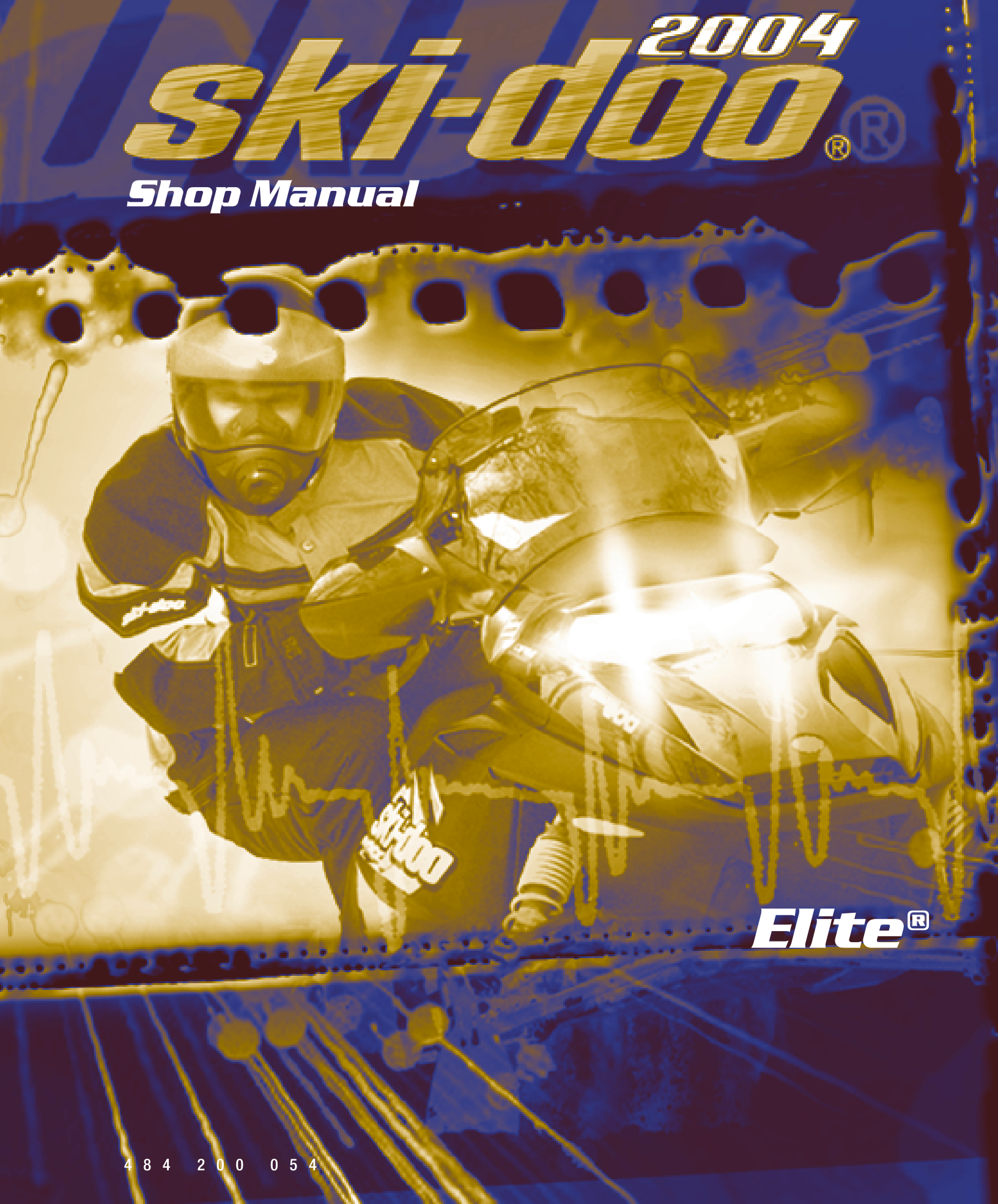
2004

ski-doo®

Shop Manual



Elite®

484 200 054

2004
Shop Manual

ELITE SERIES

Bombardier Recreational Products Inc.

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Technical Publications
Bombardier Recreational Products Inc.
Valcourt (Quebec) Canada

Printed in Canada

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

SAFETY NOTICE

This manual has been prepared as a guide to correctly service and repair some 2004 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.

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 Recreational Products Inc. (BRP) 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.

⚠ WARNING

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.

⚠ WARNING

Unless otherwise specified, engine should be turned OFF and cold for all maintenance and repair procedures.

INTRODUCTION

This shop manual covers the following BRP made 2004 Elite series models:

TYPICAL — ELITE SERIES

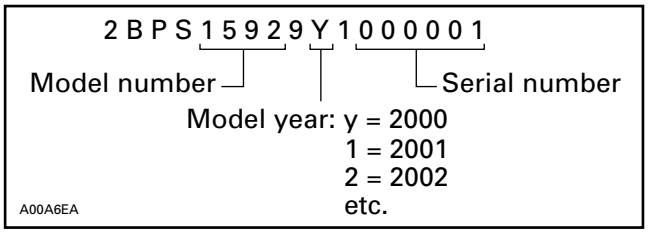
MODEL	ENGINE	COLOR	MODEL NUMBER
Elite SE CAN/U.S.	1500	Silver	2227
Elite SE Europe	1500	Silver	4070

VEHICLE IDENTIFICATION NUMBER

VEHICLE IDENTIFICATION NUMBER LOCATION

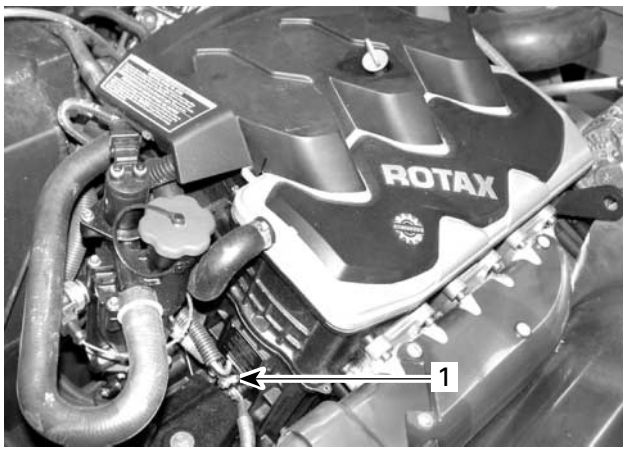
TYPICAL
1. Vehicle identification number

IDENTIFICATION NUMBER MEANING



ENGINE SERIAL NUMBER

ENGINE SERIAL NUMBER LOCATION



TYPICAL
1. Engine serial number

LIST OF ABBREVIATIONS USED IN THIS MANUAL

ABBREVIATION	MEANING
A	ampere
amp	ampere
A•h	ampere-hour
AC	alternate current
ACM	acceleration and control modulator
ADSA	advanced direct shock action
AMG	absorbed glass mat
APS	air pressure sensor
ATS	air temperature sensor
BDC	bottom dead center
BTDC	before top dead center
B.U.D.S.	Bombardier Utility and Diagnostic Software
°C	degree Celsius
cc	cubic centimeter
CDI	capacitor discharge ignition
CPS	Crankshaft Position Sensor
CTR	center
cm	centimeter
cm^2	square centimeter
cm^3	cubic centimeter
DC	direct current
DESS	digitally encoded security system
DPM	digital performance management
°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^2	square inch
in^3	cubic inch
k	kilo (thousand)
kg	kilogram
km/h	kilometer per hour
kPa	Kilopascal
L	liter
lb	pound
lbf	pound (force)
lbf/in^2	pound per square inch
LH	left hand

ABBREVIATION	MEANING
LO	low
m	meter
MAG	magneto
Max.	maximum
Min.	minimum
mL	milliliter
mm	millimeter
MPEM	multi-purpose electronic module
MPH	mile per hour
N	newton
N.A.	not applicable
no.	number
0	continuity
0.L	open line (open circuit)
O.D.	outside diameter
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
RPM	revolution per minute
RMS	root mean square
RRIM	reinforced reaction injection molding
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)
Vdc	Volt (direct current)
VSA	variable sheave angle
WTS	water temperature sensor

ARRANGEMENT OF THIS MANUAL

The manual is divide into 12 major sections:

01 Service Tools and Service Products

02 Maintenance

03 Troubleshooting

04 1503 Engine (4-TEC)

05 1503 Engine Management (4-TEC)

06 Transmission

07 Electrical System

08 Rear Suspension

09 Steering/Front Suspension

10 Body/Frame

11 Technical Data

12 Wiring Diagram

Each section is divided in various subsections, and again, each subsection has one or more division.

GENERAL INFORMATION

The information and component/system descriptions contained in this manual are correct at time of publication. BRP 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.

BRP 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).

SELF-LOCKING APPLICATION 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.

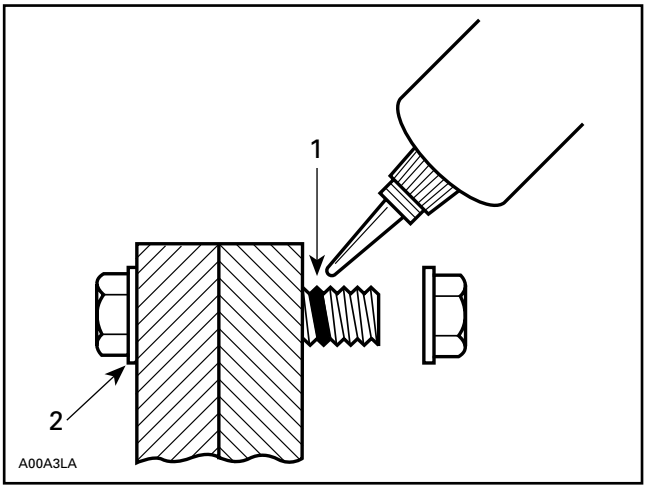
LOCTITE® APPLICATION PROCEDURE

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.

THREADLOCKER

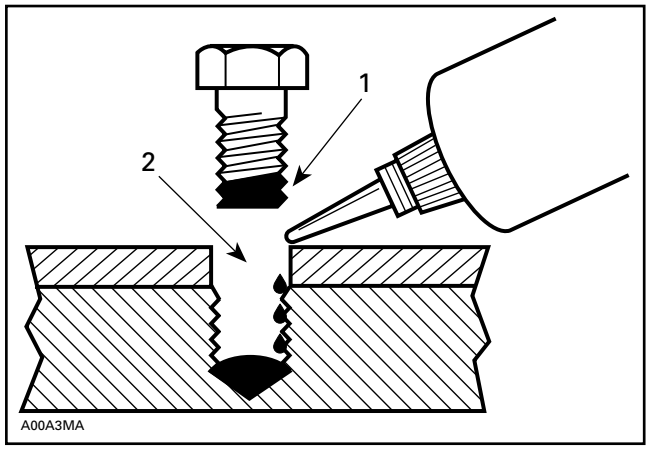
Uncovered Holes (bolts and nuts)



1. Apply here
2. Do not apply

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

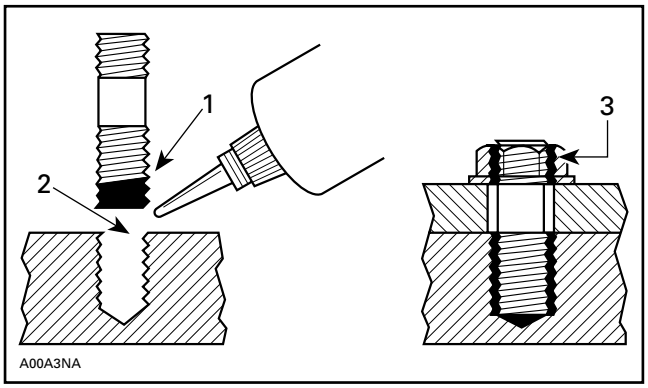
Blind Holes



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

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

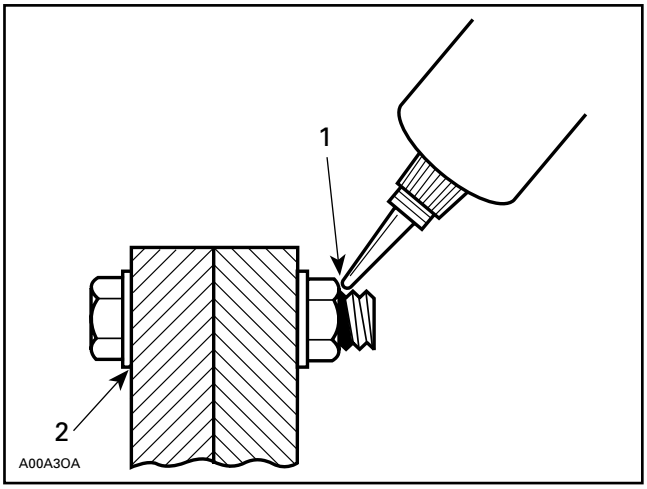
Stud in Blind Holes



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

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

Preassembled Parts

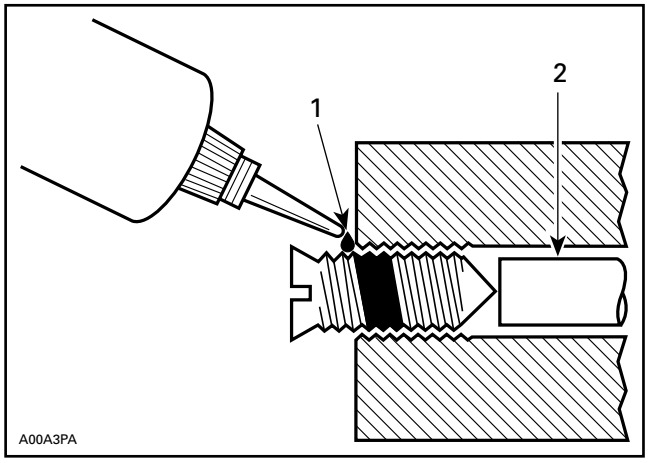


1. Apply here
2. Do not apply

– Clean bolts and nuts with solvent.
– Assemble components.
– Tighten nuts.
– Apply drops of proper strength Loctite on bolt/nut contact surfaces.
– 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



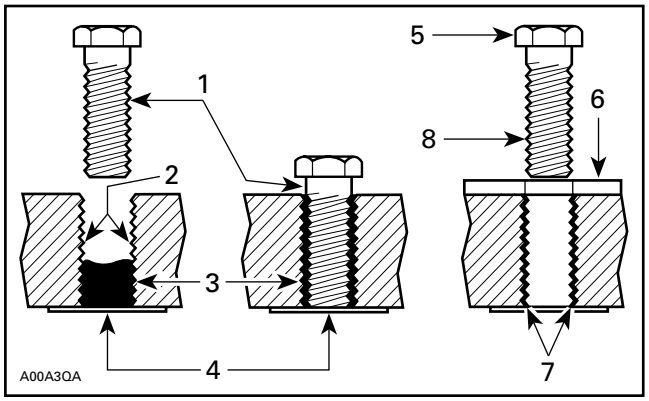
1. Apply here
2. Plunger

– Adjust screw to proper setting.
– Apply drops of proper strength Loctite threadlocker on screw/body contact surfaces.
– 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

– Follow instructions on Loctite FORM-A-THREAD 81668 package.
– If a plate is used to align bolt:
  – Apply release agent on mating surfaces.
  – Put waxed paper or similar film on the surfaces.
  – 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.

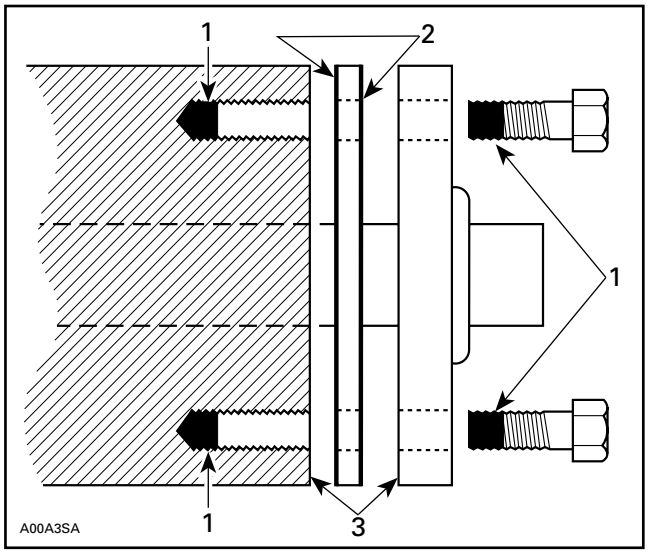
Option 2: Apply FORM-A-THREAD on the screw and insert in damaged hole.

Permanent Stud Installation (light duty)

– Use a stud or thread on desired length.
– DO NOT apply release agent on stud.
– Do a STANDARD THREAD REPAIR.
– Allow to cure for 30 minutes.
– Assemble.

GASKET COMPOUND

All Parts



1. Proper strength Loctite
2. Loctite Primer N (P/N 293 800 041) and Gasket Eliminator 515 (P/N 413 702 700) on both sides of gasket
3. Loctite Primer N only

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

NOTE: Avoid grinding.

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

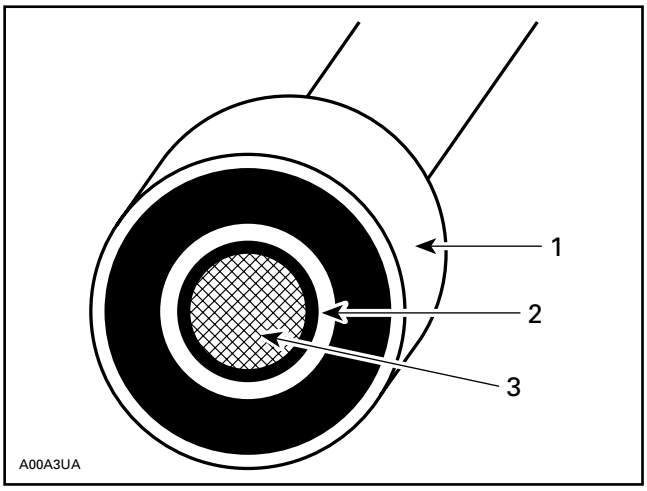
NOTE: If the cover is bolted to blind holes (above), apply proper strength Loctite in the hole and on threads. Tighten.

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

– Tighten as usual.

MOUNTING ON SHAFT

Mounting with a Press



1. Bearing
2. Proper strength Loctite
3. Shaft

Standard

– Clean shaft external part and element internal part.
– 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.

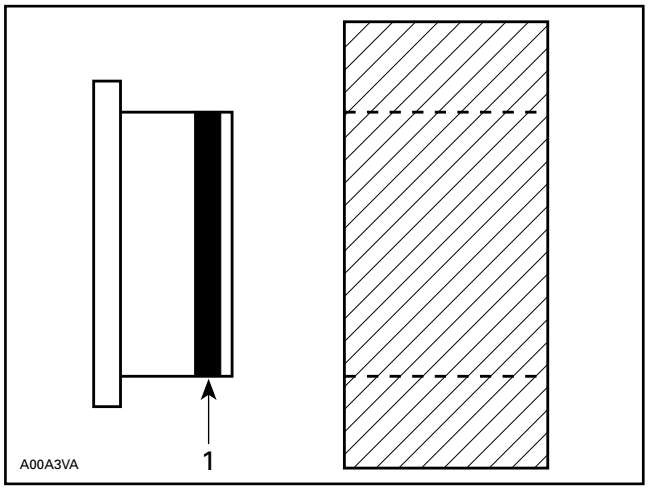
– DO NOT use anti-seize Loctite or any similar product.
– No curing period is required.

Mounting in Tandem

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

CASE-IN COMPONENTS

Metallic Gaskets



1. Proper strength Loctite

– Clean inner housing diameter and outer gasket diameter.
– Spray housing and gasket with Loctite Primer N (P/N 293 800 041).
– 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.

– Install according to standard procedure.
– Wipe off surplus.
– 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.

TIGHTENING TORQUE

Tighten fasteners to torque mentioned in exploded views and/or text, When they are not specified, refer to following table. The table also gives the metric conversion.

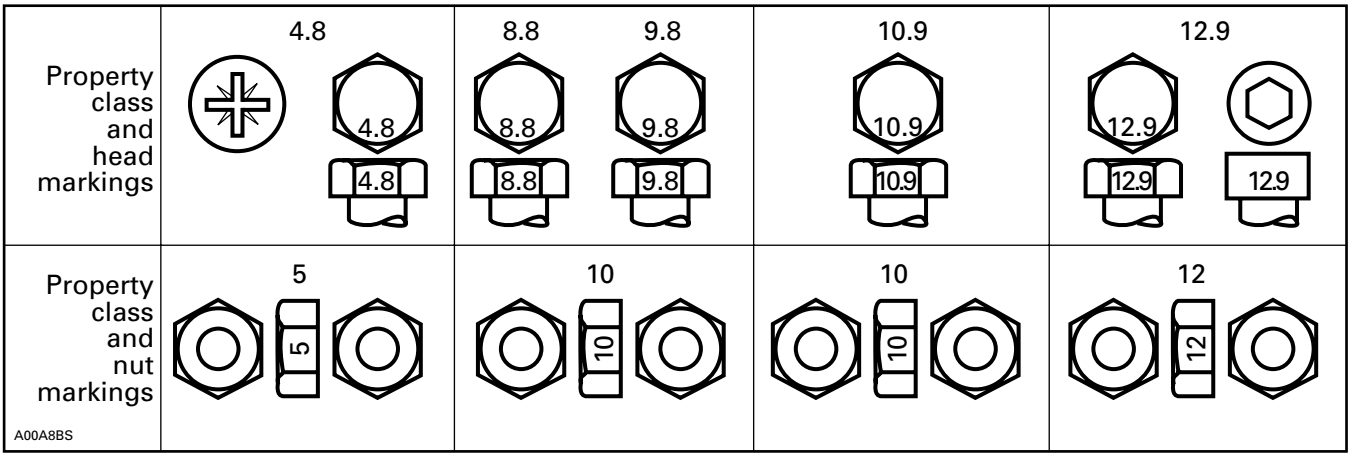
⚠ WARNING

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.

In order to avoid a poor assembling, tighten screws, bolts or nuts in accordance with the following procedure:

– Manually screw all screws, bolts and/or nuts.
– Apply the half of the recommended torque value.

CAUTION: Be sure to use proper tightening torque for the proper strength grade.



FASTENER SIZE	FASTENER GRADE/TORQUE			
	5.8 Grade	**8.8** Grade	**10.9** Grade	**12.9** Grade
M4	1.5 — 2 N•m (13 — 18 lbf•**in**)	2.5 — 3 N•m (22 — 27 lbf•**in**)	3.5 — 4 N•m (31 — 35 lbf•**in**)	4 — 5 N•m (35 — 44 lbf•**in**)
M5	3 — 3.5 N•m (27 — 31 lbf•**in**)	4.5 — 5.5 N•m (40 — 47 lbf•**in**)	7 — 8.5 N•m (62 — 75 lbf•**in**)	8 — 10 N•m (71 — 89 lbf•**in**)
M6	6.5 — 8.5 N•m (58 — 75 lbf•**in**)	8 — 12 N•m (71 — 106 lbf•**in**)	10.5 — 15 N•m (93 — 133 lbf•**in**)	16 N•m (142 lbf•**in**)
M8	15 N•m (11 lbf•ft)	24.5 N•m (18 lbf•ft)	31.5 N•m (23 lbf•ft)	40 N•m (30 lbf•ft)
M10	29 N•m (21 lbf•ft)	48 N•m (35 lbf•ft)	61 N•m (45 lbf•ft)	72.5 N•m (53 lbf•ft)
M12	52 N•m (38 lbf•ft)	85 N•m (63 lbf•ft)	105 N•m (77 lbf•ft)	127.5 N•m (94 lbf•ft)
M14	85 N•m (63 lbf•ft)	135 N•m (100 lbf•ft)	170 N•m (125 lbf•ft)	200 N•m (148 lbf•ft)

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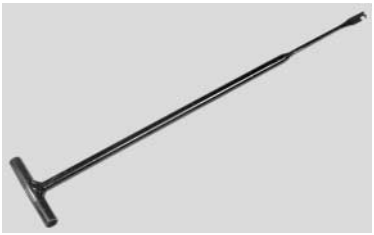
SERVICE TOOLS

This is a list of tools to properly service Ski-Doo snowmobiles. The list includes both the mandatory tools and the recommended tools. If you need to replace or add your tool inventory these items can be ordered through the regular parts channel.

Following mention points out new tool and product: **N–>**

ENGINE — MANDATORY TOOLS

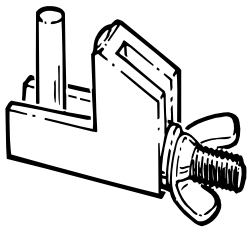
Exhaust spring installer/remover
(P/N 529 035 401)



APPLICATION
All models.

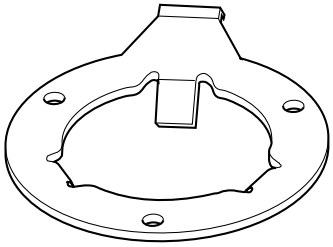
NOTE: This tool replaces exhaust spring installer/remover (P/N 529 035 400).

Hose pincher (2)
(P/N 295 000 076)



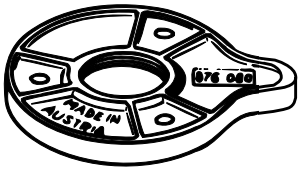
APPLICATION
All vehicles.

Holder wrench
(P/N 420 876 357)



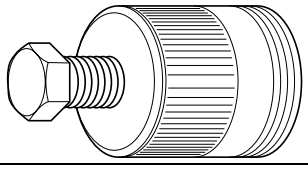
APPLICATION
All axial fan cooled engines.

Magneto puller ring
(P/N 420 876 080)



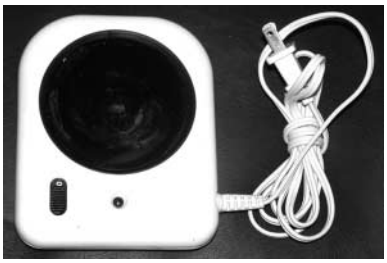
APPLICATION
All axial fan cooled engines.

Magneto puller
(P/N 529 035 547)



APPLICATION
All engines.

N–> Bearing heater
(P/N 529 035 969)



APPLICATION
All models.

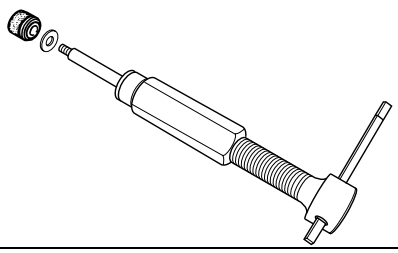
N–> Temperature indicator
(P/N 529 035 970)

APPLICATION
All models.

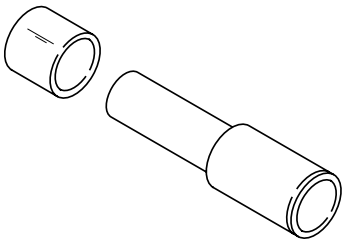
Fuel and oil system leak tester kit
(P/N 529 033 100)

APPLICATION
All models.

1) Piston pin puller
(P/N 529 035 503)



2) Sleeve kit 18 mm
(P/N 529 035 541)
3) Sleeve kit 20 mm
(P/N 529 035 542)



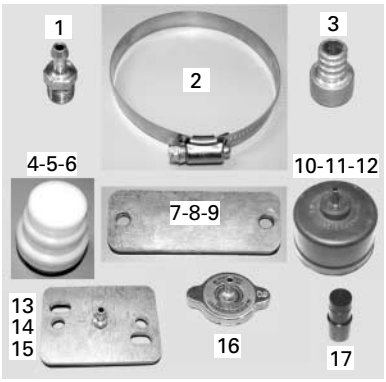
NOTE: 18 mm sleeve kit contains 1 shouldered sleeve and 3 sleeves. 20 mm sleeve kit contains 1 shouldered sleeve and 2 sleeves.

APPLICATION

1) All engines.
2) 277 and 443 engines.
3) 552, 593, 693 and 793 engines.

Engine leak tester kit
(P/N 861 749 100)

NOTE: Should be used with hand pump (P/N 529 021 800).



1) Fitting
(P/N 408 201 100) (2)
2) Clamp
(P/N 408 803 500)
3) Adapter
(P/N 517 234 900) (2)
4) Intake plug
(P/N 529 011 000) (2)
5) Intake plug
(P/N 529 030 500)
6) Intake plug
(P/N 529 035 963) (2)
7) RAVE plate
(P/N 529 011 200) (2)
8) RAVE plate
(P/N 529 035 971) (2)
9) RAVE plate
(P/N 529 035 972) (2)
10) Manifold plug
57 mm (2-1/4 in)
(P/N 529 021 100)
11) Manifold plug
63 mm (2-1/2 in)
(P/N 529 035 961)
12) Manifold plug
70 mm (2-3/4 in)
(P/N 529 021 200)
13) Exhaust plate
(P/N 529 021 300) (2)
14) Exhaust plate
(P/N 529 024 600) (2)
15) Exhaust plate
(P/N 529 035 962) (2)
16) Radiator cap
(P/N 529 021 400)
17) Resonator plug
(P/N 529 035 973) (2)

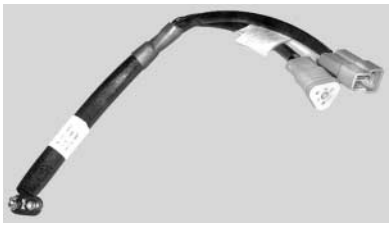
APPLICATION
All engines.

NOTE: To prevent leak in manifold plug, use Loctite Black MAX (P/N 413 408 300).

Piston circlip installer 20 mm
(P/N 529 035 686)

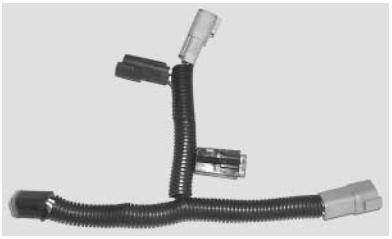
APPLICATION
Engines with tab type circlip.

9-volt adaptor
(P/N 529 035 675)



APPLICATION
All models equipped with a DESS.

Supply harness
(P/N 529 035 869)



APPLICATION
All DESS equipped models.

VCK
(Vehicle Communication Kit)
(P/N 529 035 981)

APPLICATION
All models equipped with a DESS.

DESS KEY for B.U.D.S.
(P/N 529 035 896)

APPLICATION
All models equipped with a DESS.

Engine removal hook
(P/N 529 035 829)

APPLICATION
REV series.

Lifting ring (2)
(P/N 529 035 830)

APPLICATION
Liquid cooled engines except 4-TEC.

ENGINE — RECOMMENDED TOOLS

The following tools are highly recommended to optimize your basic tool kit and reduce repair time.

N–> Support plate
(P/N 529 035 976)

APPLICATION
552 engine type.

N–> Crankshaft distance gauge

a. (P/N 529 035 965)
b. (P/N 529 035 966)
c. (P/N 529 035 967)
d. (P/N 529 035 968)

APPLICATION
a. 552 engine type.
b. 493 and 593 engine type.
c. 593 HO, 593 SDI, 693 and 793.
d. 793 HO and 793 HO SDI.

Hand pump
(P/N 529 021 800)

APPLICATION
All models.

N–> Leak down tester
(P/N 529 035 661)

APPLICATION
1004 and 1503 engines.

Crankshaft locking tool
(P/N 529 035 900)

APPLICATION
1004 engines.

N–> Crankshaft locking tool
(P/N 529 035 821)

APPLICATION
1503 engines.

N–> Engine support bearing installer
(P/N 529 035 952)

APPLICATION
1503 engines.

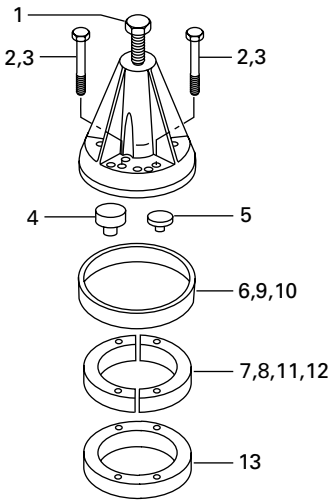
N–> Engine support bearing support
(P/N 529 035 953)

APPLICATION
1503 engines.

N–> 4-Tooth socket
(P/N 529 035 960)

APPLICATION
1503 engines.

Crankshaft bearing puller
(P/N 420 877 635)



1) Screw M16 x 1.5 x 150 (P/N 420 940 755)
2) Screw M8 x 40 (4) (P/N 420 840 681)
3) Screw M8 x 70 (4) (P/N 420 841 201)
4) Crankshaft protector PTO (P/N 420 876 552)
5) Crankshaft protector MAG (P/N 420 876 557)
6) Puller ring (P/N 420 977 490) (use with half rings (P/N 420 977 475) or (P/N 420 276 025))
7) Half ring (2) (P/N 420 977 475) (for 72 mm O.D. bearings)
8) Half ring (2) (P/N 420 276 025) (for 62 mm O.D. bearings)
9) Puller ring (P/N 420 977 480)
10) Puller ring (P/N 420 977 494) (for hal rings (P/N 420 977 479))
11) Half ring (2) (P/N 420 977 479) (for 80 mm O.D. bearings)
12) Half ring (2) (P/N 420 876 330) (for 52 mm O.D. bearings)
13) Distance ring (P/N 529 035 964) (for MAG side bearing)

APPLICATION
All engines.

N–> Torque flange remover
(P/N 529 035 958)

APPLICATION
1503 engines.

Piston circlip installer
(P/N 529 035 765)

APPLICATION
1004 and 1503 engines.

Piston circlip installer

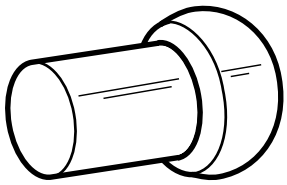
a. 18 mm (P/N 529 035 561)
b. 20 mm (P/N 529 035 562)

APPLICATION

a. All engines except 593, 693 and 793.
b. 2001 and older 593 and 693 engines.

Piston pin/connecting rod bearing centering tool
(P/N 529 009 100)

NOTE: New diameter is 9.65 mm (.380 in).



APPLICATION
All engines except cageless engines.

Pusher (55/59 mm)
(P/N 529 035 913)

APPLICATION
1004 engines.

Pusher (38/42 mm)
(P/N 529 035 914)

APPLICATION
1004 engines.

Support sleeve
(P/N 529 035 944)

APPLICATION
1004 engines.

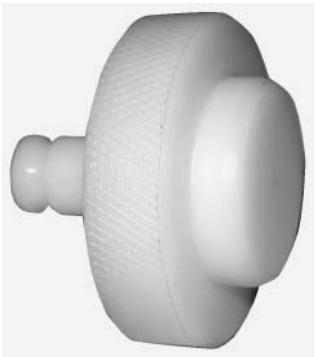
N–> Water pump ceramic seal installer
(P/N 529 035 766)

APPLICATION
1004 engines.

N–> Water pump oil seal installer
(P/N 529 035 757)

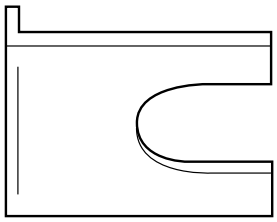
APPLICATION
1004 engines.

PTO cover oil seal installer
(P/N 529 035 910)



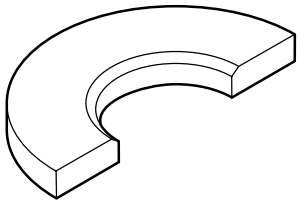
APPLICATION
1004 engines.

Crankshaft feeler gauge
(P/N 420 876 620)



APPLICATION
377 and 443 engines.

Crankshaft distance gauge
(5.7 mm)
(P/N 420 876 822)



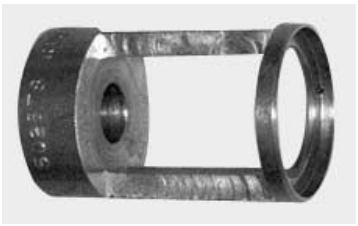
APPLICATION
377 and 443 engines.

N–> Camshaft locking tool
(P/N 529 035 839)

APPLICATION
1004 and 1503 engines.

Valve spring compressor cup
a) (P/N 529 035 764)

N–> b) (P/N 529 035 725)



APPLICATION
a. 1004 engines.
b. 1503 engines.

Ring compressor
Not sold by BOMBARDIER.

Snap-On RC980

APPLICATION
1004 and 1503 engines.

Special pliers for valve stem seal removal
Not sold by BOMBARDIER.

Snap-On YA 8230

APPLICATION
1004 and 1503 engines.

Valve stem seal installer
(P/N 529 035 687)

APPLICATION
1004 and 1503 engines.

Oil VAC
(P/N 529 035 880)

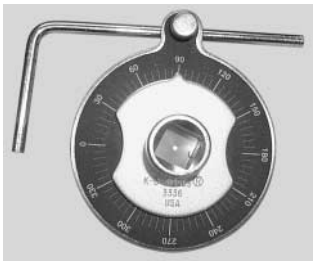
APPLICATION
All liquid cooled models.

Spring compressor clamp
(P/N 529 035 724)

APPLICATION
1004 and 1503 engines.

Torque angle gauge
Not sold by BOMBARDIER.

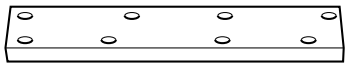
Snap-On TA362



APPLICATION
1004 and 1503 engines.

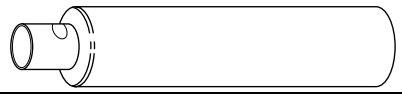
Cylinder aligning tool

a. (P/N 420 876 904) (on exhaust side)
b. (P/N 420 876 171) (on intake side)



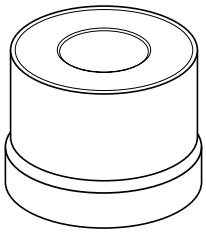
APPLICATION
a. 2-cylinder liquid cooled engines.
b. 2-cylinder fan cooled engines.

Driver tool
(P/N 529 035 521)



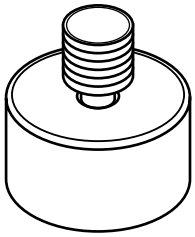
APPLICATION
Mini Z.

Attachment
(P/N 529 035 522)



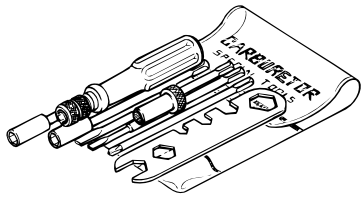
APPLICATION
Mini Z.

Pilot 22 mm
(P/N 529 035 523)



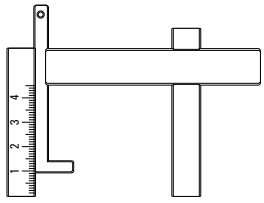
APPLICATION
Mini Z.

Carburetor tool kit
(P/N 404 112 000)



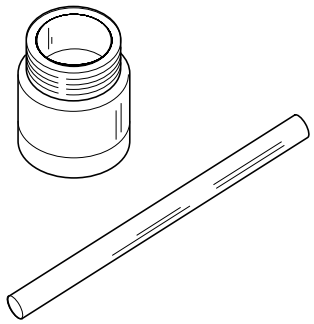
APPLICATION
All models with carburetor(s).

Float level gauge
(P/N 529 035 520)



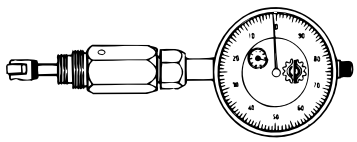
APPLICATION
All models with carburetor(s).

RAVE movement indicator
(P/N 861 725 800)



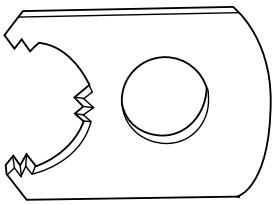
APPLICATION
All RAVE equipped engines.

Dial indicator (TDC gauge)
(P/N 414 104 700)



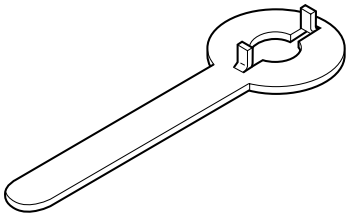
APPLICATION
All engines.

Injection pump gear holder
(P/N 420 876 695)



APPLICATION
377 engines.

Injection pump gear holder
(P/N 420 277 905)

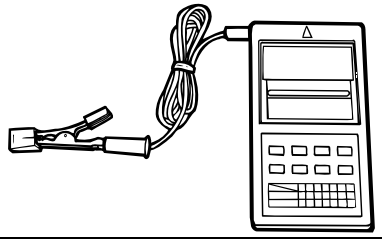


APPLICATION
All liquid cooled engines except 1004 and 1503.

Multimeter
(P/N 529 035 868)

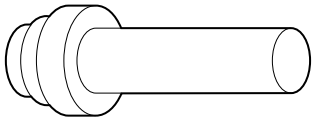
APPLICATION
All models.

Digital/induction type tachometer
(P/N 529 014 500)



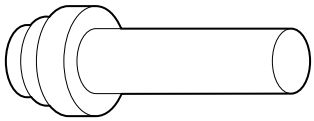
APPLICATION
All engines.

MAG seal pusher
(P/N 420 277 875)



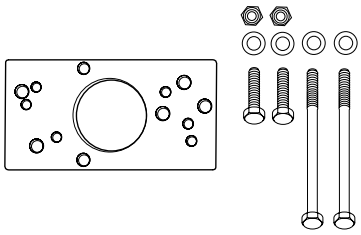
APPLICATION
277 engines.

PTO seal pusher
(P/N 420 876 660)



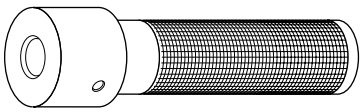
APPLICATION
277 engines.

Base puller plate kit
(P/N 529 024 900)



APPLICATION
277 engines.

Insertion jig handle
(P/N 420 877 650)

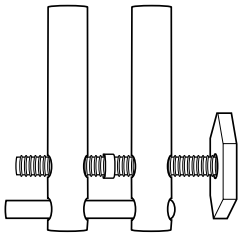


APPLICATION
1004 engines.

Oil pump seal installer
(P/N 529 035 911)

APPLICATION
1004 engines.

Large hose pincher
(P/N 529 032 500)

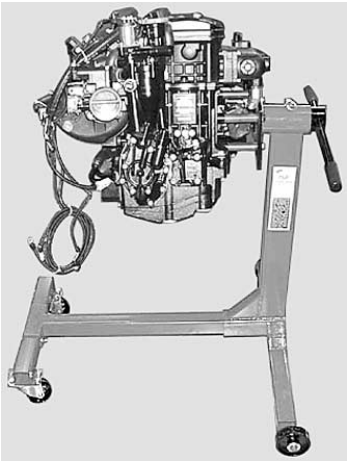


APPLICATION
All vehicles.

N–> 2-stroke engine lifting tool
(P/N 529 035 940)

APPLICATION
2-stroke engines.

Engine stand
Not sold by BOMBARDIER.



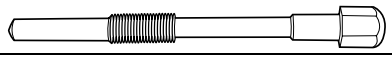
APPLICATION
1503 engines.

TRANSMISSION — MANDATORY TOOLS

Drive pulley retainer
(P/N 529 035 674)

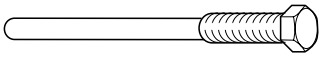
APPLICATION
All TRA, TRA III, TRA IV and TRA IV HD drive pulleys.

Drive pulley puller
(P/N 529 022 400)



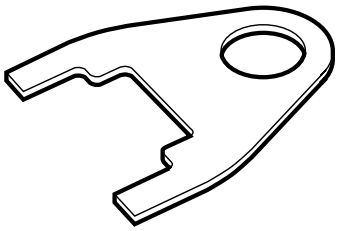
APPLICATION
2003 and up BOMBARDIER Lite drive pulley.
Most TRA, TRA III and TRA IV drive pulleys.

TRA drive pulley puller (25 mm)
(P/N 529 007 900)



APPLICATION
TRA drive pulley for 443 engines.

Forks (3)
(P/N 529 005 500)



APPLICATION
All vehicles equipped with a TRA drive pulley.

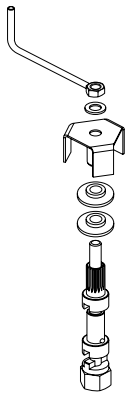
Specific alignment bar
(P/N 529 035 530)

APPLICATION
ZX series with TRA and RER.

Universal alignment bar
(P/N 529 035 831)

APPLICATION
All models except Elite.

Pulley spring compressor
(P/N 529 035 524)

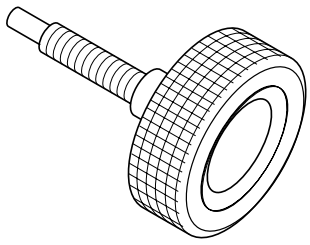


APPLICATION
All models.

Tension tester
(P/N 414 348 200)

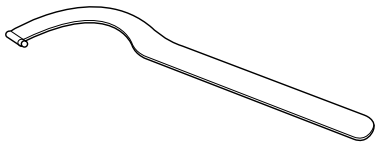
APPLICATION
All models.

Driven pulley opening tool
(P/N 529 017 200)



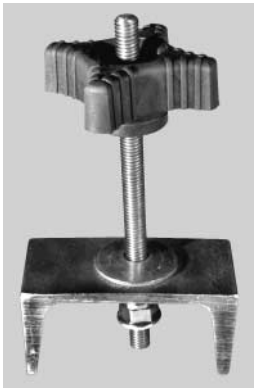
APPLICATION
Most models.

Clutch holder
(P/N 529 027 600)



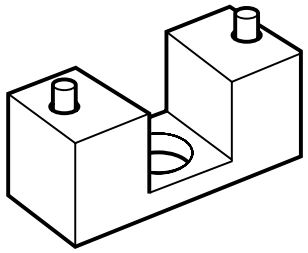
APPLICATION
BOMBARDIER Lite drive pulley.

Driven pulley spring compressor
(P/N 529 035 300)



APPLICATION
Tundra.

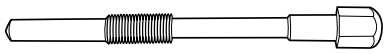
Spring cover tool
(P/N 529 027 300)



APPLICATION
BOMBARDIER Lite drive pulley.

TRANSMISSION — RECOMMENDED TOOLS

N–> Drive pulley puller
(P/N 529 035 959)



APPLICATION
Elite.

Tapered tool
(P/N 529 035 826)

APPLICATION
Skandic LT.

Spider tool
(P/N 529 025 200)

APPLICATION
Skandic LT.

Drive pulley puller
(P/N 529 025 000)

APPLICATION
Skandic LT.

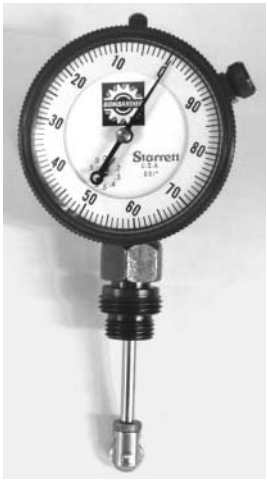
Governor cup
(P/N 529 035 894)

APPLICATION
TRA IV.

N–> TRA IV dial indicator kit
(P/N 529 035 939)

APPLICATION
TRA IV and TRA IV HD.

N–> Short dial indicator
(P/N 295 000 143)



APPLICATION
TRA IV and TRA IV HD.

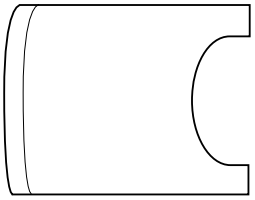
TRA IV drive pulley support
(P/N 529 035 942)

APPLICATION
TRA IV and TRA IV HD.

Driven pulley opening tool
(P/N 529 034 200)

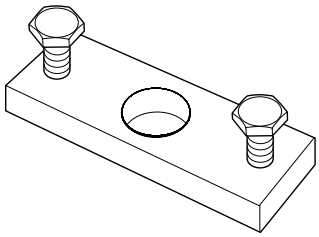
APPLICATION
Tundra.

Alignment tool
(P/N 420 476 010)



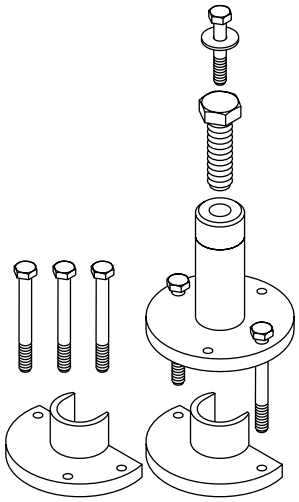
APPLICATION
Skandic WT.

Cam pusher
(P/N 529 012 900)



APPLICATION
Tundra.

Countershaft bearing remover/ installer
(P/N 529 035 699)

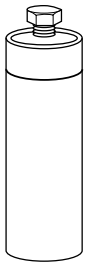


APPLICATION
ZX series.

Countershaft bearing remover
(P/N 529 035 812)

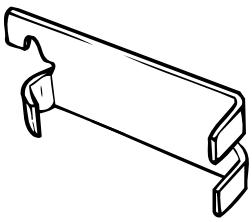
APPLICATION
Skandic LT.

Countershaft bearing installer
(P/N 529 035 815)



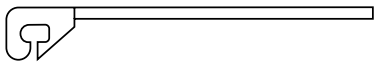
APPLICATION
Skandic LT.

Spring scale hook (long)
(P/N 529 006 500)



APPLICATION
Tundra.

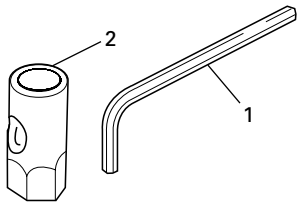
Transmission adjuster
(P/N 529 030 300)



APPLICATION
Vehicles equipped with "push-pull shifter" reverse transmission.

Drive belt tension adjuster tool
(P/N 529 008 700)
Parts included:

1) Hexagonal wrench (P/N 420 876 730)
2) Socket wrench (P/N 529 015 000)



APPLICATION
All vehicles except Tundra and Skandic WT.

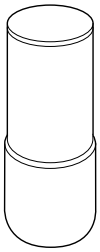
Alignment bar
a. (P/N 529 035 808)
b. (P/N 529 035 586)
c. (P/N 529 035 594)
d. (P/N 529 026 900)
e. (P/N 529 026 700)
N–>f. (P/N 529 035 974)

APPLICATION
a. Skandic LT.
b. ZX series with BOMBARDIER Lite and RER.
c. Elite model.

NOTE: The alignment bar (P/N 529 035 594) must be modified to fit on Elite. Refer to PULLEY DISTANCE AND ALIGNMENT.

d. Tundra
e. ZX series with TRA.
f. 2004 Skandic WT/SWT/SUV 550.

Burnishing bar
(P/N 529 026 402)

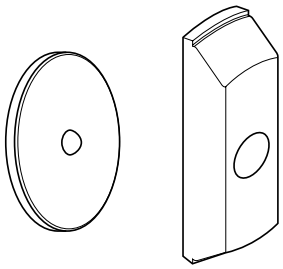


APPLICATION
Tundra and Skandic.

Bushing extractor/installer
(P/N 529 031 300)

APPLICATION
TRA drive pulley spring cover with replaceable bushing.

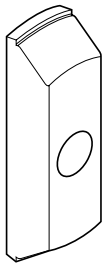
Large bushing extractor
(P/N 529 031 100)



APPLICATION
Formula type driven pulley.

NOTE: Use this tool only with former puller (P/N 529 018 600) that has regular threads.

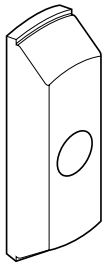
Large bushing extractor
(P/N 529 035 576)



APPLICATION
Formula type driven pulley.

NOTE: Use this tool only with new puller (P/N 529 035 524) that has Acme threads and support plate included with extractor (P/N 529 031 100).

Large bushing extractor
(P/N 529 035 575)



APPLICATION
LPV 27 driven pulley.

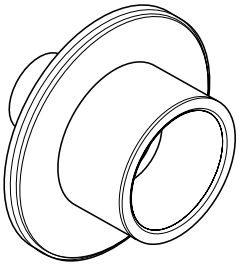
NOTE: Use this tool only with new puller (P/N 529 035 524) that has Acme threads and support plate included with extractor (P/N 529 031 100).

N–> Sliding half bushing remover/installer
(P/N 529 035 931)

APPLICATION
TRA III and TRA IV.

Large bushing installer and small bushing extractor

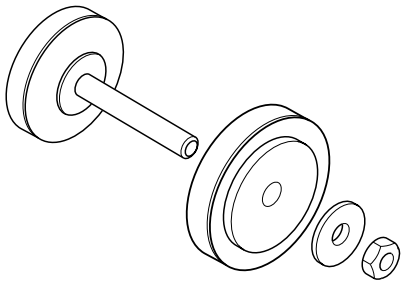
a. (P/N 529 031 200)
b. (P/N 529 035 931)



APPLICATION

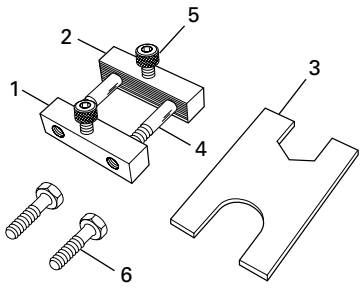
a. All models except Tundra, Skandic WT/SWT.
b. TRA III drive pulley spring cover.

Chaincase seal pusher
(P/N 529 035 584)



APPLICATION
ZX series.

Drive axle sprocket adjuster
(P/N 861 725 700)



Parts included in the kit:

1) Block with threads (P/N 529 010 700)
2) Block without threads (P/N 529 010 800)
3) Plate (P/N 529 010 600)
4) Bolt M10 (2) (P/N 222 007 565)
5) Allen screw M8 (2) (P/N 222 983 065)
6) Screw M8 (2) (P/N 222 082 565)

NOTE: When the tool is to be used between tunnel and sprocket use screw M8.

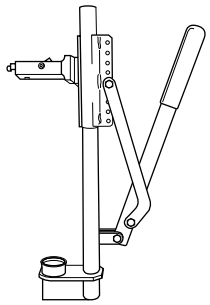
APPLICATION
All vehicles.

Belt tension tool
(P/N 529 035 957)

APPLICATION
Elite.

SUSPENSION — MANDATORY TOOLS

Shock spring removal kit
(P/N 529 035 504)
Replacement clevis pin
(P/N 414 528 400)

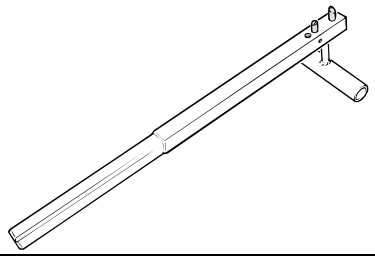


APPLICATION
All suspension with coil spring.

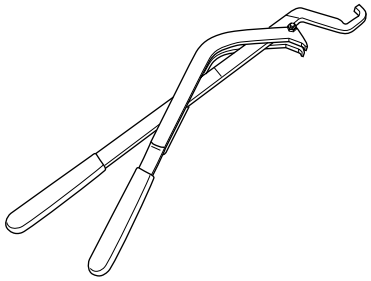
SUSPENSION — RECOMMENDED TOOLS

a) Track cleat remover
(P/N 529 008 200)
Pins
(P/N 529 008 204)

NOTE: Pins can be rotated 180° depending on wheter the tool is used by a left-hander or righ-hander.



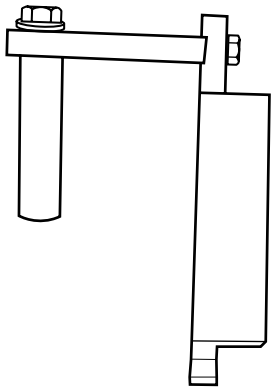
b) Track cleat remover
(P/N 529 028 700)



APPLICATION
a. 1993 and older.
b. All models except Tundra.

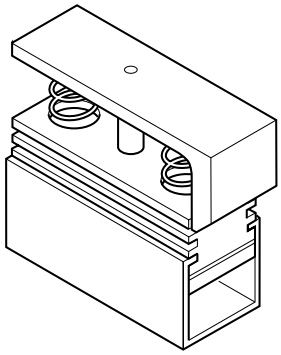
Camber angle tool
(P/N 529 021 600)

NOTE: Angle finder with a magnetic base must be used.
Suggestion: K-D tool no. 2968



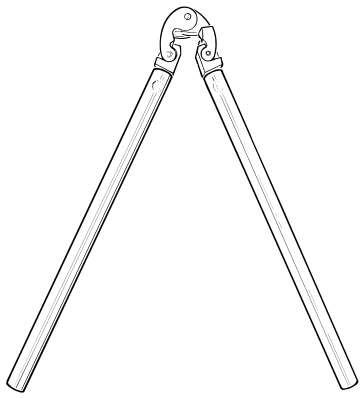
APPLICATION
All DSA front suspensions.

Track tension gauge
(P/N 529 021 500)



APPLICATION
All models.

Track cleat installer
(P/N 529 028 800) narrow



APPLICATION
1994 and newer.

Dome guide

a. (P/N 529 026 500)
b. (P/N 529 035 728)

APPLICATION
a. C-36 T/A shocks.
b. C-46 T/A shocks.

N–> Floating piston puller
(P/N 529 035 901)

APPLICATION
T/A shock with external gas reservoir.

Shock wrench
(P/N 529 035 727)

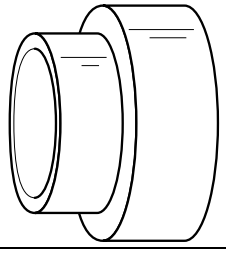
APPLICATION
All T/A shocks.

HPG shock holding tool
(P/N 529 035 769)

APPLICATION
All HPG shocks.

Piston guide

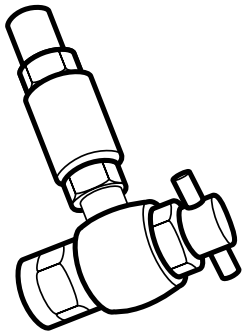
a. (P/N 529 026 600)
b. (P/N 529 035 608)



APPLICATION

a. C-36 T/A shocks.
b. C-46 T/A shocks.

Gas shock valve tool (tire valve type)
(P/N 529 035 570)

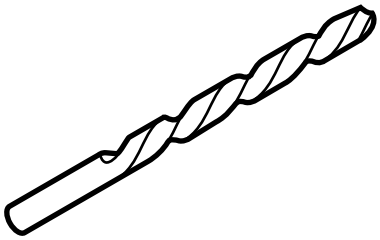


APPLICATION
Some 2000 and up T/A shocks.

Gas fill tool kit (needle type)
(P/N 503 190 102)

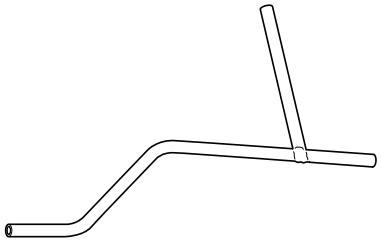
APPLICATION
2003 and up T/A shocks.

Drill bit
(P/N 529 031 800)



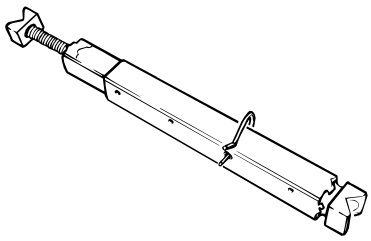
APPLICATION
All 3/16 inch rivets.

Spring installer (bar)
(P/N 529 005 000)



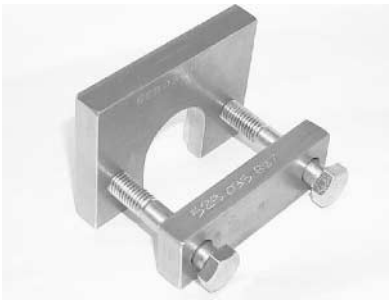
APPLICATION
Tundra and all SC-10 suspensions.

Drive axle holder
(P/N 529 007 200)



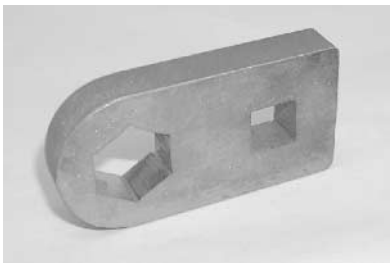
APPLICATION
All models.

Ball joint extractor
(P/N 529 035 827)



APPLICATION
REV series.

N–> Extension to torque ball joint nut
(P/N 529 035 876)



APPLICATION
REV series.

N–> REV ball joint lock
(P/N 529 035 945)

APPLICATION
REV series.

Ball joint remover support
(P/N 529 035 873)

APPLICATION
REV series.

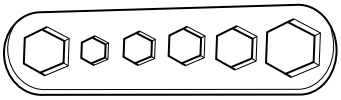
N–> Ball joint installer
(P/N 529 035 975)

APPLICATION
2004 REV series.

Ball joint installer support
(P/N 529 035 875)

APPLICATION
REV series.

Hexagonal wrench
(P/N 529 014 700)



APPLICATION
All SC-10 suspensions.

Suspension adjustment wrench
(P/N 529 032 900)

APPLICATION
SC-10 suspensions.

Adjustment wrench
(P/N 520 000 126)

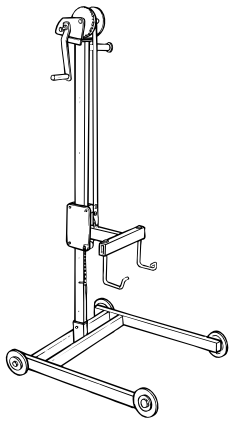
APPLICATION
SC-10 II and III (coupling blocks).

VEHICLE — RECOMMENDED TOOLS

Protective mat
(P/N 529 030 600)

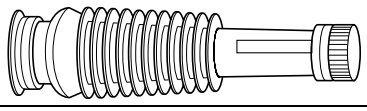
APPLICATION
All vehicle.

Snowmobile jack
(P/N 529 020 000)



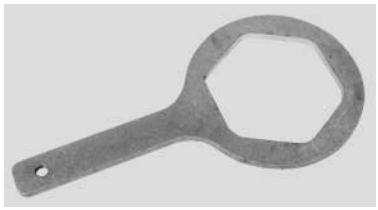
APPLICATION
All models.

Flexible spout for oil container
(P/N 414 837 300)



APPLICATION
All models.

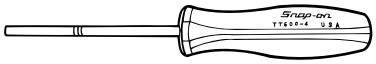
Adjustment wrench
(P/N 529 035 603)



APPLICATION
To remove and install fuel tank nut on ZX series.

Terminal (Packard) remover
Not sold by BOMBARDIER.

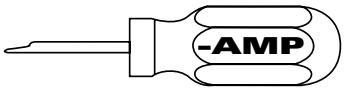
Snap-On TT 600–4



APPLICATION
Models with Packard connectors.

Multilock-terminal housing connector extractor tool
Not sold by BOMBARDIER.

AMP 755430–2

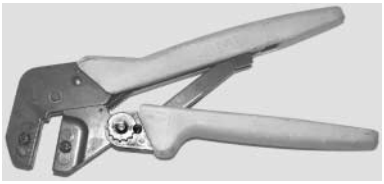


APPLICATION
For AMP multilock-terminals.

N–> DESS socket
(P/N 529 035 943)

APPLICATION
All DESS equipped models.

N–> Crimping tool
(dies sold separately)
(P/N 529 035 909)



APPLICATION
To crimp specific terminals.

Crimper die

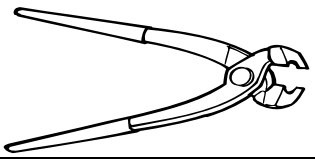
a. (P/N 529 035 828)
b. (P/N 529 035 906)
N–> c. (P/N 529 035 908)

APPLICATION

a. AMP multilock connectors.
b. ECM connectors A and B.
c. Some Deutsch connectors.

NOTE: These dies fit on crimping tool (P/N 529 035 909).

Hose clamp pliers
(P/N 295 000 070)



APPLICATION
Some models.

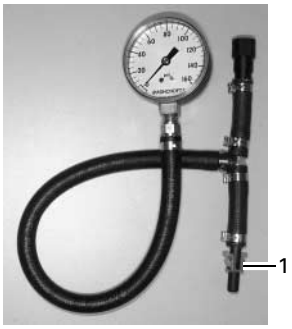
Adjustment wrench
(P/N 529 035 891)

APPLICATION
REV series.

Fuel pump nut wrench
(P/N 529 035 899)

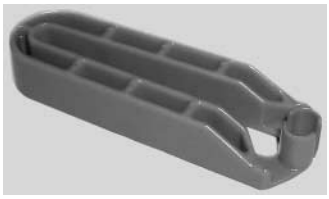
APPLICATION
2-TEC and 1004 engine equipped models.

Pressure gauge
(P/N 529 035 591)
1) Clip
(P/N 275 500 429)



APPLICATION
2-TEC, 1004 and 1503 engine equipped models.

Fuel line remover
(P/N 529 035 714)



APPLICATION
2-TEC, 1004 and 1503 engine equipped models.

Oil pressure gauge
(P/N 529 035 709)

APPLICATION
1004 and 1503 engine equipped models.

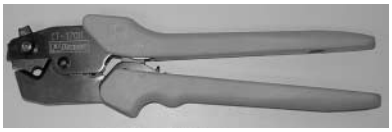
Oil pressure adaptor
(P/N 529 035 652)

APPLICATION
1004 and 1503 engine equipped models.

Heated grips insertion tool
a. (P/N 529 035 897)
b. (P/N 529 035 936)

APPLICATION
a. ZX liquid cooled models with straight grips.
b. Models with j-hook type grips.

Crimp pliers
(P/N 529 035 730)



APPLICATION
All models with a battery.

N–> Insert pliers
(P/N 295 000 162)

APPLICATION
6 mm insert equipped models.

SERVICE PRODUCTS

Retaining compound
(P/N 413 703 100)
Loctite® RC/609:
Retaining compound
(10 mL) (green)

APPLICATION
Used for retaining bushings, bearings in slightly worn housing or on shaft.

Medium-strength threadlocker
(P/N 293 800 060)
Loctite® 243: Threadlocker
(10 mL) (blue, medium strength)

APPLICATION
Flywheel nut, crankcase studs, etc.

NOTE: This product replaces Loctite 242 (P/N 293 800 015).

High strength threadlocker
(P/N 293 800 005)
Loctite® 271:
Threadlocker (10 mL) (red, high strength)

APPLICATION
Fasteners and studs up to 25 mm (1 in) diameter.

Sealing compound
(P/N 420 297 906)
(30 mL)

APPLICATION
To seal crankcase on all ZX series engines.

NOTE: This product replaces the larger tube (P/N 420 297 905).

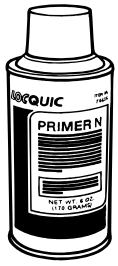
Paste gasket
(P/N 413 702 700)
Loctite® 515:
Gasket eliminator (50 mL)

APPLICATION
Crankcase halves and gearbox mating surfaces.

Paste gasket
(P/N 293 800 038)
Loctite® 518:
Gasket eliminator (50 mL)

APPLICATION
Crankcase halves and gearbox mating surfaces.

Loctite® primer
(P/N 293 800 041)
Primer N 128 g (5 oz)



APPLICATION
To prepare mating surfaces before applying paste gasket, retaining compound or threadlockers.

NOTE: Only the P/N has been changed. This product is identical to the P/N 413 708 100.

Gasket/paint remover
(P/N 413 708 500)
Loctite® Chisel 510 g (18 oz)

APPLICATION
Clean mating surfaces of cylinders and crankcase. Remove carbon in combustion chambers.

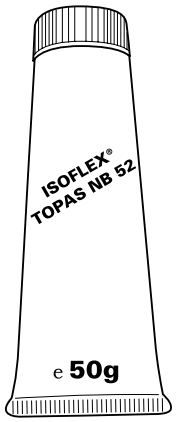
Molykote PG 54
(P/N 420 899 763)
(10 g)

APPLICATION
To lubricate pawl and pawl lock of rewind starter.

Molykote G-n paste
(P/N 711 297 433)
(50 g)

APPLICATION
To lubricate RAVE valve stem on engine with oil seal in RAVE housing.

Isoflex grease
(P/N 293 550 021)
(50 g)



APPLICATION
To lubricate some crankshaft bearings on some engines.

Petamo grease
(P/N 420 899 271)

APPLICATION
To lubricate lip of all ZX series engine crankshaft seals and plain bearings on 4-TEC.

SYNTHETIC BOMBARDIER
4-STROKE engine oil
0W-40
(P/N 293 600 054)
(12 x 1 L)

APPLICATION
4-TEC.

Pre-mix oil
(P/N 413 803 100)
(12 x 500 mL)

APPLICATION
All pre-mix models.

BOMBARDIER FORMULA XP-S II synthetic injection oil
(P/N 293 600 045)
(12 x 1 liter)

(P/N 293 600 046)
(3 x 4 liter)

(P/N 293 600 047)
(205 liter)

APPLICATION
All engines.

NOTE: This synthetic injection oil replaces XP-S and XP-S DI injection oils.

BOMBARDIER injection oil
(P/N 413 802 900)
(12 x 1 liter)

(P/N 413 803 000)
(3 x 4 liters)

(P/N 413 803 200)
(205 liters)

APPLICATION
All engines.

Premixed coolant 50/50
- 37°C (- 35°F)
(P/N 293 600 038)
(16 x 1 L)

APPLICATION
All liquid cooled models.

NOTE: This product replaces pre-mixed coolant (P/N 413 711 802).

Fuel stabilizer
(P/N 413 408 600)
(12 x 8 oz)

APPLICATION
All models.

Chaincase oil
(P/N 413 801 900)
(16 x 250 mL)

APPLICATION
Chaincase lubricant on all fan-cooled models except Skandic WT series.

Storage oil
CANADA: (P/N 413 711 600)
U.S.A.: (P/N 413 711 900)
(350 g spray can) (12 x 350 g)

APPLICATION
All models.

NOTE: Only the P/N has been changed. This product is identical to the P/N 496 014 100.

Synthetic chaincase oil
(P/N 413 803 300)
(12 x 355 mL)

APPLICATION
Chaincase lubricant on all liquid-cooled models and Skandic WT series.

Grease LMZ no. 1
(P/N 413 707 500)
(400 g)

APPLICATION
Mainly used between regulators or rectifiers and frame to transfer the heat build-up and to assure a good ground.

Synthetic grease
(P/N 413 711 500)
(400 g)

APPLICATION
Drive axle bearing.

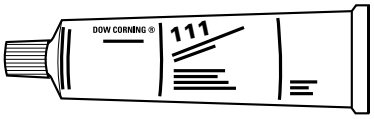
N–> Suspension synthetic grease
(P/N 293 550 033)
(10 tubes of 400 g each)

APPLICATION
For front and rear suspension components and drive axle bearing.

BOMBARDIER LUBE
(P/N 293 600 016)
(12 x 14 oz)

APPLICATION
Steering ball joints on all models.

Molykote 111
(P/N 413 707 000)



APPLICATION
Crankshaft seals on all engines except ZX series ones.

Brake fluid SRF (DOT 4)
(P/N 293 600 063)

APPLICATION
All models with hydraulic brake.

Brake fluid GTLMA (DOT 4)
(P/N 293 600 062)

APPLICATION
All models with hydraulic brake.

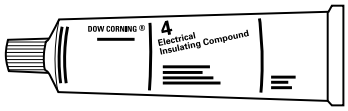
Shock oil
(P/N 293 600 035)
(32 oz)

APPLICATION
T/A shocks.

Anti-seize lubricant
(P/N 293 800 070)
Loctite anti-seize lubricant
236 mL (8 oz)

APPLICATION
Mounting surfaces of driven pulley and brake disc on countershaft.

Silicone dielectric grease
(P/N 293 550 004)
(3 oz)



APPLICATION
On all electric connections. High tension coil and spark plug connections. Connector housings, etc.

NOTE: Only the P/N has been changed. This product is identical to the (P/N 413 701 700).

Pulley flange cleaner
(P/N 413 711 809)
(320 g)

APPLICATION
Engine crankcase joining surfaces, pulleys and any greasy surfaces.

Heavy duty cleaner
(P/N 293 110 001)
(400 g)
(P/N 293 110 002)
(4 L)

APPLICATION
All models.

Plastic & vinyl cleaner
(P/N 413 711 200)
(6 x 1 L)

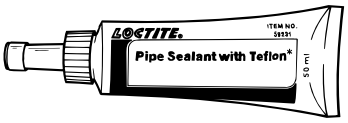
APPLICATION
Hood, bottom pan and seat.

High temperature and strength retaining compound
(P/N 413 711 400)
Loctite 648 (5 mL) (green)

APPLICATION
To fasten oil injection nozzle to crankcase.

NOTE: Only the P/N has been changed. This product is identical to the P/N 420 899 788.

Pipe sealant
(P/N 293 800 018)
Loctite 592 (50 mL)



APPLICATION
Engine plugs and senders.

NOTE: Only the P/N has been changed. This product is identical to the P/N 413 702 300.

Loctite 5150
(P/N 293 800 086)

APPLICATION
All models to seal bottom pan.

Instant gasket
(P/N 293 800 088)
(7 oz)

APPLICATION
All models.

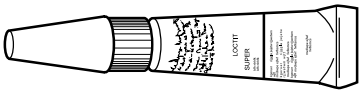
RTV silicone sealant
(P/N 293 800 066)
Loctite 5900 (300 mL)

APPLICATION
Tundra R chaincase cover.

Gel instant adhesive
(P/N 413 708 300)
Loctite 454-40
20 g (.70 oz)

APPLICATION
Isolating foam and rubber strip.

General purpose instant adhesive
(P/N 293 800 021)
Loctite 495 (3 g)



APPLICATION
Rubber to metal bonding and most hard plastic.

NOTE: Only the P/N has been changed. This product is identical to the P/N 413 703 200.

Tough adhesive
(P/N 413 408 300)
Loctite Black Max 3 mL (.10 oz)

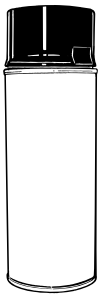
APPLICATION
Shifter boot or grip.

High temperature RTV sealant
(P/N 293 800 090)
Ultra Copper (80 mL)

APPLICATION
All models.

NOTE: Only the P/N has been changed. This product is identical to the P/N 413 710 300.

Paint for frame touch-up
(P/N 413 401 000)
Black semi-gloss (spray can)



APPLICATION
All models with a black frame.

N–> Scratch remover
(P/N 861 774 800)

APPLICATION
All models.

MAINTENANCE CHART

I: Inspect, verify, clean, adjust, lubricate or replace if necessary C: Clean L: Lubricate R: Replace A: Adjust	**10 h or 500 km (300 m.) (1)**	**Weekly or every 240 km (150 m.)**	**Monthly or every 800 km (500 m.)**	**Once a year or every 5000 km (3100 m.)**	**Every 10000 km (6200 m.)**	**Storage (1)**	**Preseason preparation (1)**	**Refer to the following**
ENGINE								
Engine Nuts and Screws	I			I		I		Section 04
Exhaust System	I		I			I		Subsection 04-05
Engine Lubrication						L		Subsection 02-03
Cooling System	I			I			I	Subsection 04-07
Coolant	I					R		Subsections 02-03 and 04-07
Condition of Seals (4)						I	I	Section 04
LUBRICATION								
Engine Oil and Filter Replacement	R			R		R		Subsection 03-08
FUEL								
Fuel Stabilizer						R		Subsection 02-03
Fuel Injection System (Visual Inspection)					I		I	Subsection 05-03
Fuel Lines and Connections	I					I	I	Subsection 05-03
Throttle Cable	I			I		I	I	Subsection 05-03
Air Filter			C				C	Operator's Guide

I: Inspect, verify, clean, adjust, lubricate or replace if necessary C: Clean L: Lubricate R: Replace A: Adjust	**10 h or 500 km (300 m.) (1)**	**Weekly or every 240 km (150 m.)**	**Monthly or every 800 km (500 m.)**	**Once a year or every 5000 km (3100 m.)**	**Every 10000 km (6200 m.)**	**Storage (1)**	**Preseason preparation (1)**	**Refer to the following**
DRIVE								
Drive Belt	I	I					I	Subsection 06-02
Final Drive Belt	I			I	R	I	I	Subsection 06-07
Drive and Driven Pulleys	I		I	C		I	C	Subsections 02-03, 06-03 and 06-04
Tightening Torque of Drive Pulley Screw	I			I			I	Subsection 06-03
Driven Pulley Preload	I			I		I		Subsection 06-04
BRAKE								
Brake Fluid	I	I				R	I	Subsection 06-06
Brake	I	I	A			I, A	I	Subsection 06-06
TRANSMISSION								
Gearbox Oil	R		I			R	I	Subsection 06-07
Drive Axle (2)	L		L			L		Subsection 08-03
STEERING/FRONT SUSPENSION								
Steering and Front Suspension Mechanism (2)	A, I, L		A, I	L		A, I, L		Section 09
Wear and Condition of Skis and Runners	I	I				I		Subsection 09-03
SUSPENSION								
Suspension Adjustments	AS REQUIRED							Operator's Guide
Suspension (2)	I		I, L			I, L		Subsection 08-03
Suspension Stopper Strap				I		I		Subsection 08-02
Tracks	I		I			I		Subsection 08-03
Track Tension and Alignment	A	AS REQUIRED						Subsection 08-04

I: Inspect, verify, clean, adjust, lubricate or replace if necessary C: Clean L: Lubricate R: Replace A: Adjust	**10 h or 500 km (300 m.) (1)**	**Weekly or every 240 km (150 m.)**	**Monthly or every 800 km (500 m.)**	**Once a year or every 5000 km (3100 m.)**	**Every 10000 km (6200 m.)**	**Storage (1)**	**Preseason preparation (1)**	**Refer to the following**
ELECTRICAL								
EMS Fault Codes (4)	I			I				Subsection 05-04
ECU Connectors				I				Subsection 05-03
Spark Plugs (3) (4)	I						R	Subsection 05-03
Battery	I		I			I	I	Subsection 07-03
Alternator Belt	I			I		I		Subsection 07-02
Headlamp Beam Aiming				A			A	Subsection 10-02
Wiring Harnesses, Cables and Lines (4)	I		I			I		Subsection 10-02
Operation of Lighting System (HI/LO beam, brake light, etc.). Test Operation of Engine Cut-Out Switch and DESS Switch	I	I				I		Operator's Guide
VEHICLE								
Rags in Air Intake and Exhaust System						R	C	Subsections 02-03 and 02-04
Engine Compartment	C		C			C		Subsection 02-03
Vehicle Cleaning and Protection	C		C			C		Subsection 02-03

(1) To be performed by an authorized Ski-Doo dealer.

(2) Lubricate whenever the vehicle is used in wet conditions (wet snow, rain, puddles).

(3) Before installing new spark plugs at preseason preparation, it is suggested to burn excess storage oil by starting the engine with the old spark plugs. Only perform this operation in a well-ventilated area.

(4) Emission-related.

STORAGE

GENERAL

Proper snowmobile storage is a necessity during the summer months or when a vehicle is not being used for more than one month.

Refer to storage column from MAINTENANCE CHART jointly with the present storage procedure in order to cover each and every aspect of the snowmobile storage procedure. Any worn, broken or damaged parts should be replaced.

⚠ WARNING

Unless otherwise specified, engine should be turned off for storage procedure.

FUEL STABILIZER

With the new fuel additives, it is critical to use the fuel stabilizer (P/N 413 408 600) (250 mL) to prevent fuel deterioration, gum formation and fuel system components corrosion. Follow manufacturer's instructions for proper use.

Pour fuel stabilizer in fuel tank.

Fill up fuel tank completely. Ensure there is no water inside fuel tank.

CAUTION: Should any water be trapped inside fuel tank, severe internal damage will occur to the fuel injection system.

CAUTION: Fuel stabilizer should be added prior to engine lubrication to ensure fuel system components protection against varnish deposits.

⚠ WARNING

Fuel is inflammable and explosive under certain conditions. Always work in a well ventilated area. Do not smoke or allow open flames or sparks in the vicinity. Fuel tank may be pressurized, slowly turn cap when opening. Never use an open flame to check fuel level. When fueling, keep vehicle level. Do not overfill or top off the fuel tank and leave vehicle in the sun. As temperature increases, fuel expands and might overflow. Always wipe off any fuel spillage from the vehicle. Periodically inspect fuel system.

COOLING SYSTEM

Antifreeze should be replaced for the storage period to prevent antifreeze deterioration.

Make sure to perform an antifreeze density test.

CAUTION: Improper antifreeze mixture might allow freezing of the liquid in the cooling system if vehicle is stored in area where freezing point is reached. This would seriously damage the engine. Failure to replace the antifreeze for storage may allow its degradation that could result in poor cooling when engine will be used.

Refer to COOLING SYSTEM section.

ENGINE OIL CHANGE AND FILTER

Change engine oil and filter. Refer to LUBRICATION in ENGINE section.

ENGINE LUBRICATION

Fogging of the engine is recommended at the end of the season and before any extended storage period to provide additional corrosion protection. This will lubricate the engine intake valves, the cylinders and the exhaust valves.

To fog the engine valves, proceed as follows:

- Remove the two bolts that retains the fuel rail.
- Remove the rail along with the three fuel injectors.
- Spray storage oil (P/N 413 711 600) for Canada and (P/N 413 711 900) for USA into the intake ports.
- Crank engine at wide open throttle to put it in the drown engine mode. This will prevent fuel injection and ignition.
- Carefully inspect O-rings condition before reinstalling fuel injectors. Replace O-rings with new ones if damaged. Lubricate O-rings with injection oil prior to installing.
- Reinstall the injectors.
- Apply Loctite 243 and torque the two bolts to 10 N•m (89 lbf•**in**) that hold the fuel rail on.
- Make sure there is no leak at injectors when cranking the engine in the upcoming steps.

⚠ WARNING

If a leak is present, immediately stop the engine. Do not start engine until the leak is repaired.

⚠ WARNING

At preseason preparation, ensure to perform a fuel pressure test and ensure there is no leak. Also run engine and check for leaks. Refer to ENGINE MANAGEMENT section.

– Pull engine cover upward to remove it.
– Disconnect ignition coil connectors.

⚠ WARNING

When disconnecting coil from spark plug, always disconnect coil from main harness first. Never check for engine ignition spark from an open coil and/or spark plug in the engine compartment as spark may cause fuel vapor to ignite.

IMPORTANT: Never cut the locking ties of coil connectors. This would allow mixing the wires between cylinders.

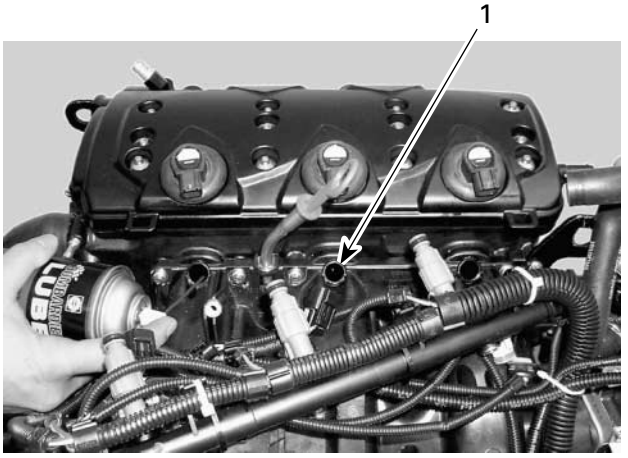
– Remove ignition coils.

CAUTION: Ensure there is no dirt in coil holes prior to removing the spark plugs. Otherwise, dirt would fall into cylinders and will damage the internal components.

– Remove the spark plugs.
– Apply BOMBARDIER LUBE storage oil (P/N 413 711 600) for Canada and (P/N 413 711 900) for USA lubricant into the cylinders.
– Reinstall spark plugs and ignition coils.
– Reconnect ignition coil connectors.

NOTE: Prior to inserting the ignition coil in its location, apply some Molykote 111 grease (P/N 413 707 000) around the seal area that touches the spark plug hole. After installation, ensure the seal seats properly with the engine top surface.

– To reinstall engine cover, push it downward until it snaps.
– Crank engine several times while keeping throttle fully depressed to distribute lubricant on exhaust valves.



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TYPICAL
1. Engine intake ports

ENGINE COMPARTMENT

Keep clean of grass, twigs, cloth, etc. These are combustible under certain conditions.

PULLEY PROTECTION

After inspection and interior cleaning of pulleys, spray BOMBARDIER LUBE (P/N 293 600 016) on sheaves. Do not reinstall drive belt.

BATTERY

Remove battery, clean its tray and its exterior surface. Charge battery as explained in BATTERY section.

VEHICLE CLEANING

To facilitate the inspection and ensure adequate lubrication of components, it is recommended to clean the entire vehicle.

Remove any dirt or rust.

To clean the entire vehicle, use only flannel cloths or equivalent. Use water and mild detergent.

CAUTION: It is necessary to use flannel cloths or equivalent on windshield and hood to avoid damaging further surfaces to clean.

To clean metallic parts use BOMBARDIER Cleaner (P/N 293 110 001 (spray can 400 g) and P/N 293 110 002 (4 L)).

CAUTION: Do not use BOMBARDIER Cleaner on decals or vinyl.

For vinyl and plastic parts, use Vinyl & Plastic Cleaner (P/N 413 711 200 (6 x 1 L)).

To remove scratches on windshield or hood use BOMBARDIER Scratch Remover Kit (P/N 861 774 800).

CAUTION: Never clean plastic parts or hood with strong detergent, degreasing agent, paint thinner, acetone, products containing chlorine, etc.

Inspect the body and repair any damage.

Touch up all metal spots with touch-up paint where paint has been scratched off.

Spray all bare metal parts including shock chromed rods with BOMBARDIER LUBE (P/N 293 600 016).

Wax the body for better protection. Use a non-abrasive wax such as silicon wax.

NOTE: Apply wax on glossy finish only.

RAGS IN AIR INTAKE AND EXHAUST SYSTEM

Block air intake hole and exhaust system hole using clean rags.

VEHICLE PROTECTION

Protect the vehicle with the supplied tarpaulin to prevent dust accumulation during storage.

CAUTION: The snowmobile has to be stored in a cool and dry place and covered with the supplied tarpaulin. This will prevent sun rays and grime from affecting plastic components and vehicle finish. Never store snowmobile in a plastic bag.

Lift rear of vehicle until tracks are clear of the ground. Install on a wide-base snowmobile mechanical stand.

NOTE: Do not release track tension.

PRESEASON PREPARATION

Proper vehicle preparation is necessary after the summer months or when a vehicle has not been used for more than one month.

Refer to preseason preparation column from MAINTENANCE CHART jointly with the present preseason preparation procedure in order to cover each and every aspect of the snowmobile preseason preparation procedure.

Any worn, broken or damaged parts found during the storage procedure should have been replaced. If not, proceed with the replacement.

⚠ WARNING

Unless otherwise specified, engine should be turned off for preparation procedure.

AIR FILTER CLEANING

Clean air filter with compressed air. Check that inside of air silencer is clean and dry then properly reinstall the filter.

CAUTION: These snowmobiles have been calibrated with the filter installed. Operating the snowmobile without it, may cause engine damage.

RAGS IN AIR INTAKE AND EXHAUST SYSTEM

Remove rags that were installed during STORAGE PREPARATION.

CLEANING OF DRIVE AND DRIVEN PULLEYS

Clean drive and driven pulleys sheaves with Pulley Flange Cleaner (P/N 413 711 809).

CLEANING OF BRAKE DISKS

Remove any rust built-up on braking surfaces. Clean brake disks braking surfaces with Pulley Flange Cleaner (P/N 413 711 809). Refer to BRAKE for access instructions.

DRIVE BELT AND FINAL DRIVE BELT CONDITION

Inspect belt for cracks, fraying or abnormal wear. Replace if necessary. Make sure to install the proper drive belt, with arrow printed on belt pointing front of vehicle.

FUEL SYSTEM

Check lines and fasteners. Perform a pressure test. Refer to ENGINE MANAGEMENT SECTION.

SPARK PLUGS

Once preseason preparation is done, start engine with the old spark plugs to burn excess storage oil. Then, install new properly gapped spark plugs if required.

ENGINE

The following charts are provided to help in diagnosing the probable source of troubles. It should be used as a guideline. This section pertains to engine mechanical components only. Some related problems can come from other systems such as ignition system, fuel system, etc. and have an impact on the engine. Ensure to check the other systems before concluding that the engine is faulty.

COOLING SYSTEM

SYMPTOM	**HIGH ENGINE OPERATING TEMPERATURE.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check coolant level. a. Coolant level lower than recommended. *Refill and proceed with a leak test (refer to COOLING SYSTEM).*
	2. Check temperature sensor for electrical/mechanical failure. a. Temperature sensor defective. *Replace.*
	3. Check coolant reservoir cap. a. Coolant reservoir cap is defective (refer to COOLING SYSTEM for testing). *Replace.*
	4. Check radiator thermostatic fan. a. Radiator thermostatic fan is defective (refer to COOLING SYSTEM for testing). *Replace.*
	5. Check radiator thermostatic switch. a. Radiator thermostatic switch is defective (refer to COOLING SYSTEM for testing). *Replace.*
	6. Check radiator. a. Radiator fins are choked by debris. *Clean.* b. Radiator fins are damaged. *Replace.* c. Restricted radiator. *Flush or replace.*
	7. Check Heat exchangers. a. Heat exchangers are covered by debris. *Clean.* b. Heat exchangers are damaged. *Replace.*
	8. Check thermostat. a. Thermostat defective (does not open or opens too slowly when engine gets hot). *Replace thermostat.*
	9. Check control bore (beside water pump housing) if coolant leaks. a. Coolant leaking from control bore means a damaged water pump rotary seal. *Replace rotary seal (refer to COOLING SYSTEM and CRANKCASE).*

SYMPTOM	**HIGH ENGINE OPERATING TEMPERATURE.**
CONDITION	NORMAL USE.
TEST/INSPECTION	10. Check condition of hoses and hose clamps fixation. a. Hoses are brittle and/or hard. *Replace.* b. Hose clamps are loose. *Retighten clamps.*
	11. Check condition of impeller located on the water pump shaft. a. Impeller wings broken and/or impeller threads are damaged. *Replace.*
	12. Check gasket on water pump housing. a. Gasket on water pump housing leaks. *Retighten screws and/or replace gasket.*
	13. Check cylinder head and/or cylinder base gasket. a. Worn out gasket(s) is(are) causing coolant leakage. *Replace.*

ALTERNATOR

SYMPTOM	**NOT CHARGING AT ALL OR CHARGING VOLTAGE INADEQUATE.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check the alternator and measure the charging voltage. a. Defective alternator. *Replace the alternator (refer to ALTERNATOR).*
	2. Inspect the alternator belt tension. a. Alternator belt tension too loose. *Readjust alternator belt tension.*
	3. Check wire harness for cracks or other damages. a. Harness shows electrical failure and/or other damages. *Replace wire harness.*
	4. Check the alternator charging light on the dashboard for proper functioning. Alternator charging light defective. *Replace the alternator charging light.*

LUBRICATION

SYMPTOM	**LOW OR NO OIL PRESSURE.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check oil level and search for leakage on crankcase and/or sealing parts. a. Crankcase is leaking due to damage. *Rebuild engine with new crankcase and gasket parts. Use Bombardier's recommended oil (refer to TECHNICAL DATA).* b. Crankcase is leaking due to loose screws. *Retighten screws with recommended torque.* c. Sealing rings, O-rings and/or gaskets are brittle and/or hard or damaged. *Replace damaged parts.* d. Piston rings worn out (blue coloured engine exhaust emission). *Replace piston rings (refer to ENGINE BLOCK).* e. Piston rings are broken (low compression). *Replace piston rings (refer to ENGINE BLOCK).* f. Valve stem seal damaged and/or sealing lip is hard and/or brittle. *Replace all valve stem seals.*
	2. Check oil drain plug on engine bottom. a. Plug is loosed and/or gasket ring is missing. *Retighten the plug and/or place gasket ring.*
	3. Check control bore if oil leaks (beside water pump housing). a. Oil leaking from control bore means a damaged oil seal on water pump shaft. *Replace oil seal (refer to COOLING SYSTEM).*
	4. Check oil pressure switch function. a. Oil pressure switch damaged. *Replace oil pressure switch.*
	5. Check oil orifice(s) on the oil pump suction side. a. Oil orifice(s) is(are) clogged. *Clean from contamination. Replace oil and oil filter if necessary (refer to MAINTENANCE or LUBRICATION SYSTEM).*
	6. Check oil pump function. a. Oil pump rotor is out of wear limit. *Replace oil pump shaft (refer to LUBRICATION SYSTEM).* b. Oil pump seized due to oil leakage and/or air inclusion. *Replace oil pump (refer to LUBRICATION SYSTEM).* c. Gears driving oil pump are broken or otherwise damaged. *Replace gears.* d. Incorrect oil being used. *Use Bombardier's recommend oil (refer to TECHNICAL DATA).*
	7. Check oil pressure regulator valve (spring) function. a. Valve spring damaged (valve always open). *Replace spring.* b. Valve piston is stuck in oil pump housing. *Repair valve piston.*
	8. Check plain bearings in crankcase for heavy wear. a. Plain bearings out of specification (increased clearance). *Replace plain bearings.*

SYMPTOM	**OIL CONTAMINATION (white appearance).**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check control bore (beside water pump housing) if water and oil leaks. a. Leakage of oil/water mixture from bore means damaged water pump seal ring and rotary seal. *Replace sealing ring, rotary seal and refill with recommended oil and/or coolant (refer to COOLING SYSTEM).*
	2. Check cylinder head and/or cylinder base gasket. a. Gasket damaged or leaking. *Retighten cylinder head with recommended torque and/or replace gasket.*
	3. Check tightening torque of cylinder head screws. a. Screws not properly tightened. *Retighten screws to recommended torque and replace oil.*
	4. Check oil for particles (may indicate possible engine internal damages). a. Oil contamination due to metal or plastic particles. *Replace possibly damaged parts. Use Bombardier's recommended oil (refer to TECHNICAL DATA).*

CYLINDER AND CYLINDER HEAD

SYMPTOM	**UNUSUAL ENGINE NOISE AND/OR VIBRATIONS.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check noise coming from cylinder head area. a. Faulty chain tensioner. *Replace spring and/or mechanism.* b. Chain guide worn out. *Replace chain guide.* c. Stretched chain and/or worn out sprockets. *Replace chain and sprockets.* d. Sprocket screws got loose. *Retighten screws with recommended torque.* e. Hydraulic element inside rocker arm(s) is(are) worn out (valve adjustment). *Replace rocker arm(s).* f. Rocker arm screws not tightened. *Replace screws and perform the torque procedure (refer to CYLINDER AND CYLINDER HEAD).*

SYMPTOM	**OIL CONTAMINATION ON CYLINDER AND/OR CYLINDER HEAD.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check screws for torque. a. Loose screws. *Retighten screws with recommended torque.* b. Gaskets are brittle, hard, worn out or otherwise damaged. *Replace damaged gaskets, O-rings or the V-ring on breather.* c. Contact area between spark plug and stick coils fouled by oil. *Clean spark plug area and replace spark plug tube.*

CRANKSHAFT

SYMPTOM	**UNUSUAL ENGINE NOISE AND/OR VIBRATIONS.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check noise coming from crankshaft area. a. Crankshaft bushings are damaged. *Replace the crankshaft bushings (refer to ENGINE BLOCK).* b. Connecting rod bushings are damaged. *Replace the connecting rod bushings (refer to ENGINE BLOCK).*
	2. Check if drive gears are loose. a. Crankshaft nut retaining drive gear is loose. *Retighten retaining nut with recommended torque.*

ELECTRICAL STARTER

SYMPTOM	**STARTER DOES NOT TURN.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check the battery voltage. a. Battery discharged. *Charge the battery.*
	2. Check wiring harness for cracks or other damages. a. Harness shows electrical failure and/or other damages. *Replace wiring harness.*
	3. Check 30 A and 5 A fuses. a. Burnt fuse. *Check wiring condition and replace fuse.*
	4. Check continuity of starter switch contact points. a. Poor contact of starter switch contact points. *Repair or replace switch.*
	5. Check continuity between starter switch and ECM. a. Open circuit. *Repair.*
	6. Check continuity between ECM and solenoid switch. a. Open circuit. *Repair.*

SYMPTOM	**STARTER TURNS, BUT ENGINE DOES NOT CRANK.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check the starter gear. a. Starter gear and/or intermediate gear is worn or damaged. *Replace starter gear and/or intermediate gear (refer to ENGINE BLOCK).*
	2. Check the sprag clutch. a. Sprag clutch is worn or otherwise damaged. *Replace sprag clutch (refer to ENGINE BLOCK).*
	3. Check battery capacity. a. Shorted battery cell(s). *Replace.*
	4. Check battery charge. a. Low battery. *Recharge battery and check recharge system and wires.*
	5. Check wire connection. a. Inadequate connection (too much resistance). *Clean and reconnect.*
	6. Check brushes. a. Poor contact of brushes. *Replace starter.*
	7. Check commutator. a. Burnt commutator. *Replace starter.*
	8. Check engine. a. Engine seized. *Overhaul the engine.*
	9. Check field coil resistance. a. Shorted field coil. *Replace starter.*
	10. Check armature resistance. a. Shorted armature. *Replace starter.*
	11. Check tension of brush springs. a. Weak brush spring tension. *Replace starter.*
	12. Check if bushings are worn. a. Worn bushings. *Replace starter.*

ENGINE GENERAL

SYMPTOM	**ENGINE BACKFIRES.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check spark plug. a. Carbon accumulation caused by defective spark plug. *Clean carbon accumulation and replace spark plug.*
	2. Check leakage on intake manifold. a. Air leak on intake system. *Retighten screws and/or replace intake manifold gasket.*
	3. Check exhaust air leaking. a. Exhaust gasket is leaking. *Retighten screws and/or replace exhaust gasket.*
	4. Check intake valve(s) for leaking. a. Intake valve(s) is(are) leaking. *Repair or replace valve(s).*
	5. Check if fuel supply is sufficient at high RPM. a. Fuel line is contaminated and/or bent (engine gets lean). *Clean and/or replace defective part(s).*
	6. Check fault codes in B.U.D.S. system. a. Check if electrical actuator(s) is/are defective. *Replace defective part(s) (refer to COMPONENT INSPECTION AND ADJUSTMENT).*

SYMPTOM	**ENGINE SUDDENLY TURNS OFF.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Perform engine leak test. Refer to ENGINE LEAK TEST procedure. Check for possible piston seizure. a. Damaged head gasket and/or seal and/or leaking inlet/exhaust valve(s). *Replace and/or repair defective parts.*
	2. «Four-corner» seizure of piston. a. Accelerating too fast when engine is cold. Piston expands faster than cylinder. *Replace pistons. Ask driver to refer to warm-up procedure in Operator's Guide.*
	3. Piston seizure (from arrow to piston exhaust side). a. Spark plug heat range is too hot. *Install spark plug with appropriate heat range (refer to TECHNICAL DATA).* b. Compression ratio is too high. *Install genuine parts.* c. Poor oil quality. *Use BOMBARDIER oil.* d. Leaks at air intake manifold (engine gets too lean). *Retighten screws or replace air intake manifold gasket.*

SYMPTOM	**ENGINE SUDDENLY TURNS OFF.**
CONDITION	NORMAL USE.
TEST/INSPECTION	4. Piston color is dark due to seizure on intake and exhaust sides. a. Cooling system leaks and lowers coolant level. *Tighten clamps or replace defective parts. Add antifreeze in cooling system until appropriate level is reached. Replace damaged parts.*
	5. Cracked or broken piston. a. Cracked or broken piston due to excessive piston/cylinder clearance or engine overreving. *Replace piston. Check piston/cylinder clearance (refer to ENGINE BLOCK).*
	6. Check piston rings and cylinder surface for grooves. a. Poor oil quality. *Use Bombardier's recommended oil.* b. Contamination through engine intake. *Replace defective part(s) and use new air filter.*
	7. Check crankshaft, rocker arms movement. a. Oil pump failure due to leak of oil. *Repair and replace defective parts and use Bombardier's recommended oil.* b. Oil contamination due to clogged oil filter/oil sieve. *Replace oil, replace defective part(s) (refer to MAINTENANCE CHART and LUBRICATION SYSTEM).*
	8. Check valve springs exhaust/intake. a. Broken valve spring damages the cylinder head, valve(s), rocker arm(s), piston, piston rings and connecting rod. *Replace defective part(s).*
	9. Check if fuel supply is sufficient at high RPM. a. Fuel line is contaminated and/or bent. *Clean and/or replace defective part(s).*
	10. Check fault codes in B.U.D.S. system. a. Check if electrical actuator(s) is/are defective. *Replace defective part(s) (refer to COMPONENT INSPECTION AND ADJUSTMENT).*

SYMPTOM	**ENGINE DOES NOT OFFER MAXIMUM POWER AND/OR DOES NOT REACH MAXIMUM OPERATING RPM.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check spark plug condition and/or gap. a. Fouled spark plug or wrong spark plug gap. *Readjust gap and clean spark plug or replace.*
	2. Check spark plug type. a. Improper spark plug heat range. *Install recommended spark plug (refer to TECHNICAL DATA).*
	3. Perform engine leak test. Refer to ENGINE LEAK TEST procedure. Check for possible piston seizure. a. Damaged head gasket and/or seal and/or leaking intake/exhaust valve(s). *Replace and/or repair defective parts.*

SYMPTOM	**ENGINE DOES NOT OFFER MAXIMUM POWER AND/OR DOES NOT REACH MAXIMUM OPERATING RPM.**
CONDITION	NORMAL USE.
TEST/INSPECTION	4. Check for water in fuel (wrong fuel). a. There is water in fuel or wrong fuel. *Drain fuel system, search for leakage and refill it with appropriate fuel.*
	5. Check engine compression. a. Worn piston(s) and/or piston ring(s). *Replace (refer to CYLINDER AND HEAD).*
	6. Check fuel pressure. a. Low fuel pressure. Perform fuel pressure test (refer to COMPONENT INSPECTION AND ADJUSTMENT).
	7. Check fault codes in B.U.D.S. system. a. Check if electrical actuator(s) is/are defective. *Replace defective part(s) (refer to COMPONENT INSPECTION AND ADJUSTMENT).*

SYMPTOM	**ENGINE CRANKS BUT FAILS TO START.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check if stick coil fits on spark plug (refer to SPARK PLUG).
	2. Check spark plug. a. Define spark plug (no spark) or wrong spark plug gap. *Readjust gap and clean spark plug or replace.*
	3. Check for fuel on spark plug. a. Flooded engine (spark plug wet when removed). *Activate engine drowned mode and crank engine with rags over the spark plug holes (refer to OVERVIEW in EMS system).*
	4. Check engine compression. a. Insufficient engine compression. *Replace defective part(s) (ex.: piston, ring(s), etc.).*
	5. Check battery voltage. a. Battery is discharged and starter works not properly. *Charge battery.*
	6. Check fault codes in B.U.D.S. system. a. Check if electrical actuator(s) is/are defective. *Replace defective part(s) (refer to COMPONENT INSPECTION AND ADJUSTMENT).*

SYMPTOM	**HIGH ENGINE OPERATING TEMPERATURE.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check if cooling system shows any failure (see COOLING SYSTEM). a. System is leaking. *Repair and/or replace damaged part(s).*
	2. Check function of lubrication system (see LUBRICATION SYSTEM). a. Lubrication is not working properly. *Repair and/or replace damaged part(s).*
	3. Check condition and heat range of spark plug. a. Melted spark plug tip or inadequate heat range. *Replace.*
	4. Check water temperature sensor. a. Temperature sensor is defective. *Replace temperature sensor (refer to COMPONENT INSPECTION AND ADJUSTMENT).*

SYMPTOM	**ENGINE DOES NOT START— NO SPARK AT SPARK PLUG (REFER TO ENGINE MANAGEMENT SYSTEM).**
CONDITION	AT ENGINE CRANKING.
TEST/INSPECTION	1. Verify spark plug condition. a. Defective, improperly set, worn out, fouled. *Identify source of problem and correct. Replace spark plug.*
	2. Check stick coil (refer to COMPONENT INSPECTION AND ADJUSTMENT). a. Defective part. *Replace stick coil.*
	3. Check crankshaft position sensor (refer to COMPONENT INSPECTION AND ADJUSTMENT). a. Defective crankshaft position sensor. Corroded connector terminals. *Replace crankshaft position sensor. Clean terminals and apply silicone dielectric grease.*
	4. Check condition of wiring harness and connectors. a. Cables and/or connectors are damaged and/or corroded. *Replace connectors or complete wiring harness (refer to COMPONENT INSPECTION AND ADJUSTMENT). Clean terminals and apply silicone dielectric grease.*
	5. Check fault codes in B.U.D.S. system. a. Check if electrical actuator(s) is/are defective. *Replace defective part(s) (refer to COMPONENT INSPECTION AND ADJUSTMENT).*

TRANSMISSION AND BRAKE SYSTEM

The following chart is provided to help diagnose the probable source of troubles. It should be used as a guideline. Some causes or corrections may not apply to a specific model.

TRANSMISSION

SYMPTOM	**THE SNOWMOBILE ACCELERATES SLOWLY, ESPECIALLY FROM A STANDING START.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check drive belt condition. a. Belt is too narrow (drive belt engagement is higher in drive pulley). *Replace belt if width is less than specified in DRIVE BELT.*
	2. Check distance between pulleys and/or drive belt deflection. a. Distance is too small between pulleys or deflection is too high (drive belt engagement is higher in drive pulley). *Adjust distance between pulleys and/or drive belt height according to specifications (refer to PULLEY DISTANCE AND ALIGNMENT and DRIVE BELT).*
	3. Check if driven pulley sliding half slides freely. a. Jammed sliding half. *Replace.*
	4. Check spring tension of driven pulley sliding half. a. Sliding half rotation is accelerated when spring tension is too weak. *Adjust according to specifications (refer to TECHNICAL DATA).*
	5. Refer to VIBRATIONS ORIGINATING FROM DRIVE PULLEY and VIBRATIONS ORIGINATING FROM DRIVEN PULLEY and check items listed.
	6. Check drive pulley spring tension. a. Spring tension is too weak. *Replace.*

SYMPTOM	**ENGINE MAXIMUM RPM IS TOO HIGH AND TOP SPEED IS NOT REACHED.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check items 1, 2 and 3 of THE SNOWMOBILE ACCELERATES SLOWLY, ESPECIALLY FROM A STANDING START.
	2. Check driven pulley spring tension. a. Spring tension is too stiff. *Adjust according to specifications (refer to TECHNICAL DATA).*
	3. Check position of the calibration screws (TRA drive pulley). a. Selected numbers are too high. *Adjust according to specifications (refer to TECHNICAL DATA).*
	4. Refer to VIBRATIONS ORIGINATING FROM DRIVE PULLEY and check items listed.
	5. Check the driven pulley. a. Driven pulley does not open completely. *Clean, readjust or replace driven pulley.*
	6. Check if levers of drive pulley move freely. a. Stuck levers. *Replace lever bushings.*

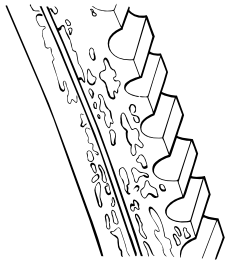
SYMPTOM	**LOOSE IN DRIVE SYSTEM WHEN ACCELERATING/DECELERATING.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check final drive belt tension. a. Final Drive belt is too loose. *Adjust.*
	2. Check radial play of driven pulley and drive sprocket on gearbox output shaft. a. Worn splines. *Replace defective parts.*
	3. Check radial play of drive axles. a. Worn splines. *Replace defective parts.*

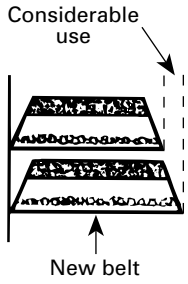
SYMPTOM	**VIBRATIONS ORIGINATING FROM DRIVE PULLEY.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check drive belt. a. Belt width is uneven on several places. *Replace.*
	2. Check tightening torque of drive pulley screw. a. Moving governor cup. *Retighten screw.*
	3. Spring cover screws. a. Spring cover moves and restrains sliding half movement. *Retighten screws.*
	4. Check spring cover (TRA TYPE) and/or sliding half bushings. a. Excessive gap between bushings and fixed half shaft, thus restraining sliding half movements. *Replace bushing(s).*
	5. Check lever assembly. a. Lever assembly is damaged (worn bushing, bent lever etc.). *Replace damaged part.*

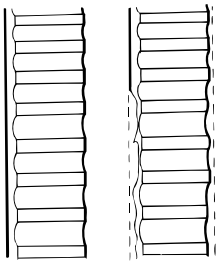
SYMPTOM	**VIBRATIONS ORIGINATING FROM DRIVEN PULLEY.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check sliding half side play. a. Sliding half bushing worn out. *Replace sliding half bushing.*
	2. Check sliding half and fixed half straightness. a. Sliding half/fixed half warped. *Replace.*
	3. Check cam slider shoes. a. One or two slider shoes out of three are broken. *Replace.*

SYMPTOM	**PULLEYS DO NOT DOWN SHIFT PROPERLY.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check driven pulley spring tension. a. Spring tension is too low. *Adjust according to specifications (refer to TECHNICAL DATA) or replace spring.*
	2. Refer to VIBRATIONS COMING FROM DRIVEN PULLEY and check items listed.
	3. Check drive pulley bushings (cleanliness, wear, etc.). a. Bushings stick to fixed half pulley shaft. *Clean or replace.*

SYMPTOM	**UNEVEN BELT WEAR ON ONE SIDE.**
CONDITION	NORMAL USE.
TEST/INSPECTION 	1. Check tightening torque of engine mount bolts. a. Loose engine mount. *Tighten mount nuts/bolts equally.*
	2. Check pulley alignment. a. Pulley misalignment. *Align pulleys.*
	3. Check drive belt contact area on pulleys. a. Rough or scratched pulley surfaces. *Repair or replace pulley half.*
	4. Check driven pulley sliding half play. a. Driven pulley bushing worn. *Replace bushing.*

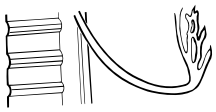
SYMPTOM	**BELT GLAZED EXCESSIVELY OR HAVING BAKED APPEARANCE.**
CONDITION	NORMAL USE.
TEST/INSPECTION 	1. Check if drive pulley bushings are worn. a. Slipping due to insufficient pressure on belt sides. *Replace bushing.*
	2. Check condition of drive pulley fixed half shaft. a. Slipping due to rusted drive or driven pulley shafts. *Clean shaft with fine steel wool.*
	3. Check if pulley halves are clean. a. Slipping due to oily pulley surfaces. *Clean pulley halves.*
	4. Check pulley calibration. a. Slipping due to improper pulley calibration. *Calibrate according to specifications.*

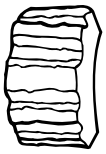
SYMPTOM	**BELT WORN EXCESSIVELY IN TOP WIDTH.**
CONDITION	NORMAL USE.
TEST/INSPECTION 	1. Check drive pulley. a. Excessive slippage due to jamming of drive pulley. *Inspect drive pulley.*
	2. Check drive belt identification number. a. Improper belt angle (wrong type of belt). *Replace belt with an appropriate drive belt.*
	3. Check drive belt width. a. Considerable use. *Replace belt if less than specified in DRIVE BELT.*

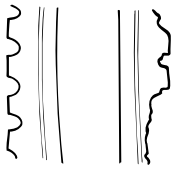
SYMPTOM	**BELT TOO NARROW ON ONE SECTION.**
CONDITION	NORMAL USE.
TEST/INSPECTION 	1. Check for frozen tracks. a. Frozen tracks. *Free tracks from ice.*
	2. Check parking brake. a. Parking brake is engaged. *Release parking brake.*
	3. Check track tension/alignment. a. Track too tight. *Adjust track tension and alignment.*
	4. Check drive pulley. a. Drive pulley does not operate properly. *Repair or replace drive pulley.*
	5. Check drive belt length. a. Incorrect belt length. *Replace with an appropriate drive belt (refer to TECHNICAL DATA).*
	6. Check distance between pulleys. a. Incorrect pulley distance. *Readjust according to specifications.*
	7. Check belt height. a. Belt height is incorrect. *Adjust according to specifications.*

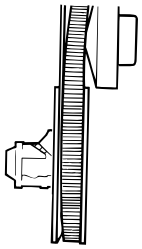
SYMPTOM	**BELT SIDES WORN CONCAVE.**
CONDITION	NORMAL USE.
TEST/INSPECTION 	1. Check pulley half surfaces. a. Rough or scratched pulley half surfaces. *Repair or replace.*
	2. Check drive belt identification number. a. Wrong belt. *Replace with an appropriate drive belt (refer to TECHNICAL DATA).*

SYMPTOM	**BELT DISINTEGRATION.**
CONDITION	NORMAL USE.
TEST/INSPECTION 	1. Check drive belt identification number. a. Excessive belt speed. *Wrong type of belt. Replace with proper type of belt (refer to TECHNICAL DATA).*
	2. Check if pulley halves are clean. a. Oil on pulley surfaces. *Clean pulley surfaces with fine emery cloth and wipe clean using pulley flange cleaner (P/N 413 711 809) and a cloth.*

SYMPTOM	**BELT CORD POPPED OUT.**
CONDITION	NORMAL USE.
TEST/INSPECTION 	1. Check pulley alignment. a. Pulley misalignment. *Align pulley according to specifications (refer to TECHNICAL DATA).*

SYMPTOM	**FATIGUE CRACKS BETWEEN COGS.**
CONDITION	NORMAL USE.
TEST/INSPECTION 	1. Check drive belt condition. a. Belt considerably worn, worn out. *Replace.* b. Distortion of natural belt shape due to improper storage. *Store properly.*

SYMPTOM	**TOOTH CHUNK OUT.**
CONDITION	NORMAL USE.
TEST/INSPECTION 	1. Check drive belt rotational direction. a. Improper belt installation. *Replace.*
	2. Check if drive belt rubs against components. a. Belt rubs against fixed components. *Relocate components.*
	3. Check drive pulley. a. Violent engagement of drive pulley. *Check drive pulley engagement speed, drive pulley bushings and components.*

SYMPTOM	**BELT "FLIP-OVER" AT HIGH SPEED.**
CONDITION	NORMAL USE.
TEST/INSPECTION 	1. Check pulley alignment. a. Pulley misalignment. *Align pulley according to specifications (refer to TECHNICAL DATA).*
	2. Check drive belt identification number. a. Wrong type of belt. *Replace with an appropriate drive belt.*

BRAKE SYSTEM

HYDRAULIC BRAKE

SYMPTOM	**SPONGY BRAKE CONDITION.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Contaminated brake fluid. *Replace brake fluid and bleed system. If the problem persists, replace master cylinder.*

SYMPTOM	**BRAKE FLUID LEAKAGE.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check for loosen hose connectors. *Replace copper washers and retighten.*
	2. Check for damaged hose, master cylinder and caliper. *Replace part(s) and check for proper mounting.*

SYMPTOM	**BRAKE SYSTEM IS NOISY.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check brake pad thickness. a. Pads are worn out. *Replace.*

ELECTRICAL SYSTEM

The following chart is provided to help diagnose the probable source of troubles. It should be used as a guideline.

SYMPTOM	**STARTER DOES NOT TURN.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check fuse. a. Burnt fuse. *Check wiring condition and replace fuse.*
	2. Check continuity of starter switch contact points. a. Poor contact of starter switch contact points. *Repair or replace switch.*
	3. Check continuity between starter switch and ECM on liquid-cooled models. a. Open circuit. *Repair.*
	4. Check continuity between ECM and solenoid switch. a. Open circuit. *Repair.*

SYMPTOM	**STARTER TURNS BUT DOES NOT CRANK THE ENGINE.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check battery capacity. a. Shorted battery cell(s). *Replace.*
	2. Check battery charge. a. Low battery. *Recharge battery and check recharge system and wires.*
	3. Check wire connection. a. Inadequate connection (too much resistance). *Clean and reconnect.*
	4. Check solenoid switch contact disc. a. Burnt or poor contact of solenoid switch contact disc. *Replace solenoid switch.*
	5. Check brushes. a. Poor contact of brushes. *Replace brushes.*
	6. Check commutator. a. Burnt commutator. *Machine commutator on a lathe. Respect outer diameter wear limit. Refer to ELECTRIC STARTER.*

SYMPTOM	**STARTER TURNS BUT DOES NOT CRANK THE ENGINE.**
CONDITION	NORMAL USE.
TEST/INSPECTION	7. Check engine. a. Engine seized. *Overhaul the engine.*
	8. Check height of commutator mica. a. Commutator mica too high. *Undercut mica.*
	9. Check field coil resistance. a. Shorted field coil. *Repair or replace yoke.*
	10. Check armature resistance. a. Shorted armature. *Repair or replace armature.*
	11. Check tension of brush springs. a. Weak brush spring tension. *Replace springs.*
	12. Check yoke assembly magnets. a. Weak magnets. *Replace yoke assembly.*
	13. Check if bushings are worn. a. Worn bushings. *Replace bushings.*

SYMPTOM	**STARTER TURNS, BUT OVERRUNNING CLUTCH PINION DOES NOT MESH WITH RING GEAR.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check clutch pinion gear. a. Worn clutch pinion gear. *Replace clutch.*
	2. Check clutch. a. Defective clutch. *Replace clutch.*
	3. Check clutch bushing. a. Worn clutch bushing. *Replace clutch.*
	4. Check ring gear. a. Worn ring gear. *Replace ring gear.*
	5. Check for proper starter rotation direction. a. Starter turns in wrong direction, incorrectly installed brushes, wrong polarity or wrong starter. *Replace starter or reconnect properly.*

SYMPTOM	**ELECTRIC STARTER KEEPS TURNING WHEN ENGINE IS STARTED.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check clutch. a. Jammed clutch pinion gear. *Replace or clean.*
	2. Check starter relay. a. Shorted starter relay winding(s). *Replace starter relay.*
	3. Check starter relay contacts. a. Melted starter relay contacts. *Replace starter relay.*
	4. Check starter relay. a. Starter relay returns poorly. *Replace starter relay.*
	5. Check start switch contacts. a. Contacts shorted. *Replace start switch.*

SYMPTOM	**ELECTRIC STARTER SOMETIMES DOES NOT WORK WHEN ACTIVATED.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check battery cables and starter wires. a. Corroded and/or loose connection(s). *Clean and/or retighten.*
	2. Check fuse. a. Oxidized or burnt fuse. *Clean or replace.*
	3. Check wiring harness connections. a. Oxidized connections. *Clean or replace defective terminals.*
	4. Check START switch. a. Defective contacts in START switch. *Replace.* b. Moisture in START switch. *Blow dry START switch.*
	5. Check solenoid of electric starter. a. Shorted solenoid wiring harness or corroded contact washer. *Replace.*

SYMPTOM	**HEADLAMP NOT LIGHTING.**
CONDITION	WHITE BULB.
TEST/INSPECTION	1. Check bulb. a. Gas leak. *Replace bulb.*
CONDITION	BROKEN ELEMENT.
TEST/INSPECTION	1. Check for loose headlamp housing and bulb socket. a. Vibration problem. *Tighten headlamp mounting screws. Lock bulb in socket. Replace bulb.*
CONDITION	MELTED FILAMENT (ends of element holder) AND BLACK BULB.
TEST/INSPECTION	1. Check voltage at headlamp at different speeds. It must not be above 15 Vdc. a. Excessive voltage in lighting circuit. *Replace alternator. Retest.*

SYMPTOM	**HEADLAMP DIMING.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check voltage at headlamp at different speeds. It must not be below 11 Vdc. a. Insufficient voltage in lighting circuit. *Replace alternator and retest.*
	2. Visually inspect wiring harness for damaged and/or melted wires and/or bad wire terminal crimping and/or connections. a. Heating, rotating or sharp part in contact with harness. Improper harness routing. *Repair/replace damaged wires and/or terminals. Reroute harness where necessary.*
	3. Check if optional electric accessories are overloading the alternator. a. Excessive electrical load to alternator. *Reduce the electrical load by removing excess accessories. Reconnect as recommended by manufacturer.*

SYMPTOM	**FALSE FUEL AND/OR TEMPERATURE GAUGE READINGS.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Verify sender unit for free movement and/or correct arm position. a. Defective or damaged part. *Correct or replace sender unit.*
	2. Verify sender unit/gauge wiring harness condition. a. Heating, rotating or sharp part in contact with harness. Improper harness routing. *Replace or repair damaged wires. Reroute where necessary.*

SYMPTOM	**BRAKE LIGHT REMAINS ON.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check if bulb is properly installed. a. Bulb is not installed correctly (contact elements are reversed). *Install bulb correctly.*
	2. Check brake switch. a. Switch contact remains closed. *Replace brake switch.*
	3. Check wiring harness. a. Shorted wiring harness. *Replace or repair wiring harness.*

SYMPTOM	**REAR LIGHT BULB FLASHES.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check bulb tightness in housing. a. Looseness at bulb contact elements. *Install bulb correctly.*
	2. Check if rear light is properly connected. a. Connector housing is partially connected. *Install connector housing properly.*
	3. Check continuity of wires. a. Corroded terminals and/or broken wires. *Replace terminal(s) or crimp defective wires.*

SYMPTOM	**TACHOMETER DOES NOT WORK.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check continuity of wires. a. Corroded terminals and/or broken wires. *Replace terminal(s) or crimp defective wires.*

SUSPENSION AND TRACK

The following chart is provided to help diagnose the probable source of troubles. It should be used as a guideline. Some causes or corrections may not apply to a specific model.

SYMPTOM	**SUSPENSION IS TOO LOW.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check condition of springs. a. Springs are broken. *Replace springs.*
	2. Check springs preload. a. Too low spring preload. *Increase preload to the recommended position.*

SYMPTOM	**REAR SUSPENSION BOTTOMS OUT.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check condition of springs. a. Springs are broken. *Replace springs.*
	2. Check springs preload. a. Too low spring preload. *Increase preload to the recommended position.*
	3. Check the rear shock motion ratio position. a. It is adjusted in soft position. *Adjust rear shock motion ratio to firm position.*

SYMPTOM	**REAR SUSPENSION IS TOO STIFF.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check rear spring preload. a. Too much preload. *Adjust to a softer position.*
	2. Check springs. a. Springs installed are too stiff. *Install optional softer springs, refer to Service Bulletin SPRING REFERENCE ACCORDING TO LOAD.*
	3. Check the rear shock motion ratio position. a. It is adjusted in firm position. *Adjust rear shock motion ratio to soft position.*
	4. Check track tension. a. Track is too tight. *Adjust.*
	5. Check if axles are properly lubricated. a. Improper lubrication and/or contaminated grease (sticky oil sludge). *Clean and/or lubricate.*

SYMPTOM	**WHEN STEERING WHEEL IS TURNED, SNOWMOBILE UNDERSTEERS.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check ski runner condition. a. Worn ski runners. *Replace.*
	2. Check ski spring preload. a. Insufficient ski pressure on the ground. *Increase spring preload.*
	3. Check if thicker part of coupling blocks is facing rearward. a. Insufficient ski pressure on the ground. *Turn coupling block so their thicker part is facing rearward.*
	4. Check if front arm stopper straps are too long. a. Insufficient ski pressure on the ground. *Shorten stopper straps.*

SYMPTOM	**STEERING WHEEL IS DIFFICULT TO TURN.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check if the steering wheel turns freely when skis are off the ground. a. Ball joints corrosion restrains movement. *Lubricate or replace the ball joint.* b. Component need proper lubrication. *Lubricate. Refer to MAINTENANCE.* c. Bent parts. *Replace parts.*
	2. Check ski spring preload. a. Too much preload. *Reduce ski spring preload.*
	3. Check if thicker part of coupling blocks is facing downward. a. Too much ski pressure on the ground. *Turn coupling block so their thicker part is facing downward.*
	4. Check position of stopper straps. a. Too much weight when stopper straps are short. *Lengthen front arm stopper straps.*

SYMPTOM	**THE SNOWMOBILE ZIGZAGS.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check ski runner condition. a. Worn or bent ski runners. *Replace ski runners.*
	2. Check ski alignment. a. Improper ski alignment. *Align skis in order to obtain proper toe-out (opening) (to adjust, refer to STEERING SYSTEM).*
	3. Check if bushings are too loose in steering system. a. Bushings are too loose. *Replace.*
	4. Check ski pressure. a. Too much pressure on skis. *Reduce ski spring preload and/or increase center spring preload.*

SYMPTOM	**SLIDER SHOES WEAR OUT PREMATURELY/OR TRACK CLEATS BECOME BLUE.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check track tension. a. Pressure is too great on slider shoes. *Adjust according to specifications (refer to TECHNICAL DATA).* *Replace defective parts.*
	2. Check idler wheel condition. a. Stuck bearing, flat spot on wheel or damaged wheel. *Replace defective parts.*
	3. Check snow conditions or lack of snow. a. Lack of lubrication of slider shoes. *Ask driver to ride in appropriate snow conditions (see Operator's Guide).*
	4. Check slider shoes and/or suspension retaining screws. a. Twisted slider shoes or loose retaining screws. *Replace defective parts and/or tighten loose screws.*

SYMPTOM	**DERAILING TRACKS.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check track tension. a. Tracks are too loose. *Adjust.*
	2. Check if tracks and slider shoes are properly aligned. a. Improper alignment. *Adjust.*

SYMPTOM	**NOISE OR VIBRATION COMING FROM THE TRACKS.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check slide suspension retaining bolts. a. Missing bolt(s) (some components interfere with track rotation). *Replace missing bolt(s).*
	2. Check condition of idler wheel(s). a. Idler wheel rubber is damaged. *Replace.*
	3. Check guide cleats. a. Top portion of guide cleat(s) is bent. *Replace.*
	4. Check sprockets. a. One or several teeth of drive shaft sprockets are broken. *Replace sprocket(s).*
	5. Check track tension. a. Tracks are too loose. *Adjust to recommended tension.*
	6. Check track rods and/or internal traction teeth. a. One or several track rods and/or teeth are broken. *Replace track.*

LEAK TEST

LEAK TEST PROCEDURE

The procedure has to be done when engine operating temperature of approx. 70°C (158°F) is reached.

⚠ WARNING

Prevent burning yourself due to handling on the hot engine.

PREPARATION

Remove:

⚠ WARNING

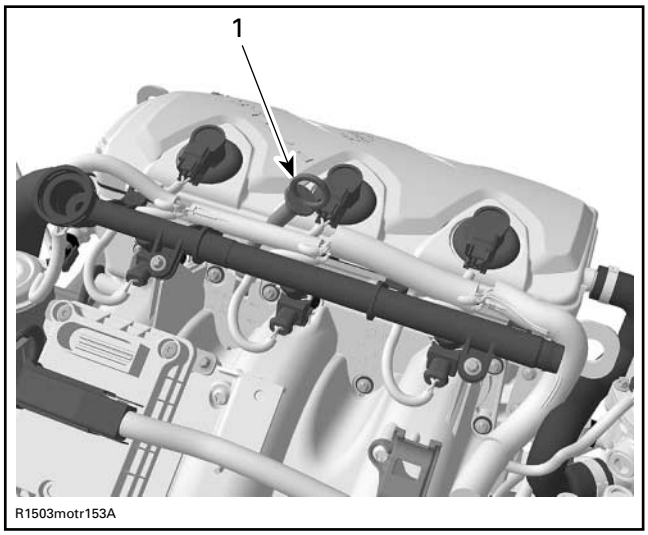
Tether cord cap must be removed to prevent engine to be cranked while fuel rail is removed to prevent fuel to be sprayed out. Fuel is flammable.

– tether cord cap
– coolant tank cap

⚠ WARNING

To prevent burning yourself, wear the appropriate safety equipments to remove the coolant tank cap.

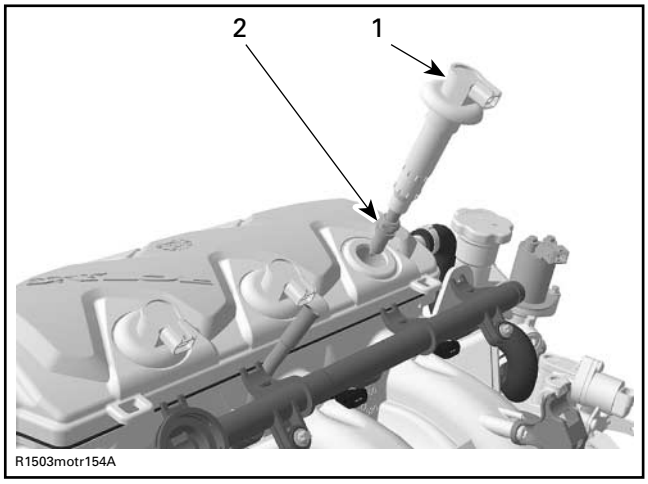
– fuel rail cover, then remove fuel rail retaining screws and move away just enough to see the injection holes
– oil dipstick
– exhaust manifold
– air intake manifold



1. Oil dipstick

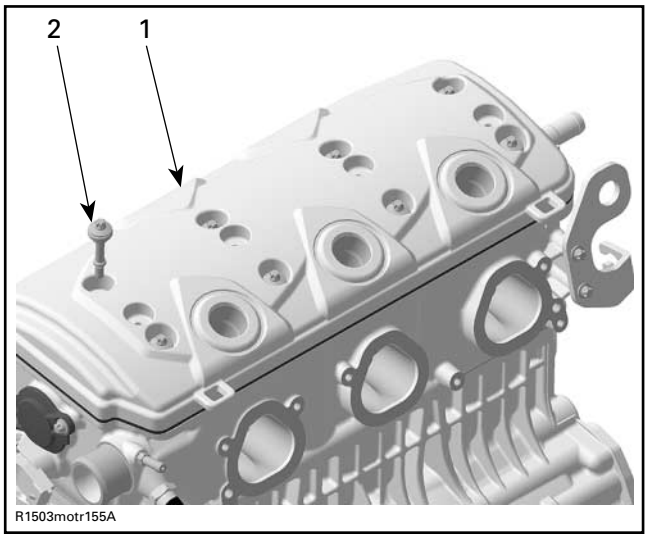
– unplug ignition coil and pull it out
– spark plug from cylinder head.

NOTE: Ignition coil may be used as an extractor.



1. Ignition coil
2. Spark plug

– Remove valve cover cowl.
– Unscrew and remove valve cover.



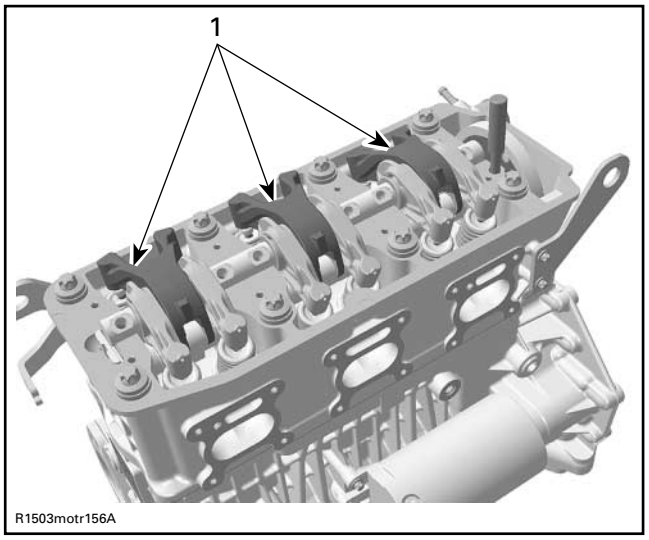
1. Valve cover
2. Valve cover screw

PROCEDURE

The following procedure has to be performed for each cylinder separately, because of the 120° offset between the TDCs.

Rotate crankshaft **counterclockwise** using drive shaft adaptor (P/N 529 035 892) until the cylinder **no. 3** is at top dead center (TDC) compression stroke.

NOTE: Cylinder numbers are molded on valve cover.



1. Intake rocker arms

As the engine is turned over, observe the movement of intake rocker arm of the cylinder **no. 3**. After it completes the cycle and the intake valve closes, observe the piston. When it reaches its uppermost position that is TDC compression stroke.

Then perform the leak test on cylinder **no. 3** as mentioned below.

To perform the leak test on cylinder **no. 1**, rotate the crankshaft **counterclockwise** to 240° so that the cylinder **no. 1** is at TDC compression stroke. Follow the instructions mentioned below to check the leakage.

Rotate crankshaft **counterclockwise** to 240° so that the cylinder **no. 2** is at top dead center (TDC) compression stroke. Follow the below given procedure to check the leakage.

The following procedure should be done for each cylinder separately after positioning them at TDC compression stroke, as per the procedure given above.

Hold the crankshaft in this position by using drive shaft adaptor (P/N 529 035 892).

Install gauge adapter into previously cleaned spark plug hole.

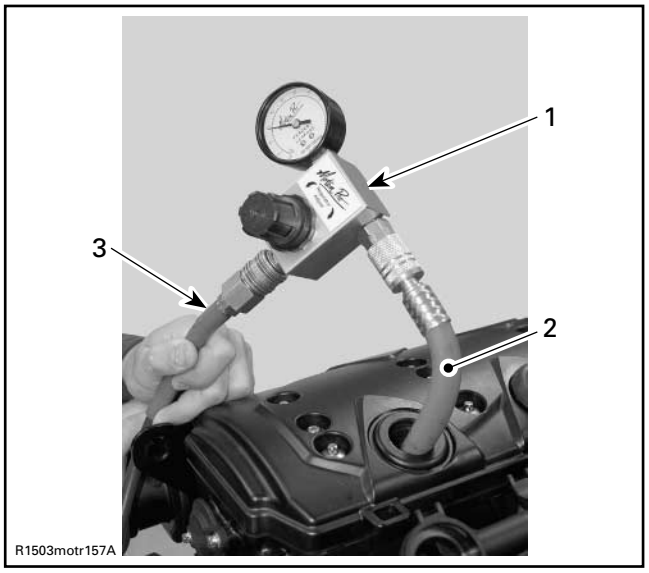
Use leak down tester (P/N 529 035 661).

Connect to adequate air supply.

NOTE: Each tester will have specific instruction on the gauge operation and required pressure.

Set needle of measuring gauge to zero.

Supply combustion chamber with air.



1. Measuring gauge
2. Adequate adapter for spark plug hole
3. Air supply

Note the amount of leaking or percentage (depending on tester).

LEAKAGE PERCENTAGE	ENGINE CONDITION
0% to 7%	Excellent condition.
8% to 15%	Fair condition; proceed with tuned up or adjustment.
16% to 30%	Poor condition; engine will run and performance might be down in some cases.
30% and higher	Very poor condition, diagnose and repair engine.

Diagnose

Pressurize area to be tested, spray soap/water solution at the indicated location and look and/or listen for air bubbles.

– air escaping on intake port means leaking intake valve(s)
– air escaping on exhaust port means leaking exhaust valve(s)
– air bubbles out of coolant tank means leaking cylinder head gasket
– air escaping into crankcase area means excessively worn and/or broken piston rings.

INSTALLATION

NOTE: For installation use the torque values and Loctite products from the exploded views (refer to proper engine subsection).

For installation, reverse the preparation procedure.

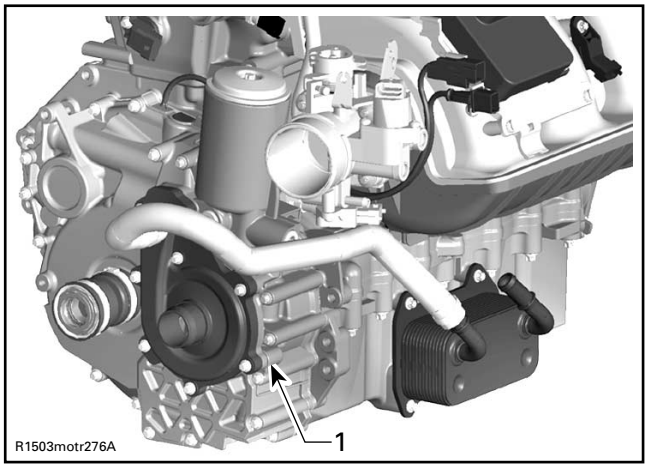
NOTE: Prior to inserting the ignition coil in its location, apply some Molykote 111 (P/N 413 707 000) around the seal area that touches the spark plug hole. After installation, ensure the seal seats properly with the engine top surface.

General Engine Leakage

Spray soap/water solution at the indicated location and look and/or listen for air bubbles.

Paying attention to the following checkpoints:

– clamp(s) tightened
– coolant hoses
– air/oil escaping from crankcase means damaged gasket(s) and/or loosened screws (refer to ENGINE BLOCK)
– air/water escaping from cylinder/head means damaged gasket(s) and/or loosened screws (refer to CYLINDER HEAD AND VALVES)
– oily contamination on weep hole (speed sensor area) means a damaged oil seal on coolant pump shaft
– coolant escaping from weep hole means a damaged rotary seal on coolant pump shaft (refer to COOLING SYSTEM)

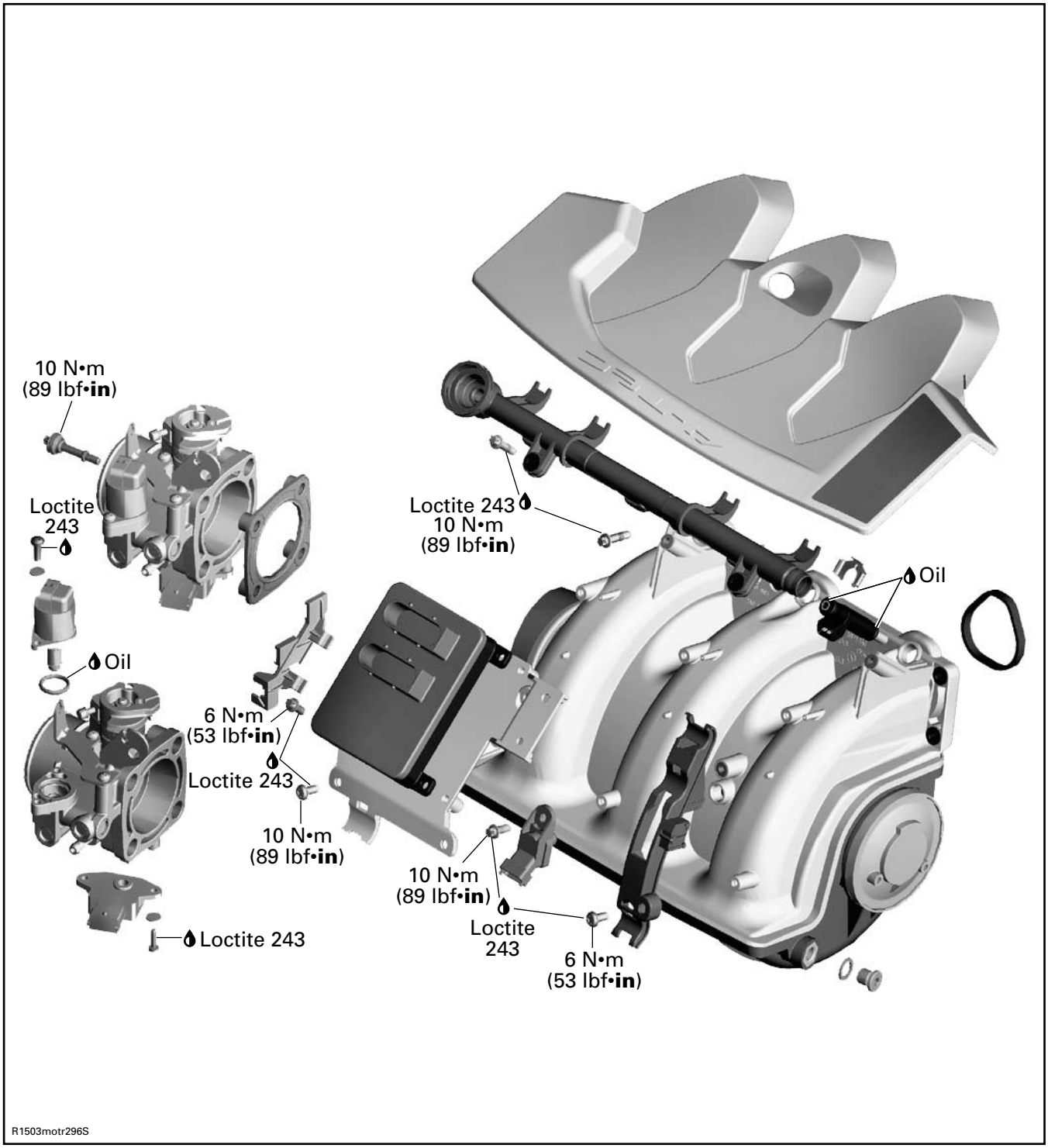


1. Weep hole

– coolant escaping from coolant pump housing means damaged gasket(s) and/or loosened screws (refer to COOLING SYSTEM).

NOTE: For all the checkpoints mentioned above see the appropriate engine section to diagnose and repair the engine.

INTAKE SYSTEM



TYPICAL

REMOVAL

Air Intake Manifold

Open hood.

Remove long hose between throttle body and TOPS housing.

1. Remove hose

Unfasten air intake silencer and disconnect its hose from throttle body.

Pull air intake silencer toward rear to disconnect ATS connector then, remove intake silencer.

1. Air intake silencer
2. ATS connector

Remove oil dipstick.

Pull fuel rail cover out.

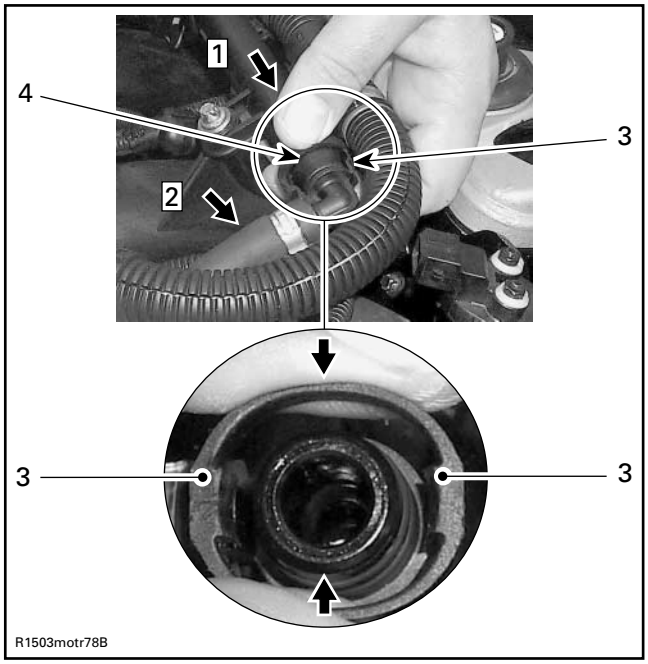
Release the fuel pressure in the system, refer to ENGINE MANAGEMENT section.

Disconnect battery cables from battery.

⚠ WARNING

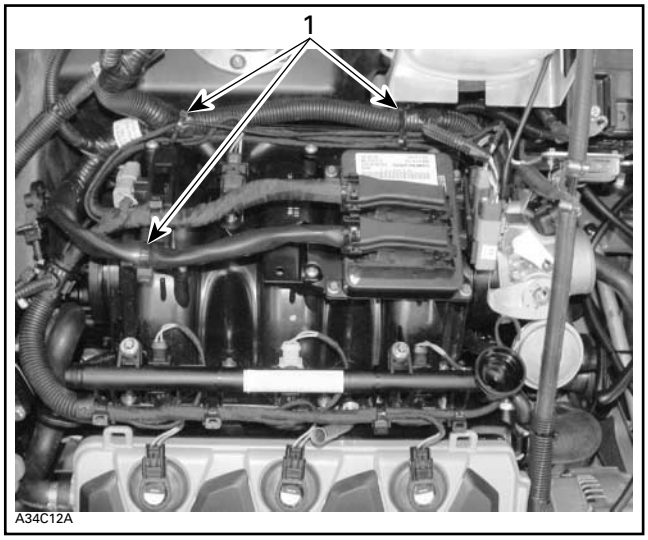
Always connect battery cables exactly in the specified order, RED positive cable first then the BLACK negative battery cable last.

Disconnect fuel hose connector at fuel rail.



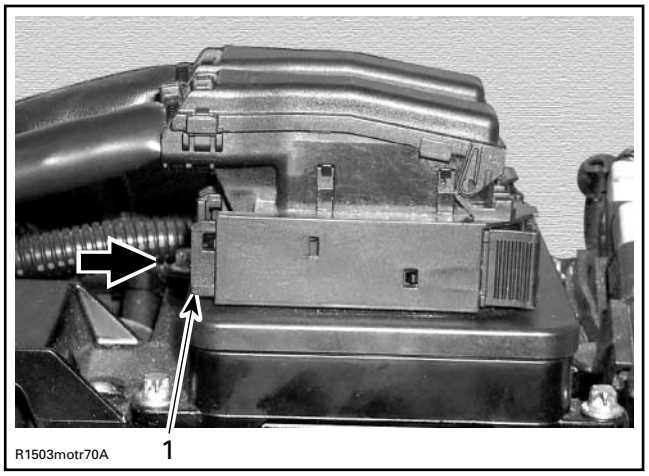
1. Squeeze
2. Pull out
3. Supporting tabs
4. Squeeze in middle of supporting tabs, hold and pull out

Cut locking ties where shown.

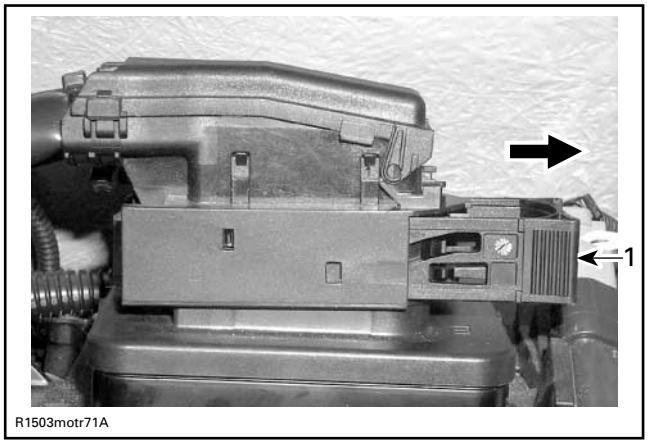


1. Cut locking ties to release harness coming from vehicle

Unplug the "B" connector from the Engine ECU.

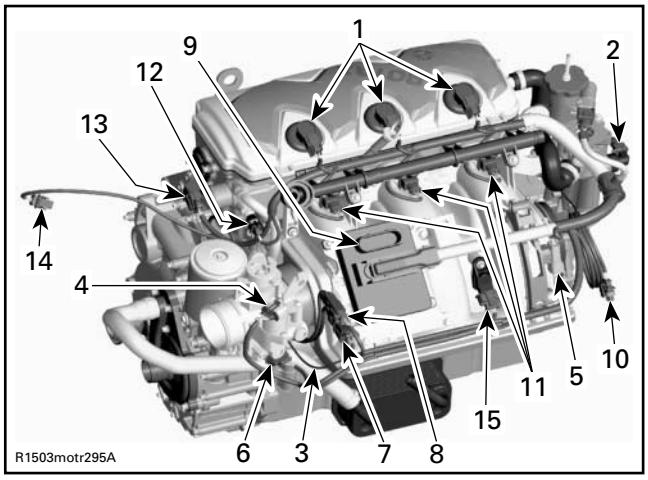


1. Push this end to unlock



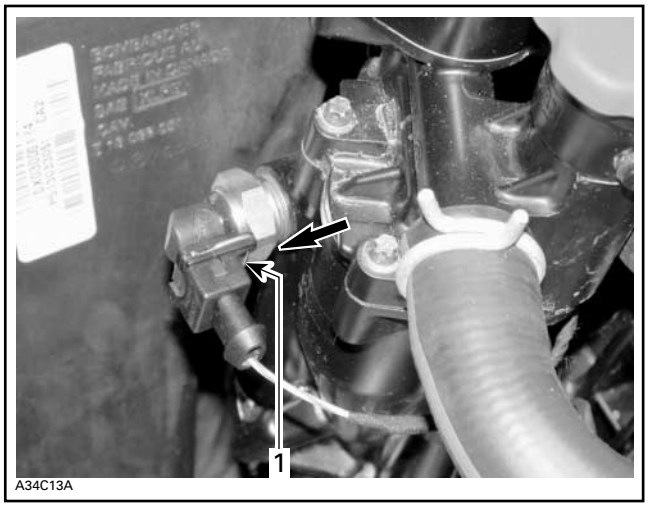
1. Pull here to release

Cut appropriate locking tie(s) and unplug connectors of sensors attached to the engine wiring harness.



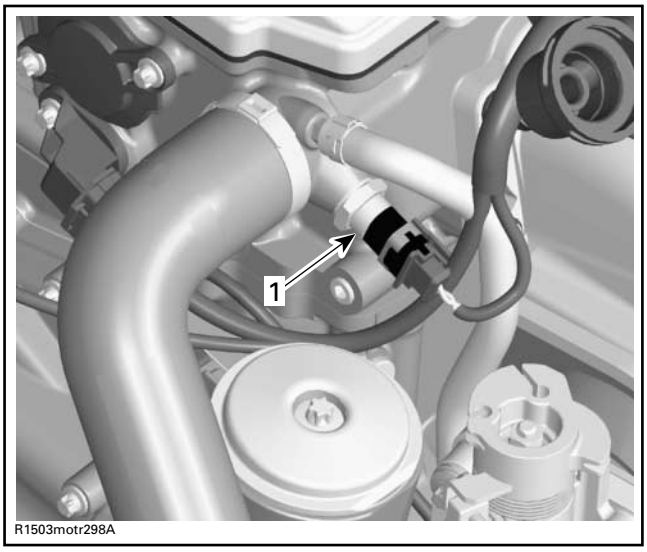
CONNECTORS OVERVIEW
1. Ignition coils
2. OSPS
3. OPS
4. Idle bypass valve
5. Engine connector
6. TPS
7. KS
8. CPS
9. "B"-Connector housing
10. ATS
11. Injectors
12. CTS
13. CAPS
14. RCTS
15. MAPS

Disconnect OSPS connector.



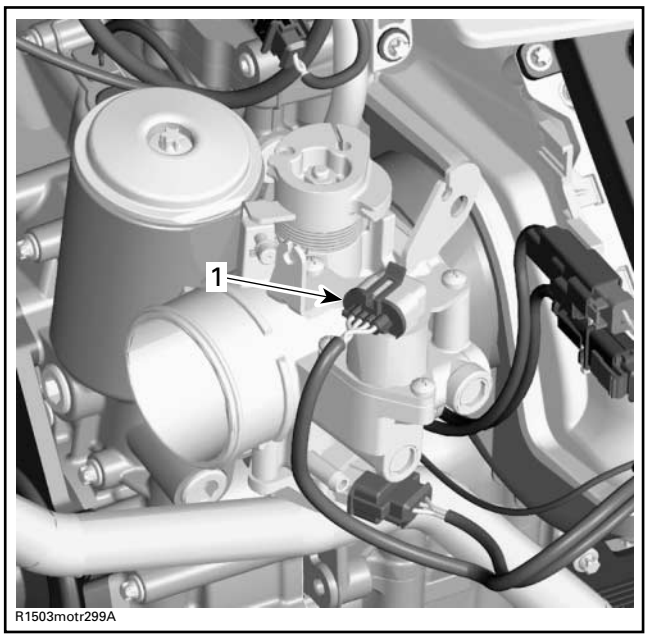
1. Push here with a small screwdriver and hold while pulling connector out

Disconnect CTS connector.



1. CTS connector

Disconnect idle bypass valve connector.

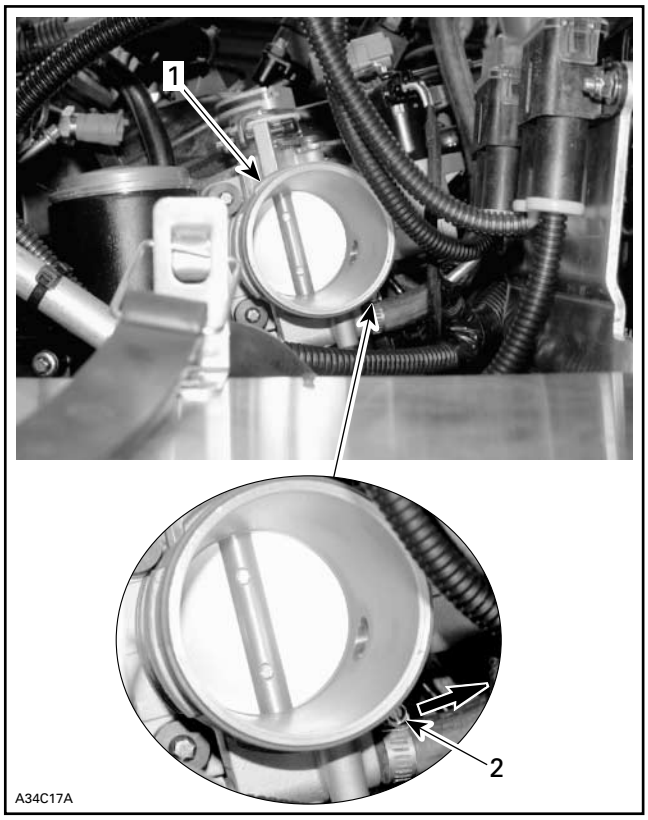


1. Idle bypass valve connector

Slacken coolant hose collar at the front of RH lower screw of throttle body. Move collar away to have access to the screw behind.

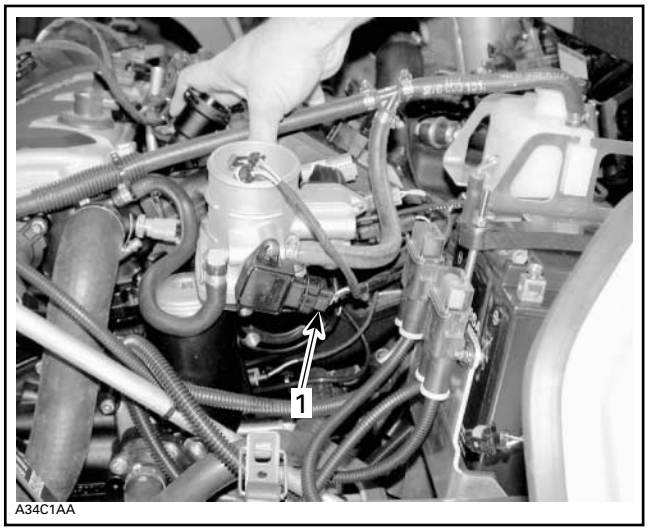
Remove throttle body from intake manifold and move away. Reposition and retighten collar to avoid coolant leakage.

NOTE: Do not disconnect throttle cable.



1. Idle bypass valve
2. Coolant hose collar

Disconnect TPS connector.

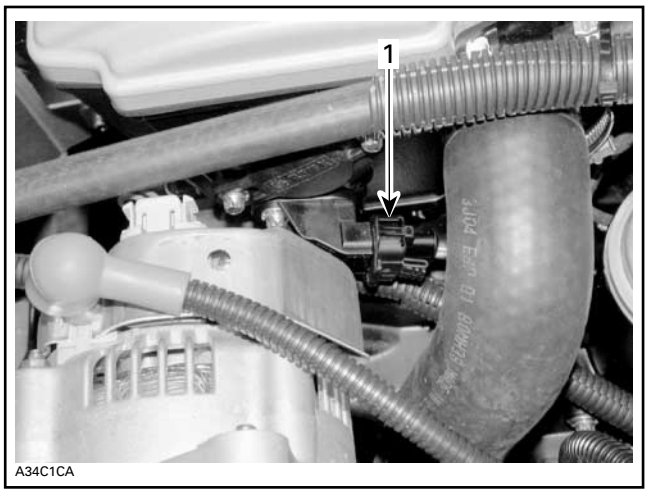


1. TPS connector

Disconnect OPS connector.

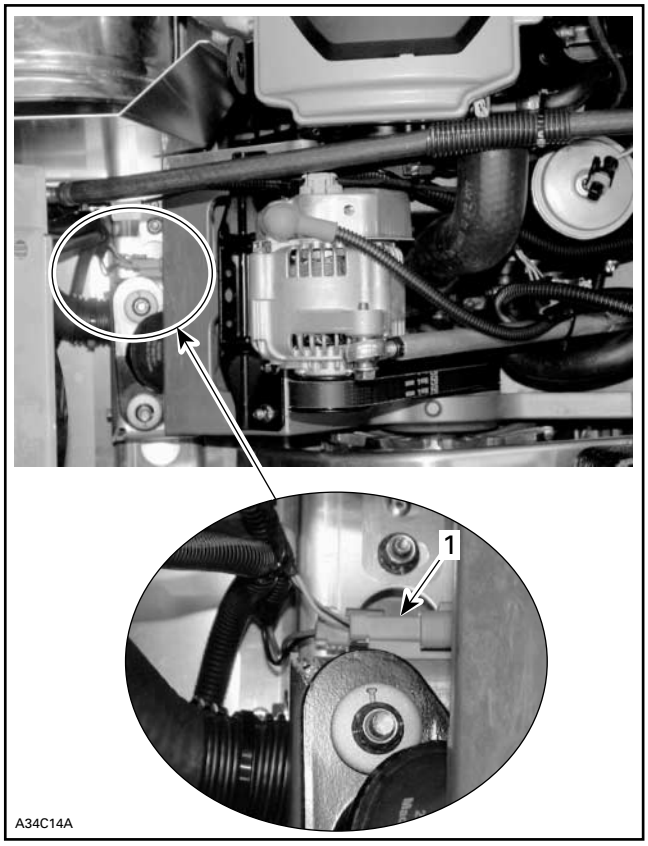
1. OPS connector

Disconnect CAPS connector.



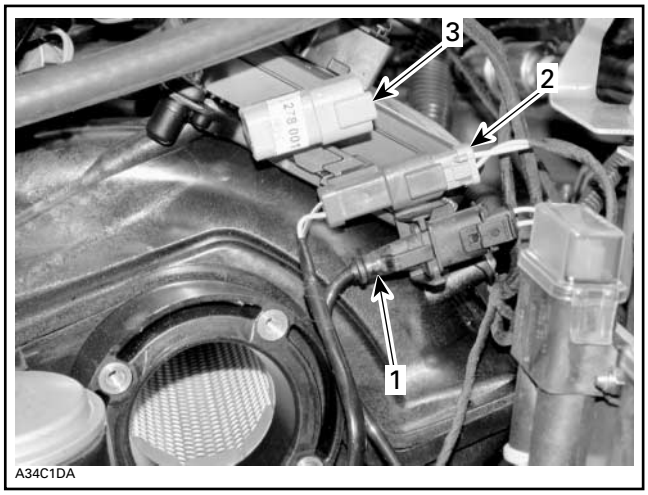
TYPICAL
1. CAPS connector

Disconnect RCTS connector.



1. RCTS connector

Pull the connectors for KS and CPS out of the ECU support. Refer to WIRING DIAGRAMS section. Disconnect KS, CPS and diagnostic connectors.

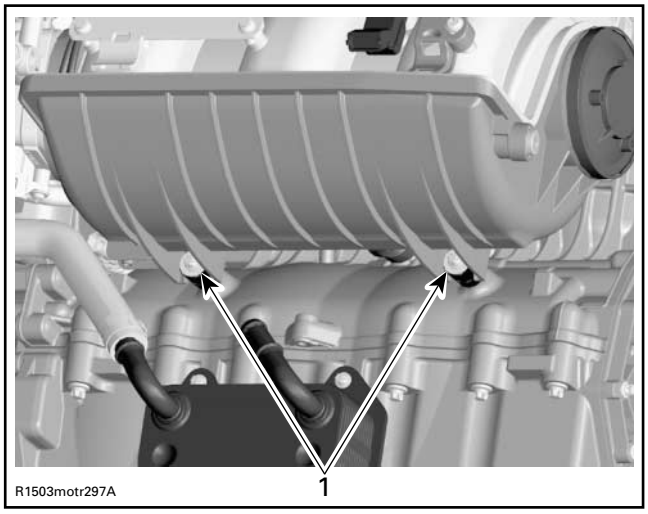


1. KS connector
2. CPS connector
3. Diagnostic connector

Pull EMS wiring harness away from intake manifold.

Remove intake manifold retaining screws and push the oil dipstick tube out of the manifold slot.

Lift intake manifold up to pull it out of the mounting brackets.



1. Mounting brackets

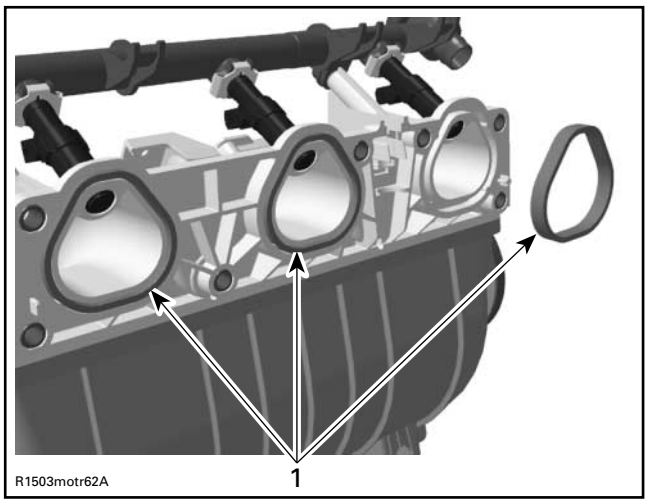
Remove the intake manifold from engine.

NOTE: The flame arrester in intake manifold is maintenance free.

INSTALLATION

Air Intake Manifold

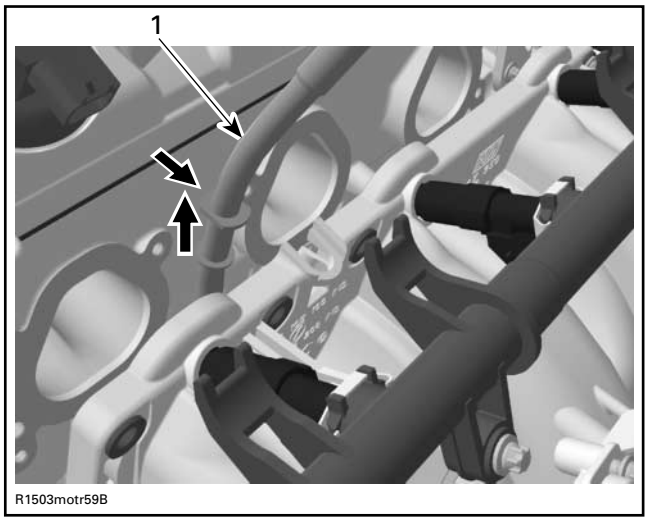
Ensure that all gaskets are properly installed and in a good condition.



INTAKE MANIFOLD
1. Gaskets

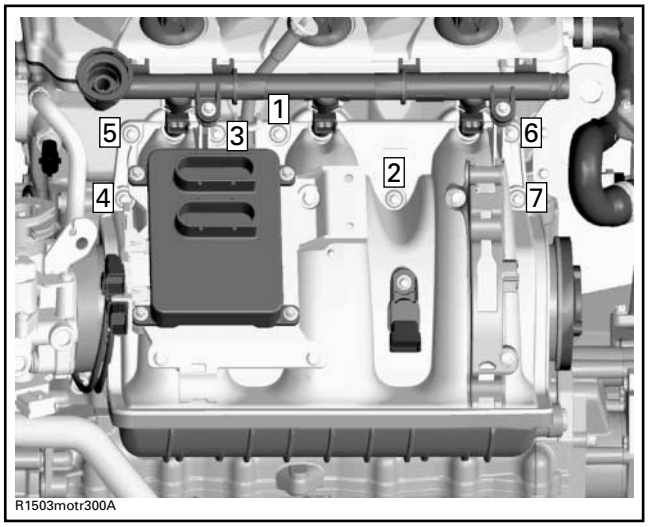
First, position intake manifold on front mounting bracket then push manifold toward engine to then proceed with rear mounting bracket.

When installing the intake manifold, lift up the oil dipstick tube a little bit to fit in the slot of the manifold.



1. Oil dipstick tube

Apply Loctite 243 (blue) on the intake manifold screws. Torque them to 10 N•m (89 lbf•**in**) following the tightening sequence shown.



⚠ WARNING

Always check O-ring for damage such as deformation at reinstallation. Replace the O-ring if it is damaged.

Reinstall remaining parts in the opposite order of their removal and pay attention to the following.

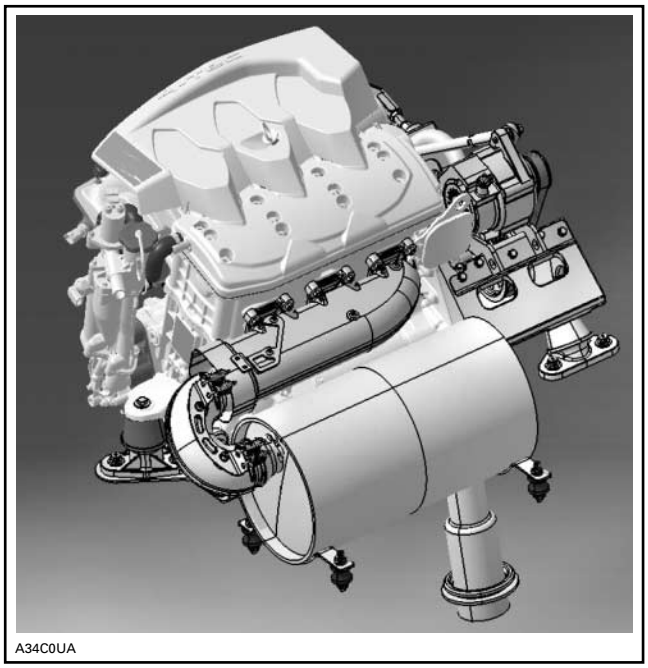
Ensure to properly route and resecure wiring harness with locking ties. Reconnect all connectors.

Properly reconnect battery.

⚠ WARNING

Always connect battery cables exactly in the specified order, RED positive cable first then the BLACK negative battery cable last.

EXHAUST SYSTEM


A34C0UA

TYPICAL

⚠ WARNING

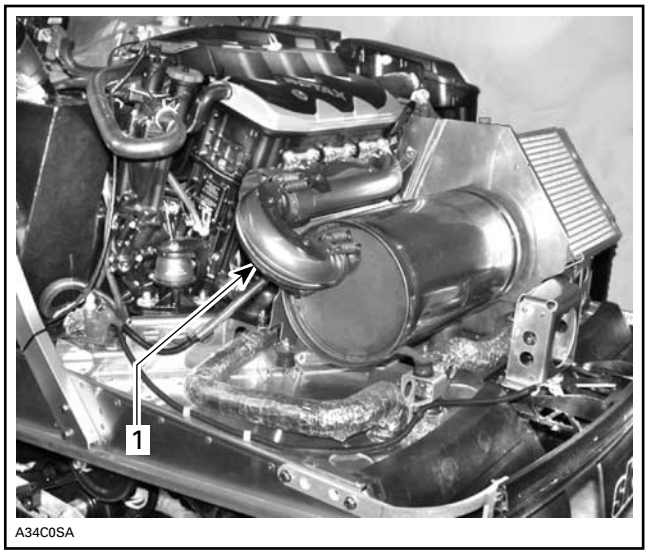
Certain components in the engine compartment may be very hot. Direct contact may result in skin burn. Let exhaust system cool down prior to removing parts.

MUFFLER

Removal

Open hood.

Remove the connecting pipe using exhaust spring remover/installer (P/N 529 035 539).



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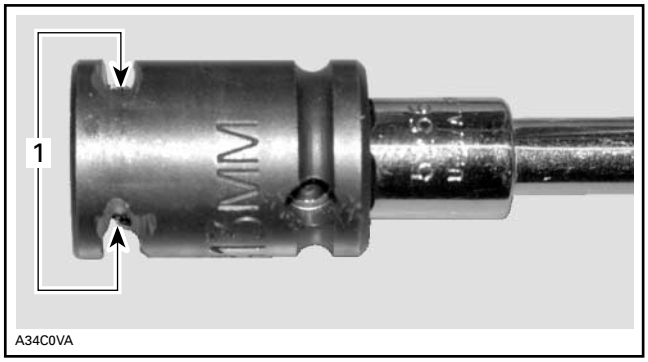
1. Connecting pipe

Unbolt the muffler from its rubber mounts. A 13 mm socket can be modified as per following photos to undo the front right retaining nut.



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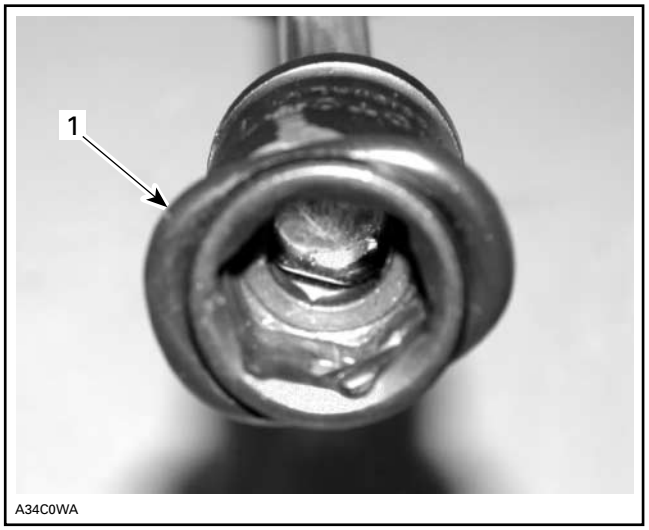
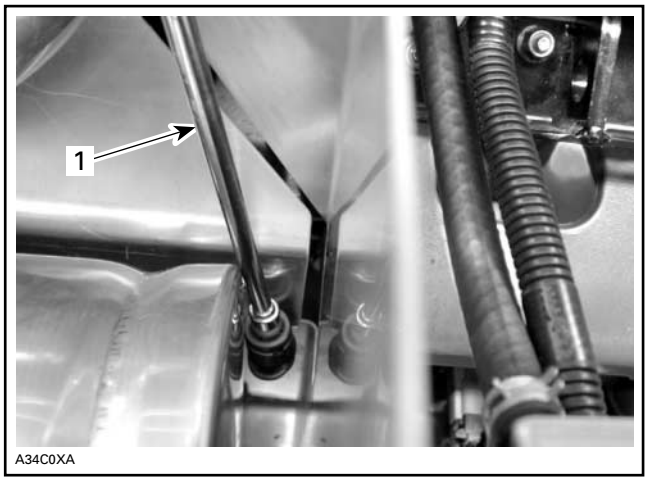
1. One slot each side



1. O-ring in slot to hold the nut



1. 14 inch-drive extension with the modified socket

Remove the muffler.

Inspection

Inspect the muffler and connecting pipe paying attention for cracks or other damage. Check doughnut-shaped exhaust gaskets, coupling areas, heat shield, springs, spring brackets, rubber mounts and tail pipe grommet. Replace any defective part.

Installation

Installation is essentially the reverse of the removal procedures. However, pay particular attention to the following:

Loosely install the muffler on its 4 rubber mounts.

Install the connecting pipe and its springs.

Tighten the muffler rubber mount nuts.

After installation, ensure there is no exhaust gas leak when engine is running.

EXHAUST MANIFOLD

Removal

Remove muffler, then unbolt exhaust manifold.

Inspection

Inspect exhaust manifold paying attention for cracks or other damage. Check contact surfaces. Replace any defective part.

Inspect plane surfaces for warpage. Small deformation can be corrected by grinding surface with a fine sand paper. Install sand paper on a surface plate and rub part against oiled sand paper.

Clean all metal components in a solvent.

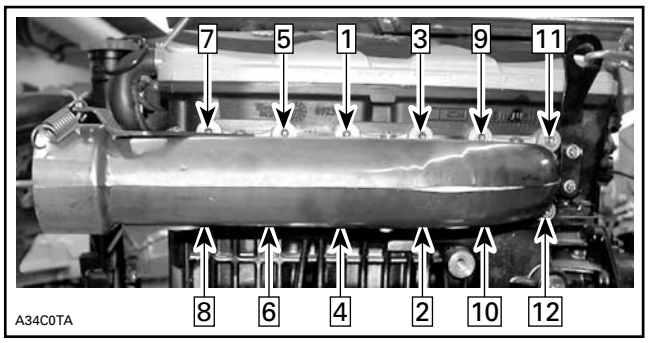
Installation

Installation is essentially the reverse of removal procedures. However, pay particular attention to the following:

Install a new exhaust gasket.

Apply Loctite 518 on threads of screws.

Torque screws to 10 N•m (88 lbf•**in**) as per following illustrated sequence. Repeat the procedure, torquing screws again to 10 N•m (88 lbf•**in**).



After installation, ensure there is no exhaust gas leak when the engine is running.

REMOVAL AND INSTALLATION

ENGINE REMOVAL

Use B.U.D.S. to release fuel pressure. Refer to B.U.D.S. instructions.

Disconnect the BLACK (-) cable from battery.

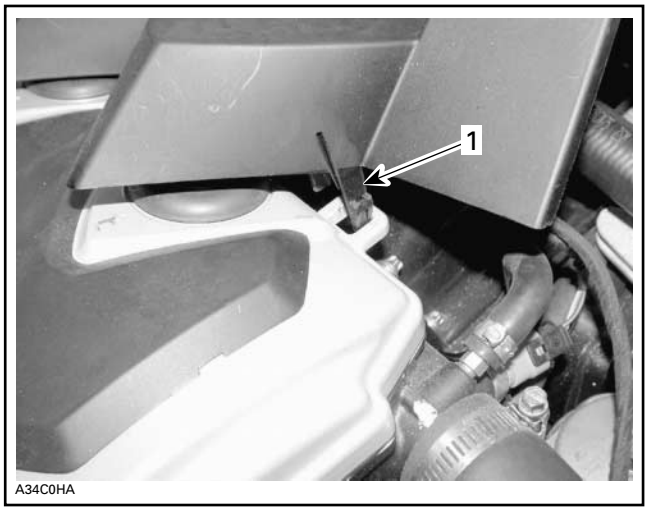
⚠ WARNING

Battery BLACK (-) cable must always be disconnected first and connected last.

⚠ WARNING

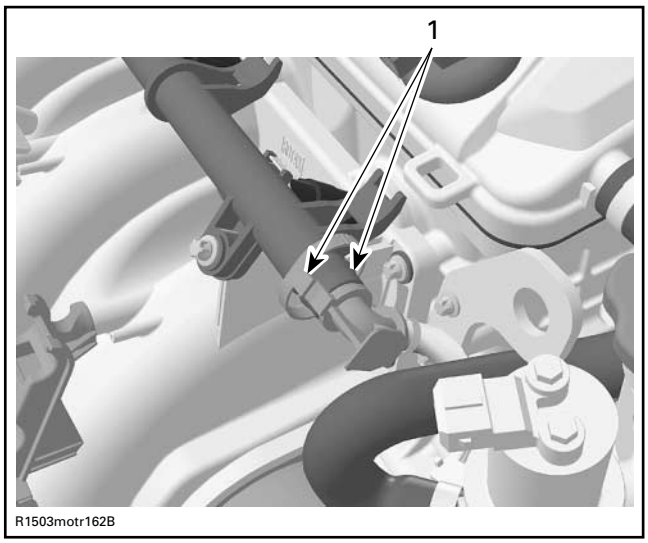
Never charge or boost battery while installed. Battery contains sulfuric acid which is corrosive and poisonous. In case of contact with skin, flush with water and call a physician immediately.

Remove the stick coil cover by unfastening its both tabs from valve cover.



1. RH side tab

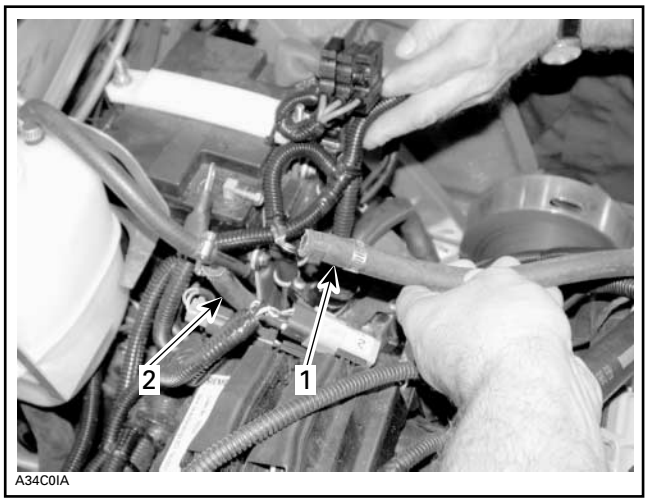
Unplug the fuel supply line by inserting a pointed tool on both sides of fitting.



1. Pointed tools to be inserted here

Siphon coolant from the coolant tank.

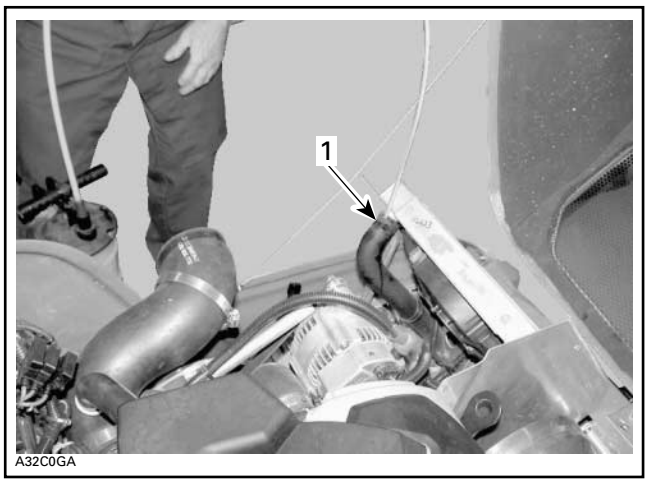
Disconnect the radiator bleed hose and the heated throttle body hose from Y-fitting.



A34C0IA

1. Bleed hose disconnected from Y-fitting
2. Heated throttle body hose

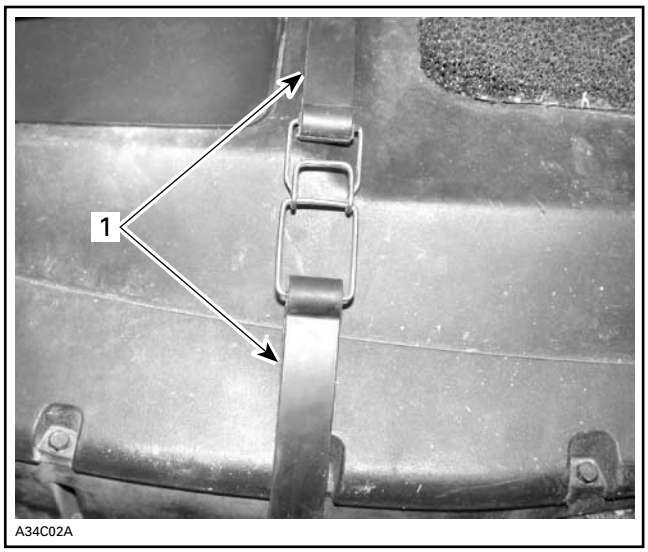
Siphon coolant from the top hose on radiator.



A32C0GA

1. Top hose

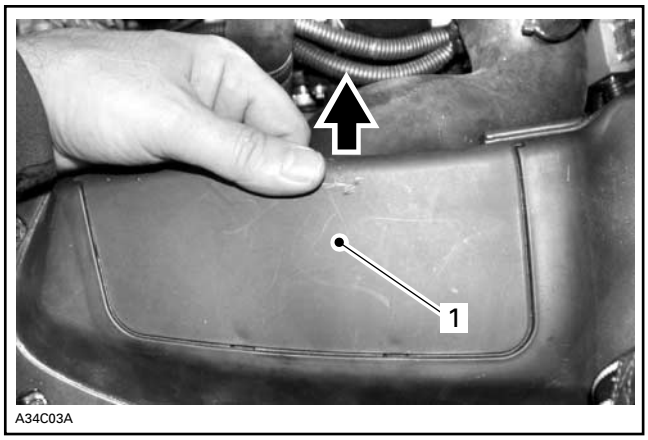
Unfasten air silencer retaining straps.



A34C02A

1. Retaining straps

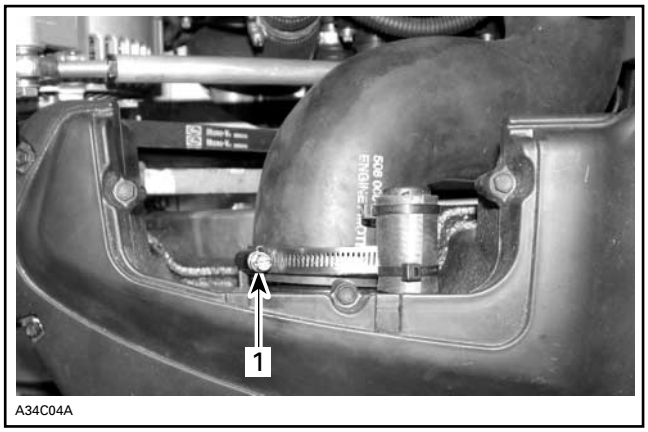
Remove air silencer access panel.



A34C03A

TYPICAL
1. Access panel

Loosen collar.



A34C04A

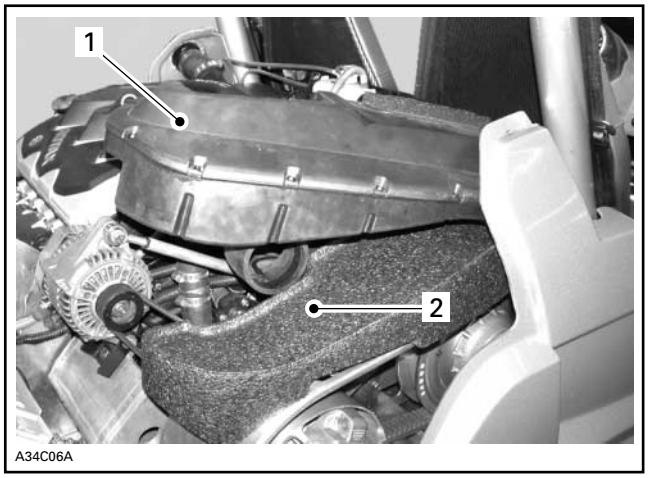
TYPICAL
1. Collar

Disconnect air temperature sensor at rear of air silencer.

A34C05A

TYPICAL
1. Air temperature sensor

Remove air silencer then, formed foam.

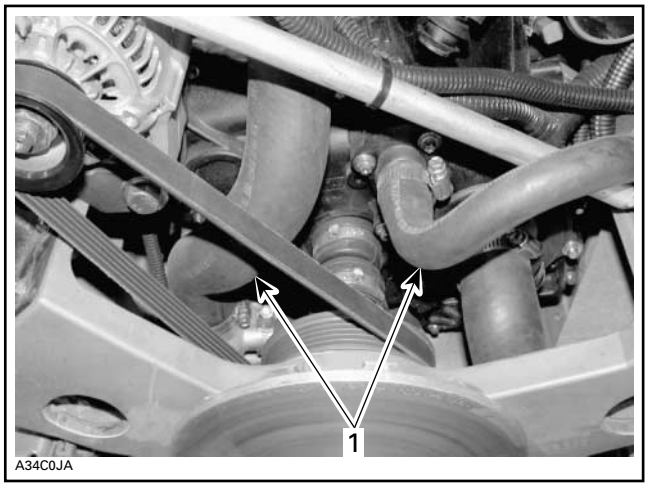


A34C06A

TYPICAL
1. Air silencer
2. Formed foam

Remove the belt guard and the drive pulley.

Disconnect the 2 coolant hoses from RH side of engine and siphon coolant from these hoses.

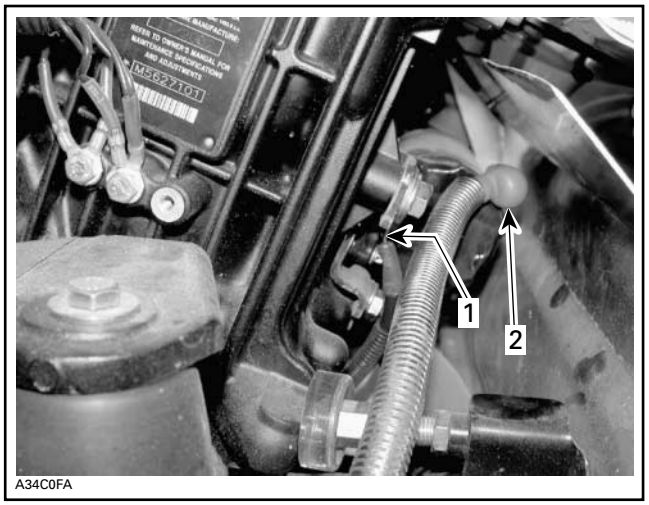


A34C0JA

1. RH side coolant hoses to be disconnected

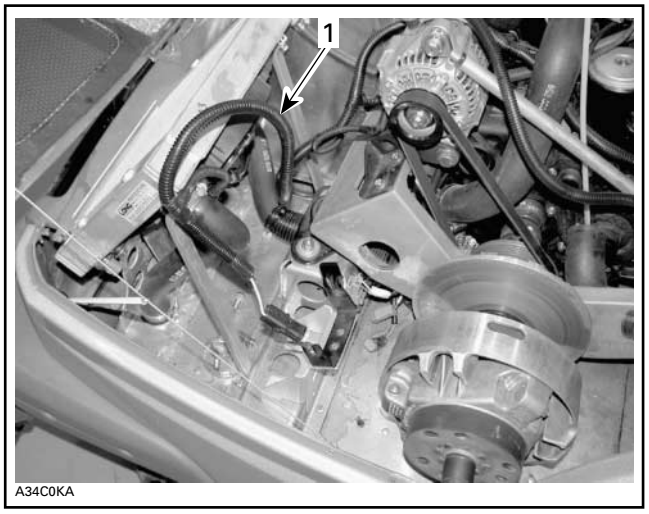
Remove the muffler. Refer to EXHAUST SYSTEM.

Remove the heat shield, then disconnect the BLACK (-) cable from engine block and the RED (+) cable from starter.



TYPICAL
1. *BLACK cable*
2. *RED cable*

Disconnect the radiator wiring harness and move it toward front of vehicle.



1. *Radiator wiring harness*

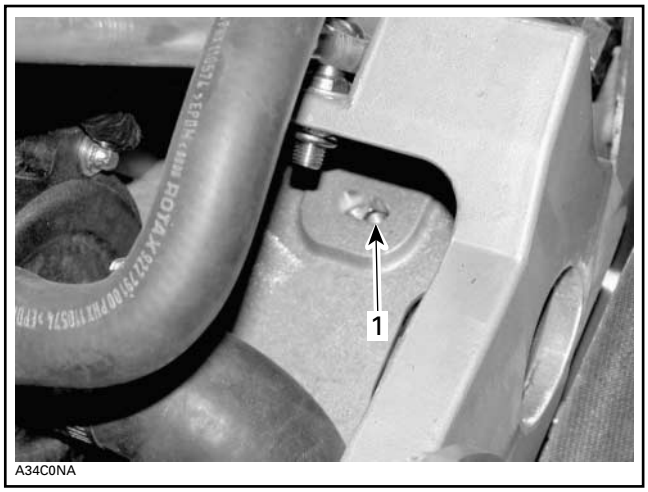
Disconnect the alternator RED cable and the terminal housing.

Disconnect all electrical connectors from the engine including EMS connectors, diagnostic connectors and ground wires.

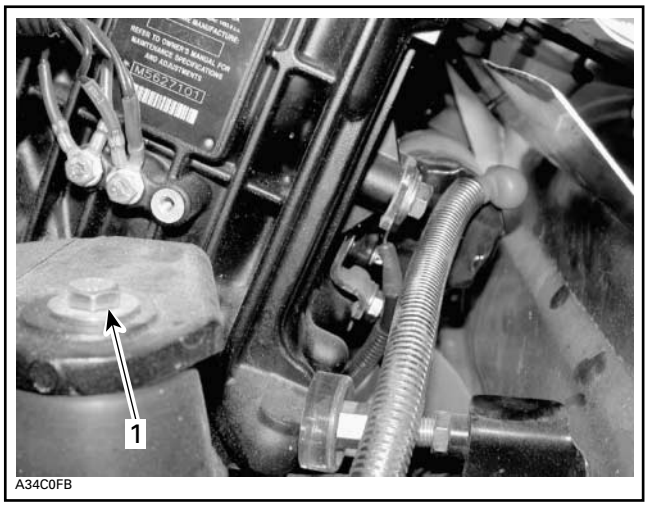
Detach the throttle cable.

Loosen the torque rod on LH side engine mount and the two torque rods on RH side engine mount at front.

Remove all three engine mounts center screws.



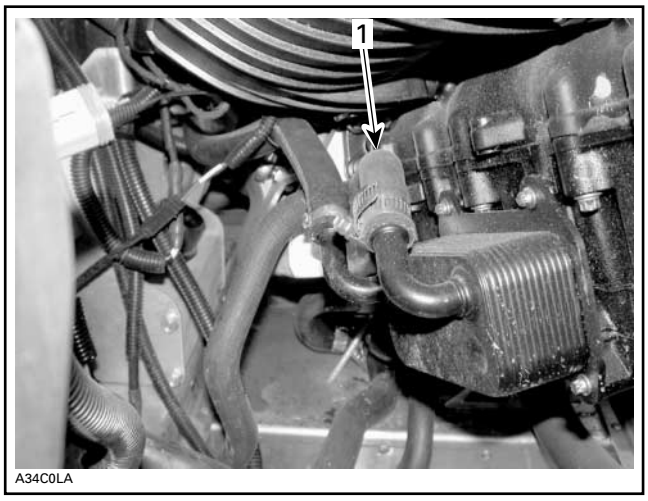
FRONT RH SIDE SHOWN
1. *Engine mount center screw removed*



TYPICAL — LH SIDE SHOWN
1. *Engine mount center screw to be removed*

Slightly lift the engine using an appropriate lifting device.

Disconnect the coolant hose between oil cooler and chassis.



1. Hose to be disconnected

Remove the engine from the vehicle using an appropriate lifting device.

Drive Shaft and Engine Support

Removal

Unbolt the engine support from the engine block.

Disassembly

Remove bearing circlip, then press the drive shaft along with the bearing out of the engine support. Multi-rib pulley will come off the drive shaft at the same time.

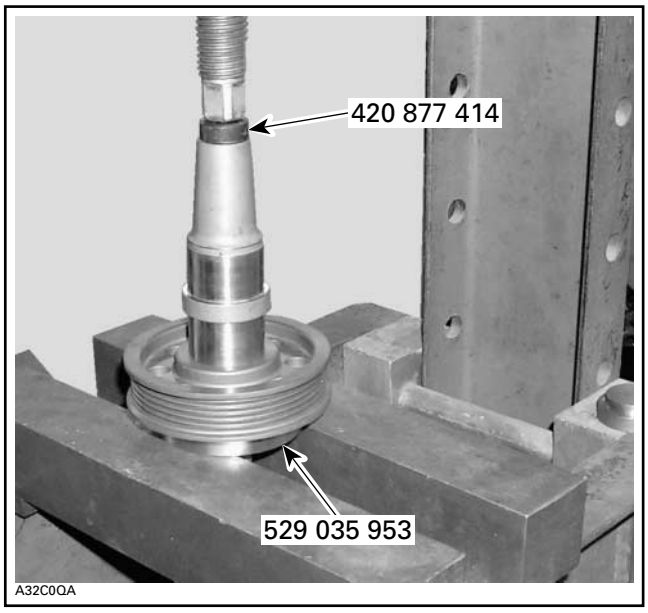
Assembly

Support multi-rib pulley by its center using the recess side of the bearing support (P/N 529 035 953).

NOTE: The multi-rib pulley is symmetric, it can be installed either way.

Protect drive shaft end with protector cap (P/N 420 877 414).

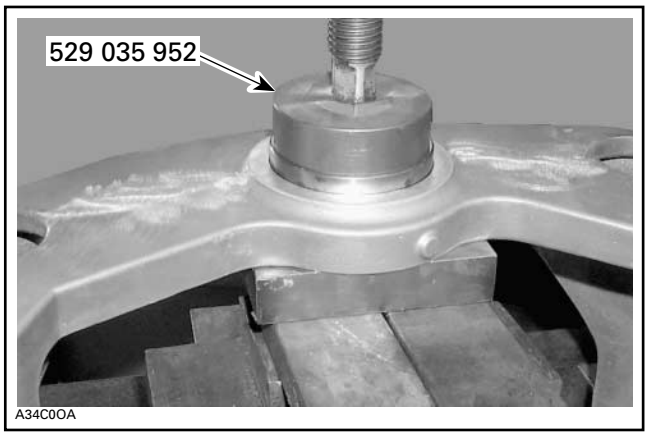
Push drive shaft with its splines first into multi-rib pulley until it bottoms.



CAUTION: Always install a new ball bearing into the engine support.

Position a new ball bearing in the engine support with its drive pin placed outward.

Use engine support bearing installer (P/N 529 035 952) to push the new ball bearing by its outer race into the engine support.



Position bearing support (P/N 529 035 953) against ball bearing as illustrated.

A32C0PA

Turn the engine support upside down and position it on a workshop press. Make sure the bearing support (P/N 529 035 953) is supporting the ball bearing inner race.

Place an aluminum or brass protection cap over splines of drive shaft.

Push the drive shaft into the supported ball bearing.

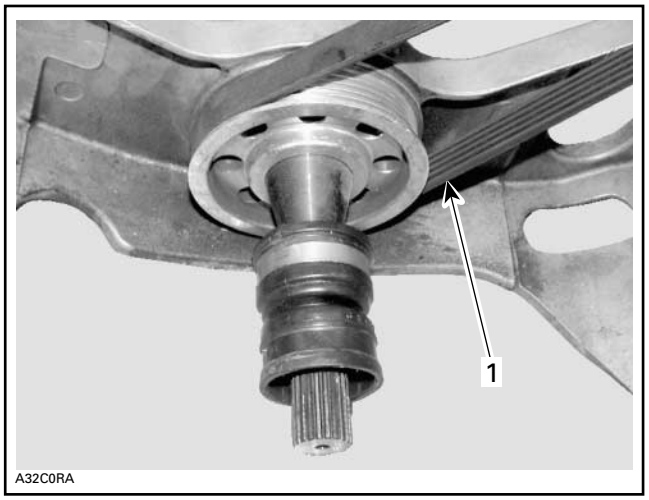
Install ball bearing circlip.

Check for smooth drive shaft turning.

Installation

IMPORTANT: Loosely install the alternator belt on multi-rib pulley before engine support reinstallation.

Remove seal carrier from PTO cover and install it on the drive shaft.



A32C0RA

SEAL CARRIER INSTALLED ON DRIVE SHAFT
1. Alternator belt loosely installed

Loosely install a new collar on the seal carrier.

Once engine support is installed on the engine, fasten the new collar to secure seal carrier boot to PTO housing.

ENGINE INSTALLATION

Before engine installation make sure the engine rubber mounts are in good condition. If not, replace damaged parts.

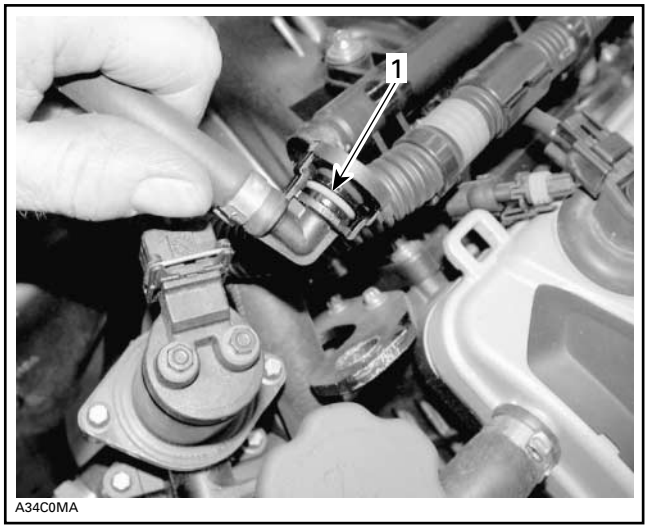
To install engine on vehicle, reverse removal procedure. However, pay attention, to all appropriate component/system reinstallation procedures described throughout this Shop Manual and to the following:

Check pulley alignment and drive belt height.

NOTE: No sealant required on doughnut shaped exhaust gasket.

⚠ WARNING

Install a new O-ring on fuel supply connector. Refer to appropriate model-year Parts Catalog for the proper O-ring to be installed. Do not substitute this O-ring with any other including the one from SEA-DOO 1503 engine.

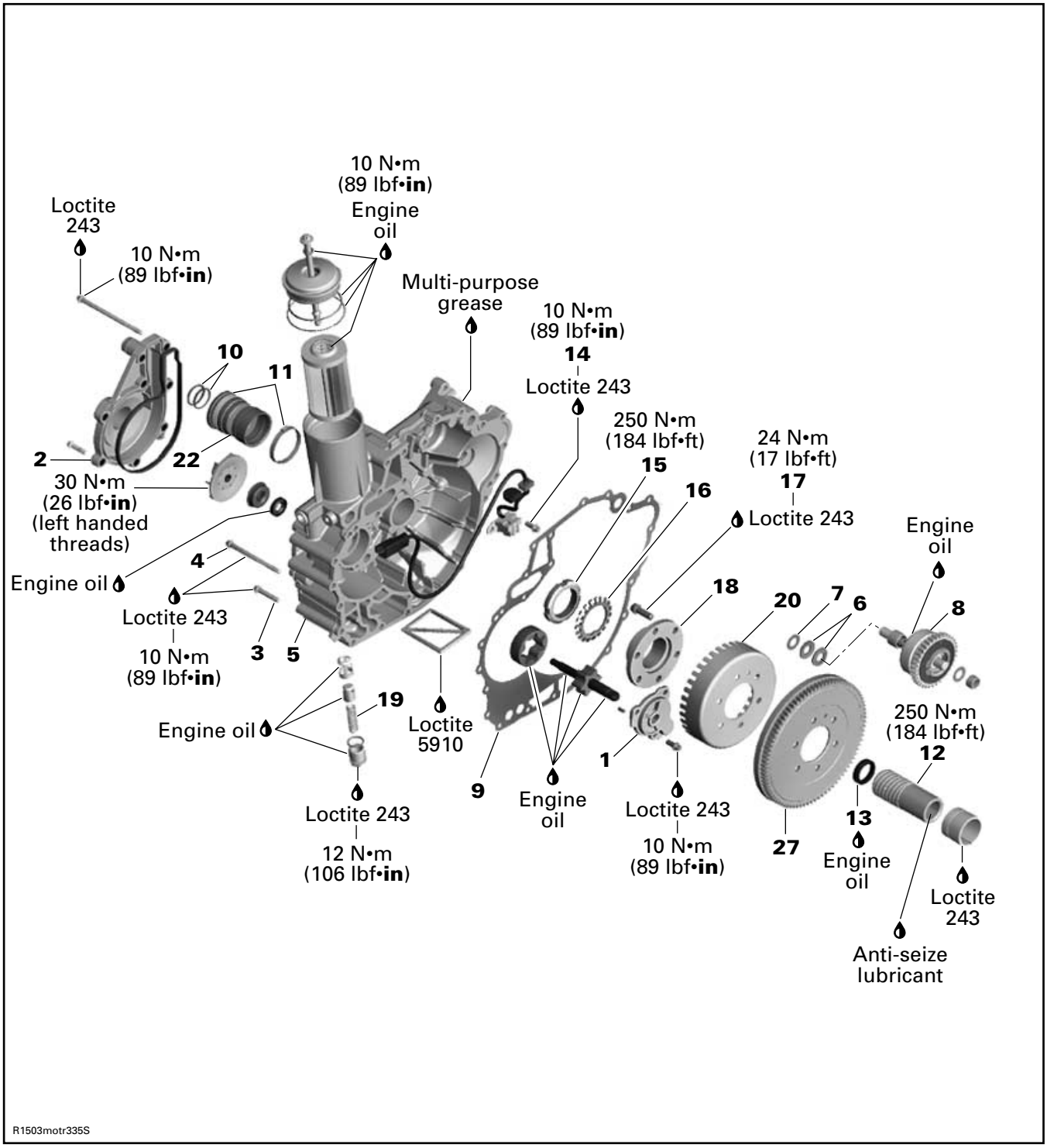


A34C0MA

1. O-ring on fuel supply connector

Do not forget to connect air temperature sensor to air silencer otherwise a trouble code will appear.

PTO HOUSING


10 N•m
(89 lbf•in)
Engine
oil
Loctite
243
10 N•m
(89 lbf•in)
Multi-purpose
grease
10 N•m
(89 lbf•in)
14
Loctite 243
250 N•m
(184 lbf•ft)
15
24 N•m
(17 lbf•ft)
17
Loctite 243
16
10
11
2
22
30 N•m
(26 lbf•in)
(left handed
threads)
Engine oil
4
Loctite 243
10 N•m
(89 lbf•in)
3
5
18
20
7
6
8
Engine
oil
19
Engine oil
Loctite
5910
9
Engine
oil
1
Loctite 243
10 N•m
(89 lbf•in)
27
250 N•m
(184 lbf•ft)
12
13
Engine
oil
Loctite
243
Loctite 243
12 N•m
(106 lbf•in)
Anti-seize
lubricant
R1503motr335S

GENERAL

Clean threads before using Loctite when installing the CPS.

PTO HOUSING

Removal

NOTE: When drive shaft will be removed, some oil will flow out. To prevent it, start engine, run at 4000 RPM for 10 seconds and stop engine at this RPM. This will move oil out of PTO housing into oil tank.

CAUTION: Never run engine without being connected to the cooling system.

Drain engine oil. Refer to LUBRICATION in ENGINE section.

Place a small pan under PTO housing to prevent spillage. Up to 250 mL (8 oz) of oil could flow out when removing PTO housing.

Disconnect battery cables.

⚠ WARNING

Always disconnect battery or starter cables exactly in the specified order, BLACK negative cable first. Disconnect electrical connections prior to disconnecting fuel lines.

Remove:

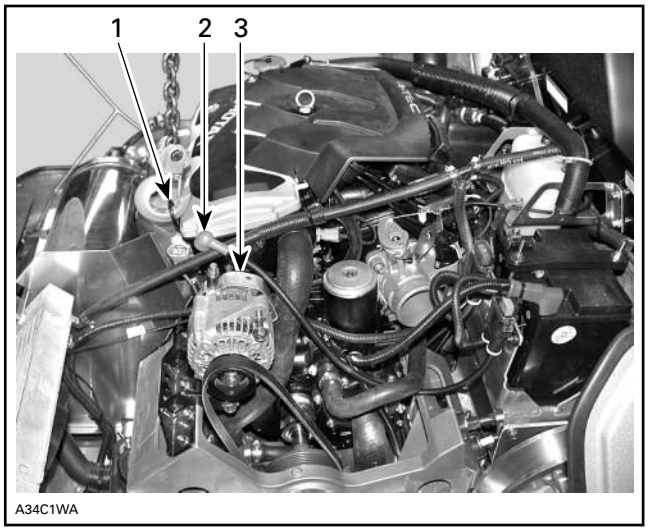
– ATS from air intake silencer
– air intake silencer from throttle body

1. Air intake silencer
2. ATS connector

– formed foam
– drive and driven pulleys (refer to TRANSMISSION).

Support RH side of engine with a lifting device.

Disconnect alternator RED cable and connector.



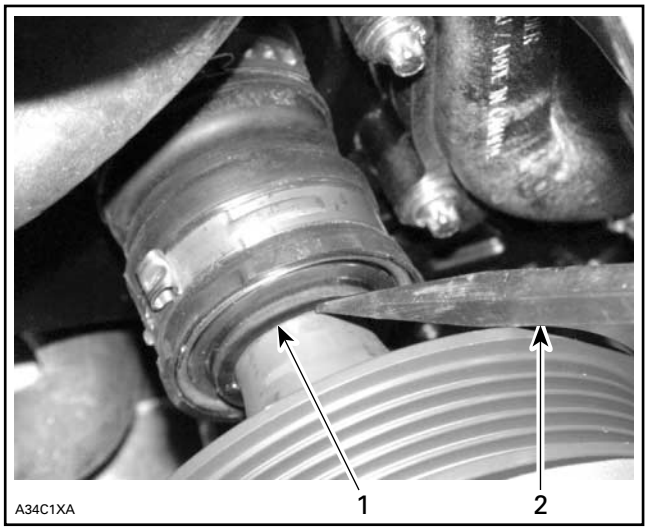
1. Slightly lift engine here to release pressure on engine support
2. Alternator RED cable
3. Connector

Loosen alternator belt and remove its tie rod.

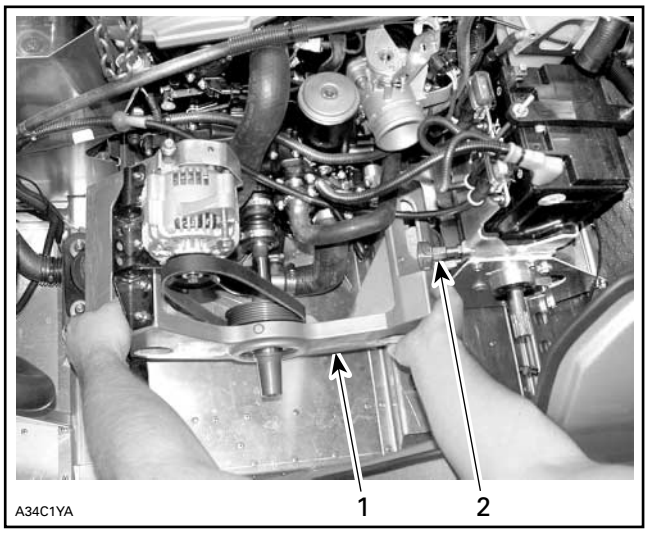
Slacken torque pads.

Unbolt engine support (with drive shaft) from engine block and engine mounts. Pull engine support out.

NOTE: To release PTO seal from drive shaft, it may be necessary to gently tap flange of PTO seal with a screwdriver and a hammer.



1. PTO seal flange
2. Screwdriver



1. Engine support
2. Torque pads

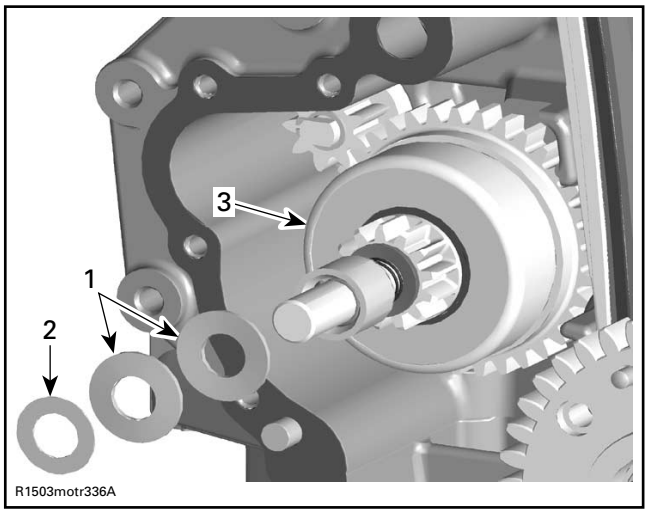
Disconnect CPS from wiring harness.

Remove screws **no. 3** and **no. 4**.

NOTE: Carefully separate the PTO housing from the engine using two flat screwdrivers prying equally at the same time. Proceed slowly so that starter gear disc springs **no. 6** and washer **no. 7** do not fall down.

Remove PTO housing **no. 5**.

CAUTION: Ensure to use prying lugs to separate PTO housing to prevent damaging contact surface.



1. Disc springs
2. Washer
3. Starter drive gear

Remove gasket **no. 9**.

Inspection

Check PTO housing for cracks or other damages. Replace if necessary.

Installation

NOTE: Clean all metal component in a non-ferrous metal cleaner.

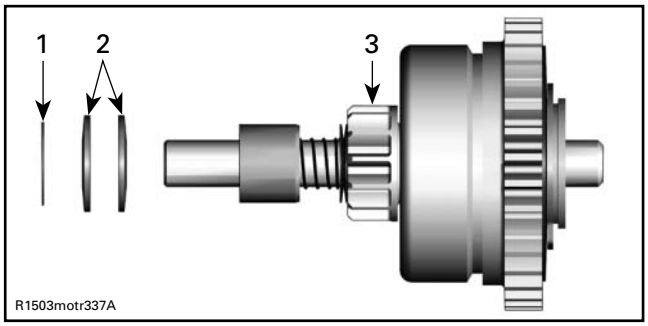
⚠ WARNING

Wear safety glasses and work in a well ventilated area when working with strong chemical products. Also wear suitable non-absorbent gloves to protect your hands.

For installation, reverse the removal procedure. However, pay attention to the following.

NOTE: Turn the oil/coolant pump shaft in the right position to fit into the balance shaft.

Position the disc springs **no. 6** and washer **no. 7** as per the following illustration.

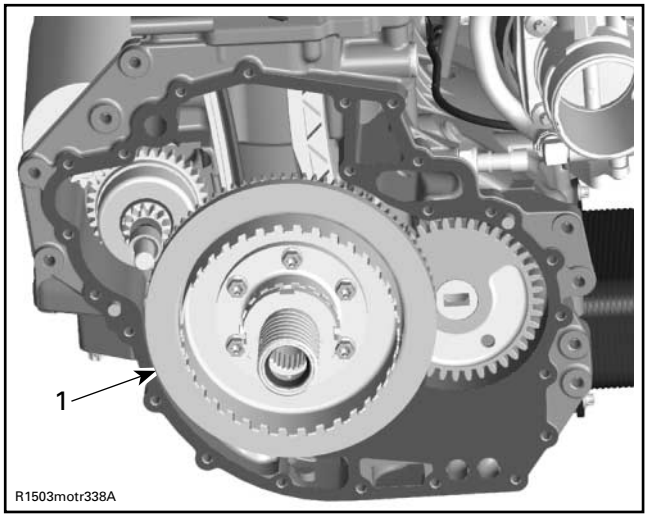


1. Washer
2. Disc spring
3. Starter drive ass'y

CAUTION: Ensure the starter drive gear shaft is well engaged in its bore.

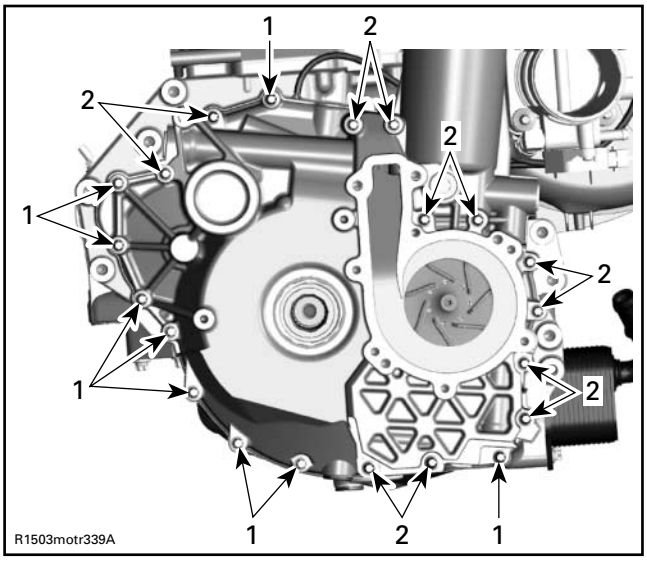
Gently install PTO housing.

CAUTION: While installing housing, pay particular attention that gasket does not get pinched or slide out of its contact surface in the area shown in the following illustration. Never force to install cover. If there is a strong resistance, remove housing and check oil/coolant pump alignment and starter gear alignment.



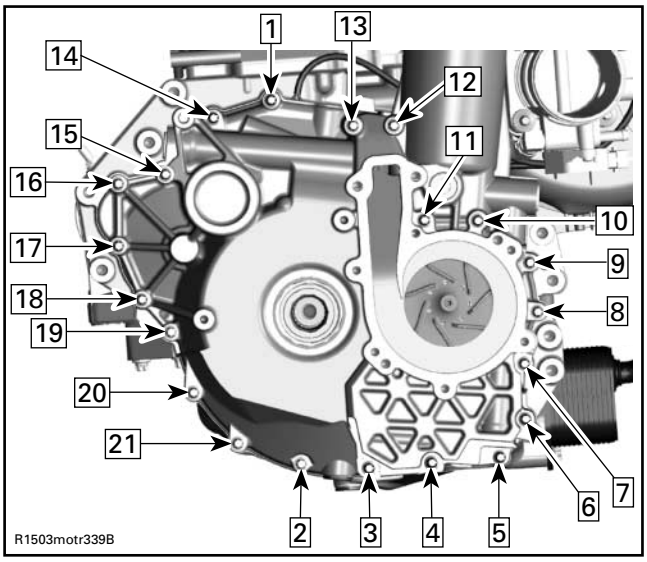
1. Pay attention that gasket remains properly positioned on this surface

Refer to the following illustration for proper installation of screws.



1. Screws M6 x 35
2. Screws M6 x 85

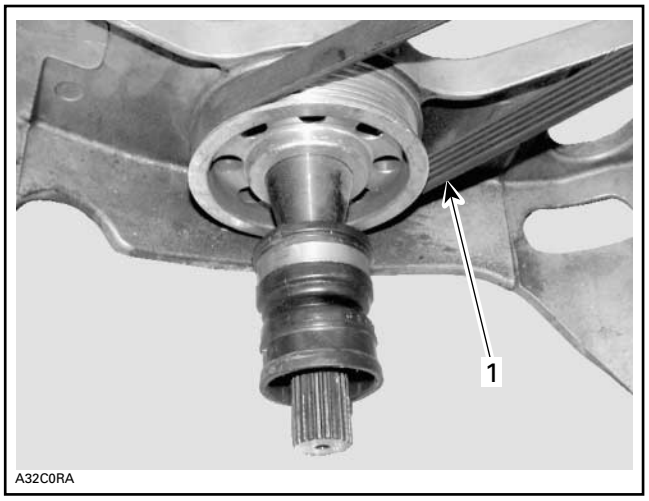
Tightening sequence for screws on PTO housing is as per following illustration.



Ensure torque pads are in place before reinstalling engine support.

IMPORTANT: Ensure the alternator belt is installed on multi-rib pulley before engine support reinstallation.

Remove seal carrier from PTO cover and install it on the drive shaft.



SEAL CARRIER INSTALLED ON DRIVE SHAFT
1. Alternator belt loosely installed

Loosely install a new collar on the seal carrier.

Reinstall engine support (with drive shaft).

NOTE: While installing engine support, turn drive shaft to mesh splines.

Fasten the new collar to secure seal carrier boot to PTO housing.

Secure engine support to engine block first, then secure to engine mounts.

Refill engine with oil. Refer to ENGINE section.

Align drive and driven pulleys. Refer to TRANSMISSION.

Adjust alternator belt tension. Refer to ELECTRICAL SYSTEM.

PTO SEAL

Inspection

Check the PTO seal **no. 22** and O-rings **no. 10** on the PTO housing. If brittle, hard or damaged, or if you see a sign of oil leakage, replace it.

Removal

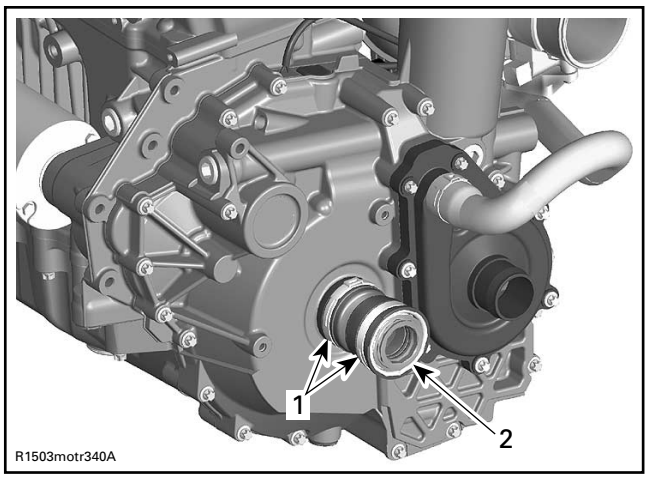
NOTE: When drive shaft will be removed, some oil will flow out. To prevent it, start engine, run at 4000 RPM for 10 seconds and stop engine at this RPM. This will move oil out of PTO housing into oil tank.

CAUTION: Never run engine without being connected to the cooling system.

Place a small pan under PTO housing to prevent spillage. If spillage occurs, clean immediately with the pulley flange cleaner (P/N 413 711 809) to prevent oil stains.

Remove:

– engine support (with drive shaft). See above in PTO HOUSING
– Oetiker clamp **no. 11** located close to the PTO housing
– PTO seal **no. 22**.



1. Oetiker clamps
2. PTO seal

Installation

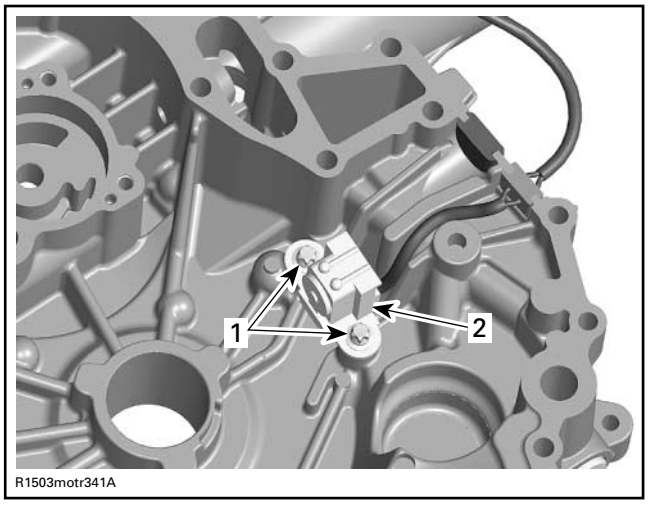
Reinstall removed parts in the reverse order.

CPS

Removal

Remove:

– PTO housing (refer to PTO HOUSING REMOVAL elsewhere in this section)
– screws **no. 14**
– grommet on CPS cable from housing
– CPS.



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1. CPS screws
2. CPS

Inspection

Check CPS condition. If damaged replace the faulty part.

For electrical inspection, refer to ENGINE MANAGEMENT for the CPS.

Installation

For installation, reverse the removal procedure. However, pay attention to the following.

NOTE: Apply Loctite 243 on threads. Torque CPS screws to 10 N•m (89 lbf•**in**).

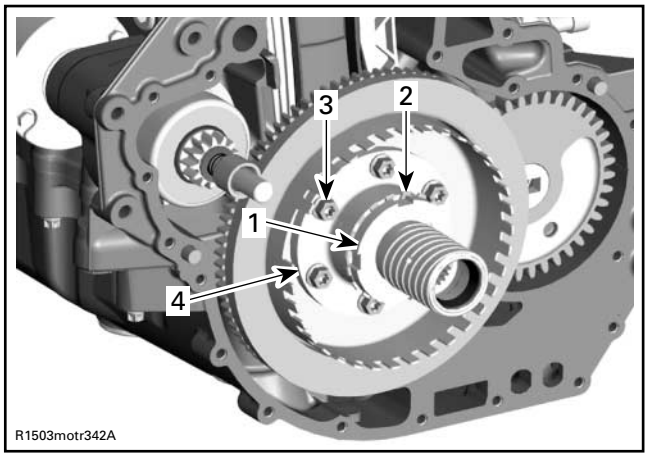
ADAPTER SLEEVE AND FLANGE COUPLING

Removal

Lock crankshaft with locking tool (P/N 529 035 821). Refer to CRANKSHAFT LOCKING in ENGINE BLOCK subsection.

Remove:

– PTO housing
– nut **no. 15** using 4-tooth sprocket (P/N 529 035 960)
– retaining ring with lug **no. 16**
– hexagonal screws **no. 17**
– flange coupling **no. 18**.



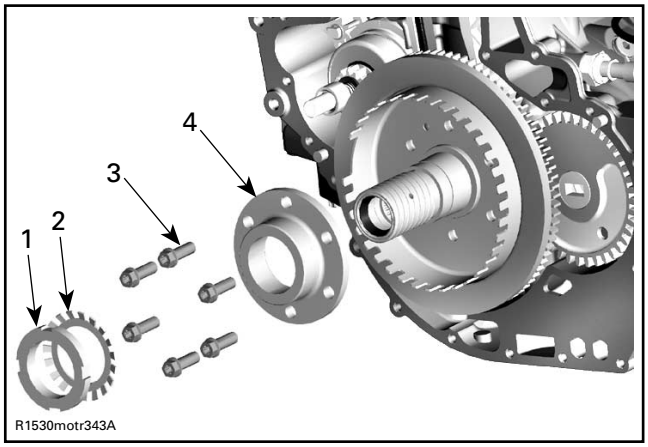
R1503motr342A

1. Nut
2. Retaining ring with lug
3. Hexagonal screws
4. Flange coupling

NOTE: Carefully remove the flange coupling **no. 18** using torque flange remover (P/N 529 035 958).

Inspection

Check nut, retaining ring with lug and flange coupling condition. If damaged, replace faulty part.



R1530motr343A

1. Nut
2. Retaining ring with lug
3. Hexagonal screws
4. Flange coupling

Installation

For installation, reverse the removal procedure. However, pay attention to the following.

Use Loctite 243 on the cone at the flange coupling, push flange coupling on adapter sleeve and align the hole pattern. Apply Loctite 243 on threads. Tighten the hexagonal screws and nut by hand to help centering. First torque hexagonal screws to 24 N•m (18 lbf•ft).

Torque nut to 250 N•m (184 lbf•ft) and secure nut with the retaining ring with lug.

COUPLING

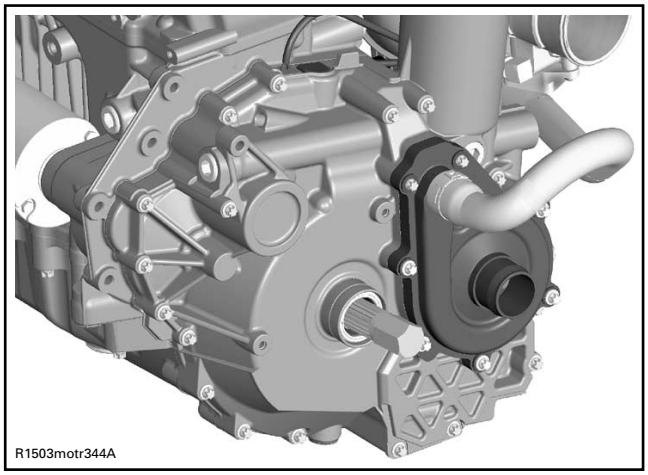
Removal

Lock crankshaft with locking tool (P/N 529 035 821). Refer to CRANKSHAFT LOCKING in ENGINE BLOCK subsection.

Remove:

– PTO housing
– nut **no. 15**
– retaining ring with lug **no. 16**
– hexagonal screws **no. 17**
– flange coupling **no. 18**
– coupling **no. 12** using impeller remover/installer (P/N 529 035 820).

CAUTION: Apply some oil on the tool to protect the seal located in the PTO coupling.

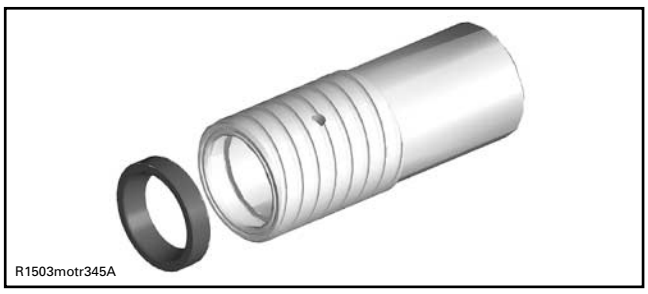

R1503motr344A

Inspection

Check if seal **no. 13** is brittle, cracked or hard.

Check coupling for worn splines.

If damaged, replace faulty part.


R1503motr345A

Installation

For installation, reverse the removel procedure.

Torque PTO coupling to 250 N•m (184 lbf•ft). Apply Loctite 648 on threads.

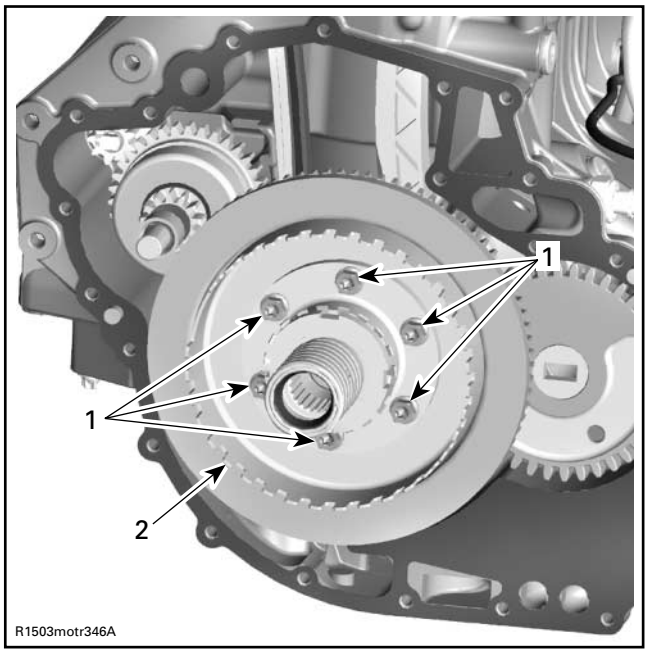
ENCODER WHEEL

Removal

Lock crankshaft with locking tool (P/N 529 035 821). Refer to CRANKSHAFT LOCKING in ENGINE BLOCK subsection.

Remove:

– PTO housing
– nut **no. 15**
– retaining ring with lug **no. 16**
– hexagonal screws **no. 17**
– flange coupling **no. 18**
– encoder wheel **no. 20**.



R1503motr346A

TYPICAL
1. Hexagonal screws
2. Encoder wheel

Inspection

Check bent teeth and encoder wheel condition. If damaged, replace faulty part.

Installation

For installation, reverse the removal procedure. However, pay attention to the following.

Encoder wheel position has to be located with the location pin on the crankshaft gear.

Apply Loctite 243 on threads. Torque rotor screws to 24 N•m (17 lbf•ft).

RING GEAR

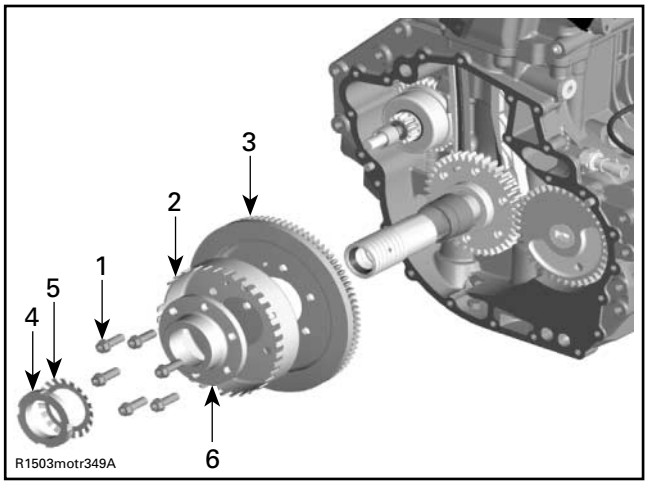
Removal

Lock crankshaft with locking tool (P/N 529 035 821). Refer to CRANKSHAFT LOCKING in ENGINE BLOCK subsection.

Remove:

– PTO housing cover
– hexagonal screws **no. 17**
– nut **no. 15**
– retaining ring with lug **no. 16**
– flange coupling **no. 18**
– encoder wheel **no. 20**
– ring gear **no. 21**.

Withdraw encoder wheel **no. 20** and ring gear **no. 21**.



1. Hexagonal screws
2. Encoder wheel
3. Ring gear
4. Nut
5. Retaining ring with lug
6. Flange coupling

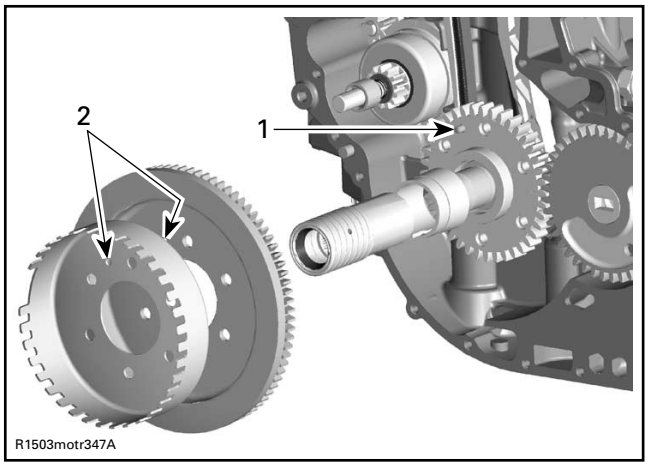
Inspection

Check ring gear condition, especially teeth condition. If damaged, replace faulty part.

Installation

For installation, reverse the removal procedure. However, pay attention to the following.

Ring gear and encoder wheel position has to be located with the location pin on the crankshaft gear.



1. Location pin
2. Location pin holes

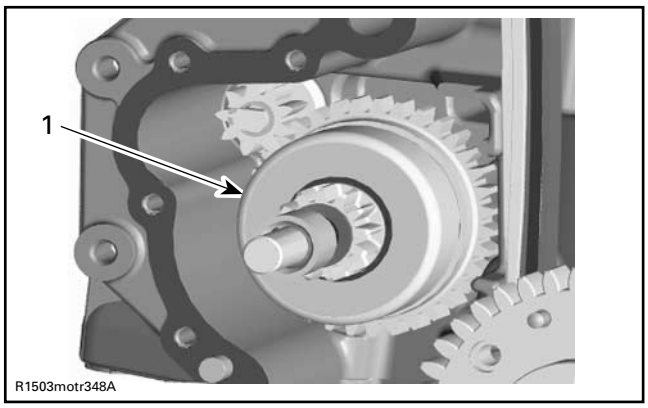
Apply Loctite 243 on threads. Torque rotor screws to 24 N•m (17 lbf•ft)).

STARTER DRIVE ASS'Y

Removal

Remove:

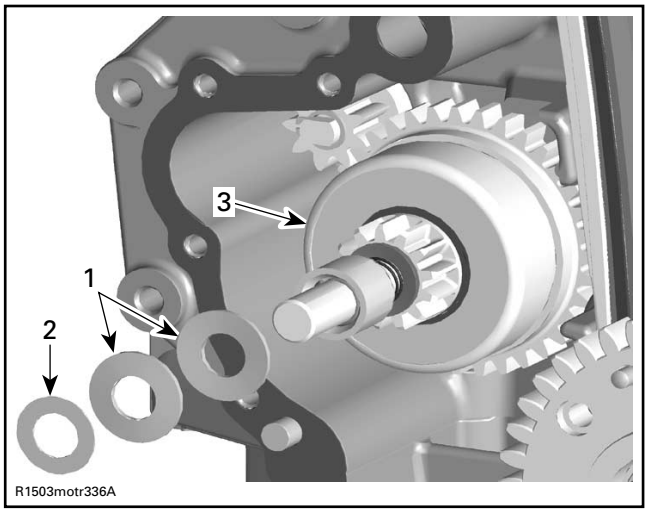
– PTO housing and ring gear as described above
– starter drive ass'y **no. 8**.



1. Starter drive ass'y

NOTE: The starter drive ass'y cannot be removed without removing the ring gear.

CAUTION: Be careful not to lose the distance washer, disc springs no. 6 and washer no. 7 located on the starter drive shaft.



1. Disc springs
2. Washer
3. Starter drive gear

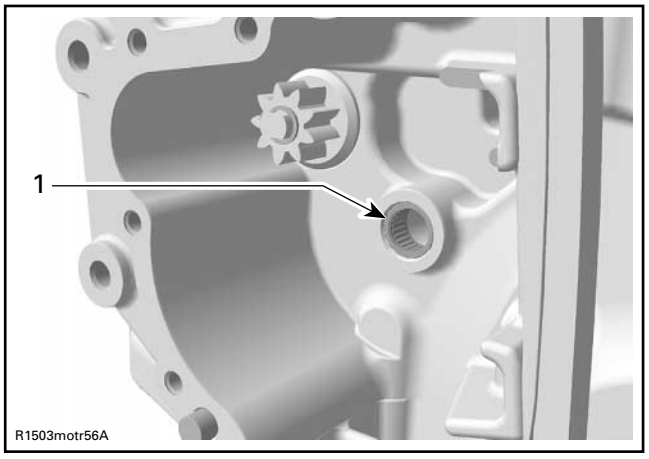
Inspection

Check condition of the teeth, shaft, etc. and if the sprag clutch operates well. If damaged, replace faulty part.

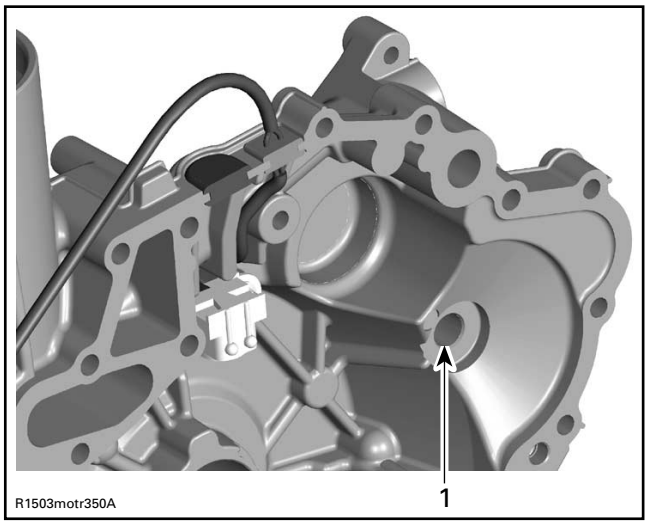
Installation

For installation, reverse the removal procedure. However, pay attention to the following.

Apply some Isoflex Topas NB52 grease (P/N 293 550 021) on the starter drive bearing located in the engine block and on the starter drive support in the PTO housing cover.



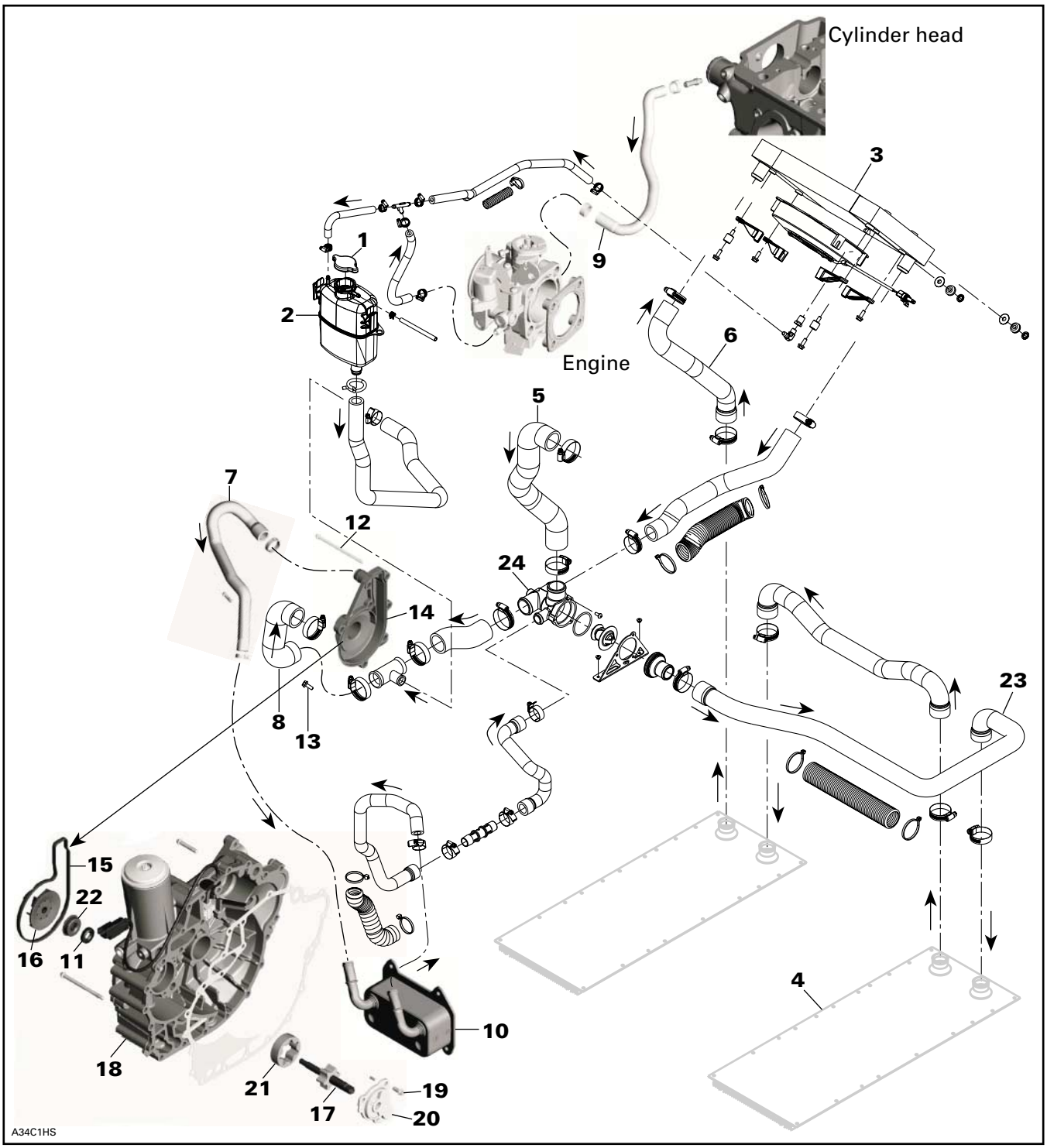
1. Starter drive bearing



1. Starter drive support

CAUTION: Be sure not to forget the distance washer, disc springs and washer on the starter drive shaft when assembling.

COOLING SYSTEM



GENERAL

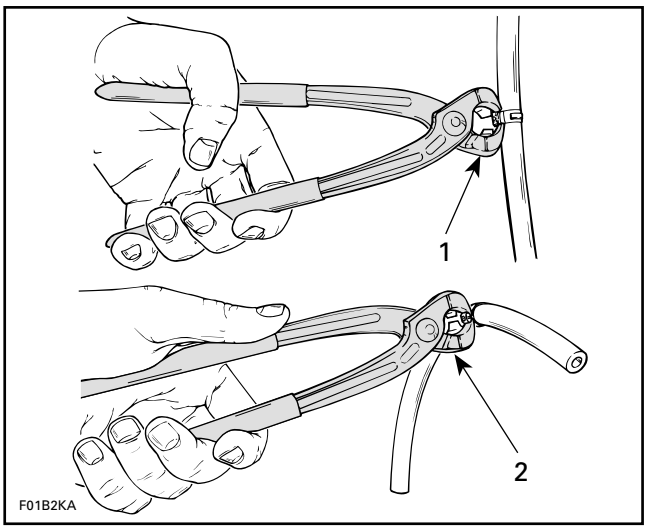
CAUTION: All hoses and fittings of the cooling system have calibrated inside diameters to assure proper cooling of the engine. Always replace using appropriate Bombardier part number.

CAUTION: Never modify cooling system arrangement, otherwise serious engine damage could occur.

Refer to exploded view for coolant flow in circuit.

Clamp

To cut or secure non-reusable Oetiker clamps of cooling system hoses, use pliers (P/N 295 000 070).



1. Cutting clamp
2. Securing clamp

PRESSURE CAP

Check if cap **no. 1** pressurizes the system. Otherwise, install a new 110 kPa (16 PSI) cap (do not exceed this pressure).

COOLING SYSTEM LEAK TEST

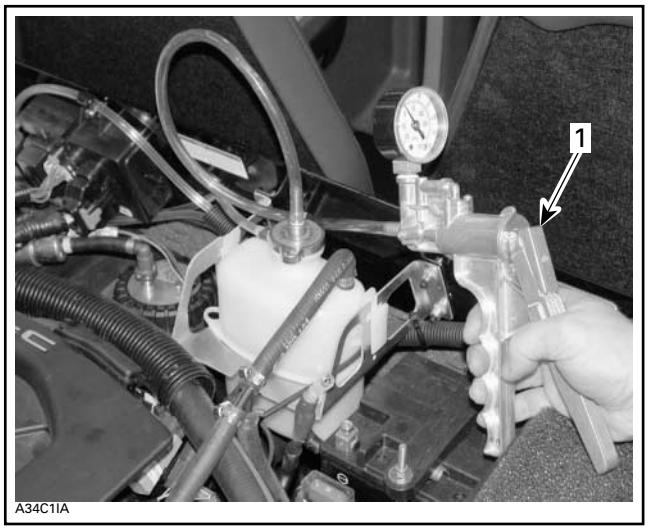
⚠ WARNING

To prevent burning yourself, do not remove the coolant reservoir cap if the engine is hot.

Remove coolant reservoir cap **no. 1**.

Install test radiator cap (P/N 529 035 991). Pressurize all system through coolant reservoir to 110 kPa (16 PSI).

NOTE: It is not required to use a hose pincher on overflow hose with this test cap.



1. Pressure pump (P/N 529 021 800)

Check all hoses, engine, radiator, heat exchangers and oil cooler for coolant leaks. Spray a soap/water solution and look for air bubbles.

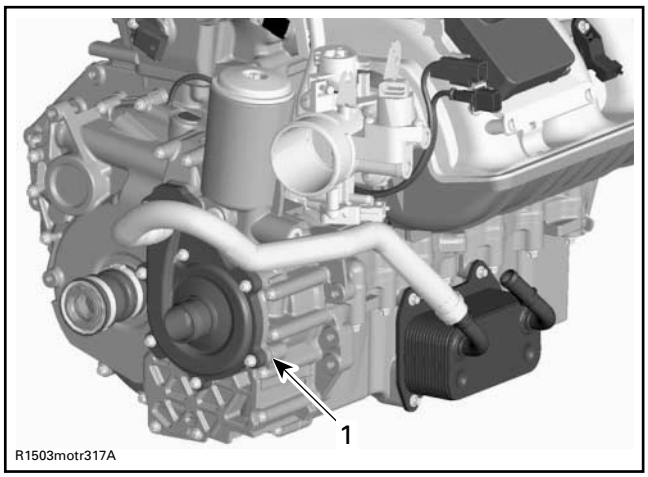
Remove test pressure cap.

Reinstall coolant reservoir cap **no. 1**.

INSPECTION

Check general condition of hoses and clamp tightness.

Check the weep hole if there is oil or coolant.



1. Weep hole

NOTE: Flowing coolant indicates a damaged rotary seal. Oil out of the weep hole indicates a non working oil seal.

DRAINING THE SYSTEM

⚠ WARNING

To prevent risk of burn injuries, Never open coolant reservoir cap, drain or refill cooling system when engine is hot. Never open coolant reservoir cap while someone is seated in the vehicle.

Remove coolant reservoir cap **no. 1**.

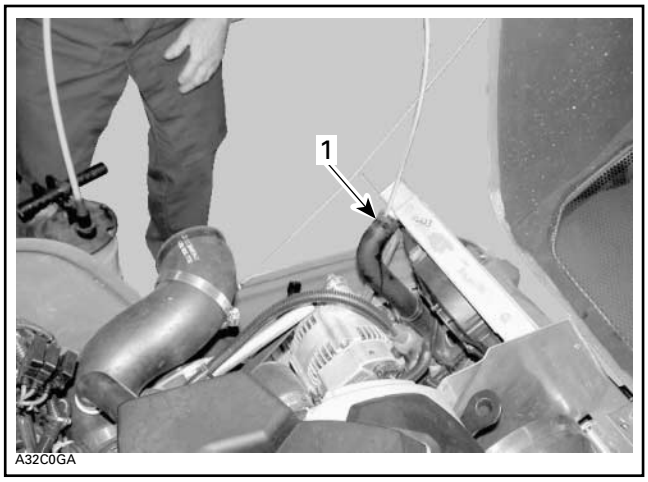
Siphon coolant from reservoir **no. 2**.

NOTE: Insert siphon tube as deep as possible in hose connected at bottom of reservoir.


A34C0CA

Siphon coolant from top hose **no. 6** of radiator **no. 3**.

NOTE: Insert siphon tube in hose as deep as possible.



A32C0GA

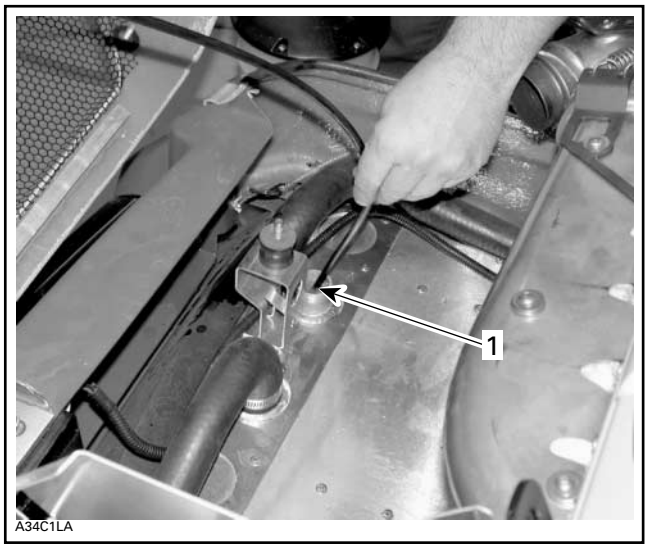
1. Top hose

The heat exchangers need to be drained. Proceed as follows.

Remove muffler and the rear shield plate. Refer to EXHAUST SYSTEM.

Disconnect LH hose **no. 6** of LH heat exchanger **no. 4**.

Siphon coolant from heat exchanger fitting.

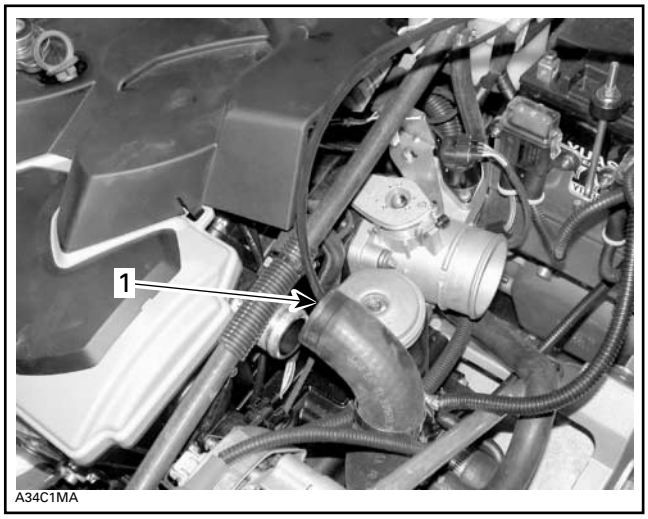


A34C1LA

1. LH fitting of LH heat exchanger

Lift and securely block front of vehicle to allow coolant to flow toward rear.

Disconnect hose **no. 5** from engine head. Insert siphon tube as deep as possible in hose. Siphon remaining coolant.



A34C1MA

1. Engine head hose

Lower front of vehicle.

Reconnect hose on engine head. The remaining disconnected hose and muffler are to be reinstalled while performing the refilling process.

Dispose coolant as per local regulations.

COOLANT REPLACEMENT

Recommended Coolant

Use a blend of 50% antifreeze with 50% water. Premixed antifreeze/water is available (P/N 293 600 038, 16 x 1 L).

To prevent antifreeze deterioration, always use the same brand. Never mix different brands unless cooling system is completely flushed and refilled.

Do not reinstall pressure cap.

CAUTION: To prevent rust formation or freezing condition in cold areas, always replenish the system with 50% antifreeze and 50% water. Pure antifreeze will freeze at a higher temperature than the optimal water/antifreeze mix. Always use ethylene glycol antifreeze containing corrosion inhibitors specifically recommended for aluminum engines.

System Capacity

Refer to TECHNICAL DATA.

Coolant Replacement Procedure

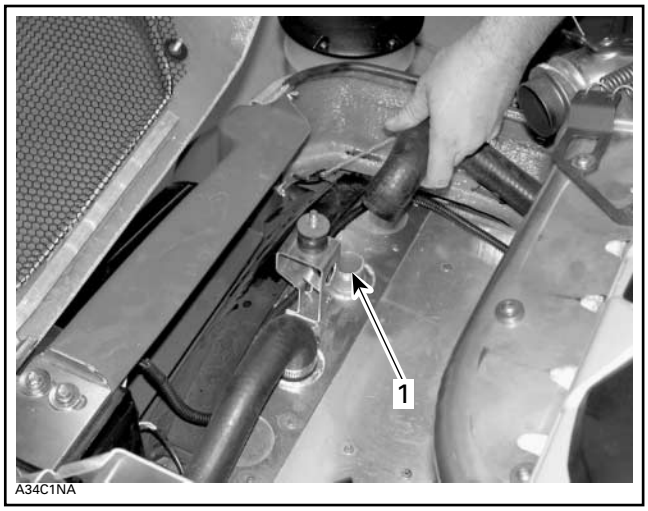
⚠ WARNING

To prevent burning yourself do not remove the coolant reservoir cap if the engine is hot.

Drain the system completely as described above.

Vehicle should be level and engine cold for refilling.

Ensure LH hose or LH heat exchanger is disconnected as described in DRAINING THE SYSTEM above. Pour coolant (approximately 2.8 L (3 U.S. qt)) in coolant reservoir while watching coolant at the disconnected hose. When coolant reaches heat exchanger fitting, reinstall hose.



1. Watch air bubbles flowing here

Reinstall rear shield plate and muffler. Refer to EXHAUST SYSTEM.

Continue to pour and fill coolant reservoir between minimum and maximum marks.

1. Level between marks when engine is cold

Do not install pressure cap at this time.

Start engine and let run until thermostat opens.

NOTE: Feel the temperature of upper hose no. 6 on radiator with your hand. It warms-up when thermostat opens.

Stop engine and wait 15 minutes to cool down. Refill reservoir as necessary and install cap.

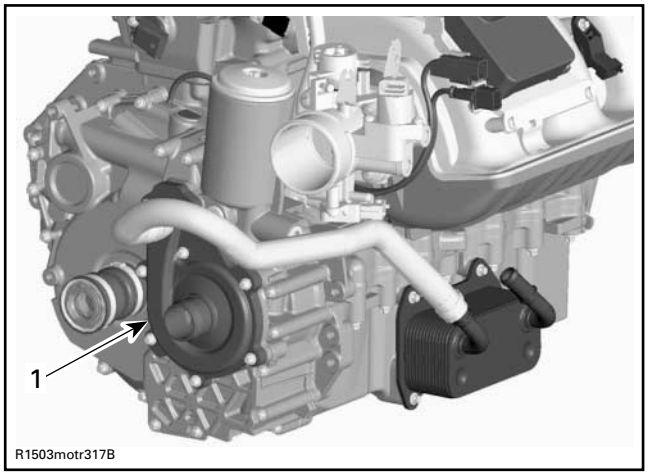
Test the density of the coolant using an antifreeze hydrometer.

NOTE: Follow hydrometer manufacturer instructions for proper use.

The reading should be - 37°C (- 37°F) or lower. Add demineralized water or antifreeze accordingly. Refill to the proper level.

CAUTION: Pure antifreeze will freeze at a higher temperature than the optimal water/antifreeze mix.

COOLANT PUMP HOUSING



1. Coolant pump housing

Removal

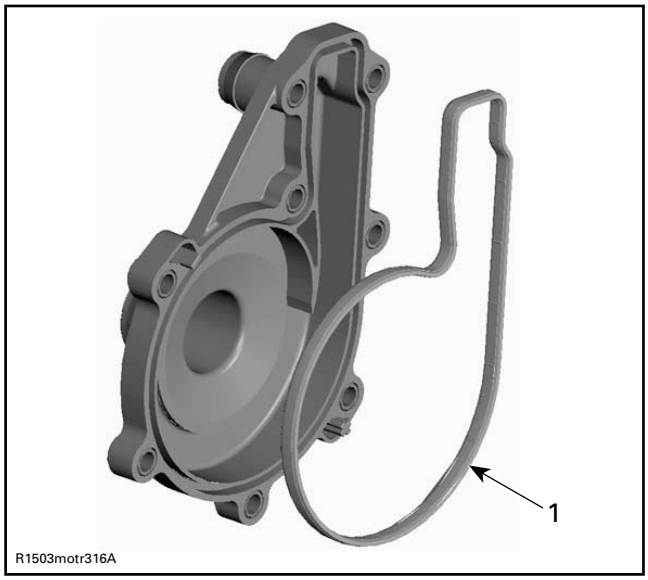
Drain cooling system (see above) and engine oil (refer to LUBRICATION SYSTEM).

Remove from housing:

– oil cooler outlet hose **no. 7**
– coolant hose **no. 8**
– screws **no. 12** and **no. 13** retaining coolant pump housing **no. 14**
– coolant pump housing **no. 14**.

Inspection

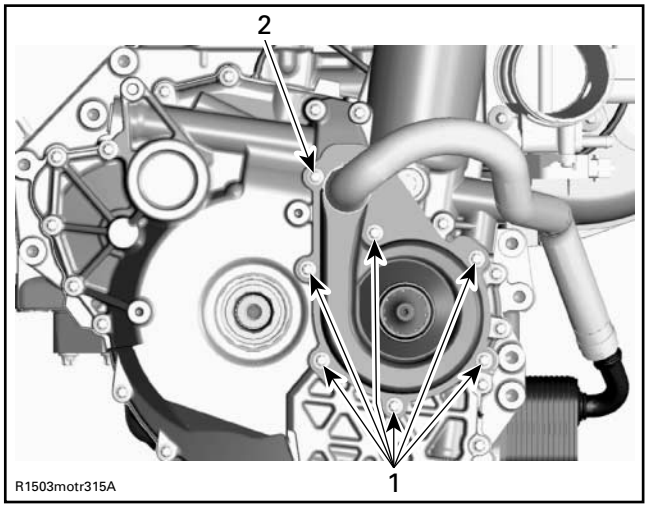
Check if gasket **no. 15** is brittle, hard or damaged and replace as necessary.



1. Pump housing gasket

Installation

The installation is the opposite of the removal procedure. Install screws as per the following illustration.



1. Screws M6 x 25
2. Screws M6 x 105

CAUTION: To prevent leaking, take care that the gaskets are exactly in groove when you reinstall the coolant pump housing.

Apply Loctite 243 on screw threads and torque to 10 N•m (89 lbf•**in**).

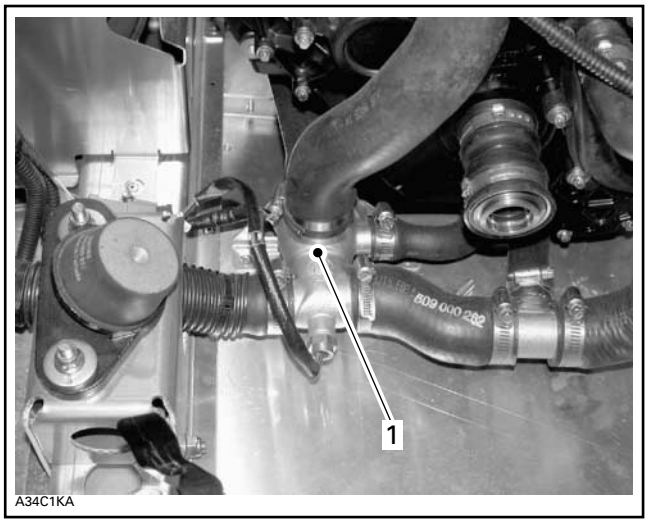
Tightening sequence for screws on coolant pump housing is as per following illustration.

THERMOSTAT

The thermostat is a single action type.

Removal

NOTE: The thermostat is located inside a housing **no. 23** underneath engine support in alternator area.



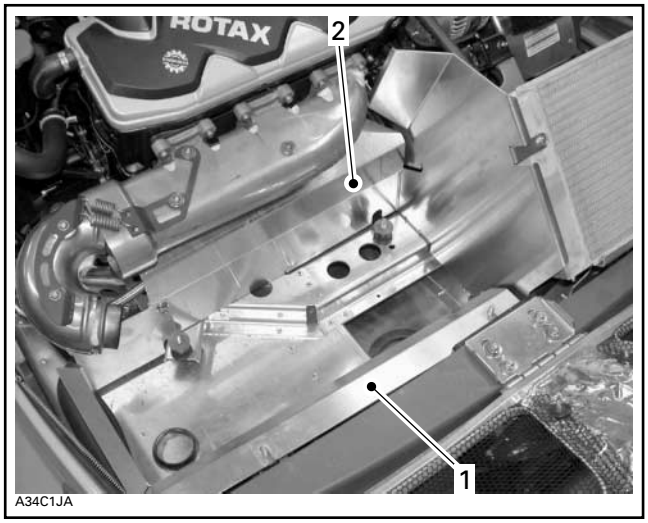
SOME PARTS HAVE BEEN REMOVED FOR CLARITY PURPOSE ONLY
1. Thermostat housing

Remove intake silencer and formed foam. Refer to INTAKE SYSTEM.

Remove drive belt. Refer to TRANSMISSION.

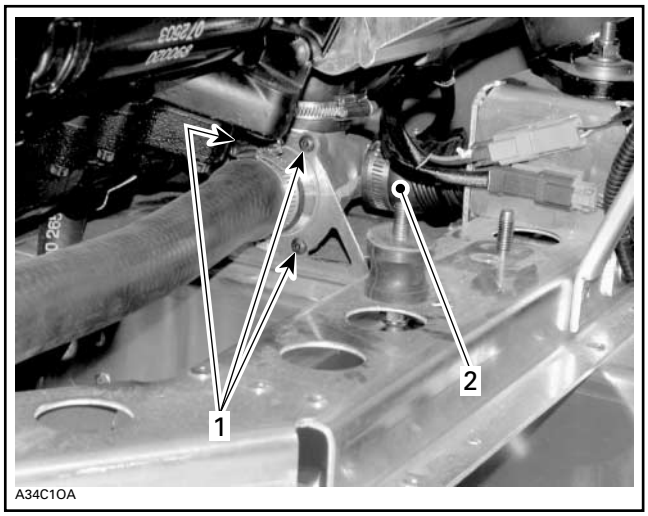
Drain cooling system (see above).

Remove rear and front shield plates.



1. Rear shield plate
2. Front shield plate

Remove thermostat retaining screws.



1. Thermostat retaining screws
2. Hose connected to bottom of radiator

NOTE: Place rags under thermostat housing area to prevent coolant spillage.

To withdraw thermostat from its housing, it is necessary to first disconnect hose coming from bottom of radiator then to pull housing from the PTO housing side while extracting thermostat from the opposite side.

To check the operation of the thermostat, put it in water and heat water. Thermostat should open when water temperature reaches 87°C (188°F).

If there is no operation, replace thermostat.

Installation

For installation, reverse the removal procedure.

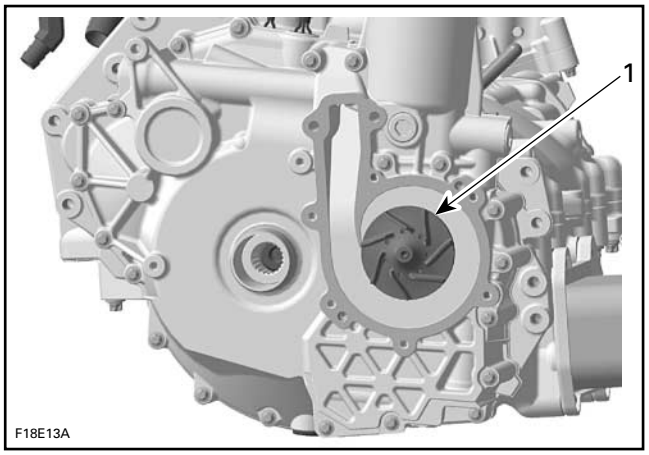
Properly refill cooling system. See COOLANT REPLACEMENT above.

COOLANT PUMP IMPELLER

Removal

Remove:

– coolant pump housing **no. 14**
– unscrew the impeller **no. 16** clockwise.



1. Impeller

CAUTION: Coolant/Oil pump shaft **no. 17** and impeller **no. 16** have left-hand threads. Remove by turning clockwise and install by turning counterclockwise.

Inspection

Check impeller for cracks or other damage. Replace impeller if damaged.

Installation

The installation is the opposite of the removal procedure. Pay attention to the following details.

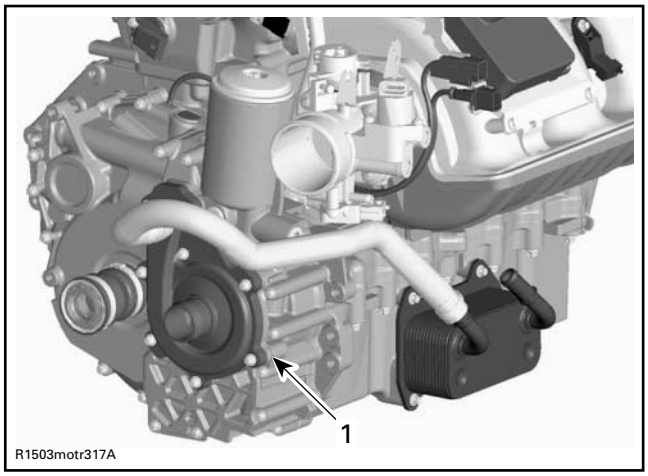
CAUTION: Be careful not to damage impeller wings during installation.

Torque impeller to 3 N•m (26 lbf•**in**).

ROTARY SEAL

Inspection

Check weep hole for oil or coolant leak.



1. Weep hole

Coolant leaking out of the hole indicates a defective rotary seal. Leaking oil indicates a faulty oil seal.

However, if seal is disassembled both parts have to be replaced together.

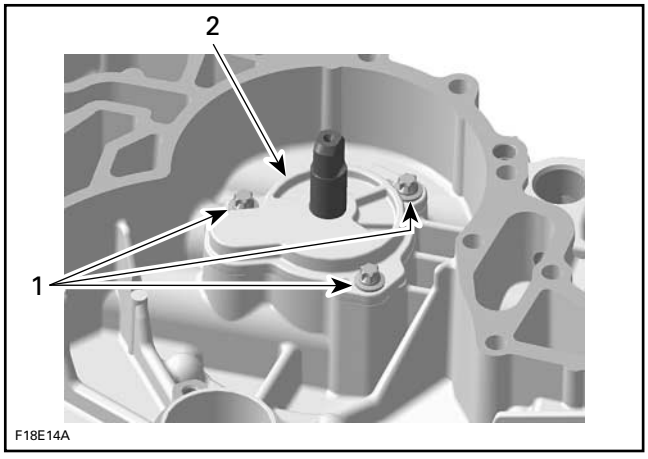
Removal

Remove:

– coolant pump housing **no. 14**

CAUTION: Always unscrew the impeller clockwise otherwise you can damage the components.

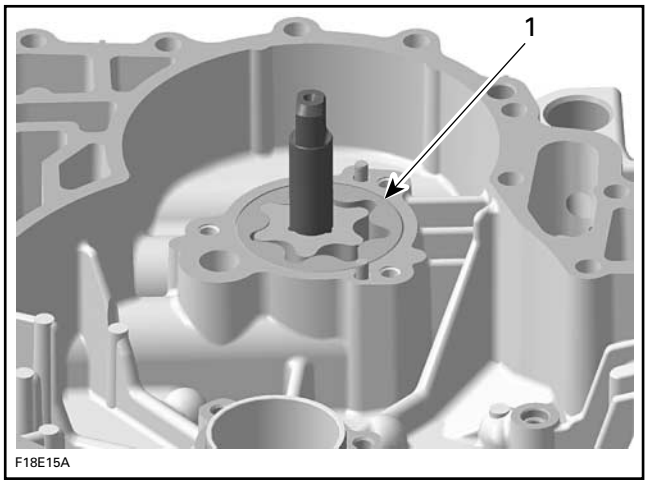
– unscrew the impeller **no. 16** clockwise
– remove PTO cover **no. 18** (refer to PTO HOUSING/MAGNETO section)
– remove screws **no. 19** retaining oil pump cover



1. Retaining screws
2. Oil pump cover

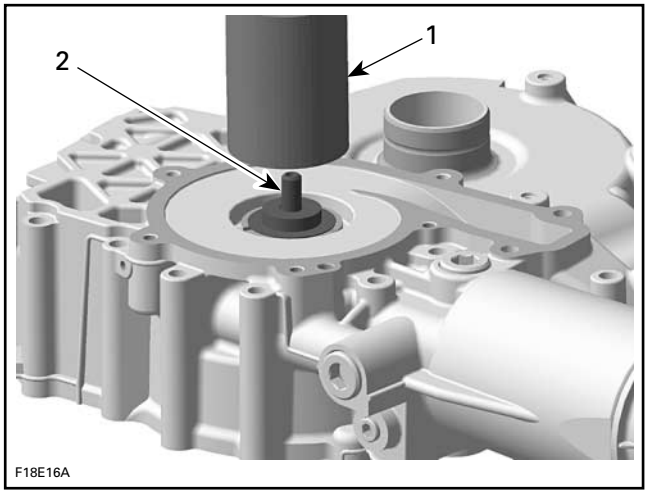
– remove oil pump cover **no. 20**

– remove outer oil pump rotor **no. 21**



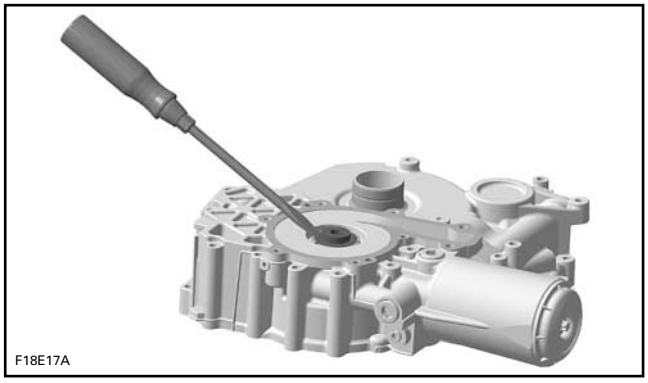
1. Outer oil pump rotor

– extract the coolant/oil pump shaft **no. 19** from outside PTO housing cover with a pusher



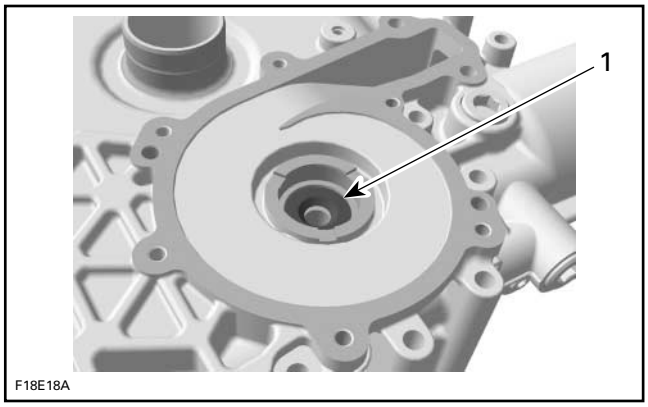
1. Pusher
2. Coolant/oil pump shaft

– remove rotary seal **no. 22** with a screwdriver



CAUTION: Be careful not to damage the surface of the rotary seal bore in magneto housing cover.

– always replace also the oil seal **no. 11** behind the rotary seal.



1. Oil seal

Installation

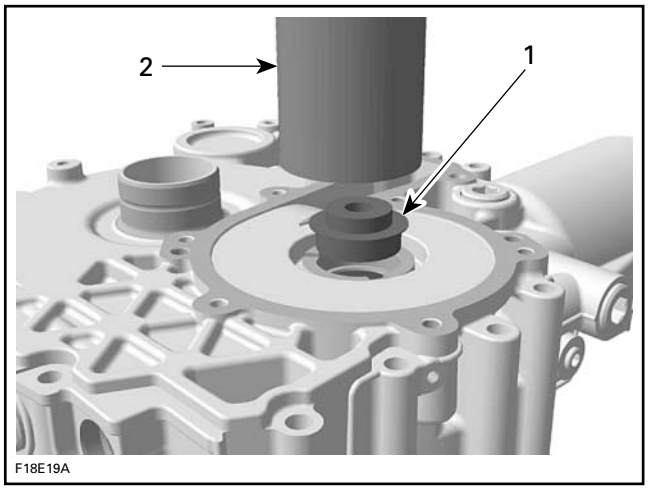
The installation is the opposite of the removal procedure. Pay attention to the following details.

NOTE: Never use oil in the press fit area of the oil seal and rotary seal.

Push water pump shaft oil seal in place by using thumb.

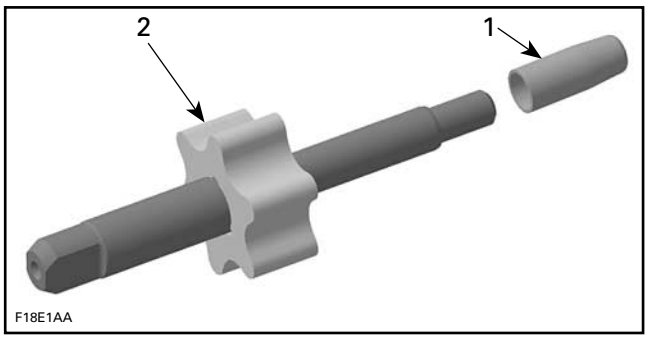
Install the new rotary seal using the rotary seal installer (P/N 529 035 823).

CAUTION: Never use a hammer for the rotary seal or water/oil pump shaft installation. Only use a press to avoid damaging the ceramic component.

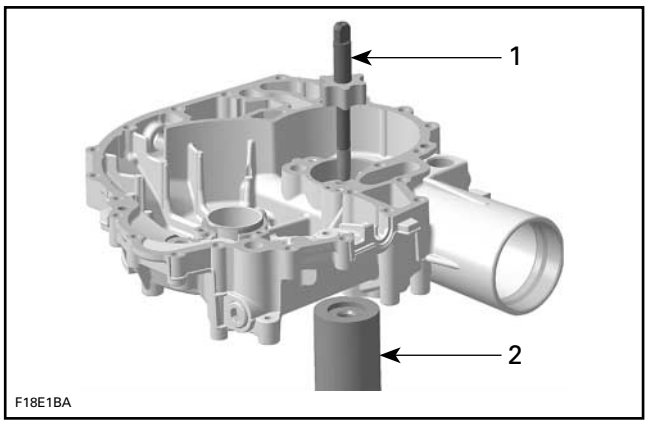


1. Rotary seal
2. Rotary seal installer

Install the coolant/oil pump shaft using the rotary seal installer (P/N 529 035 823) on the opposite side to the rotary seal and the oil seal protector (P/N 529 035 822) with a press.



1. Oil seal protector
2. Coolant/oil pump shaft



1. Coolant/oil pump shaft with oil seal protector
2. Rotary seal installer

Radiator

Prior to disconnecting hoses from radiator no. 3, drain cooling system. See DRAINING THE SYSTEM above.

Check radiator fins for clogging or damage.

Remove dust or other obstructions with compressed air or low pressure water.

Check for any coolant leakage from radiator and hoses.

For the fan thermosensor testing, refer to ENGINE MANAGEMENT section.

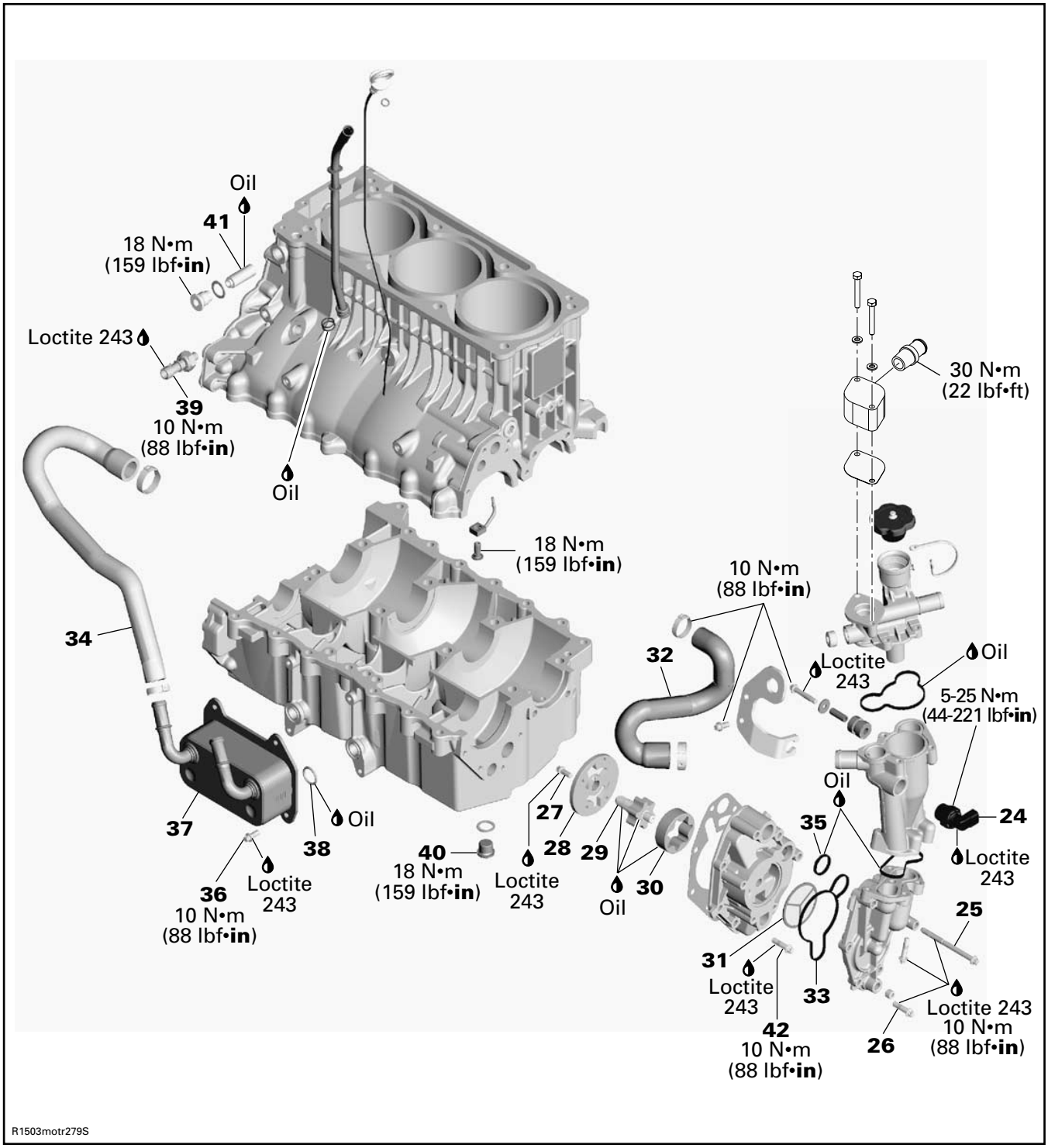
After radiator reinstallation, properly refill cooling system. See COOLANT REPLACEMENT above.

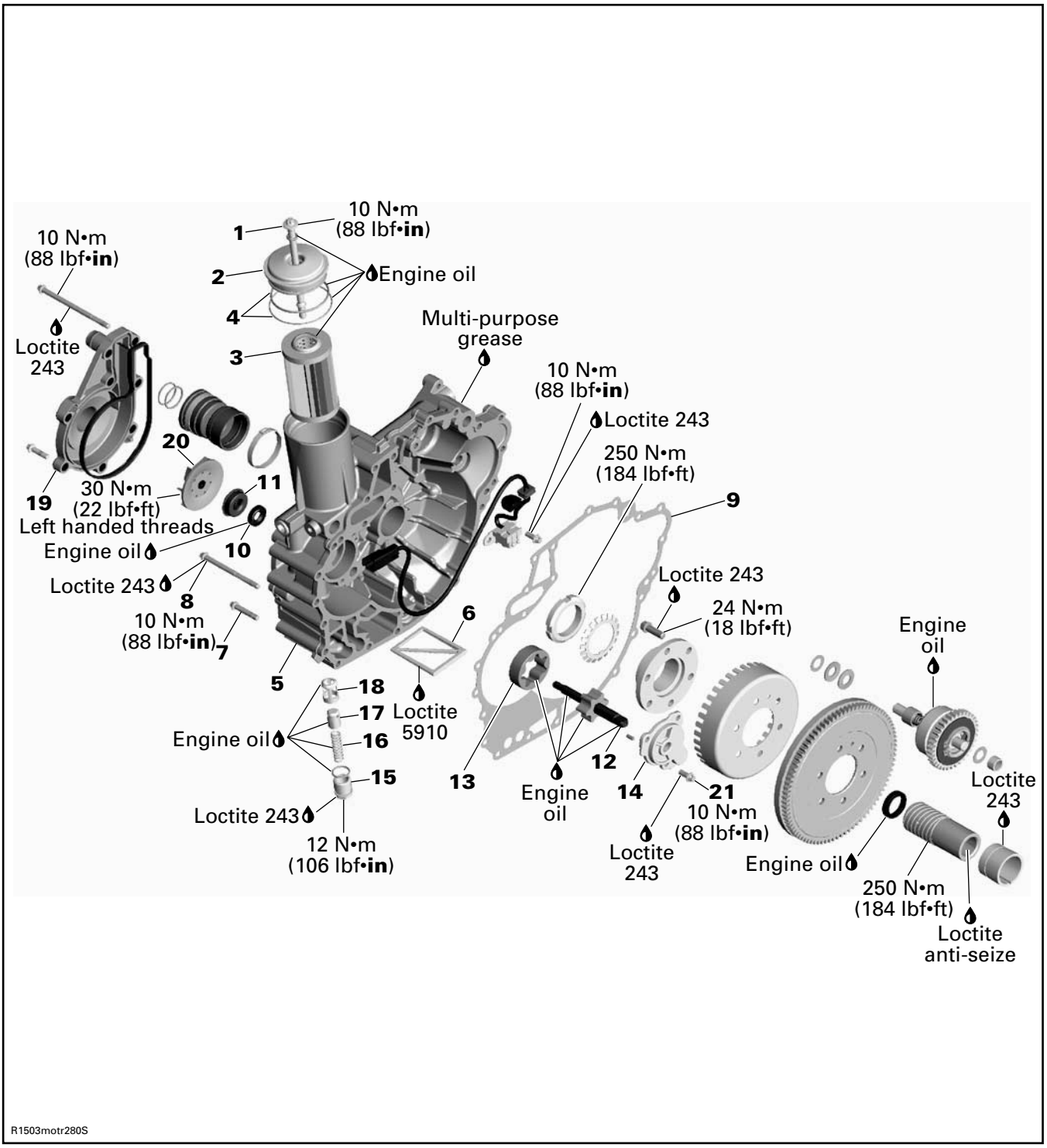
CARE

For winterization of cooling system, refer to STORAGE.

TECHNICAL DATA	
Type	Closed loop cooling system
Coolant flow	Flow build-up at coolant pump
Temperature control	Thermostat and electric fan controlled by a thermosensor. Refer to ENGINE MANAGEMENT section
System bleeding	Self-bleed type through coolant reservoir (hose at uppermost point of circuit)
Overheat warning lamp	Turns on at 105°C (220°F)
Coolant life cycle	To be replaced for storage

LUBRICATION SYSTEM




10 N•m
(88 lbf•in)
1
2
4
3
Engine oil
Multi-purpose
grease
10 N•m
(88 lbf•in)
Loctite 243
250 N•m
(184 lbf•ft)
9
10 N•m
(88 lbf•in)
Loctite
243
20
19
30 N•m
(22 lbf•ft)
Left handed threads
11
Engine oil
10
Loctite 243
8
10 N•m
(88 lbf•in)
7
6
5
18
17
16
15
Engine oil
Loctite
5910
Loctite 243
12 N•m
(106 lbf•in)
13
Engine
oil
12
14
21
10 N•m
(88 lbf•in)
Loctite
243
Loctite 243
24 N•m
(18 lbf•ft)
Engine
oil
Loctite
243
Engine oil
250 N•m
(184 lbf•ft)
Loctite
anti-seize
R1503motr280S

GENERAL

Prior to changing the oil, ensure vehicle is on a level surface.

Oil and oil filter must be replaced at the same time. Oil change and oil filter replacement should be done with a warm engine.

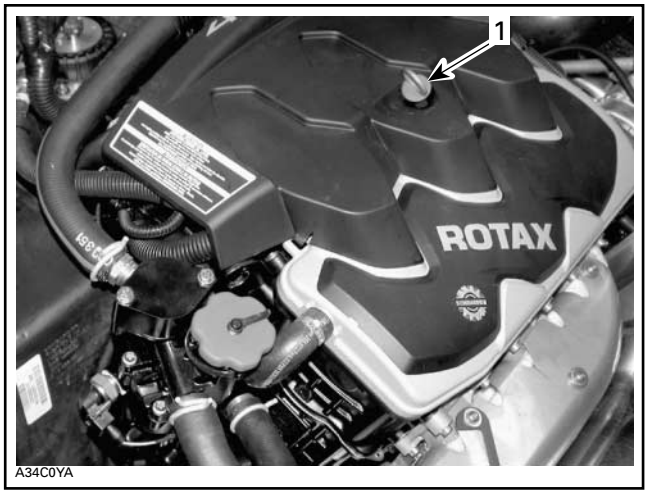
⚠ WARNING

The engine oil can be very hot. Wait until engine oil is warm.

dispose oil and filter as per your local environmental regulations.

OIL LEVEL VERIFICATION

CAUTION: Check level frequently and refill if necessary. Do not overfill, it would make the engine smoke and reduce its power. Operating the engine with an improper level may severely damage engine. Wipe off any spillage.



1. Dipstick

Check the oil level as follows:

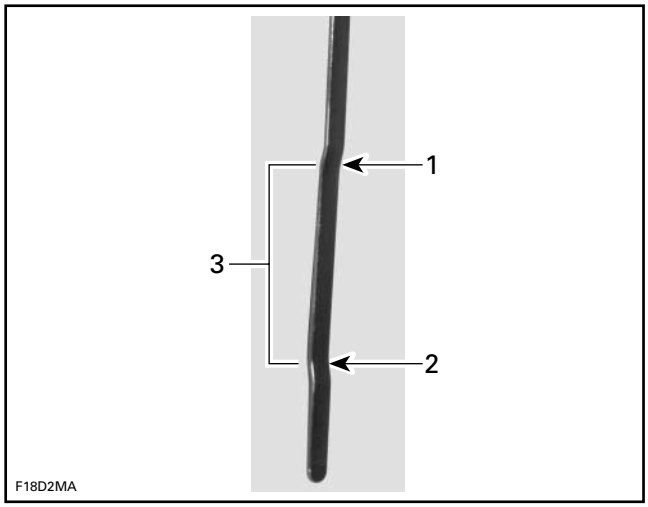
NOTE: **Before** checking the oil level on this engine, it is necessary to let it idle for 30 seconds **before** shutting it off. Thereafter it is necessary to wait 30 seconds. Then, the oil can be checked. This is required to allow the oil to properly level in the different oil chambers. Otherwise, you will have a false oil level reading.

– Vehicle must be level. Engine should be warm.
– Warm-up engine then let **idle for 30 seconds** before stopping.
– Stop engine.
– **Wait at least 30 seconds** then pull dipstick out and wipe clean.

⚠ WARNING

Engine oil may be hot. Certain components in the engine compartment may be very hot. Direct contact may result in skin burn.

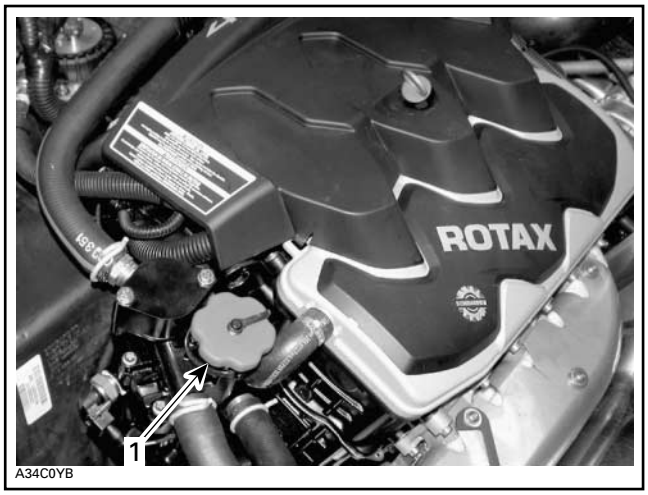
– Reinstall dipstick, push in completely.
– Remove dipstick and read oil level. It should be between marks.



1. Full
2. Add
3. Operating range

NOTE: There is a capacity of 1 L (34 U.S. oz) between the two marks.

– Otherwise, add oil until its level is between marks as required.
– To add oil, unscrew oil cap. Place a funnel into the opening and add the recommended oil to the proper level. **Do not overfill**.



1. Oil cap

NOTE: Before checking the oil level on this engine, it is necessary to let it idle for 30 seconds **before** shutting it off. Thereafter it is necessary to wait 30 seconds. Then, the oil can be checked. This is required to allow the oil to properly level in the different oil chambers. Otherwise, you will have a false oil level reading.

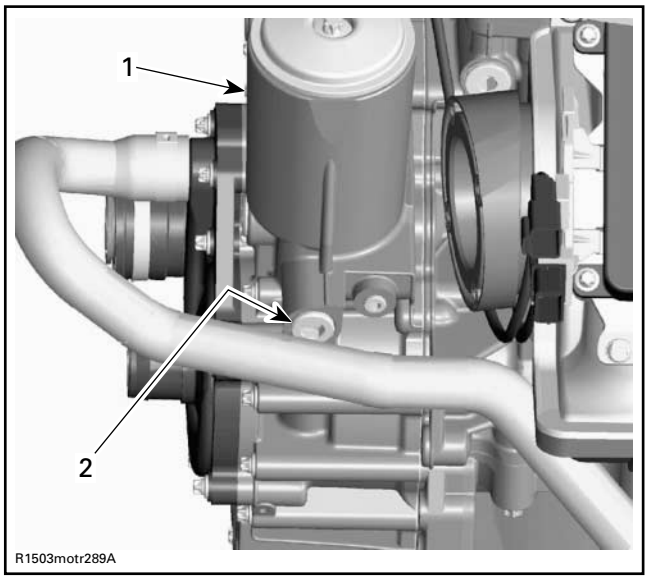
ENGINE OIL PRESSURE TEST

NOTE: The engine pressure test should be done with a **warm engine** and the **recommended oil.**

Remove plug below oil filter housing.

Use oil pressure gauge (P/N 529 035 709) and hose adaptor (P/N 529 035 652) and install where shown.

Start engine and read pressure at different RPM as per following table.



1. Oil filter housing
2. Pressure test plug

NOTE: Oil pressure switch works between 180 kPa (26 PSI) and 220 kPa (32 PSI).

The engine oil pressure should be within the following values.

OIL PRESSURE TEST	
Engine RPM	Pressure kPa (PSI)
Idle (cold)	300 - 400 (44 - 58)
Idle (at 80°C (176°F))	min. 160 (23)
4000 - 7500	300 - 400 (44 - 58)

If the engine oil pressure is out of specifications, check the points described in TROUBLESHOOTING section.

Reinstall plug.

OIL CHANGE

Engine in Vehicle

Bring engine to its normal operating temperature.

⚠ WARNING

Engine oil may be hot. Certain components in the engine compartment may be very hot. Direct contact may result in skin burn.

Remove the drive belt.

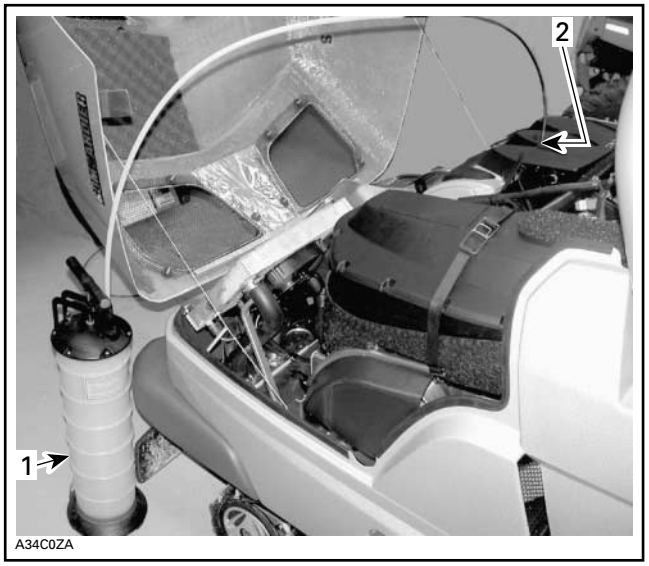
Run engine for 10 seconds at 4000 RPM and **shut it off at this RPM**. This will move oil from PTO housing to oil tank to allow maximum oil draining.

Remove oil filler cap and dipstick.

Using the Oil VAC (P/N 529 035 880), siphon oil through dipstick hole.

CAUTION: Never crank or start engine when siphon tube is in dipstick hole. Never start engine when there is no oil in engine.

NOTE: Since the siphon tube must be inserted at the proper depth to siphon the oil, it is suggested to put some electrical tape on siphon tube at 475 mm (18.7 in) from its end. Then, insert siphon tube until you reach the tape.



1. Oil VAC
2. Siphon tube in dipstick hole

Pull siphon tube out of dipstick hole. Make sure that drive belt is removed. Crank engine (do not start) while in engine drown mode (fully depress throttle lever and HOLD, then crank engine).

Crank engine for 10 seconds. Siphon oil again. Repeat the crank-siphon cycle 2 - 3 times.

Inspection

Oil condition gives information about the engine condition. See TROUBLESHOOTING section.

Installation

Reinstall removed parts and fill in the new engine oil.

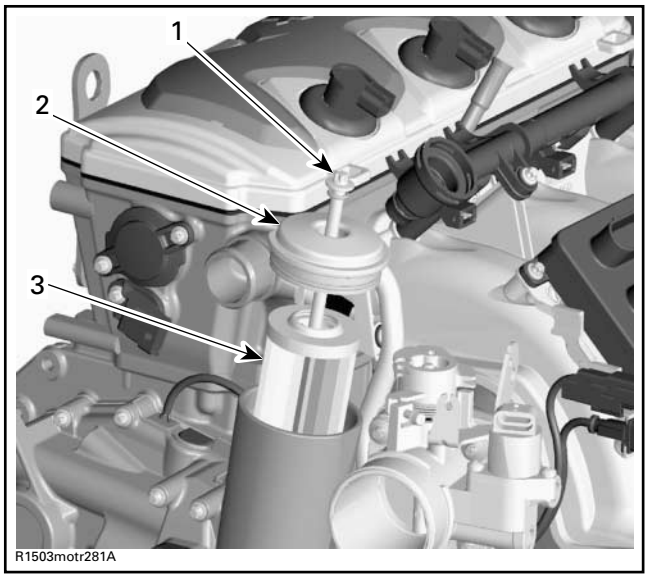
OIL TYPE AND SYSTEM CAPACITY

Refer to TECHNICAL DATA. For refilling procedure, refer to OIL LEVEL VERIFICATION above.

OIL FILTER

Removal

Remove:
– engine oil (refer to OIL CHANGE)
– oil filter screw **no. 1**
– oil filter cover **no. 2**
– oil filter **no. 3**.



TYPICAL
1. Oil filter screw
2. Oil filter cover
3. Oil filter

Place rags around filter housing to prevent spillage. If spillage occurs, clean immediately with the pulley flange cleaner (P/N 413 711 809) to prevent stains.

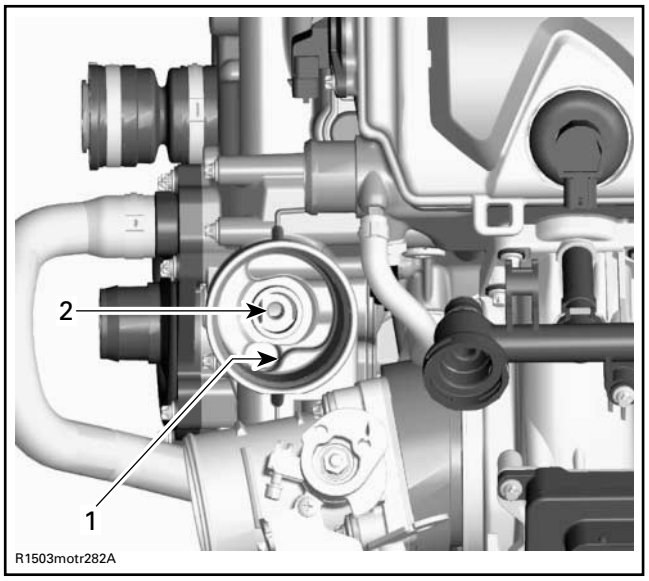
⚠ WARNING

Wear safety glasses and work in a well ventilated area when working with strong chemical products. Also wear suitable non-absorbent gloves to protect your hands.

Inspection

Check oil filter cover O-ring **no. 4** and oil filter screw O-ring, change if necessary.

Check and clean the oil filter inlet and outlet area for dirt and other contaminations.



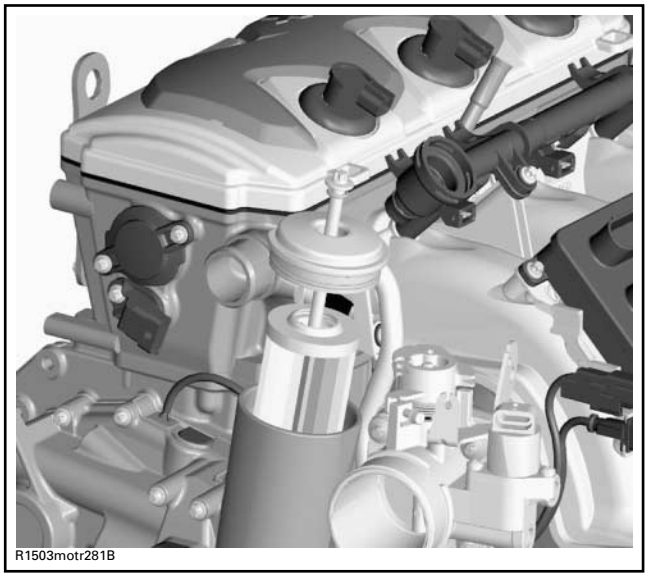
TYPICAL
1. *Inlet bore from the oil pump to the oil filter*
2. *Outlet bore to the engine oil providing system*

Installation

For installation, reverse the removal procedure. Pay attention to the following details.

Install a new oil filter.

Install O-ring on oil filter cover.



TYPICAL

Torque oil filter screw to 9 N•m (80 lbf•**in**).

OIL STRAINERS

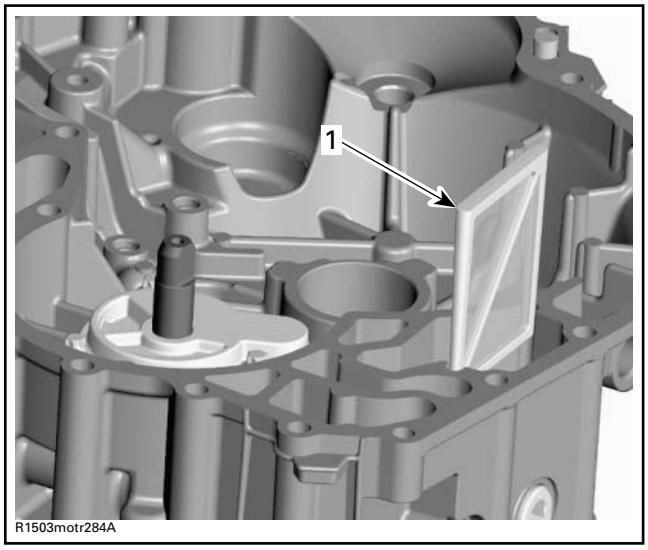
The oil strainers do not need to be cleaned at every oil change. Clean them during other inspections, especially when the engine is disassembled.

PTO — Oil Strainer

Removal

Remove:

– engine oil (refer to OIL CHANGE)
– PTO cover **no. 5** (refer to PTO COVER/MAGNETO section)
– oil strainer **no. 6**.



1. Oil strainer

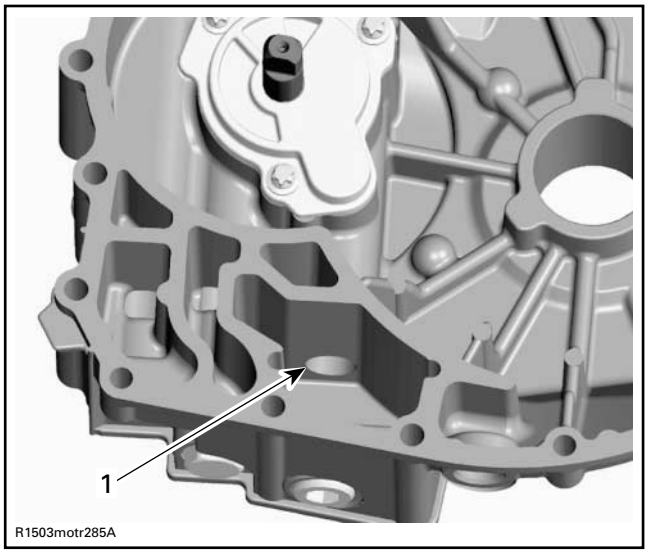
Cleaning and Inspection

Clean oil strainer with a part cleaner then use an air gun to dry it.

⚠ WARNING

Always wear eye protector. Chemicals can cause a rash break out in and an injury to your eyes.

Check and clean the oil outlet area for dirt and other contaminations.



1. Oil inlet to the oil pump

Installation

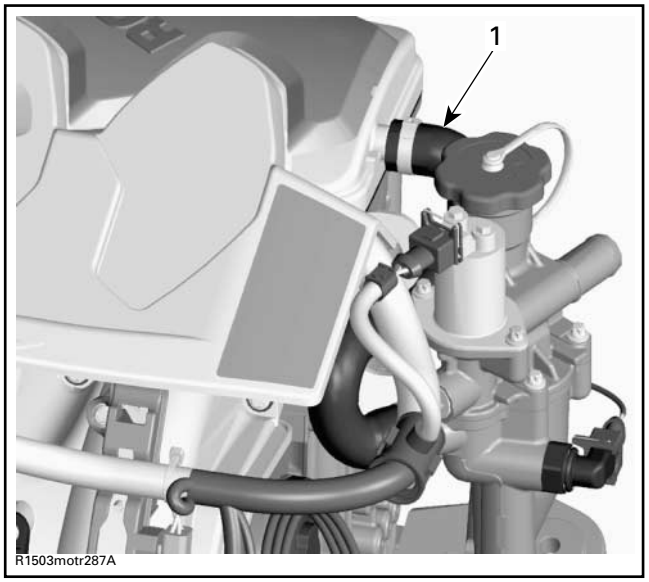
For installation, reverse the removal procedure.

Refill engine at the proper level with the recommended oil. Refer to TECHNICAL DATA for capacity and OIL LEVEL VERIFICATION above for procedure.

Suction Pump — Oil Strainer

Removal

– Remove crankcase ventilation hose **no. 32**.



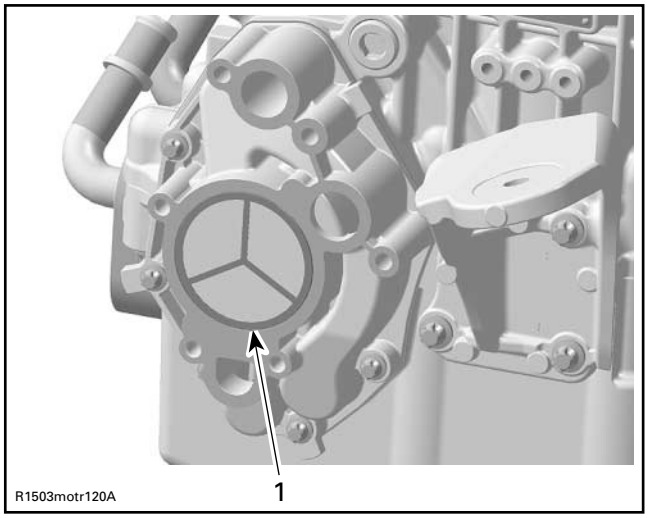
TYPICAL
1. Crankcase ventilation hose

– Disconnect wiring harness from OSPS **no. 24**.
– Detach air silencer from throttle body.
– Disconnect battery cables and vent tube then remove battery. Refer to BATTERY in CHARGING SYSTEM section for proper procedures.
– Remove retaining screws **no. 25** and **no. 26** .
– Place rags under cover to prevent spillage. If spillage occurs, clean immediately with the pulley flange cleaner (P/N 413 711 809) to prevent stains.

⚠ WARNING

Wear safety glasses and work in a well ventilated area when working with strong chemical products. Also wear suitable non-absorbent gloves to protect your hands.

– Remove suction pump cover with oil separator.
– Remove oil strainer **no. 31**.



1. Oil strainer

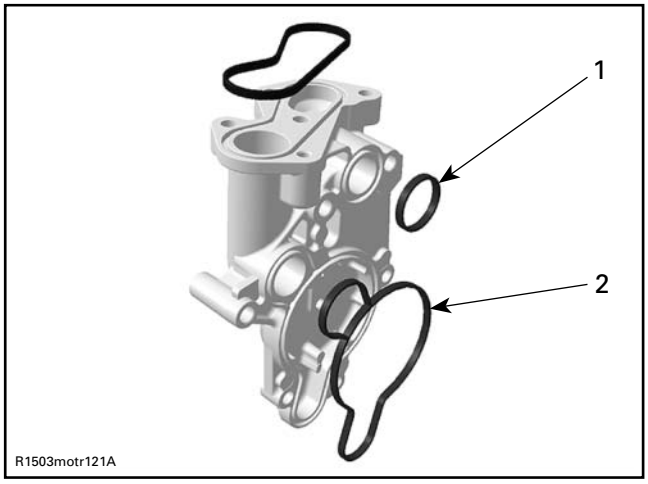
Cleaning and Inspection

Clean oil strainer with a part cleaner then use an air gun to dry it.

⚠ WARNING

Always wear eye protector. Chemicals can cause a rash break out in and an injury to your eyes.

Inspect rubber rings **no. 33** and **no. 35**.

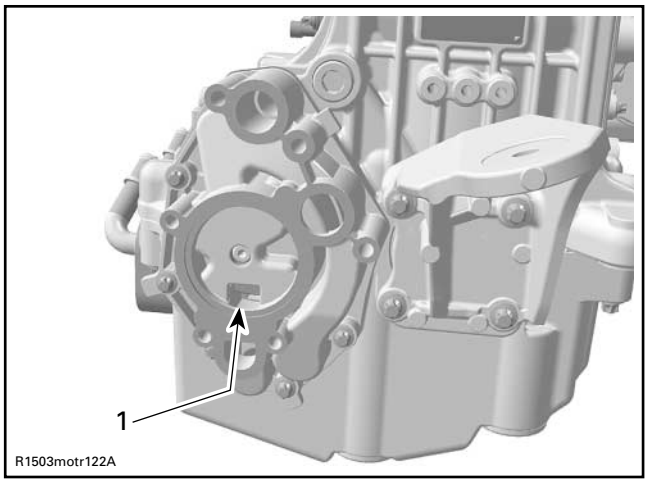


1. O-ring
2. Rubber ring gasket

If rubber rings are brittle, cracked or hard, replace them.

Clean both contact surfaces of oil strainer cover.

Check and clean the oil inlet and outlet area for dirt and other contaminations.

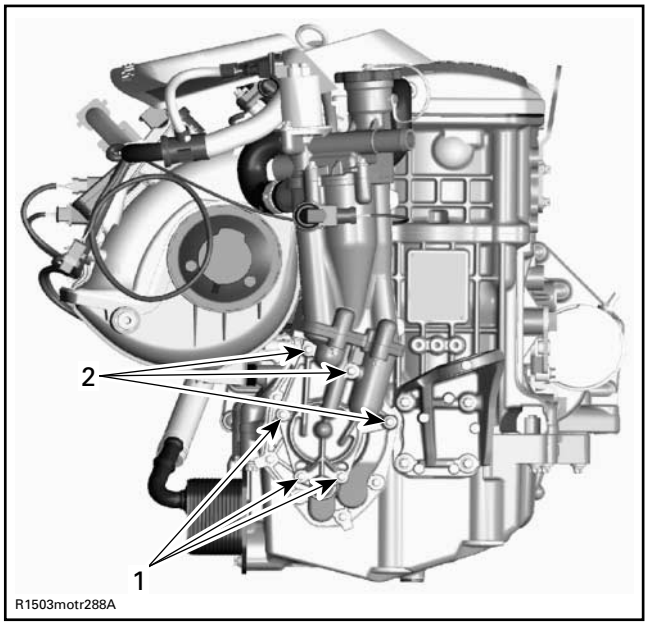


1. Oil inlet to the oil pump

Installation

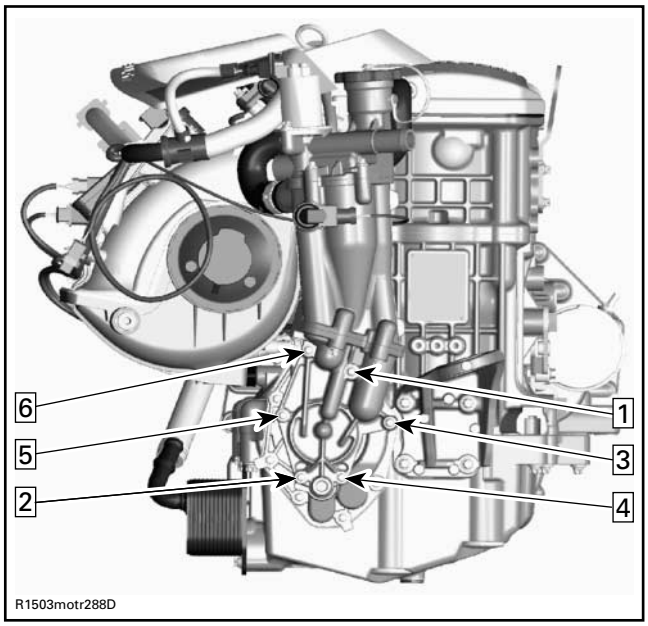
For installation, reverse the removal procedure.

Position screws according to their length as shown.



1. Screws M6 x 25
2. Screws M6 x 85

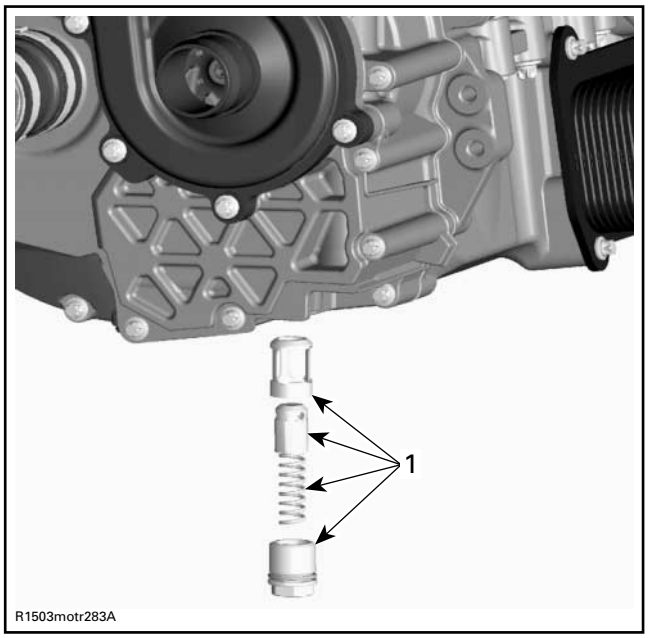
Torque suction pump cover screws to 10 N•m (88 lbf•**in**) as per sequence illustrated below. Apply Loctite 243 on threads.



TYPICAL

ENGINE OIL PRESSURE REGULATOR

The oil pressure regulator is located on the bottom of the PTO housing.



1. Oil pressure regulator

NOTE: The oil pressure regulator system opens when the oil pressure exceeds 400 kPa (58 PSI).

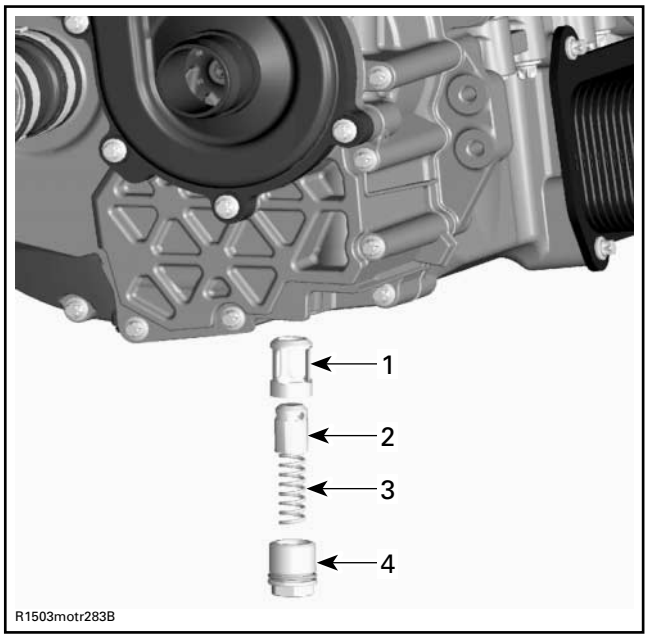
Removal

Remove:

– engine oil (refer to OIL CHANGE)
– oil pressure regulator plug **no. 15**, compression spring **no. 16,** valve piston **no. 17** and valve piston guide **no. 18**.

⚠ WARNING

Oil pressure regulator plug on oil pump housing is spring loaded.



1. Valve piston guide
2. Valve piston
3. Compression spring
4. Oil pressure regulator plug

Inspection

Inspect valve piston and valve piston guide for scoring or other damages.

Check compression spring for free length.

COMPRESSION SPRING FREE LENGTH	
NEW NOMINAL	60 mm (2.362 in)
SERVICE LIMIT	50.3 mm (1.980 in)

Replace parts if important wear or damage are present.

Clean bore and threads in the PTO housing from metal shavings and other contaminations.

Installation

For installation, reverse the removal procedure. Pay attention to the following details.

Be careful that the O-ring on plug screw is in place.

Torque plug screw to 12 N•m (106 lbf•**in**) maximum. Apply Loctite 243 on threads.

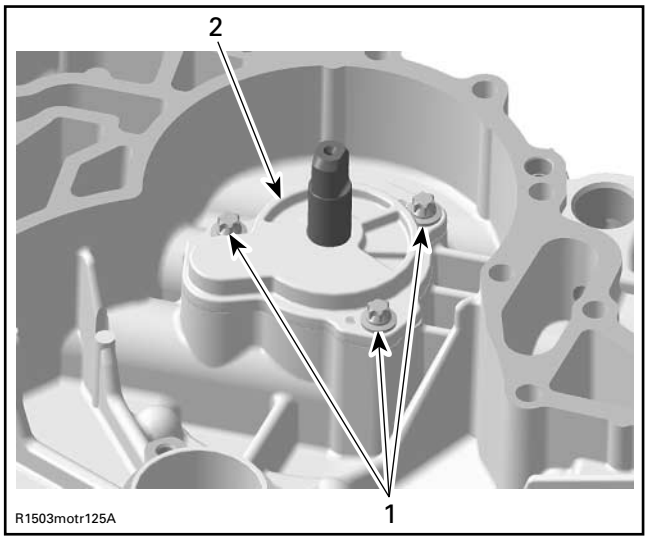
OIL PRESSURE PUMP

The oil pressure pump is located in the PTO housing and is driven by the balance shaft.

Removal

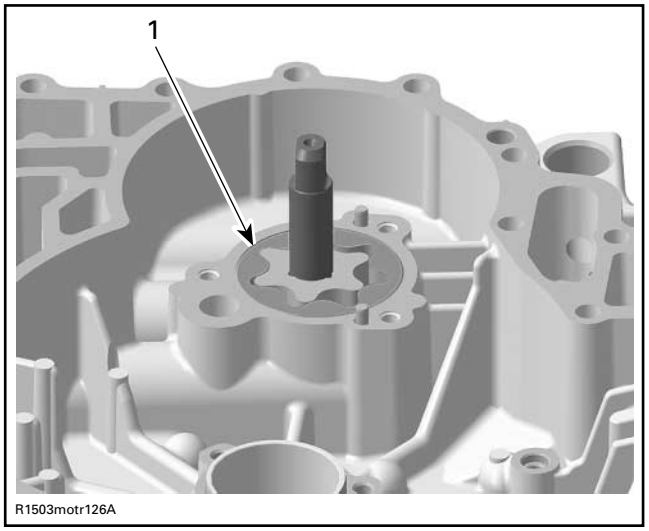
Remove:

– engine oil (refer to OIL CHANGE)
– PTO housing (refer to PTO HOUSING/MAGNETO section)
– coolant pump housing **no. 19** and impeller **no. 20** (refer to COOLING SYSTEM section)
– screws **no. 21**
– oil pump cover **no. 14**



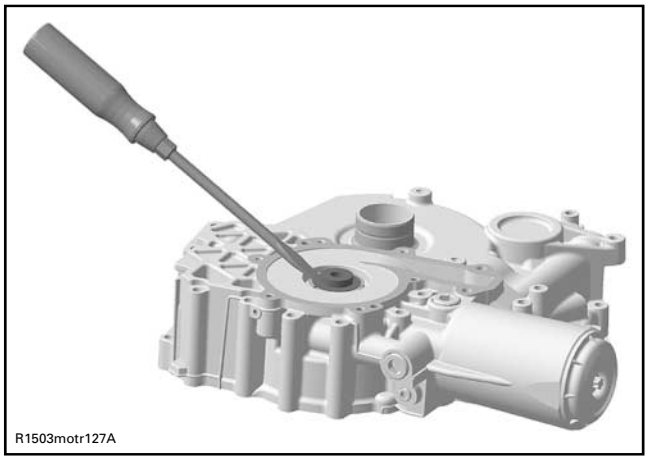
1. Screws
2. Oil pump cover

– outer oil pump rotor **no. 13**



1. Outer oil pump rotor

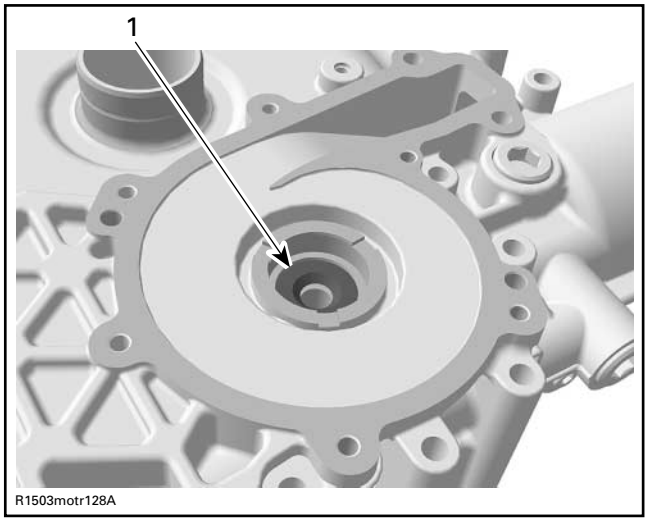
– extract the coolant/oil pump shaft **no. 12** from outside PTO housing with a pusher
– remove rotary seal **no. 11** with a screwdriver



TYPICAL

CAUTION: Be careful not to damage the surface of the rotary seal bore in PTO housing cover.

– oil seal **no. 10**.

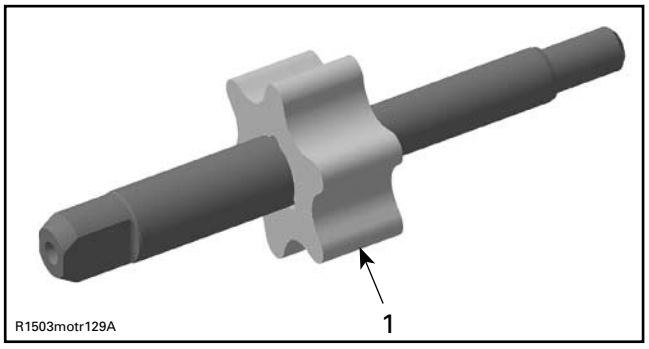


1. Oil seal

Inspection

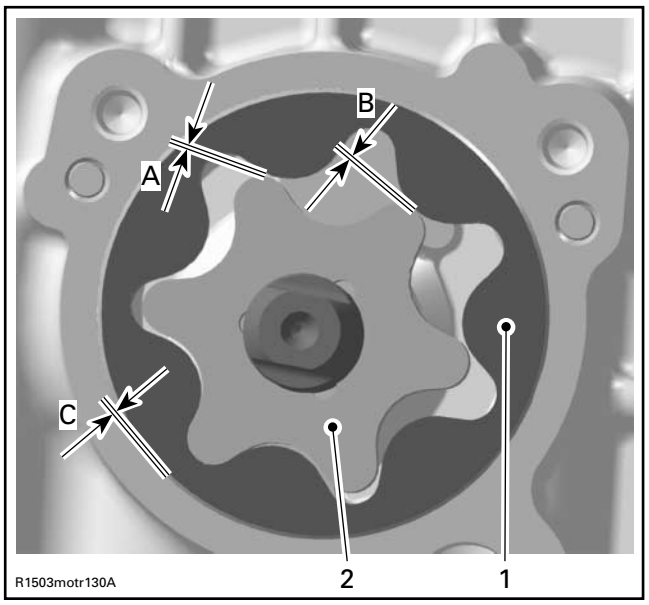
Inspect oil pump shaft assembly, housing and cover for marks or other damages.

Check inner rotor for corrosion pin-holes or other damages. If so, replace oil pump shaft assembly. Ensure to also check oil pump housing and cover and replace if damaged.



1. Pittings on the teeth

Using a feeler gauge, measure the clearance between inner and outer rotors.



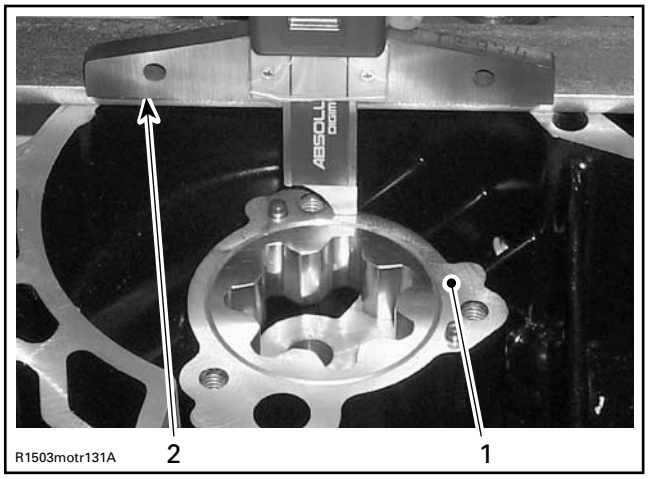
1. Outer rotor
2. Inner rotor

OUTER AND INNER ROTOR CLEARANCE mm (in)	
SERVICE LIMIT	
A	0.25 mm (.009 in)
B	
C	

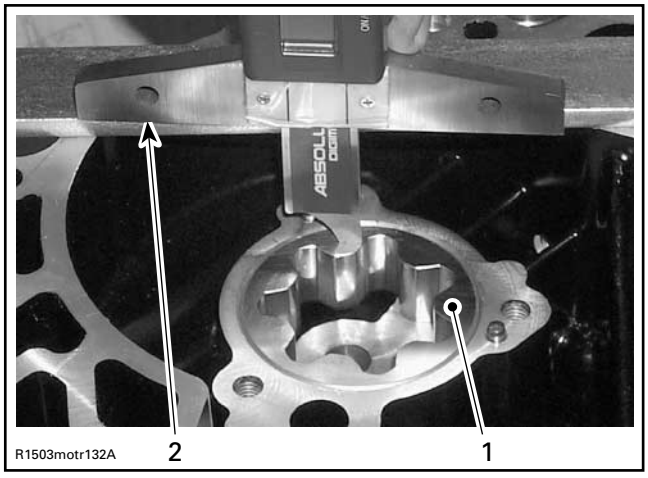
If clearance between inner and outer rotors exceeds the tolerance, replace coolant/oil pump shaft assembly. Ensure to also check oil pump housing and cover and replace if damaged.

If clearance between outer rotor and its bore in oil pump exceeds the tolerance, replace the complete oil pump and the PTO housing.

Using a vernier depth gauge, measure side wear as shown.



1. PTO housing surface
2. Vernier depth gauge



1. Oil pump outer rotor surface
2. Vernier depth gauge

Difference between pump housing and outer rotor should not exceed 0.1 mm (.004 in). If so, replace the complete oil pump assembly.

NOTE: When the axial clearance of the oil pump shaft assembly increases, the oil pressure decreases.

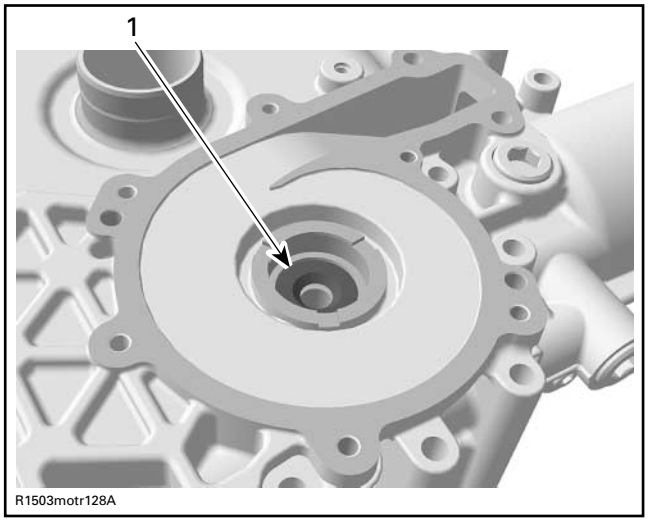
Check the inside of oil pump housing and its cover for scoring or other damages and replace if damaged.

Installation

For installation, reverse the removal procedure. Pay attention to the following details.

NOTE: Never use oil in the press fit area of the rotary seal.

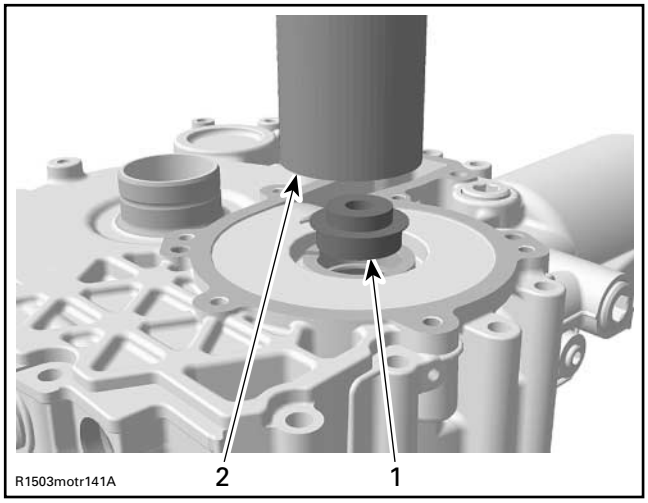
Push coolant/oil pump shaft seal in place by using thumb.



1. Oil seal

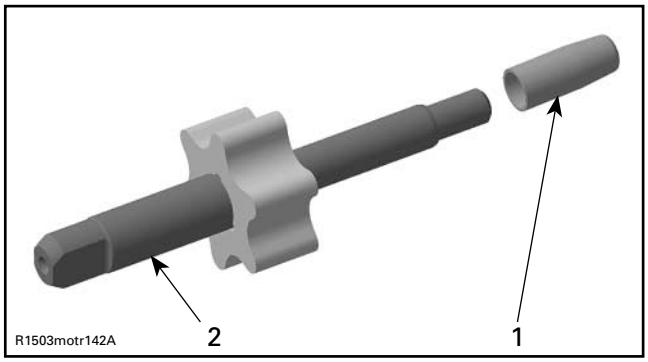
Install the new rotary seal by using the rotary seal pusher (P/N 529 035 823).

CAUTION: Never use a hammer for the rotary seal or coolant/oil pump shaft installation. Only use a press to avoid damaging the ceramic component.

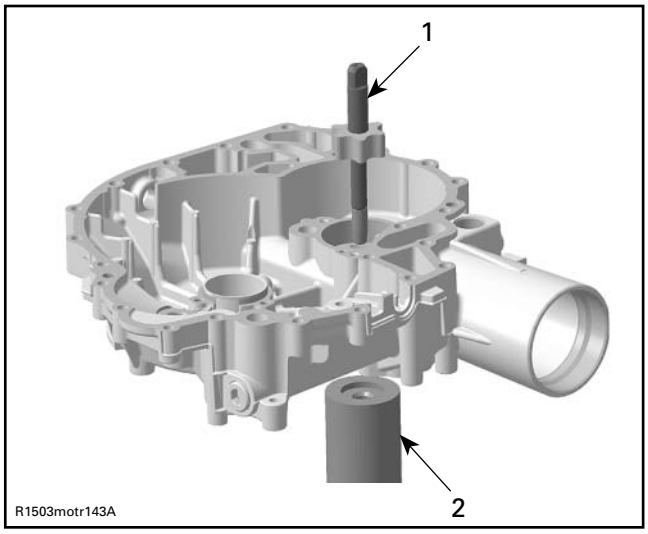


TYPICAL
1. Rotary seal
2. Rotary seal pusher

Install the coolant/oil pump shaft using the rotary seal pusher (P/N 529 035 823) on the opposite side to support the rotary seal. Use the oil seal guide (P/N 529 035 822) with a press.



1. Oil seal guide
2. Coolant/oil pump shaft



1. Coolant/oil pump shaft with oil seal guide
2. Rotary seal pusher

Tighten oil pump cover screws and torque to 10 N•m (88 lbf•**in**). Apply Loctite 243 on threads.

Final Test

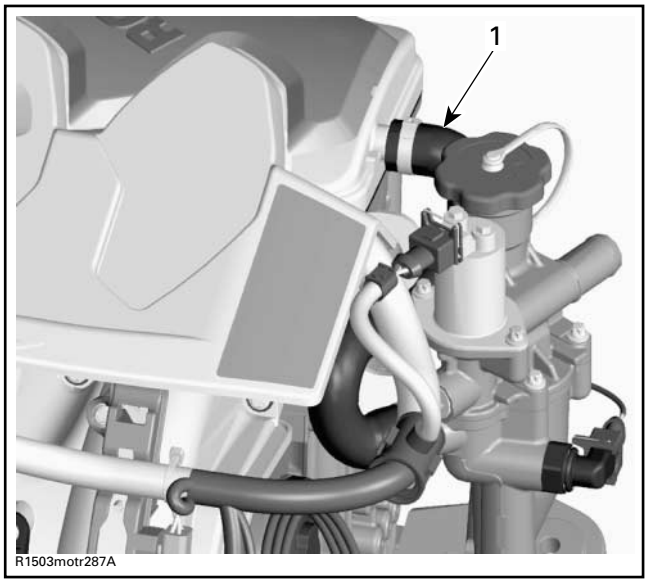
After engine is completely reassembled, start engine and make sure oil pressure is within specifications.

OIL SUCTION PUMP

The oil suction pump is located on the front side of the engine at the bottom of the oil separator.

Removal

– Remove crankcase ventilation hose **no. 32**.



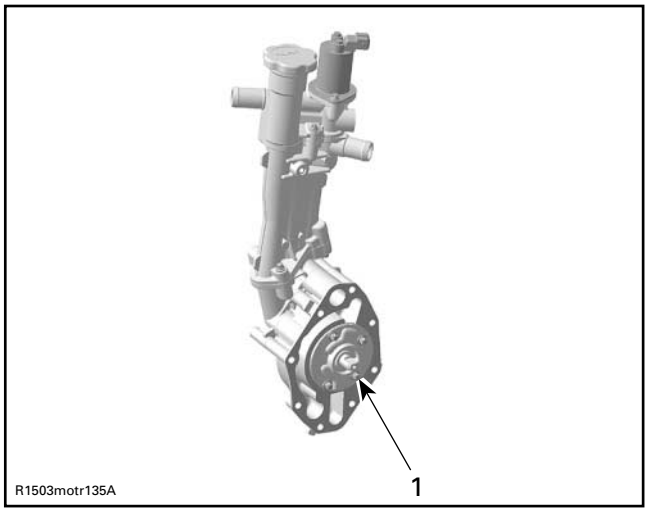
TYPICAL
1. Crankcase ventilation hose

– Disconnect wiring harness from OSPS **no. 24**.
– Detach air silencer from throttle body.
– Disconnect battery cables and vent tube then remove battery. Refer to BATTERY section for proper procedures.
– Remove retaining screws **no. 42**.
– Place rags under cover to prevent spillage. If spillage occurs, clean immediately with the pulley flange cleaner (P/N 413 711 809) to prevent stains.

⚠ WARNING

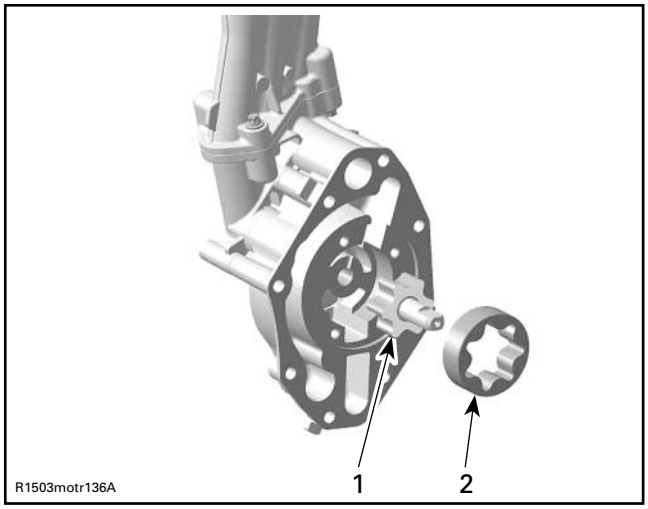
Wear safety glasses and work in a well ventilated area when working with strong chemical products. Also wear suitable non-absorbent gloves to protect your hands.

– Remove oil suction pump housing with oil separator.
– Remove oil pump screws **no. 27** and cover **no. 28**.



1. Oil pump cover

– Remove oil pump shaft ass'y **no. 29**.
– Remove outer rotor **no. 30**.

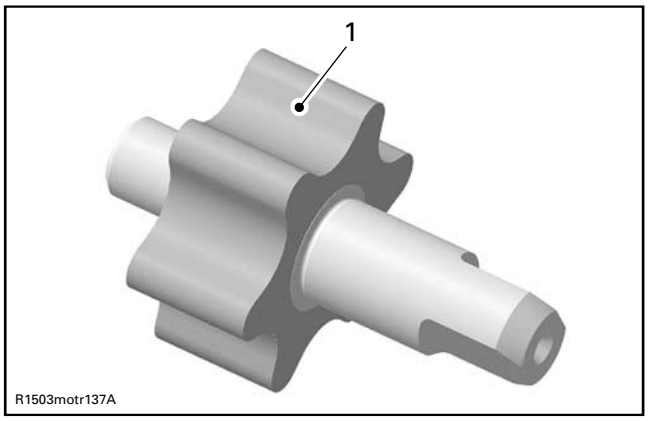


1. Oil pump shaft ass'y
2. Outer rotor

Inspection

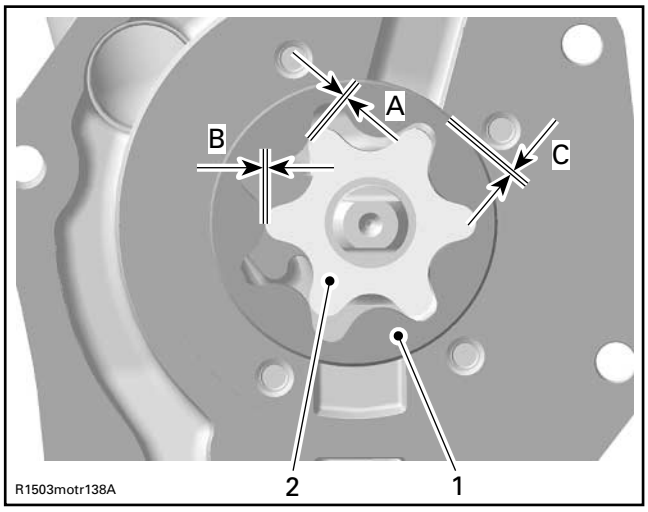
Inspect oil pump shaft assembly, housing and cover for marks or other damages.

Check inner rotor for corrosion, pin-holes or other damages. If so, replace oil pump shaft assembly. Ensure to also check oil pump housing and cover and replace if damaged.



1. Pittings on the teeth

Using a feeler gauge, measure the clearance between inner and outer rotors.



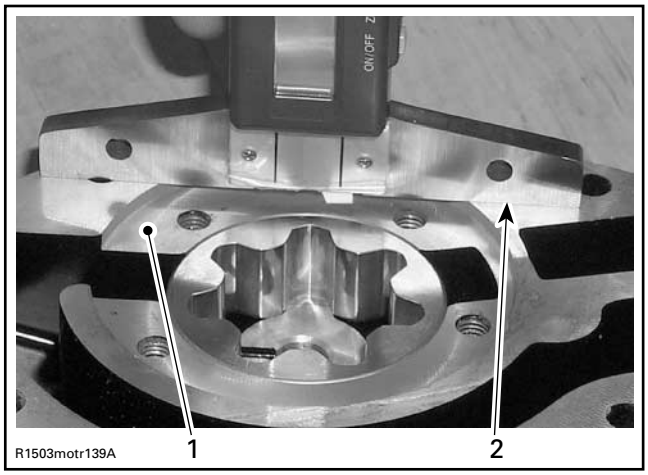
1. Outer rotor
2. Inner rotor

OUTER AND INNER ROTOR CLEARANCE mm (in)	
SERVICE LIMIT	
A	0.25 mm (.009 in)
B	
C	

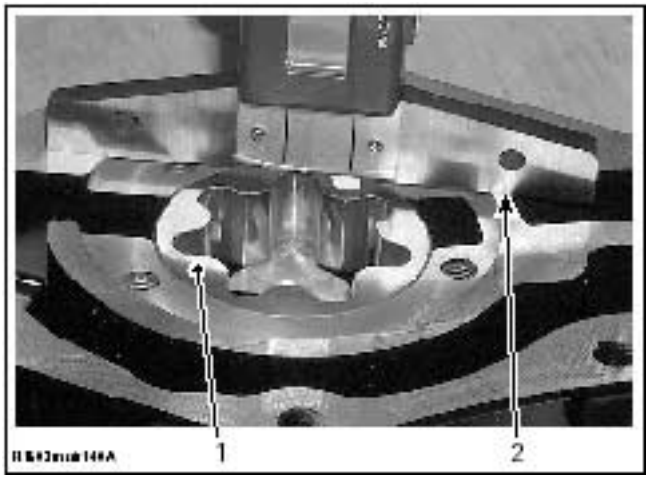
If clearance between inner and outer rotors exceeds the tolerance, replace oil pump shaft assembly. Ensure to also check oil pump housing and cover and replace if damaged.

If clearance between outer rotor and its bore in oil pump exceeds the tolerance, replace the complete oil pump and the PTO housing.

Using a vernier depth gauge, measure side wear as shown.



1. Oil pump housing surface
2. Vernier depth gauge



1. Oil pump outer rotor surface
2. Vernier depth gauge

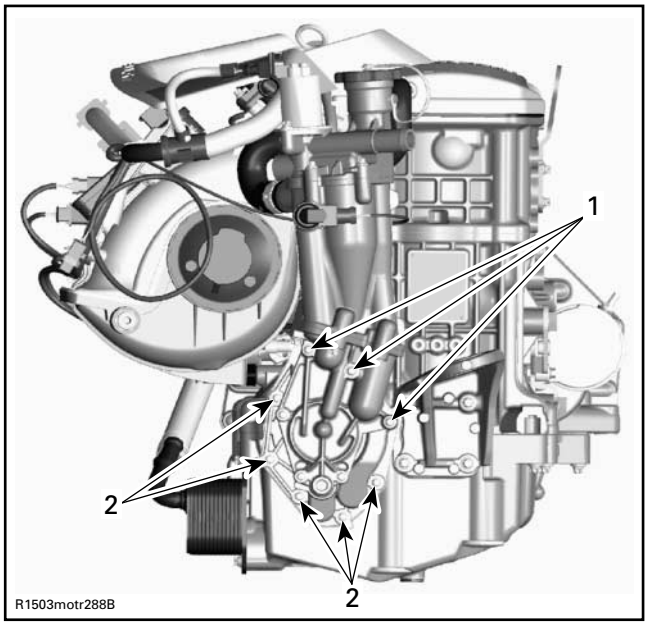
Difference between pump housing and outer rotor should not exceed 0.1 mm (.004 in). If so, replace the complete oil pump assembly.

NOTE: When the axial clearance of the oil pump shaft assembly increases, the oil pressure decreases.

Check the inside of oil pump housing and its cover for scoring or other damages and replace if damaged.

Installation

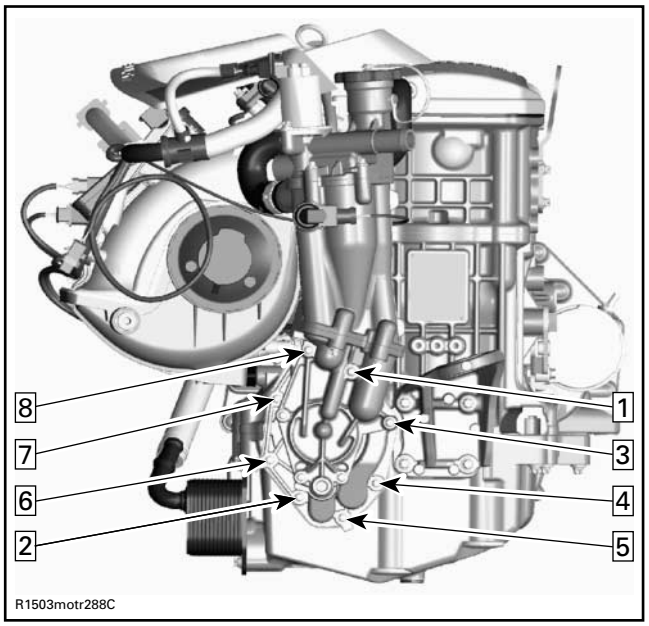
For installation, reverse the removal procedure. Pay attention to the following details.



1. Screws M6 x 85
2. Screws M6 x 25

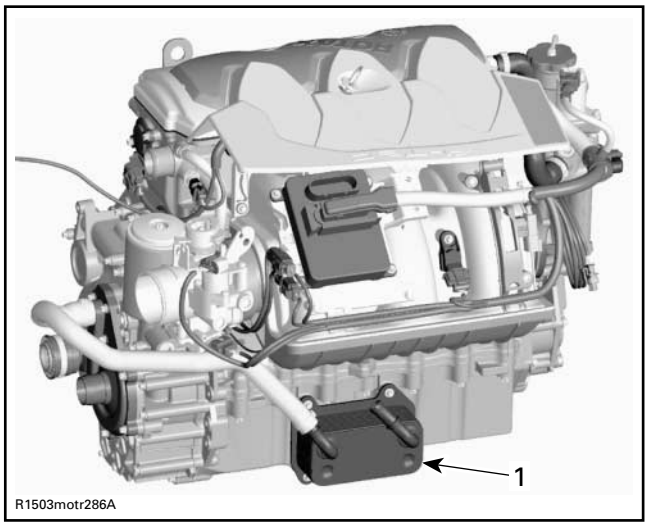
Torque oil pump cover screws to 10 N•m (88 lbf•**in**).

Tighten suction pump screws as per following sequence and torque to 10 N•m (88 lbf•**in**). Apply Loctite 243 (blue) on threads.



OIL COOLER

The oil cooler is located below the air intake manifold.

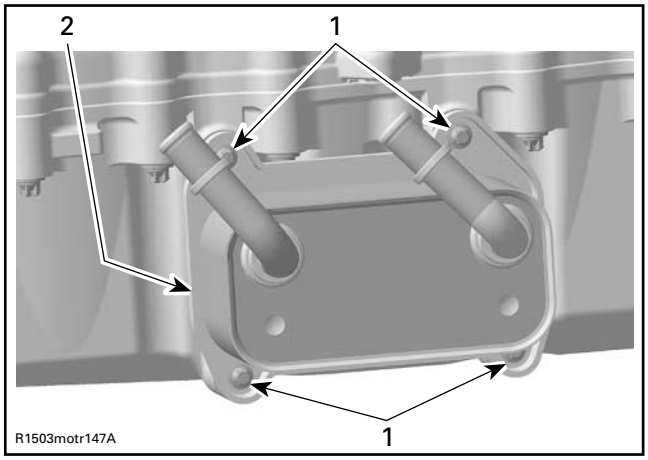


TYPICAL
1. Oil cooler

Removal

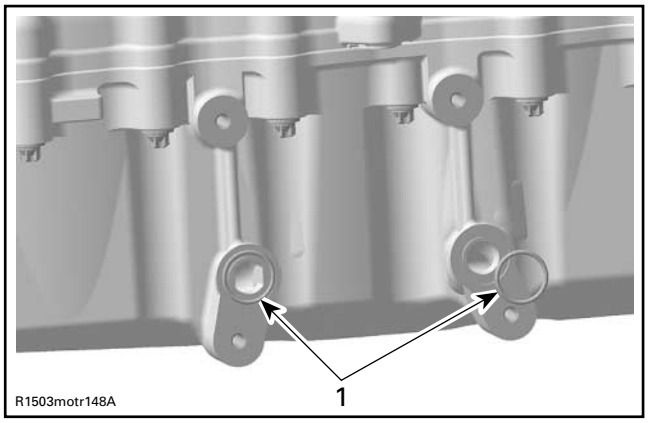
Remove:

– cooling hoses **no. 34** and **no. 35**
– retaining screws **no. 36**
– oil cooler **no. 37**



1. Screws
2. Oil cooler

– O-rings **no. 38**.



1. O-rings

Inspection

If O-rings are brittle, cracked or hard, replace them.

Clean both contact surfaces of oil cooler.

Check and clean the oil inlet and outlet area for dirt and other contaminations.

Installation

For installation, reverse the removal procedure. Pay attention to the following details.

Apply grease on O-rings.

Torque oil pump cover screws to 10 N•m (88 lbf•**in**). Apply Loctite 243 (blue) on threads.

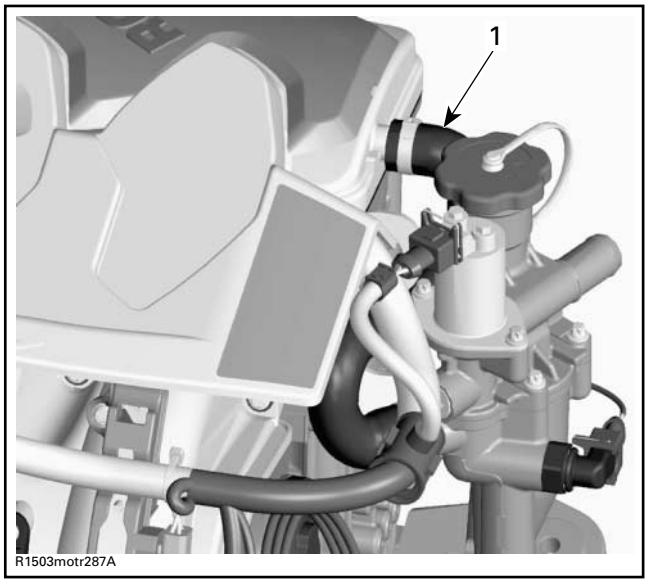
OIL SEPARATOR

Pressure Test

Refer to ENGINE MANAGEMENT section.

Removal

– Remove crankcase ventilation hose **no. 32**.



TYPICAL
1. Crankcase ventilation hose

– Disconnect wiring harness from OSPS **no. 24**.
– Detach air silencer from throttle body.
– Disconnect battery cables and vent tube then remove battery. Refer to BATTERY for proper procedures.
– Remove retaining screws **no. 42**.
– Place rags under cover to prevent spillage. If spillage occurs, clean immediately with the pulley flange cleaner (P/N 413 711 809) to prevent stains.

⚠ WARNING

Wear safety glasses and work in a well ventilated area when working with strong chemical products. Also wear suitable non-absorbent gloves to protect your hands.

– Remove suction pump cover with oil separator ass'y.
– Completely disassemble oil separator ass'y.

Inspection

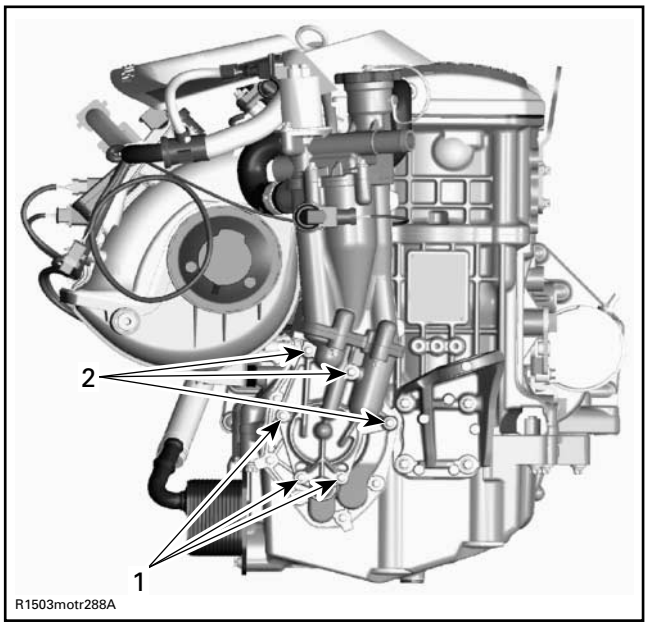
If O-rings and rubber rings are brittle, cracked or hard, replace them.

Clean all contact surfaces of oil separator.

Check and clean the oil and blow-by channels for dirt and other contaminations.

Installation

For installation, reverse the removal procedure. Pay attention to the following details.

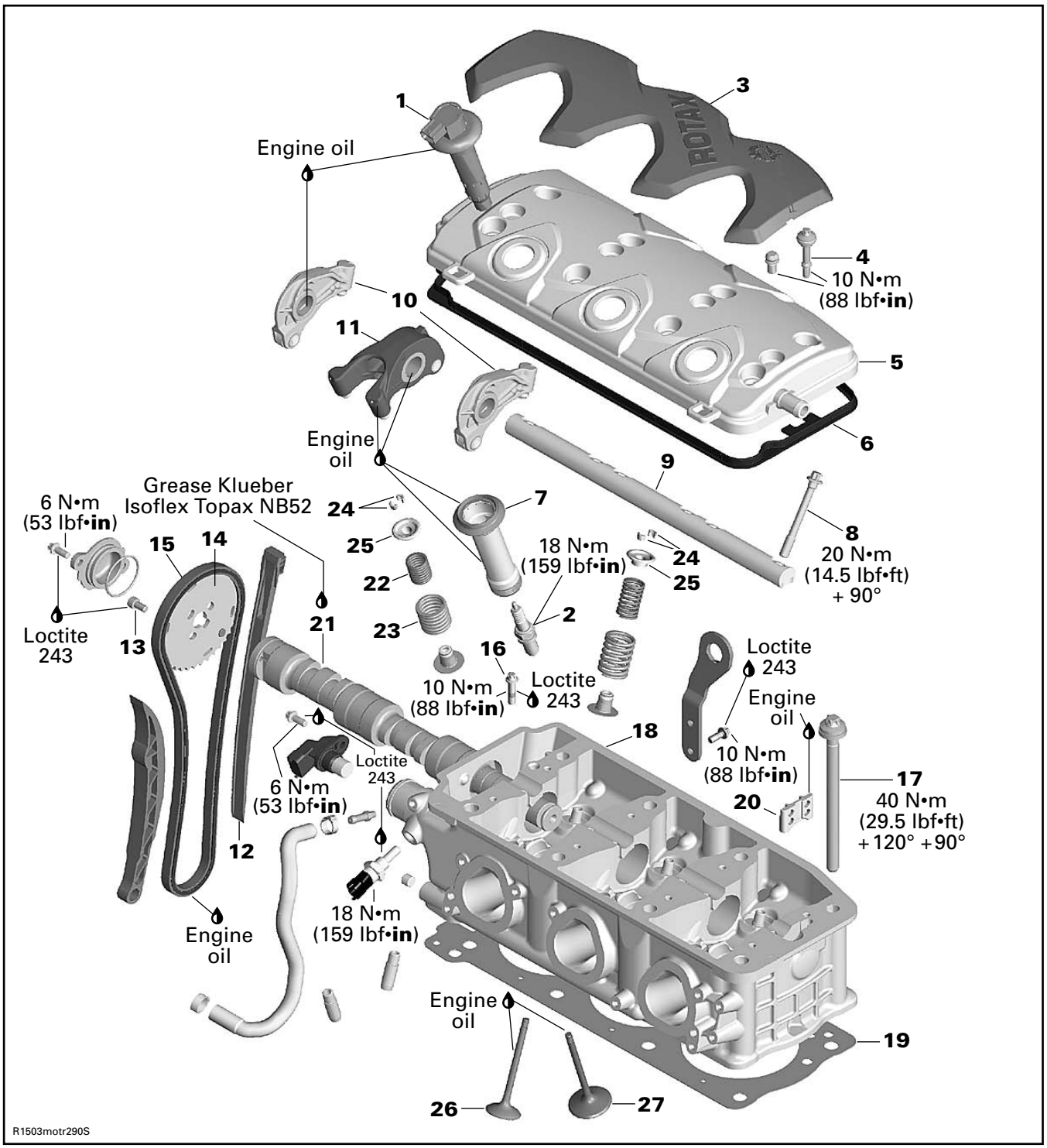


1. Screws M6 x 25
2. Screws M6 x 85

Apply grease on O-rings and rubber rings.

Torque screws to 10 N•m (88 lbf•**in**). Apply Loctite 243 (blue) on threads.

CYLINDER HEAD AND VALVES



NOTE: For cylinder head removal, it is not necessary to remove engine from vehicle.

GENERAL

NOTE: When diagnosing an engine problem, always perform a cylinder leak test. This will help pin-point a problem. Refer to the instructions included with your leak tester and LEAK TEST for procedures.

Always place the vehicle on level surface.

NOTE: For a better understanding, the following illustrations are taken with engine out of vehicle. To perform the following instructions, it is not necessary to remove engine from vehicle.

Always disconnect the negative wire from the battery before working on the engine.

Even if the removal of many parts is not necessary to reach another part, it is recommended to remove these parts in order to check them.

For installation, use the torque values and Loctite products as mentioned. Clean threads before using Loctite product when installing screws.

When disassembling parts that are duplicated in the engine, (e.g.: valves, bushings), it is strongly recommended to note their position (cylinder 1, 2 or 3) and to keep them as a "group". If you find a defective component, it would be much easier to find the cause of the failure within the group of parts (e.g.: you found a worn valve guide. A bent spring could be the cause and it would be easy to know which one among the springs is the cause to replace it if you grouped them at disassembly). Besides, since used parts have matched together during the engine operation, they will keep their matched fit when you reassemble them together within their "group".

SPARK PLUG

Removal

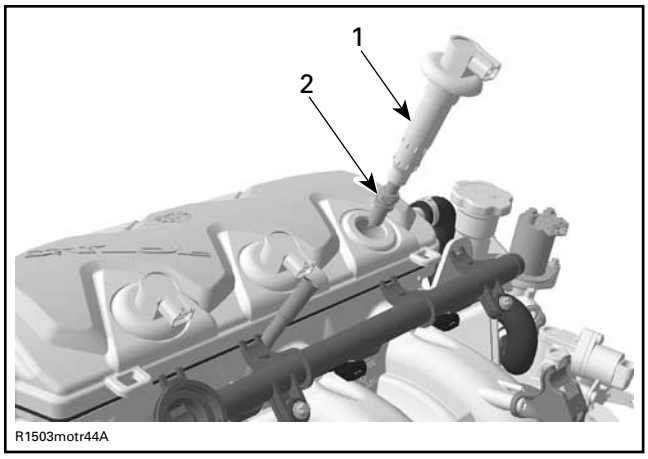
Remove fuel rail cover from engine.

Unplug the single-spark ignition coil connector on the spark plug you need to remove.

Remove the single-spark ignition coil **no. 1**.

Clean spark plug and single-spark ignition coil area before disassembly.

Unscrew spark plug **no. 2** then use the single-spark ignition coil to take spark plug out of spark plug hole.



1. Single-spark ignition coil
2. Spark plug

Inspection

Check spark plug and single-spark ignition coil condition (refer to ENGINE MANAGEMENT SYSTEM).

Installation

For installation, reverse the removal procedure. Pay attention to the following details.

Check spark plug gap.

Place spark plug into single-spark ignition coil, screw spark plug then remove the single-spark ignition coil. Torque spark plug. Reinstall the single-spark ignition coil.

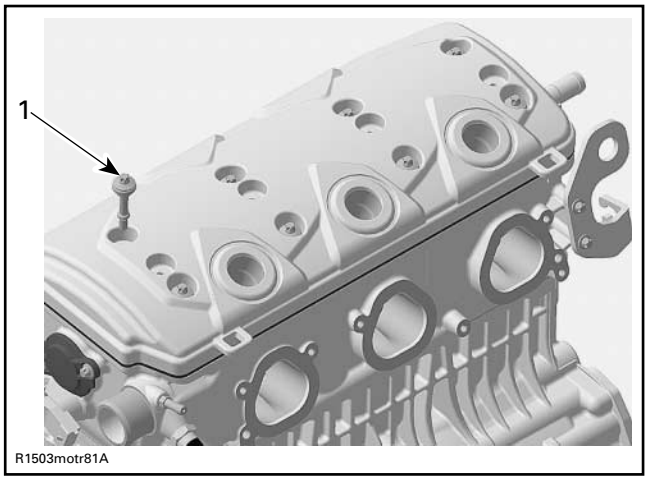
NOTE: Prior to inserting the ignition coil in its location, apply some BOMBARDIER LUBE lubricant around the seal area that touches the spark plug hole. After installation, ensure the seal seats properly with the engine top surface.

VALVE COVER

Removal

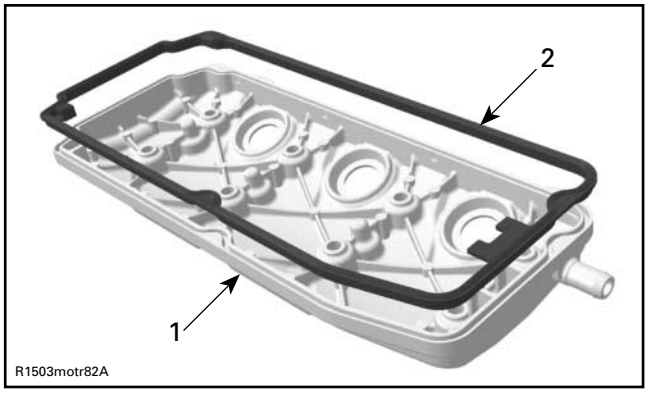
Remove:

– valve cover shield **no. 3**
– valve cover screws **no. 4**



1. Valve cover screws

– valve cover **no. 5** and profile sealing ring **no. 6**.



1. Valve cover
2. Profile sealing ring

Inspection

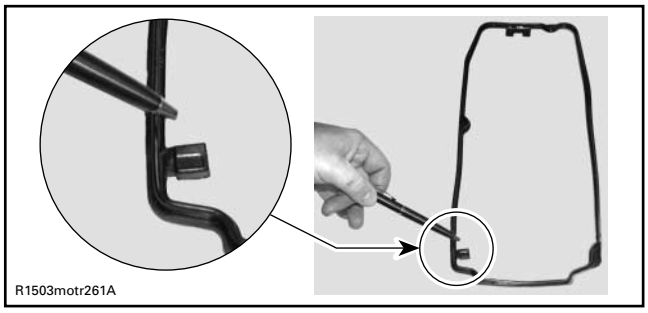
Check if the profile sealing ring on the valve cover and the rubber bushing on the valve cover screws are brittle, cracked or hard. If so, replace the profile sealing ring or the valve cover screw accordingly.

Installation

For installation, reverse the removal procedure.

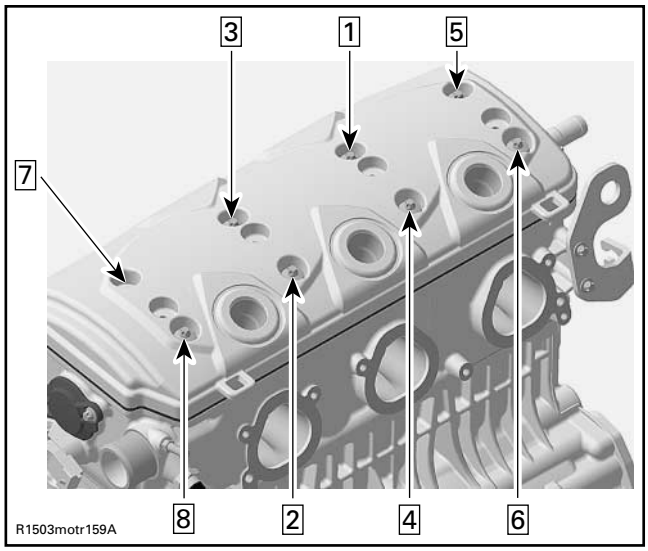
Check valve cover gasket. If there is a rubber tab on chain guide side, cut it out.

CAUTION: Never assemble the cover on a gasket having this tab. The tab must be cut out.



CUT THIS TAB

NOTE: Install the valve cover screws according to following sequence.



Torque screws to 10 N•m (89 lbf•**in**).

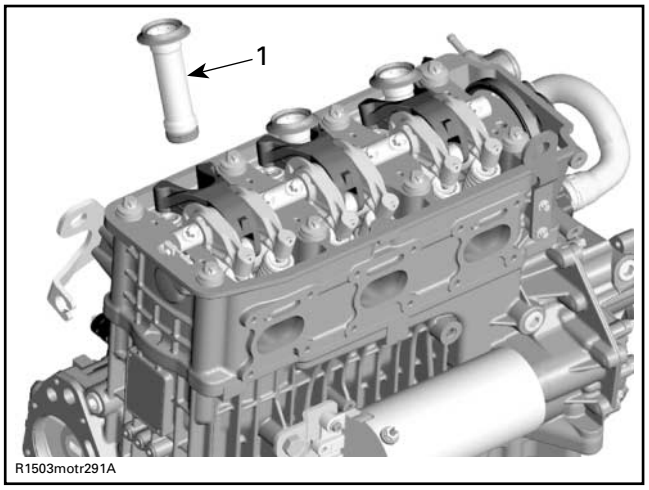
ROCKER ARM

Removal

Lock crankshaft with crankshaft locking tool (P/N 529 035 821) , refer to CRANKSHAFT LOCKING in ENGINE BLOCK section.

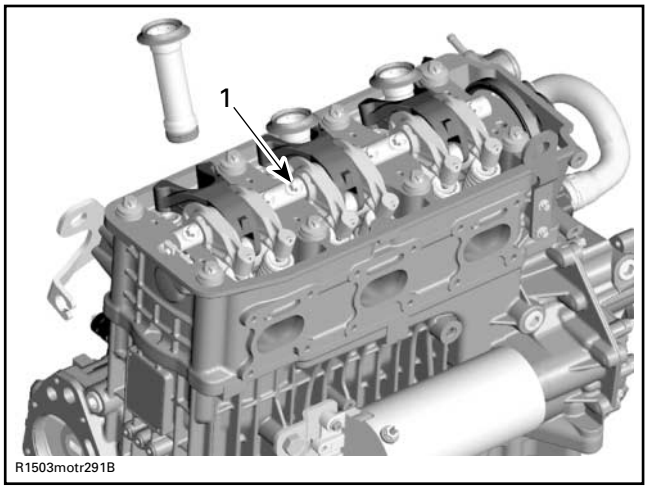
Remove:

– spark plug
– valve cover
– spark plug tube **no. 7**



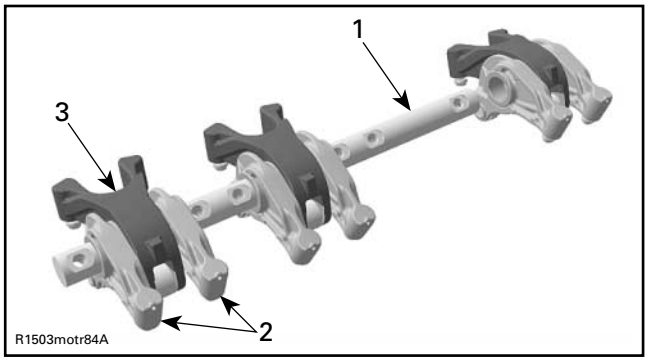
1. Spark plug tube

– rocker arm shaft screws **no. 8**. Discard screws

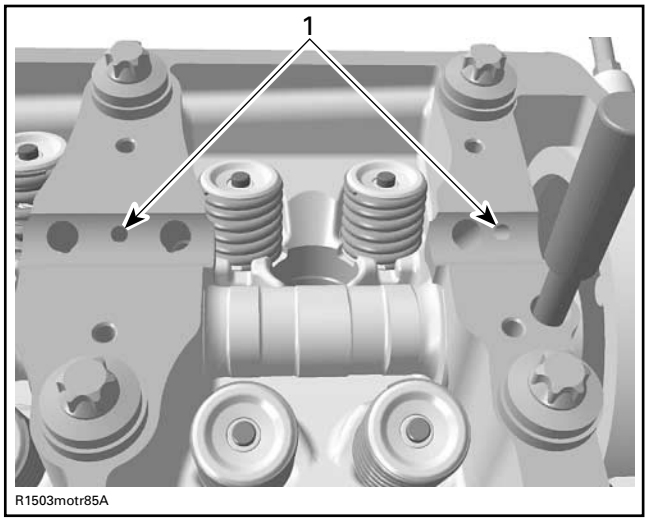


1. Rocker arm shaft screws

– rocker arm shaft **no. 9** with rocker arm assembly (exhaust side **no. 10** and intake side **no. 11**).



1. Rocker arm shaft
2. Rocker arms (exhaust side)
3. Rocker arm (intake side)

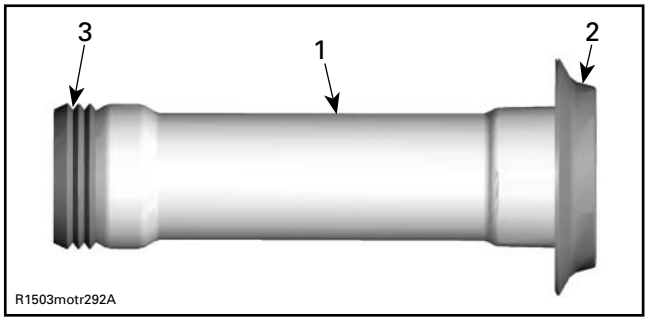


1. Oil supply from the camshaft to the rocker arm shaft, then to the rocker arms and finally to the valve adjustment

Inspection

Spark Plug Tube

Check seals on spark plug tube. If seals are brittle, cracked or hard, replace spark plug tube.

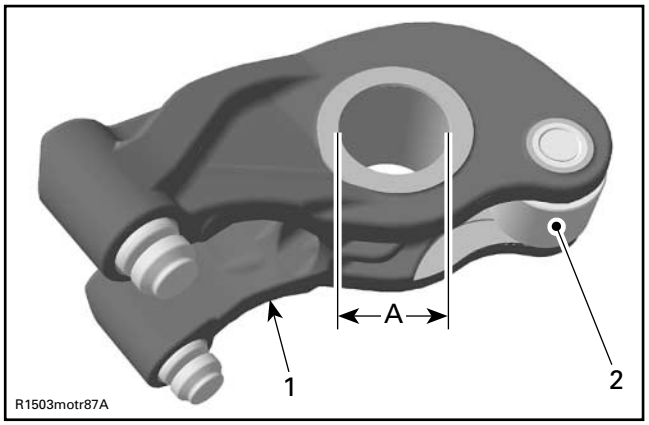


1. Spark plug tube
2. Seal to the valve cover
3. Seal to the cylinder head

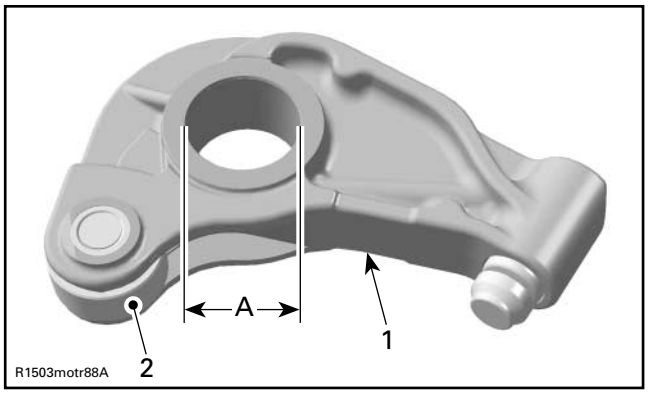
Rocker Arm

Inspect each rocker arm for cracks and scored friction surfaces. If so, replace rocker arm assembly.

Check the rocker arm rollers for free movement, wear and excessive radial play. Replace rocker arm assembly as necessary.



1. Rocker arm (intake side)
2. Roller
A. Bore for rocker arm shaft

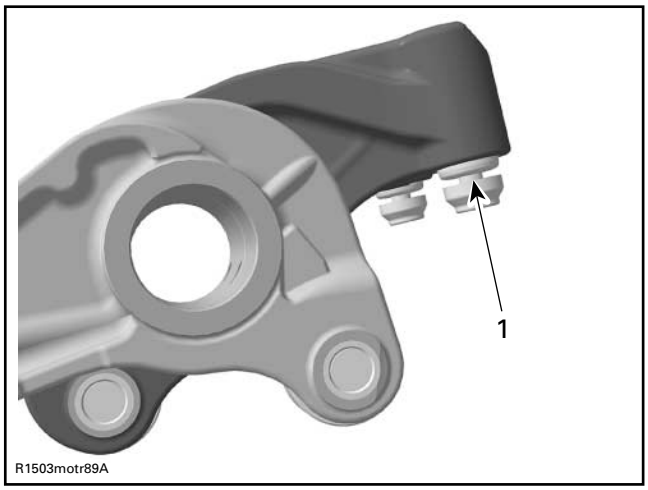


1. Rocker arm (exhaust side)
2. Roller
A. Bore for rocker arm shaft

Measure rocker arm bore diameter. If diameter is out of specification, change the rocker arm assembly.

ROCKER ARM BORE DIAMETER	
NEW MINIMUM	20.007 mm (.7877 in)
NEW MAXIMUM	20.020 mm (.7881 in)
SERVICE LIMIT	20.035 mm (.7887 in)

Press the hydraulic lifter with your thumb. If the hydraulic lifter groove disappears inside rocker arm casting, replace rocker arm assembly. Lifter must turn freely in rocker arm bore. Otherwise, replace.



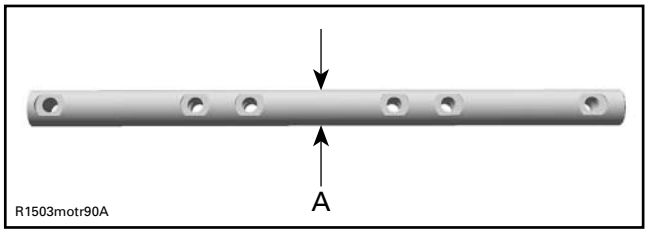
1. Hydraulic lifter groove

Rocker Arm Shaft

Check for scored friction surfaces, if so, replace parts.

Measure rocker arm shaft diameter.

ROCKER ARM BORE DIAMETER	
NEW MINIMUM	19.980 mm (.7866 in)
NEW MAXIMUM	20.007 mm (.7877 in)
SERVICE LIMIT	19.965 mm (.7860 in)



A. Measure rocker arm shaft diameter here

Any area worn excessively will require parts replacement.

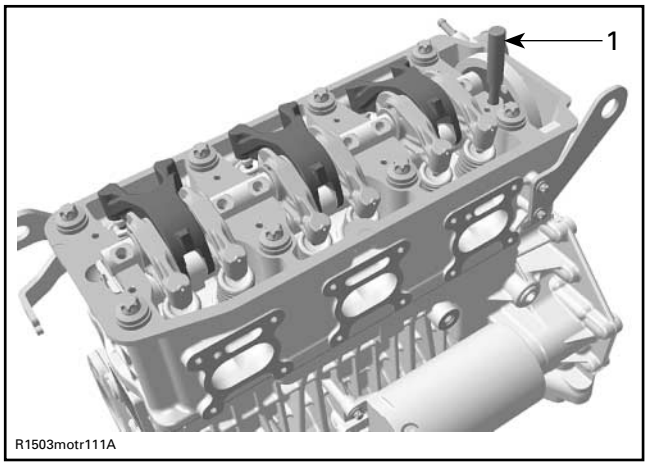
Installation

For installation, reverse the removal procedure. Pay attention to the following details.

Apply engine oil on rocker arm shaft.

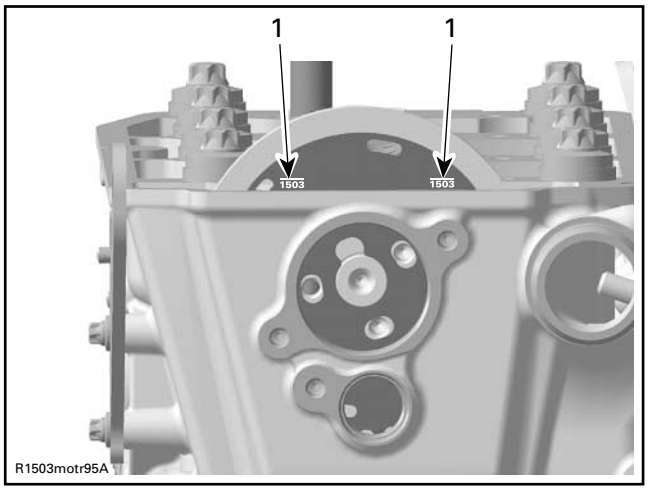
IMPORTANT: The rocker arm shaft can only be installed in one specific position. Therefore crankshaft as well as camshaft has to be positioned with their locking pins when the piston of cylinder **no. 3** is on ignition TDC. Refer to CRANKSHAFT LOCKING in ENGINE BLOCK section for crankshaft and the following for the camshaft locking.

Use camshaft locking tool (P/N 529 035 839). Rotate camshaft so that tool can be pushed in camshaft hole and lock camshaft in place.



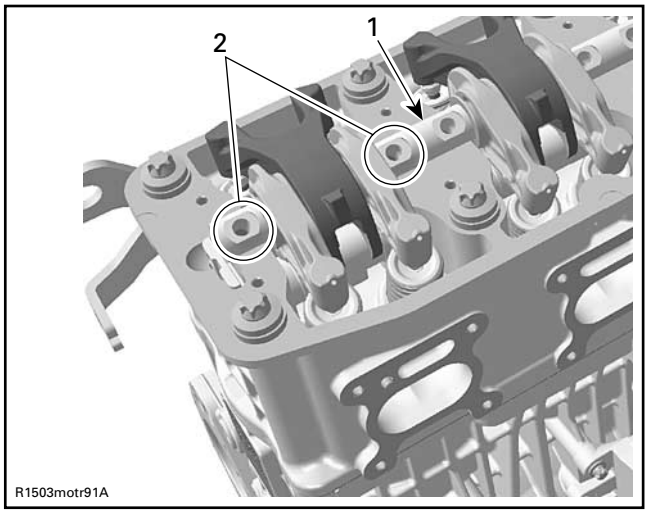
1. Camshaft locking tool

Then, the camshaft sprocket lines should be lined up as shown in the following illustration.



1. Position lines

Position the rocker arm shaft with the notches on top.

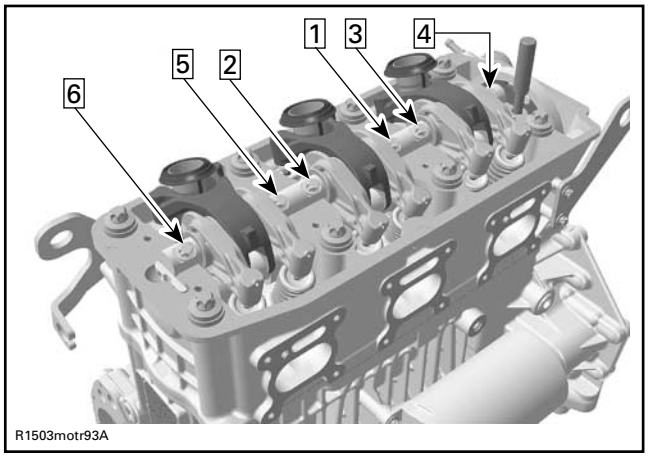


1. Rocker arm shaft
2. Rocker arm shaft notches

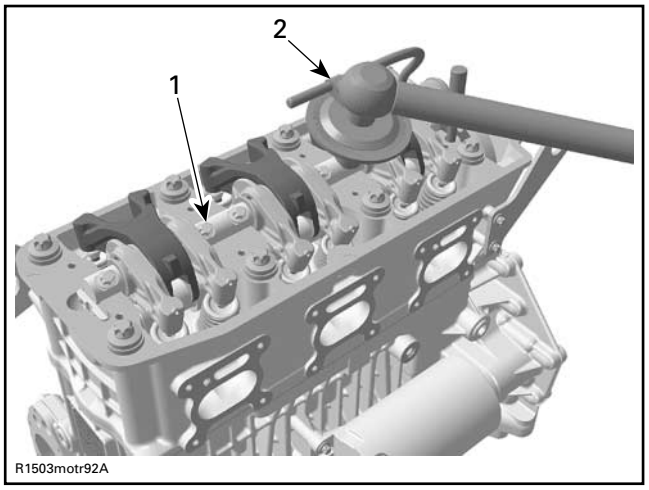
Install NEW rocker arm shaft screws **no. 8**. Torque as per following procedure:

CAUTION: This assembly uses stretch screws. As the screws have been stretched from the previous installation, it is very important to use new screws at assembly . Failure to replace screws and to strictly follow the torque procedure may cause screws to loosen and lead to engine damage.

– Torque screws at first to 10 N•m (88 lbf•**in**) according to following sequence.



– Torque screws to 20 N•m (177 lbf•**in**).
– Finish tightening screws turning an additional 90° rotation with a torque angle gauge.



1. Rocker arm shaft screw
2. Torque angle gauge

CAMSHAFT TIMING GEAR

NOTE: Although it is not necessary to position crankshaft to TDC for disassembly, it is a good practice to do it, as a troubleshooting step, to know before disassembly if valve timing was appropriate.

Removal

Lock crankshaft with crankshaft locking tool (P/N 529 035 821), refer to CRANKSHAFT LOCKING in ENGINE BLOCK section.

Remove:

– valve cover
– chain tensioner (refer to CHAIN TENSIONER REMOVAL in ENGINE BLOCK section)
– chain guide **no. 12**
– Allen screws **no. 13**
– camshaft timing gear **no. 14**.

NOTE: Secure timing chain **no. 15** with a retaining wire.

Inspection

Check camshaft timing gear for wear or deterioration.

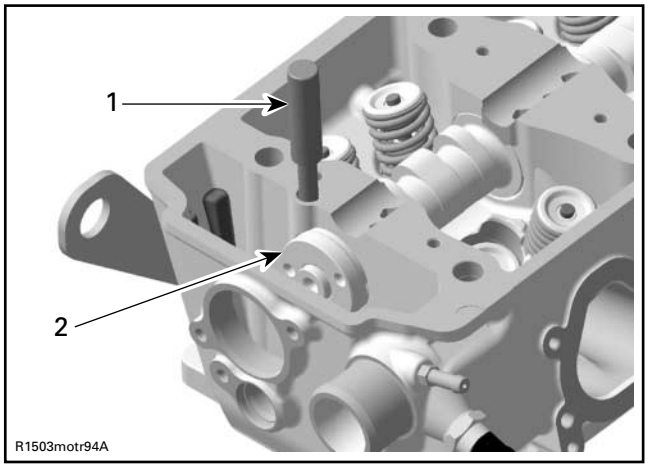
If gear is worn or damaged, replace it as a set (camshaft timing gear and timing chain).

For crankshaft timing gear, refer to ENGINE BLOCK section.

Installation

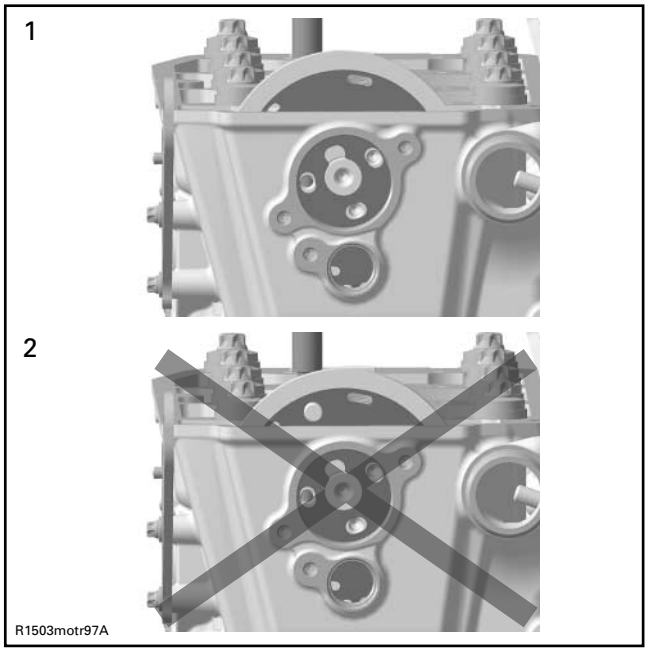
For installation, reverse the removal procedure. Pay attention to the following details.

Using the camshaft locking tool (P/N 529 035 839), lock camshaft on TDC position.



1. Camshaft locking tool
2. Camshaft on TDC position

Install the camshaft timing gear with the writing visible, i.e. to be able to see the position lines when looking from outside of engine.



1. Good (with 1503 aligned)
2. Never

Install timing chain. Refer to ENGINE BLOCK section.

Ensure chain guides are in place.

Loosely install screws.

Install chain tensioner.

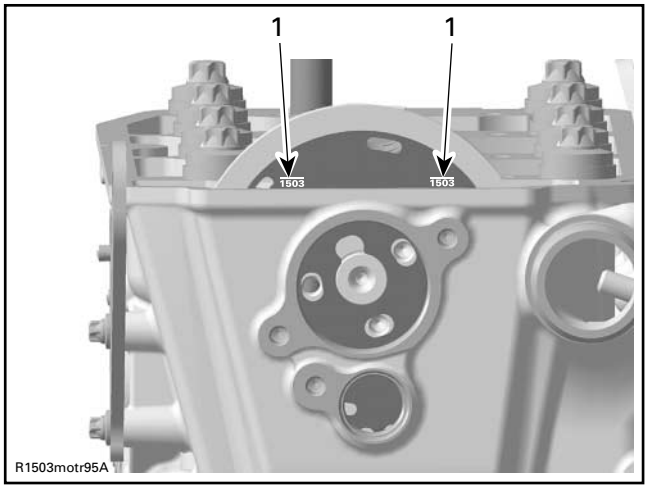
NOTE: There can be 2 different positions to install the timing gear on the camshaft. Basically both positions are working well, since the camshaft and crankshaft are locked in their proper position. Due to some tolerances, there could be one position which fits better than the other one. To check this, perform the following test.

Check if screws are still loose. If screws are squeezed by the timing gear, remove the chain tensioner again and rotate timing gear by one tooth clockwise. Then install the chain tensioner again.

Tighten screws and torque to 10 N•m (88 lbf•**in**).

Remove locking tools.

CAUTION: Crankshaft and camshaft must be locked on TDC position to place camshaft timing gear and timing chain in the proper position. To double check, take a look at the timing gear lines. They must be parallel to the cylinder head surface.



1. Position lines

CAUTION: Ensure to remove locking tools when finished.

TIMING CHAIN

Refer to ENGINE BLOCK section.

CYLINDER HEAD

Removal

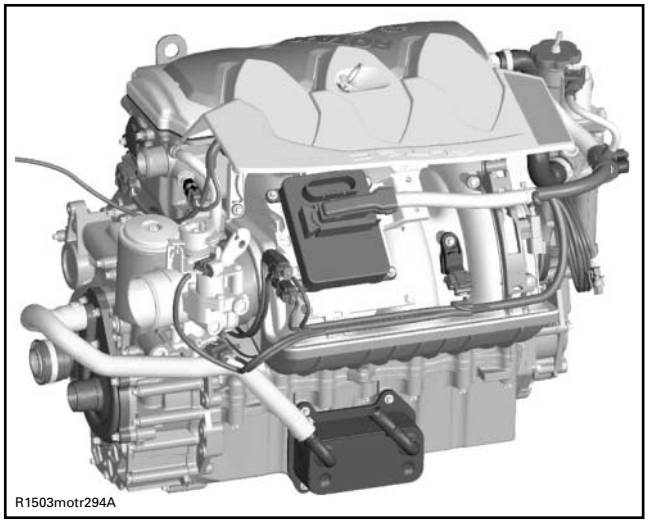
Lock crankshaft with crankshaft locking tool (P/N 529 035 821), refer to CRANKSHAFT LOCKING in ENGINE BLOCK section.

Drain coolant (refer to COOLING SYSTEM).

Disconnect coolant temperature and camshaft position sensors (CTS and CAPS).

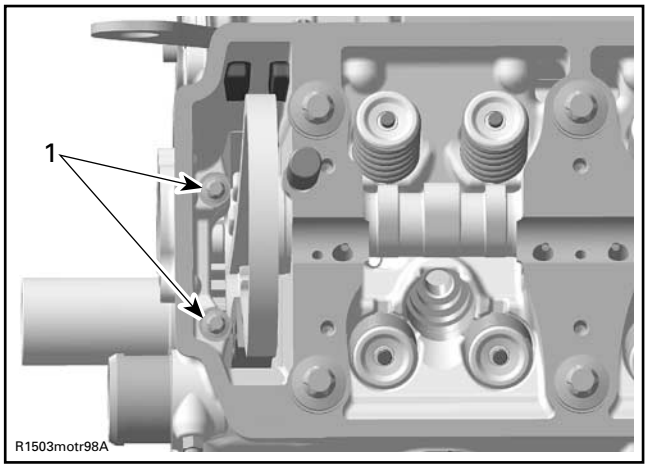
Remove:

– exhaust manifold (refer to EXHAUST MANIFOLD REMOVAL elsewhere in this section)
– engine hoses



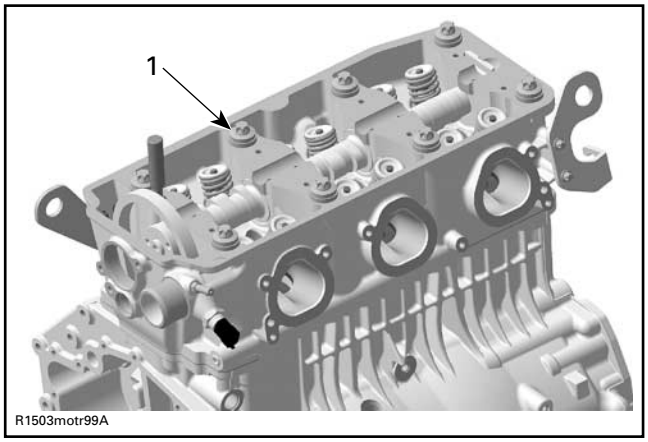
TOPS VENTILATION HOSE

– chain tensioner (refer to CHAIN TENSIONER REMOVAL in ENGINE BLOCK section)
– valve cover shield
– (see VALVE COVER REMOVAL above)
– camshaft timing gear
– cylinder head screws M6 **no. 16**



1. Cylinder head screws M6

– cylinder head screws M11 **no. 17** retaining cylinder head to engine block.



1. Cylinder head screws M11

Pull up cylinder head **no. 18**.

Remove gasket **no. 19**.

Cleaning

Remove carbon deposits from combustion chamber, exhaust port and piston top.

Inspection

Check for cracks between valve seats, if so, replace cylinder head.

Check mating surface between cylinder and cylinder head for contamination. If so, clean both surfaces.

Installation

For installation, reverse the removal procedure. Pay attention to the following details.

Ensure dowel pins are in place.

Install new cylinder head gasket.

CAUTION: Each installation of the cylinder head requires a new cylinder head gasket. Using a gasket twice will cause engine damage, even if the engine had not run.

Install cylinder screws M11 **no. 17**. Torque screws as per following procedure.

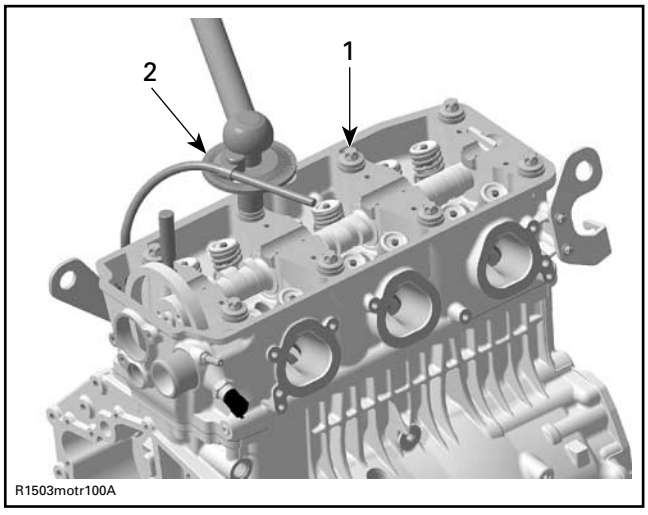
CAUTION: This assembly uses stretch screws. As the screws have been stretched from the previous installation, it is very important to measure each screw at assembly. If screw is out of specification, replace by a new. Failure to replace screws and to strictly follow the torque procedure may cause screws to loosen and lead to engine damage.

CYLINDER SCREW M11	
SERVICE LIMIT	148.5 mm (5.846 in)

Torque screws according to following sequence.

First torque to 40 N•m (30 lbf•ft).

Then tighten screws turning an additional 120° rotation with a torque angle gauge and finish tightening with a 90° rotation. Torque screws **no. 16** to 10 N•m (88 lbf•**in**).



1. Cylinder screws M11
2. Angle torque wrench

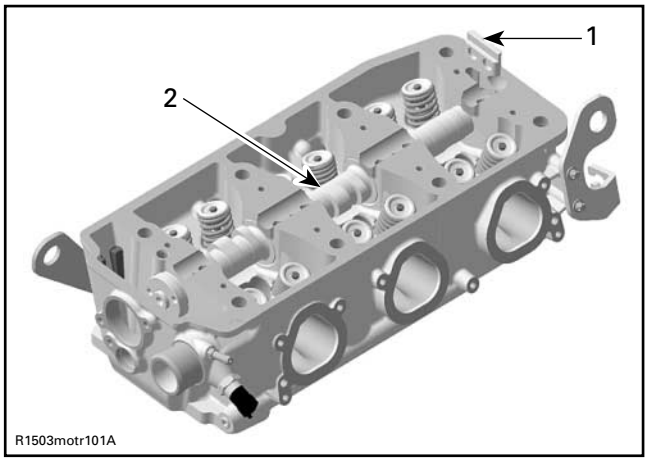
Remove crankshaft locking tool then install plug with sealing ring.

CAMSHAFT

Removal

Remove:

– valve cover
– rocker arms
– chain tensioner (refer to CHAIN TENSIONER REMOVAL in ENGINE BLOCK section)
– camshaft timing gear
– camshaft lock **no. 20**
– camshaft **no. 21**.



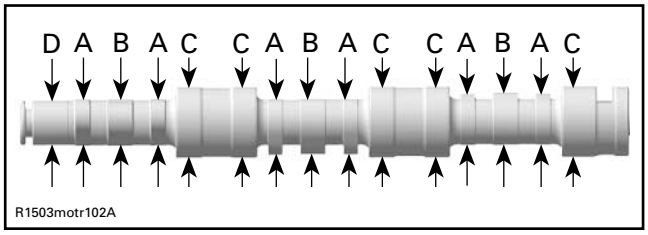
1. Camshaft lock
2. Camshaft

Inspection

Check each lobe and bearing journal of camshaft for scoring, scuffing, cracks or other signs of wear.

Measure camshaft bearing journal diameter and lobe height using a micrometer.

Measure clearance between both ends of camshaft and cylinder head.



A. Camshaft lobe (exhaust valves)
B. Camshaft lobe (intake valves)
C. Camshaft bearing journal
D. Camshaft bearing journal – engine front

CAMSHAFT LOBE - EXHAUST VALVE	
NEW MINIMUM	31.699 mm (1.248 in)
NEW MAXIMUM	31.809 mm (1.252 in)
SERVICE LIMIT	31.670 mm (1.247 in)
CAMSHAFT LOBE - INTAKE VALVE	
NEW MINIMUM	31.480 mm (1.239 in)
NEW MAXIMUM	31.590 mm (1.244 in)
SERVICE LIMIT	31.450 mm (1.238 in)
CAMSHAFT BEARING JOURNAL	
NEW MINIMUM	39.892 mm (1.5705 in)
NEW MAXIMUM	39.905 mm (1.5711 in)
SERVICE LIMIT	39.860 mm (1.5693 in)
CAMSHAFT BEARING JOURNAL - ENGINE FRONT	
NEW MINIMUM	24.939 mm (.9818 in)
NEW MAXIMUM	24.960 mm (.9826 in)
SERVICE LIMIT	24.910 mm (.9807 in)
CAMSHAFT BORE MEASURED IN DIAMETER	
NEW MINIMUM	40.000 mm (1.5748 in)
NEW MAXIMUM	40.016 mm (1.5754 in)
SERVICE LIMIT	40.050 mm (1.5767 in)
CAMSHAFT BORE - ENGINE FRONT MEASURED IN DIAMETER	
NEW MINIMUM	25.000 mm (.9842 in)
NEW MAXIMUM	25.013 mm (.9848 in)
SERVICE LIMIT	25.050 mm (.9862 in)

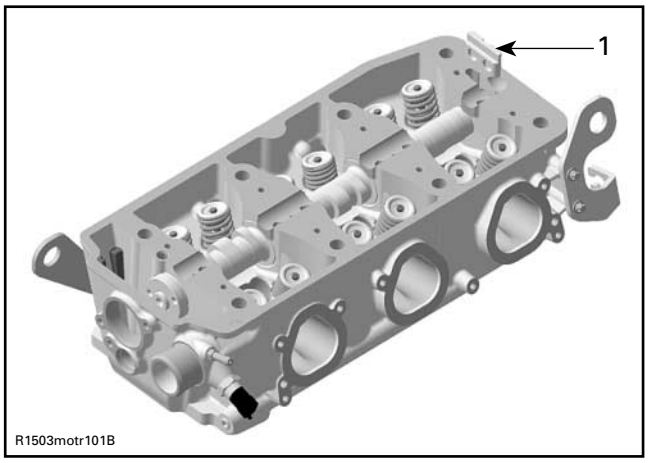
Replace parts that are not within specifications.

Installation

For installation, reverse the removal procedure. Pay attention to the following details.

Grease the camshaft bearing journals well by using the grease Klueber Isoflex (P/N 293 550 021)or a similar product.

Install camshaft then place the camshaft lock **no. 20** in the slot.



1. Camshaft lock position

For other parts, refer to proper installation procedure.

VALVE SPRING

Removal

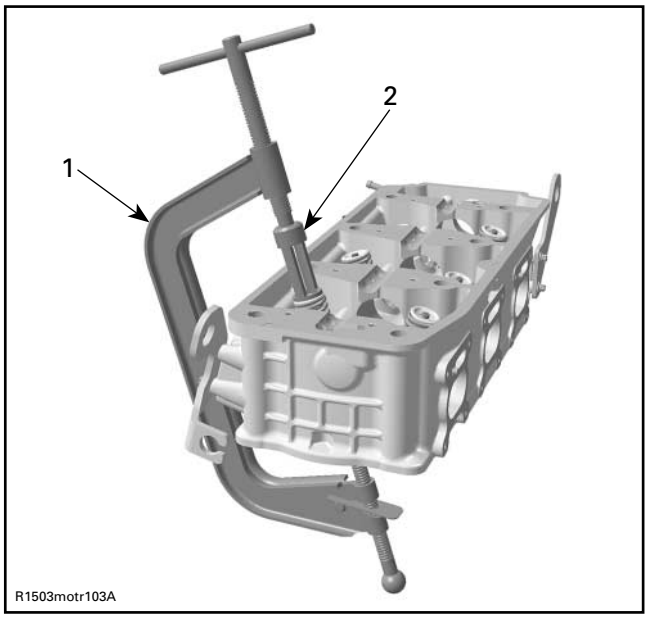
Remove:

– rocker arms
– cylinder head.

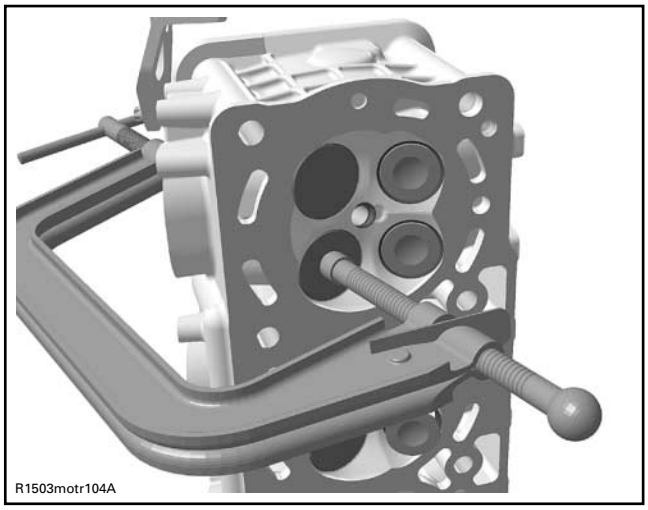
Compress valve springs **no. 22** and **no. 23**. Use valve spring compressor clamp (P/N 529 035 724) and valve spring compressor cup (P/N 529 035 725).

⚠ WARNING

Always wear safety glasses when disassembling valve springs. Be careful when unlocking valves. Components could fly away because of the strong spring preload.



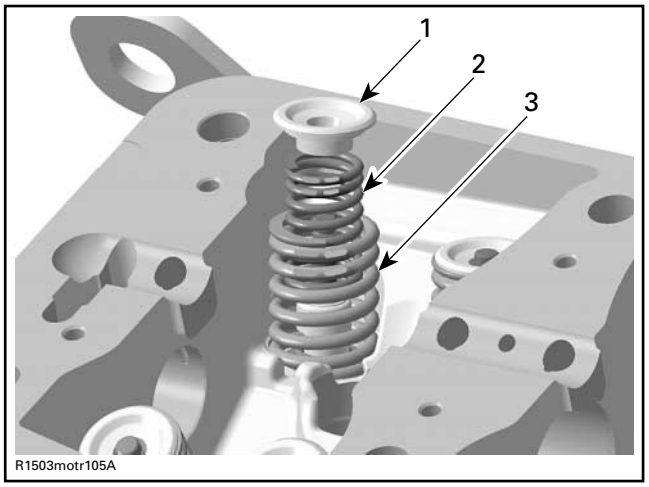
1. Valve spring compressor clamp
2. Valve spring compressor cup



LOCATE VALVE SPRING COMPRESSOR CLAMP IN CENTER OF THE VALVE

Remove valve cotters **no. 24**.

Withdraw valve spring compressor, valve spring retainer **no. 25** and valve springs.



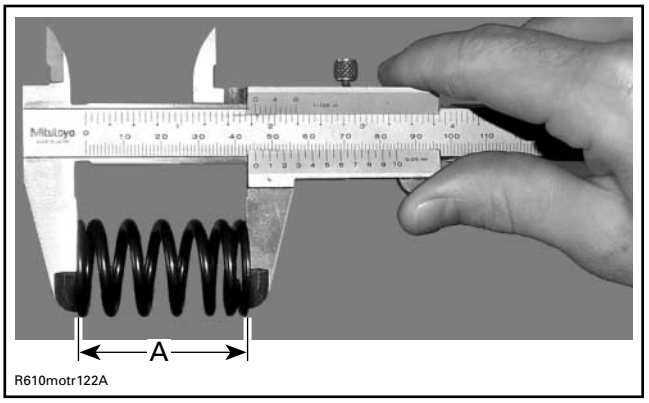
1. Valve spring retainer
2. Inner valve spring
3. Outer valve spring

Inspection

Check valve springs for rust, corrosion or other visible damages. If so, replace faulty valve springs.

Check valve springs for free length and straightness.

Replace valve springs if not within specifications.



A. Valve spring length

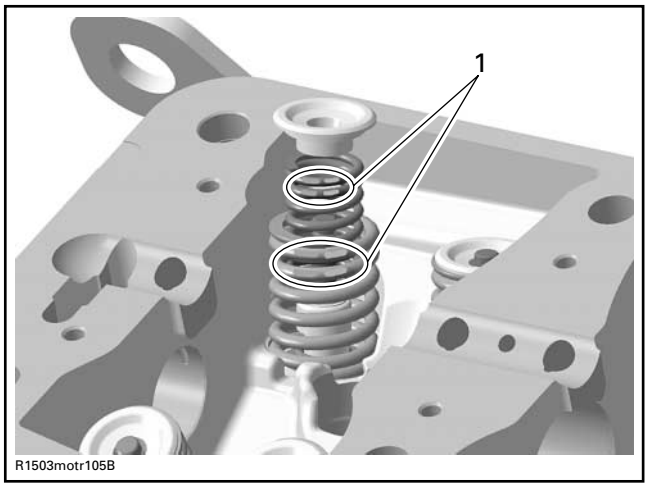
OUTER VALVE SPRING FREE LENGTH	
NEW NOMINAL	45.45 mm (1.789 in)
SERVICE LIMIT	43 mm (1.693 in)
INNER VALVE SPRING FREE LENGTH	
NEW NOMINAL	41.02 mm (1.615 in)
SERVICE LIMIT	38.8 mm (1.499 in)

Installation

For installation, reverse the removal procedure. Pay attention to the following details.

Colored area of the valve spring must be placed on top.

NOTE: Valve cotters must be properly engaged in valve stem grooves.



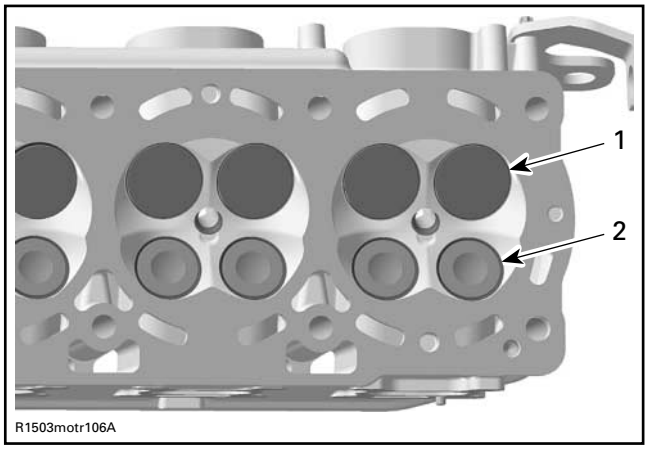
1. Position of the valve spring

VALVE

Removal

Remove valve spring.

Push valve stem then pull valves **no. 26** and **no. 27** out of valve guides.



1. Intake valve 38 mm
2. Exhaust valve 31 mm

Remove valve stem seal **no. 28** with special pliers such as Snap-on YA 8230.


R610motr125A

Inspection

Valve Stem Seal

Inspection of valve stem seals is not needed because new seals should always be installed whenever cylinder head is removed.

Valve

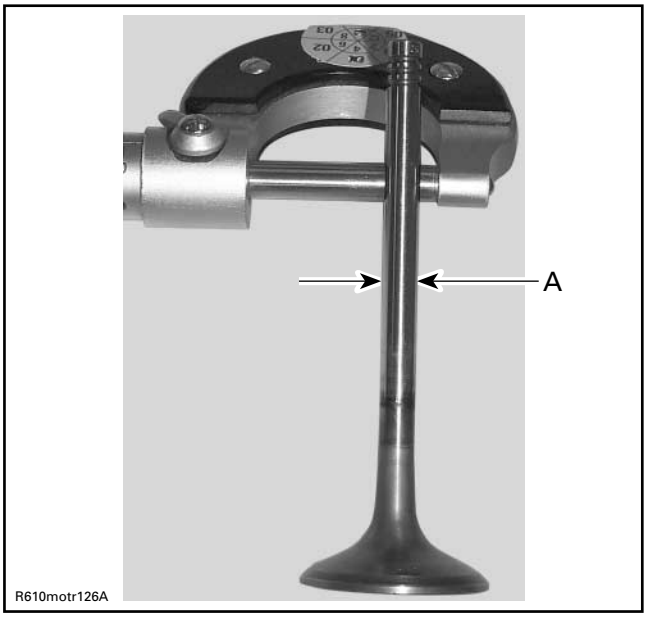
Inspect valve surface, check for abnormal stem wear and bending. If so, replace by a new one.

Valve Stem and Valve Guide Clearance

Measure valve stem and valve guide in three places, using a micrometer and a small bore gauge.

NOTE: Clean valve guide to remove carbon deposits before measuring.

Change valve if valve stem is out of specification or has other damages such as wear or friction surface.



R610motr126A

A. Valve stem diameter

VALVE STEM DIAMETER mm (in)	
NEW MINIMUM	
Exhaust	5.946 mm (.2341 in)
Intake	5.961 mm (.2347 in)
NEW MAXIMUM	
Exhaust	5.960 mm (.2346 in)
Intake	5.975 mm (.2352 in)
SERVICE LIMIT	
Exhaust	5.93 mm (.233 in)
Intake	

Replace valve guide if it is out of specification or has other damages such as wear or friction surface. Refer to valve guide replacement below.

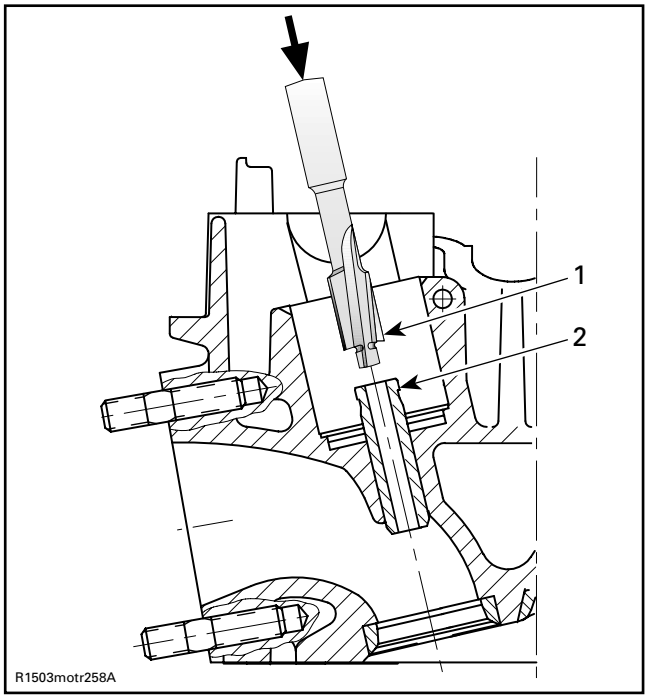
VALVE GUIDE diameter mm (in)	
NEW MINIMUM	
Exhaust	5.994 mm (.2359 in)
Intake	
NEW MAXIMUM	
Exhaust	6.018 mm (.2369 in)
Intake	
SERVICE LIMIT	
Exhaust	6.018 mm (.2369 in)
Intake	

Valve Guide Replacement

CAUTION: Do not heat cylinder head for this procedure.

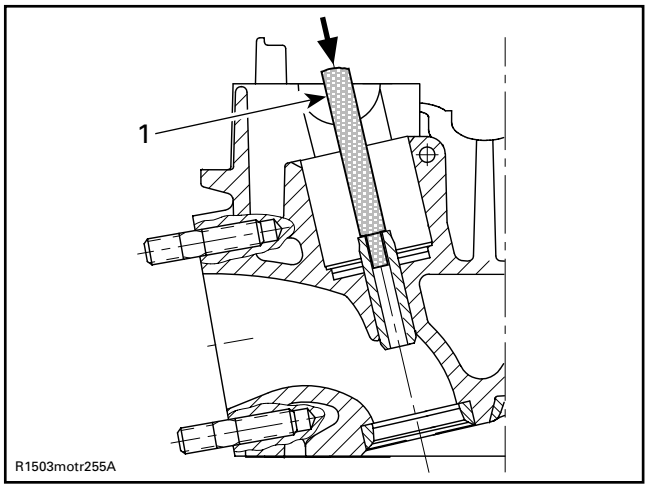
CAUTION: The sharp edge near the top of the valve guide must be machined away. Otherwise it will foul the valve guide hole in the cylinder head and destroy the cylinder head, as the valve guide is removed.

Use a special reamer as far as the top of the notch.



TYPICAL
1. Special reamer
2. Notch

Chase valve guide out of the cylinder head towards combustion chamber by using a suitable punch.



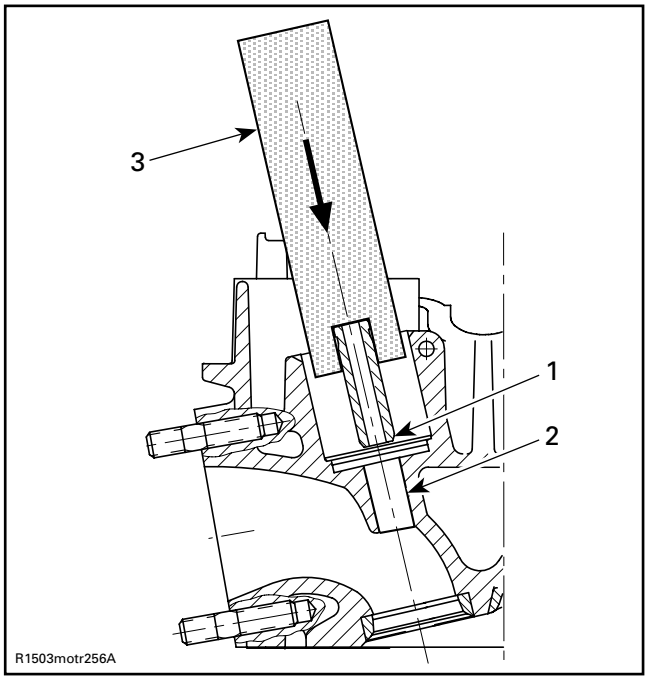
TYPICAL
1. Punch

Check valve guide bore for abreased material.

NOTE: If valve guide has caused scoring during extraction, replace the cylinder head.

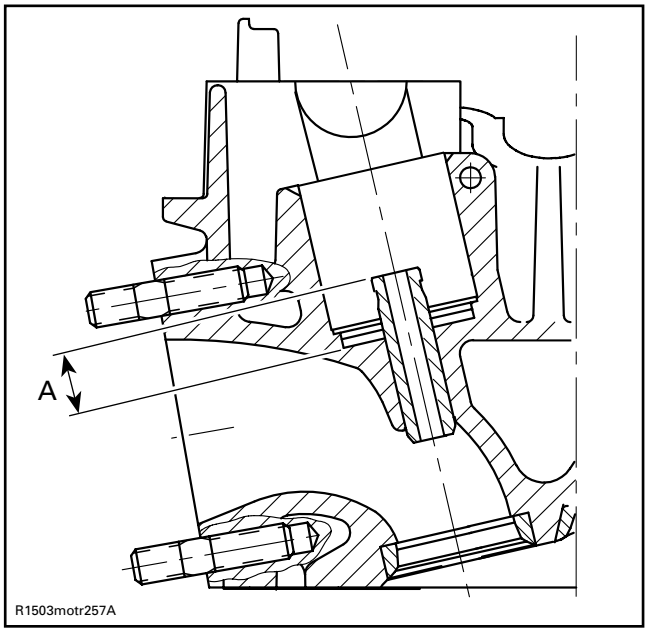
The inlet and exhaust valve guides have the same length and are interchangeable.

Grease the bore in cylinder head and the leading end of valve guide with Molykote G-N slide paste.



TYPICAL
1. *Valve guide leading end*
2. *Cylinder head bore*
3. *Jig*

With a suitable jig press the valve guide into the cold cylinder head as shown.



TYPICAL
A. Protrusion

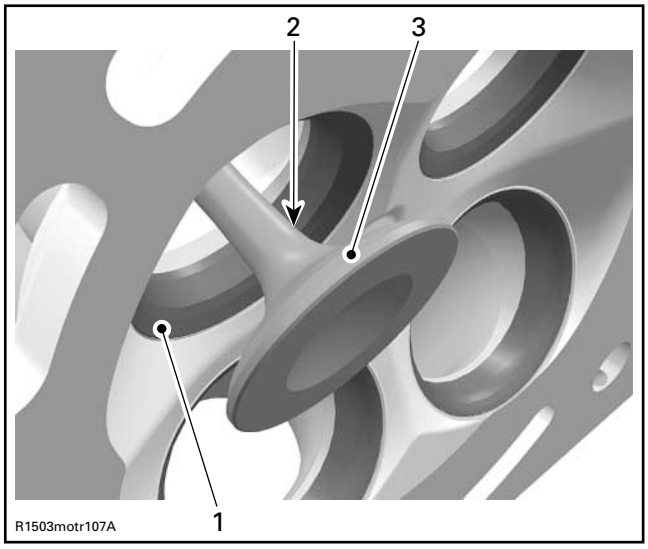
VALVE GUIDE PROTRUSION mm (in)	
MINIMUM	12.4 mm (.4882 in)
MAXIMUM	12.8 mm (.5039 in)

NOTE: For lubrication of the reamer use only cutting oil. Turn the reamer only forward, in cutting direction, never backward. Clean the reamer at short intervals from swarf, moving the reamer only while turning in cutting direction.

Ream the new valve guide with a **6 mm** diameter reamer.

Clean cylinder head carefully. Check that the valve seat is concentric with the new guide axis (check contact surface with engineer's blue).

Valve Face and Seat



1. *Valve seat*
2. *Exhaust valve contaminated area*
3. *Valve face (contact surface to valve seat)*

Check valve face and seat for burning or pittings and replace valve or cylinder head if there are signs of damage.

Ensure to seat valves properly. Apply some lapping compound on valve face and work valve on its seat with a lapping tool.

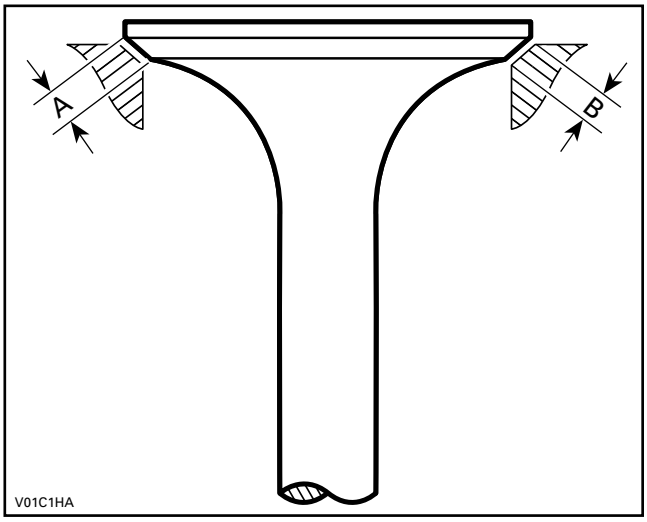
Measure valve face contact width.

NOTE: The location of contact area should be in center of valve seat.

Measure valve seat width, using a caliper.

VALVE SEAT CONTACT WIDTH mm (in)	
NEW	
Exhaust	1.25 to 1.55 mm (.049 to .061 in)
Intake	1.10 to 1.30 mm (.043 to .051 in)
SERVICE LIMIT	
Exhaust	2 mm (.078 in)
Intake	1.8 mm (.07 in)

If valve seat contact width is too wide or has dark spots, replace the cylinder head.

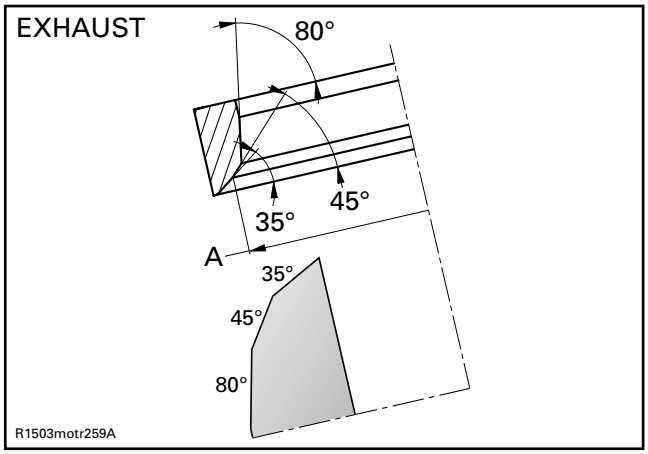


A. Valve face contact width
B. Valve seat contact width

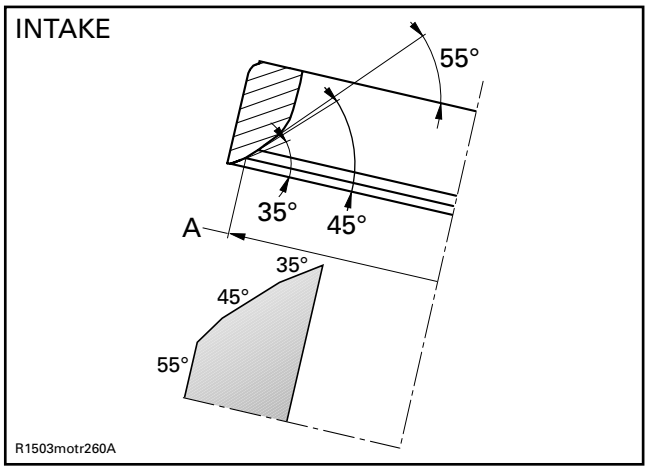
Valve Seat Grinding

NOTE: The valve seats may be reground with a valve seat grinder which centers on the valve guide.

– Grind the valve seat at 45°. Remove no more material than absolutely necessary to clean the seat up.
– Using a 35° stone, narrow the valve seat until the appropriate outer diameter is obtained.



A. Valve seat outer diameter EXHAUST



A. Valve seat outer diameter INTAKE

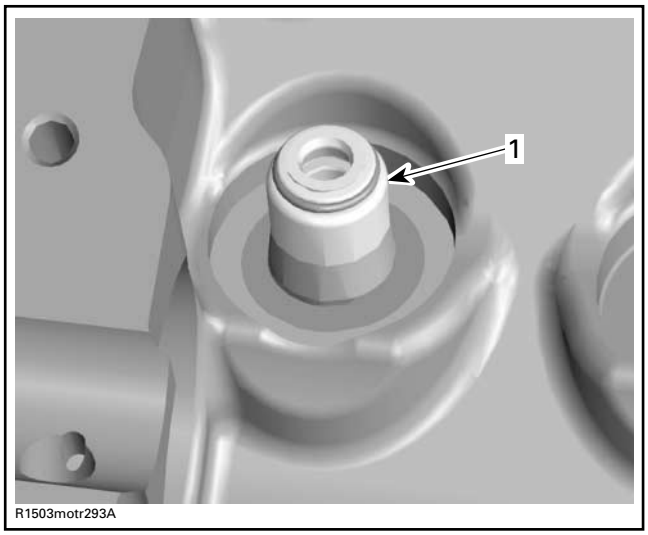
VALVE SEAT OUTER DIAMETER mm (in)	
Intake	37.35 mm (1.4705 in)
Exhaust	30.3 mm (1.1929 in)

– Using a 55° stone for the intake and an 80° stone for the exhaust valve, reduce the valve seat contact width to the appropriate value mentioned above.
– Finally, coat the valve head sealing seating surface with a fine paste of valve grinding compound using a manual valve grinding mandrel. Lightly grind the valves until a smooth, even, uniform sealing surface of the appropriate inside and outside diameter is obtained on both the valve and the seat. Use only a hand held valve grinding mandrel with a suction cup, rotating the valve back and forth through about 45°, and then advancing the valve 45° before repeating this operation.

Installation

For installation, reverse the removal procedure. Pay attention to the following details.

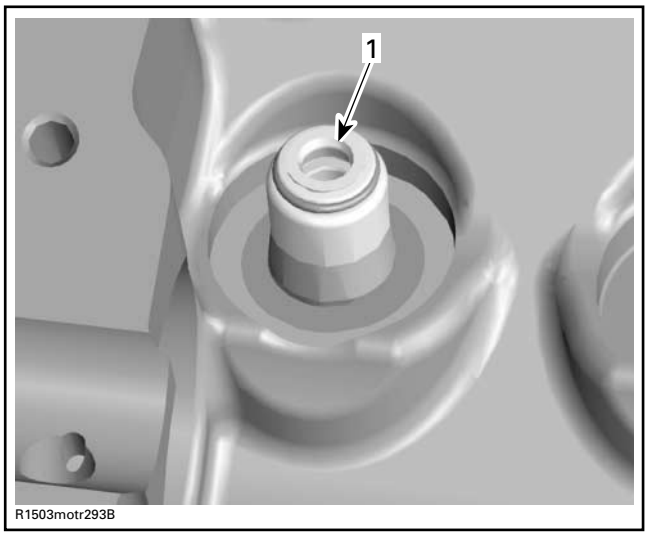
Install valve stem seal no. 28.



1. Valve stem seal

Apply engine oil on valve stem and install it.

CAUTION: Be careful when valve stem is passed through sealing lips of valve stem seal.



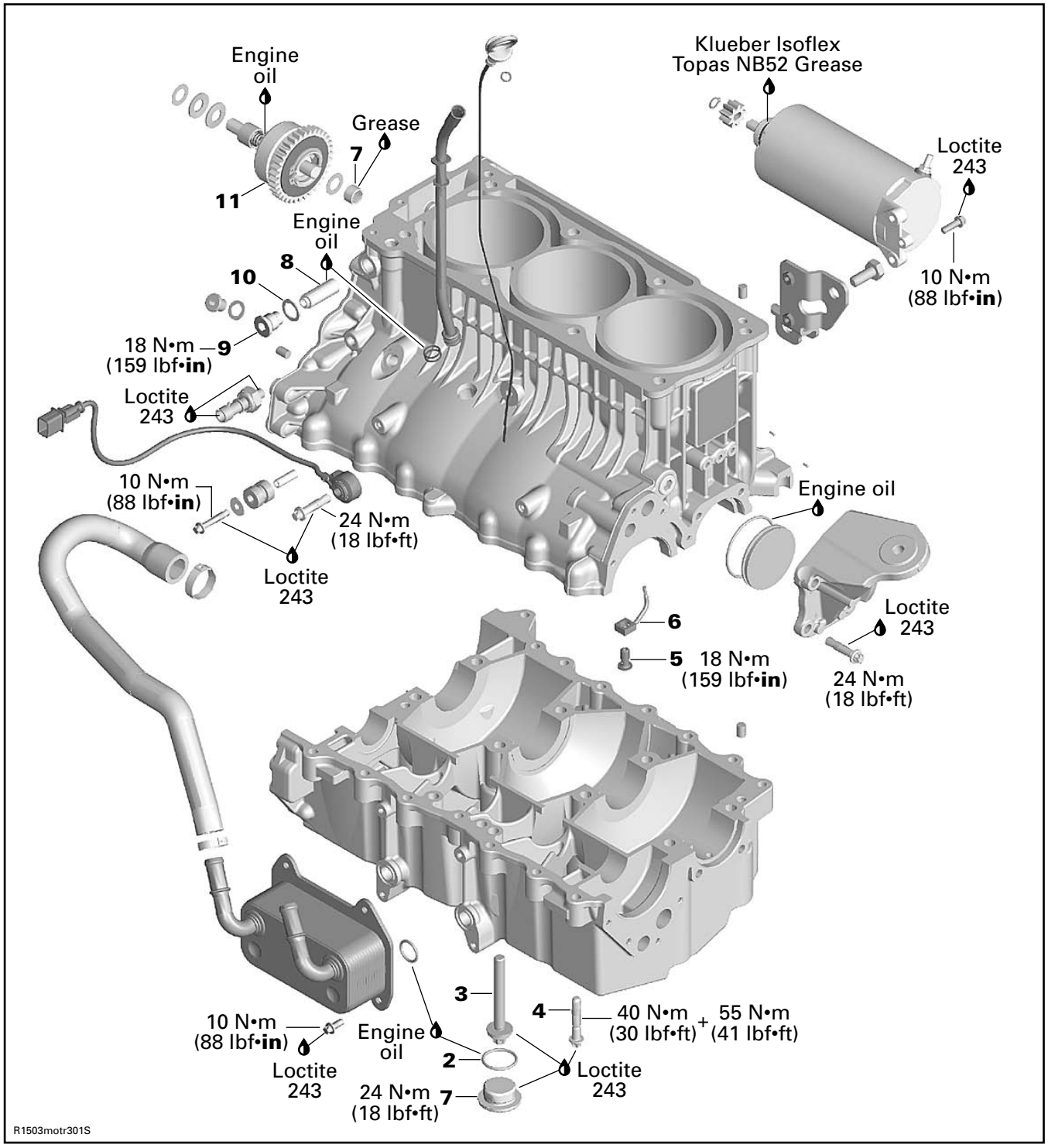
1. Sealing lips of valve stem seal

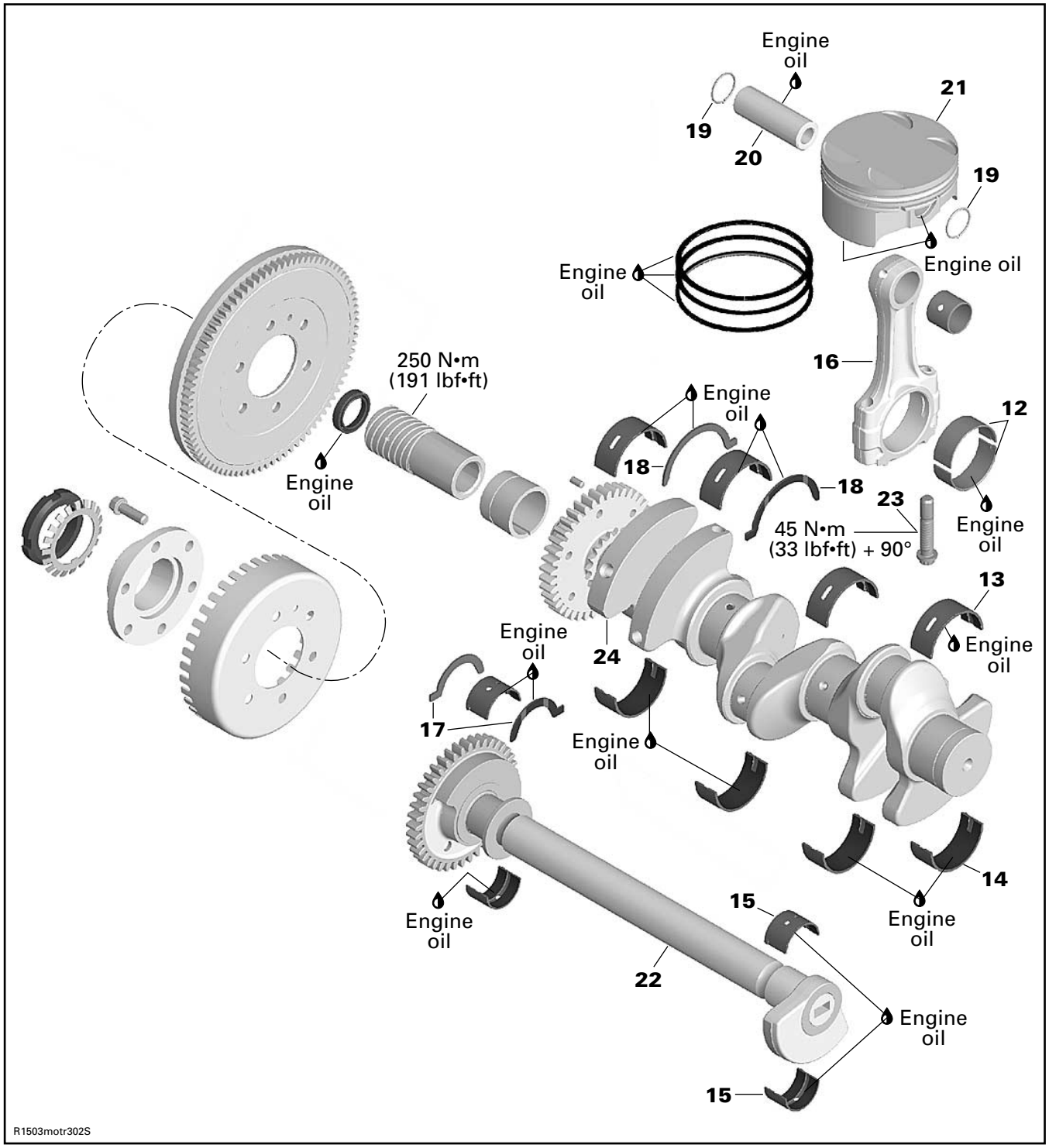
To ease installation of cotters, apply oil or grease on them so that they remain in place while releasing the spring.

After spring is installed, ensure it is properly locked by tapping on valve stem end with a soft hammer so that valve opens and closes a few times.

CAUTION: An improperly locked valve spring will cause engine damage.

ENGINE BLOCK




Engine oil
21
19
20
19
Engine oil
Engine oil
16
250 N•m (191 lbf•ft)
Engine oil
12
18
Engine oil
18
23
45 N•m (33 lbf•ft) + 90°
Engine oil
Engine oil
13
Engine oil
24
17
Engine oil
Engine oil
14
Engine oil
15
22
Engine oil
15
R1503motr302S

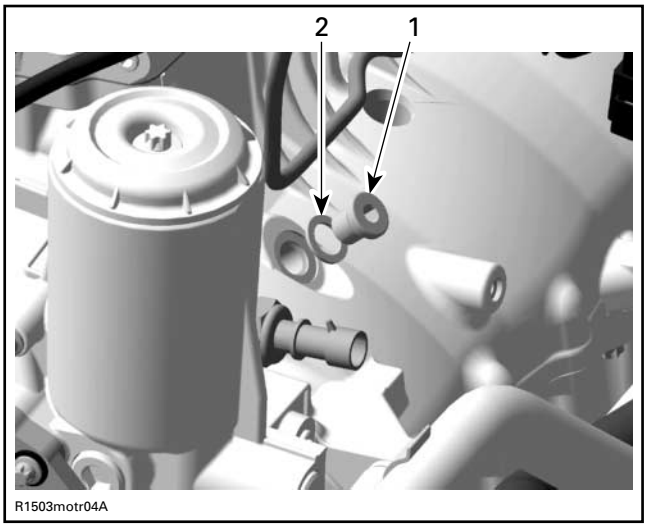
GENERAL

When disassembling parts that are duplicated in the engine, (e.g.: pistons, connecting rods etc.), it is strongly recommended to note their position (cylinder 1, 2 or 3) and to keep them as a "group". If you find a defective component, it would be much easier to find the cause of the failure within the group of parts (e.g.: you found a worn valve guide. A bent spring could be the cause and it will be easy to know which one among the springs is the cause to replace it if you grouped them at disassembly). Besides, since used parts have matched together during the engine operation, they will keep their matched fit when you reassemble them together within their "group".

CRANKSHAFT LOCKING

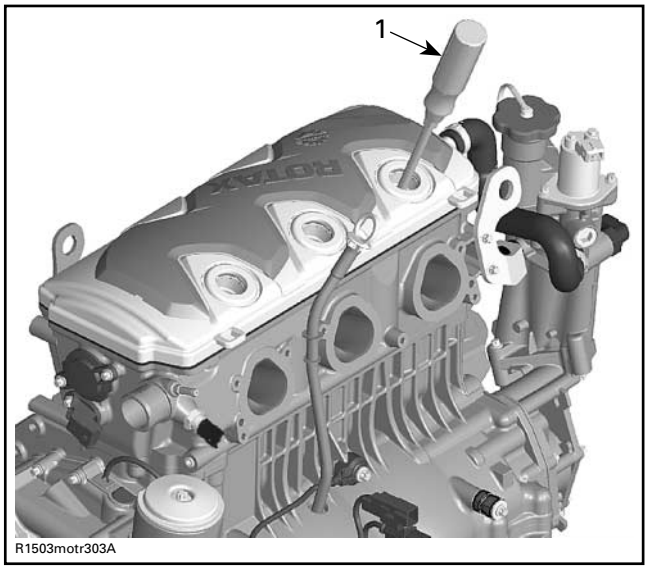
Remove:

– seat and vent tube support
– air intake manifold (refer to AIR INTAKE MANIFOLD REMOVAL in ENGINE section)
– fuel rail cover
– spark plugs
– plug screw.



1. Plug screw
2. Gasket ring

Put a screwdriver or similar tool into the spark plug hole of cylinder **no. 3** and feel when the piston reaches TDC.



1. Screwdriver

In this position, the crankshaft can be locked by using crankshaft locking tool (P/N 529 035 821).

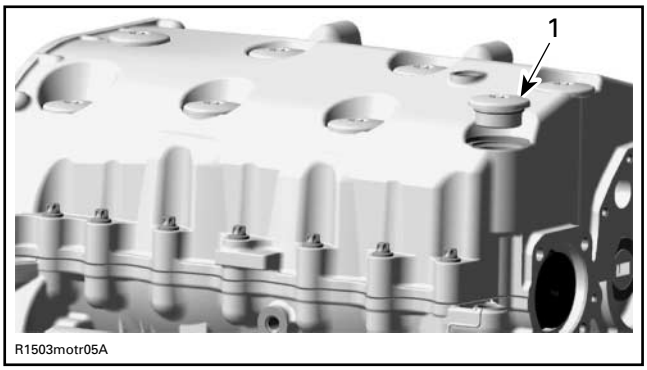
When finished, reinstall all removed parts.

CRANKSHAFT

Removal

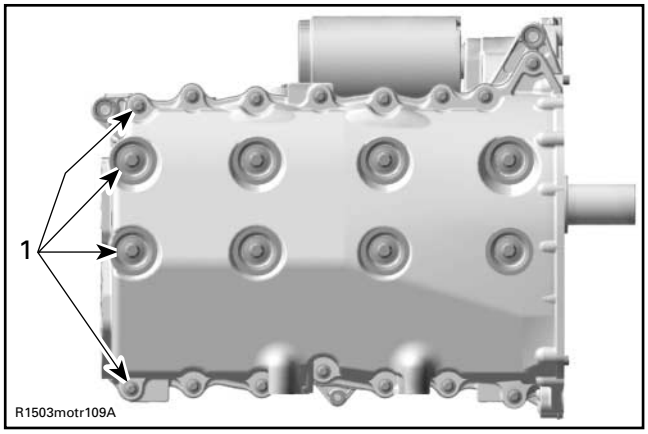
Remove:

– (refer to OIL CHANGE in LUBRICATION section)
– (refer to REMOVAL AND INSTALLATION)
– (refer to CYLINDER HEAD REMOVAL in CYLINDER HEAD AND VALVES section)
– PTO housing (refer to PTO HOUSING REMOVAL in PTO HOUSING/MAGNETO section)
– (refer to STARTER GEAR REMOVAL in PTO HOUSING/MAGNETO section)
– starter drive ass'y
– (refer to SUCTION PUMP REMOVAL in LUBRICATION section)
– engine mounting brackets
– oil tank plug screws **no. 1** with O-ring **no. 2**



ENGINE UPSIDE DOWN
1. Oil tank plug screw with O-ring

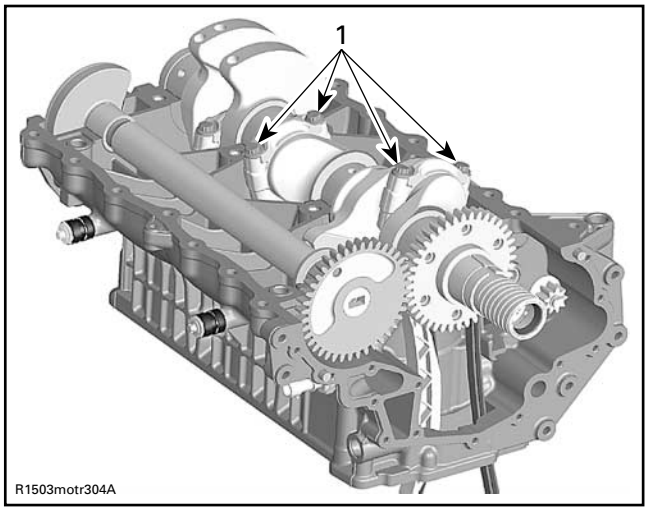
– engine block screws **no. 3** and **no. 4**



BOTTOM VIEW OF ENGINE
1. Screws

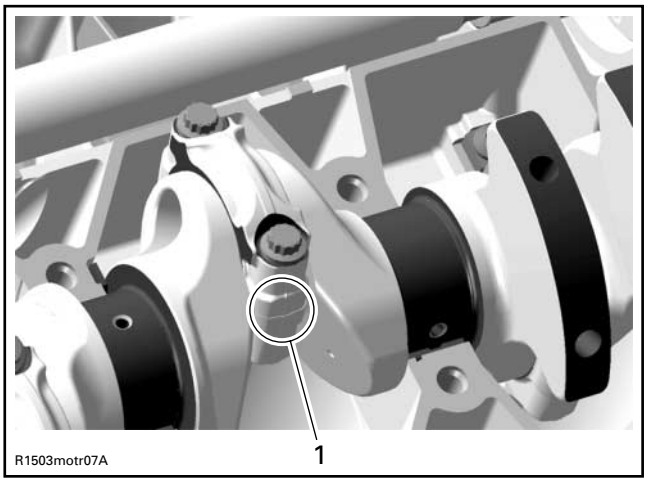
NOTE: While removing the engine block screws **no. 3**, heat with a torch may be applied to get the screws loose.

– bottom engine block half
– connecting rod screws



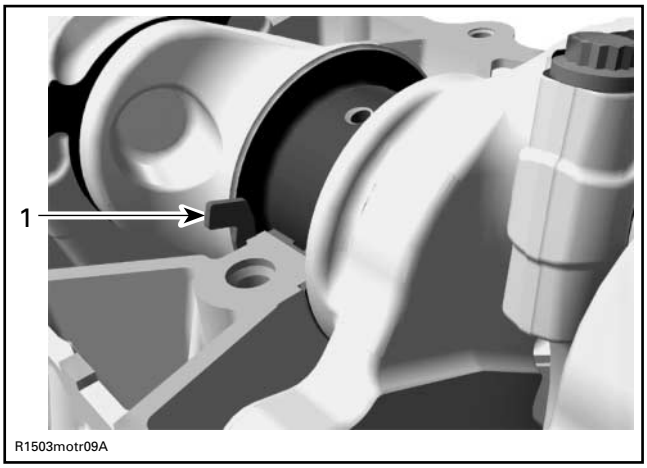
1. Connecting rod screws

NOTE: Before removing the connecting rod bearing caps, mark them to remember the right position when reassembling.



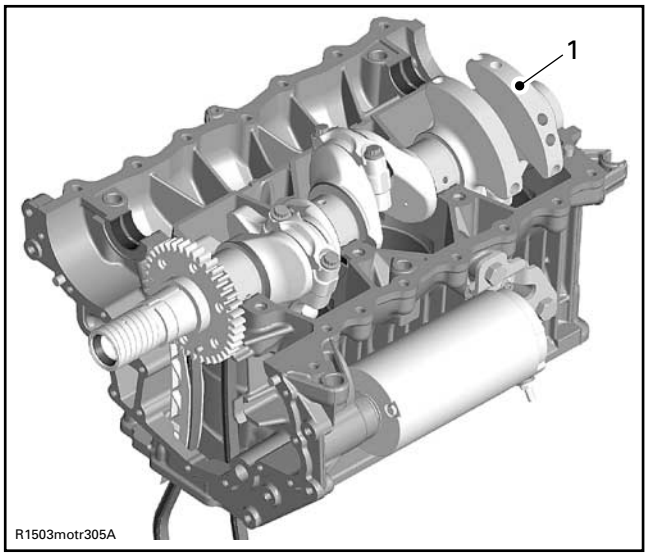
1. Mark on connecting rod

– thrust washers **no. 18**



1. Thrust washer

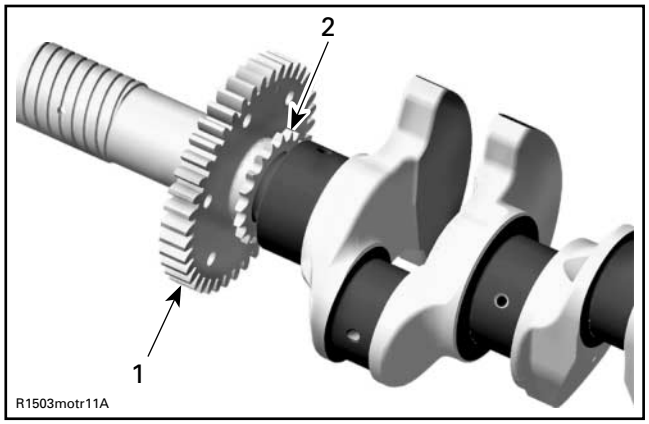
– crankshaft **no. 24**.



1. Crankshaft

Inspection

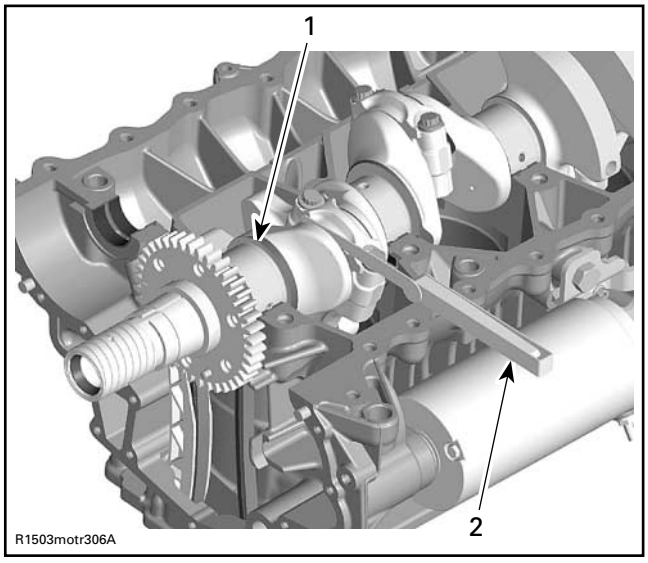
Replace crankshaft if the gears are worn or otherwise damaged.



1. Balancer gear
2. Crankshaft timing gear

Connecting Rod Big End Axial Play

Using a feeler gauge, measure distance between butting face of connecting rod and crankshaft counterweight. If the distance exceeds specified tolerance, replace the worn part.

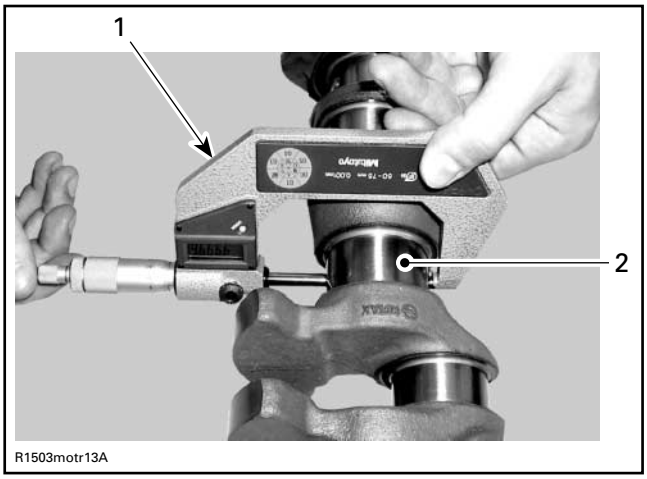


1. Crankshaft
2. Feeler gauge

CONNECTING ROD BIG END mm (in)	
NEW MINIMUM	0.150 mm (.06 in)
NEW MAXIMUM	0.302 mm (.01 in)
SERVICE LIMIT	0.5 mm (.02 in)

Crankshaft Radial Play

Measure all crankshaft journals. Compare to in side diameter of crankshaft bushings (elsewhere in this section).



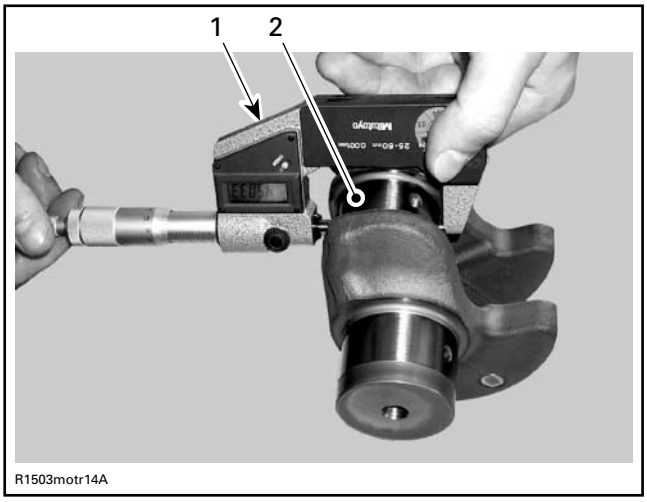
1. Micrometer
2. Crankshaft area for bushing

CRANKSHAFT JOURNAL DIAMETER mm (in)	
NEW MINIMUM	49.91 mm (1.9650 in)
NEW MAXIMUM	50.01 mm (1.9689 in)
SERVICE LIMIT	49.88 mm (1.9637 in)

CRANKSHAFT JOURNAL RADIAL CLEARANCE mm (in)	
SERVICE LIMIT	0.07 mm (.0028 in)

Crankshaft Pin

Measure all crankshaft pin diameters. Compare to in side diameter of connecting rod bushings (elsewhere in this section).



1. Micrometer
2. Crankshaft pin area for bushing

CRANKSHAFT PIN DIAMETER mm (in)	
NEW MINIMUM	45.032 mm (1.7729 in)
NEW MAXIMUM	45.048 mm (1.7735 in)
SERVICE LIMIT	45.029 mm (1.7728 in)

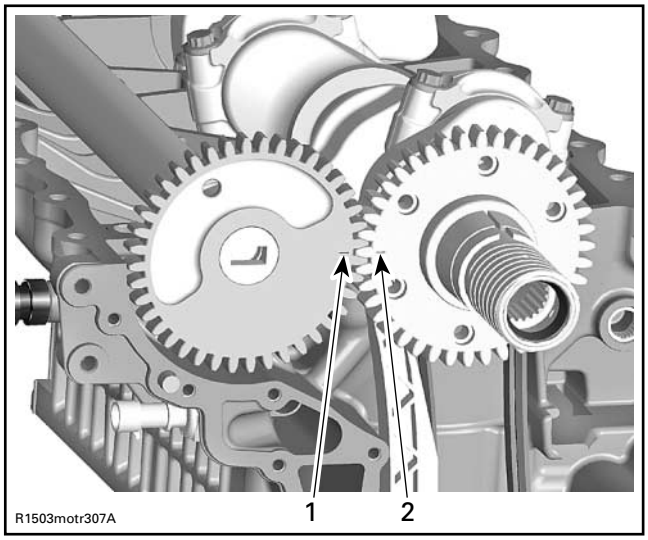
CRANKSHAFT PIN RADIAL CLEARANCE mm (in)	
SERVICE LIMIT	0.09 mm (.0035 in)

Installation

For installation, reverse the removal procedure. Pay attention to following details.

NOTE: Before installing the crankshaft, make sure that the timing chain is on the crankshaft and the chain guide has been installed first. Those parts cannot be installed when the crankshaft is in place.

CAUTION: Crankshaft and balancer shaft marks have to be aligned.



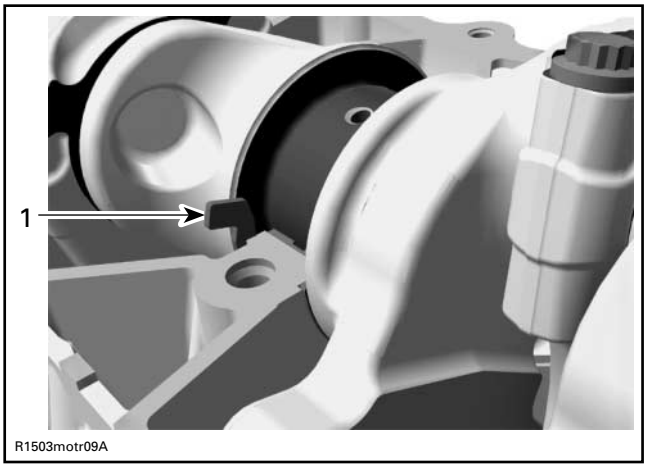
1. Mark on balancer shaft
2. Mark on crankshaft

For correct installation of the connecting rods refer to CONNECTING ROD INSTALLATION elsewhere in this section.

CAUTION: It is absolutely necessary to follow this procedure. Otherwise severe engine damage can occur.

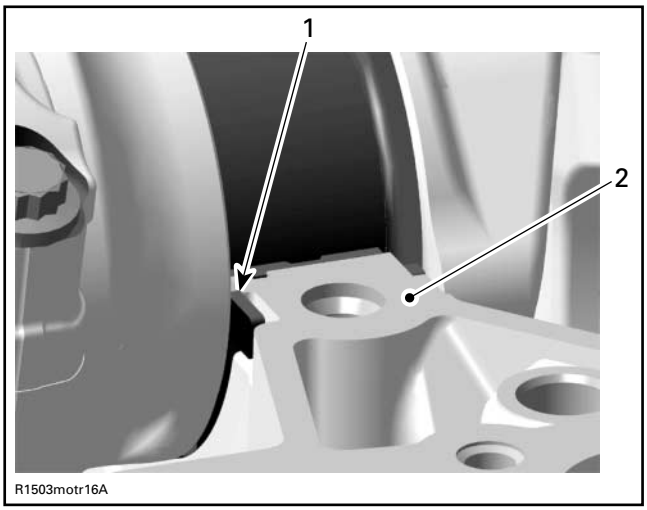
CAUTION: Never forget thrust washers no. 18 on center of crankshaft to control axial adjustment.

Insert thrust washers as soon as crankshaft is in place as per following illustration.



THRUST WASHER INSERT DIRECTION
1. Thrust washer

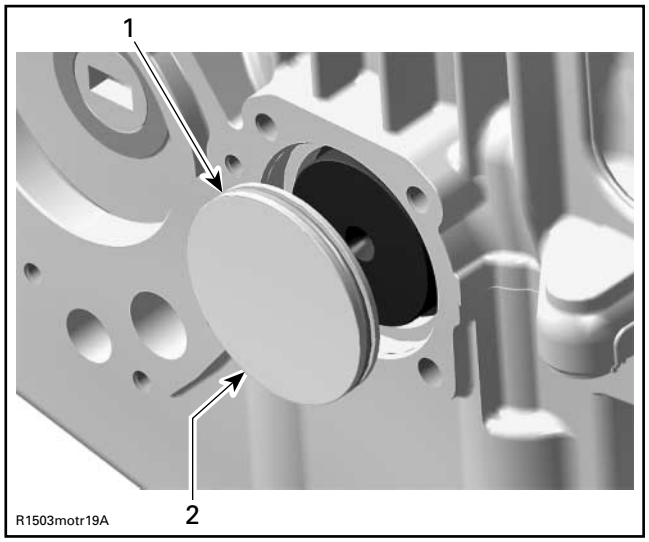
CAUTION: Thrust washers have to be flush with the engine block sealing surface.



1. Thrust washer
2. Sealing surface

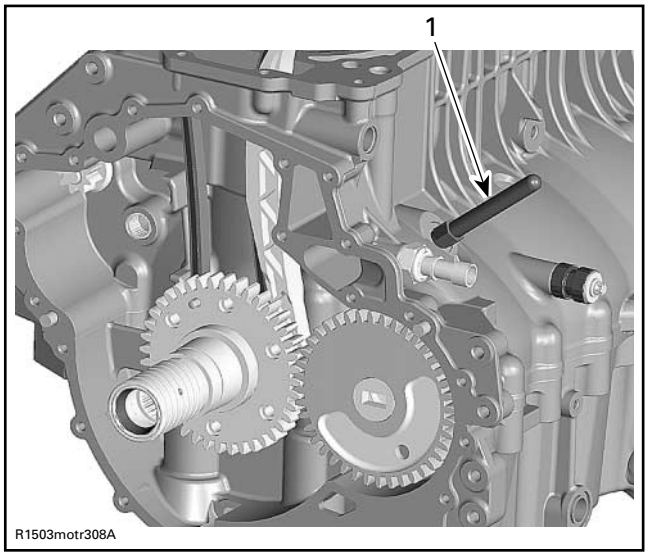
Install lower engine block half. Refer to ENGINE BLOCK ASSEMBLY elsewhere in this section for proper procedure to clean surfaces, apply Loctite 5910 and proper torquing sequence.

Install the crankshaft cover before mounting the engine bracket. Apply oil on O-ring and press cover in. Crankshaft cover has to be flush with engine block surface.



1. O-ring
2. Crankshaft cover

CAUTION: Install crankshaft locking tool (P/N 529 035 821) right away to position crankshaft at TDC before installing the camshaft and rockers (refer to CYLINDER HEAD AND VALVES).



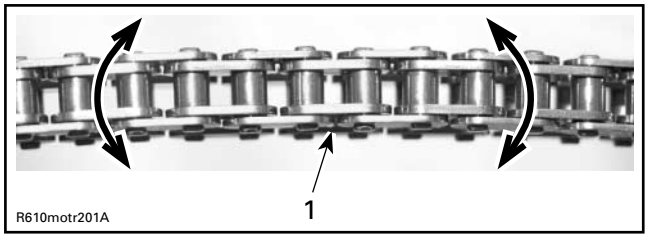
1. Crankshaft locking tool

TIMING CHAIN

Inspection

Check timing chain on camshaft gear for excessive radial play.

Check chain condition for wear and rollers condition.



1. Timing chain

If chain is excessively worn or damaged, replace it as a set (camshaft timing gear and timing chain).

Removal

Remove:

– (refer to OIL CHANGE in LUBRICATION section)
– (refer to REMOVAL AND INSTALLATION)
– cylinder head (refer to CYLINDER HEAD REMOVAL in CYLINDER HEAD AND VALVES section)
– PTO housing (refer to PTO HOUSING REMOVAL in PTO HOUSING/MAGNETO section)
– crankshaft (refer to CRANKSHAFT REMOVAL elsewhere in this section)
– timing chain.

Installation

The installation is essentially the reverse of the removal procedure but, pay attention to the following details.

Ensure to perform proper valve timing. Lock crankshaft and camshaft at TDC (refer to CYLINDER HEAD AND VALVES).

Install chain then, install chain tensioner.

CAUTION: Improper valve timing will damage engine components.

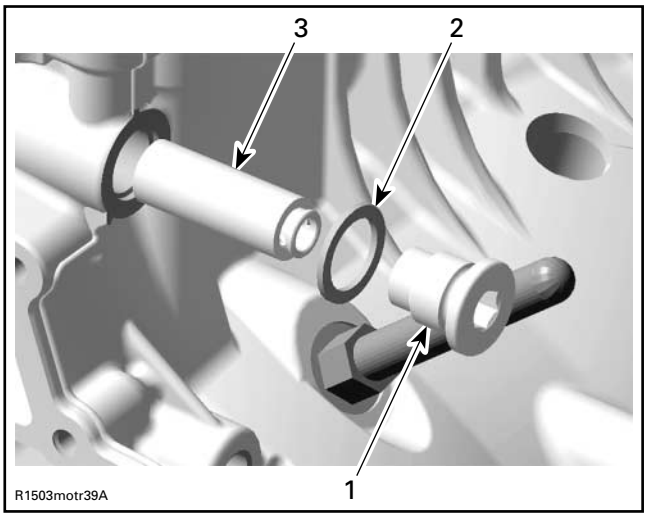
CHAIN TENSIONER

Removal

NOTE: Removal of the air intake manifold allows easier access to the chain tensioner, but is not necessary. Refer to AIR INTAKE MANIFOLD REMOVAL in INTAKE section.

Remove:

– chain tensioner plug screw **no. 9** with gasket ring **no. 10**
– chain tensioner **no. 8**.



1. Plug screw
2. Gasket ring
3. Chain tensioner

Inspection

Check chain tensioner for excessive wear or cracks. Also check free movement of the chain tensioner piston.

Installation

The installation is essentially the reverse of the removal procedure but, pay attention to the following details.

Torque chain tensioner plug screw to 18 N•m (160 lbf•**in**).

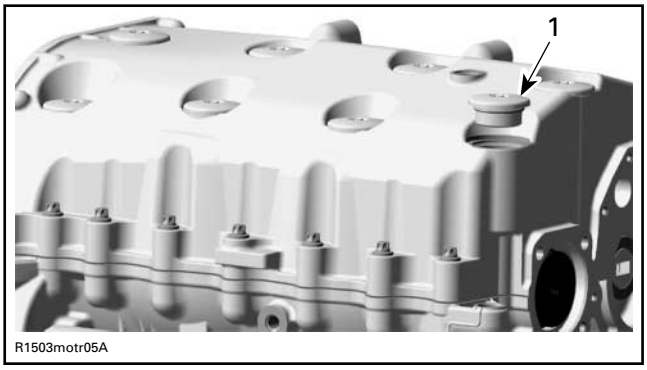
BALANCER SHAFT

Removal

Remove:

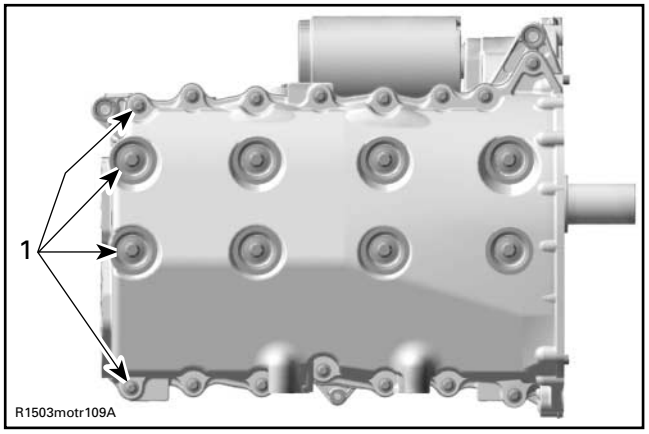
– (refer to OIL CHANGE in LUBRICATION section)
– engine from vehicle (refer to REMOVAL AND INSTALLATION)
– cylinder head (refer to CYLINDER HEAD REMOVAL in CYLINDER HEAD AND VALVES section)
– PTO housing (refer to PTO HOUSING REMOVAL in PTO HOUSING section)
– starter gear (refer to STARTER GEAR REMOVAL in PTO HOUSING section)
– starter drive ass'y

– oil suction pump with oil separator ass'y (refer to SUCTION PUMP REMOVAL in LUBRICATION section)
– engine mounting brackets
– oil reservoir plug screws **no. 1** with O-ring **no. 2**



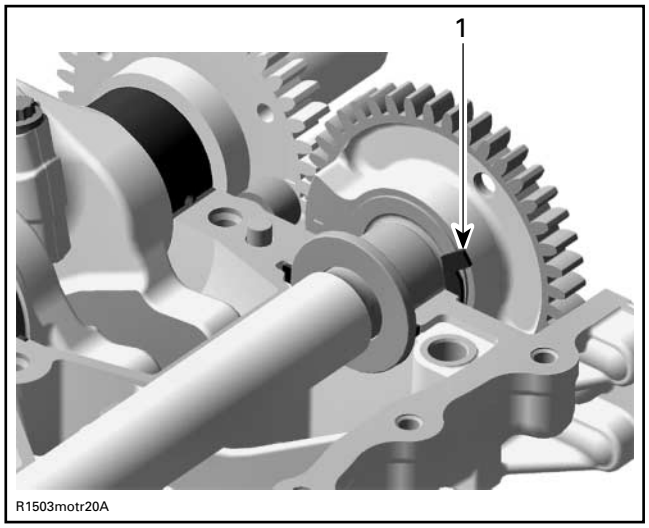
ENGINE UPSIDE DOWN
1. Oil reservoir plug screw with O-ring

– engine block screws **no. 3**



1. Screws

– bottom engine block half
– thrust washers **no. 17**



1. Thrust washer

– balancer shaft.

Inspection

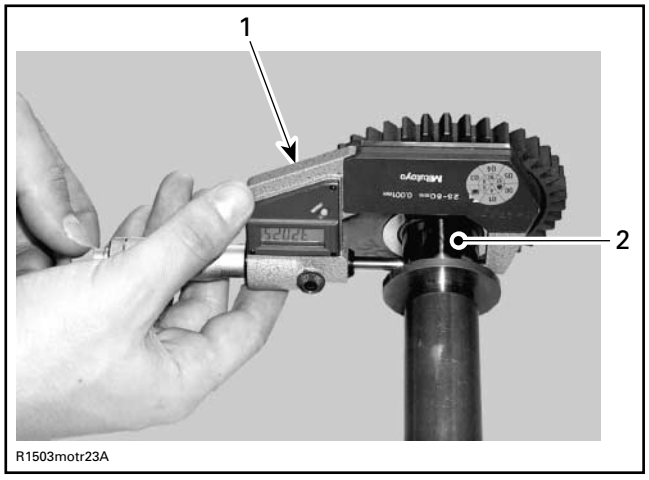
Check balancer shaft and replace if damaged.

If the gear on the balancer shaft is damaged, replace balancer shaft.

Check gear on the crankshaft at the same time and replace crankshaft if necessary (refer to CRANKSHAFT above).

Balancer Shaft Bushing Seat Play

Measure all balancer shaft bushing seats. Compare to inside diameter of balancer shaft bushings (elsewhere in this section).



1. Micrometer
2. Balancer shaft area for bushing

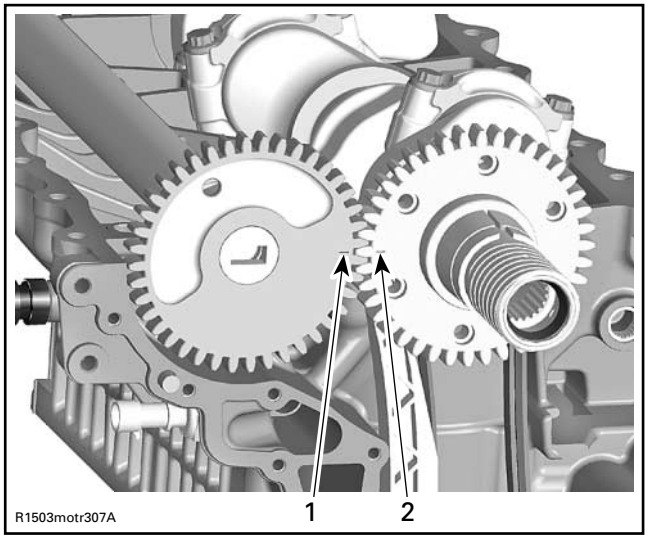
BALANCER SHAFT SEAT DIAMETER mm (in)	
NEW MINIMUM	31.984 mm (1.2592 in)
NEW MAXIMUM	32.000 mm (1.2598 in)
SERVICE LIMIT	31.960 mm (1.2583 in)

BALANCER SHAFT SEAT RADIAL CLEARANCE mm (in)	
SERVICE LIMIT	0.07 mm (.0028 in)

Installation

For installation, reverse the removal procedure. Pay attention to following detail.

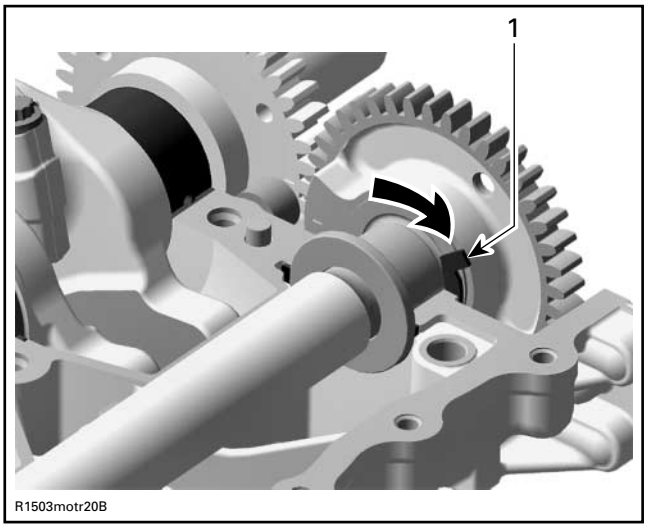
CAUTION: Balancer shaft and crankshaft marks have to be aligned.



1. Mark on balancer shaft
2. Mark on crankshaft

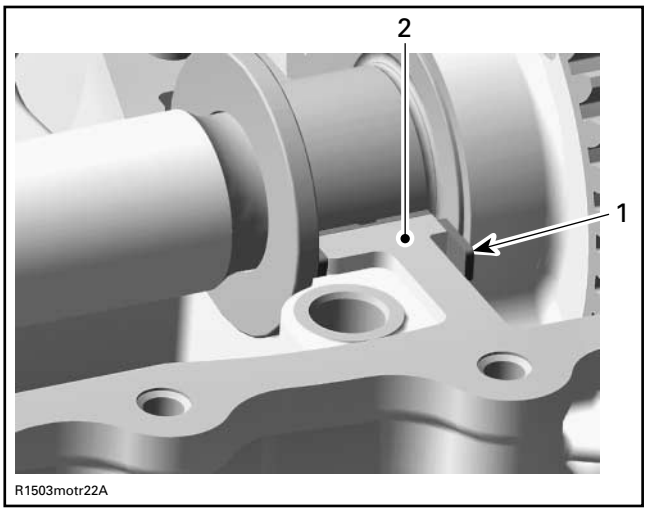
CAUTION: Never forget thrust washers no. 17 on PTO side to control axial adjustment on balancer.

Insert thrust washers as soon as balancer shaft is in place as per following illustration.



THRUST WASHER INSERT DIRECTION
1. Thrust washer

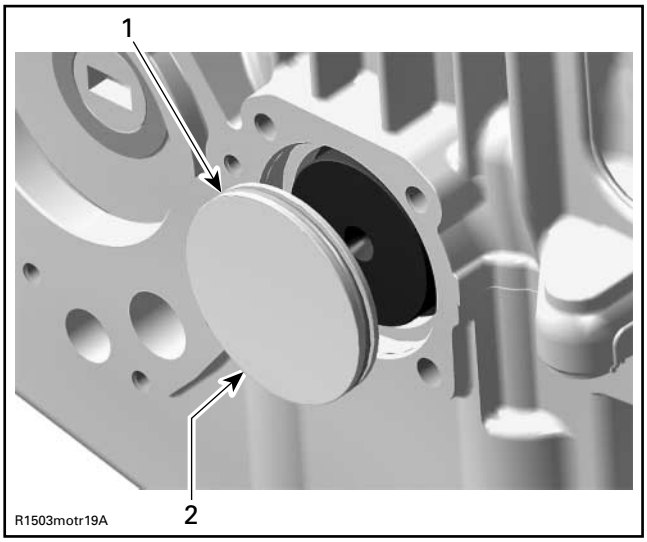
CAUTION: Thrust washers have to be flush with the engine block sealing surface.



1. Thrust washer
2. Sealing surface

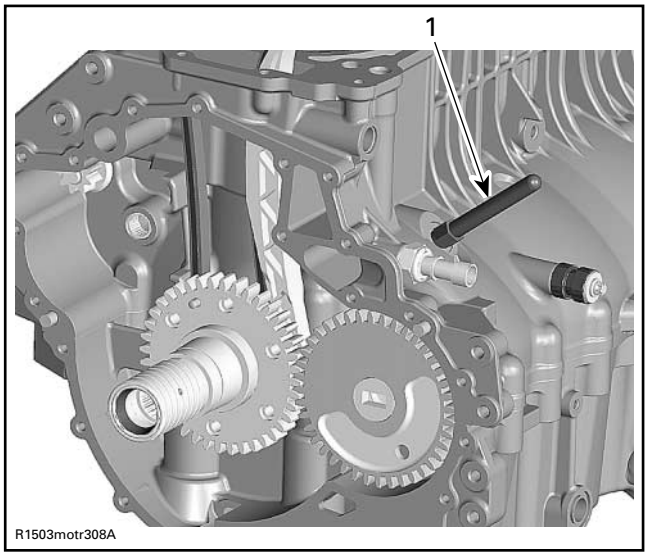
Install lower engine block half. Refer to ENGINE BLOCK ASSEMBLY elsewhere in this section for proper procedure to clean surfaces, apply Loctite 5910 and proper torquing sequence.

Install the crankshaft cover before mounting the engine bracket. Apply oil on O-ring and press cover in. Crankshaft cover has to be flush with engine block surface.



1. O-ring
2. Crankshaft cover

CAUTION: Install crankshaft locking tool (P/N 529 035 821) right away to position crankshaft at TDC before installing the camshaft and rockers (refer to CYLINDER HEAD AND VALVES).



1. Crankshaft locking tool

ENGINE BLOCK

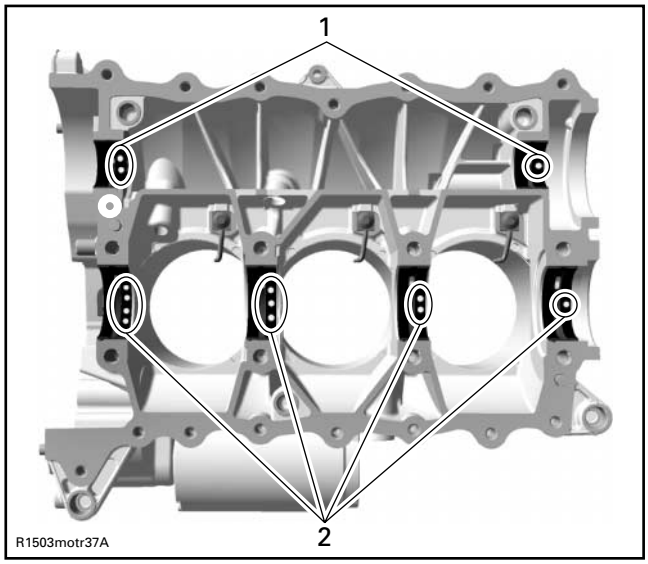
Removal

Remove:

– (refer to OIL CHANGE in LUBRICATION section)
– engine from vehicle (refer to REMOVAL AND INSTALLATION)
– cylinder head (refer to CYLINDER HEAD REMOVAL in CYLINDER HEAD AND VALVES section)
– PTO housing (refer to PTO HOUSING REMOVAL in PTO HOUSING/MAGNETO section)
– starter gear (refer to STARTER GEAR REMOVAL in PTO HOUSING/MAGNETO section)
– starter drive ass'y
– oil suction pump with oil separator ass'y (refer to SUCTION PUMP REMOVAL in LUBRICATION section)
– balancer shaft (refer to BALANCER SHAFT REMOVAL elsewhere in this section)
– crankshaft (refer to CRANKSHAFT REMOVAL elsewhere in this section)
– piston with connecting rod (refer to PISTON REMOVAL elsewhere in this section).

Bushings

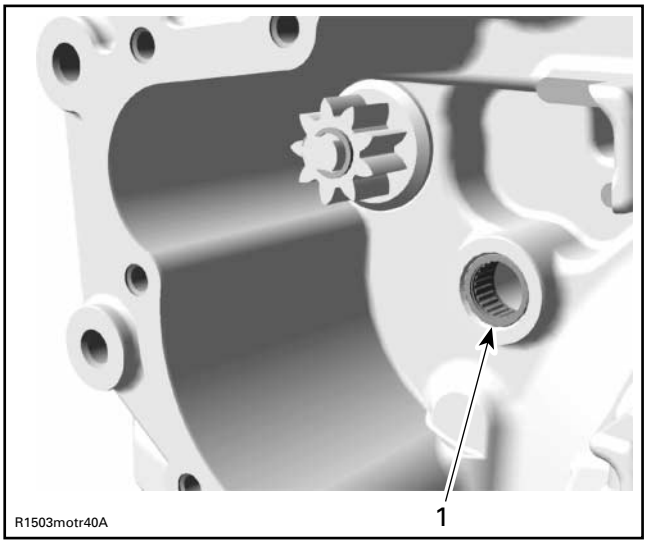
When bushings need to be removed from the engine block, mark them to identify the correct position at installation. See the following illustration for an example:



1. Mark on balancer shaft bushings
2. Mark on crankshaft bushings

Starter Drive Bearing

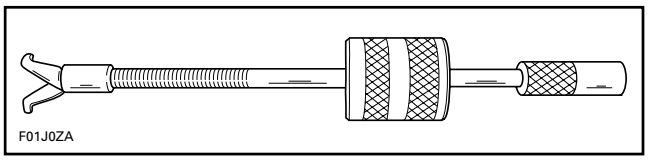
Check bearing **no. 7** of starter drive assembly **no. 11** in engine block and replace it if damaged.



1. Bearing of starter drive assembly

Starter drive bearing can be easily removed from lower crankcase half using the following suggested tool or equivalent:

– Snap-on hammer puller including:
– handle CJ93-1
– hammer CJ125-6
– claws CJ93-4.



Close puller claws so that they can be inserted in end bearing. Holding claws, turn puller shaft clockwise so that claws open and become firmly tight against bearing.

Slide puller hammer outwards and tap puller end. Retighten claws as necessary to always maintain them tight against bearing. Continue this way until bearing completely comes out.

Inspection

Cylinder

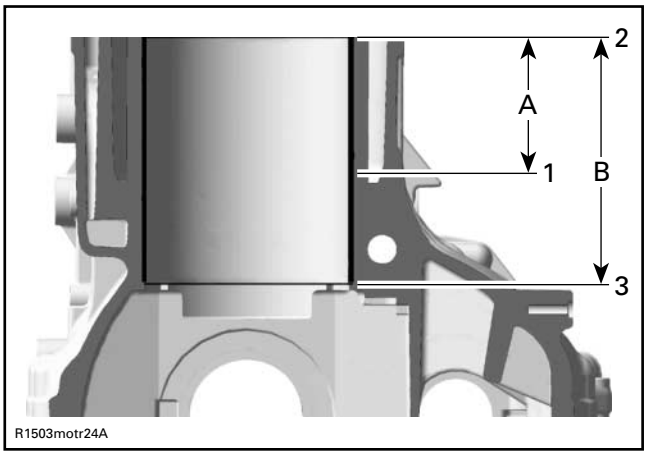
Check cylinder for cracks, scoring and wear ridges on the top and bottom of the cylinder. If so, replace cylinder.

Cylinder Taper

Measure cylinder bore and if it is out of specifications, rehone cylinder sleeve and replace piston ass'y with first oversize.

NOTE: It is not necessary to have all cylinders rehoned if they are not all out of specification. Mixed standard size and oversize cylinders are allowed.

Measure cylinder bore at 3 recommended positions. See the following illustration.



1. First measuring diameter
2. Second measuring diameter
3. Third measuring diameter

A. 60 mm (2.362 in)
B. 110 mm (4.331 in)

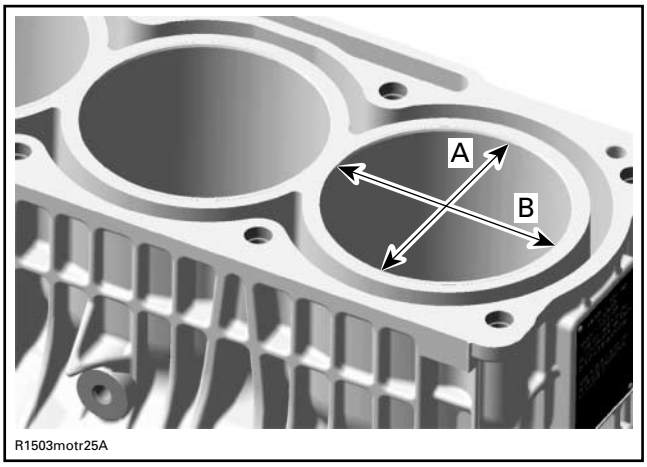
CYLINDER TAPER IN DIAMETER mm (in)	
NEW MAXIMUM	0.038 mm (.001 in)
SERVICE LIMIT	0.090 mm (.004 in)

Distance between measurements should not exceed the service limit mentioned above.

Cylinder Out of Round

Measure cylinder diameter in piston axis direction from top of cylinder. Take an other measurement 90° from first one and compare.

NOTE: Take the same measuring points as described in CYLINDER TAPER above.



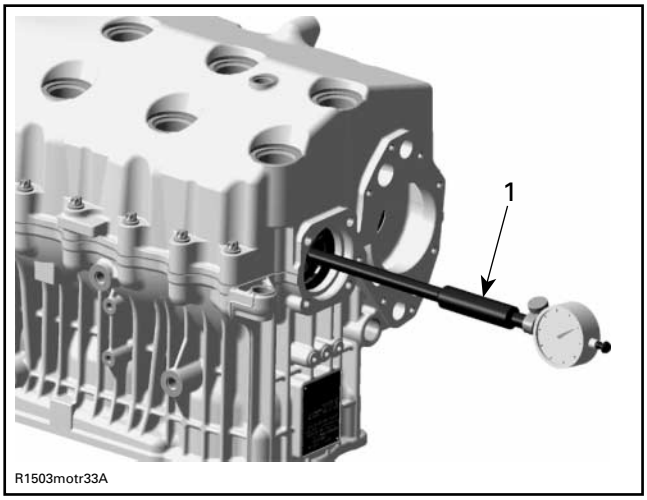
A. Perpendicular to crankshaft axis
B. Parallel to crankshaft axis

CYLINDER OUT OF ROUND mm (in)	
NEW MAXIMUM	0.008 mm (.0003 in)
SERVICE LIMIT	0.015 mm (.0006 in)

Bushings

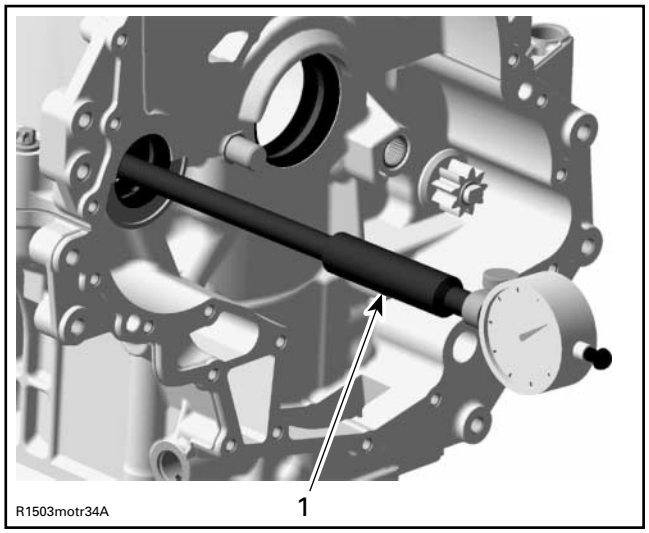
To measure the wear of the crankshaft bushings **no. 13** and **no. 14** and balancer shaft bushings **no. 15**, both engine block halves with OLD bushings have to be screwed together as per tightening procedure described below.

Measure the inside diameter of the bushings with a bore gauge.



ENGINE UPSIDE DOWN
1. Bore gauge

CRANKSHAFT BUSHING INSIDE DIAMETER mm (in)	
SERVICE LIMIT	50.1 mm (1.9724 in)



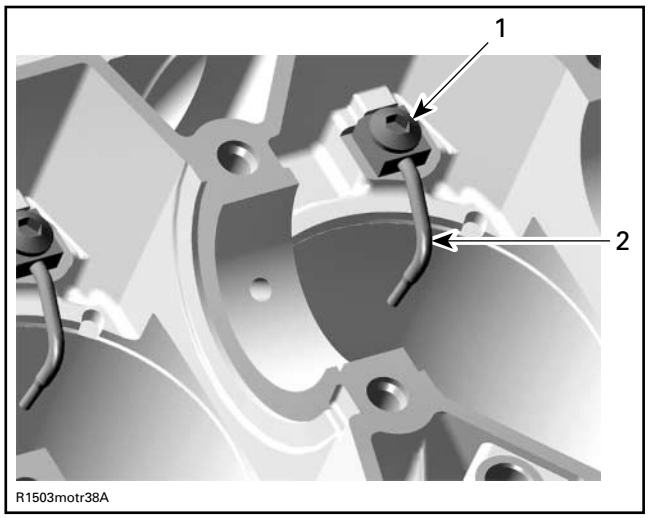
ENGINE UPSIDE DOWN
1. Bore gauge

BALANCER SHAFT BUSHING INSIDE DIAMETER mm (in)	
SERVICE LIMIT	32.11 mm (1.2642 in)

Replace bushings if they are out of specifications.

Oil Spray Nozzles

Remove oil spray nozzle **no. 6** and banjo screw **no. 5** from engine block.



1. Banjo screw
2. Oil spray nozzle

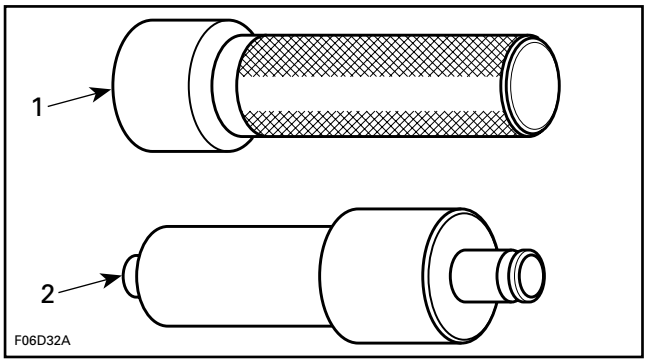
Check if ball inside moves freely in the banjo screw. Clean nozzle and banjo screw from dirt and debris.

Installation

For installation, reverse the removal procedure. Pay attention to the following details.

Torque oil spray nozzle to 18 N•m (160 lbf•**in**).

To install starter drive bearing **no. 7** of starter drive assembly, use pusher (P/N 290 876 502) and handle (P/N 420 877 650).

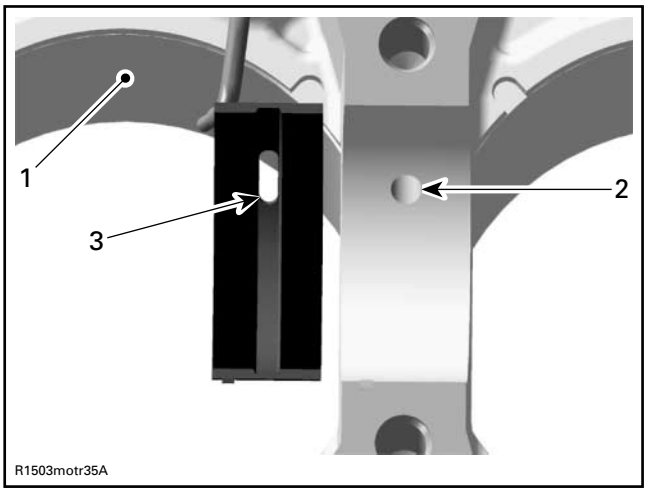


1. Handle
2. Pusher

Use NEW bushings when diameters are out of specification.

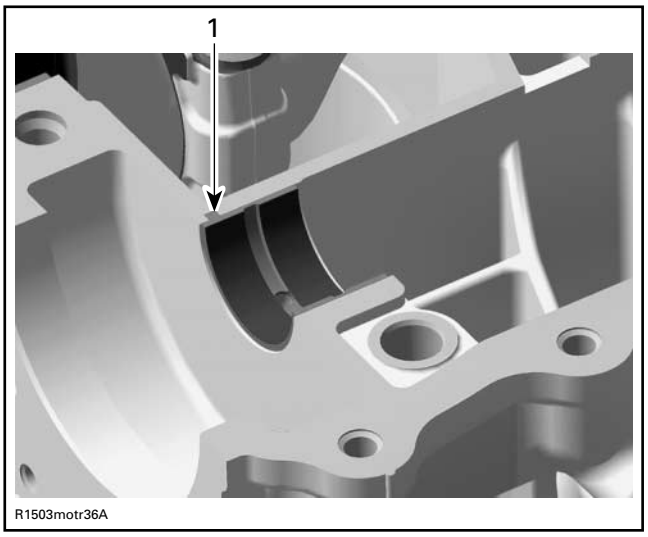
If OLD bushings can be used again, make sure they are at the same position as they were before.

Correctly install bushings. Top crankshaft bushing halves have a bore which has to be placed in the upper engine block.



1. Upper engine block half
2. Oil bore in engine block
3. Oil bore in bushing

Bushings have to be flush with the engine block split surface and their protrusions have to fit in the notched areas in the engine block seat.



1. Bushing protrusion in engine block notch

Apply engine oil on all bushings, in the bottom area of the cylinder bore and also on the band of the piston ring compressor tool.

For proper installation of pistons, refer to PISTON INSTALLATION elsewhere in this section.

NOTE: Before installing the crankshaft, make sure that the timing chain is on the crankshaft and the chain guide has been installed first. Those parts cannot be installed after as the crankshaft is in place.

Clean oil passages and make sure they are not clogged.

Clean all metal components in a solvent.

Engine block mating surfaces are best cleaned using a combination of the chisel gasket remover (P/N 413 708 500) and a brass brush. Brush a first pass in one direction then make the final brushing perpendicularly (90°) to the first pass (cross hatch).

CAUTION: Do not wipe with rags. Use a new clean hand towel only.

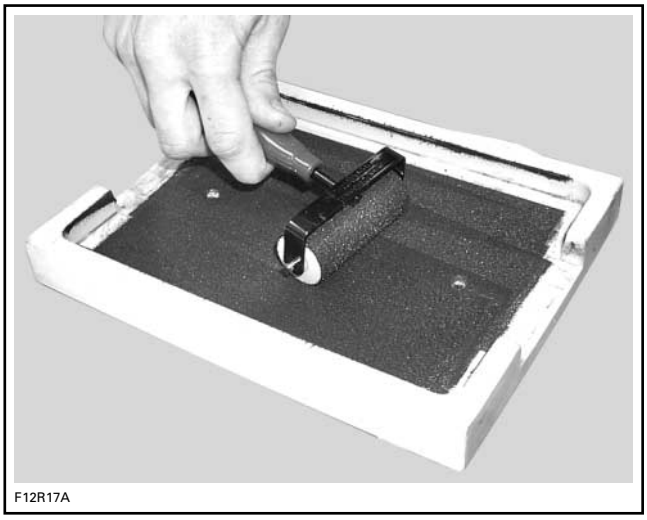
IMPORTANT: When beginning the application of the crankcase sealant, the assembly and the first torquing should be done within 10 minutes. It is suggested to have all you need on hand to save time.

NOTE: It is recommended to apply this specific sealant as described here to get an uniform application without lumps. If you do not use the roller method, you may use your finger to uniformly distribute the sealant (unlike the Drei Bond sealing compound, using a finger will not affect the adhesion).

Use the silicone-based Loctite 5910 (P/N 293 800 081) on mating surfaces.

CAUTION: Do not use Loctite 515 or 518 to seal crankcase. Do not use Loctite Primer N with the Loctite 5910. Using these products or non silicone-based sealant over a previously sealed crankcase with Loctite 5910 will lead to poor adhesion and possibly a leaking crankcase. These products are chemically incompatibles. Even after cleaning, the Loctite 5910 would leave incompatible microscopic particles.

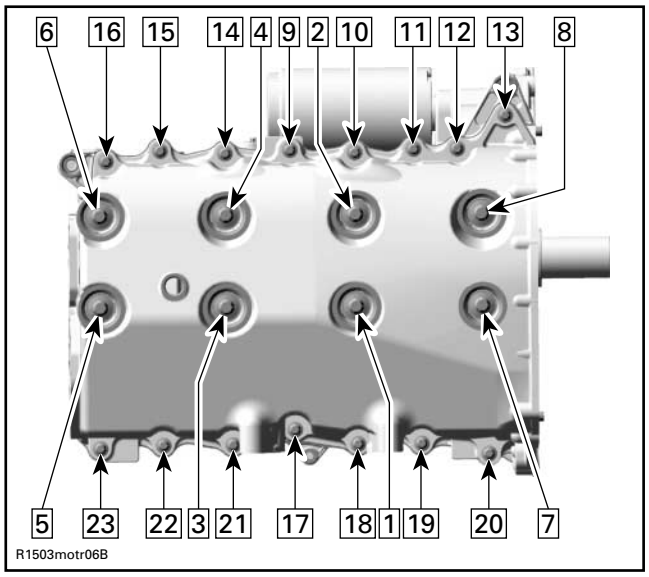
Use a plexiglass plate and apply some sealant on it. Use a soft rubber roller (50 - 75 mm (2 - 3 in)) (available in arts products suppliers for printmaking) and roll the sealant to get a thin uniform coat on the plate (spread as necessary). When ready, apply the sealant on crankcase mating surfaces.


F12R17A

Do not apply in excess as it will spread out inside crankcase.

NOTE: Do not use Loctite Primer N with this sealant. The sealant curing time is similar to the Loctite 518 without using the Primer N, which is 4 to 24 hours.

Tighten engine block screws as per following sequence.

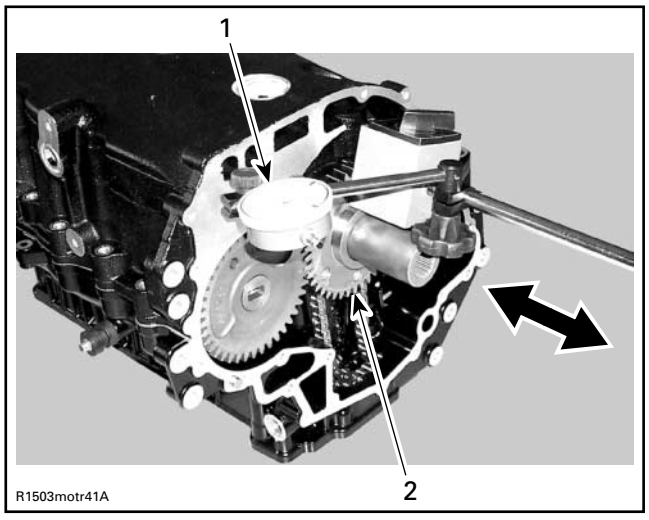


R1503motr06B

Apply Loctite 243 (blue) on threads. Torque engine block screws **no. 3** at first to 40 N•m (30 lbf•ft) and in a second sequence to 55 N•m (41 lbf•ft).

Torque engine block screws **no. 7** to 24 N•m (18 lbf•ft).

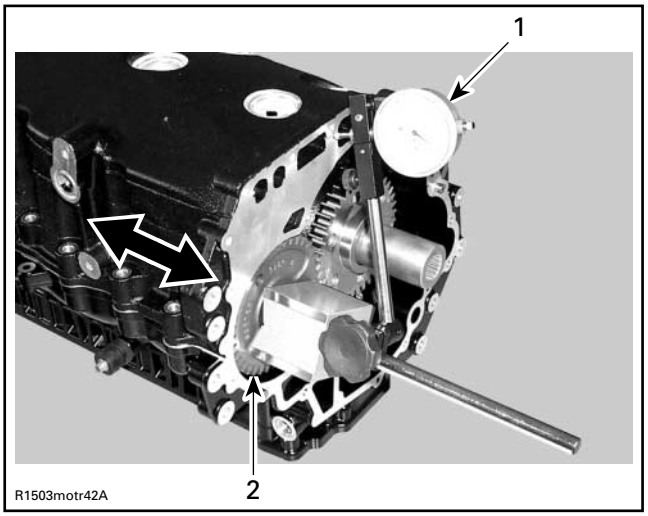
Before continuing the installation process, the axial clearance of balancer shaft and crankshaft has to be checked.



R1503motr41A

1. Dial gauge
2. Crankshaft

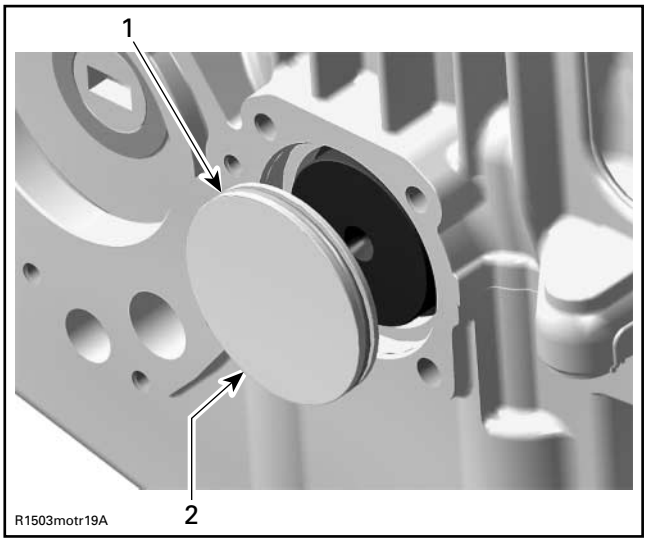
CRANKSHAFT AXIAL CLEARANCE mm (in)	
NEW MINIMUM	0.08 mm (.003 in)
NEW MAXIMUM	0.22 mm (.009 in)
SERVICE LIMIT	0.35 mm (.014 in)



1. Dial gauge
2. Balancer shaft

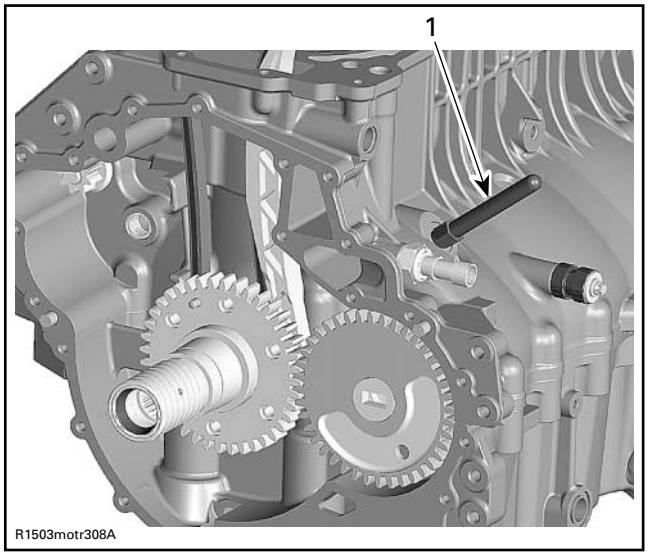
BALANCER SHAFT AXIAL CLEARANCE mm (in)	
NEW MINIMUM	0.02 mm (.001 in)
NEW MAXIMUM	0.25 mm (.010 in)
SERVICE LIMIT	0.35 mm (.014 in)

Install the crankshaft cover before mounting the engine bracket. Apply oil on O-ring and press cover in. Crankshaft cover has to be flush with engine block surface.



1. O-ring
2. Crankshaft cover

CAUTION: Install crankshaft locking tool (P/N 529 035 821) right away to position crankshaft at TDC before installing the camshaft and rockers (refer to CYLINDER HEAD AND VALVE).



1. Crankshaft locking tool

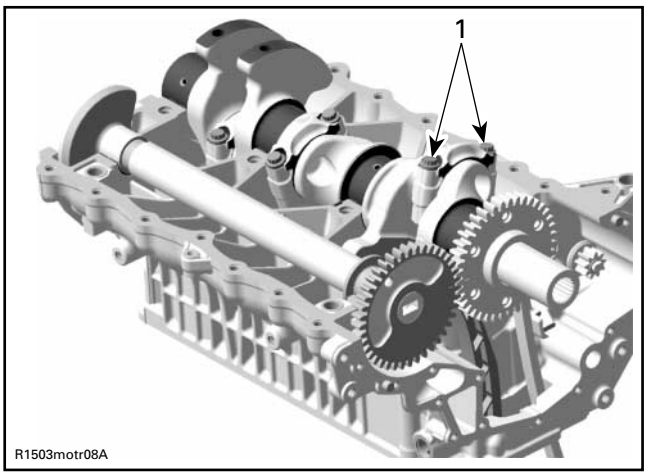
Install cylinder head, PTO housing and the other parts in accordance with the proper installation procedures.

PISTON/CONNECTING ROD

Removal

Disassemble engine block as per ENGINE BLOCK REMOVAL above.

Remove connecting rod screws.

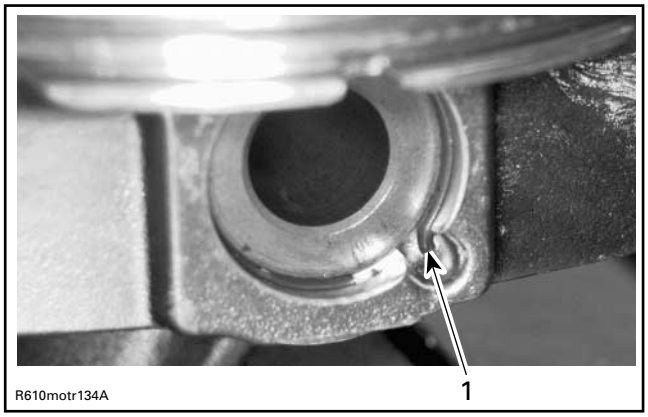


1. Connecting rod screws

NOTE: Before removing the connecting rod bearing caps, mark them to remember the right position when reassembling.

Pull piston with connecting rod out of the cylinders.

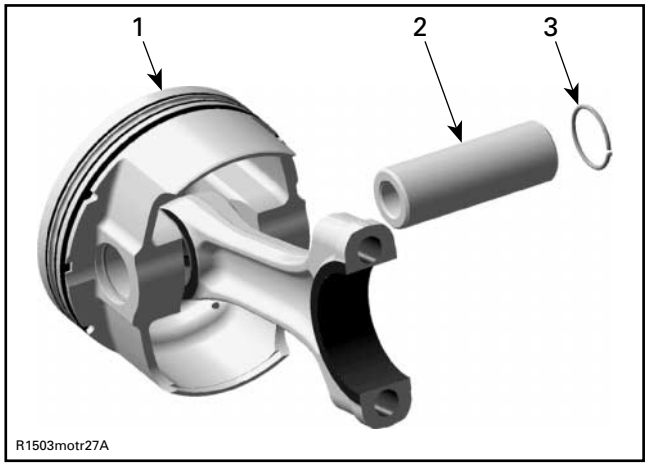
Remove one piston circlip **no. 19** and discard it.



1. Piston circlip

NOTE: The removal of both piston circlips is not necessary to remove piston pin.

Push piston pin **no. 20** out of piston.



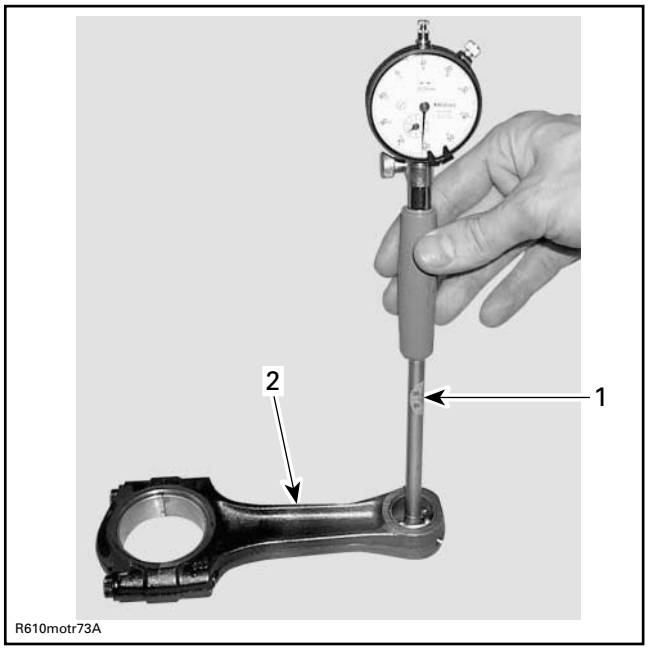
1. Piston
2. Piston pin
3. Circlip

Detach piston **no. 21** from connecting rod.

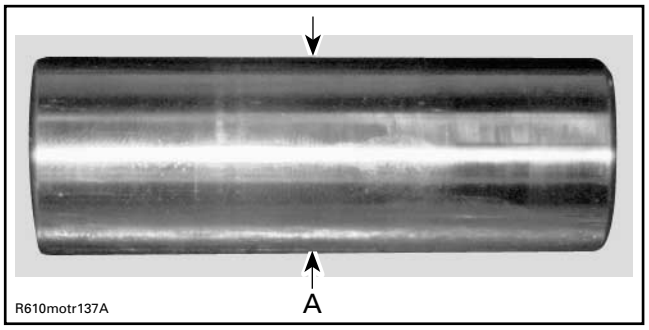
Inspection

Connecting Rod/Piston Pin Clearance

Measure piston pin. Compare to inside diameter of connecting rod **no. 16**.



1. Bore gauge
2. Connecting rod



A. Piston pin diameter in the area of the bushing

CONNECTING ROD SMALL END DIAMETER mm (in)	
NEW MINIMUM	23.01 mm (.9059 in)
NEW MAXIMUM	23.02 mm (.9063 in)
SERVICE LIMIT	23.07 mm (.908 in)

PISTON PIN DIAMETER mm (in)	
NEW MINIMUM	22.996 mm (.9053 in)
NEW MAXIMUM	23.000 mm (.9055 in)
SERVICE LIMIT	22.990 mm (.904 in)

PISTON PIN BORE CLEARANCE mm (in)	
SERVICE LIMIT	0.080 mm (.0035 in)

If the connecting rod small end diameter is out of specification, replace connecting rod.

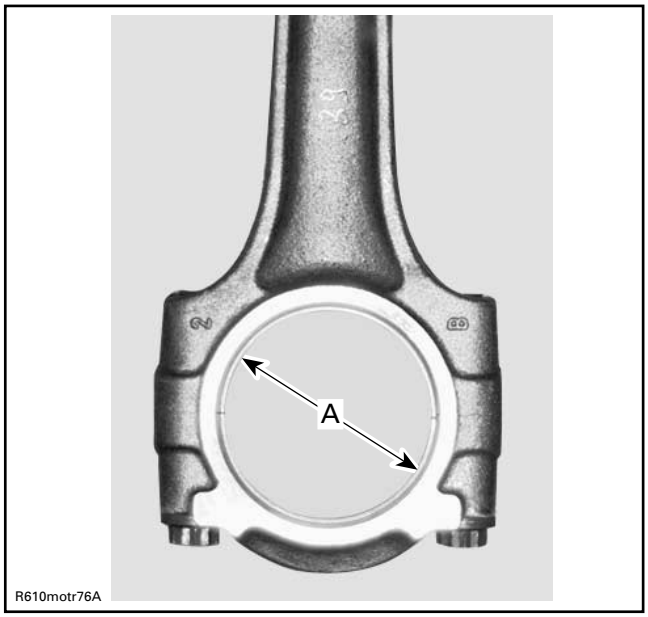
Connecting Rod Big End Radial Play

Measure inside diameter of connecting rod big end. Compare to crankshaft pin.

To measure the connecting rod big end diameter, use the OLD screws **no. 11**.

Install the OLD bushings **no. 12** as they were mounted initially.

Do the torque procedure as described below.



A. Connecting rod big end bushing

CONNECTING ROD BIG END DIAMETER mm (in)	
SERVICE LIMIT	45.080 mm (1.774 in)

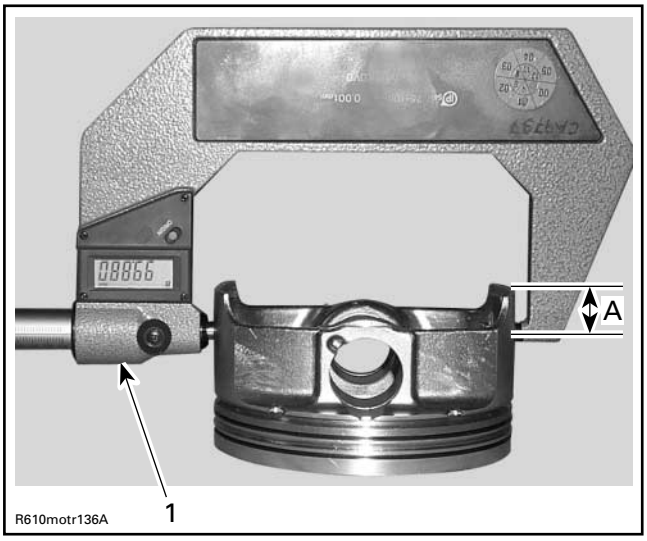
CONNECTING ROD BIG END CLEARANCE mm (in)	
SERVICE LIMIT	0.09 mm (.0035 in)

Use NEW bushings **no. 12**, when connecting rod big end diameter is out of specification.

Piston

Inspect piston for scoring, cracking or other damages. Replace piston and piston rings if necessary.

Using a micrometer, measure piston at 18 mm (.709 in) perpendicularly (90°) to piston pin axis.



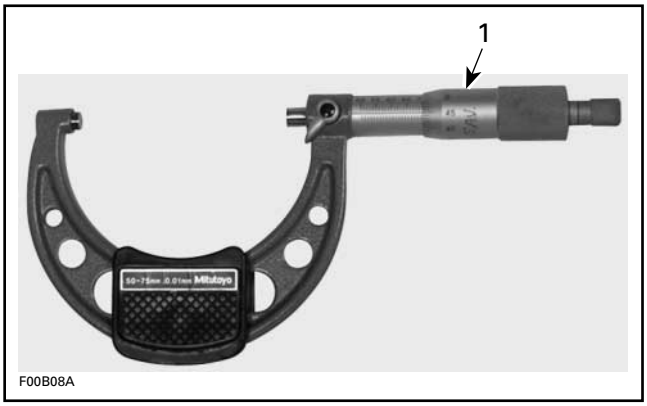
1. Measuring perpendicularly (90°) to piston pin axis
A. 18 mm (.709 in)

The measured dimension should be as described in the subsequent table. If not, replace piston.

PISTON MEASUREMENT mm (in)	
NEW NOMINAL	99.951 to 99.969 mm (3.935 to 3.936 in)
SERVICE LIMIT	99.80 mm (3.929 in)

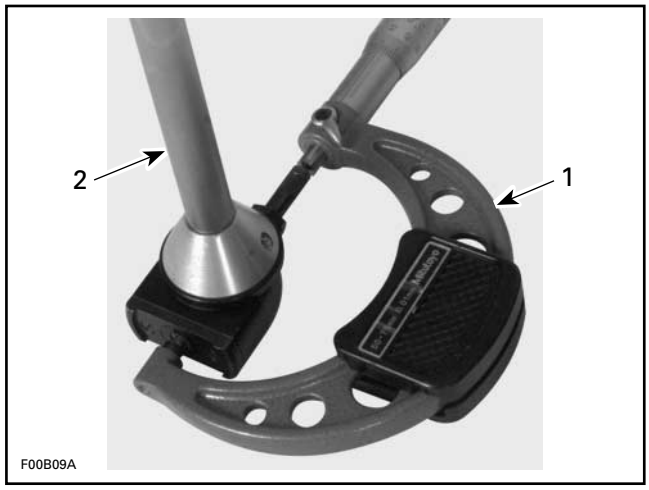
Piston/Cylinder Clearance

Adjust and lock a micrometer to the piston dimension.

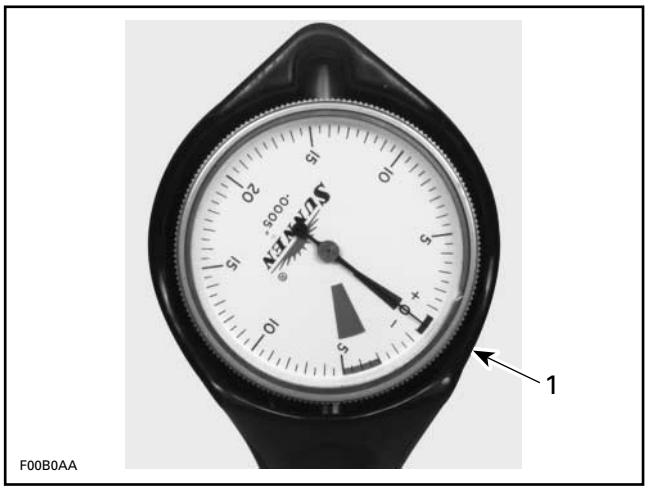


1. Micrometer set to the piston dimension

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



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



TYPICAL
1. Indicator set to 0 (zero)

Position the dial bore gauge 62 mm (2.44 in) above cylinder base, measuring perpendicularly (90°) to piston pin axis.

Read the measurement on the cylinder bore gauge. The result is the exact piston/cylinder wall clearance.

PISTON/CYLINDER CLEARANCE mm (in)	
NEW NOMINAL	0.024 to 0.056 mm (.0009 to .0022 in)
SERVICE LIMIT	0.090 mm (.004 in)

NOTE: Make sure used piston is not worn. See PISTON MEASUREMENT above.

If clearance exceeds specified tolerance, rehone cylinder sleeve and replace piston ass'y by an oversize one.

NOTE: It is not necessary to have all pistons replaced with an oversize if they are not all out of specification. Mixed standard size and oversize piston are allowed.

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

Piston Pin

Using synthetic abrasive woven, clean piston pin from deposits.

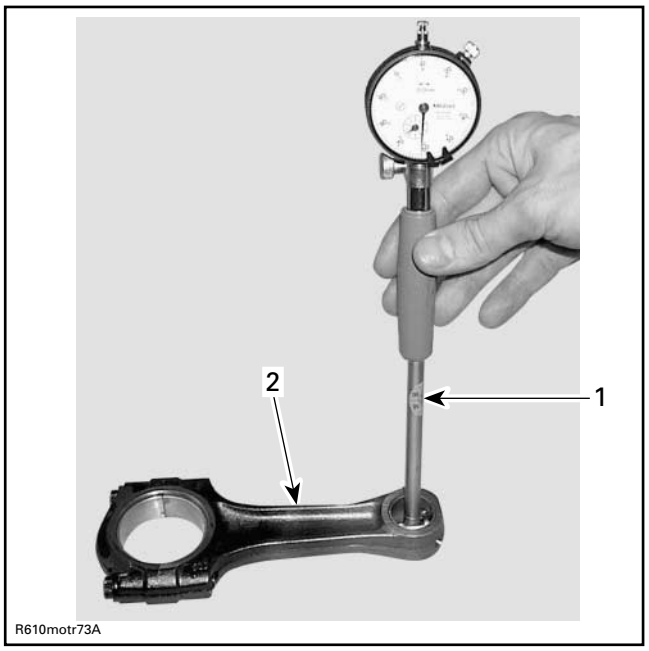
Inspect piston pin for scoring, cracking or other damages.

Measure piston pin. See the following illustration for the proper measurement positions.

Piston Pin/Connecting Rod Bushing Clearance

Measure inside diameter of connecting rod.

CONNECTING ROD SMALL END DIAMETER mm (in)	
NEW MINIMUM	23.01 mm (.9059 in)
NEW MAXIMUM	23.02 mm (.9063 in)
SERVICE LIMIT	23.07 mm (.908 in)



1. Bore gauge
2. Connecting rod

Replace connecting rod if diameter of connecting rod small end is out of specifications. Refer to CRANKSHAFT AND BALANCER SHAFT for removal procedure of connecting rod.

Installation

For installation, reverse the removal procedure. Pay attention to the following details.

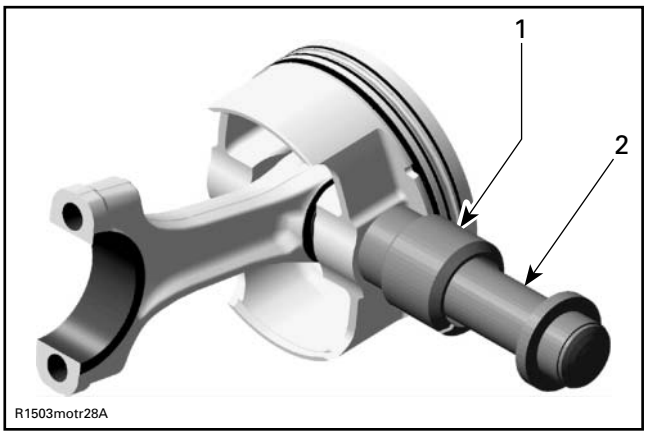
Apply engine oil on the piston pin.

Insert piston pin into piston and connecting rod.

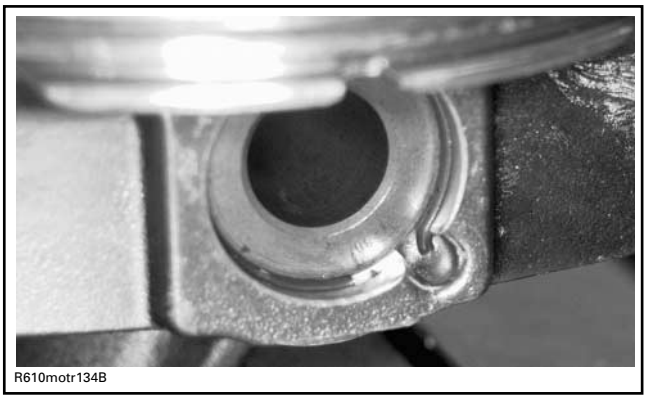
Use the piston circlip installer (P/N 529 035 765) to assemble the piston circlip.

CAUTION: Secure piston pin with new piston circlips

NOTE: Take care that the hook of the piston circlip is positioned properly.

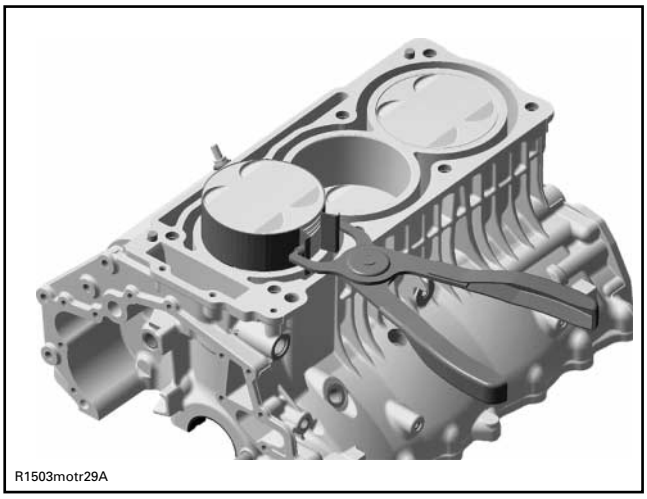


1. Sleeve with piston circlip inside
2. Assembly jig from piston clip installer

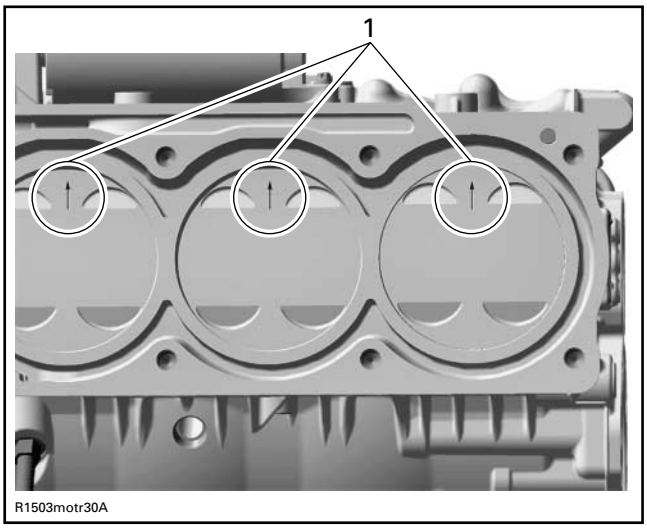


CORRECT POSITION OF THE PISTON CIRCLIP

Using a piston ring compressor plier, such Snap-on RC-980, slide piston into cylinder.


R1503motr29A

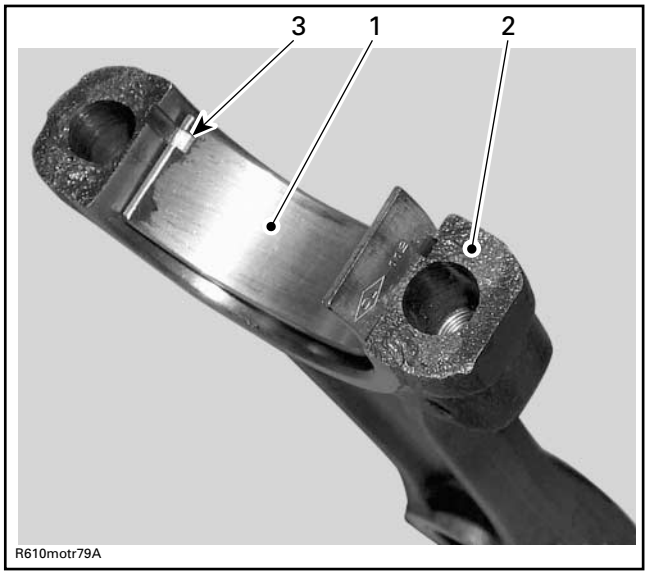
CAUTION: Install piston with punched arrow toward exhaust side.



R1503motr30A

1. Arrow toward exhaust side

Correctly install bushings and carefully clean split surface on both sides (cracked area).



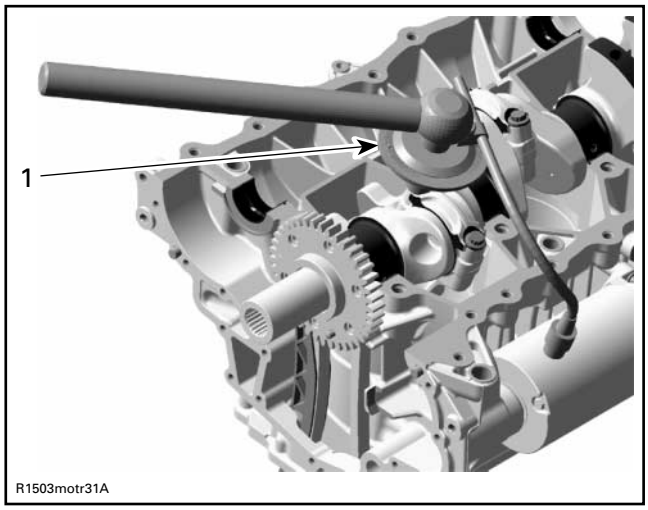
R610motr79A

1. Half bushing of connecting rod big end
2. Split surface of the connecting rod
3. Protrusion of bushing in line with connecting rod groove

Torque NEW connecting rod screws **no. 11** as per following procedure:

– Install screws and torque to 45 N•m (33 lbf•ft). Do not apply any thread locker product.
– Finish tightening the screws with an additional 90° turn using an angle torque wrench.

CAUTION: Failure to strictly follow this procedure may cause screw to loosen and lead to engine damage. Knowing that the screws have been stretched from the previous installation, it is very important to use new screws at assembly.



R1503motr31A

1. Angle torque wrench

PISTON RINGS

Removal

Remove piston ass'y as described above.

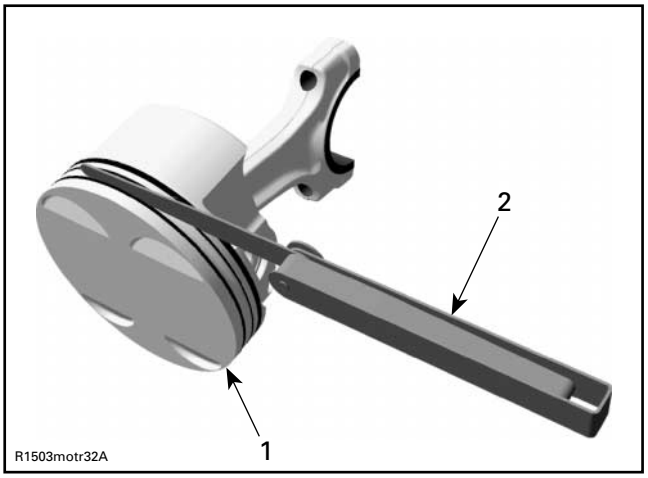
Remove rings.

Inspection

Ring/Piston Groove Clearance

Using a feeler gauge measure each ring/piston groove clearance. If the clearance is too large, the piston and the piston rings should be replaced.

RING/PISTON GROOVE CLEARANCE mm (in)	
NEW MINIMUM	
RECTANGULAR	0.025 mm (.001 in)
TAPER-FACE	0.015 mm (.0006 in)
OIL SCRAPER RING	0.020 mm (.0008 in)
NEW MAXIMUM	
RECTANGULAR	0.070 mm (.0028 in)
TAPER-FACE	0.060 mm (.0024 in)
OIL SCRAPER RING	0.055 mm (.0021 in)
SERVICE LIMIT	
ALL	0.15 mm (.006 in)



1. Piston
2. Filler gauge

Ring End Gap

RING END GAP mm (in)	
NEW MINIMUM	
RECTANGULAR	0.15 mm (.006 in)
TAPER-FACE	0.15 mm (.006 in)
OIL SCRAPER RING	0.15 mm (.006 in)
NEW MAXIMUM	
RECTANGULAR	0.35 mm (.014 in)
TAPER-FACE	0.35 mm (.014 in)
OIL SCRAPER RING	0.30 mm (.012 in)
SERVICE LIMIT	
ALL	1 mm (.04 in)

Measure position for ring end gap in the area of 8 to 16 mm (.315 to .630 in) from top of cylinder.

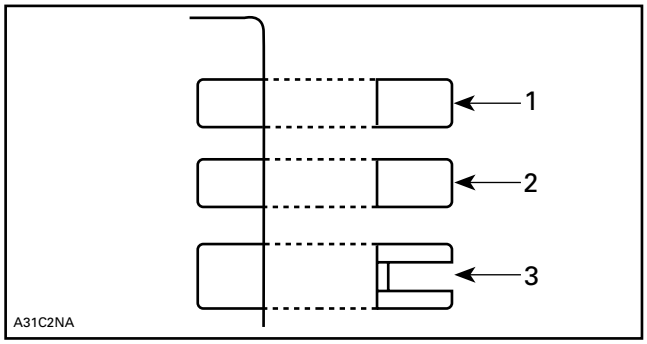
NOTE: In order to correctly position the ring in the cylinder, use piston as a pusher.

Using a feeler gauge, check ring end gap. Replace ring if gap exceeds above described specified tolerance.

Installation

For installation, reverse the removal procedure. Pay attention to the following details.

Install the oil scraper ring first, then the taper-face ring with the word "TO" facing up, then the rectangular ring with the word "T" facing up.



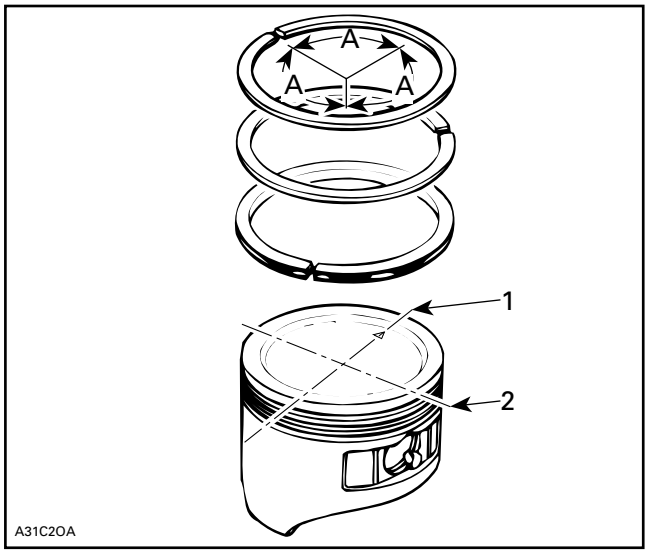
1. Rectangular ring
2. Taper-face ring
3. Oil scraper ring

CAUTION: Ensure that top and second rings are not interchanged

NOTE: Use a ring expander to prevent breakage during installation. The oil ring must be installed by hand.

Check that rings rotate smoothly after installation.

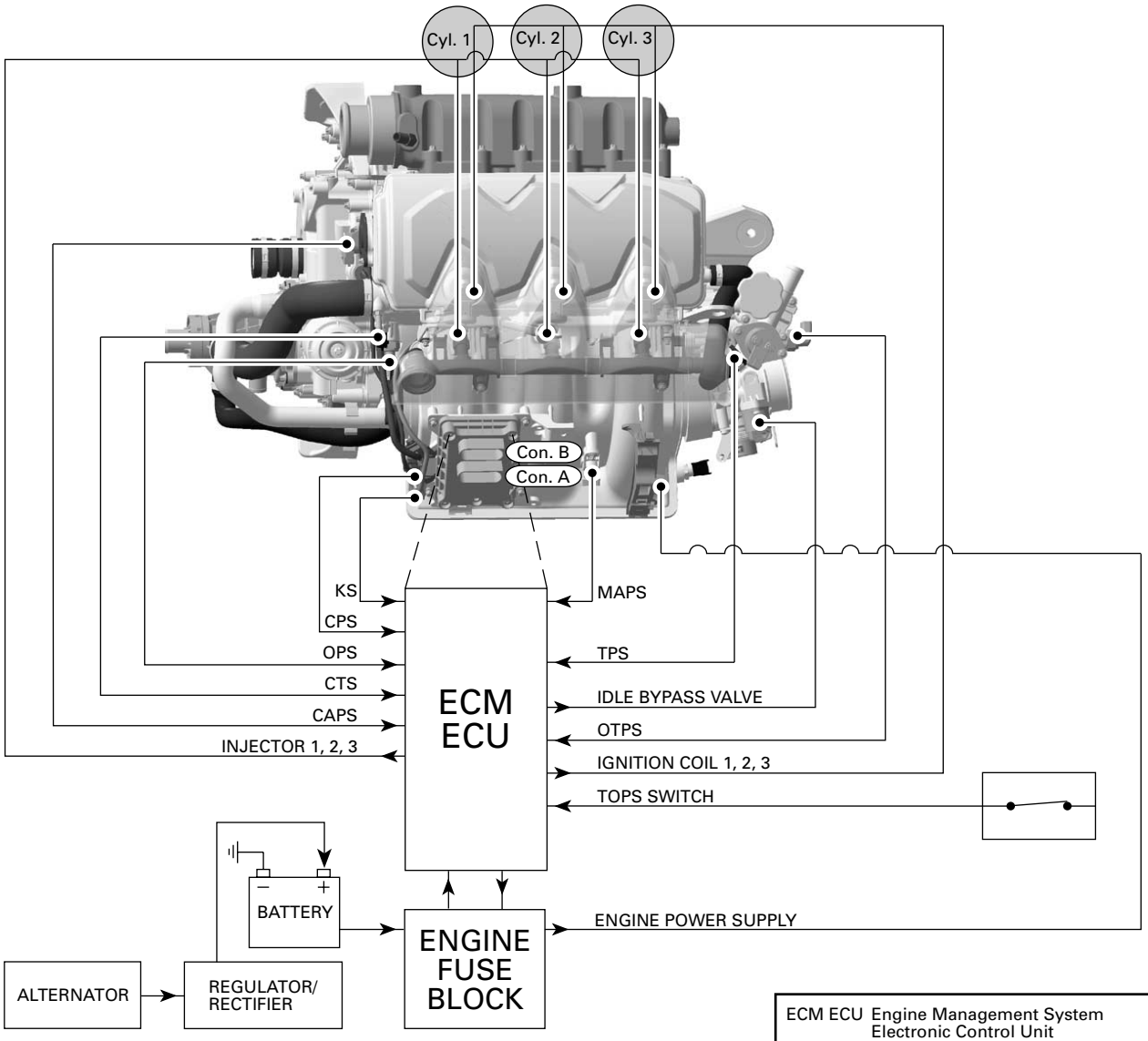
Space the piston ring end gaps 120° apart and do not align the gaps with the piston pin bore or the thrust side axis.



1. DO NOT align ring gap with piston trust side axis
2. DO NOT align ring gap with piston pin bore axis
A. 120°

OVERVIEW

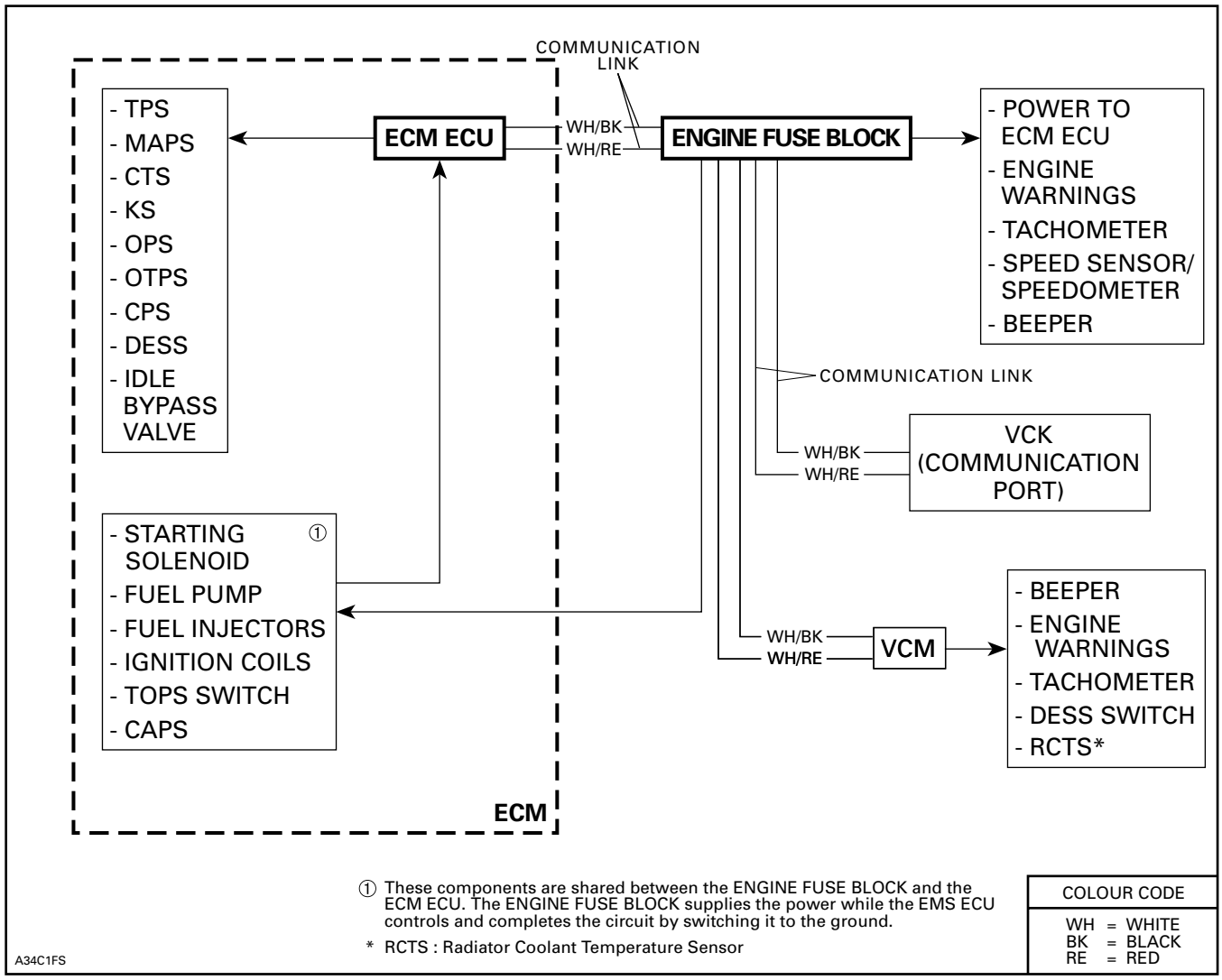
ENGINE CONTROL MODULE — OVERVIEW
ROTAX 4-TEC 1503



ECM ECU	Engine Management System Electronic Control Unit
KS	Knock Sensor
CPS	Cranshaft Position Sensor
OTPS	Oil Tank Pressure Sensor
CTS	Coolant Temperature Sensor
CAPS	Camshaft Position Sensor
MAPS	Manifold Air Pressure Sensor
TOPS	Tip-Over Protection System
Con. A	Connector for Engine Wiring Harness
Con. B	Connector for Boat Wiring Harness
OPS	Oil Pressure Sensor
TPS	Throttle Position Sensor

R1503motr314S

COMPLETE ELECTRICAL SYSTEM OVERVIEW



The complete electrical system is managed by micro-controllers working together. Overall, the VCM (vehicle control module) manages the vehicle electrical system, the ECM (engine control module) controls the engine.

A communication link is used between the electronic modules to communicate with each other. It consists of a twisted pair of wires (WHITE/RED and WHITE/BLACK).

For communication link troubleshooting, refer to INSTRUMENTS AND ACCESSORIES in ELECTRICAL section.

The communication link is also used to communicate informative messages, monitoring and diagnostic codes to the VCK (vehicle communication kit) where B.U.D.S.™ (Bombardier Utility and Diagnostic System) is used for diagnosing and troubleshooting the system.

NOTE: Use version 2.1.1 or higher.

The fault codes can be seen from B.U.D.S. Refer to DIAGNOSTIC PROCEDURES section.

ALTERNATOR

The alternator is the primary source of electrical energy. It transforms magnetic field into electric current (AC).

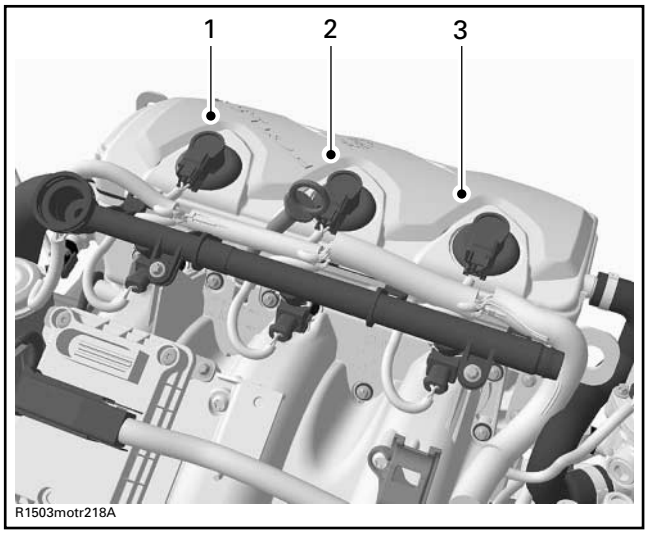
It supplies DC current to battery after being transformed by the voltage regulator/rectifier. Refer to CHARGING SYSTEM.

NOTE: The voltage regulator is integrated in the alternator.

OPERATING PRINCIPLE OF ENGINE MANAGEMENT

A highly advanced engine control module (ECM) has been used to ensure a high power output with cleanest combustion. The ECM calculates the proper air/fuel mixture and ignition timing for each cylinder separately. The fuel is injected into the intake port of each cylinder.

NOTE: On this engine, PTO and alternator (MAG side) are on the same engine side (right). Each cylinder is referenced as **1**, **2** and **3** instead of PTO, CENTRE and MAG. The numbers are stamped on the valve cover.

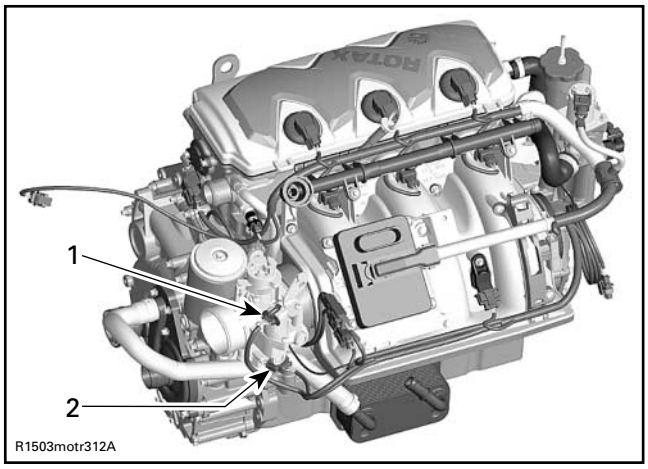


TYPICAL
1. *Cylinder 1*
2. *Cylinder 2*
3. *Cylinder 3*

NOTE: «ECM» stands for engine control module. «ECM» includes an ECU (electronic control unit), sensors, injectors, electromagnetic valves and ignition system.

AIR INDUCTION

Air for combustion is drawn directly at the front of the engine through one 52 mm throttle body. The air flow is controlled by a throttle plate and an idle bypass valve respectively. The air continues through the intake manifold, which contains the flame arrester and goes into the cylinder head.



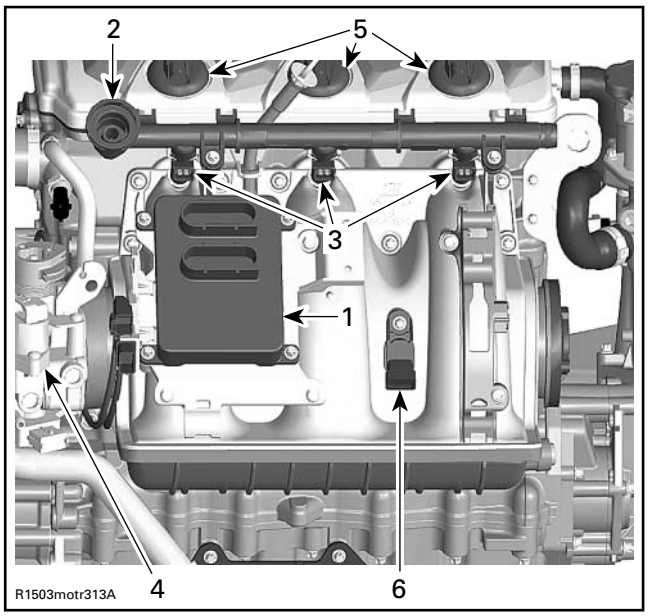
52 MM THROTTLE BODY
1. *Idle bypass valve*
2. *Throttle position sensor (TPS)*

FUEL DELIVERY SYSTEM

BASIC OPERATION

The ECM ECU (Electronic Control Module) opens the fuel injector and fuel is discharged into the intake port at the air intake manifold by the high fuel pressure inside the fuel rail. The air/fuel mixture enters then the combustion chamber through the open intake valve. This mixture is then ignited by the spark plug.

INTAKE MANIFOLD



INTAKE MANIFOLD
1. *Electronic Control Unit (ECM ECU)*
2. *Fuel rail*
3. *Injector*
4. *Throttle body*
5. *Ignition coil*
6. *Manifold air pressure sensor (MAPS)*

The intake manifold is mounted on the engine block on the engine starboard side. It provides support for the fuel injectors, the fuel rail, the ECM ECU, the flame arrester and the throttle body. The air intake manifold is a resonator between the throttle body and the air intake at the cylinder head with the flame arrester.

Fuel Rail

The fuel rail is a small tube on which the three injectors are mounted. It ensures all the time, that enough fuel at the right pressure can be delivered to the fuel injectors. The fuel rail is fed by the fuel pump with a fuel pressure of approximately 400 kPa (58 PSI).

Fuel Injector

Three fuel injectors (one per cylinder) are used to inject fuel into the intake port of the cylinder head.

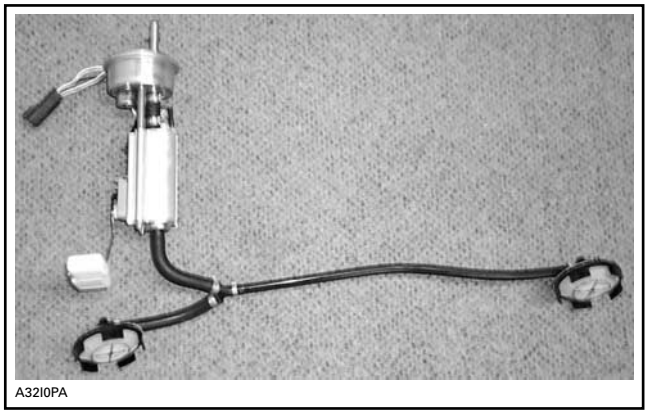
Flame Arrester

The flame arrester is a tube inside the air intake manifold. It prevents flames leaving through the intake system if the engine backfires.

Throttle Body

It is a 52 mm throttle body mounted on intake manifold. Fitted on the throttle body, there is the TPS and the idle bypass valve which allows the ECM ECU to control the RPM while the throttle plate is closed. This throttle body is heated to prevent the possibility of freezing.

FUEL PUMP MODULE



The fuel pump modules is located inside the fuel tank. The module includes fuel pump, fuel pressure regulator and fuel level sensor.

Fuel Pump

It provides fuel pressure and flow rate to the system.

Fuel Pressure Regulator

A fuel pressure regulator controls the pressure in the system and allows the excess of fuel to return to the fuel tank. The fuel pressure regulator regulates the fuel pressure at approximately 400 kPa (58 PSI).

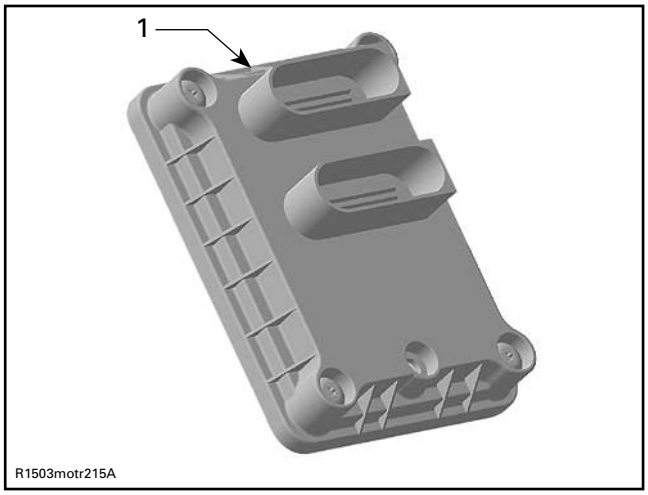
Fuel Pickups

Two fuel pickups come with 50 microns filter. One is located at the front right side of the fuel tank and the other at the rear left side. Also, an inline fuel filter is installed between the fuel pump and fuel rail.

ELECTRONIC MANAGEMENT

ECM (ENGINE CONTROL MODULE)

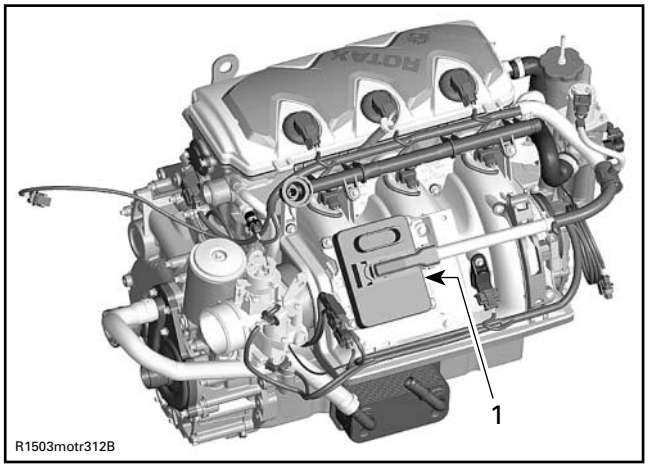
The engine control module is controlled by the ECM ECU.



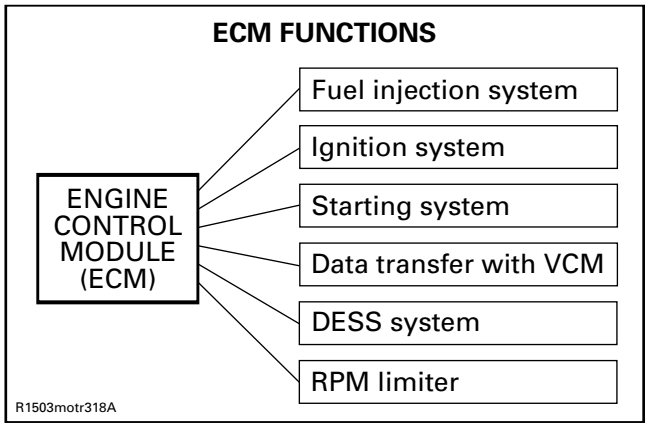
TYPICAL
1. ECM ECU

ECM ECU

The ECM ECU is mounted on the intake manifold. It controls all engine management functions, by processing the information given by various sensors.



TYPICAL
1. ECM ECU on intake manifold



The ECM ECU gets its power by the engine fuse block which is directly powered by the battery. It is responsible for the following engine management/electrical functions:

- interpreting information
- distributing information
- start/stop function
- DESS (Digitally Encoded Security System)
- ignition timing control
- injection control
- The ECM ECU applies the proper map (injection and ignition) for optimum engine operation in all conditions.
- engine RPM limiter
- etc.

The ECM ECU features a permanent memory that will keep the programmed tether cord cap(s) active, fault codes and other engine information, even when the battery is removed from the vehicle.

ECM — GENERAL FUNCTIONS

Antistart Feature

This system allows starting the vehicle only with tether cord cap(s) that has been programmed to operate a specific snowmobile. This functionality is the DESS system. See below for details.

Digitally Encoded Security System (DESS™)

The following components are specially designed for this system: Vehicle Control Module (VCM), ECM ECU, tether cord cap and DESS post.

The tether cord cap contains a magnet and a ROM chip. The magnet actually closes the reed switch inside the post which is the equivalent of a mechanical ON/OFF switch. The chip has a unique digital code.

The DESS circuitry in the ECM ECU is activated at the factory. Therefore, a tether cord cap must be programmed to start the engine.

NOTE: Actually, it is the memory of the ECM ECU which is programmed to recognize the digital code of the tether cord cap. This is achieved with the VCK (Vehicle Communication Kit) (P/N 529 035 981). Refer to B.U.D.S.™ help system to program a tether cord cap.

The system is quite flexible. Up to 8 tether cord capsmay be programmed in the memory of the vehicle ECM. They can also be erased individually.

NOTE: If desired, a tether cord cap can be used on other snowmobile equipped with the DESS. It only needs to be programmed for that snowmobile.

The memory of the ECM ECU features a self-diagnostic mode for the DESS operation. Refer to DIAGNOSTIC PROCEDURES section for more information.

The memory of the ECM ECU is permanent. If the battery is disconnected, no information is lost.

Engine Starting

If the ECM ECU recognizes a valid tether cord cap, it allows engine to start when the ignition key is turned.

If ignition switch is held after engine has started, the ECM ECU automatically stops the starter when the engine speed reaches 1600 RPM.

Engine RPM Limiter

The ECM ECU will limit the maximum engine speed.

Engine Stopping

There are 3 ways to stop the engine.

Press engine stop switch or turn ignition switch to OFF or remove the tether cord cap from its post.

Low-Oil Pressure Warning Device

When the oil pressure falls under a certain level, the ECM ECU sends out a signal for the beeper and to the warning gauge. Additionally the engine goes into limp home mode.

High Coolant Temperature Warning Device

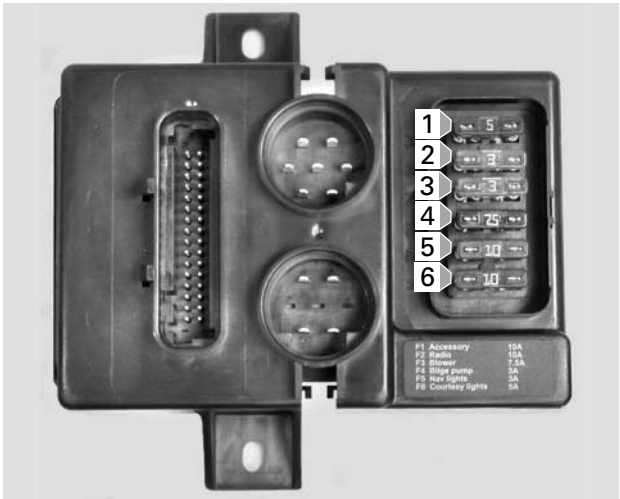
When the coolant temperature is getting too high, the ECM ECU sends signals to the warning gauge. Additionnally the engine goes into limp home mode.

Fuse Block

The fuse block is located in engine compartment, near coolant tank on engine compartment wall .

The ECM ECU switches the ground to complete the electrical circuits it controls. Take this into account when troubleshooting the electrical system. Refer to the illustration at the beginning of this section.

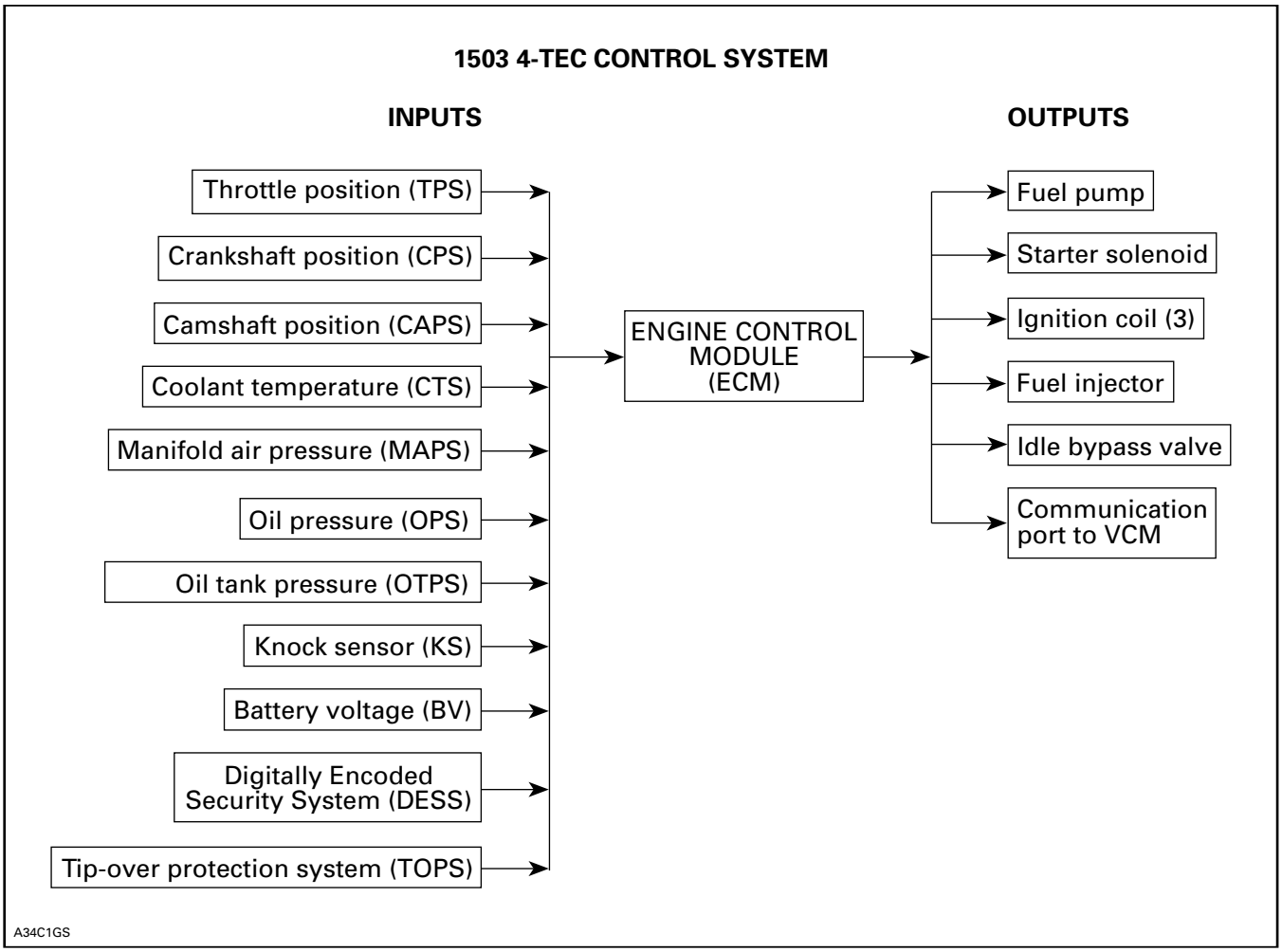
The engine fuse block distributes power from the battery to all engine components and vehicle gauges.



F04H70A

TYPICAL
1. *Charging*
2. *Cylinder 2*
3. *Cylinder 1*
4. *Gauges*
5. *Cylinder 3*
6. *Fuel pump*

EMS — ENGINE MANAGEMENT FUNCTIONS



This engine management system controls both the fuel injection and the ignition timing.

As shown in the CONTROL SYSTEM illustration, the ECM ECU is the central point of the fuel injection system. It reads the inputs, makes computations, uses pre-determined parameters and sends the proper signals to the outputs for proper engine management.

The ECM ECU also stores the fault codes and general information such as: operating conditions, vehicle hours, serial numbers, customer and maintenance information.

Electronic Fuel Injection

The ECM ECU reads the signals from different sensors which indicate engine operating conditions at milli-second intervals.

Signals from sensors are used by the ECM ECU to determine the injection parameters (fuel maps) required for optimum air-fuel ratio.

The CPS, the MATS, the MAPS and the TPS are the primary sensors used to control the injection and ignition timing. Other sensors (like temperature sensors, etc.) are used for secondary input.

NOTE: The OPS and OTPS sensors do not provide control inputs to the ECM ECU. Their sole purpose is to protect the engine components by emitting a warning signal and/or a fault code in the event of overheating or low oil pressure.

Ignition System

The ignition system is a digital inductive type. The ECM ECU controls the ignition system parameters, such as spark timing, duration and firing in order to achieve the proper engine requirements.

Ignition Coils

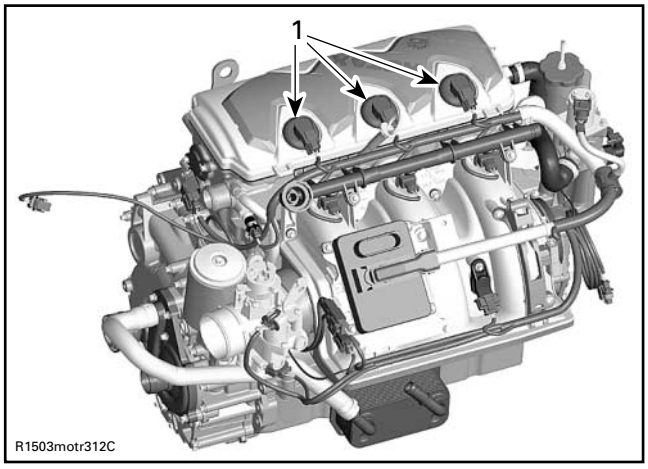
Three separate ignition coils induce voltage to a high level in the secondary windings to produce a spark at the spark plug.

The ignition coils receive input from the ECM ECU. Each coil provides high voltage to its corresponding spark plug.

This ignition system allows spark plugs to spark independently.

NOTE: Ignition coil cables are not interchangeable due to different lengths.

All three ignition coils are located on the cylinder head directly on the spark plugs.



1. Ignition coils

Ignition Timing

The ECM ECU is programmed with data (it contains ignition mappings) for optimum ignition timing under all operating conditions. Using engine operating conditions provided by the sensors, the ECM ECU controls the ignition timing for optimum engine operation.There is no mechanical adjustment to perform.

Knock Sensor

A knock sensor is mounted on the engine block behind the air intake manifold. It detects specific vibrations that would be typically generated by engine detonation. If detonation occurs, the knock sensor detects this and the ECM ECU retards the ignition advance temporarily (it goes in a specific mode) until detonation stops. The ECM ECU is able to evaluate the knocking cylinder and modifies the ignition advance on just the one detonating.

Engine Modes of Operation

The ECM ECU controls different operation modes of the engine to allow proper operation for all possible conditions: Cranking, start-up, idle, warm up, part load, full load, engine speed limiter and drowned engine.

Fuel-Flooded Engine

If engine is fuel-flooded and does not start, this special mode can be activated to prevent fuel injection and ignition while cranking. Proceed as follows to activate it.

First, remove drive belt. Refer to DRIVE BELT.

With tether cord cap on its post while engine is stopped, press and HOLD throttle lever in neutral position.

Press the ignition key. The mode is now on.

Releasing throttle lever will bring back to its normal mode.

If engine does not start, it may be necessary to remove spark plugs and crank engine with rags over spark plug holes. Refer to COMPONENT INSPECTION AND ADJUSTMENT subsection.

⚠ WARNING

When disconnecting coil from spark plug, always disconnect coil from main harness first. Never check for engine ignition spark from an open coil and/or spark plug in the engine compartment as spark may cause fuel vapor to ignite.

Diagnostic Mode

The malfunctions are recorded in the memory of the ECM ECU. The memory of the ECM ECU can be checked using the VCK (Vehicle Communication Kit) (P/N 529 035 981) to see the fault codes. The ECM ECU and the VCK are able to communicate through a connector on the vehicle. Refer to the DIAGNOSTIC PROCEDURES section. B.U.D.S.™ Version 2.1.1 and up must be used for this system.

VCM — VEHICLE CONTROL MODULE

Power Distribution

The VCM distributes power from battery to all accessories. Accessories are protected by fuses integrated in the VCM. Fuse ratings are identified beside their holder.

IMPORTANT: Some components are continuously powered with the supply from the battery through VCM.

Gauges Current Supply

The purpose of this function is to allow reading of gauges without the engine running.

Gauges are supplied with current whenever the tether cord cap is installed on its post.

NOTE: The fuel pump will be activated for 2 seconds to build up pressure in the fuel injection system, only when connecting the tether cord cap to the post and ignition key is turned ON.

Monitoring System

The ECM ECU monitors the electronic components of the fuel injection system and also the engine components of the electrical system. When a fault occurs, it sends audible signals through a beeper to inform you of a particular condition. Refer to the DIAGNOSTIC PROCEDURES section for the beeper coded signals chart.

COMPONENT INSPECTION AND ADJUSTMENT

GENERAL

Engine problems are not necessarily related to the electronic fuel injection system.

It is important to ensure that the mechanical integrity of the engine/drive propulsion system is present:

– good transmission system operation
– good engine compression and properly operating mechanical components, no leaks etc.
– fuel pump connection and fuel lines without leaks.

Check the chart in TROUBLESHOOTING section to have an overview of problems and suggested solutions.

When replacing a component, always check its operation after installation.

FUEL SYSTEM

⚠ WARNING

The fuel system of a fuel injection system holds much more pressure than on a carbureted vehicle. Prior to disconnecting a hose or to removing a component from the fuel system, follow the recommendation described here. Note that some hoses may have more than one clamp at their ends. Ensure to reinstall the same quantity of clamps at assembly.

Use the VCK (Vehicle Communication Kit) (P/N 529 035 981) to release the fuel pressure in the system. Look in the Activation section of the B.U.D.S. software.

⚠ WARNING

Fuel lines remain under pressure at all times. Always proceed with care and use appropriate safety equipment when working on pressurized fuel system. Wear safety glasses. Do not allow fuel to spill on hot engine parts and/or on electrical connectors. Proceed with care when removing/installing high pressure test equipment or disconnecting fuel line connections. Use the VCK (Vehicle Communication Kit) to release fuel pressure prior to removing a hose. Cover the fuel line connection with an absorbent shop rag. Slowly disconnect the fuel hose to minimize spilling. Wipe off any fuel spillage in the vehicle. Fuel is flammable and explosive under certain conditions. Always work in a well ventilated area. Always disconnect battery prior to working on the fuel system. After performing a pressure test, use the valve on the fuel pressure gauge to release the pressure (if so equipped).

Always disconnect battery properly prior to working on the fuel system. Refer to BATTERY section.

When the job is done, ensure that hoses from fuel rail going to fuel pump are properly secured in their supports. Then, pressurize the fuel system. Perform the high pressure test as explained in this section and pressurize the fuel tank and fuel lines as explained in FUEL SYSTEM section.

Properly reconnect the battery.

⚠ WARNING

Ensure to verify fuel line connections for damage and that NO fuel line is disconnected prior to installing the tether cord cap on the DESS post. Always perform the high pressure test if any component has been removed. A pressure test must be done before connecting the tether cord cap. The fuel pump is started each time the tether cord cap is installed and it builds pressure very quickly.

To check fuel rail for leaks, first pressurize the system then spray soapy water on all hose connections, regulators and injectors. Air bubbles will show the leaking area. Check also for leaking fuel or fuel odor.

⚠ WARNING

If any gasoline leak and/or odor are present, do not start the engine. Repair the leak.

⚠ WARNING

Never use a hose pincher on high pressure hoses.

⚠ WARNING

PRESSURIZED FUEL. Do not unscrew protective cap. Do not operate the vehicle without cap properly installed.

ELECTRICAL SYSTEM

It is important to check that the following electrical system components are functioning properly:

– battery
– fuses
– DESS
– ignition (spark)
– ground connections
– wiring connectors.

It is possible that a component seems to operate in static condition but in fact, it is defective. In this case, the best way to solve this problem is to remove the original part and replace it with one which is in good condition.

Never use a battery charger to substitute temporarily the battery, as it may cause the VCM/ECM ECU to work erratically or not to work at all. Check related-circuit fuse solidity and condition with an ohmmeter. Visual inspection could lead to false results.

⚠ WARNING

All electrical actuators (idle bypass valve, TOPS resistance, injectors, fuel pump, ignition coils and starter solenoid) are permanently supplied by the battery when the tether cord cap is installed. Always disconnect the battery prior to disconnecting any electrical or electronic parts.

To perform verifications, a good quality multimeter such as Fluke 111 (P/N 529 035 868) should be used.

Pay particular attention to ensure that terminals are not out of their connectors or out of shape. The troubleshooting procedures cover problems not resulting from one of these causes.

⚠ WARNING

Ensure all terminals are properly crimped on wires and connector are properly fastened.

Before replacing a VCM or ECM ECU, always check electrical connections. Make sure that they are very tight and they make good contact and that they are corrosion free. Particularly check VCM and ECM ECU ground connections. Ensure that contacts are good and clean. A "defective module" could possibly be repaired simply by unplugging and replugging the VCM or ECM ECU. The voltage and current might be too weak to go through dirty wire terminals. Check carefully if terminals show signs of moisture, corrosion or if they look dull. Clean terminals properly and then coat them prior to assembling as follows:

AMP connectors, ECM ECU connectors, OPS and OSPS connectors: Apply a thin coat of DEOXIT contact lubricant (P/N 293 550 034).

Other connectors: Apply a silicon-based dielectric grease or other appropriate lubricant. If the newly replaced VCM or ECM ECU is working, try the old one and recheck if it works.

Ensure that all electronic components are genuine - any modification on the wiring harness may lead to generate fault codes or bad operation.

NOTE: For diagnostics purposes, use Vehicle Communication Kit (VCK). See DIAGNOSTIC PROCEDURES subsection.

After a problem has been solved, ensure to clear the fault(s) in the ECM ECU using the VCK. Refer to DIAGNOSTIC PROCEDURES subsection.

Resistance Measurement

When measuring the resistance with an ohmmeter , all values are given for a temperature of 20°C (69°F). The value of a resistance varies with the temperature. The resistance value for usual resistor or windings (such as injectors) increases as the temperature increases. However, our temperature sensors are NTC types (Negative Temperature Coefficient) and work the opposite which means that the resistance value decreases as the temperature increases. Take it into account when measuring at temperatures different from 20°C (69°F). Use this table for resistance variation relative to temperature for temperature sensors.

TEMPERATURE		RESISTANCE (OHMS)		
°C	°F	Nominal	Low	High
- 30	- 22	12600	11800	13400
- 20	- 4	11400	11000	11800
- 10	14	9500	8000	11,000
0	32	5900	4900	6900
10	50	3800	3100	4500
20	68	2500	2200	2800
30	86	1700	1500	1900
40	104	1200	1080	1320
50	122	840	750	930
60	140	630	510	750
70	158	440	370	510
80	176	325	280	370
90	194	245	210	280
100	212	195	160	210
110	230	145	125	160
120	248	115	100	125

CONVERSION CHART FOR TEMPERATURE SENSORS

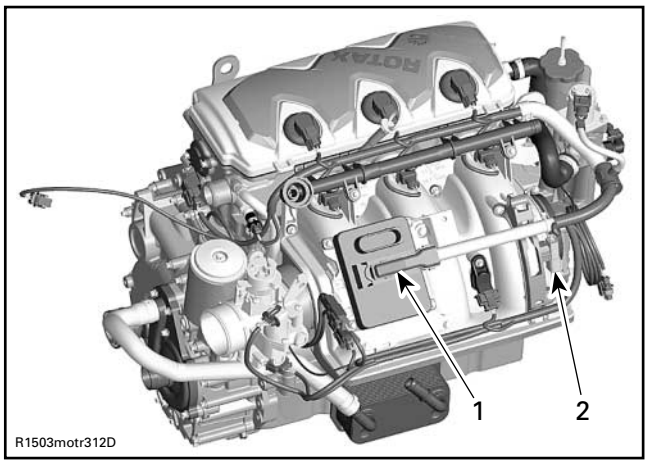
The resistance value of a temperature sensor may test good at a certain temperature but it might be defective at other temperatures. If in doubt, try a new sensor.

Also remember this validates the operation of the sensor at ambient temperature. It does not validate the over temperature functionality. To test it, the sensor could be removed from the engine/muffler and heated with a heat gun while it is still connected to the harness to see if the ECM ECU will detect the high temperature condition and generate a fault code.

NOTE: In case of overheating CTS do not generate fault codes. A message will be displayed on the information center, the beeper will be activated and the ECM will be set in limp home mode.

ENGINE CONNECTOR PIN OUT

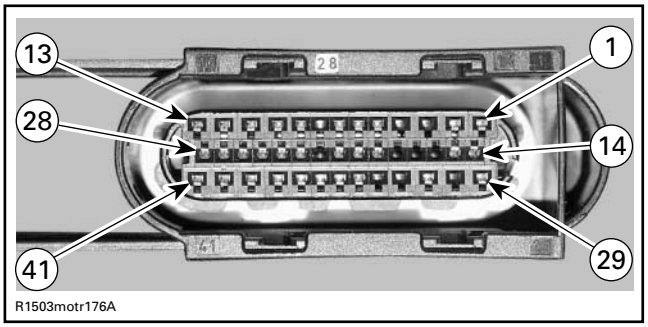
Connector Position



TYPICAL
1. ECM ECU connector A
2. Engine connector

ECM ECU Connector

Use this diagram to locate the terminal numbers on the ECM ECU connector A of the wiring harness when performing tests.



ECM ECU CONNECTOR PIN-OUT (WIRING HARNESS SIDE)

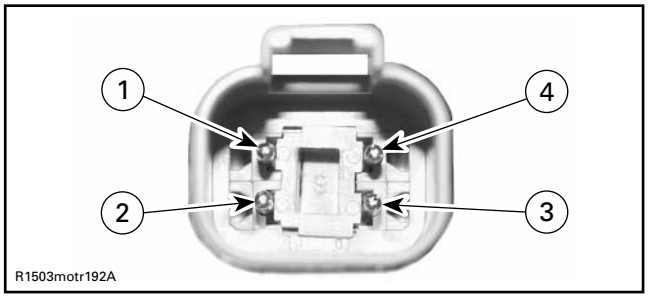
CAUTION: Probe on top of terminal only. Do not try to probe inside terminal or to use a paper clip to probe inside terminal, it can damage the square-shaped terminal.

CAUTION: Do not disconnect the ECM ECU connector needlessly. They are not designed to be disconnected/reconnected repeatedly.

Engine Connector

Use this diagram to locate the terminal numbers on the Engine connector of the wiring harness when performing tests.

CAUTION: Before unplugging engine connector, always remove tether cord cap first then wait 15 seconds. Otherwise, damage to CAPS may occur.

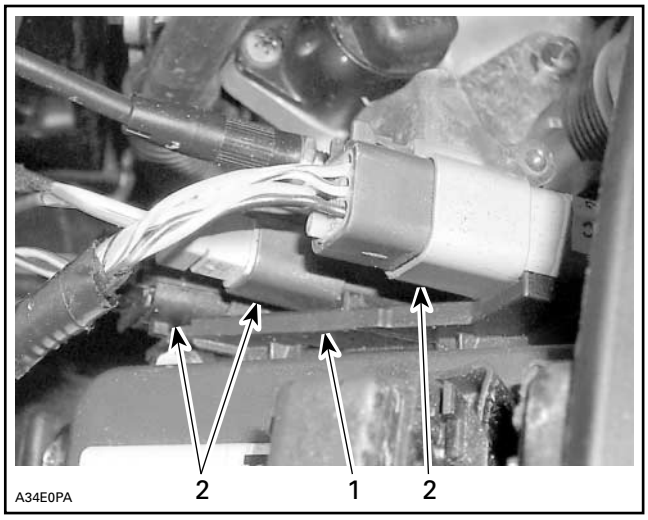


ENGINE CONNECTOR PIN-OUT (WIRING HARNESS SIDE)

CONNECTORS ON ENGINE

Removal

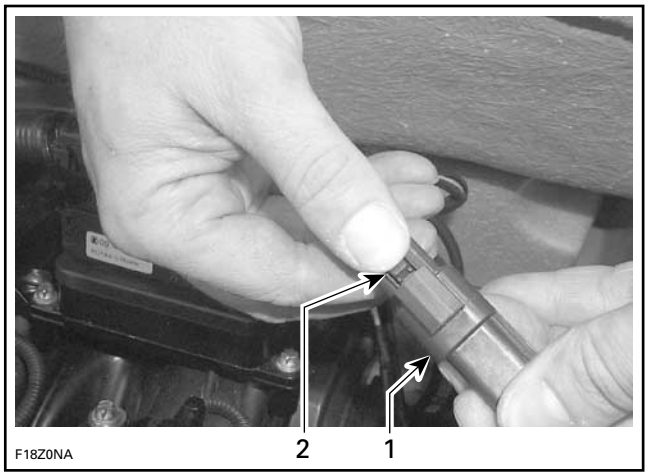
To remove connectors from engine connector bracket, slide a flat screwdriver between the connector bracket and the connectors and remove connectors.



1. Engine connector bracket
2. Connectors

1. Connector
2. Flat screwdriver

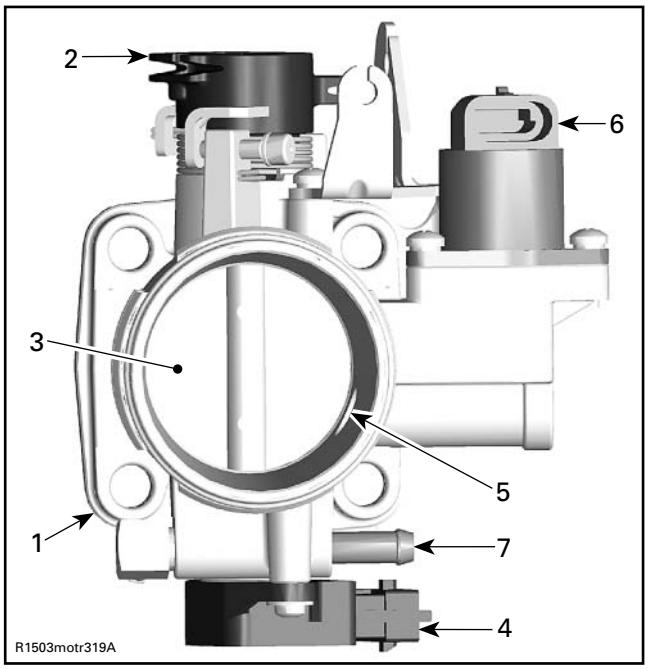
To disconnect two connectors slide a flat screwdriver between each other to disengage, press the release button and disconnect them.



TYPICAL
1. Connectors
2. Release button

AIR INDUCTION SYSTEM

THROTTLE BODY



1. Throttle body
2. Throttle cable attachment
3. Throttle plate
4. TPS
5. Idle bypass channel
6. Idle bypass valve
7. Preheating nipple

Mechanical Inspection

Check that the throttle plate moves freely and smoothly when depressing throttle lever. Take this opportunity to lubricate the throttle cable.

IMPORTANT: The throttle body is designed to be tamper proof. Changing the idle stop or modifying it in any way will not increase performance or change the idle speed but may cause poor startability and erratic idling.

Before replacing any part, check the following as these could be causing the fault. Perform the test while the engine is not running.

– Throttle cable adjustment too tight. Not returning fully to idle stop.
– Throttle body idle set screw is loose or worn.
– TPS is loose.
– Idle bypass valve is loose.
– Corroded or damaged wiring or connectors.
– Throttle body has been replaced and the Closed Throttle and Idle Actuator reset has not been performed.
– ECM ECU has been replaced and the Closed Throttle and Idle Actuator reset has not been performed.

Electrical Inspection

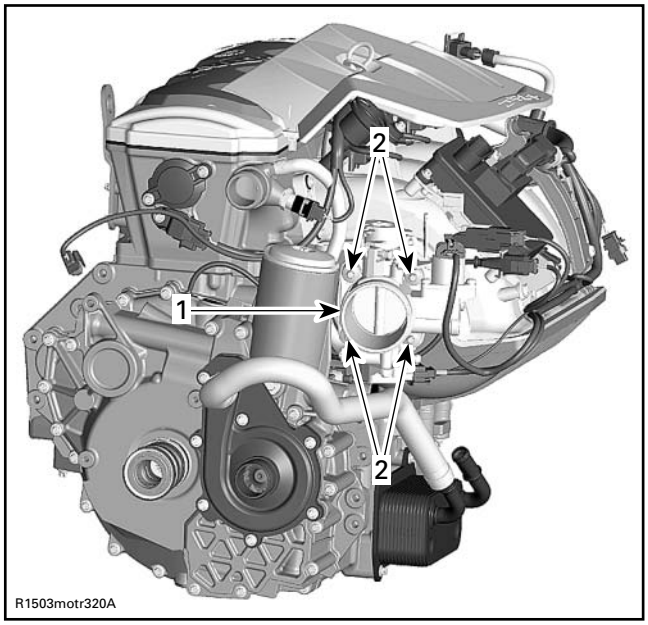
Refer to THROTTLE POSITION SENSOR (TPS) and IDLE BYPASS VALVE in ELECTRONIC MANAGEMENT below.

Replacement

Removal

To remove the throttle body from engine, proceed as follows:

– Disconnect air intake silencer from throttle body. Move boot away.
– Remove retaining screws of throttle body.



1. Throttle body
2. Screws

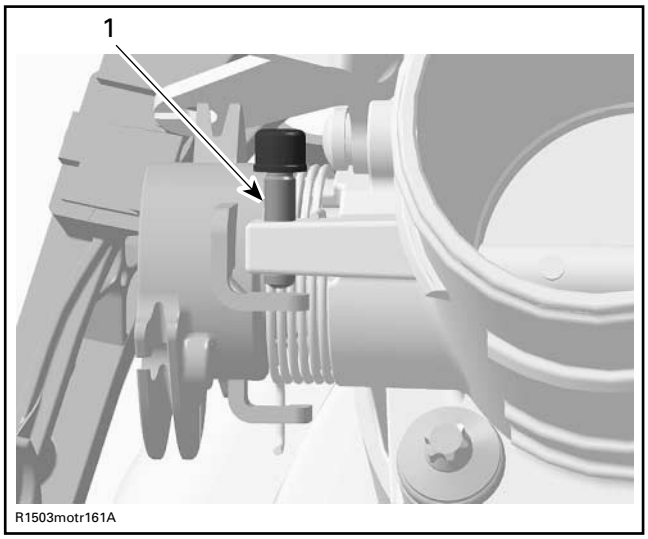
– Slightly pull throttle body out.
– Disconnect connectors from idle bypass valve, and TPS.
– Disconnect throttle cable.

Installation

Installation of the new throttle body is the reverse of the removal procedure.

For TPS and idle bypass valve replacement procedures, refer to the respective paragraph in ELECTRONIC MANAGEMENT below.

Adjustment



THROTTLE BODY
1. Idle stop screw

CAUTION: It is not allowed to perform any change on the idle stop screw.

The adjustment of the idle stop screw is optimized by the throttle body manufacturer and locked to prevent any modification.

CAUTION: Never attempt to adjust the idle speed through the throttle body tamper proof screw. If so, it would impair the idle speed stability. Besides, no adjustment could be performed by the dealer or the factory to correct the idle speed. The throttle body would need to be replaced. Also take into account that it might change the engine emission level and the engine might not meet the EPA/CARB requirements.

CAUTION: Do not alter or tamper with throttle cable adjustment or routing. It may cause poor startability and erratic idling.

When the throttle body has been replaced, perform throttle cable adjustment (see below) and then the Closed Throttle and Idle Actuator reset. Refer to THROTTLE POSITION SENSOR (TPS) in ELECTRONIC MANAGEMENT below.

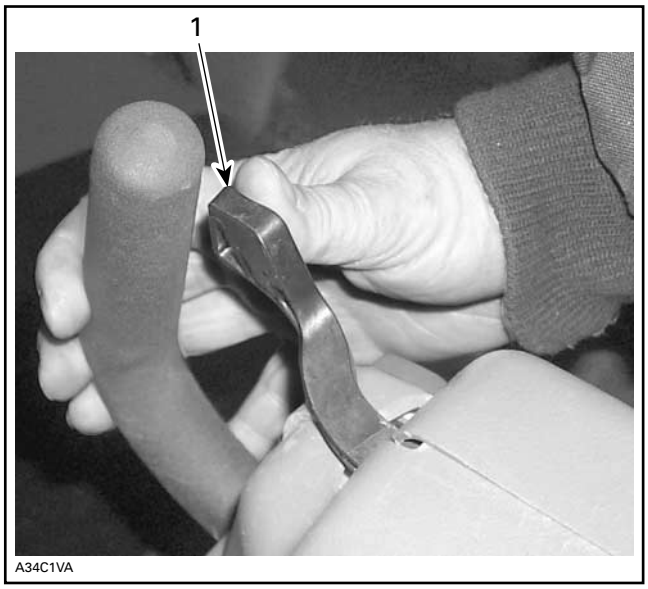
Throttle Cable Adjustment

Mechanically adjust the throttle cable.

Lubricate cable with BOMBARDIER LUBE lubricant.

When throttle is released, cable must have a free play of 0.5 - 4 mm (1/64 - 5/32 in).

Besides, throttle lever must almost reach steering wheel grip without causing strain to cable or brackets. Ensure throttle lever fully closes on it's stopper.



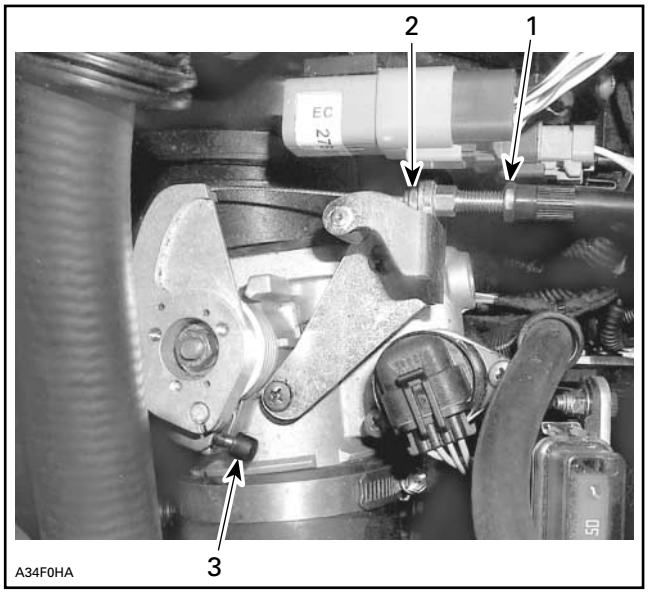
1. Must almost touch steering wheel

Ensure throttle body is fully open at full throttle position. At this position, throttle lever stopper is almost in contact with throttle body.

NOTE: Apply a light pressure on the throttle plate, a slight play should be obtained.

CAUTION: If there is no free-play at idle position, it may cause poor idling and startability. Improper cable adjustment will cause strain on cable and/or damage cable bracket or throttle lever at handlebar.

To adjust, loosen jam nut then turn adjustment nut as necessary.



1. Adjustment nut
2. Jam nut
3. Throttle lever stopper

Tighten jam nut and recheck adjustment.

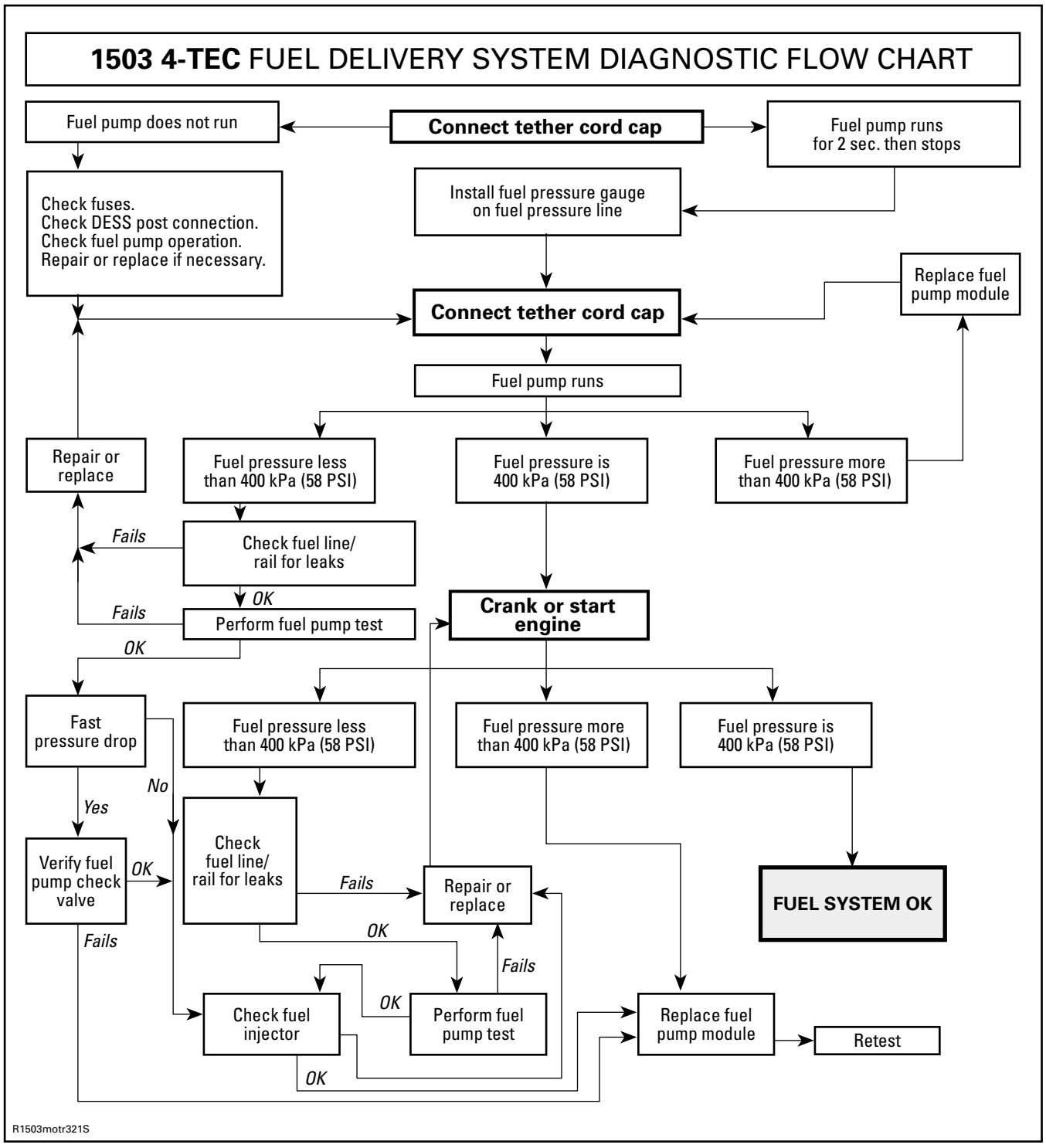
⚠ WARNING

Make sure idle speed stopper contacts throttle cam when throttle lever is fully released at handlebar.

Closed Throttle and Idle Actuator Reset

Perform the Closed Throttle and Idle Actuator reset as described in THROTTLE POSITION SENSOR (TPS) in ELECTRONIC MANAGEMENT below.

FUEL DELIVERY



FUEL PUMP

Before proceeding to the pressure test ensure the battery is fully charged. Battery voltage must be over 12 volts.

Release the fuel pressure in the system using B.U.D.S. Look in the Activation tab.

⚠ WARNING

The fuel hose may be under pressure. Cover the fuel line connection with an absorbent shop rag. Slowly disconnect the fuel hose to release the pressure. Wipe off any fuel spillage inside inside engine compartment.

The pressure test will show the available pressure at the fuel pump outlet. It validates the pressure regulator, the fuel pump and leaks in the system.

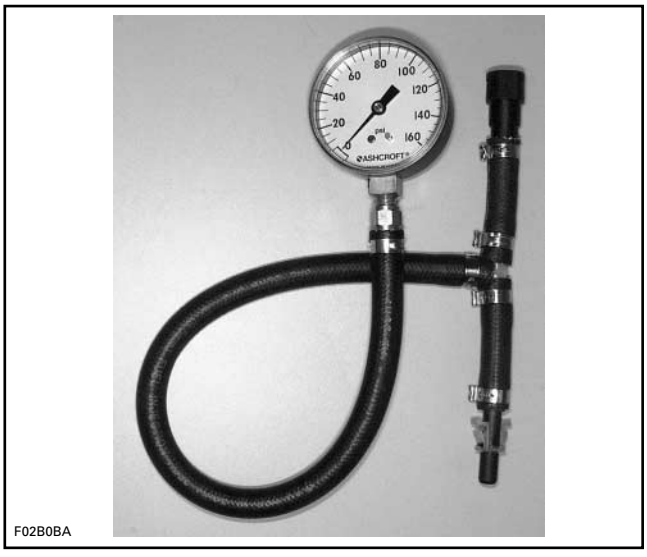
Remove air vent tube from front storage area.

Ensure there is no leak from hoses and fittings. Repair any leak.

Ensure there is enough gas in fuel tank.

Disconnect outlet hose from fuel pump.

Install fuel pressure gauge (P/N 529 035 591) between disconnected hose (inline installation).



FUEL PRESSURE GAUGE (P/N 529 035 591)

Install tether cord cap Activate the cut-out switch so the engine will not crank. Insert key in Ignition switch. Turn key to ON and observe fuel pressure. Do not crank engine . Repeat twice. Release pressure using B.U.D.S.so that the gauge is "reset" to zero (0). Remove the tether cord cap and install it again. Repeat the test.

FUEL PRESSURE (when installing tether cord cap)
400 kPa (58 PSI)

Crank or start engine and observe fuel pressure. The fuel pressure should be the same as above.

If pressure is within limits, fuel pump and pressure regulator are working adequately.

A rapid pressure drop indicates leakage either from the fuel rail or from the fuel pump check valve. Check fuel rail for leaks. If it is not leaking then replace fuel pump.

A slow pressure drop indicates leakage either from the fuel injector or from the fuel pressure regulator. Check fuel injector for leaks (see below). If it is not leaking then replace fuel pump module.

Release fuel pressure in the system using B.U.D.S. Look in the Activation tab.

Remove pressure gauge and reinstall fuel hose.

⚠ WARNING

Wipe off any fuel spillage in the vehicle. Fuel is flammable and explosive under certain conditions. Always work in a well ventilated area.

Reinstall removed parts.

Electrical Test

When connecting the tether cord cap to the DESS post, the fuel pump should run for 2 seconds to build up the pressure in the system.

If the pump does not work, disconnect the connector from the fuel pump.

Install a temporary connector on the fuel pump connector. and apply voltage (12 V) to this test harness.

If pump does not run, replace the fuel pump module.

Otherwise, probe terminals of fuel pump connector on vehicle harness side. When installing tether cord cap, you should read battery voltage for approximately 2 seconds (then voltage will drop to approximately 11 V). If battery voltage is read, the problem can be in fuel pump or in harness connector. Repair or replace appropriate part.

If battery voltage is not read, probe terminal A and battery ground.

a. If battery voltage is read, check continuity of circuit going towards ECM ECU. If it is good, try a new ECM ECU.
b. If battery voltage is not read, check continuity of circuit going towards VCM. If it is good, try a new VCM.

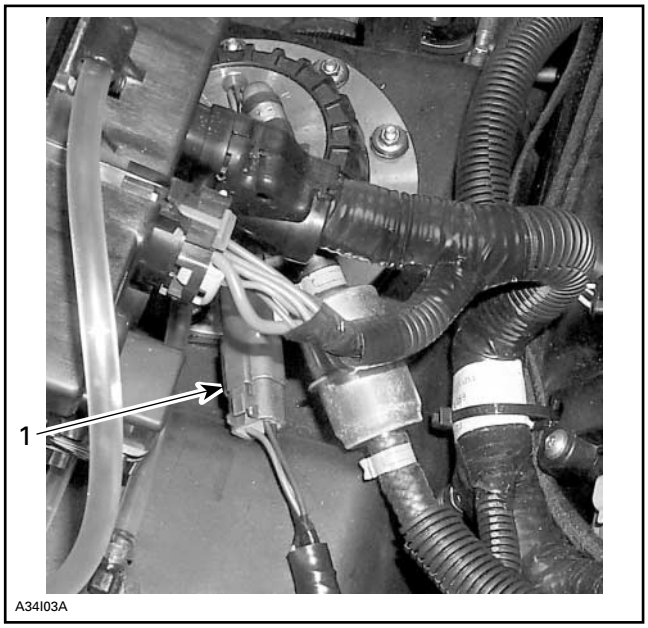
Fuel Pump Replacement

NOTE: Electrical connectors can be moved aside to facilitate the removal process.

Removal

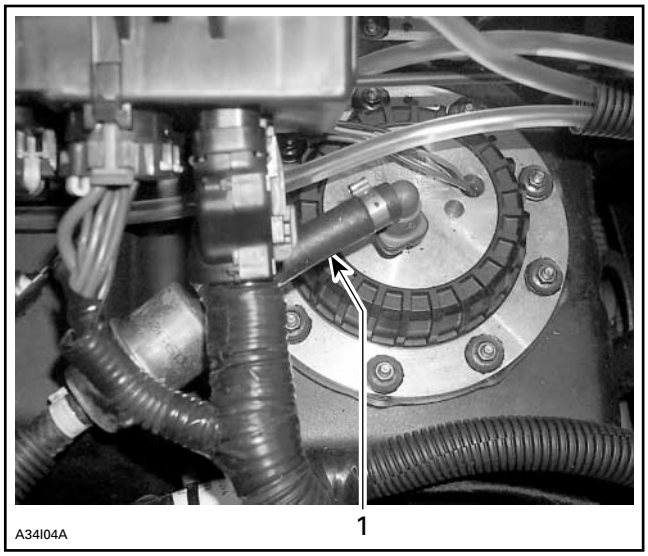
Open hood. Connect VCK (P/N 529 035 981). Use B.U.D.S. to release pressure.

Disconnect the fuel connector.



1. Fuel pump connector

Disconnect fuel supply hose from fuel pump module. Disconnect vent tube.



1. Fuel supply hose

With two screwdrivers or a bent rod holding the flange, unscrew fuel pump nut using fuel pump wrench (P/N 529 035 899).

Pull fuel pump module out of fuel tank to expose sensor body. Unclip retainer from sensor body, then remove float ass'y from sensor body.

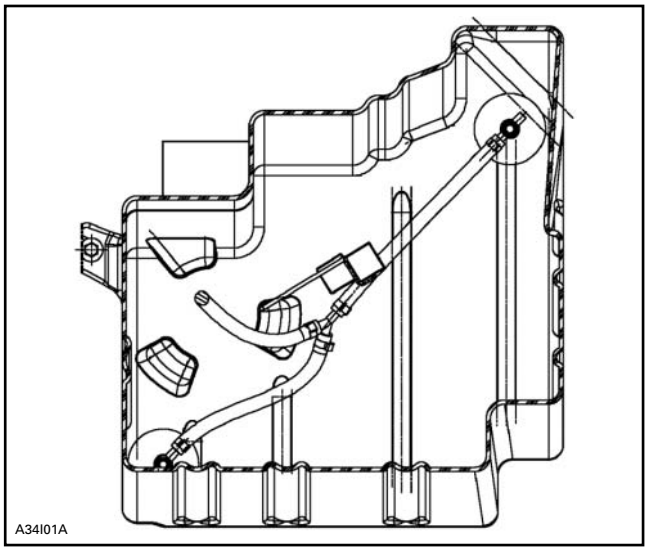
Remove fuel pump module. Guide fuel pickups when pulling out fuel pickup hoses.

Installation

For installation, reverse the removal process but pay attention to the following.

Install a new gasket.

Make sure that rear pickup hose is positioned as following illustration.



Align the arrow on fuel pump module with the one on fuel tank. Keep arrows aligned during fuel pump module nut tightening.

Install a torque wrench perpendicularly (90°) to fuel pump nut wrench (P/N 529 035 899). Torque fuel pump nut to 27 - 30 N•m (20 - 22 lbf•ft).

Bleed the fuel system as following procedure.

Fuel Bleeding Procedure

The rear fuel pickup hose has to be bled.

Pour 12 L (3.17 U.S. gal.) of recommended fuel in the fuel tank.

Apply parking brake. Start the engine. Let it run at idle speed.

Lift the front of vehicle at a 45° angle.

Put the vehicle back on the ground.

Repeat the operation twice.

Stop the engine. The rear fuel pickup hose is now bled.

Resistor Card Ass'y Kit (P/N 861 301 800)

Remove fuel pump module as explained above.

Unclip retainer from sensor body, then remove float ass'y from sensor body.

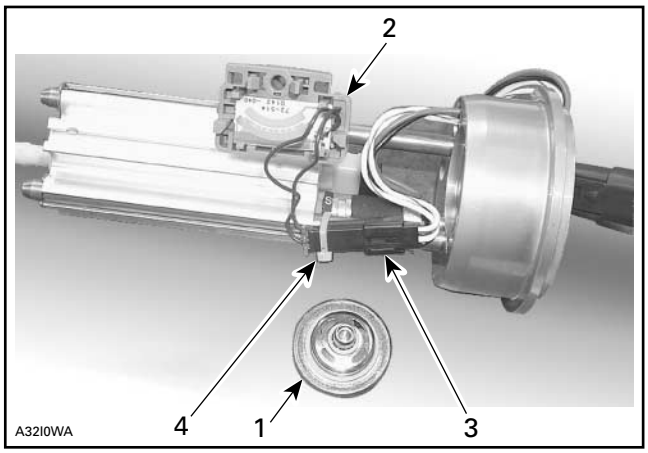
Loosen screw retaining lock plate. Slide lock plate out of aluminum extrusion.

Cut locking tie retaining electric connectors of resistor card ass'y. Unplug the connectors.

Remove regulator from pump module flange to make room for resistor card ass'y removal.

Slide old resistor card ass'y out of aluminum extrusion.

Reverse removal procedure for installation.



TYPICAL
1. *Fuel regulator removed*
2. *Resistor card ass'y ready to be installed*
3. *Connectors to be unplugged*
4. *Locking tie to be cut*

Install a new gasket, then reinstall fuel pump module as explained above.

Float Ass'y Kit (P/N 861 301 900)

Remove fuel pump module as explained above.

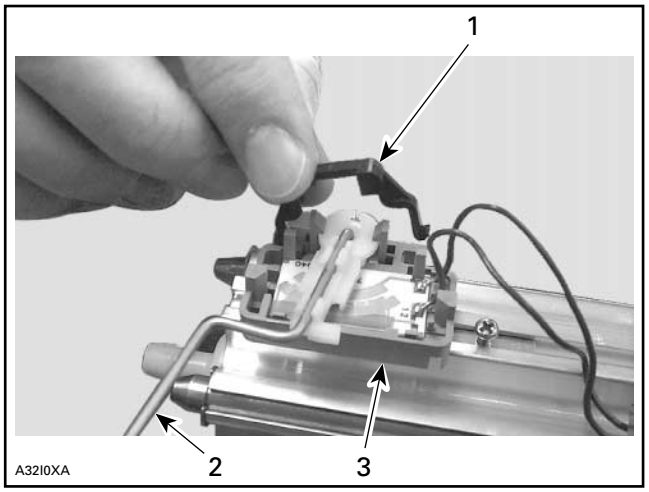
Unclip retainer from sensor body, then remove old float ass'y from sensor body.

Install new float ass'y on sensor body, then install new retainer.

Install a new gasket, then reinstall fuel pump module as explained above.

Unclip retainer from sensor body, then remove old float ass'y from sensor body.

Install new float ass'y on sensor body, then install new retainer.



1. Retainer
2. Float ass'y
3. Sensor body

Install a new gasket, then reinstall fuel pump module as explained above.

Pump Ass'y Kit (P/N 861 302 000)

Remove fuel pump module as explained above.

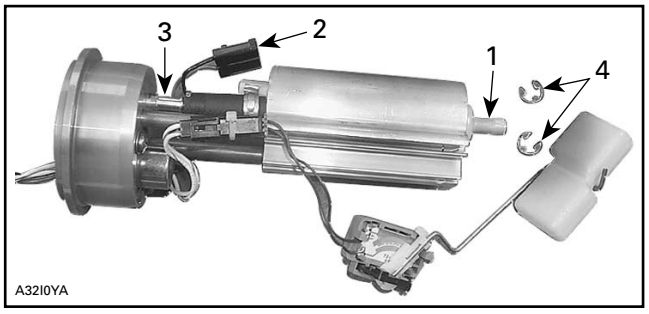
Disconnect fuel hose from pump inlet nipple.

Unlock and remove lock plate of resistor card ass'y.

Disconnect pump electric connector.

Disconnect pump outlet hose from pump module flange nipple.

Remove circlips. Slide pump ass'y out of retaining rods. Make sure that resistor card ass'y slides along the aluminum extrusion.



1. Pump inlet nipple
2. Pump electric connector
3. Pump module flange nipple
4. Circlips

Reverse removal procedure for installation.

Install a new gasket, then reinstall fuel pump module as explained above.

Regulator Kit (P/N 861 302 100)

Remove fuel pump module as explained above.

Remove 2 screws retaining regulator to pump module flange.

Remove regulator from pump module flange.

Replace O-rings with new ones. Install them in pump module flange bore.

CAUTION: Regulator O-rings must be installed in pump module flange bore.

Reverse removal procedure for installation.

Install a new gasket, then reinstall fuel pump module as explained above.

FUEL RAIL

Pressure at fuel rail is supplied and controlled by the fuel pump module. Refer to FUEL PUMP for pressure test.

Fuel Rail Replacement

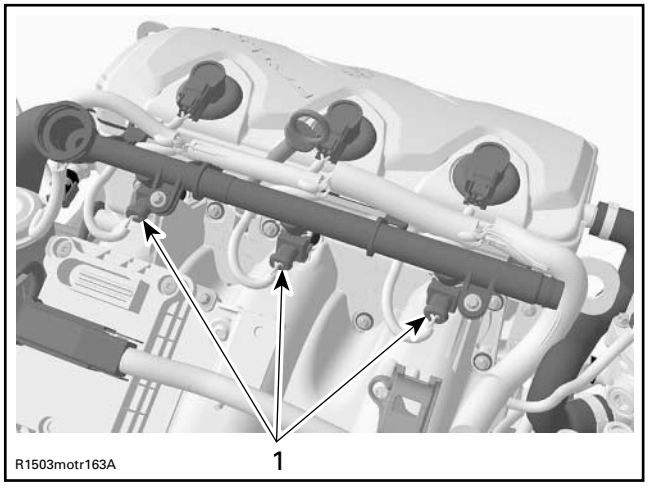
Removal

Remove fuel rail cover from the engine.

Release the fuel pressure in the system using B.U.D.S. Look in the Activation tab.

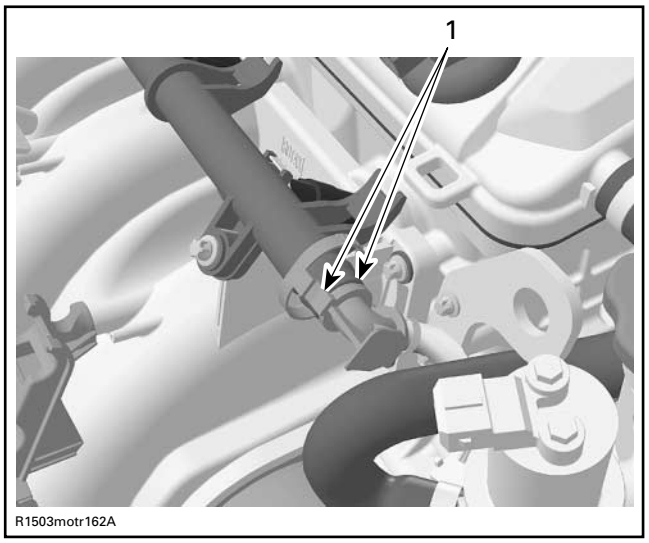
Insert pointed tools each side of fuel hose connector.

Disconnect wiring harness from the three fuel injectors.



1. Fuel injector connectors

Disconnect fuel hose.



1. Insert pointed tools each side

Wrap a rag around the hose end to prevent rail draining.

Cut tie raps and remove the wiring harness from the fuel rail.

Unscrew rail retaining screws.

Gently pull rail up by hand, working each side slightly at a time.

Pull rail out with fuel injectors.

If necessary remove fuel injectors as described below.

Installation

For installation, reverse the removal process but pay attention to the following.

A thin film of injection oil should be applied to O-rings of fuel injectors to ease installation in intake manifold.

Apply Loctite 243 on rail retaining screws then torque to 10 N•m (89 lbf•**in**).

When installing fuel line connector to the fuel rail, put some oil on the O-ring to ease installation.

⚠ WARNING

Perform a fuel pressure test and ensure that there is no leak. Refer to FUEL PUMP above. Run engine and check for leaks.

FUEL INJECTOR

Leakage Test

To perform a leakage test, the injectors and fuel rail have to be removed from the engine. Refer to REMOVAL in FUEL RAIL REPLACEMENT for the procedure.

NOTE: Do not detach injectors from the fuel rail.

Reconnect the fuel line and the wiring harness.

Place each injector in a clean bowl.

Install the tether cord cap on the DESS post to activate the fuel pump.

Check for fuel leakage from the injector nozzle. There should be less than 1 drop per minute. Perform the test for 2 minutes.

If not within specification, replace the fuel injector(s).

Properly reinstall removed parts.

The leakage test is validated when performing the FUEL DELIVERY SYSTEM DIAGNOSTIC FLOW CHART elsewhere in this section.

Electrical Test

Voltage Test

Tether cord cap must be on DESS post.

Using the vehicle communication kit (VCK) with the B.U.D.S. software, energize the fuel injector from the Activation section.

If the injector does not work, disconnect the connector from the injector.

Install a temporary connector on the injector with wires long enough to make the connection outside the vehicle and apply voltage (12 V) to this test harness.

This will validate the injector mechanical and electrical operation.

If it does not work, replace it. If it works, continue procedure.

Using B.U.D.S., activate injector while probing terminal 2 (of injector on harness side) and battery ground.

– If 12 V is read, check continuity of circuit as per following table. If it is good, try a new ECM ECU.

CIRCUIT NUMBER (ECM ECU connector "A")	INJECTOR NUMBER
A-15	1
A-33	2
A-14	3

– If it does not read 12 V, check continuity of circuit as per following table. If it is good, try a new VCM.

CIRCUIT NUMBER (AMP connector #2)	INJECTOR NUMBER
2-16	1
2-17	2
2-18	3

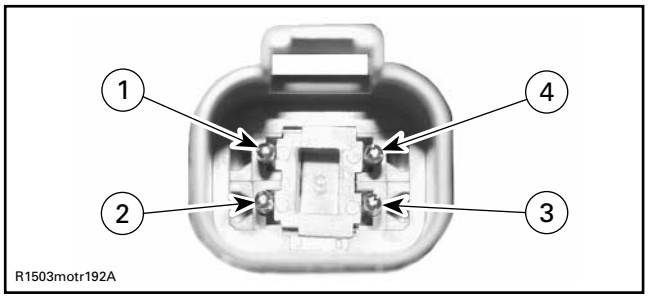
Resistance Test

Reconnect the injector and disconnect the ECM ECU connector A.

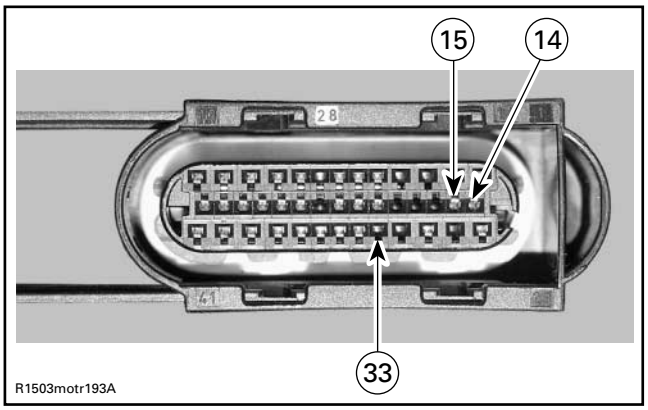
Remove tether cord cap and wait 15 seconds. Disconnect engine connector.

CAUTION: Before unplugging engine connector, always remove tether cord cap and wait 15 seconds. Otherwise, damage to CAPS may occur.

Using a multimeter, check resistance value between terminals as follows.



ENGINE CONNECTOR



ECM ECU CONNECTOR

COMPONENT	TERMINAL LOCATION
Fuel injector cylinder 1	1 (engine connector) and A-15 (ECM ECU connector)
Fuel injector cylinder 2	2 (engine connector) and A-33 (ECM ECU connector)
Fuel injector cylinder 3	3 (engine connector) and A-14 (ECM ECU connector)

The resistance should be between 11.4 and 12.6 Ω.

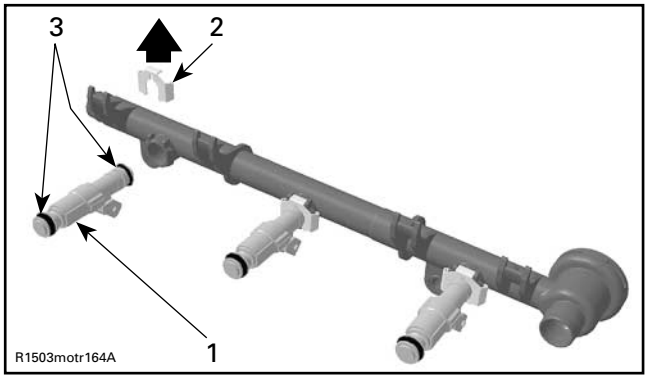
If resistance value is correct, try a new ECM ECU. Refer to ECM ECU REPLACEMENT procedures elsewhere in this section.

If resistance value is incorrect, repair the wiring harness/connectors or replace the wiring harness between ECM ECU connector and fuel injector.

Fuel Injector Replacement

Removal

Before removing the injectors, the fuel rail has to be removed from the engine. Refer to REMOVAL in FUEL RAIL REPLACEMENT for the procedure.



FUEL RAIL ASS'Y
1. *Fuel injector*
2. *Injector clip*
3. *O-ring*

Then remove the injector clip. Now the fuel injector can be easily pulled out of the fuel rail.

Installation

For the installation, reverse the removal procedure. Paying attention to the following details.

If you reinstall a used injector, carefully inspect O-ring condition before reinstalling fuel injector. Replace O-ring with a new one if damaged. Insert the fuel injector in place with your hand.

NOTE: A thin film of engine oil should be applied to O-rings to ease insertion in rail.

Apply Loctite 243 on rail retaining screws then torque to 10 N•m (89 lbf•**in**).

⚠ WARNING

Perform a fuel pressure test and ensure that there is no leak. Refer to FUEL PUMP above. Run engine and check for leaks.

ELECTRONIC MANAGEMENT

ECM ECU AND VCM REPLACEMENT

General

Prior to replacing a suspected ECM ECU or VCM, ensure that all the recommendations in the general introduction of this section have been followed.

IMPORTANT: When the ECM ECU is replaced, the Closed Throttle and Idle Actuator must be reprogrammed/reset. Refer to its specific section for adjustment.

To allow transferring the previous recorded information from the old ECM ECU or VCM to the new one, use the vehicle communication kit (VCK) with the B.U.D.S. software. Use Replace ECM or VCM in the Module menu. Follows instructions in its help system.

NOTE: If the old ECM ECU or VCM is working, it must be read inside B.U.D.S. prior to removing it from the vehicle to carry vehicle information and history to the new ECM ECU or VCM . Otherwise, perform the operations described in If the previous VCM was not read with B.U.D.S. below.

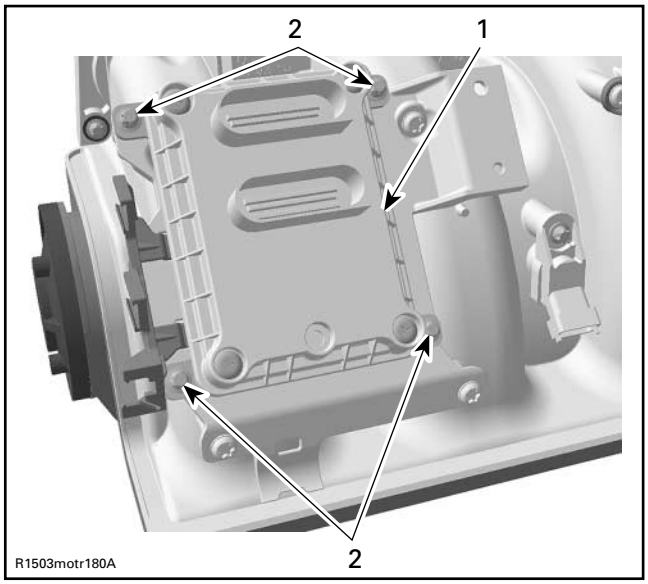
ECM ECU Replacement

Disconnect battery cables.

⚠ WARNING

Battery BLACK negative cable must always be disconnected first and connected last.

Disconnect both ECM ECU connectors from ECM ECU.



TYPICAL
1. *ECM ECU*
2. *Retaining screws*

Unscrew all retaining screws and remove the engine ECM ECU from intake manifold.

Install the new ECM ECU to the engine.

Reconnect ECM ECU connectors to ECM ECU then battery cables.

IF THE PREVIOUS ECM ECU WAS READ WITH B.U.D.S.

Transfer the data from the previous ECM ECU to the new one using B.U.D.S. then proceed with the required resets.

Continue procedure as per FINALIZING ECM ECU REPLACEMENT below.

IF THE PREVIOUS ECM ECU WAS NOT READ WITH B.U.D.S.

– Enter the old ECM ECU (named ECM in B.U.D.S.) serial number in the Part Replacement under History tab. Click on Add part in History .
– Reprogram tether cord cap(s).

NOTE: The ECM ECU serial number can be found on the ECM ECU sticker that also shows the P/N.

Continue procedure as per FINALIZING ECM ECU REPLACEMENT below.

FINALIZING ECM ECU REPLACEMENT

After performing the required resets, ensure to clear all faults from the newly replaced ECM ECU.

Start the engine and increase engine speed above 5000 RPM (after a warm up period) to be sure no fault appears.

VCM Replacement

Disconnect battery cables.

⚠ WARNING

Battery BLACK negative cable must always be disconnected first and connected last.

Disconnect AMP connectors from VCM. Remove retaining nuts on top.

Pull VCM out.

Install the new VCM in vehicle. Reconnect AMP connectors to VCM.

IF THE PREVIOUS VCM WAS READ WITH B.U.D.S.

Transfer the data from the previous VCM to the new one using B.U.D.S.

Continue procedure as per finalizing VCM replacement below.

IF THE PREVIOUS VCM WAS NOT READ WITH B.U.D.S.

– Enter the vehicle and engine serial numbers in the Vehicle tab.
– Enter the old VCM and the actual ECM ECU (named ECM in B.U.D.S.) serial numbers in the Part Replacement under History tab. Click on Add part in History .
– Manually activate the options installed on vehicle under the Setting tab.

NOTE: The VCM serial number can be found on the VCM sticker that also shows the P/N.

NOTE: If an option is installed but not checked in B.U.D.S., the information center will not display that option. If an option is checked in B.U.D.S. but not installed in vehicle, a fault code will be generated.

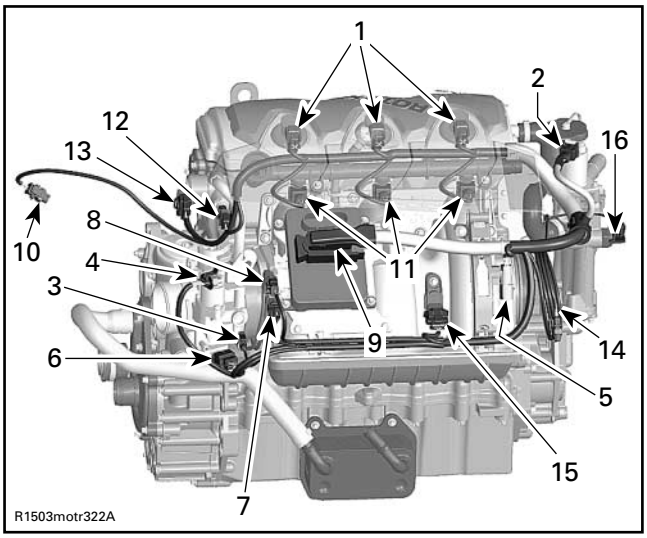
Continue procedure as per finalizing VCM replacement below.

Finalizing VCM Replacement

Ensure to clear all faults from the newly replaced VCM.

Start engine and ensure no fault is active.

ENGINE WIRING HARNESS



4-TEC ENGINES
1. *Ignition coils*
2. *BBV*
3. *OPS (hidden behind throttle body)*
4. *Idle bypass valve*
5. *Engine connector*
6. *Potentiometer*
7. *KS*
8. *Crank sensor*
9. *Connector housing*
10. *Temperature sensor*
11. *Injectors*
12. *WTS*
13. *CAPS*
14. *WTS*
15. *MAPS*
16. *OTPS*

Resistance Test

Check continuity of the circuits according to the wiring diagram in the WIRING DIAGRAMS section of this manual.

If wiring harness is good, check the respective sensor/actuator as described in this section.

Otherwise, repair the connectors, replace the wiring harness or the ECM ECU/VCM as diagnosed.

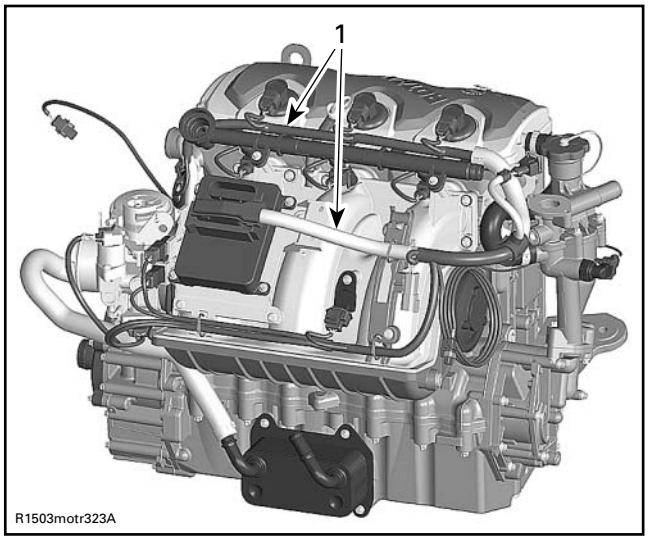
Removal

Remove fuel rail cover.

Disconnect the wiring harness from all sensors/actuators.

Disconnect the ECM ECU connector from the ECM ECU.

Cut all tie raps which are holding the wiring harness in position.

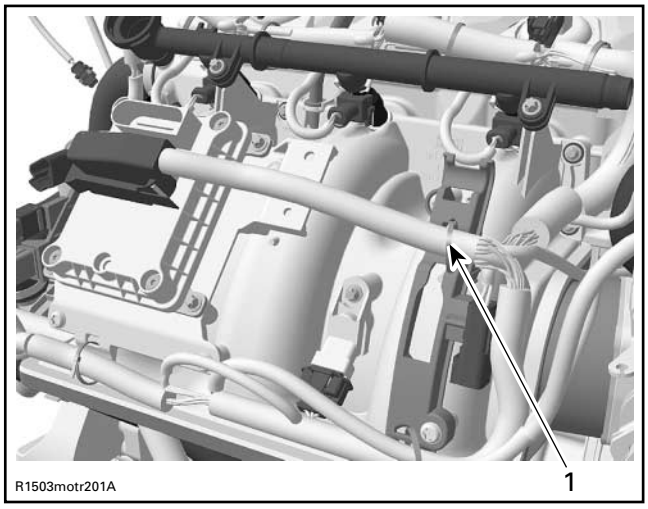


1. Wiring harness

Remove complete wiring harness.

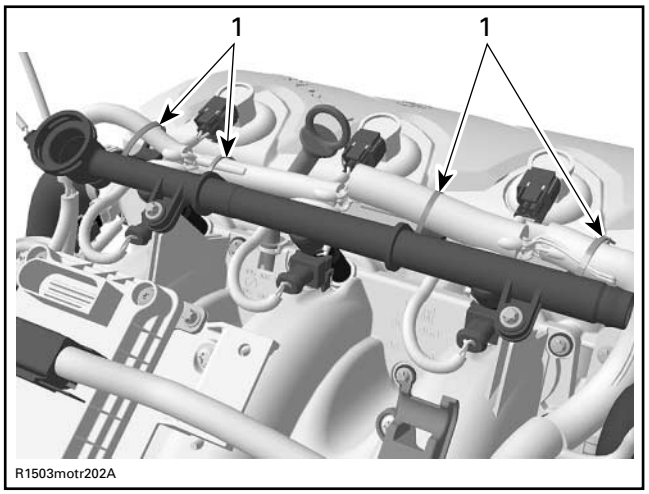
Installation

First connect the ECM ECU connector A to the ECM ECU and fix the harness on the wiring support with a locking tie.



1. Locking tie

Lead the cable bundle with the injector and ignition coil connectors to the fuel rail and fix it also by using 4 locking ties.



1. Locking tie

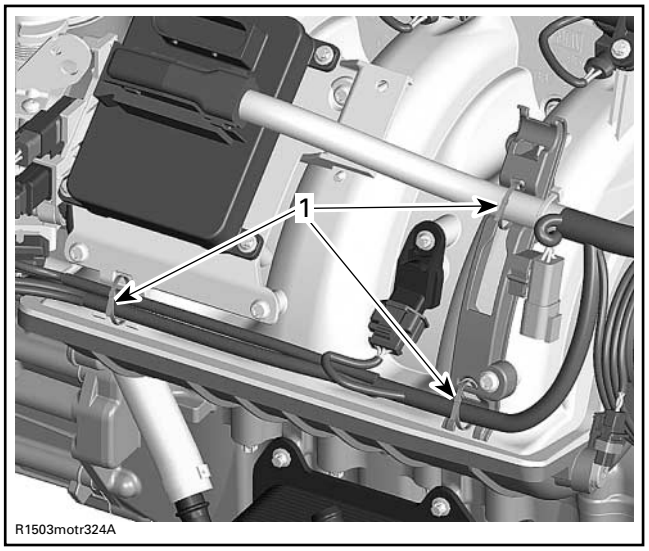
Connect the fuel injectors, ignition coils, CAPS and CTS to the wiring harness.

⚠ WARNING

Pay attention not to mix injectors or ignition coils wires between cylinders. The location of the splice connectors indicate which cylinder wires belong to.

Install the engine connector on the appropriate bracket on the wiring support.

Then fix the other bundle on the appropriate supports on the wiring support and the ECM ECU bracket with locking ties.



TYPICAL
1. Locking tie

Connect the CPS, KS, OPS, and the MAPS to the wiring harness.

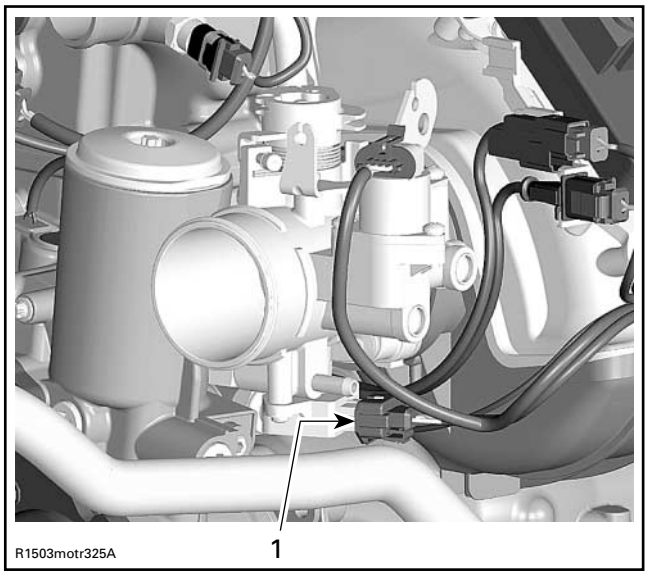
Also connect now the TPS, OSPS, idle bypass and TOPS resistance to the wiring harness.

Install all remaining parts, which has been removed.

THROTTLE POSITION SENSOR (TPS)

General

The throttle position sensor (TPS) is a potentiometer that sends a signal to the ECM ECU which is proportional to the throttle shaft angle.



1. Throttle position sensor (TPS)

IMPORTANT: Prior to testing the TPS, ensure that mechanical components/adjustments are adequate according to THROTTLE BODY in AIR INDUCTION SYSTEM above.

The ECM may generate several fault codes pertaining to the TPS. Refer to SYSTEM FAULT CODES in DIAGNOSTIC PROCEDURES section for more information.

Wear Test

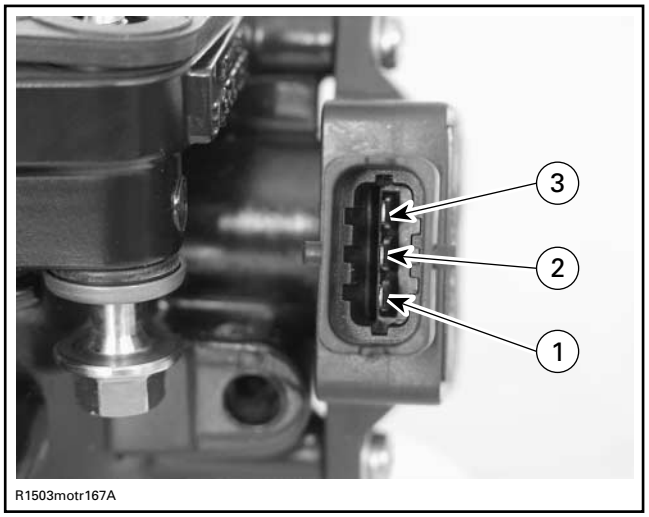
While engine is not running, activate throttle and pay attention for smooth operation without physical stops of the cable.

Using the vehicle communication kit (VCK) with the B.U.D.S. software, use the Throttle Opening display under Monitoring .

Slowly and regularly depress the throttle. Observe the needle movement. It must change gradually and regularly as you move the throttle. If the needle "sticks", bounces, suddenly drops or if any discrepancy between the throttle movement and the needle movement is noticed, it indicates a worn TPS that needs to be replaced.

Voltage Test

Check the ECM ECU voltage output from to the throttle position sensor.



R1503motr167A

Disconnect connector from throttle position sensor. To unlock connector, insert a small screwdriver between the folded tab.

To see the connector pin-out, temporarily remove the connector shield joining the harness, to expose the terminal numbers. Connect a voltmeter to the terminals of the wiring harness as per the following table.

Remove and reinstall the tether cord cap to activate the ECM ECU.

Check the voltage readings as follows.

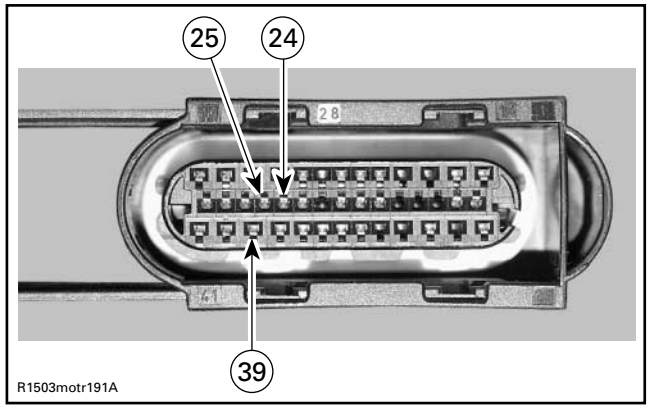
CONNECTION	VOLTAGE
Terminal 1 with engine ground	0 V
Terminal 2 with engine ground	5 V
Terminal 3 with engine ground	4.5 - 5 V

If voltage test is not good, check the resistance of the TPS circuit.

Resistance Test

Reconnect the TPS.

Disconnect the ECM ECU connector A on the ECM ECU.



R1503motr191A

Using a multimeter, check resistance value between terminal A-25 and A-39.

The resistance should be 1600 - 2400 Ω .

Check the resistance between terminal A-24 and terminal A-39 with the throttle plate in idle position.

The resistance should be approximately 2500 Ω.

Check the resistance between terminal A-24 and terminal A-39 with the throttle plate in wide open position.

The resistance should be 1000 - 1100 Ω.

Check the resistance between terminal A-24 and A-25 with throttle plate in idle position.

The resistance should be 1000 - 1100 Ω.

Now check the resistance with the throttle plate in wide open position.

The resistance should be 2600 - 2700 Ω.

NOTE: When measuring between terminals A-24 and A-39, resistance value decreases while depressing throttle lever. when measuring between terminals A-24 and A-25, resistance value increases while depressing throttle lever. The resistance value should change smoothly and proportionally to throttle movement. Otherwise, replace TPS.

If resistance values are correct, try a new ECM ECU. Refer to ECM ECU REPLACEMENT procedures elsewhere in this section.

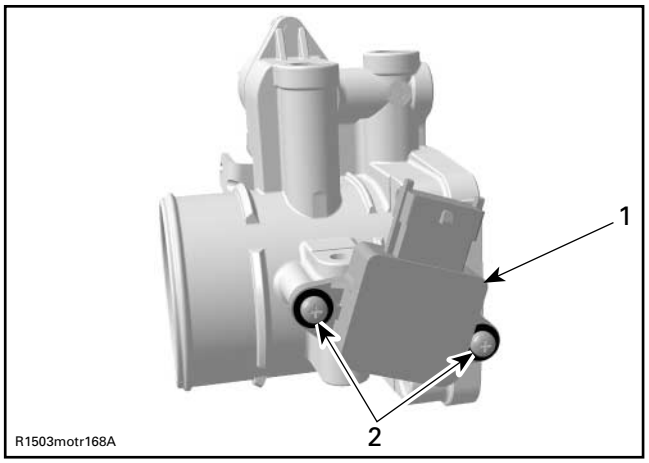
If resistance values are incorrect, repair connector or replace the wiring harness between ECM ECU connector and the TPS. If wiring harness and connector test good, replace TPS.

Replacement

Remove the throttle body as described above.

Loosen two screws retaining the TPS.

Remove TPS.



THROTTLE BODY
1. *Throttle position sensor (TPS)*
2. *Screws*

Apply Loctite 243 on screw threads, install the new TPS.

Reinstall remaining removed parts.

Proceed with the Closed Throttle and Idle Actuator Reset. See below.

Closed Throttle and Idle Actuator Reset

NOTE: This operation performs a reset of the values in the ECM ECU.

This reset is very important. The setting of the TPS will determine the basic parameters for all fuel mapping and several ECM ECU calculations and the setting of the idle bypass valve will determine the basic parameters for the idle speed control of the engine.

NOTE: Reset must be done each time the throttle position sensor (TPS) or the idle bypass valve is loosened or removed or throttle body is replaced or ECM ECU is replaced.

CAUTION: An improperly set TPS or idle bypass valve may lead to poor engine performance and emission compliance could possibly be affected. In addition, improper idle bypass valve reset may lead to poor engine starting, improper idle (too low or way too high) and engine stop on deceleration.

Use the vehicle communication kit (VCK) with the B.U.D.S. software to perform this adjustment.

Ensure the throttle body plate stop lever rest against its stopper. Open throttle approximately one quarter then quickly release. Repeat 2 - 3 times to settle throttle plate. If stopper does not rest against its stop lever, perform throttle cable adjustment. Refer to THROTTLE BODY in AIR INDUCTION SYSTEM above.

To properly reset valve, first install tether cord cap then remove it and then wait 5 seconds. Repeat this cycle 2-3 times.

Push the Reset button in the Setting section of B.U.D.S.

NOTE: No message will be displayed if operation is good. If operation is wrong, an error message will be displayed.

NOTE: There is no idle speed adjustment to perform. The ECM ECU takes care of that. If TPS is not within the allowed range while resetting the Closed Throttle and Idle Actuator , the ECM ECU will generate a fault code and will not accept the setting.

Start engine and make sure it operates normally through its full engine RPM range. If fault codes appear, refer to SYSTEM FAULT CODES in DIAGNOSTIC PROCEDURES section for more information.

IDLE BYPASS VALVE

An idle bypass valve with good resistance measurement can still be faulty. It is also possible that a mechanical failure occurs which is not detectable without measuring the air flow. Replacing the idle bypass valve may be necessary as a test.

Resistance Test

Disconnect idle bypass valve from the wiring harness.

Using a multimeter, check the resistance in both windings.

Check the resistance between terminals A and D and also between terminals C and B of the idle bypass valve.

The resistance in each winding should be approximately 50 Ω at 23°C (73°F).

If the resistance of one or both windings is not good, replace the idle bypass valve.

If resistance test of valve windings is good, check continuity of circuits A-35, A-36, A-37, A-38.

Visual Inspection

Remove idle bypass valve from throttle body.

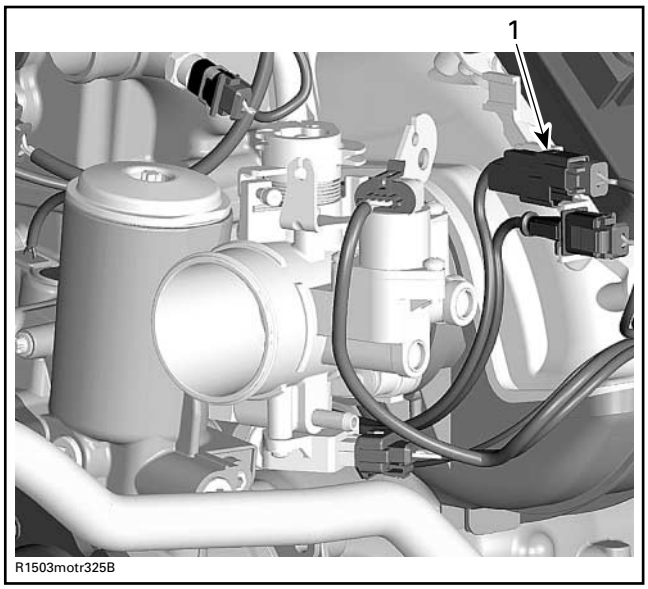
Check the piston and bypass channel for dirt/deposits which can cause a sticking piston.

CAUTION: Do not try to operate the piston of the idle bypass valve when it is dismounted. Also do not move the piston by hand. The screw drive is very sensitive and will be destroyed.

Clean the parts and install the idle bypass valve on the throttle body.

Proceed with the Closed Throttle and Idle Actuator Reset. See above.

CRANKSHAFT POSITION SENSOR (CPS)



1. CPS connector

Ensure that information center works. Needles will sweep, LED and LCD segments will turn on when the tether cord cap is installed. Check for RPM display at the information center while cranking in engine drowned mode. Press and HOLD throttle lever then press start/stop button. 800-1000 RPM should display. Otherwise perform the following tests.

NOTE: Take into account that a CPS fault can be triggered by bent or missing encoder wheel teeth. First check fault codes then check the teeth condition if necessary. See below.

Disconnect CPS wiring harness connector. Probe terminals coming from CPS while cranking engine. Voltage should be within 1-2 Vac. Otherwise, inspect wiring and replace CPS if wiring is good.

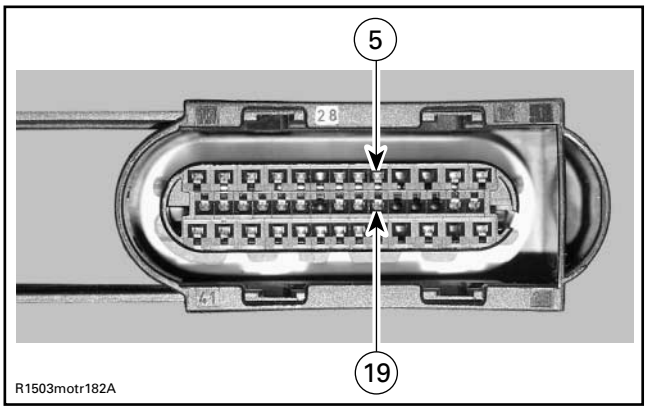
Resistance Test

Disconnect the CPS connector from the wiring harness and check the resistance of the sensor itself.

The resistance should be between 190 Ω and 290 Ω.

Otherwise, replace the CPS.

If resistance tests good, reconnect the CPS and disconnect the ECM ECU connector A on the ECM ECU.



Using a multimeter, recheck resistance value between terminals 5 and 19.

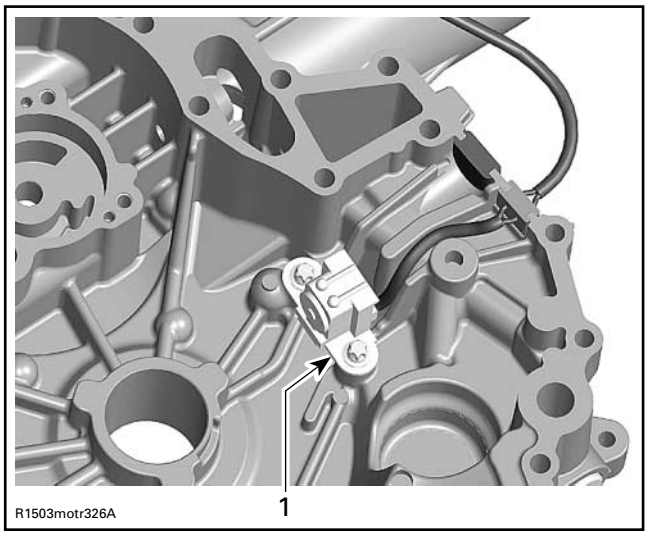
If resistance value is correct, try a new ECM ECU. Refer to ECM ECU REPLACEMENT procedures elsewhere in this section.

If resistance value is incorrect, repair the connectors or replace the wiring harness between ECM ECU connector and the CPS.

Replacement

Disconnect connectors and remove the PTO cover. Refer to PTO HOUSING/MAGNETO in ENGINE section.

Remove CPS.



1. CPS inside PTO cover

Apply Loctite 243 on screw threads then install the new CPS. Torque to 10 N•m (89 lbf•**in**).

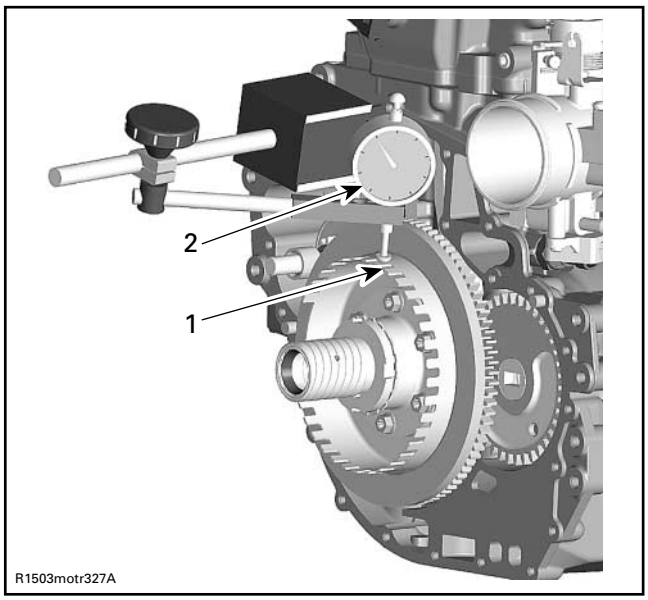
Reinstall remaining removed parts.

Encoder Wheel Inspection

To check the encoder wheel for bent teeth, proceed as follows.

Remove PTO cover. Refer to PTO HOUSING in ENGINE section.

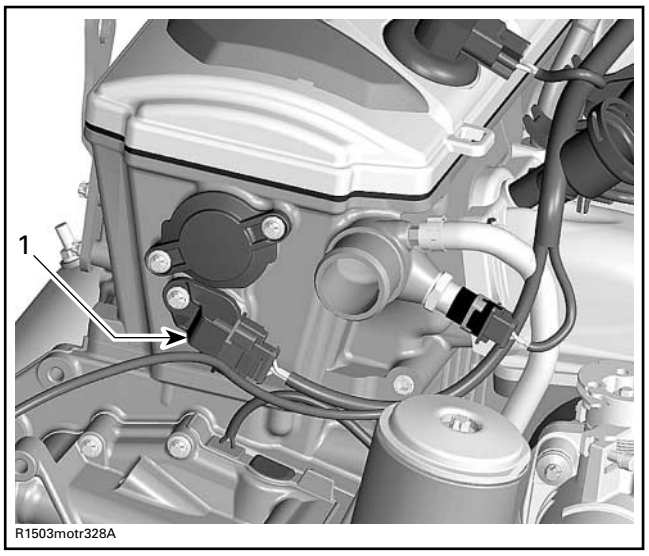
Install a dial indicator on crankcase casting. Position the gauge on a tooth and set it to zero (0). Rotate flywheel and check needle movement. The maximum allowed difference between teeth is 0.15 mm (.006 in). Otherwise, straighten the tooth or replace the encoder wheel.



1. Encoder wheel
2. Dial indicator

Properly reinstall cover.

CAMSHAFT POSITION SENSOR (CAPS)



1. CAPS

Voltage Test (harness)

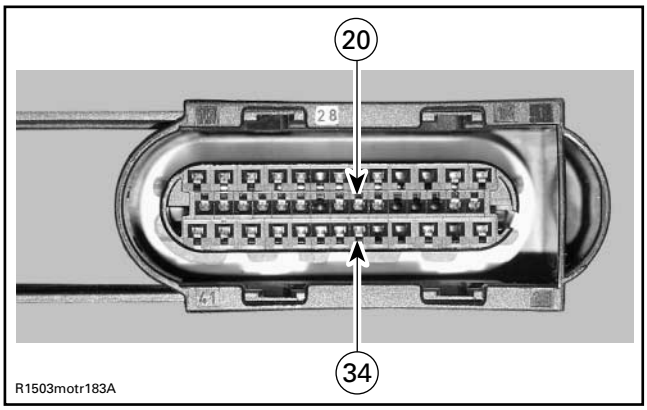
Disconnect the connector from the wiring harness.

To see the connector pin-out, temporarily remove the connector shield joining the harness, to expose the terminal numbers.

Remove and reinstall tether cord cap to activate the system.

Probe terminal 3 of CAPS connector (wiring harness side) and battery ground.

– If 12 V is read, check continuity of circuits A-20 and A-34. If they test good, perform the CAPS voltage test as explained below. If CAPS tests good, try a new ECM ECU.

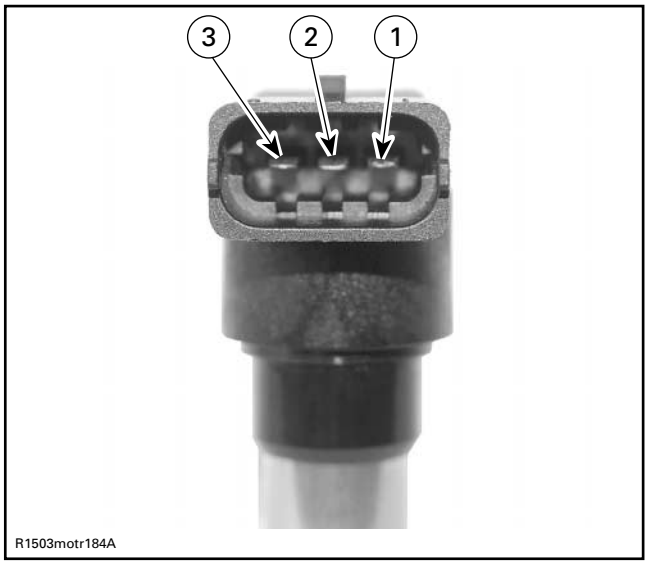


ECM ECU CONNECTOR

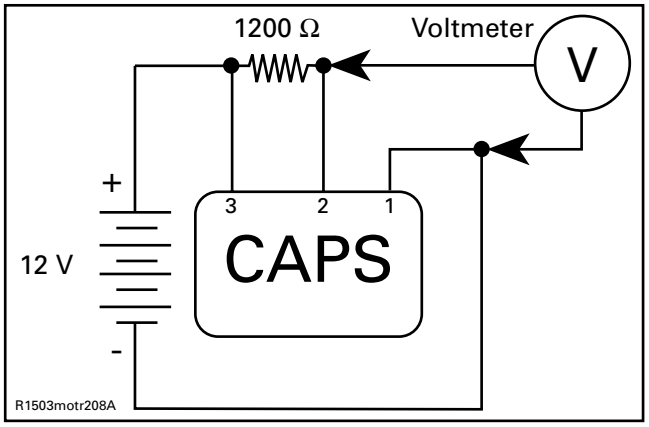
– If 12 V is not read, check continuity of circuit 2-19 from VCM to the CAPS. If it tests good, try a new VCM. Otherwise, repair wiring harness.

Remove the CAPS from the cylinder head.

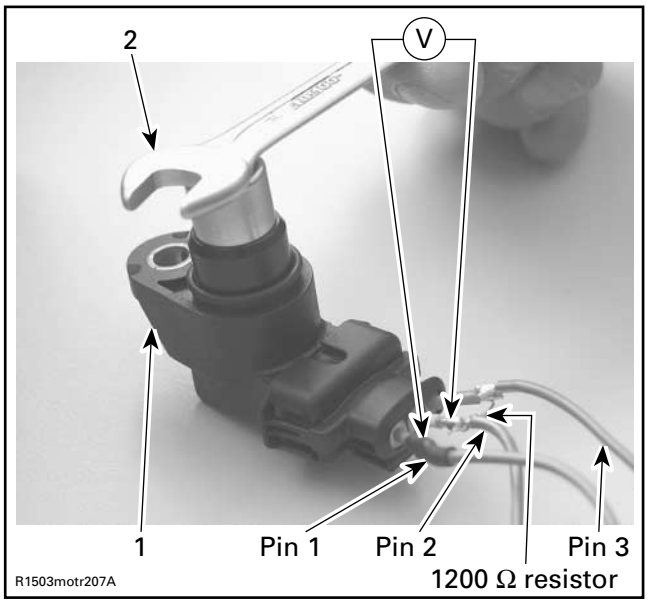
Set up the following electric circuit to perform the voltage test.



CAPS PIN-OUT



Touch the CAPS with a conductor (ex.: screwdriver) and look if the voltage at the multimeter switches from 12 V to less than 1 V.



1. CAPS
2. Conductor

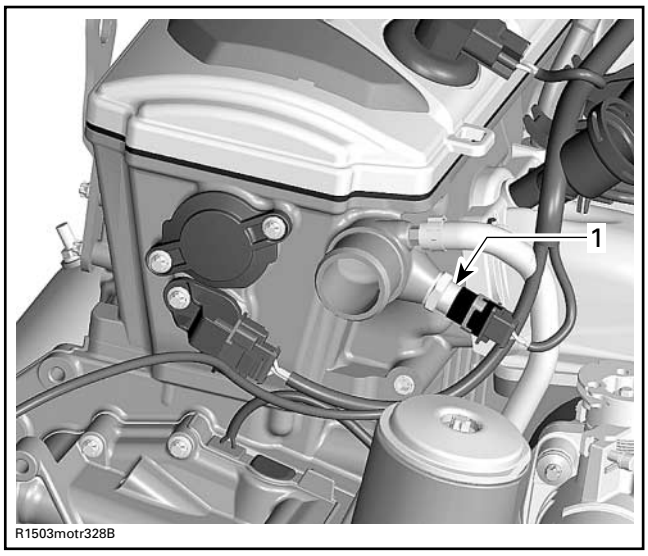
If the voltage is not good, replace the CAPS.

Replacement

Unscrew the retaining screw and replace the CAPS. Ensure to reinstall O-ring.

Apply Loctite 243 (blue) on thread and torque to 6 N•m (53 lbf•**in**).

COOLANT TEMPERATURE SENSOR (CTS)



1. Coolant temperature sensor (CTS)

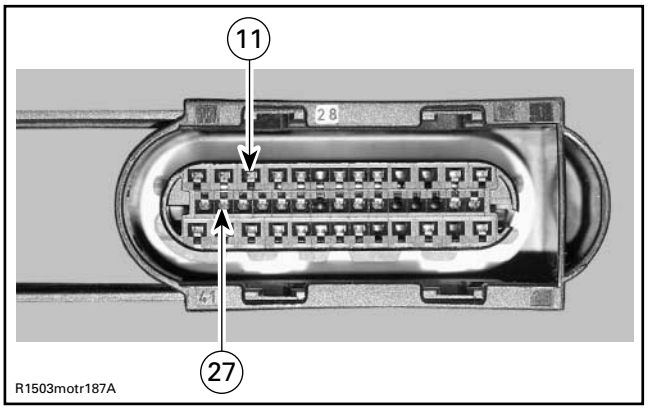
Resistance Test

Disconnect the connector from the CTS and check the resistance of the sensor itself.

The resistance should be between 2280 Ω and 2740 Ω at 20°C (68°F).

Otherwise, replace the CTS.

If resistance tests good, reconnect the CTS and disconnect the ECM ECU connector A on the ECM ECU.



Using a multimeter, recheck resistance value between terminals 11 and 27.

If resistance value is correct, try a new ECM ECU. Refer to ECM ECU REPLACEMENT procedures elsewhere in this section.

If resistance value is incorrect, repair the connectors or replace the wiring harness between ECM ECU connector and the CTS.

Replacement

Unlock expansion tank and temporarily move away to gain access.

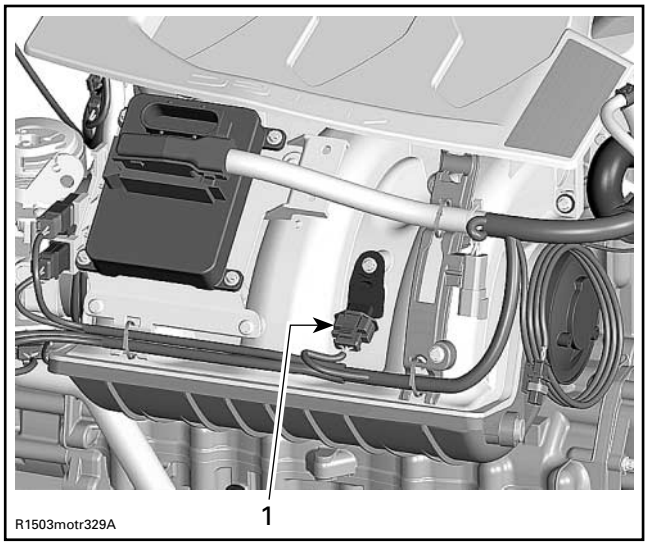
Remove the fuel rail cover.

Disconnect CTS connector and remove CTS.

Install the new CTS and torque to 18 N•m (159 lbf•**in**).

Reinstall remaining removed parts.

MANIFOLD AIR PRESSURE SENSOR (MAPS)



1. Manifold air pressure sensor (MAPS)

NOTE: This sensor is a dual function device. When engine is started and it runs at idle speed, the sensor takes the atmospheric pressure and stores it in the ECM ECU. Thereafter, it takes the manifold air pressure at operating RPMs.

Ensure sensor is correctly installed on intake manifold. Otherwise, the MAPS could generate a fault code for an unexpected sensor range at idle when it reads the atmospheric pressure. Remove sensor and check for oil or dirt on its end and if problem persists, check throttle plate condition/position and the wiring harness. Perform the following tests.

Voltage Test

Check the voltage output from ECM ECU to the manifold air pressure sensor (MAPS).

Disconnect connector from MAPS and connect a voltmeter to the terminals of the wiring harness as per the following table.

CONNECTION	VOLTAGE
Terminal 1 with engine ground	5 V
Terminal 2 with engine ground	0 V
Terminal 3 with engine ground	0 V

Remove and reinstall the tether cord cap to activate the ECM ECU.

If voltage test is good, replace the MAPS.

If voltage test is not good, check the continuity of the MAPS circuit.

Resistance Test

Disconnect the ECM ECU connector A on the ECM ECU.

Using a multimeter, check continuity of circuits 12, 28 and 40.

If wiring harness is good, try a new ECM ECU. Refer to ECM ECU REPLACEMENT procedures elsewhere in this section.

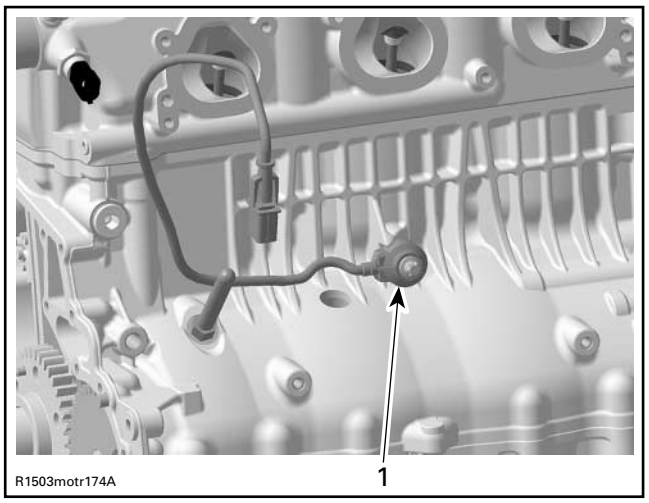
Otherwise, repair the connectors or replace the wiring harness between ECM ECU connector and the MAPS.

Replacement

Disconnect MAPS connector and remove the MAPS.

Install the new MAPS paying attention to index its tab into the adaptor notch. Apply Loctite 243 (blue) on screw then torque to 10 N•m (89 lbf•**in**).

KNOCK SENSOR (KS)



1. Knock sensor (KS)

Dynamic Test

Using the vehicle communication kit (VCK) with the B.U.D.S. software, monitor the knock sensor using the Faults section.

Start the engine and bring engine RPM above 5000 RPM. If no fault code occurs, the knock sensor is good.

Otherwise, do the following.

Ensure sensor and cylinder head contact surfaces are clean and mounting bolt and washer are correct and properly torqued down.

NOTE: It is necessary to remove intake manifold to inspect contact surfaces. Refer to INTAKE SYSTEM section.

Check the knock sensor resistance.

Disconnect the connector from knock sensor harness.

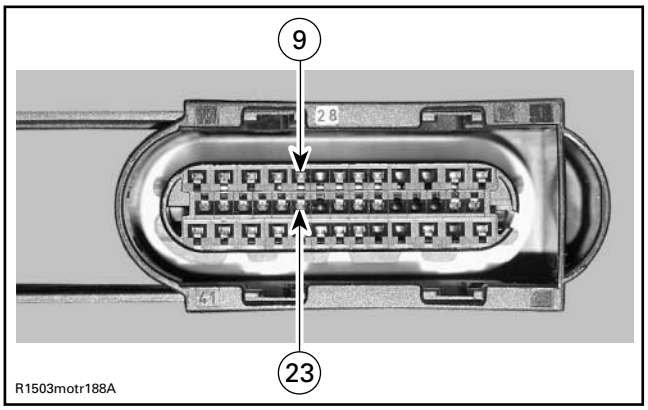
Static Resistance Test

Using a multimeter, check the resistance between both terminals on the knock sensor harness side.

The resistance should be approximately 5 MΩ.

If resistance is not good, replace knock sensor.

If resistance is good, reconnect the knock sensor connector and disconnect the EMS ECU connector A from the ECM ECU.



Using a multimeter, recheck resistance value between terminals 9 and 23.

If wiring harness is good, try a new ECM ECU. Refer to ECM ECU REPLACEMENT procedures elsewhere in this section.

Otherwise, repair the connector or replace the wiring harness between ECM ECU connector and knock sensor.

Replacement

Remove the intake manifold. Refer to INTAKE MANIFOLD REPLACEMENT in INTAKE section.

Unscrew and remove knock sensor.

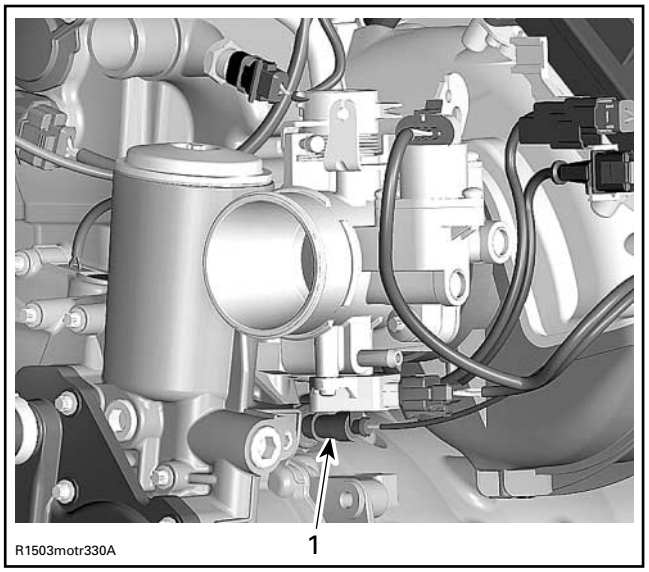
Clean contact surface, apply Loctite 243 in threaded hole then install the new knock sensor.

Torque screw to 24 N•m (18 lbf•ft).

CAUTION: Improper torque might prevent sensor to work properly and lead engine to severe damage of internal components.

Replug connector.

OIL PRESSURE SENSOR (OPS)



1. OPS

Oil Pressure Test

First, carefully check the condition of the connector terminals. Clean to remove dirt and corrosion that coud affect proper operation of the sensor.

IMPORTANT: Do not apply grease on terminal.

To check the function of the oil pressure sensor, an, oil pressure test has to be performed. Refer to OIL PRESSURE TEST in LUBRICATION SYSTEM section.

If the engine oil pressure is out of specifications, check the points described in troubleshooting section.

If the engine oil pressure is good, check the resistance of the OPS while engine is off and while engine is running.

Resistance Test

Disconnect the connector from the OPS and use a multimeter to check the resistance between OPS terminal and engine ground while engine is stopped (without oil pressure) and while engine is running (with oil pressure).

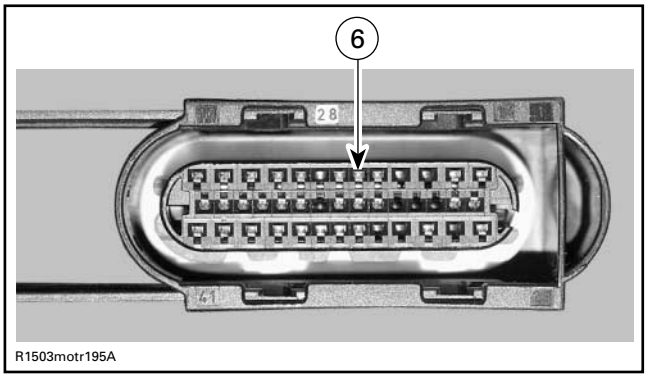
When engine is stopped the resistance is infinitely high (normally open switch).

When engine is running and the oil pressure reaches 180 - 220 kPa (26 - 32 PSI), the resistance of the OPS is close to 0 Ω.

If resistance values are incorrect, replace OPS.

If the values are correct, check the continuity of the wiring harness.

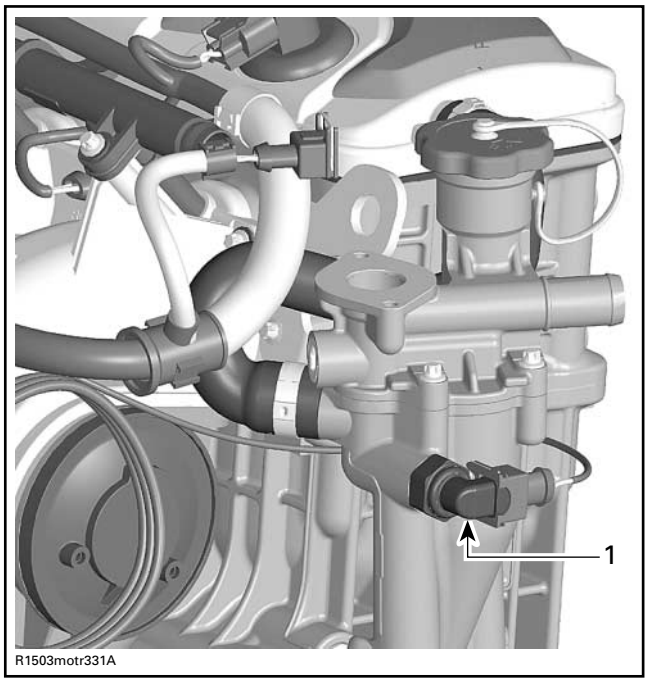
Disconnect the ECM ECU connector A from the ECM ECU and check continuity of circuit 6.



If wiring harness is good, try a new ECM ECU. Refer to ECM ECU REPLACEMENT procedures elsewhere in this section.

Otherwise, repair the connector or replace the wiring harness between ECM ECU connector and OPS.

OIL SEPARATOR PRESSURE SENSOR (OSPS)



1. OSPS

To check the function of the OSPS (oil separator pressure sensor), disconnect the TOPS resistance and perform pressure test as follows.

Remove oil dipstick from engine.

Using appropriate tubes, install the engine leak test pump (P/N 529 021 800) on dipstick tube. Ensure to have a tight fit.

Start engine. Spray soapy water on the tubes from the pump to the dipstick tube to ensure there is no leak. If so, correct the leak before measuring the pressure.

⚠ WARNING

Stop the engine and wait at least 30 seconds before removing the pump and tubes, so that pressure drops.

Otherwise, check the resistance of the OSPS while engine is off and while engine is running.

Resistance Test

Disconnect the connector from the OSPS and use a multimeter to check the resistance between OSPS terminal and engine ground while engine is stopped (without blow-by pressure) and while engine is running (with blow-by pressure).

The valve is turned on as soon as tether cord cap is installed on its post. The valve opening allows ventilation of crankcase.

The OSPS monitors the pressure to detect a malfunction of this valve. If pressure rises above a preset threshold, the valve is re-energized again and if it fails, a fault code is generated.

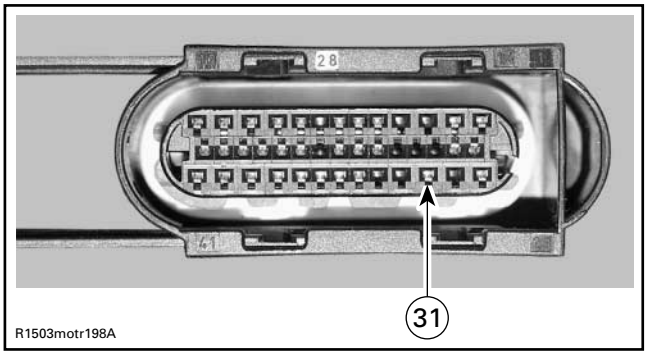
The TOPS switch (mercury type), located on battery rack the , monitors the vehicle position. If the vehicle rolls above a preset threshold (or tips over) the switch opens and the ECM ECU closes the valve to prevent oil in engine crankcase to flow towards intake manifold. Besides, the engine RPM will be gradually reduced then engine will be stopped.

When engine is stopped and the blow-by pressure is released, the resistance of the OSPS is close to 0 Ω (normally closed switch).

If resistance values are incorrect, replace OSPS.

If the values are correct, check the continuity of the wiring harness.

Disconnect the ECM ECU connector A from the ECM ECU and check continuity of circuit 31.



If wiring harness is good, try a new ECM ECU. Refer to ECM ECU REPLACEMENT procedures elsewhere in this section.

Otherwise, repair the connector or replace the wiring harness between ECM ECU connector and OSPS.

TOPS

Resistance Test

Disconnect the connector from the TOPS resistance and check the resistance of the solenoid itself.

The resistance should be between 1.27 Ω and 2.47 Ω.

Otherwise, replace the TOPS resistance.

TOPS Switch

Disconnect TOPS switch.

Using ohmmeter, measure resistance between terminals.

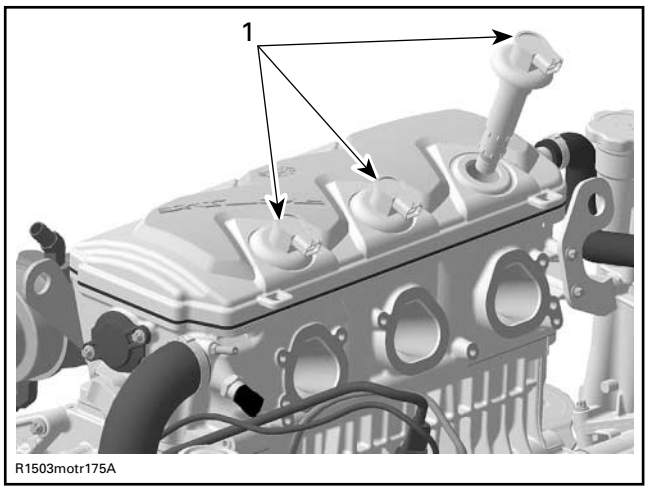
Position switch as it is located in vehicle. Resistance should be close to 0 Ω.

Rotate switch as it would do in vehicle. Switch should remain closed up to approximately 120° (from the vertical axis) in either direction. Otherwise, replace switch.

NOTE: Since this is a mercury switch, dispose it properly according to the environmental regulations in your area.

Farther than 120° and when switch is upside down, switch should be open and resistance will be infinite.

IGNITION COILS



TYPICAL
1. Ignition coil

NOTE: The VCM energizes the primary side of each ignition coil individually. It can detect open and short circuit in the primary winding but it does not check the secondary winding.

Using the vehicle communication kit (VCK) with the B.U.D.S. software, energize the ignition coil from the Activation section.

You should hear the spark occurring. In doubt, use an inductive spark tester or a sealed tester - available from after-market tool/equipment suppliers - to prevent spark occurring in the vehicle. Otherwise, perform the following checks.

An ignition coil with good resistance measurement can still be faulty. Voltage leak can occur at high voltage level which is not detectable with an ohmmeter. Replacing the ignition coil may be necessary as a test.

⚠ WARNING

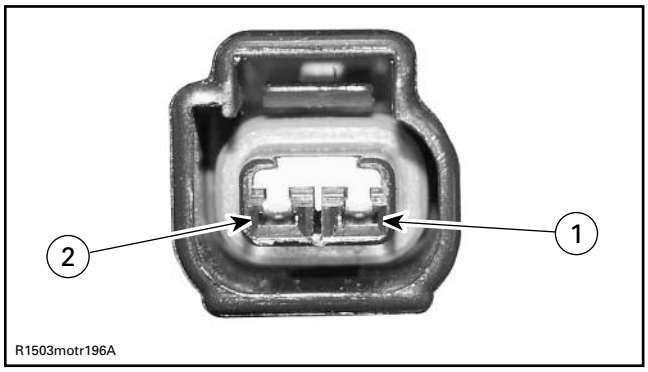
Never make a spark test with spark plug removed. Flammable vapors may be present in the vehicle and ignited which could cause an explosion.

Voltage Test

⚠ WARNING

When disconnecting coil from spark plug, always disconnect coil from main harness first. Never check for engine ignition spark from an open coil and/or spark plug in the engine compartment as spark may cause fuel vapor to ignite.

Disconnect the connector from the ignition coil and check the voltage supplied by the VCM.



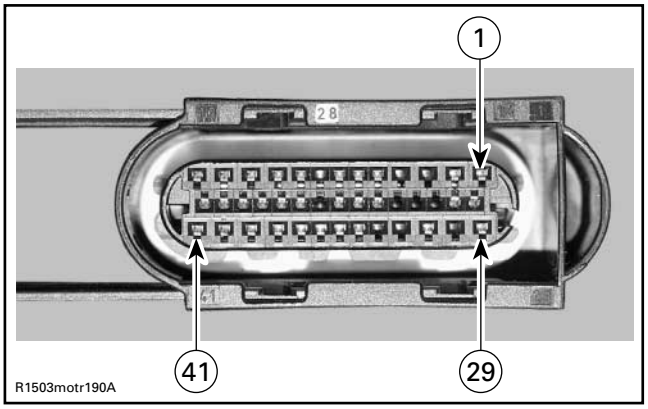
Install tether cord cap on the DESS post.

Check voltage between terminal 2 of ignition coil connector on the wiring harness and battery ground.

The voltage should be 12 V.

If 12 V is NOT read, check continuity of appropriate circuit 2-16 (cylinder 1), 2-17 (cylinder 2) or 2-18 (cylinder 3). If it tests good, try a new VCM.

If 12 V is read, disconnect the ECM ECU connector A from the ECM ECU and check the continuity of appropriate circuit 41 (cylinder 1), 1 (cylinder 2) or 29 (cylinder 3).



ECM ECU CONNECTOR

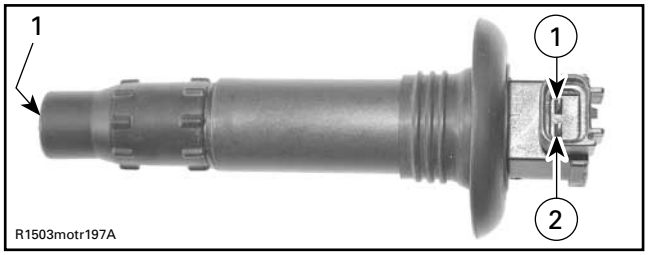
If wiring harness is defective, repair the connector or replace the wiring harness between ECM ECU connector and the ignition coil.

If wiring harness is good, test resistance of primary and secondary winding of ignition coil.

Resistance Test

CAUTION: Do not remove the ignition coil before disconnecting the connector, or the wires will be damaged. Do not pry up ignition coil with a screwdriver to avoid damage.

Remove ignition coil from spark plug.



1. Spark plug terminal

Using a multimeter, check the resistance in both primary and secondary windings.

For primary winding check the resistance between terminals 1 and 2 of the ignition coil.

The resistance should be between 0.85 and 1.15 Ω at 20°C (68°F).

For secondary winding check the resistance between terminal 1 and spark plug terminal.

The resistance should be between 9.5 and 13.5 kΩ at 20°C (68°F).

If the resistance of one of both windings is not good, replace the defective ignition coil.

If the windings test good, try a new engine ECM ECU.

NOTE: Prior to inserting the ignition coil to its location, apply some silicone lubricant (P/N 293 600 041) around the seal area that touches the spark plug hole. After installation, ensure the seal seats properly with engine top surface.

⚠ WARNING

Always reconnect ignition coil cables at the same spark plugs where they come from. Otherwise, severe backfire may occur with possible damage to exhaust system components. The genuine wiring harness is designed to prevent a cable mixing by using different cable lengths.

TDC SETTING (TOP DEAD CENTER)

The ECM is able to determine the exact position of camshaft and crankshaft. That means that no TDC setting has to be performed. It is used for both injection and ignition timings.

ENGINE START SWITCH VERIFICATION

If the vehicle fails to wake-up or start while turning ON the ignition switch, check battery voltage and fuses.

NOTE: Make sure the engine cut-out switch is not in operation.

DESS SWITCH VERIFICATION

If 2 short beeps are not heard whenengine is started, refer to DIAGNOSTIC PROCEDURES.

The following continuity tests can also be performed using an ohmmeter.

Disconnect DESS post wires.

Tether Cord Cap Removed

Connect test probes to DESS post BLACK/WHITE and BLACK wires. Measure resistance, there should be NO continuity (open circuit).

Connect one test probe to the WHITE/GRAY wire and the other test probe to the switch top terminal. Measure resistance, it must be close to 0 ohm.

Connect one test probe to the BLACK/WHITE wire and the other test probe to the DESS post ring. Measure resistance, it must be close to 0 ohm.

Tether Cord Cap on DESS Post

Connect test probes to switch BLACK and BLACK/YELLOW wires. Measure resistance, it must be close to 0 ohm.

SPARK PLUGS

Disassembly

⚠ WARNING

Never remove ignition coil from the spark plug without disconnecting it from the wiring harness. Flammable vapors may be present in the vehicle and ignited by a spark which could cause an explosion.

Disconnect the wiring harness from the ignition coil.

Remove the ignition coil.

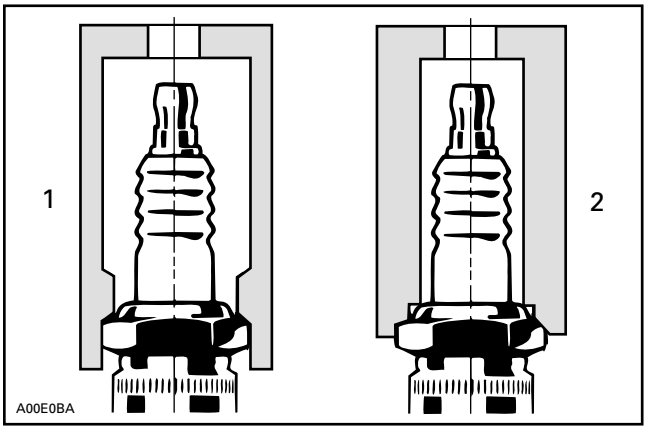
First unscrew the spark plug one turn.

Clean the spark plug and cylinder head with pressurize air then completely unscrew.

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 according to the following chart.
2) Apply anti-seize lubricant over the spark plug threads to prevent possible seizure.
3) Hand screw spark plug into cylinder head. Then, tighten the spark plug clockwise an additional 1/4 turn with a proper socket.



1. Proper socket
2. Improper socket

ENGINE	SPARK PLUG	TORQUE	GAP mm (in)
1503 4-TEC	NGK DCPR8-ES	Hand tighten + 1/4 turn with a socket	0.6 (.024)

CRANKING SYSTEM

See above for switch and the DESS post testing. Refer to STARTING SYSTEM section for other tests.

DIAGNOSTIC PROCEDURES

GENERAL

Here is the basic order suggested to diagnose a suspected engine management or fuel injection related problem:

– Check all fuses.
– Check fuel rail pressure.
– Check spark plugs condition.
– Check fuel pump pressure.
– Check all connections of the wiring harness.
– Refer to COMPONENT INSPECTION AND ADJUSTMENT section for procedures.

Terminology

Some documents or softwares use technical terms that may be different from the one used in this manual. The following table will help to find the equivalence.

TERMS USED IN THIS MANUAL	TERMS USED IN OTHER DOCUMENTS/ SOFTWARES
ECM ECU (Engine Control Unit of Engine Control Module)	ECM (Engine control module)
MAPS (Manifold Air Pressure Sensor)	APS (Air Pressure Sensor) or (Atmospheric Pressure Sensor)
MATS (Manifold Air Temperature Sensor)	ATS (Air Temperature Sensor) or (Intake manifold Temperature Sensor)
Communication link	CAN
CTS (Coolant Temperature Sensor)	WTS (Water Temperature Sensor)
TOPS valve (Tip-Over Protection System)	Blow-by valve
Idle bypass valve	- DLA (Digital Linear Actuator) - Idle actuator - Idle valve
OSPS (Oil Separator Pressure Switch)	OTPS (Oil Tank Pressure Switch)
DESS tether cord	Key
VCM (Vehicle Control Module)	VMS (Vehicle Management System)

SELF-DIAGNOSTIC MODE

Refer to the following chart. For other problems, refer to COMPONENT INSPECTION AND ADJUSTMENT section.

CODED SIGNALS	POSSIBLE CAUSE	REMEDY
2 short beeps (while installing DESS tether cord cap on DESS post). DESS/RER pilot lamp also blinks.	Confirms that proper DESS tether cord cap is installed. Engine can be started.	(Normal condition).
1 long beep (while installing DESS tether cord cap on DESS post). DESS/RER pilot lamp also lights up for one second. Engine cannot be started.	Bad DESS system connection.	Reinstall DESS tether cord correctly over post.
	Defective DESS tether cord cap.	Use another programmed DESS tether cord cap.
	Dirt or dried salt in DESS tether cord cap.	Clean DESS tether cap.
	Defective DESS post.	Replace DESS post.
1 long beep per second and DESS/RER pilot lamp lights up at same rate.	Reverse is selected.	Vehicle can be driven in reverse
3 short beeps per second. Engine can be started.	DESS tether cord cap left on post while engine is not running.	Remove the DESS tether cord cap from its post when leaving the vehicle.
Battery pilot lamp lights up.	No charging or over charging.	Check battery and charging system.

VCK (VEHICLE COMMUNICATION KIT)

The VCK (Vehicle Communication Kit) (P/N 529 035 981) is the primary tool to diagnose engine management and fuel injection related problems.

NOTE: The MPEM programmer does not work on 4-TEC models.

The 4-TEC requires B.U.D.S. version 2.1.1.

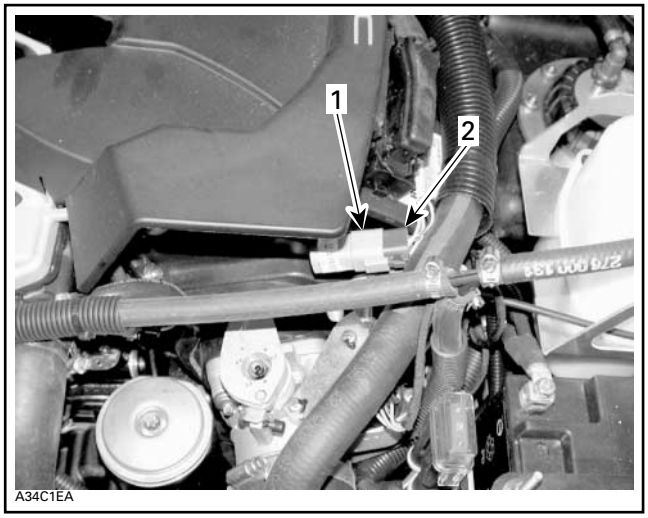
B.U.D.S. (Bombardier utility and diagnostic software) is designed to allow among other things, the programming of DESS tether cord(s), entering customer information, engine monitoring, allowing actuators, sensors and electronic equipments inspection, diagnostic options and reset such as the closed throttle and idle actuator.

For more information pertaining to the use of the software B.U.D.S., use its help which contains detailed information on its functions.

⚠ WARNING

If the computer you are using is connected to the 110 Vac power outlet, there is a potential risk of electrocution when working in contact with water. Be careful not to touch water while working with the VCK.

Electrical Connections



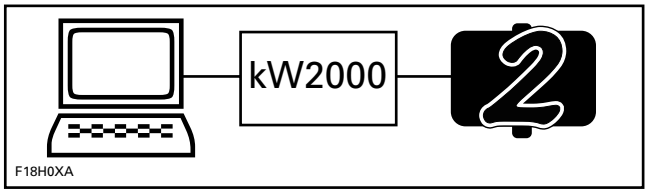
1. Connector cap besides throttle body
2. Pull out connector and attach VCK connector to it

After all connections are done, connect the DESS tether cord to its post, turn on the ignition switch and the engine cut-out switch to activate the communication.

IMPORTANT: When using the software B.U.D.S., with the 4-TEC engines, ensure that the protocol "KW2000" is properly selected in "MPI" under "Choose protocol".

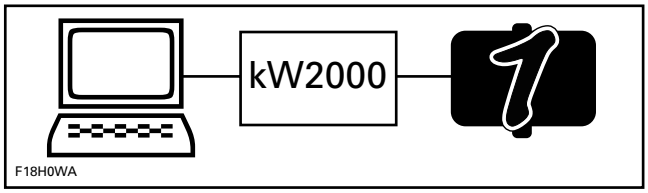
When B.U.D.S. is connected with VCM and ECM ECU, the status bar shows the protocol (KW2000) and a number 1 or 2 to the right. To work with the vehicle, number 2 must be displayed.

Number 2 means that 2 "ECUs" are connected (VCM and ECM ECU).



VCM AND ECM ECU ARE CONNECTED

Number 1 means that 1 "ECU" is connected (either VCM or ECM ECU). Therefore, there is a problem. Check fuses and connections.



ONLY ONE "ECU" IS WORKING. THERE IS A PROBLEM

If an "X" is shown, the DESS tether cord is not installed on its post or there is a problem with both "ECUs". Ensure VCK is working properly and check connections on VCK and vehicle.

VCK Supply

The VCK (MPI box) can use the vehicle power for its supply.

Changes in ECM ECU

Anytime a change is brought in ECM ECU through B.U.D.S., there will be an "ECM Tracking" message that will say "Remove key from vehicle...". When this occurs, remove the DESS tether cord from its post and wait until the message disappears (it lasts approximately 15 seconds after lanyard removal). Then, reinstall DESS tether cord to reinitialize B.U.D.S.

4-TEC SYSTEM FAULT CODES

General

The faults registered in the VCM/ECM ECU are kept when the battery is disconnected.

IMPORTANT: After a problem has been solved, ensure to clear the fault(s) in the VCM/ECM ECU using the VCK. This will properly reset the appropriate counter(s). This will also records that the problem has been fixed in the VCM/ECM ECU memory.

Many fault codes at the same time is likely to be burnt fuse(s).

For more information pertaining to the code faults (state, count, first, etc.) and report, refer to B.U.D.S. online help.

Supplemental Information for Some Specific Faults

ECM ECU fault codes P0601, P0602, P0604 and P605: These codes may occur in the following situations:

– Electrical noise is picked up by the ECM ECU. Ensure that all connections are in good condition, also grounds (battery, ECM ECU, engine and ignition system), they are clean and well tightened and that all electronic components are genuine — particularly in the ignition system. Installing resistive caps, non-resistive spark plugs or improper knock sensor wiring/routing may lead to generate this fault code.
– Electrical noise might also lead engine to occasional cutout without generating a fault code when engine is restarted. When looking at the fault code, pay attention to the "count" value in the software B.U.D.S. A value between 1 and 9 confirms an electrical noise problem. A value of 10 and above will generate a fault code.
– When installing a new ECM ECU. It is not properly programmed from the factory. The ECM ECU must be returned to be properly "activated".
– Perform service action recommended in B.U.D.S. under the "Faults" tab.
– If everything is in good condition, try a new ECM ECU.

When using the service action suggested in the Fault section of B.U.D.S., Refer to WIRING DIAGRAM to have the explanation of the system circuits coding that are referred to in B.U.D.S.

TPS (Throttle Position Sensor) Faults

Faults which are reported in B.U.D.S. fall into two groups TPS faults and adaption faults. These are displayed on the B.U.D.S. system as TPS OUT OF RANGE and TPS ADAPTION FAILURE.

TPS "OUT OF RANGE" Fault

It is caused by the sensor reading going out of its allowable range. This fault can occur during the whole range of movement of the throttle.

To diagnose this fully, it is recommended to operate the throttle through its full range. It is also recommended to release the throttle quickly as this may also show up a fault that is intermittent.

POSSIBLE CAUSES	RESULT	ACTION
Check if connector is disconnected from TPS	Yes	Fix.
Check if sensor is loose	Yes	Fix and reset **Closed Throttle and Idle Actuator**.
Inspect sensor for damage or corrosion	Yes	Replace and reset **Closed Throttle and Idle Actuator**.
Inspect wiring (voltage test)	Failed	Repair.
Inspect wiring and sensor (resistance test)	Failed	If bad wiring, repair. If bad TPS, replace and reset **Closed Throttle and Idle Actuator**.
Test sensor operation (wear test)		Replace and reset **Closed Throttle and Idle Actuator**.

TPS "ADAPTATION FAILURE" Fault

It is caused by the idle position moving out of an acceptable range.

Following failures can be effected by a TPS "Adaption Failure":

Idle speed is out of range.

Engine stops, when throttle is released quickly.

Engine runs inconsistent in low partload or low RPM.

POSSIBLE CAUSES	RESULT	ACTION
Sensor has been replaced and TPS closed position not reset	Yes	Reset **Closed Throttle and Idle Actuator**.
Throttle body has been replaced and TPS closed position not reset	Yes	Reset **Closed Throttle and Idle Actuator**.
ECM ECU has been replaced and TPS closed position not reset	Yes	Reset **Closed Throttle and Idle Actuator**.
Throttle cable too tight	Yes	Fix and reset **Closed Throttle and Idle Actuator**.
Sensor is loose	Yes	Fix and reset **Closed Throttle and Idle Actuator**.
Throttle bracket is loose	Yes	Fix and reset **Closed Throttle and Idle Actuator**.
Adjustment screw worn or loose	Yes	Change throttle body.

DRIVE BELT

APPLICATION CHART

MODEL	PART NUMBER	MINIMUM WIDTH (wear limit) mm (in)
Elite	417 300 207	34.2 (1.346)

INSPECTION

Inspect belt for cracks, fraying or abnormal wear (uneven wear, wear on one side, missing cogs, cracked fabric). If abnormal wear is noted, probable cause could be pulley misalignment, excessive RPM with frozen track, fast starts without warm-up period, burred or rusty sheave, oil on belt or distorted spare belt.

Check drive belt width. Replace the drive belt if width is under minimum recommended width (see table above).

CHECKING NEUTRAL FUNCTION

⚠ WARNING

Always check neutral function when servicing.

Apply parking brake. Vehicle must be on the ground and on a plane level surface. No one should be in front of vehicle.

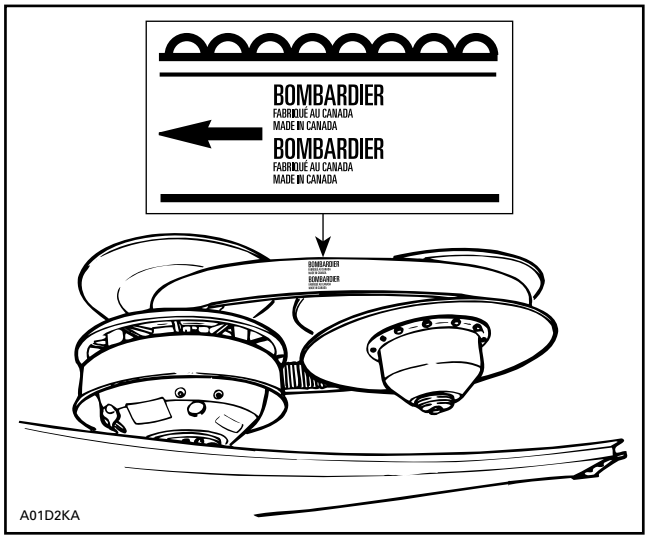
Attach vehicle DESS tether cord to your clothing. Sit in vehicle and properly fasten safety belt, then start engine.

Release parking brake. Vehicle must not creep when engine is idling. Otherwise, make sure that:

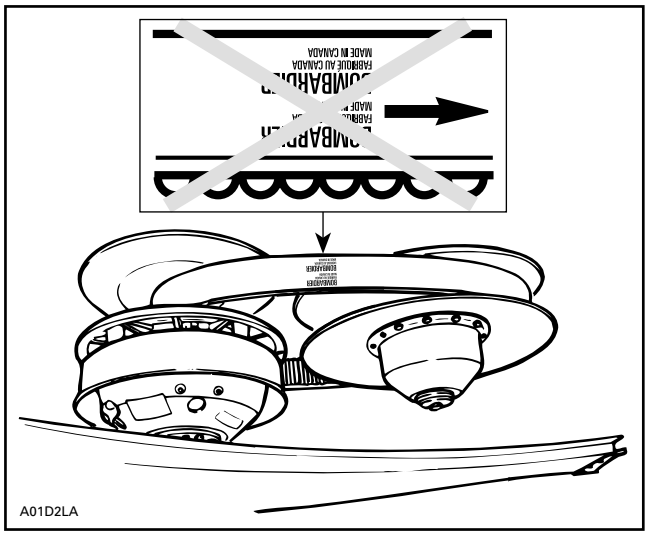
– idle speed is as specified
– proper belt is installed
– pulley center-to-center is as specified
– belt deflection is as specified.

ROTATION DIRECTION

The maximum drive belt life span is obtained when the drive belt is installed as shown. This will ensure that correct direction of rotation is respected.



CORRECT



INCORRECT

NOTE: For used drive belt, mark and reinstall in the same position.

DRIVE BELT HEIGHT MEASUREMENT AND ADJUSTMENT

Measurement

NOTE: The drive belt height measurement must be performed each time a new drive belt is installed.

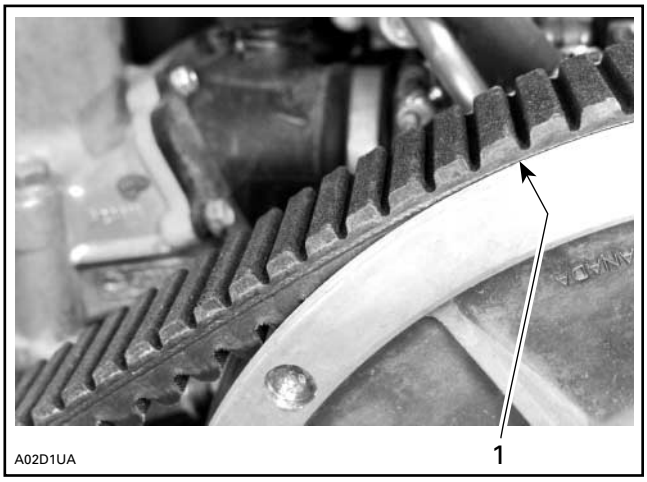
NOTE: To obtain an accurate drive belt height measurement, it is suggested to allow a break-in period of 50 km (30 miles).

Before checking the belt height, ensure that a good-condition proper belt (refer to the APPLICATION CHART) is installed.

Adjust pulley distance and alignment. Refer to PULLEY DISTANCE AND ALIGNMENT.

To obtain maximum vehicle performance, the belt height must be adjusted according to specifications shown in the accompanying chart.

MODEL	BELT HEIGHT
All models	Top edge of drive belt cord should be flush with driven pulley edge.

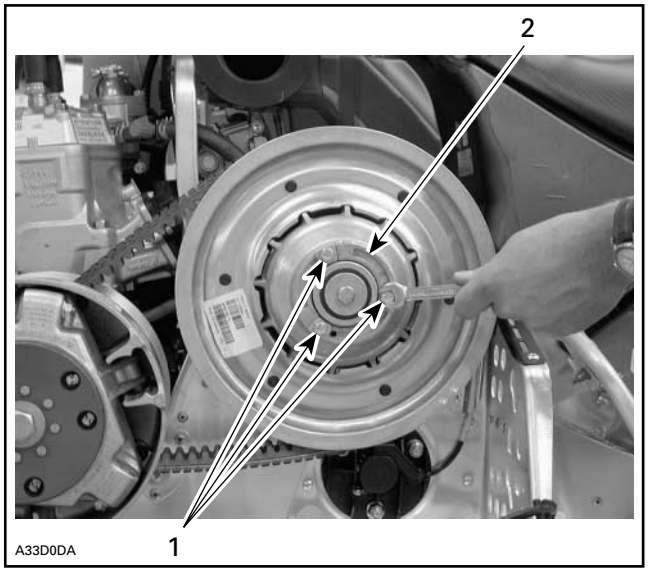


1. Flush

Adjustment

Before adjusting the belt height, ensure that a good-condition proper belt (refer to the APPLICATION CHART) is installed.

Adjust pulley distance according to specification, refer to PULLEY DISTANCE AND ALIGNMENT.

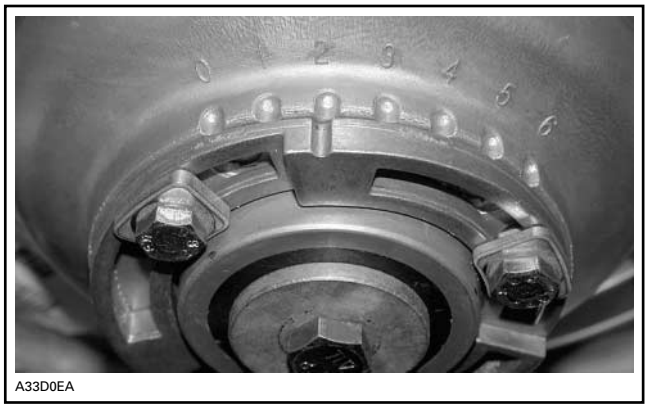


TYPICAL
1. Screws
2. Adjustment ring

Loosen screws and turn adjustment ring as follows:

To lower belt in driven pulley: turn adjustment ring counterclockwise and tighten the screws.

To raise belt in driven pulley: turn ring clockwise and tighten the screws.



DRIVEN PULLEY NOTCHES

Turn the adjustment ring up to one notch, tighten the screws, then rotate driven pulley to allow drive belt to settle in pulley. Check height, if required the adjustment ring can be turned up to 1/4 or 1/2 the notch. Check height, repeat as required.

NOTE: Notches are there on the driven pulley for reference purpose only and the desired adjustment can be attained at any point.

DRIVE BELT DEFLECTION MEASUREMENT (REFERENCE ONLY)

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).

Before checking the belt deflection, ensure vehicle has the proper belt (refer to the APPLICATION CHART).

Adjust pulley distance and alignment. Refer to PULLEY DISTANCE AND ALIGNMENT.

To obtain maximum vehicle performance, the belt tension must be adjusted according to specifications shown in the accompanying chart.

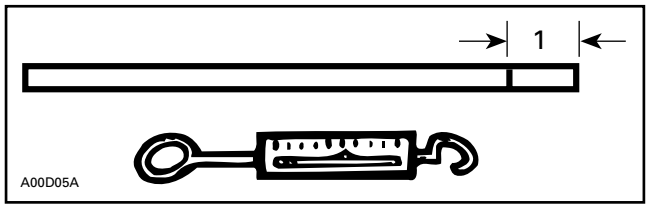
MODEL	DEFLECTION † mm (in)	FORCE kg (lb)
All models	32 ± 5 (1.260 ± .197)	11.5 (25)

† FOR REFERENCE ONLY

To Check Tension

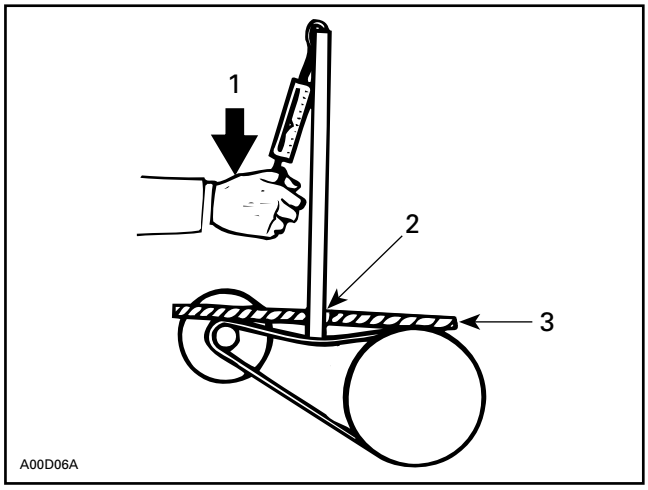
Position a reference rule on drive belt.

Wooden Stick and Spring Scale Method



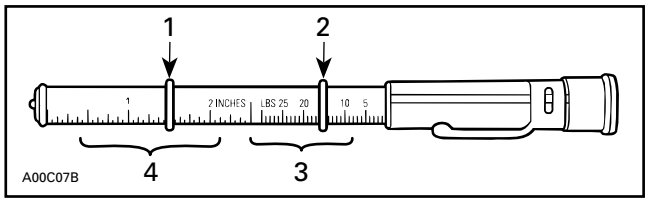
1. Mark specified deflection

Using spring scale and stick, apply specified force on drive belt halfway between pulleys as shown.



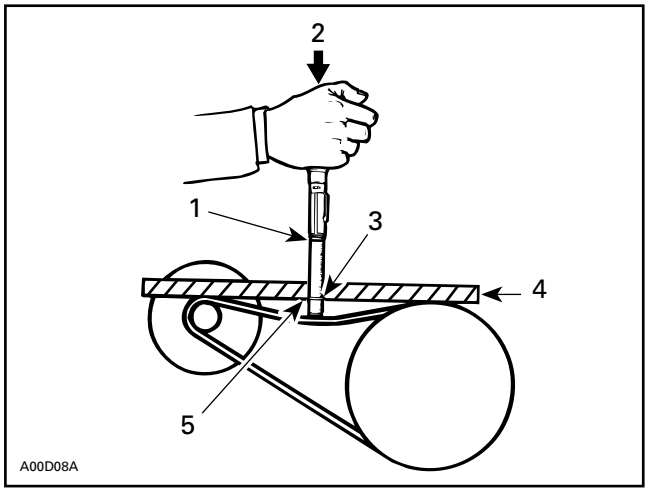
1. Force
2. Read deflection here
3. Reference rule

Or use the belt tension tester (P/N 414 348 200).



1. Lower O-ring
2. Upper O-ring
3. Force (read down)
4. Deflection (read up)

1) Slide lower O-ring of deflection scale to specified measure.
2) Slide upper O-ring to 0 (zero) on the force scale.
3) Apply pressure until lower O-ring is flush with edge of rule and read force on the upper scale at top edge of O-ring.

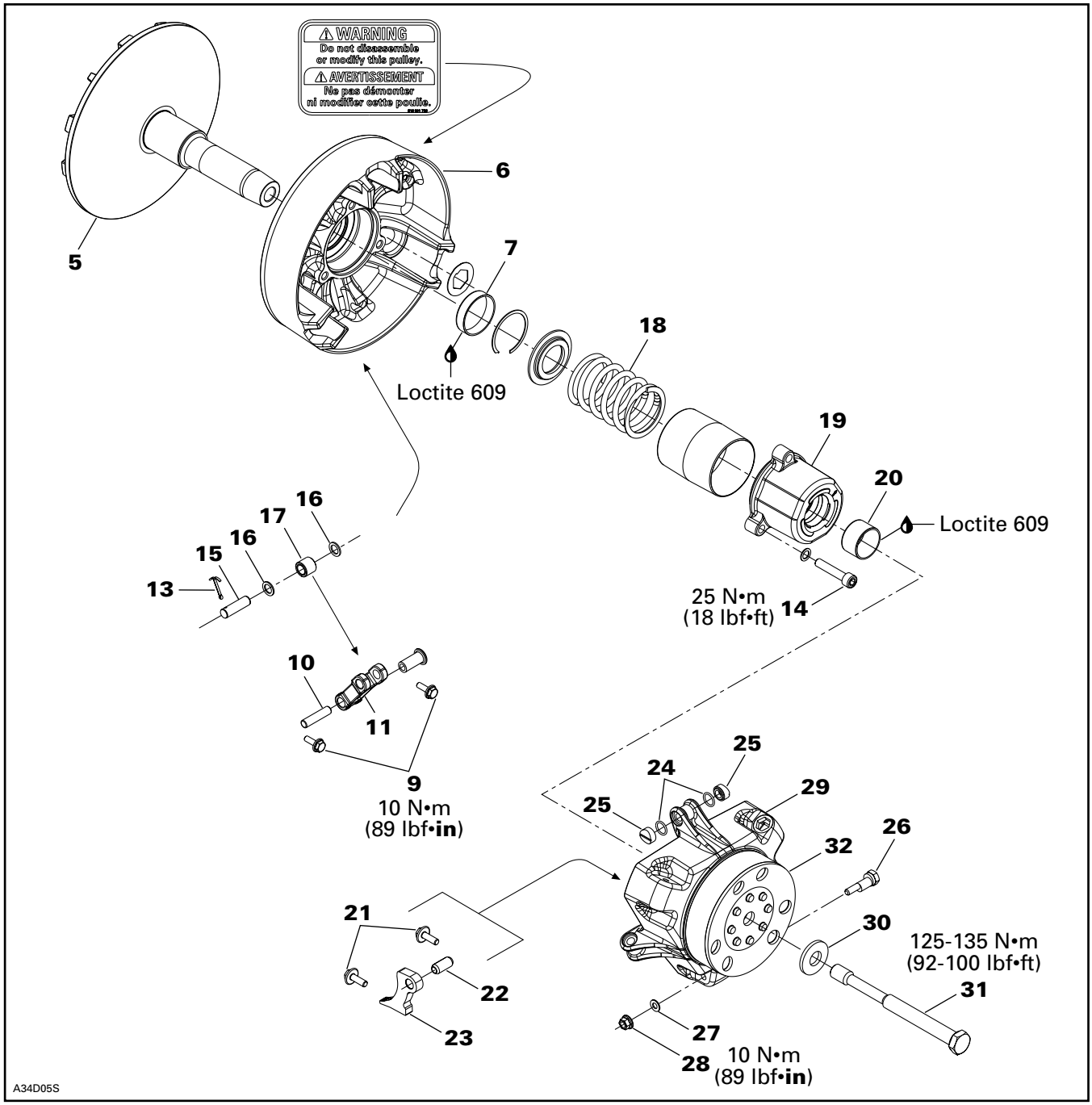


1. Upper O-ring — force
2. Force
3. Lower O-ring — deflection
4. Reference rule
5. Deflection

DRIVE PULLEY

TRA IV HD

NOTE: This is a lubrication free drive pulley. Always refer to appropriate parts catalog for replacement part. Most parts of TRA IV HD are not interchangeable with those of the TRA.



GENERAL

Some drive pulley components (return spring, ramp) can be changed to improve vehicle performance in high altitude regions. A service bulletin will give information about calibration according to altitude.

CAUTION: Such modifications should only be performed by experienced mechanics since they can greatly affect vehicle performance. Verify spring specifications before installation. Do not only refer to the spring color code.

NOTE: TRA drive pulley stand for Total Range Adjustable drive pulley.

⚠ WARNING

Any drive pulley repairs must be performed by an authorized Bombardier snowmobile dealer. Sub-component installation and assembly tolerances require strict adherence to procedures detailed.

REMOVAL

30,31, Conical Spring Washer and Screw

Secure drive pulley retainer (P/N 529 035 674) over a sliding half tower.

⚠ WARNING

Never use any type of impact wrench at drive pulley removal and installation.

Remove retaining screw.

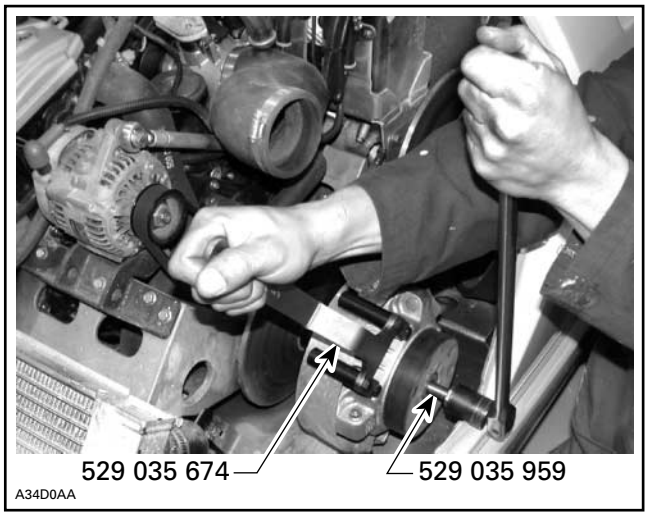
To remove drive pulley ass'y and/or fixed half from engine, use puller (P/N 529 035 959).

CAUTION: This pulley has metric threads. Do not use imperial threads puller. Always tighten puller by hand to ensure that the drive pulley has the same type of threads (metric vs imperial) prior to fully tightening.

To Remove Drive Pulley Ass'y:

Retain drive pulley with drive pulley retainer (P/N 529 035 674).

Install puller (P/N 529 035 959) in pulley shaft then tighten.

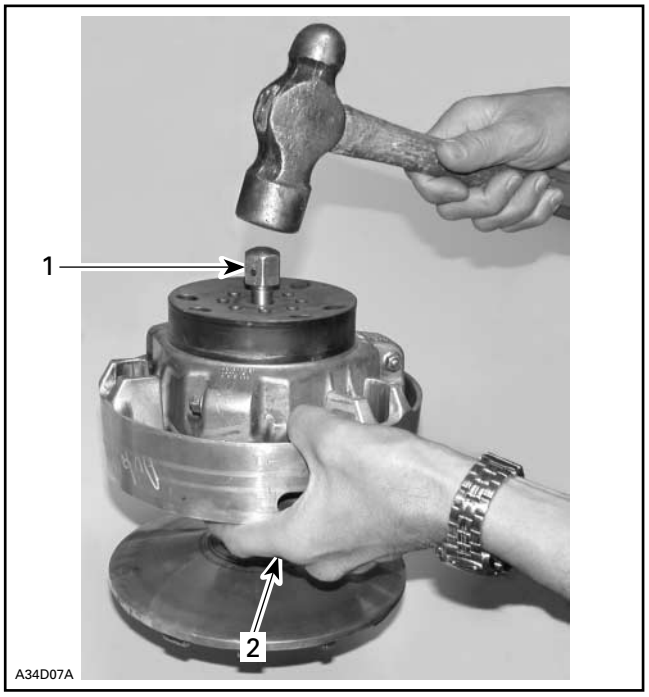


DISASSEMBLY

5,6, Fixed and Sliding Half

CAUTION: Do not tap on governor cup.

Screw puller into fixed half shaft about 13 mm (1/2 in). Raise drive pulley and hold it by the sliding half while knocking on puller head to disengage fixed half.



TYPICAL
1. Puller
2. Holding sliding half

NOTE: No components marking is required before disassembling this drive pulley since it has factory mark and arrows as indexing reference.

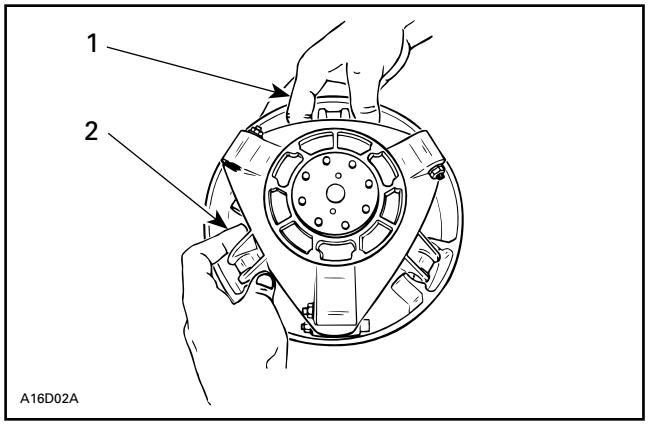
32, Cushion Drive

CAUTION: Do not disassemble cushion drive. Governor cup and cushion drive are factory balanced as an assembly.

25,29, Slider Shoe and Governor Cup

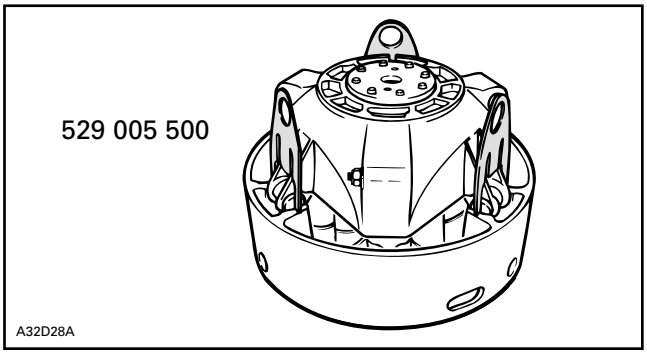
Carefully lift governor cup until slider shoes come at their highest position into guides.

Hold a slider shoe set then carefully lift its housing and remove slider shoes. Proceed the same way for other housings lifting one at a time.



TYPICAL
1. Hold slider shoes
2. Lift one housing at a time

NOTE: To ease disassembly, forks (P/N 529 005 500) should be used to hold slider shoes prior to removing governor cup.



TYPICAL

19, Spring Cover Ass'y

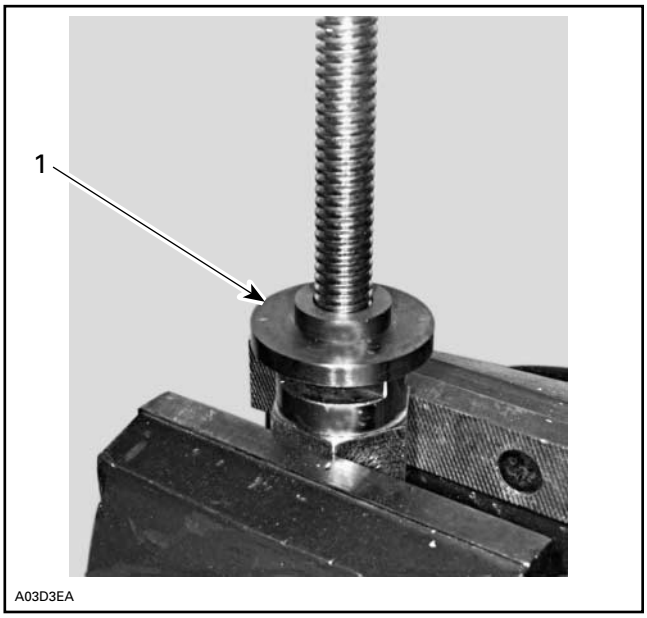
It is pushed by clutch spring pressure.

⚠ WARNING

Clutch spring is very strong. Never attempt to remove spring cover without the recommended tools.

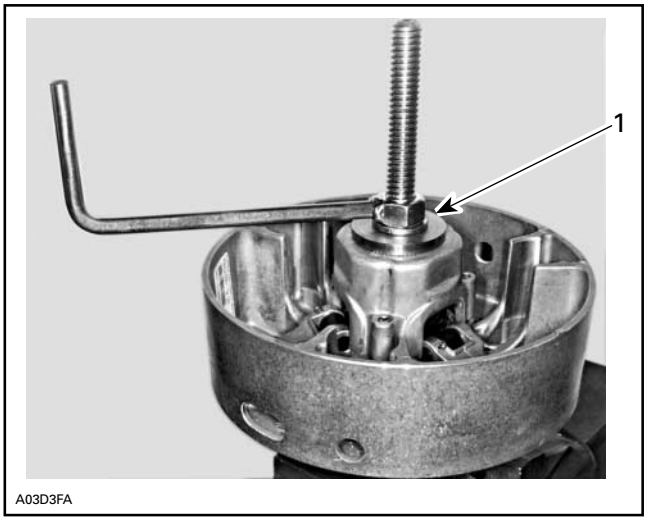
Use spring compressor (P/N 529 035 524).

Install support guide.



TYPICAL
1. Support guide

Install sliding half then a second support guide. These support guides will prevent bushing damages.



TYPICAL
1. Support guide

Remove 3 Allen screws retaining spring cover then unscrew compressor.

CLEANING

5,6, Fixed and Sliding Half

Clean pulley faces and shaft with fine steel wool and clean dry cloth.

5,29, Fixed Half/Crankshaft End and Governor Cup/Fixed Half Post

Parts must be at room temperature before cleaning.

Using a paper towel with Pulley flange cleaner (P/N 413 711 809), clean crankshaft tapered end, the taper inside the fixed half, the fixed half post taper end and the taper inside governor cup.

Before installation of drive pulley, clean also crankshaft threads and retaining screw threads.

⚠ WARNING

This procedure must be performed in a well-ventilated area.

CAUTION: Avoid contact between cleaner and crankshaft seal because damage may occur.

Remove all hardened oil deposits that have baked on tapered surfaces with coarse or medium steel wool and/or sand paper no. 600.

CAUTION: Do not use any other type of abrasive.

Reclean mounting surfaces with paper towel and cleaning solvent.

Wipe off the mounting surfaces with a clean, dry paper towel.

CAUTION: Mounting surfaces must be free of any oil, cleaner or towel residue.

7,20, Bushing

Only use petrol base cleaner when cleaning bushings.

CAUTION: Do not use acetone to clean bushing.

INSPECTION

Drive pulley should be inspected annually.

16,17, Thrust Washer and Roller

Check roller for roundness of external diameter. Check thrust washer for thickness wear. Replace as required.

CAUTION: Ensure rollers are in good condition. Replace as required.

10,12, Lever Axle and Bushing

Check for wear, replace as required.

24,25, O-Ring and 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.

7,20, Sliding Half Bushing and Spring Cover Bushing

Visually inspect coating. Replace bushing if the coating is worn.

Sliding Half Bushing Replacement

This bushing is not replacable. If worn out, replace sliding half ass'y.

Spring Cover Bushing Replacement

Under normal use there is no need to replace this bushing.

Mount compressor (P/N 529 035 524) in a vise.

Use tools (P/N 529 035 932 and 529 035 931) to remove old bushing.

CAUTION: Bushing must be bonded with retaining compound.

Apply retaining compound Loctite 609 outside of bushing then press it down to counterbore from outside end.

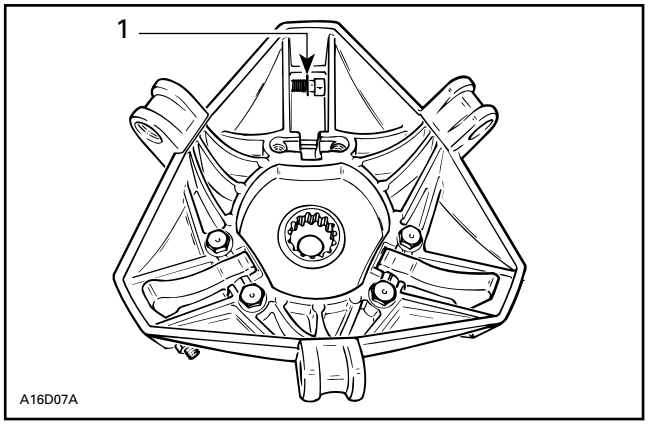
CAUTION: Insert bushing from sliding half side (inner side) of spring cover.

ASSEMBLY

NOTE: This drive pulley is lubrication free. Do not lubricate any component.

26,27,28, Calibration Screw, Washer and Locking Nut

When installing calibration screw, make sure to install washer as shown.



TYPICAL
1. Washer

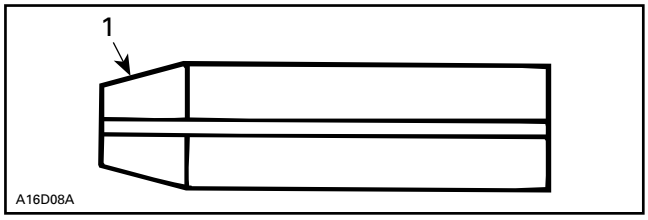
Torque locking nut to 10 N•m (89 lbf•**in**).

15, Pin

Always use the same type of pin as originally installed when servicing. Different types have different weights for calibration purpose. Refer to TECHNICAL DATA.

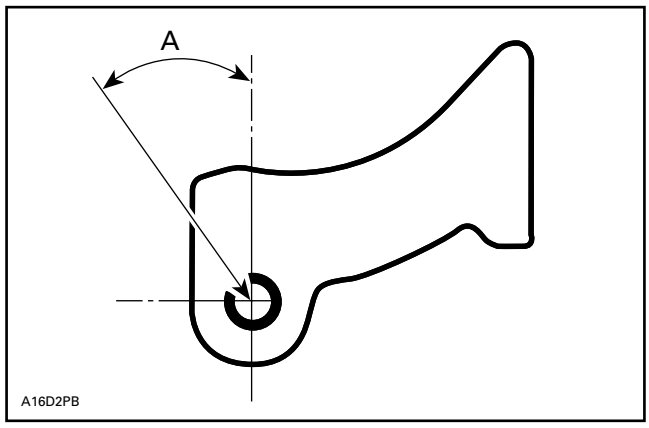
21,22,23, Screw, Dowel Tube and Ramp

Insert dowel tube from chamfered side. Make sure ramp is centered on dowel tube.

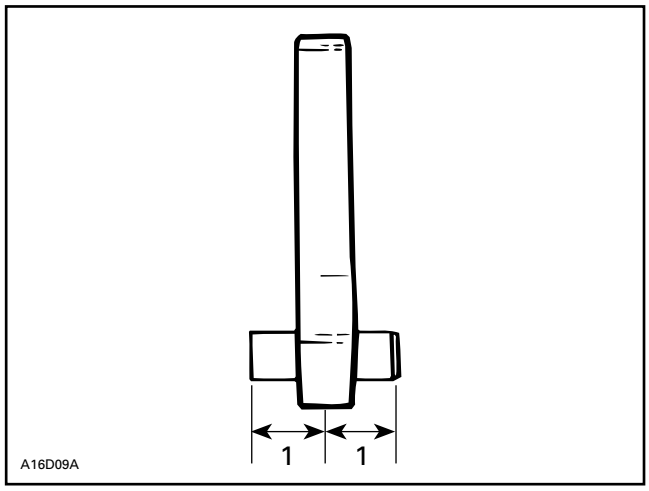


1. Chamfered side

Position dowel tube split at the angle A.



MODEL	ANGLE (A)
TRA IV HD	45 ± 3°



1. Equal distance

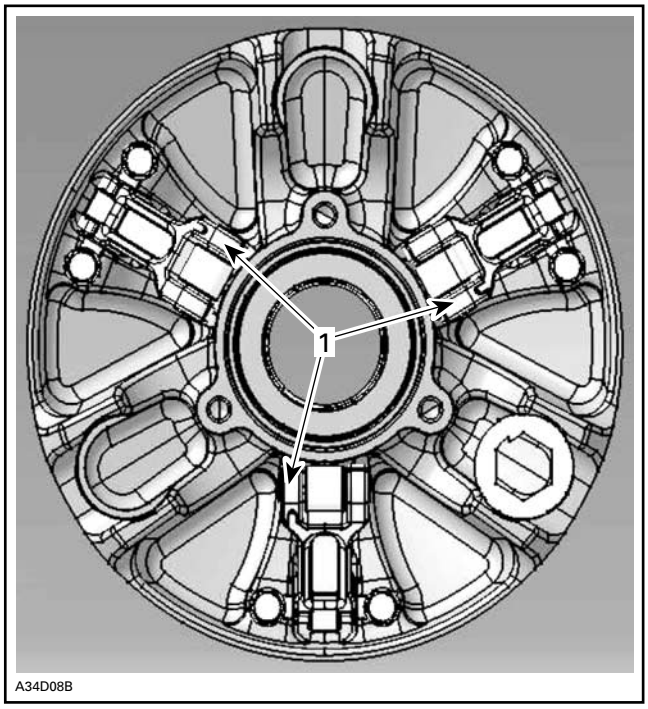
Torque screws to 10 N•m (89 lbf•**in**).

9,10,11,13, Screw, Lever Axle, Lever and Cotter Pin

Always install lever assemblies so that cotter pins are on the left hand side. Besides install cotter pin head on top when lever is sat at bottom of sliding half. Bend cotter pin ends to sit perfectly against lever.

⚠ WARNING

Whenever replacing centrifugal levers, always replace all 3 at the same time. Otherwise, drive pulley misbalancing will occur because of levers difference.



1. Head on top and on the left hand side

CAUTION: Lever assemblies must be installed so that cotter pins are on the left hand side.

Torque screws **no. 9** to 10 N•m (89 lbf•**in**).

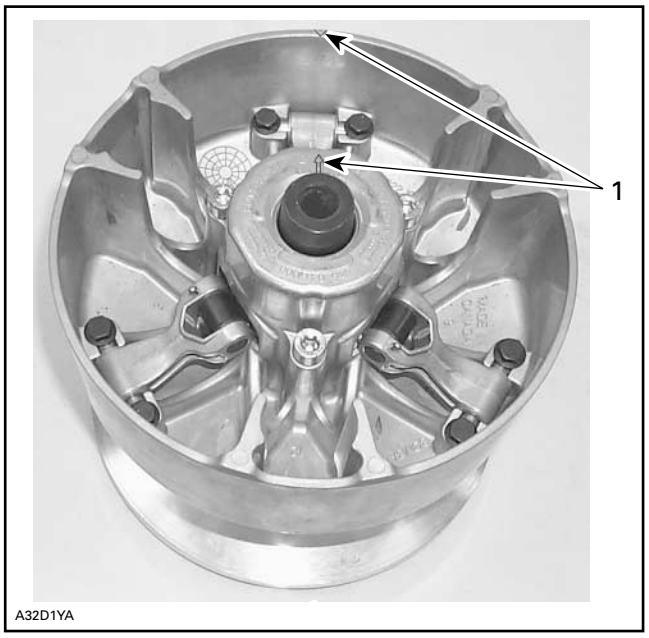
CAUTION: Lever ass'y and rollers must move easily after installation.

5,6,14,18,19, Fixed Half, Sliding Half, Cover Screw, Spring and Spring Cover

To install spring cover, use spring compressor (P/N 529 035 524).

Assemble fixed and sliding halves. Note that fixed halves have different cone angle. Match cone angle with crankshaft.

Lift sliding half against spring cover and align spring cover arrow with sliding half mark.

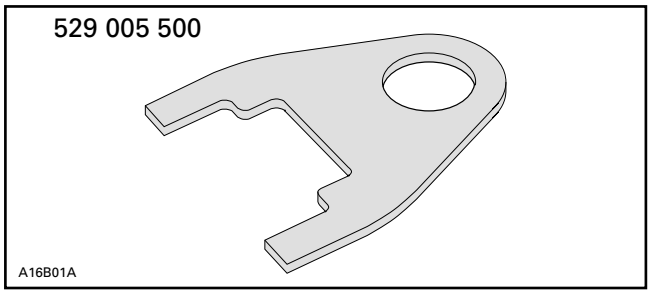


TYPICAL
1. Align

Tighten cover screws **no. 14** to 25 N•m (18 lbf•ft).

6,25,29, Sliding Half, Slider Shoe and Governor Cup

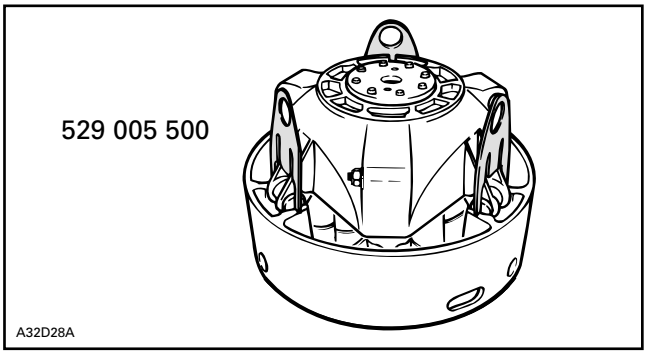
To install governor cup, use following tool:



Insert slider shoes into governor cup so that groove in each slider shoe is vertical to properly slide in guides.

CAUTION: Make sure O-rings are installed on slider shoes and that grooves are positioned vertically.

Install fork (P/N 529 005 500) into slider shoe grooves to maintain them for governor cup installation. Proceed on 3 set of slider shoes.



TYPICAL

Make sure to align governor cup arrow with sliding half and fixed half mark.

INSTALLATION

⚠ WARNING

Do not apply anti-seize or any lubricant on crankshaft and drive pulley tapers.

⚠ WARNING

Never use any type of impact wrench at drive pulley removal and installation.

Clean mounting surfaces as described in CLEANING above.

Drive Pulley Ass'y

The following installation procedure must be strictly adhered to.

Install drive pulley on crankshaft extension.

Install a new conical spring washer with its concave side towards drive pulley then install screw.

⚠ WARNING

Never substitute conical spring washer and/or screw with jobber ones. Always use Bombardier genuine parts for this particular case.

Use holder. See removal procedure.

Torque screw to 125 to 135 N•m (92 to 100 lbf•ft).

Install drive belt and guard.

Raise and block the rear of the vehicle and support it with a mechanical stand.

⚠ WARNING

Ensure that the track is free of particles which could be thrown out while track is rotating. Keep hands, tools, feet and clothing clear of track. Ensure nobody is standing near the vehicle.

Accelerate the vehicle at low speed (maximum 30 km/h (20 MPH)) and apply the brake, repeat 5 times.

Retorque screw to 125 to 135 N•m (92 to 100 lbf•ft).

⚠ WARNING

After 10 hours of operation the transmission system of the vehicle must be inspected to ensure the retaining screw is properly torqued.

DRIVE PULLEY ADJUSTMENT

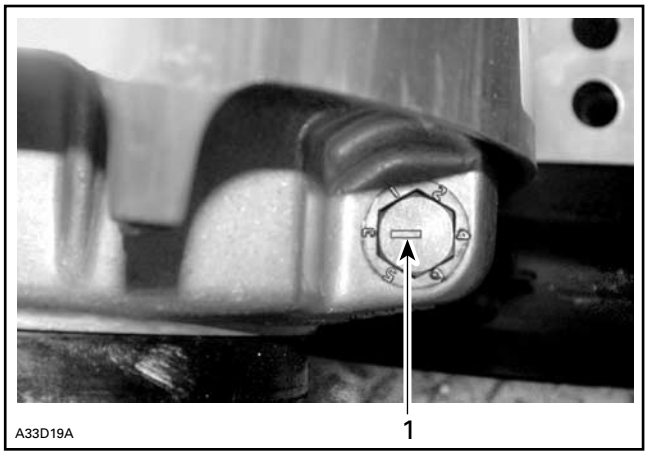
From factory TRA drive pulley adjustment screws are set to position 3. This position allows the best compromise between acceleration, top speed and fuel economy.

Position 1 or 2 would provide the best fuel economy. Top speed would be reduced.

Position 4 would give the best acceleration. Fuel economy would be reduced.

26,28,29, Calibration Screw, Locking Nut and Governor Cup

Calibration screw has a notch on top of its head.



1. Notch

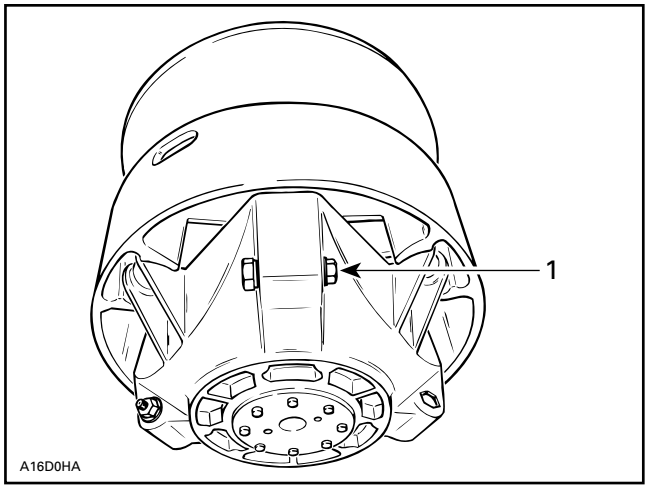
Governor cup has 6 positions numbered 1 to 6.

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 otherwise its inside washer will fall off.

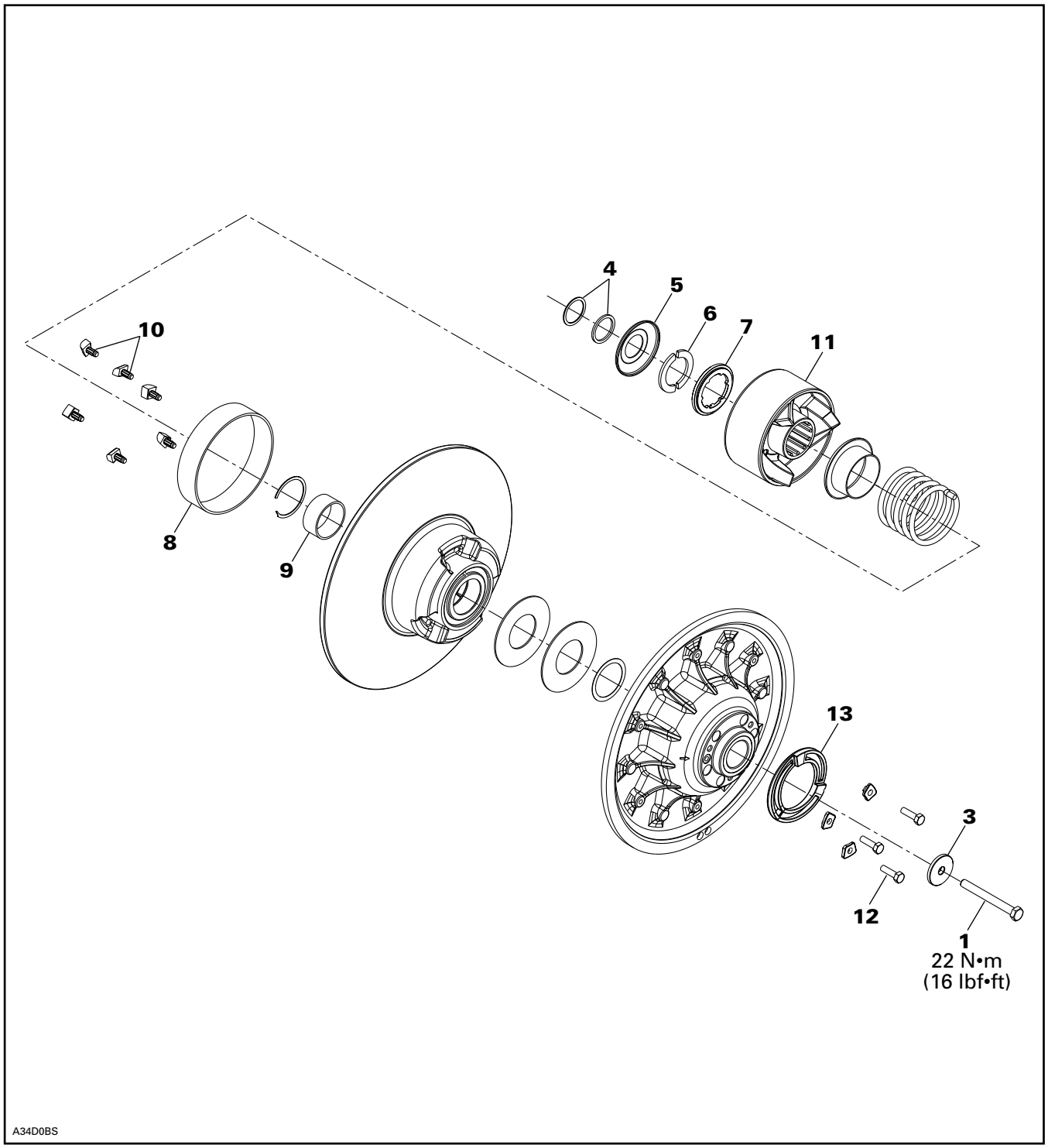
CAUTION: Always adjust all 3 calibration screws and make sure they are all set at the same number.



TYPICAL
1. Loosen just enough to permit rotating of calibration screw

DRIVEN PULLEY

HPV VSA



REMOVAL

Remove guard and drive belt from vehicle.

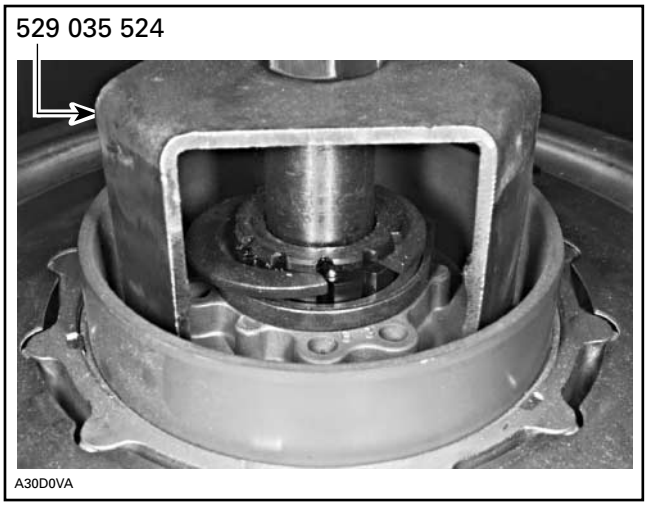
Remove cap screw **no. 1** and shouldered washer **no. 13** then pull the driven pulley from the countershaft.

Note shouldered washer position for reinstallation.

Take care not to lose spacer **no. 4**.

DISASSEMBLY

Use spring compressor (P/N 529 035 524).



Remove half keys **no. 6** and spacer **no. 7** to disassemble the cam and the 2 pulley halves.

⚠ WARNING

Driven pulley cam is spring loaded, use above mentioned tool.

CLEANING

8,9, Large Bushing and Small Bushing

During break-in period (about 10 hours of use), teflon from bushing moves to cam or shaft surface. A teflon over teflon running condition occurs, leading to low friction. So it is normal to see gray teflon deposit on cam or shaft. Do not remove that deposit, it is not dust.

When a dust deposit has to be removed from the cam or the shaft, use dry cloth to avoid removing transferred teflon.

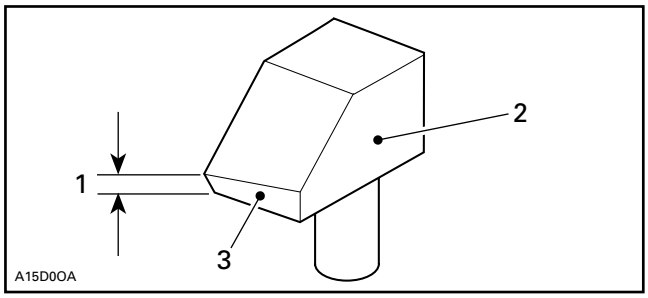
Pulley Half Cleaning

Use Pulley Flange Cleaner (P/N 413 711 809).

INSPECTION

10, Slider Shoe

Check cam slider shoes for wear. Replace when inside edge thickness of cam slider shoe slope base is worn to 1 mm (.039 in) or less.



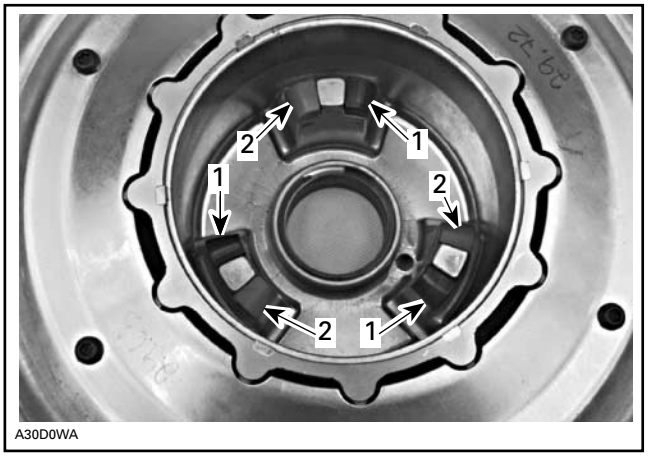
1. Measure thickness of slope base here
2. Sliding pulley side
3. Slope base

ASSEMBLY

10, Cam Slider Shoe

When replacing slider shoes, always install a new set (3 shoes) to maintain equal pressure on the cam.

Install slider shoes as per following photo.



1. BLACK slider shoe
2. RED slider shoe

12, Screws

These screws are machined at there end. With the adjustment ring set to position 0 (zero), screw ends are flush with inner side of fixed pulley half once tightened.

CAUTION: If any of these screws is not flush with inner side of sliding pulley, bushings will worn unequally.

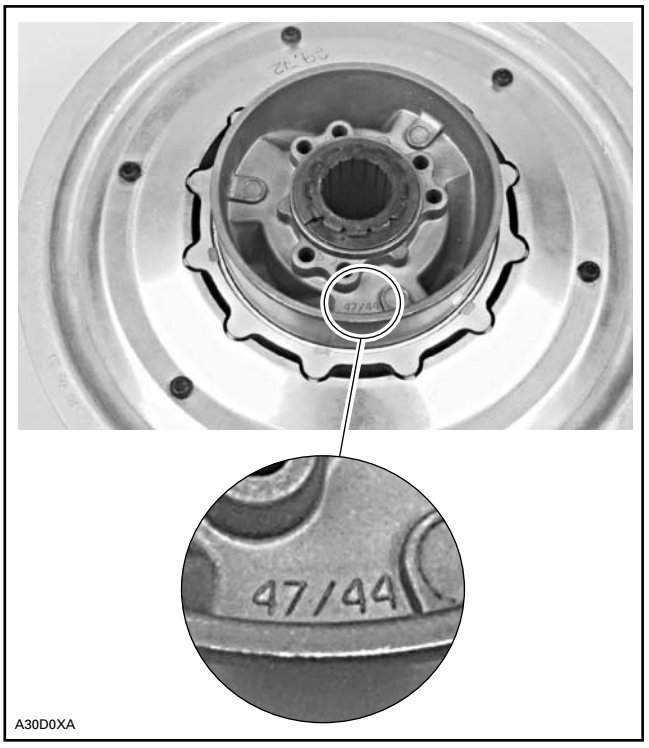
Assemble driven pulley components by reversing the disassembly procedure.

11, Cam

Coat cam interior with anti-seize lubricant.

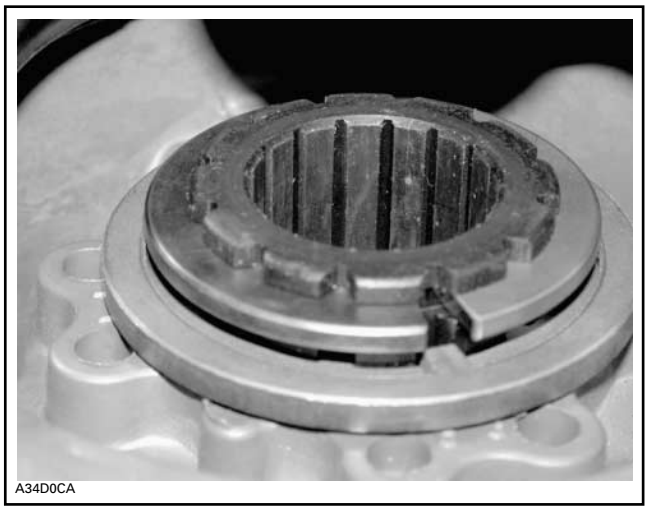
Make sure to install proper cam. Refer to TECHNICAL DATA.

Cam angle is identified on cam.



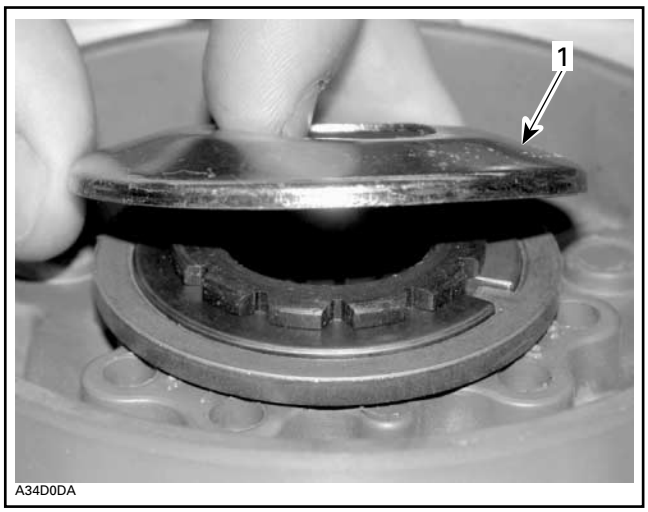
NOTE: For high altitude regions, a service bulletin will give information about calibration according to altitude.

Install spacer **no. 7** and half keys **no. 6** as per following photo.



HALF KEYS INSTALLATION

CAUTION: Make sure to install the proper protector no. 5. The proper protector no. 5 completely covers the half keys no. 6 and the spacer no. 7 without touching them.



1. Proper protector

INSTALLATION

5, Countershaft

CAUTION: Always apply anti-seize lubricant (P/N 293 800 070) on the countershaft before final pulley installation.

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.

Driven pulley end-play is 0 (zero).

1, Pulley Retaining Screw

Torque to 22 N•m (16 lbf•ft).

ADJUSTMENT

Pulley Alignment and Drive Belt Height

Refer to PULLEY DISTANCE AND ALIGNMENT and DRIVE BELT to perform adjustments.

Loosen screws no. 12, turns adjustment ring no. 13 then retighten screws to adjust drive belt height.

CAUTION: Drive belt and pulley adjustments must always be checked whenever pulleys have been removed, replaced or disassembled.

PULLEY DISTANCE AND ALIGNMENT

GENERAL

Both pulley distance and pulley alignment must be checked 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.

All Pulley Alignment Specifications Refer to:

X = Distance between straight bar and drive pulley fixed half edge, **measured between pulleys**.

Y = Distance between straight bar and drive pulley fixed half edge, **measured at the end of straight bar**.

Z = Distance between outside diameter of pulleys.

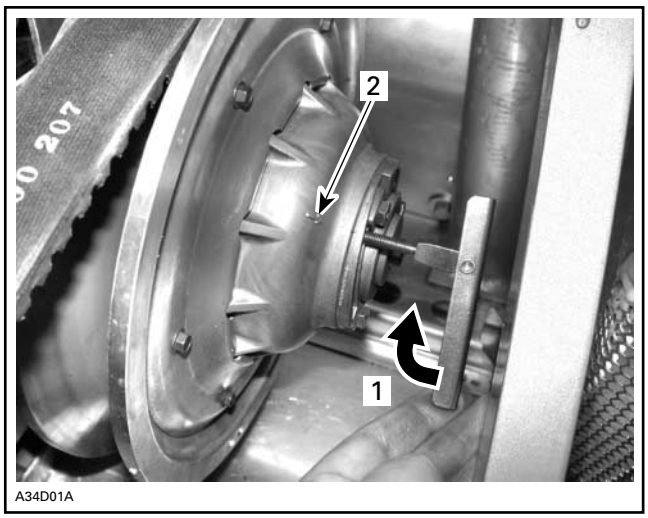
PROCEDURE

Remove the belt guard and the drive belt.

Untighten all torque rods. Loosen all engine supports.

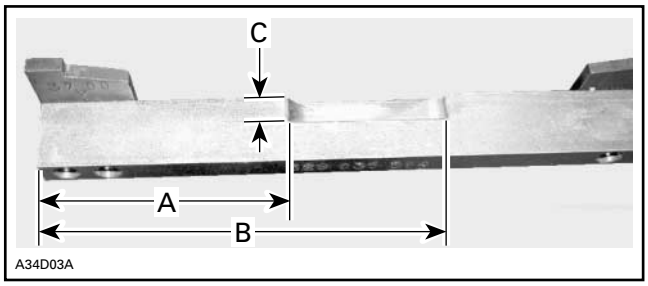
Screw the driven pulley opening tool (P/N 529 017 200) in the threaded hole (in line with embossed arrow) and tighten to open the driven pulley.

NOTE: The drive belt installer/remover included in the vehicle tool kit can also be used to open driven pulley.



TYPICAL
1. Tighten to open pulley
2. Embossed arrow

Modify the alignment bar (P/N 529 035 594) as per the following dimensions.

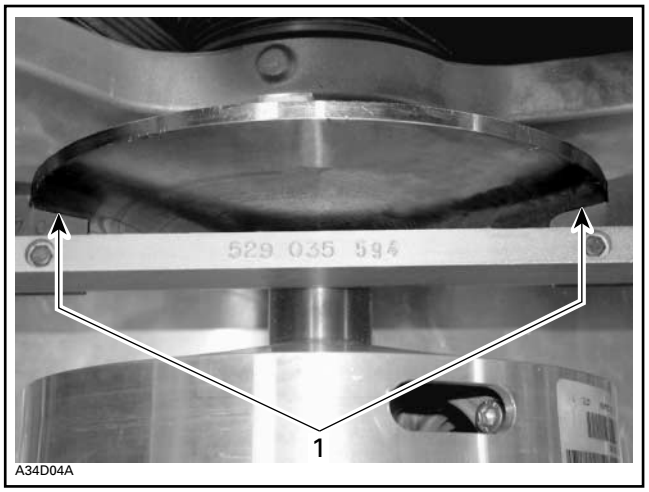


A. 92 mm (3-5/8 in)
B. 152 mm (6 in)
C. 10 mm (3/8 in) wide by 5 mm (3/16 in) deep

Insert the modified alignment bar (P/N 529 035 594) into the opened driven pulley.

Slowly close the driven pulley by unscrewing the driven pulley opening tool. Note if the alignment bar plates fit with the pulley flange surfaces.

If not, move the engine until alignment bar plates fit perfectly.



1. Alignment bar plates

Retighten the engine supports.

Adjust all torque rods so they slightly touch the engine block or engine support depending on their location.

Drive Belt Deflection

NOTE: When pulley distance and alignment are adjusted to specifications, refer to DRIVE BELT to adjust drive belt deflection.

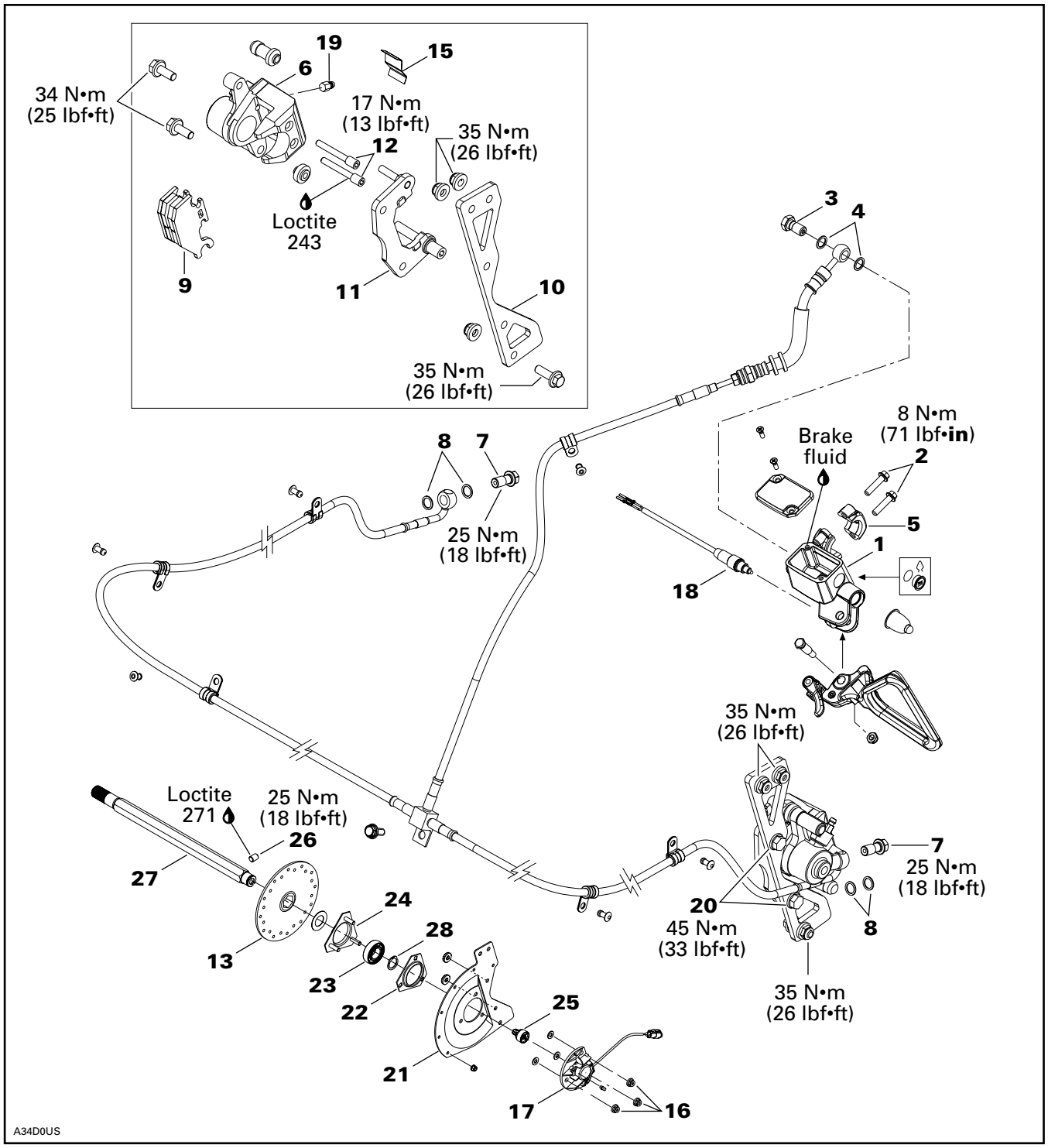
CAUTION: This section deals mainly with adjustment procedures. For complete assembly requirements, refer to the proper ENGINE or TRANSMISSION installation section.

PULLEY ALIGNMENT AND DISTANCE SPECIFICATIONS CHART

MODEL	PULLEY DISTANCE	OFFSET		ALIGNMENT BAR P/N
	Z	X	Y-X	
	± 0.50 mm (.020 in)			
ELITE	121.0 (4.764)	37.0 (1.456)	1.5 (0.060)	529 035 594

BRAKE

HYDRAULIC BRAKE



GENERAL

There are two identical hydraulic brakes installed on the vehicle. In this section procedure for mainly one side is provided. Procedure for another side is the same with few differences of component locations.

BRAKE FLUID

Recommended Fluid

The brake fluid must be changed in accordance with the maintenance chart.

Always use brake fluid meeting the specification DOT 4 only.

CAUTION: Use only DOT 4 brake fluid, SRF (P/N 293 600 063) or GTLMA (P/N 293 600 062) from a sealed container. Do not use fluids other than the recommended one, nor mix different fluids for topping up.

Fluid Level

With vehicle on a level surface , check brake fluid in master cylinder reservoir for proper level. It should be above MIN. mark.

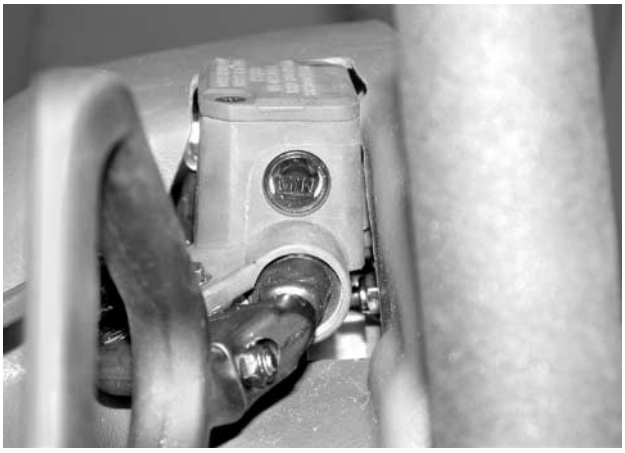
NOTE: Brake fluid level below minimum level may indicates leakage or worn out brake pads.

If fluid level below minimum level, before refilling the reservoir, visually inspect brake hoses joints for leaks and tears or worn out. Replace if damaged.

Add fluid as required. Do not overfill.

CAUTION: Spilling brake fluid on plastic, rubber or painted parts can cause severe damage. Protect these parts with a rag when servicing brake system.

Turn steering in the straight-ahead position to ensure reservoir is level. Check the brake fluid level, the reservoir is full when the fluid reaches the top of window.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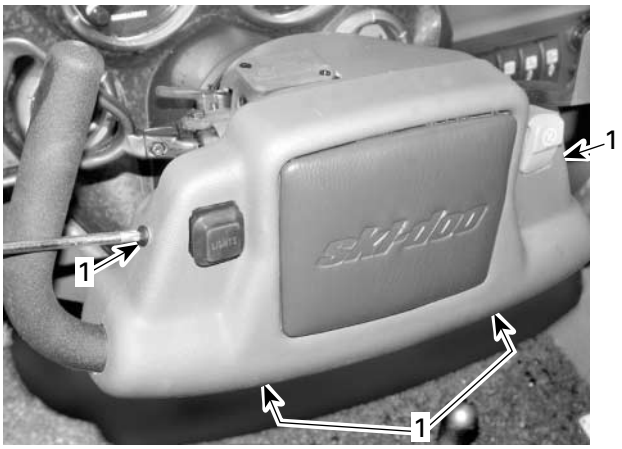
MASTER CYLINDER

Removal

The master cylinder **no. 1** is located on the LH side of steering wheel. Remove the steering cover as mentioned below to access the screws **no. 2** retaining the brake lever to the steering wheel.

Remove the screws as shown in the following picture.



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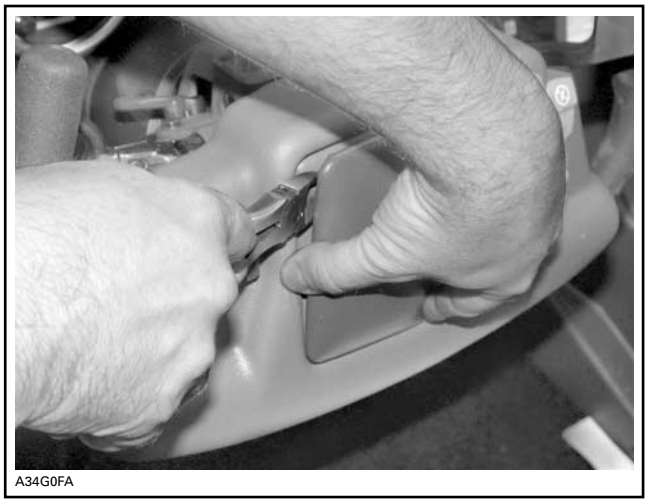
1. Screws to be removed

Slide the steering pad to cut the 4 darts retaining it with the steering cover.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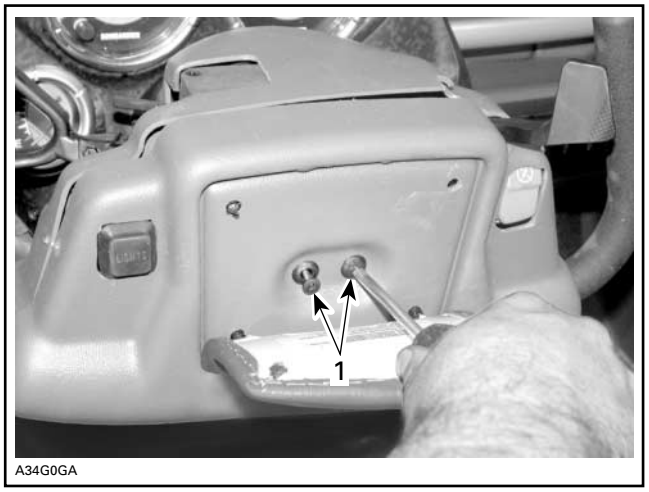
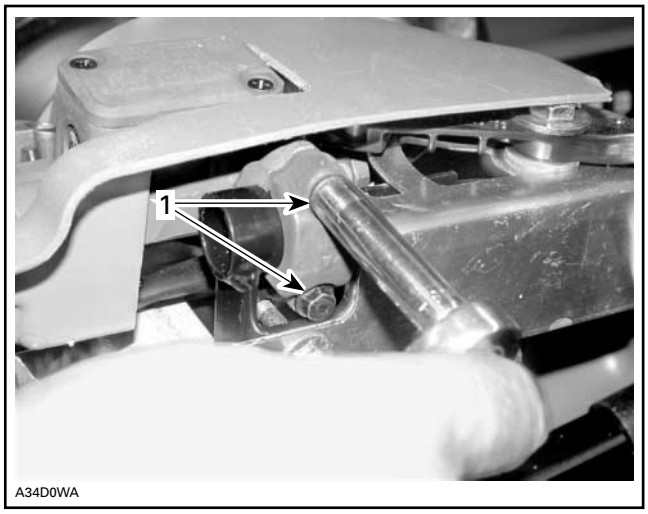
Remove the steering cover by unscrewing the retaining screws.



A34G0GA

1. Retaining screws

Unscrew the screws **no. 2** to detach the brake lever from steering wheel.



A34D0WA

1. Screws

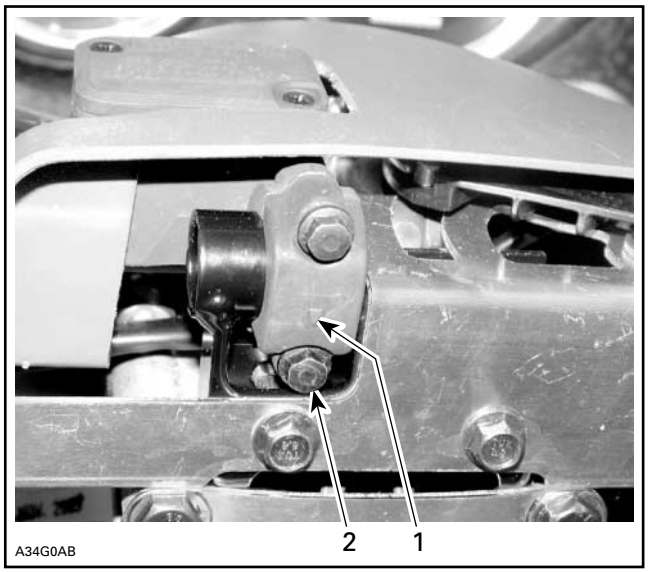
Place a container under Banjo bolt **no. 3** then unscrew it. Discard the sealing rings **no. 4**.

Installation

The installation is the reverse of removal procedure. Pay attention to the following.

Always use new sealing rings **no. 4** during installation.

Install clamp **no. 5** with its arrow pointing at downwards. Tighten to 8 N•m (71 lbf•**in**) lower screw before upper one.



A34G0AB

1. Arrow on upper clamp pointing downwards
2. Tighten lower screw first

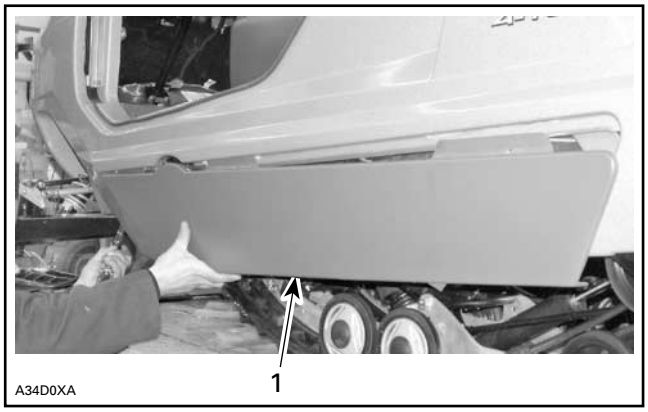
Bleed the brake system. Refer to BLEEDING.

CALIPER

There is one caliper installed on each side of the vehicle. Procedure for LH and RH side caliper is the same. Procedure for LH side is provided below.

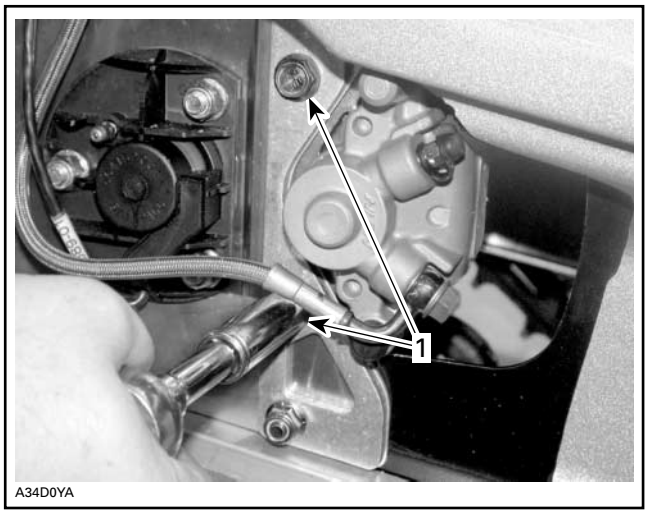
Removal

Remove the plastic molding.



1. Plastic molding

Remove screws **no. 20** and detach caliper **no. 6** from the chassis.



1. Screws

NOTE: There are two spacers glued to brake support bracket **no. 10**. While doing the caliper removal procedure make sure to save those for installation.

CAUTION: Do not let the caliper hang by the hose and do not stretch or twist the hose.

Unscrew the bleeder screw **no. 19** and drain the brake system completely.

To completely drain the brake fluid, continuously press the brake lever until all liquid escaped out.

CAUTION: Spilling brake fluid on plastic, rubber or painted parts can cause severe damage. Protect these parts with a rag when servicing brake system.

Place a container under caliper. Do not remove the Banjo bolt **no. 7** during draining.

When the system is empty, remove the Banjo bolt. Discard the sealing washers **no. 8**.

Inspection

Remove brake pads **no. 9**, refer further in this section.

Check pistons for scratches , rust or other damages. If so, replace the caliper as an assembly.

NOTE: Only brake pads are available as spare parts.

Installation

Push pistons all the way in to allow caliper installation over brake disc.

Install the Banjo bolt **no. 7** with two new sealing rings **no. 8**.

Fill the brake system and bleed it. Refer to BLEEDING in this section.

⚠ WARNING

Make sure spacers are between caliper support no. 11 and brake support bracket no. 10. Use loctite 271 to stick spacers on brake support bracket.

The brake disc **no. 13** must be centered in caliper. Apply brake then check for proper brake disc positioning.

Push on appropriate caliper piston in order to move pad inward allowing proper brake disc positioning.

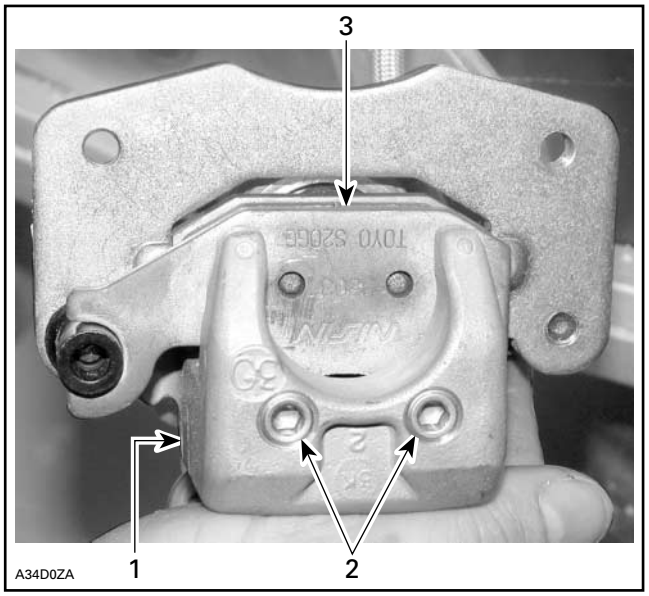
Apply brake then recheck.

BRAKE PADS

Removal

Brake pads removal procedure is as follows:

– Detach the caliper from the chassis as per the procedure mentioned above.
– Unscrew pad pins **no. 12**.



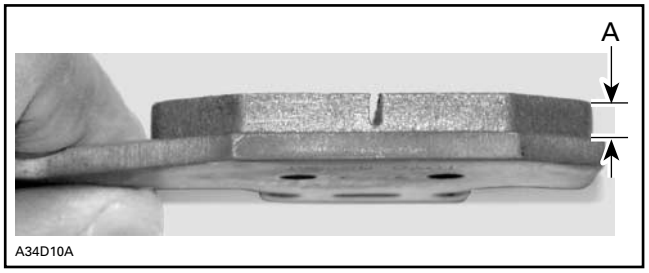
1. Caliper
2. Pad pins
3. Brake pads

– Remove the brake pads **no. 9**.

Inspection

Brake pads **no. 9** must be replaced when lining is 1.5 mm (1/16 in) thick or less.

CAUTION: Brake pads must always be replaced in pairs.



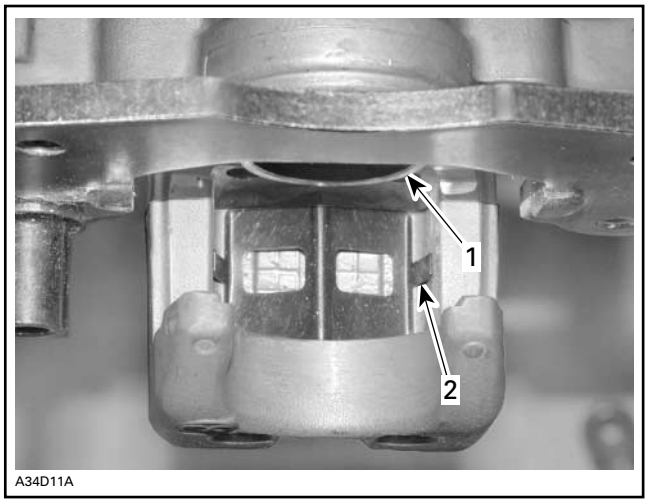
A. 1.5 mm (1/16 in) minimum

Installation

Push caliper piston inwards before installing brake pads.

NOTE: To avoid damaging the piston, use an old pad to push it into the caliper.

Make sure that pad spring **no. 15** is in position as shown in the following picture.



1. Piston
2. Pad spring

Install new brake pads.

⚠ WARNING

Avoid getting fluid, oil or grease on brake pads. Contaminated brake pads can affect stopping capacities.

Install new pad pins by pushing in the pads against pad spring to align pad slots in the pads and caliper body.

Install caliper so that the disc is centered between pads. Refer to CALIPER.

NOTE: Be careful not to damage pads and make sure pads are correctly inserted in their location.

After the job is completed, firmly press the brake lever until both new pads are touching the brake disc. Check for leaks and make sure the brakes operate normally before driving. The pads must rest flat on the disk.

BRAKE DISC

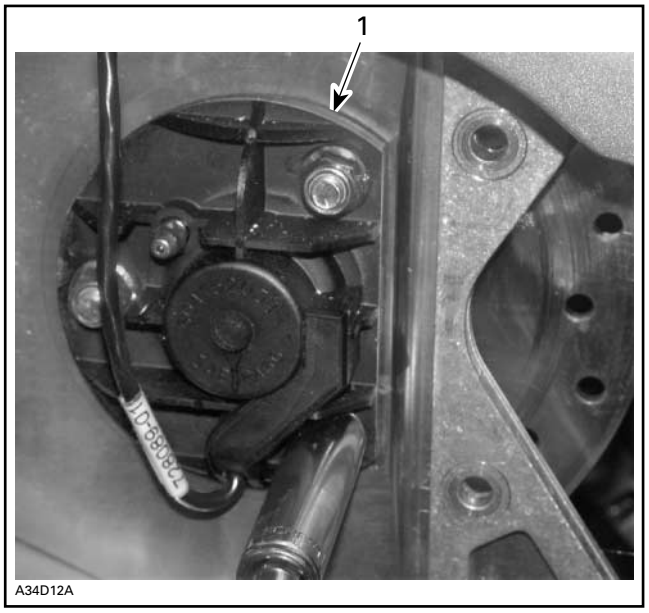
Removal

Brake disc **no. 13** can be removed as follows:

– Detach caliper from brake support **no. 10**.

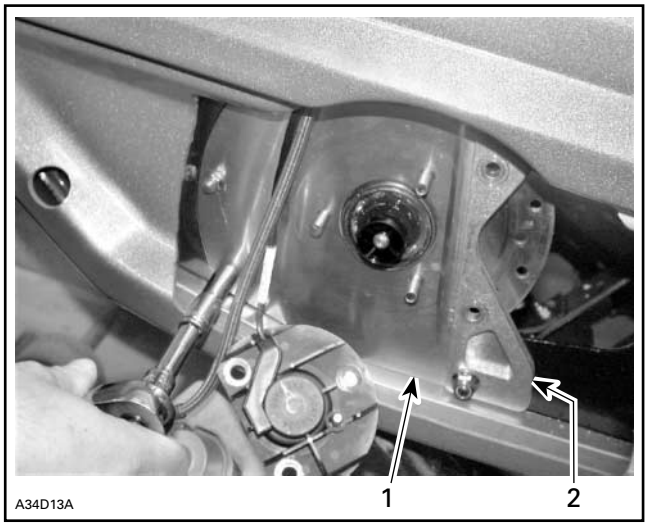
CAUTION: Do not let the caliper hang by the hose and do not stretch or twist the hose.

– Remove elastic flanged nuts **no. 16** to remove the speed sensor **no. 17**.



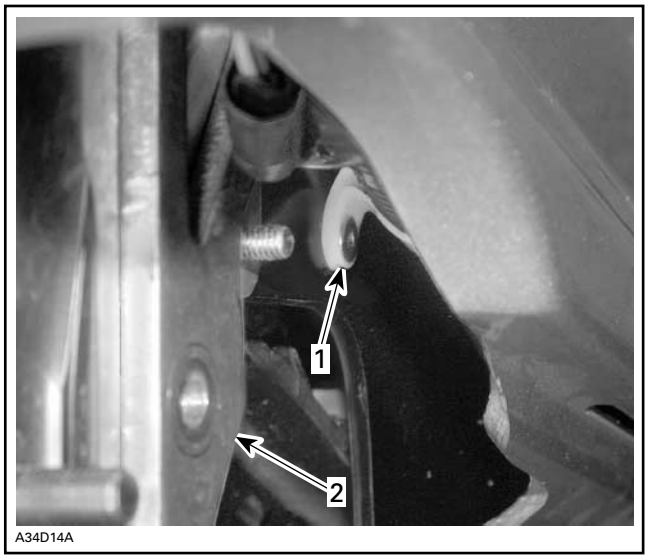
1. Speed sensor

– Remove the nuts retaining the sprocket plate **no. 21**.



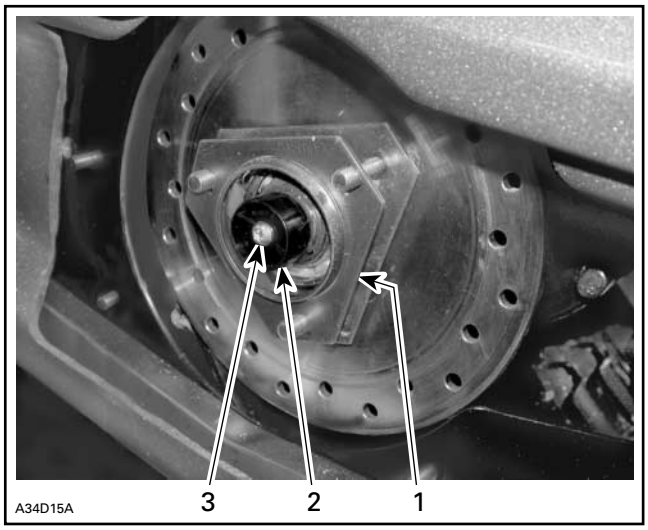
1. Sprocket plate
2. Brake support

– Cut the tie rap to have access to brake support retaining nuts.



1. Tie rap
2. Brake support

– Remove the remaining sprocket plate nuts and remove it from the brake disc.
– Remove the flange **no. 22**, magnetic adaptor **no. 25** and retaining screw.

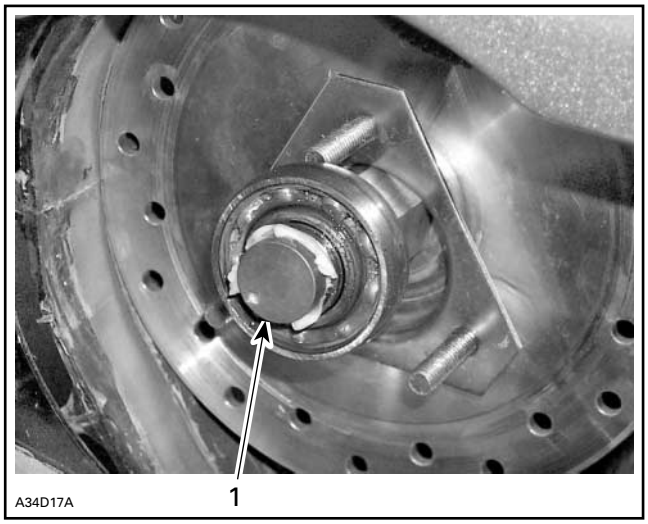


1. Flange
2. Magnetic adaptor
3. Screw

– Remove circlip **no. 28** from the bearing.


A34D16A

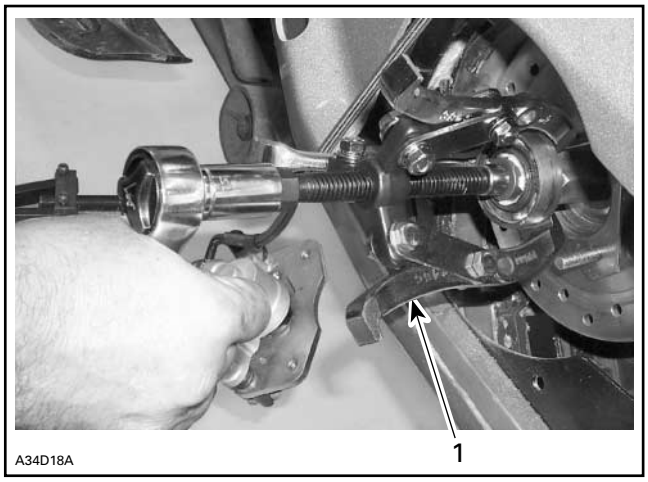
– Unscrew the brake disc set screw **no. 26**.
– Loosen the track tension and move the disc inwards.
– Install a protective cap with some grease, on the bearing.



A34D17A

1. Protective cap

– Using 3 jaw puller remove the bearing **no. 23**.



A34D18A

1. Puller

– Remove bearing housing **no. 24** and slide out the brake disc **no. 13**.

Inspection

Check for scoring, cracking or bending, replace as required.

CAUTION: Brake disc should never be machined.

Installation

For the installation, reverse the removal procedure. Pay attention to the following.

CAUTION: Do not reuse drive shaft bearing. If ever removed, always replace bearing with new one.

Apply anti-seize lubricant (P/N 293 800 070) on shaft. Before re-installing set screw apply loctite 271 on it.

Pay attention to main harness while inserting brake disc, brake support and sprocket plate.

BRAKE LIGHT SWITCH

Removal

The brake light switch **no. 18** is located near the brake lever. To remove the switch, use the following.

Disconnect the switch.

Take out the master cylinder from the steering wheel.

Overturn the master cylinder so that the bottom is on the top.

Fix the master cylinder in a rigid way preferably in a vise.

Pull out the switch wire and rubber cover.

Activate the parking brake.

With the help of a proper tool, carefully unscrew the switch body paying attention not to twist or distort switch.

Remove the remaining glue with alcohol on a piece of cotton and then clean the seat threads with the clamp screw. If there is resistance to the advance of the clamp screw, use a proper wrench.

NOTE: In case of switch body breaking while removal, re-tap threads on master cylinder seat and finalise installation procedure.

Installation

NOTE: The brake light switch is not adjustable.

Put the switch on the seat, rotating it only 1.5 turns.

Put one drop of Loctite 609 (P/N 413 703 100) on the free switch threads.

Screw the switch by hand until it is in a correct position.

For safety reasons, check the activation of the switch by pulling the brake lever. In case of no switch activation, repeat all the procedure replacing a new switch.

NOTE: If parking brake release during the mounting operations, set the master cylinder in a sloping position (with lever on the top) and hold the master cylinder lever for 3/4 times.

Reinstall the master cylinder on the steering wheel taking it in a horizontal position avoiding the risk of glue contamination for the switch rod.

Release the parking brake.

Wait 24 hours to allow glue to set.

Recheck if switch is working properly.

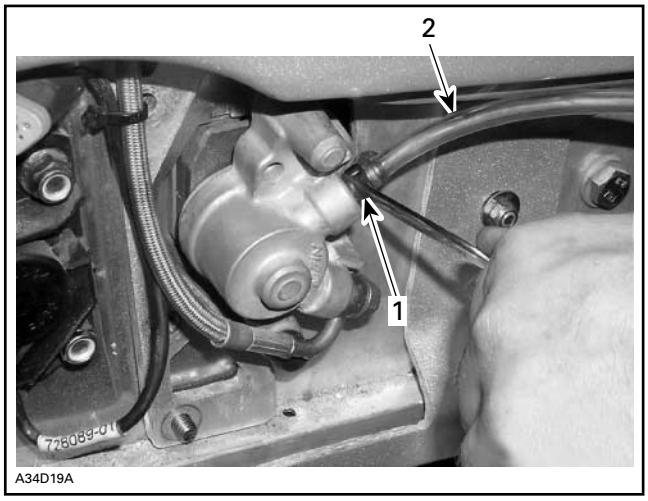
BLEEDING

Bleed brake system as follows:

Keep sufficient recommended brake fluid in reservoir at all times.

CAUTION: Use only DOT 4 brake fluid, SRF (P/N 293 600 063) or GTLMA (P/N 293 600 062). Do not use fluids other than the recommended one, nor mix different fluids for topping up.

Install a clear hose on no. 19. Route this hose to a container. Open bleeder.



1. Open bleeder
2. Clear hose to catch used brake fluid

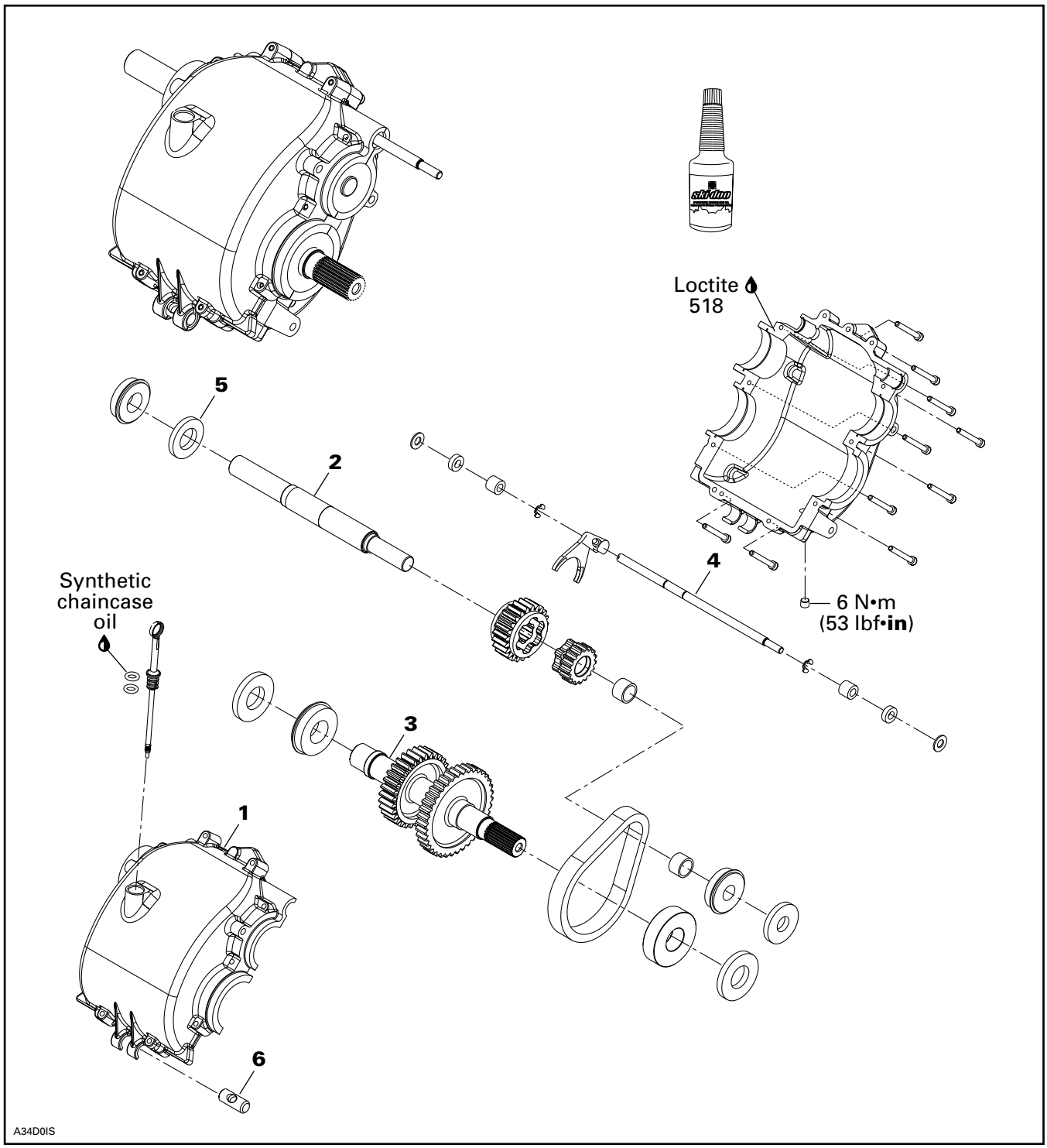
Pump brake lever until no air escapes from hose.

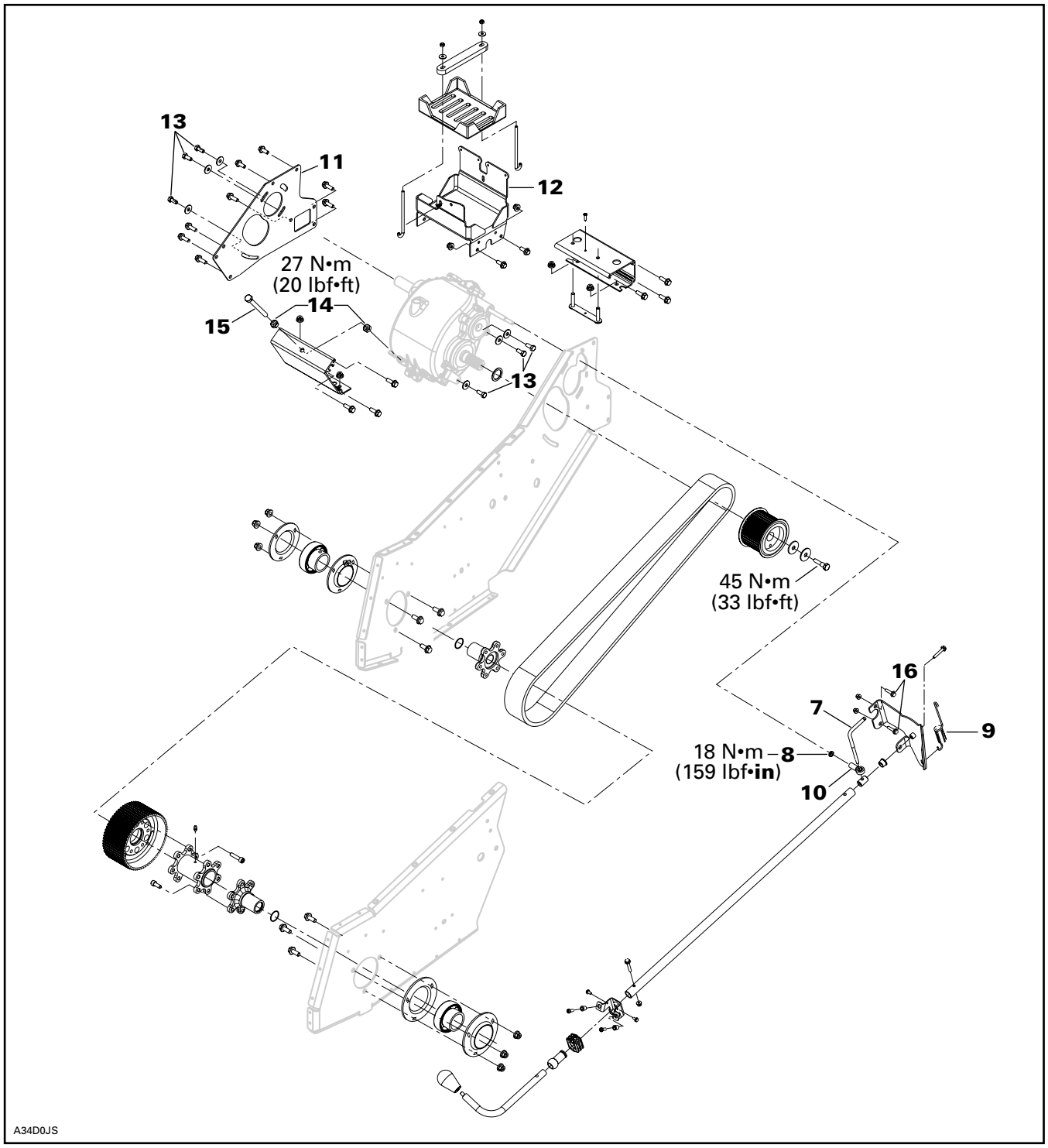
Close bleeder.

⚠ WARNING

Avoid getting oil on brake pads.

GEARBOX AND FINAL DRIVE BELT




13
11
12
27 N•m
(20 lbf•ft)
14
15
13
45 N•m
(33 lbf•ft)
16
7
9
18 N•m
(159 lbf•in)
8
10
A34D0JS

GEARBOX

OIL CHANGE

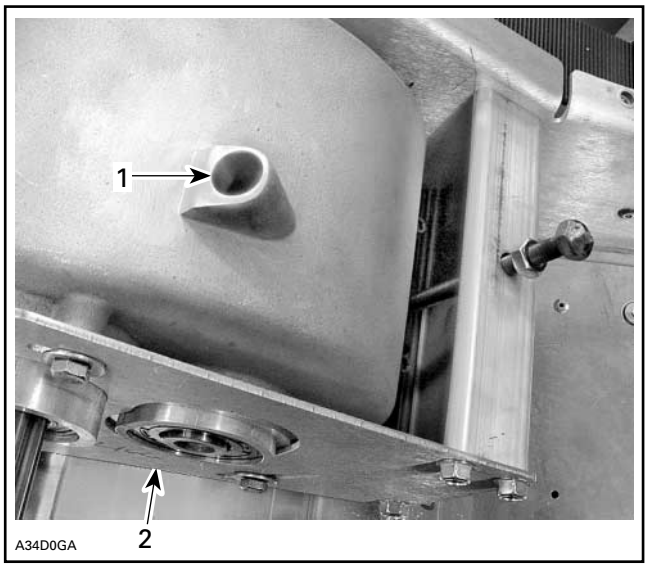
Remove the dipstick.

Remove metal particles from the magnet at the end of dipstick.

NOTE: It is normal to find metallic particles stuck to dipstick magnet. If bigger pieces of metal are found, overhaul the gearbox.

Siphon used gearbox oil through the dipstick hole.

Remove the drain plug to completely drain gearbox.

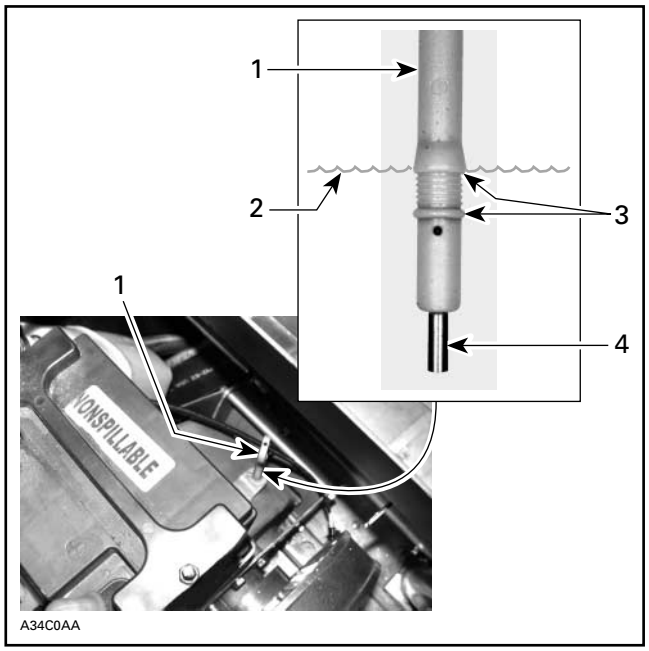


1. Dipstick hole
2. Drain plug

Reinstall the drain plug.

Pour recommended gearbox oil through dipstick hole. Refer to TECHNICAL DATA for oil type and quantity.

With snowmobile on a level surface, check the oil level by removing dipstick. Oil level must be between upper and lower marks. Refill as required. Do not overfill.



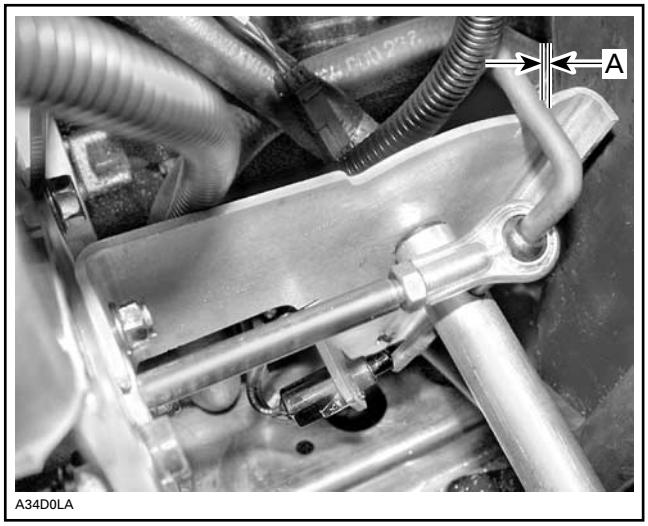
1. Dipstick
2. Oil level
3. Safe operation level
4. Magnet

SHIFTER ADJUSTMENT

NOTE: Fork axle movement range should be centered with shifter movement range.

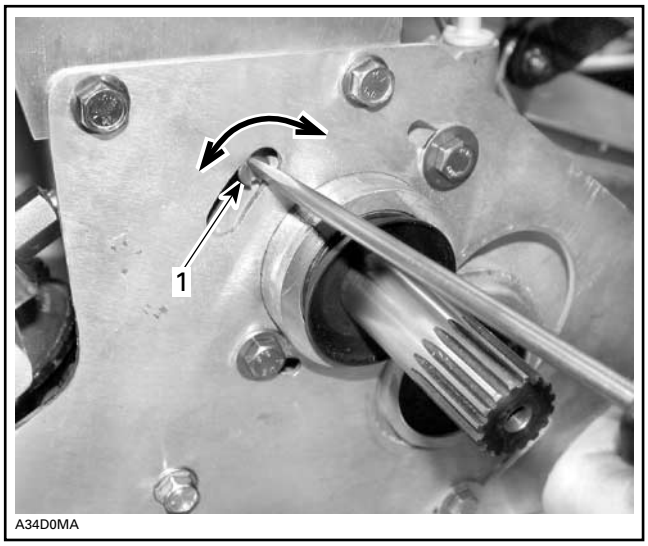
Shift in reverse.

Check if pivot **no. 7** is at least 0.5 mm (.020 in) from stopper.



REVERSE POSITION
A. 0.5 mm (.020 in)

To adjust, loosen lock nut **no. 8** and turn fork axle accordingly.

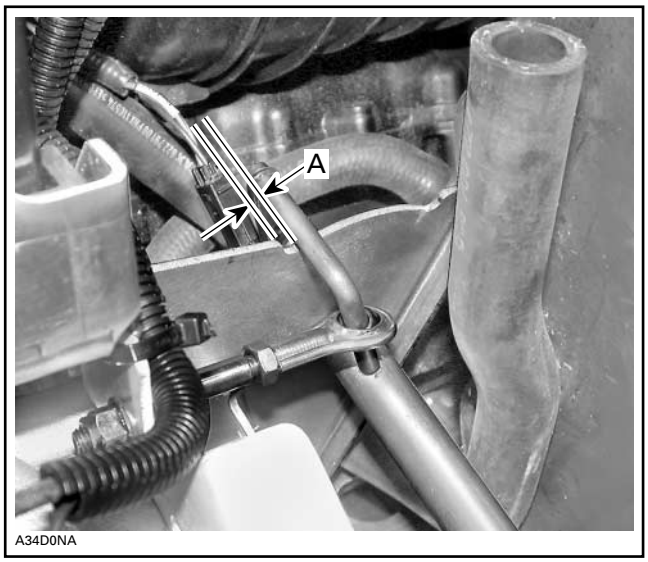


DRIVEN PULLEY REMOVED
1. Fork axle end

Before tightening lock nut **no. 8**, position ball joint **no. 10** 90° to pivot **no. 7** to allow proper ball joint free rotation.

Shift in forward position.

Check if pivot **no. 7** is at least 0.5 mm (.020 in) from stopper.



FORWARD POSITION
A. 0.5 mm (.020 in)

To adjust, proceed as described above.

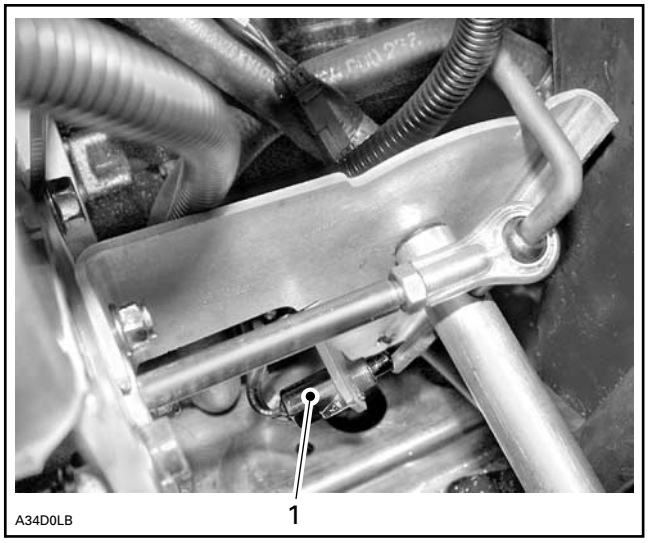
Check reverse switch adjustment as described above.

REVERSE SWITCH ADJUSTMENT

Short to ground the ORANGE/WHITE wire of VCM. Refer to TESTING PROCEDURE.

Shift in reverse.

Reverse alarm must sound. If not, unplug reverse switch to avoid twisting wires, loosen lock nut and screw switch in.



1. Reverse switch

Reconnect and check for sound. Repeat adjustment as required.

Reconnect switch and tighten lock nut. Reconnect ORANGE/WHITE wire.

REMOVAL

Remove the drive belt and the driven pulley.

Remove the battery. Refer to BATTERY.

Remove the battery rack **no. 12**.

Drain gearbox oil as explained in OIL CHANGE.

Remove final drive belt from top drive sprocket as explained in FINAL DRIVE BELT. Remove the drive sprocket from output shaft of gearbox.

Unfasten fork axle from ball joint **no. 10**.

Remove transmission support **no. 11**.

Unbolt gearbox from chassis and remove it.

DISASSEMBLY

Unbolt the gearbox cover **no. 1**.

Remove the input **no. 2** and output **no. 3** shafts together.

Remove the fork axle **no. 4**.

Discard all oil seals.

Use a workshop press to remove ball bearings from shafts.

INSPECTION

Bearings

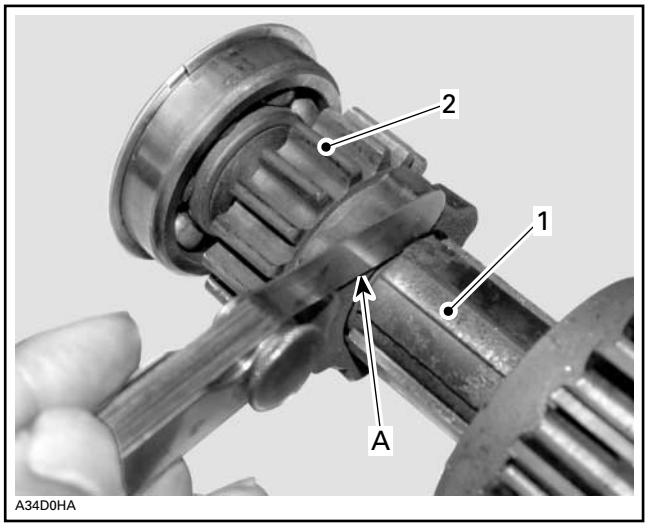
Check bearing condition. There must be no discoloration, missing balls or rollers, broken cages, etc.. Replace damaged bearings.

Sprockets and Gears

Check teeth and splines. Replace damaged parts.

ASSEMBLY

When pressing the LH side ball bearing, respect a side play of 0.2 to 0.4 mm (.008 to .016 in) between input shaft counterbore and the sprocket.



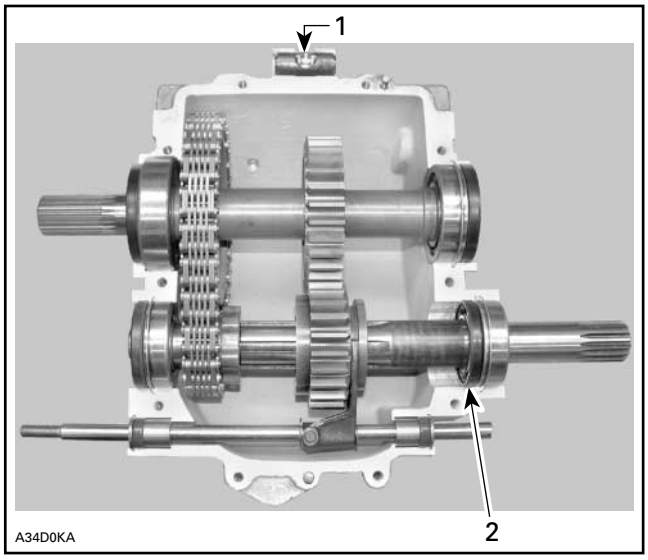
1. Input shaft
2. Sprocket
A. 0.2 to 0.4 mm (.008 to .016 in)

Note position of oil seal **no. 5**. Refer to following photo.

Install stopper **no. 6** in gearbox housing before closing gearbox.

Apply Loctite 518 (P/N 293 800 038) on sealing surface.

Tighten cover screws in a crisscross sequence.



1. Stopper no. 6
2. Oil seal no. 5

INSTALLATION

Reverse removal procedure. Pay attention to the following.

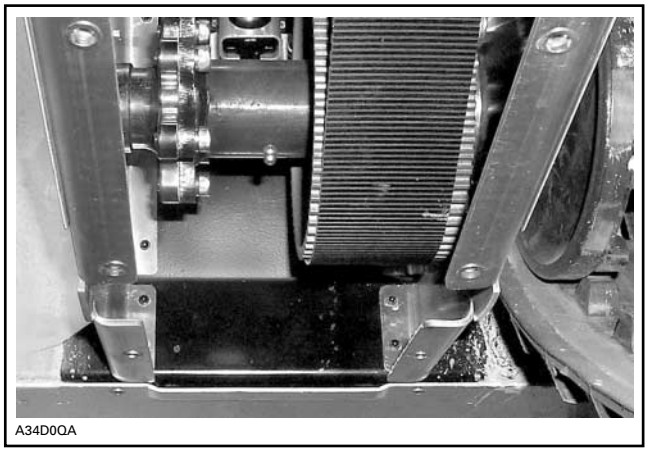
Readjust final drive belt deflection. Refer to DEFLECTION ADJUSTMENT.

Readjust shifter. Refer to SHIFTER ADJUSTMENT.

FINAL DRIVE BELT

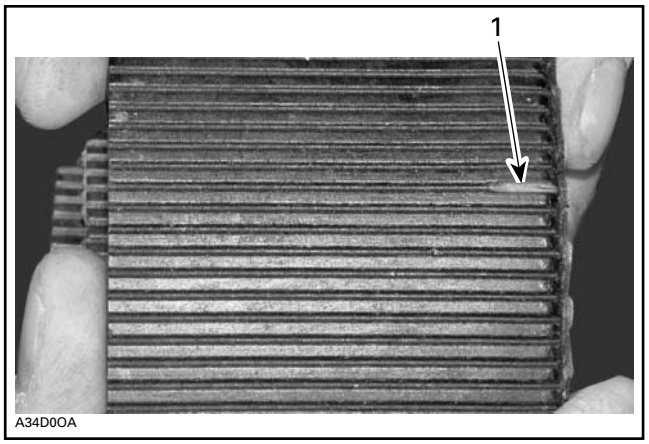
INSPECTION

Working underneath of vehicle, remove the bottom protective plate.



BOTTOM PROTECTIVE PLATE REMOVED

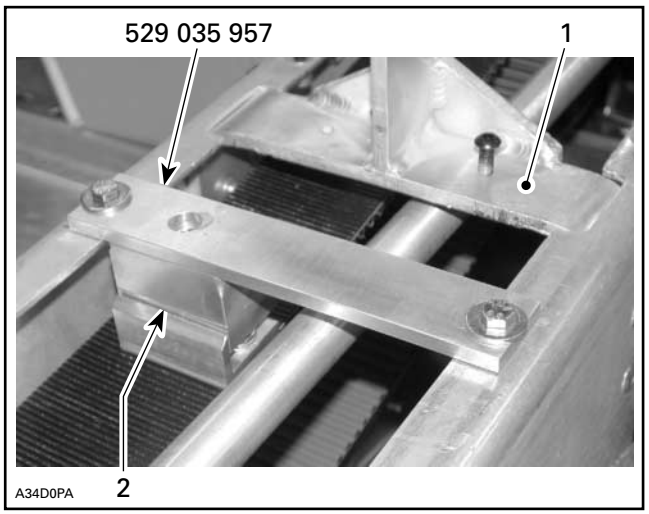
Check final drive belt all over its length for cracks. Replace if any cracks are found.



1. Crack

DEFLECTION ADJUSTMENT

Remove seats and top protective plate. Install belt tension tool (P/N 529 035 957) as per following photo.



1. Safety belt anchor
2. Correct deflection line

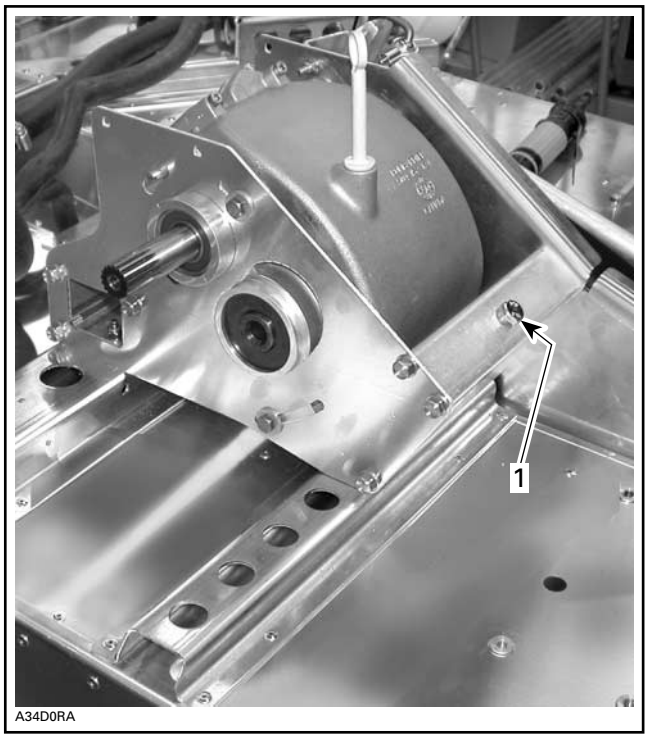
Sliding part edge of belt tension tool should be equal to correct deflection line. This line corresponds to a deflection of 10.8 mm (.425 in) when applying a downward force of 20.69 to 21.99 kgf (45.61 to 48.48 lbf).

To adjust, remove driven pulley and engine compartment wall.

IMPORTANT: Loosen the two M6 x 25 bolts **no. 16** retaining the shifter pivot plate to RH reinforcement. The shifter pivot plate must be moved out from gearbox machined emboss (around fork axle) in order to allow free gearbox movement for belt deflection adjustment.

Loosen gearbox retaining bolts **no. 13** and adjuster lock nuts **no. 14**.

Turn adjuster **no. 15** accordingly. Screw in adjuster will reduce deflection.



1. Adjuster

Retighten lock nuts **no. 14** to 27 N•m (20 lbf•ft).

Retighten shifter pivot plate nuts and bolts **no. 16**.

Check shifter adjustment as described above.

REMOVAL

Remove drive belt and driven pulley.

Remove seats, top protective plate, engine compartment wall and bottom protective plate.

IMPORTANT: Loosen the two M6 x 25 bolts **no. 16** retaining the shifter pivot plate to RH reinforcement. The shifter pivot plate must be moved out from gearbox machined emboss (around fork axle) in order to allow free gearbox movement for belt deflection adjustment.

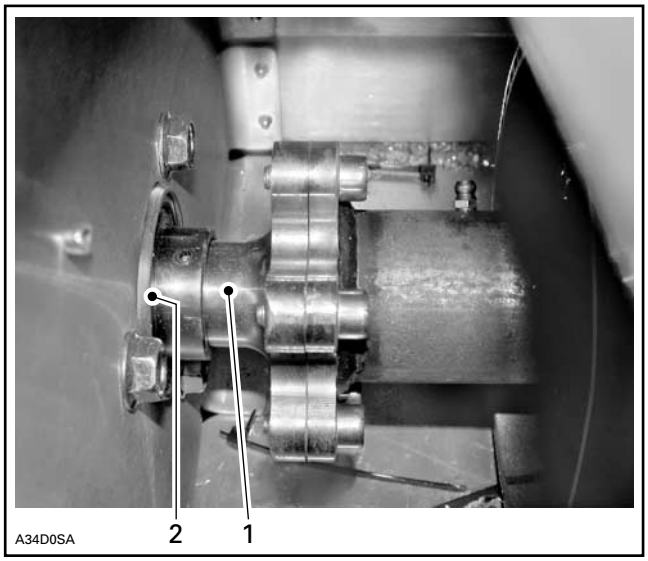
Loosen final drive belt tension. Refer to DEFLECTION ADJUSTMENT.

Remove final drive belt from drive sprocket.

Remove LH side rear suspension. Refer to SC–10 III SUSPENSION.

Remove LH side drive axle. Refer to DRIVE AXLE.

Unbolt LH side hub and end bearing of drive axle.



SEEN FROM TOP
1. Hub
2. End bearing

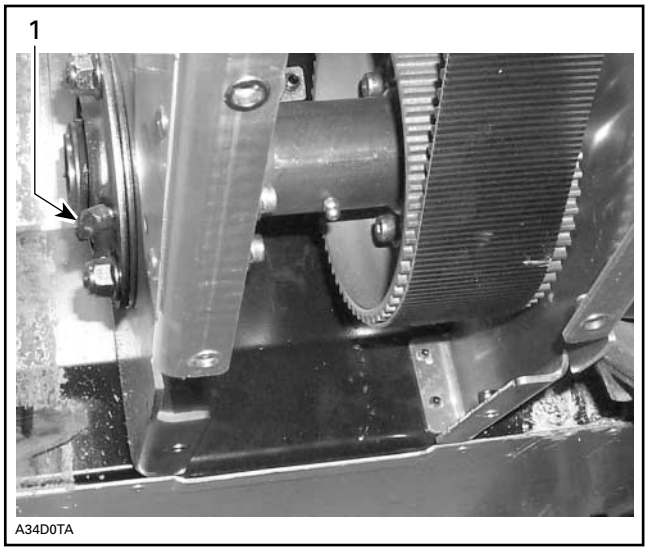
Move LH side hub against tunnel wall.

Pass the final drive belt between junction axle and LH hub.

INSTALLATION

Reverse removal procedure. Pay attention to the following.

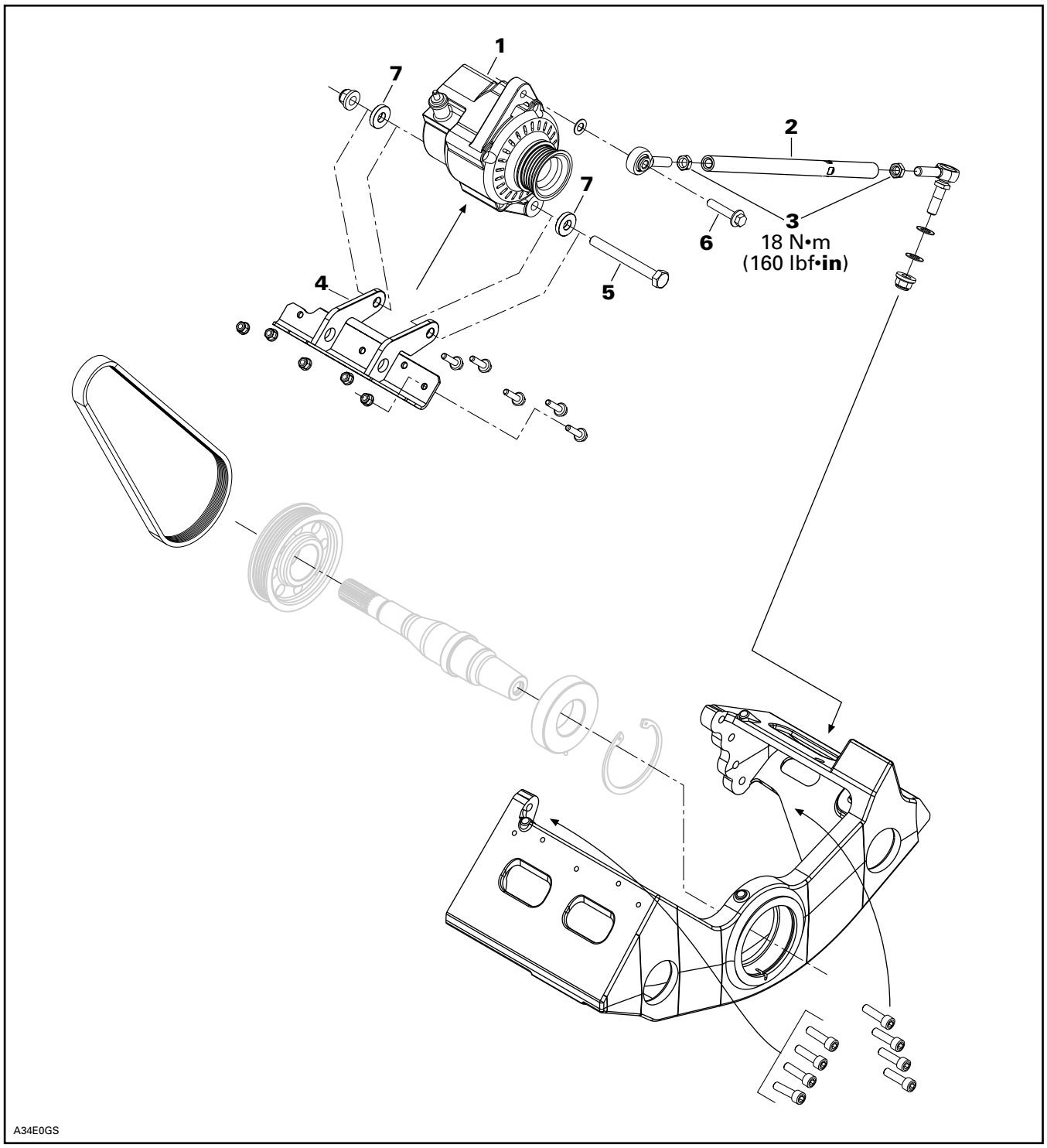
Install end bearing with its grease fitting pointing downward.



SEEN FROM UNDERNEATH
1. Grease fitting of end bearing housing

Readjust deflection of final drive belt. Refer to DEFLECTION ADJUSTMENT.

ALTERNATOR



REMOVAL

Disconnect BLACK negative cable from battery.

⚠ WARNING

Battery BLACK negative cable must always be disconnected first and connected last.

Remove air silencer, foam and belt guard.

Disconnect RED cable from alternator. Disconnect electric connector from alternator.

Loosen alternator belt tension. To do so, loosen alternator mounting bolt **no. 5** and retaining bolt **no. 6**, then lock nuts **no. 3**. Turn adjustment rod **no. 2** accordingly.

Remove alternator belt from alternator pulley.

Unfasten adjustment rod **no. 2** from alternator, then remove mounting bolt **no. 5**. Remove alternator.

NOTE: If the engine pulley or the alternator belt needs to be replaced, refer to PTO HOUSING.

INSPECTION

NOTE: The alternator does not require any maintenance and must not be opened for repair work.

Inspect the housing and ball bearings for damage or wear. In case of damage, the alternator must be replaced. The alternator can only be replaced as a complete assembly.

INSTALLATION

The installation is the reverse of removal procedure. Pay attention to the following details.

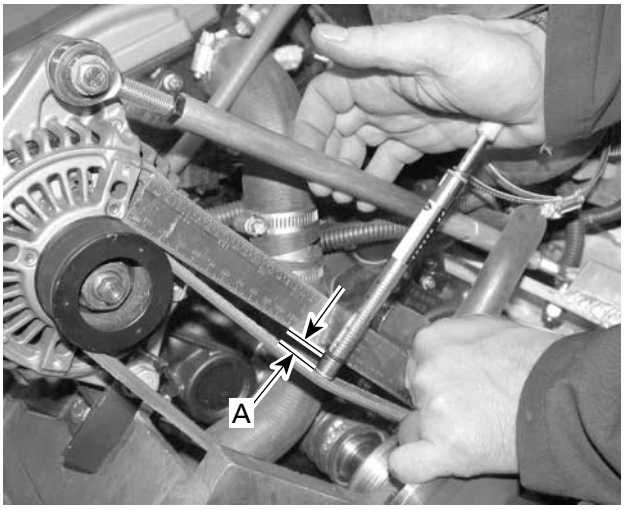
Make sure to install a washer **no. 7** on each side of alternator mounting emboss and alternator support **no. 4**.

Proceed with alternator belt tension adjustment.

BELT TENSION ADJUSTMENT

Make sure alternator mounting bolt **no. 5**, retaining bolt **no. 6** and lock nuts **no. 3** are loose.

Measure belt deflection when applying a downward force of 2.27 kg (5 lb) on the belt at mid point between pulleys. Deflection must be 4 mm (.157 in).



A. Deflection

Turn adjustment rod **no. 2** accordingly. Retighten lock nuts **no. 3**, alternator mounting bolt **no. 5** and retaining bolt **no. 6**, then recheck deflection. Readjust if required.

BATTERY

GENERAL

Absorbed Glass Mat (AGM) battery (YIX30L, P/N 515 175 949) is used for the Elite model. AGM battery is sealed, non-spillable and maintenance free.

REMOVAL

⚠ WARNING

Battery BLACK negative cable must always be disconnected first and connected last.

⚠ WARNING

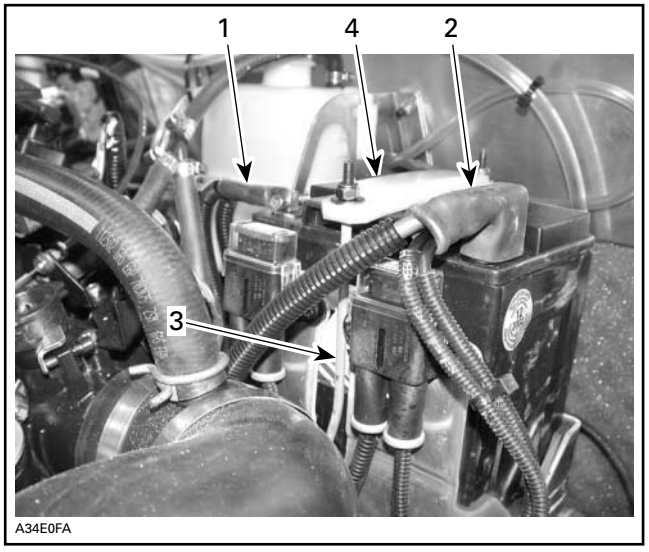
Never charge or boost battery while installed on vehicle.

Disconnect the BLACK negative cable first.

Slide off the rubber boot from the RED positive post and disconnect RED positive cables.

Unfasten both retaining rods and remove the battery retainer.

Remove the battery.



1. BLACK negative post
2. Rubber boot for RED positive post
3. Retaining rods
4. Battery retainer

CAUTION: Should any electrolyte spillage occur, immediately wash off with a solution of baking soda and water to prevent damage to vehicle components.

CLEANING

Clean the battery, battery casing, cables and battery posts using a solution of baking soda and water.

Remove corrosion from battery cable terminals and battery posts using a firm wire brush. Battery top should be cleaned by soft brush and baking soda/water solution.

INSPECTION

Visually inspect battery casing for cracks, leaks or other possible damage. Discoloration, warping or raised top, indicates that battery has overheated or been overcharged. If casting is damaged, replace battery and thoroughly clean battery tray and close area with water and baking soda.

⚠ WARNING

Should the battery casing be damaged, wear a suitable pair of non-absorbent gloves when removing the battery by hand.

Inspect battery posts for security of mounting.

BATTERY CHARGE TESTING

The sealed and maintenance free battery has to be tested with a voltmeter.

Battery testing requires a voltmeter that can measure DC voltage. Connect a voltmeter parallel to the circuit being tested, observing polarity; otherwise, wrong voltmeter reading will appear.

Check charge condition by using voltmeter. Voltmeter readings appear instantly to show the state of charge.

⚠ WARNING

Connect the positive lead to the battery's positive terminal, and the negative lead to the negative terminal.

STATE OF CHARGE	VOLTAGE READING	ACTION	CHARGE TIME*
100%	12.8 - 13.0 V	None	None required
75% – 100%	12.5 - 12.8 V	Needs charge	3 - 6 hours
50% – 75%	12.0 - 12.5 V	Needs charge	5 - 11 hours
25% – 50%	11.5 - 12.0 V	Needs charge	At least 13 hours then verify state of charge
0% – 25%	11.5 V or less	Needs charge	20 hours

*Charge time using constant current charger at standard amps specified on top of battery. Charging times can vary depending on type of charger. Follow the charger's instruction.

BATTERY CHARGING

CAUTION: Do not ever pry the sealing strip off or add any other fluid to this battery.

CAUTION: Watch charging times carefully. Always stop charging if the battery becomes really warm to the touch. Let it cool down before resuming charging.

Always verify battery state of charge one or two hours after end of charging.

NOTE: When using an automatic charger, refer to charger manufacturer's instructions.

NOTE: When using a constant current charger, follow the recommendation in the above table.

BATTERY STORAGE

Disconnect and remove battery from the vehicle.

The battery must always be stored in fully charged condition.

Clean battery posts and cable terminals using a wire brush. Apply a light coat of dielectric grease (P/N 293 550 004) or petroleum jelly on posts.

Clean battery casing using a solution of baking soda and water. Rinse battery with clear water and dry well using a clean cloth.

Charge the battery every month if stored at temperature **below** 15°C (60°F).

Charge the battery every two week if stored at temperature **above** 15°C (60°F).

ACTIVATION OF NEW BATTERY

⚠ WARNING

Never charge or boost battery while installed on vehicle.

Refer to battery manufacturer's instructions.

INSTALLATION OF BATTERY

Install the battery in the battery support with its posts facing rear of vehicle.

Connect RED positive cables to positive battery terminal. Connect RED wires (coming from 50 A and 60 A fuses).

Connect BLACK negative cable LAST.

⚠ WARNING

Battery BLACK negative cable must always be disconnected first and connected last.

⚠ WARNING

Never charge or boost battery while installed on vehicle.

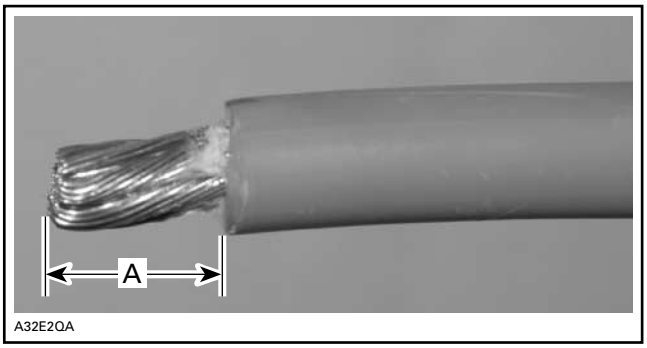
Cover the RED positive terminal with rubber boot.

Install the battery retainer and the retainer rods.

Apply silicone dielectric grease (P/N 293 550 004) on battery posts and connectors.

CABLE TERMINAL INSTALLATION

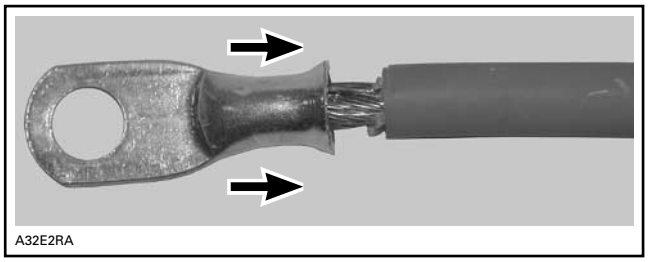
Carefully strip the wire approximately to 13 mm (1/2 in) in length, using a wire stripping tool or sharp blade/knife.



A. 13 mm (1/2 in)

NOTE: Make sure not to cut wire strands while stripping the wire.

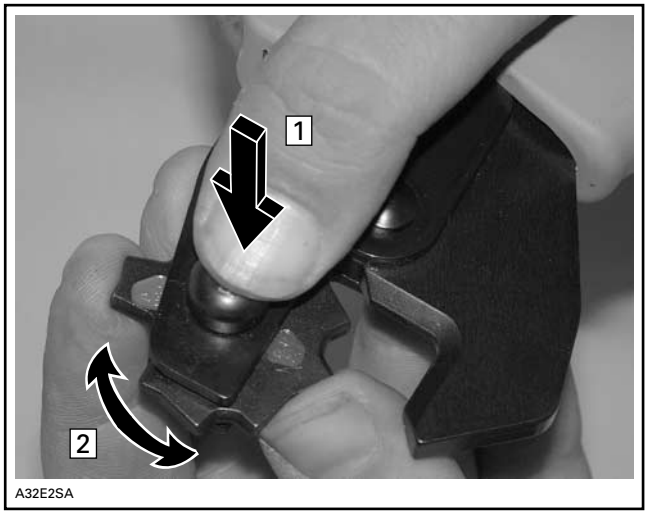
Install the appropriate terminal on the wire according to the requirement. Refer to appropriate parts catalog.


A32E2RA

INSTALLATION OF TERMINAL

Follow the instructions provided with the crimp pliers (P/N 529 035 730) to select the proper position of the tool.

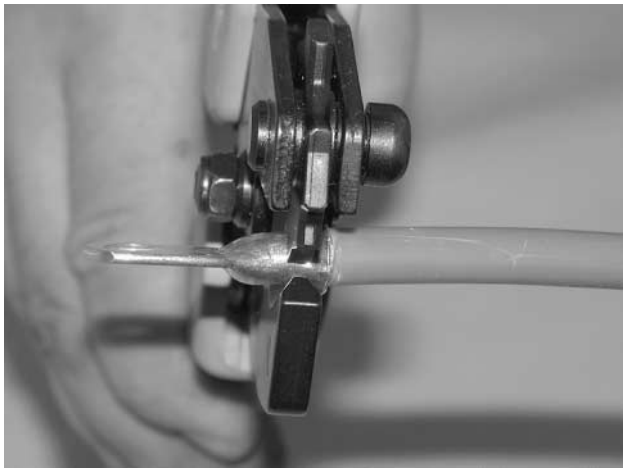
NOTE: Different wires require different crimp pliers settings, so make sure to follow the instruction supplied with the tool.



A32E2SA

POSITIONING THE CRIMP PLIER
1. Press
2. Rotate

After positioning the crimp plier, crimp the terminal already installed on wire.


A32E2TA

CRIMPING OF WIRE


A32E2UA

PROPERLY CRIMPED WIRE

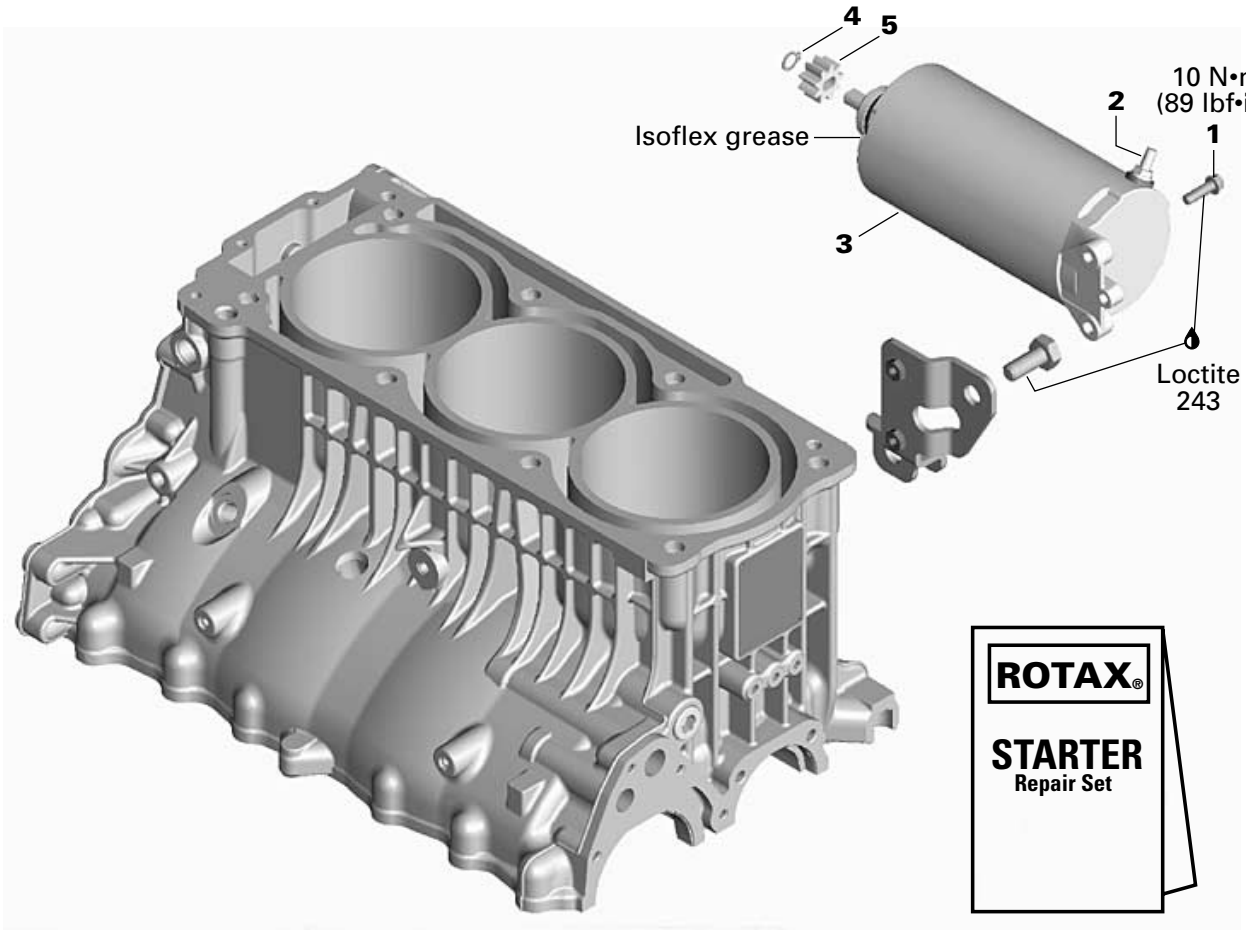
To verify, if the wire is properly crimped, apply some pulling force on wire and the terminal at the same time from both directions.

CAUTION: Never weld the wire to the terminal. Welding can change the property of the wire and it can become brittle and break.

Install the protective heat shrink rubber tube (P/N 278 001 692) on the terminal. Heat the heat shrink rubber tube using the heat gun so that it grasps the wire and the terminal.

CAUTION: Make sure that the protective heat shrink rubber tube has been properly installed and no part of wire is exposed.

ELECTRIC STARTER



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REMOVAL

⚠ WARNING

Short circuiting electric starter is always a danger, therefore disconnect the battery ground cable before carrying out any kind of maintenance on starting system. Do not place tools on battery.

NOTE: For starter drive ass'y servicing, refer to PTO HOUSING.

Disconnect BLACK cable ground connection from battery.

⚠ WARNING

Always disconnect ground cable first and reconnect last.

Disconnect RED cable connection from battery.

Remove the muffler. Refer to EXHAUST SYSTEM.

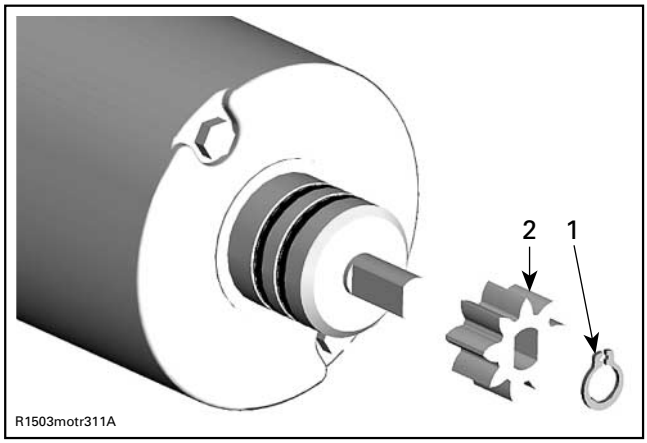
Remove the heat shield.

Disconnect red cable from starter. Remove retaining screws **no. 1** from starter.

Pull starter **no. 3** out.

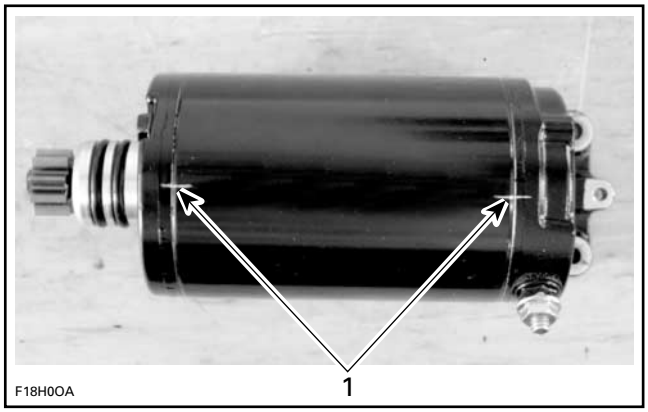
DISASSEMBLY

Remove starter gear retaining circlip **no. 4**, then starter gear **no. 5**.



1. Retaining circlip no. 4
2. Starter gear no. 5

Locate index marks on yoke and end covers.



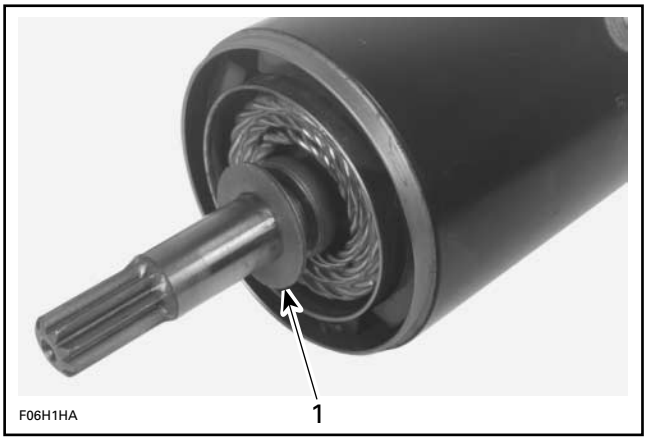
TYPICAL
1. Index marks

Loosen through bolts.

1. Through bolts

Remove end cover.

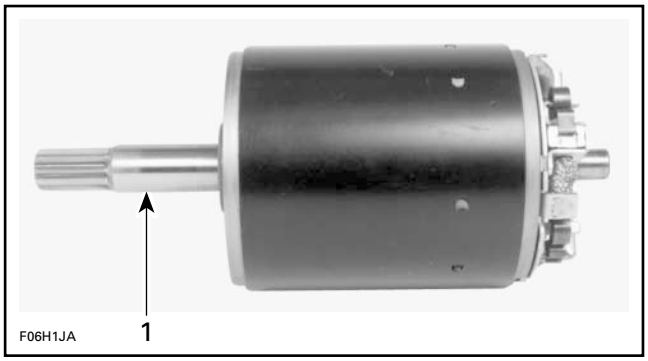
Remove thrust washer from armature shaft.



TYPICAL
1. Thrust washer

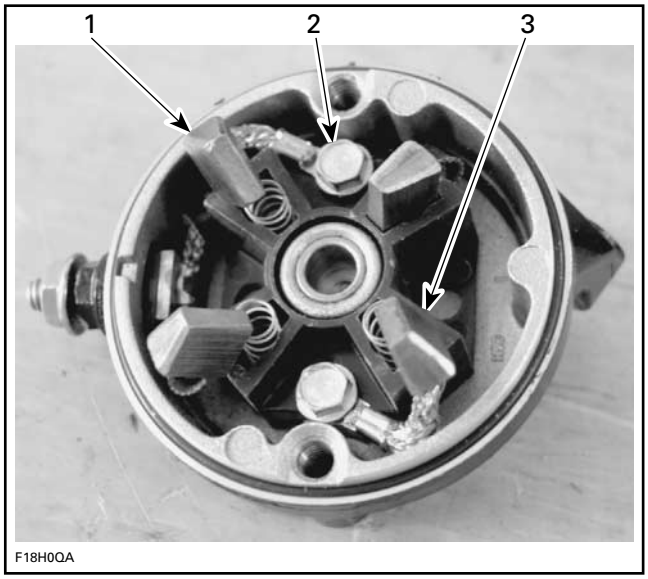
Remove the other end cover with brushes and brush holder assembly.

Remove armature.



TYPICAL
1. Pull armature shaft

Remove brushes from brush holder by loosening retaining screws.



1. Brushes
2. Retaining screw
3. Brush holder

Remove springs.

CLEANING

CAUTION: Yoke ass'y and drive unit assembly must not be immersed in cleaning solvent.

Discard all O-rings.

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.

⚠ WARNING

Always wear safety glasses when 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 ring gear teeth and starter drive ass'y as required. Refer to PTO HOUSING.

NOTE: Bushings or bearings must not be cleaned with grease dissolving agents.

Immerse all metal components in cleaning solution. Dry using a clean, dry cloth.

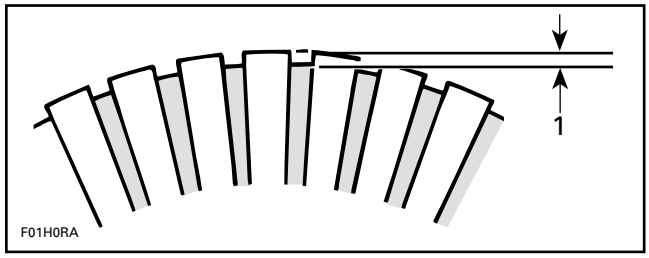
PARTS INSPECTION

Armature

NOTE: An ohmmeter may be used for the following testing procedures, except for the one concerning shorted windings in armature.

Check commutator for roughness, burnt or scored surface. If necessary, turn commutator on a lathe, enough to resurface only.

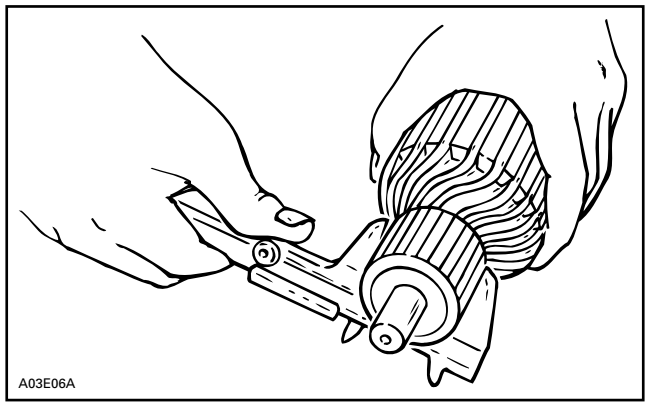
Check commutator for mica depth. If depth is less than 0.20 mm (.008 in), undercut mica. Be sure that no burrs are left and no copper dust remains between segments after undercutting operation is completed.



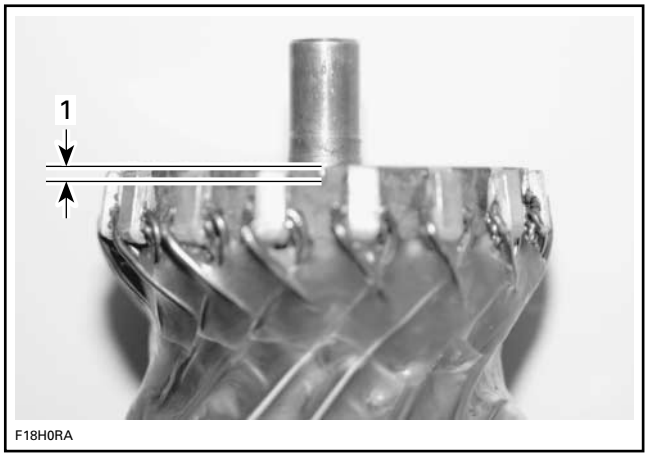
1. Commutator undercut 0.20 mm (.008 in)

Check commutator out of round condition with V-shaped blocks and an indicator. If commutator out of round is more than 0.40 mm (.016 in), commutator should be turned on a lathe.

Check commutator outer diameter. If less than 27 mm (1.063 in), replace.



Check commutator condition with an indicator. If out of specification, replace the starter.



1. Commutator undercut 0.20 mm (.008 in)

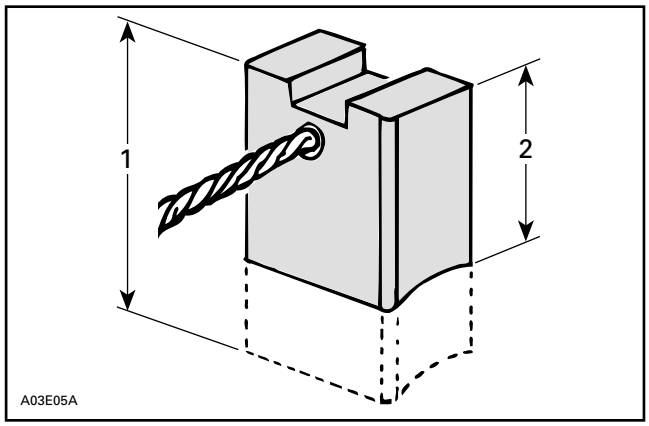
Brush Holder

Check brush holder for insulation using an ohmmeter. Place one test probe on insulated brush holder and the other test probe on brush holder plate. If continuity is found, brush holder has to be repaired or replaced.

Brush

Measure brush length. If less than 8.5 mm (.335 in), replace them.

NOTE: New brush length is 12 mm (.472 in).



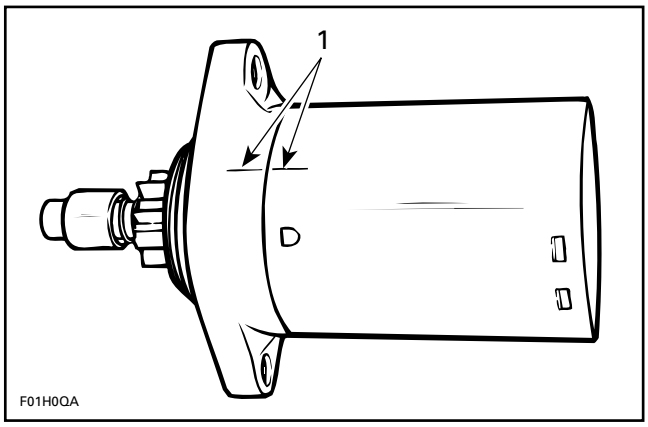
1. New
2. Wear limit 8.5 mm (.335 in)

ASSEMBLY

Reverse the order of disassembly to reassemble starter. However, attention should be paid to the following operations.

Yoke Assembly and Clutch Housing

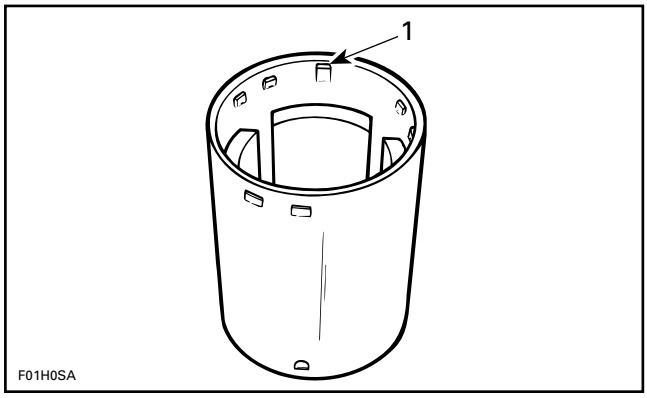
Align previously traced indexing marks.



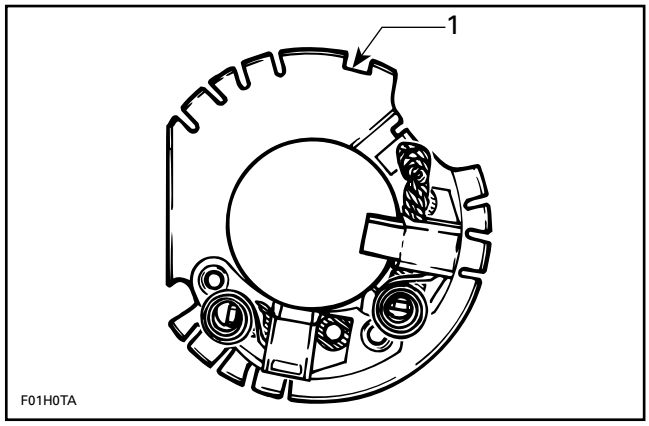
TYPICAL
1. Align marks

Open brushes and slide over commutator.

Align end frame locating notch with yoke locating protrusion and properly sit brush holder into yoke.

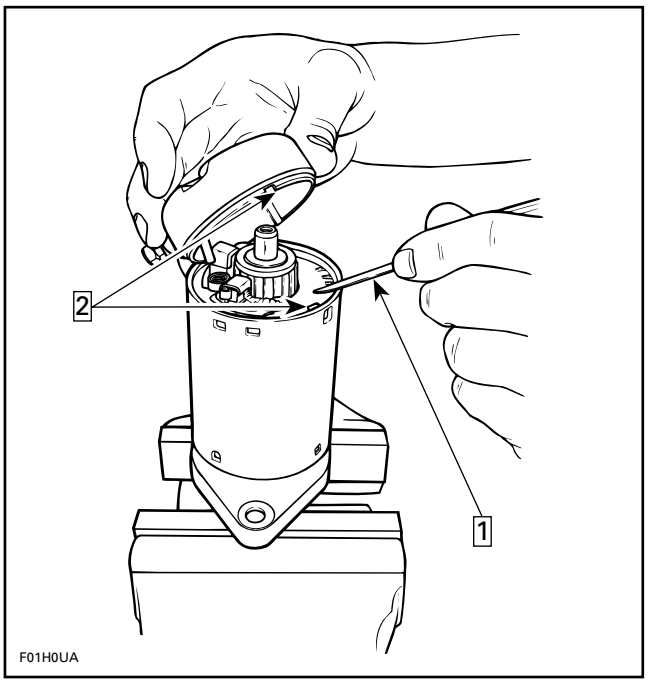


1. Locating protrusion is the higher one



1. Brush holder locating notch

To ease end frame installation, retain brush holder with a small screwdriver while installing end frame.



TYPICAL
1. Retaining brush holder with a screwdriver
2. Align here

Align end frame notch with brush holder notch/ yoke protrusion.

CAUTION: Make sure end frame fits perfectly on yoke.

Apply Loctite 271 (red) on through bolts threads and torque to 6 N•m (53 lbf•**in**).

INSTALLATION

Installation is essentially the reverse of removal procedure. However, pay particular attention to the following.

Make sure that starter and engine mating surfaces are free of debris. Serious trouble may arise if starter is not properly aligned.

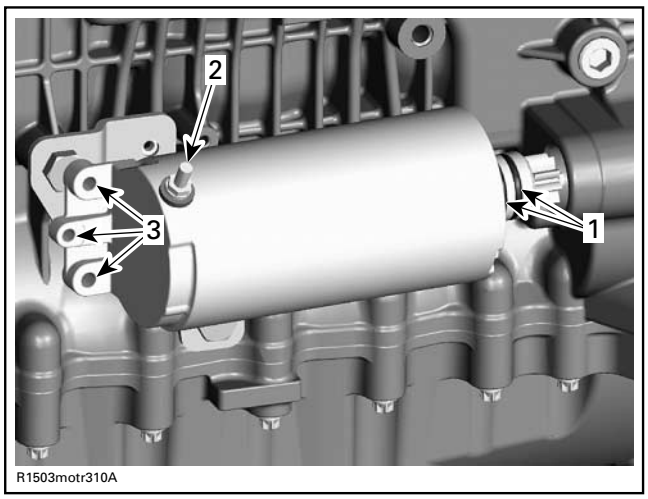
Apply grease Isoflex Topas NB52 (P/N 293 550 021) on O-rings of starter.

Install starter.

NOTE: If starter does not mesh properly, try to pull it out and slightly rotate the starter gear; then re-install starter. One could also temporarily remove both O-rings, properly mesh gears then remove starter to reinstall O-rings, being careful not to rotate gear to keep its position, to finally reinstall starter.

Apply Loctite 243 (blue) on retaining screws **no. 1** and torque to10 N•m (89 lbf•**in**).

Connect the RED positive cable to the starter and torque nut to 7 N•m (62 lbf•**in**). Apply dielectric grease on terminal and nut.



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1. *Grease on O-rings*
2. *Torque nut to 7 N•m (62 lbf•**in**) and apply dielectric grease*
3. *Apply Loctite 243 to threads and torque screws to 10 N•m (89 lbf•**in**)*

Ensure to slide protector over nut to hide metallic parts.

⚠ WARNING

Always connect RED positive cable first then BLACK negative cable last. Whenever connecting the RED positive cable to the starter motor make sure the battery cables are disconnected to prevent electric shock.

STARTER SPECIFICATION

VOLTAGE	12 V
ROTATION	Counterclockwise (viewed from pinion side)
WEIGHT	2.9 kg (6.4 lb)
BATTERY	12 V, 30 Ah

TESTING PROCEDURE

INSPECTION OF HEATING ELEMENTS

Throttle Lever Heating Element

Resistance Measurement at 20°C to 30°C (68°F to 86°F)

INTENSITY	WIRES	OHMS
HIGH	BROWN and BLACK/YELLOW	1.73 to 4.22
LOW	BROWN/YELLOW and BLACK/YELLOW	5.73 to 18.54

Steering Grip Heating Element

Resistance Measurement at 21°C (70°F)

INTENSITY	WIRES	OHMS
HIGH	BLACK and ORANGE	6.8 to 8.4
LOW	BLACK and ORANGE/VIOLET	13.7 to 16.7

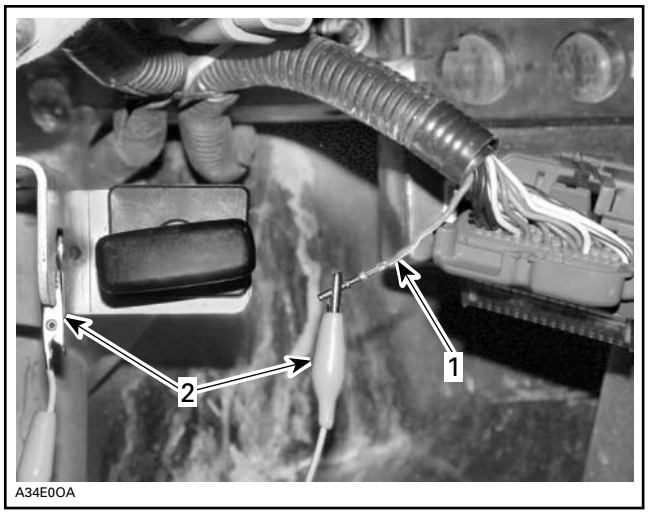
Passenger Heating Grip

Resistance Measurement at 21°C (70°F)

INTENSITY	WIRES	OHMS
HIGH	BLACK and ORANGE	11.4 to 14.0
LOW	BLACK and ORANGE/VIOLET	22.9 to 28.0

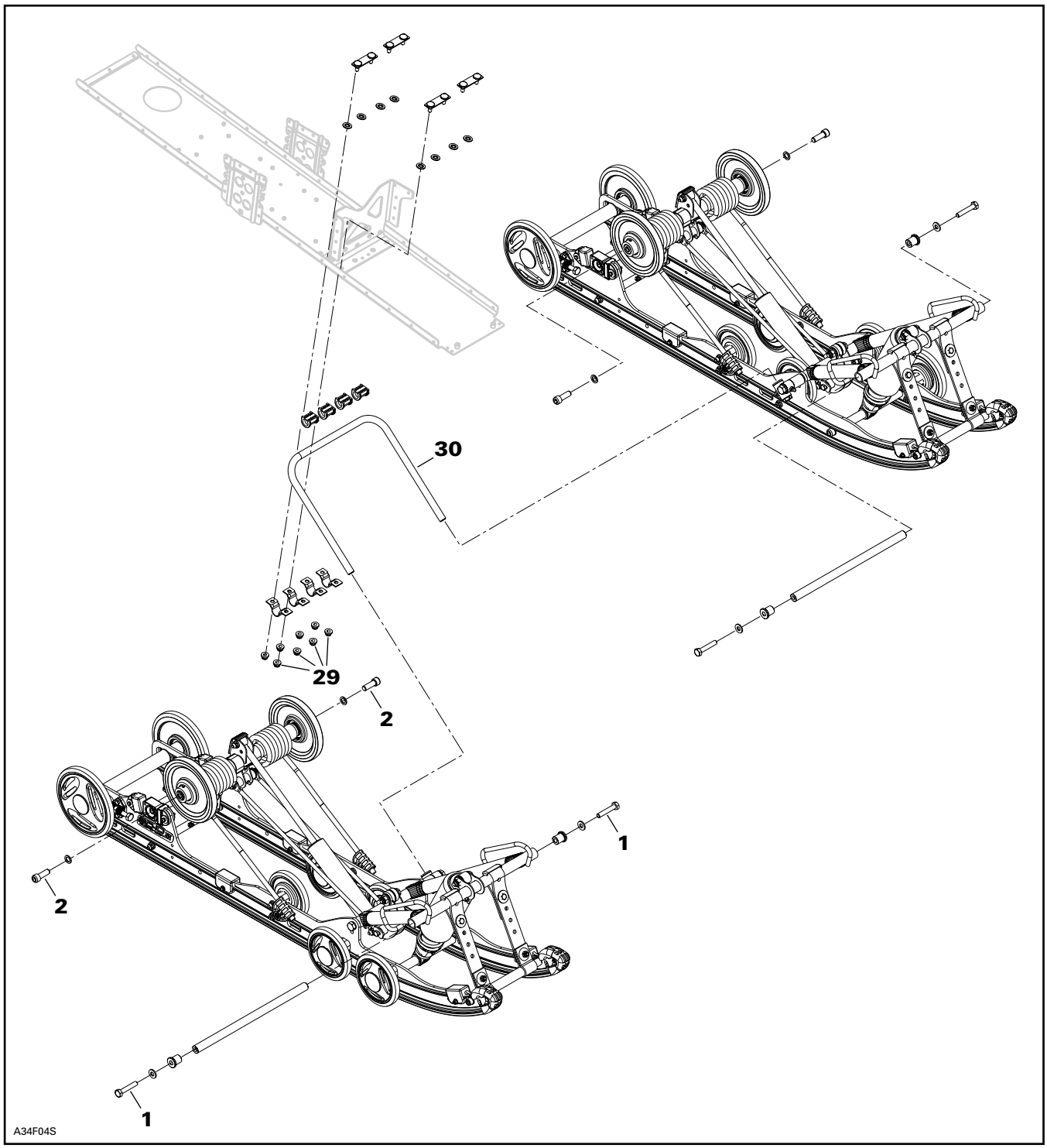
HEADLIGHT AND ACCESSORIES SYSTEMS TESTING

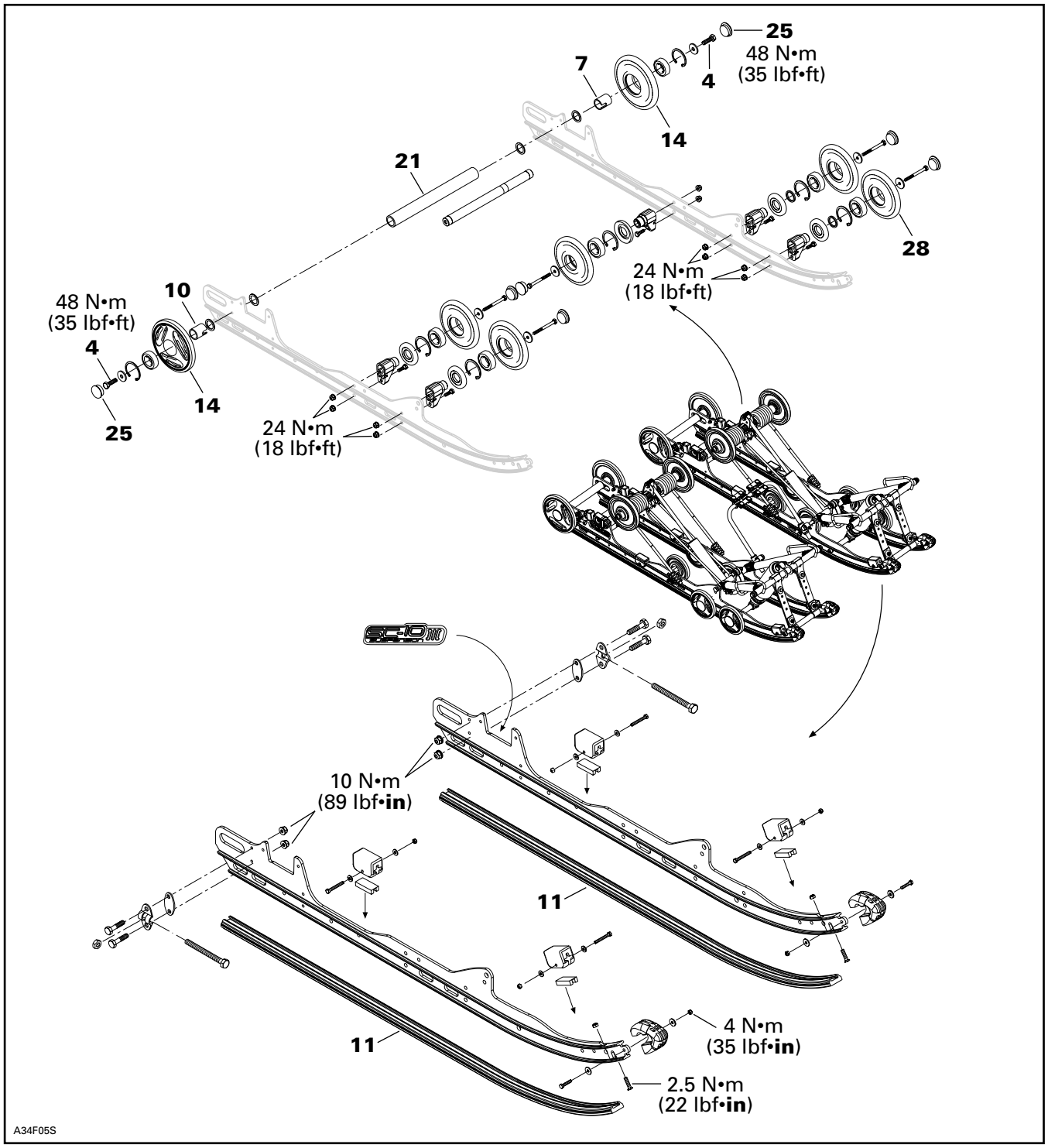
To supply headlight and accessories with 12 volts, ground the ORANGE/WHITE wire that goes into the Vehicle Control Module (VCM). Refer to WIRING HARNESS to remove the ORANGE/WHITE wire from connector housing.

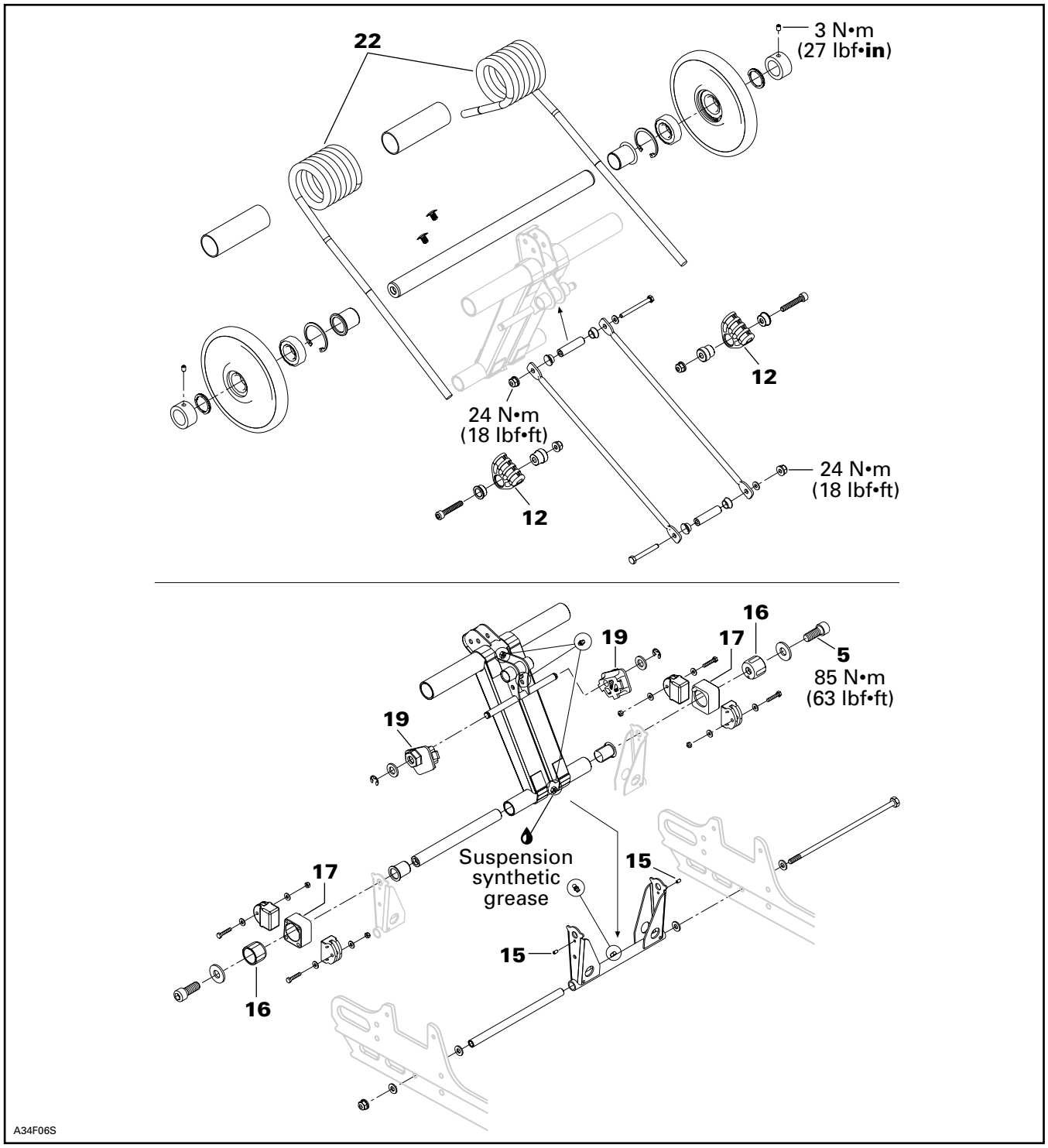


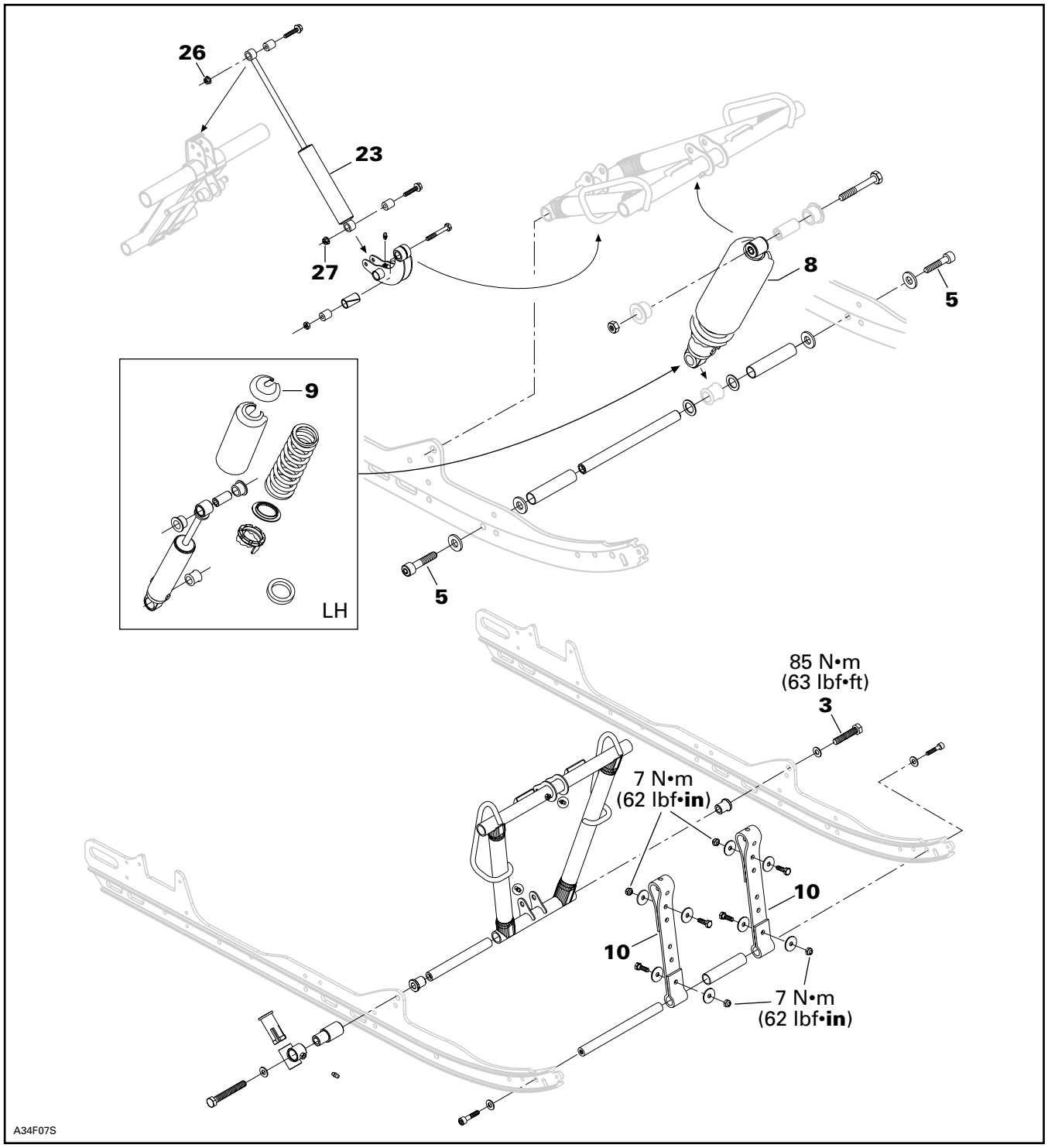
UNDERNEATH DASH ON LEFT HAND SIDE OF STEERING COLUMN
1. *ORANGE/WHITE wire*
2. *Jumper connected to ground*

SC-10 III SUSPENSION




25
48 N•m
(35 lbf•ft)
4
7
14
21
28
24 N•m
(18 lbf•ft)
48 N•m
(35 lbf•ft)
10
4
14
25
24 N•m
(18 lbf•ft)
10 N•m
(89 lbf•in)
11
11
4 N•m
(35 lbf•in)
2.5 N•m
(22 lbf•in)
A34F05S


22
3 N•m
(27 lbf•**in**)
12
24 N•m
(18 lbf•ft)
12
24 N•m
(18 lbf•ft)
16
19
17
5
85 N•m
(63 lbf•ft)
19
Suspension
synthetic
grease
15
17
15
16
A34F06S


26
23
27
8
5
9
LH
5
85 N•m
(63 lbf•ft)
3
7 N•m
(62 lbf•in)
10
10
7 N•m
(62 lbf•in)
A34F07S

GENERAL

There are two identical SC-10 III suspensions installed on the vehicle. In this section procedure for mainly one side is given. Procedure for other side is the same with few differences of component locations.

COMPONENT REMOVAL AND INSTALLATION

Rear Axle

Lift rear of vehicle and support it off the ground.

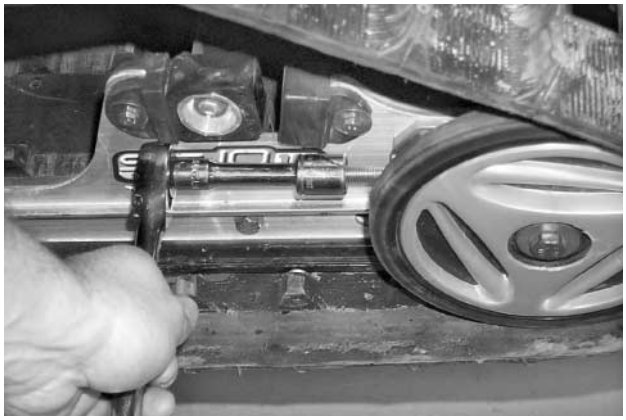
A34F08A

Remove wheel caps **no. 25**.

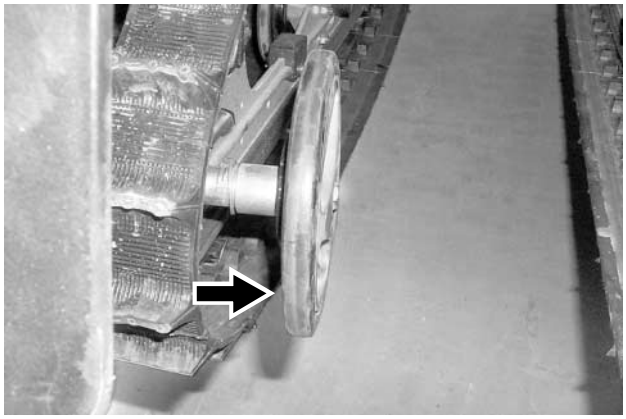
Remove screw **no. 4** on rear axle **no. 21** on side of offset wheel **no. 14**.

A34F09A

Completely loosen track tension.


A34F0AA

Pull out rear axle from opposite side of offset inner wheel.


A34F0BA

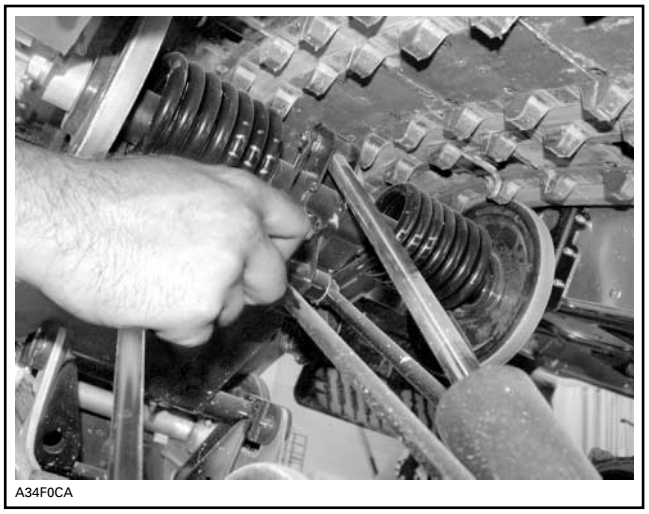
At assembly, align spacer hole with adjusting bolt.

Make sure to reinstall washer on each side of runner.

Rear Shock

Lift rear of vehicle.

Remove nut **no. 26** on top end of shock **no. 23**.


A34F0CA

Remove nut **no. 27** on bottom end of shock.

Installation is reverse of removal procedure.

CAUTION: Take care not to damage grease fittings.

Front Shock

Unfasten one end of stopper strap(s).

Unbolt shock **no. 8** from the top.

Remove the front idler wheel **no. 28** to gain access to the axle retaining self-locking screws **no. 5**. Follow the instructions provided in this section to unfasten these screws. Slide out the axle and remove the shock.

Rear Spring

Decrease spring preload by turning cams **no. 19** accordingly.

Slightly turn adjusting cam to expose spring end. Using spring installer (P/N 529 005 000), remove both springs from adjusting cams.

Remove spring ends from adjusting cams.

Unbolt rear arm top axle from chassis.

Unscrew set screws from locking ring at each end of top axle.

Remove spacers and top idler wheels.

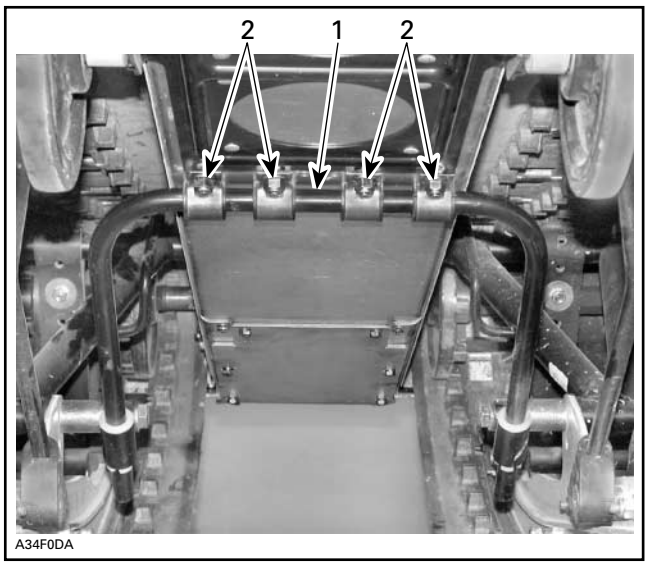
Remove springs **no. 22**.

At reassembly, respect THIS SIDE OUT inscription on wheel.

SUSPENSION ASSEMBLY REMOVAL

Lift rear of vehicle and support it off the ground.

Remove flanged nuts **no. 29** and pull out stabilizing bar **no. 30**.



A34F0DA

1. Stabilizing bar
2. Nuts

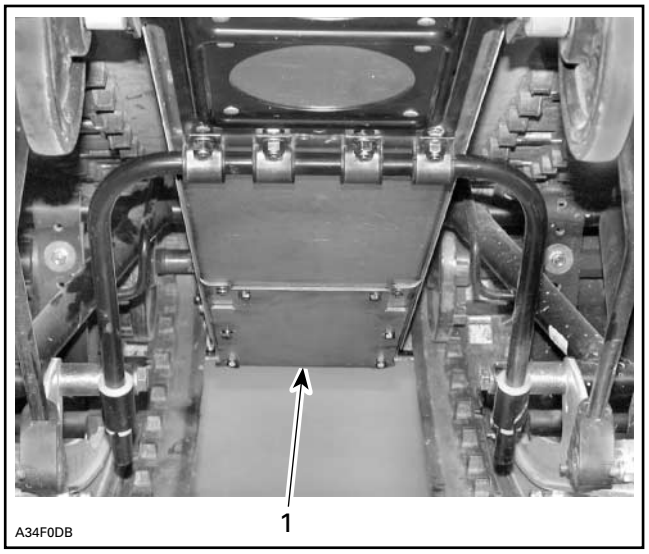
Secure bushing and clamps for reassembly.

Decrease spring preload by turning cams **no. 19** accordingly.

Loosen track tension.

Slightly turn adjusting cam to expose spring end. Using spring installer (P/N 529 005 000), remove both springs from adjusting cams.

Remove the panel to access the screws **no. 1** retaining front arm to tunnel.

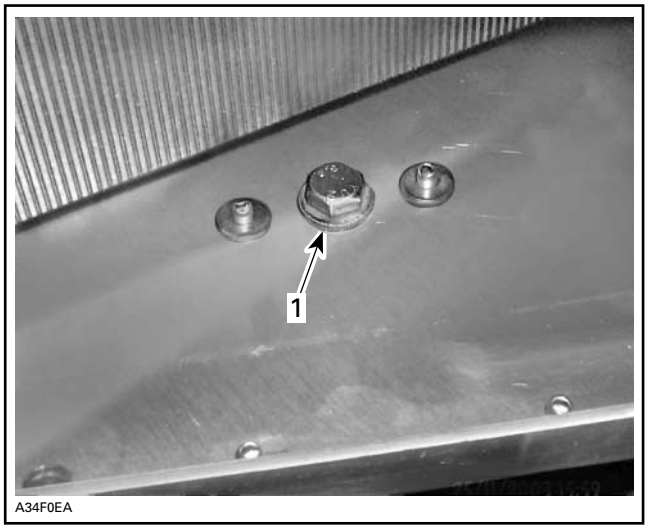


1. Panel

Remove rear arm top axle self-locking screws **no. 2** from chassis.

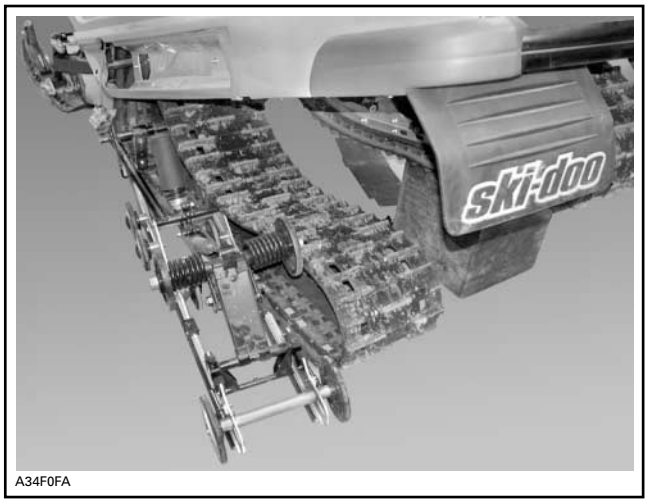
Lift rear of vehicle at least 1 m (3 ft).

Remove both self-locking screws **no. 1** retaining front arm to tunnel. Inner screw is accessible through the panel.



1. Screw

Remove suspension.



Self-Locking Screws

CAUTION: These self-locking screws must always be replaced by new ones everytime they are removed.

NOTE: To prevent axle from turning when unscrewing self-locking screws **nos. 1, 2, 3, 4, 5, 6,** proceed as follows:

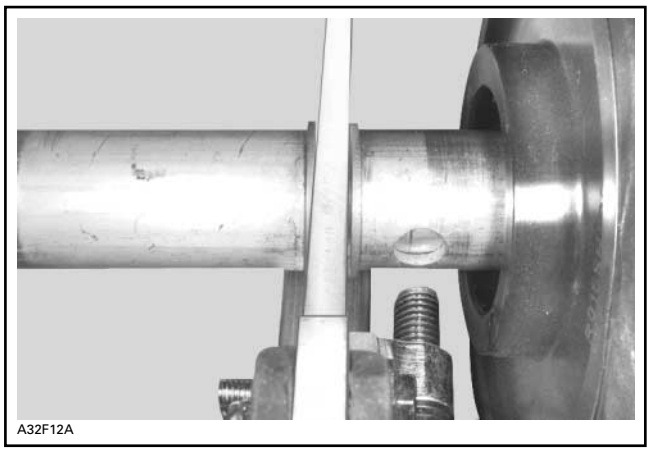
- Remove one self-locking screw then install a 10 mm shorter non-self-locking one in place. Torque as specified in exploded view.
- Remove the opposite self-locking screw.
- Remove the temporary installed non-self-locking screw.
- If it doesn't work, heat bolt head to melt thread locker.

DISASSEMBLY AND ASSEMBLY

Inspect track thoroughly before reinstalling suspension. Refer to TRACK.

Outer Bushing

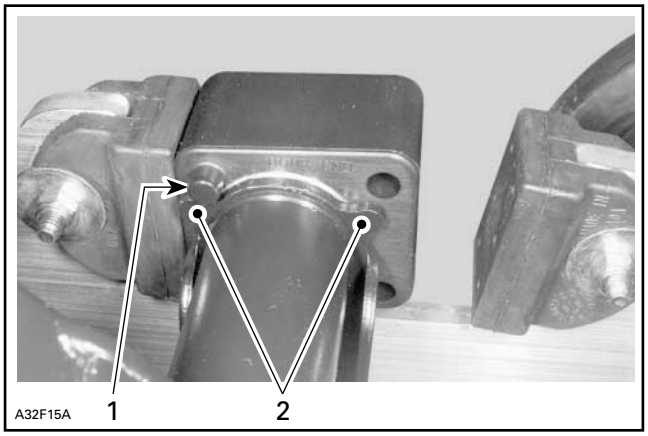
At installation, hole of outer bushing **no. 7** must face adjustment screw.


A32F12A

Block

Both blocks **no. 17** are identified R or L (right or left), see second following photo. At installation, make sure to install proper block on proper side.

Also, note that protrusion must be positioned above stoppers.

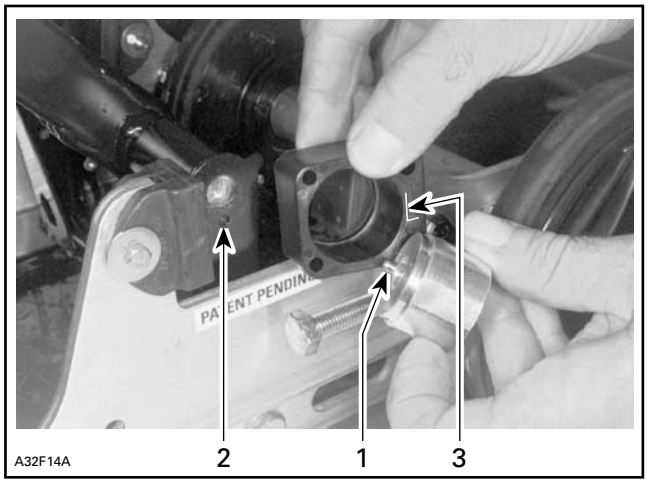


1. *Protrusion*
2. *Stoppers*

Dowel Pin and Block Guide

Dowel pin **no. 15** must exceed block guide **no. 16** by 2 to 2.3 mm (.079 to .091 in).

At installation, insert dowel pin into pivot arm hole.



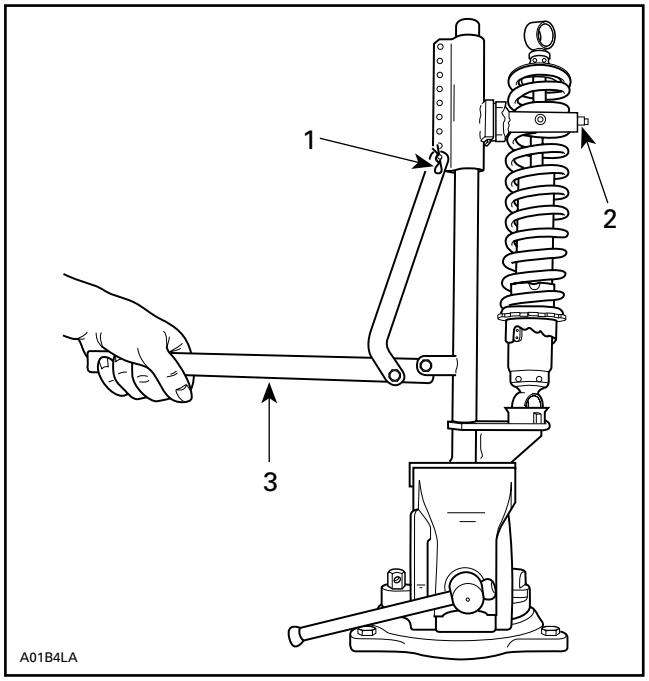
LEFT SIDE SHOWN
1. *Dowel pin*
2. *Pivot arm hole*
3. *«L» identification for left side*

Front Shock and Spring Stopper

Use shock spring remover (P/N 529 035 504) and put it in a vise. Mount shock **no. 8** in it and turn shock so that spring coils matched spring compressor.

Close and lock bar. Adjust handle horizontal by changing position of clevis pin.

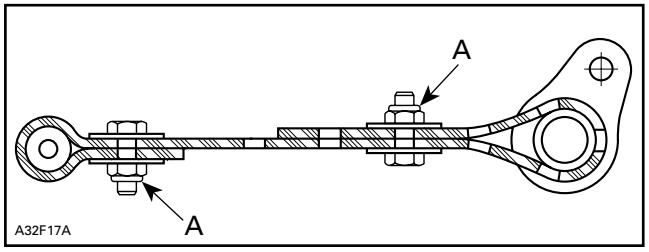
Push down on handle until it locks. Remove spring stopper **no. 9** then release handle.



1. Clevis pin
2. Bar
3. Handle horizontal

Stopper Strap

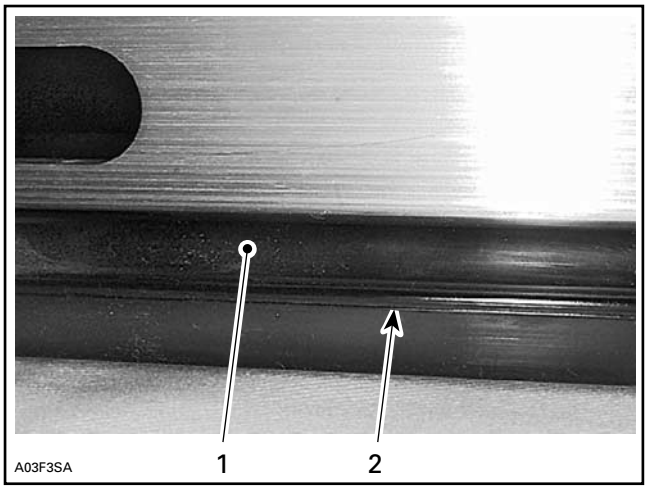
Inspect strap **no. 10** for wear or cracks, bolt and nut for tightness. If loose, inspect hole for deformation. Replace as required. Make sure it is attached through proper holes. Torque nut to 7 N•m (62 lbf•**in**).



*A. 7 N•m (62 lbf•**in**)*

Slider Shoe

Molding line is the wear limit indicator.



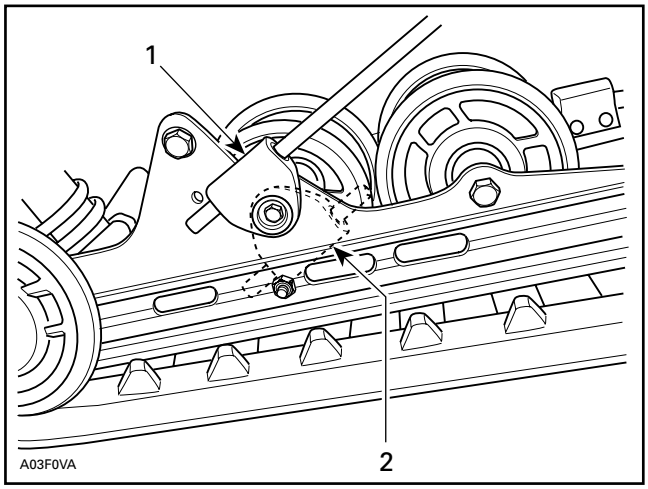
TYPICAL
1. Slider shoe
2. Molding line (wear limit indicator)

Replace slider shoes **no. 11** when wear limit is reached.

CAUTION: Slider shoes must always be replaced in pairs.

Spring Support

CAUTION: To avoid track damage, spring supports **no. 12** must be mounted upward.

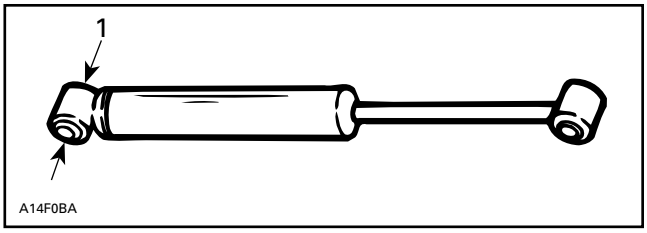


TYPICAL — RIGHT SIDE SHOWN
1. Right position: upward
2. Wrong position

SHOCK ABSORBER INSPECTION

NOTE: Shocks installed on this vehicle are painted black or dark gray.

Secure the shock body end in a vise with its rod upward.



1. Clamp

CAUTION: Do not clamp directly on shock body.

Examine each shock for leaks. Extend and compress the piston several times over its entire stroke. Check that it moves smoothly and with uniform resistance with its rod upward.

After at least 5 complete strokes, 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.

If suspecting a frozen shock proceed as follows:

Place shock in a freezer (temperature below 0°C (32°F)) for 4 hours.

Push down on rod and note its resistance. If shock is frozen it will be impossible to compress than for the new one.

INSTALLATION

Install assembled suspension into track with front portion first.

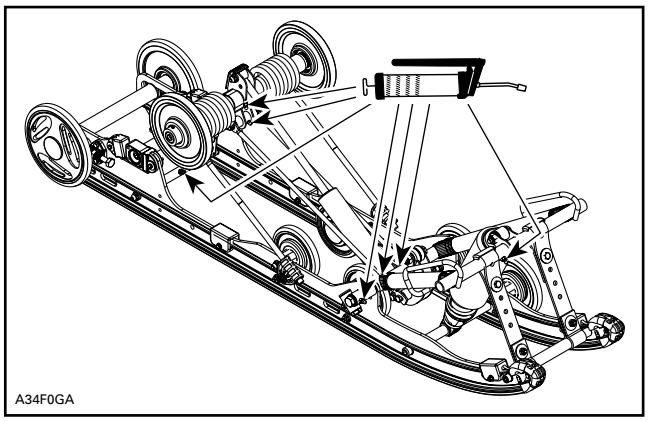
Insert rear portion of suspension into track.

Bolt front arm and rear arm.

Adjust track tension. Refer to TRACK.

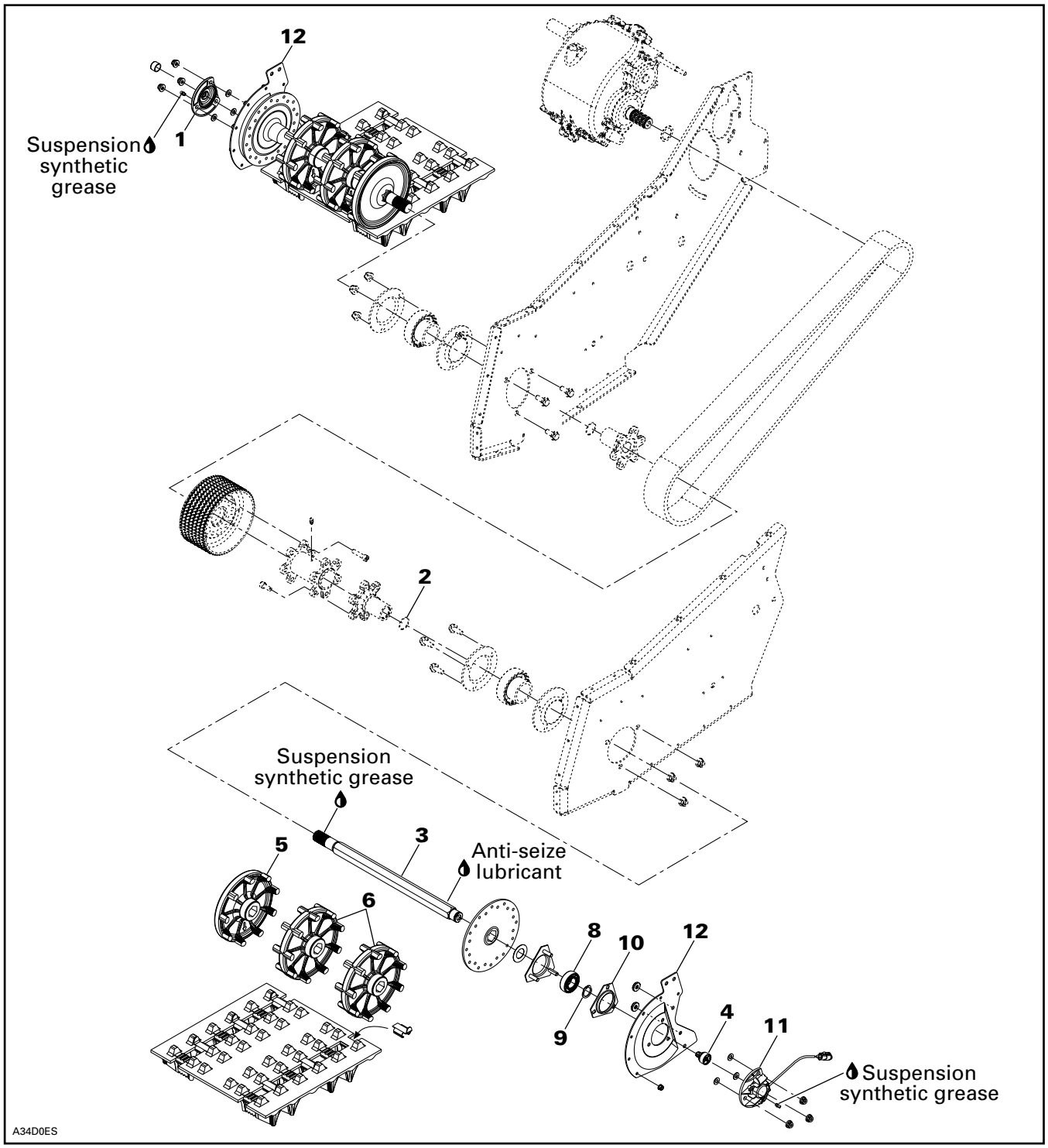
LUBRICATION

Lubricate front and rear arms at grease fittings using suspension synthetic grease (P/N 293 550 033).



SC-10 III: 7 GREASE FITTINGS

DRIVE AXLE


12
Suspension synthetic grease
1
2
Suspension synthetic grease
3
5
Anti-seize lubricant
6
8
10
12
4
11
9
Suspension synthetic grease
A34D0ES

REMOVAL

Raise and block rear of vehicle off the ground.

Remove suspension on appropriate side. Refer to proper subsection.

Remove speedometer sensor **no. 11** or end bearing housing plastic cap **no. 1** depending on the side of drive axle removal.,

Remove brake caliper on appropriate side. Remove sprocket plate **no. 12**.

NOTE: Drive axle can be removed without extracting brake disc and end bearing **no. 8**.

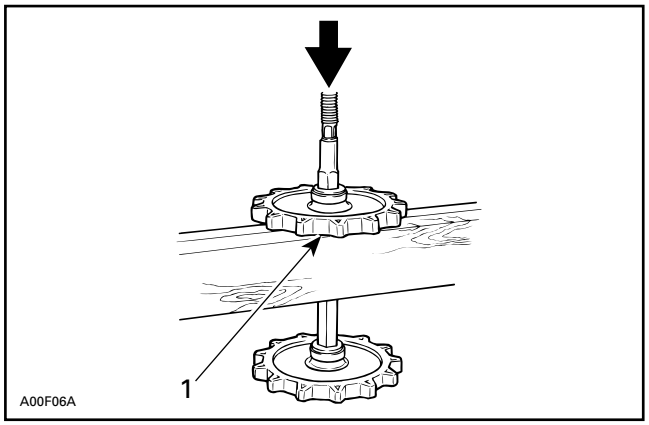
Pull drive axle out of vehicle through brake disc access hole.

Remove outer flange **no. 10** and circlip **no. 9**.

Remove end bearing **no. 8** and brake disc from drive axle

Sprocket and Half-Sprocket

To remove press fit sprockets **no. 5** and **no. 6**, use a press and a suitable support as illustrated.

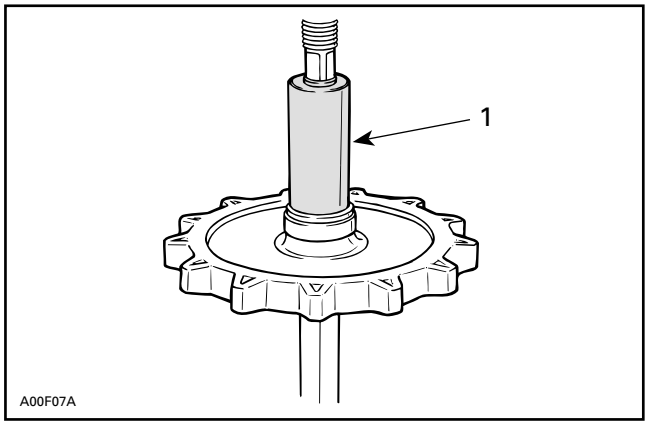


TYPICAL
1. Support sprocket near hub

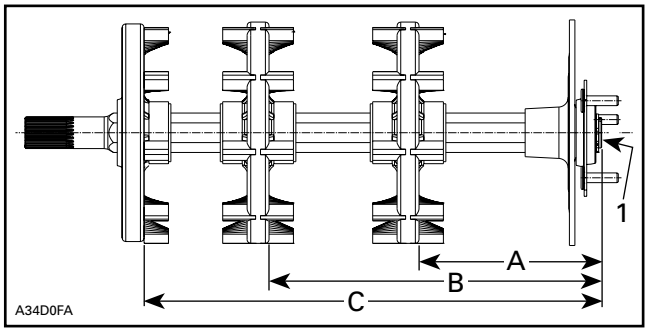
ASSEMBLY

Drive Axle and Sprocket

To assemble press fit sprockets **no. 5** and **no. 6**, use a press and a suitable pipe as illustrated. Sprockets must be assembled according to the following dimensions measured from drive axle end.

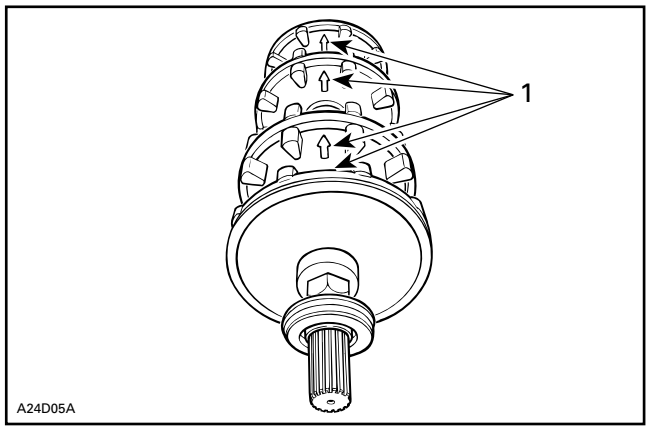


TYPICAL
1. Pipe



1. Measure from end of drive axle
A. 149.8 mm (5.898 in)
B. 272.8 mm (10.740 in)
C. 375.3 mm (14.776 in)

Ensure to align indexing marks of each sprocket when assembling.

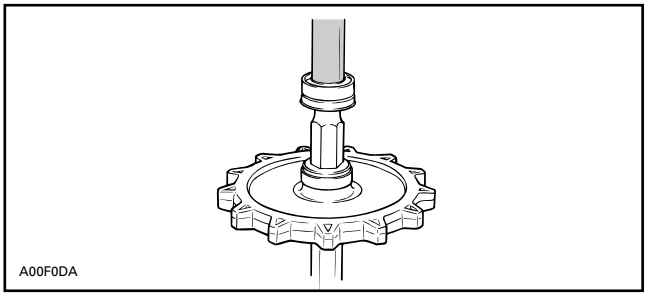


TYPICAL
1. Indexing marks aligned

CAUTION: The same sprocket must not be pressed twice on the axle. When sprocket has been removed from drive axle, use a new sprocket at the installation.

Bearing

Always push bearing **no. 8** by inner race.



TYPICAL

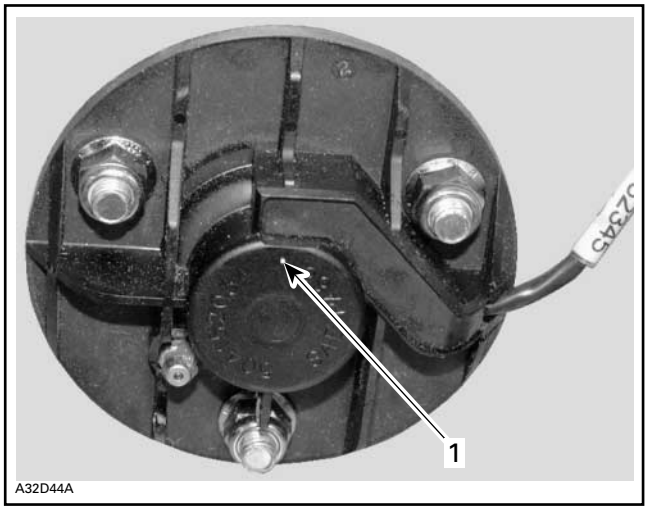
INSTALLATION

Reverse removal procedure.

Check condition of O-rings **no. 2** before drive axle installation. If damaged, replace with new ones.

LUBRICATION

Lubricate end housing bearing with suspension synthetic grease (P/N 293 550 033). Continue lubricating until grease flows out of the pilot hole.



TYPICAL
1. Lubricate until grease flows out here

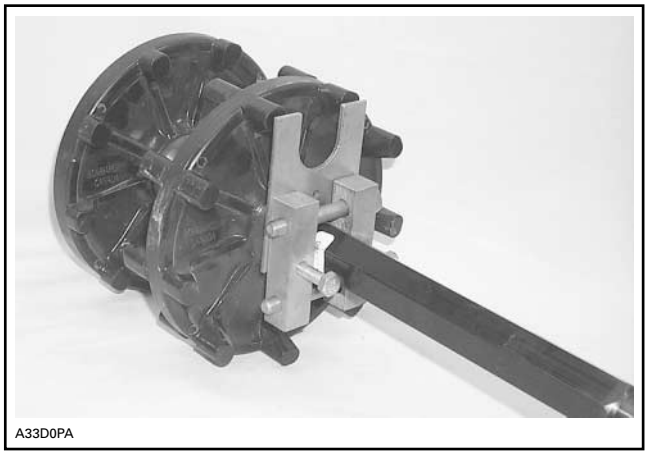
ADJUSTMENT

Sprocket/Track Alignment

CAUTION: Do not temper with sprocket/track alignment if frame or suspension is damaged.

Sprockets might be repositioned to fit lugs without removing drive axle.

Use drive axle sprocket adjuster kit (P/N 861 725 700).



TRACK

TRACK TYPE APPLICATION

Refer to TECHNICAL DATA.

GENERAL

This section gives guidelines for track removal. Some components require more detailed disassembly procedures. In these particular cases, refer to the pertaining section in this manual.

INSPECTION

Visually inspect track for:

– cuts and abnormal wear
– broken rods
– broken or missing track cleats.

If track is damaged or rods are broken, replace track. For damaged or missing cleats, replace by new ones, using cleat remover (P/N 529 028 700). Use narrow-cleat installer (P/N 529 008 500).

⚠ WARNING

Do not operate a snowmobile with a cut, torn or damaged track.

REMOVAL

NOTE: Each track can be removed individually.

Remove the following parts:

– rear suspension
– plastic molding (refer to BODY)
– end bearing housing
– drive axle
– track.

INSTALLATION

Reverse the removal procedure.

NOTE: When installing the track, respect rotation direction indicated by an arrow on track thread.

Check sprocket/track alignment as described in DRIVE AXLE.

ADJUSTMENT

Track Tension and 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.

Track Tension

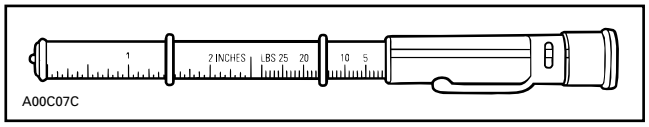
NOTE: Ride the snowmobile in snow about 15 to 20 minutes prior to adjusting track tension.

Lift the rear end of snowmobile by the bumper with a suitable lifting device.

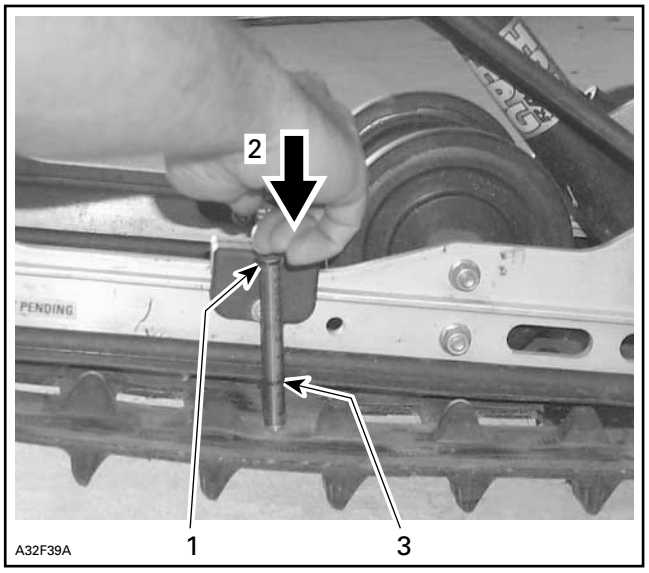
NOTE: The vehicle can also be lifted off the ground by the structural upper chassis.

Allow the rear suspensions to fully extend and check gap half-way between front and rear idler wheels. Measure between slider shoe bottom and inside of track. The gap should be as given in SPECIFICATIONS. If the track tension is too loose, track will have a tendency to thump.

NOTE: A belt tension tester (P/N 414 348 200) may be used to measure deflection as well as force applied.



BELT TENSION TESTER

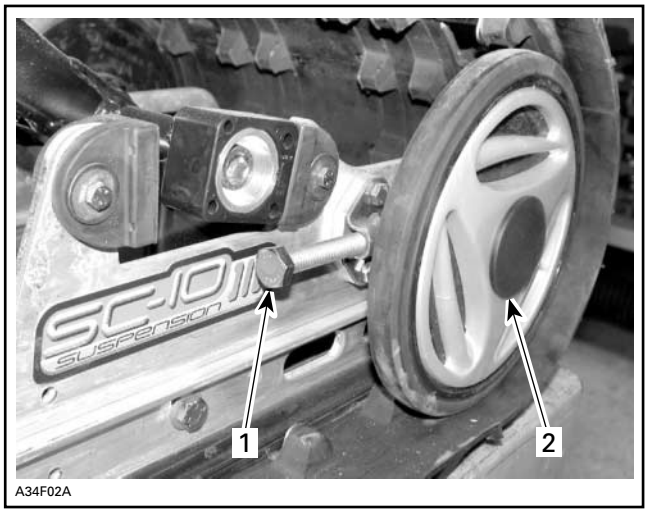


1. *Top tool O-ring positioned at 7.3 kg (16 lb)*
2. *Push on top portion of tool until it contacts the top O-ring*
3. *Measured track deflection*

CAUTION: Too much tension will result in power loss and excessive stresses on suspension components.

To Adjust Tension:

– Remove the DESS tether cord cap.
– Remove the cap then, loosen one of the rear idler wheel retaining screws.
– Turn adjustment screws to adjust.



1. *Adjustment screw*
2. *Loosen screw*

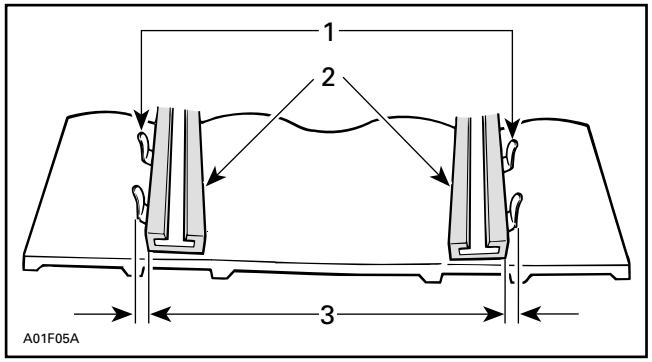
Alignment

⚠ WARNING

Before checking track alignment, ensure that the tracks are free of all particles which could be thrown out while tracks are rotating. Keep hands, tools, feet and clothing clear of tracks. Ensure no one is standing in close proximity to the vehicle. Never rotate at high speed.

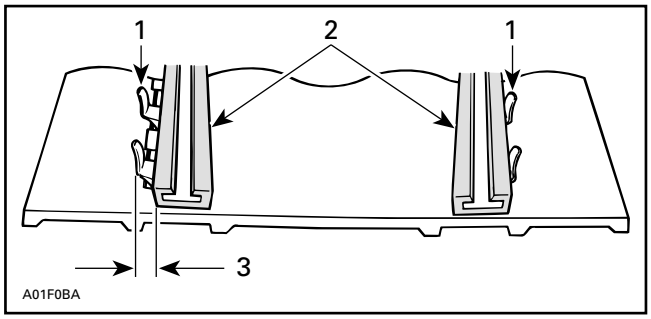
Start the engine and accelerate slightly so that tracks barely turn. This must be done in a short period of time (1 to 2 minutes).

Check that each track is well centered; equal distance on both sides between edges of track guides and slider shoes.



TYPICAL
1. *Guides*
2. *Slider shoes*
3. *Equal distance*

To correct, stop engine, loosen rear wheel screws, then tighten the adjustment screw on side where the slider shoe is the farthest from the track insert guides.



1. *Guides*
2. *Slider shoes*
3. *Tighten on this side*

Restart engine, rotate tracks **slowly** and recheck alignment. If the satisfactory alignment is achieved, then tighten the idler wheel retaining screws to 48 N•m (35 lbf•ft).

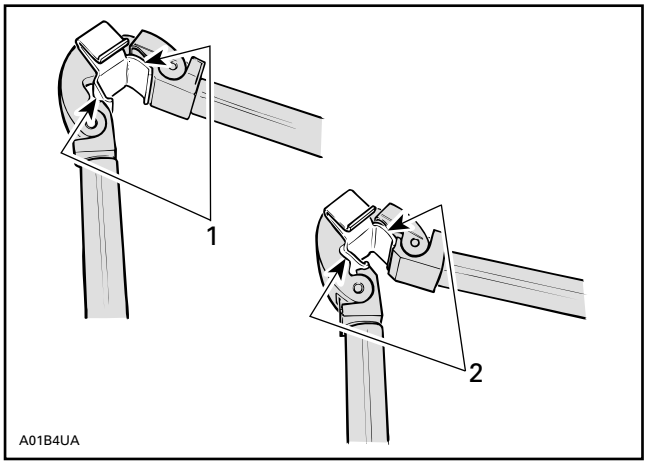
Track Cleat

Removal

– Raise rear of vehicle off the ground and lift snowguard then hand rotate track to expose a cleat to be replaced.
– Use track cleat remover (P/N 529 028 700) for all models.

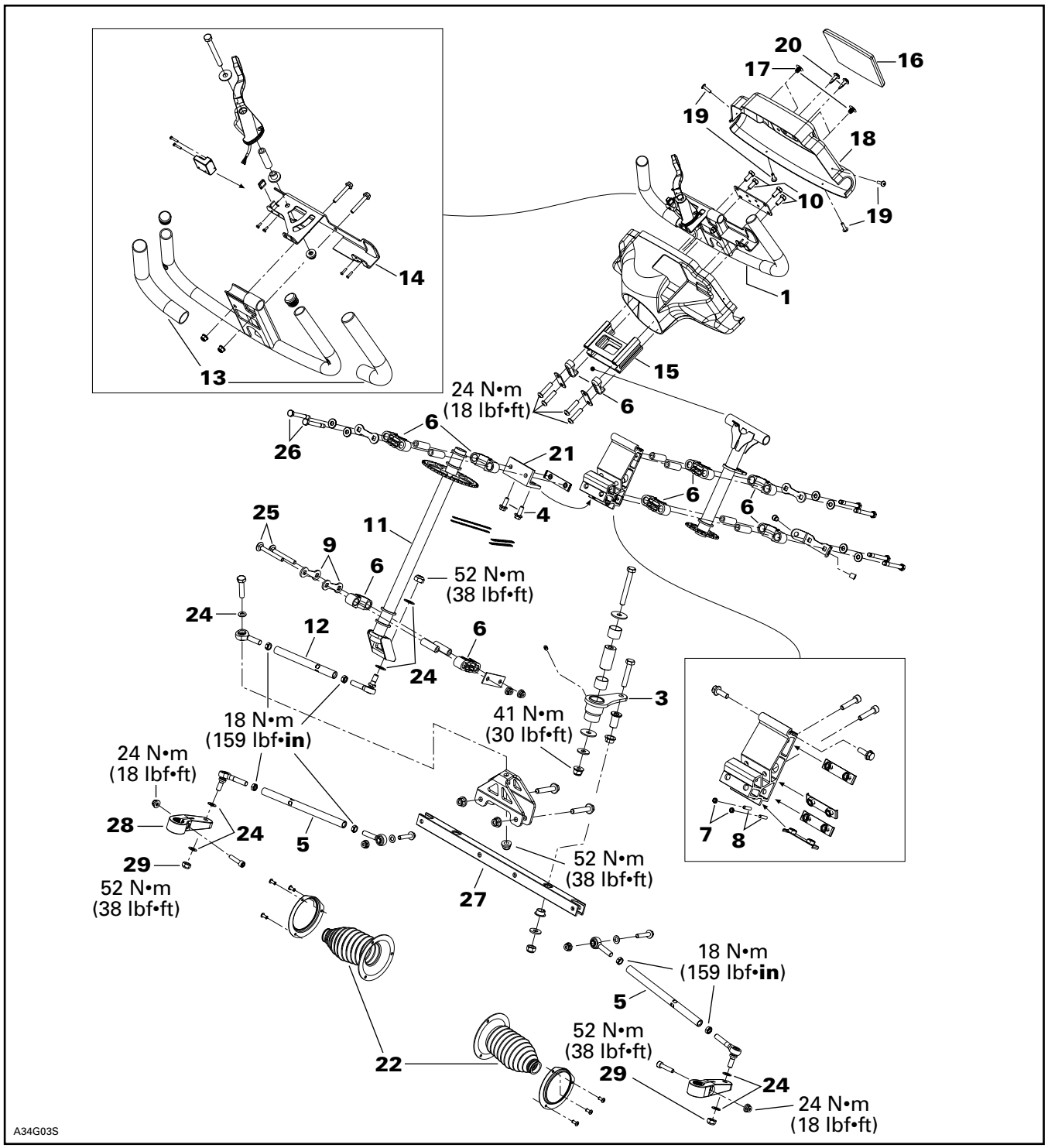
Installation

– Place new cleat in position on the track and using narrow track cleat installer (P/N 529 008 500) bend cleat then push tabs into rubber.
– Re-open installer, then position cleat tabs on open end of tool and squeeze tabs until they are indented in rubber.



TYPICAL
1. First step
2. Second step (to push tabs into rubber)

STEERING SYSTEM



GENERAL

During assembly/installation, use the torque values and service products as in the exploded views.

Clean threads before applying a threadlocker. Refer to SELF-LOCKING FASTENERS and LOCTITE APPLICATION at the beginning of this manual for complete procedure.

⚠ WARNING

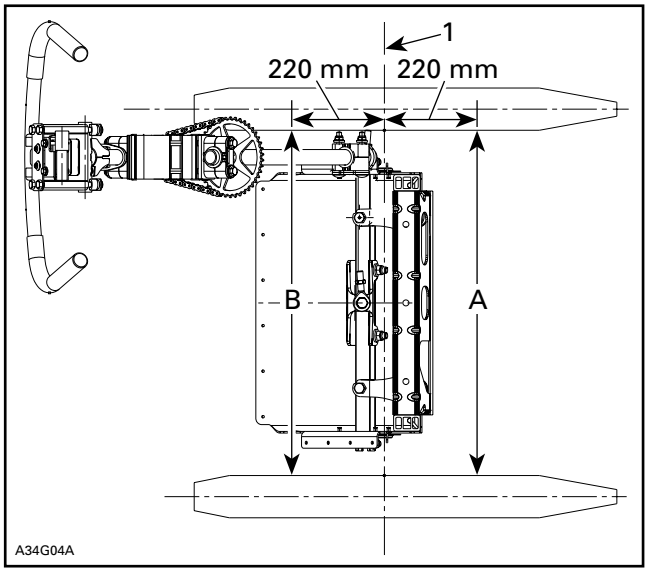
Torque wrench tightening specifications must strictly be adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, etc.) must be installed or replaced with new ones where specified. If the efficiency of a locking device is impaired, it must be renewed.

STEERING ADJUSTMENT (SKIS)

Definitions

TOE-OUT:

A difference measured between the front edge of the skis "A" and rear edge "B" as viewed from the top. It is adjustable. For the **Elite**, toe-out is measured at 220 mm (8-21/32 in) from ski pivot bolt axis.



TYPICAL
1. Ski pivot bolt axis

CAMBER:

A specific inward or outward tilt angle of ski leg compared to a vertical line when viewing the vehicle from front. The camber is not adjustable on the **Elite**.

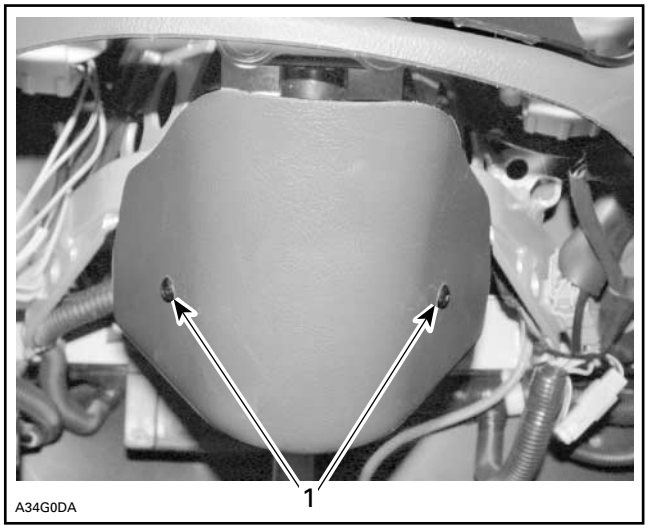
Adjustments

Adjustments should be performed following this sequence:

– upper and lower steering columns positioning
– pivot arm centering
– camber checking
– ski alignment.

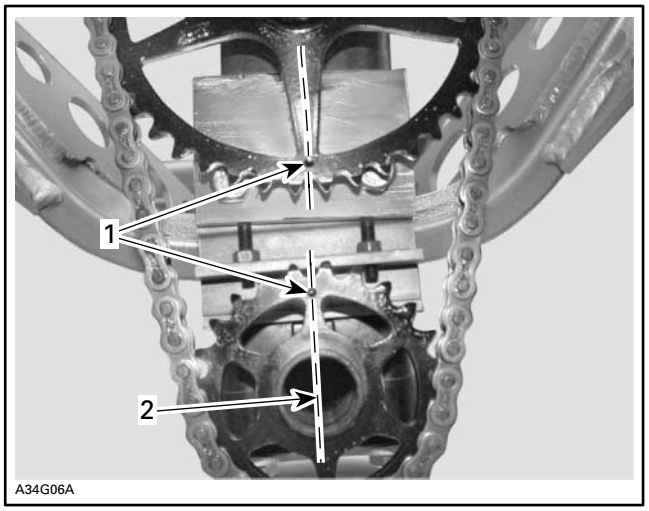
UPPER AND LOWER STEERING COLUMNS POSITIONING

Remove protective cap to gain access to marks.



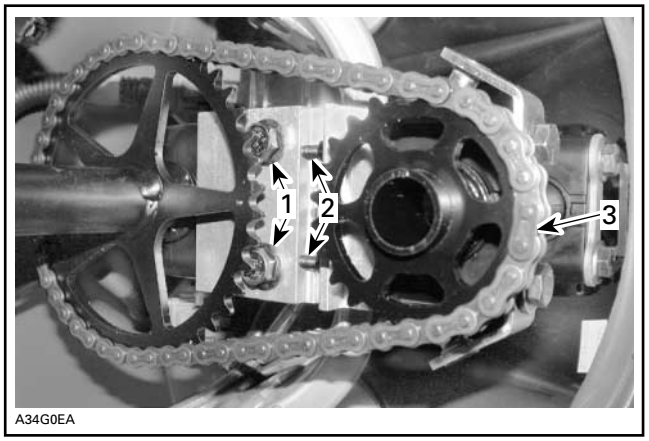
1. Screws retaining protective cap

With the steering wheel in straight ahead position, both marks must aligned together with the center line of both tubes.



1. Marks aligned
2. Center line of both tubes

If marks do not align, loosen retaining bolts **no. 4**, lock nuts **no. 7**, then untighten adjustment screws **no. 8**. Unfasten connecting link and remove the chain.



1. Retaining bolts
2. Adjustment screws
3. Connecting link

Turn upper or lower steering column until both marks aligned.

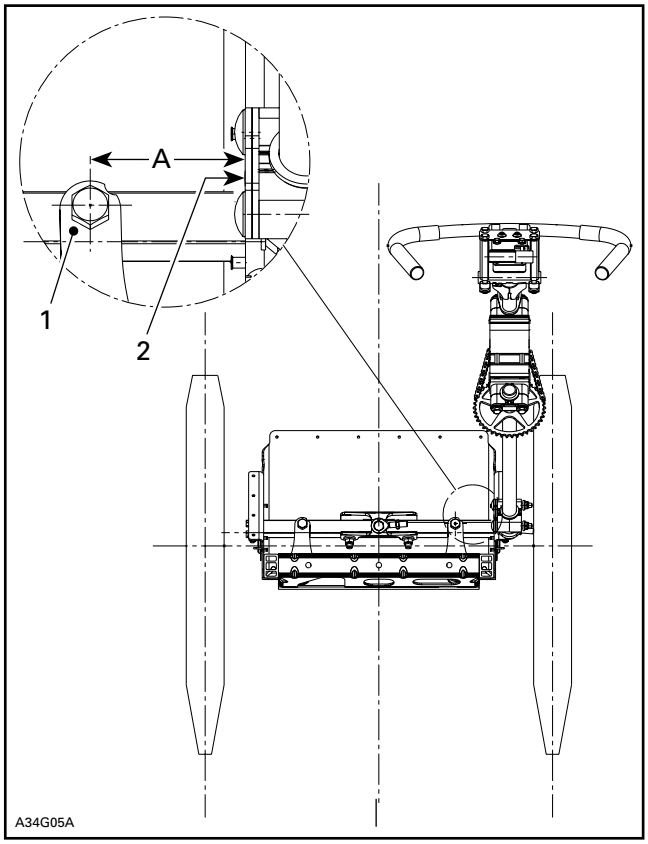
Reinstall the chain. Readjust chain tension to get a smooth and easy-to-turn steering without play.

PIVOT ARM CENTERING

⚠ WARNING

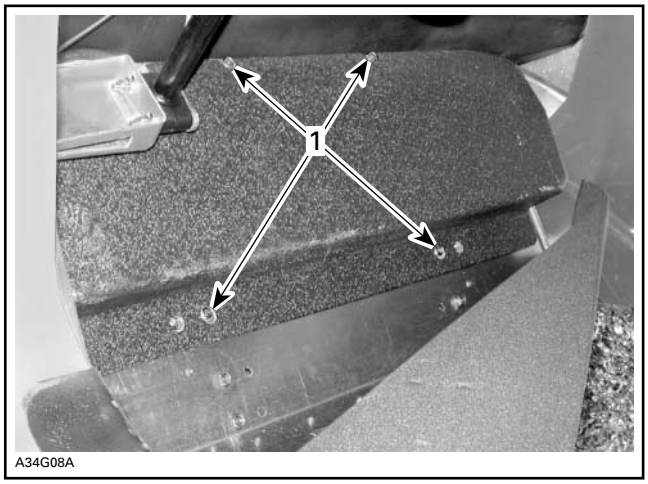
Do not attempt to adjust straight ahead ski position by turning the short tie rod no. 12.

With the steering wheel in straight ahead position, measure the distance A between bolt center of left side swivel arm **no. 3** and the stopper plate of lower steering column attachment. Distance A must be equal to 71.2 mm (2.803 in).



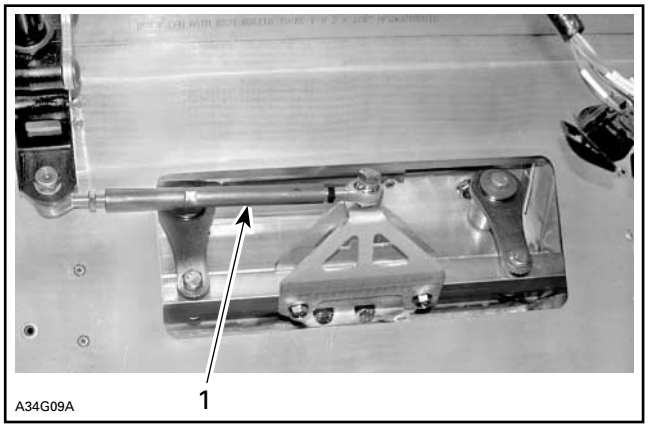
1. Left side swivel arm
2. Stopper plate
A. 71.2 mm (2.803 in)

To adjust, first remove the footrest.



1. Retaining screws of footrest

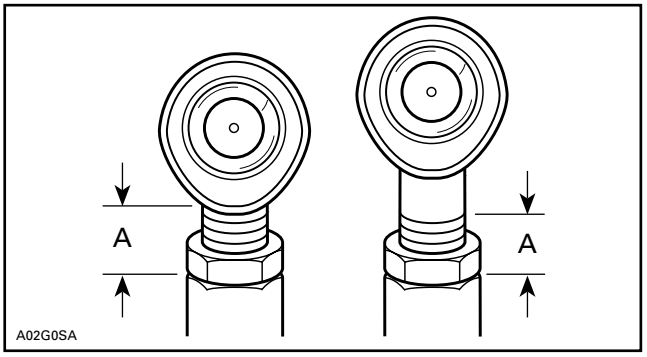
Loosen jam nuts of short tie rod **no. 12**. Turn short tie accordingly. Tighten jam nuts to 18 N•m (159 lbf•**in**).



1. Short tie rod

⚠ WARNING

Never lengthen this tie rod so that the external unengaged threaded portion of ball joint exceeds 20 mm (25/32 in). After jam nut tightening, you should be able to rotate short tie rod by 10°.



TYPICAL
A. 20 mm (25/32 in) MAX.

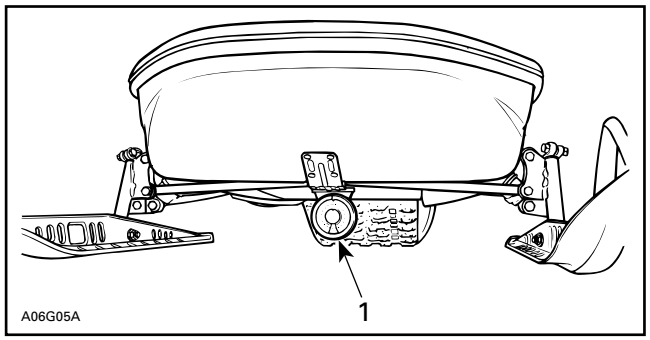
CHECKING CAMBER

The camber is not adjustable on the Elite. It must be equal to 0°.

However, it is recommended to check the camber if a problem with the steering control is detected. Use the following procedure.

Make sure the vehicle is leveled by placing an angle finder under the main frame member as shown on the following illustration.

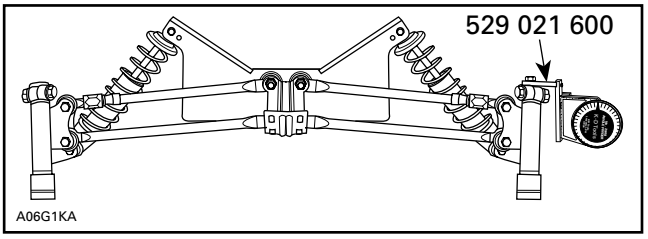
Vehicle skis must be off the ground.



TYPICAL
1. Angle finder

Using special tool (P/N 529 021 600) mounted to the ski leg, position the angle finder on the tool as shown in the following illustration. An alternate location for the angle finder if the special tool is not available is the outside of the ski leg housing.

CAUTION: Angle finder must sit square against swing arm. Positioning angle finder against weld bead or decal may result in false reading.



TYPICAL — CAMBER CHECKING SET-UP

If the camber is out of specification, check parts for wear or damages and change defective parts.

SKI ALIGNMENT

Ski alignment is performed by adjusting length of left and right long tie rods **no. 5**.

⚠ WARNING

Do not attempt to adjust skis in a straight ahead position by turning short tie rod no. 12.

Procedure:

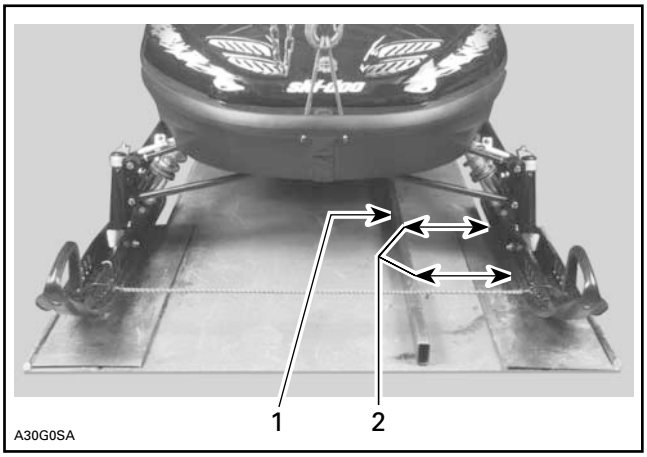
Position steering wheel **no. 1** in straight ahead position.

A rubber cord must be hooked in front of skis to keep them closed and to take all slack from steering mechanism.

Lift the front of vehicle off the ground.

Make sure skis are in a straight-ahead position by placing a straight edge against pre-adjusted track and measure the distance between front and rear of skis and straight edge. Measuring points are 220 mm (8-21/32 in) at front and rear of ski pivot axis.

To reduce tolerance when measuring, set one ski to proper toe-out (half the total toe-out) then measure from that ski to the opposite ski.



TYPICAL
1. Straight edge
2. Measure at 220 mm (8-21/32 in) from ski pivot axis

If adjustment is needed, loosen jam nuts of both long tie-rods **no. 5**.

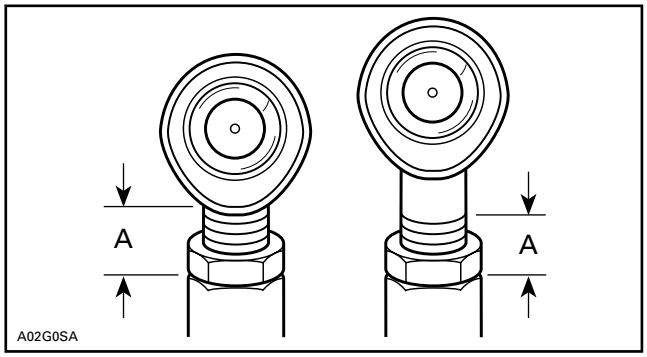
Toe-out must be as specified in the following chart.

MODEL	TOTAL TOE-OUT ± 3 mm (± 1/8 in)
Elite	3.0 (1/8)

Turn the tie rod to change its length then torque jam nuts.

⚠ WARNING

Never lengthen tie rod so that the external unengaged threaded portion of ball joint exceeds 20 mm (25/32 in). After jam nut tightening, you should be able to rotate long tie rods by 20°.



TYPICAL
A. Maximum: 20 mm (25/32 in)

GRIP

Inspection

To check the heating grip element, refer to TESTING PROCEDURE in ELECTRICAL SYSTEM section.

Removal

Unplug heating element connectors.

Cut the grips **no. 13** to remove them from steering wheel.

CAUTION: Removing grip from handlebar will damage the heating element. Do not remove needlessly.

Installation

⚠ WARNING

Never use lubricants (e.g. oil, grease, soap etc.) to install the handlebar grip.

Insert new grip with compressed air.

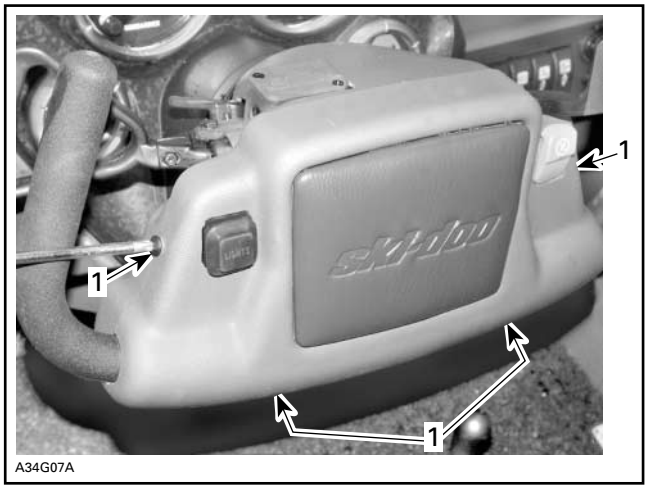
STEERING WHEEL

Inspection

Inspect the steering wheel **no. 1** for damage, cracks or bending, replace if any problem is detected.

Removal

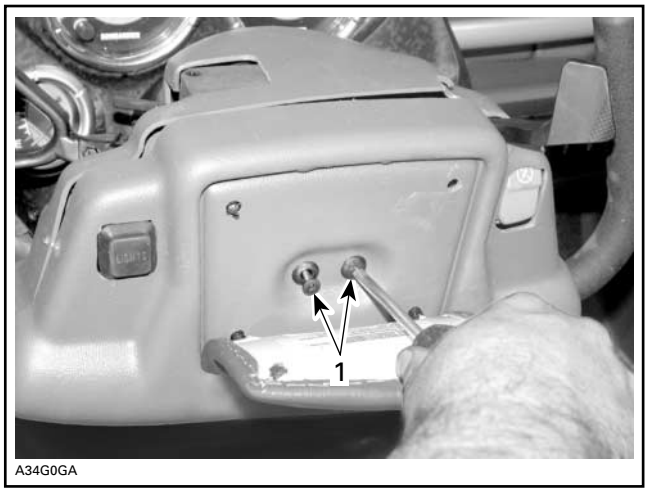
Remove the screws **no. 19** as shown in the following photo.



1. Screws to be removed

Slide the steering pad **no. 16** to cut the 4 darts **no. 17** retaining it with the steering cover **no. 18**.

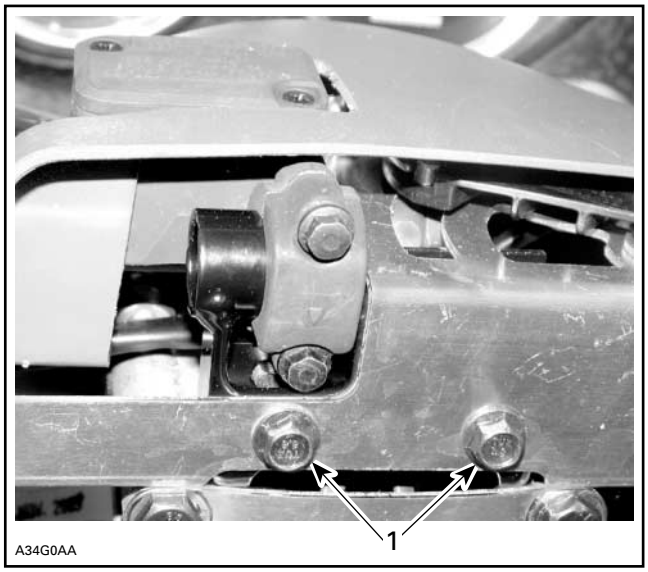
Remove the steering cover **no. 18** by unscrewing the retaining screws **no. 20**.



TYPICAL — STEERING PAD SHOULD BE COMPLETELY REMOVED
1. Retaining screws

Remove master cylinder from steering wheel and put it aside.

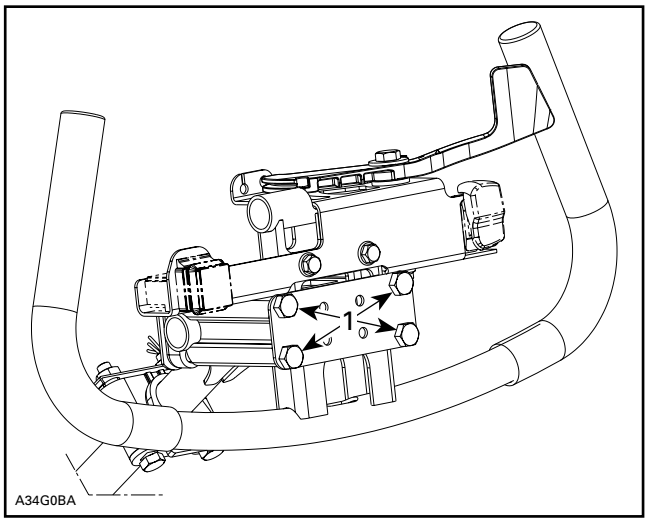
Unbolt control support **no. 14** from the steering wheel.



1. Retaining screws of control support

Unplug heating element connectors.

Unscrew all 4 screws **no. 10** securing steering wheel.

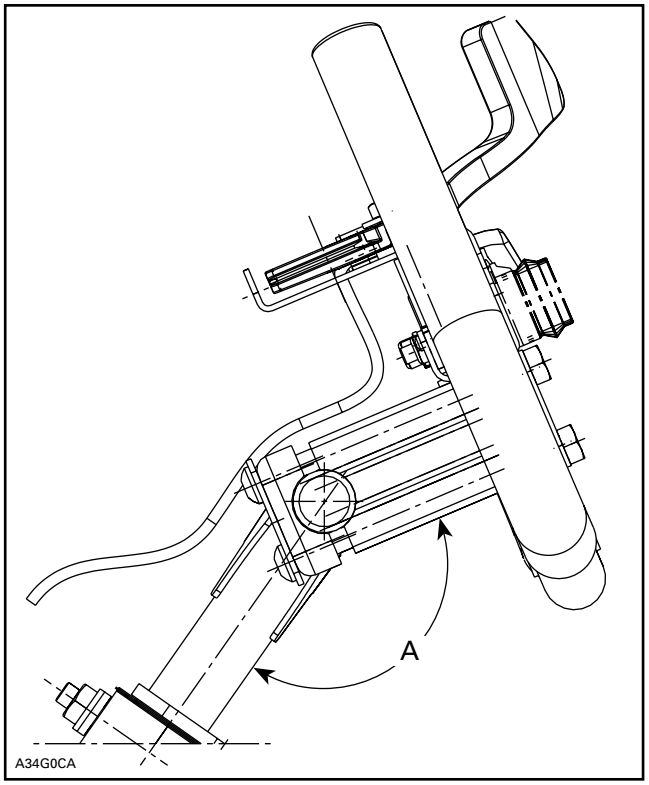


1. Screws securing steering wheel

Installation

For the installation, reverse the removal procedure.

Make sure that steering wheel extension **no. 15** is positioned at the lower position.



LOWER POSITION
A. 148°

LOWER STEERING COLUMN

Removal

Remove chain as explained in UPPER AND LOWER STEERING COLUMN POSITIONING.

Detach the short tie rod **no. 12** from the lower steering column **no. 11**. Note that a hardened flat washer **no. 24** goes on each side of steering column lever.

Disengage carriage bolts **no. 25** from chassis.

Disengage carriage bolts **no. 26** from upper steering support **no. 21**, then pull steering column out of vehicle.

Inspection

Check steering column for cracks, bending or other damages. Replace if any problem is detected.

Check plastic U-clamps for wear or cracks. Replace if necessary.

Installation

The installation is the reverse of the removal procedure. Readjust chain tension as described in UPPER AND LOWER STEERING COLUMN POSITIONING.

SHORT AND LONG TIE-RODS

NOTE: The short tie-rod **no. 12** links the swivel bar **no. 27** and the lower steering column **no. 11** while the long tie-rods **no. 5** are located between swivel bar **no. 27** and steering arm **no. 28**.

Removal

Remove the tie-rod end nut **no. 29** as well as the hardened washers **no. 24**.

Unfasten long tie rods **no. 5** from swivel bar **no. 27**.

Inspection

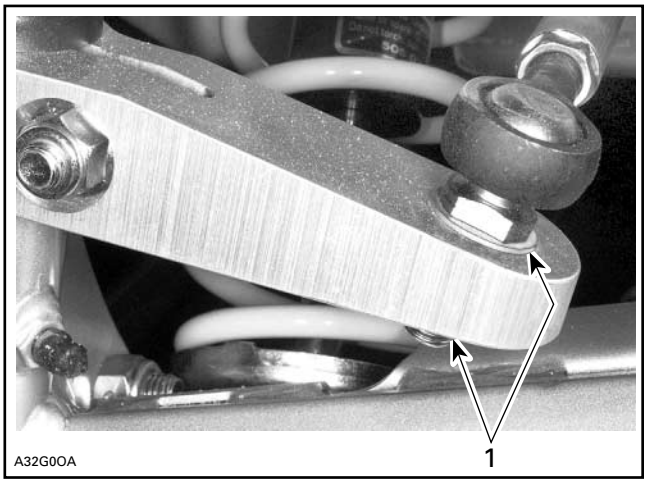
Inspect tie-rod ends for wear and looseness, if excessive, replace them.

Installation

The installation is the reverse of removal procedure. However, pay attention to the following details.

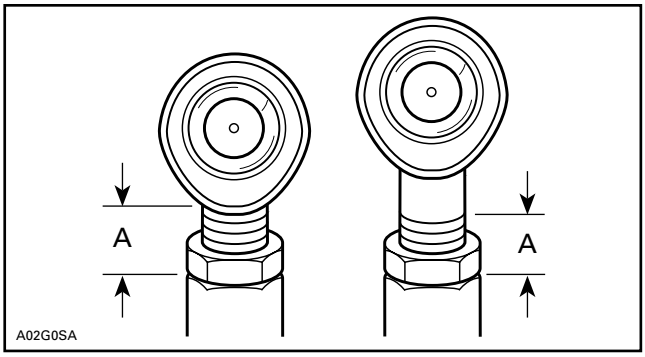
All long tie-rod end using a nut, need a hardened washer **no. 24** on each side of the part where the tie-rod is installed.

Note position of the hardened washer **no. 24** on short tie rod end. Refer to exploded view at the beginning of this subsection.



TYPICAL
1. Hardened washers

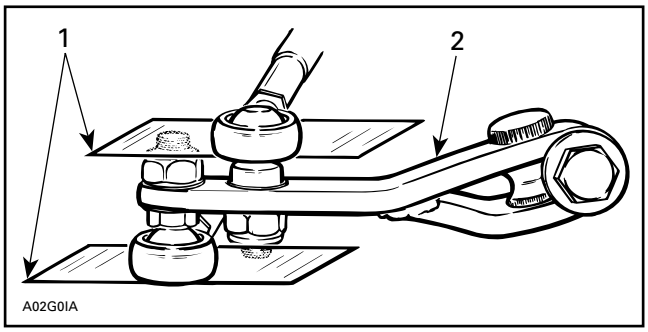
The maximum external threaded length not engaged in the tie rod must not exceed 20 mm (25/32 in).



TYPICAL
A. Maximum: 20 mm (25/32 in)

The ball joint should be restrained when tightening the tie rod end lock nut. Align it so the tie rod end is parallel to the steering arm when assembled on the vehicle, refer to the following illustration.

For proper torque specifications refer to the specific exploded view for the vehicle being serviced.



TYPICAL
1. Parallel with steering arm
2. Steering arm

⚠ WARNING

The cut off section of the ball joint must run parallel with the swivel bar no. 27. When tightening lock nuts, restrain ball joint with appropriate size wrench. The maximum external threaded length not engaged in the tie rod must not exceed 20 mm (25/32 in). After jam nut tightening, you should be able to rotate long tie rods by 20° and short tie rod by 10°.

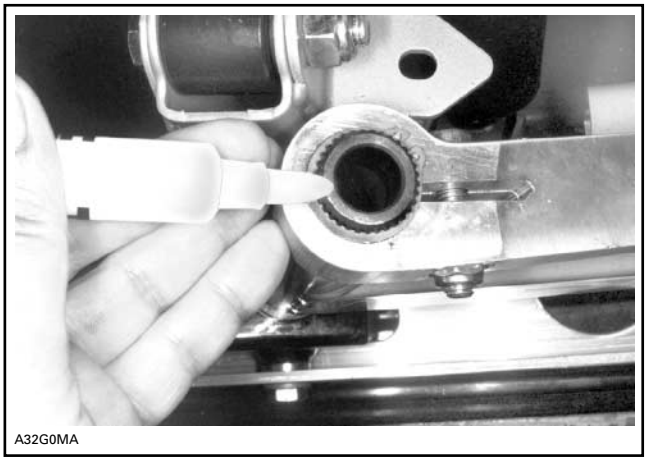
STEERING ARM

Removal

Unfasten the long tie rod **no. 5** from steering arm **no. 28**.

Remove steering arm from ski leg.

NOTE: To maintain correct steering geometry for reassembly, scribe a mark on the steering arm **no. 28** and ski leg before disassembly.



Inspection

Make sure steering arm and ski leg splines interlock.

⚠ WARNING

Any parts having worn splines have to be replaced with new ones.

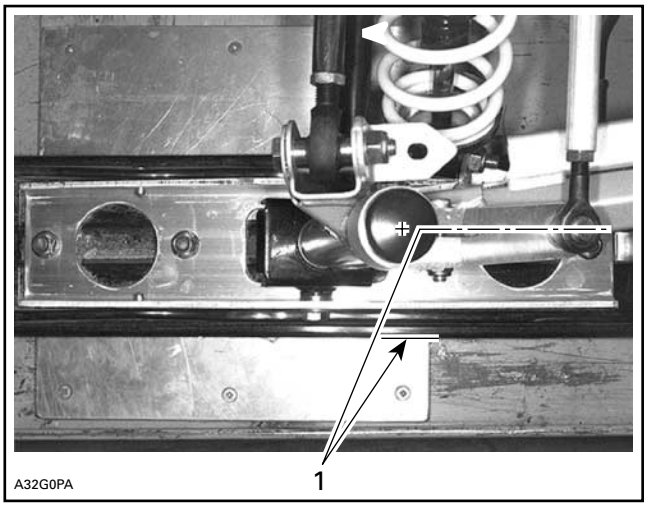
Check the general condition of the steering system components for wear. Replace if necessary.

Installation

For installation, reverse the removal procedure. Pay attention to the following details.

The steering arm angles should be equal on both sides when skis are parallel with vehicle.

Steering arm axis (from plastic cap center to ball center of ball joint) must run parallel to ski.



TYPICAL
1. Parallel

Push down on steering arm to eliminate axial play on ski leg before pinch bolt and nut tightening.

Tighten the steering arm pinch bolt and nut to the torque specified in the exploded view.

LUBRICATION

⚠ WARNING

Do not lubricate throttle cable or housing.

The parts listed below should be lubricate by using BOMBARDIER LUBE (P/N 293 600 016).

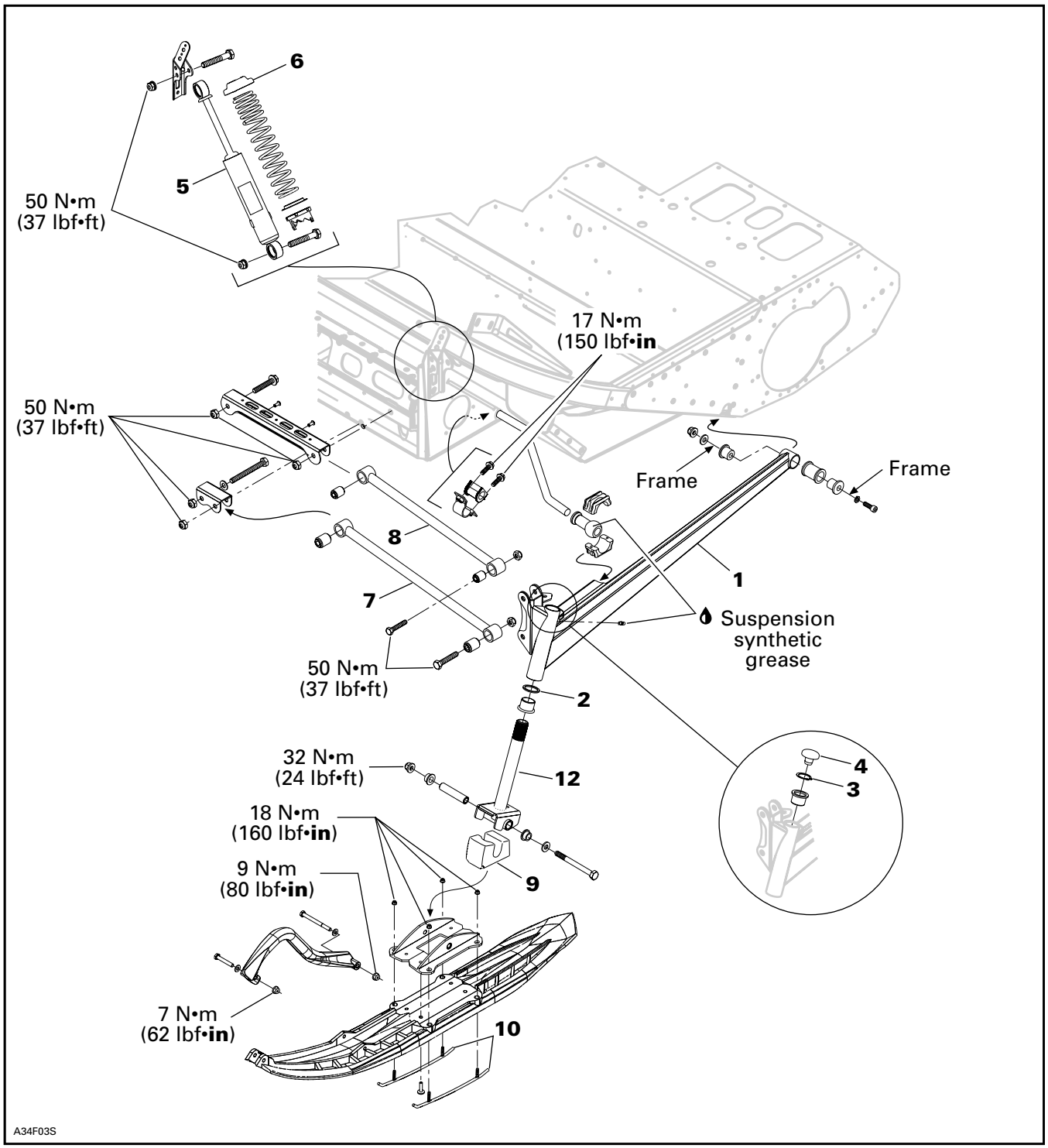
Lubricate:

– long tie rod ends
– short tie rod ends

Grease the following items with suspension synthetic grease (P/N 293 550 033).

– plastic U-clamps no. 6
– ski legs
– LH and RH swivel arms no. 3
– stabilizer blocks in swing arm.

FRONT SUSPENSION



DISASSEMBLY

Shock

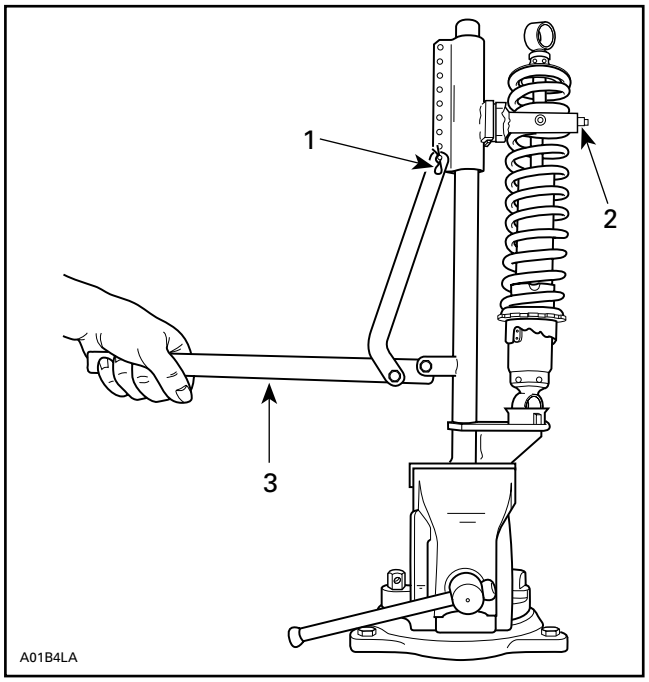
Lift front of vehicle and support it off the ground.

Reduce spring preload by turning adjusting ring accordingly.

Remove lower bolt then upper bolt of shock **no. 5**.

For shock spring disassembly use shock spring remover (P/N 529 035 504) in a vise. Mount shock in it and turn shock so that spring coils match spring compressor.

Close and lock the bar. Adjust the handle at horizontal position by changing the position of the clevis pin.



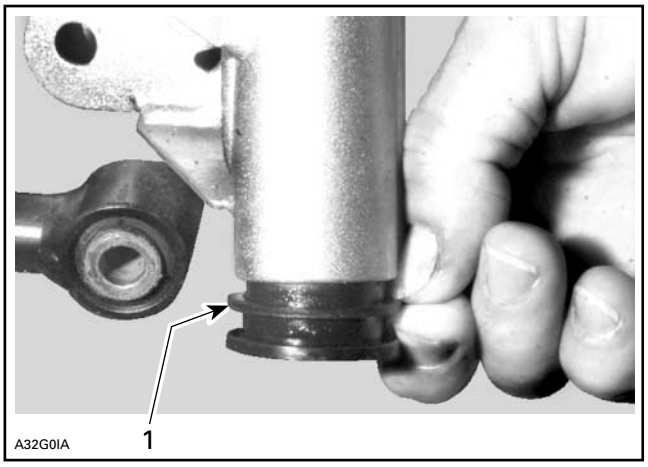
1. Clevis pin
2. Bar
3. Handle horizontal

Push down on the handle until it locks. Remove spring stopper **no. 6** then release handle.

Swing Arm

Lift front of vehicle and support it off the ground.

Remove cap **no. 4**, circlip **no. 3** then loosen steering arm bolt and pull up steering arm . Ski leg may fall off from swing arm **no. 1**. Note shim **no. 2** position.



1. Shim

Unbolt upper and lower arms.

Unbolt rear of swing arm from frame.

Pull swing arm off the vehicle.

INSPECTION

Check all rubber cushions for crack and wear. Replace as required.

Check straightness of ski leg **no. 12** and make sure that splines are properly interlocking with steering arm. Replace as required.

Check for straightness of swing arm. Replace as required.

Check for clogged grease fittings. Clean or replace as required.

Check skis and runners **no. 10** for wear, replace as necessary.

Check condition of ski stopper **no. 9**. Replace it when deteriorated.

To check condition of shock, refer to SC-10 III SUSPENSION then look for SHOCK ABSORBER INSPECTION.

INSTALLATION

For assembly, reverse the disassembly procedure. However, pay attention to the following.

Apply suspension synthetic grease (P/N 293 550 033) to ski leg components.

Tighten nuts and screws to proper torque as mentioned in exploded view.

Upper and Lower Arms

Position lower arm no. 7 and upper arm no. 8 horizontally before tightening nuts. Apply the tightening torque to the bolt head on the swing arm attachments.

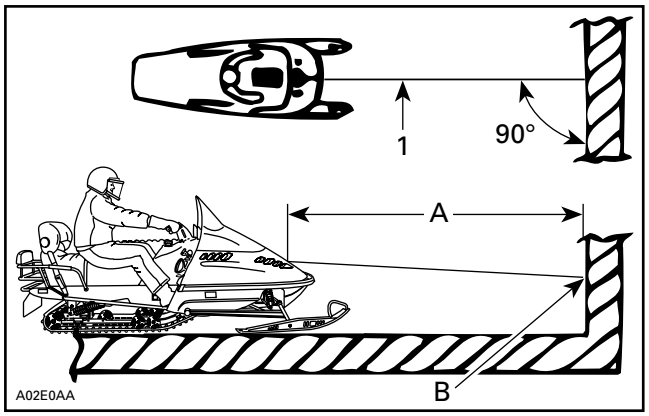
BODY

INSTALLATION AND ADJUSTMENT

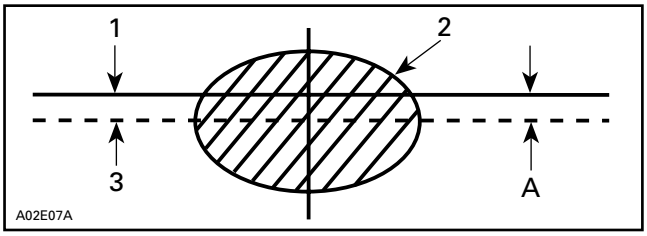
HEADLAMP BEAM AIMING

Beam aiming is correct when center of high beam is 25 mm (1 in) below the headlamp horizontal center line, scribed on a test surface, 381 cm (12 ft 6 in) away.

Measure headlamp center distance from ground. Scribe a line at this height on test surface (wall or screen). Light beam center should be 25 mm (1 in) below scribed line.



TYPICAL
1. Headlamp center line
A. 381 cm (12 ft 6 in)
B. 25 mm (1 in) below center line



1. Headlamp horizontal
2. Light beam (high beam) (projected on the wall)
3. Light beam center
A. 25 mm (1 in)

Required Conditions

Place the vehicle on a flat surface perpendicular to test surface (wall or screen) and 381 cm (12 ft 6 in) away from it.

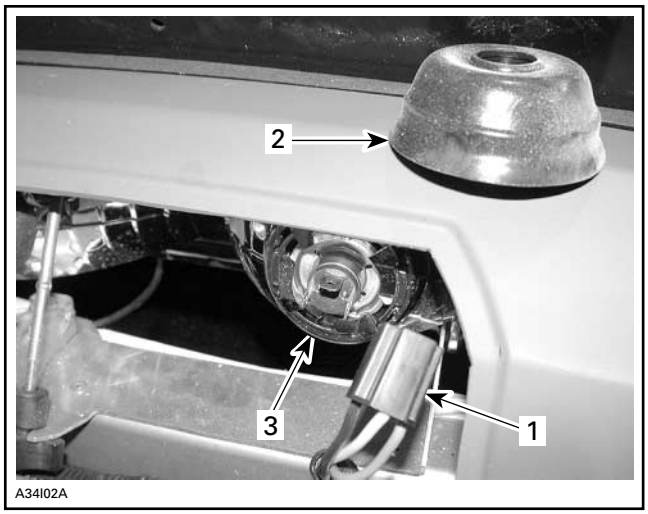
Rider or equivalent weight must be on the vehicle.

Select **high** beam.

BULB REPLACEMENT

Headlamp

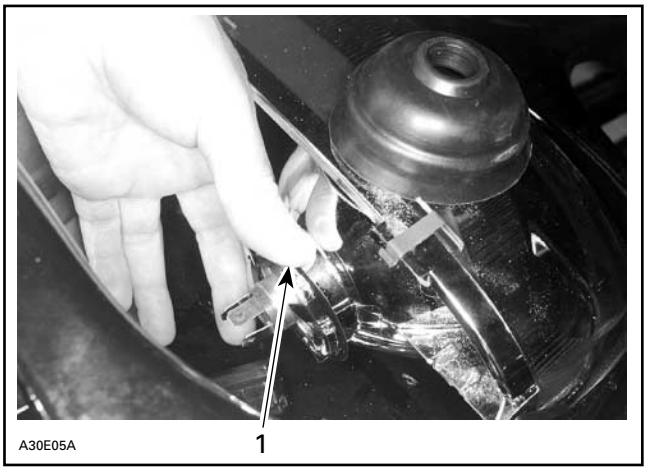
If any headlight bulb is burnt, open access door in dashboard.



TYPICAL — ACCESS DOOR REMOVED
1. Connector
2. Rubber boot
3. Retainer ring

Unplug burnt bulb connector. Remove the rubber boot.

Unfasten bulb retainer ring. Detach the bulb and replace. Properly reinstall parts.



TYPICAL
1. Locking ring

CAUTION: Never touch glass portion of an halogen bulb with bare fingers, as it shortens its operating life. If by mistake glass is touched, clean it with isopropyl alcohol which will not leave a film on the bulb.

Taillight

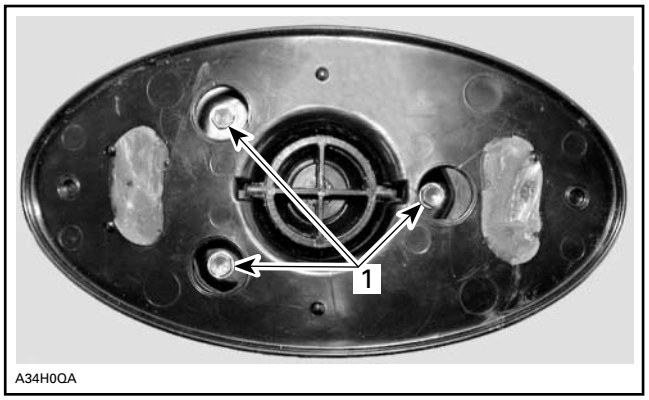
If the taillight bulb is burnt, expose the bulb by removing red plastic lens. To remove, unscrew the 2 retaining screws. Verify all lights after replacement.

REARVIEW MIRROR

Removal

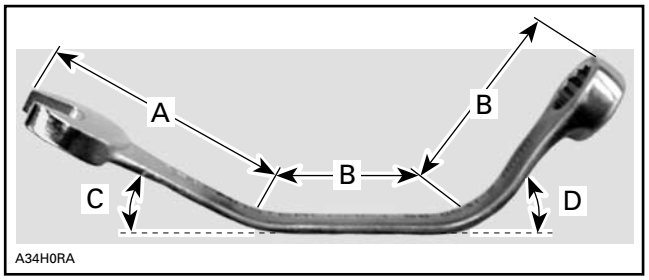
Remove the mirror from its back plate.

Unfasten the three bolts retaining the mirror back plate to the mirror base.



1. Three bolts

Bent a 8 mm wrench as illustrated.



A. 65 mm (2-9/16 in)
B. 32 mm (1-1/4 in)
C. 33°
D. 55°

With the modified 8 mm wrench, unfasten the two nuts retaining the mirror base to the structural upper chassis. Use a magnet to catch the two nuts.

TYPICAL — CUTAWAY

Installation

For installation, reverse the removal procedure.

DECAL

To remove a decal; heat old decal with a heat gun and peel off slowly.

Using isopropyl alcohol, clean the surface and dry thoroughly.

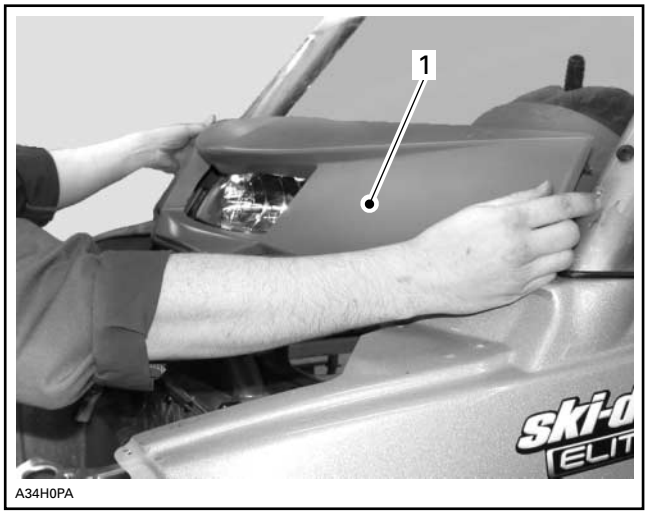
Apply liquid soap to new decal and carefully position the decal. Using a sponge or a squeegee, remove the air bubbles and surplus water working from the center toward the edges. Allow to air dry.

CAUTION: Do not apply isopropyl alcohol or solvent directly on decals. Use only in a well ventilated area.

WINDSHIELD INSTALLATION

Remove protective film.

Position the windshield in its place then fasten it. Put back the headlamp trim.



TYPICAL
1. Headlamp trim

GUARD

Disassembly and Assembly

NOTE: For additional information (ex.: exploded view) refer to the correspondent *Parts Catalog*.

⚠ WARNING

Engine should be running only with guard well secured in place.

Inspection

Check guard mounting bosses, clips and retainers for wear. Replace parts as required.

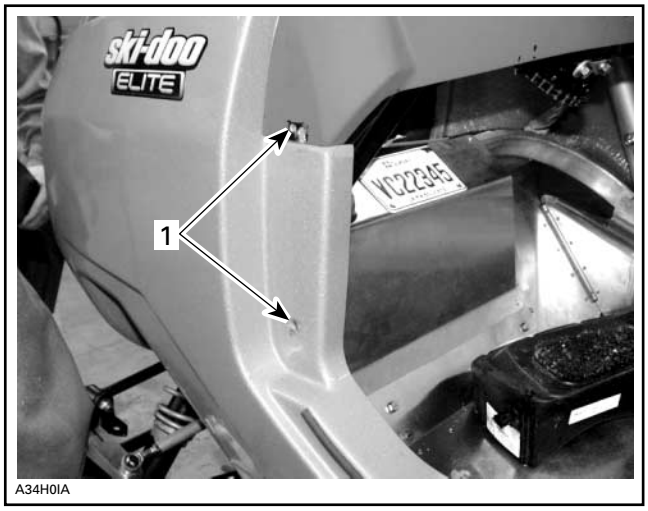
BODY

Removal

Remove the hood.

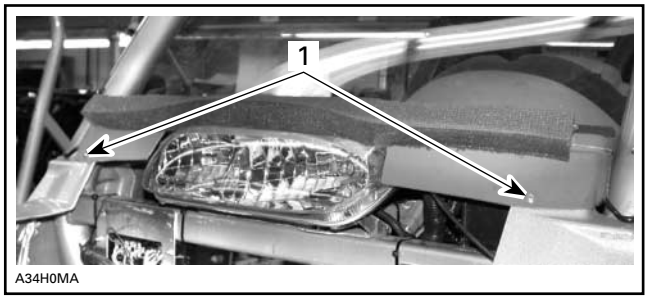
Open the doors. Lift each door to unhook it from its hinges. Remove each door from vehicle.

Remove both door hinges from vehicle.



LEFT HAND SIDE SHOWN
1. Hinge removed

Unbolt then remove the storage compartment cover. Remove the headlamp trim. Remove both top screws retaining the side panels to the dashboard.



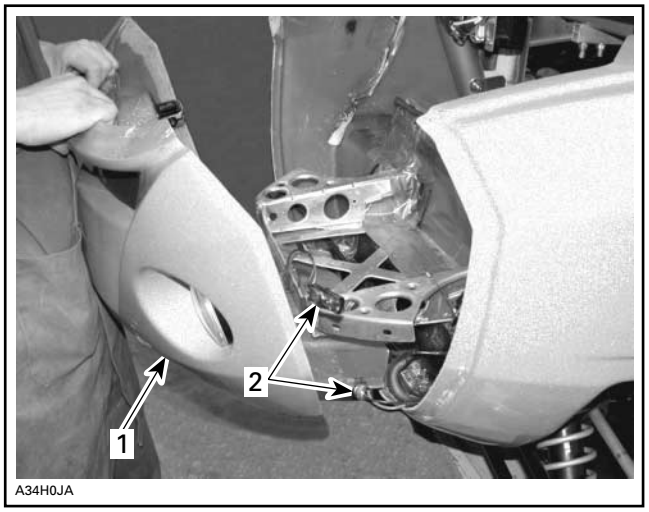
1. Top screws

Remove the cap plugs inside the storage compartment, then unscrew the nose.

Drill the rivet on the top and the bottom of the nose.

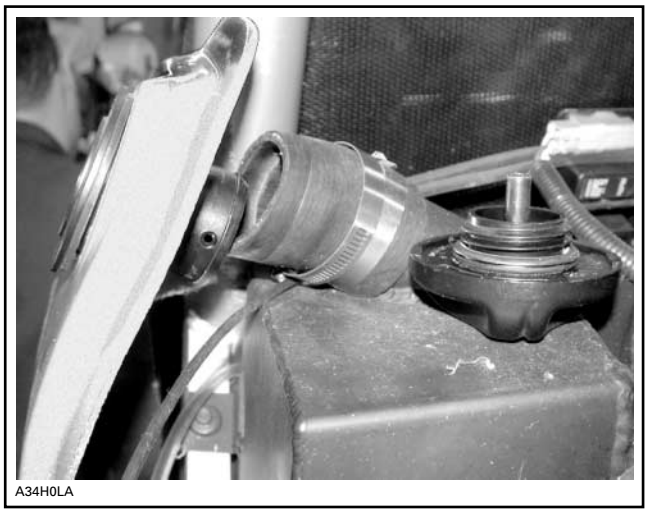
Unplug both fog lights.

Remove the nose.



TYPICAL — STORAGE COMPARTMENT REMOVED
1. Nose
2. Left hand side fog light connectors

Remove the fuel tank cap then, loosen the collar retaining the filler neck.



FILLER NECK UNFASTENING

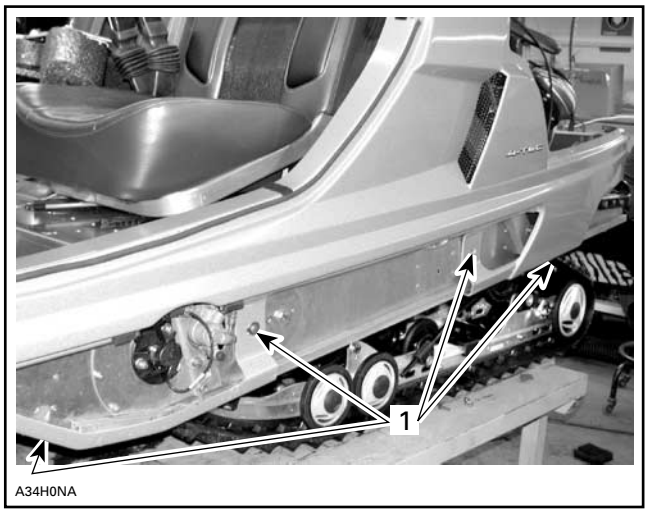
Remove both rear bumper extensions.

Unfasten both plastic moldings.

REMOVAL OF LEFT HAND SIDE PLASTIC MOLDING

Drill the 2 rivets retaining the rear of side panel to the rear part.

Remove the four screws retaining lower portion of each side panel.



1. Screws location

Remove the inner plastic panel to gain access to door hook bracket. Unfasten the door hook bracket from the chassis.

Remove the side panels from the vehicle.


A34H00A

REMOVAL OF THE LEFT HAND SIDE PANEL

Installation

For installation, reverse the removal procedure.

WIRING HARNESS

⚠ WARNING

Ensure all terminals are properly crimped on the wires and that all connector housings are properly fastened. Keep wires away from any rotating, moving, heating and vibrating parts. Use proper fastening devices as required.

CABLES

⚠ 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.

TUBING

⚠ WARNING

Always ensure that the fuel and vent lines are properly fixed to their connectors, that they are not perforated or kinked and that they are properly routed away from any rotating, moving, heating or vibrating parts. Also check for leaks. Replace if required.

NOTE: Refer to proper *Parts Catalog* to find suitable clip part numbers.

PLASTIC MAINTENANCE AND REPAIR

MAINTENANCE

Clean the vehicle thoroughly, removing all dirt and grease accumulation.

To clean use a soft clean cloth and either soapy water or isopropyl alcohol.

To remove grease, oil or glue use isopropyl alcohol.

CAUTION: Do not apply isopropyl alcohol or acetone directly on decals.

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
- varsol
- naphtha
- acetone
- strong detergents
- abrasive cleaners
- waxes containing an abrasive or a cleaning agent in their formula.

Apply wax on glossy finish 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 preferable to cover it with an opaque tarpaulin. This will prevent the sun rays from affecting the plastic components and the vehicle finish.

WINDSHIELD REPAIR

⚠ WARNING

Polycarbonate windshields must never be repaired by welding or otherwise.

BODY REPAIR

General

Gelcoat is the smooth and durable cosmetic finish which coats the fiberglass body. It consists of a mixture of resin, pigment (coloring), fillers, monomers and catalyst which is sprayed into the mold.

The body is constructed of chopped fiberglass, saturated with resin. It is sprayed on the layer of gelcoat along with pieces of fiberglass mat, cloth and woven roving which are added at required areas. This type of construction is very accommodating for high quality repairs. With patience, the proper techniques and materials, a damaged area can be restored to an original finish.

NOTE: Fiberglass repair kit is available through automotive or marine suppliers. Gelcoat repair kits are available directly from GELCOTE INTERNATIONAL LTD.

⚠ WARNING

Protect skin, wear gloves when in contact with resin, hardeners and gelcoat. A barrier skin cream may also be used. Do not expose area to open flame or lit cigarette. Some of the materials are flammable. Protect eyes, wear safety glasses when grinding, sanding or spraying. Use a dust mask when sanding or grinding. When spraying wear a respirator or paint mask. Always read warning labels on products.

Air Bubbles

Possible cause:

– Air pocket trapped between layers of laminate and gelcoat.

PREPARATION OF SURFACE

Remove all of the damaged gelcoat surrounding the air bubble with a putty knife or preferably a carbide grinding tip. Make sure all loose and weak areas are completely removed. Sand a small area of the gelcoat surface with 220-grit sandpaper. If needed, sand the cavity itself. These areas must have a rough surface to allow the gelcoat putty to bond properly.

FILLING THE CAVITY

The prepared surface must be cleaned with acetone on a cloth. Use a gelcoat repair kit. Follow the mixing instructions in the kit when preparing the gelcoat putty.

Carefully mix the required amount while making sure there are no air bubbles in the mixture. With a putty knife, fill the repair area and cover with plastic film. Curing time may depend on temperature, amount of putty and percentage of catalyst. After 2 hours, press lightly on the surface with fingers to test the hardness. When the area becomes hard, remove the plastic film.

SANDING

Begin block sanding the patch with 320-grit sandpaper until you come close to the original surface. Remove dust with a water soaked cloth and continue sanding with a 400-grit wet paper. Finish wet sanding with a 600-grit to remove deeper scratches. If needed you can wet sand with finer grit paper such as 1000-grit.

BUFFING AND WAXING

Buff the surface using a heavy duty polisher with a buffing pad. Make sure the pad is free of dirt or you may damage the gelcoat. Carefully begin buffing with a white medium compound. Finish off using a fine compound. While buffing, pay close attention to avoid overheating the surface.

Blisters

Possible causes:

– Insert catalyst.
– Improper catalyst/gelcoat ratio.

A blister is a visible bump on the body surface that may not necessarily come right through the gelcoat layer. In the case of only a few blisters, follow the same repair procedure as for air bubbles. If they are numerous and in close concentration, spray liquid gelcoat to achieve proper repair. This procedure is covered in **Minor Gelcoat Fractures**.

Minor Gelcoat Fractures

Possible causes:

– Flexing of fiberglass laminate.
– Gelcoat thickness.
– Direct result of impact.

In case of fractures which have not penetrated past the gelcoat layer, the repair concerns the gelcoat only. If flex cracking or impact are evident, then additional reinforcement may be necessary. This subject will be covered in **Compound Fractures**.

PREPARING THE SURFACES

Small Fractures

Open the cracks up with a sharp triangular can opener or preferably a carbide tipped die grinder. The V groove will provide a good bonding area for the gelcoat. With 220-grit sandpaper, sand the sides of the notched out areas.

Numerous Fractures

Using a grinder with a 24-grit disk, remove the gelcoat. Sand the area edge with 220-grit sandpaper.

FILLING THE REPAIR AREA

Small Fractures

Refer to the same procedure as in the AIR BUBBLES.

Numerous Fractures Over Large Surface:

Prepare the area for spray application of liquid gelcoat. Wipe down the surface with acetone. Mask the area off to protect the body from overspray.

Mix the needed quantity of gelcoat and catalyst according to suppliers recommendations. The gelcoat can be thinned with acetone up to 10%. If it needs more consistency you can add cabosil.

Make sure that the air supply is free of oil, dirt and water.

Test spray the gelcoat mixture on paper to verify its consistency and pattern. You may have to apply 5 or 6 coats to cover the area properly. Overlap each coat further than the last, leaving at least 30 seconds between passes. Avoid trying to coat the surface with only a few heavy coats, this will not allow the gelcoat to dry properly.

Apply a coat of polyvinyl alcohol (PVA) to seal off the air and protect the gelcoat surface from dust. PVA speeds up the curing process because gelcoat will not cure properly when exposed to air.

SANDING

Wash the polyvinyl alcohol off with water. Depending on the size of the area repaired, you can either block sand as per previous procedure or you may use an air sander. Sand the surface down with progressively finer grits of sandpaper until the desired finish is achieved.

BUFFING AND WAXING

Buff the surface using a heavy duty polisher with a buffing pad. Make sure the pad is free of dirt or you may damage the gelcoat. Carefully begin buffing with a white medium compound. Finish off using a fine compound. While buffing, pay close attention to avoid overheating the surface.

Compound Fractures

Possible causes:

– Thickness of fiberglass laminate.
– Direct result of impact.

Compound fractures are those that have gone past the gelcoated surface and in through the layers of fiberglass laminate. Two types of repairs have to be performed. The first is to restore the structural integrity of the damaged area. Fracture types can vary from a simple crack to a large hole. Usually, fiberglass reinforcement becomes necessary, especially if the fracture can be attributed to weakness. The final part of the repair is the gelcoating, which cannot be done until the interior and exterior laminate surfaces have been repaired.

Outside

Remove the damaged gelcoat and fiberglass with a 24-grit disk using a power sander. Grind outward at least 2 inches from the fracture to allow the patch to bond to strong material. Cut enough pieces of fiberglass mat necessary to build up the area. The pieces should be cut so they overlap each other by at least a half inch. For a smoother finish, the last layer should be fiberglass cloth. If the fracture is small enough all you may have to do is fill the area with an epoxy filler.

Inside

For the interior repair, you can grind more. This will allow for more fiberglass material which will strengthen the area. If the fracture opening is too large after surface preparation, you may need a backing support to cover the opening. Cut alternating pieces of fiberglass mat and cloth in overlapping sizes.

PATCHING THE REPAIR AREA

Outside

The outside should be done first. Wipe clean the area with acetone on a cloth, then mask off area. For a small crack use an epoxy filler in the same way you would use gelcoat repair putty. When laying up a larger area you will use mat, cloth and fiberglass resin and catalyst. Use a clean container to mix the resin, mix only what you will need. Follow the recommended catalyst ratio.

Using a clean paintbrush, brush the mixed resin on the surface. Place the smallest piece of mat over the fracture and then wet out the mat. Follow with the remaining pieces of mat and final layer of cloth. While wetting the pieces make sure you work the air bubbles out and saturate all the pieces evenly. Try to work quickly, you may only have 15 or 20 minutes. You may clean the brush with acetone.

Wait until the repair has hardened before moving on to the interior repair. If the size of the opening is too large for the pieces to maintain the proper shape, you will have to use a backing support. It is a shaped piece of cardboard that fits flush to the interior surface and has a plastic layer on the repair side. It is held in place by tape or a support.

Inside

Wipe down the area with acetone on a cloth. Apply the same procedure as for outside repair when laminating the alternating pieces of fiberglass material. If a backing support was used, remove it before starting the repair. After the area has hardened, remove sharp edges of material from surface. If required paint the surface.

SANDING

Outside

This surface will have to be prepared for application of gelcoat. The size of the area will determine the gelcoating procedure to be used. Refer to the repair procedure for minor gelcoat fractures.

BUFFING AND WAXING

Refer to the buffing and waxing for **Minor Gelcoat Fractures**.

TOOLS AND MATERIALS LIST

Tools

- safety glasses
- air mask
- white cloths
- sanding block
- putty knife
- plastic film
- stirring stick
- cover sheets and masking tape
- scissors
- buffing pad
- heavy-duty polisher
- power sander
- paint brush
- plastic container (mixing)
- spray gun
- plastic squeegee.

Materials

– fiberglass mat
– fiberglass cloth
– polyester resin
– cardboard
– masking tape
– sandpaper (100-grit, 220-grit, 320-grit, 400-grit, 600-grit, 1000-grit)
– 24-grit sanding disks
– gelcoat putty
– liquid gelcoat
– acetone
– cabosil
– epoxy filler
– medium compound (white)
– fine compound (white)
– wax.

FRAME

FRAME CLEANING

NOTE: On bare aluminum frame use only aluminum cleaner and follow instructions on container. (Dursol cleaner or equivalent).

Clean frame and tunnel with appropriate cleaners and rinse with high pressure water jet.

CAUTION: Never direct high-pressure water jet towards decals. They would peel off.

Touch up all metal spots where paint has been scratched off. Spray all bare metal parts of vehicle with metal protector.

Seat Cleaning

Clean the seats with a solution of **warm soapy water**, using a soft clean cloth.

CAUTION: Avoid use of harsh detergents such as strong soaps, degreasing solvents, abrasive cleaners, paint thinners, etc., that may cause damage to the seats.

FRAME WELDING

Aluminum Frame

– No welds should be done on aluminum frame except if mentioned or required on a Bombardier bulletin.
– Use ER-5356 rods for MIG or TIG welding.

CAUTION: Before performing electrical welding anywhere on the vehicle, unplug both the ECU and VCU. Also unplug the negative cable from the battery. This will protect the electronic boxes and battery against damage caused by flowing current when welding.

CAUTION: If welding is to be done near plastic material, it is recommended to either remove the part from the area or to protect it with aluminum foil to prevent damage.

FRAME COMPONENT REPLACEMENT

Drilling Procedure

When drilling self-piercing rivets, use Supertanium™ drill bit (P/N 529 031 800), available in a 5 mm (3/16 in) size and shipped in packs of 2.

For proper drilling instructions and to prevent premature wear, follow the procedure below.

Always use a variable speed electric drill.

Partially drill rivet end — not the rivet head.

Maintain a slow to medium speed at all times when drilling. The proper speed is attained when a constant chip is ejected.

NOTE: To increase bit life, use Bombardier synthetic chaincase oil (P/N 413 803 300) as a cutting oil.

CAUTION: High speed drilling will cause excessive heat which may destroy the cutting edge of the bit; therefore, avoid using pneumatic drills.

Cut rivet using a chisel.

Remove riveted part.

Drive out remaining rivet head using a punch.

SI METRIC INFORMATION GUIDE

SI* METRIC INFORMATION GUIDE

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	1000
centi	c	one hundredth	0.01
milli	m	one thousandth	0.001
micro	µ	one millionth	0.000001

CONVERSION FACTORS

TO CONVERT	TO (1)	MULTIPLY BY
in	mm	25.4
in	cm	2.54
in²	cm²	6.45
in³	cm³	16.39
ft	m	0.3
oz	g	28.35
lb	kg	0.45
lbf	N	4.4
lbf•in	N•m	0.11
lbf•ft	N•m	1.36
lbf•ft	lbf•in	12
PSI	kPa	6.89
imp. oz	U.S. oz	0.96
imp. oz	mL	28.41
imp. gal	U.S. gal	1.2
imp. gal	L	4.55
U.S. oz	mL	29.57
U.S. gal	L	3.79
MPH	km/h	1.61
Fahrenheit	Celsius	(°F - 32) ÷ 1.8
Celsius	Fahrenheit	(°C x 1.8) + 32
hp	kW	.75

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* The international system of units abbreviates SI in all languages.

(1) To obtain the inverse sequence, divide by the given factor. To convert **millimeters** to **inches**, divide by 25.4.

NOTE: Conversion factors are rounded off to 2 decimals for easier use.

ENGINE

ELITE			SE
ENGINE			
Engine type			BOMBARDIER-ROTAX 1503 4-TEC, 4-stroke, Over Head Camshaft (OHC), liquid cooled
Number of cylinders			3
Number of valves			12 valves with hydraulic lifters (no adjustment)
Bore		Standard	100 mm (3.9 in)
Stroke			63.4 mm (2.49 in)
Displacement			1493.8 cc (58.81 in^3)
Compression ratio			10.6 ± 0.4
Maximum HP RPM (1)			7300 ± 100 RPM
Lubrication			Dry sump with replaceable oil filter
Oil filter			CHAMPION
Intake valve opening			10° BTDC
Intake valve closing			45° ABDC
Exhaust valve opening			50° BBDC
Exhaust valve closing			5° ATDC
Starting system			Electric start
Valve stem diameter	Intake	New minimum	5.961 mm (.2347 in)
		New maximum	5.975 mm (.2352 in)
		Wear limit	5.930 mm (.2330 in)
	Exhaust	New minimum	5.946 mm (.2341 in)
		New maximum	5.960 mm (.2346 in)
		Wear limit	5.930 mm (.2330 in)
Valve guide diameter		New minimum	5.994 mm (.2360 in)
		New maximum	6.018 mm (.2369 in)
		Wear limit	6.060 mm (.2386 in)
Valve spring free length	Inner	New nominal	41.02 mm (1.615 in)
		Wear limit	38.8 mm (1.499 in)
	Outer	New nominal	45.45 mm (1.789 in)
		Wear limit	43 mm (1.693 in)

ELITE			SE
ENGINE (cont'd)			
Valve seat contact width	Intake	New nominal	1.1 to 1.3 mm (.043 to .051 in)
		Wear limit	1.6 mm (.063 in)
	Exhaust	New nominal	1.25 to 1.55 mm (.049 to .061 in)
		Wear limit	1.8 mm (.071 in)
Rocker arm bore diameter		New minimum	20.007 mm (.7876 in)
		New maximum	20.020 mm (.7881 in)
		Wear limit	20.035 mm (.7887 in)
Rocker arm shaft diameter		New minimum	19.980 mm (.7866 in)
		New maximum	19.993 mm (.7871 in)
		Wear limit	19.965 mm (.7860 in)
Cylinder head screw		Service limit	148.5 mm (5.846 in)
Piston ring type and quantity		1st	Rectangular
		2nd	Taper-face
		3rd	Oil scraper ring
Ring end gap	Rectangular	New minimum	0.15 mm (.006 in)
	Taper-face		0.15 mm (.006 in)
	Oil scraper ring		0.15 mm (.006 in)
	Rectangular	New maximum	0.3 mm (.012 in)
	Taper-face		0.3 mm (.012 in)
	Oil scraper ring		0.4 mm (.016 in)
	All	Wear limit	1.5 mm (.06 in)
Ring/piston groove clearance	Rectangular	New minimum	0.025 mm (.001 in)
	Taper-face		0.015 mm (.0006 in)
	Oil scraper ring		0.02 mm (.0008 in)
	Rectangular	New maximum	0.07 mm (.0028 in)
	Taper-face		0.06 mm (.0024 in)
	Oil scraper ring		0.055 mm (.0021 in)
	All	Wear limit	0.15 mm (.006 in)
Piston/cylinder wall clearance		New (minimum)	0.024 - 0.056 mm (.001 - .0022 in)
		Wear limit	0.1 mm (.0039 in)
Cylinder taper (maximum)			0.03 mm (.0011 in)
Cylinder out of round (maximum)			0.008 mm (.0003 in)

ELITE			SE
ENGINE (cont'd)			
Camshaft bearing journal	Front	New minimum	24.939 mm (.9818 in)
		New maximum	24.960 mm (.9827 in)
		Wear limit	24.930 mm (.9815 in)
	PTO and center	New minimum	39.892 mm (1.5705 in)
		New maximum	39.905 mm (1.5711 in)
		Wear limit	39.885 mm (1.5703 in)
Camshaft bore	Front	New minimum	25.000 mm (.9842 in)
		New maximum	25.013 mm (.9848 in)
		Wear limit	25.025 mm (.9852 in)
	PTO and center	New minimum	40.000 mm (1.5748 in)
		New maximum	40.016 mm (1.5754 in)
		Wear limit	25.025 mm (1.5758 in)
Cam lobe	Intake	New minimum	31.480 mm (1.2394 in)
		New maximum	31.590 mm (1.2437 in)
		Wear limit	31.430 mm (1.2374 in)
	Exhaust	New minimum	31.699 mm (1.2480 in)
		New maximum	31.809 mm (1.2523 in)
		Wear limit	31.650 mm (1.2461 in)
Crankshaft axial clearance		New minimum	0.08 mm (.0031 in)
		New maximum	0.22 mm (.0087 in)
Crankshaft journal diameter		New minimum	49.984 mm (1.9679 in)
		New maximum	50.000 mm (1.9685 in)
		Wear limit	49.950 mm (1.9665 in)
Crankshaft radial clearance		Wear limit	0.007 mm (.0028 in)
Connecting rod big end diameter		Service limit	45.080 mm (1.7740 in)
Connecting rod big end clearance		Service limit	0.09 mm (.0035 in)
Connecting rod big end axial play		New minimum	0.135 mm (.0053 in)
		New maximum	0.287 mm (.0113 in)
		Wear limit	0.500 mm (.0197 in)
Crankshaft deflection			0.050 mm (.002 in)
Connecting rod small end diameter		New minimum	23.010 mm (.9059 in)
		New maximum	23.020 mm (.9063 in)
		Wear limit	23.070 mm (.9080 in)

ELITE		SE
ENGINE (cont'd)		
Piston pin diameter	New minimum	22.996 mm (.9053 in)
	New maximum	23.000 mm (.9055 in)
	Wear limit	22.990 mm (.9051 in)
Piston pin bore clearance	Wear limit	0.080 mm (.0035 in)
Balance shaft journal diameter	New minimum	31.984 mm (1.2592 in)
	New maximum	32.000 mm (1.2598 in)
	Wear limit	31.950 mm (1.2579 in)
Balance shaft radial clearance	Wear limit	0.07 mm (.0028 in)
Balance shaft axial clearance	New minimum	0.02 mm (.0008 in)
	New maximum	0.25 mm (.0098 in)

ELITE		SE
ELECTRICAL		
Alternator output		55 A
Ignition system type		DI (Digital Induction)
Ignition timing		Not adjustable
Spark plug	Make and type	NGK DCPR8ES
	Gap	0.75 mm (.030 in)
Generating coil		N.A.
Ignition coil	Primary (2)	0.45 Ω — 0.55 Ω
	Secondary (2)	6.8 kΩ — 10.2 kΩ
Engine RPM limiter setting		7650 RPM

ELITE		SE
FUEL SYSTEM		
Fuel injection type		Rotax EMS (engine management system) Multipoint Fuel Injection. Single throttle body (52 mm (2.05 in))
Fuel pressure		58 PSI
Idle speed		1500 ± 50 RPM
Throttle Position Sensor (TPS) (2)		1.6 kΩ - 2.4 kΩ
Crankshaft Position Sensor (CPS)		5 volts
Camshaft Position Sensor (CAPS)		12 volts
Camshaft Position Sensor (CAPS) (2)		1.2 kΩ
Air Temperature Sensor (ATS) (2)		2.28 kΩ - 2.74 kΩ
Coolant Temperature Sensor (CTS) (2)		2.28 kΩ - 2.74 kΩ
Manifold Air Pressure Sensor (MAPS) (2)		0 Ω (continuity between terminals 3 and 1)
Knock Sensor (KS) (2)		5 MΩ
Oil Pressure Switch (OPS) (2)		0 Ω , if oil pressure is greater than 26 - 32 PSI
Oil Separator Pressure Switch (OSPS) (2)		0 Ω , if blow-by pressure is less than 6 PSI
Fuel injector (2)		14.5 Ω — 15 Ω
Fuel	Type	Unleaded gasoline
	Minimum octane number	87

ELITE	SE
COOLING	
Type	Liquid cooled
Coolant (3)	50% Ethylene-glycol/50% water. Coolant containing corrosion inhibitors for internal combustion aluminum engines
Thermostat	87°C (188°F)
Monitoring beeper setting	110°C (230°F)

VEHICLE

ELITE				SE
DRIVE				
Final drive ratio				38/63
Final drive belt deflection			mm (in)	11 (.433)
Forward gear ratio				23/31
Reverse gear ratio				17/38
Chain	Pitch		in	3/8
	Type/links qty/plate qty			Silent 46/13
Drive pulley	Type			TRA IV HD
	Calibration	Clutch engagement	RPM	2200 ± 100
		Spring color		Red/Yellow
		Spring length	mm (in)	87.9 (3.461)
		Weight		N.A.
		Block		N.A.
		Cap		N.A.
		Pin		Solid
		Ramp		609
		Screw position		3 (4)
Driven pulley	Type			HPV VSA
	Spring preload		± 0.7 kg (± 1.5 lb)	7.0 (15.4)
	Cam angle			47°/30°
Pulley distance	Z		mm (in)	124.0 ± 0.5 (4.882 ± .020)
Offset	X		mm (in)	37.0 ± 0.5 (1.457 ± .020)
	Y – X	MIN.-MAX.	mm (in)	1.5 ± 0.75 (.060 ± .030)
Drive belt part number (P/N)				417 300 207
Drive belt width (5)		Wear limit	mm (in)	34.2 (1.346)
Drive belt adjustment		Deflection	mm (in)	32 ± 5 (1.260 ± .197)
		Force (1)	kg (lbf)	11.34 (25)
Track	Width		mm (in)	381 (15)
	Length		mm (in)	3455 (136)
	Adjustment	Deflection	mm (in)	30 to 35 (1.181 to 1.378)
		Force (2)	kg (lbf)	7.3 (16)
Suspension type		Track		SC-10 III
		Ski		ADSA

ELITE		SE
ELECTRICAL		
Battery		12 V, 30 A•h
Headlamp	W	2 x 60/55 (H4)
Fog Lights	W	2 x 55 (H3)
Taillight and stoplight	W	8/27
Tachometer and speedometer bulbs	W	2 x 1.5
Fuel and temperature gauge bulbs	W	3
CAPACITIES		
Fuel tank	L (U.S. gal)	52 (13.7)
Gearbox	mL (U.S. oz)	1100 (37.2)
Cooling system (3)	L (U.S. oz)	6.6 (223)
Engine oil change quantity (with filter replacement)	L (U.S. oz)	3.0 (101)
Total engine oil quantity (rebuild)	L (U.S. oz)	4.5 (152)
VEHICLE INFORMATIONS		
Mass (dry)	kg (lb)	499 (1100)
Length	mm (in)	2908 (114.5)
Width	mm (in)	1213 (47.759)
Height	mm (in)	1683 (66.260)
Ski stance (between outer runners)	mm (in)	1196 (47.1)
Ground contact area	cm^2 (in^2)	11251.6 (1744)
Ground contact pressure	kPa (PSI)	4.35 (.631)
Frame material		Aluminum
Body		Fiberglass
Add-on parts		HDPE/polypro softtouch

TECHNICAL DATA LEGENDS

ENGINE LEGEND

ABDC: After Bottom Dead Center

ATDC: After Top Dead Center

BBDC: Before Bottom Dead Center

BTDC: Before Top Dead Center

K: Kilo (x 1000)

N.A.: Not Applicable

PTO: Power Take Off

(1) The maximum horsepower RPM applicable on the vehicle. It may be different under certain circumstances and BOMBARDIER reserves the right to modify it without obligation.

(2) All resistance measurements must be performed with parts at room temperature (approx. 20°C (68°F)). Temperature greatly affects resistance measurements.

(3) Use Bombardier premixed coolant (P/N 293 600 038) or a solution of ethylene glycol antifreeze for aluminum engines with distilled water (50% antifreeze, 50% distilled water).

VEHICLE LEGEND

ADSA: Advance Direct Shock Action

N.A.: Not Applicable

TRA: Total Range Adjustable

VSA: Variable Sheave Angle

W: Watt

(1) Force applied midway between pulleys to obtain specified tension deflection.

(2) Force or downward pull applied to track to obtain specified tension deflection.

(3) Use Bombardier premixed coolant (P/N 293 600 038) or a solution of ethylene glycol antifreeze for aluminum engines with distilled water (50% antifreeze, 50% distilled water).

(4) From factory TRA IV HD drive pulley adjustment screws are set to **position 3**. This position allows the best compromise between acceleration, top speed and fuel economy. **Position 1 or 2** would provide the best fuel economy. Top speed would be reduce. **Position 4** would give the best acceleration. Fuel economy would be reduced.

(5) Minimum allowable width may not be less than 3 mm (1/8 in) of new drive belt.

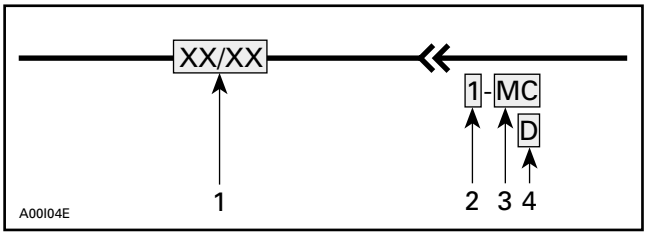
WIRING DIAGRAM

Wiring diagram can be found at the end of this subsection.

WIRING DIAGRAM LEGEND

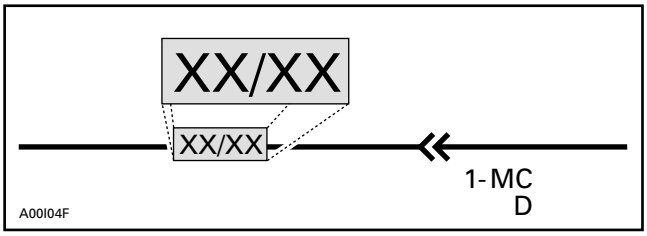
⚠ WARNING

Ensure all terminals are properly crimped on the wires and all connector housings are properly fastened.



1. *Wire colors*
2. *Connector housing area*
3. *Housing reference code per area*
4. *Wire connector location in housing*

WIRE COLORS



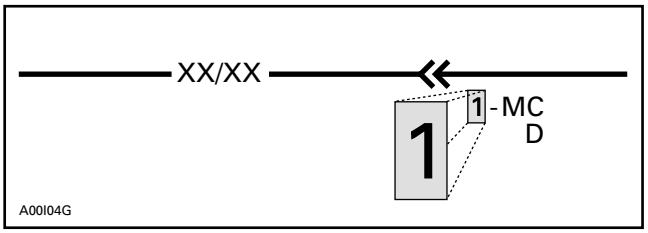
The first color of a wire is the main color, second color is the stripe.

Example: YL / BK is a YELLOW wire with a BLACK stripe.

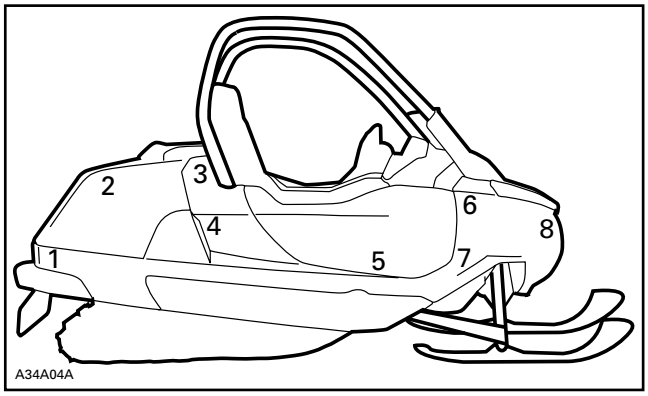
COLOR CODE	
BE — BEIGE	OR — ORANGE
BK — BLACK	RD — RED
BU — BLUE	VI — VIOLET
BR — BROWN	WH — WHITE
GN — GREEN	YL — YELLOW
GY — GREY	

CONNECTOR HOUSING AREA

The first digit of the connector identification number presents the location of the connector on the vehicle.



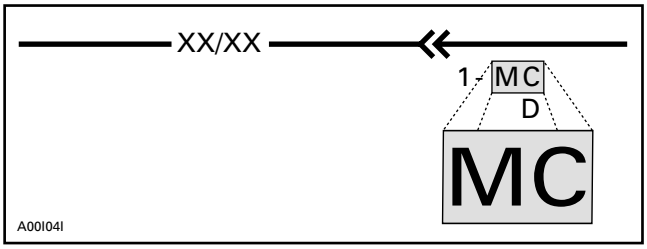
The following illustration shows the snowmobile with number on it. These numbers will correspond with the locations of the connector on the vehicle along with a brief description.



AREA	LOCATION
1	Engine compartment, near radiator and alternator
2	Engine
3	Engine compartment on firewall
4	Near battery
5	Seat, speed sensor
6	LH side of dash (speedometer)
7	Fuse box and switches (RH side of dash)
8	Front (fog lights, headlight)

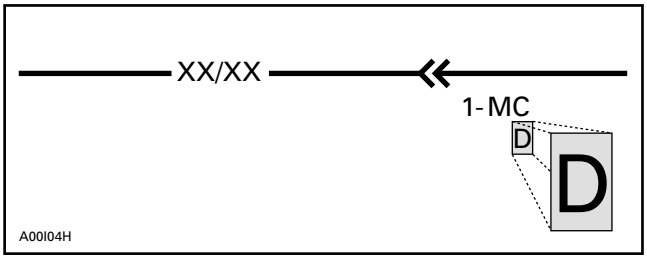
HOUSING REFERENCE CODE PER AREA

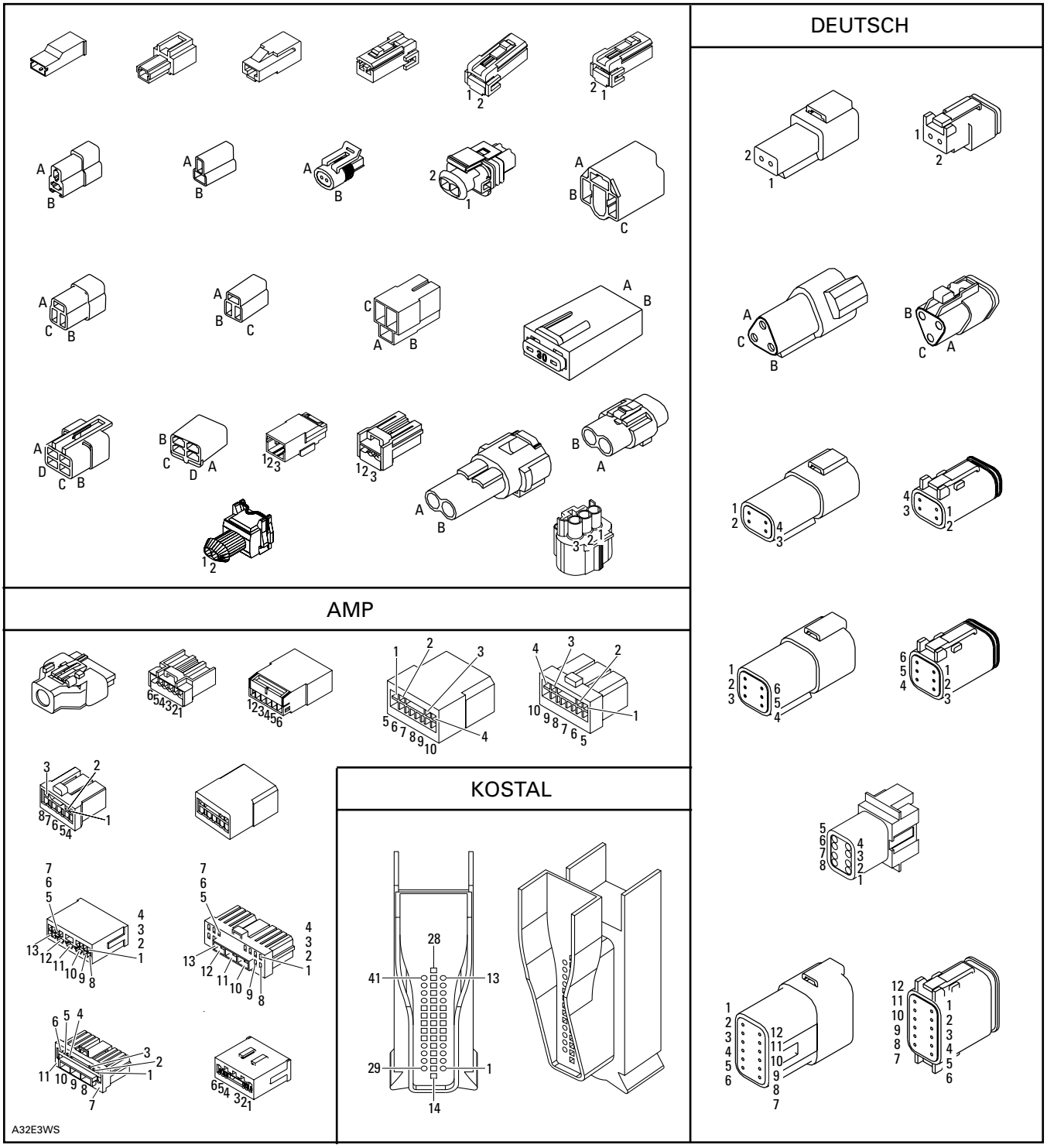
The next two letters of the connector identification number represents a connector reference code. If there are many connectors in the same area this helps identify which wire is in which connector.



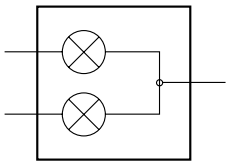
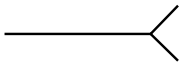
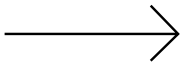
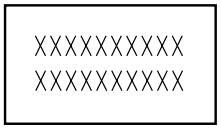
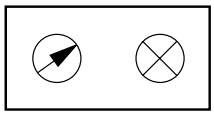
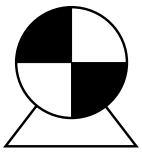
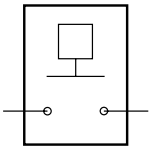
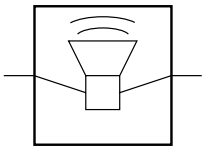
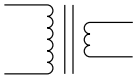
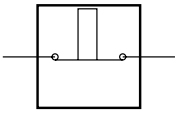
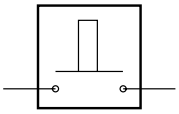
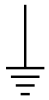
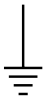
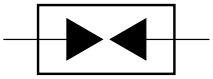
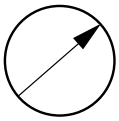
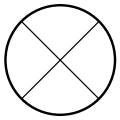
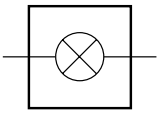
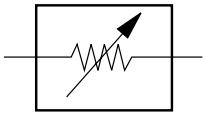
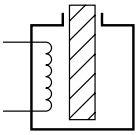
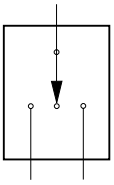
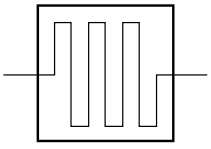
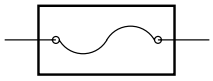
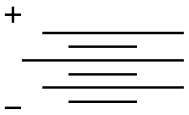
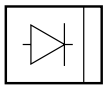
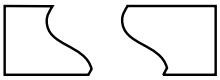
WIRE LOCATION IN CONNECTOR HOUSING

The third portion of the connector identification number represents the location of the wire in the connector housing. This could be identified by either a number such as 1, 2, 3 or by a letter such as A, B, C depending on the type of connector used.




DEUTSCH
AMP
KOSTAL
A32E3WS

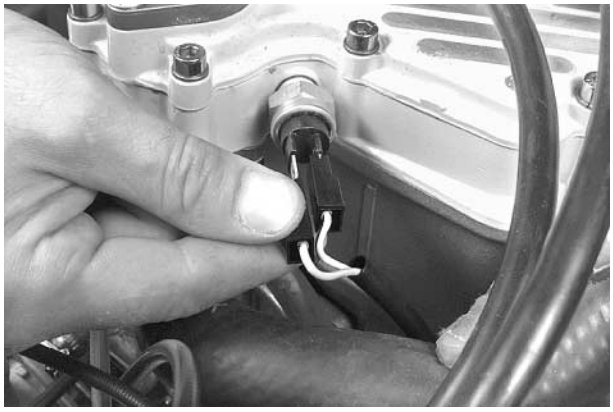
SYMBOLS DESCRIPTION

Beam and tail light 	Female terminal 	Male terminal 	Electronic module 
Meter 	Electric motor 	Low level sensor 	Buzzer 
Ignition coil 	Normally close switch 	Normally open switch 	Male terminal on instrument 
Engine ground 	Frame ground  Frame	Spark plug 	Meter movement 
Bulb 	Pilot 	Analog sensor 	Solenoid valve 
Magneto (Delta) 	3 position switch 	Heating element 	Fuse 
Trigger coil 	Battery 	Diode 	Partially illustrated component 

A00E9PS

UNPLUGING CONNECTORS

Always unplug connectors by pulling on housing not on wire.

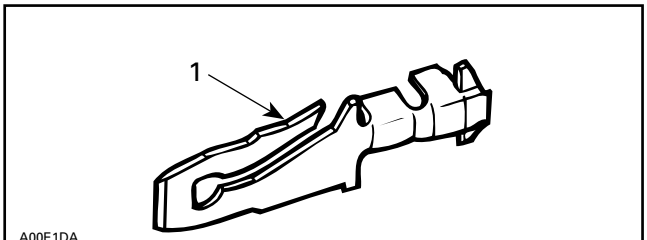

A06E1PA

TYPICAL

TAB AND RECEPTACLE CONNECTORS REMOVAL

Tab Connector

It is locked in its housing by a spring tab on its side. Removal is done by squeezing this tab.

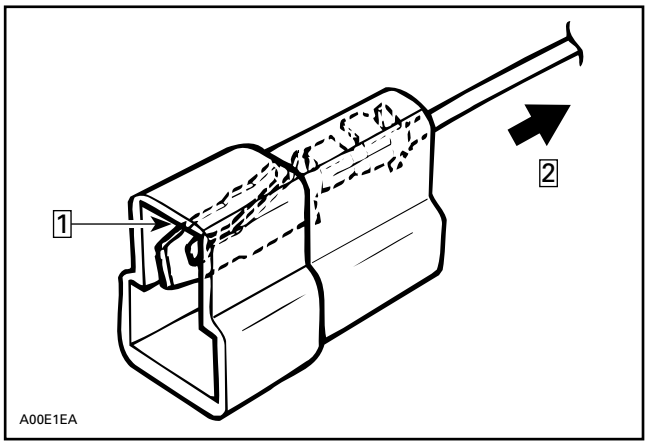


A00E1DA

TAB CONNECTOR
1. Locking tab

To remove:

– Insert a screwdriver or Snap-on TT 600-5 from opposite side of wire and pry locking tab.
– While holding locking tab pried, pull connector toward wire side.



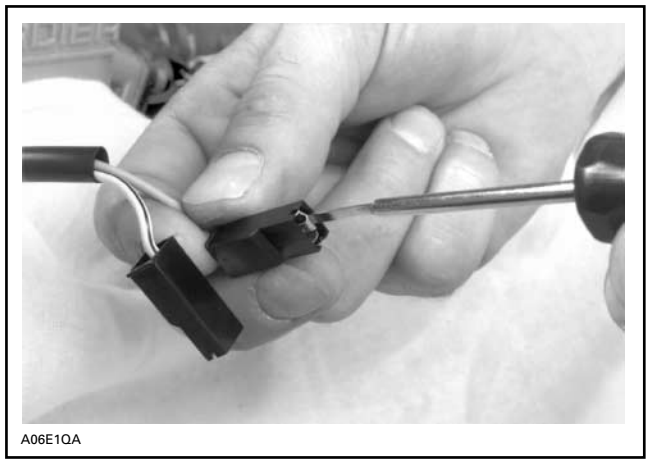
A00E1EA

1. Insert screwdriver here
2. Pull this side

Locking Receptacle Connector

To remove:

– Insert tool Snap-on TT 600-5 in access opening then pull housing toward wire side.

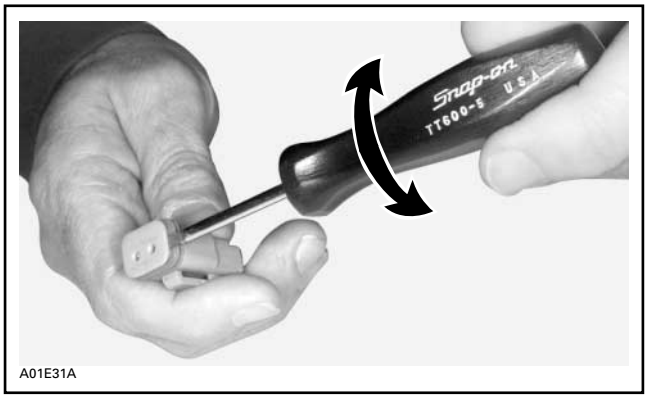

A06E1QA

Waterproof Connector Housing

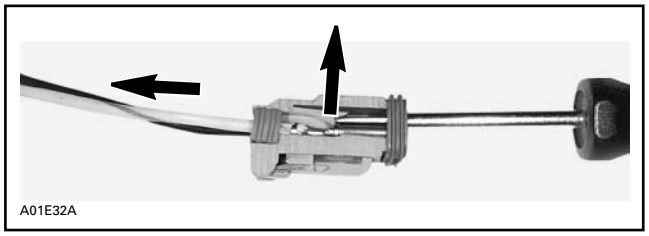
Female Connector Housing

To remove:

– Insert tool Snap-on TT 600-5 under lock and twist to lift it.



– Pry tab to free connector then pull wire out of housing.

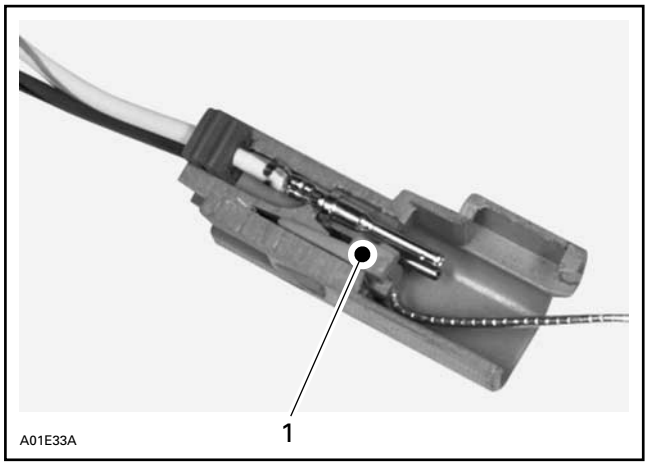


FEMALE CONNECTOR HOUSING — CUT-AWAY

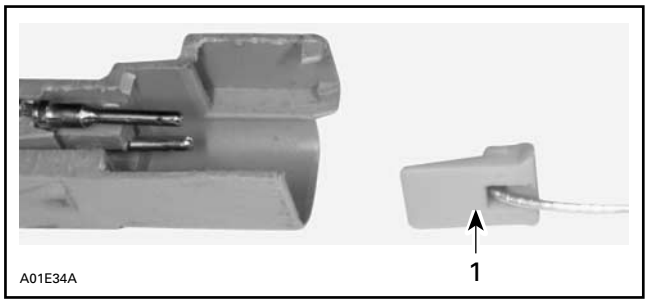
Male Connector Housing

To remove:

– Using a small hook, pull out the lock.

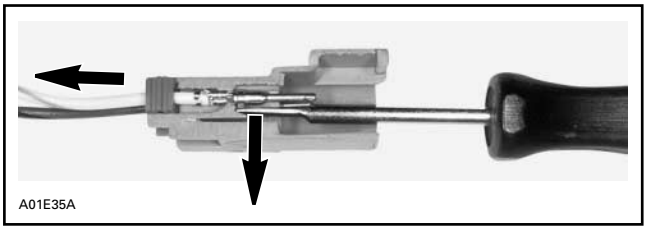


1. Lock



1. Lock

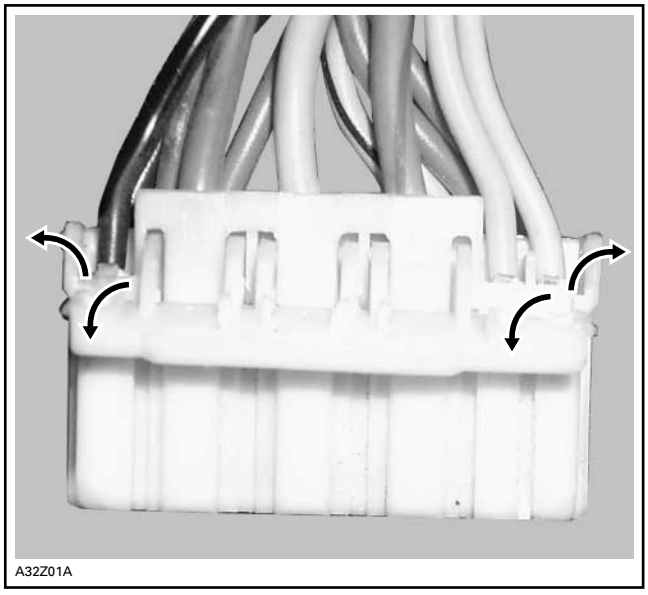
– Pry tab to free connector then pull wire out of housing.



MALE CONNECTOR HOUSING — CUT-AWAY

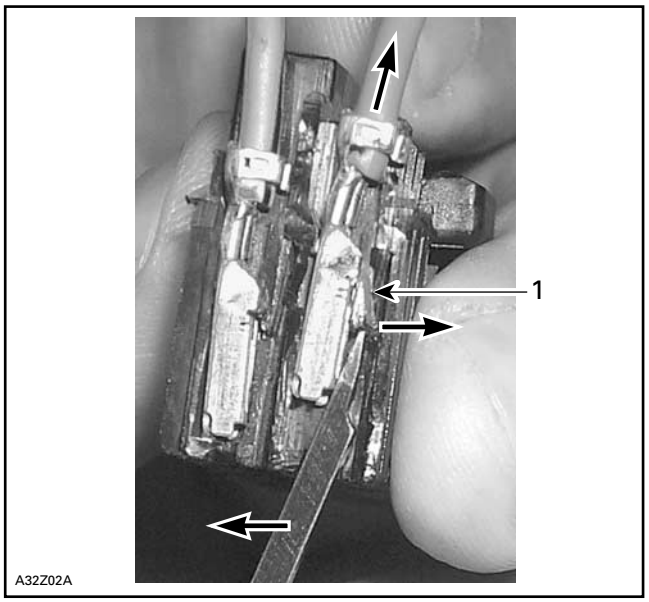
Multilock Connector Housing

Female Connector Housing



To remove:

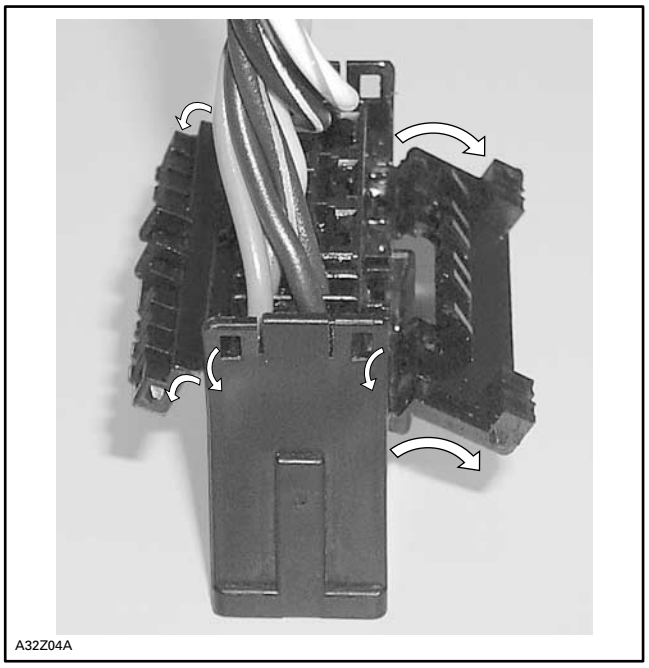
– Insert tool AMP- 755430-2 under lock and twist to lift it.



FEMALE CONNECTOR HOUSING — CUT-AWAY
1. Lock

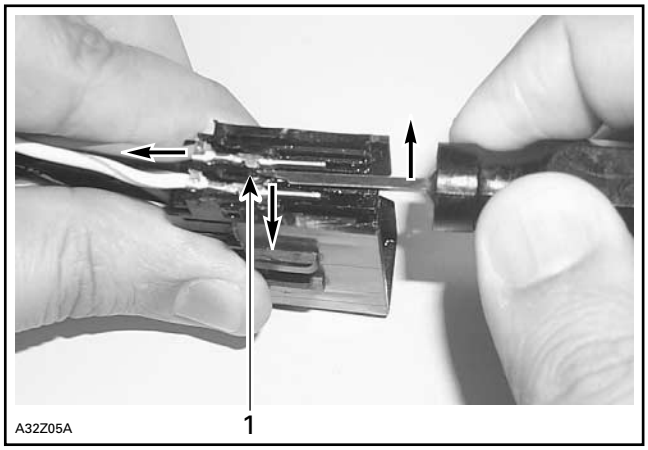
Receptacle connectors can be removed from female housing with sharp head pin.

Male Connector Housing



To remove:

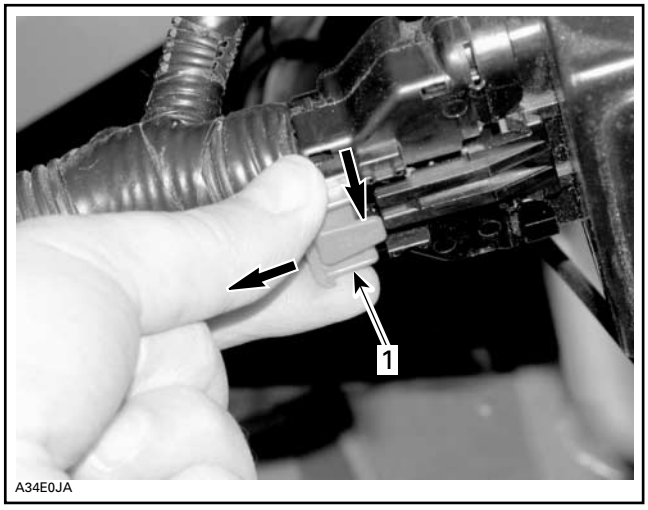
– Insert tool AMP-755430-2 under lock and twist to lift it.



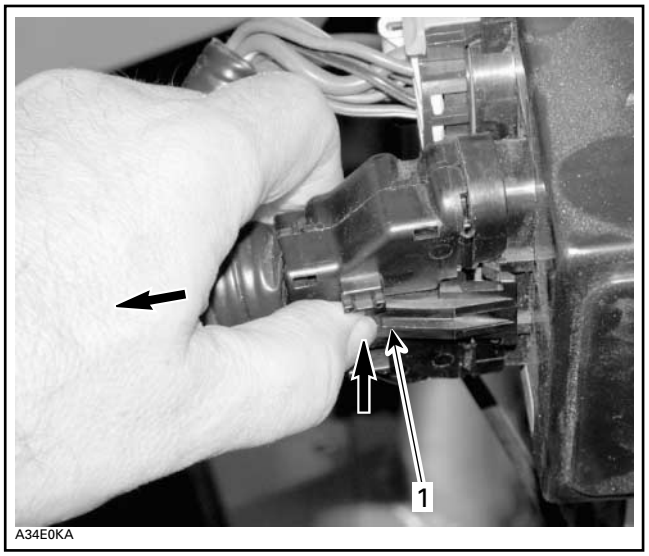
MALE CONNECTOR HOUSING — CUT-AWAY
1. Lock

24-Circuit and 32-Circuit Connector Housings

Remove locking tab then unlock connector and pull out. See illustrations.

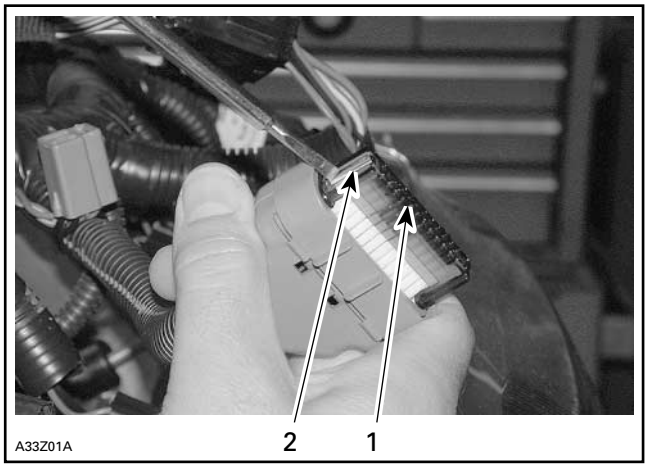


1. Lift tab and hold while sliding out



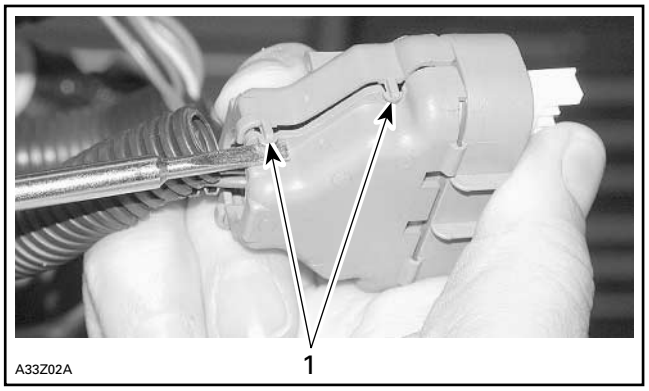
1. Push tab and hold while pulling connector out

Push on both tabs to remove retainer.



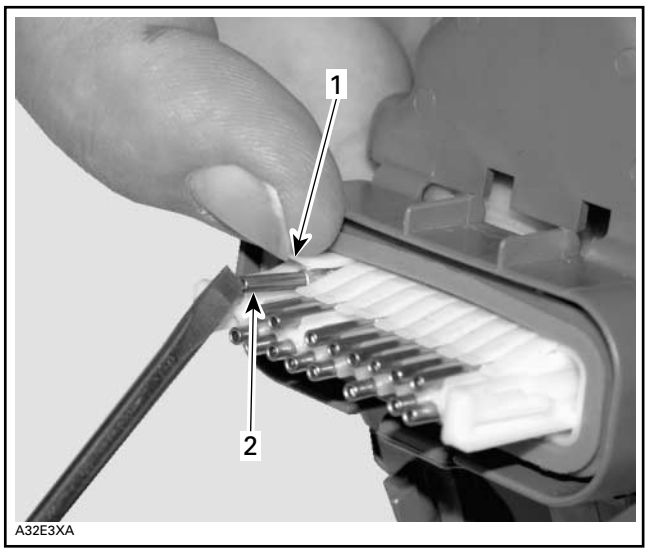
1. Retainer
2. Tab (one on each side)

Open housing by lifting 4 tabs.



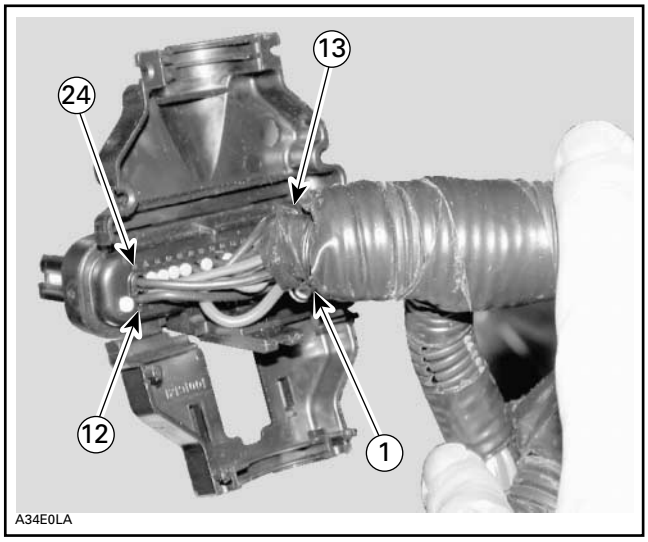
1. Tabs (2 on each side)

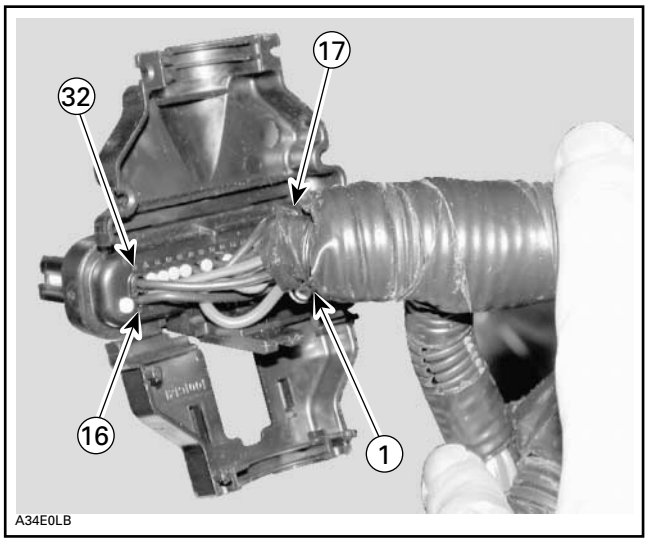
Lift the top plastic lock of the female terminal to be removed and hold in position. Lift the female terminal to unlock from the housing and push out of housing.



1. Lift and hold plastic lock
2. Lift to unlock and push out

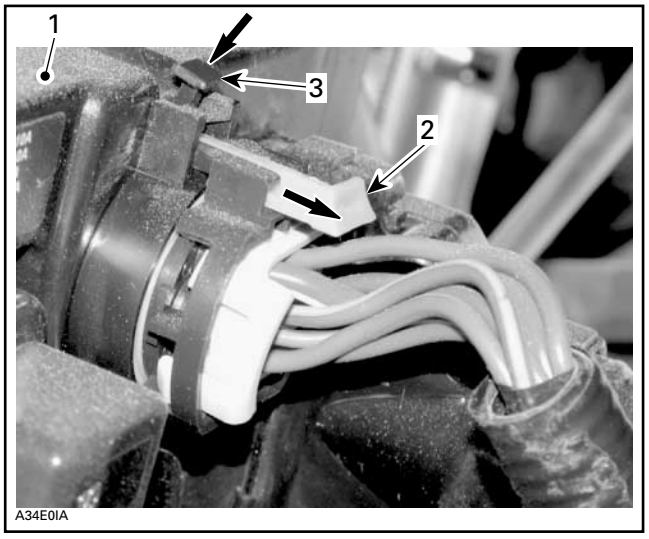
Refer to the illustrations for the connector pinout.



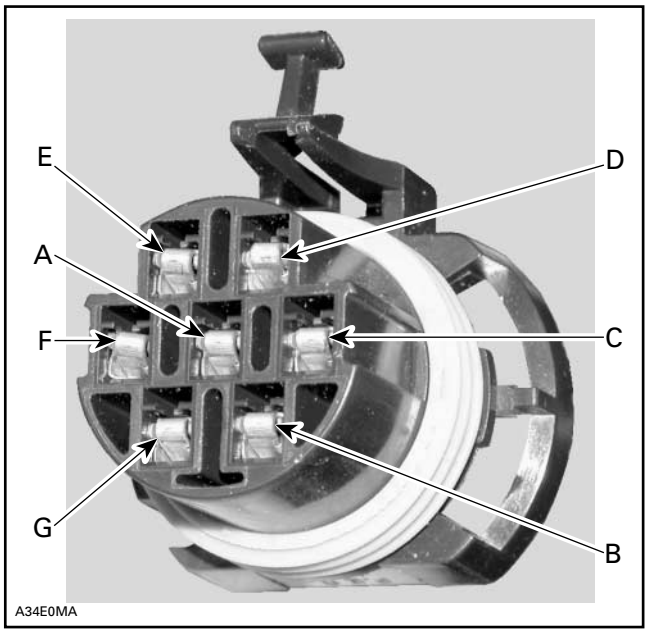


7-Pin Connector

Refer to the illustration for the connector pinout.

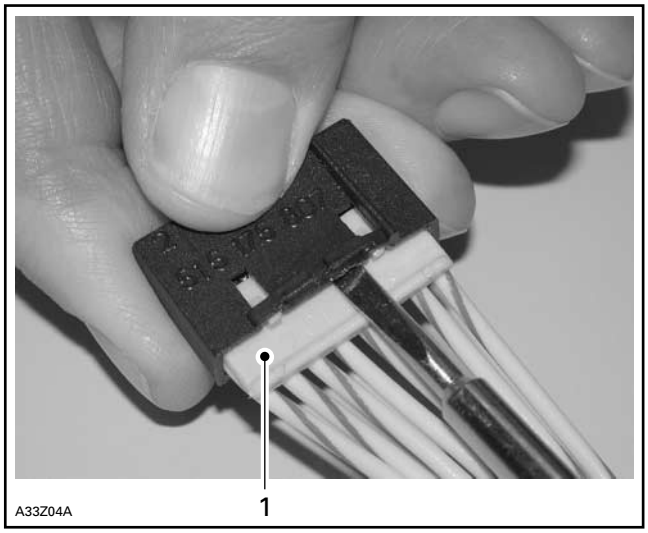


1. *VCM (vehicle control module)*
2. *Pull out the green locking tab*
3. *Push down this tab and hold while pulling out connector*



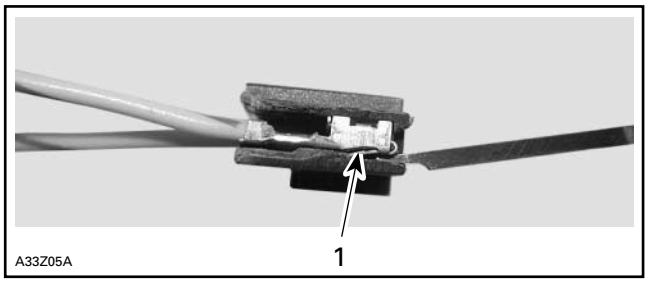
8-Circuit Connector Housing

Pry housing to release lock.



1. *Lock*

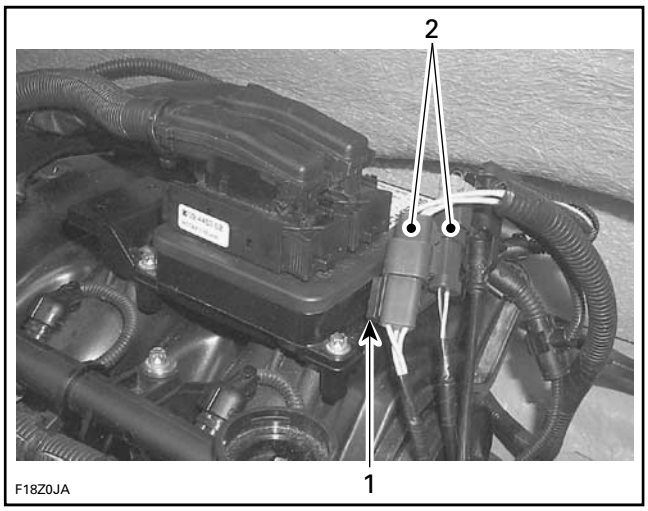
Insert tool AMP-755430-2 under tab and pry it to free connector. Pull on the female terminal wire to remove female terminal from housing.



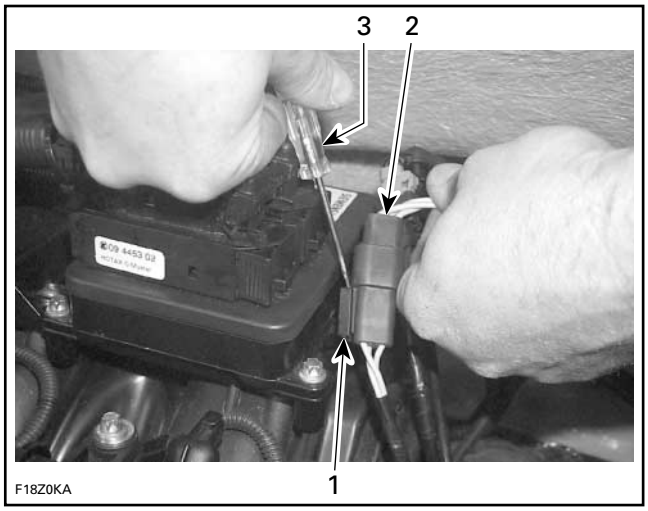
8-CIRCUIT CONNECTOR HOUSING — CUT-AWAY
1. Tab

Removal of Deutsch connectors from Engine Connector Bracket

To remove Deutsch connectors from engine connector bracket, slide a flat screwdriver between the connector bracket and the Deutsch connectors and remove connectors.

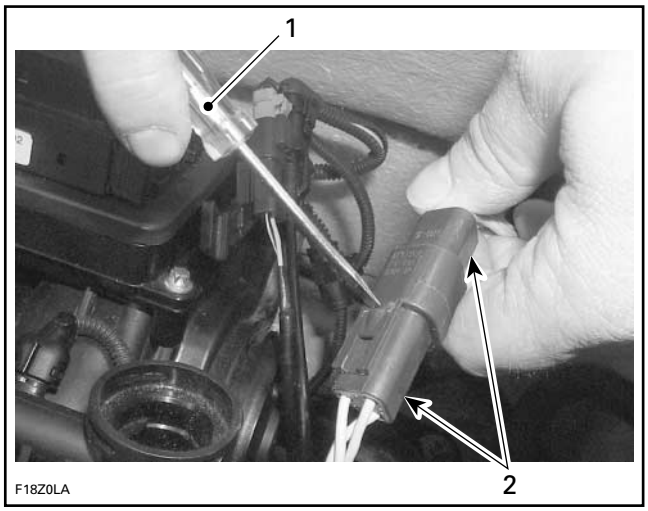


TYPICAL
1. Engine connector bracket
2. Deutsch connectors

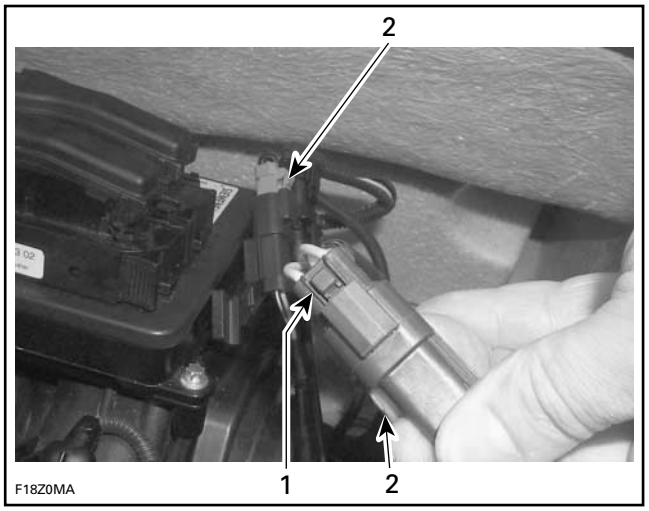


TYPICAL
1. Engine connector bracket
2. Deutsch connectors
3. Flat screwdriver

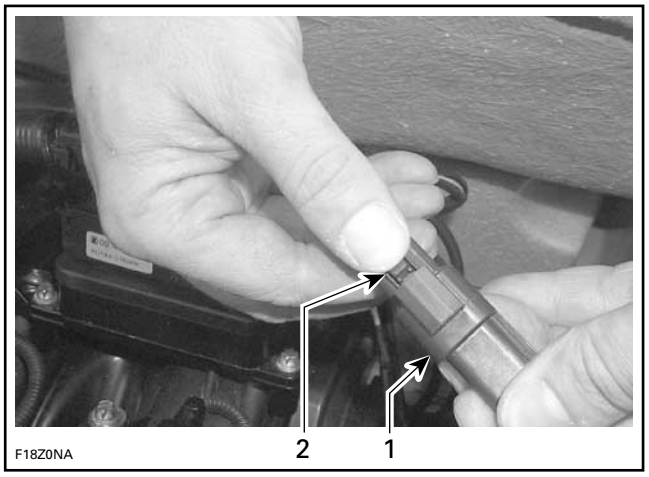
To disconnect the two Deutsch connectors, slide a flat screwdriver between each other to disengage, press the release button and disconnect them.



TYPICAL
1. Flat screwdriver
2. Deutsch connectors



TYPICAL
1. Release button
2. Deutsch connectors

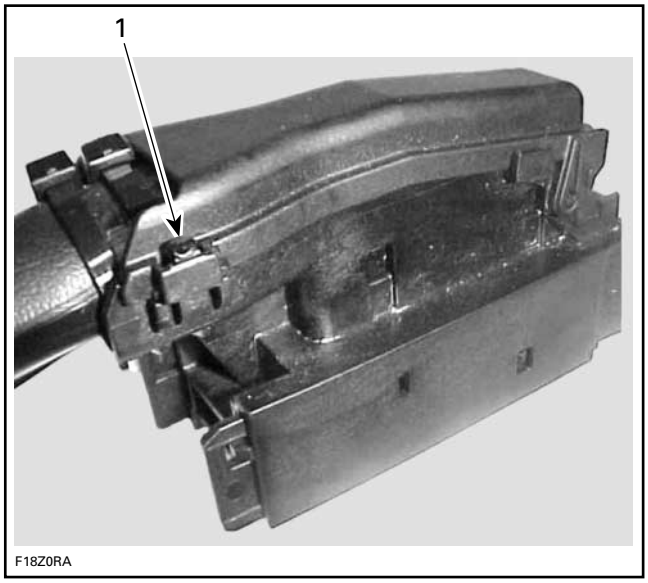


TYPICAL
1. Deutsch connectors
2. Press release button

Connector housing A and B on ECM

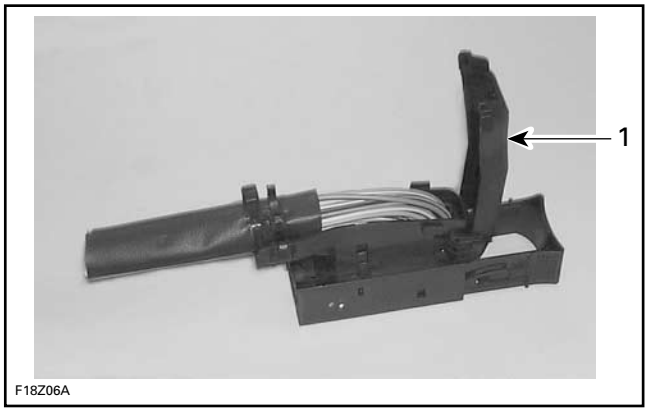
Terminal Removal

Unlock the connector housing cover by pushing in the tabs on top of the housing with a flat screwdriver to be able to flip the top cover up.



1. Push in tab

Lift the cover by pushing it forward.

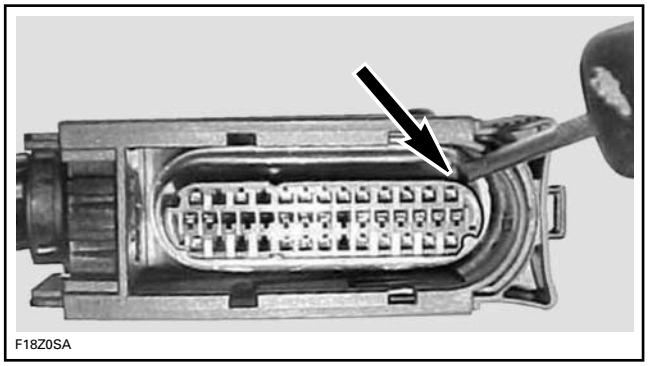


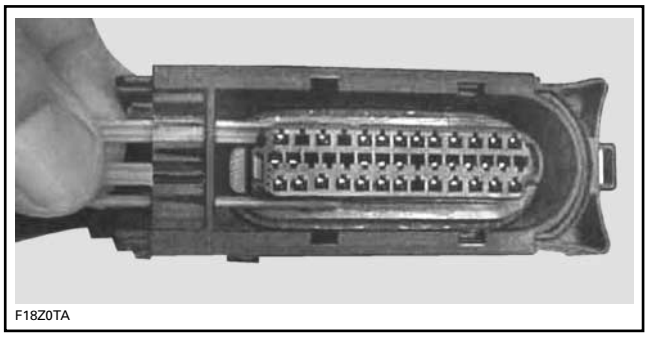
1. Cover

Cut both locking ties that secure the harness to the housing.

1. Locking ties

Turn the housing over and remove the lock by pushing and then pulling toward the wire harness.

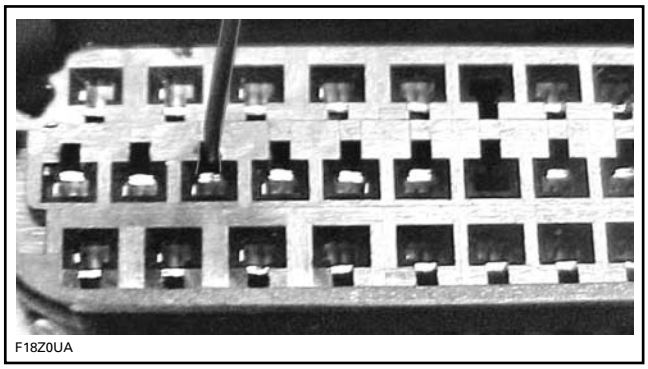


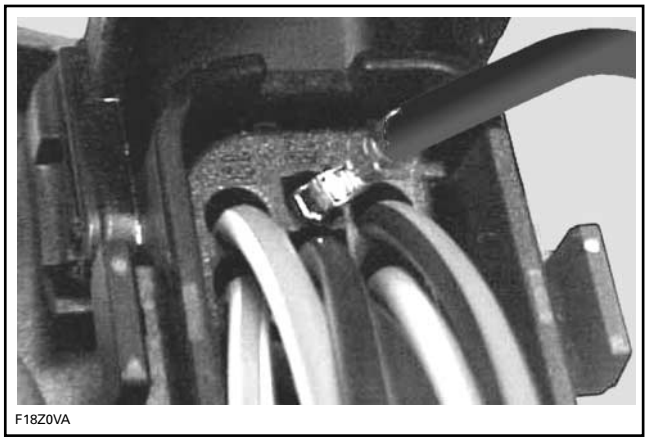


Use a 0.76 mm (.030 in) oxyacetylene torch tip cleaner or a no. 68 drill bit inserted down into the housing to release the locking tab on the connector.

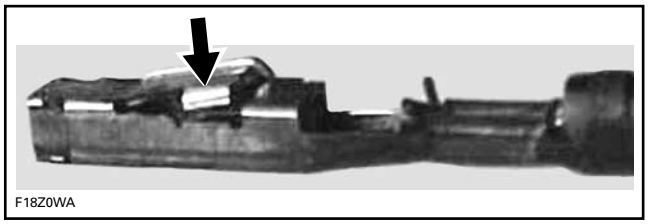
CAUTION: Using a probe larger than 0.76 mm (.030 in) may damage the terminal.

Insert the probe into the housing as shown, and locate the appropriate wire in the back of the housing. You may have to slightly cam the probe against the locking tab to release it, then remove the terminal from the housing.





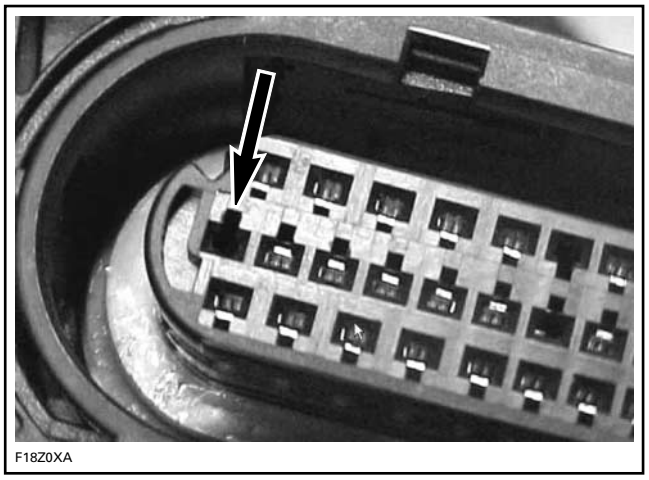
The locking tab on the connector may have to be bent out a little so it will lock in the housing when it's re-inserted.



If the wire is in good condition but the terminal is rusted or corroded, remove defective terminal and crimp a new one. If wire and terminal are defective, acquire a new genuine wire and new terminal and crimp them together as explained below.

IMPORTANT: Use genuine wires only. Otherwise wires will not fit properly.

When re-inserting the connector, the locking tab must be installed facing the smaller cutout of the connector cavity.


F18Z0XA

Insert the connector, ensuring the locking tab snaps into the housing.

Re-install the lock, attach the 2 tie raps, and close the housing cover.

Terminal Crimping (Kostal and AMP multilock)

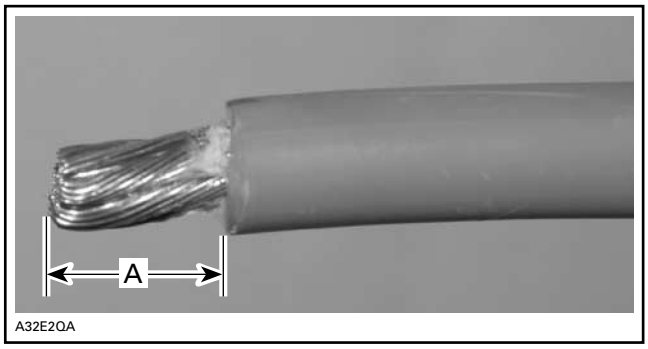
To crimp a new connector terminal, use the connector crimping tool (P/N 529 035 909) and the crimper die (P/N 529 035 906).


F00B0EA

CRIMPING TOOL

To properly crimp the wires, strictly follow this procedure.

Strip the wire to a maximum of 3 mm (1/8 in).

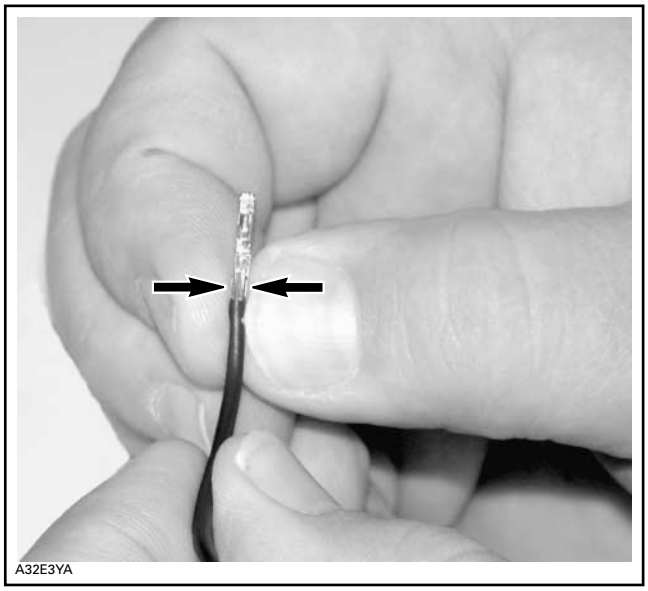


A32E2QA

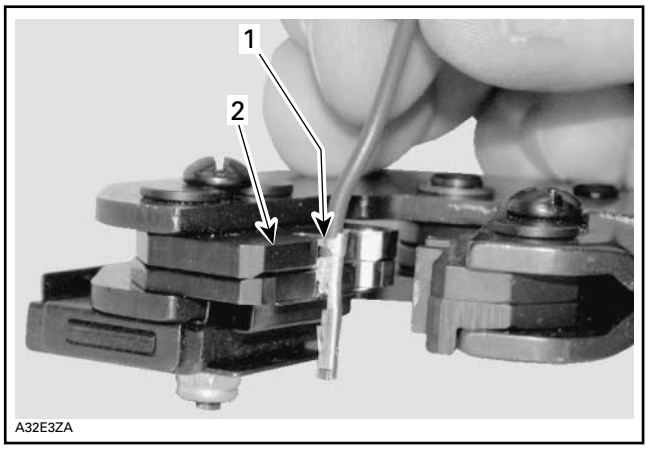
TYPICAL
A. 3 mm (1/8 in) max.

Position wire in terminal.

Squeeze the terminal tabs with your fingers to temporarily retain terminal in place.


A32E3YA

Insert terminal with wire in crimping pliers and position so that top of terminal tabs are flush with pliers edge or a little bit lower as shown.



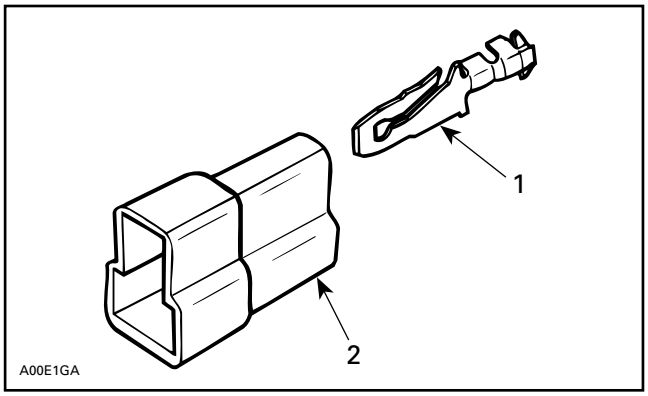
1. Top of terminal tabs
2. Align tabs with pliers edge

Crimp terminal. Ensure no tiny wire goes out of terminal. This might cause strange problems of the electrical system.

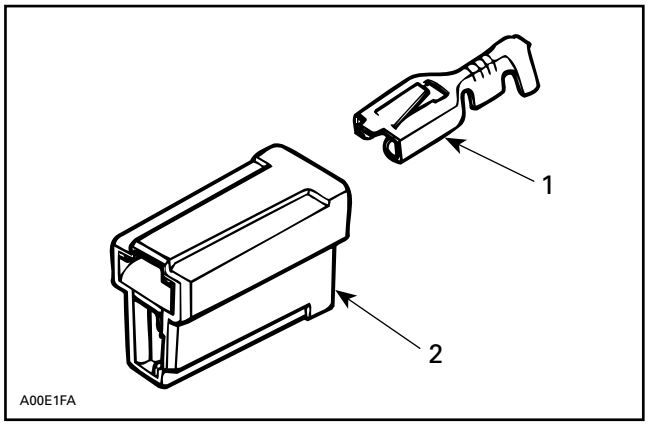
TAB AND RECEPTACLE CONNECTORS INSTALLATION

Prior to installing, make sure locking tab is sufficiently lifted to properly lock.

Insert tab and receptacle connectors in their respective housings as shown in following illustrations. Push sufficiently so that they snap. Try pulling wire to ensure they are properly locked.



1. Tab
2. Housing



TYPICAL
1. Receptacle
2. Housing

⚠ WARNING

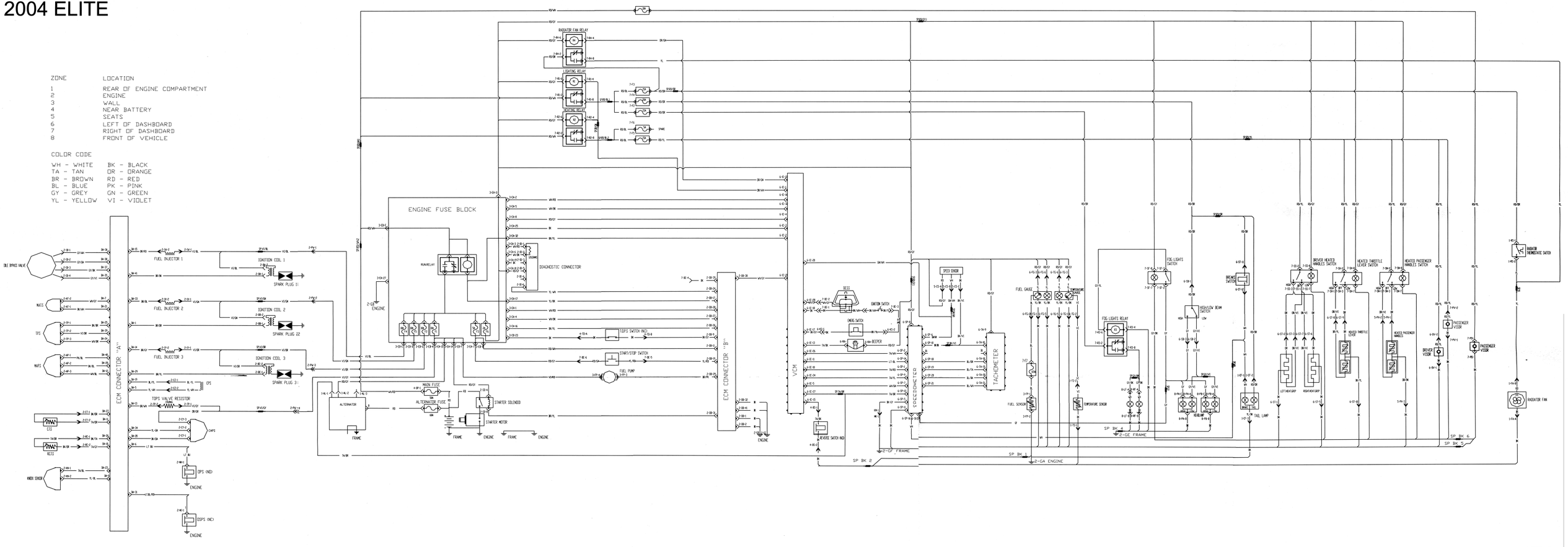
Keep wires away from any rotating, moving, heating, vibrating or sharp edge. Use proper fastening devices as required.

2004 ELITE

ZONE	LOCATION
1	REAR OF ENGINE COMPARTMENT
2	ENGINE
3	WALL
4	NEAR BATTERY
5	SEATS
6	LEFT OF DASHBOARD
7	RIGHT OF DASHBOARD
8	FRONT OF VEHICLE

COLOR CODE

WH - WHITE	BK - BLACK
TA - TAN	OR - ORANGE
BR - BROWN	RD - RED
BL - BLUE	PK - PINK
GY - GREY	GN - GREEN
YL - YELLOW	VI - VIOLET



ENGINE MANAGEMENT POWER DISTRIBUTION STARTING CIRCUIT INSTRUMENTATION LIGHTING HEATING ACCESSORIES

A34Z01