2004 ski-doo®

Shop Manual

ZX Series

BOMBARDIER

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2004
Shop Manual

ZX SERIES

BOMBARDIER
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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 Inc. disclaims liability for all damages and/or injuries resulting from the improper use of the contents. We strongly recommend that any services be carried out and/or verified by a highly skilled professional mechanic. It is understood that certain modifications may render use of the vehicle illegal under existing federal, provincial and state regulations.

⚠ 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.

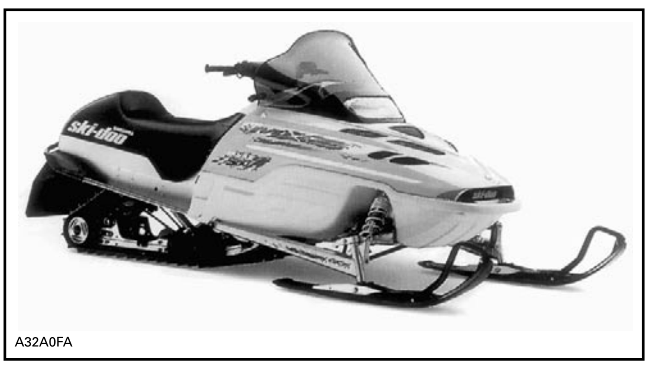
INTRODUCTION

This shop manual covers the following Bombardier made 2004 ZX Series models:

MODEL	PACKAGE	ENGINE	ENGINE TYPE	COLOR	COUNTRY	MODEL NUMBER
LEGEND (E)	FAN	380 F (R)	377 F (R)	Black	C/U	2916
LEGEND (E)	FAN	550 F (R)	552 F (R)	Black	C/U	2909
LEGEND (E)	FAN G.T.	380 F (R)	377 F (R)	Black	C/U	2918
LEGEND (E)	FAN G.T.	380 F (R)	377 F (R)	Black	EUR	4055
LEGEND (E)	FAN G.T.	550 F (R)	552 F (R)	Black	C/U	2912
LEGEND (E)	FAN G.T.	550 F (R)	552 F (R)	Black	EUR	4053
LEGEND (E)	SE	600 HO (R) SDI	593 HO (R) SDI	Autumn Red metallic	C/U	2933
LEGEND (E)	SE	600 HO (R) SDI	593 HO (R) SDI	Black	C/U	2932
LEGEND (E)	SE	700 (R)	693 (R)	Black	C/U	2940
LEGEND (E)	SE	700 (R)	693 (R)	Autumn Red metallic	C/U	2941
LEGEND (E)	SE	800 (R) SDI	793 (R) SDI	Autumn Red metallic	C/U	2929
LEGEND (E)	SE	800 (R) SDI	793 (R) SDI	Black	C/U	2928
LEGEND (E)	SE	V-1000 (R)	V-1004	Black	C/U	2920
LEGEND (E)	SE	V-1000 (R)	V-1004	Autumn Red metallic	C/U	2921
LEGEND (E)	SE G.T.	600 HO (R) SDI	593 HO (R) SDI	Black	C/U	2934
LEGEND (E)	SE G.T.	600 HO (R) SDI	593 HO (R) SDI	Autumn Red metallic	C/U	2935
LEGEND (E)	SE G.T.	600 HO (R) SDI	593 HO (R) SDI	Autumn Red metallic	EUR	4057
LEGEND (E)	SE G.T.	700 (R)	693 (R)	Black	C/U	2942
LEGEND (E)	SE G.T.	700 (R)	693 (R)	Autumn Red metallic	C/U	2943
LEGEND (E)	SE G.T.	800 (R) SDI	793 (R) SDI	Black	C/U	2930
LEGEND (E)	SE G.T.	800 (R) SDI	793 (R) SDI	Autumn Red metallic	C/U	2931
LEGEND (E)	SE G.T.	800 (R) SDI	793 (R) SDI	Black	EUR	4069
LEGEND (E)	SE G.T.	V-1000 (R)	V-1004	Autumn Red metallic	C/U	2923
LEGEND (E)	SE G.T.	V-1000 (R)	V-1004	Black	C/U	2922
LEGEND (E)	SE G.T.	V-1000 (R)	V-1004	Autumn Red metallic	EUR	4056
LEGEND (E)	SPORT	500 SS (R)	593 (R)	Autumn Red metallic	C/U	2953
LEGEND (E)	SPORT	500 SS (R)	593 (R)	Black	C/U	2952
LEGEND (E)	SPORT	600 HO (R) SDI	593 HO (R) SDI	Black	C/U	2936
LEGEND (E)	SPORT	600 HO (R) SDI	593 HO (R) SDI	Autumn Red metallic	C/U	2937
LEGEND (E)	SPORT	700 (R)	693 (R)	Autumn Red metallic	C/U	2949
LEGEND (E)	SPORT	700 (R)	693 (R)	Black	C/U	2948
LEGEND (E)	SPORT	V-1000 (R)	V-1004	Autumn Red metallic	C/U	2925

MODEL	PACKAGE	ENGINE	ENGINE TYPE	COLOR	COUNTRY	MODEL NUMBER
LEGEND (E)	SPORT	V-1000 (R)	V-1004	Black	C/U	2924
LEGEND (E)	SPORT G.T.	500 SS (R)	593 (R)	Black	C/U	2954
LEGEND (E)	SPORT G.T.	500 SS (R)	593 (R)	Autumn Red metallic	C/U	2955
LEGEND (E)	SPORT G.T.	500 SS (R)	593 (R)	Black	EUR	4058
LEGEND (E)	SPORT G.T.	600 HO (R) SDI	593 HO (R) SDI	Black	C/U	2938
LEGEND (E)	SPORT G.T.	600 HO (R) SDI	593 HO (R) SDI	Autumn Red metallic	C/U	2939
LEGEND (E)	SPORT G.T.	700 (R)	693 (R)	Black	C/U	2950
LEGEND (E)	SPORT G.T.	700 (R)	693 (R)	Autumn Red metallic	C/U	2951
LEGEND (E)	SPORT G.T.	V-1000 (R)	V-1004	Autumn Red metallic	C/U	2927
LEGEND (E)	SPORT G.T.	V-1000 (R)	V-1004	Black	C/U	2926
MX Z	FAN	380 F (R)	377 F (R)	Black	C/U	2914
MX Z	FAN	380 F (R)	377 F (R)	Black	EUR	4054
MX Z	FAN	550 F (R)	552 F (R)	Black	C/U	2907
MX Z	FAN	550 F (R)	552 F (R)	Black	EUR	4052
SKANDIC	SPORT	550 F (R)	552 F (R)	Black	C/U	4022
SUMMIT	FAN	550 F (R)	552 F (R)	Black	C/U	4019
SUMMIT	FAN	550 F (R)	552 F (R)	Black	EUR	4021

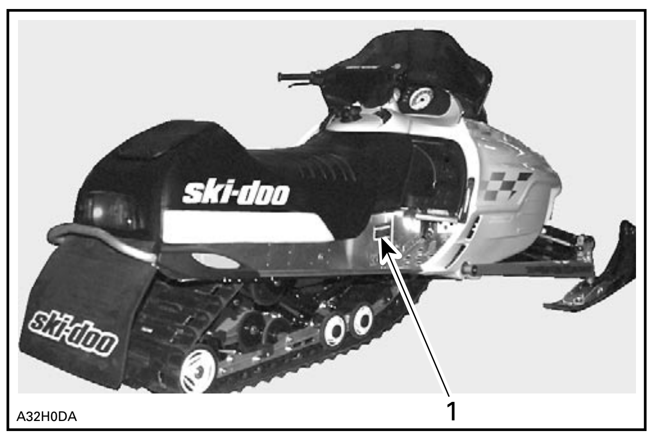
All the above-listed models are ZX Series models.



TYPICAL — ZX SERIES

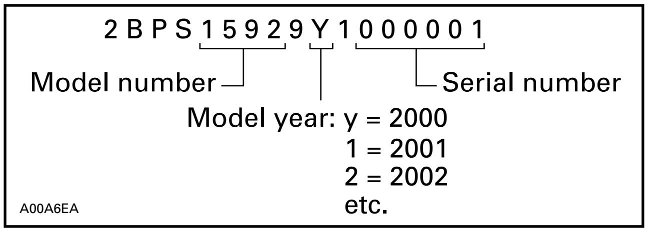
VEHICLE IDENTIFICATION NUMBER

Vehicle identification number location



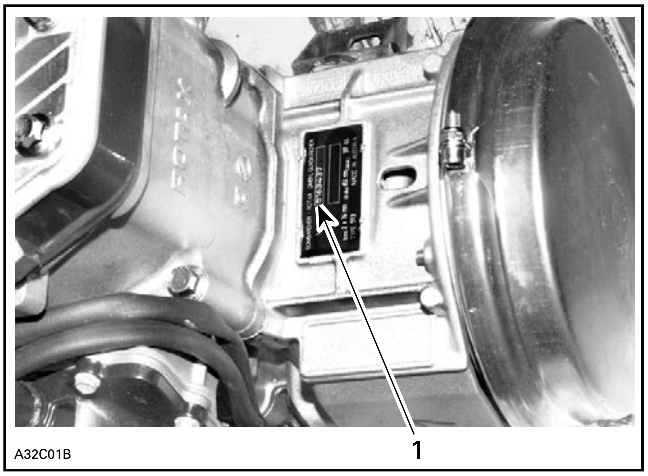
TYPICAL
1. Vehicle identification number

Identification Number Meaning



ENGINE SERIAL NUMBER

Engine Serial Number Location



TYPICAL
1. Engine serial number

LIST OF ABBREVIATIONS USED IN THIS MANUAL

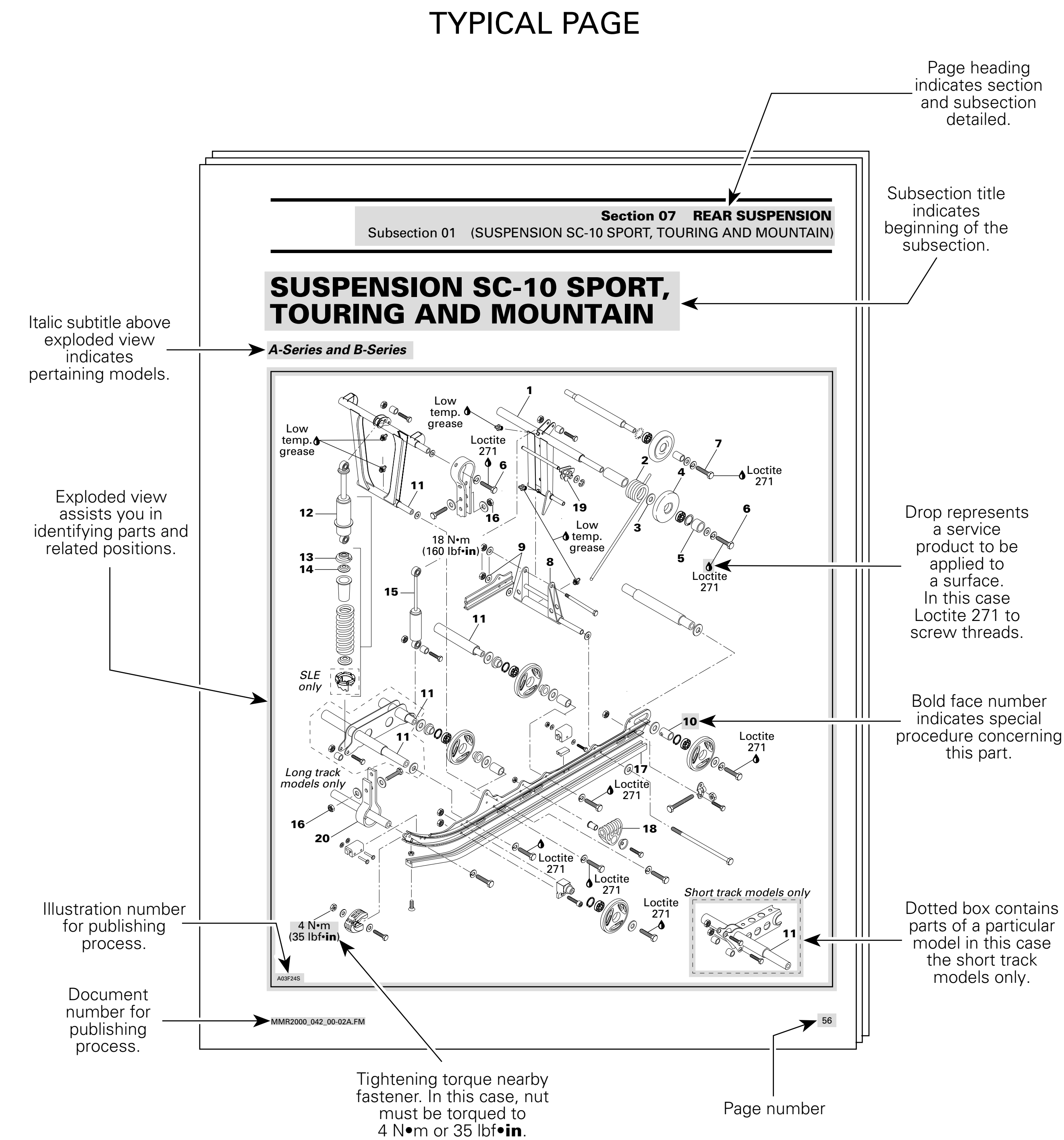
ABBREVIATION	MEANING
A	ampere
amp	ampere
A•h	ampere-hour
AC	alternate current
ACM	acceleration and control modulator
ADSA	advanced direct shock action
AMG	absorbed glass mat
BDC	bottom dead center
BTDC	before top dead center
°C	degree Celsius
cc	cubic centimeter
CDI	capacitor discharge ignition
CTR	center
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)
lb/in^2	pound per square inch

ABBREVIATION	MEANING
LH	left hand
LO	low
LT	long track
m	meter
MAG	magneto
Max.	maximum
Min.	minimum
mL	milliliter
mm	millimeter
M.E.	millennium edition
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

ABBREVIATION	MEANING
ST	semi-trapez
TDC	top dead center
TRA	total range adjustable
U.S. oz	ounce (United States)
V	volt
Vac	volt (alternative current)
VSA	variable sheave angle

ARRANGEMENT OF THIS MANUAL

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



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

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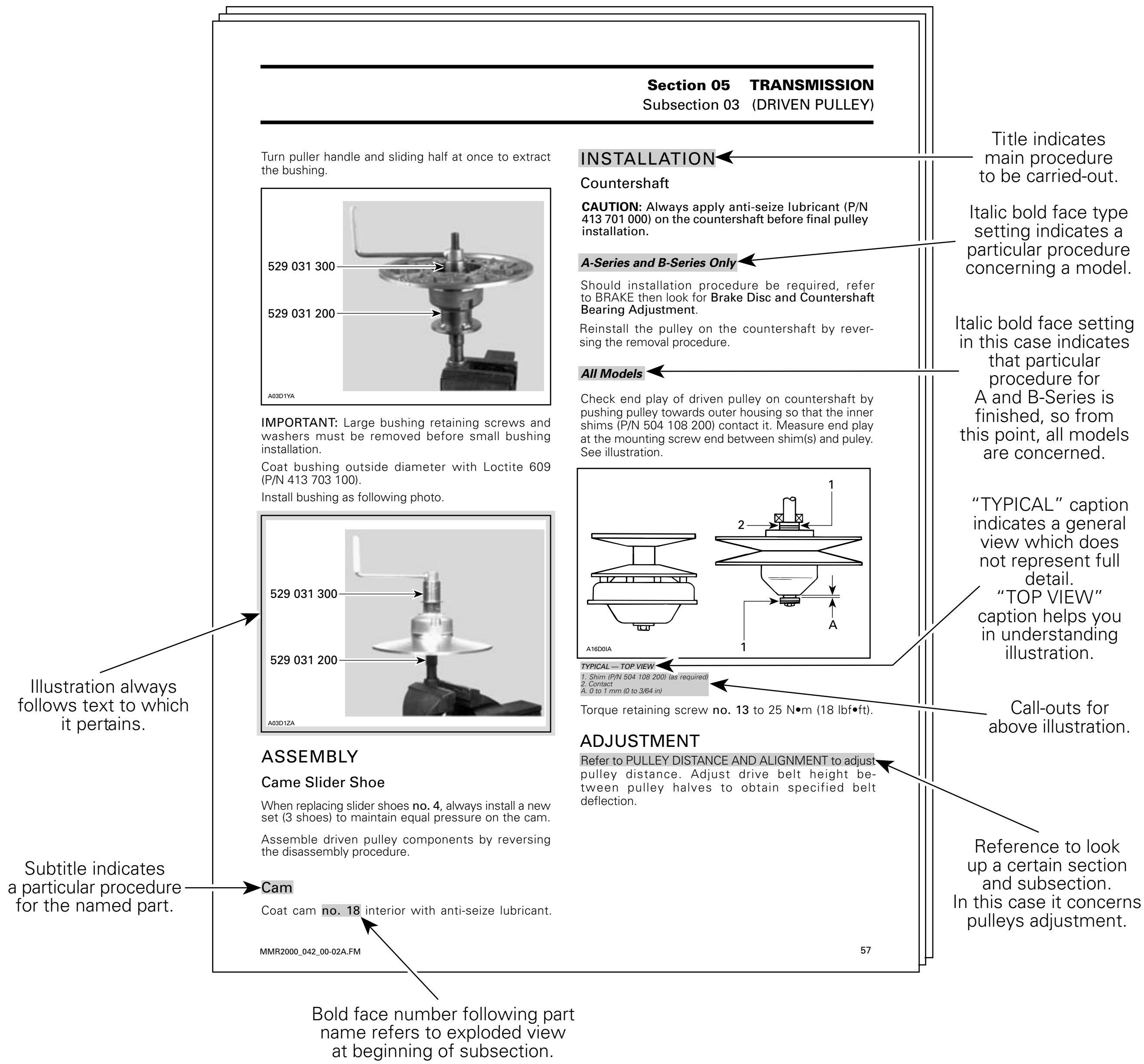
TYPICAL PAGE



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

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

529 031 300
529 031 200
A03D1YA

IMPORTANT: Large bushing retaining screws and washers must be removed before small bushing installation.

Coat bushing outside diameter with Loctite 609 (P/N 413 703 100).

Install bushing as following photo.

529 031 300
529 031 200
A03D1ZA

ASSEMBLY

Came Slider Shoe

When replacing slider shoes **no. 4**, always install a new set (3 shoes) to maintain equal pressure on the cam.

Assemble driven pulley components by reversing the disassembly procedure.

Cam

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

INSTALLATION

Countershaft

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

A-Series and B-Series Only

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

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

All Models

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

1 2 A 1
A16D0IA

TYPICAL — TOP VIEW
1. Shim (P/N 504 108 200) (as required)
2. Contact
A. 0 to 1 mm (0 to 3/64 in)

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

ADJUSTMENT

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

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GENERAL INFORMATION

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

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

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

ILLUSTRATIONS AND PROCEDURES

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

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

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

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

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

TYPICAL
1. Left
2. Right

SELF-LOCKING FASTENERS PROCEDURE

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

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

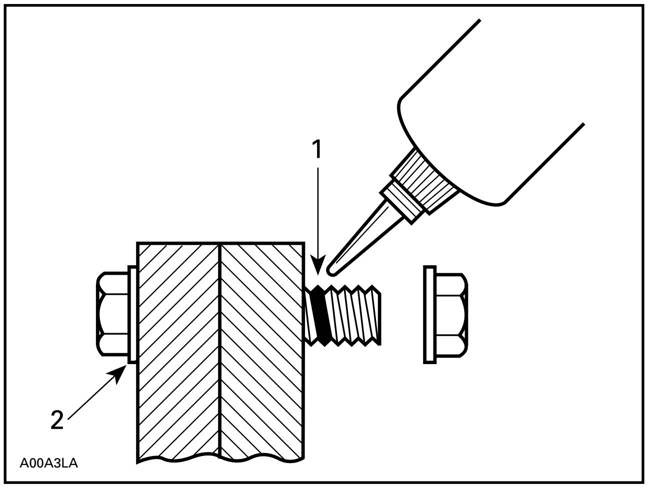
LOCTITE APPLICATION PROCEDURE

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

NOTE: Always use proper strength Loctite product as recommended in this shop manual.

THREADLOCKER

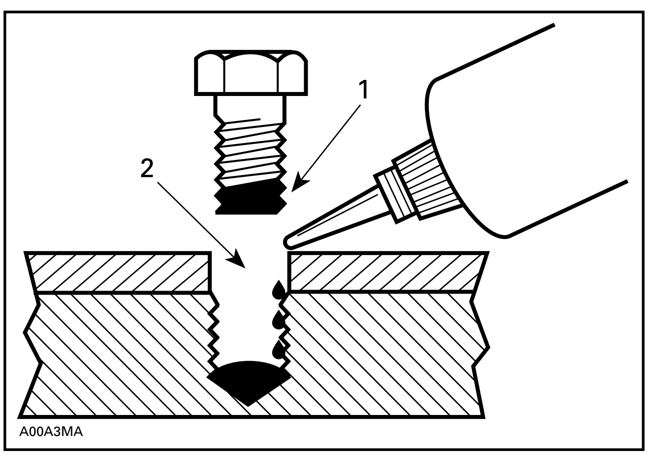
Uncovered Holes (bolts and nuts)



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.

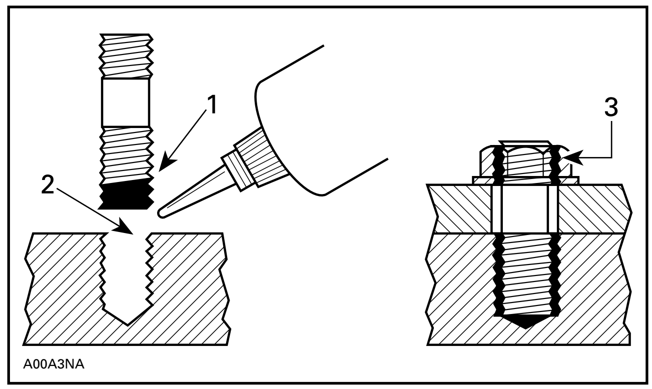
Blind Holes



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.

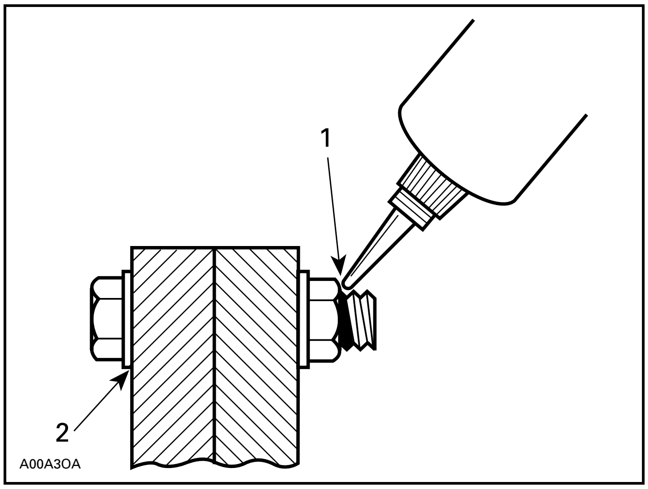
Stud in Blind Holes



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

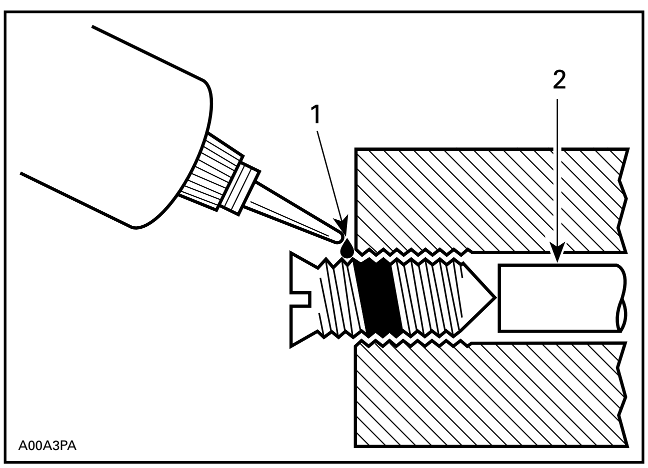


1. Apply here
2. Do not apply

- 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



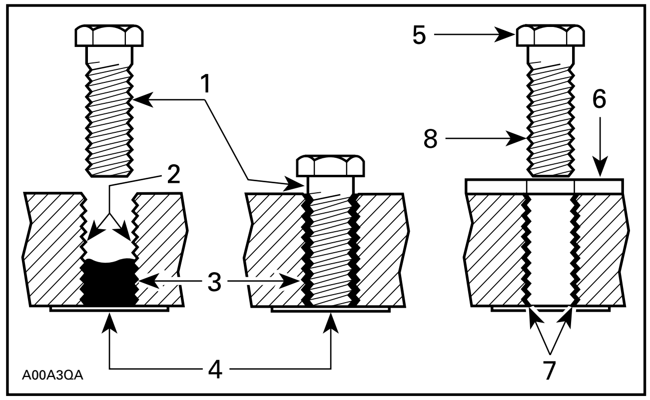
1. Apply here
2. Plunger

- 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.

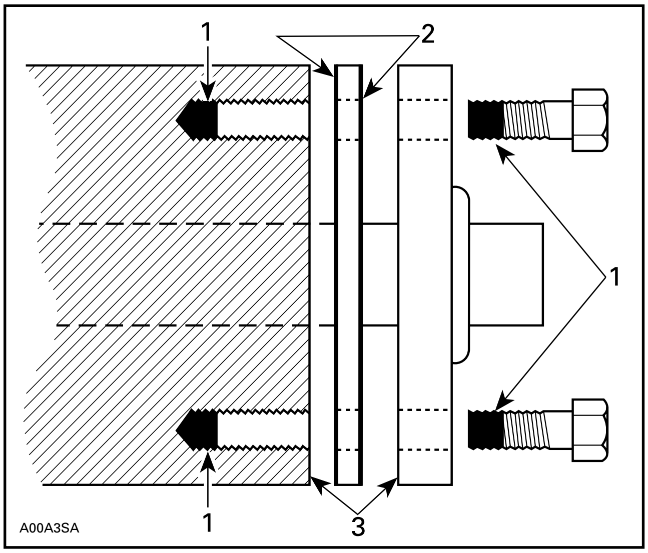
Option 2: Apply FORM-A-THREAD on the screw and insert in damaged hole.

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 413 708 100) 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.

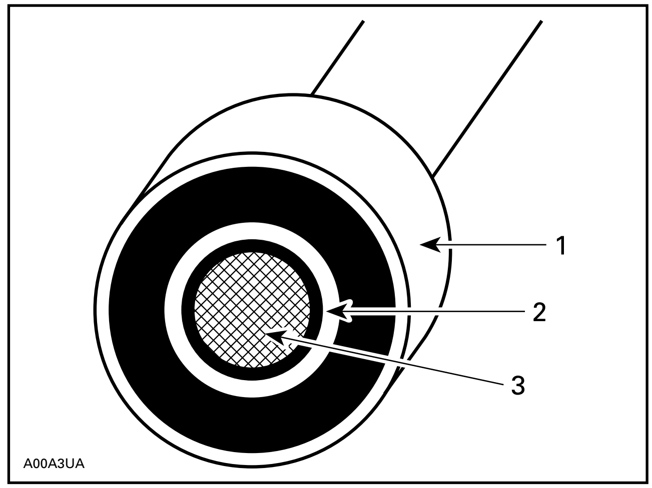
NOTE: If the cover is bolted to blind holes (above), apply proper strength Loctite in the hole and on threads. Tighten.

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.

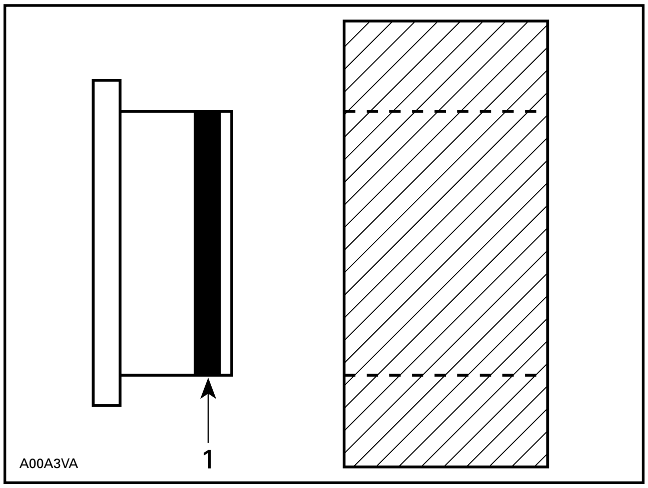
Mounting in Tandem

– 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 TORQUES

⚠ WARNING

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

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

N•m	FASTENER SIZE (8.8 GRADE)	Lbf•in
2	**M4**	18
3	M4	27
4	**M5**	35
8	M6	71
9	M6	80
10	**M6**	89
11	M6	97
12	M6	106

N•m	FASTENER SIZE (8.8 GRADE)	Lbf•ft
21	M8	15
22	M8	16
23	**M8**	17
24	M8	18
25	M8	18
43	M10	32
44	M10	32
45	M10	33
46	M10	34
47	**M10**	35
48	M10	35
49	M10	36
50	M10	37
51	M10	38
52	M10	38
53	M10	39
76	M12	56
77	M12	57
78	M12	58

N•m	FASTENER SIZE (8.8 GRADE)	Lbf•ft
79	M12	58
80	M12	59
81	M12	60
82	M12	60
83	M12	61
84	M12	62
121	M14	89
122	M14	90
123	M14	91
124	M14	91
125	M14	92
126	M14	93
127	M14	94
128	M14	94
129	M14	95
130	M14	96
131	M14	97
132	M14	97
133	M14	98
134	M14	99
135	M14	100
136	M14	100
137	M14	101
138	M14	102
139	M14	103
140	M14	103
141	M14	104
142	M14	105
143	M14	105
144	M14	106
145	M14	107
146	M14	108

N•m	FASTENER SIZE (8.8 GRADE)	Lbf•ft
147	M14	108
148	M14	109
149	M14	110
150	M14	111

We would be pleased if you could communicate to Bombardier any suggestions you may have concerning our publications.

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Bombardier SERVICE PUBLICATIONS REPORT

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Machine ____________ Report of error ❑ Suggestion ❑

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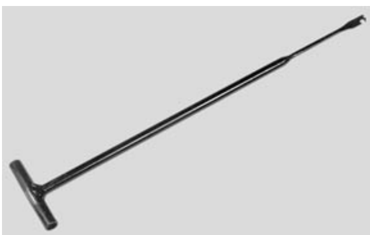
A00A80

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.

ENGINE — MANDATORY TOOLS

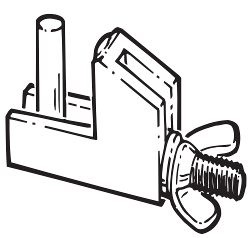
Exhaust spring installer/remover
(P/N 529 035 401)



APPLICATION
All models.

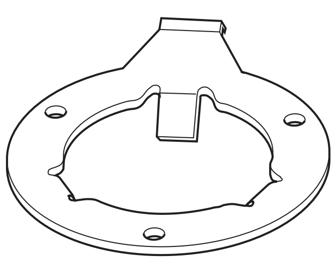
NOTE: This tool replaces exhaust spring installer/remover (P/N 529 035 400).

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



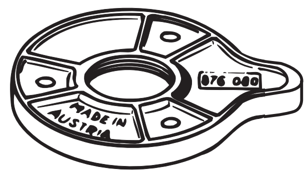
APPLICATION
All vehicles.

Holder wrench
(P/N 420 876 357)



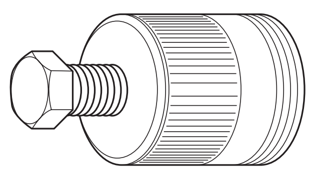
APPLICATION
All axial fan cooled engines.

Magneto puller ring
(P/N 420 876 080)



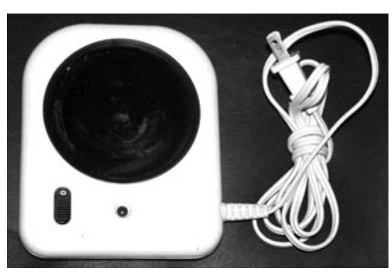
APPLICATION
All axial fan cooled engines.

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.

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

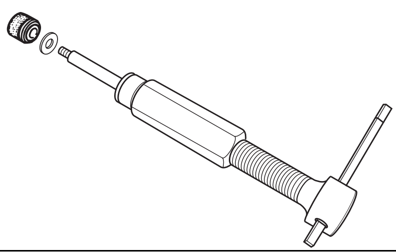
NOTE: Should be used with hand pump (P/N 529 021 800).

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)

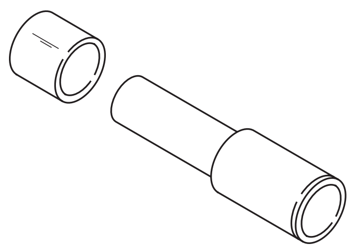
APPLICATION
All engines.

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

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.

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 529 035 844)

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.

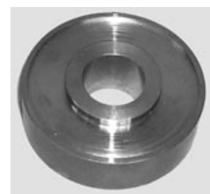
Crankshaft locking tool
(P/N 529 035 900)

APPLICATION
1004 engines.

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

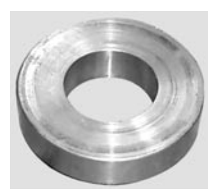
APPLICATION
1503 engines.

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



APPLICATION
1503 engines.

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

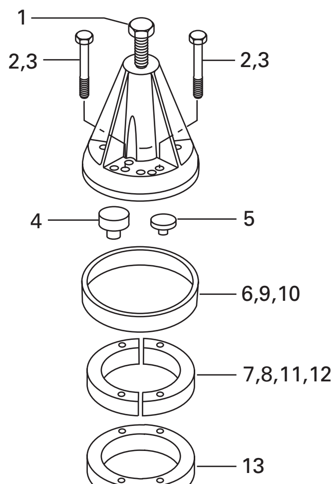


APPLICATION
1503 engines.

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.

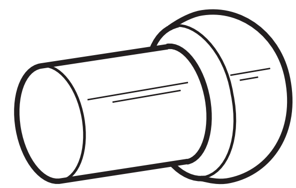
Piston circlip installer

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.

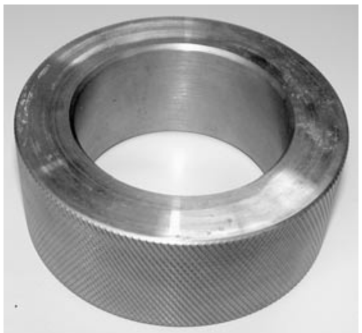
Pusher (55/59 mm)
(P/N 529 035 913)

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.

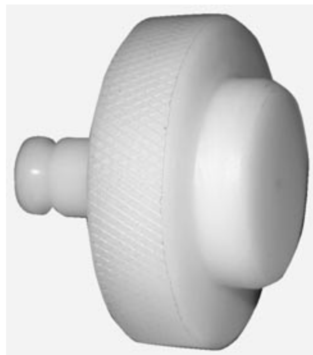
N–> Water pump ceramic seal installer
(P/N 529 035 766)

APPLICATION
1004 engines.

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

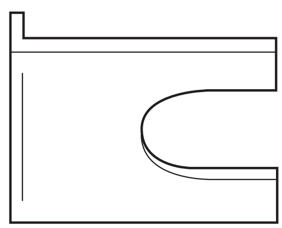
APPLICATION
1004 engines.

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



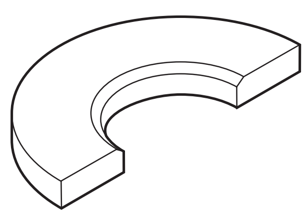
APPLICATION
1004 engines.

Crankshaft feeler gauge
(P/N 420 876 620)



APPLICATION
377 and 443 engines.

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



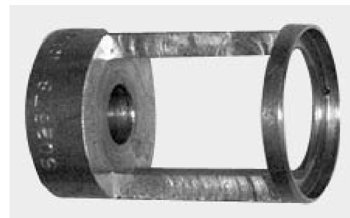
APPLICATION
377 and 443 engines.

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)

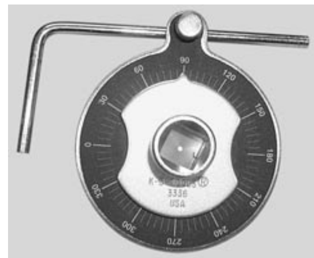
APPLICATION
1503 engines.

Spring compressor clamp
(P/N 529 035 724)

APPLICATION
1004 and 1503 engines.

Torque angle gauge
Not sold by BOMBARDIER

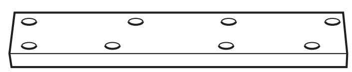
Snap-On TA362



APPLICATION
1004 and 1503 engines.

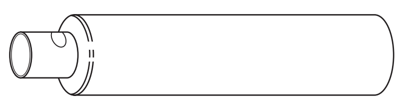
Cylinder aligning tool

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



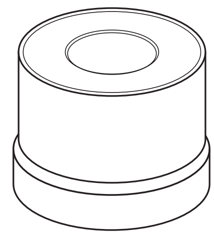
APPLICATION
a. 2–cylinder liquid cooled engines.
b. 2–cylinder fan cooled engines.

Driver tool
(P/N 529 035 521)



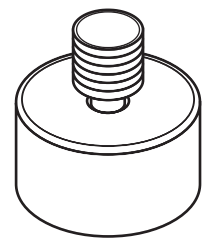
APPLICATION
Mini Z

Attachment
(P/N 529 035 522)



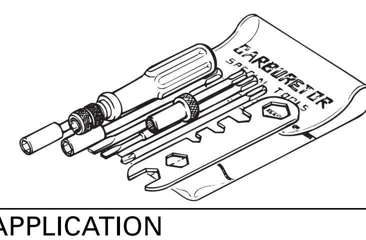
APPLICATION
Mini Z

Pilot 22 mm
(P/N 529 035 523)



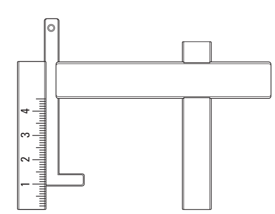
APPLICATION
Mini Z

Carburetor tool kit
(P/N 404 112 000)



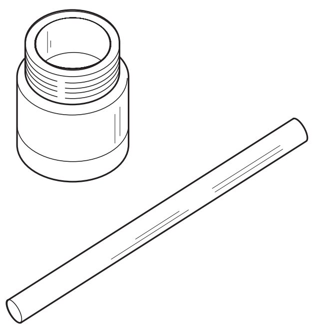
APPLICATION
All models with carburetor(s).

Float level gauge
(P/N 529 035 520)



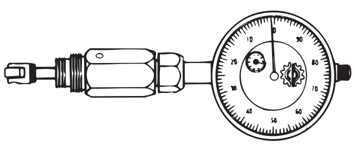
APPLICATION
All models with carburetor(s).

RAVE movement indicator
(P/N 861 725 800)



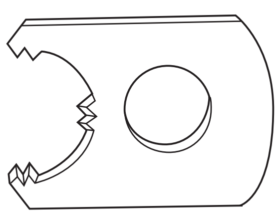
APPLICATION
All RAVE equipped engines.

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



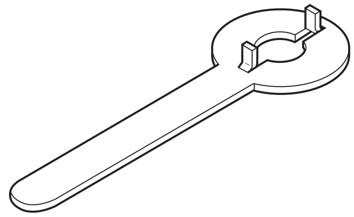
APPLICATION
All engines.

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



APPLICATION
377engines.

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

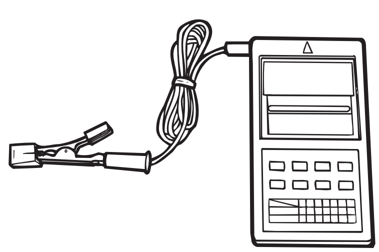


APPLICATION
All liquid cooled engines except 1004 and 1503.

Multimeter
(P/N 529 035 868)

APPLICATION
All models.

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



APPLICATION
All engines.

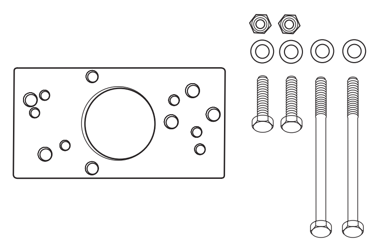
MAG seal pusher
(P/N 420 277 875)

APPLICATION
277 engines.

PTO seal pusher
(P/N 420 876 660)

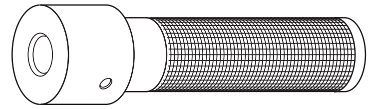
APPLICATION
277 engines.

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



APPLICATION
277 engines.

Insertion jig handle
(P/N 420 877 650)

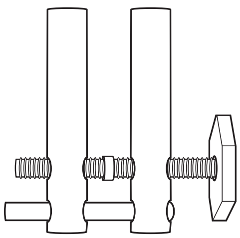


APPLICATION
1004 engines.

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

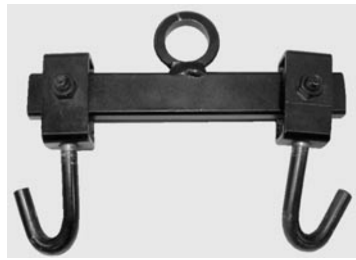
APPLICATION
1004 engines.

Large hose pincher
(P/N 529 032 500)



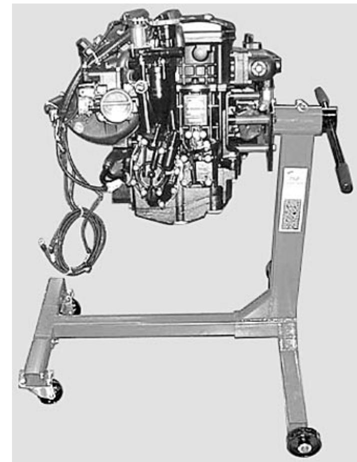
APPLICATION
All vehicles.

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



APPLICATION
2-stroke engines.

Engine stand
Not sold by BOMBARDIER



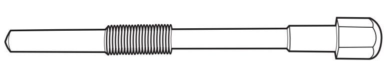
APPLICATION
1503 engines.

TRANSMISSION — MANDATORY TOOLS

Drive pulley retainer
(P/N 529 035 674)

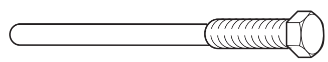
APPLICATION
All TRA, TRA III, TRA IV and TRA IV HD drive pulleys.

Drive pulley puller
(P/N 529 022 400)



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

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

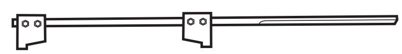


APPLICATION
TRA drive pulley for 443 engines.

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

APPLICATION
All vehicles equipped with a TRA drive pulley.

Specific alignment bar
(P/N 529 035 530)

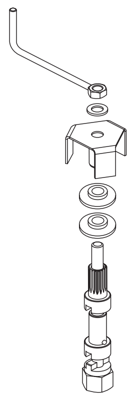


APPLICATION
ZX series with TRA and RER.

Universal alignment bar
(P/N 529 035 831)

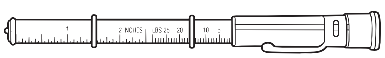
APPLICATION
All models except Elite.

Pulley spring compressor
(P/N 529 035 524)



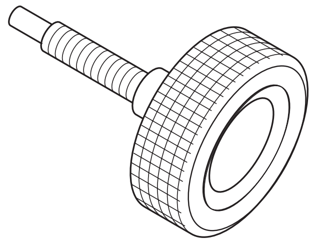
APPLICATION
All models.

Tension tester
(P/N 414 348 200)



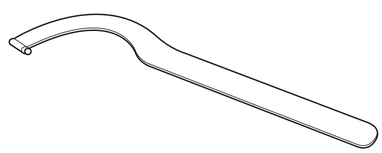
APPLICATION
All models.

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



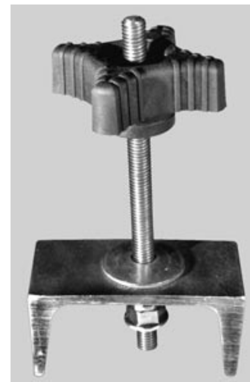
APPLICATION
Most models.

Clutch holder
(P/N 529 027 600)



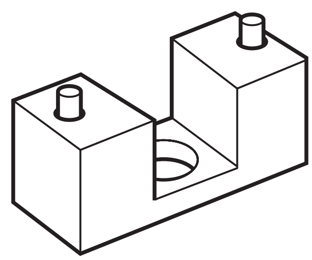
APPLICATION
BOMBARDIER Lite drive pulley.

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



APPLICATION
Tundra .

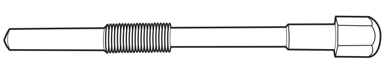
Spring cover tool
(P/N 529 027 300)



APPLICATION
BOMBARDIER Lite drive pulley.

TRANSMISSION — RECOMMENDED TOOLS

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

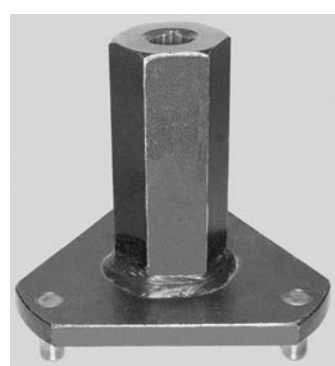


APPLICATION
Elite

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.

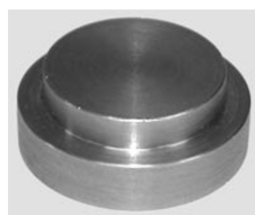
N–> TRA IV dial indicator kit
(P/N 529 035 939)

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)

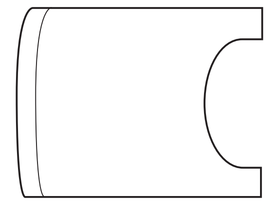


APPLICATION
TRA IV and TRA IV HD.

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

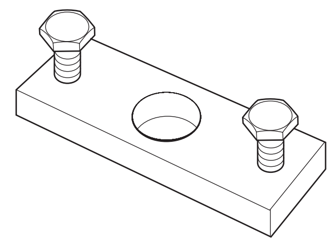
APPLICATION
Tundra.

Alignment tool
(P/N 420 476 010)



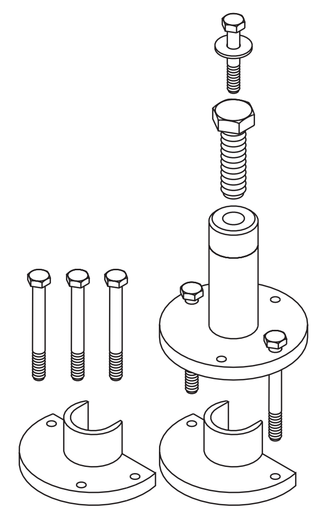
APPLICATION
Skandic WT.

Cam pusher
(P/N 529 012 900)



APPLICATION
Tundra.

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

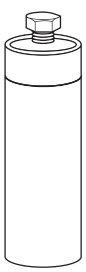


APPLICATION
ZX Series.

Countershaft bearing remover
(P/N 529 035 812)

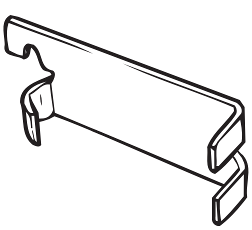
APPLICATION
Skandic LT.

Countershaft bearing installer
(P/N 529 035 815)



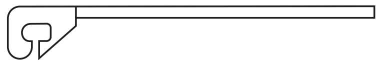
APPLICATION
Skandic LT.

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



APPLICATION
Tundra.

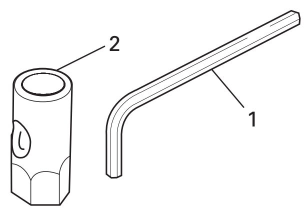
Transmission adjuster
(P/N 529 030 300)



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

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

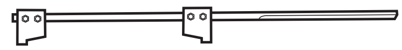
1) Hexagonal wrench (P/N 420 876 730)
2) Socket wrench (P/N 529 015 000)



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)

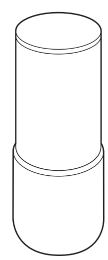


APPLICATION
a. Skandic LT.
b. ZX series with BOMBARDIER Lite and RER.
c. Elite model.

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)

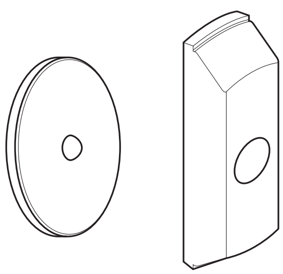


APPLICATION
Tundra and Skandic.

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

APPLICATION
TRA drive pulley spring cover with replaceable bushing.

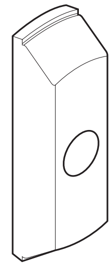
Large bushing extractor
(P/N 529 031 100)



APPLICATION
Formula type driven pulley.

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

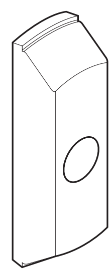
Large bushing extractor
(P/N 529 035 576)



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.

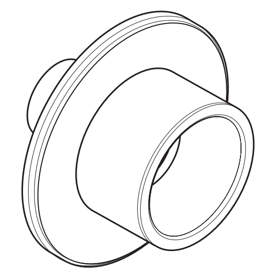
NOTE: Use this tool only with new puller (P/N 529 035 524) that has Acme threads and support plate included with extractor (P/N 529 031 100).

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

APPLICATION
TRA III and TRA IV.

Large bushing installer and small bushing extractor

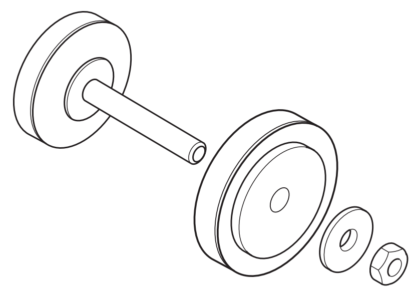
a. (P/N 529 031 200)
b. (P/N 529 035 931)



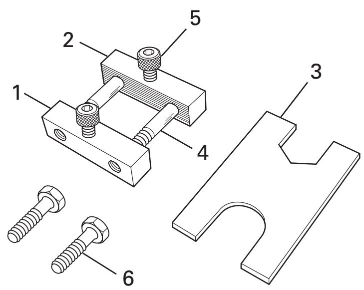
APPLICATION
a. All models except Tundra, Skandic WT/SWT.
b. TRA III drive pulley spring cover.

Chaincase

seal pusher
(P/N 529 035 584)



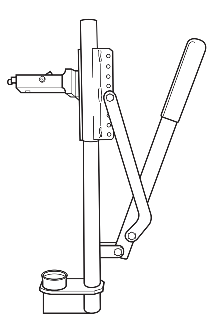
APPLICATION
ZX series.

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 used between tunnel and sprocket use screw M8.
APPLICATION All vehicles.

Belt tension tool (P/N 529 035 957)

APPLICATION Elite.

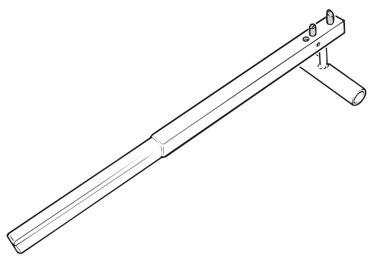
SUSPENSION — MANDATORY TOOLS

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

APPLICATION All suspension with coil spring.

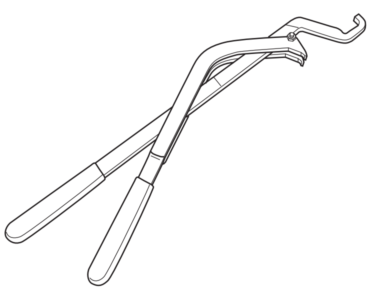
SUSPENSION — RECOMMENDED TOOLS

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)



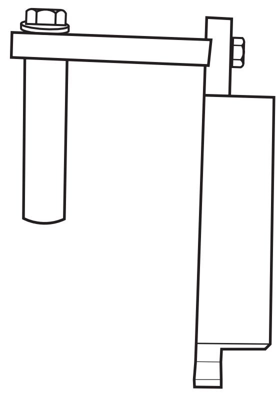
APPLICATION

a. 1993 and older.

b. All models except Tundra.

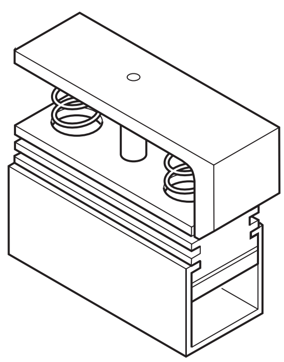
Camber angle tool
(P/N 529 021 600)

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



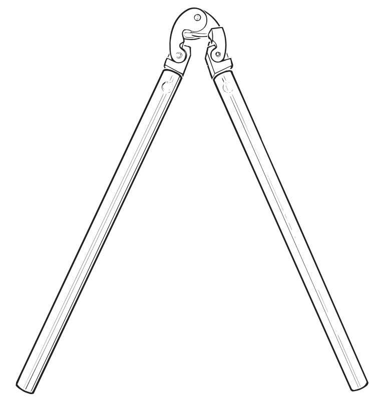
APPLICATION
All DSA front suspensions.

Track tension gauge
(P/N 529 021 500)



APPLICATION
All models .

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

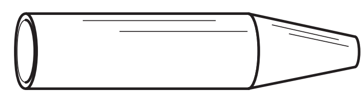


APPLICATION

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)

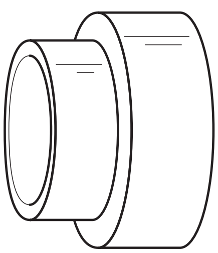
APPLICATION
All T/A shocks.

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)



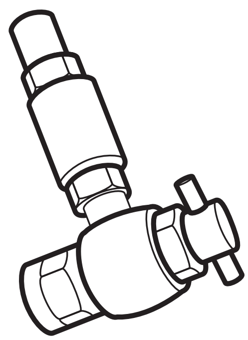
APPLICATION

a. C-36 T/A shocks.
b. C-49 T/A shocks.

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

APPLICATION
2003 and up T/A shocks.

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

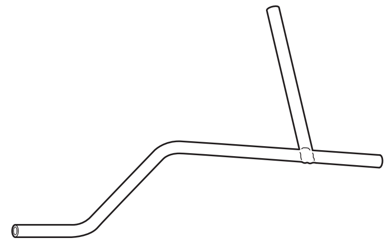


APPLICATION
Some 2000 and up T/A shocks.

Drill bit
(P/N 529 031 800)

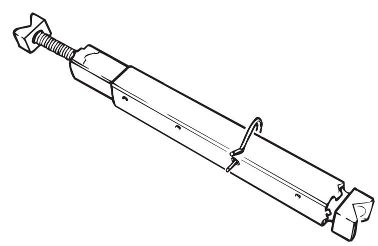
APPLICATION
All 3/16 inch rivets.

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



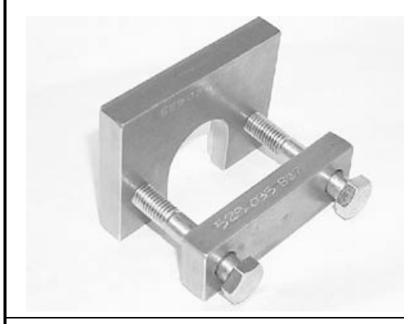
APPLICATION
Tundra and all SC-10 suspensions.

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.

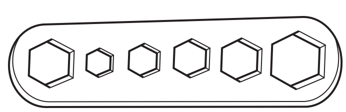
N–> Ball joint installer
(P/N 529 035 975)

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)

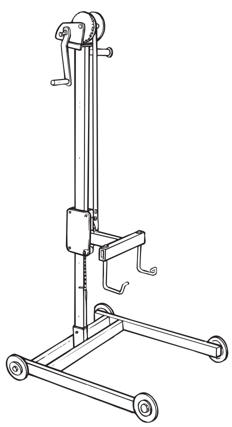
APPLICATION
SC-10 II and III (coupling blocks)

VEHICLE — RECOMMENDED TOOLS

Protective mat
(P/N 529 030 600)

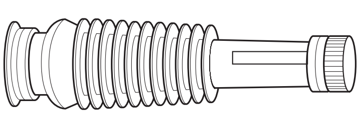
APPLICATION
All vehicle.

Snowmobile jack
(P/N 529 020 000)



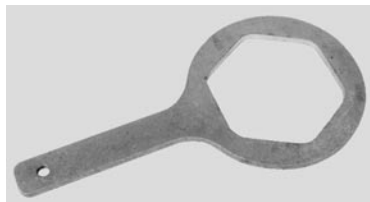
APPLICATION
All models.

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



APPLICATION
All models.

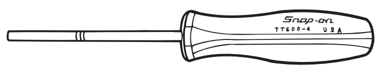
Adjustment wrench
(P/N 529 035 603)



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

Terminal (Packard) remover
Not sold by BOMBARDIER

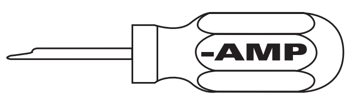
Snap-On TT 600–4



APPLICATION
Models with Packard connectors.

Multilock-terminal housing connector extractor tool
Not sold by BOMBARDIER

AMP 755430–2

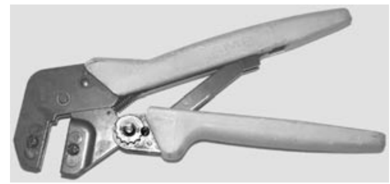


APPLICATION
For AMP multilock-terminals.

N–> DESS socket
(P/N 529 035 943)

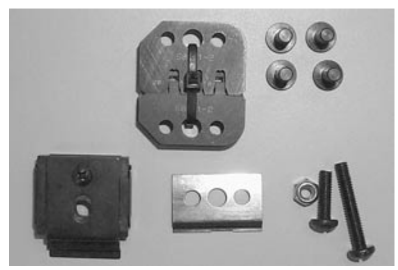
APPLICATION
All DESS equipped models.

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



APPLICATION
To crimp specific terminals.

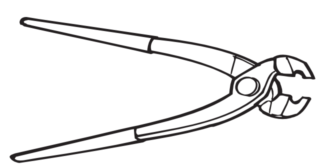
Crimper die
a. (P/N 529 035 828)
b. (P/N 529 035 906)
c. **N –>** (P/N 529 035 908)



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.

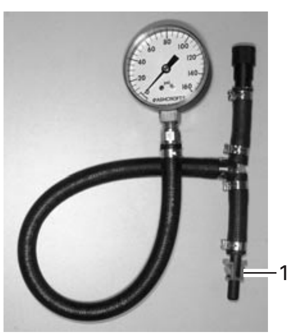
Adjustment wrench
(P/N 529 035 891)

APPLICATION
REV series.

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

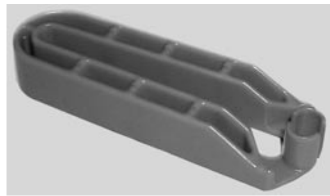
APPLICATION
2-TEC and 1004 engine equipped models.

Pressure gauge
(P/N 529 035 591)
1) Clip
(P/N 529 021 800)



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)

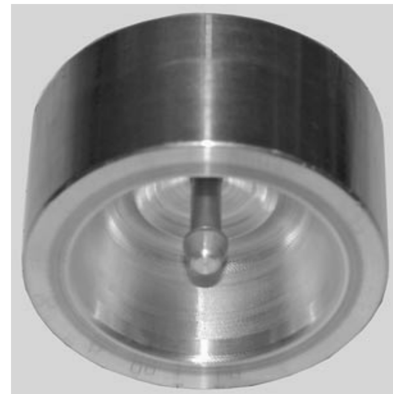
APPLICATION
1004 and 1503 engine equipped models.

Oil pressure adaptor
(P/N 529 035 652)

APPLICATION
1004 and 1503 engine equipped models.

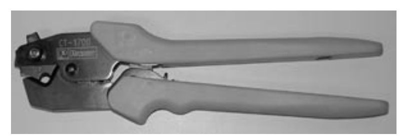
Heated grips insertion tool

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:
(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:
(10 mL) (blue)

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:
(10 mL) (red)

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).

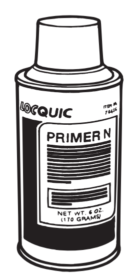
Paste gasket
(P/N 413 702 700)
Loctite® 515:
Gasket eliminator
(50 mL)

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.

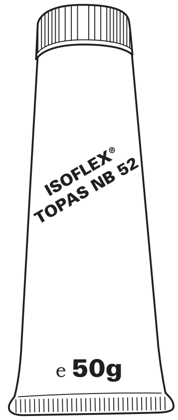
Molykote PG 54
(P/N 420 899 763)
(10 g)

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)

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.

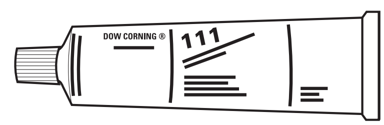
N–> Suspension synthetic grease
(P/N 293 550 033)
(400 g each)

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.

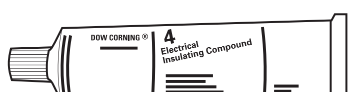
Shock oil
(P/N 293 600 035)
(32 oz)

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.

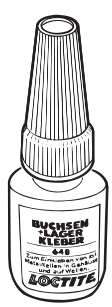
Heavy duty cleaner
(P/N 293 110 001)
(400 g)
(P/N 293 110 002)
(4 L)

APPLICATION
All models.

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

APPLICATION
Hood, bottom pan and seat.

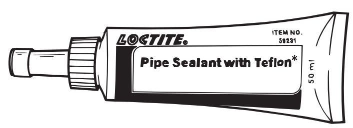
High temperature and strength retaining compound
(P/N 413 711 400)
Loctite® 648
(5 mL) (green)



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.

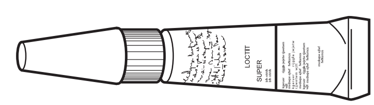
RTV silicone sealant
(P/N 293 800 066)
Loctite® 5900
(300 mL)

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)

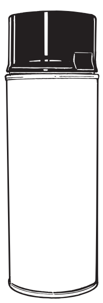
APPLICATION
Shifter boot or grip.

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 inspection or 500 km (300 m.) (1)	Weekly or 240 km (150 m.)	Monthly or 800 km (500 m.)	Once a year or 3200 km (2000 m.)	6000 km (3700 m.)	Storage (1)	Preseason preparation (1)	Refer to the following subsection(s)
ENGINE								
Rewind Starter and Rope						I, L, C	I	04-08
Engine Nuts and Screws	I			I		I		Appropriate subsection: See TOP END
Exhaust System	I		I			I		Appropriate subsection: See ENGINE REMOVAL
Engine Lubrication						L		02-02
Cooling System	I			I			I	04-06/07 and 05-04
Coolant	I					R		04-07 and 05-04
Condition of Seals (4)						I	I	04-01/02/03, and 05-03 to 05-08
RAVE Valves (4)				C				Appropriate subsection: See TOP END
LUBRICATION								
Oil and Filter Replacement (4-TEC)					R			05-05
Injection Oil Filter			I			R		04-05
Oil Injection Pump	A			A			A	04-05
FUEL								
Fuel Stabilizer						R		02-02
Fuel Filter							R	02-03
Fuel Lines, Fuel Rail and Connections	I					I	I	04-09
Carburetor	A			A			A, C	04-09
Throttle Cable	I			I		I	I	04-05 and 04-10
Air Filter			C				C	02-03
Fuel Injection System (visual inspection)				I				06-02 and 07-02
Throttle Body Bores and Throttle Plates (4)							C	06-02 and 07-02

I: Inspect, verify, clean, adjust, lubricate or replace if necessary C: Clean L: Lubricate R: Replace A: Adjust	10 h inspection or 500 km (300 m.) (1)	Weekly or 240 km (150 m.)	Monthly or 800 km (500 m.)	Once a year or 3200 km (2000 m.)	6000 km (3700 m.)	Storage (1)	Preseason preparation (1)	Refer to the following subsection(s)
DRIVE								
Drive Belt	I	I					I	08-01
Drive and Driven Pulleys	I		I	C		I	C	08-02 and 08-03
Tightening Torque of Drive Pulley Screw	I			I			I	08-02
Driven Pulley Preload	I			I		I		08-03
BRAKE								
Brake Fluid	I	I				R	I	08-05
Brake	I	I				I	I	08-05
TRANSMISSION								
Drive Chain Tension	A		A			A		08-06
Countershaft	L		L			L		08-05
Chaincase and Gearbox Oil	I		I			R	I	08-06
Drive Axle End Bearing (2)	L		L			L		10-03
STEERING/FRONT SUSPENSION								
Steering and Front Suspension Mechanism (2)	A,I,L		A,I	L		A,I,L		11-01 and 11-02
Wear and Condition of Skis and Runners	I	I				I		11-02
SUSPENSION								
Suspension adjustments	A	AS REQUIIRED						Appropriate subsection: See Section 10
Suspension (2)	I		I,L			I,L		
Suspension Stopper Strap				I		I		Appropriate subsection: See Section 10
Track	I		I			I		10-04
Track Tension and Alignment	A	AS REQUIRED						10-04
ELECTRICAL								
EMS Fault Codes (4)	I				I			06-02 or 07-02
Spark Plugs (3)(4)	I		I				R	09-02
Battery (if so equipped)	I		I			I	I	09-03
Headlamp Beam Aiming				A			A	12-01
Wiring Harnesses, Cables and Lines (4)	I		I			I		12-01
Operation of Lighting System (HI/LO beam, brake light, etc.) Test Operation of Engine Cut-Out Switch and Tether Cut-Out Switch	I	I				I		Operator's Guide

I: Inspect, verify, clean, adjust, lubricate or replace if necessary C: Clean L: Lubricate R: Replace A: Adjust	**10 h inspection or 500 km (300 m.)** (1)	**Weekly or 240 km (150 m.)**	**Monthly or 800 km (500 m.)**	**Once a year or 3200 km (2000 m.)**	**6000 km (3700 m.)**	**Storage** (1)	**Preseason preparation** (1)	**Refer to the following subsection(s)**
VEHICLE								
Rags in Air Intake and Exhaust System						R	C	02-02 and 02-03
Engine Compartment	C		C			C		02-02
Vehicle Cleaning and Protection	C		C			C		02-02

(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.

2-Stroke Engines

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 prior to starting engine for internal parts lubrication so that stabilizer flows everywhere in fuel system. 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 (if so equipped).

After engine starting, use primer several times so that stabilizer flows inside it.

Do not drain fuel system.

CAUTION: Fuel stabilizer should be added prior to engine lubrication to ensure carburetor protection against varnish deposit.

⚠ 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.

ENGINE LUBRICATION

NOTE: Be sure to add fuel stabilizer before starting the engine.

Engine internal parts must be lubricated to protect them from possible rust formation during the storage period.

Proceed as follows:

Start the engine and allow it to run at idle speed until the engine reaches its operating temperature.

⚠ WARNING

Ensure the track is free of all particles which could be thrown out while it is rotating. Keep hands, tools, feet and clothing clear of track. Ensure no one is standing in close proximity to the vehicle.

Stop the engine.

Remove air silencers to spray storage oil into each carburetor/throttle body bore.

Restart engine and run at idle speed.

Inject storage oil until the engine stalls or until a sufficient quantity of oil has entered the engine (approximately half a can).

With the engine stopped, remove the spark plug and spray storage oil (P/N 413 711 600) for Canada and (P/N 413 711 900) for USA into each cylinder.

Crank slowly 2 or 3 revolutions to lubricate cylinders.

Reinstall the spark plugs and the outlet primer hose or air silencers.

⚠ WARNING

This procedure must only be performed in a well-ventilated area. Do not run engine during storage period.

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.

COUNTERSHAFT LUBRICATION

Driven pulley and brake disc must be floating on the countershaft for efficient operation. Lubricate with anti-seize lubricant (P/N 293 800 070).

CAUTION: Do not lubricate excessively as lubricant could contact and soil brake pads and/or 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.

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

To clean the entire vehicle, including bottom pan and metallic parts use Heavy duty cleaner (P/N 293 110 001) (spray can 400 g) and (P/N 293 110 002) (4 L)).

CAUTION: Do not use Heavy duty 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 hood 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 hood and the painted portion of the frame for better protection. Use a non-abrasive wax such as silicone 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 a cover to prevent dust accumulation during storage.

CAUTION: The snowmobile has to be stored in a cool and dry place and covered with an opaque but ventilated tarpaulin. This will prevent sun rays and grime from affecting plastic components and vehicle finish.

Lift rear of vehicle until track is clear of the ground. Install on a snowmobile mechanical stand.

NOTE: Do not release track tension.

4-Stroke Models

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.

Cooling system must be filled with BOMBARDIER premixed coolant (P/N 293 600 038) or with distilled water antifreeze solution (50% distilled water, 50% antifreeze)

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 hold the fuel rail on.
– 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 (413 711 600 for Canada and 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.

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) 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 is 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

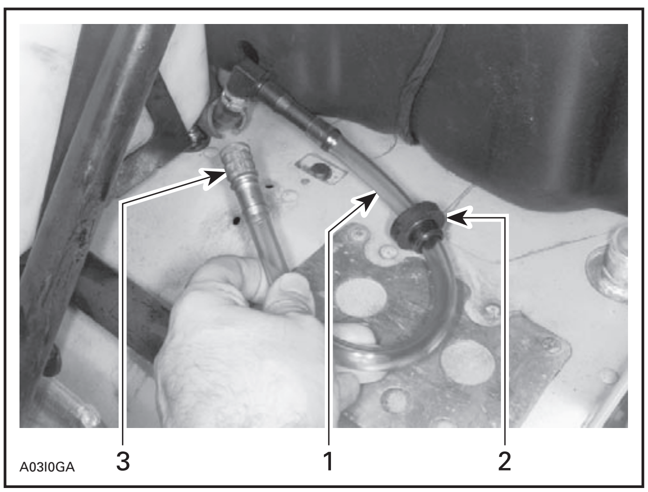
Unless otherwise specified, engine should be turned off for preparation procedure.

FUEL FILTER REPLACEMENT

All Models except V-1000 and 793 SDI engine equipped models

Drain fuel tank.

Remove fuel line grommet from fuel tank and pull out inlet fuel line from tank.



TYPICAL
1. Inlet fuel line
2. Position of grommet when installing
3. Fuel filter

Replace fuel filter. To facilitate the fuel line installation, slide grommet on fuel line about 50 mm (2 in) away from elbow then install grommet on fuel tank and push elbow through grommet.

V-1000 and 793 SDI engine equipped models only

Fuel filter, inlet and outlet hoses come as an assembly.

The fuel filter is located beside the steering column, next to coolant tank.

Using B.U.D.S. release the fuel pressure. Refer to COMPONENT INSPECTION AND ADJUSTMENT.

Remove console to gain access to top of fuel pump module.

Disconnect both ends of fuel filter line.

Unfasten clip retaining fuel filter line to fuse box support.

Unscrew the fuel filter support nut then remove the filter.

Reverse removal procedure for installation.

THROTTLE BODY CLEANING (ON SO EQUIPPED MODELS)

Remove the throttle body from vehicle.

Using the Pulley Flange Cleaner (P/N 413 711 809), remove the dirt ejected by the drive belt from the throttle plate and from both throttle body bores. After throttle body installation, adjust throttle and injection oil cables.

CARBURETOR CLEANING (ON SO EQUIPPED MODELS)

Disassemble carburetor(s) in order to clean all internal parts. Do not hesitate to replace any jets having gum or varnish on their surfaces.

AIR FILTER CLEANING

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 DISK

Remove any rust built-up on braking surfaces. Clean brake disk braking surfaces with Pulley Flange Cleaner (P/N 413 711 809).

DRIVE BELT CONDITION

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

SPARK PLUGS

Once preseason preparation is done, start engine with the old spark plug(s) to burn excess storage oil. Then, install new properly gapped spark plug(s).

ENGINE

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.

NOTE: For the 1004 4-TEC engine troubleshooting, refer to 4-STROKE 1004 4-TEC ENGINE. For engine management system troubleshooting, refer to appropriate subsection.

SYMPTOM	**ENGINE BACKFIRES.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check spark plugs. a. Carbon accumulation caused by defective spark plug(s). *Clean carbon accumulation from piston and cylinder head and install dry properly gapped spark plug(s).*
	2. Check ignition timing. a. Timing is too advanced. *Set timing according to specifications (refer to TECHNICAL DATA).*
	3. Check for erratic sparks. a. Poor electrical connections. *Repair.* b. Faulty stator. *Replace defective parts.*
	4. Check carburetor. a. Fuel passages obstructed. *Clean carburetor and install new filter(s).* b. Fuel level too low. *Adjust float level according to specifications.*
	5. Check cooling system. Fan-Cooled Engines a. Loose fan belt. *Adjust or replace fan belt (refer to AXIAL FAN COOLING SYSTEM).* b. Dirty cooling fins or blocked air ducts. *Clean.* Liquid-Cooled Engines a. Low antifreeze level. *Adjust antifreeze level. Proceed with a leakage test (refer to LIQUID COOLING SYSTEM) and repair as required.* b. Defective tank cap. *Replace cap.* c. Defective thermostat. *Replace thermostat.* d. Air in system. *Bleed system.*

SYMPTOM	**ENGINE SUDDENLY TURNS OFF AT HIGH RPM AND/OR WITH LIGHT LOAD.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check that all 3 ground wires are well connected.

SYMPTOM	**ENGINE SUDDENLY TURNS OFF.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Perform engine leak test. Refer to ENGINE LEAK VERIFICATION FLOW CHART. Check possible piston seizure. a. Damaged gasket and/or seal. *Replace defective parts.*
	2. "Four-corner" seizure of piston(s). a. High acceleration when engine is cold. Piston expands faster than cylinder. *Replace piston(s). Ask driver to refer to the WARM-UP PROCEDURE in the Operator's Guide.*
	3. Piston(s) seizure on exhaust side (color on piston dome is correct). a. Kinked fuel tank vent tube. *Relocate fuel tank vent tube.* b. Leaks at fuel line connections or damaged fuel lines. *Replace defective lines.* c. Fuel does not flow through carburetor(s) (foreign particles in needle area and/or varnish formation in carburetor(s)). *Clean carburetor(s) and install new filter(s).* d. Spark plug heat range is too warm. *Install spark plugs with appropriate heat range (refer to TECHNICAL DATA).* e. Improper ignition timing. *Adjust according to specifications (refer to TECHNICAL DATA).* f. Restriction in exhaust system. *Replace.* g. Compression ratio is too high. *Install genuine parts.* h. Too low fuel octane number. *Use proper fuel octane number.* i. Carburetor calibration is too lean. *Adjust according to specifications (refer to TECHNICAL DATA).* j. Improper reed valve adjustment or damage. *Adjust according to specifications (refer to appropriate engine subsection) and/or install Bombardier's recommended reed valve.* k. Poor quality oil. *Use Bombardier injection oil.* l. Leaks at air intake silencer. *Replace air intake silencer grommets.*

SYMPTOM	ENGINE SUDDENLY TURNS OFF.
CONDITION	NORMAL USE.
TEST/INSPECTION	4. Melted and/or perforated piston dome; melted section at ring end gap. a. When piston reaches TDC, mixture is ignited by heated areas in combustion chamber. This is due to an incomplete combustion of a poor quality oil. *Clean residue accumulation in combustion chamber and replace piston(s). Use Bombardier injection oil.* b. Spark plug heat range is too high. *Install recommended dry properly gapped spark plugs (refer to TECHNICAL DATA).* c. Ignition timing is too advanced. *Adjust according to specifications (refer to TECHNICAL DATA).* d. Inadequate fuel quality. *Use appropriate fuel.* e. Carburetion is too lean. *Adjust according to specifications (refer to TECHNICAL DATA).*
	5. Seized piston all around the circumference (dry surface). a. Lack of oil, damaged oil line or defective injection pump. *Replace defective part(s).*
	6. Grooves on intake side of piston only. a. Oil film eliminated by water (snow infiltration in engine). This can also be caused by running engine on choke for too long. Excessive fuel will remove the oil film on the piston and make marks. *Replace piston(s) and check if intake system leaks.*
	7. Piston color is dark due to seizure on intake and exhaust sides. a. Cooling system leaks and lowers coolant level. *Proceed with a leakage test (refer to LIQUID COOLING SYSTEM) and repair as required. Add coolant in cooling system until appropriate level is reached.* b. Accumulation of foreign particles in needle valve and/or main jet area. *Clean carburetor(s).*
	8. Cracked or broken piston(s). a. Cracked or broken piston(s) due to excessive piston/cylinder clearance or engine overrevving. *Replace piston(s). Check piston/cylinder clearance (refer to TECHNICAL DATA). Adjust drive pulley according to specifications (refer to TECHNICAL DATA) and/or clean pulley sheaves if they are contaminated with greasy particles.*
	9. DPM manifold air vent is obstructed. a. Carburetion is too lean. *Ensure proper air vent.*

SYMPTOM	PISTON RING AND CYLINDER SURFACES ARE SCRATCHED.
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check oil quality. a. Poor quality oil. *Use Bombardier injection oil.*
	2. Check injection pump and its hoses. a. Inadequate injection pump adjustment and/or defective hoses. *Adjust pump according to specifications (refer to ENGINE) and/or replace hoses.*

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 gap. a. Fouled spark plugs or wrong spark plug gap. *Replace or readjust gap.*
	2. Check if there is water in fuel. a. There is water in fuel. *Drain fuel system, then fill with appropriate fuel.*
	RAVE Equipped Engines 3. Check proper operation of RAVE valves. (Refer to ENGINE EQUIPPED WITH RAVE VALVE DOES NOT REACH ITS FULL OPERATING RPM (500 TO 1000 RPM LOWER). *Repair.*
	4. Check items listed in ENGINE RUNS OUT OF FUEL (refer to FUEL AND OIL SYSTEMS subsection).
	5. Check carburetor adjustments and cleanliness. a. Inadequate carburetor adjustments or dirt accumulation. *Adjust according to specifications (refer to TECHNICAL DATA) or clean.*
	6. Check drive belt. a. Worn belt. *Replace belt if width is 3 mm (1/8 in) less than nominal dimension (refer to TECHNICAL DATA).*
	7. Check track adjustment. a. Too much tension and/or improper alignment. *Align track and adjust its tension to specifications (refer to TECHNICAL DATA).*
	8. Check drive pulley. a. Improper calibration screw adjustments (TRA pulley) and/or worn bushing(s). *Adjust according to specifications (refer to TECHNICAL DATA) and/or replace bushing(s).*
	9. Check driven pulley. a. Worn bushing and/or spring tension. *Replace spring and/or adjust its tension according to specifications (refer to TECHNICAL DATA).*
	10. Check exhaust system. a. Restriction or exhaust system leakage. *Replace or reseal with Ultra Copper.*
	11. Check ignition timing. a. Decrease in power due to delayed ignition. *Adjust according to specifications (refer to TECHNICAL DATA).*
	12. Check engine compression. a. Worn piston(s) and ring(s). *Replace (refer to TECHNICAL DATA for specifications).*
	13. Check engine cooling system. a. Coolant level is low, cap fails to pressurize system or air circulates through lines. *Adjust level, replace cap or bleed cooling system.*
	14. Check reed valve. a. Improper tightness and/or opening. *Replace or adjust. (Refer to proper ENGINE subsection).*

SYMPTOM	ENGINE DETONATION AT MAXIMUM RPM.
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check which type of fuel is used. a. Octane number is too low and/or alcohol level is too high. *Use recommended fuel type.*
	2. Check spark plug type. a. Improper spark plug heat range. *Install recommended spark plugs (refer to TECHNICAL DATA).*
	3. Check exhaust system. a. Too much restriction. *Replace.*
	4. Check ignition timing. a. Timing is too advanced. *Adjust according to specifications (refer to TECHNICAL DATA).*
	RAVE Equipped Engines 5. Check proper operation of RAVE valves. (Refer to ENGINE EQUIPPED WITH RAVE VALVE DOES NOT REACH ITS FULL OPERATING RPM (500 TO 1000 RPM LOWER). *Repair.*
	6. Check if engine is overheating. (Refer to HIGH ENGINE OPERATING TEMPERATURE).
	7. Check carburetion. a. Fouled and/or improper carburetor components. *Clean or replace according to specifications (refer to TECHNICAL DATA).*
	8. Check compression ratio and combustion chamber volume. a. Compression ratio is too high. *Install genuine parts.*

SYMPTOM	**ENGINE TURNS OVER BUT FAILS TO START.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check switches. a. Ignition switch, emergency cut-out switch or tether switch is OFF. *Place all switches in the RUN or ON position. If it still does not work, connect DESS switch BK/GN and BK/WH wires together (harness side).*
	2. Check fuel level. a. Mixture too lean to start cold engine. *Check fuel tank level and use choke.*
	3. Check spark plug. a. Defective spark plug (no spark) or wrong spark plug gap. *Replace spark plugs or readjust gap.*
	4. Check amount of fuel on spark plug. a. Flooded engine (spark plug wet when removed). *Do not overprime or overchoke. Remove wet spark plugs, turn ignition switch to OFF and crank engine several times. Install clean dry properly gapped spark plugs. Start engine following usual starting procedure.*
	5. Check fuel lines. a. No fuel to the engine (spark plugs dry when removed). *Check fuel tank level ; turn fuel valve on if applicable; check fuel filter, replace if clogged ; check condition of fuel and impulse lines and their connections.*
	6. Check engine compression. a. Insufficient engine compression. *Replace defective part(s) (ex.: piston(s), ring(s), etc.).*

SYMPTOM	**IRREGULAR ENGINE IDLE.**
CONDITION	NORMAL USE AFTER ENGINE WARM UP.
TEST/INSPECTION	1. Check choke. a. Choke plunger may be partially opened. *Readjust.*
	2. Check carburetor adapter. a. Air enters through a crack. *Replace.*
	3. Check air screw position. a. Inadequate fuel/air mixture. *Adjust according to specifications (refer to TECHNICAL DATA).*
	4. Check dimension of pilot jet. a. Inadequate fuel/air mixture. *Adjust according to specifications (refer to TECHNICAL DATA).*
	5. Check reed valve. a. Improper tightness and/or opening. *Replace or adjust. Refer to proper engine subsection.*
	6. Perform engine leak test. a. Leaking gaskets allow air to enter in engine. *Replace defective parts.*
	7. DPM manifold air vent is obstructed. a. Carburetion is too lean. *Ensure proper air vent.*

SYMPTOM	**HIGH ENGINE OPERATING TEMPERATURE.**
CONDITION	NORMAL USE.
TEST/INSPECTION	Fan-Cooled Engines 1. Check cooling system. a. Loose fan belt. *Adjust or replace fan belt (refer to AXIAL FAN COOLING SYSTEM).* b. Dirty cooling fins or blocked air ducts. *Clean.*
	2. Check carburetion. a. Improperly adjusted or inadequate carburetor components. *Adjust according to specifications (refer to TECHNICAL DATA) or replace inadequate component(s).*
	3. Check cylinder O-rings. a. Worn O-rings. *Replace.*

SYMPTOM	**HIGH ENGINE OPERATING TEMPERATURE.**
CONDITION	NORMAL USE.
TEST/INSPECTION	4. Check ignition timing. a. Ignition timing is too advanced. *Adjust according to specifications (refer to TECHNICAL DATA).*
	5. Check if there are leaks at air intake silencer and/or engine crankcase. a. Leak(s). *Repair or replace.*
	6. Check condition and heat range of spark plugs. a. Melted spark plug tip or inadequate heat range. *Replace.*
	Liquid-Cooled Engines 1. Check temperature gauge sensor. a. False reading. *Check terminal connections. If problem persists, replace sensor.*
	2. Check if heat exchangers are clean. a. Dirty heat exchangers. *Clean heat exchangers.*
	3. Check coolant level and check if there is air infiltration in the system or if there are leaks in gasket areas. a. Low coolant level or air in system. *Add coolant until recommended level is reached, bleed system and/or tighten clamps.*
	4. Check if coolant flows through system properly. a. Foreign particles and/or broken coolant pump impeller. *Clean cooling system and/or replace coolant pump impeller.*
	5. Check thermostat. a. Thermostat reacts slowly or not at all. *Replace.*
	6. Check antifreeze concentration. a. Antifreeze concentration is too high. *Adjust concentration according to Bombardier's recommendations.*
	7. Check tank cap. a. Cap does not hold pressure. *Replace.*
	8. Check carburetion. a. Improperly adjusted or inadequate carburetor components. *Adjust according to specifications (refer to TECHNICAL DATA) or replace inadequate component(s).*
	9. Check cylinder head gaskets. a. Worn gaskets. *Replace.*
	10. Check ignition timing. a. Ignition timing is too advanced. *Adjust according to specifications (refer to TECHNICAL DATA).*

SYMPTOM	**HIGH ENGINE OPERATING TEMPERATURE.**
CONDITION	NORMAL USE.
TEST/INSPECTION	11. Check if there are leaks at air intake silencer and/or engine crankcase. a. Leak(s). *Repair or replace.*
	12. Check condition and heat range of spark plugs. a. Melted spark plug tip or inadequate heat range. *Replace.*

SYMPTOM	**ENGINE EQUIPPED WITH RAVE VALVE DOES NOT REACH ITS FULL OPERATING RPM (500 TO 1000 RPM SLOWER).**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check RAVE valve pistons. a. Valve piston(s) is (are) not screwed to the bottom. *Screw valve piston(s) to bottom.*
	2. Check that valve moves freely. a. Valve stuck in closed position. *Clean.*
	3. Check RAVE valve stems. a. Bent RAVE valve stem(s). *Replace.*
	4. Check RAVE valves. a. Jammed valve(s). *Clean.*
	5. Check tension of RAVE springs. a. Inadequate spring tension. *Replace.*
	6. Check RAVE pressure holes. a. Clogged holes. *Clean.*
	7. Check clamps or sleeves. a. Damaged clamp(s) or sleeve(s). *Replace.*
	8. Check exhaust tightness. a. Exhaust system is leaking leading to a too low back pressure. *Replaces parts and reseal.*

SYMPTOM	**ENGINE EQUIPPED WITH RAVE. ENGINE HESITATES AT LOW OR MID-SPEED AND REACHES MAXIMUM PERFORMANCE ONLY AFTER A WHILE.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check RAVE valve spring(s). a. Spring tension is too low or spring(s) is (are) broken. *Replace.*
	2. Check RAVE valve cover red adjustment screws. a. Adjustment screw(s) is (are) too loose. *Adjust according to ASSEMBLY PROCEDURE in appropriate engine subsections.*
	3. Check RAVE valve movement (RAVE movement indicator P/N 861 725 800). a. Valve(s) is (are) stuck in open position. *Clean.*

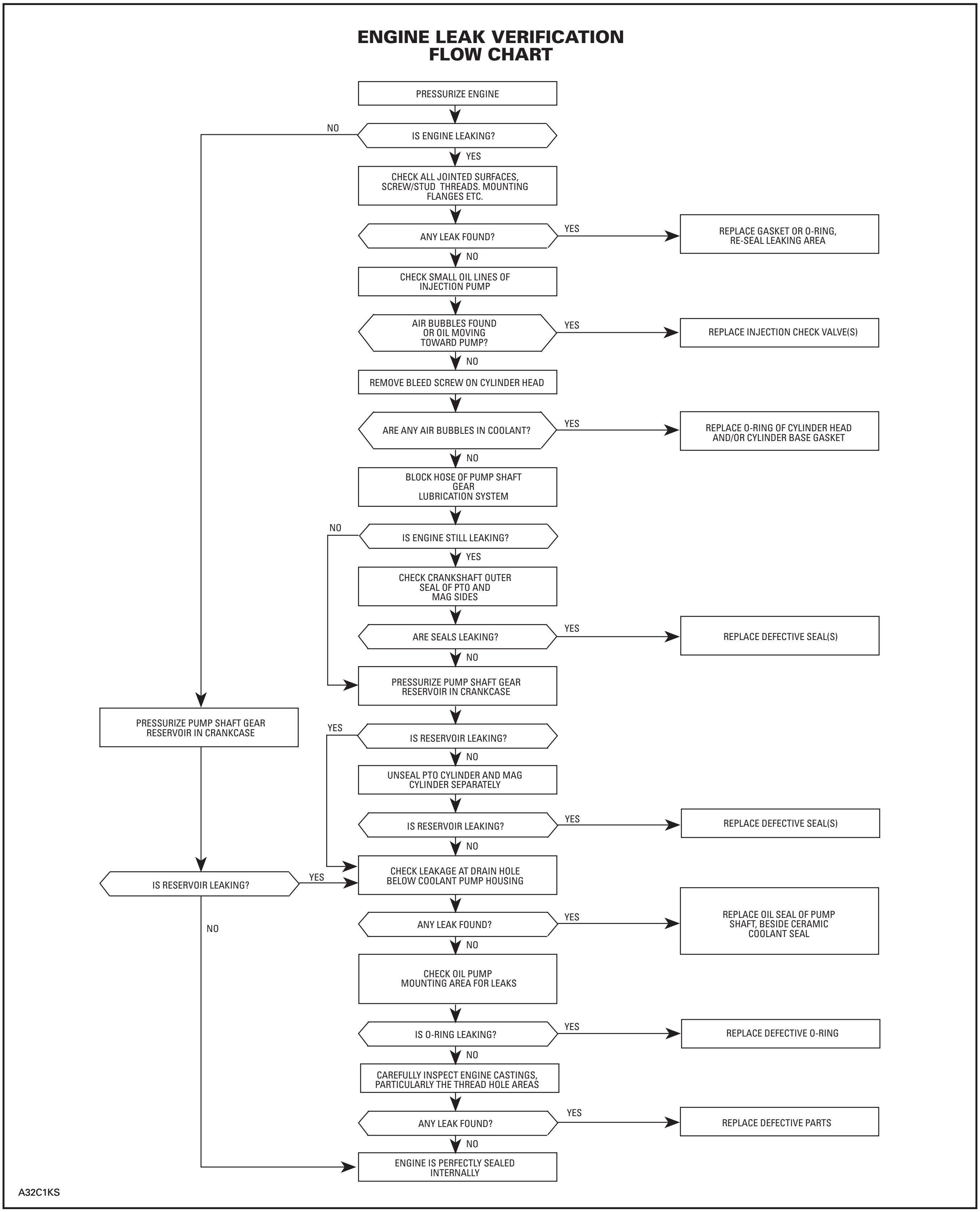
SYMPTOM	**REWIND STARTER ROPE DOES NOT REWIND.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check rewind spring. a. Broken spring. *Replace spring.*

SYMPTOM	**REWIND STARTER PAWL DOES NOT ENGAGE.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check stopper spring. a. Broken stopper spring. *Replace.*
	2. Check pawl and pawl lock. a. Pawl and pawl lock have stuck together because of heat. *Replace.*
	3. Check pawl and rope sheave. a. Pawl and rope sheave have stuck together because of heat. *Replace.*

SYMPTOM	**ENGINE PINGING.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check for proper fuel octane number according to engine type. a. Too low fuel octane number. *Use appropriate fuel octane number (Refer to Operator's Guide).*
	2. Check fuel lines. a. Bent fuel lines (preventing fuel from flowing through). *Relocate or replace fuel lines.*
	3. Check if carburetor(s) is (are) clean. a. Dirt prevents fuel from flowing through. *Clean.*
	4. Check ignition timing. a. Timing is too advanced. *Adjust according to specifications (refer to TECHNICAL DATA).*
	5. Check compression ratio. a. Compression ratio is too high. *Replace inadequate part(s) to obtain manufacturer's recommended compression ratio or use a higher grade fuel.*

SYMPTOM	**ENGINE GENERATES A LOT OF VIBRATIONS.**
CONDITION	NORMAL USE.
TEST/INSPECTION	1. Check engine supports and stopper. a. Loose and/or broken supports or interference between support(s) and chassis. *Retighten to specification (refer to TECHNICAL DATA) or replace.*
	2. Check drive pulley (refer to VIBRATIONS ORIGINATING FROM DRIVE PULLEY).
	3. Check carburetor synchronization. a. Throttle slide height is not the same on each carburetor and/or throttle slides opening is unsynchronized. *Adjust throttle slide heights and throttle cable.*
	4. Check for crankshaft and bearings. a. Loose crankshaft bearings or uneven crankshaft. *Retighten or replace the parts.*

ENGINE LEAK VERIFICATION FLOW CHART



FUEL AND OIL SYSTEMS

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.

NOTE: For the SDI and 1004 4-TEC fuel and oil systems troubleshooting, also refer to appropriate ENGINE subsection.

SYMPTOM	**HIGH FUEL CONSUMPTION OR RICH MIXTURE.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check fuel tank. a. Perforated fuel tank. *Replace fuel tank.*
	2. Check fuel pump, reservoir and carburetor fittings. a. Leaking fittings. *Replace defective part.*
	3. Check choke adjustment. a. Fuel flows through choke circuit while engine runs. *Readjust choke.*
	4. Check float height in carburetor(s). a. Fuel level is too high in float bowl(s). *Adjust according to specifications (refer to TECHNICAL DATA).*
	5. Check needle valve on each carburetor. a. Foreign particles prevent needle valve from closing and/or pounded seating area. *Clean or replace needle valve, then clean seating area.*

SYMPTOM	**FUEL LEAKS IN ENGINE BASE WHEN ENGINE IS STOPPED.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check items 3, 4 and 5 of HIGH FUEL CONSUMPTION.
	2. Check fuel pump diaphragm. a. Cracked diaphragm. *Replace.*

SYMPTOM	**ENGINE LACKS POWER OR STALLS AT HIGH RPM.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check fuel tank vent hose. a. Kinked or clogged hose. *Relocate or replace.*
	2. Check fuel filter. a. Clogged filter. *Replace.*
	3. Check fuel lines. a. Kinked or clogged lines. *Relocate or replace.*
	4. Check fuel pump flow. a. Check impulse hose. *Replace.* b. Dried diaphragm. *Replace.*
	5. Check if carburetor(s) is (are) clean. a. Varnish. *Clean.*

SYMPTOM	**HIGH INJECTION OIL CONSUMPTION.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check oil injection pump adjustment. a. Oil injection pump adjusted too rich. *Adjust.*
	2. Check injection pump identification. a. Wrong pump. *Replace with the appropriate pump. Refer to OIL INJECTION SYSTEM.*
	3. Check injection oil lines and their fitting. a. Leaking lines and/or cover. *Replace defective part(s).*
	4. Check injection pump cover gasket. a. Broken gasket. *Replace.*
	5. Check nipple check valve. a. Check valve stuck open. *Replace.*
	6. Check pump. a. Defective pump. *Replace pump or connecting cable.*
	7. Test pump shaft gear reservoir for leaks. a. Leaking seal(s). *Replace seal(s).*

SYMPTOM	**ENGINE LACKS FUEL OR (LEAN MIXTURE).**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check fuel filter ball located in fuel tank. Ball must move freely. a. Corrosion due to oxidation at installation. *Replace fuel filter.*
	2. Check if lines are perforated, kinked, or if they leak at fittings. a. Lines are too big for their fittings or are improperly routed. *Replace or properly relocate lines.*
	3. Check fuel pump outlet flow. a. Dirt clogging fuel pump lines or torn membrane. *Clean or replace fuel pump.*
	4. Check needle valve on each carburetor. a. Dirt (varnish, foreign particle) clogging fuel line inlets. *Clean.*
	5. Check main jet. a. Dirt (varnish, foreign particle) accumulation at main jet. *Clean.*
	6. Check float(s) height in carburetor bowl on each carburetor. a. Lack of fuel at high speed because float height is too low. *Adjust float height according to specifications.*

SYMPTOM	**DPM SEEMS TO BE DEFECTIVE.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check electrical connections. a. Corroded terminals. *Clean or replace.*
	2. Fuel mixture is too rich or too poor. a. Possible damage to DPM. *If DPM does not operate properly, unplug compensation solenoid connector while engine is running. The carburetion is now identical to that of carburetors without a DPM, provided that all pipe fittings are tight and that solenoid is in good condition, (it must not be half-open). If problem is resolved with this procedure, DPM is faulty.*
	3. Check for DPM manifold leaking. a. DPM manifold is leaking. *Repair or replace.*

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.*

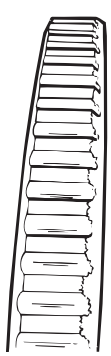
SYMPTOM	**LOOSE IN DRIVE SYSTEM WHEN ACCELERATING/DECELERATING.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check drive chain tension. a. Drive chain is too loose. *Adjust.*
	2. Check radial play of driven pulley. a. Worn splines. *Replace pulley.*

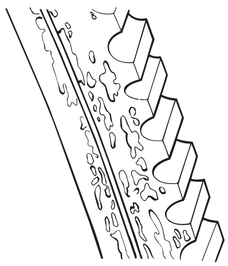
SYMPTOM	**VIBRATIONS ORIGINATING FROM DRIVE PULLEY.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check drive belt. a. Belt width is uneven on several places. *Replace.*
	2. Check tightening torque of drive pulley screw. a. Moving governor cup. *Retighten screw.*
	3. Spring cover screws. a. Spring cover 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 governor cup splines. a. Excessive radial play. *Replace governor cup.*
	6. Check lever assembly. a. Lever assembly is damaged (worn bushing, bent lever etc.). *Replace damaged part.*

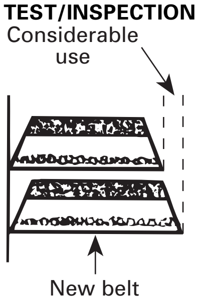
SYMPTOM	**VIBRATIONS ORIGINATING FROM DRIVEN PULLEY.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check sliding half side play. a. Sliding half bushing worn out. *Replace sliding half bushing.*
	2. Check sliding half and fixed half straightness. a. Sliding half/fixed half warped. *Replace.*
	3. Check cam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

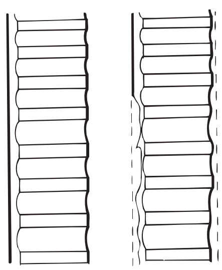
SYMPTOM	**PULLEYS DO NOT DOWN SHIFT PROPERLY.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check driven pulley spring tension. a. Spring tension is too low. *Adjust according to specifications (refer to TECHNICAL DATA) or replace spring.*
	2. Refer to VIBRATIONS COMING FROM DRIVEN PULLEY and check items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

SYMPTOM	**IN REVERSE ENGINE FAILS AND DRIVEN PULLEY OPENS TOO FAST (DRIVE BELT IS LOW IN DRIVEN PULLEY).**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check pulley distance and alignment. a. Improper adjustment. *Adjust according to specifications (refer to PULLEY DISTANCE AND ALIGNMENT) and make sure that engine stopper is resting against engine.*
	2. Check for reverse sliding shoes. a. Sliding shoes are worn or missing. *Replace sliding shoes.*
	3. Check spring. a. Spring is weak or insufficient tension. *Replace spring.*

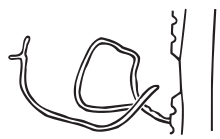
SYMPTOM	**UNEVEN BELT WEAR ON ONE SIDE.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check tightening torque of engine mount bolts. a. Loose engine mount. *Tighten mount nuts/bolts equally.*
	2. Check pulley alignment. a. Pulley misalignment. *Align pulleys.*
	3. Check drive belt contact area on pulleys. 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.*

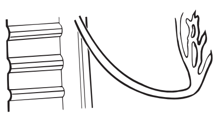
SYMPTOM	**BELT GLAZED EXCESSIVELY OR HAVING BAKED APPEARANCE.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check if drive pulley bushings are worn. a. Slipping due to insufficient pressure on belt sides. *Replace bushing.*
	2. Check condition of drive pulley fixed half shaft. a. Slipping due to rusted drive 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.*

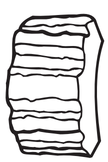
SYMPTOM	**BELT WORN EXCESSIVELY IN TOP WIDTH.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check drive pulley. a. Excessive slippage due to jamming of drive pulley. *Inspect drive pulley.*
	2. Check drive belt identification number. a. Improper belt angle (wrong type of belt). *Replace belt with an appropriate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

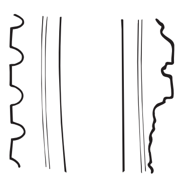
SYMPTOM	**BELT TOO NARROW ON ONE SECTION.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check for frozen track. a. Frozen track. *Free track from ice.*
	2. Check parking brake. a. Parking brake is engaged. *Release parking brake.*
	3. Check track tension/alignment. a. Track too tight. *Adjust track tension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

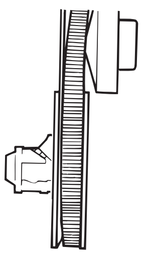
SYMPTOM	**BELT SIDES WORN CONCAVE.**
CONDITION	NORMAL USE
TEST/INSPECTION 	1. Check pulley half surfaces. a. Rough or scratched pulley half surfaces. *Repair or replace.*
	2. Check drive belt identification number. a. Wrong belt. *Replace with an appropriate drive belt (refer to TECHNICAL DATA).*

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 POP 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

MECHANICAL BRAKE

SYMPTOM	**BRAKE DOES NOT ADJUST AUTOMATICALLY.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check ratchet wheel spring. a. Broken ratchet wheel spring tab. *Replace.*
	2. Check mobile pad stud. a. Stud rotates in pad. *Replace.*

SYMPTOM	**BRAKE HANDLE DOES NOT RETURN COMPLETELY.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check brake return spring. a. Broken return spring. *Replace.*
	2. Check if brake cable moves freely in its housing. a. Brake cable movement is limited due to oxidation or dirt accumulation. *Replace.*
	3. Check distance between brake lever and caliper. a. Distance is too wide. *Adjust according to specifications (refer to TRANSMISSION).*

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

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.*
	2. Check key/keyway. a. Key/keyway is worn out. *Replace parts.*

ELECTRICAL 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.

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 solenoid on fan-cooled models or between starter switch and MPEM on liquid-cooled models. a. Open circuit. *Repair.*
	4. On liquid-cooled models check continuity between MPEM 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 brackets. a. Worn or broken brackets. *Replace brackets.*
	4. Check movement of clutch on splines. a. Poor movement of clutch on splines. *Clean and correct.*
	5. Check clutch bushing. a. Worn clutch bushing. *Replace clutch.*
	6. Check starter bushings. a. Worn starter bushing(s). *Replace bushing(s).*

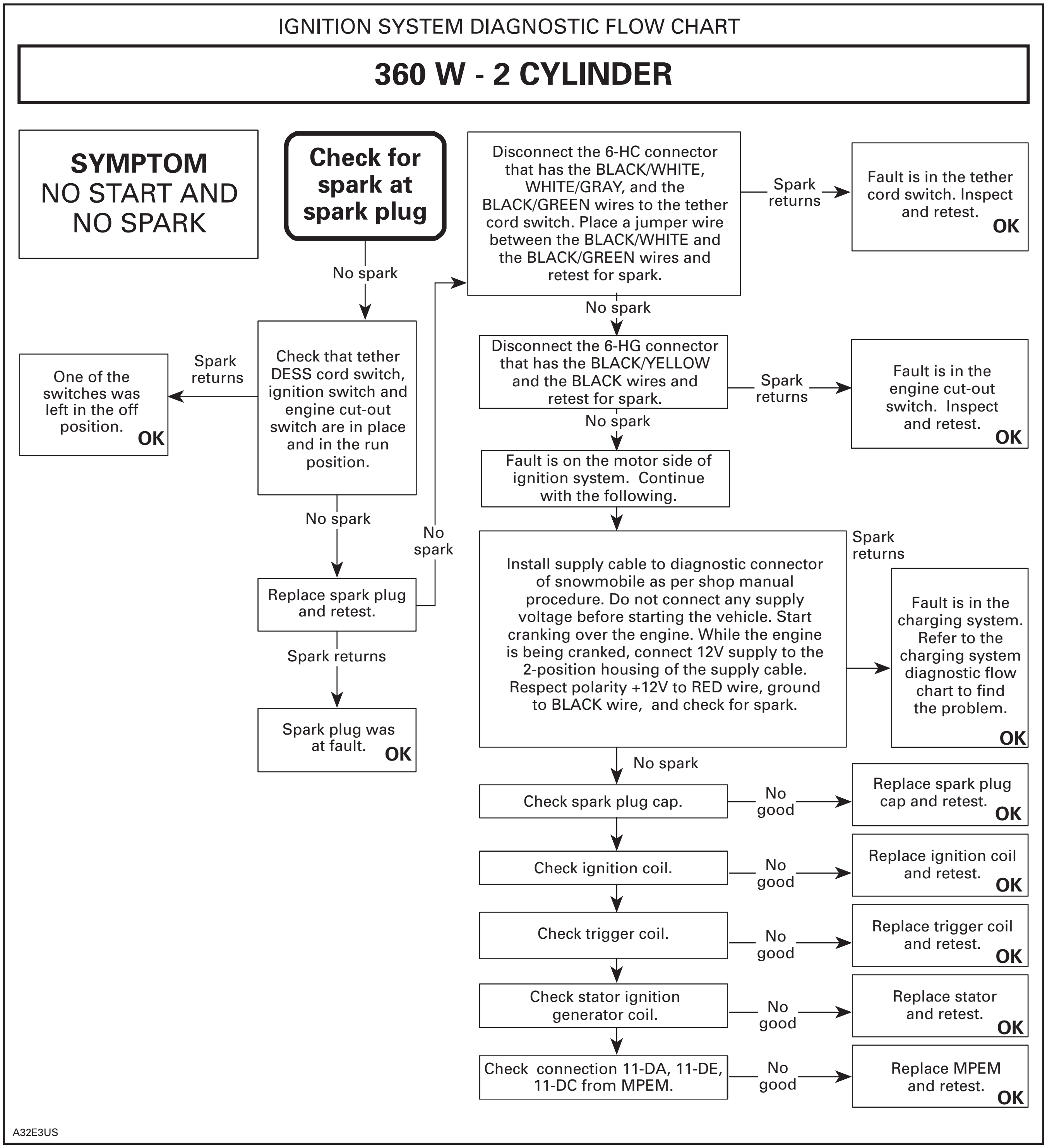
SYMPTOM	**STARTER TURNS, BUT OVERRUNNING CLUTCH PINION DOES NOT MESH WITH RING GEAR.**
CONDITION	NORMAL USE
TEST/INSPECTION	7. Check ring gear. a. Worn ring gear. *Replace ring gear.*
	8. Check for proper starter rotation direction. a. Starter turns in wrong direction, incorrectly installed brushes, wrong polarity or wrong starter. *Replace starter or reconnect properly.*

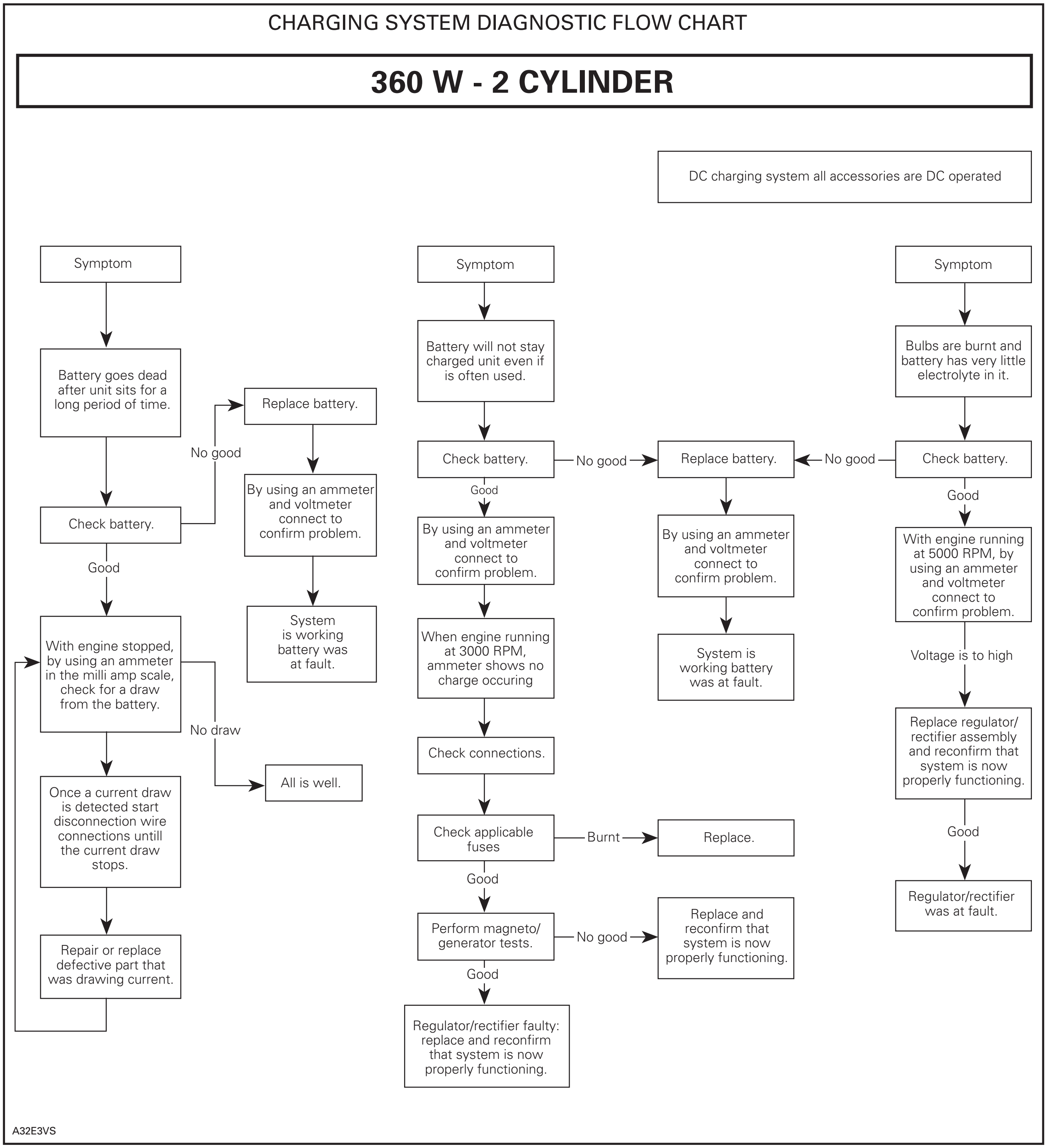
SYMPTOM	**ELECTRIC STARTER KEEPS TURNING WHEN ENGINE IS STARTED.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check clutch. a. Jammed clutch pinion gear. *Replace or clean.*
	2. Check movement of clutch on splines. a. Clutch is stuck on splines. *Clean.*
	3. Check starter brackets. a. Broken bracket(s). *Replace bracket(s).*
	4. On fan-cooled models check ignition switch. a. Ignition switch does not return to its ON position or is short-circuited. *Adjust switch position. Face nut is too far in.*
	5. Check starter relay. a. Shorted starter relay winding(s). *Replace starter relay.*
	6. Check starter relay contacts. a. Melted starter relay contacts. *Replace starter relay.*
	7. Check starter relay. a. Starter relay returns poorly. *Replace starter relay.*
	8. Check start switch contacts. a. Contacts shorted. *Replace start switch.*

SYMPTOM	**NOISE OCCURENCE WHEN STARTING ENGINE.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check if ring gear is well-mounted to drive pulley fixed half. a. Loose and/or broken bolts. *Retighten bolts using thread locker or replace ring gear and drive pulley fixed half.*

SYMPTOM	**ON FAN-COOLED MODELS 20 A FUSE ON BLACK WIRES IN FRONT OF VEHICLE IS BURNT OUT.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check that big ground wire at battery is well connected to chassis. a. Corroded and/or loose connection(s). *Clean and/or retighten.*

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 ignition switch. a. Defective contacts in ignition switch. *Replace.*
	5. Check solenoid of electric starter. a. Shorted solenoid wiring harness or corroded contact washer. *Replace.*


IGNITION SYSTEM DIAGNOSTIC FLOW CHART
360 W - 2 CYLINDER
SYMPTOM
NO START AND NO SPARK
Check for spark at spark plug
No spark
Check that tether DESS cord switch, ignition switch and engine cut-out switch are in place and in the run position.
Spark returns
One of the switches was left in the off position. OK
No spark
Replace spark plug and retest.
Spark returns
Spark plug was at fault. OK
No spark
Disconnect the 6-HC connector that has the BLACK/WHITE, WHITE/GRAY, and the BLACK/GREEN wires to the tether cord switch. Place a jumper wire between the BLACK/WHITE and the BLACK/GREEN wires and retest for spark.
Spark returns
Fault is in the tether cord switch. Inspect and retest. OK
No spark
Disconnect the 6-HG connector that has the BLACK/YELLOW and the BLACK wires and retest for spark.
Spark returns
Fault is in the engine cut-out switch. Inspect and retest. OK
No spark
Fault is on the motor side of ignition system. Continue with the following.
Install supply cable to diagnostic connector of snowmobile as per shop manual procedure. Do not connect any supply voltage before starting the vehicle. Start cranking over the engine. While the engine is being cranked, connect 12V supply to the 2-position housing of the supply cable. Respect polarity +12V to RED wire, ground to BLACK wire, and check for spark.
Spark returns
Fault is in the charging system. Refer to the charging system diagnostic flow chart to find the problem. OK
No spark
Check spark plug cap.
No good
Replace spark plug cap and retest. OK
Check ignition coil.
No good
Replace ignition coil and retest. OK
Check trigger coil.
No good
Replace trigger coil and retest. OK
Check stator ignition generator coil.
No good
Replace stator and retest. OK
Check connection 11-DA, 11-DE, 11-DC from MPEM.
No good
Replace MPEM and retest. OK
A32E3US


CHARGING SYSTEM DIAGNOSTIC FLOW CHART
360 W - 2 CYLINDER
DC charging system all accessories are DC operated
Symptom
Battery goes dead after unit sits for a long period of time.
Check battery.
No good
Replace battery.
By using an ammeter and voltmeter connect to confirm problem.
System is working battery was at fault.
Good
With engine stopped, by using an ammeter in the milli amp scale, check for a draw from the battery.
No draw
All is well.
Once a current draw is detected start disconnection wire connections untill the current draw stops.
Repair or replace defective part that was drawing current.
Symptom
Battery will not stay charged unit even if is often used.
Check battery.
No good
Replace battery.
By using an ammeter and voltmeter connect to confirm problem.
System is working battery was at fault.
Good
By using an ammeter and voltmeter connect to confirm problem.
When engine running at 3000 RPM, ammeter shows no charge occuring
Check connections.
Check applicable fuses
Burnt
Replace.
Good
Perform magneto/ generator tests.
No good
Replace and reconfirm that system is now properly functioning.
Good
Regulator/rectifier faulty: replace and reconfirm that system is now properly functioning.
Symptom
Bulbs are burnt and battery has very little electrolyte in it.
Check battery.
No good
Good
With engine running at 5000 RPM, by using an ammeter and voltmeter connect to confirm problem.
Voltage is to high
Replace regulator/ rectifier assembly and reconfirm that system is now properly functioning.
Good
Regulator/rectifier was at fault.
A32E3VS

SYMPTOM	**THE MPEM DOES NOT WORK.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check that high tension coil wires do not touch any metal parts. a. Short circuit. *Isolate and reroute wires.*

SYMPTOM	**ENGINE STALLS.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Refer to IGNITION SYSTEM DIAGNOSTIC FLOW CHART.

SYMPTOM	**ENGINE IS MISFIRING — ERRATIC SPARK AT SPARK PLUG.**
CONDITION	RIDING ON WET SNOW.
TEST/INSPECTION	1. Check if spark plug wires and/or spark plug cap seals are sealing out moisture. a. Defective wires and/or seals. *Replace defective part.*
	2. Check if ignition system wiring harness connectors are in good condition and/or are sealing out moisture. a. Loose connectors, corroded terminals or defective parts. *Clean terminals and apply silicone dielectric grease. Replace defective parts.*
CONDITION	NORMAL USE
TEST/INSPECTION	1. Verify misfiring by observing flash of stroboscopic timing light; unplug connectors between magneto/generator and vehicle wiring harness to isolate problem. Check condition of connectors. a. Defective spark plug(s) and/or cable(s)/cap(s). Defective electrical system wiring harness and/or accessories and/ignition cut-out switches. Condition of connector terminals. *Replace defective parts and/or repair damaged wires. Replace defective switch(es). Clean terminals and apply silicone dielectric grease.*
CONDITION	RIDING IN DEEP AND THICK SNOW.
TEST/INSPECTION	1. Perform all verifications outlined under ENGINE DOES NOT START — NO SPARK AT SPARK PLUG.
	2. Check spark plugs. Proceed with spark plug analysis in order to identify source of problem. a. Defective and/or worn spark plug(s) and/or cable(s) and/or cap(s). Engine related problem. *Replace defective part(s). Proceed with ignition system testing procedures. Perform engine analysis.*

SYMPTOM	**FOULED (BLACK) SPARK PLUG TIP.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check carburetor. a. Carburetion is too rich. *Adjust according to specifications (refer to TECHNICAL DATA).*
	2. Check injection oil consumption. a. Injection pump flow is too high. *Adjust according to specifications or replace.*
	3. Check oil quality. a. Poor quality oil (creation of deposits). *Use Bombardier injection oil.*
	4. Check engine compression. a. Leaking piston ring(s). *Replace.*

SYMPTOM	**SPARK PLUG TIP IS LIGHT GRAY.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Refer to ENGINE SLOWS DOWN OR STOPS AT HIGH RPM and check items listed.
	2. Check spark plug heat range. a. Spark plug heat range is too high. *Replace by Bombardier's recommended spark plug (refer to TECHNICAL DATA).*
	3. Check if air intake silencer leaks. a. Air surplus coming from opening(s) located between halves. *Seal.*
	4. Check carburetor adapter collars. a. Loose collar(s). *Tighten.*
	5. Check carburetor adapter(s). a. Cracked or deformed adapter(s). *Replace.*
	6. Check if primary compression leaks. a. Primary compression leaks. *Perform leak down test and repair as necessary.*

SYMPTOM	**RER (ROTAX ELECTRONIC REVERSE) DOES NOT WORK.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check idle speed. a. Wrong idle speed. *Adjust according to specification (refer to TECHNICAL DATA).*
	2. Check spark plug. a. Faulty spark plug. *Replace.*
	3. Check engine compression. a. Too low engine compression; engine stalls when pushing RER button. *Rebuilt the engine.*
	4. Check drive belt height. a. Wrong belt height. *Adjust according to specification (refer to DRIVE BELT).*
	5. Check carburetor synchronization and air screw adjustment. a. Wrong adjustment. *Adjust according to specification (refer to TECHNICAL DATA) and read carburetor subsection.*
	6. Check switch electrical connections. a. Bad electrical connections or damaged wires. *Clean or replace.*
	7. Check MPEM. a. Faulty MPEM. *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 Vac. NOTE: If quartz halogen bulb is involved, ensure that proper voltage regulator is installed. a. Excessive voltage in lighting circuit. *Replace voltage regulator and ensure proper grounding. Retest.*

SYMPTOM	**HEADLAMP DIMING.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check voltage at headlamp at different speeds. It must not be below 11 Vac. a. Insufficient voltage in lighting circuit. *Replace voltage regulator 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. On manual start models : Verify regulator ground. a. Rusted or loose retaining screws. *Clean, apply lithium grease (LMZ1) and firmly tighten screws.*
	4. On fan-cooled models verify if there is an interconnection between AC and DC current. a. Faulty installation of optional equipment. *Find optional equipment connected directly to DC ground (BK wire or chassis) or to any DC hot wire (RD, RD/BU). Disconnect and reconnect to AC current (YL and YL/BK wires). Refer to Testing Procedure.*
	5. Check if optional electric accessories are overloading the magneto/generator. a. Excessive electrical load to magneto/generator. *Reduce the electrical load by removing excess accessories. Reconnect as recommended by manufacturer.*
	6. Hot Grips brand: Verify if they were connected in parallel by mistake. a. Excessive electrical load to magneto/generator. *Reconnect as recommended by manufacturer.*
	7. Bombardier heating grips: Verify if the return wires of the elements were grounded to the chassis by mistake. a. Faulty installation of optional equipment. *Reconnect as recommended by manufacturer.*
	8. Check if heating grips installation overloads the magneto capacity. a. Excessive electrical load to magneto/generator. *Reduce the electrical load by removing accessories.*

SYMPTOM	**FALSE FUEL AND/OR TEMPERATURE GAUGE READINGS.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. On fan-cooled models verify if gauge was connected on DC current by mistake (in case of optional installation). a. Faulty installation of optional equipment. *Find optional wires connected directly to DC ground (BK wire to chassis) or to any DC hot wire (RD, RD/BU). Disconnect and reconnect to AC current (YL and YL/BK wires).*
	2. Verify sender unit for free movement and/or correct arm position. a. Defective or damaged part. *Correct or replace sender unit.*
	3. 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	**NO ELECTRICAL ACCESSORIES WORK WHEN ENGINE IS ON IDLE.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check idle speed. a. Too low idle speed. *Readjust to specifications.*
	2. Verify regulator. a. Faulty regulator. *Replace.*

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.*
	2. Check tachometer part number. a. Models with 360 W magneto have a different tachometer. *Replace with appropriate one.*

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 weakened or broken. *Replace springs.*
	2. Check springs preload. a. Low spring preload. *Increase preload to the recommended position.*
	3. Check springs. a. Installed springs are too soft. *Install optional stiffer springs, refer to service bulletin SPRING REFERENCE ACCORDING TO LOAD.*

SYMPTOM	**REAR SUSPENSION BOTTOMS OUT.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check condition of springs. a. Springs are weakened or broken. *Replace springs.*
	2. Check springs preload. a. Low spring preload. *Increase preload to the recommended position.*
	3. Check springs. a. Springs installed are too soft. *Install optional stiffer springs, refer to service bulletin SPRING REFERENCE ACCORDING TO LOAD.*
	4. 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 HANDLEBAR 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 front arm stopper strap is too long. a. Insufficient ski pressure on the ground. *Shorten stopper strap.*
	4. Check front arm spring preload. a. Insufficient ski pressure on the ground. *Loosen spring tension.*

SYMPTOM	**HANDLEBAR IS DIFFICULT TO TURN.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check if the handlebar 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 position of stopper strap. a. Too much weight when stopper strap is short. *Lengthen front arm stopper strap.*
	4. Check position of front arm spring adjustment cam(s). a. When spring tension is weak, more weight is transferred to the skis. *Increase spring preload.*
	5. Check swing arm camber. a. Too much ski leg inclination. *Adjust camber to specifications.*

SYMPTOM	**THE SNOWMOBILE ZIGZAGS.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check ski runner condition. a. Worn or bent ski runners. Replace 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.*
	NOTE: If all parts are in good condition and the customer still complains about an unstable snowmobile, consider the installation of optional Proactive Control System.

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.*

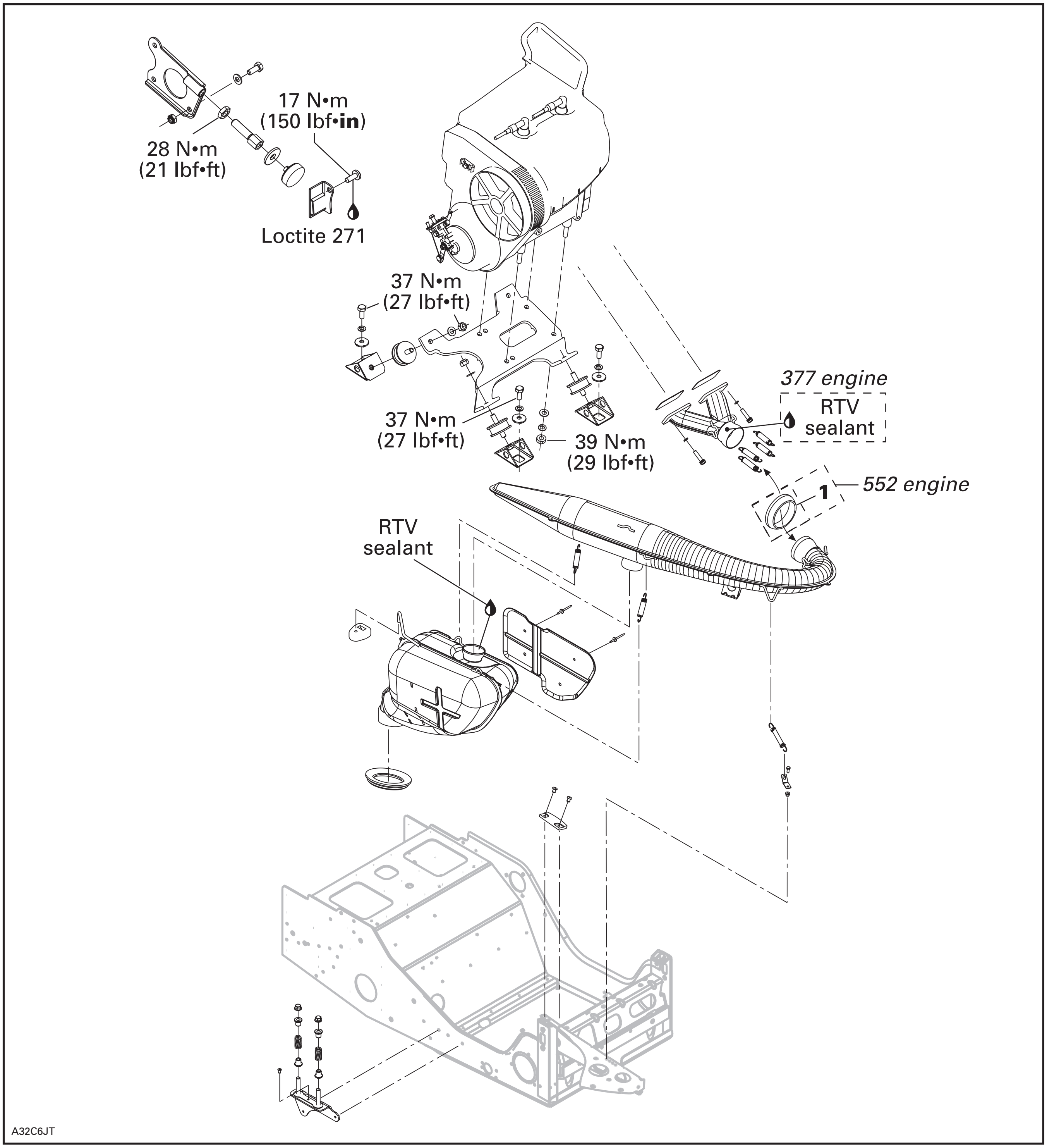
SYMPTOM	**DERAILING TRACK.**
CONDITION	NORMAL USE
TEST/INSPECTION	1. Check track tension. a. Track is too loose. *Adjust.*
	2. Check if track and slider shoes are properly aligned. a. Improper alignment. *Adjust.*

SYMPTOM	**NOISE OR VIBRATION COMING FROM THE TRACK.**
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. Track is 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.*

377 AND 552 ENGINE TYPES

ENGINE REMOVAL AND INSTALLATION

377 and 552 Engine Types



ENGINE REMOVAL AND INSTALLATION

Disconnect or remove the following:

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

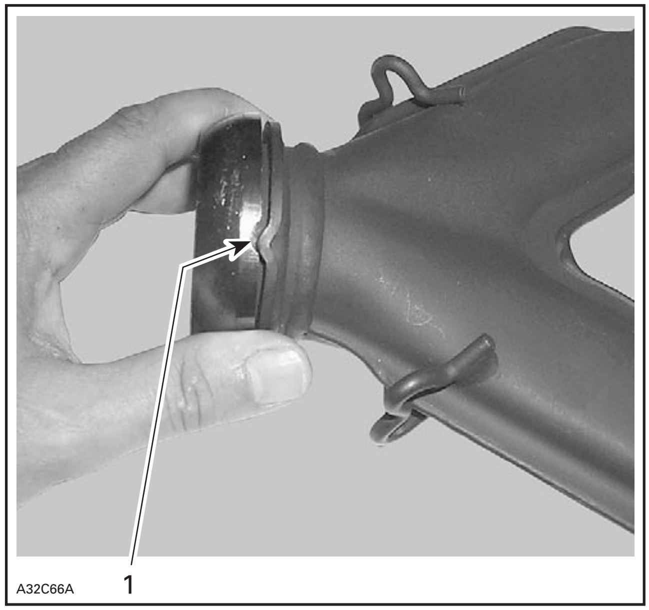
– negative cable from battery (on electric starting models)
– guard
– drive belt
– drive pulley using appropriate puller, refer to DRIVE PULLEY
– air silencer and carburetors
– impulse line from engine crankcase
– electrical connector housings
– exhaust pipe
– oil pump inlet line and plug it
– oil pump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

Tighten fasteners to recommended torque in appropriate exploded view.

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

552 Engine Only

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

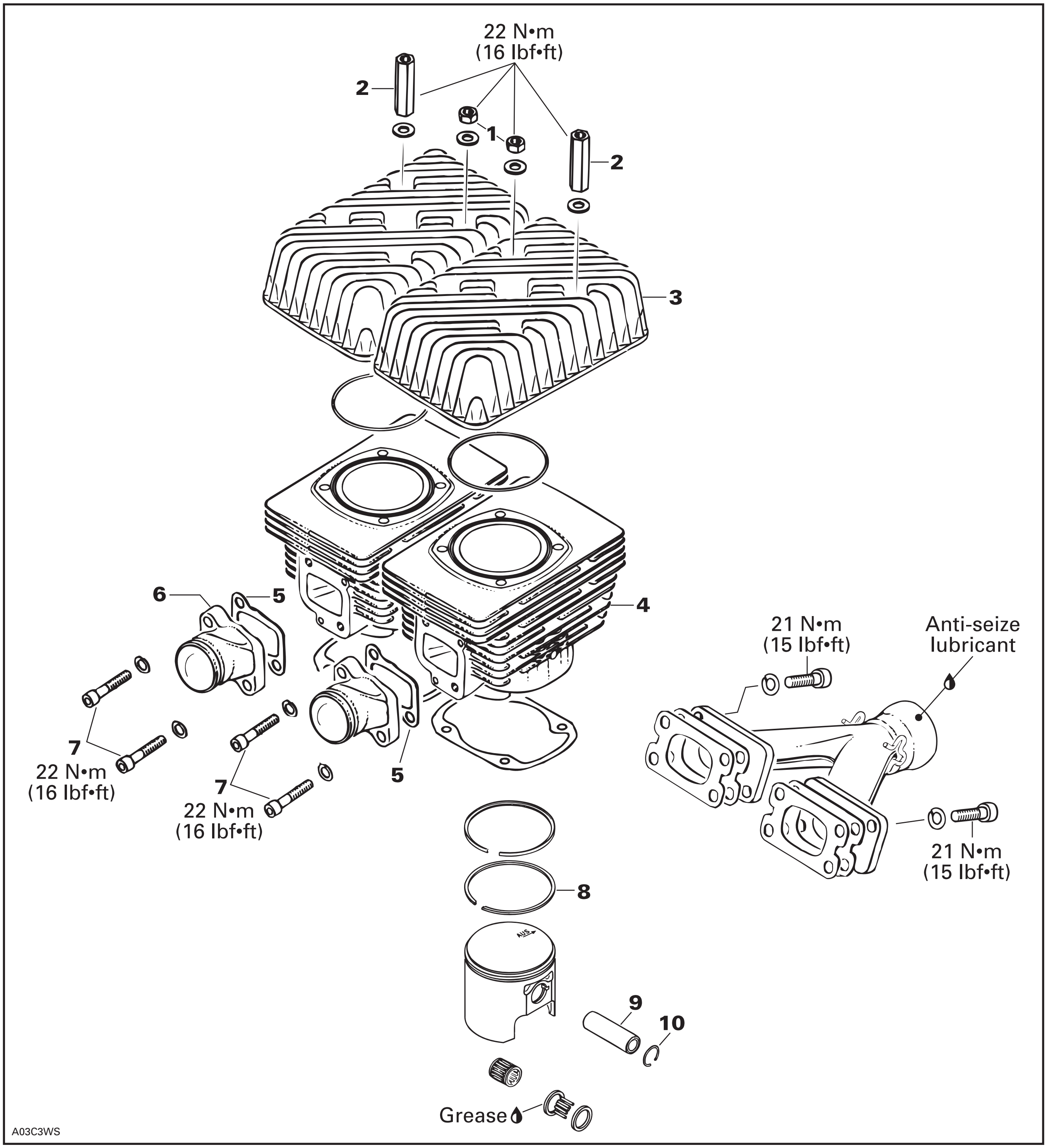


ONE SIDE SHOWN
1. Notch aligned with protrusion

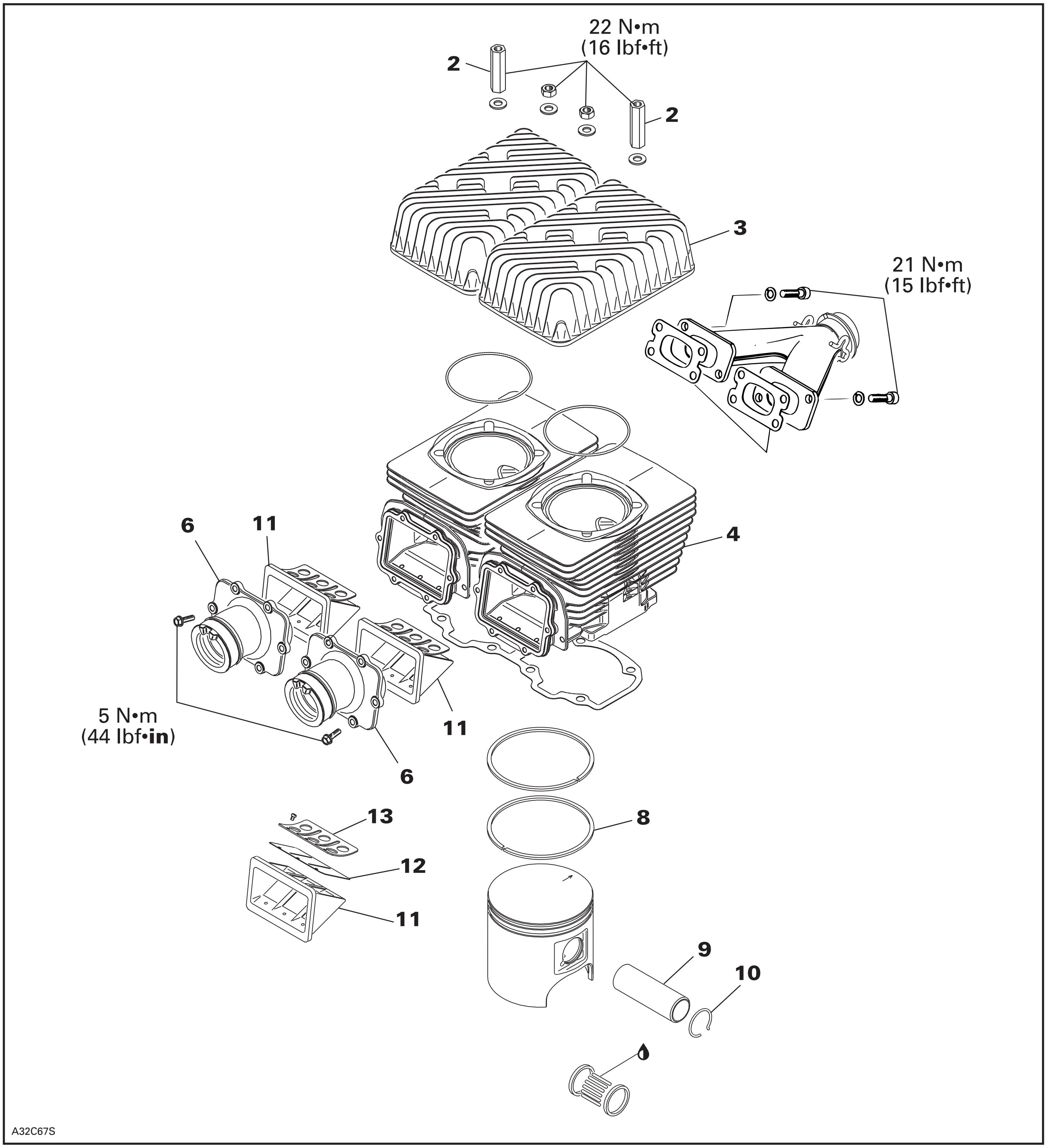
NOTE: No RTV sealant required on doughnut shaped exhaust gasket **no. 1**.

TOP END

377 Engine Type



552 Engine Types



GENERAL

CAUTION: While performing any engine related procedure, always make sure that the working area is clean and free from dust or particles to reduce the risk of damaging the engine.

TROUBLESHOOTING

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

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

CLEANING

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

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

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

NOTE: The letters «AUS» and arrow on the piston dome must be visible after cleaning.

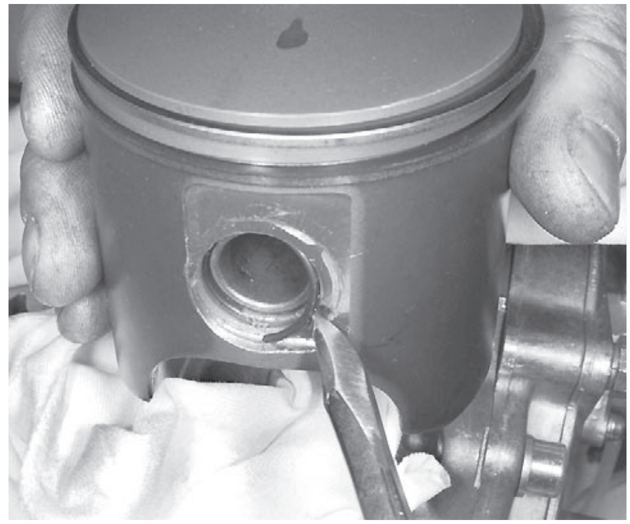
Clean the piston ring grooves with a groove cleaner tool, or with a piece of broken ring.

DISASSEMBLY

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

Remove cylinder heads.

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



A02C29A

TYPICAL

377 Engine

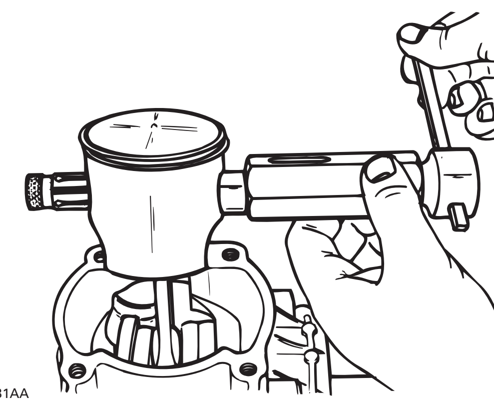
To remove piston pin **no. 9**, use piston pin puller (P/N 529 035 503).

Fully screw puller handle.

Insert puller end into piston pin.

Screw (LH threads) extracting nut.

Hold puller firmly and rotate puller handle counterclockwise to pull piston pin.



A01B1AA

TYPICAL

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

552 Engine

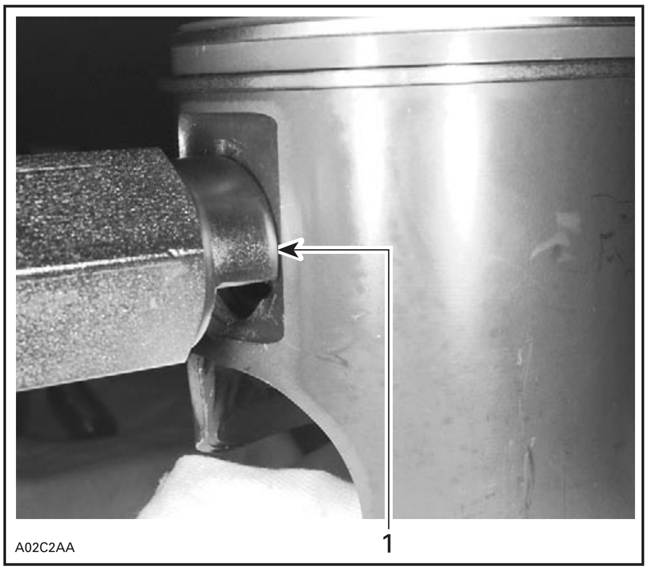
On this engine, piston pin needle bearing is mounted without a cage.

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

Use piston pin puller (P/N 529 035 503) along with 20 mm sleeve kit (P/N 529 035 542) and locating sleeve (P/N 529 023 800).

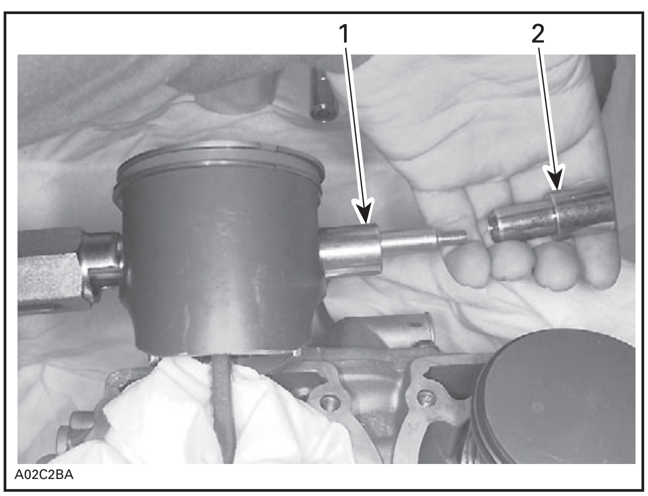
NOTE: The locating sleeve is the same that contains new cageless bearing.

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



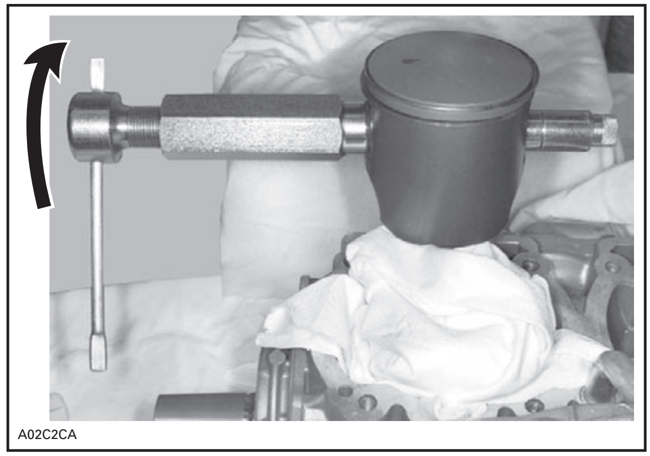
TYPICAL
1. *Properly seated all around*

Install sleeve then shouldered sleeve over puller rod.

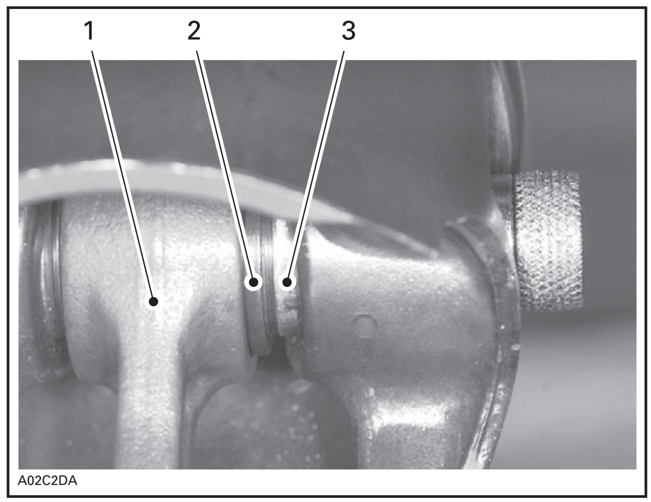


TYPICAL — INSTALLATION OF SLEEVE KIT
1. *Sleeve*
2. *Shouldered sleeve*

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

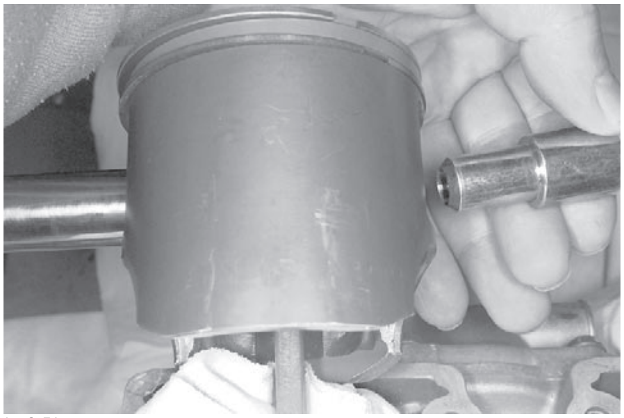


TYPICAL — PISTON PIN EXTRACTION



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

Remove puller. Pull out shouldered sleeve carefully.

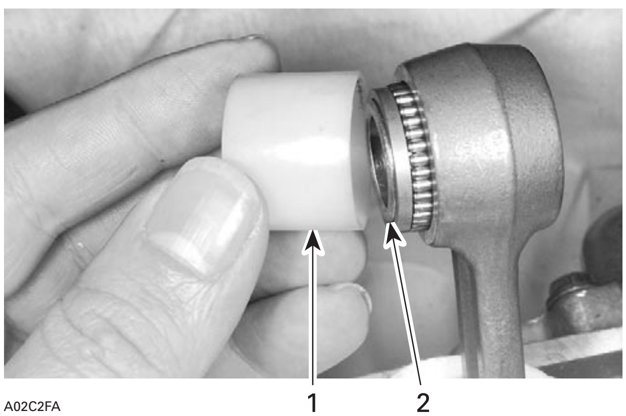


A02C2EA

TYPICAL

Remove piston from connecting rod.

Install locating sleeve. Then push needle bearings along with thrust washers and sleeve.



A02C2FA

TYPICAL
1. Locating sleeve
2. Sleeve

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

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

INSPECTION

Refer to ENGINE DIMENSIONS MEASUREMENT.

ASSEMBLY

552 Engine

When reinstalling original needle bearings, make sure that 34 needles are inserted between sleeve and locating sleeve.

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

A02C2GA

TYPICAL
1. Sleeve

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

Insert cageless bearing into connecting rod.

A02C2HA

TYPICAL — CAGELESS BEARING AND SLEEVE INSTALLED

Heat piston using bearing heater (P/N 529 035 969).

A32CBHA

CAUTION: Piston temperature must not exceed 46°C (115°F). NEVER USE DIRECT FLAME to heat the piston and never freeze the pin. Inappropriate heating procedure(s) may damage the piston.

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

A01C01A

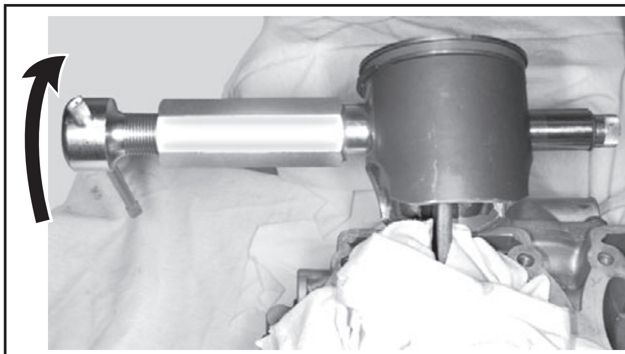
1. *Exhaust*

Install shouldered sleeve.

A02C2IA

TYPICAL — SHOULDERED SLEEVE INSTALLATION

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



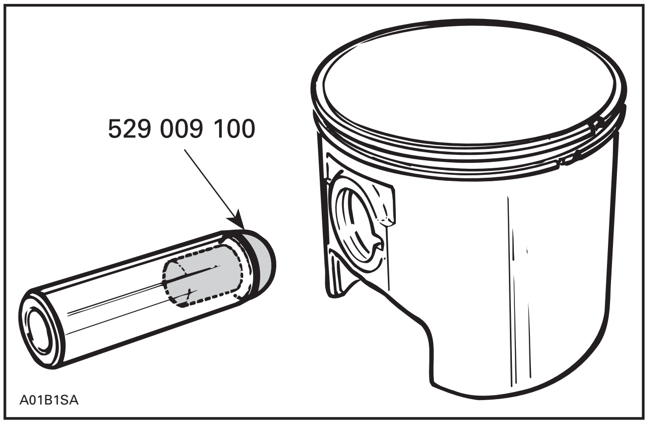
A02C2JA

TYPICAL

– Remove piston pin puller and sleeve kit.

377 Engine

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

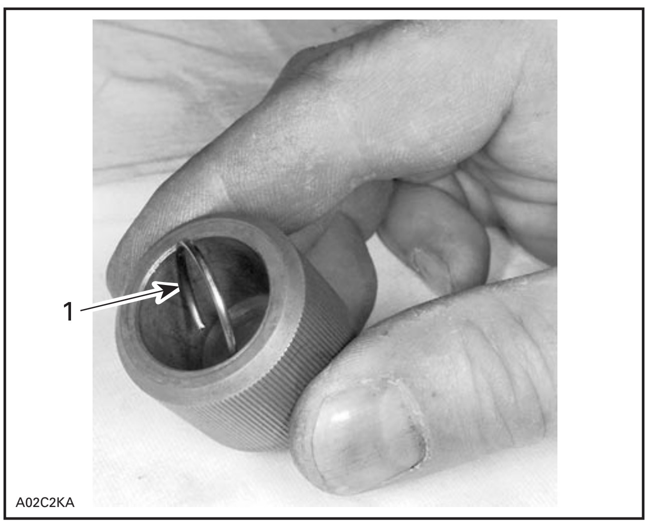


NOTE: The circlip on the opposite side can be installed before pin installation, the tool will easily go out.

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

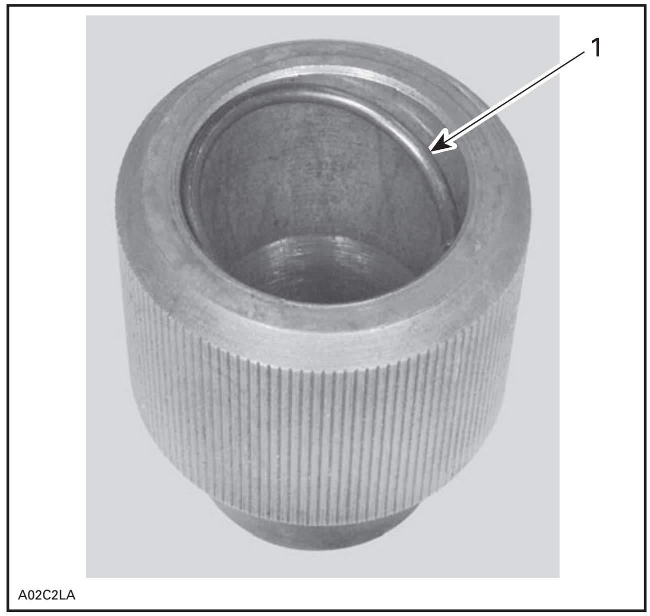
To minimize the effect of acceleration forces on circlip, install each circlip so the circlip break is at 6 o'clock as illustrated. Use piston circlip installer (P/N 529 035 561).

Insert circlip in tool at an angle.



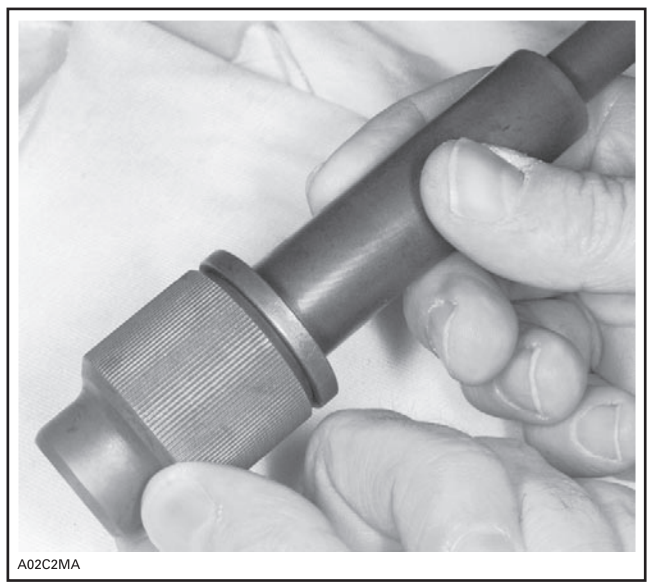
1. *Circlip*

Square it up using a finger.

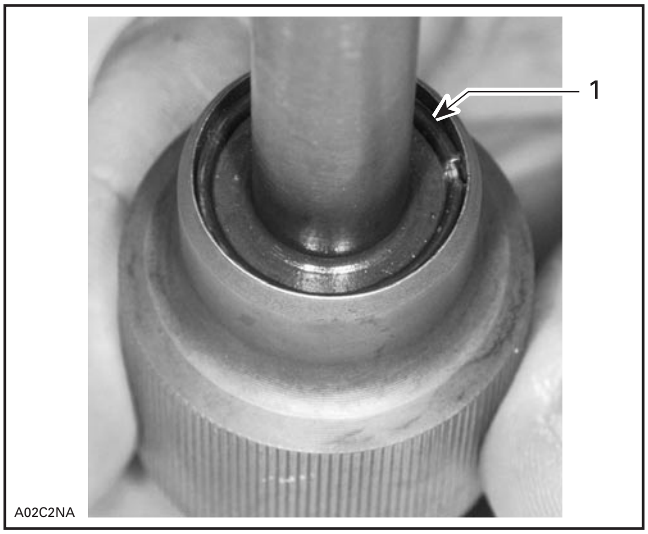


1. *Circlip*

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

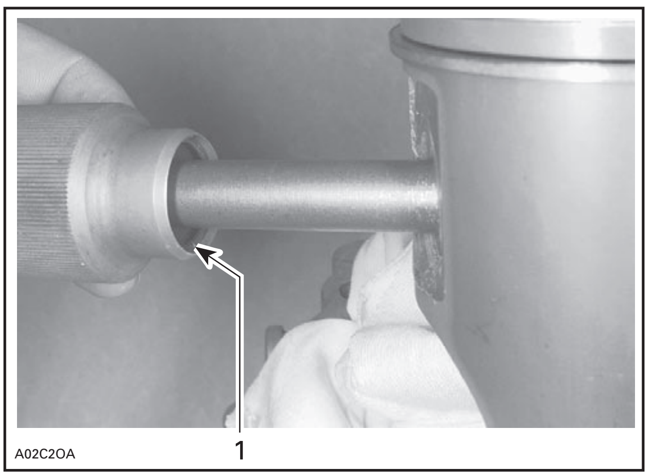


Using square end of tool, push circlip in until it rests in groove.



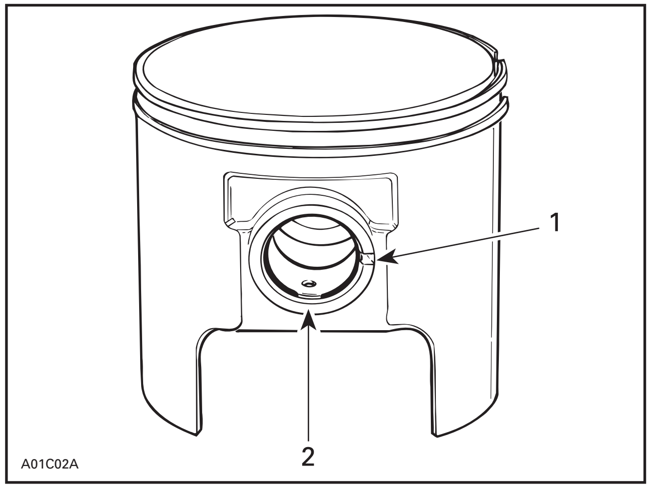
1. Circlip in groove

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



TYPICAL
1. Circlip break facing down

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



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

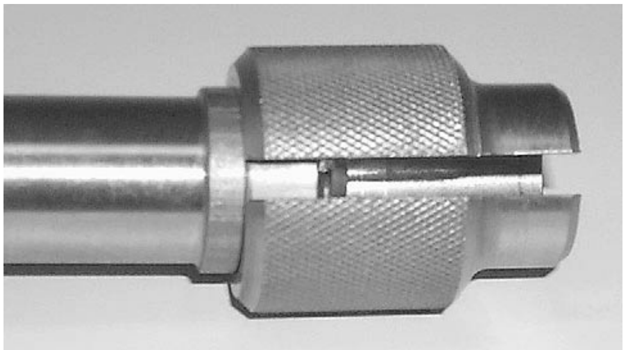
CAUTION: Circlips must not move freely in the groove after installation. If so, replace them.

552 Engine

Use circlip installer (P/N 529 035 686) to install new mono-hook circlips **no. 10**.

Insert circlip into support in such a way that when installed in piston groove, the tab will face upward.

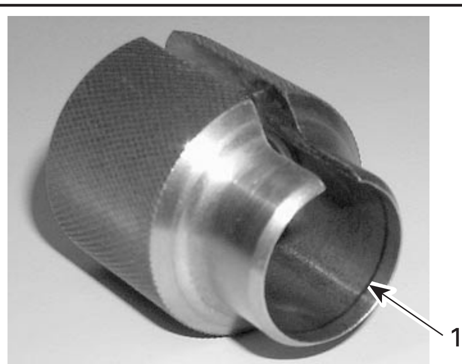
With round end of pusher, position circlip perpendicular to the support axis.



A32B0BA

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

A32B0CA



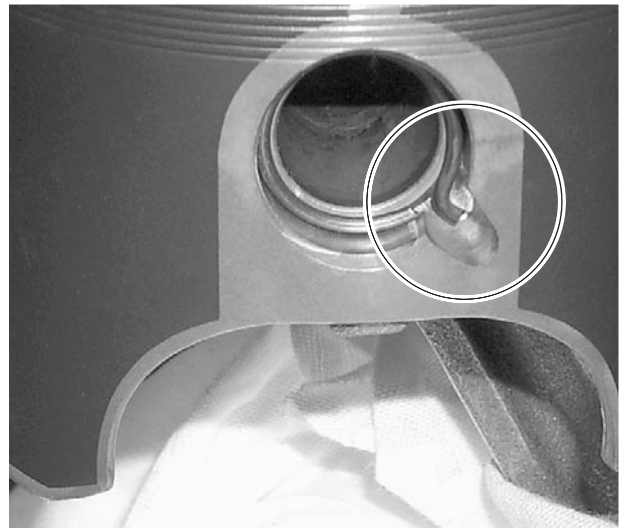
A32B0DA

1. *Groove*

A32B0EA

CIRCLIP READY TO BE INSTALLED ON PISTON

Using a plastic hammer, tap pusher to insert circlip in place. Take care to install new circlips with tab toward top as per following photo.



A32C4BA

TAB TOWARD TOP

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

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

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

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

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

All Models

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

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

Install proper ring compressor on piston assembly.

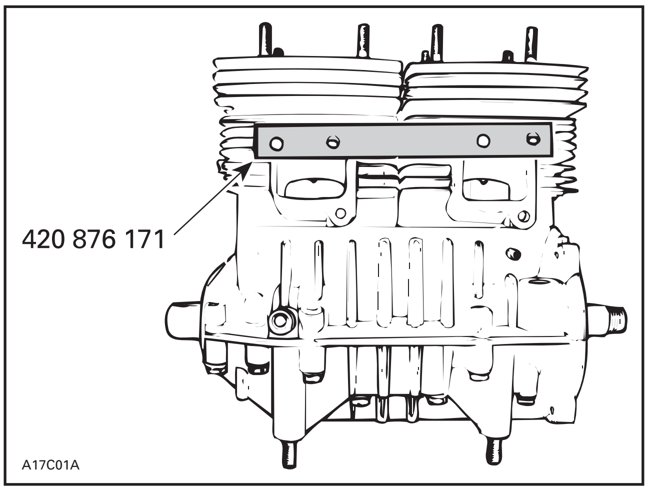
ENGINE TYPE	RING COMPRESSOR P/N
377	420 876 090
552	420 876 972

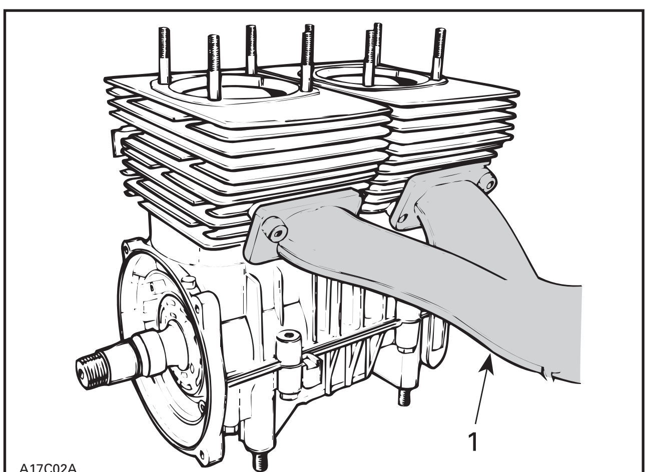
NOTE: The ring compressor will not fit on over size pistons.

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

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

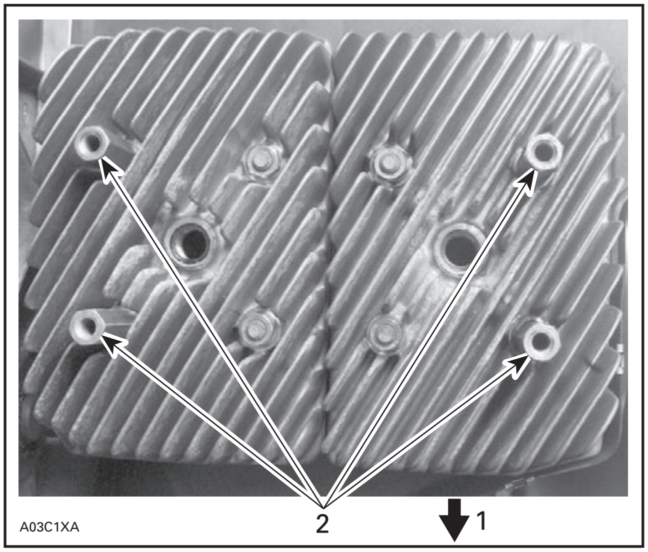
ENGINE TYPE	ALIGNING TOOL P/N
377 and 552	420 876 171





1. Or use exhaust manifold to align cylinders

Position distance nuts no. 2 as shown below.



1. Exhaust
2. Distance nuts

Cross torque cylinder head nuts no. 1 and no. 2 to 22 N•m (16 lbf•ft); torque each cylinder head individually.

Install armature plate, fan housing and then air deflector.

Install a gasket on each side of the air deflector.

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

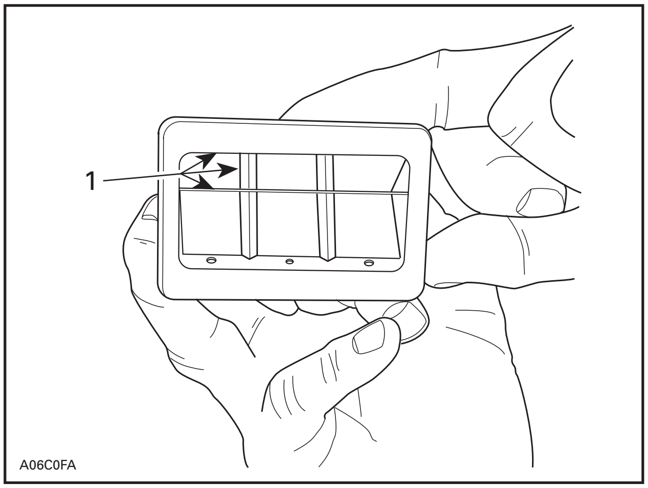
552 Engine

12, Reed Valve

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

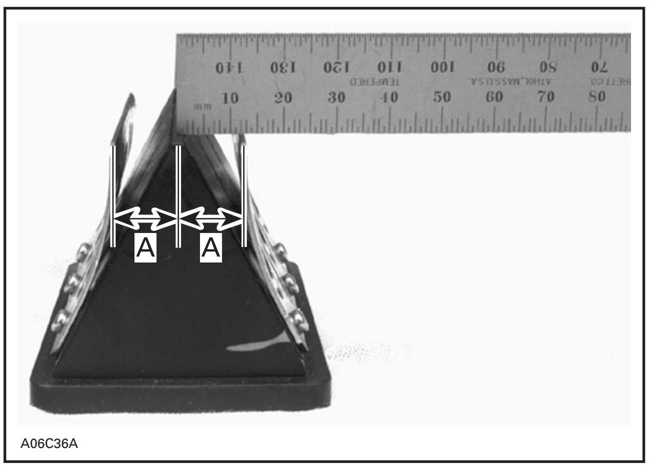
With blade stopper no. 13 removed, check reed valve for proper tightness. There must be no play between blade and valve body when exerting a finger pressure on blade at blade stopper location.

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



1. No play

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



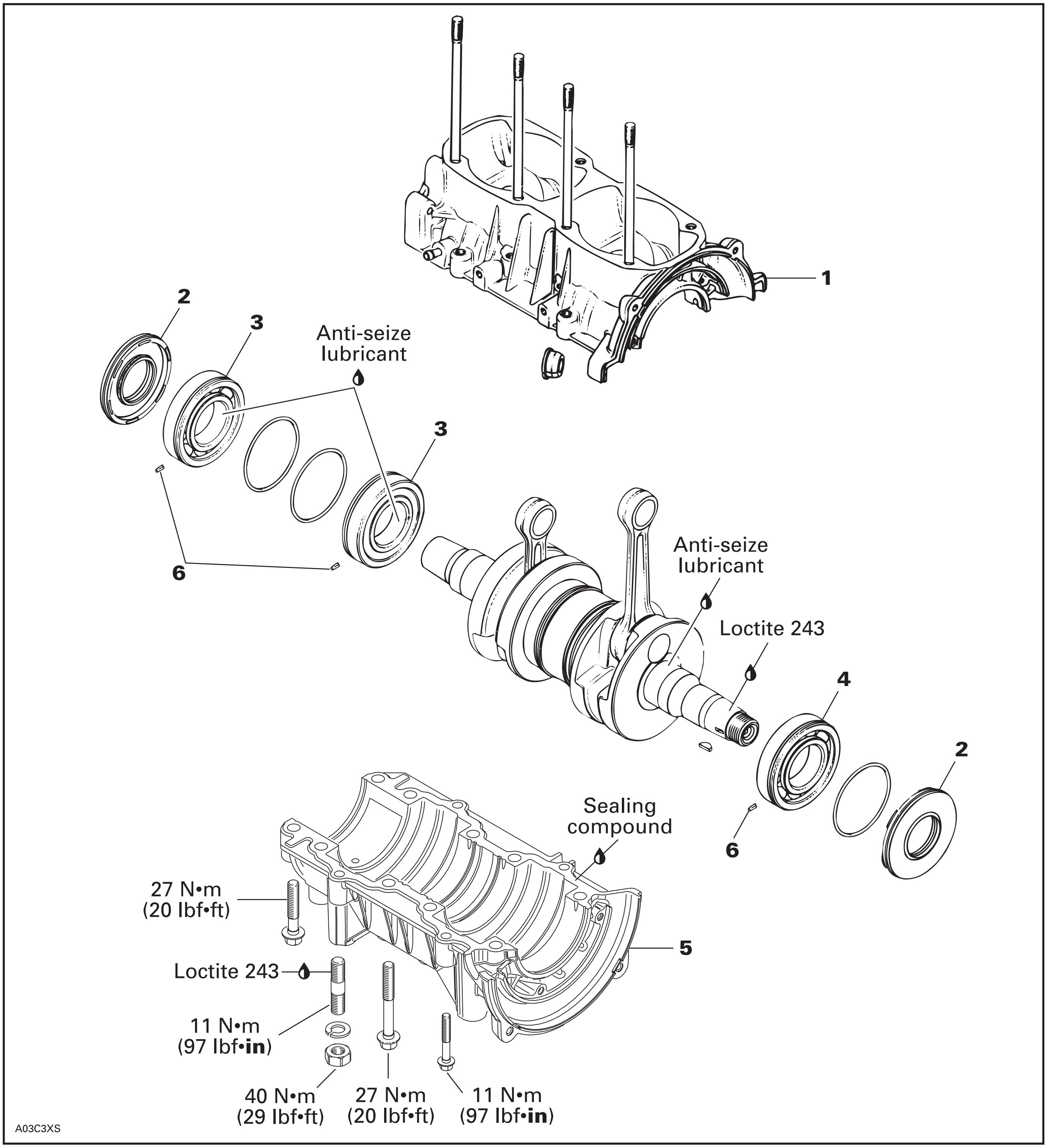
TYPICAL
A. 14.75 - 0, + 0.75 mm (.580 - 0, + .030 in)

Bent blade stopper as required to obtain the proper distance.

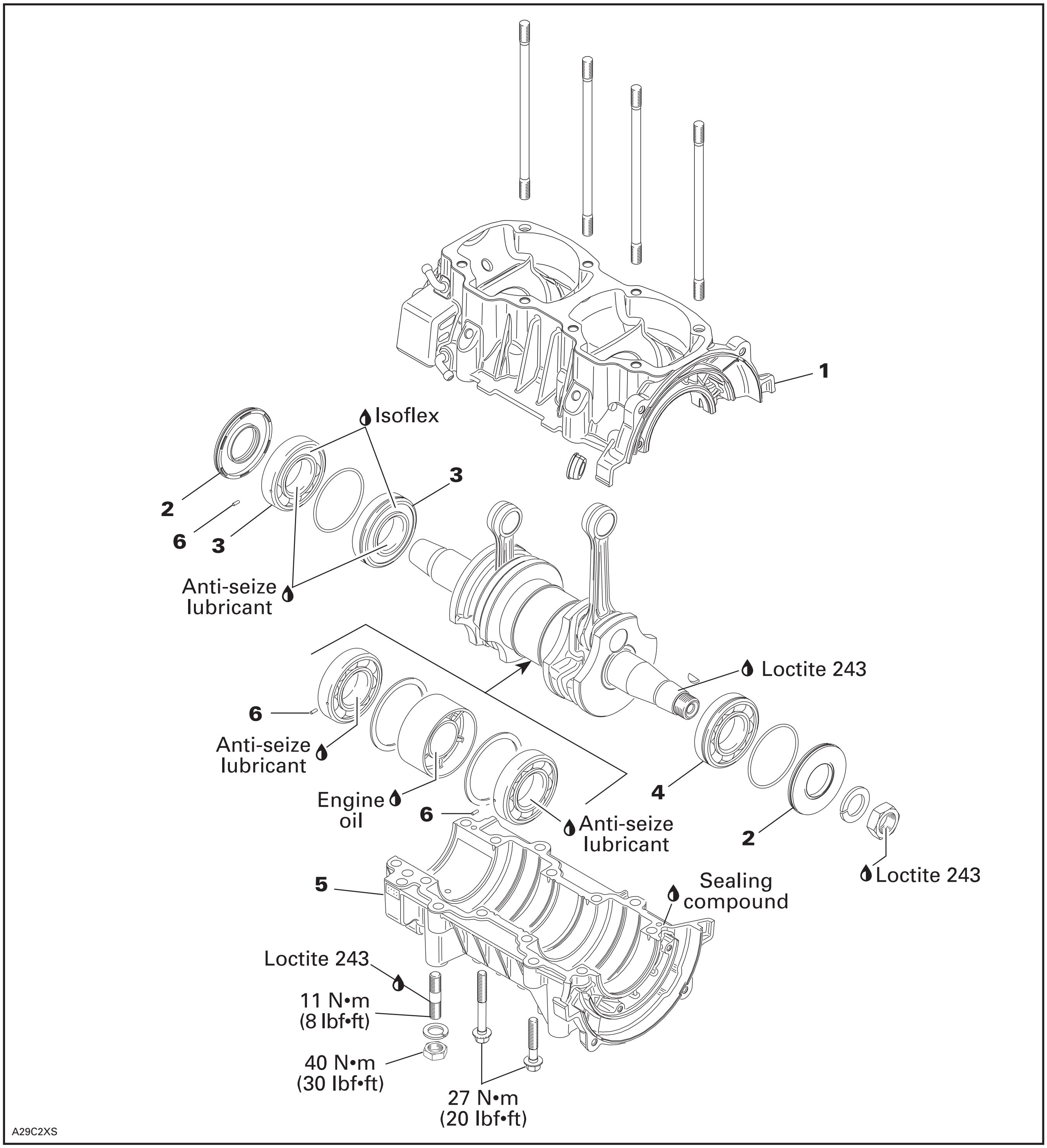
Blade stoppers may slightly interfere with cylinder during installation. Adjusted distance will be reduced automatically upon installation.

BOTTOM END

377 Engine Type



552 Engine Types



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

Remove engine from chassis.

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

Remove stator plate.

CLEANING

Discard all seals, gaskets and O-rings.

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

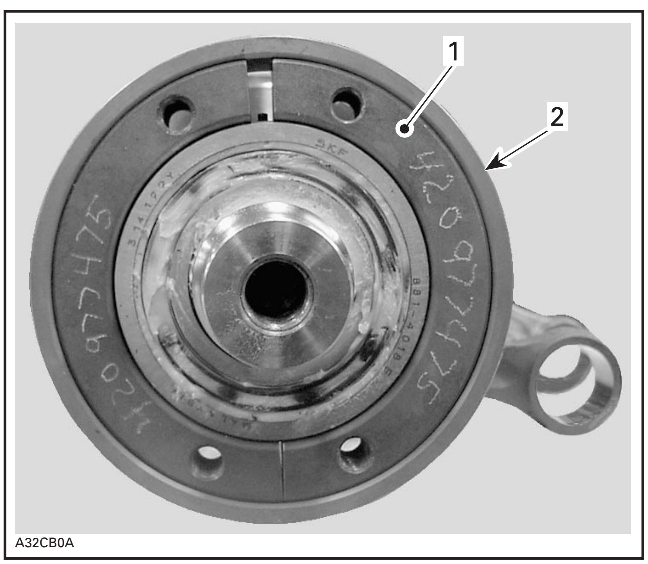
Remove all trace of Loctite 243 from crankshaft taper.

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

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

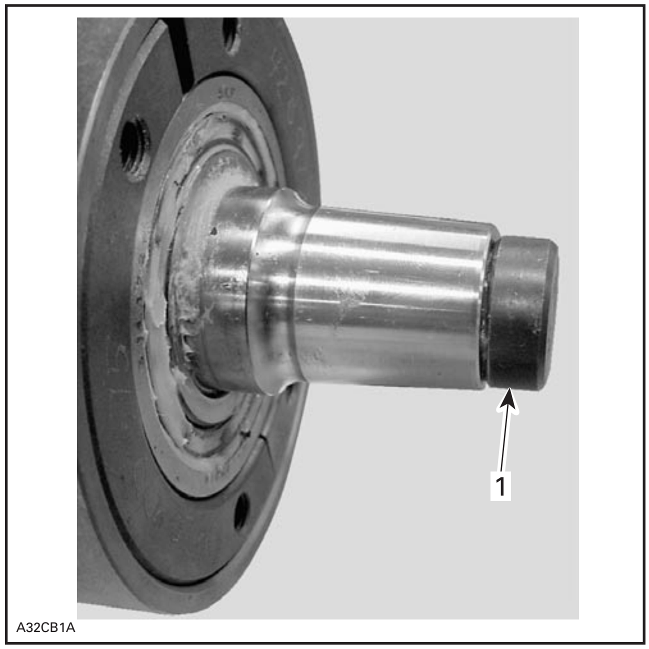
DISASSEMBLY

To remove PTO side bearings **no. 3** from crankshaft, install half rings and puller ring on the bearing.



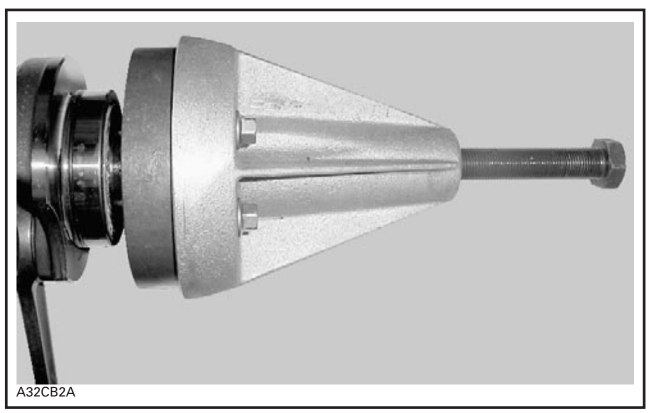
1. Half ring
2. Puller ring

Apply synthetic grease (P/N 413 711 500) on the crankshaft end and install protective cap (P/N 420 876 552).



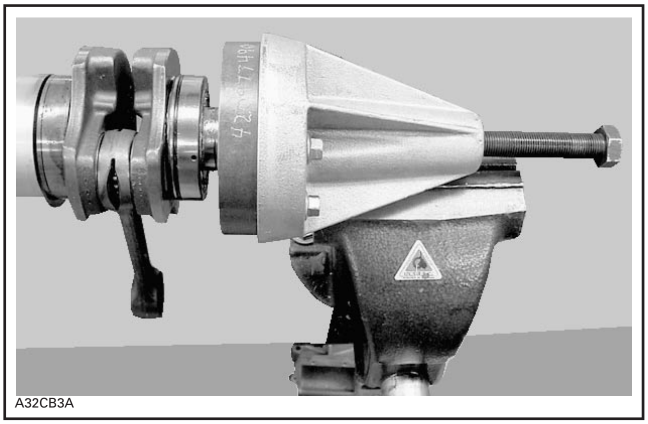
1. Protective cap

Using screws (P/N 420 840 681) Install bearing puller on the half rings.



PULLER INSTALLED ON THE HALF RINGS

Secure the bearing puller in a vise by one of its rib.



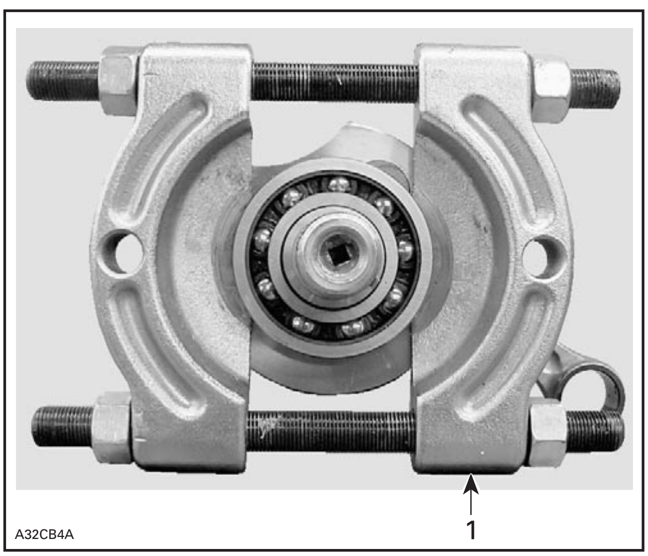
BEARING PULLER SECURED IN THE VISE

CAUTION: Never use any air impact tool for tightening the puller bolt.

Lubricate the puller bolt and then proceed with tightening the puller bolt until the bearing comes out.

Follow the same procedure for the inner bearing.

NOTE: In the case of damaged bearing or less clearance between crankshaft counterbalance and the bearing or on the MAG side bearing, use bearing separator (SNAP-ON tool (P/N CJ951 or SPX/OTC) tool (P/N 1124) to facilitate the removal.



1. *Bearing separator*

Procedure for MAG side bearings **no. 4** is same as of PTO side with the exception of protective cap (P/N 420 876 557).

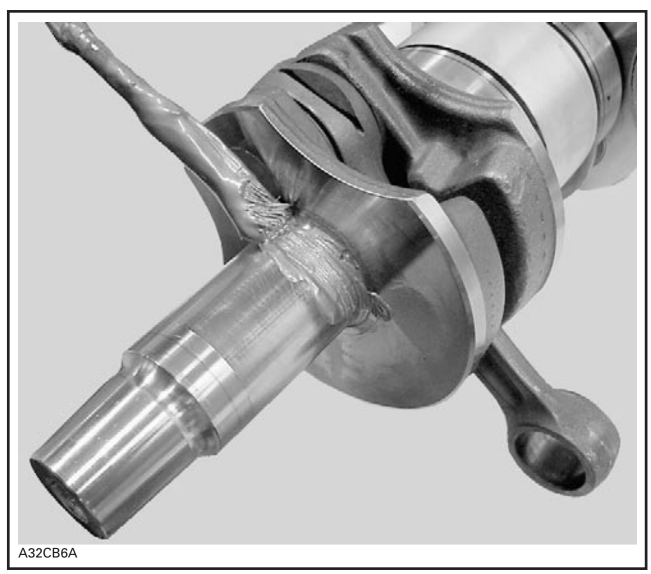
INSPECTION

Refer to ENGINE DIMENSIONS MEASUREMENT.

ASSEMBLY

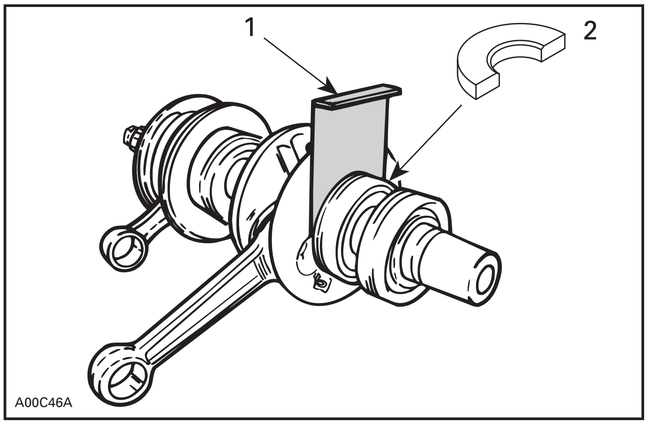
Clean crankshaft end with sand paper no. 180 and remove all residue using Pulley flange cleaner (P/N 413 711 809).

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



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

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



1. *Feeler gauge*
2. *Distance gauge*

Prior to installation, heat the bearing as per the procedure given farther in this sub-section.

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

552 Engine

Heat up the bearing(s) using bearing heater (P/N 529 035 969). This will expand bearings and ease installation. If required, put a suitable plate or shim to avoid the direct contact between integrated seal with the heating surface.

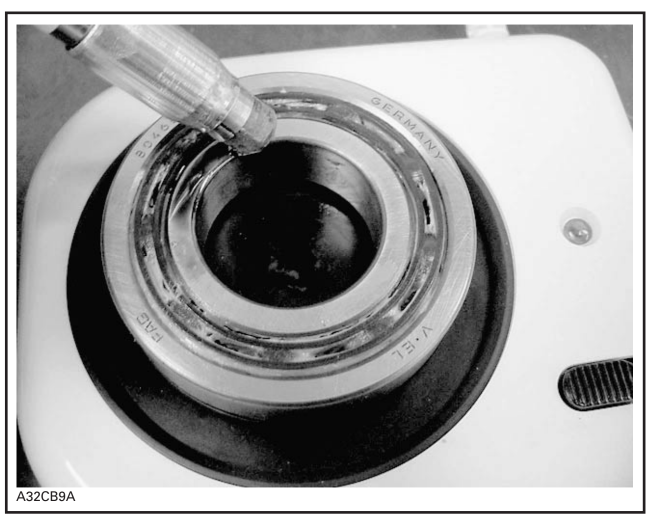
CAUTION: Bearing should not be heated to more than 80°C (176°F). Do not heat bearing with direct flame or heat gun or heated oil. Inappropriate heating procedure(s) may cause inner seal failure.

Turn bearing(s) several times during heating process for heating it (them) properly.

NOTE: Normally it takes approximately 10 minutes to heat up a bearing so in the event of replacing bearing, it's recommended to start the bearing heating process prior to removal operation. Two bearings can be heated at the same time on one bearing heater.

1. *Bearings*

Touch the inner race of the bearing with the temperature indicator stick (P/N 529 035 970). Stick will liquefy when the bearing reach the proper temperature.

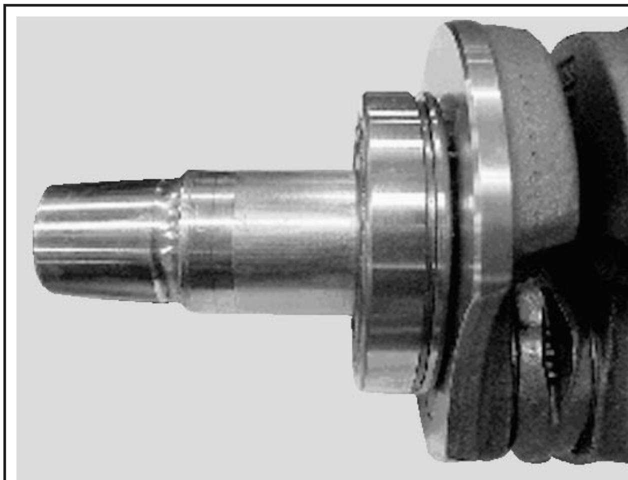


⚠ WARNING

Do not touch heated bearing with bare hands. Wear heat resisting gloves before handling the heated bearing(s).

Slide in the inner PTO bearing with the integrated seal facing crankshaft. Push bearing to end position.

A32CBAA

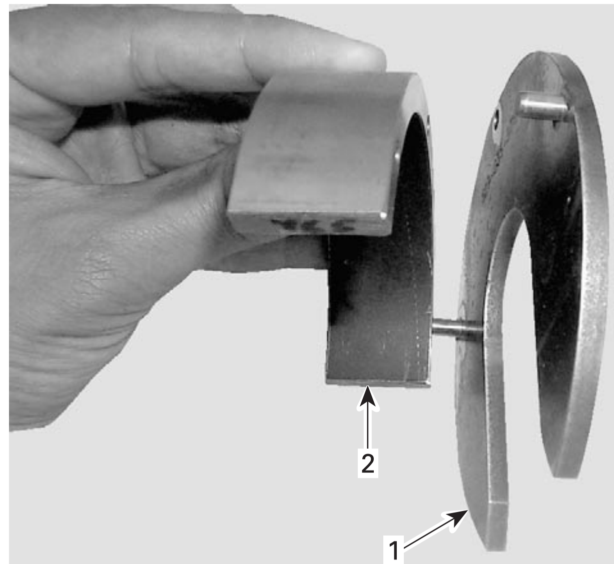


A32CBBA

BEARING TO END POSITION

Install the O-ring.

Make a bearing locator tool using support plate (P/N 529 035 976) and distance gauge (P/N 529 035 965).



A32CBCA

1. Support plate
2. Distance gauge

Install bearing locator tool.

A32CBDA

Slide in the heated outer PTO bearing onto the crankshaft.

A32CBEA

Install the MAG side heated bearing.

A32CBFA

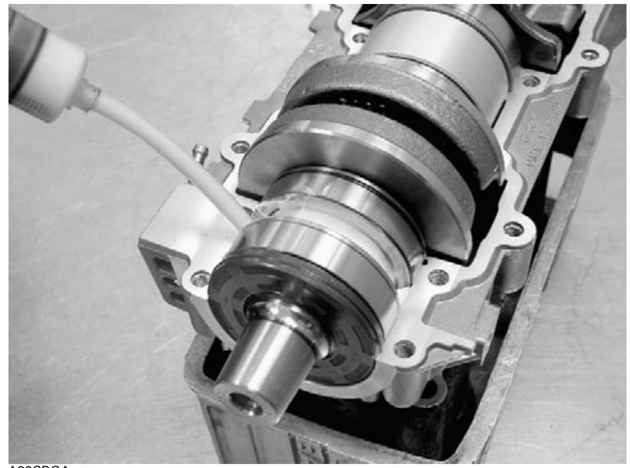
552 Engine

CAUTION: Use only the recommended Isoflex grease (P/N 293 550 021). Make sure not to push Isoflex grease between outside bearing race and half crankcase.

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

Put 27 to 32 mL of grease in a syringe.

With the syringe, fill in the PTO side ball bearings with 27 to 32 mL of Isoflex grease as shown below.



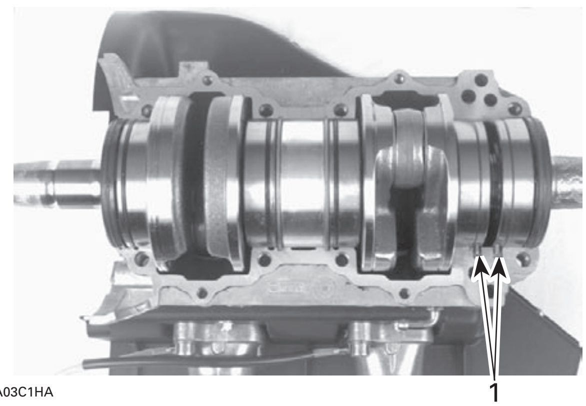
A32CBGA

TYPICAL — BALLS COATED WITH A SEAM OF GREASE

All Engines

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

When installing crankshaft, position drive pins **no. 6** as illustrated.



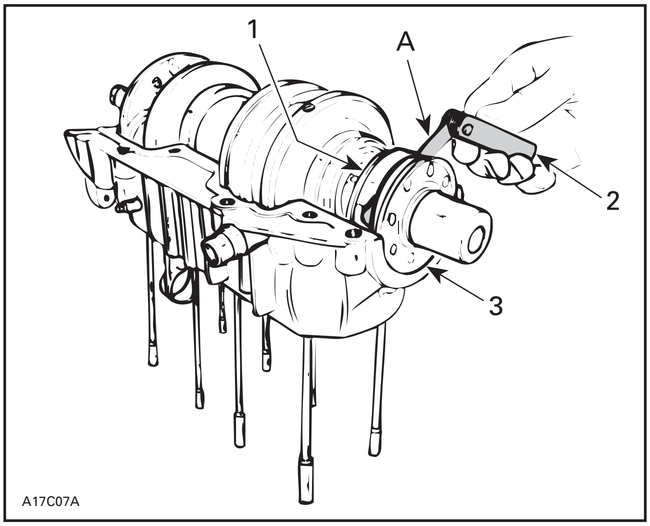
A03C1HA

TYPICAL
1. Drive pins

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

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

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



1. Bearing
2. Feeler gauge
3. Plain oil seal

A. 1 mm (.040 in)

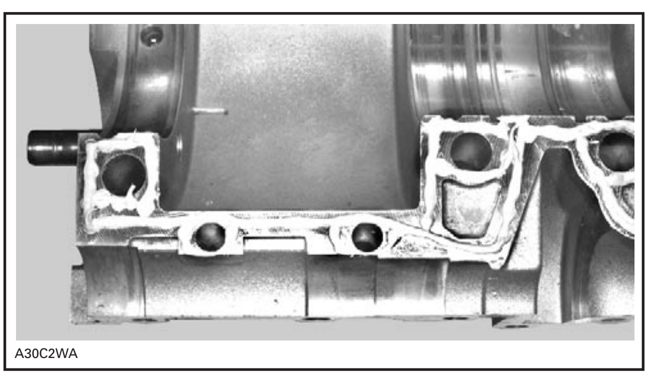
Crankcase halves **nos.1** and **5** are factory matched and therefore, are not interchangeable as single halves.

Crankcase Assembly

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

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

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



TYPICAL

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

Align both crankcase halves before tightening screws.

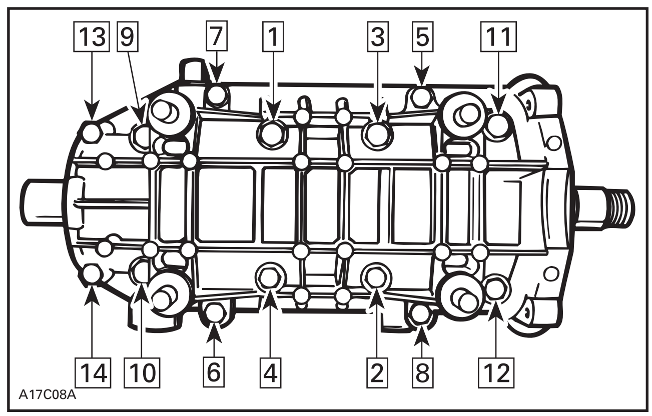
Position the crankcase halves together and tighten bolts by hand then install and tighten armature plate on magneto side to correctly align the crankcase halves.

Screw the 4 central bolts (bolts **no. 1** to **no. 4** in the torquing sequence) to squeeze compound between crankcase halves before it starts to dry.

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

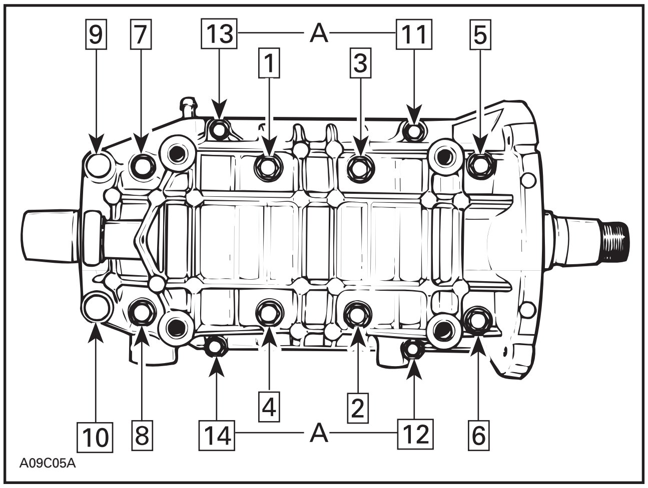
Screw all crankcase bolts in place in the following sequence and to the appropriate torque through a two steps torquing: first, screw bolts up to 60% of the final torque 13 N•m (115 lbf•**in**) for M8 bolts), then, tighten to the required torque (i.e. 22 N•m (16 lbf•ft).

552 Engine Type



TIGHTENING SEQUENCE FOR 552 ENGINE TYPE

377 Engine Type



TIGHTENING SEQUENCE FOR 377 ENGINE TYPE
A. 10 N•m (89 lbf•in)
All the other screws are torqued to 22 N•m (16 lbf•ft)

All Engines

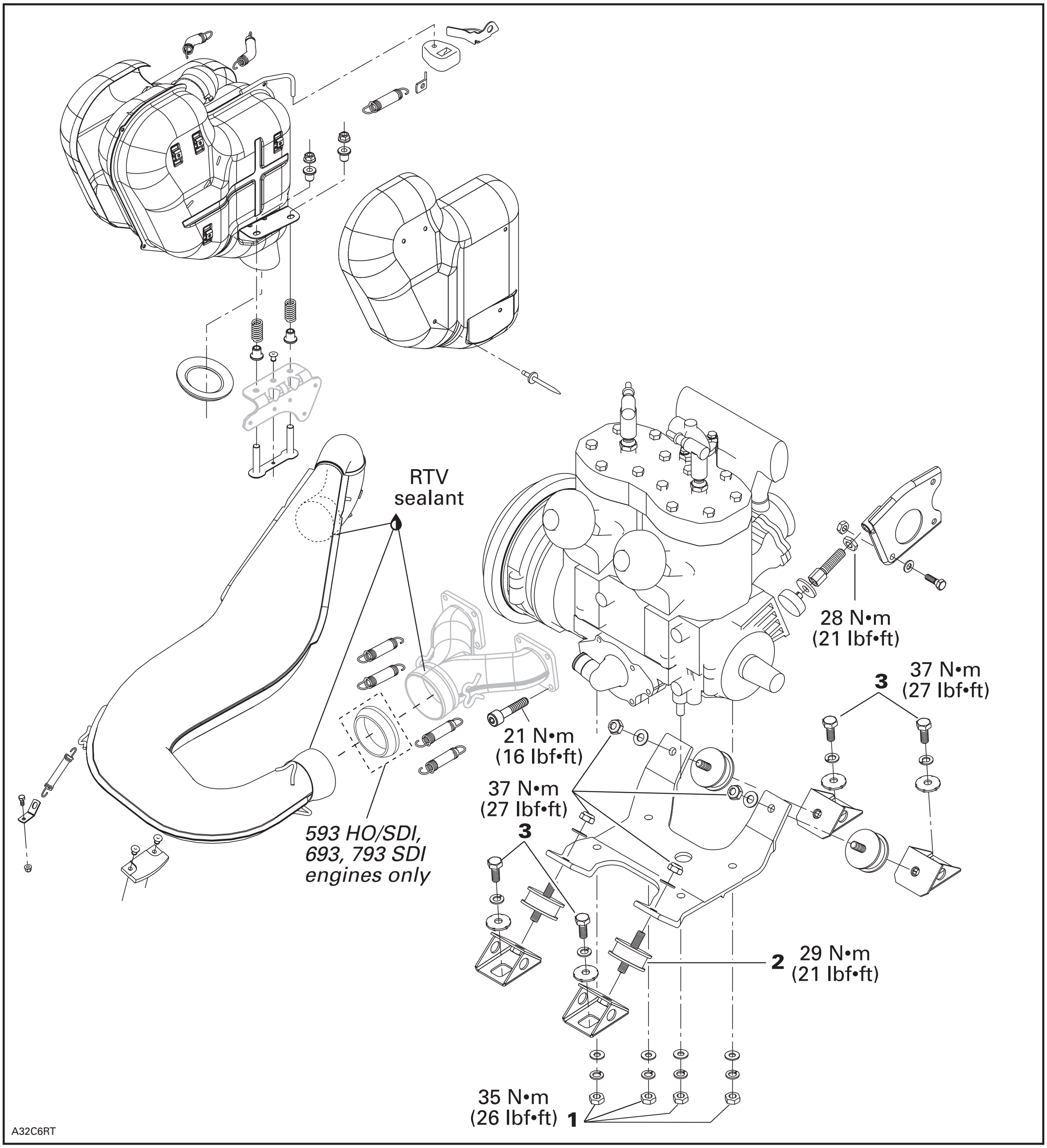
To install magneto, refer to CDI MAGNETO.

BREAK-IN

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

593, 593 HO SDI, 693 AND 793 SDI ENGINE TYPES

ZX Series



TYPICAL

REMOVAL FROM VEHICLE

Open hood.

SDI Models

Using B.U.D.S. software, remove the pressure in the fuel system. Refer to ENGINE MANAGEMENT.

All Models

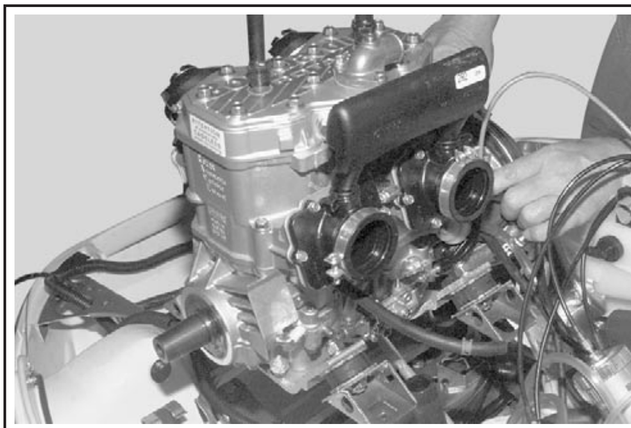
Remove tuned pipe and muffler.

Drain engine coolant.

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

NOTE: Use of a hoist is recommended.

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


A32C13A

TYPICAL — ENGINE REMOVAL

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

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

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

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

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

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

INSTALLATION ON VEHICLE

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

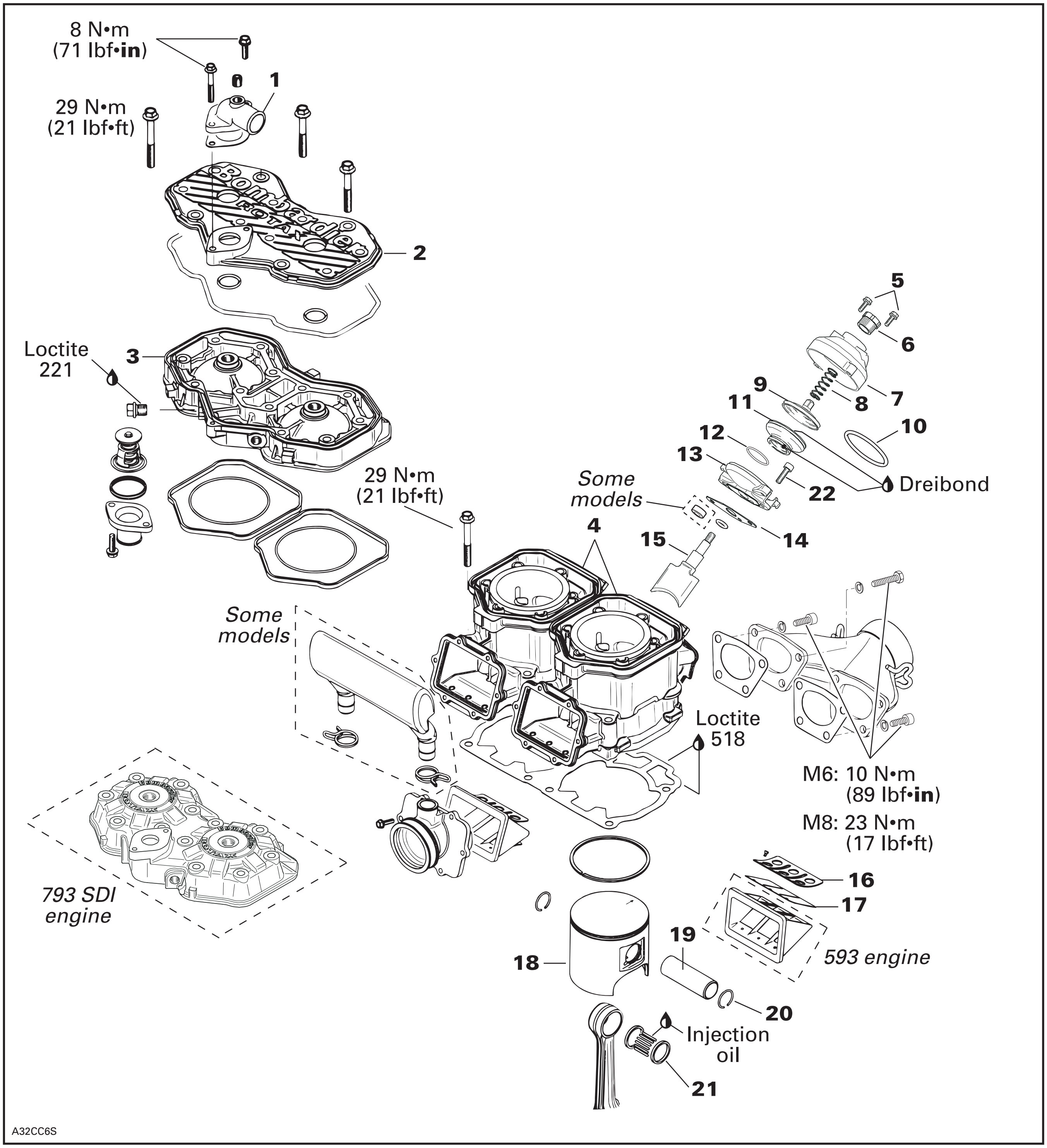
– After throttle cable installation, check carburetor maximum throttle opening and oil injection pump adjustment.
– Check pulley alignment and drive belt tension.
– Seal exhaust ball joints with RTV sealant (P/N 293 800 090).

593 HO, 693, 793, 793 HO Engines

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

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

TOP END


8 N•m
(71 lbf•in)
29 N•m
(21 lbf•ft)
1
2
Loctite
221
3
29 N•m
(21 lbf•ft)
Some
models
4
5
6
7
8
9
10
11
12
13
22
Dreibond
Some
models
14
15
Loctite
518
M6: 10 N•m
(89 lbf•in)
M8: 23 N•m
(17 lbf•ft)
16
17
593 engine
793 SDI
engine
18
19
20
Injection
oil
21
A32CC6S

GENERAL

CAUTION: While performing any engine related procedure, always make sure that the working area is clean and free from dust or particles to reduce the risk of damaging the engine.

TROUBLESHOOTING

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

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

COMPONENT REMOVAL WITH THE ENGINE INSTALLED

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

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

CLEANING

Discard all gaskets and O-rings.

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

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

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

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

DISASSEMBLY

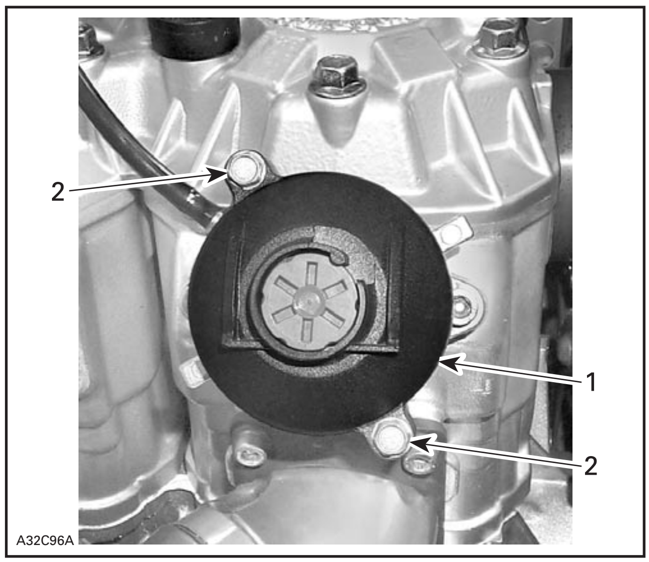
RAVE System

NOTE: RAVE stands for Rotax Adjustable Variable Exhaust.

Remove RAVE valve cover **no. 7** by removing screws **no. 5**.

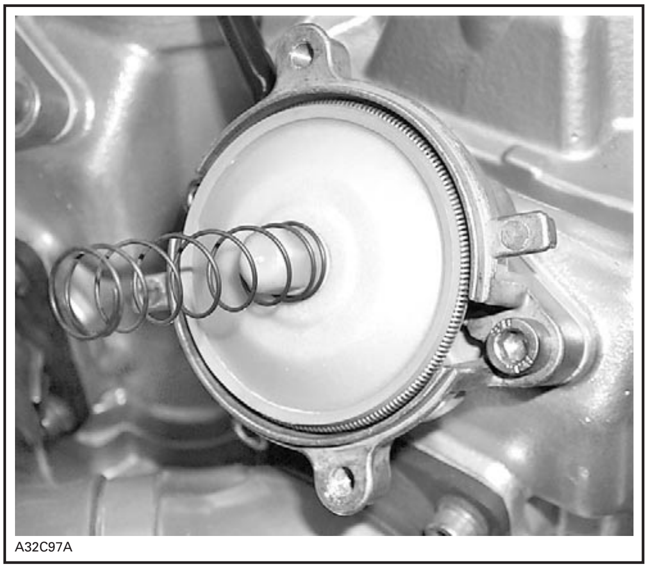
⚠ WARNING

Firmly hold cover to valve base. The compression spring inside the valve is applying pressure against the cover.



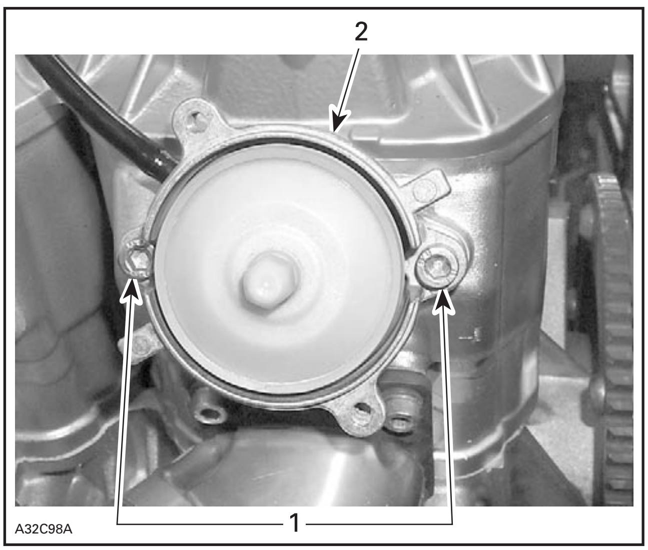
TYPICAL
1. RAVE valve cover
2. Screws

Remove the compression spring **no. 8**.



A32C97A

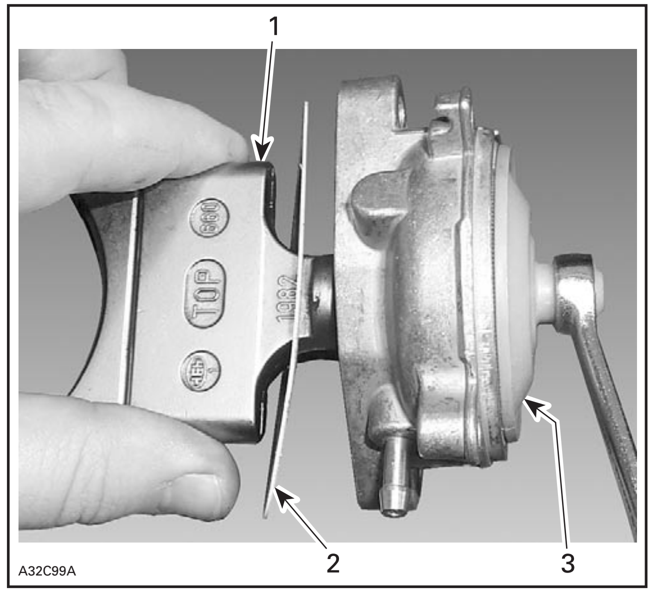
Unscrew the Allen socket screws **no. 22** then remove the RAVE valve base **no. 13**.



A32C98A

TYPICAL
1. Allen socket screws
2. RAVE valve base

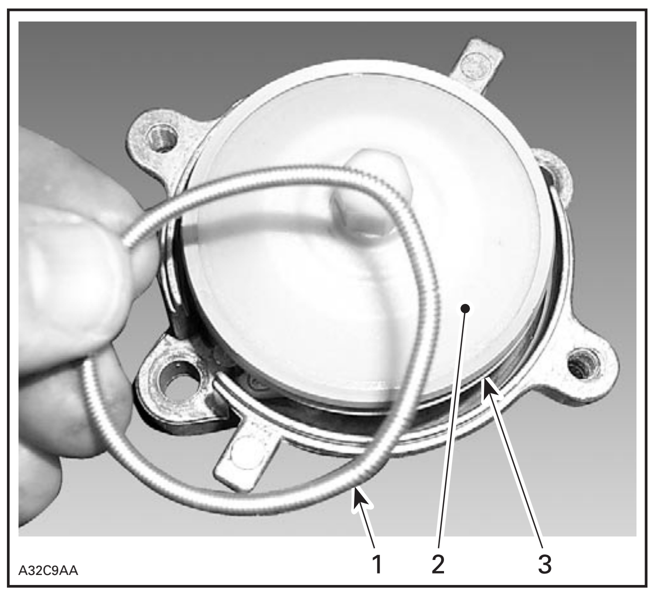
Unscrew and remove the guillotine **no. 15** from the valve piston **no. 9** than remove the gasket **no. 14**.



A32C99A

1. Guillotine
2. Gasket
3. Valve piston

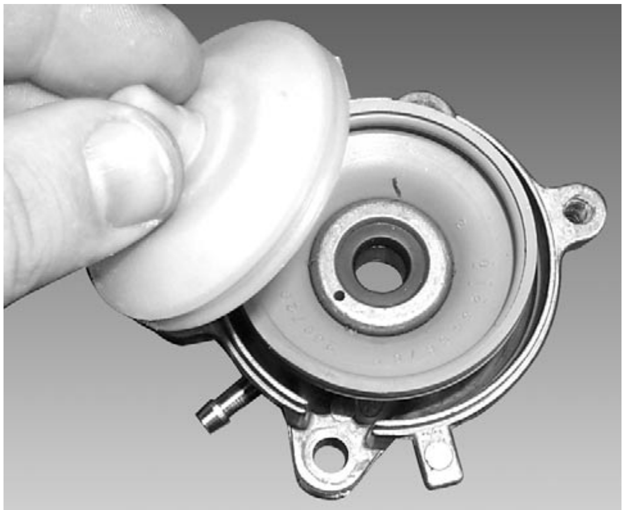
Remove spring **no. 10** retaining bellows **no. 11** to valve piston.



A32C9AA

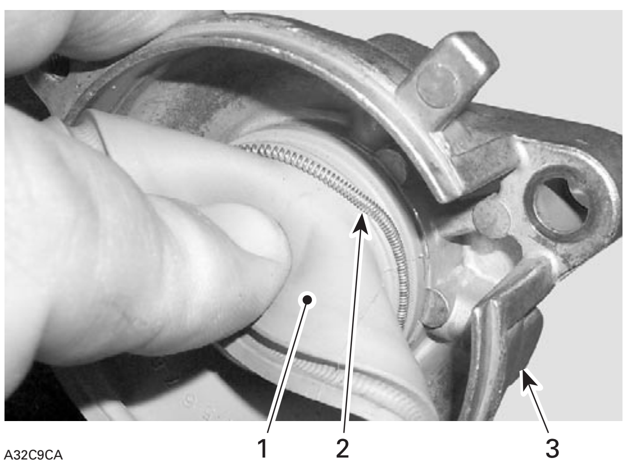
1. Spring
2. Valve piston
3. Bellows

Remove the valve piston.



A32C9BA

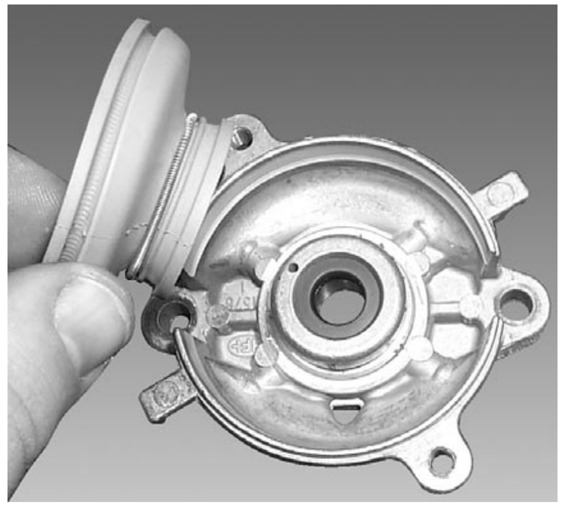
Remove the small spring **no. 12** retaining bellows to valve base.



A32C9CA

1. Bellows
2. Small spring
3. Valve base

Remove bellows from valve base.



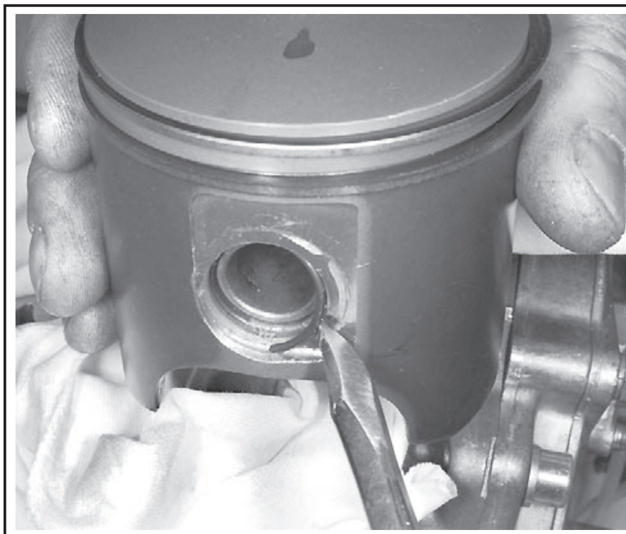
A32C9DA

2, Cylinder

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

18, Piston

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



A02C29A

TYPICAL

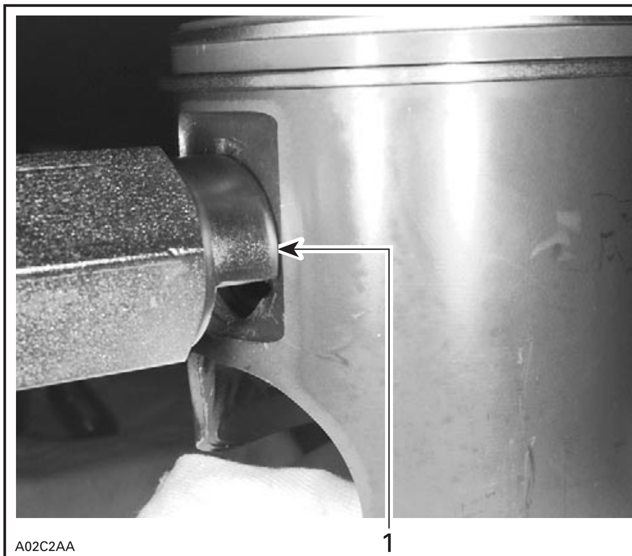
All engines are equipped with cageless piston pin bearings.

A32C17A

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

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

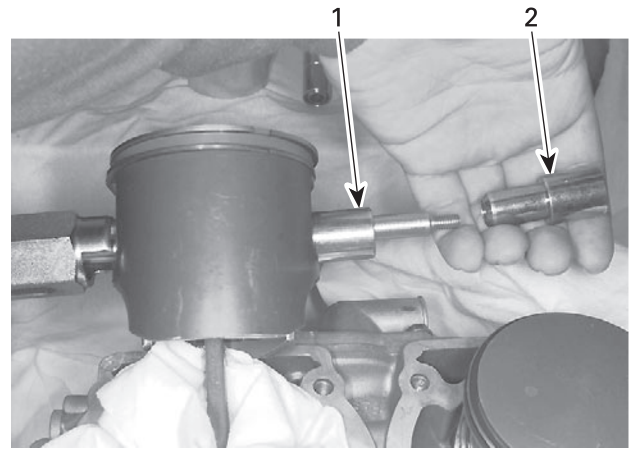
Insert piston pin puller (P/N 529 035 503) making sure it sits squarely against piston.



A02C2AA

TYPICAL
1. *Properly seated all around*

Install sleeve then shouldered sleeve over puller rod.



A02C2BA

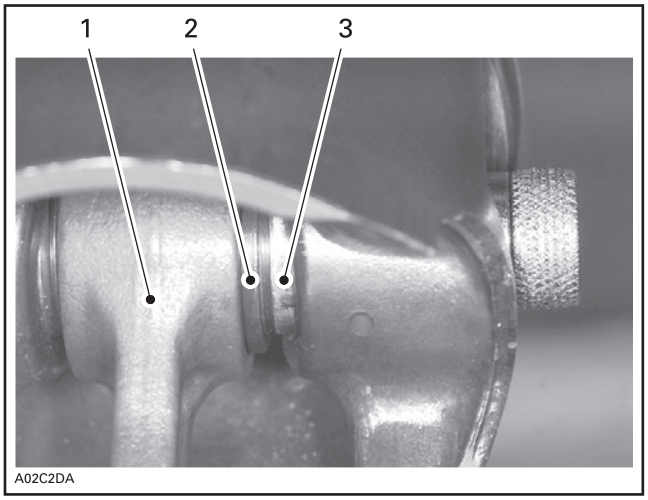
TYPICAL — INSTALLATION OF SLEEVE KIT
1. *Sleeve*
2. *Shouldered sleeve*

Screw (LH threads) extracting nut.

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

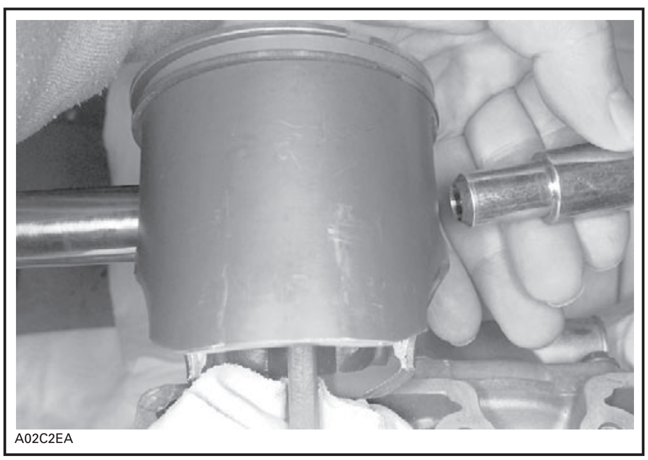
A02C2CA

TYPICAL — PISTON PIN EXTRACTION



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

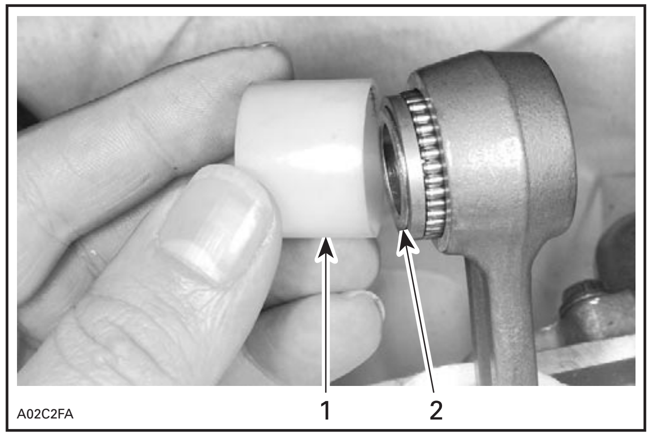
Remove puller. Pull out shouldered sleeve carefully.



TYPICAL

Remove piston from connecting rod.

Install locating sleeve. Then push needle bearings along with thrust washers and sleeve.



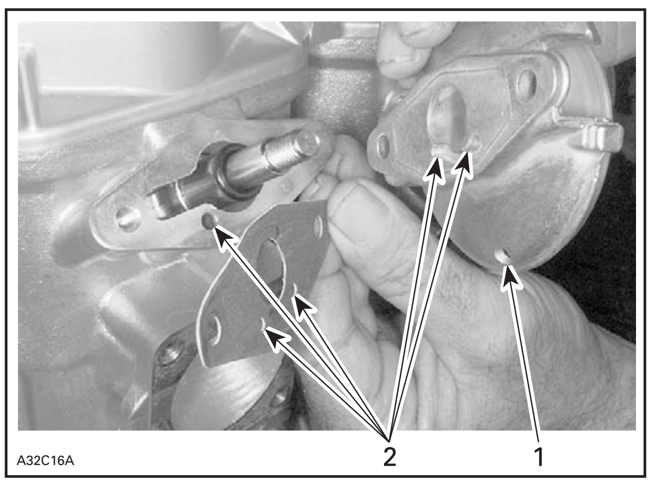
TYPICAL
1. *Locating sleeve*
2. *Sleeve*

INSPECTION

NOTE: Refer to LEAK TEST AND ENGINE DIMENSIONS MEASUREMENT.

RAVE System

Check valve rod housing and cylinder for clogged passages.



1. *Draining hole*
2. *Passages*

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

11, Bellows

Check for cracked, dried or perforated bellows.

8, Spring

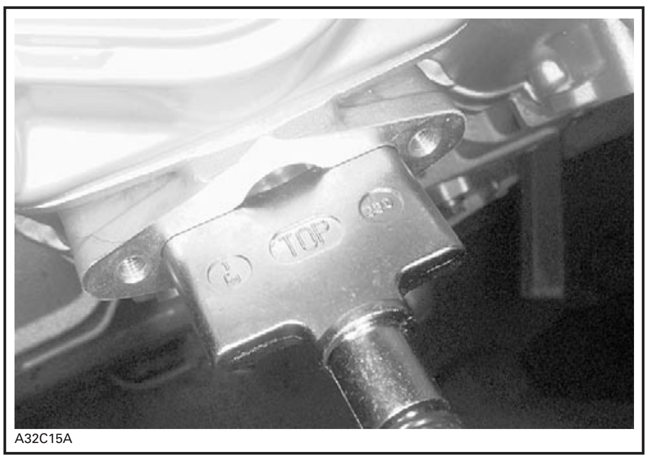
ENGINE TYPE	SPRING P/N	COLOR	WIRE DIA. mm (in)	FREE LENGTH mm (in)	PRELOAD IN N (LBF) AT COMPRESSED LENGTH OF 14 mm (.551 in)
593 and 593 HO/SDI	420 239 944	Brown	0.9 (.035)	48.5 (1.91)	15.9 (3.56)
693	420 239 948	Black	0.8 (.031)	42.5 (1.67)	7.3 (1.64)
793 SDI	420 239 941	Dark blue	0.8 (.031)	52.5 (2.07)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

ASSEMBLY

RAVE System

Apply sealing compound Dreibond (P/N 420 297 906) in the groove of valve base and in the piston valve groove, then install bellows.

Install RAVE valve with its mention top as illustrated in the following photo.



RAVE VALVE PARTIALLY INSERTED

Tighten red cap screw to bottom.

4,18, Cylinder and Piston

593 Engines Only

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

All Engines

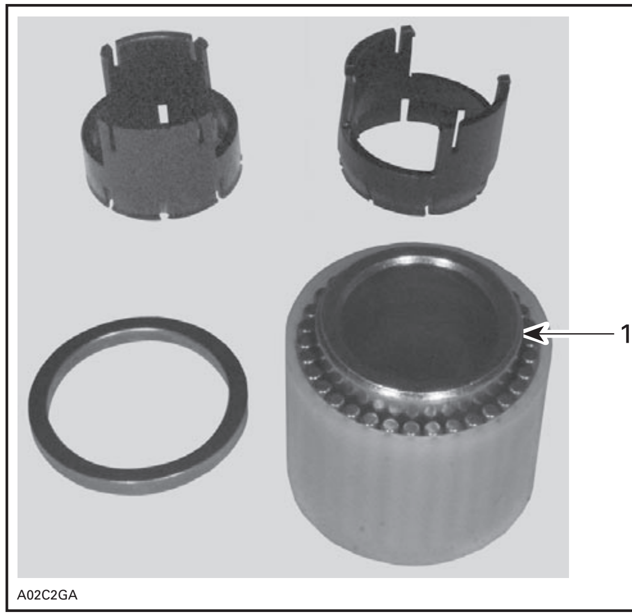
Before inserting piston in cylinder, lubricate the cylinder with new injection oil or equivalent.

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

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

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

NOTE: All cageless bearings have 28 needles.



TYPICAL
1. Sleeve

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

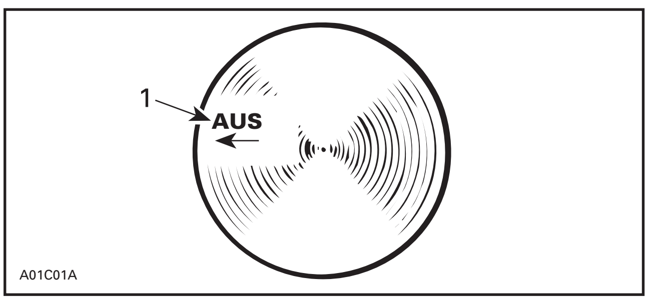
Insert cageless bearing into connecting rod.

TYPICAL — CAGELESS BEARING AND SLEEVE INSTALLED

Heat piston using bearing heater (P/N 529 035 969).

CAUTION: Piston temperature must not exceed 46°C (115°F). NEVER USE DIRECT FLAME to heat the piston and never freeze the pin. Inappropriate heating procedure(s) may damage the piston.

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

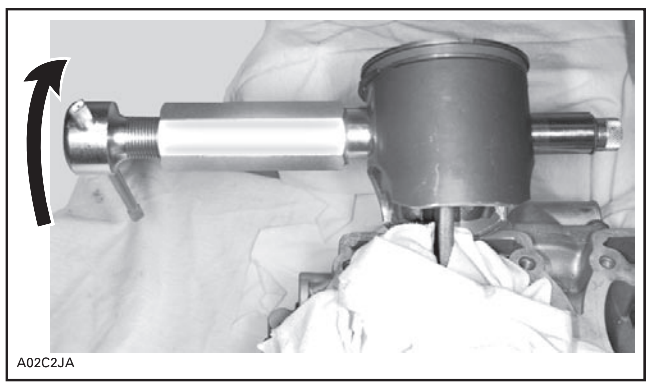


1. Exhaust

Install shouldered sleeve.

TYPICAL — SHOULDERED SLEEVE INSTALLATION

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



TYPICAL

All Models

CAUTION: Always install new circlips.

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

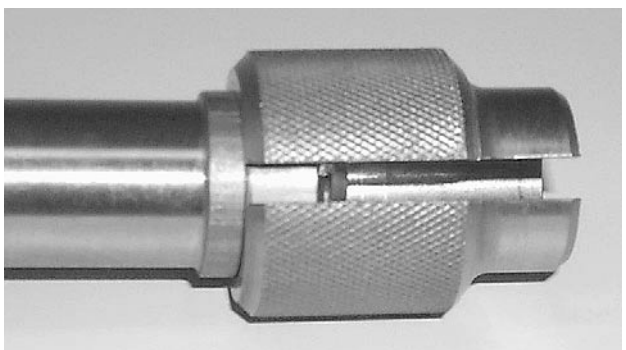
ENGINE TYPE	PISTON CIRCLIP INSTALLER (P/N)
All	529 035 686

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

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

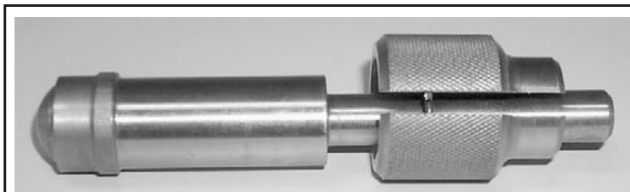
A32B0AA

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

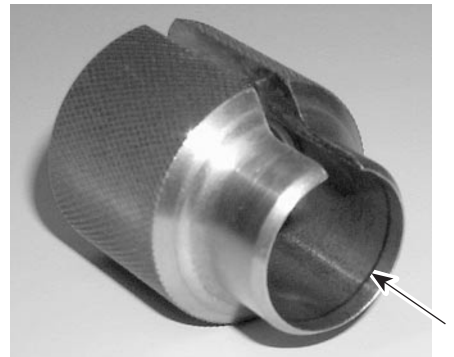


A32B0BA

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



A32B0CA



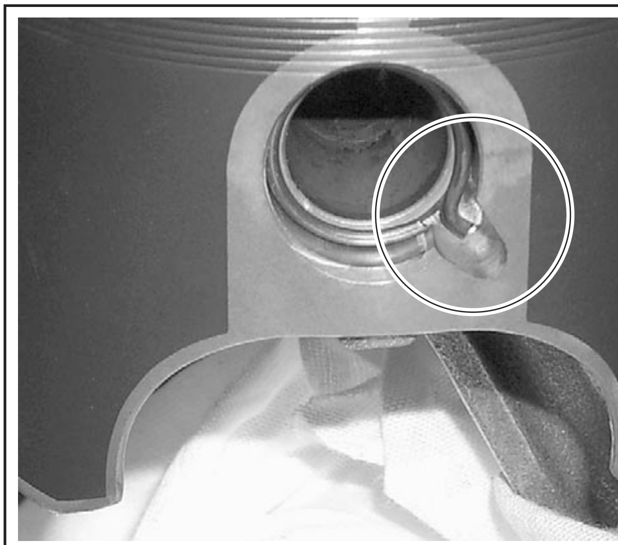
A32B0DA

1. *Groove*

A32B0EA

CIRCLIP READY TO BE INSTALLED ON PISTON

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



A32C4BA

TAB TOWARD TOP

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

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

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

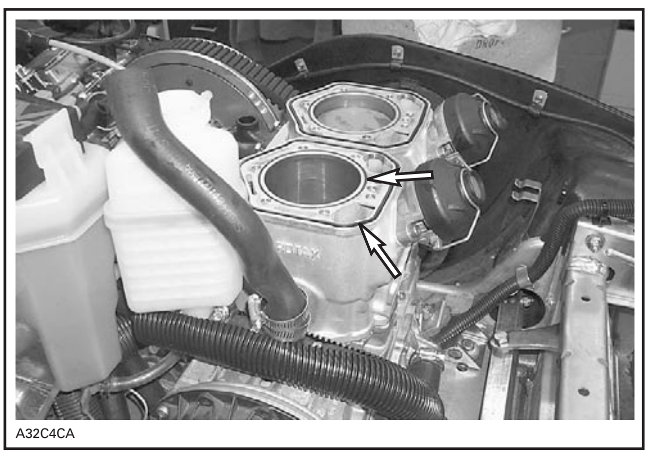
Coat crankcase mating surface with Loctite 518 (P/N 293 800 038). Choose the right gasket thickness according to combustion chamber volume. Refer to LEAK TEST AND ENGINE DIMENSION MEASUREMENT. Install it on crankcase. Coat gasket with Loctite 518.

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

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

Install cylinders. Do not tighten.

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



TYPICAL

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

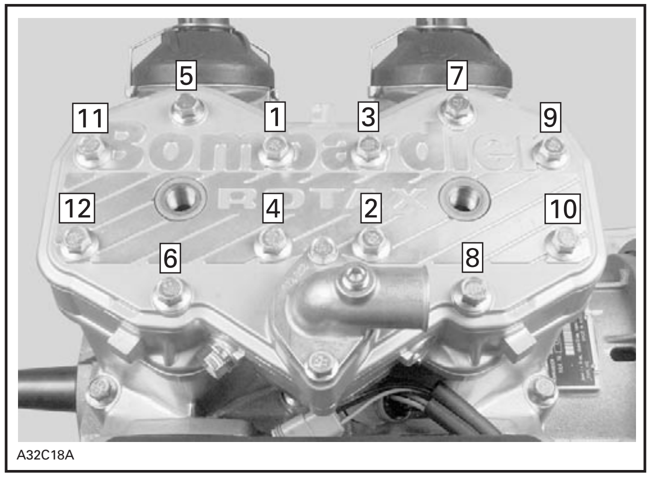
Install exhaust manifold with gaskets. Do not tighten yet.

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

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

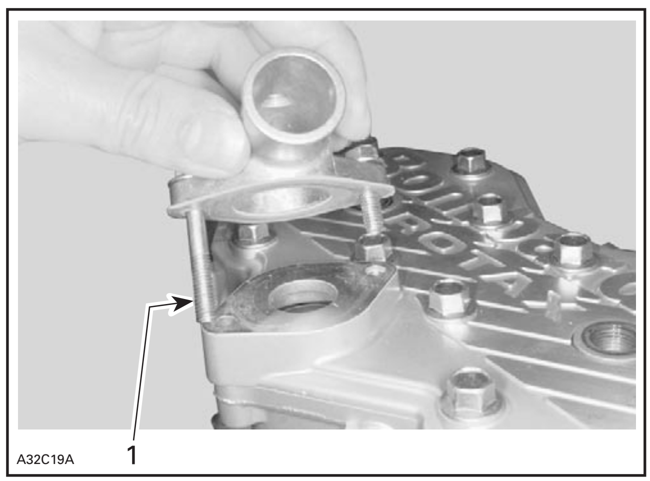
At assembly, torque cylinder head screws to 29 N•m (21 lbf•ft) in the following illustrated sequence.

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



TYPICAL

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



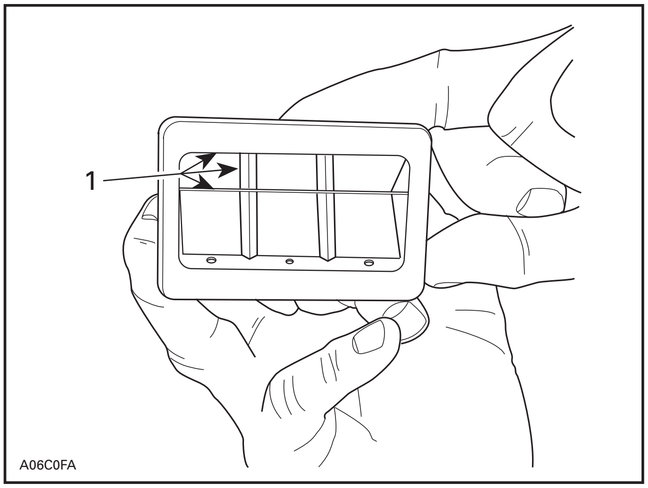
1. *Longer screw*

17, Reed Valve

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

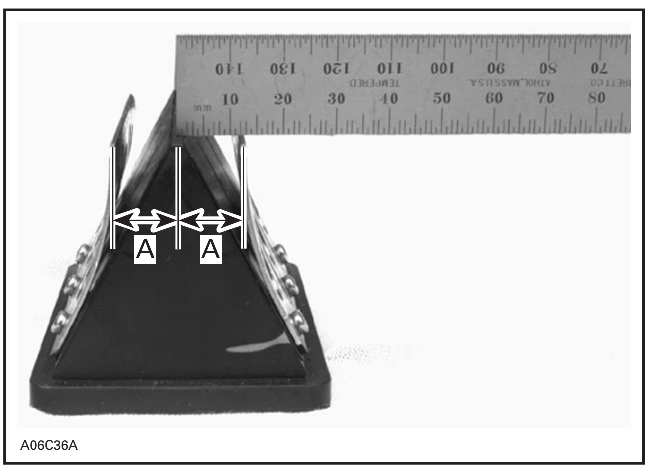
With blade stopper **no. 16** removed, check reed valve for proper tightness. There must not be any play between blade and valve body when exerting a finger pressure on blade at blade stopper location.

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



1. No play

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

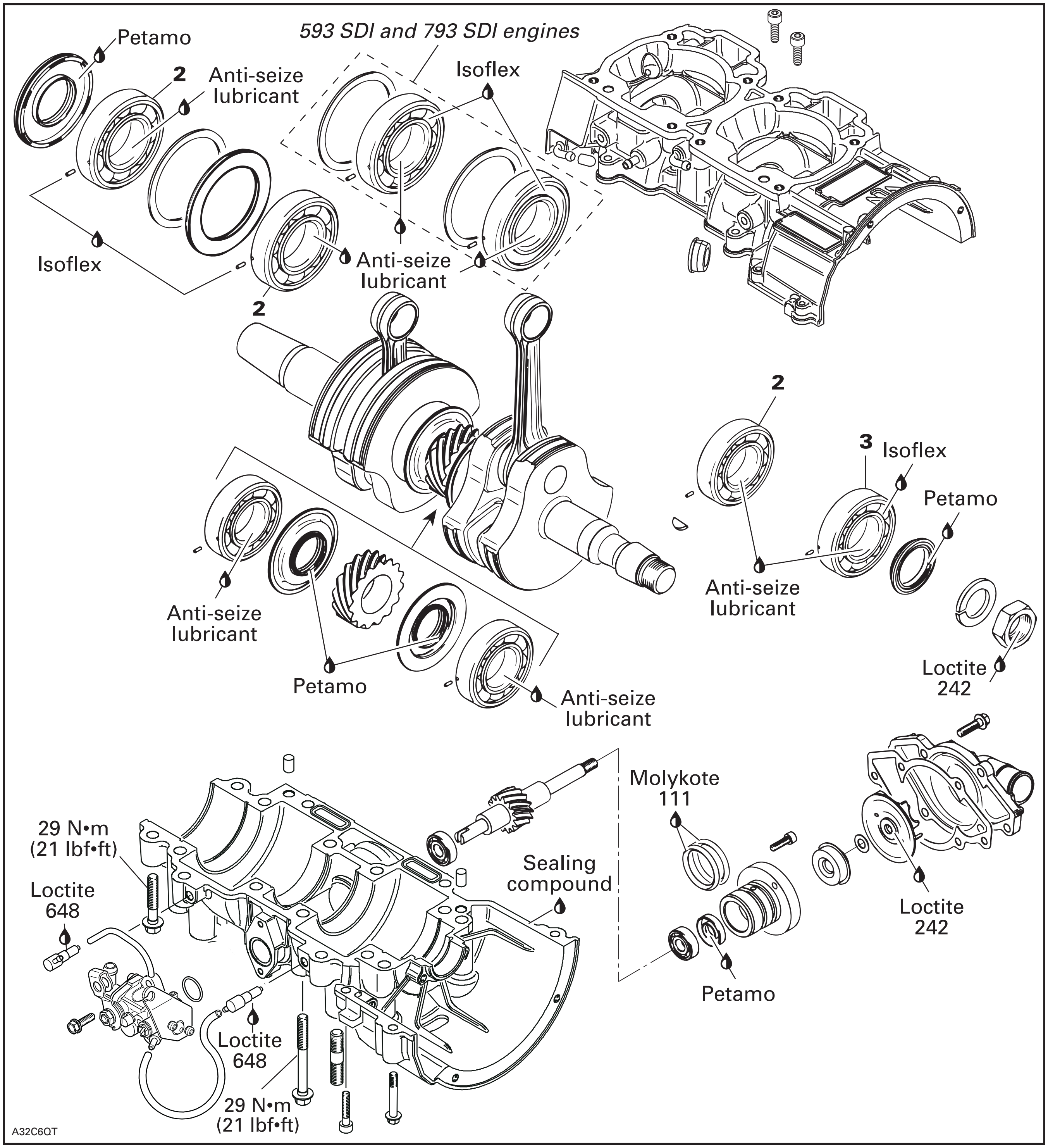


TYPICAL
A. 17.0 - 0, + 0.75 mm (.669 - 0, + .030 in)

Bent blade stopper as required to obtain the proper distance.

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

BOTTOM END


Petamo
593 SDI and 793 SDI engines
2
Anti-seize lubricant
Isoflex
Isoflex
Anti-seize lubricant
2
2
3
Isoflex
Petamo
Anti-seize lubricant
Anti-seize lubricant
Petamo
Anti-seize lubricant
Loctite 242
Molykote 111
29 N•m (21 lbf•ft)
Loctite 648
Sealing compound
Loctite 242
Petamo
Loctite 648
29 N•m (21 lbf•ft)
A32C6QT

GENERAL

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

CLEANING

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

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

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

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

DISASSEMBLY

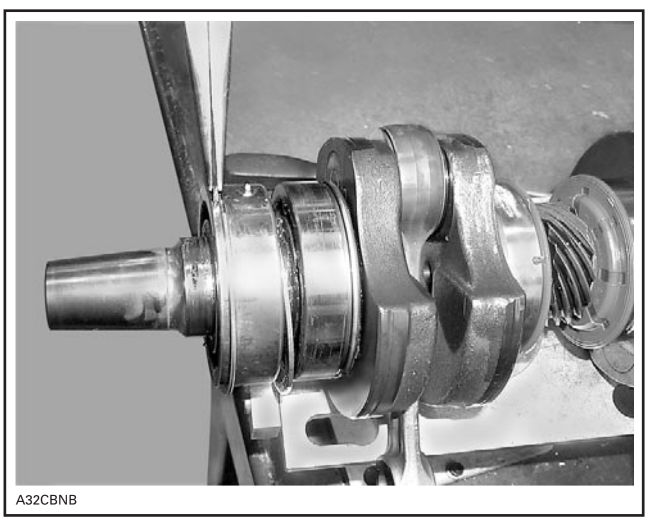
General

To remove drive pulley, refer to DRIVE PULLEY.

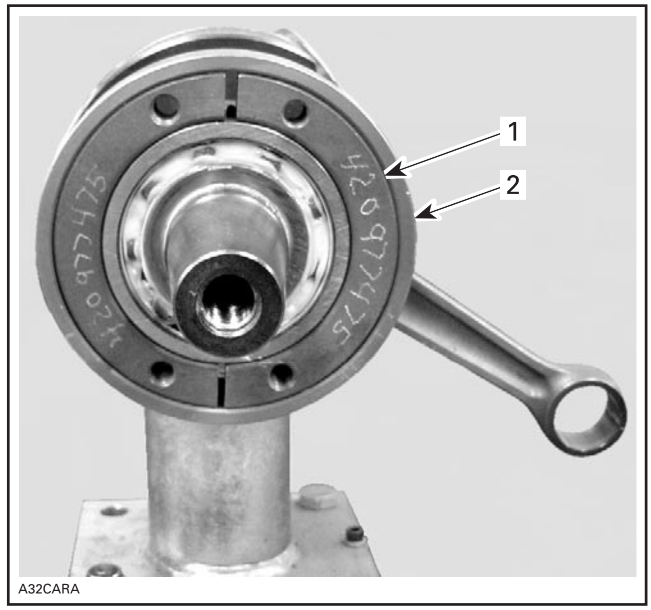
To remove magneto, refer to CDI SYSTEM.

2,3, Crankshaft Bearing

NOTE: For 793 SDI models, remove circlip from outer bearing.



To remove PTO side bearings from crankshaft, install half rings (P/N 420 977 479) and puller ring (P/N 420 977 494) on the outer bearing.

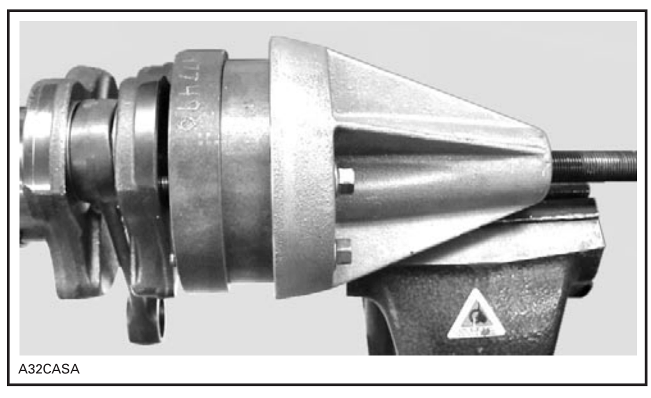


1. *Half ring*
2. *Puller ring*

NOTE: Apply grease (P/N 413 711 500) on PTO end in order to hold in place the crankshaft protector (P/N 420 876 552)

Using screws (P/N 420 840 681) Install bearing puller (P/N 420 877 635) on the half rings.

Secure the bearing puller in a vise by one of its rib.



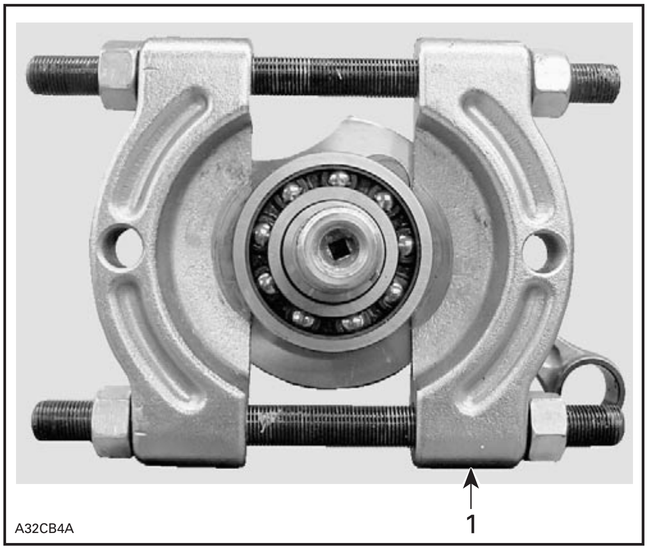
BEARING PULLER SECURED IN THE VISE

CAUTION: Never use any air impact tool for tightening the puller bolt. Lubricate the bolt with BOMBARDIER LUBE (P/N 293 600 016) to avoid damaging the threads.

Screw in the puller bolt until the bearing comes out.

Follow the same procedure for the inner PTO bearing

NOTE: In the case of damaged bearing or less clearance between crankshaft counterbalance and the bearing or on the MAG side bearing, use bearing separator (SNAP-ON tool (P/N CJ951 or SPX/OTC) tool (P/N 1124) to facilitate the removal.



1. *Bearing separator*

Procedure for MAG side bearings **no. 4** is same as of PTO side with the exception of protective cap (P/N 420 876 557).

INSPECTION

NOTE: Refer to LEAK TEST AND ENGINE DIMENSIONS MEASUREMENT.

ASSEMBLY

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

2, Crankshaft Bearing

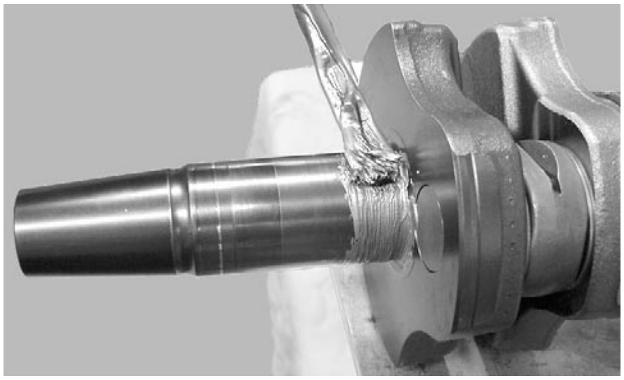
CAUTION: Never reinstall a bearing that has been removed.

Inspect crankshaft ends for damage.

Clean crankshaft ends and crankshaft balancer surface with sand paper no. 180 to remove possible seal marks and debris.

Remove all residue using Pulley flange cleaner (P/N 413 711 809).

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



A32CAUA

Heat up the bearing(s) using bearing heater (P/N 529 035 969). This will expand bearings and ease installation. If required, put a suitable plate or shim to avoid the direct contact between integrated seal with the heating surface.

A32CB7A

CAUTION: Bearings should not be heated to more than 80°C (176°F). Do not heat bearings on direct flame, or with a heat gun or in an oil bath. Inappropriate bearing heating may result in inner seals or cage failure.

Turn bearing several times to obtain an even heating process.

NOTE: Normally it takes approximately 10 minutes to heat up a bearing so in the event of replacing bearing, it's recommended to start the bearing heating process prior to removal operation. Two bearings can be heated at the same time on one bearing heater.

A32CB8A

1. Bearings

Probe the inner race of the bearing with the temperature indicator stick (P/N 529 035 970). Stick will liquefy when the bearing reach the proper temperature.

A32CB9A

⚠ WARNING

Do not touch heated bearing with bare hands. Always wear heat resisting gloves before handling the heated bearing(s).

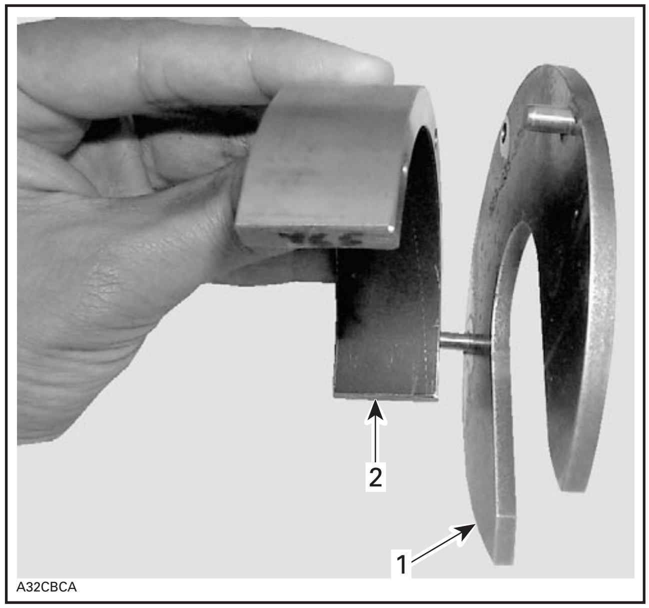
Slide in the inner PTO bearing with the integrated seal facing crankshaft. Push bearing to end position.

NOTE: Heated bearings will slide onto the crankshaft. If required, push with a steel tube on the inner ring of the bearing. **Pay special attention to correct positioning of the drive pins and/or retaining discs.**

Install retaining discs.

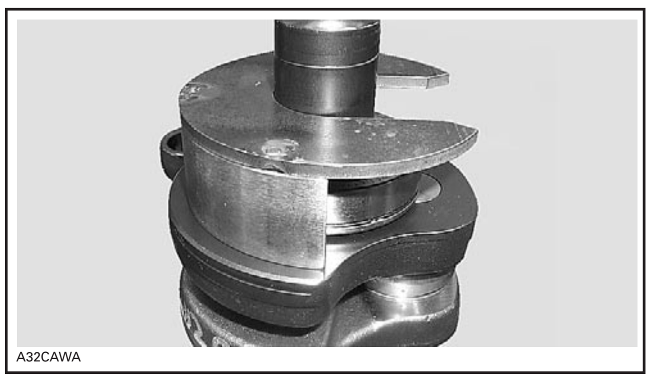
Install support plate (P/N 529 035 976) with appropriate distance gauge; refer to following table.

DISTANCE GAUGE P/N	APPLICATION
529 035 966	593 engine
529 035 967	593 HO and 693
529 035 968	593 HO SDI and 793 SDI



1. *Support plate*
2. *Distance gauge*

Install bearing locator tool.



Slide in the heated outer PTO bearing onto the crankshaft until it contacts the distance gauge.

Slide-in the first MAG bearing **with the integrated seal facing crankshaft**. Push bearing to the bottom with pusher , using a rubber hammer.

A32CC4B

Slide-in the second bearing until it contacts the first one.

A32CC5B

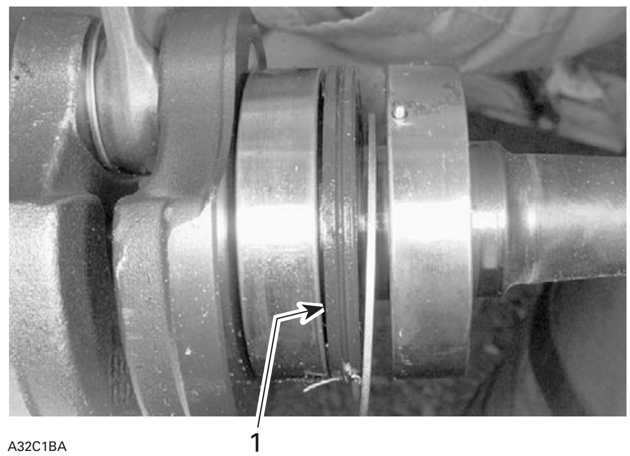
NOTE: To prevent seal pop-out, it is recommended to use PTO seal

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

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

Put 45 to 50 mL of grease in a syringe.

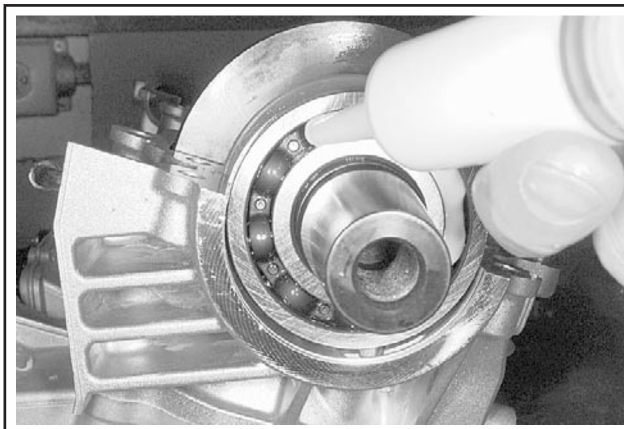
Fill PTO side inner seal with Isoflex grease (about 10 mL).



A32C1BA

TYPICAL
1. PTO side inner seal filled with Isoflex grease

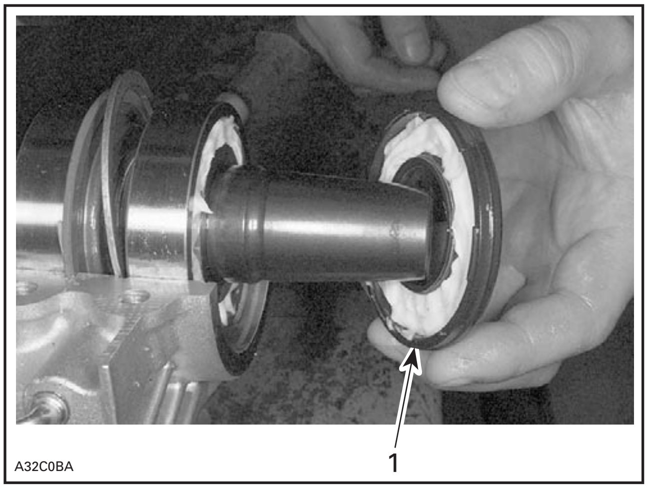
With the syringe, fill the outer ball bearing with 35 to 40 mL of Isoflex grease.



A32C0AA

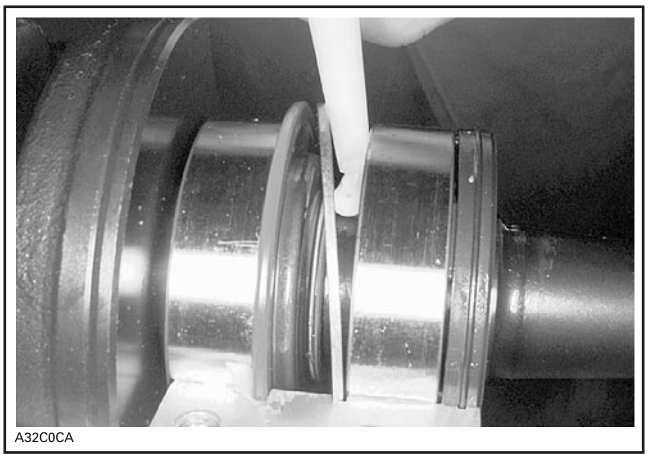
BALLS COATED WITH A SEAM OF GREASE

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



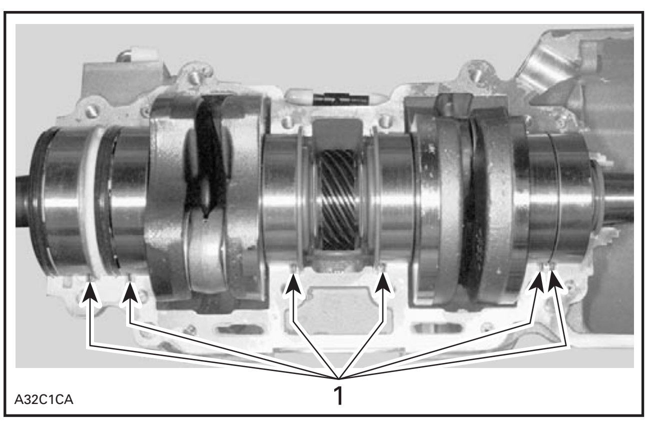
1. *Fill with grease and set in place*

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



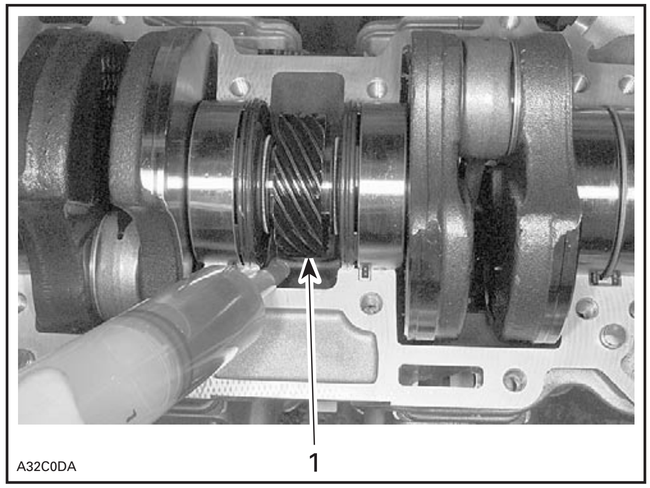
Apply 6 mL of grease to MAG side outer bearing.

At crankshaft installation, position drive pins as illustrated.



1. *Position pins*

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



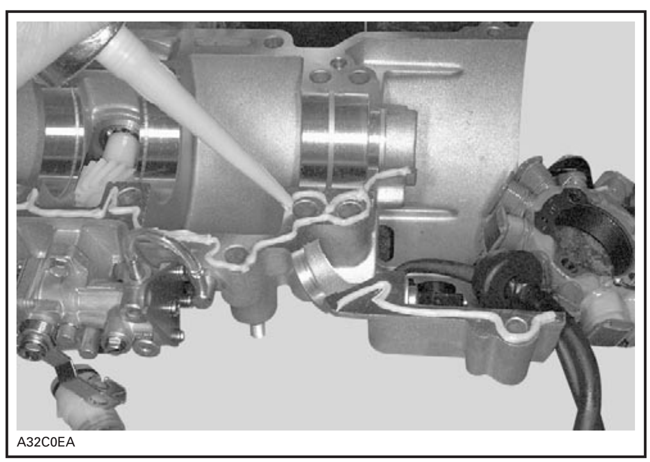
1. *Oil bath*

Crankcase Assembly

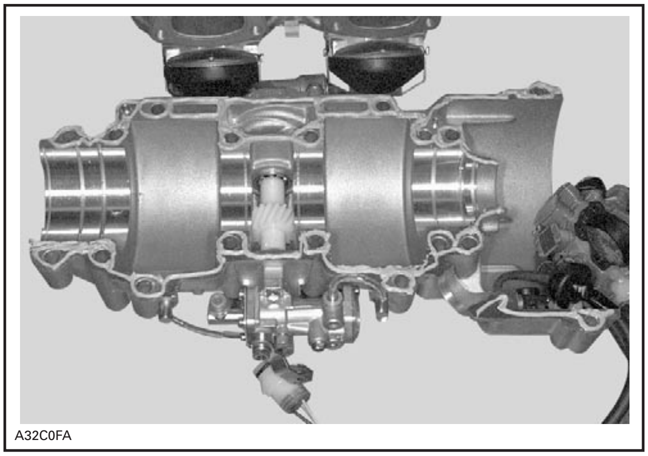
IMPORTANT: The total assembly sequence, including sealing compound spreading, screwing and torquing of bolts according to the proper sequence, must be performed within 10 minutes. **Do not wait between each bolt torquing. All bolts must be torqued in a row.**

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

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

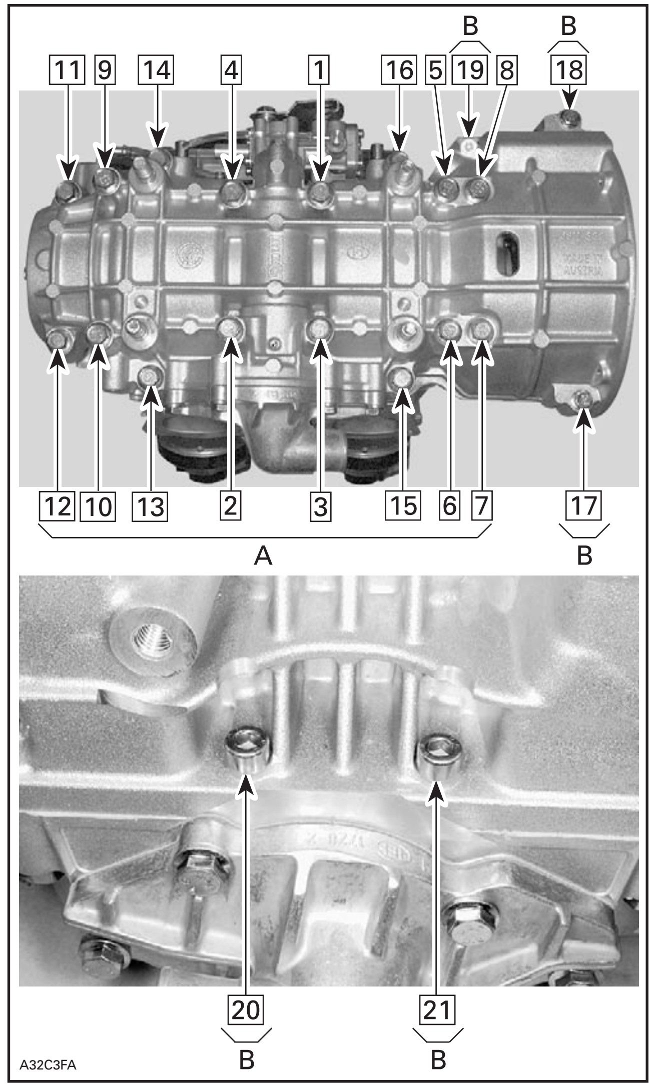


As far as possible, sealing compound must be applied in one run to avoid any risks of leakage through the crankcase.



SEAMING COMPLETED — CONTACT SURFACES COVERED AND SCREW HOLES SURROUNDED

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



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

BREAK-IN

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

ENGINE LEAK TEST AND MEASUREMENT

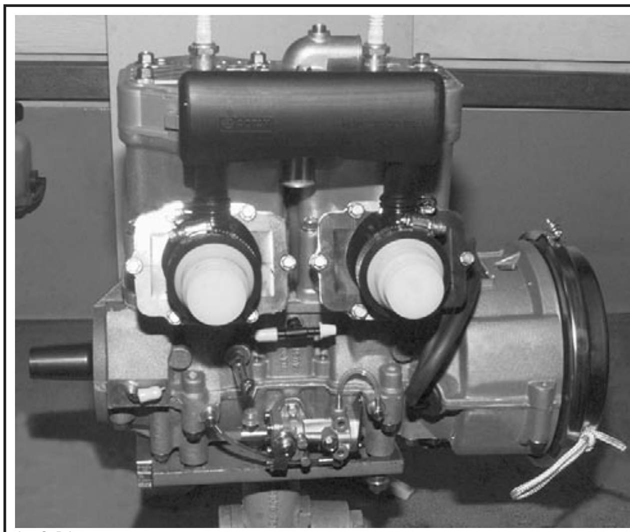
LEAK TEST

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

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

PREPARATION

– Remove tuned pipe.
– Install plug over exhaust manifold.
– Remove carburetors/throttle body assembly (as applicable).
– Unplug fuel inlet line from fuel rail.
– Insert plugs in intake rubber boots. Tighten with existing clamps.

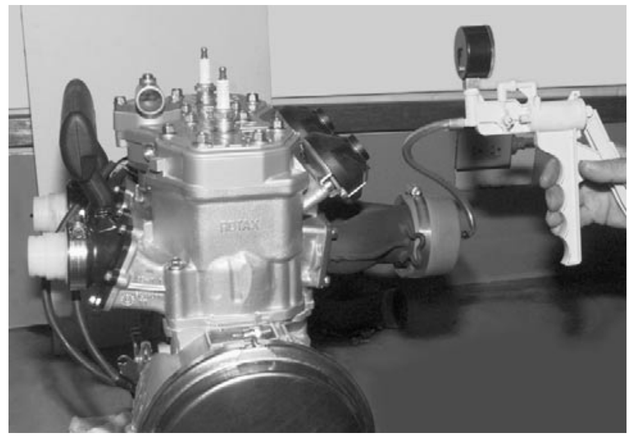


A32C1DA

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

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

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



A32C1FA

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

PROCEDURE

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

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

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

- If there is a leak at the tested location, it is recommended to continue testing next items before overhauling engine. There is a possibility of more than one leak.

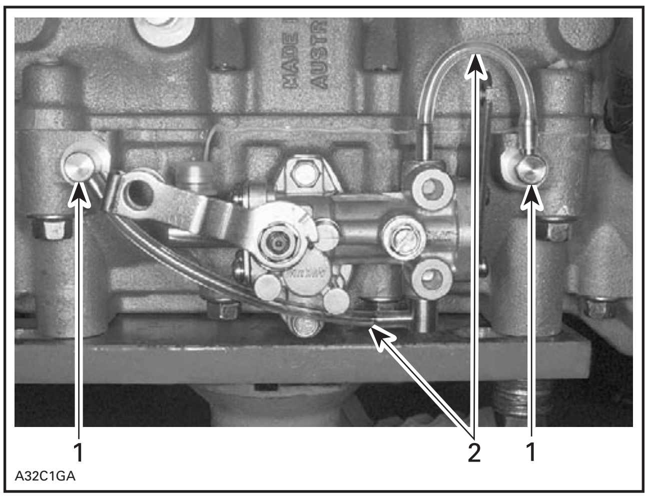
- If there is no leak at the tested location, continue pumping to maintain pressure and continue with next items until leak is found.

Engine

Check the following:

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

– Small injection oil lines coming from pump.



TYPICAL
1. Injection nipples
2. Small injection oil lines

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

– Remove cooling system cap.

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

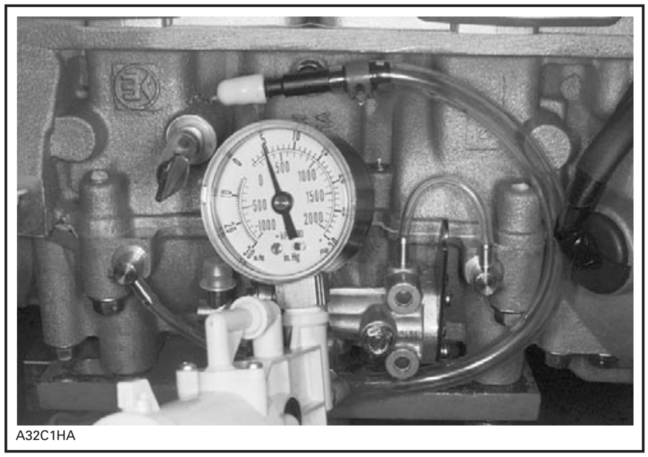
– Remove drive pulley then check crankshaft outer seal.

– Remove rewind starter and magneto system then check crankshaft outer seal.

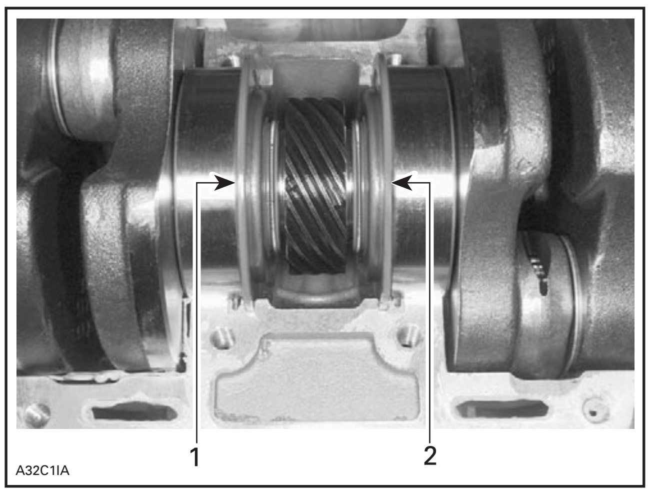
– Check pump shaft gear oil reservoir.

Pump Shaft Oil Gear Reservoir

Install air pump on adapter and pressurize as above.

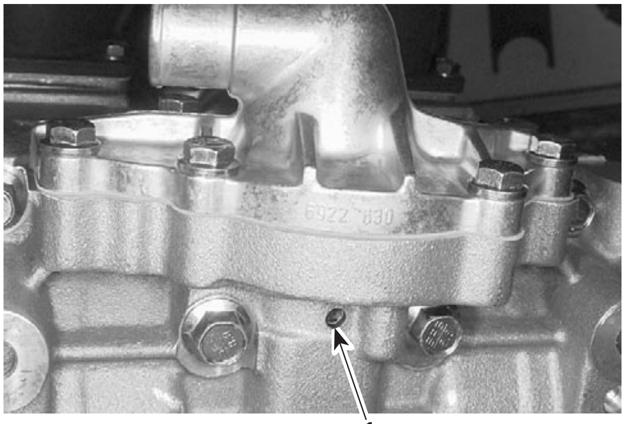


If pressure drops, it indicates a defective crankshaft inner seal.



TYPICAL — CRANKSHAFT INSTALLED IN UPPER HALF CRANKCASE
1. Crankshaft inner seal on PTO side
2. Crankshaft inner seal on MAG side

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



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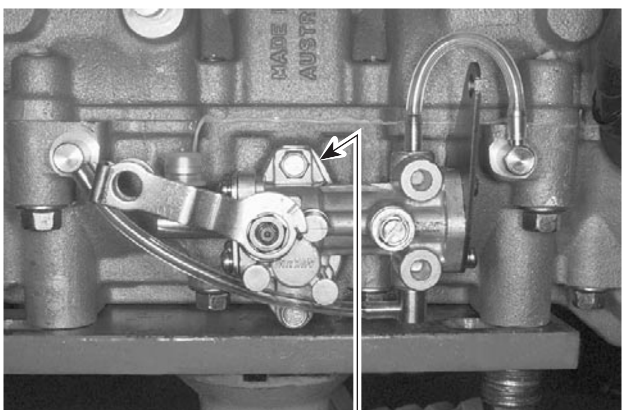
1. Weep hole

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

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



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TYPICAL
1. Check mounting area

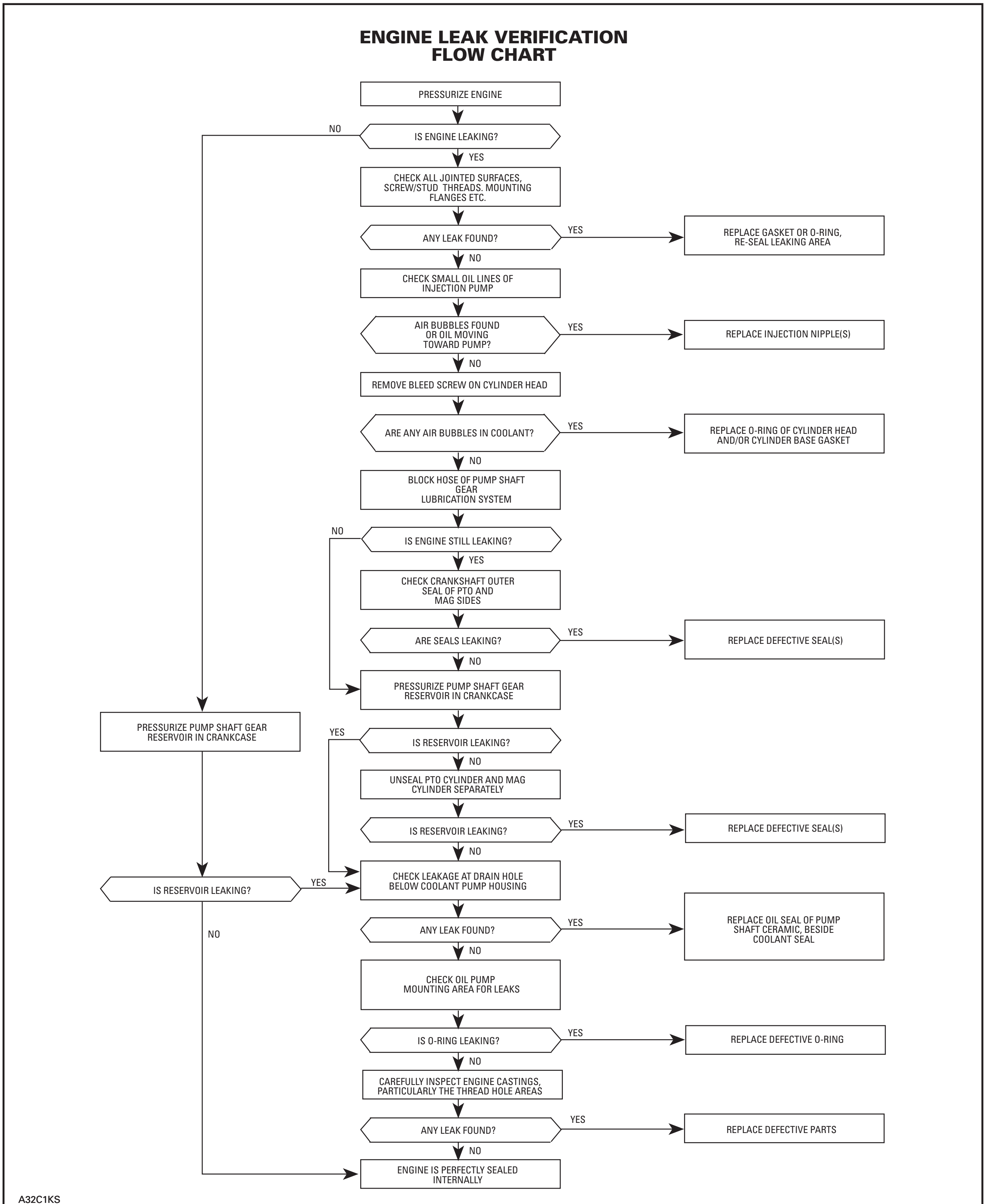
– If leak still persists, it indicates a defective casting somewhere in engine.

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

FINALIZING REASSEMBLY

After reassembling engine, always recheck for leakage.

ENGINE LEAK VERIFICATION FLOW CHART



ENGINE DIMENSION MEASUREMENT

This section covers all engine types.

CYLINDER HEAD WARPAGE

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

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

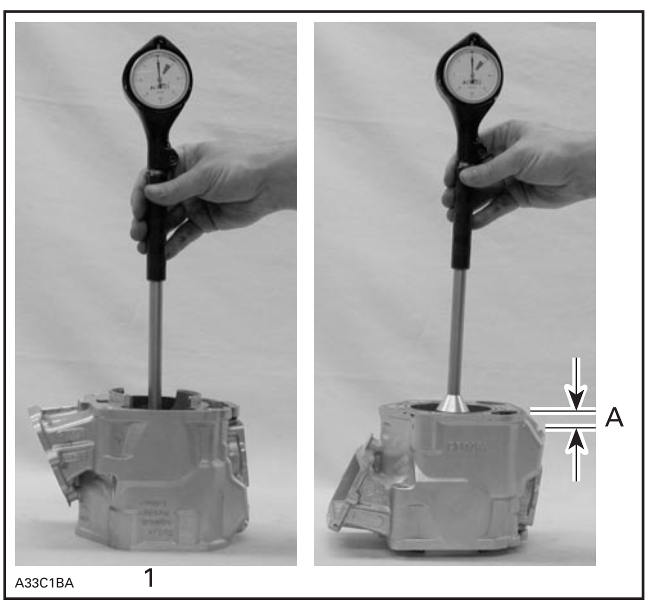
CYLINDER TAPER

ENGINE TYPE	MAXIMUM
All	0.10 mm (.004 in)

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

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

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



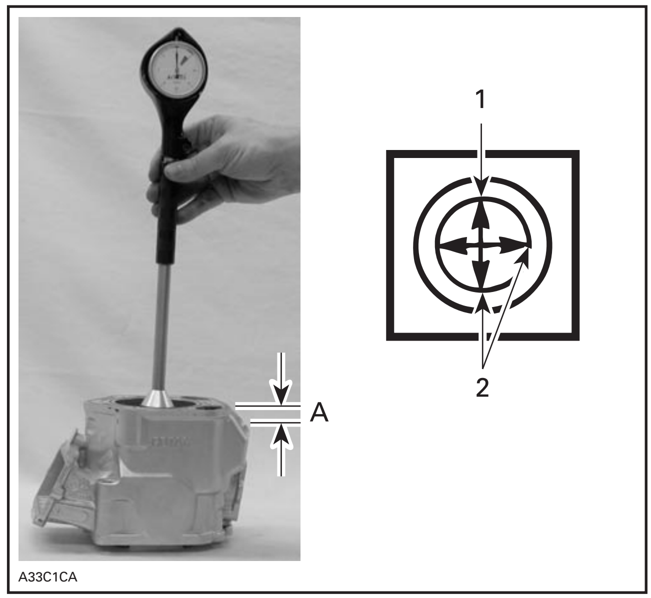
1. Below the intake port
A. 16 mm (5/8 in) from top

CYLINDER OUT OF ROUND

ENGINE TYPE	MAXIMUM
All	0.08 mm (.003 in)

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

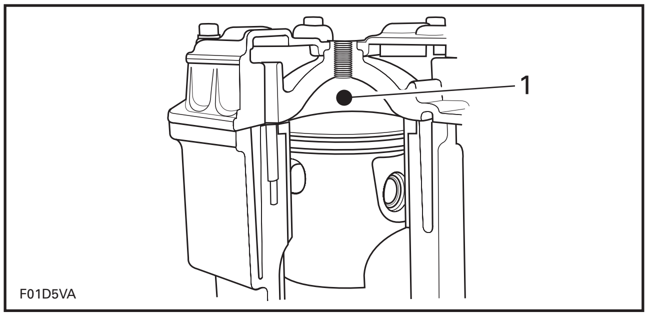
NOTE: Be sure to restore the chamfer around all cylinder sleeve port openings.



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

COMBUSTION CHAMBER VOLUME MEASUREMENT

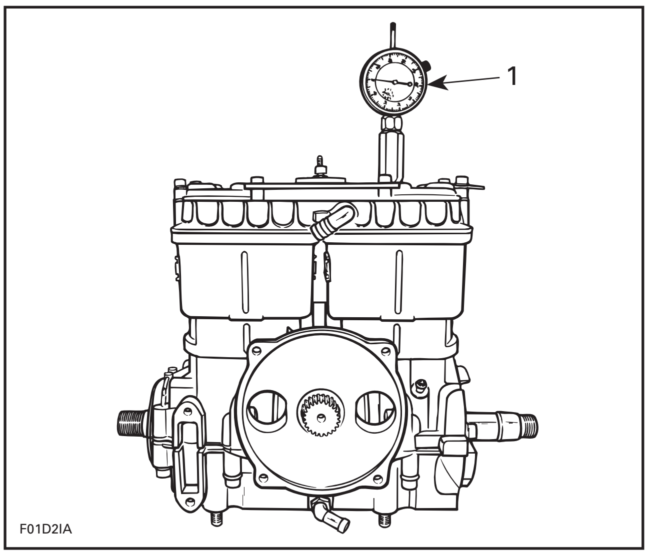
The combustion chamber volume is the region in the cylinder head above the piston at Top Dead Center. It is measured with the cylinder head installed on the engine.



1. Combustion chamber

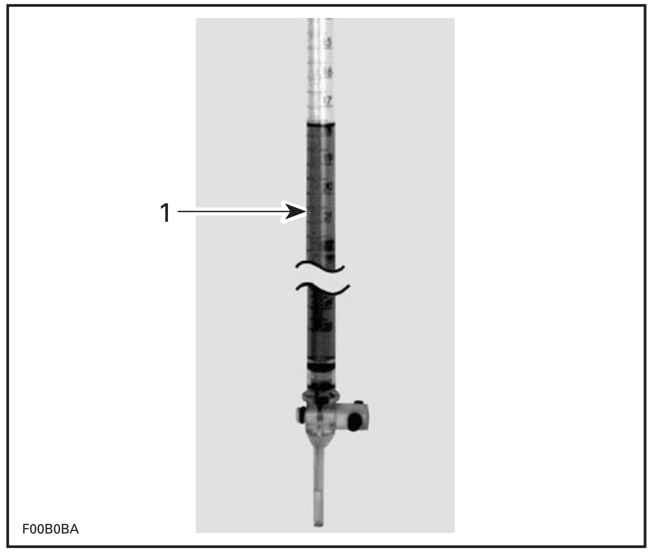
NOTE: When checking the combustion chamber volume, engine must be cold, piston must be free of carbon deposits and cylinder head must be leveled.

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



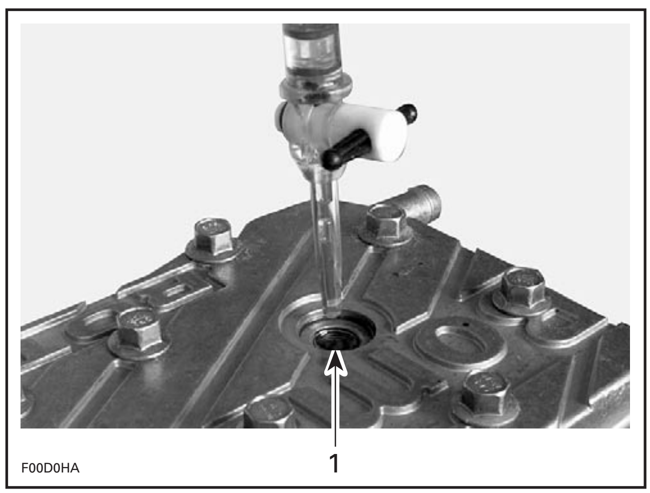
1. Bring piston to TDC

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



1. Graduated burette (0 - 50 cc)

– Open burette valve to fill its tip. Add liquid in burette until level reaches 0 cc.
– Inject the burette content through the spark plug hole until liquid touches the top spark plug hole.



1. Top of spark plug hole

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

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

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

– Repeat the procedure for the other cylinder.

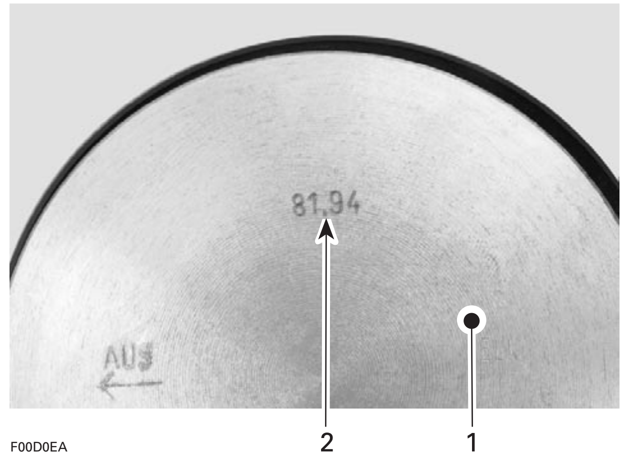
ENGINE TYPE	COMBUSTION CHAMBER VOLUME (cc) (up to top thread of spark plug hole)
377	20.35 ± 0.8
552	35.54 ± 1.2
593	26.67 ± 1.29 - 1.18
593 HO/SDI	26.4 ± 1.2
693	31.71 + 1.51 - 1.38
793 HO/SDI	36.34 + 1.73 - 1.58

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

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

USED PISTON MEASUREMENT

Note the measurement on the piston dome.



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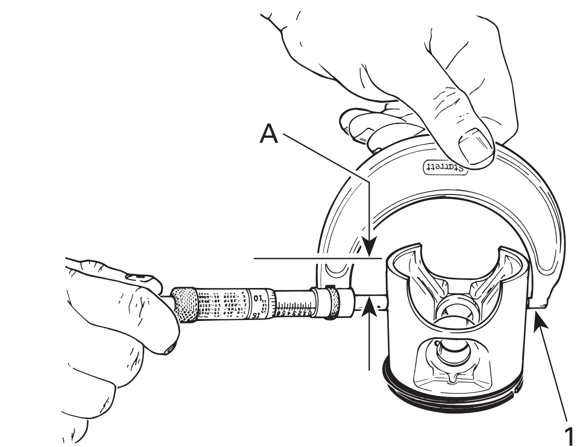
1. *Piston dome*
2. *Piston measurement*

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



F01D0NA

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

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

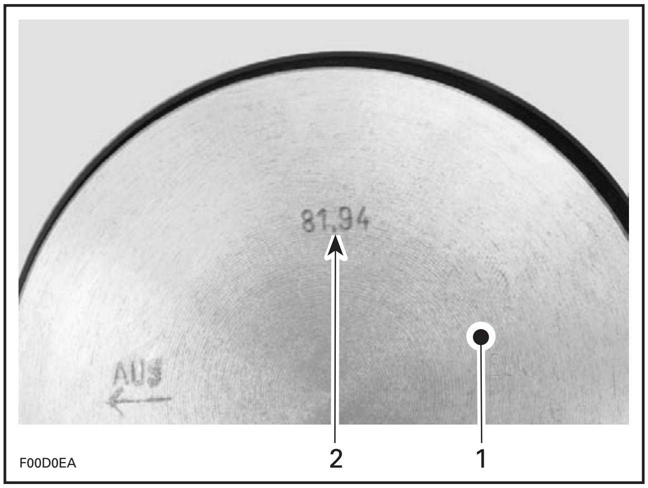
The measured dimension must not be less than 0.15 mm (.006 in) of the one scribed on piston dome. Otherwise, install a new piston.

CYLINDER/PISTON CLEARANCE

Used and New Pistons

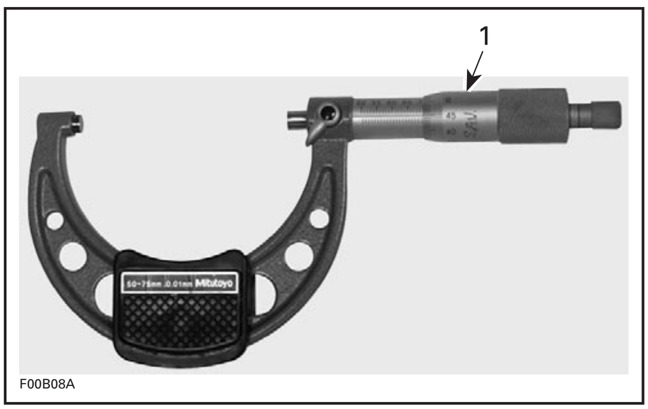
IMPORTANT: Make sure used piston is not worn more than specified. See USED PISTON MEASUREMENT above.

Take the measurement on the piston dome.



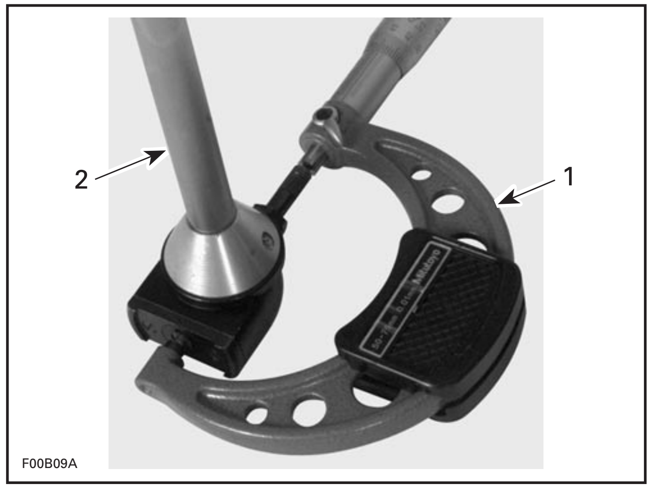
1. Piston dome
2. Piston measurement

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

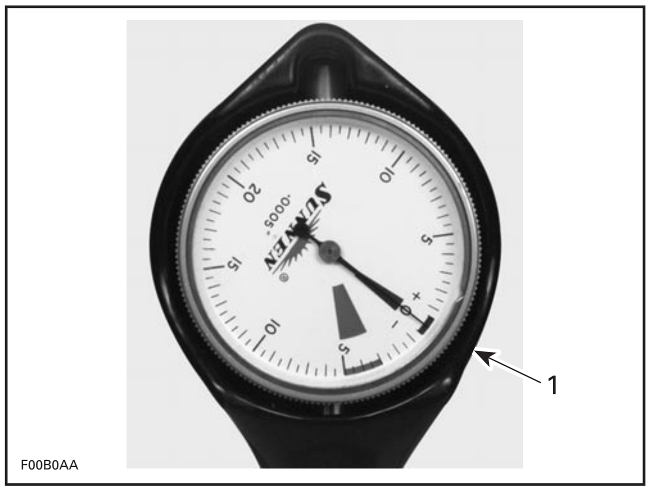


1. Micrometer set to the piston dimension

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



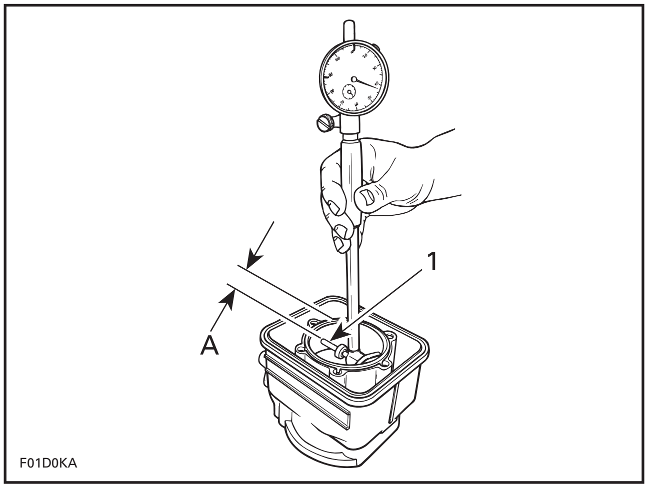
1. Use the micrometer to set the cylinder bore gauge
2. Dial bore gauge



1. Indicator set to 0 (zero)

IMPORTANT: Always remove cylinders from crankcase before measuring.

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



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

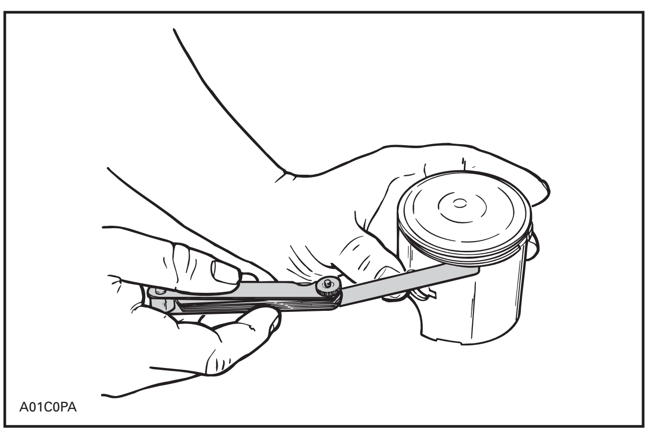
Read the measurement on the cylinder bore gauge. The result is the exact piston/cylinder wall clearance. If clearance exceeds specified tolerance, replace cylinder or rebore and install oversize piston depending on engine type. Refer to TECHNICAL DATA.

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

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

RING/PISTON GROOVE CLEARANCE

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

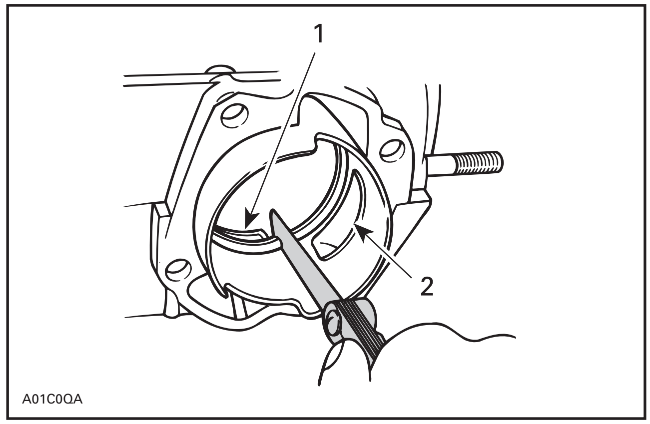


RING END GAP

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

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

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



1. Transfer port
2. Intake port

CRANKSHAFT DEFLECTION

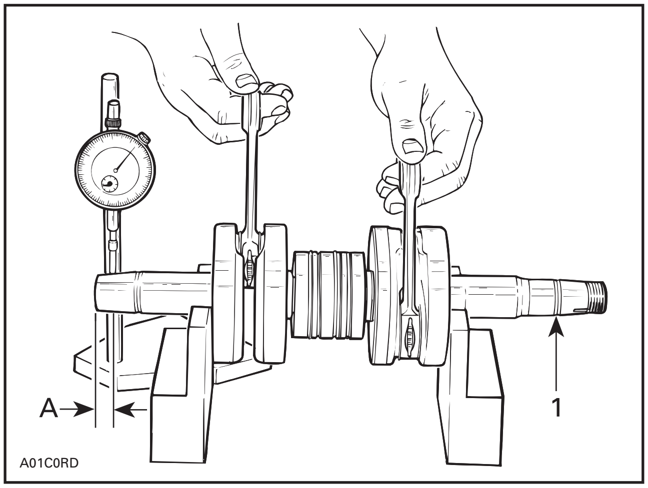
Crankshaft deflection is measured with a dial indicator.

Measuring (in crankcase)

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

Measuring (on bench)

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



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

Crankshaft Deflection on PTO Side

ENGINE TYPE	MAXIMUM ON PTO SIDE mm (in)
All	0.06 (.0024)

Crankshaft Deflection on MAG Side

ENGINE TYPE	MAXIMUM ON MAG SIDE mm (in)
593, 593 HO/SDI, 693, 793 HO/SDI	0.05 (.002)
377, 552	0.030 (.001)

Crankshaft Deflection in Center of Crankshaft

ENGINE TYPE	MAXIMUM IN CENTER OF CRANKSHAFT mm (in)
All	0.08 (.0031)

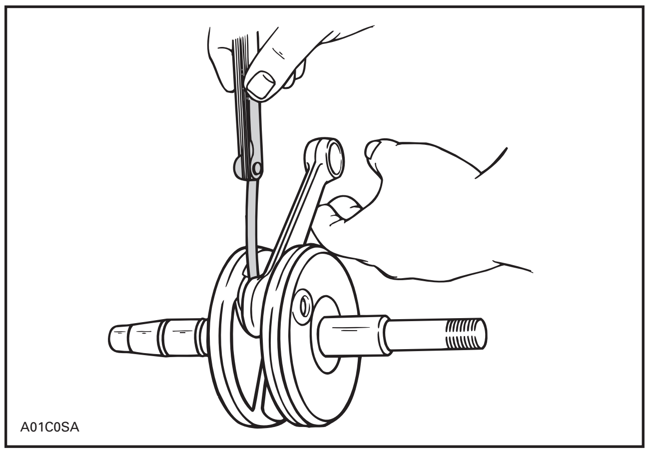
NOTE: Crankshaft deflection cannot be correctly measured between centers of a lathe.

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

CONNECTING ROD BIG END AXIAL PLAY

ENGINE TYPE	NEW PARTS MIN. — MAX.	WEAR LIMIT
377, 552	0.2 - 0.53 mm (.007 - .026 in)	1.20 mm (.047 in)
593	0.39 - 0.74 mm (.015 - .029 in)	1.20 mm (.047 in)
593 HO/SDI, 693, 793 HO SDI	0.31 - 0.67 mm (.012 - .026 in)	1.20 mm (.047 in)

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



TYPICAL

CRANKSHAFT END-PLAY

All Engine Types

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

CHECKING CRANKSHAFT ALIGNMENT

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

Remove both spark plugs.

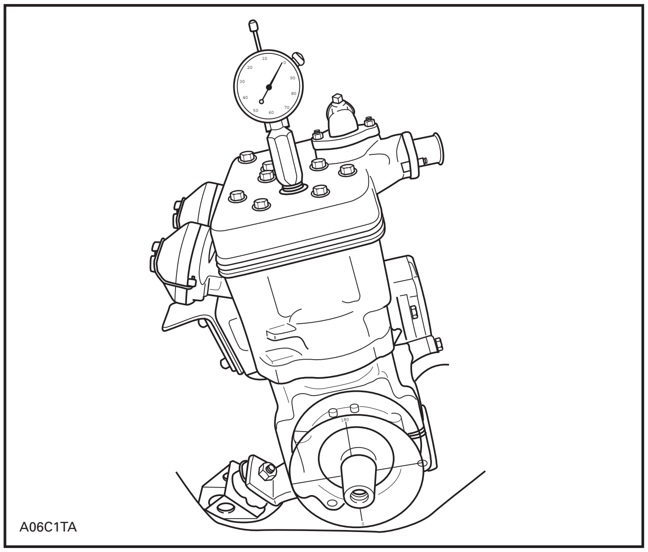
Install a TDC gauge (P/N 414 104 700) in spark plug hole on MAG side.

Bring MAG piston at top dead center.

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

Remove TDC gauge and install it on center cylinder.

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



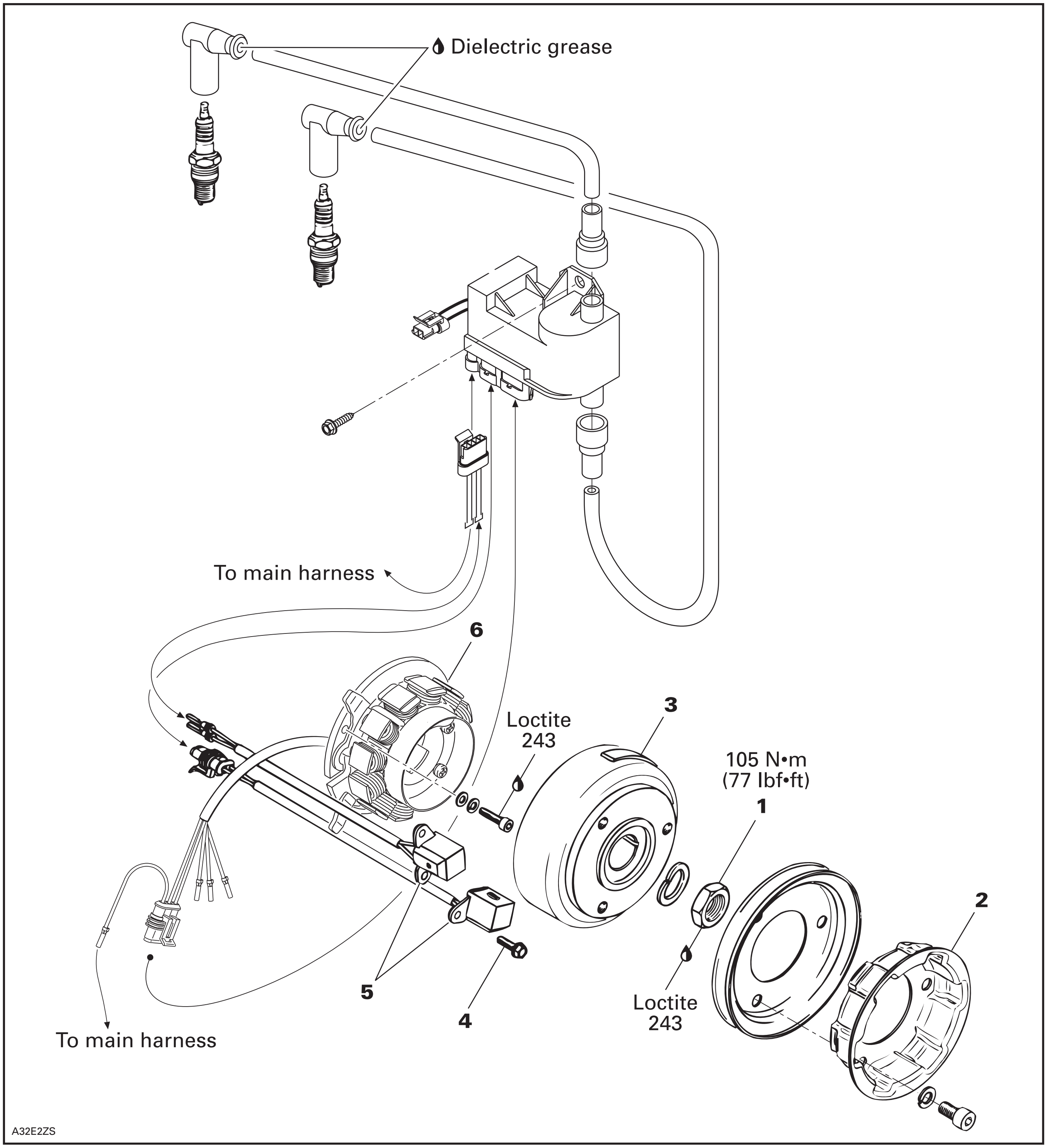
TYPICAL

Interval between cylinders must be 180° ± 0.5.

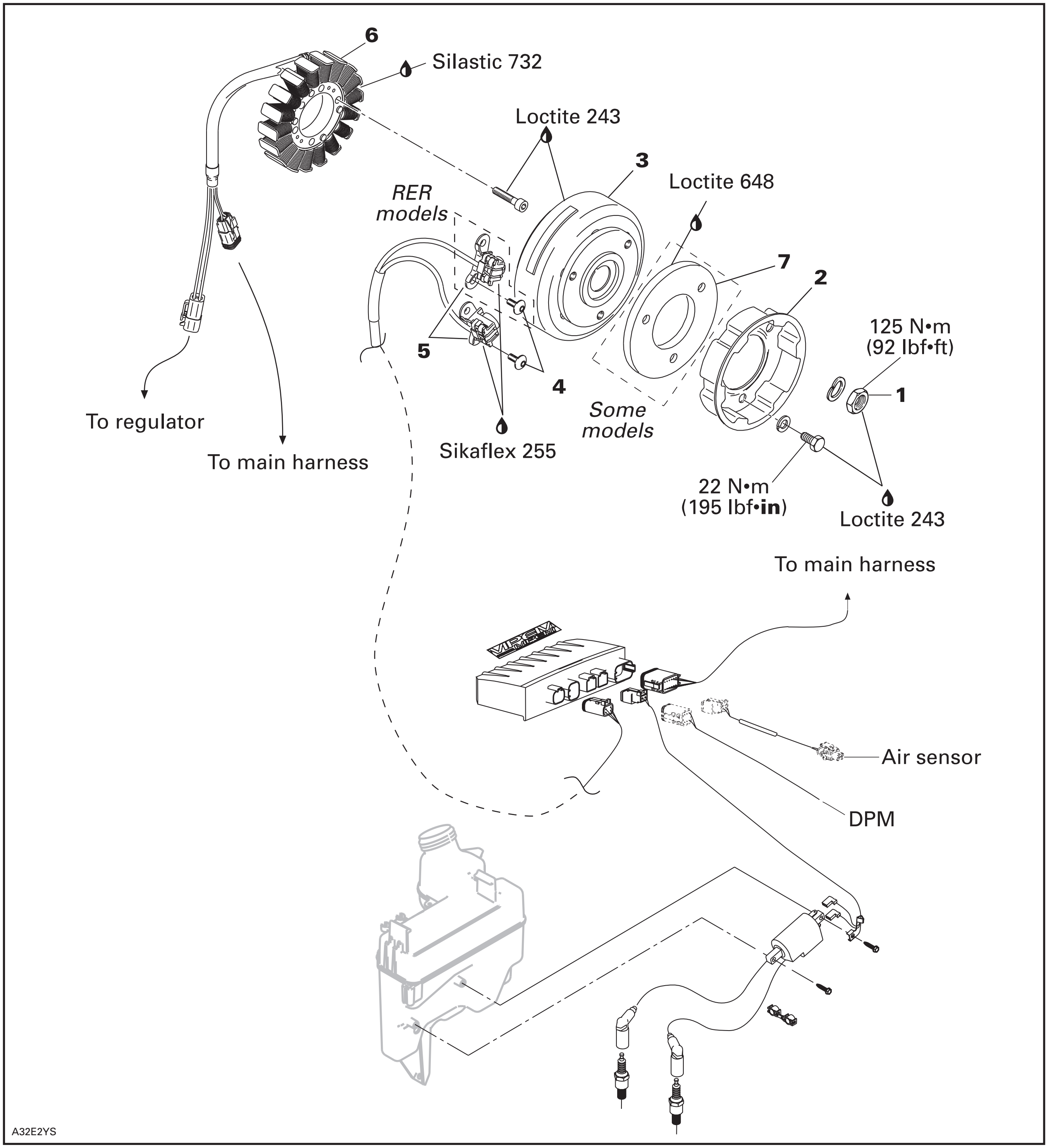
Any other reading indicates a misaligned (twisted) crankshaft.

MAGNETO SYSTEM

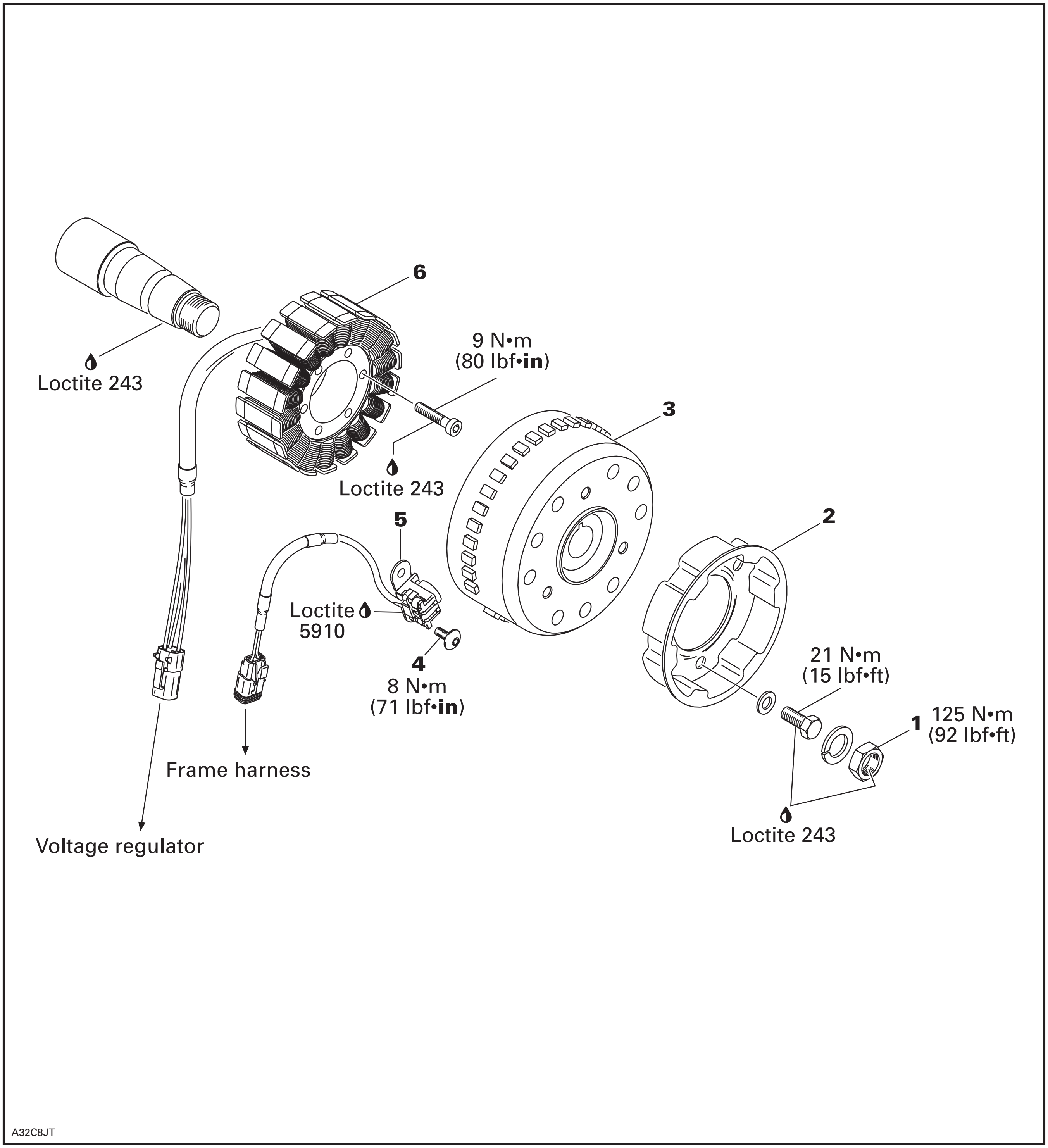
340 W on ZX Series



360 W on ZX Series



480 W on ZX Series



GENERAL

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

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.

CLEANING

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

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

DISASSEMBLY

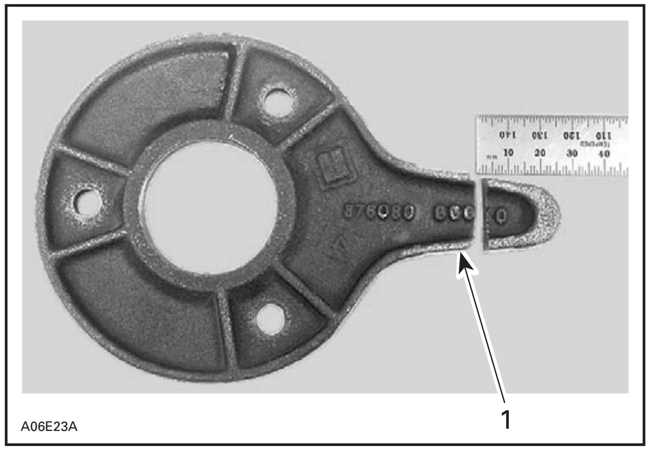
Magneto Flywheel

To gain access to magneto flywheel **no. 3** assembly, remove the following parts as needed on different engines:

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

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

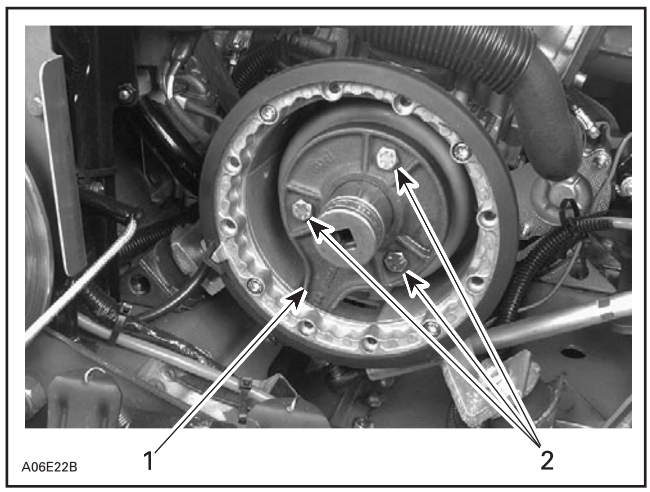
– Use magneto puller ring (P/N 420 876 080). Former puller must be modified as shown.



1. Cut by 25 mm (1 in)

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

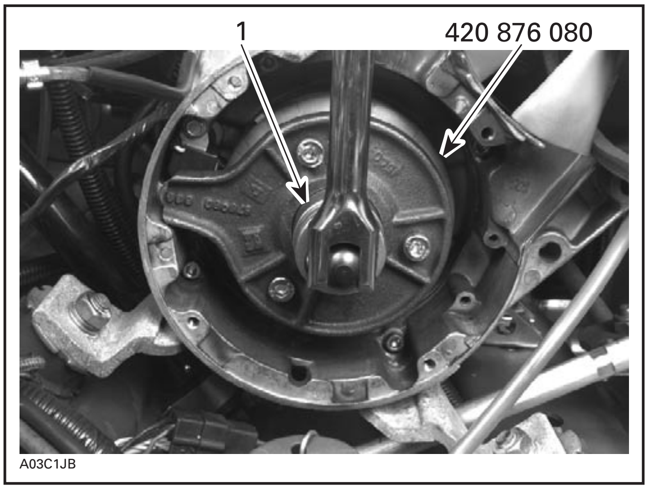
CAUTION: Use only M8 x 20 mm screws to bolt puller to magneto flywheel. When a counterweight no. 7 (for liquid cooled models only) is installed on magneto flywheel use M8 x 30 mm screws.



TYPICAL
1. Tab in magneto housing opening
2. M8 screws

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

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



TYPICAL
1. 30 mm socket

To remove magneto flywheel, install crankshaft protector (P/N 420 876 557) on crankshaft end. Screw puller (P/N 529 035 547) into puller ring.

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

Stator

NOTE: Always check stator before changing it the stator **no. 6**, refer to TESTING PROCEDURE.

Remove:

- magneto flywheel **no. 3**
- all Allen socket screws retaining stator to magneto housing
- grommet from crankcase where trigger coil and stator wires exit magneto housing.

Unplug the trigger coil connectors and pull the wires through the grommet location.

NOTE: To pass the stator connector into the grommet location it is necessary to pass the trigger coil connector first.

Unplug the stator connector and remove the stator.

Trigger Coil

NOTE: Always check trigger coils **no. 5** before changing them. Refer to OVERVIEW section.

To replace the trigger coil(s), remove the following:

- magneto flywheel **no. 3**
- Air intake silencer to allow an access to the trigger coil connectors (if necessary).
- Disconnect trigger coil connector housing(s).
- grommet from crankcase where trigger coil wire(s) exit(s) magneto housing.
- retaining screws **no. 4**.
- trigger coil(s) and carefully pull wires.

ASSEMBLY

Trigger Coil

For installation, reverse the removal procedure.

NOTE: It is important to remove the old silicon at trigger coil location then apply new silicon. Screw trigger coil then stick the trigger coil wires in the silicon.

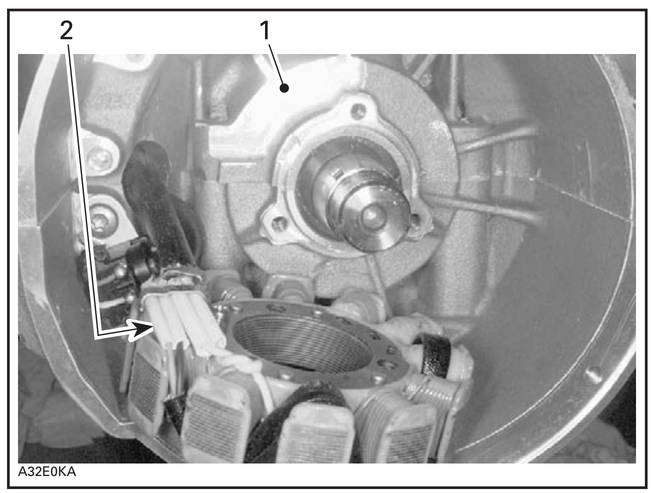
Stator

For Liquid Cooled Models Only

Insert the stator connector into crankcase grommet then the trigger coil connector(s).

Install the grommet on crankcase

Position stator **no. 6** so that its wire protectors are over crankcase recess.



1. Crankcase recess
2. Wire protectors

NOTE: During installation, make sure the stator harness is located on the left side.

Apply Loctite 243 on threads of stator screws then torque them to 9 N•m (80 lbf•**in**).

Reinstall all other removed parts.

Magneto Flywheel

All Models

Clean crankshaft extension (taper) and apply Loctite 243 (blue) on taper, then position Woodruff key, magneto flywheel **no. 3** and lock washer on crankshaft.

Clean magneto flywheel nut threads and apply Loctite 243 (blue) then tighten nut **no. 1** to 105 N•m (77 lbf•ft) for fan cooled engines and to 125 N•m (92 lbf•ft) for liquid cooled engines.

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

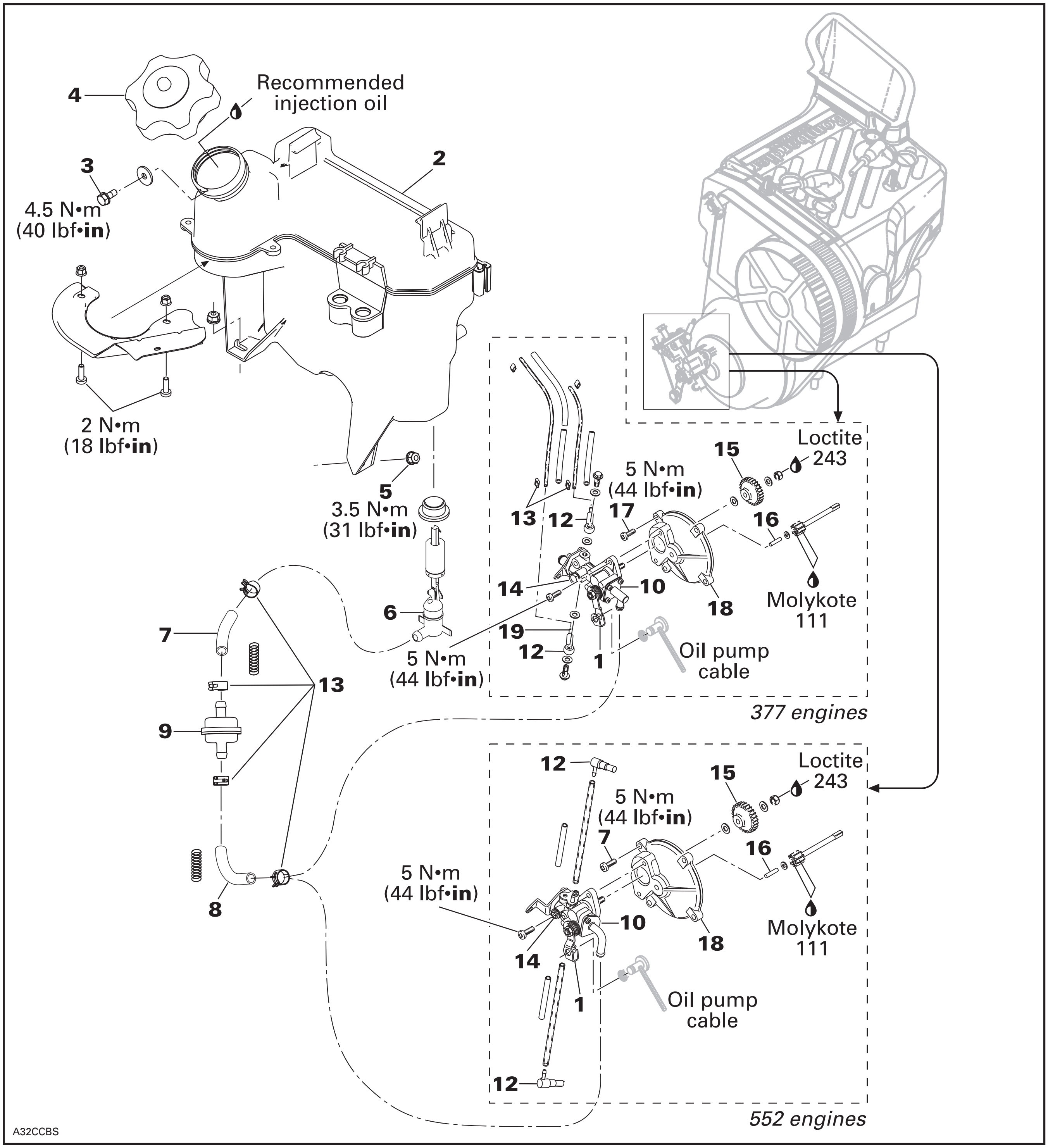
CAUTION: Do not use silicone «sealant», this product will corrode contacts. Do not apply silicone dielectric grease on any Deutsch waterproof housing otherwise housing seal will be damaged.

Ignition Timing

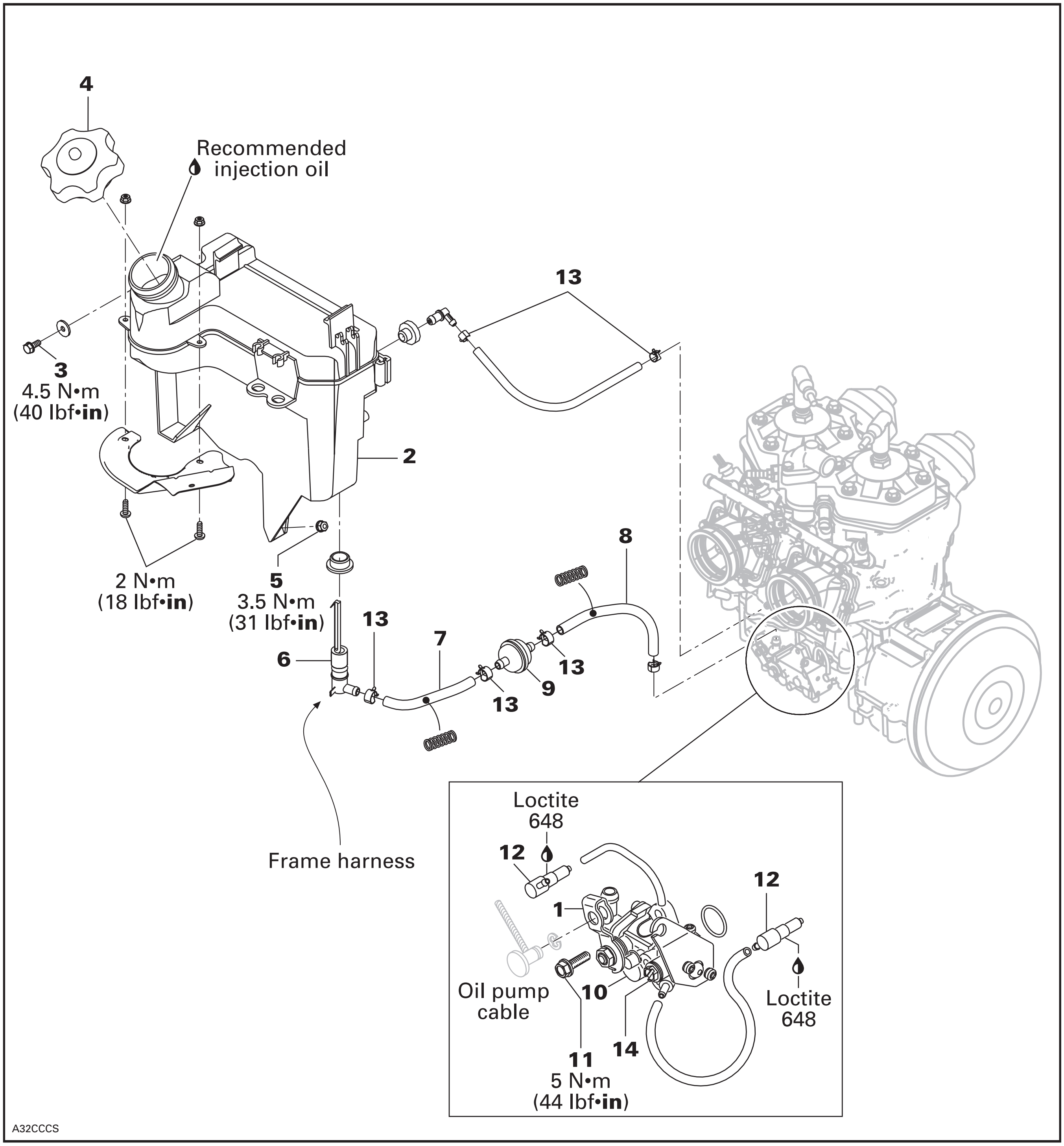
Check as described in IGNITION TIMING.

OIL INJECTION SYSTEM

377 and 552 Engines



593, 593 HO SDI, 693 and 793 SDI Engines



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 strickly 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.

⚠ WARNING

Wipe off any oil spills. Oil is highly flammable.

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

OIL TYPE

MODEL	OIL TYPE
2-TEC SDI	BOMBARDIER FORMULA XP-S II synthetic injection oil (1)
All others 2-stroke engines	BOMBARDIER FORMULA XP-S II synthetic injection oil OR BOMBARDIER injection oil (2) (3)

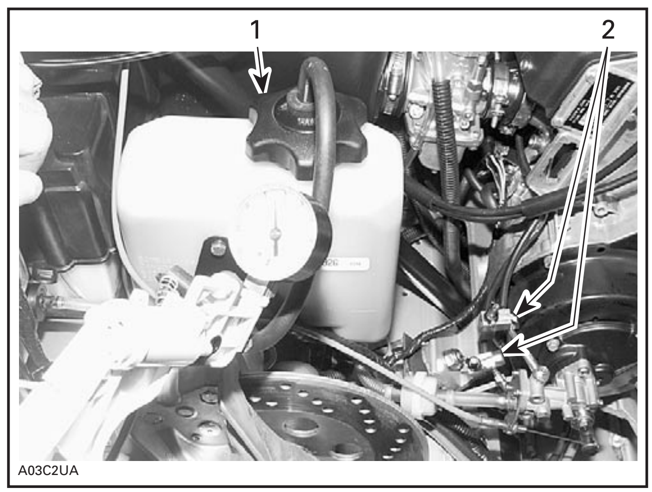
(1) **CAUTION: The BOMBARDIER Formula XP-S II synthetic injection oil is specially formulated and tested for the severe requirement of these engines. Use of any other brand two-stroke oil may void the limited warranty. Use only BOMBARDIER Formula XP-S II synthetic injection oil. There is no known equivalent on the market for the moment. If a high quality equivalent were available, it could be used.**
(2) If BOMBARDIER injection oil is not available, API TC high-quality low ash two-stroke injection oil may be used.
(3) BOMBARDIER FORMULA XP-S II synthetic injection oil and BOMBARDIER injection oil are compatible, they can be mixed together.

OIL SYSTEM LEAK TEST

The following test will indicate any leak from oil reservoir and all other component of oil system.

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

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



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

Connect leak testing kit pump to special cap.

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

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

NOTE: An oil pump shaft test must be done to complete the oil system leak test. Refer to LEAK TEST AND ENGINE DIMENSION MEASUREMENT for the procedure.

OIL PUMP IDENTIFICATION

Pump Lever

Different engines need different pumps. See identification on lever **no. 1**.

CAUTION: Always mount proper pump on engine.

ENGINE TYPE	OIL PUMP IDENTIFICATION
377	05
552	03
593 and 593 HO SDI	02
693	01
793 SDI	01

CLEANING

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

DISASSEMBLY

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

Injection Oil Reservoir

Empty injection oil reservoir **no. 2** by siphoning injection oil.

Remove:

– tuned pipe
– electronic module or fuse box
– upper screw **no. 3** (near reservoir cap **no. 4**)
– lower nut **no. 5**.

NOTE: Cut the ties retaining the wiring harness if necessary.

Injection Oil Level Switch

Before replacing the injection oil level switch **no. 6**, check it according to the following procedure:

– Remove tuned pipe.
– Disconnect switch connectors and place a jumper wire between them.
– If the oil light turns on, replace the switch.
– If the light stay off, check the light and the wiring harness.

To remove the switch, use the following procedure.

Remove tuned pipe.

Siphon injection oil reservoir.

Unplug switch connectors.

Pull oil level switch **no. 6** out of reservoir.

Injection Oil Filter

Remove tuned pipe.

Siphon injection oil reservoir.

Disconnect oil filter hose **no. 7** from the reservoir **no. 2**.

Remove air box and carburetor or throttle body.

Disconnect oil hoses **no. 7** and **no. 8** from the oil filter **no. 9** and remove it.

Injection Oil Pump

NOTE: Before removing the injection oil pump **no. 10**, check its operation. Refer to the end of this section.

377 and 552 Engines

Remove:

– air box
– carburetor
– pump mounting flange screws **no. 17**

Unplug all hoses connected to oil pump **no. 10**.

NOTE: Mark hose locations for installation.

Disconnect the oil pump cable.

593, 593 HO SDI, 693 and 793 SDI Engines

Remove:

– air box
– carburetor or throttle body
– screw **no. 11**.

Unplug all hoses connected to oil pump **no. 10**.

NOTE: Mark hose locations for installation.

Disconnect the oil pump cable.

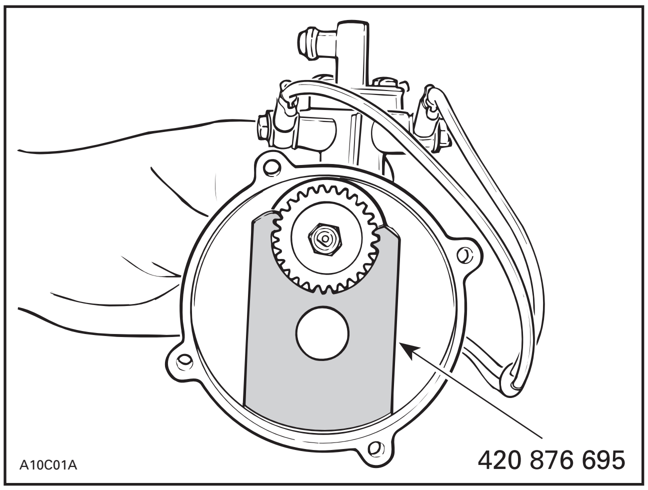
Oil Pump Gear

377 and 552 Engines

Remove the oil pump from engine.

To remove the gear retaining nut **no. 15**, first extract the needle roller **no. 16** with pliers then lock gear in place using the following gear holder.

ENGINE TYPE	TOOL P/N
377 and 552	420 876 695



TYPICAL

Separate the oil pump from the pump mounting flange **no. 18** by removing oil pump screws **no. 19**.

Check Valve

552, 593, 593 HO SDI, 693 and 793 SDI Engines

NOTE: Before removing check valve **no. 12**, check its operation. Refer to the end of this section.

Remove air box and carburetor or throttle body.

Clean check valve area to remove oil or dirt.

Heat check valve **no. 12** then pull it out of crankcase.

ASSEMBLY

NOTE: During installation, always check for spring clips **no. 13** tightness.

Injection Oil Reservoir

For installation, reverse the removal procedure.

Injection Oil Level Switch

For installation, reverse the removal procedure.

Injection Oil Filter

For installation, reverse the removal procedure.

NOTE: The filter must be installed with the arrow pointing toward the pump.

Injection Oil Pump

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

Torque the screws **no. 11** to 5 N•m (44 lbf•**in**).

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

Secure barrel with plastic washer and circlip.

Install cable lock washer on left side of support.

Verify cable and oil pump lever operation then adjust cable.

Oil Pump Gear

377 and 552 Engines

The installation is the reverse of removal procedure. However, pay attention to the following details.

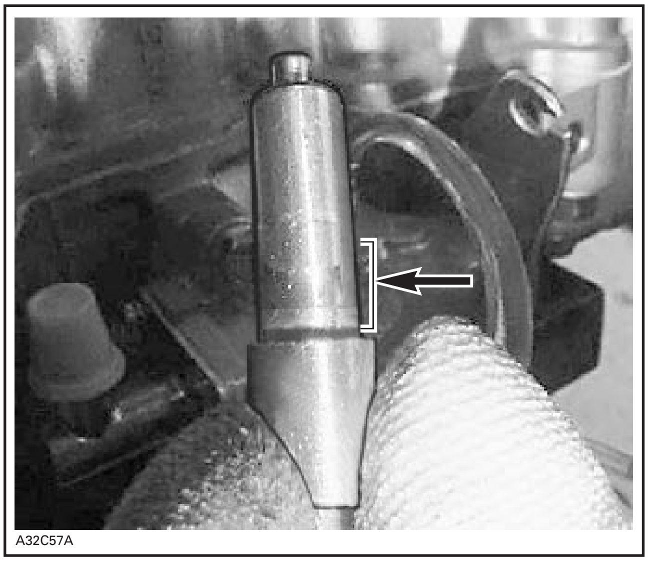
At gear assembly, apply a light coat of Molykote 111 (P/N 413 707 000) on gear teeth.

The needle roller **no. 16** must be engaged as deep as possible in the pump mounting flange.

Check Valve

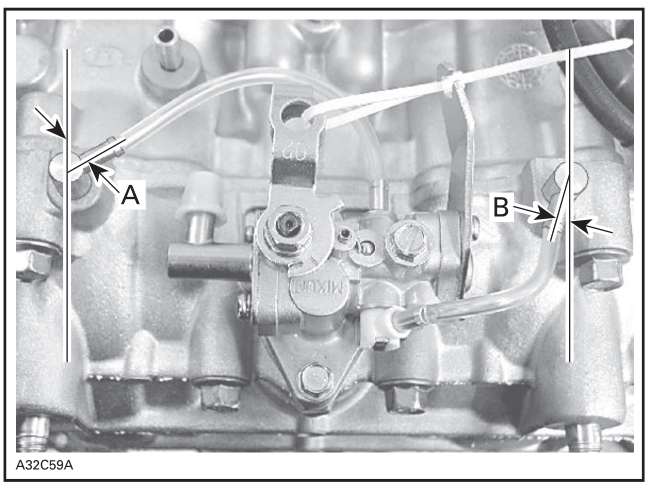
Apply Loctite 648 (green) (P/N 413 711 400) on the outer diameter of the check valve (machined section). Take care that Loctite is ONLY in this area.

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



APPLY LOCTITE ON THIS AREA ONLY

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



TYPICAL — POSITION FOR LIQUID COOLED ENGINES
A. PTO side 45° ± 5° from cylinder axis to the top
B. MAG side 20° ± 5° from cylinder axis to the bottom

Punch in the check valve carefully with a plastic hammer.

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

ADJUSTMENT

Oil Pump Cable

377 and 552 Engines

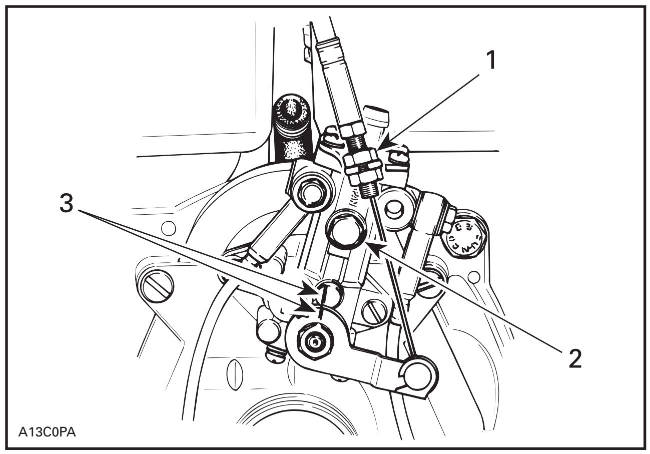
Prior to adjusting the pump, make sure all carburetor adjustments are completed and engine is stopped.

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

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

Loosen the adjuster nut and adjust accordingly.

Retighten the adjuster nut.



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

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

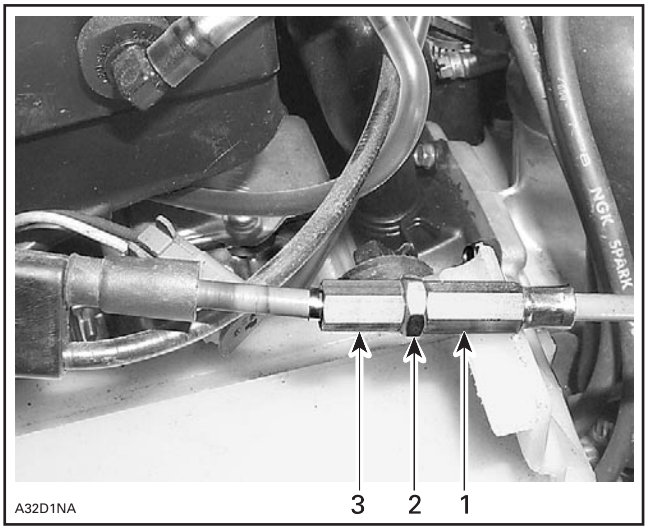
593, 593 HO SDI, 693 and 793 SDI Engines

Prior to adjusting the pump, make sure throttle cable adjustment is completed and engine is stopped.

Stretch the adjusting cable through a maximum force of 34 N (7.6 lbf).

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

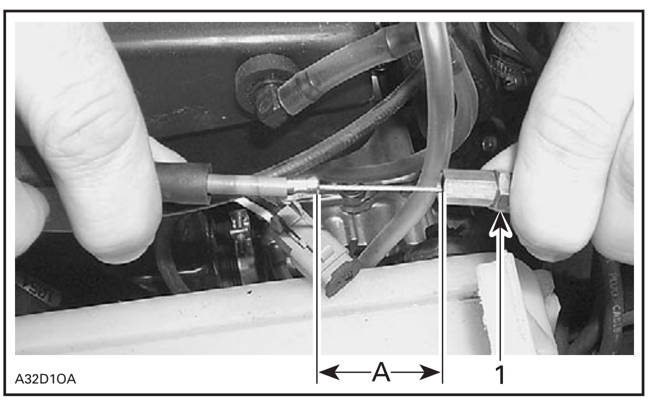
Check the visible distance of the stretched cable, while one person is stretching it and other checking the distance.



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

Refer to the following table to know the visible stretched distance of the cable .

MODELS	VISIBLE STRETCHED DISTANCE
593, 593 HO SDI and 693	18 ± 0.3 mm (0.71 ± 0.12 in)
793 SDI	19.5 ± 0.3 mm (0.77 ± 0.12 in)



TYPICAL
1. Lock nut
A. Visible stretched distance

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

To Bleed Oil Lines

Bleed main oil line (between reservoir and pump) by loosening the bleeder screw **no. 14** until air has escaped from the line. Add injection oil as required.

Reinstall all parts.

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

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

⚠ WARNING

No ensure not operate carburetor throttle mechanism. Secure the rear of the vehicle on a stand.

CHECKING OPERATION

Oil Pump

On Vehicle

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

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

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

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

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

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

Test Bench

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

Check Valve

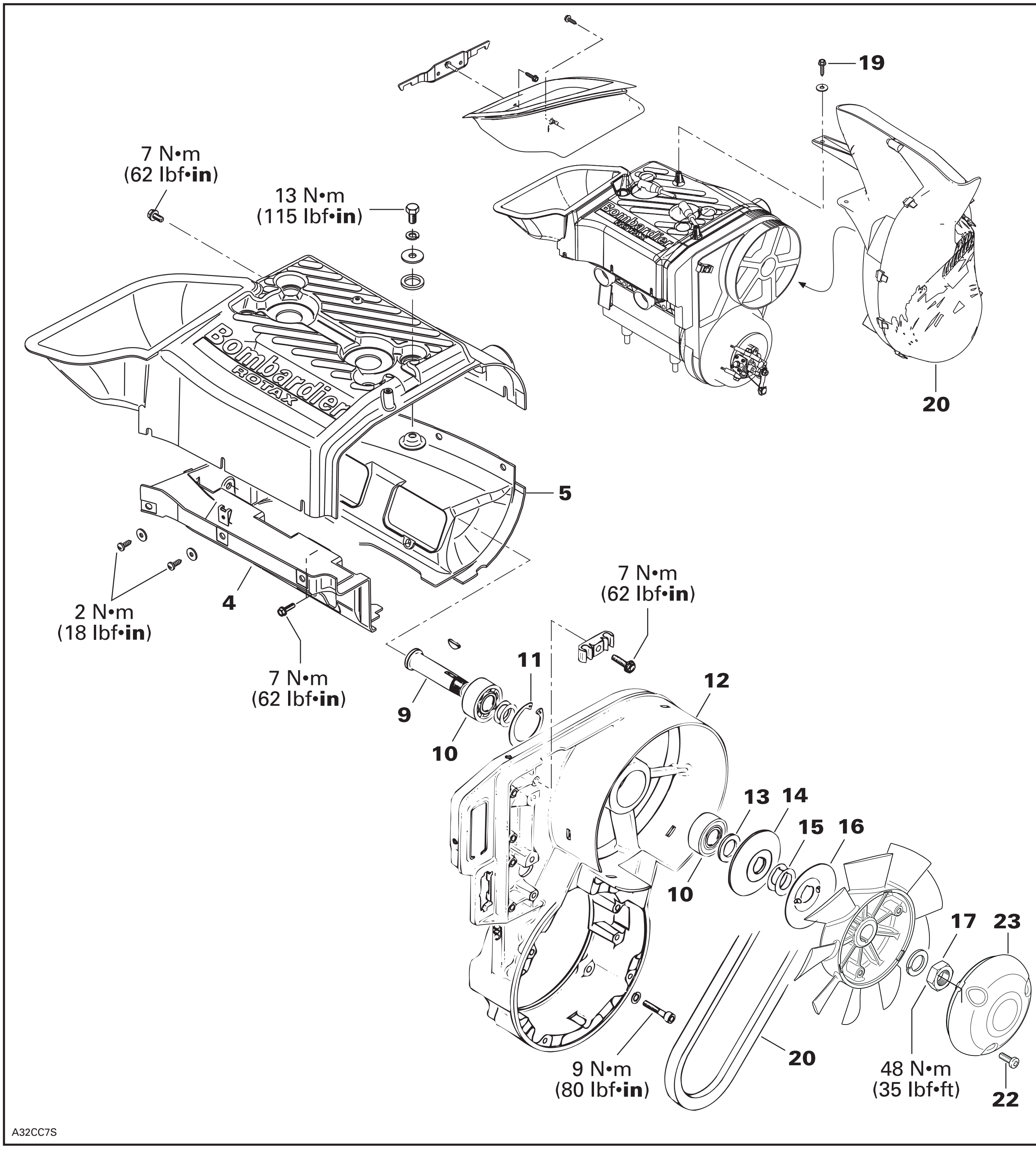
For all engines, check valve is part (built-in) of injection nozzle.

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

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

AXIAL FAN COOLING SYSTEM

377 and 552 Engines



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

REMOVAL

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

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

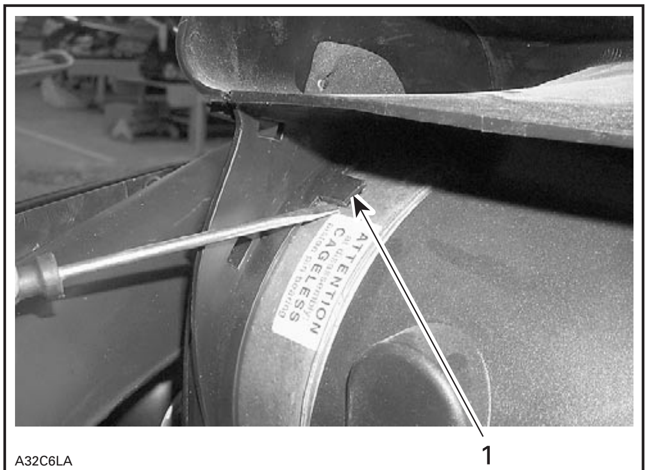
CLEANING

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

DISASSEMBLY AND ASSEMBLY

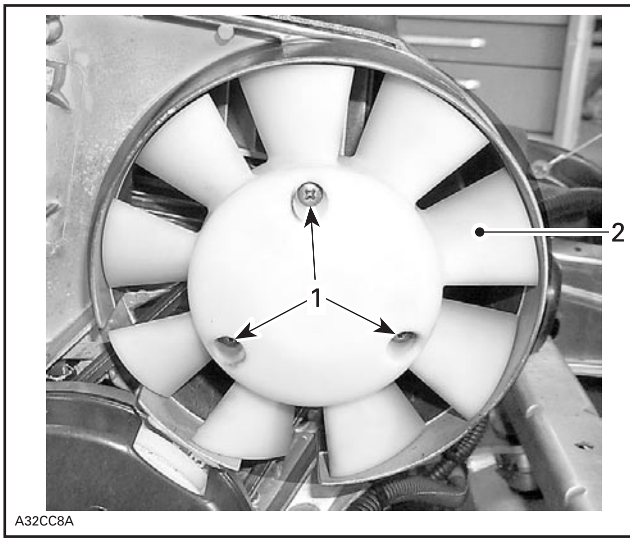
Remove the tuned pipe to gain access.

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



1. *Tab*

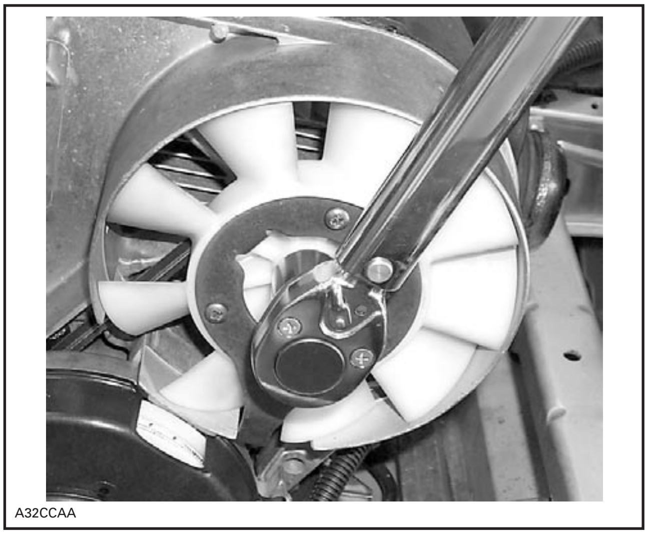
Unscrew the screws **no. 22** to remove the fan cover **no. 23**.



1. *Screws*
2. *Cover*

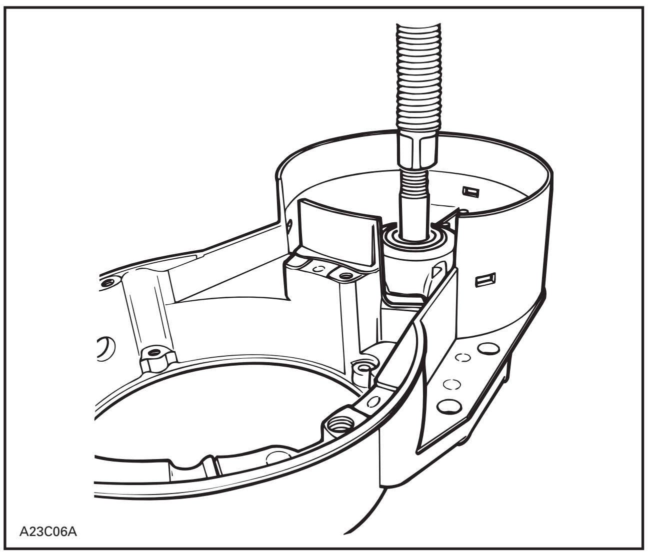
To remove or install fan pulley retaining nut **no. 17**, lock fan pulley with special holder wrench (P/N 420 876 357) and 3 screws.

At assembly, torque nut to 48 N•m (35 lbf•ft).

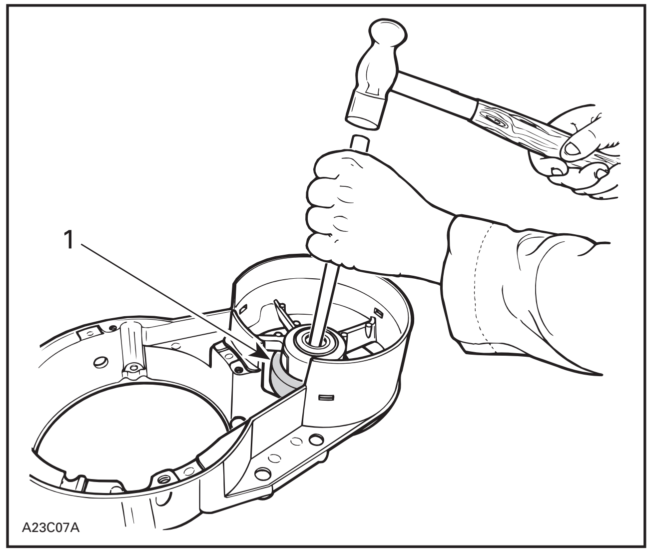


TYPICAL

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



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



1. Ring supporting fan housing

Remove circlip **no. 11** then remaining bearing.

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

INSTALLATION

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

A gasket must be placed on both sides (inner and outer) of intake and exhaust holes of cylinder cowl **no. 4** and **no. 5**.

Reinstall fan protector **no. 18** properly.

⚠ WARNING

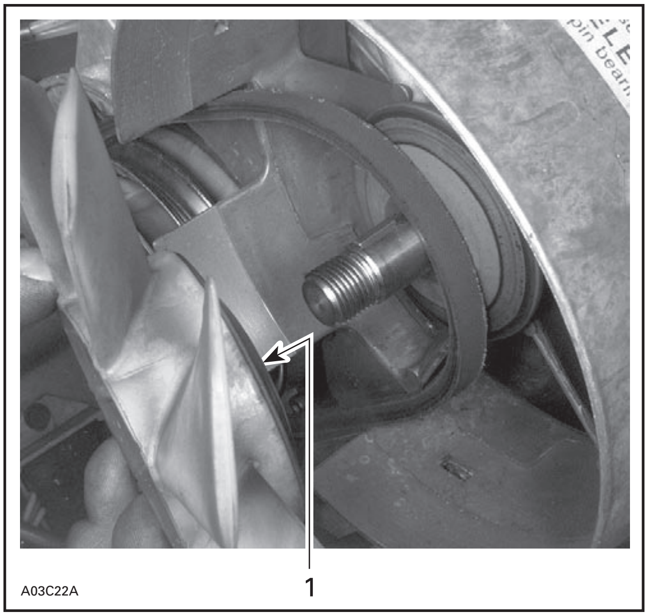
Always reinstall fan protector after servicing.

FAN BELT REPLACEMENT AND DEFLECTION ADJUSTMENT

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

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

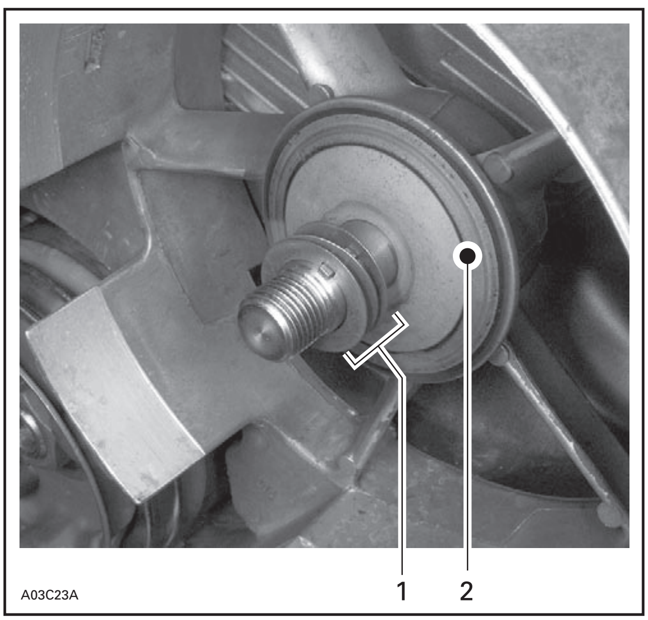
Remove fan with pulley half.



1. Remove fan with pulley half

Remove fan belt.

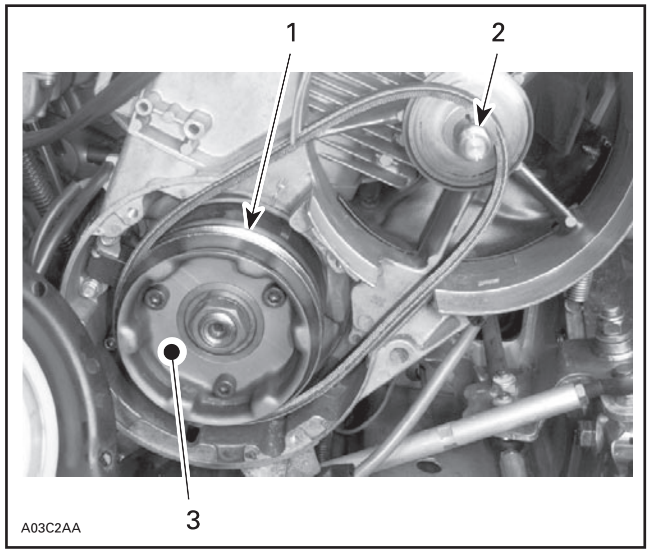
Leave shims and second half pulley in place. Refer to the following photo.



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

Reassembly

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



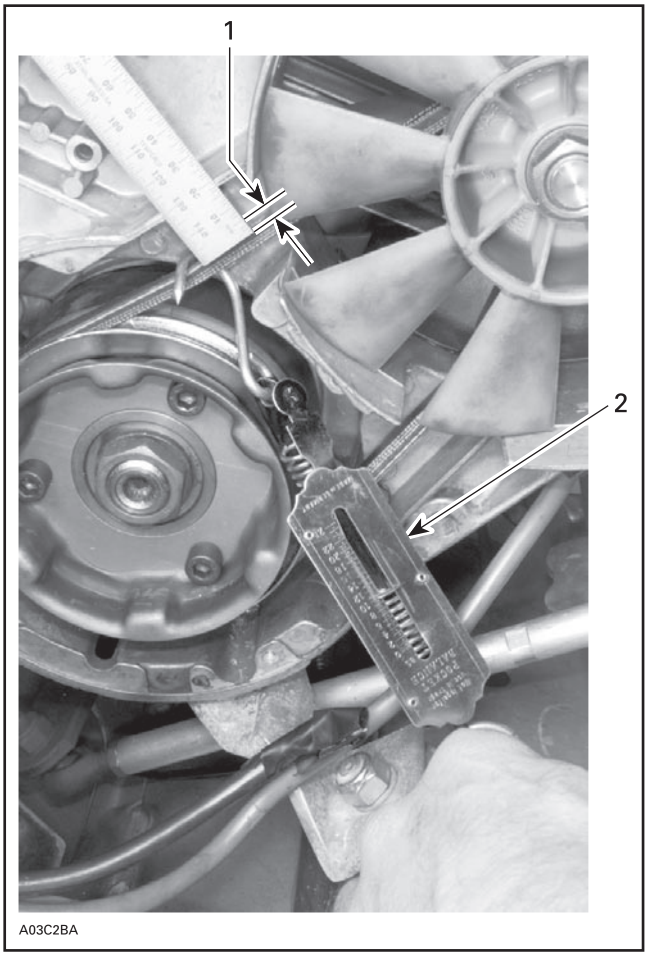
FAN BELT PROPERLY INSTALLED ON BOTTOM PULLEY AND FAN SHAFT
1. Bottom pulley
2. Fan shaft
3. Starting pulley

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

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

Fan Belt Deflection Adjustment

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

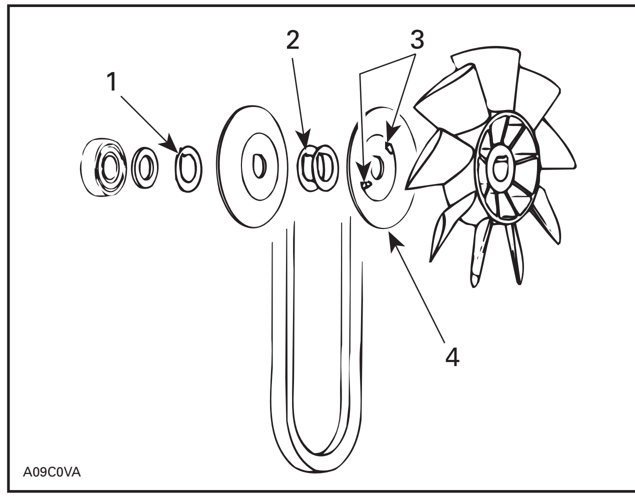


TYPICAL
1. Measure deflection here
2. Fish scale

Belt deflection must be according to the following specifications:

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

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



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

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

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

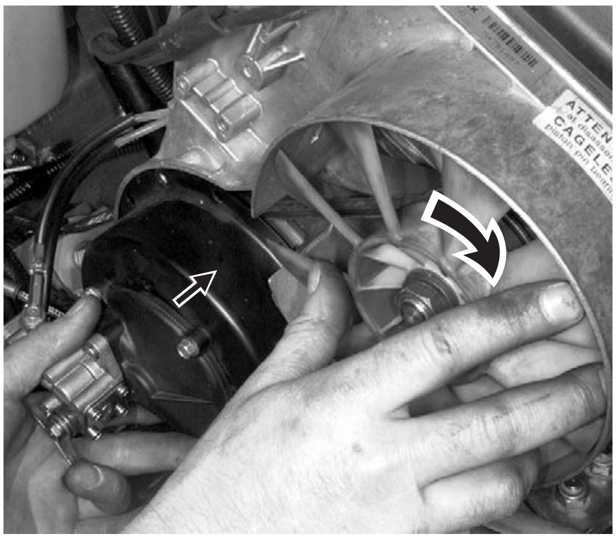
NOTE: Apply Loctite 243 (blue) on fan nut threads.

TYPICAL — TORQUE FAN NUT USING HOLDER WRENCH

Finalizing Reassembly

Reinstall rewind starter.

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



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TURN FAN TO SLIDE OIL PUMP SHAFT IN PLACE

Secure rewind starter with original screws.

Reinstall fan protector **no. 18** properly.

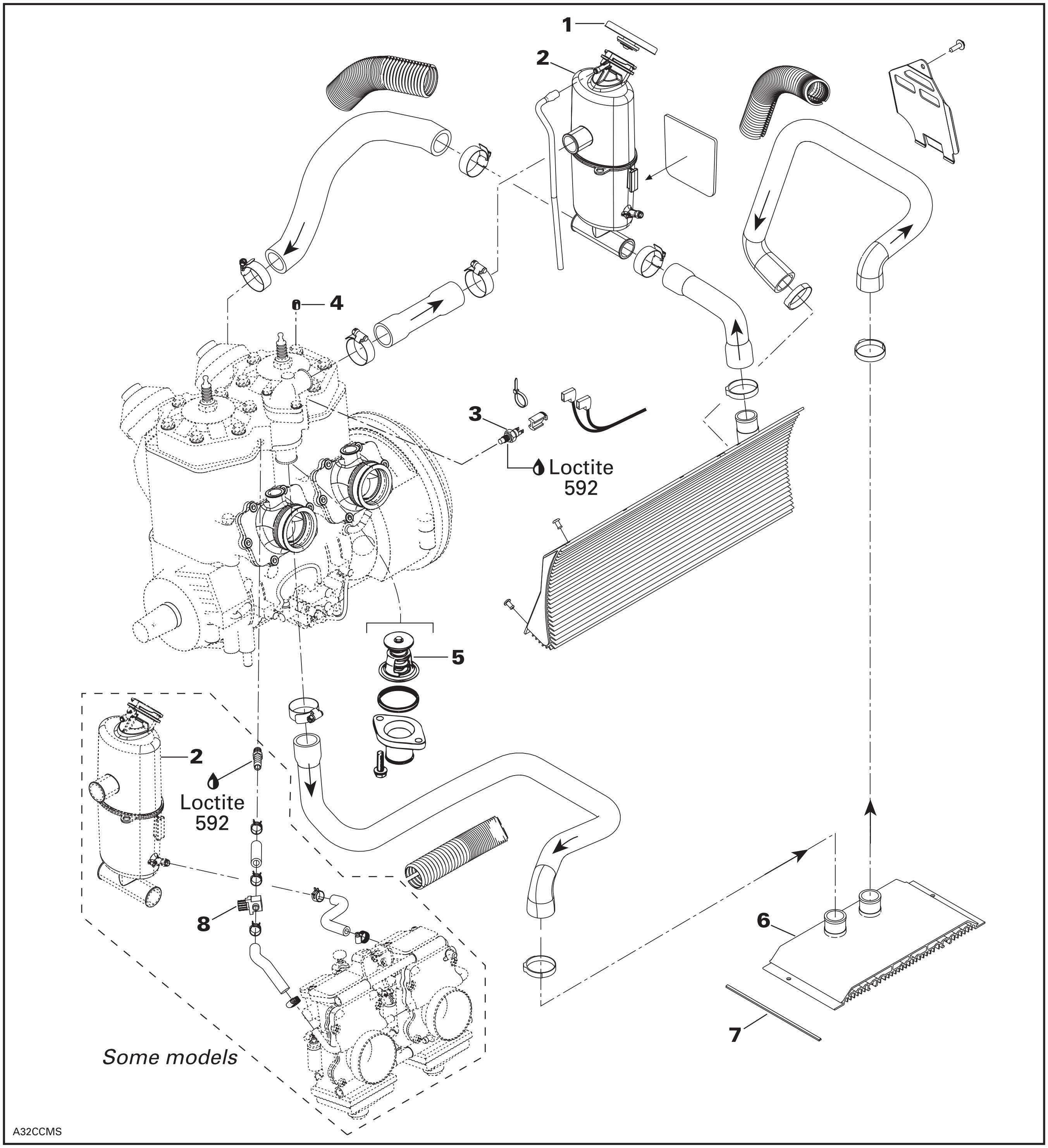
Install the air inlet duct **no. 20** with screws **no. 19** and Loctite Black Max 380.

⚠ WARNING
Always reinstall fan protector after servicing.

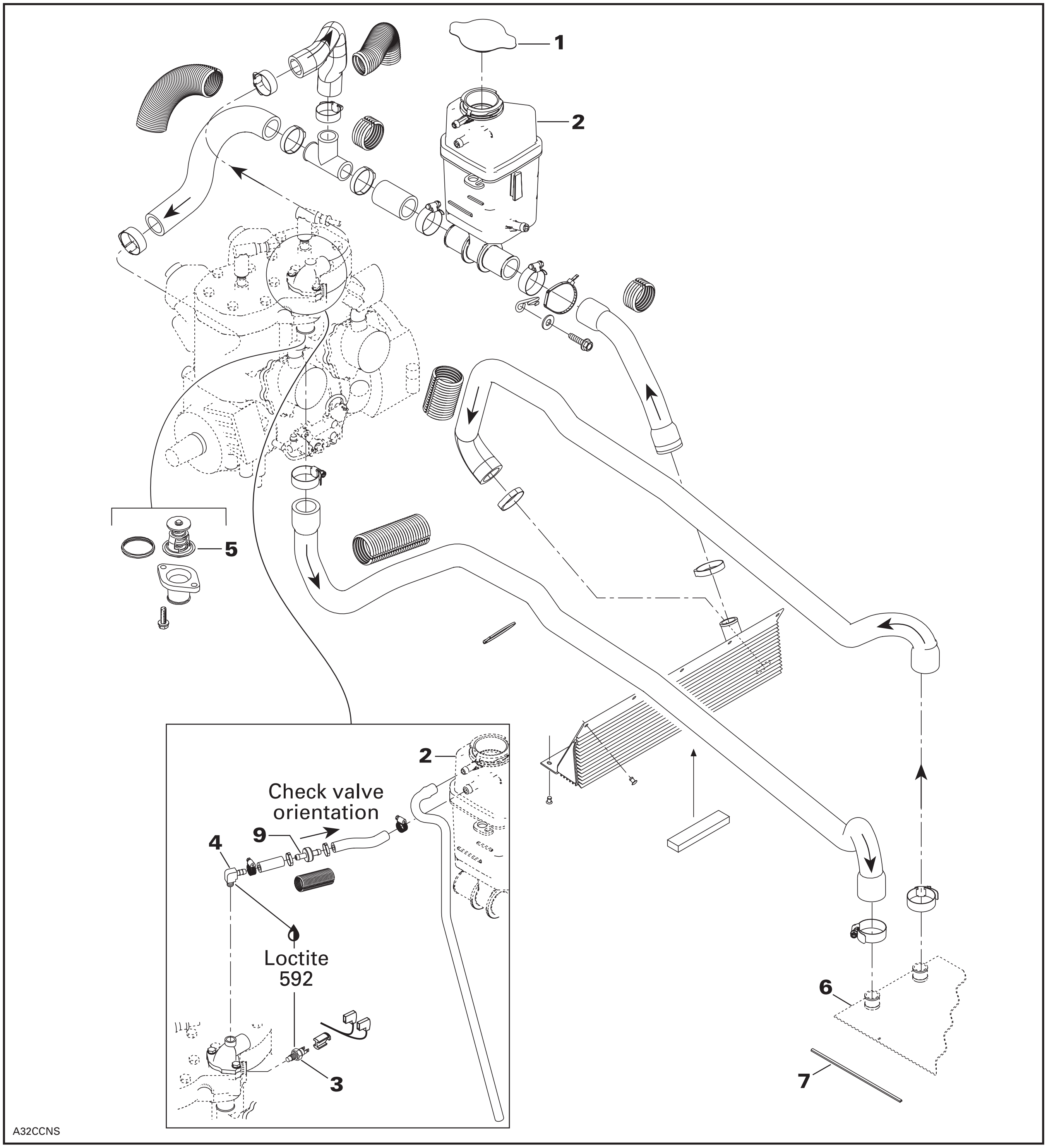
Reinstall muffler.

LIQUID COOLING SYSTEM

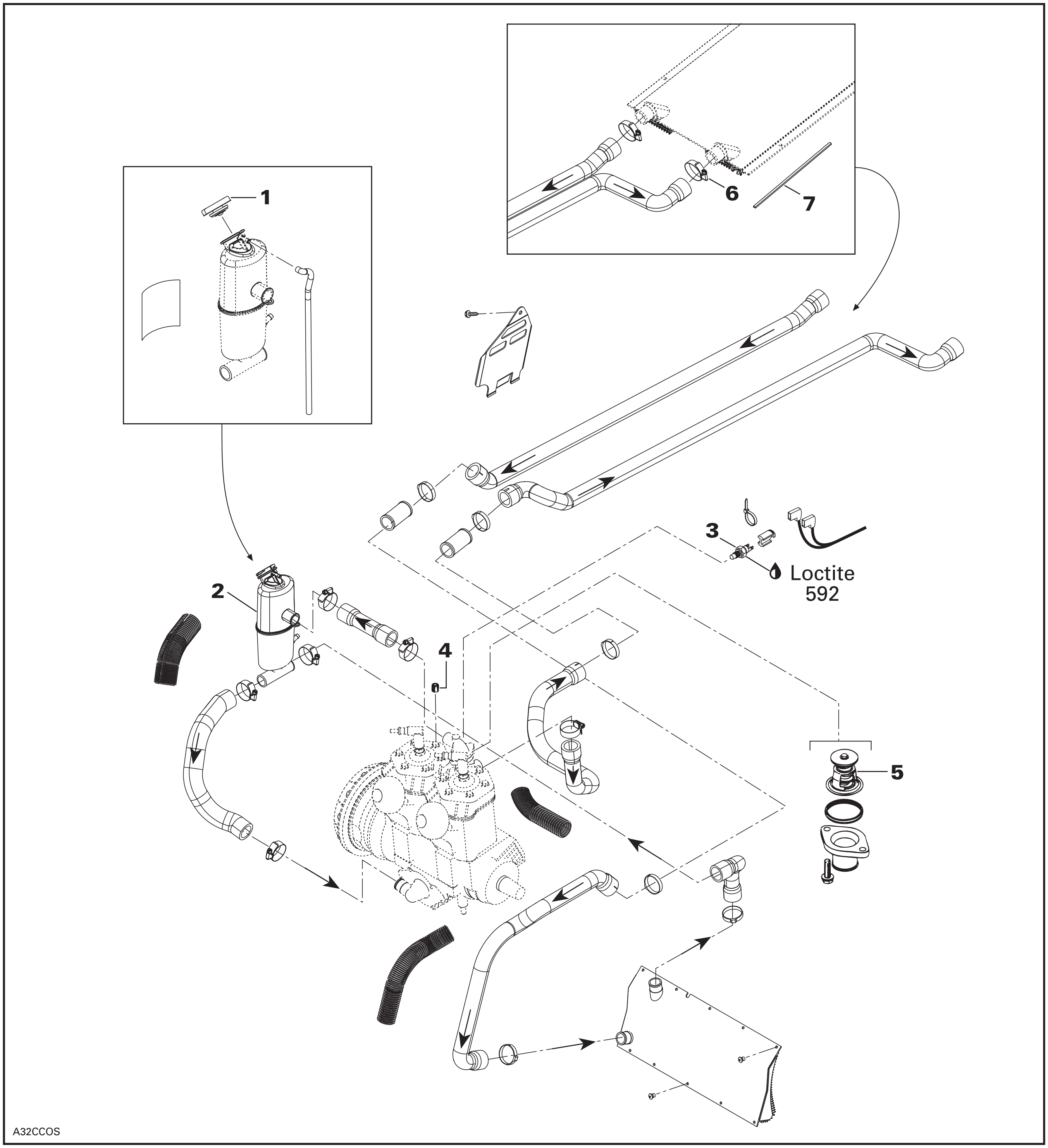
GSX Series



Legend Series



Summit Series



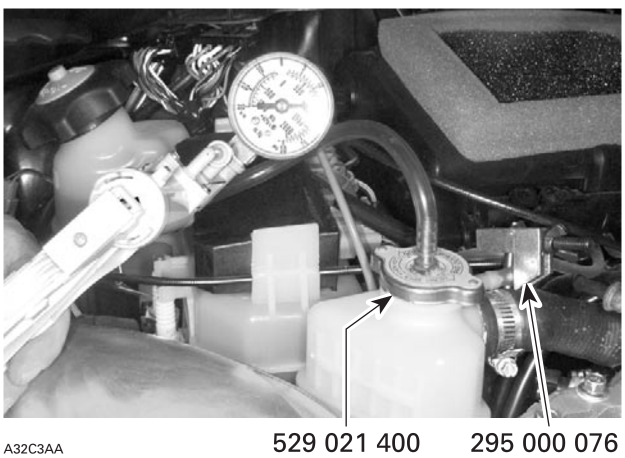
COOLING SYSTEM LEAK TEST

⚠ WARNING

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

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

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



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INSPECTION

Check general condition of hoses and clamp tightness.

DRAINING THE SYSTEM

⚠ WARNING

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

To drain the cooling system, siphon the coolant mixture from the coolant tank **no. 2** using the siphon tool (P/N 529 035 880). Disconnect hose at water pump to drain coolant from engine.

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

DISASSEMBLY AND ASSEMBLY

Coolant Pump

Refer to BOTTOM END section.

Sender and Plug or Elbow

Apply Loctite 592 (P/N 293 800 018) thread sealant on sender **no. 3** and plug or elbow **no. 4** to avoid leaks.

Pressure Cap

Check if the cap **no. 1** pressurizes the system for 3 minutes. If not, install a new 90 kPa (13 PSI) cap (do not exceed this pressure).

Coolant Tank

For removal, drain cooling system before removing coolant tank **no. 2**.

Remove all hoses from coolant tank.

Slide down the coolant tank to disengage it from oil tank.

Check if the tank is cracked or melted. Replace if necessary.

For installation, reverse the removal procedure.

NOTE: It may be necessary to move oil tank for an easier installation of coolant tank.

Check Valve

For removal, drain cooling system.

Remove air intake silencer.

Unclip both ends of check valve **no. 9** then separate check valve from hoses.

For installation, blow into the check valve to know the flow direction. Install the check valve so that flow direction goes from engine towards coolant tank.

Refill the cooling system. See further in this section for the procedure.

Front Radiator

Remove all debris between radiator fins. A clean radiator is more efficient than a dirty one.

Check if the radiator fins are damaged. Replace the front radiator if necessary.

NOTE: A radiator with many broken fins does not work properly.

For disassembly, drain cooling system.

Remove rear suspension (refer to REAR SUSPENSION).

Using Supertanium™ bit (P/N 529 031 800), drill all rivets retaining front radiator to the frame or grind the rivets with a grinding disk.

Pull the radiator a little and remove the Oetiker clamps.

For installation, reverse the removal procedure.

Rear Radiator and Rear Radiator Protector

Refer to FRAME for rear radiator removal/installation procedures.

For cleaning and inspection refer to FRONT RADIATOR.

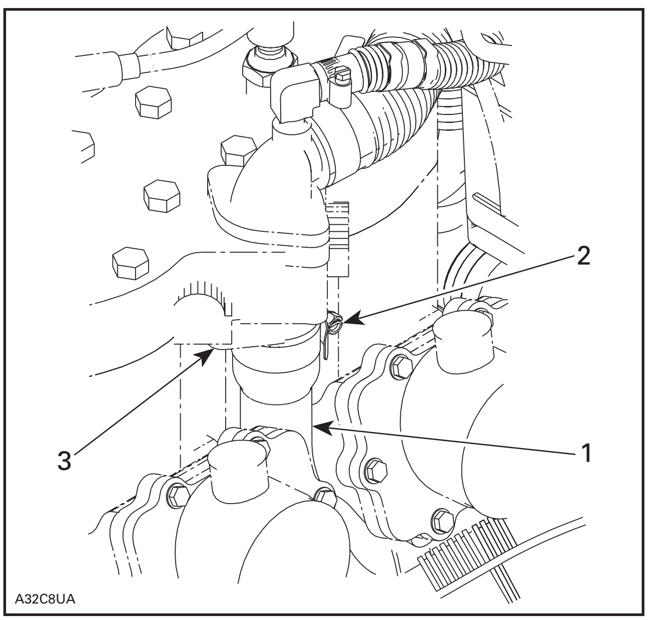
Radiator and Radiator Protector

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

Thermostat

For disassembly, drain the cooling system (see above).

Unscrew clamp retaining hose to the water outlet socket.



1. *Hose*
2. *Clamp*
3. *Water outlet socket*

Remove:
– water outlet
– socket screws
– gasket thermostat.

To check thermostat, put in water and heat water. Thermostat should start to open when water temperature reaches the following degree.

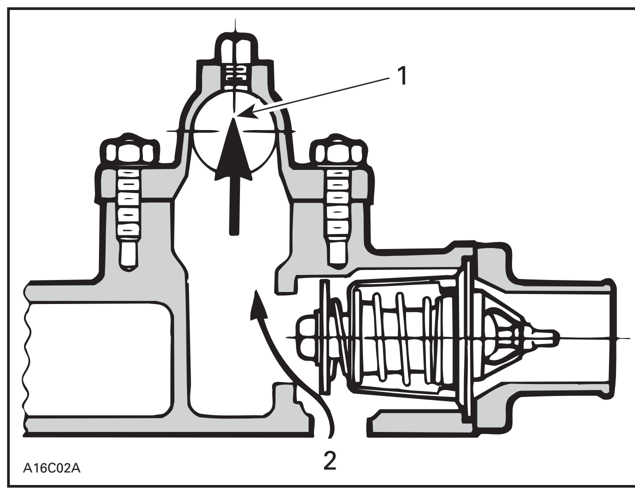
To check thermostat, put in water and heat water. Thermostat should start to open when water temperature reaches the following degree.

ENGINE	TEMPERATURE
All	42°C (108°F)

It will be almost fully open at 50°C (122°F).

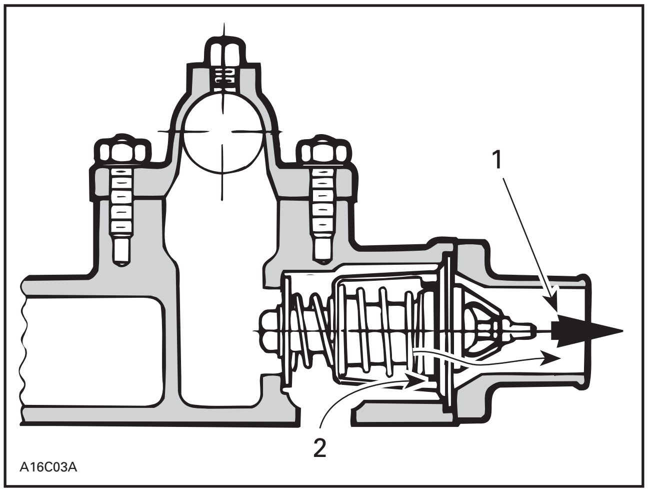
Thermostat is a double action type.

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



TYPICAL — CLOSED THERMOSTAT, COLD ENGINE
1. *To reservoir*
2. *From cylinders*

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



TYPICAL — OPEN THERMOSTAT, WARM ENGINE
1. To radiators
2. From cylinders

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

For installation, reverse the removal procedure.

COOLING SYSTEM REFILLING PROCEDURE

CAUTION: To prevent rust formation or freezing condition, always replenish the system with the Bombardier premixed coolant or with 50% antifreeze and 50% water. Pure antifreeze without water freezes (like slush ice). Always use ethylene glycol antifreeze containing corrosion inhibitors specifically recommended for aluminum engines.

System Capacity

Refer to TECHNICAL DATA.

Refilling Procedure

IMPORTANT: USE THE 50/50 PREMIXED COOLANT - 37°C (- 35°F) (P/N 293 600 038). Do not reinstall pressure cap.

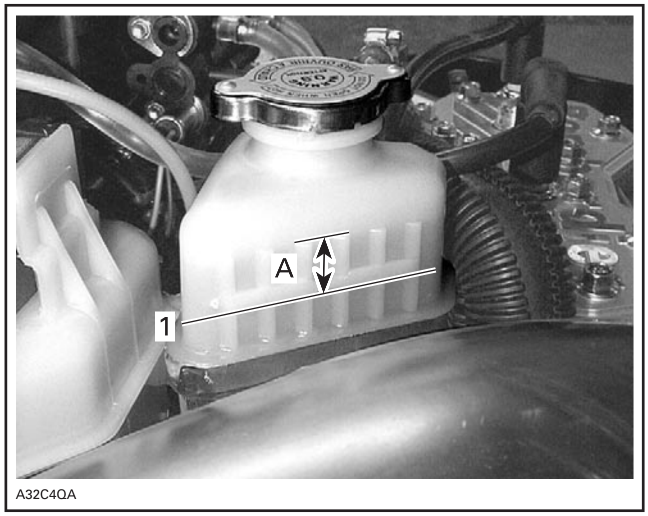
With engine cold, refill coolant tank up to COLD LEVEL line. Start engine. Refill up to line while engine is idling until rear radiators are warm to the touch (about 4 to 5 minutes). Always monitor coolant level while filling tank to avoid emptying. Install pressure cap.

Lift rear of vehicle and support it safely.

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

Apply the brake.

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



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

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

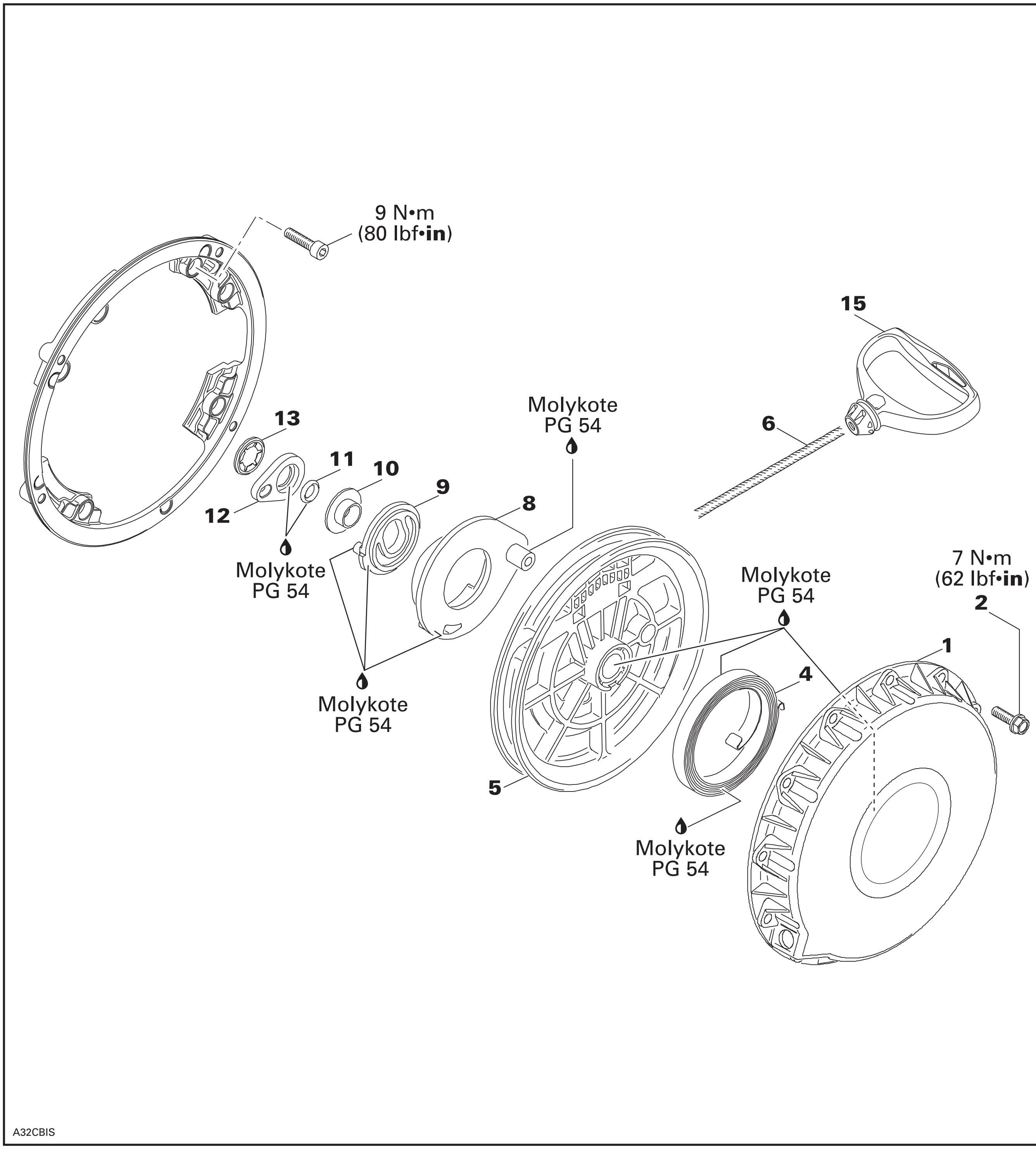
Put vehicle back on ground and add coolant up to 15 mm (1/2 in) over COLD LEVEL line.

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

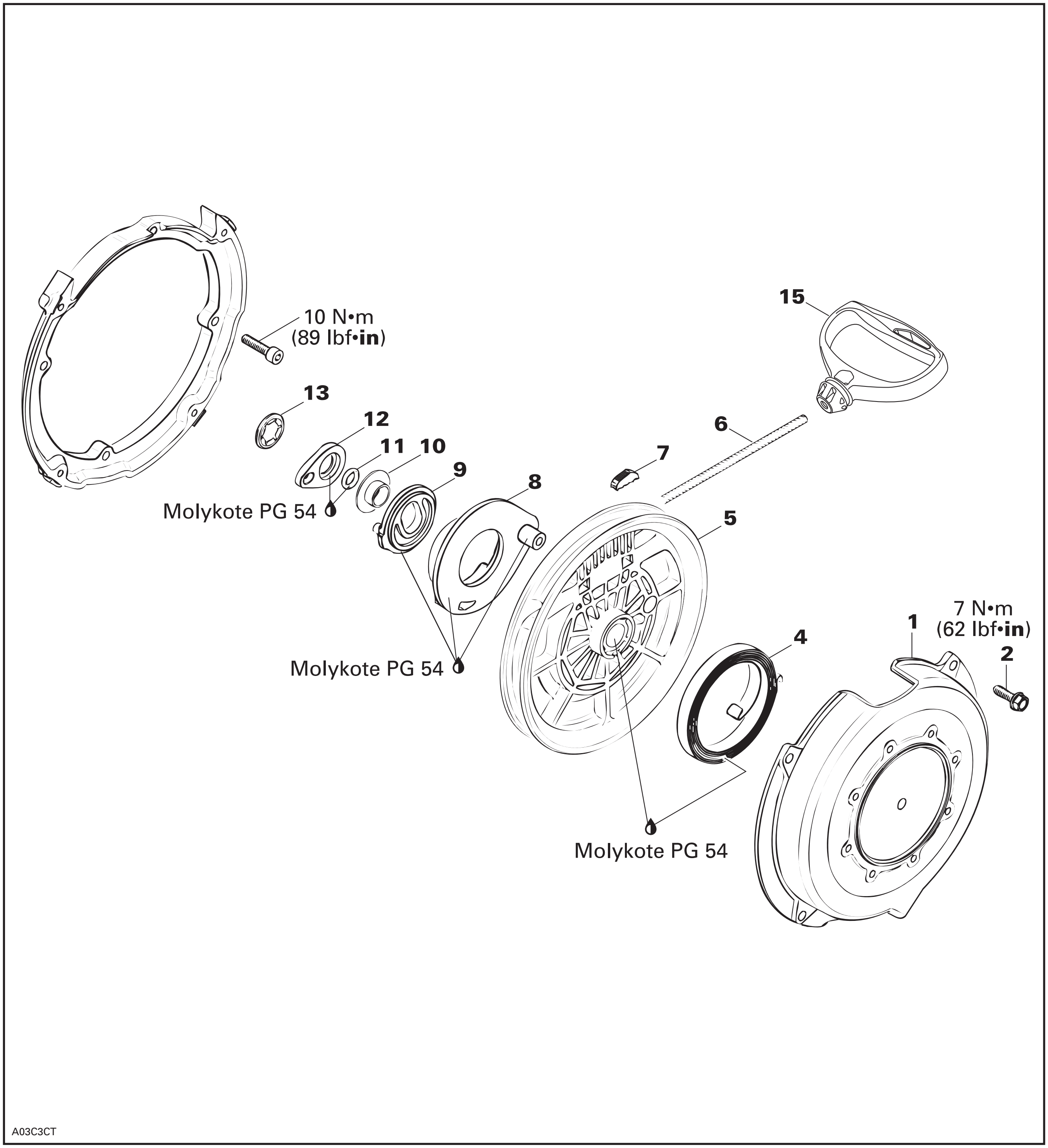
Check for coolant mixture freezing point. Specification is - 37°C (- 35°F). Adjust as necessary.

REWIND STARTER

Plastic Rewind Starter on ZX Liquid Cooled Models



Plastic Rewind Starter on ZX Fan Cooled Models



INSPECTION

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

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

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

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

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

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

REMOVAL

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

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

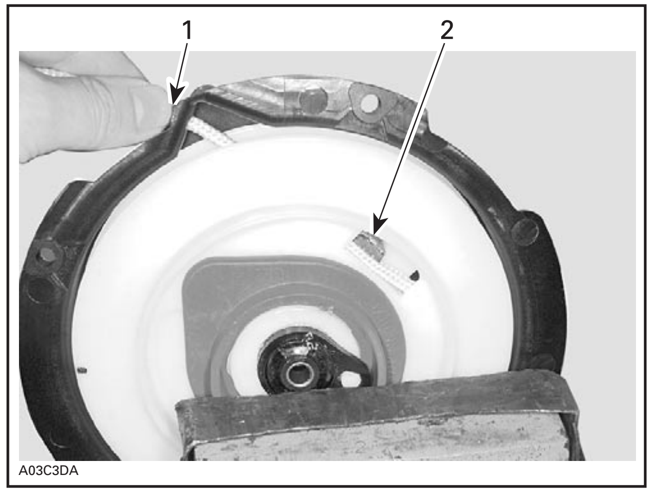
Fan Cooled Models Only

Remove pump from rewind starter cover.

ROPE REPLACEMENT

Fan Cooled Models Only

Completely pull out rope. Hold rewind starter in a vise.



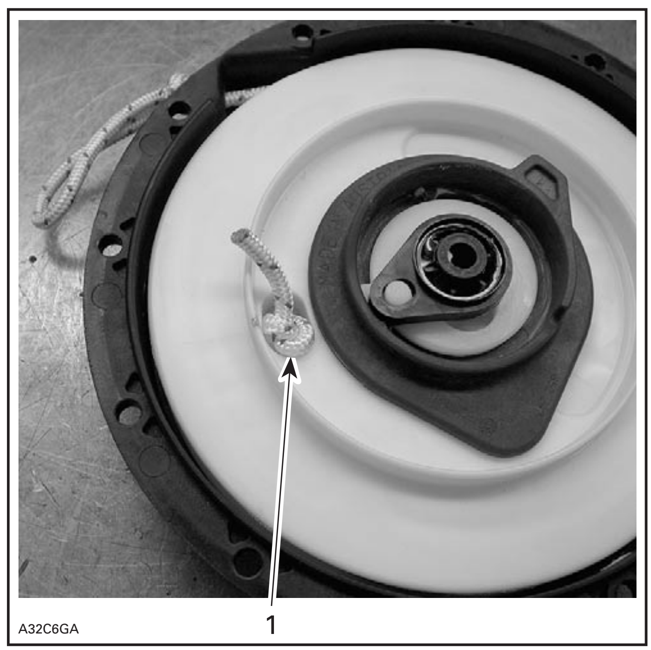
1. Rope exit hole
2. Key to be removed

With a long thin pin punch inserted through rope exit hole, push key **no. 7**. Remove key and rope. Install a new rope and lock it using key **no. 7**.

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

Liquid Cooled Models Only

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



1. Knot to be untied.

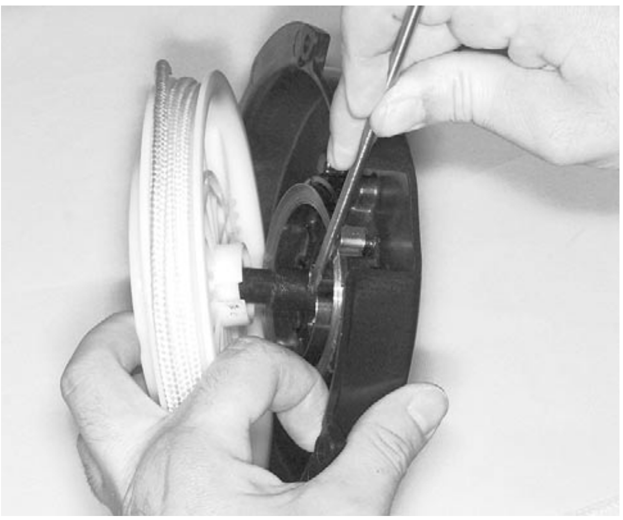
NOTE: When rope is completely pulled out, spring preload is 4-1/2 turns.

DISASSEMBLY

Undo knot previously tied at removal. Carefully let sheave unwind to release spring preload.

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

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



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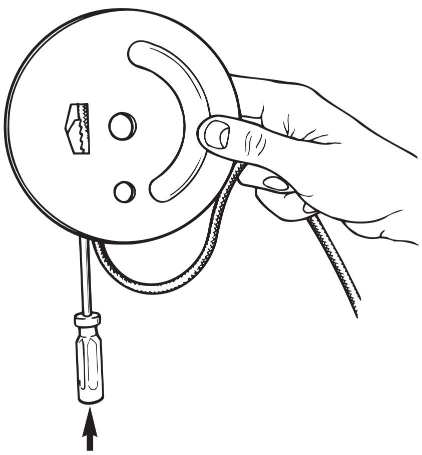
Take out knot and then pull out rope **no. 6**.

Fan Cooled Models Only

Disengage key no. 7 and pull out rope **no. 6**.



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GENTLY TAP ON KEY

ASSEMBLY

At assembly, position spring **no. 4** outer end into spring guide notch then wind the spring counterclockwise into guide.

⚠ WARNING

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

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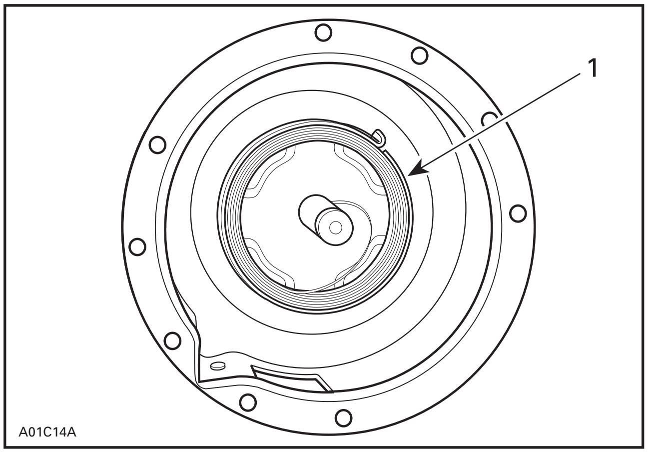
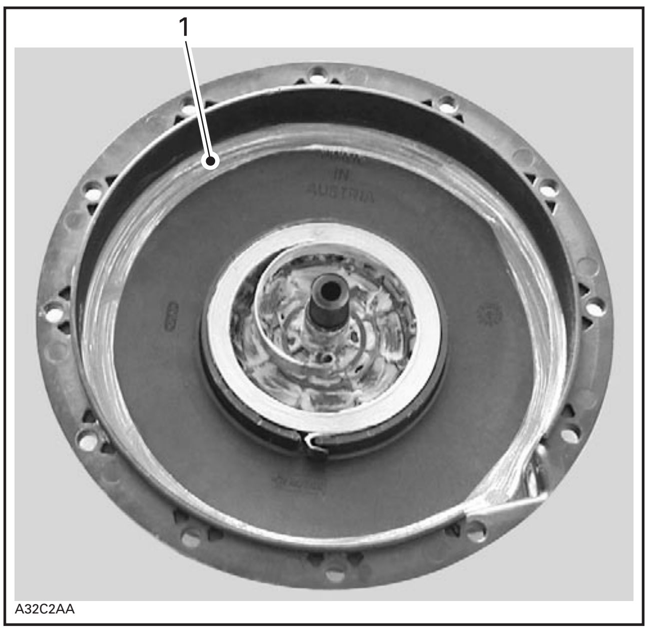
TYPICAL
1. Outer end into guide notch

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

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



TYPICAL
1. Molykote PG 54 inside spring guide

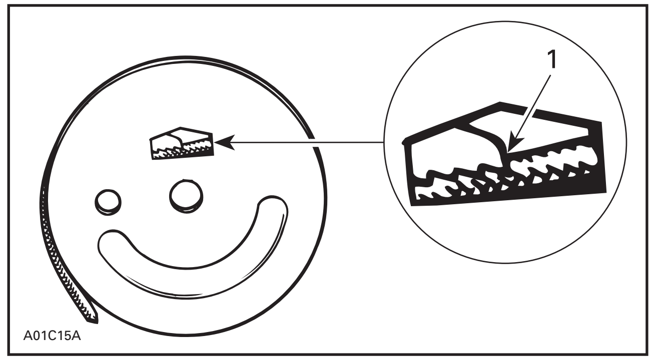


1. Molykote PG 54 applied 1 cm (1/2 in) wide on bottom of housing

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

Fan Cooled Models Only

To install rope **no. 6**, insert rope into sheave **no. 5** orifice and lock it with the key **no. 7** as illustrated.

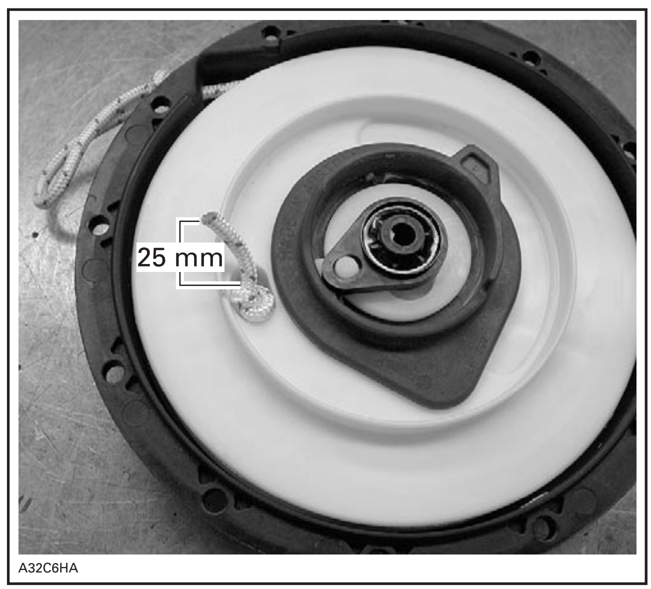


1. Push to lock

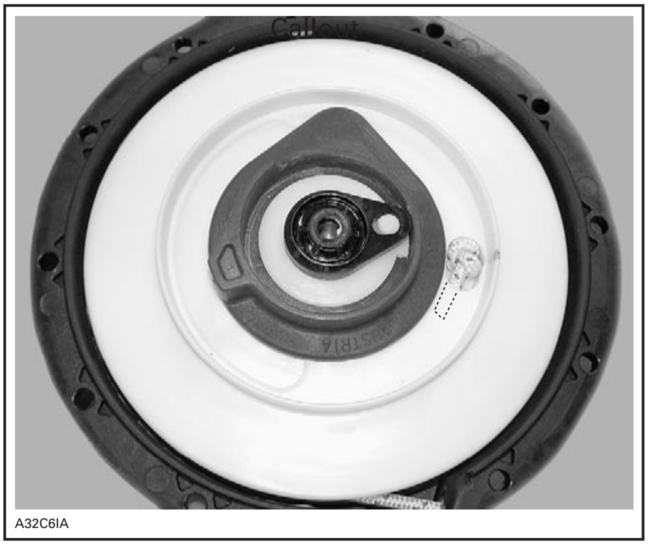
Lubricate housing post with Molykote PG 54. Install sheave.

Liquid Cooled Models Only

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



FREE PORTION



FREE PORTION INSERTED INTO SHEAVE

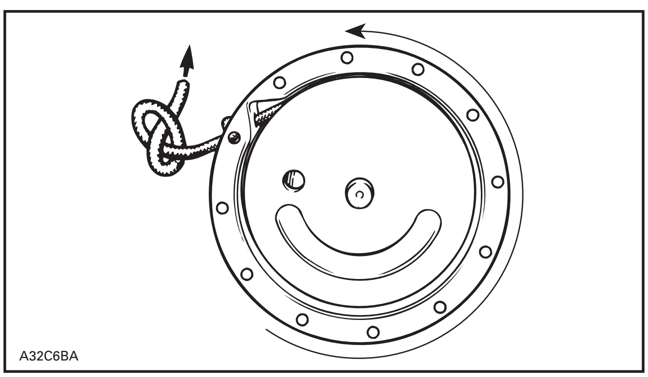
Lubricate housing post with Molykote PG 54. Install sheave.

To Adjust Rope Tension

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

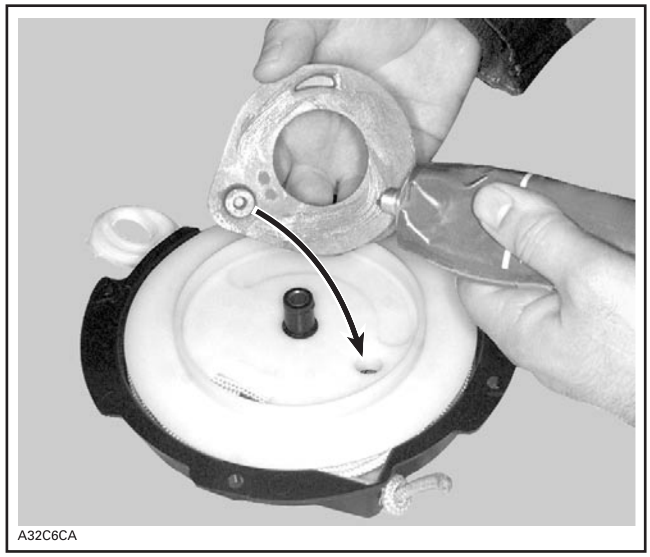
Rotate the sheave counterclockwise until rope end is accessible through rope exit hole. This will give 1/2 turn of preload.

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

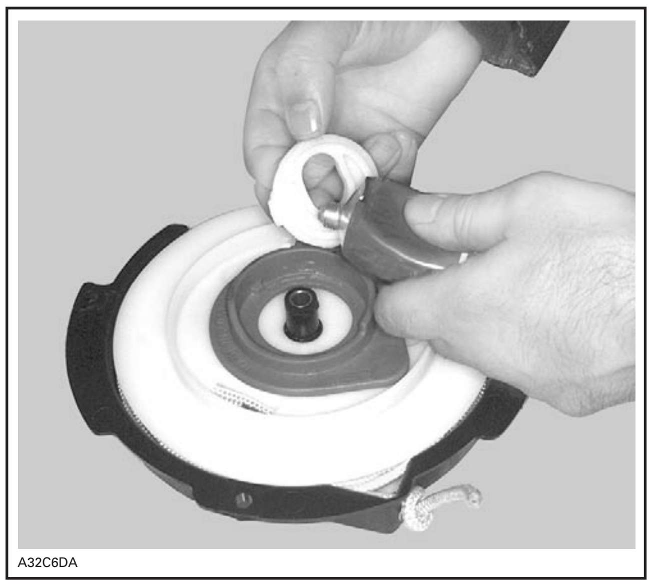


TYPICAL

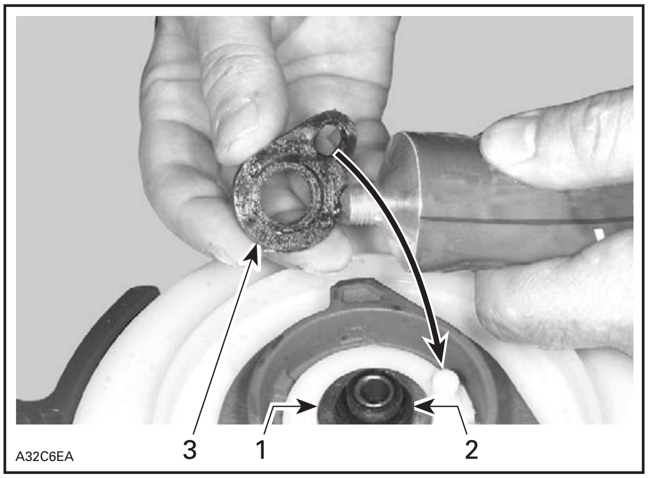
Lubricate pawl **no. 8** with Molykote PG 54 (P/N 420 899 763) then install over rope sheave.



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



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



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

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

INSTALLATION

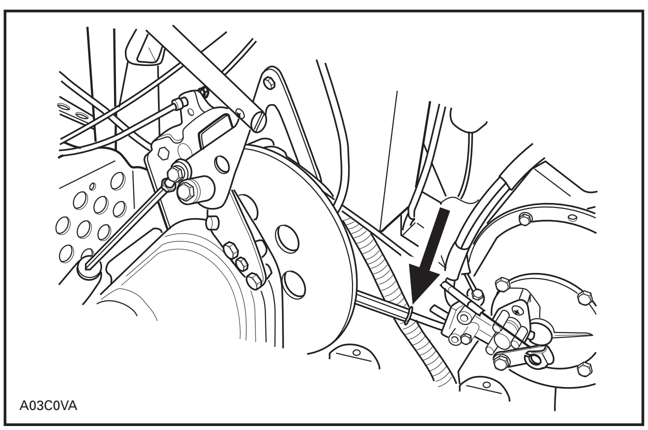
Fuse rope end with a lit match.

Fan Cooled Engines Only

Reinstall oil pump on rewind starter assembly.

All Models

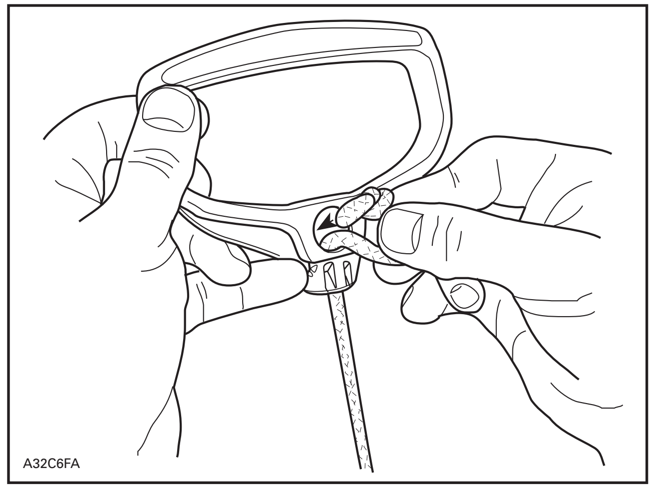
Thread starter rope **no. 6** through rope guide when applicable.



TYPICAL

Reinstall rewind starter assembly on engine.

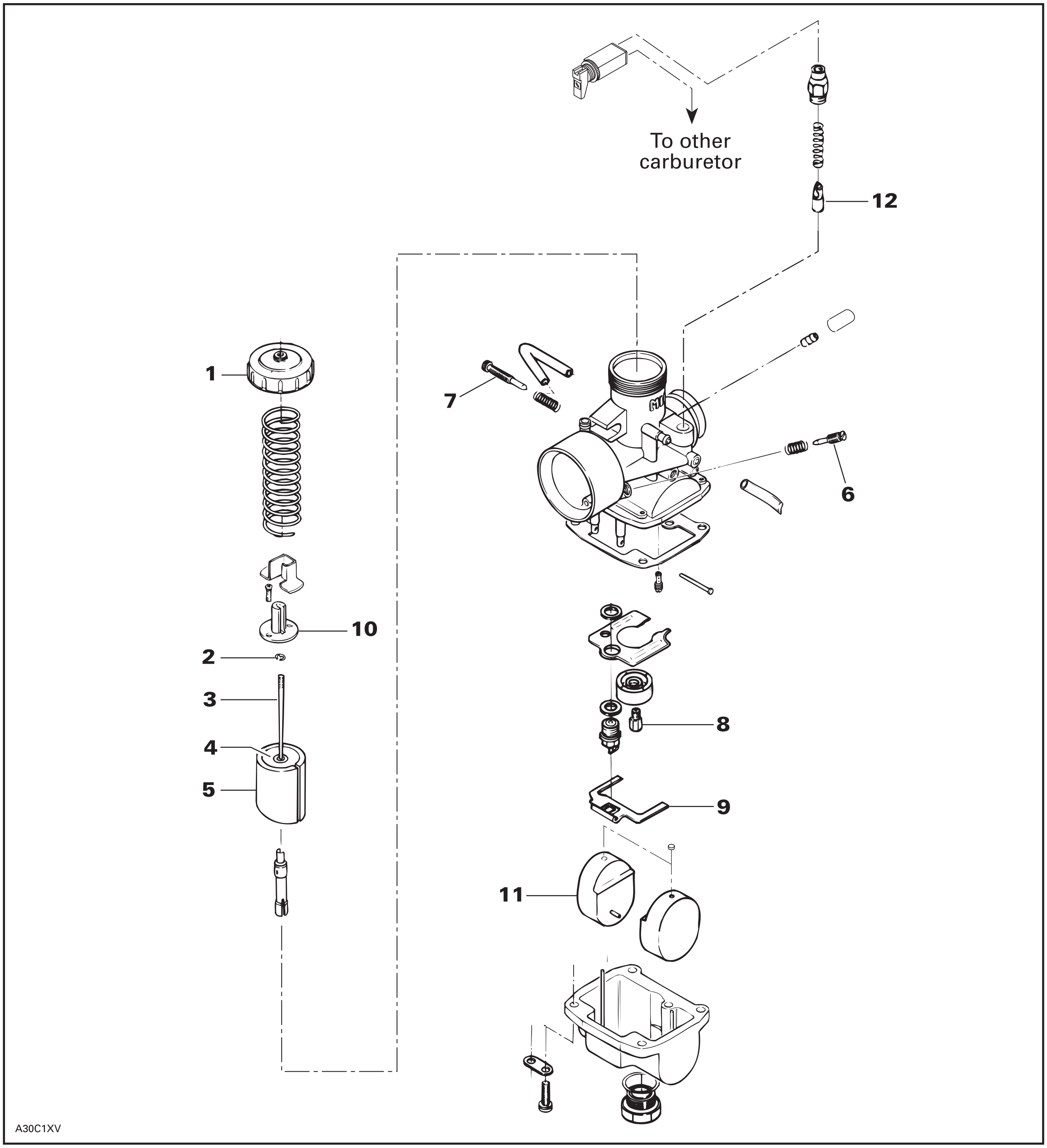
Prior to installing starter grip **no. 15** on new rope, it is first necessary to fuse the rope end with a lit match. Pass rope through starter grip and tie a knot in the rope end. Fuse the knot with a lit match then insert rope end down and pull the starter grip over the knot.



TYPICAL

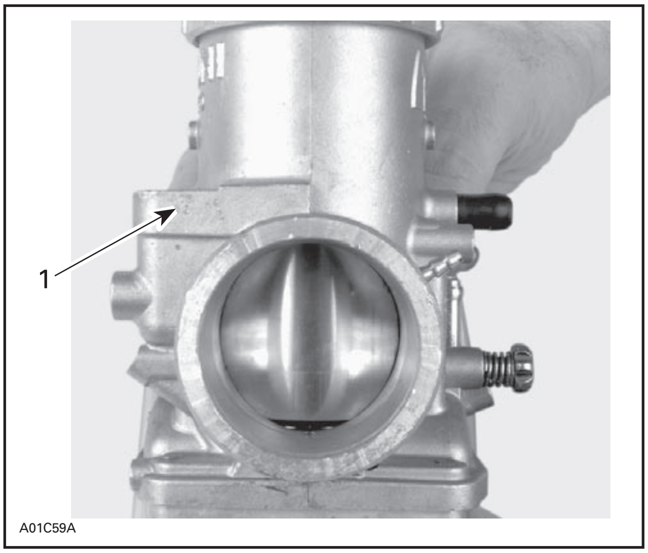
CARBURETOR AND THROTTLE CABLE

CARBURETOR — VM TYPE



IDENTIFICATION

All carburetors are identified on their body.



TYPICAL
1. Identification: 34-482

REMOVAL

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

Disconnect fuel inlet lines.

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

Disconnect throttle cable from throttle slide.

Remove carburetors from engine.

Unscrew choke plunger from each carburetor.

CLEANING AND INSPECTION

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

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

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

⚠ WARNING

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

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

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

Check throttle slide **no. 5** for wear. Replace as necessary.

Check idle speed screw straightness. Replace as necessary.

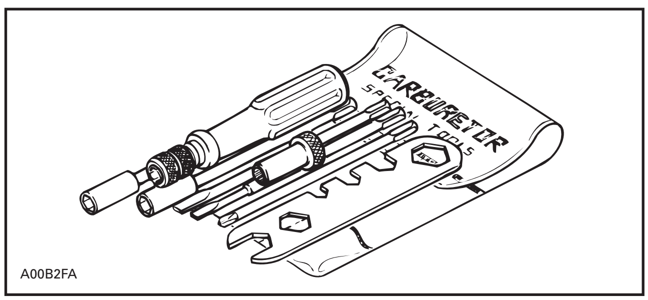
Check for fuel soaked into float **no. 11**; replace as necessary.

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

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

DISASSEMBLY AND ASSEMBLY

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

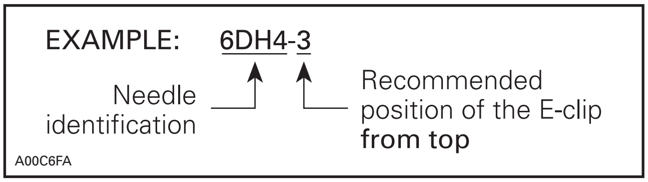


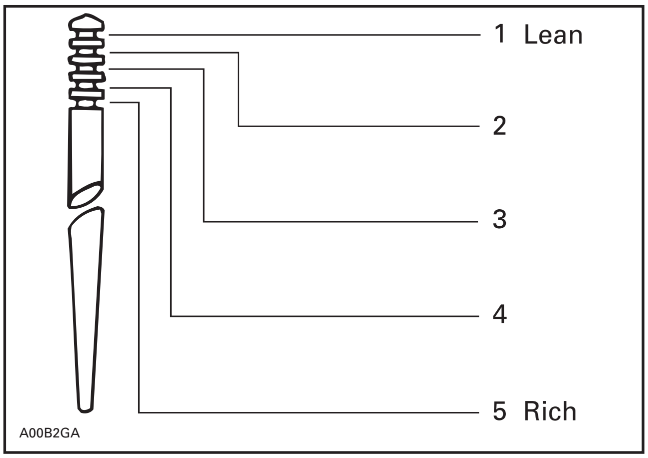
E-Clip and Needle

Remove screws from needle retaining plate **no. 10** to remove the needle **no. 3**.

The position of the needle in the throttle slide is adjustable by means of an E-clip **no. 2** inserted into 1 of 5 grooves located on the upper part of the needle. Position 1 (at top) is the leanest, 5 (at bottom) the richest.

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





CLIP POSITIONS

Main Jet

The main jet **no. 8** installed in the carburetor has been selected for a temperature of - 20°C (0°F) at sea level. Different jetting can be installed to suit temperature and/or altitude changes. A service bulletin will give information about calibration according to altitude and temperature.

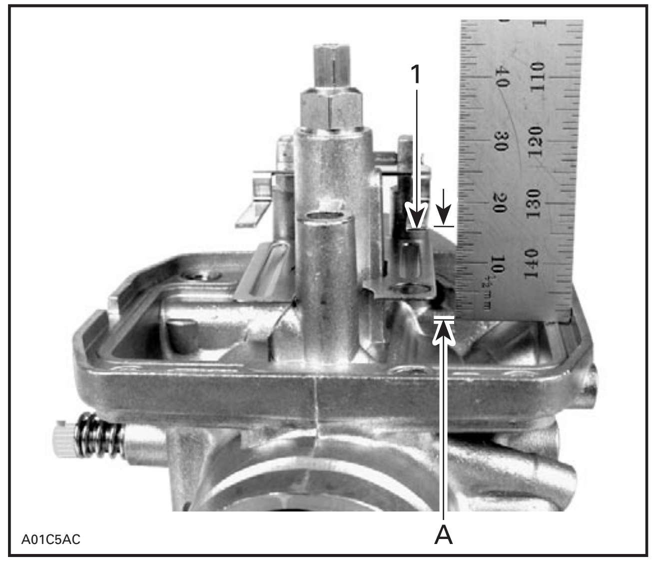
CARBURETOR FLOAT LEVEL ADJUSTMENT

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

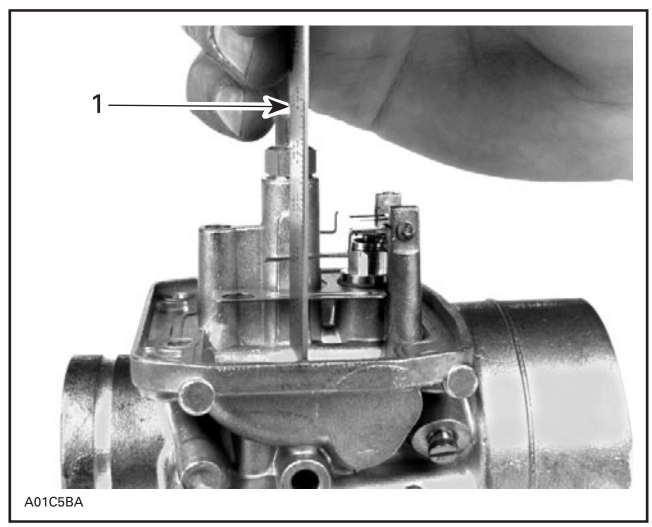
Float Arm

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

– Make sure that float arm **no. 9** is symmetrical — not distorted.
– Remove float bowl and gasket from carburetor.
– With carburetor chamber upside-down on a level surface, measure height H between bowl seat and top edge of float arm. Keep ruler perfectly vertical and in line with main jet hole.

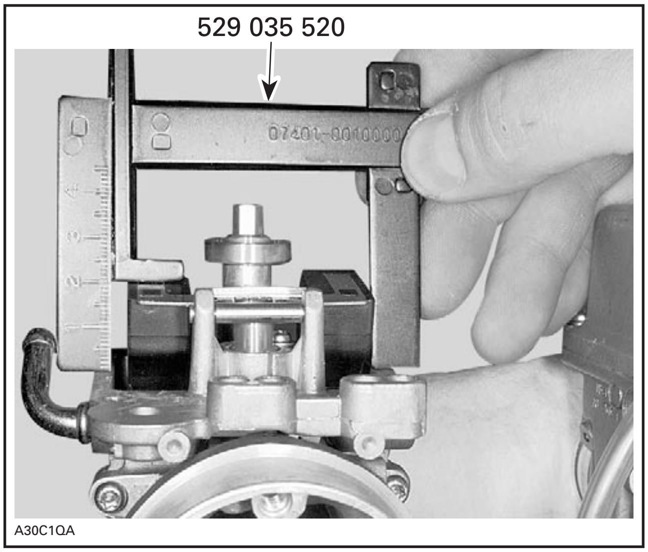


TYPICAL — VM TYPE
1. Measure from top of float arm
A. Float height (including float arm thickness)



TYPICAL — VM TYPE
1. Ruler vertical and in line with main jet

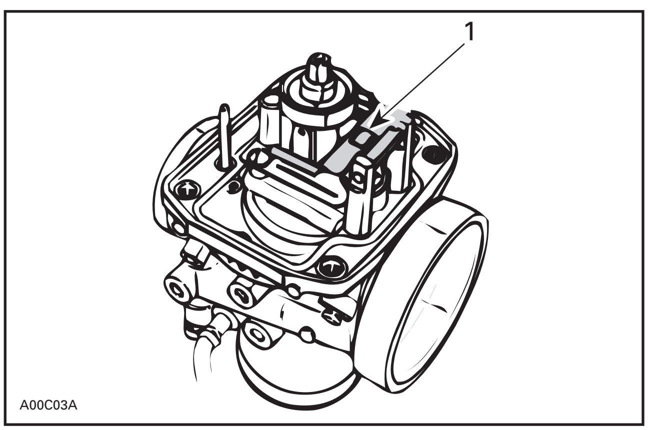
Float level height can be checked using tool (P/N 529 035 520). Keep tool in line with main jet as explained above.



CARBURETOR IDENTIFICATION	FLOAT HEIGHT
VM 30-210	23.9 mm (.941 in)
VM 34-590	
VM 34-591	

To Adjust Height

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



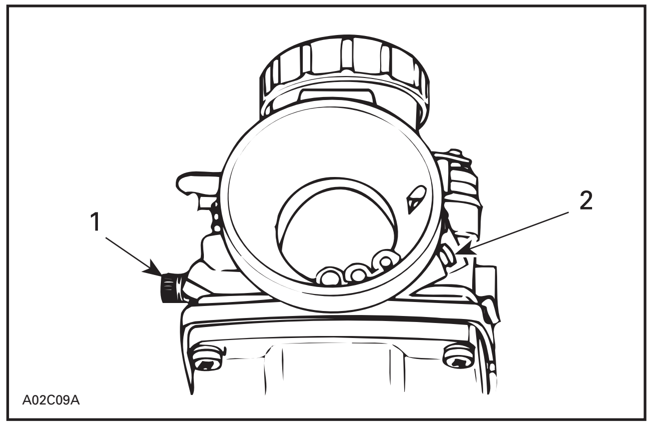
TYPICAL
1. Contact tab

CARBURETOR ADJUSTMENTS

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

Adjustments should be performed following this sequence:

– air screw **no. 6** adjustment
– throttle slide **no. 5** height (preliminary idle speed adjustment)
– throttle cable adjustment
– carburetor synchronization
– final idle speed adjustment (engine running)
– oil pump and carburetor synchronization.



1. Idle speed screw
2. Air screw

Air Screw Adjustment

Completely close the **air screw no. 6** (until a slight seating resistance is felt) then back off as specified.

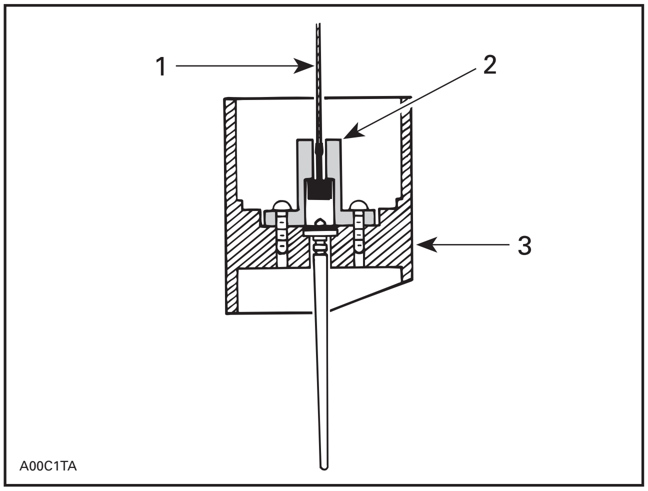
Turning screw in clockwise enriches mixture and conversely, turning it out counterclockwise leans mixture.

Refer to TECHNICAL DATA for the specifications.

Throttle Slide Height (preliminary idle speed adjustment)

Hook throttle cable into the needle retainer plate.

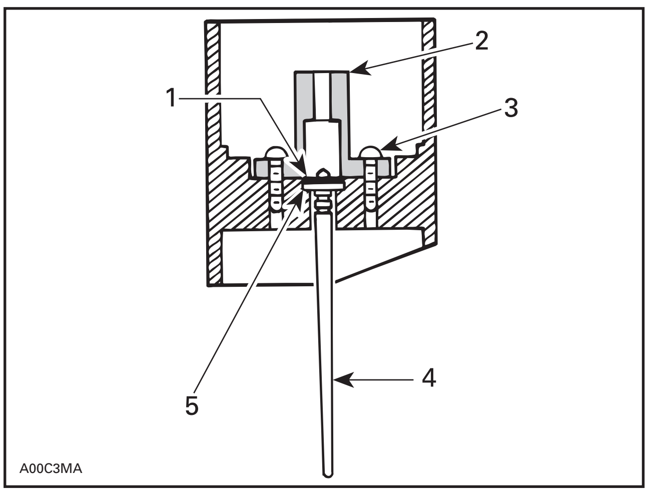
NOTE: Do not obstruct hole in throttle slide when installing needle retaining plate. This is important to allow air escaping through and thus allowing a quick response.



CENTER POST TYPE
1. Throttle cable
2. Needle retaining plate
3. Throttle slide

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

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



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

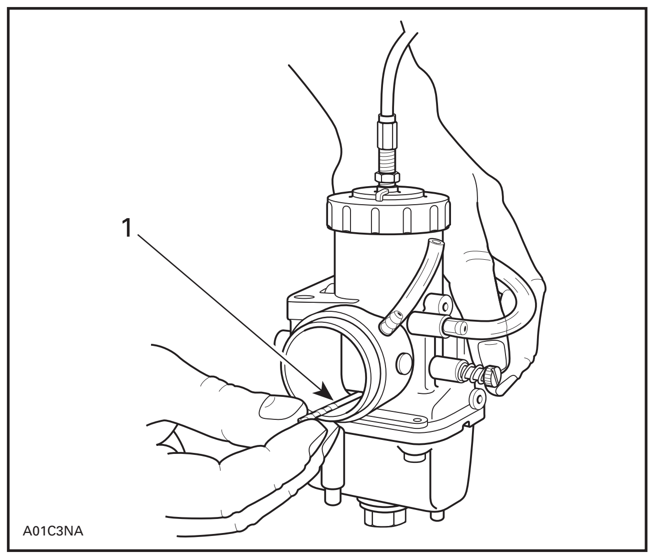
Using a drill bit, adjust throttle slide height (see following table) by turning idle speed screw **no. 7**.

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

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

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

MODELS	THROTTLE SLIDE HEIGHT (drill bit size) ± 0.1 mm (± .004 in)
MX Z 550 Fan, Legend 550 Fan, Legend Grand Touring 550 Fan, Skandic Sport 550 Fan, Summit 550 Fan (Europe)	1.6 (0.063)
MX Z 380 Fan, Legend 380 Fan, Legend Grand Touring 380 Fan	1.7 (0.067)
Summit 550 Fan (Can/US)	1.9 (0.075)



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

INSTALLATION

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

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

To install carburetor on engine, inverse removal procedure.

However, pay attention to the following:

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

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

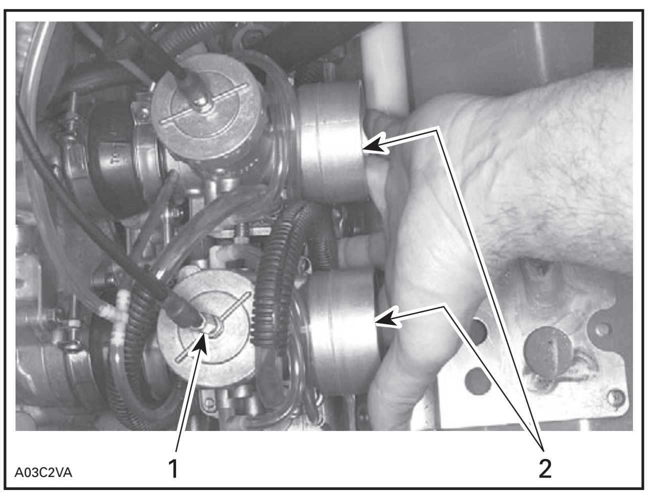
Install clamps in a way that their tightening bolts are staggered — not aligned.

Adjust throttle cable, refer to THROTTLE CABLE ADJUSTMENT to the end of this section.

Carburetor Synchronization

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

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



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

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

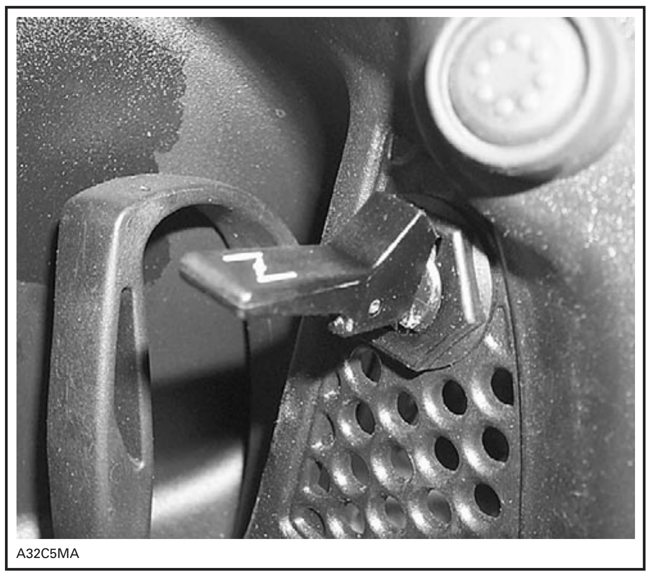
CAUTION: If the throttle slide rests against the carburetor cover at full throttle opening, this will create too much strain and may damage the throttle cable or other components in throttle mechanism.

CAUTION: Make sure all carburetors start to operate simultaneously.

CHOKE

Choke Plunger Adjustment

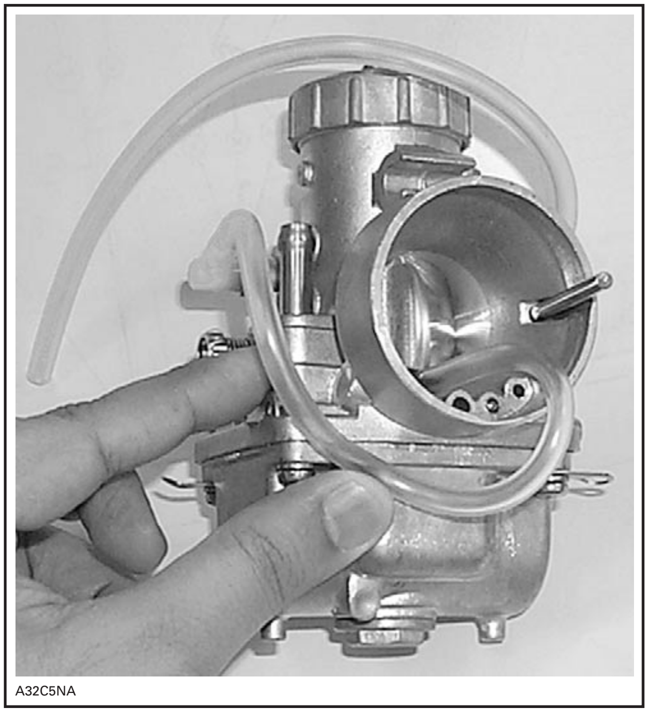
Set choke lever to half open position.



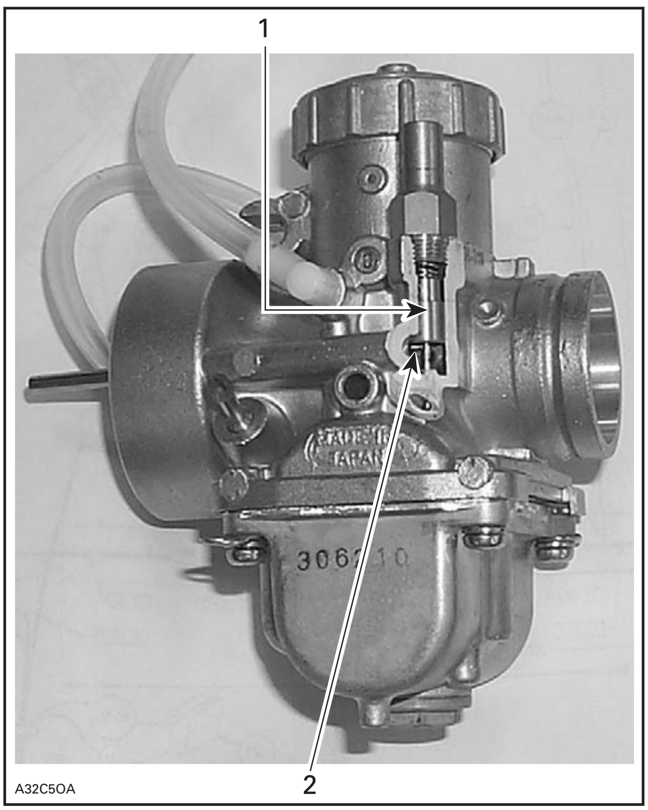
CHOKE LEVER — HALF OPEN POSITION

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

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



AIR SILENCER SIDE SHOWN



CUT-AWAY (ENGINE SIDE SHOWN)
1. Choke plunger
2. Tool properly seated under choke plunger

If tool tip does not seat under choke plunger **no. 12**, adjust as follows:

Make sure choke lever is at half open position.

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

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

Tighten choke cable lock nut and reinstall protector cap.

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

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

Idle Speed Final Adjustment

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

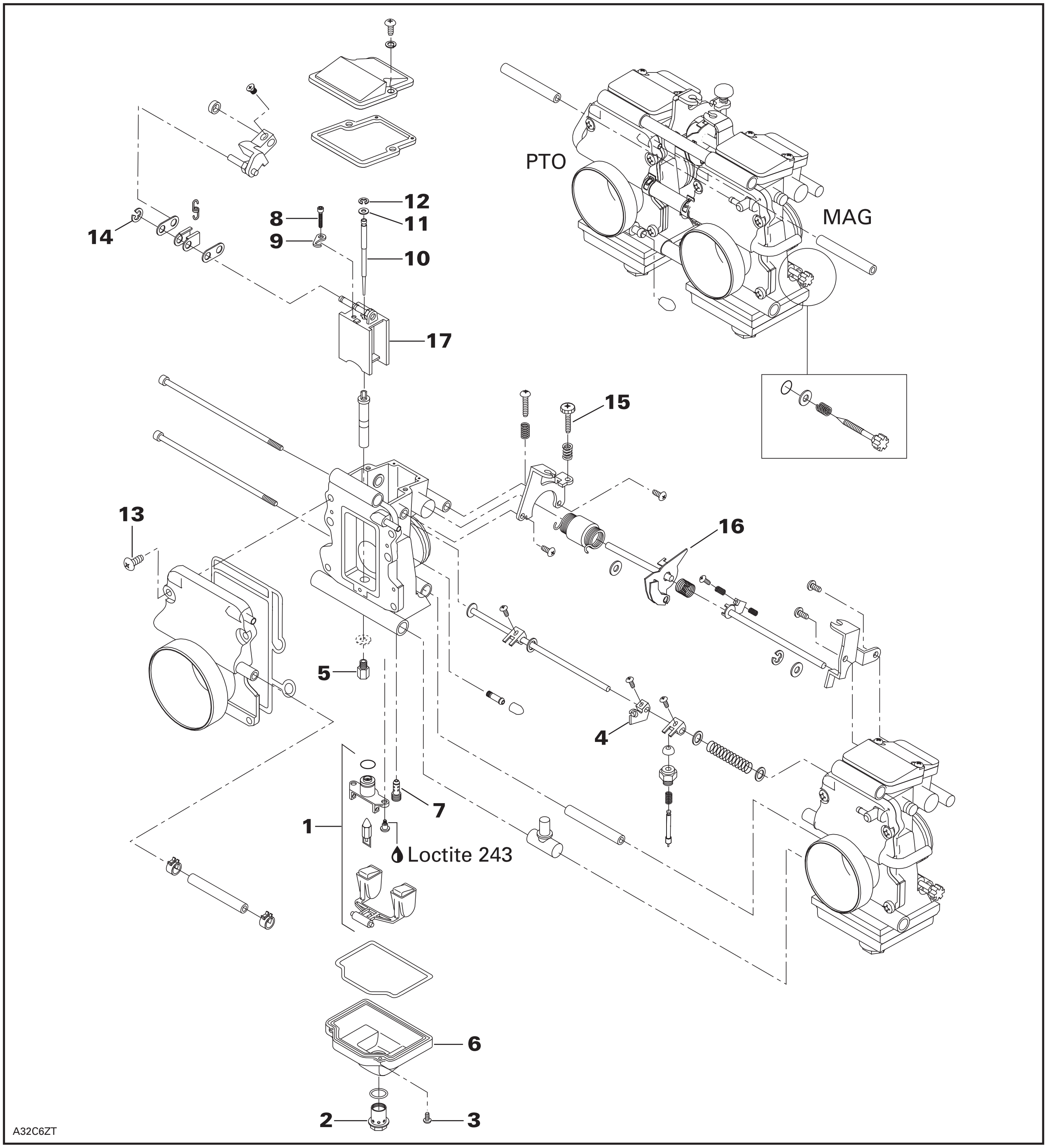
Start engine and allow it to warm then adjust idle speed to specifications by turning **idle speed** screw clockwise to increase engine speed or counterclockwise to decrease it.

Refer to TECHNICAL DATA for the specifications.

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

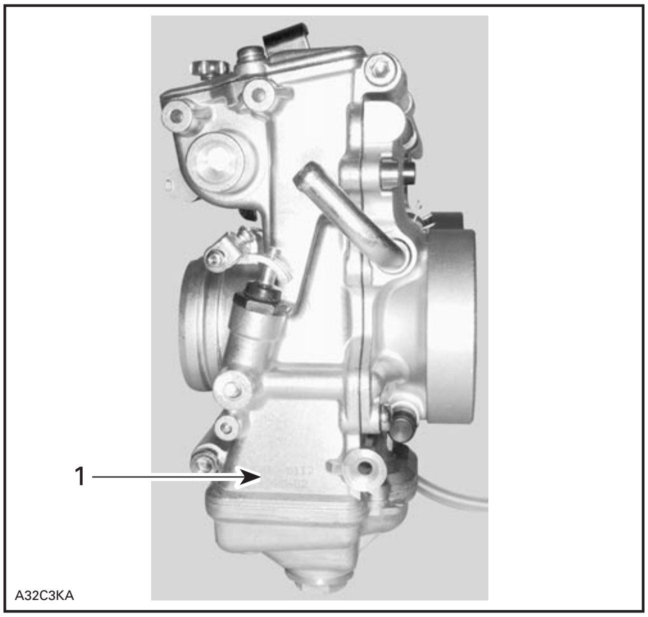
CAUTION: Do not attempt to set the idle speed by using the air screw. Severe engine damage can occur.

CARBURETOR — TM TYPE



IDENTIFICATION

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



TYPICAL
1. Identification: TM 40-B112

REMOVAL

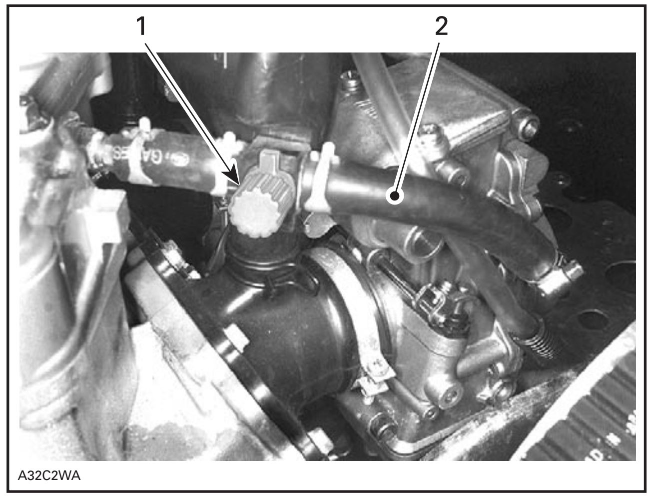
Lift hood.

Disconnect carburetor float bowl vent hose nipple from air silencer.

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

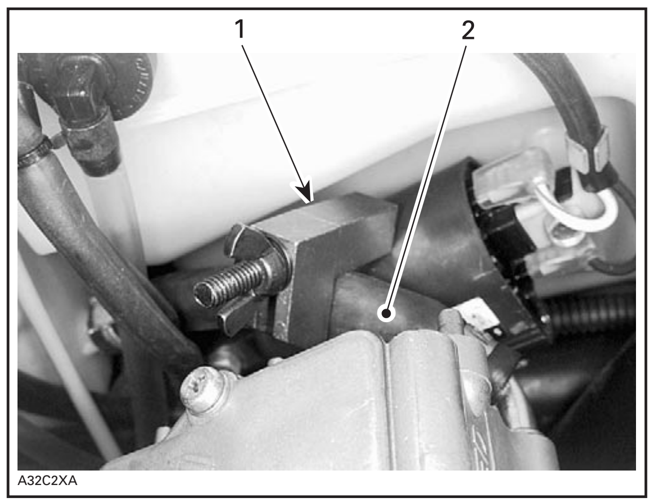
Heated Carburetor Models

Close valve at heated carburetor coolant inlet line.



1. Valve
2. Inlet line

Pinch heated carburetor coolant outlet line.



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

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

All Models

Disconnect throttle and choke cables.

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

⚠ WARNING

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

CLEANING AND INSPECTION

All Models

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

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

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

⚠ WARNING

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

Check throttle slide for wear. Replace as necessary.

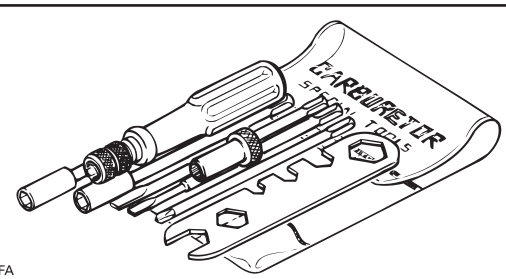
Check for fuel soaked into float **no. 1**; replace as necessary.

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

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

DISASSEMBLY AND ASSEMBLY

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



A00B2FA

Float Bowl

Unscrew drain screw **no. 2** and screw **no. 3**. Remove float bowl **no. 6**.

Float and Needle Valve Ass'y

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

At assembly, apply Loctite 243 on screw threads.

Main Jet

The main jet **no. 5** installed in the carburetor has been selected for a temperature of - 20 °C (0 °F) at sea level. Different jetting can be installed to suit temperature and/or altitude changes. A service bulletin will give information about calibration according to altitude and temperature.

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

Pilot Jet

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

Throttle Slide

⚠ WARNING

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

Do not disassemble throttle slide **no. 17** needlessly.

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

Heated Carburetor Models

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

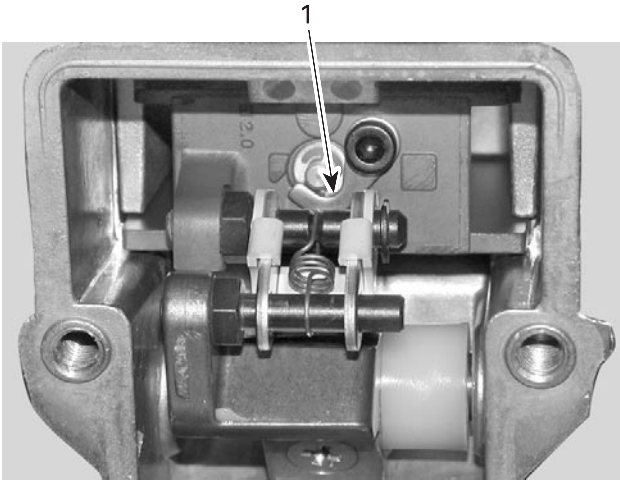
All Models

Remove carburetor cover.

Loosen needle retainer screw **no. 8**.

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

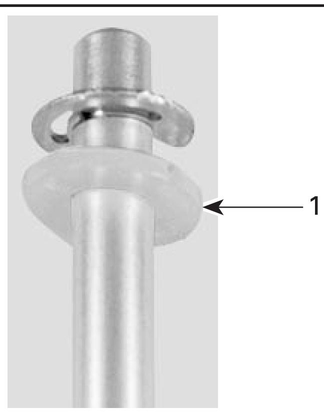
Move aside needle retainer **no. 9**.



A32C6TA

1. *Needle retainer moved aside*

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



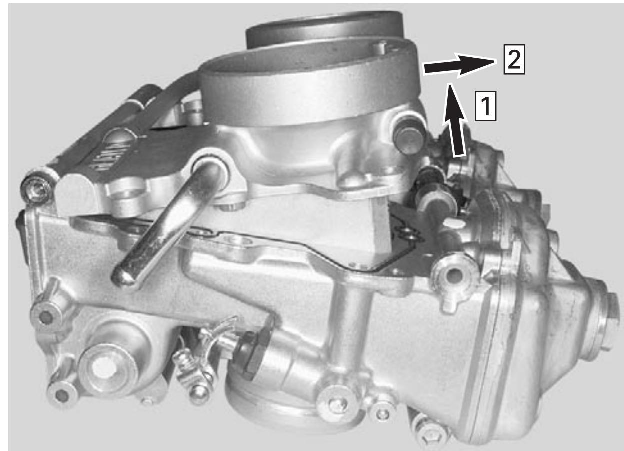
A32C3RA

1. *Plastic washer*

Unscrew throttle slide cover screws **no. 13**.

Open throttle 3/4 wide and keep that opening.

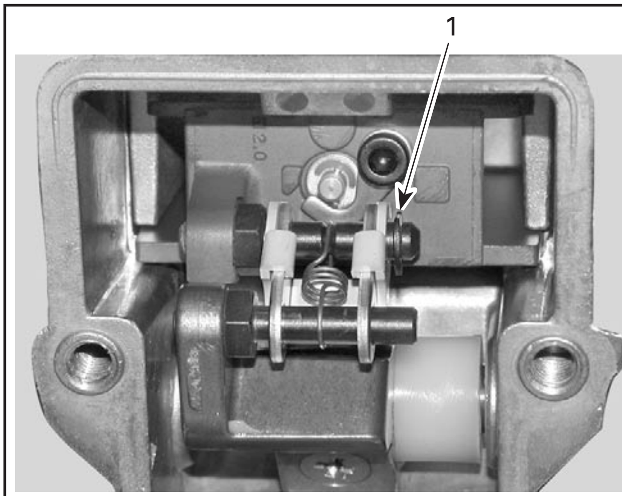
Lift throttle slide covers bottom first until they are free from carburetor bodies. Then, slide them out.



A32C2OA

1. *Lift bottom first*
2. *Slide out*

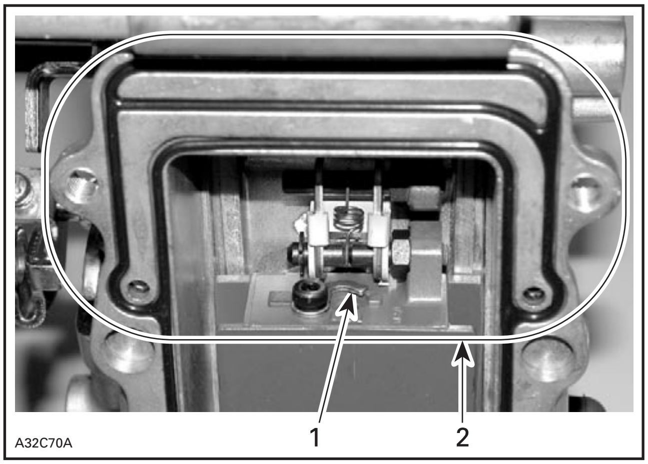
Remove circlip **no. 14** retaining throttle slide.



A32C6TB

1. *Circlip*

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



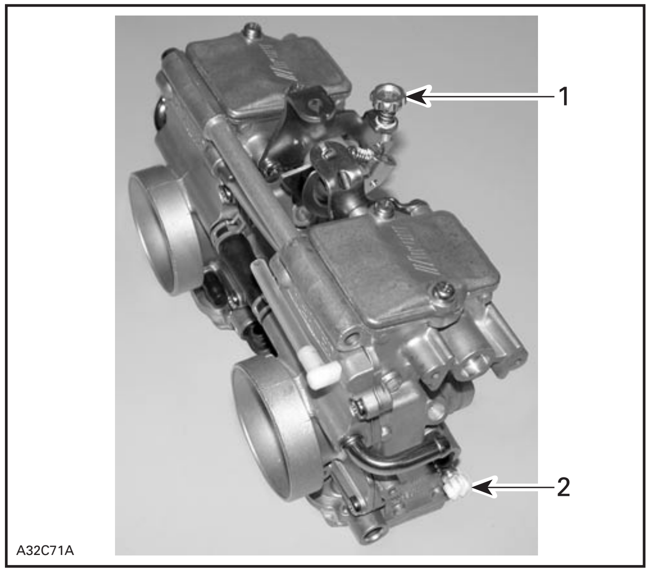
1. Needle retainer
2. Ensure O-ring gasket is properly seated

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

CARBURETOR ADJUSTMENTS

Adjustments should be performed following this sequence:

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



1. Idle speed screw
2. Pilot screw (one on each carburetor)

Pilot Screw Adjustment

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

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

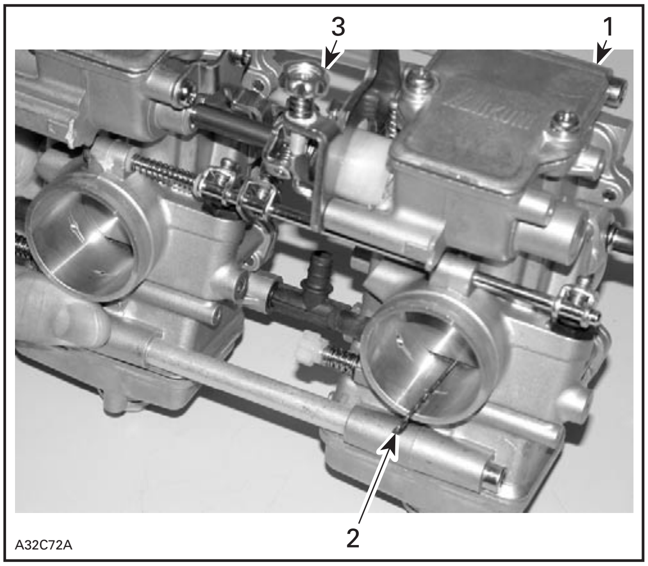
Refer to TECHNICAL DATA for the specifications.

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

First proceed on PTO carburetor.

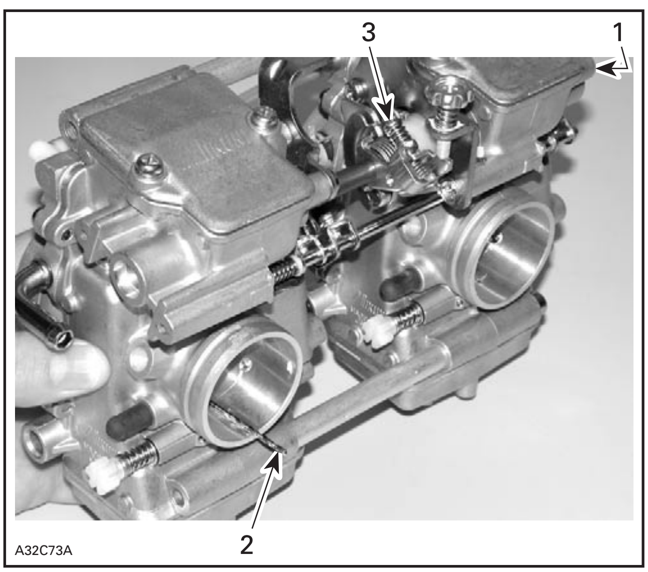
Use a drill bit to measure throttle slide height (see following table) on **outlet** side of carburetor (engine side).

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



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

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



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

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

MODELS	THROTTLE SLIDE HEIGHT (drill bit size) ± 0.1 mm (± .004 in)
Legend SE 700 Legend SE Grand Touring 700 Legend Sport 700, Legend Grand Touring 700	1.5 (0.059)
Legend Sport 500 SS, Legend Sport Grand Touring 500 SS	1.8 (0.071)

INSTALLATION

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

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

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

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

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

Connect all hoses to dual carburetor assembly .

Choke Cable Adjustment

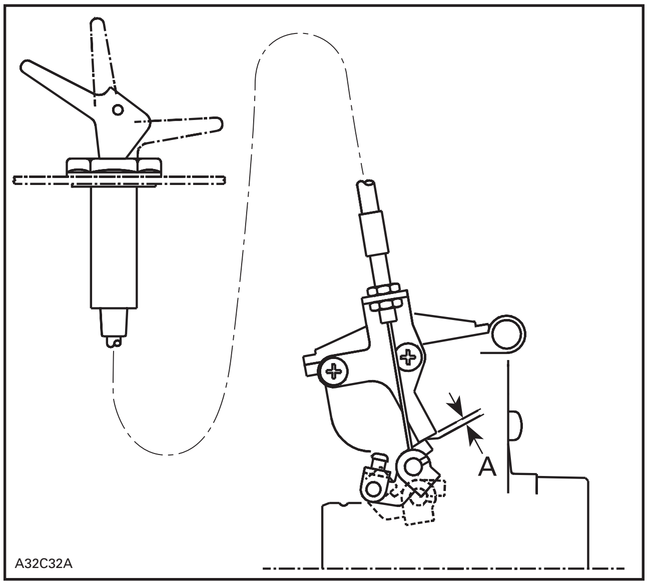
Adjust choke cable as per following procedure:

Loosen choke cable housing adjusting and locking nuts.

Connect choke cable on starter lever **no. 4**.

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

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



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

Reinstall air silencer.

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

Idle Speed Final Adjustment

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

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

Refer to TECHNICAL DATA for the specifications.

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

THROTTLE CABLE

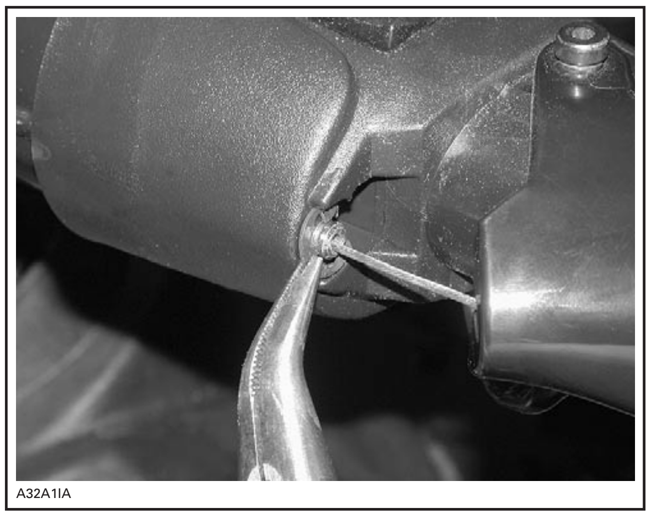
Throttle/Oil Pump Cable Removal

NOTE: Before removing the cable from vehicle, note its routing for installation.

Remove:

– handlebar adjusting lever (if so equipped)

– steering cover and its padding
– retaining circlip.



Using long nose pliers to hold the cable, push the end of cable out of its location.

Unhook the cable sheath then remove cable from handle.

Remove air intake silencer.

Disconnect the cable end from carburetors or throttle body.

Disconnect cable end from oil pump.

NOTE: The carburetor or the throttle body can be removed to allow an easier access to the oil pump.

Throttle/Oil Pump Cable Installation

For installation, reverse the removal procedure.

To adjust throttle and oil pump cables see further in this section.

Throttle Cable Adjustment

With VM Carburetor

⚠ WARNING

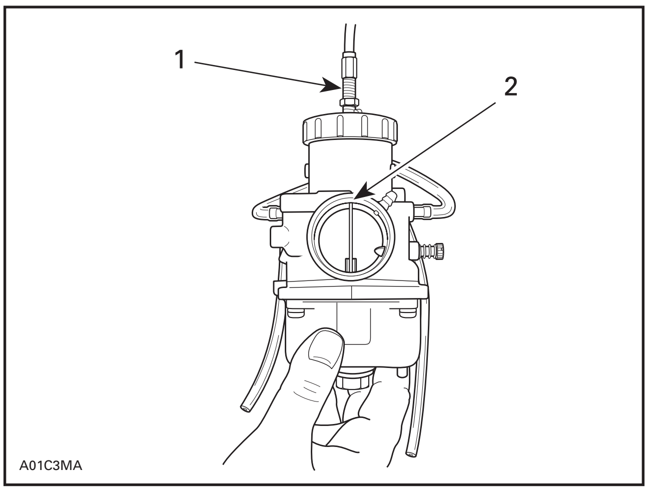
Ensure the engine is turned OFF, prior to performing the throttle cable adjustment.

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

For maximum performance, correct cable adjustment is critical.

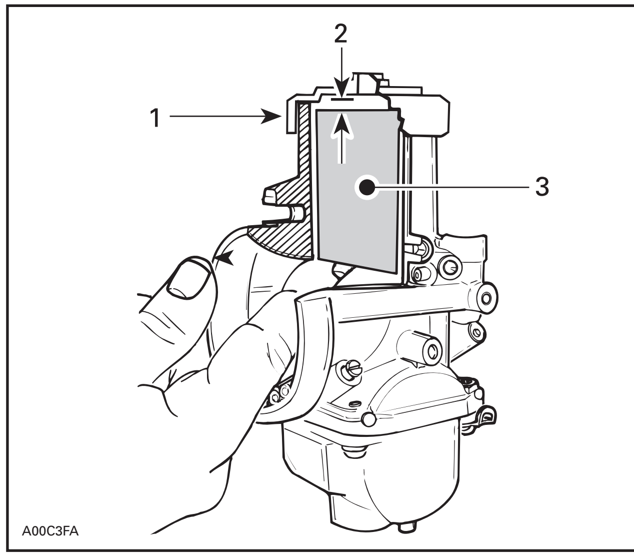
At full opening, throttle slide must be flush or 1.0 mm (.040 in) lower than the top of carburetor **outlet** bore (engine side). Use a mirror and look through inlet bore.

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



FULL OPENING (THROTTLE LEVER AGAINST HANDLE GRIP)
1. Throttle cable adjuster
2. Throttle slide flush or 1.0 mm (.040 in) lower than carburetor outlet bore (engine side)

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



FULL OPENING (THROTTLE LEVER AGAINST HANDLE GRIP)
1. Cover
2. Free play
3. Throttle slide

⚠ WARNING

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

After throttle cable adjustment, synchronized carburetors (refer to CARBURETOR SYNCHRONIZATION) and adjusted oil pump cable (refer to OIL INJECTION PUMP).

With TM Carburetors

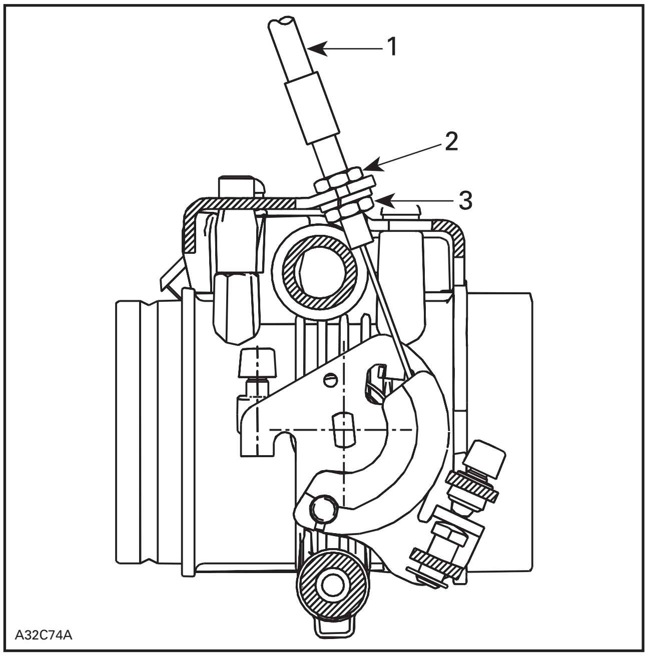
Adjust throttle cable as per following procedure:

Loosen throttle cable housing adjusting and locking nuts.

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

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

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



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

After throttle cable adjustment, synchronized carburetors (refer to CARBURETOR SYNCHRONIZATION) and adjusted oil pump cable (refer to OIL INJECTION PUMP).

SDI Models

Refer to COMPONENT INSPECTION AND ADJUSTMENT in ENGINE MANAGEMENT (2-TEC).

4-TEC Models

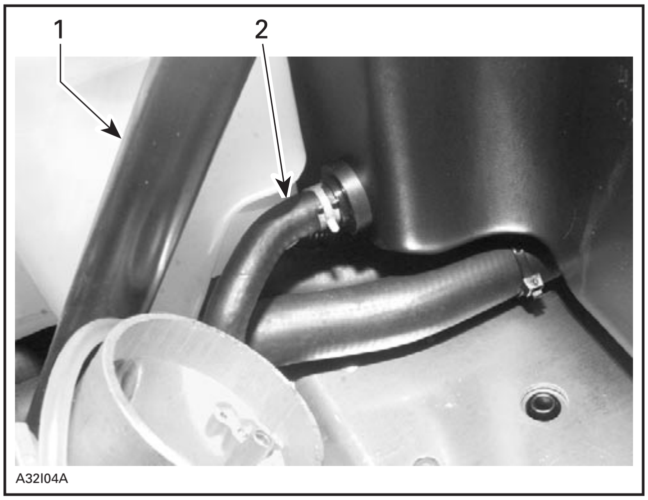
Refer to COMPONENT INSPECTION AND ADJUSTMENT in ENGINE MANAGEMENT (4-TEC).

FUEL TANK AND FUEL PUMP

FUEL TANK

FUEL TANK REMOVAL

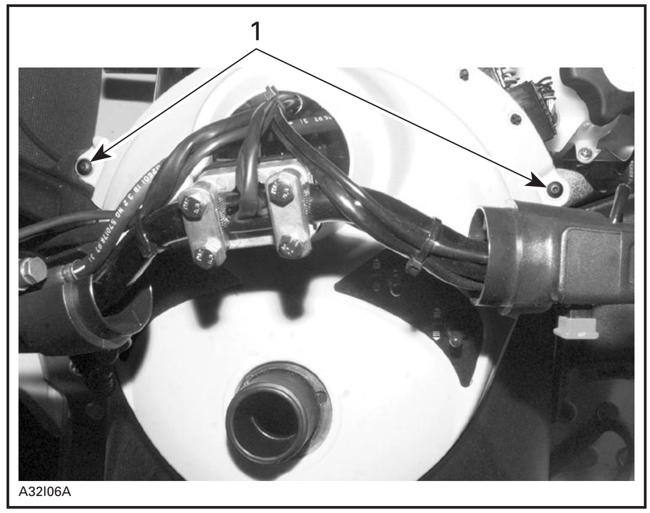
After draining fuel tank, unplug fuel line.



1. *Steering column*
2. *Fuel line*

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

Unscrew console and move it toward front.



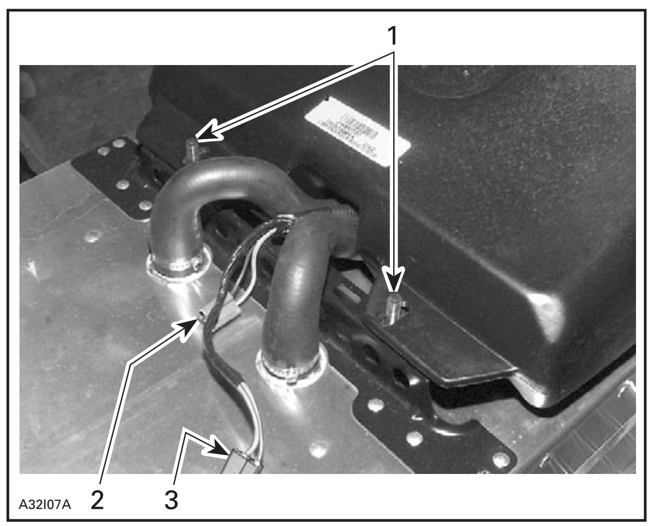
1. *Remove these screws*

Open storage compartment at rear of seat.

Remove nuts and washers retaining rear of seat then move seat rearward.

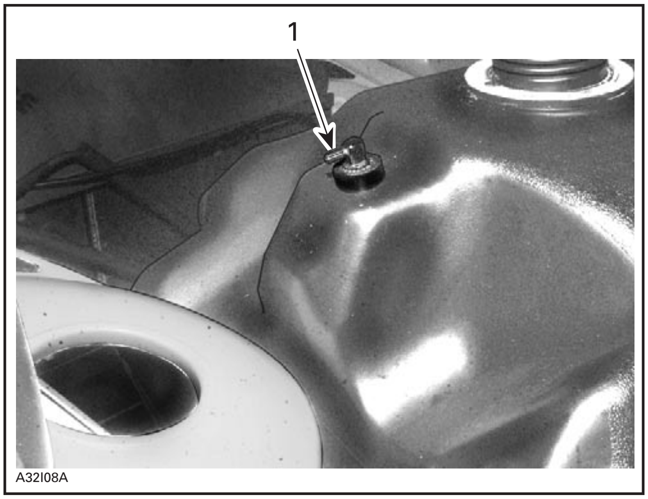
Disconnect taillight connector housing located between seat and fuel tank.

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



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

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



1. *Vent fitting*

FUEL TANK INSTALLATION

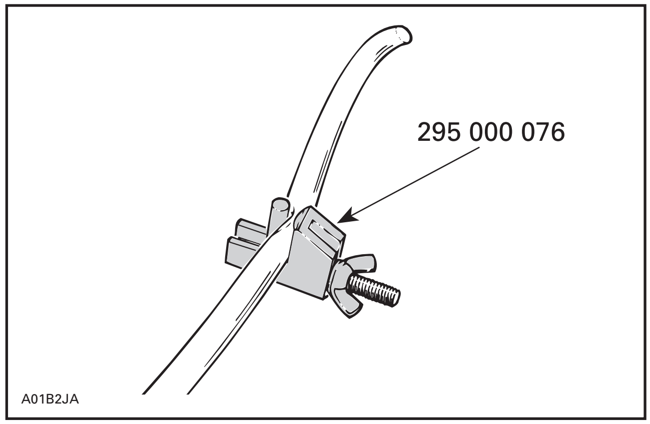
The installation is the reverse of the removal procedure.

NOTE: Always perform a pressurization test after working on fuel system. Refer to FUEL SYSTEM PRESSURIZATION.

FUEL TANK LINES

⚠ WARNING

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



IMPULSE/FUEL LINES SPRING CLIPS (ALL MODELS)

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

FUEL LEVEL SENSOR

Inspection

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

Fuse Replacement

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

Fuel Level Sensor Screws

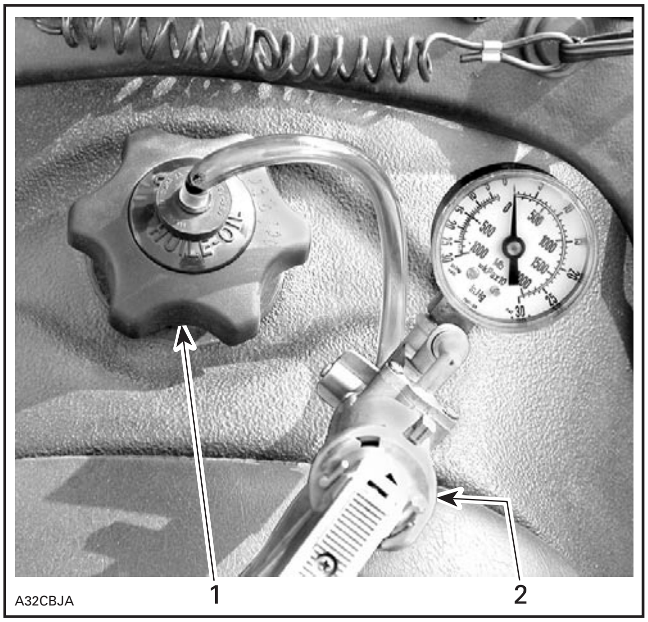
Torque fuel level sensor retaining screws to 1 N•m (8 lbf•**in**) in a criss-cross sequence and then to 2.8 N•m (25 lbf•**in**), using the same sequence.

FUEL SYSTEM PRESSURIZATION

Fill up fuel tank.

Install on fuel tank, the special cap of leak testing kit (P/N 529 033 100).

Using air pump from engine leak test kit (P/N 861 749 100), inject air into fuel tank. See next photo.



TYPICAL
1. Special cap on tank
2. Air pump

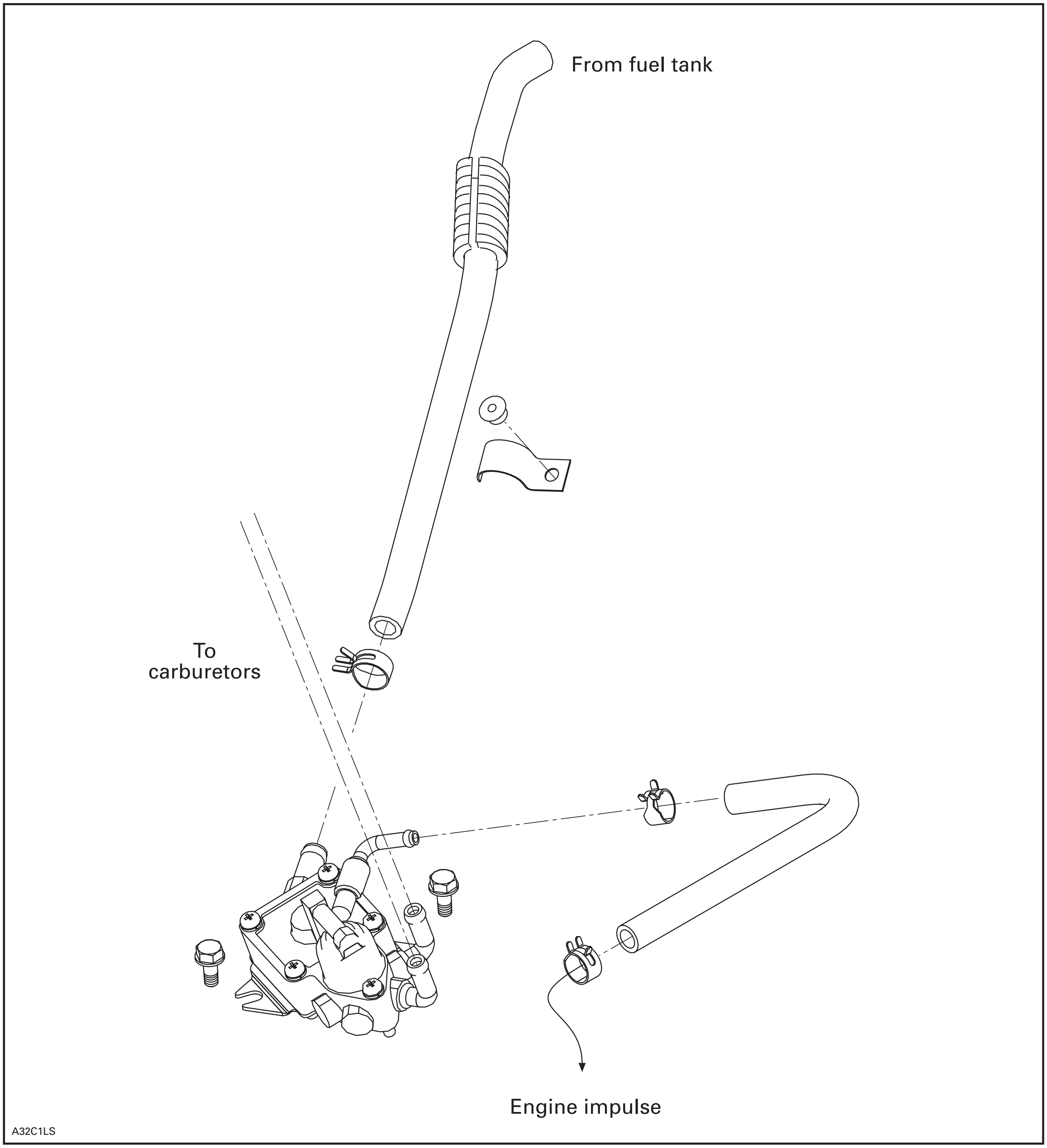
Pressurize fuel system to 21 kPa (3 PSI). The pressure must not drop during 3 minutes.

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

To ease locating leak(s) at fuel tank vent fitting, fuel gauge or fuel cap, spray soapy water on components; bubbles will indicate leak location(s).

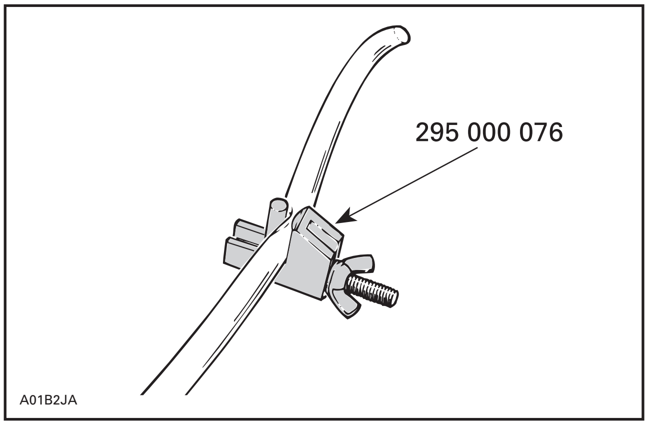
FUEL PUMP

All Models



REMOVAL

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



Disconnect fuel outlet line(s).

Disconnect impulse line.

Remove screws securing fuel pump to chassis.

PUMP VERIFICATION

Check fuel pump valves operation as follows:

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

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

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

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

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

CLEANING AND INSPECTION

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

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

⚠ WARNING

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

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

INSTALLATION

Inverse removal procedure.

⚠ WARNING

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

TROUBLESHOOTING

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 (refer to COOLING SYSTEM).*
	2. Check temperature sensor for electrical/mechanical failure. a. Temperature sensor defective. *Replace.*
	3. Check thermostat (located in the thermostat housing on the alternator side cover). a. Thermostat defective (does not open when engine gets hot). *Replace water pump housing (refer to COOLING SYSTEM).*
	4. Check control bore (beside thermostat 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).*
	5. Check condition of hoses and hose clamps fixation. a. Hoses are brittle and/or hard. *Replace.* b. Hose clamps are loose. *Retighten clamps.*
	6. Check condition of impeller located on the water pump shaft. a. Impeller wings broken and/or impeller threads are damaged. *Replace.*
	7. Check gasket on water pump housing. a. Gasket on water pump housing leaks. *Retighten screws and/or replace gasket.*
	8. 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; check if it is turning along during starting. a. Generator gear damaged. *Replace the generator gear (refer to CRANKSHAFT/DRIVE GEARS).*
	3. Check wiring 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. a. 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 CRANKSHAFT/DRIVE GEARS).* e. Piston rings are broken (low compression). *Replace piston rings (refer to CRANKSHAFT/DRIVE GEARS).* 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 thermostat 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.*

SYMPTOM	**LOW OR NO OIL PRESSURE.**
CONDITION	NORMAL USE
Test/Inspection	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 thermostat 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 change oil, oil filter and/or coolant (refer to LUBRICATION SYSTEM , COOLING SYSTEM and CRANKCASE).*
	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 part(s) including oil and oil filter. Use Bombardier's recommended oil (refer to TECHNICAL DATA).*

CYLINDER AND CYLINDER HEAD

SYMPTOM	**UNUSUAL ENGINE NOISE AND/OR VIBRATION.**
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 CRANKSHAFT/DRIVE GEARS).* b. Connecting rod bushings are damaged. *Replace the connecting rod bushings. (refer to CRANKSHAFT/DRIVE GEARS).*
	2. Check if drive gears are loosen. a. Crankshaft nut retaining drive gear is loose. *Retighten retaining nut with recommended torque.*

ELECTRIC 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 wire 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 CRANKSHAFT/DRIVE GEARS).*
	2. Check the sprag clutch. a. Sprag clutch is worn or otherwise demaged. *Replace sprag clutch (refer to CRANKSHAFT/DRIVE GEARS).*
	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. Check spark plug condition and/or gap. a. Fouled spark plug or wrong spark plug gap. *Readjust gap and clean spark plug or replaceplace pistons. Ask driver to refer to warm-up procedure in Operator's Guide.*
	3. Piston seizure. 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.* e. Snow/water intrusion through intake system into combustion chamber. *Clean intake system and replace defective part(s).*
	4. Melted and/or perforated piston dome; melted section at ring end gap. a. Spark plug heat range is too hot. *Install recommended spark plug (refer to TECHNICAL DATA).* b. Coolant less than recommended level (engine gets too hot). *Repair cooling circuit and/or refill with recommended liquid.* c. Poor quality and/or wrong fuel. *Clean from contamination and use appropriate fuel (refer to TECHNICAL DATA).*
	5. 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.* b. Oil nozzle is clogged or bent. *Clean or replace oil nozzle (refer to LUBRICATION SYSTEM).*
	6. 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 CRANKSHAFT/DRIVE GEARS).*

SYMPTOM	**ENGINE SUDDENLY TURNS OFF.**
CONDITION	NORMAL USE
	7. 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.*
	8. Check crankshaft, rocker arms movement. a. Oil pump failure due to leack 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 and oil filter at the same time,replace defective part(s) (refer to MAINTENANCE CHART and LUBRICATION SYSTEM).*
	9. 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).*
	10. Check if fuel supply is sufficient at high RPM. a. Fuel line is contaminated and/or bent. *Clean and/or replace defective part(s).*
	11. 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.*
	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. In cold weathers, check engine decompressor (located on camshaft sprocket/ timing gear). a. Centrifugal weight spring is not engaged and/or damaged. *Readjust spring or replace centrifugal weight if damaged.*
	6. Check battery voltage. a. Battery is discharged and starter works not properly. *Charge battery.*
	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	**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).*

LEAK TEST

VERIFICATION

Before performing the cylinder leak test, verify the following:

– clamp(s) tightness
– radiator and hoses
– oily contamination on leak indicator hole means a damaged oil seal on water pump shaft
– coolant out of leak indicator hole means a damaged rotary seal on water pump shaft (refer to COOLING SYSTEM)
– coolant escaping from water 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.

LEAK TEST PROCEDURE

NOTE: The following instructions are valid for both cylinders.

PREPARATION AND TEST

NOTE: The following procedures should be done with a cold engine.

PREPARATION

Disconnect battery.

⚠ WARNING

Always respect this order for disassembly; disconnect BLACK (-) cable first. Electrolyte or fuel vapors can be present in engine compartment and a spark may ignite them and possibly cause personal injuries.

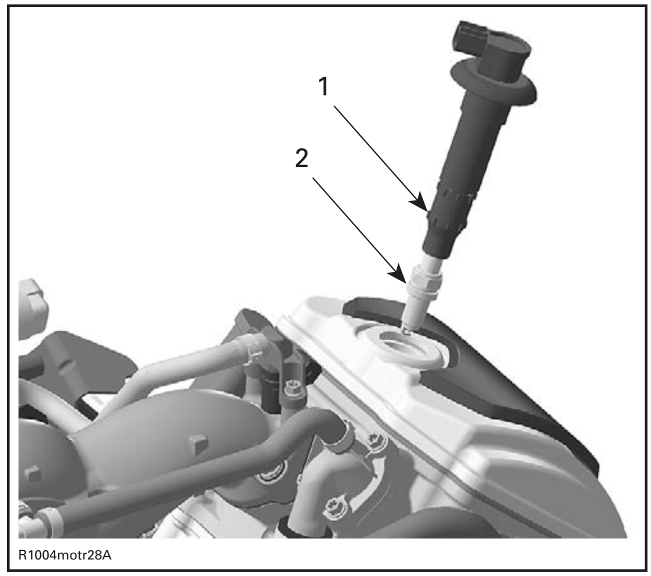
Remove:

– radiator cap.

Unplug and remove ignition coil.

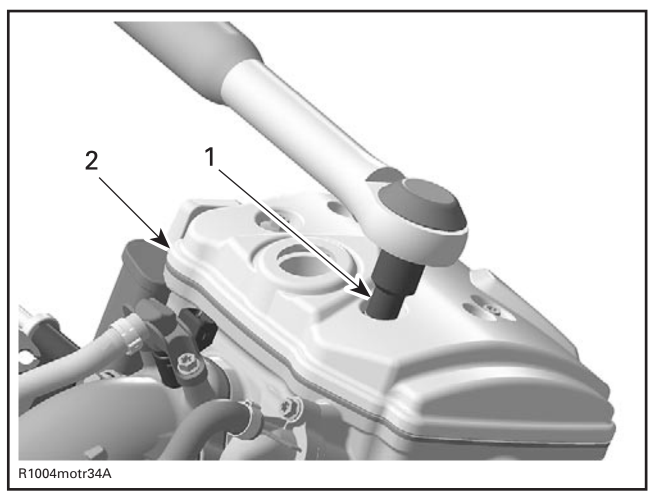
Remove spark plug from cylinder head.

NOTE: Ignition coil can help removing spark plug.



1. *Ignition coil*
2. *Spark plug*

Remove valve cover.

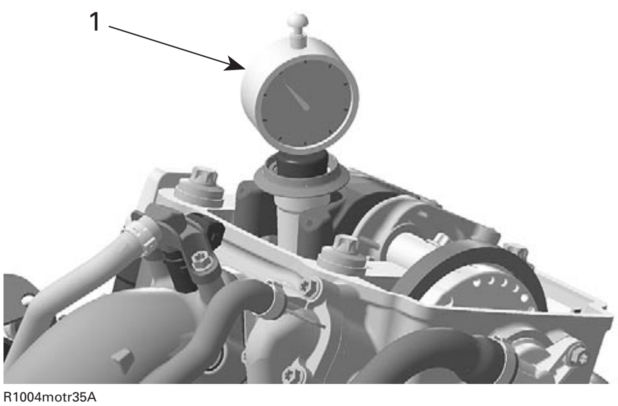


1. *Ratchet wrench*
2. *Valve cover*

Preparation

Using a dial gauge set the crankshaft and the piston to precisely ignition TDC. If a dial gauge is not available, use a screwdriver or another similarly suitable tool.

NOTE: The engine must be set to precisely ignition TDC; if this is not ensured the engine will continue to rotate when pressure builds up.



1. *Dial gauge*

Connect to adequate air supply.

Set needle of measuring gauge to zero.

NOTE: All testers have specific instructions on gauge operation and required pressure.

Install gauge adapter into previously cleaned spark plug hole.

Supply combustion chamber with air pressure.

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

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

Diagnose

Listen for air leaks.

– air escaping on intake port/carburetor means leaking intake valve(s)
– air escaping on exhaust port means leaking exhaust valve(s)
– air bubbles out of radiator means leaking cylinder head gasket
– air/oil escaping from crankcase means damaged gasket and/or loosened screws (refer to CRANKCASE)
– air/coolant escaping from cylinder/head means damaged gasket(s) and/or loosened screws (refer to CYLINDER AND HEAD)
– air escaping into crankcase area means excessively worn cylinder and/or broken piston rings.

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

INSTALLATION

NOTE: Within the course of the assembly, always replace the valve cover gasket.

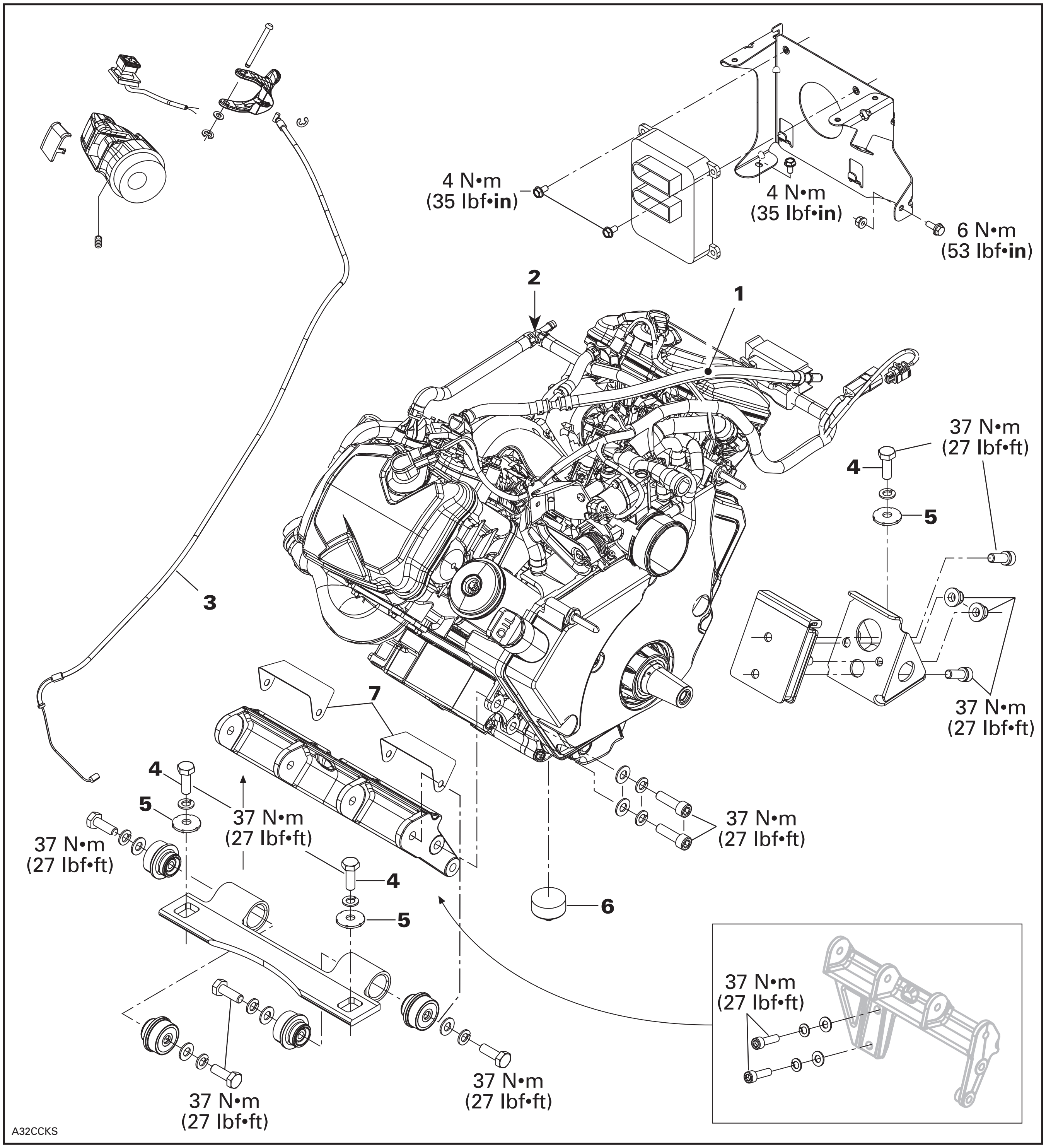
Torque valve cover screws to 9 N•m (80 lbf•**in**).

Torque spark plugs to 17 N•m (150 lbf•**in**).

Slightly oil the bottom outer part of the stick coil. This will simplify installation.

For installation, reverse the preparation procedure.

REMOVAL AND INSTALLATION



ENGINE REMOVAL

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

Disconnect and remove battery.

⚠ WARNING

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

⚠ WARNING

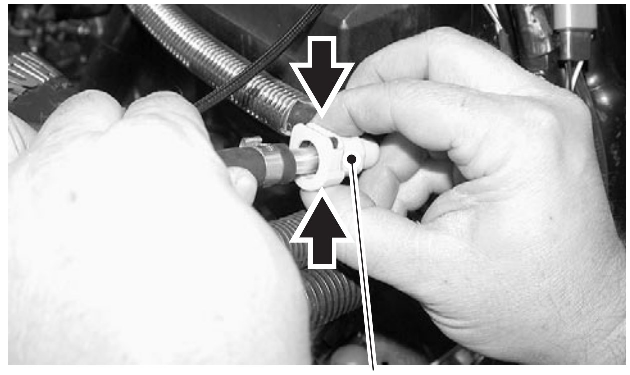
Never charge or boost battery while installed. Battery contains sulfuric acid which is corrosive and poisonous. In case of contact with skin, flush with water and call a physician immediately.

⚠ WARNING

Should the battery casing be damaged, wear a suitable pair of non-absorbent gloves when removing the battery by hand.

1. BLACK (-) cable

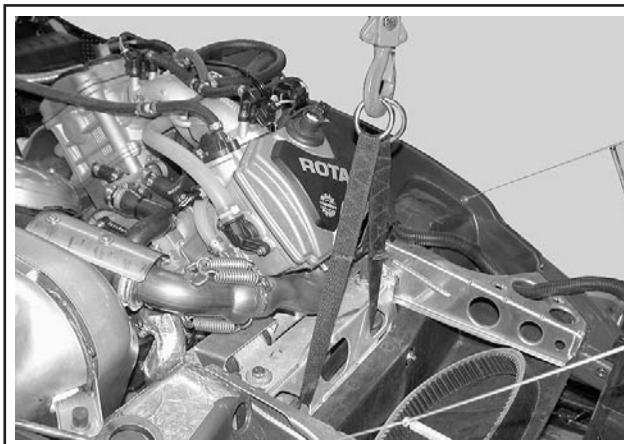
Unplug fuel supply line **no. 1** by squeezing spring lock of plastic female coupling.



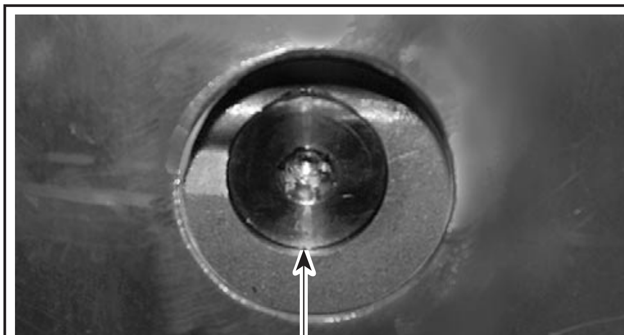
1. Plastic female coupling

Lift front of vehicle by the front cross member.

CAUTION: Never lift front of 4-TEC models by the front bumper.



Should the engine needs repair, oil may drain at this moment. Working underneath bottom pan remove oil drain plug then lift oil filter cover.



1. Oil drain plug

Drain the engine oil.

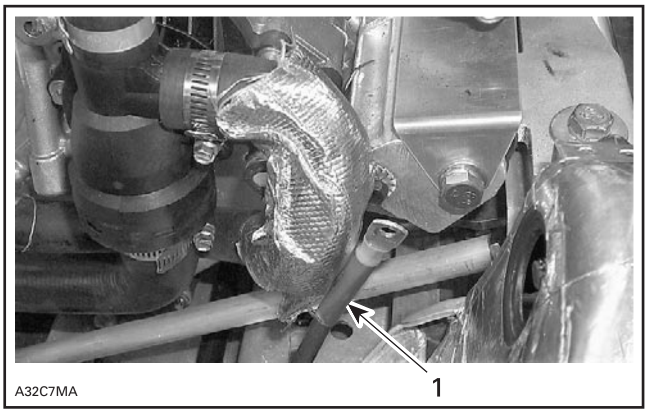
Put back vehicle on the ground.

Remove muffler and pipes.

Remove coolant reservoir cap. Siphon as much coolant as possible. Disconnect bottom hose from thermostat housing. Disconnect side hose from thermostat housing.

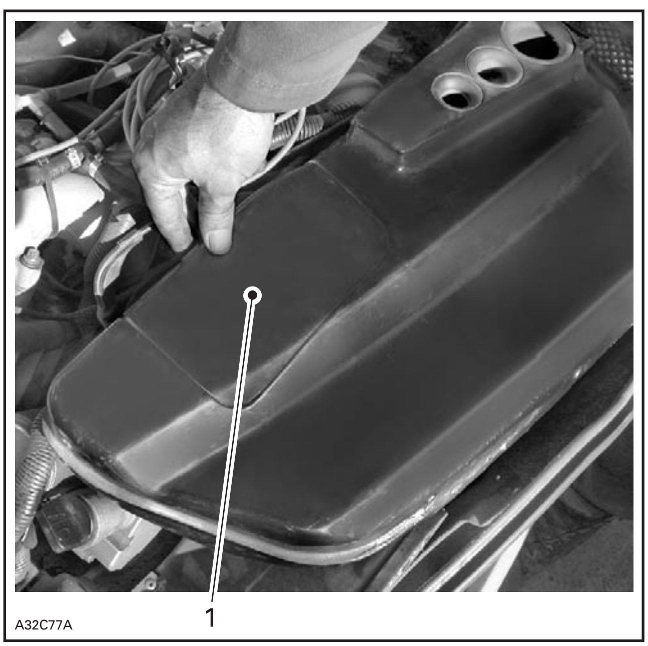
Disconnect air bleed hose from T-fitting **no. 2**.

Disconnect alternator, then ground cable from engine support.



1. *Ground cable*

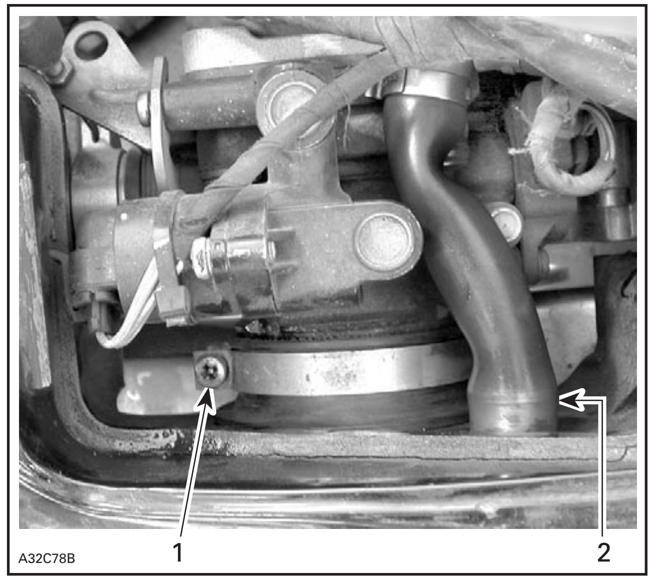
Remove air silencer access panel.



1. *Access panel*

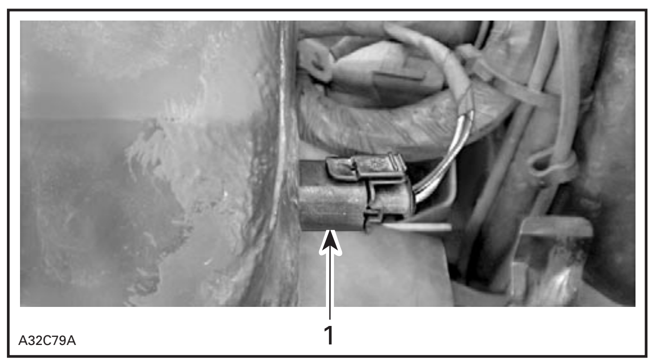
Loosen collar screw on air silencer grommet.

Disconnect blow-by hose from air silencer.



1. *Collar screw*
2. *Blow-by hose*

Disconnect air temperature sensor at rear of air silencer.



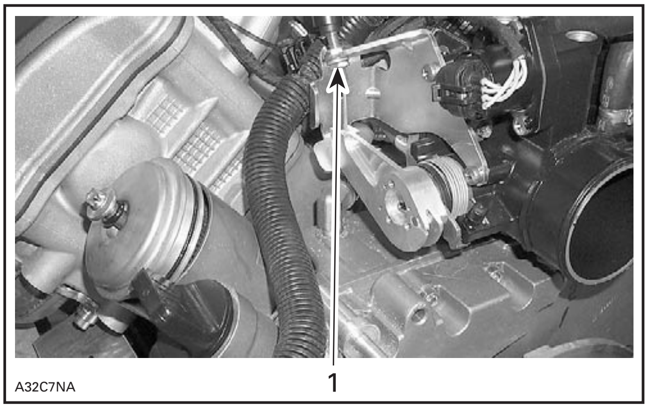
1. *Air temperature sensor*

Remove air silencer.

Remove guard, drive belt, drive pulley, driven pulley.

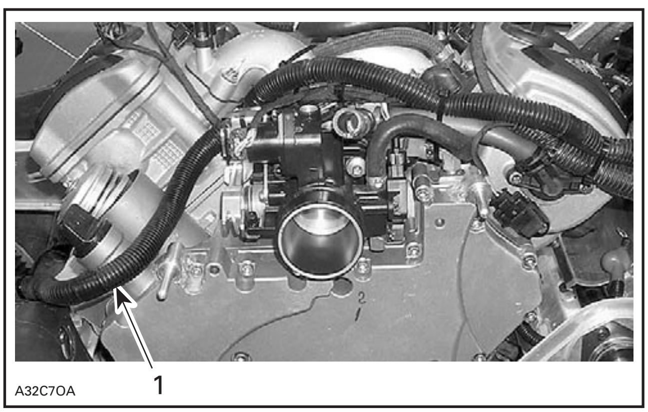
Disconnect the starter RED (+) cable from starter solenoid.

Disconnect throttle cable housing **no. 3** from throttle body.



1. *Throttle cable housing attachment*

Cut the locking ties retaining vehicle harness to engine. Move the vehicle harness away from engine.

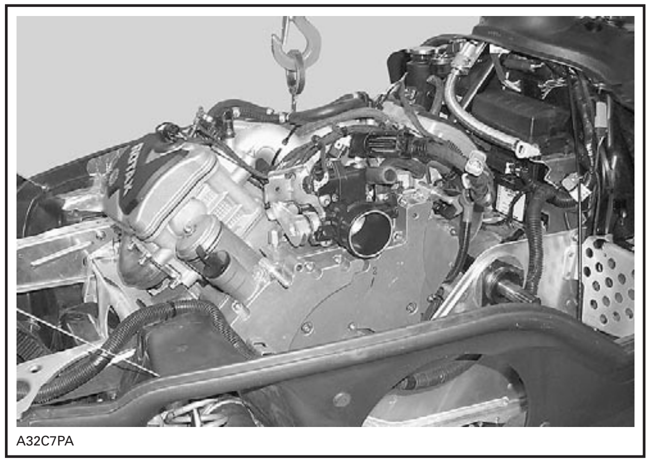


1. *Vehicle harness*

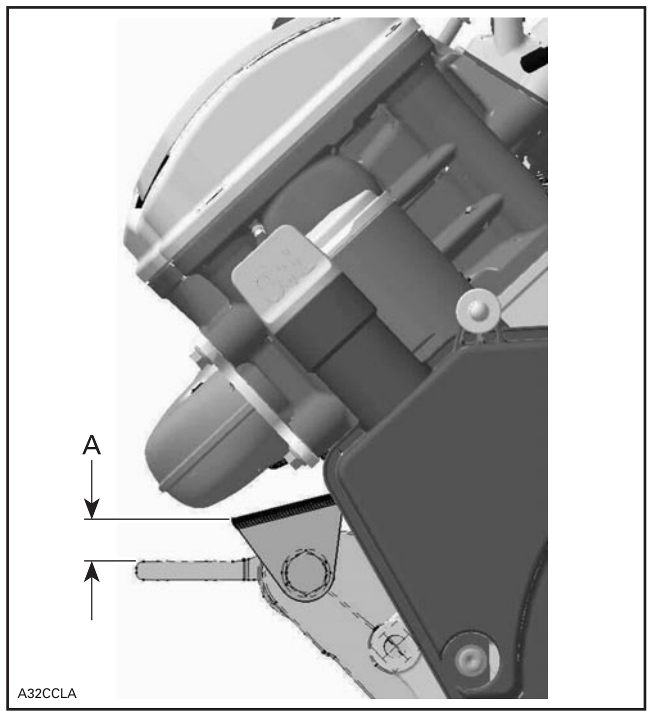
Disconnect engine harness connector (bottom one) from ECM (engine control module).

Remove screws **no. 4** of engine supports.

Hook up engine by lifting eye located on intake manifold. Using appropriate lifting device, remove engine from vehicle.



Before engine installation, make sure that the front deflectors **no. 7** are positioned as per following illustration



A. *13 ± 1.5 mm (1/2 ± 1/16 in)*

ENGINE INSTALLATION

Before engine installation make sure a good condition stopper **no. 6** is in place.

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

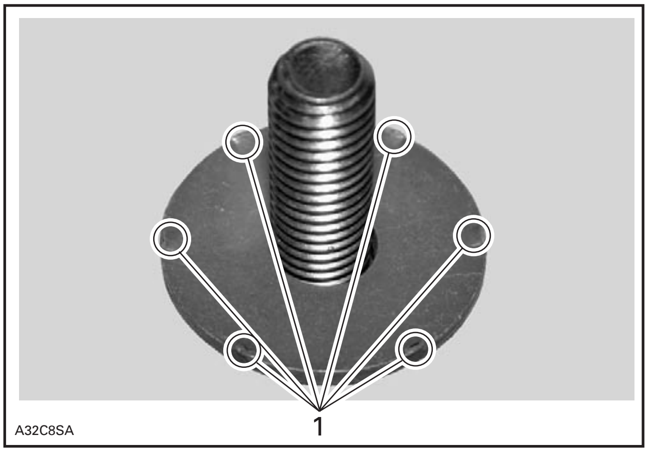
Check pulley alignment and drive belt height.

Install doughnut shaped exhaust gasket with both notches aligned with Y-manifold protrusions.

NOTE: No sealant required on doughnut shaped exhaust gasket.

Torque screws **no. 6** of engine supports to 37 N•m (27 lbf•ft).

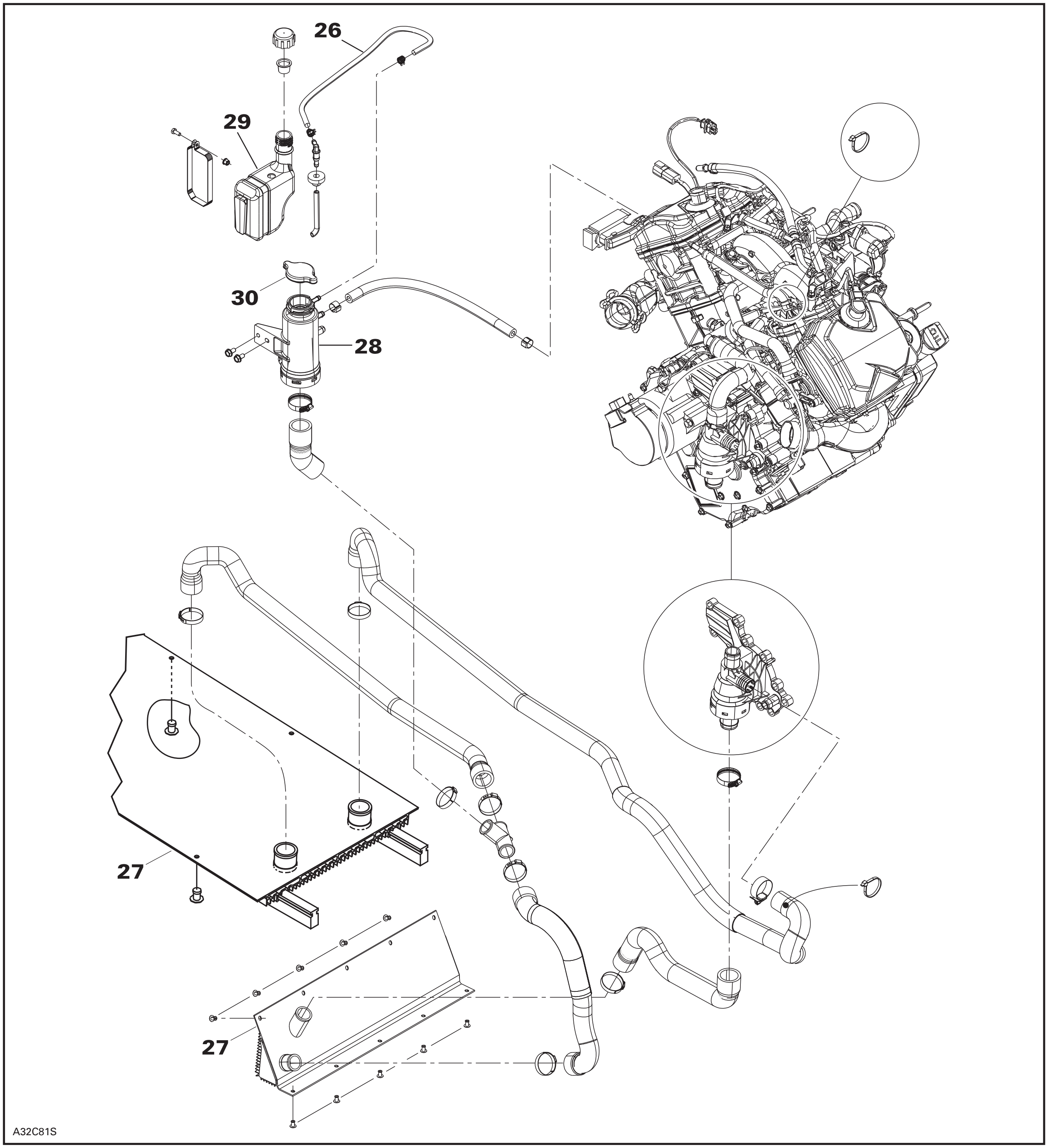
NOTE: Install washers **no. 5** with the teeth toward the support.

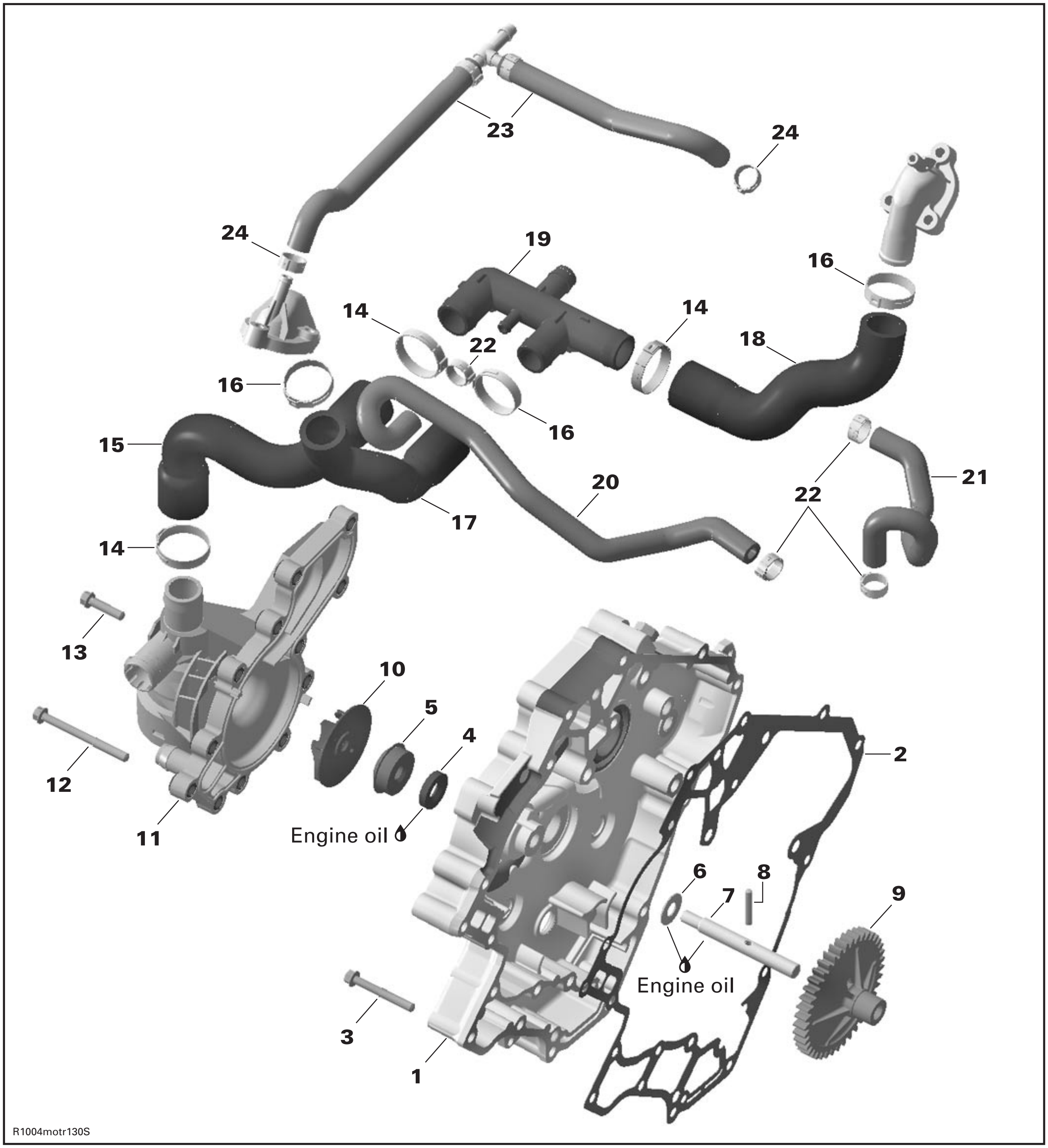


1. Teeth

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

COOLING SYSTEM

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COOLING SYSTEM LEAK TEST

⚠ WARNING

To prevent burning yourself, do not work on cooling system when the engine is hot.

Remove pressure cap **no. 30**.

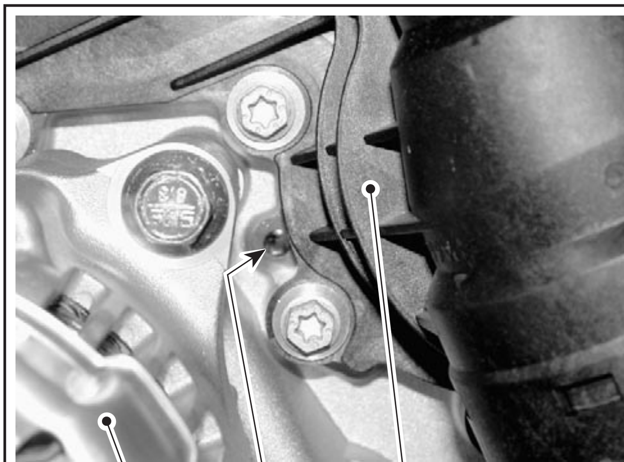
Install special radiator cap (P/N 529 021 400) included in engine leak tester kit (P/N 861 749 100) on coolant tank **no. 28**. Install hose pincher (P/N 295 000 076) on overflow hose **no. 26**. Using the hand pump (P/N 529 021 800) pressurize all system through coolant tank to 120 kPa (17 PSI).

Check all hoses, radiators **no. 27** and cylinder/base for coolant leaks.

INSPECTION

Check general condition of hoses and clamp tightness.

Check leak indicator hole to see if there is oil or coolant .



1. *Leak indicator hole*
2. *Alternator*
3. *Water pump*

NOTE: Flowing coolant indicates a damaged rotary seal **no. 5**. Oil out of the leak indicator hole indicates a defective oil seal **no. 4**.

COOLANT REPLACEMENT

Recommended Coolant

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

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

System Capacity

Refer to TECHNICAL DATA.

Draining the System

⚠ WARNING

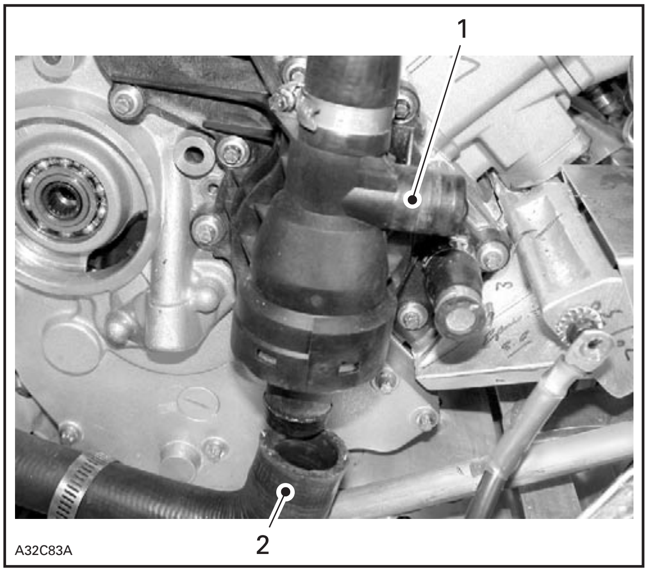
To prevent burning yourself do not work on cooling system when the engine is hot.

Remove pressure cap **no. 30**.

Siphon as much coolant through coolant tank **no. 28**.

Empty the overflow coolant tank **no. 29**.

Disconnect side hose and bottom hose from thermostat housing.

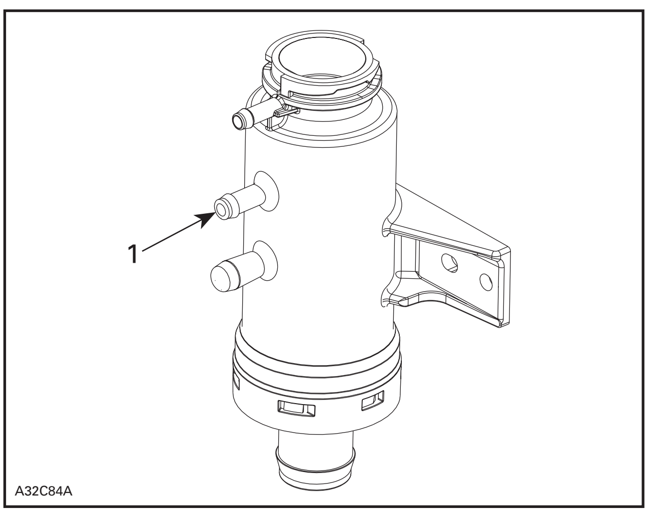


1. *Side hose location*
2. *Bottom hose*

Let coolant drain.

Refilling the System

With vehicle on a flat surface, engine cold, slowly half fill coolant tank **no. 28**.Coolant level must not reach bleed hose nipple to allow air to escape from the system.



1. *Bleed hose nipple*

Coolant level will be stable once coolant tank is half filled.

Do not install the pressure cap **no. 30**.

Start engine. Check level in coolant tank. Refill with coolant to keep coolant tank half filled.

CAUTION: Never allow coolant tank to be empty during the filling procedure.

Let engine idling for about 10 minutes or until radiators are warm — which means that the thermostat is open.

Keep engine idling for an additional 5 minutes maximum or until coolant temperature reaches 100°C (212°F). Always keep coolant tank half filled but the bleed hose free.

CAUTION: Never allow coolant to exceed 100°C (212°F). Put a thermometer in coolant tank to monitor the temperature.

Stop engine. Fill up both coolant tank **no. 28** and overflow coolant tank **no. 29**. Install their respective caps.

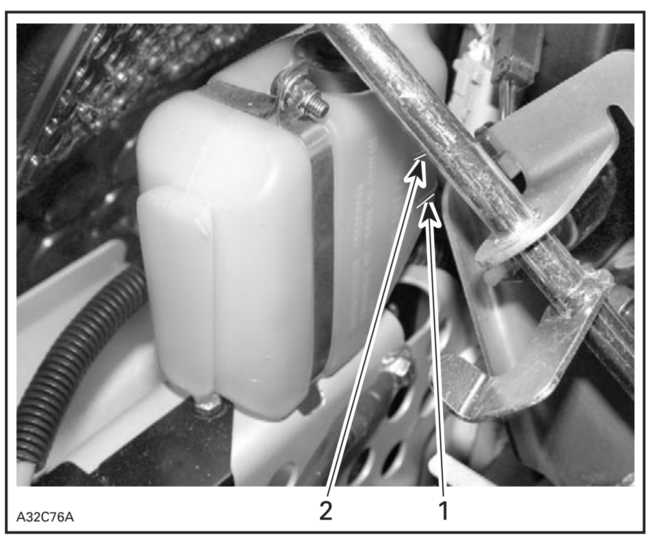
Let vehicle cool down for at least 30 minutes.

Check coolant level in overflow coolant tank **no. 29**. Some coolant should have been sucked through the overflow hose up to the coolant tank. If not repeat refilling procedure.

If some coolant have been siphoned from the overflow coolant tank **no. 29**, remove pressure cap **no. 30** and fill up the coolant tank **no. 28**. Reinstall pressure cap **no. 30**.

Fill overflow coolant tank **no. 29** to maximum level line.

Recheck coolant level after vehicle has completely cooled down. Coolant tank **no. 28** must be full and the level in overflow coolant tank **no. 29** must be between the minimum and maximum marks.



1. *Minimum*
2. *Maximum*

After the first few kilometers (miles) of running recheck level.

COOLANT HOSES

Any damaged/leaky or brittle coolant hose or component must be replaced. When replacing a hose, also replace the clamps.

At installation, do not twist or bend the hoses.

WATER PUMP HOUSING/ THERMOSTAT

The thermostat is a dual action type.

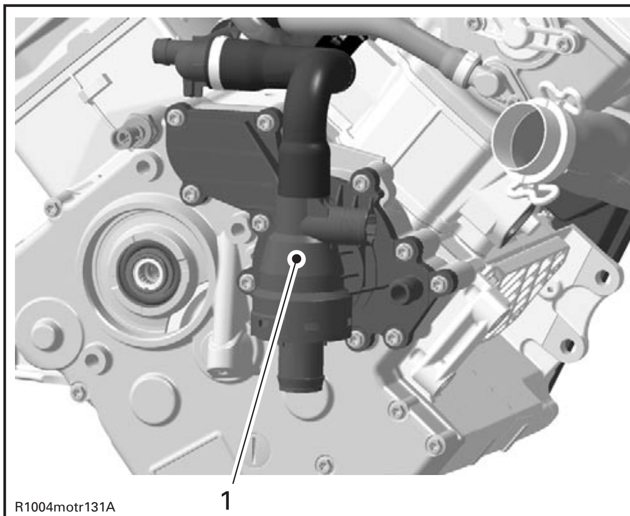
Removal

NOTE: The thermostat is located on the ignition cover. Thermostat and water pump housing form one unit and can only be replaced as one complete component.

Drain cooling system (refer to DRAINING THE SYSTEM above).

Remove:

– water pump housing screws **no. 12** and **no. 13** and pull water pump housing **no. 11**.



1. *Water pump housing with screws and thermostat inside*

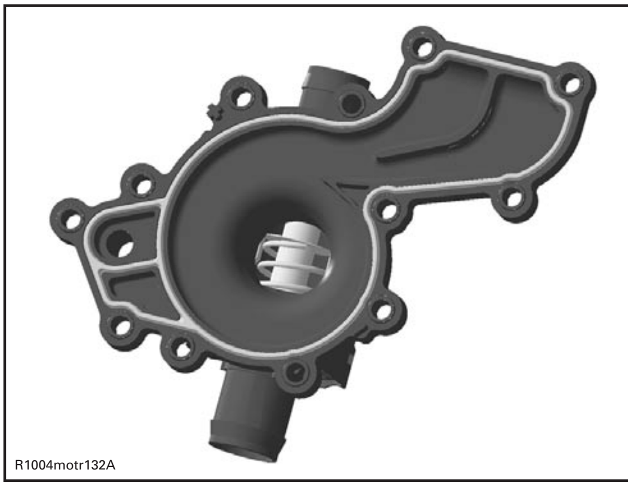
Test

To check thermostat, put in water and heat water. Thermostat should open when water temperature reaches 80°C (176°F).

Inspection

Check the water pump housing for cracks or other damage.

Replace water pump housing if damaged.



WATER PUMP HOUSING WITH GASKET

Installation

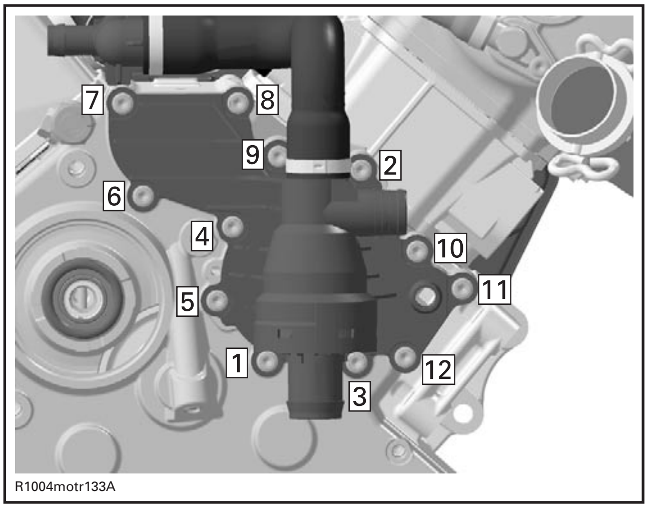
The installation is the opposite of the removal procedure.

NOTE: At installation, replace the gasket of the water pump housing.

Torque water pump housing screws to 9 N•m (80 lbf•**in**).

CAUTION: To prevent leakage, make sure the gasket is exactly in the groove when the water pump housing is reinstalled.

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



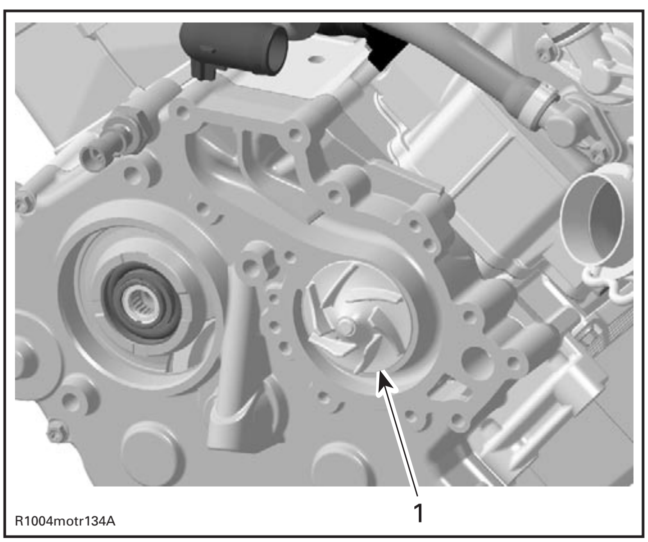
WATER PUMP IMPELLER

Removal

Remove:

– water pump housing **no. 11**
– impeller **no. 10**.

Using pliers, carefully turn the impeller anti-clockwise to remove it from the water pump shaft without any damage. The thread of the water pump shaft is right-hand.



1. Impeller

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. Tighten impeller to 7 N•m(62 lbf•in)

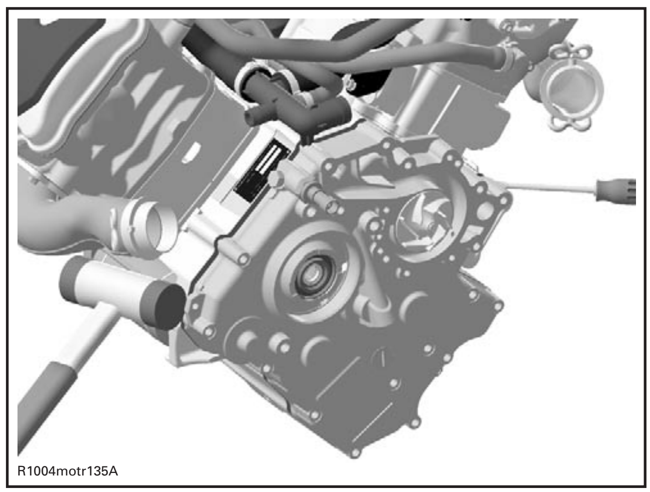
IGNITION COVER

Removal

Remove:

– drain lubrication system (refer to OIL CHANGE)
– alternator (refer to ALTERNATOR)
– water pump housing **no. 11**
– impeller **no. 10**
– screws **no. 3** and pull ignition cover **no. 1**.

Carefully remove the ignition cover using a screwdriver and a plastic hammer.



Ball Bearing Removal Procedure

NOTE: Heat ignition cover up to 100°C (212°F) before removing ball bearings.

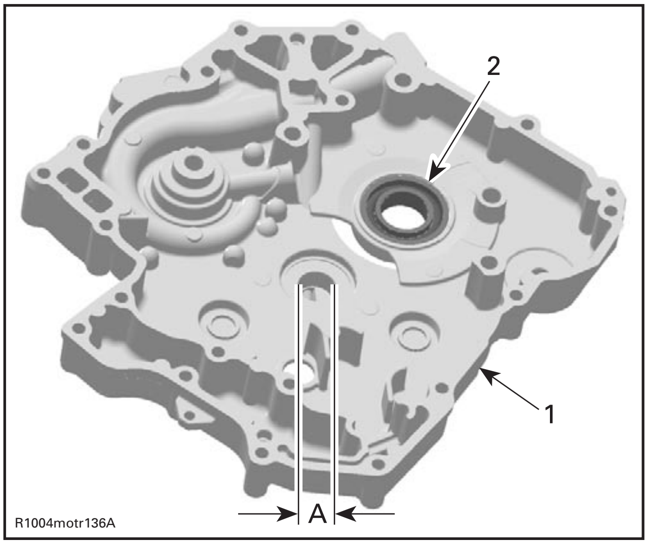
⚠ WARNING

Clean oil, outside and inside ignition cover before heating it.

NOTE: Using a suitable arbor, eject the ball bearing with slight hammer blows towards the inside. The ignition cover has to be supported from below in order to prevent damage of the sealing surface.

Inspection

Check oil supply hole/support bearing for scorings or other damages.There are no plain bearings in the ignition cover.



1. *Ignition cover*
2. *Ball bearing*

A. *Oil supply hole/support bearing diameter*

NOTE: Measure oil supply hole/support bearing diameter. Compare to crankshaft journal diameter on alternator (refer to CRANKSHAFT). Replace the ignition cover if the measurement is out of specification.

DIAMETER OF OIL SUPPLY HOLE/ SUPPORT BEARING	
SERVICE LIMIT	20.040 mm (0.7889 in)

NOTE: Check ball bearing for excessive play and smooth operation. Replace if necessary.

Installation

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

Ball Bearing Installation Procedure

NOTE: Heat ignition cover up to 100°C (212°F) before installing ball bearing.

⚠ WARNING

Clean oil, outside and inside housing before heating it.

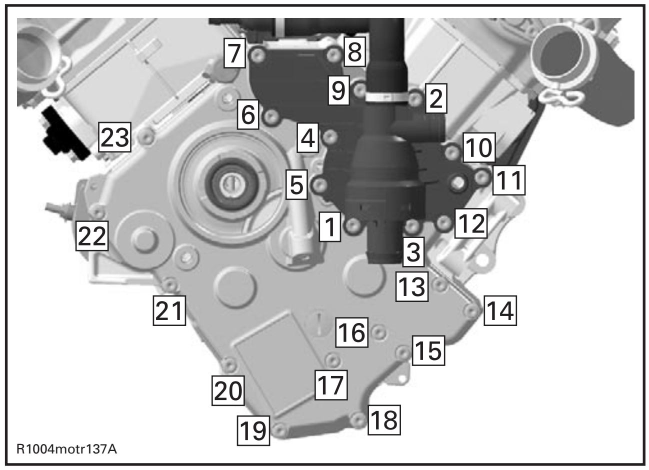
Place new ball bearing in freezer for 10 minutes before installation.

NOTE: Do not use any striking tool to insert the ball bearing. The bearing must be mounted manually with moderate (thumb) pressure into the ignition cover.

Replace gasket **no. 2**.

Torque ignition cover screws to 9 N•m(80 lbf•**in**).

Tighten screws in the following sequence.

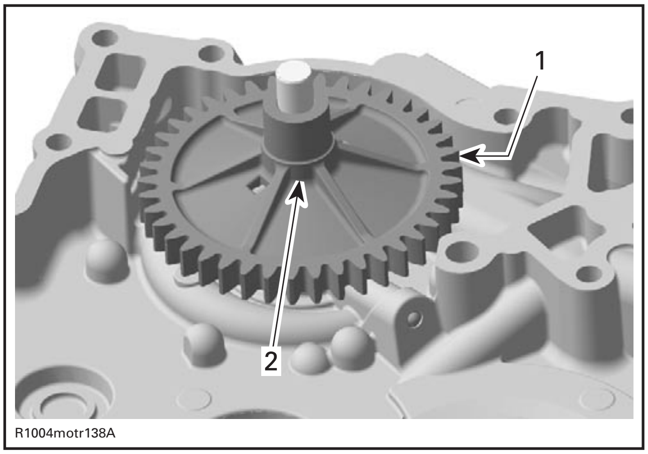


WATER PUMP SHAFT

Removal

Remove:

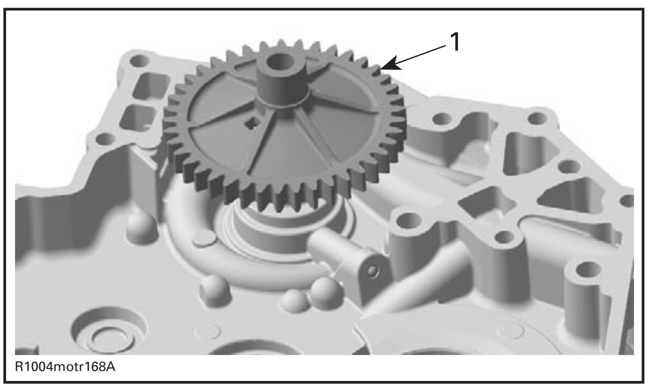
– water pump housing **no. 11**
– impeller **no. 10**
– ignition cover



1. *Water pump gear*
2. *Thrust washer behind water pump gear*

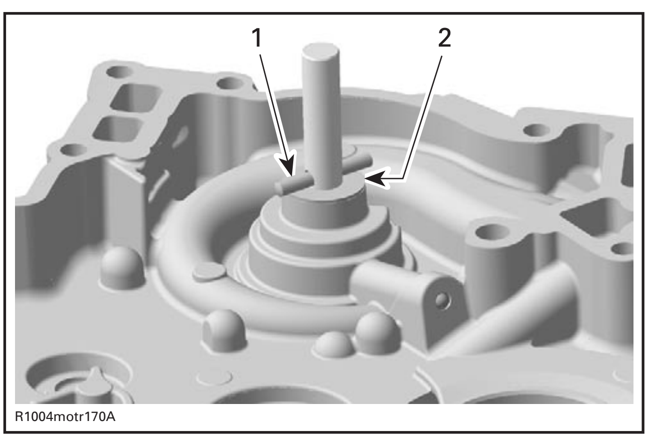
– water pump gear **no. 9**

NOTE: The water pump gear is held by a needle pin on the water pump shaft.



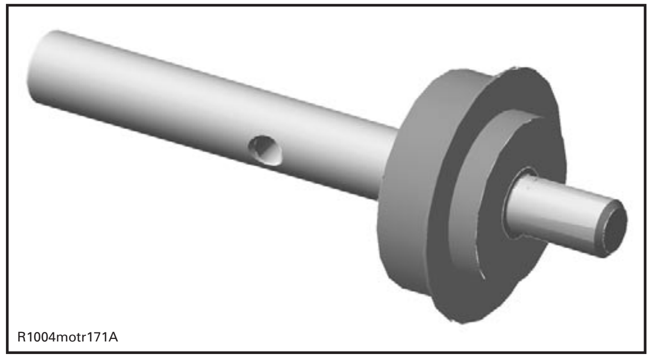
1. *Water pump gear*

– needle pin **no. 8** and thrust washer **no. 6**.

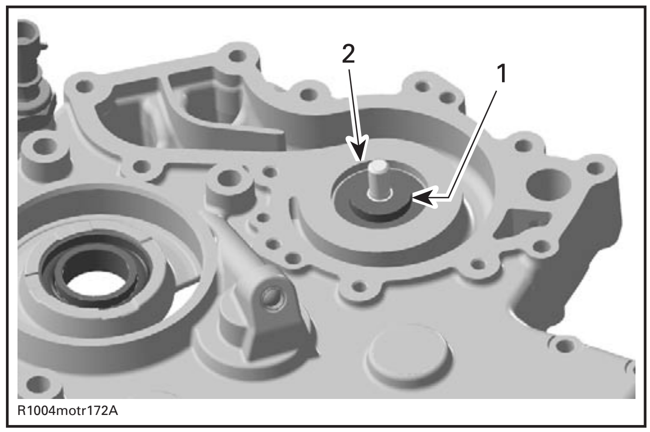


1. *Needle pin*
2. *Thrust washer*

CAUTION: When removing water pump shaft, always replace rotary seal with water pump shaft no. 7 and oil seal no. 4 (behind rotary seal).



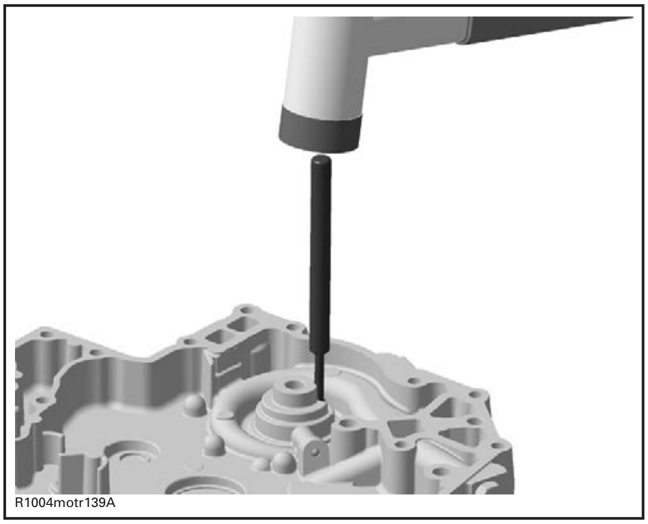
WATER PUMP SHAFT WITH ROTARY SEAL



1. *Oil seal behind the rotary seal*
2. *Rotary seal bore*

Extract the water pump shaft with rotary seal **no. 5** together with oil seal **no. 4** from inside ignition cover with a pusher.

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



Inspection

Inspect water pump gear for wear and damage on the snap mechanism to the needle pin. Replace if damaged.

Water pump shaft with rotary seal must rotate freely. Otherwise, replace it.

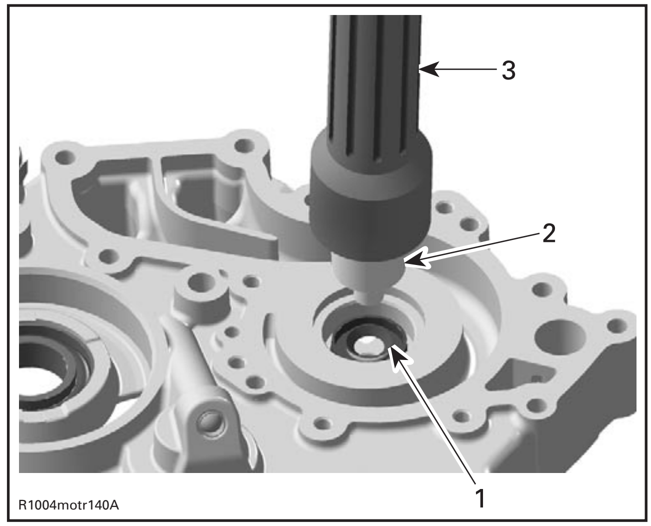
NOTE: When removing water pump shaft, always replace together retaining ring, oil seal, water pump shaft with rotary seal with new parts.

Installation

For installation, reverse the removal procedure.

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

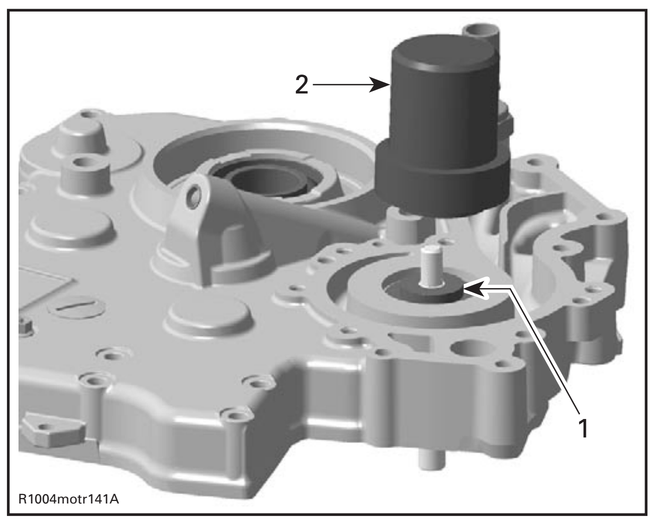
Push water pump shaft oil seal in place by using the oil seal pusher (P/N 529 035 757).



1. Oil seal for the water pump shaft
2. Oil seal pusher (P/N 529 035 757)
3. Handle for insertion jig (P/N 420 877 255)

Install the water pump shaft assembly using the water pump ceramic seal installer (P/N 529 035 766).

CAUTION: Never use a hammer for the rotary seal installation. Only use a press to avoid damaging the ceramic component.



1. Water pump shaft with rotary seal
2. Water pump ceramic seal installer (P/N 529 035 766)

Mount thrust washer **no. 6** and needle pin **no. 8**.

NOTE: The water pump shaft must be slightly preloaded by the spring of the rotary seal.

Use multi-purpose grease in water pump shaft bore.

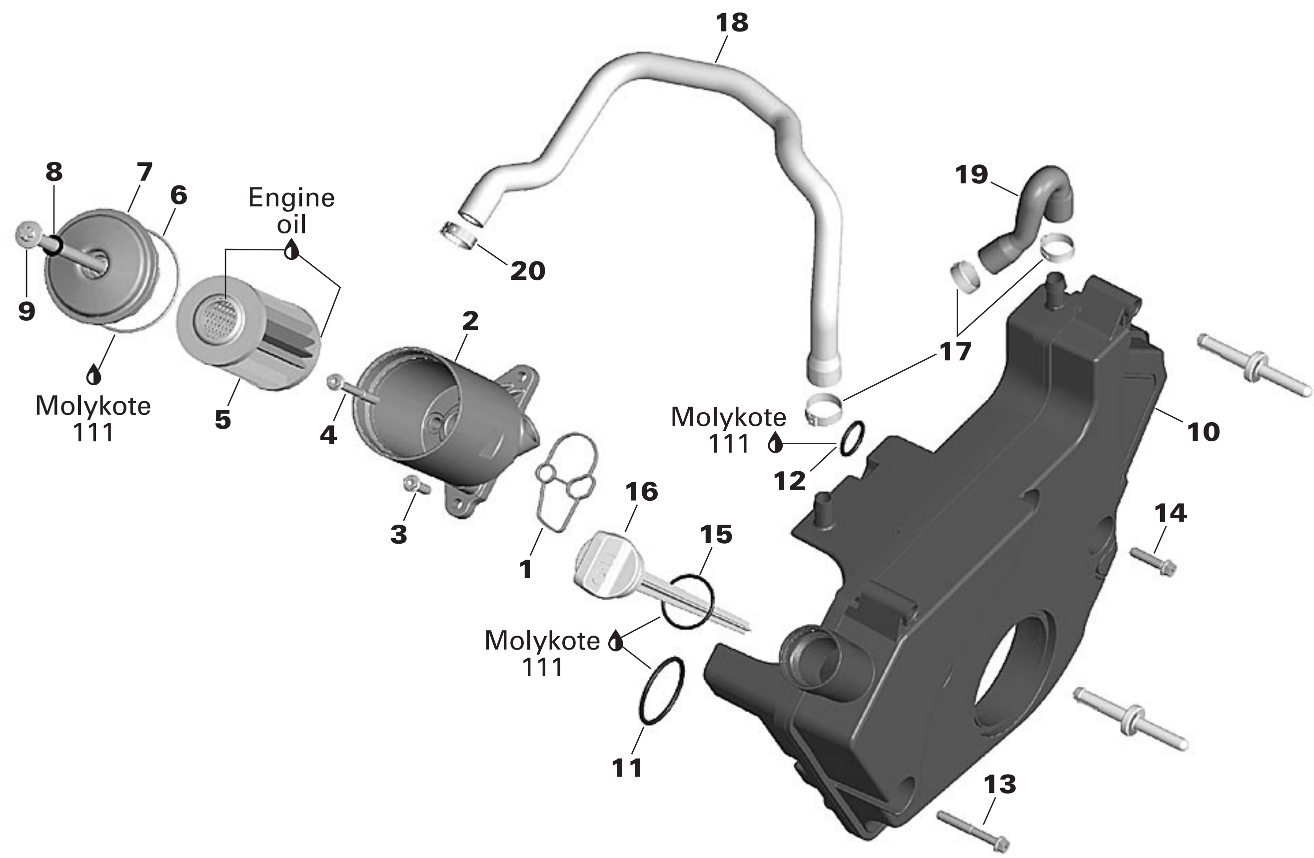
PRESSURE CAP

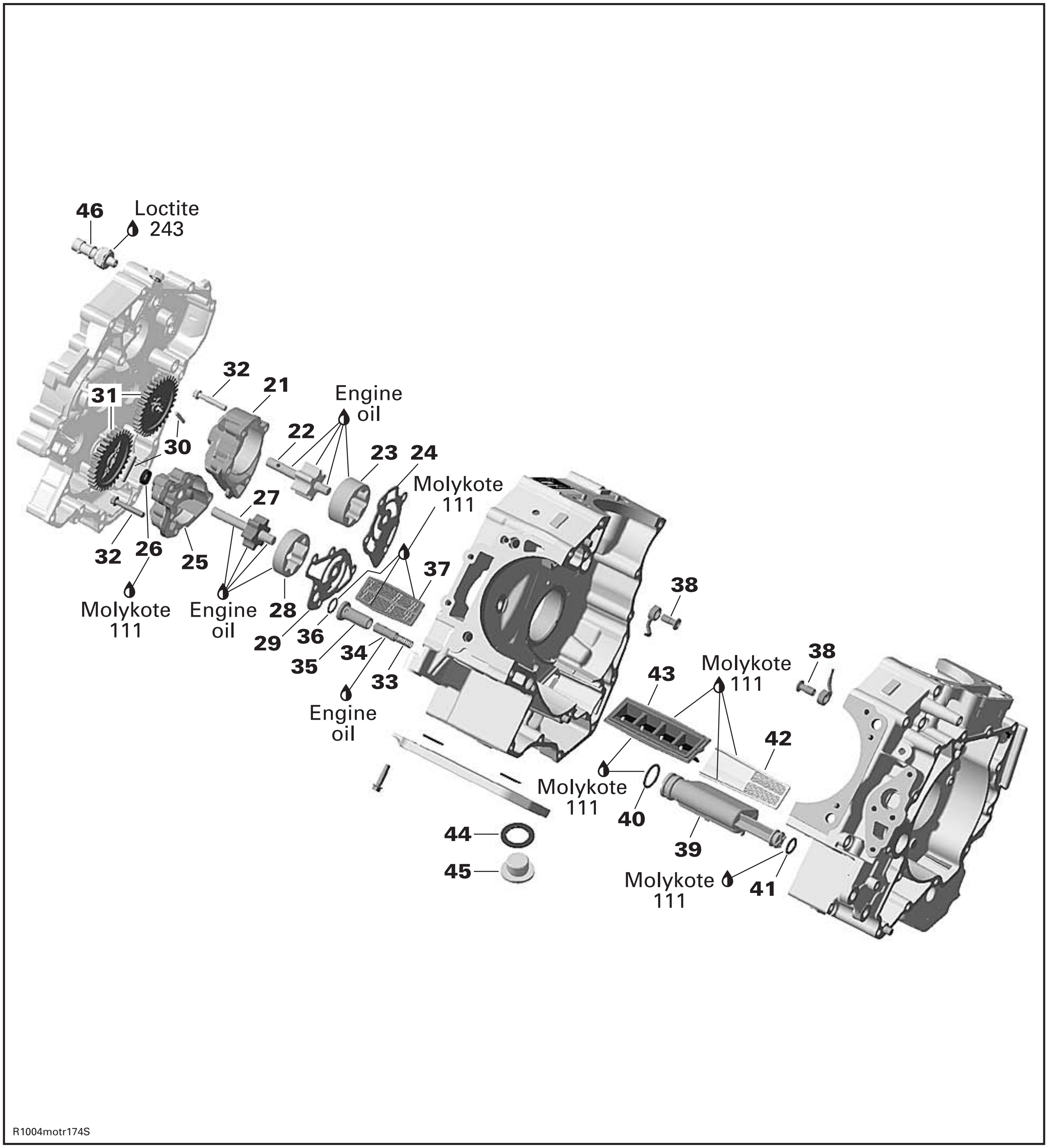
Check if cap pressurizes the system. If not, install a new 110 kPa (16 PSI) cap (do not exceed this pressure).

RADIATORS

Refer to CHASSIS for radiators **no. 27** removal and installation.

LUBRICATION SYSTEM





46
Loctite 243
32
21
31
30
22
Engine oil
23
24
Molykote 111
27
32
26
25
37
28
Molykote 111
Engine oil
29
36
35
34
33
Engine oil
38
38
43
Molykote 111
42
Molykote 111
40
39
44
45
Molykote 111
41
R1004motr174S

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.

At installation, use torque values and service products from the exploded view. Clean threads before using Loctite products when installing screws.

Dispose oil and filter as per your local environmental regulations.

OIL LEVEL CHECK

Snowmobile must be on a level surface.

Warm up the engine to 80°C (176°F).

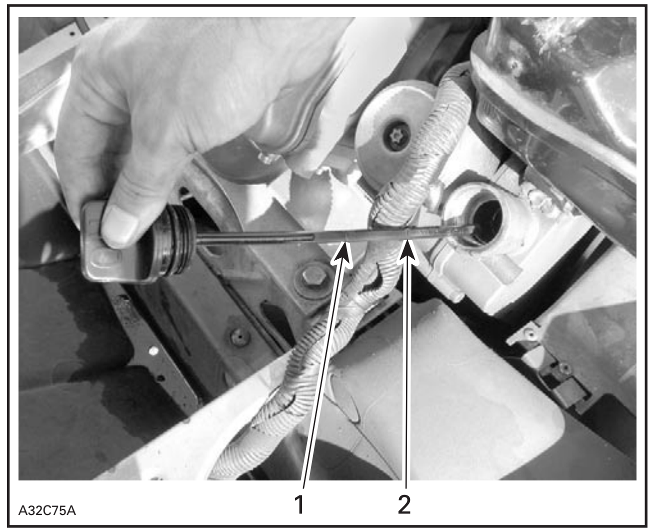
Leave engine running at idle for at least 30 seconds.

Stop engine and wipe the dipstick.

Dipstick must be completely screwed in before checking oil level.

Oil level must be between minimum and maximum marks on dipstick.

There is a capacity of 500 mL (17 U.S. oz) between the two marks.



1. Maximum
2. Minimum

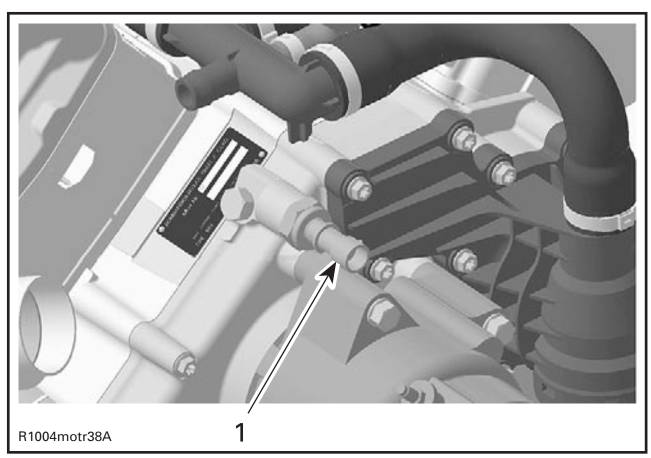
Add BOMBARDIER synthetic oil 0W40 through dipstick hole as required.

Reinstall dipstick.

ENGINE OIL PRESSURE TEST

NOTE: The engine oil pressure test should be done with a **warm engine** 80°C (176°F) and the **recommended oil**.

Remove the oil pressure switch **no. 46** in the area of the cylinder head (intake side), mounted on the ignition cover and install the oil pressure gauge (P/N 529 035 709) and oil pressure adapter (P/N 529 035 652). Use fuel line remover (P/N 529 035 714) to unplug oil pressure adapter from oil pressure gauge.



1. Oil pressure switch

NOTE: Oil pressure switch works between 20 kPa (2.9 PSI) and 40 kPa (5.8 PSI).

The engine oil pressure should be within the following values.

OIL PRESSURE	1300 RPM	7250 RPM
MINIMAL	150 kPa (22 PSI)	400 kPa (58 PSI)
NOMINAL	200 kPa (29 PSI)	450 kPa (65 PSI)
MAXIMAL	250 kPa (36 PSI)	550 KPa (80 PSI)

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

To install oil pressure switch, reverse the removal procedure.

NOTE: Fit oil pressure switch with Loctite 243.

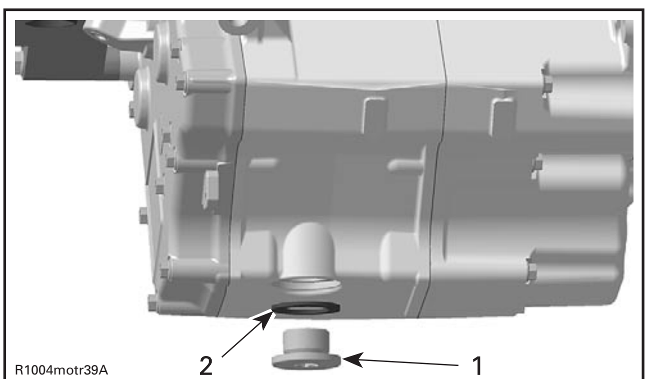
OIL CHANGE

Removal

Place a drain pan under the engine drain plug area.

Clean the drain plug area.

Unscrew drain plug **no. 45** then remove dipstick **no. 16**.



1. *Drain plug*
2. *Gasket ring*

– Unscrew retaining screw **no. 9** to drain the oil filter housing.
– Wait a while to allow oil to flow out of oil filter.

Inspection

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

Installation

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

NOTE: At installation, remember to replace the gasket ring **no. 44** of the drain plug.

Torque drain plug to 55 N•m (40 lbf•ft).

System Capacity

Refer to TECHNICAL DATA.

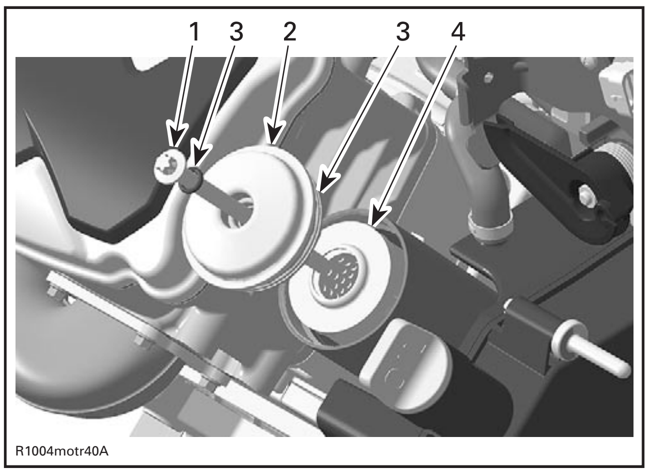
NOTE: After filling, warm up the engine to 80°C (176°F) and check the oil level with the dipstick. Refer to OIL LEVEL CHECK above.

OIL FILTER

Removal

Remove:

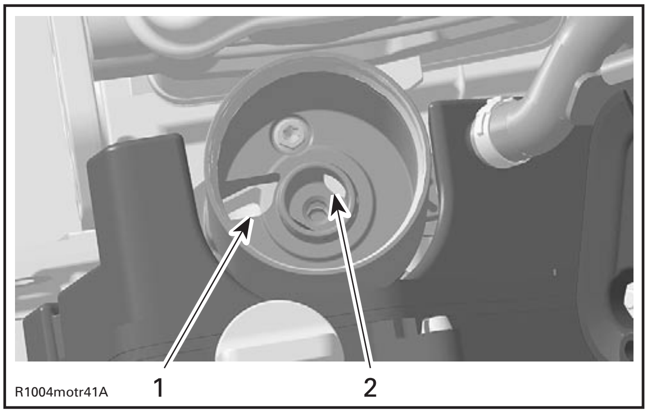
– engine oil (refer to OIL CHANGE)
– oil filter screw **no. 9**
– oil filter cover **no. 7**
– oil filter**no. 5**.



1. *Oil filter screw*
2. *Oil filter cover*
3. *Gaskets*
4. *Oil filter*

Inspection

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



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

Installation

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

NOTE: Slightly oil the two gaskets at the top and bottom sides of the oil filter before assembly. This will ease assembly and prevent displacement of the gasket during installation.

At assembly, remember to replace the two O-rings **no. 6** and **no. 8** of the oil filter screw.

Slightly grease the O-ring **no. 6** of the oil filter cover before assembly using multi-purpose grease. This will ease assembly and prevent displacement of the gasket during installation.

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

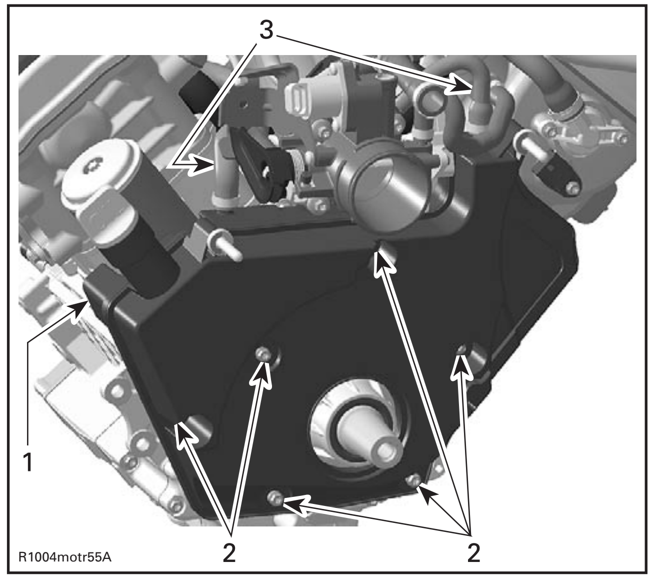
OIL TANK

Removal

First drain the lubrication system (refer to OIL CHANGE).

Remove:

– hose clamps **no. 17** and pull hoses
– oil tank screws **no. 13** and **no. 14** and pull oil tank **no. 10**.



1. Oil tank
2. Six screws
3. Hoses

CAUTION: Make sure that the O-rings no. 11 and no. 12 do not get stuck in the crankcase.

Inspection

Inspect the oil tank for cracks/fractures or other damage/leakage.

NOTE: If necessary, replace the oil tank.

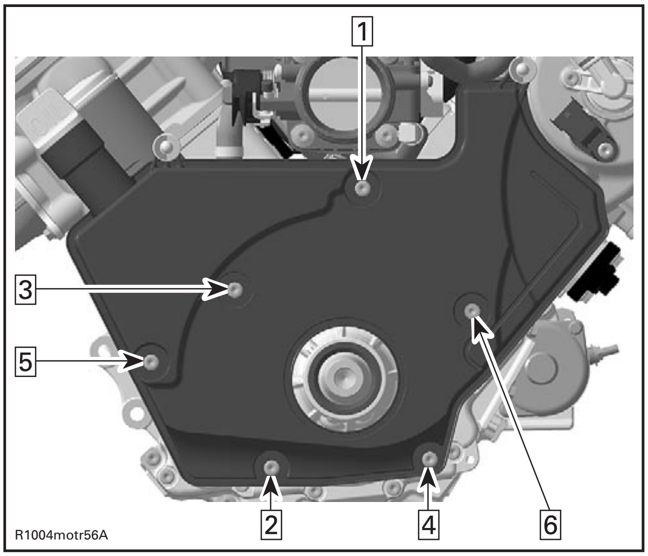
Installation

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

NOTE: At assembly, replace both O-rings **no. 11** and **no. 12**.

Before assembly, slightly grease the O-rings. This will ease assembly and prevent displacement of the gasket during installation.

Torque oil tank screws to 9 N•m (80 lbf•**in**) as per following sequence.



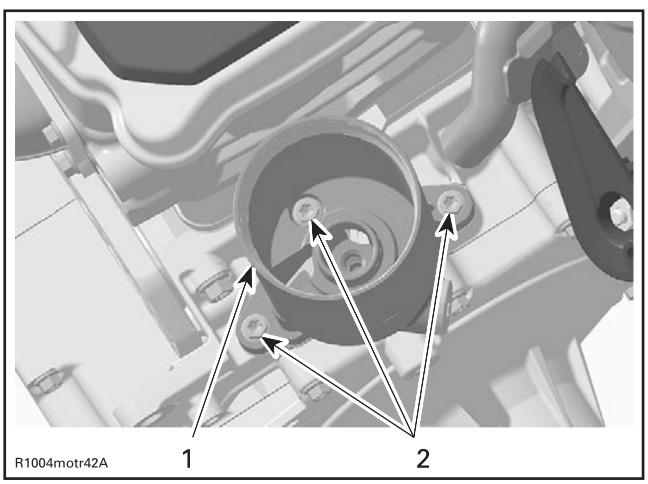
OIL FILTER HOUSING

Removal

First drain the lubrication system (refer to OIL CHANGE).

Remove:

– oil tank (refer to OIL TANK)
– oil filter (refer to OIL FILTER)
– oil filter housing screws **no. 3** and **no. 4** and pull oil filter housing **no. 2**.



1. *Oil filter housing*
2. *Three screws*

Inspection

Check the oil filter housing for cracks or other damage.

Replace oil filter housing if damaged.

Installation

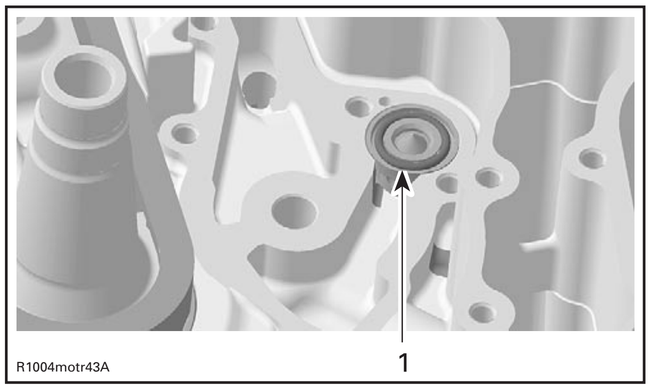
The installation is the opposite of the removal procedure. Pay attention to the following details.

NOTE: Always replace gasket **no. 1**.

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

ENGINE OIL PRESSURE REGULATOR

The oil pressure regulator is located on the engine alternator side (behind ignition cover/pressure oil pump cover).



1. *Engine oil pressure regulator*

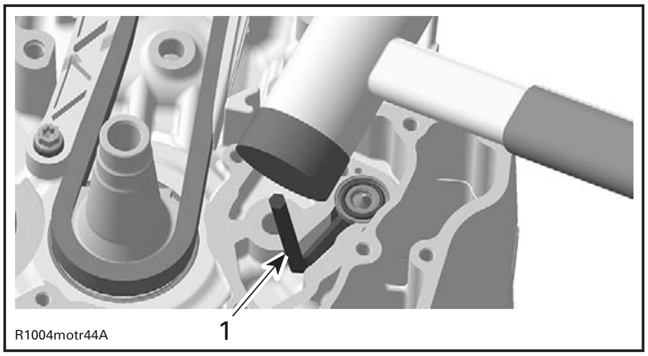
NOTE: The oil pressure regulator system works between 240 kPa (35 PSI) and 430 kPa (62 PSI).

Removal

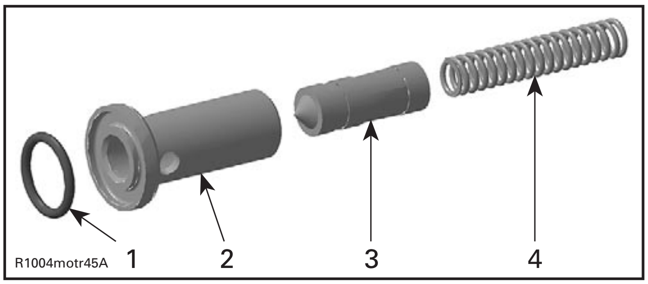
Remove:

– water pump housing (refer to COOLING SYSTEM)
– ignition cover (refer to COOLING SYSTEM)
– oil pump cover **no. 25** (refer to PRESSURE OIL PUMP)
– O-ring **no. 36**, valve seat **no. 35**, pressure regulating piston **no. 34** and spring **no. 33**.

Put a suitable Allen wrench or another 90° angle tool under the engine oil pressure regulator. By slight hammer blows against the Allen wrench carefully drive out the oil pressure regulator.



1. Allen wrench



1. O-ring
2. Valve seat
3. Pressure regulator piston
4. Spring

Inspection

Inspect pressure regulator piston and valve seat for scoring or other damages.

Check spring for free length.

SPRING FREE LENGTH	
NEW NOMINAL	46 mm (1.811 in)
SERVICE LIMIT	45 mm (1.771 in)

NOTE: Replace worn or damaged components. Pressure regulator piston and valve seat may only be replaced together.

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

Installation

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

NOTE: Oil the pressure regulator piston before installation.

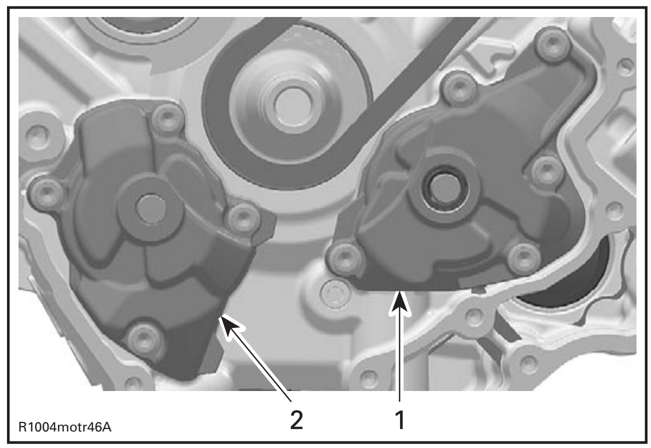
Fit the engine oil pressure regulator by pushing it carefully with an aluminum or brass rod. The engine oil pressure regulator must be flush with the crankcase. Following installation check the pressure regulator piston for easy movement.

NOTE: At installation always replace the O-ring **no. 36**, and fit it with grease.

OIL PUMPS

The oil pumps are located on the engine alternator side (behind ignition cover).

The engine is equipped with two oil pumps, a pressure oil pump and a suction oil pump.



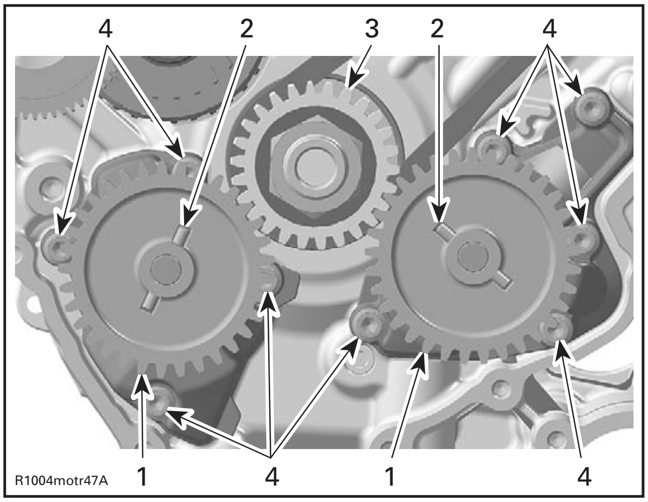
1. Pressure oil pump
2. Suction oil pump

PRESSURE OIL PUMP

Removal

Remove:

– water pump housing (refer to COOLING SYSTEM)
– ignition cover (refer to COOLING SYSTEM)
– oil pump gear **no. 31**
– needle pin **no. 30**
– drive gear of crankshaft (refer to CRANKSHAFT)
– oil pump cover screws **no. 32** and pull oil pump cover **no. 25**
– oil pump shaft with inner rotor **no. 27** and outer rotor **no. 28**
– intermediate plate **no. 29**.

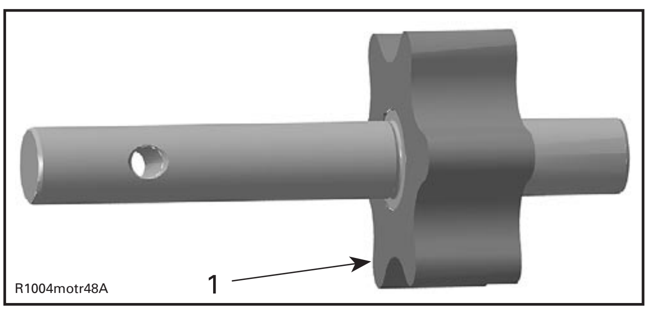


1. Oil pump gear
2. Needle pin
3. Drive gear of crankshaft
4. Oil pump cover screws

Inspection

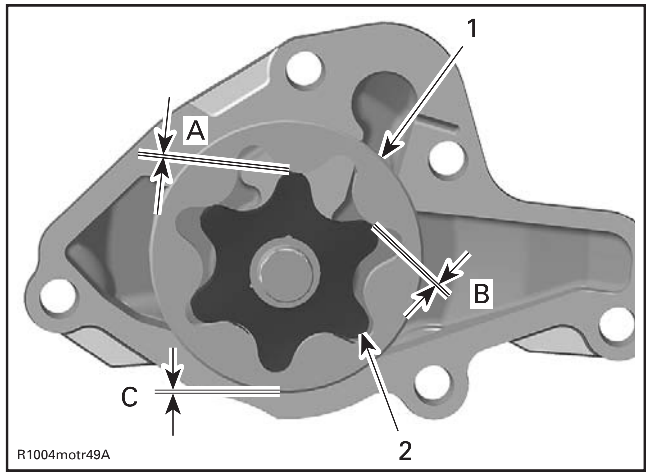
Inspect oil pump shaft assembly and the oil pump cover for marks or other damages.

Check inner rotor for corrosion pin-holes or other damages. If so, replace oil pump shaft assembly. Also check the oil pump cover. If damaged, replace the complete oil pump assembly.



1. Pittings on the teeth

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



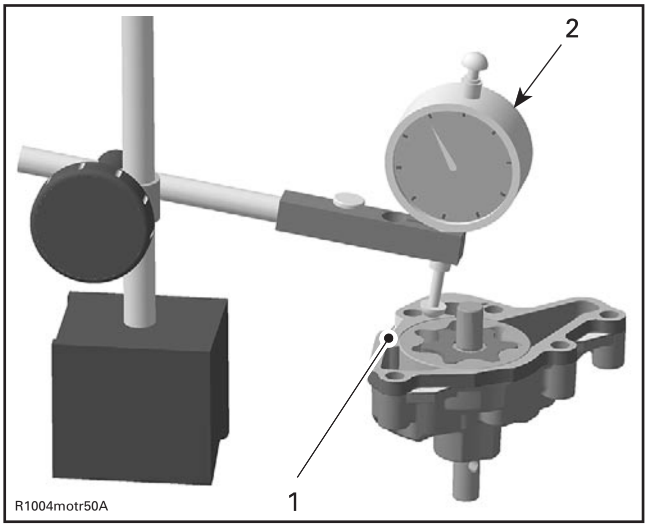
1. Outer rotor
2. Inner rotor

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

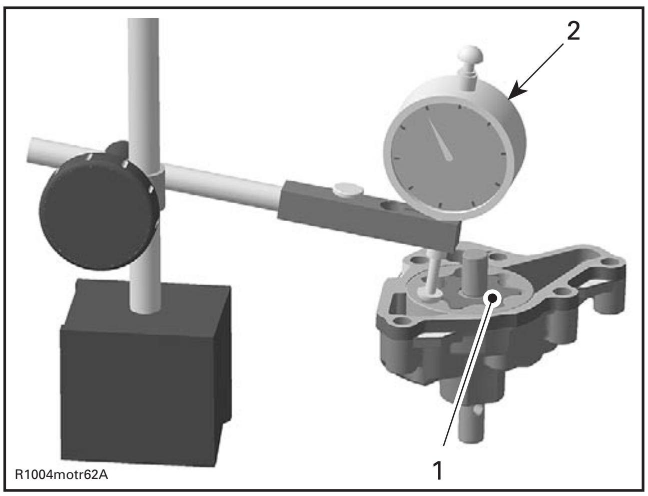
If clearance between inner and outer rotors exceeds the tolerance, replace oil pump shaft assembly. Ensure to also check oil pump cover. If damaged, replace the complete oil pump assembly.

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

Using a dial indicator, measure side wear as shown.



1. *Oil pump cover surface*
2. *Dial indicator*



1. *Oil pump outer rotor surface*
2. *Dial indicator*

Difference between oil pump cover 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.

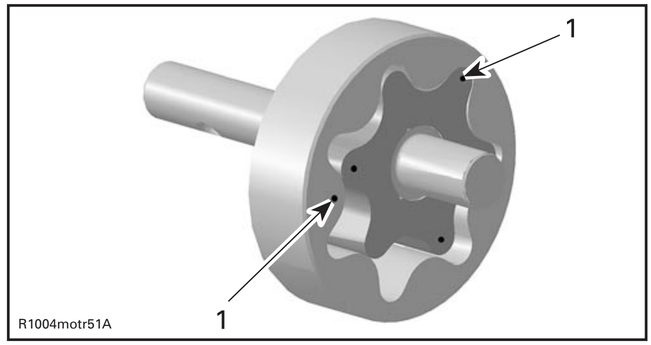
Check the inside of oil pump cover for scoring or other damages. If so, change the complete oil pump assembly.

Installation

For installation, reverse the removal procedure.

Pay attention to the following details.

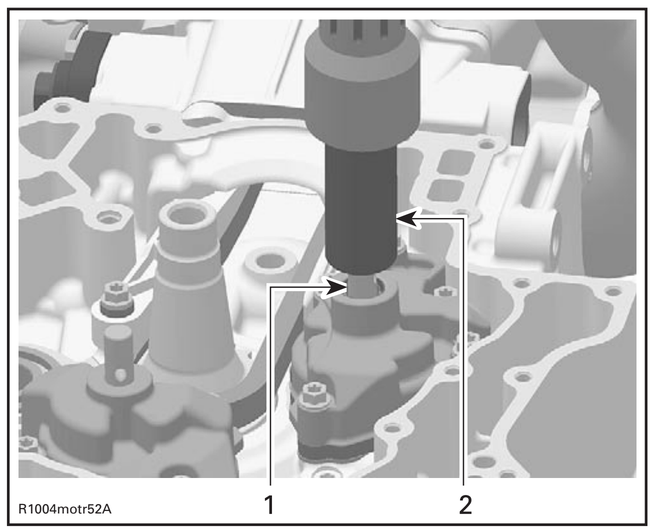
CAUTION: The outer rotor no. 28 and the oil pump shaft with inner rotor no. 27 are marked on the upper side. When installing, make sure that the position of the outer rotor is not reversed.



1. *Marking*

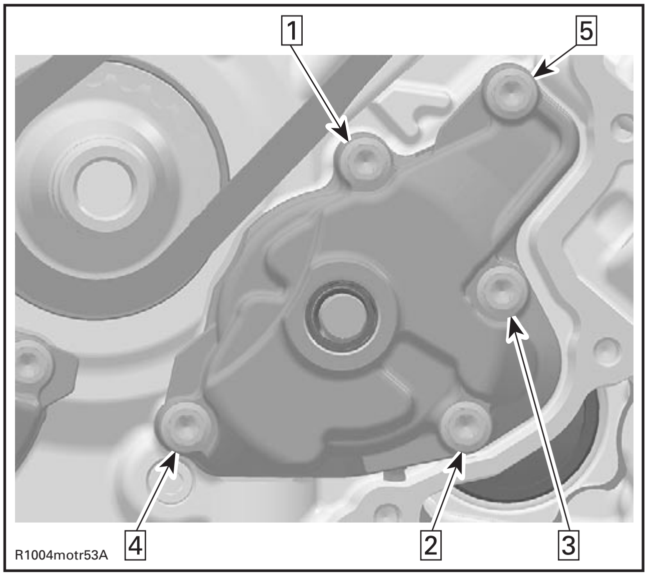
NOTE: At installation always replace the oil seal **no. 26** fitted in the oil pump cover.

Push oil seal in place by using the oil seal pusher (P/N 529 035 911).



1. *Oil seal*
2. *Oil seal pusher (P/N 529 035 911)*

Torque oil pump housing screws to 9 N•m (80 lbf•**in**) as per following sequence.



Final Test

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

SUCTION OIL PUMP

Removal

For information about disassembly of the suction oil pump please refer to PRESSURE OIL PUMP. Disassembly is the same for both pumps.

Inspection

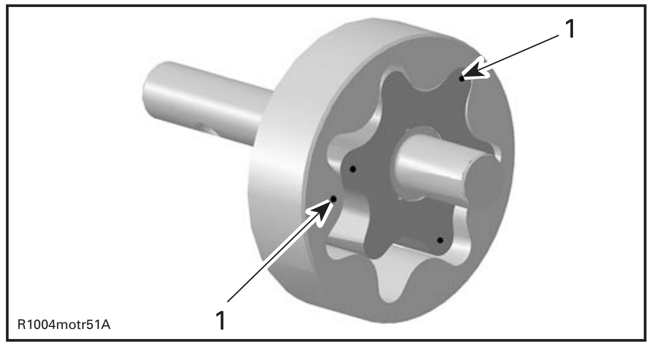
For information about inspection of the suction oil pump please refer to PRESSURE OIL PUMP. Inspection is the same for both pumps.

Installation

For installation, reverse the removal procedure.

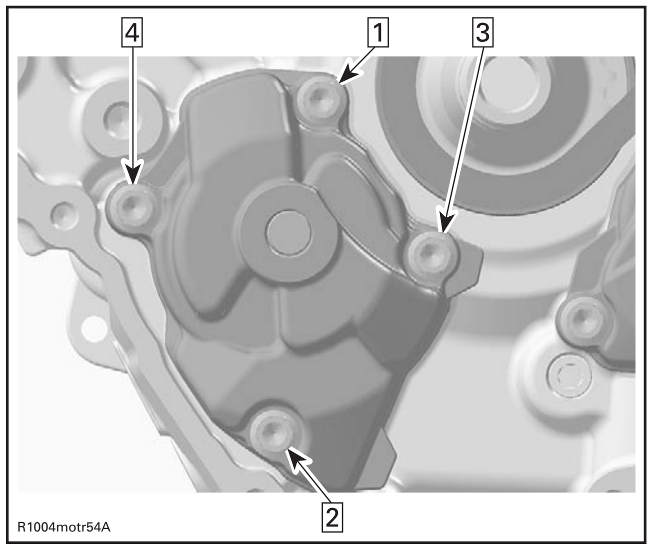
Pay attention to the following details.

CAUTION: The outer rotor no. 23 and the oil pump shaft with inner rotor no. 22 are marked on the upper side. When installing, make sure that the position of the outer rotor is not reversed.



1. Marking

Torque oil pump housing screws to 9 N•m (80 lbf•**in**) as per following sequence.

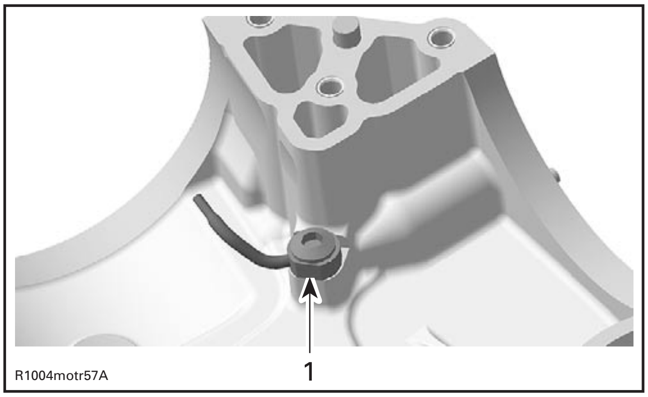


Final Test

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

OIL NOZZLE

The oil nozzles **no. 38** are located within the crankcase. Each piston is equipped with a separate oil nozzle.



1. *Oil nozzle*

NOTE: If the engine has to be disassembled within the scope of repair work, take this opportunity to clean the oil nozzles.

Cleaning and Inspection

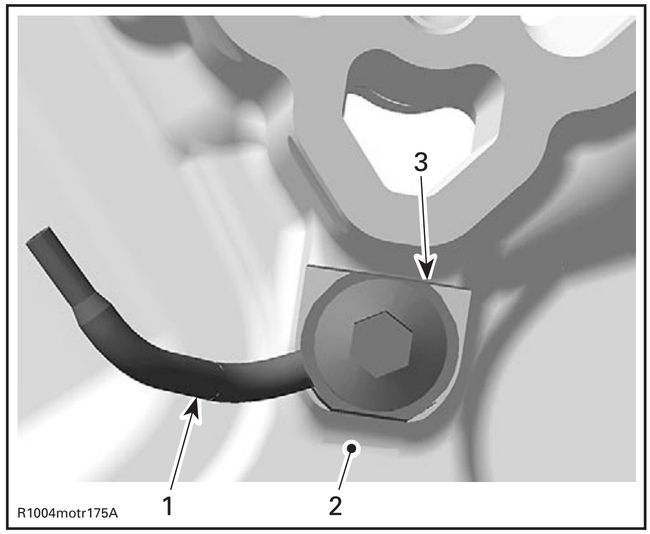
Clean oil nozzle with a part cleaner then use an air gun to dry it.

⚠ WARNING

Always wear eye protector. Chemicals can cause a rash break out and injure your eyes.

Installation

CAUTION: At assembly, make sure the contact surfaces of the oil nozzle are well fitted onto the crankcase. If this is not ensured, the spray direction will change, causing potential damage to the engine.



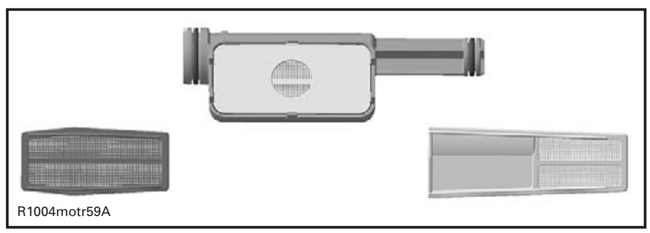
1. *Oil nozzle*
2. *Crankcase*
3. *Contact surface*

NOTE: If the oil nozzles are damaged or bent during installation work in the crankcase, they must be replaced immediately.

Torque oil nozzle screws to 19 N•m (168 lbf•**in**).

OIL SIEVES

The engine is equipped with 3 oil sieves **no. 37**, **no. 39** and **no. 42** for filtering dirt and abraded particles from the oil circuit. The sieves are fitted into the crankcase.



3 OIL SIEVES

NOTE: Cleaning of the oil sieves is only possible if the engine is disassembled. So, if the engine has to be disassembled within the scope of repair work, clean the sieves at the same time.

Cleaning and Inspection

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

⚠ WARNING

Always wear eye protector. Chemicals can cause a rash break out and injure your eyes.

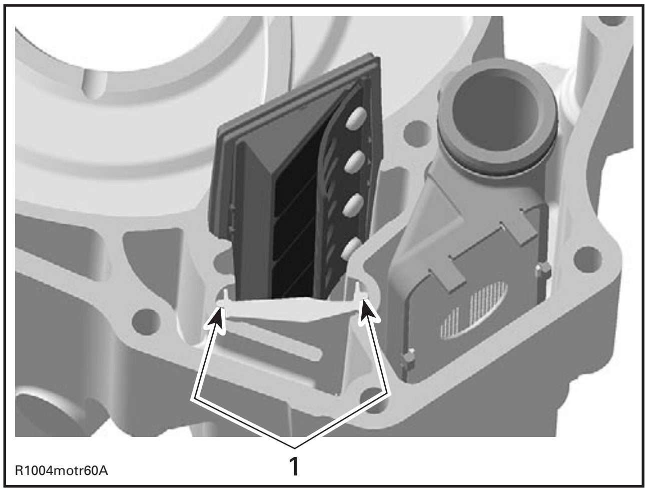
Check sieves for cracks or other damage.

NOTE: Replace sieves if damaged.

Installation

NOTE: During assembly always replace both O-rings **no. 40** and **no. 41**.

CAUTION: Take particular care with oil sieve no. 42 to ensure that it is re-installed in exactly the same position.

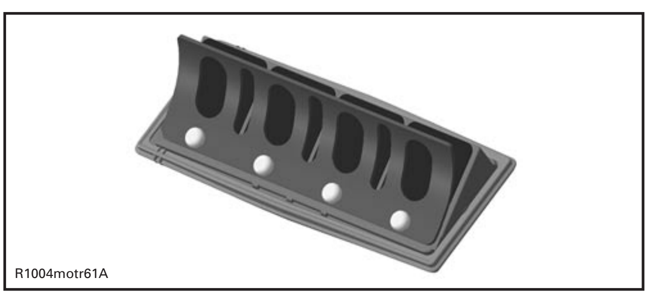


1. *Correct installation position of oil sieve*

NOTE: Before assembly, slightly oil the O-rings and the sieves at the outside using multi-purpose grease. This will ease assembly and prevent displacement of the gasket during installation.

REED VALVE

The engine is equipped with a reed valve **no. 43** which prevents accumulation of larger oil quantities in the crankcase. The reed valve is fitted into the crankcase.



REED VALVE

NOTE: If the engine has to be disassembled within the scope of repair work, take this opportunity to clean the reed valve, using a rag.

Inspection

Check reed valve for cracks or other damage.

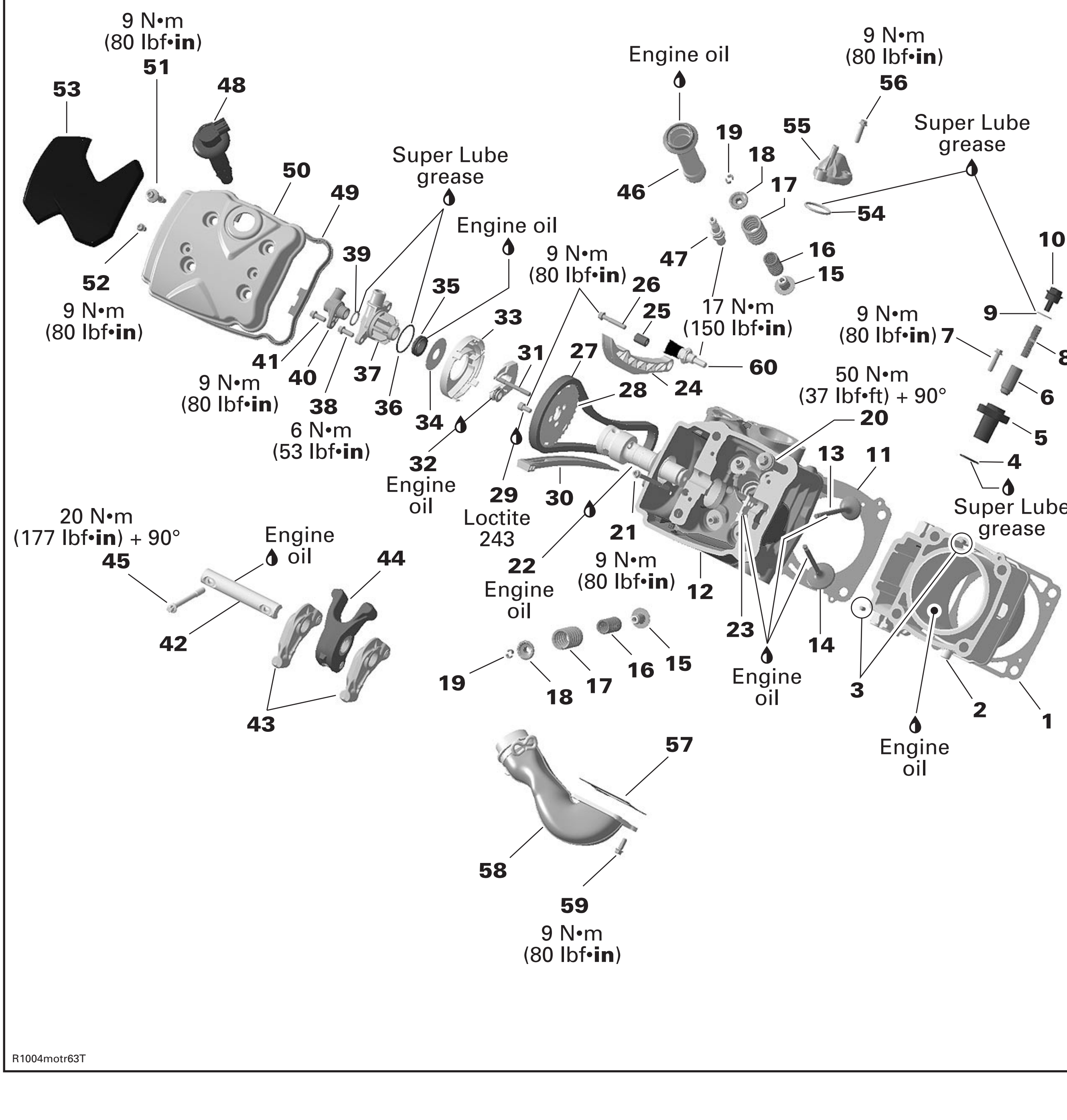
NOTE: Replace reed valve if damaged.

Installation

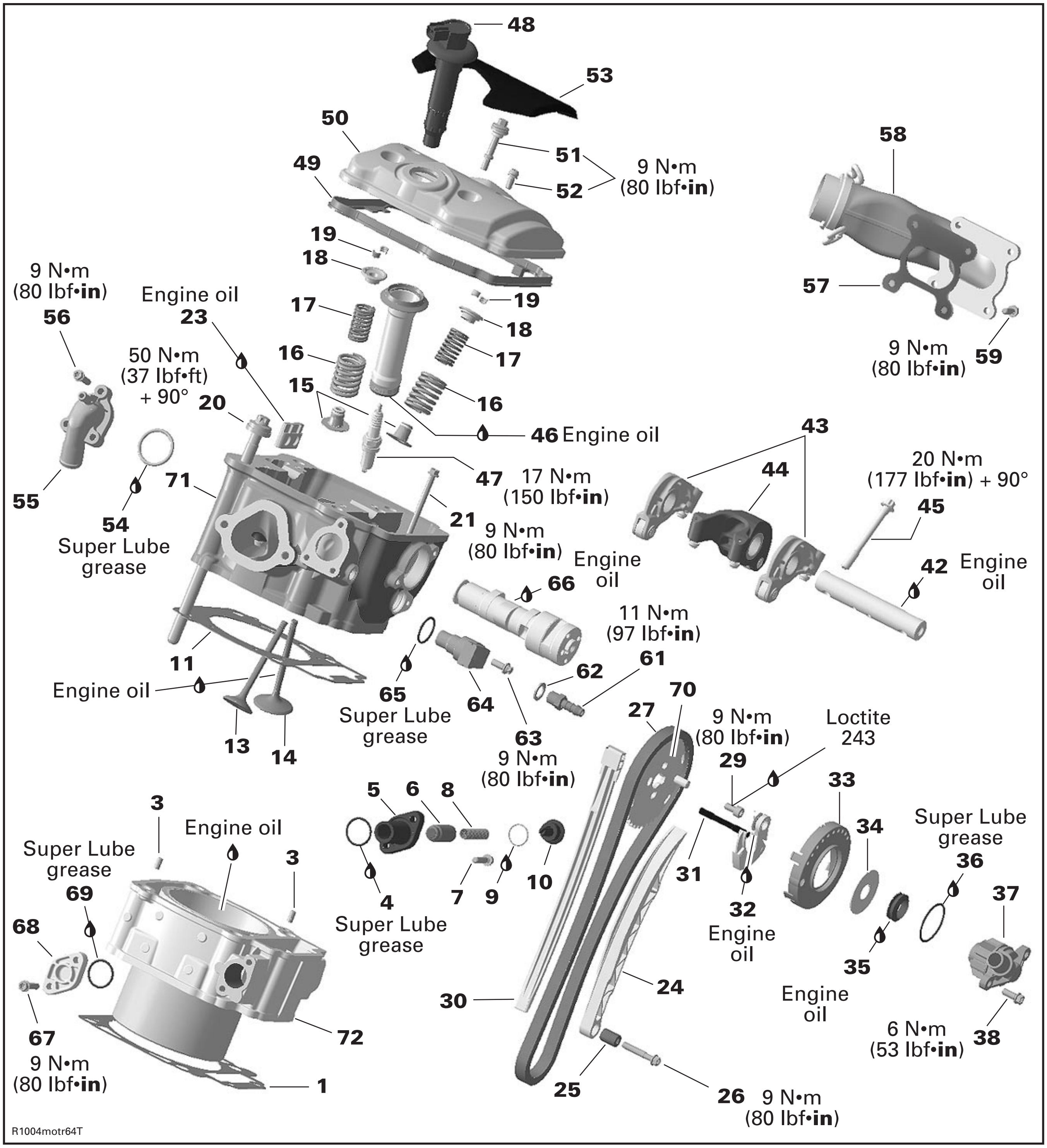
NOTE: Before assembly slightly grease the rubber gasket of the reed valve with multi-purpose grease.

CYLINDER AND CYLINDER HEAD

CYLINDER/CYLINDER HEAD 1 (FRONT-SIDE)



CYLINDER/CYLINDER HEAD 2 (REAR-SIDE)



GENERAL

NOTE: Components which are identical for both cylinders/cylinder heads are identified in the two exploded views by the same number. Components which are different or which are, for instance, present on one of the cylinders/cylinder heads but not on the other, have different numbers. The information given below always relates to both cylinders/cylinder heads as a general rule.

Special reference is made in the text to work instructions which are not the same for cylinder 1 and cylinder 2.

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

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

Always place the vehicle on a level surface.

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

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

Even though many parts do not need to be removed to reach other parts, it is recommended to remove these parts anyway in order to check them.

For installation, use the torque values and service products from exploded views. Clean threads before using Loctite product when installing screws.

When disassembling parts that are duplicated in the engine, (e.g.: valves), it is strongly recommended to note their position (PTO, alternator side) and to keep them as a "group". If you find a defective component, it will be much easier to find the cause of the failure among its group of parts (e.g.: you found a worn valve guide. A bent spring could be the cause. It will be easy to know which one among the springs is defective 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

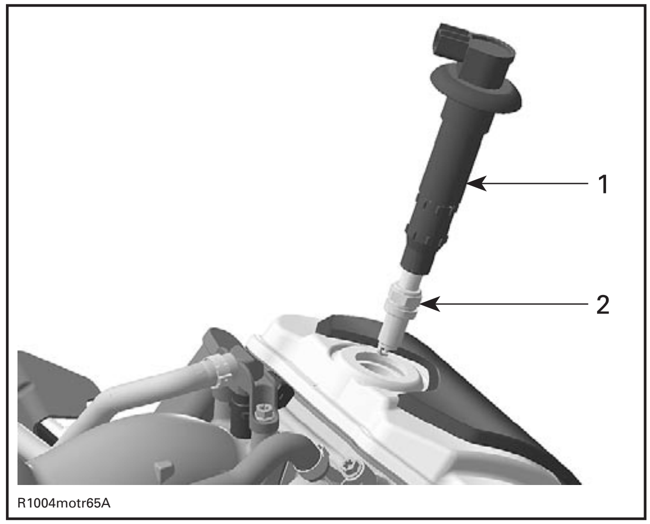
Removal

Unplug the stick coil connector.

Remove the stick coil **no. 48**.

Clean spark plug and stick coil area before disassembly.

Unscrew spark plug **no. 47** then use the stick coil to take spark plug out of spark plug hole.



1. Stick coil
2. Spark plug

Inspection

Check spark plug and stick coil condition (refer to COMPONENT INSPECTION AND ADJUSTMENT).

Installation

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

Check spark plug gap (refer to TECHNICAL DATA).

Slightly oil the bottom outer part of the stick coil. This will ease installation.

Place spark plug into stick coil, screw spark plug then remove the stick coil. Torque spark plug to 17 N•m (150 lbf•**in**). Reinstall the stick coil.

TEMPERATURE SENSOR

Temperature sensor **no. 60** is located in the cylinder head 1 (front-side).

Inspection

Check the temperature sensor for damage or leakage. For electrical inspection refer to COMPONENT INSPECTION AND ADJUSTMENT.

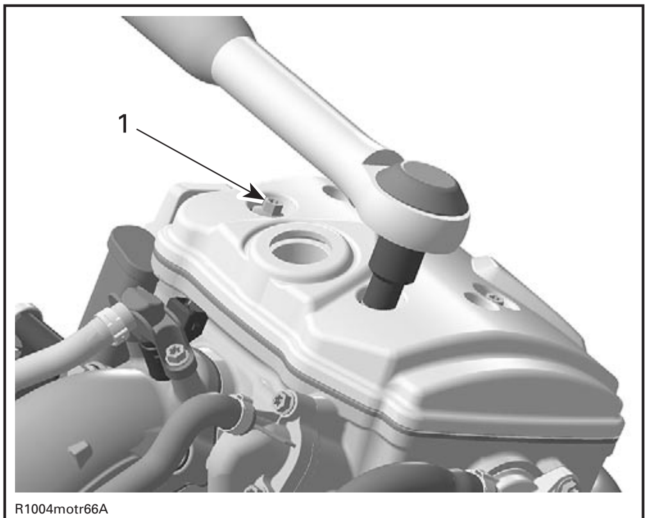
Torque temperature sensor to 17 N•m (150 lbf•**in**).

VALVE COVER

Removal

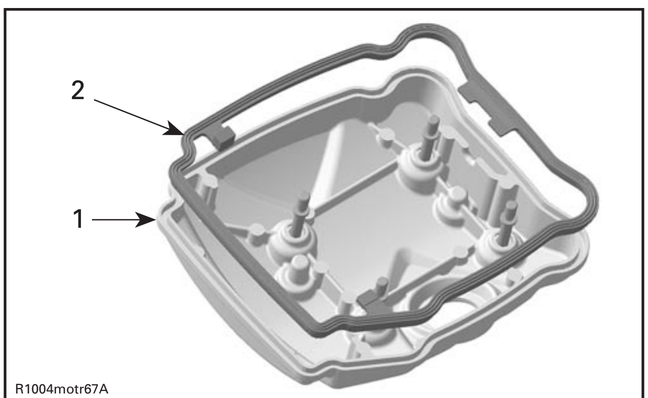
Remove:

– valve cover shield **no. 53**
– valve cover screws **no. 51**



1. Valve cover screws

– valve cover **no. 50** and profile sealing ring **no. 49**.



1. Valve cover
2. Profile sealing ring

Inspection

Check the profile sealing ring on the valve cover and the rubber bushing on the valve cover screws if they 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. Pay attention to the following details.

NOTE: At installation, replace the profile sealing ring **no. 49**.

NOTE: Install the valve cover screws in a criss-cross sequence.

Torque valve cover screws to 9 N•m (80 lbf•**in**).

ROCKER ARM

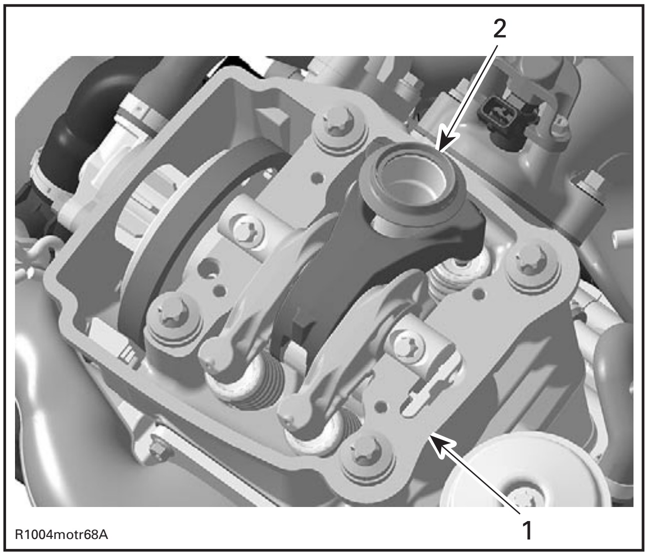
When disassembling the rocker arms, the specified sequence must be followed. Start with cylinder 1, continue with cylinder 2.

Removal Cylinder 1 (front-side)

Lock crankshaft with crankshaft locking bolt (P/N 529 035 900), refer to CRANKSHAFT/DRIVE GEARS.

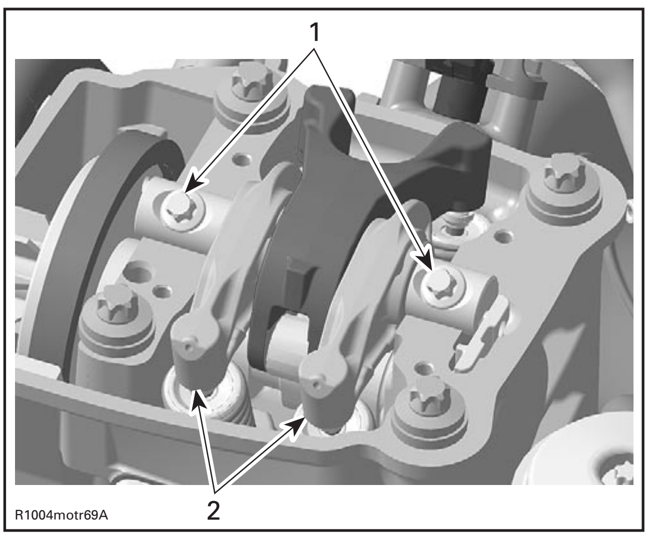
Remove:

– spark plug (refer to SPARK PLUG)
– valve cover (refer to VALVE COVER)
– spark plug tube **no. 46**



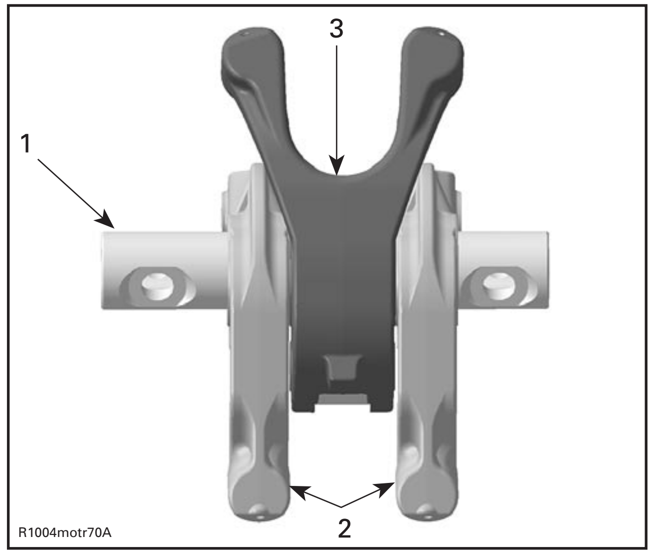
1. *Cylinder head*
2. *Spark plug tube*

– rocker arm shaft screws **no. 45** (discard screws)

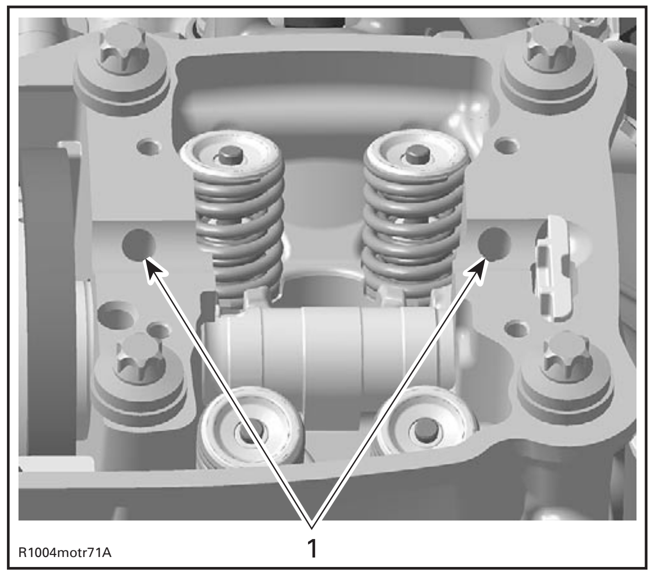


1. *Rocker arm shaft screws*
2. *Rocker arms*

– rocker arm shaft **no. 42** with rocker arm assembly (exhaust side **no. 43** and intake side **no. 44**).



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*

Removal Cylinder 2 (rear-side)

Remove:

– spark plug (refer to SPARK PLUG)
– valve cover (refer to VALVE COVER)
– spark plug tube **no. 46**

Remove the crankshaft locking bolt (P/N 529 035 900).

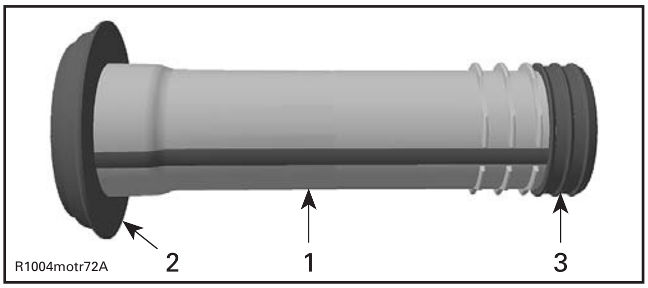
Crank the engine further until the second cylinder is positioned at ignition TDC.

– rocker arm shaft screws **no. 45** (discard screws)
– rocker arm shaft **no. 42** with rocker arm assembly (exhaust side **no. 43** and intake side **no. 44**).

Inspection

Spark Plug Tube

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

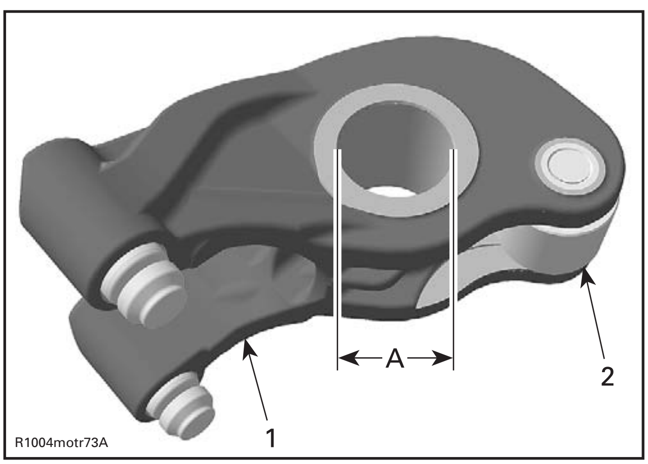


1. Spark plug tube
2. Seal to the valve cover
3. Seal to the cylinder head

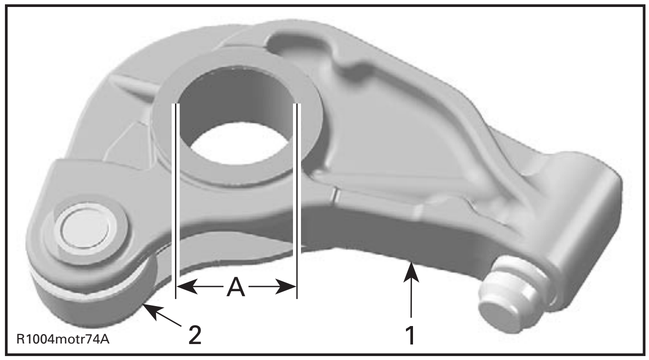
Rocker Arm

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 if necessary.



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

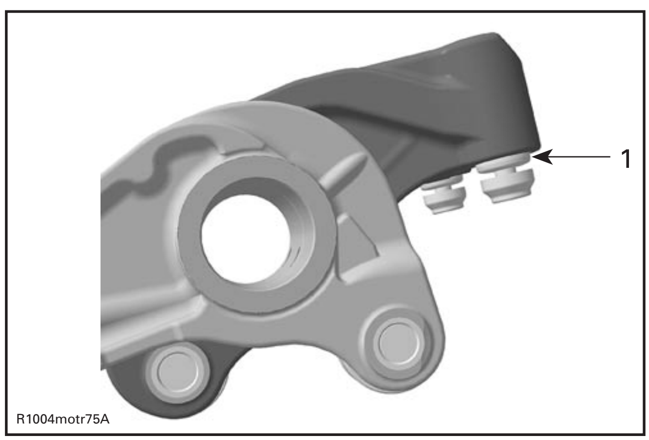


1. Rocker arm (exhaust side)
2. Roller
A. Bore for rocker arm shaft

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

ROCKER ARM BORE DIAMETER	
MINIMUM (NEW)	20.007 mm (.7877 in)
MAXIMUM (NEW)	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.



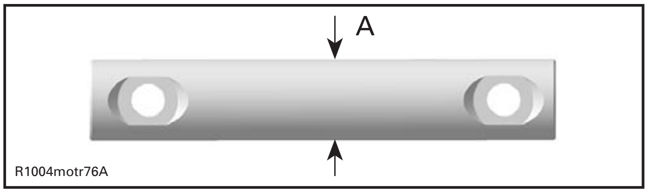
1. Hydraulic lifter groove

Rocker Arm Shaft

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

Measure rocker arm shaft diameter.

ROCKER ARM SHAFT DIAMETER	
MINIMUM (NEW)	19.980 mm (.7866 in)
MAXIMUM (NEW)	19.993 mm (.7871 in)
SERVICE LIMIT	19.965 mm (.7860 in)



A. Measure rocker arm shaft diameter here

Replace any part that shows excessive wear.

Installation

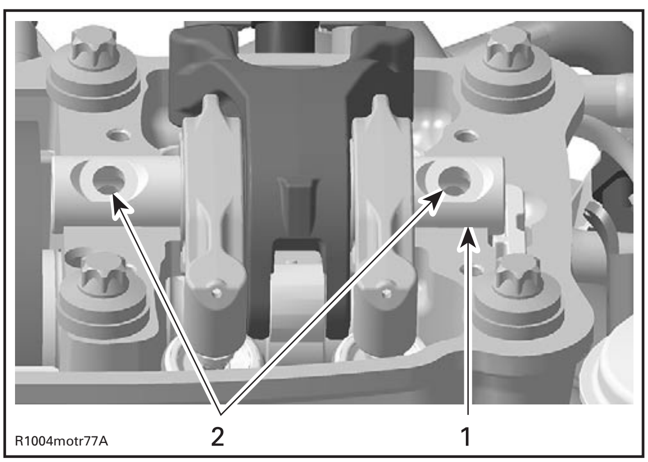
For installation, reverse the removal procedure. Pay attention to the following details.

CAUTION: Make sure to observe the correct matching of rocker arm shaft and rocker arm. When installing the components, make sure they are fitted exactly in their original position on their respective cylinder head. Any inversion of the components may cause damage to the engine.

NOTE: At assembly, position the cylinder to ignition TDC. This will ensure stress-free installation of the rocker arm shaft.

Apply engine oil on rocker arm shaft.

Position the rocker arm shaft with the notches on top.

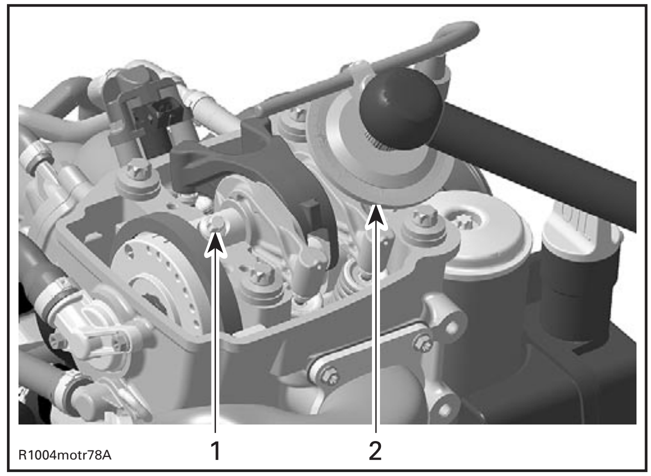


1. Rocker arm shaft
2. Rocker arm shaft notches

Install **NEW** rocker arm shaft screws **no. 45**. Torque as per following procedure:

CAUTION: For this assembly, stretch screws are used. 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 rocker arm shaft screws to 10 N•m (88 lbf•**in**).
– Torque rocker arm shaft 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

CHAIN TENSIONER

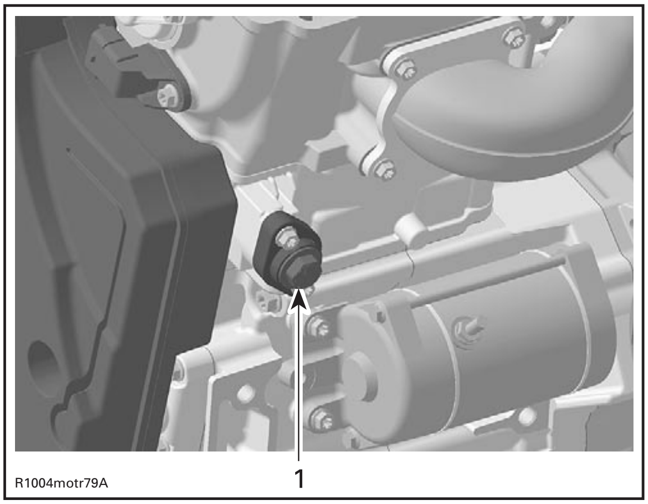
Removal

⚠ WARNING

Chain tensioner is spring loaded. Take that into account when removing chain tensioner plug.

Remove:

– air silencer, guard and driven pulley to gain access to cylinder 2 chain tensioner
– chain tensioner plug **no. 10**

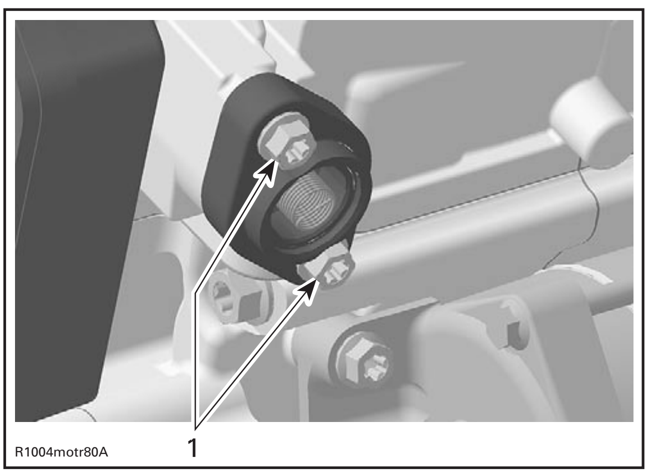


1. *Chain tensioner plug*

⚠ WARNING

Never perform this operation immediately after the engine has been run because the exhaust system can be very hot. Wait until exhaust system is warm or cold.

– spring **no. 8**
– screws **no. 7**

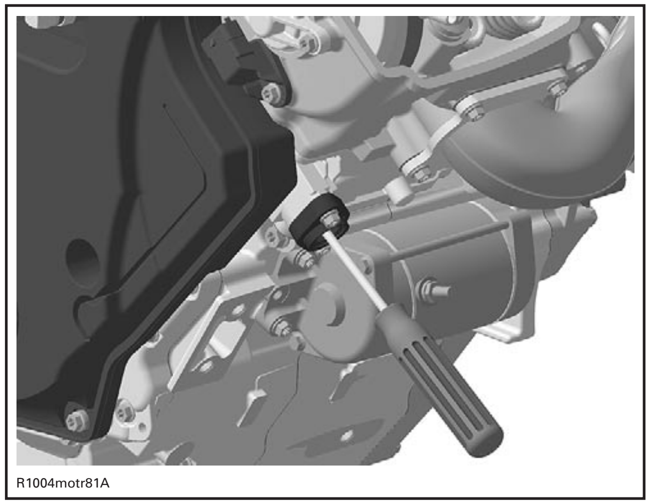


1. *Chain tensioner screws*

– chain tensioner housing **no. 5**.

Inspection

Using a flat screwdriver, unscrew chain tensioner plunger **no. 6**. Check chain tensioner plunger for free movement in the threads of chain tensioner housing.



Check chain tension guides **no. 24** for wear. Replace as necessary.

Check spring condition. Replace if broken or worn.

Installation

NOTE: At installation, replace the O-rings **no. 4** and **no. 9**. Slightly grease the O-rings before assembly using super lube grease.

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

Torque chain tensioner housing screws to 9 N•m (80 lbf•**in**).

NOTE: Screw the plunger until it touches the chain tension guide.

Install a spring end in plunger groove and the other in the plug groove. Screw plug. There must be no distortion of the spring during installation.

BREATHER

Removal

Remove:

– exhaust pipe and muffler
– air silencer then move vehicle harness away from engine
– remove breather hose then unscrew breather screws **no. 38**
– pull out the breather **no. 37**.

NOTE: Pull out the breather with utmost care. Thrust washer **no. 34** may get caught on the breather and drop into the crankcase.

Inspection

Inspect the breather for cracks/fractures or other damage/leakage.

If necessary, replace the breather.

Installation

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

NOTE: At installation, replace the O-ring **no. 36**, and fit it with grease.

Take care during installation that the flat surface of thrust washer precisely fits in the cover **no. 33.**

Torque breather screws to 6 N•m (53 lbf•**in**).

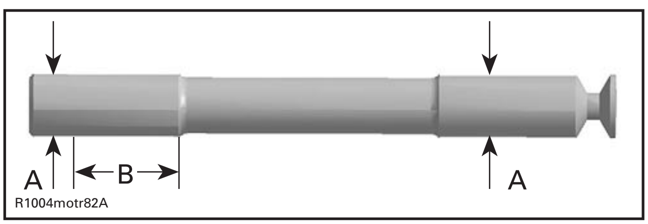
DECOMPRESSOR

Removal

Remove:
– breather (refer to BREATHER)
– valve cover (refer to VALVE COVER)
– thrust washer **no. 34**
– cover **no. 33**
– centrifugal weight **no. 32**
– decompressor shaft **no. 31**.

Inspection

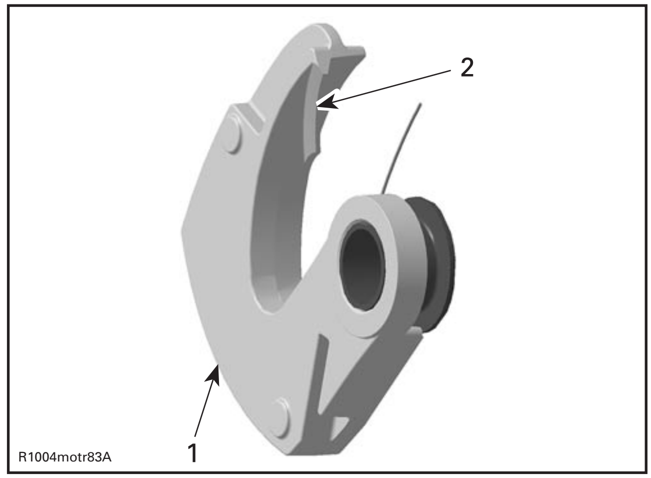
Check decompressor shaft for service limit, replace if it out of specifications.



DECOMPRESSOR SHAFT
A. Measure here
B. Measurement area

DECOMPRESSOR SHAFT MEASUREMENT A	
MINIMUM (NEW)	5.978 mm (.235 in)
MAXIMUM (NEW)	5.990 mm (.236 in)
SERVICE LIMIT	5.850 mm (.230 in)

Check torsion spring and edge of the centrifugal weight for visible wear. If so, replace them together.

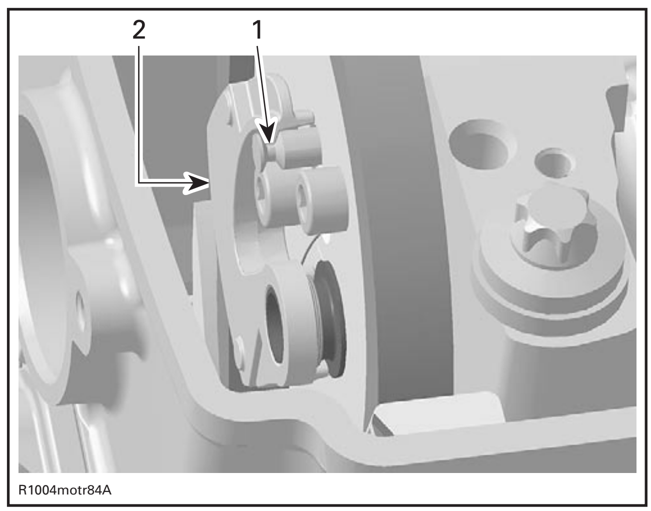


1. Centrifugal weight with torsion spring
2. Edge of centrifugal weight

Installation

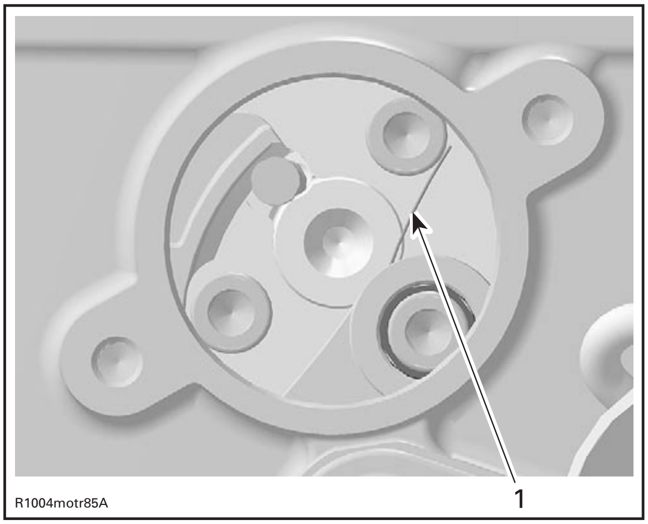
The installation is essentially the reverse of the removal procedure but, pay attention to the following details.

NOTE: Engage the edge of centrifugal weight into the decompressor shaft groove then put the parts in place.



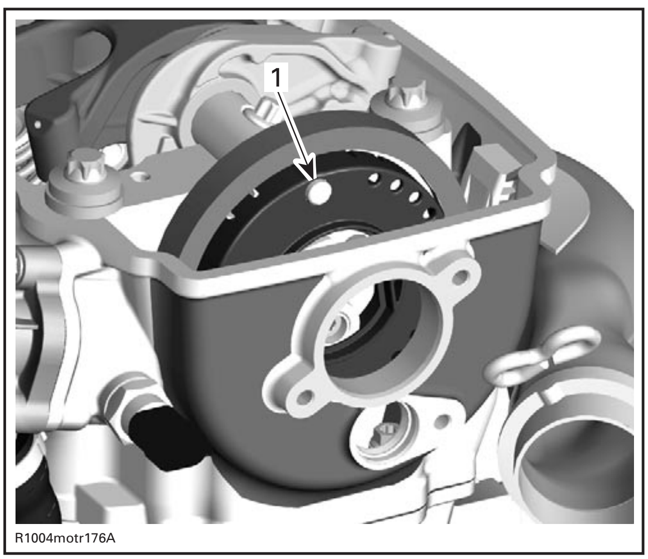
1. Decompressor shaft groove
2. Centrifugal weight

Place the torsion spring end under socket screw head.



1. *Position of torsion spring end*

Install the cover **no. 33**. Position the cover on the timing gear so that the holes fits to the pin of timing gear.



1. *Hole in cover fits to pin of timing gear*

CAUTION: Before and after cover installation, make sure the centrifugal system works properly.

CAMSHAFT TIMING GEAR

The engine is equipped with two camshaft timing gears **no. 28** and **no. 70**. The timing gear provides the signals for the camshaft position sensor and is located in the cylinder head of the cylinder 2.

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

The procedure for disassembly of the two camshaft timing gears **no. 28** and **no. 70**, is the same.

Lock crankshaft with crankshaft locking bolt (P/N 529 035 900), refer to CRANKSHAFT AND DRIVE GEARS.

Remove:

– valve cover (refer to VALVE COVER)
– breather (refer to BREATHER)
– chain tensioner (refer to CHAIN TENSIONER)
– decompressor (refer to DECOMPRESSOR)
– chain guide **no. 30**
– screws **no. 29**
– camshaft timing gear **no. 70**.

NOTE: Secure camshaft chain **no. 27** with a retaining wire.

Inspection

Check camshaft timing gear for wear or deterioration.

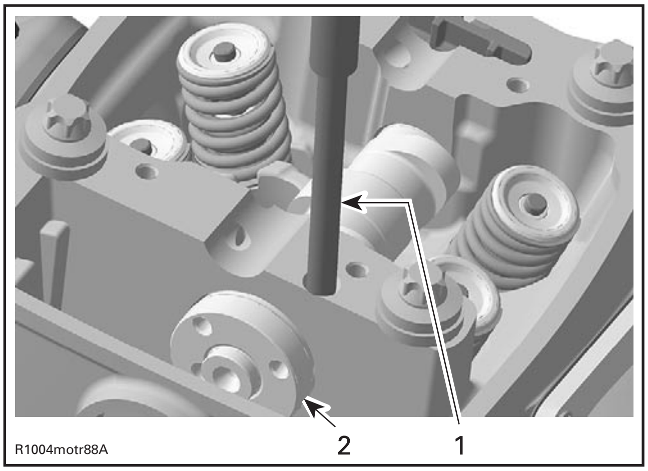
If gear is worn or damaged, replace it as a set (camshaft timing gear and timing chain).

For crankshaft timing gear, refer to CRANKSHAFT AND DRIVE GEARS.

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.

IMPORTANT: Make sure that tensioner is in place and properly preloaded before tightening sprocket screws.

Fit the screws with Loctite 243.

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

CAUTION: Crankshaft and camshaft must be locked on ignition TDC position of cylinder 1 (front-side) to place camshaft timing gear and timing chain in the proper position.

TIMING CHAIN

Refer to CRANKSHAFT/DRIVE GEARS.

CYLINDER HEAD

Removal

The removal procedure is the same for both cylinder heads **no. 12** and **no. 71**.

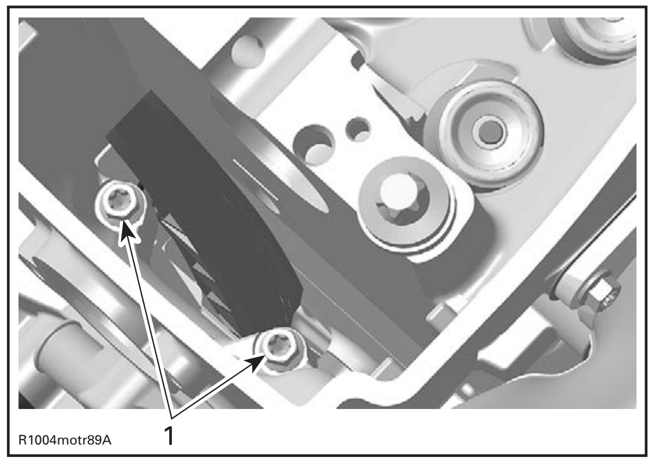
Lock crankshaft with crankshaft locking bolt (P/N 529 035 900), refer to CRANKSHAFT/DRIVE GEARS.

Drain coolant (refer to COOLING SYSTEM).

Disconnect temperature sensor and/or camshaft position sensor.

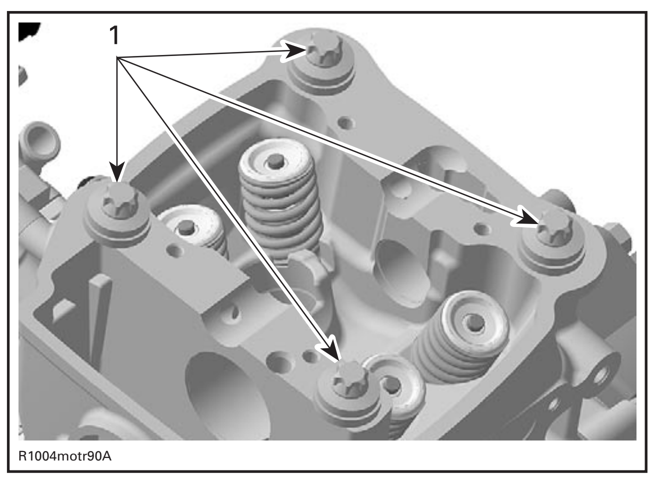
Remove:

- RH side cover
- seat support
- exhaust pipe and upper engine support(refer to REMOVAL AND INSTALLATION)
- engine outlet hose
- air intake manifold (refer to COMPONENT INSPECTION AND ADJUSTMENT)
- chain tensioner (refer to CHAIN TENSIONER)
- valve cover (refer to VALVE COVER)
- valve cover and profile sealing ring (see VALVE COVER above)
- breather (refer to BREATHER)
- decompressor (refer to DECOMPRESSOR)
- camshaft timing gear (refer to CAMSHAFT TIMING GEAR)
- cylinder head screws M6 **no. 21**



1. Cylinder head screws M6

- cylinder head screws M11 **no. 20** retaining cylinder head and cylinder to cylinder base.



1. Cylinder head screws M11

Pull up cylinder head **no. 71**.

Remove gasket **no. 11**.

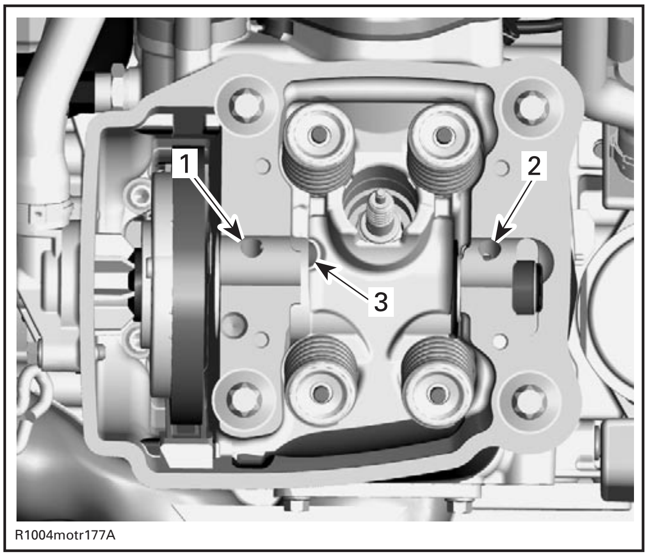
Inspection

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

Check gasket for cracks or other damages.

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

Check oil supply hole in cylinder head for contamination.



1. *Oil supply to camshaft bearing journal- big end*
2. *Oil supply to camshaft bearing journal- small end*
3. *Oil back flow through chain compartment to engine bottom*

Installation

NOTE: The cylinder heads are not identical in design. Do not invert the cylinder heads at assembly.

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

NOTE: At installation, replace gasket **no. 11**.

Ensure dowel pins are in place.

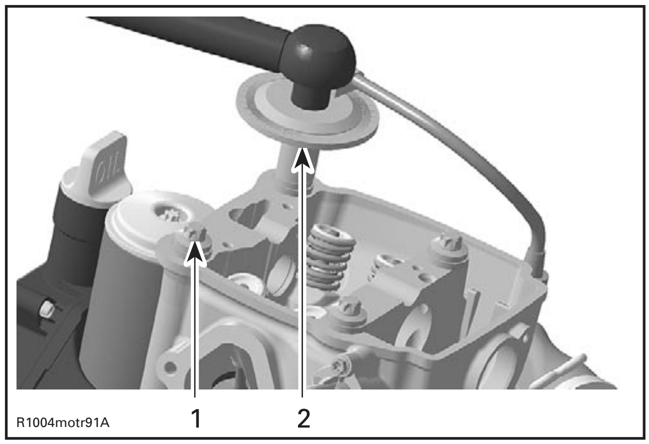
Install cylinder head screws M6 and M11.

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 screws are out of specification, replace by a new ones. Failure to replace screws and to strictly follow the torque procedure may cause screws to loosen and lead to engine damage.**

CYLINDER HEAD SCREW M11	
SERVICE LIMIT	216.5 mm (8.524 in)

- Torque cylinder head screws M11 in criss-cross sequence to 25 N•m (18 lbf•ft).
- Torque cylinder head screws M11 in criss-cross sequence to 50 N•m (37 lbf•ft).
- Finish tightening screws turning an additional 90° rotation with a torque angle gauge then, torque cylinder head screws M6 to 9 N•m (80 lbf•**in**).

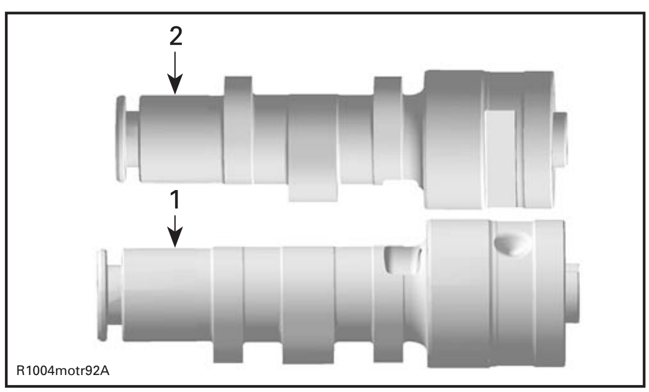


1. *Cylinder screws M11*
2. *Angle torque wrench*

Remove crankshaft locking bolt then install plug with sealing ring.

CAMSHAFT

NOTE: The engine is equipped with two different camshafts **no. 22** and **no. 66**.



1. *Camshaft of cylinder 1*
2. *Camshaft of cylinder 2*

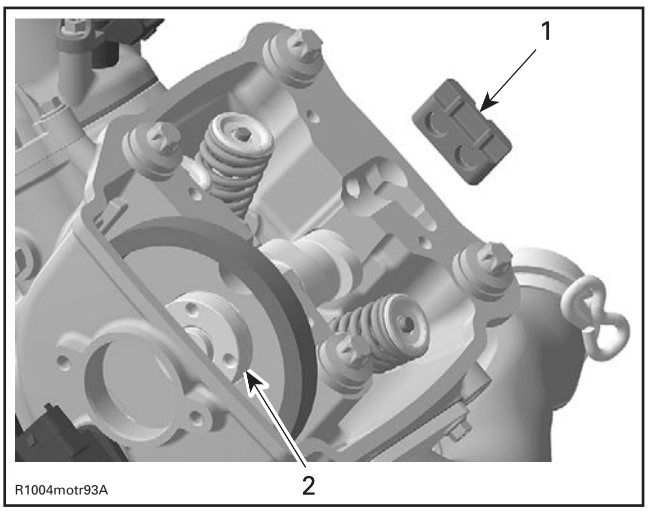
Removal

The removal procedure is the same for both camshafts.

Each camshaft is different in design. Thus, it is important not to mix up any parts of the camshaft assembly with that of the other cylinder. Keep parts as a "group".

Remove:

– valve cover (refer to VALVE COVER)
– chain tensioner (refer to CHAIN TENSIONER)
– breather (refer to BREATHER)
– decompressor (refer to DECOMPRESSOR)
– rocker arms (refer to ROCKER ARMS)
– camshaft timing gear (refer to CAMSHAFT TIMING GEAR)
– camshaft lock **no. 23**
– camshaft **no. 22** and/or **no. 66**.



1. Camshaft lock
2. Camshaft

Cleaning

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

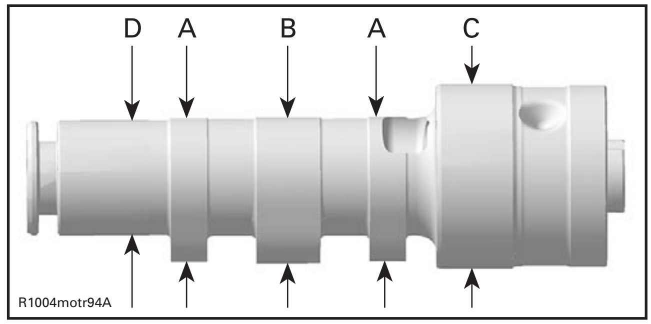
Inspection

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.

NOTE: The data in the following tables are valid for both camshafts.



A. Camshaft lobe (exhaust valves)
B. Camshaft lobe (intake valves)
C. Camshaft bearing journal (big end)
D. Camshaft bearing journal (small end)

CAMSHAFT LOBE - EXHAUST VALVE	
MINIMUM (NEW)	31.435 mm (1.237 in)
MAXIMUM (NEW)	31.635 mm (1.245 in)
SERVICE LIMIT	31.400 mm (1.236 in)
CAMSHAFT LOBE - INTAKE VALVE	
MINIMUM (NEW)	31.654 mm (1.246 in)
MAXIMUM (NEW)	31.854 mm (1.254 in)
SERVICE LIMIT	31.600 mm (1.244 in)
CAMSHAFT BEARING JOURNAL - BIG END	
MINIMUM (NEW)	39.927 mm (1.5719 in)
MAXIMUM (NEW)	39.935 mm (1.5722 in)
SERVICE LIMIT	39.920 mm (1.5716 in)
CAMSHAFT BEARING JOURNAL - SMALL END	
MINIMUM (NEW)	24.967 mm (.9829 in)
MAXIMUM (NEW)	24.980 mm (.9835 in)
SERVICE LIMIT	24.960 mm (.9827 in)
CAMSHAFT BORE - BIG END MEASURED IN DIAMETER	
MINIMUM (NEW)	39.984 mm (1.5742 in)
MAXIMUM (NEW)	40.000 mm (1.5748 in)
SERVICE LIMIT	40.020 mm (1.5756 in)

CAMSHAFT BORE - SMALL END MEASURED IN DIAMETER	
MINIMUM (NEW)	24.987 mm (.9837 in)
MAXIMUM (NEW)	25.000 mm (.9842 in)
SERVICE LIMIT	25.020 mm (.9850 in)

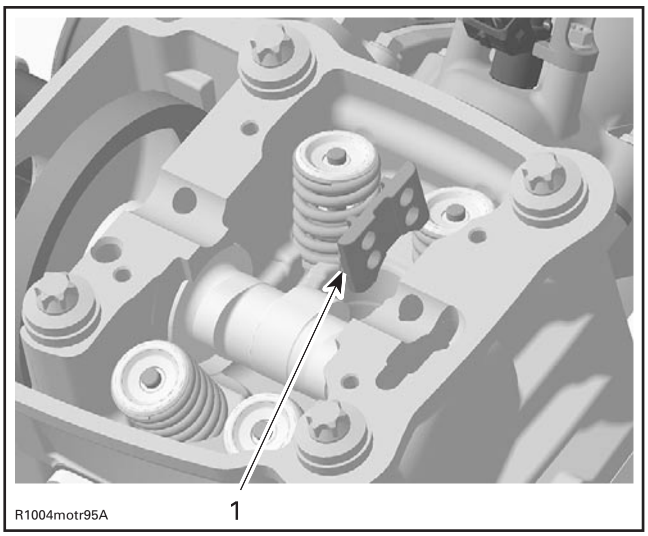
Replace parts that are not within specifications.

Installation

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

CAUTION: The camshafts are not identical in design. Do not invert the camshafts during assembly. Any mix-up of the components will lead to engine damage.

Install camshaft then place the camshaft lock in the slot.



1. *Camshaft lock*

For other parts, refer to proper installation procedure.

VALVE SPRINGS

NOTE: The engine is equipped with two different valve springs **no. 16** (inner) and **no. 17** (outer) for every valve.

Removal

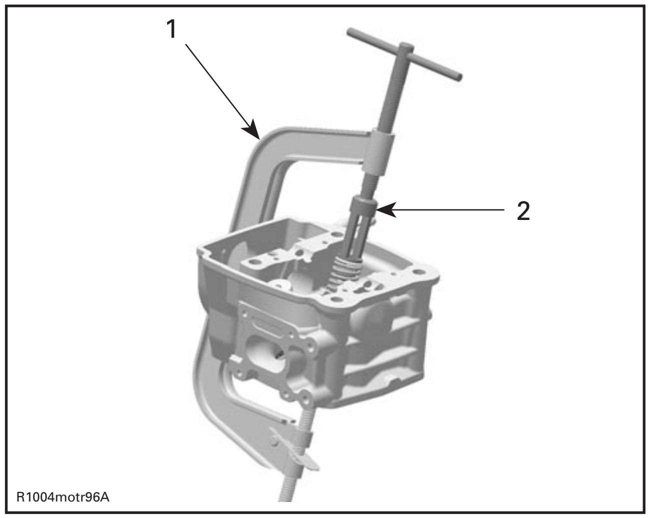
Remove:

– rocker arms (refer to ROCKER ARMS)
– cylinder head (refer to CYLINDER HEAD).

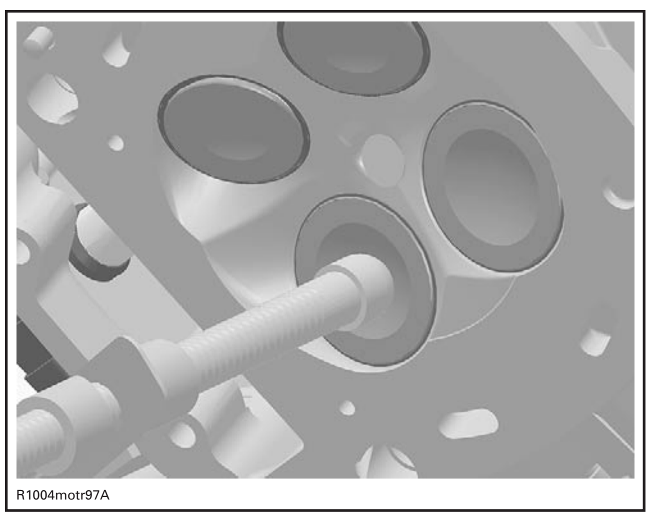
Compress valve springs **no. 16** and **no. 17**, use valve spring compressor clamp (P/N 529 035 764) and valve spring compressor cup (P/N 529 035 724).

⚠ WARNING

Always wear safety glasses when disassembling valve springs. Be careful when unlocking valves. Components could be expelled under pressure from preloaded spring.



1. *Valve spring compressor clamp (P/N 529 035 764)*
2. *Valve spring compressor cup (P/N 529 035 724)*



LOCATE VALVE SPRING COMPRESSOR CLAMP IN CENTER OF THE VALVE

Remove valve cotters **no. 19**.

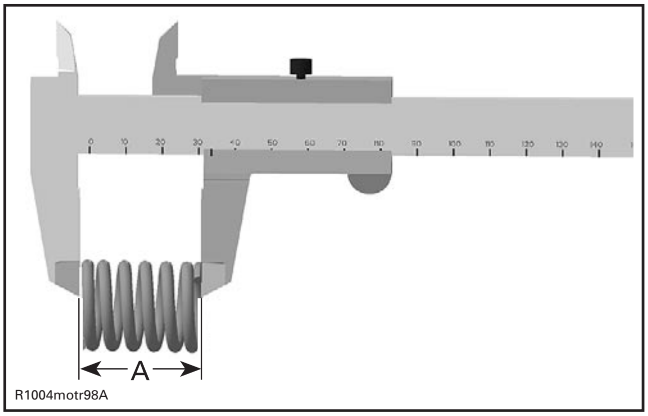
Withdraw valve spring compressor, valve spring retainer **no. 18** and valve springs.

Inspection

Check valve springs for rust, corrosion or other visible damages. If so, replace valve springs.

Check valve springs for free length and straightness.

Replace valve springs if not within specifications.



A. Valve spring length

VALVE SPRING FREE LENGTH	
OUTER VALVE SPRING	
NOMINAL (NEW)	45.45 mm (1.789 in)
SERVICE LIMIT	43 mm (1.693 in)
INNER VALVE SPRING	
NOMINAL (NEW)	41.02 mm (1.615 in)
SERVICE LIMIT	38.80 mm (1.528 in)

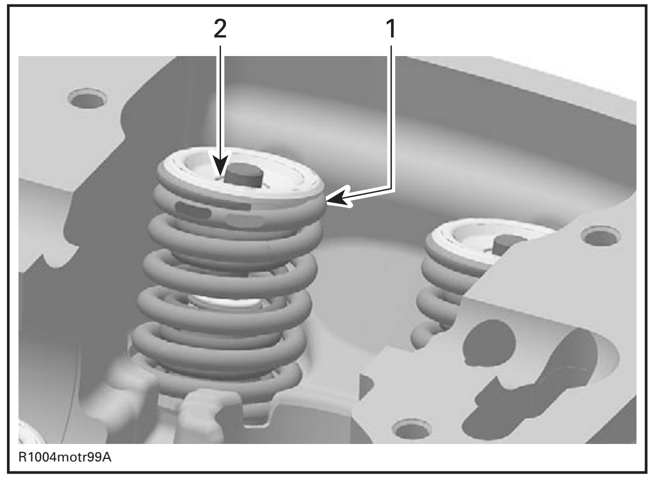
Installation

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

NOTE: Colored area of the valve spring must be placed on top.

If the color cannot be identified any more, orientation is possible, based on the shape of the spring. The spacing of the coils is smaller at one end. At installation, this end must be directed towards the cylinder head.

NOTE: Valve cotters must be properly engaged in valve stem grooves.



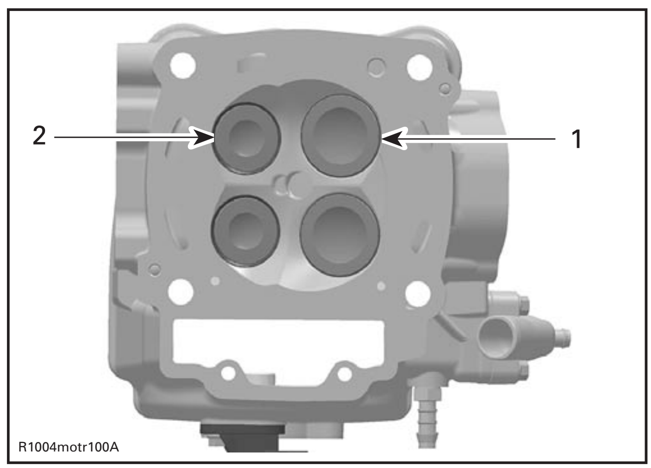
1. Position of the valve spring
2. Valve cotters

VALVE

Removal

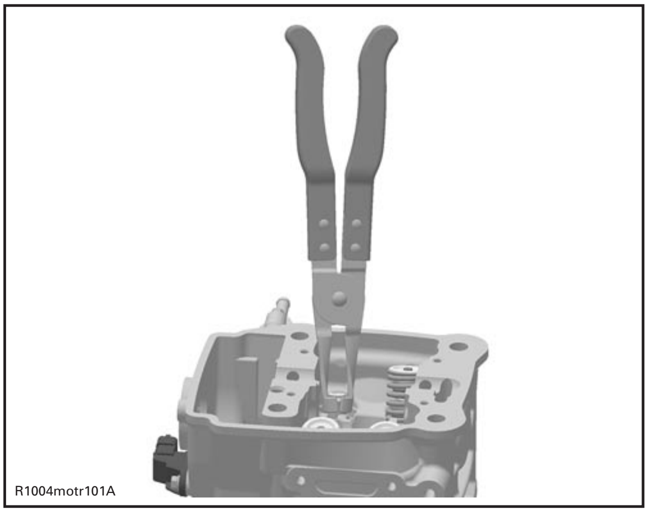
Remove valve springs.

Push valve stem then pull valves **no. 13** and **no. 14** out of valve guide.



1. Intake valve 38 mm
2. Exhaust valve 31 mm

Remove valve stem seal **no. 15** with special pliers such as Snap-ON YA 8230.



R1004motr101A

Inspection

Valve Stem Seal

NOTE: Inspection of valve stem seals is not needed because new seals should always be installed whenever cylinder head is removed.

Valve

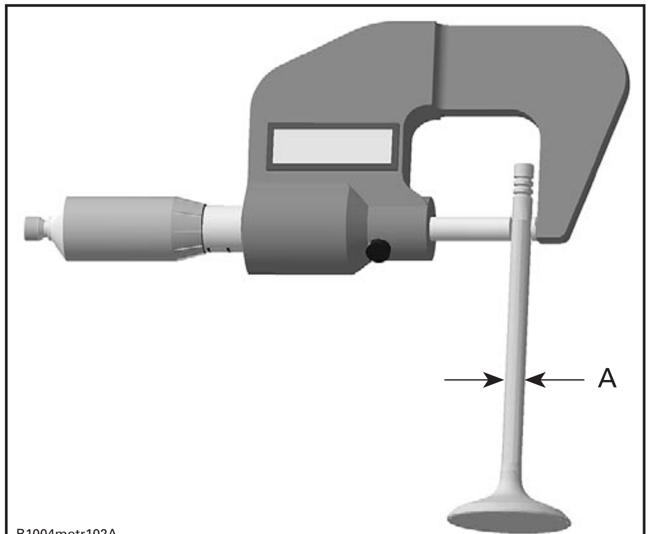
Inspect valve surface, check for abnormal stem wear and bending. If so, replace by a new one.

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 traces of friction.



R1004motr102A

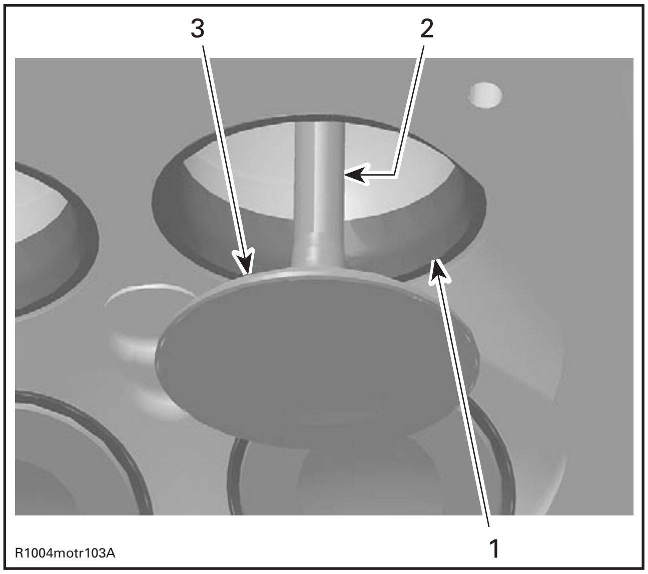
A. Valve stem diameter

VALVE STEM DIAMETER mm (in)	
MINIMUM (NEW)	
Exhaust	5.946 mm (.2341 in)
Intake	5.961 mm (.2347 in)
MAXIMUM (NEW)	
Exhaust	5.960 mm (.2346 in)
Intake	5.975 mm (.2352 in)
SERVICE LIMIT	
Exhaust	5.93 mm (.233 in)
Intake	

Replace cylinder head if valve guide is out of specification or has other damages such as wear or traces of friction.

VALVE GUIDE DIAMETER mm (in)	
SERVICE LIMIT	
Exhaust	6.060 mm (.2386 in)
Intake	

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 to valve face and work valve on its seat with a lapping tool.

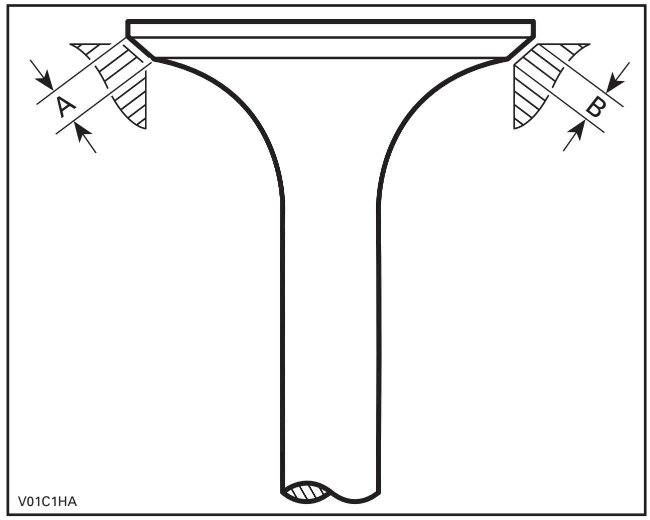
Measure valve face contact width.

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	1.8 mm (.071 in)
Intake	1.6 mm (.063 in)

If valve seat contact width is too wide or has dark spots, replace the cylinder head.

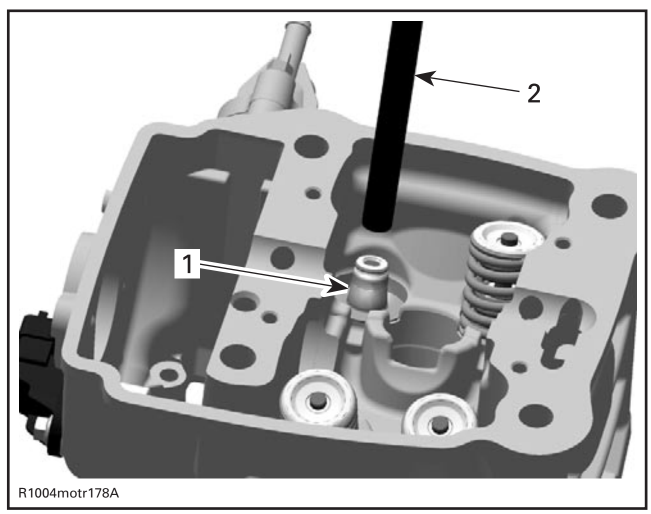


A. Valve face contact width
B. Valve seat contact width

Installation

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

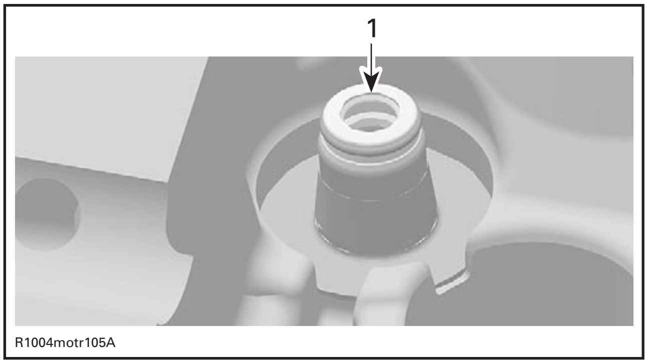
NOTE: At installation, replace the valve stem seal **no. 15**, use valve stem seal installer (P/N 529 035 687).



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

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.

CYLINDER

NOTE: The engine is equipped with two different cylinders **no. 2** and **no. 72**.

Removal

Lock crankshaft with locking bolt (P/N 529 035 900), refer to CRANKSHAFT/DRIVE GEARS.

Remove:

– cylinder heads (refer to CYLINDER HEAD).

Pull cylinder **no. 2** and **no. 72**.

Discard cylinder gaskets **no. 1**.

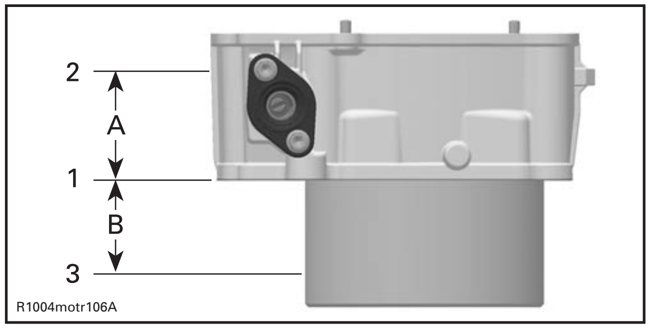
Inspection

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 at 3 recommended positions. See the following illustration.



1. First measuring diameter in line with cylinder bottom
2. Second measuring diameter
3. Third measuring diameter
A. 60 mm (2.362 in)
B. 50 mm (1.968 in)

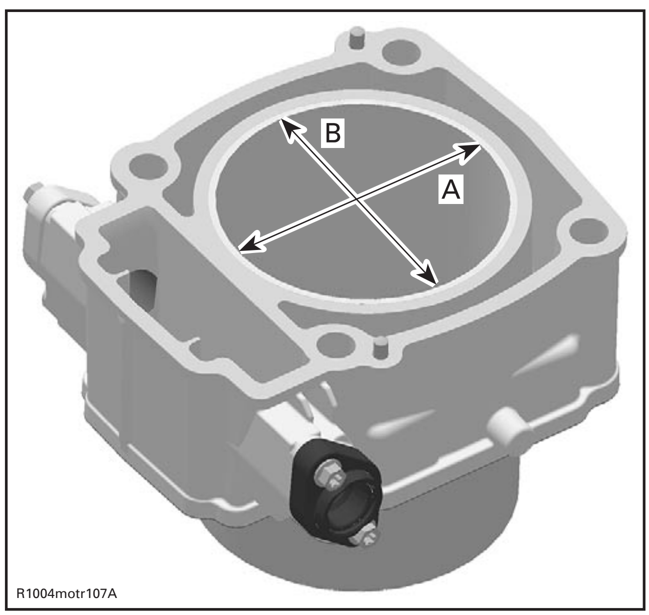
CYLINDER TAPER mm (in)	
MAXIMUM (NEW)	0.038 mm (.001 in)
SERVICE LIMIT	0.090 mm (.004 in)

Difference 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 another measurement 90° from first one and compare.

NOTE: Take the same measuring points like described in CYLINDER TAPER above.



A. Parallel to piston axis
B. Perpendicular to piston axis

CYLINDER OUT OF ROUND mm (in)	
MAXIMUM (NEW)	0.01 mm (.0002 in)
SERVICE LIMIT	0.02 mm (.0008 in)

CAUTION: Always replace gasket no. 1 before installing the cylinder.

Installation

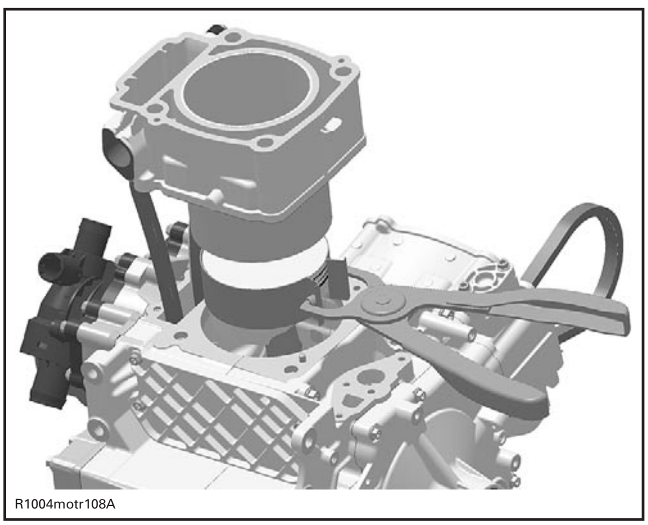
For installation, reverse the removal procedure. Pay attention to the following details.

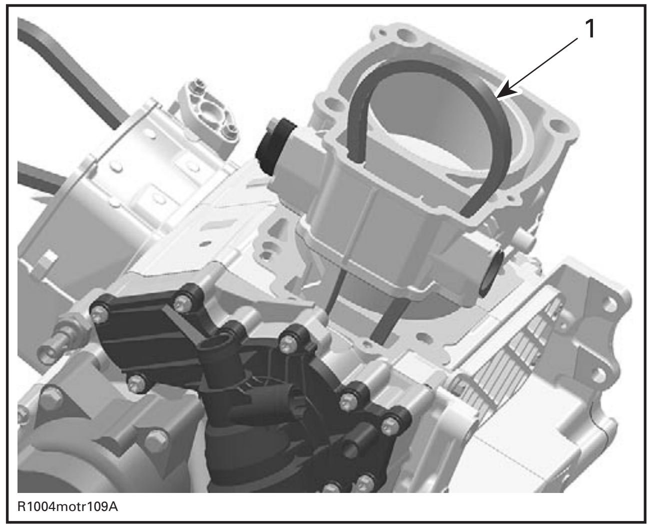
NOTE: The cylinders are not identical in design. Do not invert the cylinders during assembly.

First mount cylinder 1. Then remove the locking bolt (P/N 529 35 900). Crank the engine further and position piston 2 at TDC. Mount cylinder 2. The cylinder cannot be pushed fully over the piston unless the piston is located at TDC.

Apply engine oil in the bottom area of the cylinder bore and also on the band of the piston ring compressor tool.

Using a piston ring compressor plier, such Snap-On RC-980, slide piston into cylinder.





1. *Timing chain*

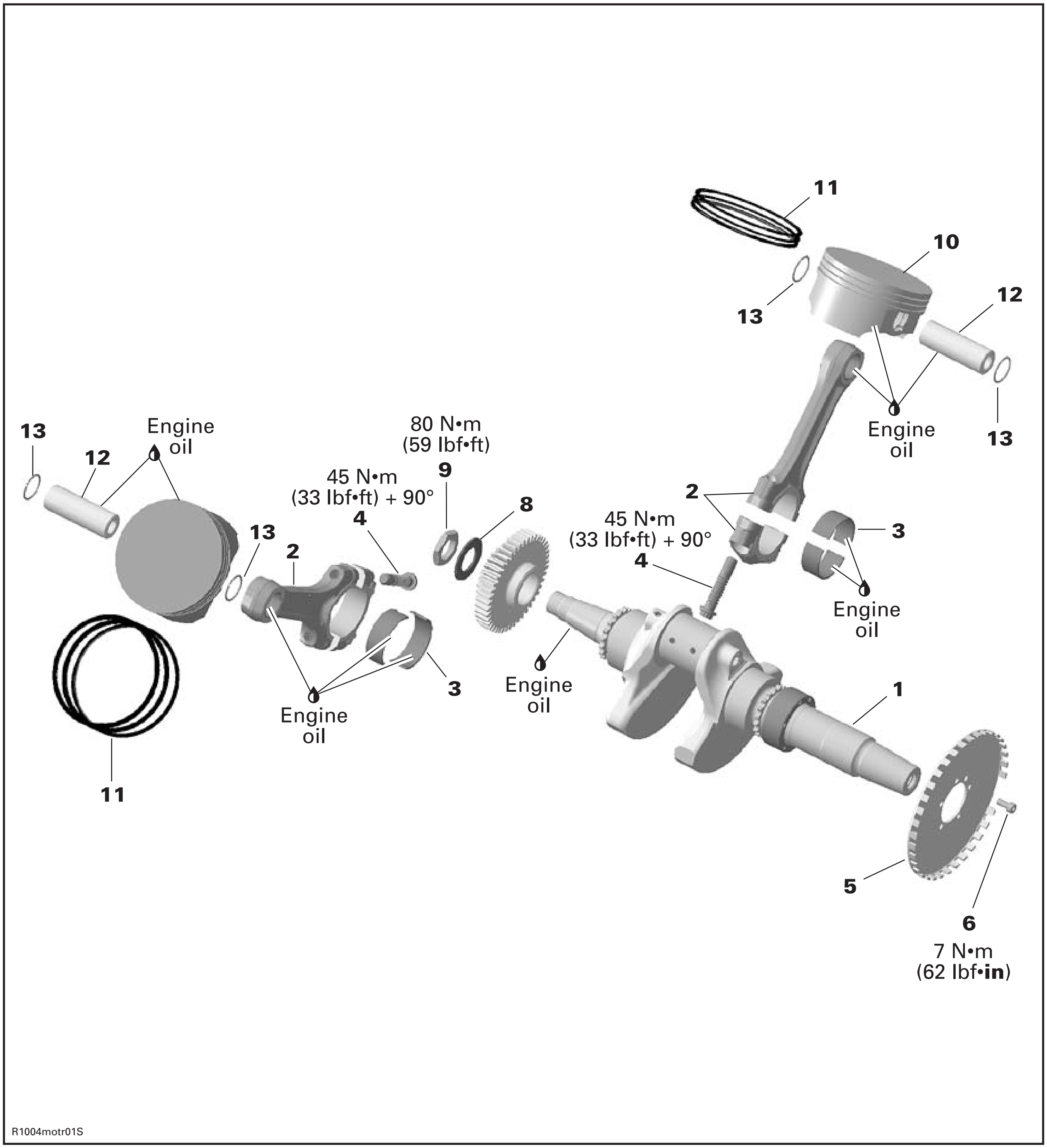
NOTE: Put timing chain through the chain pit then put the cylinder in place.

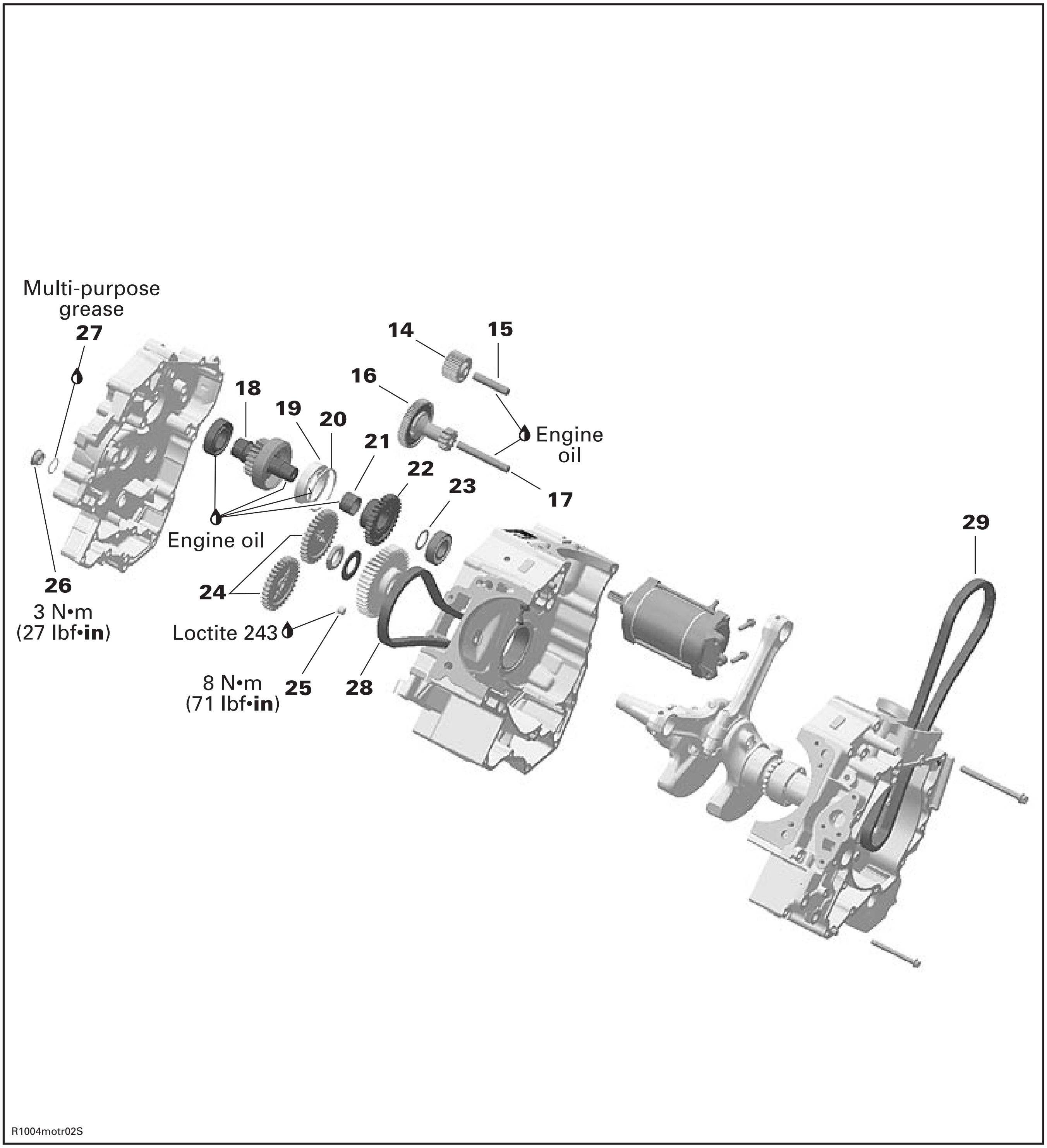
Install cylinder head and the other parts in accordance with the proper installation procedures.

PISTON

Refer to CRANKSHAFT/DRIVE GEARS.

CRANKSHAFT/DRIVE GEARS




Multi-purpose grease
27
14
15
18
16
19
20
21
Engine oil
22
23
17
29
Engine oil
26
3 N•m (27 lbf•in)
24
Loctite 243
8 N•m (71 lbf•in)
25
28
R1004motr02S

TIMING CHAIN

The engine is equipped with two timing chains **no. 28** and **no. 29**. One of the timing chains is located on the engine alternator side behind the ignition cover. The second is located on the PTO side behind the PTO cover.

Removal of Alternator Side Timing Chain

Remove:

- ignition cover (refer to COOLING SYSTEM)
- chain tensioner and chain guide (refer to CYLINDER AND CYLINDER HEAD)
- camshaft sprocket (refer to CYLINDER AND CYLINDER HEAD)
- oil pump gears **no. 24** (refer to LUBRICATION SYSTEM)
- crankshaft drive gear **no. 7** (refer to DRIVE GEARS).

Carefully pull the timing chain sideward and down from the crankcase.

Removal of PTO Side Timing Chain

Remove:

- engine from vehicle (refer to REMOVAL AND INSTALLATION)
- oil tank (refer to LUBRICATION SYSTEM)
- chain tensioner and chain guide (refer to CYLINDER AND CYLINDER HEAD)
- camshaft timing gear (refer to CYLINDER AND CYLINDER HEAD)
- PTO cover (refer to CRANKCASE)
- trigger wheel **no. 6** (refer to TRIGGER WHEEL).

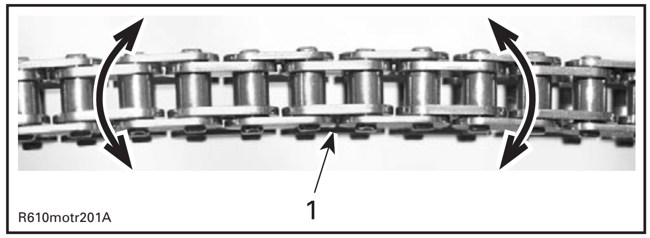
Carefully pull the timing chain sideward and down from the crankcase.

Inspection

Inspection is the same for both timing chains **no. 28** and **no. 29**. Pay attention to the following details.

NOTE: Check timing chain on camshaft sprocket/iming 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 sprocket/timing gear and timing chain).

Installation

Installation is the same for both timing chains **no. 28** and **no. 29**.

The installation is essentially the reverse of the removal procedure but, pay attention to the following details.

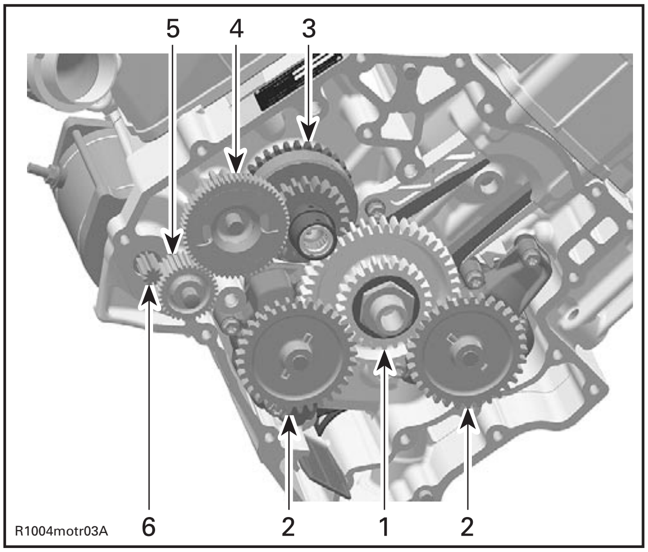
NOTE: Ensure to perform proper valve timing. Lock crankshaft and camshaft at TDC (refer to CYLINDER AND CYLINDER HEAD).

Install chain then, adjust chain tension (refer to CYLINDER AND CYLINDER HEAD).

CAUTION: Improper valve timing will damage engine components.

DRIVE GEARS

The drive gears are located on the engine alternator side behind the ignition cover.



1. *Crankshaft drive gear*
2. *Oil pump gears*
3. *Generator gear*
4. *Double gear*
5. *Intermediate gear*
6. *Starter gear*

Removal

Lock crankshaft with crankshaft locking bolt (P/N 529 035 900) (refer to CRANKSHAFT LOCKING BOLT).

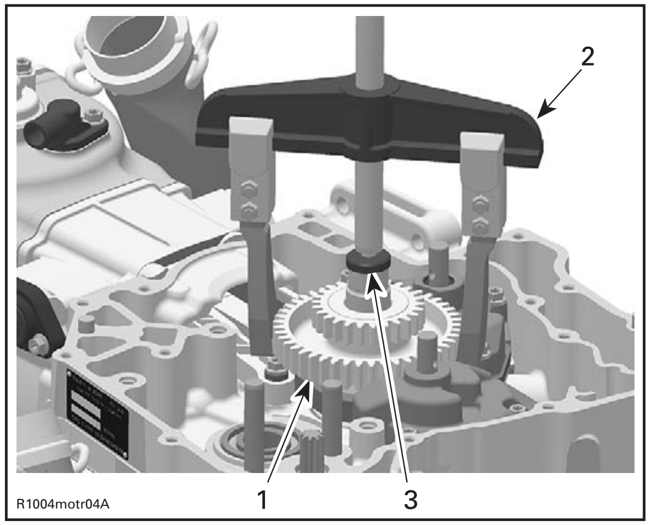
Remove:

– ignition cover (refer to COOLING SYSTEM)
– oil pump gears **no. 24** (refer to LUBRICATION SYSTEM)
– crankshaft nut **no. 9**
– crankshaft drive gear **no. 7**.

Remove crankshaft drive gear with gear puller (aftermarket tool). Also use the protection mushroom (P/N 420 876 552) to avoid damage of the crankshaft.

⚠ WARNING

The gear puller and the crankshaft drive gear are highly tensioned. When the crankshaft drive gear is loosened, the puller may forcefully swing up.



1. *Crankshaft drive gear*
2. *Gear puller*
3. *Protection mushroom (P/N 420 876 552)*

– generator gear **no. 18** and thrust washer **no. 23**
– double gear **no. 16**
– intermediate gear **no. 14**.

Inspection

Double Gear/Intermediate Gear/Crankshaft Drive Gear

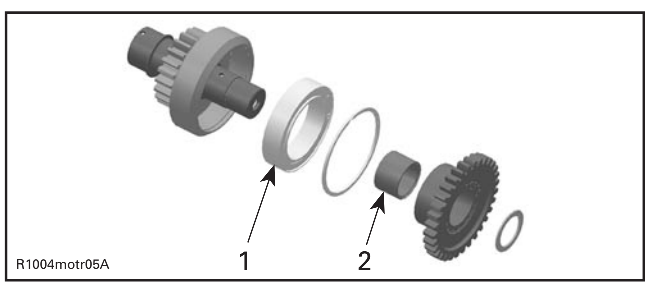
NOTE: Inspect the gears for wear and damage.

Oil Pump Gears

Refer to LUBRICATION SYSTEM.

Generator Gear

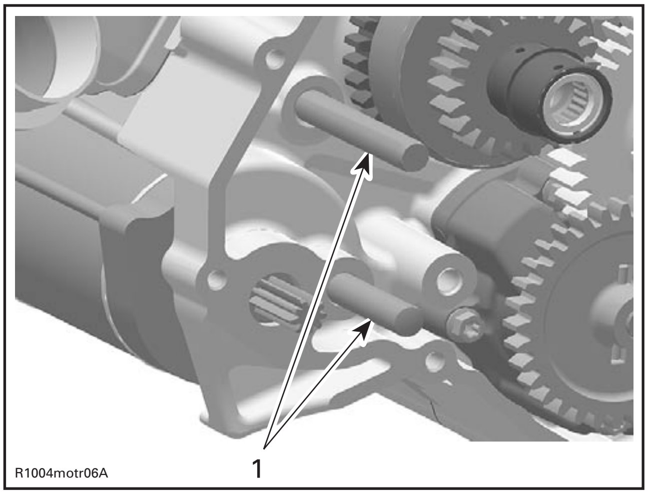
Completely disassemble the generator gear.



1. *Sprag clutch*
2. *Needle bearing*

NOTE: Inspect all components, especially the needle bearing, for wear and damage. Perform a function test of the sprag clutch.

Location Pins



1. *Location pins*

NOTE: Inspect all pins for wear and damage. The pins are firmly pressed into the crankcase but may work loose during the course of time. If the pins can be rotated, there is no need for repair work.

Installation

The installation is essentially the reverse of the removal procedure, but pay attention to the following details.

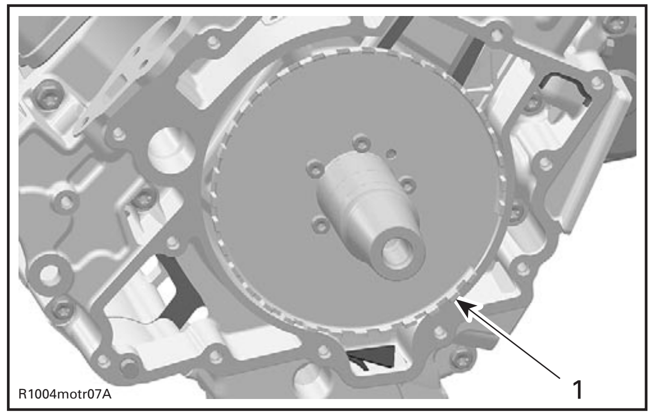
NOTE: Adequately oil all components prior to installation. The oil pump gears and the crankshaft drive gear do not need to be oiled.

The generator gear and the double gear must be installed at the same time on their respective location pin.

Torque crankshaft nut **no. 9** to 80 N•m (59 lbf•ft).

TRIGGER WHEEL

The trigger wheel is located on the engine PTO side behind the PTO cover.



1. *Trigger wheel*

Removal

Remove:

– oil tank (refer to LUBRICATION SYSTEM)
– PTO cover (refer to CRANKCASE)
– trigger wheel screws **no. 6** and pull trigger wheel **no. 5**.

Inspection

NOTE: Refer to COMPONENT INSPECTION AND ADJUSTMENT in ENGINE MANAGEMENT section.

Installation

For installation, reverse the removal procedure.

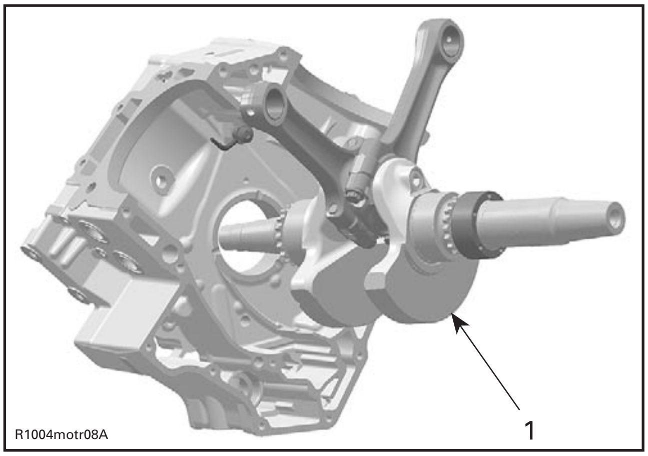
Torque trigger wheel screws to 7 N•m (62 lbf•**in**).

CRANKSHAFT

Removal

Remove:

– drive gears (refer to DRIVE GEARS above)
– crankcase (refer to CRANKCASE)
– crankshaft **no. 1**



1. *Crankshaft*

– connecting rods **no. 2**.

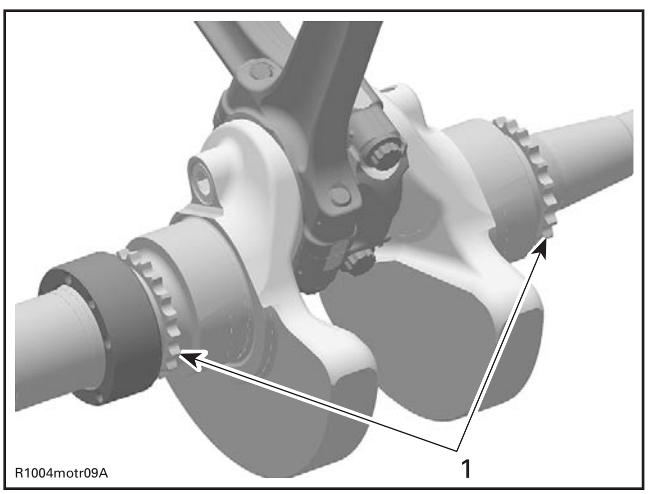
NOTE: Mark the connecting rods prior to dismantling. The connecting rods must be reinstalled in exactly the same position and running direction.

Inspection

NOTE: Check each bearing journal of crankshaft for scoring, scuffing, cracks or other signs of wear.

NOTE: Replace crankshaft if the gears are worn or otherwise damaged.

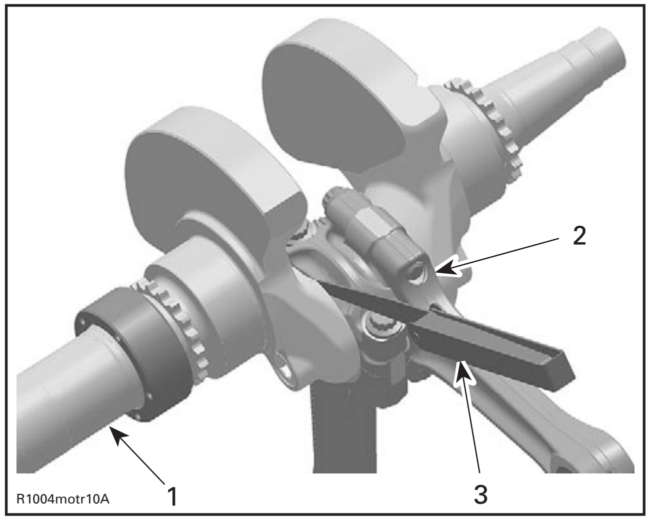
CAUTION: Components with less than the service limit always have to be replaced. If this is not observed, severe damage may be caused to the engine.



1. *Crankshaft timing gear*

Connecting Rod Big End Axial Play

Using a feeler gauge, measure distance between butting face of connecting rods and crankshaft counterweight. If the distance exceeds specified tolerance, replace the crankshaft.

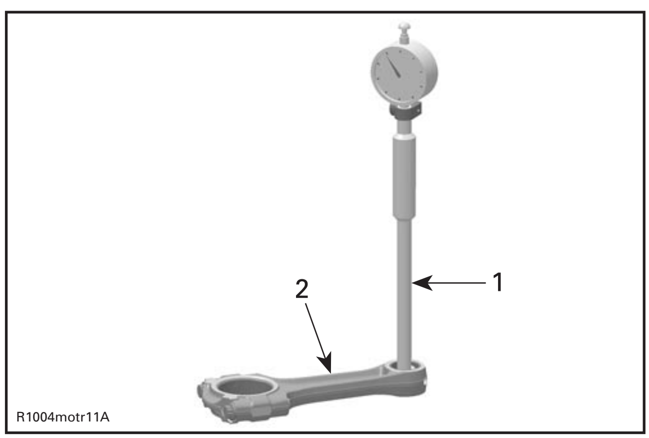


1. *Crankshaft*
2. *Connecting rods*
3. *Feeler gauge*

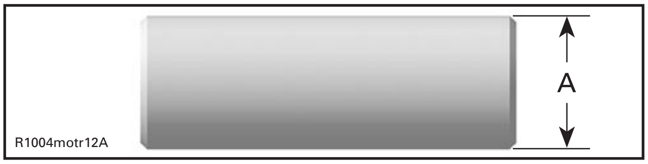
CONNECTING ROD BIG END	
NEW MINIMUM	0.150 mm (.006 in)
NEW MAXIMUM	0.450 mm (.017 in)
SERVICE LIMIT	0.5 mm (.020 in)

Connecting Rod/Piston Pin Clearance

Measure piston pin. Compare to inside diameter of connecting rod **no. 2**.



1. *Bore gauge*
2. *Connecting rod*



A. Piston pin diameter in the area of the bushing

CONNECTING ROD SMALL END DIAMETER	
NEW MINIMUM	23.01 mm (.9059 in)
NEW MAXIMUM	23.02 mm (.9063 in)
SERVICE LIMIT	23.07 mm (.908 in)

PISTON PIN DIAMETER	
NEW MINIMUM	22.996 mm (.9053 in)
NEW MAXIMUM	23.000 mm (.9055 in)
SERVICE LIMIT	22.990 mm (.904 in)

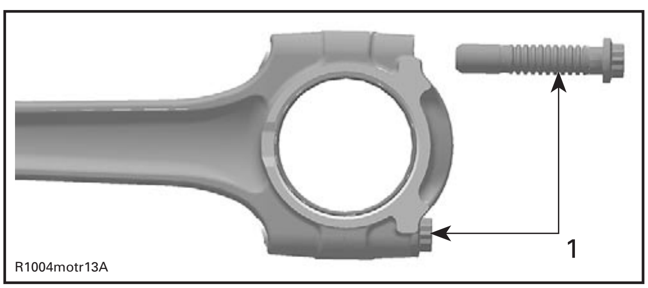
PISTON PIN BORE CLEARANCE	
SERVICE LIMIT	0.080 mm (.0035 in)

NOTE: If the connecting rod small end diameter is out of specification, replace connecting rod.

Connecting Rod Big End Radial Play

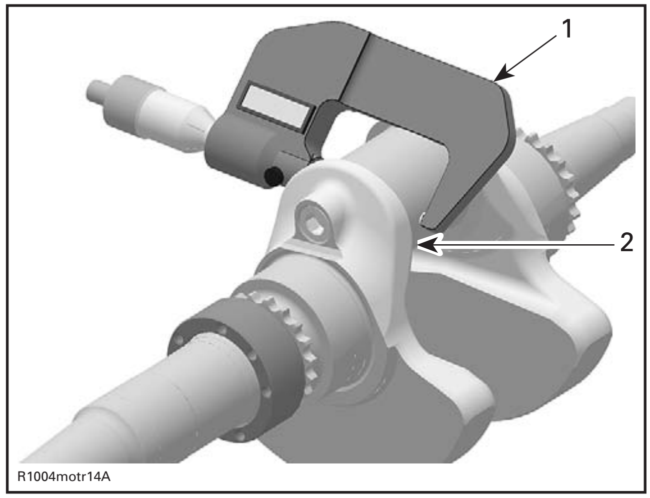
Remove connecting rod **no. 2** from crankshaft **no. 1**.

CAUTION: Always replace connecting rod screws no. 4 if removing the connecting rod. It is recommended to replace bushings no. 3, in case of installing the connecting rod.



1. Connecting rod screw

Measure crankpin. Compare to inside diameter of connecting rod big end.

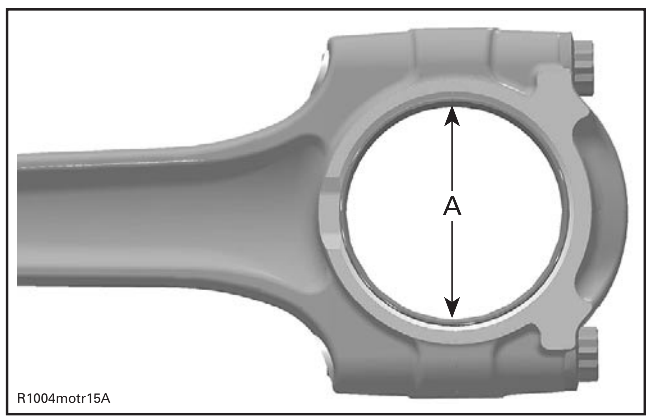


1. Micrometer
2. Crankpin area for bushings

To measure the connecting rod big end diameter, use the OLD screws **no. 4**.

Install the OLD bushings **no. 3** as they were mounted initially.

Do the torque procedure as described further.



A. Connecting rod big end bushing

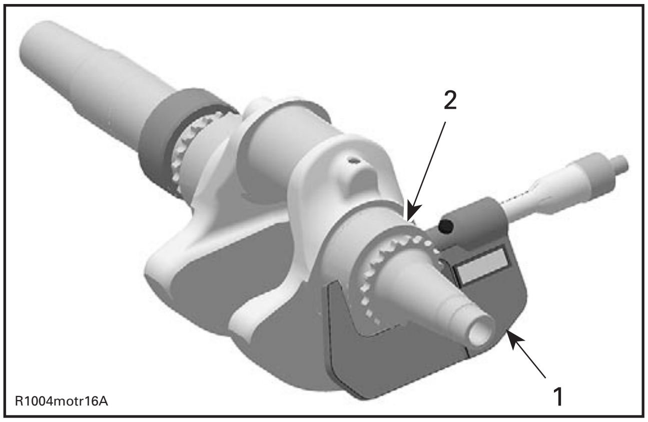
CRANKSHAFT PIN DIAMETER	
NEW MINIMUM	45.017 mm (1.7723 in)
NEW MAXIMUM	45.033 mm (1.7729 in)
SERVICE LIMIT	45.000 mm (1.772 in)

CONNECTING ROD BIG END DIAMETER	
SERVICE LIMIT	45.090 mm (1.775 in)

CONNECTING ROD BIG END CLEARANCE	
SERVICE LIMIT	0.09 mm (.0035 in)

Crankshaft Radial Play Alternator Side

Measure crankshaft on alternator side. Compare to inside diameter of alternator bushing (refer to CRANKCASE).



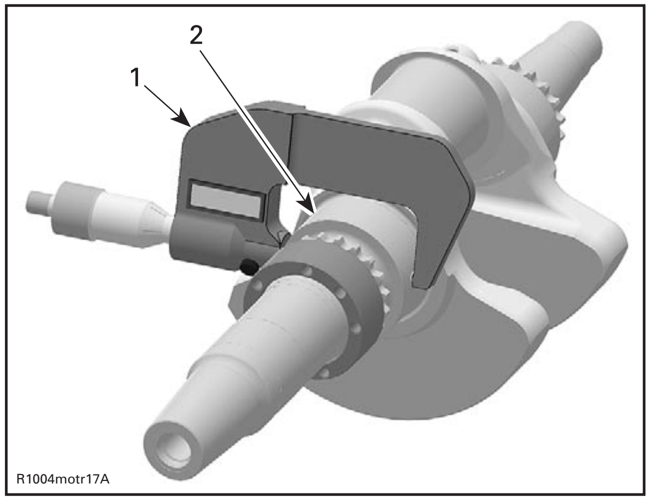
1. *Micrometer*
2. *Crankshaft area for alternator bushing*

CRANKSHAFT ALTERNATOR SIDE DIAMETER	
NEW MINIMUM	54.961 mm (2.1638 in)
NEW MAXIMUM	54.980 mm (2.1645 in)
SERVICE LIMIT	54.940 mm (2.1629 in)

CRANKSHAFT ALTERNATOR SIDE RADIAL CLEARANCE	
SERVICE LIMIT	0.08 mm (.0031 in)

Crankshaft Radial Play (PTO side)

Measure crankshaft on PTO side. Compare to inside diameter of PTO bushing (refer to CRANKCASE).



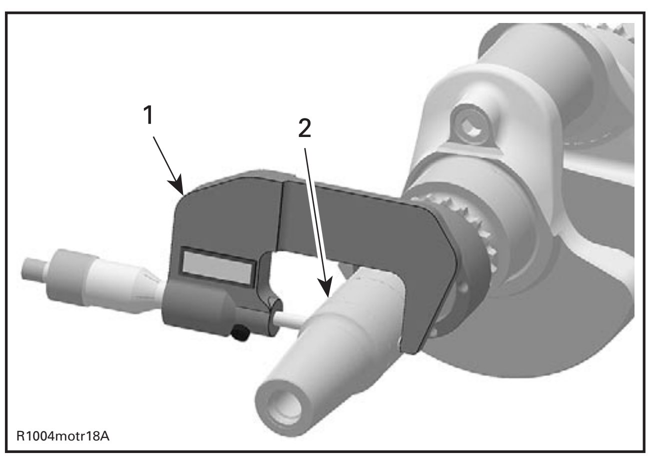
1. *Micrometer*
2. *Crankshaft area for PTO bushing*

CRANKSHAFT JOURNAL PTO DIAMETER	
NEW MINIMUM	54.961 mm (2.1638 in)
NEW MAXIMUM	54.980 mm (2.1645 in)
SERVICE LIMIT	54.940 mm (2.1629 in)

CRANKSHAFT ALTERNATOR SIDE RADIAL CLEARANCE	
SERVICE LIMIT	0.08 mm (.0031 in)

Crankshaft Radial Play (PTO side support bearing)

Measure crankshaft on PTO side journal for support bearing. Compare to inside diameter of PTO support bearing (refer to PTO COVER in CRANKCASE section).



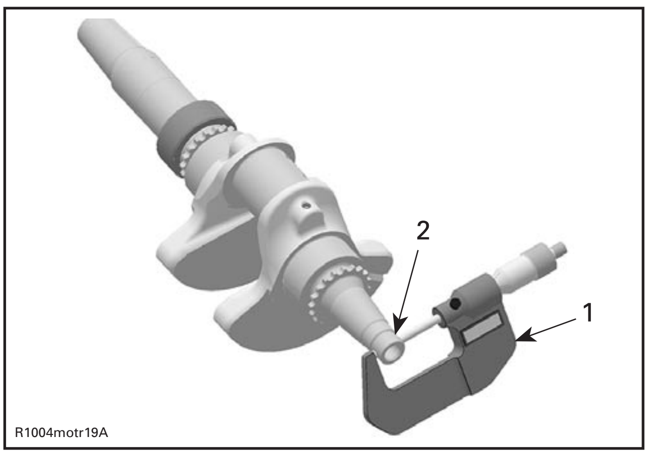
1. *Micrometer*
2. *Crankshaft area (PTO support bearing)*

CRANKSHAFT JOURNAL DIAMETER (PTO support bearing)	
NEW MINIMUM	37.984 mm (1.4954 in)
NEW MAXIMUM	38.000 mm (1.4960 in)
SERVICE LIMIT	37.960 mm (1.4945 in)

CRANKSHAFT PTO SUPPORT BEARING RADIAL CLEARANCE	
SERVICE LIMIT	0.08 mm (.0031 in)

Crankshaft Radial Play (alternator side — oil supply hole)

Measure crankshaft on alternator side journal for oil supply hole. Compare to inside diameter of oil supply hole in ignition cover (refer to ignition cover in COOLING SYSTEM).



1. *Micrometer*
2. *Crankshaft area (journal for oil supply hole)*

CRANKSHAFT JOURNAL DIAMETER (oil supply hole)	
NEW MINIMUM	19.987 mm (0.7869 in)
NEW MAXIMUM	20.00 mm (0.7874 in)
SERVICE LIMIT	0.08 mm (.0031 in)

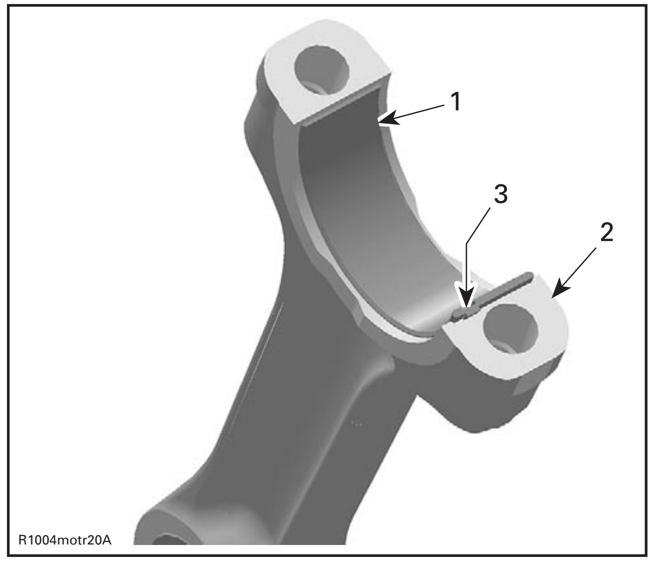
CRANKSHAFT PTO SUPPORT BEARING RADIAL CLEARANCE	
SERVICE LIMIT	0.08 mm (.0031 in)

Installation

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

NOTE: Use NEW bushings **no. 3**, when connecting rod big end diameter is out of specification.

Put bushings correctly in place and clean the split surface on both sides (cracked area) carefully.



1. *Half bushing of connecting rod big end*
2. *Split surface of the connecting rod*
3. *Nose of bushing in line with connecting rod groove*

NOTE: Oil the plain bearing of the connecting rod before installation.

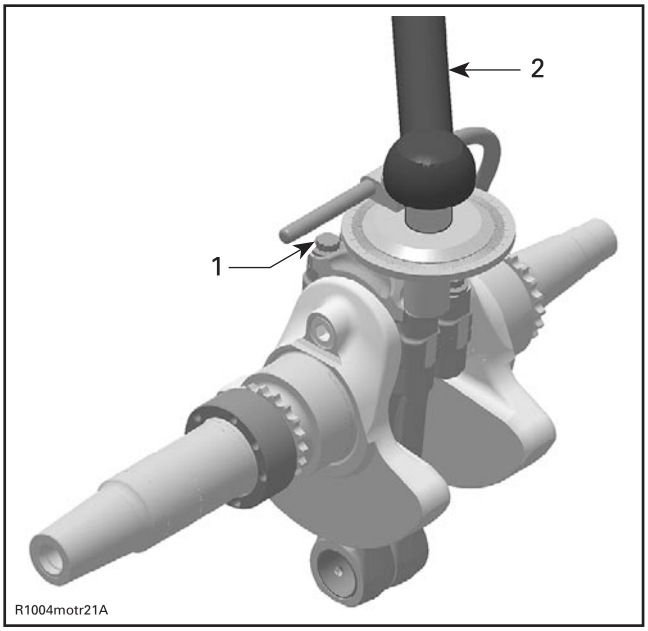
Torque NEW connecting rod screws **no. 4** as per following procedure:

– Torque connecting rod screws to 20 N•m (177 lbf•**in**). Do not apply any thread locker product.
– Torque connecting rod screws to 45 N•m (33 lbf•ft).
– 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. The bushing tapered end must be against the counterweight. Besides, as the "crankpin" screw has been stretched from the previous installation, it is very important to use a new screw at assembly.**

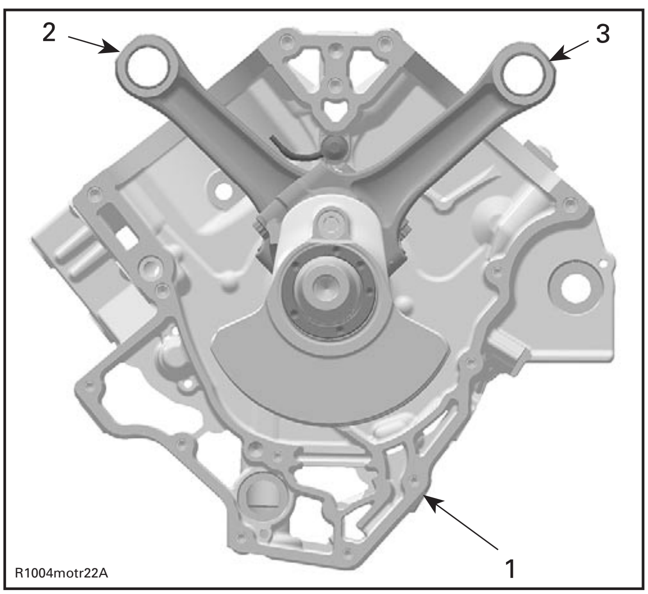
Take care during installation that the connecting rods are not installed with a twist. The running direction of the big end bearings and of the piston pins must not change.

Do not mix up the connecting rods of cylinders 1 and 2 during installation.



1. Connecting rod screws
2. Angle torque wrench

CAUTION: Observe the correct installation position when fitting the crankshaft with the connecting rods. The connecting rod alternator side has to face to cylinder 1.

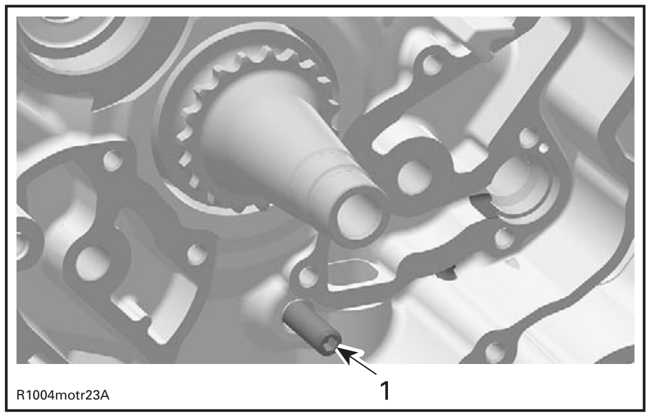


1. Crankcase alternator side
2. Connecting rod cylinder 1
3. Connecting rod cylinder 2

CAUTION: Install crankshaft locking bolt (P/N 529 035 900) (refer to crankshaft locking bolt) right away to put crankshaft in TDC position before installing the camshaft and rockers (refer to CYLINDER AND CYLINDER HEAD).

CRANKSHAFT LOCKING BOLT

The engine must be locked for removal and installation work on crankshaft and camshaft. The opening for the crankshaft locking bolt is located in the ignition cover and in crankcase alternator side.



1. Crankshaft locking bolt (P/N 529 035 900)

Removal

Remove:

– plug screw **no. 26**
– plug screw **no. 25**.

CAUTION: Pull out the plug screw with utmost care to prevent it from being dropped into the crankcase during dismantling.

Installation

Fit the plug screw **no. 25** with Loctite 243.

Torque plug screw **no. 25** to 8 N•m (71 lbf•**in**).

Replace O-ring **no. 27** during installation and grease it with multi-purpose grease.

Torque plug screw **no. 26** to 3 N•m (26 lbf•**in**).

PISTON

Removal

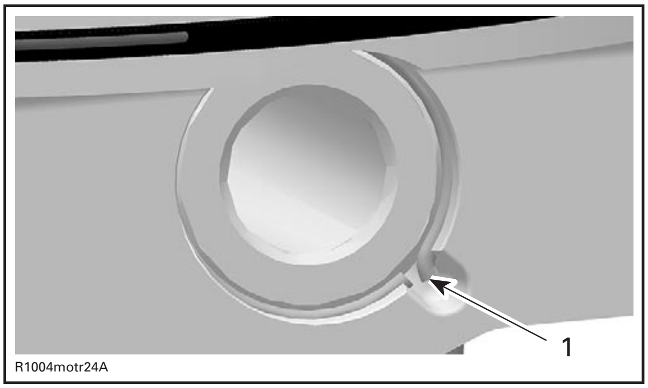
Remove:

– cylinder head(refer to CYLINDER AND CYLINDER HEAD)

– cylinder(refer to CYLINDER AND CYLINDER HEAD).

Place a rag under piston.

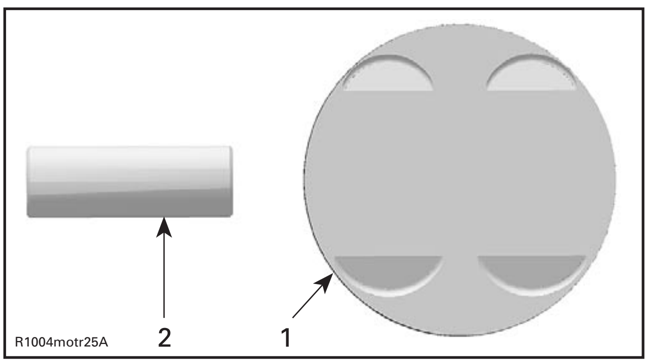
Remove one piston circlip **no. 13** and discard it.



1. Piston circlip

NOTE: The removal of both piston circlips is not necessary to remove piston pin.

Push piston pin **no. 12** out of piston.



1. Piston
2. Piston pin

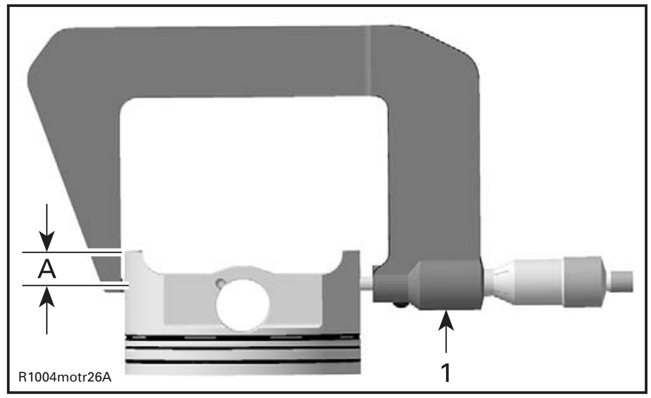
Detach piston **no. 10** from connecting rod.

Inspection

Piston

NOTE: 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.



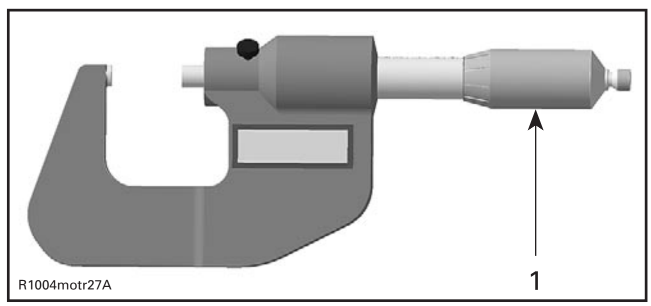
1. Measuring perpendicularly (90°) to piston pin
A. 18 mm (.709 in)

The measurement should be as in the following table. If not, replace piston.

PISTON MEASUREMENT	
NEW NOMINAL	99.951 to 99.969 mm (3.935 to 3.936 in)
SERVICE LIMIT	99.80 mm (3.929 in)

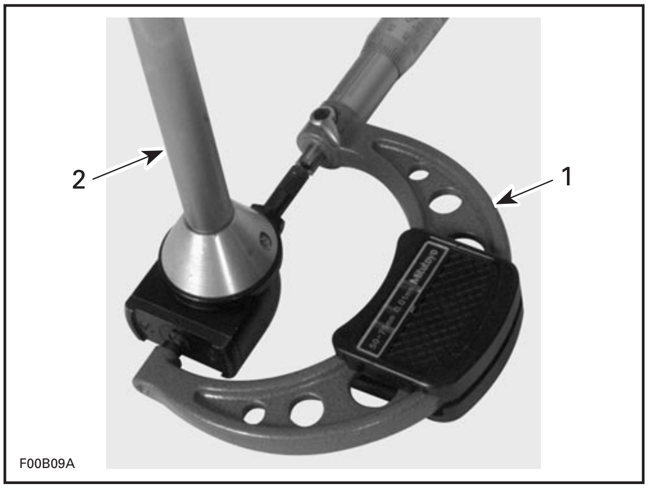
Piston/Cylinder Clearance

Adjust and lock a micrometer to the piston dimension.

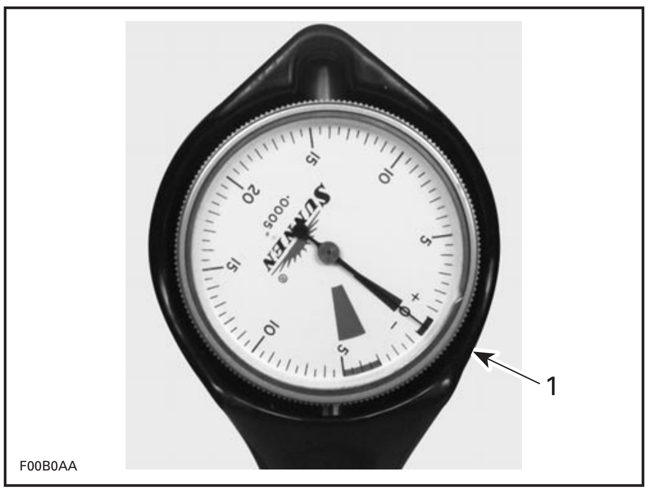


1. Micrometer set to the piston dimension

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 50 mm (2 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	
NEW NOMINAL	0.024 to 0.056 mm (.001 to .002 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, replace cylinder.

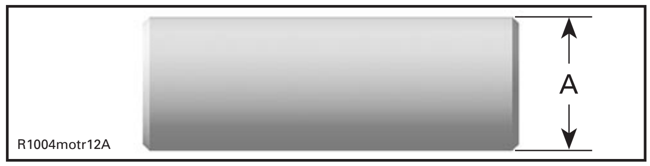
NOTE: Make sure the cylinder bore gauge indicator is set exactly at the same position as with the micrometer, otherwise the reading will be false.

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 position.



A. Piston pin diameter

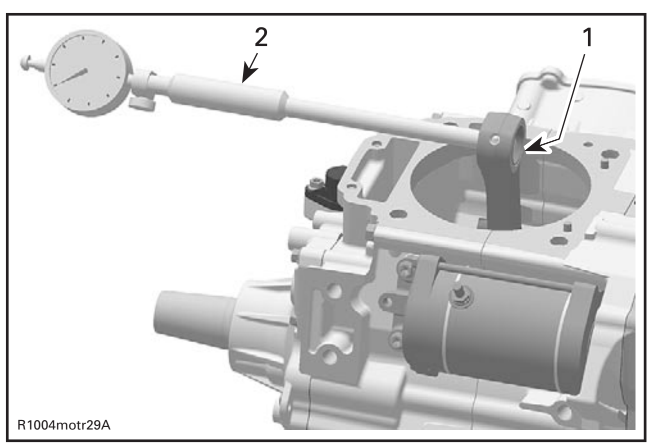
PISTON PIN	
NEW MINIMUM	22.996 mm (.9053 in)
NEW MAXIMUM	23.000 mm (.9055 in)
SERVICE LIMIT	22.990 mm (.9051 in)

NOTE: Replace piston pin if diameter is out of specifications.

Piston Pin/Connecting Rod Bushing Clearance

Measure inside diameter of connecting rod.

CONNECTING ROD SMALL END DIAMETER	
NEW MINIMUM	23.01 mm (.9059 in)
NEW MAXIMUM	23.02 mm (.9063 in)
SERVICE LIMIT	23.07 mm (.908 in)



1. Bushing of the connecting rod
2. Bore gauge

NOTE: Replace connecting rod if diameter of connecting rod small end is out of specifications.

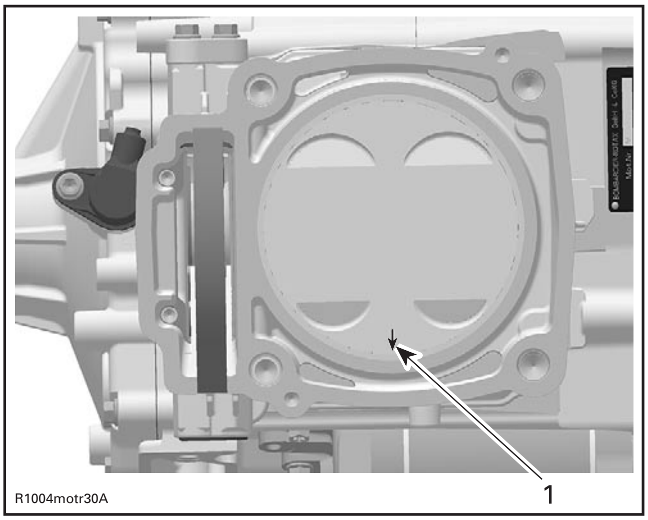
Installation

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

NOTE: Apply engine oil on the piston pin.

Insert piston pin into piston and connecting rod.

CAUTION: Take care that piston will be installed with the punched arrow on piston top to the exhaust side.

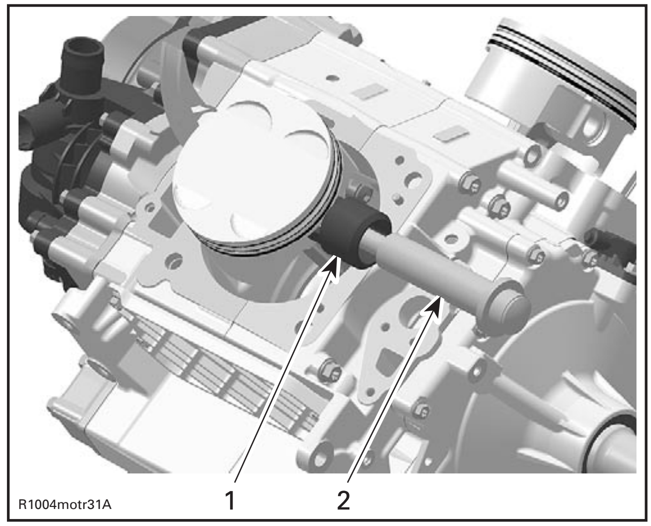


1. Arrow should indicate to the exhaust side

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

PISTON RINGS

Removal

Remove:

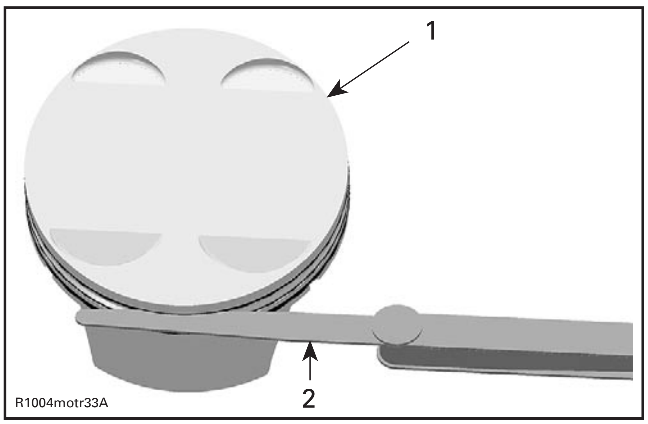
– cylinder head(refer to CYLINDER AND CYLINDER HEAD)
– cylinder(refer to CYLINDER AND CYLINDER HEAD)
– piston pin **no. 12** (refer to PISTON above)
– piston **no. 10**.

Inspection

Ring/Piston Groove Clearance

NOTE: 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	
UPPER COMPRESSION RING (rectangular)	0.025 mm (.001 in)
LOWER COMPRESSION RING (taper-face)	0.015 mm (.0006 in)
Oil SCRAPER RING	0.020 mm (.0008 in)
NEW MAXIMUM	
UPPER COMPRESSION RING (rectangular)	0.070 mm (.0028 in)
LOWER COMPRESSION RING (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. *Feeler gauge*

Ring End Gap

RING END GAP	
NEW MINIMUM	
UPPER COMPRESSION RING (rectangular)	0.15 mm (.006 in)
LOWER COMPRESSION RING (taper-face)	0.15 mm (.006 in)
Oil SCRAPER RING	0.15 mm (.006 in)
NEW MAXIMUM	
UPPER COMPRESSION RING (rectangular)	0.35 mm (.014 in)
LOWER COMPRESSION RING (taper-face)	0.35 mm (.014 in)
Oil SCRAPER RING	0.30 mm (.012 in)
SERVICE LIMIT	
All	0.15 mm (.006 in)

Measure position for ring end gap in the area of 8 to 16 mm (.315 to .630 in) from top of cylinder.

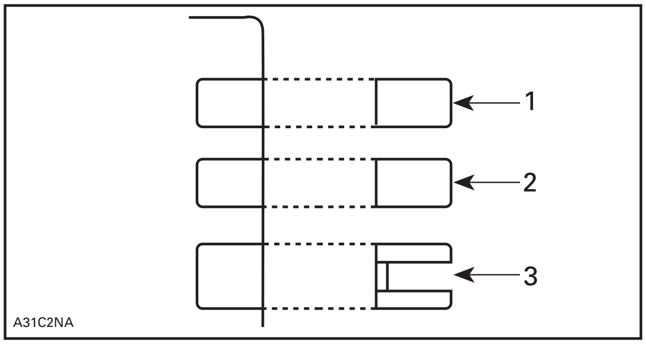
NOTE: In order to correctly position the ring in the cylinder, use piston as a pusher.

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.

NOTE: Install the oil scraper ring first with "O" facing up, then the lower compression (taper-face) ring with the word "TOP" facing up, then the upper compression (rectangular) ring with the word "TOP" facing up.



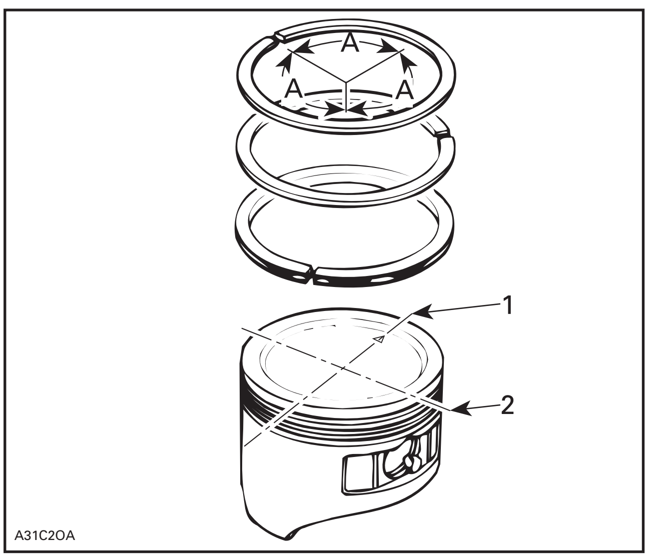
1. Rectangular ring
2. Taper-face ring
3. Oil scraper ring

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.

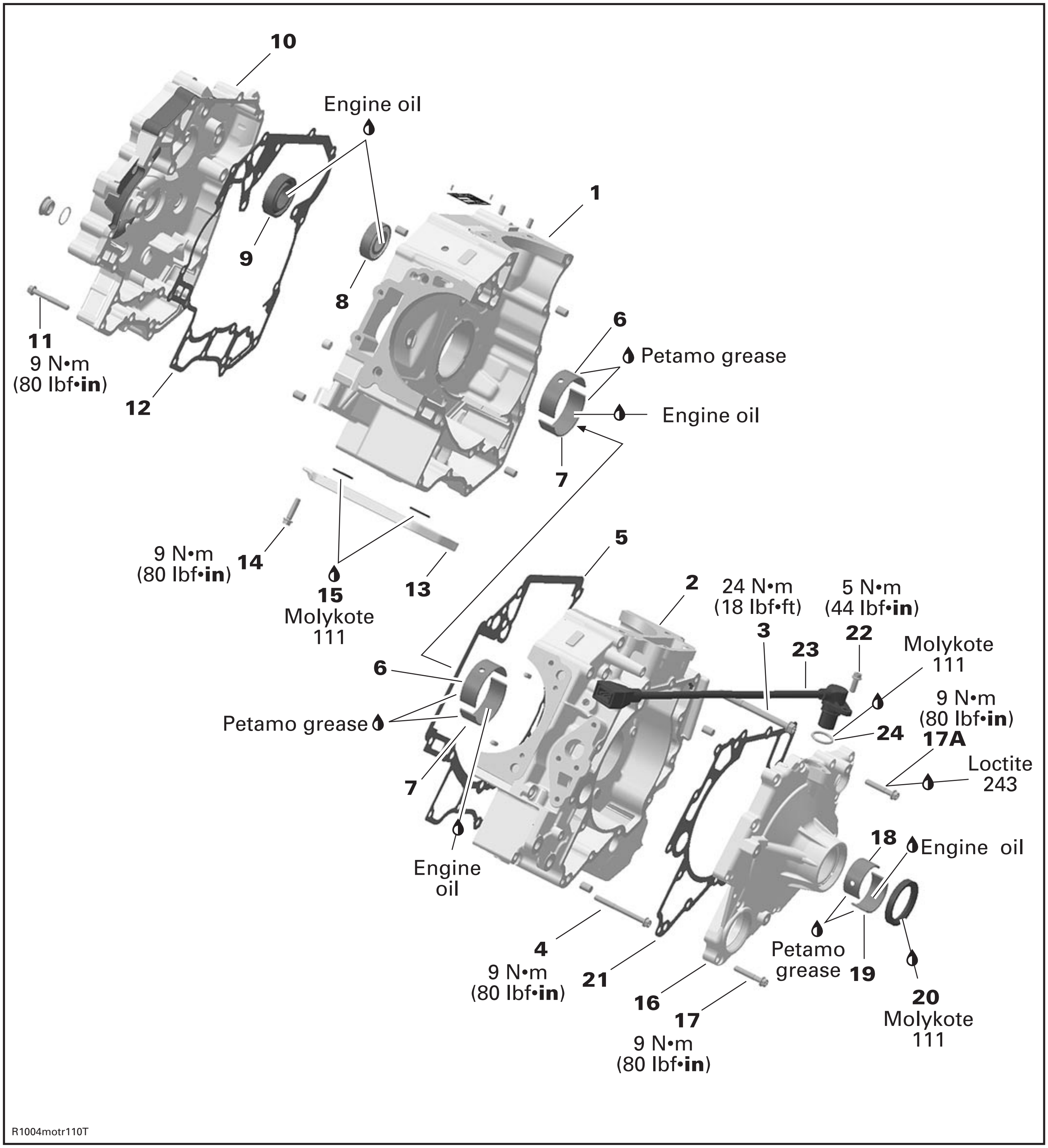
Check that rings rotate smoothly after installation.

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 thrust side axis
2. DO NOT align ring gap with piston pin bore axis
A. 120°

CRANKCASE


10
Engine oil
1
9
8
11
9 N•m
(80 lbf•**in**)
12
6
Petamo grease
Engine oil
7
9 N•m
(80 lbf•**in**)
14
15
Molykote
111
13
5
2
24 N•m
(18 lbf•ft)
3
5 N•m
(44 lbf•**in**)
22
23
Molykote
111
6
9 N•m
(80 lbf•**in**)
Petamo grease
24
17A
Loctite
243
7
18
Engine oil
Engine
oil
Petamo
grease
19
4
9 N•m
(80 lbf•**in**)
21
16
20
Molykote
111
17
9 N•m
(80 lbf•**in**)
R1004motr110T

GENERAL

To remove crankcase, the engine removal is necessary.

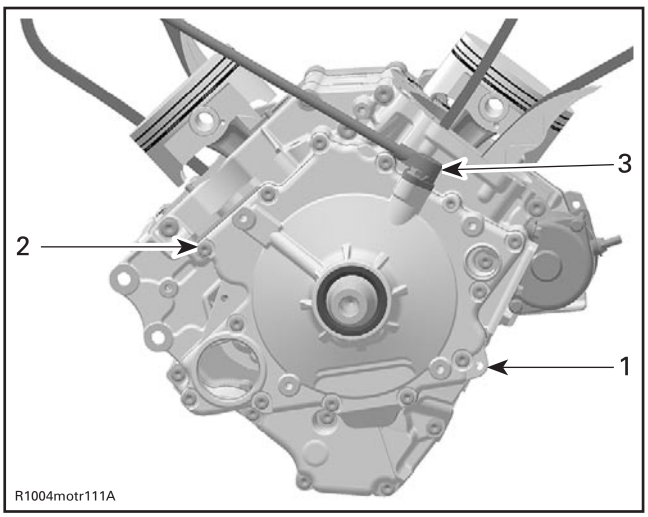
For installation, use the torque values and Loctite products indicated in the exploded view. Clean threads before using Loctite when installing screws.

PTO COVER

Removal

Remove:

– engine from the vehicle (refer to REMOVAL AND INSTALLATION)
– oil tank (refer to LUBRICATION SYSTEM)
– disconnect crankshaft position sensor **no. 23**
– PTO cover screws **no. 17** and **no. 17A** and pull PTO cover **no. 16**.



1. PTO cover
2. PTO cover screws
3. Crankshaft position sensor

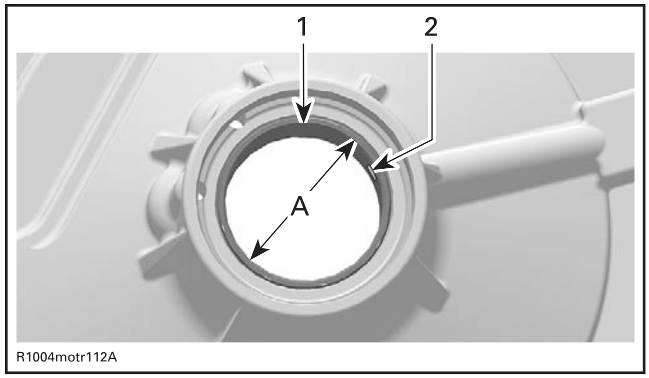
Inspection

Check the PTO cover for cracks or other damage.

Replace PTO cover if damaged.

Check plain bearings **no. 18** and **no. 19** for scorings or other damages.

NOTE: Measure plain bearing inside diameter and compare to crankshaft journal diameter (PTO support bearing). Refer to CRANKSHAFT/DRIVE GEARS. Replace if the measurement is out of specification.



1. Plain bearing
2. Oil bore
A. Plain bearing inside diameter to be measured in area of oil bore

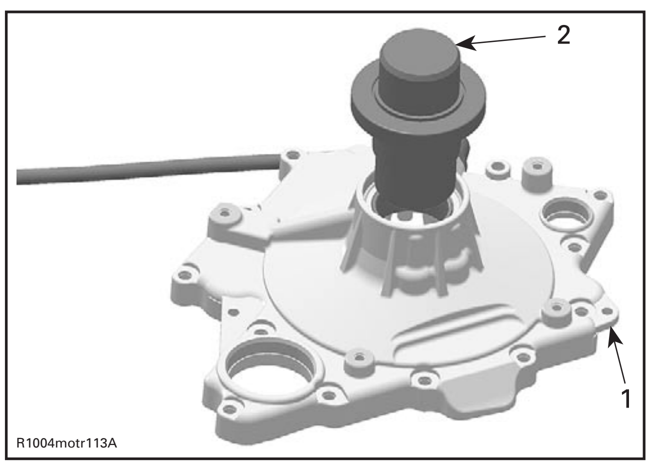
PLAIN BEARING INSIDE DIAMETER (PTO side support bearing)	
SERVICE LIMIT	38.040 mm (1.4976 in)

Bearing Removal Procedure

Carefully remove the oil seal **no. 20** with a screwdriver, without inflicting damage to the PTO cover.

TOOLS P/N TO REMOVE PTO SIDE PLAIN BEARING	
PTO side plain bearing remover	529 035 914

NOTE: Carefully push-out the plain bearings **no. 18** and **no. 19** from the outside towards the inside. The PTO cover has to be supported from below with suitable support with straight surface , in order to prevent damage of the sealing surface.



1. PTO cover
2. Plain bearing remover (P/N 529 035 914)

Bearing Installation Procedure

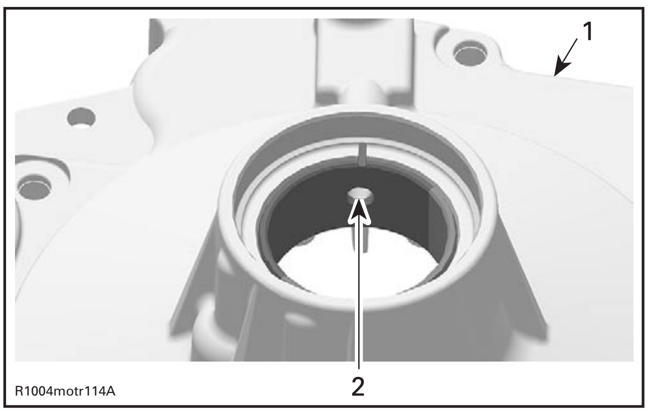
NOTE: Unless otherwise instructed, never use hammer to install plain bearings. Use press machine only.

Install plain bearings with the proper plain bearing installer/remover (P/N 529 035 914).

Fit the plain bearings with Petamo grease (P/N 420 899 271).

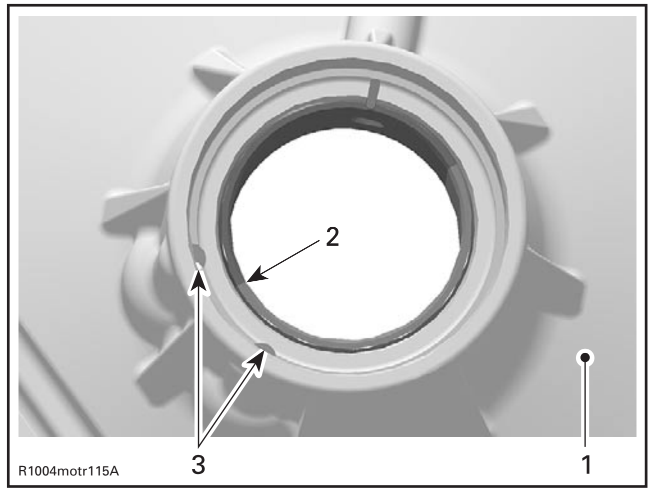
NOTE: Carefully press-in the plain bearings **no. 18** and **no. 19** in the same direction as during disassembly, from the outside towards the inside. Support PTO cover with suitable support with straight surface, in order to prevent damage of the sealing surface.

CAUTION: Mark position of oil bore in plain bearing on crankcase half. Align mark on plain bearing installer/remover with mark on crankcase half. Wrong oil bore position will stop oil supply to plain bearing and will damage the engine.



1. *PTO cover*
2. *Oil bore*

CAUTION: The partition of the plain bearings must be positioned between the oil return holes (refer to no. 3 in next illustration) in the PTO cover.

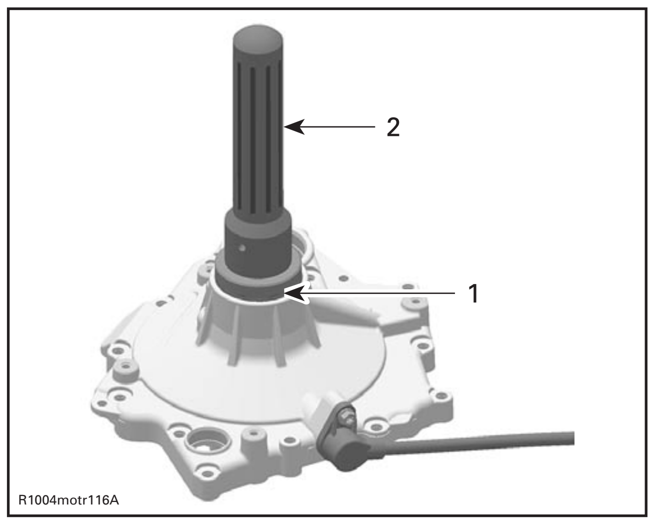


1. *PTO cover*
2. *Partition*
3. *Oil return holes*

Oil Seal Installation Procedure

NOTE: At installation, replace PTO cover oil seal **no. 20**.

Push PTO cover oil seal in place by using the oil seal pusher (P/N 529 035 910).



1. *Oil seal for the PTO cover*
2. *Oil seal pusher (P/N 529 035 910)*

Installation

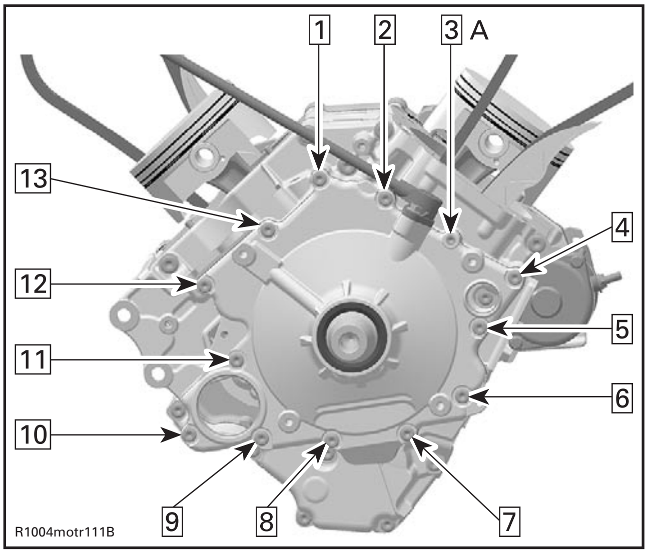
For installation, reverse the removal procedure.

Pay attention to the following details.

NOTE: At installation, replace gasket **no. 21**.

Torque PTO cover screws to 9 N•m (80 lbf•**in**).

Tightening sequence for screws on PTO cover is as per following illustration. Fit the screw **no. 17A** with Loctite 243.



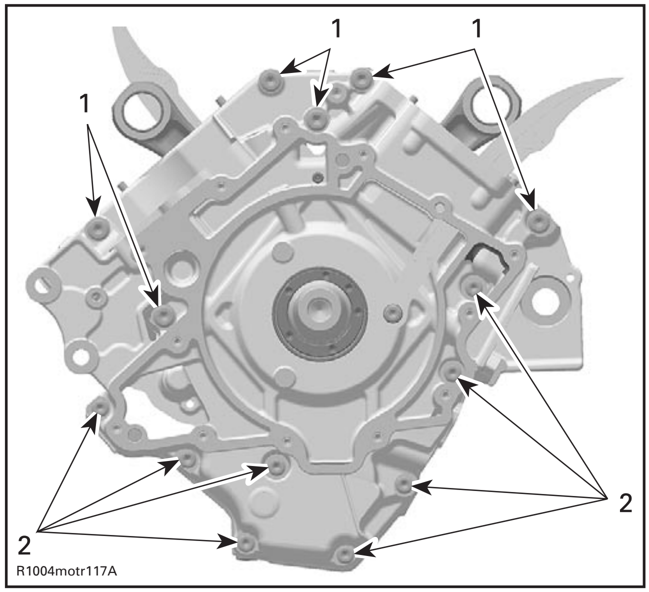
A. Screw 17A with Loctite 243

CRANKCASE

Disassembly

Remove:

– engine from vehicle(refer to REMOVAL AND INSTALLATION)
– oil tank and oil filter housing(refer to LUBRICATION SYSTEM)
– PTO cover (refer to PTO COVER above)
– trigger wheel (refer to CRANKSHAFT/DRIVE GEARS)
– electric starter (refer to ELECTRIC STARTER)
– alternator side cover (refer to COOLING SYSTEM)
– drive gears (refer to CRANKSHAFT/DRIVE GEARS)
– cylinder head and cylinder (refer to CYLINDER AND CYLINDER HEAD)
– timing chains (refer to CRANKSHAFT/DRIVE GEARS)
– cover **no. 13**
– screws **no. 3** and **no. 4** retaining crankcase halves.

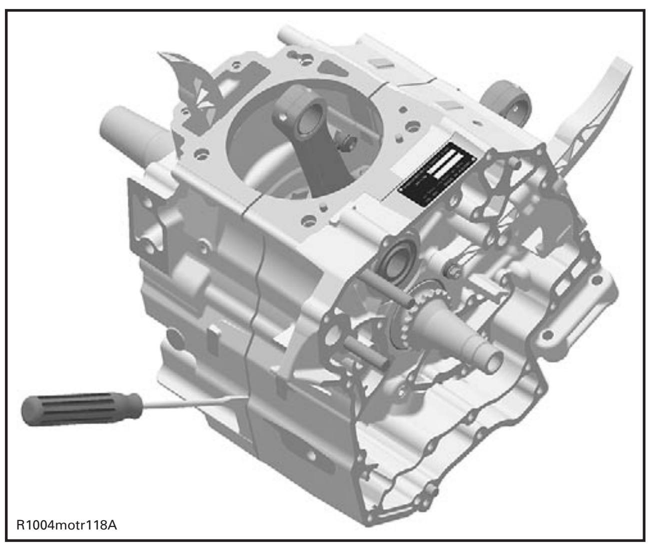


1. Six screws M8 x 90
2. Eight screws M6 x 65

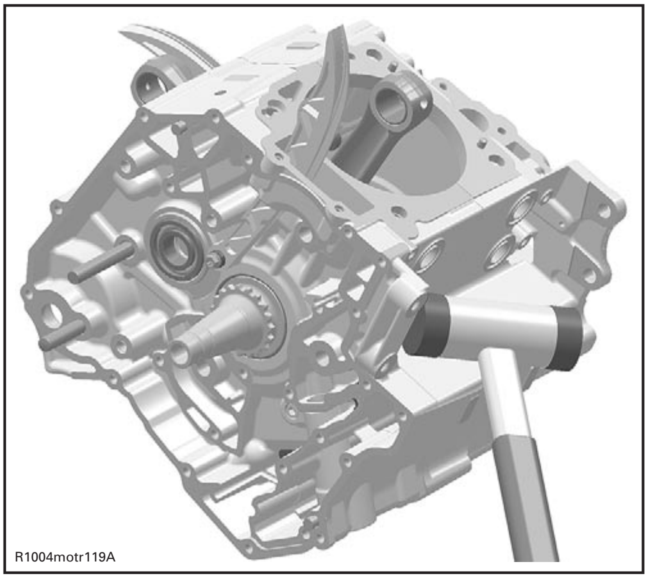
Place the crankcase on a wood stand, PTO side upwards.

Carefully separate crankcase halves by using a screwdriver and a plastic hammer.

NOTE: During disassembly, do not damage the sealing surfaces of the crankcase halves.



POSITION FOR SCREWDRIVER



POSITION FOR PLASTIC HAMMER

Inspection

NOTE: Remove all remaining parts from the crankcase halves; they could get damaged during the repair work.

Clean crankcase halves from contaminations and blow the oil supply lines with compressed air.

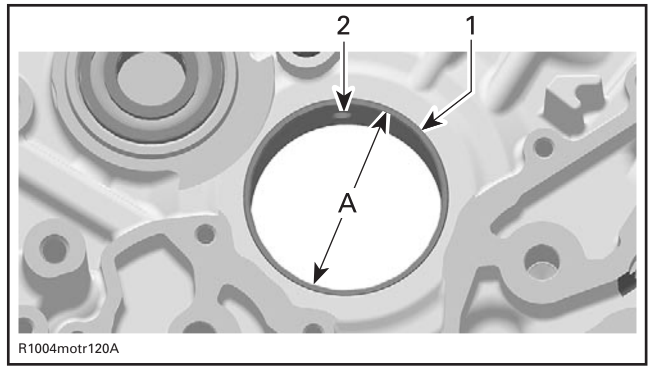
⚠ WARNING

Use safety goggles to avoid eye injuries.

Check bearing **no. 8**, for excessive play and smooth operation. Replace if necessary.

Check plain bearings **no. 6** and **no. 7** for scorings or other damages.

NOTE: Measure plain bearing inside diameter and compare to PTO/alternator side journal diameters (refer to CRANKSHAFT/DRIVE GEARS). Replace if the measurement is out of specification.



1. Plain bearing
2. Oil bore
A. Plain bearing inside diameter to be measured in area of oil bore

PLAIN BEARING INSIDE DIAMETER (alternator side)	
SERVICE LIMIT	55.020 mm (2.1661 in)
PLAIN BEARING INSIDE DIAMETER (PTO side)	
SERVICE LIMIT	55.020 mm (2.1661 in)

Bearing Removal Procedure

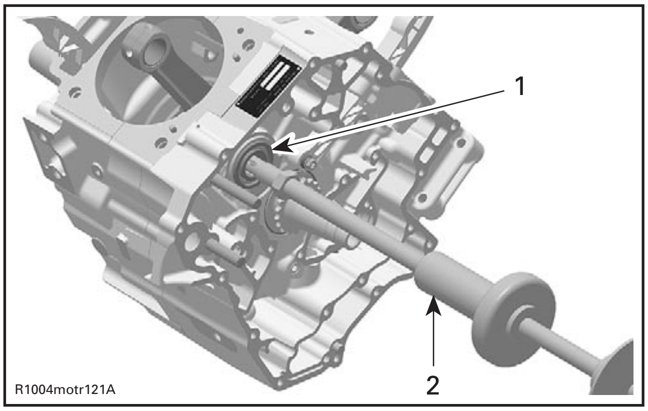
Always heat crankcase half up to 100°C (212°F) before removing ball bearings.

⚠ WARNING

Clean oil, outside and inside of crankcase half before heating it.

CAUTION: Always support crankcase halves properly when ball bearings or plain bearings are removed. Damages to crankcase halves may occur if this procedure is not performed correctly.

The generator gear ball bearing **no. 8** in alternator side crankcase half is removed with a suitable bearing puller.



1. Ball bearing
2. Bearing puller

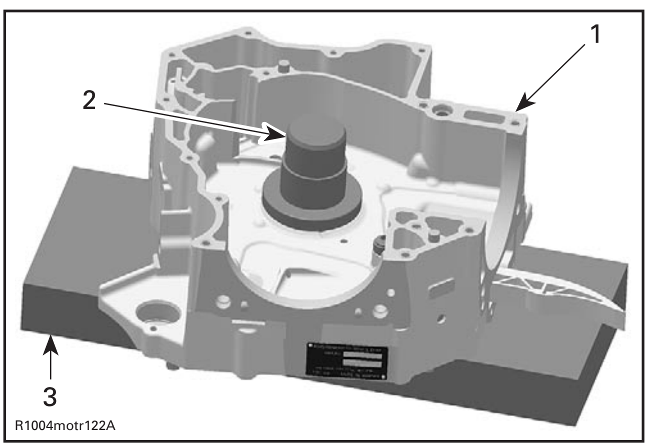
Remove plain bearings **no. 6**, **no. 7**, **no. 18** and **no. 19** with the proper plain bearing remover.

NOTE: Carefully push the plain bearings out, from the crankcase half inside towards the outside.

NOTE: Place the proper support sleeve under PTO crankcase half before removing plain bearings. There is no support sleeve for alternator side crankcase half. To brace the crankcase half, use a suitable wooden block or other support.

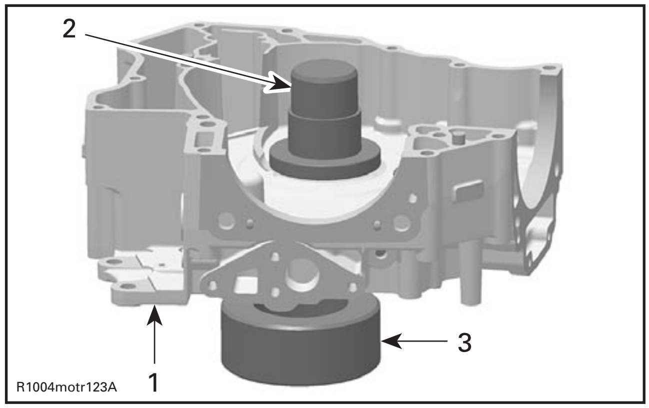
CAUTION: Suitable support sleeve must have straight surface.

During disassembly, make sure not to damage the sealing surfaces of the crankcase halves.



PUSH PLAIN BEARINGS OUTSIDE
1. Crankcase half alternator side
2. Plain bearing remover
3. Wooden block

PLAIN BEARING REMOVER	
Alternator side	529 035 913
PTO side	
SUPPORT SLEEVE	
PTO side	529 035 944



PUSH PLAIN BEARINGS OUTSIDE
1. Crankcase half PTO side
2. Plain bearing remover
3. Support sleeve (P/N 529 035 944)

Bearing Installation Procedure

Unless otherwise instructed, never use hammer to install ball bearings or plain bearings. Use press machine only.

Always heat crankcase half up to 100°C (212°F) before installing ball bearing.

⚠ WARNING

Clean oil, outside and inside of crankcase half before heating it.

NOTE: Place new ball bearing in freezer for 10 minutes before installation.

NOTE: No striking tools are to be used to insert the ball bearing. With moderate (thumb) pressure the bearing has to be mounted manually into the alternator side cover.

Install plain bearings **no. 6**, **no. 7**, **no. 18** and **no. 19** with the proper plain bearing installer/remover.

Fit the plain bearings with Petamo grease (P/N 420 899 271).

NOTE: Carefully press-in the plain bearings in the same direction as during disassembly, from the case inside towards the outside.

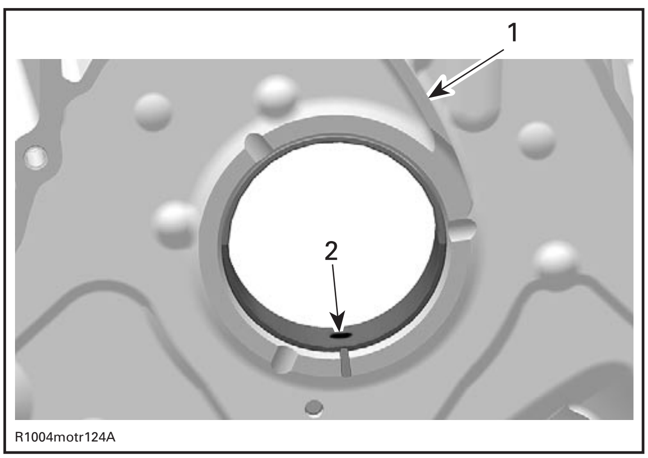
NOTE: Place the proper support sleeve under PTO crankcase half before installing the plain bearings. There is no support sleeve for alternator side crankcase half. For bracing of the crankcase half use a suitable wooden block or other support (refer to BEARING REMOVAL PROCEDURE above).

CAUTION: Suitable support sleeve must have straight surface.

During reassembly, make sure not to damage the sealing surfaces of the crankcase halves.

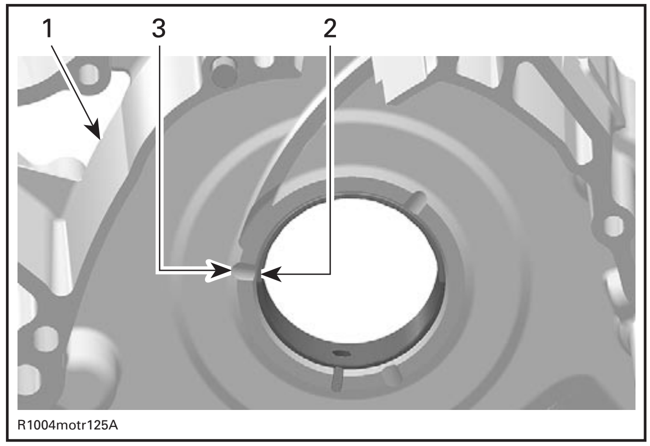
PLAIN BEARING INSTALLER/REMOVER	
Alternator side	529 035 913
PTO side	
SUPPORT SLEEVE	
PTO side	529 035 944

CAUTION: Mark position of oil bore in plain bearing on crankcase half. Align mark on plain bearing installer/remover with mark on crankcase half. Wrong oil bore position will stop oil supply to plain bearing and will damage the engine.



1. Crankcase
2. Oil bore

CAUTION: The partition of the plain bearings must be positioned near the groove (refer to no. 3 in next illustration) of the crankcase.



1. Crankcase
2. Partition
3. Groove

NOTE: Use an O-ring (∅ 55 x 1 to 1.5 mm (.04 to .06 in) thickness) to hold plain bearings in place during installation. The O-ring will disappear in the groove of the plain bearing installer/remover.

Assembly

The assembly of crankcase is essentially the reverse of removal procedure. However, pay attention to the following details.

NOTE: Clean oil passages and make sure they are not clogged.

Clean all metal components in a solvent.

NOTE: At installation, replace gasket **no. 5**.

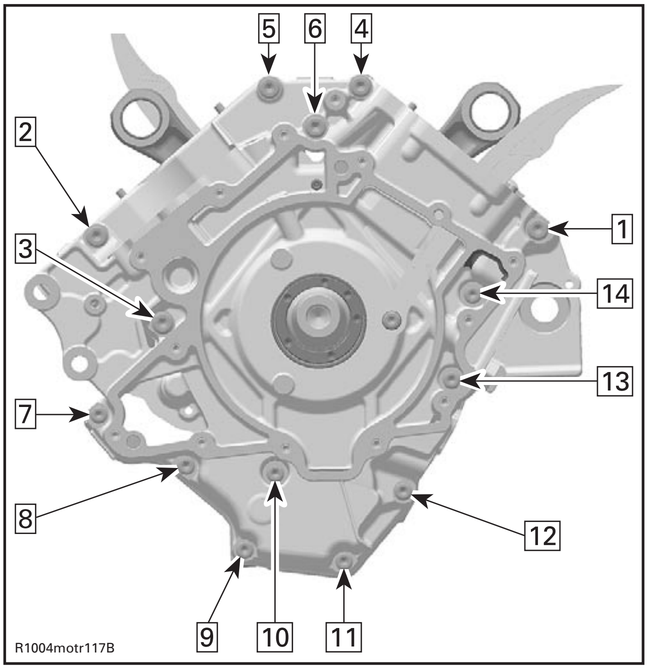
NOTE: Oil the plain bearings before mounting the crankshaft.

Reinstall all other parts (refer to LUBRICATION SYSTEM).

Torque screws **no. 4** M6 x 65 to 9 N•m (80 lbf•**in**).

Torque screws **no. 3** M8 x 90 to 24 N•m (18 lbf•ft).

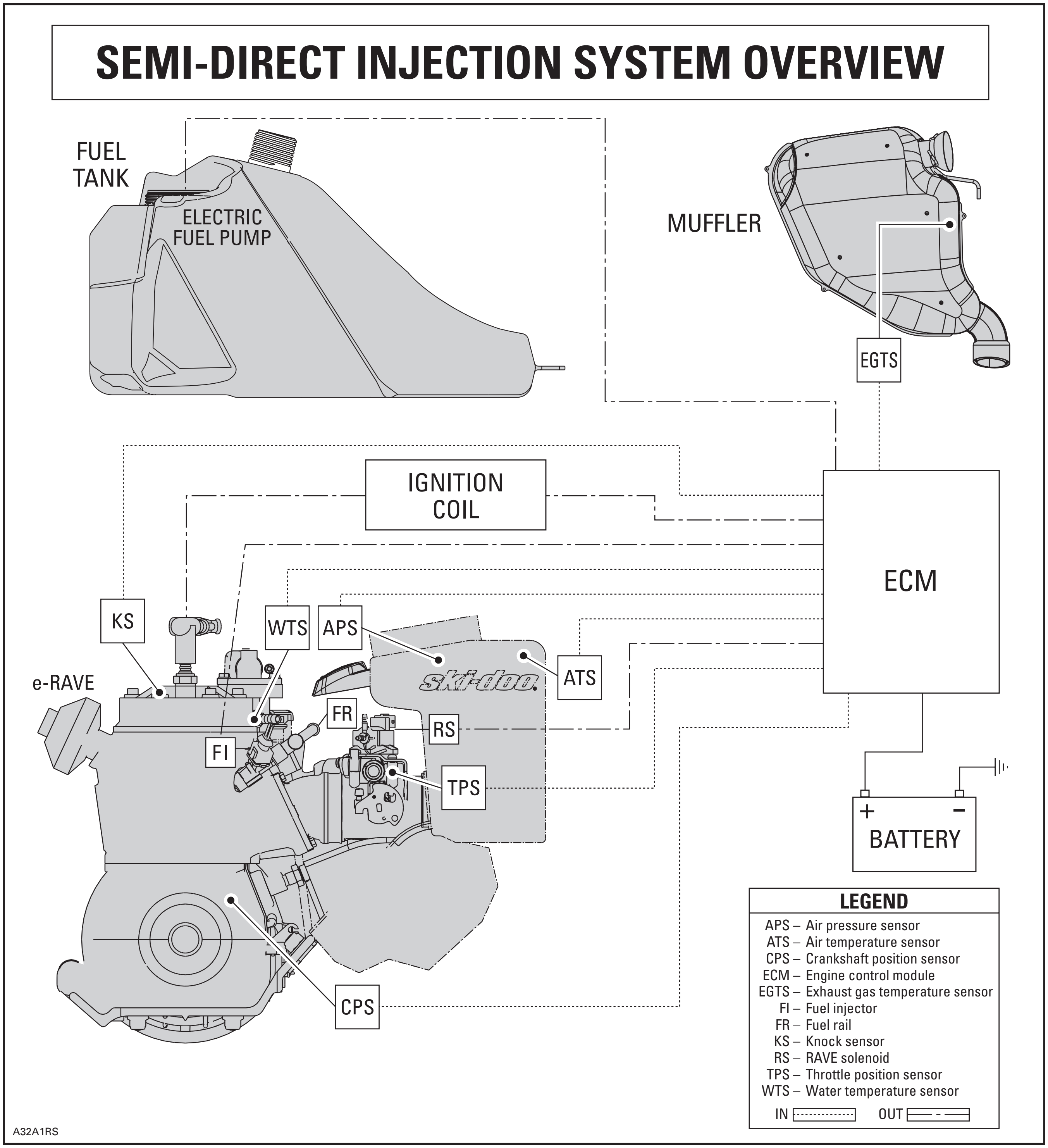
Tightening sequence for screws on crankcase is as per following illustration.



NOTE: At installation, replace gasket rings **no. 15**.

Slightly grease the gasket rings **no. 15** before assembly using molykote 111. Torque cover screws **no. 14** to 9 N•m (80 lbf•**in**).

OVERVIEW

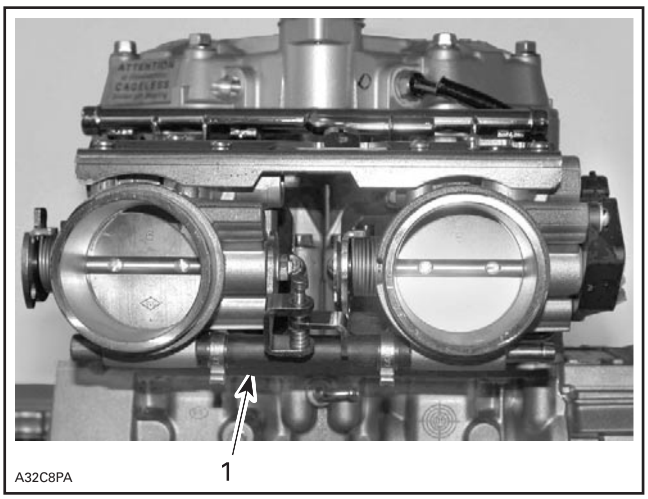

SEMI-DIRECT INJECTION SYSTEM OVERVIEW
FUEL TANK
ELECTRIC FUEL PUMP
MUFFLER
EGTS
IGNITION COIL
ECM
KS
WTS
APS
ATS
e-RAVE
FR
RS
FI
TPS
BATTERY
CPS
LEGEND
APS – Air pressure sensor
ATS – Air temperature sensor
CPS – Crankshaft position sensor
ECM – Engine control module
EGTS – Exhaust gas temperature sensor
FI – Fuel injector
FR – Fuel rail
KS – Knock sensor
RS – RAVE solenoid
TPS – Throttle position sensor
WTS – Water temperature sensor
IN
OUT
A32A1RS

OPERATING PRINCIPLE

For this SDI 2-stroke engine, a highly advanced engine management system (EMS) has been used to ensure a high power output combined with cleanest combustion. An ECM (Engine Control Module) calculates the proper air/fuel mixture and ignition timing for each cylinder separately. The fuel is injected into the transfer port of each cylinder.

AIR INDUCTION

Through air filters mounted on dash, air goes into air silencer. The ECM measures at this point air pressure and temperature. Then, air for combustion is drawn through two throttle bodies. The air flow is controlled by two throttle plates. The air continues through the reed valves into the cylinder base then the crankcase.



THROTTLE BODY ASSEMBLY
1. Coolant-heated line

FUEL DELIVERY SYSTEM

GENERAL

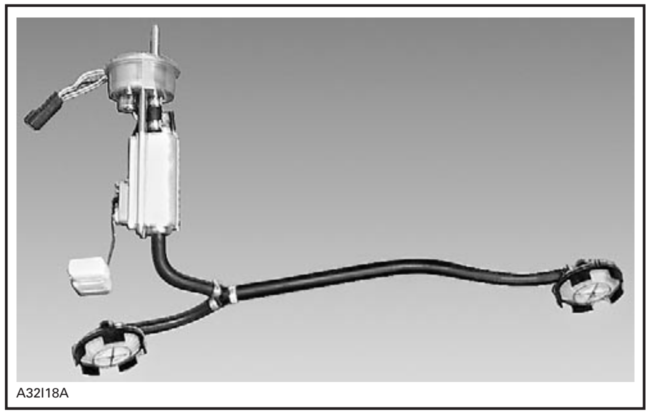
When the piston reaches the correct position, the ECM opens the fuel injectors and fuel is discharged into the transfer ports of cylinders. This air/fuel mixture is then ignited by the spark plug.

COMPONENT DESCRIPTION

Fuel Pump and Fuel Pressure Regulator

They provide fuel pressure and flow rate to the system.

The fuel pump module is located inside the fuel tank. The module includes the fuel pump and the fuel level sensor.



The 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 Rail

The fuel rail is a small tube on which the four injectors are mounted. It ensures at all times 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 Injectors

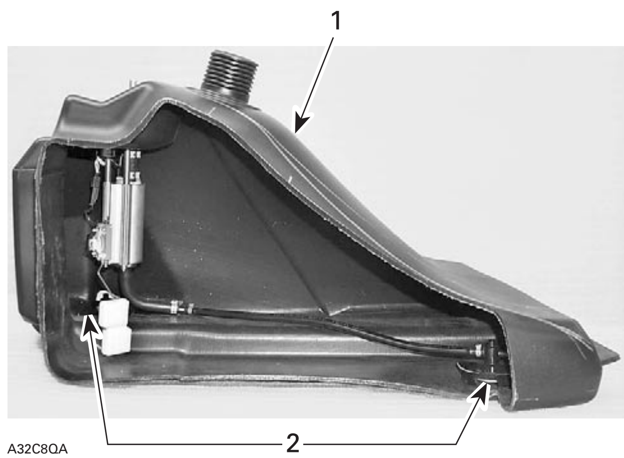
Fuel injectors (two per cylinder) are used to inject fuel into the transfer port of cylinder.

Throttle Body

It is a dual throttle body mounted on the engine intake side. Fitted on this dual throttle body, there is a TPS (Throttle Position Sensor) that sends information to the ECM.

Fuel Pickups

The two fuel pickups come with 70 micron filter. One is located at the front right side of the fuel tank and the other at the rear left side.



1. Fuel tank
2. Fuel pickups

In-Line Fuel Filter

The in-line 10 micron fuel filter is fastened under the steering console. It comes as a complete assembly.

ENGINE MANAGEMENT SYSTEM (EMS)

The EMS (Engine Management System) is equipped with an ECM which controls the ignition system, the vehicle electrical system, the fuel injection system and the electronically controlled RAVE.

TYPICAL — ECM

The ECM is mounted in the front of the vehicle, beside injection oil tank.

The ECM 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 control
– injection control

NOTE: The ECM applies the proper maps (injection and ignition) for optimum engine operation in all conditions.

– engine RPM limiter
– RER (Rotax Electronic Reverse)
– etc.

The ECM features a permanent memory that will keep the programmed tether cord cap(s) active, fault codes and other vehicle information, even when the battery is removed from the vehicle.

EMS — GENERAL FUNCTIONS

Automatic Power Shut-Down

The ECM is equipped with an automatic power shut-down. This feature prevents the battery from losing its charge if the tether cord cap is left on the post when the engine is not running for more then 30 seconds. The ECM will remain offline until the electric starter or the rewind starter is activated. The ECM will shut down all outputs after 5 seconds when the tether cord cap is removed.

Antidrive Feature

This system allows the engine to reach pulley engagement speed only if a programmed tether cord cap is installed on DESS post. See below for details.

Digitally Encoded Security System (DESS)

The following components are specially designed for this system: ECM, 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.

NOTE: Actually, it is the memory of the ECM which is programmed to recognize the digital code of the tether cord cap. This is achieved with the MPEM programmer (P/N 529 035 878) or the VCK (Vehicle Communication Kit P/N 529 035 844). Refer to their operation manual or help system to program a tether cord cap.

The system is quite flexible. Up to 8 tether cord caps may 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 vehicle equipped with the DESS. It only needs to be programmed for that vehicle.

When waking up the ECM with a tether cord cap on the post, the DESS is activated and will emit audible signals:

– 2 short beeps indicate a working tether cord cap. Engine starting can take place.
– 1 short beep indicates a wrong tether cord cap is being used or that something is defective. Engine starting is not allowed.

The memory of the ECM features two self-diagnostic modes for the DESS operation. Refer to DIAGNOSTIC PROCEDURES section for more information.

The memory of the ECM is permanent. If the battery is disconnected, no information is lost.

Note that the DESS anti-drive circuitry is already activated on all new ECMs.

Gauges Current Supply

The purpose of this function is to allow reading of gauges without the engine running. It will give access to most functions of the information center gauge without starting the engine.

Gauges are supplied with current for 30 seconds when connecting the tether cord cap on its post and pressing the START/RER switch.

NOTE: Each time the tether cord cap is connected to the post, the fuel pump is activated for 2 seconds to build up pressure in the fuel injection system.

Engine Starting

If the ECM recognizes a valid tether cord cap, it allows engine to rev above 3000 RPM.

If the tether cord cap is left on the DESS post for more than 30 seconds after stopping the engine, the ECM will shut down. The current supply to gauges will be stopped as explained in the ANTIDRIVE FEATURE section.

Engine RPM Limiter

The ECM will limit the maximum engine speed.

Low-Oil Level Warning Device

When the oil falls under a certain level, the low oil level LED will be illuminated. The buzzer will also be activated intermittently.

High Coolant Temperature Warning Device

When the coolant temperature is getting to high, the ECM sends out signals to the buzzer, the high temperature LED and to the check engine LED.

Power Distribution

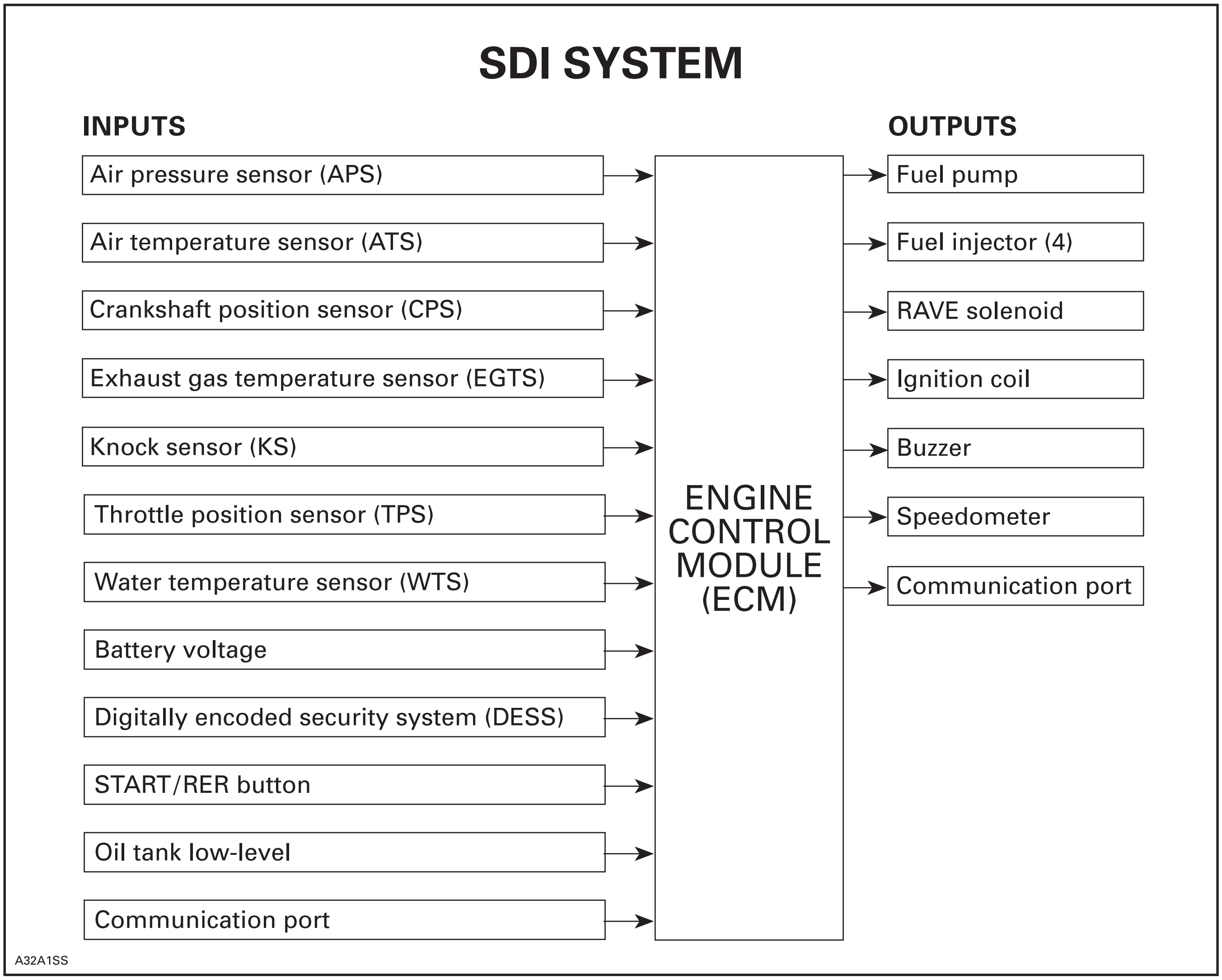
The ECM distributes power from battery to all accessories. Accessories are protected by fuses located in the fuse holder. Fuses are identified besides their holder.

IMPORTANT: The sensors and injectors are continuously powered with the supply from the battery. **The ECM switches the ground to complete the electrical circuits it controls.** Take this into account when troubleshooting the electrical system.

The system uses 3 relays: a main relay, a second for the headlights and a third for the accessories.

If a problem occurs with the magneto system, the ECM will turn off the accessories relay to distribute the remaining voltage to the main systems.

ECU — ENGINE MANAGEMENT FUNCTIONS



This engine management system controls the fuel injection, the ignition timing and the electronically controlled RAVE.

As shown in the SDI CONTROL SYSTEM illustration, the ECM 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 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 receives the signals from different sensors which indicate engine operating conditions at milli-second intervals.

Signals from sensors are used by the ECM to determine the injection parameters (fuel maps) required for optimum air-fuel ratio.

The CPS and TPS are the primary sensors used to control the injection and ignition timing. Other sensors are used for secondary input.

IGNITION TIMING

The ECM 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 controls the ignition timing for optimum engine operation.

ELECTRONICALLY CONTROLLED RAVE

The electronically controlled RAVE (e-RAVE) offers two performance enhancements to conventional RAVE system.

– The opening of the valve is now activated electronically. A solenoid holds the valve closed. The ECM monitors altitude, engine temperature, throttle position and RPM, and operates the solenoid in optimal conditions.
– The valve is now opened by crankcase pressure, as opposed to exhaust pressure. The greater and more constant pressure from the crankcase opens the valve more crisply.

NOTE: An electric heating element has been added to the RAVE solenoid to ensure proper function in very cold weather.

KNOCK SENSOR

A knock sensor is mounted on top of the cylinder head. It detects specific vibration that would be typically generated by engine detonation. If detonation occurs, the knock sensor detects it and the ECMs retards the ignition advance and extend the injection period temporarily (it goes in a specific mode) until detonation stops.

ENGINE MODES OF OPERATION

The ECM controls different operation modes of the engine to allow proper operation for all possible conditions: Cranking, start up, idle, warm up, normal operation, engine speed limiter, flooded engine and limp home (see below).

FLOODED ENGINE (DROWNED MODE)

If the engine does not start and it is fuel-flooded, this special mode can be activated to prevent fuel injection and ignition while cranking. Proceed as follows:

With tether cord cap on its post while engine is stopped, press completely and HOLD throttle lever.

Press the START/RER button. The mode is now on.

The engine should be cranked for 20 seconds.

NOTE: No spark occurs on drowned mode.

Release START/RER button and throttle lever. Try to start the engine normally.

If the engine does not start, it may be necessary to remove the spark plugs and crank the engine with rags over spark plug holes. Refer to COMPONENT INSPECTION AND ADJUSTMENT.

MONITORING SYSTEM

The ECM monitors the electronic components of the fuel injection system and some components of the electrical system.

When a fault occurs, it sends visual messages through the referring LED and/or audible signals through a buzzer to inform you of a particular condition. Refer to the DIAGNOSTIC PROCEDURES section for the referring LED and the buzzer coded signals chart.

LIMP HOME MODES

Besides the signals as seen above, the ECM may automatically set default parameters to the engine management to ensure the adequate operation of the vehicle if a component of the fuel injection system is not operating properly.

NOTE: Sensor failures will not lead to a limp home mode, warning will follow by the check engine LED and the buzzer.

When minor fault occurs, the fault and message/buzzer will disappear automatically, when the condition disappears.

Depending on the severity of the malfunction, the vehicle speed may be reduced and not allowed to reach its usual top speed.

The engine RPM may be limited if some critical components fail. In this case, releasing throttle and letting the engine returning to idle speed may allow normal operation to come back. If does not work, try removing and reinstalling the tether cord cap on DESS post.

These performance-reduced modes allow the rider to go back home which would not be possible without this advanced system. Refer to the DIAGNOSTIC PROCEDURES for a complete chart.

If a fault occurs and involves a limp home mode operation, the engine management system will reduce engine RPM gradually to the proper level.

DIAGNOSTIC MODE

The malfunctions are recorded in the memory of the ECM. The memory of the ECM can be checked using the VCK (Vehicle Communication Kit) (P/N 529 035 844) to see the fault codes. Refer to the DIAGNOSTIC PROCEDURES section.

The ECM and the VCK are able to communicate through a connector on the vehicle. The B.U.D.S. software, version G2.10, P2.10 or up must be used for this system.

CHARGING SYSTEM

The ignition system consists of different sub-systems where some are interrelated.

Unregulated AC current is produced by the magneto. AC current is rectified and regulated between 13.4 and 15 volts for the vehicle electrical system.

Vehicle 12-volt battery supplies the ECM with DC current.

Refer to MAGNETO SYSTEM.

The following type of ignition system is used:

– Digital Inductive System.

MAGNETO SYSTEM

The magneto is the primary source of electrical energy. It transforms magnetic field into electric current (AC).

The magneto has a 3 phases, delta wound stator on 18 poles. Capacity is 480 watts.

DOUBLE IGNITION COIL

Double ignition coil has two separate windings, one for each spark plug.

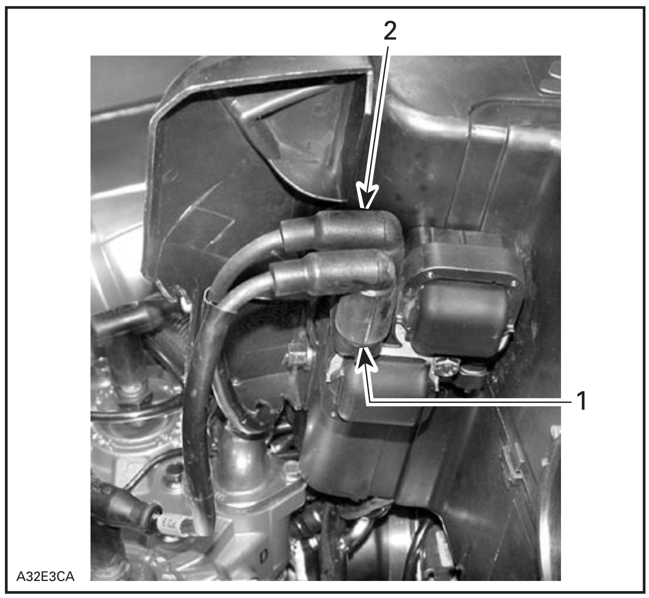
Ignition coil induces voltage to a high level in the secondary windings to produce a spark at the spark plug.

Two separate windings receive input from the ECM. Each winding provides high voltage to its corresponding spark plug.

This ignition system allows spark plugs to spark independently.

CAUTION: Do not interchange spark plug cables. Match reference (PTO or MAG printed on high tension cable yellow tag) with corresponding cylinder spark plug.

Double ignition coil is located underneath air silencer.



TYPICAL
1. PTO side high tension cable
2. MAG side high tension cable

TRIGGER COIL

Trigger coil is used for:

1) Forward engine rotation.
2) Reverse engine rotation.
3) As a crankshaft position sensor (CPS). This information is sent to the ECM.

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/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 that of a carbureted snowmobile. Prior to disconnecting a hose or to removing a component from the fuel system, follow the recommendation described here. Pay attention 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 software B.U.D.S. (version G 2.10, P 2.10 or higher).

⚠ 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 and work in a well ventilated area. 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 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 engine compartment. 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, release the pressure.

– 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 fuel pressure test as explained in this 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 and pressure quickly builds-up each time the tether cord cap is installed and the START/RER button is depressed (or rewind starter is pulled).

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

Never use a hose pincher on injection system high pressure hoses.

ELECTRICAL SYSTEM

It is important to check that the electrical system is 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 ECM (engine control module) 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 (injectors, fuel pump, ignition coils and starter solenoid) may be suddenly supplied by the battery when the tether cord cap is installed and the start button is depressed or if engine is rotated (manually or with the rewind starter). Even a small movement of the crankshaft or the usage of the supply cable (P/N 529 035 869) will automatically activate the actuators. Always disconnect the tether cord cap and the battery prior to disconnecting any electric 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 pins are not out of their connectors or out of shape. The troubleshooting procedures cover problems not resulting from one of these causes.

CAUTION: Ensure all terminals are properly crimped on wires and connector housings are properly fastened.

CAUTION: Check if wiring harness shows any signs of scoring prior to replace the ECM.

Before replacing a ECM, always check electrical connections. Make sure that they are very tight and they make good contact and that they are corrosion- free. Particularly check ECM ground connections. Ensure that contacts are good and clean. A "defective module" could possibly be repaired simply by unplugging and replugging the ECM. The voltage and current might be too weak to go through dirty wire pins. Check carefully if pins show signs of moisture, corrosion or if they look dull. Clean pins properly and then coat them prior to assembling as follows:

Apply a silicon-based dielectric grease or other appropriate lubricant.

NOTE: Do not apply dielectric grease or other lubricant on the ECM connectors.

If the newly replaced ECM works, 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 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 (68°F). The resistance 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 (68°F). Use this table for resistance variation relative to temperature for **temperature** sensors.

TEMPERATURE SENSOR TABLE					
TEMPERATURE		**RESISTANCE (ohms)**			
°C	**°F**	**ATS**	**EGTS**	**CTS for**	
				GAUGE	**ECM**
- 40	- 40		169.7		72412
- 35	- 31				52637
- 30	- 22	28000			38681
- 25	- 13				28718
- 20	- 4	14500	185.1	733.8	21529
- 15	5			587.7	16288
- 10	14			474	12431
- 5	23			384.8	9565
0	32	5500	200.5	314.3	7418
5	41			258.4	5807
10	50			213.7	4582
15	59			177.7	3644
20	68	2500		148.7	2919
25	77		219.6	125	2355
30	86			105.6	1912
35	95			98.69	1562
40	104	1200		76.5	1284
45	113			65.54	1062
50	122		238.5	56.38	882.6
55	131			48.72	738.9
60	140	600		42.28	622

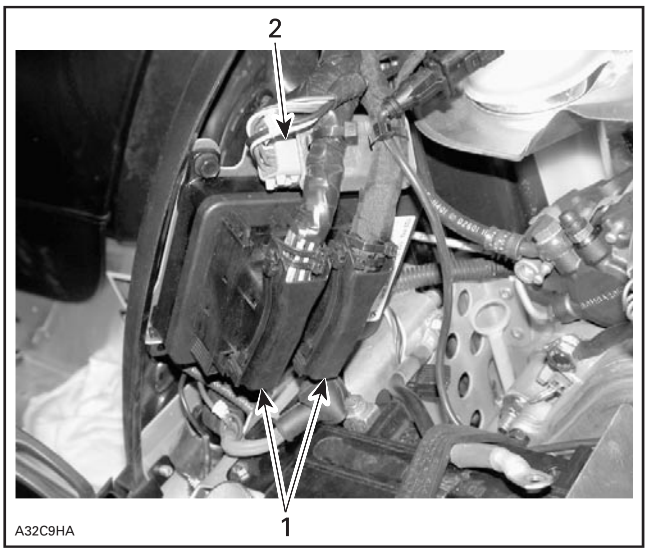
TEMPERATURE SENSOR TABLE					
TEMPERATURE		**RESISTANCE (ohms)**			
°C	**°F**	**ATS**	**EGTS**	**CTS for**	
				GAUGE	**ECM**
65	149			36.82	526.3
70	158			32.19	447.5
75	167			28.24	382.3
80	176	320		24.86	328.1
85	185			21.95	282.8
90	194			19.45	244.8
95	203			17.28	212.8
100	212	180	275.9	15.4	185.6
105	221				162.4
110	230				142.7
115	239				125.9
120	248				111.5
125	257				99.02
130	266	90			88.26
135	275				78.93
140	284				70.81
145	293				63.71
150	302		312.7		57.49
200	392		349.0		
250	482		384.6		
300	572		419.7		
350	662		454.2		
400	752		488.1		
450	842		521.4		
500	932		554.1		
600	1112		617.8		
700	1292		679.2		
800	1472		738.2		
900	1652		794.9		
1000	1832		849.2		

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 room temperature. It does not validate the over temperature functionality. To test it, the sensor could be removed from the engine/air silencer and heated with a heat gun while it is still connected to the harness to see if the ECM will detect the high temperature condition and generate a fault code.

ENGINE CONNECTOR PIN-OUTS

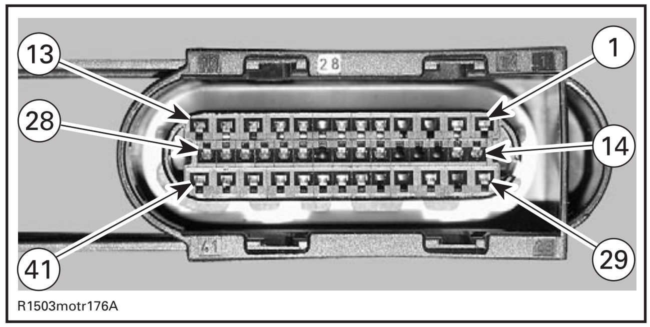
Connector Position



1. ECM connectors
2. Engine connector

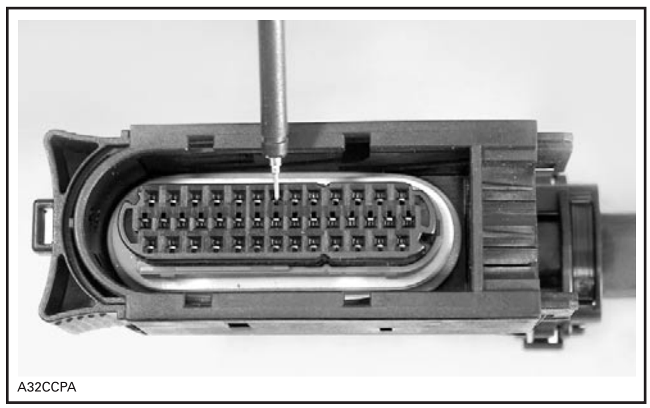
ECM Connector

Use this diagram to locate the pin numbers on the ECM connector of the wiring harness when performing tests.



ECM 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 will damage the square-shaped terminal and this could lead to improper function of the engine management system.



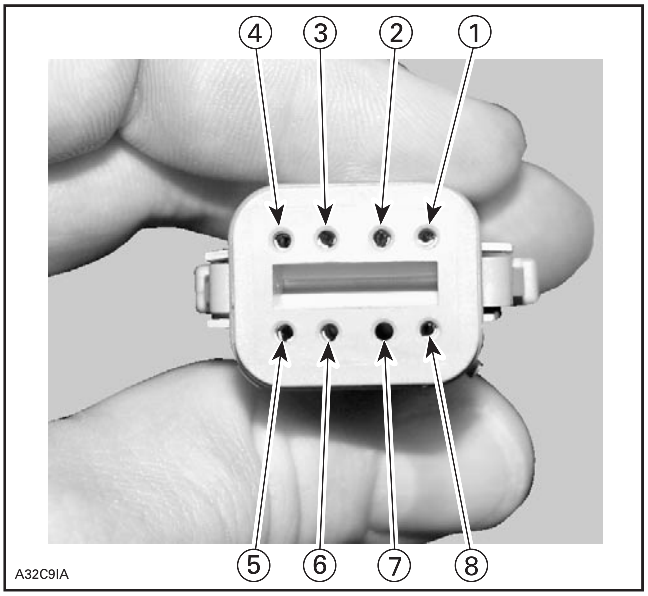
PROBE ONLY ON THE PIN NOZZLE OF FEMALE CONNECTOR

CAUTION: Do not disconnect the ECM connector needlessly. They are not designed to be disconnected/reconnected repeatedly.

NOTE: Do not apply dielectric grease or other lubricant on the ECM connectors.

Engine Connector

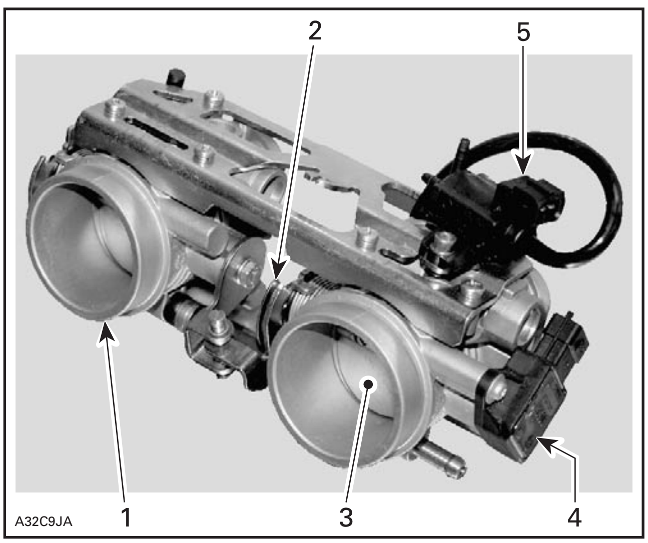
Use this illustration to locate the pin numbers on the engine connector of the wiring harness when performing tests.



ENGINE CONNECTOR PIN-OUT (WIRING HARNESS SIDE)

AIR INDUCTION SYSTEM

THROTTLE BODY



1. *Throttle body*
2. *Throttle cable attachment*
3. *Throttle plate*
4. *TPS*
5. *E-RAVE solenoid*

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 zero position stop screw or synchronization screw or modifying them in any way will not increase performance 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.
– Throttle linkage between the two throttles has moved.
– TPS is loose.
– Corroded or damaged wiring or connectors.
– Throttle body has been replaced and the **Closed Throttle** reset has not been performed.
– ECM has been replaced and the **Closed Throttle** reset has not been performed.

Electrical Inspection

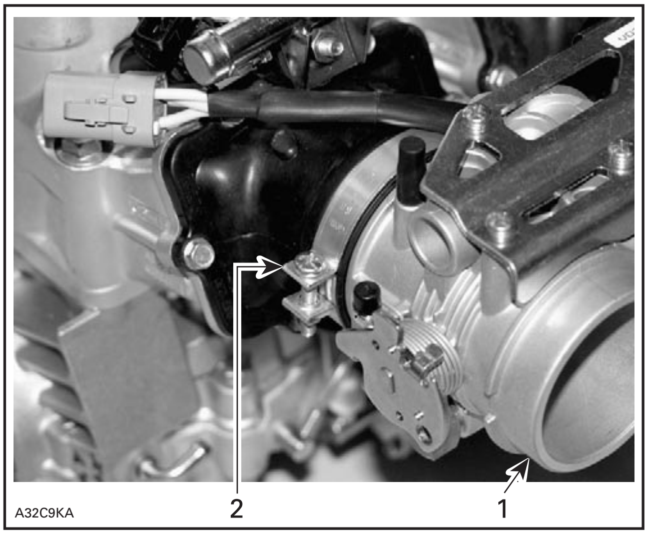
Refer to THROTTLE POSITION SENSOR (TPS) in ELECTRONIC MANAGEMENT below.

Replacement

Removal

To remove the throttle body from engine, proceed as follows:

– Disconnect connectors from ATS (Air Temperature Sensor) and APS (Air Pressure Sensor).
– Disconnect air intake silencer from throttle body. Move boot away.
– Drain cooling system.
– Remove clamps and hoses for throttle body heating from nipples.
– Disconnect connectors and hoses from e-RAVE solenoid and TPS.
– Disconnect throttle cable.
– Unscrew retaining clamps of throttle body.



1. *Throttle body*
2. *Clamp*

– Slightly pull throttle body out.

Installation

Installation of the new throttle body is the reverse of the removal procedure. Pay attention to the following details.

Refill and bleed the cooling system, refer to LIQUID COOLING SYSTEM.

For TPS and e-RAVE solenoid replacement procedures, refer to the respective paragraph in ELECTRONIC MANAGEMENT below.

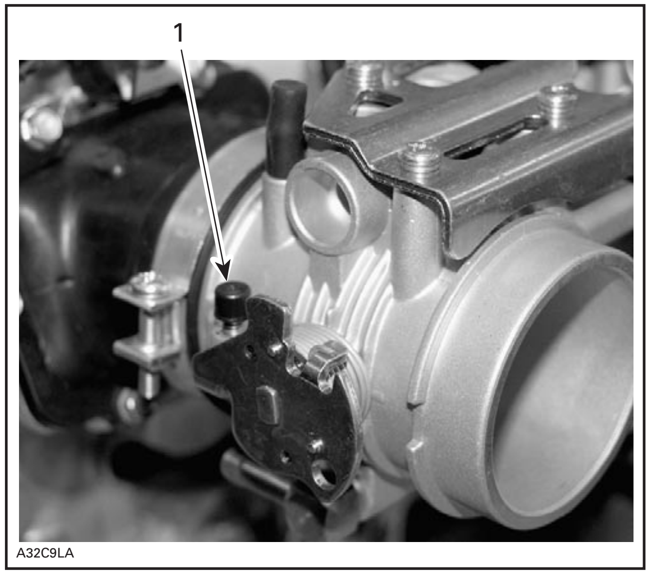
Adjustment

Throttle Body Synchronization

CAUTION: It is not allowed to perform any change on the synchronization screw.

Before installation, clean throttle plates and bores with Pulley flange cleaner (P/N 413 711 809).

NOTE: The throttle body is designed as a single part for both cylinders. No synchronization is required as it has already been done at the factory. However, proceed with throttle cable and closed TPS adjustments as described below.

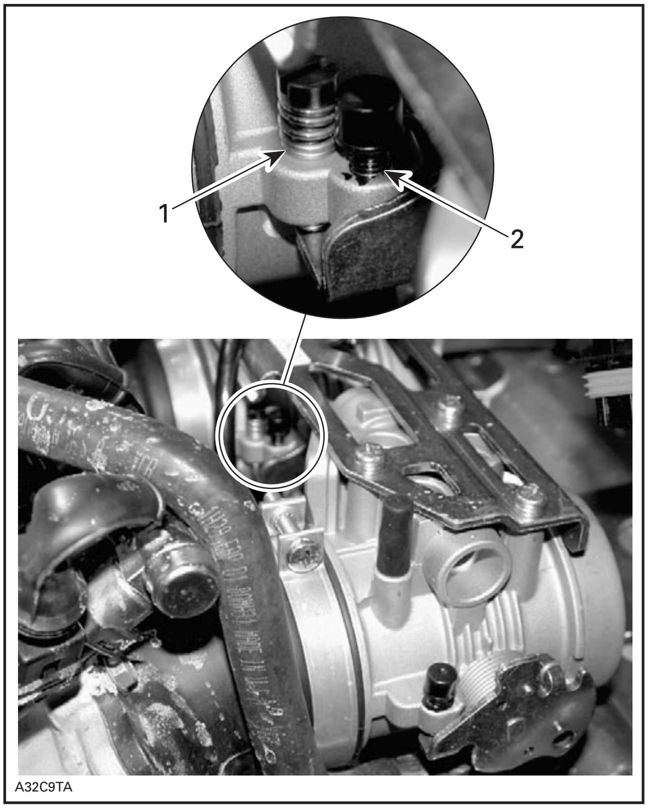


THROTTLE BODY
1. *Zero position stopper screw*

CAUTION: It is not allowed to perform any change on the zero position stopper screw.

The adjustment of the zero position stopper screw is optimized by the throttle body manufacturer and locked to prevent any modification.

CAUTION: Never attempt to adjust the zero position stopper screw (the capped one) or the idle speed adjustment would be impaired. Besides, no adjustment could be performed by the dealer nor the factory to correct the zero position stopper screw. The throttle body would need to be replaced.



1. *Idle speed screw*
2. *Zero position stopper screw*

CAUTION: Do not alter or tamper with throttle cable adjustment or routing. It may cause poor startability and erratic idling.

The only screw that has to be adjusted is the idle speed screw and it has to be adjusted only with the closed throttle reset procedure or for high altitude application. This has to be done only if the ECM or throttle body are replaced or if screw has been tampered with by mistake. Refer to THROTTLE POSITION SENSOR (TPS) in ELECTRONIC MANAGEMENT below.

Throttle Cable Adjustment

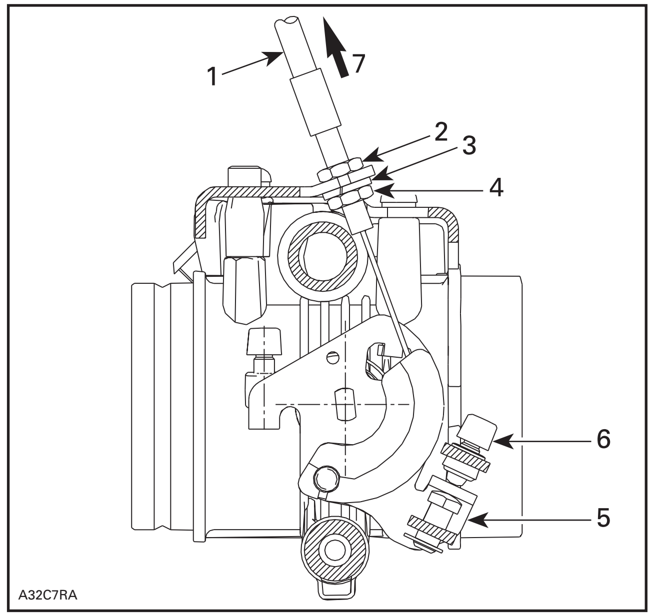
If closed throttle reset is required, then do it before throttle cable adjustment.

Mechanically adjust the throttle cable.

Handlebar and throttle cable must be at their normal position.

Adjust top nut to have a small free play at idle position.

Tighten bottom nut to 4.5 N•m (40 lbf•**in**).



1. *Cable sheath*
2. *Upper nut*
3. *Lock washer*
4. *Lower nut*
5. *Throttle lever*
6. *Adjusting screw*
7. *Pull in this direction*

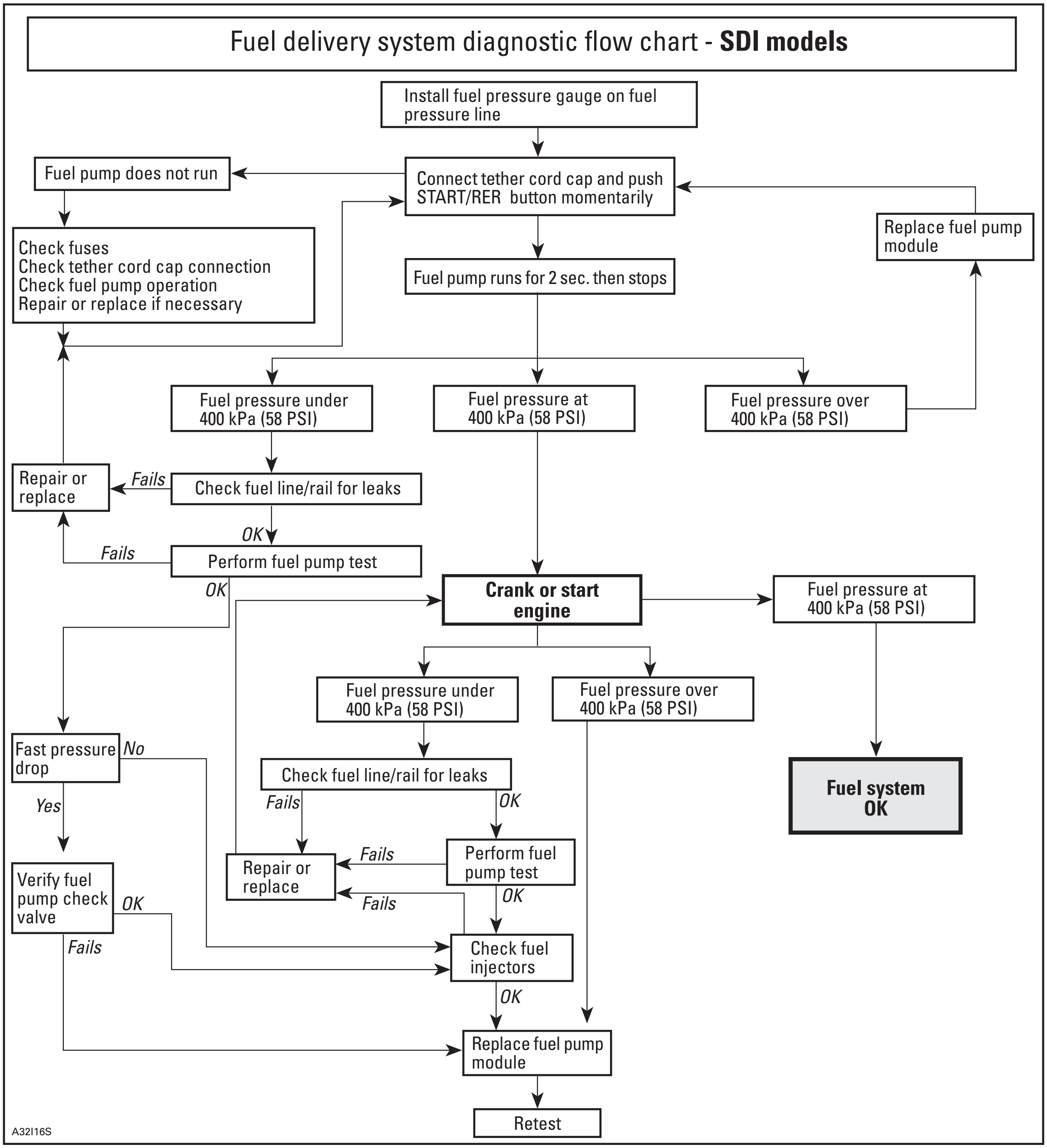
Activate the throttle lever a few times. Make sure throttle cam of throttle body rests against idle speed screw without any tension on the cable.

Using the VCK with B.U.D.S., perform the wide open verification. In monitoring tab check if throttle opening is within 82° to 86° when in wide open position on throttle lever.

Closed Throttle Reset

Perform the **Closed Throttle** reset as described in THROTTLE POSITION SENSOR (TPS) in ELECTRONIC MANAGEMENT below.

FUEL DELIVERY



FUEL PUMP

Fuel Pressure Test

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. Refer to 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 engine compartment.

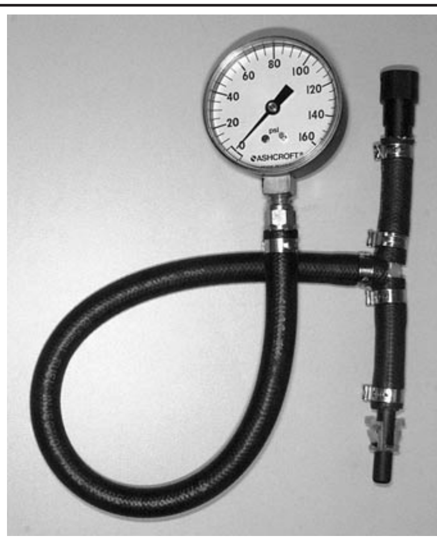
The pressure test will show the available pressure at the fuel pump outlet. It validates the pressure regulator, the fuel pump and leaks in the system.

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).



F02B0BA

TYPICAL — FUEL PRESSURE GAUGE (P/N 529 035 591)

Remove tether cord cap. Depress START/RER button and observe fuel pressure. **Do not crank engine.** Repeat twice. Release pressure using B.U.D.S. between tests so that the gauge is "re-set" to zero (0).

FUEL PRESSURE (when depressing start button)
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 pump check valve. 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 engine compartment. Fuel is flammable and explosive under certain conditions. Always work in a well ventilated area.

Reinstall removed parts.

Electrical Test

When depressing the START/RER button, the fuel pump should run for 2 seconds to build up the pressure in the system.

If the pump does not work, disconnect the plug connector from the fuel pump.

Install a temporary connector to the fuel pump connector and apply voltage (12 V) to this test harness.

NOTE: Place the (+) on pin 4 and the (-) on pin 3.

If pump does not run, replace the fuel pump module.

Otherwise, probe terminals 4 and battery ground of fuel pump connector on vehicle harness side. When depressing the START/RER button, you should read battery voltage for approximately 2 seconds (then, the voltage will drop). If battery voltage does not appear, the problem can be in harness or in fuel pump connector. Repair or replace appropriate part (fuel pump may be blown).

Check continuity between terminal 3 of the fuel pump connector on the vehicle harness side and terminal 29 of the ECM connector B. If there is no continuity the problem is in the harness.

Fuel Pump Module Replacement

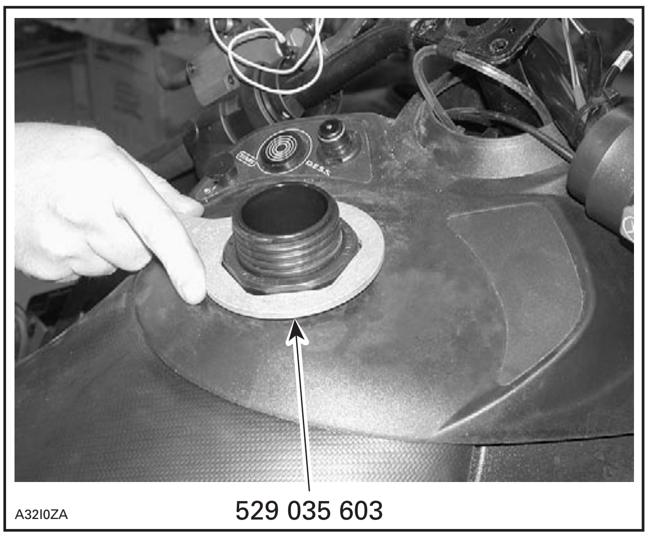
Removal

Open hood. Connect VCK (P/N 529 035 981). Use B.U.D.S. to release fuel pressure.

Drain fuel tank as much as possible.

Remove steering pad. Unbolt handlebar and move it forward.

Unscrew fuel tank nut using wrench (P/N 529 035 603).

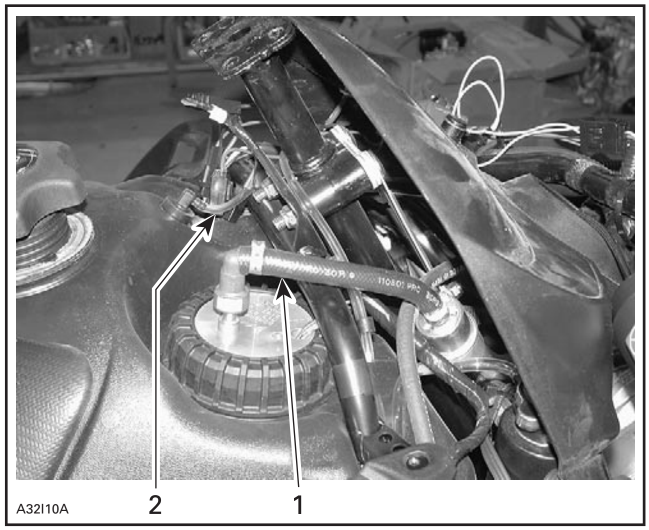


TYPICAL

Unbolt console, then move it forward.

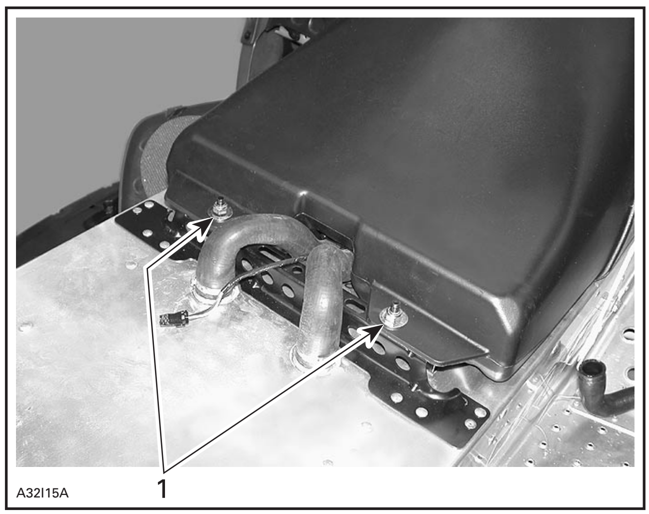
Disconnect fuel supply hose from fuel pump module.

Disconnect vent tube from vent elbow.



1. *Fuel supply hose*
2. *Vent tube*

Remove seat. Unbolt fuel tank.

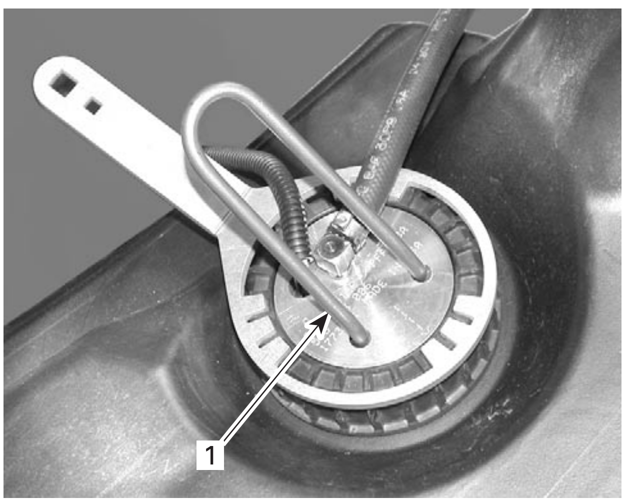


1. *Fuel tank retaining screws*

Move fuel tank rearward, then unplug the fuel pump module electric connector.

With two screwdrivers or a bent rod holding the flange, unscrew fuel pump nut using fuel pump nut wrench (P/N 529 035 899).

A32I11A



A32I19A

1. Bent rod

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.

A32I12A

FLOAT ASS'Y REMOVAL

Remove fuel pump module. Guide fuel pickups when pulling out fuel pickup hoses.

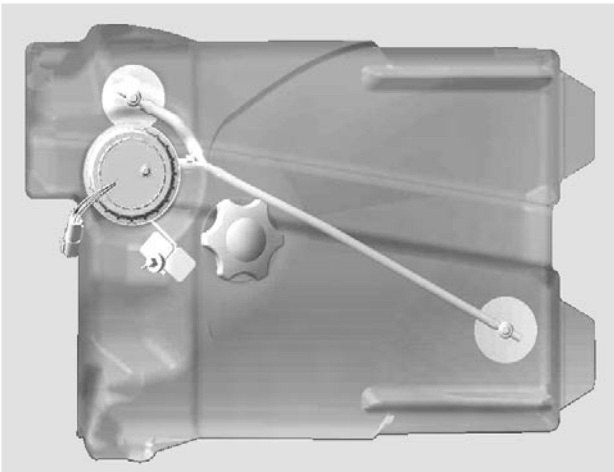
A32I13A

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.



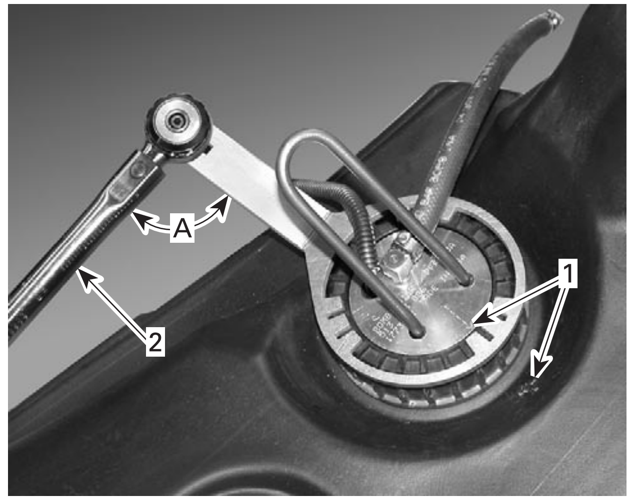
A32I1AA

Align the arrow on fuel pump module with the one on fuel tank. Keep arrows aligned during fuel pump module nut tightening.

A32I14A

1. Arrows

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).



A32I1BA

1. Arrows
2. Torque wrench
A. 90°

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.

Do the above procedure three times.

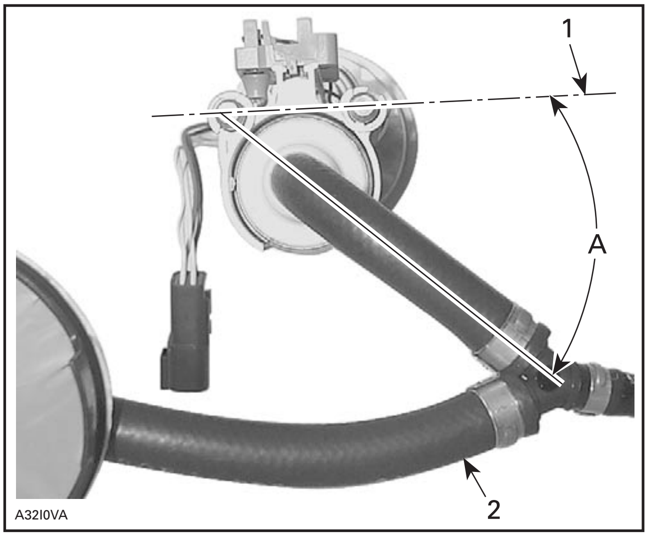
Stop the engine. The rear fuel pickup hose is now bled.

Fuel Hose Kit (P/N 861 302 300)

Remove fuel pump module as explained above.

Unfasten blue hose clamp retaining old fuel hose ass'y to pump inlet nipple. Remove old fuel hose ass'y.

Install fuel hose ass'y to pump at an angle of 46 ± 3° from retaining rods axis.



1. Retaining rods axis
2. Fuel hose ass'y
A. 46 ± 3°

Install a new blue hose clamp on fuel hose ass'y.

Install a new gasket, then reinstall fuel pump module as explained above.

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.

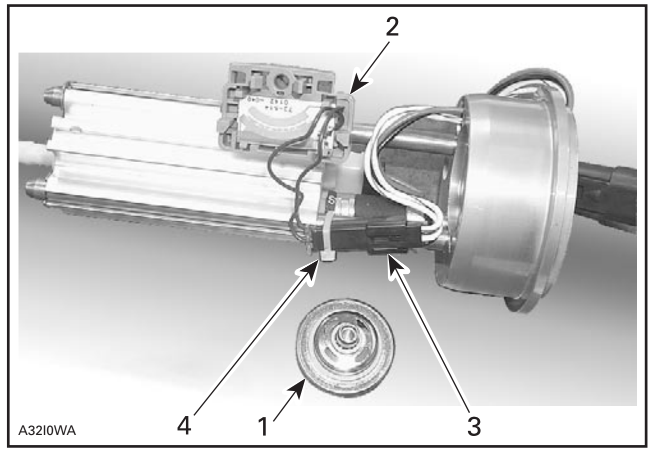
Loosen screw retaining lock plate. Slide lock plate out of aluminum extrusion.

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.



1. Fuel regulator removed
2. Resistor card ass'y ready to be installed
3. Connectors to be unplugged
4. Locking tie to be cut

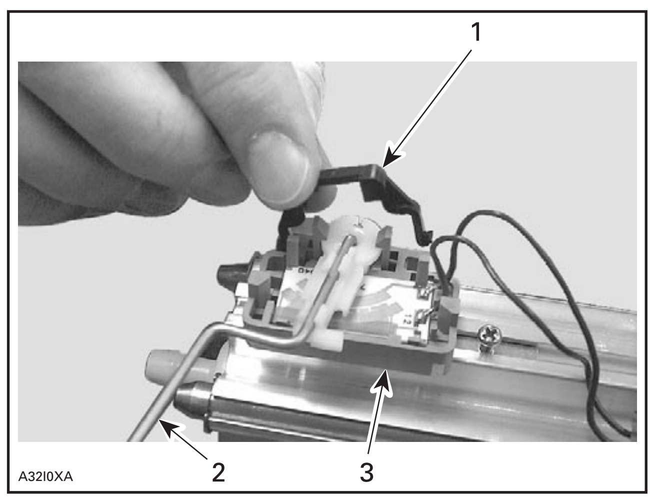
Install a new gasket, then reinstall fuel pump module as explained above.

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.



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.

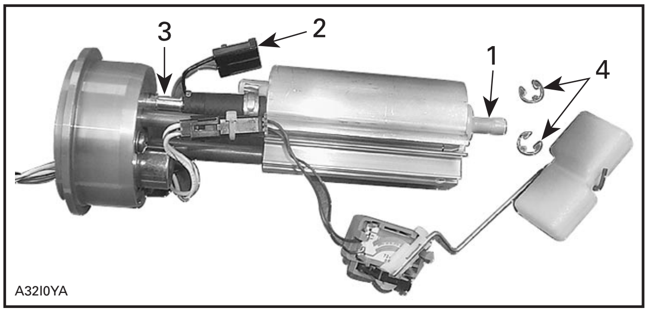
Disconnect fuel hose from pump inlet nipple.

Unlock and remove lock plate of resistor card ass'y.

Disconnect pump electric connector.

Disconnect pump outlet hose from pump module flange nipple.

Remove E-clips. 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. E-clips

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.

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 RAILS

Pressure at fuel rails is supplied and controlled by the fuel pump module. Refer to FUEL PUMP for pressure test.

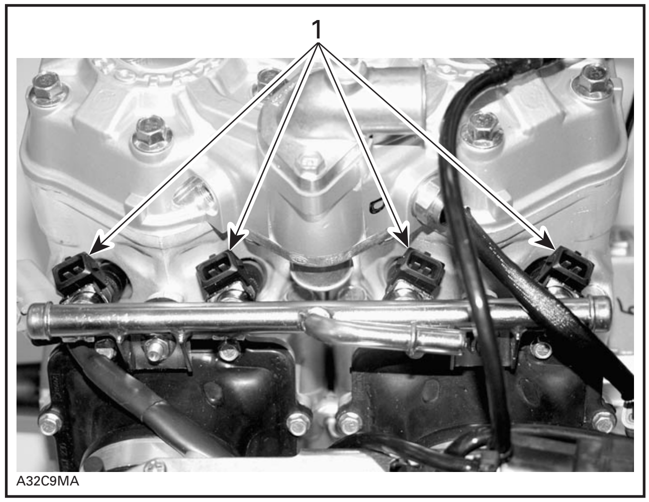
Fuel Rail Replacement

Removal

Release the fuel pressure in the system using B.U.D.S. Look in the **Activation** tab.

Disconnect fuel hose at the connector.

Wrap a rag around the hose end to prevent rail draining.



1. Fuel injectors

Disconnect wiring harness from the four fuel injectors.

Cut tie raps and remove the wiring harness from the fuel rail.

Unscrew rail retaining nuts.

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.

Replace O-rings with new ones.

A thin film of injection oil should be applied to O-rings of fuel injectors to ease installation in cylinder.

Torque rail retaining nuts to 10 N•m (89 lbf•**in**).

Make sure that injector clips are well in place.

Add dielectric grease (P/N 293 550 004) to injector electrical connector.

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 INJECTORS

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 and press the engine START/RER button 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).

The leakage test is validated when performing the FUEL DELIVERY SYSTEM DIAGNOSTIC FLOW CHART elsewhere in this section.

Electrical 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 plug connector from the injector.

Install a temporary connector to the injector with wires long enough to make the connection outside the engine compartment 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.

Wake up ECM using START button and measure voltage between pin 1 (of injector on harness side) and ground.

If 12 V is read, disconnect connector A from the ECM and check continuity of circuit as per following table.

CIRCUIT NUMBER (ECM connector «DA»)	INJECTOR NUMBER
DA-15	1/1 (MAG external)
DA-33	2/1 (PTO external)
DA-14	1/2 (MAG internal)
DA-30	2/2 (PTO internal)

If it is good, check the resistance of the fuel injector circuit.

Resistance test

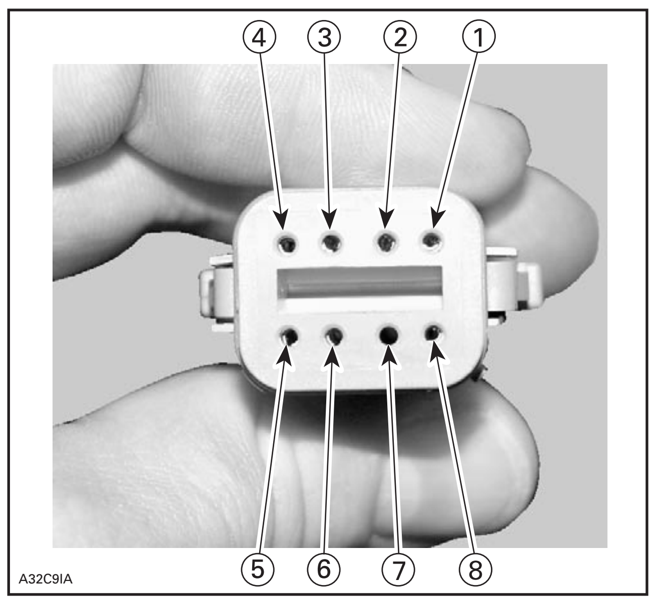
Disconnect the injector from the wiring harness and check the resistance of the injector itself.

The resistance should be around 14.5 Ω.

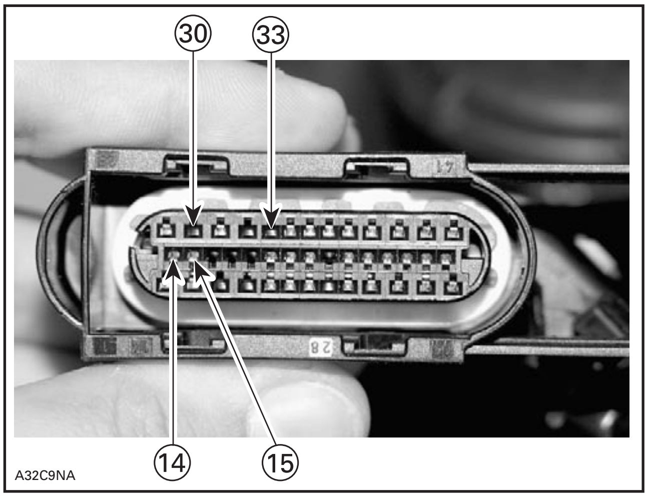
If resistance value is incorrect, replace the injector.

Reconnect the injector and disconnect the connector A from the ECM as well as the engine connector.

Using a multimeter, check resistance value between terminals as shown in the table below.



ENGINE CONNECTOR



ECM CONNECTOR

COMPONENT	CONTACT LOCATION
Fuel injector 1 cylinder 1	4 (Engine Connector) and A-15 (ECM connector)
Fuel injector 2 cylinder 2	3 (Engine Connector) and A-14 (ECM connector)
Fuel injector 1 cylinder 1	4 (Engine Connector) and A-33 (ECM connector)
Fuel injector 2 cylinder 2	3 (Engine Connector) and A-30 (ECM connector)

The resistance should be around 14.5 Ω.

If resistance value is correct, try a new ECM. Refer to ECM REPLACEMENT procedures elsewhere in this section.

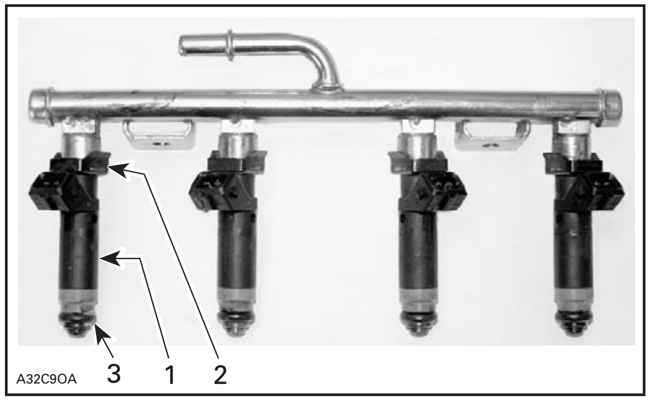
NOTE: Check if wiring harness shows any signs of scoring prior to replace the ECM.

If resistance value is incorrect, repair the wiring harness/connectors or replace the wiring harness between ECM 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. Pay attention to the following details.

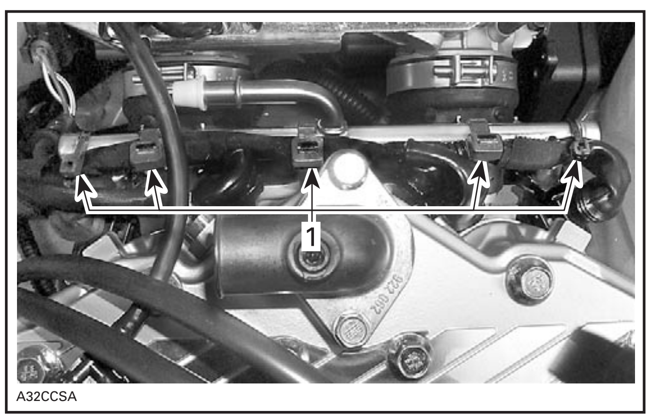
Insert injectors with your hand. Do not use any tool. Ensure clip and injector are properly installed.

Replace O-rings with new ones.

NOTE: A thin film of engine oil should be applied to O-rings to ease insertion in rail.

Torque rail retaining nuts to 10 N•m (89 lbf•**in**).

Attach injector wires with locking ties as shown in following photo.



1. Locking ties

⚠ 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 REPLACEMENT

General

Prior to replacing a suspected ECM, ensure that all the recommendations in the general introduction of this section have been followed.

IMPORTANT: When the ECM is replaced, the tether cord cap(s) and the **Closed Throttle** must be reprogrammed/reset. Refer to their specific section for adjustment.

To allow transferring the previous recorded information from the old ECM to the new one, use the vehicle communication kit (VCK) with the B.U.D.S. software. Use **Replace ECM** in the **ECM** menu. Follow instructions provided by the help system.

NOTE: If the old ECM can still communicate, 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.

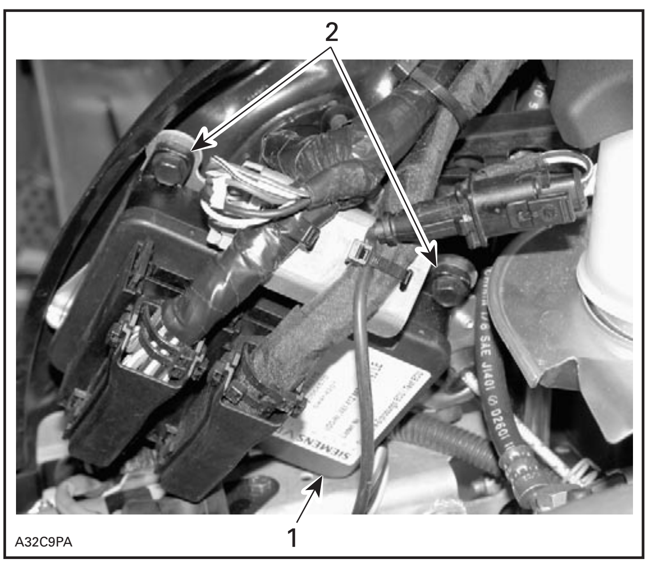
ECM Replacement

Disconnect battery cables.

⚠ WARNING

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

Disconnect both connectors from ECM.



1. ECM
2. Retaining screws

Unscrew all retaining screws and remove the engine ECM from its support.

Install the new ECM to the support.

Reconnect ECM connectors to ECM, and then battery cables.

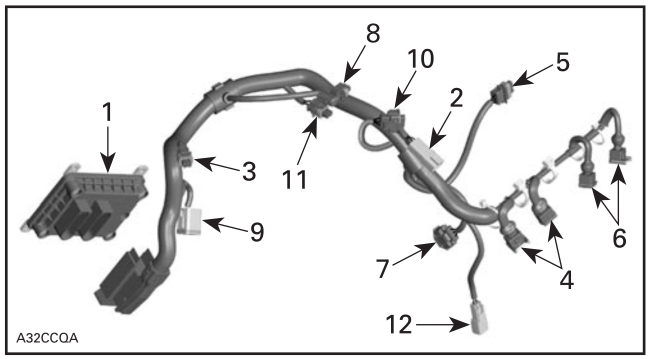
Transfer the data from the previous ECM to the new one using B.U.D.S. then proceed with the required resets and reprogram tether cord cap(s), if you were unable to transfer the data.

NOTE: If data cannot be transferred, manually enter information in **Vehicle** tab.

After performing the required resets, ensure to clear all faults from the newly replaced ECM.

Start the engine and increase engine speed above 5000 RPM to be sure no fault appears.

ENGINE WIRING HARNESS



1. ECM
2. CTS connector
3. EGTS connector
4. Fuel injector connector (cylinder MAG side)
5. Ignition coil connector
6. Fuel injector connector (cylinder PTO side)
7. TPS connector
8. ATS connector
9. Engine connector
10. APS connector
11. KS connector
12. CPS connector

NOTE: Check if wiring harness shows any signs of scoring.

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 as diagnosed.

Removal

Remove air intake silencer.

Disconnect the wiring harness from all sensors/actuators.

Disconnect the connector from the ECM.

Cut all locking tie which are holding the wiring harness in position.

Remove complete wiring harness.

Installation

First connect the connector A to the ECM and the engine connector to the vehicle wiring harness.

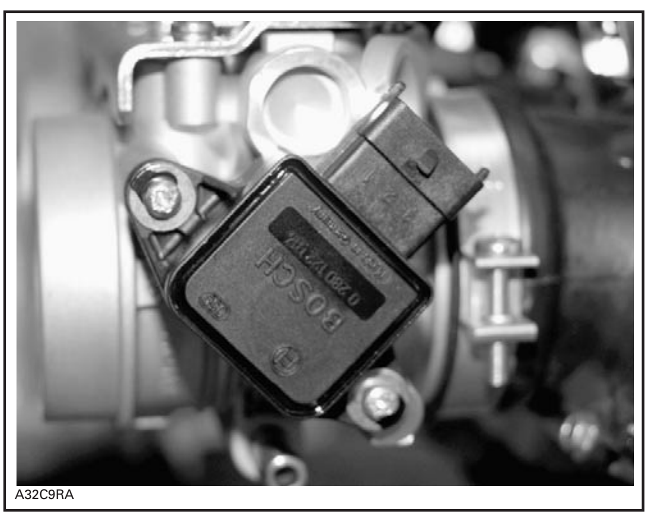
Reconnect the wiring harness to all sensors/actuators and reinstall all locking tie that have been removed.

Install all remaining parts, which have been removed.

THROTTLE POSITION SENSOR (TPS)

General

The throttle position sensor (TPS) is a potentiometer that sends a signal to the ECM which is proportional to the throttle shaft angle.



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

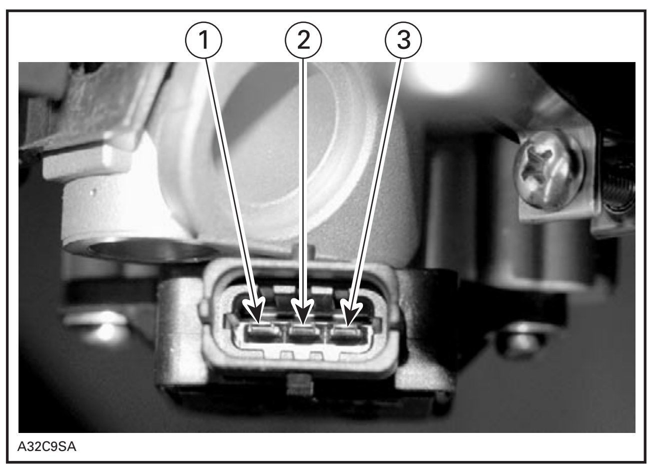
While engine is not running, activate throttle and pay attention for smooth operation without physical stops of the cable.

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 voltage output from ECM to the desired throttle position sensor.



TPS

Disconnect plug connector from throttle position sensor. To unlock connector, insert a small screwdriver between the folded tab. To see the connector pin-out and its pin numbers, temporarily remove the connector shield joining the harness.

Install the tether cord cap, turn OFF engine cut-out switch and push START/RER button momentarily to activate the ECM.

Connect a voltmeter between pin 1 and 2 in the wiring harness.

Voltage should be 5 V.

Check the continuity between pin 3 on wiring harness TPS connector and pin 24 on wiring harness ECM connector.

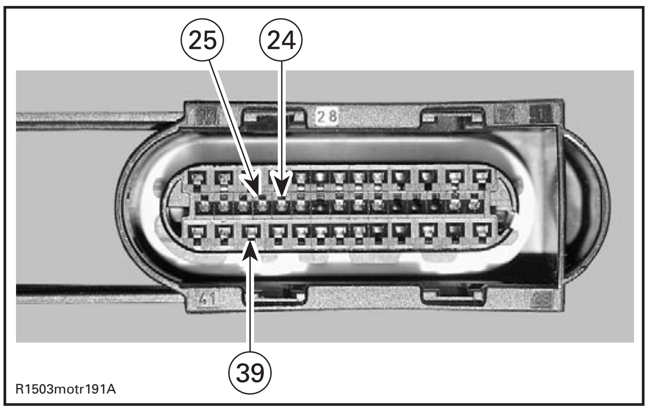
If tests are good, replace the TPS.

If voltage tests are not good, continue to check the resistance of the rest of the TPS circuit.

Resistance Test

Reconnect the TPS.

Disconnect the connector DA from the ECM.



Using a multimeter, check resistance value between terminal DA-25 and DA-39.

The resistance should be 1600 - 2400 Ω in any throttle position.

Check the resistance between terminal DA-24 and terminal DA-39 with the throttle plate in **idle** position.

The resistance should be approximately 1000 Ω.

Check the resistance between terminal DA-24 and terminal DA-39 with the throttle plate in **wide open** position.

The resistance should be 2500 Ω.

Check the resistance between terminal DA-24 and DA-25 with throttle plate in **idle** position.

The resistance should be 2500 Ω.

Now check the resistance with the throttle plate in **wide open** position.

The resistance should be approximately 1000 Ω.

NOTE: When measuring between pins DA-24 and DA-39, resistance **value increases** while depressing throttle lever. When measuring between pins DA-24 and DA-25, resistance **value decreases** while depressing throttle lever. The resistance value should change smoothly and proportionally to the throttle movement. Otherwise, replace TPS.

If resistance values are correct, try a new ECM. Refer to ECM REPLACEMENT procedures elsewhere in this section.

NOTE: Check if wiring harness shows any signs of scoring prior to replace the ECM.

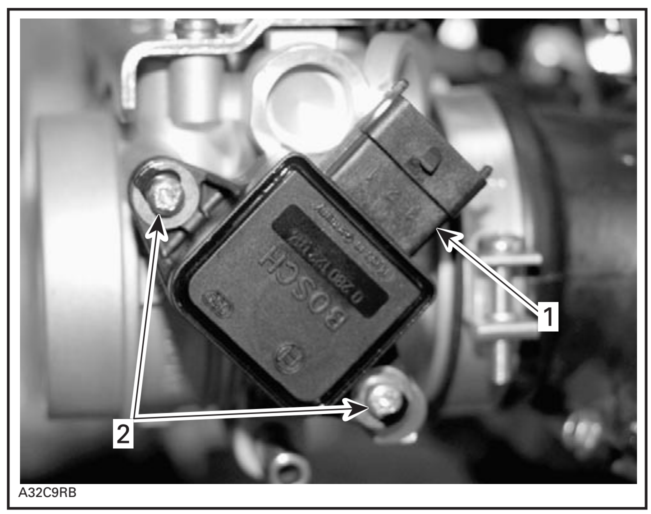
If resistance values are incorrect, repair connector or replace the wiring harness between ECM connector and the TPS.

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

Install the new TPS.

Apply Loctite 243 on the TPS retaining screws, then torque to 3 N•m (27 lbf•**in**).

Reinstall remaining removed parts.

Proceed with the **Closed Throttle Reset**. See below.

Closed Throttle Reset

NOTE: This operation performs a reset of the values in the ECM.

This reset is very important. The setting of the TPS will determine the basic parameters for all fuel mapping and several ECM calculations in idle speed control of the engine.

NOTE: Reset must be done each time the throttle position sensor (TPS) is loosened or removed or throttle body or ECM is replaced.

CAUTION: An improperly set TPS may lead to poor engine performance.

Use the vehicle communication kit (VCK) with the B.U.D.S. software to perform this adjustment.

Unscrew idle speed screw until the throttle body plate stop lever rest against its zero position stopper screw (capped screw). If necessary, loosen the throttle cable. Open throttle approximately one quarter then quickly release. Repeat 2 - 3 times to settle throttle plate.

Push the **Reset** button in the **Setting** section of B.U.D.S.

The following message will be displayed:

Make sure the idle screw is not in contact with the throttle stopper. Click OK to continue.

Follow instructions and click OK.

Another message will appear to ask you to perform a ECU tracking shut down to save the changes into the ECU permanent memory.

Remove the tether cord cap from the DESS post and wait until the message disappears before reinserting the tether cord cap.

Re-power up the ECM by pushing the START/RER button momentarily.

The throttle opening displayed in B.U.D.S. should be 0.00 (0.05 maximum).

If TPS is not within the allowed range while resetting the **Closed Throttle**, the ECM will generate a fault code and will not accept the setting.

Now, the idle speed screw has to be adjusted. To do this, screw in the idle speed screw until B.U.D.S. throttle opening displays value as per following table.

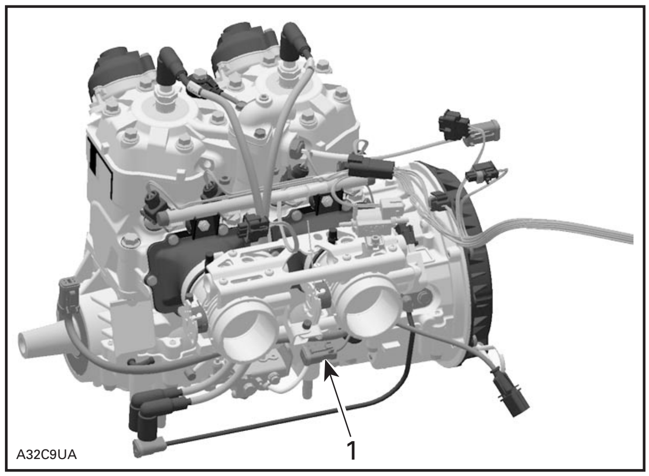
ENGINE TYPE	VALUE	
	AT SEA LEVEL	ABOVE 1800 m (6000 ft)
593 SDI	3.9°	4.1°
793 SDI	2.9°	2.9°

If throttle cable has been loosen during the procedure, adjust a throttle cable.

Start engine and make sure it operates normally through its full engine RPM range. If fault codes appear, refer to SYSTEM FAULT CODES in the DIAGNOSTIC PROCEDURES section for more information.

CRANKSHAFT POSITION SENSOR (CPS)

NOTE: The CPS is the trigger coil used for forward and reverse.



1. CPS connector

NOTE: Take into account that a CPS fault can be triggered by 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.

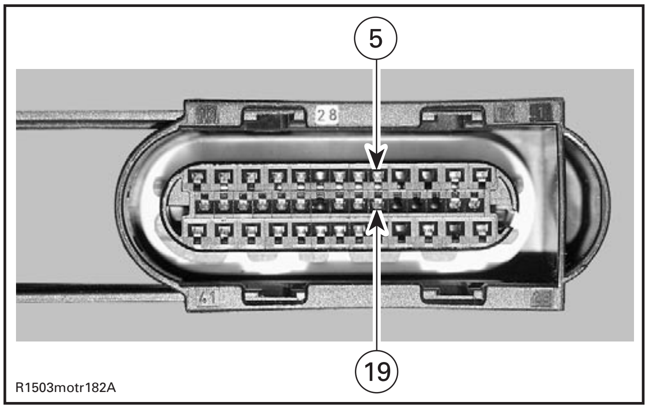
Resistance Test

Disconnect the CPS plug connector from the wiring harness and check the resistance of the sensor itself.

The resistance should be between 190 Ω and 300 Ω.

Otherwise, replace the CPS.

If resistance tests good, **reconnect** the CPS and disconnect the connector DA on the ECM.



Using a multimeter, recheck resistance value between terminals 5 and 19.

If resistance value is correct, try a new ECM. Refer to ECM REPLACEMENT procedures elsewhere in this section.

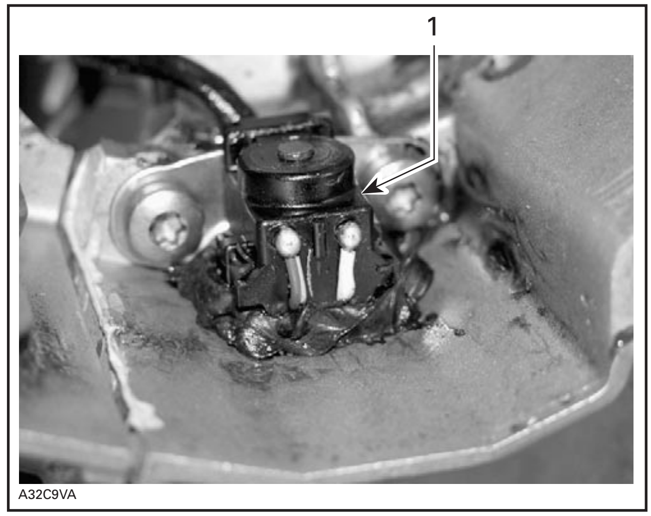
NOTE: Check if wiring harness shows any signs of scoring prior to replace the ECM.

If resistance value is incorrect, repair the connectors or replace the wiring harness between ECM connector and the CPS.

Replacement

Disconnect connectors and remove the rewind starter, then the magneto flywheel. Refer to MAGNETO SYSTEM.

Remove CPS.



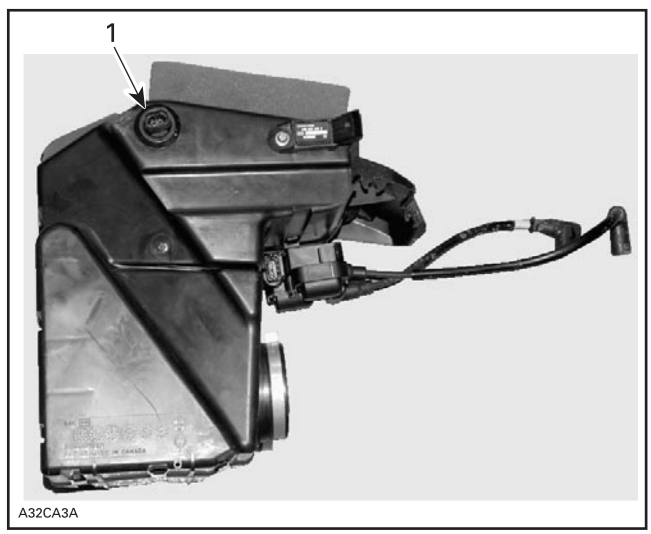
1. *CPS inside crankcase*

When installing new CPS apply Loctite 5910 between CPS and crankcase.

Torque to 8 N•m (71 lbf•**in**).

Reinstall remaining removed parts.

AIR TEMPERATURE SENSOR (ATS)



1. *Air temperature sensor (ATS)*

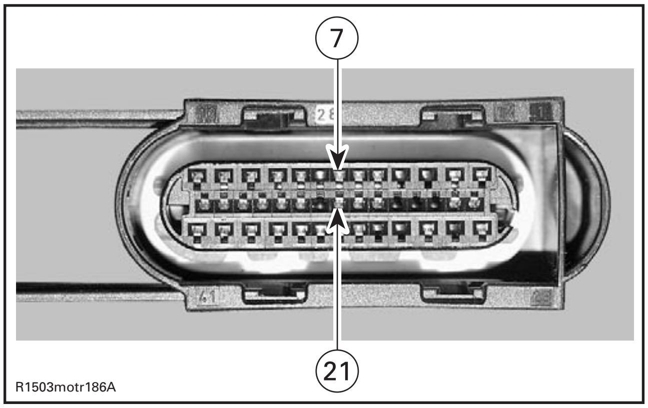
Resistance Test

Disconnect the plug connector from the ATS and check the resistance of the sensor itself.

Refer to TEMPERATURE SENSOR TABLE at the beginning of this section to find the corresponding resistance value for this sensor temperature.

If out of specification, replace the sensor.

If resistance tests good, **reconnect** the ATS and disconnect the connector DA on the ECM.



Using a multimeter, recheck resistance value between terminals 7 and 21.

If resistance value is correct, try a new ECM. Refer to ECM REPLACEMENT procedures elsewhere in this section.

NOTE: Check if wiring harness shows any signs of scoring prior to replace the ECM.

If resistance value is incorrect, repair the connectors or replace the wiring harness between ECM connector and the ATS.

Replacement

Disconnect the connector of the ATS.

Pull the ATS out of the air intake silencer.

Follow this procedure to install the ATS.

First, install the ATS rubber ring.

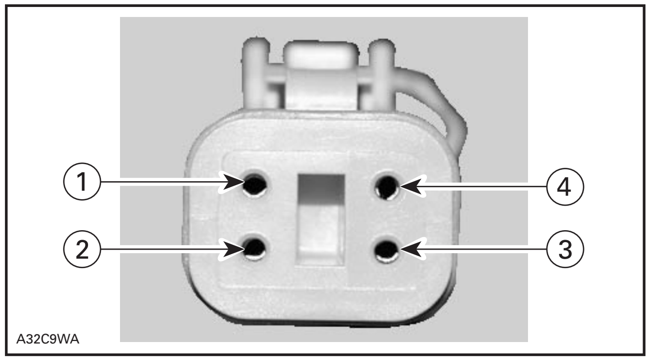
NOTE: If the rubber ring is installed on ATS sensor, remove it before ATS installing.

Spray soapy water on ring. Install ring on air intake silencer then push the sensor in place. Reconnect it.

COOLANT TEMPERATURE SENSOR (CTS)

Resistance Test

Disconnect the plug connector from the CTS and check the resistance of the sensor itself.



The resistance between pin 1 and 2 is used for temperature gauge.

Refer to TEMPERATURE SENSOR TABLE at the beginning of this section to find the corresponding resistance value for this sensor temperature.

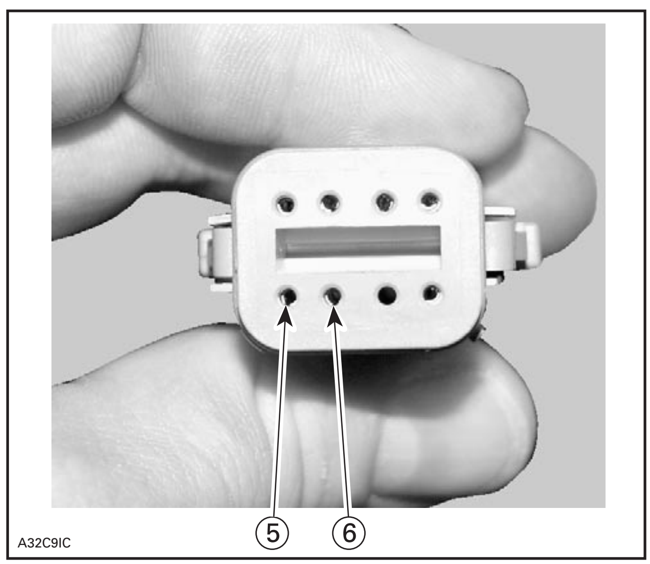
If out of specification, replace the sensor.

The resistance between pin 3 and 4 is used for ECM.

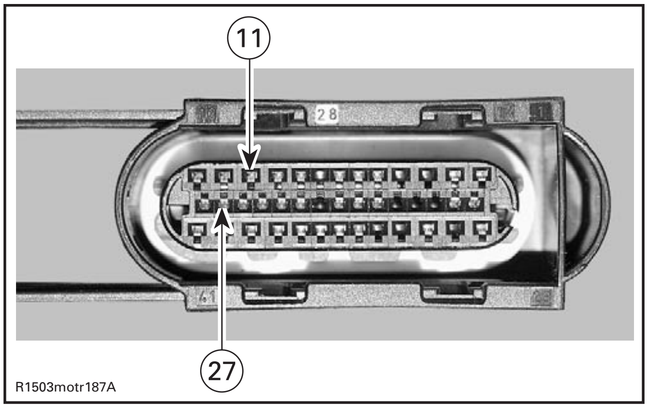
Refer to TEMPERATURE SENSOR TABLE at the beginning of this section to find the corresponding resistance value for this sensor temperature.

If out of specification, replace the sensor.

If resistance tests good, **reconnect** the CTS and disconnect the connector A on the ECM as well as the engine connector.



ENGINE CONNECTOR



ECM CONNECTOR A

Using a multimeter, recheck resistance value between terminals 5 and 6 on engine connector. This resistance is used for temperature gauge.

Refer to TEMPERATURE SENSOR TABLE at the beginning of this section to find the corresponding resistance value for this sensor temperature.

Recheck also resistance value between terminals 11 and 27 on ECM connector DA. This resistance is used for ECM.

Refer to TEMPERATURE SENSOR TABLE at the beginning of this section to find the corresponding resistance value for this sensor temperature.

If resistance value is correct, try a new ECM. Refer to ECM REPLACEMENT procedures elsewhere in this section.

NOTE: Check if wiring harness shows any signs of scoring prior to replace the ECM.

If resistance value is incorrect, repair the connectors or replace the wiring harness between ECM connector and the CTS.

Replacement

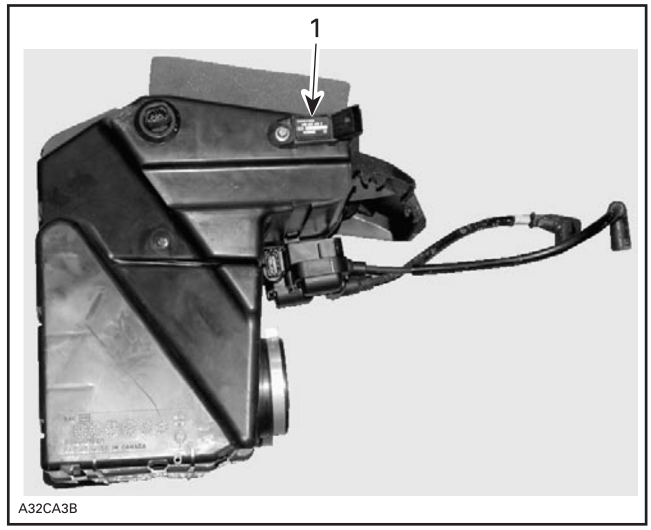
Drain cooling system.

Disconnect CTS connector and remove CTS. Install the new CTS and torque to 12 N•m (106 lbf•**in**).

Reinstall remaining removed parts.

Refill engine coolant and bleed cooling system. Refer to LIQUID COOLING SYSTEM section.

AIR PRESSURE SENSOR (APS)



1. *Air pressure sensor (APS)*

Ensure sensor is correctly installed on air intake silencer. Otherwise, the APS could generate a fault code. Remove sensor and check for oil or dirt on its end and if problem persists, check the wiring harness. Perform the following tests.

Voltage Test

Check the voltage output from ECM to the APS.

Install the tether cord cap, turn OFF engine cut-out switch and push START/RER button momentarily to activate the ECM.

Disconnect plug connector from APS and connect a voltmeter between pin 1 and 2 of wiring harness.

Voltage should be 5 V.

Check the continuity between pin 3 on APS connector and pin 18 on ECM connector.

If tests are good, replace the APS.

If tests are not good, continue to check the continuity of the rest of the APS circuit on the harness.

Disconnect the connector A from the ECM.

Using a multimeter, check continuity of circuits as per following table.

CIRCUIT NUMBER (ECM CONNECTOR DA)	APS CONNECTOR
DA-3	PIN 1
DA-4	PIN 2
DA-18	PIN 3

If wiring harness is good, try a new ECM. Refer to ECM REPLACEMENT procedures elsewhere in this section.

NOTE: Check if wiring harness shows any signs of scoring prior to replace the ECM.

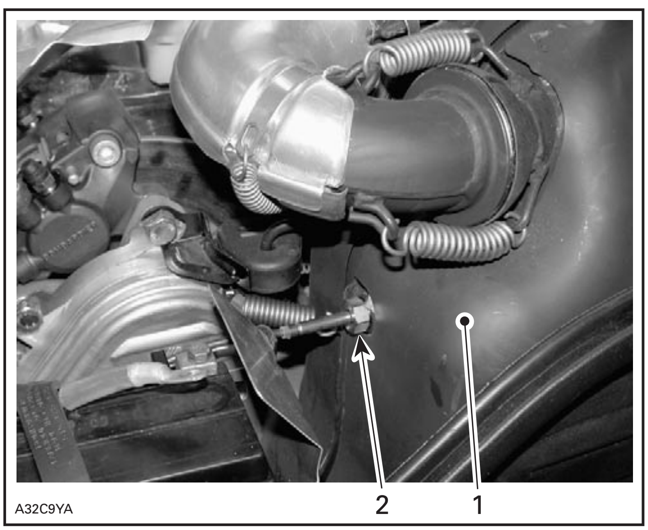
Otherwise, repair the connectors or replace the wiring harness between ECM connector and the APS.

Replacement

Disconnect APS connector and remove the APS. The ATS is retained with a screw.

Install the new APS.

EXHAUST GAS TEMPERATURE SENSOR (EGTS)



1. Muffler
2. Exhaust gas temperature sensor (EGTS)

Resistance Test

Disconnect the plug connector from the EGTS and check sensor resistance.

Refer to TEMPERATURE SENSOR TABLE at the beginning of this section to find the corresponding resistance value for this sensor temperature.

If out of specification, replace the sensor.

If resistance tests good, **reconnect** the EGTS and disconnect the connector A on the ECM.

Using a multimeter, recheck resistance value between terminals 10 and 26.

If resistance value is correct, try a new ECM. Refer to ECM REPLACEMENT procedures elsewhere in this section.

NOTE: Check if wiring harness shows any signs of scoring prior to replace the ECM.

If resistance value is incorrect, repair the connector or replace the wiring harness between ECM connector and the EGTS.

Replacement

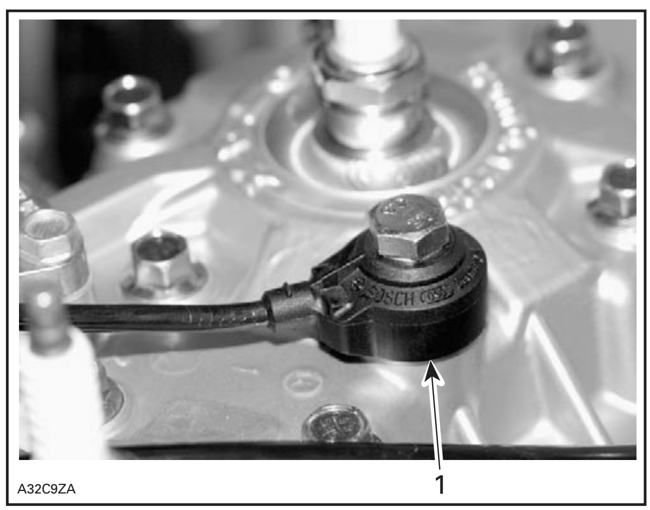
Disconnect EGTS connector and remove EGTS.

Apply anti-seize lubricant (P/N 293 800 070) over EGTS threads to prevent possible seizure.

Torque the new EGTS to 45 N•m (33 lbf•ft).

Replug connector.

KNOCK SENSOR (KS)



1. Knock sensor (KS)

Dynamic Test

Lift rear of vehicle off the ground and support it with a wide-base mechanical stand.

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 6000 RPM. If no fault code occurs, the knock sensor is good.

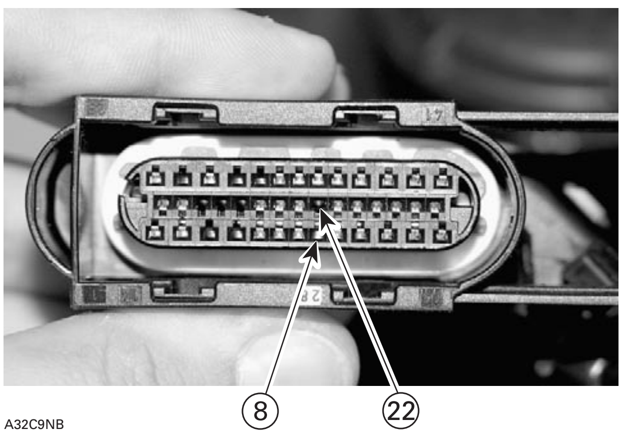
Otherwise, do the following.

Ensure sensor and head contact surfaces are clean and mounting bolt and washer are correct and properly torqued down.

Check the knock sensor circuit on wiring harness.

Disconnect the connector from knock sensor harness.

Disconnect connector DA form the ECM and check continuity of circuit as per following table.



A32C9NB

CIRCUIT NUMBER (ECM CONNECTOR A)	KS CONNECTOR
DA-22	PIN 1
DA-8	PIN 2

If test is not good, repair the connector or replace the wiring harness between ECM connector and knock sensor.

Replacement

Unscrew and remove knock sensor from cylinder head.

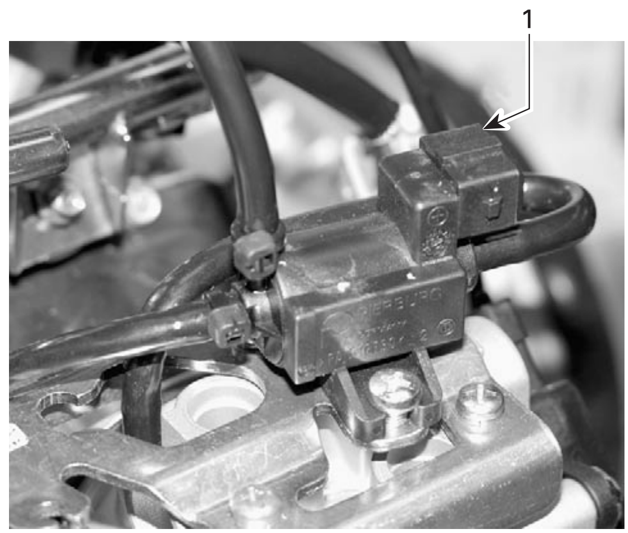
Clean contact surface, then install the new knock sensor.

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.

E-RAVE SOLENOID



A32CA1A

1. *E-RAVE solenoid*

Resistance Test

Disconnect the solenoid connector.

Check resistance value between both terminals of the solenoid.

The resistance value should be approximately 30 Ω.

Voltage Test

Install the tether cord cap and push the START/RER button momentarily to activate ECM.

Battery voltage should be present on VIOLET/GREY wire. If test fail, fuse may be blown.

Continuity Test

BROWN/WHITE wire must show continuity between solenoid connector and pin 15 on connector DB from the ECM.

If test fail, repair connector or replace wiring harness between ECM connector and solenoid.

Replacement

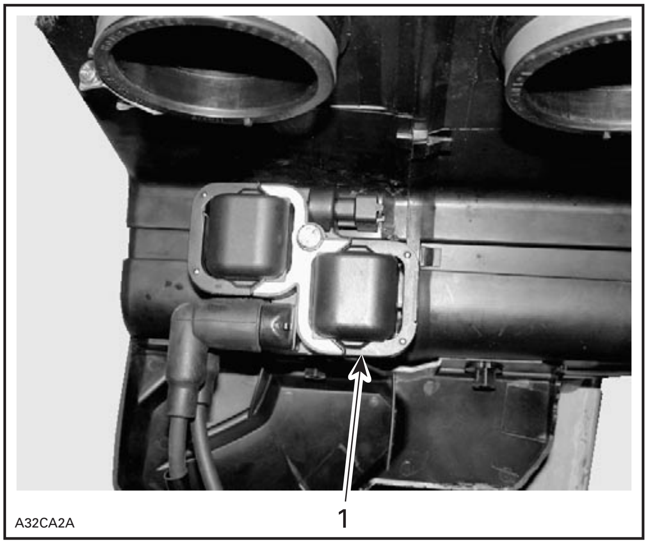
Remove the air intake silencer. Unplug the solenoid connector and all hoses.

NOTE: Mark hose locations for installation.

Remove solenoid screws then the solenoid.

For installation, reverse the removal procedure.

DOUBLE IGNITION COIL



1. Ignition coil

NOTE: The ECM energizes the primary side of each ignition coil individually. It can detect if the double ignition coil is connected otherwise a trouble code will appear upon starting..

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 engine compartment. Otherwise, perform the following checks.

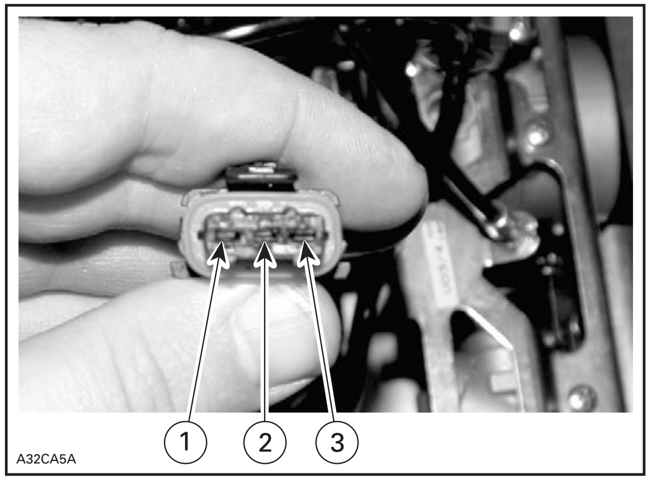
An ignition coil with good resistance measurement can still be faulty. Voltage leak can occur at high voltage level which is not detectable with an ohmmeter. Replacing the ignition coil may be necessary as a test.

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 plug connector from the ignition coil and check the voltage supplied by the battery.



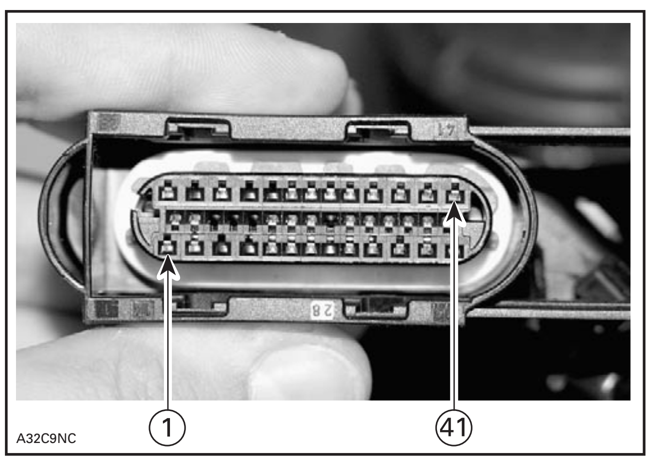
Install **tether cord cap** on the DESS post and push the START/RER button momentarily to activate the ECM.

Check voltage between terminal 2 of ignition coil connector on the wiring harness and battery ground.

Battery voltage should be present (approx. 12 V).

If 12 V is NOT read, check continuity between terminal 2 of ignition coil and the corresponding fuse. Otherwise repair wiring harness.

If 12 V is read, disconnect the connector A from the ECM and check the continuity of appropriate circuit 41 (cylinder 1) or 1 (cylinder 2) and of ignition coil connector, pin 3 and pin 1 respectively.



ECM CONNECTOR

If wiring harness is defective, repair the connector or replace the wiring harness between ECM connector and the ignition coil.

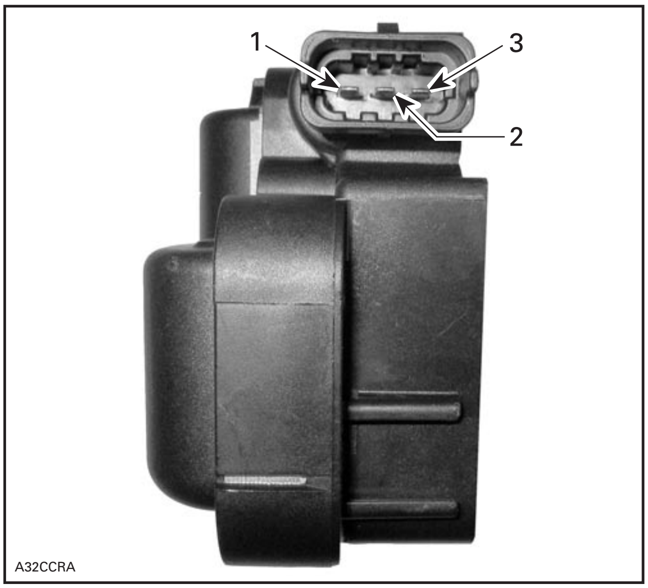
If wiring harness is good, test resistance of primary winding of ignition coil.

Resistance Test

Remove spark plug cables from ignition coil.

Using a multimeter, check the resistance of primary winding.

NOTE: The secondary winding can not be measured with an ohmmeter. Try a new double ignition coil if necessary.



1. Terminal 1a
2. Terminal 15
3. Terminal 1b

For primary winding, check the resistance between terminal 15 and terminal 1a (cylinder 1) of the ignition coil and between terminal 15 and terminal 1b (cylinder 2) respectively.

The resistance should be between 0.40 and 1.15 Ω at 20°C (68°F).

If the resistance of one of both windings is not good, replace the ignition coil.

If the windings test good, try a new ECM.

NOTE: Check if wiring harness shows any signs of scoring prior to replace the ECM.

⚠ 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.

TDC SETTING (TOP DEAD CENTER)

Refer to IGNITION TIMING section.

ENGINE START/RER BUTTON VERIFICATION

A quick operation test can be done using the vehicle communication kit (VCK) with the B.U.D.S. software, using the **Monitoring** section. Press the START/RER button and look at the START/RER button LED. It should turn on, indicating the starting system is working on the input side of the starting system (START/RER button, ECM and wiring). You know now the problem is on the output side of the starting system (ECM output signal to starting solenoid, wiring harness going to the solenoid and starter motor. Refer to STARTING SYSTEM for testing procedures). Otherwise, check the input side as follows.

Disconnect the two connectors of the steering harness.

Measure the resistance of the two wires on the small connector (BEIGE and BLACK) for 0Ω. Depress start button and the reading should change from 0Ω to infinitely high.

Release the start button and measure the resistance between pin 2 (BEIGE wire) of the small connector and pin 6 (RED/BROWN wire) on the big connector for infinitely high resistance to 0Ω while the start button is depressed.

⚠ WARNING

Always respect the wire position when connecting the switch. Refer to the wiring diagram.

Test continuity of circuit DB-19. If it is good, try a new ECM. Otherwise, repair harness/connectors.

DESS SWITCH VERIFICATION

If 2 short beeps are not heard when starting the engine, refer to DIAGNOSTIC PROCEDURES.

The following continuity tests can also be performed using an ohmmeter.

Disconnect switch wires.

Tether Cord Cap Removed

Connect test probes to switch BLACK/GREEN and BLACK/WHITE wires. Measure resistance, there should be NO continuity (open circuit).

Connect one test probe to the WHITE/GREY 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/GREEN wire and the other test probe to the switch ring. Measure resistance, it must be close to 0 ohm.

Tether Cord Cap on DESS Post

Connect test probes to switch BLACK/GREEN and BLACK/WHITE wires. Measure resistance, it must be close to 0 ohm.

SPARK PLUGS

Disassembly

Disconnect the spark plug cable from the spark plug.

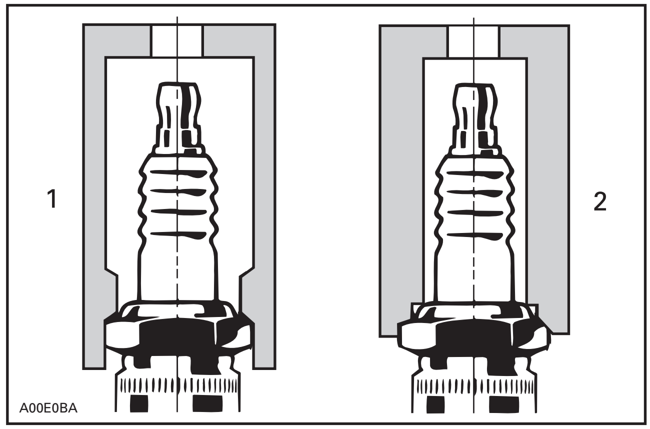
First unscrew the spark plug one turn.

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)
593 SDI and 793 SDI 2-TEC	NGK BR 9 ECS	Hand tighten + 1/4 turn with a socket	0.8 (.031)

CRANKING SYSTEM

See above for start/stop switch and the DESS post testing. Refer to STARTING SYSTEM section for other tests.

DIAGNOSTIC PROCEDURE

GENERAL

Here is the basic order suggested to diagnose a suspected engine management or fuel injection related problem:

– Check the chart in TROUBLESHOOTING section to have an overview of problems and suggested solutions.
– Check if the engine management system (EMS) pilot lamp lights up. If so, use the VCK (Vehicle Communication Kit) and look for fault codes to diagnose the trouble.
– Check all fuses.
– Check fuel pressure.
– Check spark plugs condition.
– Check all connections of the wiring harness.

Refer to COMPONENT INSPECTION AND ADJUSTMENT section for procedures.

TROUBLESHOOTING

The following chart is provided to help in diagnosing the probable source of simple troubles.

Monitoring Beeper Coded Signals

CODED SIGNALS	POSSIBLE CAUSE	REMEDY
2 short beeps (when engine is started). DESS/RER pilot lamp also blinks.	Confirms that proper tether cord cap is installed. Engine can rev above clutch engagement.	No problem detected. Good ride.
1 short beep every 1.5 seconds (when engine is started). DESS/RER pilot lamp also blinks. Engine cannot reach pulley engagement speed. Vehicle cannot be driven.	Bad DESS system connection. Defective tether cord cap. Dirt or snow in tether cord cap. Defective DESS post.	Reinstall tether cord cap correctly over post. Use another programmed tether cord cap. Clean tether cord cap. Replace DESS post.
1 long beep per second.	Reverse is selected.	Vehicle can be driven in reverse.
3 short beeps per second. DESS/RER pilot lamp also blinks. Engine cannot reach pulley engagement speed. Vehicle cannot be driven.	Wrong tether cord cap is installed.	Install proper tether cord cap. Program key into ECM.
3 short beeps per second. Engine overheating pilot lamp also blinks.	Engine is overheating.	Stop engine immediately and allow to cool. Check cooling system.
3 short beeps per second.	Low battery voltage.	Check battery and charging system.
4 short beeps every 2 minutes. Oil pilot lamp also lights up.	Low oil level on 2-TEC models.	Check oil level and replenish as soon as possible.
Battery pilot lamp lights up.	No charging.	Check battery and charging system.

Many other codes use the engine pilot lamp and the buzzer to indicate a problem. A complete list of codes is available in B.U.D.S.

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 **SDI models**.

The **SDI models** require B.U.D.S. version G2.1 or P2.1 or above.

B.U.D.S. (Bombardier Utility and Diagnostic Software) is designed to allow 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.

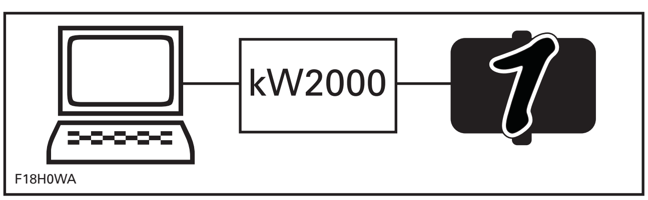
⚠ WARNING

If the computer you are using is connected to the 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.

IMPORTANT: When using the software B.U.D.S., with the **SDI engine**, ensure that the protocol "kW2000" is properly selected in **"MPI"** (multi protocol interface) under **"Choose protocol"**.

When B.U.D.S. is connected to the vehicle, the status bar shows the protocol (kW2000) and the number 1 to the right. To communicate with the ECM, number 1 must be displayed.

Number 1 means that one module is connected.



ONE MODULE IS CONNECTED

If an "X" is shown, this means that no communication between the MPI and the ECM is possible. In this case possible causes are:

– ECM is not powered-up
– wrong protocol is used
– bad connection between MPI and module.

ECM Supply

To power-up the ECM, push the START button shortly while the engine cut-out switch is depressed and the tether cord cap installed on DESS post. If your intention is to program the vehicle key, use GRAY diagnostic key (P/N 529 035 896) on DESS post.

The supply cable (P/N 529 035 869) may also be used. Just the fact to connect it between MPI and vehicle will power-up the ECM.

VCK Supply

The VCK (MPI box) can use the vehicle power for its supply. Four AA batteries or an AC/DC power supply can also be used. Make sure to respect MPI specification if a power supply is used.

Writing in ECM

When writing in ECM through B.U.D.S., there will be an "EMS Tracking" message that will say "Remove key from vehicle". When this occurs, remove the tether cord cap from its post and wait until the message disappears (it lasts approximately 15 seconds after tether cord cap removal).

2-TEC SYSTEM FAULT CODES

General

The faults registered in the ECM (engine control module) are kept when the battery is disconnected.

IMPORTANT: After a problem has been solved, ensure to clear the fault(s) in the ECM using the VCK. This will properly reset the appropriate counter(s). This will also record that the problem has been fixed in the ECM 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

– Electrical noise is picked up by the ECM. Ensure that all connections are in good condition, also grounds (battery, ECM, engine and ignition system), they are clean and well tightened and that all electronic components are genuine — particularly in the ignition system. Installing non-resistive spark plugs may lead to generate fault code.
– Electrical noise might also lead engine to occasional cutout without generating a fault code .
– If everything is in good condition, try a new ECM.

When using the service action suggested in the Fault section of B.U.D.S., the system circuits are referred to as DA-41, which means connector “A” on the ECM and the circuit D41.

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 reveal a fault that is intermittent.

POSSIBLE CAUSES	RESULT	ACTION
Check if connector is disconnected from TPS	Yes	Reconnect.
Check if sensor is loose	Yes	Tighten sensor and reset **Closed Throttle**.
Inspect sensor for damage or corrosion	Yes	Replace sensor and reset **Closed Throttle**.
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**.
Test sensor operation (wear test)		Replace sensor and reset **Closed Throttle**.

TPS “ADAPTATION FAILURE” Fault

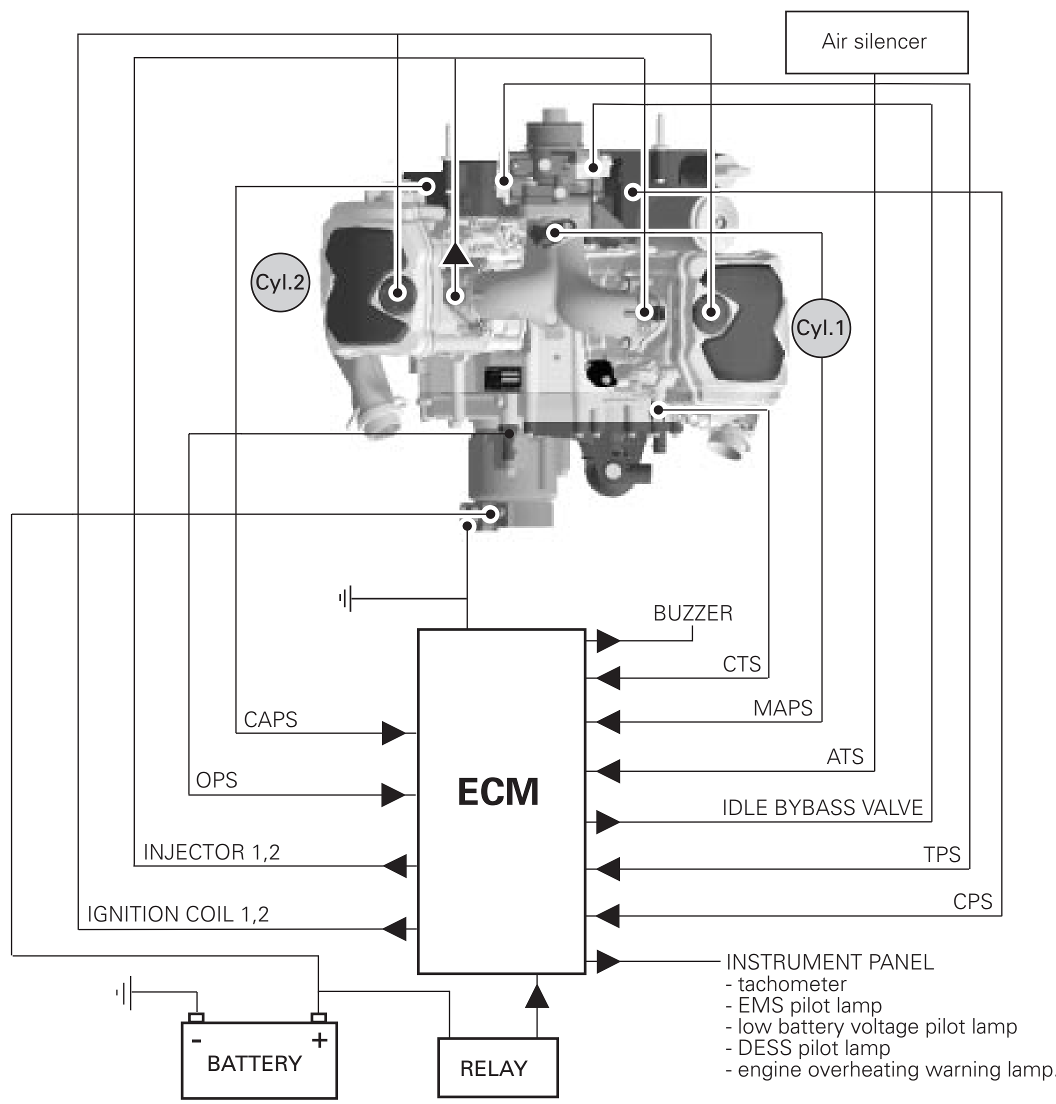
It is caused by the idle position moving out of an acceptable range.

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**.
Throttle body has been replaced and TPS closed position not reset	Yes	Reset **Closed Throttle**.
EMS has been replaced and TPS closed position not reset	Yes	Reset **Closed Throttle**.
Throttle cable too tight	Yes	Adjust cable and reset **Closed Throttle**.
Sensor is loose	Yes	Tighten sensor and reset **Closed Throttle**.
Throttle bracket is loose	Yes	Fix and reset **Closed Throttle**.
Adjustment screw worn or loose	Yes	Adjust idle speed screw using B.U.D.S.

OVERVIEW

ENGINE MANAGEMENT SYSTEM - OVERVIEW
ROTAX 4-TEC 1004



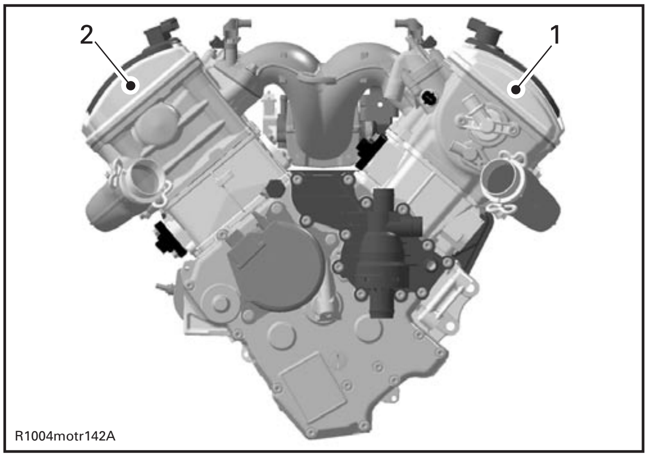
CPS	Crankshaft Position Sensor
TPS	Throttle Position Sensor
ATS	Air Temperature Sensor
CTS	Coolant Temperature Sensor
OPS	Oil Pression Switch
CAPS	Camshaft Position Sensor
MAPS	Manifold Air Pression Sensor
EMS	Engine Management System
ECM	Engine Control Module

A32I0LS

OPERATING PRINCIPLE OF ENGINE MANAGEMENT

A highly advanced engine management system (EMS) has been used to ensure a high power output with cleanest combustion. The EMS 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 the 1004, the cylinders are referenced as 1 (front) and 2 (rear) instead of PTO and MAG.

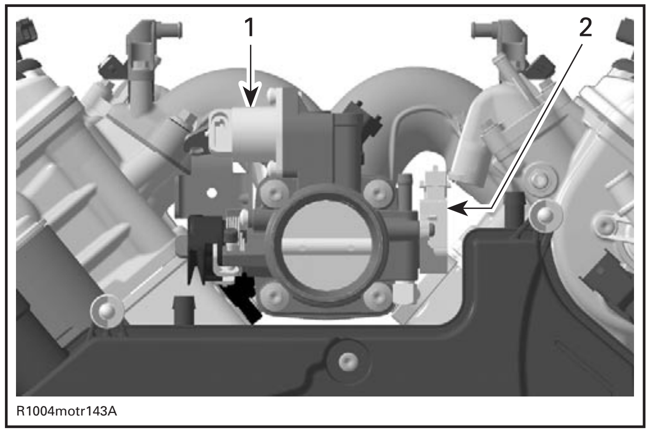


1. Cylinder 1
2. Cylinder 2

NOTE: "EMS" stands for engine management system. "EMS" includes an ECM (engine control module), sensors and injectors.

AIR INDUCTION

Through air filters, air goes into the air silencer. ECM measures at this point air temperature. Air pressure is measured directly in the intake manifold. Then, air for combustion is drawn 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 and goes into the cylinder head.



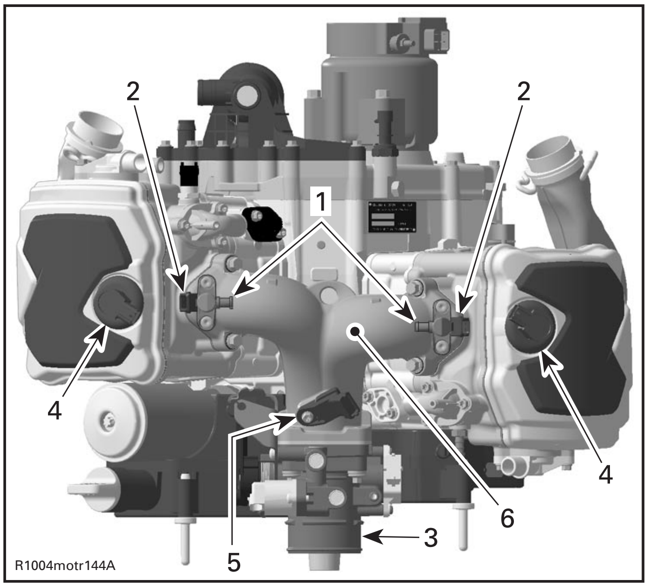
52 MM THROTTLE BODY
1. Idle bypass valve
2. Throttle position sensor (TPS)

FUEL DELIVERY SYSTEM

BASIC OPERATION

When the intake valve reaches the correct position, the ECM (engine 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. *Fuel rail*
2. *Injector*
3. *Throttle body*
4. *Ignition coil*
5. *Manifold air pressure sensor (MAPS)*
6. *Intake manifold*

The intake manifold is mounted on the top of the engine on both cylinder heads. It provides support for the fuel injectors, the fuel rails, MAPS (manifold air pressure sensor) and the throttle body. The air intake manifold is a resonator between the throttle body and the air intake at the cylinder heads.

Fuel Rail

Two fuel rails, one for each injector, are mounted on the intake manifold. The fuel rails ensure all the time, that enough fuel at the right pressure can be delivered to the fuel injectors. The fuel rails are fed by the fuel pump with a fuel pressure of approximately 400 kPa (58 PSI).

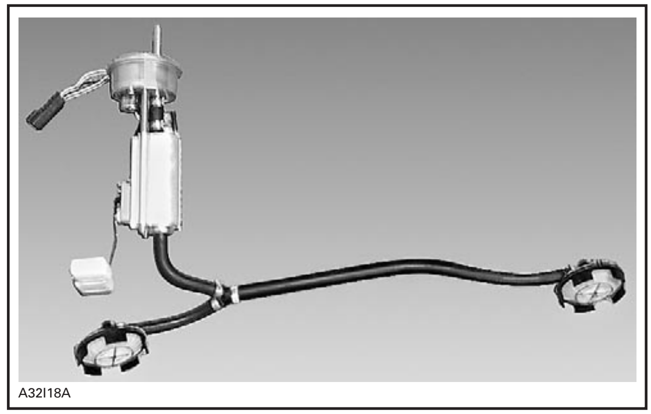
Fuel Injector

Two fuel injectors (one per cylinder) are used to inject fuel into the intake port of the cylinder head.

Throttle Body

It is a 52 mm heated throttle body mounted on intake manifold. Fitted on the throttle body, there is the TPS and the idle bypass valve which allows the ECM to control the RPM while the throttle plate is closed.

FUEL PUMP MODULE



The fuel pump module 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.

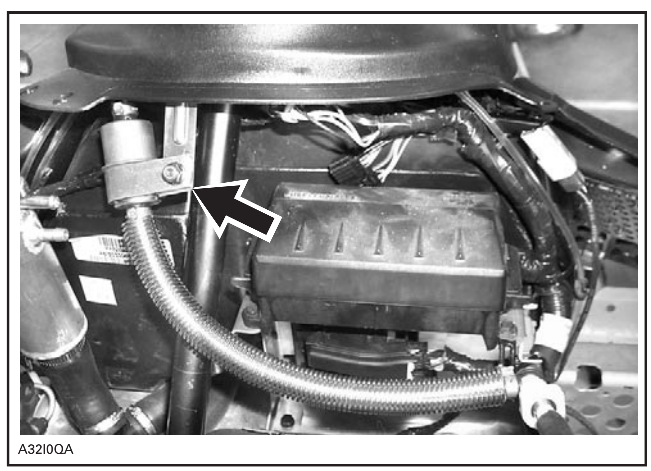
Fuel Pressure Regulator

A fuel pressure regulator controls the pressure in the system and allows excess 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 70 micron filter. One is located at the front right side of the fuel tank and the other at the rear left side.

In-Line Fuel Filter

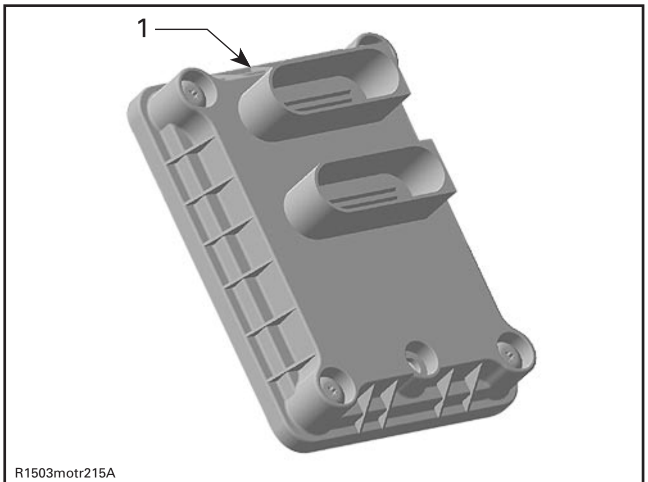


The in-line fuel filter is fastened under the steering console. It comes as a complete assembly.

ELECTRONIC MANAGEMENT

EMS (ENGINE MANAGEMENT SYSTEM)

The engine management system is controlled by the ECM.

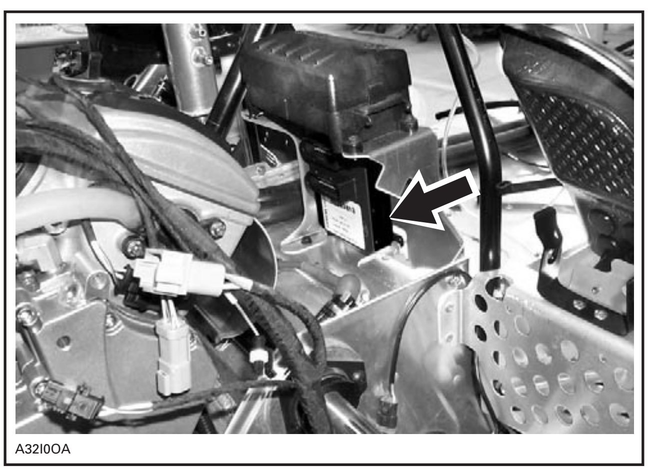


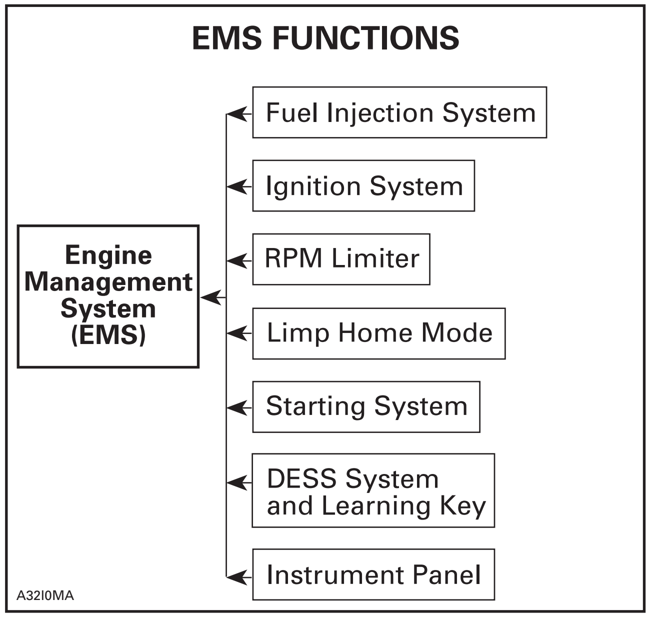
TYPICAL
1. ECM

ECM

The ECM is located between the engine and the fuel tank, under the fuse box.

It controls all engine management functions, by processing the information given by various sensors.





The ECM (engine control module) is directly powered by the battery. It is responsible for the following engine management/electrical functions:

- analysis of information
- distribution of information
- start/stop function
- timer
- DESS (Digitally Encoded Security System)
- ignition timing control
- injection control
- proper mapping (injection and ignition) for optimum engine operation in all conditions.
- engine RPM limiter
- etc.

The ECM 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.

EMS — GENERAL FUNCTIONS

Anti-Drive Feature

This system allows the engine to reach pulley engagement speed only if a programmed tether cord cap is installed on DESS post. See below for details.

Digitally Encoded Security System (DESS)

The ECM is designed to work with the DESS.

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.

NOTE: Actually, it is the memory of the ECM which is programmed to recognize the digital code of the tether cord cap. This is achieved with the VCK (Vehicle Communication Kit) (P/N 529 035 844). Refer to B.U.D.S. help system to program a tether cord cap.

The system is quite flexible. Up to 8 tether cord caps may 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 vehicles equipped with the DESS. It only needs to be programmed for that vehicle.

The memory of the ECM features a self-diagnostic mode for the DESS operation. Refer to DIAGNOSTIC PROCEDURES section for more information.

The memory of the ECM is permanent. If the battery is disconnected, no information is lost.

Note that the DESS anti-drive circuitry is already activated on all new ECM.

Engine RPM Limiter

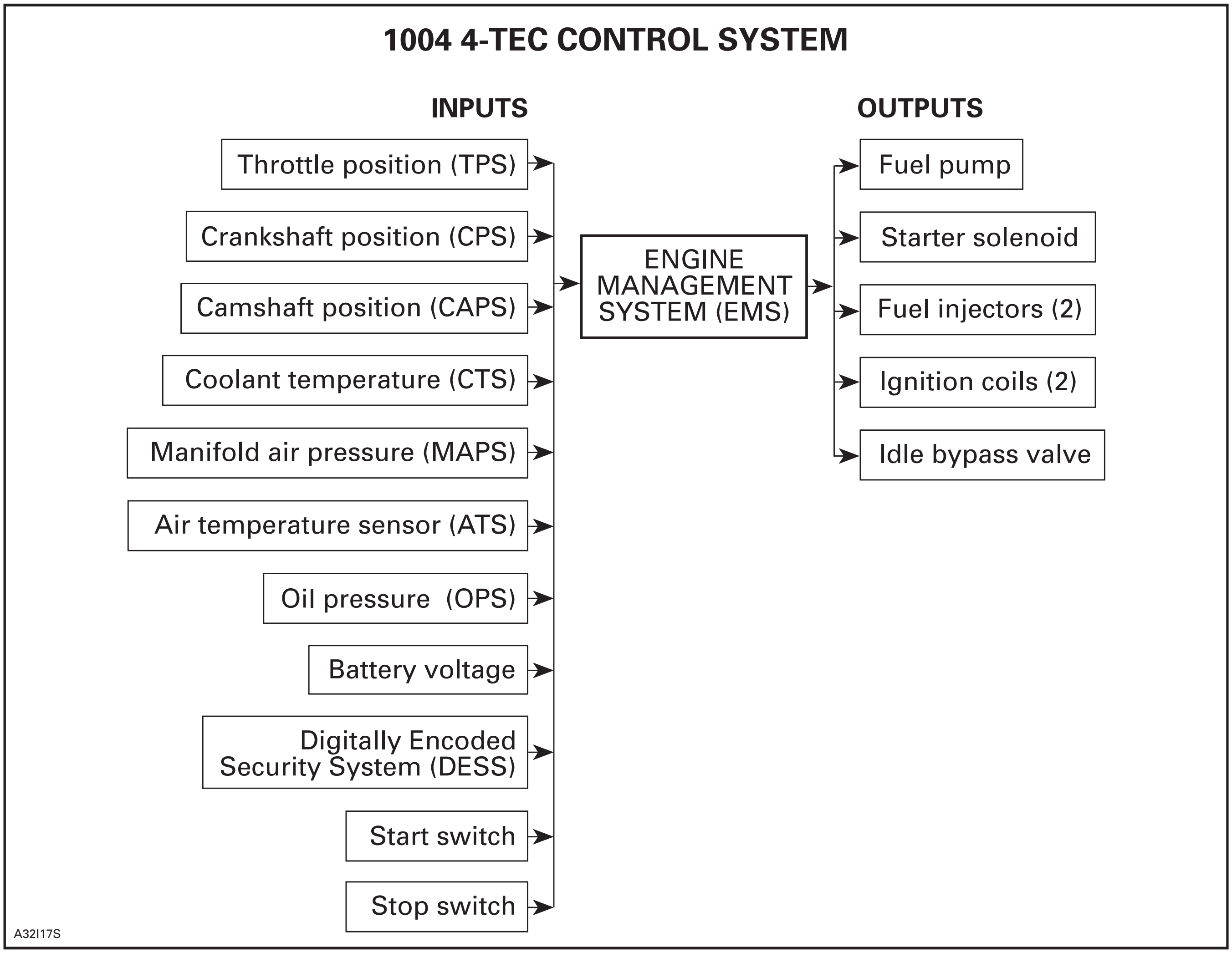
The ECM will limit the maximum engine speed.

Low Oil Pressure Warning Device When the oil pressure falls under a certain level, the ECM sends out signals to the buzzer,the low oil pressure warning lamp and to the EMS pilot lamp.

High Coolant Temperature Warning Device

When the coolant temperature is getting to high, the ECM sends out signals to the buzzer, the engine overheating warning lamp and to the EMS pilot lamp.

EMS — ENGINE MANAGEMENT FUNCTIONS



This engine management system controls both the fuel injection and the ignition timing.

As shown in the 1004 4-TEC CONTROL SYSTEM illustration, the ECM 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 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 reads the signals from different sensors which indicate engine operating conditions at millisecond intervals.

Signals from sensors are used by the ECM to determine the injection parameters (fuel maps) required for optimum air-fuel ratio.

The CPS, the ATS, 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.

Ignition System

The ignition system is fully managed by the ECM which controls the ignition system parameters, such as spark timing, duration and firing in order to achieve the proper engine requirements.

Ignition Coils

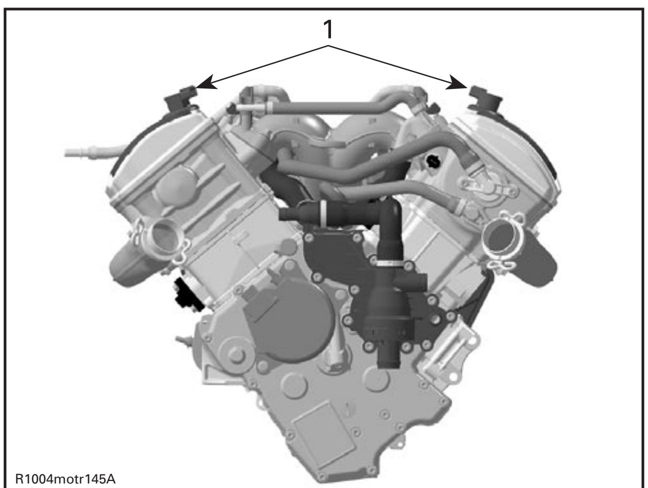
Two separate ignition coils induce voltage to a high level in the secondary windings to produce a spark at the spark plug.

The ignition coils receive input from the ECM. Each coil provides high voltage to its corresponding spark plug.

This ignition system allows spark plugs to spark independently.

NOTE: Ignition coil wires are not interchangeable due to different lengths of the wiring harness.

Both ignition coils are located on the cylinder heads directly on the spark plugs.



1. Ignition coils

Ignition Timing

The ECM 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 controls the ignition timing for optimum engine operation.There is no mechanical adjustment to perform.

Engine Modes of Operation

The ECM 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, drowned engine and limp home (see below).

Flooded Engine (drowned mode)

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.

With tether cord cap on its post while engine is stopped, press and HOLD throttle lever at WOT position.

Press the start button. The mode is now on.

Releasing throttle lever will bring back the 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.

Limp Home Modes

Besides the signals as seen above, the ECM may automatically set default parameters to the engine management to ensure the adequate operation of the vehicle if a component of the fuel injection system is not operating properly.

Sensor failures will not lead to a limp home mode, warning will follow through the EMS pilot lamp and the buzzer.

When minor fault occurs, the fault and message/buzzer disappear automatically when the condition no longer exists.

Releasing throttle and letting the engine returning at idle speed may allow normal operation to come back. If it does not work, try removing and reinstalling the tether cord cap on its post.

These performance-reduced modes allow the rider to go back home which would not be possible without this advanced system. Refer to the DIAGNOSTIC PROCEDURES for a complete chart.

Shutdown Mode

ECM will shut down all outputs 5 seconds after the tether cord cap is removed.

If the tether cord cap is still on DESS post but the engine is turned off using engine cut-out switch, the ECM will shut down all outputs after 15 seconds.

Diagnostic Mode

The malfunctions are recorded in the memory of the ECM. The memory of the ECM can be checked using the VCK (Vehicle Communication Kit) (P/N 529 035 844) to see the fault codes.

The ECM and the VCK are able to communicate through a connector on the vehicle. Refer to the DIAGNOSTIC PROCEDURES section. B.U.D.S. Version G2.10 or P2.10 and up must be used for this system.

Monitoring System

The ECM monitors the electronic components of the fuel injection system and also the electrical system. When a fault occurs, it sends visual messages through the referring LED and/or audible signals through a buzzer to inform you of a particular condition. Refer to the DIAGNOSTIC PROCEDURES section for the LED and the buzzer 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/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 snowmobile. Prior to disconnecting a hose or to removing a component from the fuel system, follow the recommendation described here. Pay attention 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 software B.U.D.S.

⚠ 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 and work in a well ventilated area. Do not allow fuel to spill on hot engine parts and/or on electrical connectors. Proceed with care when removing/installing 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 engine compartment. 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 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 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 rails 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

Never use a hose pincher on injection system high pressure hoses.

ELECTRICAL SYSTEM

It is important to check that the electrical system is 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 ECM (engine control module) 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, injectors, fuel pump, ignition coils and starter solenoid) are permanently supplied by the battery when the VCK (Vehicle Communication Kit) is connected to the diagnostic connector of the engine wiring harness and the tether cord cap is installed. Always disconnect the battery prior to disconnecting any electric 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 pins 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 housings are properly fastened.

Before replacing an ECM, always check electrical connections. Make sure connectors are properly crimped on wires and fastened in housing, and that they are free of corrosion. Ensure proper electrical connection. Particularly check ECM ground connections. Ensure that contacts are good and clean. A «defective module» could possibly be repaired simply by unplugging and replugging the ECM. The voltage and current might be too weak to go through dirty wire pins. Check carefully if pins show signs of moisture, corrosion or if they look dull. Clean pins properly and then coat them prior to assembling as follows:

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 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 (68°F). The resistance 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 (68°F). Use this table for resistance variation relative to temperature for **temperature** sensors.

TEMPERATURE SENSOR TABLE			
TEMPERATURE		RESISTANCE (ohms)	
°C	°F	ATS	CTS
- 40	- 40	—	45000
- 30	- 22	28000	28000
- 20	- 4	14500	15000
0	32	5500	5750
20	68	2500	2600
40	104	1200	1200
60	140	600	600
80	176	320	320
100	212	180	180
130	266	90	90

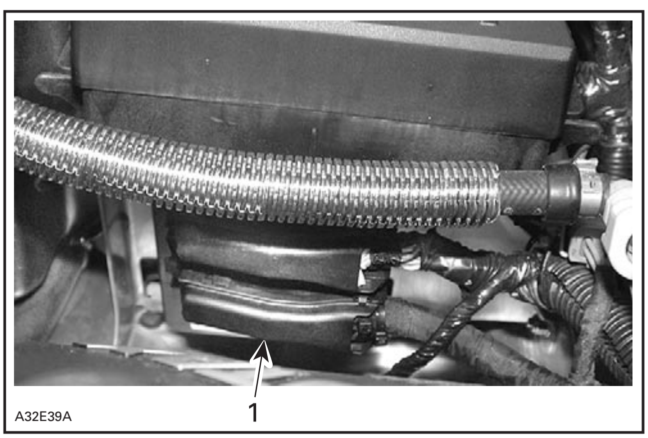
CONVERSION CHART FOR TEMPERATURE SENSORS

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 room temperature. It does not validate the over temperature functionality. To test it, the sensor could be removed from the engine and heated with a heat gun while it is still connected to the harness to see if the ECM will detect the high temperature condition and generate a fault code.

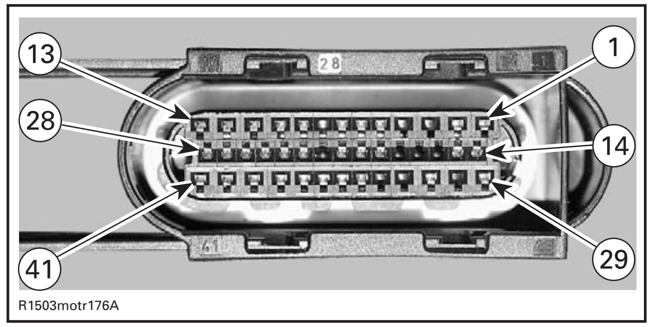
ENGINE CONNECTOR PIN-OUTS

Connector Position



1. *ECM connector A*

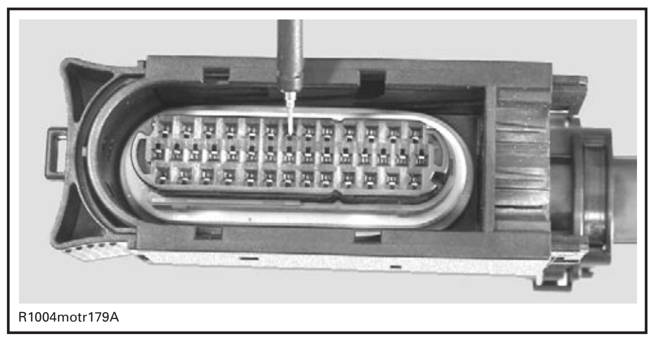
Use this diagram to locate the pin numbers on the ECM connector A of the wiring harness when performing tests.



ECM CONNECTOR PIN-OUT (WIRING HARNESS SIDE)

ECM Connector

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 will damage the square-shaped terminal and this may lead to improper function of the engine management system.

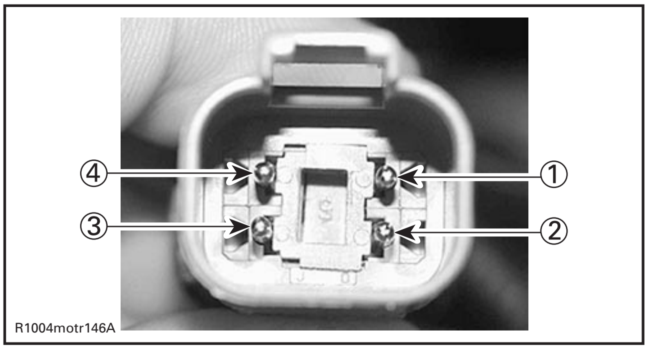


PROBE ONLY ON THE PIN NOZZLE OF FEMALE CONNECTOR

CAUTION: Do not disconnect the ECM connector needlessly. They are not designed to be disconnected/reconnected repeatedly.

Engine Connector

Use this diagram to locate the pin numbers on the Engine connector of the wiring harness when performing tests.

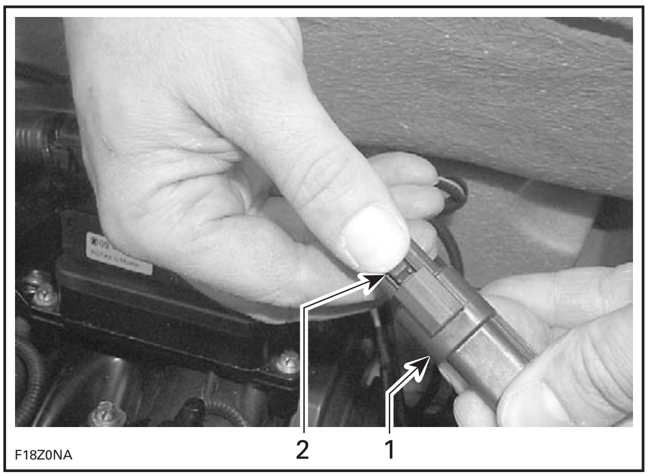


ENGINE CONNECTOR PIN-OUT (WIRING HARNESS SIDE)

CONNECTORS ON ENGINE

Removal

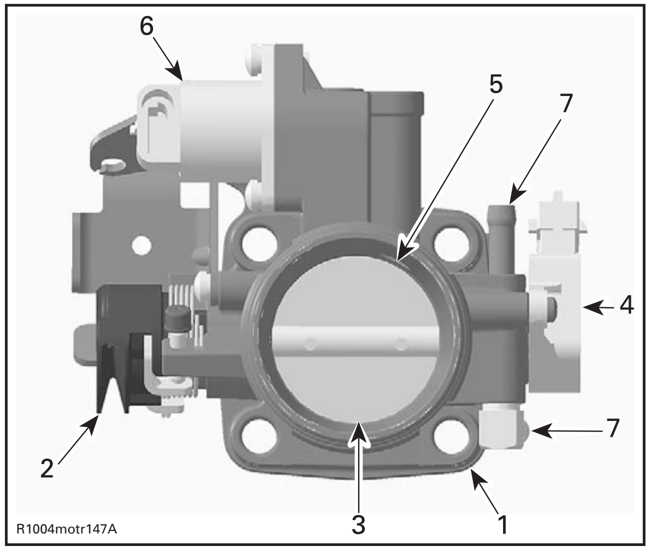
To disengage both connectors, press the release button and disconnect them.



TYPICAL
1. Connector
2. Press 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. Nipples for throttle body heating

Mechanical Inspection

Check that the throttle plate moves freely and smoothly when depressing throttle lever.

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 off.

– 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 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.

To verify the engine RPM with the tachometer (P/N 529 014 500), use the following procedure.

The inductive tachometer works on these ignition coils (stick coils) as well as on regular high tension coil. Simply wrap the tachometer's wire a few times around the protruding part of ignition coil.

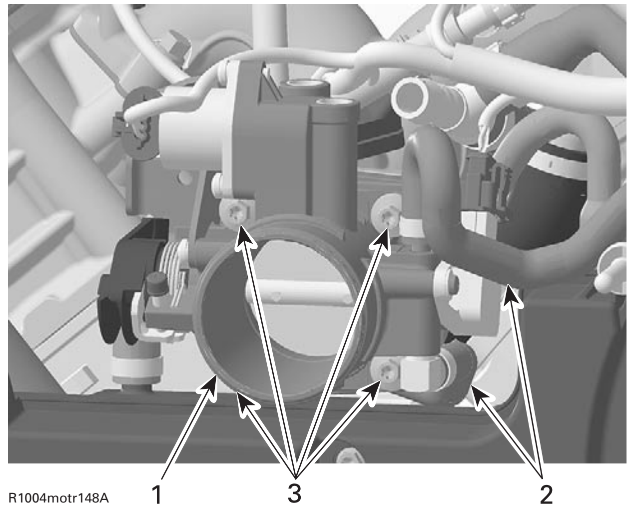
TYPICAL

Replacement

Removal

To remove the throttle body from engine, proceed as follows:

– Disconnect air intake silencer from throttle body.
– Drain cooling system.
– Remove clamps and hoses for throttle body heating from nipples.
– Remove retaining screws of throttle body.



1. *Throttle body*
2. *Hoses*
3. *Screws*

– Slightly pull throttle body out.
– Disconnect connectors from idle bypass valve, and TPS.
– Disconnect throttle cable.

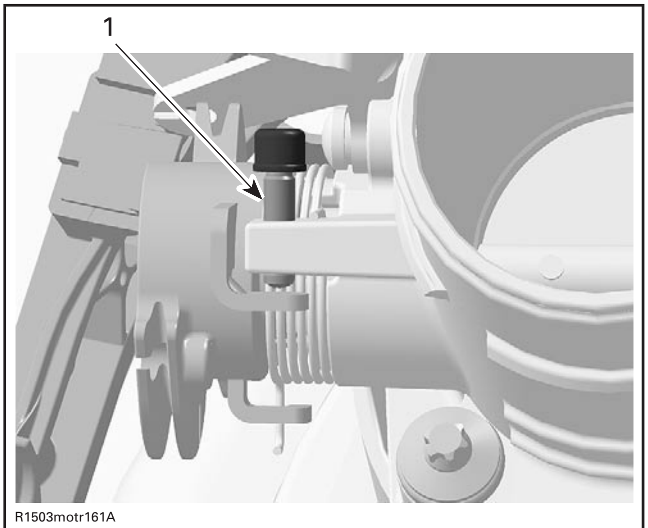
Installation

Installation of the new throttle body is the reverse of the removal procedure. Pay attention for the following details.

Refill and bleed the cooling system, refer to COOLING SYSTEM subsection.

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 nor the factory to correct the idle speed. The throttle body would need to be replaced.

CAUTION: Do not alter or tamper with throttle cable adjustment or routing. It may cause poor start ability and erratic idling.

The only thing that has to be performed when the throttle body has been replaced is the **Closed Throttle and Idle Actuator** reset. Refer to THROTTLE POSITION SENSOR (TPS) in ELECTRONIC MANAGEMENT below.

Throttle Cable Adjustment

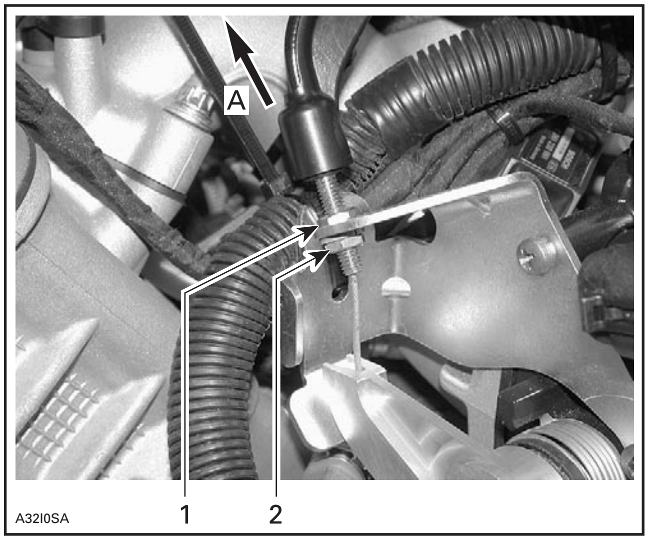
Mechanically adjust the throttle cable.

Handlebar and throttle cable must be at their normal position.

Apply full throttle.

Pull on throttle cable housing with a force of 50 N (11 lbf). Tighten top nut to 1 N•m (9 lbf•**in**).

Tighten bottom nut to 4.5 N•m (40 lbf•**in**).



WIDE OPEN THROTTLE POSITION
*1. Top nut torqued to 1 N•m (9 lbf•**in**)*
*2. Bottom nut torqued to 4.5 N•m (40 lbf•**in**)*
A. 50 N (11 lbf)

Activate throttle lever a few times. Make sure throttle cam of throttle body rests against idle speed screw without any tension in the cable.

CAUTION: If there is no free-play at idle position, it may cause poor idling and start ability. Improper cable adjustment will cause strain on cable and/or damage cable bracket or throttle lever at handlebar.

⚠ 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 PUMP

Fuel Pressure Test

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 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.

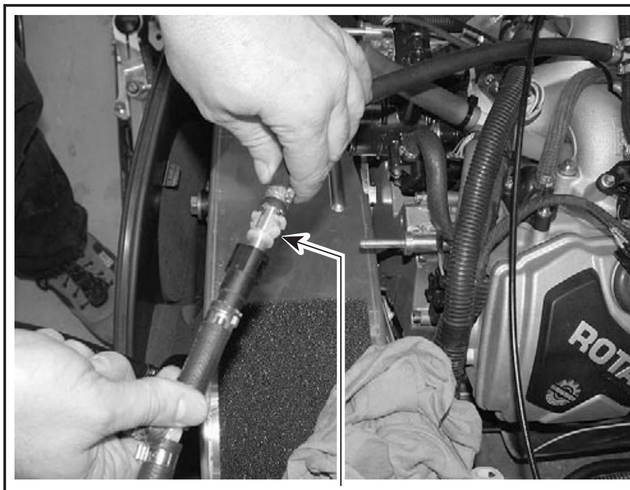
Ensure there is no leak from hoses and fittings. Repair any leak.

Ensure there is enough gas in fuel tank.

Disconnect outlet hose.

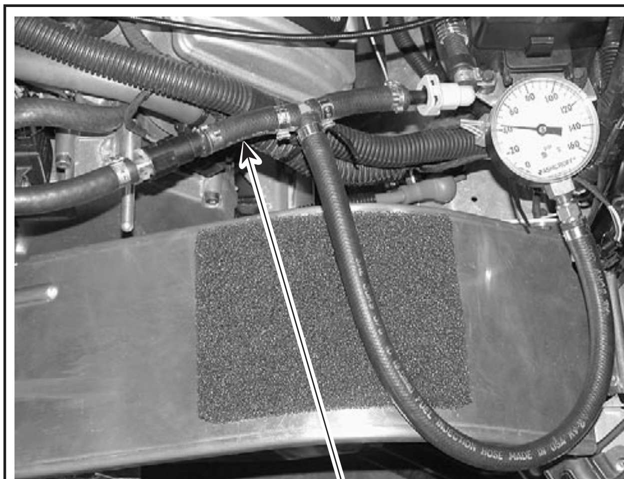
Remove plastic clip (P/N 275 500 429) from male fitting of pressure gauge (P/N 529 035 591).

Install the clip on male fitting of fuel rail inlet hose.



1. Clip installed on male fitting of fuel rail inlet hose

Install fuel pressure gauge (P/N 529 035 591) between disconnected hoses (in line installation).



1. In-line installation of fuel pressure gauge

Install the tether cord cap. Active the cut-out switch so the engine will not crank. Depress start button and observe fuel pressure. 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 depressing start button)
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 plastic clip from inlet hose. Reconnect inlet hose.

⚠ WARNING

Wipe off any fuel spillage in the engine compartment. Fuel is flammable and explosive under certain conditions. Always work in a well ventilated area.

Reinstall removed parts.

Electrical Test

When depressing start button, the fuel pump should run for 2 seconds to build up the pressure in the system.

If the pump does not work, disconnect the plug connector from the fuel pump.

Install a temporary connector to the fuel pump connector 6-PE. Apply 12 V (+ on pin 4 and - on pin 3) to this test harness.

If pump does not run, replace the fuel pump module.

Otherwise, probe terminals 3 and 4 of fuel pump connector 6-PE on vehicle harness side. When depressing start button, 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 harness or in fuel pump connector. Repair or replace appropriate part.

Fuel Pump Module Replacement

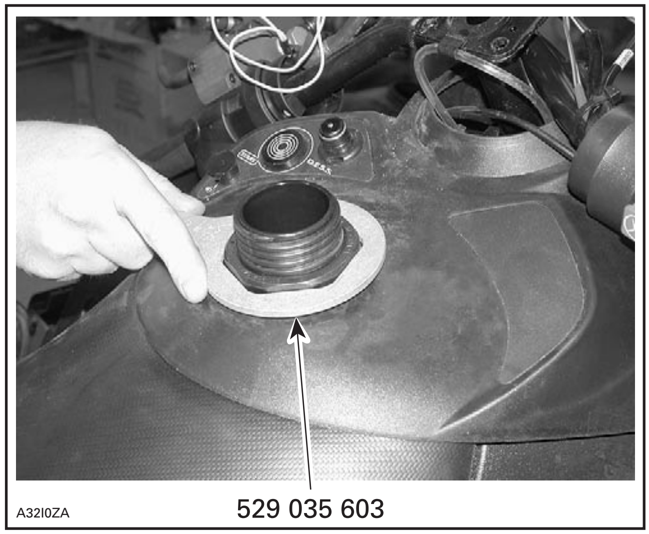
Removal

Open hood. Connect VCK (P/N 529 035 981). Use B.U.D.S. to release fuel pressure.

Drain fuel tank as much as possible.

Remove steering pad. Unbolt handlebar and move it forward.

Unscrew fuel tank nut using wrench (P/N 529 035 603).

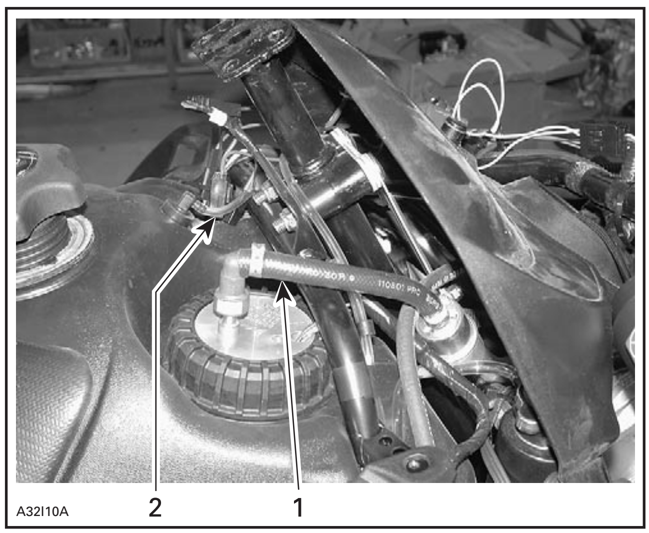


TYPICAL

Unbolt console, then move it forward.

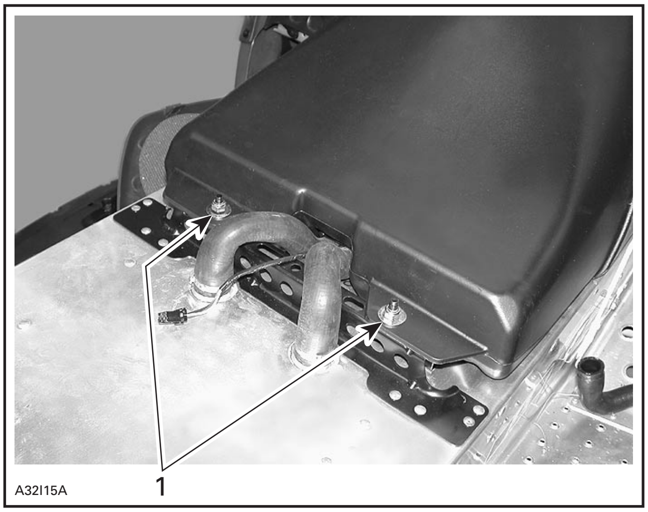
Disconnect fuel supply hose from fuel pump module.

Disconnect vent tube from vent elbow.



TYPICAL
1. Fuel supply hose
2. Vent tube

Remove seat. Unbolt fuel tank.

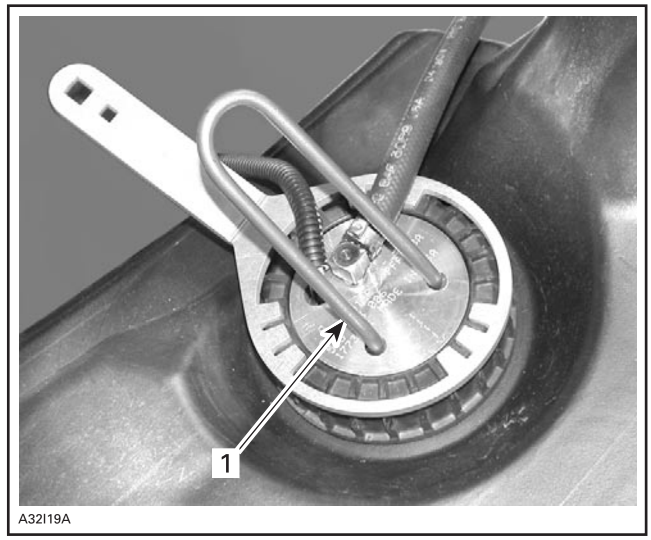


TYPICAL
1. Fuel tank retaining screws

Move fuel tank rearward, then unplug the fuel pump module electric connector.

With two screwdrivers or a bent rod holding the flange, unscrew fuel pump nut using fuel pump nut wrench (P/N 529 035 899).

TYPICAL



TYPICAL
1. Bent rod

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.

TYPICAL — FLOAT ASS'Y REMOVAL

Remove fuel pump module. Guide fuel pickups when pulling out fuel pickup hoses.

A32I13A

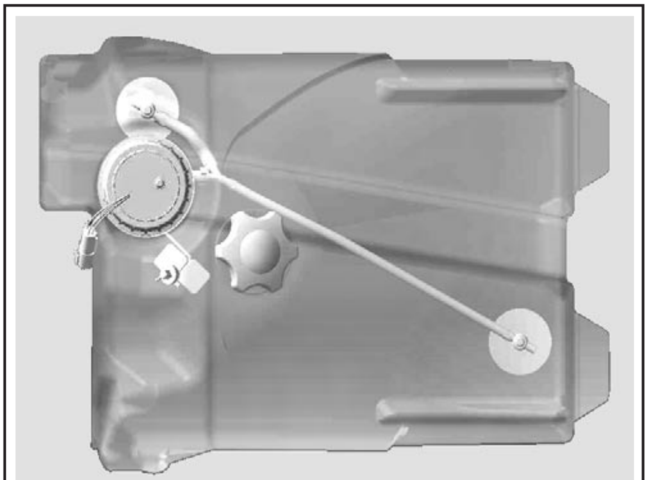
TYPICAL

Installation

For installation, reverse the removal process but pay attention to the following.

Install a new gasket.

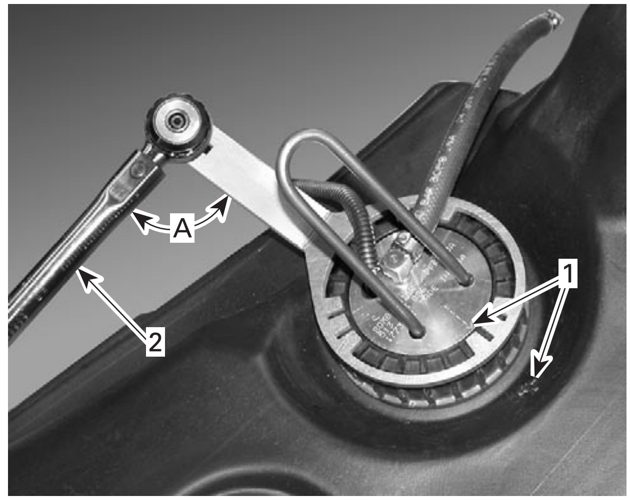
Make sure that rear pickup hose is positioned as following illustration.



A32I1AA

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).



A32I1BA

1. *Arrows aligned*
2. *Torque wrench*

A. 90°

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.

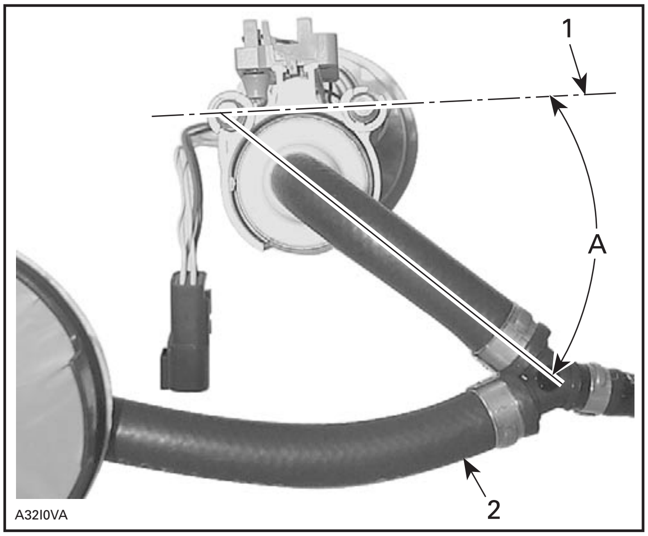
Stop the engine. The rear fuel pickup hose is now bled.

Fuel Hose Kit (P/N 861 302 300)

Remove fuel pump module as explained above.

Unfasten blue hose clamp retaining old fuel hose ass’y to pump inlet nipple. Remove old fuel hose ass’y.

Install fuel hose ass’y to pump at an angle of 46 ± 3° from retaining rods axis.



1. Retaining rods axis
2. Fuel hose ass'y
A. 46 ± 3°

Install a new blue hose clamp on fuel hose ass'y.

Install a new gasket, then reinstall fuel pump module as explained above.

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.

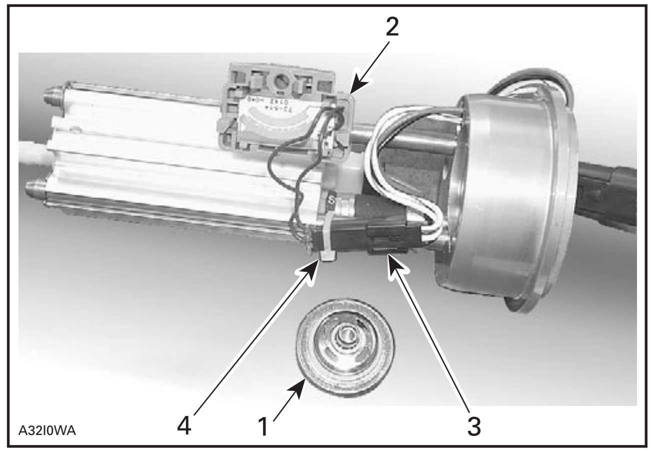
Loosen screw retaining lock plate. Slide lock plate out of aluminum extrusion.

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.



1. Fuel regulator removed
2. Resistor card ass'y ready to be installed
3. Connectors to be unplugged
4. Locking tie to be cut

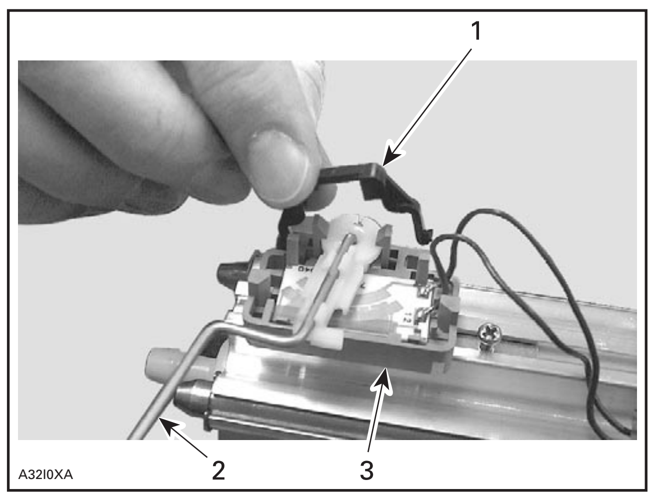
Install a new gasket, then reinstall fuel pump module as explained above.

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.



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.

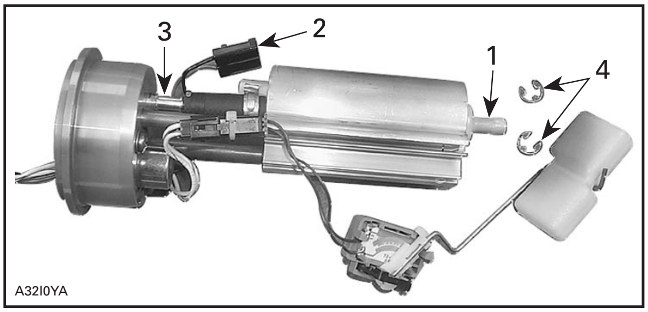
Disconnect fuel hose from pump inlet nipple.

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 RAILS

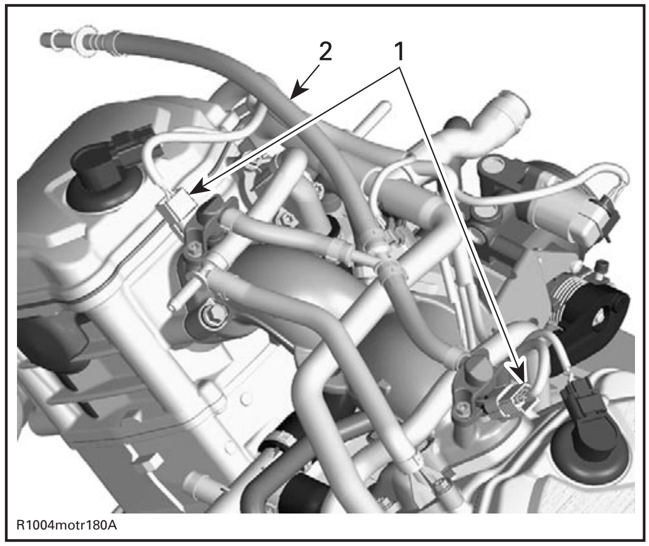
Pressure at fuel rails is supplied and controlled by the fuel pump module. Refer to FUEL PUMP for pressure test.

Fuel Rail Replacement

Removal

Release the fuel pressure in the system using B.U.D.S. Look in the **Activation** tab.

Wrap a rag around the hose end to prevent rail draining.



1. Fuel injector connectors
2. Fuel hose

Remove clamps and fuel hose from the fuel rails.

Disconnect wiring harness from the two fuel injectors.

Unscrew rail retaining screws.

Gently pull rail up by hand.

Pull rail out with fuel injector.

If necessary remove fuel injector 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.

Tightening torque of the rail retaining screws is 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.

FUEL INJECTORS

Leakage Test

To perform a leakage test, the injectors and fuel rails have to be removed from the engine.

NOTE: Do not detach injectors and fuel rails from the intake manifold. Remove complete intake manifold with installed fuel rails and injectors to perform this test.

Reconnect the fuel line and the wiring harness.

Place each injector in a clean bowl.

Install the tether cord cap on the DESS post and push start button, without cranking the engine, 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).

The leakage test is validated when performing the FUEL DELIVERY SYSTEM DIAGNOSTIC FLOW CHART elsewhere in this section.

Electrical 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 plug connector from the injector.

Install a temporary connector to the injector with wires long enough to make the connection outside the engine compartment 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.

Using B.U.D.S., activate injector while probing pin corresponding to the power for the injector (VIOLET/BLUE for injector 1 and VIOLET/GREEN for injector 2) and engine ground.

– If 12 V is read, check continuity of circuit as per following table. If it is good, try a new ECM.

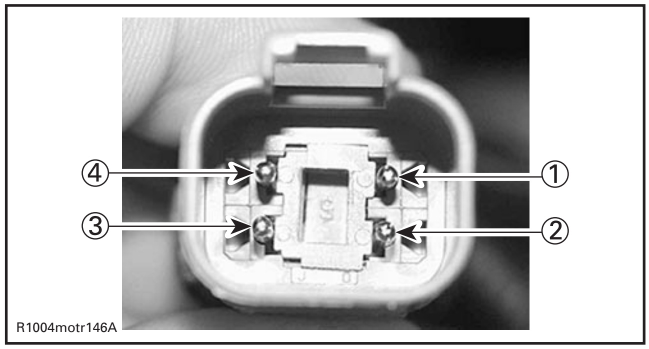
CIRCUIT NUMBER (ECM connector «A»)	INJECTOR NUMBER
DA-15	1
DA-33	2

– If it does not read 12 V, check continuity of circuit between pin 2 (of injector on harness side) and the corresponding fuse. If continuity is faulty, repair wiring harness.

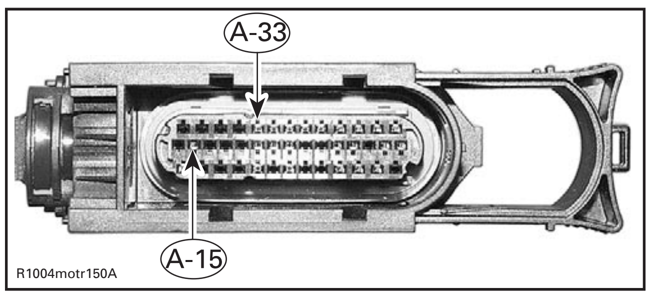
If not, check the resistance of the fuel injector circuit.

Reconnect the injector and disconnect the ECM connector DA from the ECM.

Using a multimeter, check resistance value between terminals as follows.



ENGINE CONNECTOR



ECM CONNECTOR

COMPONENT	CONTACT LOCATION
Fuel injector cylinder 1	1 (Engine Connector) and DA-15 (ECM Connector)
Fuel injector cylinder 2	2 (Engine Connector) and DA-33 (ECM Connector)

The resistance should be between 13.8 and 15.2 Ω.

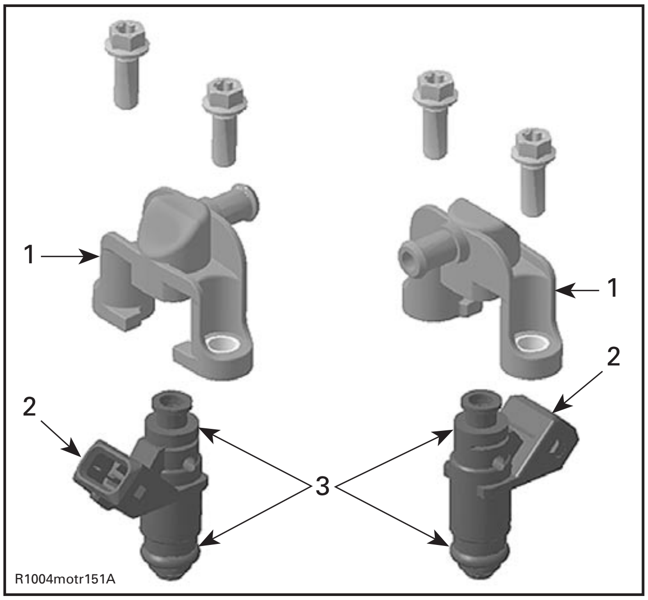
If resistance value is correct, try a new ECM. Refer to ECM REPLACEMENT procedures elsewhere in this section.

If resistance value is incorrect, repair the wiring harness/connectors or replace the wiring harness between ECM plug connector and fuel injector.

Fuel Injector Replacement

Removal

Before removing the injector, 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 rail*
2. *Fuel injector*
3. *O-ring*

The fuel injector can be easily pulled out of the fuel rail.

Installation

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

Install new O-rings, if you reinstall a used injector then insert the fuel injector in place with your hand. Do not use any tool.

NOTE: A thin film of engine oil should be applied to O-rings to ease insertion in rail.

Tightening torque of the rail retaining screws is 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 REPLACEMENT

General

Prior to replacing a possibly faulty ECM, ensure that all the recommendations in the general introduction of this section have been carried out.

IMPORTANT: When the ECM is replaced, the tether cord cap(s) and the Closed Throttle and Idle Actuator must be reprogrammed/reset. Refer to their specific section for adjustment.

To allow transferring the previous recorded information from the old ECM to the new one, use the vehicle communication kit (VCK) with the B.U.D.S. software. Use Replace ECM in the ECM menu. Follow instructions in its help system.

NOTE: If the old ECM still works, its information must be read by B.U.D.S. before being removed from the vehicle in order to transfer vehicle information and history to the new ECM.

ECM Replacement

Disconnect battery cables.

⚠ WARNING

Battery BLACK negative cable must always be disconnected first and connected last.

Disconnect both EMS ECM connectors from EMS ECM.

Unscrew all retaining screws and remove the ECM from vehicle.

Install the new ECM to the vehicle.

Reconnect ECM connectors to ECM, and then battery cables.

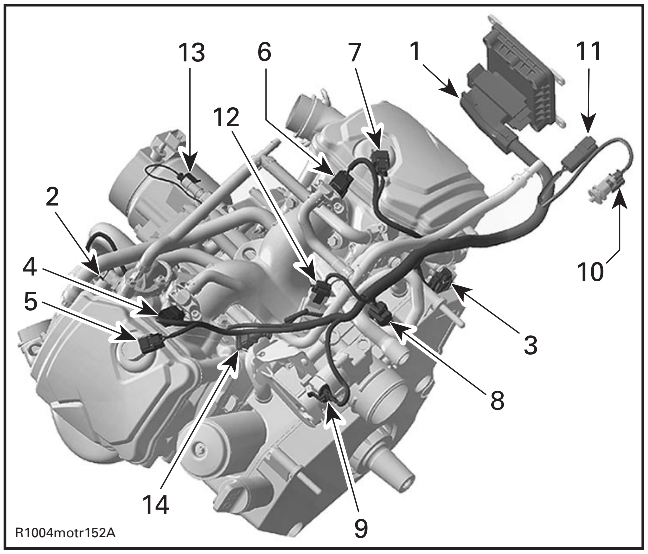
Transfer the data from the previous ECM to the new one using B.U.D.S. then proceed with the required resets and reprogram tether cord cap(s), if you were unable to transfer the data.

NOTE: If data cannot be transferred, manually enter information in Vehicle tab.

After performing the required resets, ensure to clear all faults from the newly replaced ECM.

Start the engine and increase engine speed above 5000 RPM to be sure no fault appears.

ENGINE WIRING HARNESS



1. *ECM connector A*
2. *CTS connector*
3. *CAPS connector*
4. *Fuel injector connector (cylinder 1)*
5. *Ignition coil connector (cylinder 1)*
6. *Fuel injector connector (cylinder 2)*
7. *Ignition coil connector (cylinder 2)*
8. *TPS connector*
9. *Idle bypass valve connector*
10. *ATS connector*
11. *Engine connector*
12. *MAPS connector*
13. *OPS connector*
14. *CPS connector*

Resistance Test

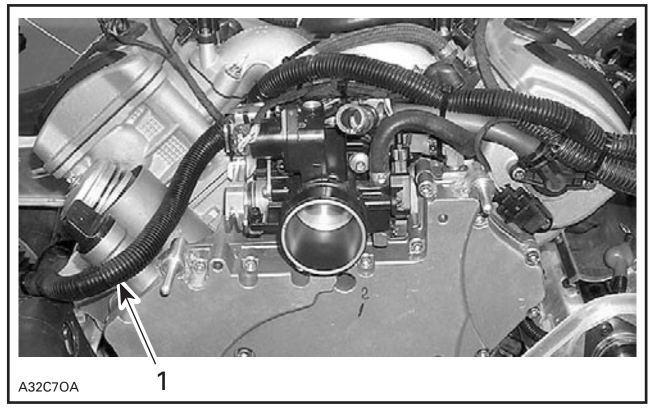
Check continuity of the circuits according to the wiring diagram in the WIRING DIAGRAMS section of this manual.

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 as diagnosed.

Removal

Cut the locking ties retaining vehicle harness to engine. Move the vehicle harness away from engine.

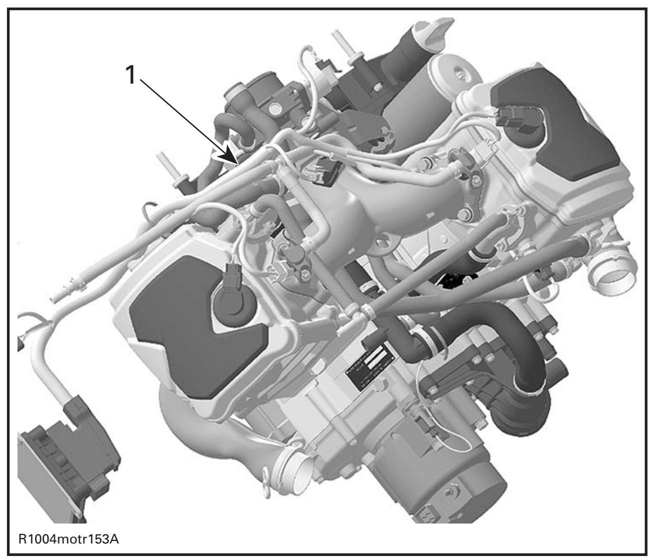


1. *Vehicle harness*

Disconnect the wiring harness from all sensors/ actuators.

Disconnect the ECM connector A from the ECM.

Cut all locking ties which are holding the wiring harness in position.



1. *Wiring harness*

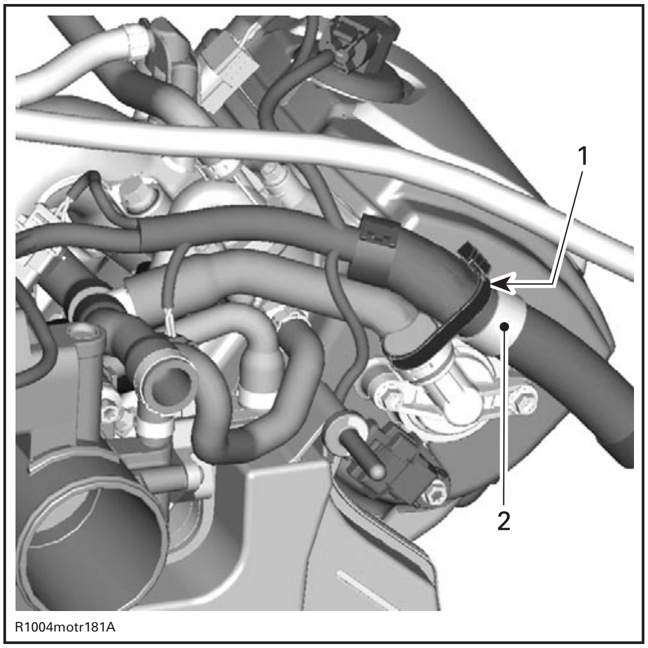
Remove complete wiring harness.

Installation

First connect the ECM connector DA to the ECM and the engine connector to the vehicle wiring harness.

Now attach the engine wiring harness with a locking tie to the breather hose.

NOTE: Wiring harness is marked with a green tape, where locking tie has to be installed.



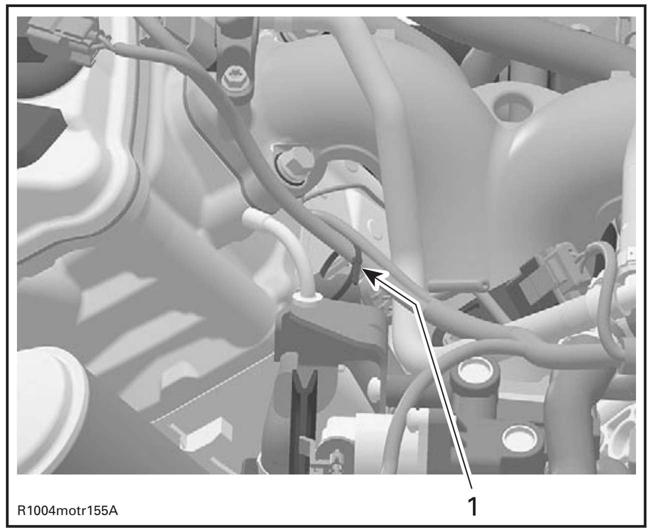
1. *Position of locking tie*
2. *Green mark (tape) on wiring harness*

Then connect CAPS. Ensure the cable is above the breather hose, then fasten it with a locking tie.

Connect injector and ignition coil of cylinder 2 to the wiring harness. Ensure that cables are underneath the fuel line.

Also connect the TPS, MAPS (grey connector) and the idle bypass valve to the wiring harness.

Then connect injector and ignition coil of cylinder 1 to the wiring harness. Attach the cable with locking tie on the throttle cable bracket.

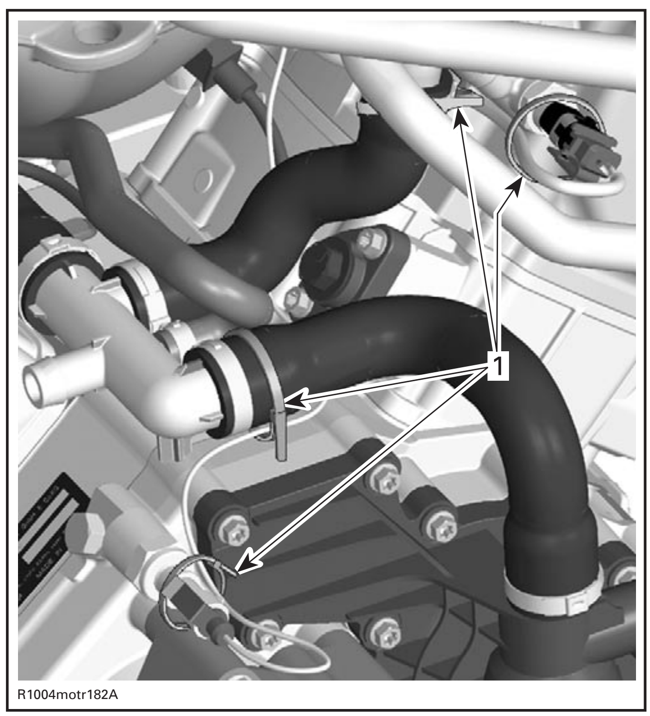


1. *Locking tie*

Connect the CPS, CTS and OPS to the wiring harness.

NOTE: Routing of the harness for CAPS, CTS and OPS has to be between the intake manifold and cylinder 1, underneath the water hoses.

Use locking ties to attach the cables for the CTS on the water hose and on the sensor itself then for the OPS on the T-fitting and on the sensor itself.



1. *Locking ties*

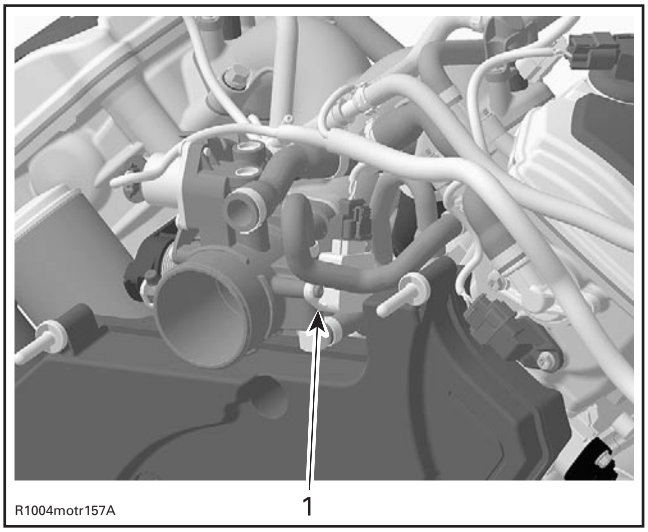
Install all remaining parts, which have been removed.

Do not forget to connect ATS connector to the ATS on the air intake silencer.

THROTTLE POSITION SENSOR (TPS)

General

The throttle position sensor (TPS) is a potentiometer that sends a signal to the ECM 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 EMS may generate several fault codes pertaining to the TPS. Refer to SYSTEM FAULT CODES in DIAGNOSTIC PROCEDURES section for more information.

Wear Test

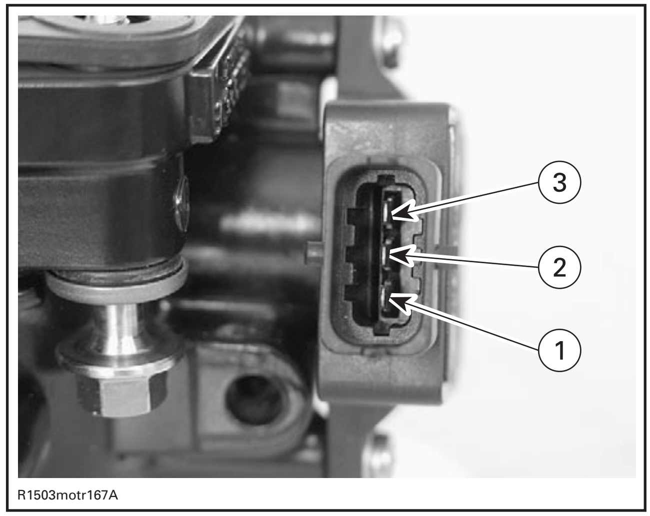
While engine is not running, activate throttle and pay attention for smooth operation without physical stops of the cable.

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 that the TPS needs to be replaced.

Voltage Test

Check the voltage output from ECM to the desired throttle position sensor.



TPS

Disconnect plug connector from throttle position sensor. To unlock connector, press the release tab. To see the connector pin-out, temporarily remove the connector shield joining the harness, to expose the pin numbers. Connect a voltmeter between pin 1 and 3 and also between pin 1 and 2 in the wiring harness.

Install the tether cord cap, then depress the cutout switch and push start button momentarily to activate the ECM.

Check the voltage readings as follows.

CONNECTION	VOLTAGE
Pin 1 with engine ground	0 V
Pin 2 with engine ground	5 V
Pin 3 with engine ground	4.75 - 5 V

NOTE: Make sure the engine is properly grounded.

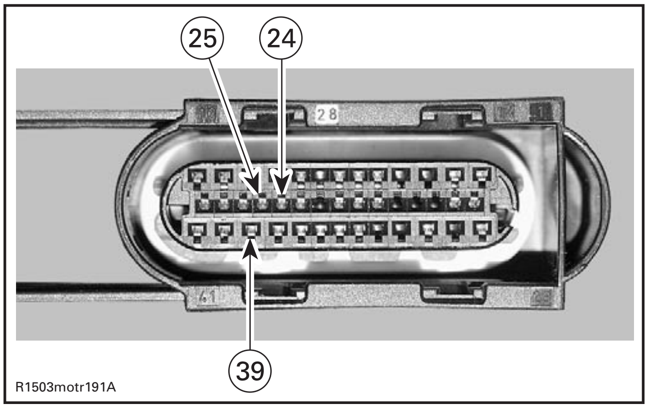
If voltage test is good, replace the TPS.

If voltage test is not good, check the resistance of the TPS circuit.

Resistance Test

Reconnect the TPS.

Disconnect the ECM connector DA from the ECM.



Using a multimeter, check resistance value between terminal DA-25 and DA-39.

The resistance should be 1600 - 2400 Ω.

Check the resistance between terminal DA-24 and terminal DA-39 with the throttle plate in **idle** position.

The resistance should be approximately 2500 Ω.

Check the resistance between terminal DA-24 and terminal DA-39 with the throttle plate in **wide open** position.

The resistance should be 1000 - 1100 Ω.

Check the resistance between terminal DA-24 and DA-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 pins DA-24 and DA-39, resistance **value decreases** while depressing throttle lever. when measuring between pins DA-24 and DA-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. Refer to ECM REPLACEMENT procedures elsewhere in this section.

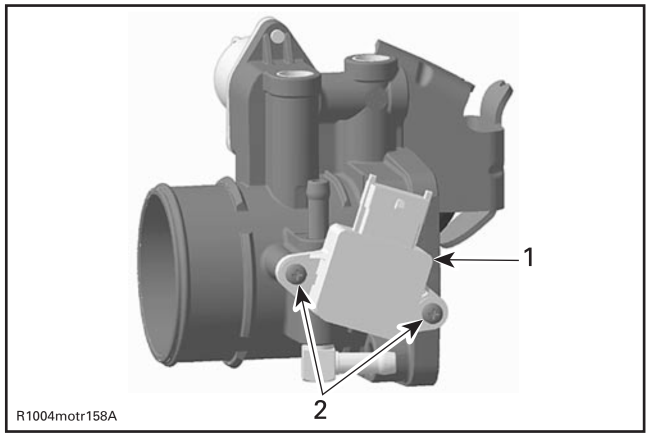
If resistance values are incorrect, repair connector or replace the wiring harness between ECM connector and the TPS.

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

Install the new TPS.

Apply Loctite 243 on the TPS retaining screws, then torque to 3 N•m (27 lbf•**in**).

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.

This reset is very important. The setting of the TPS will determine the basic parameters for all fuel mapping and several ECM 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) is loosened or removed or throttle body is replaced or ECM is replaced.

CAUTION: An improperly set TPS or idle bypass valve may lead to poor engine performance.

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.

Click on 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 takes care of that. If TPS is not within the allowed range while resetting the Closed Throttle and Idle Actuator, the ECM 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 the DIAGNOSTIC PROCEDURES section for more information.

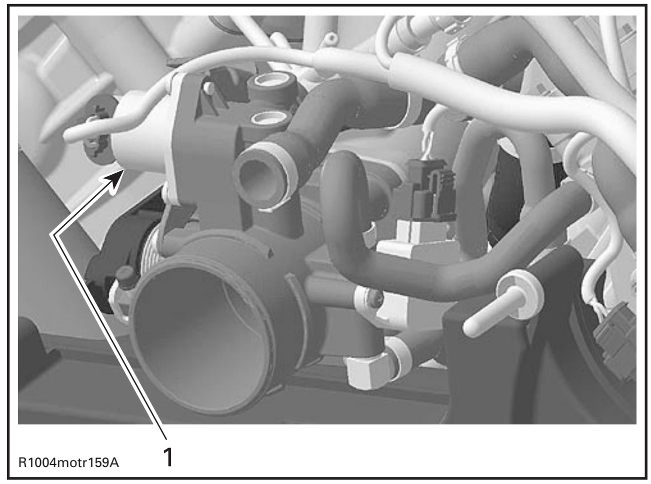
IDLE BYPASS VALVE

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.



1. *Idle bypass valve*

Check the resistance between pin A and pin D and also between pin C and pin 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

NOTE: Make sure the tether cord cap is removed during the following procedure.

Remove idle bypass valve from throttle body.

Check the piston and bypass channel for dirt/deposits which can cause a sticking piston.

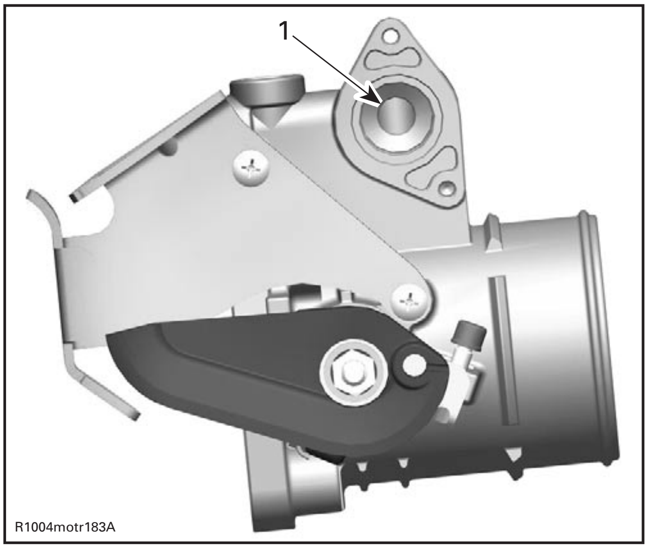
CAUTION: Always keep the tether cord cap disconnected, while the idle bypass valve is removed.

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 drive screw is very sensitive and may be destroyed.

Using a part cleaner, clean idle bypass in throttle body from contamination then use an air gun to dry it.

⚠ WARNING

Always wear eye protector. Chemicals can cause a rash break out and injure your eyes.

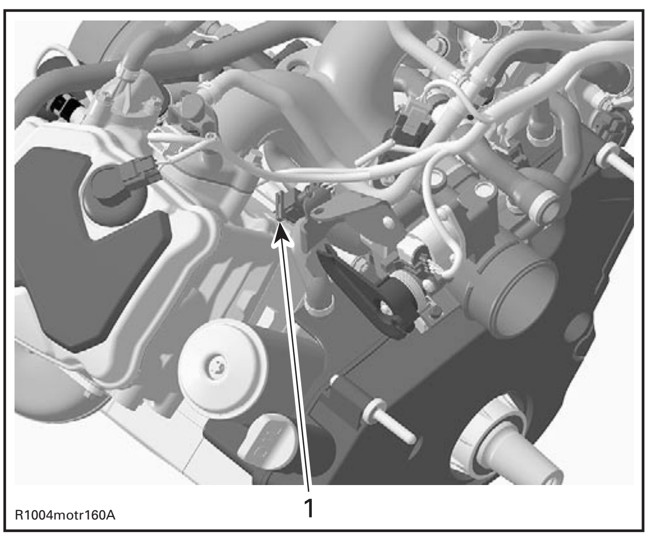


1. Clean bore from contamination

Clean all remaining 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

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 1 and 2 coming from CPS while cranking engine. Voltage should be within 1-2 Vac. Otherwise, inspect wiring and replace CPS if wiring is good.

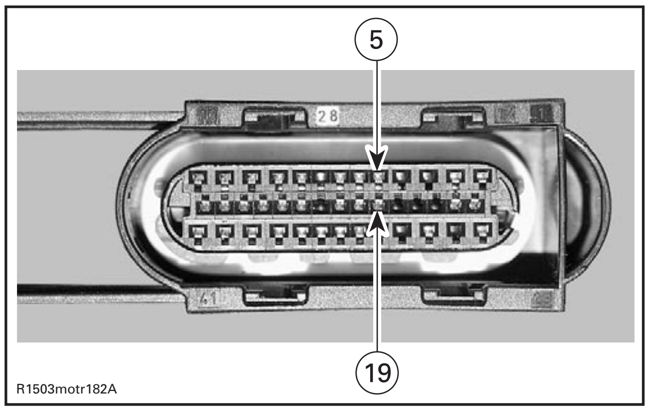
Resistance Test

Disconnect the CPS plug connector from the wiring harness and check the resistance of the sensor itself.

The resistance should be between 0.7 kΩ and 1.1 kΩ.

Otherwise, replace the CPS.

If resistance tests good, **reconnect** the CPS and disconnect the ECM connector DA on the ECM.



Using a multimeter, recheck resistance value between terminals 5 and 19.

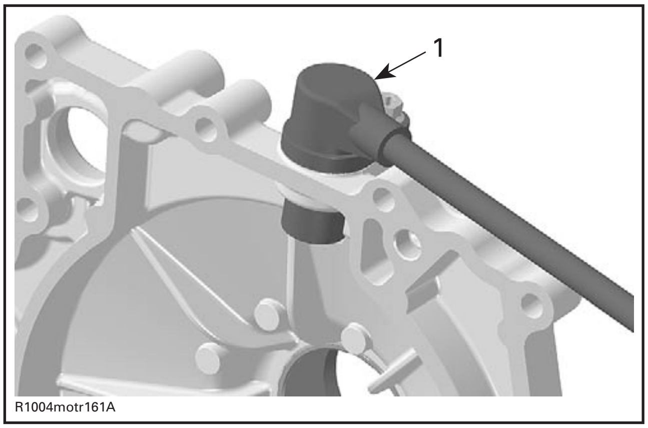
If resistance value is correct, try a new ECM. Refer to ECM REPLACEMENT procedures elsewhere in this section.

If resistance value is incorrect, repair the connectors or replace the wiring harness between ECM connector and the CPS.

Replacement

Disconnect CPS connector and remove the PTO cover. Refer to CRANKCASE subsection in ENGINE section.

Remove CPS.



1. CPS inside PTO cover

Install new CPS.

Tightening torque of the CPS retaining screws is 6 N•m (53 lbf•**in**).

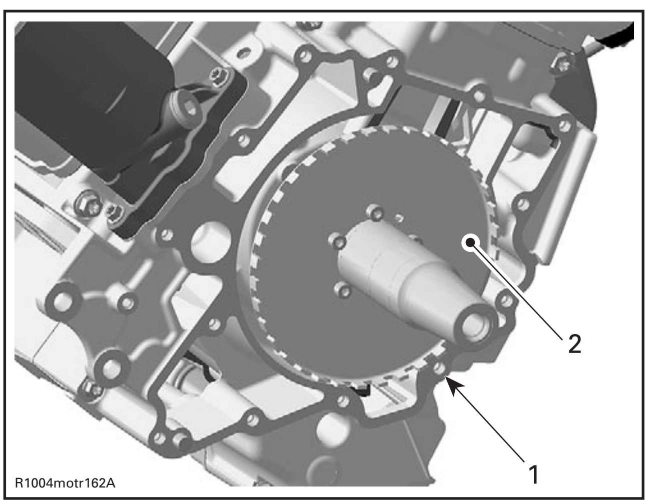
Reinstall remaining removed parts.

Trigger Wheel Inspection

Remove PTO cover. Refer to CRANKCASE subsection in ENGINE section.

Remove trigger wheel.

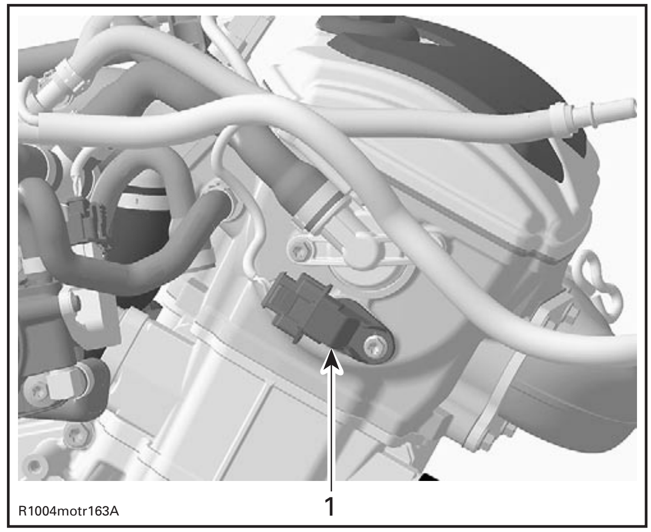
Perform visual inspection of the trigger wheel for bent teeth and also check the mating surface for straightness. If necessary, straighten the teeth or replace the trigger wheel.



1. Trigger wheel
2. Mating surface

Properly reinstall trigger wheel and cover.

CAMSHAFT POSITION SENSOR (CAPS)



1. CAPS

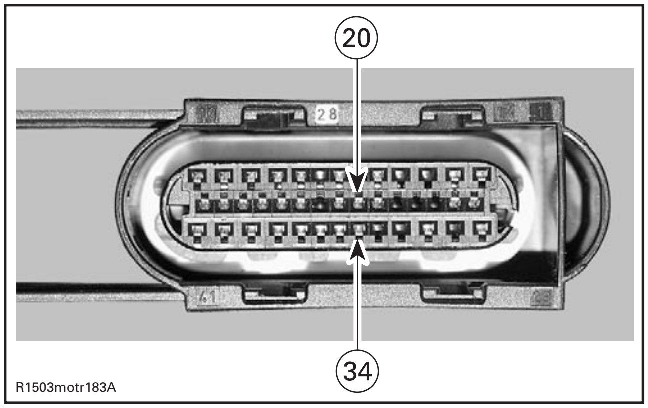
Voltage Test (harness)

Disconnect the connector from the CAPS.

Install the tether cord cap, then depress the cut-out switch and push start button momentarily to activate the ECM.

Probe pin 3 of CAPS connector (wiring harness side) and battery ground.

– If 12 V is read, check continuity of circuits DA-20 and DA-34. If test is good, perform the CAPS voltage test as explained below. If CAPS tests good, try a new ECM.

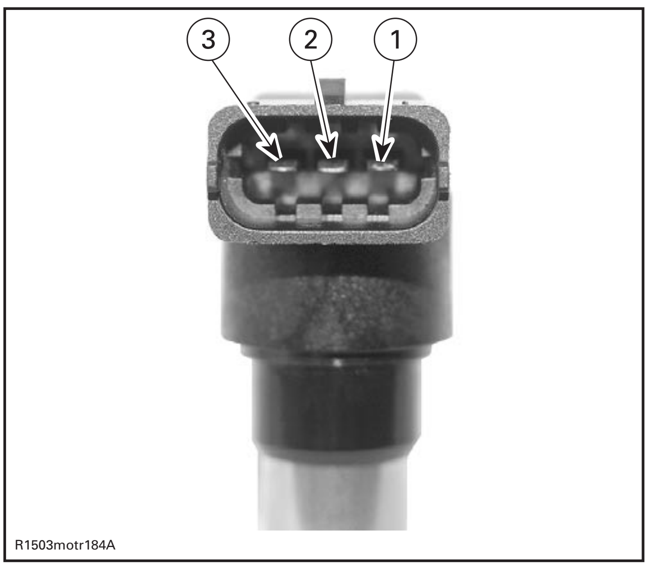


ECM CONNECTOR

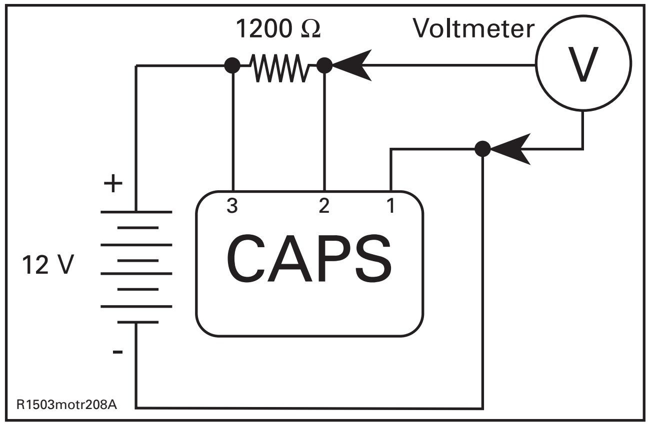
– If 12 V is not read, check continuity of circuit between pin 3 of CAPS connector and the corresponding fuse. Otherwise, repair wiring harness.

Remove the CAPS from the cylinder head.

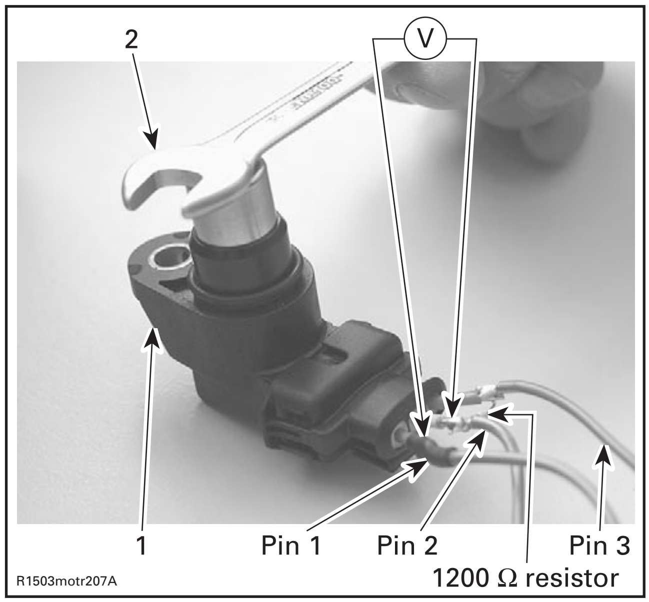
Set up the following electric circuit to perform the voltage test.



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

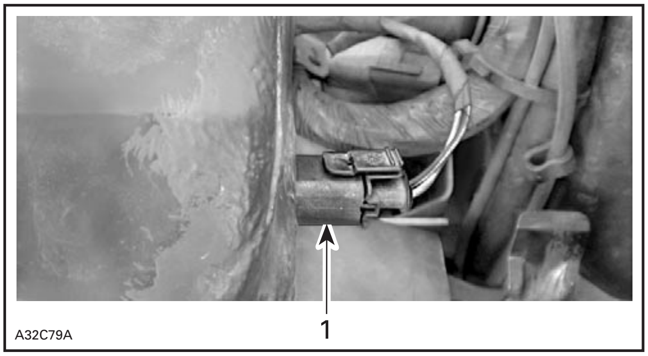
If the voltage is not good, replace the CAPS.

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**).

AIR TEMPERATURE SENSOR (ATS)



AIR SILENCER
1. Air temperature sensor (ATS)

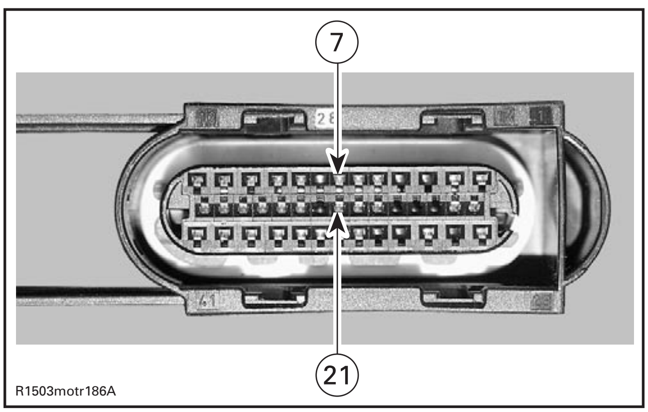
Resistance Test

Disconnect the plug connector from the ATS 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 ATS.

If resistance tests good, **reconnect** the ATS and disconnect the ECM connector DA on the ECM.



Using a multimeter, recheck resistance value between terminals 7 and 21.

If resistance value is correct, try a new ECM. Refer to ECM REPLACEMENT procedures elsewhere in this section.

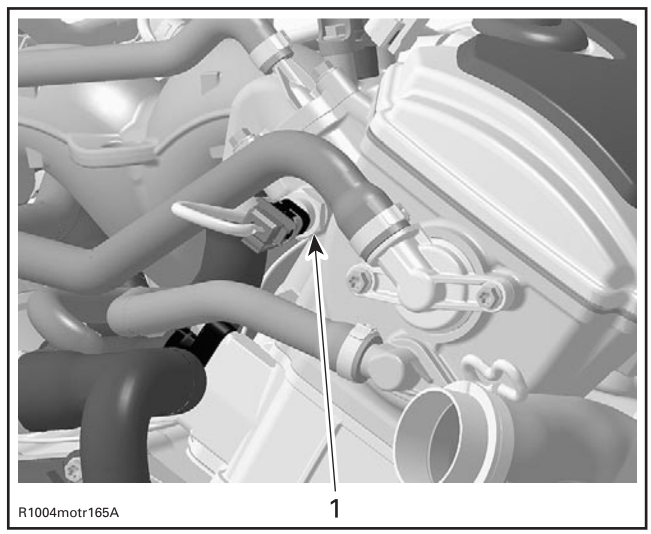
If resistance value is incorrect, repair the connectors or replace the wiring harness between ECM connector and the ATS.

Replacement

Disconnect the connector of the ATS.

Pull ATS out and install the new one.

COOLANT TEMPERATURE SENSOR (CTS)



1. Coolant temperature sensor (CTS)

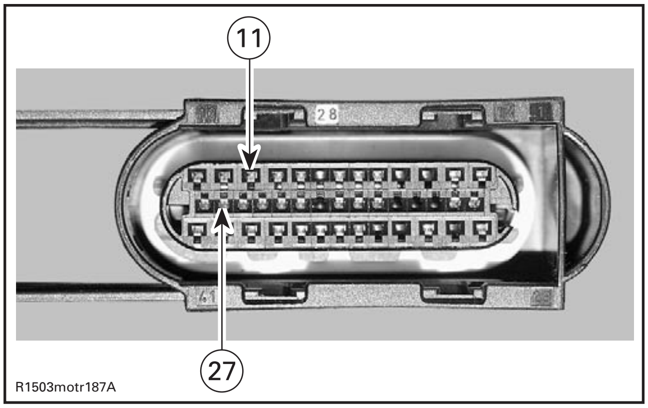
Resistance Test

Disconnect the plug 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 connector DA on the ECM.



Using a multimeter, recheck resistance value between terminals 11 and 27.

If resistance value is correct, try a new ECM. Refer to ECM REPLACEMENT procedures elsewhere in this section.

If resistance value is incorrect, repair the connectors or replace the wiring harness between ECM connector and the CTS.

Replacement

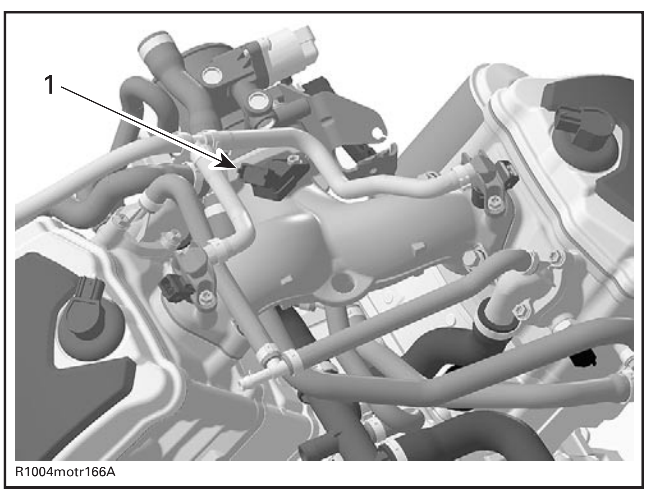
Disconnect CTS connector and remove CTS.

Install the new CTS and torque to 18 N•m (159 lbf•**in**).

Reinstall remaining removed parts.

Refill and bleed the cooling system, refer to COOLING SYSTEM subsection.

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. 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 to the manifold air pressure sensor (MAPS).

Disconnect plug connector from MAPS and connect a voltmeter between pin 1 and 2.

Install the tether cord cap, then depress the cut-out switch and push start button momentarily to activate the ECM.. The measure should be 5 Vdc on the voltmeter.

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 connector A on the ECM.

Using a multimeter, check continuity of circuits 12, 28 and 40.

If wiring harness is good, try a new ECM. Refer to ECM REPLACEMENT procedures elsewhere in this section.

Otherwise, repair the connectors or replace the wiring harness between ECM connector and the MAPS.

Verification Test

Using VCK, energize the MAPS from the MONITORING section and read out the proper pressure value while engine is stopped.

Perform the same test with a new MAPS and compare both readings.

Values have to be within ± 3.4 kPa (0.5 PSI).

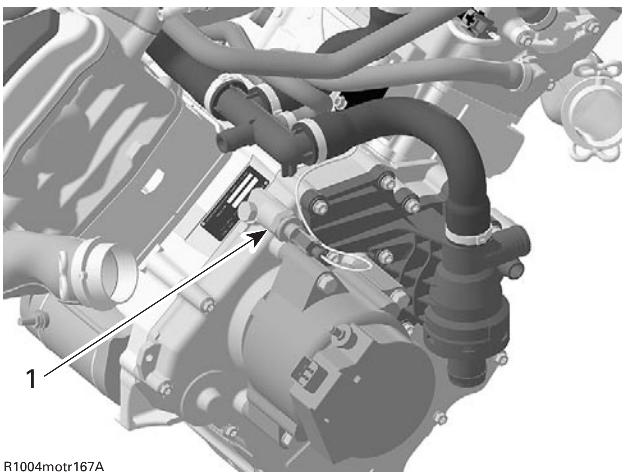
If old MAPS's value is out of this range, replace it.

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 6 N•m (53 lbf•**in**).

OIL PRESSURE SWITCH (OPS)



1. OPS

Oil Pressure Test

To check the function of the oil pressure switch, 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 plug connector from the OPS and use a multimeter to check the resistance between OPS pin and engine ground while engine is stopped (without oil pressure) and while engine is running (with oil pressure).

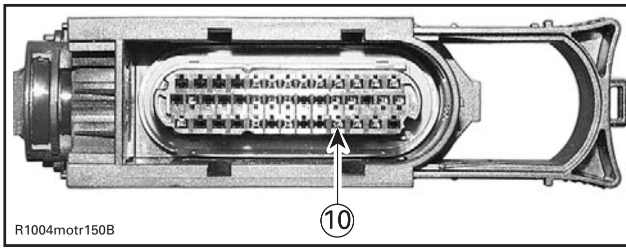
When engine is stopped the resistance is close to 0 Ω (normally close switch).

When engine is running and the oil pressure reaches 20 - 40 kPa (2.9 - 5.8 PSI), the resistance of the OPS is infinitely high .

If resistance values are incorrect, replace OPS.

If the values are correct, check the continuity of the wiring harness.

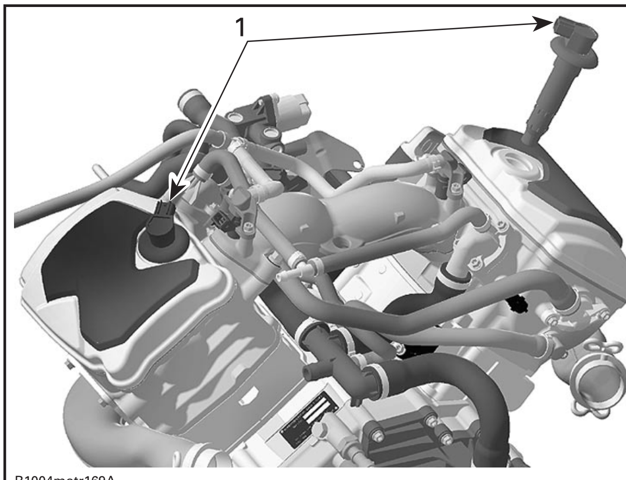
Disconnect the ECM connector DA from the ECM and check continuity of circuit 10.



If wiring harness is good, try a new ECM. Refer to ECM REPLACEMENT procedures elsewhere in this section.

Otherwise, repair the connector or replace the wiring harness between ECM connector and OPS.

IGNITION COILS



1. Ignition coil

NOTE: The ECM energizes the primary side of each ignition coil individually. A trouble code will appear if the ECM can not energize the ignition coils.

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 engine compartment. 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

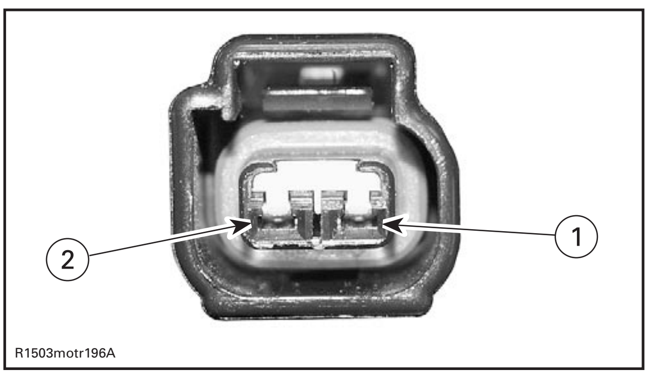
Never make a spark test with spark plug removed. Flammable vapors may be present in the engine compartment and ignited which could cause an explosion.

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 plug connector from the ignition coil and check the voltage supplied by the battery.



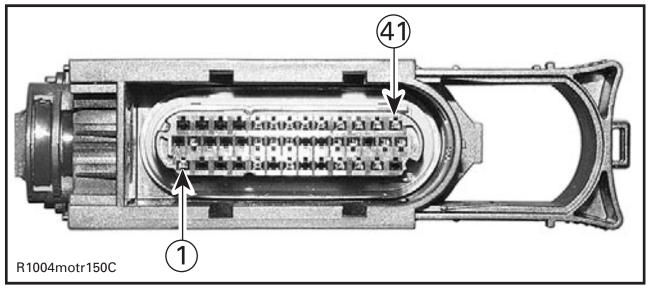
Install tether cord cap and connect the VCK (Vehicle Communication Kit) to activate the system.

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 between terminal 2 of ignition coil and the corresponding fuse. Otherwise, repair wiring harness.

If 12 V is read, disconnect the ECM connector A from the ECM and check the continuity of appropriate circuit 41 (cylinder 1) or 1 (cylinder 2).



ECM CONNECTOR

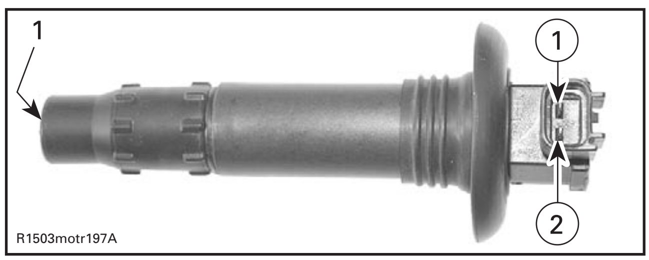
If wiring harness is defective, repair the connector or replace the wiring harness between ECM connector and the ignition coil.

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 may be damaged. To avoid damage, do not pry up ignition coil with a screwdriver.

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 pin 1 and pin 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 pin 1 and spark plug terminal.

The resistance should be between 9.2 and 13.8 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.

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 mixing up the cables since they are different in length.

ENGINE START SWITCH VERIFICATION

If the vehicle fails to wake-up or start while depressing start button check battery voltage and fuses F10 and F11. Connect supply cable (P/N 529 035 869) to wake-up the vehicle.

NOTE: Make sure the engine cut-out switch is not in operation.

A quick operation test can be done using the vehicle communication kit (VCK) with the B.U.D.S. software, using the **Monitoring** section. Press the start button and look at the start button LED. It should turn on, indicating the starting system is working on the input side of the starting system (start button, ECM and wiring). You know now the problem is on the output side of the starting system (ECM output signal to starting solenoid, wiring harness going to the solenoid and starter motor. Refer to STARTING SYSTEM for testing procedures). Otherwise, check the input side as follows.

Disconnect the two connectors of the steering harness.

Measure the resistance of the two wires on the small connector (BEIGE and BLACK) for 0 Ω. Depress start button and the reading should change from 0 Ω to infinitely high.

Release the start button and measure the resistance between pin 2 (BEIGE wire) of the small connector and pin 6 (RED/BROWN wire) on the big connector for infinitely high resistance to 0 Ω while the start button is depressed.

⚠ WARNING

Always respect the wire position when connecting the switch. Refer to the wiring diagram.

Test continuity of circuit B-17. If it is good, try a new ECM. Otherwise, repair harness/connectors.

Test continuity of circuit B-19. If it is good, try a new EMS ECM. Otherwise, repair harness/connectors.

DESS SWITCH VERIFICATION

If 2 short beeps are not heard when engine 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/GREEN and BLACK/WHITE 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 DESS post top terminal. Measure resistance, it must be close to 0 ohm.

Connect one test probe to the BLACK/GREEN 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 DESS post BLACK/GREEN and BLACK/WHITE 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 engine compartment and ignited by a spark which could cause an explosion.

Disconnect the wiring harness from the ignition coil.

Remove the ignition coil.

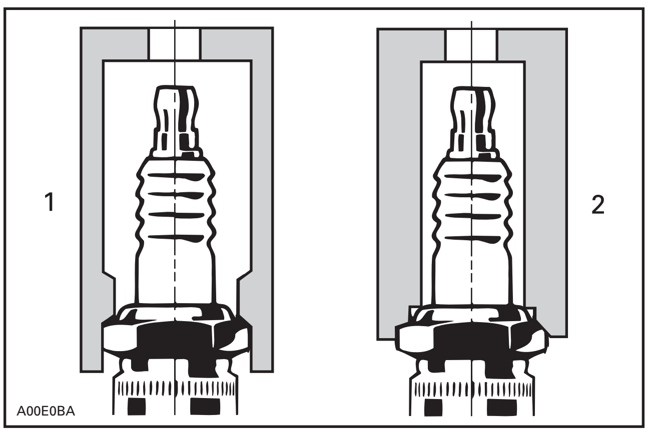
First unscrew the spark plug one turn.

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.

– Using a wire feeler gauge, set electrode gap according to the following chart.
– Apply anti-seize lubricant over the spark plug threads to prevent possible seizure.
– Hand screw spark plug into cylinder head. Then, tighten the spark plug clockwise an additional 1/4 turn with a proper socket.



TYPICAL
1. Proper socket
2. Improper socket

ENGINE	SPARK PLUG	TORQUE	GAP ± 0.05 mm (± .002 in)
1004 4-TEC	NGK DCPR8-E	Hand tighten + 1/4 turn with a socket	0.75 (.030)

CRANKING SYSTEM

See above for start switch and the DESS post testing. Refer to STARTING SYSTEM section for other tests.

DIAGNOSTIC PROCEDURE

GENERAL

Here is the basic order suggested to diagnose a suspected engine management or fuel injection related problem:

- Check the chart in the TROUBLESHOOTING section to have an overview of problems and suggested solutions.
- Check if the engine management system (EMS) pilot lamp lights up. If so, use the VCK (Vehicle Communication Kit) and look for fault codes to diagnose the trouble.
- Check all fuses.
- Check fuel pressure.
- Check spark plugs condition.
- Check all connections of the wiring harness.
- Refer to COMPONENT INSPECTION AND ADJUSTMENT section for procedures.

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 G2.1 or P2.1 or above.

B.U.D.S. (Bombardier Utility and Diagnostic Software) is designed to allow 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.

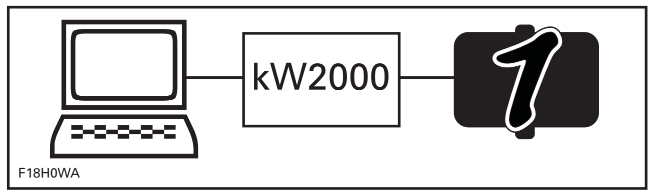
⚠ WARNING

If the computer you are using is connected to the 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.

IMPORTANT: When using the software B.U.D.S., with the **4-TEC engine**, ensure that the protocol "kW2000" is properly selected in **"MPI"** (multi-protocol interface) under **"Choose protocol"**.

When B.U.D.S. is connected to the vehicle, the status bar shows the protocol (kW2000) and the number 1 to the right. To communicate with the ECM (Engine Control Module), number 1 must be displayed.

Number 1 means that one module is connected.



ONE MODULE IS CONNECTED

If an "X" is shown, this means that no communication between the MPI and the ECM is possible. Possible causes are:

- ECM is not powered-up
- wrong protocol is used
- bad connection between MPI and module.

ECM Supply

To power-up the ECM, push the START button shortly while the engine cut-out switch is OFF and the tether cord cap installed on DESS post. If your intent is to program the vehicle key, use gray key (P/N 529 035 896) on DESS post.

The supply cable (P/N 529 035 869) may also be used. Connecting it between MPI and vehicle will power-up the ECM.

VCK Supply

The VCK (MPI box) can use the vehicle power for its supply. Four AA batteries or an AC/DC power supply can also be used. Make sure to respect MPI specification if a power supply is used.

Writing in ECM

When writing in ECM through B.U.D.S., there will be an “EMS Tracking” message that will say “Remove key from vehicle”. When this occurs, remove the tether cord cap from its post and wait until the message disappears (approximately 15 seconds after tether cord cap removal).

4-TEC SYSTEM FAULT CODES

General

The faults saved in the ECM (Engine Control Module) are kept even if the battery is disconnected.

IMPORTANT: After a problem has been solved, ensure to clear the fault(s) in the ECM using the VCK. This will properly reset the appropriate counter(s) and will also record that the problem has been fixed in the ECM 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

– Electrical noise is picked up by the ECM. Ensure that all connections are in good condition, also grounds (battery, ECM, engine and ignition system), they are clean and well tightened and that all electronic components are genuine — particularly in the ignition system. Installing non-resistive spark plugs may lead to generate fault code.
– Electrical noise might also lead engine to occasional cutout without generating a fault code when engine is restarted.
– If everything is in good condition, try a new ECM.

When using the service action suggested in the Fault section of B.U.D.S., the system circuits are referred to as DA-41, which means connector “DA” on the ECM and the circuit 41.

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.

4-TEC TPS FAULT TABLES

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 reveal a fault that is intermittent.

<table>
<tr><th>POSSIBLE CAUSES</th><th>RESULT</th><th>ACTION</th></tr>
<tr><td>Check if connector is disconnected from TPS</td><td>Yes</td><td>Fix.</td></tr>
<tr><td>Check if sensor is loose</td><td>Yes</td><td>Fix and reset Closed Throttle and Idle Actuator.</td></tr>
<tr><td>Inspect sensor for damage or corrosion</td><td>Yes</td><td>Replace and reset Closed Throttle and Idle Actuator.</td></tr>
<tr><td>Inspect wiring (voltage test)</td><td>Failed</td><td>Repair.</td></tr>
<tr><td>Inspect wiring and sensor (resistance test)</td><td rowspan="2">Failed</td><td>If bad wiring, repair.
If bad TPS, replace and reset Closed Throttle and Idle Actuator.</td></tr>
<tr><td>Test sensor operation (wear test)</td><td>Replace and reset Closed Throttle and Idle Actuator.</td></tr>
</table>

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**.
EMS ECM 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.
Idle bypass valve replaced but not reset	Yes	Reset **Closed Throttle and Idle Actuator** using B.U.D.S.

DRIVE BELT

APPLICATION CHART

MODEL	PART NUMBER	MINIMUM WIDTH (wear limit) mm (in)
All fan cooled models	415 060 600	32.30 (1–9/32)
All 593 HO/SDI engine equipped models	417 300 197	34.20 (1–11/32)
All 593 engine equipped models	414 860 700	32.50 (1–9/32)
All 693 engine equipped models	417 300 127	33.95 (1–11/32)
All 793 HO/SDI engine equipped models	417 300 166	35.3 (1–3/8)
All V-1004 engine equipped models	417 300 197	34.2 (1–11/32)

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 tether cord to your clothing. Stand aside of vehicle, then start engine.

⚠ WARNING

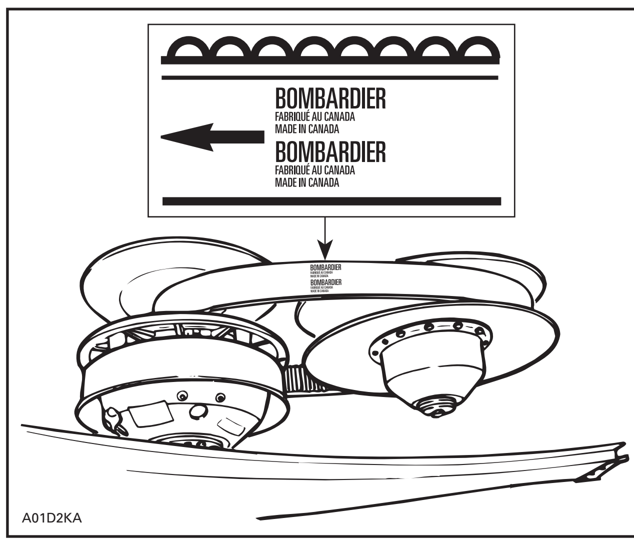
Do not sit on vehicle.

Release parking brake. Vehicle must not creep when engine is idling. Otherwise, make sure that:

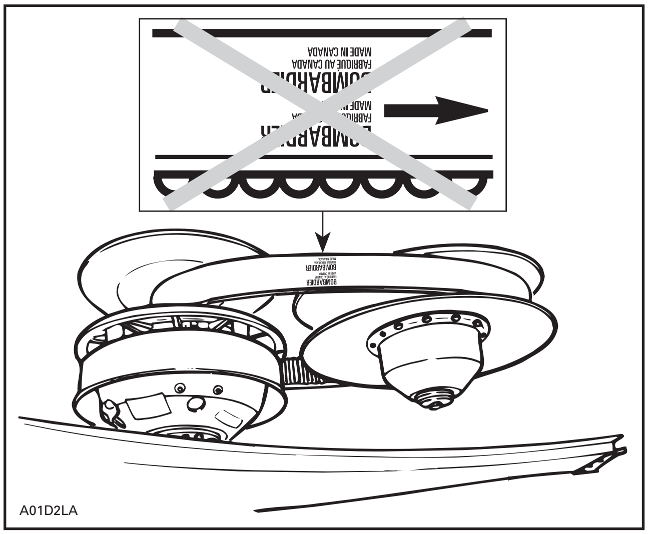
– idle speed is as specified
– proper belt is installed
– pulley center-to-center is as specified
– belt deflection is as specified.

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.

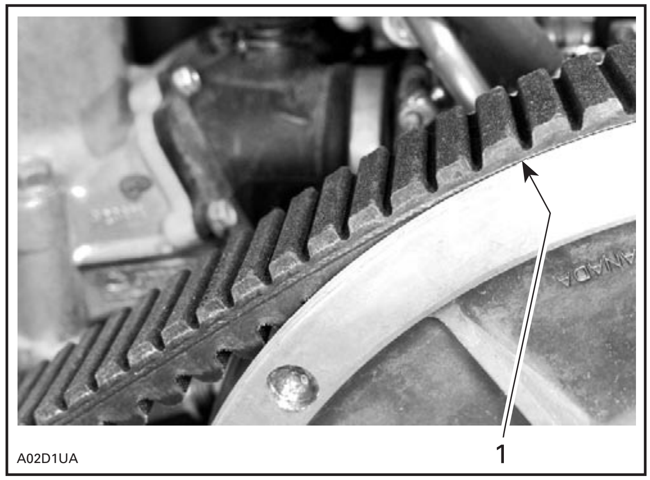
NOTE: To obtain an accurate drive belt height measurement, it is suggested to allow a break-in period of 50 km (30 miles).

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.

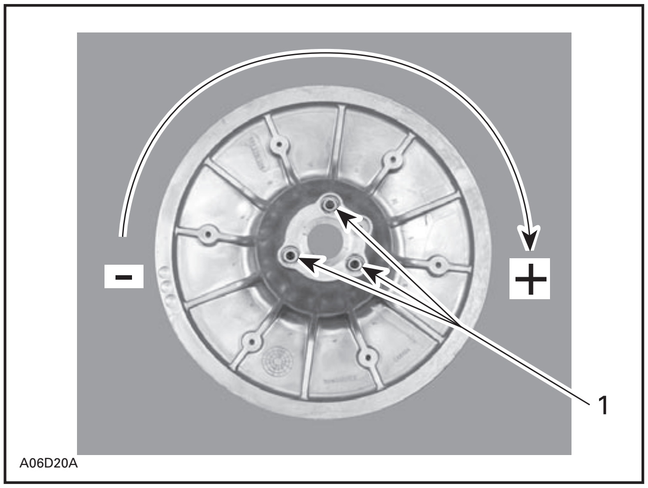
Models Equipped with Formula Type Driven Pulley

Adjust drive belt height using Allen screws, as shown.

To lower belt in driven pulley: turn Allen screws clockwise.

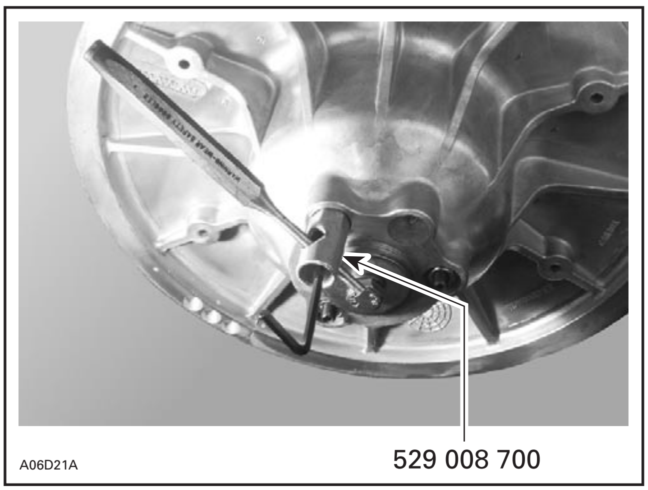
To raise belt in driven pulley: turn Allen screws counterclockwise.

NOTE: Turn Allen screws 1/4 turn at a time, then rotate driven pulley to allow drive belt to settle in pulley. Check height, repeat as required.



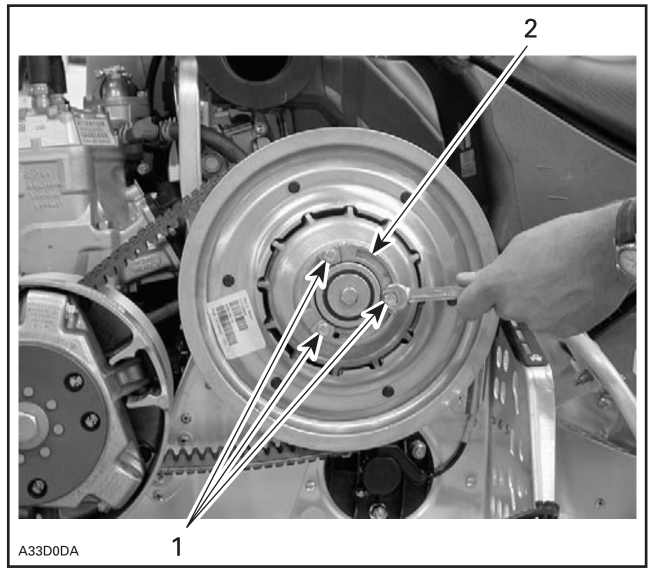
TYPICAL
1. Allen screws with jam nuts

Allen screws must be restrained while tightening jam nut to prevent throwing adjustment out. Use drive belt tension adjuster (P/N 529 008 700).



TYPICAL

Models Equipped with HPV Type Driven Pulley

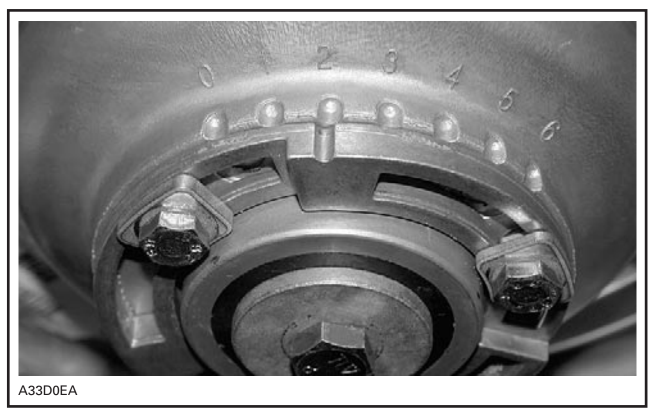


1. Screws
2. Adjustment ring

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 adjustment 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.

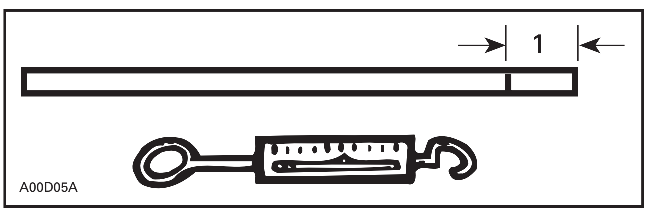
MODEL	DEFLECTION† mm (in)	FORCE kg (lb)
All models	32 ± 5 (1.260 ± .197)	11.5 (25)

†FOR REFERENCE ONLY

To Check Tension

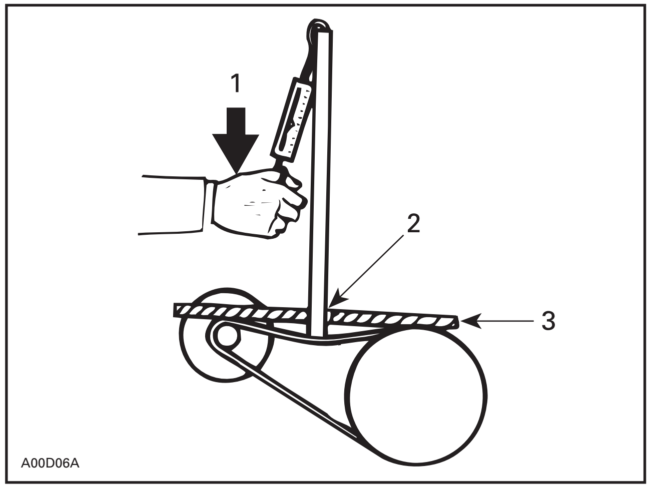
Position a reference rule on drive belt.

Wooden Stick and Spring Scale Method



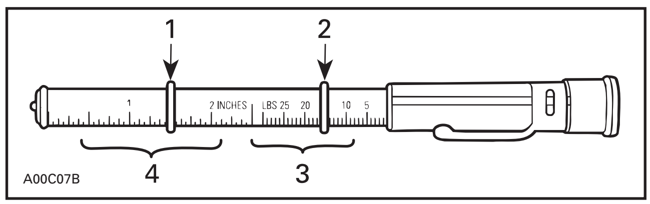
1. Mark specified deflection

Using spring scale and stick, apply specified force on drive belt halfway between pulleys as shown.



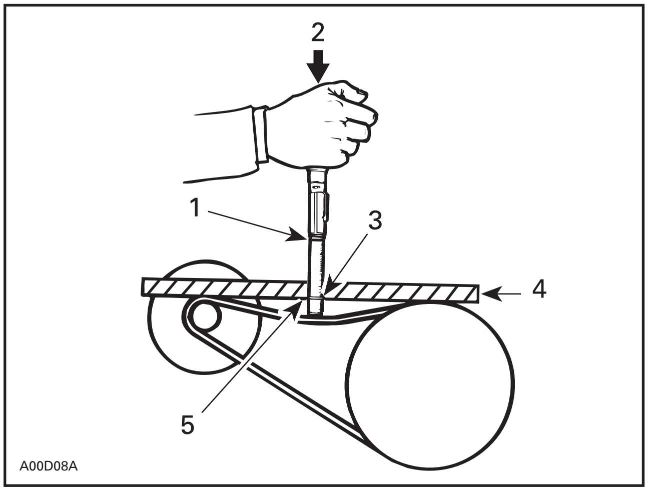
1. Force
2. Read deflection here
3. Reference rule

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.



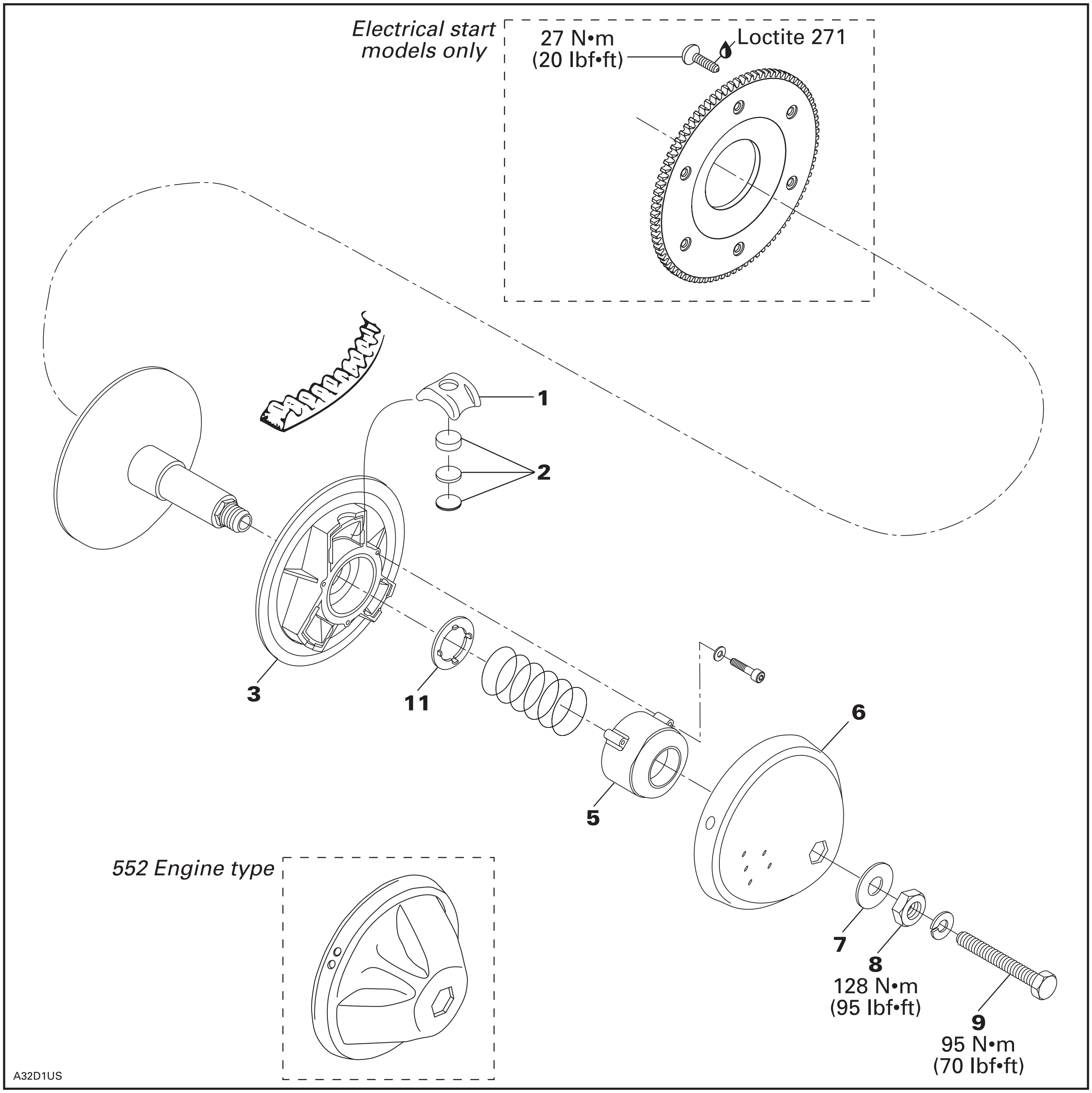
1. Upper O-ring — force
2. Force
3. Lower O-ring — deflection
4. Reference rule
5. Deflection

DRIVE PULLEY

BOMBARDIER LITE

NOTE: This is a lubrication free drive pulley.

377 and 552 Engines Equipped ZX Series Models



GENERAL

Some drive pulley components (return spring, calibration disk) 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 experience mechanics since they can greatly affect vehicle performance.**

⚠ 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

NOTE: If disassembling drive pulley, first straighten tab washer **no. 7** then untighten nut **no. 8**.

⚠ WARNING

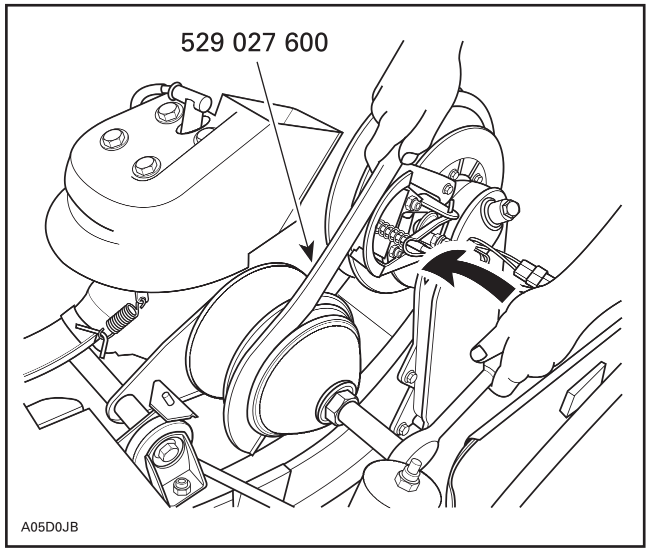
Never use an impact wrench to remove or install the drive pulley.

⚠ WARNING

The drive pulley assembly is a precisely balanced unit. Never replace parts with used parts from another drive pulley assembly.

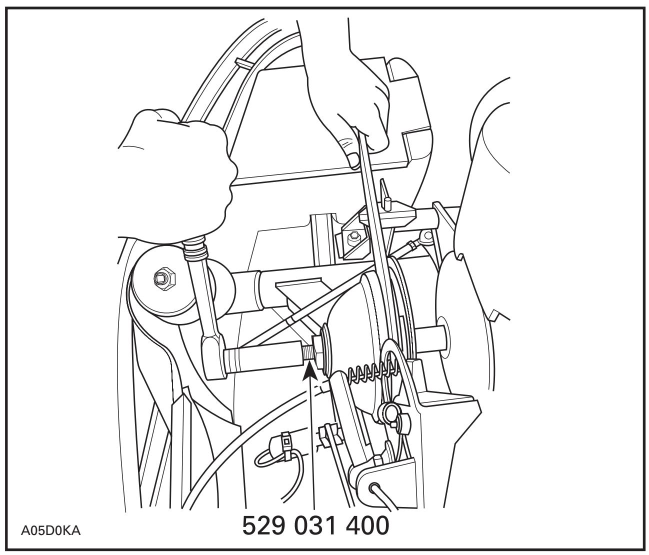
Use holder (P/N 529 027 600).

Remove retaining screw **no. 9**.



TYPICAL

Insert drive pulley puller (P/N 529 031 400) then remove drive pulley.

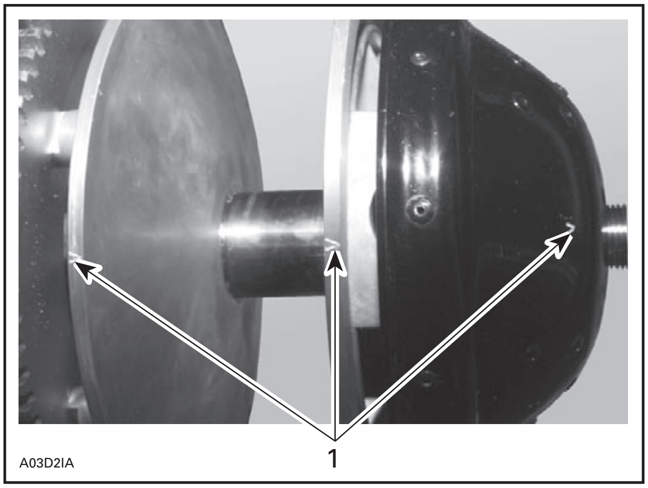


TYPICAL

DISASSEMBLY

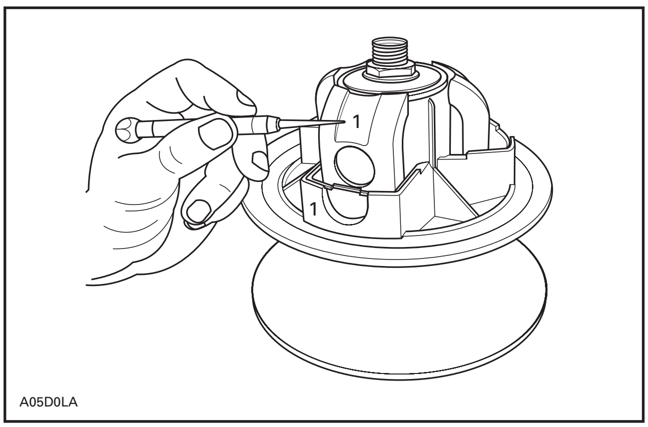
Unscrew nut. Remove tab washer.

Check for alignment marks for proper indexing at reassembly.



1. *Alignment marks*

Identify blocks **no. 1** and their respective positive positions for reassembly.

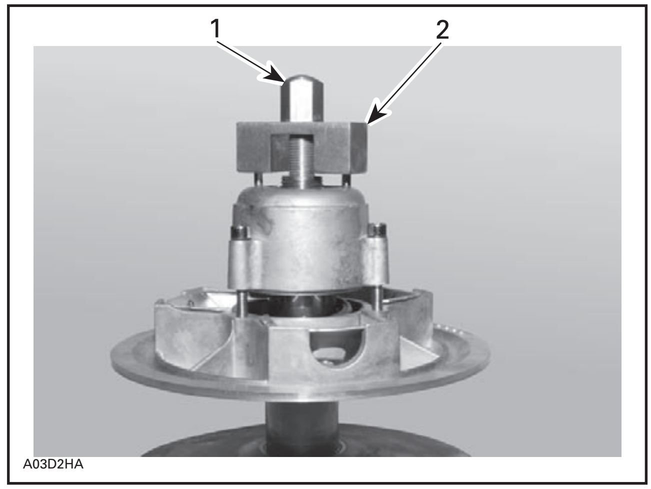


1. *Identify*

2, Cap, Washer and Disk

These are calibration parts. Refer to TECHNICAL DATA.

Install spring cover tool (P/N 529 027 300) with puller (P/N 529 031 400) on spring cover.



1. *Puller tool*
2. *Spring cover tool*

Screw puller (hand tight) to hold spring cover and remove screws holding spring cover.

Slowly unscrew puller to release spring pressure.

Remove spring cover no. 5, spring and spring seat **no. 11**.

CLEANING

Clean pulley faces and shaft with fine steel wool and clean dry cloth. Clean sliding half bushing with clean dry cloth.

INSPECTION

Check sliding half for excessive lateral play and fixed half shaft for scratches. Replace as required.

ASSEMBLY

Install spring seat **no. 11** then the spring and its cover **no. 5**.

Make sure to install blocks at their original position and with their curved end toward governor cup. See following illustration.

Tighten nut **no. 8** to 128 N•m (95 lbf•ft).

INSTALLATION

Torque screw to 80 to 100 N•m (59 to 74 lbf•ft).

Install drive belt and belt guard.

Raise and block the rear of the vehicle and support it with a mechanical stand.

⚠ WARNING

Make sure the track is free of particles that 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 90 to 100 N•m (66 to 74 lbf•ft).

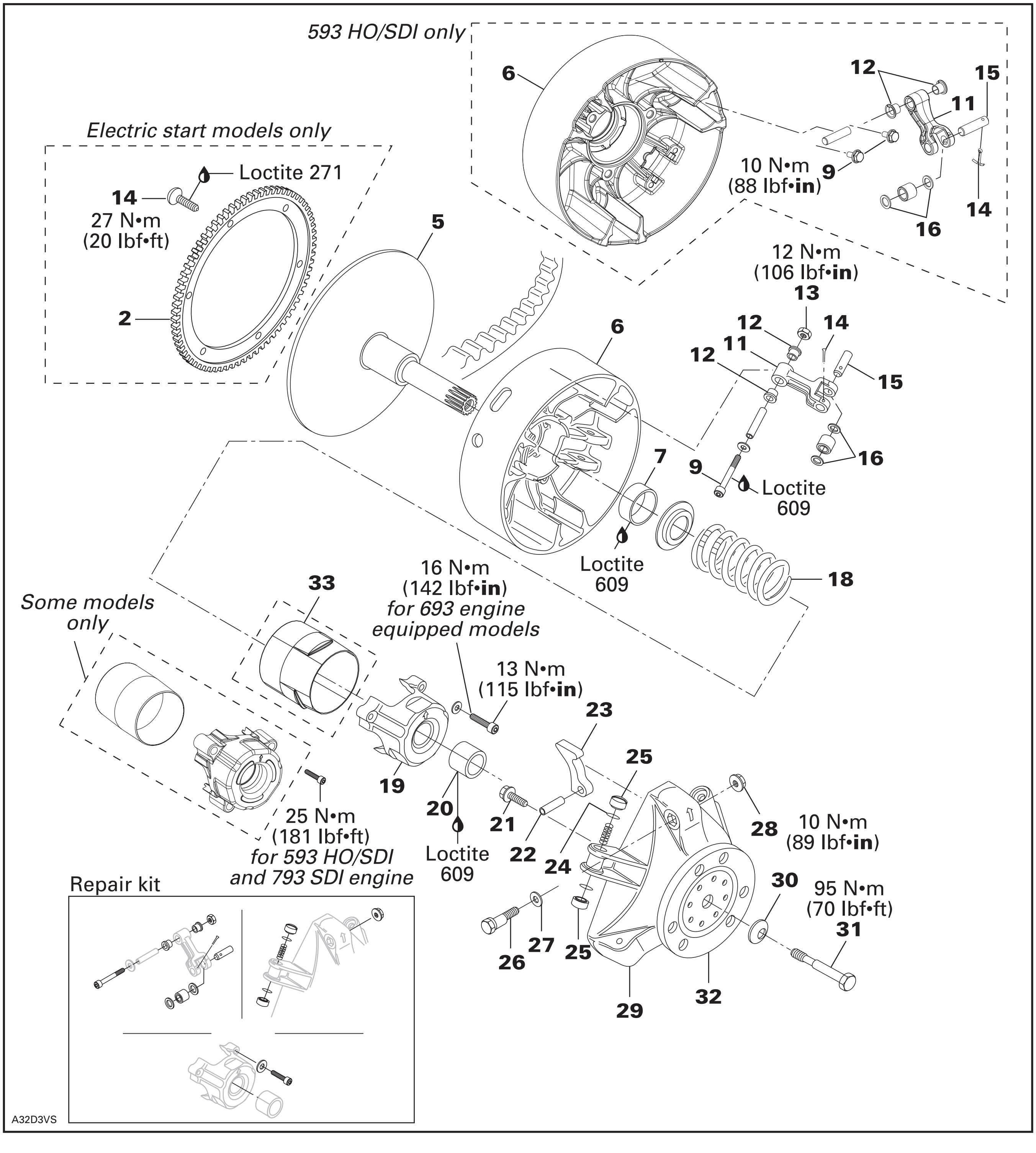
⚠ WARNING

After 10 hours of operation the transmission system of the vehicle must be inspected to ensure the retaining screw is properly torqued.

TRA AND TRA III

All Liquid Cooled ZX Models except 4-TEC Models

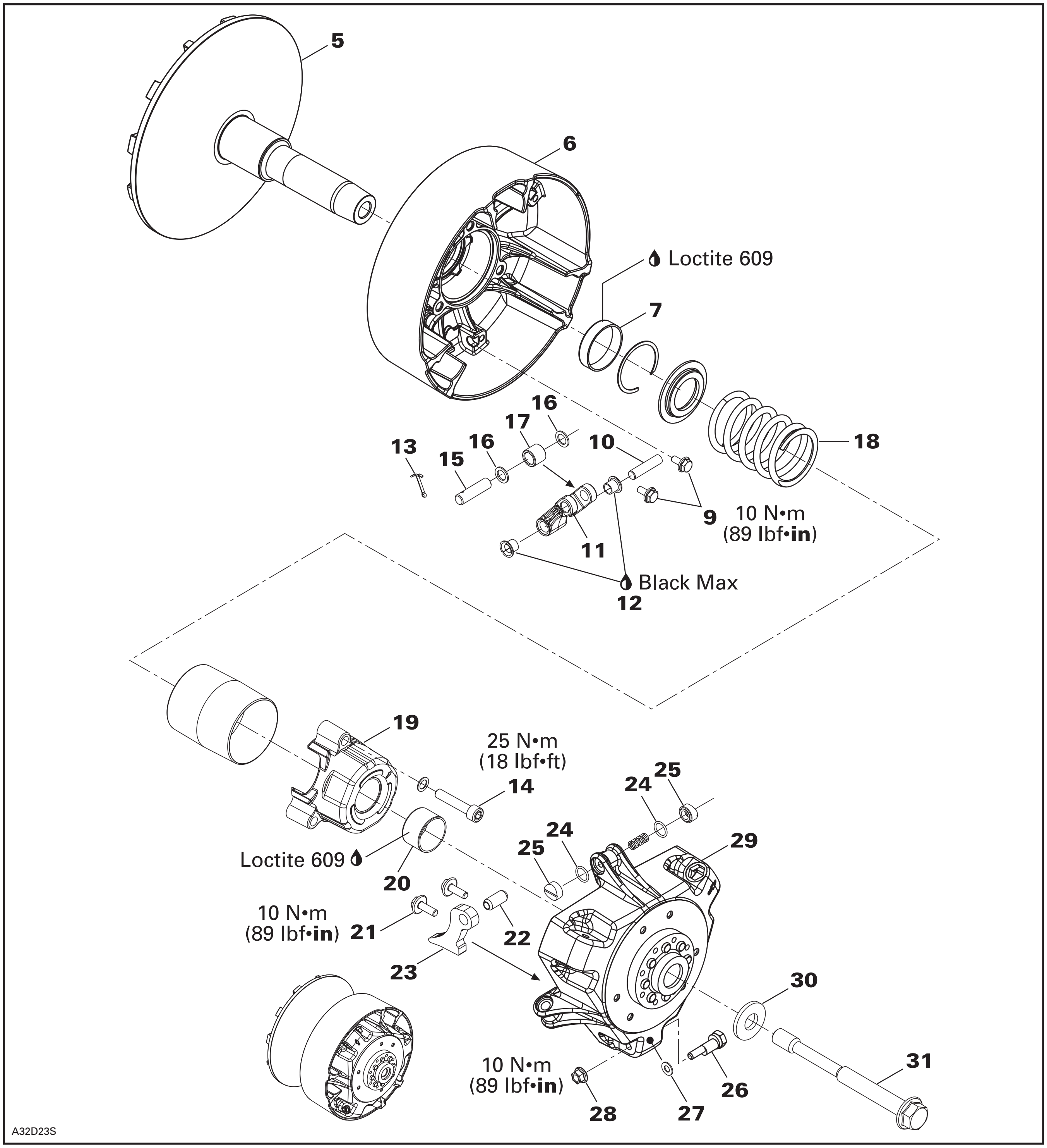
NOTE: These are lubrication free drive pulleys. Always refer to appropriate parts catalog for replacement part. Most parts of TRA III are not interchangeable with those of the TRA.



TRA IV

4-TEC Models

NOTE: This is a lubrication free drive pulleys. Always refer to appropriate parts catalog for replacement part. Most parts of TRA IV are not interchangeable with those of the TRA/TRA III.



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 stands for Total Range Adjustable drive pulley.

⚠ WARNING

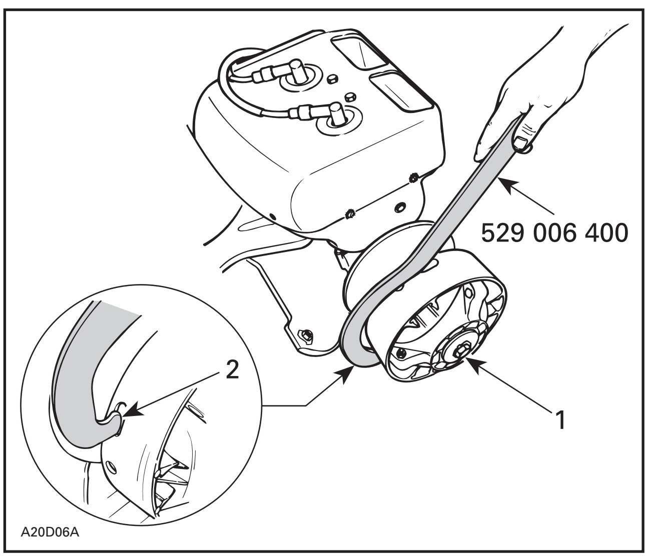
Any drive pulley repairs must be performed by an authorized Bombardier snowmobile dealer. Sub-component installation and assembly tolerances require strict adherence to procedures detailed.

REMOVAL

30,31, Conical Spring Washer and Screw

Models with TRA

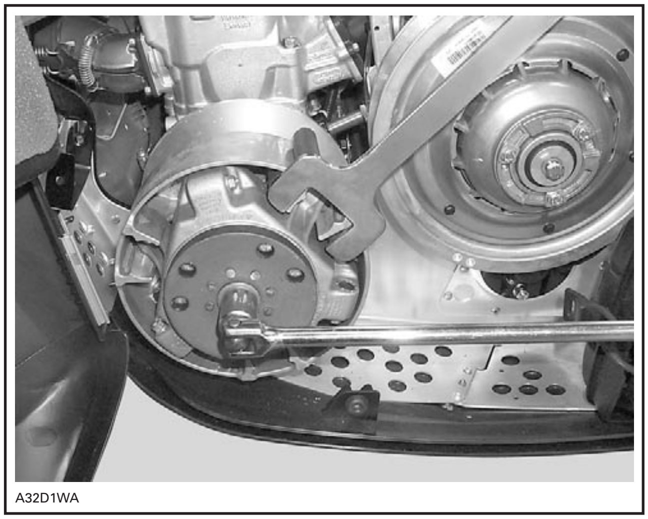
Use holder (P/N 529 006 400).



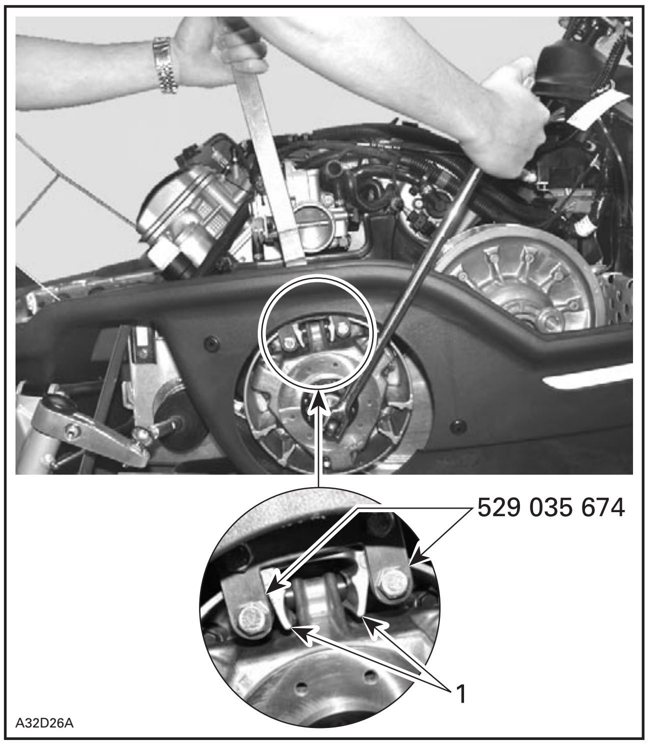
TYPICAL
1. Retaining screw
2. Insert in any slot

Models with TRA III and IV

Secure drive pulley retainer (P/N 529 035 674) over a sliding half tower.



TRA III — INSERT THE TOOL IN SLIDING FLANGE TOWER



1. TRA IV — 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 529 022 400).

CAUTION: These pulleys have 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 in pulley shaft then tighten.

DISASSEMBLY

Models with TRA and TRA III

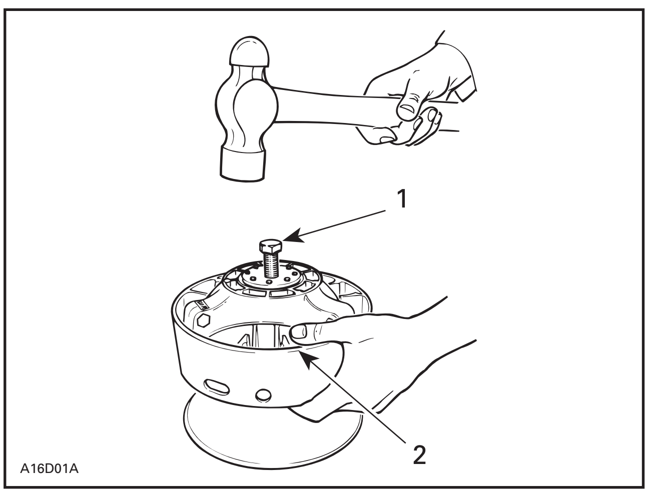
1,2, Screw and Ring Gear

CAUTION: Retaining screws must be heated before disassembly. Do not exceed 150°C (300°F).

5,6, Fixed and Sliding Halves

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.



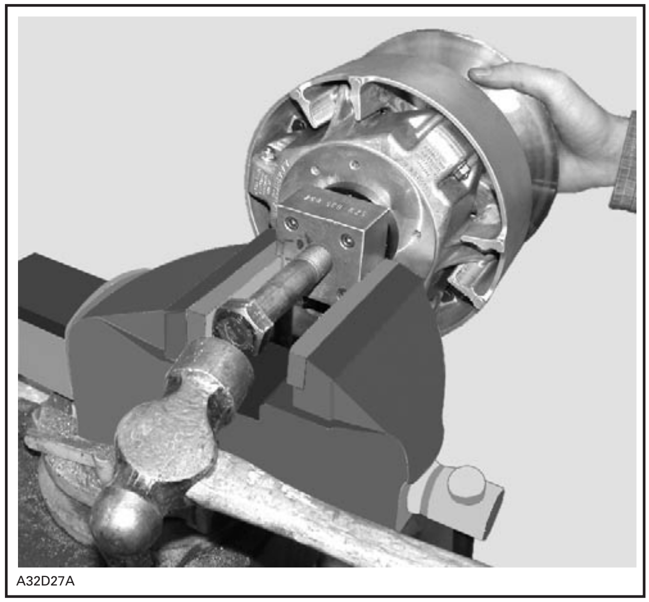
TYPICAL
1. Puller
2. Holding sliding half

Models with TRA IV

Install governor cup extractor (P/N 529 035 894) on governor cup. Tighten Allen screws in a criss-cross sequence.

Mount governor cup extractor in a vise.

Tighten extractor screw. Hold fixed half and slighty hammer on extractor screw head. Fixed half will come off.



All Models

NOTE: No components marking is required before disassembling this drive pulley since it has factory mark and arrows as indexing reference.

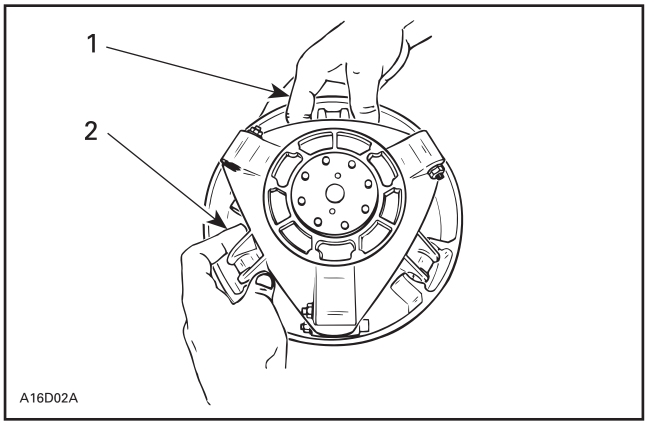
32, Cushion Drive

CAUTION: Do not disassemble cushion drive. Governor cup and cushion drive are factory balanced as an assembly.

25,29, Slider Shoe and Governor Cup

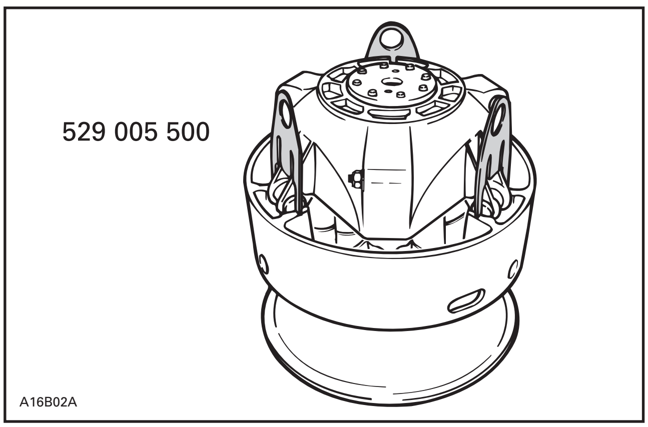
Carefully lift governor cup until slider shoes come at their highest position into guides.

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.



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.



19, Spring Cover Ass'y

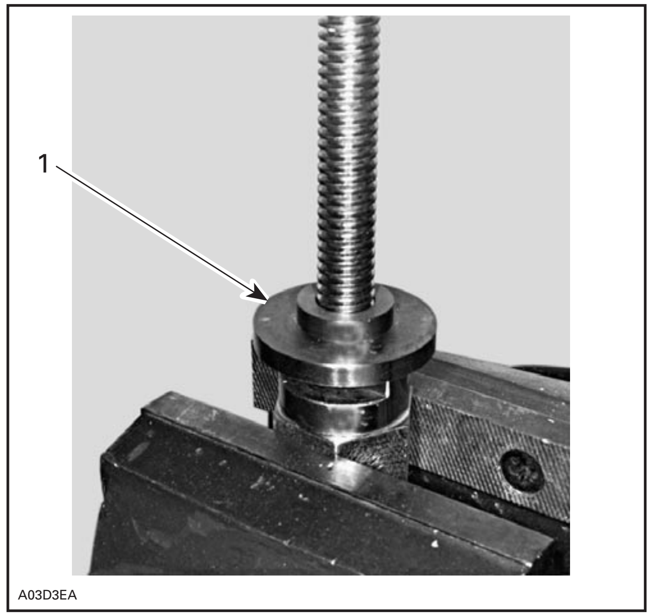
It is pushed by clutch spring pressure.

⚠ WARNING

Clutch spring is very strong. Never attempt to remove spring cover without the recommended tools.

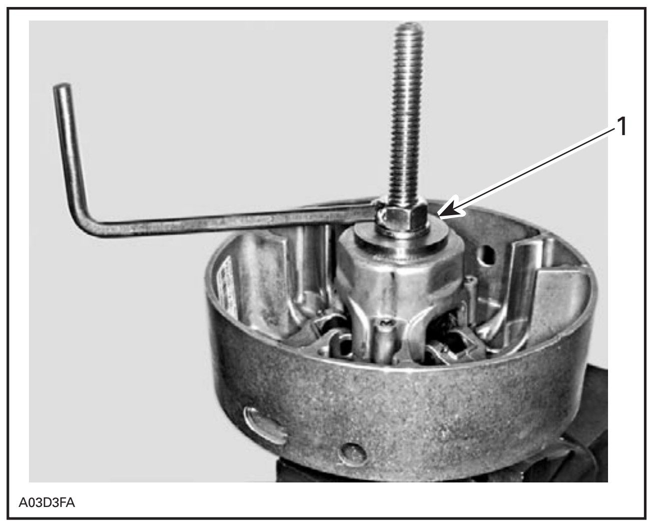
Use spring compressor (P/N 529 035 524).

Install support guide.



1. *Support guide*

Install sliding half then a second support guide. These support guides will prevent bushing damages.



1. *Support guide*

Remove 3 Allen screws retaining spring cover then unscrew compressor.

CLEANING

5,6, Fixed and Sliding Halves

Clean pulley halves and shaft with fine steel wool and 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 and the taper inside the fixed half of the drive pulley, crankshaft threads and retaining screw threads.

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 crankshaft and pulley 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.

9,12, Fitting Bolt Ass'y and Flanged 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.

5,29, Fixed Half and Governor Cup

Inspect splines and free play between both parts. Maximum free play is 0.5 mm (.020 in) measured at calibration screw radius. Replace if required.

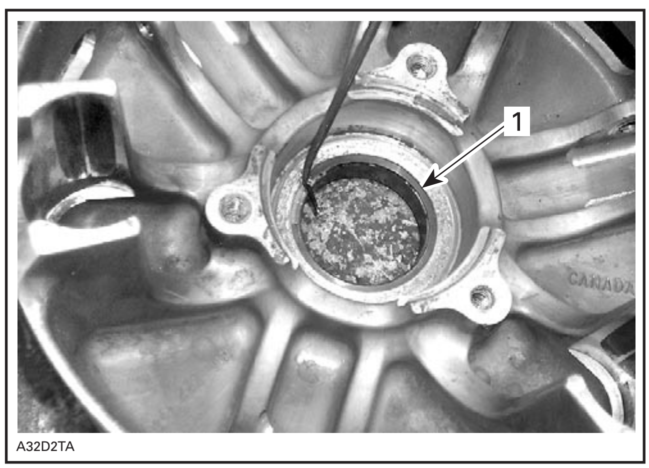
7,20, Sliding Half and Spring Cover Bushing

Visually inspect coating. Replace if worn.

Sliding Half Bushing Replacement

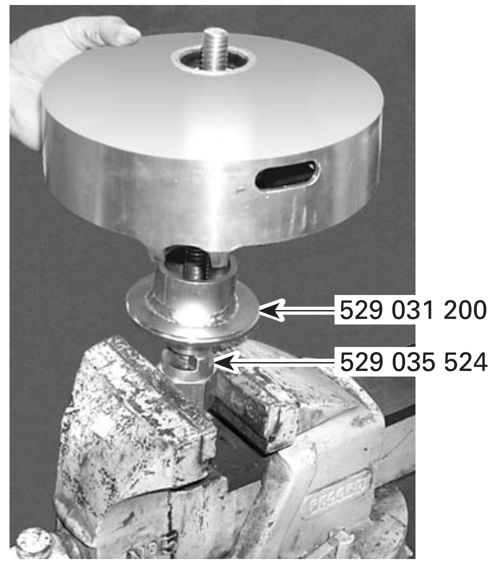
NOTE: In case of worn out bushing, it is advisable to replace whole sliding half ass'y as replacing just the bushing may reduce the drive pulley performance.

Remove circlip from the sliding half.



1. Circlip

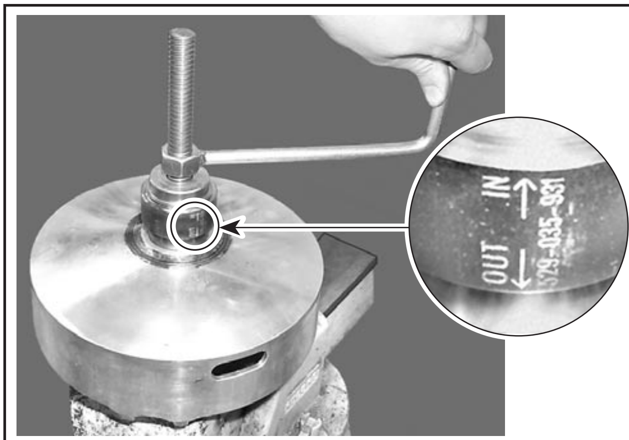
Secure the spring compressor (P/N 529 035 524) in a vise.Mount tool (P/N 529 031 200) and the sliding half ass'y on it.



A32D2UA

Use tool (P/N 529 035 931) to press out old bushing.

NOTE: Make sure to use the tool (P/N 529 035 931) as marked; to remove the bushing press using the side marked “OUT”, as shown below in the picture.



A32D2VA

Use a soft sand paper to clean sliding half bushing mounting surface.


A32D2WA

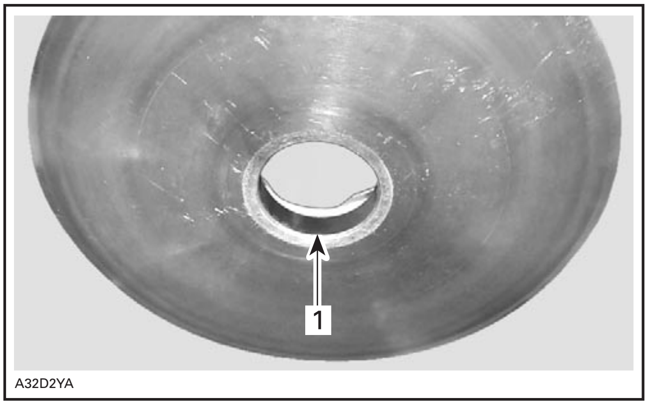
Clean sliding half bushing mounting surface with pulley flange cleaner (P/N 413 711 809).

To install a new bushing, secure the spring compressor (P/N 529 035 524) in a vise and mount the sliding half ass’y. Insert the bushing from inner side of sliding half ass’y.

Mount tool (P/N 529 035 931) with side marked “IN” to press in a new bushing.

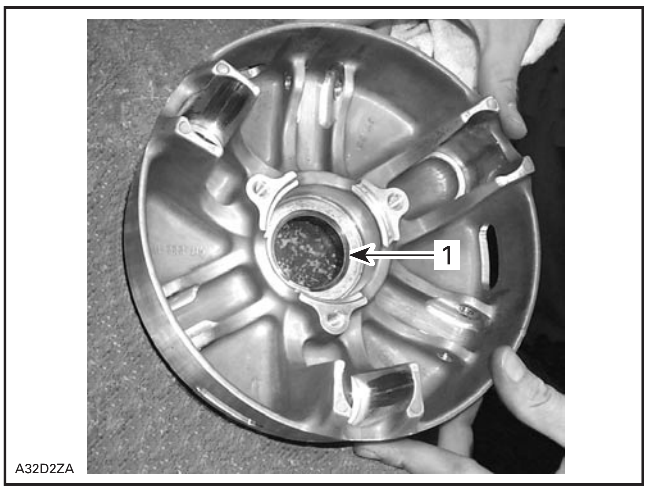

A32D2XA

NOTE: Make sure that the bushing is well seated on the sliding half ass’y.



1. Bushing

Install the circlip.



1. Circlip

Spring Cover Bushing Replacement

Under normal use there is no need to replace this bushing.

In case of replacement, it's recommended to replace spring cover ass'y.

ASSEMBLY

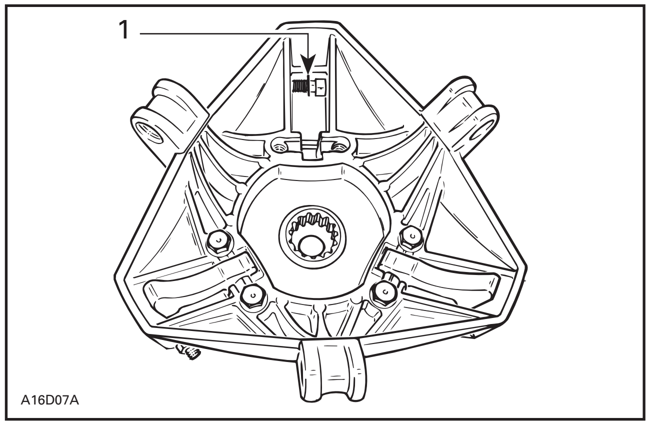
NOTE: This drive pulley is lubrication free. Do not lubricate any component.

1,2,3, Screw, Ring Gear and Loctite 271

Apply Loctite 271 (P/N 413 702 900) on threads and then torque to 27 N•m (20 lbf•ft).

26,27,28, Calibration Screw, Washer and Locking Nut

When installing calibration screw, make sure to install washer as shown.



TYPICAL
1. Washer

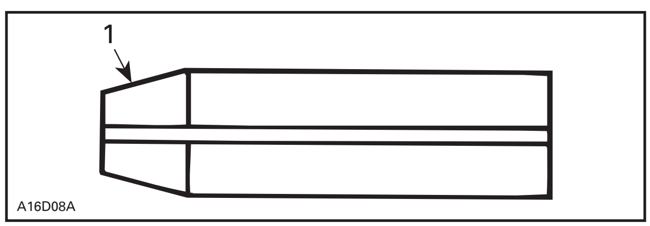
Torque locking nut to 10 N•m (89 lbf•**in**).

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.

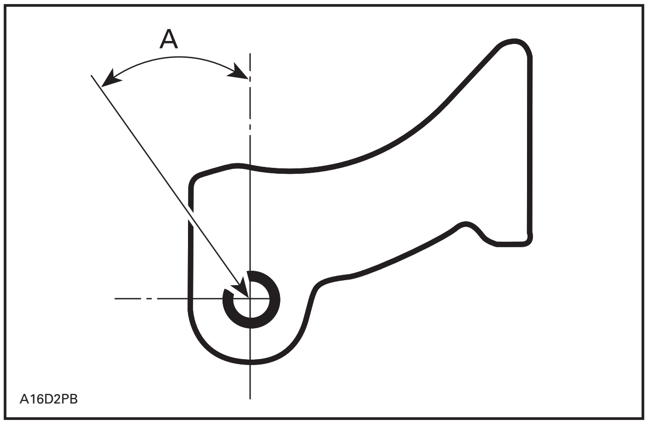
21,22,23, Screw, Dowel Tube and Ramp

Insert dowel tube from chamfered side. Make sure ramp is centered on dowel tube.

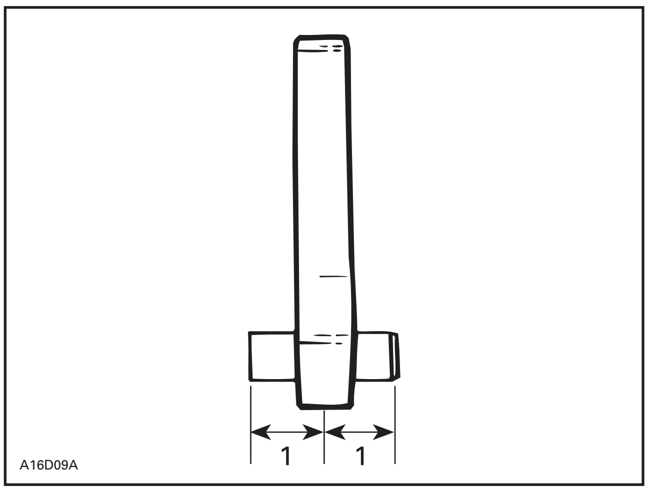


1. Chamfered side

Position dowel tube split at the angle A.



MODEL	ANGLE (A)
With TRA	30 ± 5°
With TRA III and IV	45 ± 3°



1. Equal distance

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

9,11,13,14, Screw, Lever Ass'y, Nut and Cotter Pin

TRA III and IV

NOTE: While installing lever assemblies make sure that the curved sides of the levers are outwards as shown.

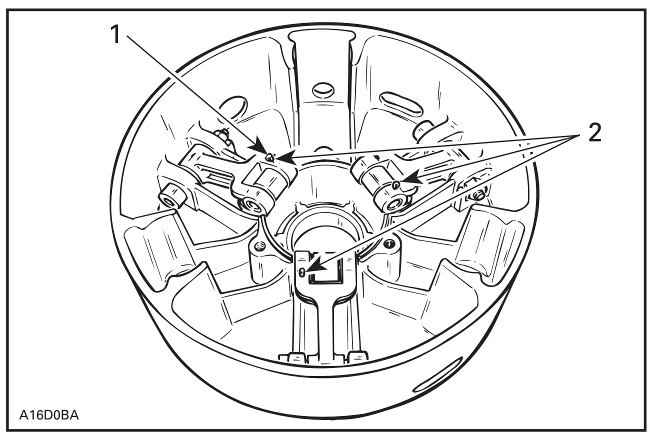
All Models

Always install lever assemblies so that cotter pins are on the shown 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

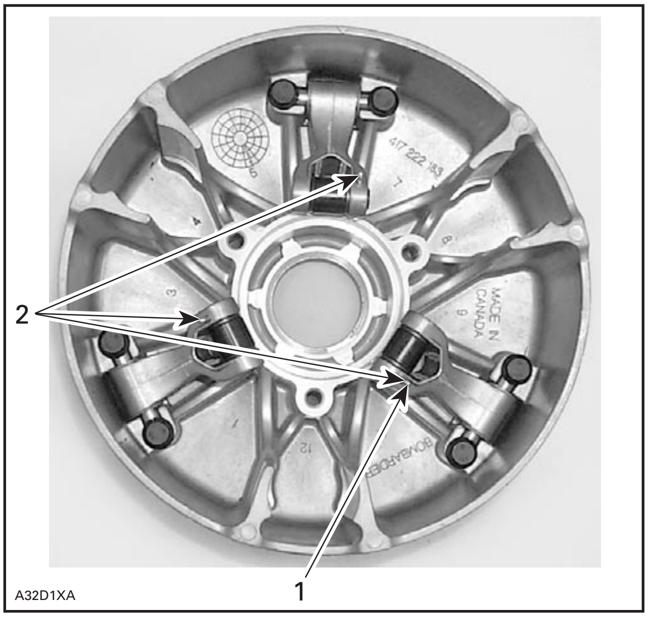
Whenever replacing centrifugal levers, always replace all 3 at the same time. Otherwise, drive pulley misbalancing will occur because of levers difference.

All Models Except 593 HO/SDI and V-1000 Engine Equipped Models



TYPICAL
1. Head on top
2. All on the same side

593 HO/SDI and V-1000 Engine Equipped Models Only



1. Head on top
2. All on the same side

All Models

CAUTION: Lever assemblies must be installed so that cotter pins are on the same side.

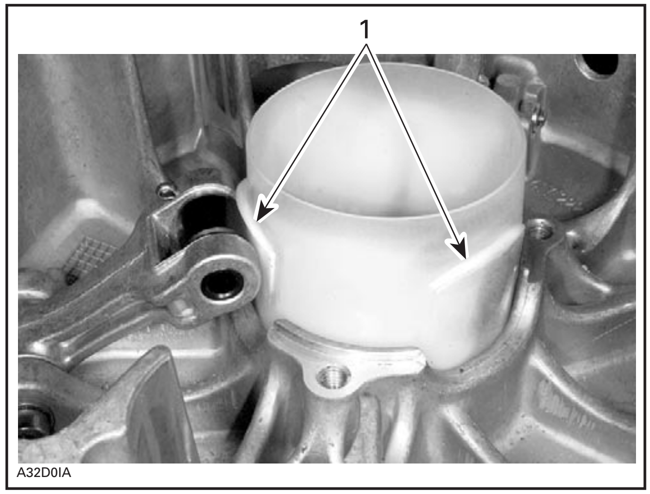
Torque nuts **no. 9** as per the exploded view.

CAUTION: Lever ass'y and rollers must move easily after installation.

33, Guard

Some Models Only

Install guard with its reinforcements in line with levers.



1. Reinforcements

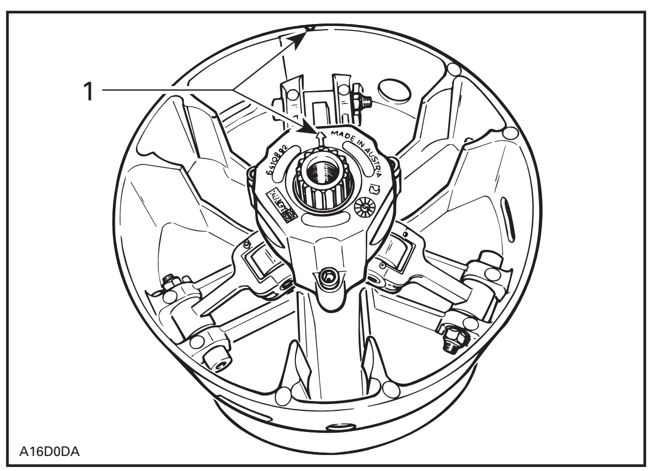
5,6,18,19, Fixed Half, Sliding Half, Spring, Spring Cover and Screw

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.

All Models Except 593 HO/SDI and V-1000 Engine Equipped Models



TYPICAL
1. Align

593 HO/SDI and V-1000 Engine Equipped Models Only

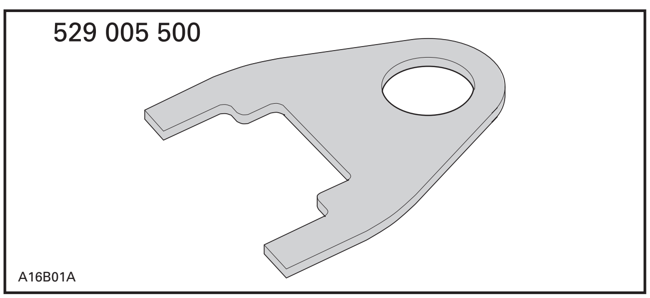
1. Align

All Models

Tighten screws to proper torque as mentioned in exploded view.

6,25,29, Sliding Half, Slider Shoe and Governor Cup

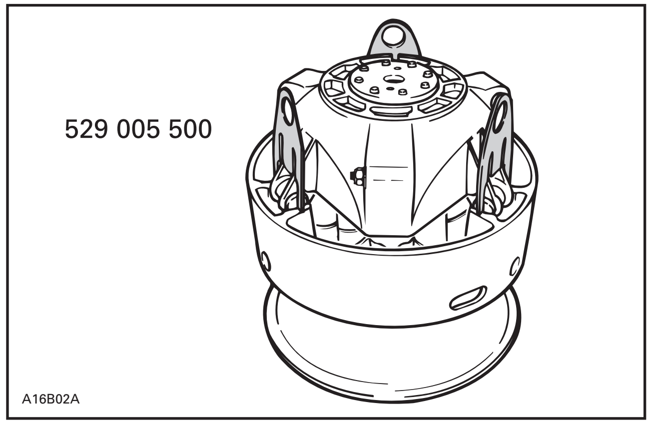
To install governor cup, use following tool:



Insert spring and 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.

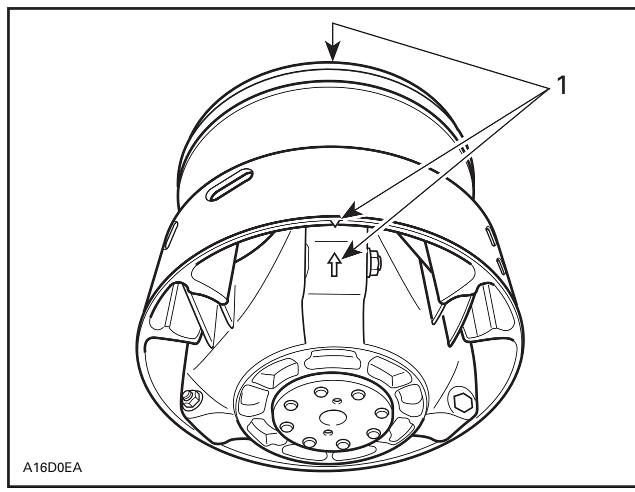


TYPICAL

Make sure to align governor cup arrow with sliding half and fixed half mark.

TRA and TRA III

NOTE: If fixed half has no mark, align governor cup mark with segment **no. 1** of inner half. Segments are identified on engine side.



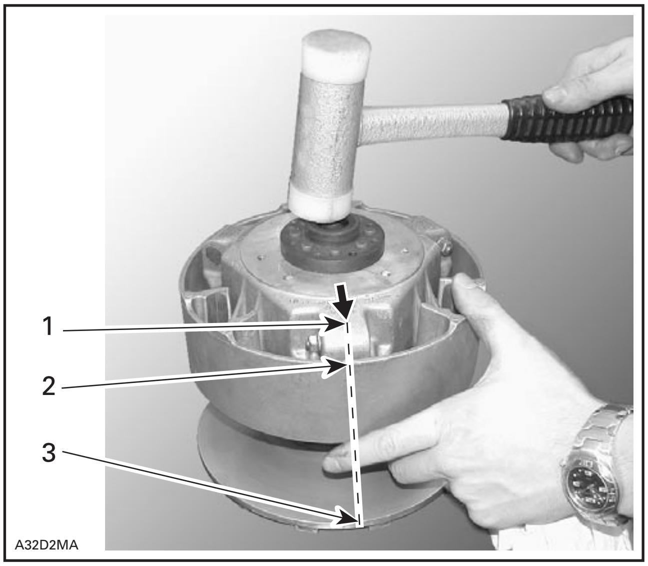
TYPICAL
1. Align

Carefully slide governor cup into sliding half. Align mark of governor cup with mark of fixed half.

Remove forks and push governor cup so that its splines engage with fixed half shaft splines.

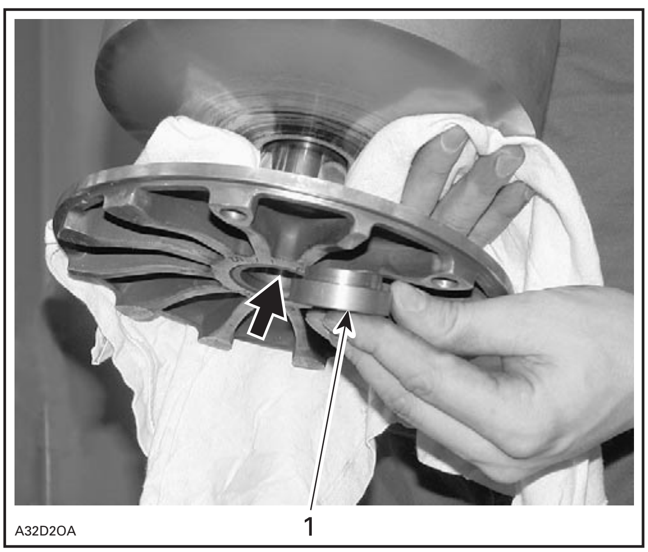
TRA IV

Using a plastic hammer, strike hub firmly 2 or 3 times to ensure proper seating of cones.



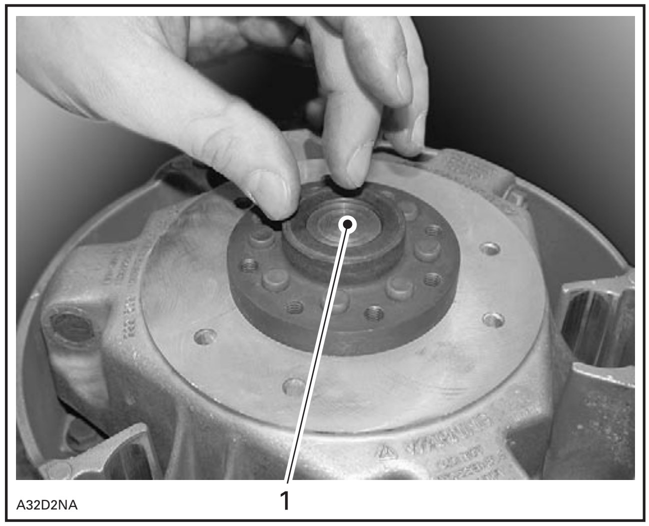
STRIKING HUB
1. *Alignment mark (arrow)*
2. *Sliding flange alignment mark*
3. *Fixed flange alignment mark (reported from underneath)*

Position TRA IV drive pulley support tool (P/N 529 035 942) in hole and align assembly on press, with press shaft.



POSITIONING TRA IV DRIVE PULLEY SUPPORT
1. *TRA IV drive pulley support*

Position dial support tool in hub and make sure it is well seated on fixed flange shaft.

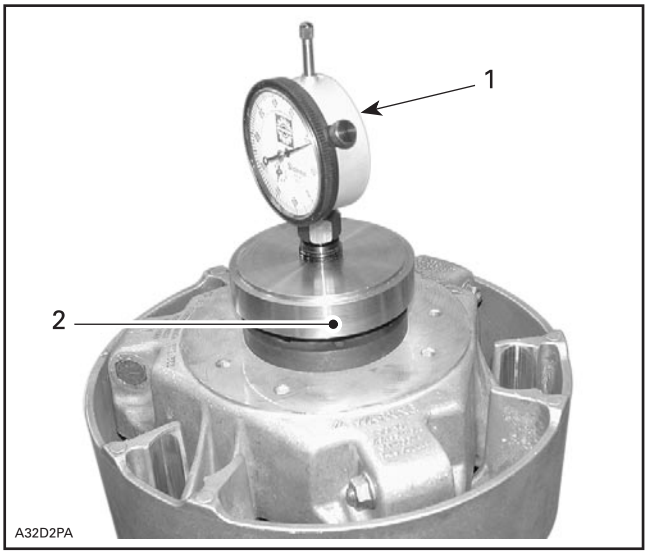


1. *Dial support in hub*

CAUTION: **For following procedure, make sure to take off the wheel from the extremity of the dial indicator.**

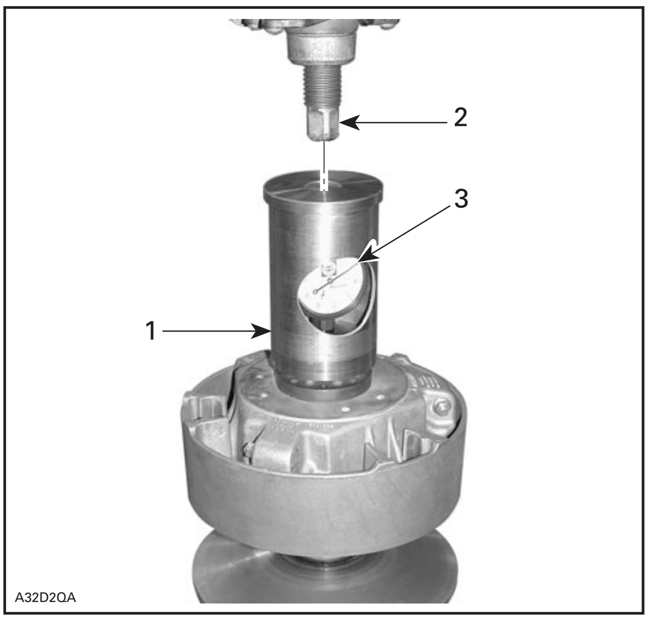
SHOWS WHEEL REMOVED

Completely screw dial indicator (P/N 295 000 143) in housing support tool and install it on pulley assembly; set dial indicator to "0". Make sure the set-up is well mounted and the dial constantly reads "0".



1. Indicator
2. Housing support

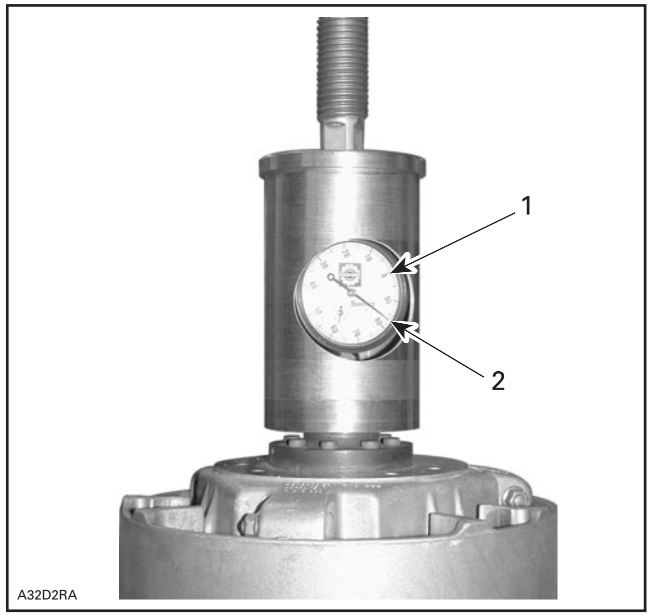
Cover indicator with dial housing tool.



1. Dial housing
2. Press shaft (aligned)
3. Needle at absolute "0"

Align press shaft just over and without touching the very middle of dial housing; do not apply pressure yet.

Ensure indicator needle is still set at absolute "0" and then start activating press until needle reads a displacement of .017 ± .0005 in.



1. Absolute "0"
2. .017 in displacement

CAUTION: Make sure to respect given specification to ensure adequate reassembly of drive pulley. Failure to do so could cause damage to drive pulley assembly.

CAUTION: Make sure splines of both parts are fully engaged.

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.

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.

TRA and TRA III

Torque screw to 80 to 100 N•m (59 to 74 lbf•ft).

TRA IV

Torque screw to 125 to 135 N•m (92 to 100 lbf•ft).

All Models

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.

TRA and TRA III

Retorque screw to 90 to 100 N•m (66 to 74 lbf•ft).

TRA IV

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

TRA and TRA III

The drive pulley is factory calibrated to transmit maximum engine power at a predefined RPM. Factors such as ambient temperature, altitude or surface condition may vary this critical engine RPM thus affecting snowmobile efficiency.

This adjustable drive pulley allows setting maximum engine RPM in the vehicle to maintain maximum power.

Calibration screws should be adjusted so that actual maximum engine RPM in vehicle matches the maximum horsepower RPM given in TECHNICAL DATA.

NOTE: Use precision digital tachometer for engine RPM adjustment.

NOTE: The adjustment has an effect on high RPM only.

To adjust, modify ramp end position by turning calibration screws.

TRA IV

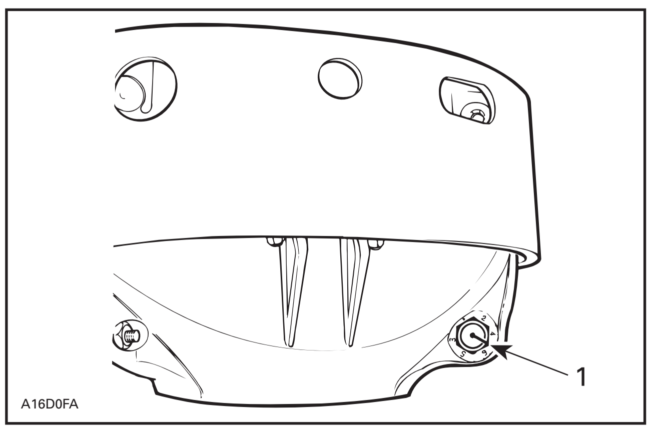
From factory TRA drive pulley adjustment screws are set to position 3. This position allows the best compromise between acceleration, top speed and fuel economy.

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

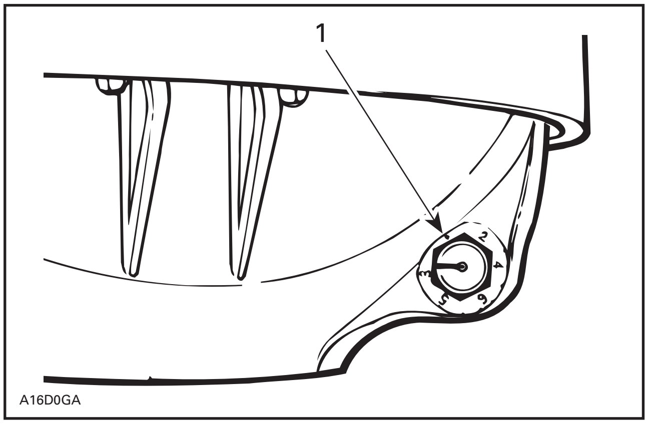
Calibration screw has a notch on top of its head.



1. Notch

Governor cup has 6 positions numbered 2 to 6. Note that in position 1 there is no stamped number (due to its location on casting).

See TECHNICAL DATA for original setting.



1. Position 1 (not numbered)

Each number modifies maximum engine RPM by about 200 RPM.

Lower numbers decrease engine RPM in steps of 200 RPM and higher numbers increase it in steps of 200 RPM.

Example:

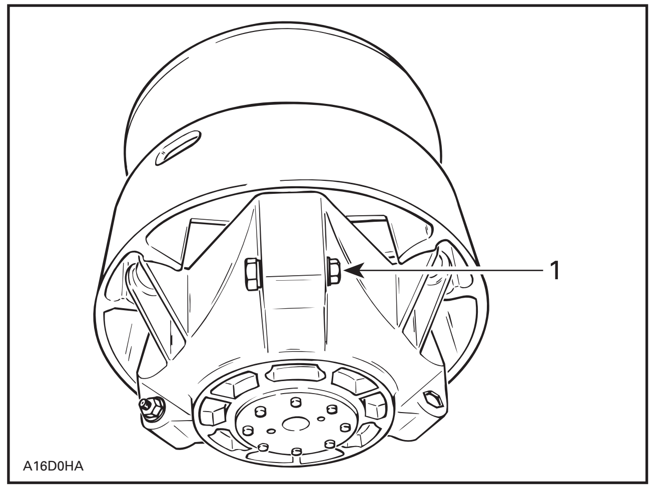
Calibration screw is set at position 3 and is changed to position 5. So maximum engine RPM is increased by about 400 RPM.

To Adjust:

Just loosen locking nut enough to pull calibration screw partially out and adjust to desired position. Do not completely remove the locking nut. Torque locking nuts to 10 N•m (89 lbf•**in**).

CAUTION: Do not completely remove calibration screw 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.

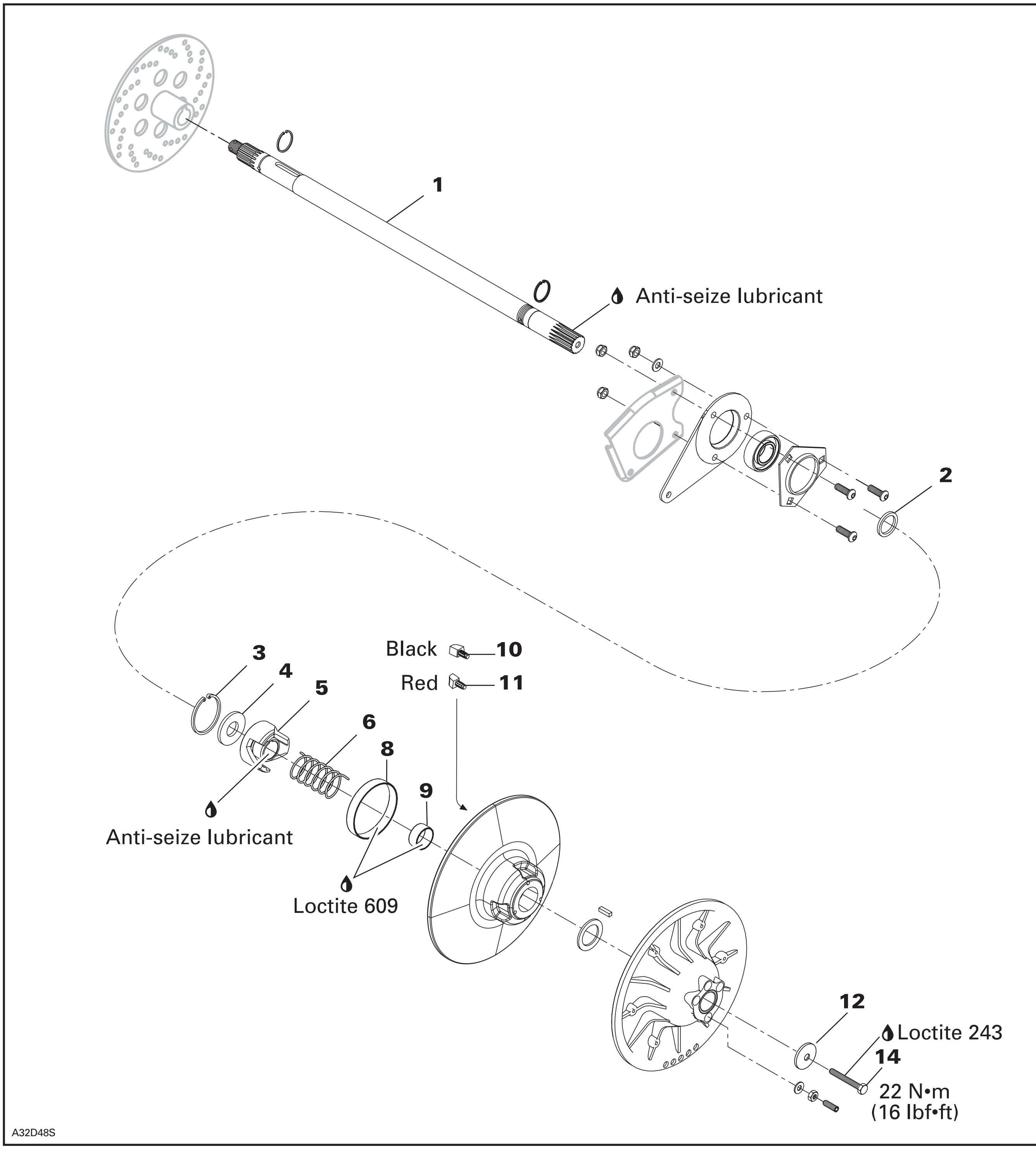


TYPICAL
1. Loosen just enough to permit rotating of calibration screw

DRIVEN PULLEY

FORMULA RER

ZX Series Fan Cooled



REMOVAL

Remove guard and drive belt from vehicle.

Remove pulley retaining screw **no. 14** and shouldered washer **no. 12** then pull the driven pulley from the countershaft.

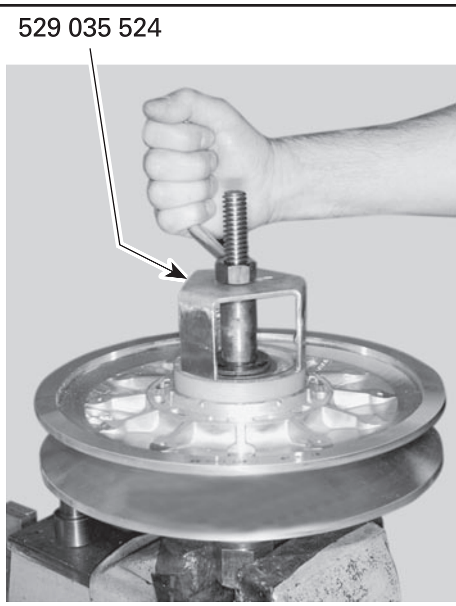
Take care not to lose spacer **no. 2**.

1, Countershaft

Should countershaft **no. 1** removal be required, refer to BRAKE then look for COUNTERSHAFT and BRAKE DISC REMOVAL.

DISASSEMBLY

Use spring compressor (P/N 529 035 524).



TYPICAL

Remove circlip **no. 3** and washer **no. 4** to disassemble the outer 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

8,9, Bushings

Check for cracks, scratch and for free movement when assembled to fixed half.

Using a dial bore gauge measure bushing diameter. Measuring point must be at least 5 mm (1/4 in) from bushing edge.

Replace bushing(s) if worn more than specified.

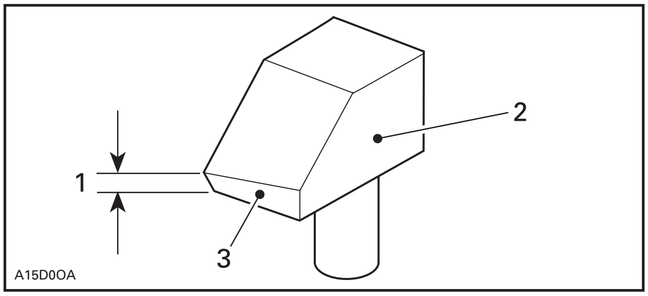
DRIVEN PULLEY BUSHING WEAR LIMIT mm (in)	
Small bushing	38.30 (1.508)
Large bushing	108.2 (4.260)

10,11, Slider Shoe

Black slider shoe = forward.

Red slider shoe = reverse.

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

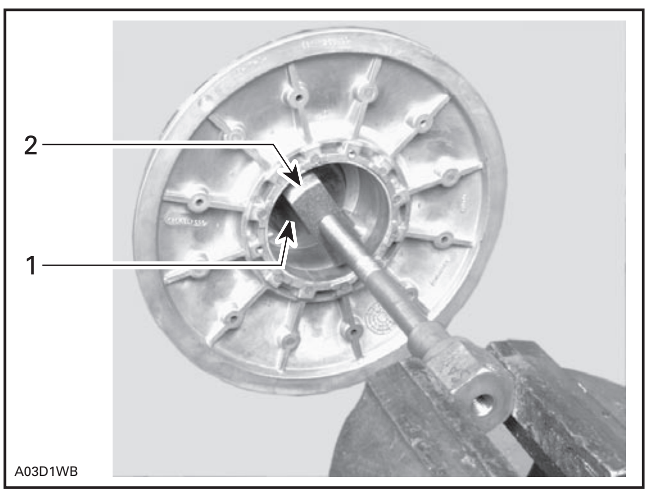
BUSHING REPLACEMENT

Large Bushing

Remove Allen screws if applicable. Heat to break Loctite bond.

Install support plate included in tool (P/N 529 031 100) inside sliding half.

Place extractor (P/N 529 035 575) below bushing.



TYPICAL
1. Support plate
2. Extractor

Mount screw head of new puller (P/N 529 035 524) in a vise.

Turn pulley half by hand to extract old bushing.

Before bushing installation, file sliding half bore to remove burrs from crimping areas.

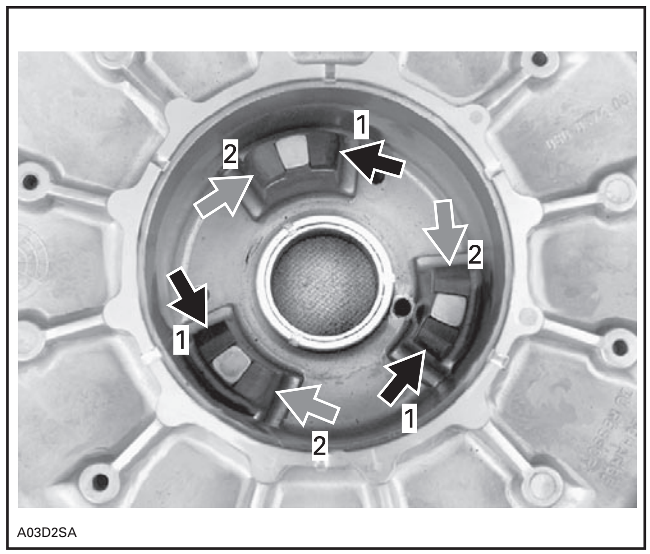
Coat bushing outside diameter with Loctite 609 (P/N 413 703 100). Place new bushing on sliding half and slightly tap to engage squarely the bushing in the sliding.

ASSEMBLY

10,11, 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. Red slider shoes are being used for reverse and black ones for forward



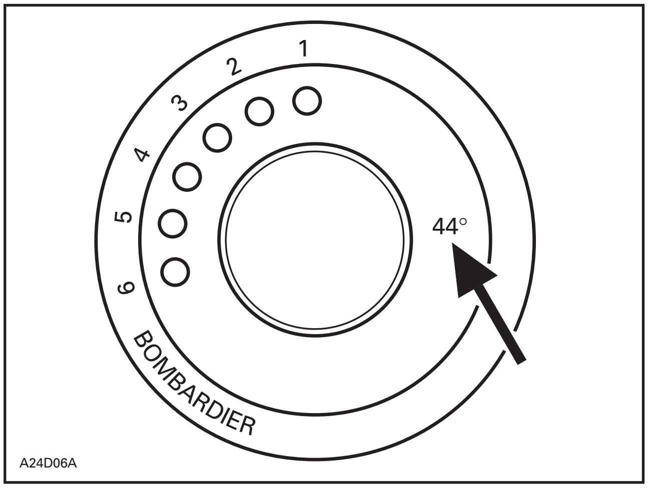
1. BLACK slider shoe
2. RED slider shoe

Assemble driven pulley components by reversing the disassembly procedure.

5,6, Cam and Spring

Make sure to install proper cam. Refer to TECHNICAL DATA.

Cam angle is identified on cam.



Install spring in sliding half with its end inserted in hole B.

Position cam **no. 5** then insert spring in adjusting hole no. 2 into outer cam.

IMPORTANT: With the spring ends at positions B and 2, spring preload is equal to zero (0). To work properly, the driven pulley must have a zero preload.

Compress outer cam using spring compressor (P/N 529 035 524). Install washer **no. 4** then secure outer cam with circlip **no. 3**.

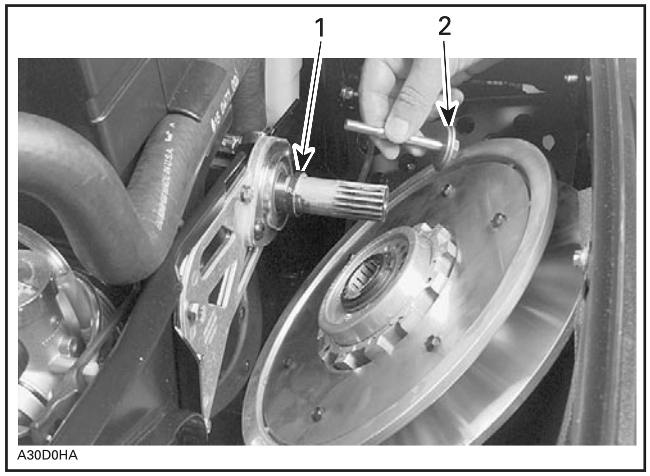
CAUTION: Ensure that circlip is properly inserted into shaft groove and that spacer recess is facing circlip.

INSTALLATION

1, Countershaft

CAUTION: Always apply anti-seize lubricant (P/N 293 800 070) on the countershaft before final pulley installation.

Make sure that spacer **no. 2** is on countershaft before installing driven pulley. Note also that washer shoulder is facing driven pulley.



TYPICAL
1. Spacer
2. Shoulder on this side

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.

14, Pulley Retaining Screw

Torque to 25 N•m (18 lbf•ft).

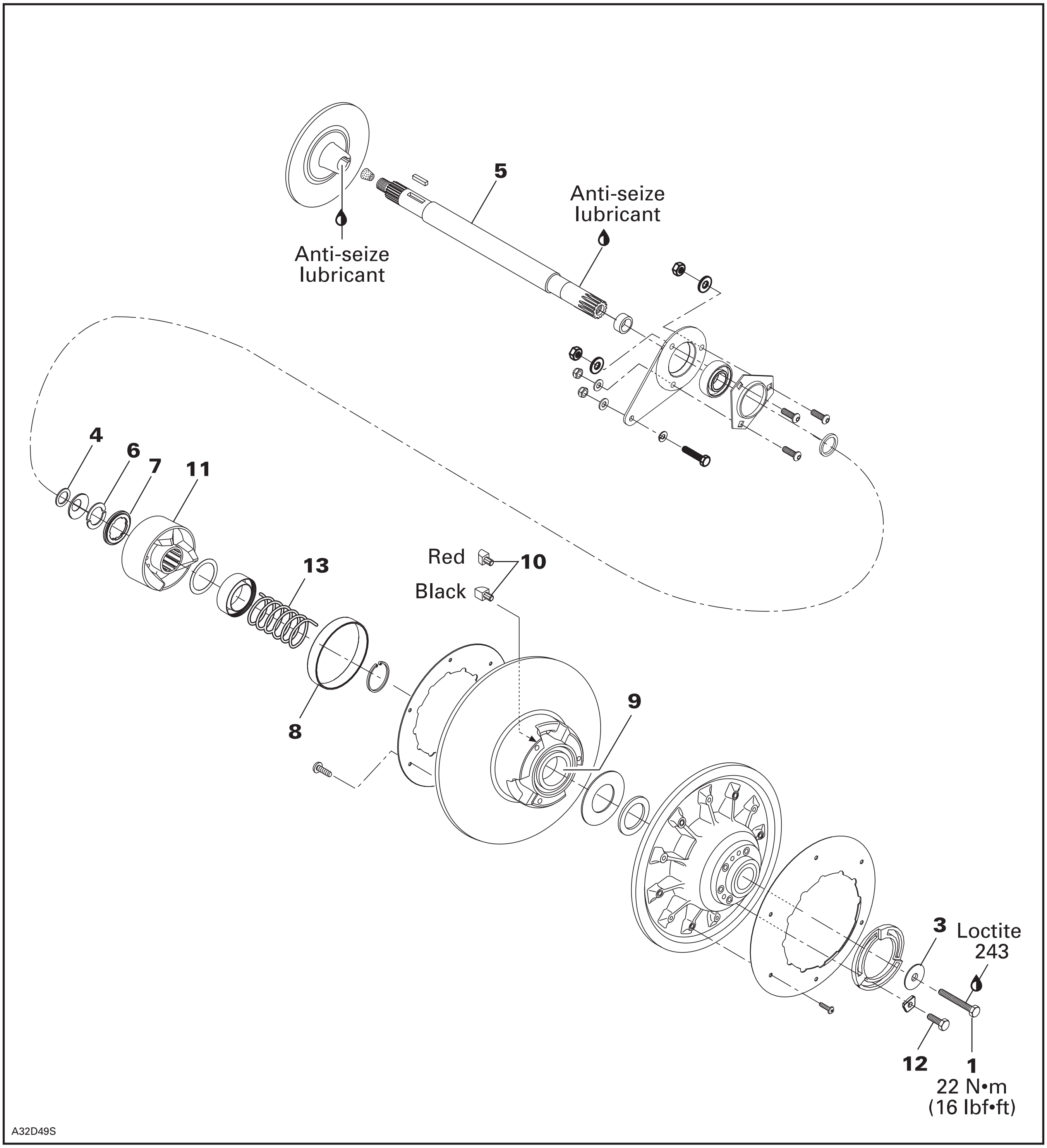
ADJUSTMENT

Pulley Alignment and Drive Belt Deflection

Refer to PULLEY DISTANCE AND ALIGNMENT and DRIVE BELT to perform adjustments.

CAUTION: Drive belt and pulley adjustments must always be checked whenever pulleys have been removed, replaced or disassembled.

HPV 27/HPV VSA/HPV VSA 10

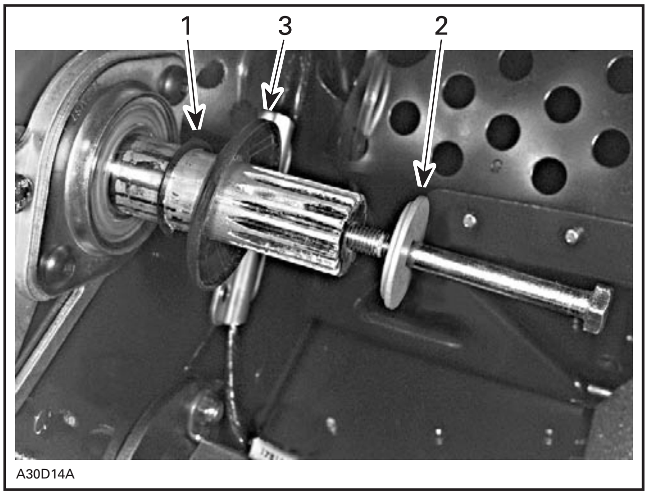


REMOVAL

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**.



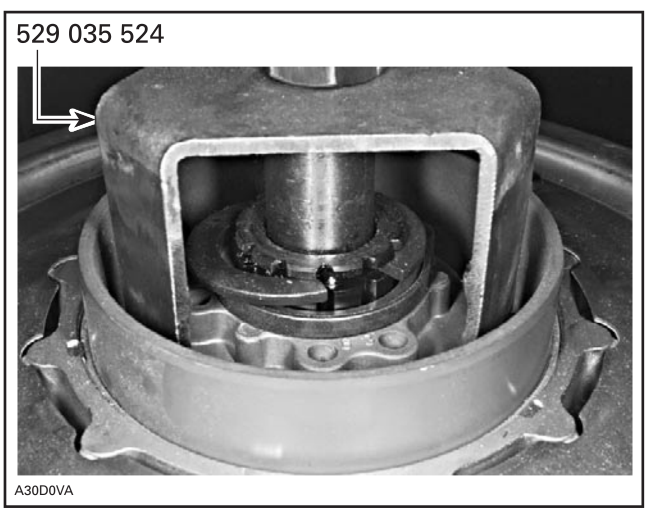
1. Spacer
2. Shoulder on this side
3. Concave side facing driven pulley

5, Countershaft

Should countershaft **no. 5** removal be required, refer to BRAKE then look for COUNTERSHAFT AND BRAKE DISC REMOVAL.

DISASSEMBLY

Use spring compressor (P/N 529 035 524).



Remove half keys **no. 6** and washer **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.

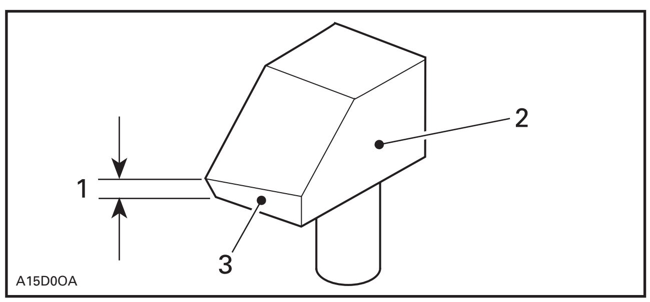
Pulley Half Cleaning

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.



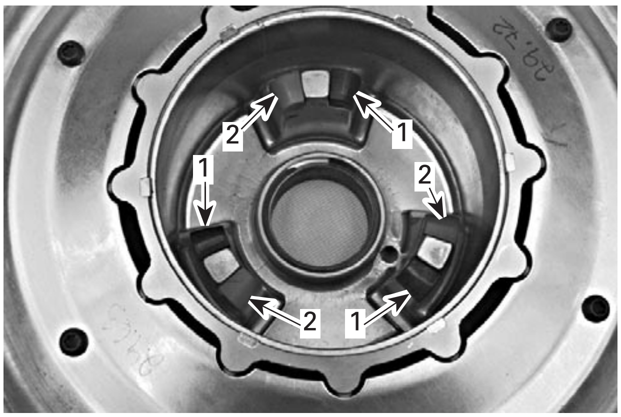
1. Measure thickness of slope base here
2. Sliding pulley side
3. Slope base

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. Red slider shoes are being used for reverse and black ones for forward.



1. BLACK slider shoe
2. RED slider shoe

12, Screws

These screws are machined at there end. With the adjustment ring steel to position 0 (zero), screw ends are flush with inner side of fixed pulley half when tighten.

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.

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.

ADJUSTMENT

V 1004 Engine Equipped Models

7, Spring

General

It is usual to experience spring setting during breaking period of a new spring. The factory spring preload is slightly higher (about 1 kg (2 lb)) to compensate for spring setting. Specifications in TECHNICAL DATA are applicable after break-in period (about 10 hours of use).

Spring Torsional Pre-Load

To check spring pre-load adjustment, use a fish scale.

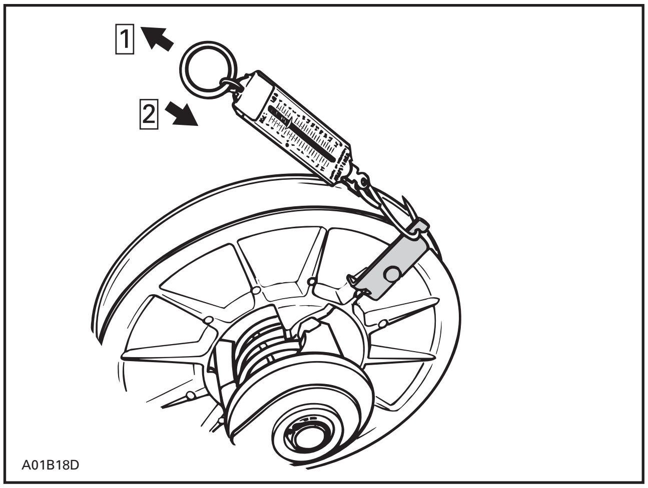
Remove drive belt.

Preventing fixed half from turning, pull sliding half with the fish scale perpendicularly with pulley axle.

Take 1st measurement when sliding half begins to turn. Rotate sliding half to 10 mm (3/8 in) of rotation. Hold fish scale at this position. Slowly release tension from fish scale and take 2 nd measurement when sliding half begins to return. Spring pre-load is the average measurement between these 2.

$$\frac{\text{1st measurement (when opening)} + \text{2nd measurement (when closing)}}{2} = \text{Spring pre-load}$$

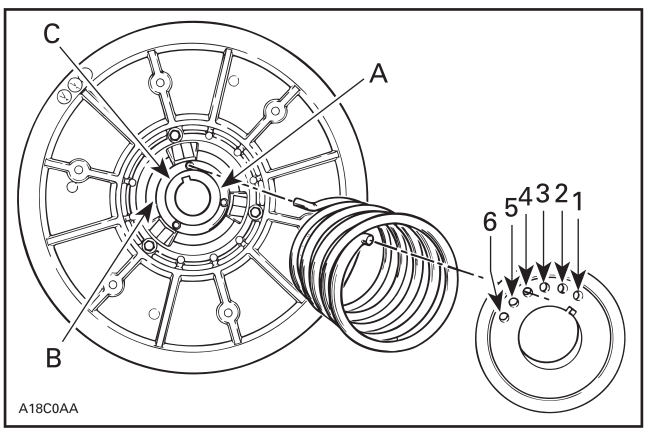
$$\text{Example: } \frac{\text{3.8 kg (8.4 lb) (when opening)} + \text{3.4 kg (7.5 lb) (when closing)}}{2} = \text{3.6 kg (8 lb) Actual spring pre-load}$$



TYPICAL
1. Step 1: 1st measurement
2. Step 2: 2nd measurement

To adjust spring pre-load, relocate spring end in cam, moving it clockwise to increase the pre-load and counterclockwise to decrease it. Refer to TECHNICAL DATA.

NOTE: If spring pre-load can not be adjusted, try to relocate the other end of spring in sliding pulley (holes A, B and C).



TYPICAL — LETTERS AND NUMBERS SHOWN IN ILLUSTRATION ARE ACTUAL LETTERS AND NUMBERS EMBOSSED ON PARTS

NOTE: Always recheck torsional pre-load after adjusting.

Pulley Alignment and Drive Belt Height

All Models

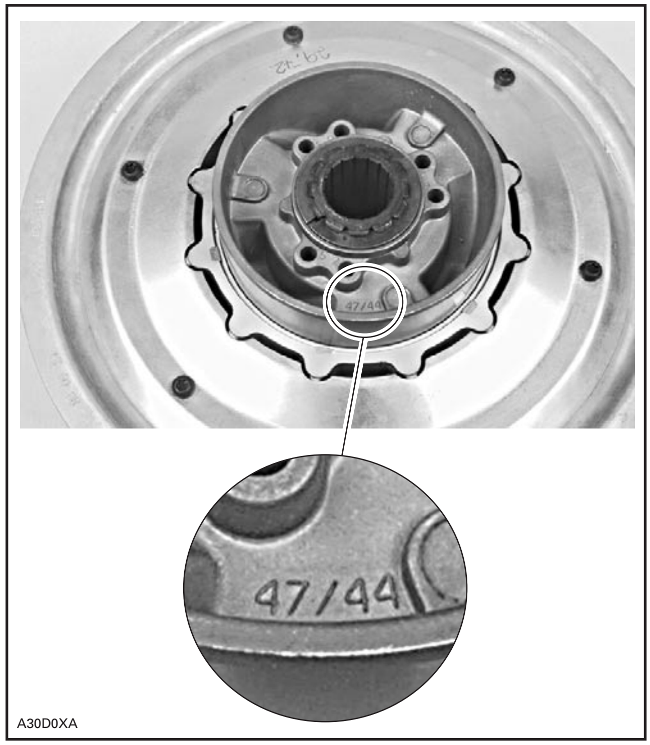
Refer to PULLEY DISTANCE AND ALIGNMENT and DRIVE BELT to perform adjustments.

CAUTION: Drive belt and pulley adjustments must always be checked whenever pulleys have been removed, replaced or disassembled.

11, Cam

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.

PULLEY DISTANCE AND ALIGNMENT

GENERAL

The pulley distance we will refer to in this section, is the space separating the drive and driven pulley outside diameters (Z measurement).

This basic distance is provided as an assembly guide and indicates the dimensions between which satisfactory belt deflection will be obtained.

Both pulley distance adjustment and pulley alignment must be carried out to ensure the highest efficiency of the transmission system. Furthermore, optimum drive belt operation and minimal wear will be obtained only with proper pulley alignment.

CAUTION: Before checking pulley adjustment, the rear suspension must be mounted on the vehicle and track tension/alignment must be done. Always check pulley adjustment after suspension is adjusted.

⚠ 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.

GENERAL PROCEDURE

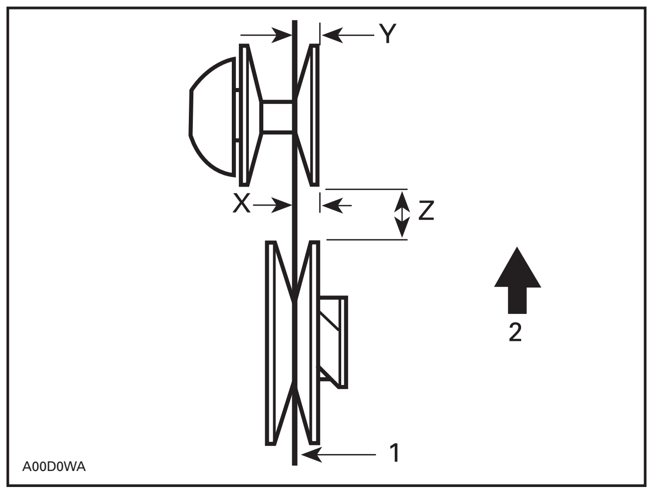
Remove guard and drive belt.

By turning and pushing the sliding half, open the driven pulley. Insert a straight bar 9.5 mm (.375 in) square, 48 cm (19 in) long or the proper alignment bar into the opened driven pulley.

Measuring Procedure

Using Straight Bar

Always measure distances X and Y from the farther straight bar side (including its thickness to the fixed half edge).



TYPICAL
1. Straight bar
2. Front of vehicle

The distance Y **must** exceed distance X to compensate for the twist due to the engine torque.

Drive Belt Deflection

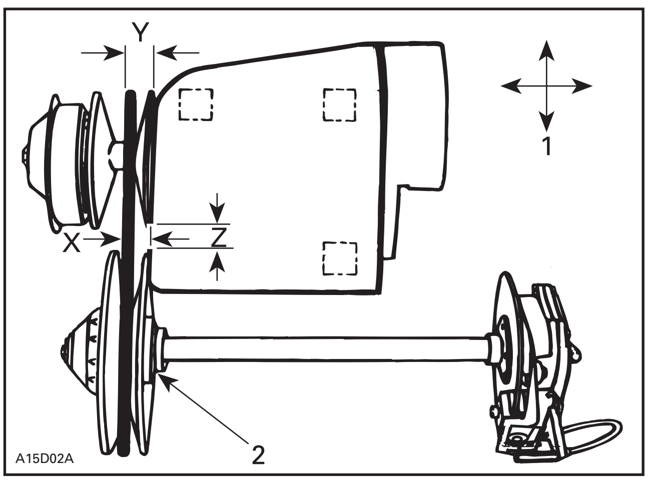
NOTE: When pulley distance and alignment are adjusted to specifications, refer to DRIVE BELT to adjust drive belt deflection.

CAUTION: This section deals mainly with adjustment procedures. For complete assembly requirements, refer to the proper ENGINE or TRANSMISSION installation section.

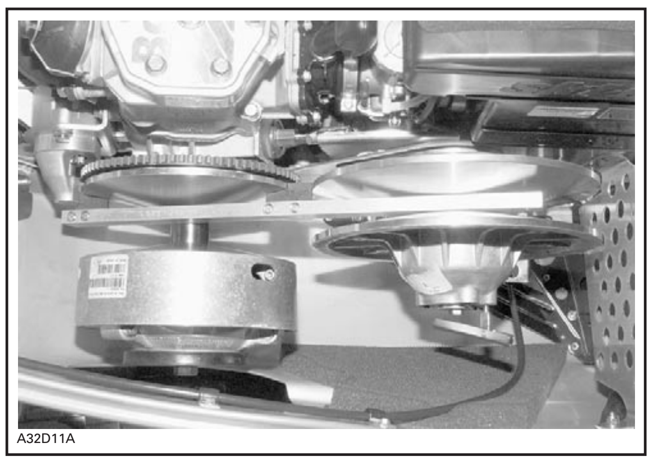
PULLEY ALIGNMENT AND DISTANCE SPECIFICATIONS CHART

MODEL	PULLEY DISTANCE	OFFSET		ALIGNMENT BAR ① P/N
	Z	X	Y-X	
	± 0.50 mm (.020 in)			
ALL ZX RER FAN	26.0 (1.023)	33.40 (1.314)	1.0 (0.040)	529 035 586
ALL ZX LIQUID WITH FORMULA	19.0 (0.748)	37.0 (1.456)	1.5 (0.060)	529 026 700
ALL ZX LIQUID WITH HPV 27	17.5 (0.688)	35.50 (1.397)	1.5 (0.060)	529 035 530
ALL ZX LIQUID WITH HPV 27 VSA	20.0 (0.787)	37.0 (1.456)	1.5 (0.060)	529 035 530
ALL 4-TEC MODELS	20.0 (0.787)	37.0 (1.456)	1.5 (0.060)	529 035 831

① Alignment bars have been made according to pulley alignment nominal values. However, they do not take into account allowed tolerances for alignment specifications. They are used as GO/NO GO gauges for quick alignment and pulley distance check and as templates to reach alignment nominal values.

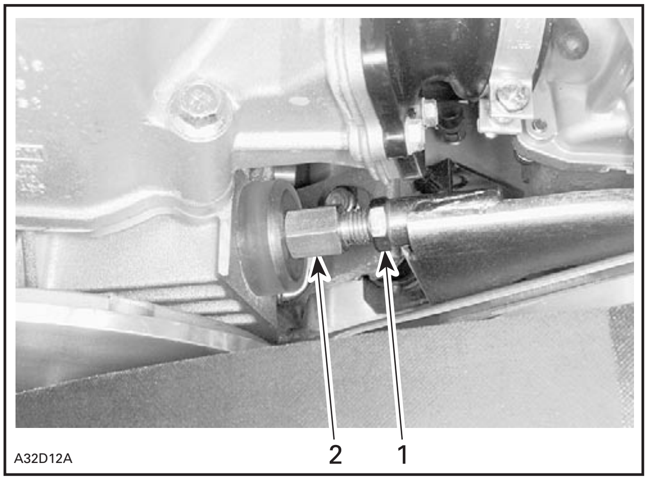


TYPICAL
1. *Engine movement*
2. *Contact*



ALIGNMENT BAR IN PULLEYS

NOTE: Prior to performing pulley adjustment, loosen torque rod nut to allow engine movement. Engine supports have tendency to stick to frame, work engine loose prior to aligning. Disconnect the tuned pipe and air intake silencer. Clean and lubricate torque rod threads.



1. *Loosen lock nut first*
2. *Loosen*

Pulley Distance Adjustment Method

Engine Movement

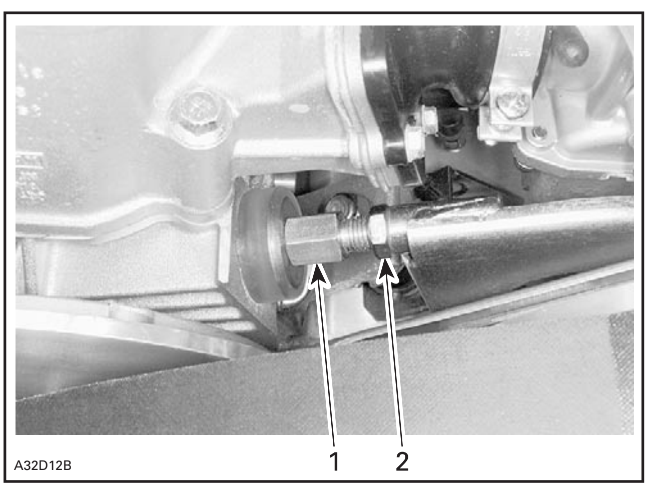
The engine support has slotted mounting holes. Move engine to obtain specified distance between pulleys.

Pulley Alignment Method

Engine Movement

Loosen the 4 bolts (3 in case of 4-TEC models) retaining engine support to the frame. Position engine to obtain the specified alignment.

NOTE: After alignment, adjust torque rod so it slightly contacts stopper plate, then turn an additional half turn. Do not over tighten, it will disalign pulleys.

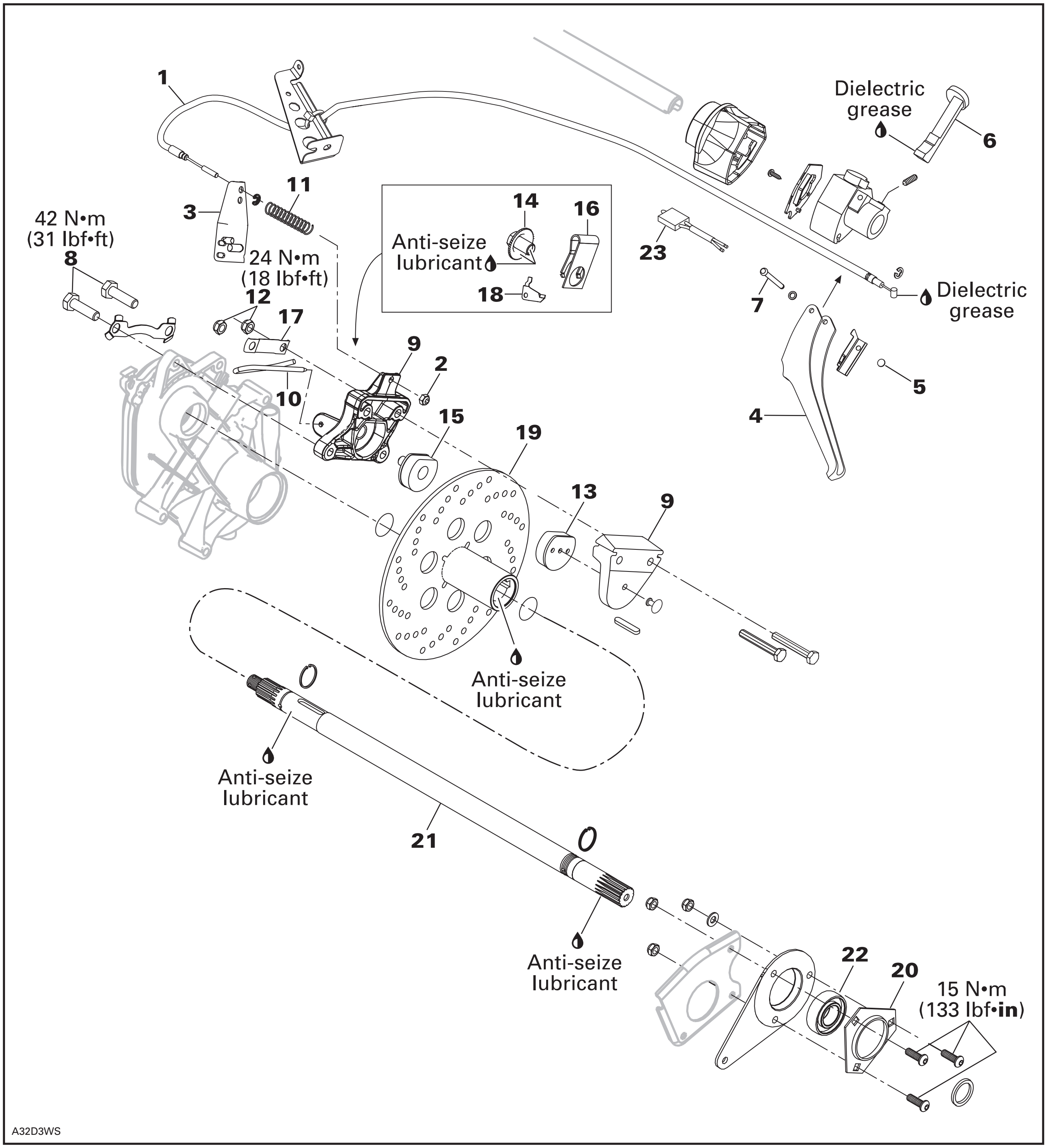


1. *Half turn preload*
2. *Retighten*

BRAKE

MECHANICAL BRAKE

ZX Models with 377 Engine



BRAKE CABLE

Removal

Remove the protector under oil injection reservoir.

Hold brake cable **no. 1** and unscrew the cable nut **no. 2**.

Detach the cable from the caliper lever **no. 3**.

Remove the steering pad.

Detach the cable from the brake lever **no. 4**.

Cut all locking ties then pull the cable out of vehicle.

NOTE: Note the routing for the installation.

Installation

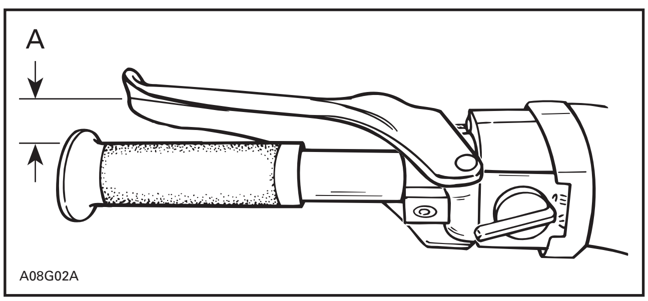
The installation is the reverse of removal procedure.

Insert brake cable into upper hole in caliper lever and caliper. Install nut and tighten until a few threads exceed. Refer to ADJUSTMENT.

Adjustment

Screw the cable nut **no. 2** until 5 to 7 threads of cable end are visible.

Fully depress brake lever several times to obtain 13 mm (1/2 in) between brake lever and handlebar grip when brake is fully applied.



TYPICAL
A. 13 mm (1/2 in)

Should this adjustment be unattainable, retighten nut **no. 2** as needed.

BRAKE LEVER

Removal

Detach cable from caliper, refer to BRAKE CABLE.

Remove the circlip **no. 5** located under stop button **no. 6** then remove the brake lever pin **no. 7**.

Remove the steering pad.

Detach the cable from the brake lever **no. 4**.

Installation

The installation is the reverse of the removal procedure.

NOTE: It necessary to adjust cable after brake lever replacement.

CALIPER

Removal

Unscrew the caliper bolts **no. 8** from chaincase.

Remove brake cable from caliper lever, refer to BRAKE CABLE.

Inspection

Check the caliper for cracks or other damages. Replace it if necessary.

Installation

The installation is the reverse of removal procedure.

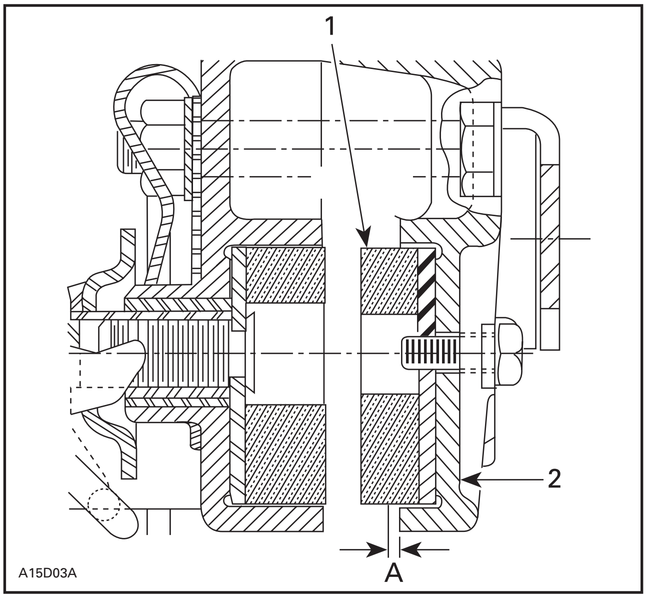
NOTE: Do not forget to fold the locking tab over caliper bolt.

BRAKE PAD

Inspection

Brake pads **no. 13** and **no. 15** must be replaced when fixed pad **no. 13** projects only 1 mm (1/32 in) from caliper.

CAUTION: Brake pads must always be replaced in pairs.



TYPICAL
1. Fixed pad
2. Inner caliper
A. 1 mm (1/32 in) minimum

Removal

Remove the caliper and place it in a vise, do not tighten excessively.

Remove the locking pin **no. 10**. Pull strongly.

Remove the caliper lever **no. 3** and the ratchet spring **no. 18**.

Unscrew the nuts **no. 12** to separate the caliper.

Fixed Pad

Using a bit, drill the rivet retaining the fixed pad **no. 13** on the caliper half then remove the fixed pad.

Sliding Pad

Unscrew ratchet wheel **no. 14** then remove the sliding pad **no. 15**.

Installation

Fixed Pad

The installation is the reverse of removal procedure.

Sliding Pad

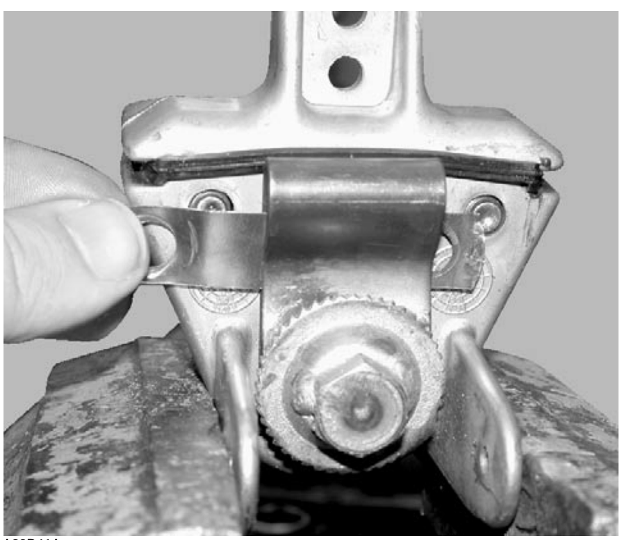
Place the release spring **no. 16** with the flat side on caliper.

A32D40A

Screw ratchet wheel completely.

NOTE: Apply anti-seize lubricant (P/N 293 800 070) on threads and spring seat prior to installing. Fully tighten then back off one turn.

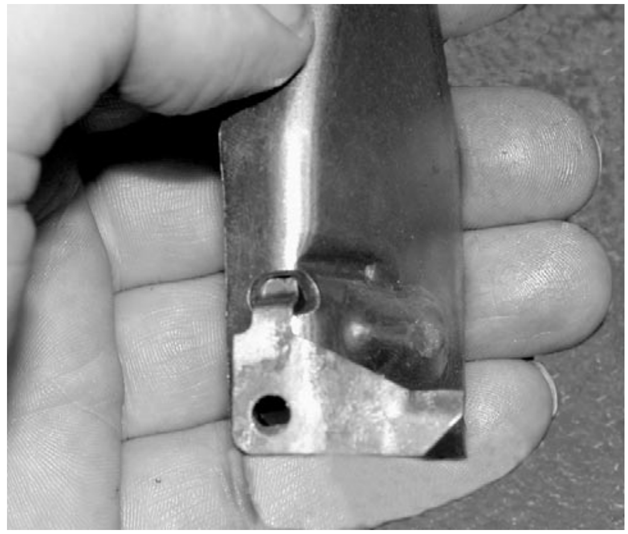
Assemble both parts of caliper together. Do not forget the locking tab **no. 17**.



A32D41A

NOTE: Do not forget to pry both ends of locking tab against a flat side of the nuts **no. 12**.

Install the caliper lever with the ratchet spring.



A32D42A

Install locking pin.

Install the caliper on vehicle then adjust the brake cable.

BRAKE DISC

Removal

Brake disc **no. 10** can be removed without removing chaincase. Proceed as follows:

– Remove belt guard, belt and driven pulley.
– Remove air silencer.
– Unbolt bearing support **no. 15** from chassis.
– Unscrew caliper from chaincase.
– Open chaincase and remove upper sprocket.
– Pull countershaft **no. 16** toward driven pulley side to free from chaincase and disc.
– Remove disc.

Inspection

Check for scoring, cracking or bending, replace as required.

CAUTION: Brake disc should never be machined.

Installation

The installation is the reverse of removal procedure. However, pay attention to the following details.

The brake disc must be floating on countershaft for efficient operation of brake.

Apply anti-seize lubricant (P/N 293 800 070) on shaft and check that disc slides freely.

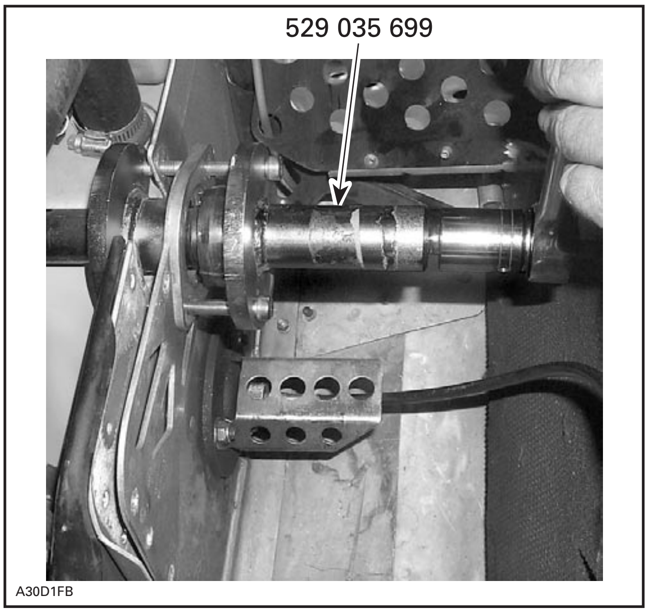
The disc hub exceeds the disc more from one side than from the other. Install disc with the longer exceeding portion toward driven pulley.

Push O-rings inside disc hub.

COUNTERSHAFT BEARING

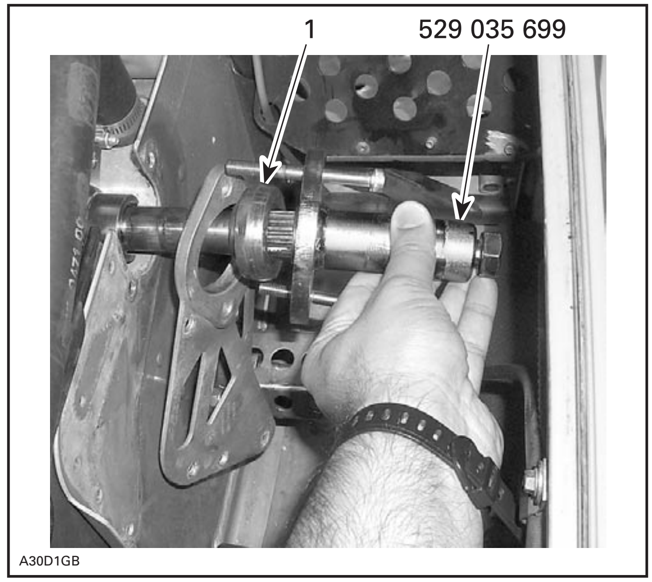
Removal

Unbolt bearing support **no. 15**. Install screw from remover (P/N 529 035 699).



TYPICAL

Install remover (P/N 529 035 699) on countershaft for complete bearing **no. 17** removal.



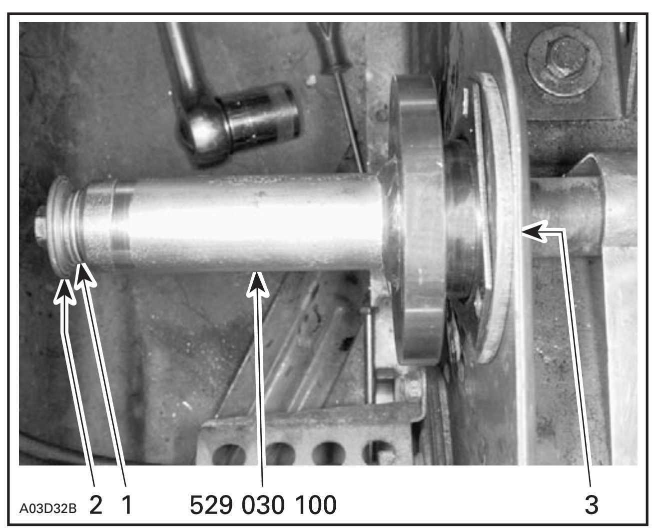
TYPICAL
1. Bearing

Installation

Insert countershaft (with brake disc) from chaincase side through countershaft support (driven pulley side), then insert into chaincase.

Install countershaft bearing **no. 17** using proper tool.

To install bearing on countershaft, use remover (P/N 529 030 100) and some flat washers of 3 mm (1/8 in) total thickness. Using original retaining screw and shouldered washer tighten until bearing rests against circlip.



1. Washers use as a 3 mm (1/8 in) spacer
2. Original retaining screw and shouldered washer
3. Bearing against circlip

Ensure that countershaft is properly aligned, then tighten 3 retaining screws.

NOTE: A misaligned countershaft will result in difficulty to center the bearing in its support.

Torque castellated nut of upper sprocket to 45 to 75 N•m (33 to 55 lbf•ft).

Close chaincase referring to CHAINCASE.

COUNTERSHAFT

Removal

Proceed the same as for countershaft bearing removal and then remove the countershaft **no. 16**.

Inspection

Check countershaft for bending, rust or other damages. Replace if necessary.

Installation

The installation is the reverse of removal procedure.

BRAKE LIGHT SWITCH

Removal

Unplug the brake light switch **no. 23** then unscrew it from brake lever.

Installation

The installation is the reverse of removal procedure.

Adjustment

Brake light should light up before brake pads touch brake disc. To adjust, unscrew nut **no. 2** until brake light goes on.

⚠ WARNING

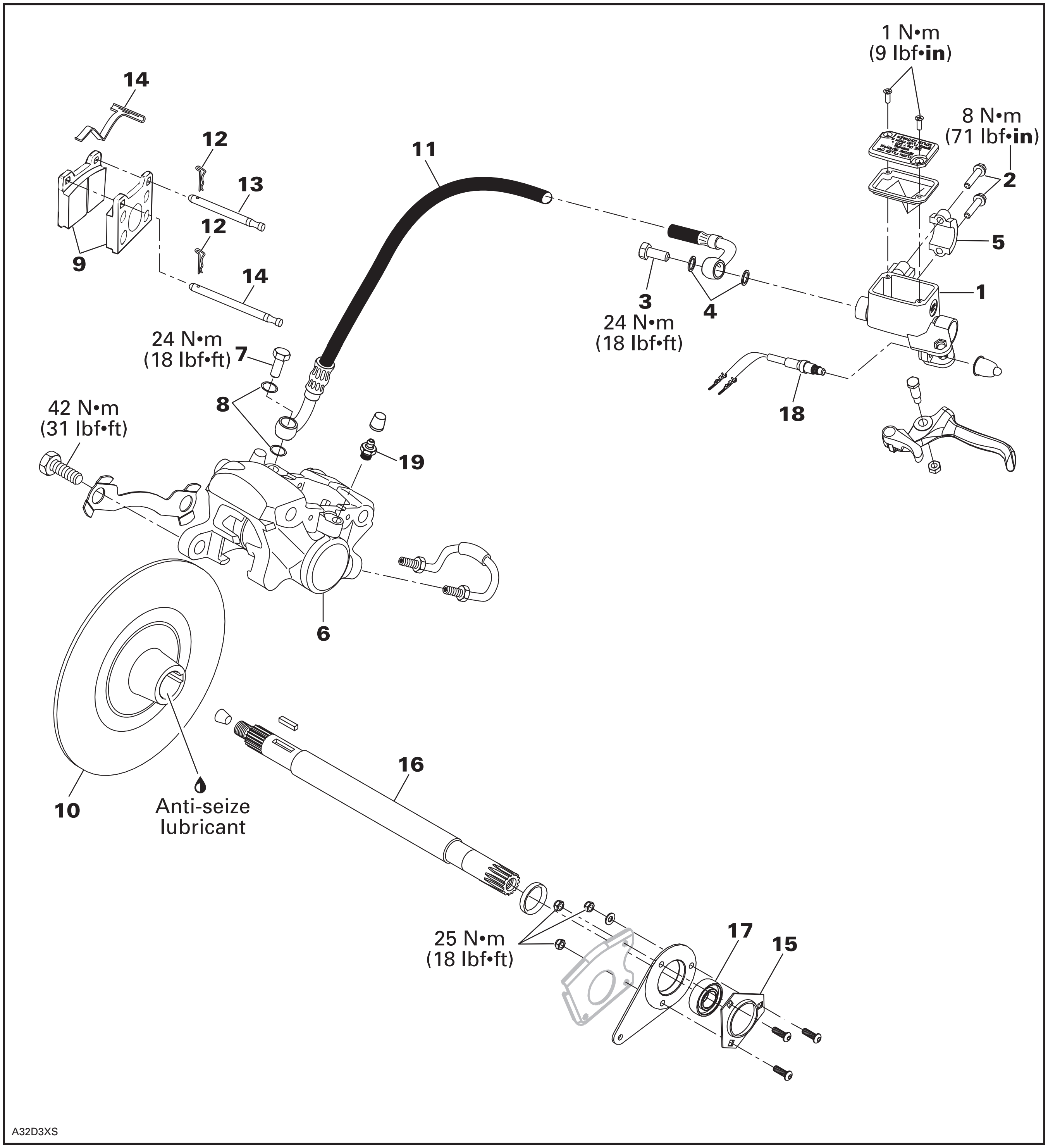
At least 3 full threads must exceed the elastic stop nut.

Check brake adjustment as described above.

NOTE: If brake light adjustment is unattainable while respecting brake adjustment, ratchet wheel may be too far out. If so, tighten ratchet wheel.

HYDRAULIC BRAKE

All ZX Models except 377 Engines



BRAKE FLUID

The brake fluid must be changed in accordance with the maintenance chart.

Use recommended brake fluid SRF (DOT 4) (P/N 293 600 063) or GTLMA (DOT 4) (P/N 293 600 062).

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.

MASTER CYLINDER

Removal

The master cylinder **no. 1** is located on the LH side of handlebar. To remove it, unscrew both screws **no. 2** retaining the brake lever to the handlebar.

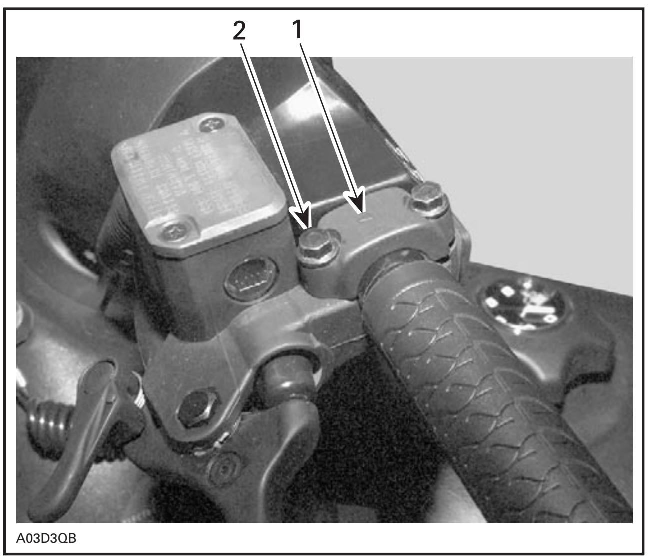
Place a container under Banjo bolt **no. 3** then unscrew it. Discard the sealing rings **no. 4**.

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 front of vehicle. Tighten to 8 N•m (71 lbf•**in**) front screw before rear one.



TYPICAL
1. Arrow on upper clamp pointing at front of vehicle
2. Tighten front screw first

Bleed the brake system. Refer to BLEEDING.

CALIPER

Removal

Remove the air silencer (**on liquid cooled models**).

Unscrew caliper **no. 6** from chaincase.

Place a container under caliper and unscrew the Banjo bolt **no. 7**. Do not remove the Banjo bolt completely 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.

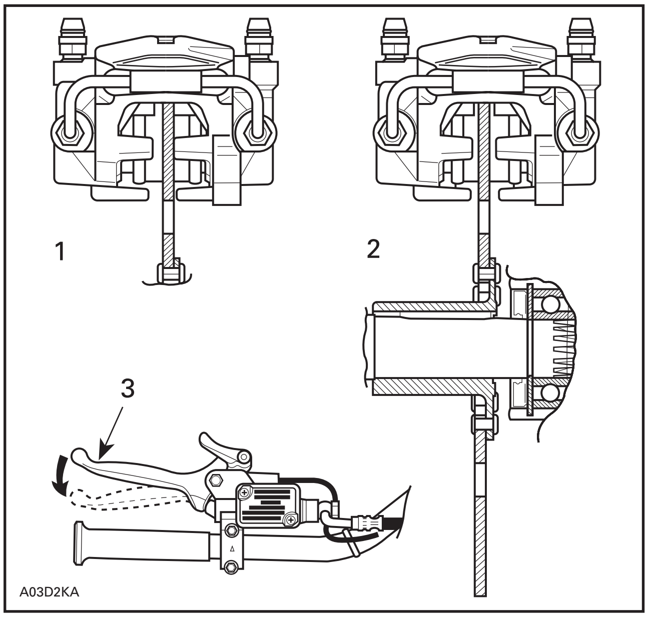
Install the Banjo bolt **no. 7** with two new sealing rings **no. 8**.

Fasten caliper on chaincase. Do not forget to fold locking tab over caliper bolt.

Fill the brake system and bleed it. Refer to BLEEDING in this section.

The brake disc **no. 10** 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.



TYPICAL
1. Brake disc not centered
2. Brake disc centered
3. Apply brake before checking

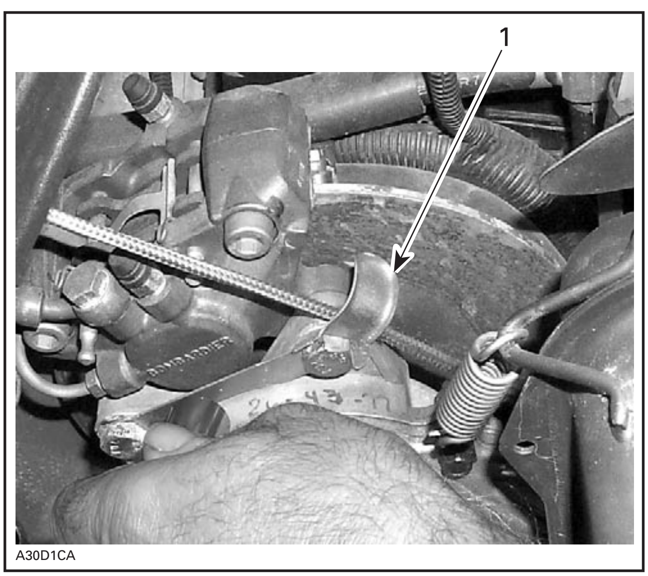
Apply brake then recheck.

BRAKE PADS

Removal

Brake pads removal procedure is as follows:

– Remove locking tab.



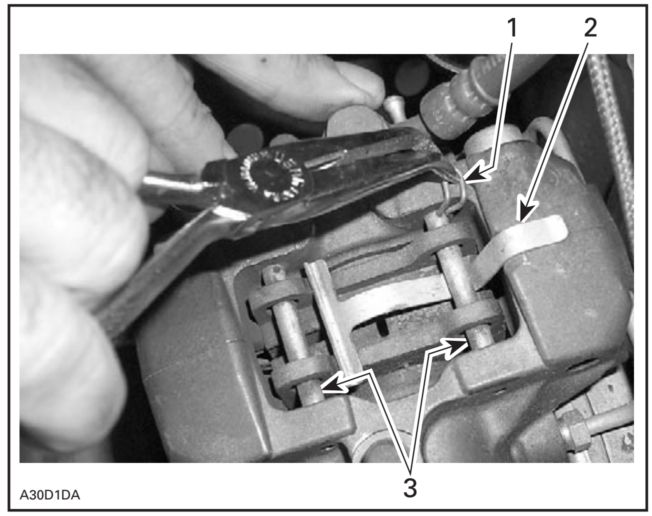
TYPICAL
1. Locking tab

– Pull out caliper **no. 6** from the brake disc **no. 10**.

CAUTION: Do not let the caliper hang by the hose and do not stretch or twist the hose.

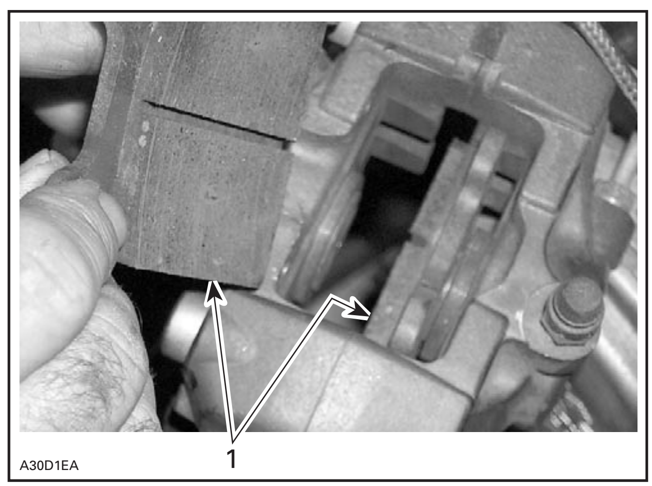
– Remove 2 retainers **no. 12** from the pins **no. 13**.

– Pull out the pins which releases the spring **no. 14**.



TYPICAL
1. Retainer
2. Spring
3. Pins

– Remove the brake pads **no. 9**.

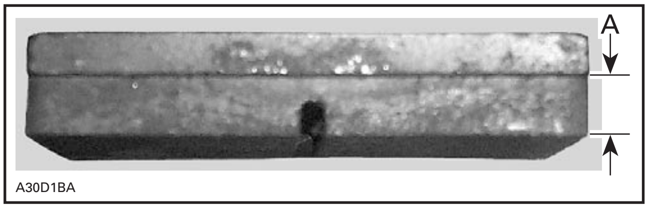


1. Brake pad

Inspection

Brake pads **no. 7** must be replaced when lining is 1 mm (1/32 in) thick or less.

CAUTION: Brake pads must always be replaced in pairs.



A. 1 mm (1/32 in) minimum

Installation

Using a C-clamp or another suitable tool, push the pistons all the way in to allow installation of new pads. To avoid damaging the pistons, use an old pad to push the pistons into the caliper.

NOTE: Clean remaining O.D. of pistons out from caliper with clean brake fluid before pushing the pistons back in. Make sure the pistons are free of any contaminant and are shiny.

Install:

– new brake pads
– spring and push 2 pins to lock the brake pads
– 2 retainers in the pin holes
– caliper on the brake disc (do not torque yet)
– locking tab.

NOTE: Do not forget to fold locking tab over caliper bolt.

⚠ WARNING

Avoid getting fluid, oil or grease on brake pads. Contaminated brake pads can affect stopping capacities.

Press the brake lever until both new pads are touching the brake disc.

Center the brake disc into the caliper. Refer to CALIPER.

BRAKE DISC

Removal

Brake disc **no. 10** can be removed without removing chaincase. Proceed as follows:

– Remove belt guard, belt and driven pulley.
– Remove air silencer.
– Unbolt bearing support **no. 15** from chassis.
– Unscrew caliper from chaincase.
– Open chaincase and remove upper sprocket.
– Pull countershaft **no. 16** toward driven pulley side to free from chaincase and disc.
– Remove disc.

Inspection

Check for scoring, cracking or bending, replace as required.

CAUTION: Brake disc should never be machined.

Installation

Apply anti-seize lubricant (P/N 293 800 070) on shaft.

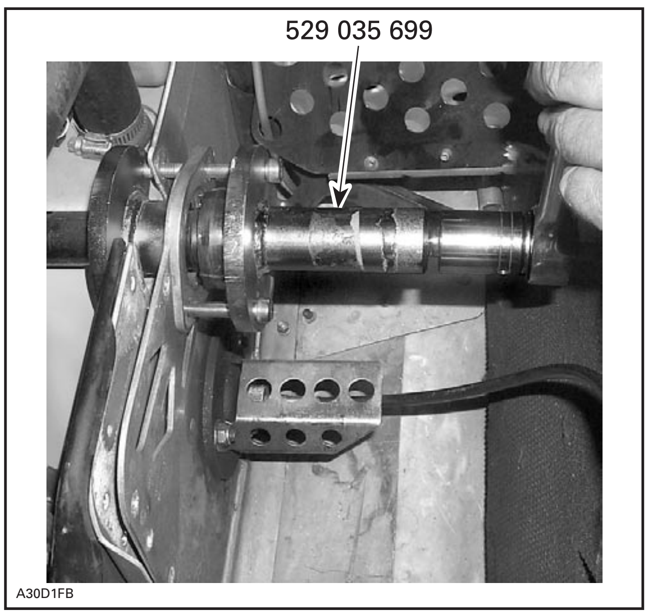
The disc hub exceeds the disc more from one side than from the other. Install disc with the longer exceeding portion toward driven pulley.

Reinstall all removed parts.

COUNTERSHAFT BEARING

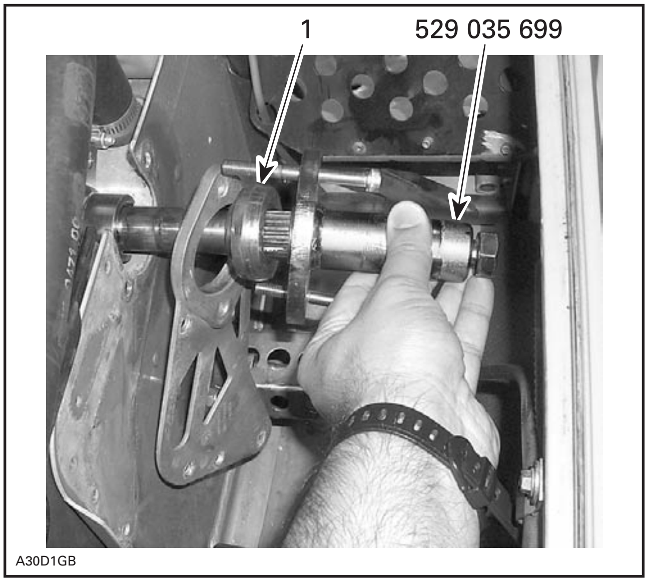
Removal

Unbolt bearing support **no. 15**. Install screw from remover (P/N 529 035 699).



TYPICAL

Install remover (P/N 529 035 699) on countershaft for complete bearing **no. 17** removal.



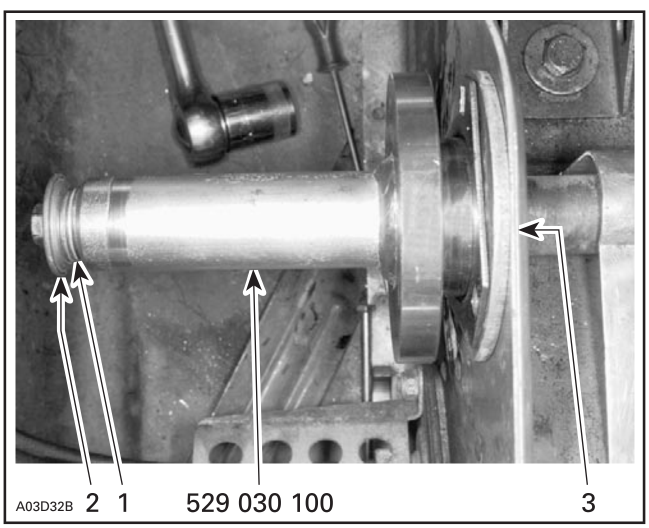
TYPICAL
1. Bearing

Installation

Insert countershaft (with brake disc) from chaincase side through countershaft support (driven pulley side), then insert into chaincase.

Install countershaft bearing **no. 17** using proper tool.

To install bearing on countershaft, use remover (P/N 529 030 100) and some flat washers of 3 mm (1/8 in) total thickness. Using original retaining screw and shouldered washer tighten until bearing rests against circlip.



1. Washers use as a 3 mm (1/8 in) spacer
2. Original retaining screw and shouldered washer
3. Bearing against circlip

Ensure that countershaft is properly aligned, then tighten 3 retaining screws.

NOTE: A misaligned countershaft will result in difficulty to center the bearing in its support.

Torque castellated nut of upper sprocket to 45 to 75 N•m (33 to 55 lbf•ft).

Close chaincase referring to CHAINCASE.

COUNTERSHAFT

Removal

Proceed the same as for countershaft bearing removal and then remove the countershaft **no. 16**.

Inspection

Check countershaft for bending, rust or other damages. Replace if necessary.

Installation

The installation is the reverse of removal procedure.

BRAKE LIGHT SWITCH

Removal

The brake light switch **no. 18** is located near the brake lever. To remove the switch, do the following.

Disconnect the switch.

Take out the master cylinder from the handlebar.

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, unscrew the switch body paying attention to apply a torque in axial direction with steps of little torque angles and paying attention to not apply a force in radial direction (flexion).

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 during the unscrewing activity, act mechanical restoring the threads on master cylinder seat and then go on with the installation procedure.

Installation

NOTE: The brake light switch is not adjustable.

Put the switch on the seat, rotating it only for 1 or 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 releases 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 handlebar 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.

BLEEDING

Bleed brake system as follows:

Keep sufficient recommended brake fluid in reservoir at all times.

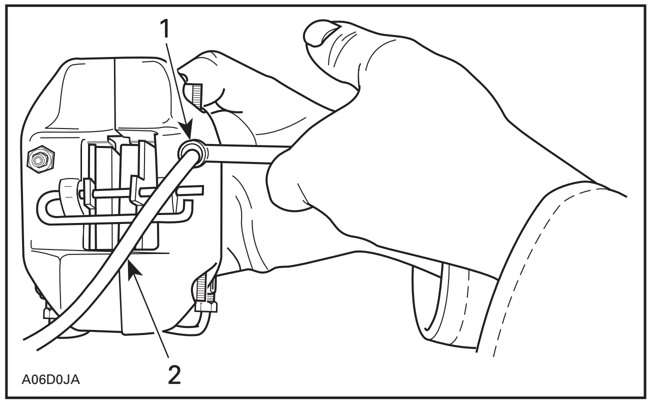
CAUTION: Use only DOT 4 brake fluid, SRF (P/N 293 600 063) or GTLMA (P/N 293 600 062). Do not use fluids other than the recommended one, nor mix different fluids for topping up.

Install a clear hose on left side bleeder **no. 19**. Route this hose to a container. Open bleeder.

Pump brake lever until no air escapes from hose.

Close bleeder.

Proceed the same way with the right side bleeder **no. 20**.



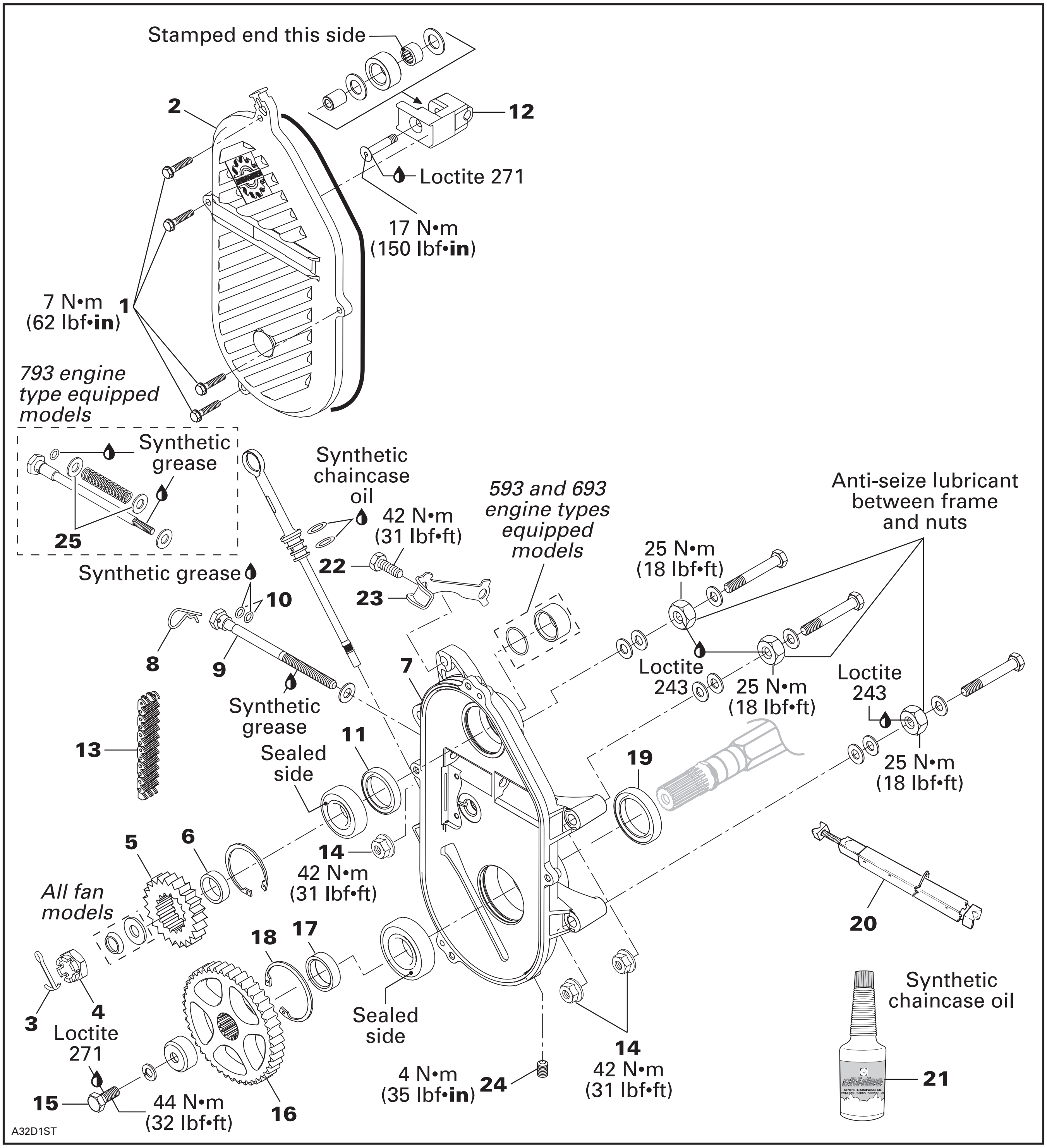
TYPICAL
1. Open bleeder
2. Clear hose to catch used brake fluid

⚠ WARNING

Avoid getting oil on brake pads.

CHAINCASE

All Models except 4-TEC



REMOVAL AND DISASSEMBLY

To remove chaincase proceed as follows.

Remove tuned pipes and muffler.

⚠ WARNING

Never remove exhaust components when engine is hot.

Remove hair pin **no. 8**. Release drive chain tension by unscrewing tensioner adjustment screw.

Drain oil by removing drain plug **no. 24**.

3,4,5,6,13,16,17, Cotter Pin, Nut, Sprocket, Shim and Drive Chain

Apply parking brake.

Remove cotter pin **no. 3** and nut **no. 4** retaining upper sprocket **no. 5** and screw **no. 15** retaining lower sprocket **no. 16**. Pull sprockets and drive chain simultaneously. Remove shims **no. 6** and **no. 17**.

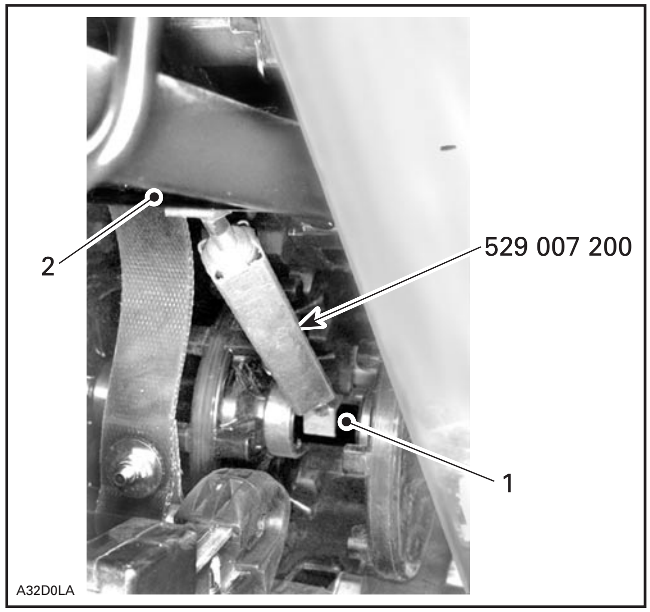
NOTE: Should countershaft removal be required, refer to BRAKE then look for COUNTERSHAFT REMOVAL.

Release parking brake.

Remove 3 nuts **no. 14**.

Unfold locking tab **no. 23** then remove caliper retaining screws **no. 22**.

Release track tension, use drive axle holder **no. 20** (P/N 529 007 200).

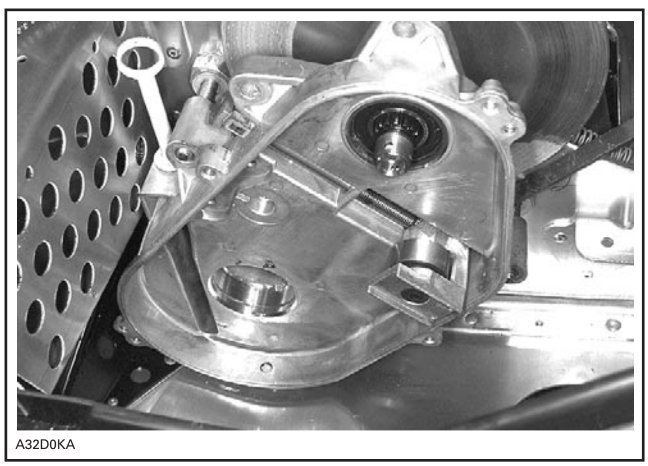


1. Drive axle
2. Suspension front arm upper axle

Pry out drive axle oil seal **no. 19** from chaincase.

Pull chaincase from drive axle and countershaft.

Using 2 large prybars inserted between chaincase housing **no. 7** and frame, pry complete assembly from vehicle.



CHAINCASE HOUSING REMOVAL

INSPECTION

Visually inspect the chain for cracked, damaged or missing links. Check for worn or defective bearings, sprockets and chain tensioner components.

⚠ WARNING

If chain deflection is greater than 38 mm (1.5 in) (without chain tensioner), replace chain and check condition of sprockets.

GEAR RATIO MODIFICATION

For particular applications, the number of teeth of the sprockets can be increased or decreased on lower and upper sprockets.

Refer to TECHNICAL DATA for gear ratios.

CAUTION: Gear ratio modifications should only be performed by experienced mechanics since they can greatly affect vehicle performance.

NOTE: For high altitude regions, a service bulletin will give information about calibration according to altitude.

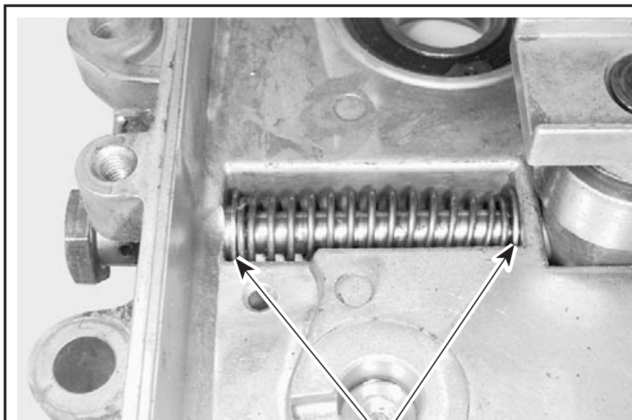
INSTALLATION AND ASSEMBLY

Reverse removal and disassembly procedure and pay attention to the following. Replace oil seals, gaskets O-rings and drain plug.

25, Hardened Washer

793 Engine Equipped Models Only

Make sure to install a hardened washer on each end of spring.



1. Hardened washers

All Models

11, Oil Seal

Using an appropriate pusher, press the oil seal into chaincase hub. Oil seal must fit flush with the chaincase edge.

NOTE: Should installation procedure for countershaft be required, refer to BRAKE.

5,16, Sprockets

Position the sprockets with the backside of writing facing the chaincase cover. Sprocket hub faces toward chaincase.

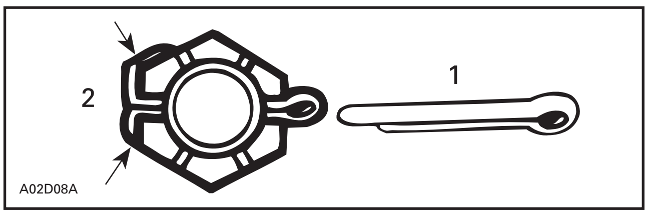
4, Upper Sprocket Castellated Nut

Torque to 45 to 75 N•m (33 to 55 lbf•ft).

Install new cotter pin in the position shown.

CAUTION: When removing a cotter pin always replace with a new one.

CAUTION: Cotter pin will rub on chaincase cover if installed otherwise.



1. New
2. Fold cotter pin over castellated nut flats only

18, Circlip

CAUTION: It is of the utmost importance to install the circlip otherwise damage to the chaincase components may occur.

DRIVE CHAIN ADJUSTMENT

NOTE: Brake disc key must be in good condition before checking if chain is loose.

10, O-Ring

Replace O-ring **no. 10** on tensioner adjustment screw. Fully tighten tensioner adjustment screw **by hand**, then back off only far enough for hair pin to engage in locking hole.

This initial adjustment should provide 3 - 5 mm (1/8-13/64 in) free-play when measured at the outer circumference of the brake disc.

CAUTION: Free-play must not exceed 5 mm (13/64 in), readjust if necessary.

⚠ WARNING

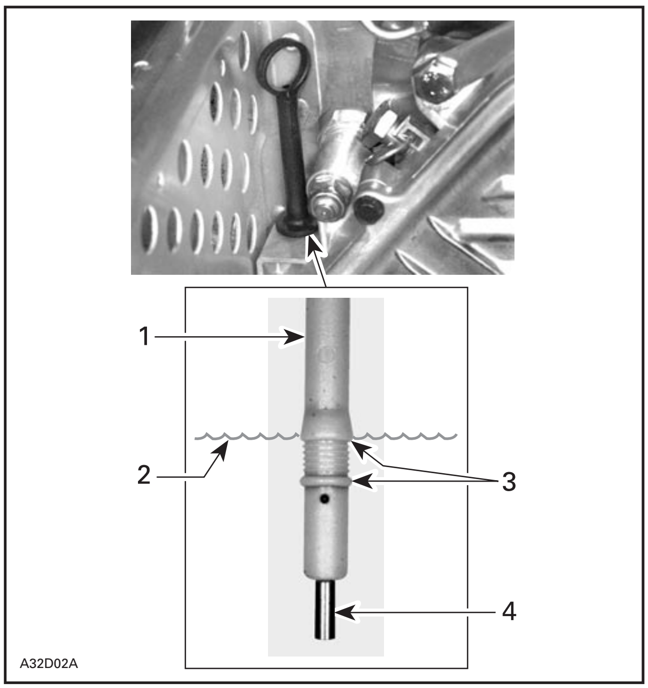
If the specified free-play is not reached with the tensioner screw fully tightened, replace chain and check the condition of sprockets.

21, Chaincase Oil

Pour 250 mL (8.5 U.S. oz) of synthetic chaincase oil (P/N 413 803 300) into chaincase.

NOTE: Chaincase oil capacity is 250 mL (8.5 U.S. oz).

Check oil level with the dipstick then add if required. Remove metal particles from magnet.



TYPICAL
1. Dipstick
2. Oil level
3. Level between marks
4. Magnet

NOTE: Chaincase must be in its proper position when checking oil level.

ADJUSTMENT

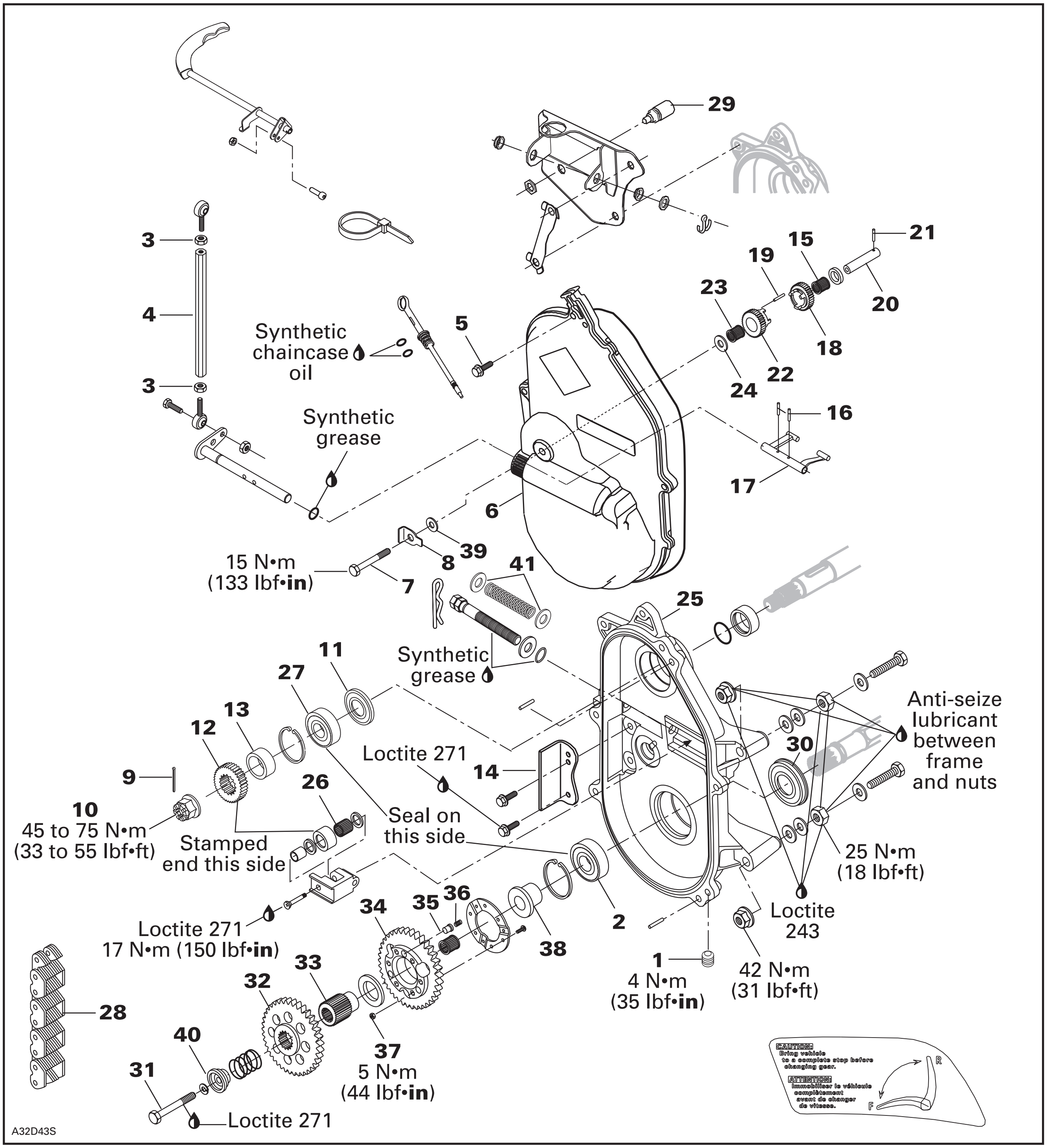
Pulley Alignment

Refer to PULLEY DISTANCE AND ALIGNMENT.

Track Tension and Alignment

Refer to TRACK.

GEARBOX


29
21
3
19
15
23
20
4
Synthetic chaincase oil
5
18
3
24
22
Synthetic grease
16
17
6
15 N•m (133 lbf•in)
39
41
8
7
25
Synthetic grease
11
27
Anti-seize lubricant between frame and nuts
13
12
30
Loctite 271
14
9
26
10
45 to 75 N•m (33 to 55 lbf•ft)
Seal on this side
Stamped end this side
25 N•m (18 lbf•ft)
36
34
35
Loctite 271
17 N•m (150 lbf•in)
2
Loctite 243
38
33
1
4 N•m (35 lbf•in)
42 N•m (31 lbf•ft)
32
28
40
37
5 N•m (44 lbf•in)
31
Loctite 271
A32D43S

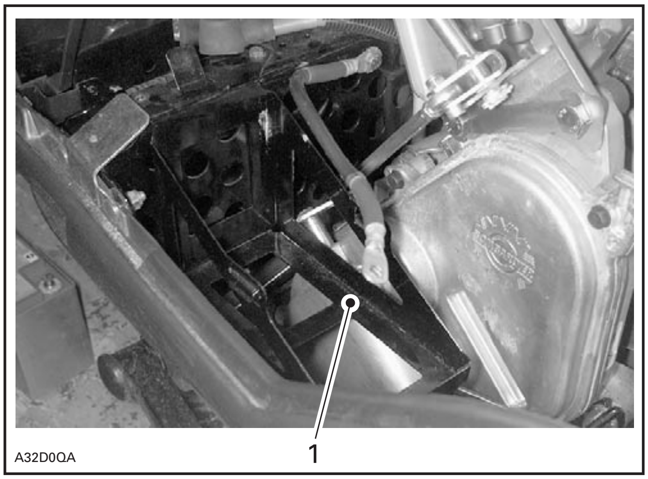
DISASSEMBLY

Disconnect negative cable from battery.

Drain gearbox oil by removing drain plug **no. 1**.

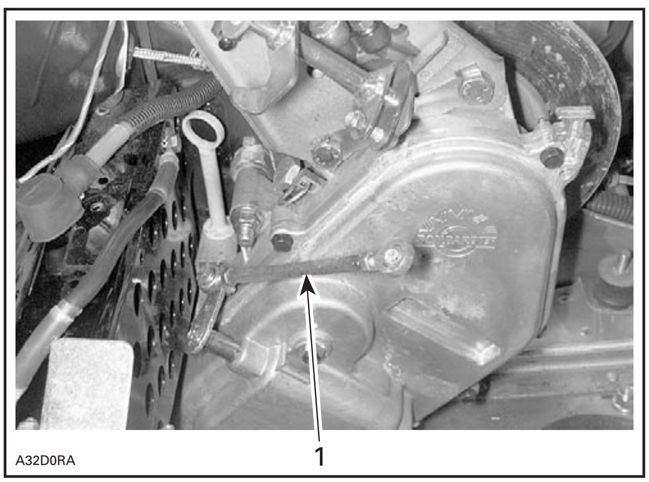
Remove tuned pipe, muffler and muffler grommet.

Remove battery then, battery rack.



TYPICAL
1. Battery rack

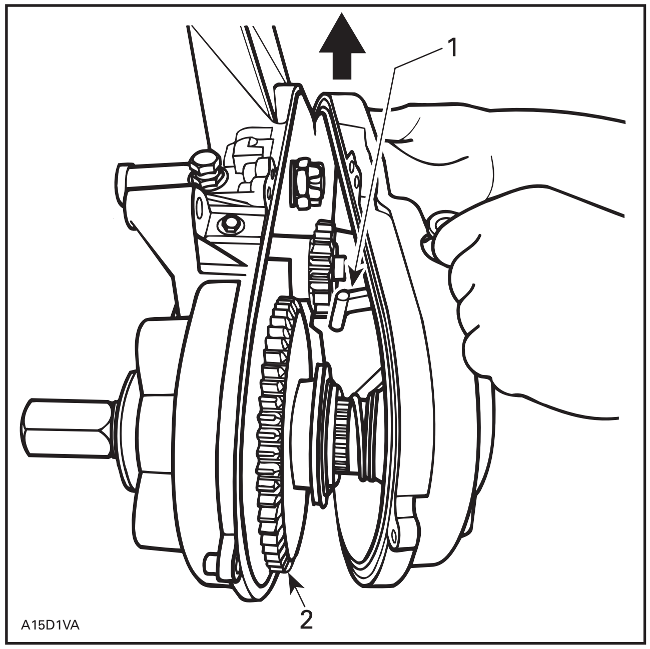
Unfasten tie rod from shifter.



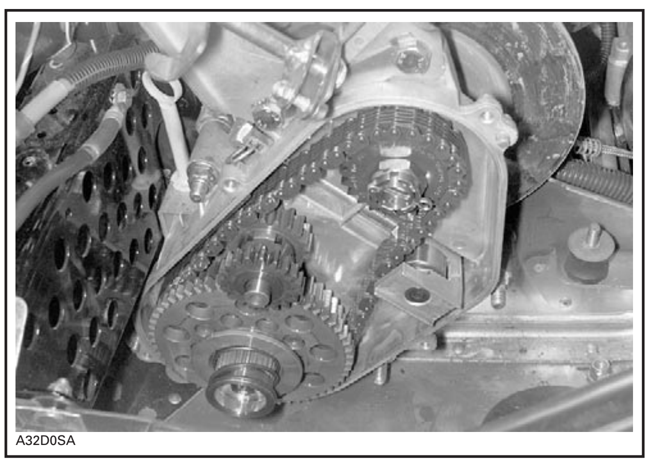
TYPICAL
1. Tie rod

Unscrew cover screws **no. 5** as well as reverse axle screw **no. 7**.

Separate cover **no. 6** from housing and move it toward the front in order to disengage fork from sliding gear.

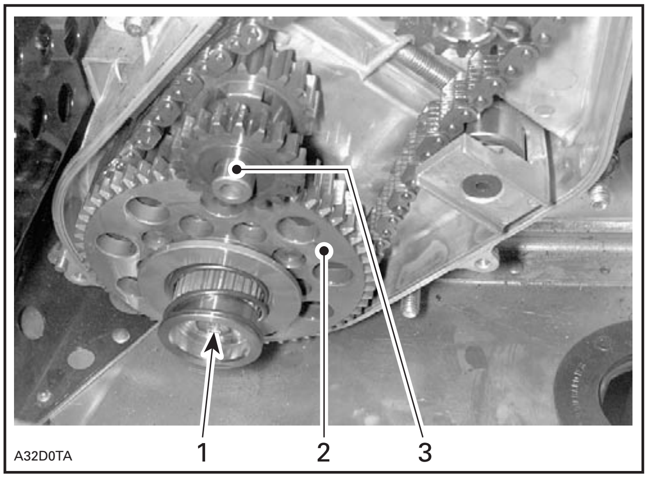


TYPICAL
1. Fork
2. Sliding gear



TYPICAL — GEARBOX COVER REMOVED

Loosen chain tension, unscrew sliding gear retaining screw **no. 31**, then remove sliding gear **no. 32**.



1. *Retaining screw*
2. *Sliding gear*
3. *Reverse axle*

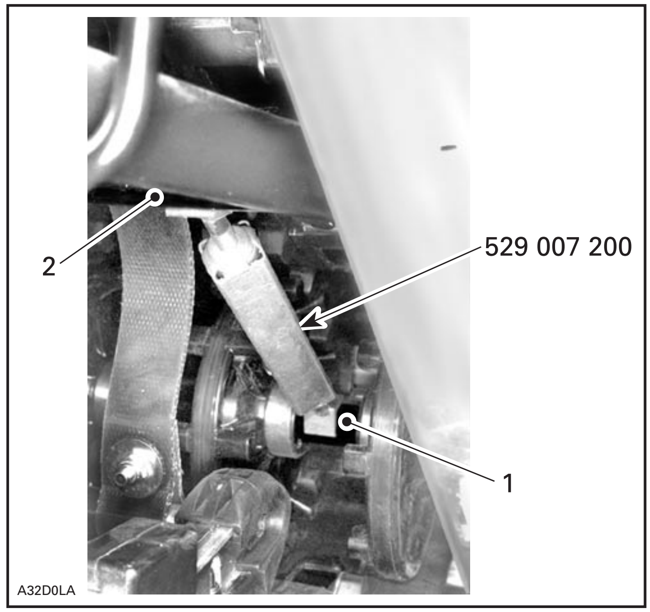
Remove 19-tooth reverse gear **no. 18** then remove reverse axle **no. 20**.

Remove coupling shaft **no. 33**, 44-tooth sprocket **no. 34**, spacer **no. 38** and chain **no. 28**.

First unscrew castellated nut **no. 10**, then remove 21 or 23-tooth sprocket **no. 12** (as applicable).

Force 2 spring pins **no. 16** out to disengage fork **no. 17** from its axle.

Install drive axle holder (P/N 529 007 200) before removing gearbox housing.



1. *Drive axle*
2. *Suspension front arm upper axle*

INSPECTION

14, Chain Slider

Replace slider if maximum wear is 1.0 mm (.039 in) at contact point.

Bearings

Check bearing condition. There must be no discoloration, missing rollers, broken cages, etc.

Sprockets and Gears

Check teeth.

ASSEMBLY

Reinstall gearbox housing.

Sealed side of bearings **no. 2** and **no. 27** must face gearbox cover.

Do not reuse removed oil seals. Replace them with new ones.

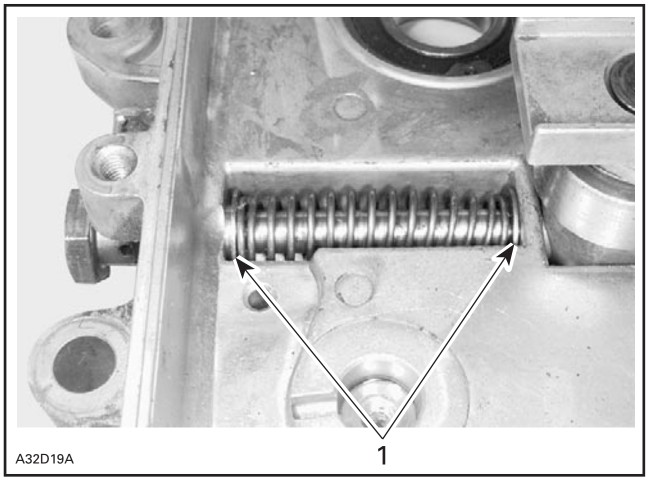
Install bearing **no. 2** and circlip in chaincase bore.

Temporary install spacer **no. 38** with its large outer diameter against sprocket, 44-tooth sprocket **no. 34**, coupling shaft **no. 33**, cap **no. 40** and screw **no. 31**.

Place a 25 cm (10 in) rule against sprockets. Maximum allowable offset is 1 mm (.040 in).

If upper sprocket is too far in, possible cause is that countershaft: bearing on driven pulley side may be too far in. To check, pull out bearing then recheck sprocket alignment. Reposition bearing. Bearing housing (triangle) must be against frame without preload.

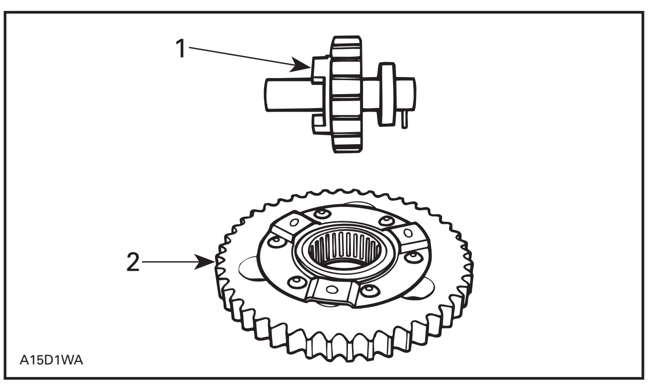
Make sure to install a hardened washer on each end of spring.



1. *Hardened washers*

Press needle bearing in 44-tooth sprocket. Assemble drive pins **no. 35** and their spring **no. 36** on 44-tooth sprocket. Tighten nut **no. 37** to 5 N•m (44 lbf•**in**) in a criss-cross sequence.

Insert spring pin **no. 21** in reverse axle up to inside diameter. Press needle bearing in 19-tooth sprocket. Install ring **no. 24** and 19-tooth sprocket on reverse axle.



1. *Reverse axle ass'y*
2. *Sliding gear ass'y*

Install spacer **no. 13** and 21 or 23-tooth sprocket (drive) **no. 12** (as applicable), then tighten castellated nut **no. 10** and conical spring washer. Secure with a new cotter pin.

Install chain **no. 28**, 44-tooth sprocket **no. 34** and its spacer **no. 38**. Spacer's large outer diameter must be against sprocket. Insert coupling shaft **no. 33** in 44-tooth sprocket.

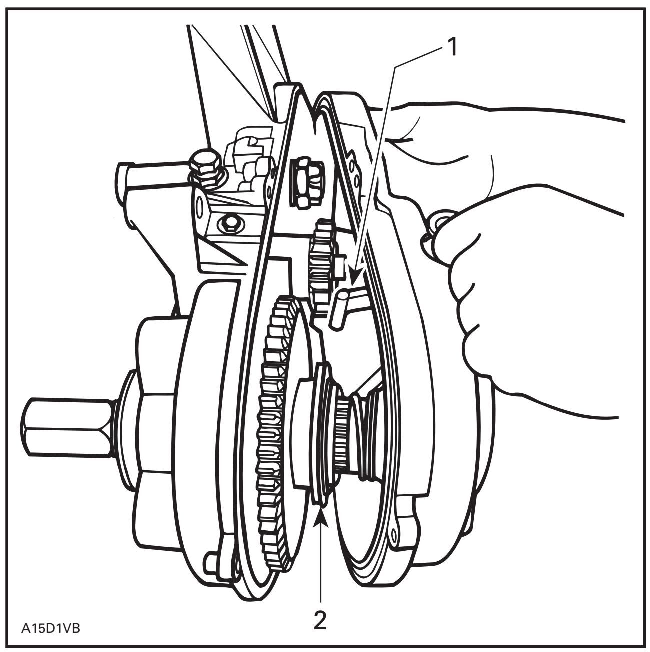
Install needle bearing **no. 15** (wider one) in reverse gear **no. 18**.

Install reverse axle **no. 20** (assembly) making sure to properly position spring pin in housing slot. Install alignment rod **no. 19**, reverse gear **no. 18** and spacer **no. 24**. Drive sprocket hole and driven gear hole must be aligned to insert alignment rod.

Mount chain tensioner (assembly) to adjustment screw already fixed to gearbox. Assemble fork **no. 17** to axle using spring pins **no. 16**. Apply grease on O-rings.

6, Cover

Join cover (assembly) to housing. Make sure fork tabs are behind sliding sprocket thrust washer.

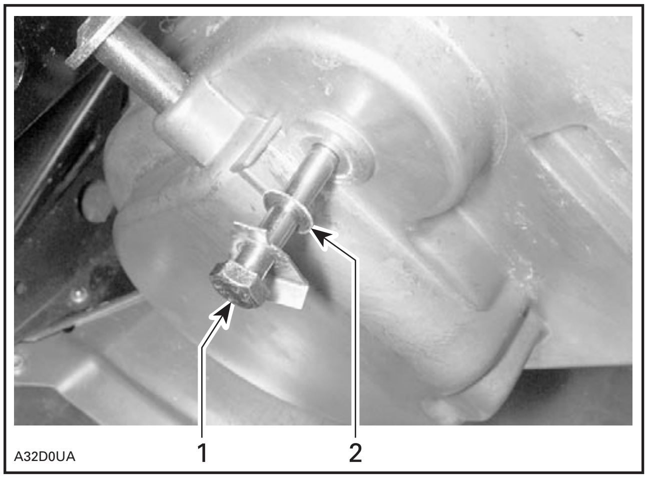


1. *Fork tabs*
2. *Thrust washer*

CAUTION: Gearbox cover must lay completely against housing.

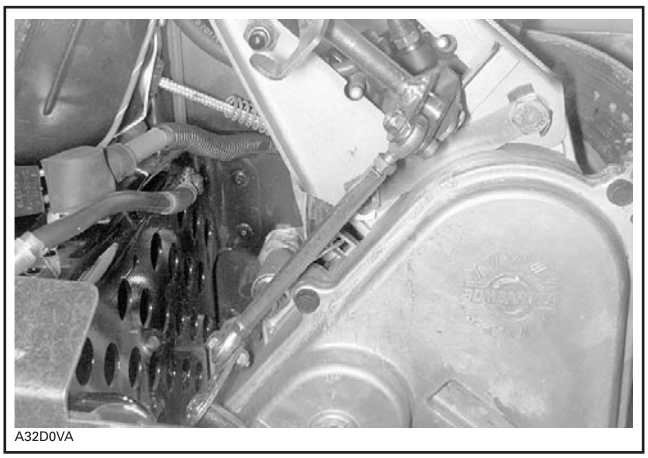
5,7,8,39, Screws, Locking Tab and Copper Washer

Tighten screws in a criss-cross sequence starting with the one above reverse axle. Install reverse axle screw, copper washer and bend locking tab against screw head flat.



1. Reverse axle screw
2. Copper washer

Bolt tie rod to shifter.



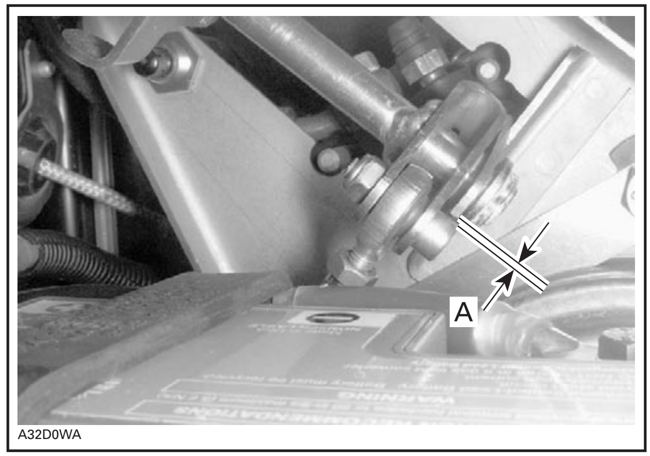
ADJUSTMENT

28, Chain

Fully tighten adjustment screw by hand, then back off only far enough for hair pin to engage in locking hole.

4, Gear Shift Linkage

– Check proper fit of handle in console.
– Shift into forward gear.
– Loosen ball joint lock nuts on the tie-rod.
– Lengthen tie-rod until distance between upper ball joint screw head and stopper is 0 to 0.3 mm (0 to .012 in).



A. 0 to 0.3 mm (0 to .012 in)

NOTE: It is normal to feel a light friction when shifting into gear.

– Statically test transmission operation in forward and reverse positions.
– Hold linkage and tighten ball joint jam nut.

29, Alarm Switch

Adjust backup alarm switch so that buzzer sounds when transmission is in reverse gear while engine is running.

OIL CHANGE

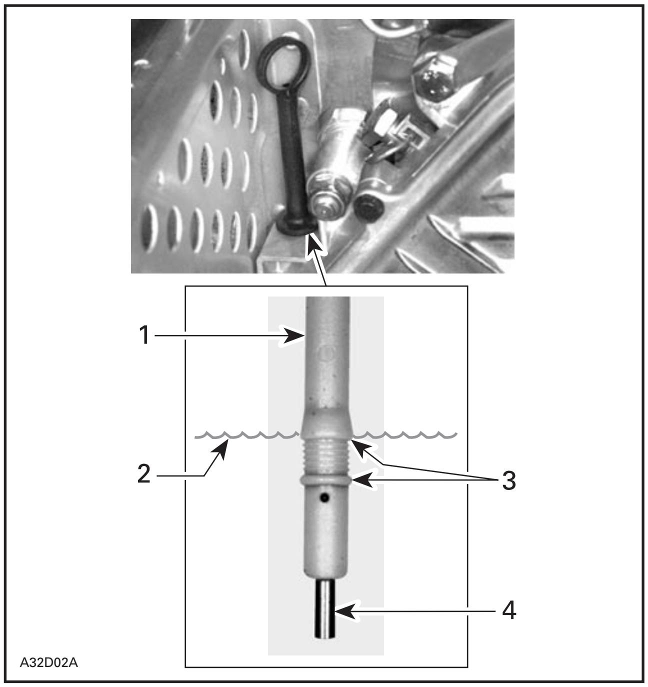
Place a container under bottom pan (gearbox side).

Remove drain plug.

NOTE: It is normal to find metallic particles stuck to dipstick magnet. If bigger pieces of metal are found, disassemble and check all parts.

Fill gearbox with Bombardier synthetic chaincase oil (P/N 413 803 300 — 12 x 250 mL). Oil capacity is 250 mL (8.5 oz).

Check oil level with dipstick. With dipstick unscrewed, oil level must be between MIN. and MAX. marks.



TYPICAL
1. Dipstick
2. Oil level
3. Level between marks
4. Magnet

DRIVE CHAIN

SILENT CHAIN

There are 2 types of silent chains. One is 11-plates wide and the other is 13-plates wide (stronger). Do not interchange chains. Fit chain on top sprocket to make sure that you are using right one according to width. Refer to TECHNICAL DATA.

NOTE: No work (separation, lengthening) can be done on the silent chain type.

IGNITION TIMING

377 and 552 Engine Types

If for any reason, ignition timing accuracy is suspected, it can be verified as follows.

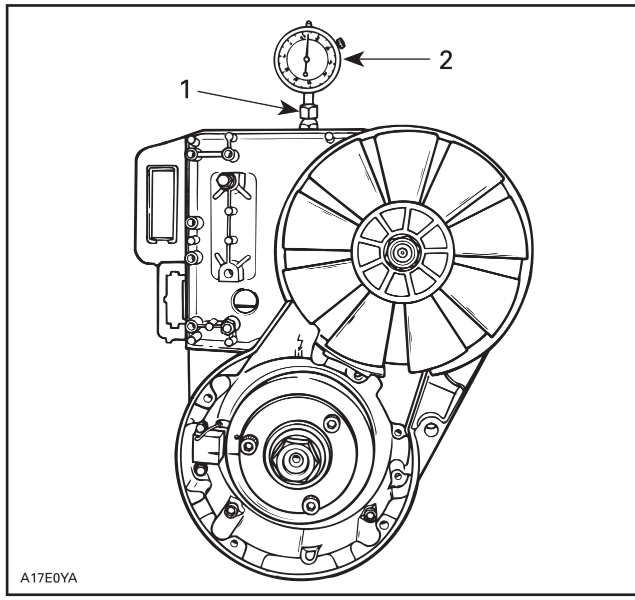
VERIFYING MAGNETO FLYWHEEL TIMING MARK POSITION

Prior to checking the timing, it may be necessary to verify the position of the timing mark on the magneto flywheel, for the following reasons:

- To detect a missing or broken magneto flywheel Woodruff key which would allow a change of timing to occur, with eventual breakdown of the engine.
- To correctly locate and mark a timing mark on a new service magneto flywheel.
- To verify the correct location of the factory timing mark.
- To detect a wrong magneto flywheel corresponding to a different engine type.

To verify the position of the timing mark on the magneto flywheel, proceed as follows:

- Clean the area around the spark plugs, and remove them.
- Remove the rewind starter from the engine.
- Install the TDC gauge in the spark plug hole, (magneto/generator side) and adjust as follows:
  – Position the magneto flywheel at approximately TDC.

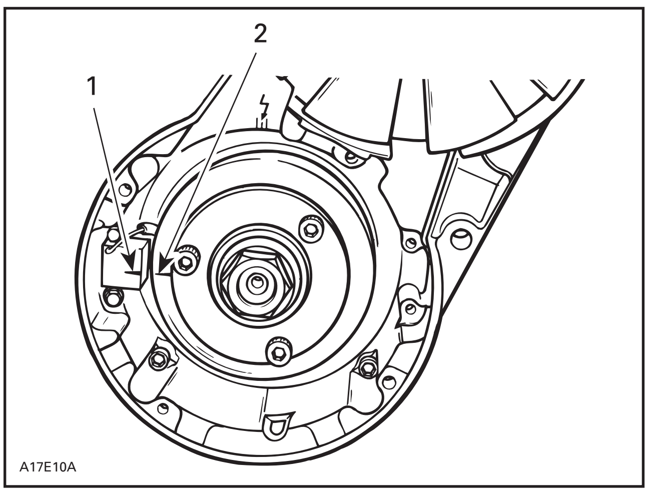


TYPICAL — INSTALLATION OF TDC GAUGE
1. Adaptor lock nut
2. Gauge on MAG side cylinder

  – Assemble the gauge to the adaptor and tighten the roller lock nut. Do not tighten the adaptor lock nut.
  – Screw the adaptor into the spark plug hole and tighten to prevent movement in the plug hole.
  – Position the dial face toward the magneto/generator. Move the gauge down until the needle just begins to move, then move down a further 5 or 6 mm (approximately 1/4 in). Tighten adaptor lock nut by hand.
- Locate the piston TDC position as follows:
  – Slowly rotate the magneto flywheel back and forth across TDC while observing the needle. Note that the needle stops moving only as the piston is changing direction.
  – Rotate the dial face so that «0» is in line with the needle when it stops moving.
  – Again, slowly rotate the magneto flywheel back and forth across TDC and adjust the dial face to «0», until the needle always stops exactly at «0» before changing direction.
  – «0» now indicates exact TDC.
- Verify the position of the timing mark on the magneto flywheel as follows:

NOTE: When checking timing, certain procedures require that the magneto flywheel be turned in a clockwise direction, viewed facing the magneto/generator. If it is necessary to turn back (counterclockwise) for any reason, rotate the magneto flywheel at least one-quarter turn counterclockwise, and then rotate it clockwise. The last magneto flywheel movement when making a critical check must always be in a clockwise direction, to ensure that the slack in engine moving parts is taken-up.

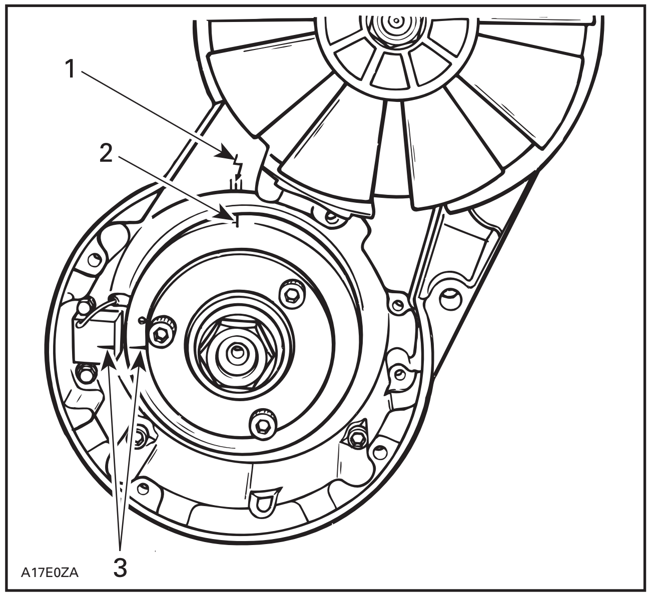
- Rotate the magneto flywheel counterclockwise, one-quarter turn then carefully rotate it clockwise until the needle indicates the specified measurement. Refer to TECHNICAL DATA.
- Verify that the magneto flywheel mark perfectly aligns with the mark on the trigger coil, refer to illustration.
- If the marks do not align, check magneto flywheel and trigger coil part numbers and check Woodruff key condition. If all parts are the appropriate ones and if Woodruff key is in good condition, continue the procedure.



TYPICAL
1. *Trigger coil mark*
2. *Magneto flywheel mark*

NOTE: These marks cannot be used to check dynamic (with engine running) ignition timing with a timing light: a new mark must be scribed on magneto flywheel for this purpose.

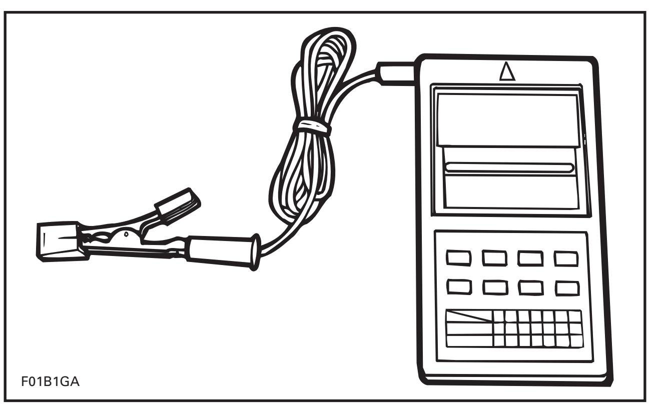
- Scribe a new mark on magneto flywheel as follows.
  - Remove the fan cover from the engine.
  - Maintain magneto flywheel so that previous marks remain aligned.
  - Scribe or punch a mark on magneto flywheel so that it perfectly aligns with the arrow on crankcase, refer to illustration. This new timing mark should be used for future timing checks (dynamic timing).
  - Reinstall rewind starter.
  - Check the timing with a timing light.



TYPICAL
1. *Crankcase arrow*
2. *Scribe a mark here*
3. *Maintain verified timing marks aligned (static timing)*

CHECKING IGNITION TIMING

Use a timing light and digital induction type tachometer (P/N 529 014 500).



TACHOMETER

To check the ignition timing, refer to illustration and proceed as follows:

- Place ski tips against a wall, raise rear of vehicle on a stand, so that track does not contact the ground.

⚠ WARNING

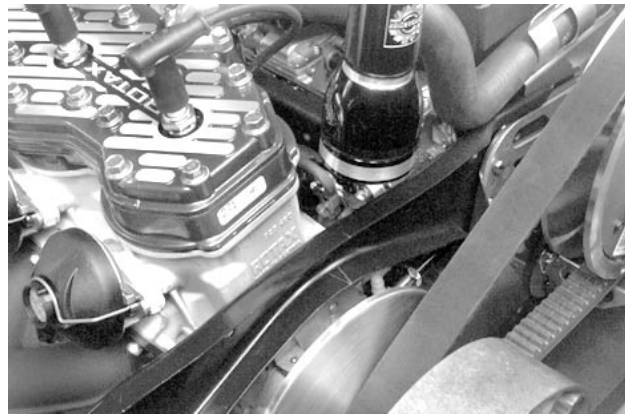
Do not allow anyone in front of or behind the vehicle while engine is running. Keep clear of track and do not wear loose clothing which can get caught in moving parts.

- Connect the timing light pick-up to a spark plug cable.

NOTE: To avoid an incorrect reading due to parallax, view the magneto flywheel and the crankcase timing marks in a straight line.

- Connect tachometer wire to spark plug wire or aim tachometer toward spark plug wire without using any connection wire.
- Start the engine and raise the engine speed at least to 3500 RPM (3000 to 4000 RPM) while observing the timing marks, refer to illustration. The magneto flywheel mark scribed previously and the crankcase arrow should be perfectly aligned. If the marks do not align, a faulty trigger coil (check proper grounding of coil), a faulty flywheel, a faulty Woodruff key, a misaligned (twisted) crankshaft or a faulty CDI module could be the cause: substitute one part at a time and recheck timing marks (check connectors condition prior to substituting any part).

NOTE: Ignition timing may be verified when engine speed is anywhere within 3000 - 4000 RPM.


A30E1UA

TYPICAL

- Install parts which were removed.

593, 593 HO SDI, 693 and 793 SDI Engines

Normally ignition timing adjustment should not be required. It has been set at factory and it should remain correctly adjusted since every part is fixed and not adjustable. The only time the ignition timing might have to be changed would be when removing and reinstalling the magneto housing, replacing the crankshaft, the magneto flywheel, the trigger coil or the MPEM. If the ignition timing is found incorrect, first check for proper crankshaft alignment. This might be the indication of a twisted crankshaft. Refer to LEAK TEST AND ENGINE DIMENSION MEASUREMENT.

The ignition timing can be checked with either the engine hot or cold. Also, the ignition timing is to be checked at 3500 RPM with a timing light.

Engine retard timing varies depending on engines/models for their first hours of operation.

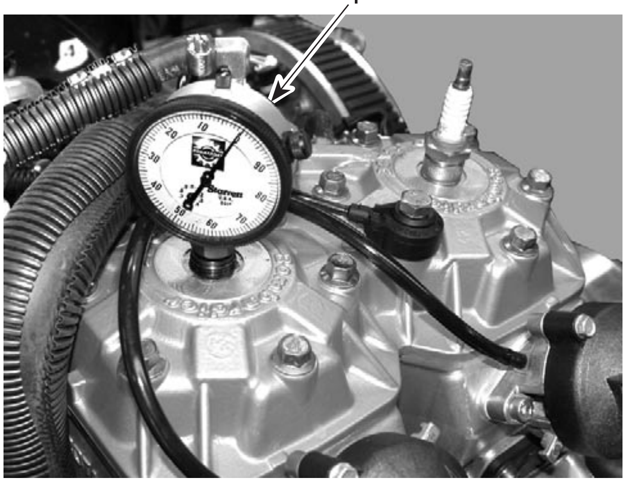
ENGINE/MODELS	ENGINE RETARD TIMING (°)/DURATION (h)
593	– 3°/1 h
593 HO SDI	– 2°/3 h
693	– 3°/2 h
793 SDI	– 2°/3 h

NOTE: Between 3000 and 4000 RPM, the spark advance does not change. So when checking ignition timing at 3500 RPM, a change in engine speed within ± 500 RPM will not affect the timing mark when checked with the timing light.

SCRIBING A TIMING MARK

- Clean the area around the MAG spark plug, and remove it.
- Install the TDC gauge in the spark plug hole, (magneto side) and adjust as follows:
  – Position the MAG piston at approximately TDC.

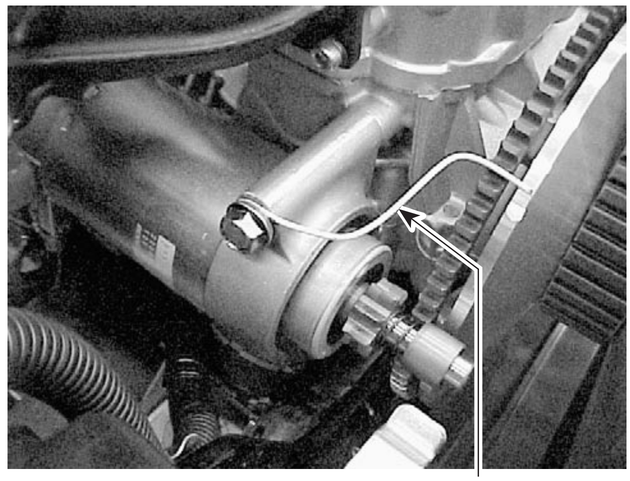
1



A32C9GA

TYPICAL
1. TDC gauge on MAG side

  – Assemble the gauge to the adaptor and tighten the roller lock nut. Do not tighten the adaptor lock nut.
  – Screw the adaptor into the spark plug hole and tighten to prevent movement in the plug hole.
  – Position the dial face toward the PTO. Move the gauge down until the needle just begins to move, then move down a further 5 or 6 mm (approximately 1/4 in). Tighten adaptor lock nut by hand.
- Locate the piston TDC position as follows:
  – Slowly rotate the drive pulley back and forth across TDC while observing the needle. Note that the needle stops moving only as the piston is changing direction.
  – Rotate the dial face so that «0» is in line with the needle when it stops moving.
  – Again, slowly rotate the drive pulley back and forth across TDC and adjust the dial face to «0», until the needle always stops exactly at «0» before changing direction.
  – «0» now indicates exact TDC.
- Rotate the drive pulley clockwise, one-quarter turn then carefully rotate it counterclockwise until the needle indicates the specified measurement, indicated in TECHNICAL DATA.
- Twist a wire as shown and use it as a pointer. Install the wire on upper starter bolt.



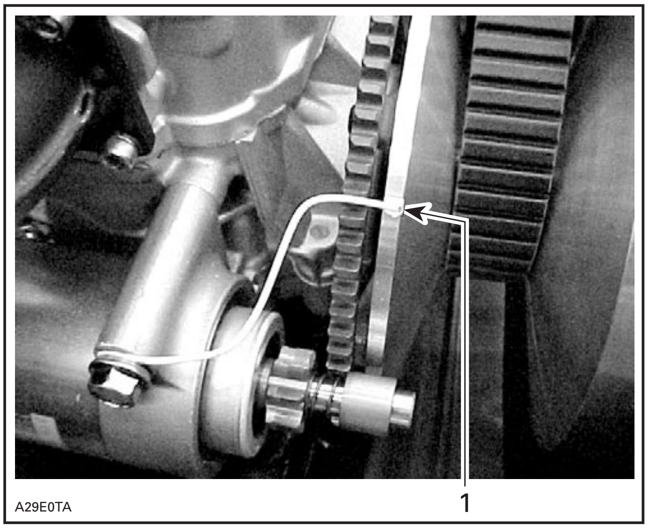
A29E0RA 1

1. Pointer

- With the TDC gauge indicating specified timing, scribe a mark on drive pulley inner half in line with pointer end.

A29E0SA 1

TYPICAL
1. TDC gauge indicating specified timing



1. *Timing mark in line with pointer end*

CHECKING IGNITION TIMING

Use a timing light.

To check the ignition timing proceed as follows:

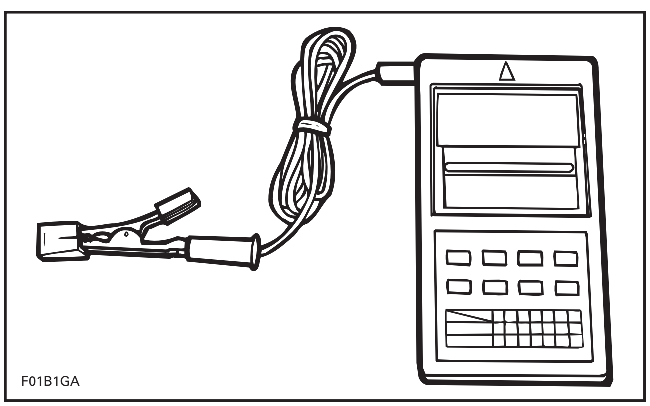
Place ski tips against a wall, raise rear of vehicle on a stand, so that track does not contact the ground.

⚠ WARNING

Do not allow anyone in front of or behind the vehicle while engine is running. Keep clear of track and do not wear loose clothing which can get caught in moving parts.

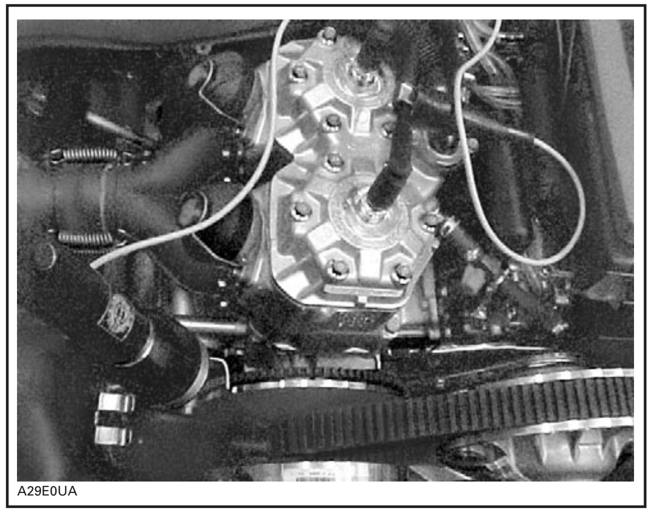
Connect the timing light pick-up to a spark plug cable.

Connect a digital induction type tachometer (P/N 529 014 500).



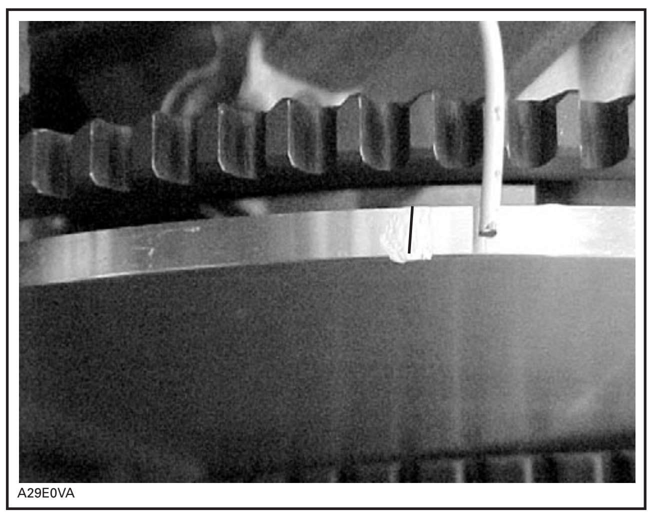
TACHOMETER

Start the engine and point timing light on timing mark. Bring engine to 3500 RPM for a brief instant.

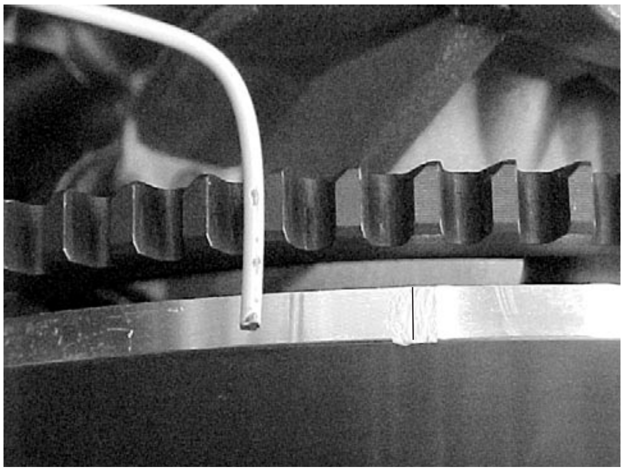


The timing mark must be aligned with pointer end. If such is not the case, note if timing is retarded or advanced.

ENGINE TYPE	TOLERANCE
593, 693	± 1°
593 HO SDI, 793 SDI	± 0.5°



TIMING RETARDED BY ABOUT 1°



A29E0WA

TIMING ADVANCED BY ABOUT 2°

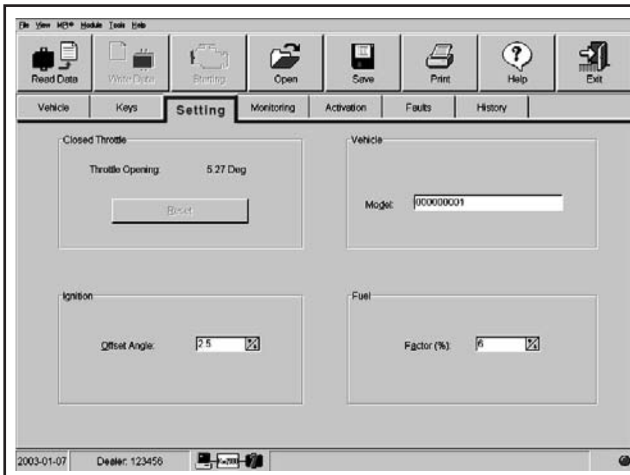
CHANGING TIMING

All Engine Types

NOTE: To change the timing on the SDI engines, the VCK is mandatory. The MPEM programmer cannot be used with these engines.

VCK (Vehicle Communication Kit)

VCK (Vehicle Communication Kit) (P/N 529 035 981) can be used, with BUD. software to change the ignition timing. Look under the proper **Setting** section of the BUDS software to change the ignition timing.



A32A1TA

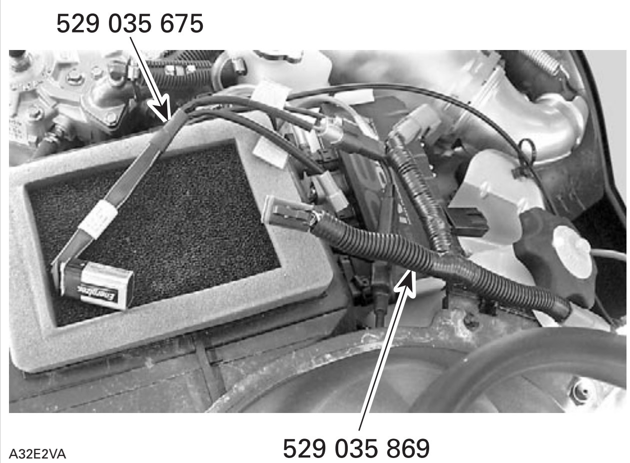
Detailed information about the BUDS software and its usage is available under its **Help** section.

MPEM Programmer

593 and 693 Engine Types

Timing can also be changed using the MPEM programmer (P/N 529 035 878).

Connect 9-volt adaptor (P/N 529 035 675) to supply cable (P/N 529 035 869) and supply cable to diagnostic connector, located on right side of the vehicle.



A32E2VA

Connect MPEM programmer to DESS post.

Turn on programmer then enter password.

From main menu select no. 3. INFO VEHICLE.

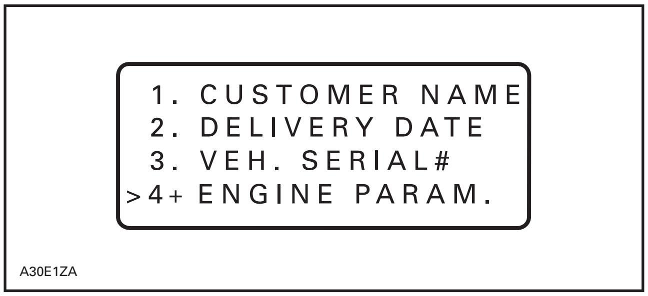
A30E1XA

Vehicle information is transferred from MPEM to programmer.

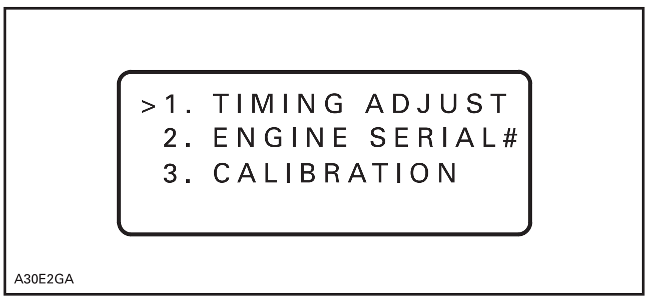
A30E1YA

NOTE: In fact the programmer takes a **copy** of all vehicle parameters scribed in MPEM. This copy will be modified within the programmer then transferred to the MPEM.

Select no. 4. ENGINE PARAMETER.

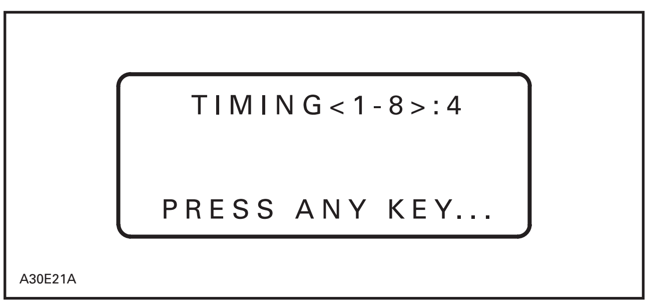


Select no. 1 TIMING ADJUSTMENT.



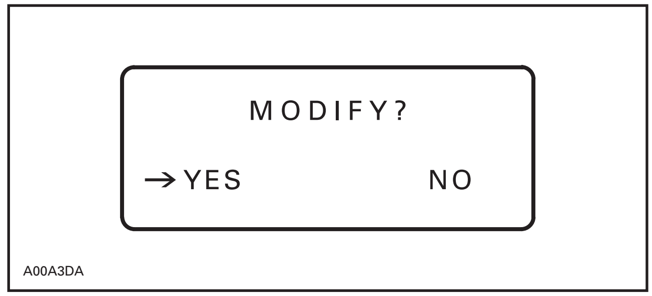
Press ENTER.

Now the display shows the engine timing correction factor that is programmed in the MPEM. In the following example timing correction factor is no. 4.



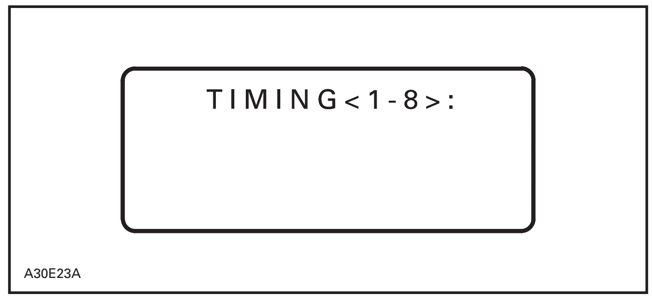
Press any key.

Select YES using the key ↔.



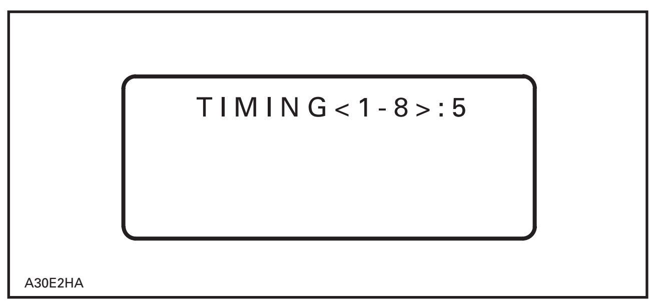
Press ENTER.

Select a timing correction factor corresponding to correction needed.



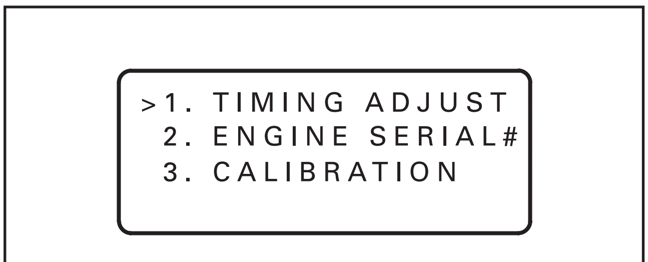
Example: Timing mark as verified with a timing light at 3500 RPM was too early by 2°. The correction factor programmed is no. 4.

Select correction factor no. 5. This will retard the timing by 2° because the difference between correction factor no. 4 and no. 5 is - 2° (passing from 1° to - 1°).



IGNITION CORRECTION FACTOR	
CORRECTION FACTOR PROGRAMMED IN MPEM	IGNITION TIMING CORRECTION
2	3°
3	2°
4	1°
1	0°
5	– 1°
6	– 2°
7	– 3°
8	– 4°

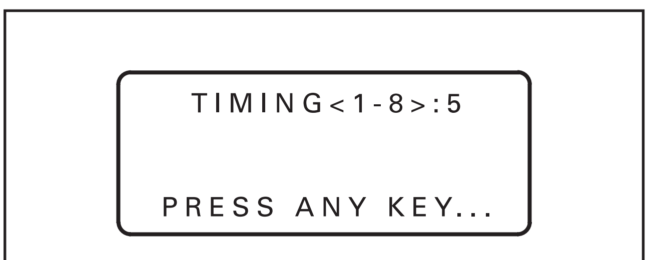
Press ENTER.



A30E2GA

Press ENTER.

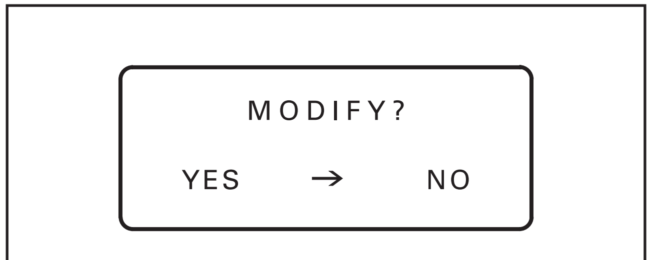
The display confirms that correction factor has been changed to no. 5.



A30E24A

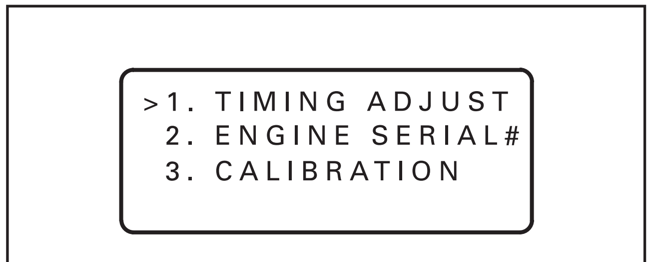
Press any key.

If the new correction factor selected above is the good one select NO and press ENTER.



A30E27A

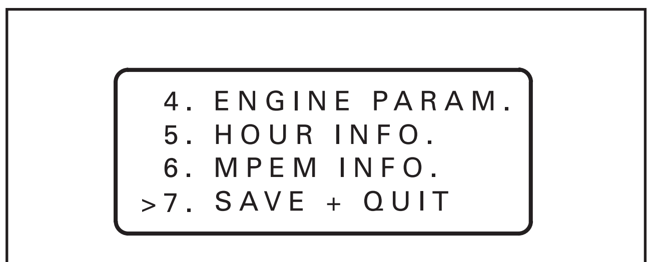
Otherwise select YES to choose an other correction factor.



A30E2GA

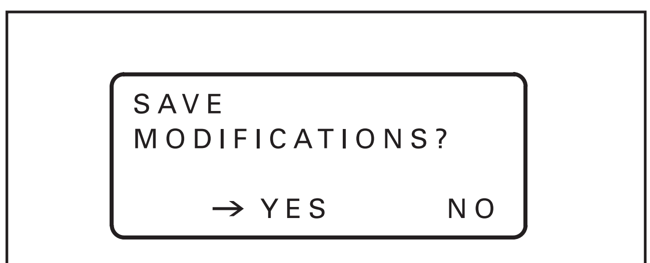
Press MENU.

Scroll to no. 7 SAVE AND QUIT.



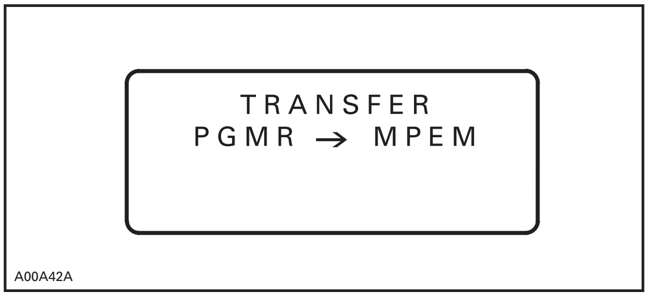
A30E29A

Press ENTER.



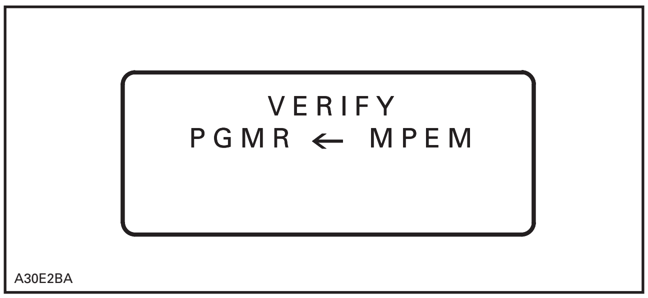
A30E2AA

Press ENTER.



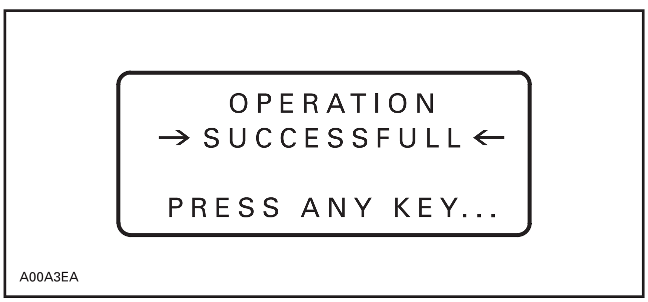
A00A42A

During a very short period of time the following message will appear.



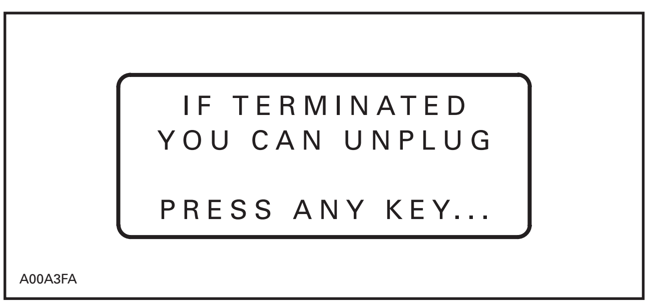
A30E2BA

After the programmer has verified, following message will appear.



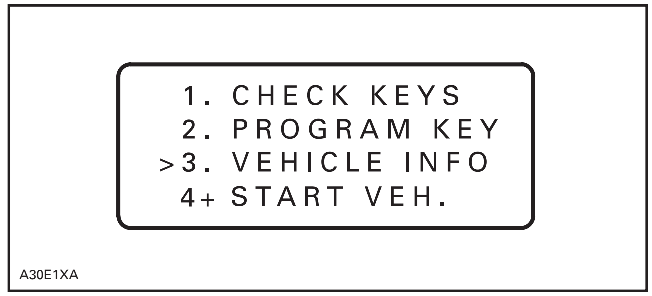
A00A3EA

Press any key.



A00A3FA

Press any key.



A30E1XA

Unplug supply cable and 9-volt adaptor.

Recheck ignition timing with timing light when completed.

SPARK PLUGS

DISASSEMBLY

First unscrew the spark plug 1 turn.

Clean the spark plug and cylinder head with pressurized air, then completely unscrew.

⚠ WARNING

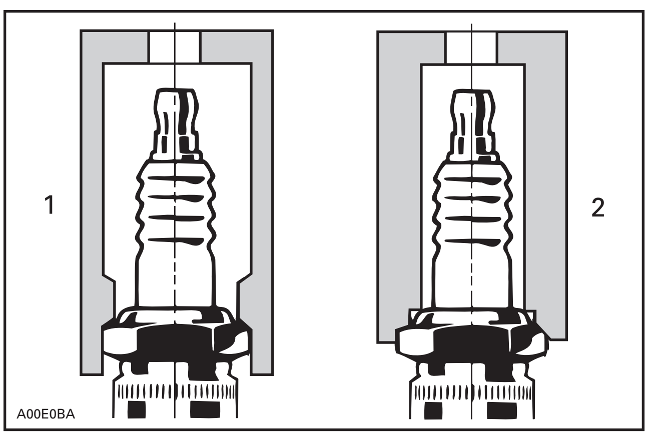
Whenever using compressed air, always wear protective eye wear.

SPARK PLUG INSTALLATION

Prior to installation make sure that contact surfaces of the cylinder head and spark plug are free of grime.

CAUTION: Do not adjust electrode gap of spark plug BR9ECS.

1) Using a wire feeler gauge, set electrode gap according to TECHNICAL DATA.
2) Apply anti-seize lubricant (P/N 293 800 070) over the spark plug threads to prevent possible seizure.
3) Hand screw spark plug into cylinder head and tighten with a torque wrench and a proper socket.



TYPICAL
1. Proper socket
2. Improper socket

SPARK PLUG TIGHTENING TORQUE

MODEL	SPARK PLUGS	TORQUE
All models except 4-TEC	NGK	27 N•m 20 lbf•ft)
4-TEC	NGK DCPR8E	17 N•m 12 lbf•ft)

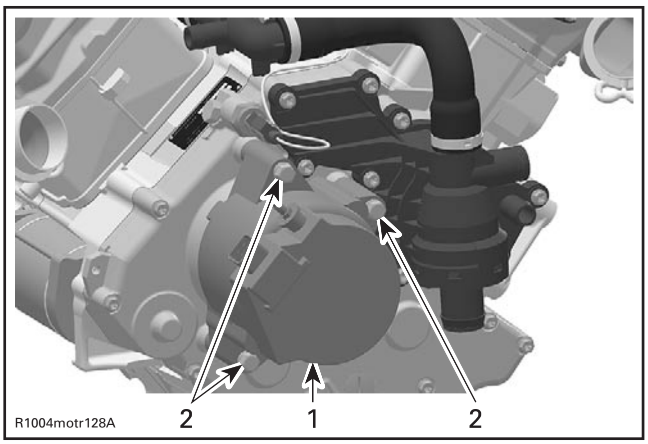
ALTERNATOR

The alternator is located on the ignition cover on the engine right hand side (alternator side).

REMOVAL

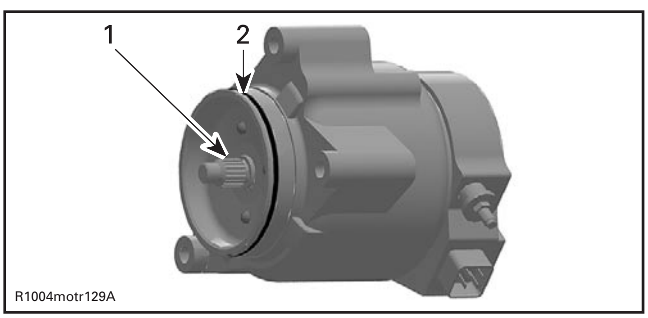
Remove:

– alternator cable
– alternator plug
– alternator screws and pull alternator.



1. Alternator
2. Three screws

INSPECTION



1. Drive gear
2. O-ring

NOTE: The alternator does not require any maintenance and must not be opened for repair work.

Inspect the housing, O-ring and the alternator drive gear 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.

NOTE: At assembly replace the O-ring of the alternator. Grease the drive gear and the O-ring before assembly using multi purpose grease. This will ease assembly and prevent displacement of the gasket during installation.

If it is not possible to move the alternator into the guide, this is due to the position of the drive gear. Pull the alternator out once more, slightly rotate the drive gear and try again.

Torque alternator screws to 23 N•m (17 lbf•ft).

BATTERY

GENERAL

Sealed valve regulated lead acid (VRLA) battery are used. They are non-spillable and maintenance reduced — no electrolyte level to be checked and readjusted. No ventilation tube is attached to the battery.

MODEL	SUPPLIER P/N	BOMBARDIER P/N
2-stroke	YTX20L-BS	515 1756 42
4-stroke	YTX24HL-BS	515 175 895

REMOVAL

All Models

⚠ WARNING

Battery BLACK negative cable must always be disconnected first and connected last.

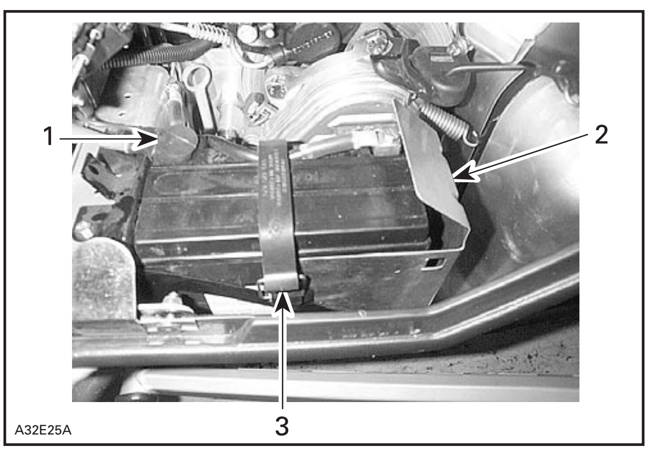
⚠ WARNING

Never charge or boost battery while installed on vehicle.

Unfasten the strap and remove battery guard.

2-Stroke Models

Disconnect the BLACK negative cable first followed by RED cable and remove battery.



1. Rubber boot for RED positive cable terminal
2. Battery guard
3. Strap

4-TEC Models

⚠ WARNING

Ensure rubber boot completely covers the RED cable end and battery post prior to lifting the battery to prevent any possible spark if bare cable/post were touching metallic part of the vehicle.

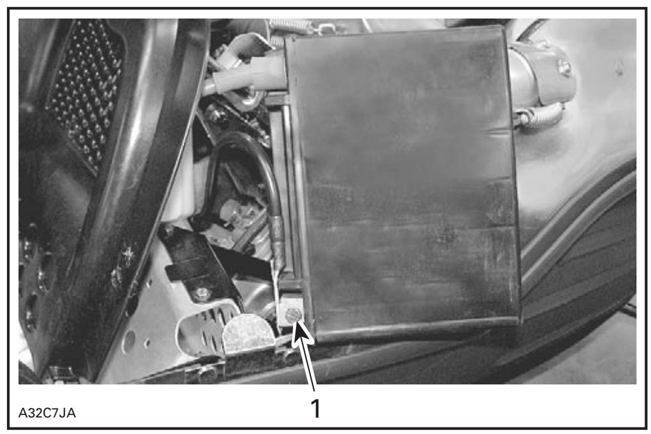
Slowly lift the battery to expose BLACK negative cable connection.

Disconnect the BLACK negative cable from battery post.

Slide away the rubber boot from the RED cable connection.

Disconnect RED positive cable from the battery post.

Remove the battery.



1. BLACK (-) cable

All Models

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 any grease-cutting soap or baking soda 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

Voltmeter Test

NOTE: These sealed batteries have to be tested with a voltmeter. They also need to be tested when their voltage is stabilized. Disconnect battery to have open connectors and wait 1 – 2 hours prior to reading the voltage.

Batteries with a voltage above 12.8 V do not need to be charged.

Batteries with a voltage of 12.8 V and below need to be charged. Refer to BATTERY CHARGING below.

BATTERY STORAGE

CAUTION: A discharged battery will freeze and it may damage its casing. A damaged casing will allow electrolyte spillage that may damage surrounding parts.

Disconnect and remove battery from the vehicle.

The battery must always be stored in fully charged condition.

Clean battery terminals and cable connections using a wire brush. Apply a light coat of dielectric grease (P/N 293 550 004) or petroleum jelly on terminals.

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

Refer to the instructions provided with the battery.

BATTERY CHARGING

⚠ WARNING

Always wear safety glasses and charge in a ventilated area. Never charge or boost battery while installed on vehicle. Do not open the sealed caps during charging. Do not place battery near open flame.

CAUTION: If battery becomes hot, stop charging and allow it to cool before continuing.

NOTE: Sealed VRLA batteries have an internal safety valve. If battery pressure increases due to overcharging, the valve opens to release excess pressure, preventing battery damage.

An automatic charger is the fastest and most convenient way for error-proof charging.

Battery Voltage below 12.8 V and above 11.5 V

STANDARD CHARGING (recommended)		
BATTERY TYPE	TIME	CHARGE
YTX20L-BS	4 – 9 hours	2 A
YTX24HL-BS	5 – 10 hours	

QUICK CHARGING		
BATTERY TYPE	TIME	CHARGE
YTX20L-BS	50 minutes	10 A
YTX24HL-BS	1 hour	

Battery Voltage below 11.5 V

Batteries with voltage below 11.5 V requires special procedures to recharge. In charging an overdischarged battery, its internal resistance may be too high to charge at a normal charging voltage. Therefore, it may be necessary to raise the voltage of the battery initially to 25 V as a maximum, and charge for approximately 5 minutes.

If the charger ammeter shows no change in current after 5 minutes, you need a new battery. Current flowing into the battery at high voltage can become excessive. Monitor amperage and adjust voltage as necessary to keep current at the battery's standard amp rating. Charge for approximately 20 hours.

INSTALLATION OF BATTERY

All Models

Connect RED positive cable it to positive battery terminal. Connect RED wire (coming from 30 A fuse).

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.

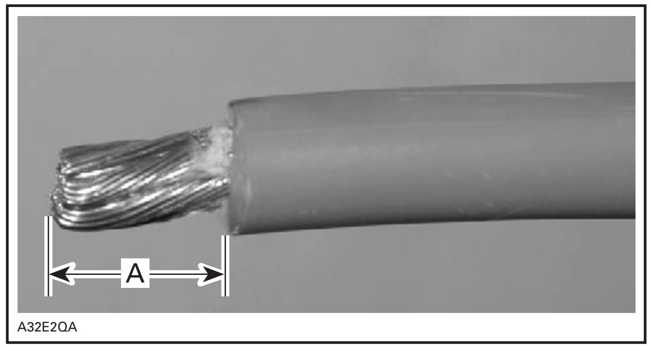
Cover the RED positive terminal with rubber boot.

Put the battery guard and fasten the strap.

Apply silicone dielectric grease (P/N 293 550 004) on battery posts and connectors.

CABLE TERMINAL INSTALLATION

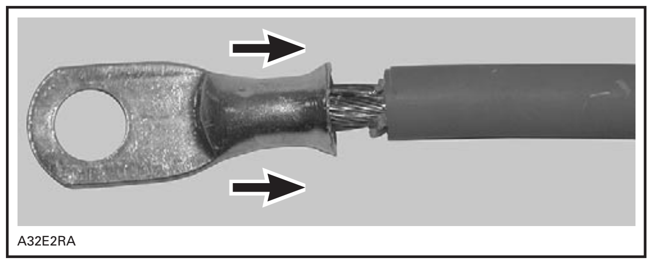
Carefully strip the wire approximately to 10 mm (3/8 in) in length, using a wire stripping tool or sharp blade/knife.



A. 10 mm (3/8 in)

NOTE: Make sure not to cut wire strands while stripping the wire.

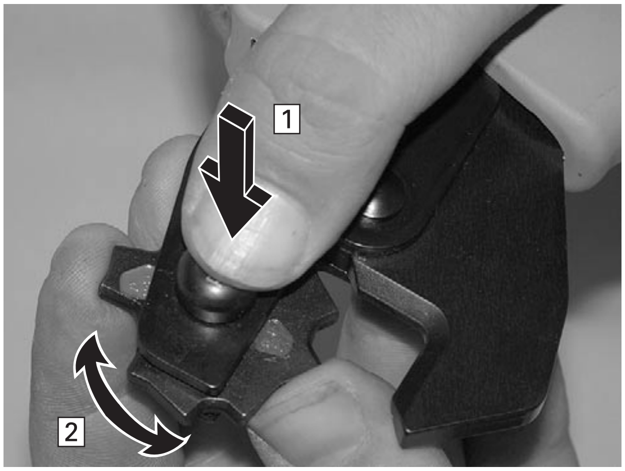
Install the appropriate terminal on the wire according to the requirement. Refer to appropriate parts catalog.



INSTALLATION OF TERMINAL

Follow the instructions provided with the crimp pliers (P/N 529 035 730) to select the proper position of the tool.

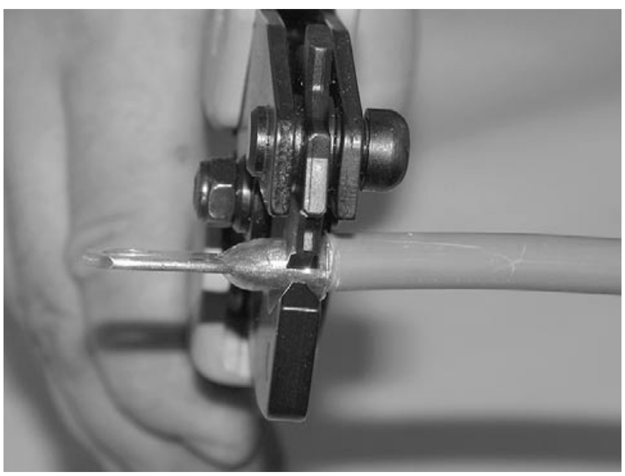
NOTE: Different wires require different crimp pliers settings, so make sure to follow the instruction supplied with the tool.



A32E2SA

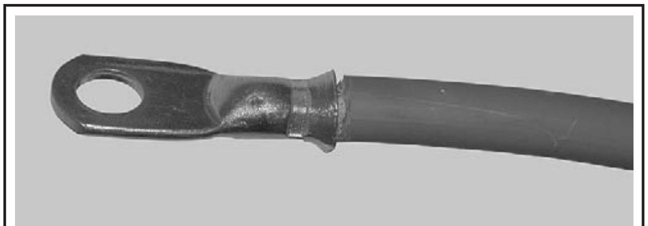
POSITIONING THE CRIMP PLIERS
1. Press
2. Rotate

After positioning the crimp pliers, 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.

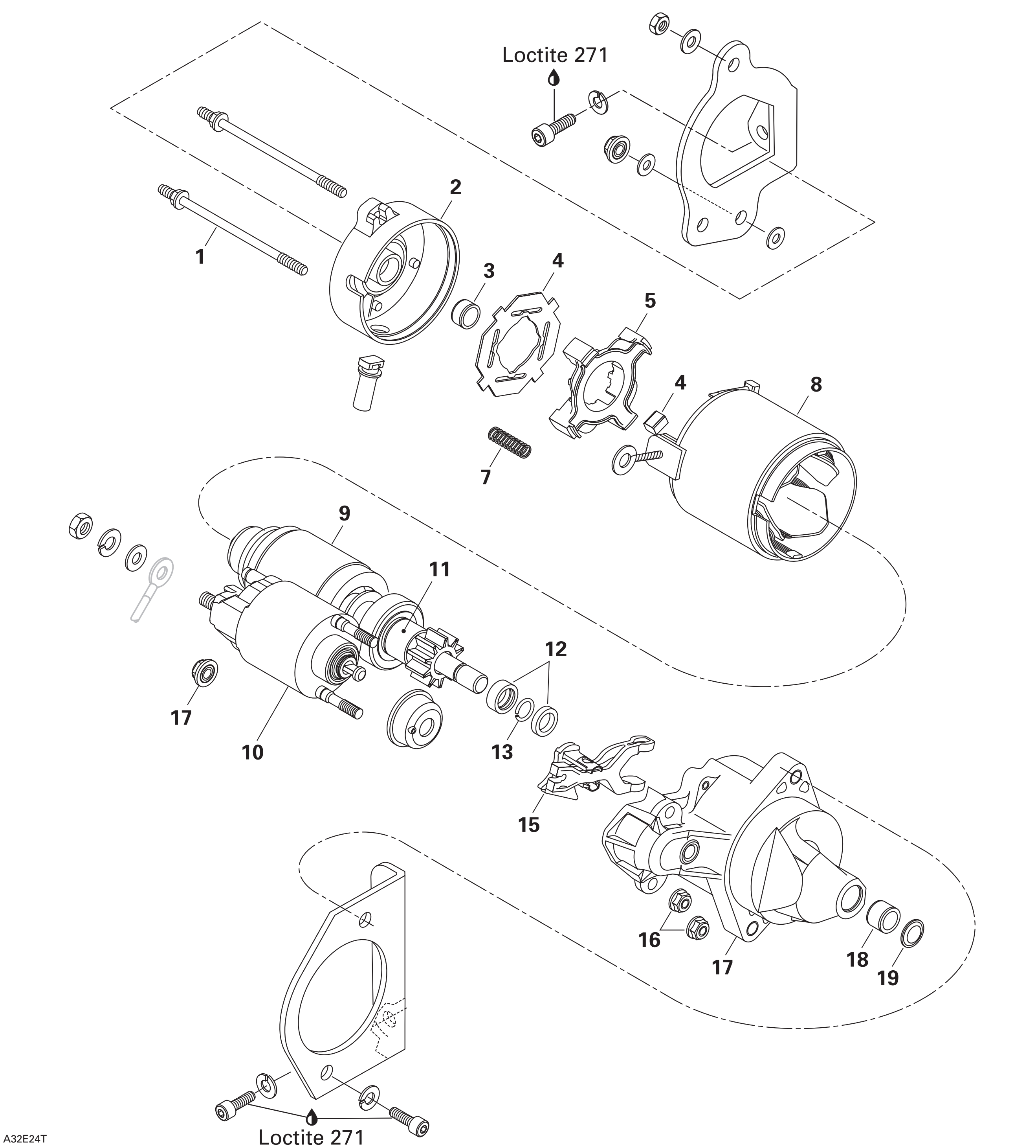
CAUTION: Never solder the wire to the terminal. Soldering can change the property of the wire and it can become brittle and break.

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.

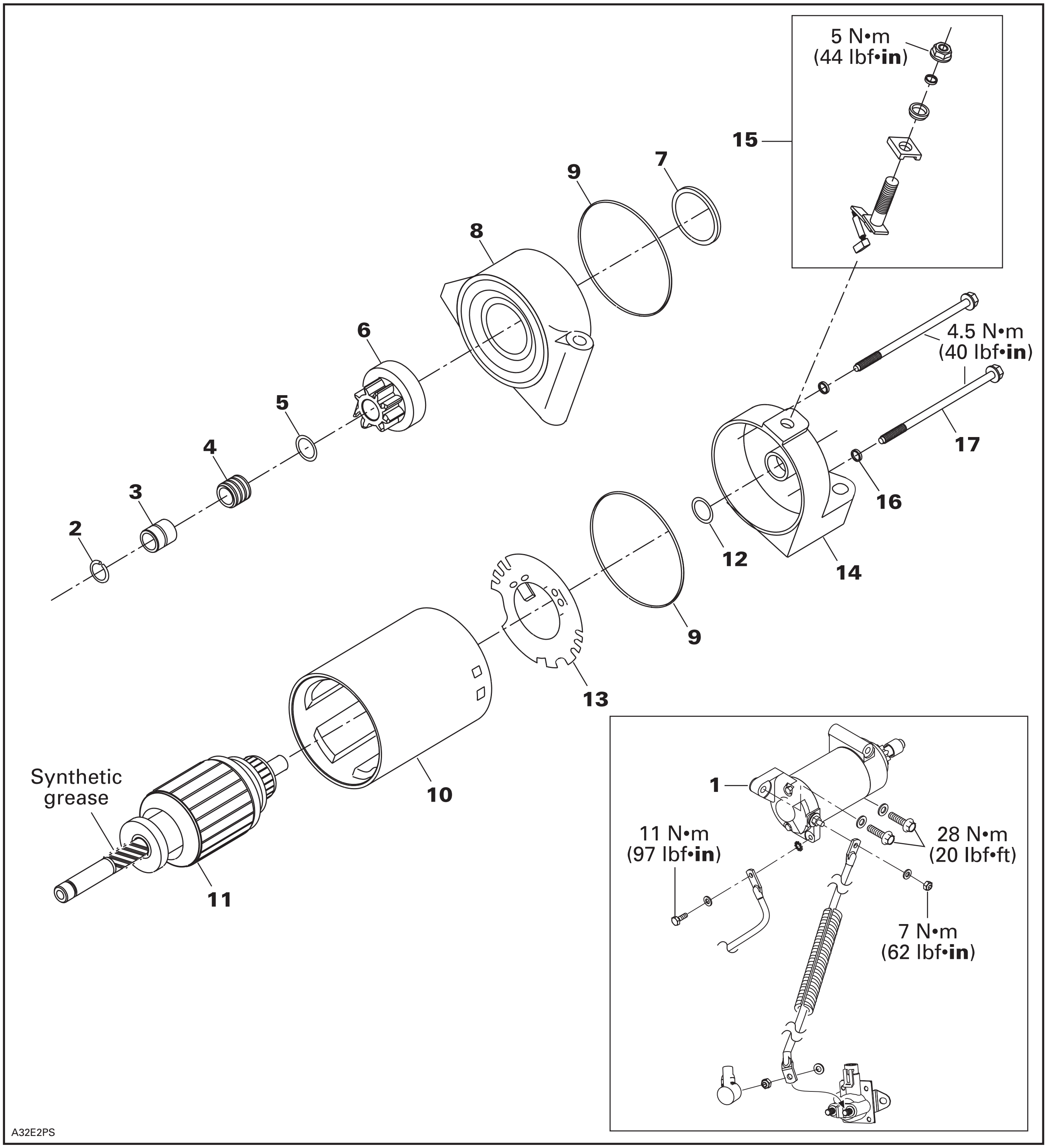
ELECTRIC STARTER

Fan Cooled ZX Series with Electric Starting



A32E24T

2-Stroke Liquid Cooled ZX Series with Electric Starting



REMOVAL

Fan Cooled ZX Series Starter

Disconnect BLACK (-) cable from battery.

> **⚠ WARNING**
> **Always disconnect ground cable first and connect last.**

Remove tuned pipe.

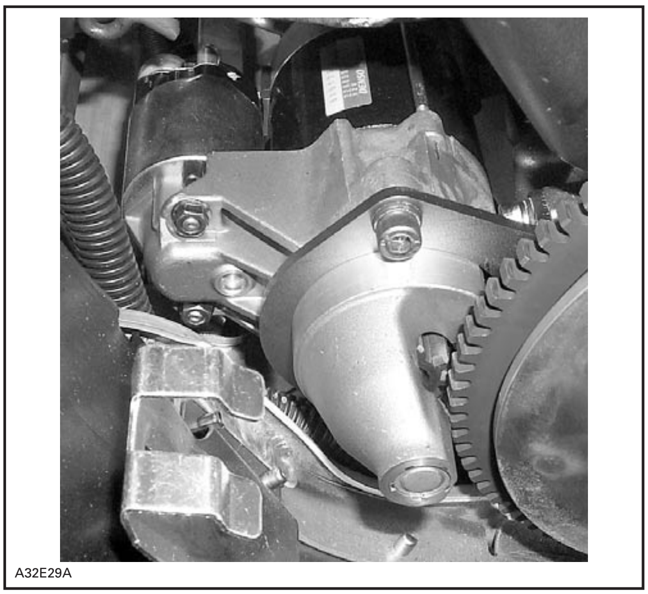
Disconnect RED cable and RED/GREEN wire from starter relay.

Disconnect ground cable from MAG side bracket.

Unbolt starter from PTO side bracket.

Unbolt MAG side bracket from engine.

Remove starter from engine.



TYPICAL

2-Stroke Liquid Cooled ZX Series

Disconnect BLACK (-) cable from battery.

> **⚠ WARNING**
> **Always disconnect BLACK (-) cable first and connect last.**

Remove tuned pipe.

Disconnect RED cable from starter.

Disconnect ground cable from starter.

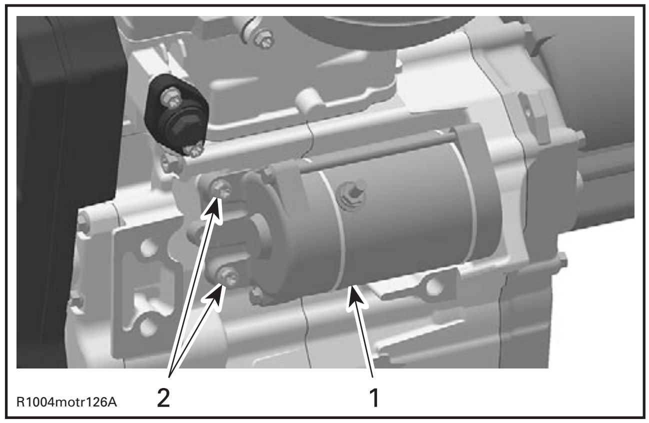
Unbolt and remove starter from engine.

4-TEC Engines

Disconnect BLACK (-) cable from battery.

> **⚠ WARNING**
> **Always disconnect BLACK (-) cable first and connect last.**

The starter is located below the second cylinder in the crankcase.



1. *Electric starter*
2. *Two screws*

Remove:

– starter cable
– starter screws and pull starter.

DISASSEMBLY

4-TEC Engines

The starter for these engines is not available in spare parts. Replace the starter with a new one.

Fan Cooled ZX Series

Disconnect bare wire linking starter and relay.

Remove nuts **no. 16** then relay **no. 10** by lifting and pulling to disengage from drive lever **no. 15**.

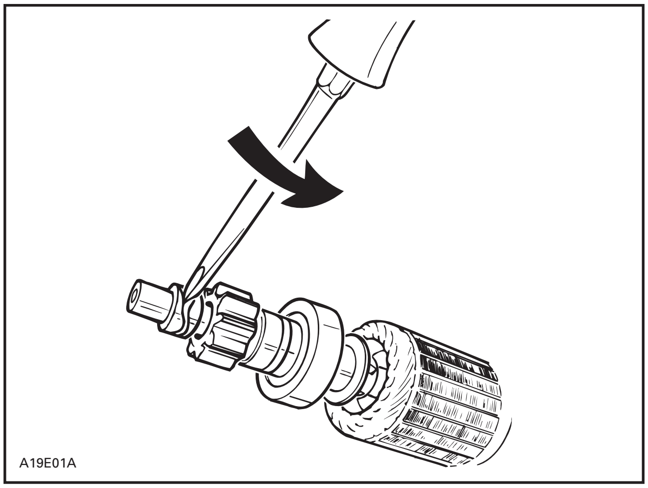
Unscrew starter screws (long) **no. 1** then pull yoke **no. 8** with end frame **no. 2** to separate from drive housing **no. 17**.

Pull armature **no. 9** with drive lever **no. 15**.

Remove insulator **no. 4** then brush springs **no. 7** being careful not to lose them since they will be projected out.

Pull brush holder **no. 5** from yoke **no. 8**.

Insert blade of a small screwdriver between stop collars.



TYPICAL

Twist screwdriver to separate stop collars **no. 12** thus giving access to circlip **no. 13**.

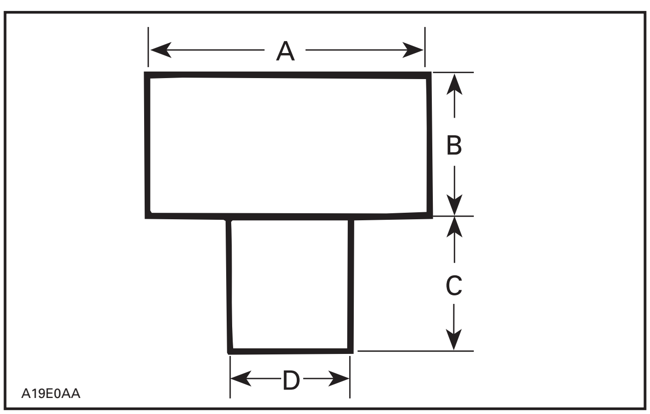
Remove outer collar, circlip then inner collar.

Remove overrunning clutch **no. 11**.

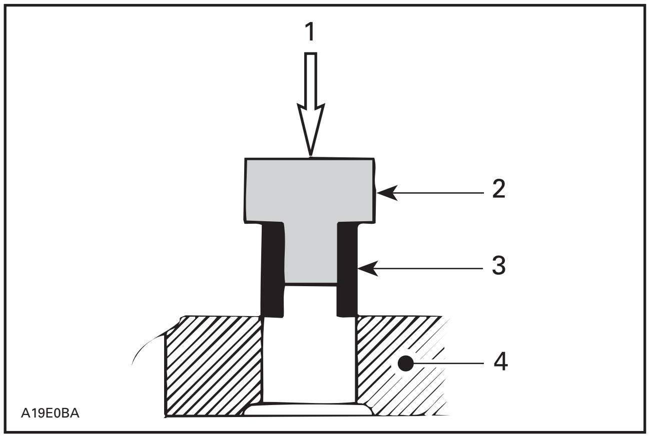
Check the wear on bushing **no. 18** by measuring the amount of radial play between the armature shaft and the bushing.

The radial play should not exceed 0.20 mm (.008 in). If greater, replace the bushing. To replace, press out the old one toward bushing cover and press in a new one with a bushing pusher. The correct size of the bushing pusher to use is given on next illustration.

CAUTION: Support drive housing adequately to prevent damage when pressing bushing.

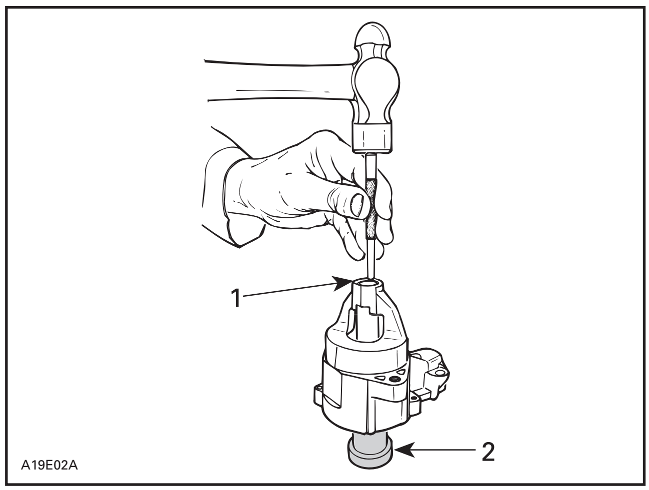


BUSHING PUSHER
A. 16 mm (5/8 in) diameter
B. 13 mm (1/2 in)
C. 11 mm (7/16 in)
D. 11.0 mm (.433 in)



1. *Press-in*
2. *Bushing pusher*
3. *Bushing*
4. *Drive housing*

Install bushing cover **no. 19** then, using a punch, stake bushing cover in place.



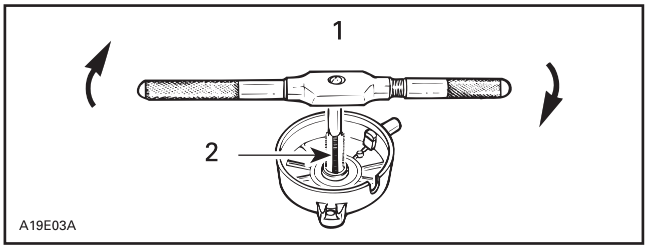
1. *Stake bushing cover*
2. *Support*

Bushing (end frame)

Check the wear on bushing **no. 3** by measuring the amount of radial play between the armature shaft and the bushing.

The radial play should not exceed 0.20 mm (.008 in). If greater, replace bushing as follows:

Using a 12 mm tap, cut threads into bushing so that the tap contacts the end frame. Continue to rotate tap until the bushing comes free.



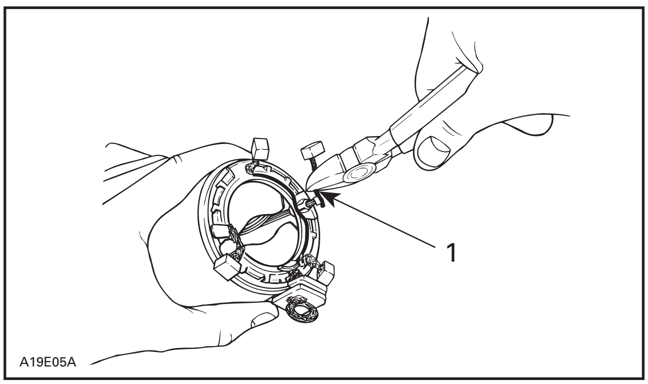
1. Turn until bushing goes out
2. 12 mm tap

To install new bushing, use the same bushing pusher as for drive housing bushing installation.

Brush

To replace brush **no. 6**, proceed as follows:

Cut brush wire close to connector at the welded portion.



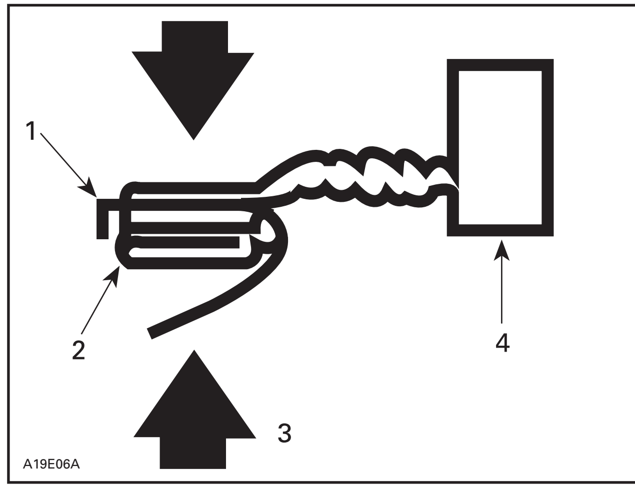
1. Cut close to connector

Remove burrs with a file on the remaining welded portion.

CAUTION: **Be careful not to damage plastic portion of yoke.**

Place spare brush plate edge against yoke connector edge (welded portion).

Crimp plate over yoke connector with a pair of pliers.



1. Plate edge
2. Yoke connector
3. Crimp
4. Spare brush

Solder the crimped portion.

CAUTION: **Do not overheat and quickly perform soldering to prevent solder from flowing to the brush through the wire. Preferably use a heat sink.**

2-Stroke Liquid Cooled ZX Series

Before disassembling, trace index marks on starter housing **no. 10** and starter housing assembly **no. 8** to ease further assembly.

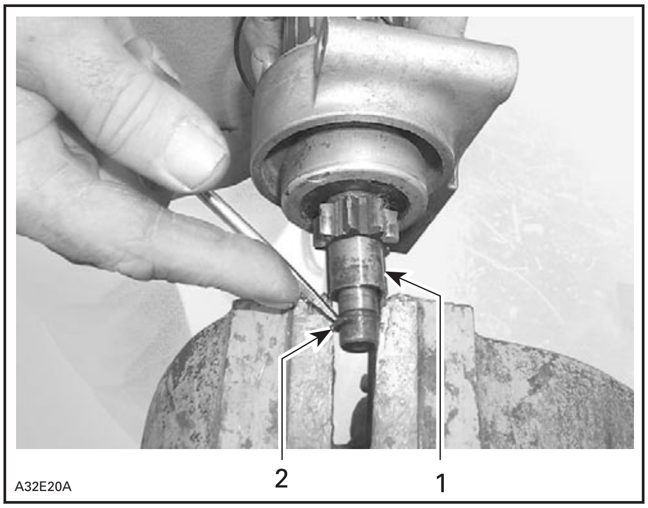
Remove starter through bolts **no. 17**. Separate end frame housing **no. 14** from starter housing **no. 10**. Withdraw starter housing from armature **no. 11**.

Brush holder **no. 13** can be removed from end frame housing **no. 14** by disconnecting the end frame attached brush from brush holder **no. 13**.

Check the radial play between the armature shaft and end frame bearing. Replace the end frame bearing or replace starter. If parts are in good condition then coat with synthetic grease (P/N 413 711 500) before reinstalling them.

Push back the collar **no. 3** using a screwdriver.

Remove snap ring **no. 2**. Remove collar **no. 3** and spring **no. 4**.



1. Collar
2. Snap ring

Turn starter clutch **no. 6** clockwise to remove it from armature assembly **no. 11**.

Pull housing from armature.

CLEANING

All Models except 4-TEC Engines

CAUTION: Yoke assembly and drive unit assembly must not be immersed in cleaning solvent.

Clean brushes and holders with a clean cloth soaked in solvent. Brushes must be dried thoroughly with a clean cloth.

Blow brush holders clean using compressed air.

⚠ 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 and dry cloth.

Clean engine ring gear teeth and drive unit (clutch).

NOTE: Bushings or bearings must not be cleaned with grease dissolving agents.

Immerse all metal components in cleaning solution. Dry using a clean and dry cloth.

INSPECTION

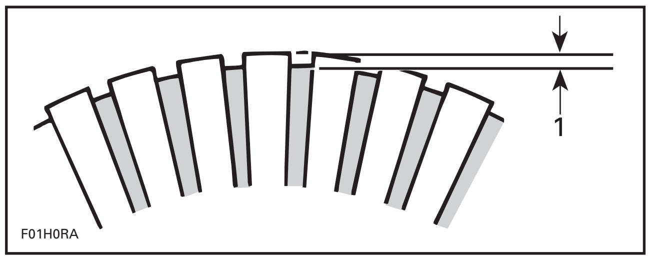
All Models except 4-TEC Engines

Armature

NOTE: An ohmmeter may be used for the following testing procedures, except for the one concerning the shorted windings in the armature.

Check the commutator for roughness, burnt or scored surface. If necessary, turn the commutator on a lathe, enough to remove grime only.

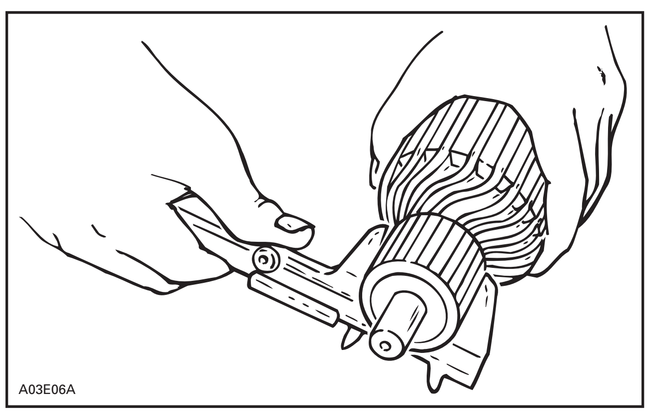
Check the commutator for mica depth. If the depth is less than 0.20 mm (.008 in), undercut the mica. Be sure that no burrs are left and no copper dust remains between the segments after the undercutting operation is completed.



1. Commutator undercut 0.20 mm (.008 in)

Check the commutator out-of-round condition with V Blocks and an indicator. If the commutator out-of-round is more than 0.40 mm (.016 in), the commutator should be turned on a lathe.

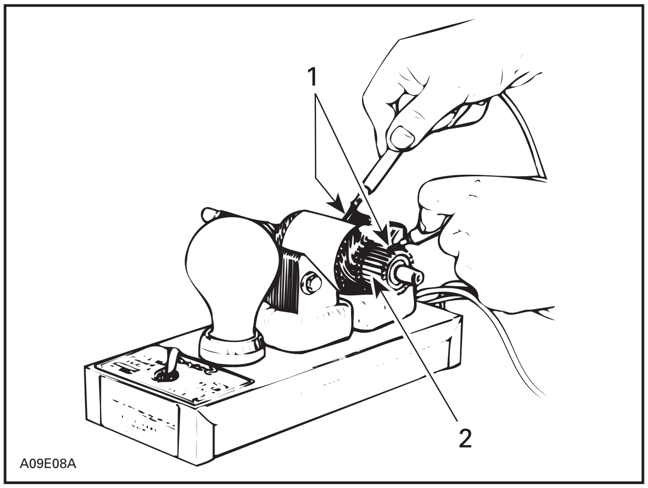
Check commutator outer diameter. If less than specified value, replace.



MODEL	WEAR LIMIT
ZX Series	27 mm (1.063 in)

Test for Ground Circuit in the Armature

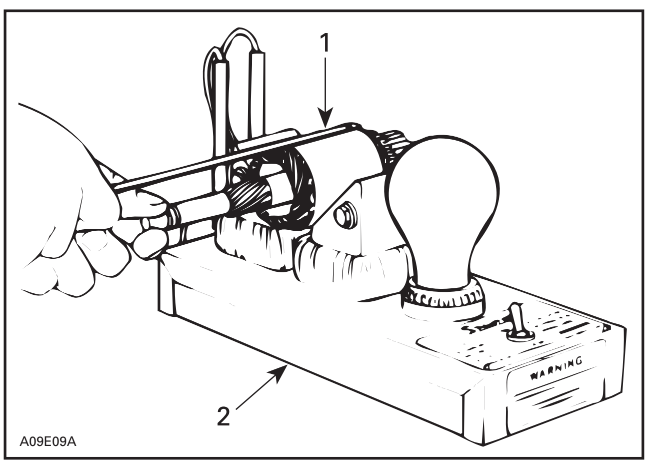
Use growler test probes. Check between armature core and the commutator bars. If growler lamp turns on, bars are grounded. If so, replace armature.



1. Test probes
2. Commutator bars

Test Armature for Shorted Winding

When the armature is rotated in the growler with a steel strip (hacksaw blade) held above it, the strip will vibrate over that area of the armature which has short circuit. Replace armature if so.



1. Steel strip (hack-saw blade)
2. Growler

Test the Armature for Open Circuit

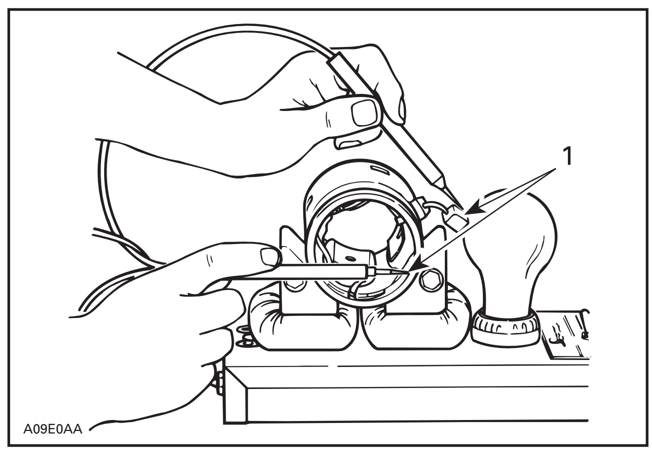
Use growler test probes. Place one test probe on a commutator bar and the other test probe on the neighboring bar. Repeat this operation for all bars, moving one test probe at a time. If the growler lamp does not turn on, the armature circuit between these 2 bars is opened. The armature should be replaced or repaired; open circuits most often occur at the commutator riser where coils are soldered. (Burnt commutator bars are usually an indication of an open-circuit armature coil).

Field Windings and Brushes

Fan Cooled ZX Series

Test the Field Winding for Open Circuit

Use growler test probes. Place one test probe on the negative brush and the other test probe on the yoke. If growler lamp does not turn on, the field winding has an open-circuit. The yoke has to be repaired or replaced.



1. Test probes

Check the dynamic brake winding for open circuit by placing one test probe on the positive brush and the other probe on the negative brush.

If growler lamp does not turn on, the winding circuit is open-circuit and the yoke has to be repaired or replaced.

Brush Holder

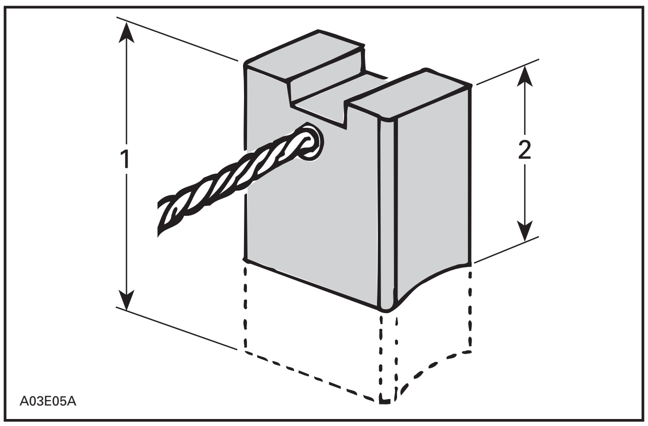
All Models except 4-TEC Engines

Check the brush holder for insulation using growler test probes. Place one test probe on the insulated brush holder and the other test probe on the brush holder plate. If the growler lamp turns on, the brush holder has to be repaired or replaced.

Brush Length

Measure brush length. If less than the specified value, replace them.

MODEL	LENGTH	
	NEW	WEAR LIMIT
ZX Series	10 mm (.400 in)	6 mm (.236 in)

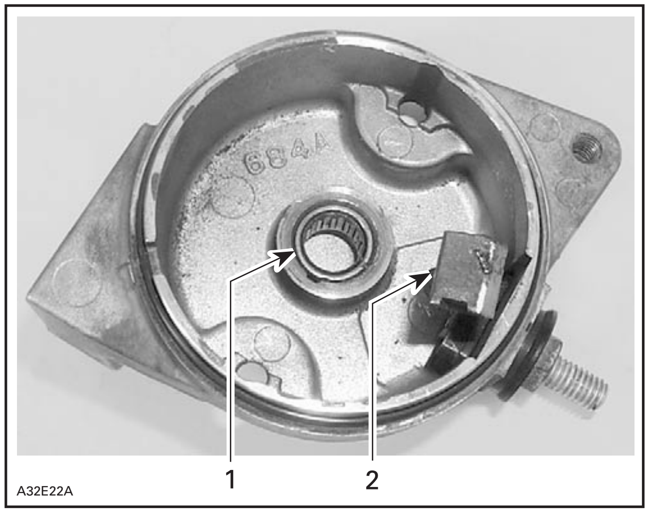


TYPICAL
1. New
2. Wear limit

End Housing

2-Stroke Liquid Cooled ZX Series

Check the mica insulation of the positive brush and also the roller bearing condition. Replace, if necessary.



1. Roller bearing
2. Positive brush

Overrunning Clutch

All Models except 4-TEC Engines

The pinion of the overrunning clutch should turn smoothly in a clockwise direction, and should not slip in a counterclockwise direction. If defective, replace.

Check the pinion teeth for wear and damage. If defective, replace.

RELAY

Inspect connections and clean as necessary. Relay condition can be checked with an ohmmeter. Install test probes on large connectors of relay when it is activated (+ on RED/GREEN wire and - on relay body for the fan cooled models and - on the BLACK wire for liquid cooled models).

IMPORTANT: No current must be present on large cables when using ohmmeter, otherwise meter could be damaged.

ASSEMBLY

Fan Cooled ZX Series

Prior to assembling, coat sliding surfaces and moving parts on armature shaft splines, overrunning clutch, relay plunger, drive lever and bushings with synthetic grease (P/N 413 711 500).

Proceed as follows for assembling.

Secure drive housing in a vise.

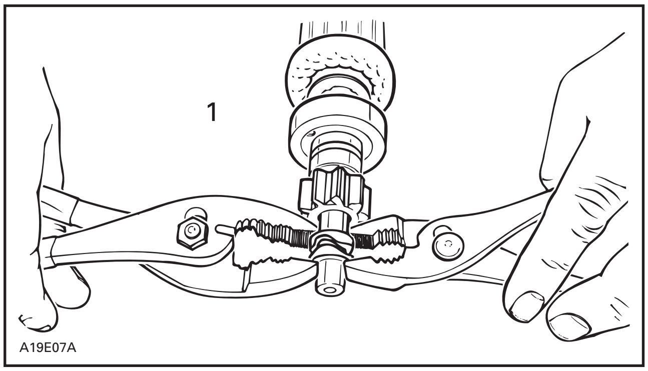
CAUTION: Do not overtighten since housing might be damaged.

Install overrunning clutch onto armature shaft. Insert **inner** collar onto shaft. Install a new circlip.

CAUTION: Always install a new circlip when servicing.

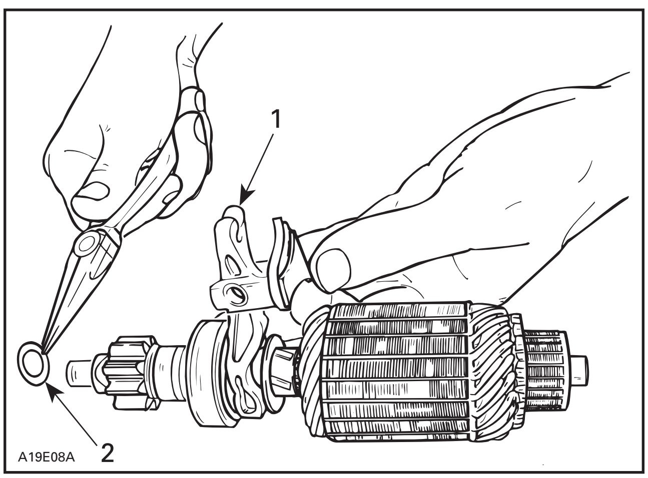
Insert **outer** collar being careful to match protrusions with notches of collars.

Using a pair of pliers on each side of stop collars, squeeze evenly until collars sit over circlip.



1. Squeeze evenly

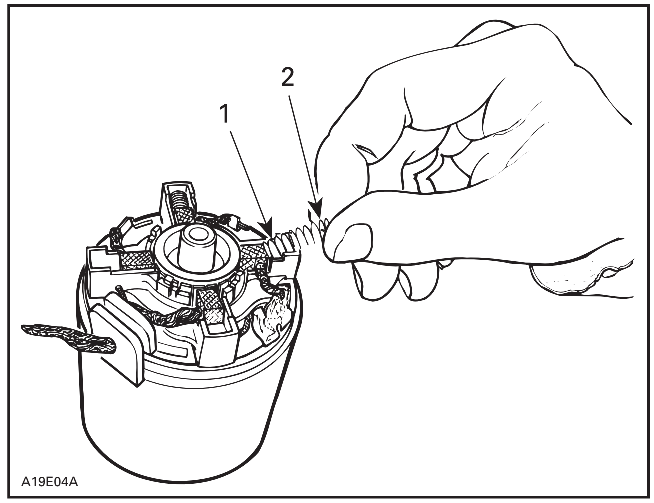
Install thrust washer against outer stop collar. Place drive lever onto overrunning clutch then insert into drive housing.



1. Install on overrunning clutch
2. Install thrust washer

Slide yoke over armature.

Install brush holder then brushes in their housings. Insert springs as follows: place one end of spring against brush, compress, then push the other end of spring onto its housing. Repeat for remaining springs.



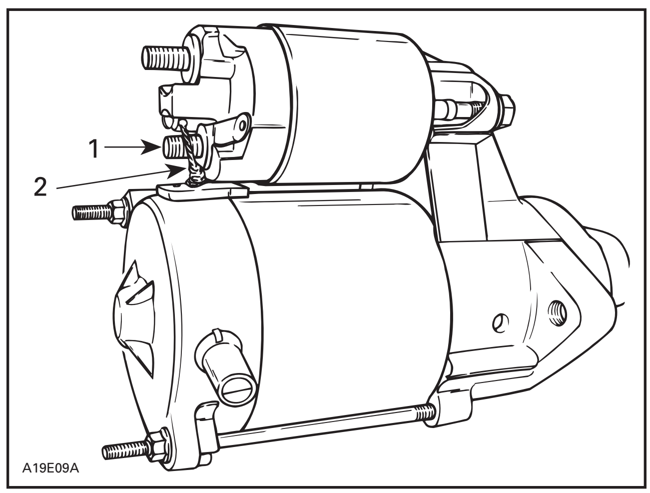
1. This end first
2. Push this end to complete

Secure insulator over brushes and springs. Properly install end frame and tighten screws.

Insert relay plunger inside of drive lever fork and secure to drive housing.

Connect starter bare wire to relay.

NOTE: Connect this wire on the shorter relay stud.



TYPICAL
1. Shorter stud
2. Bare wire

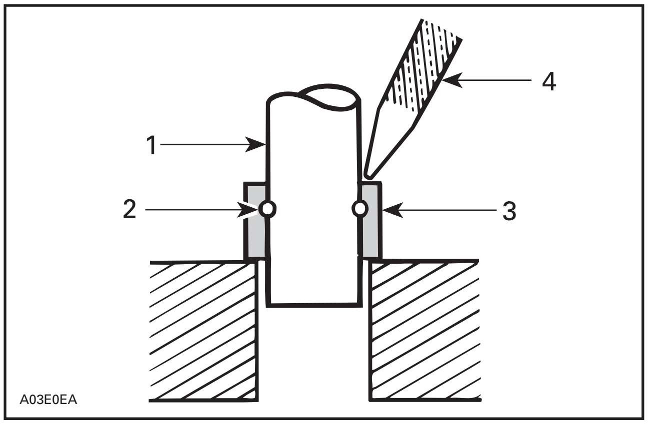
2-Stroke Liquid Cooled ZX Series

Reverse the order of disassembly to reassemble starter. However, attention should be paid to the following operations.

Prior to assembling, coat sliding surfaces on armature shaft splines, overrunning clutch and bushing with synthetic grease (P/N 413 711 500).

After placing collar **no. 3** on armature shaft **no. 11**, fit new snap ring **no. 2** on armature shaft, then make sure that it is properly secured.

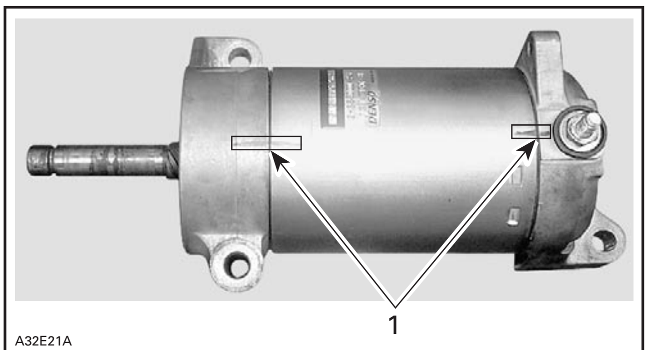
Slide collar **no. 3** over snap ring **no. 2** and secure in place by punching it at two or three places.



1. *Armature shaft*
2. *Snap ring*
3. *Collar*
4. *Punch*

Starter Housing Assembly and Starter Housing

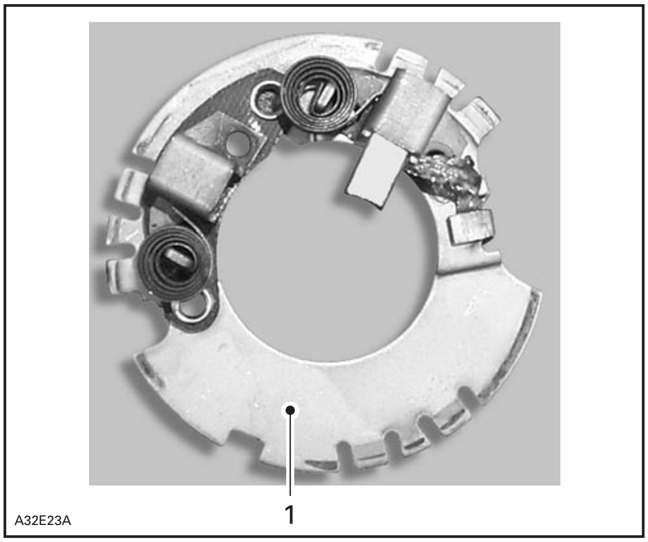
Align previously traced indexing marks.



TYPICAL
1. *Aligned indexing marks*

Open brushes and slide over commutator.

Align end frame locating notch with yoke locating protrusion and properly sit brush holder **no. 13** into housing **no. 14**.



1. *Brush holder*

To ease end frame installation, retain brush holder with a small screwdriver while installing armature assembly.

CAUTION: Make sure to place two end housings on a flat surface before tightening the through bolts.

CAUTION: Make sure end frame fits perfectly on yoke.

INSTALLATION

Fan Cooled ZX Series

Install carriage bolt in MAG side bracket before installing starter.

Make sure that starter and engine mating surfaces are free of grime. Serious trouble may arise if starter is not properly aligned.

CAUTION: Make sure that both starter brackets are well seated against engine crankcase and starter before torquing all retaining bolts.

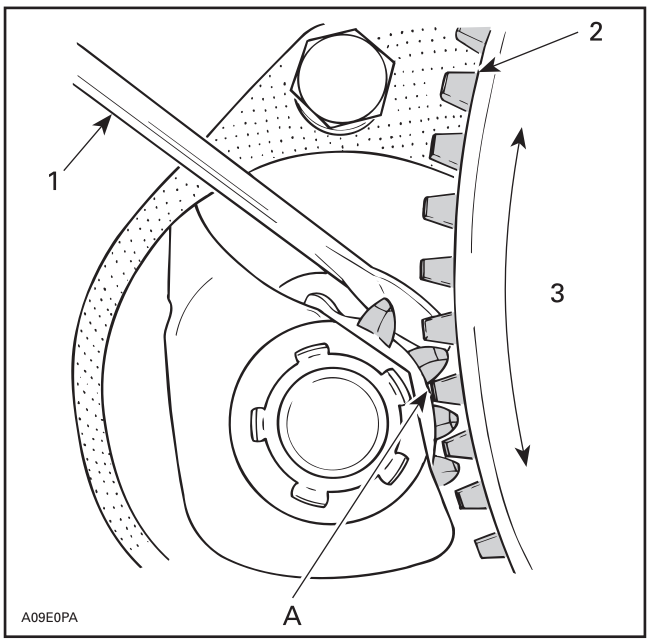
Torque all M8 bolts to 24 N•m (17 lbf•ft).

Torque all M5 bolts to 5 N•m (44 lbf•**in**).

CAUTION: Before checking engaging depth of starter pinon teeth, make sure that battery cables are disconnected

NOTE: Check proper engaging depth of starter pinion teeth to ring gear teeth (see illustration). Install hardened washers (P/N 503 007 900) between engine and starter supports accordingly.

CAUTION: Always install new self-locking fasteners.



1. *Screwdriver pulling starter pinion*
2. *Ring gear*
3. *No excessive backlash*

A. *0.5 to 1.5 mm (.020 to .060 in)*

Connect the RED battery cable and the RED wire to the large terminal of the relay. Connect RED/GREEN wire to small terminal of relay.

2-Stroke Liquid Cooled ZX Series

Use new teflon washers on the 3 bolts retaining starter to engine.

Torque the bolts to 28 N•m (20 lbf•ft).

Make sure that starter and engine mating surfaces are free of grime. Serious trouble may arise if starter is not properly aligned.

Connect the RED battery cable and the RED wire to the large terminal of the starter.

⚠ WARNING

Always disconnect ground cable first and connect last.

Torque large terminal nut to 7 N•m (62 lbf•**in**).

Connect ground cable to the starter with star washer in between.

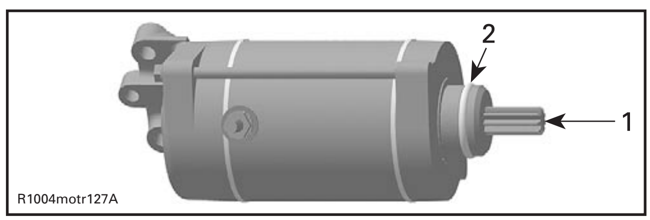
Torque ground cable connecting bolt to 11 N•m (97 lbf•**in**).

4-TEC Engines

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

NOTE: During assembly replace the O-ring of the starter. Grease the drive gear and the O-ring before assembly using multi purpose grease. This will simplify assembly and prevent displacement of the O-ring during installation.

If it is not possible to move the starter into the guide, this is due to the position of the drive gear. Pull the starter out once more, slightly rotate the drive gear and try again.



1. *Drive gear*
2. *O-ring*

Torque starter screws to 9 N•m (80 lbf•**in**).

TESTING PROCEDURE

GENERAL

NOTE: The 4-TEC engines are equipped with an alternator, not with a magneto. Refer to ALTERNATOR section for the checking procedure.

The following chart gives the engine types with their implemented system.

MODELS	IGNITION SYSTEM	CHARGING SYSTEM OUTPUT
ZX fan cooled models with 552 and 377 engines	RER dual trigger coil CDI (twin cylinder)	340
All ZX liquid cooled except SDI models	BOMBARDIER DC 360 W	360
SDI Models	BOMBARDIER DC 480 W	480

RER Dual Trigger Coil CDI (twin cylinder)

The RER dual trigger coil CDI system has an ignition coil integrated to the MPEM which is mounted on oil reservoir.

MPEM is connected to a single ignition generator coil via a 3-connector housing (BLACK and RED wires).

MPEM is programmed to recognize a signal sent by the switch located on snowmobile console.

When switch is activated, MPEM cuts off ignition and engine rev drops at approximately 450 RPM.

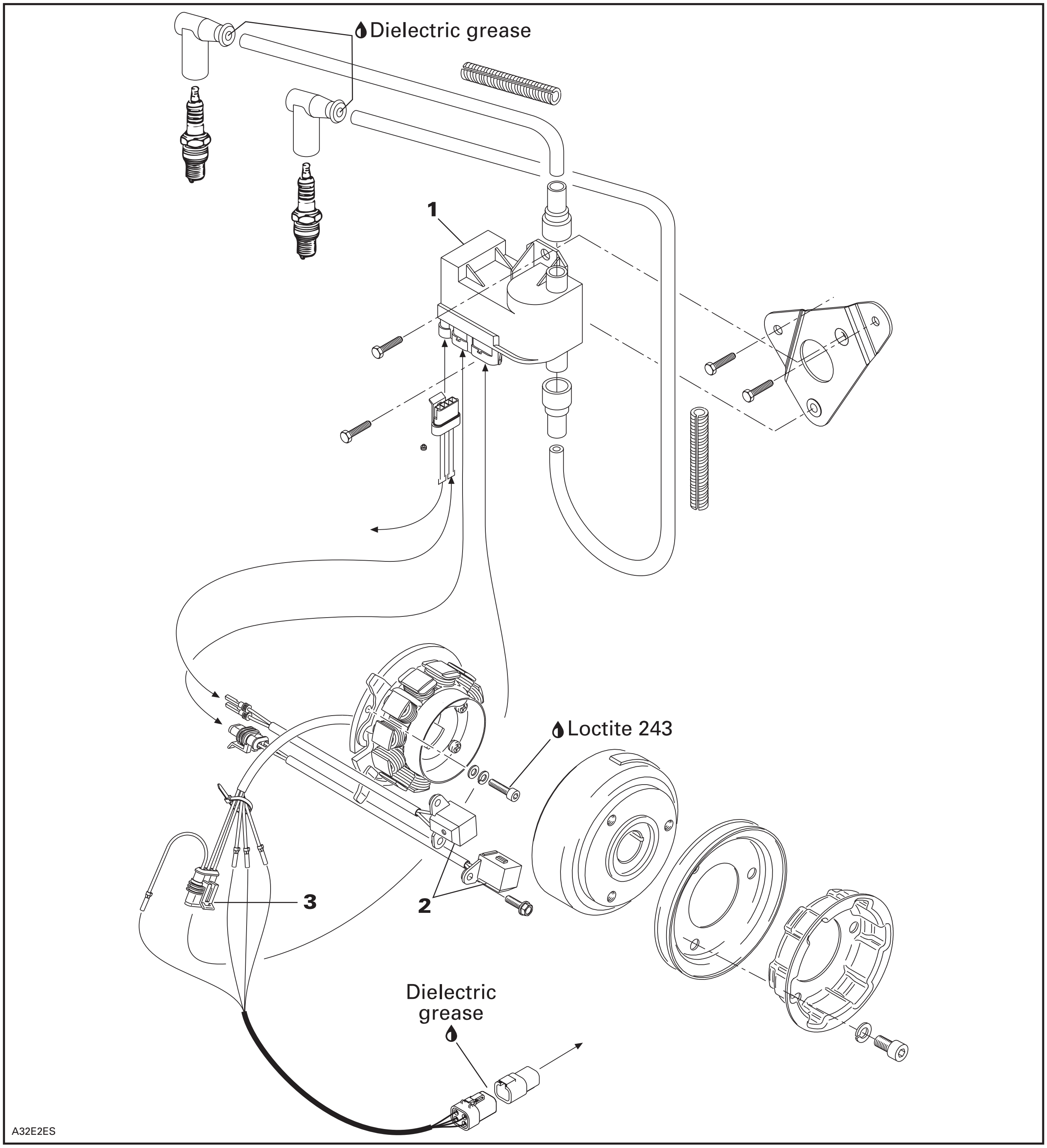
MPEM fires a spark at a great advance creating a thrust which reverses engine rotation.

Second trigger coil located on crankcase takes over to produce spark in reverse rotation.

A safety device is incorporated to MPEM preventing it from reading any signal coming from reverse switch if RPM is not between 1000 and 3400 RPM.

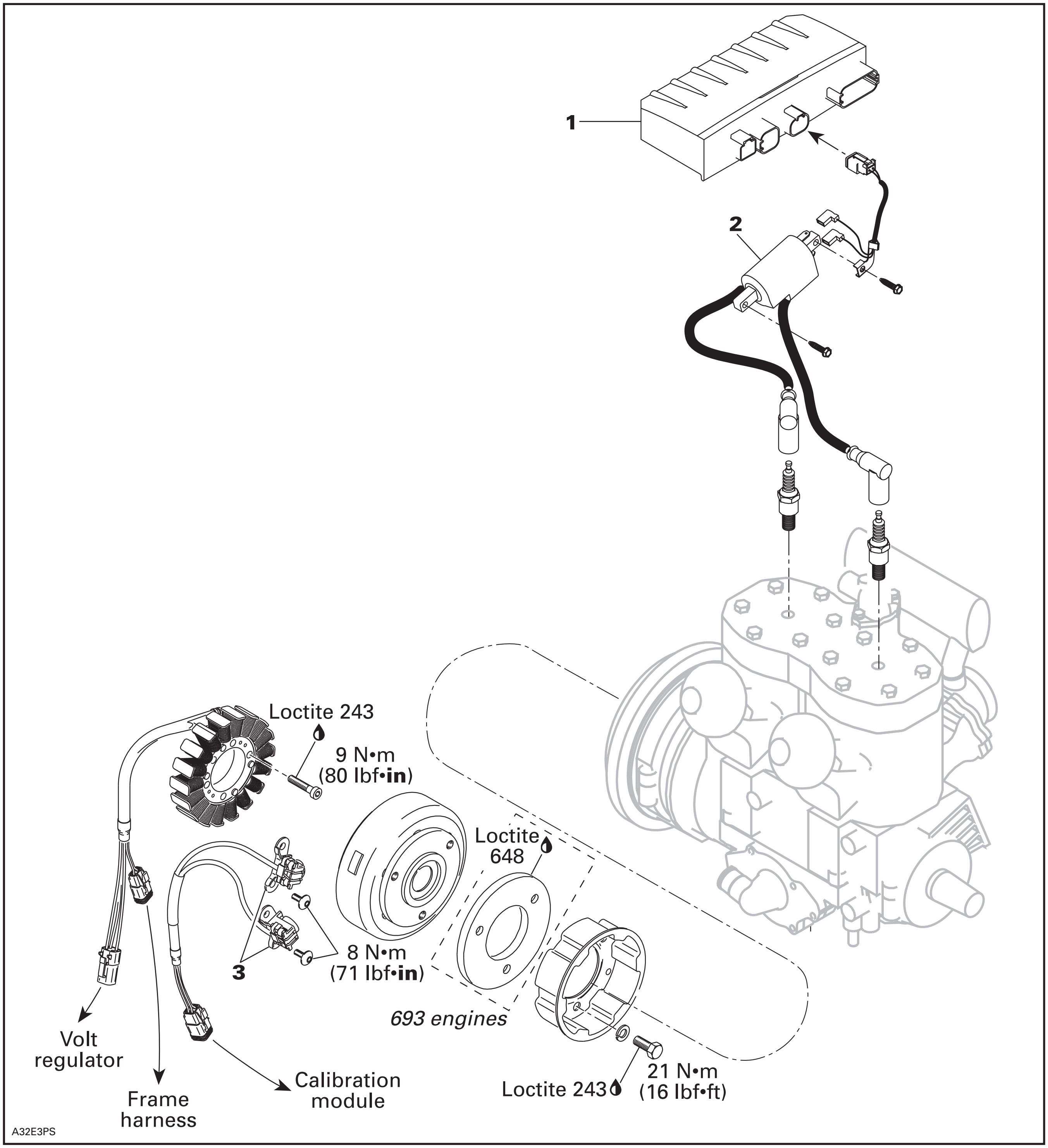
Below 1000 RPM and above 3500 RPM = No reverse signal.

RER Dual Trigger Coil CDI System (twin cylinder)



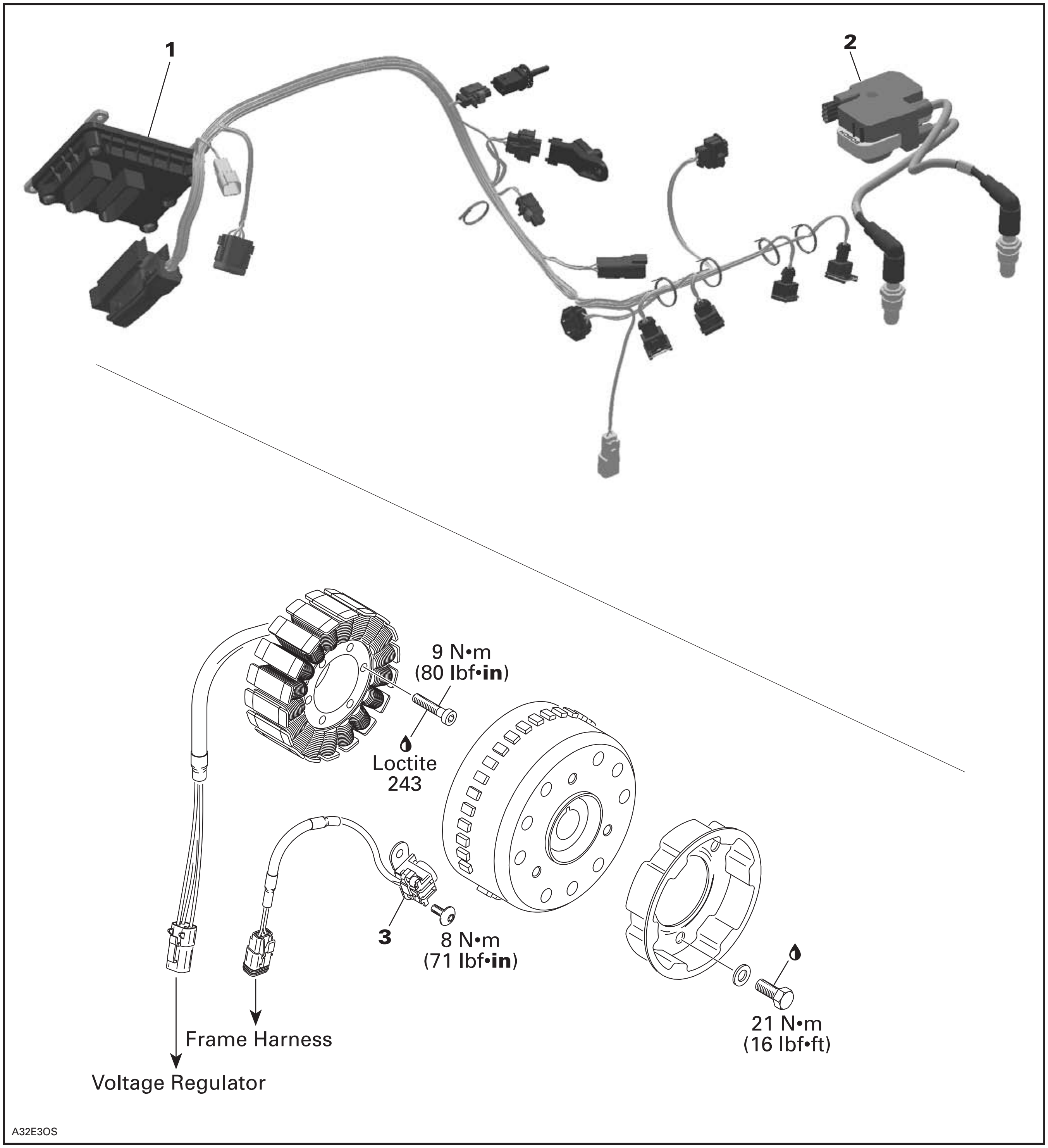
1. *MPEM*
2. *Trigger coils*
3. *11-DC housing (BLACK and RED wires)*

Bombardier DC 360 W



1. *MPEM*
2. *Ignition coil*
3. *Trigger coils*

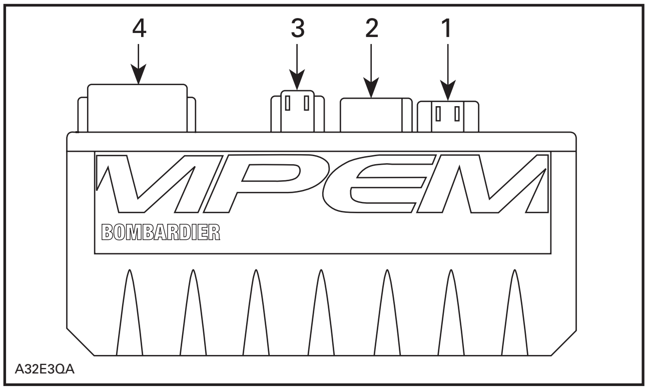
Bombardier DC 480 W



1. *ECM*
2. *Ignition coil*
3. *Trigger coil*

Multi-Purpose Electronic Module (MPEM) Connections

Bombardier 360 W



1. *Trigger coil*
2. *Cooling temperature sensor*
3. *High tension coil*
4. *DESS, ignition and engine stop switches, DESS pilot lamp*

Bombardier 480 W

For more informations concerning the Engine Control Module (ECM) refer to OVERVIEW in ENGINE MANAGEMENT (2-TEC) section.

TYPICAL — ECM

CHECKING CALIBRATION PROGRAM

Using VCK (Vehicle Communication Kit)

All Liquid Cooled Models

The VCK (P/N 529 035 981) can be used with the B.U.D.S. software to check the calibration. Detailed information about the B.U.D.S. software and its usage is available under its **Help** section.

Using MPEM Programmer

Liquid Cooled except SDI Models

Calibration can also be checked using the MPEM programmer (P/N 529 035 878).

CAUTION: Do not interchange MPEM from a model to an other. Even if the P/N stamped on the MPEM is the same, calibration program may be different. When ordering a new MPEM always refer to appropriate model parts catalog. The service P/N published in parts catalogs are the ones with the good calibration program according to model.

With Engine Running

If the below mentioned tool is not available start engine. Turn on programmer then enter password.

Increase engine speed to 2000 - 2500 RPM then follow the same procedure as WITH ENGINE STOPPED.

CAUTION: Engine must run till the end of the procedure.

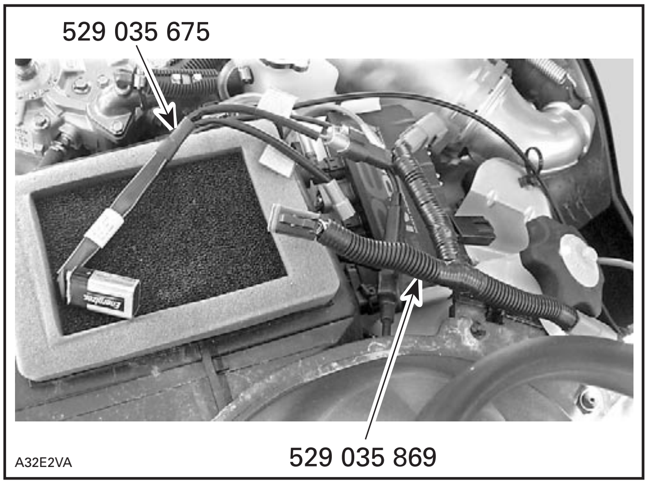
When data are being transferred, you must rev the engine at 2000 - 2500 RPM and make sure connection between programmer and vehicle is good.

IMPORTANT: In following procedure each time ← **Trs** symbol appears, make sure to rev engine between 2000 and 2500 RPM.

Engine will misfire while vehicle information is being transferred from MPEM to programmer. If engine stalls, restart it, keep engine speed at 2000 - 2500 RPM and select no. 3 VEHICLE INFO again.

With Engine Stopped

Connect 9-volt adaptor (P/N 529 035 675) to supply cable (P/N 529 035 869) and supply cable to diagnostic connector, located on right side of the vehicle.



A32E2VA

When cables are connected a beeping signal from the reverse buzzer will be heard (if vehicle is so equipped). This indicates that the MPEM is now ready to transfer programming operations.

Once MPEM calibration program checking is done, unplug 9 volt adaptor and supply cable.

Turn on programmer then enter password.

From main menu select no. 3. VEHICLE INFO; ← **Trs**.

```
 1. CHECK KEYS
 2. PROGRAM KEY
>3. VEHICLE INFO
 4+ START VEH.
```

A30E1XA

Vehicle information is transferred from MPEM to programmer.

```
   TRANSFER
PGMR ← MPEM
```

A30E1YA

NOTE: In fact the programmer takes a **copy** of all vehicle parameters scribed in MPEM. This copy will be modified within the programmer then transferred to the MPEM.

Select no. 4. ENGINE PARAMETER.

```
 1. CUSTOMER NAME
 2. DELIVERY DATE
 3. VEH. SERIAL#
>4+ ENGINE PARAM.
```

A30E1ZA

Select no. 3 CALIBRATION.

```
 1. TIMING ADJUST
 2. ENGINE SERIAL#
>3. CALIBRATION
```

A30E2IA

Press ENTER ← **Trs**.

Following screen appears temporarily:

```
   VERIFY
PGMR ← MPEM
```

A30E2BA

And then following screen showing the actual calibration number in the MPEM.

```
CALIBRATION NUMBER
   XXX XXX XXX
     MODIFY?
 YES          >NO
```

A30E2JA

Check for proper calibration number. See table below.

Select NO and press ENTER.

Press MENU twice; ← **Trs** then turn off programmer, unplug it from MPEM. Remove 9-volt adaptor.
Stop engine when using WITH ENGINE RUNNING procedure.

MODEL	ENGINE	CALIBRATED MPEM P/N	CALIBRATION P/N	MPEM P/N
Liquid Cooled				
Legend Sport 500 SS	593	512 059 833	512 059 640	512 059 796
Legend SE 700	693	512 059 832	512 059 646	512 059 796
Legend Sport 700	693	512 059 832	512 059 646	512 059 796
Fan Cooled				
Legend 380 F	377	512 059 518	512 059 521	512 058 941
MX Z 380 F	377	512 059 518	512 059 521	512 058 941
Legend 550 F	552	512 059 626	512 059 627	512 059 941
MX Z 550 F	552	512 059 626	512 059 627	512 058 941
Skandic Sport 550 F	552	512 059 626	512 059 627	512 058 941
Summit 550 F	552	512 059 628	512 059 627	512 059 337

NOTE: When a new MPEM is necessary, always order CALIBRATED MPEM P/N.

CHANGING MPEM CALIBRATION PROGRAM

Using VCK (Vehicle Communication Kit)

All Liquid Cooled Models

The VCK (P/N 295 035 981) can be used with the B.U.D.S. software to change the MPEM calibration. Detailed information about the B.U.D.S. software and its usage is available under its **Help** section.

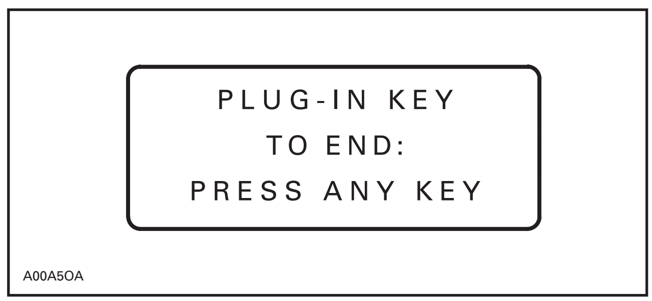
Using MPEM Programmer

Liquid Cooled except SDI Models

Proceed the same as for checking MPEM calibration but select YES to MODIFY? and press ENTER following screen appears:

A00A5NA

Enter new calibration number and press ENTER, following screen appears:



A00A5OA

Simultaneously with the following operation a transfer will occur; ← **Trs**. At this point, be ready to rev the engine so it won't fall below the 2000 RPM mark when not using 9-volt adaptor.

Plug-in the desired calibration cartridge (special red key) onto the programmer post, the following screens will appear temporarily:

```
TRANSFER
+
VERIFY
```

A00A41A

```
TRANSFER
PGMR → MPEM
```

A00A42A

```
VERIFY
PGMR ← MPEM
```

A30E2BA

```
OPERATION
→ SUCCESSFULL ←

PRESS ANY KEY...
```

A00A3EA

Press any key, display will show followed by next screen:

```
1. TIMING ADJUST
2. ENGINE SERIAL #
3. CALIBRATION
```

A00A5YA

Press MENU twice, following screen will show:

```
 1. CHECK KEYS
 2. PROGRAM KEY
>3. VEHICLE INFO
 4+ START VEH.
```

A30E1XA

After procedure is completed, ensure engine idle speed with engine hot is 1800 - 2000 RPM.

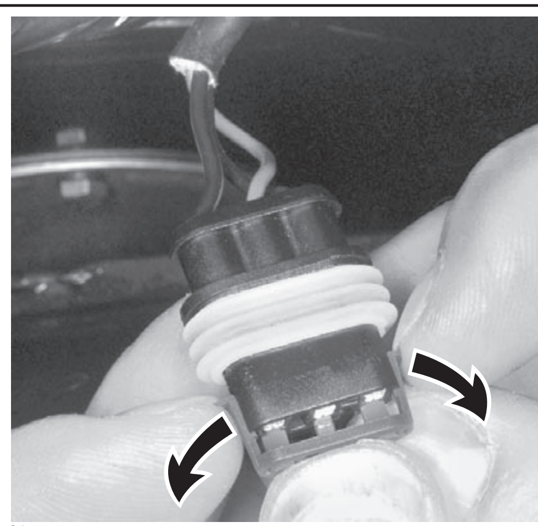
Stop the engine.

ACCESS TO MPEM CONNECTORS

Fan Cooled Models

To ease electrical readings on MPEM connectors, connector cap must be removed.

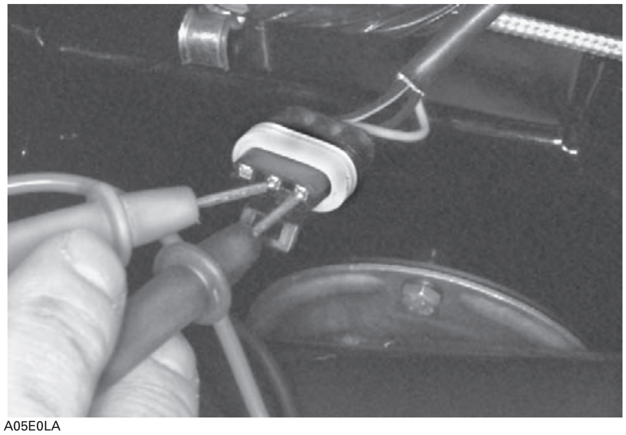
Hold connector in hands then lift both tabs to remove connector cap.



A05E0GA

LIFT TABS TO REMOVE CAP

Insert multimeter probes into connector.



TEST USING MULTIMETER PROBES

SYSTEM TESTING

Ignition System Testing Sequence

In the case of ignition problems, check the following in the prescribed order until the problem can be solved.

1) Sparking/spark plug condition.
2) Electrical connectors.
3) Ignition switch, DESS switch or tether cut-out switch and engine cut-out switch.
4) Ignition generator coil.
5) Trigger coil.
6) MPEM voltage (liquid cooled models only).
7) High voltage coil (liquid cooled models only).
8) Buzzer testing.

Lighting System Testing Sequence

1) Electrical connectors.
2) Magneto output (lighting generator coil).

Testing Conditions

Voltage measurements are always taken upon vehicle starting. Readings when the engine is running will be higher than indicated range. Part temperature must be approximately 20°C (68°F) (room temperature), otherwise readings could be distorted.

Analysis of Readings

- Voltage Readings

When testing the different magneto components, it is important to take into consideration that readings vary according to the force applied onto the manual starter. It is therefore important to employ enough force upon each trial.

The reading must be 3 times within or above the range indicated in the corresponding table. If the reading is too low, the part is considered to be defective and must be replaced.

- Resistance Readings

Place multimeter selector switch to Ω in order to measure resistance. Readings must be within the indicated range. Otherwise, the part is considered to be defective and must be replaced.

CAUTION: When taking measurements, it is useless to try to start the vehicle since readings would then be distorted.

- Intermittent Ignition Problems

It is difficult to make a diagnostic in the case of intermittent ignition problems. Thus, problems occurring only when the engine operating temperature is normal must be checked in similar conditions.

In most cases when problems are caused by temperature or vibrations, these can only be solved by replacing parts. Most problems cannot be detected when the engine is stopped.

- Multiple Problems

As a matter of fact, more that one component can be defective. As a result, if the problem remains although a part was replaced, start over the whole verification from the beginning in order to identify the other defective component.

1. Sparking

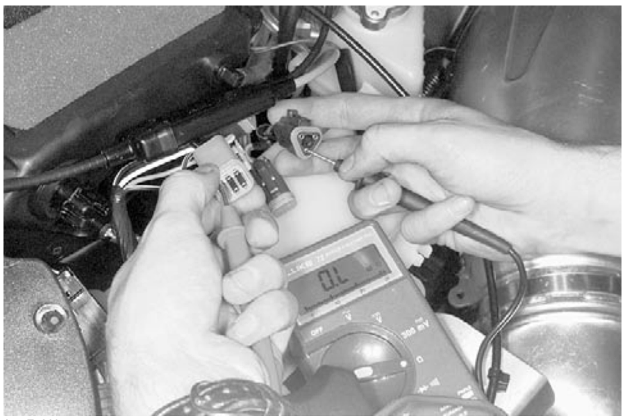
During this operation, it is important to use the snowmobile spark plug and not a new one. Bring the plug in contact with the engine. Pull rewind starter. If no spark is produced, replace the spark plug with a new one and do the test again.

2. Electrical Connector Testing

Make sure that none of the connectors are disconnected.

3. Ignition Switch, DESS Switch or Tether Cut-Out Switch and Engine Cut-Out Switch Testing

Disconnect connector housings and check resistance as indicated in IGNITION table.



A32E0XA

If readings are acceptable, go on to next step.

If readings are inadequate, individually check each switch as follows.

Ignition Switch (key, if equipped)

Disconnect switch housing. Using a multimeter, check between MAG and GRD terminals if the circuit is open (0.L MΩ) in operating position and if the circuit is closed (0 Ω) in off position.

DESS Switch

Liquid Cooled Models Only

Check using a multimeter by connecting probes to BLACK/GREEN and BLACK/WHITE wires. The multimeter should indicate a closed circuit (0 Ω) in operating position and a open circuit (0.L MΩ) in off position.

If readings do not correspond to the above mentioned indications, replace switch.

If none of these verifications are conclusive, the problem finds its source in the main wiring harness. Proceed as follows:

Fan Cooled Models Only

Tether Cord Switch

Unplug switch block connected to main wiring harness. Check using a multimeter by connecting probes to appropriate wires. Refer to corresponding ignition and electrical system testing table in this subsection.The multimeter should indicate an open circuit (0.L MΩ) in operating position and if the circuit is closed (0 Ω) in off position.

Engine Cut-Out Switch

All Models

Unplug switch block connected to main wiring harness. Check using a multimeter by connecting probes to appropriate wires. Refer to corresponding ignition and electrical system testing table in this subsection. The multimeter should indicate an open circuit (0.L MΩ) in operating position and a close circuit (0 Ω) in off position.

NOTE: For the next step, no switch must be connected to the main wiring harness.

Disconnect all switches from the main wiring harness and check the continuity of each wire by connecting probes to the end of wires of the same color. Repeat with all other wires. It is important to mention that all wires of the same color within a given harness are connected together. These wires should therefore have a closed circuit. On the other hand, BLACK and BLACK/YELLOW wires must have an open circuit (0.L MΩ).

Repair or replace if necessary.

4. Ignition Generator Coil Testing

Resistance Testing

– Disconnect housing between the magneto and the MPEM.
– Connect multimeter probes to appropriate wires and measure resistance. Refer to corresponding IGNITION and ELECTRICAL SYSTEM TESTING table in this subsection.

A32E0YA

– Compare readings with those appearing in the IGNITION table.

Voltage Testing

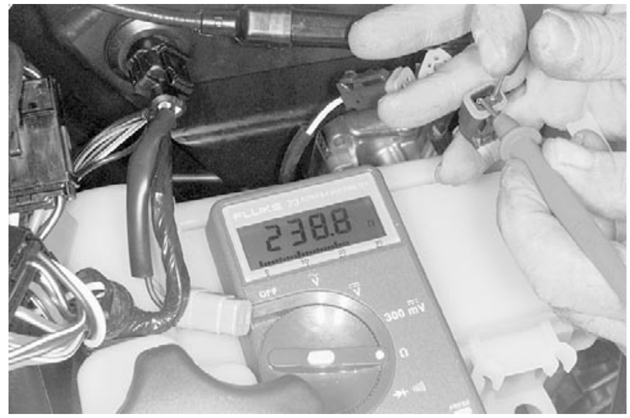
When manually starting the engine while the spark plug is installed, the engine will tend to accelerate beyond the compression point. This will result in higher magneto output power.

– Disconnect housing between the magneto and the MPEM.
– Connect multimeter probes to appropriate wires. Refer to corresponding ignition and electrical system testing table in this subsection. Bring the selector switch to V and the scale to 00.0 Vac.
– Activate the manual starter and check values indicated by the multimeter.
– Repeat operation 3 times.
– Compare readings with those appearing in the IGNITION table.

5. Trigger Coil Testing

Resistance Testing

– Connect probes to appropriate wires from trigger coil housing. Refer to corresponding ignition and electrical system testing table in this subsection.



A32E10A

– Compare readings with those appearing in the IGNITION table.

Voltage Testing

– Connect probes to appropriate wires from trigger coil housing. Refer to corresponding IGNITION and ELECTRICAL SYSTEM TESTING table in this subsection.
– Activate the manual starter and check values indicated by the multimeter.
– Repeat operation 3 times.
– Compare readings with those appearing in the IGNITION table.

6. MPEM Voltage Testing

Liquid Cooled Models Only

– Disconnect the housing between module and high voltage coil.
– Connect multimeter probes to WHITE/BLUE and BLACK wires coming out from module. Place the selector switch to V and the scale to 00.0 Vac.

A32E0ZA

TYPICAL

– Activate the manual starter and check values indicated by the multimeter.
– Repeat operation 3 times.
– Compare readings with those appearing in the IGNITION table.

7. High Voltage Coil Testing

Liquid Cooled Models Only

Resistance Testing

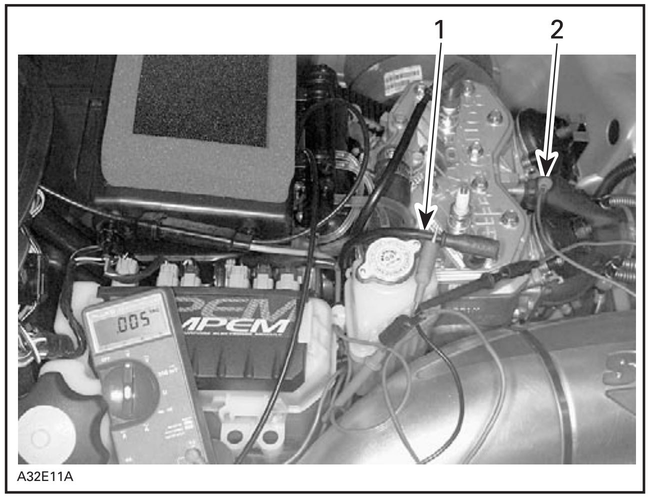
– Unplug housing between high tension coil and MPEM.
– Connect multimeter probes to WHITE/BLUE and BLACK wires and measure resistance.

A32E12A

– Compare readings with those appearing in the IGNITION table.

Voltage Testing

– Disconnect spark plug cap from spark plug.
– Fasten alligator clip to spark plug cable, near the spark plug.
– Connect other multimeter wire to engine (ground), then place selector switch to V and scale to 0.00 Vac.



A32E11A

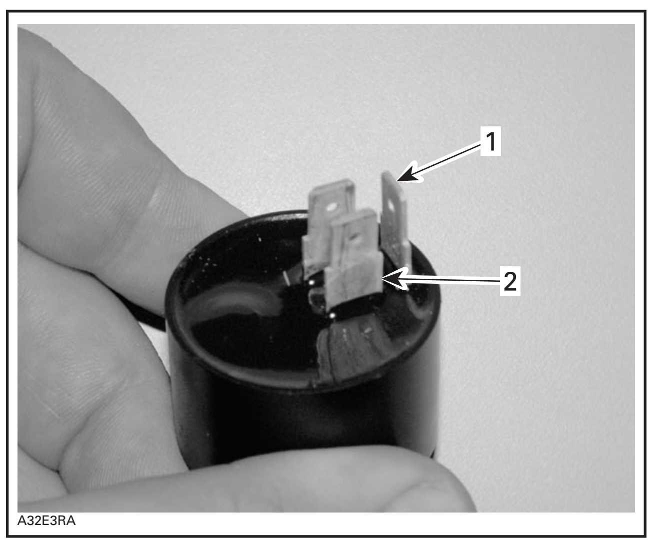
1. *MAG side spark plug cable*
2. *Connected to ground*

– Activate the manual starter and check values indicated by the multimeter.
– Repeat operation 3 times.
– Compare readings with those appearing in the IGNITION table.

8. Buzzer Testing

2-Stroke Engines

NOTE: Before testing the buzzer, make sure the connectors are installed on proper buzzer tabs.



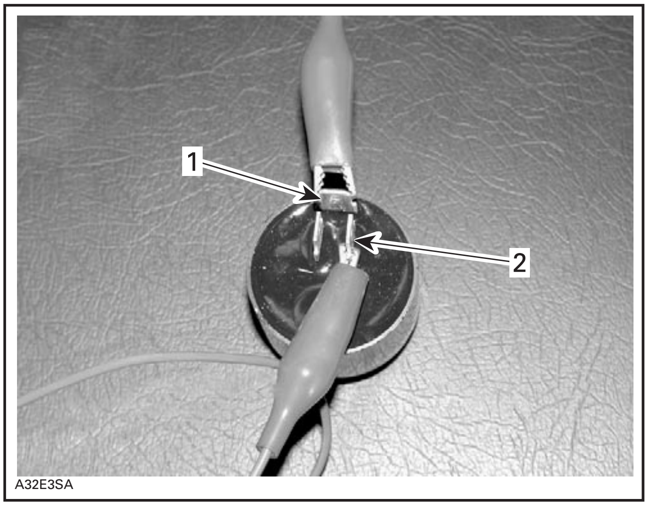
A32E3RA

1. *BEIGE/BLACK wire on positive tab*
2. *GREEN/RED wire on negative tab*

Using jumper wires, connect battery positive post to buzzer positive tab.

Connect battery negative post to buzzer negative tab. See next photo.

CAUTION: To avoid buzzer damage, ensure that polarity is respected.



TYPICAL — 12-VOLT BATTERY PLUGGED TO BUZZER
1. Buzzer positive tab
2. Buzzer negative tab

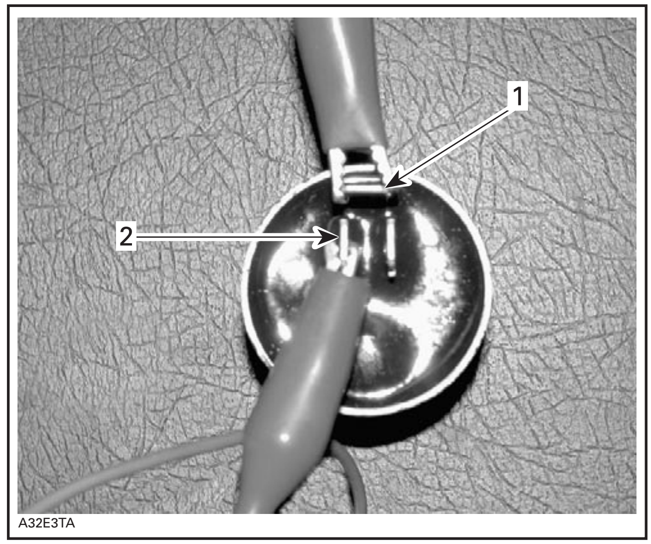
A continuous sound should be heard. if not, replace the buzzer with a new one.

4-Stoke Engines

Using jumper wires, connect battery positive post to buzzer positive tab.

Connect battery negative post to buzzer negative tab. See next photo.

CAUTION: To avoid buzzer damage, ensure that polarity is respected.

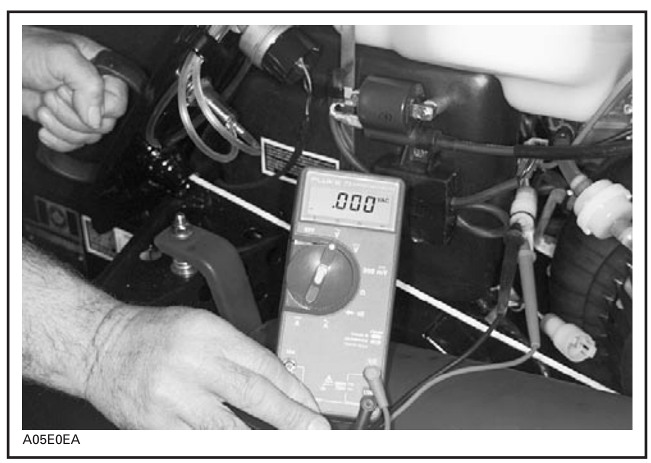


TYPICAL — 12-VOLT BATTERY PLUGGED TO BUZZER
1. Buzzer positive tab
2. Buzzer negative tab

An intermittent sound should be heard. If not, replace the buzzer with a new one.

Lighting Generator Coil Voltage Testing

– Disconnect housing from engine (YELLOW wires).
– Connect multimeter probes to YELLOW wires, then place selector switch to V and scale to 0.00 Vac.
– Activate the manual starter and check values indicated by the multimeter.
– Repeat operation 3 times.



TYPICAL

– Compare readings with those appearing in the LIGHTING table.

Conclusion

If none of the above testing operations produced valid results, it is strongly recommended to keep on testing according to the list appearing in the RESISTANCE column of IGNITION or LIGHTING table.

Set the multimeter as indicated.

NOTE: For the 480 W models, use B.U.D.S. software.

IGNITION AND LIGHTING SYSTEM TESTING (ZX Fan Series with RER/340 W)							
PART	TEST TO BE PERFORMED	WIRE COLOR	RESISTANCE Ω		VOLTAGE V		NOTE
			VALUE (ohms)	MULTIMETER SCALE	VALUE (volt)	MULTIMETER SCALE	
Stop switch	Running insulation	BK and BK/YL	0.L	00.0 MΩ	—	—	All switches must be in run position.
	Continuity in STOP position	BK and BK/YL	00.0 - 00.5	00.0 Ω	—	—	Only one stop switch must be in stop position. Test them one after the other.
Ignition generator coil	Output	RD and BK	4.5 - 6.5	00.0 Ω	7.0 - 15.0	00.0 Vac	—
	Ground continuity	BK and engine	00.0 - 00.5	00.0 Ω	—	—	The term "engine" refers to the engine metal parts connected to the magneto housing.
Front trigger coil	Resistance and output	WH/YL and BL/YL	160 -180	00.0 Ω	.150 - .350	.000 Vac	—
Rear trigger coil	Resistance and output	WH/YL and BL/YL	160 -180	00.0 Ω	.150 - .350	.000 Vac	—
MPEM and high voltage coil	Secondary winding voltage	BK and engine	—	—	.100 - .250	0.00 Vac	The measurement must be taken on the spark plug cable (without the spark plug).
Spark plug cable and cap	Cable resistance	—	4.0 K - 6.0 K	00.0 KΩ	—	—	—
Lighting generator coil	Power	YL and YL/BK	00.0 - 00.6	00.0 Ω	3.0 - 7.0	00.0 Vac	—
	Insulation	YL and engine	0.L	00.0 MΩ	—	—	The term "engine" refers to the engine metal parts connected to the magneto housing.
	Ground continuity	BK and engine	00.0 - 00.5	00.0 Ω	—	—	

NOTE: Engine stop switches include the ignition switch, the tether cord switch and the engine cut-out switch.

It is important to take note that voltage measurements must be taken while starting the vehicle using the manual starter.

Voltages obtained upon starting are proportional to the force applied onto the manual starter. A low voltage is therefore normal under a low cranking force.

Perform testing in the prescribed order and replace any parts not performing according to specifications.

It is important to resume all tests when replacing a component.

If not specified, the probe connecting sequence is not important.

360 W ZX LC IGNITION AND ELECTRICAL SYSTEM TESTING								
PART	TEST TO BE PERFORMED	WIRE COLOR	MULTIMETER PROBE CONNECTION	RESISTANCE Ω		VOLTAGE V		NOTE
				MULTIMETER SCALE	VALUE (ohms)	MULTIMETER SCALE	VALUE (volt)	
Engine stop switch	Running insulation	BK and BK/YL	11–DA-3–F 11–DA-6–F	00.0 Ω or auto range	0.L	—	—	Engine cut-out switches must be in run position.
	Continuity in STOP position	BK and BK/YL	11–DB-3–F 11–DA-6–F	00.0 Ω or auto range	00.0 - 00.5	—	—	Engine cut-out switches must be in stop position.
DESS switch	Insulation with DESS removed	BK/WH and BK/GN	11–DA-4–F 11–DA-5–F	00.0 Ω or auto range	0.L	—	—	Tether cap must be in place.
	Continuity with DESS in run position	BK/WH and BK/GN	11–DA-4–F 11–DA-5–F	00.0 Ω or auto range	00.0 - 00.5	—	—	Tether cap must be in place.
MPEM	Ground connection	BK and negative battery terminal or body	11–DA-3–F	00.0 Ω or auto range	00.0 - 00.5	—	—	—
MPEM power (with battery)	Power from battery	RD/GY and BK	11–DA-12–F 11–DA-3–F	—	—	00.0 Vdc	Same as battery voltage	Voltage always present.
	Power from regulator	RD/BR and BK	11–DA-1–F 11–DA-3–F	—	—	00.0 Vdc	1 to 2 volts	While cranking engine.
MPEM power (without battery)	Power from regulator	RD/BU and BK	11–DA-2–F 11–DA-3–F	—	—	00.0 Vdc	3 to 5 volts	While cranking engine.
MPEM output voltage	Voltage to ignition coil	WH/BU and BK	Wires from primary of high voltage coil	—	—	00.0 Vdc	225.0 to 275.0	With tether cap in place and engine cut-out switches in run position. While cranking engine.
Trigger coil no. 1	Resistance and output	BU/YL and WH/YL	11–DE-4–F 11–DE-1–F	00.0 Ω or auto range	190 - 300	00.0 Vdc	.200 – .350	While cranking engine.
Trigger coil no. 2	Resistance and output	GN/YL and GY/YL	11–DE-3–F 11–DE-2–F	00.0 Ω or auto range	190 - 300	00.0 Vdc	.200 – .350	While cranking engine.
High voltage coil	Primary winding resistance	WH/BU and BK	11–DC-2–F 11–DC-1–F	00.0 Ω or auto range	00.2 to 0.5	—	—	Disconnect the ignition coil from the MPEM
	Secondary winding resistance spark plug wires and cap included	Between both spark plug caps	Between both spark plug caps	00.0 Ω	14.5 k to 23.5 k	—	—	Do not attempt to remove spark plug caps from the wires.
	Secondary winding resistance spark plug wires removed	Male terminal to male terminal	On male terminals of high voltage coil	00.0 Ω	9.6 k to 14.4 k	—	—	With spark plug wires removed from high voltage coil.
	Secondary winding voltage	BK and engine	On spark plug wire insulation and on engine	—	—	00.0 Vdc	1.5 to 2.5	Do not probe into spark plug cap with spark plug wire removed from spark plug.

360 W ZX LC IGNITION AND ELECTRICAL SYSTEM TESTING								
PART	TEST TO BE PERFORMED	WIRE COLOR	MULTIMETER PROBE CONNECTION	RESISTANCE Ω		VOLTAGE V		NOTE
				MULTIMETER SCALE	VALUE (ohms)	MULTIMETER SCALE	VALUE (volt)	
Start/RER switch (with battery)	Start/RER signal at MPEM	BE and BK	11–DA-7–F 11–DA-3–F	—	—	00.0 Vdc	Battery voltage	When start/RER switch is activated in all conditions.
Charging voltage	Battery voltage to switch from 5 A fuse	RD/GY and negative battery terminal	12–HG-5 and negative battery terminal	—	—	00.0 Vdc	Battery voltage	The 5 A fuse is located on the electrical config harness.
Start/RER switch (without battery)	RER signal at MPEM	BE/BK	11–DA-7–F 11–DA-3–F	—	—	00.0 Vdc	11 to 13 volts	When RER button is activated and the engine is running.
Start/RER switch (all)	Continuity from start/RER switch to MPEM	BE and BE	12–HG-8–M 11–DA-7–F	00.0 Ω or autorange	1.0 Ω	—	—	—
	Voltage supply from regulator	RD/BU and negative battery terminal	5–RR-87–F and negative battery terminal	—	—	Above battery voltage below 15 volts	00.0 Vdc	—
Charging current	Current to battery	RD and RD/WH	6–FA-A-F 6–FA-B-F	—	—	10 A scale	2–4 A	Engine @ 5000 RPM with fully charged battery. With 30 A fuse removed and ammeter in series.
Lighting generator coil	Output	YL and YL and GN	2–MO-(1, 2, 3)-F	00.0 Ω or autorange	00.0 to 00.5 3 times	00.0 Vac	3.5 to 5.5 3 times	Do the test between A and B, A and C and B and C using manual starter.
	Coil insulation	YL and engine	2–MO-(1, 2, 3)-F and engine	00.0 Ω or autorange	0.L	—	—	The term engine refers to the metal parts connected to the magneto housing.
Relay (with battery)	Coil	WH/GN and BK	5–RC-85–F 5–RC-86–F	—	—	00.0 Vdc	10.5 to 13.5	Engine idling (1500 to 1800 RPM)
	Contacts	RD/WH and RD/BR	5–RC-87–F 5–RC-30–F	—	—	00.0 Vdc	00.0 to 0.10	Engine idling (1500 to 1800 RPM)
Relay (without battery)	Coil	WH/GN and BK	5–RC-85–F 5–RC-86–F	—	—	00.0 Vdc	10.5 to 13.6	Engine idling (1500 to 1800 RPM)
	Contacts	RD/BU and RD/BR	5–RC-87–F 5–RC-30–F	—	—	00.0 Vdc	00.0 to 0.11	Engine idling (1500 to 1800 RPM)

NOTE: If voltage is present at the coil and contact, replace the relay.

An approved automotive spark plug tester is preferred for testing the secondary winding voltage.

All cranking tests are performed with the manual starter. Faster cranking speeds may produce higher voltages.

Ignition and electric starter will not work if the Engine stop switches is in the kill position.

Charging system test should be performed if a no spark condition is encountered on this vehicle.

INSPECTION OF AC CIRCUIT INSULATION

Fan Cooled Electric Start Models

NOTE: If AC circuit is not insulated from frame, headlamp beam will weaken.

Disconnect regulator/rectifier.

Connect one digital ohmmeter probe (needle ohmmeter will not offer enough precision) to frame and other probe to YELLOW wire (2-MO).

Measured resistance must be infinite. If such is not the case, it means there is a connection between AC circuit and frame.

Disconnect one accessory at the time to identify the faulty circuit.

INSPECTION OF HEATING ELEMENTS

NOTE: All measurements must be performed at 21°C (70°F).

Throttle Lever Heating Element

All Models

Current Measurement

HIGH INTENSITY	BROWN wire	0.23 A minimum
LOW INTENSITY	BROWN /YELLOW wire	0.13 A minimum

Handlebar Grip Heating Element

Resistance Measurement

Fan Cooled Models

INTENSITY	WIRES	OHMS
HIGH	YELLOW/BLACK and ORANGE/VIOLET	13.7 to 16.7*
LOW	YELLOW/BLACK and ORANGE	6.8 to 8.4*

Liquid Cooled Models except SDI and V-1000

INTENSITY	WIRES	OHMS
HIGH	BLACK and ORANGE/VIOLET	13.7 to 16.7*
LOW	BLACK and ORANGE	6.8 to 8.4*

SDI and V-1000 Models

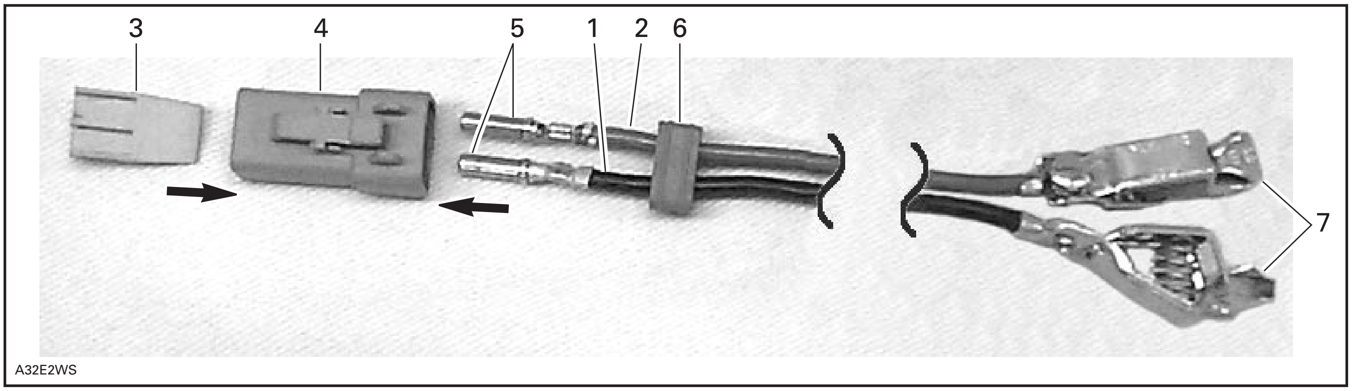
INTENSITY	WIRES	OHMS
HIGH	BLACK and ORANGE/VIOLET	17 to 21*
LOW	BLACK and ORANGE	8.6 to 10.5*

* When measuring resistance at terminals the actual value will be half the measurement in table. The reason for that is the elements are connected in parallel. Therefore the total resistance is half the resistance of one element.

HEADLIGHT AND ACCESSORIES SYSTEM TESTING

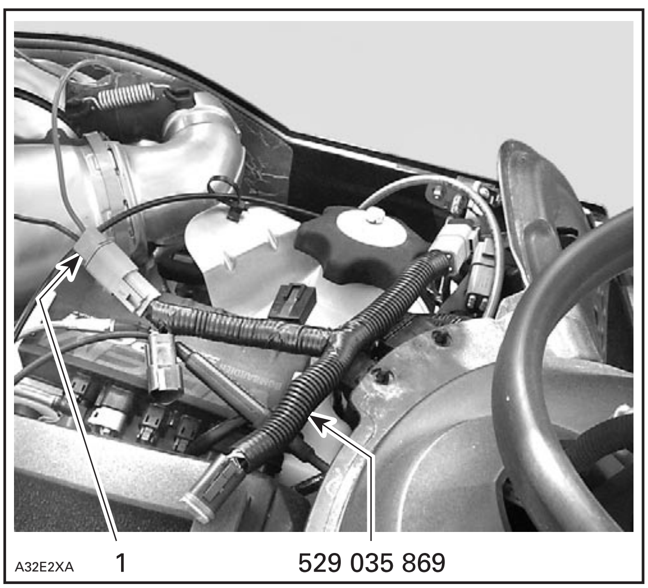
360 W Models Only

Make an homemade adaptor as shown below.



1. *Black wire in position no. 1*
2. *Red wire in position no. 2*
3. *P/N 278 001 671*
4. *P/N 278 001 673*
5. *P/N 515 175 567 (2)*
6. *Seal (included with housing)*
7. *Alligator clips*

Connect 12-volt supply to the 2 position housing of the supply cable (P/N 529 035 869). Respect polarity by connecting 12 V to RED wire and ground to BLACK wire.



1. *Homemade adaptor*

Connect supply cable (P/N 529 035 869) to diagnostic connector, located on right side of the vehicle. Now the headlight and accessories systems are supplied with 12 volts. Refer to appropriate wiring diagram in wiring diagram section to troubleshoot headlight system.

Once headlight system testing is done, disconnect supply cable from vehicle and then 12-volt supply from the supply cable.

480 W Models (SDI Engines)

Connect VCK (P/N 529 035 981). In B.U.D.S., click on the relay 2 (R2) button to supply headlight system with 12 volts.

To supply 12 volts in the accessories system, click on the relay 3 (R3) button.

Use the wiring diagram in WIRING DIAGRAM section to troubleshoot headlight and accessories systems.

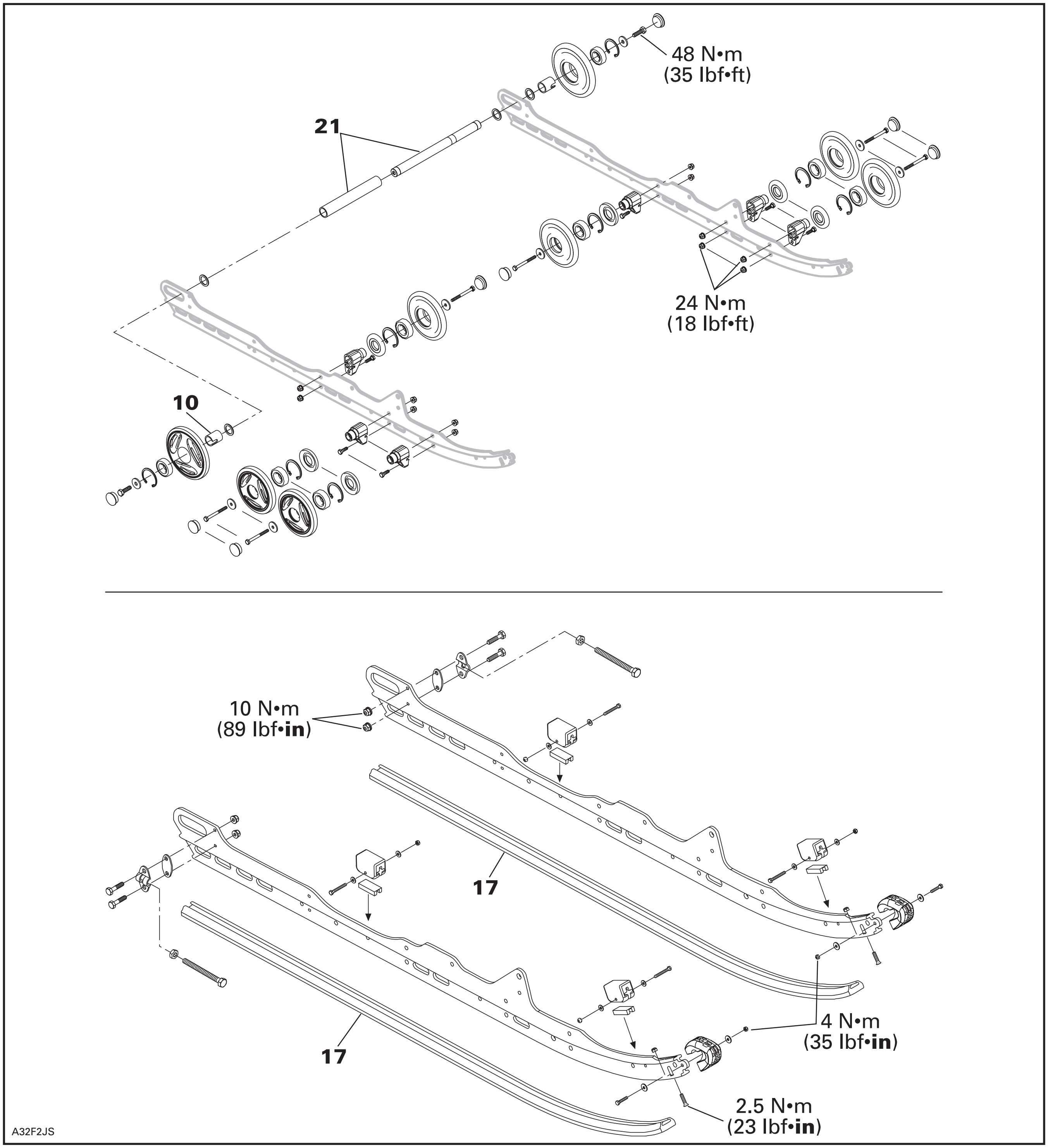
Models equipped with an alternator (V-1000)

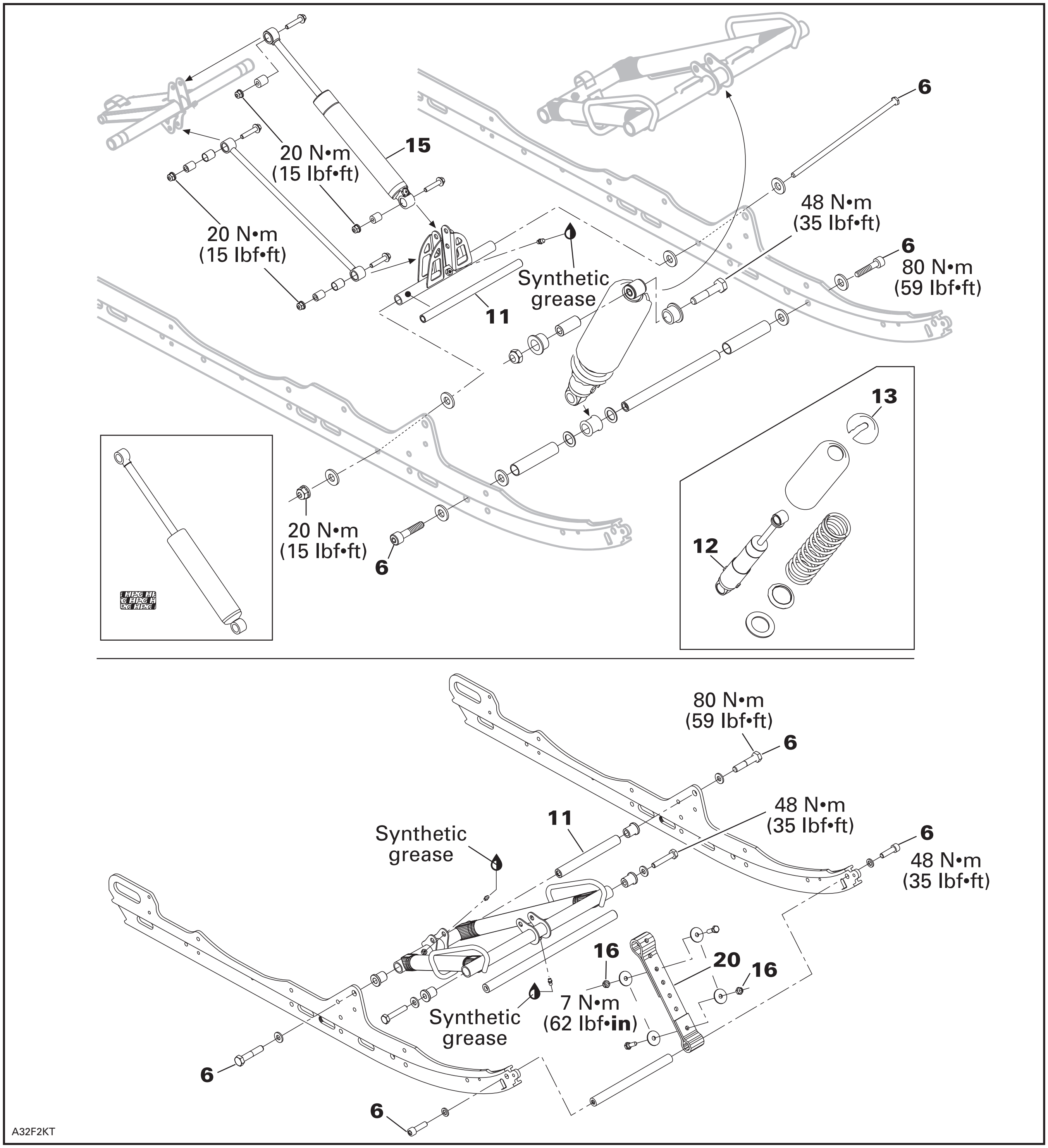
Connect VCK (P/N 529 035 981). In B.U.D.S., click on the relay 2 (R2) button to supply headlight and accessories systems with 12 volts.

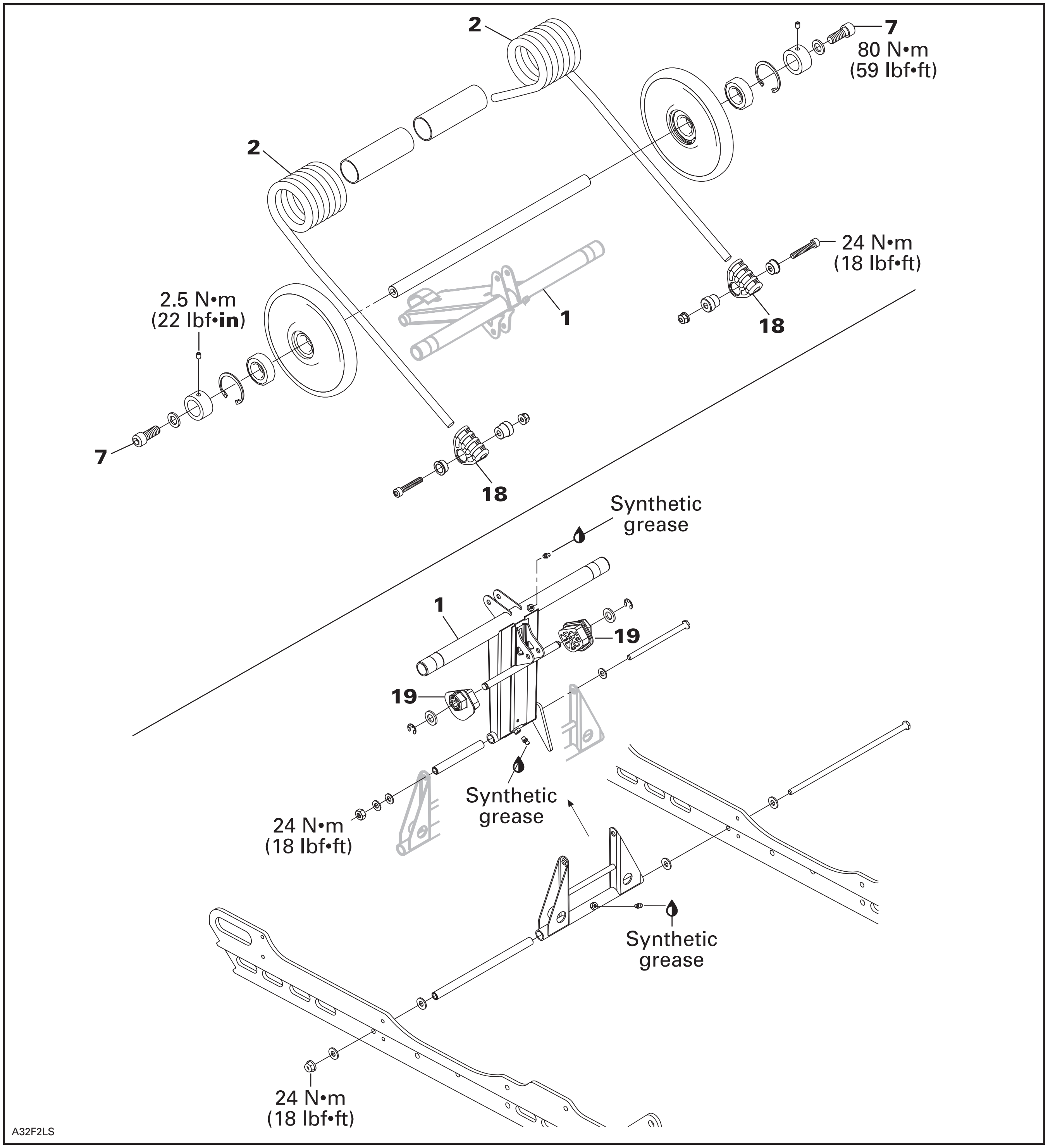
Use the wiring diagram in WIRING DIAGRAM section to troubleshoot headlight and accessories systems.

SC-10 SUSPENSION

Summit Fan 550




6
20 N•m
(15 lbf•ft)
15
48 N•m
(35 lbf•ft)
6
80 N•m
(59 lbf•ft)
20 N•m
(15 lbf•ft)
Synthetic
grease
11
13
20 N•m
(15 lbf•ft)
6
12
80 N•m
(59 lbf•ft)
6
48 N•m
(35 lbf•ft)
11
Synthetic
grease
6
48 N•m
(35 lbf•ft)
16
20
16
7 N•m
(62 lbf•in)
Synthetic
grease
6
6
A32F2KT


2
7
80 N•m
(59 lbf•ft)
2
24 N•m
(18 lbf•ft)
2.5 N•m
(22 lbf•in)
1
18
7
18
Synthetic
grease
1
19
19
Synthetic
grease
24 N•m
(18 lbf•ft)
Synthetic
grease
24 N•m
(18 lbf•ft)
A32F2LS

COMPONENT REMOVAL AND INSTALLATION

Lift rear of vehicle and support it off the ground.

21, Rear Axle

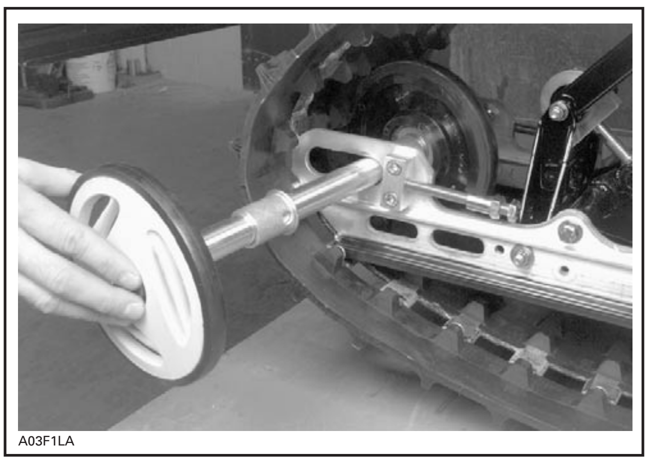
Remove screw on rear axle on side of offset wheel.

Completely loosen track tension.

Pull out rear axle from opposite side of offset inner wheel.

At assembly, align spacer hole with adjusting bolt.

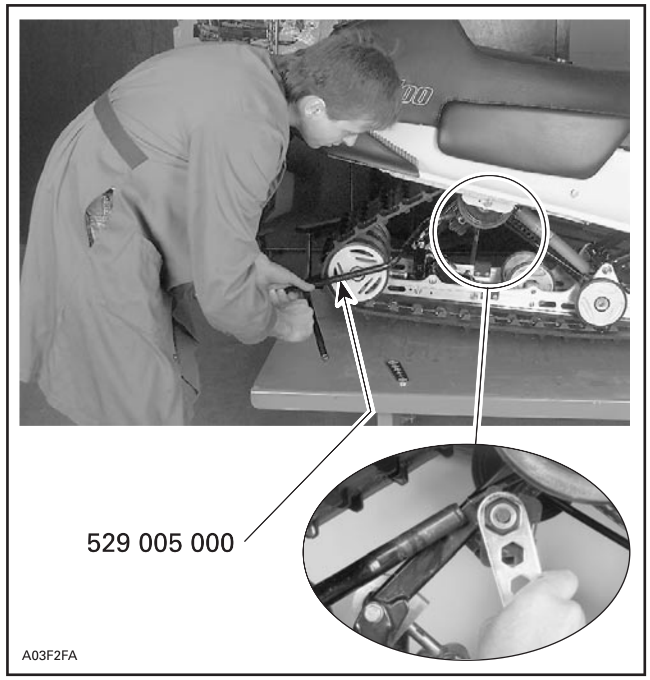
Make sure to reinstall washer on each side of runner.



TYPICAL

15, Rear Shock

Lift rear of vehicle.

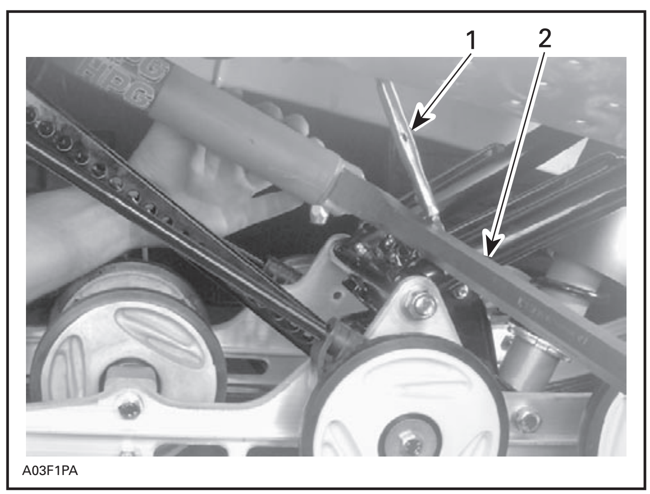


Remove nut on top end of shock.

Remove nut on bottom end of shock. Pry up shock bottom end to ease removing bolt (gas shock only). See installation illustration below.

Installation is reverse of removal procedure. To easily compress gas shock absorber, use a pry bar and locking pliers as a stopper.

CAUTION: **Take care not to damage grease fitting.**



TYPICAL
1. Locking pliers
2. Pry bar

12, Front Shock

Unfasten one end of stopper strap(s).

Unbolt shock from the top.

Remove the front idler wheels to gain access to the axle retaining self-locking screws **no. 6**. Follow the instructions provided in this section to unfasten these screws. Slide out the axle and remove the shock.

2, Rear Spring

Remove spring ends from adjusting cams.

Unbolt rear arm top axle from chassis.

SUSPENSION ASSEMBLY REMOVAL

19, Cam

Decrease spring preload by turning cams accordingly.

Lift rear of vehicle and support it off the ground.

Loosen track tension.

Remove rear arm top axle screws **no. 7** from chassis.

6,7, Self-Locking Screws

CAUTION: These self-locking screws must always be replaced by new ones every time they are removed.

NOTE: To prevent axle from turning when unscrewing self-locking screws, 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 screw head to melt threadlocker.

Lift rear of vehicle at least 1 m (3 ft).

TYPICAL
A. At least 1 m (3 ft)

Remove screws **no. 6** retaining front arm to tunnel.

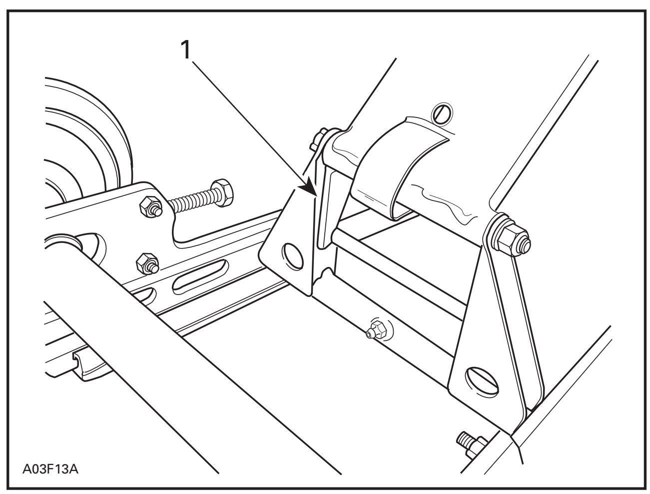
Remove suspension.

DISASSEMBLY AND ASSEMBLY

Inspect track thoroughly before reinstalling suspension. Refer to TRACK.

1, Rear Arm

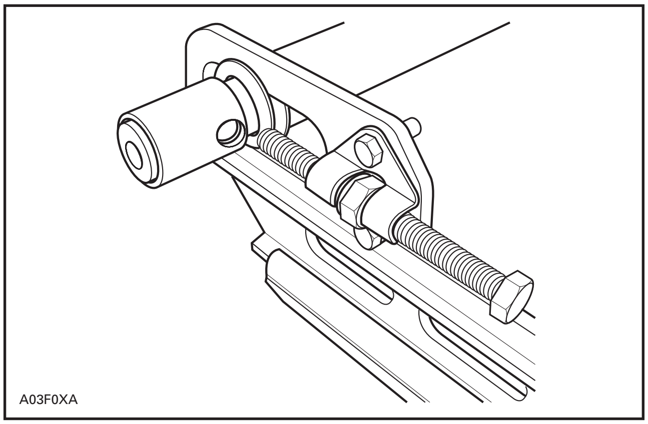
At installation, rear arm stroke limiter must be on rear side.



1. Stroke limiter on rear side

10, Outer Bushing

At installation, hole must face adjustment screw.

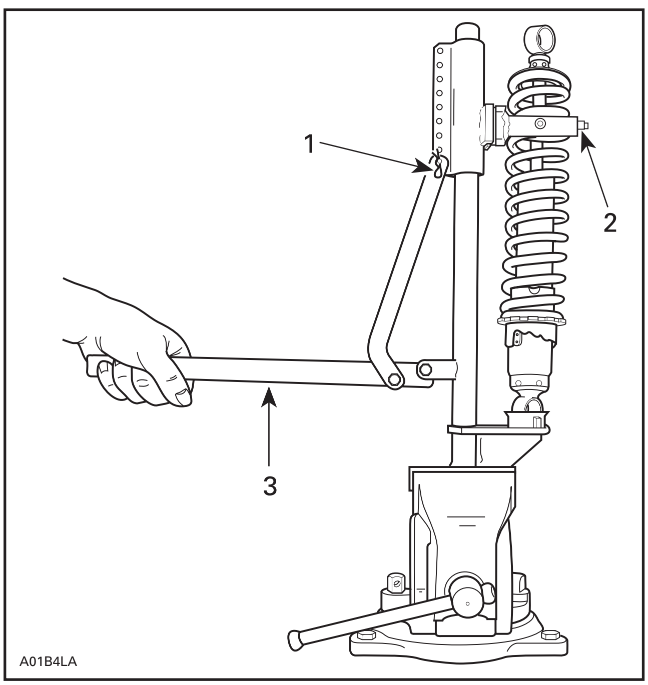


12,13,14, Front Shock, Spring Stopper and Cap

Use shock spring remover (P/N 529 035 504) and put it in a vise. Mount shock in it and turn shock so that a spring coil rests against spring compressor jaw.

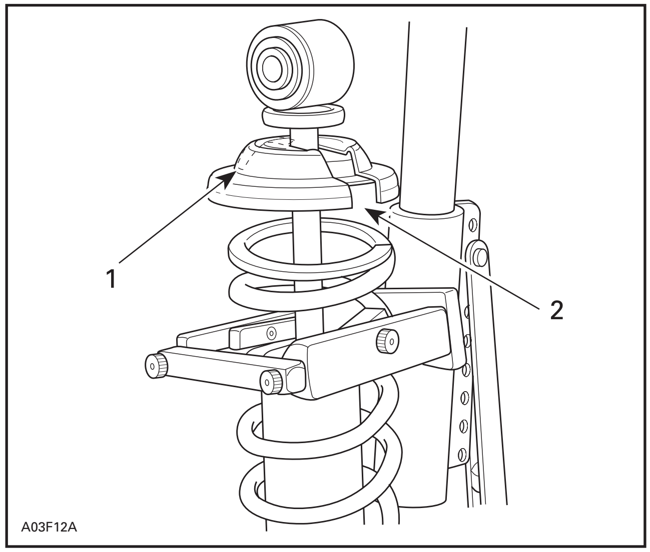
Close and lock bar. Place handle horizontally by changing position of clevis pin.

Push down on handle until it locks. Remove spring stopper and cap then release handle.



1. Clevis pin
2. Bar
3. Handle placed horizontally

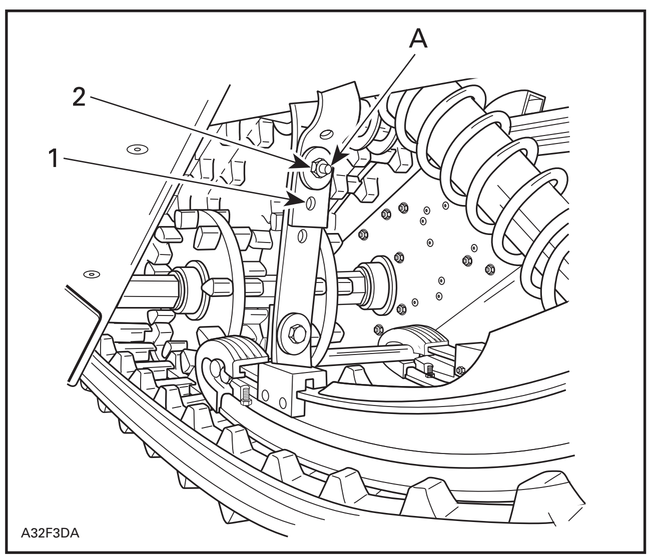
At installation, cap opening must be 180° from spring stopper opening.



1. Cap opening
2. Spring stopper opening

20, Stopper Strap

Inspect strap for wear or cracks, bolt and nut for tightness. If loose, inspect hole for deformation. Replace as required. Make sure it is attached through proper hole from the end. Torque nut to 7 N•m (62 lbf•**in**).

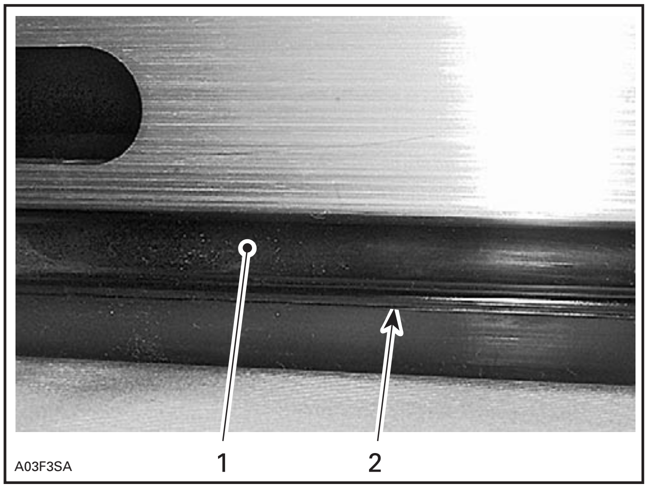


ALL MODELS EXCEPT SUMMIT LIQUID COOLED MODELS
1. 1st hole
2. 2nd hole

*A. 7 N•m (62 lbf•**in**)*

17, Slider Shoe

Molding line is the wear limit indicator.



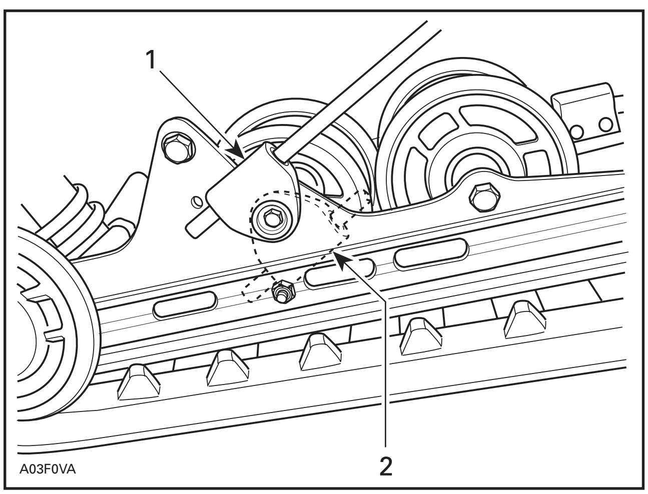
TYPICAL
1. *Slider shoe*
2. *Molding line (wear limit indicator)*

Replace slider shoes when wear limit is reached.

CAUTION: Slider shoes must always be replaced in pairs.

18, Spring Support

CAUTION: To avoid track damage, spring supports must be mounted upward.



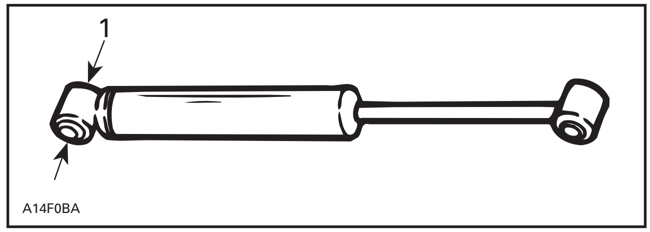
RIGHT SIDE SHOWN
1. *Right position: upward*
2. *Wrong position*

SHOCK ABSORBER INSPECTION

All Models Equipped with Hydraulic Shock

NOTE: Hydraulic shocks are painted black.

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.

Pay attention to the following conditions which 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.

INSTALLATION

Install assembled suspension into track with front portion first.

Insert rear section of suspension into track.

Bolt front arm, rear arm then center top idler wheel axle.

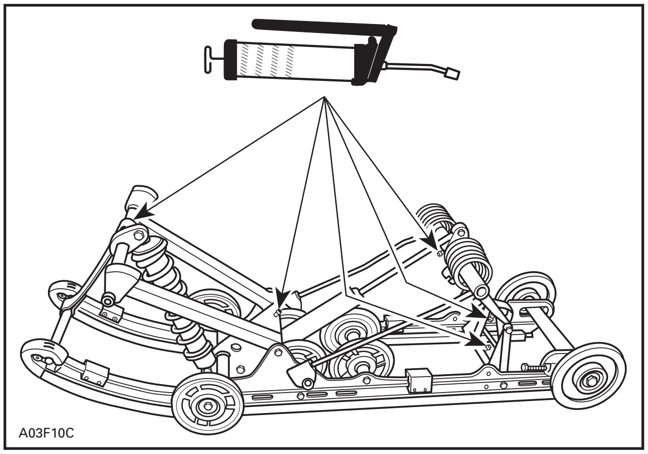
Adjust track tension.

RIDE ADJUSTMENT

Refer to *Operator's Guide*.

LUBRICATION

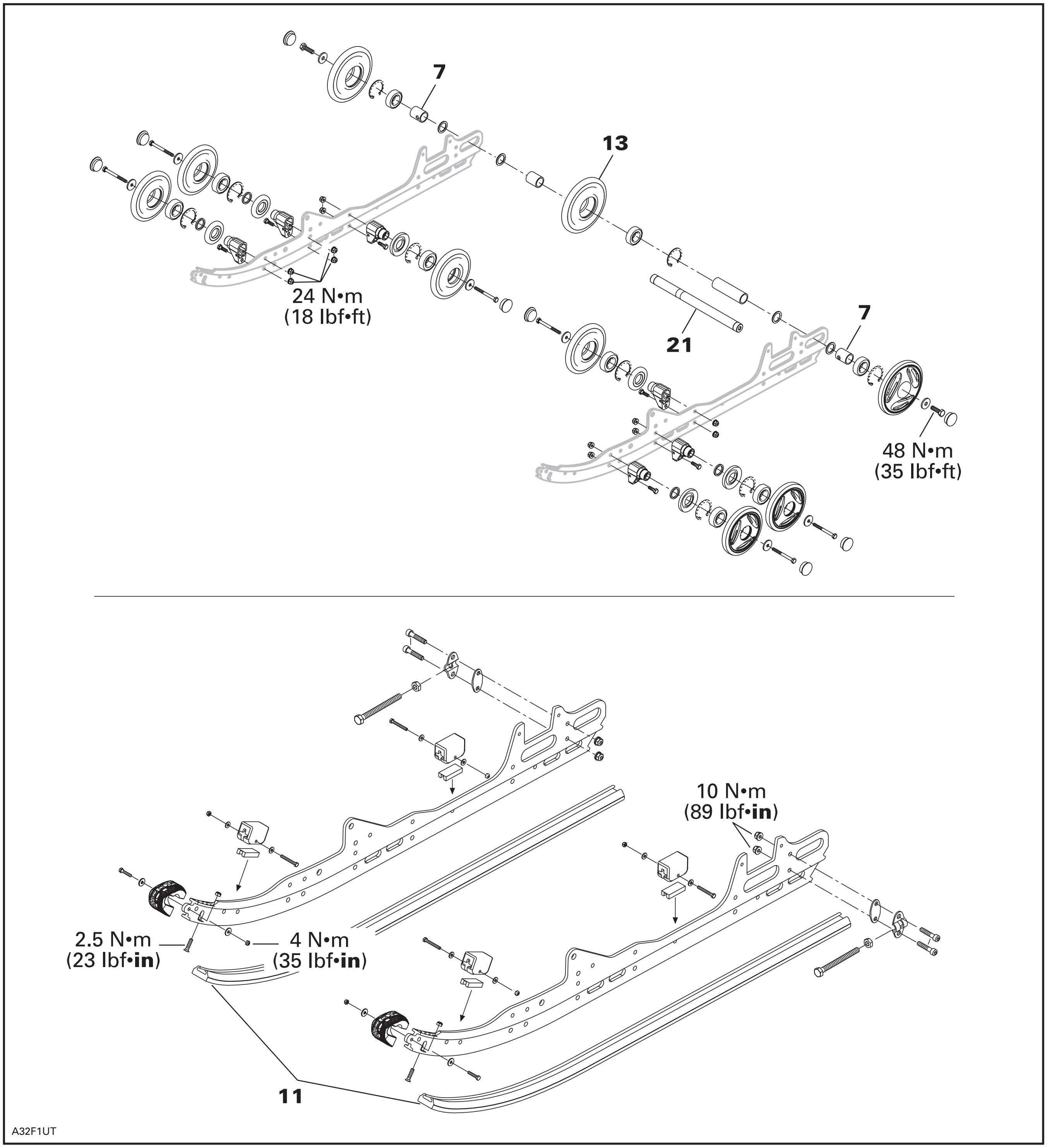
Lubricate front and rear arms at grease fittings using suspension synthetic grease (P/N 293 550 033).

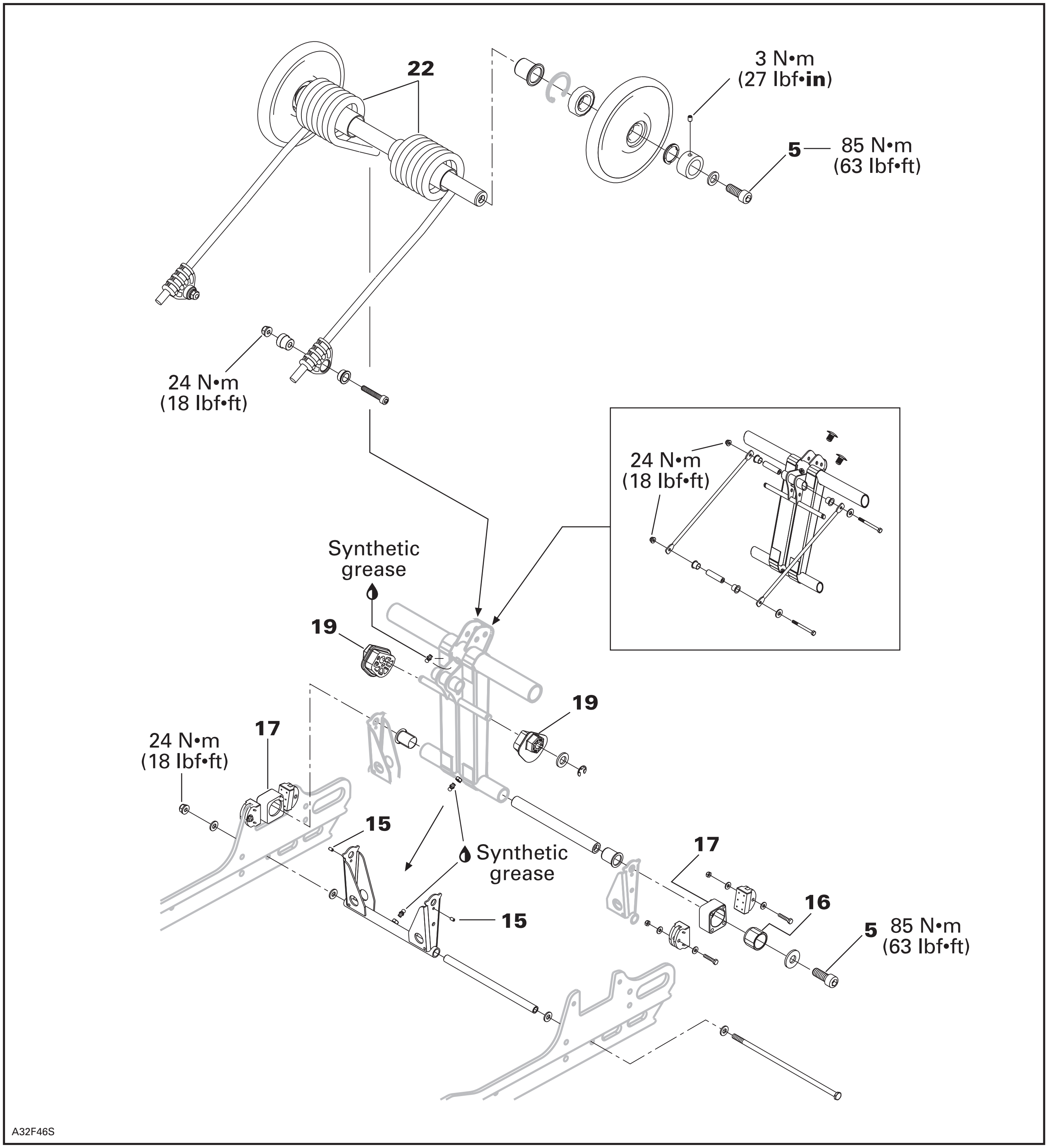


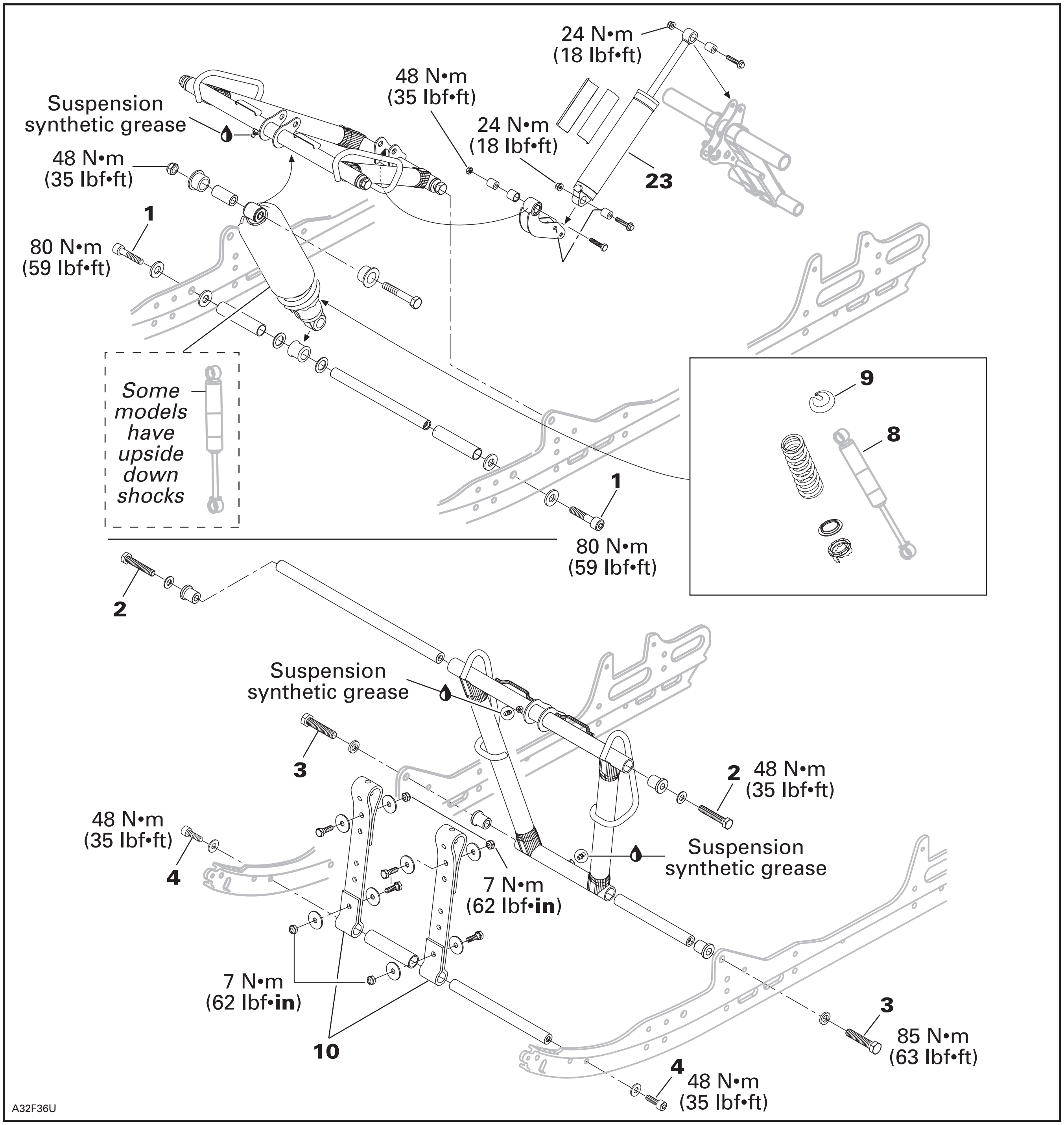
SC-10 SPORT, MOUNTAIN AND TOURING: 5 GREASE FITTINGS

SC-10 III SUSPENSION

SC-10 III




22
3 N•m
(27 lbf•**in**)
5
85 N•m
(63 lbf•ft)
24 N•m
(18 lbf•ft)
24 N•m
(18 lbf•ft)
Synthetic
grease
19
19
24 N•m
(18 lbf•ft)
17
15
Synthetic
grease
17
16
15
5
85 N•m
(63 lbf•ft)
A32F46S


24 N•m
(18 lbf•ft)
48 N•m
(35 lbf•ft)
Suspension
synthetic grease
24 N•m
(18 lbf•ft)
48 N•m
(35 lbf•ft)
23
1
80 N•m
(59 lbf•ft)
Some
models
have
upside
down
shocks
9
8
1
80 N•m
(59 lbf•ft)
2
Suspension
synthetic grease
3
2
48 N•m
(35 lbf•ft)
48 N•m
(35 lbf•ft)
4
Suspension
synthetic grease
7 N•m
(62 lbf•in)
7 N•m
(62 lbf•in)
10
3
85 N•m
(63 lbf•ft)
4
48 N•m
(35 lbf•ft)
A32F36U

COMPONENT REMOVAL AND INSTALLATION

Lift rear of vehicle and support it off the ground.

21, Rear Axle

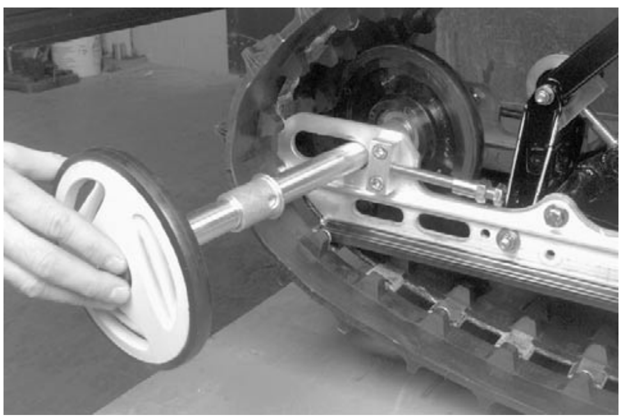
Remove screw on rear axle on side of offset wheel.

Completely loosen track tension.

Pull out rear axle from opposite side of offset inner wheel.

At assembly, align spacer hole with adjusting bolt.

Make sure to reinstall washer on each side of runner.

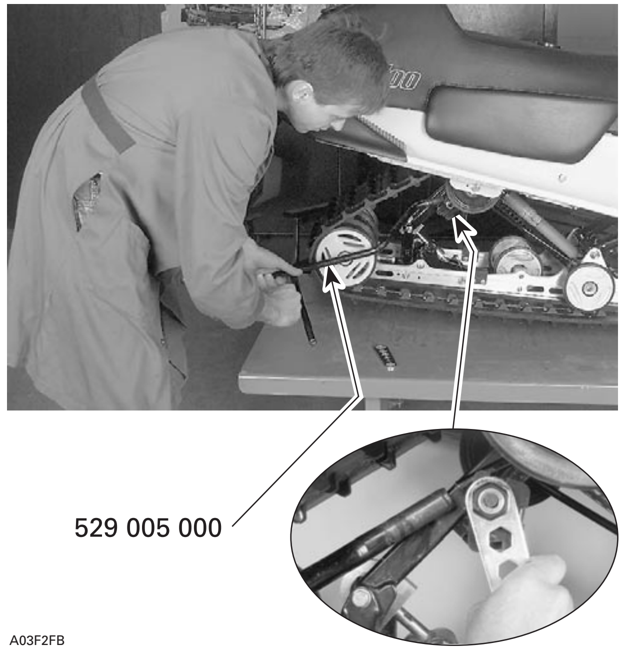


A03F1LA

TYPICAL

23, Rear Shock

Lift rear of vehicle.



A03F2FB

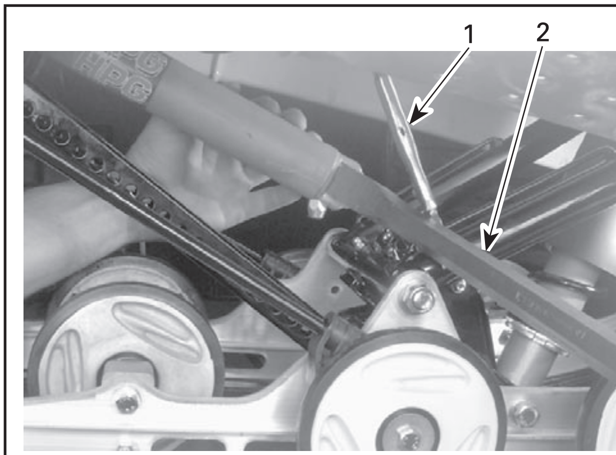
TYPICAL

Remove nut on top end of shock.

Remove nut on bottom end of shock. Pry up shock bottom end to ease removing bolt (gas shock only). See installation illustration below.

Installation is reverse of removal procedure. To easily compress gas shock absorber, use a pry bar and locking pliers as a stopper.

CAUTION: Take care not to damage grease fitting.



A03F1PA

TYPICAL
1. Locking pliers
2. Pry bar

8, Front Shock

Unfasten one end of stopper strap(s).

Unbolt shock from the top.

Remove the front idler wheels to gain access to the axle retaining self-locking screws **no. 2** and **no. 3**. Follow the instructions provided in this section to unfasten these screws. Slide out the axle and remove the shock.

22, Rear Spring

All Models

Remove spring ends from adjusting cams.

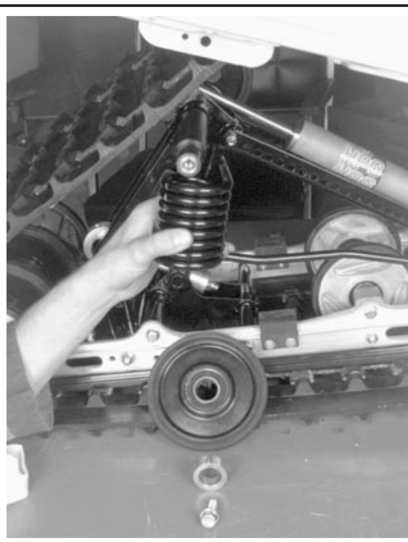
Unbolt rear arm top axle from chassis.

Liquid Cooled Models

Unscrew set screws from locking ring at each end of top axle.

Remove spacers and top idler wheels.

Remove springs.



A03F1QA

TYPICAL

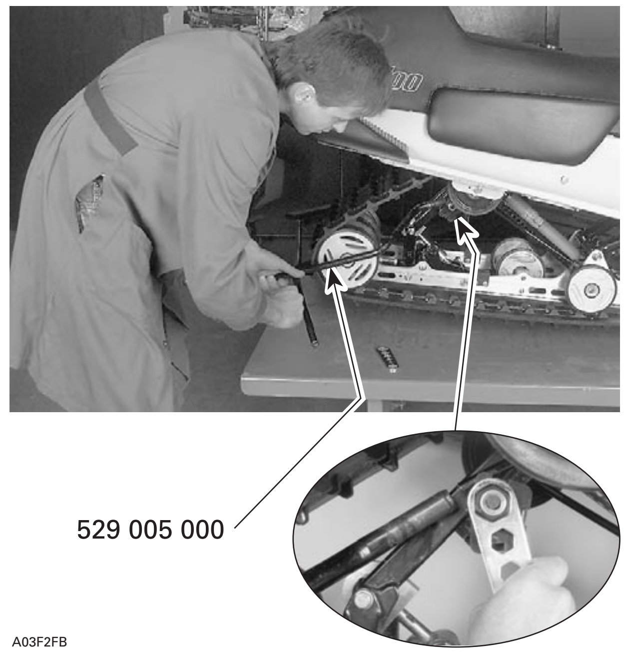
At reassembly, respect THIS SIDE OUT inscription on wheel.

SUSPENSION ASSEMBLY REMOVAL

19, Cam

Decrease spring preload by turning cams accordingly.

Slightly turn adjusting cam to expose spring end. Using spring installer (P/N 529 005 000), remove both springs from adjusting cams.



A03F2FB

TYPICAL

Lift rear of vehicle and support it off the ground.

Loosen track tension.

1,2,3,4,5,6, 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, 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 threadlocker.

Remove rear arm top axle self-locking screws **no. 5** from chassis.

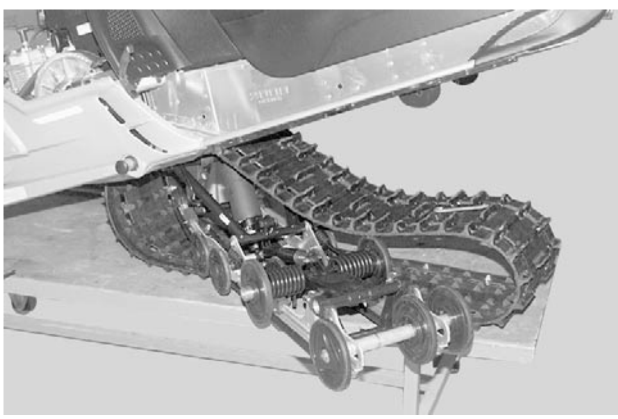
Lift rear of vehicle at least 1 m (3 ft).

A32F10A

TYPICAL
A. At least 1 m (3 ft)

Remove both self-locking screws **no. 2** retaining front arm to tunnel.

Remove suspension.



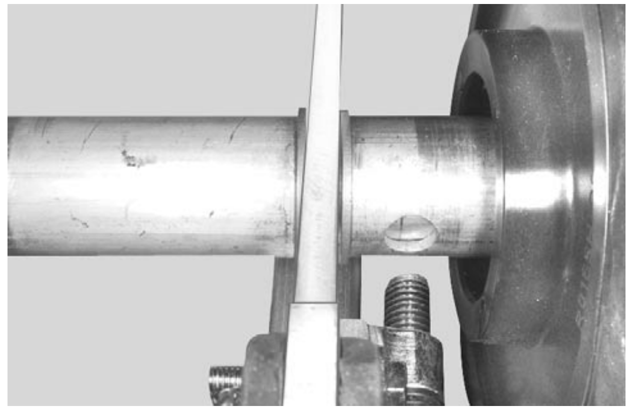
A32F11A

DISASSEMBLY AND ASSEMBLY

Inspect track thoroughly before reinstalling suspension. Refer to TRACK.

7, Outer Bushing

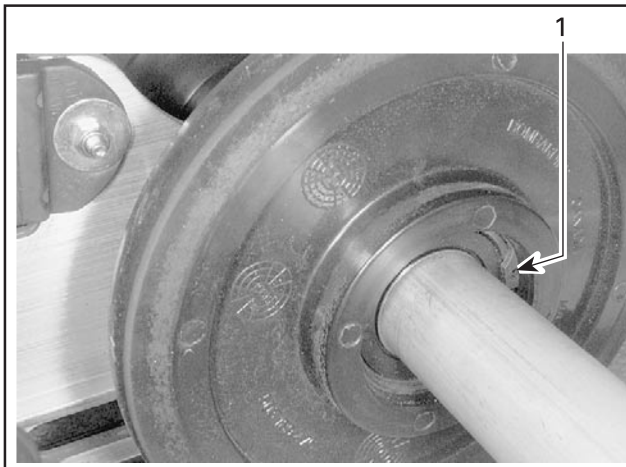
At installation, hole must face adjustment screw.



A32F12A

13,14, Center Rear Wheel and Top Idler Wheels

At installation, circlip must face inner side.



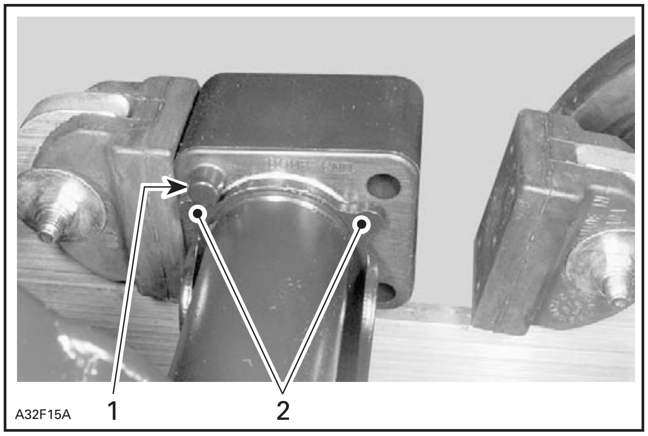
A32F13A

1. Circlip facing inner side

17, Block

Both blocks 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.

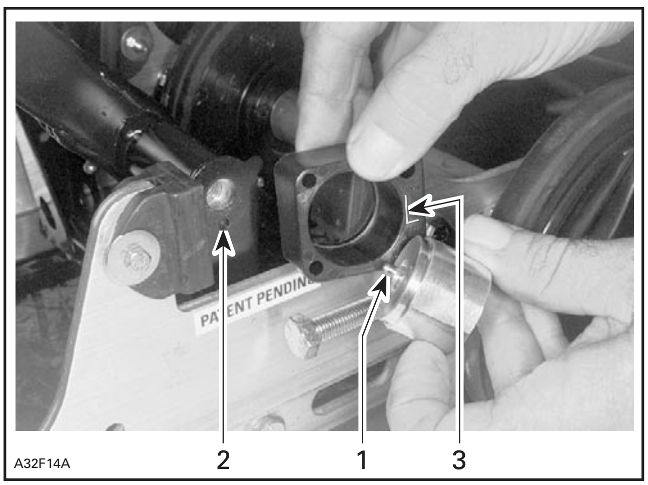


1. *Protrusion*
2. *Stoppers*

15,16, Dowel Pin and Block Guide

Dowel pin must exceed block guide by 2 to 2.3 mm (.079 to .091 in).

At installation, insert dowel pin into pivot arm hole.



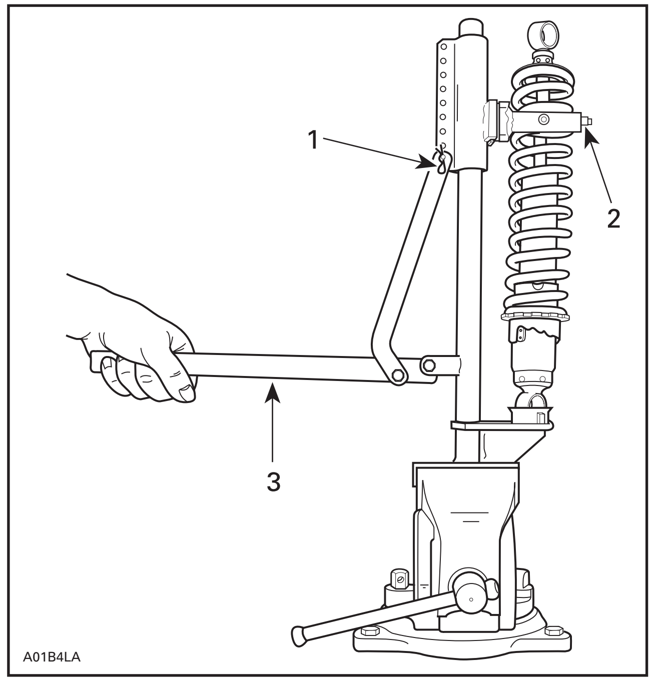
LEFT SIDE SHOWN
1. *Dowel pin*
2. *Pivot arm hole*
3. *«L» identification for left side*

8,9, Front Shock and Spring Stopper

Use shock spring remover (P/N 529 035 504) and put it in a vise. Mount shock 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.

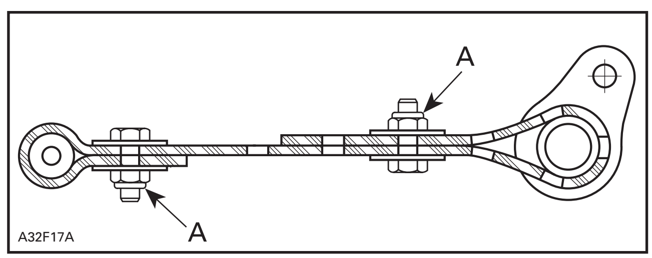
Push down on handle until it locks. Remove spring stopper then release handle.



1. *Clevis pin*
2. *Bar*
3. *Handle horizontal*

10, Stopper Strap

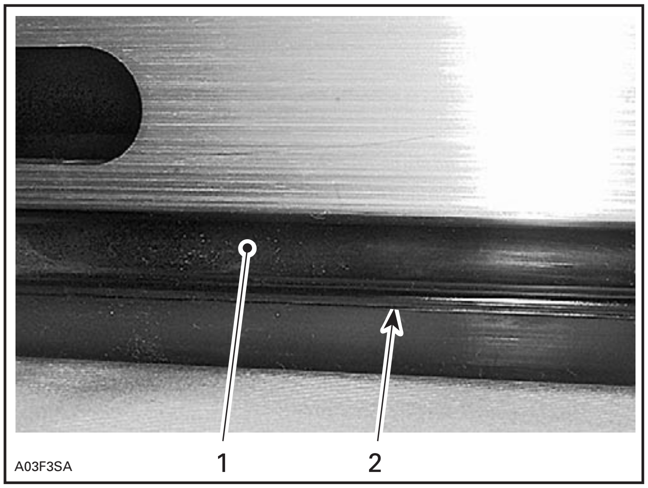
Inspect strap for wear or cracks, bolt and nut for tightness. If loose, inspect hole for deformation. Replace as required. Make sure it is attached through proper holes. Torque nut to 7 N•m (62 lbf•**in**).



*A. 7 N•m (62 lbf•**in**)*

11, Slider Shoe

Molding line is the wear limit indicator.



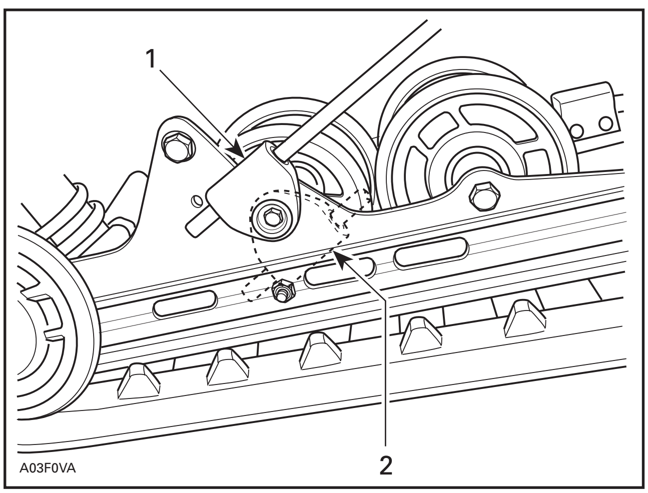
TYPICAL
1. Slider shoe
2. Molding line (wear limit indicator)

Replace slider shoes when wear limit is reached.

CAUTION: Slider shoes must always be replaced in pairs.

12, Spring Support

CAUTION: To avoid track damage, spring supports must be mounted upward.



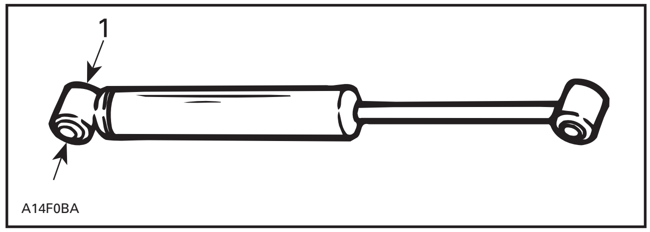
TYPICAL — RIGHT SIDE SHOWN
1. Right position: upward
2. Wrong position

SHOCK ABSORBER INSPECTION

All Models Equipped with Hydraulic Shock

NOTE: Hydraulic shocks 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.

MC VR Shock

For the verification of stroke, install shock in vise keeping the rod upward. Verify the stroke compression when the rod is fully extended.

The feeling will be stiff for around first 25 mm (1 in), soft up to 25 to 50 mm (1 to 2 in) and stiff after that. This stiff, soft and stiff phenomenon shows the normal operation of shock.

All Models Equipped with Gas Pressurized Shock

NOTE: Gas pressurized shocks are light gray or purple painted, or bare aluminum.

Gas shock can be inspected as follows:

Because of gas pressure, strong resistance is felt when compressing shock. When released, the shock will extend unassisted. Renew as required.

If suspecting an internal gas leak between oil chamber and gas chamber, check shock as follows:

Install shock in a vise clamping on its bottom eyelet with its rod upward.

Let it stand for 5 minutes.

Completely push down the shock rod then release.

Rod must come out at a steady speed. If speed suddenly increases particularly at end of extension, replace shock.

HPG VR Shock

NOTE: Gas pressurized shocks are light gray or purple painted, or bare aluminum.

Gas shock can be inspected as follows:

Because of gas pressure, strong resistance is felt when compressing shock. When released, the shock will extend unassisted. The rod speed coming out will go slow - faster and slow again due to the VR zone. Renew as required.

For the verification of stroke, install shock in vise keeping the rod upward. Verify the stroke compression when the rod is fully extended.

The feeling will be stiff for around first 25 mm (1 in), soft up to 25 to 50 mm (1 to 2 in) and stiff after that. This stiff, soft and stiff phenomenon shows the normal operation of shock.

All Types of Shock

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 much more difficult to compress than for the new one.

HPG T/A SHOCK SERVICING

Disassembly and Assembly

There are two types of high pressure gas take apart (HPG T/A) shock. One type has a tire valve and the other has a needle valve.

SHOCK TYPE	INFLATION TOOL
Tire valve type	529 035 570
Needle valve type	503 190 102

T/A shocks come in two sizes. C-36 shock is 36 mm (1.417 in) in diameter and C-46 shock is 46 mm (1.811 in).

SHOCK SIZE	SERVICING TOOL	P/N
C-36	Piston guide	529 026 600
	Seal guide	529 026 500
	Shock wrench	529 035 727
C-46	Piston guide	529 035 608
	Seal guide	529 035 728
	Shock wrench	529 035 727

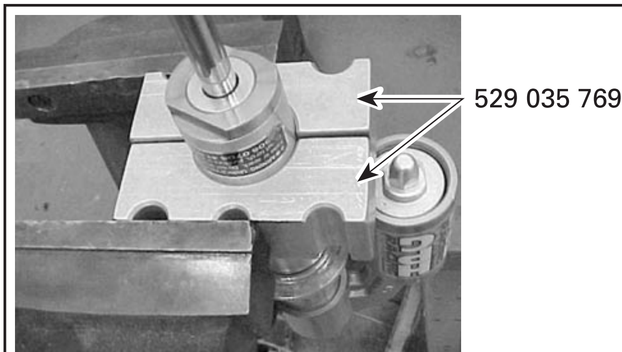
Release N^2 (nitrogen) pressure on any HPG T/A shock with internal floating piston (IFP).

⚠ WARNING

Nitrogen gas is under extreme pressure. Use caution when releasing this gas volume. Protective eye wear should be used.

All T/A Shock Types

Mount shock in a vise with HPG shock holding tool (P/N 529 035 769).



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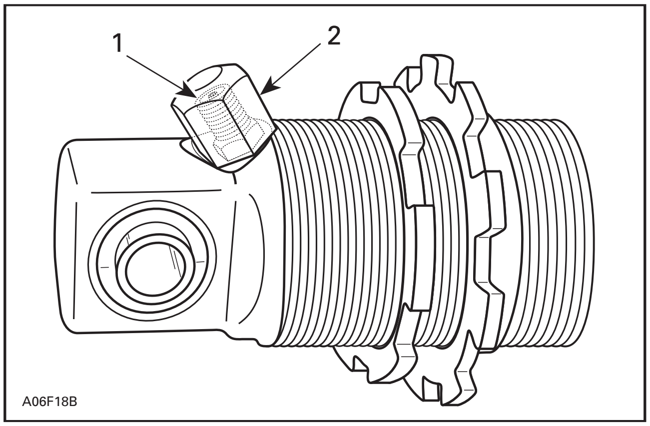
Tire Valve Type Shock

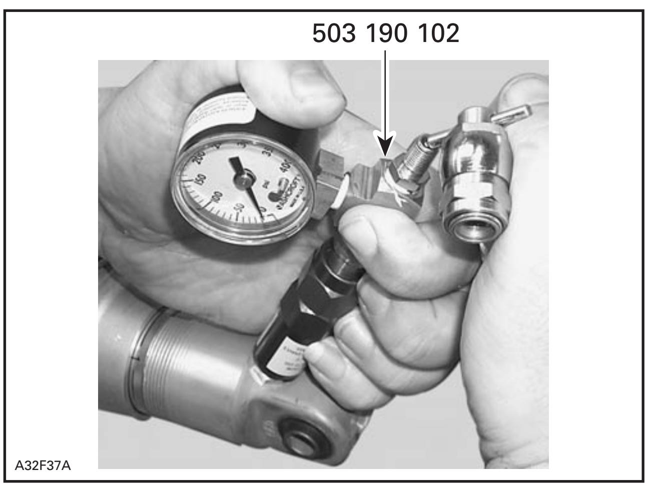
Remove tire valve cap and push on center rod of valve to release gas pressure.



1. *Tire valve*
2. *Tire valve cap*

Needle Valve Type Shock

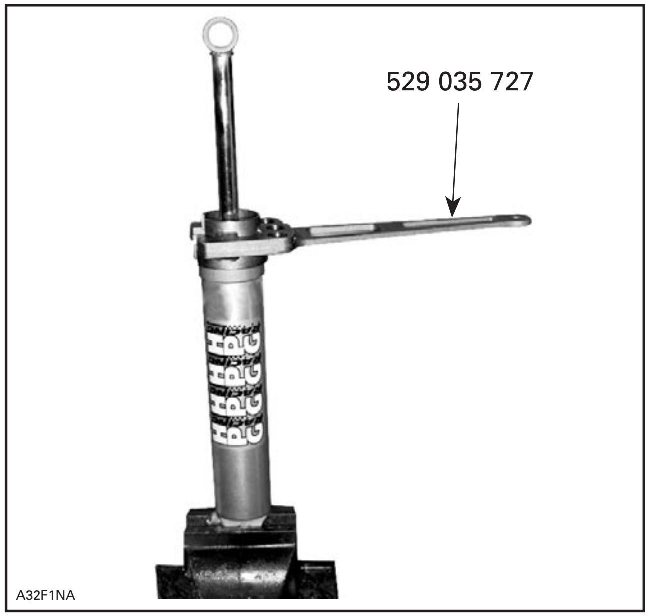
Remove screw on top of valve. Place the needle guide of gas refill needle type shock tool (P/N 503 190 102) on the shock valve. Press the detent pin and push forward the needle assembly very slowly towards rubber of needle valve. Push on shock tool valve center rod to release gas pressure.



Remove tool from shock.

All Types of Shock

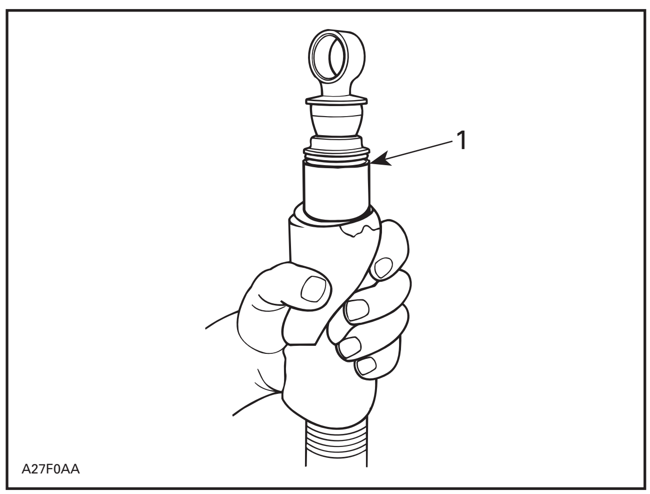
Using appropriate size of shock wrench (P/N 529 035 727) unscrew seal carrier.



TYPICAL

With the seal carrier removed, slowly lift and remove damper rod assembly from the damper body.

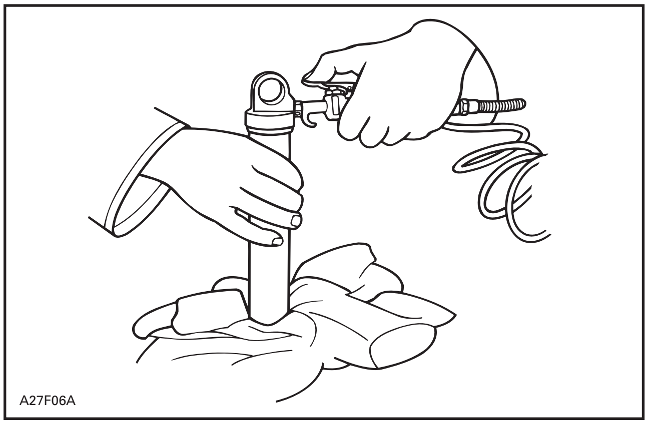
NOTE: Remove damper rod assembly slowly to reduce oil spillage and prevent piston seal damage by damper body threads. Wrap the damper body with a shop cloth to capture possible overflow oil while removing the damper piston.



1. *Oil flows*

Discard old oil into storage container. Never reuse damper oil during shock rebuild.

Remove valve core. Using compressed air pressure, carefully remove floating piston from damper body. Hold shop cloth over damper body opening to catch released floating piston. Allow room for floating piston to leave damper body.



TYPICAL

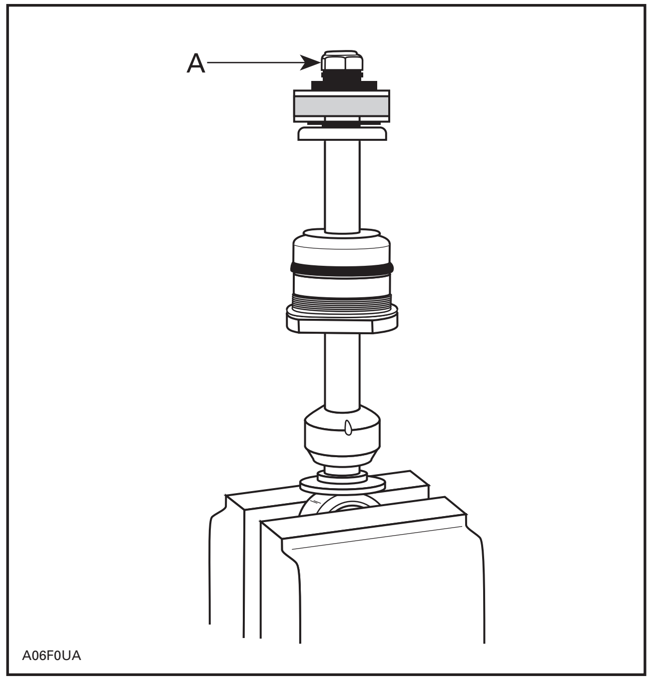
⚠ WARNING

Whenever using compressed air, use an O.S.H.A. approved air gun and wear protective eye wear.

Thoroughly clean, with a typical cleaning solution, and blow dry using low pressure air. Carefully inspect the damper body for any imperfections or signs of wear in the damper bore.

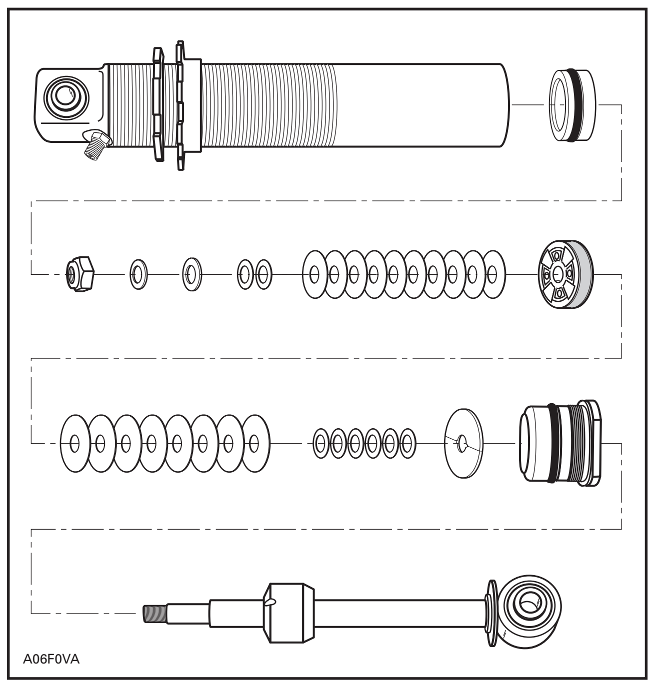
Replace damper body if wear is identified.

Holding the damper rod assembly in a bench vise, begin piston and valve removal.



A. Remove damper nut

Always arrange parts removed in the sequence of disassembly.



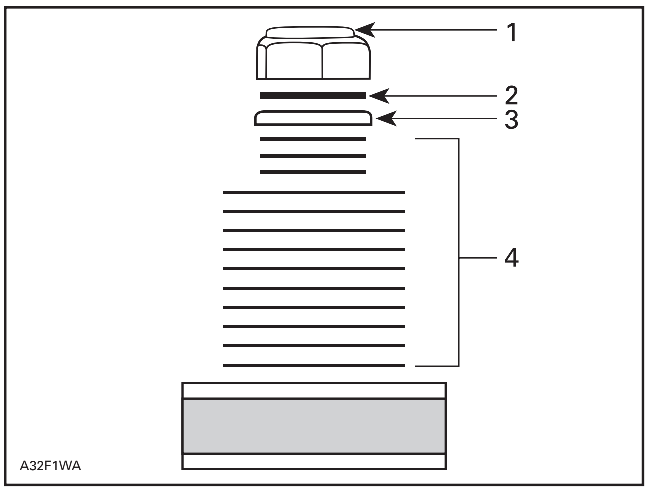
NOTE: As a general rule we suggest replacing the damper rod lock-nut after 4 rebuilds to ensure good locking friction and use Loctite 271 each time.

NOTE: If revalving is to be done, it is imperative that you identify the original shim pack (size and number of shims). The seal carrier need not be removed if only revalving is to be done.

Shims can be measured by using a vernier caliper or a micrometer.

NOTE: All shims should be carefully inspected and any bent or broken shims must be replaced for the shock to function properly.

After the new or replacement shim pack has been selected, reassemble in the reverse order of disassembly. Torque piston nut to 27 - 29 N•m (20 - 21 lbf•ft).



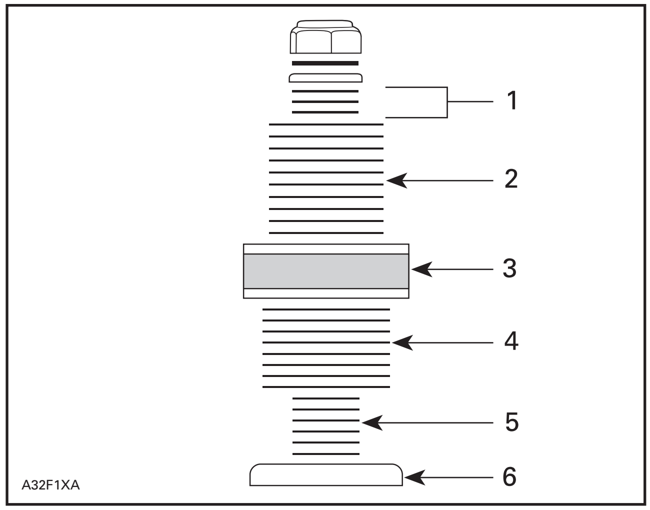
1. *Damper nut*
2. *Spacer*
3. *Stopper with its round edge facing nut*
4. *Shim pack*

CAUTION: The damper rod nut can only be reused 4 times, then, must be replaced. Do not substitute this part for non - O.E.M. use Loctite 271 on nut each time.

This (these) spacer washer(s) must be used as shown to ensure damper rod nut does not bottom out or contact shaft threads.

Rebound valve stopper with round edge facing nut.

NOTE: Rebound shim stack must not reach into threads of damper shaft. Spacer under damper shaft nut is used to prevent damper shaft nut from bottoming on threads.

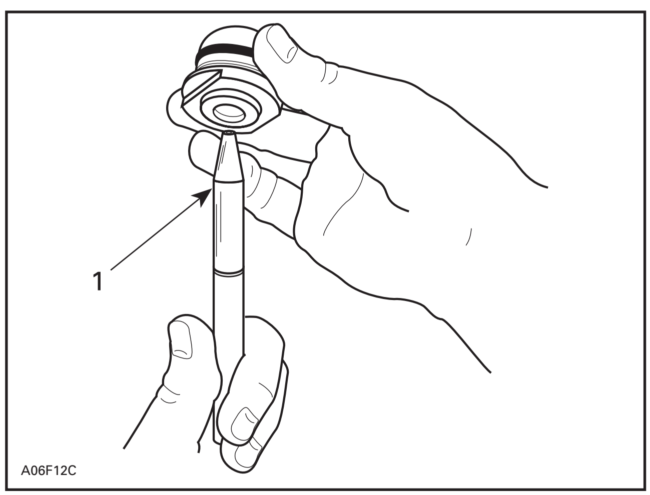


1. *Rebound dampening shim pack*
2. *Rebound dampening shim pack*
3. *Piston*
4. *Compression dampening shim pack*
5. *Compression dampening shim pack*
6. *Stopper*

If the seal carrier assembly is replaced, use seal pilot to guide seal over damper shaft. Lubricate seal carrier guide pilot before use.

CAUTION: Failure to use seal pilot will result in seal damage.

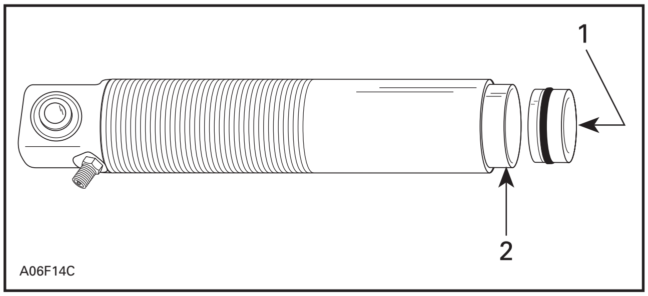
Reassemble damper rod assembly, taking care to properly assemble shim packs as required for your dampening needs. Ensure that the shaft piston is installed with the slits/larger intake holes facing the rebound shim stack.



1. *Seal guide*

If floating piston has been removed, reinstall floating piston into damper body (ensure that valve core has been removed). Use Molykote G-n paste (P/N 711 297 433) to ease O-ring past damper body threads with floating piston guide.

CAUTION: Failure to install IFP correctly could result in shock damage.

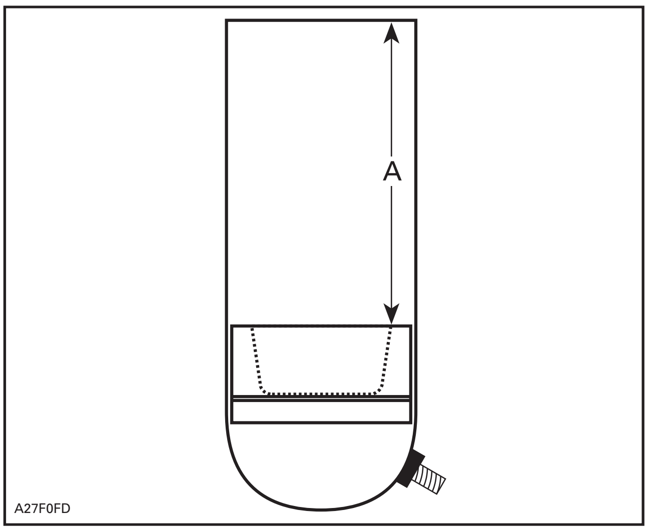


1. Push (slowly) by hand
2. Floating piston guide

NOTE: Lubricate inside of piston guide with Molykote G-n paste (P/N 711 297 433).

Install floating piston to the proper depth refer to following the table.

On all HPG take apart shocks, the floating piston is installed hollow side up.



A. Installation distance for floating piston installation

SHOCK P/N	INSTALLATION DISTANCE OF FLOATING PISTON mm
505 070 903	44.5
505 070 904	44.5
505 070 937	44.5
505 070 938	44.5
503 190 016	128
503 190 247	128
503 190 289	130
503 190 008	132
503 190 019	132
503 190 201	132
503 190 015	134
503 190 017	134
503 190 226	134
505 070 753	176
503 190 007	185
503 190 205	185
503 190 290	185
505 070 966	186
505 071 111	186
503 190 020	187
503 190 024	187
503 190 013	188
503 190 248	188

NOTE: If the floating piston is installed too far into the damper body, light air pressure through valve (with core removed) will move piston outward.

NOTE: Reinstall tire valve core after IFP has been installed at correct height and before adding oil.

⚠ WARNING

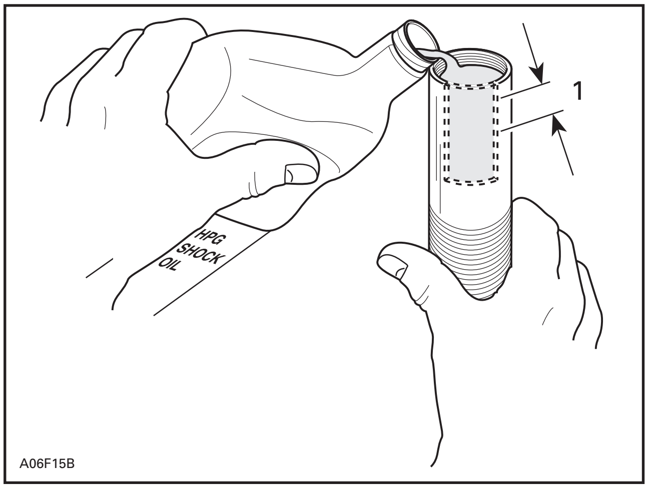
Whenever using compressed air exercise extreme caution, cover damper opening with shop cloth to reduce chance of possible injury.

CAUTION: Moisture laden compressed air will contaminate the gas chamber and rust floating piston.

⚠ WARNING

Always wear protective eye wear whenever using compressed air.

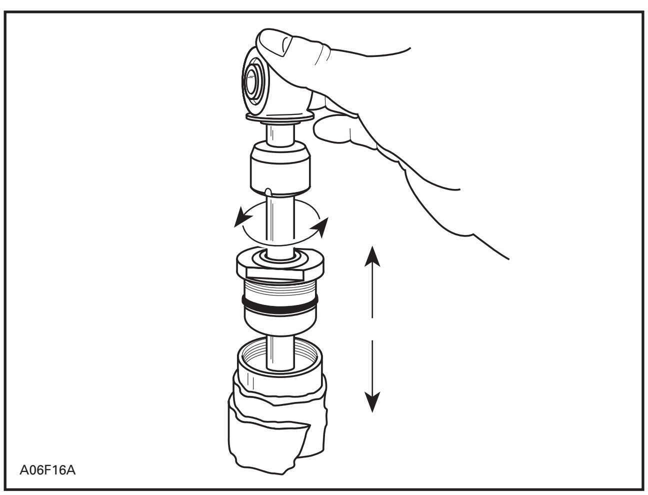
Fill the shock with Bombardier HPG shock oil (P/N 293 600 035) to approximately 10 mm (.393 in), from the base of seal carrier threads.



1. Fill to 10 mm (.393 in)

NOTE: Although we do not measure the exact amount of oil added to the damper, approximately 252 mL (8.52 oz.U.S.) will be used.

Carefully insert damper rod into the damper body. Lightly oil damper piston seal ring with shock oil to ease installation.



NOTE: Some shock oil will overflow when installing damper. Wrap damper with shop cloth to catch possible overflow oil.

CAUTION: Use care when passing piston into damper body at damper body threads.

Slight oscillation of damper rod may be required to allow piston to enter damper body bore.

Slowly push piston into damper body. Slight up and down movement may be required on short stroke to allow all air to pass through piston assembly. The gentle tapping of a small wrench, on the shock eye, may help dislodge air trapped in the submersed piston. Be careful not to drive the shaft any deeper into the oil than is necessary to just cover the shim stack.

NOTE: Fast installation of the damper rod may displace the floating piston from its original position. This must not occur if the damper is expected to perform as designed.

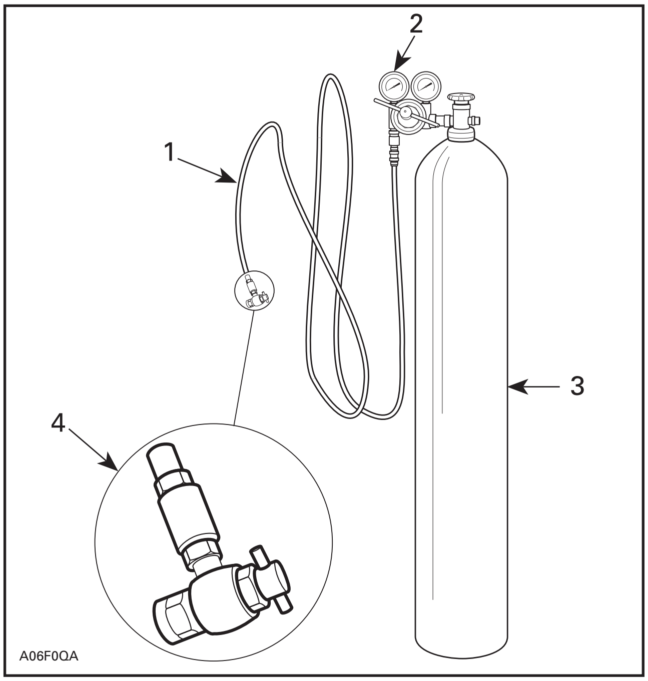
With damper rod piston into oil, TOP OFF damper oil volume. Oil level should be to damper body thread base.

Seal carrier assembly can now be threaded into damper body. This should be done slowly to allow weapage of oil and to minimize IFP displacement. Torque seal carrier to 90 to 100 N•m (66 to 74 lbf•ft). After the seal carrier is fully in place avoid pushing the shaft into the body until the nitrogen charge is added.

When removing and retightening the tire valve acorn nut use minimal torque. When the cap is over tightened and subsequently removed it may prematurely break the seal of the tire valve to the shock body and cause a loss of nitrogen charge without being noticed. If you suspect this has happened then recharge the shock as a precaution. Inspect the tire valve cap before installation to ensure that the internal rubber gasket is in its proper position.

Adding Gas Pressure

Nitrogen (N_2) can now be added to damper body.



1. *High pressure hose*
2. *2 stage regulator, delivery pressure range 2070 kPa (300 PSI)*
3. *High pressure cylinder filled with industrial grade nitrogen*
4. *Valve tip (P/N 529 035 570) permanently installed*

NOTE: Never substitute another gas for nitrogen. Nitrogen has been selected for its inert qualities and will not contaminate the gas chamber of the shock.

Preset your pressure regulator to 2070 kPa (300 PSI) nitrogen (N_2), this gas pressure will restore the correct pressure for your damper.

CAUTION: Do not exceed the recommended pressure values.

⚠ WARNING

Whenever working with high pressure gas, use eye wear protection. Never direct gas pressure toward anybody.

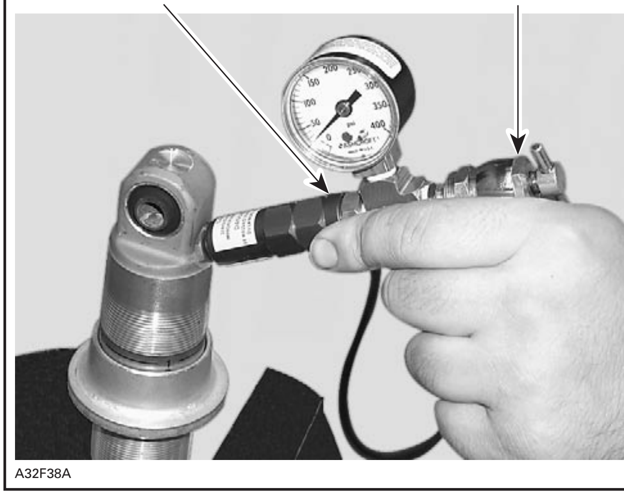
Use appropriate inflation tool.

Needle Valve Type Shock

Install the gas refill needle type shock tool (P/N 503 190 102) on valve tip (P/N 529 035 570). Set the regulator pressure on the nitrogen cylinder as per the shock requirement.

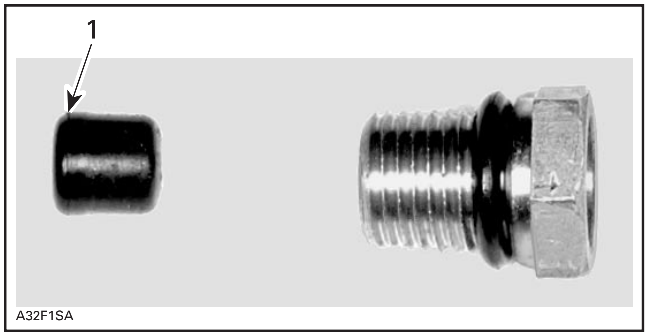
Mount the shock on vise. Remove screw on top of valve. Place the needle guide of gas refill tool on the shock valve. While depressing the detent pin of the gas refill tool and pushing forward the needle assembly, insert the needle through the rubber core of the pressure valve assembly of the shock.

503 190 102 529 035 570



NOTE: For replacement of the needle or filling the shock, carefully follow the instructions provided with the gas refill needle type tool kit (P/N 503 190 102).

On some models, rubber may pop out of needle valve when inserting tool needle. If so, remove valve core and rubber then, reinstall rubber with its larger diameter last.



1. *Larger diameter*

All Shock Types

NOTE: Carefully inspect damper for gas or oil leaks. Any leaks must be corrected before continuing.

Damper gas pressure cannot be confirmed by using a pressure gauge. The volume of gas in the shock is very small, and the amount lost during gauge installation will lower the pressure too much and require refilling.

After recharging is complete the rebuilt shock should be bench-tested. Stroke the shock to ensure full travel and smooth compression and rebound action. If the shaft moves in or out erratically this could indicate too much air is trapped inside. If the shaft will not move or has partial travel then it may be hydraulically locked. In either event the shock must be rebuilt again. Pay particular attention to the placement of the IFP, quantity of oil and shim stack/piston assembly.

INSTALLATION

Install assembled suspension into track with front portion first.

Insert rear portion of suspension into track.

Bolt front arm and rear arm.

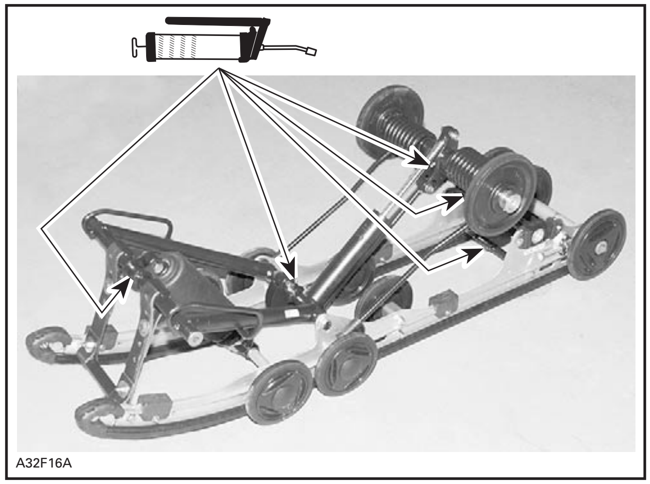
Adjust track tension.

RIDE ADJUSTMENT

Refer to *Operator's Guide*.

LUBRICATION

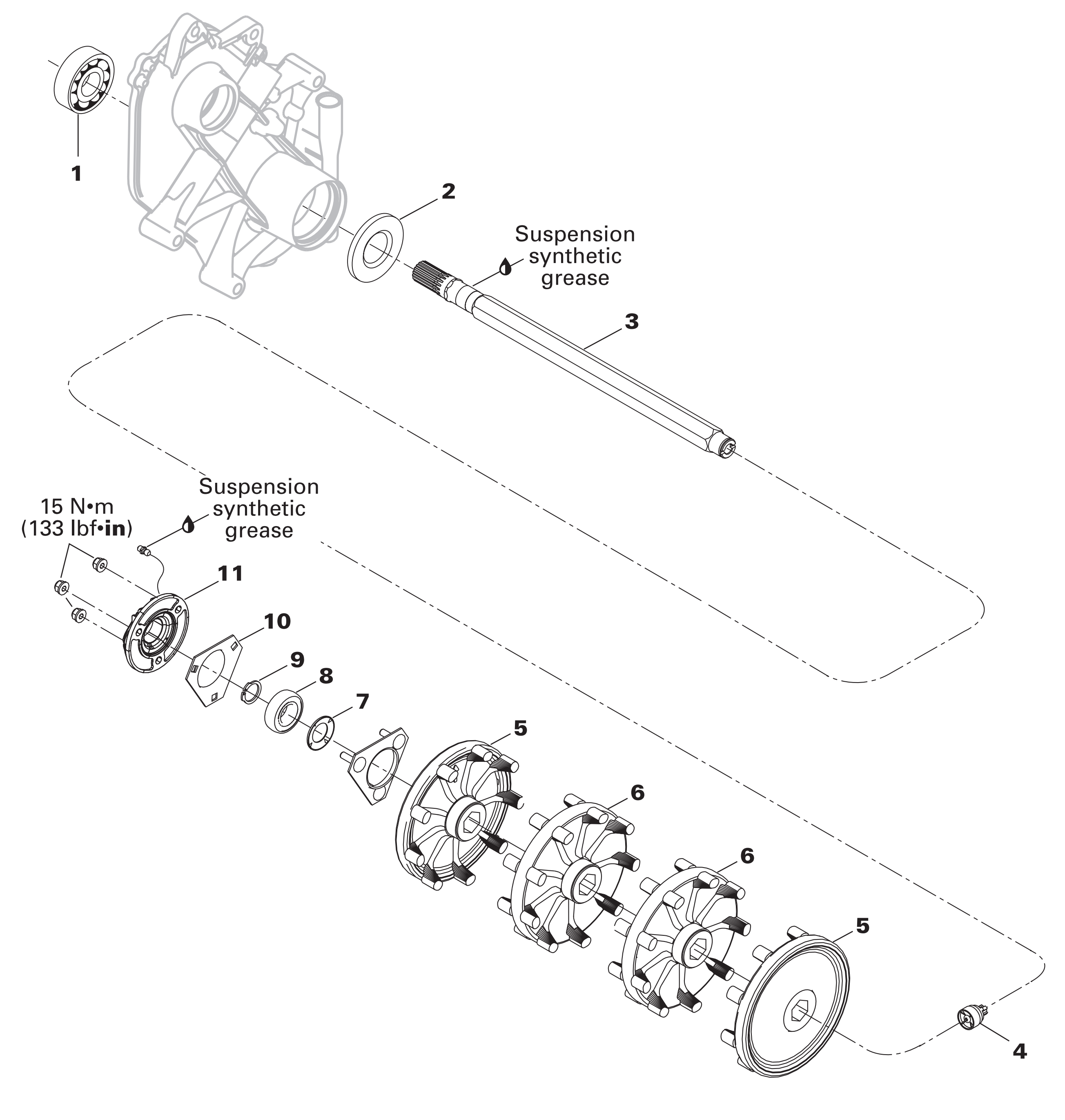
Lubricate front and rear arms at grease fittings using suspension synthetic grease (P/N 293 550 033).



SC-10 III: 5 GREASE FITTINGS

DRIVE AXLE

All Models



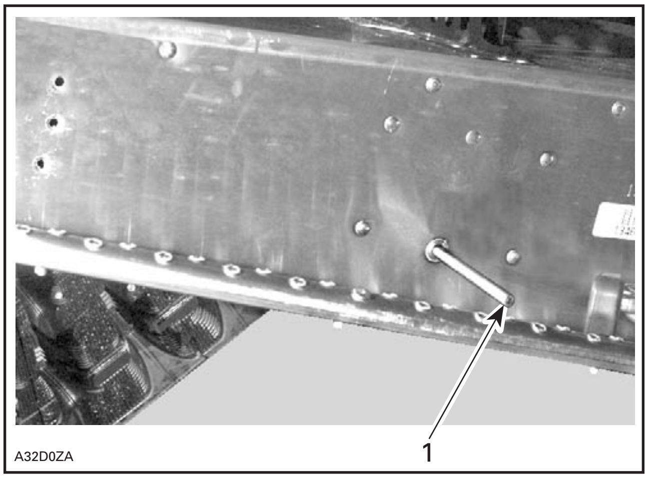
REMOVAL

According to model, drain oil from chaincase or gearbox. Remove chaincase or gearbox cover. Release drive chain tension.

Raise and block rear of vehicle off the ground.

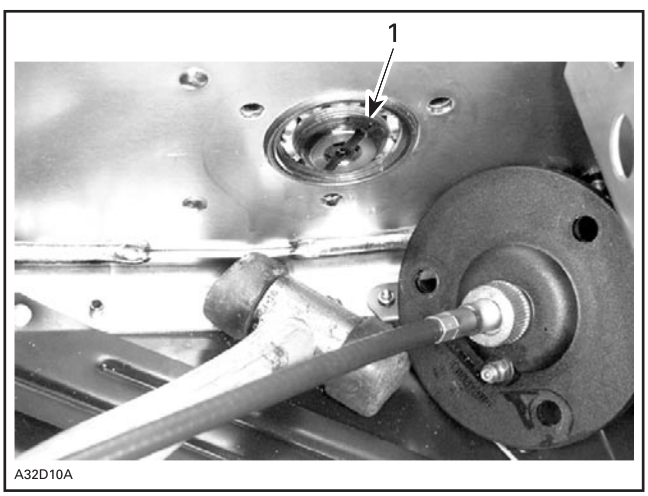
Remove suspension. Refer to proper subsection.

Track can be held in tunnel using a rod in place of center idler wheel axle.



1. Rod

Remove speedometer sensor **no. 11**, outer flange **no. 10** and circlip **no. 9** from left side.



TYPICAL
1. Circlip

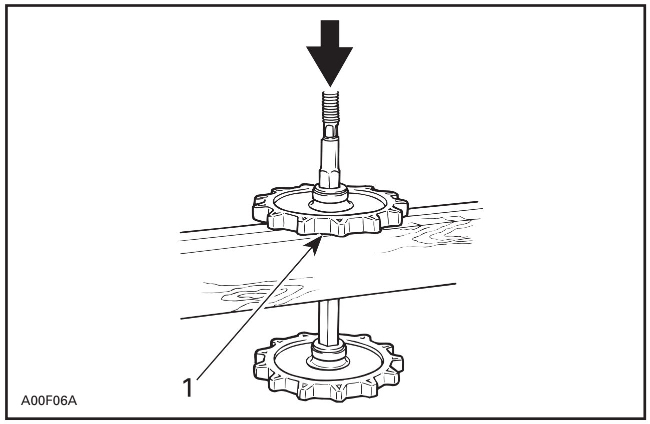
Apply parking brake.

Remove chain and sprockets then circlip from right side.

Release drive axle sprocket from track and at the same time, push the drive axle **no. 3** toward the right side. Drive axle bearing **no. 1** in chaincase or gearbox will fall off.

Sprocket and Half-Sprocket

To remove press fit sprockets **no. 5, 6**, use a press and a suitable support as illustrated.

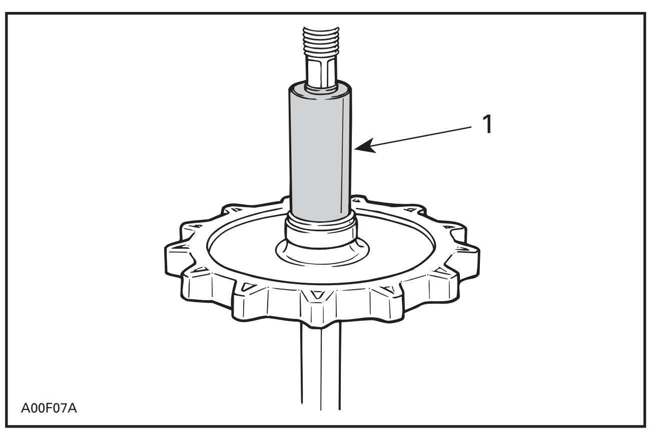


TYPICAL
1. Support sprocket near hub

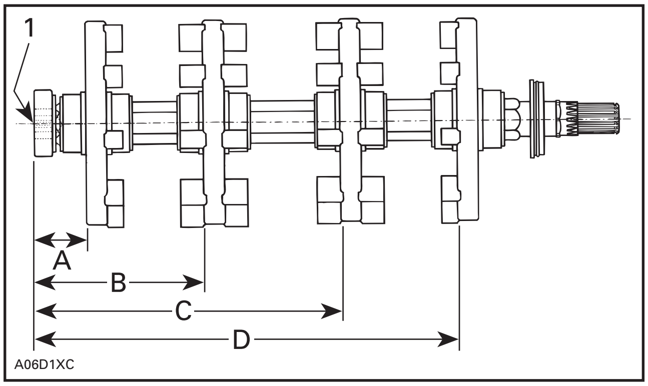
ASSEMBLY

Drive Axle and Sprocket

To assemble press fit sprockets **no. 5, 6**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.

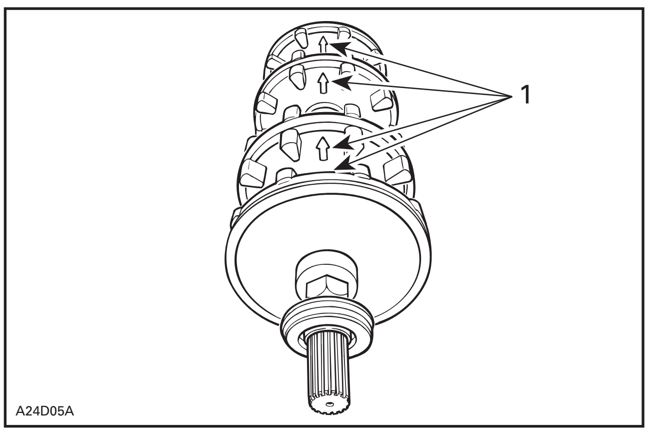


TYPICAL
1. Pipe



1. Measure from end of drive axle
A. 47.3 mm (1.862 in)
B. 149.8 mm (5.898 in)
C. 272.8 mm (10.740 in)
D. 375.3 mm (14.776 in)

Ensure to align indexing marks of each sprocket when assembling.



TYPICAL
1. Indexing marks aligned

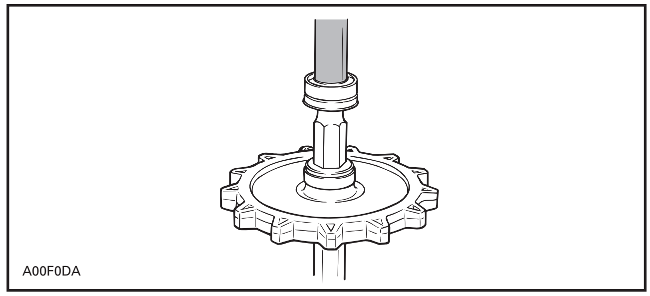
CAUTION: The same sprocket must not be pressed twice on the axle. When sprocket has been removed from drive axle, use a new sprocket at the installation.

Bearing Protector

At assembly, flat side of bearing protector **no. 7** must be against bearing.

Bearing

Always push bearing **no. 8** by inner race.



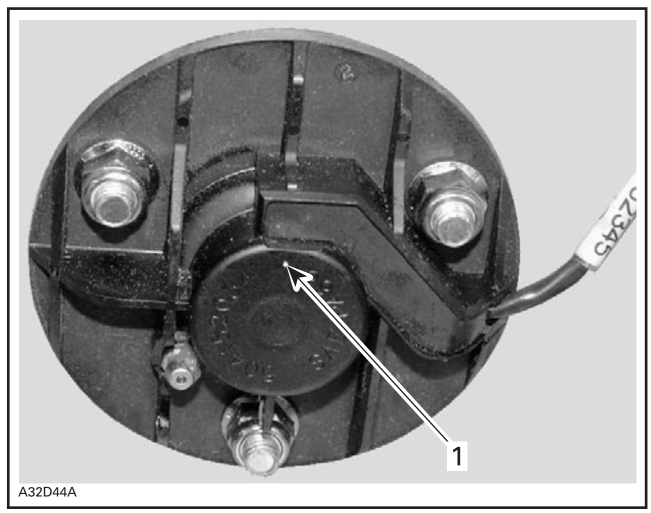
TYPICAL

The bearing **no. 8** must have its shield facing the sprocket.

The bearing **no. 1** must have its shield facing right side (cover).

LUBRICATION

Lubricate end housing bearing with suspension synthetic grease (P/N 293 550 033). Continue lubricating until grease flows out of the pilot hole on speedometer sensor.



1. Lubricate until grease flows out here

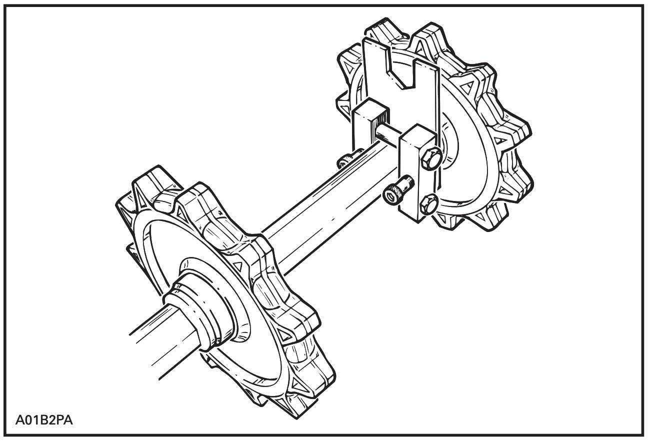
ADJUSTMENT

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).



TYPICAL

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 529 008 800).

⚠ **WARNING**

Do not operate a snowmobile with a cut, torn or damaged track.

REMOVAL

Remove the following parts:

– speedometer cable
– driven pulley
– end bearing housing
– muffler
– chaincase or gearbox cover
– sprockets and chain
– rear suspension
– drive axle seal
– 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

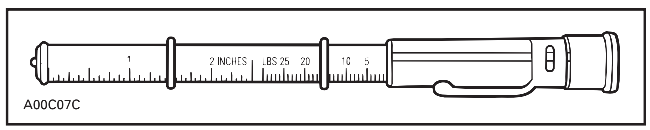
Track tension and alignment are inter-related. Do not adjust one without checking the other. Track tension procedure must be carried out prior to track alignment.

Tension

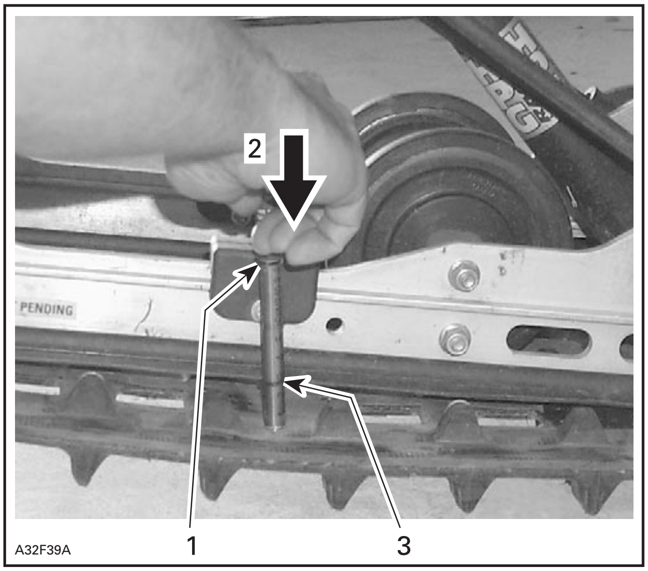
Lift rear of snowmobile and support it with a wide-base snowmobile mechanical stand (P/N 529 020 000).

Allow the rear suspension 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

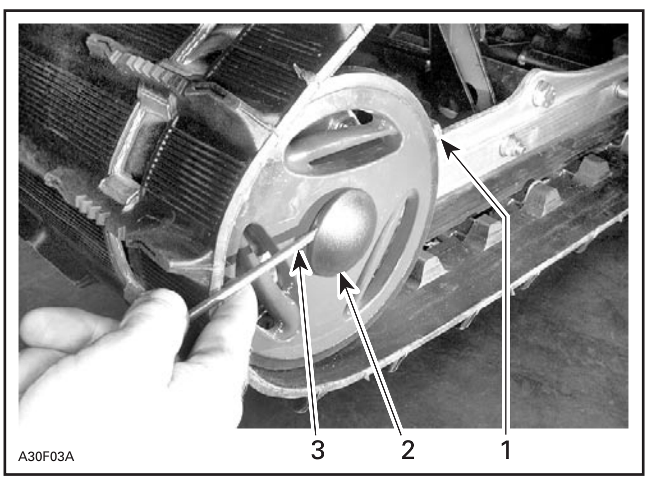


1. Top tool O-ring positioned at 7.3 kg (16 lb)
2. Push on top portion of tool until it contacts the top O-ring
3. Measured track deflection

CAUTION: Too much tension will result in power loss and excessive stresses on suspension components.

To adjust tension:

– Remove wheel caps.
– Loosen the rear idler wheel retaining screws.
– Turn adjustment screws to adjust.



TYPICAL
1. Adjustment screw
2. Retaining screw
3. Wheel cap removal

Alignment

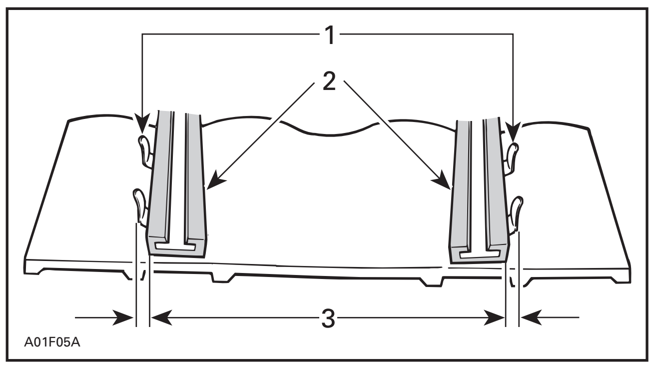
⚠ WARNING

Before checking track alignment, ensure that the track is free of all particles which could be thrown out while track is rotating. Keep hands, tools, feet and clothing clear of track. Ensure no one is standing in close proximity to the vehicle. Never rotate at high speed.

All Models

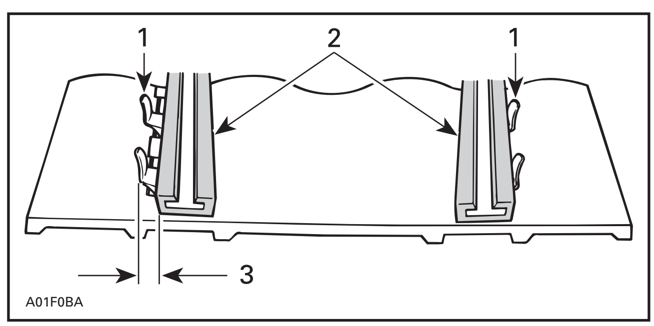
Start the engine and accelerate slightly so that track barely turns. This must be done in a short period of time (1 to 2 minutes)

Check that the track is well centered; equal distance on both sides between edges of track guides and slider shoes.



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 track slowly and recheck alignment. If the satisfactory alignment is achieved, then tighten the idler wheel retaining screws to 48 N•m (35 lbf•ft). Reinstall the wheel caps.

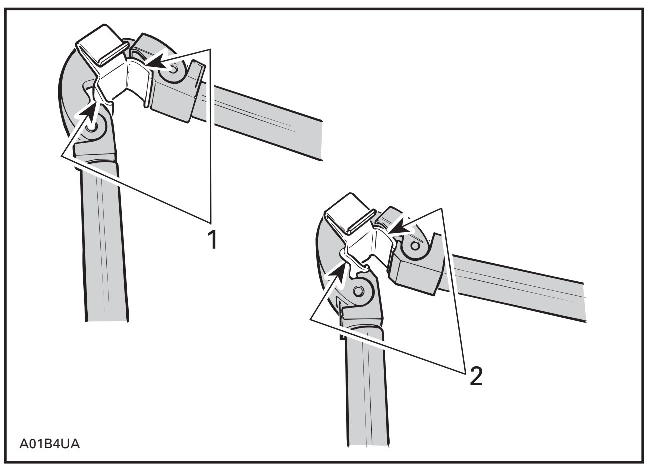
Track Cleat

Removal

– Raise rear of vehicle off the ground and lift snow guard then hand rotate track to expose a cleat to be replaced.
– Using track cleat remover (P/N 529 028 700) for all models.

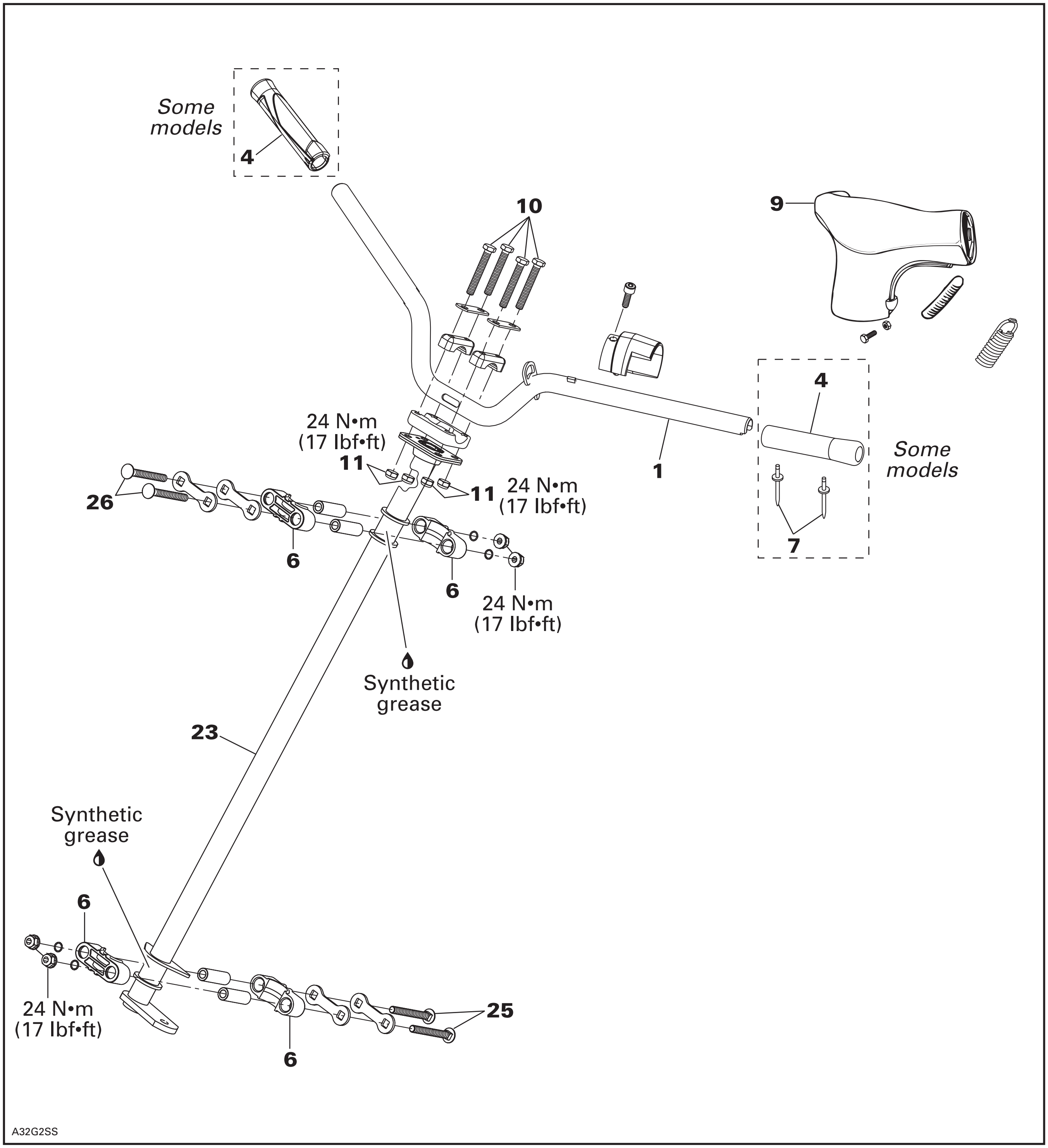
Installation

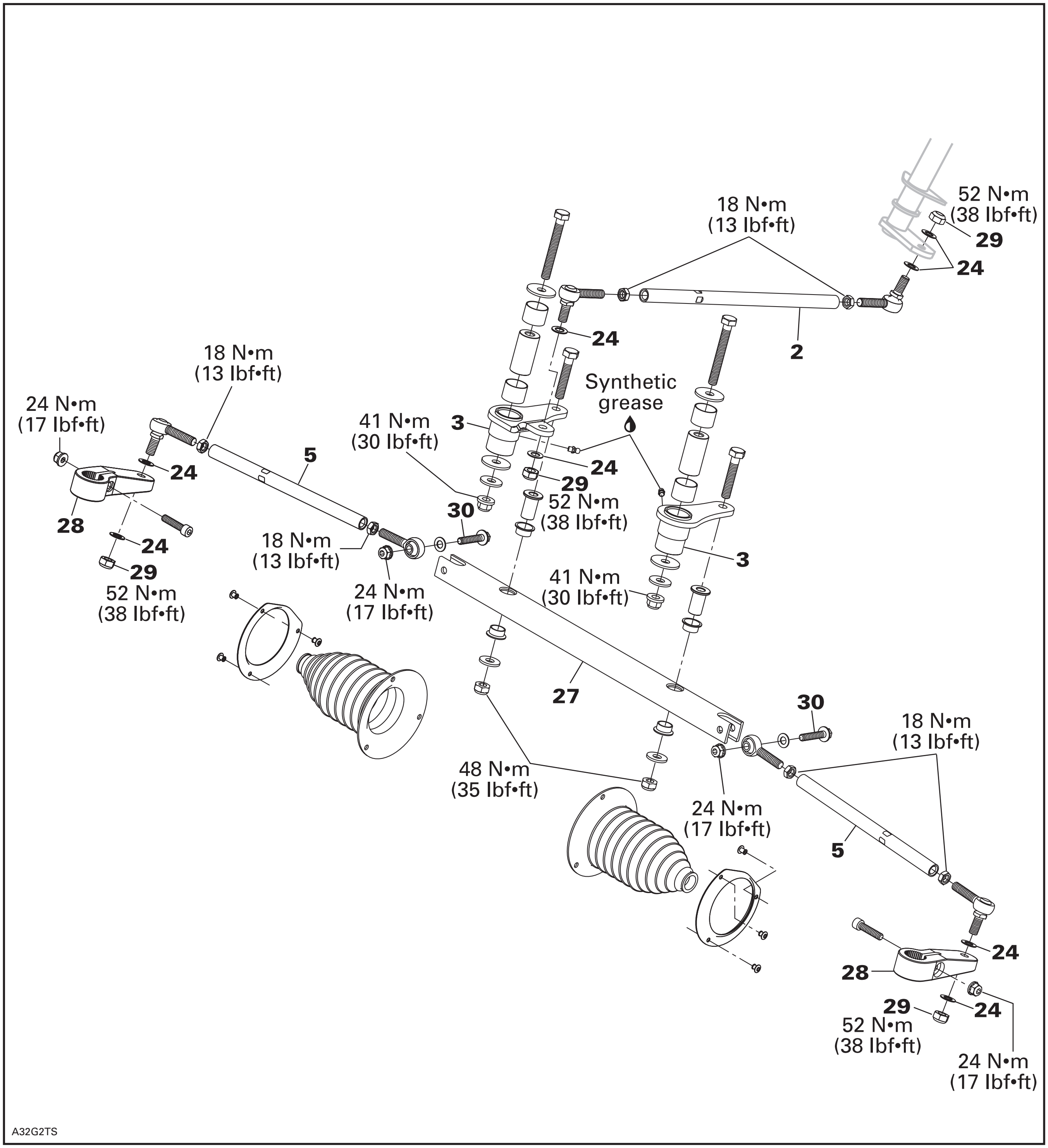
– Place new cleat in position on the track and using narrow track cleat installer (P/N 529 008 500) bend cleat then push tabs into rubber.
– Re-open installer, then position cleat tabs on open end of tool and squeeze tabs until they are indented in rubber.



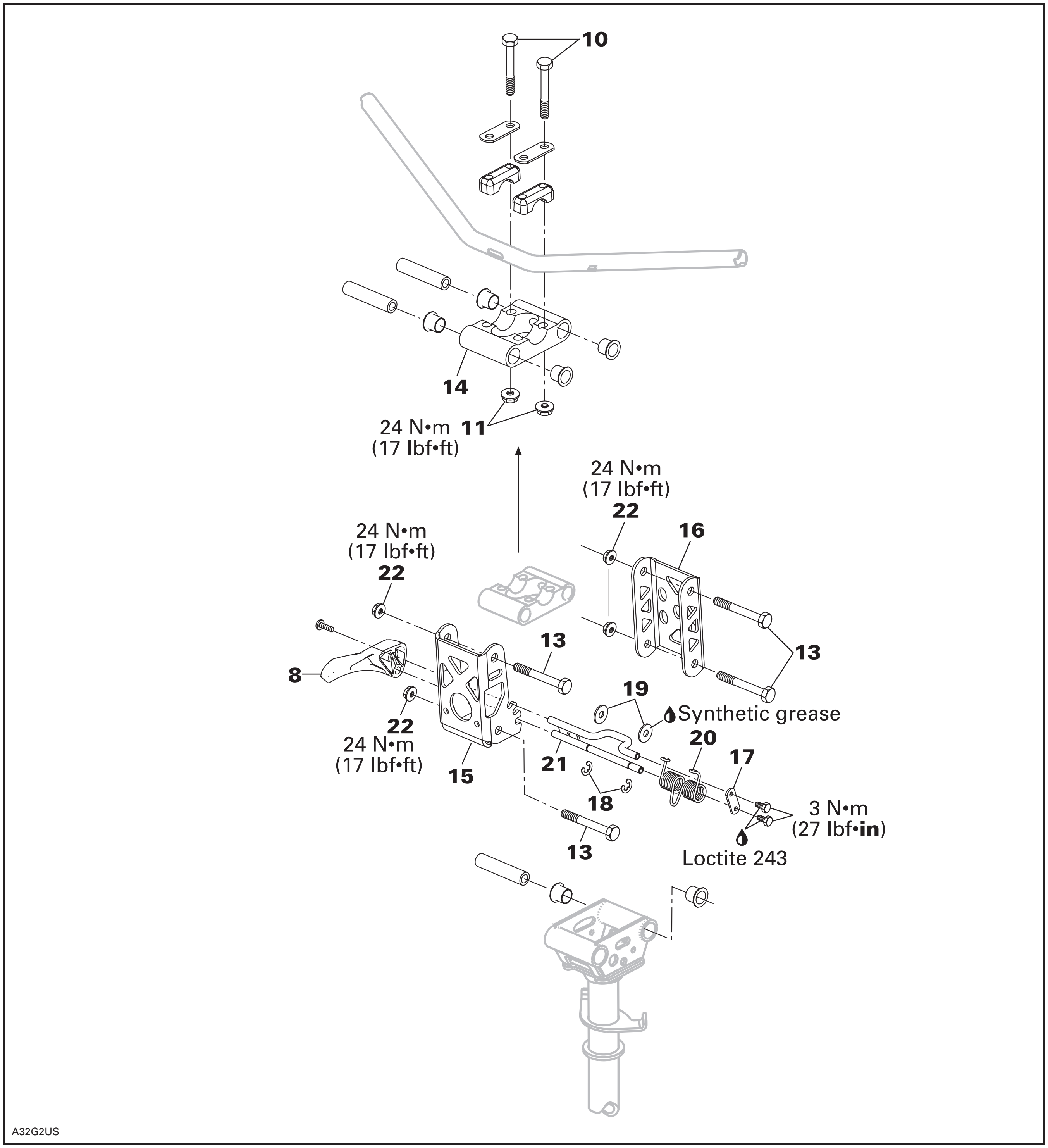
TYPICAL
1. First step
2. Second step (to push tabs into rubber)

STEERING SYSTEM




18 N•m
(13 lbf•ft)
52 N•m
(38 lbf•ft)
29
24
24
2
18 N•m
(13 lbf•ft)
24 N•m
(17 lbf•ft)
Synthetic
grease
41 N•m
(30 lbf•ft)
3
5
24
24
29
28
30
52 N•m
(38 lbf•ft)
24
18 N•m
(13 lbf•ft)
3
29
52 N•m
(38 lbf•ft)
24 N•m
(17 lbf•ft)
41 N•m
(30 lbf•ft)
27
30
18 N•m
(13 lbf•ft)
48 N•m
(35 lbf•ft)
24 N•m
(17 lbf•ft)
5
24
28
29
24
52 N•m
(38 lbf•ft)
24 N•m
(17 lbf•ft)
A32G2TS

Tilt Handlebar Mechanism



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.

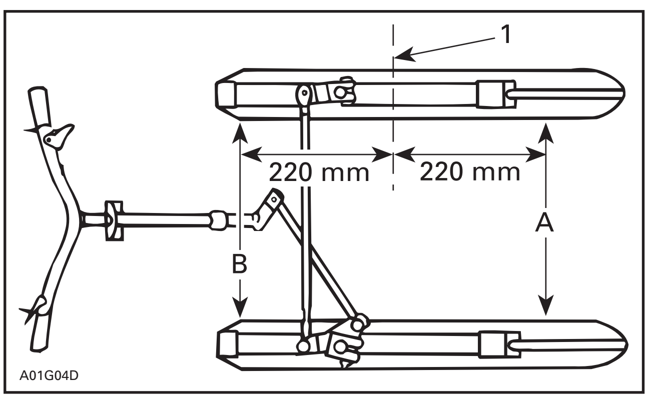
> ⚠ **WARNING**
>
> **Torque wrench tightening specifications must strictly be adhered to.**
> **Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, etc.) must be installed or replaced with new ones where specified. If the efficiency of a locking device is impaired, it must 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 all **ZX series models**, 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.

Adjustments

Adjustments should be performed following this sequence:

– pivot arm centering
– camber angle
– ski alignment.

QUICK CHECK

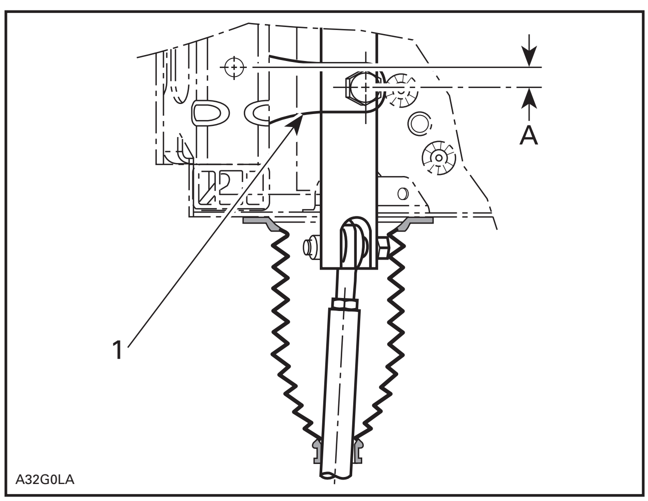
Position handlebar **no. 1** in a straight ahead position as explained below.

Verify pivot arm centering as explained below. If it is within 9 - 13 mm (23/64 - 33/64 in), proceed directly with camber adjustment. Otherwise, proceed with handlebar adjustment in PIVOT ARM CENTERING, then perform CAMBER ADJUSTMENT to then finally perform SKI ALIGNMENT.

PIVOT ARM CENTERING

> ⚠ **WARNING**
>
> **Do not attempt to adjust straight ahead ski position by turning the ball joint on tie rod.**

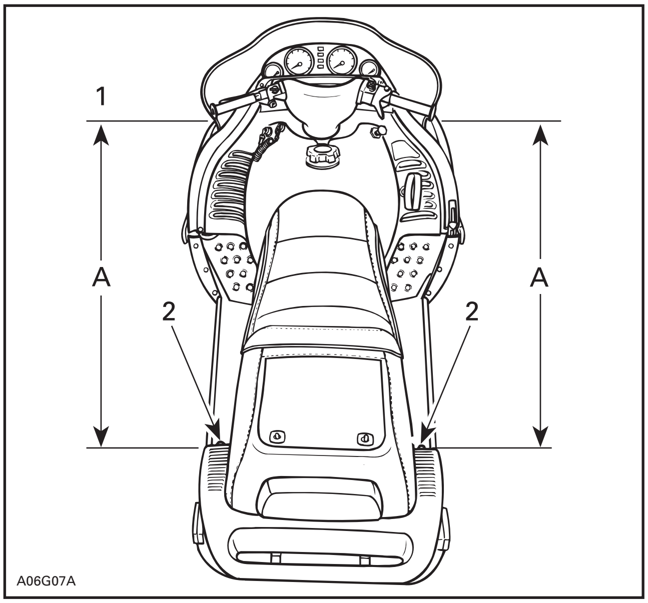
Turn handlebar until bolt center of left side swivel arm **no. 3** is 11 mm (27/64 in) from chassis hole center.



1. Left side swivel arm
A. 11 mm (.27/64 in)

Check that handlebar is horizontal by measuring from the extremities of the grips **no. 4** to the rear-most edge of the tunnel, as shown.

NOTE: The reference point must be the same relative to each side.



TYPICAL
1. Equal distance «A» on each side
2. Same reference point

If it is NOT horizontal, remove engine (refer to ENGINE section) and adjust short tie rod **no. 2** as explained below. If it is horizontal and does not need adjustment, continue with camber adjustment.

Loosen the jam nuts on short tie rod **no. 2** (LH threads on steering column end) and turn tie rod accordingly. Retighten the jam nuts to 18 N•m (159 lbf•**in**).

⚠ WARNING

Never lengthen this tie rod so that the external unengaged threaded portion of ball joint exceeds 20 mm (25/32 in).

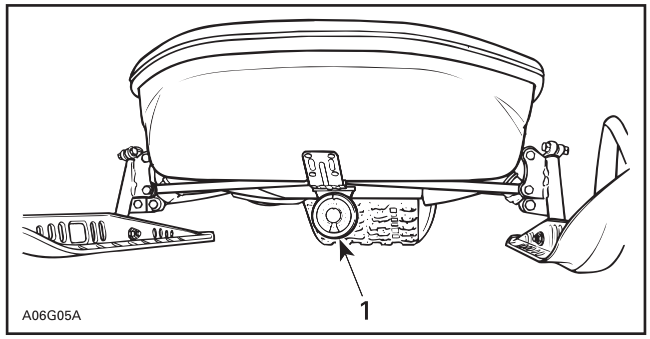
CAMBER ADJUSTMENT

The camber is not adjustable on the models described in this shop manual. 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.

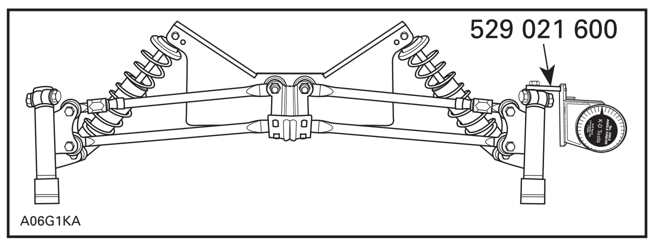
Vehicle skis must be off the ground.



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 ADJUSTMENT 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**.

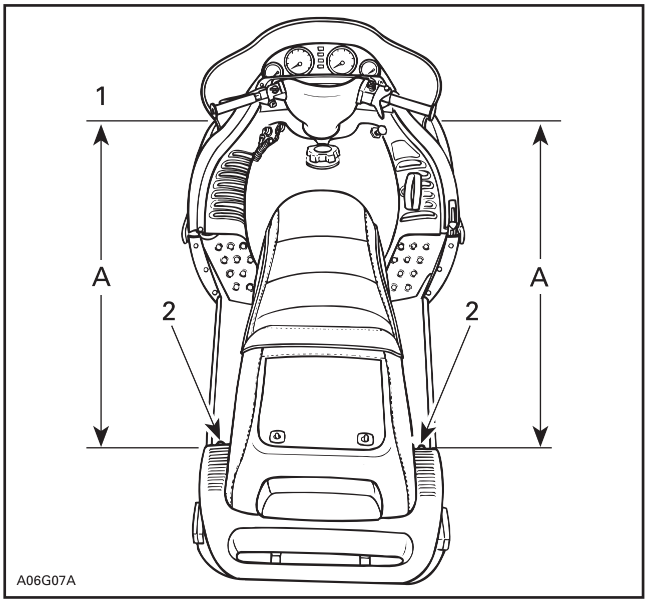
⚠ WARNING

Do not attempt to adjust skis in a straight ahead position by turning ball joint on tie rod.

Procedure:

Position handlebar **no. 1** so that it is horizontal by measuring from the extremities of the grips **no. 4** to the rear most edge of the tunnel, as shown.

NOTE: The reference point must be the same relative to each side.



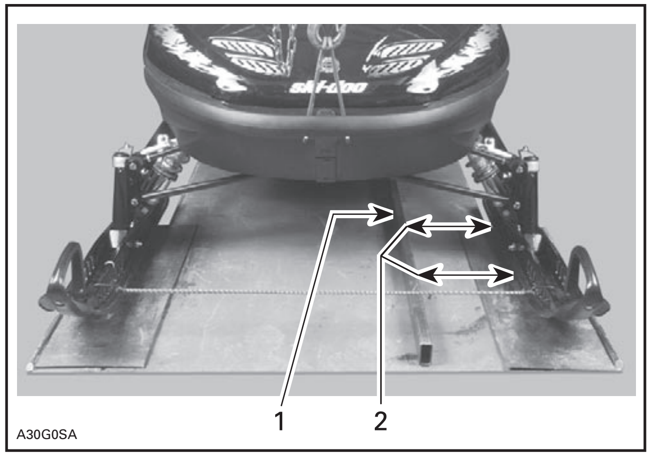
TYPICAL
1. Equal distance «A» on each side
2. Same reference point

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) - 0 mm (- 0 in)
Summit Fan	9.0 (11/32)
Legend Fan/Grand Touring Fan, Legend SE/Grand Touring SE, Legend Sport/Grand Touring Sport, MX Z Fan, Skandic Sport	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).

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
– upper arm ball joint on so equipped models.

Grease the following items with the synthetic grease (P/N 413 711 500).

– plastic U-clamps no. 6
– ski legs
– LH and RH swivel arms no. 3
– stabilizer blocks in swing arm.

GRIP

Inspection

To check the heating grip element, refer to TESTING PROCEDURE in ELECTRICAL SYSTEM section.

Removal

Fan Cooled Models

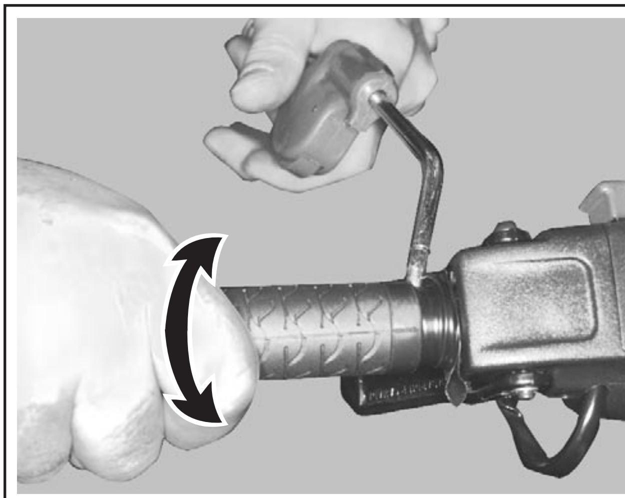
Grips no. 4 must be carefully removed to prevent damaging the heating elements.

Remove rivet no. 7.

Heat grip with a heat gun.

Apply tape to handlebar no. 1 near the grip to protect paint.

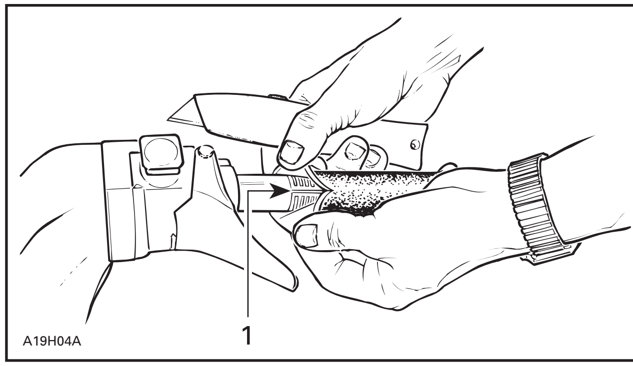
Inject compressed air into the handlebar and twist grip as pulling it out.



A30G0OA

The grips might be unremovable as explained above, in this case, carefully proceed as follows to prevent damaging the heating elements.

Locate the element wires inside the handlebar; look through end of grip. Start cutting the grip exactly opposite the element wires and immediately peel it open to locate the gap in the heating element, as shown.



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TYPICAL
1. Gap in the heating element opposite the wires

Continue cutting along the gap and remove the grip.

If required, slowly peel heating element from handlebar and remove it.

Liquid Cooled Models

NOTE: These models feature an integrated heating element in the plastic sleeve of the grip no. 4.

CAUTION: Removing grip from handlebar might damage the heating element. Do not remove needlessly.

NOTE: If heating grip does not work and needs to be replaced, the grip can be cut with a knife for removal.

Remove locking lever no. 8 of tilt handlebar mechanism (if so equipped).

Remove steering pad no. 9.

Cut locking tie and unplug heating grip connector.

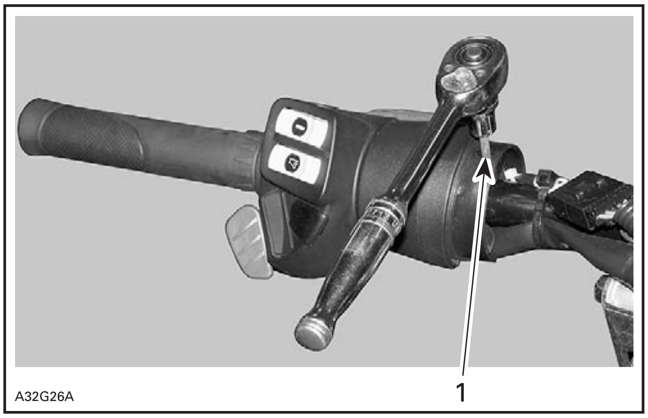
Using the multilock-terminal housing extraction tool AMP (P/N 755430-2), push the 3 wires out of the heating grip connector. Note the position of the wires for reinstallation.

Throttle Side:

Loosen set screw of throttle lever housing (underneath). Slide housing away of grip.

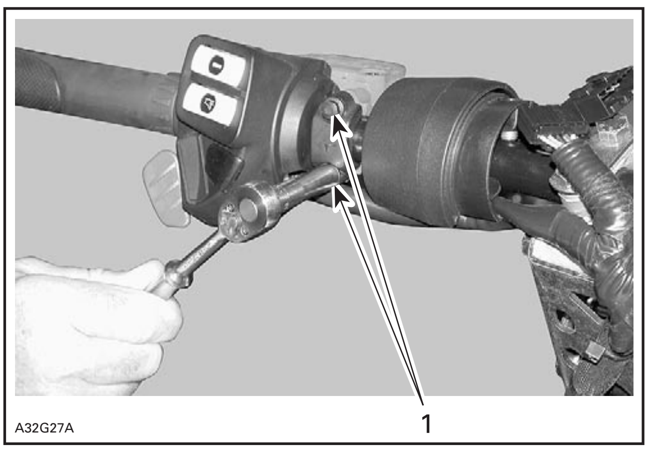
Brake Side:

Loosen set screw of electrical switch housing. Slide housing inward.



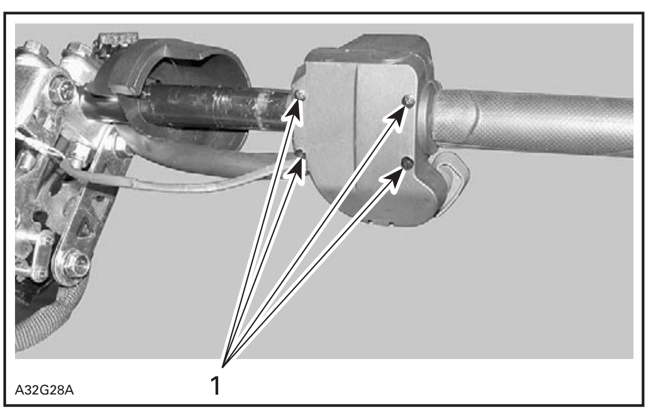
1. Set screw

Remove retaining screws of brake housing. Slide housing away of grip.



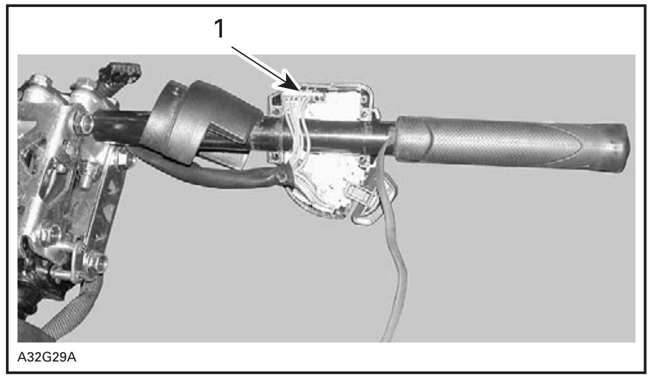
1. Retaining screws

Remove the 4 screws from the electrical control housing.



1. Screws

Disconnect the top connector (heating grip and dimmer switches) and move housing away to make room.



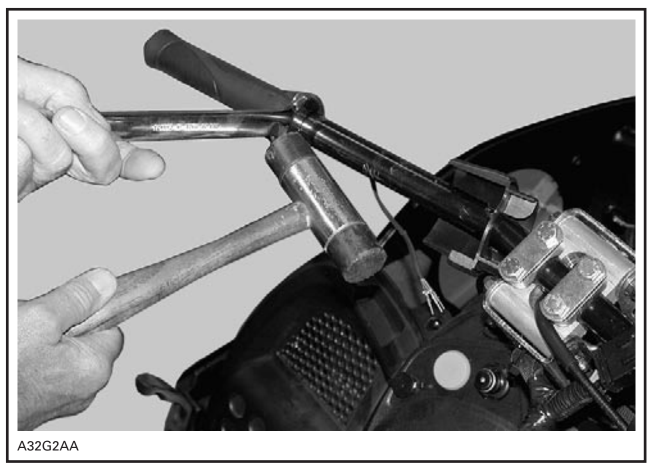
1. Unplug connector

Both Sides:

Insert the open side of a 23 mm (7/8 in) wrench against the inner end of grip.

CAUTION: Pay attention not to damage wires with the wrench.

Using a plastic hammer, tap on the side of the wrench end to make the grip sliding out.



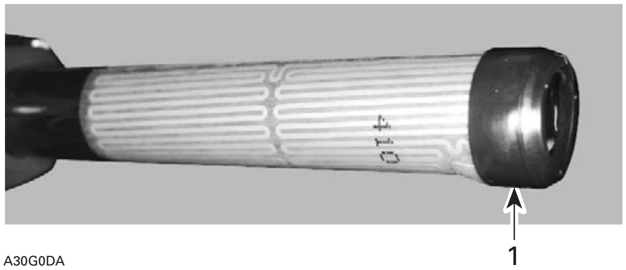
Installation

Installation is the opposite procedure of the removal but pay attention to the following details.

Fan Cooled Models

To install, stick the heating element to the handlebar making sure the wires do not interfere with operation of the accelerator or brake handle.

Prior to install grips, position heating element protector.



A30G0DA

1. Heating element protector

⚠ WARNING

Never use lubricants (e.g. oil, grease, soap etc.) to install the handlebar grip.

Heat the grip with a heater gun or a spot light to ease installation. Insert new grip with compressed air.

A30G0NA

TYPICAL

Locate former rivet holes in handlebar then, drill 4.8 mm (3/16 in) dia. hole through grip in this position. Install 2 rivets **no. 7** both sides of handle.

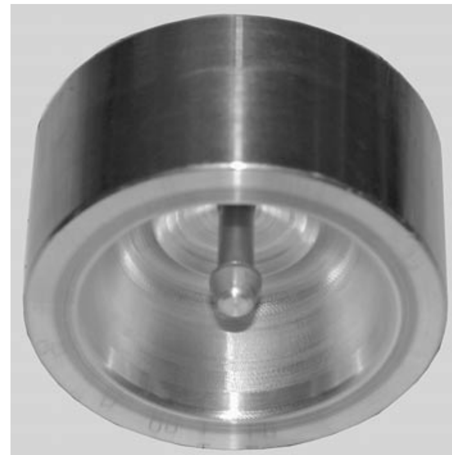
Liquid Cooled Models

Clean handlebar ends and inside of heating grip with isopropyl alcohol. Let dry before installation.

⚠ WARNING

Handlebar end and inside of heating grip must be clean and dry before installing heating grip to ensure proper adhesion.

Use the insertion tool (P/N 529 035 897) to properly install grip.



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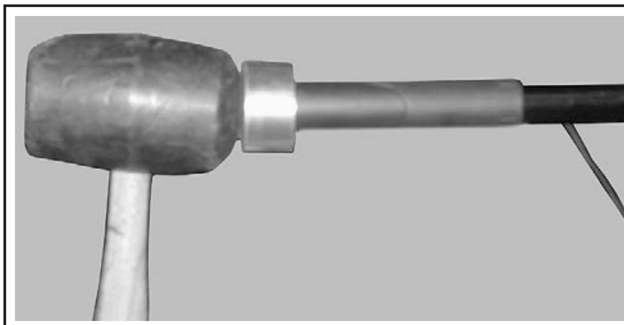
CAUTION: Installing grip without the special tool is likely to damage its heating element.

Position the insertion tool at the outside end of grip.

Using a plastic hammer, tap on tool to push grip on. Continue to tap until grip bottoms.



A32G2CA

Properly route wires then reposition and tighten throttle and brake housings.

Reinstall terminals and replug connectors. Test grips to ensure they heat properly.

HANDLEBAR

Inspection

Inspect the handlebar **no. 1** for damage, cracks or bending, replace if any problem is detected.

Removal

Remove the steering pad **no. 9**.

Remove master cylinder from handlebar and put it aside.

Unhook throttle cable from throttle lever.

Unplug all connector housing of handlebar switches.

Unscrew all 4 bolts **no. 10** securing handlebar .

Installation and Adjustment

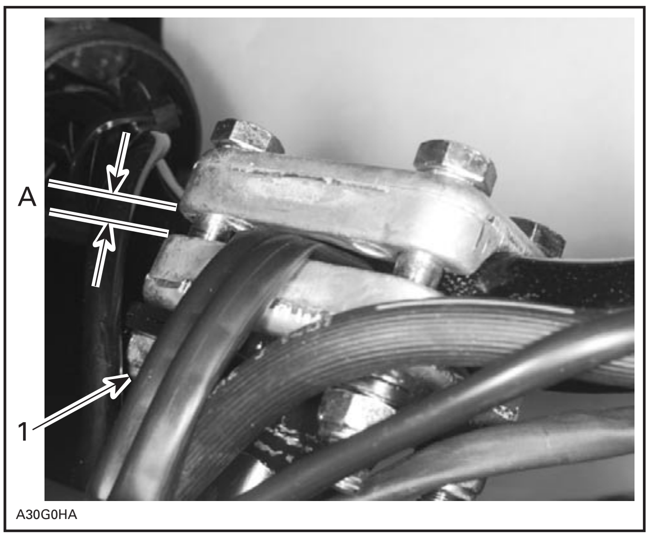
For the installation, reverse the removal procedure.

To adjust the handlebar, the 4 bolts **no. 10** must be loosed. Position the handlebar to the desired position then lock it in place by tightening the 4 nuts **no. 11**.

⚠ WARNING

Avoid contact between the brake handle and the windshield by NOT adjusting the handlebar too high.

CAUTION: Tighten the nuts or bolts equally in a criss-cross sequence and ensure there is an equal gap on each side of the clamps.



TYPICAL
1. Torque to 25 N•m (18 lbf•ft).
A. Equal gap all around

⚠ WARNING

Make sure that the steering pad and all controls are properly fixed to their normal location on the handlebar.

TILT HANDLEBAR MECHANISM (IF SO EQUIPPED)

Removal

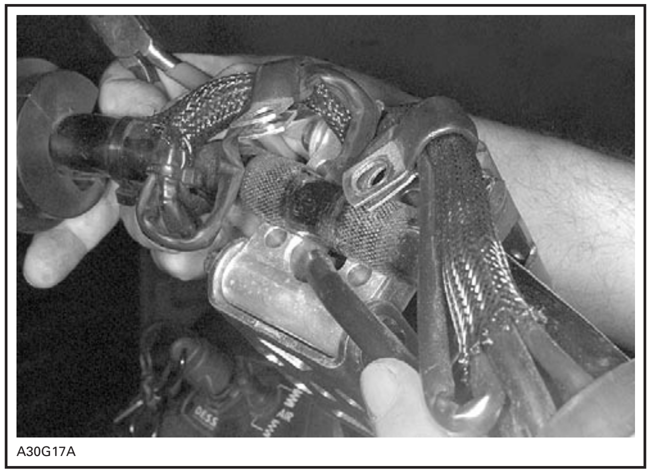
Move handlebar **no. 1** to its higher position.

Remove Allen screw retaining locking lever **no. 8**. Pull out locking lever.

Remove steering pad. Unhook throttle cable from throttle lever.

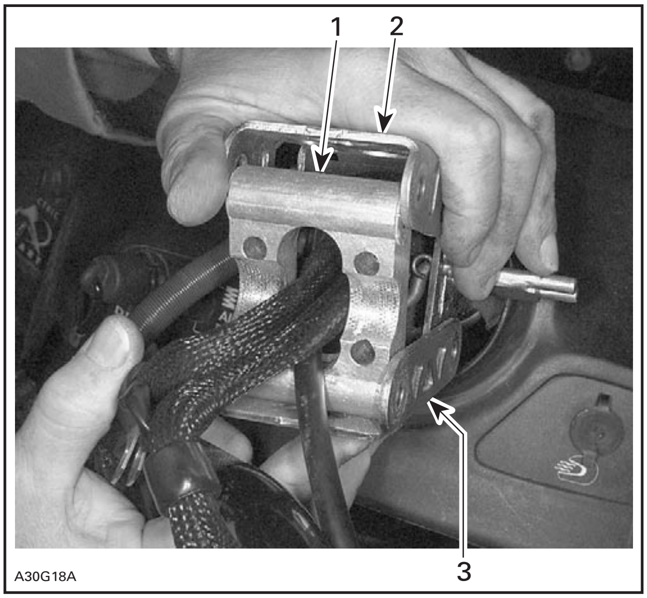
Unscrew all 4 bolts **no. 10** securing handlebar.

NOTE: Do not unbolt master cylinder needlessly. Move handlebar apart, keeping master cylinder reservoir in upward position.



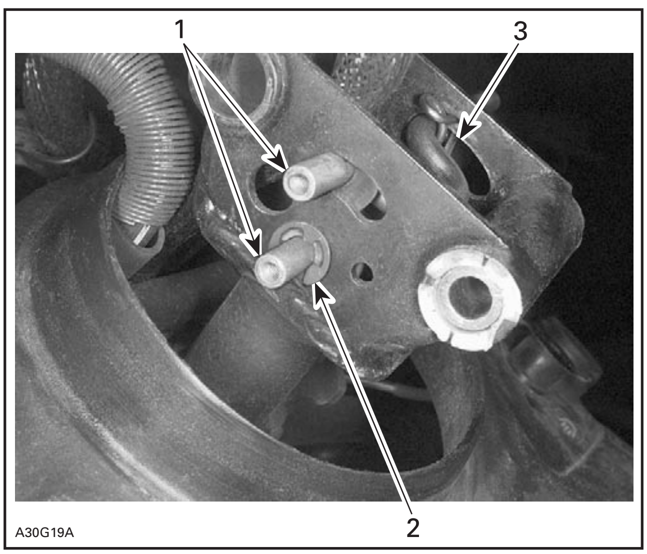
HANDLEBAR READY TO BE MOVED

Unbolt 4 bolts **no. 13** retaining clamp **no. 14**, front **no. 15** and rear **no. 16** arms.



1. Clamp
2. Front arm
3. Rear arm

Remove plate **no. 17**, circlip **no. 18** on left side then, plastic washer **no. 19** on right side.

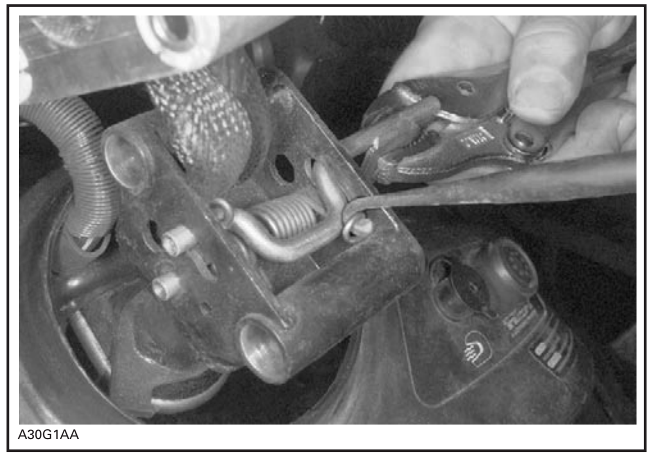


1. Plate removed
2. Circlip to be removed
3. Plastic washer on right side

Using a hook, pull spring **no. 20** right side end to allow removing welded lock **no. 21**.

⚠ WARNING

Spring will be ejected upon welded lock removal.

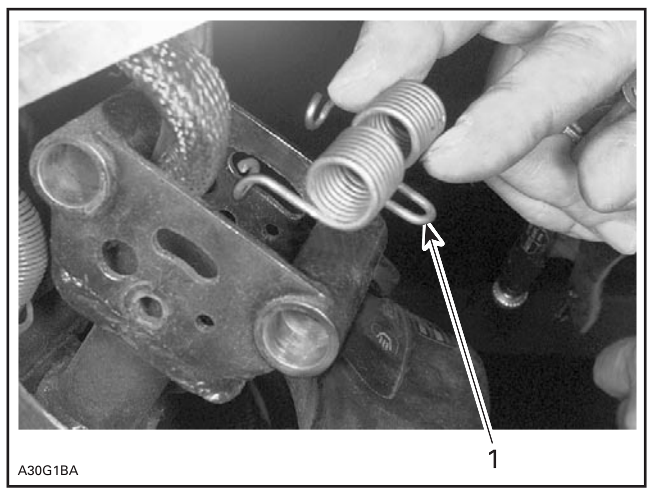


WELDED LOCK REMOVAL

Installation

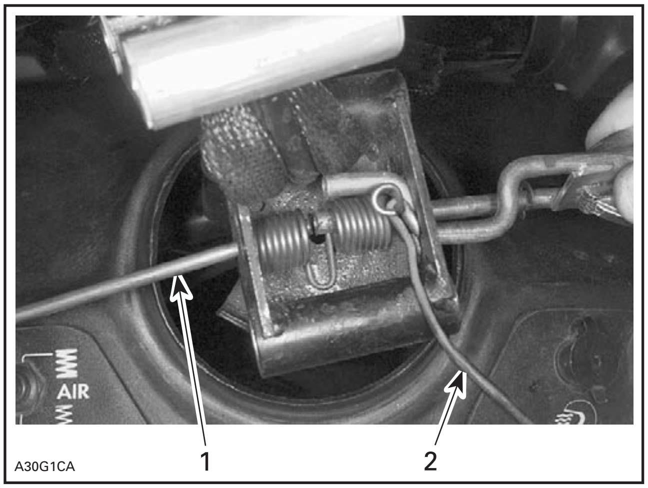
To reassemble tilt handlebar mechanism, reverse disassembly procedure. However, pay attention to the following:

Install spring **no. 20** with its locking tab facing bottom and rear.



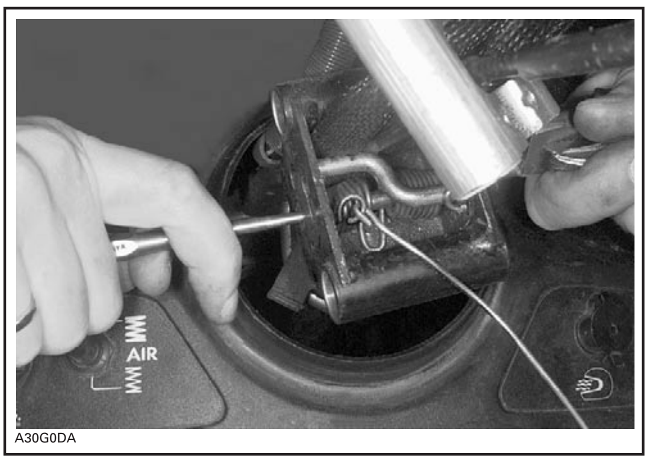
1. Spring locking tab

Hold left side portion of spring with a punch inserted in lower bracket. Pull right side spring end with a hook during welded lock insertion.

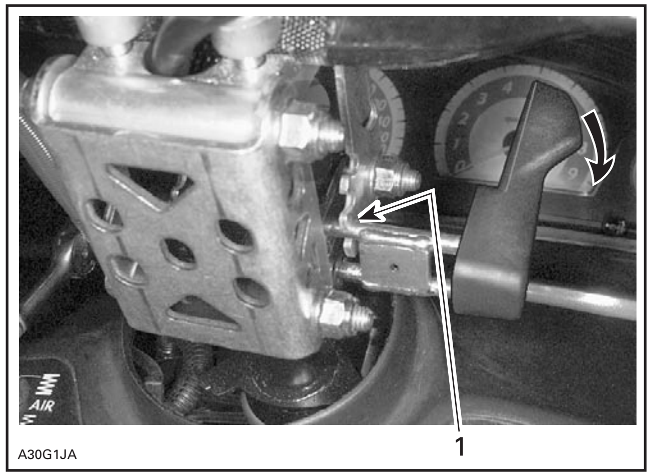


1. Punch
2. Hook to pull spring end

Proceed the same with left side spring end.

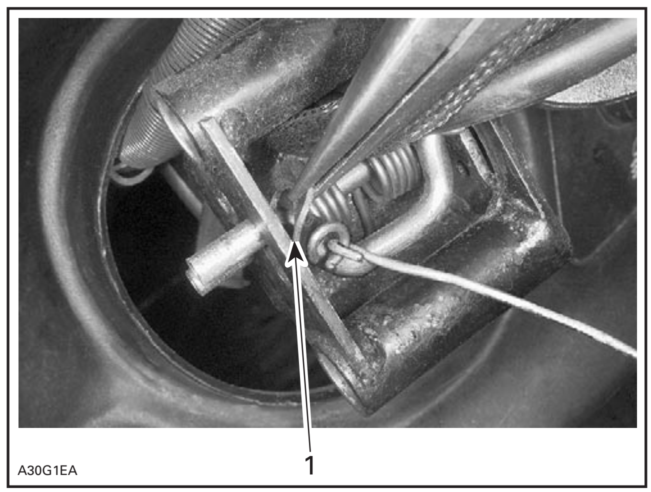


Temporary install locking lever. Push it forward in order to maintain locking rod fully engaged. Tighten screws retaining plate while keeping locking rod fully engaged.

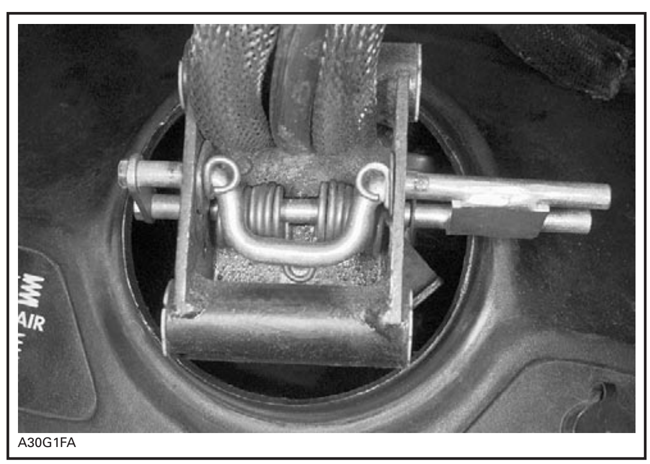


1. Locking rod fully engaged

Install a new plastic washer on each end of spring.



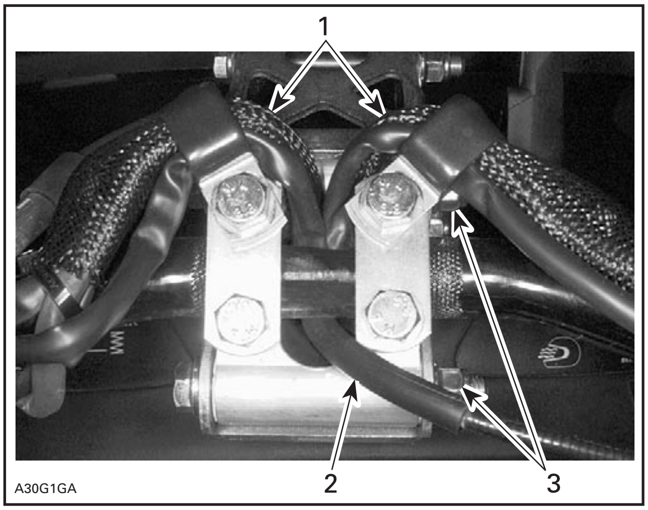
1. Plastic washers



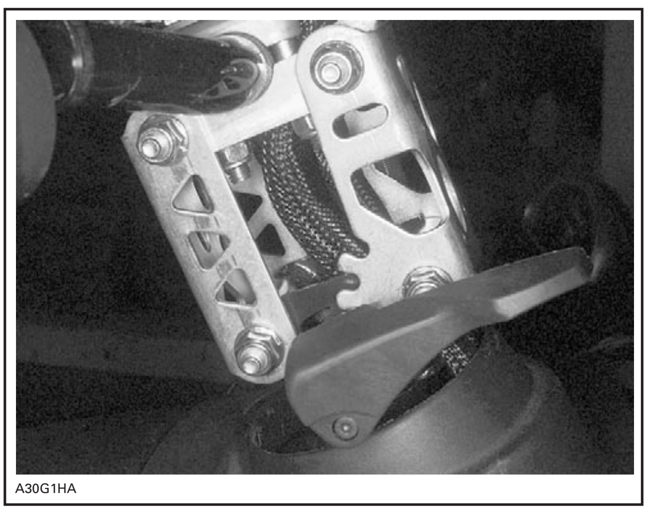
WELDED LOCK INSTALLED

Throttle cable must be under handlebar and wiring harnesses above.

All 4 nuts **no. 22** retaining front and rear arms must be on right side.



1. Wiring harnesses
2. Throttle cable
3. Nuts on right side



HANDLEBAR IN UPPER POSITION

HANDLEBAR IN LOWER POSITION

STEERING COLUMN

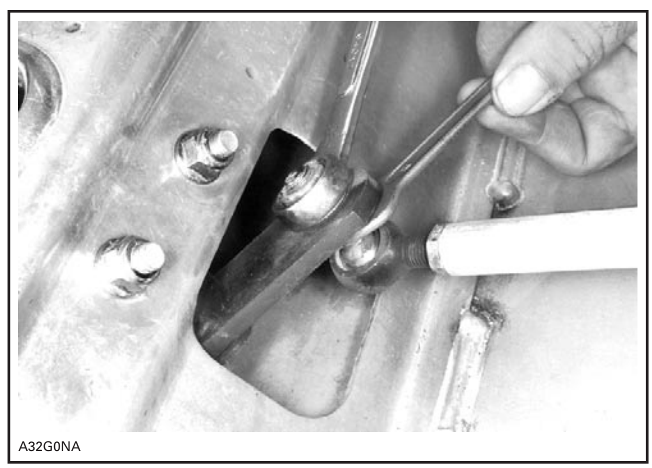
Removal

Remove:

– handlebar **no. 1**
– air intake silencer
– engine (refer to 2-STROKE ENGINE section).

Unbolt console.

Detach the short tie rod **no. 2** from the steering column **no. 23**. 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 steering support then, pull steering column from top.

Plastic U-clamps **no. 6** will come out along with steering column.

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. However, pay attention to the following detail.

Place the handlebar and skis straight before torquing the short tie-rod to the handlebar.

SHORT AND LONG TIE-RODS

NOTE: The short tie-rod **no. 2** links the swivel bar **no. 27** and the steering column **no. 23** while the long tie-rods **no. 5** are located between swivel bar **no. 27** and steering arm **no. 28**.

Removal

NOTE: The engine removal is necessary to remove the short tie-rod **no. 2**, refer to the appropriate section.

Remove the tie-rod end nut **no. 29** as well as the hardened washers **no. 24**.

NOTE: The tie-rod end on the swivel bar **no. 27** is retained by a screw **no. 30**. Remove it to separate the tie-rod end from swivel bar.

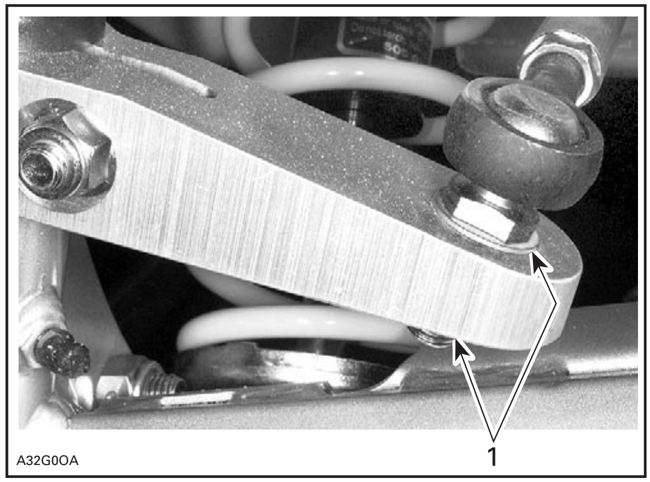
Inspection

Inspect tie-rod ends for wear and looseness, if excessive, replace them.

Installation

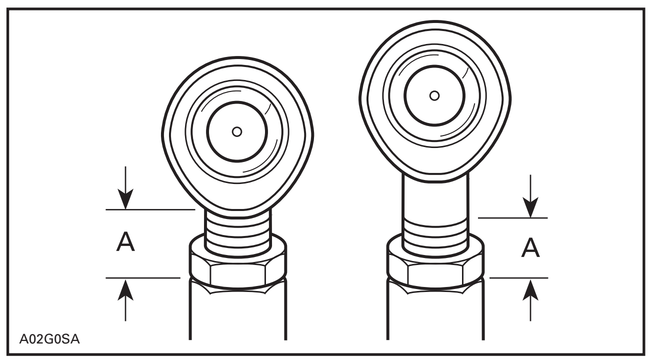
The installation is the reverse of removal procedure. However, pay attention to the following details.

All tie-rod end using a nut, need a hardened washer **no. 24** on each side of the part where the tie-rod is installed.



TYPICAL
1. Hardened washers

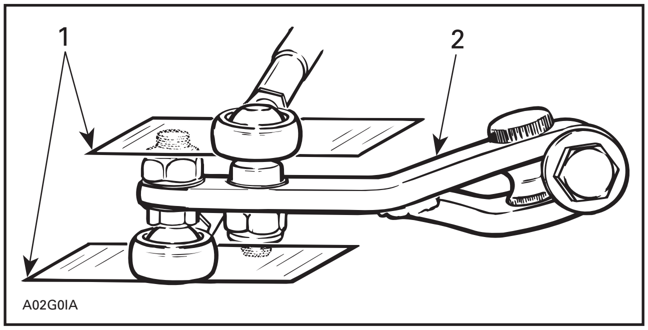
The maximum external threaded length not engaged in the tie rod must not exceed 20 mm (25/32 in).



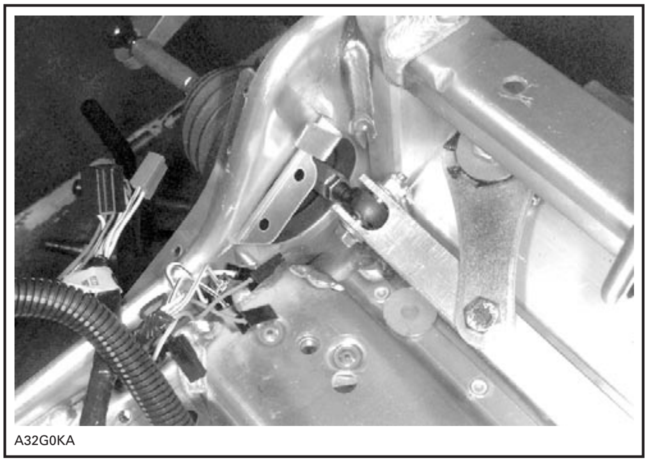
TYPICAL
A. Maximum: 20 mm (25/32 in)

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



TIE ROD BALL JOINT PARALLEL TO SWIVEL BAR BEFORE TIGHTENING

⚠ WARNING

The cut off section of the ball joint must run parallel with the swivel bar no. 9. 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).

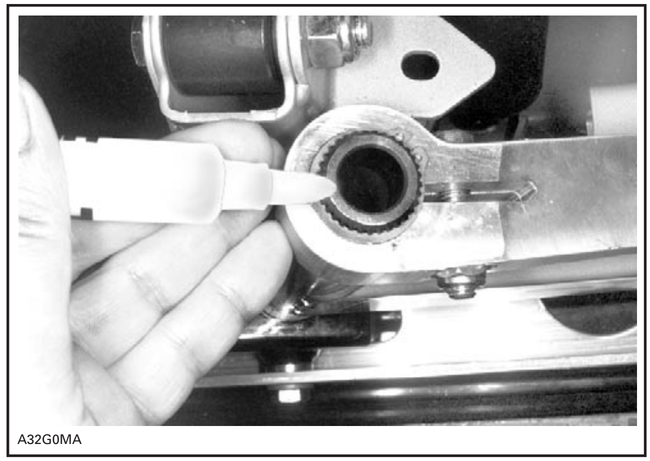
STEERING ARM

Removal

Unscrew the long tie rod end **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 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.

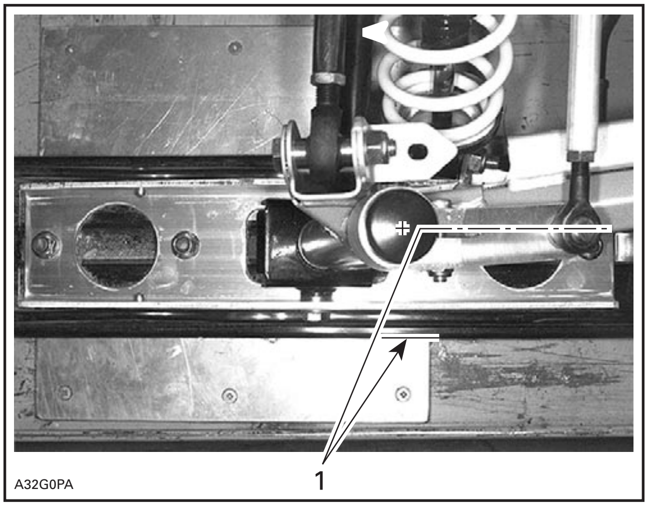
Check the general condition of the steering system components for wear. Replace if necessary.

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.

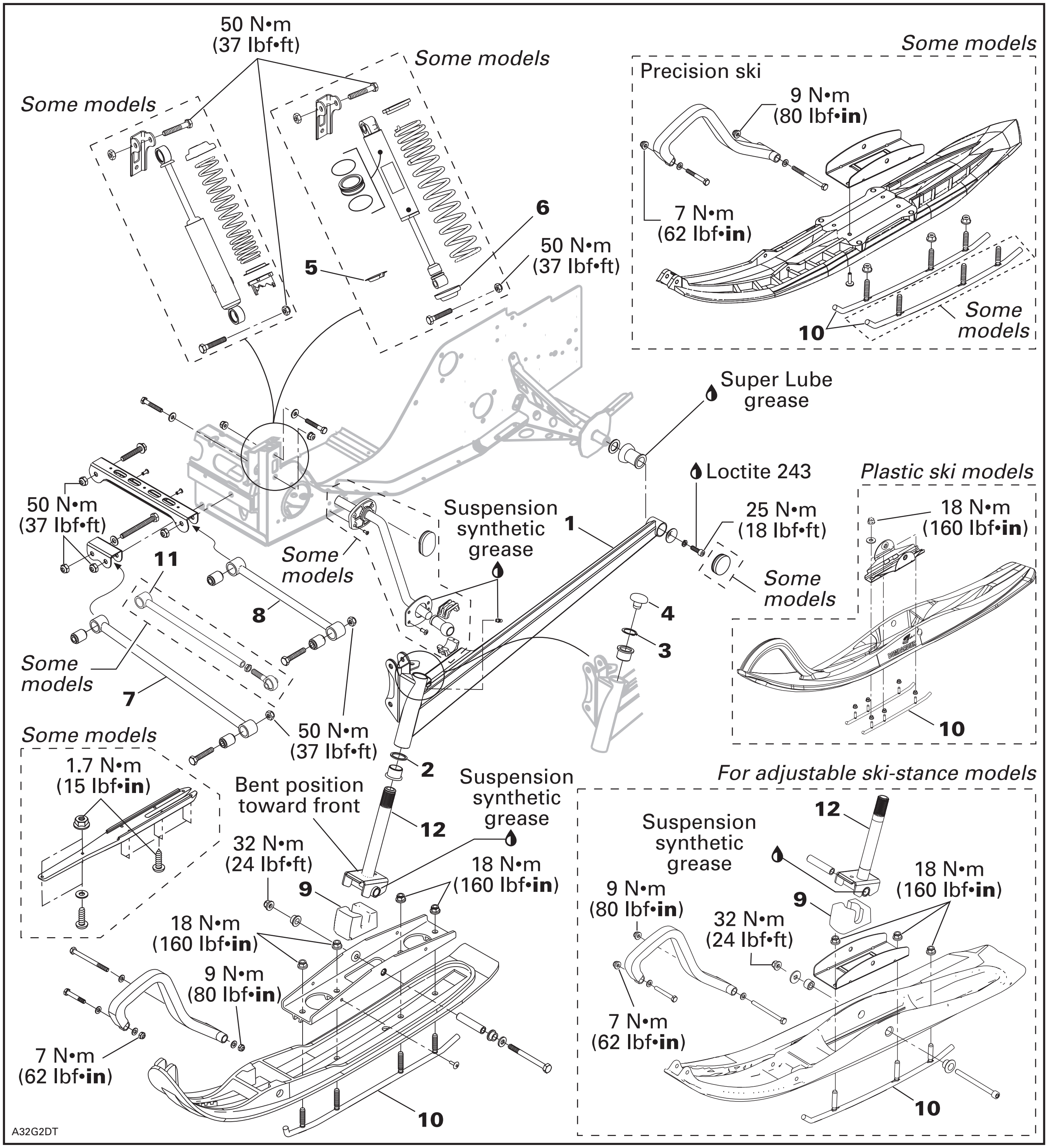


TYPICAL
1. Parallel

Tighten the steering arm pinch bolt and nut to the torque specified in the exploded view.

SUSPENSION AND SKI SYSTEM

ZX Series



DISASSEMBLY

Shock

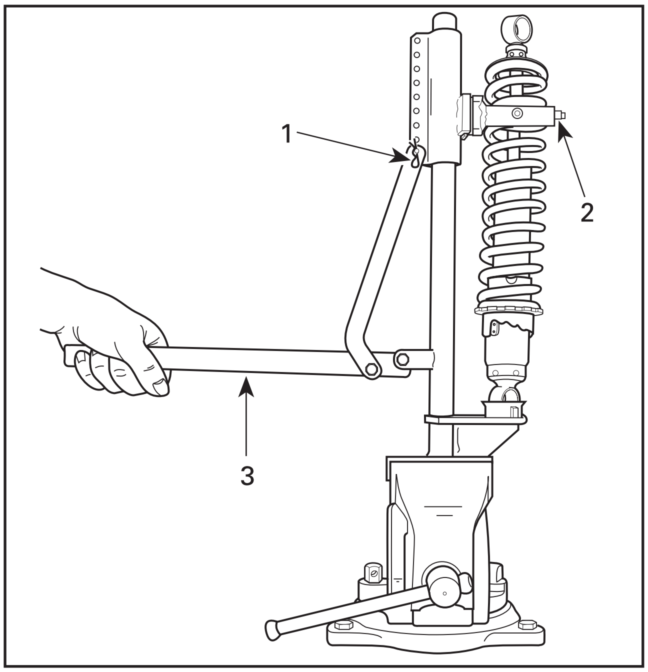
Lift front of vehicle and support it off the ground.

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.

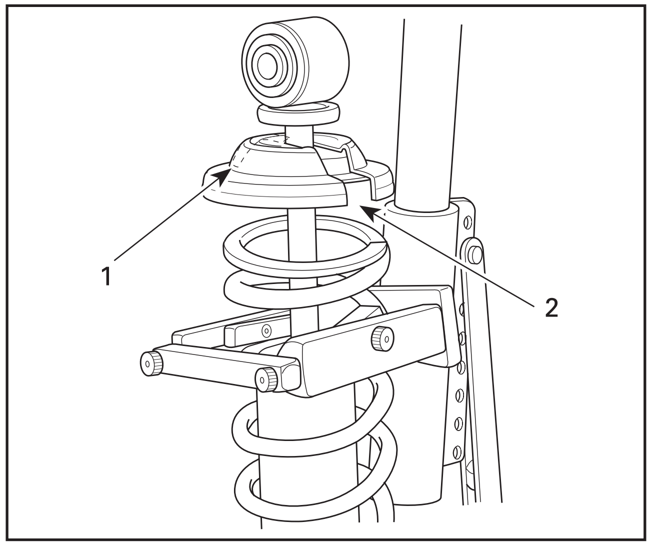
Close and lock the bar. Adjust the handle at horizontal position by changing the position of the clevis pin.



1. Clevis pin
2. Bar
3. Handle horizontal

Push down on the handle until it locks. Remove spring stopper then release handle.

At installation, cap opening **no. 6** must be 180° from spring stopper **no. 5** opening.

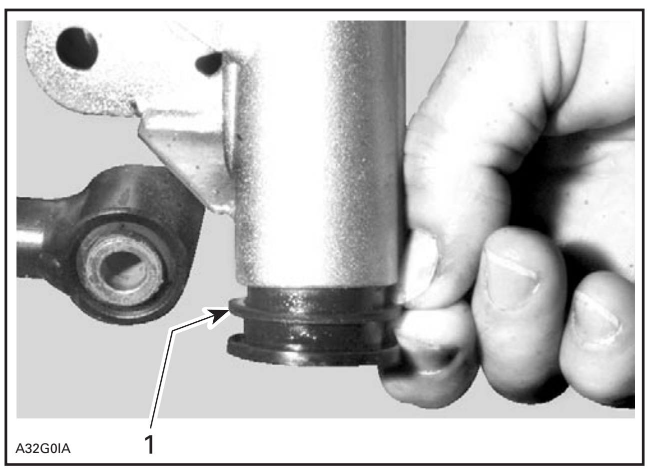


1. Cap opening
2. Spring stopper opening

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 **no. 1**. Ski leg may fall off from swing arm. 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 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** or lower arm **no. 7** and adjustable arm **no. 11** horizontally before tightening nuts. Apply the tightening torque to the screw head.

Adjustable Arm

Some Models Only

Refer to STEERING SYSTEM for proper camber adjustment on models using these arms.

All Models

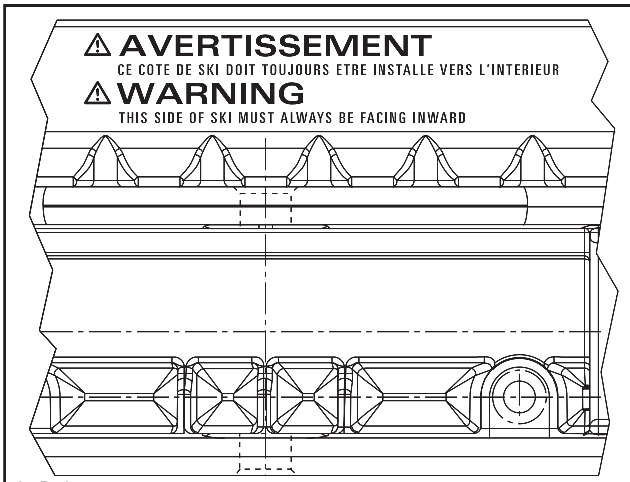
Proceed with ski alignment. Refer to STEERING SYSTEM.

Ski

Summit Models Only

⚠ WARNING

Make sure the raised side of ski is always facing inward.



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CONVERTIBLE SKI STANCE

Some Models Only

Convertible models are always fitted with offset ski legs. To change the ski stance from narrow to wide or vise versa follow the procedure as given below.

Remove the connecting bolt of ski and ski leg.

Remove the ski.

Disconnect the steering arm from ski leg.

Rotate ski leg to 180° to change from narrow to wide or wide to narrow.

Connect steering arm to the ski leg. Refer to STEERING SYSTEM for proper tightening torque.

Install ski. Refer to exploded view for proper tightening torque.

Repeat the same procedure on the opposite ski.

⚠ WARNING

Both ski legs should always be adjusted to narrow or wide position together.

Check ski alignment. Refer to STEERING SYSTEM.

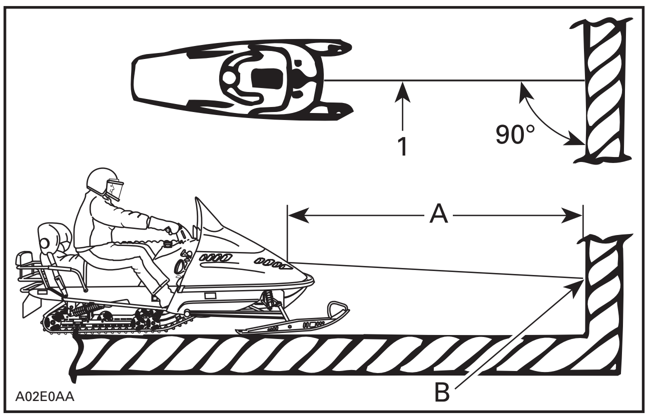
BODY

INSTALLATION AND ADJUSTMENT

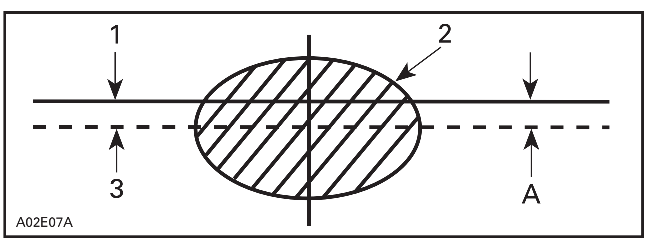
HEADLAMP BEAM AIMING

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.

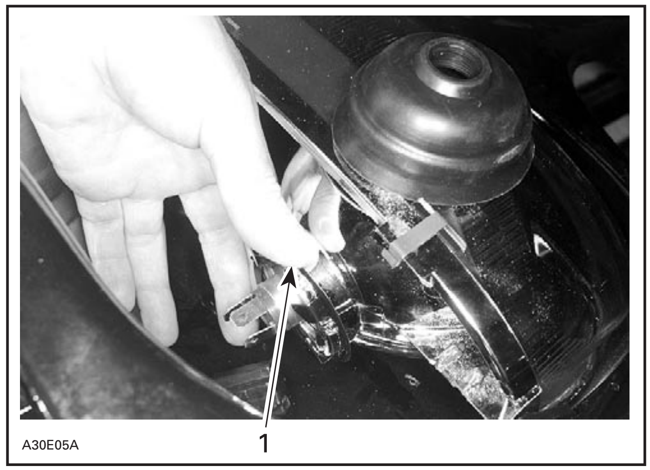
BULB REPLACEMENT

Headlamp

If any headlight bulb is burnt, remove windshield.

Unplug burnt bulb connector. Remove the rubber boot.

Unfasten bulb retainer ring. Detach the bulb and replace. Properly reinstall parts.



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.

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 on the hood then push it down until the tabs are fully inserted into the hood slots. Lock the windshield tabs in position.

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.

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, vent, primer, impulse, injection oil and rotary valve oil 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.

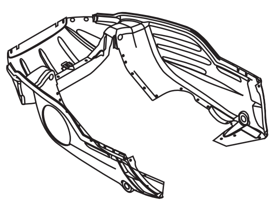
CAUTION: If for some reason the snowmobile has to be stored outside, it is preferable to cover it with an opaque tarpaulin. This will prevent the sun rays from affecting the plastic components and the vehicle finish.

REPAIR

The very first step before repairing plastic materials is to find out exactly which type of material is involved. Refer to following chart.

CAUTION: Consult chart below and repair kit instructions carefully, some repair products are not compatible with certain plastics.

⚠ WARNING
Polycarbonate windshields must never be repaired by welding or otherwise.

PART	REPAIRABLE		
	IMPACT COPOLYMER	R.R.I.M. POLYURETHANE	SURLYN
HOOD		4-TEC and Model no. 2955	All Others
BOTTOM PAN 	All ZX series		

For hood repair, refer to a specialized shop.

The following company provides a complete line of products to repair plastic materials:

CREST INDUSTRIES, INC.Trenton, MI 48183	Phone: 734-479-4141 Toll Free: 1-800-822-4100 Fax: 1-800-344-4461 Fax: 734-479-4040 E-Mail: info@crestauto.com www.crestauto.com

FRAME

FRAME CLEANING

NOTE: For bare aluminum frames 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 hose.

CAUTION: Never direct high-pressure water jet towards decals. They will 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

For all models, it is recommend to clean the seat with a solution of **warm soapy water**, using a soft clean cloth.

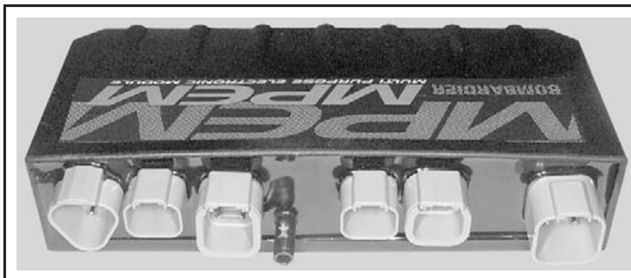
CAUTION: Avoid use of harsh detergents such as strong soaps, degreasing solvents, abrasive cleaners, paint thinners, etc., that may cause damage to the seat cover.

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 MPEM. On models equipped with a battery, also unplug the negative cable. This will protect the electronic box and battery against damage caused by flowing current when welding.



A32E0WB

TYPICAL — MPEM UNPLUGED

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 (3/16in) 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.

A03H2FA

Cut rivet using a chisel.

Remove riveted part.

Drive out remaining rivet head using a punch.

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.

ENGINES

MX Z 380 F, Legend 380 F and Legend GT 380 F			MX Z	Legend	
			380 F	380 F	Grand Touring 380 F
Country			**CAN/U.S.**	**CAN/U.S.**	**CAN/U.S.**
Engine Type			**377**		
ENGINE					
Number of cylinder			2		
Bore	Standard	mm (in)	62 (2.441)		
Stroke		mm (in)	61.00 (2.402)		
Displacement		cm^3 (in^3)	368.30 (22.475 in)		
Compression ratio			11.2 ± 0.5		
Maximum power engine speed (1)			6800 ± 100 RPM		
Piston ring type	1st		Semi-trapezoidal		
	2nd		Rectangular		
Ring end gap	New	mm (in)	0.02 to 0.35 (.008 to .0138)		
	Wear limit	mm (in)	1.0 (.039)		
Ring/piston groove clearance	New	mm (in)	0.040 to 0.110 (.0016 to .0043)		
	Wear limit	mm (in)	0.2 (.0079)		
Piston/cylinder wall clearance	New	mm (in)	0.070 ± 0.016 (.0028 ± .0006)		
	Wear limit	mm (in)	0.2 (.0079)		
Maximum crankshaft end play (2)	New	mm (in)	0.3 (.012)		
Maximum crankshaft deflection at PTO	Wear limit	mm (in)	0.06 (.0024)		
Connecting rod big end axial paly	New	mm (in)	0.200 to 0.527 (.0079 to .0207)		
	Wear limit	mm (in)	1.2 (.0472)		
ELECTRICAL					
Magneto generator output			340 W		
Ignition type			CDI		
Spark plug	Make and type		NGK BR9ES		
	Gap	mm (in)	0.40 to 0.50 (.016 to .020)		
Ignition timing BTDC (3)		mm (in)	2.79 (.110)		
Trigger coil (4)		Ω	160 to 180		
Generating coil (4)	Low speed		N.A.		
	High speed	Ω	6.3 to 7.7		
Lighting coil (4)		Ω	0.145 to 0.175		
High tension coil (4)	Primary		N.A.		
	Secondary		N.A.		

MX Z 380 F, Legend 380 F and Legend GT 380 F			MX Z	Legend	
			380 F	380 F	Grand Touring 380 F
Country			**CAN/U.S.**	**CAN/U.S.**	**CAN/U.S.**
Engine Type			**377**		
FUEL SYSTEM					
Carburetor type	PTO/MAG		VM30–210		
Main jet	PTO/MAG		185/185		
Needle jet			Q-0 (159)		
Pilot jet			40		
Needle identification — clip position	PTO/MAG		6CDY02-50		
Slide cut-away			2.0		
Float adjustment		mm (in)	23.90 ± 1 (.941 ± .040)		
Air or pilot screw adjustment	± 1/16 turn		N.A.		
Idle speed	± 200 RPM		1650		
Gas type			Unleaded		
Pump octane number			87 (R+M)/2 or higher		
Gas/oil ratio			Injection		
COOLING SYSTEM					
Type			Fan		
Axial fan belt adjustment	Deflection	mm (in)	9.5 ± 0.5 (.374 ± .020)		
	Force	kg (lbf)	5.0 (11.0)		
Thermostat opening temperature			N.A.		
Radiator cap opening pressure			N.A.		
TIGHTENING TORQUE (engine cold)					
Drive pulley retaining screw			(7)		
Exhaust manifold nuts or bolts			22 N•m (16 lbf•ft)		
Magneto ring nut			105 N•m (77 lbf•ft)		
Crankcase nuts or screws	M6		N.A.		
	M8		22 N•m (16 lbf•ft)		
Crankcase/engine support nuts or screws			40 N•m (30 lbf•ft)		
Cylinder head screws			22 N•m (16 lbf•ft)		
Crankcase/cylinder nuts or screws			N.A.		
Axial fan shaft nut			48 N•m (35 lbf•ft)		

MX Z 380 F and Legend GT 380 F			MX Z 380 F	Legend Grand Touring 380 F
Country			**EUROPE**	**EUROPE**
Engine Type			**377**	
ENGINE				
Number of cylinder			2	
Bore	Standard	mm (in)	62 (2.441)	
Stroke		mm (in)	61.00 (2.402)	
Displacement		cm^3 (in^3)	368.30 (22.475)	
Compression ratio			11.2 ± 0.5	
Maximum power engine speed (1)			6800 ± 100 RPM	
Piston ring type	1st		Semi-trapezoidal	
	2nd		Rectangular	
Ring end gap	New	mm (in)	0.02 to 0.35 (.008 to .0138)	
	Wear limit	mm (in)	1.0 mm (.039 in)	
Ring/piston groove clearance	New	mm (in)	0.040 to 0.110 (.0016 to .0043)	
	Wear limit	mm (in)	0.2 (.0079)	
Piston/cylinder wall clearance	New	mm (in)	0.070 ± 0.016 (.0028 ± .0006)	
	Wear limit	mm (in)	0.2 (.0079)	
Maximum crankshaft end play (2)	New	mm (in)	0.3 (.012)	
Maximum crankshaft deflection at PTO	Wear limit	mm (in)	0.06 (.0024)	
Connecting rod big end axial paly	New	mm (in)	0.200 to 0.527 (.0079 to .0207)	
	Wear limit	mm (in)	1.2 (.0472)	
ELECTRICAL				
Magneto generator output		W	340	
Ignition type			CDI	
Spark plug	Make and type		NGK BR9ES	
	Gap	mm (in)	0.40 to 0.50 (.016 to .020)	
Ignition timing BTDC (3)		mm (in)	2.79 (.110)	
Trigger coil (4)		Ω	160 to 180	
Generating coil (4)	Low speed		N.A.	
	High speed	Ω	6.3 to 7.7	
Lighting coil (4)		Ω	0.145 to 0.175	
High tension coil (4)	Primary		N.A.	
	Secondary		N.A.	

MX Z 380 F and Legend GT 380 F			MX Z 380 F	Legend Grand Touring 380 F
Country			**EUROPE**	**EUROPE**
Engine Type			**377**	
FUEL SYSTEM				
Carburetor type	PTO/MAG		VM30–210	
Main jet	PTO/MAG		185/185	
Needle jet			Q-0 (159)	
Pilot jet			40	
Needle identification — clip position	PTO/MAG		6CDY02-50	
Slide cut-away			2.0	
Float adjustment		mm (in)	23.90 ± 1 (.941 ± .040)	
Air or pilot screw adjustment	± 1/16 turn		N.A.	
Idle speed	± 200 RPM		1650	
Gas type			Unleaded	
Pump octane number			87 (R+M)/2 or higher	
Gas/oil ratio			Injection	
COOLING SYSTEM				
Type			Fan	
Axial fan belt adjustment	Deflection	mm (in)	9.5 ± 0.5 (.374 ± .020)	
	Force	kg (lbf)	5.0 (11.0)	
Thermostat opening temperature			N.A.	
Radiator cap opening pressure			N.A.	
TIGHTENING TORQUE (engine cold)				
Drive pulley retaining screw			(7)	
Exhaust manifold nuts or bolts			22 N•m (16 lbf•ft)	
Magneto ring nut			105 N•m (77 lbf•ft)	
Crankcase nuts or screws	M6		N.A.	
	M8		22 N•m (16 lbf•ft)	
Crankcase/engine support nuts or screws			40 N•m (30 lbf•ft)	
Cylinder head screws			22 N•m (16 lbf•ft)	
Crankcase/cylinder nuts or screws			N.A.	
Axial fan shaft nut			48 N•m (35 lbf•ft)	

MX Z 550 F, Legend 550 F and Legend GT 550 F			MX Z 550 F	Legend 550 F	Legend Grand Touring 550 F
Country			**CAN/U.S.**	**CAN/U.S.**	**CAN/U.S.**
Engine Type			**552**		
ENGINE					
Number of cylinder			2		
Bore	Standard	mm (in)	76 (2.992)		
Stroke		mm (in)	61.00 (2.402)		
Displacement		cm^3 (in^3)	553.40 (33.771)		
Compression ratio			9.6 ± 0.5		
Maximum power engine speed (1)			6950 ± 100 RPM		
Piston ring type	1st		Semi-trapezoidal		
	2nd		Rectangular		
Ring end gap	New	mm (in)	0.40 to 0.55 (.016 to .022)		
	Wear limit	mm (in)	1.0 (.039)		
Ring/piston groove clearance	New	mm (in)	0.04 to 0.08 (.0016 to .0030)		
	Wear limit	mm (in)	0.2 (.0079)		
Piston/cylinder wall clearance	New	mm (in)	0.147 ± 0.026 (.0058 ± .0010)		
	Wear limit	mm (in)	0.2 (.0079)		
Maximum crankshaft end play (2)	New	mm (in)	0.3 (.012)		
Maximum crankshaft deflection at PTO	Wear limit	mm (in)	0.06 (.0024)		
Connecting rod big end axial paly	New	mm (in)	0.200 to 0.527 (.0079 to .0207)		
	Wear limit	mm (in)	1.2 (.0472)		
ELECTRICAL					
Magneto generator output		W	340		
Ignition type			CDI		
Spark plug	Make and type		NGK BR9ES		
	Gap	mm (in)	0.40 to 0.50 (.016 to .020)		
Ignition timing BTDC (3)		mm (in)	2.77 (.109)		
Trigger coil (4)		Ω	160 to 180		
Generating coil (4)	Low speed		N.A.		
	High speed	Ω	6.3 to 7.7		
Lighting coil (4)		Ω	0.145 to 0.175		
High tension coil (4)	Primary		N.A.		
	Secondary		N.A.		

MX Z 550 F, Legend 550 F and Legend GT 550 F		MX Z 550 F	Legend 550 F	Legend Grand Touring 550 F
Country		**CAN/U.S.**	**CAN/U.S.**	**CAN/U.S.**
Engine Type		**552**		
FUEL SYSTEM				
Carburetor type	PTO/MAG	VM34–591		
Main jet	PTO/MAG	250/250		
Needle jet		P-8 (159)		
Pilot jet		40		
Needle identification — clip position	PTO/MAG	6BCY–40		
Slide cut-away		2.5		
Float adjustment	mm (in)	23.90 ± 1 (.941 ± .040)		
Air or pilot screw adjustment	± 1/16 turn	N.A.		
Idle speed	± 200 RPM	1650		
Gas type		Unleaded		
Pump octane number		87 (R+M)/2 or higher		
Gas/oil ratio		Injection		
COOLING SYSTEM				
Type		Fan		
Axial fan belt adjustment	Deflection mm (in)	9.5 ± 0.5 (.374 ± .020)		
Axial fan belt adjustment	Force kg (lbf)	5.0 (11.0)		
Thermostat opening temperature		N.A.		
Radiator cap opening pressure		N.A.		
TIGHTENING TORQUE (engine cold)				
Drive pulley retaining screw		(7)		
Exhaust manifold nuts or bolts		22 N•m (16 lbf•ft)		
Magneto ring nut		105 N•m (77 lbf•ft)		
Crankcase nuts or screws	M6	N.A.		
Crankcase nuts or screws	M8	22 N•m (16 lbf•ft)		
Crankcase/engine support nuts or screws		40 N•m (30 lbf•ft)		
Cylinder head screws		22 N•m (16 lbf•ft)		
Crankcase/cylinder nuts or screws		N.A.		
Axial fan shaft nut		48 N•m (35 lbf•ft)		

MX Z 550 F and Legend GT 550 F			MX Z 550 F	Legend Grand Touring 550 F
Country			**EUROPE**	**EUROPE**
Engine Type			**552**	
ENGINE				
Number of cylinder			2	
Bore	Standard	mm (in)	76 (2.992)	
Stroke		mm (in)	61.00 (2.402)	
Displacement		cm^3 (in^3)	553.40 (33.771)	
Compression ratio			9.6 ± 0.5	
Maximum power engine speed (1)			6950 ± 100 RPM	
Piston ring type	1st		Semi-trapezoidal	
	2nd		Rectangular	
Ring end gap	New	mm (in)	0.40 to 0.55 (.016 to .022)	
	Wear limit	mm (in)	1.0 (.039)	
Ring/piston groove clearance	New	mm (in)	0.04 to 0.08 (.0016 to .0030)	
	Wear limit	mm (in)	0.2 (.0079)	
Piston/cylinder wall clearance	New	mm (in)	0.147 ± 0.026 (.0058 ± .0010)	
	Wear limit	mm (in)	0.2 (.0079)	
Maximum crankshaft end play (2)	New	mm (in)	0.3 (.012)	
Maximum crankshaft deflection at PTO	Wear limit	mm (in)	0.06 (.0024)	
Connecting rod big end axial paly	New	mm (in)	0.200 to 0.527 (.0079 to .0207)	
	Wear limit	mm (in)	1.2 (.0472)	
ELECTRICAL				
Magneto generator output		W	340	
Ignition type			CDI	
Spark plug	Make and type		NGK BR9ES	
	Gap	mm (in)	0.40 to 0.50 (.016 to .020)	
Ignition timing BTDC (3)		mm (in)	2.77 (.109)	
Trigger coil (4)		Ω	160 to 180	
Generating coil (4)	Low speed		N.A.	
	High speed	Ω	6.3 to 7.7	
Lighting coil (4)		Ω	0.145 to 0.175	
High tension coil (4)	Primary		N.A.	
	Secondary		N.A.	

MX Z 550 F and Legend GT 550 F			MX Z 550 F	Legend Grand Touring 550 F
Country			**EUROPE**	**EUROPE**
Engine Type			**552**	
FUEL SYSTEM				
Carburetor type		PTO/MAG	VM34–591	
Main jet		PTO/MAG	250/250	
Needle jet			P-8 (159)	
Pilot jet			40	
Needle identification — clip position		PTO/MAG	6BCY–40	
Slide cut-away			2.5	
Float adjustment		mm (in)	23.90 ± 1 (.941 ± .040)	
Air or pilot screw adjustment		± 1/16 turn	N.A.	
Idle speed		± 200 RPM	1650	
Gas type			Unleaded	
Pump octane number			87 (R+M)/2 or higher	
Gas/oil ratio			Injection	
COOLING SYSTEM				
Type			Fan	
Axial fan belt adjustment	Deflection	mm (in)	9.5 ± 0.5 (.374 ± .020)	
	Force	kg (lbf)	5.0 (11.0)	
Thermostat opening temperature			N.A.	
Radiator cap opening pressure			N.A.	
TIGHTENING TORQUE (engine cold)				
Drive pulley retaining screw			(7)	
Exhaust manifold nuts or bolts			22 N•m (16 lbf•ft)	
Magneto ring nut			105 N•m (77 lbf•ft)	
Crankcase nuts or screws		M6	N.A.	
		M8	22 N•m (16 lbf•ft)	
Crankcase/engine support nuts or screws			40 N•m (30 lbf•ft)	
Cylinder head screws			22 N•m (16 lbf•ft)	
Crankcase/cylinder nuts or screws			N.A.	
Axial fan shaft nut			48 N•m (35 lbf•ft)	

Skandic Sport 550 F and Summit 550 F			Skandic	Summit	
			Sport 550 F	550 F	550 F
Country			**CAN/U.S.**	**CAN/U.S.**	**EUROPE**
Engine Type			**552**		
ENGINE					
Number of cylinder			2		
Bore	Standard	mm (in)	76 (2.992)		
Stroke		mm (in)	61.00 (2.402)		
Displacement		cm^3 (in^3)	553.40 (33.771)		
Compression ratio			9.6 ± 0.5		
Maximum power engine speed (1)			6950 ± 100 RPM		
Piston ring type	1st		Semi-trapezoidal		
	2nd		Rectangular		
Ring end gap	New	mm (in)	0.40 to 0.55 (.016 to .022)		
	Wear limit	mm (in)	1.0 (.039)		
Ring/piston groove clearance	New	mm (in)	0.04 to 0.08 (.0016 to .0030)		
	Wear limit	mm (in)	0.2 (.0079)		
Piston/cylinder wall clearance	New	mm (in)	0.147 ± 0.026 (.0058 ± .0010)		
	Wear limit	mm (in)	0.2 (.0079)		
Maximum crankshaft end play (2)	New	mm (in)	0.3 (.012)		
Maximum crankshaft deflection at PTO	Wear limit	mm (in)	0.06 (.0024)		
Connecting rod big end axial paly	New	mm (in)	0.200 to 0.527 (.0079 to .0207)		
	Wear limit	mm (in)	1.2 (.0472)		
ELECTRICAL					
Magneto generator output		W	340		
Ignition type			CDI		
Spark plug	Make and type		NGK BR9ES		
	Gap	mm (in)	0.40 to 0.50 (.016 to .020)		
Ignition timing BTDC (3)		mm (in)	2.77 (.109)		
Trigger coil (4)		Ω	160 to 180		
Generating coil (4)	Low speed		N.A.		
	High speed	Ω	6.3 to 7.7		
Lighting coil (4)		Ω	0.145 to 0.175		
High tension coil (4)	Primary		N.A.		
	Secondary		N.A.		

Skandic Sport 550 F and Summit 550 F		Skandic	Summit	
		Sport 550 F	550 F	550 F
Country		CAN/U.S.	CAN/U.S.	EUROPE
Engine Type		552		
FUEL SYSTEM				
Carburetor type	PTO/MAG	VM34–591	VM34–590	VM34–591
Main jet	PTO/MAG	250/250	210/210	250/250
Needle jet		P-8 (159)		
Pilot jet		40		
Needle identification — clip position	PTO/MAG	6BCY–40		
Slide cut-away		2.5		
Float adjustment	mm (in)	23.90 ± 1 (.941 ± .040)		
Air or pilot screw adjustment	± 1/16 turn	N.A.		
Idle speed	± 200 RPM	1650		
Gas type		Unleaded		
Pump octane number		87 (R+M)/2 or higher		
Gas/oil ratio		Injection		
COOLING SYSTEM				
Type		Fan		
Axial fan belt adjustment	Deflection mm (in)	9.5 ± 0.5 (.374 ± .020)		
	Force kg (lbf)	5.0 (11.0)		
Thermostat opening temperature		N.A.		
Radiator cap opening pressure		N.A.		
TIGHTENING TORQUE (engine cold)				
Drive pulley retaining screw		(7)		
Exhaust manifold nuts or bolts		22 N•m (16 lbf•ft)		
Magneto ring nut		105 N•m (77 lbf•ft)		
Crankcase nuts or screws	M6	N.A.		
	M8	22 N•m (16 lbf•ft)		
Crankcase/engine support nuts or screws		40 N•m (30 lbf•ft)		
Cylinder head screws		22 N•m (16 lbf•ft)		
Crankcase/cylinder nuts or screws		N.A.		
Axial fan shaft nut		48 N•m (35 lbf•ft)		

Legend SE 600 HO SDI and Legend SE GT 600 HO SDI			Legend SE	
			600 HO SDI	Grand Touring 600 HO SDI
Country			**CAN/U.S.**	**CAN/U.S.**
Engine Type			**593**	
ENGINE				
Number of cylinder			2	
Bore	Standard	mm (in)	72 (2.835)	
Stroke		mm (in)	73.00 (2.874)	
Displacement		cm^3 (in^3)	594.40 (36.273)	
Compression ratio			12.25 ± 0.5	
Maximum power engine speed (1)			8000 ± 100 RPM	
Piston ring type	1st		Semi-trapezoidal	
	2nd		—	
Ring end gap	New	mm (in)	0.40 to 0.55 (.016 to .022)	
	Wear limit	mm (in)	1.0 (.039)	
Ring/piston groove clearance	New	mm (in)	0.05 to 0.10 (.0020 to .0039)	
	Wear limit	mm (in)	0.2 (.0079)	
Piston/cylinder wall clearance	New	mm (in)	0.105 ± 0.013 (.0041 ± .0009)	
	Wear limit	mm (in)	0.18 (.0071)	
Maximum crankshaft end play (2)	New	mm (in)	0.3 (.012)	
Maximum crankshaft deflection at PTO	Wear limit	mm (in)	0.06 (.0024)	
Connecting rod big end axial paly	New	mm (in)	0.310 to 0.677 (.0122 to .0267)	
	Wear limit	mm (in)	1.2 (.0472)	
ELECTRICAL				
Magneto generator output		W	480	
Ignition type			Inductive	
Spark plug	Make and type		NGK BR9ECS	
	Gap	mm (in)	0.75 to 0.85 (.030 to .033) (8)	
Ignition timing BTDC (12)		mm (in)	5.390 (.2122)	
Trigger coil (4)		Ω	190 to 290	
Generating coil (4)	Low speed		N.A.	
	High speed	Ω	N.A.	
Lighting coil (4)		Ω	0.145 to 0.185	
High tension coil (4)	Primary		N.A.	
	Secondary		N.A.	

Legend SE 600 HO SDI and Legend SE GT 600 HO SDI			Legend SE	
			600 HO SDI	Grand Touring 600 HO SDI
Country			**CAN/U.S.**	**CAN/U.S.**
Engine Type			593	
FUEL SYSTEM				
Throttle body type		PTO/MAG	Dell'Orto without IACV	
Main jet		PTO/MAG	N.A.	
Needle jet			N.A.	
Pilot jet			N.A.	
Needle identification — clip position		PTO/MAG	N.A.	
Slide cut-away			N.A.	
Float adjustment		mm (in)	N.A.	
Air or pilot screw adjustment		± 1/16 turn	N.A.	
Idle speed		± 200 RPM	1500	
Gas type			Unleaded	
Pump octane number			87 (R+M)/2 or higher	
Gas/oil ratio			Injection	
COOLING SYSTEM				
Type			Liquid	
Axial fan belt adjustment	Deflection	mm (in)	N.A.	
	Force	kg (lbf)	N.A.	
Thermostat opening temperature			42°C (108°F)	
Radiator cap opening pressure			90 kPa (13 PSI)	
TIGHTENING TORQUE (engine cold)				
Drive pulley retaining screw			(7)	
Exhaust manifold nuts or bolts			22 N•m (16 lbf•ft)	
Magneto ring nut			125 N•m (92 lbf•ft)	
Crankcase nuts or screws		M6	9 N•m (80 lbf•in)	
		M8	29 N•m (21 lbf•ft)	
Crankcase/engine support nuts or screws			35 N•m (26 lbf•ft)	
Cylinder head screws			29 N•m (21 lbf•ft)	
Crankcase/cylinder nuts or screws			40 N•m (29 lbf•ft)	
Axial fan shaft nut			N.A.	

Legend SE 700 and Legend SE GT 700			**Legend SE**	
			700	**Grand Touring 700**
Country			**CAN/U.S.**	**CAN/U.S.**
Engine Type			**693**	
ENGINE				
Number of cylinder			2	
Bore	Standard	mm (in)	78 (3.071)	
Stroke		mm (in)	73.00 (2.874)	
Displacement		cm^3 (in^3)	697.60 (42.570)	
Compression ratio			12.0 ± 0.5	
Maximum power engine speed (1)			8000 ± 100 RPM	
Piston ring type	1st		Semi-trapezoidal	
	2nd		N.A.	
Ring end gap	New	mm (in)	0.40 to 0.55 (.016 to .022)	
	Wear limit	mm (in)	1.0 (.039)	
Ring/piston groove clearance	New	mm (in)	0.04 to 0.09 (.0016 to .0035)	
	Wear limit	mm (in)	0.2 (.0079)	
Piston/cylinder wall clearance	New	mm (in)	0.115 ± 0.013 (.0045 ± .0005)	
	Wear limit	mm (in)	0.2 (.0079)	
Maximum crankshaft end play (2)	New	mm (in)	0.3 (.012)	
Maximum crankshaft deflection at PTO	Wear limit	mm (in)	0.06 (.0024)	
Connecting rod big end axial paly	New	mm (in)	0.310 to 0.677 (.0122 to .0267)	
	Wear limit	mm (in)	1.2 (.0472)	
ELECTRICAL				
Magneto generator output		W	360	
Ignition type			CDI	
Spark plug	Make and type		NGK BR9ECS	
	Gap	mm (in)	0.40 to 0.50 (.016 to .020) (8)	
Ignition timing BTDC (3)		mm (in)	3.37 (.133)	
Trigger coil (4)		Ω	190 to 300	
Generating coil (4)	Low speed		N.A.	
	High speed	Ω	N.A.	
Lighting coil (4)		Ω	0.1 to 1.0	
High tension coil (4)	Primary		N.A.	
	Secondary		N.A.	

Legend SE 700 and Legend SE GT 700			Legend SE	
			700	Grand Touring 700
Country			**CAN/U.S.**	**CAN/U.S.**
Engine Type			693	
FUEL SYSTEM				
Carburetor type		PTO/MAG	TM40–B241	
Main jet		PTO/MAG	510N/510N	
Needle jet			P-0 (5)	
Pilot jet			17.5	
Needle identification — clip position		PTO/MAG	9ZLY3–58 (6)	
Slide cut-away			2.0	
Float adjustment		mm (in)	N.A.	
Air or pilot screw adjustment		± 1/16 turn	1.5	
Idle speed		± 200 RPM	1500	
Gas type			Unleaded	
Pump octane number			87 (R+M)/2 or higher	
Gas/oil ratio			Injection	
COOLING SYSTEM				
Type			Liquid cooled	
Axial fan belt adjustment	Deflection	mm (in)	N.A.	
	Force	kg (lbf)	N.A.	
Thermostat opening temperature			42°C (108°F)	
Radiator cap opening pressure			90 kPa (13 PSI)	
TIGHTENING TORQUE (engine cold)				
Drive pulley retaining screw			(7)	
Exhaust manifold nuts or bolts			22 N•m (16 lbf•ft)	
Magneto ring nut			125 N•m (92 lbf•ft)	
Crankcase nuts or screws		M6	9 N•m (80 lbf•**in**)	
		M8	29 N•m (21 lbf•ft)	
Crankcase/engine support nuts or screws			35 N•m (26 lbf•ft)	
Cylinder head screws			29 N•m (21 lbf•ft)	
Crankcase/cylinder nuts or screws			40 N•m (29 lbf•ft)	
Axial fan shaft nut			N.A.	

Legend SE 800 SDI and Legend SE GT 800 SDI			Legend SE 800 SDI	Legend SE Grand Touring 800 SDI
Country			**CAN/U.S.**	**CAN/U.S.**
Engine Type			**793**	
ENGINE				
Number of cylinder			2	
Bore	Standard	mm (in)	82 (3.228)	
Stroke		mm (in)	75.70 (2.980)	
Displacement		cm^3 (in^3)	799.50 (48.789)	
Compression ratio			12.0 ± 0.5	
Maximum power engine speed (1)			7850 ± 100 RPM	
Piston ring type	1st		Semi-trapezoidal	
	2nd		—	
Ring end gap	New	mm (in)	0.40 to 0.55 (.016 to .022)	
	Wear limit	mm (in)	1.0 (.039)	
Ring/piston groove clearance	New	mm (in)	0.05 to 0.10 (.0020 to .0039)	
	Wear limit	mm (in)	0.2 (.0079)	
Piston/cylinder wall clearance	New	mm (in)	0.125 ± 0.013 (.0049 ± .0009)	
	Wear limit	mm (in)	0.2 (.0079)	
Maximum crankshaft end play (2)	New	mm (in)	0.3 (.012)	
Maximum crankshaft deflection at PTO	Wear limit	mm (in)	0.06 (.0024)	
Connecting rod big end axial paly	New	mm (in)	0.310 to 0.677 (.0122 to .0267)	
	Wear limit	mm (in)	1.2 (.0472)	
ELECTRICAL				
Magneto generator output		W	480	
Ignition type			Inductive	
Spark plug	Make and type		NGK BR9ECS	
	Gap	mm (in)	0.75 to 0.85 (.030 to .033) (8)	
Ignition timing BTDC (12)		mm (in)	3.520 (.1386)	
Trigger coil (4)		Ω	190 to 290	
Generating coil (4)	Low speed		N.A.	
	High speed	Ω	N.A.	
Lighting coil (4)		Ω	0.145 to 0.185	
High tension coil (4)	Primary		N.A.	
	Secondary		N.A.	

Legend SE 800 SDI and Legend SE GT 800 SDI		Legend SE 800 SDI	Legend SE Grand Touring 800 SDI
Country		**CAN/U.S.**	**CAN/U.S.**
Engine Type		**793**	
FUEL SYSTEM			
Throttle body type	PTO/MAG	Dell'Orto without IACV	
Main jet	PTO/MAG	N.A.	
Needle jet		N.A.	
Pilot jet		N.A.	
Needle identification — clip position	PTO/MAG	N.A.	
Slide cut-away		N.A.	
Float adjustment	mm (in)	N.A.	
Air or pilot screw adjustment	± 1/16 turn	N.A.	
Idle speed	± 200 RPM	1500	
Gas type		Unleaded	
Pump octane number		87 (R+M)/2 or higher	
Gas/oil ratio		Injection	
COOLING SYSTEM			
Type		Liquid	
Axial fan belt adjustment	Deflection mm (in)	N.A.	
	Force kg (lbf)	N.A.	
Thermostat opening temperature		42°C (108°F)	
Radiator cap opening pressure		90 kPa (13 PSI)	
TIGHTENING TORQUE (engine cold)			
Drive pulley retaining screw		(7)	
Exhaust manifold nuts or bolts		22 N•m (16 lbf•ft)	
Magneto ring nut		125 N•m (92 lbf•ft)	
Crankcase nuts or screws	M6	9 N•m (80 lbf•**in**)	
	M8	29 N•m (21 lbf•ft)	
Crankcase/engine support nuts or screws		35 N•m (26 lbf•ft)	
Cylinder head screws		29 N•m (21 lbf•ft)	
Crankcase/cylinder nuts or screws		40 N•m (29 lbf•ft)	
Axial fan shaft nut		N.A.	

Legend SE GT 600 HO SDI and Legend SE GT 800 SDI			Legend SE Grand Touring 600 HO SDI	Legend SE Grand Touring 800 SDI
Country			**EUROPE**	**EUROPE**
Engine Type			**593**	**793**
ENGINE				
Number of cylinder			2	
Bore	Standard	mm (in)	72 (2.835)	82 (3.228)
Stroke		mm (in)	73.00 (2.874)	75.70 (2.980)
Displacement		cm^3 (in^3)	594.40 (36.273)	799.50 (48.789)
Compression ratio			12.25 ± 0.5	12.0 ± 0.5
Maximum power engine speed (1)			8000 ± 100 RPM	7850 ± 100 RPM
Piston ring type	1st		Semi-trapezoidal	
	2nd		—	
Ring end gap	New	mm (in)	0.40 to 0.55 (.016 to .022)	
	Wear limit	mm (in)	1.0 (.039)	
Ring/piston groove clearance	New	mm (in)	0.05 to 0.10 (.0020 to .0039)	
	Wear limit	mm (in)	0.2 (.0079)	
Piston/cylinder wall clearance	New	mm (in)	0.105 ± 0.013 (.0041 ± .0009)	0.125 ± 0.013 (.0049 ± .0009)
	Wear limit	mm (in)	0.18 (.0071)	0.2 (.0079)
Maximum crankshaft end play (2)	New	mm (in)	0.3 (.012)	
Maximum crankshaft deflection at PTO	Wear limit	mm (in)	0.06 (.0024)	
Connecting rod big end axial paly	New	mm (in)	0.310 to 0.677 (.0122 to .0267)	
	Wear limit	mm (in)	1.2 (.0472)	
ELECTRICAL				
Magneto generator output		W	480	
Ignition type			Inductive	
Spark plug	Make and type		NGK BR9ECS	
	Gap	mm (in)	0.75 to 0.85 (.030 to .033) (8)	
Ignition timing BTDC (3)		mm (in)	5.390 (.2122)	3.520 (.1386)
Trigger coil (4)		Ω	190 to 290	
Generating coil (4)	Low speed		N.A.	
	High speed	Ω	N.A.	
Lighting coil (4)		Ω	0.145 to 0.185	
High tension coil (4)	Primary		N.A.	
	Secondary		N.A.	

Legend SE GT 600 HO SDI and Legend SE GT 800 SDI			Legend SE	
			Grand Touring 600 HO SDI	Grand Touring 800 SDI
Country			**EUROPE**	**EUROPE**
Engine Type			**593**	**793**
FUEL SYSTEM				
Throttle body type		PTO/MAG	Dell'Orto without IACV	
Main jet		PTO/MAG	N.A.	
Needle jet			N.A.	
Pilot jet			N.A.	
Needle identification — clip position		PTO/MAG	N.A.	
Slide cut-away			N.A.	
Float adjustment		mm (in)	N.A.	
Air or pilot screw adjustment		± 1/16 turn	N.A.	
Idle speed		± 200 RPM	1500	
Gas type			Unleaded	
Pump octane number			87 (R+M)/2 or higher	
Gas/oil ratio			Injection	
COOLING SYSTEM				
Type			Liquid	
Axial fan belt adjustment	Deflection	mm (in)	N.A.	
	Force	kg (lbf)	N.A.	
Thermostat opening temperature			42°C (108°F)	
Radiator cap opening pressure			90 kPa (13 PSI)	
TIGHTENING TORQUE (engine cold)				
Drive pulley retaining screw			(7)	
Exhaust manifold nuts or bolts			22 N•m (16 lbf•ft)	
Magneto ring nut			125 N•m (92 lbf•ft)	
Crankcase nuts or screws		M6	9 N•m (80 lbf•in)	
		M8	29 N•m (21 lbf•ft)	
Crankcase/engine support nuts or screws			35 N•m (26 lbf•ft)	
Cylinder head screws			29 N•m (21 lbf•ft)	
Crankcase/cylinder nuts or screws			40 N•m (29 lbf•ft)	
Axial fan shaft nut			N.A.	

Legend SE V-1000 and Legend SE GT V-1000				Legend SE V-1000	Legend SE Grand Touring V-1000
Country				**CAN/U.S.**	**CAN/U.S.**
Engine Type				**1004**	
ENGINE					
Engine type				BOMBARDIER-ROTAX 1004 4-TEC, 4-stroke, Over Head Camshaft (OHC), liquid cooled	
Cylinder arrangement and quantity				V2	
Valves per cylinder				4 valves with hydraulic lifters (no adjustment)	
Bore		Standard	mm (in)	100 mm (3.937 in)	
Stroke			mm (in)	63.4 mm (2.496 in)	
Displacement			cm^3 (in^3)	995.90 cm^3 (60.774 in^3)	
Compression ratio				10.5 ± 0.5	
Decompressor type				Automatic	
Engine speed for transmission calibration (9)				6000 to 7250 RPM progressive	
Lubrication				Dry sump with replaceable oil filter	
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	mm (in)	5.961 to 5.975 (.2347 to .2352)	
		Wear limit	mm (in)	5.930 (.2330)	
	Exhaust	New	mm (in)	5.946 to 5.960 (.2341 to .2346)	
		Wear limit	mm (in)	5.930 (.2330)	
Valve guide diameter		Wear limit	mm (in)	6.060 (.2386)	
Valve spring free length	Inner	Nominal (new)	mm (in)	41.02 (1.615)	
		Wear limit	mm (in)	38.8 (1.499)	
	Outer	Nominal (new)	mm (in)	45.45 (1.789)	
		Wear limit	mm (in)	43 (1.693)	
Valve seat contact width	Intake	Nominal (new)	mm (in)	1.1 to 1.3 (.043 to .051)	
		Wear limit	mm (in)	1.6 (.063)	
	Exhaust	Nominal (new)	mm (in)	1.25 to 1.55 (.049 to 061)	
		Wear limit	mm (in)	1.8 (.071)	
Rocker arm bore diameter		New	mm (in)	20.007 to 20.020 (.7876 to .7881)	
		Wear limit	mm (in)	20.035 (.7887)	
Rocker arm shaft diameter		New	mm (in)	19.980 to 19.993 (.7866 to 7871)	
		Wear limit	mm (in)	19.965 (.7860)	
Cylinder head screw length		Service limit	mm (in)	216.5 (8.524)	

Legend SE V-1000 and Legend SE GT V-1000				Legend SE V-1000	Legend SE Grand Touring V-1000
Country				CAN/U.S.	CAN/U.S.
Engine Type				1004	
ENGINE (cont'd)					
Piston ring type		1st		Rectangular	
		2nd		Taper-face	
		3rd		Oil scraper ring	
Ring end gap	1st	New	mm (in)	0.15 to 0.35 (.006 to .014)	
	2nd		mm (in)	0.15 to 0.35 (.006 to .014)	
	3rd		mm (in)	0.15 to 0.3 (.006 to .012)	
	All	Wear limit	mm (in)	1.5 (.060)	
Ring/piston groove clearance	1st	New	mm (in)	0.025 to 0.07 (.001 to .0028)	
	2nd		mm (in)	0.015 to 0.06 (.0006 to .0024)	
	3rd		mm (in)	0.02 to 0.055 (.0008 to .0021)	
	All	Wear limit	mm (in)	0.15 (.006)	
Piston/cylinder wall clearance		New	mm (in)	0.024 to 0.056 (.001 to .0022)	
		Wear limit	mm (in)	0.09 (.0035)	
Cylinder taper (maximum)		New (maximum)	mm (in)	0.038 (.0015)	
		Wear limit	mm (in)	0.09 (.0035)	
Cylinder out of round		New (maximum)	mm (in)	0.01 (.0004)	
		Wear limit	mm (in)	0.02 (.0008)	
Camshaft bearing journal	PTO side	New	mm (in)	24.967 to 24.980 (.9830 to .9835)	
		Wear limit	mm (in)	24.960 (.9827)	
	Alternator side	New	mm (in)	39.927 to 39.935 (1.5719 to 1.5722)	
		Wear limit	mm (in)	39.920 (1.5716)	
Camshaft bore	PTO side	New	mm (in)	25.000 to 25.013 (.9842 to .9848)	
		Wear limit	mm (in)	25.020 (.9850)	
	Alternator side	New	mm (in)	40.000 to 40.016 (1.5748 to 1.5754)	
		Wear limit	mm (in)	40.020 (1.5756)	
Cam lobe	Intake	New	mm (in)	31.654 to 31.854 (1.2462 to 1.2541)	
		Wear limit	mm (in)	31.600 (1.2441)	
	Exhaust	New	mm (in)	31.435 to 31.635 (1.2376 to 1.2455)	
		Wear limit	mm (in)	31.400 (1.2362)	
Crankshaft axial clearance		New	mm (in)	0.100 to 0.400 (.0039 to .0157)	
Crankshaft journal diameter		New	mm (in)	54.961 to 54.980 (2.1638 to 2.1646)	
		Wear limit	mm (in)	54.940 (2.1630)	
Crankshaft deflection		Wear limit	mm (in)	0.050 (.002)	
Crankshaft radial clearance		Wear limit	mm (in)	0.080 (.0031)	

Legend SE V-1000 and Legend SE GT V-1000			Legend SE	
			V-1000	**Grand Touring V-1000**
Country			**CAN/U.S.**	**CAN/U.S.**
Engine Type			**1004**	
ENGINE (cont'd)				
Connecting rod big end diameter	Wear limit	mm (in)	45.090 (1.7752)	
Connecting rod big end clearance	Wear limit	mm (in)	0.09 (.0035)	
Connecting rod big end axial paly	New	mm (in)	0.150 to 0.450 (.0059 to .0177)	
	Wear limit	mm (in)	0.500 (.0197)	
Connecting rod small end diameter	New	mm (in)	23.010 to 23.020 (.9059 to 9063)	
	Wear limit	mm (in)	23.070 (.9080)	
Piston pin diameter	New	mm (in)	22.996 to 23.000 (.9053 to .9055)	
	Wear limit	mm (in)	22.990 (.9051)	
Piston pin bore clearance	Wear limit	mm (in)	0.080 (.0031)	
ELECTRICAL				
Alternator output		A	40	
Ignition system type			DI (Digital Induction)	
Ignition timing			Not adjustable	
Spark plug	Make and type		NGK DCPR8E	
	Gap	mm (in)	0.75 (.030)	
Ignition coil	Primary	Ω	0.85 to 1.15	
	Secondary	kΩ	9.2 to 13.8	
Engine RPM limiter setting			8000 RPM	
FUEL SYSTEM				
Fuel injection type			ROTAX EMS (Engine Management System) Multipoint Fuel Injection, Single throttle body (52 mm)	
Fuel pressure		kPa (PSI)	400 kPa (58 PSI)	
Idle speed			1400 ± 100 RPM	
Throttle Position Sensor (TPS) (4)		kΩ	1.6 to 2.4	
Crankshaft Position Sensor (CPS) (4)		Ω	0.7 to 1.1	
Camshaft Position Sensor (CAPS)			12 volts	
Camshaft Position Sensor (CAPS) (4)		kΩ	1.2	
Air Temperature Sensor (ATS) (4)		kΩ	2.28 to 2.74	
Coolant Temperature Sensor (CTS) (4)		kΩ	2.28 to 2.74	
Manifold Air Pressure Sensor (MAPS)			5 volts	
Idle bypass valve (4)		Ω	50	
Oil Pressure Switch (OPS) (4)			0 Ω, if oil pressure is lower than 20 kPa (2.9 PSI)	
Fuel injector		Ω	13.8 to 15.2	
Fuel	Type		Regular unleaded gasoline	
	Octane		87 (R+M)/2 or higher	

Legend SE V-1000 and Legend SE GT V-1000		Legend SE	
		V-1000	Grand Touring V-1000
Country		**CAN/U.S.**	**CAN/U.S.**
Engine Type		**1004**	
COOLING SYSTEM			
Type		Liquid cooled	
Coolant		(10)	
Thermostat		82°C (180°F)	
TIGHTENING TORQUE (engine cold)			
Drive pulley retaining screw		(11)	
Cylinder head screws	M11	50 N•m (37 lbf•ft) + 90° rotation	
	M6	9 N•m (80 lbf•**in**)	
Rocker arm shaft screws		20 N•m (15 lbf•ft) + 90° rotation	
Crankshaft nut		82 N•m (60 lbf•ft)	
Connecting rod screws		45 N•m (33 lbf•ft) + 90° rotation	
Crankcase screws	M6	9 N•m (80 lbf•**in**)	
	M8	23 N•m (17 lbf•ft)	
Oil drain plug		55 N•m (41 lbf•ft)	
Alternator screws		23 N•m (17 lbf•ft)	
Oil filter cover screw		9 N•m (80 lbf•**in**)	
Manifold screws		23 N•m (17 lbf•ft)	

Legend Sport 500 SS and Legend Sport GT 500 SS			Legend SPORT 500 SS	Legend SPORT Grand Touring 500 SS
Country			**CAN/U.S.**	**CAN/U.S.**
Engine Type			**593**	
ENGINE				
Number of cylinder			2	
Bore	Standard	mm (in)	76 (2.992)	
Stroke		mm (in)	65.80 (2.591)	
Displacement		cm^3 (in^3)	597.00 (36.431)	
Compression ratio			12.0 ± 0.5	
Maximum power engine speed (1)			8000 ± 100 RPM	
Piston ring type	1st		Semi-trapezoidal	
	2nd		N.A.	
Ring end gap	New	mm (in)	0.40 to 0.55 (.016 to .022)	
	Wear limit	mm (in)	1.0 (.039)	
Ring/piston groove clearance	New	mm (in)	0.04 to 0.09 (.0016 to .0035)	
	Wear limit	mm (in)	0.2 (.0079)	
Piston/cylinder wall clearance	New	mm (in)	0.120 ± 0.016 (.0047 ± .0006)	
	Wear limit	mm (in)	0.2 (.0079)	
Maximum crankshaft end play (2)	New	mm (in)	0.3 (.012)	
Maximum crankshaft deflection at PTO	Wear limit	mm (in)	0.06 (.0024)	
Connecting rod big end axial paly	New	mm (in)	0.390 to 0.737 (.0154 to .0290)	
	Wear limit	mm (in)	1.2 (.0472)	
ELECTRICAL				
Magneto generator output		W	360	
Ignition type			CDI	
Spark plug	Make and type		NGK BR9ECS	
	Gap	mm (in)	0.40 to 0.50 (.016 to .020) (8)	
Ignition timing BTDC (3)		mm (in)	3.00 (.118)	
Trigger coil (4)		Ω	190 to 300	
Generating coil (4)	Low speed		N.A.	
	High speed	Ω	N.A.	
Lighting coil (4)		Ω	0.1 to 1.0	
High tension coil (4)	Primary		N.A.	
	Secondary		N.A.	

Legend Sport 500 SS and Legend Sport GT 500 SS		Legend SPORT 500 SS	Legend SPORT Grand Touring 500 SS
Country		**CAN/U.S.**	**CAN/U.S.**
Engine Type		**593**	
FUEL SYSTEM			
Carburetor type	PTO/MAG	TM40–B232	
Main jet	PTO/MAG	500/500	
Needle jet		P-0 (5)	
Pilot jet		20	
Needle identification — clip position	PTO/MAG	9HGY1–58 (6)	
Slide cut-away		2.0	
Float adjustment	mm (in)	N.A.	
Air or pilot screw adjustment	± 1/16 turn	1.5	
Idle speed	± 200 RPM	1600	
Gas type		Unleaded	
Pump octane number		87 (R+M)/2 or higher	
Gas/oil ratio		Injection	
COOLING SYSTEM			
Type		Liquid cooled	
Axial fan belt adjustment	Deflection mm (in)	N.A.	
Axial fan belt adjustment	Force kg (lbf)	N.A.	
Thermostat opening temperature		42°C (108°F)	
Radiator cap opening pressure		90 kPa (13 PSI)	
TIGHTENING TORQUE (engine cold)			
Drive pulley retaining screw		(7)	
Exhaust manifold nuts or bolts		22 N•m (16 lbf•ft)	
Magneto ring nut		125 N•m (92 lbf•ft)	
Crankcase nuts or screws	M6	9 N•m (80 lbf•**in**)	
Crankcase nuts or screws	M8	29 N•m (21 lbf•ft)	
Crankcase/engine support nuts or screws		35 N•m (26 lbf•ft)	
Cylinder head screws		29 N•m (21 lbf•ft)	
Crankcase/cylinder nuts or screws		40 N•m (29 lbf•ft)	
Axial fan shaft nut		N.A.	

Legend Sport 600 HO SDI and Legend Sport GT 600 HO SDI			Legend Sport	
			600 HO SDI	Grand Touring 600 HO SDI
Country			**CAN/U.S.**	**CAN/U.S.**
Engine Type			**593**	
ENGINE				
Number of cylinder			2	
Bore	Standard	mm (in)	72 (2.835)	
Stroke		mm (in)	73.00 (2.874)	
Displacement		cm^3 (in^3)	594.40 (36.273)	
Compression ratio			12.25 ± 0.5	
Maximum power engine speed (1)			8000 ± 100 RPM	
Piston ring type	1st		Semi-trapezoidal	
	2nd		—	
Ring end gap	New	mm (in)	0.40 to 0.55 (.016 to .022)	
	Wear limit	mm (in)	1.0 (.039)	
Ring/piston groove clearance	New	mm (in)	0.05 to 0.10 (.0020 to .0039)	
	Wear limit	mm (in)	0.2 (.0079)	
Piston/cylinder wall clearance	New	mm (in)	0.105 ± 0.013 (.0041 ± .0009)	
	Wear limit	mm (in)	0.18 (.0071)	
Maximum crankshaft end play (2)	New	mm (in)	0.3 (.012)	
Maximum crankshaft deflection at PTO	Wear limit	mm (in)	0.06 (.0024)	
Connecting rod big end axial paly	New	mm (in)	0.310 to 0.677 (.0122 to .0267)	
	Wear limit	mm (in)	1.2 (.0472)	
ELECTRICAL				
Magneto generator output		W	480	
Ignition type			Inductive	
Spark plug	Make and type		NGK BR9ECS	
	Gap	mm (in)	0.75 to 0.85 (.030 to .033) (8)	
Ignition timing BTDC (12)		mm (in)	5.390 (.2122)	
Trigger coil (4)		Ω	190 to 290	
Generating coil (4)	Low speed		N.A.	
	High speed	Ω	N.A.	
Lighting coil (4)		Ω	0.145 to 0.185	
High tension coil (4)	Primary		N.A.	
	Secondary		N.A.	

Legend Sport 600 HO SDI and Legend Sport GT 600 HO SDI			**Legend Sport**	
			600 HO SDI	**Grand Touring 600 HO SDI**
Country			**CAN/U.S.**	**CAN/U.S.**
Engine Type			**593**	
FUEL SYSTEM				
Throttle body type		PTO/MAG	Dell'Orto without IACV	
Main jet		PTO/MAG	N.A.	
Needle jet			N.A.	
Pilot jet			N.A.	
Needle identification — clip position		PTO/MAG	N.A.	
Slide cut-away			N.A.	
Float adjustment		mm (in)	N.A.	
Air or pilot screw adjustment		± 1/16 turn	N.A.	
Idle speed		± 200 RPM	1500	
Gas type			Unleaded	
Pump octane number			87 (R+M)/2 or higher	
Gas/oil ratio			Injection	
COOLING SYSTEM				
Type			Liquid	
Axial fan belt adjustment	Deflection	mm (in)	N.A.	
	Force	kg (lbf)	N.A.	
Thermostat opening temperature			42°C (108°F)	
Radiator cap opening pressure			90 kPa (13 PSI)	
TIGHTENING TORQUE (engine cold)				
Drive pulley retaining screw			(7)	
Exhaust manifold nuts or bolts			22 N•m (16 lbf•ft)	
Magneto ring nut			125 N•m (92 lbf•ft)	
Crankcase nuts or screws		M6	9 N•m (80 lbf•in)	
		M8	29 N•m (21 lbf•ft)	
Crankcase/engine support nuts or screws			35 N•m (26 lbf•ft)	
Cylinder head screws			29 N•m (21 lbf•ft)	
Crankcase/cylinder nuts or screws			40 N•m (29 lbf•ft)	
Axial fan shaft nut			N.A.	

Legend Sport 700 and Legend Sport GT 700			Legend Sport	
			700	Grand Touring 700
Country			**CAN/U.S.**	**CAN/U.S.**
Engine Type			**693**	
ENGINE				
Number of cylinder			2	
Bore	Standard	mm (in)	78 (3.071)	
Stroke		mm (in)	73.00 (2.874)	
Displacement		cm^3 (in^3)	697.60 (42.570)	
Compression ratio			12.0 ± 0.5	
Maximum power engine speed (1)			8000 ± 100 RPM	
Piston ring type	1st		Semi-trapezoidal	
	2nd		N.A.	
Ring end gap	New	mm (in)	0.40 to 0.55 (.016 to .022)	
	Wear limit	mm (in)	1.0 (.039)	
Ring/piston groove clearance	New	mm (in)	0.04 to 0.09 (.0016 to .0035)	
	Wear limit	mm (in)	0.2 (.0079)	
Piston/cylinder wall clearance	New	mm (in)	0.115 ± 0.013 (.0045 ± .0005)	
	Wear limit	mm (in)	0.2 (.0079)	
Maximum crankshaft end play (2)	New	mm (in)	0.3 (.012)	
Maximum crankshaft deflection at PTO	Wear limit	mm (in)	0.06 (.0024)	
Connecting rod big end axial paly	New	mm (in)	0.310 to 0.677 (.0122 to .0267)	
	Wear limit	mm (in)	1.2 (.0472)	
ELECTRICAL				
Magneto generator output		W	360	
Ignition type			CDI	
Spark plug	Make and type		NGK BR9ECS	
	Gap	mm (in)	0.40 to 0.50 (.016 to .020) (8)	
Ignition timing BTDC (3)		mm (in)	3.370 (.1327)	
Trigger coil (4)		Ω	190 to 300	
Generating coil (4)	Low speed		N.A.	
	High speed	Ω	N.A.	
Lighting coil (4)		Ω	0.1 to 1.0	
High tension coil (4)	Primary		N.A.	
	Secondary		N.A.	

Legend Sport 700 and Legend Sport GT 700			Legend Sport	
			700	Grand Touring 700
Country			**CAN/U.S.**	**CAN/U.S.**
Engine Type			693	
FUEL SYSTEM				
Carburetor type	PTO/MAG		TM40 – B241	
Main jet	PTO/MAG		510N/510N	
Needle jet			P-0 (5)	
Pilot jet			17.5	
Needle identification — clip position	PTO/MAG		9ZLY3–58 (6)	
Slide cut-away			2.0	
Float adjustment		mm (in)	N.A.	
Air or pilot screw adjustment	± 1/16 turn		1.5	
Idle speed	± 200 RPM		1500	
Gas type			Unleaded	
Pump octane number			87 (R+M)/2 or higher	
Gas/oil ratio			Injection	
COOLING SYSTEM				
Type			Liquid cooled	
Axial fan belt adjustment	Deflection	mm (in)	N.A.	
	Force	kg (lbf)	N.A.	
Thermostat opening temperature			42°C (108°F)	
Radiator cap opening pressure			90 kPa (13 PSI)	
TIGHTENING TORQUE (engine cold)				
Drive pulley retaining screw			(7)	
Exhaust manifold nuts or bolts			22 N•m (16 lbf•ft)	
Magneto ring nut			125 N•m (92 lbf•ft)	
Crankcase nuts or screws	M6		9 N•m (80 lbf•**in**)	
	M8		29 N•m (21 lbf•ft)	
Crankcase/engine support nuts or screws			35 N•m (26 lbf•ft)	
Cylinder head screws			29 N•m (21 lbf•ft)	
Crankcase/cylinder nuts or screws			40 N•m (29 lbf•ft)	
Axial fan shaft nut			N.A.	

Legend Sport V-1000 and Legend Sport GT V-1000				Legend Sport	
				V-1000	Grand Touring V-1000
Country				**CAN/U.S.**	**CAN/U.S.**
Engine Type				**1004**	
ENGINE					
Engine type				BOMBARDIER-ROTAX 1004 4-TEC, 4-stroke, Over Head Camshaft (OHC), liquid cooled	
Cylinder arrangement and quantity				V2	
Valves per cylinder				4 valves with hydraulic lifters (no adjustment)	
Bore		Standard	mm (in)	100 (3.937)	
Stroke			mm (in)	63.4 (2.496)	
Displacement			cm^3 (in^3)	995.90 (60.774)	
Compression ratio				10.5 ± 0.5	
Decompressor type				Automatic	
Engine speed for transmission calibration (9)				6000 to 7250 RPM progressive	
Lubrication				Dry sump with replaceable oil filter	
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	mm (in)	5.961 to 5.975 (.2347 to .2352)	
		Wear limit	mm (in)	5.930 (.2330)	
	Exhaust	New	mm (in)	5.946 to 5.960 (.2341 to .2346)	
		Wear limit	mm (in)	5.930 (.2330)	
Valve guide diameter		Wear limit	mm (in)	6.060 (.2386)	
Valve spring free length	Inner	Nominal (new)	mm (in)	41.02 (1.615)	
		Wear limit	mm (in)	38.8 (1.499)	
	Outer	Nominal (new)	mm (in)	45.45 (1.789)	
		Wear limit	mm (in)	43 (1.693)	
Valve seat contact width	Intake	Nominal (new)	mm (in)	1.1 to 1.3 (.043 to .051)	
		Wear limit	mm (in)	1.6 (.063)	
	Exhaust	Nominal (new)	mm (in)	1.25 to 1.55 (.049 to 061)	
		Wear limit	mm (in)	1.8 (.071)	
Rocker arm bore diameter		New	mm (in)	20.007 to 20.020 (.7876 to .7881)	
		Wear limit	mm (in)	20.035 (.7887)	
Rocker arm shaft diameter		New	mm (in)	19.980 to 19.993 (.7866 to 7871)	
		Wear limit	mm (in)	19.965 (.7860)	
Cylinder head screw length		Service limit	mm (in)	216.5 (8.524)	

Legend Sport V-1000 and Legend Sport GT V-1000				Legend Sport V-1000	Legend Sport Grand Touring V-1000
Country				CAN/U.S.	CAN/U.S.
Engine Type				1004	
ENGINE (cont'd)					
Piston ring type		1st		Rectangular	
		2nd		Taper face	
		3rd		Oil scraper ring	
Ring end gap	1st	New	mm (in)	0.15 to 0.35 (.006 to .014)	
	2nd	New	mm (in)	0.15 to 0.35 (.006 to .014)	
	3rd	New	mm (in)	0.15 to 0.3 (.006 to .012)	
	All	Wear limit	mm (in)	1.5 (.060)	
Ring/piston groove clearance	1st	New	mm (in)	0.025 to 0.07 (.001 to .0028)	
	2nd	New	mm (in)	0.015 to 0.06 (.0006 to .0024)	
	3rd	New	mm (in)	0.02 to 0.055 (.0008 to .0021)	
	All	Wear limit	mm (in)	0.15 (.006)	
Piston/cylinder wall clearance		New	mm (in)	0.024 to 0.056 (.001 to .0022)	
		Wear limit	mm (in)	0.09 (.0035)	
Cylinder taper (maximum)		New (maximum)	mm (in)	0.038 (.0015)	
		Wear limit	mm (in)	0.09 (.0035)	
Cylinder out of round		New (maximum)	mm (in)	0.01 (.0004)	
		Wear limit	mm (in)	0.02 (.0008)	
Camshaft bearing journal	PTO side	New	mm (in)	24.967 to 24.980 (.9830 to .9835)	
		Wear limit	mm (in)	24.960 (.9827)	
	Alternator side	New	mm (in)	39.927 to 39.935 (1.5719 to 1.5722)	
		Wear limit	mm (in)	39.920 (1.5716)	
Camshaft bore	PTO side	New	mm (in)	25.000 to 25.013 (.9842 to .9848)	
		Wear limit	mm (in)	25.020 (.9850)	
	Alternator side	New	mm (in)	40.000 to 40.016 (1.5748 to 1.5754)	
		Wear limit	mm (in)	40.020 (1.5756)	
Cam lobe	Intake	New	mm (in)	31.654 to 31.854 (1.2462 to 1.2541)	
		Wear limit	mm (in)	31.600 (1.2441)	
	Exhaust	New	mm (in)	31.435 to 31.635 (1.2376 to 1.2455)	
		Wear limit	mm (in)	31.400 (1.2362)	
Crankshaft axial clearance		New	mm (in)	0.100 to 0.400 (.0039 to .0157)	
Crankshaft journal diameter		New	mm (in)	54.961 to 54.980 (2.1638 to 2.1646)	
		Wear limit	mm (in)	54.940 (2.1630)	
Crankshaft deflection		Wear limit	mm (in)	0.050 (.002)	
Crankshaft radial clearance		Wear limit	mm (in)	0.080 (.0031)	

Legend Sport V-1000 and Legend Sport GT V-1000			Legend Sport	
			V-1000	Grand Touring V-1000
Country			CAN/U.S.	CAN/U.S.
Engine Type			1004	
ENGINE (cont'd)				
Connecting rod big end diameter		Wear limit mm (in)	45.090 (1.7752)	
Connecting rod big end clearance		Wear limit mm (in)	0.09 (.0035)	
Connecting rod big end axial paly		New mm (in)	0.150 to 0.450 (.0059 to .0177)	
		Wear limit mm (in)	0.500 (.0197)	
Connecting rod small end diameter		New mm (in)	23.010 to 23.020 (.9059 to 9063)	
		Wear limit mm (in)	23.070 (.9080)	
Piston pin diameter		New mm (in)	22.996 to 23.000 (.9053 to .9055)	
		Wear limit mm (in)	22.990 (.9051)	
Piston pin bore clearance		Wear limit mm (in)	0.080 (.0031)	
ELECTRICAL				
Alternator output		A	40	
Ignition system type			DI (Digital Induction)	
Ignition timing			Not adjustable	
Spark plug	Make and type		NGK DCPR8E	
	Gap	mm (in)	0.75 (.030)	
Ignition coil	Primary	Ω	0.85 to 1.15	
	Secondary	kΩ	9.2 to 13.8	
Engine RPM limiter setting			8000 RPM	
FUEL SYSTEM				
Fuel injection type			ROTAX EMS (Engine Management System) Multipoint Fuel Injection, Single throttle body (52 mm)	
Fuel pressure		kPa (PSI)	400 (58)	
Idle speed			1400 ± 100 RPM	
Throttle Position Sensor (TPS) (4)		kΩ	1.6 to 2.4	
Crankshaft Position Sensor (CPS) (4)		Ω	0.7 to 1.1	
Camshaft Position Sensor (CAPS)			12 volts	
Camshaft Position Sensor (CAPS) (4)		kΩ	1.2	
Air Temperature Sensor (ATS) (4)		kΩ	2.28 to 2.74	
Coolant Temperature Sensor (CTS) (4)		kΩ	2.28 to 2.74	
Manifold Air Pressure Sensor (MAPS)			5 volts	
Idle bypass valve (4)		Ω	50	
Oil Pressure Switch (OPS) (4)			0 Ω, if oil pressure is lower than 20 kPa (2.9 PSI)	
Fuel injector		Ω	13.8 to 15.2	
Fuel		Type	Regular unleaded gasoline	
		Octane	87 (R+M)/2 or higher	

Legend Sport V-1000 and Legend Sport GT V-1000		Legend Sport	
		V-1000	Grand Touring V-1000
Country		**CAN/U.S.**	**CAN/U.S.**
Engine Type		**1004**	
COOLING SYSTEM			
Type		Liquid cooled	
Coolant		(10)	
Thermostat		82°C (180°F)	
TIGHTENING TORQUE (engine cold)			
Drive pulley retaining screw		(11)	
Cylinder head screws	M11	50 N•m (37 lbf•ft) + 90° rotation	
	M6	9 N•m (80 lbf•**in**)	
Rocker arm shaft screws		20 N•m (15 lbf•ft) + 90° rotation	
Crankshaft nut		82 N•m (60 lbf•ft)	
Connecting rod screws		45 N•m (33 lbf•ft) + 90° rotation	
Crankcase screws	M6	9 N•m (80 lbf•**in**)	
	M8	23 N•m (17 lbf•ft)	
Oil drain plug		55 N•m (41 lbf•ft)	
Alternator screws		23 N•m (17 lbf•ft)	
Oil filter cover screw		9 N•m (80 lbf•**in**)	
Manifold screws		23 N•m (17 lbf•ft)	

VEHICLES

<table>
<tr><th colspan="3" rowspan="2">MX Z 380 F, Legend 380 F and Legend GT 380 F</th><th>MX Z</th><th colspan="2">Legend</th></tr>
<tr><th>380 F</th><th>380 F</th><th>Grand Touring 380 F</th></tr>
<tr><td colspan="3">Country</td><td>CAN/U.S.</td><td>CAN/U.S.</td><td>CAN/U.S.</td></tr>
<tr><td colspan="6">DRIVE</td></tr>
<tr><td colspan="3">Chain drive ratio</td><td colspan="3">19/43</td></tr>
<tr><td rowspan="2">Chain</td><td colspan="2">Pitch in</td><td colspan="3">3/8</td></tr>
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<tr><td rowspan="10">Drive pulley</td><td colspan="2">Type</td><td colspan="3">Bombardier Lite</td></tr>
<tr><td rowspan="9">Calibration</td><td>Clutch engagement RPM</td><td colspan="3">3600 ± 100</td></tr>
<tr><td>Spring color</td><td colspan="3">Blue/Green</td></tr>
<tr><td>Spring length</td><td colspan="3">—</td></tr>
<tr><td>Weight 417 120 400 = 21 g
417 114 400 = 3.4 g</td><td colspan="3">1 x 417 120 400 + 4 x 417 114 400</td></tr>
<tr><td>Block</td><td colspan="3">417 118 100</td></tr>
<tr><td>Cap</td><td colspan="3">1 x 417 114 500</td></tr>
<tr><td>Pin</td><td colspan="3">—</td></tr>
<tr><td>Ramp</td><td colspan="3">—</td></tr>
<tr><td>Screw position</td><td colspan="3">—</td></tr>
<tr><td rowspan="3">Driven pulley</td><td colspan="2">Type</td><td colspan="3">Formula RER</td></tr>
<tr><td colspan="2">Spring preload</td><td colspan="3">N.A.</td></tr>
<tr><td colspan="2">Cam angle</td><td colspan="3">44°</td></tr>
<tr><td>Pulley distance</td><td colspan="2">Z mm (in)</td><td colspan="3">26.0 ± 0.5 (1.024 ± .02)</td></tr>
<tr><td rowspan="2">Offset</td><td colspan="2">X mm (in)</td><td colspan="3">33.4 ± 0.5 (1.315 ± 0.2)</td></tr>
<tr><td>Y – X</td><td>MIN.-MAX. mm (in)</td><td colspan="3">1.0 ± 0.75 (.039 ± .030)</td></tr>
<tr><td colspan="3">Drive belt part number (P/N)</td><td colspan="3">415 060 600</td></tr>
<tr><td colspan="2">Drive belt width</td><td>Wear limit mm (in)</td><td colspan="3">31.70 (1.248)</td></tr>
<tr><td colspan="2" rowspan="2">Drive belt adjustment</td><td>Deflection mm (in)</td><td colspan="3">32 ± 5 (1.260 ± .197)</td></tr>
<tr><td>Force (1) kg (lbf)</td><td colspan="3">11.34 (25)</td></tr>
<tr><td rowspan="5">Track</td><td colspan="2">Width mm (in)</td><td colspan="3">381 (15)</td></tr>
<tr><td colspan="2">Length mm (in)</td><td colspan="2">3074 (121)</td><td>3455 (136)</td></tr>
<tr><td colspan="2">Profile height mm (in)</td><td colspan="3">18.4 (.724)</td></tr>
<tr><td rowspan="2">Adjustment</td><td>Deflection mm (in)</td><td colspan="3">35 to 40 (1.378 to 1.575)</td></tr>
<tr><td>Force (2) kg (lbf)</td><td colspan="3">7.3 (16)</td></tr>
<tr><td colspan="2" rowspan="2">Suspension type</td><td>Track</td><td colspan="3">SC–10 III</td></tr>
<tr><td>Ski</td><td colspan="3">ADSA</td></tr>
</table>

MX Z 380 F, Legend 380 F and Legend GT 380 F			MX Z	Legend	
			380 F	380 F	Grand Touring 380 F
Country			**CAN/U.S.**	**CAN/U.S.**	**CAN/U.S.**
ELECTRICAL					
Battery			N.A.	12 V, 18 A•h	
Headlamp		W	60/55 (H4)		
Taillight and stoplight		W	8/27		
Tachometer and speedometer bulbs		W	2 x 3		
Fuel and temperature gauge bulbs		W	N.A.		
Fuse	Starter solenoid	A	N.A.	30	
	Fuel level sensor	A	N.A.	0.25	
CAPACITIES					
Fuel tank		L (U.S. gal)	36 (9.5)		
Chaincase/gearbox		mL (U.S. oz)	250 (8.5)		
Cooling system (3)		L (U.S. oz)	N.A.		
Injection oil reservoir		L (U.S. oz)	3.5 (118.4)		
VEHICLE INFORMATIONS					
Mass (dry)		kg (lb)	191 (420)	200 (440)	218 (480)
Length		mm (in)	2766 (109)		3004 (118.3)
Width		mm (in)	1144 (45)		
Height		mm (in)	1130 (44.5)	1232 (48.5)	1409 (55.5)
Ski stance (carbide to carbide)		mm (in)	1080 (42.5)		
Toe-out			0		
Camber			0°		
Ground contact area		cm^2 (in^2)	6477 (1004)		7163 (1110)
Ground contact pressure		kPa (PSI)	2.89 (.419)	3.03 (.439)	2.99 (.434)
Frame material			Aluminum		
Bottom pan material			Impact Copolymer		
Hood material			Surlyn		

MX Z 380 F and Legend GT 380 F				MX Z 380 F	Legend Grand Touring 380 F
Country				EUROPE	EUROPE
DRIVE					
Chain drive ratio				19/43	18/43
Chain	Pitch		in	3/8	
	Type/links qty/plate qty			Silent 72/11	
Drive pulley	Type			Bombardier Lite	
	Calibration	Clutch engagement	RPM	3600 ± 100	
		Spring color		Blue/Green	
		Spring length		—	
		Weight	417 120 400 = 21 g 417 114 400 = 3.4 g	1 x 417 120 400 + 4 x 417 114 400	
		Block		417 118 100	
		Cap		1 x 417 114 500	
		Pin		—	
		Ramp		—	
		Screw position		—	
Driven pulley	Type			Formula RER	
	Spring preload			N.A.	
	Cam angle			44°	
Pulley distance	Z		mm (in)	26.0 ± 0.5 (1.024 ± .02)	
Offset	X		mm (in)	33.4 ± 0.5 (1.315 ± 0.2)	
	Y – X	MIN.-MAX.	mm (in)	1.0 ± 0.75 (.039 ± .030)	
Drive belt part number (P/N)				415 060 600	
Drive belt width		Wear limit	mm (in)	31.70 (1.248)	
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)	3074 (121)	3455 (136)
	Profile height		mm (in)	18.4 (.724)	
	Adjustment	Deflection	mm (in)	35 to 40 (1.378 to 1.575)	
		Force (2)	kg (lbf)	7.3 (16)	
Suspension type		Track		SC–10 III	
		Ski		ADSA	

MX Z 380 F and Legend GT 380 F			MX Z 380 F	Legend Grand Touring 380 F
Country			EUROPE	EUROPE
ELECTRICAL				
Battery			N.A.	12 V, 18 A•h
Headlamp		W	60/55 (H4)	
Taillight and stoplight		W	8/27	
Tachometer and speedometer bulbs		W	2 x 3	
Fuel and temperature gauge bulbs		W	N.A.	
Fuse	Starter solenoid	A	N.A.	30
	Fuel level sensor	A	N.A.	.25
CAPACITIES				
Fuel tank		L (U.S. gal)	36 (9.5)	
Chaincase/gearbox		mL (U.S. oz)	250 (8.5)	
Cooling system (3)		L (U.S. oz)	N.A.	
Injection oil reservoir		L (U.S. oz)	3.5 (118.4)	
VEHICLE INFORMATIONS				
Mass (dry)		kg (lb)	191 (420)	218 (480)
Length		mm (in)	2766 (109)	3069 (121)
Width		mm (in)	1144 (45)	
Height		mm (in)	1130 (44.5)	1409 (55.5)
Ski stance (carbide to carbide)		mm (in)	1080 (42.5)	
Toe-out			0	
Camber			0°	
Ground contact area		cm^2 (in^2)	6477 (1004)	7163 (1110)
Ground contact pressure		kPa (PSI)	2.89 (.419)	2.99 (.434)
Frame material			Aluminum	
Bottom pan material			Impact Copolymer	
Hood material			Surlyn	

MX Z 550 F, Legend 550 F and Legend GT 550 F				MX Z 550 F	Legend 550 F	Legend Grand Touring 550 F
Country				CAN/U.S.	CAN/U.S.	CAN/U.S.
DRIVE						
Chain drive ratio				22/43	22/43	20/43
Chain	Pitch		in	3/8		
Chain	Type/links qty/plate qty			Silent 74/11		
Drive pulley	Type			Bombardier Lite		
Drive pulley	Calibration	Clutch engagement	RPM	3500 ± 100	3500 ± 100	3300 ± 100
Drive pulley	Calibration	Spring color		Purple/Yellow	Purple/Yellow	Purple/Green
Drive pulley	Calibration	Spring length		—		
Drive pulley	Calibration	Weight	417 120 400 = 21 g 417 114 400 = 3.4 g	1 x 417 120 400 + 3 x 417 114 400	1 x 417 120 400 + 3 x 417 114 400	1 x 417 120 400 + 4 x 417 114 400
Drive pulley	Calibration	Block		—		
Drive pulley	Calibration	Cap		1 x 417 114 500		
Drive pulley	Calibration	Pin		—		
Drive pulley	Calibration	Ramp		—		
Drive pulley	Calibration	Screw position		—		
Driven pulley	Type			Formula RER		
Driven pulley	Spring preload			N.A.		
Driven pulley	Cam angle			50/47°		
Pulley distance	Z		mm (in)	26.0 ± 0.5 (1.024 ± .02)		
Offset	X		mm (in)	33.4 ± 0.5 (1.315 ± 0.2)		
Offset	Y – X	MIN.-MAX.	mm (in)	1.0 ± 0.75 (.039 ± .030)		
Drive belt part number (P/N)				415 060 600		
Drive belt width		Wear limit	mm (in)	31.70 (1.248)		
Drive belt adjustment		Deflection	mm (in)	32 ± 5 (1.260 ± .197)		
Drive belt adjustment		Force (1)	kg (lbf)	11.34 (25)		
Track	Width		mm (in)	381 (15)		
Track	Length		mm (in)	3074 (121)	3074 (121)	3455 (136)
Track	Profile height		mm (in)	22.3 (.878)		
Track	Adjustment	Deflection	mm (in)	35 to 40 (1.378 to 1.575)		
Track	Adjustment	Force (2)	kg (lbf)	7.3 (16)		
Suspension type		Track		SC–10 III		
Suspension type		Ski		ADSA		

MX Z 550 F, Legend 550 F and Legend GT 550 F			MX Z	Legend	
			550 F	550 F	Grand Touring 550 F
Country			**CAN/U.S.**	**CAN/U.S.**	**CAN/U.S.**
ELECTRICAL					
Battery			N.A.	12 V, 18 A•h	
Headlamp		W	60/55 (H4)		
Taillight and stoplight		W	8/27		
Tachometer and speedometer bulbs		W	2 x 3		
Fuel and temperature gauge bulbs		W	N.A.		
Fuse	Starter solenoid	A	N.A.	30	
	Fuel level sensor	A	N.A.	0.25	
CAPACITIES					
Fuel tank		L (U.S. gal)	36 (9.5)		
Chaincase/gearbox		mL (U.S. oz)	250 (8.5)		
Cooling system (3)		L (U.S. oz)	N.A.		
Injection oil reservoir		L (U.S. oz)	3.5 (118.4)		
VEHICLE INFORMATIONS					
Mass (dry)		kg (lb)	200 (440)	209 (460)	227 (499)
Length		mm (in)	2766 (109)		3004 (118.3)
Width		mm (in)	1144 (45)		
Height		mm (in)	1130 (44.5)	1232 (48.5)	1409 (55.5)
Ski stance (carbide to carbide)		mm (in)	1080 (42.5)		
Toe-out			0		
Camber			0°		
Ground contact area		cm^2 (in^2)	6477 (1004)		7163 (1110)
Ground contact pressure		kPa (PSI)	3.03 (.439)	3.17 (.460)	3.11 (.451)
Frame material			Aluminum		
Bottom pan material			Impact Copolymer		
Hood material			Surlyn		

MX Z 550 F and Legend GT 550 F				MX Z 550 F	Legend Grand Touring 550 F
Country				**EUROPE**	**EUROPE**
DRIVE					
Chain drive ratio				22/43	19/43
Chain	Pitch		in	3/8	
Chain	Type/links qty/plate qty			Silent 74/11	Silent 72/11
Drive pulley	Type			Bombardier Lite	
Drive pulley	Calibration	Clutch engagement	RPM	3600 ± 100	3500 ± 100
Drive pulley	Calibration	Spring color		Purple/Yellow	Purple/Green
Drive pulley	Calibration	Spring length		—	
Drive pulley	Calibration	Weight	417 120 400 = 21 g 417 114 400 = 3.4 g	1 x 417 120 400 + 3 x 417 114 400	1 x 417 120 400 + 4 x 417 114 400
Drive pulley	Calibration	Block		—	
Drive pulley	Calibration	Cap		1 x 417 114 500	
Drive pulley	Calibration	Pin		—	
Drive pulley	Calibration	Ramp		—	
Drive pulley	Calibration	Screw position		—	
Driven pulley	Type			Formula RER	
Driven pulley	Spring preload			N.A.	
Driven pulley	Cam angle			50/47°	
Pulley distance	Z		mm (in)	26.0 ± 0.5 (1.024 ± .02)	
Offset	X		mm (in)	33.4 ± 0.5 (1.315 ± 0.2)	
Offset	Y – X	MIN.-MAX.	mm (in)	1.0 ± 0.75 (.039 ± .030)	
Drive belt part number (P/N)				415 060 600	
Drive belt width		Wear limit	mm (in)	31.70 (1.248)	
Drive belt adjustment		Deflection	mm (in)	32 ± 5 (1.260 ± .197)	
Drive belt adjustment		Force (1)	kg (lbf)	11.34 (25)	
Track	Width		mm (in)	381 (15)	
Track	Length		mm (in)	3074 (121)	3455 (136)
Track	Profile height		mm (in)	22.3 (.878)	
Track	Adjustment	Deflection	mm (in)	35 to 40 (1.378 to 1.575)	
Track	Adjustment	Force (2)	kg (lbf)	7.3 (16)	
Suspension type		Track		SC–10 III	
Suspension type		Ski		ADSA	
ELECTRICAL					
Battery				N.A.	12 V, 18 A•h
Headlamp			W	60/55 (H4)	
Taillight and stoplight			W	8/27	
Tachometer and speedometer bulbs			W	2 x 3	
Fuel and temperature gauge bulbs			W	N.A.	
Fuse	Starter solenoid		A	N.A.	30
Fuse	Fuel level sensor		A	N.A.	.25

MX Z 550 F and Legend GT 550 F		MX Z 550 F	Legend Grand Touring 550 F
Country		**EUROPE**	**EUROPE**
CAPACITIES			
Fuel tank	L (U.S. gal)	36 (9.5)	
Chaincase/gearbox	mL (U.S. oz)	250 (8.5)	
Cooling system (3)	L (U.S. oz)	N.A.	
Injection oil reservoir	L (U.S. oz)	3.5 (118.4)	
VEHICLE INFORMATIONS			
Mass (dry)	kg (lb)	200 (440)	227 (499)
Length	mm (in)	2766 (109)	3069 (121)
Width	mm (in)	1144 (45)	
Height	mm (in)	1130 (44.5)	1409 (55.5)
Ski stance (carbide to carbide)	mm (in)	1080 (42.5)	
Toe-out		0	
Camber		0°	
Ground contact area	cm^2 (in^2)	6477 (1004)	7163 (1110)
Ground contact pressure	kPa (PSI)	3.03 (.439)	3.11 (.451)
Frame material		Aluminum	
Bottom pan material		Impact Copolymer	
Hood material		Surlyn	

Skandic 550 F and Summit 550 F				Skandic Sport 550 F	Summit 550 F	Summit 550 F
Country				CAN/U.S.	CAN/U.S.	EUROPE
DRIVE						
Chain drive ratio				20/43	19/43	18/43
Chain	Pitch		in	3/8		
	Type/links qty/plate qty			Silent 74/11	Silent 72/11	
Drive pulley	Type			Bombardier Lite		
	Calibration	Clutch engagement	RPM	3300 ± 100	3500 ± 100	
		Spring color		Purple/Green		Purple/Yellow
		Spring length	mm (in)	134 (5.276)		—
		Weight	417 120 400 = 21 g 417 114 400 = 3.4 g	1 x 417 120 400 + 4 x 417 114 400	1 x 417 120 400 + 1 x 417 114 400	1 x 417 120 400 + 3 x 417 114 400
		Block		—		
		Cap		1 x 417 114 500		
		Pin		—		
		Ramp		—		
		Screw position		—		
Driven pulley	Type			Formula RER		
	Spring preload			N.A.		
	Cam angle			50/47°		
Pulley distance	Z		mm (in)	26.0 ± 0.5 (1.024 ± .02)		
Offset	X		mm (in)	33.4 ± 0.5 (1.315 ± 0.2)		
	Y – X	MIN.-MAX.	mm (in)	1.0 ± 0.75 (.039 ± .030)		
Drive belt part number (P/N)				415 060 600		
Drive belt width		Wear limit	mm (in)	31.70 (1.248)		
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)	3074 (121)		3455 (136)
	Profile height		mm (in)	31.8 (1.252)	38.1 (1.500)	
	Adjustment	Deflection	mm (in)	35 to 40 (1.378 to 1.575)		30 to 35 (1.181 to 1.378)
		Force (2)	kg (lbf)	7.3 (16)		
Suspension type		Track		SC –10 III	SC – 10	
		Ski		ADSA		

Skandic 550 F and Summit 550 F			Skandic	Summit	
			Sport 550 F	550 F	550 F
Country			CAN/U.S.	CAN/U.S.	EUROPE
ELECTRICAL					
Battery			N.A.		
Headlamp		W	60/55 (H4)		
Taillight and stoplight		W	8/27		
Tachometer and speedometer bulbs		W	2 x 3		
Fuel and temperature gauge bulbs		W	N.A.		
Fuse	Starter solenoid	A	N.A.		
	Fuel level sensor	A	N.A.		
CAPACITIES					
Fuel tank		L (U.S. gal)	36 (9.5)		
Chaincase/gearbox		mL (U.S. oz)	250 (8.5)		
Cooling system (3)		L (U.S. oz)	N.A.		
Injection oil reservoir		L (U.S. oz)	3.5 (118.4)		
VEHICLE INFORMATIONS					
Mass (dry)		kg (lb)	206 (453)	202 (444)	
Length		mm (in)	3004 (118.3)	2932 (115)	
Width		mm (in)	1144 (45)	1139 (44.8)	
Height		mm (in)	1409 (55.5)	1232 (48.5)	1130 (44.5)
Ski stance (carbide to carbide)		mm (in)	1080 (42.5)		1029 (40.5)
Toe-out			0		
Camber			0°		
Ground contact area		cm^2 (in^2)	7163 (1110)	8227 (1275)	
Ground contact pressure		kPa (PSI)	2.82 (.409)	2.41 (.349)	
Frame material			Aluminum		
Bottom pan material			Impact Copolymer		
Hood material			Surlyn		

Legend SE 600 HO SDI and Legend SE GT 600 HO SDI				Legend SE	
				600 HO SDI	Grand Touring 600 HO SDI
Country				**CAN/U.S.**	**CAN/U.S.**
DRIVE					
Chain drive ratio				24/43	23/43
Chain	Pitch		in	3/8	
	Type/links qty/plate qty			Silent 74/13	
Drive pulley	Type			TRA III	
	Calibration	Clutch engagement	RPM	3800 ± 100	
		Spring color		Purple/Blue	
		Spring length	mm (in)	114.6 (4.5)	
		Weight		—	
		Block		—	
		Cap		—	
		Pin		Solid (P/N 417 004 308)	
		Ramp		410	
		Screw position		3	
Driven pulley	Type			HPV VSA	
	Spring preload			0	
	Cam angle			47/44°	
Pulley distance	Z		mm (in)	20.0 ± 0.5 (.787 ± .02)	
Offset	X		mm (in)	37.0 ± 0.5 (1.457 ± 0.2)	
	Y – X	MIN.-MAX.	mm (in)	1.5 ± 0.75 (.059 ± .030)	
Drive belt part number (P/N)				417 300 197	
Drive belt width (5)		Wear limit	mm (in)	33.35 (1.313)	
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)	3074 (121)	3455 (136)
	Profile height		mm (in)	22.3 (.878)	
	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	

Legend SE 600 HO SDI and Legend SE GT 600 HO SDI			Legend SE	
			600 HO SDI	Grand Touring 600 HO SDI
Country			**CAN/U.S.**	**CAN/U.S.**
ELECTRICAL				
Battery			12 V, 18 A•h	
Headlamp		W	60/55 (H4)	
Taillight and stoplight		W	8/27	
Tachometer and speedometer bulbs		W	2 x 3	
Fuel and temperature gauge bulbs		W	3	
Fuse	Starter solenoid	A	30	
	Fuel level sensor	A	.25	
CAPACITIES				
Fuel tank		L (U.S. gal)	36 (9.5)	
Chaincase/gearbox		mL (U.S. oz)	250 (8.5)	
Cooling system (3)		L (U.S. oz)	3.8 (128.5)	4.0 (135.3)
Injection oil reservoir		L (U.S. oz)	3.5 (118.4)	
VEHICLE INFORMATIONS				
Mass (dry)		kg (lb)	224 (493)	250 (550)
Length		mm (in)	2801 (110)	3039 (120)
Width		mm (in)	1217 (48)	
Height		mm (in)	1232 (48.5)	1409 (55.5)
Ski stance (carbide to carbide)		mm (in)	1195 (47)	
Toe-out			0	
Camber			0°	
Ground contact area		cm^2 (in^2)	6910 (1071)	7596 (1177)
Ground contact pressure		kPa (PSI)	3.18 (.461)	3.23 (.468)
Frame material			Aluminum	
Bottom pan material			Impact Copolymer	
Hood material			Surlyn	

Legend SE 700 and Legend SE GT 700				Legend SE	
				700	Grand Touring 700
Country				**CAN/U.S.**	**CAN/U.S.**
DRIVE					
Chain drive ratio				25/43	23/43
Chain	Pitch		in	3/8	
	Type/links qty/plate qty			Silent 76/13	Silent 74/13
Drive pulley	Type			TRA	
	Calibration	Clutch engagement	RPM	3600 ± 100	
		Spring color		Blue/Yellow	
		Spring length	mm (in)	115.1 (4.531)	
		Weight		—	
		Block		—	
		Cap		—	
		Pin		Solid (P/N 417 004 308)	
		Ramp		299	
		Screw position		3	
Driven pulley	Type			HPV27	
	Spring preload			0	
	Cam angle			47°	
Pulley distance	Z		mm (in)	17.5 ± 0.5 (.689 ± .02)	
Offset	X		mm (in)	35.5 ± 0.5 (1.398 ± 0.2)	
	Y – X	MIN.-MAX.	mm (in)	1.5 ± 0.75 (.059 ± .030)	
Drive belt part number (P/N)				417 300 127	
Drive belt width		Wear limit	mm (in)	32.3 (1.272)	
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)	3074 (121)	3455 (136)
	Profile height		mm (in)	22.3 (.878)	
	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	
ELECTRICAL					
Battery				12 V, 18 A•h	
Headlamp			W	60/55 (H4)	
Taillight and stoplight			W	8/27	
Tachometer and speedometer bulbs			W	2 x 3	
Fuel and temperature gauge bulbs			W	3	
Fuse	Starter solenoid		A	30	
	Fuel level sensor		A	.25	

Legend SE 700 and Legend SE GT 700		Legend SE	
		700	Grand Touring 700
Country		**CAN/U.S.**	**CAN/U.S.**
CAPACITIES			
Fuel tank	L (U.S. gal)	36 (9.5)	
Chaincase/gearbox	mL (U.S. oz)	250 (8.5)	
Cooling system (3)	L (U.S. oz)	3.8 (128.5)	4 (135)
Injection oil reservoir	L (U.S. oz)	3.5 (118.4)	
VEHICLE INFORMATIONS			
Mass (dry)	kg (lb)	224 (493)	250 (550)
Length	mm (in)	2801 (110)	3039 (120)
Width	mm (in)	1217 (48)	
Height	mm (in)	1232 (48.5)	1409 (55.5)
Ski stance (carbide to carbide)	mm (in)	1195 (47)	
Toe-out		0	
Camber		0°	
Ground contact area	cm^2 (in^2)	6910 (1071)	7596 (117)
Ground contact pressure	kPa (PSI)	3.18 (.461)	3.23 (.468)
Frame material		Aluminum	
Bottom pan material		Impact Copolymer	
Hood material		Surlyn	

Legend SE 800 SDI and Legend SE GT 800 SDI					Legend SE 800 SDI	Legend SE Grand Touring 800 SDI
Country					CAN/U.S.	CAN/U.S.
DRIVE						
Chain drive ratio					26/43	24/43
Chain	Pitch			in	3/8	
Chain	Type/links qty/plate qty				Silent 76/13	Silent 74/13
Drive pulley	Type				TRA III	
Drive pulley	Calibration	Clutch engagement		RPM	3800 ± 100	
Drive pulley	Calibration	Spring color			Violet/Yellow	
Drive pulley	Calibration	Spring length		mm (in)	158 (6)	
Drive pulley	Calibration	Weight			—	
Drive pulley	Calibration	Block			—	
Drive pulley	Calibration	Cap			—	
Drive pulley	Calibration	Pin			Solid (P/N 417 004 308)	
Drive pulley	Calibration	Ramp			414	
Drive pulley	Calibration	Screw position			3	
Driven pulley	Type				HPV VSA	
Driven pulley	Spring preload				0	
Driven pulley	Cam angle				47/44°	
Pulley distance	Z			mm (in)	20 ± 0.5 (.787 ± .02)	
Offset	X			mm (in)	37 ± 0.5 (1.457 ± 0.2)	
Offset	Y – X		MIN.-MAX.	mm (in)	1.5 ± 0.75 (.059 ± .030)	
Drive belt part number (P/N)					417 300 166	
Drive belt width (5)			Wear limit	mm (in)	34.7 (1.366)	
Drive belt adjustment			Deflection	mm (in)	32 ± 5 (1.260 ± .197)	
Drive belt adjustment			Force (1)	kg (lbf)	11.34 (25)	
Track	Width			mm (in)	381 (15)	
Track	Length			mm (in)	3074 (121)	3455 (136)
Track	Profile height			mm (in)	22.3 (.878)	
Track	Adjustment		Deflection	mm (in)	30 to 35 (1.181 to 1.378)	
Track	Adjustment		Force (2)	kg (lbf)	7.3 (16)	
Suspension type			Track		SC–10 III	
Suspension type			Ski		ADSA	

Legend SE 800 SDI and Legend SE GT 800 SDI			Legend SE	
			800 SDI	Grand Touring 800 SDI
Country			**CAN/U.S.**	**CAN/U.S.**
ELECTRICAL				
Battery			12 V, 18 A•h	
Headlamp		W	60/55 (H4)	
Taillight and stoplight		W	8/27	
Tachometer and speedometer bulbs		W	2 x 3	
Fuel and temperature gauge bulbs		W	3	
Fuse	Starter solenoid	A	30	
	Fuel level sensor	A	.25	
CAPACITIES				
Fuel tank		L (U.S. gal)	39 (10.3)	
Chaincase/gearbox		mL (U.S. oz)	250 (8.5)	
Cooling system (3)		L (U.S. oz)	3.8 (128.5)	4 (135)
Injection oil reservoir		L (U.S. oz)	3.5 (118.4)	
VEHICLE INFORMATIONS				
Mass (dry)		kg (lb)	227 (499)	253 (557)
Length		mm (in)	2801 (110)	3039 (120)
Width		mm (in)	1217 (48)	
Height		mm (in)	1232 (48.5)	1409 (55.5)
Ski stance (carbide to carbide)		mm (in)	1195 (47)	
Toe-out			0	
Camber			0°	
Ground contact area		cm^2 (in^2)	6910 (1071)	7596 (1177)
Ground contact pressure		kPa (PSI)	3.22 (.467)	3.27 (.474)
Frame material			Aluminum	
Bottom pan material			Impact Copolymer	
Hood material			Surlyn	

Legend SE GT 600 HO SDI and Legend SE GT 800 SDI				Legend SE Grand Touring 600 HO SDI	Legend SE Grand Touring 800 SDI
Country				**EUROPE**	**EUROPE**
DRIVE					
Chain drive ratio				23/43	24/43
Chain	Pitch		in	3/8	
	Type/links qty/plate qty			Silent 74/13	
Drive pulley	Type			TRA III	
	Calibration	Clutch engagement	RPM	3800 ± 100	
		Spring color		Violet/Blue	Violet/Yellow
		Spring length	mm (in)	114.6 (4.5)	158 (6)
		Weight		—	
		Block		—	
		Cap		—	
		Pin		Solid (P/N 417 004 308)	
		Ramp		410	414
		Screw position		3	
Driven pulley	Type			HPV VSA	
	Spring preload			0	
	Cam angle			47/44°	
Pulley distance	Z		mm (in)	20 ± 0.5 (.787 ± .02)	
Offset	X		mm (in)	37 ± 0.5 (1.457 ± 0.2)	
	Y – X	MIN.-MAX.	mm (in)	1.5 ± 0.75 (.059 ± .030)	
Drive belt part number (P/N)				417 300 197	417 300 166
Drive belt width (5)		Wear limit	mm (in)	33.35 (1.313)	34.7 (1.366)
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)	
	Profile height		mm (in)	31.8 (1.25)	
	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	

Legend SE GT 600 HO SDI and Legend SE GT 800 SDI			Legend SE	
			Grand Touring 600 HO SDI	Grand Touring 800 SDI
Country			**EUROPE**	**EUROPE**
ELECTRICAL				
Battery			12 V, 18 A•h	
Headlamp		W	60/55 (H4)	
Taillight and stoplight		W	8/27	
Tachometer and speedometer bulbs		W	2 x 3	
Fuel and temperature gauge bulbs		W	3	
Fuse	Starter solenoid	A	30	
	Fuel level sensor	A	.25	
CAPACITIES				
Fuel tank		L (U.S. gal)	36 (9.5)	39 (10.3)
Chaincase/gearbox		mL (U.S. oz)	250 (8.5)	
Cooling system (3)		L (U.S. oz)	4 (135)	
Injection oil reservoir		L (U.S. oz)	3.5 (118.4)	
VEHICLE INFORMATIONS				
Mass (dry)		kg (lb)	250 (550)	253 (557)
Length		mm (in)	3039 (120)	
Width		mm (in)	1217 (48)	
Height		mm (in)	1409 (55.5)	
Ski stance (carbide to carbide)		mm (in)	1195 (47)	
Toe-out			0	
Camber			0°	
Ground contact area		cm^2 (in^2)	7596 (1177)	
Ground contact pressure		kPa (PSI)	3.23 (.468)	3.27 (.474)
Frame material			Aluminum	
Bottom pan material			Impact Copolymer	
Hood material			Surlyn	

Legend SE V-1000 and Legend SE GT V-1000				Legend SE V-1000	Legend SE Grand Touring V-1000
Country				CAN/U.S.	CAN/U.S.
DRIVE					
Chain drive ratio				21/44	
Chain	Pitch		in	3/8	
Chain	Type/links qty/plate qty			Silent 74/13	
Drive pulley	Type			TRA IV	
Drive pulley	Calibration	Clutch engagement	RPM	2500 ± 100	
Drive pulley	Calibration	Spring color		Red/Yellow	
Drive pulley	Calibration	Spring length	mm (in)	87.9 (3.461)	
Drive pulley	Calibration	Weight			
Drive pulley	Calibration	Block			
Drive pulley	Calibration	Cap			
Drive pulley	Calibration	Pin		Long and solid (P/N 417 222 594)	
Drive pulley	Calibration	Ramp		607	
Drive pulley	Calibration	Screw position		3 (4)	
Driven pulley	Type			HPV VSA	
Driven pulley	Spring preload		kPa (lbf)	6.60 ± 0.7 (14.55 ± 1.5)	6.10 ± 0.7 (13.45 ± 1.5)
Driven pulley	Cam angle			50/40°	
Pulley distance	Z		mm (in)	20 ± 0.5 (.787 ± .02)	
Offset	X		mm (in)	37 ± 0.5 (1.457 ± 0.2)	
Offset	Y – X	MIN.-MAX.	mm (in)	1.5 ± 0.75 (.059 ± .030)	
Drive belt part number (P/N)				417 300 197	
Drive belt width		Wear limit	mm (in)	33.35 (1.313)	
Drive belt adjustment		Deflection	mm (in)	32 ± 5 (1.260 ± .197)	
Drive belt adjustment		Force (1)	kg (lbf)	11.34 (25)	
Track	Width		mm (in)	381 (15)	
Track	Length		mm (in)	3074 (121)	3455 (136)
Track	Profile height		mm (in)	22.3 (.878)	
Track	Adjustment	Deflection	mm (in)	30 to 35 (1.181 to 1.378)	
Track	Adjustment	Force (2)	kg (lbf)	7.3 (16)	
Suspension type		Track		SC–10 III	
Suspension type		Ski		ADSA	
ELECTRICAL					
Battery				12 V, 21 A•h	
Headlamp			W	60/55 (H4)	
Taillight and stoplight			W	8/27	
Tachometer and speedometer bulbs			W	2 x 3	
Fuel and temperature gauge bulbs			W	N.A.	

Legend SE V-1000 and Legend SE GT V-1000				Legend SE V-1000	Legend SE Grand Touring V-1000
Country				CAN/U.S.	CAN/U.S.
Fuse		Starter solenoid	A	30	
		Fuel level sensor	A	.25	
	F1:	Cylinder no.1 (alternator side) ignition coil and injector	A	5	
	F2:	Cylinder no.2 (PTO side) ignition coil and injector	A	5	
	F3:	ECM/fuel pump	A	7.5	
	F4:	Instrumentation	A	5	
	F5:	CAPS	A	1	
	F6:	Fuel level sender	A	0.5	
	F7:	Secondary load	A	20	
	F8:	Lighting	A	20	
	F9:	NOT APPLICABLE	A	N.A.	
	F10:	Battery (main)	A	30	
	F11:	Relay/start button	A	5	
	F12:	Alternator	A	5	
CAPACITIES					
Fuel tank			L (U.S. gal)	39 (10.3)	
Gearbox			mL (U.S. oz)	250 (8.5)	
Cooling system [(3)]			L (U.S. gal)	4.0 (13)	4.2 (14)
Engine oil change (with filter replacement)			L (U.S. gal)	2.9 (98)	
Total engine oil quantity (rebuild)			L (U.S. gal)	3.4 (115)	
VEHICLE INFORMATIONS					
Mass (dry)			kg (lb)	255 (561)	281 (618)
Length			mm (in)	2801 (110)	3039 (120)
Width			mm (in)	1217 (48)	
Height			mm (in)	1232 (48.5)	1409 (55.5)
Ski stance (carbide to carbide)			mm (in)	1195 (47)	
Toe-out				0	
Camber				0°	
Ground contact area			cm^2 (in^2)	6910 (1071)	7596 (1177)
Ground contact pressure			kPa (PSI)	3.62 (.525)	3.63 (.526)
Frame material				Aluminum	
Bottom pan material				Impact Copolymer	
Hood material				RRIM (polyurethane)	

Legend Sport 500 SS and Legend Sport GT 500 SS				Legend SPORT 500 SS	Legend SPORT Grand Touring 500 SS
Country				**CAN/U.S.**	**CAN/U.S.**
DRIVE					
Chain drive ratio				24/43	23/43
Chain	Pitch		in	3/8	
	Type/links qty/plate qty			Silent 74/13	
Drive pulley	Type			TRA	
	Calibration	Clutch engagement	RPM	3600 ± 100	
		Spring color		Violet/Violet	
		Spring length	mm (in)	106.98 (4.212)	
		Weight		—	
		Block		—	
		Cap		—	
		Pin		Solid (P/N 417 004 308)	
		Ramp		299	
		Screw position		3	
Driven pulley	Type			HPV27	
	Spring preload			0	
	Cam angle			47°	
Pulley distance	Z		mm (in)	17.5 ± 0.5 (.689 ± .02)	
Offset	X		mm (in)	35.5 ± 0.5 (1.398 ± 0.2)	
	Y – X	MIN.-MAX.	mm (in)	1.5 ± 0.75 (.059 ± .030)	
Drive belt part number (P/N)				414 860 700	
Drive belt width		Wear limit	mm (in)	32.3 (1.272)	
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)	3074 (121)	3455 (136)
	Profile height		mm (in)	22.3 (.878)	
	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	

Legend Sport 500 SS and Legend Sport GT 500 SS			Legend SPORT 500 SS	Legend SPORT Grand Touring 500 SS
Country			CAN/U.S.	CAN/U.S.
ELECTRICAL				
Battery			N.A.	
Headlamp		W	60/55 (H4)	
Taillight and stoplight		W	8/27	
Tachometer and speedometer bulbs		W	2 x 3	
Fuel and temperature gauge bulbs		W	N.A.	
Fuse	Starter solenoid	A	N.A.	
	Fuel level sensor	A	N.A.	
CAPACITIES				
Fuel tank		L (U.S. gal)	36 (9.5)	
Chaincase/gearbox		mL (U.S. oz)	250 (8.5)	
Cooling system (3)		L (U.S. oz)	3.8 (128.5)	4 (135)
Injection oil reservoir		L (U.S. oz)	3.5 (118.4)	
VEHICLE INFORMATIONS				
Mass (dry)		kg (lb)	223 (491)	249 (548)
Length		mm (in)	2801 (110)	3229 (127)
Width		mm (in)	1217 (48)	
Height		mm (in)	1232 (48.5)	
Ski stance (carbide to carbide)		mm (in)	1195 (47)	
Toe-out			0	
Camber			0°	
Ground contact area		cm^2 (in^2)	6910 (1071)	7596 (1177)
Ground contact pressure		kPa (PSI)	3.17 (.460)	3.22 (.467)
Frame material			Aluminum	
Bottom pan material			Impact Copolymer	
Hood material			Surlyn	

Legend Sport 600 HO SDI and Legend Sport GT 600 HO SDI				Legend Sport 600 HO SDI	Legend Sport Grand Touring 600 HO SDI
Country				**CAN/U.S.**	**CAN/U.S.**
DRIVE					
Chain drive ratio				24/43	23/43
Chain	Pitch		in	3/8	
	Type/links qty/plate qty			Silent 74/13	
Drive pulley	Type			TRA III	
	Calibration	Clutch engagement	RPM	3800 ± 100	
		Spring color		Purple/Blue	
		Spring length	mm (in)	114.6 (4.5)	
		Weight		—	
		Block		—	
		Cap		—	
		Pin		Solid (P/N 417 004 308)	
		Ramp		410	
		Screw position		3	
Driven pulley	Type			HPV VSA	
	Spring preload			0	
	Cam angle			47/44°	
Pulley distance	Z		mm (in)	20.0 ± 0.5 (.787 ± .02)	
Offset	X		mm (in)	37.0 ± 0.5 (1.457 ± 0.2)	
	Y – X	MIN.-MAX.	mm (in)	1.5 ± 0.75 (.059 ± .030)	
Drive belt part number (P/N)				417 300 197	
Drive belt width [5]		Wear limit	mm (in)	33.35 (1.313)	
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)	3074 (121)	3455 (136)
	Profile height		mm (in)	22.3 (.878)	
	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	

Legend Sport 600 HO SDI and Legend Sport GT 600 HO SDI			Legend Sport	
			600 HO SDI	Grand Touring 600 HO SDI
Country			**CAN/U.S.**	**CAN/U.S.**
ELECTRICAL				
Battery			12 V, 18 A•h	
Headlamp		W	60/55 (H4)	
Taillight and stoplight		W	8/27	
Tachometer and speedometer bulbs		W	2 x 3	
Fuel and temperature gauge bulbs		W	3	
Fuse	Starter solenoid	A	30	
	Fuel level sensor	A	.25	
CAPACITIES				
Fuel tank		L (U.S. gal)	39 (10.3)	
Chaincase/gearbox		mL (U.S. oz)	250 (8.5)	
Cooling system (3)		L (U.S. oz)	3.8 (128.5)	4.0 (135.3)
Injection oil reservoir		L (U.S. oz)	3.5 (118.4)	
VEHICLE INFORMATIONS				
Mass (dry)		kg (lb)	224 (493)	250 (550)
Length		mm (in)	2801 (110)	3039 (120)
Width		mm (in)	1217 (48)	
Height		mm (in)	1232 (48.5)	1409 (55.5)
Ski stance (carbide to carbide)		mm (in)	1195 (47)	
Toe-out			0	
Camber			0°	
Ground contact area		cm^2 (in^2)	6910 (1071)	7596 (1177)
Ground contact pressure		kPa (PSI)	3.18 (.461)	3.23 (.468)
Frame material			Aluminum	
Bottom pan material			Impact Copolymer	
Hood material			Surlyn	

Legend Sport 700 and Legend Sport GT 700				Legend SPORT 700	Legend SPORT Grand Touring 700
Country				CAN/U.S.	CAN/U.S.
DRIVE					
Chain drive ratio				25/43	23/43
Chain	Pitch		in	3/8	
	Type/links qty/plate qty			Silent 76/13	Silent 74/13
Drive pulley	Type			TRA	
	Calibration	Clutch engagement	RPM	3600 ± 100	
		Spring color		Blue/Yellow	
		Spring length	mm (in)	115.1 (4.531)	
		Weight		—	
		Block		—	
		Cap		—	
		Pin		Solid (P/N 417 004 308)	
		Ramp		299	
		Screw position		3	
Driven pulley	Type			HPV27	
	Spring preload			0	
	Cam angle			47°	
Pulley distance	Z		mm (in)	17.5 ± 0.5 (.689 ± .02)	
Offset	X		mm (in)	35.5 ± 0.5 (1.398 ± 0.2)	
	Y – X	MIN.-MAX.	mm (in)	1.5 ± 0.75 (.059 ± .030)	
Drive belt part number (P/N)				417 300 127	
Drive belt width		Wear limit	mm (in)	32.3 (1.272)	
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)	3074 (121)	3455 (136)
	Profile height		mm (in)	22.3 (.878)	
	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	
ELECTRICAL					
Battery				12 V, 18 A•h	
Headlamp			W	60/55 (H4)	
Taillight and stoplight			W	8/27	
Tachometer and speedometer bulbs			W	2 x 3	
Fuel and temperature gauge bulbs			W	N.A.	
Fuse	Starter solenoid		A	30	
	Fuel level sensor		A	.25	

Legend Sport 700 and Legend Sport GT 700		Legend SPORT 700	Legend SPORT Grand Touring 700
Country		CAN/U.S.	CAN/U.S.
CAPACITIES			
Fuel tank	L (U.S. gal)	36 (9.5)	
Chaincase/gearbox	mL (U.S. oz)	250 (8.5)	
Cooling system (3)	L (U.S. oz)	3.8 (128.5)	4 (135)
Injection oil reservoir	L (U.S. oz)	3.5 (118.4)	
VEHICLE INFORMATIONS			
Mass (dry)	kg (lb)	224 (493)	250 (550)
Length	mm (in)	2801 (110)	3039 (120)
Width	mm (in)	1217 (48)	
Height	mm (in)	1232 (48.5)	1409 (55.5)
Ski stance (carbide to carbide)	mm (in)	1195 (47)	
Toe-out		0	
Camber		0°	
Ground contact area	cm^2 (in^2)	6910 (1071)	7596 (1177)
Ground contact pressure	kPa (PSI)	3.18 (.461)	3.23 (.468)
Frame material		Aluminum	
Bottom pan material		Impact Copolymer	
Hood material		Surlyn	

Legend Sport V-1000 and Legend Sport GT V-1000				Legend Sport V-1000	Legend Sport Grand Touring V-1000
Country				**CAN/U.S.**	**CAN/U.S.**
DRIVE					
Chain drive ratio				21/44	
Chain	Pitch		in	3/8	
	Type/links qty/plate qty			Silent 74/13	
Drive pulley	Type			TRA IV	
	Calibration	Clutch engagement	RPM	2500 ± 100	
		Spring color		Red/Yellow	
		Spring length	mm (in)	87.9 (3.461)	
		Weight		—	
		Block		—	
		Cap		—	
		Pin		Long and solid (P/N 417 222 594)	
		Ramp		607	
		Screw position		3 (4)	
Driven pulley	Type			HPV VSA	
	Spring preload		kPa (lbf)	6.60 ± 0.7 (14.55 ± 1.5)	6.10 ± 0.7 (13.45 ± 1.5)
	Cam angle			50/40°	
Pulley distance	Z		mm (in)	20 ± 0.5 (.787 ± .02)	
Offset	X		mm (in)	37 ± 0.5 (1.457 ± 0.2)	
	Y – X	MIN.-MAX.	mm (in)	1.5 ± 0.75 (.059 ± .030)	
Drive belt part number (P/N)				417 300 197	
Drive belt width		Wear limit	mm (in)	33.35 (1.313)	
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)	3074 (121)	3455 (136)
	Profile height		mm (in)	22.3 (.878)	
	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	
ELECTRICAL					
Battery				12 V, 21 A•h	
Headlamp			W	60/55 (H4)	
Taillight and stoplight			W	8/27	
Tachometer and speedometer bulbs			W	2 x 3	
Fuel and temperature gauge bulbs			W	N.A.	

Legend Sport V-1000 and Legend Sport GT V-1000				Legend Sport V-1000	Legend Sport Grand Touring V-1000
Country				**CAN/U.S.**	**CAN/U.S.**
Fuse	Starter solenoid		A	30	
	Fuel level sensor		A	.25	
	F1:	Cylinder no.1 (alternator side) ignition coil and injector	A	5	
	F2:	Cylinder no.2 (PTO side) ignition coil and injector	A	5	
	F3:	ECM/fuel pump	A	7.5	
	F4:	Instrumentation	A	5	
	F5:	CAPS	A	1	
	F6:	Fuel level sender	A	0.5	
	F7:	Secondary load	A	20	
	F8:	Lighting	A	20	
	F9:	NOT APPLICABLE	A	N.A.	
	F10:	Battery (main)	A	30	
	F11:	Relay/start button	A	5	
	F12:	Alternator	A	5	
CAPACITIES					
Fuel tank			L (U.S. gal)	39 (10.3)	
Gearbox			mL (U.S. oz)	250 (8.5)	
Cooling system (3)			L (U.S. oz)	4.0 (135)	4.2 (142)
Engine oil change (with filter replacement)			L (U.S. oz)	2.9 (98)	
Total engine oil quantity (rebuild)			L (U.S. oz)	3.4 (115)	
VEHICLE INFORMATIONS					
Mass (dry)			kg (lb)	255 (561)	281 (618)
Length			mm (in)	2801 (110)	3039 (120)
Width			mm (in)	1217 (48)	
Height			mm (in)	1232 (48.5)	1409 (55.5)
Ski stance (carbide to carbide)			mm (in)	1195 (47)	
Toe-out				0	
Camber				0°	
Ground contact area			cm^2 (in^2)	6910 (1071)	7596 (1177)
Ground contact pressure			kPa (PSI)	3.62 (.525)	3.63 (.526)
Frame material				Aluminum	
Bottom pan material				Impact Copolymer	
Hood material				RRIM (polyurethane)	

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
CDI:	Capacitor Discharge Ignition
IACV:	Idle Air Control Valve
K:	Kilo (x 1000)
MAG:	Magneto
N.A.:	Not Applicable
PTO:	Power Take Off
SDI:	Semi-Direct Injection
W:	Watt

(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) Crankshaft end-play is not adjustable on these models. Specification is given for verification purposes only.

(3) At 3500 RPM with headlamp turned on.

(4) All resistance measurements must be performed with parts at room temperature (approx. 20°C (68°F)). Temperature greatly affects resistance measurements.

(5) Press fit type, not replaceable.

(6) Needle with one groove, not adjustable.

(7) Drive pulley retaining screw: torque to 80 to 100 N•m (59 to 74 lbf•ft), install drive belt, accelerate the vehicle at low speed (maximum 30 km/h (20 MPH)) and apply the brake; repeat 5 times. Retorque screw to 90 to 100 N•m (66 to 74 lbf•ft).

(8) **CAUTION: Do not attempt to adjust gap on spark plug BR 9 ECS. The specification is given for verification purpose only. If found out of specification, replace with a new one.**

(9) The engine speed for transmission calibration applicable on the vehicle. It may be different under certain circumstances and BOMBARDIER reserves the right to modify it without obligation.

(10) 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).

(11) Drive pulley retaining screw: torque to 125 to 135 N•m (92 to 100 lbf•ft), install drive belt, 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).

(12) At 4000 (600 HO SDI models) or 3500 (800 HO SDI models) RPM with APS disconnected.

VEHICLE LEGEND

ADSA: Advance Direct Shock Action

N.A.: Not Applicable

RER: Rotax Electronic Reverse

RRIM: Reinforced Reaction Injection Molding

TRA: Total Range Adjustable

VSA: Variable Sheave Angle

(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) Coolant mixture: 50% antifreeze/50% distilled water.

(4) From factory TRA IV 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.

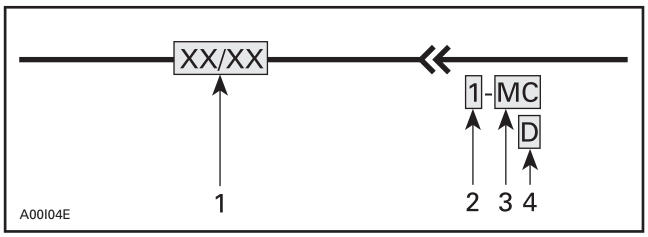
WIRING DIAGRAMS

Wiring diagrams can be found at the end of this subsection.

WIRING DIAGRAM LEGEND

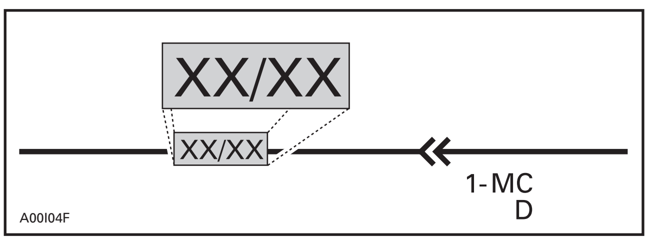
⚠ WARNING

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 code per area*
4. *Wire connector location in housing*

WIRE COLORS



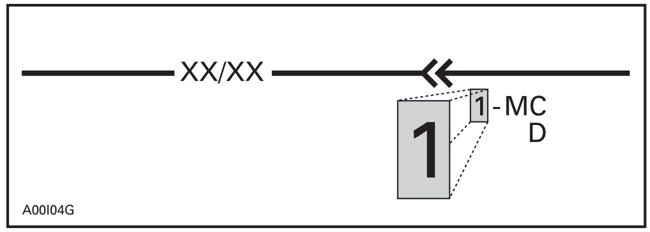
The first color of a wire is the main color, second color is the stripe.

Example: YL / BK is a YELLOW wire with a BLACK stripe.

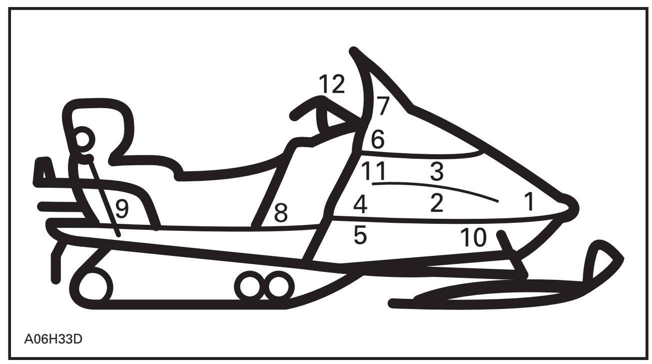
COLOR CODE					
BE	—	BEIGE	OR	—	ORANGE
BK	—	BLACK	RD	—	RED
BU	—	BLUE	VI	—	VIOLET
BR	—	BROWN	WH	—	WHITE
GN	—	GREEN	YL	—	YELLOW
GY	—	GREY			

CONNECTOR HOUSING AREA

The first digit of the connector identification number presents the location of the connector on the vehicle.



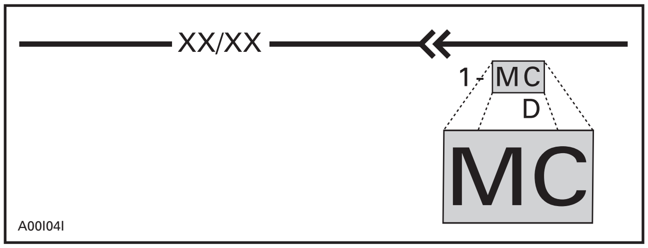
The following illustration shows the snowmobile with number on it. These numbers will correspond with the locations of the connector on the vehicle along with a brief description.



AREA	LOCATION
1	Front of engine compartment
2	Right hand side of engine
3	Engine
4	Near right hand side footrest
5	Near driven pulley
6	Under console
7	Under hood
8	Near fuel tank
9	Rear of seat
10	Under engine
11	Near steering column or on air intake silencer
12	On handlebar

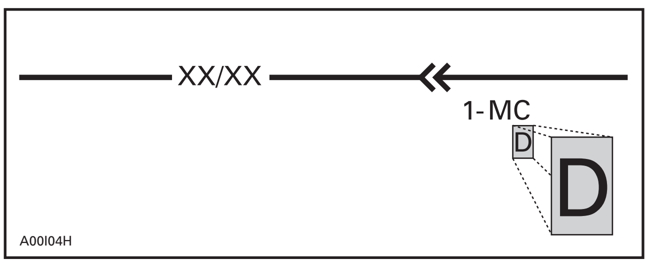
HOUSING REFERENCE PER AREA

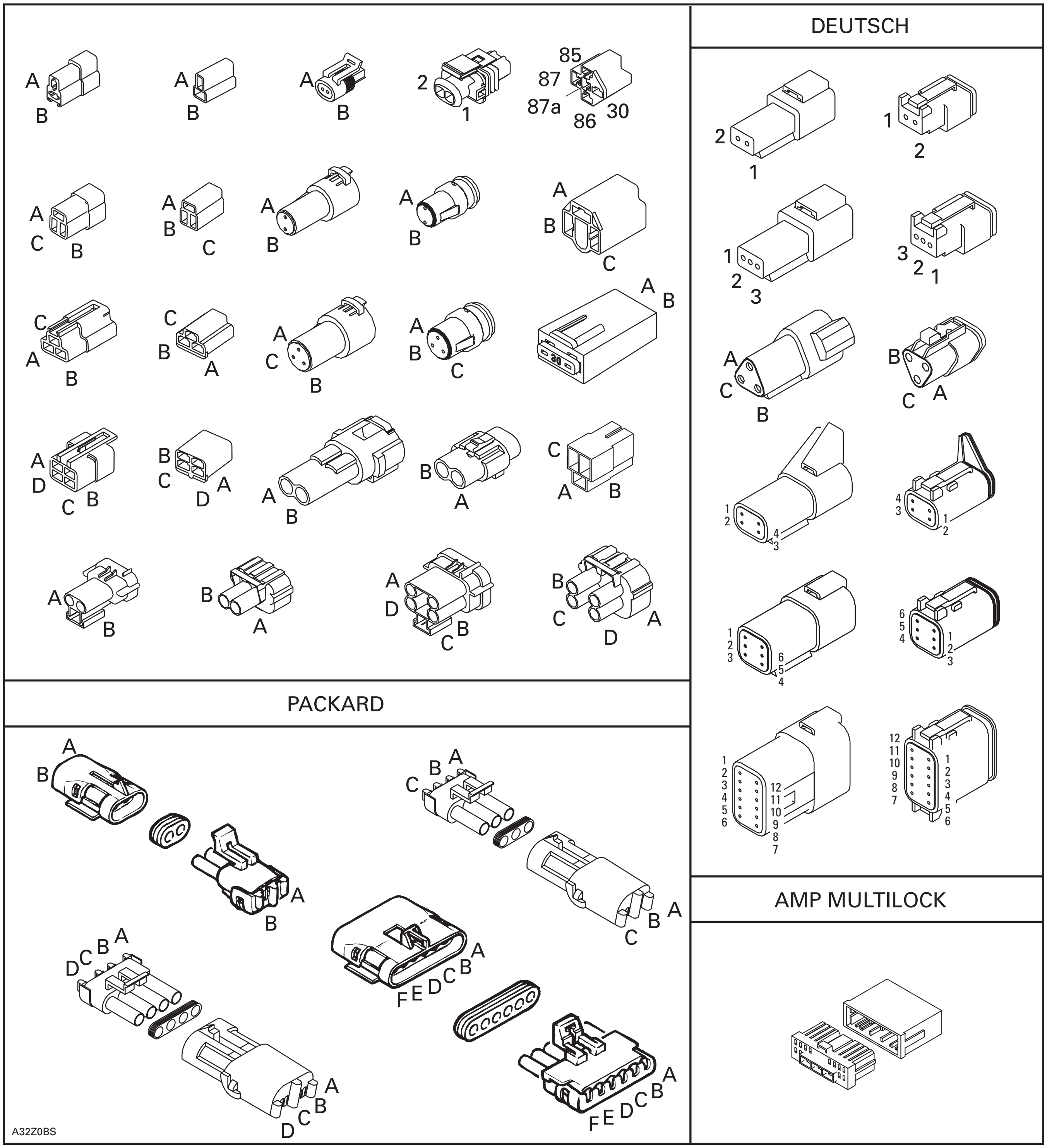
The next two letters of the connector identification number represents a connector reference. If there are many connectors in the same area this helps identify which wire is in which connector.



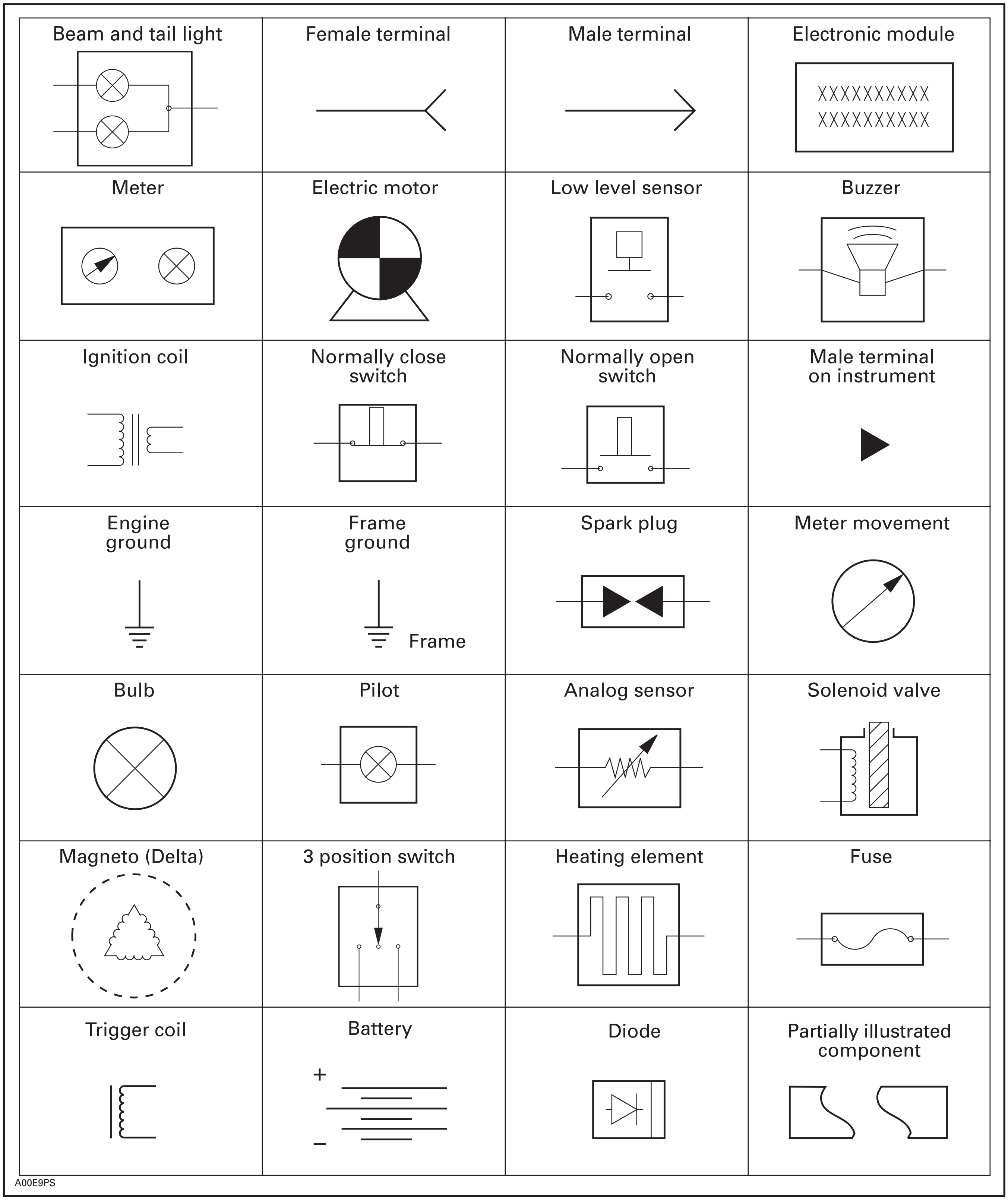
WIRE LOCATION IN CONNECTOR HOUSING

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.



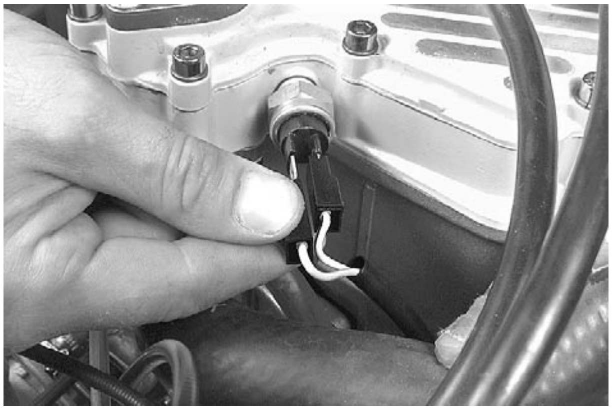

DEUTSCH
PACKARD
AMP MULTILOCK
A32Z0BS

SYMBOLS DESCRIPTION



UNPLUGING CONNECTORS

Always unplug connectors by pulling on housing not on wire.



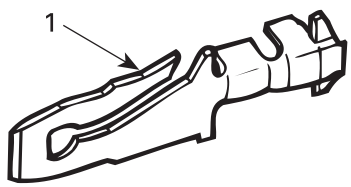
A06E1PA

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.

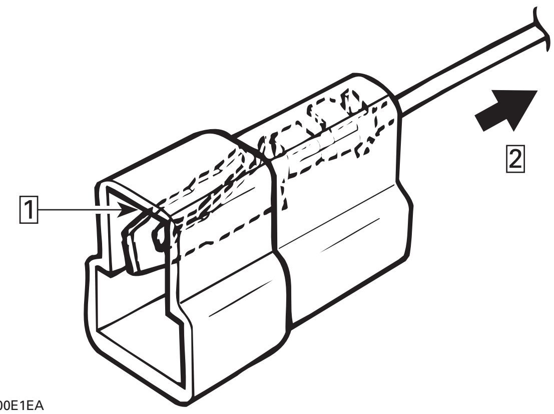


A00E1DA

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.



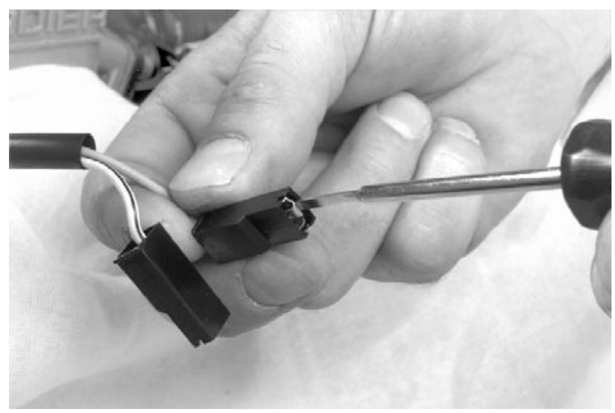
A00E1EA

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.



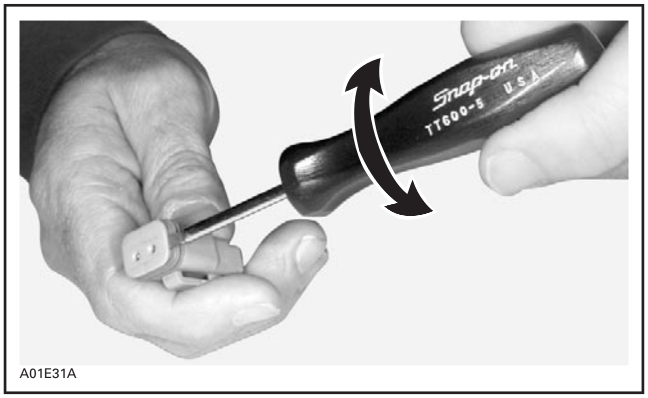
A06E1QA

Waterproof Connector Housing

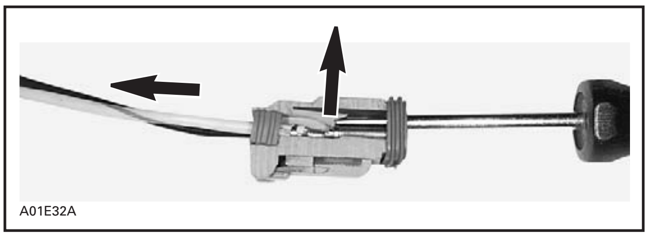
Female Connector Housing

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.

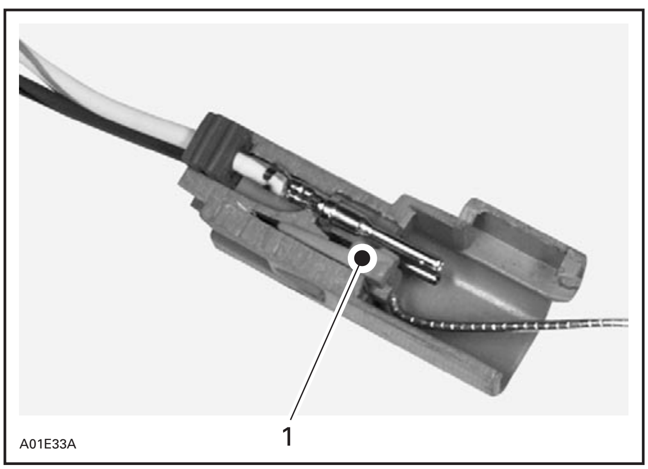


FEMALE CONNECTOR HOUSING — CUT-AWAY

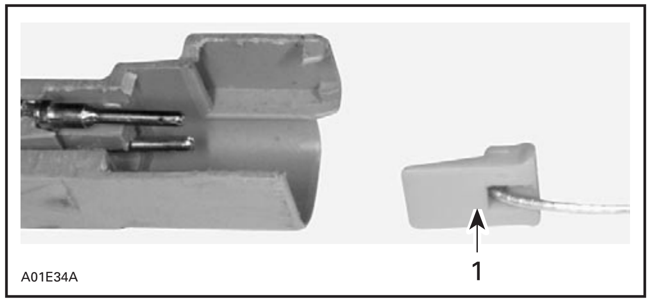
Male Connector Housing

To remove:

– Using a small hook, pull out the lock.

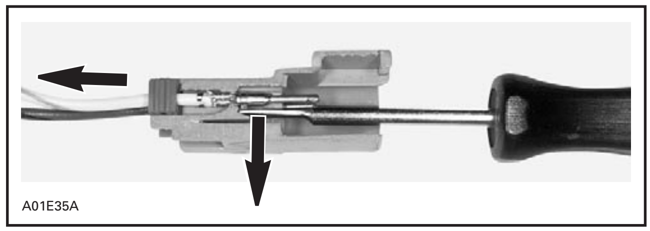


1. *Lock*



1. *Lock*

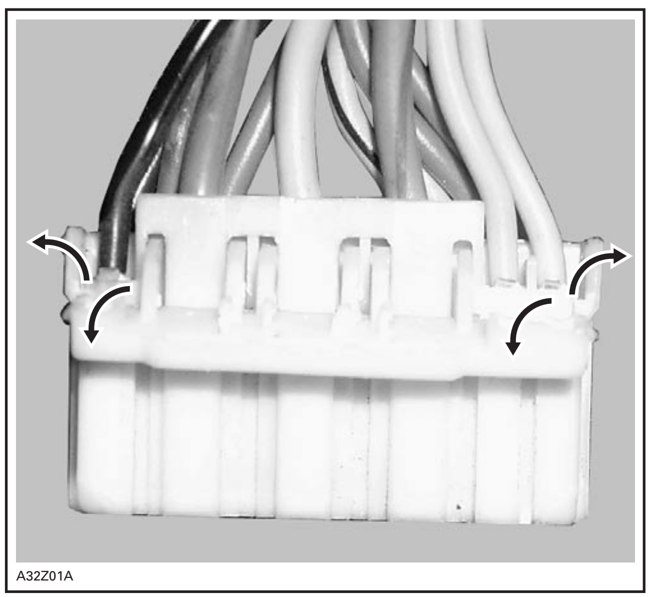
– Pry tab to free connector then pull wire out of housing.



MALE CONNECTOR HOUSING — CUT-AWAY

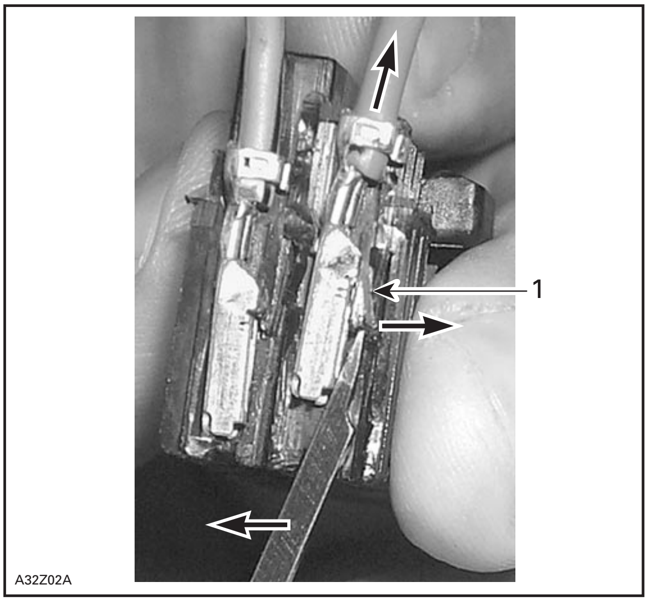
Multilock Connector Housing

Female Connector Housing



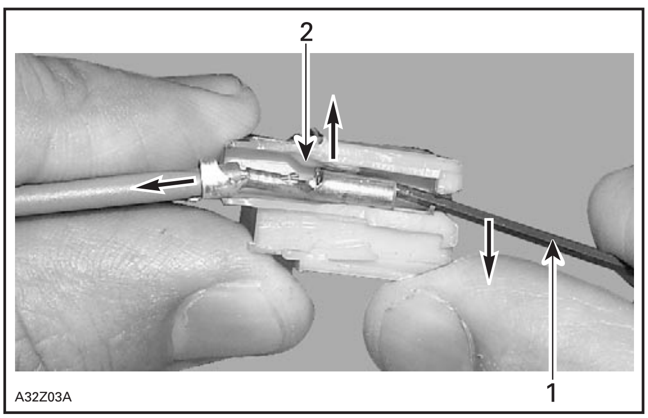
To remove:

– Insert tool AMP- 755430-2 under lock and twist to lift it.



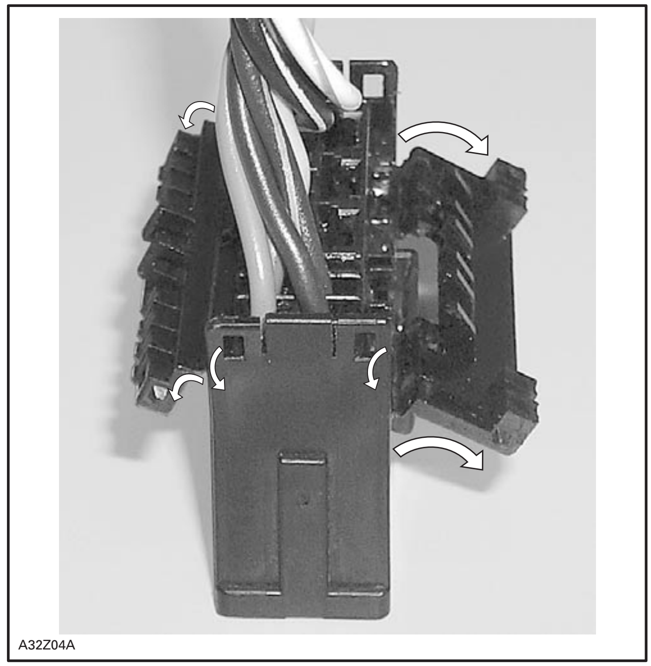
FEMALE CONNECTOR HOUSING — CUT-AWAY
1. Lock

Receptacle connectors can be removed from female housing with sharp head pin.



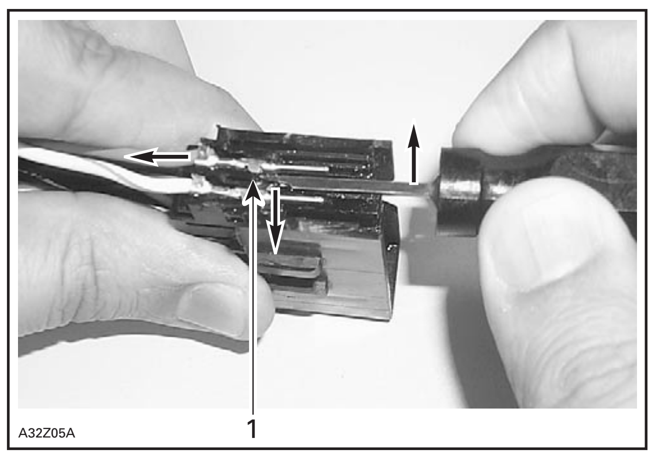
FEMALE CONNECTOR HOUSING — CUT-AWAY
1. Sharp head pin
2. Lock

Male Connector Housing



To remove:

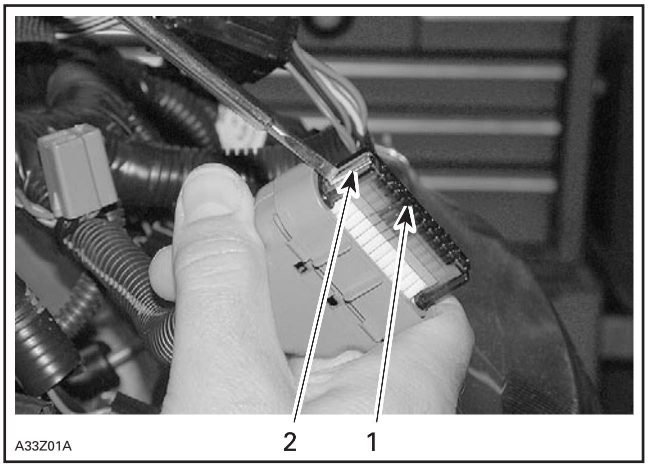
– Insert tool AMP-755430-2 under lock and twist to lift it.



MALE CONNECTOR HOUSING — CUT-AWAY
1. Lock

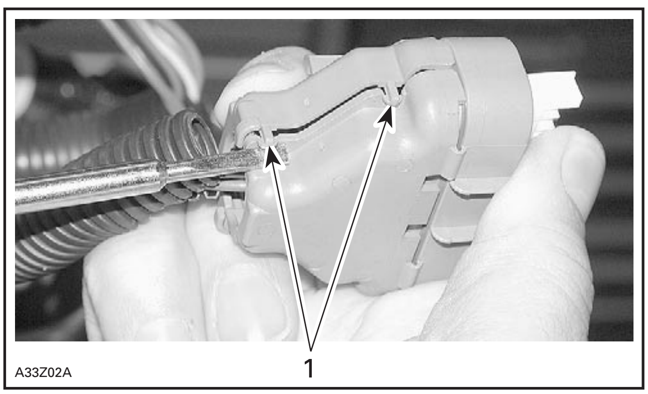
24-Circuit Connector Housing

Push on both tabs to remove retainer.



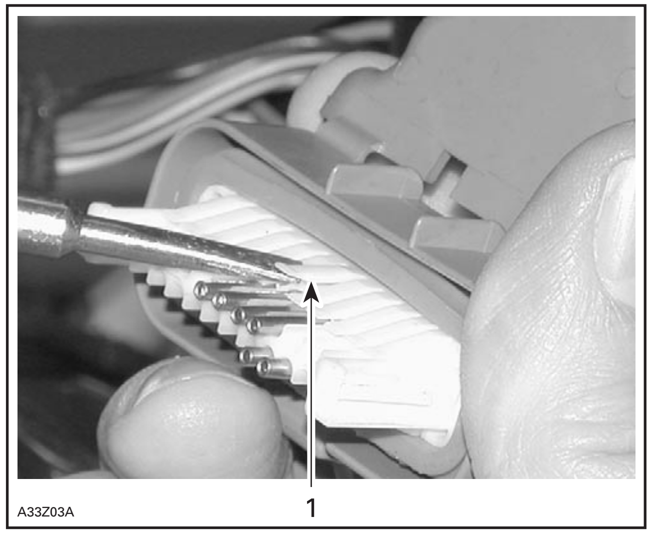
1. Retainer
2. Tab (one on each side)

Open housing by lifting 4 tabs.



1. Tabs (2 on each side)

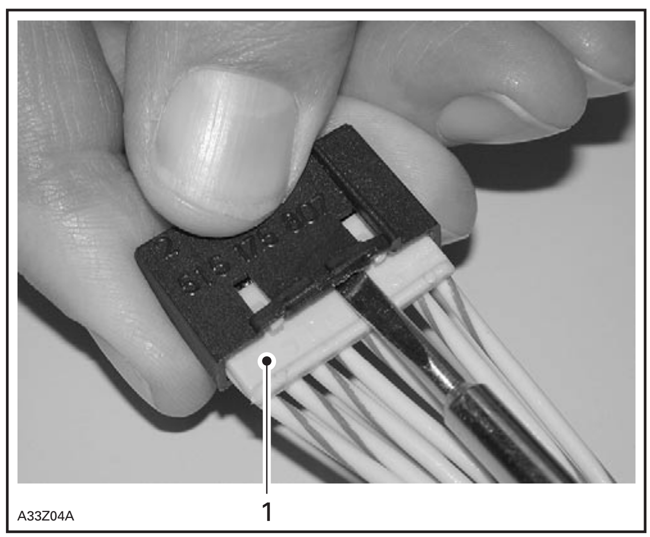
Lift plastic lock of the female terminal to be removed. Pull on the female terminal wire to remove female teminal from housing.



1. Plastic lock

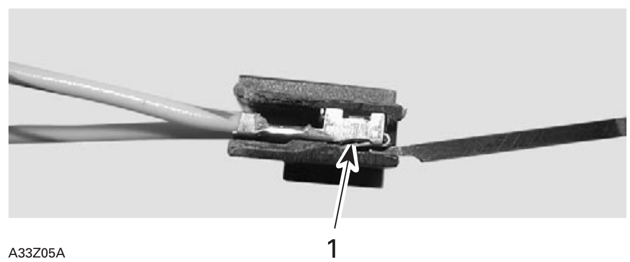
8-Circuit Connector Housing

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.

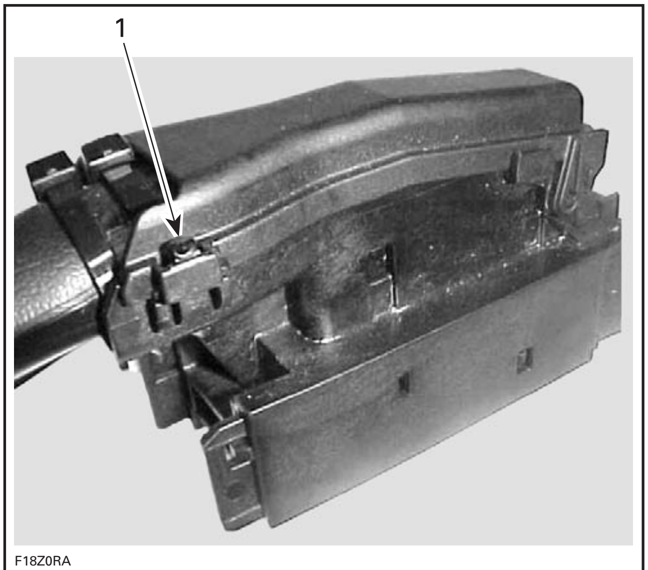


8-CIRCUIT CONNECTOR HOUSING — CUT-AWAY
1. Tab

Connector housing A and B on ECM

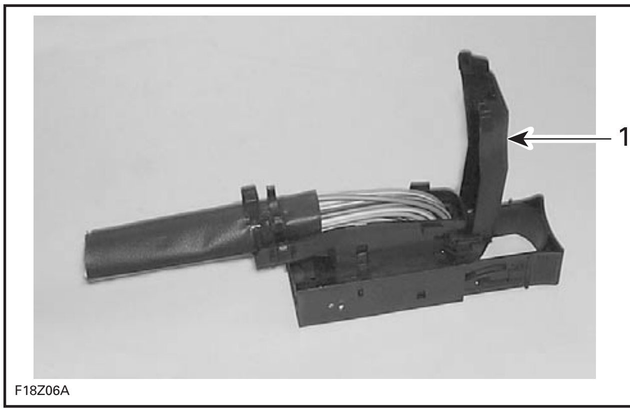
Terminal Removal

Unlock the connector housing cover by pushing in the tabs on top of the housing with a flat screw-driver to be able to flip the top cover up.



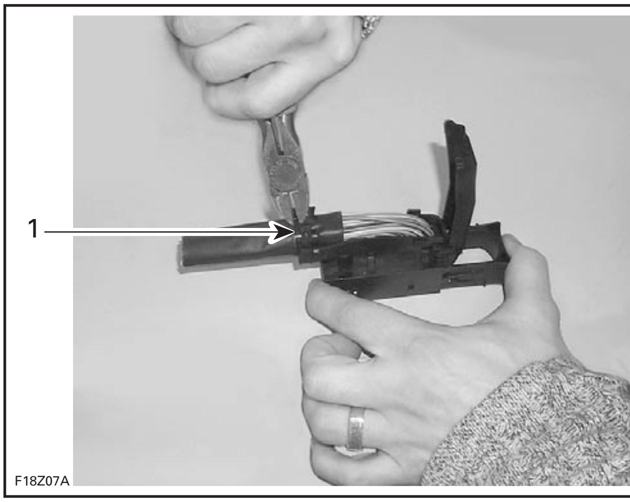
1. Push in tab

Lift the cover by pushing it forward.



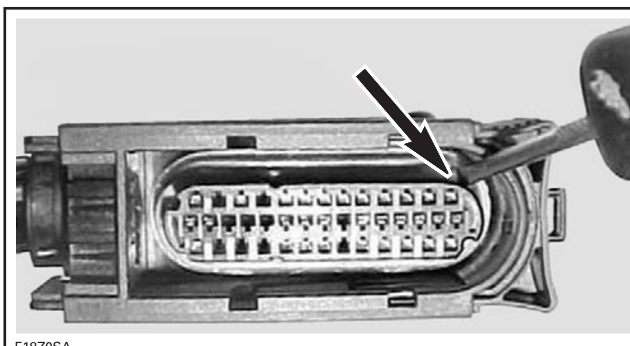
1. Cover

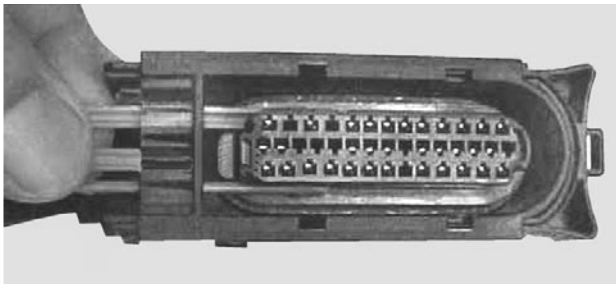
Cut both locking ties that secure the harness to the housing.



1. Locking ties

Turn the housing over and remove the lock by pushing and then pulling toward the wire harness.



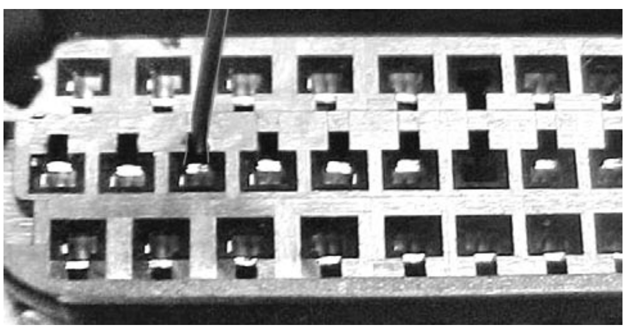


F18Z0TA

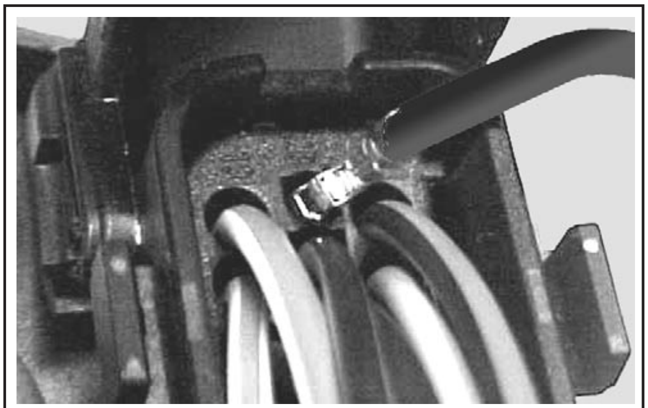
Use a 0.76 mm (.030 in) oxyacetylene torch tip cleaner or a no. 68 drill bit inserted down into the housing to release the locking tab on the connector.

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.



F18Z0UA



F18Z0VA

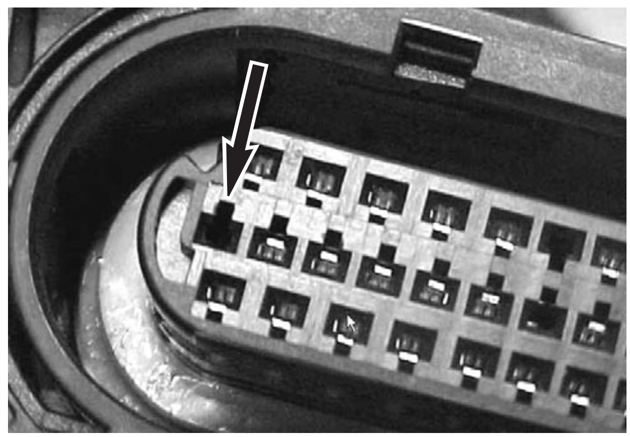
The locking tab on the connector may have to be bent out a little so it will lock in the housing when it's re-inserted.

F18Z0WA

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.



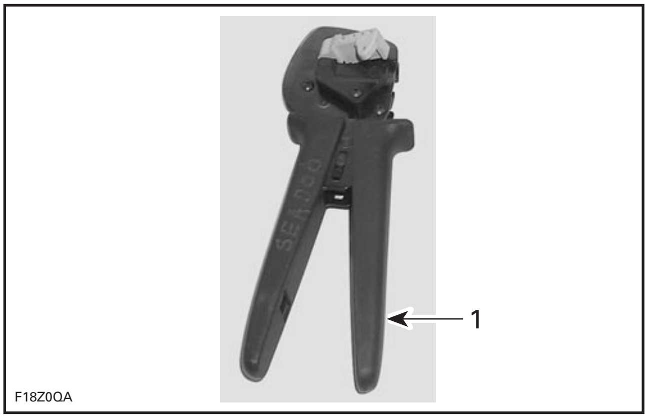
F18Z0XA

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.

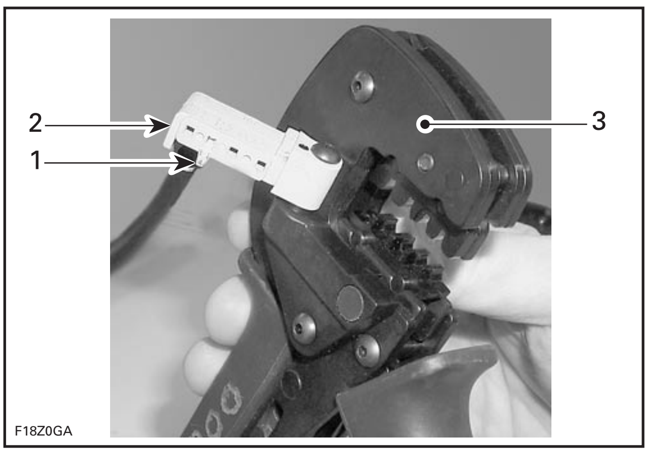
Terminal Crimping

To crimp a new connector terminal, use the ECM connector crimping tool (P/N 529 035 909) and the crimper die (P/N 529 035 906).

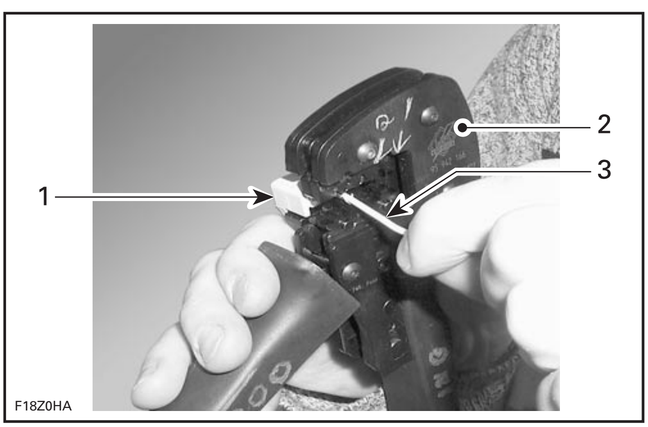


1. *Crimping tool*

Install the new terminal in the crimping tool swivel. Close the swivel in place. Place the wire on terminal barrel and crimp the wire firmly.



1. *New terminal*
2. *Crimping tool swivel*
3. *Crimping tool*

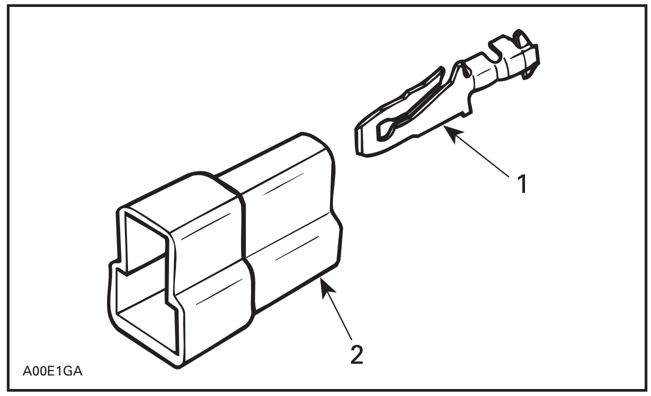


1. *Crimping tool swivel*
2. *Crimping tool*
3. *Wire*

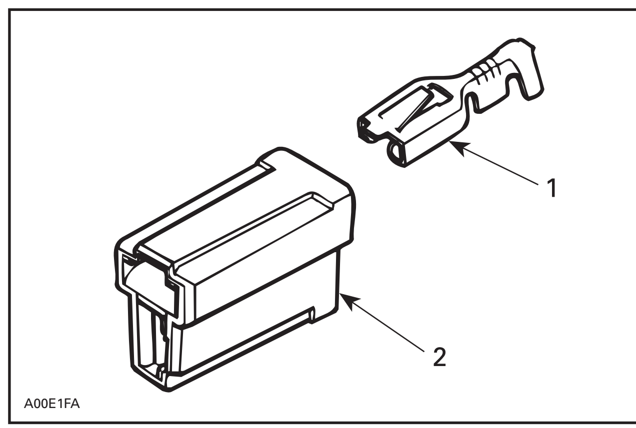
TAB AND RECEPTACLE CONNECTORS INSTALLATION

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.



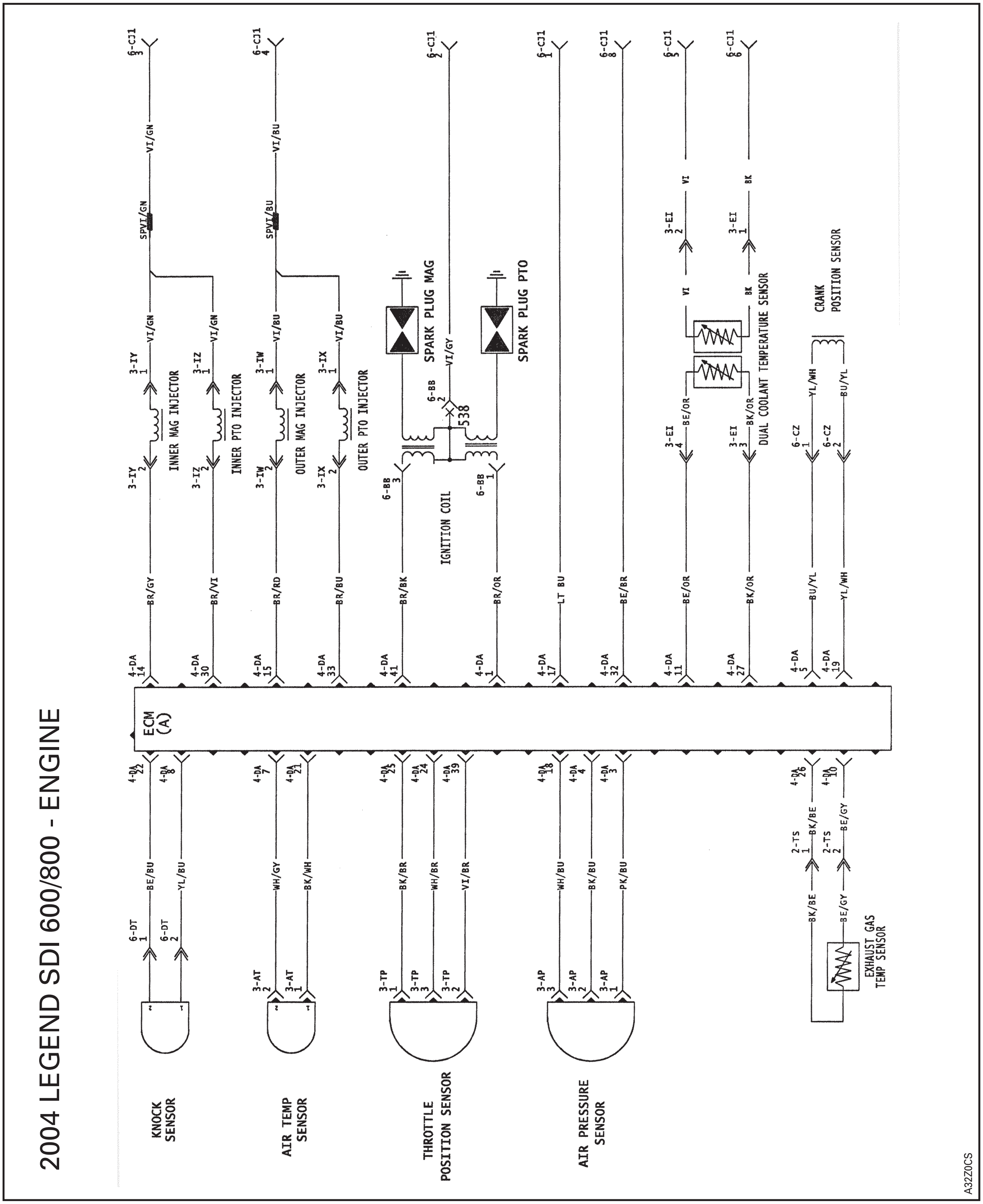
1. *Tab*
2. *Housing*

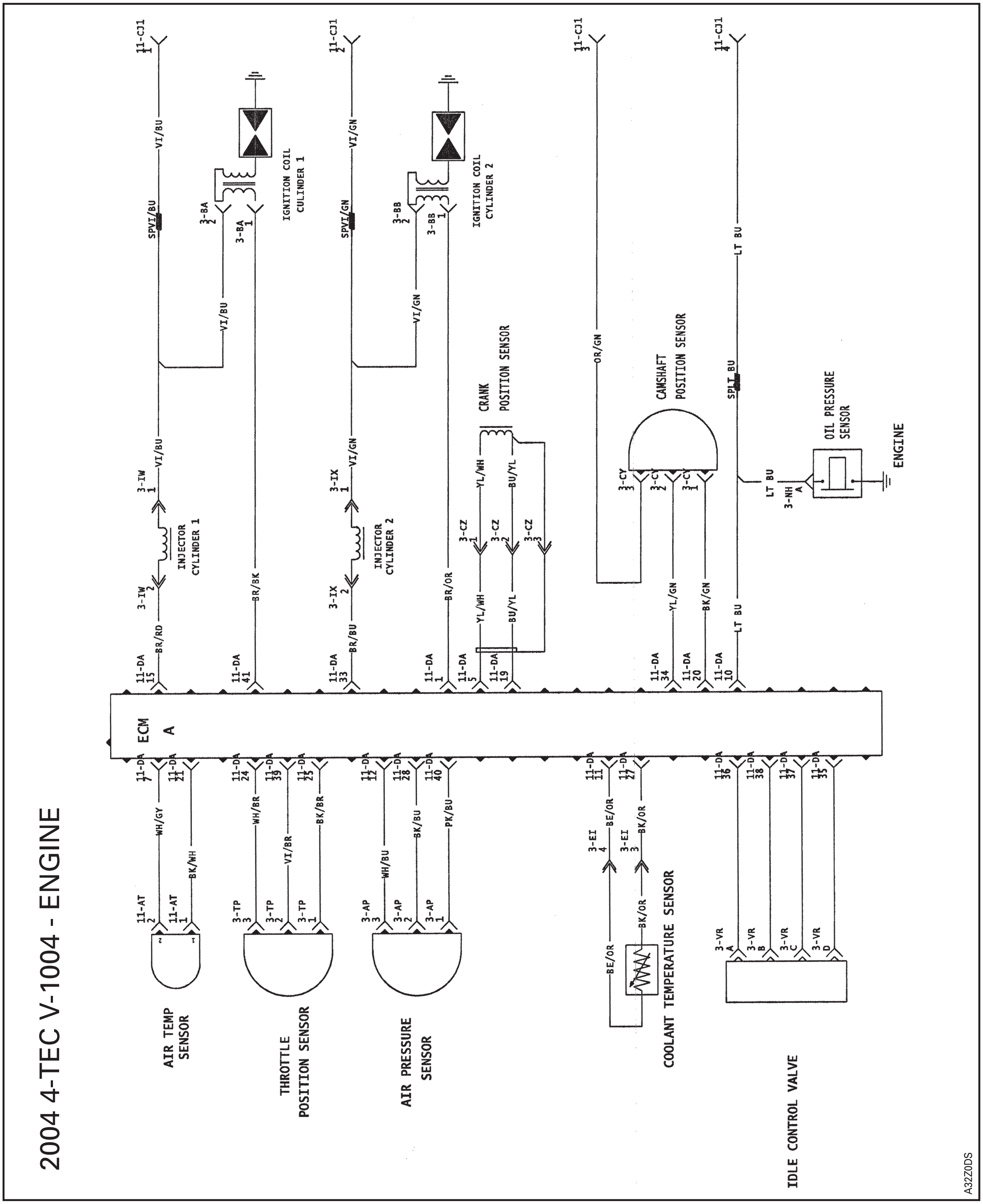


TYPICAL
1. *Receptacle*
2. *Housing*

⚠ WARNING

Keep wires away from any rotating, moving, heating, vibrating or sharp edge. Use proper fastening devices as required.


2004 LEGEND SDI 600/800 - ENGINE
ECM (A)
KNOCK SENSOR
AIR TEMP SENSOR
THROTTLE POSITION SENSOR
AIR PRESSURE SENSOR
EXHAUST GAS TEMP SENSOR
INNER MAG INJECTOR
INNER PTO INJECTOR
OUTER MAG INJECTOR
OUTER PTO INJECTOR
IGNITION COIL
SPARK PLUG MAG
SPARK PLUG PTO
DUAL COOLANT TEMPERATURE SENSOR
CRANK POSITION SENSOR
A32Z0CS



2004 4-TEC V-1004 - ENGINE
ECM A
AIR TEMP SENSOR
THROTTLE POSITION SENSOR
AIR PRESSURE SENSOR
COOLANT TEMPERATURE SENSOR
IDLE CONTROL VALVE
INJECTOR CYLINDER 1
INJECTOR CYLINDER 2
IGNITION COIL CULINDER 1
IGNITION COIL CYLINDER 2
CRANK POSITION SENSOR
CAMSHAFT POSITION SENSOR
OIL PRESSURE SENSOR
ENGINE
11-CJ1
11-DA
3-IW
3-IX
3-BA
3-BB
3-CZ
3-CY
3-NH
11-AT
3-TP
3-AP
3-EI
3-VR
VI/BU
VI/GN
SPVI/BU
SPVI/GN
BR/RD
BR/BK
BR/BU
BR/OR
YL/WH
BU/YL
OR/GN
YL/GN
BK/GN
LT BU
SPLT BU
WH/GY
BK/WH
WH/BR
VI/BR
BK/BR
WH/BU
BK/BU
PK/BU
BE/OR
BK/OR
A32Z0DS

2004 LEGEND FAN 380/550, LEGEND GT FAN 380/550, MX Z FAN 380/550, SUMMIT FAN 550, SKANDIC FAN 550

* LEGEND FAN AND LEGEND FAN GT ONLY.
OPTIONAL FOR OTHER FAN MODELS.

** SUMMIT 550 FAN ONLY.
CAP INCLUDES A JUMPER.

*** CONTACT BETWEEN YL/BK AND BK
ON MANUAL START MODELS.

**** OPTIONAL.

2004 LEGEND SDI 600/800

2004 4TEC V-1004