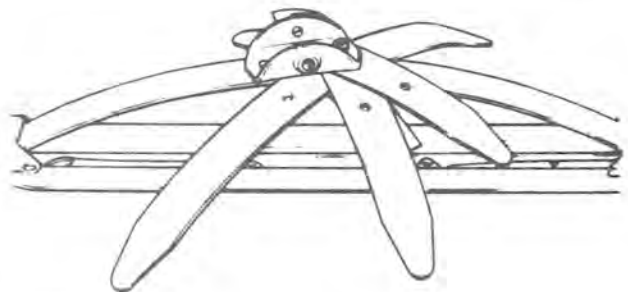
### 4,8,9, Main and auxiliary leaf springs

▼ **CAUTION:** When disassembling leaf coupler from spring leaves be careful of leaf tension.

### 12,13,30, Nut, bolt & tab lock

When assembling spring leaves, cross each and temporarily insert one (1) nut, tab lock and bolt. Position them parallel to each other and install the remaining bolt and nut. Tighten nuts to specified torque and bend tab from the tab lock, over the nuts.

◆ **WARNING:** Should removal of a nylon lock nut be required when undergoing repairs/disassembly, always replace by new ones. Tighten as specified.



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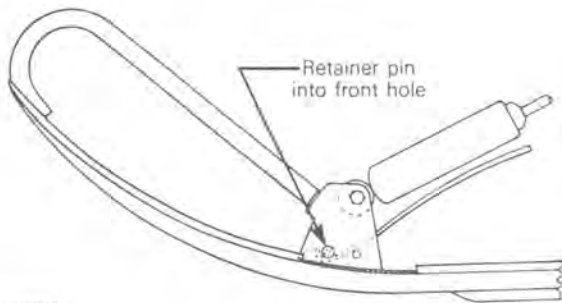
### 5, Spring slider cushions

Apply lithium grease on spring slider cushions at least once a year.

#### 4,6, Main leaf spring & retainer pin

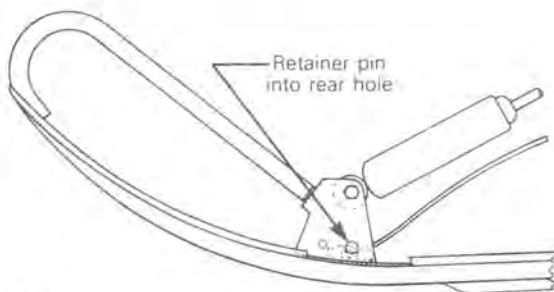
Front of single leaf spring must be fixed at the following position:

All Skandic, all Safari, all Tundra, Formula SP: Front hole.



A007006007

All Citation LS: Rear hole.



A007006008

#### 14,15, Spring coupler bolt & nut

Torque bolt and move ski by hand to check that it pivots on ski leg. Torque locking nut to 64 N•m (47 lbf•ft). For all models.

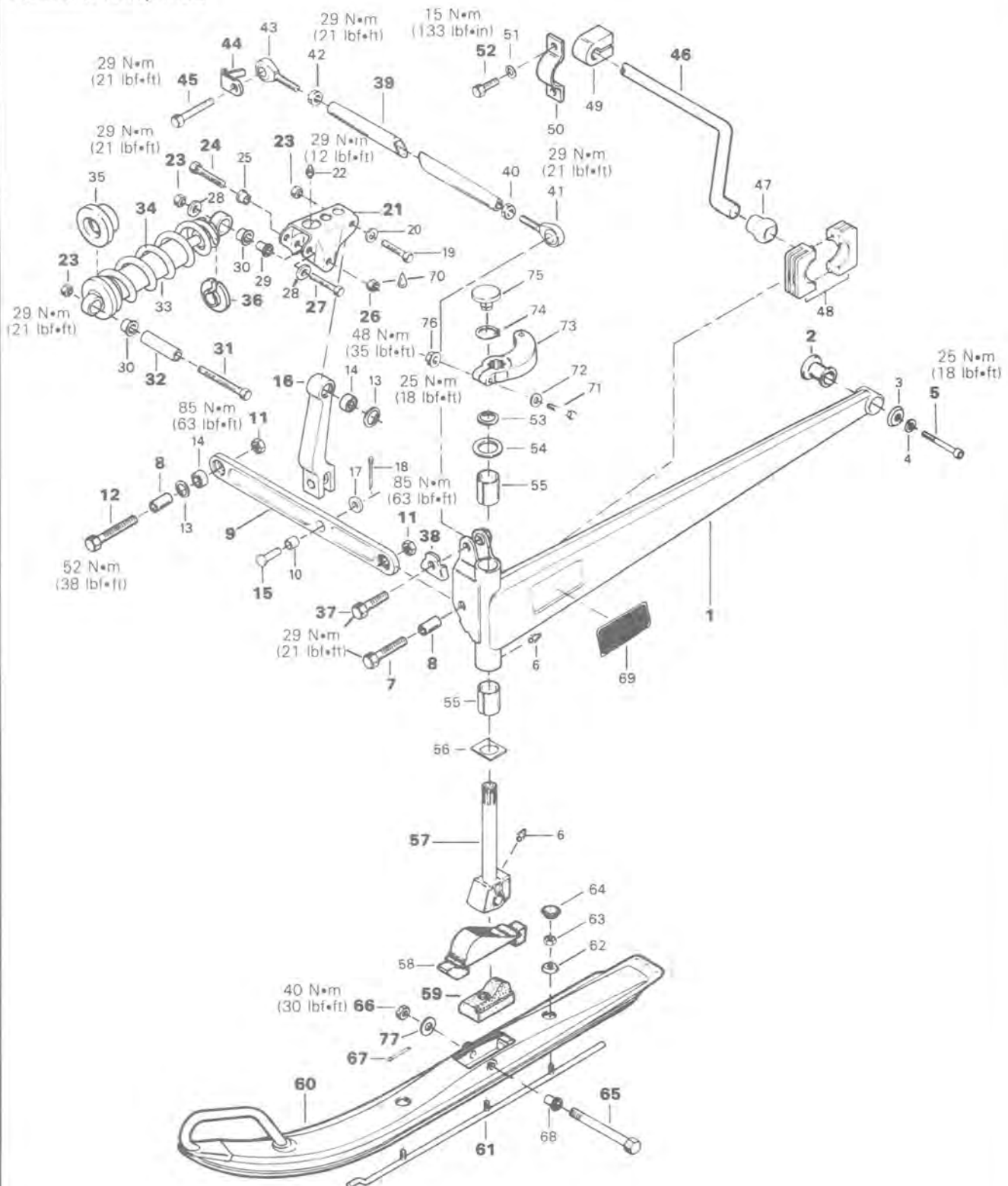
#### 32, Grease fitting

On models with grease fitting on ski leg, lubricate it.

## Section 06 STEERING/SKIS

### Sub-section 02 (SKI SYSTEM)

#### Formula MX, Plus




## Section 06 STEERING/SKIS

### Sub-section 02 (SKI SYSTEM)

1. Swing arm
2. Rubber damper
3. Bowl
4. Spring lock washer M8
5. Allen screw M8 x 25
6. Grease fitting
7. Hexagonal screw M12 x 70
8. Stopper bushing
9. Lower control arm
10. Housing
11. Hexagonal elastic stop nut M12
12. Hexagonal screw M12 x 90
13. Circlip
14. Radial ball joint
15. Clevis pin
16. Bell crank rod
17. Special washer
18. Cotter pin
19. Flanged screw
20. Shim
21. Rocker arm
22. Grease fitting
23. Hexagonal elastic stop nut M10
24. Hexagonal head screw M10 x 110
25. Housing
26. Hexagonal elastic stop nut M10
27. Hexagonal head cap screw M10 x 60
28. Flat washer
29. Bushing
30. Housing
31. Hexagonal head cap screw M10 x 95
32. Spacer
33. Front shock body
34. Front shock spring
35. Spring stopper ring
36. Spring stopper
37. Hexagonal head cap screw M10 x 45
38. Screw stopper
39. Upper control arm
40. L.H. Jam nut
41. L.H. Ball joint
42. R.H. Jam nut
43. R.H. Ball joint
44. Screw stopper
45. Hexagonal head cap screw M10 x 45
46. Stabilizer
47. Slider joint
48. Slider
49. Flange
50. Clamp
51. Lock washer 8 mm
52. Hexagonal head cap screw M8 x 20
53. Circlip
54. Thrust washer
55. Housing
56. Wear plate
57. Ski leg
58. Ski boot
59. Stop bounding
60. Ski
61. Carbide runner shoe
62. Cup
63. Hexagonal elastic stop nut M10
64. Plug
65. Bolt
66. Slotted nut M12
67. Cotter pin
68. Slider cushion
69. "PRS" decal
70. Loctite 271
71. Cap screw
72. Flat washer
73. Steering arm
74. Snap ring
75. Cap
76. Elastic stop nut
77. Flat washer

## DISASSEMBLY

 **WARNING:** Before removing any suspension components, always lift the vehicle off the ground to release load on suspension system.

Lift front end of vehicle off the ground and block on a stand. Remove muffler to gain access to linkage.

The following procedures are identical for each side of vehicle.

### 60,65,66,67, Ski, screw, slotted nut & cotter pin

To remove ski, take cotter pin off, unscrew slotted nut, remove bolt.

### 1,5,7,8,11,37,38, Swing arm, Allen screw nut screw, screw stopper & stopper bushing

Detach steering arm 73, open screw stopper, remove nut, screws and stopper bushing then take swing arm off. While removing swing arm, detach stabilizer bar.

### 23,27, Screw & nut (shock ass'y)

Remove nuts and screws then take shock assembly off.

### 21,24,26, Rocker arm, screw & nut

To remove nut 26 heat to 93°C (200°F) to break the Loctite bond. Remove screw and nut to slide the rocker arm.

## Section 06 STEERING/SKIS

### Sub-section 02 (SKI SYSTEM)

#### 15,16,18, Clevis pin, bell crank rod & cotter pin

Remove cotter pin and clevis pin then take off bell crank rod and rocker arm.

#### 39,44,45, Upper control arm, screw stopper & screw

Open screw stopper, remove screw then take upper control arm off.

#### 8,9,11,12, Stopper bushing, lower control arm, nut & screw


Remove nut, screw and stopper bushing then take lower control arm off.

#### 46,52, Stabilizer & screw

Remove screws and take stabilizer off.

### CLEANING

Clean all metal components in a non ferrous metal cleaner.

 **WARNING:** Perform cleaning in a well ventilated area.

### INSPECTION


Inspect all ball joints, bushings and moving parts for wear, crushing or play, if excessive replace them.

#### 60,61, Ski & runner shoe

Check skis and runner shoes for wear, replace as if necessary.

#### 57, Ski leg


Make sure steering arm and ski leg splines interlock.

 **WARNING:** All parts having worn splines have to be changed by new ones.

Check general condition of steering system components for wear and replace if necessary.

### ASSEMBLY

For assembly reverse the disassembly procedure. However, pay attention to the following.

 **CAUTION:** When tightening screw mounted with bushings, it is important to follow the next specified torques to avoid crushing them.

Always replace removed cotter pins, screw stoppers and hexagonal elastic stop nuts by new ones.

#### 46,52, Stabilizer & screw

Torque screws to 15 N•m (133 lbf•in) then make sure the stabilizer move easily.

#### 8,9,11,12,39,44,45, Stopper bushing, upper and lower control arms, stopper screw, screw & nut

To ease installation of control arms through tie rod cover, apply petroleum jelly into its opening lips. Install longer distance between bell crank rod and pivot point of lower control arm at inside of belly pan.

Torque screw 12 to 52 N•m (38 lbf•ft).

Torque nut 11 to 85 N•m (63 lbf•ft).

Torque screw 45 to 48 N•m (35 lbf•ft).

Bend tab of stopper screw 44 over a flat of screw head.

#### 21,26,70, Rocker arm nut & Loctite 271

Clean all threads then apply a drop of Loctite 271. Make sure bell crank rod is placed to allow required travelling space for tie rods. Make sure rocker arm pivots easily.


Torque nut 26 to 48 N•m (35 lbf•ft).

#### 23, Nut (shock absorber)

First install the screw at the bottom of the shock then the upper one. Torque them to 29 N•m (21 lbf•ft).

#### 2,5, Rubber damper & Allen screw

Apply a light coat of petroleum jelly outside of rubber damper to ease its insertion into swing arm and inside to slide onto pivot. This will prevent rubber from sticking and steel from rusting. Torque Allen screw 5 to 25 N•m (18 lbf•ft). Make sure swing arm pivots easily.

 **CAUTION:** Do not apply grease or oil on rubber damper.

**7,11,37,38, Screw, screw stopper & nut (control arms)**

Torque nut 11 to 85 N•m (63 lbf•ft)

Torque screw 7, 37 to 29 N•m (21 lbf•ft)

Bend tab of stopper screw 38 over a flat of screw head.

For steering arm installation and tightening torque, refer to "Steering" section 06-01.

**59, Stop bounding**

Install with the molded indication "front" forward.

**60,66,67,77, Ski, slotted nut, cotter pin & washer**

Torque nut to 40 N•m (30 lbf•ft). Make sure ski moves easily. Install washer and cotter pin.

**LUBRICATION**

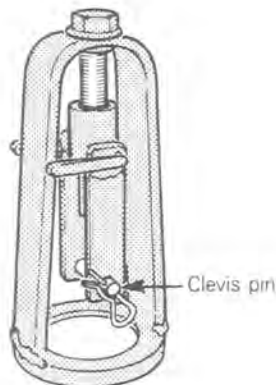
Refer to "Steering" section 06-01.

**SHOCK ABSORBER SPRING REPLACEMENT**

◆ **WARNING:** Do not attempt to dismantle a shock absorber spring without using the proper spring compressor.

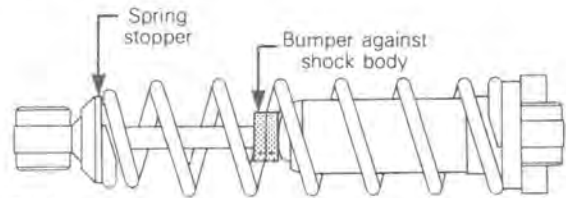
**34,36, Spring stopper & spring**

Use spring remover P/N 414 5796 00.



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○ **NOTE:** Before attempting to compress the shock spring, push the rubber bumper on the piston shaft against the shock body.



A015005026

Install the shock spring remover over the spring. Insert clevis pin through the shock eye and secure it with the hair pin.

Tighten the bolt until the spring stopper can be removed.

**ALIGNMENT & CAMBER ADJUSTMENT**

After assembly, always perform ski alignment and ski leg camber adjustment. Refer to "Steering" section 06-01.

**SHOCK ABSORBER SERVICING**

**Spring replacement**

◆ **WARNING:** Do not attempt to dismantle a shock absorber spring without using the proper spring compressor.

**34,36, Spring stopper & spring**

Using a spring compressor, remove the spring stopper and the spring.

**Shock absorber servicing**

Secure the shock body end in a vise.



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▼ **CAUTION:** Do not clamp directly on shock body.

Examine each shock for leaks. Extend and compress the piston several times over its entire stroke checking that it moves smoothly and with uniform resistance.



## Section 06 STEERING/SKIS

### Sub-section 02 (SKI SYSTEM)

Pay attention to the following conditions that will denote a defective shock:

- A skip or a hang back when reversing stroke at mid travel.
- Seizing or binding condition except at extreme end of either stroke.
- Oil leakage.
- A gurgling noise, after completing one full compression and extension stroke.

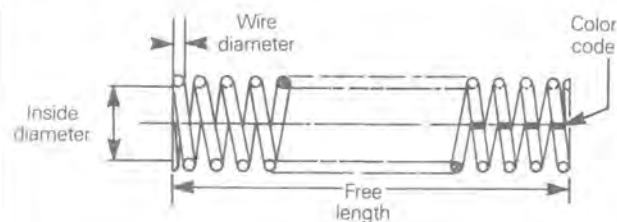
Renew if any faults are present.

## SPECIFICATIONS

### Shock spring specifications

PART NUMBER:	503 0803 00
Number of coils:	12.1
Free length $\pm 3 \text{ mm}$ ( $\pm .12''$ )	215.9 mm (8.50'')
Spring rate $\pm 1.8 \text{ N/mm}$ ( $\pm 10 \text{ lbf/in.}$ )	48.9 N/mm (279 lbf/in.)
Inside diameter (big end)	$46.7 \text{ mm} + 0.75_0$ ( $1.84 + .030''$ ) $- 0$
Wire diameter $\pm 0.05 \text{ mm}$ ( $\pm .002''$ )	9.19 mm (.362'')
Compressed length	102.4 mm (4.03'')
Color code:	White-white

Spring description:

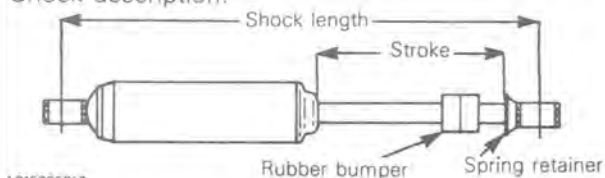


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### Shock absorber specifications

PART NUMBER:	414 5859 00
Full stroke:	62.9 mm (2.48'')
Length collapsed: - at bumper contact - at spring retainer contact	218.0 mm (8.58'') 192.6 mm (7.58'')
Length extended	255.5 mm (10.06'')

Shock description:



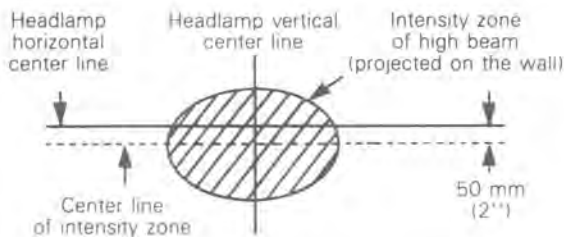
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## HOOD

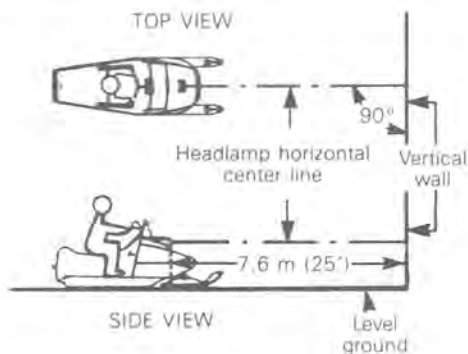
### HEADLAMP BEAM AIMING

Measure headlamp horizontal center line height from level ground and scribe this line on a vertical wall. Mark vertical headlamp center line on the same wall. See illustration.



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Place the vehicle on a level surface 7.6 m (25') from reference wall. With the suspension correctly adjusted, the rider seated on the vehicle and the high beam aimed at the wall; check that the center of the high intensity zone of the beam is 50 mm (2") below the headlamp horizontal center line and vertically centered.



A000007001

To adjust, remove headlamp ring or adjusting screw caps, turn the upper or lower adjusting screw to obtain the desired beam position.

### BULB REPLACEMENT

If headlamp is burnt, tilt cab, unplug the connector from the headlamp. Remove the rubber boot and unfasten the bulb retainer clips. Detach the bulb and replace. If the taillight bulb is burnt, expose the bulb by removing red plastic lens. To remove, unscrew the two (2) retaining screws. Verify all lights after replacement.

**CAUTION:** Never touch glass portion of an halogen bulb with bare fingers, it shortens its operating life. If by mistake glass is touched clean it with a glass cleaner that will not leave a film on the bulb.

### HOOD MAINTENANCE

Clean the vehicle thoroughly, removing all dirt and grease accumulation.

To clean use either soapy water or isopropyl alcohol.

To remove grease, oil or glue use isopropyl alcohol.

**CAUTION:** The following products **MUST NOT** be used to clean or wax any of the plastic components used on the vehicles:

- gasoline
- brake fluid
- kerosene
- diesel fuel
- lighter fluid
- strong detergents
- abrasive cleaners
- waxes containing an abrasive or a cleaning agent in their formula.

**NOTE:** Apply wax on glossy finish of hood only. Protect the vehicle with a cover to prevent dust accumulation during storage.

**CAUTION:** If for some reason the snowmobile has to be stored outside it is necessary to cover it with an opaque tarpaulin. This caution will prevent the sun rays affecting the plastic components and the vehicle finish.

### BOTTOM PAN MAINTENANCE

To remove dirt, grease or glue from a bottom pan, use isopropyl alcohol.

### HOOD, CAB NOSE & BOTTOM PAN REPAIR





Hood, cab nose and bottom pan are made of fiberglass or different plastic products. Refer to table below to see what parts are repairable or not.

**CAUTION:** All plastic parts made of polycarbonate are not compatible with Loctite thread and bushing locking products.

## Section 07 CHASSIS

### Sub-section 01 (HOOD)

#### Use of plastic material

PART	MODEL	REPAIRABLE					IRREPARABLE *SURLYN
		FIBER	R.I.M.	R.I.M.	POLY-	POLY-	
		GLASS	URETHANE	METTON	CARBONATE	ETHYLENE	
Windshield 	All models						
Hood 	Citation LS/E <sup>①</sup> Tundra/LT <sup>①</sup>						
	Formula SP Alpine						
	Formula MX PLUS						
	Elan Skandic/R Safari 377/E 447 GL, LC						
Nose piece 	Safari 377/E 447 GL, LC						
	Formula SP MX PLUS						
Bottom pan 	Citation LS/E Tundra/LT						
	Alpine						
	Safari 377/E 447 GL, LC Formula SP						
	Formula MX PLUS						

NOTE: R.I.M. stands for "reaction injection molding". Surlyn has coloration from one side to the other \*R.I.M. is painted on outside only. Surlyn is stiffer than R.I.M. urethane. R.I.M. Metton looks like fiberglass but is more flexible.

① Citation and Tundra hoods are fabricated with R.I.M. Metton on first production run.

Serial nos: 3210 00001 to 3210 02552  
3211 00001 to 3211 01002  
3212 00001 to 3212 01002  
3213 00001 to 3213 01002

Later models use polyethylene.

## Repair of plastic materials:

### Fiberglass:

This material is repairable and repaintable, using any one of the many kits available on the market.

### R.I.M. urethane:

#### CHARACTERISTICS:

- Resist Impacts to approximately  $-40^{\circ}\text{C}$ .
- Repairable and repaintable with a flexible type paint that uses an acrylic or polyurethane base.

▼ **CAUTION:** Battery acid may slowly attack the plastic material. If some acid is spilled on the material, clean immediately with a solution of sodium bicarbonate and water then rinse with clean tap water.

▼ **CAUTION:** If welding is to be done near the R.I.M. material, it is recommended to either remove the plastic part from the area or to protect it with aluminium foil to prevent damage.

To repair, follow the procedure below:

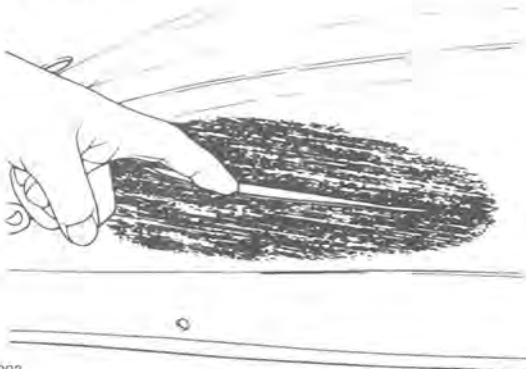
Clean the damaged area with a general-purpose adhesive cleaner and wax remover.

- Two different 3M products are available and may be used for repairs:
  - 1- 3M structural adhesive tube kit no. 8101. (Available from most automotive suppliers).
  - 2- 3M flexible parts repair material no. 05900. (Available from most automotive suppliers).

**For light scratches:** Scuff surface area with medium to fine steel wool. Textured surface finish will be easily duplicated by applying satin finish acrylic lacquer. Coat with a flexible type paint, see above.

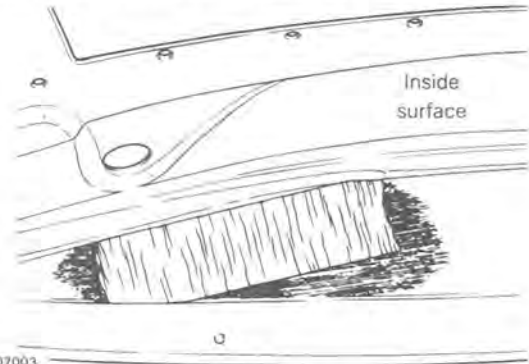
**For deep scratches:** Sand with waterproof paper #600 and then with #800 or #1000. Coat with a flexible type paint, see above.

**For large damaged area:** Example, a 100 mm (4") x 6 mm (1/4") tear.

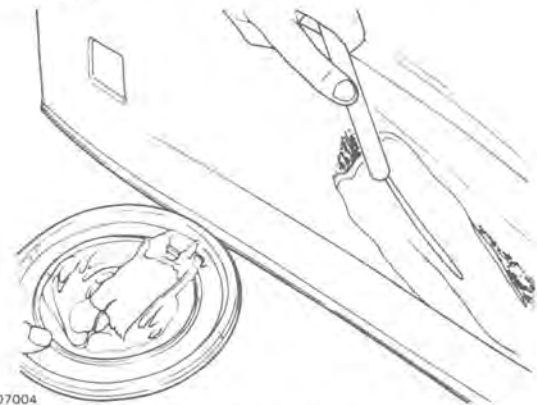


- Sand the damaged area, exceeding it by about 30 mm (1 1/4") all around, with 180 grit paper.

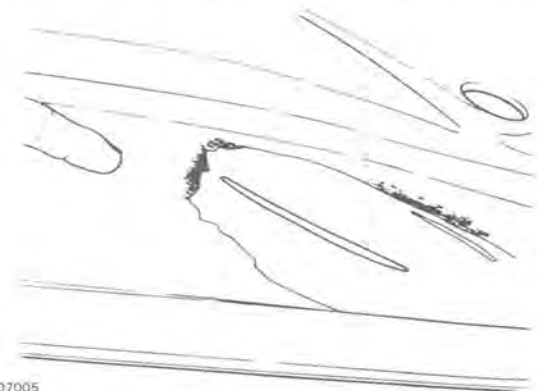
- Check surface for smoothness.
- Using chlorinated solvent, remove any dirt, or grease from the inside area.
- Sand or scuff the underside of damage area with 80 grit sand paper, exceeding it by at least 50 mm (2") all around.
- Apply 3M autobody repair tape.



- Mix filler according to manufacturers instructions.
- Apply filler to damaged area (top side). Apply in light coats only.



- Let filler set at least 20 to 30 minutes.
- Lightly sand to blend filler with surrounding area.



## Section 07 CHASSIS

### Sub-section 01 (HOOD)

- Using conventional spray equipment, apply finishing coat and allow to dry.
- After a 30 to 60 minutes drying period, use a suitable polishing compound to blend the outer edges of painted area.
- Use 3M pink fill'n glaze to fill swirls and produce a high luster finish.

#### Recommended products:

1. Dupont Lucite high gloss acrylic lacquer for all bright surfaces. This lacquer can also be purchased in a satin finish. Lucite plastic resin no. 1555 can be added in amounts not exceeding 5% by volume.
2. Sico polyurethane no. 585183 with Sico catalyst no. 581004. Mix 3 parts of paint for 1 part of catalyst.

○ **NOTE:** When using Dupont Lucite high gloss acrylic lacquer, buff with CIL acrypol polishing compound only.

Dupont clear lacquer no. 3005 may be used to blend Dupont Lucite high gloss acrylic lacquer to rest of surface.

#### FOR LIGHTLY SCRATCHED R.I.M. SURFACE:

Buff surface area with medium to fine steel wool.

Textured surface finish may be easily duplicated by applying satin finish acrylic lacquer.

#### R.I.M. Metton:

Repair with fiberglass only, to paint see R.I.M. urethane except for the following:

- Use an epoxy primer with proper catalyst as a base coat. Available from Dupont or Sico (Example: Sico Epoxy Primer #577602).
- Top coat should be a polyurethane based paint applied at 20°C (68°F).

◆ **WARNING:** Material should be repaired and repainted in a well ventilated area **only**.

▼ **CAUTION:** Clean R.I.M. Metton with isopropyl alcohol **only**. **Never** use cleaners or products that contain **chlorine**.

○ **NOTE:** R.I.M. Metton should never be exposed to temperatures above 93°C (200°F).

#### Polycarbonate:

- Basically unrepairable (some specialized shops may be equipped to repair this material).

▼ **CAUTION:** All plastic parts made of polycarbonate are not compatible with Loctite thread and bushing locking products and/or products containing hydrocarbons.

- Some repairs may be done using a heat gun and appropriately colored polycarbonate welding rods. Bear in mind that the finish of the repaired area will depend largely on the skill of the welder and the equipment used.

○ **NOTE:** This equipment may be obtained from specialized plastics repair equipment manufacturers.

- Polycarbonate may be painted with water based paints **only**.

○ **NOTE:** Use polyurethane latex with a water base.

▼ **CAUTION:** Solvents and acids will cause chemical deformation of polycarbonate.

#### Polyethylene:

- Polyethylene may be repaired by welding with appropriately colored polyethylene welding rods in much the same way as polycarbonate products.
- Small repairs may be done using polyethylene adhesives.

○ **NOTE:** No commercially available paints adhere to polyethylene, the color being injected while moulding. Repairs should thus be considered carefully before attempting.

▼ **CAUTION:** Polyethylene will permanently deform when exposed to temperatures above 82°C (180°F).

#### Surlyn:

##### Characteristics:

- Resist impacts to approximately -40°C.
- Not repairable but paintable with conventional paint.

▼ **CAUTION:** Battery acid may slowly attack the plastic material. If some acid is spilled on the material, clean immediately with a solution of sodium bicarbonate and water then rinse with clear tap water.

▼ **CAUTION:** If welding is to be done near the Surlyn material, it is recommended to either remove the plastic part from the area or to protect it with aluminium foil to prevent damage.

▼ **CAUTION:** Do not expose Surlyn to temperatures above 93°C (200°F).

**Section 07 CHASSIS**  
**Sub-section 01 (HOOD)**

**Paint codes**

**FRAME**

MODELS	COLOR & CODE	BRAND NAME & MIXTURE	PAINT P/N & QT'Y
Elan Alpine	Black B-107 Semi-gloss, 20 Gloss units	Sico no. 338-182 Acrylic lacquer	413 4010 00 (spray can)
All models (except Elan, Alpine)	Black B-106 High gloss, 90 Gloss units	Enamel R.-M. Inmont (Super Max) 01 = 100 41 = 500 42 = 700 43 = 1000	Not available

**HOOD**

MODELS	COLOR & CODE	BRAND NAME & MIXTURE	PAINT P/N & QT'Y
Formula SP	White B-122	Enamel R.-M. Inmont (Super Max) 01 = 100 94 = 1000	413 4075 00 (1 liter)
Alpine	Ice orange B-104	Enamel R.-M. Inmont (Super Max) 01 = 100 72 = 738 79 = 963 94 = 1000	414 4031 00 (spray can)
Citation LS* Tundra Tundra/LT* Formula MX *(R.I.M. Metton only)	Yellow B-121	Acrylic lacquer R.-M. Inmont 90 = 100 172 = 642 190 = 747 179 = 785 142 = 802 100 = 1000	Not available



## Section 07 CHASSIS

### Sub-section 01 (HOOD)

#### DECAL

To remove a decal; heat with a hair dryer and peel it off carefully.

Clean the surface and dry thoroughly.

Apply liquid soap on the new decal. Position the decal and using a sponge remove the air bubbles and surplus water, working from the center toward the edges. Allow to air dry.

#### WINDSHIELD INSTALLATION

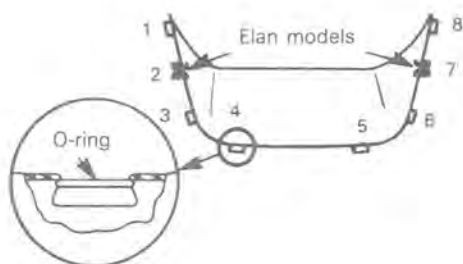
▼ **CAUTION:** Plastic alloy components such as fuel tank, windshield, hood, etc. can be cleaned using mild detergents or isopropyl alcohol. Do not use strong soaps, degreasing solvents, abrasive cleaners, paint thinners, etc.

##### All models except Skandic 377/R

Peel off protective film from windshield.

Position the windshield on the hood then push it down until the tabs are fully inserted into the hood slots. Lock the windshield tabs in position using the O-rings supplied in the kit.

○ **NOTE:** ELAN models: do not install O-rings on second and seventh tabs.



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##### Skandic 377/R

Position windshield on the hood then push down until tabs are fully inserted into hood slots.

Lock windshield tabs in position using the O-rings supplied in the kit.

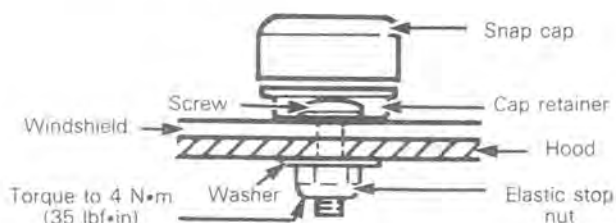
Properly seat the windshield in place.

Using windshield holes as a guide, drill 5 mm dia. (3/16") holes through the hood.

Clean the hood.

Peel off protective film from windshield.

Install the windshield mounting hardware as shown.



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#### CAB NOSE INSTALLATION

Safari 377/E, 447, Grand Luxe LC, Formula SS, SP

Put cab nose attachment in cab nose

Install it on cab torquing the nuts to 1.6 N•m (15 lbf•in).

▼ **CAUTION:** Torque is important, it prevents cab deformation.

##### Formula MX, Plus

Torque bolt to 2.4 N•m (22 lbf•in).

▼ **CAUTION:** Torque is important, it prevents cab nose inserts from pulling out of their sockets.

## RETRACTABLE HEADLAMP ADJUSTMENT

### Safari 377/E, 447, Grand Luxe LC

Assemble retractable headlamp mechanism without bolting gear cover.

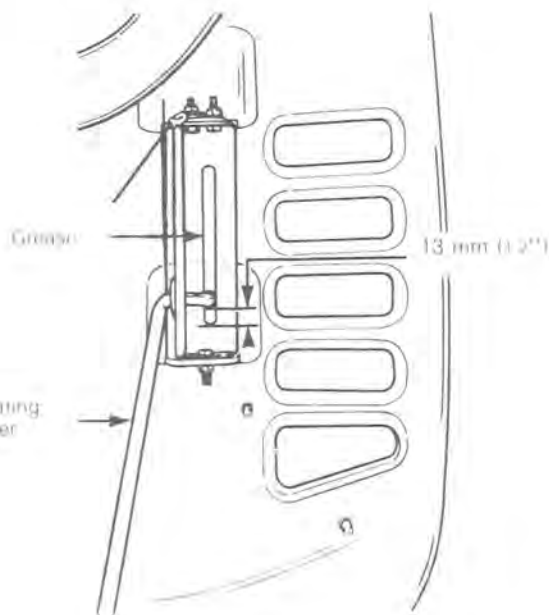
Place the rack on the pinion.

Rack and pinion adjustment is correct when at the headlamp housing opening a second step is felt which locks the housing in place.

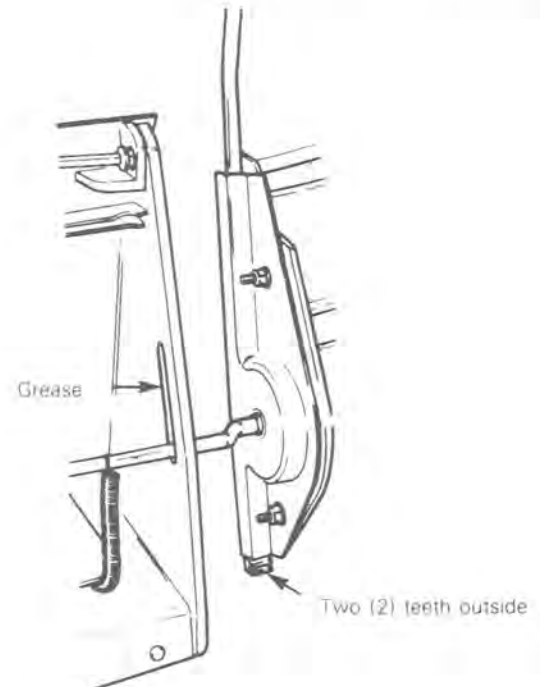
Two reference points are necessary to achieve that adjustment (see illustration below):

- Operating lever must be located 13.0 mm (1/2") before cab slot end when headlamp housing is open.
- Rack must have two teeth outside gear cover when headlamp housing is open.

Tighten gear cover.



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**CAUTION:** Make sure that headlamp housing is locked in place when it is opened.

Lubricate the two headlamp housing slots, rack and pinion and lever guide with low temperature grease.

11/11/11

11/11/11

11/11/11





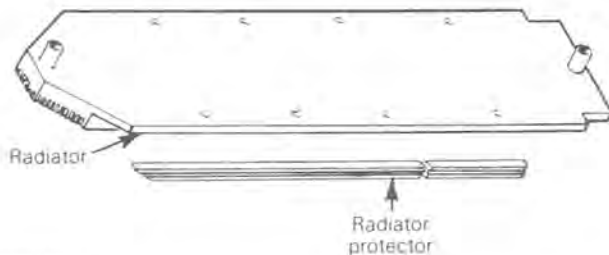
## FRAME

### FRAME CLEANING

○ **NOTE:** For aluminum frame use only "Aluminum cleaner" and follow instructions on container. (Dursol cleaner or equivalent).

Clean frame and track tunnel with appropriate cleaners and rinse with high pressure hose.

On liquid cooled models carefully clean radiators and check condition of radiator protectors. The protectors should extend far enough to keep the track from rubbing on the radiators.



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Touch up all metal spots where paint has been scratched off. Spray all bare metal parts of vehicle with metal protector.

### Seat cleaning

For all 1986 models, it is recommend to clean the seat with a solution of **soft soap/warm water** and a soft cloth.

▼ **CAUTION:** Avoid use of harsh detergent such as strong soaps, degreasing solvents, abrasive cleaners, paint thinners, etc...that may cause damage to the seat cover.

### Bottom pan repair

Some bottom pans are made of fiberglass or plastic products, to know if they are reparable or not and how to repair them refer to section 07 sub-section 01.

### FRAME WELDING

#### Steel frame:

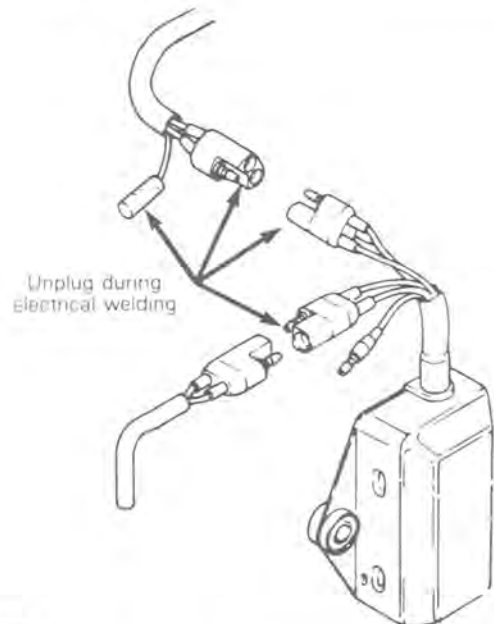
- Electric Welding
- Amperage: 70-110 Amp.
- Voltage: 20-24 volts
- Rod: E-7014 (3/32")

#### Aluminum frame: (refer to specialized welding shop)

- Argon-oxygen/acetylen welding
- Rod: ER-4043 (3/32")

▼ **CAUTION:** When electrical welding is to be performed anywhere on the vehicle, unplug the multiple connector at the electronic box prior to welding. This will protect the electronic box against damage caused by flowing current when welding.

○ **NOTE:** This procedure applies to all electronic ignition systems.



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▼ **CAUTION:** When welding is to be performed near bottom pan of Citation LS/E, Tundra/LT, Safari (all), Formula SP, MX and Plus and Alpine, protect bottom pan against fire, sparks and excessive heat. R.I.M. bottom pans are flammable.

THESE DOCUMENTS

SONT

337 1-13

# PIPING, WIRING HARNESS & CABLE ROUTING

## WIRING HARNESS

◆ **WARNING:** Ensure all terminals are properly crimped on the wires and that all connector housings are properly fastened. Ensure to protect them from any rotating, moving, heating or vibrating parts.

## CABLE

◆ **WARNING:** Before installation, ensure that all cables are in perfect condition. Properly install the cable ends and secure them in place. Pay attention to route them properly, away from any rotating, moving, heating or vibrating parts.

## PIPING

◆ **WARNING:** Always ensure that the fuel primer, impulse, oil injection and rotary valve oil lines are properly fixed to their connectors, that they are not perforated or kinked and properly routed away from any rotating, moving, heating or vibrating parts. Also check for leaks. Replace if required.

○ **NOTE:** Refer to parts catalog to find suitable clip part numbers.

1. 10/10/10  
2. 10/10/10  
3. 10/10/10

4. 10/10/10  
5. 10/10/10  
6. 10/10/10



# TECHNICAL DATA

## SI \* METRIC INFORMATION CHART

BASE UNITS		
DESCRIPTION	UNIT	SYMBOL
length	meter	m
mass	kilogram	kg
force	Newton	N
liquid	liter	L
temperature	celsius	°C
pressure	kilopascal	kPa
torque	Newton meter	N•m
speed	kilometer per hour	km/h

PREFIXES			
PREFIX	SYMBOL	MEANING	VALUE
kilo	k	one thousand	1,000
centi	c	one hundredth of a	0.01
milli	m	one thousandth of a	0.001

\*The international system of units (SYSTÈME INTERNATIONAL) abbreviates "SI" in all languages.

## Section 09 TECHNICAL DATA

CONVERSION FACTORS		
TO CONVERT	TO	MULTIPLY BY *
in	mm	25.40
in	cm	2.54
ft	m	0.30
MPH	km/h	1.61
in <sup>2</sup>	cm <sup>2</sup>	6.45
in <sup>3</sup>	cm <sup>3</sup>	16.39
imp. oz	U.S. oz	0.96
imp. oz	mL	28.41
U.S. oz	mL	29.57
imp. gal.	U.S. gal.	1.29
imp. gal.	L	4.55
U.S. gal.	L	3.79
oz	g	28.35
lb	kg	0.45
lbf	N	4.45
lbf•in	N•m	0.11
lbf•ft	N•m	1.36
lbf•ft	lbf•in	12.00
lbf/in <sup>2</sup>	kPa	6.89
Fahrenheit	Celcius	$(^{\circ}\text{F} - 32) \div 1.8$
Celcius	Fahrenheit	$(^{\circ}\text{C} + 32) \times 1.8$

\* To obtain the reverse sequence, divide by the given factor, ex: to convert mm to in, divide by 25.4

# Section 09 TECHNICAL DATA

ENGINE	BOMBARDIER ROTAX TYPE VEHICLE MODEL		247 ÉLAN®	503 ALPINE®	253 CITATION® LS/LSE	253 TUNDRA* TUNDRA LT*	377 SKANDIC* SKANDIC R*	377/E SAFARI*
	No of cylinders		1	2	1	1	2	2
	Bore	mm	69.5	72	72	72	62	62
		(inch)	(2.736)	(2.835)	(2.835)	(2.835)	(2.441)	(2.441)
	Stroke	mm	86	61	61	61	61	61
		(inch)	(2.598)	(2.402)	(2.402)	(2.402)	(2.402)	(2.402)
	Displacement	cm <sup>3</sup>	250.4	496.7	248.4	248.4	368.3	368.3
		(in. <sup>3</sup> )	(15.28)	(30.27)	(15.16)	(15.16)	(22.48)	(22.48)
	Compression ratio (effective)		5.6 : 1	6.3 : 1	6.25 : 1	6.25 : 1	6.9 : 1	6.9 : 1
	Maximum HP RPM ①		5700	5200	7000	7000	7000	7000
	Type of piston ring		2R	1 ST 1R	1 ST 1R	1 ST 1R	1 ST 1R	1 ST 1R
	Ring end gap mm (inch)	New wear limit	0.20 (.008) 1.00 (.039)	0.20 (.008) 1.00 (.039)	0.20 (.008) 1.00 (.039)	0.20 (.008) 1.00 (.039)	0.20 (.008) 1.00 (.039)	0.20 (.008) 1.00 (.039)
			0.065 — (.0026) — 0.20 (.008)	0.07 — 0.09 (.0028 — .0035) 0.20 (.008)	0.08 — 0.10 (.0031 — .0039) 0.20 (.008)	0.08 — 0.10 (.0031 — .0039) 0.20 (.008)	0.08 — 0.10 (.0031 — .0039) 0.20 (.008)	0.08 — 0.10 (.0031 — .0039) 0.20 (.008)
ELECTRICAL	Crankshaft end-play	mm (inch)	0.20 — 0.40 (.008 — .016)	N.A.	0.10 — 0.40 (.004 — .016)	0.10 — 0.40 (.004 — .016)	N.A.	N.A.
	Rotary valve/crankcase clearance	mm (inch)	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
	Rotary valve timing (marks position)		N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
	Magnet generator output (watts)		75/23	160	160	160	160	160
	Ignition type		BP	CDI	CDI	CDI	CDI	CDI
	Spark plug no		Bosch M 175 T 1	NGK BR7ES	NGK BR9ES ND W24ESR-U	NGK BR9ES ND W24 ESR-U	NGK BR8ES	NGK BR9ES
	Spark plug gap	mm inch	0.50 (.020)	0.40 (.016)	0.40 (.016)	0.40 (.016)	0.40 (.016)	0.40 (.016)
	Timing B.T.D.C.	Direct ②	3.98 (.157)	2.29 (.091)	2.31 (.091)	2.31 (.091)	2.31 (.091)	2.31 (.091)
		Indirect ②	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
		Breaker point gap	0.35 — 0.40 (.014 — .016)③	N.A.	N.A.	N.A.	N.A.	N.A.
	Other	Generating coil	3 — 3.07	L.S.: 120 — 180 H.S.: 2.8 — 4.2	L.S.: 120 — 180 H.S.: 2.8 — 4.2	L.S.: 120 — 180 H.S.: 2.8 — 4.2	L.S.: 120 — 180 H.S.: 2.8 — 4.2	L.S.: 120 — 180 H.S.: 2.8 — 4.2
		Lighting coil - large	0.38 — 0.58	0.21 — 0.31	0.21 — 0.31	0.21 — 0.31	0.21 — 0.31	0.21 — 0.31
		Lighting coil - small	1.85 — 2.35	N.A.	N.A.	N.A.	N.A.	N.A.
		H.T. coil primary	1.65 — 2.05	0.23 — 0.43	0.23 — 0.43	0.23 — 0.43	0.23 — 0.43	0.23 — 0.43
		H.T. coil secondary	4.85 — 5.85 K	2.45 — 4.55 K	2.45 — 4.55 K	2.45 — 4.55 K	2.45 — 4.55 K	2.45 — 4.55 K

BP: Breaker points  
CDI.: Condenser discharge ignition  
R.: Rectangular  
S.T.: Semi-trapez  
L.S.: Low speed

H.S.: High speed  
N.A.: Not applicable  
PTO.: Power take off  
MAG.: Magneto side

- ① The maximum horsepower RPM is applicable on the vehicle. It may be different under certain circumstances and Bombardier Inc. reserves the right to modify it without any obligation.
- ② At 6000 RPM (engine cold) with headlamp turned on.
- ③ Dynamic edge gap: 20.50 — 23.50 mm. (.807 — .925").
- ④ Formula MX (3727 model) has high altitude calibration from factory to operate at 1800 m (600 ft) above sea level.

## Section 09 TECHNICAL DATA

ENGINE	BOMBARDIER ROTAX TYPE VEHICLE MODEL		447 SAFARI*	532 SAFARI GL LC*	462 FORMULA SP*	467 FORMULA MX*	467 FORMULA MX <sup>④</sup> (3727 model)*	537 FORMULA PLUS*
	No of cylinders		2	2	2	2	2	2
	Bore	mm	67.5	72	69.5	69.5	69.5	72
		(inch)	(2.657)	(2.835)	(2.736)	(2.736)	(2.736)	(2.835)
	Stroke	mm	61	64	61	61	61	64
		(inch)	(2.402)	(2.520)	(2.402)	(2.402)	(2.402)	(2.520)
	Displacement		436.5	521.2	462.8	462.8	462.8	521.2
			(26.64)	(31.80)	(28.24)	(28.24)	(28.24)	(31.81)
	Compression ratio (effective)		6.3 : 1	6.8 : 1	6.7 : 1	7.5 : 1	7.5 : 1	6.5 : 1
	Maximum HP RPM <sup>①</sup>		7000	7000	6700	7000	7000	7800
	Type of piston ring		1 ST 1R	1 ST 1R	1 ST 1R	1 ST 1R	1 ST 1R	1 ST 1R
	Ring end gap mm (inch)	New wear limit	0.20 (.008) 1.00 (.039)	0.20 (.008) 1.00 (.039)	0.20 (.008) 1.00 (.039)	0.20 (.008) 1.00 (.039)	0.20 (.008) 1.00 (.039)	0.20 (.008) 1.00 (.039)
ELECTRICAL	Piston/cylinder wall clearance	mm	0.08 - 0.10	0.07 - 0.09	0.08 - 0.10	0.08 - 0.10	0.08 - 0.10	0.11 - 0.13
		(inch)	(.0031 - .0039)	(.0028 - .0035)	(.0031 - .0039)	(.0031 - .0039)	(.0031 - .0039)	(.0043 - .0051)
	New wear limit		0.20 (.008)	0.20 (.008)	0.20 (.008)	0.20 (.008)	0.20 (.008)	0.20 (.008)
	Crankshaft end-play		N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
	Rotary valve/crankcase clearance	mm	N.A.	0.27 - 0.48	0.27 - 0.48	0.27 - 0.48	0.27 - 0.48	0.27 - 0.48
		(inch)	N.A.	(.011 - .019)	(.011 - .019)	(.011 - .019)	(.011 - .019)	(.011 - .019)
	Rotary valve timing (marks position)		N.A.	Opening: 132° Closing: 52°	Opening: 140° Closing: 51°	Opening: 132° Closing: 52°	Opening: 132° Closing: 52°	Opening: 132° Closing: 52°
	Magnet generator output (watts)		160	160	160	160	160	160
	Ignition type		CDI	CDI	CDI	CDI	CDI	CDI
	Spark plug no		NGK BR9ES	NGK BR8ES	NGK BR8ES	NGK BR10ES	NGK BR10ES	NGK BR9ES
	Spark plug gap	mm	0.40	0.40	0.40	0.40	0.40	0.40
		(inch)	(.016)	(.016)	(.016)	(.016)	(.016)	(.016)
ELECTRICAL	Timing & T.D.C.	Direct <sup>②</sup>	mm	1.88	1.75	1.75	2.50	1.75
		(inch)	(.074)	(.069)	(.069)	(.098)	(.098)	(.069)
		Indirect <sup>②</sup>	mm	N.A.	N.A.	N.A.	N.A.	N.A.
		(inch)	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
	Breaker point gap		mm	N.A.	N.A.	N.A.	N.A.	N.A.
			(inch)	N.A.	N.A.	N.A.	N.A.	N.A.
	Wires	Generating coil	L.S.: 120 - 180 H.S.: 2.8 - 4.2	L.S.: 120 - 180 H.S.: 2.8 - 4.2	L.S.: 120 - 180 H.S.: 2.8 - 4.2	L.S.: 125 - 235 H.S.: 1.4 - 2.6	L.S.: 125 - 235 H.S.: 1.4 - 2.6	L.S.: 125 - 235 H.S.: 1.4 - 2.6
		Lighting coil - large	0.21 - 0.31	0.09 - 0.20	0.09 - 0.20	0.09 - 0.20	0.09 - 0.20	0.09 - 0.20
		Lighting coil - small	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
		H.T. coil primary	0.23 - 0.43	0.23 - 0.43	0.23 - 0.43	0.23 - 0.43	0.23 - 0.43	0.23 - 0.43
		H.T. coil secondary	2.45 - 4.55 K	2.45 - 4.55 K	2.45 - 4.55 K	2.45 - 4.55 K	2.45 - 4.55 K	2.45 - 4.55 K

BP.: Breaker points  
CDI.: Condenser discharge ignition  
R.: Rectangular  
S.T.: Semi-trapez  
L.S.: Low speed

H.S.: High speed  
N.A.: Not applicable  
P.T.O.: Power take off  
MAG.: Magneto side

① The maximum horsepower RPM is applicable on the vehicle. It may be different under certain circumstances and Bombardier Inc. reserves the right to modify it without any obligation.

② At 6000 RPM (engine cold) with headlamp turned on.

③ Dynamic edge gap: 20.50 - 23.50 mm. (.807 - .925").

④ Formula MX (3727 model) has high altitude calibration from factory to operate at 1800 m (600 ft) above sea level.



## Section 09 TECHNICAL DATA

CARBURETION	BOMBARDIER ROTAX TYPE VEHICLE MODEL		247 ÉLAN®	503 ALPINE®	253 CITATION® LS/LSE	253 TUNDRA* TUNDRA LT*	377 SKANDIC* SKANDIC R*	377/E SAFARI®
	Mikuni carburetor		VM 28-242	VM 34-297	VM 34-319	VM 34-319	VM 34-276	VM 34-309
	Main jet (sea level)		160	250	160	160	260	210
	Needle jet		0-8 (182)	P-2 (159)	P-0 (159)	P-0 (159)	P-2 (159)	P-6 (159)
	Pilot jet		30	30	40	40	35	30
	Needle identification		6DP1-3	6DH3-3	6DH2-3	6DH2-3	6DH4-3	6DH4-3
	Needle setting from top		3rd	3rd	3rd	3rd	3rd	3rd
	Slide cut-away		2.0	2.0	2.0	2.0	3.0	3.0
	Air screw adjustment (turn) ± 1/8		1 1/2	1 1/2	1	1	1 1/2	1 1/2
	Idle speed R.P.M.		1300-1500	1800-2000	1100-1300	1100-1300	1800-2000	1800-2000
COOLING	Fuel grade		Regular — leaded or unleaded					Regular — leaded
	Fuel oil ratio		50:1	50:1	oil injection	oil injection	50:1	oil injection
	Cooling type		Radial fan	Axial fan	Axial fan	Axial fan	Axial fan	Axial fan
	Cooling system capacity	liter	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
		imperial oz.						
		U.S. oz.						
TIGHTENING TORQUES	Thermostat °C (°F)		N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
	Radiator pressure cap kPa (lb/in <sup>2</sup> )		N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
	Coolant mixture (% by volume) antifreeze/water		N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
	(ENGINE COLD) lbf-in (N·m)	Magneto ring nut	85 (63)	85 (63)	85 (63)	85 (63)	85 (63)	85 (63)
		Crankcase nuts or screws	21 (15)	21 (15)	9 (7)	9 (7)	M6: 9 (7) M8: 21 (15)	M6: 9 (7) M8: 21 (15)
		Cylinder head nuts	21 (15)	21 (15)	N.A.	N.A.	21 (15)	21 (15)
		Crankcase/engine Support nuts or screws	38 (28)	38 (28)	21 (15)	21 (15)	38 (28)	38 (28)
		Crankcase cylinder nuts	N.A.	N.A.	21 (15)	21 (15)	N.A.	N.A.
		Fan shaft nut	N.A.	65 (48)	55 (41)	55 (41)	65 (48)	65 (48)

BP: Breaker points

CDI: Condenser discharge ignition

R: Rectangular

S.T.: Semi-trapez

L.S.: Low speed

H.S.: High speed

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PTO: Power take off

MAG.: Magneto side

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## Section 09 TECHNICAL DATA

CARBURETION	BOMBARDIER ROTAX TYPE VEHICLE MODEL		447 SAFARI*	532 SAFARI GL LC*	462 FORMULA SP*	467 FORMULA MX*	467 FORMULA MX ④ (3727 model)*	537 FORMULA PLUS*
	Mikuni carburetor		VM 34-310	VM 34-312	VM 34-334	PTO VM 34-352 MAG VM 34-353	PTO VM 34-355 MAG VM 34-356	PTO VM 40-29 MAG VM 40-30
	Main jet (sea level)		230	270	270	PTO 220 MAG 240	PTO 160 MAG 170	PTO 330 MAG 350
	Needle jet		P-8 (159)	P-4 (159)	P-4 (159)	P-4 (159)	P-4 (159)	AA5 (224)
	Pilot jet		30	50	40	40	40	40
	Needle identification		6EJ1-3	6EJ1-3	6EJ1-3	6DH7-3	6DH7-3	7DH2-2
	Needle setting from top		3rd	3rd	3rd	3rd	3rd	2nd
	Slide cut-away		3.0	3.0	3.0	2.5	2.5	2.5
	Air screw adjustment (turn) ± 1/8		1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1
	Idle speed R.P.M.		1800-2000	1800-2000	1800-2000	1800-2000	1800-2000	1800-2000
	Fuel grade		Regular — leaded		Regular leaded or unleaded	Premium		
	Fuel oil ratio		oil injection	oil injection	oil injection	oil injection	oil injection	oil injection
COOLING	Cooling type		Axial fan	Liquid cooled	Liquid cooled	Liquid cooled	Liquid cooled	Liquid cooled
	Cooling system capacity	liter	N.A.	4.9	4.7	4.2	4.2	4.2
		imperial oz.		172	164	148	148	148
		U.S. oz.		165	158	142	142	142
	Thermostat °C (°F)		N.A.	43 (110)	43 (110)	37 (98)	37 (98)	42 (108)
	Radiator pressure cap kPa (lb/in <sup>2</sup> )		N.A.	90 (13)	90 (13)	90 (13)	90 (13)	90 (13)
TIGHTENING TORQUES	Coolant mixture (% by volume) antifreeze/water		N.A.	60/40	60/40	60/40	60/40	60/40
	ENGINE COLD (8-16 Mm)	Magneto ring nut	85 (63)	95 (70)	95 (70)	100 (74)	100 (74)	100 (74)
		Crankcase nuts or screws	M6: 9 (7) M8: 21 (15)	M6: 9 (7) M8: 21 (15)	M6: 9 (7) M8: 21 (15)	M6: 9 (7) M8: 20 (15)	M6: 9 (7) M8: 20 (15)	M6: 9 (7) M8: 20 (15)
		Cylinder head nuts	23 (17)	21 (15)	23 (17)	20 (15)	20 (15)	20 (15)
		Crankcase/engine Support nuts or screws	38 (28)	38 (28)	38 (28)	M10: 11 (8)	M10: 11 (8)	M10: 11 (8)
		Crankcase cylinder nuts	N.A.	21 (15)	N.A.	20 (15)	20 (15)	20 (15)
		Fan shaft nut	65 (48)	N.A.	N.A.	N.A.	N.A.	N.A.

BP.: Breaker points  
 CDI.: Condenser discharge ignition  
 R.: Rectangular  
 S.T.: Semi-trapez  
 L.S.: Low speed

H.S.: High speed  
 N.A.: Not applicable  
 PTO.: Power take off  
 MAG.: Magneto side

- ① The maximum horsepower RPM is applicable on the vehicle. It may be different under certain circumstances and Bombardier Inc. reserves the right to modify it without any obligation.
- ② At 6000 RPM (engine cold) with headlamp turned on.
- ③ Dynamic edge gap: 20.50 — 23.50 mm. (.807 — .925").
- ④ Formula MX (3727 model) has high altitude calibration from factory to operate at 1800 m (600 ft) above sea level.

## Section 09 TECHNICAL DATA

DIMENSIONS	MODEL	ÉLAN® 250	ALPINE® 503	CITATION® LS	CITATION® LSE	TUNDRA®	TUNDRA LT®	SKANDIC 377®	SKANDIC 377 R®
	Engine type	247	503	253	253	253	253	377	377
	Overall length cm (inch)	224.8 (88.5)	288.3 (113.5)	242 (95.3)	242 (95.3)	272 (107.1)	287 (113)	289.5 (114)	289.5 (114)
	Overall width cm (inch)	77.5 (30.5)	90.2 (35.5)	84.5 (33.3)	84.5 (33.3)	84.5 (33.3)	84.5 (33.3)	96.5 (38)	96.5 (38)
	Overall height cm (inch)	106.7 (42)	123.2 (48.5)	91.5 (36)	91.5 (36)	111 (43.7)	111 (43.7)	108 (42.5)	108 (42.5)
	Ski stance cm (inch)	64.8 (25.5)	N.A.	72.5 (28.5)	72.5 (28.5)	72.5 (28.5)	72.5 (28.5)	81.9 (32.25)	81.9 (32.25)
	Mass weight kg (lb)	129.2 (285)	290.3 (640)	133.8 (295)	150 (324)	148.8 (328)	162.4 (358)	186 (410)	192 (422)
	Bearing area cm² (inch²)	6916 (1072)	13935 (2160)	4748 (736)	4748 (736)	6600 (1023)	7581 (1175)	7579 (1175)	7579 (1175)
	Ground pressure kPa (lb/in²)	1.87 (.263)	2.08 (.296)	2.81 (.401)	3.16 (.440)	2.25 (.321)	2.14 (.305)	2.45 (.349)	2.53 (.359)
	Frame material	Steel	Steel	Steel	Steel	Steel	Steel	Alu. & steel	Alu. & steel
	Cab material	Poly.	Fib.	R.I.M.	R.I.M.	R.I.M.	R.I.M.	Poly.	Poly.
ELECTRICAL	Battery V, a=h.	N.A.	12,22	N.A.	12,22	N.A.	N.A.	N.A.	N.A.
	Headlamp bulb watt	60/60	60/60	60/60	60/60	60/60	60/60	60/60	60/60
	Tail & stop bulb watt	5/21	5/21	5/21	5/21	5/21	5/21	5/21	5/21
	Tacho & Speedo Bulb watt	N.A.	5	N.A.	N.A.	N.A.	N.A.	5	5
	Fuel & Temp. gauge Bulb watt	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
	Fuse	Starter solenoid amp	N.A.	30	N.A.	30	N.A.	N.A.	N.A.
		Tachometer amp	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
		Ignition switch amp	N.A.	15	N.A.	N.A.	N.A.	N.A.	N.A.
LIQUID CAPACITIES	Fuel tank	SI L	13.6	22.7	26	26	26	28.4	28.4
		Imperial gal	3	5	5.7	5.7	5.7	6.25	6.25
		U.S. gal	3.6	6	6.9	6.9	6.9	7.5	7.5
	Chaincase mL (oz)	200 (7)	455 (16)	200 (7)	200 (7)	200 (7)	200 (7)	200 (7)	450 (16)
	Rotary valve reservoir mL (oz)	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
	Cooling system	SI L	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
		Imperial oz	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
		U.S. oz	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
	Injection oil reservoir L imp. oz U.S. oz	N.A.	N.A.	1.5 53 51	1.5 53 51	1.5 53 51	1.5 53 51	N.A.	N.A.

Alu.: Aluminum  
Fib.: Fiberglass  
Poly.: Polycarbonate

R.I.M.: Reaction injection molding  
Hal.: Halogen  
N.A.: Not applicable

R.S.S.: Roller square shaft (2 rollers)  
R.R.S.: Roller round shaft  
R.S.S.R.: Roller square shaft with 3  
ramps

TRA.: Total range adjustable

① Formula MX (3727 Model) has high altitude calibration from factory to operate at 1800 m (6000 ft) above sea level.

② Including ring gear measurement.

## Section 09 TECHNICAL DATA

DIMENSIONS	MODEL		SAFARI 377*	SAFARI 377E*	SAFARI 447*	SAFARI GRAND LUXE LC*	FORMULA SP *	FORMULA MX *	FORMULA MX* ① (3727 model)	FORMULA PLUS*
	Engine type		377	377	447	532	462	467	467	537
	Overall length	cm (inch)	266.7 (105)	266.7 (105)	279.4 (110)	279.4 (110)	266.7 (105)	271.8 (107)	271.8 (107)	271.8 (107)
	Overall width	cm (inch)	96.5 (38)	96.5 (38)	96.5 (38)	96.5 (38)	96.5 (38)	104.1 (41)	104.1 (41)	104.1 (41)
	Overall height	cm (inch)	96.5 (38)	96.5 (38)	96.5 (38)	96.5 (38)	99 (39)	91.4 (36)	91.4 (36)	91.4 (36)
	Ski stance	cm (inch)	81.9 (32.25)	81.9 (32.25)	81.9 (32.25)	81.9 (32.25)	81.9 (32.25)	92.1 (36.25)	92.1 (36.25)	92.1 (36.25)
	Mass weight	kg (lb)	176.9 (390)	188.7 (416)	182.3 (402)	211.8 (467)	196.9 (434)	198.7 (438)	207.7 (458)	203.2 (448)
	Bearing area	cm <sup>2</sup> (inch <sup>2</sup> )	6545 (1030)	7065 (1095)	7594 (1177)	7594 (1177)	7065 (1095)	5968 (925)	7626 (1182)	6348 (984)
	Ground pressure	kPa (lb/in <sup>2</sup> )	2.66 (1.379)	2.67 (1.380)	2.40 (1.342)	2.79 (1.396)	2.79 (1.396)	3.33 (1.474)	2.72 (1.387)	3.20 (1.455)
	Frame material		Alu. & steel	Alu. & steel	Alu. & steel	Alu. & steel	Alu. & steel	Alu. & steel	Alu. & steel	Alu. & steel
ELECTRICAL	Cab material		Poly.	Poly.	Poly.	Poly.	Fib.	R.I.M. Mettron	R.I.M. Mettron	R.I.M. Mettron
	Battery	V.e.+h.	N.A.	12.22	N.A.	12.22	N.A.	N.A.	N.A.	N.A.
	Headlamp bulb	watt	60/60	60/60	60/60	60/55 hal.	60/55 hal.	60/60	60/60	60/55 hal.
	Tail & stop bulb	watt	5/21	5/21	5/21	5/21	5/21	5/21	5/21	5/21
	Tacho & Speedo Bulb	watt	N.A.	N.A.	5	5	5	5	5	5
	Fuel & Temp. gauge Bulb	watt	N.A.	N.A.	N.A.	2	2	2	2	2
	Fuses	Starter solenoid	amp	N.A.	30	N.A.	30	N.A.	N.A.	N.A.
		Tachometer	amp	N.A.	N.A.	0.1	0.1	0.1	0.1	0.1
		Ignition switch	amp	N.A.	15	N.A.	15	N.A.	N.A.	N.A.
LIQUID CAPACITIES	Fuel tank	SI	L	28.6	28.6	28.6	28.6	28.6	40.9	40.9
		Imperial	gal	6.3	6.3	6.3	6.3	6.3	9	9
		U.S.	gal	7.6	7.6	7.6	7.6	7.6	10.8	10.8
	Chainscase	mL (oz)	200 (7)	200 (7)	200 (7)	200 (7)	200 (7)	256 (9)	256 (9)	256 (9)
	Rotary valve reservoir	mL (oz)	N.A.	N.A.	N.A.	568 (20)	568 (20)	455 (16)	455 (16)	455 (16)
	Cooling system	SI	L			4.9	4.7	4.2	4.2	4.2
		Imperial	oz	N.A.	N.A.	172	164	148	148	148
		U.S.	oz			165	158	142	142	142
	Injection oil reservoir	L	2.6	2.6	2.6	2.6	2.6	2.9	2.9	2.9
		imp. oz	92	92	92	92	92	102	102	102
		U.S. oz	88	88	88	88	88	98	98	98

484 0531 00

Alu.: Aluminum

Fib.: Fiberglass

Poly.: Polycarbonate

R.I.M.: Reaction injection molding

Hal.: Halogen

N.A.: Not applicable

R.S.S.: Roller square shaft (2 rollers)

R.R.S.: Roller round shaft

R.S.S.R.: Roller square shaft with 3 ramps

TRA.: Total range adjustable

① Formula MX (3727 Model) has high altitude calibration from factory to operate at 1800 m (6000 ft) above sea level.

② Including ring gear measurement.

## Section 09 TECHNICAL DATA

POWER TRAIN	MODEL	ÉLAN® 250	ALPINE® 503	CITATION® LS	CITATION® LSE	TUNDRA®	TUNDRA LT®	SKANDIC 377®	SKANDIC 377 R®
	Gear ratio (driven pulley to drive axle)	10/25	19/42	15/27	15/27	12/27	12/27	14/35	17/40
	Chain pitch	1/2" single	3/8" triple	1/2" single	1/2" single	1/2" single	1/2" single	3/8" double	3/8" silent
	Type of drive pulley	R.R.S.	R.S.S.R.	R.R.S.	R.R.S.	R.R.S.	R.R.S.	2R.S.S.	2R.S.S.
	Drive pulley retaining N.m screw torque	62 (46)	85 (63)	85 (63)	85 (63)	85 (63)	85 (63)	80 (59)	80 (59)
	Pressure lever identification	E4	A3S (double)	C4LS	C4LS	C4LS	C4LS	B3KSH	B3KSH
	Spring color	Bronze	Purple	Light Blue	Light Blue	Light Blue	Light Blue	Yellow	Yellow
	Spring length mm ± 1.5 (in ± .060)	81.3 (3.20)	73.7 (2.90)	119.1 (4.69)	119.1 (4.69)	119.1 (4.69)	119.1 (4.69)	100 (3.94)	100 (3.94)
	Clutch engagement R.P.M.	2000-2200	2000-2200	3500-3700	3500-3700	3500-3700	3500-3700	3700-3900	3700-3900
	Driven pulley spring preload kg ± 0.4 (lb ± 1)	3.6 (8)	5.9 (13)	4.1 (9)	4.1 (9)	4.1 (9)	4.1 (9)	5.4 (12)	5.4 (12)
	Pulley distance mm (inch)	44.45 <sup>+0.15</sup> / <sub>-0.15</sub> (1.75 <sup>+0.006</sup> / <sub>-0.006</sub> )	44.45 <sup>+0.15</sup> / <sub>-0.15</sub> (1.75 <sup>+0.006</sup> / <sub>-0.006</sub> )	36.6 <sup>+0.15</sup> / <sub>-0.15</sub> (1.44 <sup>+0.006</sup> / <sub>-0.006</sub> )	36.6 <sup>+0.15</sup> / <sub>-0.15</sub> (1.44 <sup>+0.006</sup> / <sub>-0.006</sub> )	36.6 <sup>+0.15</sup> / <sub>-0.15</sub> (1.44 <sup>+0.006</sup> / <sub>-0.006</sub> )	36.6 <sup>+0.15</sup> / <sub>-0.15</sub> (1.44 <sup>+0.006</sup> / <sub>-0.006</sub> )	41.27 <sup>+0.15</sup> / <sub>-0.15</sub> (1.62 <sup>+0.006</sup> / <sub>-0.006</sub> )	41.27 <sup>+0.15</sup> / <sub>-0.15</sub> (1.62 <sup>+0.006</sup> / <sub>-0.006</sub> )
	Offset (dimension X & Y) mm (inch)	34.5 ± 0.40 (1.23/64 ± 1/64)	34.5 ± 0.40 (1.23/64 ± 1/64)	34.03 ± 0.38 (1.11/32 ± 1/64)	45.30 ± 0.38 (1.25/32 ± 1/64) ②	34.03 ± 0.38 (1.11/32 ± 1/64)	34.03 ± 0.38 (1.11/32 ± 1/64)	34.03 ± 0.38 (1.11/32 ± 1/64)	34.03 ± 0.38 (1.11/32 ± 1/64)
	Drive belt number	570 0411 00	414 5233 00	414 3758 00	414 3758 00	414 3758 00	414 3758 00	414 3758 00	414 3758 00
	Drive belt width mm (inch)	30.2 (1.2)	34.9 (1.38)	33.3 (1.31)	33.3 (1.31)	33.3 (1.31)	33.3 (1.31)	33.3 (1.31)	33.3 (1.31)
	Drive belt tension & deflection	Force 67 N (15lbF) Force on belt between pulleys must produce the deflection							
		mm (inch)	32 (1.25)	32 (1.25)	30.2 (1.19)	30.2 (1.19)	30.2 (1.19)	30.2 (1.19)	32 (1.25)
	Track width cm (inch)	38.1 (1.5)	2 × 38.1 (2 × 1.5)	38.1 (1.5)	38.1 (1.5)	38.1 (1.5)	38.1 (1.5)	38.1 (1.5)	38.1 (1.5)
	Track length cm (inch)	289.5 (11.4)	2 × 353 (2 × 13.9)	260 (10.2)	260 (10.2)	315 (12.4)	353 (13.9)	353 (13.9)	353 (13.9)
	Suspension type	Bogie	Bogie	Slide	Slide	Slide	Slide	Slide	Slide
	Track tension mm (inch)	ÉLAN®: 35 mm (1 3/8") distance between top inside edge of track and the bottom of the footboard.							
	Track alignment	Equal distance between edges of track guides and slider							
	Track tension mm (inch)	13 mm (1/2") gap should exist between slider shoe and the bottom inside of track.							
	Track alignment	Equal distance between edges of track guides and slider							

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Fib.: Fiberglass  
Poly.: Polycarbonate

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Hal.: Halogen  
N.A.: Not applicable

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R.R.S.: Roller round shaft  
R.S.S.R.: Roller square shaft with 3 ramps

TRA.: Total range adjustable

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② Including ring gear measurement.

## Section 09 TECHNICAL DATA

POWER TRAIN	MODEL		SAFARI 377*	SAFARI 377E*	SAFARI 447*	SAFARI GRAND LUXE LC*	FORMULA SP*	FORMULA MX*	FORMULA MX* <sup>①</sup> (3727 model)	FORMULA PLUS*
	Gear ratio (driven pulley to drive axle)		16/34	16/34	19/39	21/37	21/37	26/40	26/44	20/38
	Chain pitch		3/8" double	3/8" double	3/8" double	3/8" triple	3/8" triple	3/8" silent	3/8" silent	3/8" silent
	Drive pulley	Type of drive pulley	2R.S.S.	2R.S.S.	2R.S.S.	R.S.S.R.	R.S.S.R.	R.S.S.R.	2R.S.S.R.	TRA
		Drive pulley retaining N•m screw torque (lbf•ft)	85 (63)	85 (63)	85 (63)	85 (63)	85 (63)	80 (59)	80 (59)	80 (59)
		Pressure lever identification	C6LH	C6LH	C7LH	A8S	A8S	A8S	A8S	N.A.
		Spring color	Olive	Olive	Orange	Black	Black	Black	Orange	Blue/Yellow
		Spring length mm $\pm$ 1.5 (in $\pm$ .080)	106 (4.17)	106 (4.17)	96.5 (3.80)	77.7 (3.06)	77.7 (3.06)	77.7 (3.06)	96.5 (3.80)	96.5 (3.80)
		Clutch engagement R.P.M.	3400-3600	3400-3600	3400-3600	3100-3300	3300-3500	3100-3400	3100-3400	3600-3900
	Driven pulley spring preload kg $\pm$ 0.4 (lb $\pm$ 1)		4.1 (9)	4.1 (9)	4.1 (9)	4.1 (9)	4.1 (9)	5.9 - 6.4 (13 - 14)	6.8 - 7.3 (15 - 16)	6.4 - 7.3 (14 - 16)
	Pulley distance mm (inch)		36.6 $\pm$ 1.5 (1 7/16 $\pm$ 1/8)	36.6 $\pm$ 1.5 (1 7/16 $\pm$ 1/8)	36.6 $\pm$ 1.5 (1 7/16 $\pm$ 1/8)	36.6 $\pm$ 1.5 (1 7/16 $\pm$ 1/8)	36.6 $\pm$ 1.5 (1 7/16 $\pm$ 1/8)	35 $\pm$ 1 (1 3/8 $\pm$ 1/8)	35 $\pm$ 1 (1 3/8 $\pm$ 1/8)	26.5 $\pm$ 1.2 (1 3/8 $\pm$ 1/8)
	Offset (dimension X & Y) mm (inch)		34.5 $\pm$ 0.40 (1 23/64 $\pm$ 1/64)	34.5 $\pm$ 0.40 (1 23/64 $\pm$ 1/64)	34.5 $\pm$ 0.40 (1 23/64 $\pm$ 1/64)	34.5 $\pm$ 0.40 (1 23/64 $\pm$ 1/64)	34.5 $\pm$ 0.40 (1 23/64 $\pm$ 1/64)	33 $\pm$ 0.75 (1 19/64 $\pm$ 1/32)	33 $\pm$ 0.75 (1 19/64 $\pm$ 1/32)	37 $\pm$ 0.50 (1 29/64 $\pm$ 1/64)
	Drive belt number		414 5233 00	414 5233 00	414 5233 00	414 5233 00	414 5233 00	414 5233 00	414 5233 00	414 5823 00
	Drive belt width mm (inch)		34.9 (1 3/8)	34.9 (1 3/8)	34.9 (1 3/8)	34.9 (1 3/8)	34.9 (1 3/8)	34.9 (1 3/8)	34.9 (1 3/8)	34.9 (1 3/8)
	Drive belt tension & deflection	Force								
		mm (inch)	32 (1 1/4)	32 (1 1/4)	32 (1 1/4)	32 (1 1/4)	32 (1 1/4)	25.4 - 31.8 (1 1/4 - 1 1/2)	25.4 - 31.8 (1 1/4 - 1 1/2)	25.4 - 31.8 (1 1/4 - 1 1/2)
	Track	Track width cm (inch)	38.1 (15)	41.9 (16.5)	41.9 (16.5)	41.9 (16.5)	41.9 (16.5)	38.1 (15)	41.9 (16.5)	41.9 (16.5)
		Track length cm (inch)	290 (114)	290 (114)	315 (124)	315 (124)	290 (114)	290 (114)	315 (124)	290 (114)
	Suspension type		Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide
	Belt tension	Track tension mm (inch)								
		Track alignment								
	Slide engagement	Track tension mm (inch)	FORMULA MX - PLUS 10-13 mm (3/8 - 1/2") gap should exist between slider shoe and bottom inside of track.							
		Track alignment								

Alu.: Aluminum  
Fib.: Fiberglass  
Poly.: Polycarbonate

R.I.M.: Reaction injection molding  
Hal.: Halogen  
N.A.: Not applicable

R.S.S.: Roller square shaft (2 rollers)  
R.R.S.: Roller round shaft  
R.S.S.R.: Roller square shaft with 3 ramps  
TRA.: Total range adjustable

① Formula MX (3727 Model) has high altitude calibration from factory to operate at 1800 m (6000 ft) above sea level.

② Including ring gear measurement.