

***ski-doo***®

SHOP MANUAL • SUPPLEMENT

2003

**4-TEC™**  
**Legend**  
V-1000 Sport  
**Grand Touring**  
V-1000 Sport

This supplement must be used in conjunction with the  
Ski-Doo 2003 ZX Series Shop Manual (P/N 484 200 042)



# **2003 Shop Manual Supplement**

**4-TEC™**

LEGEND V-1000 SPORT  
GRAND TOURING V-1000 SPORT

This supplement must be used in conjunction with the  
*2003 ZX Series Shop Manual (P/N 484 200 042).*

**BOMBARDIER**  
RECREATIONAL PRODUCTS



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## SAFETY NOTICE

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# SAFETY NOTICE

This manual has been prepared as a guide to correctly service and repair some 2003 Ski-Doo snowmobiles. See model list below.

This edition was primarily published to be used by snowmobile mechanic technicians who are already familiar with all service procedures relating to Bombardier made snowmobiles. Mechanic technicians should attend continuous training courses given by Bombardier Training Dept.

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 the *Parts Catalog*.

It is understood that this manual may be translated into another language. In the event of any discrepancy, the English version shall prevail.

The content depicts parts and/or procedures applicable to the particular product at time of writing. *Service* and *Warranty Bulletins* may be published to update the content of this manual. Make sure to read and understand them.

In addition, the sole purpose of the illustrations 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.

The engines and the corresponding components identified in this document should not be utilized on product(s) other than those mentioned in this document.

Torque wrench tightening specifications must strictly be adhered to. Locking devices (ex.: locking tab, self-locking fasteners, etc.) must be installed or replaced with new ones. 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 serious personal injury including possibility of death.

**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. Always use common shop safety practice.

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.

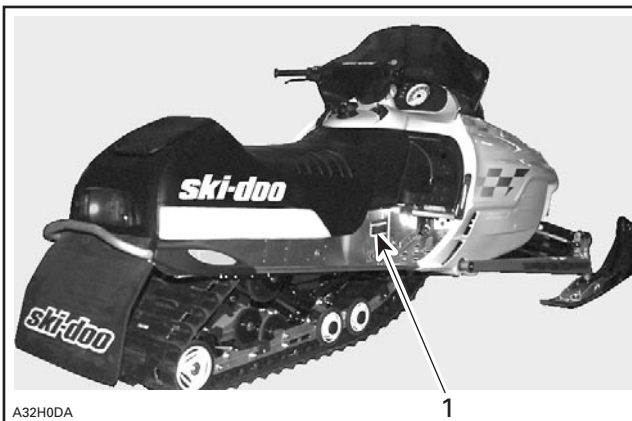
## INTRODUCTION

This *Shop Manual* covers the following Bombardier made 2003 snowmobiles:

| MODEL             | PACKAGE | ENGINE | COLOR       | COUNTRY    | MODEL NUMBER |
|-------------------|---------|--------|-------------|------------|--------------|
| GRAND TOURING (E) | SPORT   | V-1000 | 2 tone Blue | (U.S./CDN) | 2638         |
| GRAND TOURING (E) | SPORT   | V-1000 | 2 tone Blue | (EUR)      | 2644         |
| LEGEND (E)        | SPORT   | V-1000 | 2 tone Blue | (U.S./CDN) | 2637         |

### VEHICLE IDENTIFICATION NUMBER

#### Vehicle Identification Number Location

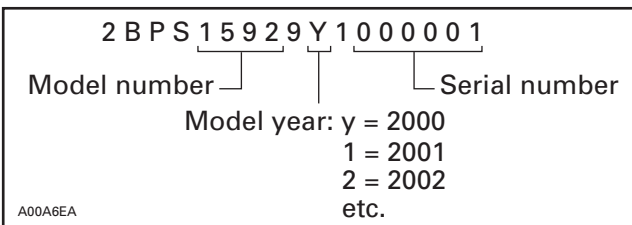


A32H0DA

TYPICAL

1. Vehicle identification number

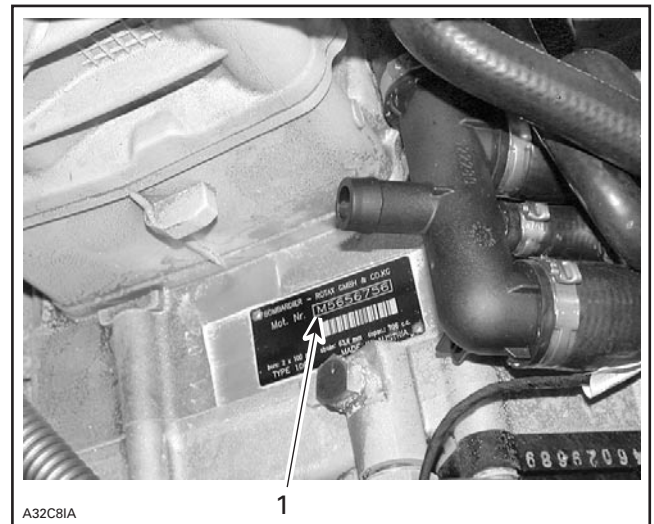
#### Identification Number Meaning



A00A6EA

### ENGINE SERIAL NUMBER

#### Engine Serial Number Location



A32C8IA

TYPICAL

1. Engine serial number

### LIST OF ABBREVIATIONS USED IN THIS MANUAL

|      |                                    |
|------|------------------------------------|
| A    | ampere                             |
| amp  | ampere                             |
| A•h  | ampere-hour                        |
| AC   | alternate current                  |
| ACM  | acceleration and control modulator |
| ADSA | advanced direct shock action       |
| ATS  | air temperature sensor             |
| BDC  | bottom dead center                 |
| BTDC | before top dead center             |
| BV   | battery voltage                    |
| CAPS | camshaft position sensor           |
| CPS  | crankshaft position sensor         |

# INTRODUCTION

|                    |                                   |
|--------------------|-----------------------------------|
| CTS                | coolant temperature sensor        |
| °C                 | degree Celsius                    |
| cc                 | cubic centimeter                  |
| CDI                | capacitor discharge ignition      |
| CTR                | center                            |
| cm                 | centimeter                        |
| cm <sup>2</sup>    | square centimeter                 |
| cm <sup>3</sup>    | cubic centimeter                  |
| DC                 | direct current                    |
| DESS               | digitally encoded security system |
| DPM                | digital performance management    |
| ECM                | engine control module             |
| EMS                | engine management system          |
| °F                 | degree Fahrenheit                 |
| FC                 | fan cooled                        |
| fl. oz             | fluid ounce                       |
| ft                 | foot                              |
| GRD                | ground                            |
| H.A.C.             | high altitude compensator         |
| hal.               | halogen                           |
| HI                 | high                              |
| IFP                | internal floating piston          |
| imp. oz            | imperial ounce                    |
| in                 | inch                              |
| in <sup>2</sup>    | square inch                       |
| in <sup>3</sup>    | cubic inch                        |
| k                  | kilo (thousand)                   |
| kg                 | kilogram                          |
| km/h               | kilometer per hour                |
| kPa                | Kilopascal                        |
| L                  | liter                             |
| lb                 | pound                             |
| lbf                | pound (force)                     |
| lb/in <sup>2</sup> | pound per square inch             |
| LH                 | left hand                         |
| LO                 | low                               |
| LT                 | long track                        |
| m                  | meter                             |
| MAPS               | manifold air pressure sensor      |

|         |                                       |
|---------|---------------------------------------|
| Max.    | maximum                               |
| Min.    | minimum                               |
| mL      | milliliter                            |
| mm      | millimeter                            |
| mn      | minute                                |
| MPH     | mile per hour                         |
| MPI     | multi protocol interface              |
| N       | newton                                |
| N.A.    | not applicable                        |
| no.     | number                                |
| 00.0    | continuity                            |
| 0.L     | open line (open circuit)              |
| O.D.    | outside diameter                      |
| OPS     | oil pressure switch                   |
| OPT     | optional                              |
| oz      | ounce                                 |
| P/N     | part number                           |
| PSI     | pound per square inch                 |
| PTO     | power take off                        |
| R       | rectangular                           |
| RH      | right hand                            |
| RAVE    | Rotax adjustable variable exhaust     |
| RER     | Rotax electronic reverse              |
| ROM     | read only memory                      |
| RPM     | revolution per minute                 |
| RMS     | root mean square                      |
| RRIM    | reinforced reaction injection molding |
| s       | second                                |
| Sp. Gr. | specific gravity                      |
| ST      | semi-trapez                           |
| TDC     | top dead center                       |
| TPS     | throttle position sensor              |
| TRA     | total range adjustable                |
| U.S. oz | ounce (United States)                 |
| V       | volt                                  |
| Vac     | volt (alternative current)            |
| VSA     | variable sheave angle                 |
| WOT     | wide open throttle                    |

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

## TYPICAL PAGE

**Section 07 REAR SUSPENSION**  
Subsection 01 (SUSPENSION SC-10 SPORT, TOURING AND MOUNTAIN)

**SUSPENSION SC-10 SPORT, TOURING AND MOUNTAIN**  
*Grand Touring 500/580, Formula 500/583 and Summit 500*

Page heading indicates section and subsection detailed.

Subsection title indicates beginning of the subsection.

Italic subtitle above exploded view indicates pertaining models.

Exploded view assists you in identifying parts and related positions.

Drop represents a service product to be applied to a surface. In this case Loctite 271 to screw threads.

Bold face number indicates special procedure concerning this part.

Dotted box contains parts of a particular model in this case the short track models only.

Illustration number for publishing process.

Document number for publishing process.

Tightening torque nearby fastener. In this case, nut must be torqued to 4 N•m or 35 lbf•in.

Page numbering system:  
07: REAR SUSPENSION section  
01: SUSPENSION SC-10 SPORT, TOURING AND MOUNTAIN subsection  
1: First page of this subsection

**CAUTION:** Pay attention to torque specifications. Some of these are in lbf•in instead of lbf•ft. Use appropriate torque wrench.

Annotations in diagram include: Low temp. grease, Loctite 271, 18 N•m (160 lbf•in), 4 N•m (35 lbf•in), SLE only, Long track models only, Short track models only, and various part numbers (1-20).

A01A2AS

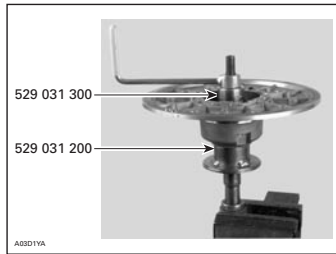


# INTRODUCTION

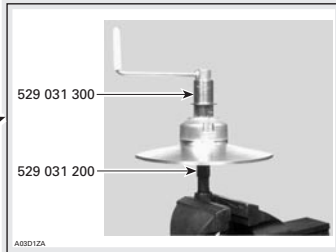
## TYPICAL PAGE

**Section 05 TRANSMISSION**  
Subsection 03 (DRIVEN PULLEY)

Turn puller handle and sliding half at once to extract the bushing.



**IMPORTANT:** Large bushing retaining screws and washers must be removed before small bushing installation.  
Coat bushing outside diameter with Loctite 609 (P/N 413 703 100).  
Install bushing as following photo.



### ASSEMBLY

#### Came Slider Shoe

When replacing slider shoes no. 4, always install a new set (3 shoes) to maintain equal pressure on the cam.  
Assemble driven pulley components by reversing the disassembly procedure.

#### Cam

Coat cam **no. 18** interior with anti-seize lubricant.

MMR2000\_042\_00-02A.FM

### INSTALLATION

#### Countershaft

**CAUTION:** Always apply anti-seize lubricant (P/N 413 701 000) on the countershaft before final pulley installation.

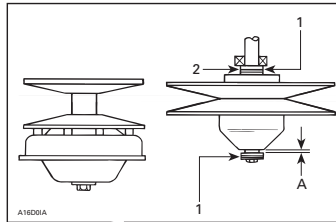
#### *A-Series and B-Series Only*

Should installation procedure be required, refer to BRAKE then look for Brake Disc and Countershaft Bearing Adjustment.

Reinstall the pulley on the countershaft by reversing the removal procedure.

#### All Models

Check end play of driven pulley on countershaft by pushing pulley towards outer housing so that the inner shims (P/N 504 108 200) contact it. Measure end play at the mounting screw end between shim(s) and pulley. See illustration.



TYPICAL — TOP VIEW

- 1. Shim (P/N 504 108 200) (as required)
- 2. Contact
- 3. 0.2 to 1 mm (0 to 3/64 in)

Torque retaining screw no. 13 to 25 N•m (18 lbf•ft).

### ADJUSTMENT

Refer to PULLEY DISTANCE AND ALIGNMENT to adjust pulley distance. Adjust drive belt height between pulley halves to obtain specified belt deflection.

Title indicates main procedure to be carried-out.

Italic bold face type setting indicates a particular procedure concerning a model.

Italic bold face setting in this case indicates that particular procedure for A and B-Series is finished, so from this point, all models are concerned.

“TYPICAL” caption indicates a general view which does not represent full detail.

“TOP VIEW” caption helps you in understanding illustration.

Call-outs for above illustration.

Reference to look up a certain section and subsection. In this case it concerns pulleys adjustment.

Illustration always follows text to which it pertains.

Subtitle indicates a particular procedure for the named part.

Bold face number following part name refers to exploded view at beginning of subsection.

## GENERAL INFORMATION

The information 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.

Due to late changes, it may have some differences between the manufactured product and the description and/or specifications in this document.

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

## ILLUSTRATIONS AND PROCEDURES

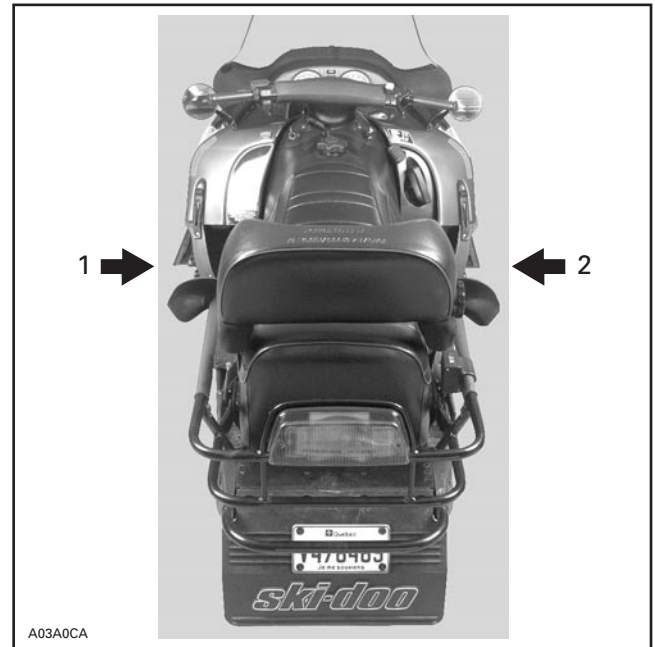
Illustrations and photos show the typical construction of the different assemblies and, in all cases, may not reproduce the full detail or exact shape of the parts shown. However, they represent parts which have the same or a similar function.

**CAUTION:** Most components of those vehicles are built with parts dimensioned in the metric system. Most fasteners are metric and must not be replaced by customary fasteners or vice-versa. Mismatched or incorrect fasteners could cause damage to the vehicle or possible personal injury.

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 subsection in which the procedure is contained.

A number of procedures throughout the book require the use of special tools. Before commencing any procedure, be sure that you have on hand all the tools required, or approved equivalents.

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



TYPICAL

1. Left
2. Right

## SELF-LOCKING FASTENERS PROCEDURE

The following describes the most common application procedures when working with self-locking fasteners.

Use a metal brush or a tap to clean the hole properly then use a solvent (Methyl-Chloride), let act during 30 minutes and wipe off. The solvent utilization is to ensure the adhesive works properly.

## LOCTITE APPLICATION PROCEDURE

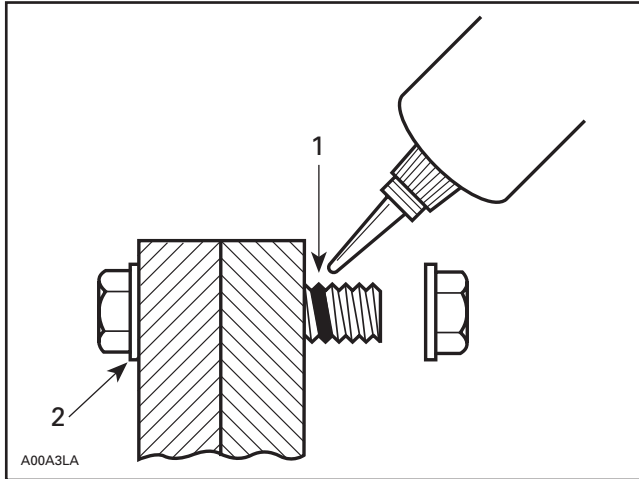
The following describes the most common application procedures when working with Loctite products.

**NOTE:** Always use proper strength Loctite product as recommended in this *Shop Manual*.

# INTRODUCTION

## THREADLOCKER

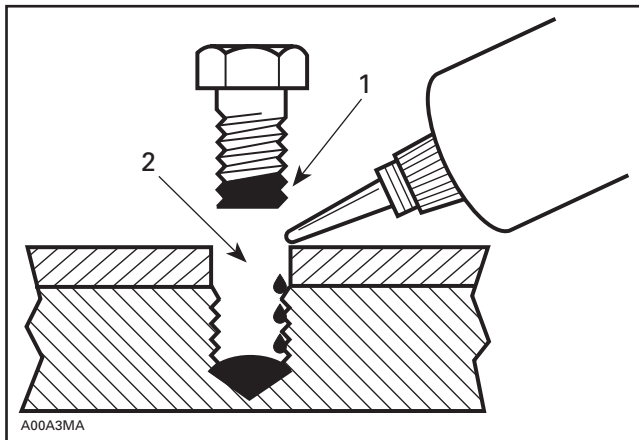
### Uncovered Holes (bolts and nuts)



1. Apply here
2. Do not apply

1. Clean threads (bolt and nut) with solvent.
2. Apply Loctite Primer N (P/N 293 800 041) on threads and allow to dry.
3. Choose proper strength Loctite threadlocker.
4. Fit bolt in the hole.
5. Apply a few drops of threadlocker at proposed tightened nut engagement area.
6. Position nut and tighten as required.

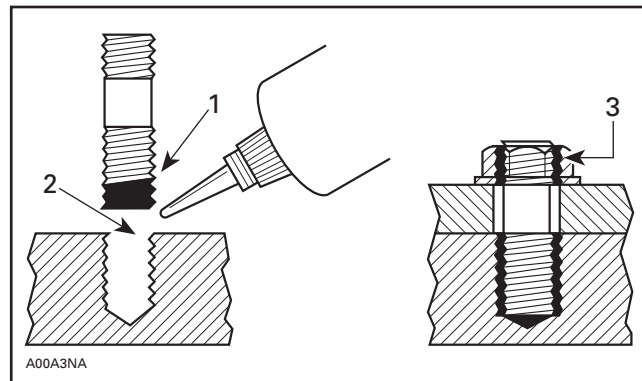
### Blind Holes



1. On threads
2. On threads and at the bottom of hole

1. Clean threads (bolt and hole) with solvent.
2. Apply Loctite Primer N (P/N 293 800 041) on threads (bolt and nut) and allow to dry for 30 seconds.
3. Choose proper strength Loctite threadlocker.
4. Apply several drops along the threaded hole and at the bottom of the hole.
5. Apply several drops on bolt threads.
6. Tighten as required.

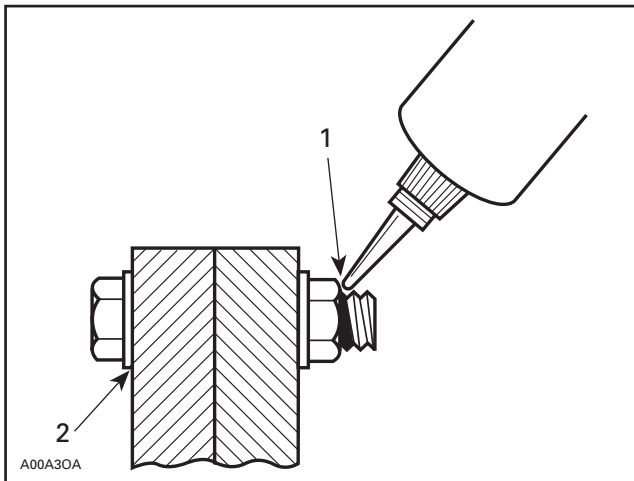
### Stud in Blind Holes



1. On threads
2. On threads and in the hole
3. Onto nut threads

1. Clean threads (stud and hole) with solvent.
2. Apply Loctite Primer N (P/N 293 800 041) on threads and allow to dry.
3. Put several drops of proper strength Loctite threadlocker on female threads and in hole.
4. Apply several drops of proper strength Loctite on stud threads.
5. Install stud.
6. Install cover, etc.
7. Apply drops of proper strength Loctite on uncovered threads.
8. Tighten nuts as required.

## Preassembled Parts

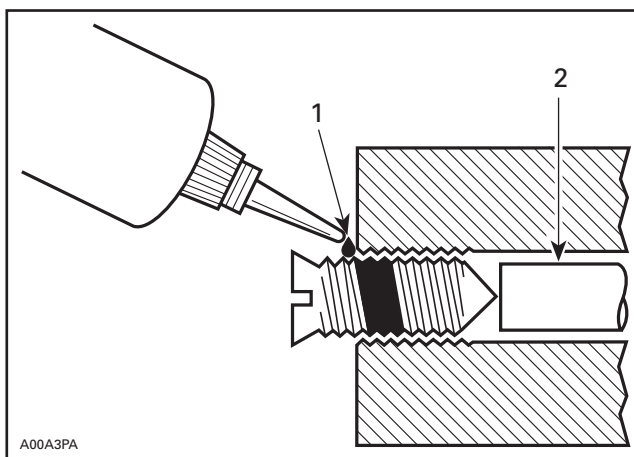


1. Apply here
2. Do not apply

1. Clean bolts and nuts with solvent.
2. Assemble components.
3. Tighten nuts.
4. Apply drops of proper strength Loctite on bolt/nut contact surfaces.
5. Avoid touching metal with tip of flask.

**NOTE:** For preventive maintenance on existing equipment, retighten nuts and apply proper strength Loctite on bolt/nut contact surfaces.

## Adjusting Screw



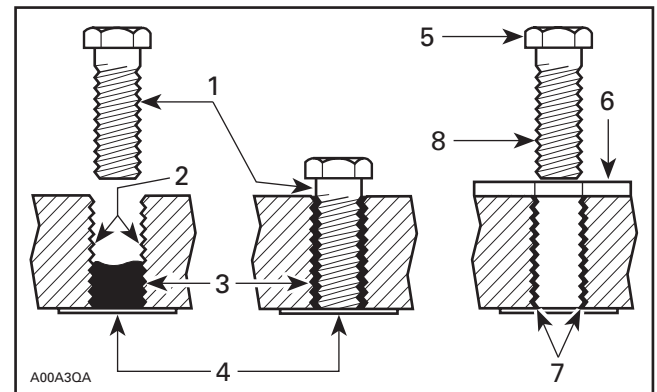
1. Apply here
2. Plunger

1. Adjust screw to proper setting.
2. Apply drops of proper strength Loctite threadlocker on screw/body contact surfaces.
3. Avoid touching metal with tip of flask.

**NOTE:** If it is difficult to readjust, heat screw with a soldering iron (232°C (450°F)).

## STRIPPED THREAD REPAIR

### Stripped Threads



1. Release agent
2. Stripped threads
3. Form-A-Thread
4. Tape
5. Cleaned bolt
6. Plate
7. New threads
8. Threadlocker

### Standard Thread Repair

1. Follow instructions on Loctite FORM-A-THREAD 81668 package.
2. If a plate is used to align bolt:
  - a. Apply release agent on mating surfaces.
  - b. Put waxed paper or similar film on the surfaces.
3. Twist bolt when inserting it to improve thread conformation.

**NOTE:** NOT intended for engine stud repairs.

### Repair of Small Holes/Fine Threads

Option 1: Enlarge damaged hole, then follow **Standard Thread Repair** procedure.

Option 2: Apply FORM-A-THREAD on the screw and insert in damaged hole.

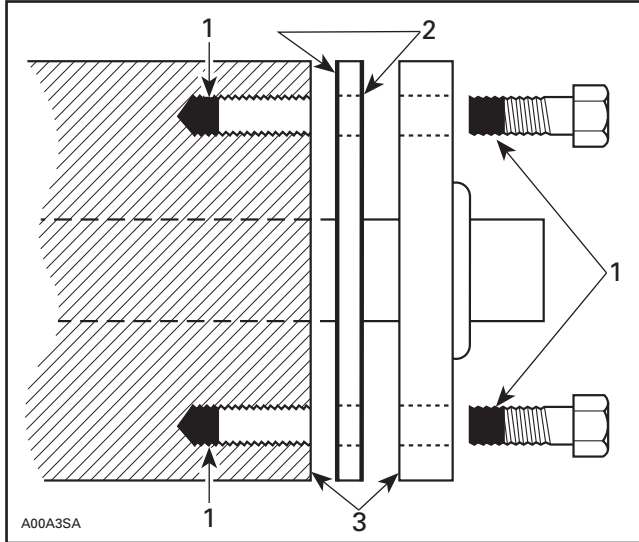
### Permanent Stud Installation (light duty)

1. Use a stud or thread on desired length.
2. **DO NOT** apply release agent on stud.
3. Do a **Standard Thread Repair**.
4. Allow to cure for 30 minutes.
5. Assemble.

# INTRODUCTION

## GASKET COMPOUND

### All Parts



1. Proper strength Loctite
2. Loctite Primer N (P/N 413 708 100) and Gasket Eliminator 515 (P/N 413 702 700) on both sides of gasket
3. Loctite Primer N only

1. Remove old gasket and other contaminants with Loctite Chisel remover (P/N 413 708 500). Use a mechanical mean if necessary.

**NOTE:** Avoid grinding.

2. Clean both mating surfaces with solvent.
3. Spray Loctite Primer N on both mating surfaces and on both sides of gasket. Allow to dry 1 or 2 minutes.
4. Apply GASKET ELIMINATOR 515 (P/N 413 702 700) on both sides of gasket, using a clean applicator.
5. Place gasket on mating surfaces and assemble immediately.

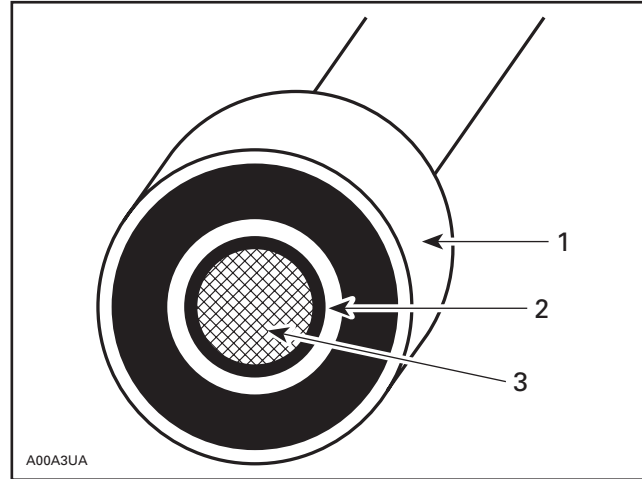
**NOTE:** If the cover is bolted to blind holes (above), apply proper strength Loctite in the hole and on threads. Tighten.

If holes are sunken, apply proper strength Loctite on bolt threads.

6. Tighten as usual.

## MOUNTING ON SHAFT

### Mounting with a Press



1. Bearing
2. Proper strength Loctite
3. Shaft

### Standard

1. Clean shaft external part and element internal part.
2. Apply a strip of proper strength Loctite on shaft circumference at insert or engagement point.

**NOTE:** Retaining compound is always forced out when applied on shaft.

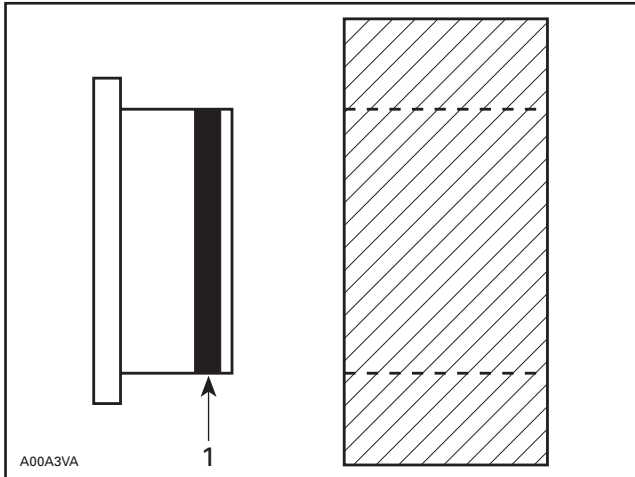
3. DO NOT use anti-seize Loctite or any similar product.
4. No curing period is required.

### Mounting in Tandem

1. Apply retaining compound on internal element bore.
2. Continue to assemble as shown above.

## CASE-IN COMPONENTS

### Metallic Gaskets



1. *Proper strength Loctite*

1. Clean inner housing diameter and outer gasket diameter.
2. Spray housing and gasket with Loctite Primer N (P/N 293 800 041).
3. Apply a strip of proper strength Loctite on leading edge of outer metallic gasket diameter.

**NOTE:** Any Loctite product can be used here. A low strength liquid is recommended as normal strength and gap are required.

4. Install according to standard procedure.
5. Wipe off surplus.
6. Allow it to cure for 30 minutes.

**NOTE:** Normally used on worn-out housings to prevent leaking or sliding.

It is generally not necessary to remove gasket compound applied on outer gasket diameter.

# INTRODUCTION

## TIGHTENING TORQUES

### WARNING

Torque wrench tightening specifications must strictly be adhered to.

Locking devices (ex.: locking tabs, elastic stop nuts, self-locking fasteners, etc.) must be installed or replaced with new ones where specified. If the efficiency of a locking device is impaired, it must be renewed.

Tighten fasteners to torque mentioned in exploded views and text. When they are not specified refer to following table. Bold face size (e.g. **M4**) indicates nominal value (mean value).

| N•m | FASTENER SIZE<br>(8.8 grade) | Lbf•in |
|-----|------------------------------|--------|
| 2   | <b>M4</b>                    | 18     |
| 3   | M4                           | 27     |
| 4   | <b>M5</b>                    | 35     |
| 8   | M6                           | 71     |
| 9   | M6                           | 80     |
| 10  | <b>M6</b>                    | 89     |
| 11  | M6                           | 97     |
| 12  | M6                           | 106    |

| N•m | FASTENER SIZE<br>(8.8 grade) | Lbf•ft |
|-----|------------------------------|--------|
| 21  | M8                           | 15     |
| 22  | M8                           | 16     |
| 23  | <b>M8</b>                    | 17     |
| 24  | M8                           | 18     |
| 25  | M8                           | 18     |
| 43  | M10                          | 32     |
| 44  | M10                          | 32     |
| 45  | M10                          | 33     |
| 46  | M10                          | 34     |
| 47  | M10                          | 35     |
| 48  | <b>M10</b>                   | 35     |
| 49  | M10                          | 36     |
| 50  | M10                          | 37     |
| 51  | M10                          | 38     |
| 52  | M10                          | 38     |

| N•m | FASTENER SIZE<br>(8.8 grade) | Lbf•ft |
|-----|------------------------------|--------|
| 53  | M10                          | 39     |
| 76  | M12                          | 56     |
| 77  | M12                          | 57     |
| 78  | M12                          | 58     |
| 79  | M12                          | 58     |
| 80  | <b>M12</b>                   | 59     |
| 81  | M12                          | 60     |
| 82  | M12                          | 60     |
| 83  | M12                          | 61     |
| 84  | M12                          | 62     |
| 121 | M14                          | 89     |
| 122 | M14                          | 90     |
| 123 | M14                          | 91     |
| 124 | M14                          | 91     |
| 125 | M14                          | 92     |
| 126 | M14                          | 93     |
| 127 | M14                          | 94     |
| 128 | M14                          | 94     |
| 129 | M14                          | 95     |
| 130 | M14                          | 96     |
| 131 | M14                          | 97     |
| 132 | M14                          | 97     |
| 133 | M14                          | 98     |
| 134 | M14                          | 99     |
| 135 | <b>M14</b>                   | 100    |
| 136 | M14                          | 100    |
| 137 | M14                          | 101    |
| 138 | M14                          | 102    |
| 139 | M14                          | 103    |
| 140 | M14                          | 103    |
| 141 | M14                          | 104    |
| 142 | M14                          | 105    |
| 143 | M14                          | 105    |
| 144 | M14                          | 106    |
| 145 | M14                          | 107    |
| 146 | M14                          | 108    |
| 147 | M14                          | 108    |
| 148 | M14                          | 109    |
| 149 | M14                          | 110    |
| 150 | M14                          | 111    |

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