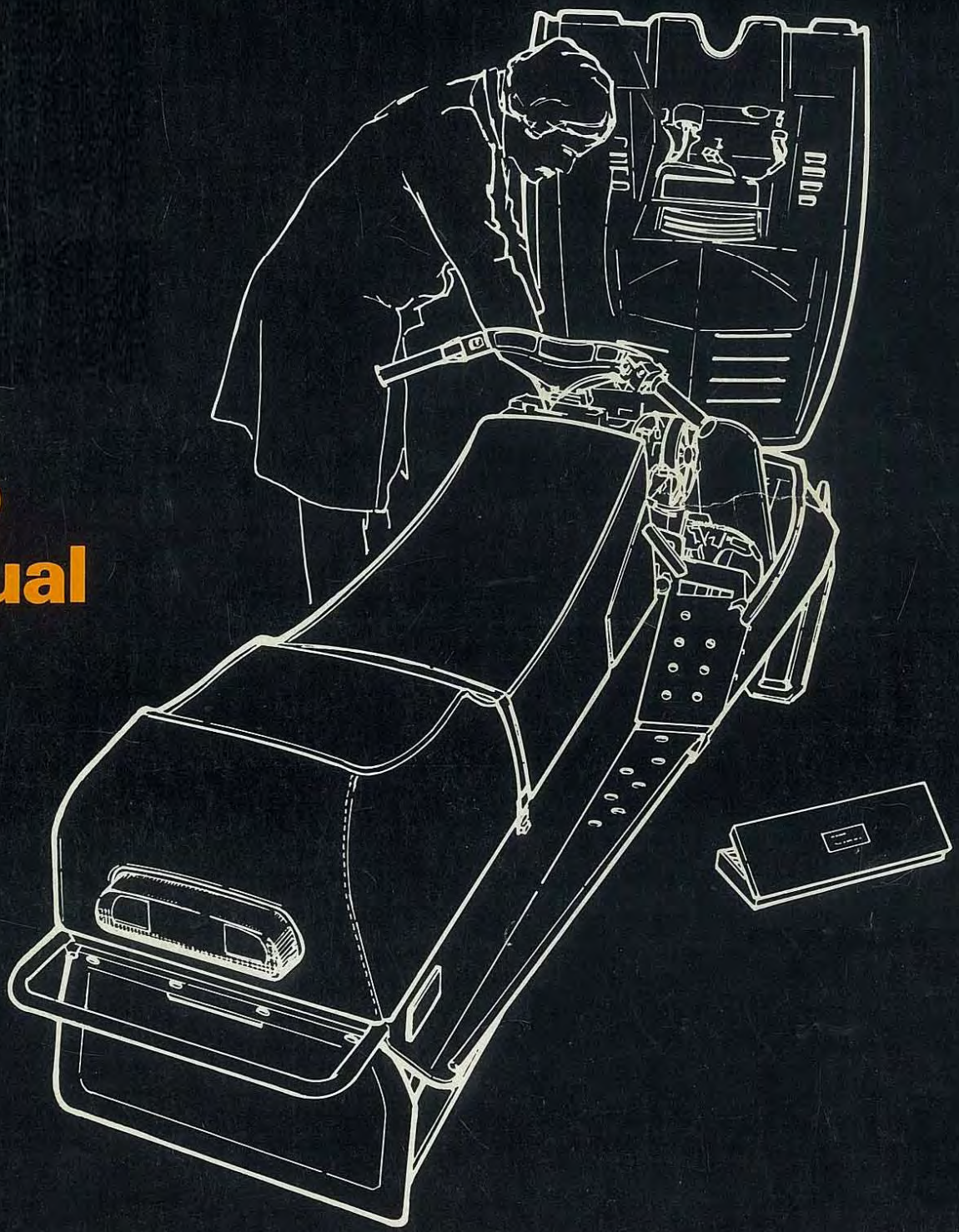
1980 BOMBARDIER snowmobiles



Shop Manual

84 0397 00

Litho'd in Canada

BOMBARDIER

1995

SAFETY NOTICE

The Bombardier snowmobile Shop manual has been prepared in order to assist skilled mechanic's in the efficient repair and maintenance of Bombardier snowmobiles.

Safety features may be impaired if other than genuine Bombardier parts are installed.

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

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

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

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

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

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

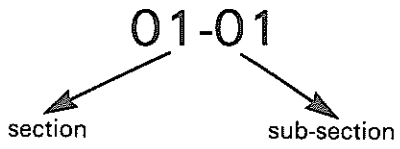
INTRODUCTION

This Shop Manual covers the following Bombardier made 1980 snowmobiles:

Elan — Spirit
Citation 3500 — Mirage I
Citation 4500/E — Mirage II/E
Citation SS — Mirage Special
Everest 500/500 E — Futura 500/500E
Everest LC — Futura LC
Blizzard 5500 — Grand Prix Special
Blizzard 7500 — Super Sonic
Blizzard 9500 — Ultra Sonic
Alpine 640
Elite 450 L/C

DEFINITION OF NUMBERING SYSTEMS

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



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

ARRANGEMENT OF THE MANUAL

The Manual is divided into nine (9) major sections:

01 Tools
02 Technical data
03 Engine
04 Electrical
05 Transmission
06 Suspension
07 Steering and skis
08 Frame and hood
09 Warranty

Each section is comprised of various sub-sections, and again each sub-section has one more division.

Ex.: 05 TRANSMISSION
07 Chaincase
Steel chaincase
Aluminum chaincase

ILLUSTRATIONS & PROCEDURES

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

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

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

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

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

GENERAL

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

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

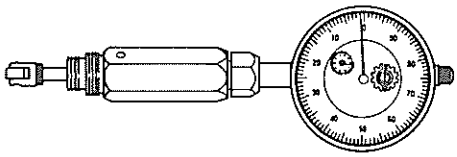
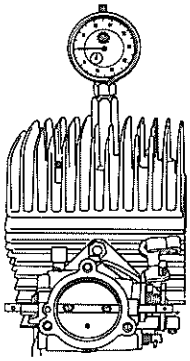
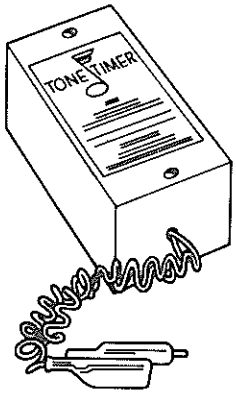
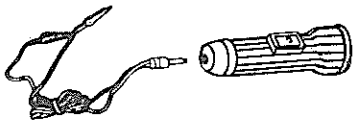
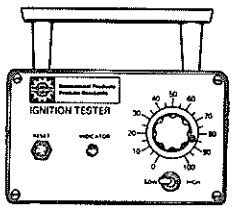
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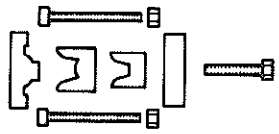
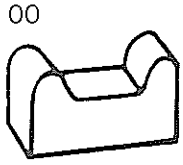
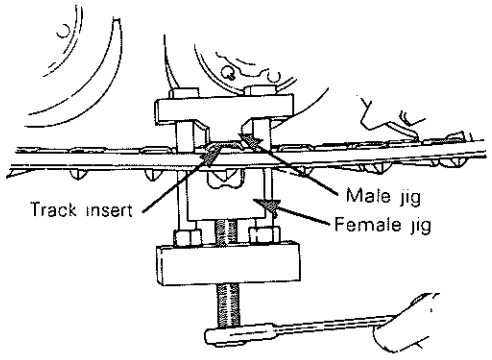
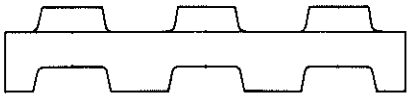
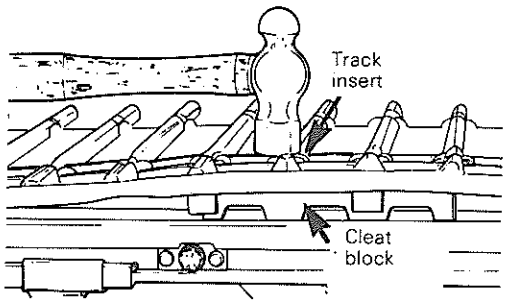
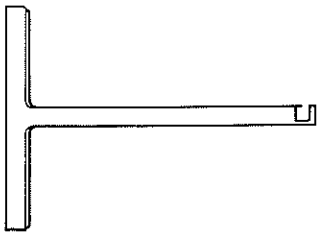
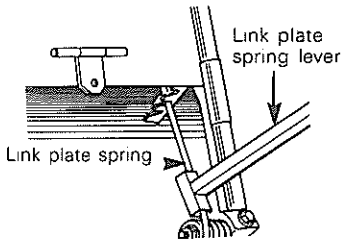
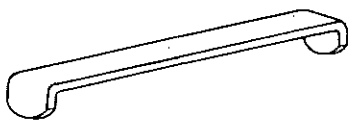
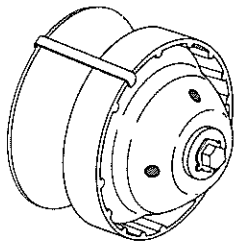
Technical Publications
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Valcourt, Quebec, Canada.

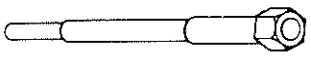
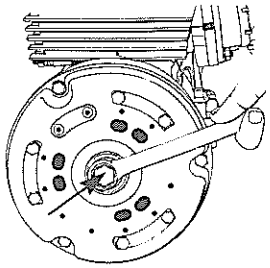
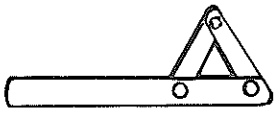
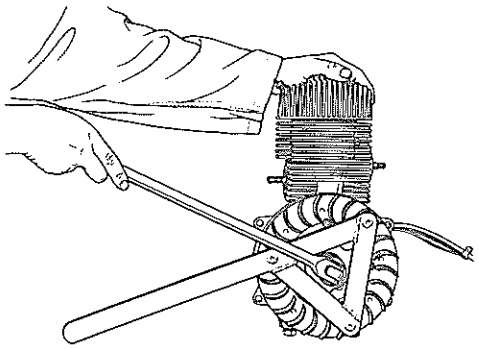
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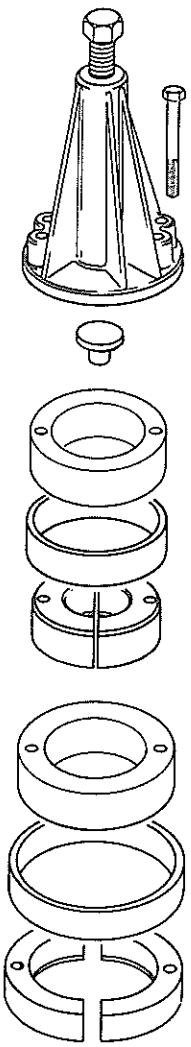
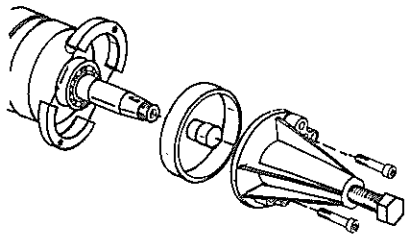
SECTION		SUB-SECTION
01	TOOLS	
02	TECHNICAL DATA	
03	ENGINE	01 — Engine tolerance measurements 02 — Engines 03 — Timing 04 — Carburetor 05 — Air intake silencer and fuel tank 06 — Rewind starter
04	ELECTRICAL	01 — Electric charts 02 — Tests procedure 03 — Electric starter 04 — Battery 05 — Alternator 06 — Spark plugs
05	TRANSMISSION	01 — Pulley guard 02 — Drive belt 03 — Drive pulley 04 — Driven pulley 05 — Pulley alignment 06 — Brake 07 — Chaincase 08 — Gearbox 09 — Drive chain
06	SUSPENSION	01 — Bogie wheel 02 — Slide suspension 03 — Rear hub 04 — Drive axle 05 — Track
07	STEERING / SKI	01 — Steering system 02 — Ski system
08	HOOD AND FRAME	01 — Hood 02 — Frame
09	WARRANTY	

TOOLS

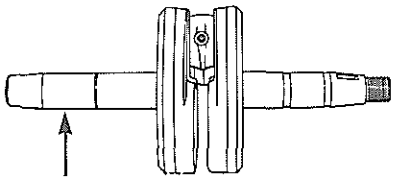
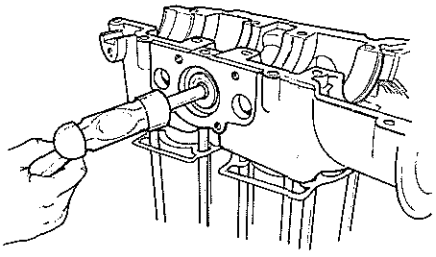
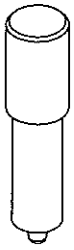
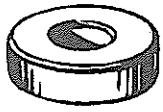
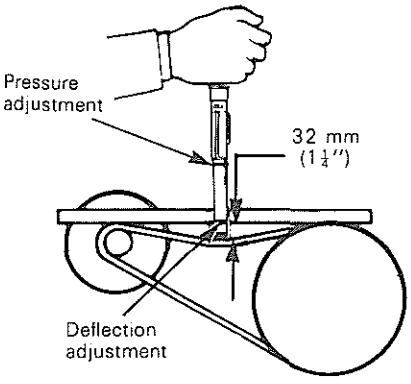
ITEM	USE	APPLICABLE TO
Dial indicator (T.D.C. gauge). 414 1047 00 	Engine timing, to determine T.D.C. 	All engine types.
Tone timer. 414 0990 00 	Engine timing (static).	All engine types.
Circuit tester (continuity light). 414 0122 00 	Engine timing (static). Continuity tests.	All engine types.
Bombardier ignition tester. 419 0033 00 	Engine electrical components tests.	All engine types.

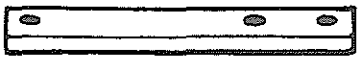
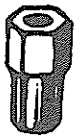
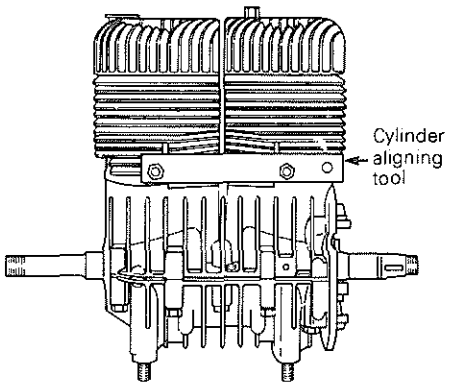
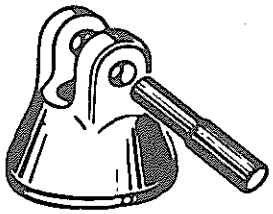
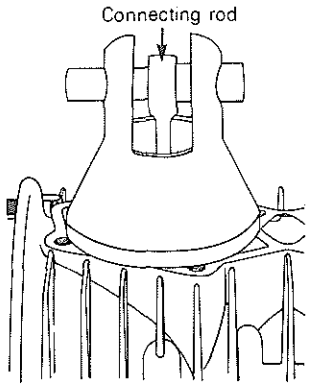
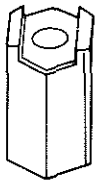
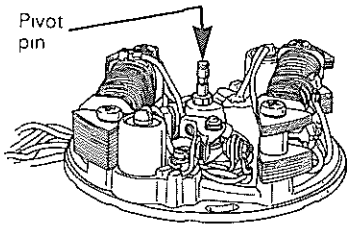
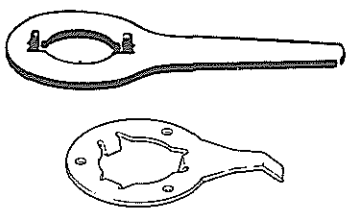
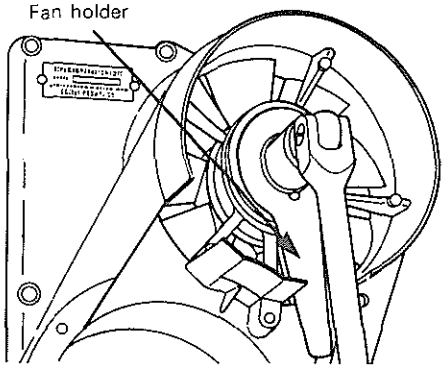
Track insert installer Heavy duty 419 0027 00  Insert block 529 0003 00 		All types of track.
Cleat block 529 0026 00 		All types of track.
Link plate spring lever. 529 0006 00 		All models with link plate springs.
Drive pulley retainer. 529 0017 00 	For indexation of governor cup. 	Square shaft drive pulley.

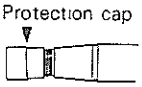
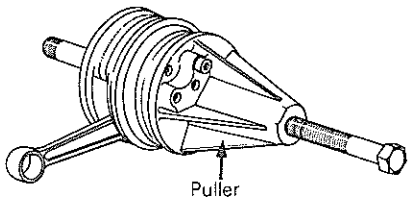
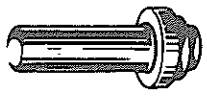
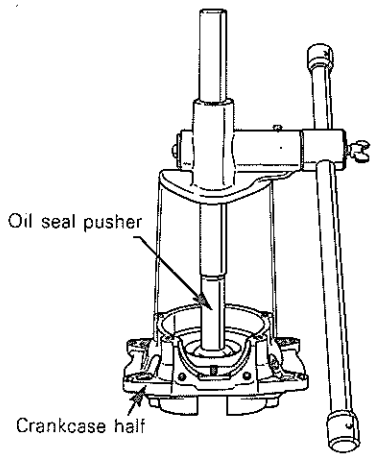
Drive pulley puller. 529 0021 00  860 4142 00 (metric) 	To remove drive pulley from crankshaft. 	Taper shaft engines.
Magneto housing holder. 420 976 550 		Single cylinder engine types.

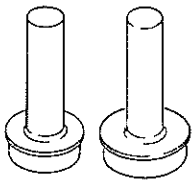
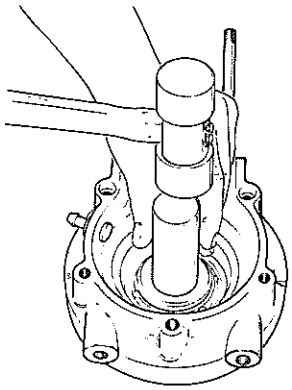
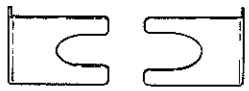
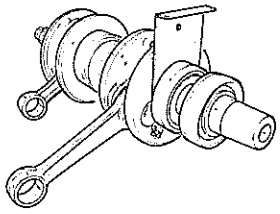
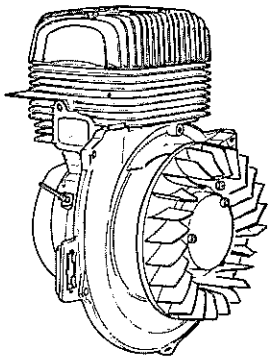
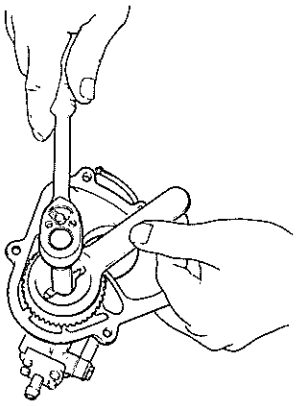
Puller assembly. 420 876 296 With 145 mm screw. 		All engine types.

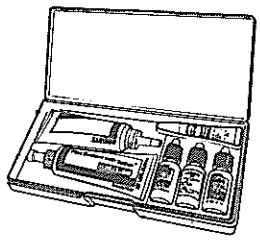
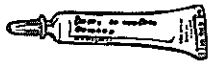
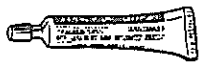
Screw M8 x 70 (2)	420 841 200	engine 377, 354, 454, 503
Screw M8 × 40 (2)	420 840 680	engine 247, 277, 444, 464, 640
Crankshaft protector PTO	420 876 550	All engines except 247, 640
Crankshaft protector Mag	420 876 555	377 engine only
Distance ring	420 876 560	all except 247 engine
Puller ring	420 977 480	all except 640 engine
Half ring ass'y	420 276 020	all except 640 engine
Distance ring	420 876 565	377, 464 engines only
Puller ring	420 977 490	377, 464, 640 engines only
Half ring ass'y	420 977 470	377, 464, 640 engines only

Oil seal sleeve 247 engines PTO 420 977 910 MAG 420 276 900  Water pump oil seal sleeve 354, 444, 454, 464 water pump 420 876 490 rotary valve 420 876 495	To avoid oil seal damage during crankshaft installation.  Oil seal sleeve (on crankshaft)	
Rotary valve shaft pusher. 420 876 610 		Liquid cooled Rotary valve engines
Ball bearing pusher. 420 876 500 	To install water pump ball bearing.	354, 444, 454, 464 engine types.
Bearing simulator. 640 engine 420 876 160 	When adjusting crankshaft play.	
Belt tension tester. 414 3482 00 	 Pressure adjustment 32 mm (1¼") Deflection adjustment	All models except Mirage I, Citation 3500 Mirage II/E, Citation 4500/E Mirage Special, Citation SS

Cylinder aligning tool. 640 engine 420 876 170 503 engine 420 876 171 354-454 engines 420 876 575   503 engines 420 240 275  640 engine 420 842 160		Twin cylinder engine types.
Connecting rod holder. 420 977 900 		All single cylinder engines
Armature plate contact set pivot pin remover (socket). 420 876 530 	To remove contact set pivot pin from armature plate. 	All engine types using breaker point type ignition.
Fan holder 640 engine 420 977 880 503 engine 420 876 355 377 engine 420 876 357 		Twin cylinder fan-cooled engines

Protection cap.  247, 277, 640 engines 18 mm 420 976 890 354, 377, 444, 454, 464, 503 22 mm 420 876 402	Protect crankshaft end, when using bearing puller.  	All engine types.
Engine Oil seal pusher. 247 engine 420 977 920 277 engine 420 277 865 420 876 660 		All single cylinder engine type.
Oil seal pusher. 420 876 510 464 engine 420 876 500 	To install water pump oil seal.	354, 444, 454, 464 engine types.
Rotary valve oil seal pusher 420 876 600 - 354, 454 engine 420 876 605 - 464 engine 	To install rotary valve shaft oil seal	354, 454, 464 engines

Polyamid ring pusher 277 engine MAG 420 273 930 PTO 420 273 940 	To install polyamid ring in crankcase. 	277 engine
Crankshaft feeler gauge. 503 engine * MAG 420 876 625 PTO 420 876 620 		* Mag side: All 503 engines up to no. 3 181 891 and engines no. 3 181 921 to 3 181 937. PTO: All 503 engines
Crankshaft locking tool 420 876 640 	To lock crankshaft 	277, 377 464 engines.
Injection pump gear holder 377 engine 420 876 690 464 engine 420 277 900 		464, 377 engine equipped with oil injection

LOCTITE SEALANT KIT 413 7026 00 contains PST Pipe Sealant with Teflon (50 mL) 413 7023 00 Gasket Eliminator 515 (50 mL) 413 7027 00 Retaining Compound RC/601 (10 mL) 413 7031 00 Threadlocker 242 (10 mL) 413 7030 00 Threadlocker 271 (10 mL) 413 7029 00 SuperBonder 495 (3-gram tube) 413 7032 00 	For threadlocking, threadsealing, gasketing, bonding and retaining applications on engines, pulleys and fasteners etc.	
LOCK'N SEAL (242) BLUE, MEDIUM STRENGTH 24 mL 413 7025 00 	A medium-strength adhesive for threadlocking and threadsealing. Vibration-proofs nuts, bolts and screws.	General purpose, nuts, bolts screws. Magneto ring nut, crankcase studs, etc.
LOCK'N SEAL (271) RED HIGH STRENGTH 6 mL 747 020 000 	High-strength threadlocking threadsealing adhesive for large parts.	Fasteners and studs under 1'' dia.
GASKET ELIMINATOR 515 50 mL 413 7027 00 	Seals instantly. For metal to metal assembly. Replaces gaskets.	On all engine crankcases.

RETAINING COMPOUND 601 10 mL 413 7031 00 	Restores fit between bearings and worn crankcase.	All engines except 247, 277.
PRIMER CRANKCASE SEALANT (SPRAY) 6 oz 413 7024 00 	Very fast cure primer. Primer NF provides fixturing in only 15-30 seconds with full cure in 4 hours or less. On part life is 30 minutes and parts should be assembled as soon as possible after adhesive is applied.	Mainly used when assembling engine crankcase.
STRIPPER NO 57 413 7021 00 	For cleaning mating surfaces before assembly.	Used to clean mating surfaces before applying Loctite 515 (Gasket Eliminator).
ANTISEIZE LUBRICANT 413 7010 00 	Protects moving and stationary parts against high temperature seizing. Prevents rust and corrosion on parts exposed to high heat.	Unpainted surfaces of drive pulley countershaft.
METAL PROTECTOR L.P.S. NO 1 SPRAY 413 9022 00 	General service light lubricant. Protects against rust. Displaces moisture. Protects all electrical systems and ignition systems.	For storage protection, on drive and driven pulleys. High tension coil protection from moisture.

METAL PROTECTOR L.P.S. NO 3 SPRAY 413 9008 00 	Heavy Duty Rust preventive lubricant. Protects bare metal parts against rust and corrosion.	For storage protection, on bare metal parts.
SILICONE DIELECTRIC GREASE 3 oz 747 018 002 	Special dielectric grease that prevents moisture and corrosion build-up in electric connections.	On all electric connections. High tension coil. Spark plug connections. Connector housings, etc.
GREASE TUBE 14 oz 498 0281 00 	Multi purpose Lithium based grease for use over a wide temperature range.	For idler bearings, skilegs, leaf spring cushion pads, oil seal interior lips, etc.
CLUTCH LUBE 413 8007 00 	Special low temperature metallic lubricant for clutch shafts only.	Citation 3500, Citation 4500/E, Mirage I, Mirage II/E, Elan and Spirit drive pulleys.
INJECTOR OIL 413 8015 00 	High quality lubricant with good resistance to high operating temperatures. Low foaming action.	Rotary valve lubricant on 354-444-454 and 464 engines.
CHAINCASE OIL 413 8012 00 	Specially formulated oil for chain and roller lubrication. Assures proper lubrication at low temperatures.	Chaincase lubricant on all models.
BOMBARDIER OIL 50/1 496 0132 00 	Specially formulated oil that meets lubrication requirements of the Bombardier-Rotax engine.	All models.

TECHNICAL DATA LIST

TOLERANCE AND WEAR LIMIT — ENGINES

IGNITION TIMING SPECIFICATIONS

CARBURETOR SPECIFICATIONS

IGNITION GENERATING COIL, TRIGGER COIL AND LIGHTING COIL RESISTANCE CHART

BOMBARDIER IGNITION TESTER DIAL POSITIONS

BOSCH SPARK PLUG CHART

VEHICLE MODEL/DRIVE BELT NUMBER

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DRIVEN PULLEY SPRING TENSION

PULLEY ALIGNMENT SPECIFICATIONS

SPROCKET AND CHAIN SPECIFICATIONS

TRACK TENSION SPECIFICATIONS (BOGIE WHEEL SUSPENSION)

TRACK TENSION SPECIFICATIONS (SLIDE SUSPENSION)

TRACK SPECIFICATIONS

STEERING SYSTEM TORQUE SPECIFICATIONS

SKI SYSTEM TORQUE SPECIFICATIONS

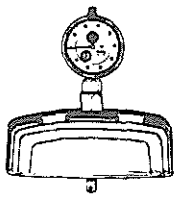
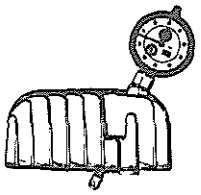
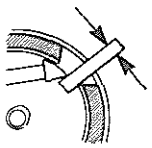
METRIC INFORMATION CHART

TOLERANCES AND WEAR LIMIT — 1980 ENGINES

ENGINE TYPE	CYLINDER BORE (NOMINAL) STD	CYLINDER BORE (NOMINAL) OVERSIZE	PISTON TO WALL CLEARANCE MIN. — MAX.	MAXIMUM RING END CAP	CRANKSHAFT END PLAY MIN. — MAX.
247	69.00 mm (2.7165")	69.50 mm (2.7362")	0.065-0.200 mm (.0026-.008")	0.20-0.35 mm (.008-.014")	0.20-0.40 mm (.008-.016")
277	72.00 mm (2.8346")	72.25 mm (2.8445")	0.060-0.200 mm (.0024-.008")	0.20-0.35 mm (.008-.014")	0.20-0.40 mm (.008-.016")
354	59.50 mm (2.3425")	59.75 mm (2.3524")	0.080-0.180 mm (.0031-.007")	0.15-0.30 mm (.006-.012")	N.A.
377	62.00 mm (2.4409")	62.25 mm (2.4508")	0.070-0.200 mm (.0028-.008")	0.20-0.35 mm (.008-.014")	N.A.
444	69.50 mm (2.7362")	69.75 mm (2.7461")	0.070-0.200 mm (.0028-.008")	0.20-0.35 mm (.008-.014")	N.A.
454	67.50 mm (2.6575")	67.75 mm (2.6673")	0.090-0.200 mm (.0035-.008")	0.20-0.35 mm (.008-.014")	N.A.
464	69.50 mm (2.7362")	69.75 mm (2.7461")	0.070-0.200 mm (.0028-.008")	0.20-0.35 mm (.008-.014")	N.A.
503	72.00 mm (2.8346")	72.25 mm (2.8445")	0.060-0.200 mm (.0024-.008")	0.20-0.35 mm (.008-.014")	N.A.
640	76.00 mm (2.9921")	76.50 mm (3.0118")	0.070-0.220 mm (.0028-.008")	0.25-0.40 mm (.010-.016")	0.20-0.40 mm (.008-.016")

N.A.: not applicable

1980 IGNITION TIMING SPECIFICATIONS

ENGINE TYPE	IGNITION TYPE	DIRECT MEASUREMENT B.T.D.C. 	INDIRECT MEASUREMENT B.T.D.C. 	EDGE CAP 
247	Breaker	3.98 mm ± 0.25 (.157" ± .010)	N.A.	7-10 mm (.275-.394")
277	Breaker	N.A.	2.60 mm ± 0.25 (.102" ± .010)	8-12 mm (.315-.472")
354	CD	* 1.39 mm ± 0.25 (.055" ± .010)	N.A.	N.A.
377	Breakers	2.07 mm ± 0.25 (.081" ± .010)	N.A.	8-12 mm (.315-.472")
444	Breakers	2.35 mm ± 0.25 (.093" ± .010)	N.A.	8-12 mm (.315-.472")
454	CD	* 1.39 mm ± 0.25 (.055" ± .010)	N.A.	N.A.
464	Breakers	2.07 mm ± 0.25 (.081" ± .010)	N.A.	8-12 mm (.315-.472")
503	Breakers	2.07 mm ± 0.25 (.081" ± 0.10)	N.A.	8-12 mm (.315-.472")
640	Breakers	N.A.	3.62 mm ± 0.25 (.143" ± .010)	7-10 mm (.275-.394")

N.A. not applicable
* Stroboscopic timing at 6000 R.P.M.

CARBURETOR SPECIFICATIONS

MODEL	ENGINE TYPE	CARBURETOR TYPE Mikuni	LOW SPEED ADJ ± 1/8	IDLE SPEED R.P.M.
ELAN & SPIRIT	247	VM28-242	1 1/2 turn	1100-1300
CITATION 3500, MIRAGE I	277	VM 34-228	1 1/2 turn	1100-1300
CITATION 4500/E, MIRAGE II/E	377	VM-34-229	1 turn	2000
CITATION SS, MIRAGE SPECIAL	377	2XVM30-111	1 1/2 turn	1800-2000
EVEREST 500/E FUTURA 500/E	503	VM36-83	1 turn	1800-2000
EVEREST LC, FUTURA LC	464	VM34-227	1 1/2 turn	2000
BLIZZARD 5500 GRAND PRIX SPECIAL	503	2XVM34-203	1 1/2 turn	1800-2000
BLIZZARD 7500 SUPER SONIC	354	MAG: VM34-230 PTO: VM34-233	1 1/2 turn	1800-2000
BLIZZARD 9500 ULTRA SONIC	454	PTO: VM36-88 MAG: VM36-86	1 turn	1800-2000
ALPINE 640ER	640	VM34-215	1 1/2 turn	1800-2000
ELITE 450 LC	444	VM34-201	1 turn	1800-2000

1980 MIKUNI CARBURETOR SPECIFICATIONS

CARBURETOR	MAIN JET	NEEDLE	NEEDLE JET	CUTAWAY	PILOT JET	AIR SCREW ② ± ⅛
		① Poor / Rich		Throttle slide		
VM28-242	160	6DP1-3	182-0-8	2.0	30	1½ turn
VM30-111	150	6DH7-3	159 P-0	3.0	40	1½ turn
VM34-201	370	6EJ1-3	159 P-2	2.5	30	1 turn
VM34-203	220	6DH2-3	159 P-4	3.0	35	1½ turn
VM34-215	280	6F9-3	159 P-2	2.0	30	1½ turn
VM34-227	380	6EJ1-3	159 P-4	3.0	40	1½ turn
VM34-228	220	6DH4-3	159 P-2	3.0	30	1½ turn
VM34-229	280	6DH4-3	159 P-0	3.0	35	1 turn
VM34-230	290	6DH4-3	159 P-4	3.5	40	1½ turn
VM34-233	260	6DH4-3	159 P-4	3.5	40	1½ turn
VM36-83	310	6F9-3	159 P-8	3.0	40	1 turn
VM36-86	320	6DH4-3	159 P-2	3.5	40	1 turn
VM36-88	300	6DH4-3	159 P-2	3.5	40	1 turn

① Jet needle last digit indicates "E" clip position from top. Ex.: 6HD2-3: 3rd slot from top.

② Turning clockwise will enrich the mixture and counterclockwise will lean it.

GENERATOR COIL, LIGHTING COIL AND TRIGGER COIL RESISTANCE CHART

ENGINE TYPE	GENERATOR COIL	TRIGGER COIL	MAIN LIGHTING COIL (large)	ADDITIONAL LIGHTING COIL (small)
247*	3-3.7 ohms	N.A.	0.38-0.58 ohm	1.85-2.35 ohms
277*	3-3.7 ohms	N.A.	0.30-0.50 ohm	2.13-2.63 ohms
354	450-550 ohms	50-60 ohms	0.15-0.19 ohm	N.A.
377*	3.2-3.7 ohms	N.A.	0.30-0.50 ohm	2.13-2.63 ohms
444*	3.2-3.7 ohms	N.A.	N.A.	N.A.
454	450-550 ohms	50-60 ohms	0.15-0.19 ohm	N.A.
464*	3.2-3.7 ohms	N.A.	0.30-0.50 ohm	2.13-2.63 ohms
503*	3.2-3.7 ohms	N.A.	0.30-0.50 ohm	2.13-2.63 ohms
640*	3.2-3.7 ohms	N.A.	0.30-0.50 ohm	2.13-2.63 ohms

* Ignition coil: -primary circuit (between nos 1 and 15 terminals):
1.65-2.05 ohms
-secondary circuit (between nos 1 and 14 terminals):
4850-5850 ohms

CONDENSER CAPACITY: 0.24-0.30 mfd

N.A.: not applicable

Components temperature must be around 20°C (70°F) when test is performed.

BOMBARDIER IGNITION TESTER ADJUSTMENT FOR 1980 COMPONENTS

ENGINE TYPE	GENERATOR COIL	TRIGGER COIL	MAIN LIGHTING COIL (large)	ADDITIONAL LIGHTING COIL (small)
247	HIGH 75		LOW 85	LOW 85
277	HIGH 70		LOW 85*	LOW 85*
354	HIGH 40	LOW 50	LOW 80	
377	HIGH 80		LOW 85*	LOW 85*
444	HIGH 80			
454	HIGH 40	LOW 50	LOW 80	
464	HIGH 80		LOW 85*	LOW 85*
503	HIGH 80		LOW 85*	LOW 85*
640	HIGH 80		LOW 85*	LOW 85*

* The two lighting coils (large one and small one) are connected in parallel and this parallel connection must be broken off for testing as each coil is to be checked individually.

1980 BOSCH SPARK PLUG CHART

	ENGINE TYPE	SPARK PLUG NO.
ELAN & SPIRIT 250	247	M175 T1 (M7A)
CITATION 3500, MIRAGE I CITATION 4500/E, MIRAGE II/E CITATION SS, MIRAGE SPECIAL	277 377 377	W275 T2 (W3C) W275 T2 (W3C) W275 T2 (W3C)
EVEREST 500/E, FUTURA 500/E FUTURA	503	W275 T2 (W3C)
EVEREST LC & FUTURA LC	464	W275 T2 (W3C)
BLIZZARD 5500/GP SPECIAL	503	W275 T2 (W3C)
BLIZZARD 7500/SUPER SONIC	354	W300 T2 (W2C)
BLIZZARD 9500/ULTRA SONIC	454	W300 T2 (W2C)
ALPINE 640 ER	640	M240 T1 (M4A2)
ELITE 450 LC	444	W275 T2 (W3C)

VEHICLE MODEL/DRIVE BELT NUMBER

	1980	WIDTH
ELAN and SPIRIT	570 0411 00	30 mm (1 3/16")
CITATION 3500 MIRAGE I CITATION 4500/E MIRAGE II/E CITATION SS MIRAGE SPECIAL	414 3945 00	30 mm (1 3/16")
EVEREST 500/E FUTURA 500/E EVEREST LC FUTURA LC	414 3758 00	33 mm (1 5/16")
EVEREST FUTURA	414 3758 00	33 mm (1 5/16")
BLIZZARD 5500 GRAND PRIX SPECIAL	414 3758 00	33 mm (1 5/16")
BLIZZARD 7500 SUPER SONIC	414 3758 00	33 mm (1 5/16")
BLIZZARD 9500 ULTRA SONIC	414 3758 00	33 mm (1 5/16")
ALPINE 640 ER	414 3758 00	33 mm (1 5/16")
ELITE 450 LC	414 3758 00	33 mm (1 5/16")

NOTE: For longer belt life, always reinstall the drive belt in the same direction of rotation.

1980 DRIVE PULLEY SPECIFICATIONS

MODEL	TYPE	COUNTER-WEIGHT IDENTIFI-CATION	ROLLER IDENTI-FICATION mm (inch)	P/N SPRING LENGTH COLOR ± 1.5 mm (.060")	CLUTCH ENGAGE-MENT R.P.M.	RETAINING BOLT TORQUE N•m (ft-lbs)
ELAN & SPIRIT	R.R.S.	E-4	Nylon 31.75 (1 1/4)	414-2580 Bronze 76.7 (3.02)	2000-2200	61 (45)
CITATION 3500 & MIRAGE I	R.R.S.	B-2-K-S	Fiber 31.75 (1 1/4)	414-2581 Blue 77.7 (3.06)	2900-3200	61 (45)
CITATION 4500/E & MIRAGE II/E	R.R.S.	C-7-L	Fiber 31.75 (1 1/4)	414-4131 Olive 105.9 (4.17)	3600-3900	61 (45)
CITATION SS & MIRAGE SPECIAL	R.S.S.	A-3-S-H	Fiber 25.4 (1.15)	414-4065 Orange 96.5 (3.80)	3900-4200	85 (63)
EVEREST 500/E & FUTURA 500/E	R.S.S.	C-6-L-H	Fiber 25.4 (1.15)	414-2328 Gold 74.4 (2.93)	2900-3200	85 (63)
EVEREST LC & FUTURA LC	R.S.S.	C-7-L-H	Fiber 25.4 (1.15)	414-1967 Light blue 119.1 (4.69)	3400-3700	85 (63)
BLIZZARD 5500 & GRAND PRIX SPECIAL	R.S.S.	C-6-L-H	Fiber 25.4 (1.15)	414-1967 Light blue 119.1 (4.69)	3300-3600	85 (63)
BLIZZARD 7500 & SUPER SONIC	R.S.S.R.	A-3-S	Alu 15.75 (.62)	414-2610 Purple 73.7 (2.90)	3800-4100	85 (63)
BLIZZARD 9500 & ULTRA SONIC	R.S.S.R.	A-3-S	Alu 15.75 (.62)	414-2610 Purple 73.7 (2.90)	3800-4100	85 (63)
ELITE 450 LC	R.S.S.	C-8	Fiber 34.04 (1.34)	414-1967 Light blue 119.1 (4.69)	3200-3500	85 (63)
ALPINE 640 ER	R.S.S.B.	C-8 double	Fiber 34.04 (1.34)	414-1966 Pink 122.2 (4.81)	2250-2400	118 (87)

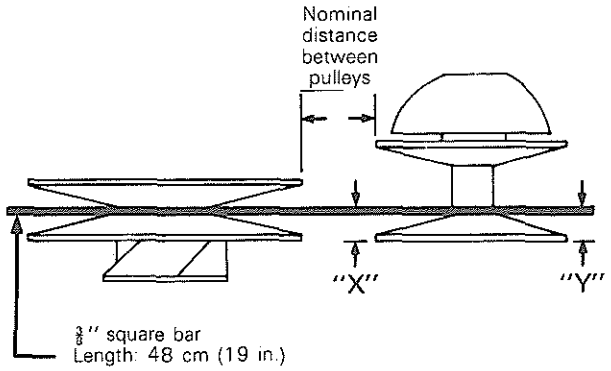
R.S.S.: Roller square shaft
R.R.S.: Roller round shaft
R.S.S.B.: Roller square shaft with bearing
R.S.S.R: Roller square shaft 3 ramps

(1) Ramps no. 2442
(2) Ramps no. 2422

DRIVEN PULLEY SPRING TENSION

	kg ± 1 (lbs ± 2)
ELAN/SPIRIT	3.6 (8)
CITATION 3500, MIRAGE I CITATION 4500/E, MIRAGE II/E	3.6 (8)
CITATION SS, MIRAGE SPECIAL	5.9 (13)
EVEREST 500/E, FUTURA 500/E EVEREST LC, FUTURA LC	5.9 (13)
BLIZZARD 5500/GRAND PRIX SPECIAL	5.9 (13)
BLIZZARD 7500/SUPER SONIC	5.9 (13)
BLIZZARD 9500, ULTRA SONIC	5.9 (13)
ELITE 450 LC	5.9 (13)
ALPINE 640 ER	5.9 (13)

1980 PULLEY ALIGNMENT



— Dimension "X" must never exceed dimension "Y".
— Dimension "Y" can exceed dimension "X" by 1.6 mm (1/16")

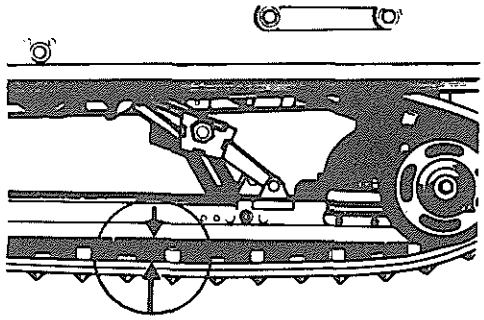
	DIMENSIONS X and Y (offset)	NOMINAL DISTANCE (between pulleys)
ELAN & SPIRIT	34 mm (1 11/32")	44 mm (1 3/4")
CITATION 3500, MIRAGE I CITATION 4500/E, MIRAGE II/E CITATION SS, MIRAGE SPECIAL	34 mm (1 11/32")	fixed
EVEREST 500/E, FUTURA 500/E EVEREST LC, FUTURA LC ①	34 mm (1 11/32")	35 mm (1 3/8")
BLIZZARD 5500 and GRAND PRIX SPECIAL ①	34 mm (1 11/32")	35 mm (1 3/8")
BLIZZARD 7500 and SUPER SONIC ①	34 mm (1 11/32")	35 mm (1 3/8")
BLIZZARD 9500 and ULTRA SONIC ①	34 mm (1 11/32")	35 mm (1 3/8")
ALPINE	34 mm (1 11/32")	44 mm (1 3/4")
ELITE 450 LC	34 mm (1 11/32")	42 mm (1 5/8")

①With a 1/16" shim between driven pulley and bearing flange. Refer to section 05-05.

1980 SPROCKET AND CHAIN SPECIFICATIONS

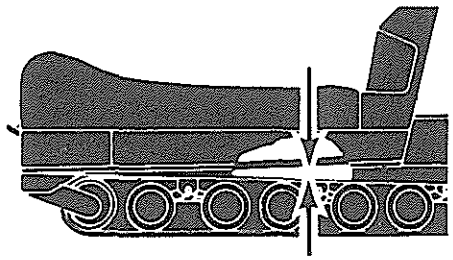
	SPROCKET UPPER/LOWER	CHAIN PITCH AND NUMBER OF LINKS
ELAN and SPIRIT 250	10/25	½" single, 62
CITATION 3500, MIRAGE I CITATION 4500/E, MIRAGE II/E	15/34 16/33	⅜" double 86 ⅜" double 86
CITATION SS, MIRAGE SPECIAL	18/34	⅜" double 88
EVEREST 500/E, FUTURA 500/E	19/40	⅜" triple 68
EVEREST LC, FUTURA LC	17/34	⅜" triple 64
BLIZZARD 5500, GRAND PRIX SPECIAL	21/38	⅜" triple 68
BLIZZARD 7500, SUPER SONIC	17/38	⅜" triple 66
BLIZZARD 9500, ULTRA SONIC	19/40	⅜" triple 68
ALPINE 640 ER	17/38	⅜" triple 90
ELITE 450 LC	17/38	⅜" triple 188

TRACK TENSION SPECIFICATIONS (SLIDE SUSPENSION)

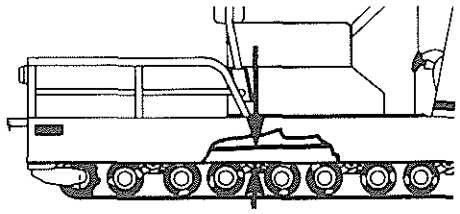


	1980
CITATION 3500, CITATION 4500/E MIRAGE I, MIRAGE II/E CITATION SS, MIRAGE SPECIAL	13 mm ($\frac{1}{2}$'')
EVEREST 500/E, EVEREST LC FUTURA 500/E, FUTURA LC	13 mm ($\frac{1}{2}$'')
BLIZZARD 5500 GRAND PRIX SPECIAL	13 mm ($\frac{1}{2}$'')
BLIZZARD 7500 SUPER SONIC	13 mm ($\frac{1}{2}$'')
BLIZZARD 9500 ULTRA SONIC	13 mm ($\frac{1}{2}$'')
ELITE 450 LC	13 mm ($\frac{1}{2}$'')

TRACK TENSION SPECIFICATIONS (BOGIE WHEEL SUSPENSION)



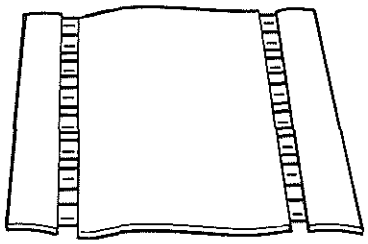
	1980
ELAN and SPIRIT 250	35 mm (1 $\frac{3}{8}$'')
ALPINE 640 ER	*57 mm (2 $\frac{1}{4}$'')



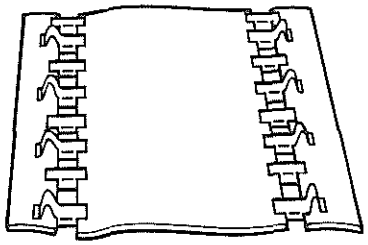
* Between top inside edge of track and center of second bogie wheel set retaining bolt (from rear).

1980 TRACK SPECIFICATIONS

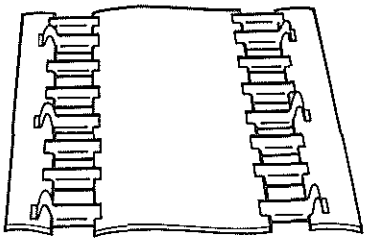
CLEAT AND GUIDE ARRANGEMENT



TYPE 1: Narrow insert.



TYPE 2: Narrow insert with shoulder



TYPE 3: Wide guide (large track hole).

	TYPE	TRACK PART NUMBER	WIDTH	LENGTH (interior)
ELAN	1	570 0006 00	38.1 cm (15")	289.6 cm (114")
SPIRIT	1	570 0085 00	38.1 cm (15")	289.6 cm (114")
CITATION 3500, CITATION SS	2	570 0091 00	38.1 cm (15")	269.2 cm (106")
MIRAGE I, MIRAGE SPECIAL	2	570 0092 00	38.1 cm (15")	269.2 cm (106")
CITATION 4500/E	2	570 0069 00	38.1 cm (15")	289.6 cm (114")
MIRAGE II/E	2	570 0068 00	38.1 cm (15")	289.6 cm (114")
EVEREST 500/E, EVEREST LC	3	570 0045 00	41.9 cm (16½")	314.9 cm (124")
FUTURA 500/E, FUTURA LC	3	570 0060 00	41.9 cm (16½")	314.9 cm (124")
BLIZZARD 5500	2	570 0086 00	38.1 cm (15")	289.6 cm (114")
GRAND PRIX SPECIAL	2	570 0068 00	38.1 cm (15")	289.6 cm (114")
BLIZZARD 7500	2	570 0093 00	38.1 cm (15")	289.6 cm (114")
SUPER SONIC	2	570 0068 00	38.1 cm (15")	289.6 cm (114")
BLIZZARD 9500	2	570 0093 00	38.1 cm (15")	289.6 cm (114")
ULTRA SONIC	2	570 0080 00	38.1 cm (15")	289.6 cm (114")
ALPINE 640 ER	1	570 0014 00	38.1 cm (15")	353 cm (139")
ELITE 450 LC	3	570 0056 00	38.1 cm (15")	304.8 cm (120")

1980 STEERING SYSTEM TORQUE SPECIFICATIONS

	HANDLEBAR RETAINING BOLT (S) N•m (ft-lbs)	STEERING ARM TO SKI LEG N•m (ft-lbs)	TIE ROD END TO STEERING ARM N•m (ft-lbs)
ELAN and SPIRIT		27 (20)	27 (20)
CITATION 3500, MIRAGE I CITATION 4500/E, MIRAGE II/E CITATION SS, MIRAGE SPECIAL	26 (19)	42 (31)	27 (20)
EVEREST 500/E, & FUTURA 500/E EVEREST LC & FUTURA LC	26 (19)	42 (31)	27 (20)
BLIZZARD 5500 GRAND PRIX SPECIAL	26 (19)	42 (31)	27 (20)
BLIZZARD 7500 SUPER SONIC	26 (19)	42 (31)	27 (20)
BLIZZARD 9500 ULTRA SONIC	26 (19)	42 (31)	27 (20)
ALPINE	42 (31)	42 (31)	*61 (45)
ELITE	42 (31)	42 (31)	27 (20)

* Ball bushing nut torque value.

1980 SKI SYSTEM TORQUE SPECIFICATIONS

	SPRING LEAF/ LEAF COUPLER RETAINING BOLT N•m (ft-lbs)	RUNNER SHOE NUT N•m (ft-lbs)	*LEAF COUPLER TO SKI LEG N•m (ft-lbs)
ELAN & SPIRIT	50 (37)	7 (5)	61 (45)
CITATION 3500 & MIRAGE I CITATION 4500/E & MIRAGE II/E CITATION SS & MIRAGE SPECIAL	54 (40)	22 (16)	61 (45)
EVEREST 500/E & FUTURA 500/E		22 (16)	61 (45)
EVEREST LC & FUTURA LC		22 (16)	61 (45)
BLIZZARD 7500 & SUPER SONIC BLIZZARD 9500 & ULTRA SONIC		22 (16)	61 (45)
ALPINE	27 (20)	22 (16)	61 (45)
ELITE	27 (20)	22 (16)	

* Tighten bolt, move ski by hand to check that it pivots easily on ski leg. Then tighten locking nut to specified torque.

SI * METRIC INFORMATION CHART

BASE UNITS		
DESCRIPTION	UNIT	SYMBOL
length	meter	m
mass	kilogram	kg
liquid	liter	L
temperature	celsius	°C
pressure	kilopascal	kPa
torque	Newton meter	N•m
speed	kilometer per hour	km/h

PREFIXES			
PREFIX	SYMBOL	MEANING	VALUE
kilo	k	one thousand	1,000
centi	c	one hundredth of a	0.01
milli	m	one thousandth of a	0.001

* THE INTERNATIONAL SYSTEM OF UNITS (SYSTEME INTERNATIONAL) ABREVIATES "SI" IN ALL LANGUAGES.

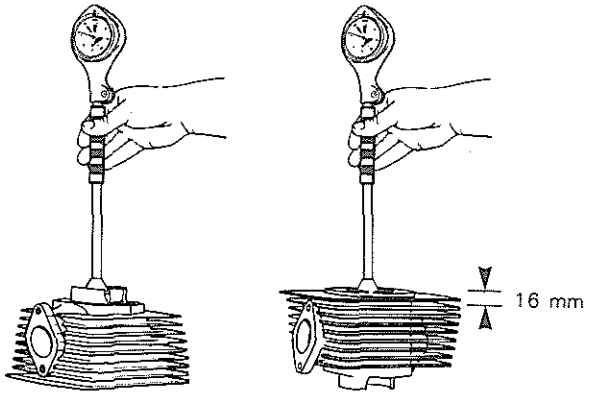
ENGINE TOLERANCES MEASUREMENT

CYLINDER TAPER

Maximum: 0.08 mm (.003")

Compare cylinder diameter 16 mm (5/8") from top of cylinder with down to just below the intake port.

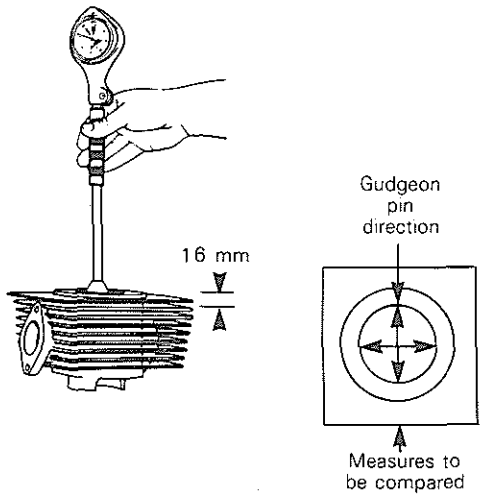
On rotary valve engines, measure just below auxiliary transfer port, facing exhaust port. If the difference exceeds 0.08 mm (.003") the cylinder should be rebored and honed or should be replaced.



CYLINDER OUT OF ROUND

Maximum: 0.05 mm (.002")

Measuring 16 mm (5/8") from top of cylinder with a cylinder gauge, check if the cylinder out of round is more than 0.05 mm (.002"). If larger, cylinder should be rebored and honed or should be replaced.

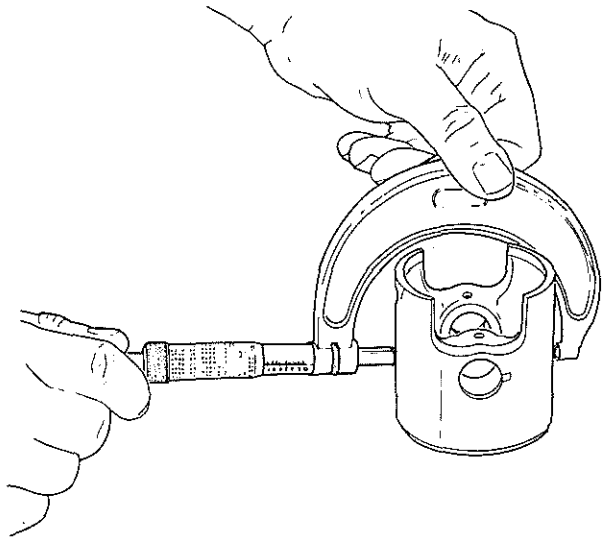


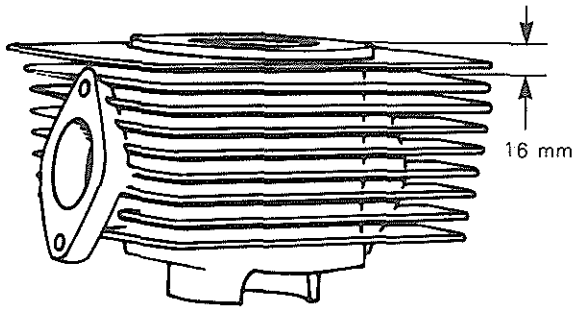
PISTON TO WALL CLEARANCE

ENGINE TYPE	PISTON TO WALL CLEARANCE MINIMUM — MAXIMUM
247	0.065 — 0.200 mm (.0026 — .008")
277	0.060 — 0.200 mm (.0024 — .008")
354	0.080 — 0.180 mm (.0031 — .007")
377	0.070 — 0.200 mm (.0028 — .008")
444	0.070 — 0.200 mm (.0028 — .008")
454	0.090 — 0.200 mm (.0035 — .008")
464	0.070 — 0.200 mm (.0028 — .008")
503	0.060 — 0.200 mm (.0024 — .008")
640	0.070 — 0.220 mm (.0028 — .0086")

Measurement

To determine piston to wall clearance, the piston should be measured right under the axis hole and the cylinder should be measured 16 mm (5/8") below its top edge.





The difference between these two measurements should be within specified tolerance.

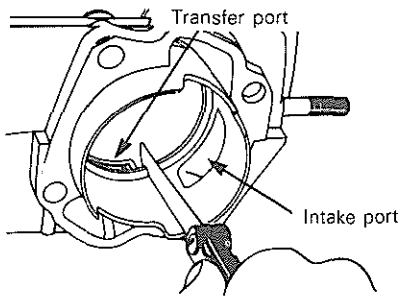
RING END GAP

ENGINE TYPE	RING END GAP (new ring)	MAXIMUM RING END GAP (worn ring)
247,277 377,444 454,464 503	0.20 — 0.35 mm (.008 — .014")	1.0 mm (.039")
354	0.15 — 0.30 mm (.006 — .012")	0.8 mm (.031")
640	0.25 — 0.40 mm (.010 — .016")	1.2 mm (.047")

Position ring half way between transfer ports and intake port. On rotary valve engines, position ring just below transfer ports.

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

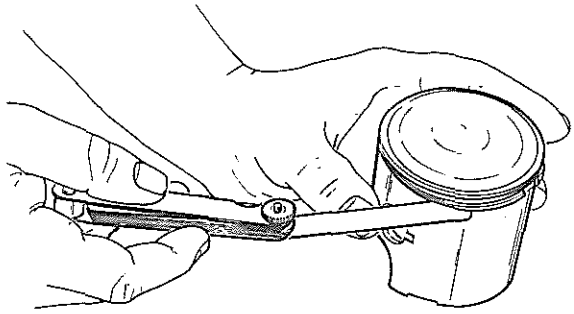
Using a feeler gauge, check ring end gap. If gap exceeds specified tolerance the ring should be replaced.



PISTON RING/GROOVE CLEARANCE

MINIMUM	— MAXIMUM
0.04 mm	— 0.20 mm
(.002")	— (.008")

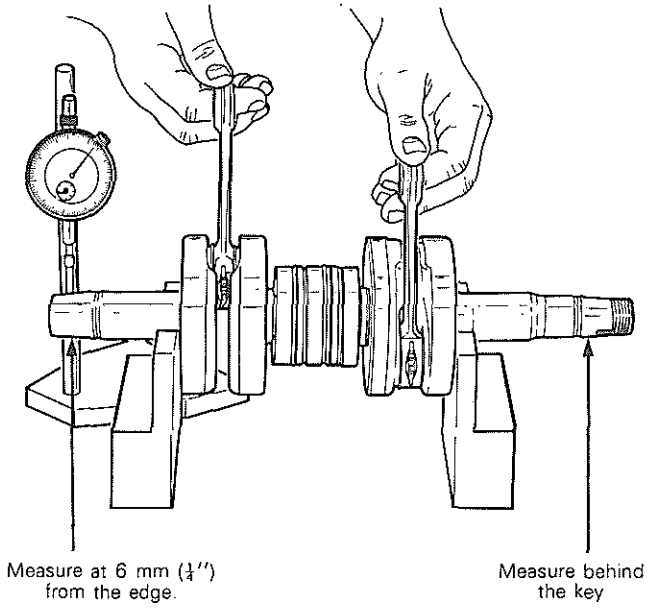
Using a feeler gauge check clearance between rectangular ring and groove. If clearance exceeds specified tolerance, replace piston.



CRANKSHAFT DEFLECTION

Maximum: 0.10 mm (.004")

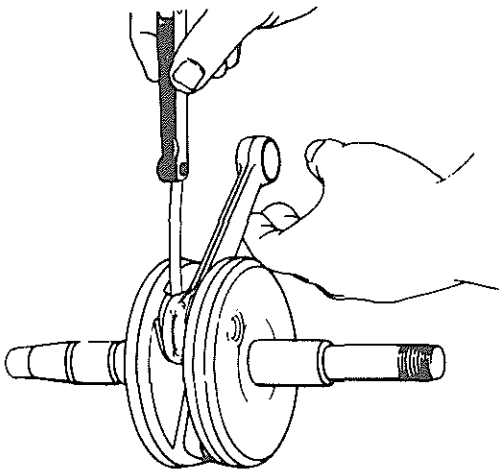
Turn crankshaft on "V" shaped blocks; using a dial indicator measure deflection on each side as illustrated. If deflection exceeds specified tolerance, the crankshaft should be repaired or replaces.



CONNECTING ROD BIG END AXIAL PLAY

TYPE	MINIMUM — MAXIMUM
247,277 377,444 503,640	0.20 — 1.00 mm (.008 — .039")
354,454 464	0.40 — 1.00 mm (.016 — .039")

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



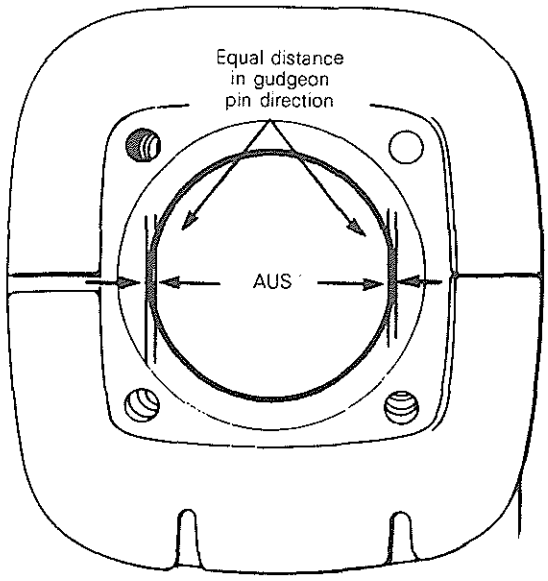
CONNECTING ROD ALIGNMENT

Check if connecting rod is bent as follows:

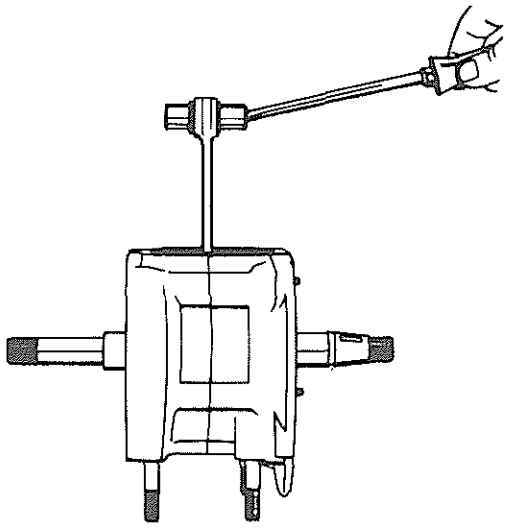
— Once engine crankcase is assembled with the piston mounted on connecting rod without its piston rings, position cylinder on piston.

NOTE: The cylinder/crankcase gasket must not be installed.

— Rotate crankshaft slowly and at the same time observe piston movement within the cylinder. If piston bears against one side (PTO or mag. side), the connecting rod is bent.



— To correct, position needle bearing and gudgeon pin on connecting rod then pry connecting rod as illustrated.



CRANKSHAFT END-PLAY

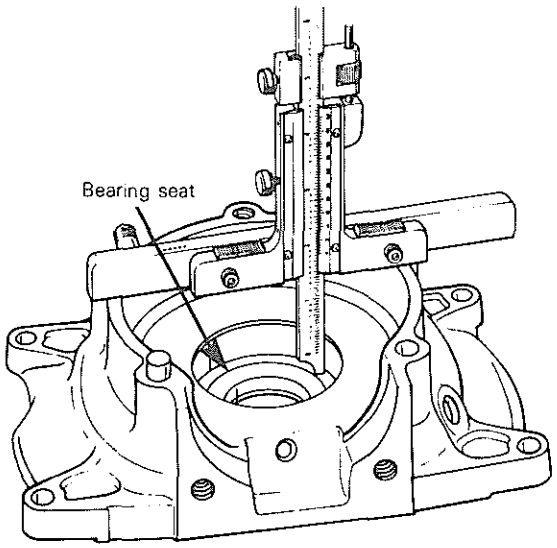
MINIMUM	— MAXIMUM
0.20 mm	— 0.40 mm
(.008")	— (.016")

NOTE: Crankshaft end-play is adjusted only when crankshaft and/or crankcase is replaced.

One cylinder engines (247, 277)

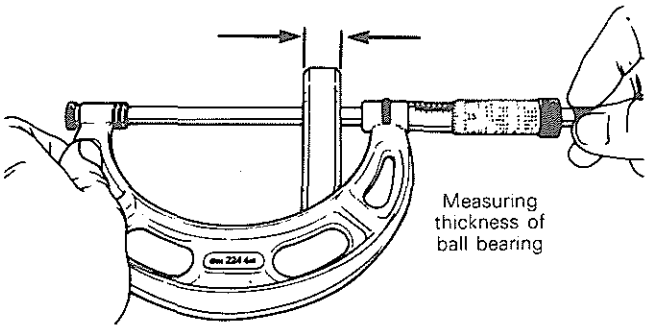
To determine crankshaft end-play, proceed as follows:

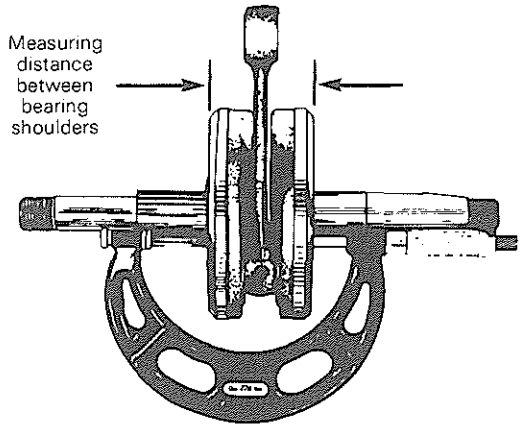
a) Measure crankcase. To do this first measure each half from mating surface to bottom of bearing seat. Add measurements of both halves then add 0.30 mm (.012") for gasket displacement. **Equal A.**



b) Measure the thickness of each ball bearing. Measure distance between bearing shoulders on crankshaft. Measure standard shims (247 type: P.T.O. side and 277 type: P.T.O. and MAG. sides).

Add measurements. **Total equals B.**





c) **Subtract measurement B from measurement A** minus tolerance. Total balance is distance to be shimmed. Shim(s) must be located between magneto side bearing and crankshaft blade.

Two cylinder engine (640)

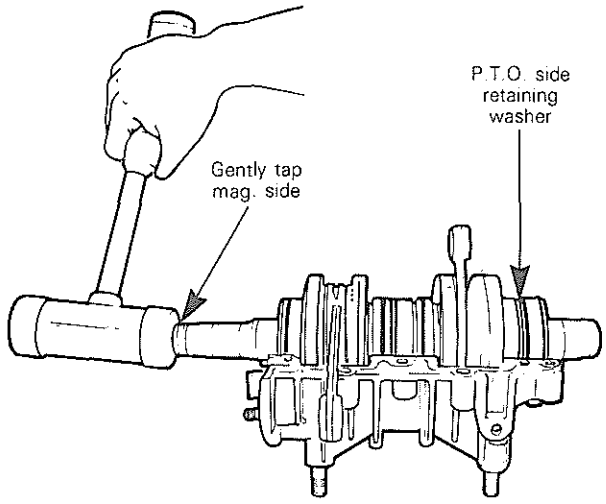
BEARING SIMULATOR NO.	AVAILABLE SHIMS
420 876 160	0.15 mm (.006"), 0.2 mm (.008"), 0.3 mm (.012")

Crankshaft end-play is adjusted with a shim(s) located between crankshaft and magneto side bearing. To determine correct amount of shims, proceed as follows.

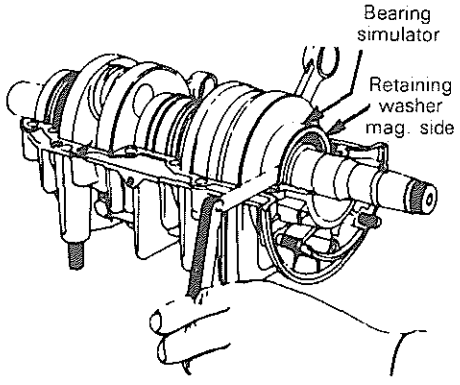
Remove magneto side bearing(s) and existing shim(s). Slide the appropriate bearing simulator and retaining washers onto the crankshaft.

Position crankshaft assembly into crankcase lower half, making sure that retaining washers are correctly seated into the grooves.

Gently tap crankshaft mag. side blade until P.T.O. side bearing bears against retaining washer.



Any free-play between the bearing simulator and magneto side retaining washer (minus end-play) is the distance to be covered by shim(s).

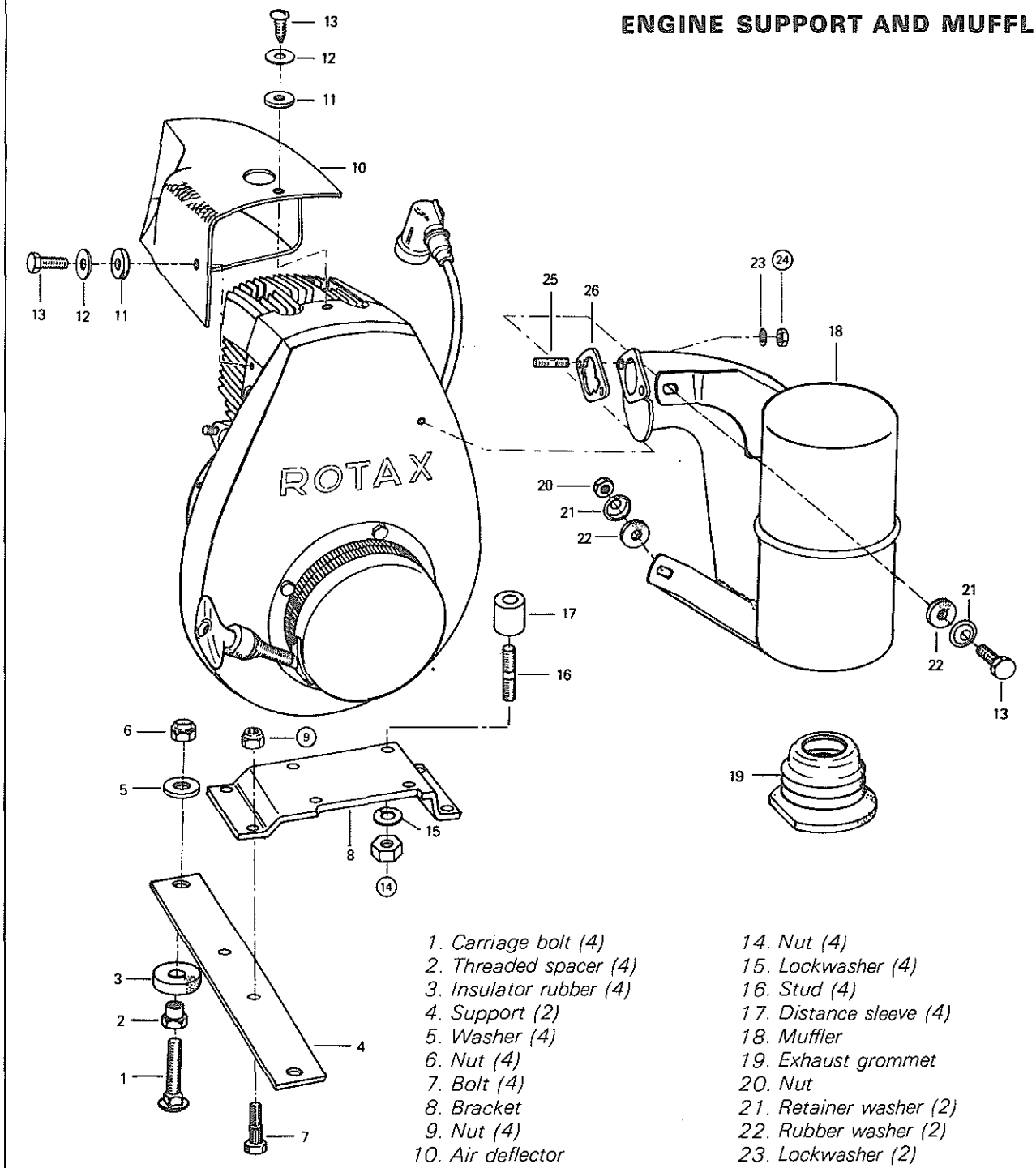


LIST OF THE SECTIONS RELATING TO ENGINES

247	Elan and Spirit 250
277	Citation 3500 and Mirage I
354-454	Blizzard 7500 and Super Sonic Blizzard 9500 and Ultra Sonic
377	Citation 4500, SS and Mirage 4500, Special
444	Elite
464	Everest and Futura LC
503	Blizzard 5500 and Grand Prix Special
640	Alpine

247 ENGINE TYPE

ENGINE SUPPORT AND MUFFLER



1. Carriage bolt (4)
2. Threaded spacer (4)
3. Insulator rubber (4)
4. Support (2)
5. Washer (4)
6. Nut (4)
7. Bolt (4)
8. Bracket
9. Nut (4)
10. Air deflector
11. Rubber spacer (3)
12. Washer
13. Screw
14. Nut (4)
15. Lockwasher (4)
16. Stud (4)
17. Distance sleeve (4)
18. Muffler
19. Exhaust grommet
20. Nut
21. Retainer washer (2)
22. Rubber washer (2)
23. Lockwasher (2)
24. Nut (2)
25. Stud M8 × 19 (2)
26. Exhaust gasket

ENGINE SUPPORT AND MUFFLER

REMOVAL FROM VEHICLE

Remove or disconnect the followings then lift engine from vehicle.

- Pulley guard.
- Drive belt.
- Muffler.
- Choke knob.
- Decompressor.
- Throttle calbe.
- Fuel lines.
- Electrical connector.
- Separate steering column support at upper column.
- Engine mount nuts.

DISASSEMBLY & ASSEMBLY

⑨ Torque to 31 N•m (23 ft-lbs).

⑭ Torque to 35 N•m (26 ft-lbs).

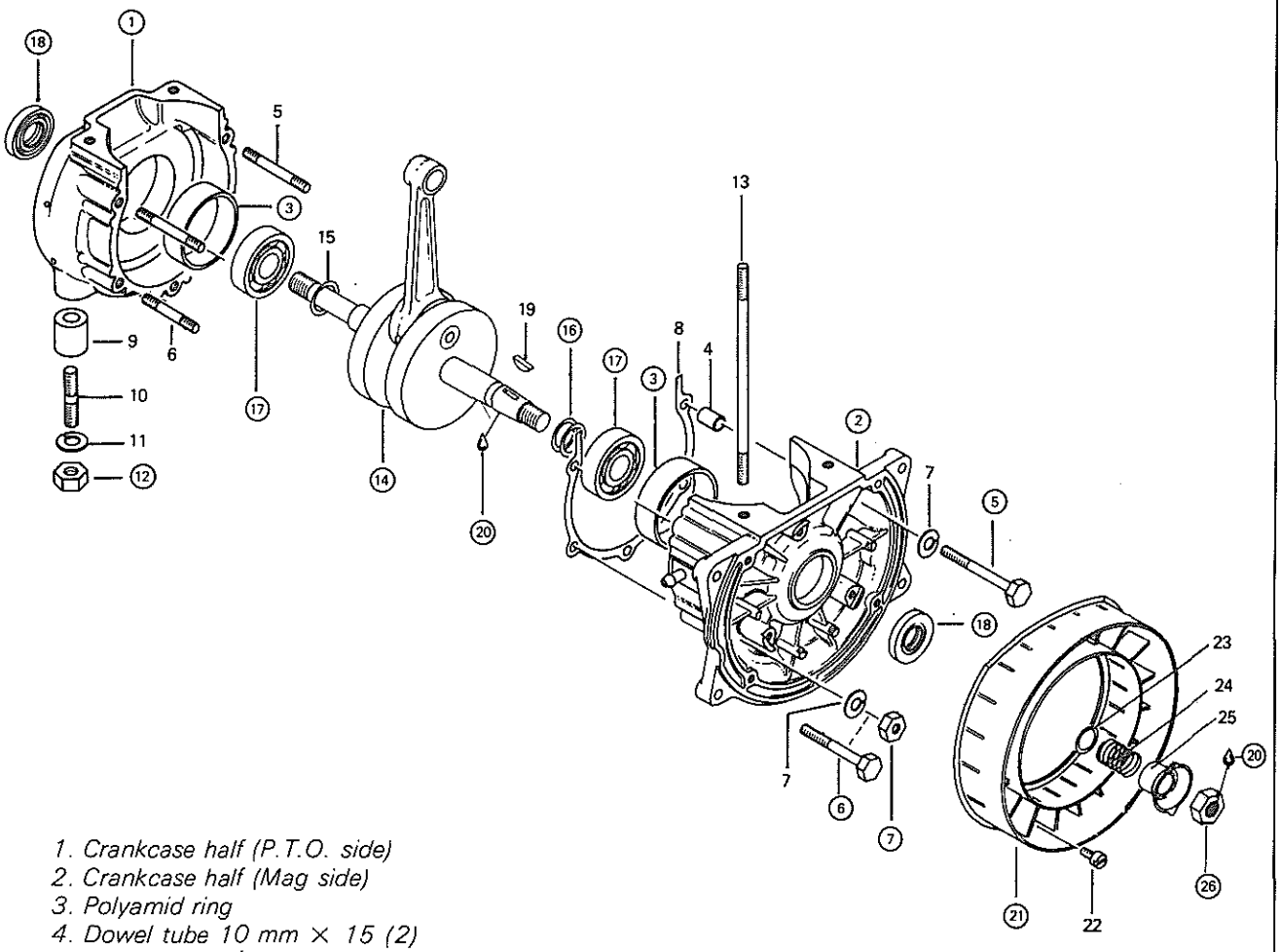
㉔ Torque to 22 N•m (16 ft-lbs).

INSTALLATION ON VEHICLE

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

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

BOTTOM END



1. *Crankcase half (P.T.O. side)*
2. *Crankcase half (Mag side)*
3. *Polyamid ring*
4. *Dowel tube 10 mm × 15 (2)*
5. *Stud M8 × 56 (crankcase with studs) (2)*
   Hexagonal head capscrew M8 × 64 (crankcase with screws) (2)
6. *Stud M8 × 46 (crankcase with studs) (3)*
   Hexagonal head capscrew M8 × 55 (crankcase with screws) (3)
7. *Lockwasher 8 (5)*
   Hexagonal nut 8 mm (crankcase with studs) (5)
8. *Crankcase gasket*
9. *Distance sleeve 22 mm (2)*
10. *Stud M10 × 42 (4)*
11. *Lockwasher 10 (4)*
12. *Hexagonal nut 10 mm (4)*
13. *Stud M8 × 171 (4)*
14. *Crankshaft*
15. *Shim 1.0 mm*
16. *Shim 0.1, 0.2, 0.3, 0.5, 1 mm*
17. *Ball bearing 6305 (2)*
18. *Oil seal (2)*
19. *Woodruff key 5 × 6.5*
20. *«Loctite 242» (blue — medium strength)*
21. *Labyrinth ring*
22. *Cylindrical slotted head screw M6 × 10 (4)*
23. *Spring seat*
24. *Spring*
25. *Breaker cam*
26. *Nut M18 × 1.5*

BOTTOM END

CLEANING

Discard all oil seals and gaskets.
Clean all metal components in a non-ferrous metal cleaner.

DISASSEMBLY & ASSEMBLY

General

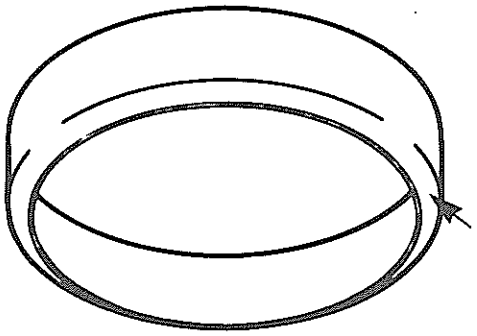
Refer to Technical Data Section for component fitted tolerance and wear limit. If necessary, refer to Drive Pulley Section to remove drive pulley.

①②When disassembling/assembling crankcase halves, do not heat the crankcase. If heat is necessary, temperature must not exceed 55°C (130°F).

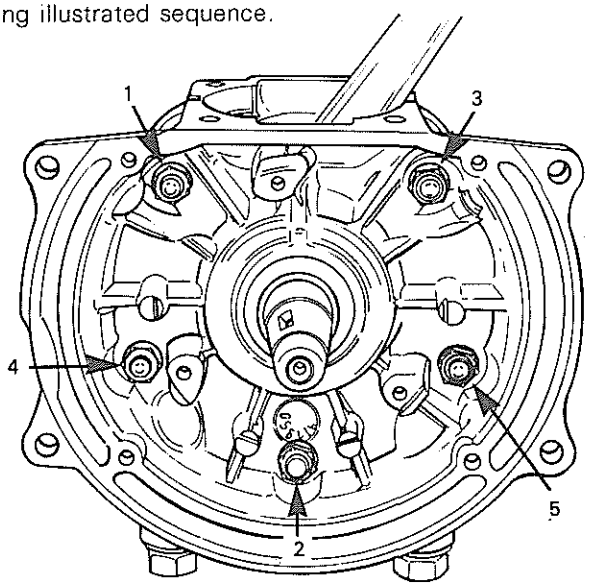
③Do not remove unless necessary.

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

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



⑤⑥⑦At assembly, torque to 22 N•m (16 ft-lbs) following illustrated sequence.



⑫ Torque to 35 N•m (26 ft-lbs).

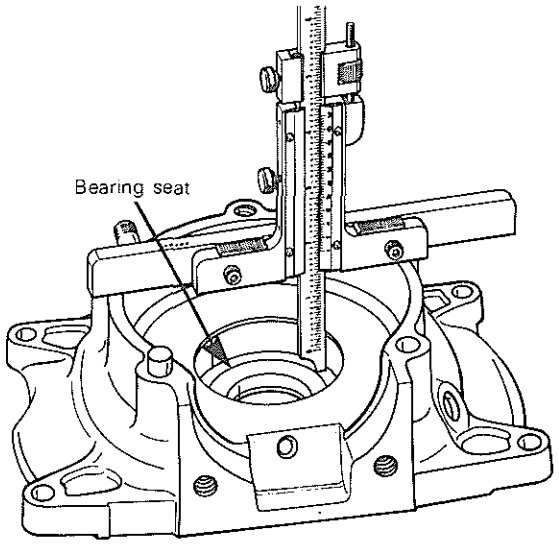
⑭⑯ **Crankshaft maximum end-play should be:**

Minimum	—	Maximum
0.20 mm		0.40 mm
(.008")		(.016")

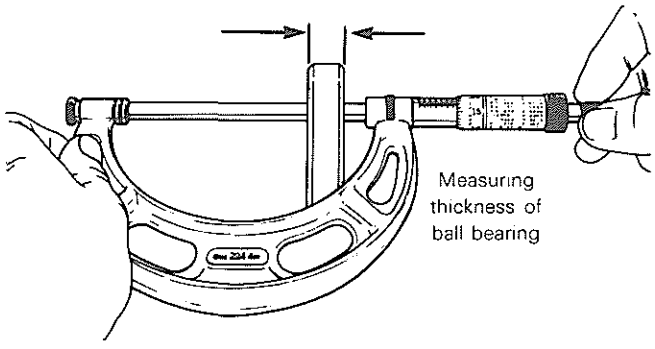
NOTE: Crankshaft end-play is adjusted only when crankshaft and/or crankcase is replaced.

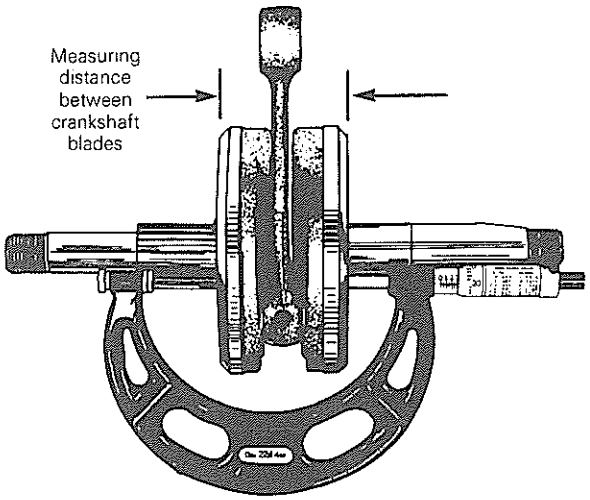
To determine end play:

a) Measure crankcase. To do this, first measure each half from mating surface to bottom of bearing seat. Add measurements of both halves then add 0.32 mm (.012") for gasket displacement. **Equals A.**



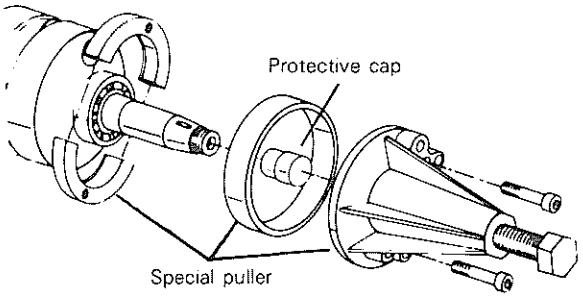
b) Measure thickness of each ball bearing. Measure distance between crankshaft blades. Add measurements with thickness of standard shim 1 mm (.040") on P.T.O. side. **Total equals B.**





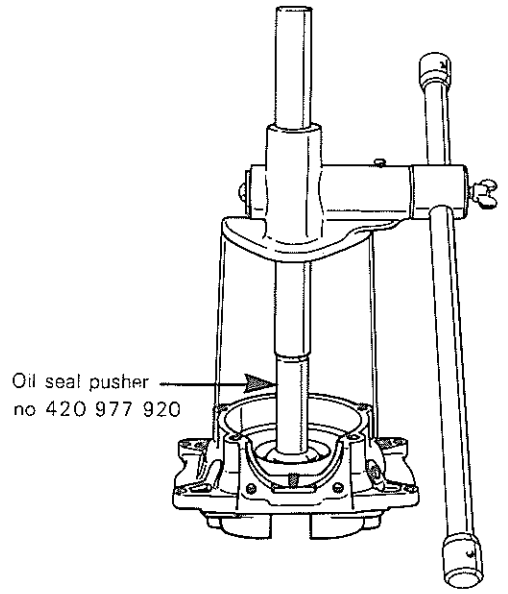
c) Subtract measurement B from measurement A minus tolerance. Total balance is distance to be shimmed. Shim(s) must be located between magneto side bearing and crankshaft blade.

⑰ To remove bearings from crankshaft use a protective cap and special puller as illustrated. (See Tools Section.)



NOTE: Prior to magneto side bearing installation, install required shim(s) (crankshaft end play) on crankshaft extension. At assembly, place bearings into an oil container and heat the oil to 100°C (210°F) for 5 to 10 min. This will expand the bearings and permit them to slide easily on the shaft.

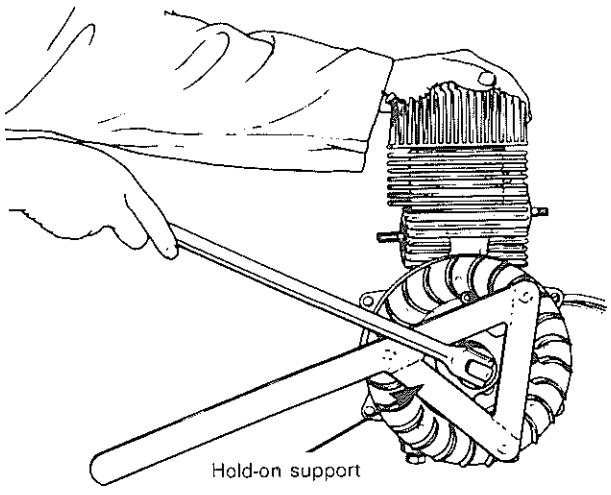
⑱ To remove or install new seal into crankcase use an appropriate oil seal pusher as illustrated. (See Tools Section).



Also, prior to crankcase adjoining, install a protector sleeve on each crankshaft extension to prevent oil seal damage (See Tools Section). Apply a light coat of lithium grease on seal lip. Seal outer surface should be flush with crankcase.

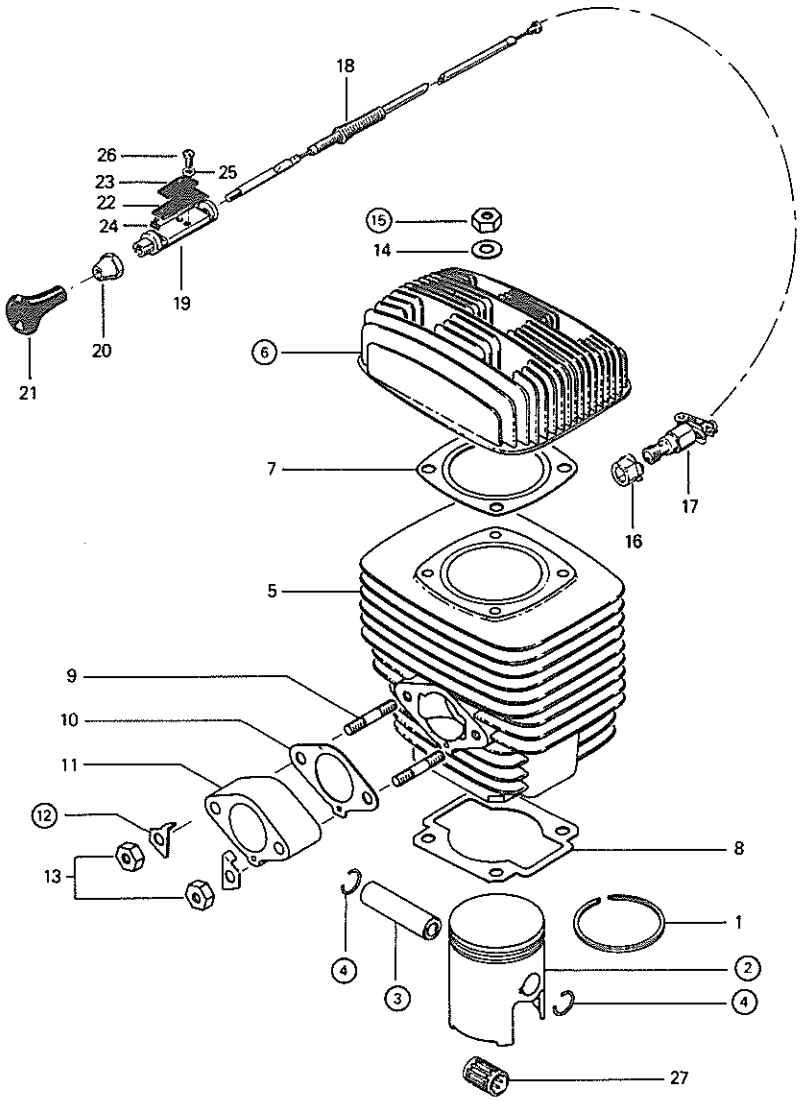
㉑ At assembly, position labyrinth ring with bevelled side on top.

⑳㉖ To remove or install magneto retaining nut, lock crankshaft in position with special hold-on support. (See Tools Section).



At assembly clean thoroughly and apply "Loctite 242" on threads then torque retaining nut to 73 N•m (54 ft-lbs).

TOP END



1. *Piston ring*
2. *Piston*
3. *Gudgeon pin*
4. *Circlip (2)*
5. *Cylinder*
6. *Cylinder head*
7. *Gasket (head / cylinder)*
8. *Gasket (cylinder / crankcase)*
9. *Stud (2)*
10. *Gasket*
11. *Insulating flange*
12. *Locking tab (2)*
13. *Nut (2)*
14. *Flat washer (4)*
15. *Nut (head) (4)*
16. *Locking sleeve*
17. *Decompressor*
18. *Cable*
19. *Switch housing*
20. *Cap nut*
21. *Knob*
22. *Spring plate*
23. *Spring plate reinforcement*
24. *Spring lock*
25. *Lockwasher*
26. *Screw*
27. *Needle bearing*

TOP END

CLEANING

Discard all gaskets.

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

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

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

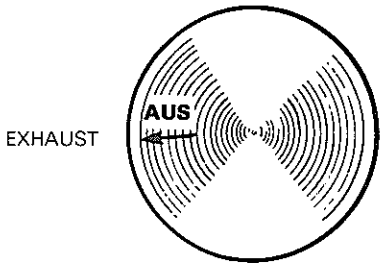
Clean the piston ring grooves with a groove cleaner tool, or with a piece of broken ring.

DISASSEMBLY & ASSEMBLY

②③④ Place a clean cloth over crankcase to prevent circlips from falling into crankcase. Use a pointed tool to remove circlips from piston.

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

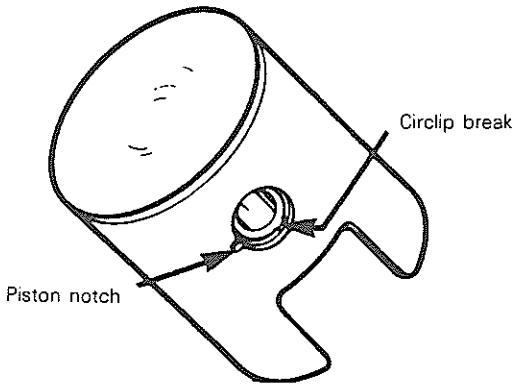
At assembly, place the piston over the connecting rod with the letters "AUS" (over an arrow on the piston dome) facing in direction of the exhaust port.



Piston to cylinder wall clearance should be:

Minimum	Maximum
0.065 mm	0.200 mm
(.0026")	(.008")

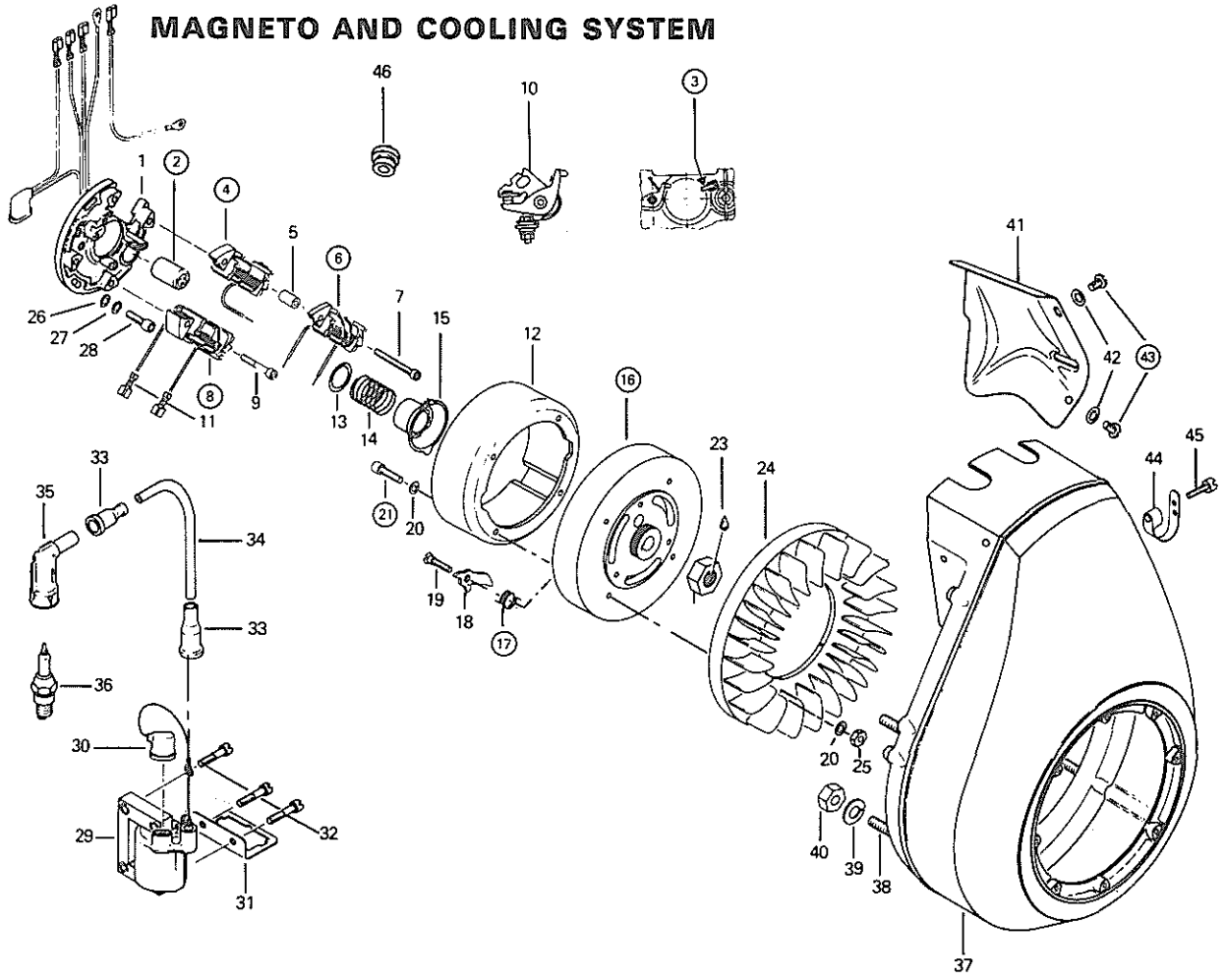
NOTE: Once the circlips are installed turn each circlip so the circlip break is not directly on piston notch. Remove any burrs on piston caused through circlip installation with very fine emery cloth.



⑥⑮ Position cylinder head on cylinder with fins in line with crankshaft center line. Cross torque retaining nuts to 20 N•m (15 ft-lbs).

⑫ Tab washer should be replaced if bent more than three (3) times. If in doubt replace.

MAGNETO AND COOLING SYSTEM



1. *Armature plate*
2. *Condenser*
3. *Lubricating wick*
4. *Generator coil*
5. *Distance sleeve 11 mm (2)*
6. *Lighting coil (brake)*
7. *Phillips cylindrical head screw M5 × 32 (2)*
8. *Lighting coil*
9. *Phillips cylindrical head screw M5 × 28 (2)*
10. *Contact breaker*
11. *Female connector (5)*
12. *Magneto ring*
13. *Spring seat*
14. *Cam spring*
15. *Breaker cam*
16. *Magneto housing*
17. *Spring*
18. *Centrifugal weight*
19. *Pivot screw*
20. *Lockwasher (8)*
21. *Allen bolt M6 × 22 (4)*
22. *Nut M18 × 1.5*
23. *"Loctite 242" (blue — medium strength)*
24. *Fan*
25. *Nut M6 (4)*
26. *Washer (3)*
27. *Lockwasher (3)*
28. *Allen bolt M5 × 18 (3)*
29. *Ignition coil*
30. *Ground cable*
31. *Junction block bracket*
32. *Cylindrical slotted head screw M5 × 22 (3)*
33. *Protection cap*
34. *Ignition cable 360 mm*
35. *Suppressor cap*
36. *Spark plug M7A (M175T1)*
37. *Fan cowl*
38. *Stud M8 × 23 (3)*
39. *Lockwasher (4)*
40. *Nut M8 (4)*
41. *Air deflector*
42. *Spring washer (2)*
43. *Slotted flat head screw M5 × 8 (2)*
44. *Cable clamp*
45. *Cylindrical slotted head screw M3 × 16*
46. *Cable grommet*

MAGNETO AND COOLING SYSTEM

CLEANING

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

CAUTION: Clean armature using only a clean cloth.

DISASSEMBLY & ASSEMBLY

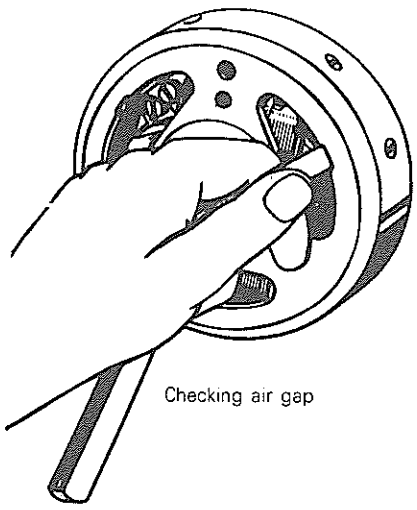
NOTE: It should be noted that to correctly remove a "Loctite" locked screw, it is first necessary to tap on head of screw to break Loctite bond. This will eliminate the possibility of screw breakage.

② To replace a condenser, it is first necessary to discontinue the two (2) black leads using a soldering iron. The condenser can then be driven out of the armature plate using a suitable pusher. To reinstall, inverse procedure.

When replacing contact breaker, apply a light coat of grease on lubricating wick.

④⑥⑧ Whenever a coil is replaced, the air gap (distance between magnet and coil end) must be adjusted.

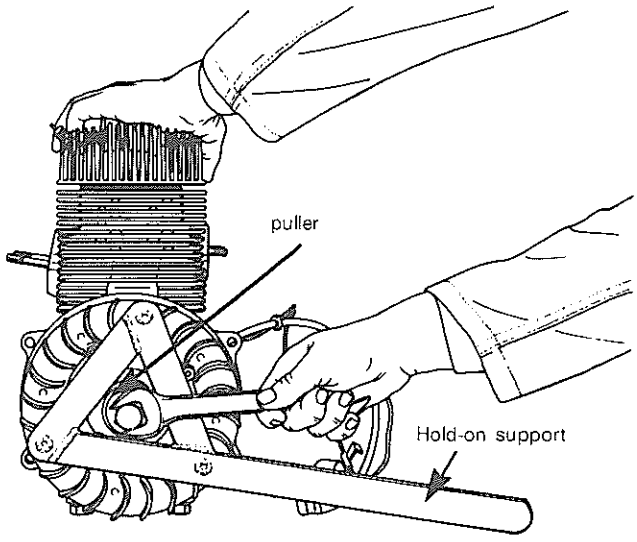
To check air gap, insert a feeler gauge of 0.25-0.38 mm (.010" - .015") between magnet and coil ends. If necessary to adjust, slacken retaining screws and relocate coil.



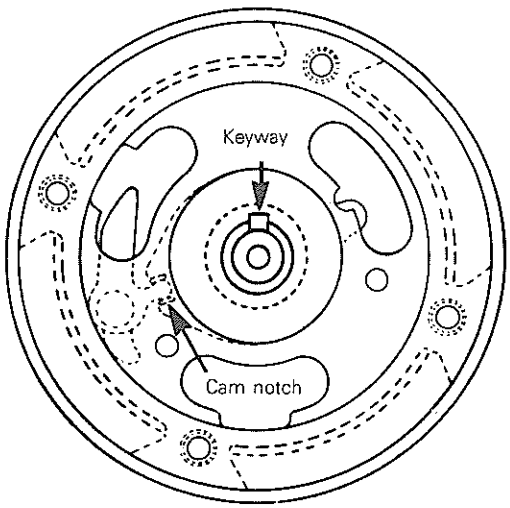
Checking air gap

⑯ With magneto retaining nut removed and hold-on support in place, install special puller onto hub.

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



At assembly, clean crankshaft extension (taper) then apply "Loctite 242", position magneto on crankshaft with the keyway and the cam notch positioned as illustrated.



⑰ At assembly, apply a small amount of grease into spring seating.

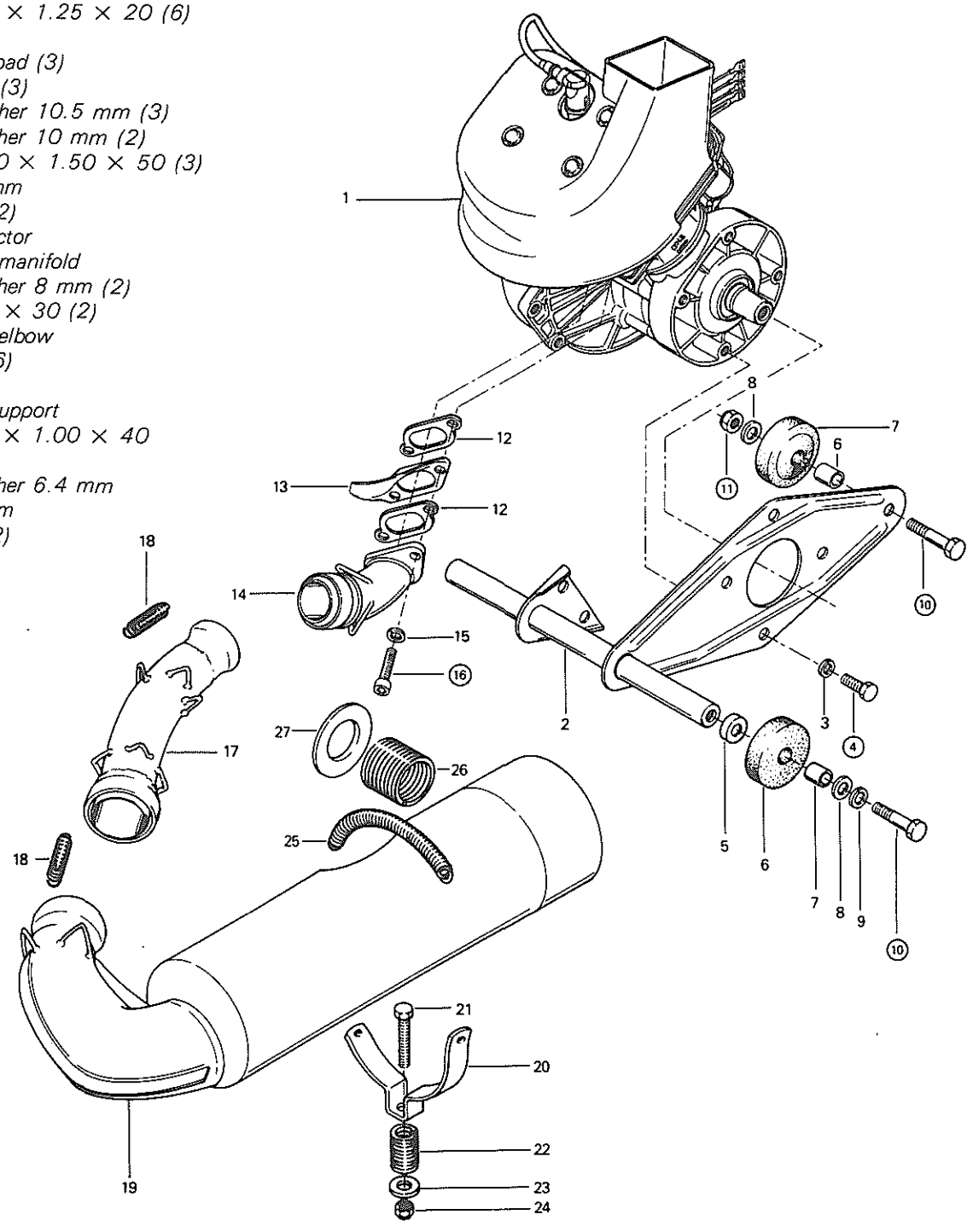
㉑ ㊸ At assembly, apply "Loctite 242" on screws threads.

㉒ At assembly, thoroughly clean threads and apply "Loctite 242", then torque retaining nut to 73 N•m (54 ft-lbs).

277 ENGINE TYPE

ENGINE SUPPORT AND MUFFLER

1. *277 engine type*
2. *Engine support*
3. *Lockwasher 8 mm (6)*
4. *Bolt M8 × 1.25 × 20 (6)*
5. *Cup (2)*
6. *Anchor pad (3)*
7. *Bushing (3)*
8. *Flat washer 10.5 mm (3)*
9. *Lockwasher 10 mm (2)*
10. *Bolt M10 × 1.50 × 50 (3)*
11. *Nut 10mm*
12. *Gasket (2)*
13. *Air deflector*
14. *Exhaust manifold*
15. *Lockwasher 8 mm (2)*
16. *Bolt M8 × 30 (2)*
17. *Exhaust elbow*
18. *Spring (6)*
19. *Muffler*
20. *Muffler support*
21. *Bolt M6 × 1.00 × 40*
22. *Spring*
23. *Flat washer 6.4 mm*
24. *Nut 6 mm*
25. *Spring (2)*
26. *Spring*
27. *Washer*



ENGINE SUPPORT AND MUFFLER

REMOVAL FROM VEHICLE

Remove or disconnect the followings then lift engine from vehicle.

— Pulley guard and drive belt
— Muffler
— Throttle cable and intake silencer
— Fuel lines
— Electrical connectors
— Hood retaining cable
— Bolts (3) securing engine support to chassis

DISASSEMBLY & ASSEMBLY

④⑯ Torque to 21 N•m (15 ft-lbs).

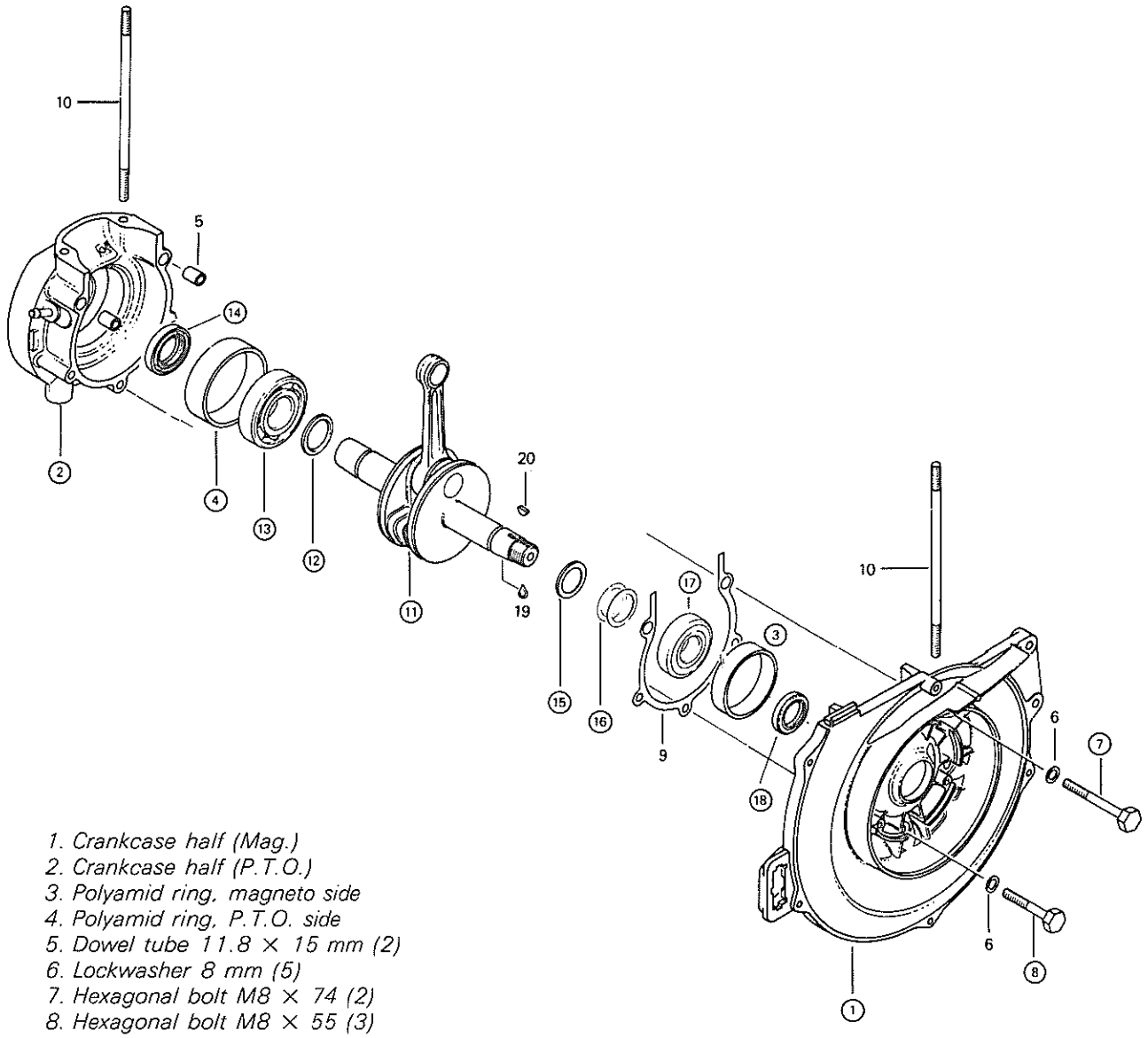
⑩⑪ Torque to 55 N•m (40 ft-lbs).

INSTALLATION ON VEHICLE

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

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

BOTTOM END



1. *Crankcase half (Mag.)*
2. *Crankcase half (P.T.O.)*
3. *Polyamid ring, magneto side*
4. *Polyamid ring, P.T.O. side*
5. *Dowel tube 11.8 × 15 mm (2)*
6. *Lockwasher 8 mm (5)*
7. *Hexagonal bolt M8 × 74 (2)*
8. *Hexagonal bolt M8 × 55 (3)*
9. *Gasket*
10. *Stud M8 × 175 (4)*
11. *Crankshaft*
12. *Distance ring, P.T.O. side*
13. *Ball bearing 6306, P.T.O. side*
14. *Seal, P.T.O. side*
15. *Distance ring, magneto side*
16. *Shim 0.1, 0.2, 0.3 or 0.5 mm*
17. *Ball bearing 6305, magneto side*
18. *Seal, magneto side*
19. *"Loctite 242" (blue, medium strength)*
20. *Woodruff key*

BOTTOM END

CLEANING

Discard all seals and gaskets.

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

DISASSEMBLY & ASSEMBLY

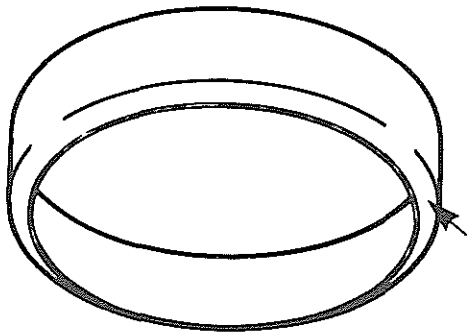
General

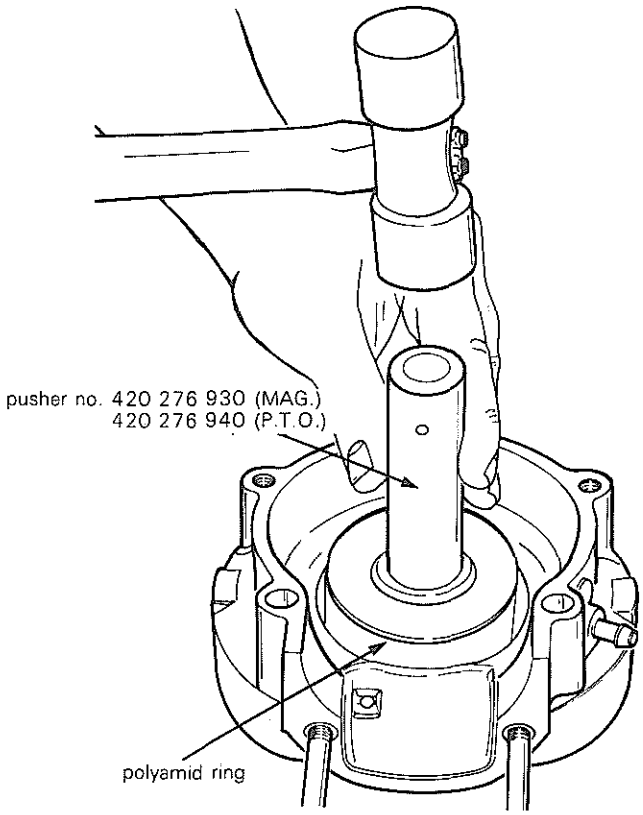
Refer to Technical Data (02) and Engine tolerances measurement (03-01) sections for some component fitted tolerance. If necessary, refer to Drive Pulley section (05-03) to remove drive pulley.

①②③④Do not remove unless necessary.

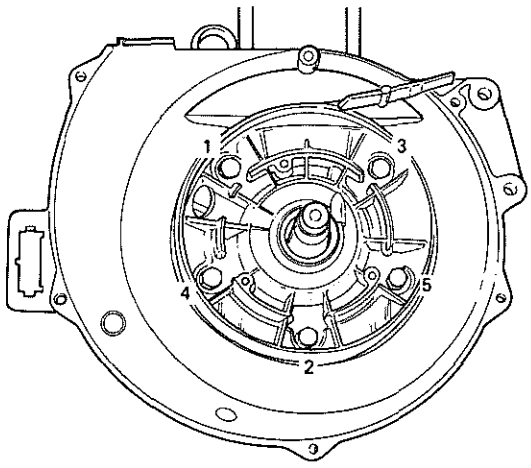
To remove, heat slightly with a butane torch then pry out using a screwdriver.

To install, apply oil on outside diameter then use no. 420 276 930 pusher for magneto side and no. 420 276 940 pusher for P.T.O. side.





⑦⑧At assembly, torque to 21 N•m (15 ft-lbs) following illustrated sequence.



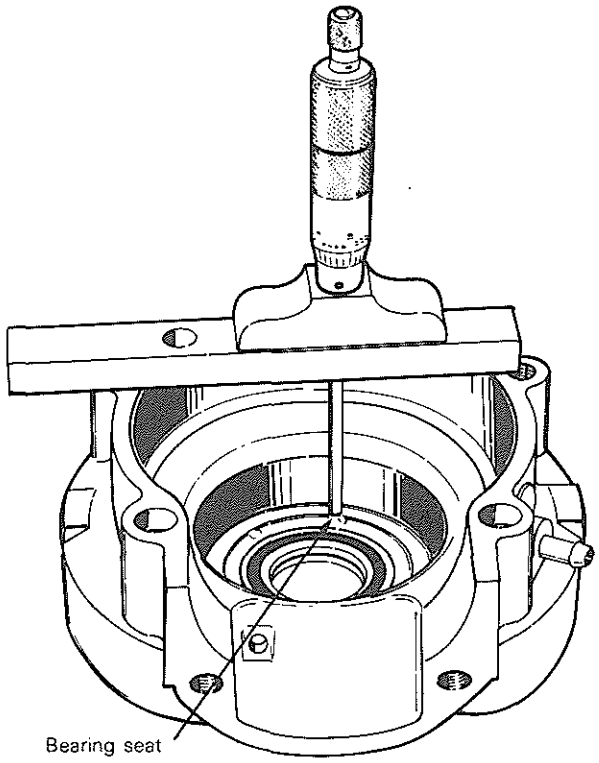
⑪⑯Crankshaft end-play should be:

Minimum	—	Maximum
0.20mm		0.40mm
(.008")		(.016")

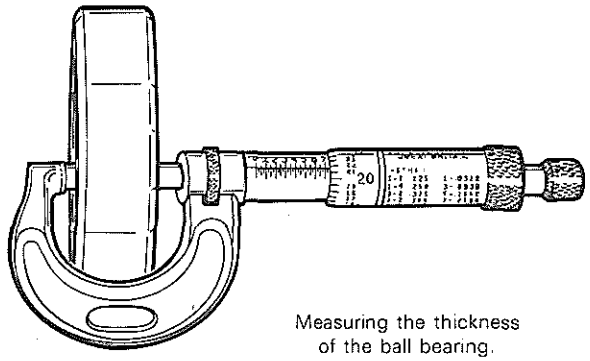
NOTE: Crankshaft end-play is adjusted only when crankshaft and/or crankcase is replaced.

To determine end-play, perform the followings.

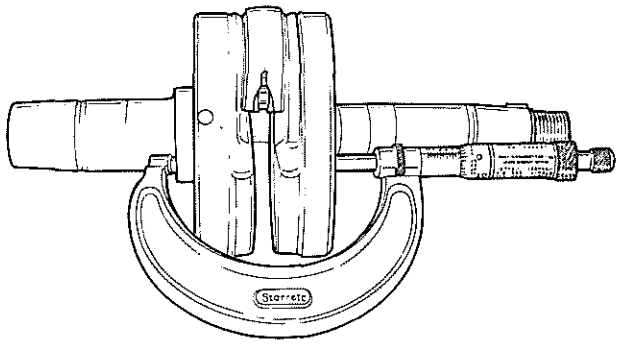
a) Measure crankcase. To do this first measure each half from mating surface to bottom of bearing seat. Add measurements of both halves then add 0.30 mm (.012") for gasket displacement. **Equals A.**



b) Measure thickness of each ball bearing and of standard shims on each side (⑫ and ⑮). Measure distance between bearing shoulders on crankshaft. Add measurements. **Total equals B.**



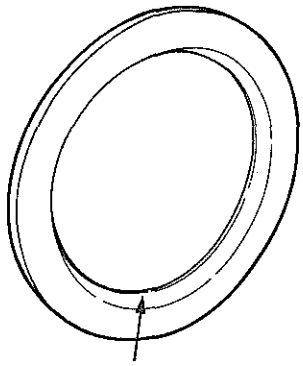
Measuring the thickness of the ball bearing.



Measuring the distance between ball bearing shoulders.

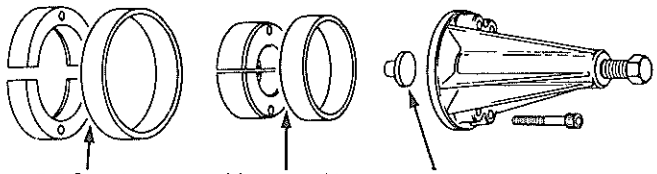
c) Subtract measurement B from measurement A minus tolerance. Total balance is distance to be shimmed. Shim(s) must be located between magneto side bearing and crankshaft blade.

⑫ ⑮ Standard shims must be installed with the inside diameter rounded edge facing crankshaft blade.



Rounded edge facing crankshaft blade.

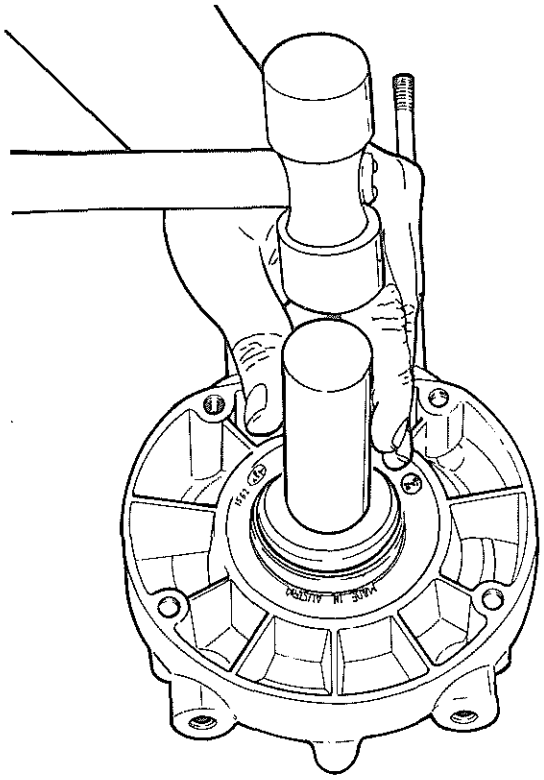
⑬ ⑰ Use appropriate puller to remove ball bearings from crankshaft (see Tools section).



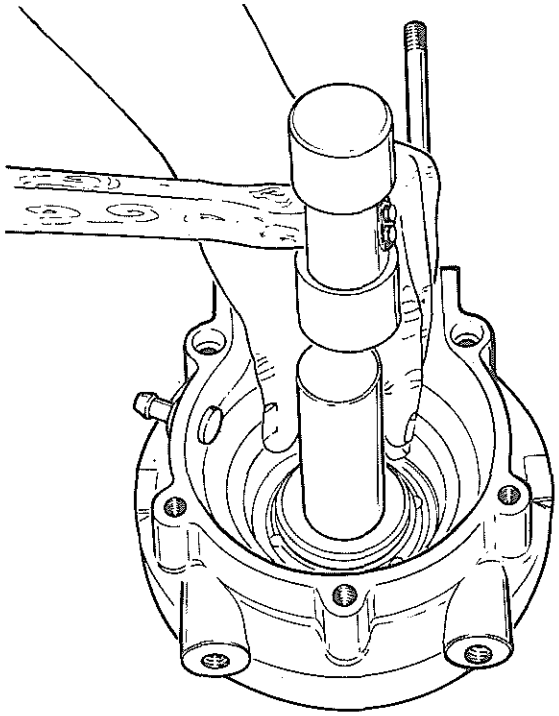
NOTE: Prior to magneto side bearing installation, install required shim(s) (crankshaft end-play) on crankshaft extension. At assembly, place bearings into an oil contained heated to 100°C (210°F). This will expand the bearings and permit them to slide easily on the shaft.

⑭⑱To remove or install a seal inside the crankcase, use no 420 277 865 pusher for magneto side and no. 420 876 660 pusher for P.T.O. side.

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



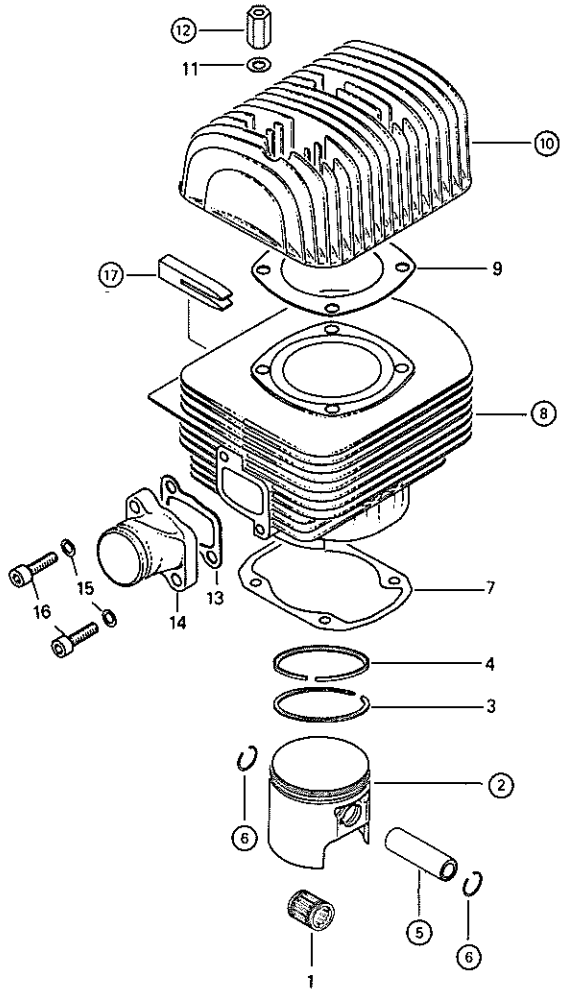
REMOVAL



INSTALLATION

Before crankshaft installation, apply a light coat of lithium grease on seal inside diameter lip, for a longer service life.

TOP END



1. *Needle bearing*
2. *Piston*
3. *Rectangular ring*
4. *Semi-trapez ring*
5. *Gudgeon pin*
6. *Circlip (2)*
7. *Cylinder gasket*
8. *Cylinder*
9. *Cylinder head gasket*
10. *Cylinder head*
11. *Washer 8.4 mm (4)*
12. *Distance nut 8 mm × 27.5 (4)*
13. *Gasket*
14. *Intake manifold*
15. *Lockwasher 8 mm (2)*
16. *Bolt M8 × 30 (2)*
17. *Insulating rubber*

TOP END

CLEANING

Discard all gaskets.

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

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

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

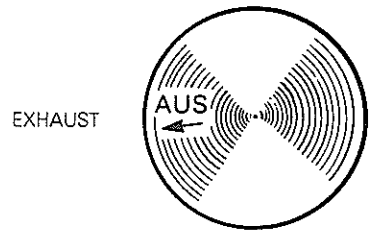
Clean the piston ring grooves with a groove cleaner tool, or with a piece of broken ring.

DISASSEMBLY & ASSEMBLY

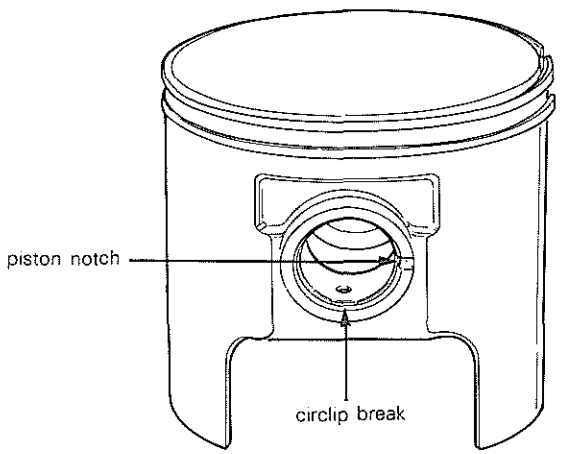
②⑤⑥ Place a clean cloth over crankcase to prevent circlips from falling into crankcase. Use a pointed tool to remove circlips from piston.

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

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



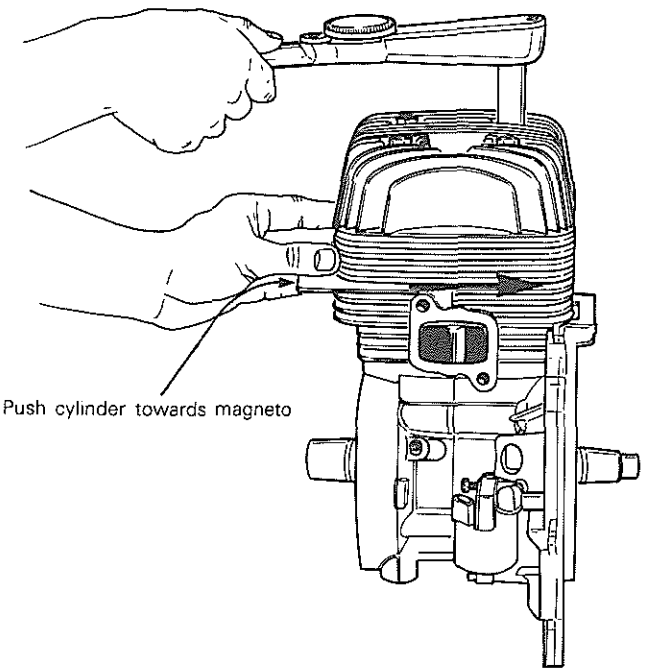
Once the circlips are installed turn each circlip so the circlip break is not directly on piston notch. Remove any burrs on piston caused through circlip installation with very fine emery cloth.



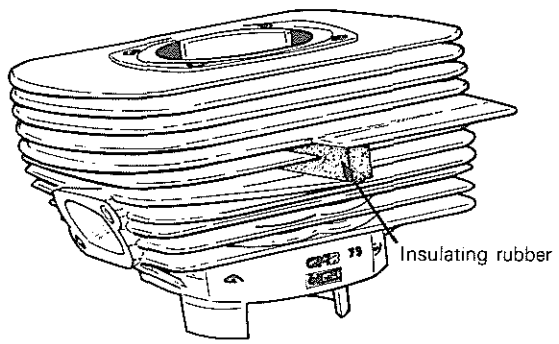
Cylinder to wall clearance should be:

MINIMUM	— MAXIMUM
0.060	— 0.200 mm
(.0024)	— (.008")

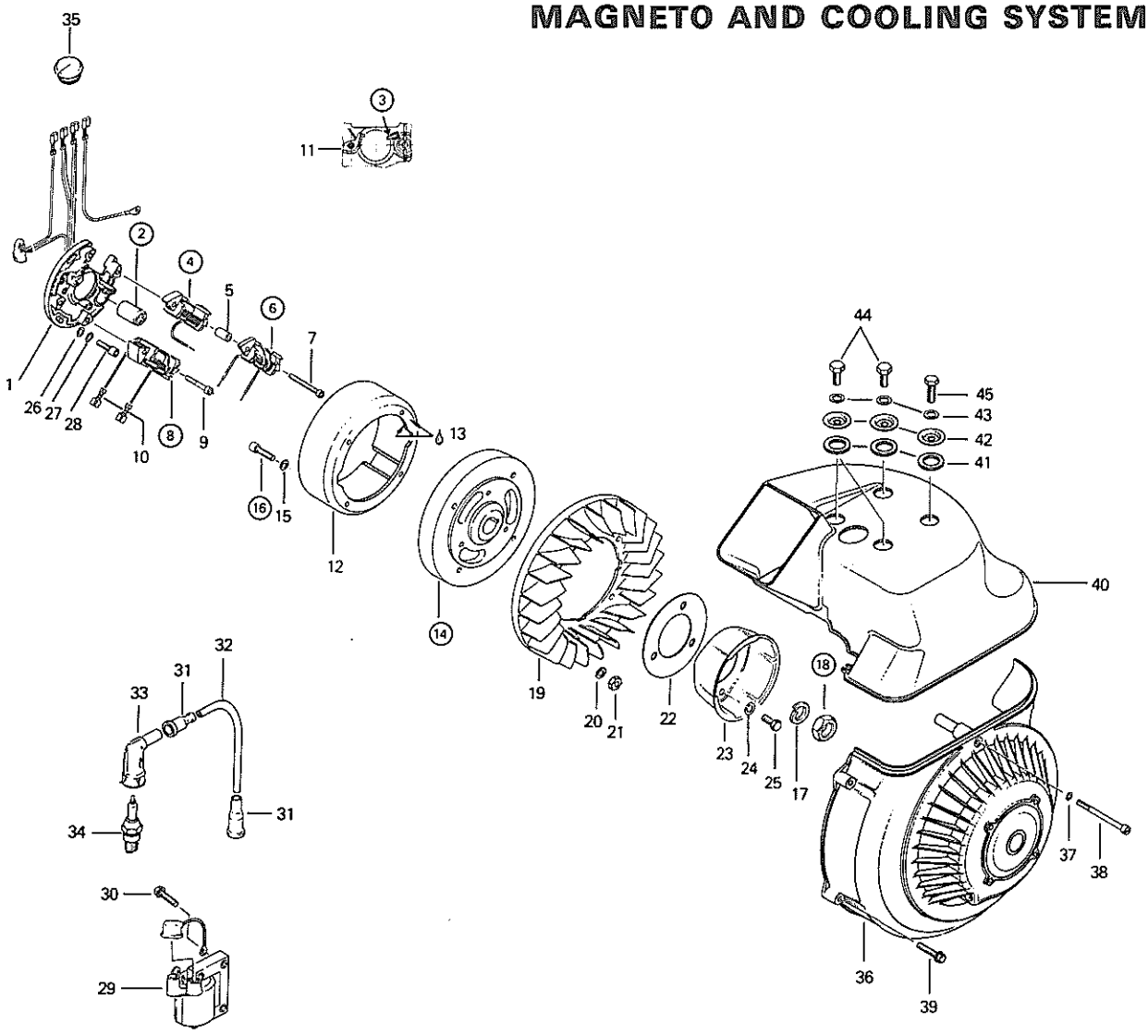
⑧⑩⑫ Position cylinder head on cylinder with nuts and push cylinder towards magneto while cross torquing nuts to 21 N•m (15 ft-lbs).



⑰ Position insulating rubber as illustrated.



MAGNETO AND COOLING SYSTEM



1. *Armature plate*
2. *Condenser*
3. *Lubricating wick*
4. *Generator coil*
5. *Distance sleeve 11 mm (2)*
6. *Lighting coil 30W*
7. *Screw M5 × 32 (2)*
8. *Lighting coil 110W*
9. *Screw M5 × 28 (2)*
10. *Female connector (4)*
11. *Breaker point*
12. *Magneto ring*
13. *"Loctite 271" (red, high strength)*
14. *Magneto housing*
15. *Lockwasher 6 mm (4)*
16. *Bolt M6 × 22 (4)*
17. *Lockwasher 18 mm*
18. *Hexagonal nut 18 mm*
19. *Fan*
20. *Lockwasher 6 mm (4)*
21. *Hexagonal nut 6 mm (4)*
22. *Washer*
23. *Starting pulley*
24. *Lockwasher 6 mm (3)*
25. *Bolt M6 × 14 (3)*
26. *Washer 5.3 mm (3)*
27. *Lockwasher 5 mm (3)*
28. *Bolt M5 × 18 (3)*
29. *Ignition coil*
30. *Self-tapping screw M5 × 22 (3)*
31. *Protection cap (2)*
32. *Ignition cable 390 mm*
33. *Suppressor cap*
34. *Spark plug W3C (W275 T2)*
35. *Cable grommet*
36. *Fan cowl*
37. *Lockwasher 6 mm*
38. *Screw M6 × 73*
39. *Self-tapping screw M6 × 30 (5)*
40. *Cylinder cowl*
41. *Rubber washer (4)*
42. *Cup (4)*
43. *Lockwasher 8 mm (4)*
44. *Bolt M8 × 16 (4)*
45. *Bolt M8 × 25 (3)*

MAGNETO AND COOLING SYSTEM

CLEANING

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

CAUTION: Clean armature using only a clean cloth.

DISASSEMBLY & ASSEMBLY

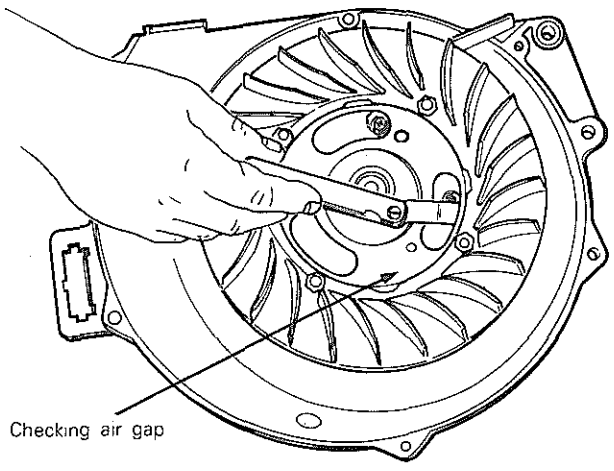
NOTE: It should be noted that to correctly remove a "Loctite" locked screw, it is first necessary to tap on head of screw to break "Loctite" bond. This will eliminate the possibility of screw breakage.

②To replace a condenser, it is first necessary to disconnect the two (2) black leads using a soldering iron. The condenser can then be driven out of the armature plate using a suitable pusher. To reinstall, inverse procedure.

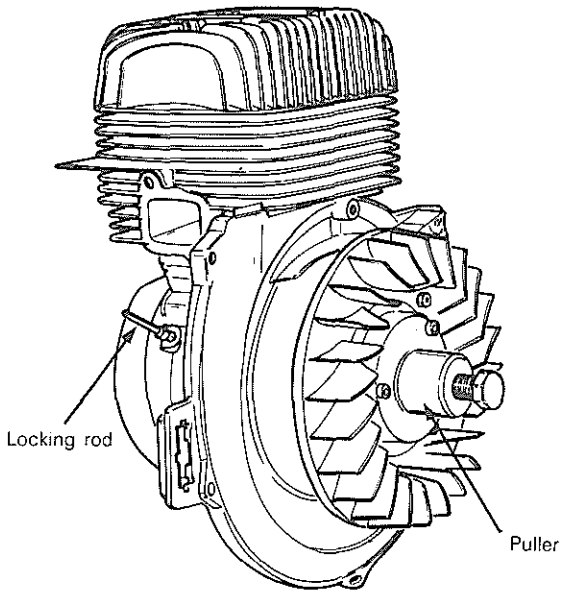
③When replacing breaker point, apply a light coat of grease on lubricating wick.

④⑥⑧Whenever a coil is replaced, the air gap (distance between magnet and coil end) must be adjusted.

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



⑭⑱With magneto retaining nut removed, adjust special puller. Tighten puller bolt and, at same time, tap on bolt head using a hammer to release magneto from its taper.



NOTE: To lock crankshaft in position, insert no. 420 876 640 locking rod in crankcase pulsation hole when piston is at T.D.C. (top dead center).

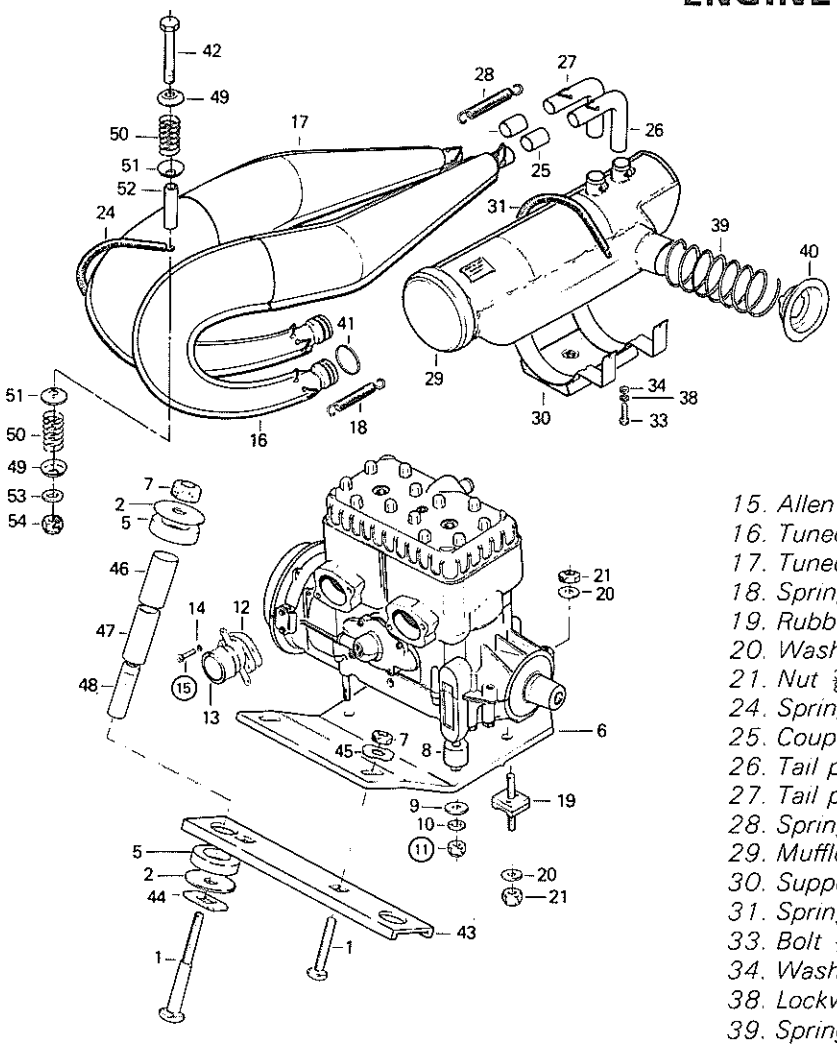
At assembly, clean crankshaft extension (taper) then apply "Loctite 242" position magneto on crankshaft.

Clean nut threads and apply "Loctite 242" on them before tightening nut to 85 N•m (63 ft-lbs).

⑯At assembly, apply "Loctite 242" on screw threads.

354, 454 ENGINE TYPES

ENGINE SUPPORT & MUFFLER



1. *Carriage bolt 7/16 — 14 × 2¾ (2)*
2. *Flat washer (4)*
5. *Vibration absorber (4)*
6. *Engine support*
7. *Nut ⅜ — 24 (2)*
8. *Distance sleeve (4)*
9. *Washer (4)*
10. *Lockwasher (4)*
11. *Nut 10 mm (4)*
12. *Gasket (2)*
13. *Exhaust manifold (2)*
14. *Lockwasher (4)*
15. *Allen bolt M8 × 30 (4)*
16. *Tuned pipe (P.T.O. side)*
17. *Tuned pipe (magneto side)*
18. *Spring (4)*
19. *Rubber shear mount (2)*
20. *Washer (4)*
21. *Nut ⅜ — 16 (4)*
24. *Spring*
25. *Coupler (2)*
26. *Tail pipe (P.T.O. side)*
27. *Tail pipe (magneto side)*
28. *Spring (4)*
29. *Muffler*
30. *Support*
31. *Spring (2)*
33. *Bolt ¼ — 20 × ½" (3)*
34. *Washer (3)*
38. *Lockwasher (3)*
39. *Spring*
40. *Spring seat*
41. *Seal ring (4)*
42. *Bolt 5/16 — 18 × 2¾"*
43. *Reinforcing cross support*
44. *Stopper plate*
45. *Internal tooth dished washer (2)*
46. *Bushing (2)*
47. *Rubber bushing (2)*
48. *Threaded bushing (2)*
49. *Retaining washer (2)*
50. *Spring (2)*
51. *Retaining washer (2)*
52. *Bushing*
53. *Flat washer*
54. *Nut 5/16 — 18*

ENGINE SUPPORT & MUFFLER

REMOVAL FROM VEHICLE

Disconnect or remove the followings from vehicle:

— Pulley guard and drive belt
— Air silencer and throttle cable
— Fuel lines, primer and pulsation lines
— Muffler
— Electric wires
— Drain the cooling system and disconnect hoses at engine
— Rotary valve oil reservoir
— Disconnect rewind starter at engine

DISASSEMBLY & ASSEMBLY

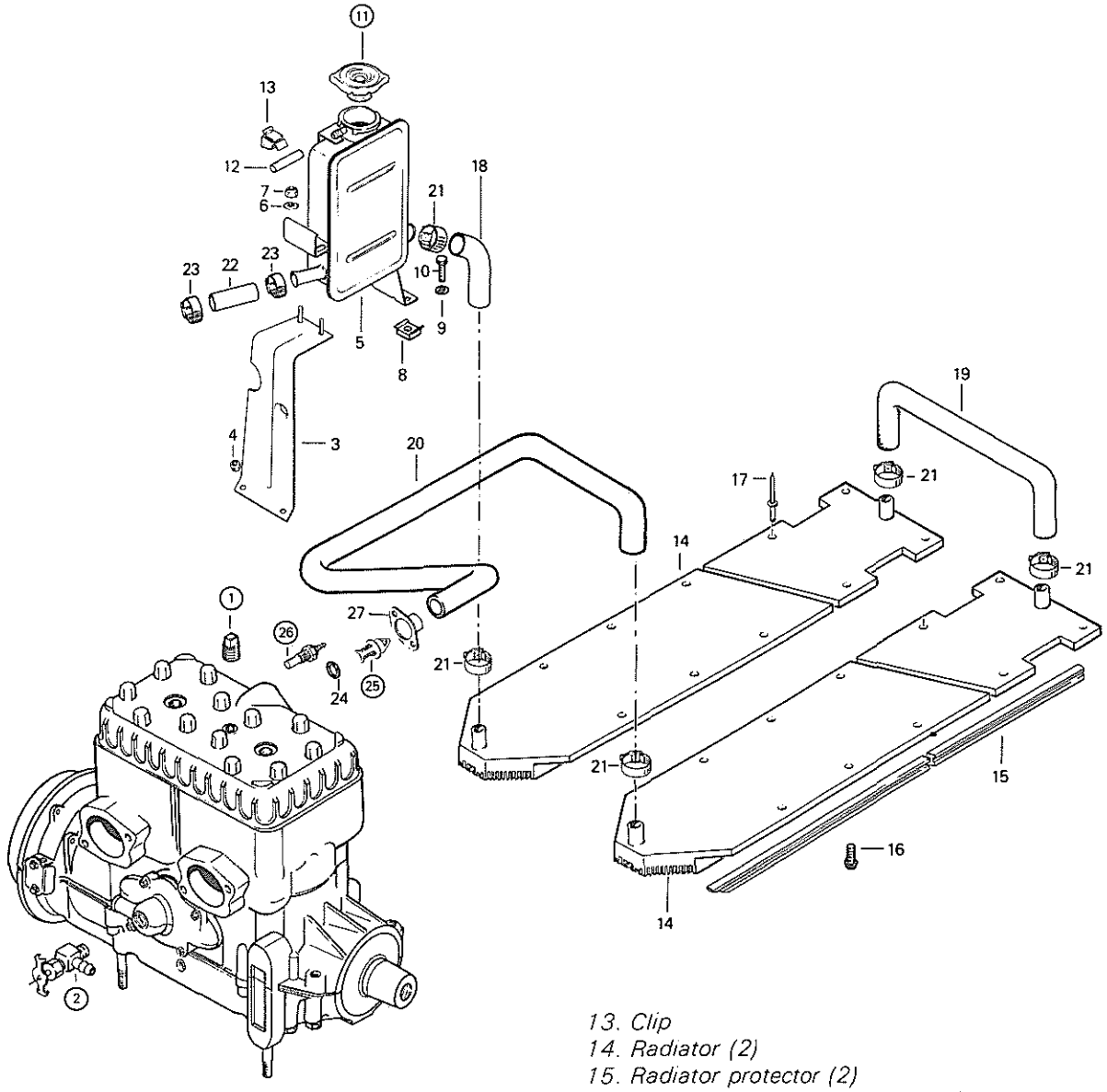
⑪ Torque to 35•m (26 ft-lbs).
⑮ Torque to 22 N•m (16 ft-lbs).

INSTALLATION ON VEHICLE

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

- Check tightness of engine mount nuts.
- After throttle cable installation, check carburetor maximum throttle slide opening.
- Check pulley alignment.

COOLING SYSTEM



1. *Plug (2)*
2. *Drain valve*
3. *Tank support*
4. *Elastic stop nut 10-24 (2)*
5. *Coolant tank*
6. *Flat washer 9/32 × 5/8 (2)*
7. *Elastic stop nut ¼-20 (2)*
8. *Clip nut (2)*
9. *Lockwasher 3/16 (2)*
10. *Bolt 10-24 × ½'' (2)*
11. *Pressure cap*
12. *Overflow hose 343 mm (13.5'')*
13. *Clip*
14. *Radiator (2)*
15. *Radiator protector (2)*
16. *Self-tapping screw 10-24 × ½'' (2)*
17. *Rivet (38)*
18. *Elbow hose*
19. *''U'' hose*
20. *Outlet hose*
21. *Clamp (6)*
22. *Hose 559 mm (21.75'')*
23. *Clamp (2)*
24. *Sealing ring*
25. *Thermostat*
26. *Sensor*
27. *Outlet collar*

COOLING SYSTEM

INSPECTION

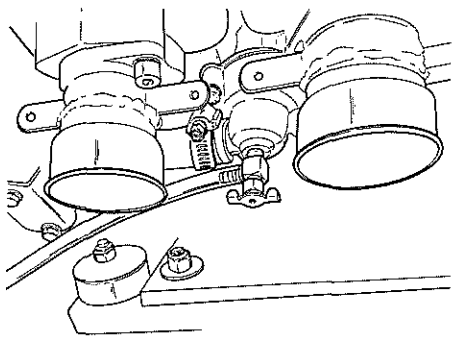
Check general condition of hoses and clamp tightness.

DRAINING THE SYSTEM

To drain the cooling system, remove the coolant tank cap.

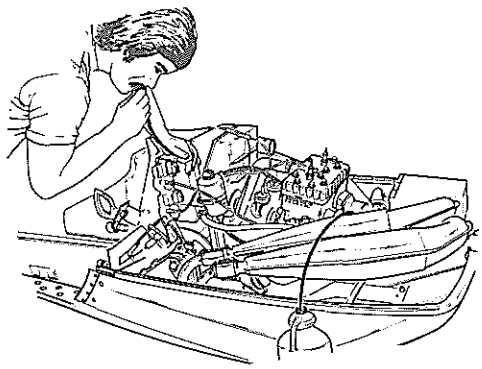
◆ WARNING: Never drain or refill the cooling system when engine is hot.

Connect a drain hose to the drain valve at pump housing. Open valve and drain system.



○ NOTE: Open end of drain hose should be lower than engine base.

However, to completely drain the system, blow into the tank through the vent tube while blocking the tank filler neck with one hand to prevent air leakage.



DISASSEMBLY & ASSEMBLY

①②㉖ Apply pipe thread sealant to avoid leaks.

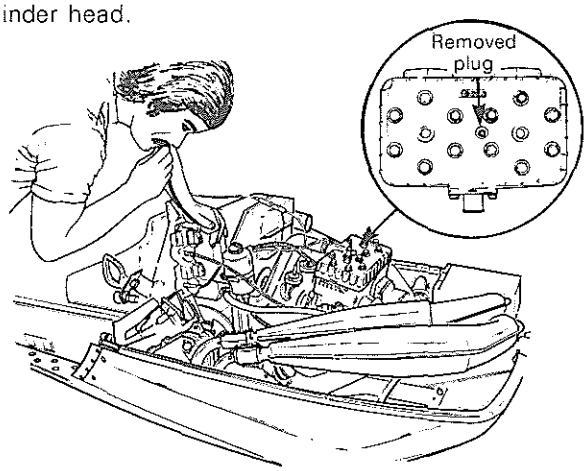
⑪ See if the cap pressurizes the system. If not, install a new 13 lbs cap, do not exceed 13 lbs of pressure.

㉕ To check thermostat, put it in water and heat water. Thermostat should open when water temperature reaches 43°C (110°F).

REFILLING THE SYSTEM

Capacity:
Approximately 5 liters
(1.1 Imp. gal.) (1.3 U.S. gal.)
55% antifreeze + 45% water

To refill the cooling system, unscrew plug on top of cylinder head.



Refill tank and blow into it through the vent tube, while maintaining the hand over the filler neck, until the liquid comes out at the plug hole on the cylinder head.

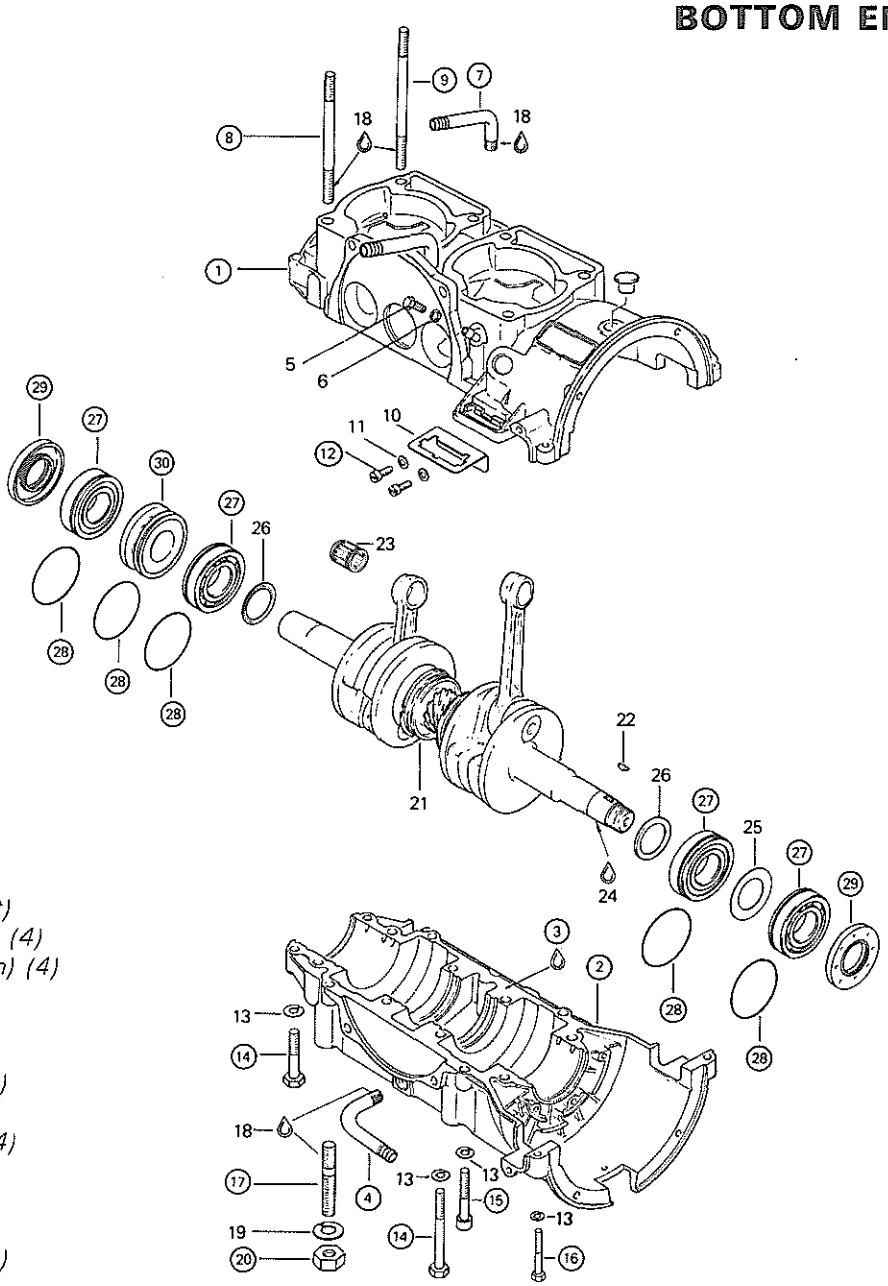
○ NOTE: It is necessary to refill tank as soon as it becomes empty.

Screw plug on cylinder head and continue to pour the liquid in the coolant tank until the coolant level reaches 25 mm (1") below filler neck.

Reinstall tank cap and start engine; let engine run until it reaches its operating temperature and thermostat opens. Allow it to run a few minutes more. Stop engine and check coolant level; refill as necessary.

◆ WARNING: Always unscrew cap to the first step with a cloth to release pressure, before removing it.

BOTTOM END



1. *Crankcase upper half*
2. *Crankcase lower half*
3. *"Loctite 515"*
4. *Angular tube (oil inlet)*
5. *Bolt M8 × 16*
6. *Sealing ring*
7. *Angular tube (oil outlet)*
8. *Cylinder stud (79 mm) (4)*
9. *Cylinder stud (104 mm) (4)*
10. *Junction block support*
11. *Lockwasher (2)*
12. *Screw M5 × 12 (2)*
13. *Lockwasher 8 mm (10)*
14. *Bolt M8 × 45 (2)*
15. *Allen bolt M8 × 40 (4)*
16. *Bolt M6 × 35 (2)*
17. *Stud M10 × 42 (4)*
18. *"Loctite 242"*
19. *Lockwasher 10 mm (4)*
20. *Nut M10 (4)*
21. *Crankshaft*
22. *Woodruff key*
23. *Needle cage bearing (2)*
24. *"Loctite 242"*
25. *Shim (1 mm)*
26. *Distance ring (2)*
27. *Bearing (4)*
28. *"O" ring (5)*
29. *Oil seal (2)*
30. *Labyrinth sleeve*

BOTTOM END

CLEANING

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

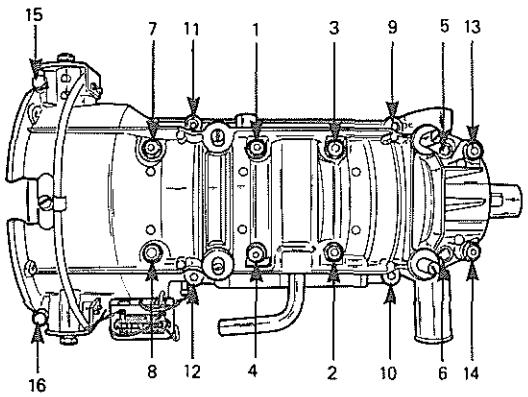
CAUTION: Never use a sharp object to scrape away old sealant as score marks incurred are detrimental to crankcase sealing.

DISASSEMBLY & ASSEMBLY

①②③Crankcase halves are factory matched and therefore, are not interchangeable or available as single halves. Prior to joining of crankcase halves, apply a light coat of "Loctite 515" (413 7027 00) on mating surfaces.

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

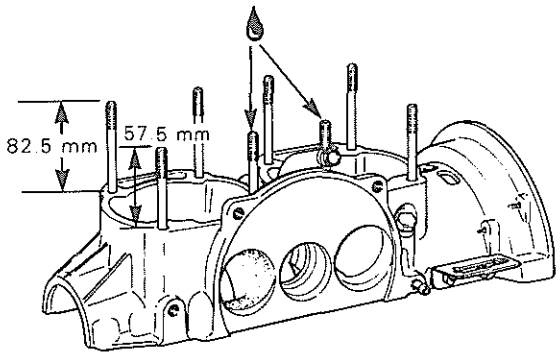
Position the crankcase halves together and torque bolts by hand, then install armature plate (tighten) on magneto side to correctly align crankcase halves. Torque bolts to 22 N•m (16ft-lbs) following illustrated sequence.



NOTE: Torque the two smaller bolts (15 and 16) on magneto side to 13 N•m (10 ft-lbs).

④⑦⑫ Apply "Loctite 242" on threads prior to assembly.

⑧⑨Because of cap nuts, cylinder studs have to be screwed into the crankcase so that they do not exceed further than 82.5 mm (3.250") on exhaust side and 57.5 mm (2.260") on intake side.



Apply "Loctite 242" on the threads of the two studs screwed above the intake ports.

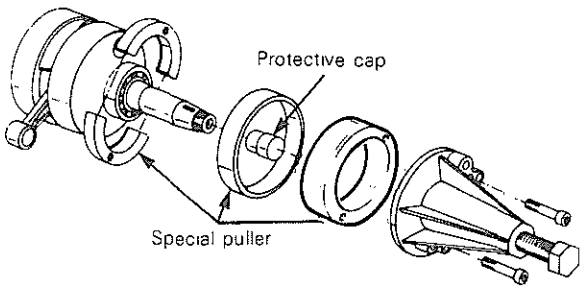
⑭⑮Torque to 22 N•m (16 ft-lbs).

⑯Torque to 14 N•m (10 ft-lbs).

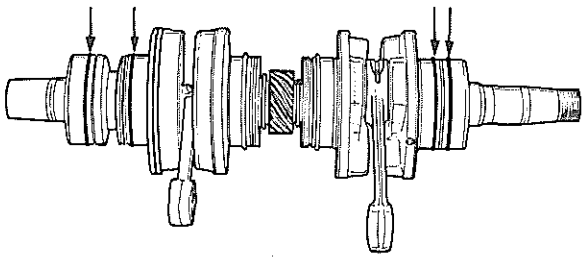
⑰At assembly on crankcase, apply "Loctite 242" on threads.

⑳Torque to 35 N•m (26 ft-lbs).

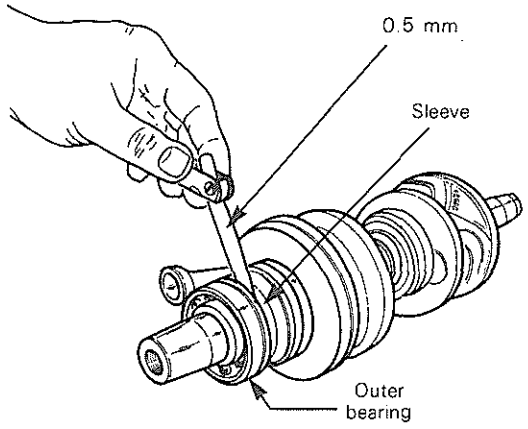
㉗㉘㉚To remove bearings from crankshaft, use a protective cap and special puller as illustrated.



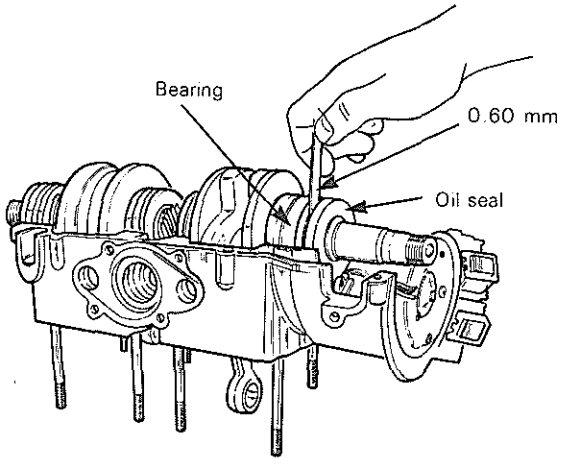
Prior to installation, place bearings into an oil container previously heated to 100°C (212°F). This will expand bearing and ease installation. Install bearings with groove as per the following illustration.



When positioning P.T.O. outer bearing on crankshaft, a gap of 0.5 mm (.020") must be left between bearing and labyrinth sleeve to avoid axial forces to the bearing.

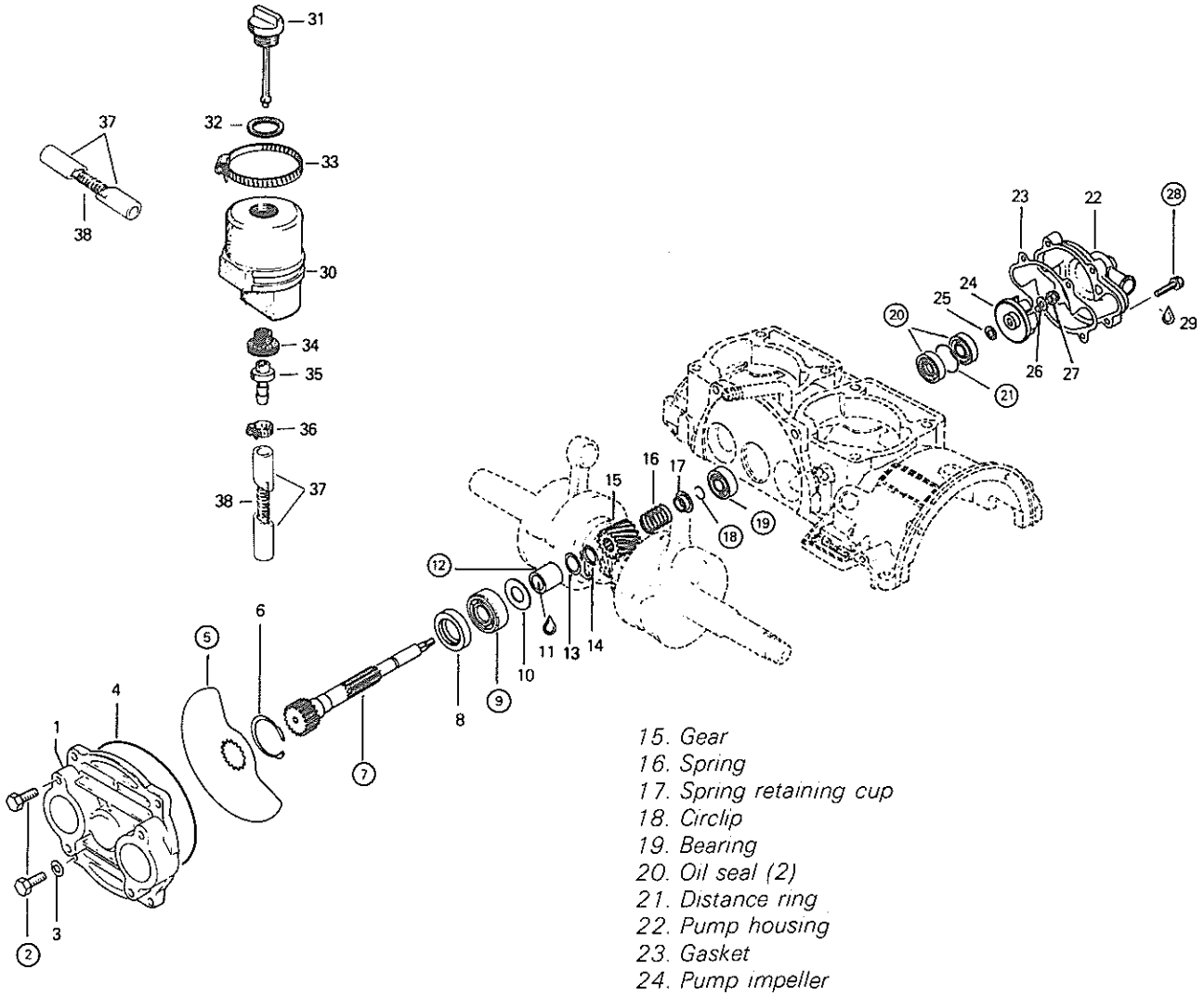


(29) At assembly, apply a light coat of lithium grease on seal lips.



To insure adequate oil supply to the bearings (magneto and P.T.O. sides), install oil seals with a gap of at least 0.60 mm (.025") with bearing.

ROTARY VALVE AND COOLANT PUMP



1. *Rotary valve cover*
2. *Bolt M8 × 20 (8)*
3. *Lockwasher 8 mm (4)*
4. *"O" ring*
5. *Rotary valve*
6. *Circlip*
7. *Rotary valve shaft*
8. *Oil seal*
9. *Bearing*
10. *Shim 0.5 mm*
11. *"Loctite 271"*
12. *Distance sleeve 24.5 mm*
13. *Shim 0.5 mm*
14. *"O" ring*
15. *Gear*
16. *Spring*
17. *Spring retaining cup*
18. *Circlip*
19. *Bearing*
20. *Oil seal (2)*
21. *Distance ring*
22. *Pump housing*
23. *Gasket*
24. *Pump impeller*
25. *Washer 8.4 mm*
26. *Washer 6.2 mm*
27. *Nut M6*
28. *Bolt M6 × 25 (4)*
29. *"Loctite 242"*
30. *Tank*
31. *Plug*
32. *Gasket*
33. *Hose clamp*
34. *Grommet*
35. *Hose fitting*
36. *Clamp*
37. *Oil line 280 mm (11") (2)*
38. *Spring (2)*

ROTARY VALVE & COOLANT PUMP

CLEANING

Discard all oil seals and "O" rings.

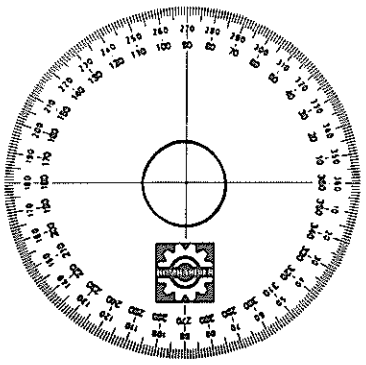
Clean all metal components in a non-ferrous metal cleaner.

DISASSEMBLY & ASSEMBLY

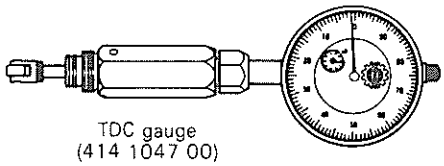
②Torque to 20 N•m (15 ft-lbs).

⑤Rotary valve adjustment when replacing crankcase having no timing marks.

REQUIRED TOOLS



Angle finder
(414 3529 00)

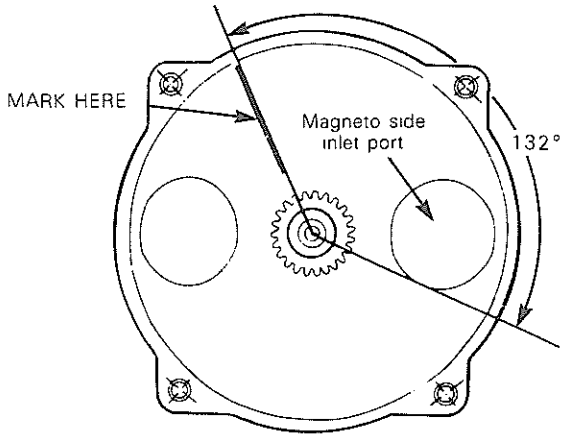


TDC gauge
(414 1047 00)

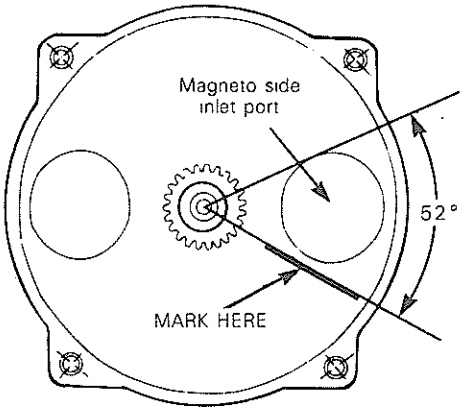
ENGINE TYPE	TIMING MARKS opening, closing
354 - 454	132°, 52°

For **example:** 132° opening
52° closing

Using angle finder, mark crankcase at 132° from bottom edge of magneto side inlet port.



From top edge of magneto side inlet port, mark crankcase at 52°.

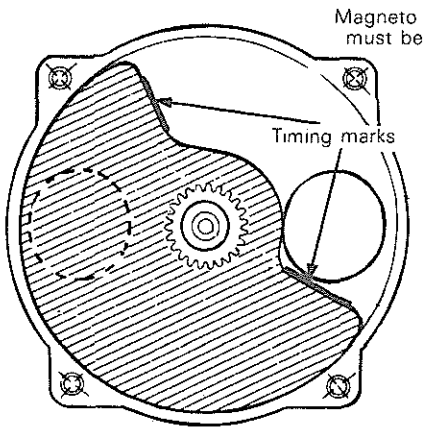


To correctly install the rotary valve disc proceed as follows:

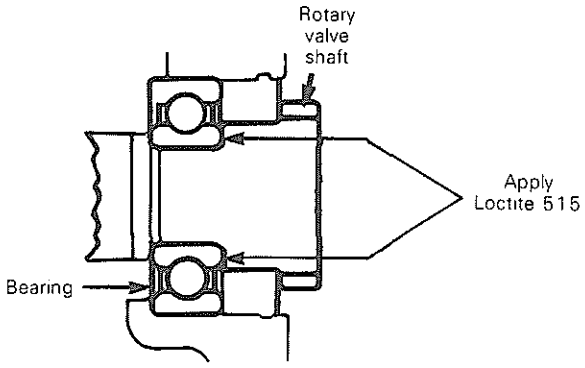
— Turning crankshaft counter-clockwise, (drive pulley side) bring magneto side piston to Top Dead Center using a T.D.C. gauge.

— Position the rotary valve disc on gear to have edges as close as possible to the marks.

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

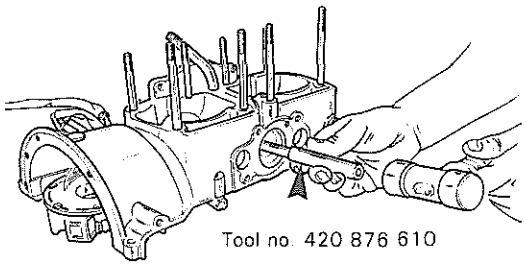


⑦⑨At assembly, apply crankcase sealant "Loctite 515" on bearing and rotary valve shaft mating surfaces.

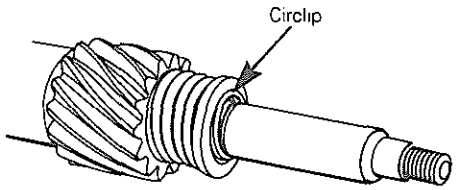


⑦ through ⑱ Rotary valve shaft assembly

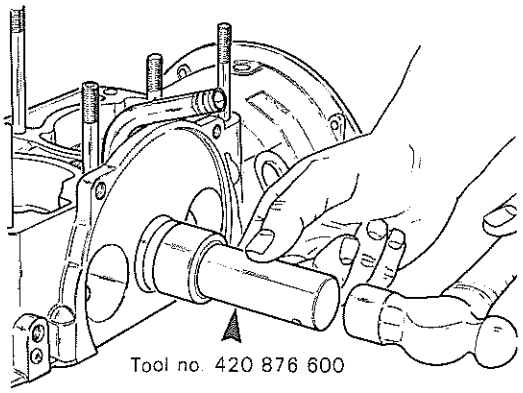
To remove rotary valve shaft assembly from crankcase, first remove coolant pump impeller ㉔ and circlip ⑥. Using the suitable pusher (P/N 420 876 610) and a fiber hammer, push shaft assembly.



If it is necessary to disassemble components of rotary valve shaft assembly, compress spring retaining cup ⑰ in order to remove circlip ⑱.



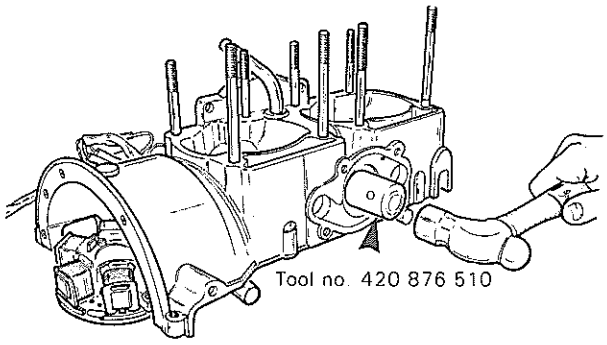
To install shaft assembly and oil seal, use pusher no. 420 876 600.



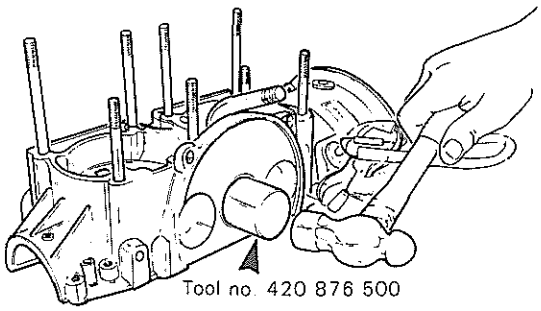
⑫ Clean rotary valve shaft and inside of distance sleeve. At assembly apply "Loctite 271" inside of distance sleeve.

⑲ Using a suitable pusher, push coolant pump bearing with shield opposite to rotary valve disc.

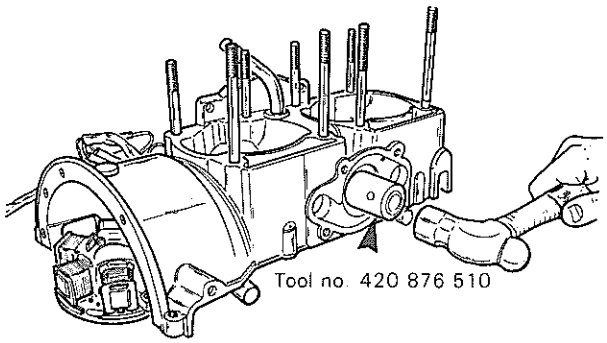
To remove bearing



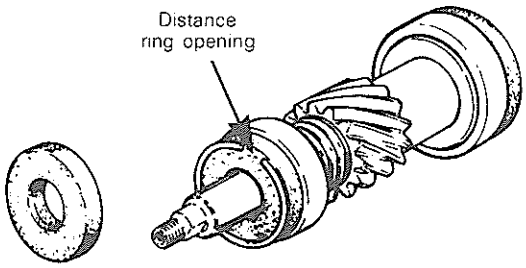
To install bearing

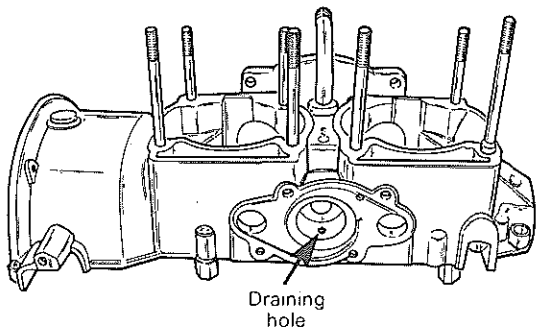


⑳ ㉑ Using no. 420 876 510 pusher, install oil seals (with lithium grease on seal lips).



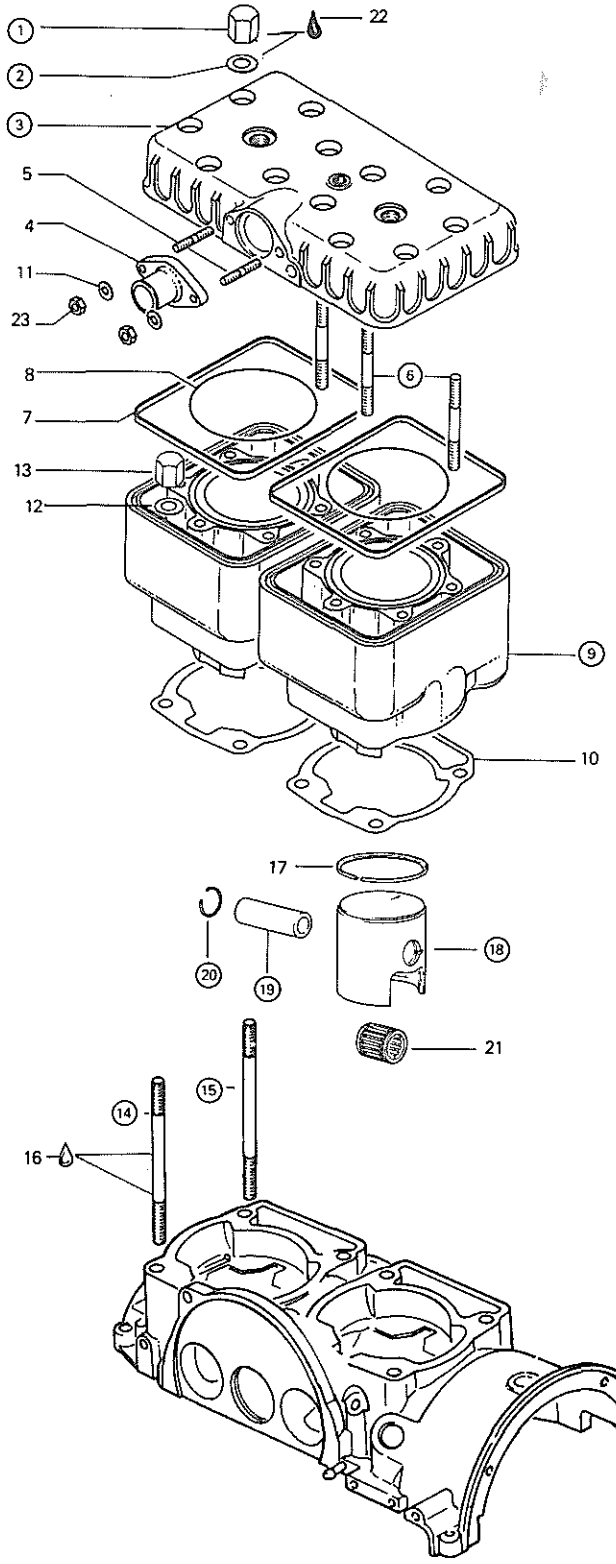
Distance ring opening must be in line with crankcase half draining hole.





㉘ Apply "Loctite 242" on threads.

TOP END



1. *Cap nut M8 (12)*
2. *Flat washer 8.4 mm (12)*
3. *Cylinder head*
4. *Coolant outlet collar*
5. *Stud M6 × 15 (2)*
6. *Stud (head) M8 × 44 (12)*
7. *Gasket (2)*
8. *Gasket (''O'' ring) (2)*
9. *Cylinder (2)*
10. *Cylinder/crankcase gasket (2)*
11. *Lockwasher 6 mm (2)*
12. *Flat washer 8.4 mm (8)*
13. *Cap nut M8 (8)*
14. *Cylinder stud (79 mm) (4)*
15. *Cylinder stud (104 mm) (4)*
16. *''Loctite 242''*
17. *''L'' ring (2)*
18. *Piston (2)*
19. *Gudgeon pin (2)*
20. *Circlip (4)*
21. *Needle bearing (2)*
22. *Silicone sealant*
23. *Nut M6 (2)*

TOP END

CLEANING

Discard all gaskets.

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

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

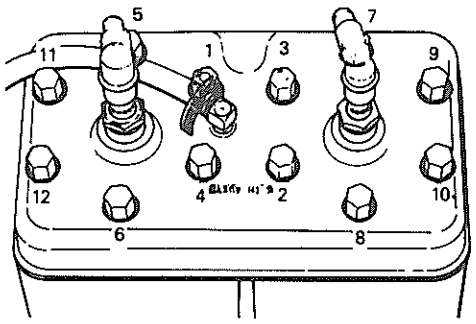
NOTE: The letters "AUS" (over an arrow on the piston dome) must be visible after cleaning.

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

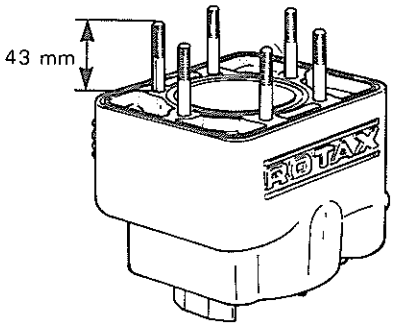
DISASSEMBLY & ASSEMBLY

①②③Prior to washer installation, apply silicone sealant around studs.

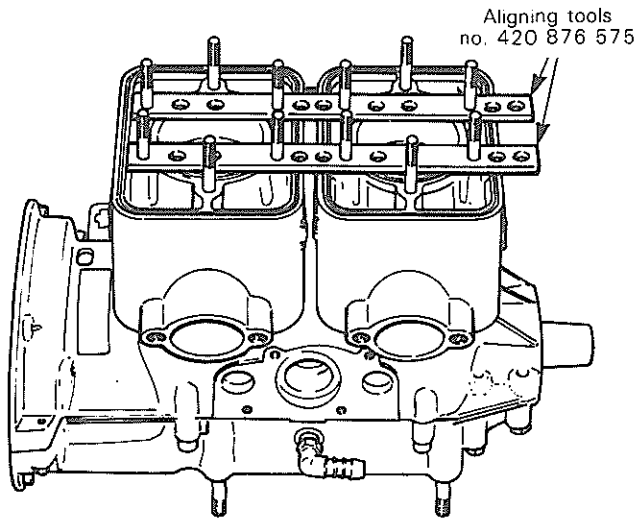
Torque cylinder head nuts to 22 N•m (16 ft-lbs) following illustrated sequence.

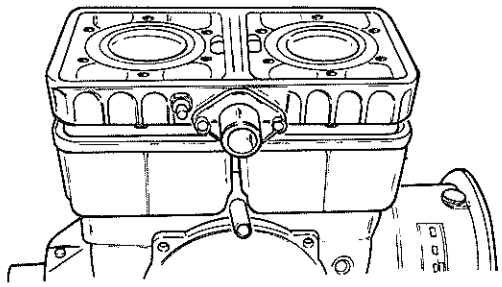


⑥⑨Because of cap nuts, cylinder head studs have to be crewed into the cylinder so that they do not protrude by more than 43 mm (1.700"). If it is not possible to obtain this length, add a washer between cylinder head and cap nut. Shorter threaded part of stud should be screwed into cylinder.

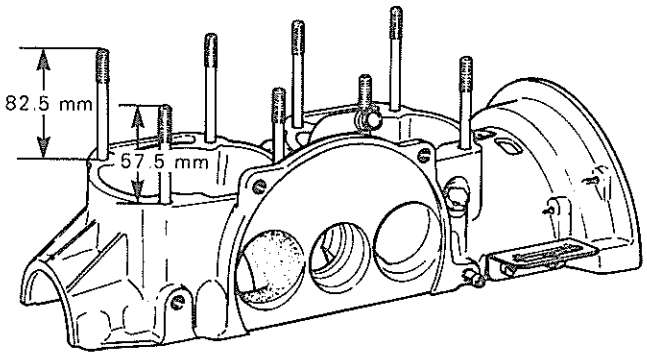


When reassembling the cylinders to the crankcase, it is important to have them properly aligned so that the cylinder head holes will match up with the studs. A special tool (as per illustration) (or cylinder head itself) can be used to align the cylinders. Cross torque cylinder nuts to 22 N•m (16 ft-lbs).





⑭ ⑮ Because of cap nuts, cylinder studs have to be screwed into the crankcase so that they do not protrude by more than 82.5 mm (3.250") on exhaust side and 57.5 mm (2.260") on intake side.



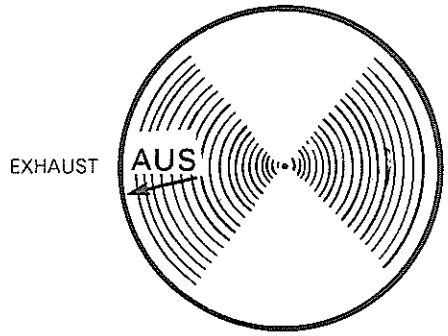
Apply "Loctite 242" on the threads of the two studs screwed above the intake ports.

⑱ ⑲ ⑳ Place a clean cloth over crankcase to prevent circlips from falling into crankcase then use a pointed tool to remove circlips from piston.

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

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

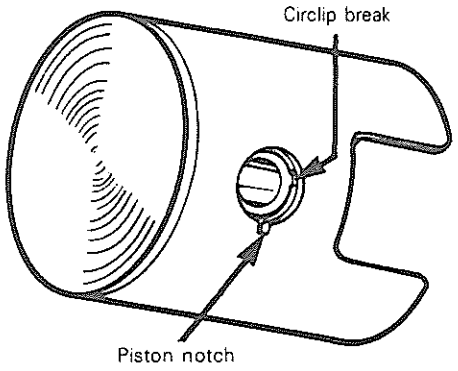
At assembly, place the pistons over the connecting rods with the letters AUS (over an arrow on the piston dome) facing the direction of the exhaust port.



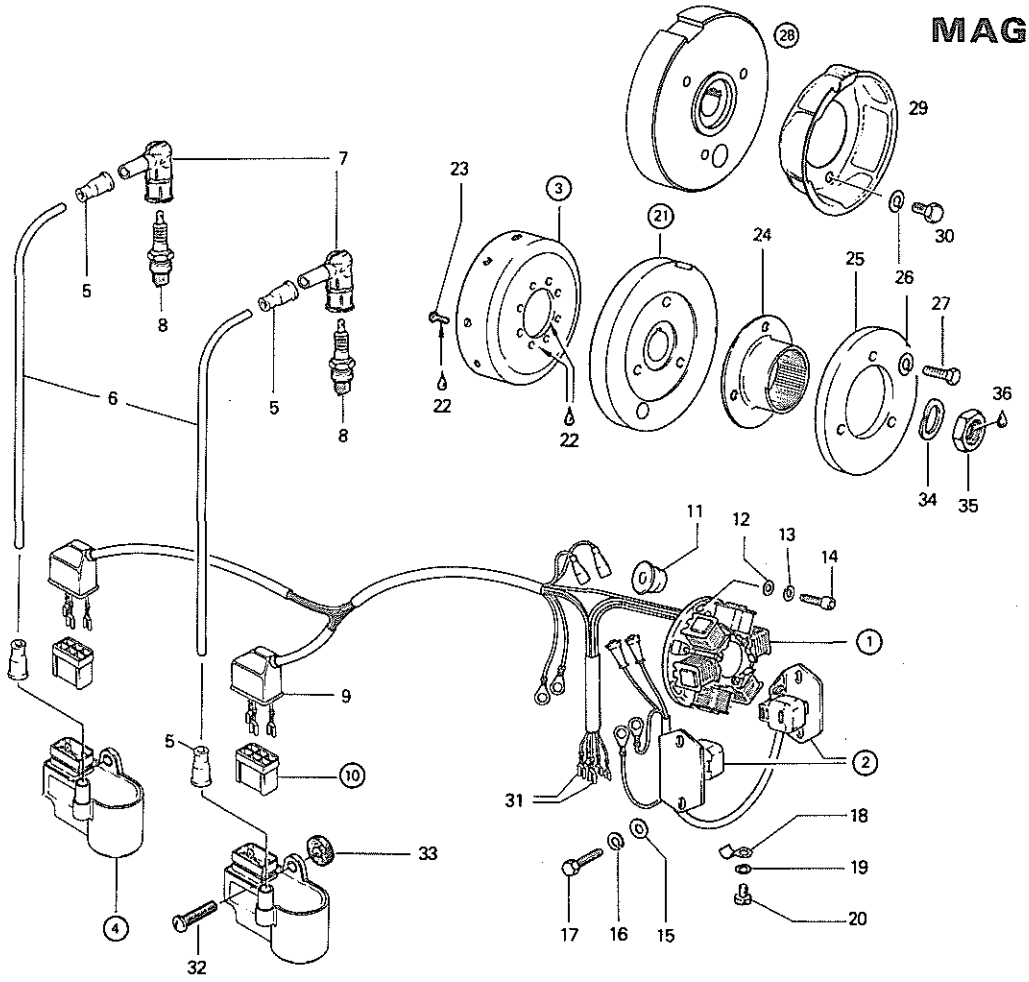
Piston to wall clearance should be:

TYPE	MINIMUM	MAXIMUM
354	0.080 mm (.0031")	0.180 mm (.007")
454	0.090 mm (.0035")	0.200 mm (.008")

Once the circlips are installed, turn each circlip so that the circlip break is not directly in line with piston notch. Using very fine emery cloth, remove any burrs on piston caused through circlip installation.



MAGNETO



1. *Armature plate*
2. *Trigger coils*
3. *Magneto ring*
4. *Electronic box (2)*
5. *Protection cap (4)*
6. *Ignition cable 540 mm*
7. *Suppressor cap (2)*
8. *Spark plug 454: WO8 SC (W340 S2S) (2)*
   354: W 2 CO (W300 MZ2) (2)
9. *Protection cap (2)*
10. *Connector housing (2)*
11. *Cable grommet*
12. *Washer 5.3 mm (4)*
13. *Lockwasher 5 mm (4)*
14. *Allen screw M5 × 18 (4)*
15. *Washer 6.4 mm (4)*
16. *Lockwasher 6 mm (4)*
17. *Bolt M6 × 20 (4)*
18. *Clip (up to serial number 3158 177)*
19. *Lockwasher 6 mm (up to serial number 3158 177)*
20. *Cylindrical head screw M6 × 8 (up to serial number 3158 177)*
21. *Magneto housing (up to serial number 3177 747)*
22. *"Loctite 271" (red, high strength)*
23. *Bolt M5 × 10 (8)*
24. *Starting pulley (up to serial number 3177 747)*
25. *Flywheel (up to serial number 3177 747)*
26. *Lockwasher 8 mm (3)*
27. *Bolt M8 × 25 (up to serial number 3177 747((3)*
28. *Magneto housing (serial number 3177 748 and up)*
29. *Starting pulley (serial number 3177 748 and up)*
30. *Hexagonal bolt M8 × 16 (serial number 3177 748 and up)*
31. *Female connector (13)*
32. *Round slotted head machine screw $\frac{1}{4}$-20 × $\frac{1}{2}$" (4)*
33. *Rubber spacer (4)*
34. *Lockwasher 22 mm*
35. *Hexagonal nut 22 × 1.5 mm*
36. *"Loctite 242" (blue, medium strength)*

MAGNETO

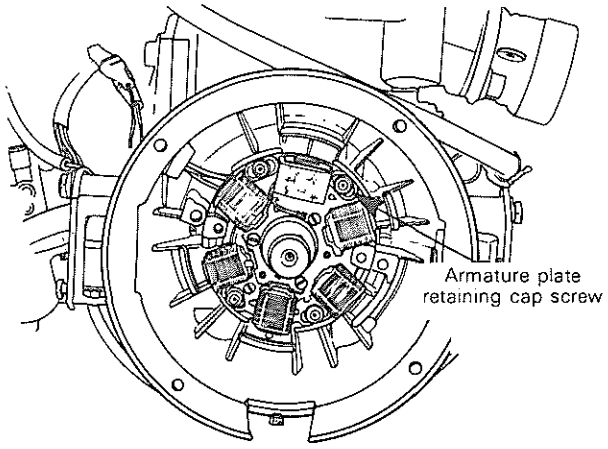
CLEANING

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

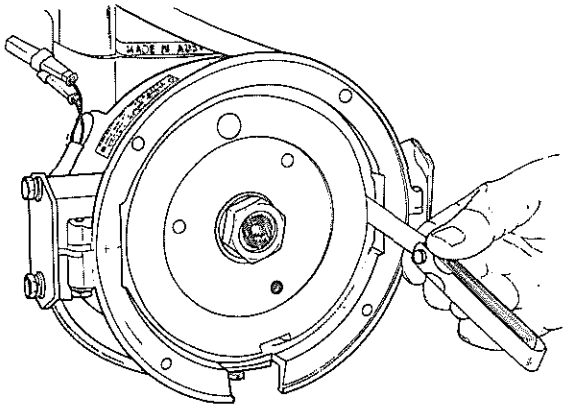
CAUTION: Clean armature and magneto using only a clean cloth.

DISASSEMBLY & ASSEMBLY

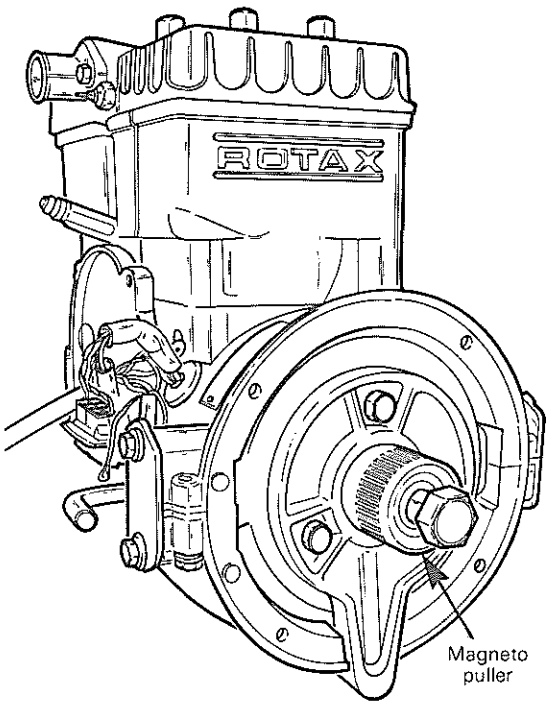
①To obtain best generator coil performance, position the armature plate on the crankcase with the retaining cap screws in the middle of the plate slots.



② Check air gap between magneto ring and trigger coil. The gap should be 0.8 - 1.2 mm (.031 - .047").



③ ㉑ ㉘To remove magneto, use special puller as illustrated. Tighten puller bolt and at same time, tap on bolt head using a hammer to release magneto from its taper.



At assembly, clean crankshaft extension (taper) then apply "Loctite 242".

④ ⑩ At the re-installation or verification of the ignition system electric connections, all the connections must be coated with lithium grease or dielectric grease to prevent corrosion.

CAUTION: To prevent moisture, ensure no air is trapped within the connections. Do not use silicone sealant as contacts will corrode.

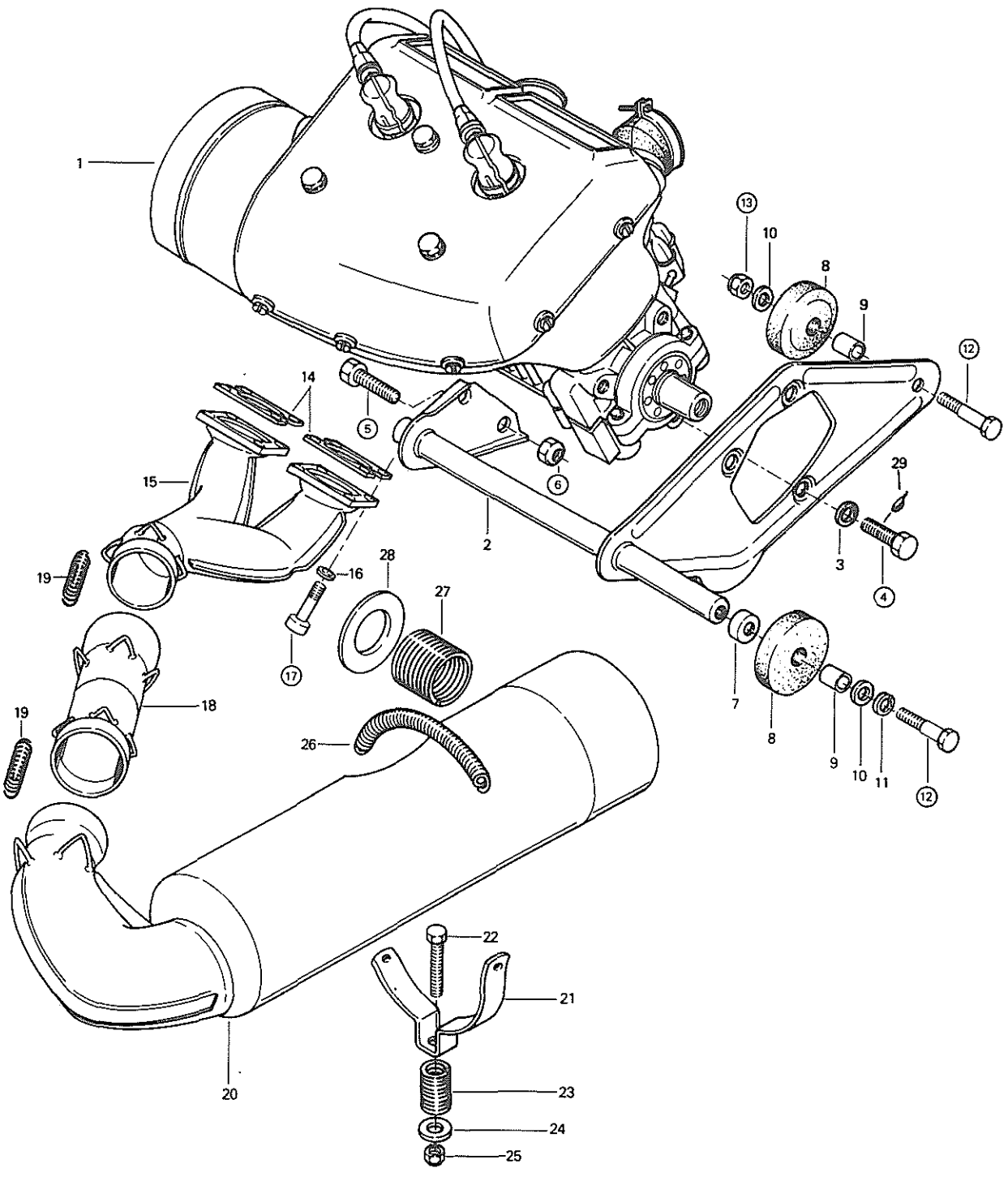
㉟ Prior to assembly, clean threads then apply "Loctite 242".

Torque to 80 N•m (60 ft-lbs).

377 ENGINE TYPE

377 ENGINE TYPE

ENGINE SUPPORT AND MUFFLER



1. *377 Rotax engine*
2. *Engine support*
3. *Lockwasher 10 mm (3)*
4. *Hexagonal head capscrew M10 × 25 mm (3)*
5. *Hexagonal head capscrew M10 × 35 mm (2)*
6. *Hexagonal elastic stop nut 10 mm (2)*
7. *Cup (2)*
8. *Rubber shear mount (3)*
9. *Bushing (3)*
10. *Flat Washer 10.5 X 21 X 2 mm (3)*
11. *Lockwasher 10 mm (2)*
12. *Hexagonal head capscrew M10 × 45 mm (3)*
13. *Hexagonal elastic stop nut 10 mm*
14. *Gasket (4)*
15. *Exhaust manifold*
16. *Lockwasher 8 mm (4)*
17. *Hexagonal socket head capscrew M8 × 30 mm (4)*
18. *Connector*
19. *Spring (6)*
20. *Muffler*
21. *Muffler support*
22. *Hexagonal head capscrew M6 × 1.00 × 40 mm*
23. *Spring*
24. *Flat washer 6.4 × 14 × 1.5 mm*
25. *Hexagonal elastic stop nut 6 mm*
26. *Spring (2)*
27. *Spring*
28. *Washer*
29. *"Loctite 222 or 242"*

ENGINE SUPPORT AND MUFFLER

REMOVAL FROM VEHICLE

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

- Pulley guard, drive belt.
- Muffler.
- Air intake silencer.
- Throttle cable at carburetor.
- Fuel lines and pulsation line.

NOTE: Secure fuel lines so that the opened ends are higher than the fuel level in the tank.

- Hood retaining cable.
- Rewind starter cable.
- Wiring harness.

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

- Engine support nuts.

DISASSEMBLY AND ASSEMBLY

④ Apply "Loctite 222 or 242" on threads then torque to 20 N•m (15 ft-lbs).

⑤ ⑥ ⑰ Torque to 20 N•m (15 ft-lbs).

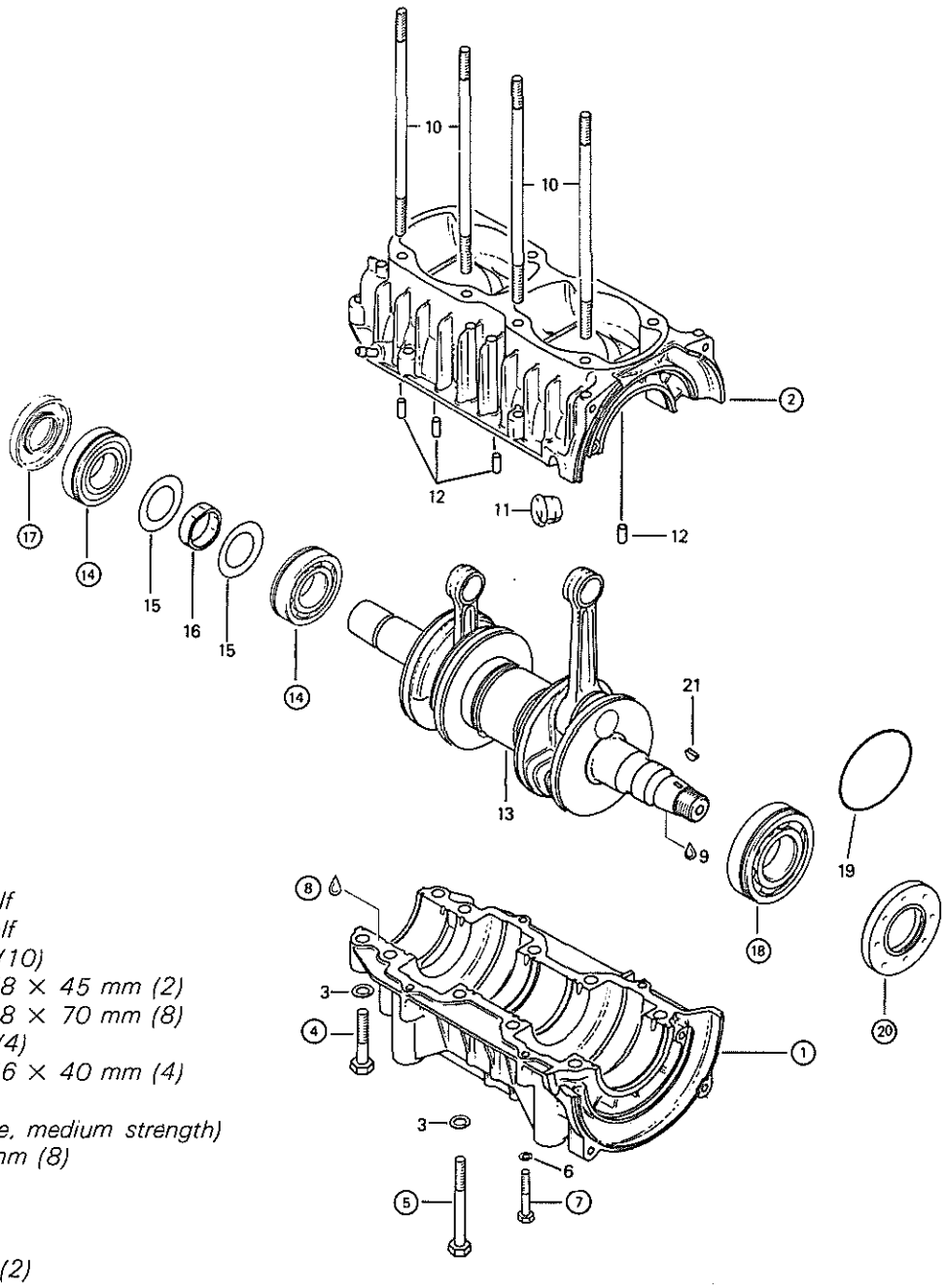
⑫ ⑬ Torque to 55 N•m (40 ft-lbs).

INSTALLATION IN VEHICLE

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

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

BOTTOM END



1. *Crankcase lower half*
2. *Crankcase upper half*
3. *Lockwasher 8 mm (10)*
4. *Hexagonal screw M8 × 45 mm (2)*
5. *Hexagonal screw M8 × 70 mm (8)*
6. *Lockwasher 6 mm (4)*
7. *Hexagonal screw M6 × 40 mm (4)*
8. *"Loctite 515"*
9. *"Loctite 242" (blue, medium strength)*
10. *Stud M8 × 167 mm (8)*
11. *Cable grommet*
12. *Rubber plug (5)*
13. *Crankshaft*
14. *Ball bearing 6206 (2)*
15. *Shim 1 mm (2)*
16. *Spacer*
17. *Seal, P.T.O. side*
18. *Ball bearing 6207*
19. *O'ring*
20. *Seal, magneto side*
21. *Woodruff key 3 × 3.7 mm*

BOTTOM END

CLEANING

Discard all seals, gaskets and "O" rings.

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

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

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

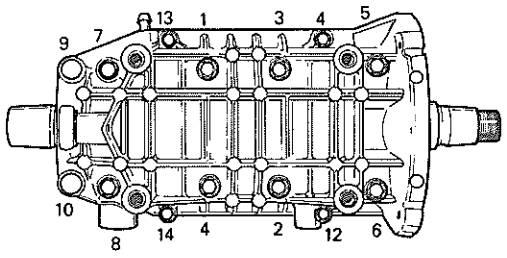
DISASSEMBLY AND ASSEMBLY

①②⑧ Crankcase halves are factory matched and therefore, are not interchangeable as single halves.

Prior to joining of crankcase halves, apply "Loctite 515" (no. 413 7027) on mating surfaces.

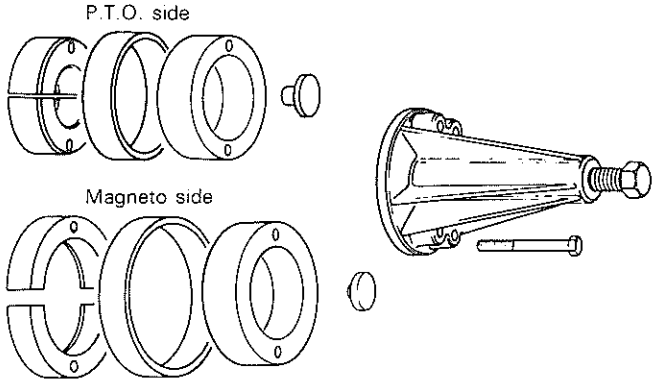
Position the crankcase halves together and tighten nuts (or bolts) by hand then install armature plate (tighten) on magneto side to correctly align the crankcase halves.

Torque bolts to 21 N•m (15 ft-lbs) following illustrated sequence.



④⑤⑦ Torque to 21 N•m (15 ft-lbs).

⑭⑱ To remove bearings from crankshaft use a protective cap and special puller, as illustrated. (See Tools section).

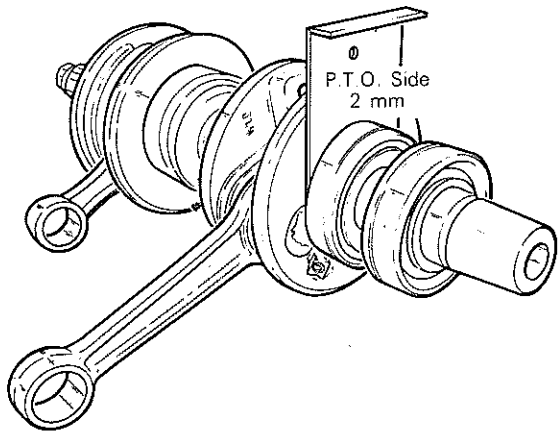


Prior to installation, place bearings into an oil container heated to 100°C (210°F).

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

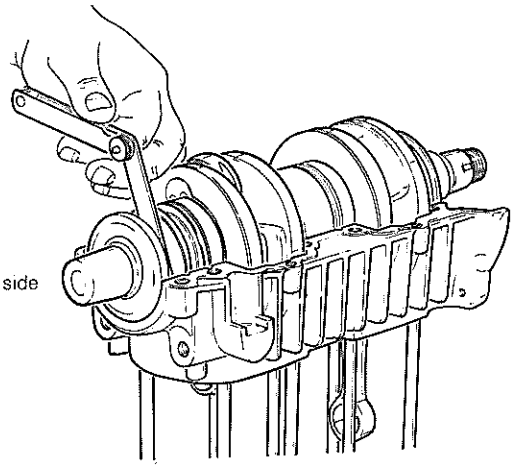
P.T.O. side

At inner bearing installation, provide a free play of 2 mm (.080") for lubrication between bearing and crankshaft blade, using P/N 420 876 620 tool.

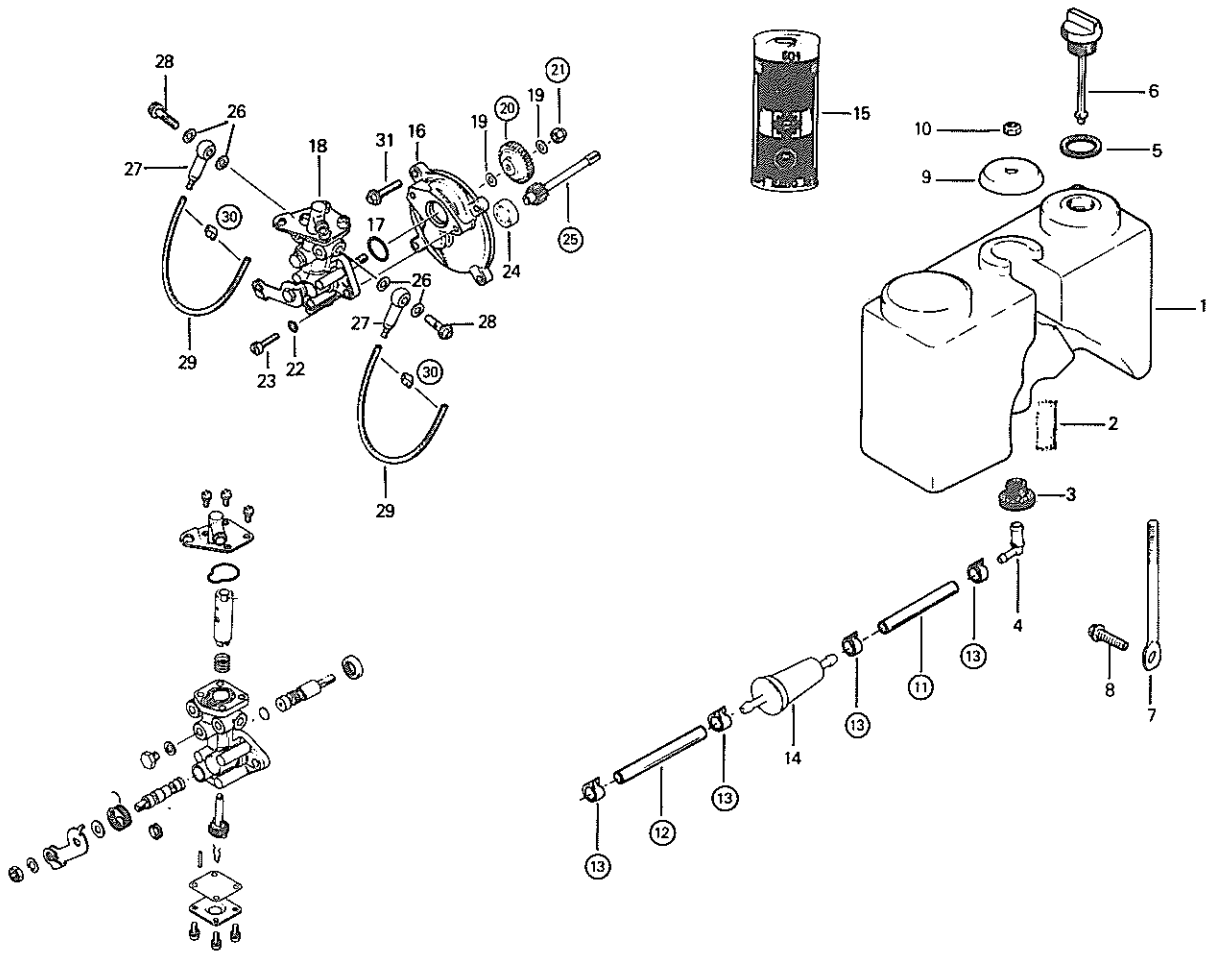


⑰ ⑳ At installation, apply a light coat of lithium grease on inside diameter lip of seal.

For P.T.O. side outer bearing lubrication, it is necessary to provide a free play of 0.80 mm (.030") between seal and bearing.



OIL INJECTION PUMP



1. *Injection oil tank*
2. *Sealer 9'' (229 mm)*
3. *Grommet*
4. *Male connector*
5. *Gasket*
6. *Oil tank cap*
7. *Retainer rod*
8. *Hexagonal washer head self-tapping screw M6 × 30 mm*
9. *Retaining washer*
10. *Hexagonal elastic stop nut 8 mm*
11. *Oil line 38 mm (1.5'')*
12. *Oil line 356 mm (14'')*
13. *Spring clip or clamp (4)*
14. *Filter*
15. *Oil*
16. *Oil pump mounting flange*
17. *O'ring*
18. *Oil pump*
19. *Washer 6.2 mm (2)*
20. *Gear 27 teeth*
21. *Lock nut 6 mm*
22. *Lockwasher 5 mm (2)*
23. *Cylindrical slotted screw M5 × 16 mm (2)*
24. *Ball bearing*
25. *Gear 9 teeth*
26. *Banjo gasket (4)*
27. *Banjo (2)*
28. *Banjo bolt (2)*
29. *Oil line 325 mm (13'')*
30. *Clamp (4)*
31. *Self-tapping screw M5 × 16 mm (4)*

OIL INJECTION PUMP

CLEANING

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

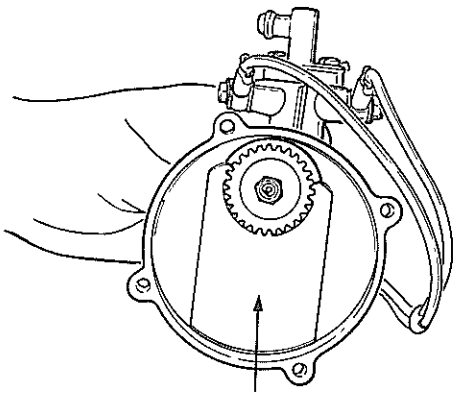
DISSASSEMBLY AND ASSEMBLY

NOTE: Oil pump components are not available as single parts.

⑪⑫ **CAUTION: On electric start models, it is recommended to install black rubber lines (P/N 414 2867) that will not be altered by battery fumes.**

⑬⑳ At assembly, always check for clamp tightness.

⑳㉑㉕ To remove retaining nut, lock gear in place using no. 420 876 690 tool.

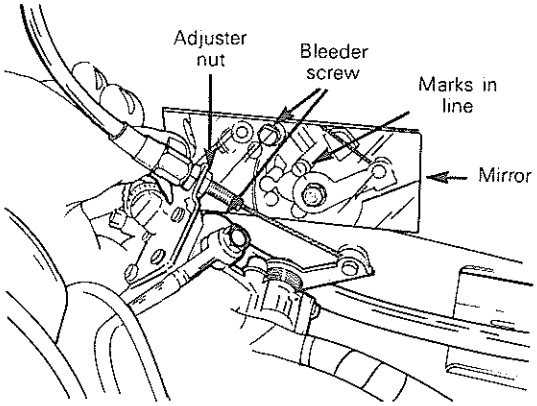


no. 420 876 690 tool

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

OIL INJECTION PUMP ADJUSTMENT

A) Prior to adjusting the pump, make sure all carburetor adjustments are completed.
Eliminate the throttle cable free play by pressing the throttle lever until a light resistance is felt, then hold in place. (A small rubber band can be used). The aligning marks on the pump casting and on the lever must align. If not, loosen the adjuster nut and adjust accordingly.
Retighten the adjuster nut.

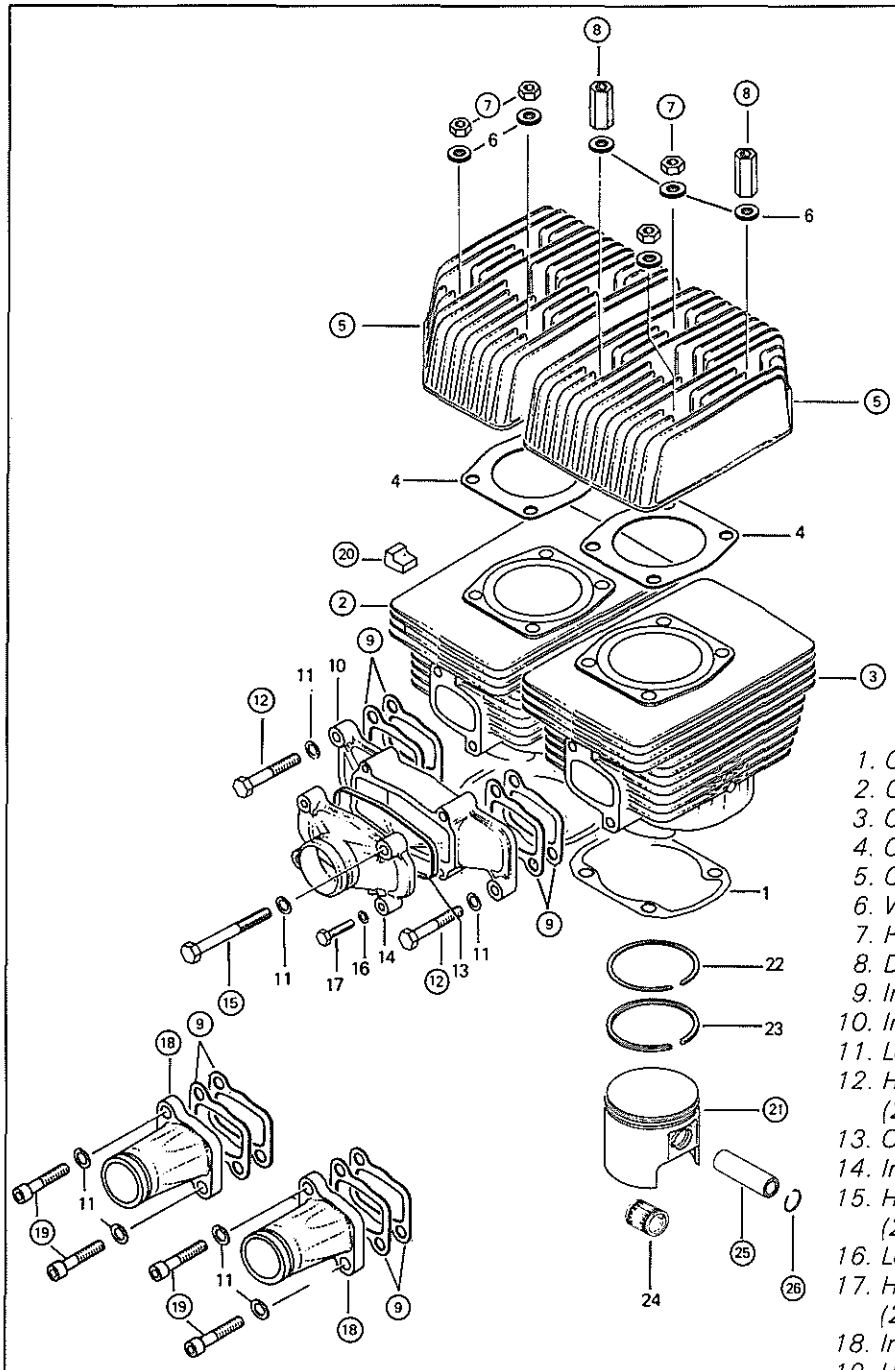


B) All oil lines should be full of oil. If required, bleed the main oil line (between tank and pump) by loosening the bleeder screw until all air has escaped from the line.

Make sure the tank is sufficiently filled.

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

TOP END



1. *Cylinder flange gasket*
2. *Cylinder, P.T.O. side*
3. *Cylinder, magneto side*
4. *Cylinder head gasket (2)*
5. *Cylinder head*
6. *Washer 8.4 mm (8)*
7. *Hexagonal nut 8 mm (5)*
8. *Distance nut 8 × 33 mm (3)*
9. *Intake manifold gasket (4)*
10. *Intake manifold*
11. *Lockwasher 8 mm (4)*
12. *Hexagonal head bolt M8 × 40 mm (2)*
13. *O'ring*
14. *Intake manifold cover*
15. *Hexagonal head bolt M8 × 74 mm (2)*
16. *Lockwasher 6 mm (2)*
17. *Hexagonal head bolt M6 × 25 mm (2)*
18. *Intake manifold (2)*
19. *Hexagonal socket head bolt M8 × 35 mm*
20. *Noise damper*
21. *Piston (2)*
22. *Rectangular ring (2)*
23. *Rectangular ring (2)*
24. *Needle bearing (2)*
25. *Gudgeon pin (2)*
26. *Circlip (4)*

TOP END

CLEANING

Discard all gaskets.

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

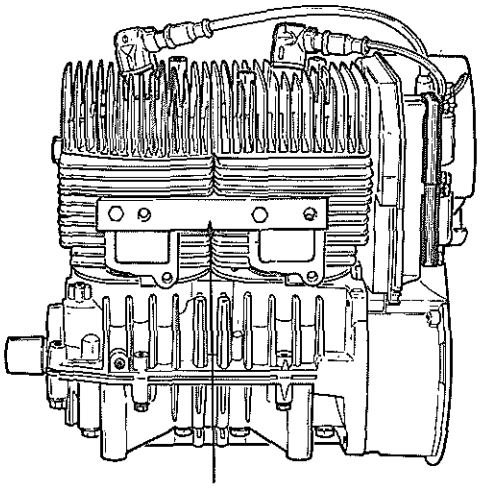
Scrape off carbon formation from cylinder exhaust port, cylinder head and piston dome using a wooden spatula.

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

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

DISASSEMBLY AND ASSEMBLY

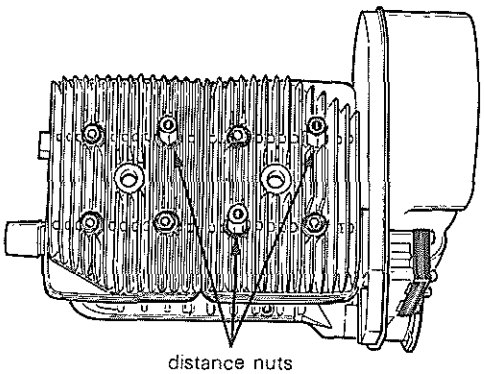
②③⑤ At cylinder and/or cylinder head installation, use P/N' 420 876 171 aligning tool to ensure sealing of intake manifold and exhaust (See Tools section), before tightening cylinder head nuts.



no. 420 876 171 tool

Cross torque cylinder head nuts to 20 N•m (15 ft-lbs); torque each cylinder head individually.

⑦⑧ Position nuts and distance nuts as illustrated.



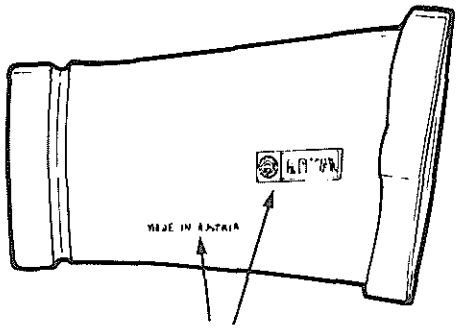
distance nuts

Torque nuts to 20 N•m (15 ft-lbs).

⑨ Install a gasket on each side of the air deflector.

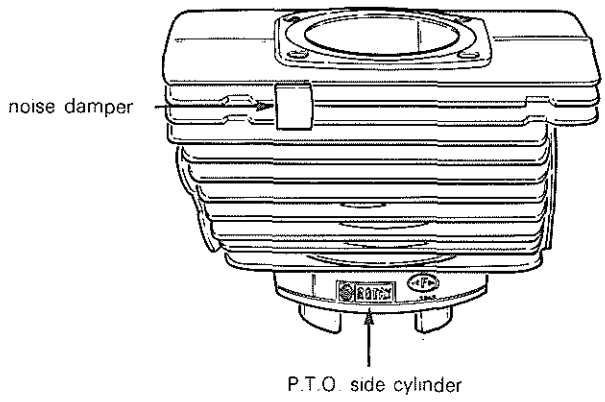
⑫⑮⑲ Torque to 20 N•m (15 ft-lbs)

⑱ Install intake manifold with identification marks towards cylinder head.



identification marks

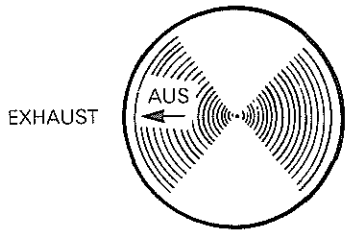
⑳ Position noise damper as per following illustration.



㉑ ㉕ ㉖ Place a clean cloth over crankcase to prevent circlips from falling into crankcase. Use a pointed tool to remove circlips from piston.

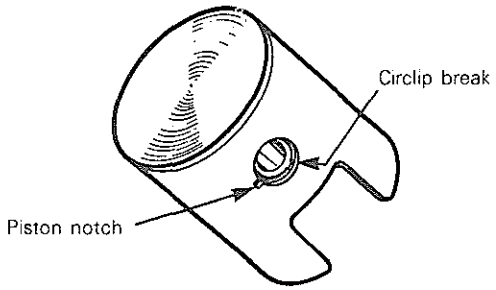
CAUTION: When tapping out gudgeon pins, hold piston firmly in place to eliminate the possibilities of transmitting shock and pressure to the connecting rod.

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

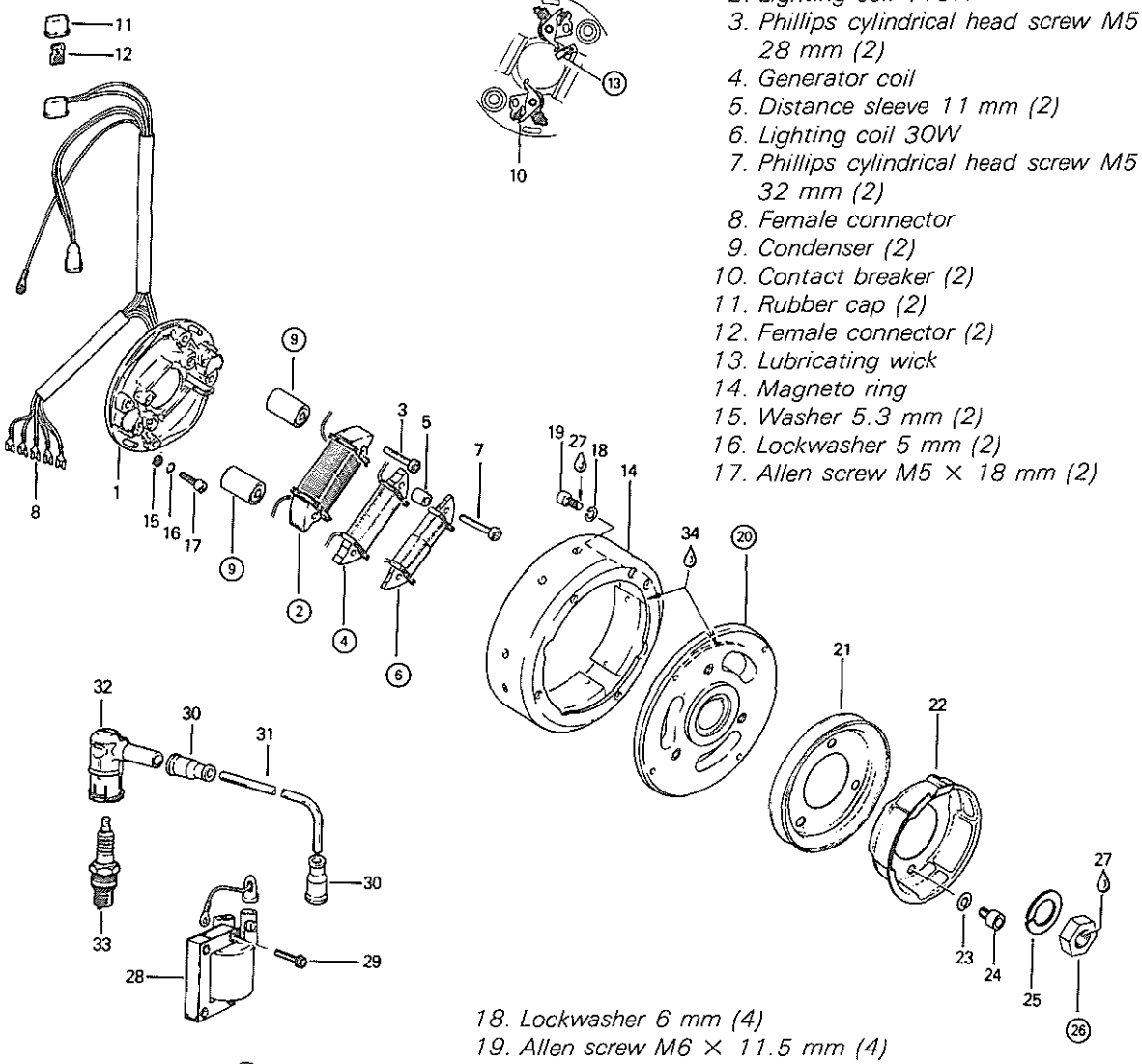


Piston to wall clearance should be:
MINIMUM: 0.070 mm (.0028")
MAXIMUM: 0.200 mm (.008")

NOTE: Once circlips are installed, turn each circlip so the circlip break is not directly on piston notch Remove any burrs from piston caused through circlip installation using very fine emery clotch.



MAGNETO



1. *Armature plate*
2. *Lighting coil 110W*
3. *Phillips cylindrical head screw M5 × 28 mm (2)*
4. *Generator coil*
5. *Distance sleeve 11 mm (2)*
6. *Lighting coil 30W*
7. *Phillips cylindrical head screw M5 × 32 mm (2)*
8. *Female connector*
9. *Condenser (2)*
10. *Contact breaker (2)*
11. *Rubber cap (2)*
12. *Female connector (2)*
13. *Lubricating wick*
14. *Magneto ring*
15. *Washer 5.3 mm (2)*
16. *Lockwasher 5 mm (2)*
17. *Allen screw M5 × 18 mm (2)*
18. *Lockwasher 6 mm (4)*
19. *Allen screw M6 × 11.5 mm (4)*
20. *Magneto housing*
21. *Fan pulley*
22. *Starting pulley*
23. *Lockwasher 8 mm (3)*
24. *Allen screw M8 × 12 mm (3)*
25. *Lockwasher 22 mm*
26. *Hexagonal nut 22 × 1.5 mm*
27. *"Loctite 242" (blue, medium strength)*
28. *Ignition coil (2)*
29. *Self-tapping screw M5 × 22 mm*
30. *Protection cap (4)*
31. *High tension cable 250 and 180 mm*
32. *Suppressor cap*
33. *Spark plug W3C (W275 T2)*
34. *"Loctite 271" (red, high strength)*

MAGNETO

CLEANING

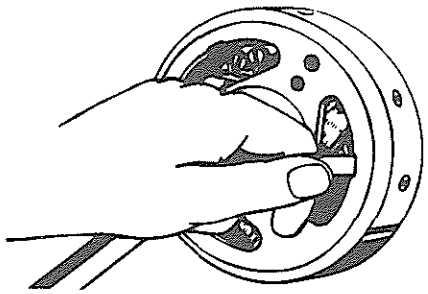
Clean all metal components in a non-ferrous metal cleaner.

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

DISASSEMBLY AND ASSEMBLY

②④⑥ Whenever a coil is replaced, the air gap (distance between coil end and magnet) must be adjusted.

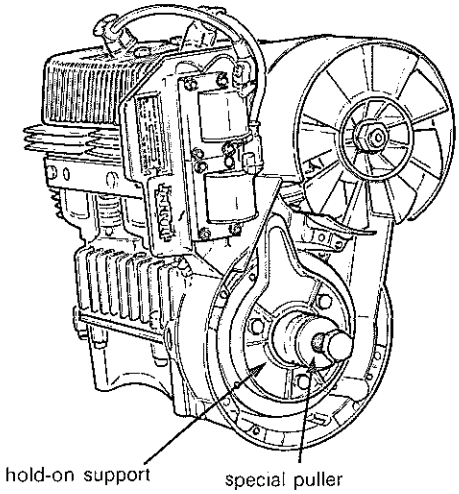
To check air gap, insert a feeler gauge of 0.30-0.45 mm (.012''-.018'') between magnet and coil ends. If necessary to adjust, slacken coil retaining screws and relocate coil.



⑨ To replace a condenser, it is first necessary to unsolder the two (2) black leads using a soldering iron. The condenser can then be driven out of the armature plate using a suitable pusher and hammer. To reinstall, inverse procedure.

⑬ When replacing contact breakers, apply a light coat of grease on lubricating wick.

⑳㉖ To remove or install magneto retaining nut, lock crankshaft in position with special hold-on support as illustrated. (See Tools section).



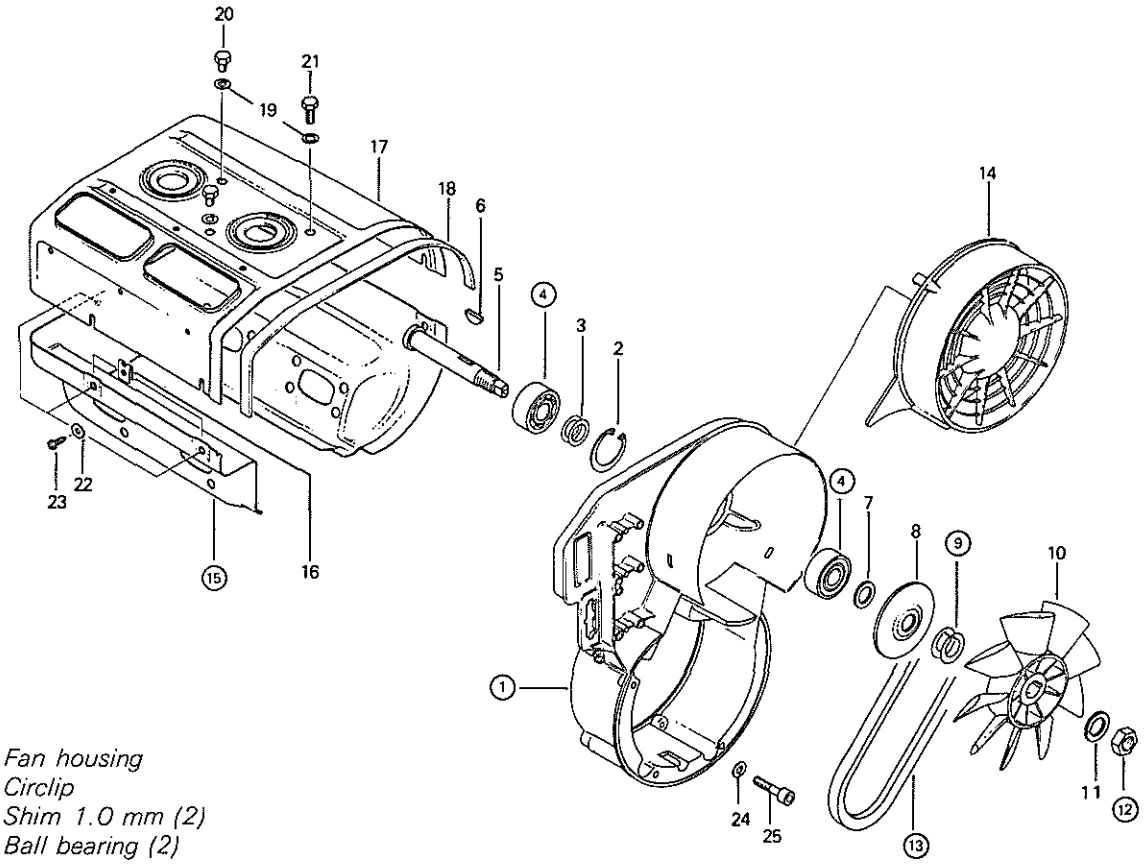
With magneto retaining nut removed, install special puller onto hold-on support.

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

At assembly, clean crankshaft extension (taper) then apply ''Loctite 242'' or equivalent.

Install magneto retaining nut (with ''Loctite 242'' on threads) and torque to 85 N•m (63 ft-lbs).

COOLING SYSTEM



1. *Fan housing*
2. *Circlip*
3. *Shim 1.0 mm (2)*
4. *Ball bearing (2)*
5. *Fan shaft*
6. *Woodruff key 3 × 5 mm*
7. *Distance sleeve*
8. *Pulley half*
9. *Shim 0.5 mm*
10. *Fan*
11. *Lockwasher 16 mm*
12. *Hexagonal nut 16 × 1.5 mm*
13. *Fan belt*
14. *Fan cover*
15. *Cylinder cowl*
16. *Speed nut (8)*
17. *Cylinder head cowl*
18. *Cowl sealing strip 380 mm*
19. *Lockwasher 8 mm (3)*
20. *Hexagonal screw M8 × 9 mm (2)*
21. *Hexagonal screw M8 × 16 mm*
22. *Wasker 4 × 15.8 mm (6)*
23. *Screw 4.8 × 16 mm (6)*
24. *Lockwasher 6 mm (4)*
25. *Allen screw M6 × 30 mm (4)*

COOLING SYSTEM

CLEANING

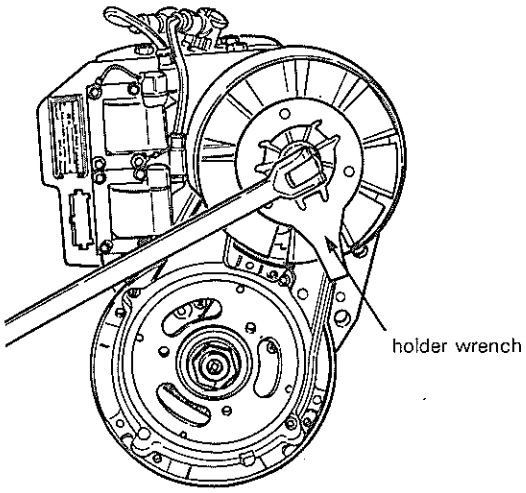
Clean all metal components in a non-ferrous metal cleaner.

DISASSEMBLY AND ASSEMBLY

①④ It is first necessary to heat bearing housing to 65 °C (150 °F) to remove or install bearing.

⑨⑬ Fan belt free-play must be 6 mm ($\frac{1}{4}$''). To adjust, install or remove shim (s) between pulley halves. Install excess shim (s) between fan and lockwasher.

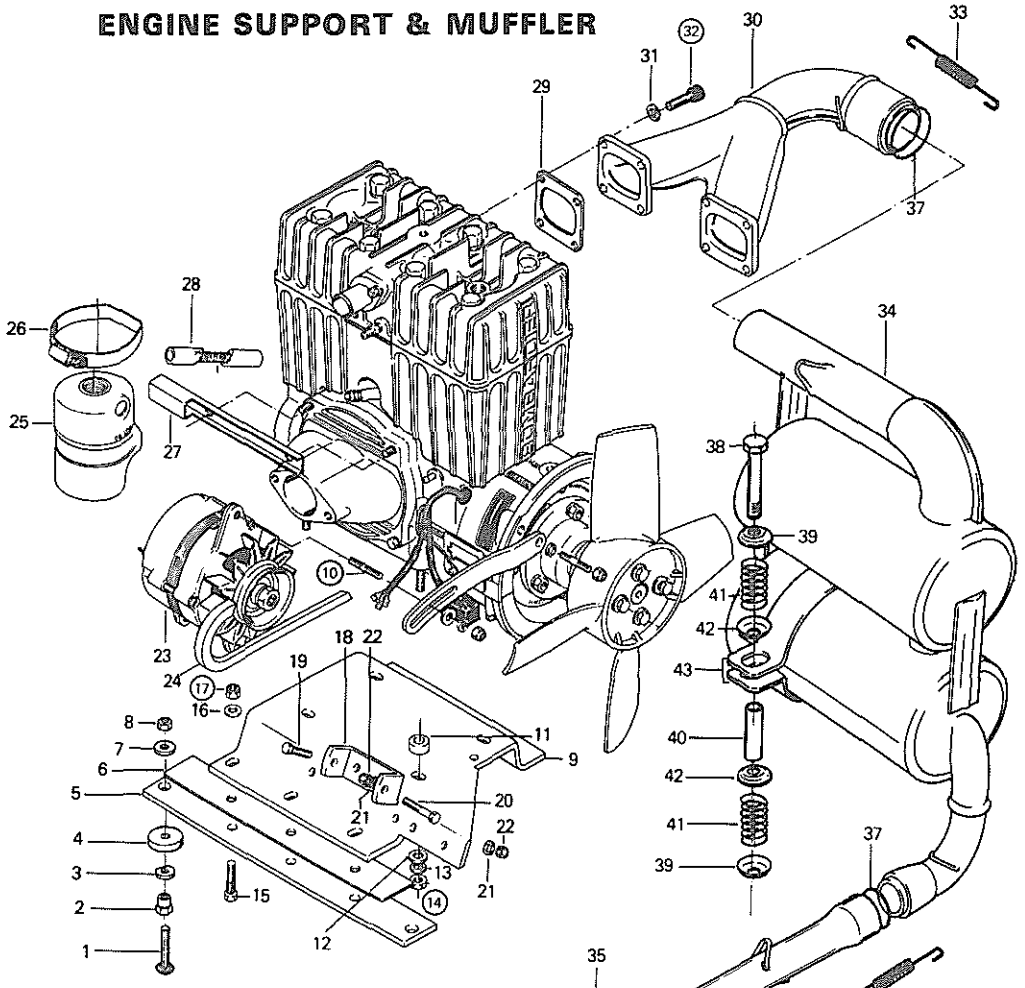
⑫To remove or install fan pulley retaining nut, lock fan pulley with special holder wrench. (See Tools section). At assembly, torque nut to 65 N•m (48 ft-lbs)



⑮A gasket must be placed on both sides (inner and outer) of intake and exhaust holes.

444 TYPE ENGINE

ENGINE SUPPORT & MUFFLER



1. *Carriage bolt $\frac{3}{8}-24 \times 1\frac{1}{2}''$ (4)*
2. *Threaded bushing (4)*
3. *Spacer (4)*
4. *Insulating rubber (4)*
5. *Bracket (2)*
6. *Spring leaf (2)*
7. *Washer (4)*
8. *Nut (4)*
9. *Engine support*
10. *Stud (4)*
11. *Distance sleeve (4)*
12. *Washer (4)*
13. *Lockwasher (4)*
14. *Nut (4)*
15. *Bolt 5/16−24 × 13/16'' (6)*
16. *Washer (6)*
17. *Nut 5/16−24 (6)*
18. *Support*
19. *Bolt 5/16−18 × 1'' (2)*
20. *Bolt 5/16−18 × $1\frac{1}{4}''$ (2)*
21. *Washer (4)*
22. *Nut 5/16−18 (2)*
23. *Alternator*
24. *Belt*
25. *Oil tank*
26. *Hose clamp*
27. *Oil tank support*
28. *Hose 120 mm*
29. *Exhaust gasket (2)*
30. *Exhaust manifold*
31. *Lockwasher 6 mm (6)*
32. *Allen screw M6 × 22 (6)*
33. *Spring (4)*
34. *Muffler*
35. *Exhaust pipe*
36. *Exhaust grommet*
37. *Asbestos string*
38. *Bolt 5/16−18 × $3\frac{1}{2}''$ (2)*
39. *Cup (4)*
40. *Bushing (2)*
41. *Spring (4)*
42. *Cup (4)*
43. *Muffler clamp (2)*

ENGINE SUPPORT AND MUFFLER

REMOVAL FROM VEHICLE

Disconnect or remove the followings from vehicle:

— Pulley guard and drive belt.

— Intake silencer and throttle cable.

— Fuel lines, primer and pulsation lines, fuel tank.

— Electrical wires (at engine, alternator, starter).

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

— Drain the cooling system and disconnect hoses at engine.

— Remove engine mount nuts then lift engine from vehicle.

DISASSEMBLY AND ASSEMBLY

⑩At assembly on crankcase, apply "Loctite 242" on threads.

⑭Torque to 36 N•m (26 ft-lbs).

⑰Torque to 32 N•m (23 ft-lbs).

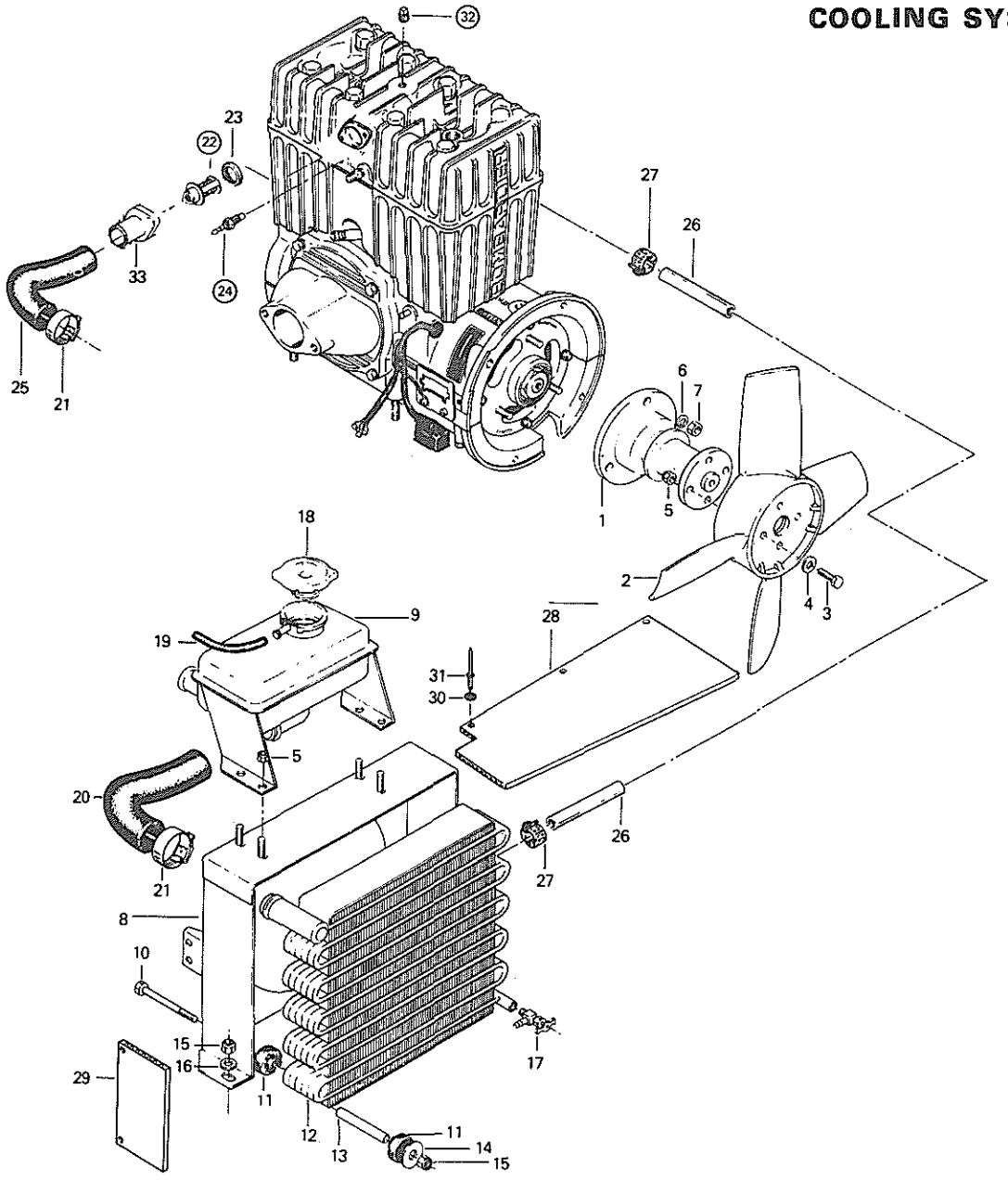
㉜Torque to 21 N•m (15 ft-lbs).

INSTALLATION ON VEHICLE

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

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

COOLING SYSTEM



1. *Fan adapter*
2. *Fan*
3. *Bolt $\frac{1}{4}-20 \times 1''$ (4)*
4. *Washer (4)*
5. *Nut $\frac{1}{4}-20$ (8)*
6. *Lockwasher 8 mm (3)*
7. *Nut 8 mm (3)*
8. *Grille (radiator)*
9. *Coolant tank*
10. *Bolt 5/16–18 × $3\frac{1}{2}''$ (4)*
11. *Rubber damper (8)*
12. *Radiator*
13. *Bushing (4)*
14. *Washer (4)*
15. *Nut 5/16–18 (8)*
16. *Washer (4)*
17. *Drain valve*
18. *Plug*
19. *Overflow hose (635 mm)*
20. *Inlet hose (radiator)*
21. *Hose clamp (4)*
22. *Thermostat*
23. *Sealing ring*
24. *Sensor*
25. *Outlet hose (engine)*
26. *Hose (380 mm)*
27. *Hose clamp (2)*
28. *Upper deflector*
29. *Side deflector (2)*
30. *Washer (7)*
31. *Pop rivet (7)*
32. *Plug (2)*
33. *Cylinder head outlet collar*

COOLING SYSTEM

INSPECTION

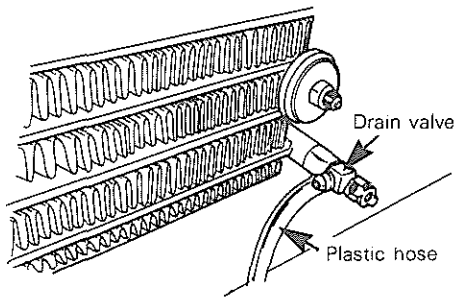
Check general condition of hoses and clamps tightness.

DRAINING THE SYSTEM

To drain the cooling system, remove the coolant tank cap.

Remove the R.H. access grill, and connect a length of plastic hose to the radiator drain valve in order to drain the cooling system outside of the body.

Open the drain valve.



DISASSEMBLY & ASSEMBLY

㉒To check thermostat, put it in water and heat water. Thermostat should open when water temperature reaches 43°C (110°F).

㉔㉜Apply pipe thread sealant to avoid leaks.

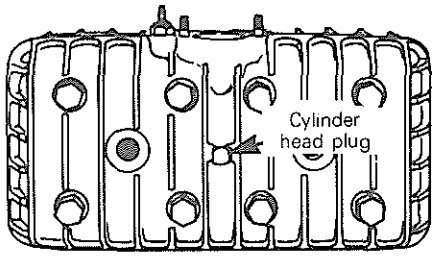
REFILLING THE SYSTEM

Capacity:

6.25 liters
(1.4 Imp. gal.) (1.7 U.S. gal.)

60% concentrated antifreeze + 40% water

To refill the cooling system, unscrew the plug on top of the cylinder head, then slowly pour the liquid into the coolant tank until it reaches the plug hole in the cylinder head. Reinstall the plug. Continue to pour the liquid in the coolant tank until the coolant level reaches 25 mm (1'') below filler neck of reservoir.

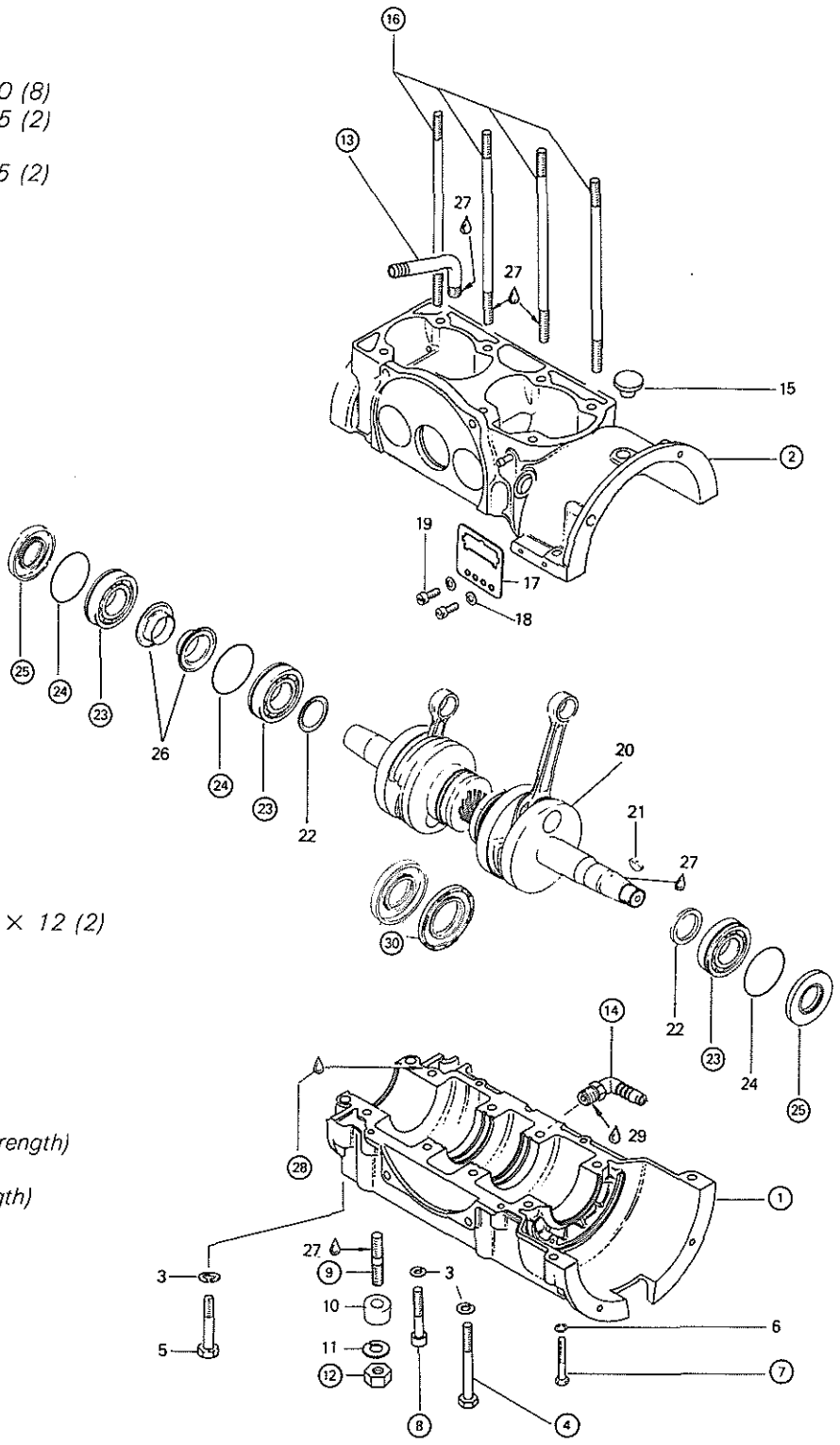


With the pressure cap removed, start engine to allow the coolant to circulate and let it run until normal temperature is reached. Stop engine.

Then recheck coolant level, ensuring that it is 25 mm (1'') below filler neck of reservoir.

BOTTOM END

1. Crankcase lower half
2. Crankcase upper half
3. Lockwasher 8 mm (14)
4. Hexagonal screw M8 × 70 (8)
5. Hexagonal screw M8 × 45 (2)
6. Lockwasher 6 mm (2)
7. Hexagonal screw M6 × 35 (2)
8. Allen screw M8 × 40 (4)
9. Stud M10 × 37 (4)
10. Distance sleeve 12mm (4)
11. Lockwasher 10 mm (4)
12. Nut M10 (4)
13. Angular tube (oil outlet)
14. Angular tube (oil inlet)
15. Plug
16. Stud M10 × 184.5 (8)
17. Junction block plate
18. Lockwasher 5 mm (2)
19. Cylindrical head screw M5 × 12 (2)
20. Crankshaft assembly
21. Woodruff key 3 × 3.7
22. Distance ring (2)
23. Ball bearing 6206 (3)
24. O'ring (3)
25. Oil seal (2)
26. Stop ring (2)
27. "Loctite 242" (medium strength)
28. "Loctite 515"
29. "Loctite 271" (high strength)
30. Oil seal (2)



BOTTOM END

CLEANING

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

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

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

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

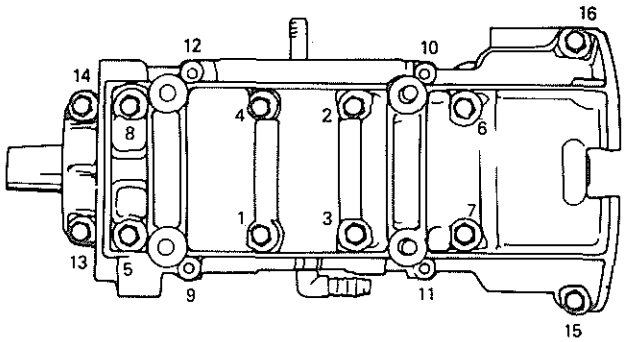
DISASSEMBLY & ASSEMBLY

①②㉘ Crankcase halves are factory matched and therefore, are not interchangeable or available as single halves. Prior to joining of crankcase halves, apply ''Loctite 515'' (no. 413 7027 00) on mating surfaces.

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

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

Torque bolts to 22 N•m (16 ft-lbs) following illustrated sequence.



④⑦⑧ Torque to 22 N•m (16 ft-lbs).

⑨ At assembly on crankcase, apply ''Loctite 242'' on threads.

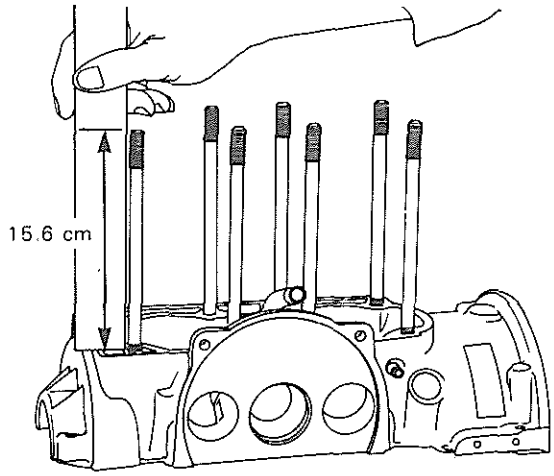
⑫ Torque to 35 N•m (26 ft-lbs).

⑬ Apply ''Loctite 242'' on threads prior to assembly.

⑭ It is recommended to wrap ''Teflon'' pipe tape around threads.

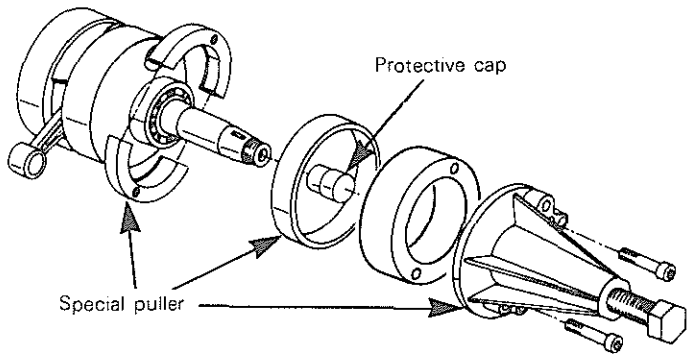
⑯ Because of cap nuts, cylinder studs have to be screwed into crankcase so that they do not protrude further than 15.6 cm (6.140''). If it is not possible to obtain this length, a washer must be added between cylinder head cap and cap nut.

Apply ''Loctite 242'' on the threads of the two studs screwed above the intake ports.



Longer threaded part of stud should be screwed into crankcase.

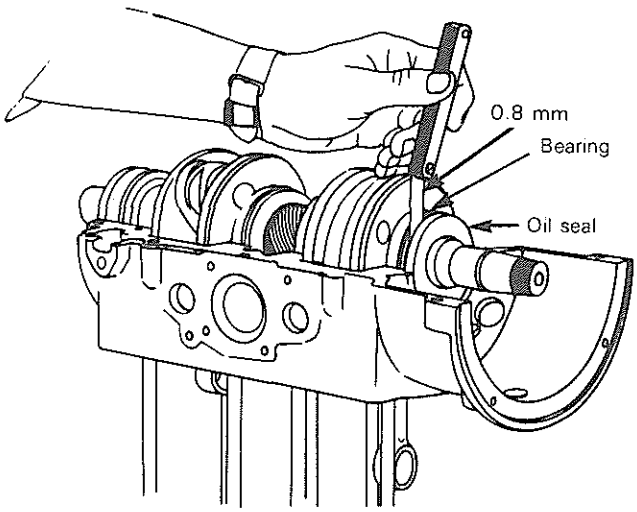
㉓ To remove bearings from crankshaft, use a protective cap and special puller as illustrated.



Prior to installation, place bearings into an oil container and heat the oil to 100°C (212°F). This will expand bearing and ease installation.

Install bearings with groove outward.

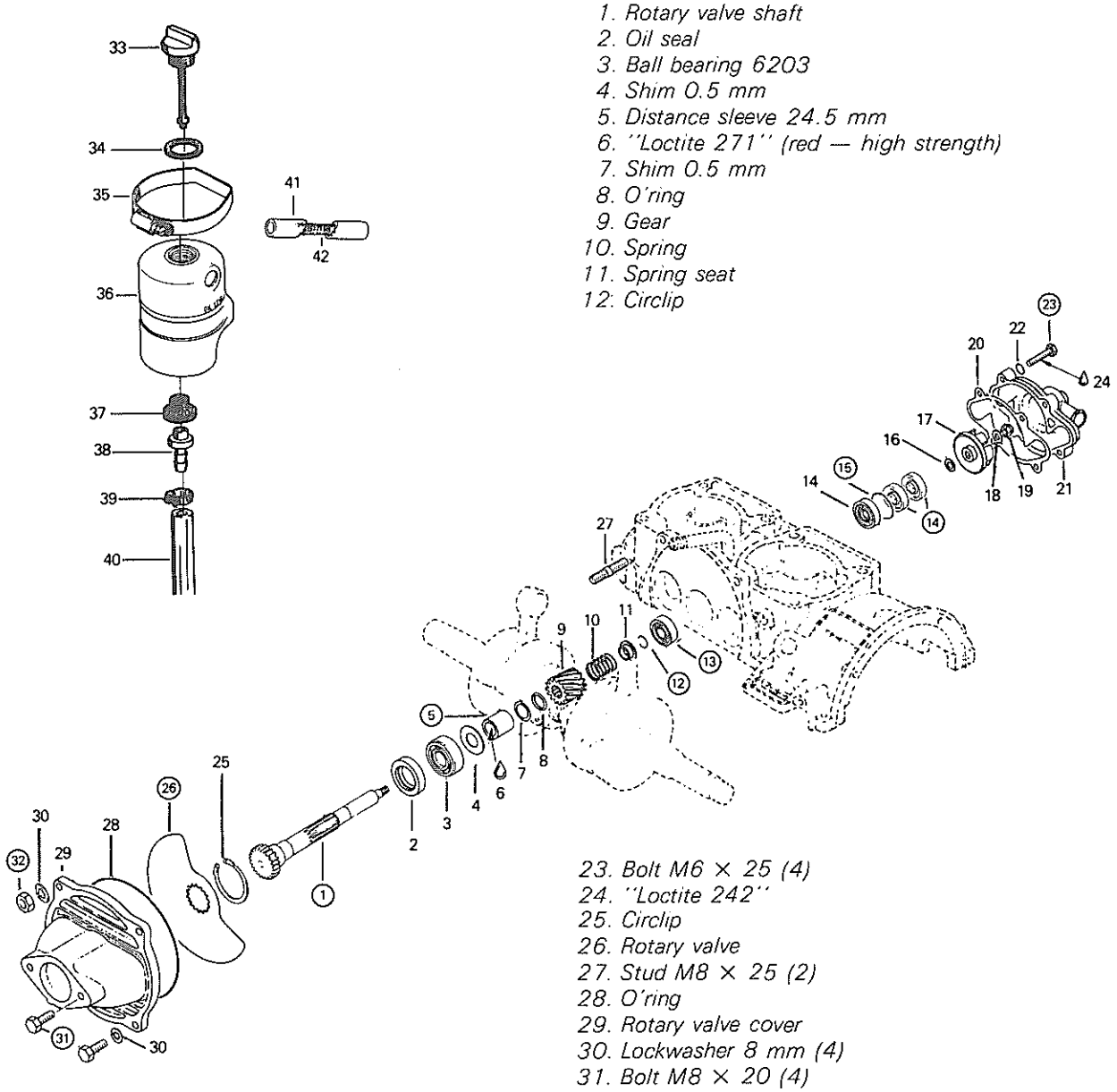
㉕ At assembly, apply a light coat of lithium grease on seal lips.



To insure adequate oil supply to the bearing on the **magneto side,** install oil seal with a gap of at least 0.8 mm (.030'') with bearing. On **P.T.O. side** install oil seal flush with crankcase, no more in.

㉚ Crankshaft center oil seals may be replaced at a crankshaft rebuild shop.

ROTARY VALVE & COOLANT PUMP



1. *Rotary valve shaft*
2. *Oil seal*
3. *Ball bearing 6203*
4. *Shim 0.5 mm*
5. *Distance sleeve 24.5 mm*
6. *''Loctite 271'' (red — high strength)*
7. *Shim 0.5 mm*
8. *O'ring*
9. *Gear*
10. *Spring*
11. *Spring seat*
12. *Circlip*

13. *Ball bearing 6201*
14. *Oil seal (3)*
15. *Distance ring*
16. *Washer 8.4 mm*
17. *Impeller*
18. *Washer 6.2 mm*
19. *Lock nut 6 mm*
20. *Gasket*
21. *Pump housing*
22. *Sealing ring (4)*

23. *Bolt M6 × 25 (4)*
24. *''Loctite 242''*
25. *Circlip*
26. *Rotary valve*
27. *Stud M8 × 25 (2)*
28. *O'ring*
29. *Rotary valve cover*
30. *Lockwasher 8 mm (4)*
31. *Bolt M8 × 20 (4)*
32. *Nut 8 mm (2)*
33. *Plug*
34. *Gasket*
35. *Clamp*
36. *Oil tank*
37. *Grommet*
38. *Connector*
39. *Clamp (4)*
40. *Oil line 508 mm (20'')*
41. *Oil line 120 mm (4.75'')*
42. *Spring*

ROTARY VALVE & COOLANT PUMP

CLEANING

Discard all oil seals and "O" rings.

Remove old crankcase sealant from rotary valve gear and adjacent bearing.

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

DISASSEMBLY & ASSEMBLY

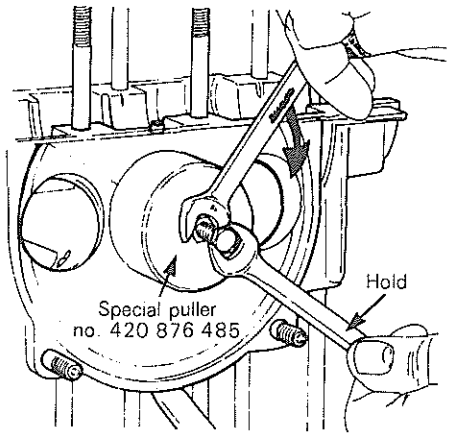
①There are two interchangeable types of rotary valve shaft. The **first one** is made of a shaft with a pinion attached to it by means of a key and Allen screw. On the **second type**, the pinion and the shaft are machined together as a single part.

First type

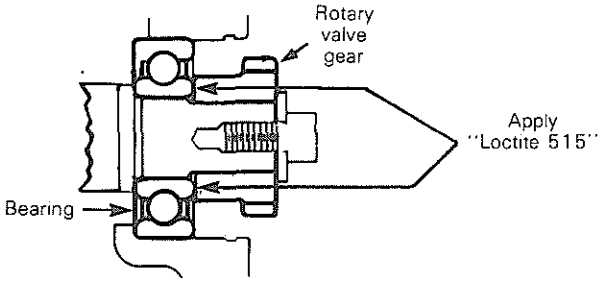


To remove rotary valve shaft assembly from crankcase, first remove pump impeller ⑰ and circlip ㉕.

Position special puller over shaft bore (with pinion removed) and screw puller bolt into rotary valve shaft. While holding puller bolt, turn puller nut clockwise until shaft comes out.



At assembly, apply "Loctite 515" on bearing and rotary valve gear mating surfaces.

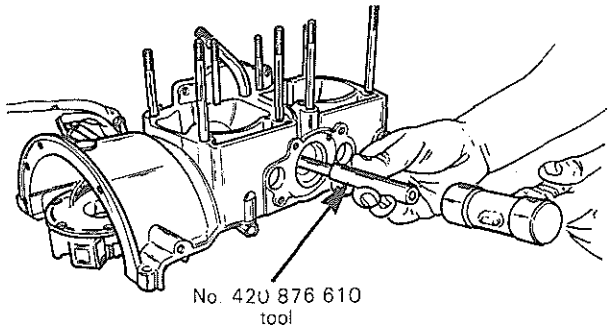


To install shaft assembly, use a fiber hammer. Use a no. 420 876 505 pusher to insert oil seal with lithium grease on seal lip.

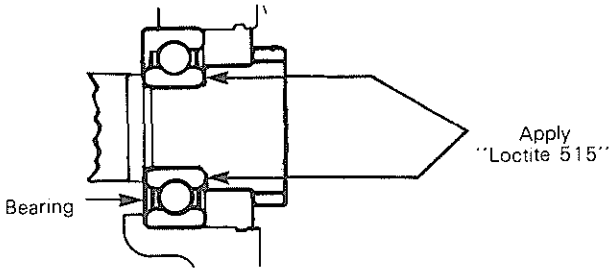
Second type



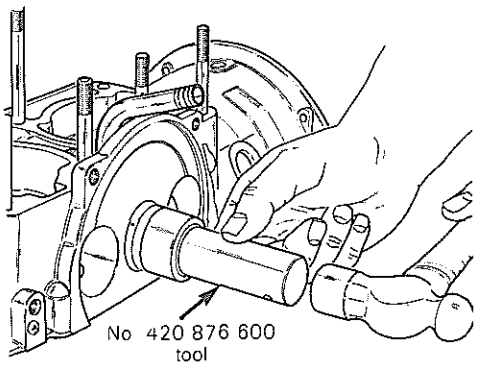
To remove rotary valve shaft assembly from crankcase, first remove pump impeller ⑰ and circlip ㉕. Using an appropriate pusher (P/N 420 876 610) and a fiber hammer, drive out shaft assembly.



At assembly, apply "Loctite 515" on bearing and rotary valve shaft mating surfaces.

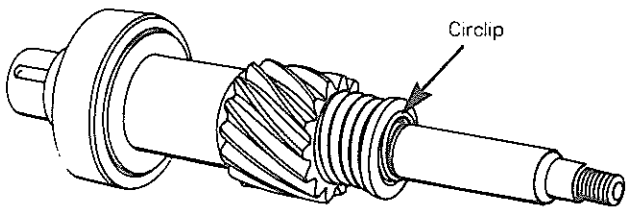


To install shaft assembly and oil seal, use no. 420 876 600 pusher.



①Through ⑫Rotary valve shaft assembly.

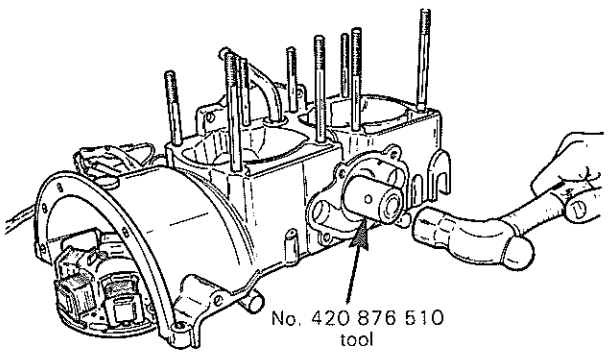
If it is necessary to disassemble components of rotary valve shaft assembly, compress spring cup ⑪ in order to remove circlip ⑫.



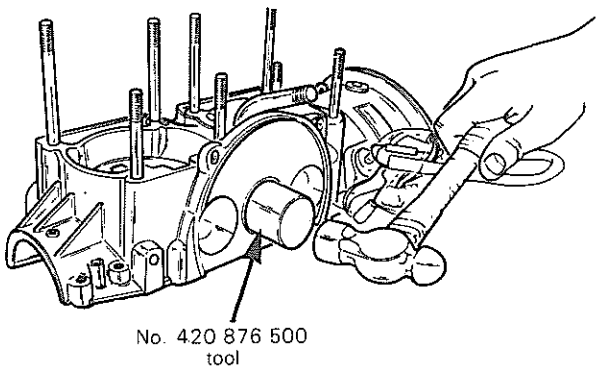
⑤ Clean rotary valve shaft and inside of distance sleeve. At assembly, apply "Loctite 271" inside of distance sleeve.

⑬ Using a suitable pusher, push pump bearing with shield facing rotary valve.

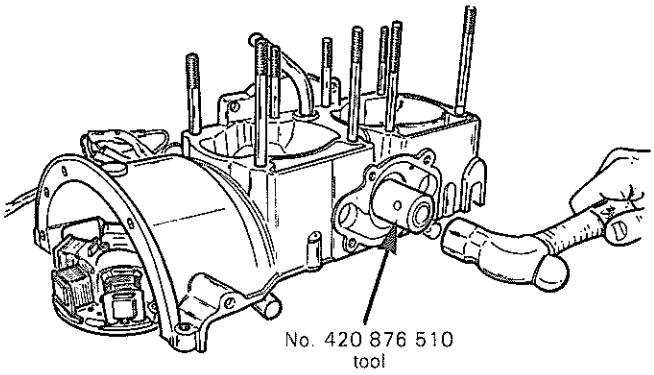
To remove bearing



To install bearing

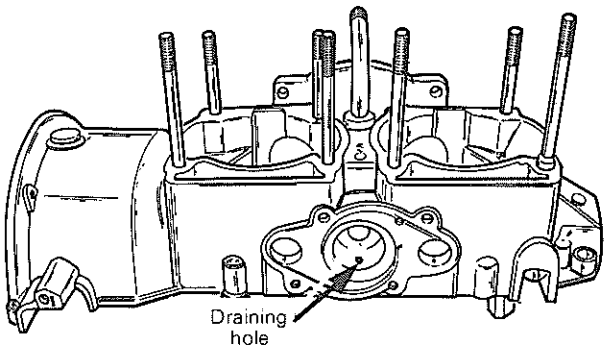


⑭⑮ From pump side, using no. 420 876 510 pusher, install oil seals (with lithium grease on lips) as per illustrations.

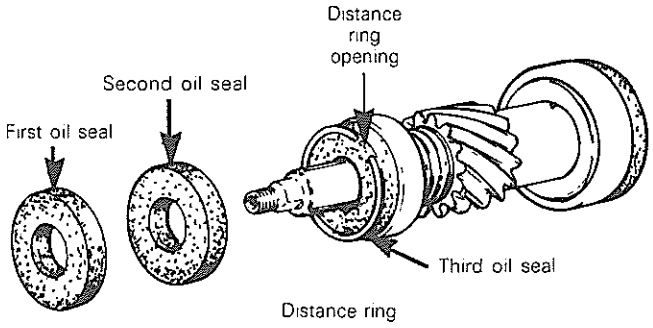


Keep in mind that:

— distance ring opening must be in line with crankcase draining hole.

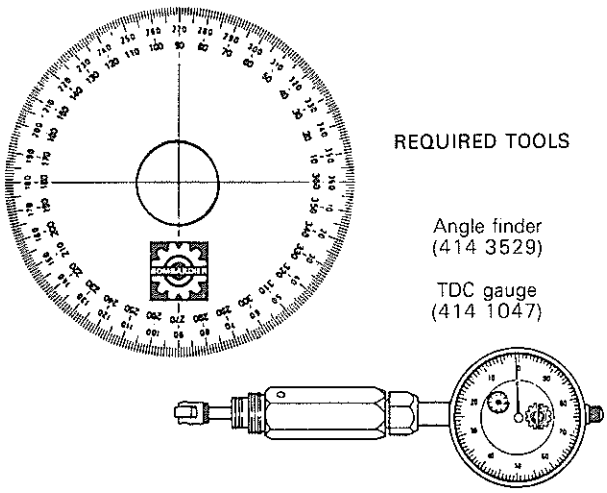


— 35% of the area between first and second oil seal (first oil seal being flush with crankcase) must be filled with lithium grease or equivalent.



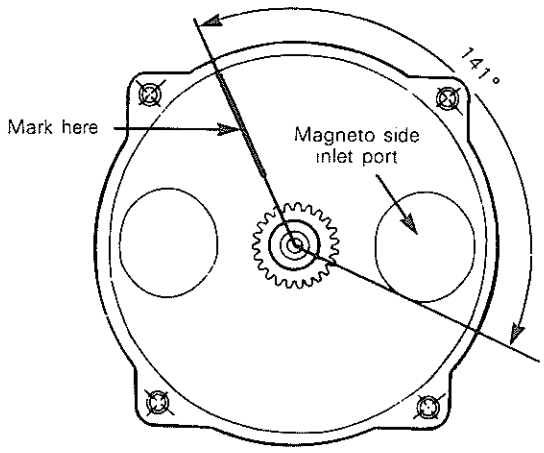
㉓ Apply "Loctite 242" on threads.

㉖ **Rotary valve adjustment with replaced crankcase having no timing marks.**

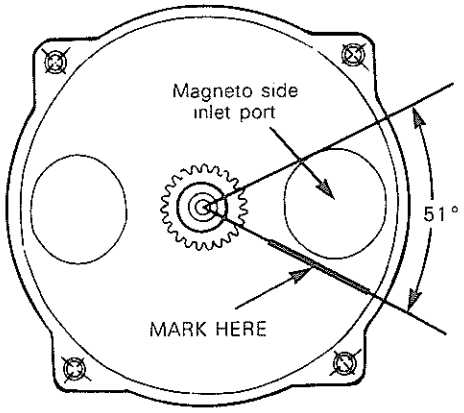


1980 **444 type:** 141° opening 51° closing

Using angle finder, mark crankcase at 141° from bottom edge of magneto side inlet port.



From top edge of magneto side inlet port, mark crankcase at 51°.

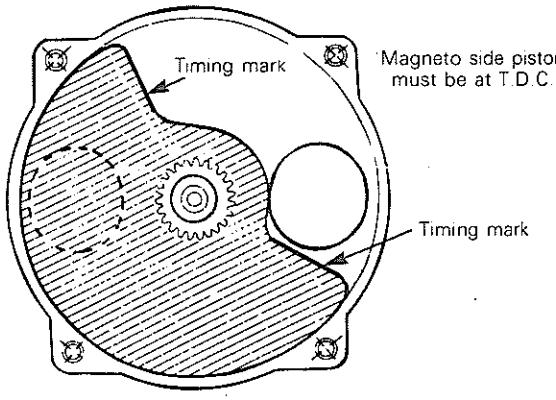


To correctly install the rotary valve proceed as follows:

— Turning crankshaft counter-clockwise, (drive pulley side) bring magneto side piston to Top Dead Center using a T.D.C. gauge.

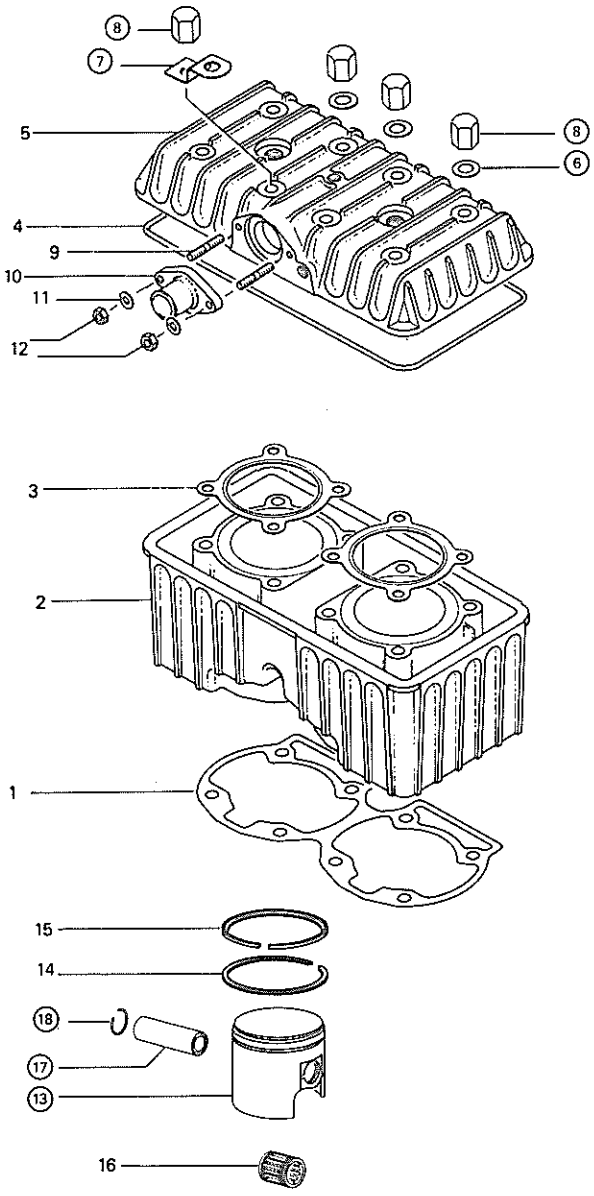
— Position the rotary valve on gear to have edges as close as possible to the marks.

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



㉛ ㉜ Torque to 20 N•m (15 ft-lbs).

TOP END



1. *Gasket*
2. *Cylinder block*
3. *Cylinder head gasket (2)*
4. *Cylinder head gasket*
5. *Cylinder head*
6. *Washer 10.5 mm (8)*
7. *Holder bracket*
8. *Nut M10 (8)*
9. *Stud M6 × 15 (2)*
10. *Socket (coolant outlet)*
11. *Lockwasher 6 mm (2)*
12. *Nut M6 (2)*
13. *Piston (2)*
14. *Rectangular ring (2)*
15. *Semi-trapez ring (2)*
16. *Needle bearing (2)*
17. *Gudgeon pin (2)*
18. *Circlip (4)*

TOP END

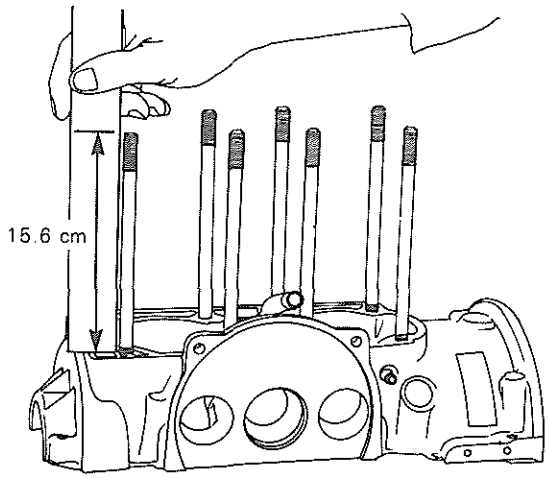
CLEANING

Discard all gaskets.

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

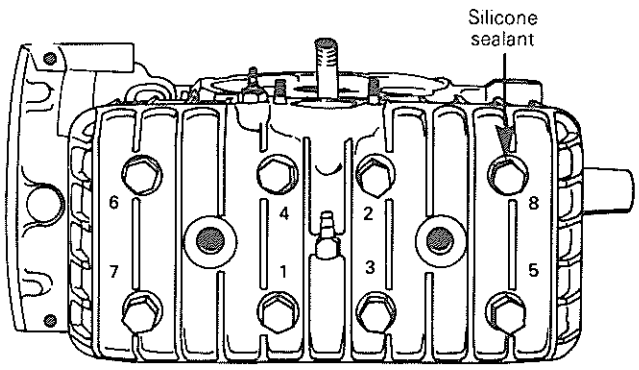
DISASSEMBLY & ASSEMBLY

⑥⑦⑧ Because of cap nuts, cylinder studs have to be screwed into crankcase so they do not protrude further than 15.6 cm (6.140''). If it is not possible to obtain this length, a washer must be added between cylinder head and cap nut.



Prior to washers ⑥⑦ installation, apply silicone sealant on washer seat of cylinder head, around stud.

Torque cylinder head nut to 38 N•m (28 ft-lbs) following illustrated sequence.



⑬⑰⑱ Place a clean cloth over crankcase to prevent circlips from falling into crankcase, then use a pointed tool to remove circlips from pistons.

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

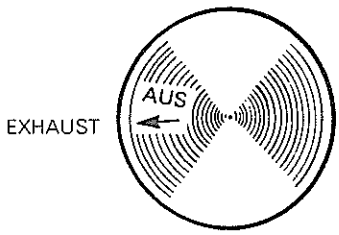
Scrape off carbon formation from cylinder exhaust port, cylinder head and piston dome using a wooden spatula.

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

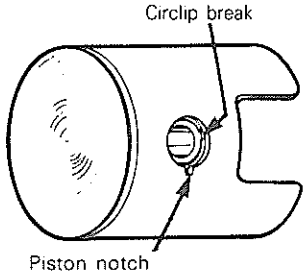
Clean the piston ring with a groove cleaner tool, or with a piece of broken ring.

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

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



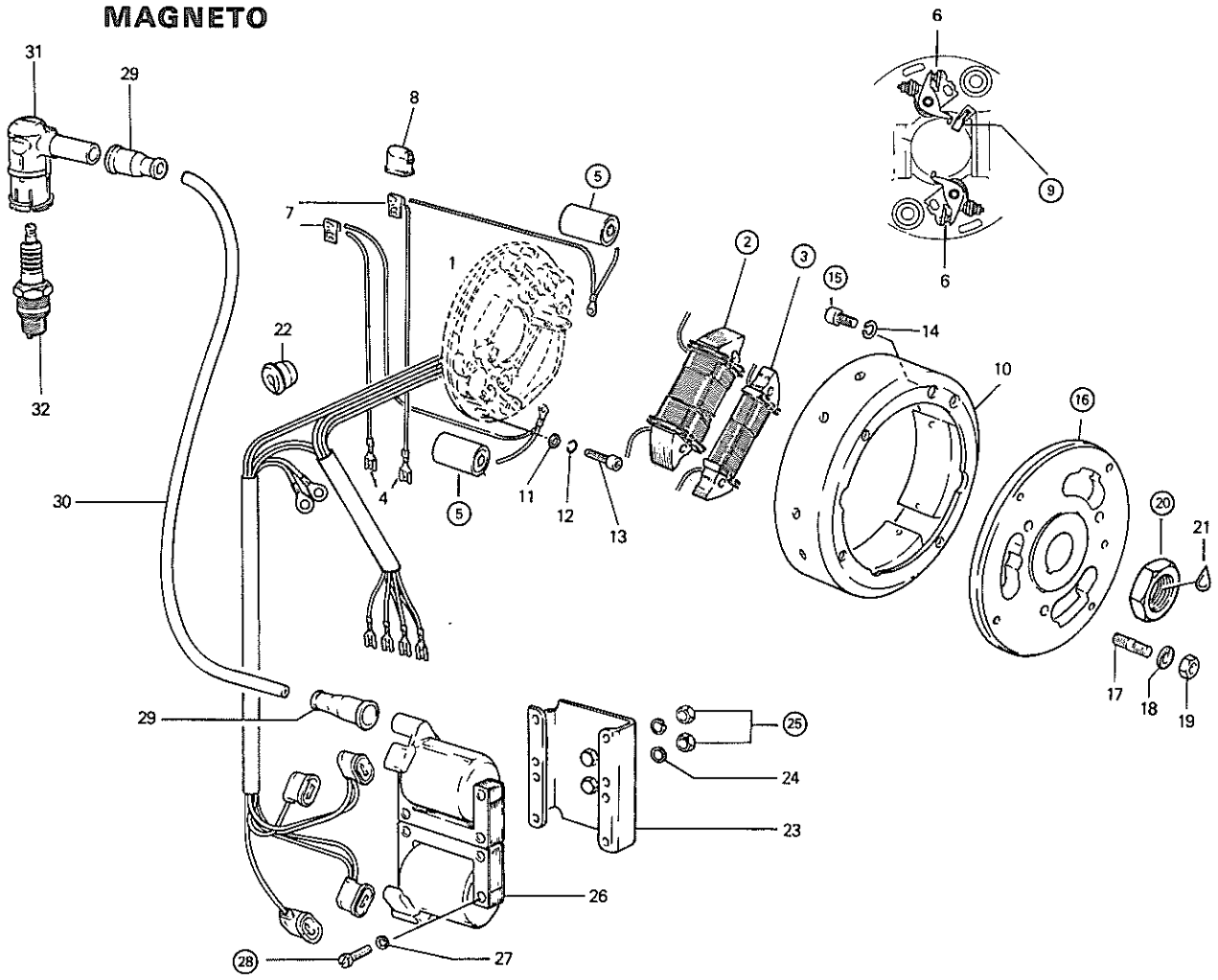
Once the circlips are installed, turn each circlip so that the circlip break is not directly in line with piston notch. Using very fine emery cloth, remove any burrs on piston caused through circlip installation.



Piston to wall clearance should be:

MINIMUM		MAXIMUM
0.070 mm	—	0.200 mm
(.0028'')	—	(.008'')

MAGNETO



1. *Armature plate*
2. *Lighting coil*
3. *Generator coil*
4. *Female connector (2)*
5. *Condenser (2)*
6. *Contact breaker (2)*
7. *Female connector (2)*
8. *Rubber cap (2)*
9. *Lubricating wick*
10. *Magneto ring*
11. *Washer 5.3 mm (2)*
12. *Lockwasher 5 mm (2)*
13. *Allen screw M5 × 18 (2)*
14. *Lockwasher 6 mm (4)*
15. *Allen screw M6 × 11.5 (4)*
16. *Magneto housing*
17. *Stud M8 × 15 (3)*
18. *Lockwasher 8 mm (3)*
19. *Nut M8 (3)*
20. *Nut M22 × 1.5*
21. *"Loctite 242" (blue, medium strength)*
22. *Cable grommet*
23. *Ignition coil bracket*
24. *Lockwasher 6 mm (2)*
25. *Nut M6 (2)*
26. *Ignition coil (2)*
27. *Lockwasher 5 mm (6)*
28. *Cylindrical head screw M5 × 20 (6)*
29. *Protection cap (4)*
30. *Ignition cable 440 mm, magneto side*
30. *Ignition cable 560 mm, P.T.O. side*
31. *Suppressor cap (2)*
32. *Spark plug (W260MZ2) (2)*

MAGNETO

CLEANING

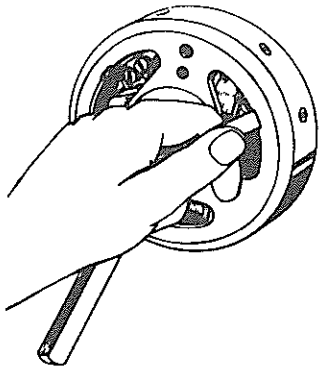
Clean all metal components in a non-ferrous metal cleaner.

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

DISASSEMBLY & ASSEMBLY

②③ Whenever a coil is replaced, the air gap (distance between coil end and magnet) must be adjusted.

To check air gap, insert a feeler gauge of 0.30-0.45 mm (.012-.018") between magnet and coil ends. If necessary to adjust, slacken coil retaining screws and relocate coil.



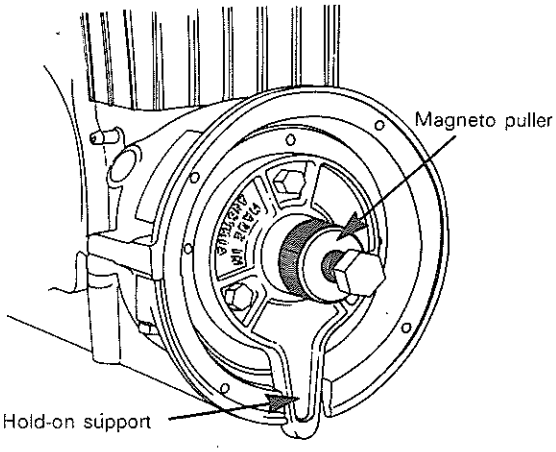
⑤ To replace a condenser, it is first necessary to unsolder the black lead using soldering iron. The condenser can then be driven out of the armature plate using a suitable pusher and hammer. To reinstall, inverse procedure.

⑨ When replacing contact breakers, apply a light coat of grease on lubricating wick.

⑮㉕㉘ Apply "Loctite 242" on threads.

⑯⑳ With magneto retaining nut removed and hold-on support in place, install special puller onto hub.

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

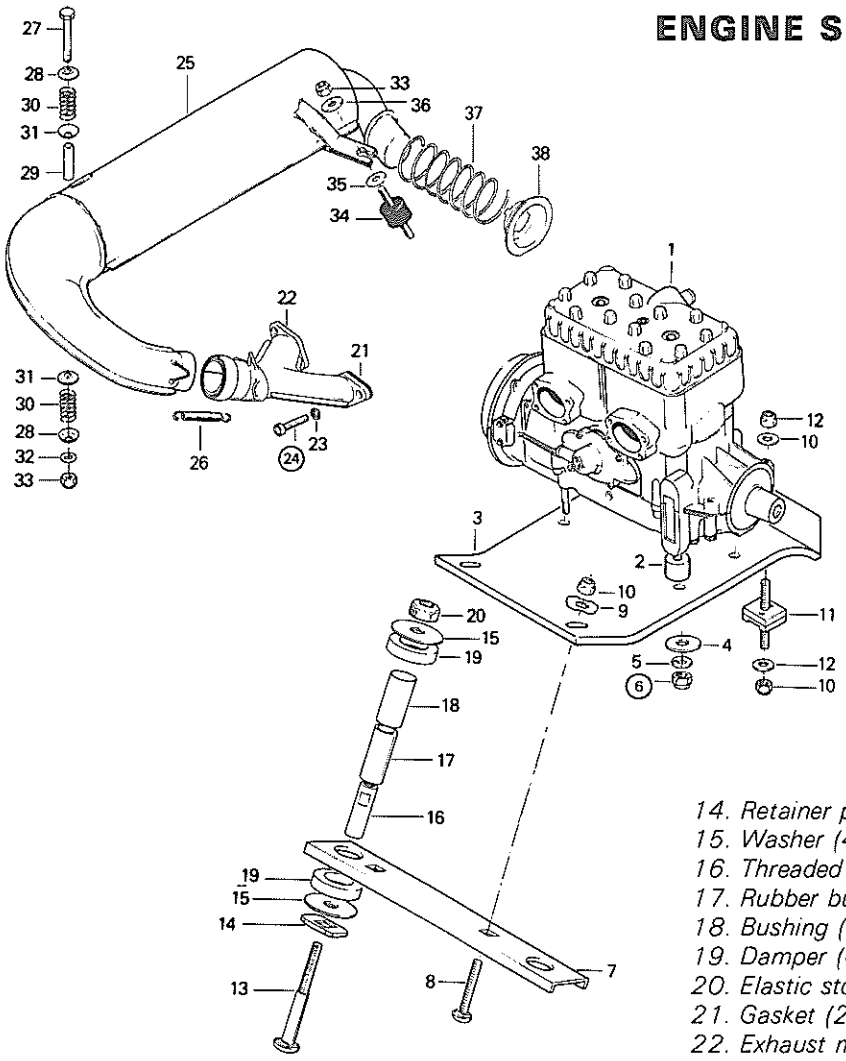


At assembly, clean crankshaft extension (taper) then apply "Loctite 242"

Install magneto retaining nut (with "Loctite 242" on threads) and torque to 80 N•m (60 ft-lbs).

464 ENGINE TYPE

ENGINE SUPPORT & MUFFLER



1. 464 Rotax engine
2. Distance sleeve (4)
3. Engine support
4. Flat washer 10.5 mm (4)
5. Lockwasher 10 mm (4)
6. Hexagonal nut 10 mm (4)
7. Cross support
8. Carriage bolt $\frac{3}{8}$ - 16 × 1$\frac{1}{4}$'' (2)
9. Internal tooth dished washer (2)
10. Hexagonal elastic stop nut (4)
11. Rubber mount
12. Washer (2)
13. Carriage bolt 7/16 - 14 × 2$\frac{3}{4}$'' (2)
14. Retainer plate (2)
15. Washer (4)
16. Threaded bushing (2)
17. Rubber bushing (2)
18. Bushing (2)
19. Damper (4)
20. Elastic stop nut 7/16 - 14 (2)
21. Gasket (2)
22. Exhaust manifold
23. Lockwasher 8 mm (4)
24. Capscrew M8 × 30 (4)
25. Muffler
26. Spring (3)
27. Capscrew 5/16 - 18 × 2$\frac{3}{4}$''
28. Retaining washer (2)
29. Bushing
30. Spring (2)
31. Retaining washer (2)
32. Flat washer 5/16 × $\frac{3}{4}$ × .060
33. Elastic stop nut 5/16 - 18 (2)
34. Rubber mount
35. Insulating washer
36. Washer
37. Spring
38. Spring seat

ENGINE SUPPORT & MUFFLER

REMOVAL FROM VEHICLE

Disconnect or remove the followings from vehicle:

— Pulley guard and drive belt
— Air silencer and throttle cable
— Fuel lines, primer, pulsation and oil injection lines
— Muffler and rewind starter
— Electric wires

WARNING: Always disconnect ground cable first, before any other wire of the starting system.

— Drain the cooling system and disconnect hoses at engine
— Rotary valve oil reservoir
— Disconnect rewind starter at engine

DISASSEMBLY & ASSEMBLY

⑥ Torque to 36 N•m (26 ft-lbs).
㉔ Torque to 22 N•m (16 ft-lbs).

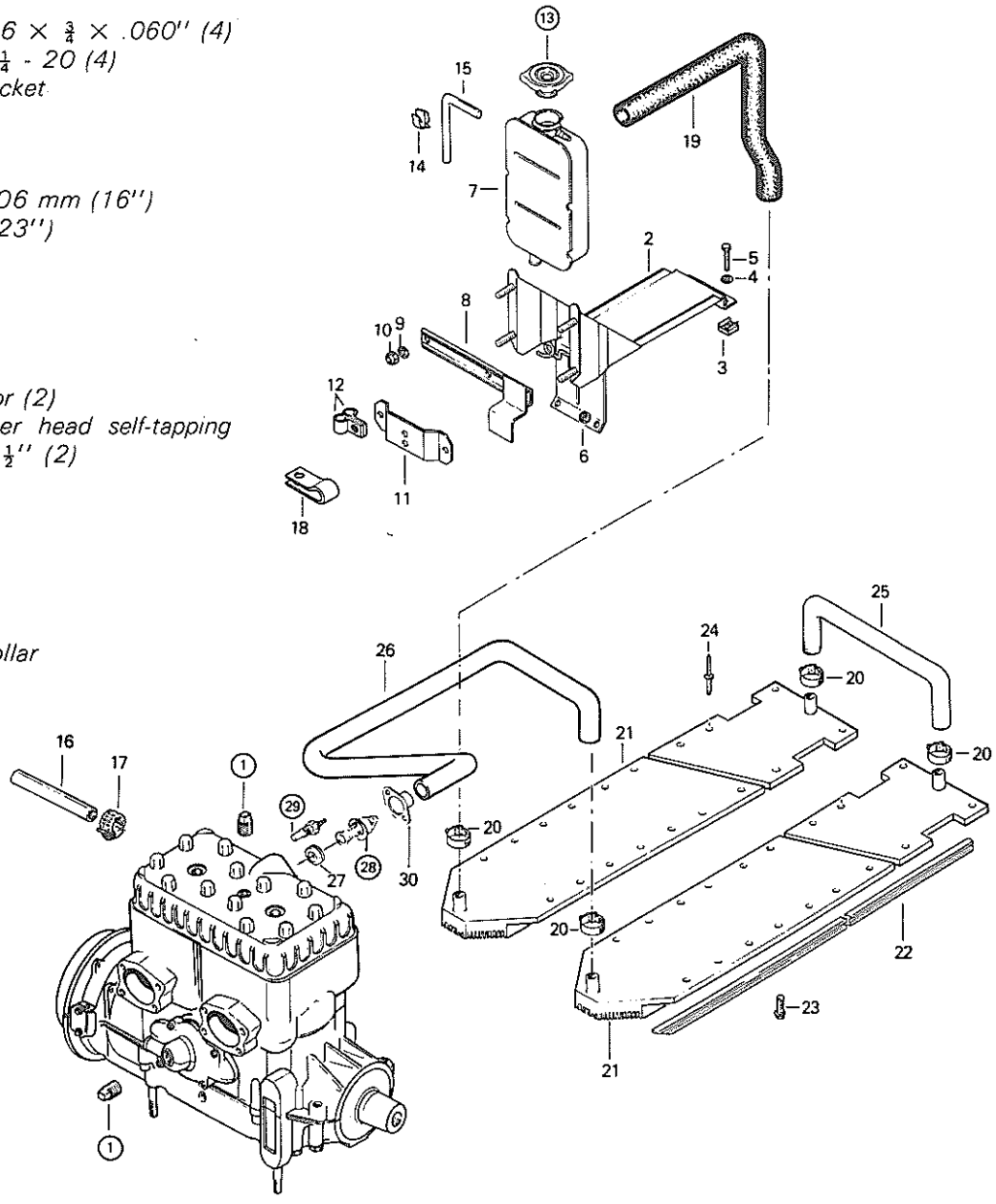
INSTALLATION ON VEHICLE

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

- Check tightness of engine mount nuts.
- After throttle cable installation, check carburetor maximum throttle slide opening and oil pump adjustment.
- Check pulley alignment.

COOLING SYSTEM

1. *Plug (2)*
2. *Rack (battery)*
3. *Clip nut (2)*
4. *Lockwasher 3/16" (2)*
5. *Capscrew 10-24 × ½" (2)*
6. *Elastic stop nut 10-24 (2)*
7. *Coolant tank*
8. *Oil tank support*
9. *Flat washer 5/16 × ¾ × .060" (4)*
10. *Elastic stop nut ¼ - 20 (4)*
11. *Ignition coils bracket*
12. *Clip (2)*
13. *Pressure cap*
14. *Clip*
15. *Overflow hose 406 mm (16")*
16. *Hose 585 mm (23")*
17. *Clamp (2)*
18. *Clamp*
19. *Inlet hose*
20. *Clamp (6)*
21. *Radiator (2)*
22. *Radiator protector (2)*
23. *Hexagonal washer head self-tapping screw 10-24 × ½" (2)*
24. *Rivet (42)*
25. *"U" hose*
26. *Outlet hose*
27. *Grommet*
28. *Thermostat*
29. *Sensor*
30. *Coolant outlet collar*



COOLING SYSTEM

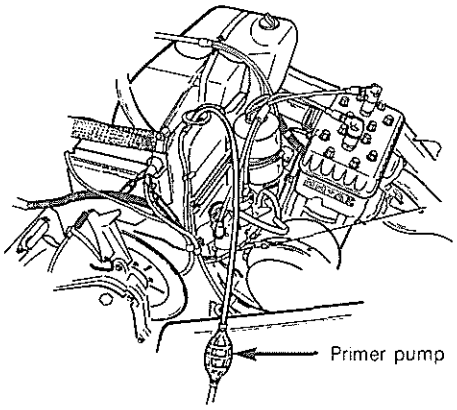
INSPECTION

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, remove the coolant tank cap and siphon the coolant mixture using a primer pump, a length of plastic hose and steel tubing inserted as deep as possible into the lower hose of the tank.



DISASSEMBLY & ASSEMBLY

①㉙ Apply pipe thread sealant to avoid leaks.

⑬ See if the cap pressurizes the system. If not, install a new 13 lbs cap, do not exceed 13 lbs of pressure.

㉘ To check thermostat, put it in water and heat water. Thermostat should open when water temperature reaches 43°C (110°F).

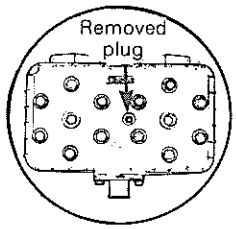
REFILLING THE SYSTEM

Blizzard 7500 & Super Sonic

Capacity:

Approximately 5 liters
(1.1 Imp. gal.) (1.3 U.S. gal.)
55% antifreeze + 45% water

To refill the cooling system, unscrew plug on top of cylinder head.

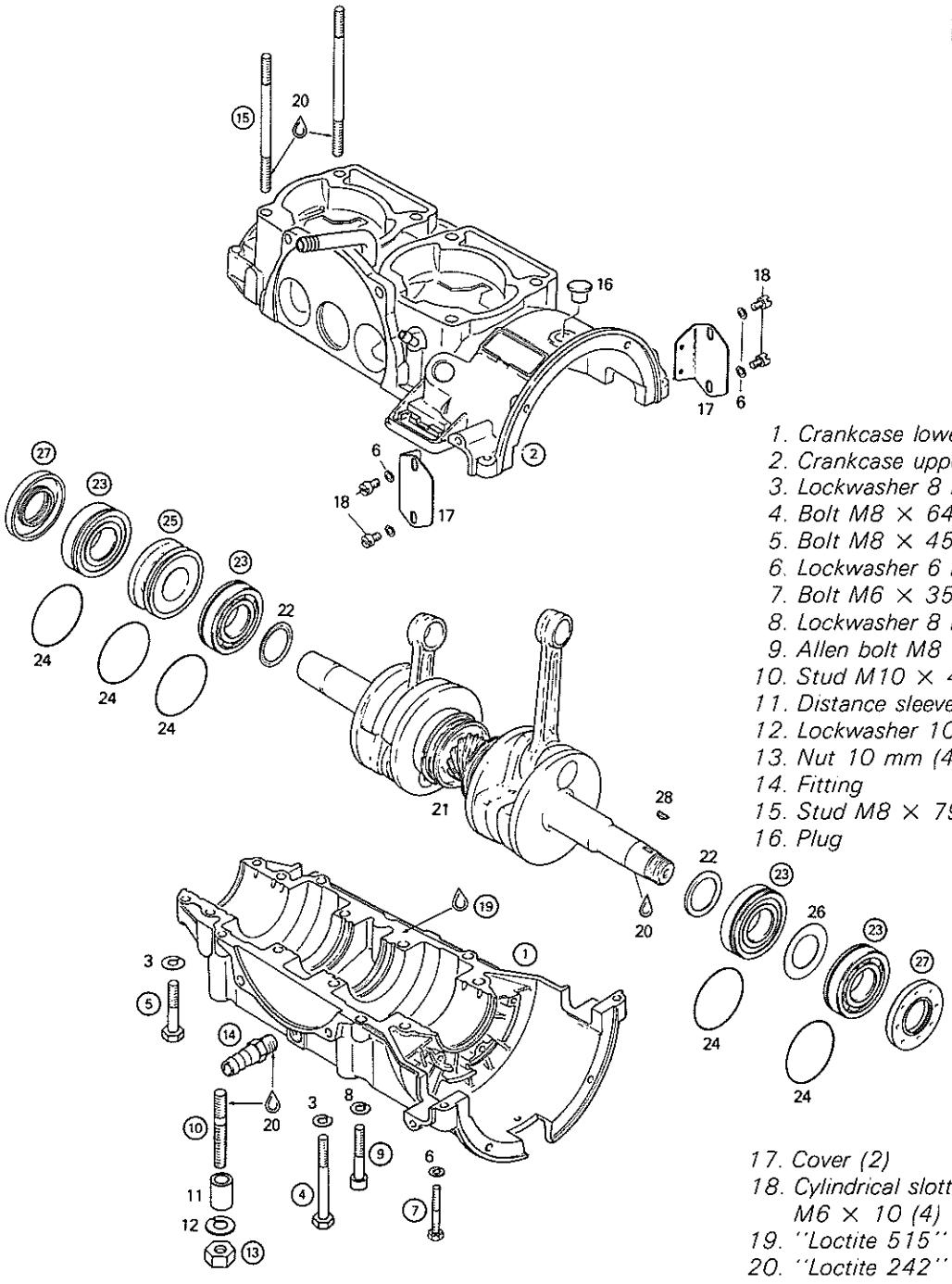


Pour the liquid in the coolant tank until the coolant level reaches 25 mm (1") below filler neck.

Reinstall tank cap and start engine; let engine run until it reaches its operating temperature and thermostat opens. Allow it to run a few minutes more. Stop engine and check coolant level; refill as necessary.

WARNING: Always unscrew cap to the first step with a cloth to release pressure, before removing it.

BOTTOM END



1. Crankcase lower half
2. Crankcase upper half
3. Lockwasher 8 mm (10)
4. Bolt M8 × 64 (8)
5. Bolt M8 × 45 (2)
6. Lockwasher 6 mm (6)
7. Bolt M6 × 35 (2)
8. Lockwasher 8 mm (4)
9. Allen bolt M8 × 40 (4)
10. Stud M10 × 45 (4)
11. Distance sleeve 22 mm (4)
12. Lockwasher 10 mm (4)
13. Nut 10 mm (4)
14. Fitting
15. Stud M8 × 79 (8)
16. Plug
17. Cover (2)
18. Cylindrical slotted head screw M6 × 10 (4)
19. "Loctite 515"
20. "Loctite 242"
21. Crankshaft
22. Distance ring (2)
23. Ball bearing (4)
24. O'ring (5)
25. Labyrinth ring
26. Shim 30.4/51/1
27. Oil seal (2)
28. Key 3 × 3.7

BOTTOM END

CLEANING

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

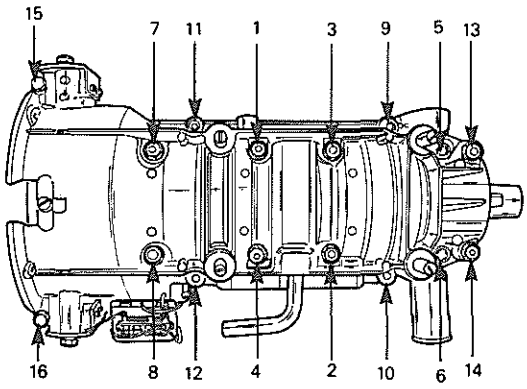
CAUTION: Never use a sharp object to scrape away old sealant as score marks incurred are detrimental to crankcase sealing.

DISASSEMBLY & ASSEMBLY

①②⑲ Crankcase halves are factory matched and therefore, are not interchangeable or available as single halves. Prior to joining of crankcase halves, apply a light coat of "Loctite 515" (413 7027 00) on mating surfaces.

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

Position the crankcase halves together and torque bolts by hand, then install armature plate (tighten) on magneto side to correctly align crankcase halves. Torque bolts to 22 N•m (16 ft-lbs) following illustrated sequence.



NOTE: Torque the two smaller bolts (15 and 16) on magneto side to 13 N•m (10 ft-lbs).

④⑤⑨ Torque to 22 N•m (16 ft-lbs).

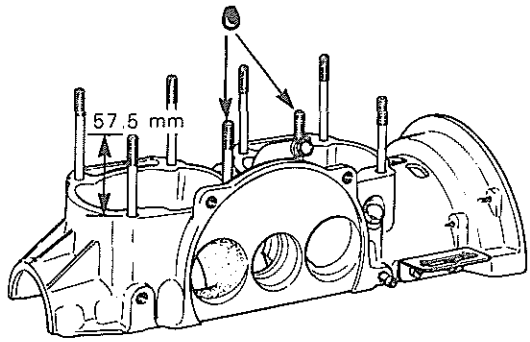
⑦ Torque to 14 N•m (10 ft-lbs).

⑩ At assembly on crankcase, apply "Loctite 242" on threads.

⑬ Torque to 36 N•m (26 ft-lbs).

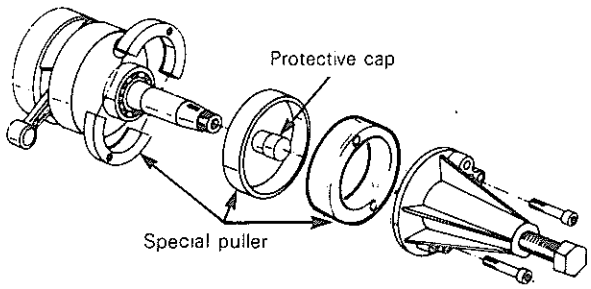
⑭ Apply "Loctite 242" on threads prior to assembly.

⑮ Because of cap nuts, cylinder studs have to be screwed into the crankcase so that they do not exceed further than 57.5 mm (2.260").

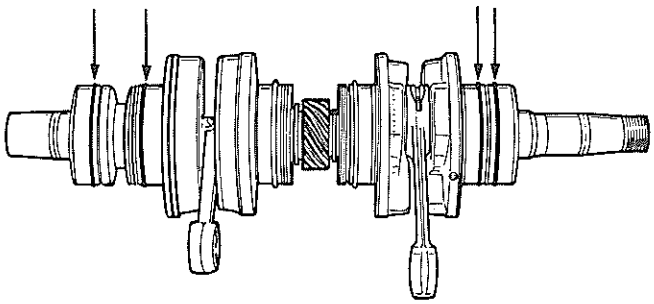


Apply "Loctite 242" on the threads of the two studs screwed above the intake ports.

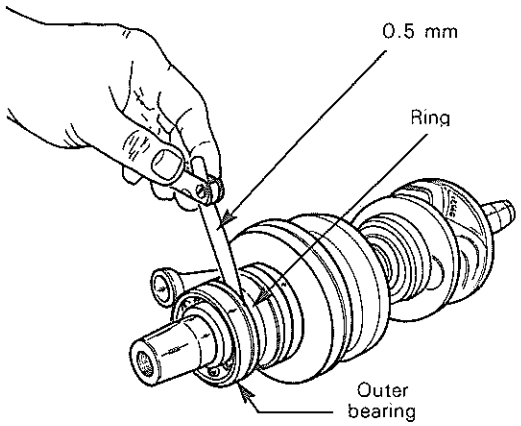
㉓㉕ To remove bearings from crankshaft, use a protective cap special puller as illustrated.



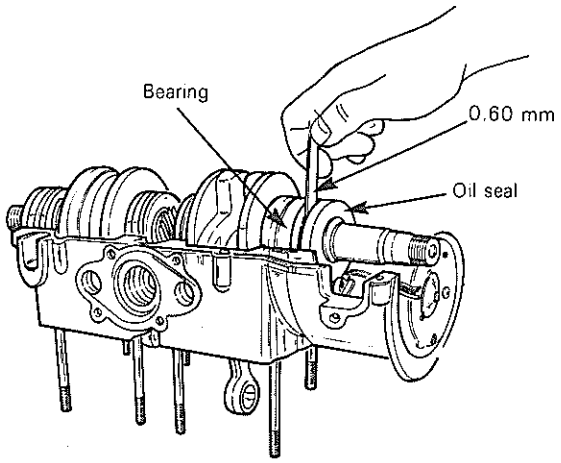
Prior to installation, place bearings into an oil container and heat the oil to 100°C (212°F). This will expand bearing and ease installation. Install bearings with groove as per the following illustration.



When positioning P.T.O. outer bearing on crankshaft, a gap of 0.5 mm (.020") must be left between bearing and labyrinth ring to avoid axial forces to the bearing.

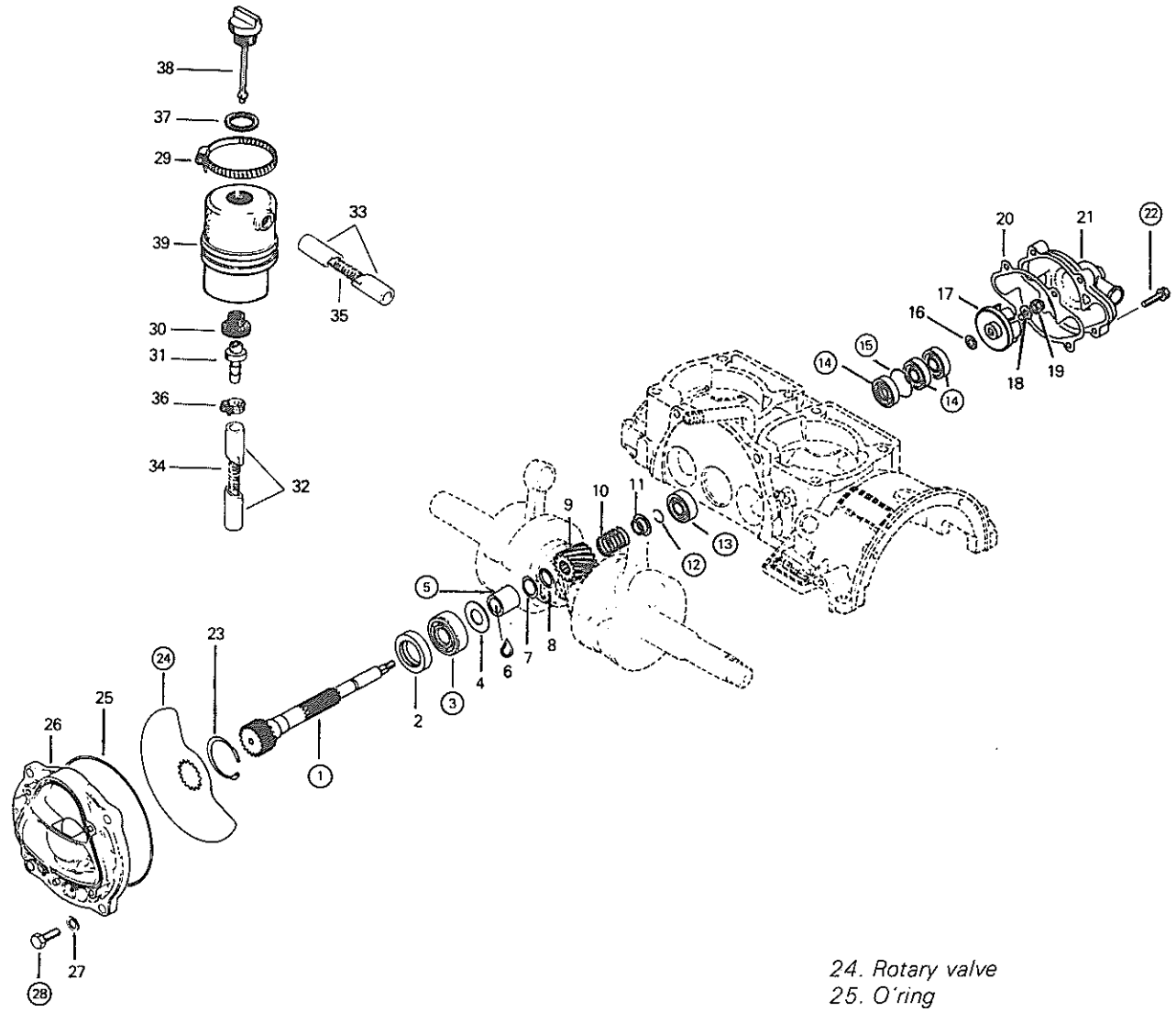


(27) At assembly, apply a light coat of lithium grease on seal lips.



To insure adequate supply to the bearings **(magneto side and P.T.O. side)**, install oil seals with a gap of a least 0.60 mm (0.25") with bearing.

ROTARY VALVE AND COOLANT PUMP



1. *Rotary valve shaft*
2. *Oil seal*
3. *Ball bearing*
4. *Shim 0.5 mm*
5. *Distance sleeves 24.5 mm*
6. *"Loctite 271" (red, high strength)*
7. *Shim 0.5 mm*
8. *O'ring*
9. *Gear*
10. *Spring*
11. *Spring seat*
12. *Circlip*
13. *Ball bearing*
14. *Oil seal (3)*
15. *Distance ring*
16. *Washer 8.4 mm*
17. *Pump impeller*
18. *Washer 6.2 mm*
19. *Lock nut 6 mm*
20. *Gasket*
21. *Pump housing*
22. *Self-tapping screw M6 × 35 (4)*
23. *Circlip*
24. *Rotary valve*
25. *O'ring*
26. *Rotary valve cover*
27. *Lockwasher (4)*
28. *Bolt (4)*
29. *Clamp*
30. *Grommet*
31. *Fitting*
32. *Oil line 216 mm (8.5")*
33. *Oil line 121 mm (4.75")*
34. *Spring*
35. *Spring*
36. *Clamp (4)*
37. *Gasket*
38. *Cap*
39. *Oil tank*

ROTARY VALVE & COOLANT PUMP

CLEANING

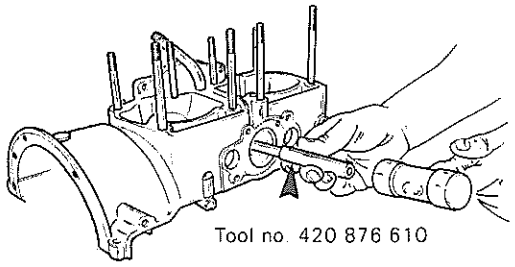
Discard all oil seals and ''O'' rings.

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

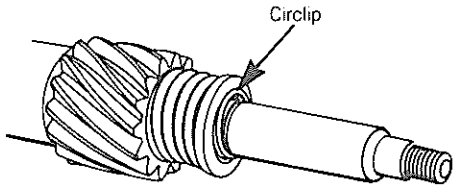
DISASSEMBLY & ASSEMBLY

① through ⑫ Rotary valve shaft assembly

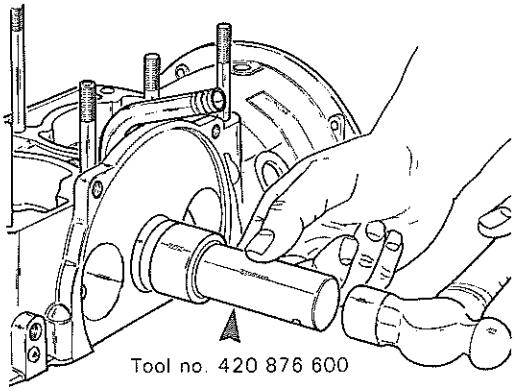
To remove rotary valve shaft assembly from crankcase, first remove coolant pump impeller⑰and circlip㉓. Using the suitable pusher (P/N 420 876 610) and a fiber hammer, push shaft assembly.


Tool no. 420 876 610

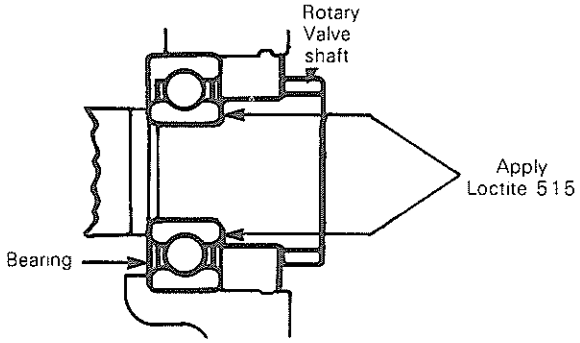
If it is necessary to disassemble components of rotary valve shaft assembly, compress spring retaining cup⑪in order to remove circlip⑫.



To install assembly and oil seal, use pusher no. 420 876 600.


Tool no. 420 876 600

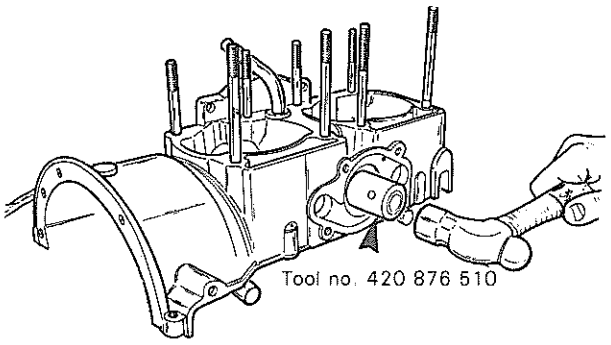
①③At assembly, apply crankcase sealant ''Loctite 515'' on bearing and rotary valve shaft mating surfaces.



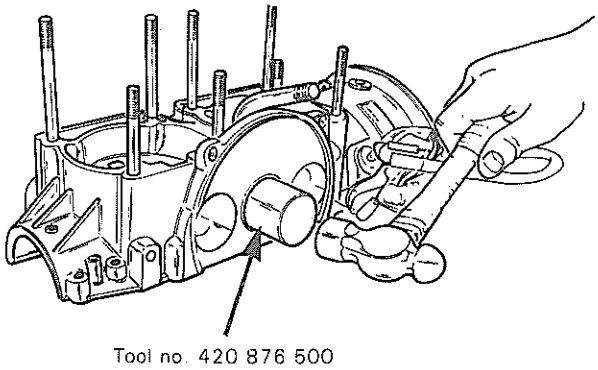
⑤Clean rotary valve shaft and inside of distance sleeve. At assembly apply ''Loctite 271'' inside of distance sleeve.

⑬Using a suitable pusher, push coolant pump bearing with shield opposite to rotary valve disc.

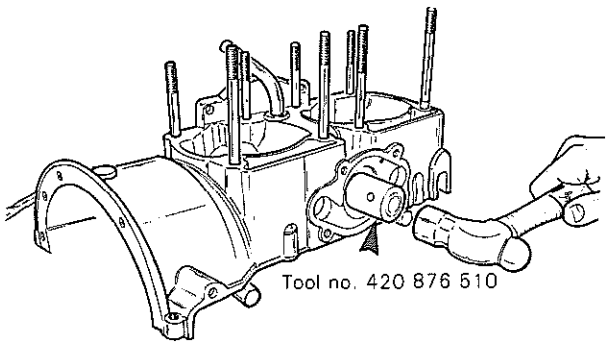
To remove bearing


Tool no. 420 876 510

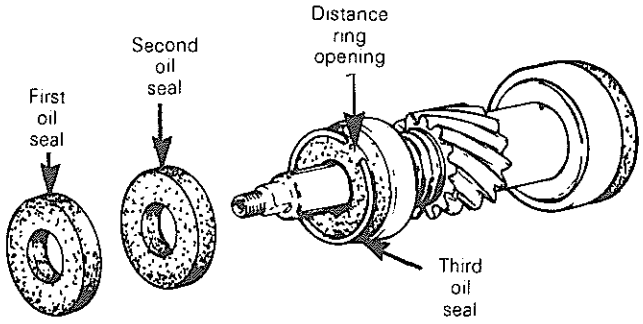
To install bearing

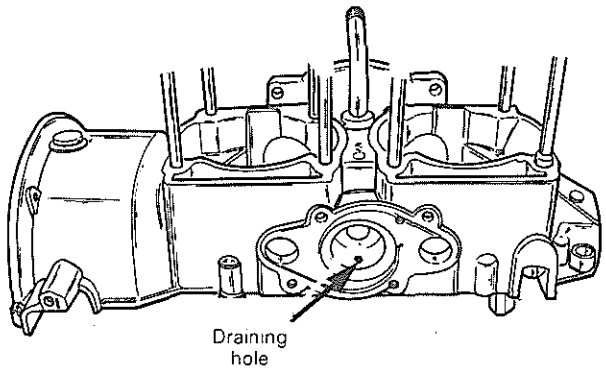

Tool no. 420 876 500

⑭⑮Using no. 420 876 510 pusher, install oil seals (with lithium grease on seal lips).



Distance ring opening must be in line with crankcase half draining hole.

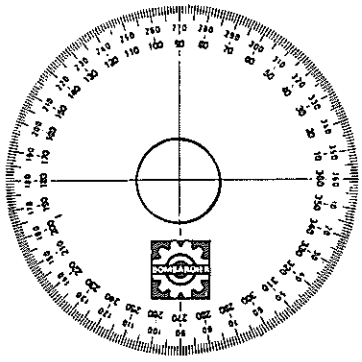




35% of the distance between first and second oil seals (first oil seal being flush with crankcase) must be filled with lithium grease or equivalent.

㉒Apply "Loctite 242" on threads.

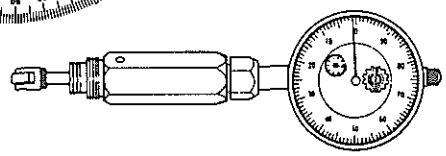
㉔Rotary valve adjustment when replacing crankcase having no timing marks.



REQUIRED TOOLS

Angle finder
(414 3529 00)

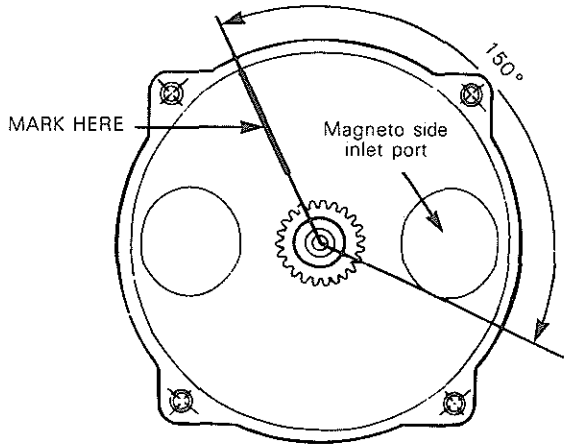
TDC gauge
(414 1047 00)



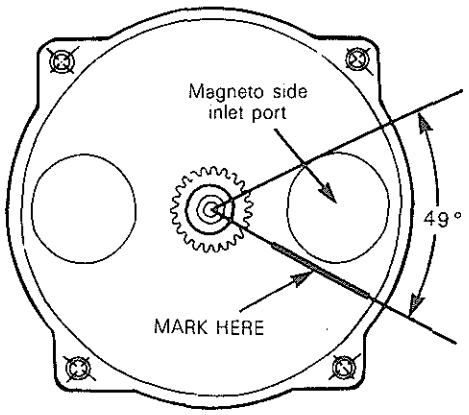
Engine type	Timing marks opening, closing
464	150°, 49°

For example: 150° opening
49° closing

Using and finder, mark crankcase at 150° from bottom edge of magneto side inlet port.



From top edge of magneto side inlet port, mark crankcase at 49°.

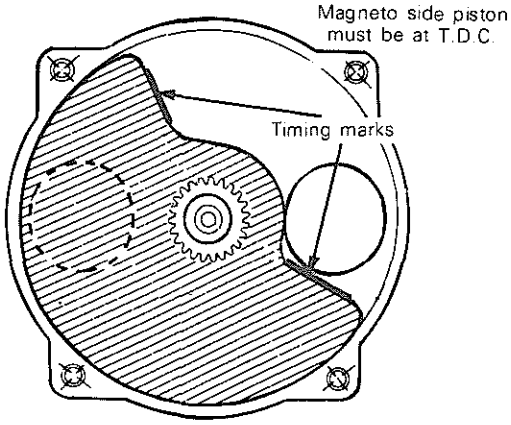


To correctly install the rotary valve disc proceed as follows:

— Turning crankshaft counter-clockwise, (drive pulley side) bring magneto side piston to Top Dead Center using a T.D.C. gauge.

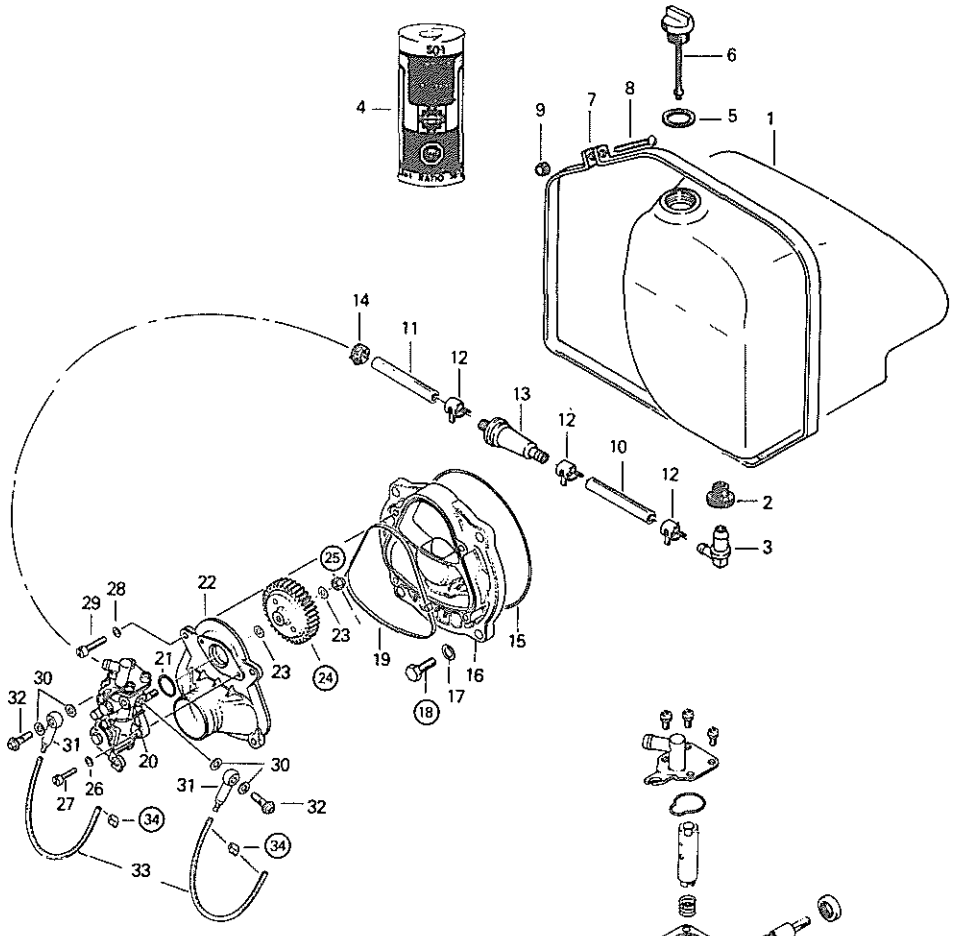
— Position the rotary valve disc on gear to have edges as close as possible to the marks.

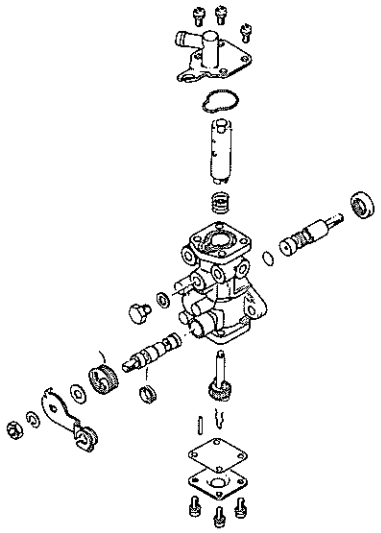
NOTE: The rotary valve disc is asymmetrical, therefore, at assembly try positioning each side of disc on gear to determine best installation position.



㉘ Torque to 20 N•m (15 ft-lbs).

OIL PUMP





1. *Oil tank*
2. *Grommet*
3. *Connector*
4. *Oil*
5. *Gasket*
6. *Cap*
7. *Retaining strip*
8. *Round slotted head machine screw 10-24 × 1 1/4''*
9. *Hexagonal elastic stop nut 10-24*
10. *Oil line 60 mm (2 3/8'')*
11. *Oil line 60 mm (2 3/8'')*
12. *Spring clip (3)*
13. *Filter*
14. *Clamp*
15. *O'ring*
16. *Rotary valve cover*
17. *Lockwasher 8 mm (4)*
18. *Hexagonal bolt M8 × 20 (4)*
19. *Gasket*
20. *Oil pump*
21. *O'ring*
22. *Intake cover*
23. *Washer 6.2 mm (2)*
24. *Gear*
25. *Lock nut 6 mm*
26. *Lockwasher 5 mm (2)*
27. *Cylindrical slotted screw M5 × 16 (2)*
28. *Lockwasher 6 mm (4)*
29. *Cylindrical slotted screw M6 × 20 (4)*
30. *Banjo gasket (4)*
31. *Banjo (2)*
32. *Banjo bolt (2)*
33. *Oil line 170 mm (6.7'')*
34. *Clamp (4)*

OIL PUMP

CLEANING

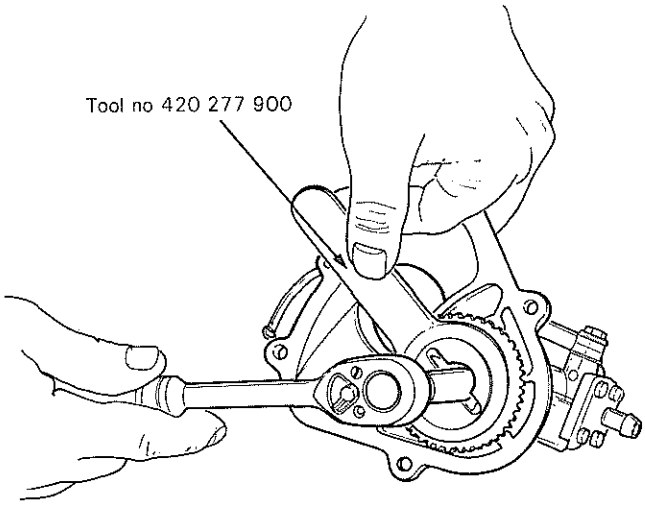
Discard all oil seals and O'rings. Clean all metal components in a non-ferrous metal cleaner.

DISASSEMBLY & ASSEMBLY

NOTE: Oil pump is not available in single parts.

⑱ Torque to 20 N•m (15 ft-lbs).

㉔ ㉕ To remove retaining nut, lock gear using no. 420 277 900 tool.



㉞ At assembly, always check for clamp tightness.

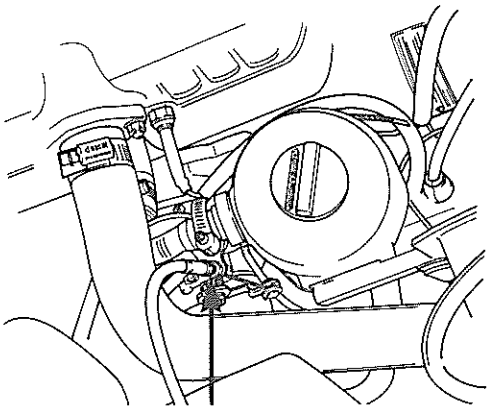
OIL PUMP ADJUSTMENT

Always perform carburetor adjustment prior to oil injection pump adjustment.

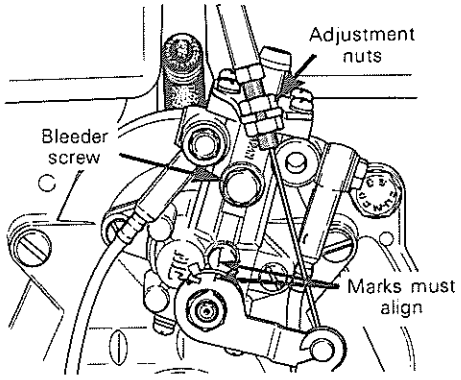
To adjust:

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

Tighten the ajuster nut.



Injection pump cable adjustment



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

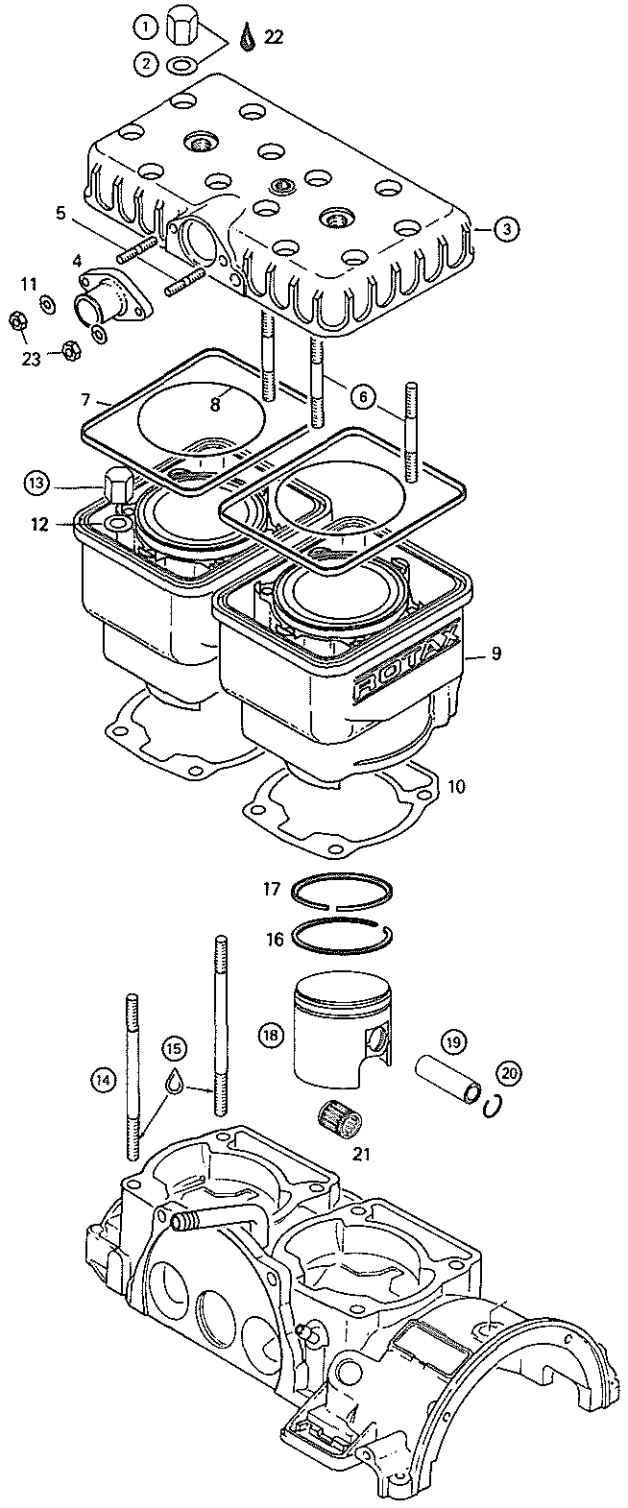
To bleed oil lines

All oil lines should be full of oil. To bleed the main oil line (between tank and pump), loosen the bleeder screw and let the air escape until oil starts to flow out.

Make sure tank has enough oil

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

TOP END



1. *Cap nut M8 (12)*
2. *Flat washer 8.4 mm (12)*
3. *Cylinder head*
4. *Coolant outlet collar*
5. *Stud*
6. *Stud (head) (12)*
7. *Gasket*
8. *Gasket*
9. *Cylinder (2)*
10. *Cylinder/crankcase gasket (2)*
11. *Lockwasher 6 mm (2)*
12. *Flat washer 8.4 mm (8)*
13. *Cap nut M8 (12)*
14. *Cylinder stud (79 mm)*
15. *''Loctite 242''*
16. *Rectangular ring (2)*
17. *''L'' ring (2)*
18. *Piston (2)*
19. *Gudgeon pin (2)*
20. *Circlip (4)*
21. *Needle bearing (2)*
22. *Silicone sealant*
23. *Nut M6 (2)*

TO END

CLEANING

Discard all gaskets.

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

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

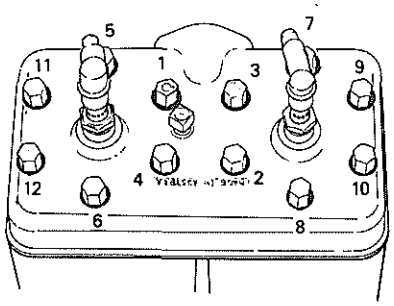
NOTE: The letters "AUS" (over an arrow on the piston dome) must be visible after cleaning.

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

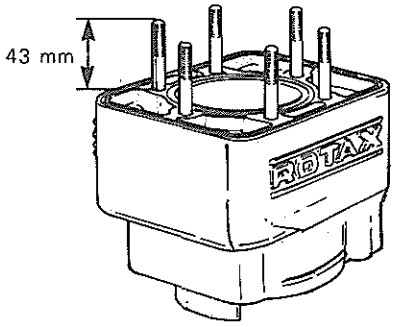
DISASSEMBLY & ASSEMBLY

①②③ Prior to washer installation, apply silicone sealant around studs.

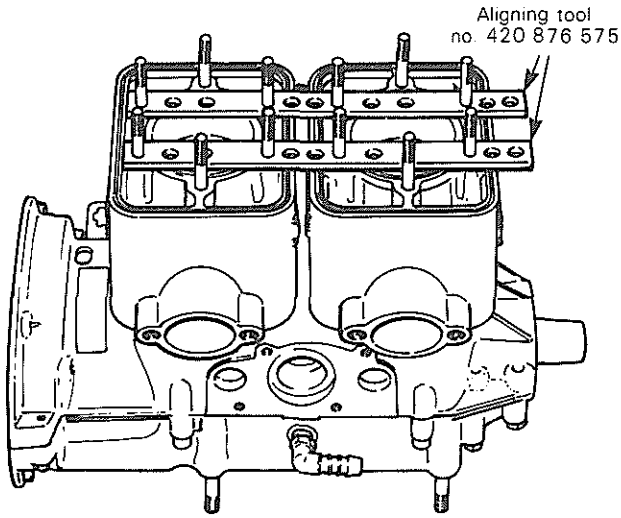
Torque cylinder head nuts to 22 N•m (16 ft-lbs) following illustrated sequence.

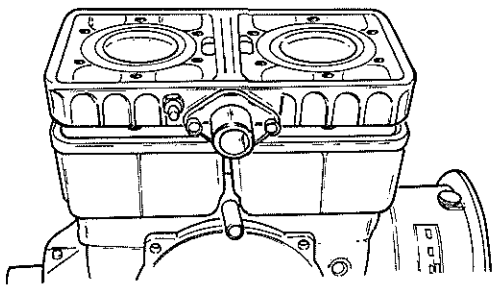


⑥⑨⑬ Because of cap nuts, cylinder head studs have to be screwed into the cylinder so that they do not protrude by more than 43 mm (1.700"). If it is not possible to obtain this length, add a washer between cylinder head and cap nut. Shorter threaded part of stud should be screwed into cylinder.

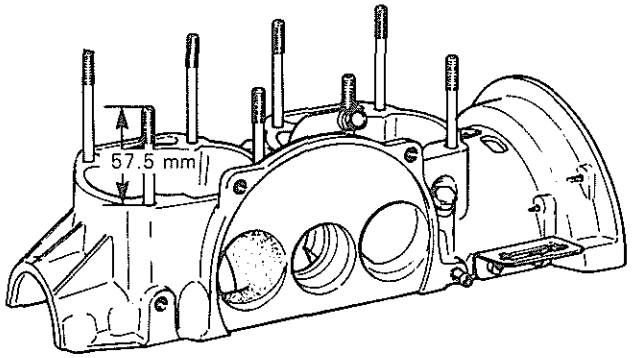


When reassembling the cylinders to the crankcase, it is important to have them properly aligned so that the cylinder head holes will match up with the studs. A special tool (as per illustration) (or cylinder head itself) can be used to align the cylinders. Cross torque cylinder nuts to 22 N•m (16 ft-lbs).





⑭⑮ Because of cap nuts, cylinder studs have to be screwed into the crankcase so that they do not protrude by more than 57.5 mm (2.260").



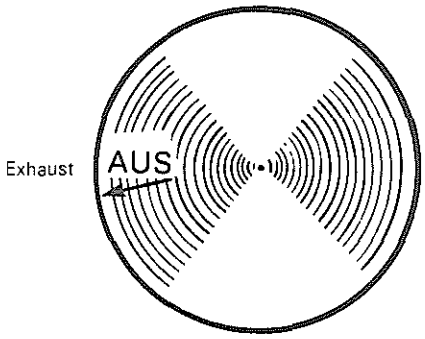
Apply "Loctite 242" on the threads of the two studs screwed above the intake ports.

⑱⑲⑳ Place a clean cloth over crankcase to prevent circlips from falling into crankcase then use a pointed tool to remove circlips from piston.

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

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

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

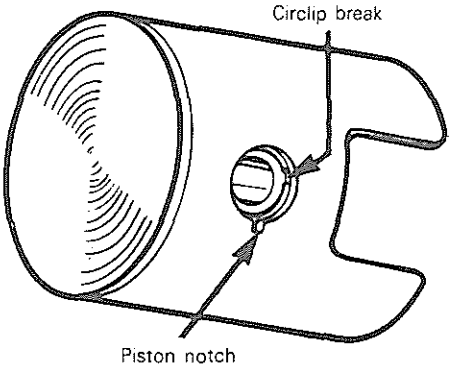


Piston to wall clearance should be:

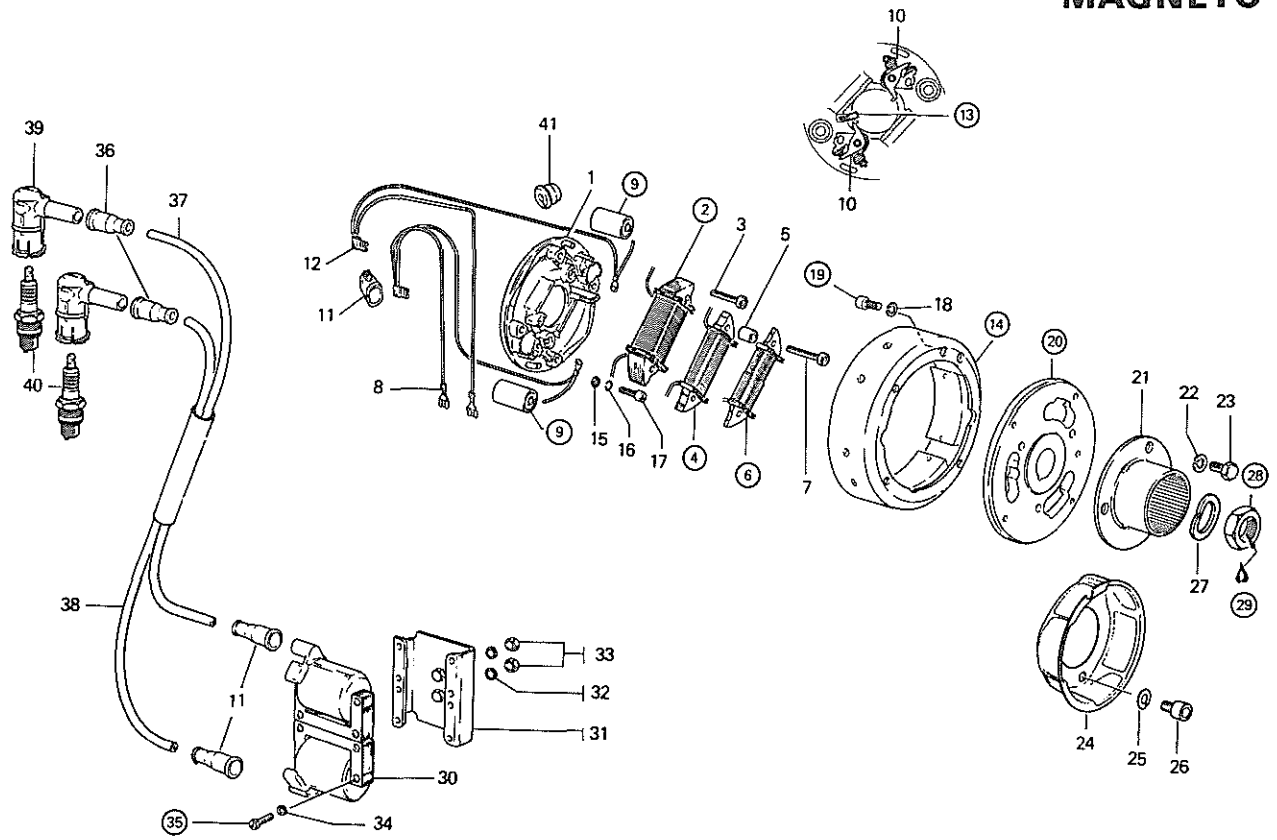
MINIMUM — MAXIMUM

0.070 — 0.200 mm
(.0028 — .008")

Once the circlips are installed, turn each circlip so that the circlip break is not directly in line with piston notch. Using very fine emery cloth, remove any burrs on piston caused through circlip installation.



MAGNETO



1. *Armature plate*
2. *Lighting coil 110W*
3. *Cylindrical Phillips head screw M5 × 28 (2)*
4. *Generator coil*
5. *Distance sleeve 11 mm (2)*
6. *Lighting coil 30W*
7. *Cylindrical Philips head screw M5 × 32 (2)*
8. *Receptacle (4)*
9. *Condenser (2)*
10. *Contact breaker (2)*
11. *Rubber cap (4)*
12. *Female connector (4)*
13. *Lubricating wick*
14. *Magneto ring*
15. *Washer 5.3 mm (2)*
16. *Lockwasher 5 mm (2)*
17. *Allen screw M5 × 18 (2)*
18. *Lockwasher 6 mm (4)*
19. *Allen screw M6 × 11.5 (4)*
20. *Magneto housing*
21. *Starting pulley (up to serial no. 3174 788)*
22. *Lockwasher 8 mm (up to serial no. 3174 788) (3)*
23. *Hexagonal head screw M8 × 16 (up to serial no. 3174 788) (3)*
24. *Starting pulley (serial no. 3174 789 and above)*
25. *Lockwasher 8 mm (serial no. 3174 789 and above) (3)*
26. *Allen screw M8 × 12 (serial no. 3174 789 and above) (3)*
27. *Lockwasher 22 mm*
28. *Hexagonal nut 22 mm × 1.5*
29. *"Loctite 242" (blue — medium strength)*
30. *Ignition coil (2)*
31. *Junction block bracket*
32. *Lockwasher 6 mm (2)*
33. *Hexagonal nut 6 mm (2)*
34. *Lockwasher 5 mm (6)*
35. *Cylindrical slotted head screw M5 × 20 (6)*
36. *Protection cap (4)*
37. *High tension cable 465 mm*
38. *High tension cable 390 mm*
39. *Suppressor cap (2)*
40. *Spark plug W3C (W275T2) (2)*
41. *Cable grommet*

MAGNETO

CLEANING

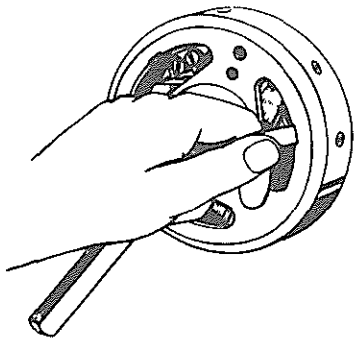
Clean all metal components in a non-ferrous metal cleaner.

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

DISASSEMBLY AND ASSEMBLY

②④⑥ Whenever a coil is replaced, the air gap (distance between coil end and magnet) must be adjusted.

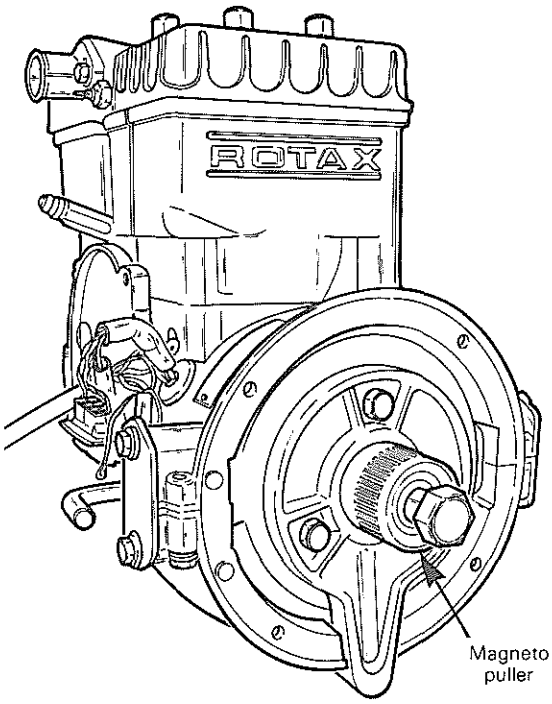
To check air gap, insert a feeler gauge of 0.30-0.45 mm (.012'' - .018'') between magnet and coil ends. If necessary to adjust, slacken coil retaining screws and relocate coil.



⑨ To replace a condenser, it is first necessary to unsolder the two (2) black leads. The condenser can then be driven out of the armature plate using a suitable pusher and hammer. To reinstall, inverse procedure.

⑬ When replacing contact breakers, apply a light coat of grease on lubricating wick.

⑭⑳ To remove magneto, use special puller as illustrated. Tighten puller bolt and at same time, tap on bolt head using a hammer to release magneto from its taper.



At assembly, clean crankshaft extension (taper) then apply ''Loctite 242''.

Torque bolt to 85 N•m (63 ft-lbs).

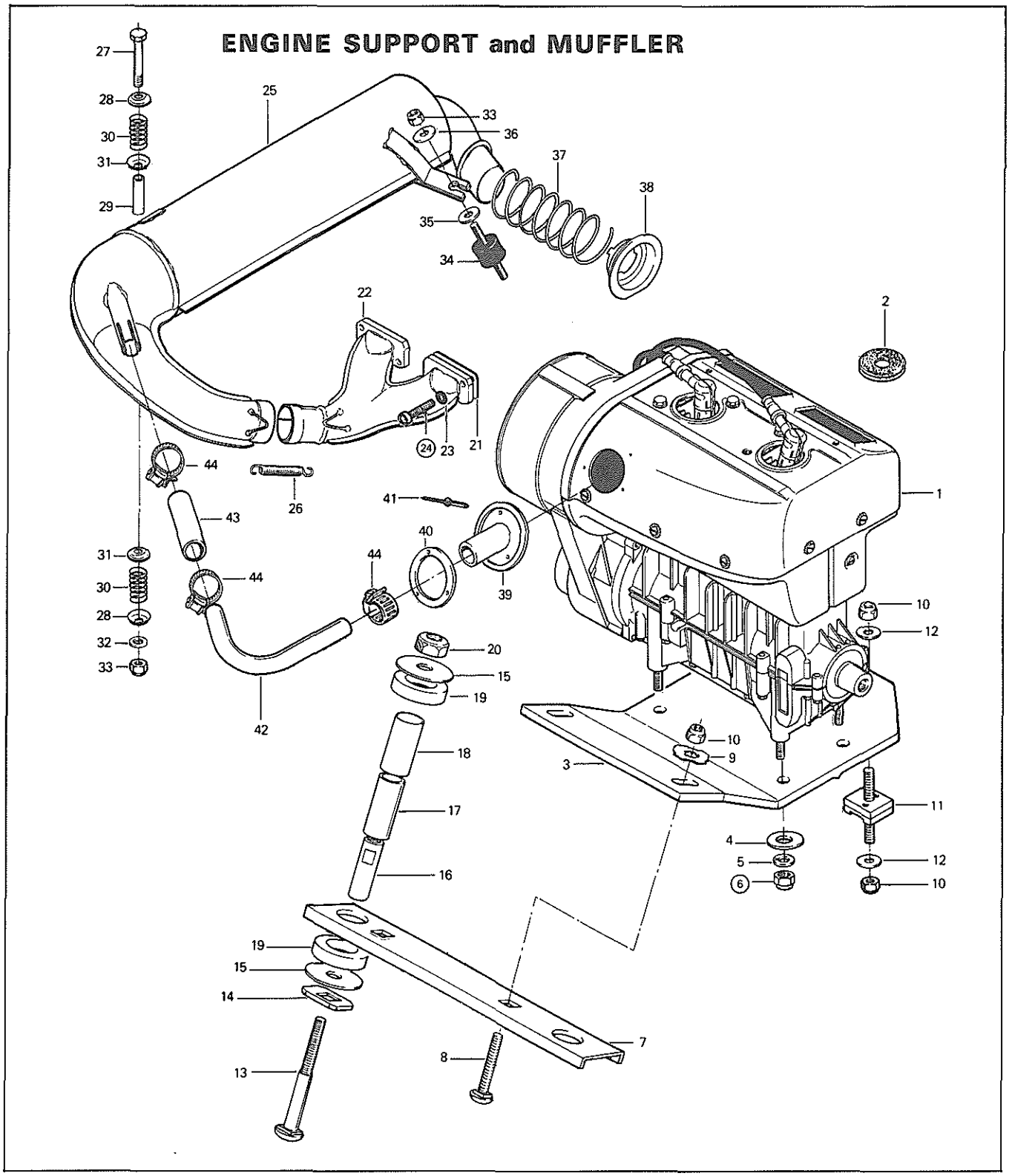
⑲㉟ At assembly, apply ''Loctite 242'' on retaining screw threads.

㉘㉙ Prior to assembly, clean threads then apply ''Loctite 242''.

Torque to 85 N•m (63 ft-lbs).

503 ENGINE TYPE

503 ENGINE TYPE



1. *503 Rotax engine*
2. *Spark plug grommet (2)*
3. *Engine support*
4. *Flat washer 10.5 mm × 21 × 2 mm (4)*
5. *Lockwasher 10 mm (4)*
6. *Hexagonal nut 10 mm (4)*
7. *Cross support*
8. *Carriage bolt $\frac{3}{8}$ - 16 × $1\frac{1}{4}$" (2)*
9. *Internal tooth dished washer (2)*
10. *Hexagonal elastic stop nut $\frac{3}{8}$-16 (4)*
11. *Rubber shear mount*
12. *Washer (2)*
13. *Carriage bolt 7/16-14 × $2\frac{3}{4}$" (threaded $1\frac{1}{4}$") (2)*
14. *Retainer plate (2)*
15. *Washer (4)*
16. *Threaded bushing*
17. *Rubber sleeve (2)*
18. *Sleeve (2)*
19. *Damper (4)*
20. *Hexagonal elastic stop nut 7/16-14 (2)*
21. *Gasket (4)*
22. *Exhaust manifold*
23. *Lockwasher 8 mm (4)*
24. *Hexagonal head capscrew M8 × 30 mm (4)*
25. *Muffler*
26. *Spring (3)*
27. *Hexagonal head capscrew 5/16-18 × $2\frac{3}{4}$"*
28. *Cap (2)*
29. *Bushing*
30. *Spring (2)*
31. *Cup (2)*
32. *Flat washer 5/16 × $\frac{3}{4}$ × .060"*
33. *Hexagonal elastic stop nut 5/16-18 (2)*
34. *Rubber shear mount*
35. *Grommet*
36. *Washer*
37. *Spring*
38. *Spring seat*
39. *Connector*
40. *Connector ring*
41. *Rivet (3)*
42. *Elbow*
43. *Hose 102 mm (4")*
44. *Clamp (3)*

ENGINE SUPPORT AND MUFFLER

REMOVAL FROM VEHICLE

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

- Pulley guard, drive belt.
- Muffler.
- Air intake silencer.
- Throttle cable at carburetor.
- Fuel lines and pulsation line.

NOTE: Secure fuel lines so that the opened ends are higher than the fuel level in the tank.

- Hood retaining cable.
- Rewind starter cable.
- Wiring harness and starter wires

WARNING: Always disconnect battery ground cable prior to any other wire of the starting system.

- Engine support and reinforcing cross support nuts (3).

DISASSEMBLY AND ASSEMBLY

⑥ Torque to 36 N•m (26 ft-lbs).

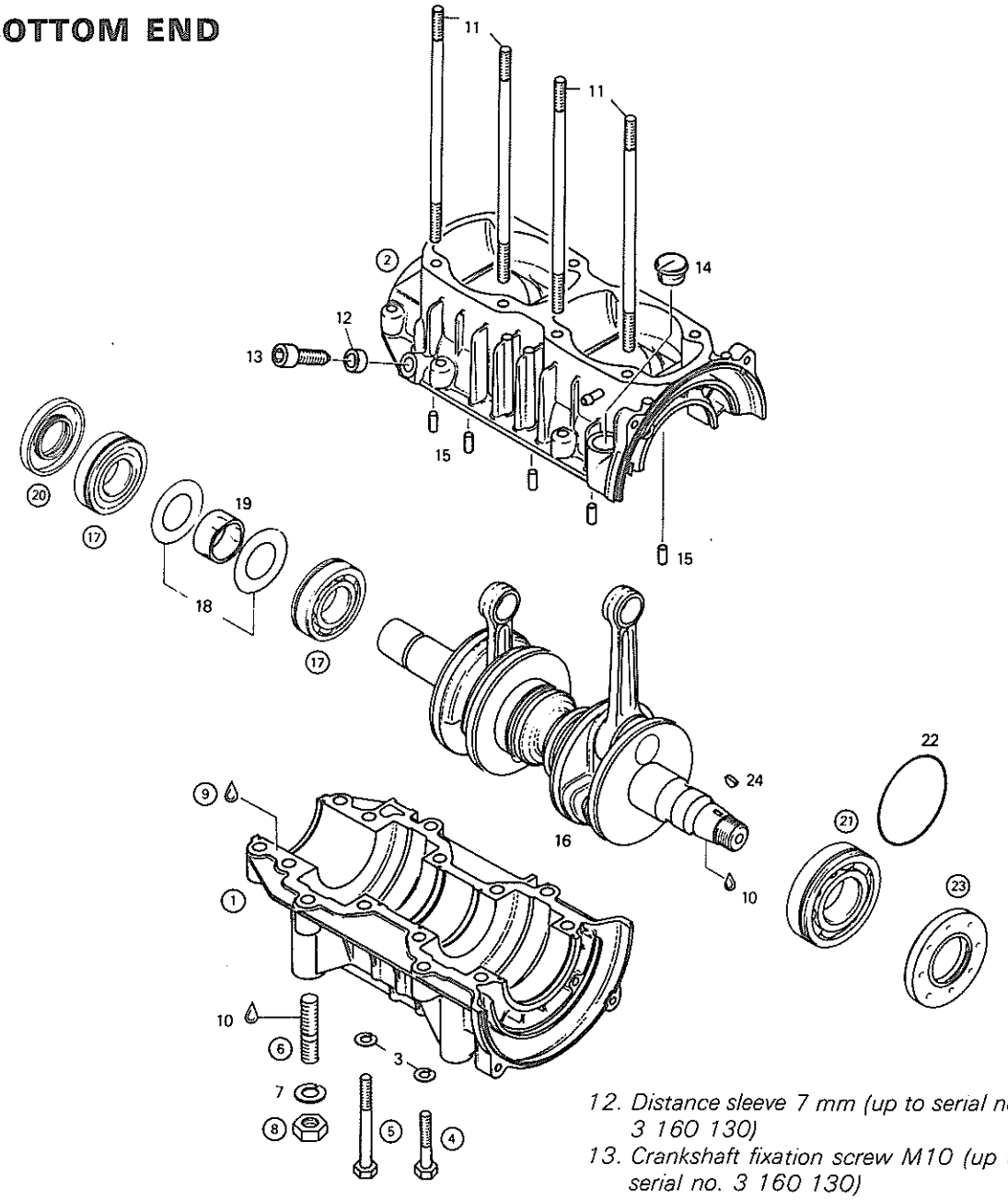
㉔ Torque to 36 N•m (15 ft-lbs).

INSTALLATION ON VEHICLE

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

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

BOTTOM END



1. *Crankcase lower half*
2. *Crankcase upper half*
3. *Lockwasher 8 mm (14)*
4. *Hexagonal screw M8 × 45 mm (8)*
5. *Hexagonal screw M8 × 70 mm (6)*
6. *Stud M10 × 25 mm (4)*
7. *Lockwasher 10 mm (4)*
8. *Hexagonal nut 10 mm (4)*
9. *"Loctite 515"*
10. *"Loctite 242" (blue, medium strength)*
11. *Stud M8 × 173 mm (8)*
12. *Distance sleeve 7 mm (up to serial no. 3 160 130)*
13. *Crankshaft fixation screw M10 (up to serial no. 3 160 130)*
14. *Cable grommet*
15. *Rubber plug*
16. *Crankshaft*
17. *Ball bearing 6206 (2)*
18. *Shim 1 mm (2)*
19. *Spacer*
20. *Seal P.T.O. side*
21. *Ball bearing 6207*
22. *O'ring*
23. *Seal, magneto side*
24. *Woodruff key 3 × 3.7 mm*

BOTTOM END

CLEANING

Discard all seals, gaskets and "O" rings.

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

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

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

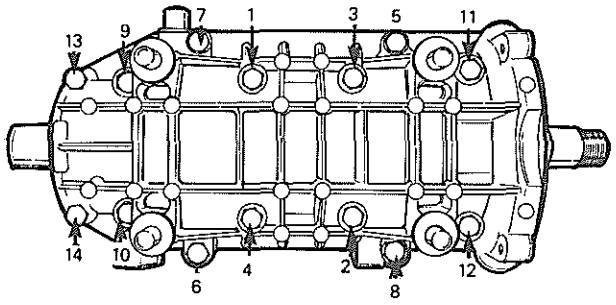
DISASSEMBLY AND ASSEMBLY

①②⑨Crankcase halves are factory matched and therefore, are not interchangeable as single halves.

Prior to joining of crankcase halves, apply "Loctite 515" (no. 413 7027) on mating surfaces.

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

Torque nuts (or bolts) to 20 N•m (15 ft-lbs) following illustrated sequence.

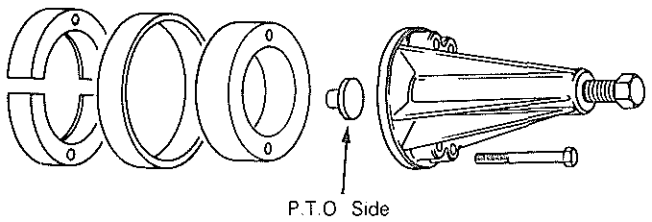


④⑤Torque to 20 N•m (15 ft-lbs).

⑥At assembly on crankcase, apply "Loctite 242" or equivalent on threads.

⑧Torque to 36 N•m (26 ft-lbs).

⑰㉑To remove ball bearings from crankshaft, use a special puller (see Tools section).

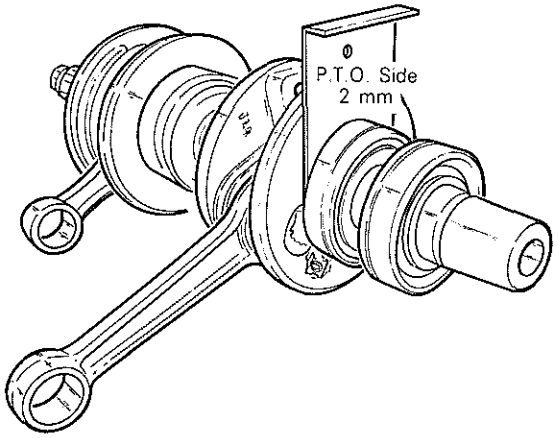


Prior to installation, place bearings into an oil container heated to 100°C (210°F).

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

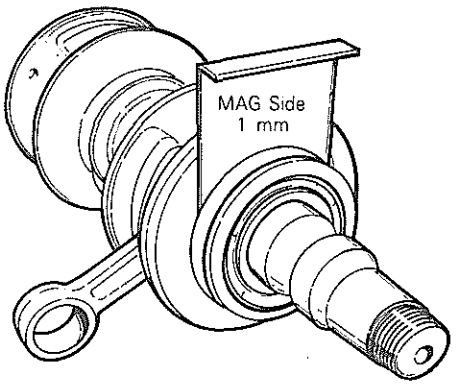
P.T.O. side (all engines)

At inner bearing installation, provide a free play of 2 mm (.080") for lubrication between bearing and crankshaft blade, using P/N 420 876 620 tool.



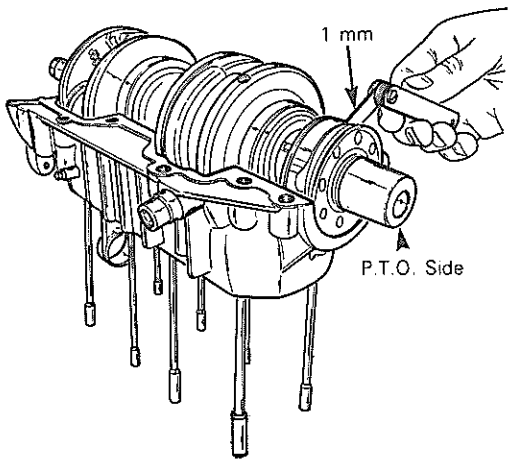
MAG side (except engines nos 3181 891 to 3181 920, and 3181 938 and up)

At bearing installation, provide a free play of 1 mm (.040") for lubrication between bearing and crankshaft blade, using P/N 420 876 625 tool.

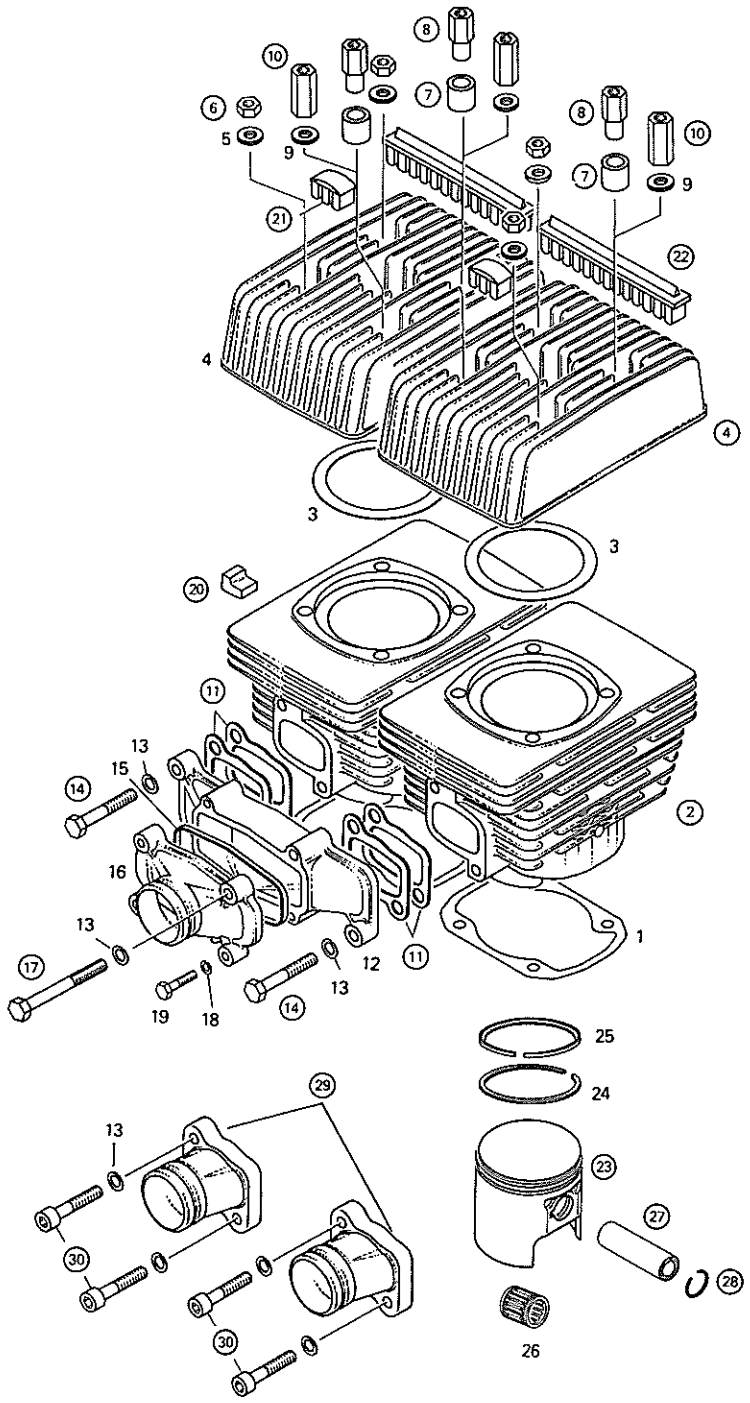


⑳ ㉓ At assembly, apply a light coat of lithium grease on seal lip.

For P.T.O. side outer bearing lubrication, it is necessary to provide a free play of 1 mm (.040") between seal and bearing.



TOP END



1. *Cylinder flange gasket (2)*
2. *Cylinder (2)*
3. *Cylinder head gasket (2)*
4. *Cylinder head (2)*
5. *Washer 8.4 mm (4)*
6. *Hexagonal nut 8 mm (4)*
7. *Distance sleeve (up to serial no. 3 182 679) (4)*
8. *Distance nut 8 × 35 mm (up to serial no. 3 182 679) (4)*
9. *Washer 8.4 mm (serial no. 3182 680 and up) (4)*
10. *Distance nut 8 × 37 mm (serial no. 3182 680 and up) (4)*
11. *Intake manifold gasket (4)*
12. *Intake manifold*
13. *Lockwasher 8 mm (4)*
14. *Hexagonal bolt M8 × 40 mm (4)*
15. *O'ring*
16. *Intake manifold cover*
17. *Hexagonal bolt M8 × 64 mm (2)*
18. *Lockwasher 6 mm (2)*
19. *Hexagonal bolt M6 × 30 mm (2)*
20. *Noise damper*
21. *Noise damper (short) (4)*
22. *Noise damper (long) (4)*
23. *Piston (2)*
24. *Rectangular ring (2)*
25. *Semi-trapez ring (2)*
26. *Needle bearing (2)*
27. *Gudgeon pin (2)*
28. *Circlip (4)*
29. *Intake manifold (2)*
30. *Allen screw M8 × 40 mm (4)*

TOP END

CLEANING

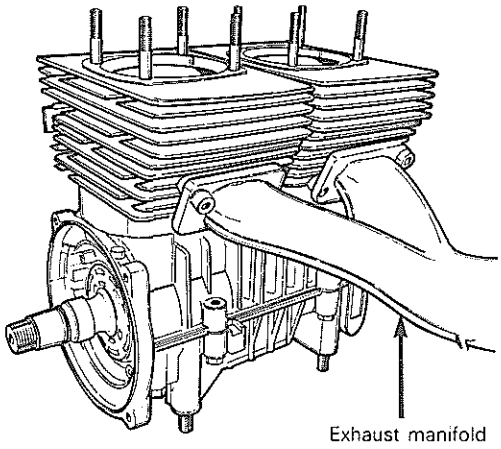
Discard all gaskets.

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

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

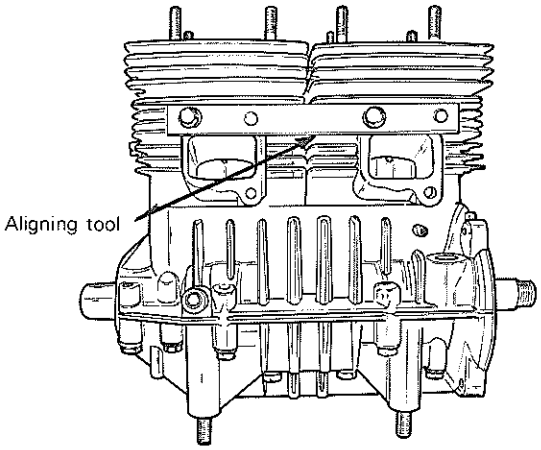
NOTE: The letter "AUS" (over an arrow on the piston dome) must be visible after cleaning.

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



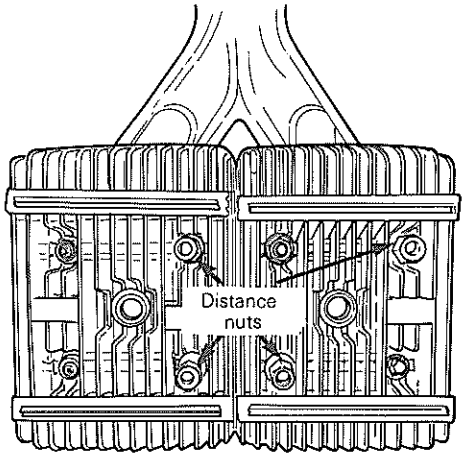
DISASSEMBLY AND ASSEMBLY

②④At cylinder and/or cylinder head installation, use P/N 420 876 171 aligning tool (or exhaust manifold) to ensure sealing of intake manifold and exhaust (See Tools Section), before tightening cylinder head nuts.



Cross torque cylinder head nuts to 20 N•m (15 ft-lbs); torque each cylinder head individually.

⑥⑦⑧⑩ Position nuts and distance nuts as illustrated.

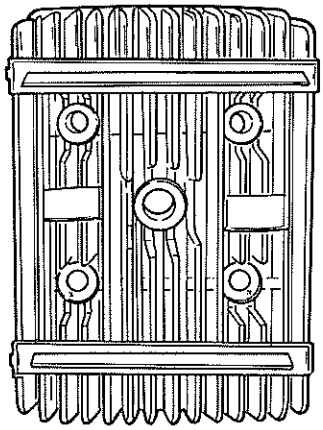


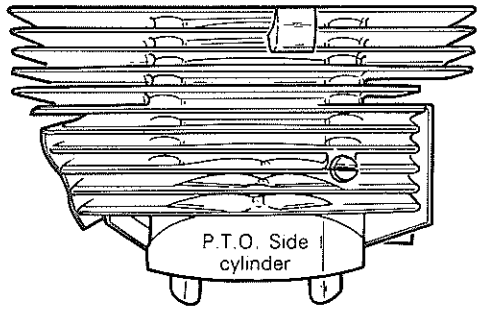
Torque nuts to 20 N•m (15 ft-lbs).

⑪Install a gasket on each side of the air deflector.

⑭⑰㉚ Torque to 20 N•m (15 ft-lbs).

⑳㉑㉒For proper position of noise dampers, refer to the following illustrations.

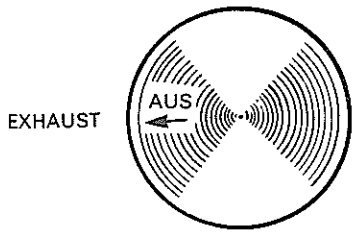




㉓㉗㉘Place a clean cloth over crankcase to prevent circlips from falling into crankcase. Use a pointed tool to remove circlips from piston.

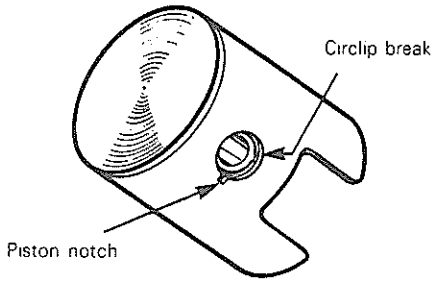
CAUTION: When tapping out gudgeon pins, hold piston firmly in place to eliminate the possibilities of transmitting shock and pressure to the connecting rod.

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

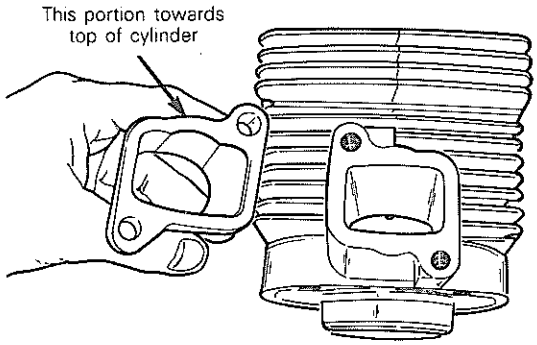


Piston to wall clearance should be:
MINIMUM: 0.060 mm (.0024")
MAXIMUM: 0.200 mm (.008")

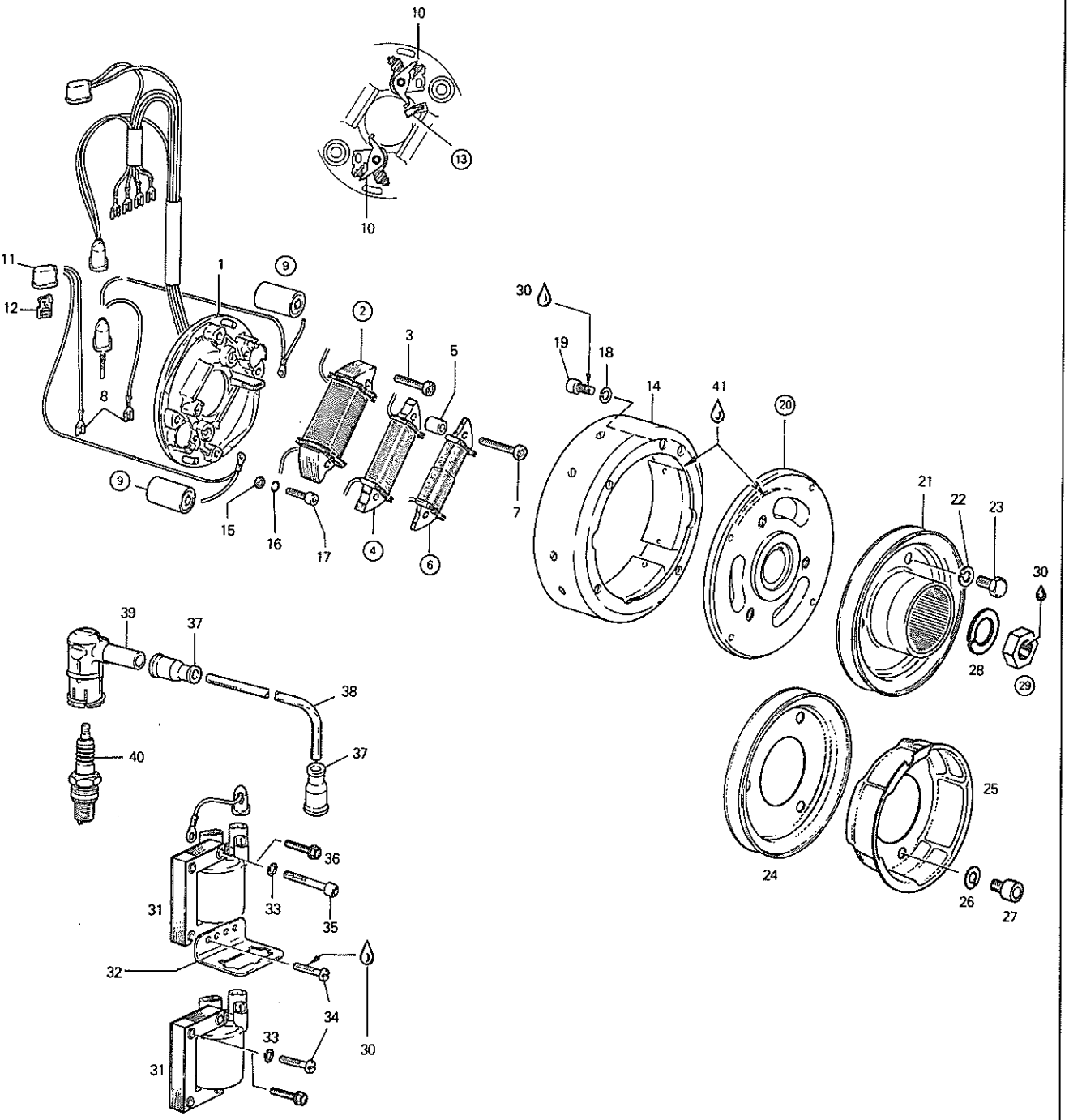
NOTE: Once circlips are installed, turn each circlip so the circlip break is not directly on piston notch. Remove any burrs from piston caused through circlip installation using very fine emery clotch.



㉙Install intake manifold as per the following illustration.



MAGNETO


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1. *Armature plate*
2. *Lighting coil 110W*
3. *Phillips cylindrical screw M5 × 28 mm (2)*
4. *Generator coil*
5. *Distance sleeve 11 mm (2)*
6. *Lighting coil 30W*
7. *Phillips cylindrical screw M5 × 32 mm (2)*
8. *Female connector (2)*
9. *Condenser (2)*
10. *Contact breaker (2)*
11. *Rubber cap (2)*
12. *Female connector (2)*
13. *Lubricating wick*
14. *Magneto ring*
15. *Washer 5.3 mm (2)*
16. *Lockwasher 5 mm (2)*
17. *Allen screw M5 × 18 mm (2)*
18. *Lockwasher 6 mm (4)*
19. *Allen screw M6 × 11.5 mm (4)*
20. *Magneto housing*
21. *Fan pulley (up to serial no. 3170 805)*
22. *Lockwasher 8 mm (up to serial no. 3170 805 (3)*
23. *Hexagonal screw M8 × 16 mm (up to serial no. 3170 805) (3)*
24. *Fan pulley (serial no. 3170 805 and up)*
25. *Starting pulley (serial no. 3170 805 and up) (3)*
26. *Lockwasher 8 mm (serial no. 3170 805 and up) (3)*
28. *Lockwasher 22 mm*
29. *Hexagonal nut 22 × 1.5 mm*
30. *"Loctite 242" (blue, medium strength)*
31. *Ignition coil*
32. *Junction block bracket (up to serial no. 3164 368)*
33. *Lockwasher 5 mm (up to serial no. 3164 368) (5)*
34. *Cylindrical slotted head screw M5 × 22 mm (up to serial no. 3164 368) (6)*
35. *Allen screw M5 × 35 mm (up to serial no. 3164 368)*
36. *Self-tapping screw M5 × 22 mm (serial no. 3164 369 and up)*
37. *Protection cap*
38. *High tension cable 225 and 265 mm*
39. *Suppressor cap (2)*
40. *Spark plug W3C (W275 T2)*
41. *"Loctite 271" (red, high strength)*

MAGNETO

CLEANING

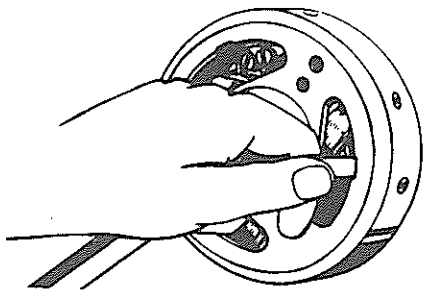
Clean all metal components in a non-ferrous metal cleaner.

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

DISASSEMBLY AND ASSEMBLY

②④⑥Whenever a coil is replaced, the air gap (distance between coil end and magnet) must be adjusted.

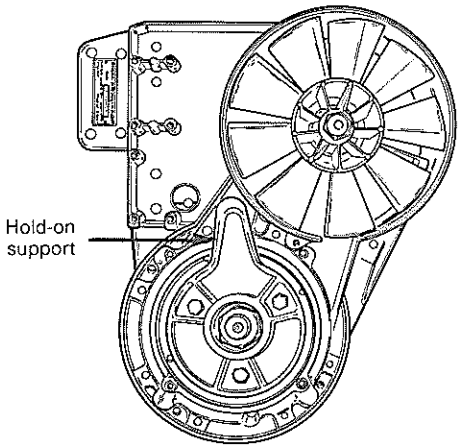
To check air gap, insert a feeler gauge of 0.30-0.45 mm (.012" - .018") between magnet and coil ends. If necessary to adjust, slacken coil retaining screws and relocate coil.



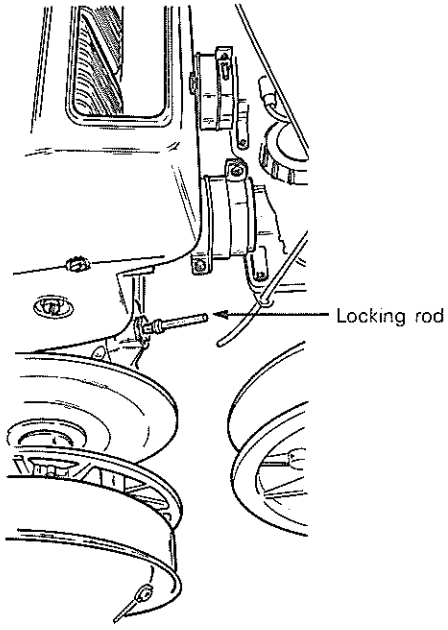
⑨ To replace a condenser, it is first necessary to unsolder the two (2) black leads using a soldering iron. The condenser can then be driven out of the armature plate using a suitable pusher and hammer. To reinstall, inverse procedure.

⑬ When replacing contact breakers, apply a light coat of grease on lubricating wick.

⑳ ㉙ To remove or install magneto retaining nut, lock crankshaft in position with special hold-on support as illustrated. (See Tools section).

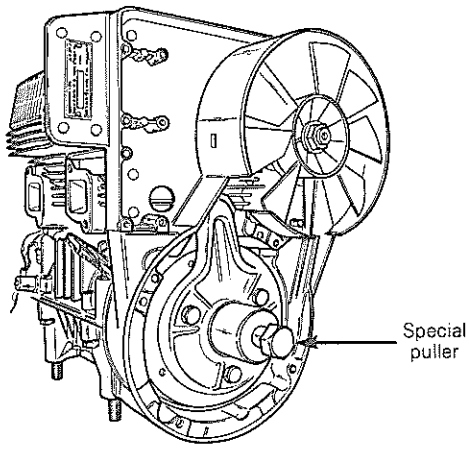


On engines no. 3160 131 and up, the crankshaft can be locked in position by inserting a locking rod (no. 420 876 640) into pulsation hole (Magneto side piston must be at top dead center).



With magneto retaining nut removed, install special puller onto hold-on support.

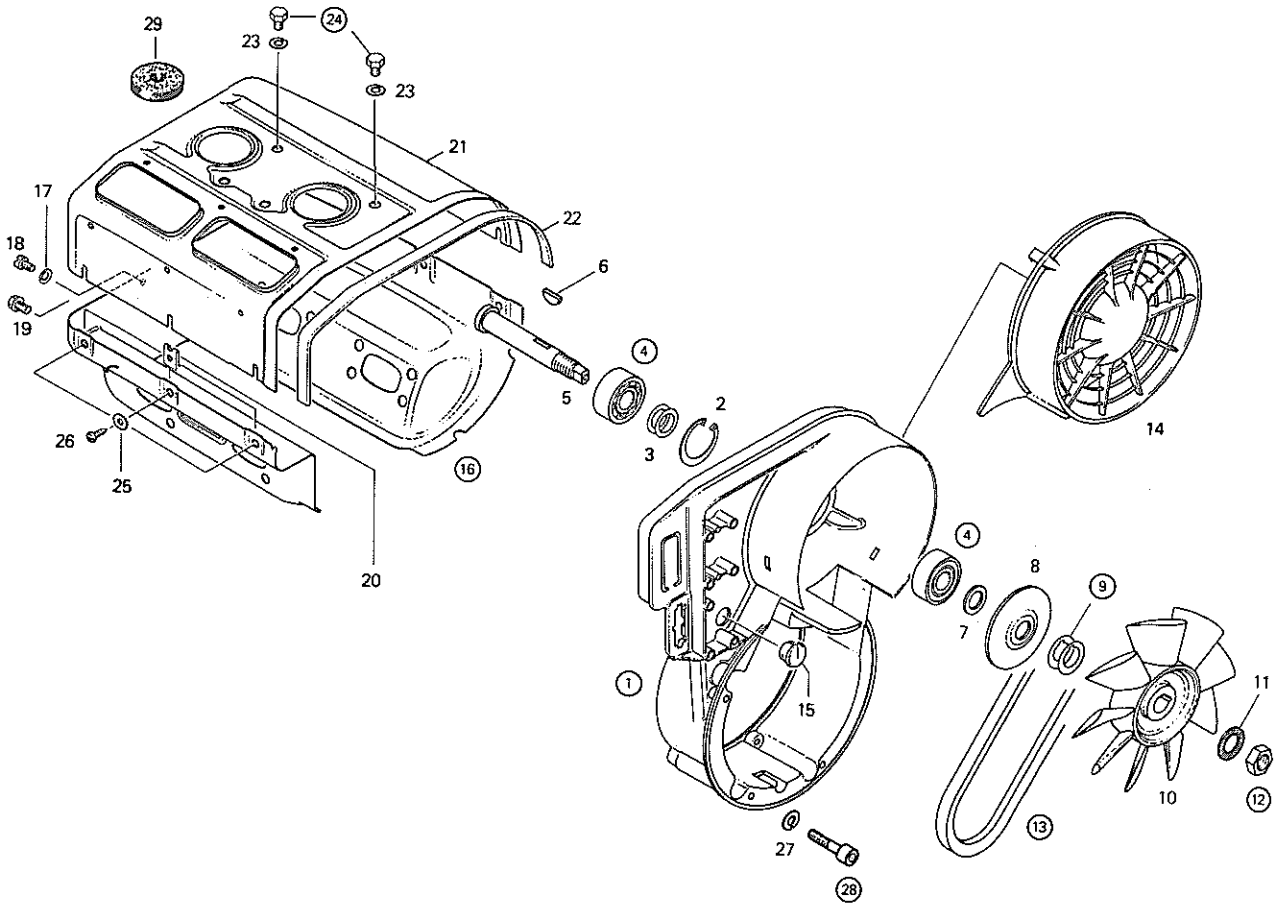
Tighten puller bolt and at same time, tap on bolt head using a hammer to release magneto from its taper.



At assembly, clean crankshaft extension (taper) then apply "Loctite 242" or equivalent.

Install magneto retaining nut (with "Loctite 242" on threads) and torque to 80 N•m (60 ft-lbs).

COOLING SYSTEM



1. *Fan housing*
2. *Locking ring*
3. *Shim 1.0 mm (2)*
4. *Ball bearing (2)*
5. *Fan shaft*
6. *Woodruff key 3 × 5 mm*
7. *Distance sleeve*
8. *Pulley half*
9. *Shim 0.5 mm*
10. *Fan*
11. *Lockwasher 16 mm*
12. *Hexagonal nut 16 × 1.5 mm*
13. *Fan belt*
14. *Fan cover*
15. *Cable grommet*
16. *Cylinder cowl*
17. *Lockwasher 6 mm (up to serial no. 3164 649)*
18. *Cylindrical slotted head screw M6 × 12 mm (up to serial no. 3164 649)*
19. *Self-tapping screw M6 × 12 mm (Serial no. 3164 650 and up)*
20. *Speed nut (8)*
21. *Cylinder head cowl*
22. *Sealing strip 440 mm*
23. *Lockwasher 8 mm (4)*
24. *Hexagonal screw M8 × 16 mm (4)*
25. *Washer 4 × 15.8 mm (8)*
26. *Screw 4.8 × 16 mm (8)*
27. *Lockwasher 6 mm (4)*
28. *Allen screw M6 × 30 mm (4)*

COOLING SYSTEM

CLEANING

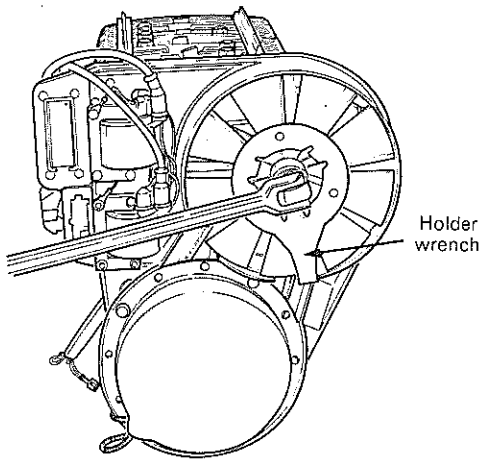
Clean all metal components in a non-ferrous metal cleaner.

DISASSEMBLY AND ASSEMBLY

①④ It is first necessary to heat bearing housing to 65° C (150° F) to remove or install bearing.

⑨⑬ Fan belt free-play must be 6 mm ($\frac{1}{4}$''). To adjust, install or remove shim (s) between pulley halves. Install excess shim (s) between fan and lockwasher.

⑫ To remove or install fan pulley retaining nut, lock fan pulley with special holder wrench. (See Tools section). At assembly, torque nut to 62 N•m (46 ft-lbs).

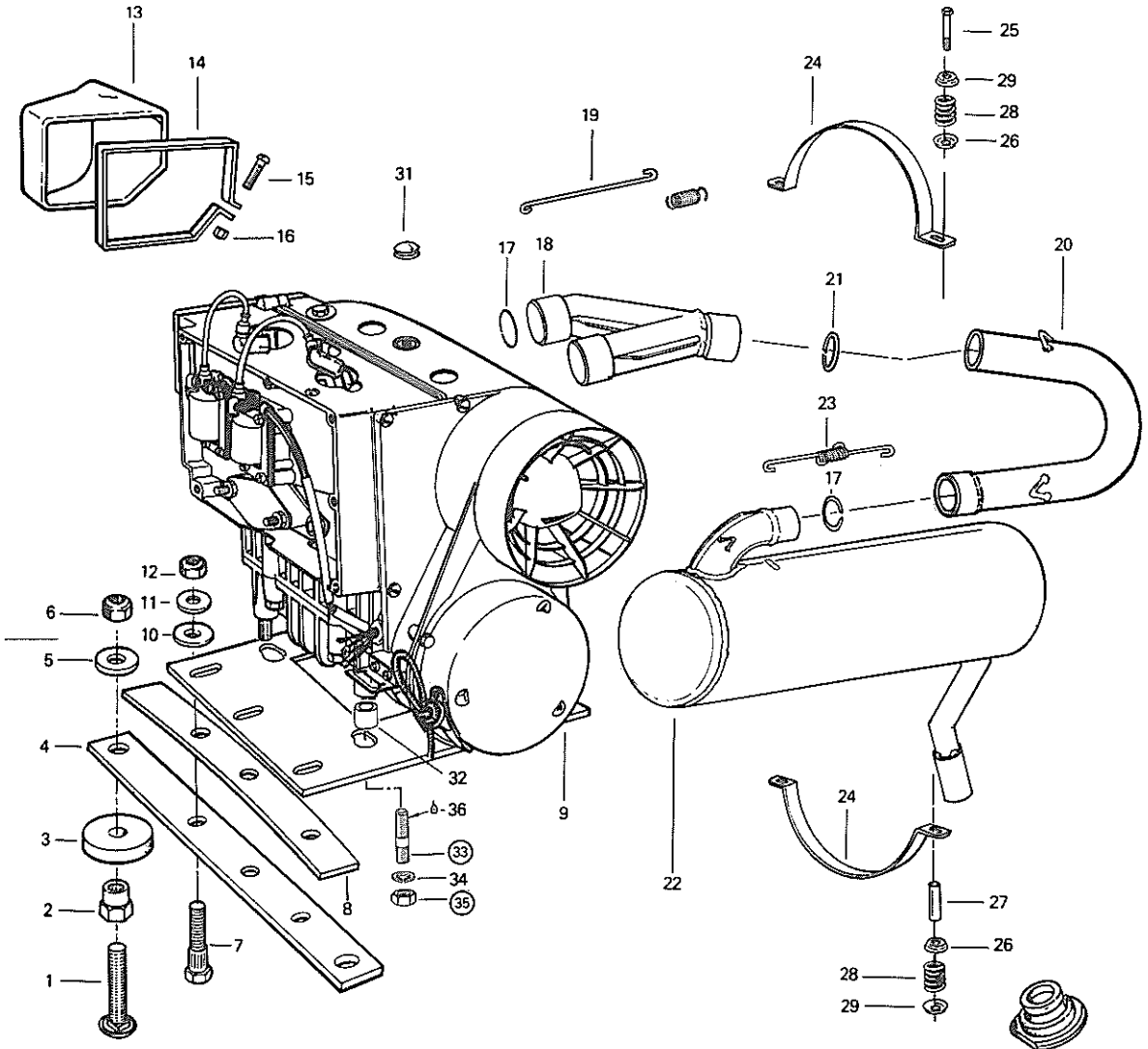


⑭㉔㉘ At assembly, apply a light coat of ''Loctite 242'' on threads. It should be noted that to correctly remove a Loctite locked screw, it is first necessary to slightly tap on head screw to break Loctite bond. The screw can then be removed. This will eliminate the possibility of screw breakage.

⑯ A gasket must be placed on both sides (inner and outer) of intake and exhaust holes.

640 ENGINE TYPE

ENGINE SUPPORT & MUFFLER



1. *Carriage bolt (4)*
2. *Threaded spacer (4)*
3. *Rubber insulator (4)*
4. *Engine support (2)*
5. *Washer (4)*
6. *Nut $\frac{3}{8}$-24 (4)*
7. *Bolt (6)*
8. *Spring leaf (2)*
9. *Engine mount*
10. *Washer $\frac{3}{8} \times \frac{7}{8}$ (6)*
11. *Washer 9/32 × $\frac{5}{8}$ (6)*
12. *Nut 5/16-24 (6)*
13. *Air duct*
14. *Retainer clamp*
15. *Screw 10-24 × 2 $\frac{1}{2}$''*
16. *Nut 10-24*
17. *Sealing ring (6)*
18. *Exhaust manifold*
19. *Hook (3)*
20. *Exhaust manifold elbow*
21. *Sealing ring (2)*
22. *Muffler*
23. *Spring (2)*
24. *Muffler clamp (2)*
25. *Bolt 5/16-18 × 2$\frac{3}{4}$'' (2)*
26. *Retaining washer (4)*
27. *Bushing (2)*
28. *Spring (4)*
29. *Retaining washer (4)*
30. *Exhaust grommet*
31. *Rubber plug (5)*
32. *Distance sleeve (4)*
33. *Stud (4)*
34. *Lockwasher (4)*
35. *Nut M12 (4)*
36. *''Loctite 242''*
37. *Spring (3)*

ENGINE SUPPORT & MUFFLER

REMOVAL FROM VEHICLE

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

- Drive belt.
- Muffler.
- Air intake silencer tube.
- Choke cable at carburetor.
- Throttle cable at carburetor
- Fuel lines at carburetor.

NOTE: Secure fuel lines so that the opened ends are higher than the fuel level in the tank.

- Disconnect negative cable (ground) from battery, then disconnect electrical connections leading to engine.
- Console.
- Engine mount nuts.

DISASSEMBLY & ASSEMBLY

(33) At assembly on crankcase, apply "Loctite 242" or equivalent on threads.

(35) Torque to 43 N•m (32 ft-lbs).

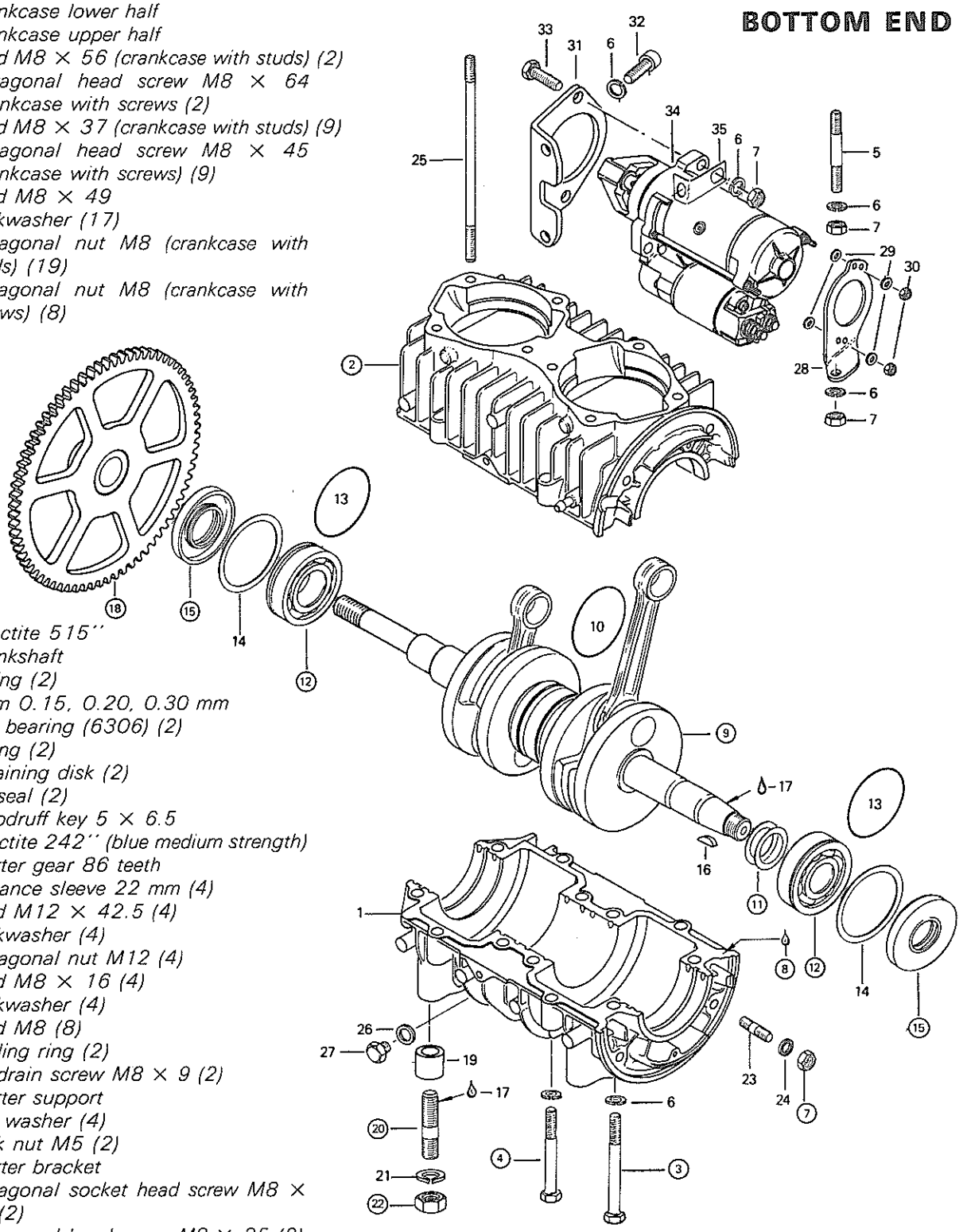
INSTALLATION ON VEHICLE

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

- Check tightness of engine mount nuts.
- After throttle cable installation, check carburetor maximum throttle slide opening.
- Check pulley alignment.

BOTTOM END

1. *Crankcase lower half*
2. *Crankcase upper half*
3. *Stud M8 × 56 (crankcase with studs) (2)*
4. *Hexagonal head screw M8 × 64 (crankcase with screws (2)*
4. *Stud M8 × 37 (crankcase with studs) (9)*
   Hexagonal head screw M8 × 45 (crankcase with screws) (9)
5. *Stud M8 × 49*
6. *Lockwasher (17)*
7. *Hexagonal nut M8 (crankcase with studs) (19)*
   Hexagonal nut M8 (crankcase with screws) (8)
8. *''Loctite 515''*
9. *Crankshaft*
10. *O'ring (2)*
11. *Shim 0.15, 0.20, 0.30 mm*
12. *Ball bearing (6306) (2)*
13. *O'ring (2)*
14. *Retaining disk (2)*
15. *Oil seal (2)*
16. *Woodruff key 5 × 6.5*
17. *''Loctite 242'' (blue medium strength)*
18. *Starter gear 86 teeth*
19. *Distance sleeve 22 mm (4)*
20. *Stud M12 × 42.5 (4)*
21. *Lockwasher (4)*
22. *Hexagonal nut M12 (4)*
23. *Stud M8 × 16 (4)*
24. *Lockwasher (4)*
25. *Stud M8 (8)*
26. *Sealing ring (2)*
27. *Oil drain screw M8 × 9 (2)*
28. *Starter support*
29. *Flat washer (4)*
30. *Lock nut M5 (2)*
31. *Starter bracket*
32. *Hexagonal socket head screw M8 × 25 (2)*
33. *Hexagonal head screw M8 × 25 (2)*
34. *Electric starter*
35. *Ground strip*



BOTTOM END

CLEANING

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

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

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

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

DISASSEMBLY & ASSEMBLY

General

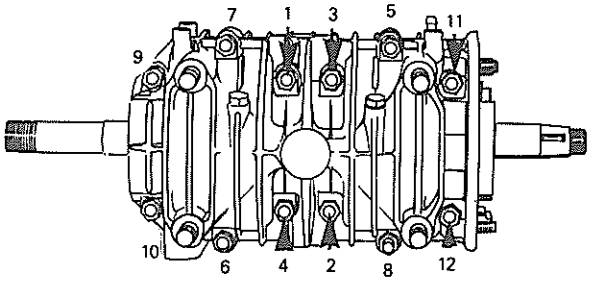
Refer to Technical Data Section for component fitted tolerance and wear limit.

①②⑧Crankcase halves are factory matched and therefore, are not interchangeable or available as single halves.

Prior to joining of crankcase halves, apply "Loctite 515" (no. 413 7027) on mating surfaces.

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

Torque nuts (or bolts) to 22 N•m (16 ft-lbs) following illustrated sequence.



③④ Torque to 22 N•m (16 ft-lbs).

⑦ Torque to 22 N•m (16 ft-lbs).

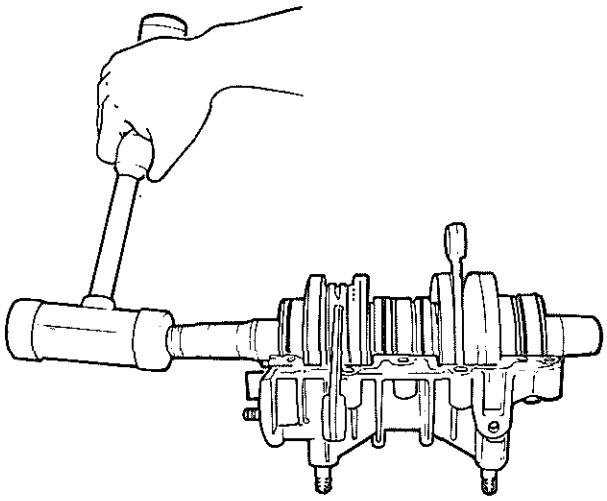
⑨⑪ **Crankshaft end-play (minimum 0.20 mm (.008"), maximum .016")** is adjusted with shim(s) located between crankshaft and magneto side bearing. To determine correct amount of shim(s), proceed as follows.

NOTE: Crankshaft end-play requires adjustment only when crankshaft and/or crankcase is replaced.

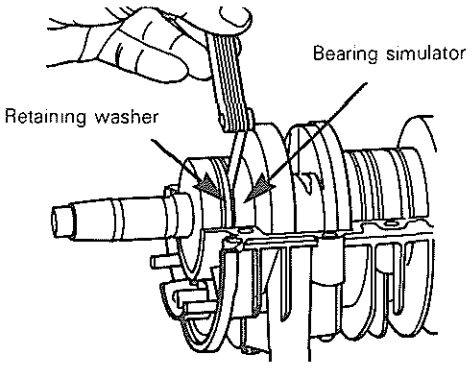
Remove magneto side bearing and existing shim(s). Slide the bearing simulator (no. 420 876 160) and the retaining washer on the crankshaft. (See Tools Section).

Position crankshaft assembly into crankcase lower half. Make sure that retaining washers are correctly seated in the grooves.

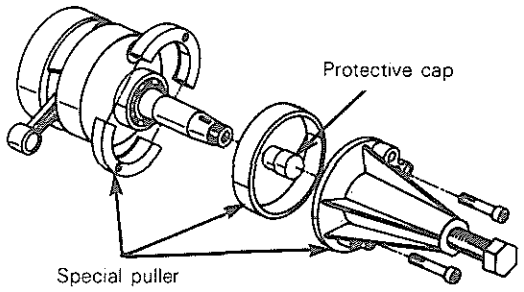
Gently tap crankshaft counterweight (mag. side) until P.T.O. side bearing bears against retaining washer.



Any free-play between the bearing simulator and magneto side retaining washer, minus end-play, is the distance to be covered by shim(s). Shims are available in the thickness of 0.15 mm (.006"), 0.2 mm (.008"), 0.3 mm (.012").



⑫To remove bearing from crankshaft use a protective cap and special puller, as illustrated. (See Tools Section).



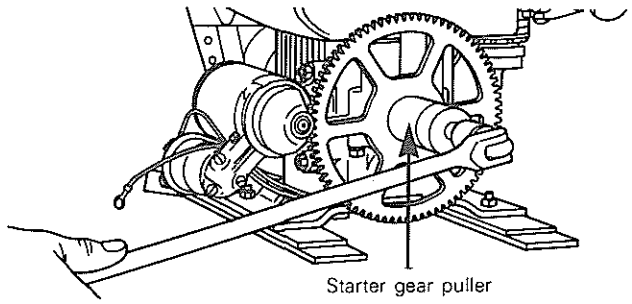
Prior to installation, place bearings into an oil container and heat the oil to 100°C (210°F) for 5 to 10 min. This will expand bearings and ease installation.

Install bearings with groove outward.

NOTE: Prior to magneto side bearing installation, determine crankshaft end-play and install required shim(s) on crankshaft extension.

⑮At assembly, apply a light coat of lithium grease on seal lip. Seal outer surface should be flush with crankcase.

⑱To remove starter gear from crankshaft it may be necessary to use a special puller as illustrated. (See Tools Section).

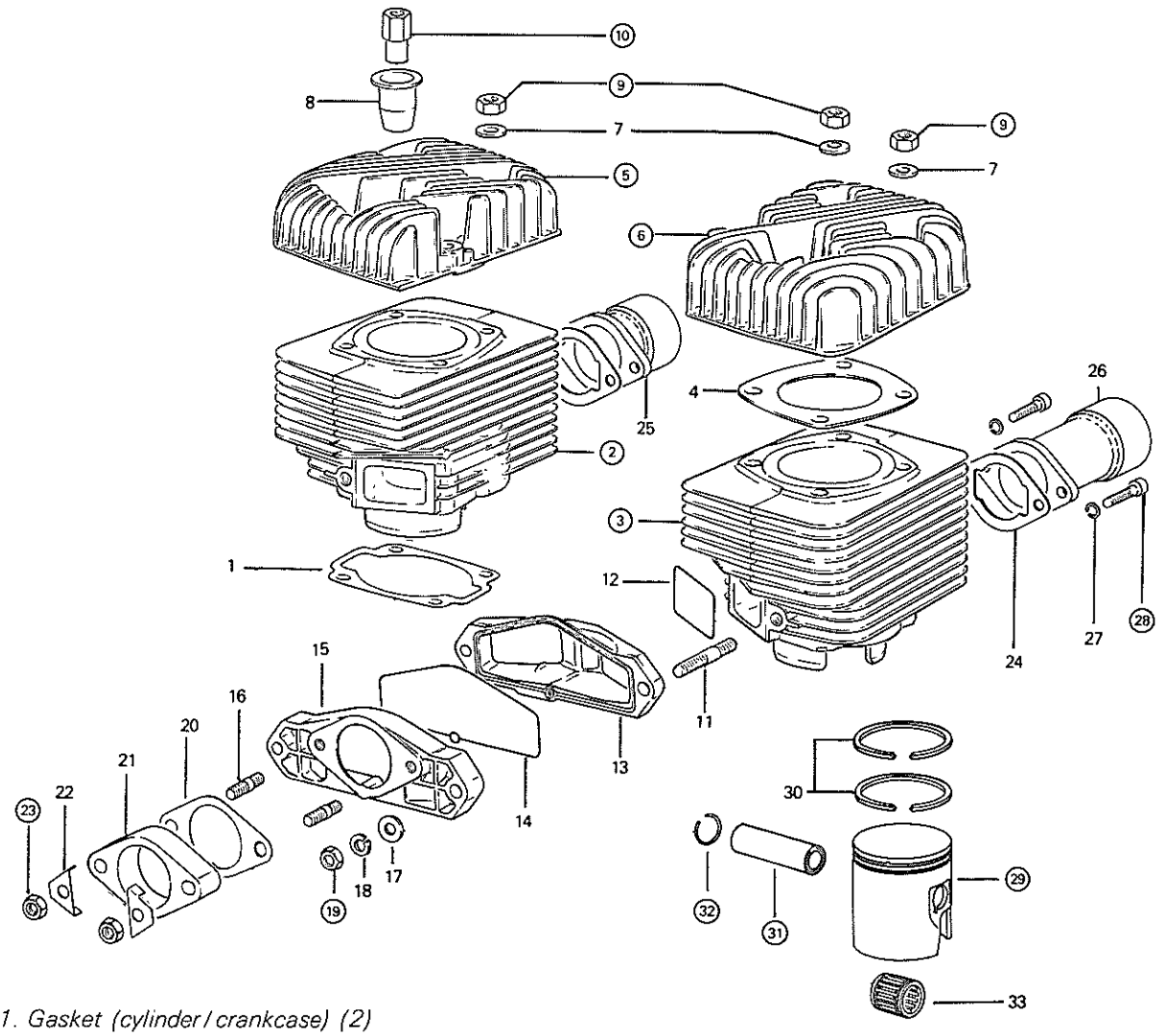


At assembly, apply a light coat of anti-seize coumpound on crankshaft extension nearest starter gear.

⑳At assembly on crankcase, apply "Loctite 242" or equivalent on threads.

㉒Torque to 44 N•m (32 ft-lbs).

TOP END



1. Gasket (cylinder / crankcase) (2)
2. Cylinder (P.T.O.)
3. Cylinder (Mag)
4. Gasket (head, cylinder) (2)
5. Cylinder head (P.T.O.)
6. Cylinder head (Mag)
7. Flat washer (7)
8. Support sleeve
9. Nut M8 (7)
10. Distance nut
11. Stud M8 (2)
12. Gasket (2)
13. Intake manifold
14. Gasket
15. Intake cover
16. Stud M8 × 38.5 (2)
17. Washer (2)
18. Lockwasher (2)
19. Nut M8 (2)
20. Gasket
21. Insulating flange
22. Locking tab (2)
23. Nut M8 (2)
24. Exhaust gasket (2)
25. Exhaust socket (P.T.O.)
26. Exhaust socket (Mag)
27. Lockwasher (4)
28. Allen screw M8 × 30 (4)
29. Piston (2)
30. Ring
31. Gudgeon pin (2)
32. Circlip (4)
33. Needle bearing (2)

TOP END

CLEANING

Discard all gaskets.

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

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

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

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

DISASSEMBLY & ASSEMBLY

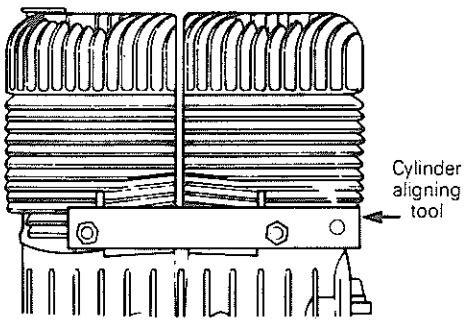
NOTE: Refer to Technical Data for component fitted tolerance and wear limit.

②③⑤⑥ When installing cylinder and / or cylinder head, the cylinder aligning tool must be used to ensure sealing of intake manifold and exhaust. (See Tools Section).

Install muffler on exhaust socket then install aligning bar.

Cross torque cylinder head nuts to 20 N•m (15 ft-lbs).

NOTE: Torque each cylinder head individually.



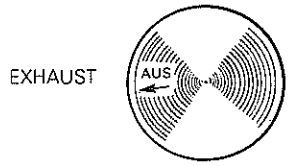
⑨⑩ Torque cylinder head nuts to 20 N•m (15 ft-lbs).

⑲㉓㉘ Torque to 20 N•m (15 ft-lbs).

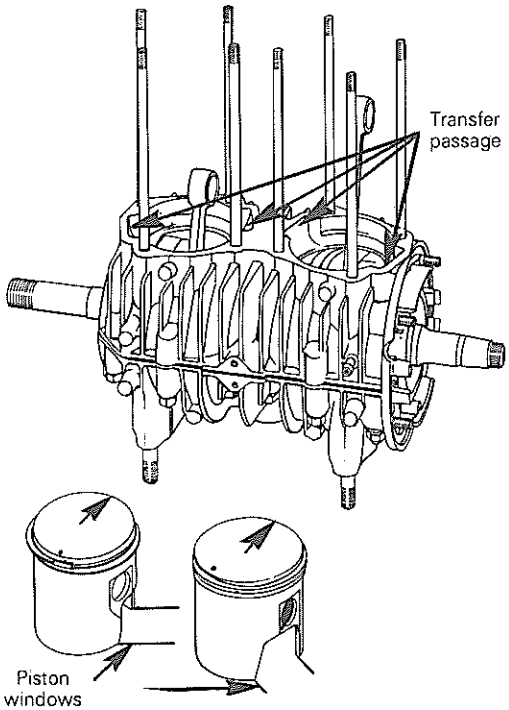
㉙㉛㉜ Place a clean cloth over crankcase to prevent circlips from falling into crankcase. Use a pointed tool to remove circlips from piston.

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

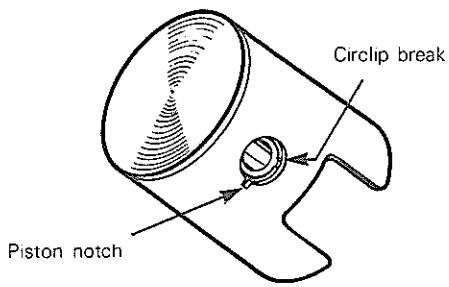
At assembly, place the pistons over the connecting rods with the letters "AUS" (over an arrow on the piston dome) facing in direction of the exhaust port.



Also make sure that the piston windows are aligned with the crankcase transfer passages when the gudgeon pin orifice is in-line with the connecting rod bore.



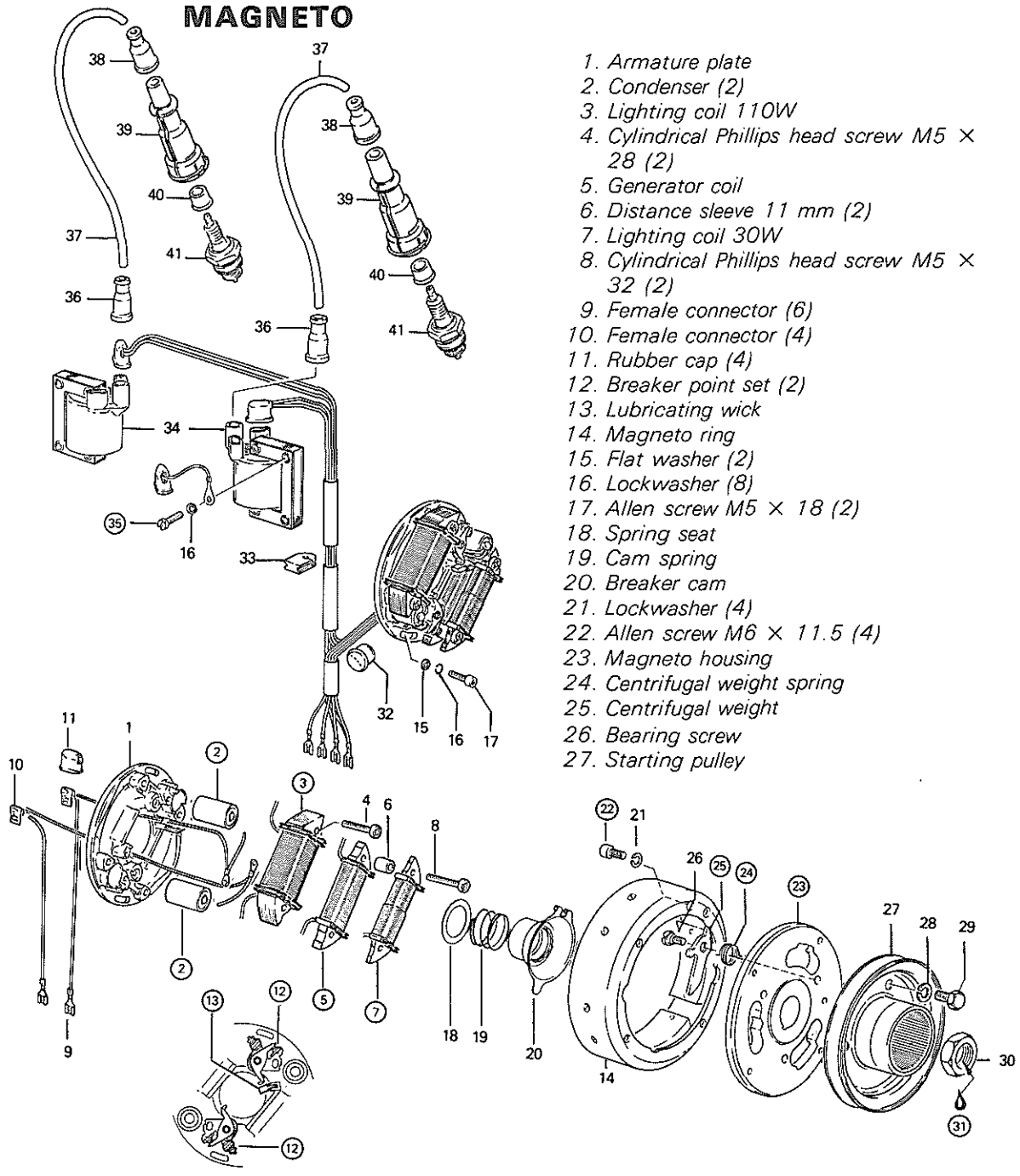
NOTE: Once circlips are installed turn each circlip so the circlip break is not directly on piston notch. Remove any burrs from piston caused through circlip installation using very fine emery cloth.



Piston to cylinder wall clearance should be:

MINIMUM — MAXIMUM
0.070 — 0.220 mm
(.0028") — (.0086")

MAGNETO



1. *Armature plate*
2. *Condenser (2)*
3. *Lighting coil 110W*
4. *Cylindrical Phillips head screw M5 × 28 (2)*
5. *Generator coil*
6. *Distance sleeve 11 mm (2)*
7. *Lighting coil 30W*
8. *Cylindrical Phillips head screw M5 × 32 (2)*
9. *Female connector (6)*
10. *Female connector (4)*
11. *Rubber cap (4)*
12. *Breaker point set (2)*
13. *Lubricating wick*
14. *Magneto ring*
15. *Flat washer (2)*
16. *Lockwasher (8)*
17. *Allen screw M5 × 18 (2)*
18. *Spring seat*
19. *Cam spring*
20. *Breaker cam*
21. *Lockwasher (4)*
22. *Allen screw M6 × 11.5 (4)*
23. *Magneto housing*
24. *Centrifugal weight spring*
25. *Centrifugal weight*
26. *Bearing screw*
27. *Starting pulley*
28. *Lockwasher (3)*
29. *Hexagonal head screw M8 × 16 (3)*
30. *Hexagonal nut M18 × 1.5*
31. *"Loctite 242" (blue, medium strength)*
32. *Grommet*
33. *Grommet*
34. *Ignition coil (2)*
35. *Cylindrical slotted head screw M5 × 22 (6)*
36. *Protection cap (2)*
37. *Ignition cable (200 mm)*
38. *Protection cap (2)*
39. *Spark plug protector (2)*
40. *Sealing sleeve (2)*
41. *Spark plug M4A2 (M240T1) (2)*

MAGNETO

CLEANING

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

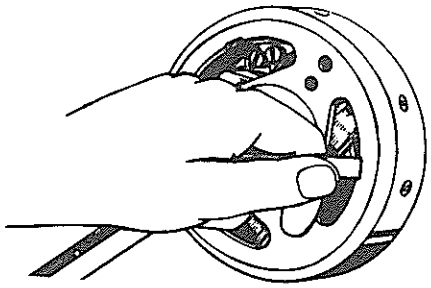
CAUTION: Clean armature and magneto using only a clean cloth.

DISASSEMBLY & ASSEMBLY

②To replace a condenser, it is first necessary to unsolder the two (2) black leads. The capacitor can then be driven out of the armature plate using a suitable pusher and hammer. To reinstall, inverse procedure.

③⑤⑦Whenever a coil is replaced, the air gap (distance between coil end and magnet) must be adjusted.

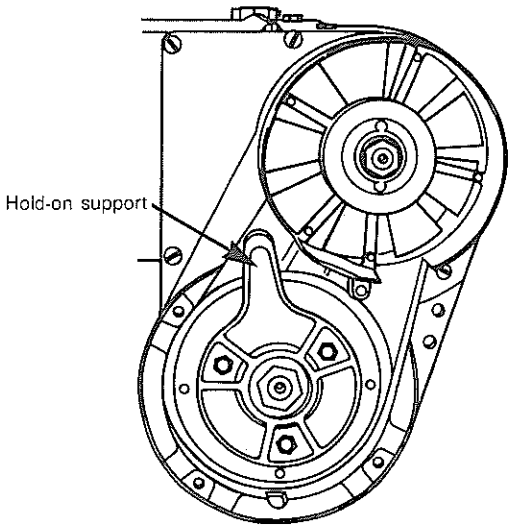
To check air gap, insert a feeler gauge of 0.30-0.45 mm (.012''-.018'') between magnet and coil ends. If necessary to adjust, slacken coil retaining screws and relocate coil.



⑫⑬When replacing breaker point set, apply a light coat of grease on lubricating wick.

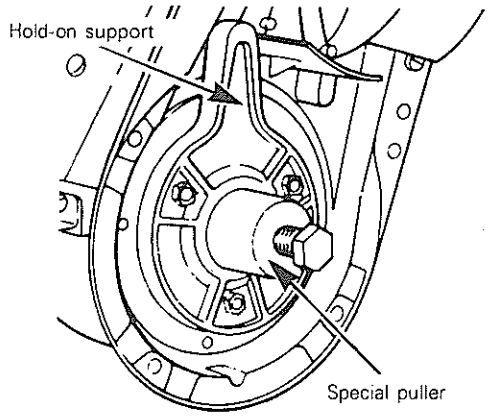
㉒At assembly, apply ''Loctite 242'' on retaining screw threads.

㉓㉚㉛To remove or install magneto retaining nut, lock crankshaft in position with special hold-on support as illustrated. (See Tools Section).

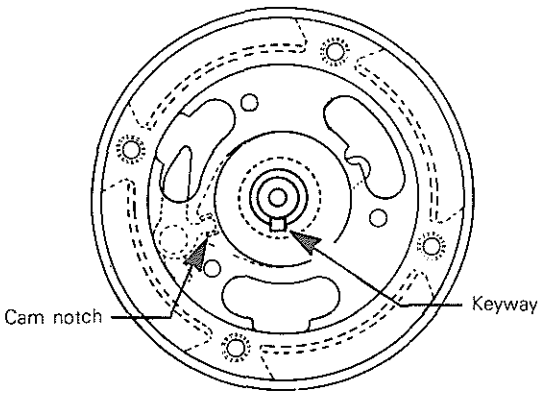


With magneto retaining nut removed and hold-on support in place, install special puller onto hub.

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



At assembly, clean crankshaft extention (taper) then apply ''Loctite 242'' or equivalent.

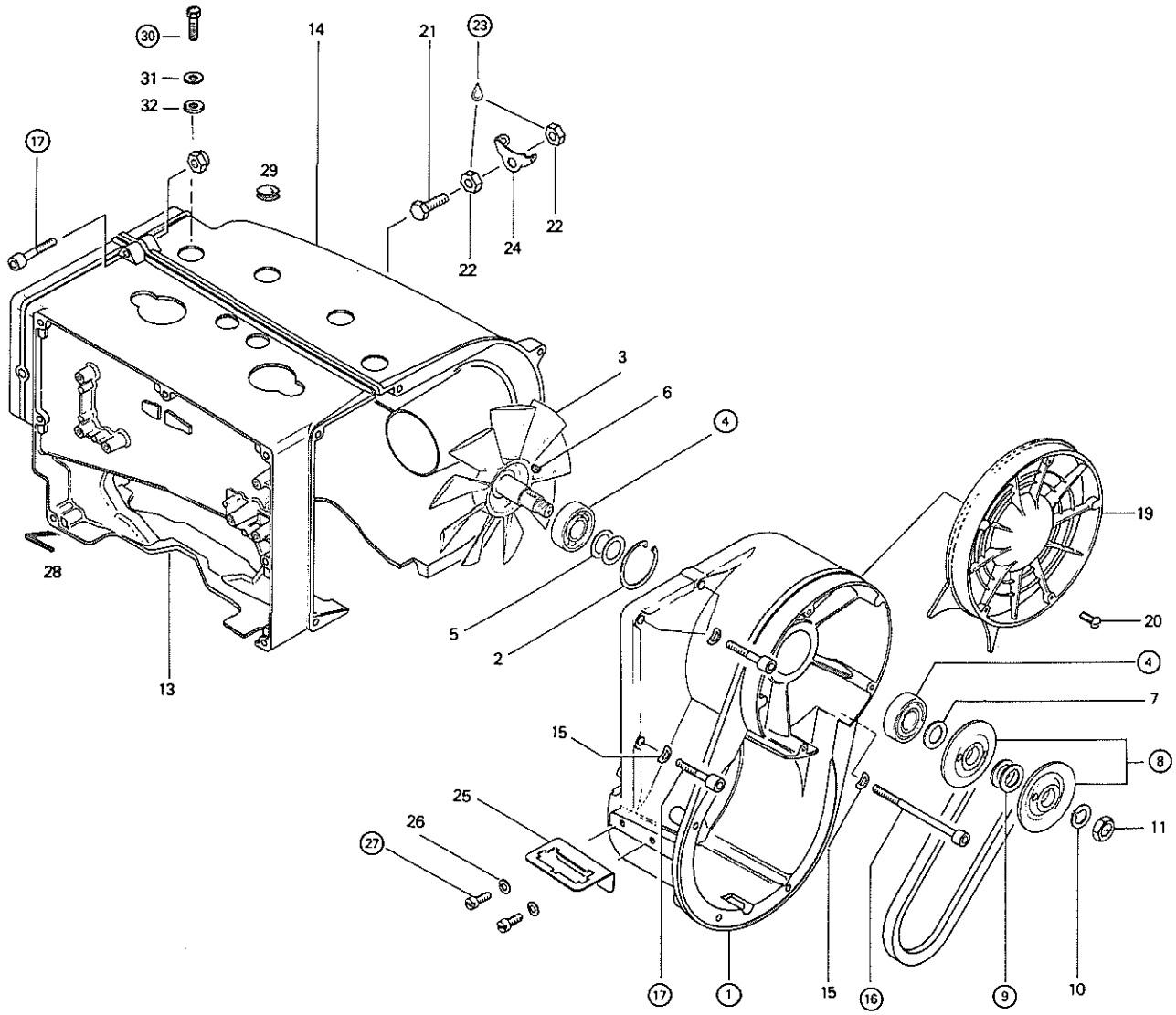


Install magneto retaining nut (with "Loctite 242" on threads) and torque to 100 N•m (75 ft-lbs).

㉔㉕ At assembly, apply a small amount of low temperature grease into spring seat.

㉟ Apply "Loctite 242" on threads.

COOLING SYSTEM



1. *Fan housing*
2. *Circlip*
3. *Fan*
4. *Bearing (2)*
5. *Washer (2)*
6. *Woodruff key*
7. *Washer*
8. *Pulley half (2)*
9. *Shim(s)*
10. *Lockwasher*
11. *Nut M14 × 1.5*
12. *Belt*
13. *Air deflector (intake)*
14. *Air deflector (exhaust)*
15. *Spring washer (4)*
16. *Allen screw M6 × 80*
17. *Allen screw M6 × 30 (5)*
18. *Nut M6*
19. *Fan cover*
20. *Screw M5 × 12 (3)*
21. *Bolt M8 × 25*
22. *Nut M8 (2)*
23. *"Loctite 242"*
24. *Spring bracket*
25. *Junction block bracket*
26. *Lockwasher (2)*
27. *Cylindrical head screw M5 × 12 (2)*
28. *Sealer (intake/deflector)*
29. *Plug (5)*
30. *Bolt 5/16-18 × ¾"*
31. *Washer*
32. *Rubber washer*

COOLING SYSTEM

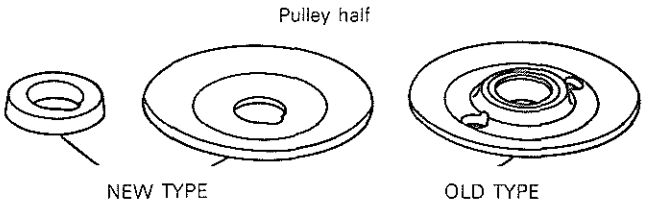
CLEANING

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

DISASSEMBLY & ASSEMBLY

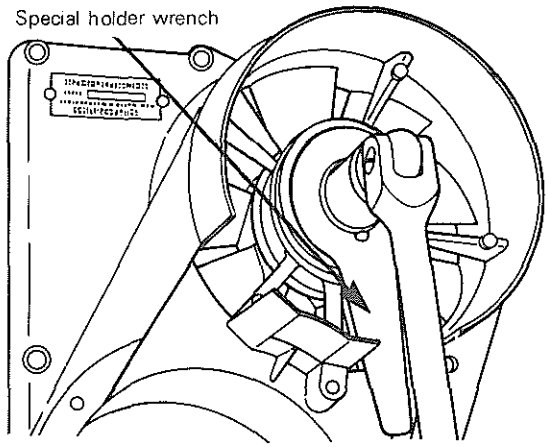
①④It is first necessary to heat bearing housing to 65°C (150°F) to remove or install bearing.

⑧Newer pulley half does not have a shoulder on its inner face so it is installed with a 6 mm (0.236") spacer.



⑨Shim(s) located between pulley halves are used to adjust fan belt free-play. Correct free-play is 6 mm (1/4"). If necessary to adjust, install or remove shim(s) between pulley halves. Install excess shim(s) between outer pulley half and washer.

⑪Lock fan pulley with special holder wrench to remove or install pulley retaining nut. (See Tools Section).



At assembly, torque to 61 N•m (45 ft-lbs).

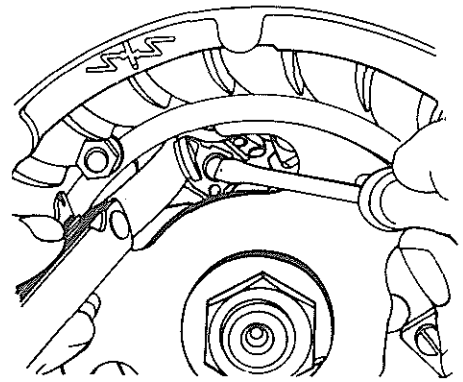
⑯⑰㉓㉗㉚At assembly, apply a light coat of "Loctite 242" on threads. It should be noted that to correctly remove a Loctite locked screw, it is first necessary to slightly tap on screw head to break Loctite bond. The screw can then be removed. This will eliminate the possibility of screw breakage.

IGNITION TIMING — ONE CYLINDER (247-277 TYPES)

Two methods are detailed in this section; the first using the timing marks stamped on the engine, the second using a Top Dead Center gauge.

TIMING MARK PROCEDURE

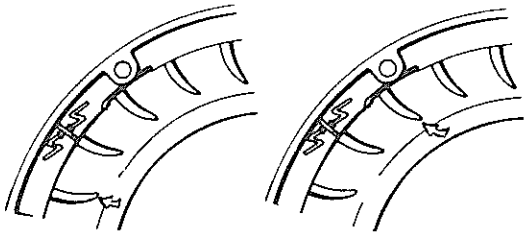
1. Disconnect spark plug wire and remove spark plug.
2. Remove rewind starter assembly from engine then remove the starting pulley from magneto ring.
3. Rotate crankshaft until breaker points, visible through magneto ring opening, are fully opened. Adjust points gap to 0.35 mm ± 0.05 (.014" ± .002) using a feeler gauge and screwdriver as illustrated.



NOTE: Breaker points gap can change upon tightening. Always recheck after tightening.

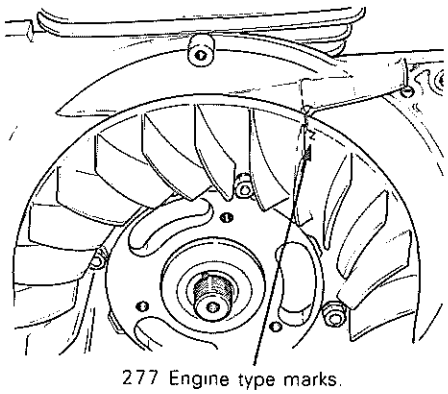
4. Disconnect junction block at engine then connect one lead of a timing light (flashlight type), or a tone timer to the blue wire leading from engine. Connect other to ground (metallic portion of the engine).
5. Turn timing instrument ON and rotate crankshaft until timing marks align. Slacken the three (3) armature plate retaining screws then rotate armature plate until timing light fluctuates or tone signal sound level varies.

Retighten retaining screws at this position.



Too early:
Turn armature
plate clockwise

Too late:
Turn armature
plate counter-clockwise



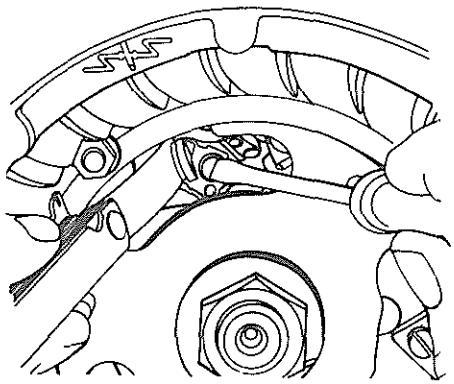
277 Engine type marks.

NOTE: Ignition timing can change upon tightening. Always recheck after tightening.

TDC GAUGE PROCEDURE

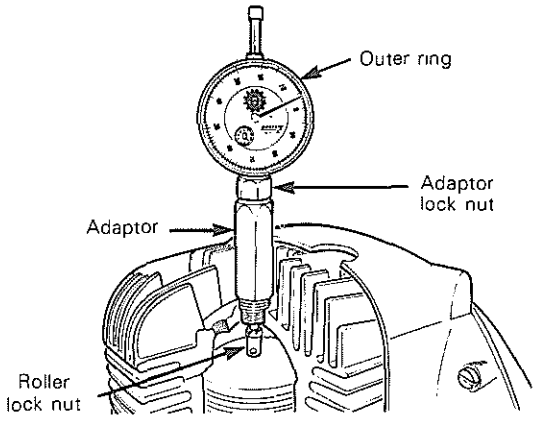
1. Disconnect spark plug wire and remove spark plug.
2. Remove rewind starter assembly from engine then remove the starting pulley from magneto ring.
3. Rotate crankshaft until breaker points, visible through magneto ring opening, are fully open. Adjust points gap to 0.35 mm ± 0.05 (.014" ± .002) using a feeler gauge and screwdriver as illustrated.

NOTE: Breaker points gap can change upon tightening. Always recheck after tightening.



4. Disconnect junction block at engine then connect one lead of a timing instrument (flashlight type) or tone timer, to the blue wire coming from engine. Connect other wire to ground (metallic portion of the engine).
5. Install and adjust T.D.C. gauge on engine as follows:

- Rotate magneto clockwise until piston is just before top dead center.
- With gauge in adaptor, adjust roller so that it is parallel with dial face. Tighten roller lock nut.



- Loosen adaptor lock nut then holding gauge with dial face toward magneto, screw adaptor in spark plug hole.
- Slide gauge far enough into adaptor to obtain a reading then finger tighten adaptor lock nut.
- Rotate magneto until piston is at Top Dead Center.
- Unlock outer ring of dial and turn it until "0" on dial aligns with pointer.
- Lock outer ring in position.

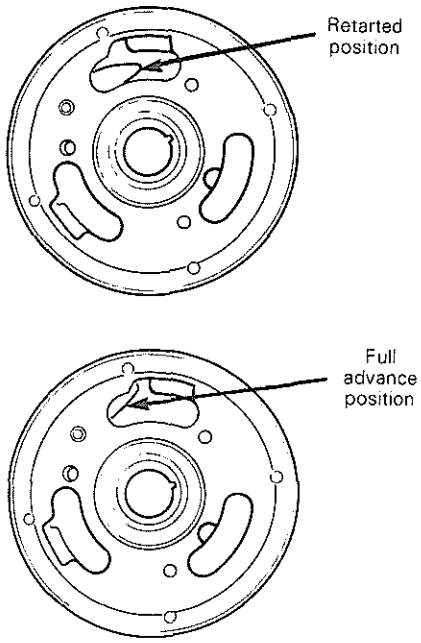
6. Slacken the three (3) armature plate retaining screws and turn timing instrument ON.
7. Rotate magneto counter-clockwise until piston is at

ENGINE TYPE	B.T.D.C.
247 (direct)	3.98 mm ± 0.25 (.157" ± .010)
277 (indirect)	2.60 mm ± 0.25 (.102" ± .010)

B.T.D.C.: before top dead center.

Slowly rotate armature plate until timing light fluctuates or until tone signal sound level varies. Retighten retaining screws.

NOTE: For 247 engine type, hold advance mechanism centrifugal lever in full advance position (toward magneto rim).



NOTE: Ignition timing can change upon tightening. Always recheck after tightening.

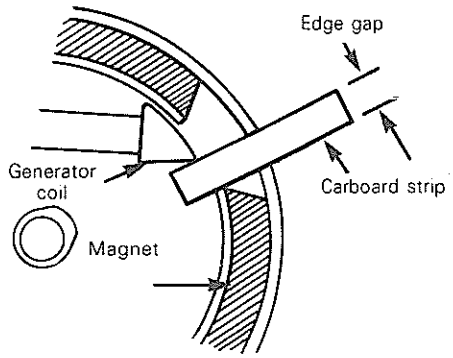
EDGE GAP VERIFICATION

By following either of the two procedures herein mentioned the edge gap will automatically be adjusted. However, if the edge gap is to be verified, proceed as follows:

From timing marks, rotate magneto clockwise $\frac{1}{4}$ of a turn, **(for 247 engine type hold advance mechanism centrifugal weight in full advance position (toward magneto rim))**, then slowly turn magneto back counter-clockwise until timing light fluctuates or until tone signal sound level increases.

At this point check the distance between generator coil end and magnet (edge gap), with a cardboard strip of appropriate width.

ENGINE TYPE	
247	7 – 10 mm (.275 – .394")
277	8 – 12 mm (.315 – .472")



If edge gap is more or less than specified, the problem lies with engine internal components (crankshaft out of alignment, broken Woodruff key, loose breaker cam, etc.); corrective measures should be applied.

IGNITION TIMING — TWO CYLINDER ENGINES (377, 444, 464, 503, 640 TYPES)

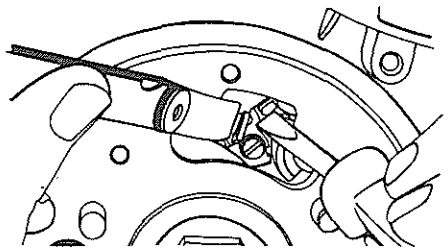
Two methods are detailed in this section; the first using the timing marks stamped on the engine, the second using a Top Dead Center gauge.

TIMING MARKS PROCEDURE

1. Disconnect spark plug wires and remove spark plugs.
2. Remove rewind starter assembly from engine then remove the fan protector, starting pulley and "V" belt.

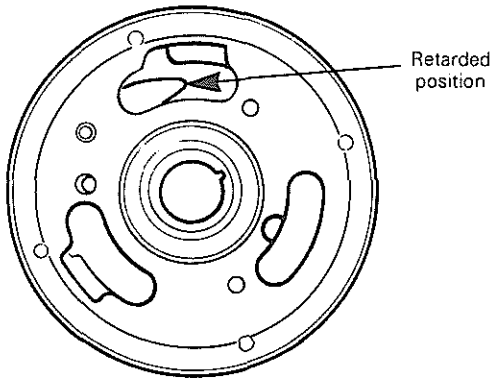
NOTE: The **upper** breaker point controls the timing of the **magneto side** piston and the **lower** breaker point controls the **P.T.O. side** piston.

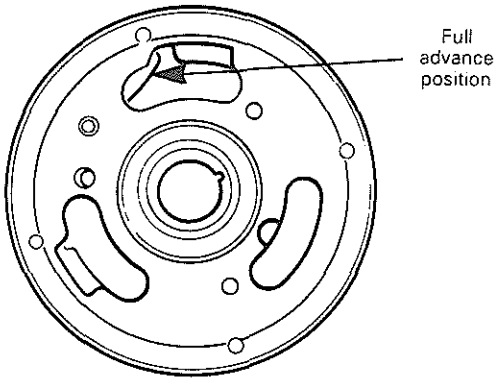
3. Rotate crankshaft until breaker points, visible through magneto ring opening, are fully opened. Adjust points setting to 0.35 mm ± 0.05 (.014" ± .002) using a feeler gauge and screwdriver, as illustrated. Repeat procedure for other point. **Adjust both sides equally.**



NOTE: Breaker points gap can change upon tightening. Always recheck after tightening.

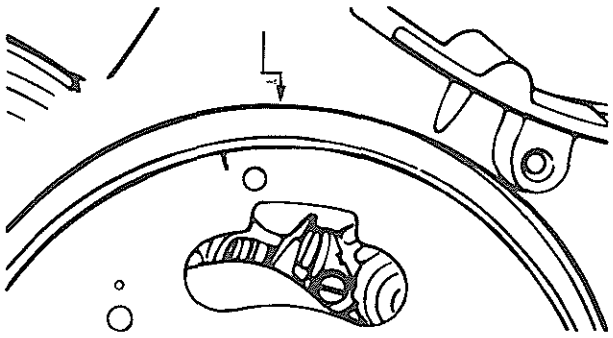
4. Disconnect junction block at engine then connect one lead of a timing light (flashlight type) or of a tone timer, to the blue wire (mag. side) leading from engine. Connect other wire to ground (metallic portion of the engine).
5. Slacken the two (2) armature plate retaining screws and turn timing instrument ON. Rotate crakshaft until mag. side piston approaches top dead center and timing marks align **(for 640 engine type, hold centrifugal advance mechanism in full advance position).**



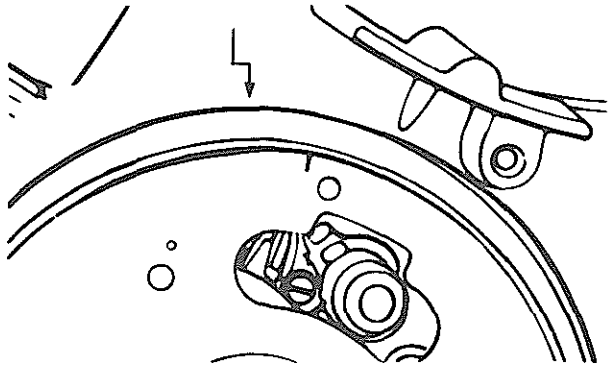


Rotate armature plate until timing light fluctuates or tone signal level varies. Retighten retaining screws.

6. Ignition timing can change upon tightening therefore, rotate the magneto counter-clockwise $\frac{1}{4}$ of a turn and slowly turn the magneto back in a clockwise direction. As soon as the timing marks align the timing light should fluctuate, or the tone signal level should vary. Readjust if necessary.

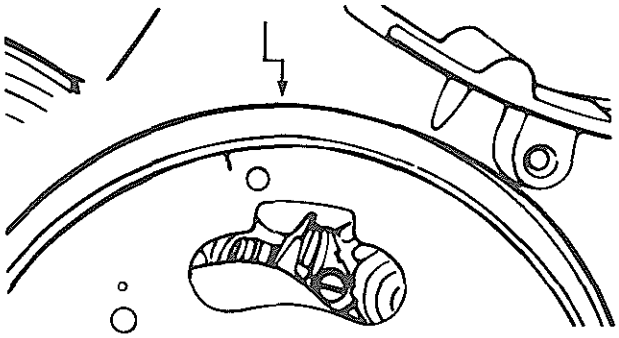


Too early: Turn armature plate clockwise

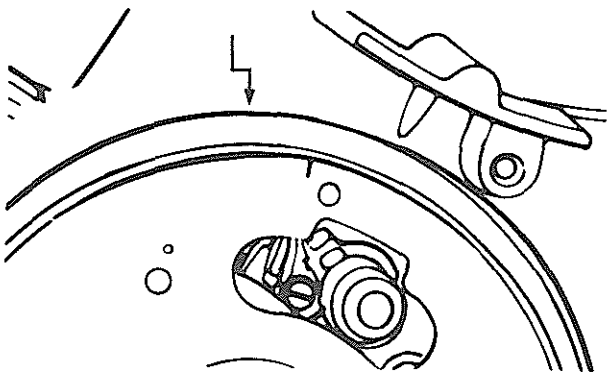


Too late: Turn armature plate counter-clockwise

7. Disconnect timing instrument wire from blue wire then reconnect it to the blue/red wire (P.T.O. side) leading from engine. Rotate crankshaft until P.T.O. side piston approaches top dead center. As soon as timing marks align, timing light should fluctuate, or tone signal sound level should vary. If necessary to adjust, proceed as follows:
   - If timing is too early decrease breaker points gap toward lower limit, i.e. 0.30 mm (.012"), then recheck timing.
   - If timing is too late increase breaker points gap toward upper limit, i.e. 0.40 mm (.016"), then recheck timing.



Too early: Decrease points gap



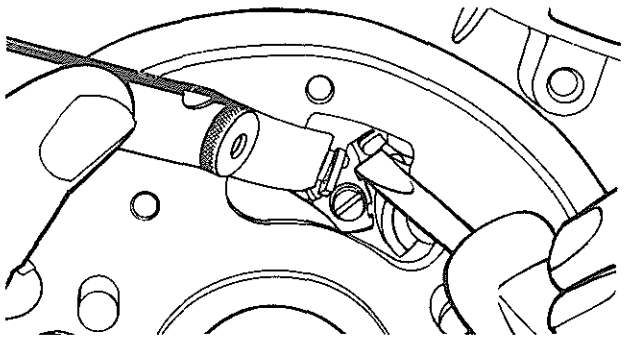
Too late: Increase points gap

TDC GAUGE PROCEDURE

1. Disconnect spark plug wires and remove spark plugs.
2. Remove rewind starter assembly from engine then remove the fan protector, starting pulley and "V" belt.

   NOTE: The **upper** breaker point controls the timing of the **magneto side** piston and the **lower** breaker point control the **P.T.O. side** piston.
3. Rotate crankshaft until breaker points, visible through magneto ring opening are fully open. Adjust points setting to 0.35 mm ± 0.05 (.014" ± .002) using a feeler gauge and screwdriver, as illustrated.

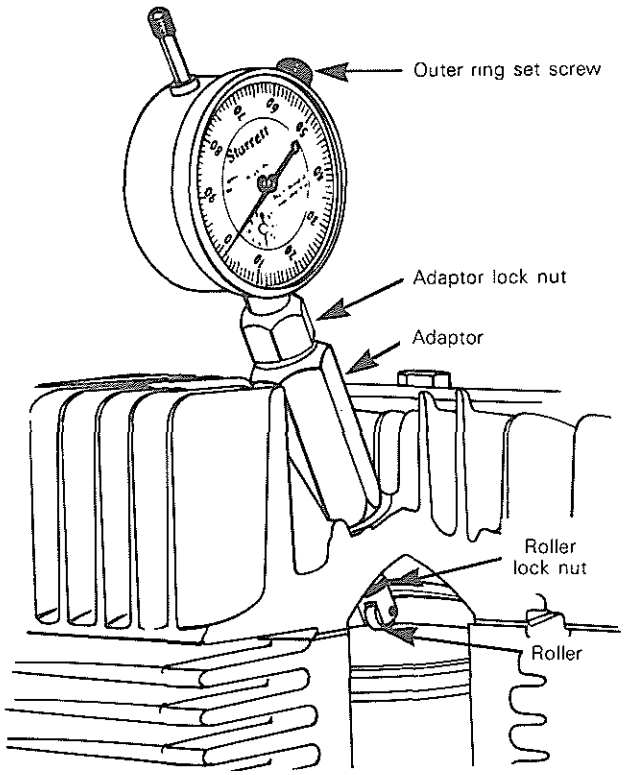
   Repeat procedure for other point. **Adjust both side equally.**



NOTE: Breaker points gap can change upon tightening. Always recheck after tightening.

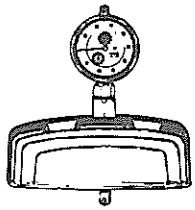
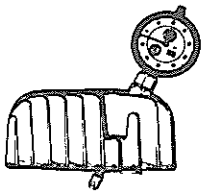
4. Disconnect junction block at engine then connect one lead of a timing light (flashlight type) or a tone timer, to the blue wire (mag. side) leading from engine. Connect other wire to ground (metallic portion of the engine).
5. Install and adjust T.D.C. gauge on engine as follows.
   - Rotate magneto until mag. side piston is just before top dead center.

- With gauge in adaptor, adjust roller so that it is parallel with dial face. Tighten roller lock nut.



- Loosen adaptor lock nut then holding gauge with dial face toward magneto, screw adaptor in mag. side spark plug hole.
- Slide gauge far enough into adaptor to obtain a reading then finger tighten adaptor lock nut.
- Rotate magneto until mag. side piston is at top dead center.
- Unlock outer ring of dial and turn it until "O" on dial aligns with pointer.
- Lock outer ring in position.

6. Slacken the two (2) armature plate retaining screws and turn timing instrument ON.
   - Rotate magneto counter-clokwise until specified piston position before top dead center is reached.

Engine type	Direct measurement B.T.D.C. 	Indirect measurement B.T.D.C. 
377	2.07 mm ± 0.25 (.081" ± .010)	N.A.
444	2.35 mm ± 0.25 (.093" ± .010)	N.A.
464	2.07 mm ± 0.25 (.081" ± .010)	N.A.
503	2.07 mm ± 0.25 (.081" ± .010)	N.A.
640	N.A.	3.62 mm ± 0.25 (.143" ± .010)

Slowly rotate armature plate until timing light fluctuates or until tone signal sound level varies. **(For 640 engine type, hold advance mechanism centrifugal lever in full advance position.)** Retighten retaining screws.

NOTE: Ignition timing can change upon tightening. Always recheck after tightening.

7. Disconnect timing instrument wire from blue wire then reconnect it to the blue/red wire leading from engine. Remove T.D.C. gauge from mag. side and reinstall it on P.T.O. side, as previously detailed.
8. Rotate crankshaft until P.T.O. piston approaches T.D.C. As soon as **same** specified piston position before top dead center as on mag. side is reached the timing light should fluctuate or tone signal level vary. **(for 640 engine type, hold advance mechanism in full advance position).**

   If necessary to adjust, proceed as follows.

With piston at specified position, slacken lower breaker point retaining screw then readjust breaker points gap until fluctuates or tone signal level varies.

- If timing is too early decrease breaker points gap toward lower limit, i.e. 0.30 mm (.012"), then recheck timing.
- If timing is too late increase breaker points gap toward upper limit, i.e. 0.40 mm (.016"), then recheck timing.

NOTE: Breaker points gap can change upon tightening. Always recheck after tightening.

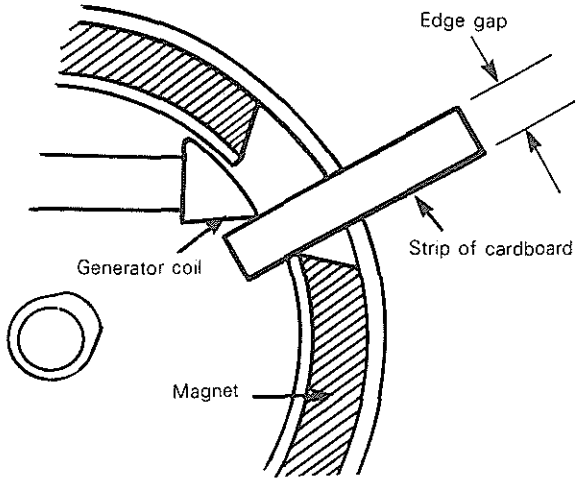
EDGE GAP VERIFICATION

By following either of the procedures mentioned herein the edge gap will automatically be adjusted. However, if the edge gap is to be verified, proceed as follows:

- From timing marks, rotate magneto clockwise $\frac{1}{4}$ of a turn, then slowly turn magneto back counterclockwise until timing light fluctuates or until tone signal sound level varies **(for 640 engine type, hold advance mechanism in full advance position).**

  At this point check the distance between generator coil end and magnet (edge gap), with a strip cardboard of appropriate width. (Refer to the following table.)

Engine type	Edge gap
377, 444, 464, 503	8 – 12 mm (.315 – .472")
640	7 – 10 mm (.275 – .394")



If edge gap is more of less than specified, the problem lies within engine internal components (crankshaft out of alignment, broken Woodruff key, loose breaker cam, etc.). Corrective measures should be applied.

C.D. IGNITION — 354-454 ENGINE TYPES

FOREWORD

On models equipped with a C.D. ignition system, plug firing is initiated by an electrical pulse. This pulse is released when a metal projection on the flywheel hub rotates near the trigger coil. Therefore, timing must be performed while the engine is running.

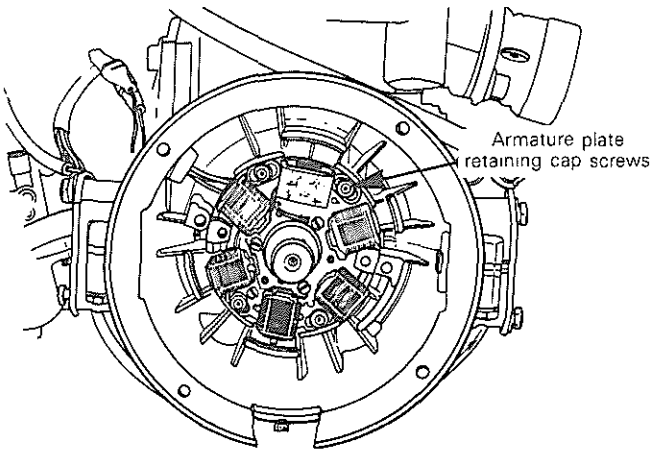
A stroboscopic timing light such as Sun PTL 45, Snap-On MT215B, Bosch EFAW 169A, or a suitable equivalent, plus a 12 volt battery are needed.

IGNITION TIMING

Timing procedure for this engine type is composed of **four main phases,** all being equally important:

1. **Position of the armature plate.**
2. **Position of the timing marks on magneto ring.**
3. **Air gap between trigger coil and magneto ring.**
4. **Timing verification using a stroboscopic timing light.**

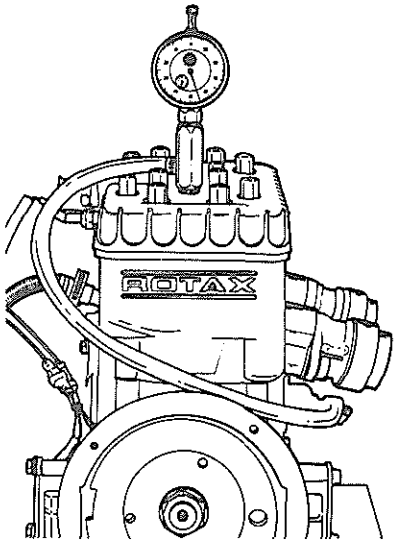
1. To obtain best generator coil performance, position the armature plate on the crankcase with the retaining cap screws in the middle of the plate slots.

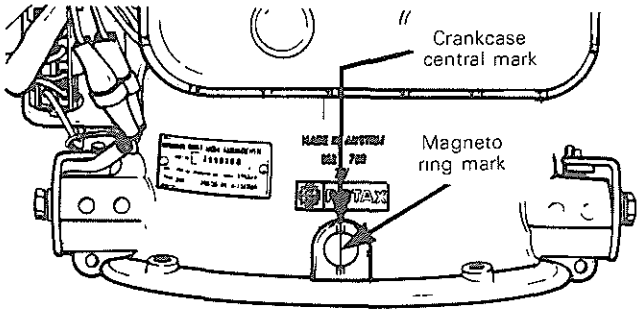


CAUTION: When assembling magneto ring on crankshaft, clean crankshaft extension (cone) and threads. Apply "Loctite 242" (no. 413 7025) on cone and threads. Torque bolt to 80 N•m (60ft-lbs).

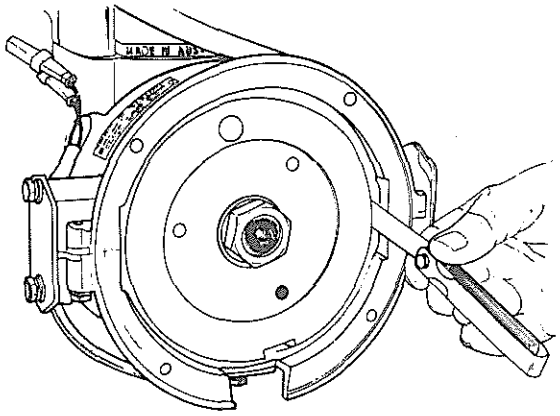
2. Check the position of the timing marks (for each cylinder) on magneto ring: repunch if necessary.

   With the piston positioned at 1.40 mm (.055") B.T.D.C., magneto ring mark should align with central mark on crankcase (around timing hole).





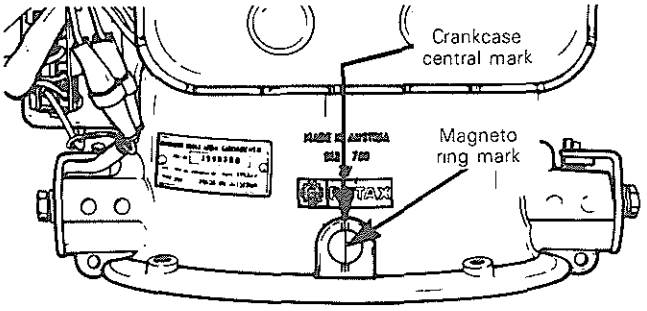
3. Check air gap between magneto ring and trigger coil. The gap should be 0.8 to 1.2 mm (.031 to .047").



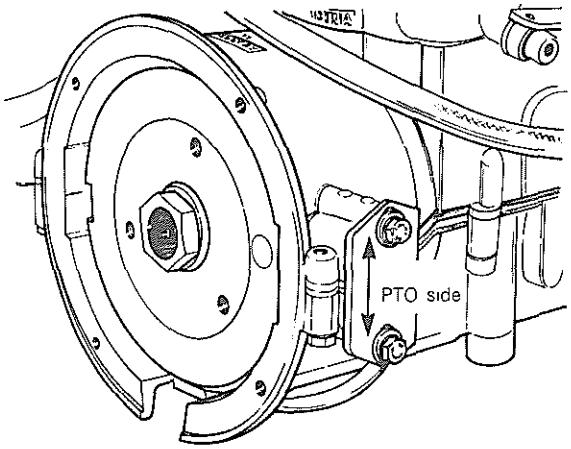
4. Check timing using a stroboscopic timing light (on each cylinder).

WARNING: Place ski tips against the wall, raise rear of vehicle so the track is not in contact with the ground and place it on a stand equipped with a protector. Make sure nobody passes behind the vehicle during timing procedure.

Magneto ring mark and crankcase central mark should align at 6500 RPM.

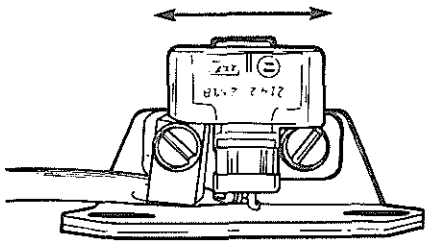


If necessary to adjust: unscrew slightly the two (2) screws holding trigger coil bracket, then move bracket up or down.



NOTE: Carburetor side trigger coil controls magneto side ignition and exhaust side trigger coil controls P.T.O. side ignition.

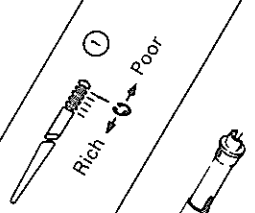
If correct timing is impossible with trigger coil braket travel, stop engine, remove bracket from crankcase and relocate the trigger coil on its bracket.



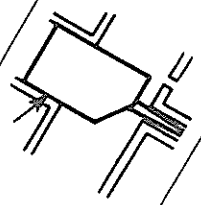
CARBURETOR SPECIFICATIONS

MODEL	ENGINE TYPE	CARBURETOR TYPE Mikuni	LOW SPEED ADJ ± ⅛	IDLE SPEED R.P.M.
ELAN & SPIRIT	247	VM28-242	1½ turn	1100-1300
CITATION 3500, MIRAGE I	277	VM34-228	1½ turn	1100-1300
CITATION 4500/E, MIRAGE II/E	377	VM34-229	1 turn	2000
CITATION SS, MIRAGE SPECIAL	377	2XVM30-111	1½ turn	1800-2000
EVEREST 500/E FUTURA 500/E	503	VM36-83	1 turn	1800-2000
EVEREST LC, FUTURA LC	464	VM34-227	1½ turn	2000
BLIZZARD 5500 GRAND PRIX SPECIAL	503	2XVM34-203	1½ turn	1800-2000
BLIZZARD 7500 SUPER SONIC	354	MAG: VM34-230 PTO: VM34-233	1½ turn	1800-2000
BLIZZARD 9500 ULTRA SONIC	454	PTO: VM36-88 MAG: VM36-86	1 turn	1800-2000
ALPINE 640ER	640	VM34-215	1½ turn	1800-2000
ELITE 450 LC	444	VM34-201	1 turn	1800-2000

CARBURETOR	MAIN JET	NEEDLE	NEEDLE JET ①	CUTAWAY	PILOT JET	AIR SCREW ② ± ⅛
VM28-242	160	6DP1-3	182-0-8	2.0	30	1½ turn
VM30-111	150	6DH7-3	159 P-0	3.0	40	1½ turn
VM34-201	370	6EJ1-3	159 P-2	2.5	30	1 turn
VM34-203	220	6DH2-3	159 P-4	3.0	35	1½ turn
VM34-215	280	6F9-3	159 P-2	2.0	30	1½ turn
VM34-227	380	6EJ1-3	159 P-4	3.0	40	1½ turn
VM34-228	220	6DH4-3	159 P-2	3.0	30	1½ turn
VM34-229	280	6DH4-3	159 P-0	3.0	35	1 turn
VM34-230	290	6DH4-3	159 P-4	3.5	40	1½ turn
VM34-233	260	6DH4-3	159 P-4	3.5	40	1½ turn
VM36-83	310	6F9-3	159 P-8	3.0	40	1 turn
VM36-86	320	6DH4-3	159 P-2	3.5	40	1 turn
VM36-88	300	6DH4-3	159 P-2	3.5	40	1 turn





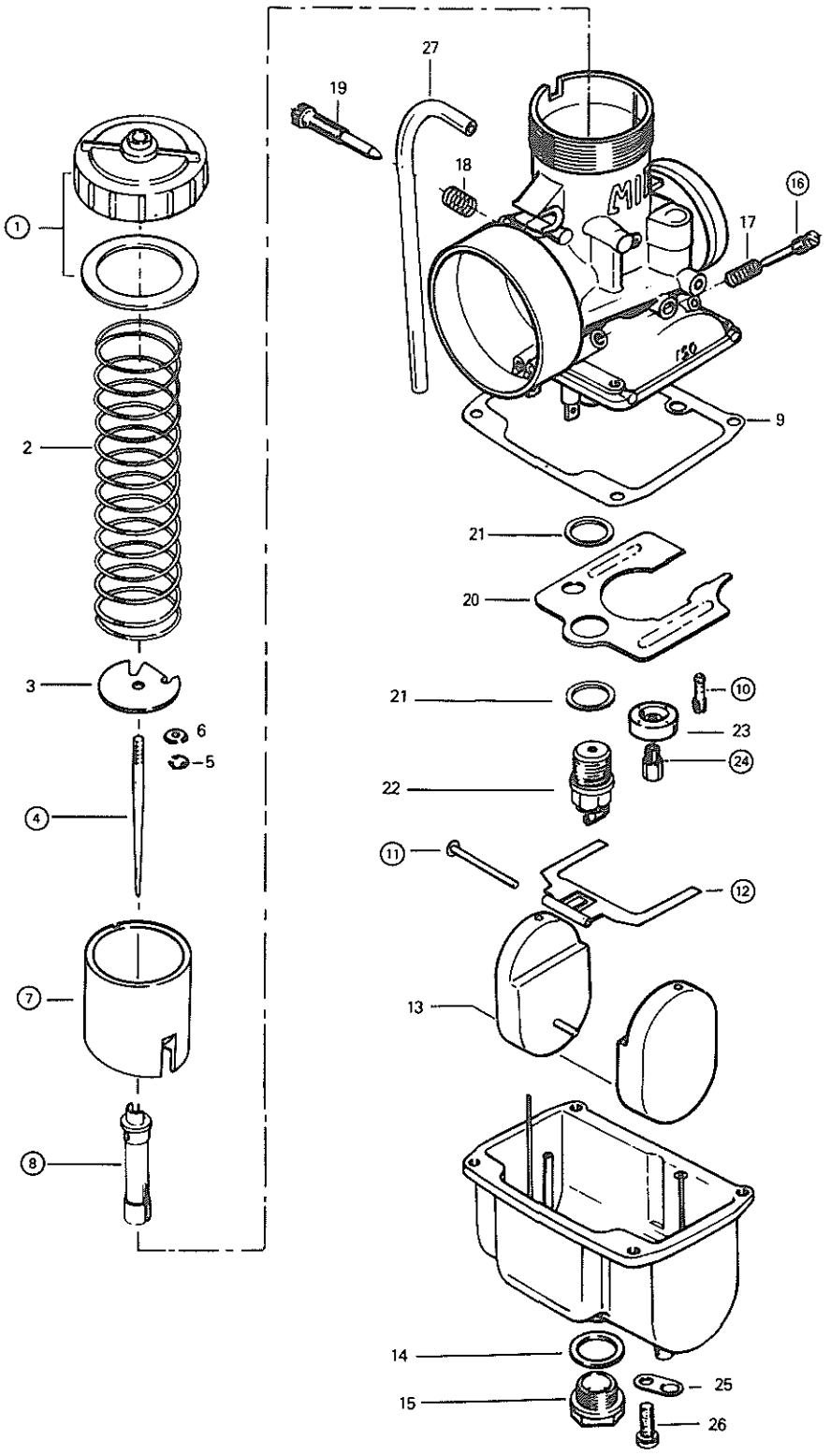




① Jet needle last digit indicates "E" clip position from top. Ex.: 6HD2-3: 3rd slot from top.

② Turning clockwise will enrich the mixture and counterclockwise will lean it.

MIKUNI CARBURETOR



1. *Cover*
2. *Spring (throttle valve)*
3. *Needle retainer plate*
4. *Jet needle*
5. *Circlip*
6. *Packing*
7. *Throttle valve*
8. *Needle*
9. *Gasket*
10. *Pilot jet*
11. *Float arm pin*
12. *Float arm*
13. *Float*
14. *O'ring*
15. *Plug screw*
16. *Idle screw*
17. *Spring*
18. *Spring (throttle stop screw)*
19. *Throttle stop screw*
20. *Baffle plate*
21. *Washer*
22. *Needle valve*
23. *Baffle ring*
24. *Main jet*
25. *Tube retainer plate*
26. *Screw and lockwasher*
27. *Vent tube*

REMOVAL

Remove air silencer box, fuel inlet line and primer line.

Unscrew carburetor cover then pull out throttle slide ass'y from carburetor.

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

Untighten rubber flange clamp then remove carburetor from engine.

CLEANING & INSPECTION

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

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

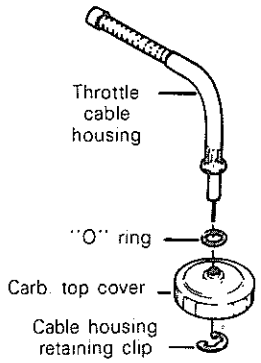
WARNING: Solvent with a low flash point such as gasoline, naphtha, benzol, etc., should not be used as they are flammable and explosive.

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

Check throttle slide for wear. Replace as necessary.

DISASSEMBLY & ASSEMBLY

①Carburetor cover and throttle cable used in 1980 are of the following type:



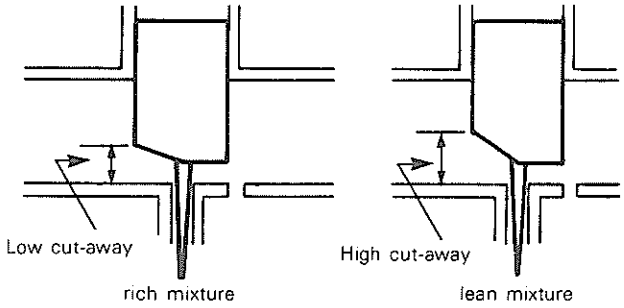
④⑧⑩⑯㉔Refer to Technical Data for exact calibration of carburetor.

④The position of the needle in the throttle slide is adjustable by means of an "E" clip inserted into one of 5 grooves located on the upper part of the needle. Position 1 is the leanest, 5 the richest.

Example: 6DH4 - 2

Needle identification — Position of the "E" clip from top.

⑦The size of the throttle slide cut-away affects the fuel mixture between 0 to $\frac{3}{4}$ throttle opening. A certain amount of richness is needed for that particular range because this is where the transition from the low speed to the high speed circuit takes place.



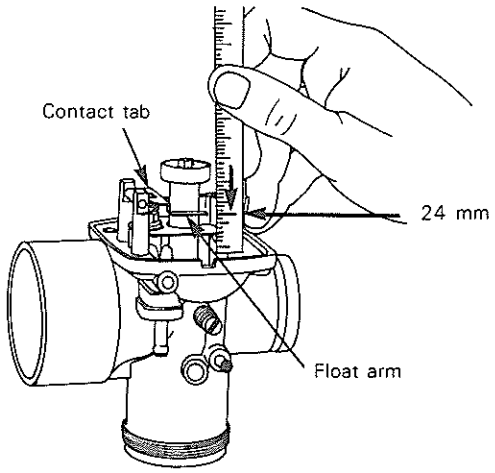
㉔The main jet installed in the carburetor is suitable for a wide range of temperature (-30° to 5°C/-20° to 40°F) at sea level. However, different jetting is available. Always check spark plug tip color to find out correct jetting.

⑪⑫Correct fuel level in float chamber is vital toward maximum engine efficiency. To check for correct level, proceed as follows:

— Remove float chamber and gasket from carburetor.

— With carburetor chamber upside-down, measure height between float chamber flange rib and top edge of float arm.

— To adjust bend contact tab of float arm until a height of 24 mm (.945") is reached.



INSTALLATION

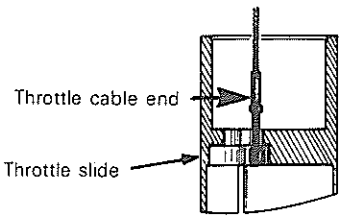
To install carburetor(s) on engine, inverse removal procedure.

However, pay attention to the following:

— Apply a thin layer of silicone sealant between carburetor rubber flange and intake cover on engine.

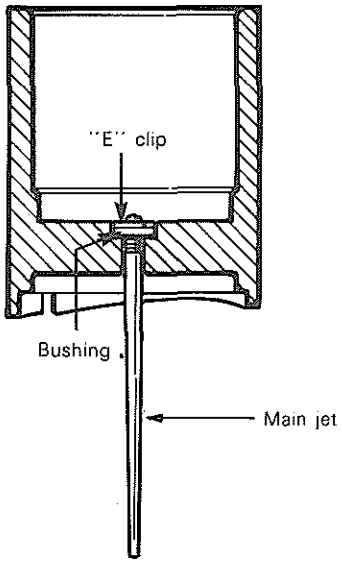
— Apply Loctite Lock'n Seal 242 on bolts retaining rubber flange to intake cover.

— When installing throttle cable end in throttle slide, hook up cable by using the stopper at the extremity of the cable.



Mikuni carburetors are equipped with a new throttle slide. The new design has a deeper "E" clip seat, to permit the installation of a nylon bushing between the "E" clip and its seat.

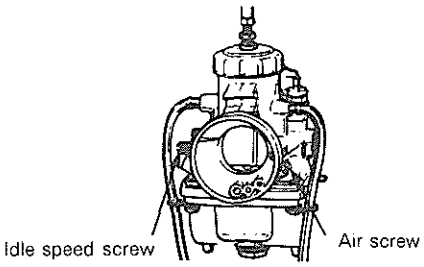
NEW DESIGN



Make sure the bushing is installed on all applicable throttle slides.

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

CARBURETOR ADJUSTMENTS



Air Screw Adjustment

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

Throttle Slide Adjustment

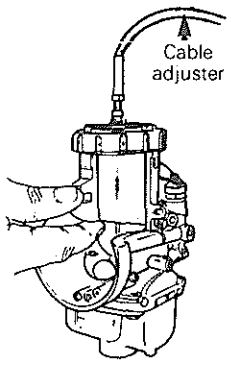
WARNING: Ensure the engine is turned **OFF**, prior to the throttle slide adjustment.

With the throttle cable adjuster jam nut unlocked, press the throttle lever against the handle grip.

By turning the cable adjuster, adjust the carburetor slide cut away so that it is flush with the top of the carburetor bore.

Tighten the cable adjuster jam nut.

Release the throttle lever.



CAUTION: On twin carburetor models, make sure both carburetors start to operate simultaneously.

WARNING: It is important that the throttle slide adjustment be performed to ensure proper functioning of throttle mechanism.

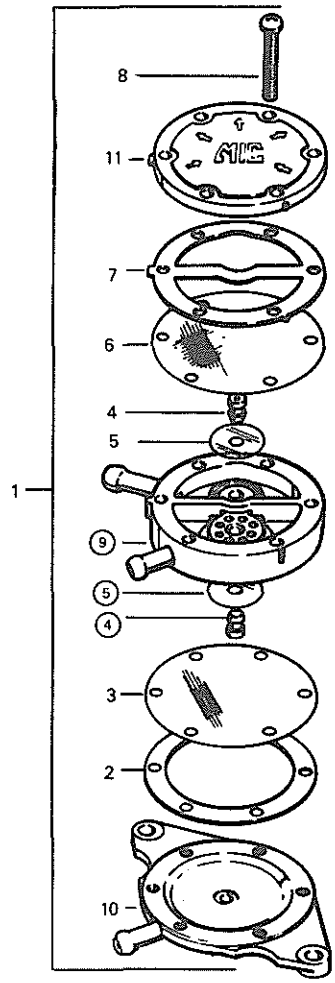
Idle Speed Adjustment

Turn idle speed screw clockwise until it contacts the throttle slide then continue turning two (2) additional turns.

This will provide a preliminary idle speed setting. Start engine and allow it to warm up then adjust idle speed to specifications by turning idle speed screw clockwise or counter-clockwise.

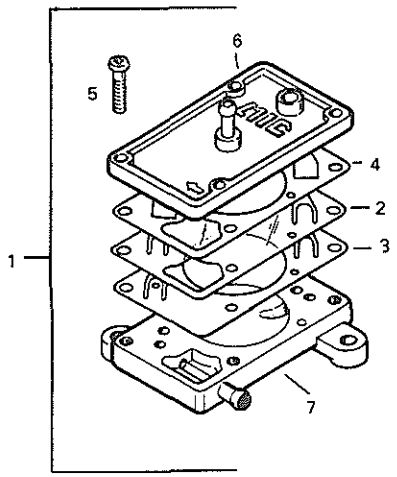
CAUTION: Do not attempt to set the idle speed by using the air screw. Severe engine damage can occur.

MIKUNI FUEL PUMP



TWO OUTLETS
PUMP

1. *Fuel pump assembly*
2. *Packing*
3. *Diaphragm*
4. *Grommet*
5. *Valve*
6. *Diaphragm*
7. *Packing (cap)*
8. *Screw*
9. *Pump body*
10. *Pulse chamber*
11. *Cover*



ONE OUTLET
PUMP

1. *Fuel pump assembly*
2. *Diaphragm*
3. *Membrane*
4. *Packing (cap)*
5. *Screw*
6. *Cover*
7. *Pulse chamber*

REMOVAL

— Disconnect fuel inlet line at fuel pump then secure fuel line to steering support so that the open end is located higher than the fuel tank.

— Disconnect fuel outlet line(s).

— Disconnect pulsation line.

— Remove nuts and bolts securing fuel pump.

DISASSEMBLY & ASSEMBLY

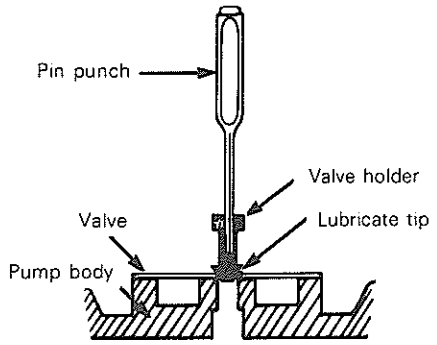
④⑤⑨ Do not disassemble valve unless replacement is indicated.

To install a new valve, proceed as follows:

— Place new valve flat on its seat.

— Insert a 3/32" pin punch inside valve holder and lubricate tip of holder with a drop of oil.

— Push holder into carburetor body as illustrated.



CLEANING & INSPECTION

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

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

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

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

Check fuel pump valves operation as follows:

Connect a length of clean plastic tubing to the inlet nipple and alternately apply pressure and vacuum with the mouth. The inlet valve should release with pressure and hold under vacuum.

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

○ NOTE: On model fitted with two outlets, plug one outlet with finger while checking outlet valve.

INSTALLATION

To install, inverse removal procedure.

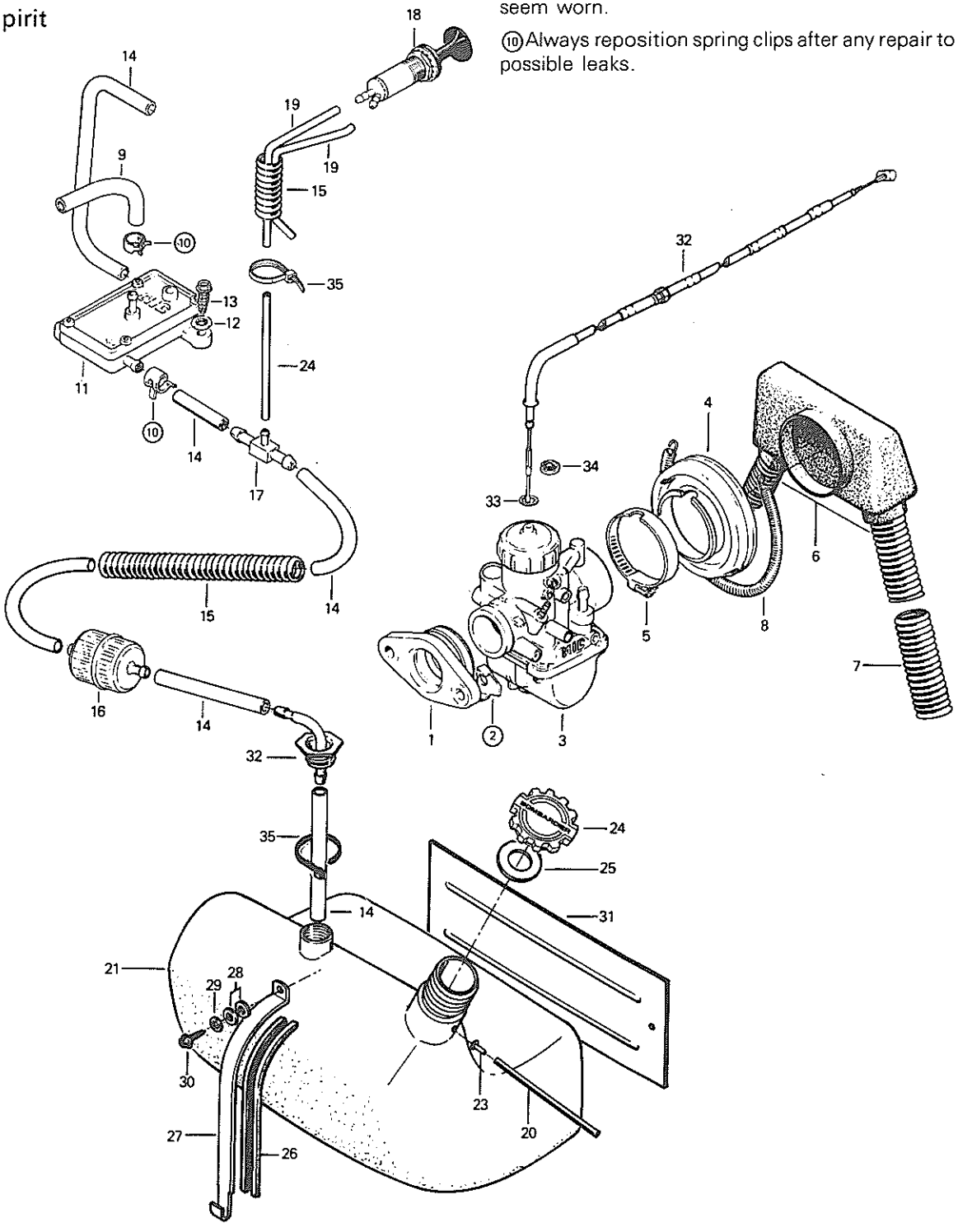
AIR INTAKE SILENCER AND FUEL TANK

AIR INTAKE SILENCER AND FUEL TANK

Elan
Spirit

(2) Always bend lock tabs over screws and replace if they seem worn.

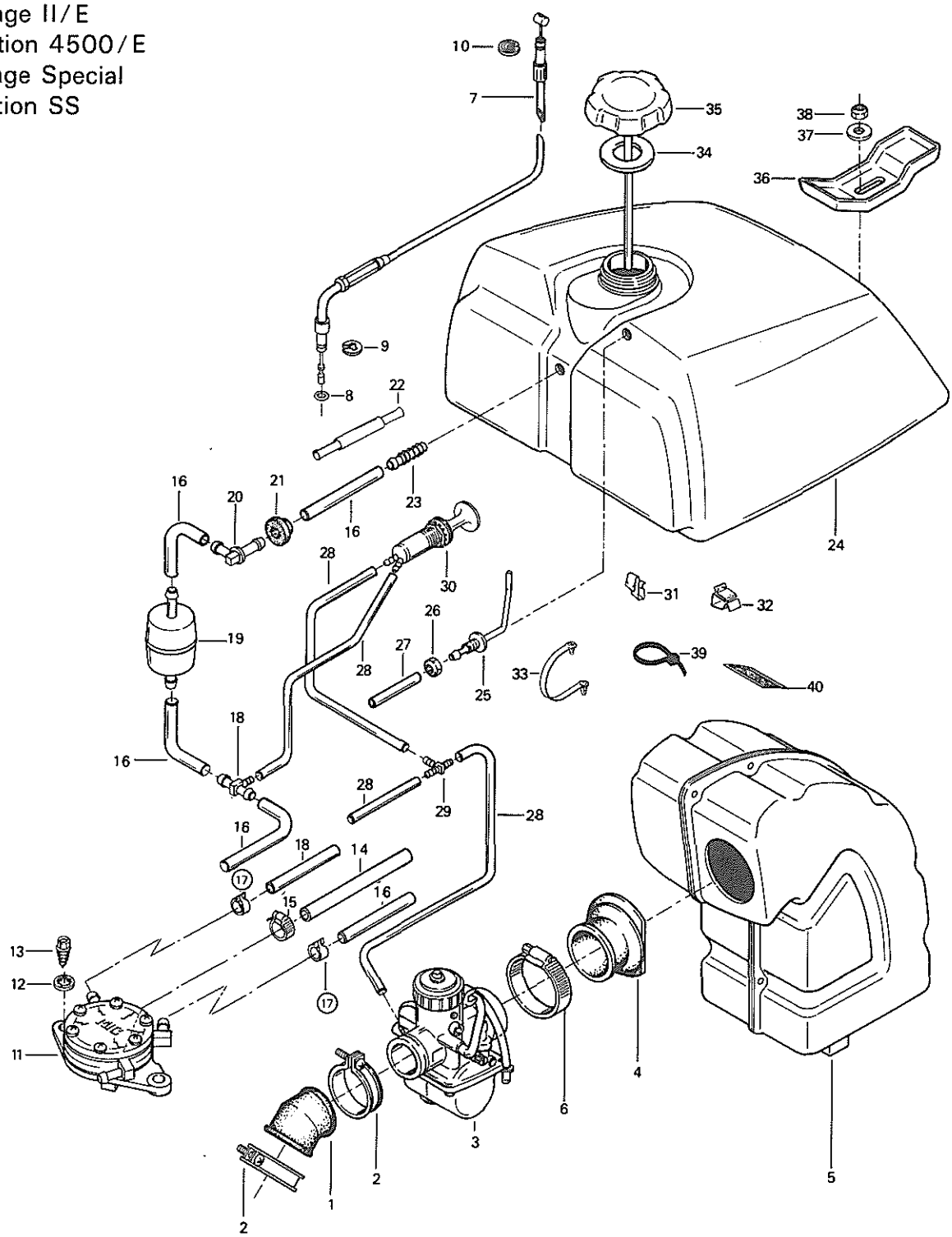
(10) Always reposition spring clips after any repair to prevent possible leaks.



1. *Rubber flange*
2. *Lock tab*
3. *Carburetor*
4. *Rubber flange*
5. *Clamp*
6. *Air intake box*
7. *Tube*
8. *Spring*
9. *Impulse hole*
10. *Spring clip*
11. *Fuel pump*
12. *Lockwasher*
13. *Metal screw*
14. *Fuel line*
15. *Isolating line*
16. *Fuel filter*
17. *Tee fitting*
18. *Primer valve*
19. *Primer tube*
20. *Air vent tube*
21. *Fuel tank*
22. *Connector*
23. *Fitting*
24. *Fuel tank cap*
25. *Gasket*
26. *Protector stripe*
27. *Retainer stripe*
28. *Rubber spacer*
29. *Flat washer*
30. *Screw*
31. *Heat shield*
32. *Throttle cable and housing*
33. *O'ring*
34. *Retainer ring*
35. *Cable tie*

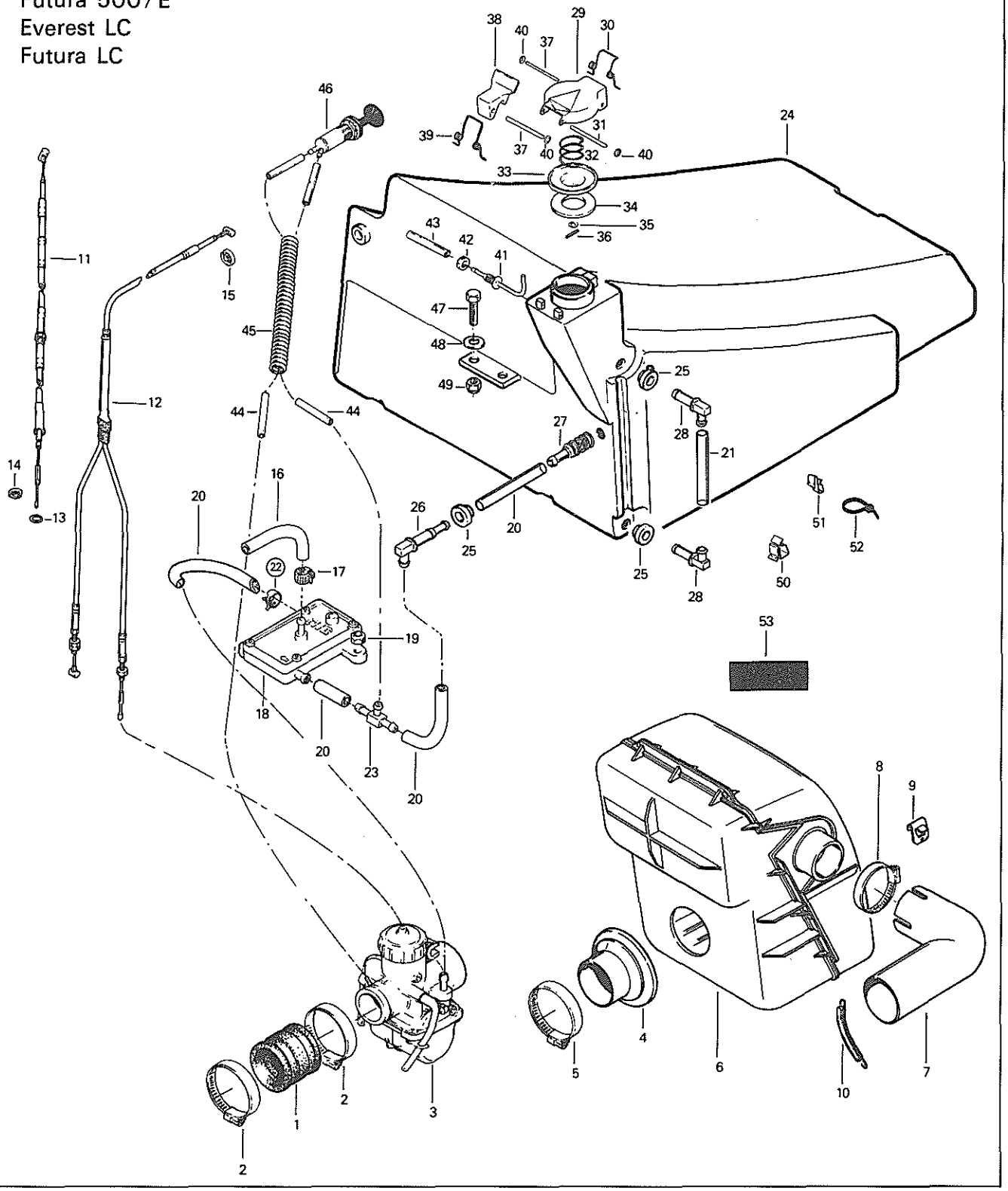
Mirage I
Citation 3500
Mirage II/E
Citation 4500/E
Mirage Special
Citation SS

⑰ Always reposition spring clips after any repair to prevent possible leaks.



1. *Rubber flange*
2. *Clamp*
3. *Carburetor*
4. *Adaptor*
5. *Air silencer*
6. *Clamp*
7. *Throttle cable and housing*
8. *O'ring*
9. *Retainer ring*
10. *Circlip*
11. *Fuel pump*
12. *Lockwasher*
13. *Screw*
14. *Impulse hose*
15. *Clip*
16. *Fuel line*
17. *Clip*
18. *Tee fitting*
19. *Fuel filter*
20. *Connector*
21. *Grommet*
22. *Tube*
23. *Fuel filter*
24. *Fuel tank*
25. *Fitting*
26. *Nut*
27. *Air vent tube*
28. *Primer tube*
29. *Tee fitting*
30. *Primer valve*
31. *Clip*
32. *Clip*
33. *Cable clip*
34. *Gasket*
35. *Cap*
36. *Retainer*
37. *Flat washer*
38. *Stop nut*
39. *Cable tie*
40. *Warning label*

Everest 500/E
Futura 500/E
Everest LC
Futura LC



1. *Rubber flange*
2. *Clamp*
3. *Carburetor*
4. *Adaptor*
5. *Gear clamp*
6. *Air silencer*
7. *Elbow*
8. *Clamp*
9. *Hook*
10. *Spring*
11. *Throttle cable (Everest 500/E, Futura 500/E)*
12. *Throttle cable (Everest LC, Futura LC)*
13. *O'ring*
14. *Retainer clip*
15. *Circlip*
16. *Impulse hose*
17. *Clamp*
18. *Fuel pump*
19. *Elastic stop nut*
20. *Fuel line*
21. *Fuel gauge*
22. *Spring clip*
23. *Tee connector*
24. *Fuel tank*
25. *Grommet*
26. *Connector*
27. *Fuel filter*
28. *Connector*
29. *Fuel tank cap*
30. *Spring*
31. *Pin*
32. *Release spring*
33. *Pressure pad*
34. *Gasket*
35. *O'ring*
36. *Roll pin*
37. *Roll pin*
38. *Lock*
39. *Spring*
40. *Push nut*
41. *Air vent fitting*
42. *Nut*
43. *Air vent tube*
44. *Primer tube*
45. *Isolating line*
46. *Primer valve*
47. *Cap screw*
48. *Flat washer*
49. *Elastic stop nut*
50. *Clip*
51. *Clip*
52. *Cable tie*
53. *Warning label*

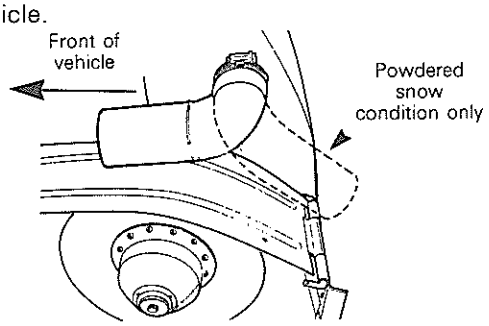
(22) Always reposition spring clips after any repair to prevent possible leaks.

AIR SILENCER

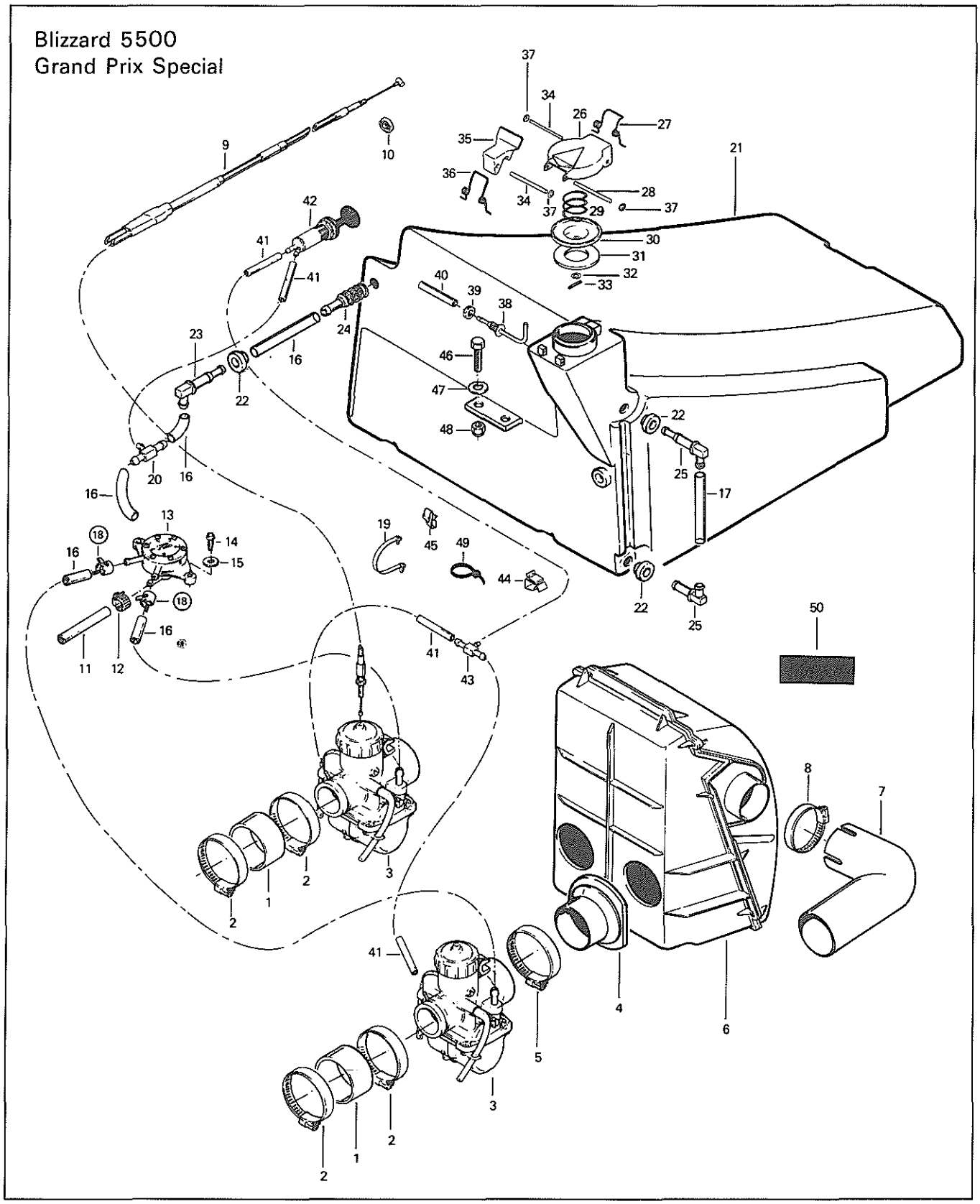
CAUTION: Never operate your snowmobile with the air intake silencer disconnected. Serious engine damage will occur if this notice is disregarded.

The air intake silencer elbow must always be turned to the front of the vehicle when operated in cold, warm temperature.

If the vehicle is to be operated in deep powdered snow it is recommended to turn the elbow towards the rear of the vehicle.



Blizzard 5500
Grand Prix Special



1. *Rubber flange*
2. *Clamp*
3. *Carburetor*
4. *Adaptor*
5. *Gear clamp*
6. *Air intake*
7. *Elbow*
8. *Clamp*
9. *Throttle cable and housing*
10. *Circlip*
11. *Impulse hose*
12. *Clamp*
13. *Fuel pump*
14. *Screw*
15. *Lock washer*
16. *Fuel line*
17. *Fuel gauge*
18. *Spring clip*
19. *Cable clip*
20. *Tee connector*
21. *Fuel tank*
22. *Grommet*
23. *Connector*
24. *Fuel filter*
25. *Connector*
26. *Fuel tank cap*
27. *Spring*
28. *Roll pin*
29. *Spring*
30. *Pressure pad*
31. *Gasket*
32. *O'ring*
33. *Roll pin*
34. *Pin*
35. *Lock*
36. *Spring*
37. *Push nut*
38. *Air vent fitting*
39. *Nut*
40. *Air vent tube*
41. *Primer tube*
42. *Primer valve*
43. *Tee connector*
44. *Clip*
45. *Clip*
46. *Cap screw*
47. *Flat washer*
48. *Elastic stop nut*
49. *Cable tie*
50. *Warning label*

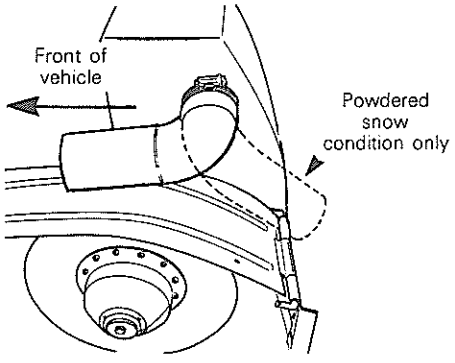
⑱ Always reposition spring clips after any repair to prevent possible leaks.

AIR SILENCER

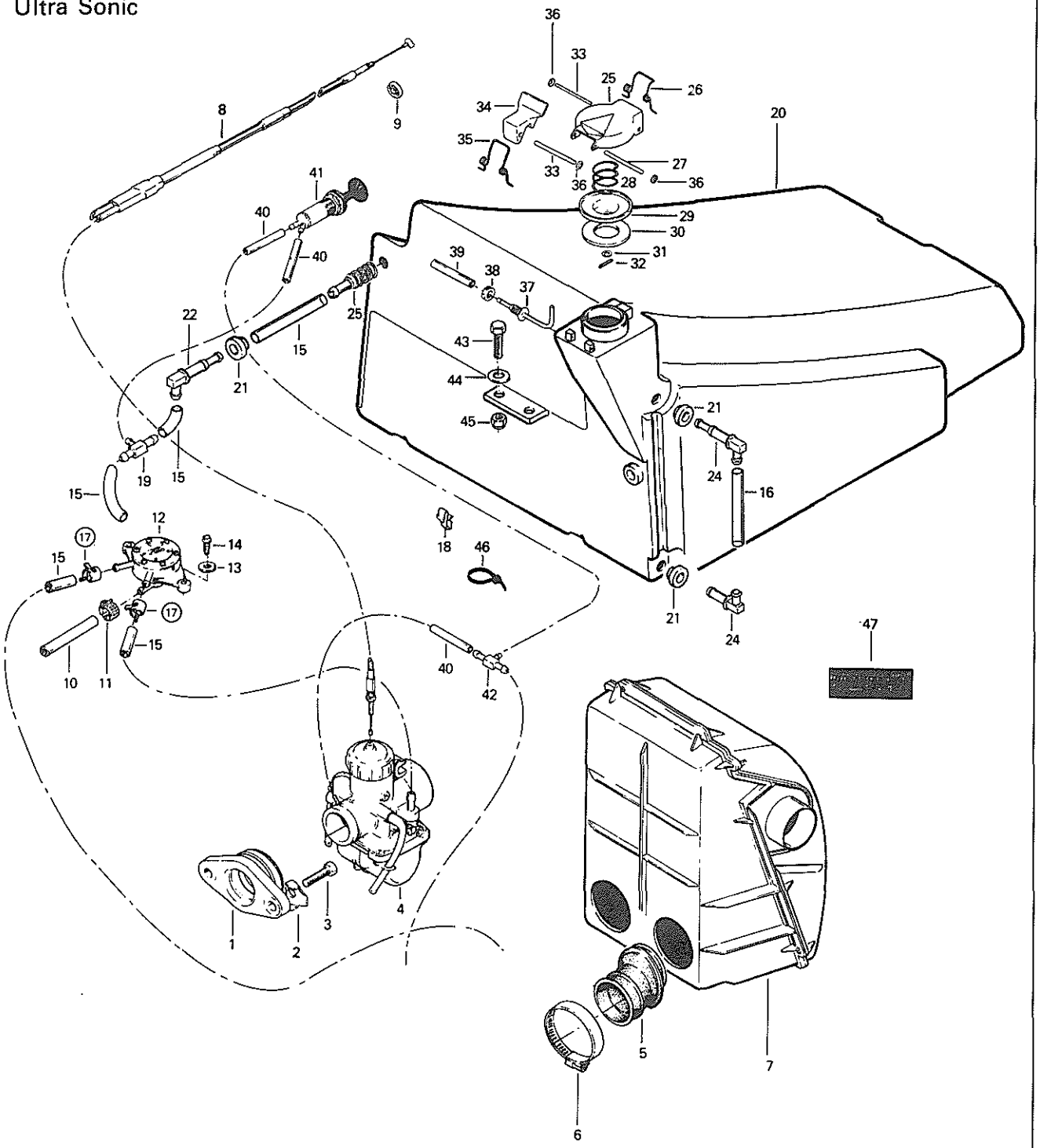
CAUTION: Never operate your snowmobile with the air intake silencer disconnected. Serious engine damage will occur if this notice is disregarded.

The air intake silencer elbow must always be turned to the front of the vehicle when operated in cold, warm temperature.

If the vehicle is to be operated in deep powdered snow it is recommended to turn the elbow towards the rear of the vehicle.

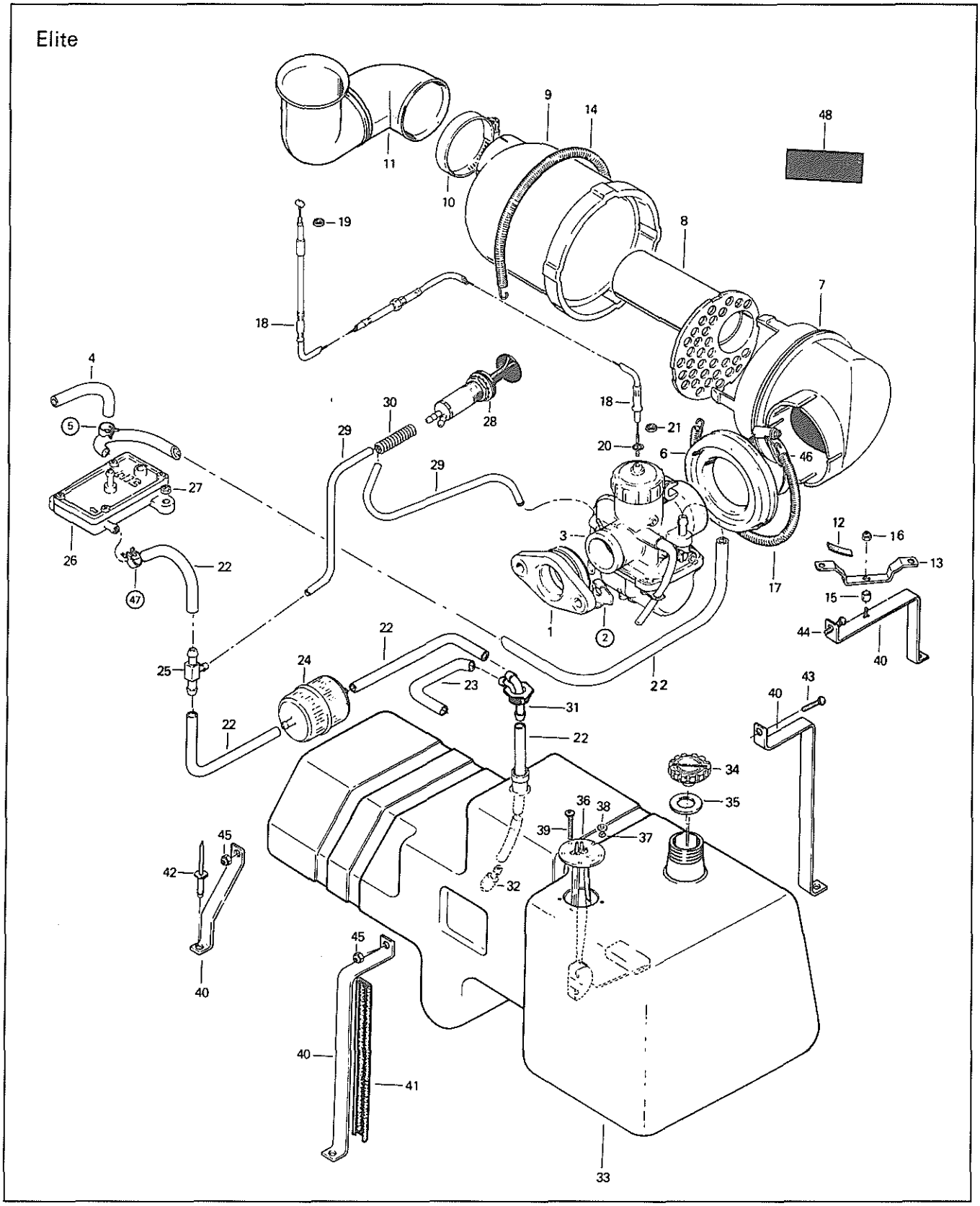


Blizzard 7500
Super Sonic
Blizzard 9500
Ultra Sonic



1. *Rubber flange*
2. *Lock tab*
3. *Cap screw*
4. *Carburetor*
5. *Adaptor*
6. *Gear clamp*
7. *Air silencer*
8. *Throttle cable and housing*
9. *Circlip*
10. *Impulse hose*
11. *Clamp*
12. *Fuel pump*
13. *Lock washer*
14. *Screw*
15. *Fuel line*
16. *Fuel gauge*
17. *Spring clip*
18. *Clip*
19. *Tee connector*
20. *Fuel tank*
21. *Grommet*
22. *Connector*
23. *Fuel filter*
24. *Connector*
25. *Fuel tank cap*
26. *Spring*
27. *Pin*
28. *Release spring*
29. *Pressure pad*
30. *Gasket*
31. *O'ring*
32. *Roll pin*
33. *Pin*
34. *Lock*
35. *Spring*
36. *Push nut*
37. *Air vent fitting*
38. *Nut*
39. *Air vent tube*
40. *Primer tube*
41. *Primer valve*
42. *Tee connector*
43. *Cap screw*
44. *Flat washer*
45. *Elastic stop nut*
46. *Cable tie*
47. *Warning label*

Elite


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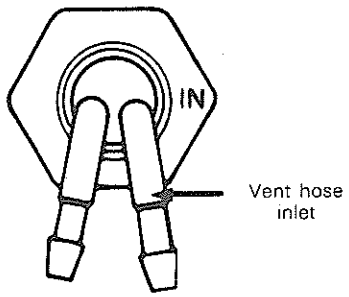
1. *Rubber flange with clamp*
2. *Lock tab*
3. *Carburetor*
4. *Impulse hose*
5. *Gear clamp*
6. *Rubber flange*
7. *Air silencer shell*
8. *Baffle*
9. *Resonator shell*
10. *Clamp*
11. *Elbow*
12. *Felt strip*
13. *Bracket*
14. *Spring*
15. *Bushing*
16. *Elastic stop nut*
17. *Spring*
18. *Throttle cable and housing*
19. *Circlip*
20. *O'ring*
21. *Retainer ring*
22. *Fuel line*
23. *Air vent hose*
24. *Fuel filter*
25. *Tee connector*
26. *Fuel pump*
27. *Elastic stop nut*
28. *Primer valve*
29. *Primer hose*
30. *Isolating line*
31. *Connector*
32. *Tube*
33. *Fuel tank*
34. *Fuel tank cap*
35. *Gasket*
36. *Sender*
37. *Pad*
38. *Flat washer*
39. *Screw*
40. *Retainer strip*
41. *Protector strip*
42. *Rivet*
43. *Screw*
44. *Screw*
45. *Elastic stop nut*
46. *Clamp*
47. *Spring clip*
48. *Warning label*

① At assembly on intake manifold, apply a light coat of silicone sealant on rubber flange mating surface.

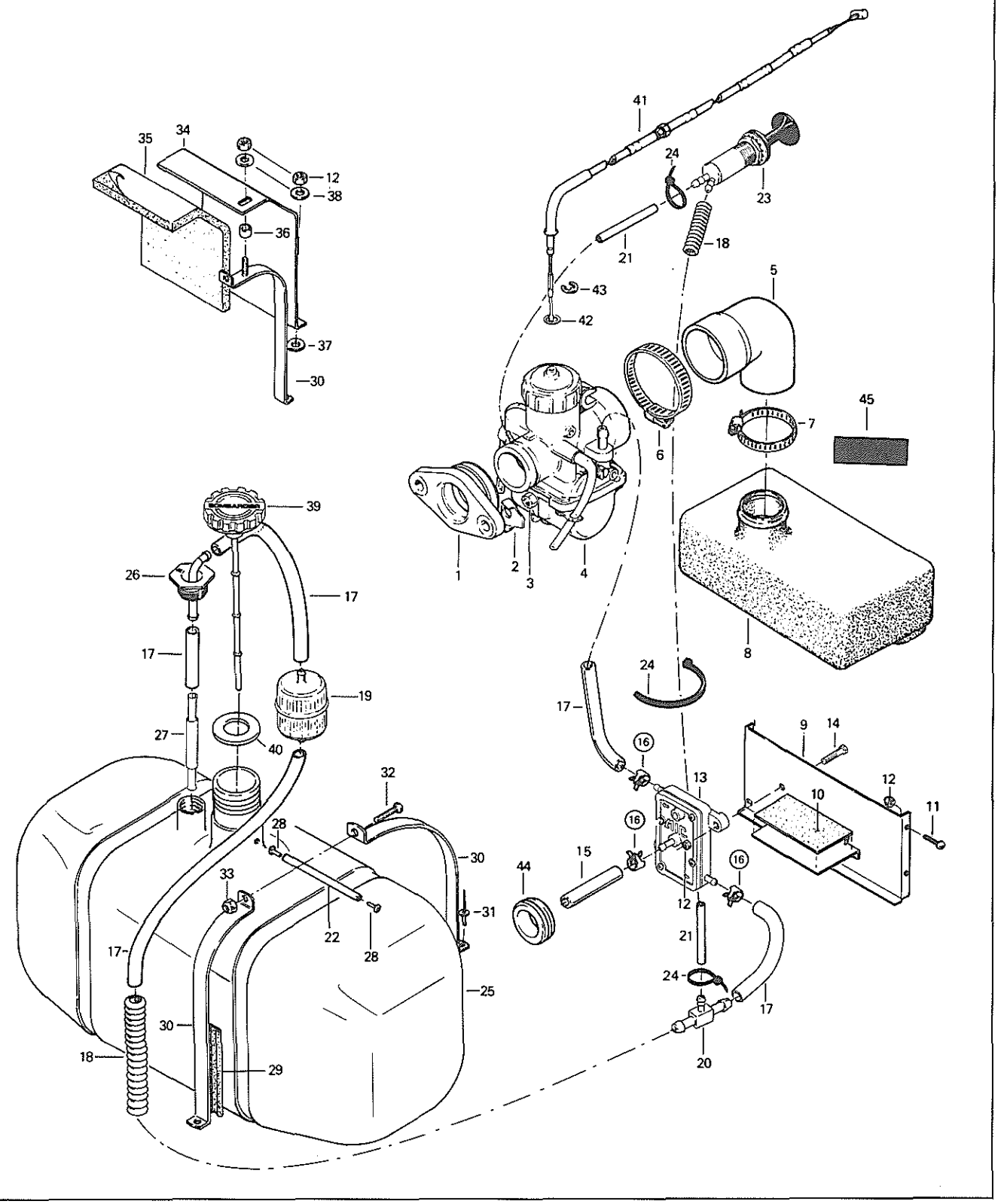
② Always bend lock tabs over screws and replace if they seem worn.

⑤ ㊼ Always reposition spring clips after any repair to prevent possible leaks.

㉛ Connect vent hose as shown on illustration.



Alpine

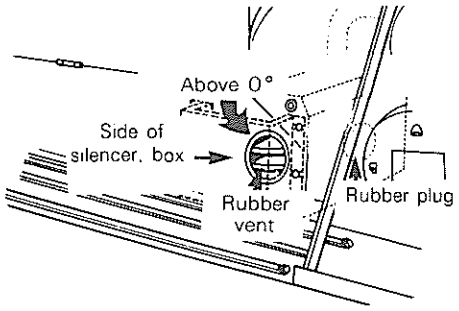

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1. *Rubber flange with clamp*
2. *Lock tab*
3. *Nut*
4. *Carburetor*
5. *Air intake elbow*
6. *Gear clamp*
7. *Clamp*
8. *Air intake silencer*
9. *Baffle*
10. *Foam*
11. *Screw*
12. *Elastic stop nut*
13. *Fuel pump*
14. *Screw*
15. *Impulse hose*
16. *Spring clip*
17. *Fuel line*
18. *Isolating line*
19. *Fuel filter*
20. *Tee connector*
21. *Primer tube*
22. *Air vent tube*
23. *Primer valve*
24. *Cable tie*
25. *Fuel tank*
26. *Connector*
27. *Tube*
28. *Air vent fitting*
29. *Protector strip*
30. *Retainer strip*
31. *Rivet*
32. *Screw*
33. *Elastic stop nut*
34. *Deflector*
35. *Foam*
36. *Rubber spacer*
37. *Rubber washer*
38. *Flat washer*
39. *Fuel tank cap*
40. *Gasket*
41. *Throttle cable and housing*
42. *O'ring*
43. *Retainer ring*
44. *Grommet*
45. *Warning label*

(2) Always bend lock tabs over screws and replace if they seem worn.

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

(8) When operating the vehicle in temperature exceeding 0°C (32°F), the rubber plug must block the engine side orifice and the rubber vent must be positioned on the side of the silencer box to allow cold air circulation.

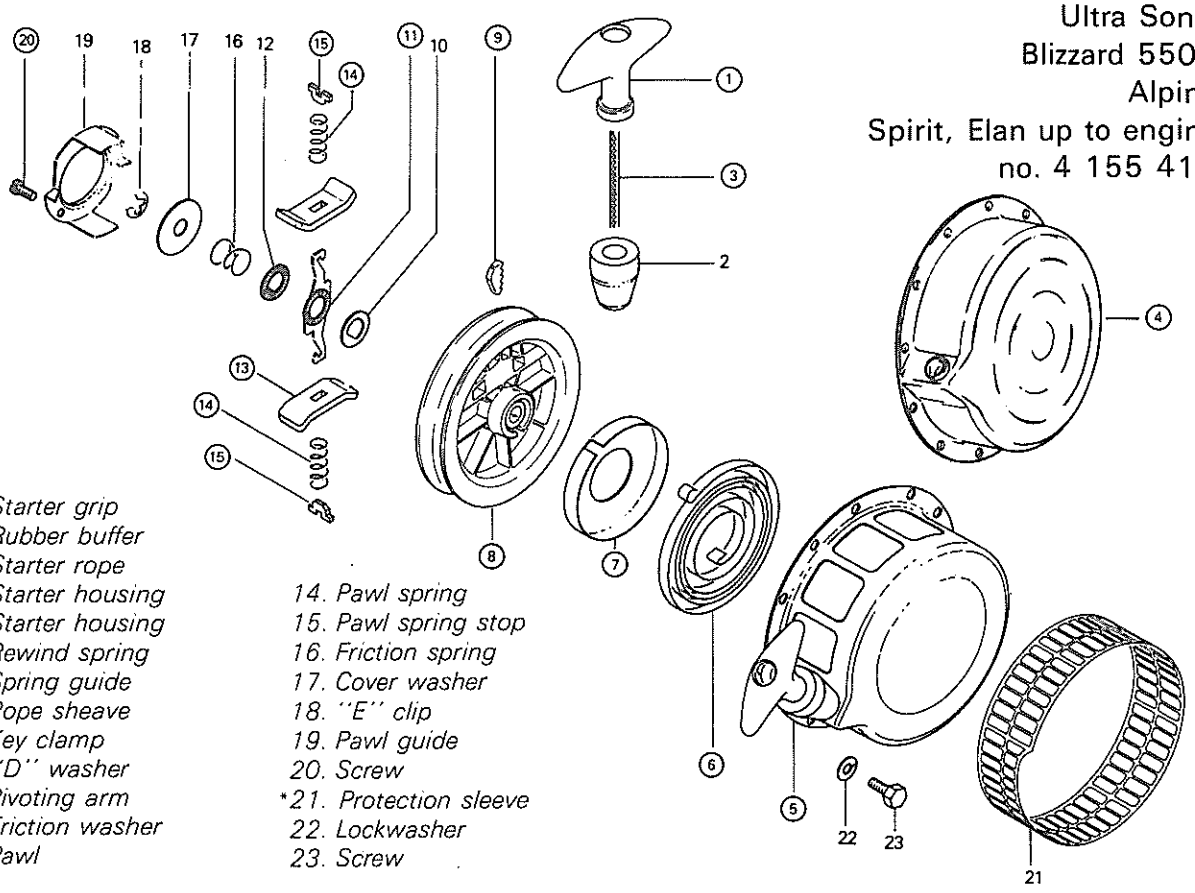


In temperatures below 0°C (32°F) and/or powder snow, the rubber plug must block the entry of fresh air on the side of the silencer box and the rubber vent must allow the warm air being emitted from the engine to be directed over the carburetor.

CAUTION: Observe temperature changes and locate plugs accordingly. Incorrect location of plugs may cause carburetor ice-up or engine overheating.

REWIND STARTER

Super Sonic
Ultra Sonic
Blizzard 5500
Alpine
Spirit, Elan up to engine
no. 4 155 416



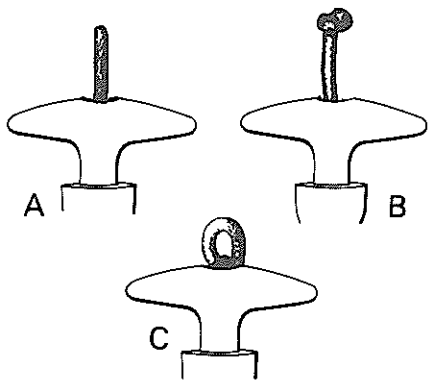
1. Starter grip
2. Rubber buffer
3. Starter rope
4. Starter housing
**5. Starter housing*
6. Rewind spring
7. Spring guide
8. Rope sheave
9. Key clamp
10. "D" washer
11. Pivoting arm
12. Friction washer
13. Pawl
14. Pawl spring
15. Pawl spring stop
16. Friction spring
17. Cover washer
18. "E" clip
19. Pawl guide
20. Screw
**21. Protection sleeve*
22. Lockwasher
23. Screw

** Applicable to one (1) cylinder engine only.*

REMOVAL

Remove bolts and washers securing rewind starter to engine, then remove rewind starter.

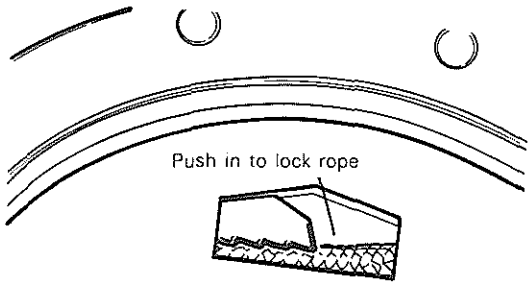
NOTE: On some models, the hood requires supporting before removing starter housing. The retaining cable is attached to one of the rewind starter attaching bolts.



DISASSEMBLY & ASSEMBLY

①③ Prior to installing starter grip 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 turn the knot down and pull the starter grip over the knot.

③⑧⑨ **To remove rope** from rewind starter mechanism, fully extend rope and hold rope sheave in position. Then using a pointed tool, disengage key clamp and pull rope free.



To install rope, proceed as follow

— Rotate sheave counter-clockwise six (6) turns to achieve correct recoil tension. Hold in position.

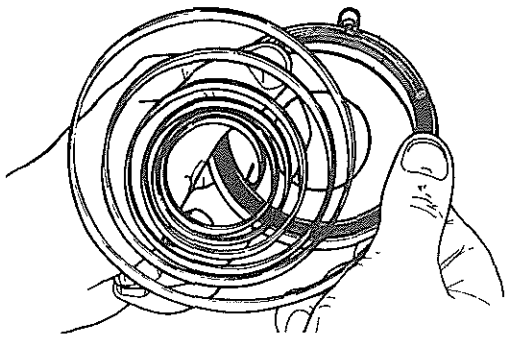
— While holding sheave under tension, rotate sheave until the starter housing orifice and sheave orifice align.

— Insert rope through both orifices until rope is visible in the key clamp housing.

— Position the key clamp in its housing then push in to lock the rope.

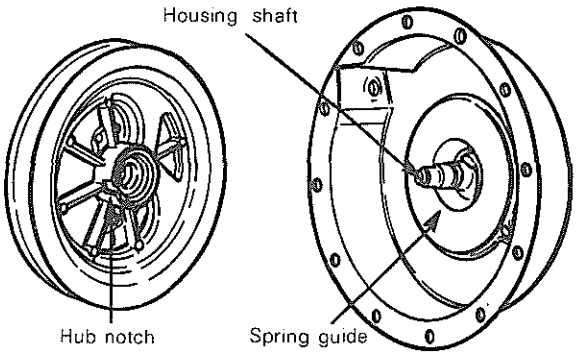
④⑤⑥⑦ At assembly, position spring outer end into spring guide notch then wind the spring clockwise into guide.

◆ **WARNING: Since the spring is tightly wound inside the guide it may fly out when the guide is manipulated. Always handle with care.**



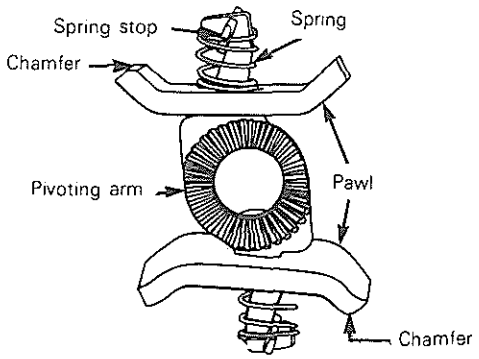
Before installing spring ass'y into starter housing, lubricate spring with light machine oil. Also apply low temperature grease on housing shaft base.

Position spring assembly into starter housing as illustrated, then place rop sheave into starter housing making sure that the sheave hub notch engages in the spring hook.

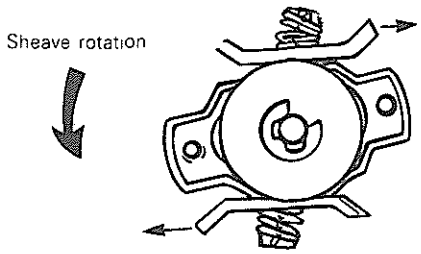


⑧⑳ Plastic rope sheaves and metal rope sheaves are interchangeable. However it is recommended to use the appropriate screws with plastic rope sheaves.

⑪⑬⑭⑮ Position pawls, springs and spring stops on pivoting arm as illustrated.



Install and secure pivoting arm assembly within rope sheave hub, making sure that the assembly moves clockwise when the rope sheave is turned counterclockwise.



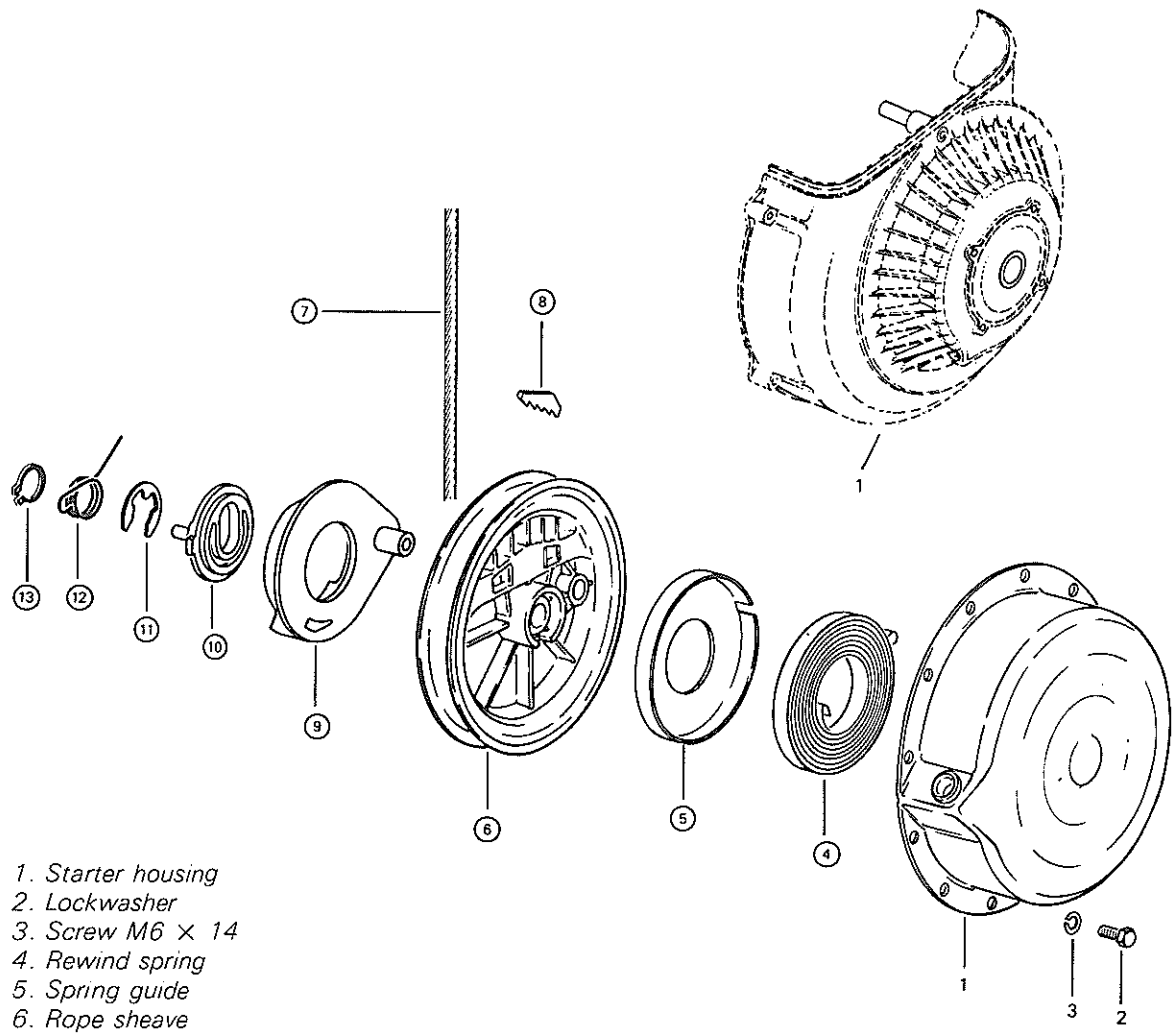
Reinstall pawl guide onto sheave (it may be necessary to pull on starter rope to ease guide installation).

INSTALLATION

Reinstall rewind starter on engine and secure with previously removed bolts and washers.

○ NOTE: If applicable, connect hood retaining cable to one (1) of the starter housing bolts.

Elan, Spirit engine no. 3 155 417 on up
Mirage I, Mirage II/E, Mirage Special
Citation 3500, Citation 4500/E, Citation SS
Everest 500/E, Everest LC
Futura 500/E, Futura LC
Grand Prix Special
Blizzard 7500, Blizzard 9500



1. *Starter housing*
2. *Lockwasher*
3. *Screw M6 × 14*
4. *Rewind spring*
5. *Spring guide*
6. *Rope sheave*
7. *Starter rope*
8. *Key*
9. *Pawl*
10. *Pawl lock*
11. *Circlip*
12. *Lock spring*
13. *Lock ring*

REMOVAL

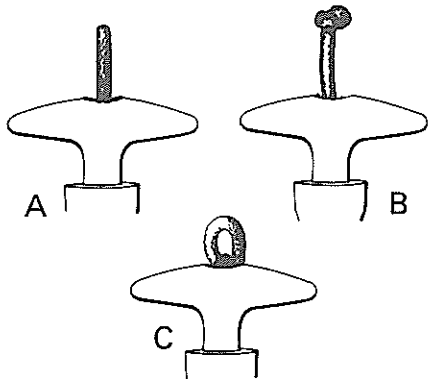
Remove bolts and washers securing rewind starter to engine, then remove rewind starter.

NOTE: On some models, the hood requires supporting before removing starter housing. The retaining cable is attached to one of the rewind starter attaching bolts.

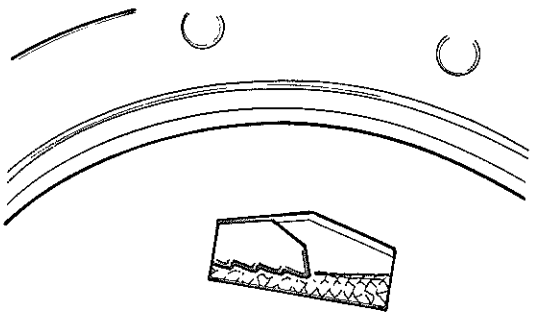
On oil injection models, remove oil injection pump from rewind starter cover.

DISASSEMBLY & ASSEMBLY

Prior to installing starter grip 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 turn the knot down and pull the starter grip over the knot.



⑥⑦⑧ To remove rope from rewind starter mechanism, first remove lock ring, lock spring, circlip, pawl lock and pawl. Fully extend rope and hold sheave in position. Using a pointed tool, disengage key and pull out rope.



To install rope, proceed as follow:

— Rotate sheave counter-clockwise six (6) turns to achieve correct recoil tension. Hold in position.

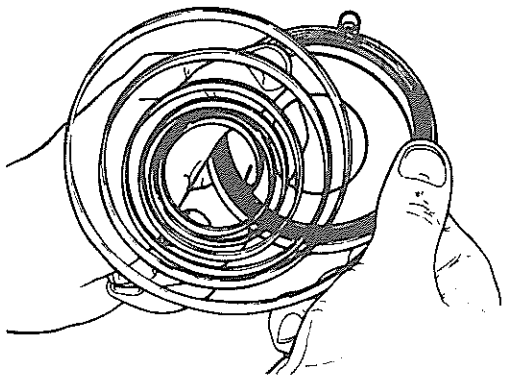
— While holding sheave under tension, rotate sheave until the starter housing orifice and sheave orifice align.

— Insert rope through both orifices until rope is visible in the key clamp housing.

— Position the key clamp in its housing then push in to lock the rope.

④⑤ At assembly, position spring outer end into spring guide notch then wind the spring clockwise into guide.

WARNING: **Since the spring is tightly wound inside the guide it may fly out when the guide is manipulated. Always handle with care.**



Before installing spring ass'y into starter housing, lubricate spring with light machine oil (L.P.S. no. 1).

Also apply low temperature grease on housing shaft base.

Position spring assembly into starter housing as illustrated, then place rope sheave into starter housing making sure that the sheave hub notch engages in the spring hook.

⑨⑩⑪ Position pawl, pawl lock and circlip.

⑫⑬ Install lock spring and lubricate with molybdenum base grease.

⑬ Install lock ring.

INSTALLATION

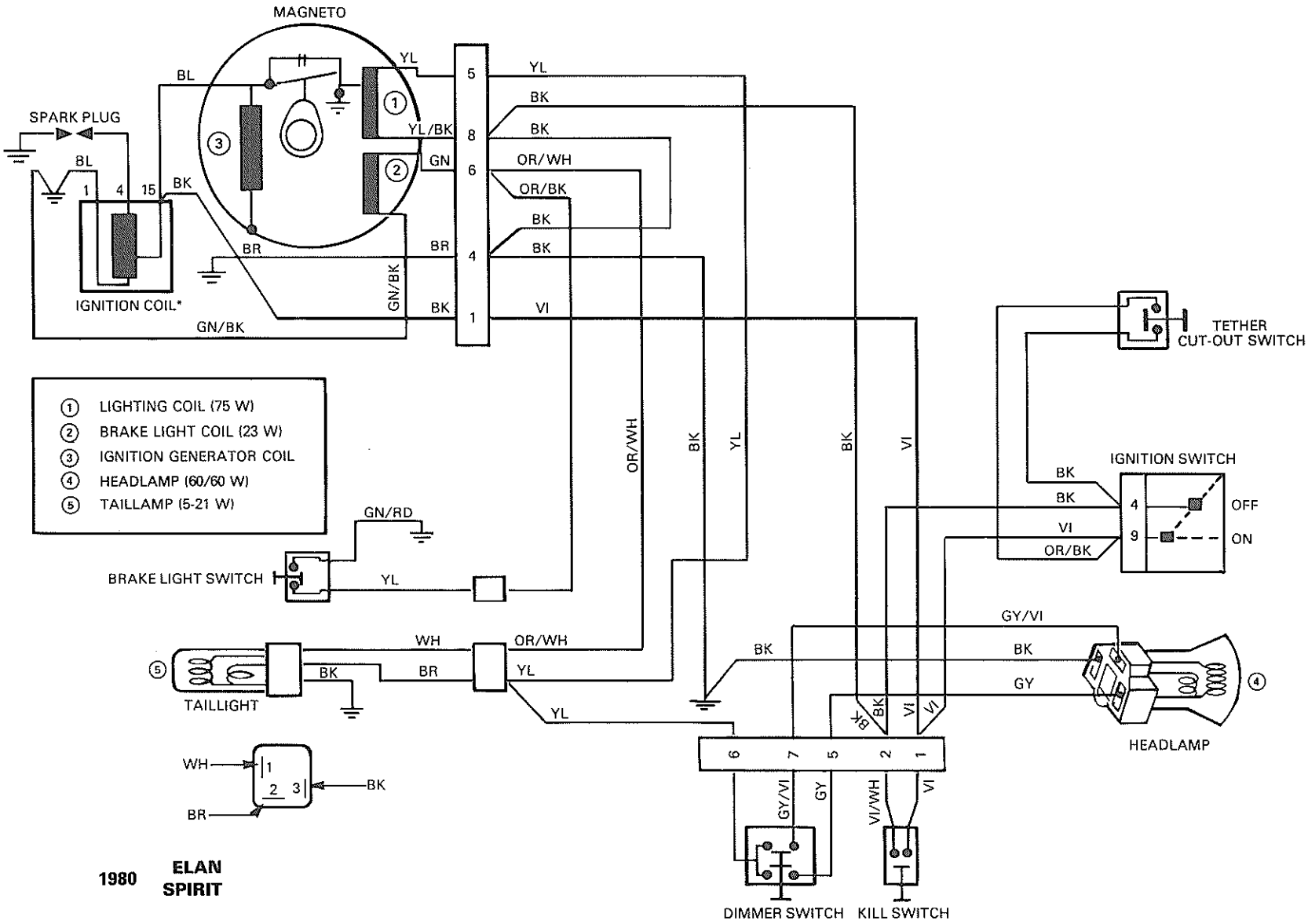
On oil injection models, reinstall oil pump on rewind starter assembly.

Reinstall rewind starter assembly on engine.

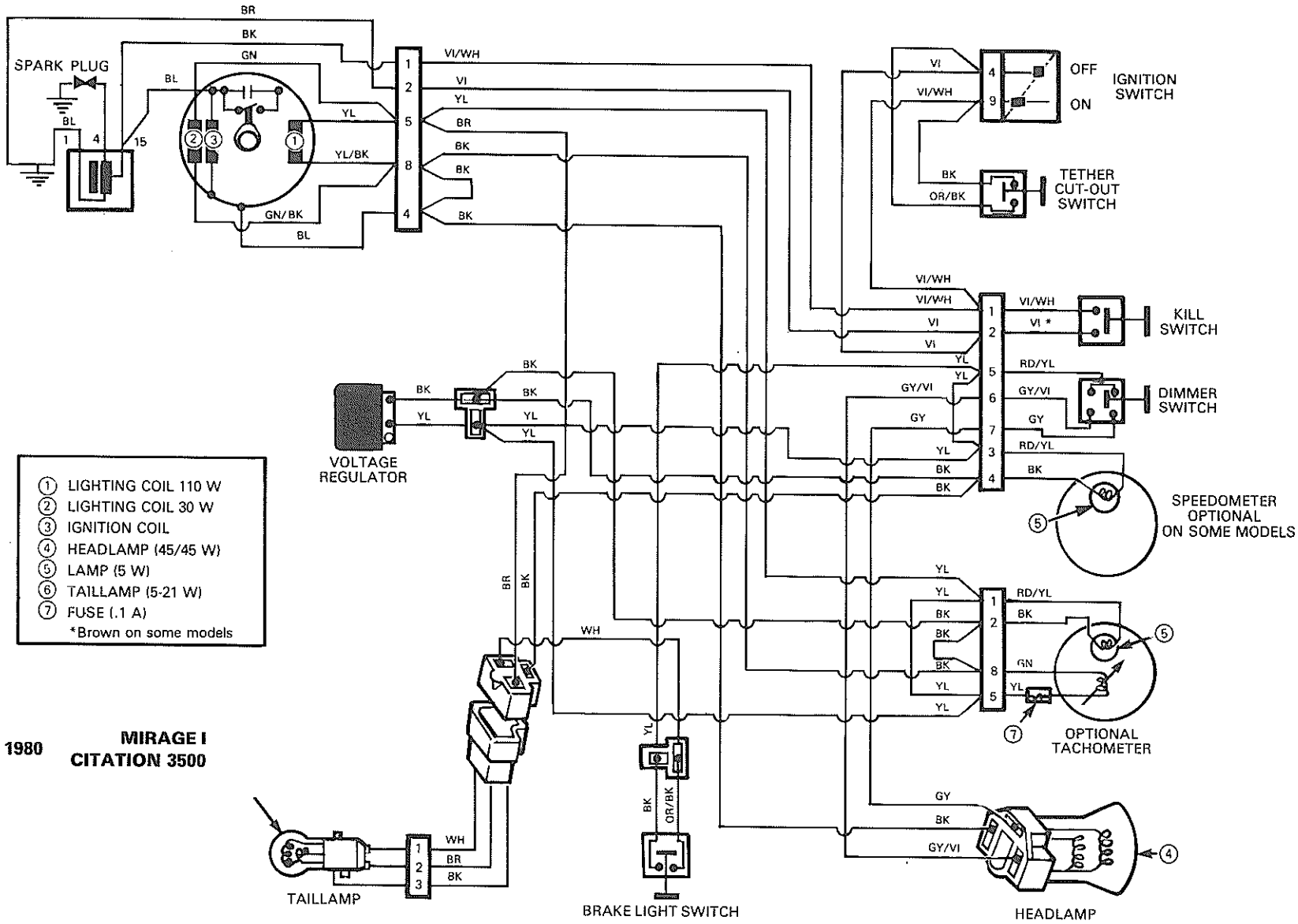
NOTE: If applicable, connect hood retaining cable to rewind starter retainer bolt.

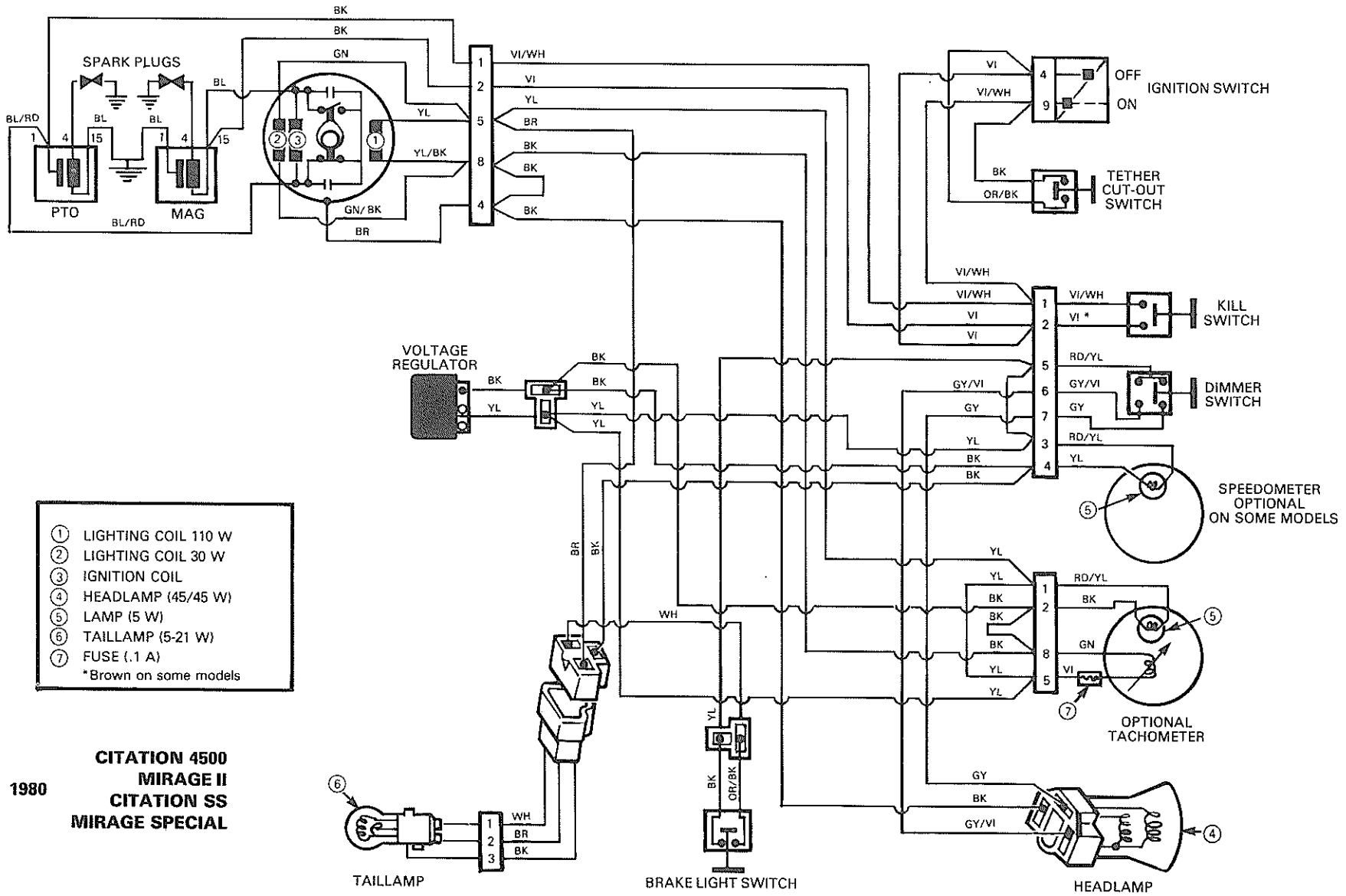
MODEL	HEADLAMP WATT	TAILLIGHT WATT
ELAN, SPIRIT	60/60	5/21
CITATION 3500, MIRAGE I	45/45	5/21
CITATION 4500, MIRAGE II	45/45	5/21
CITATION 4500 E, MIRAGE IIE	45/45	5/21
CITATION SS, MIRAGE SPECIAL	45/45	5/21
EVEREST 500, FUTURA 500	45/45	5/21
FUTURA 500E, EVEREST 500E	45/45	5/21
EVEREST LC, FUTURA LC	45/45	5/21
BLIZZARD 5500, GRAND PRIX SPECIAL	45/45	5/21
BLIZZARD 7500, SUPER SONIC	45/45	5/21
BLIZZARD 9500, ULTRA SONIC	45/45	5/21
ELITE	45/45	5/21
ALPINE	45/45	5/21

COLOUR CODE	
BK—BLACK	GN—GREEN
WH—WHITE	GY—GREY
RD—RED	VI—VIOLET
BL—BLUE	OR—ORANGE
YL—YELLOW	BR—BROWN



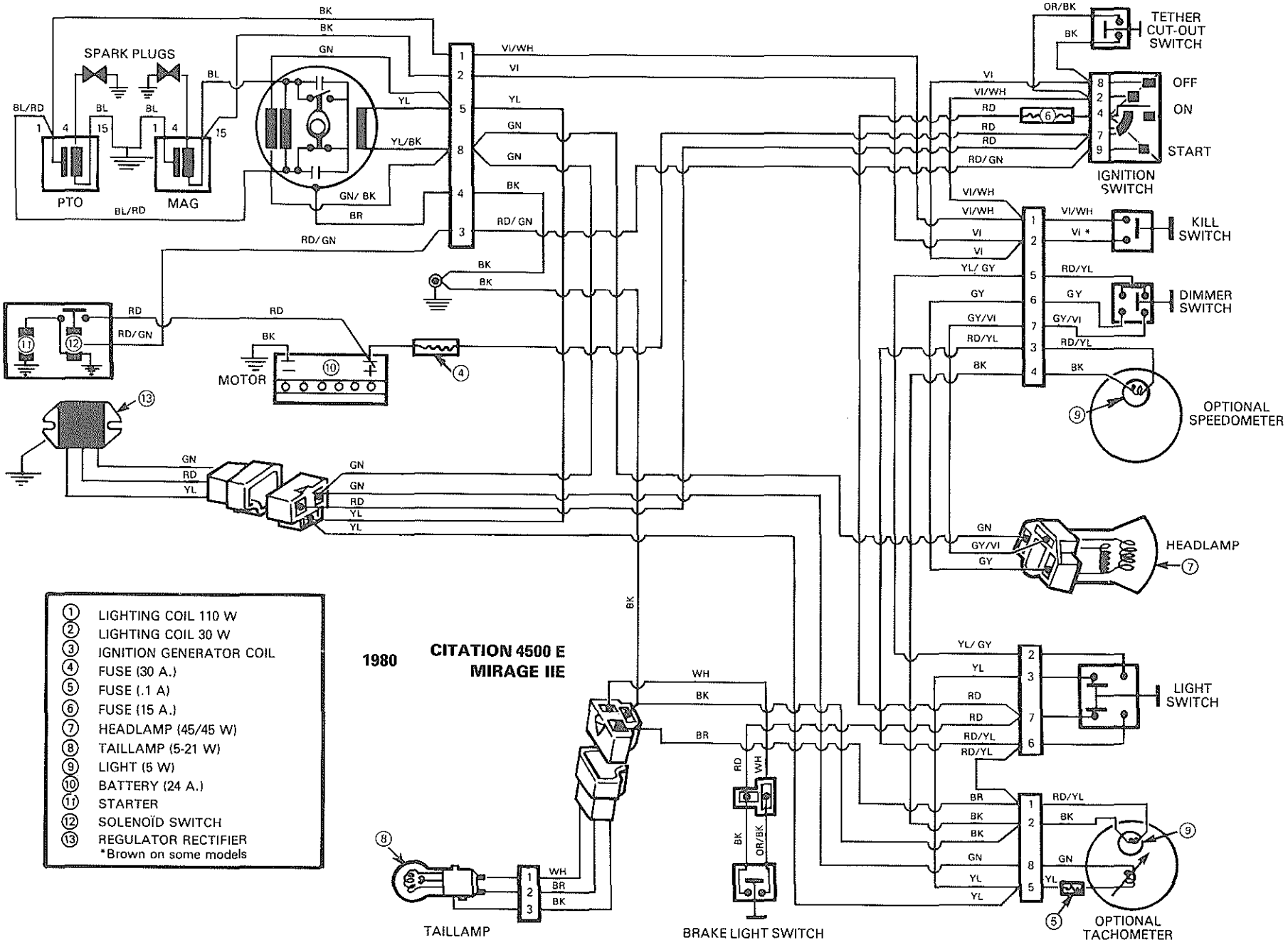
1980 ELAN SPIRIT

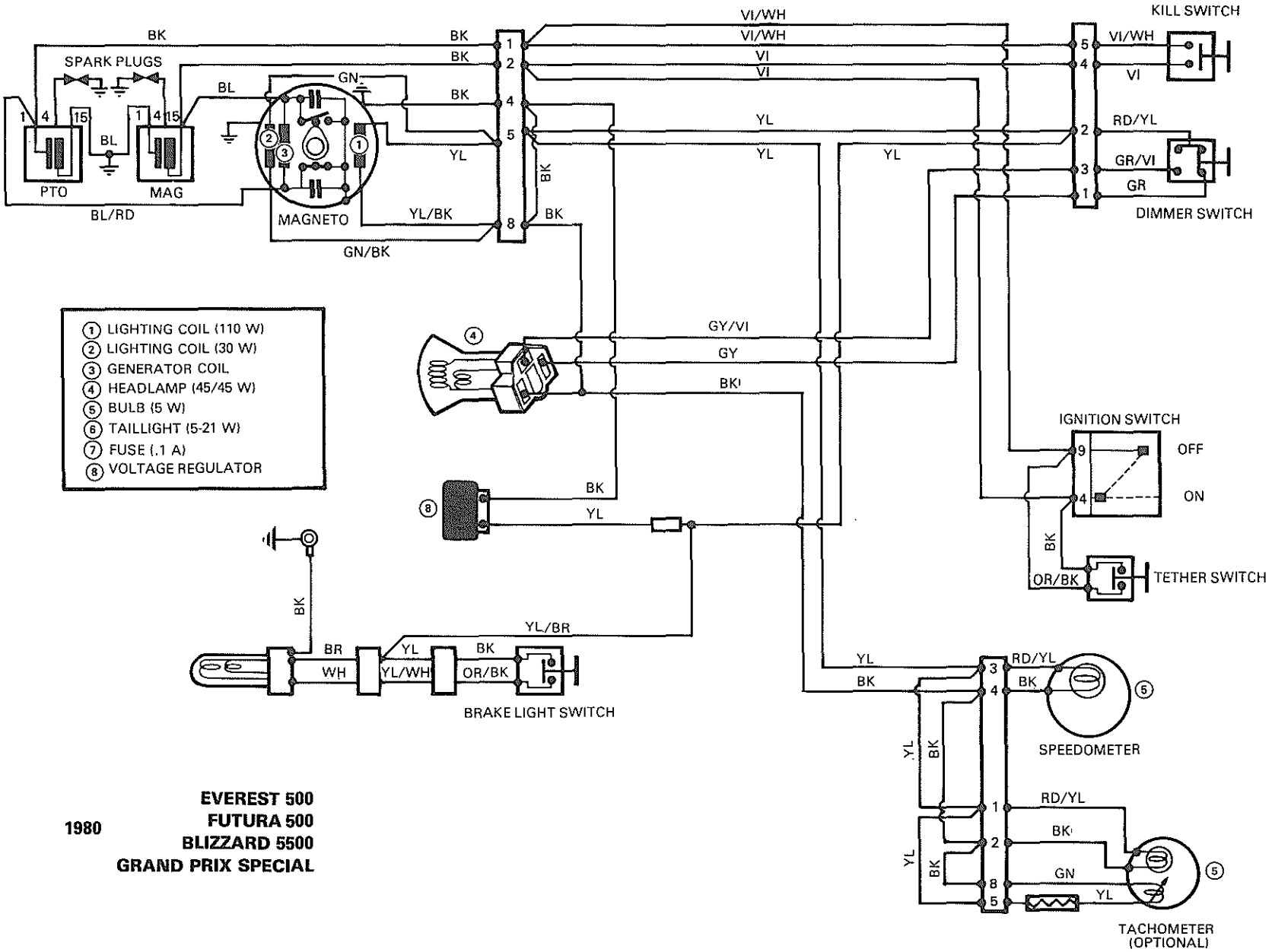

SPARK PLUG
BR
BK
GN
BL
YL
YL/BK
GN/BK
BL
VI/WH
VI
YL
BR
BK
BK
BK
OFF
ON
IGNITION SWITCH
BK
OR/BK
TETHER CUT-OUT SWITCH
KILL SWITCH
DIMMER SWITCH
RD/YL
GY/VI
GY
SPEEDOMETER OPTIONAL ON SOME MODELS
OPTIONAL TACHOMETER
GN
VOLTAGE REGULATOR
WH
TAILLAMP
BRAKE LIGHT SWITCH
OR/BK
HEADLAMP
① LIGHTING COIL 110 W
② LIGHTING COIL 30 W
③ IGNITION COIL
④ HEADLAMP (45/45 W)
⑤ LAMP (5 W)
⑥ TAILLAMP (5-21 W)
⑦ FUSE (.1 A)
*Brown on some models
1980 MIRAGE I
CITATION 3500



① LIGHTING COIL 110 W
② LIGHTING COIL 30 W
③ IGNITION COIL
④ HEADLAMP (45/45 W)
⑤ LAMP (5 W)
⑥ TAILLAMP (5-21 W)
⑦ FUSE (.1 A)
*Brown on some models

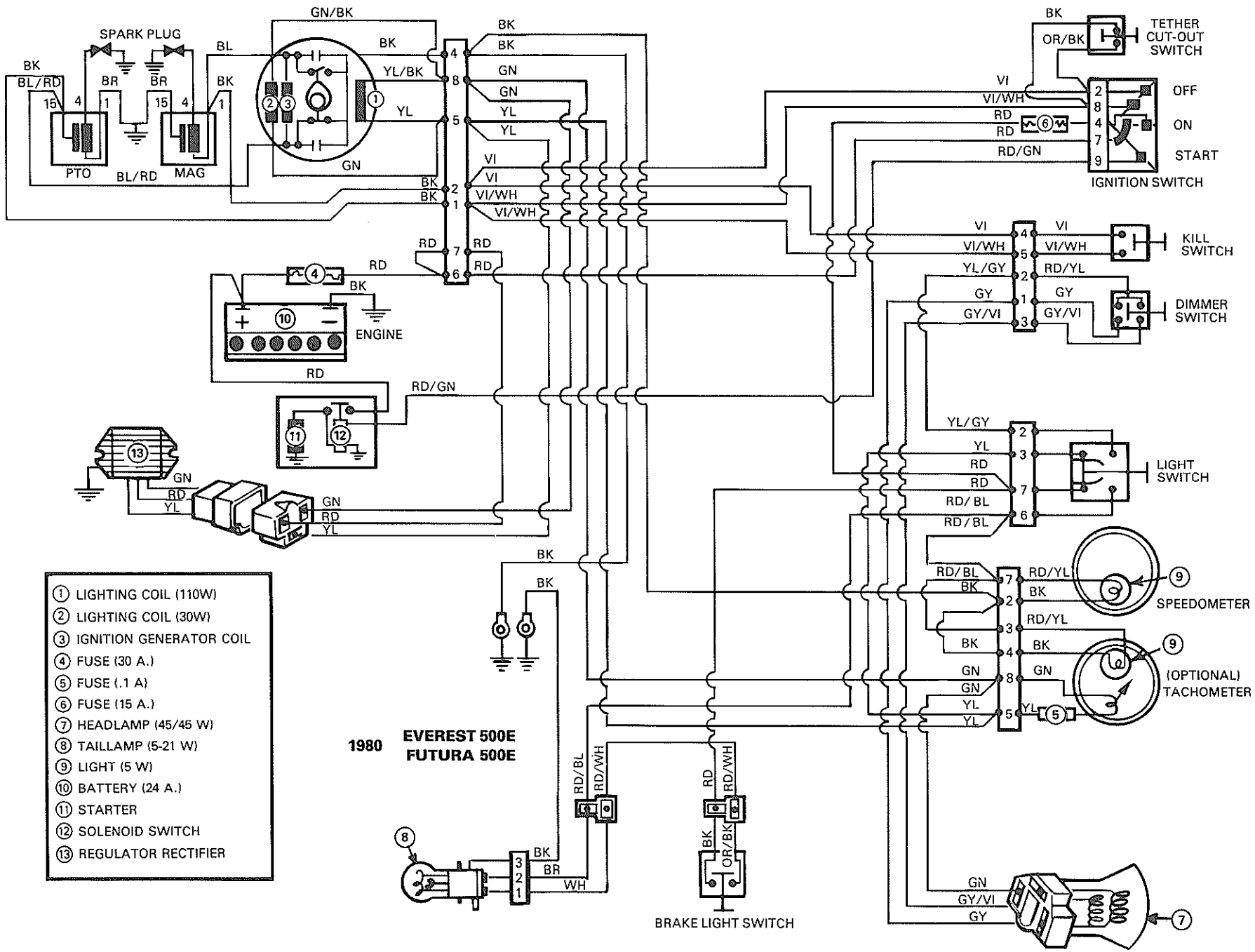
1980 CITATION 4500
MIRAGE II
CITATION SS
MIRAGE SPECIAL

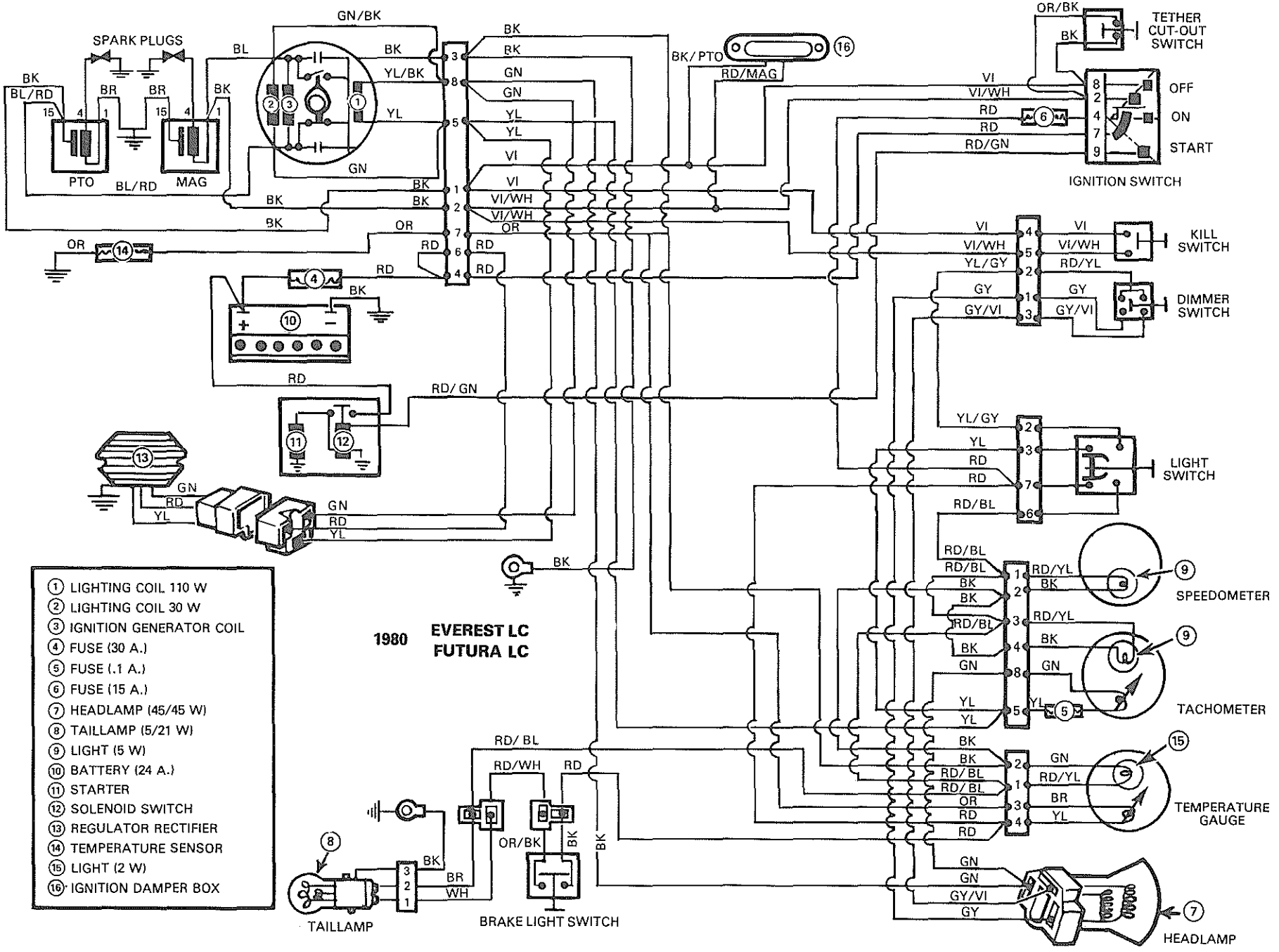

SPARK PLUGS
PTO
MAG
MOTOR
TETHER CUT-OUT SWITCH
IGNITION SWITCH
OFF
ON
START
KILL SWITCH
DIMMER SWITCH
OPTIONAL SPEEDOMETER
HEADLAMP
LIGHT SWITCH
OPTIONAL TACHOMETER
TAILLAMP
BRAKE LIGHT SWITCH
1 LIGHTING COIL 110 W
2 LIGHTING COIL 30 W
3 IGNITION GENERATOR COIL
4 FUSE (30 A.)
5 FUSE (.1 A)
6 FUSE (15 A.)
7 HEADLAMP (45/45 W)
8 TAILLAMP (5-21 W)
9 LIGHT (5 W)
10 BATTERY (24 A.)
11 STARTER
12 SOLENOÏD SWITCH
13 REGULATOR RECTIFIER
*Brown on some models
1980 CITATION 4500 E
MIRAGE IIE

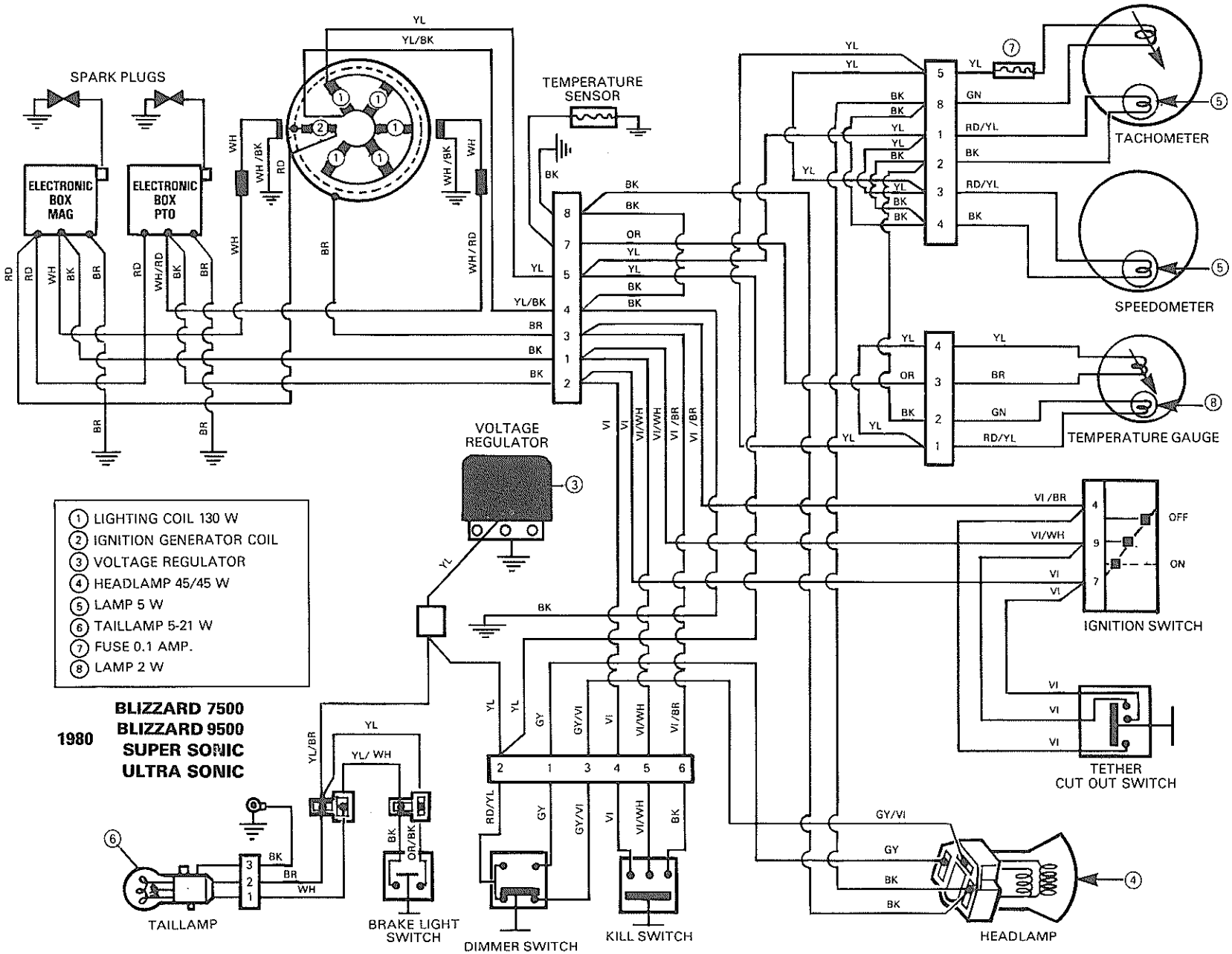


1980

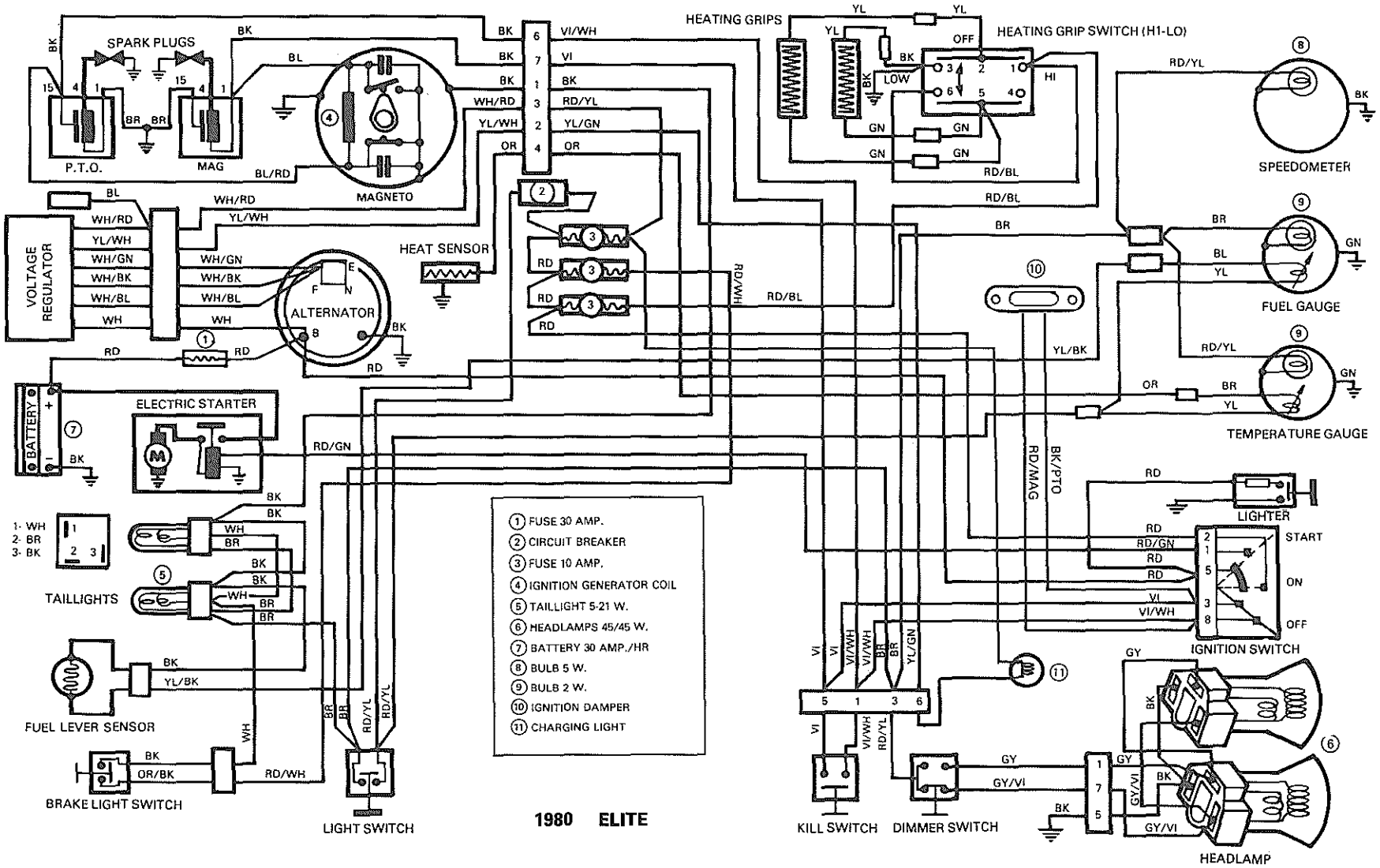
EVEREST 500
FUTURA 500
BLIZZARD 5500
GRAND PRIX SPECIAL


SPARK PLUG
BK
BL/RD
15
4
1
8R
8R
15
4
1
BK
BL
PTO
BL/RD
MAG
GN/BK
BK
YL/BK
YL
GN
BK
BK
GN
GN
YL
YL
VI
VI
BK
BK
VI/WH
VI/WH
RD
RD
RD
RD
RD
BK
ENGINE
RD
RD/GN
GN
RD
YL
GN
RD
YL
BK
BK
RD/BL
RD/WH
RD
RD/WH
BK
OR/BK
BK
BR
WH
BRAKE LIGHT SWITCH
BK
OR/BK
TETHER CUT-OUT SWITCH
VI
VI/WH
RD
RD
RD/GN
OFF
ON
START
IGNITION SWITCH
VI
VI/WH
YL/GY
GY
GY/VI
VI
VI/WH
RD/YL
GY
GY/VI
KILL SWITCH
DIMMER SWITCH
YL/GY
YL
RD
RD
RD/BL
RD/BL
LIGHT SWITCH
RD/BL
BK
BK
RD/YL
BK
GN
GN
YL
YL
RD/YL
BK
GN
GN
YL
YL
SPEEDOMETER
(OPTIONAL) TACHOMETER
GN
GY/VI
GY
1980 EVEREST 500E
FUTURA 500E
① LIGHTING COIL (110W)
② LIGHTING COIL (30W)
③ IGNITION GENERATOR COIL
④ FUSE (30 A.)
⑤ FUSE (.1 A)
⑥ FUSE (15 A.)
⑦ HEADLAMP (45/45 W)
⑧ TAILLAMP (5-21 W)
⑨ LIGHT (5 W)
⑩ BATTERY (24 A.)
⑪ STARTER
⑫ SOLENOID SWITCH
⑬ REGULATOR RECTIFIER

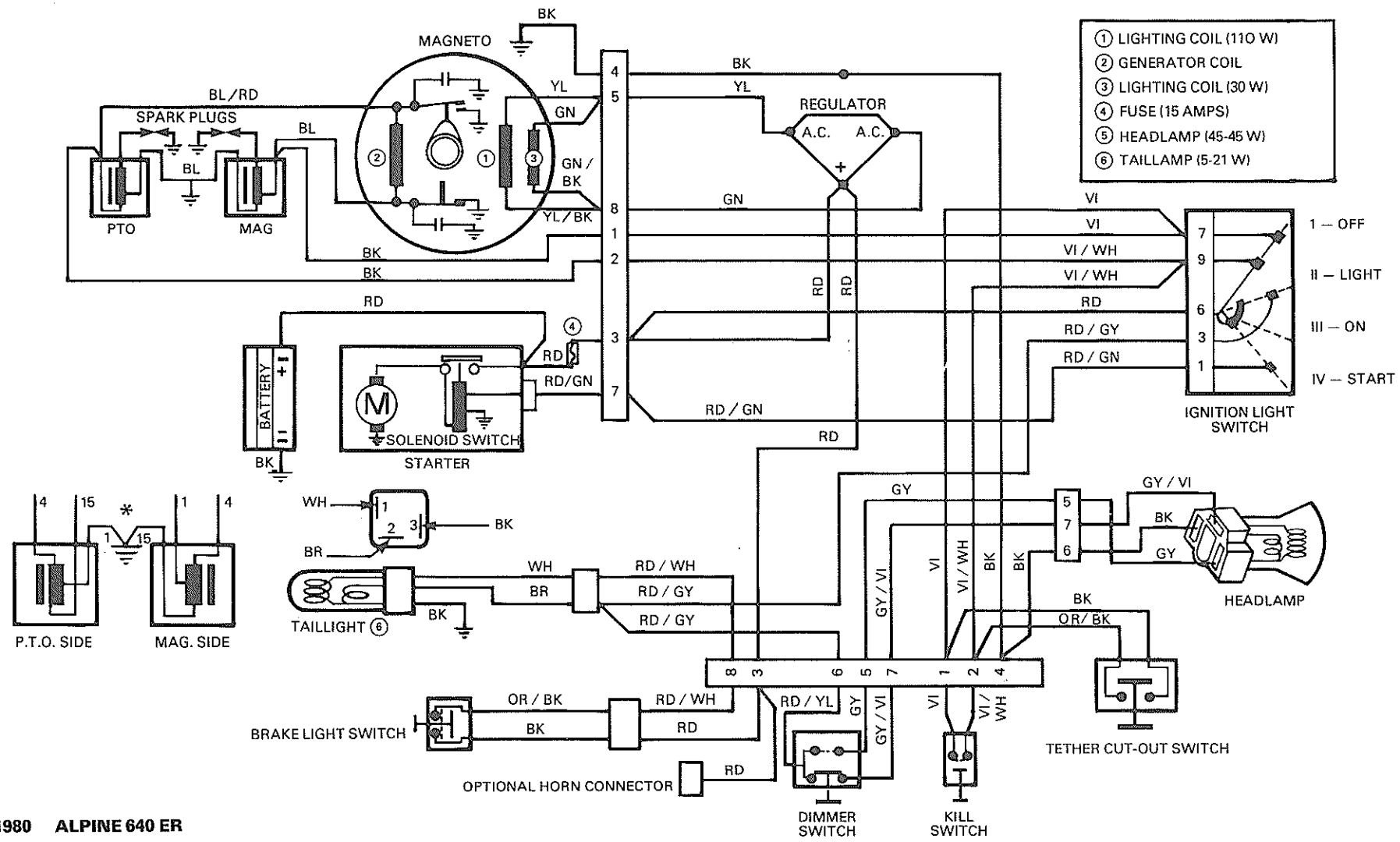

SPARK PLUGS
PTO
BL/RD
MAG
GN/BK
GN
BK/PTO
RD/MAG
TETHER CUT-OUT SWITCH
IGNITION SWITCH
OFF
ON
START
KILL SWITCH
DIMMER SWITCH
LIGHT SWITCH
SPEEDOMETER
TACHOMETER
TEMPERATURE GAUGE
HEADLAMP
TAILLAMP
BRAKE LIGHT SWITCH
1980 EVEREST LC
FUTURA LC
① LIGHTING COIL 110 W
② LIGHTING COIL 30 W
③ IGNITION GENERATOR COIL
④ FUSE (30 A.)
⑤ FUSE (.1 A.)
⑥ FUSE (15 A.)
⑦ HEADLAMP (45/45 W)
⑧ TAILLAMP (5/21 W)
⑨ LIGHT (5 W)
⑩ BATTERY (24 A.)
⑪ STARTER
⑫ SOLENOID SWITCH
⑬ REGULATOR RECTIFIER
⑭ TEMPERATURE SENSOR
⑮ LIGHT (2 W)
⑯ IGNITION DAMPER BOX



1980 BLIZZARD 7500 BLIZZARD 9500 SUPER SONIC ULTRA SONIC

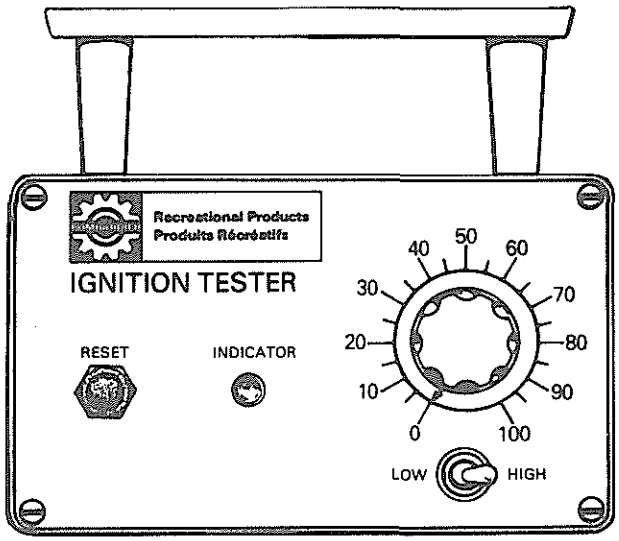

SPARK PLUGS
P.T.O.
MAG
MAGNETO
HEATING GRIPS
HEATING GRIP SWITCH (H1-LO)
OFF
LOW
HI
SPEEDOMETER
FUEL GAUGE
TEMPERATURE GAUGE
VOLTAGE REGULATOR
ALTERNATOR
HEAT SENSOR
BATTERY
ELECTRIC STARTER
LIGHTER
IGNITION SWITCH
START
ON
OFF
TAILLIGHTS
FUEL LEVER SENSOR
BRAKE LIGHT SWITCH
LIGHT SWITCH
KILL SWITCH
DIMMER SWITCH
HEADLAMP
1- WH
2- BR
3- BK
1 FUSE 30 AMP.
2 CIRCUIT BREAKER
3 FUSE 10 AMP.
4 IGNITION GENERATOR COIL
5 TAILLIGHT 5-21 W.
6 HEADLAMPS 45/45 W.
7 BATTERY 30 AMP./HR
8 BULB 5 W.
9 BULB 2 W.
10 IGNITION DAMPER
11 CHARGING LIGHT

1980 ELITE



1980 ALPINE 640 ER

BOMBARDIER IGNITION TESTER



GENERAL

The Bombardier ignition tester is an electrical energy measuring device capable of measuring the peak energy output of a coil.

The tester is of solid state construction and performs as a comparator. The correct value of energy output is indicated in each test and is then compared with the value taken from the engine being tested.

The energy output is verified by means of a 0-100 scale on the tester. The greater the energy output, the greater value indication on the scale. The indication is in the form of an incandescent lamp that lights when the scale knob is set at the position corresponding to the energy output.

The tester has two input ranges selected by a toggle switch. The **LOW** range is sensitive to AC or DC voltages from 0.5 to 27 volts. The **HIGH** range is sensitive to AC or DC voltages of from approximately 75 to 500 volts.

TEST CONDITION

All tests are performed on the vehicle at cranking speed.

Vigorous cranking against compression causes the flywheel to snap over, raising the output higher than by cranking without compression, therefore, do not remove spark plug.

Test values listed are taken against compression.

Always crank vigorously as in actuel starting.

Read all instructions **thoroughly** and as you become familiar with this test instrument it will be possible to test a complete ignition system in a matter of minutes. Always proceed in the following order:

1. Connect tester **P** and **N** clip leads as illustrated.
2. Follow test procedure sequence.
3. After every test that lights the indicator lamp, **reset** the indicator circuit by depressing the reset button.

ANALYSIS OF TEST RESULTS

Indicator lamp lights at specitic setting

Output is as specified. Test results should repeat three times. If readings do not repeat, output is erratic and cause should be investigated (loose connections or components, etc.).

Indicator lamp lights at lower setting

This indicates that the output is less than that designed to operate in a satisfactory manner. However, before coming to the conclusion of a faulty condition be certain that correct engine cranking conditions were met before condemning the ignition.

Indicator lamp does not light.

One component is defective. Proceed as instructed to find defective component.

Intermittent ignition problems

In dealing with intermittent problems there is no easy diagnosis. For example, problems that occur only at normal engine operating temperature have to be tested under similar conditions.

In most cases of temperature and/or vibration failure, only parts replacement can solve the problem as most of these failures return to normal when engine is not running.

Double trouble

There is always the possibility of more than one faulty parts. If after a component has been replaced, the problem still persists, carefully repeat the complete test procedure to find the other faulty part.

ANALYSER TEST AND MAINTENANCE

A test simulator is provided with each tester as a means to test the lamp, detector circuit, and batteries.

High scale test

a) Place switch in **HIGH** position. Plug the simulator into an electric outlet (117 VAC) for ten seconds.

CAUTION: After charging, do not touch plug terminals while pressing test button. A mild shock will result.

b) Remove the simulator from the outlet, and connect the "P" and "N" leads from the tester to the simulator as indicated on the button of the simulator.

c) Set the tester dial to 50, or below. Depress the button of the simulator. The indicator lamp on the tester should light.

NOTE: For each test performed by the simulator, it must be recharged.

Low scale test

a) Place switch in **LOW** position.

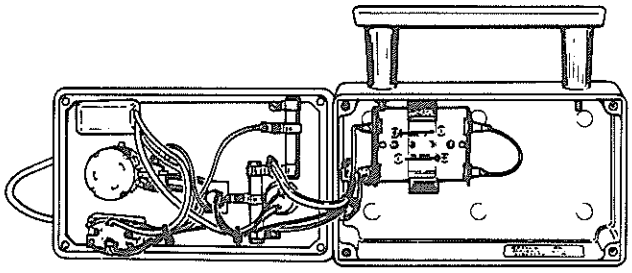
b) Set tester dial to 50, or below.

c) Connect N lead to negative terminal of 12 volt battery. Connect **P** lead to positive terminal of 12 volt battery: indicator lamp should light.

If lamp does not light, check tester batteries. If they are installed correctly and are good, check the clip leads for faulty connections. If no fault can be found, refer to the warranty statement for instructions for sending the tester back to Electro-Specialties, Inc.

Battery replacement

1. Remove the four (4) screws securing cover to case.
2. Carefully lift cover.
3. Replace batteries with size "C" Alkaline batteries. Be sure to observe polarity markings on battery holder or lamp will not light.



4. Carefully install cover on case being certain that no wires are pinched between cover and case. Secure cover.

NOTE: Weak batteries will not impair tester operation or calibration. The light will glow dim.

The ignition tester may give false readings if the rivets on the back cover come in contact with metal.

Indicator knob alignment

Check indicator knob alignment by turning knob fully clockwise. The white mark on the knob must align with no. 100 on the scale. If the marks does not line up with the no. 100, loosen the knob set screw, line the mark on the knob with no. 100, and tighten the set screw. Recheck alignment.

NOTE: If after adjustment, the knob is turned fully counter-clockwise and it does not exactly align with the 0, it is of no consequence.

TESTS INDEX

ROTAX ONE CYLINDER
BREAKER POINTS ENGINE

1. Generator coil output.
2. Lighting coils output. (247 engine type)
3. Lighting coils output. (277 engine type)

ROTAX TWO CYLINDER
BREAKER POINTS ENGINE

4. Generator coil output.
5. Lighting coils output.

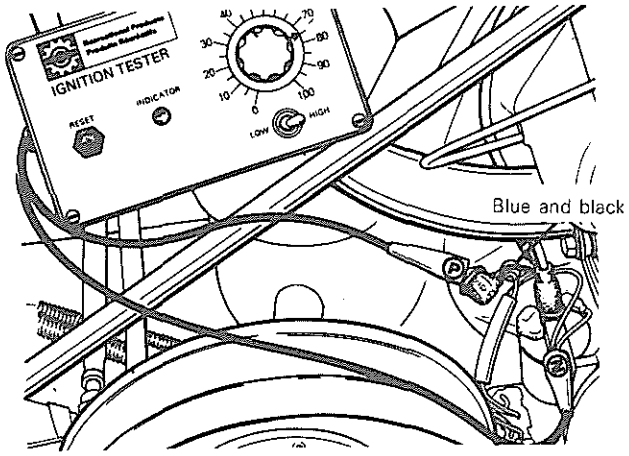
ROTAX TWO CYLINDER
ELECTRONIC IGNITION ENGINE

6. Generator coil output.
7. Trigger coil output.
8. Lighting coil output.

ONE CYLINDER ENGINES

1. GENERATOR COIL OUTPUT

1. Disconnect blue and black wires from terminal (15) of ignition coil.
2. Attach tester P lead to **blue** and **black** wires previously disconnected. Connect tester N lead to a good engine ground.



3. Set tester dial and switch as follows:

Engine type	Switch position	Dial
247	HIGH	75
277	HIGH	70

4. Turn ignition key to ON position, disable emergency cut-out button circuit and tether cut-out switch then crank engine.

A. **Indicator lamp lights:** Coil output is up to specifications. Repeat test at least three (3) times to verify reading and check for consistency.

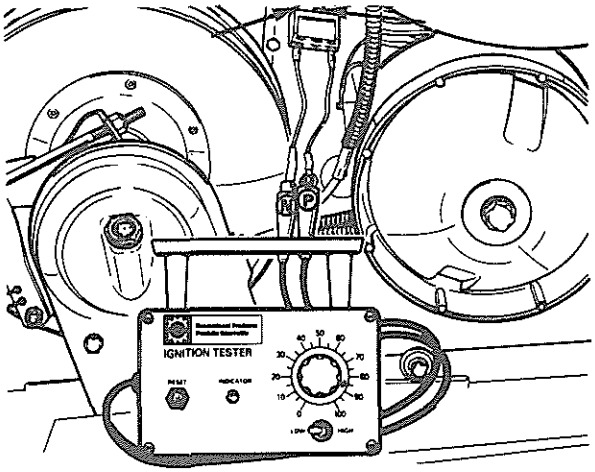
B. **Indicator lamp does not light:** Coil output is below specifications. This could be caused by a faulty coil or breaker points. Check breaker points condition and adjustment, and correct as necessary. Repeat test. If lamp still does not light the coil is defective and should be replaced.

2. LIGHTING COILS OUTPUT (247 ENGINE TYPE)

NOTE: There are two independent coils; main (large) coil wires are yellow and yellow/black while brake light coil (small) wires are green and green/black.

1. Disconnect wiring harness junction block at engine.
2. Connect tester leads as illustrated using two (2) harness adaptors.

large coil: yellow and yellow/black wires
small coil: green and green/black (or ground) wires.



3. Set tester dial and switch as follows:

Engine type	Switch position	Dial
247	LOW	85

4. Crank engine.

A. **Indicator lamp lights:** Coil output is up to specifications. Repeat test at least three (3) times to verify reading and consistency.

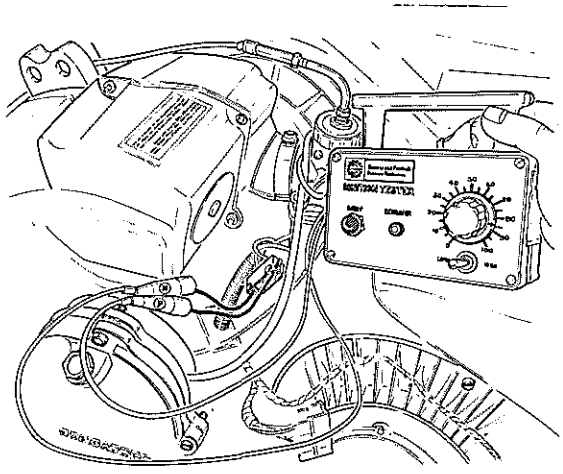
B. **Indicator lamp does not light:** Coil is faulty.

3. LIGHTING COILS OUTPUT (277 ENGINE TYPE)

NOTE: On the engine type covered by this test an additional lighting coil is connected in parallel with the main lighting coil. In this case, the parallel connection must be broken off as each coil is to be tested individually.

1. Disconnect wiring harness junction block at engine.
2. Connect tester leads as illustrated using two (2) harness adaptors.

large coil: yellow and yellow/black wires
small coil: green and green/black (or ground) wires.



3. Set tester dial and switch as follows:

Engine type	Switch position	Dial
277	LOW	85

4. With ignition key to OFF position, crank engine.

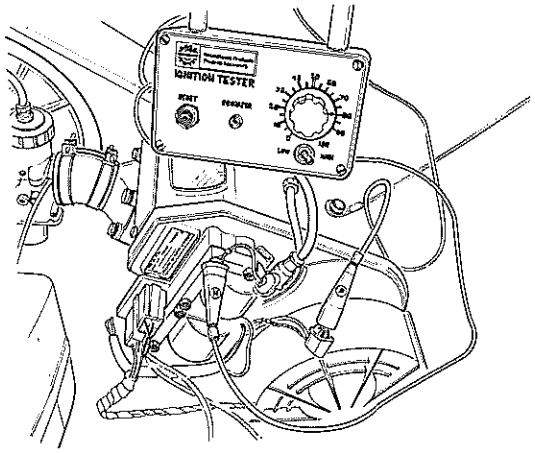
A. **Indicator lamp lights:** Coil output is up to specifications. Repeat test at least three (3) times to verify reading and consistency.

B. **Indicator lamp does not light:** Coil is faulty.

TWO CYLINDER BREAKER POINTS ENGINE

4. GENERATOR COIL OUTPUT

1. Disconnect **blue/red and black** wires from P.T.O. side ignition coil.
2. Connect tester P lead to **blue/red** and **black** wires previously disconnected. Connect N lead to a good engine ground.



3. Set tester switch and dial as follows:

Engine type	Switch position	Dial
377, 444 464, 503, 640	HIGH	80

4. Turn ignition key to ON position, disable cut-out button circuit and tether cut-out switch then crank engine.

A. **Indicator lamp lights:** Generator coil output is up to specifications. Repeat test at least three (3) times to verify reading and consistency.

B. **Indicator lamp does not light:** Generator coil output is below specifications. This could be caused either by faulty coil or breaker points.

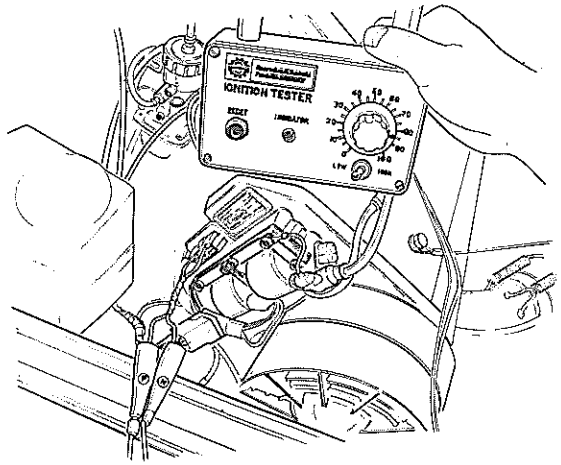
5. Repeat test with other side (magneto, **blue and black** wires). If test indicates good on magneto side wire, but not on the other, suspect faulty breaker points. If test indicates no output on either side, suspect either faulty generator coil or breaker points.

5. LIGHTING COILS OUTPUT

NOTE: On the engine types covered by this test an additional lighting coil is connected in parallel with the main lighting coil; in this case the parallel connection must be broken off as each coil is to be tested individually.

1. Disconnect wiring harness junction block at engine.
2. Connect tester leads as illustrated using two (2) harness adaptors.

large coil: yellow and yellow/black wires
small coil: green and green/black wires.



3. Set tester dial and switch as follows:

Engine type	Switch position	Dial
377, 464, 503, 640	LOW	85

4. Crank engine.

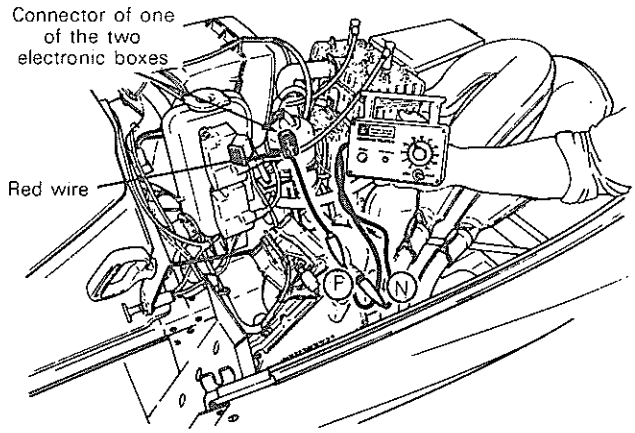
A. **Indicator lamp lights:** Coil output is up to specifications. Repeat test at least three (3) times to verify reading and consistency.

B. **Indicator lamp does not light:** Coil is faulty.

TWO CYLINDER ELECTRONIC IGNITION ENGINE

6. GENERATOR COIL OUTPUT

1. Disconnect wire connectors from C.D.I. electronic boxes.
2. Using one (1) harness adaptor, connect tester P test lead to **red** wire of one of the two connectors removed from C.D.I. electronic boxes. Connect N test lead to ground; do not use brown wire as ground.



3. Set tester switch and dial as follows:

Engine type	Switch position	Dial
354, 454	HIGH	40

4. Turn ignition key to **ON** position, disable cut-out button circuit and tether cut-out switch then crank engine.

WARNING: To prevent powerful electric shocks with engine running, do not touch any component related to electronic ignition system (ignition coil, high tension wire, wire harness, etc...)

A. **Indicator lamp lights:** Coil output is up to specifications. Repeat test at least three (3) times to verify reading and consistency.

B. **Indicator lamp does not light:** If trigger coil (no. 7) is positive, the problem is a faulty generator coil.

WARNING: Do not touch tester P lead clip while cranking the engine. Also make sure that tester P lead clip does not contact any metallic object.

7. TRIGGER COIL OUTPUT

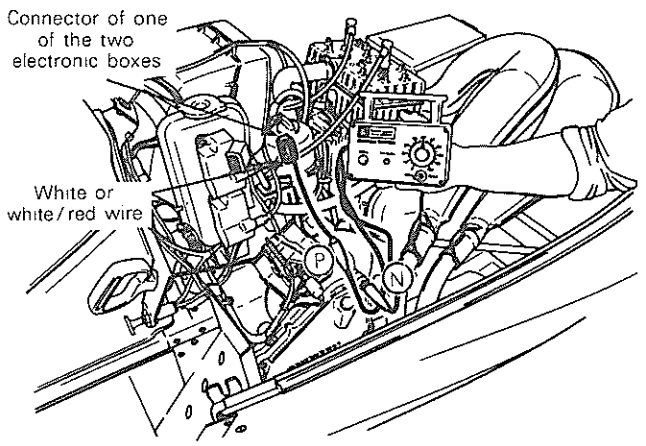
1. Disconnect electronic box connectors.

   Magneto side: Connect tester P lead to **white** wire.

   P.T.O. side: Connect tester P lead to **white/red** wire.

   Connect tester N lead to a good engine ground.

2. Set tester switch and dial as follows:



Engine type	Switch position	Dial
354, 454	LOW	50

3. Turn ignition key to **ON** position, disable cut-out button circuit then crank engine.

WARNING: To prevent powerful electric shocks with engine running, do not touch any component related to electronic ignition system (ignition coil, high tension wire, wire harness, etc...)

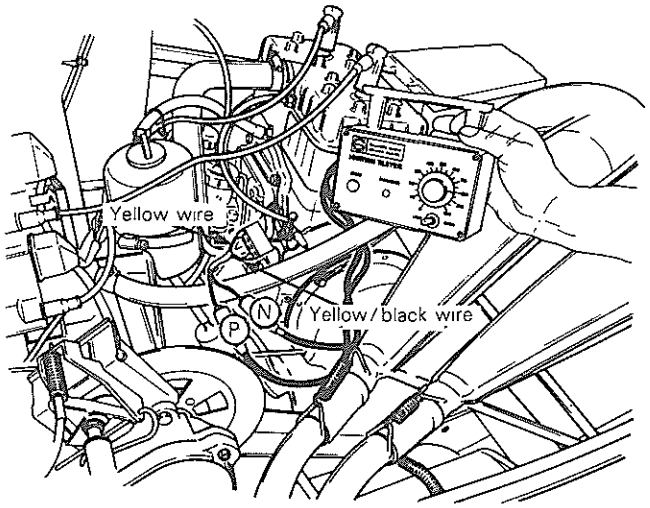
A. **Indicator lamp lights:** Trigger coil output is up to specifications. Repeat test at least three (3) times to verify reading and check for consistency.

B. **Indicator lamp does not light:** The problem is a faulty trigger coil.

NOTE: If no output is indicated on trigger coil, carefully inspect the trigger ground connection wire connected to C.D.I. electronic box retaining screw. Clean and tighten connection then repeat test.

8. LIGHTING COIL OUTPUT

1. Disconnect wiring harness junction block at engine.
2. Connect tester leads as illustrated using two (2) harness adaptors.



3. Set tester dial and switch as follows:

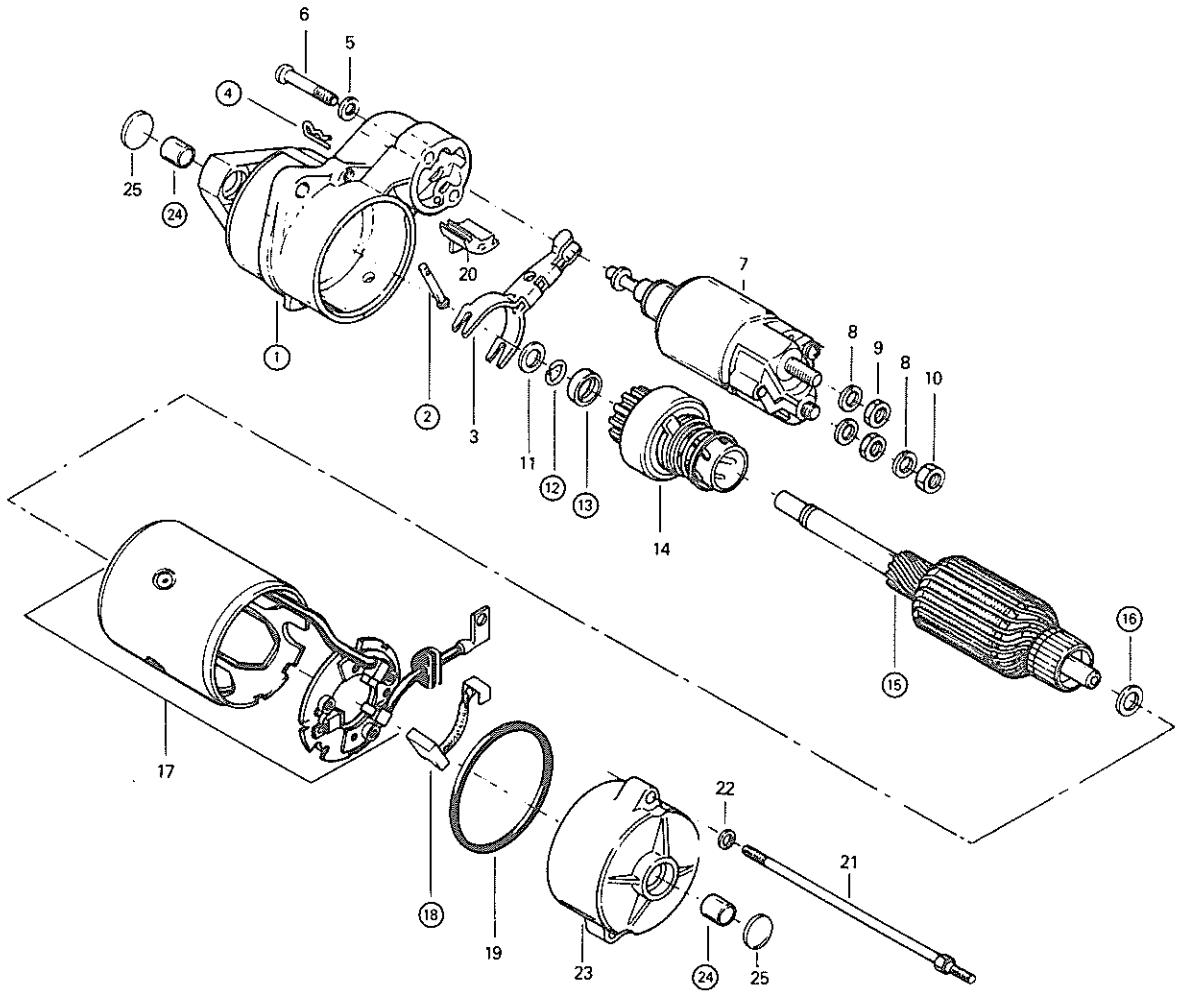
Engine type	Switch position	Dial
354, 454	LOW	80

4. Crank engine.

A. **Indicator lamp lights:** Lighting coil output is up to specifications. Repeat test at least three (3) times to verify reading and consistency.

B. **Indicator lamp does not light:** Lighting coil is faulty.

ELECTRIC STARTER



1. Drive housing Assembly
2. Drive Lever Set Pin
3. Pinion Drive Lever
4. Snap Pin
5. Lockwasher
6. Magnetic Switch Screw
7. Magnetic Switch
8. Lockwasher 8 mm
9. Hexagonal Nut 8 mm
10. Hexagonal Nut 8 mm
11. Shim
12. Snap Ring
13. Clutch Stop Collar
14. Clutch
15. Armature
16. Washer
17. Yoke
18. Brush
19. Rubber Packing
20. Rubber Seal
21. Through Bolt
22. Lockwasher
23. End Frame
24. Bushing
25. Bushing cover

REMOVAL

Disconnect black cable ground connection from battery. Disconnect red battery cable and red and green wire from solenoid switch. Remove starter.

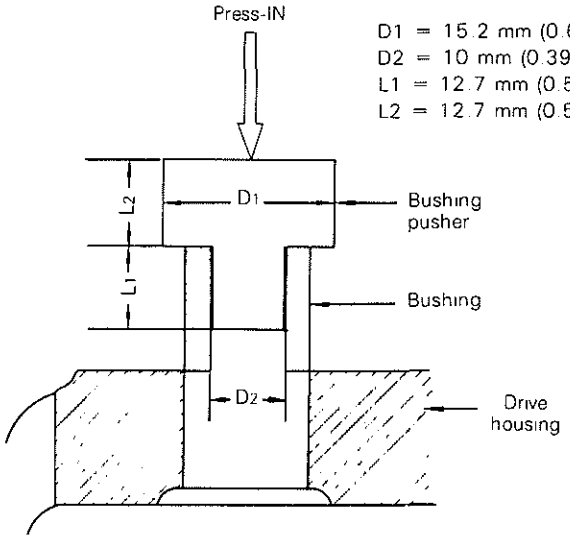
DISASSEMBLY & ASSEMBLY

CAUTION: To carry out some of the following procedures, it is necessary that special equipment be available. If you do not possess such equipment, either replace the damaged components or have the parts overhauled in a workshop equipped with proper tooling.

㉔ Check the wear on bushings by measuring the amount of side play between the armature shaft and the bushings.

The side play should not exceed 0.20 mm (0.008"). If excessive, replace the bushing. To replace a bushing, press out the old one and press in a new one with a bushing pusher. The correct size of the bushing pusher to use is given in the illustration below.

NOTE: It may be required to ream the bushing to obtain proper fit.

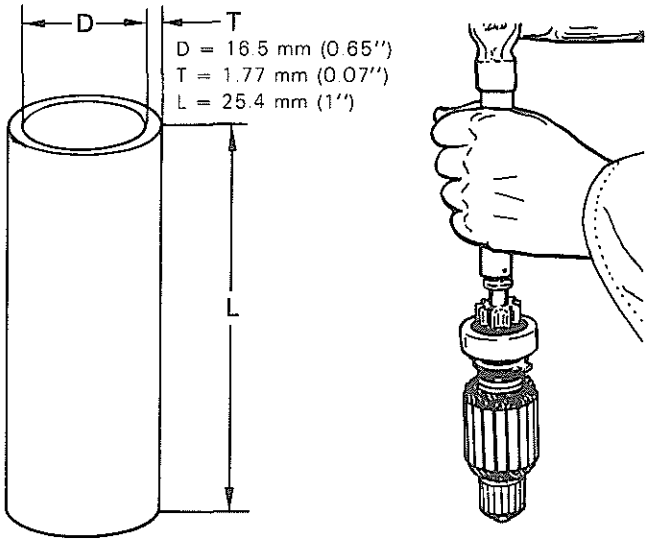


②④ To pull out the armature with overrunning clutch assembly and the drive lever from the drive housing, remove the hair pin and pull out the drive lever set pin.

⑮⑯ Note the number and the position of the washers and shims located at both ends of the armature. An end play of .050 to 0.35 mm (0.002-.014") should exist between armature and end housing.

⑫⑬ To remove the pinion stop collar from the armature, make a took similar to the illustration below.

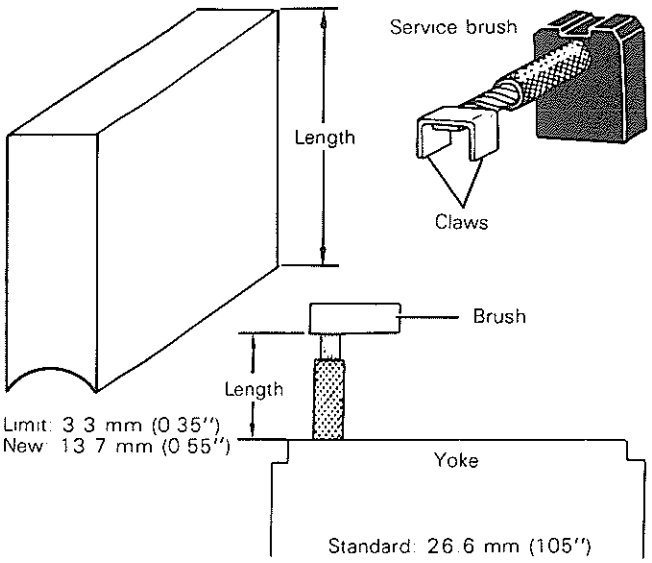
Drive out the pinion stop collar toward the overrunning clutch using the tool as shown below then remove snap ring.



⑱ Check the brush length if less than 9 mm (0.350"), replace the brush. (A new brush is 14 mm (.550" long).

To replace a brush, cut off the old brush from the yoke and insert the remaining brush lead on the yoke between the claws of the new brush. Solder it in place. Cover the soldered portion with the tube on the new brush lead.

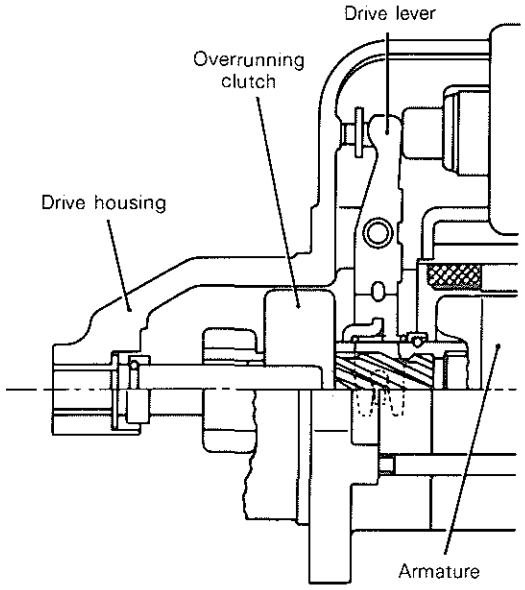
Standard brush lead length is 26.6 mm (1.05").



For assembly, follow the disassembly procedure in the reverse order, paying attention to the following:

Coat the sliding surfaces and moving portions of the armature splines, overrunning clutch, bushings and the solenoid switch plunger with multipurpose grease (water, climate and coldness resistant).

Reinstall the drive lever as illustrated below.



When reassembling the yoke to the drive housing align the embossment on the yoke with the notch pin on the drive housing.

When reassembling the brush holder to the yoke align the embossment on the brush holder with the notch on the yoke.

NOTE: Make sure to reinstall the same number of shims on the armature at the place noted during disassembly.

When reassembling the commutator end frame to the brush holder align the notch on the commutator end frame with the pilot embossment on the brush holder.

CLEANING

CAUTION: Armature starter yoke ass'y and drive unit assembly must not be immersed in cleaning solvent.

Clean brushes and holders with a clean cloth soaked in solvent. Brushes must be dried thoroughly with a clean cloth. Blow brush holders clean using compressed air. Remove dirt, oil or grease from commutator using a clean cloth soaked in suitable solvent. Dry well using a clean, dry cloth. Clean engine starter gear teeth and drive unit (clutch).

NOTE: Bearing bushing of the drive unit must not be cleaned with grease dissolving agents.

Immerse all metal components in cleaning solution. Dry using a clean, dry cloth.

INSPECTION

Armature

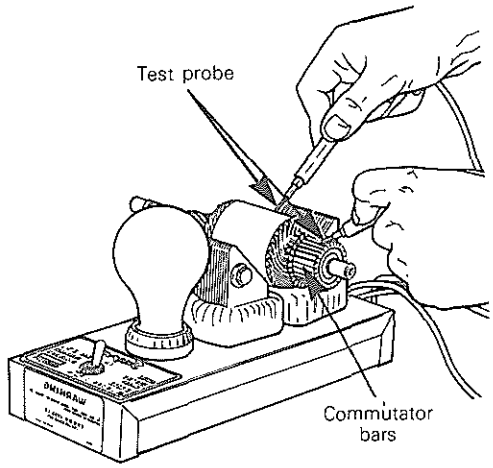
NOTE: For the following testing procedures, the use of an ohmmeter can be applicable for all tests except for the one concerning the shorted windings in the armature.

Check the commutator for roughness, burnt or scored surface. If necessary, turn the commutator in a lathe, enough to remove grime only.

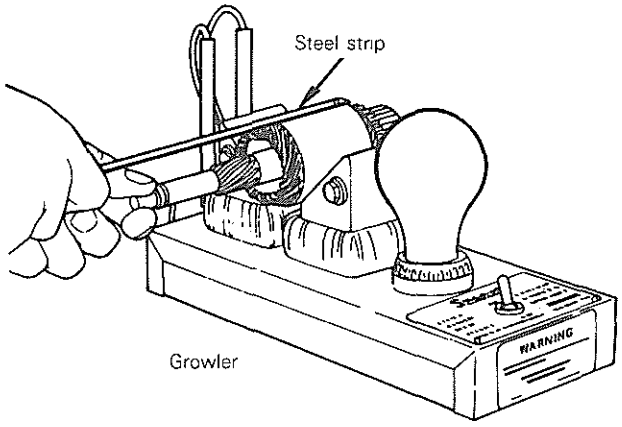
Check the commutator out-of-round condition with V Blocks and an indicator. If the commutator out-of-round is more than 0.40 mm (.016''), the commutator should be turned on a lathe.

Check the commutator for mica depth. If the depth is less than 0.20 mm (0.008''), undercut the mica. Be sure that no burrs are left and no copper dust remains between the segments after the undercutting operation is completed.

Test for ground circuit in the armature using growler test probes. Check between armature core and the commutator bars. If growler lamp turns on, bars are grounded.



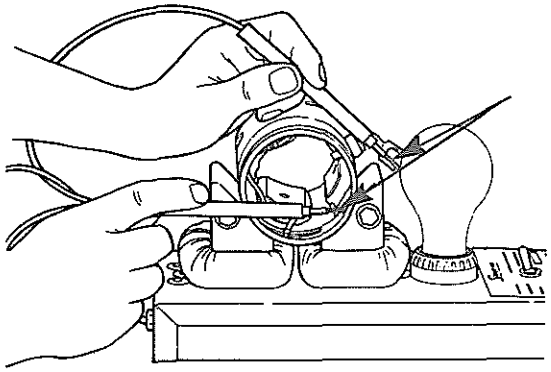
Test armature for shorted windings using a growler. When the armature is rotated in the growler with a steel strip held above it, the strip will vibrate over that area of the armature which has short circuited.



Test the armature for open circuit using growler test probes. Place one test probe on a commutator bar and the other test probe on the neighboring bar. Repeat this operation for all bars, moving one test probe at a time. If the growler lamp does not turn on, the armature circuit between these two (2) bars has an open circuit. The armature should be replaced or repaired; open circuits most often occur at the commutator riser where coils are soldered. (Burnt commutator bars are usually an indication of an open-circuited armature coil.)

Field windings and brushes

Test the field winding for open circuit using 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.



Check the dynamic brake winding for open circuit by placing one test probe on the positive brush and the other probe on the negative brush.

If growler lamp does not turn on, the winding circuit is open-circuit and the yoke has to be repaired or replaced.

Brush holder

Check the brush holder for insulation performance using growler test probes. Place one test probe on the insulated brush holder and the other test probe on the brush holder plate. If the growler lamp turns on, the brush holder has poor insulation and has to be repaired or replaced.

Check the brush spring tension with a spring scale. This should be done by placing the brush holder into position in the armature with brushes resting on the commutator. The tension reading should be made when the spring has just come off the brush.

The spring tension should be from 850.5-1162.3 grams (30-41 oz).

Overrunning clutch

The pinion of the overrunning clutch should turn smoothly in the counter-clockwise direction, and should not slip in a clockwise direction with the armature fixed. If it is defective, replace.

Check the pinion teeth for wear and damage. If defective, replace.

INSTALLATION

Make sure that starter and engine mating surfaces are free of grime. Serious trouble may arise if starter is not properly aligned.

Install starter.

Connect the red battery cable and the red wire to the large terminal of the solenoid. Connect red/green wire to small terminal of solenoid.

Connect black cable to battery.

TROUBLE SHOOTING

Causes of troubles are not necessarily in the starting system (starter) but may be due to a faulty battery, switches, electrical cables and/or connections. Trouble may also be attributed to a malfunctioning of the ignition system and/or fuel system. The following trouble shooting table is limited to the starting system.

WARNING: Short circuiting the electric starter is always a danger, therefore disconnect the ground cable at the battery before carrying out any kind of maintenance on the starting system. Do not place tools on battery.

SYMPTOM	CAUSE	REMEDY
Starter does not turn.	Poor contact of starter switch contact points.	Repair or replace switch.
Starter turns; but does not crank the engine.	Burnt or poor contact of solenoid switch contact disc.	Replace solenoid switch.
	Open circuit of solenoid switch pull-in winding.	Replace solenoid switch.
	Open circuit of solenoid switch hold-in winding.	Replace solenoid switch.
	Poor contact of brush.	Straighten commutator and brush.
	Burnt out commutator.	Turn commutator in lathe.
	Commutator mica too high.	Undercut mica.
	Shorted field coil.	Repair or replace yoke.
	Shorted armature.	Repair or replace armature.
	Weak brush spring tension.	Replace spring.
	Worn bushings.	Replace bushings.
	Weak battery.	Recharge battery.
	Shorted battery cell(s).	Replace battery.
	Poor contact of battery terminal(s).	Clean and tighten terminal(s).
	Open circuit between starter switch and solenoid switch.	Repair.
	Poor battery ground cable connection.	Clean and tighten.
Starter turns, but overrunning clutch pinion does not mesh with flywheel.	Worn clutch pinion gear.	Replace clutch.
	Defective clutch.	Replace clutch.
	Poor movement of clutch on splines.	Clean and correct.
	Worn clutch bushing.	Replace clutch.
	Worn starter bushing(s).	Replace bushing(s).
	Worn ring gear.	Replace ring gear.
Starter motor keeps running.	Shorted solenoid switch winding(s).	Replace solenoid switch.
	Melted solenoid switch contacts.	Replace solenoid switch.
	Starter switch returns poorly.	Replace ignition switch.

BATTERY

REMOVAL

WARNING: When disconnecting battery cables, always remove the black negative cable first then the positive cable (red). Care should be taken while disconnecting above mentioned cables otherwise battery post breakage could occur.

CLEANING

Clean the battery casing, vent caps, cables and battery posts using a solution of baking soda and water.

CAUTION: Do not allow cleaning solution to enter battery interior since it will destroy the electrolyte.

Remove corrosion from battery cable terminals and battery posts using a firm copper brush.

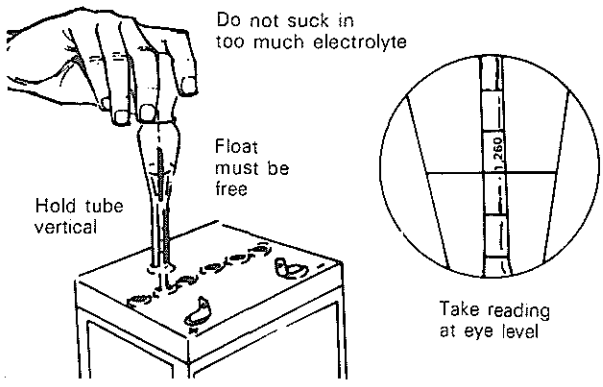
INSPECTION

Visually inspect battery casing for cracks or other possible damage. If casing is damaged, replace battery.

Inspect battery posts for security of mounting. Inspect for cracked or damaged battery caps. Ensure that vent holes are unobstructed. Replace defective caps. If vent hole is blocked, clean using a firm strand of wire.

WARNING: Some battery caps do not have holes. Make sure that overflow tube is unobstructed.

HYDROMETER TEST



A hydrometer measures a battery's state of charge in terms of specific gravity. Most hydrometers only read true at 27°C (80°F).

In order to obtain correct readings, adjust the initial reading by **adding** .004 points to the hydrometer readings for each 4°C (10°F) above 27°C (80°F) and by **subtracting** .004 points for every 4°C (10°F) below 27°C (80°F).

Refer to the following illustration.

THE ILLUSTRATION WILL AID YOU IN FINDING THE CORRECT READING.

	°C	°F			
At	38	100	add	.008	to the reading
	32	90	"	.004	" " "
	27	80		correct reading	
	21	70	subtract	.004	from the reading
	16	60	"	.008	" " "
	10	50	"	.012	" " "
	4	40	"	.016	" " "
	-1	30	"	.020	" " "
	-7	20	"	.024	" " "
	-12	10	"	.028	" " "
	-18	0	"	.032	" " "
	-23	-10	"	.036	" " "
	-29	-20	"	.040	" " "
	-34	-30	"	.044	" " "
	-40	-40	"	.048	" " "

EXAMPLE NO. 1

Temperature below 27°C (80°F)
Hydrometer Reading 1.250
Acid temperature -7°C (20°F)
Subtract .024 Sp. Gr.
Corrected Sp. Gr. is 1.226

EXAMPLE NO. 2

Temperature above 27°C (80°F)
Hydrometer Reading 1.235
Acid temperature 38°C (100°F)
Add. .008 Sp. Gr.
Corrected Sp. Gr. is 1.243

CAUTION: Do not install a partially charged battery on a snowmobile since the casing may crack at freezing temperature. The following chart shows the freezing point of the electrolyte in relation to the battery's state of charge.

Temperature-Corrected Specific Gravity	Battery State of Charge	Freezing Point of Battery
1.260	Fully Charged	-59°C (-74°F)
1.230	¾ charged	-40°C (-40°F)
1.200	½ charged	-27°C (-16°F)
1.170	¼ charged	-18°C (0°F)
1.110	Discharged	-7°C (+19°F)

BATTERY STORAGE

Disconnect and remove battery from the vehicle.

Check electrolyte level in each cell, add distilled water as required (if unavailable use drinkable water).

CAUTION: Do not overfill bottom of vent wells.

The battery should always be stored in fully charged condition. If required, recharge until specific gravity of 1.260 is obtained.

CAUTION: Battery electrolyte must not exceed 50°C (120°F).

Clean battery terminals and cable connections using a copper brush. Apply a light coat of L.P.S. No 1 Metal Protector on each. (If unavailable use petroleum jelly).

Clean battery casing and vent caps using a solution of baking soda and water. (Do not allow cleaning solution, to enter battery, otherwise it will destroy the electrolyte). Rinse battery with clear water and dry well using a clean cloth.

Store battery in a cool, dry place. Such conditions reduce self-discharging and keep fluid evaporation to a minimum.

During the storage period, recheck electrolyte level and specific gravity readings at least every forty (40) days. As necessary, keep the battery "**topped up**" and near full charge as possible (trickle charge).

ACTIVATION OF NEW BATTERY

Translucid casing

For storage purposes each battery is fitted with a temporary sealing tube. Do not remove sealing tube or loosen battery caps unless activation is desired. In case of accidental removal of caps or sealing tube prematurely, battery should be given a full charge.

1. Remove sealing tube from vent elbow. Install overflow tube contained in vehicle kit.

WARNING: Failure to remove sealing tube could result in an explosion.

2. Remove caps. Fill battery cells to upper level line with electrolyte.

3. Charge battery until specific gravity of 1.280 at 20°C (68°F) is attained.

CAUTION: If cell temperature rises higher than 54°C (127°F) discontinue charging temporarily, or reduce charging rate.

4. Reinstall caps. Wipe battery clean then install on vehicle.

WARNING: Overflow tube must be free and open. A kinked or bent tube will restrict ventilation and create gas accumulation that could result in an explosion.

INSTALLATION OF BATTERY

Install battery, connect positive cable (red) then negative cable (black).

Coat battery posts with petroleum jelly then slide protective cap over positive post.

Connect battery overflow tube to outlet tube located on bottom plate.

CAUTION: Ensure that neither the positive or the negative cables touch the muffler.

TROUBLE SHOOTING:

SYMPTOM	CAUSE	REMEDY
Discharged or weak battery	*1. Faulty rectifier	1. Replace rectifier
	2. Faulty charging coil	2. Replace charging coil
	3. Loose or bad ground connections	3. Tighten cable terminals
	4. Battery poles and/or cable terminals oxidized	4. Clean battery posts and cable terminals
	5. Faulty battery (cracked casing, damaged or loose posts)	5. Replace battery

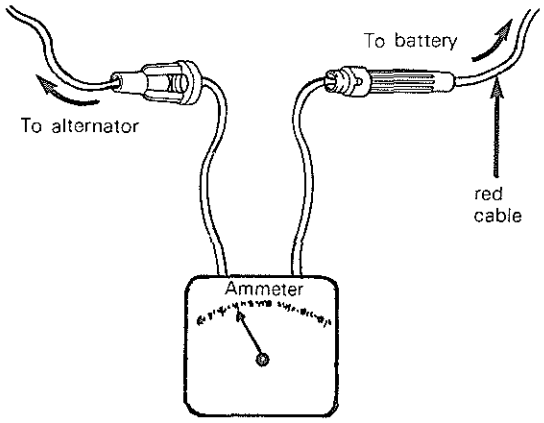
* To test the charging system, disconnect positive cable at the battery, install an ammeter between cable and battery post. If the reading indicates that the charging system operates normally, check items 2, 3 and 4.

ALTERNATOR & REGULATOR Elite

Check battery condition (refer to section 04-04)

BATTERY CHARGING RATE TEST

Connect ammeter to fuse holder of the red cable (between alternator and battery).



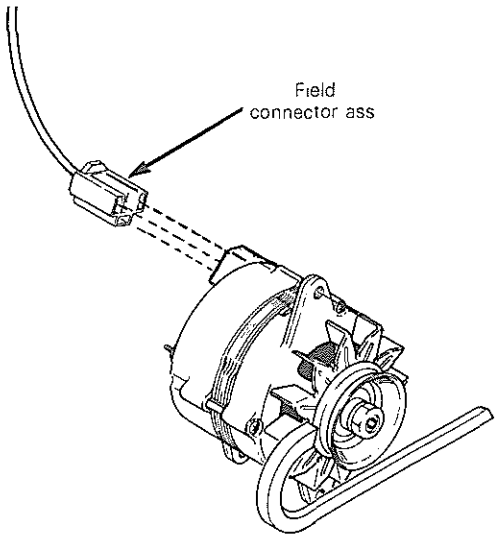
WARNING: Before checking output, support rear of vehicle with a mechanical stand. Ensure that the track is free of all particles which could be thrown out while tract is rotating. Keep hands, feet, tools and clothing clear of track.

Run engine at moderate speed and check output.

Battery condition	Output	Diagnosis
A—charged	low (less than 5A)	normal
B—charged	high (above 5A)	refer to condition B
C—discharged	high (above 5A)	normal
D—discharged	low (less than 5A)	refer to condition D

Condition B (charged battery, high output):

Disconnect field connectors ass. (plastic tab housing) on alternator.



Output drops off: alternator is OK. Check voltage regulator, repair or replace.

Output continues: alternator is faulty, repair or replace.

Condition D (discharged battery, low output)

Check all connectors, drive belt tension, wiring and connections. If problem persists, replace unit.

Check output.

SPARK PLUGS

SPARK PLUG NUMBERING SYSTEM

Bosch has introduced a new numbering code for its complete line of spark plugs. The new code is shorter, therefore easier to use. The following charts will assist you in making the change-over easily and effectively.

IMPORTANT: The new code has a different heat range identification system.

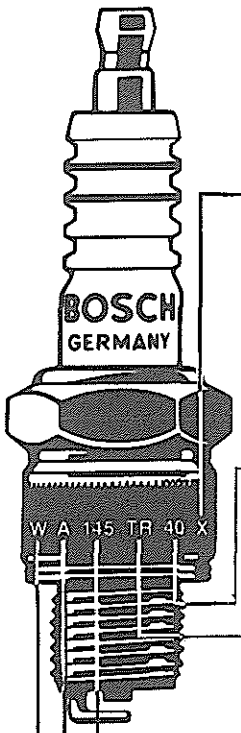
High number ——————→ hot plug

Low number ——————→ cold plug

1980 CROSS REFERENCE CHART

List of Bosch* spark plugs used on Bombardier snowmobiles:

NEW NUMBER	OLD NUMBER
M4A2	M240T1
M7A	M175T1
W3C	W275T2
W2C	W300T2



EXPLANATION OLD SYSTEM

Example:

M	For Marine Engines, resistant to seawater
P	Electrodes with Platinum Tips
S	Silver Center Electrode
X	Wide-Gap Electrodes — .060"
X4	Wide-Gap Electrodes — .044"
X6	Wide-Gap Electrodes — .060"

Thread Reach

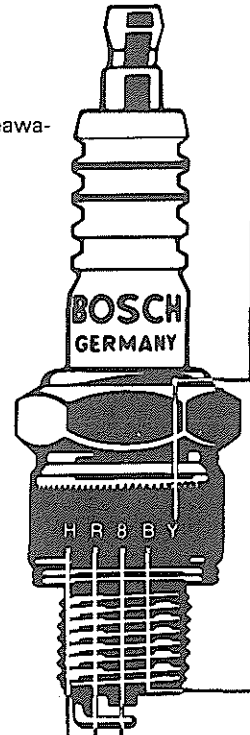
ER	Shielded, water-proof; built-in burn-off resistor
M	Plugs for 2-cycle engines
P	Electrodes of precious metals
R	Suppressor resistor, 5000 ohms, built-in
S	Silver ground electrode
T	Standard type
Z	Semicovered front electrode

Heat Range

A	SAE conical seat
AK	Miniplug with tapered seat
B	SAE connector dimensions, for 7 mm dia. cable
C	SAE connector dimensions, for 5 mm dia. cable
D	Glide-air-gap spark plug with conical seat
E	Surface gap (C.D. ignition)
G	Glide-air-gap spark plug with control electrode
K	Mini-plug with special connector
KA	Mini-plug
V	Booster gap

Thread

M	M 18 × 1.5
U	M 10 × 1
W	M 14 × 1.25
X	M 12 × 1.25
Z	$\frac{7}{8}$" -18 SAE



EXPLANATION NEW SYSTEM

Example:

X	wide gap .044" (1.1 mm)
Y	wide gap .060" (1.5 mm)
0, 1, 2, 3, 4, 5	special shell or electrode designs

Thread Reach:

A	Thread reach -.460" standard electrode
B	Thread reach .460" extended tip electrode
C	Thread reach $\frac{3}{4}$" regular electrode
D	Thread reach $\frac{3}{4}$" extended tip
E	Thread reach $\frac{3}{8}$" regular electrode
F	Thread reach $\frac{3}{8}$" extended tip electrode
P	Platinum electrode
S	Silver electrode

Heat Range

B	SAE connector for 7 mm diameter cable
C	SAE connector for 5 mm diameter cable
E	Surface gap
R	Resistor
S	Mini-plug

Thread:

D	18 mm thread diameter tapered seat
H	14 mm thread diameter tapered seat
M	18 mm thread diameter
U	10 mm thread diameter
W	14 mm thread diameter
X	12 mm thread diameter

HEAT RANGE

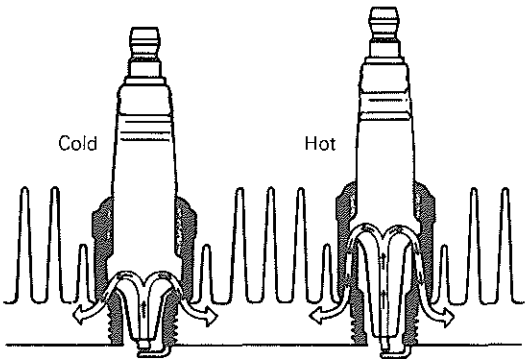
The proper operating temperature or heat range of the spark plug is determined by the spark plug's ability to dissipate the heat generated by combustion.

The longer the heat path between the electrode tip to the plug shell, the hotter the spark plug operating temperature will be — and inversely, the shorter the heat path, the colder the operating temperature will be.

A "cold" type plug has a relatively short insulator nose and transfers heat very rapidly into the cylinder head.

Such a plug is used in heavy duty or continuous high speed operation to avoid overheating.

The "hot" type plug has a longer insulator nose and transfers heat more slowly away from its firing end. It runs hotter and burns off combustion deposits which might tend to foul the plug during prolonged idle or low speed operation.



CAUTION: Severe engine damage can occur if a wrong heat range plug is used:

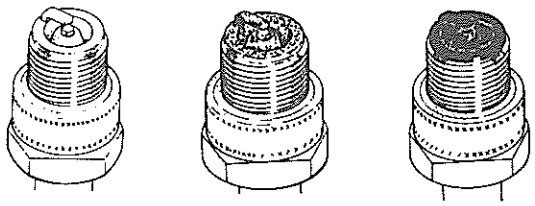
A too "hot" plug will result in overheating and pre-ignition, etc.

A too "cold" plug will result in fouling (shorting the spark plug) or may create carbon build up which can heat up red-hot and cause pre-ignition or detonation.

FOULING

Fouling of the spark plug is indicated by irregular running of the engine, decreasing engine speed due to misfiring, reduced performance, and increased fuel consumption. This is due to a loss of compression. Other possible causes are: prolonged idling, running the engine with the choke on, or running on a too rich a mixture due to a faulty carburetor adjustment or incorrect fuel and/or fuel mixing. The plug face of a fouled spark plug has either a dry coating of soot or an oily, glossy coating given by an excess either of oil or of oil with soot. Such coatings form a conductive connection between the center electrode and ground.

SPARK PLUG ANALYSIS



The plug face (and piston dome) reveals the condition of the engine, operating condition, method of driving and fuel mixture. For this reason it is advisable to inspect the spark plug at regular intervals, examining the plug face (i.e. the part of the plug projecting into the combustion chamber) and the piston dome.

SPARK PLUG INSTALLATION

Prior to installation make sure that contact surfaces of the cylinder head and spark plug are free of grime.

1. Using a wire feeler gauge, set electrode gap.
2. Apply A light coat of graphite grease over the spark plug threads to prevent possible seizure.
3. Hand screw spark plug into cylinder head and tighten with a torque wrench:

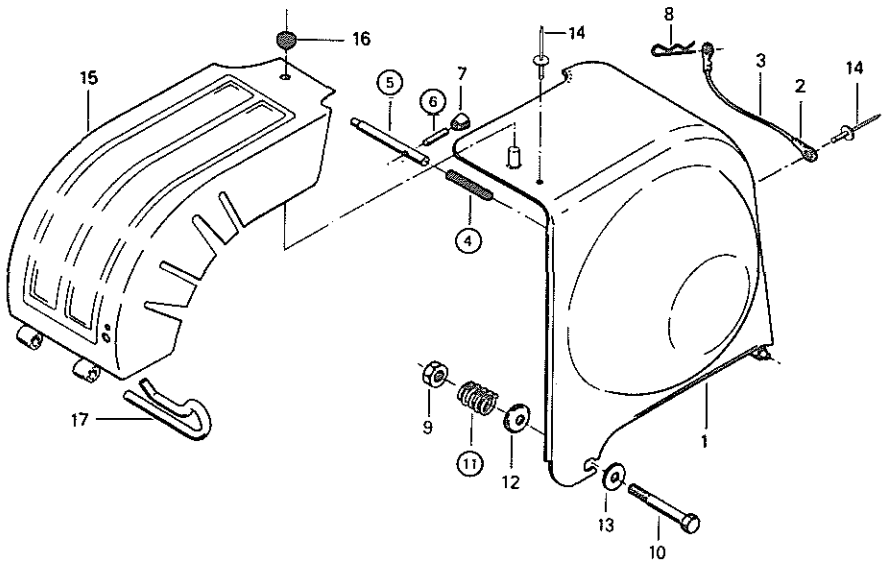
   M (18 mm) 40 N•m (30 ft-lbs)
   W (14 mm) 27 N•m (20 ft-lbs)

SPARK PLUG CHART

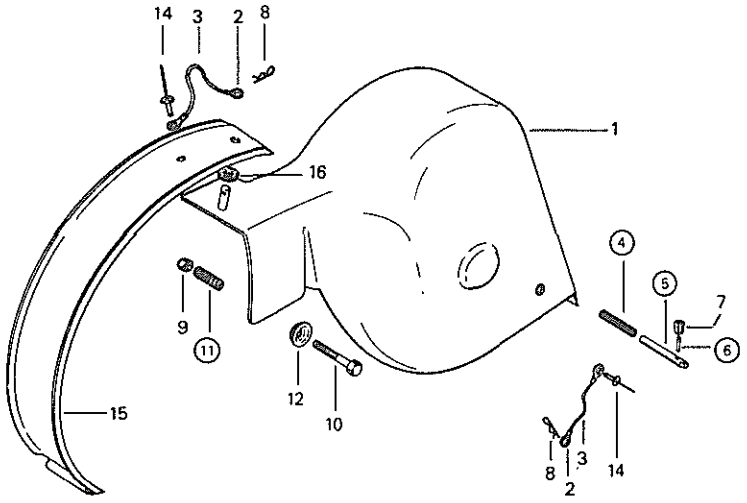
	ENGINE TYPE	
Elan & Spirit	247	M175 T1 (M7A)
Citation 3500 & Mirage I	277	W275 T2 (W3C)
Citation 4500/E & Mirage II/E	377	W275 T2 (W3C)
Citation SS & Mirage Special	377	W275 T2 (W3C)
Everest 500/E & Futura 500/E	503	W275 T2 (W3C)
Everest LC & Futura LC	464	W260 MZ2 (W4C3)
Blizzard 5500/GP Special	503	W275 T2 (W3C)
Blizzard 7500/Super Sonic	354	W300 T2 (W2C)
Blizzard 9500	454	W300 T2 (W2C)
Alpine 640ER	640	M240 T1
Elite 450 LC	444	W275 T2 (W3C)

PULLEY GUARD

Elan and Spirit



Alpine



1. *Drive pulley guard*
2. *Open barrel*
3. *Wire*
4. *Spring (pin)*
5. *Pin*
6. *Spirol pin*
7. *Cap*
8. *Hair pin cotter*
9. *Clip nut*
10. *Bolt*
11. *Spring*
12. *Retainer washer*
13. *Flat washer*
14. *Rivet*
15. *Driven pulley guard*
16. *Grommet*
17. *Hair pin*

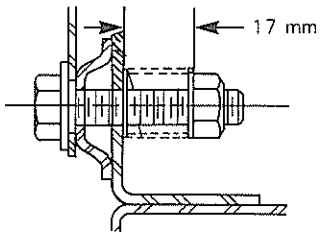
REMOVAL

Pull out hair pin and remove driven pulley guard. Pull on spring to disengage pin from frame bracket, in order to disengage drive pulley guard.

WARNING: Never start engine until pulley guard is well installed.

④ The length of uncompressed pin spring should not be less than 47 mm ($1\frac{7}{8}$").

⑪ An uncompressed front guard spring should not be less than 20 mm (13/16"). When assembling adjust length to 17 mm (11/16").

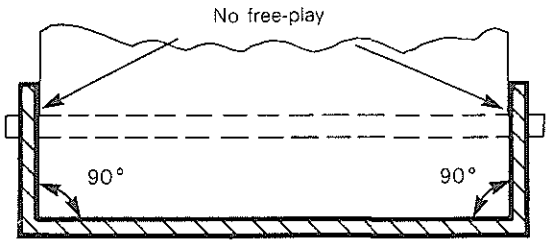


INSPECTION

⑤⑥ Check condition of coil pin. If damaged, replace.

INSTALLATION

Prior to installation, ensure that pulley guard and frame bracket are 90° with frame.



WARNING: No lateral free-play should exist between drive pulley guard and frame bracket.

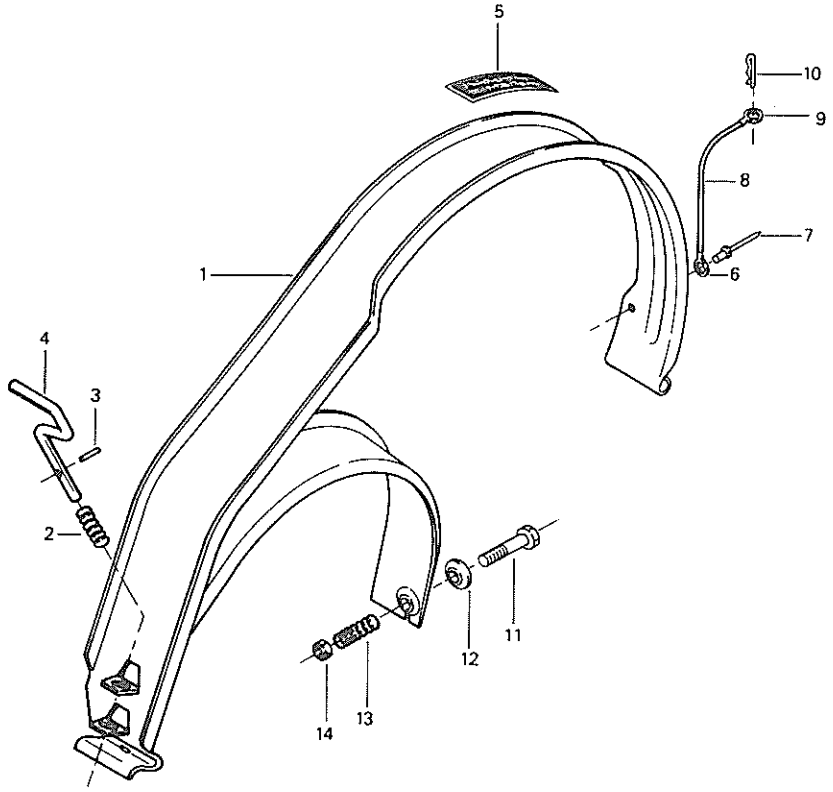
Slide pulley guard into bracket.

Pull on lower spring bolt, engage pin into frame bracket and install hair pin.

Install driven pulley guard.

Citation and Mirage

1. *Pulley guard*
2. *Spring*
3. *Roll pin*
4. *Pin*
5. *Label*
6. *Open barrel*
7. *Rivet*
8. *Wire*
9. *Open barrel*
10. *R pin*
11. *Screw*
12. *Washer*
13. *Spring*
14. *Nut*

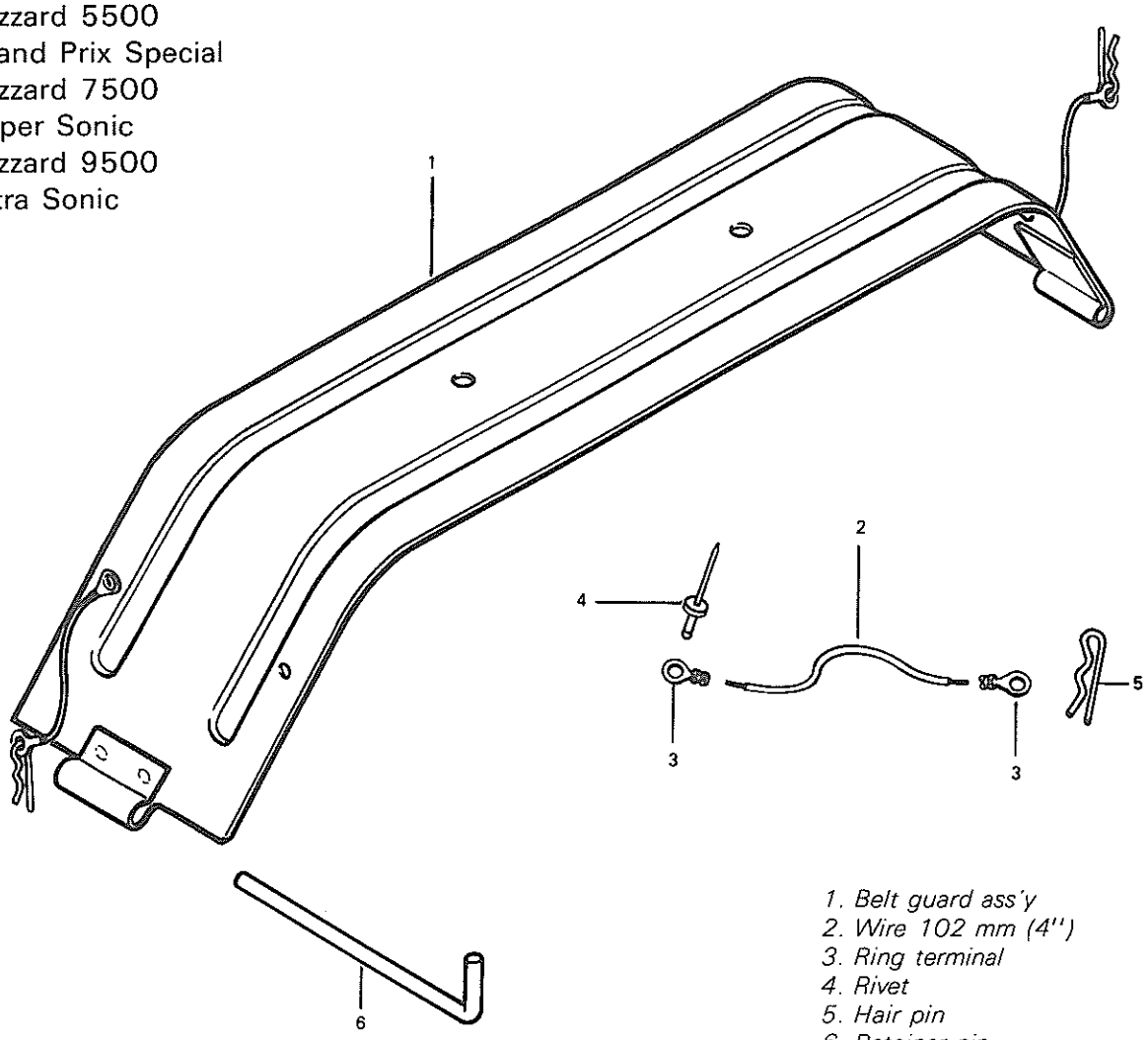


REMOVAL:

— Lift up the forward T handle and pull the guard backward then up.
— Remove the rear retainer pin.
— Pull out the guard from the center retaining clip.

To install, reverse the removal procedure.

Everest/Futura
Blizzard 5500
Grand Prix Special
Blizzard 7500
Super Sonic
Blizzard 9500
Ultra Sonic



1. Belt guard ass'y
2. Wire 102 mm (4")
3. Ring terminal
4. Rivet
5. Hair pin
6. Retainer pin

REMOVAL

Remove the two hair pins and the retainer pins, then remove the belt guard.

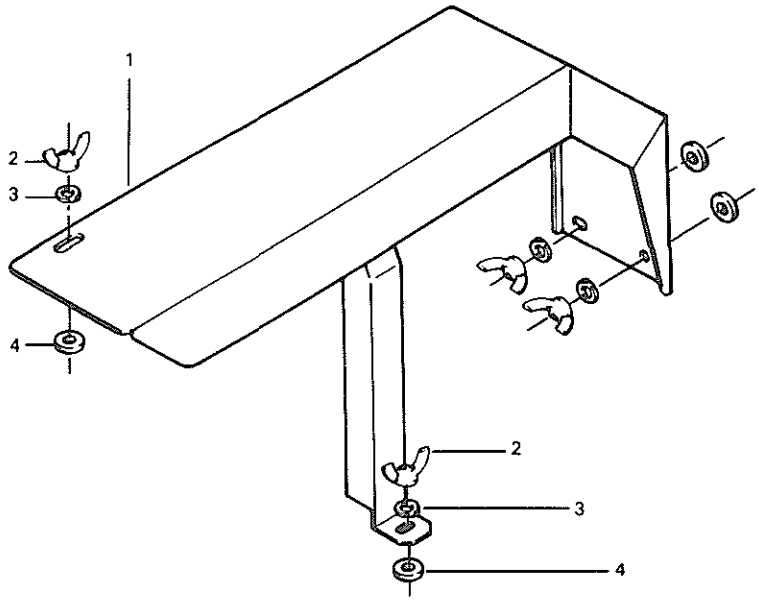
WARNING: Never start the engine without the pulley guard secured in place and the cab closed.

INSPECTION

Check all parts for wear and tear. Replace as required.

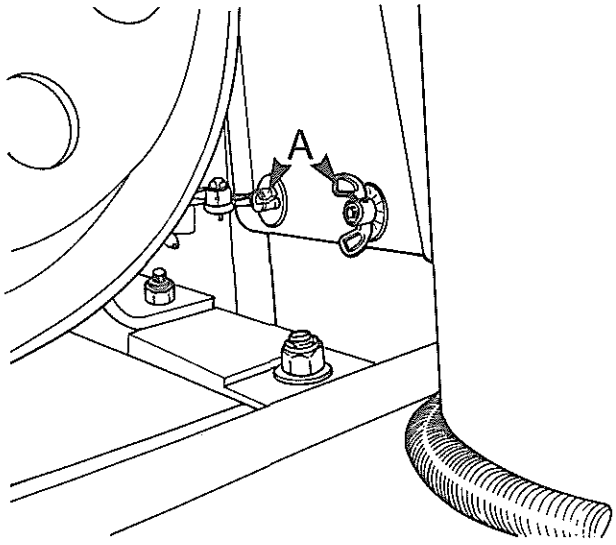
Elite

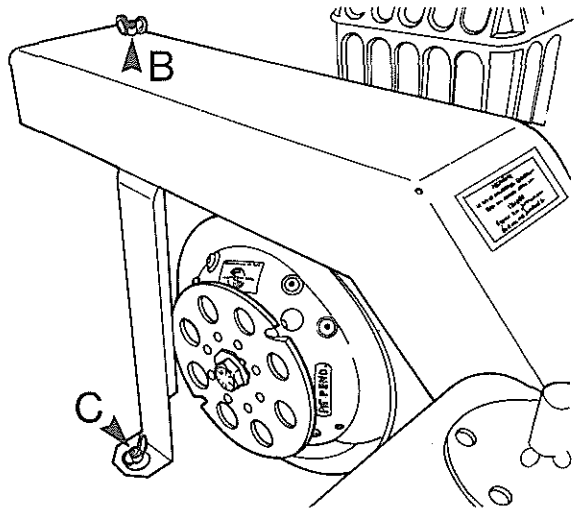
1. Pulley guard
2. Wing nut
3. Washer
4. Rubber spacer



REMOVAL

Lift and support the engine compartment hood. Unscrew the wing nuts (A) located behind the drive pulley, the wing nut (B) on top of pulley guard and the wing nut (C) at the pulley guard center support.





Disengage guard with a forward movement and remove complete assembly.

WARNING: Engine should be running only when pulley guard is secured in place and cab is closed.

INSPECTION

Check general condition of parts. If damaged, replace.

DRIVE BELT

REMOVAL & INSTALLATION

When removing a drive belt, always mark the rotation direction. Reinstall in same direction.

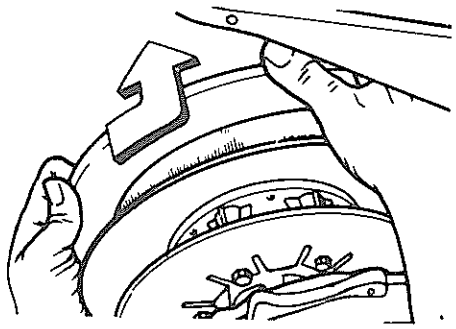
DRIVE BELT REMOVAL

Tilt cab and remove pulley guard. (Elite model: unlock and raise driven pulley support). Open driven pulley by twisting and pushing the sliding half. Hold in open position then slip slackened belt over top edge of pulley. Slip belt from drive pulley.

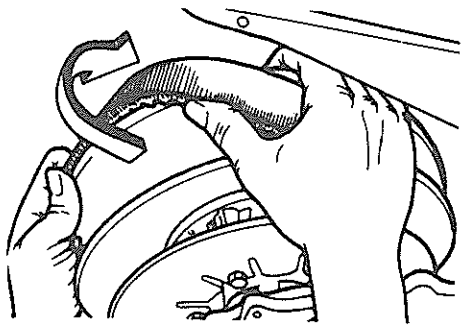
◆ WARNING: Never start or run engine without drive belt installed.

Elan, Spirit, Alpine, Elite

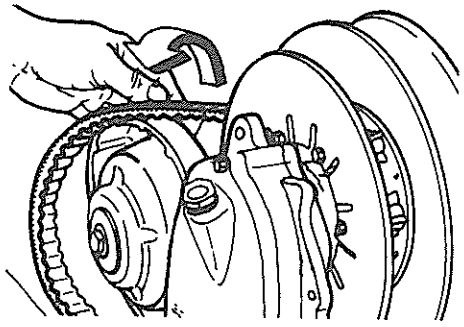
A



B

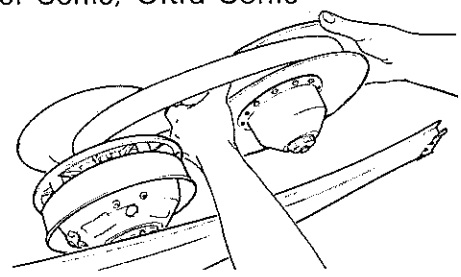


C

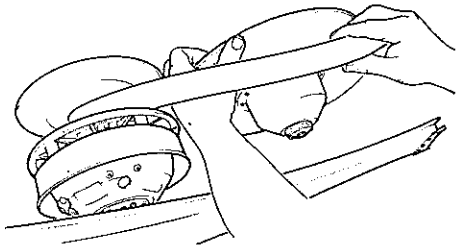


Everest, Futura, Blizzard 5500, 7500, 9500, Grand Prix Special Super Sonic, Ultra Sonic

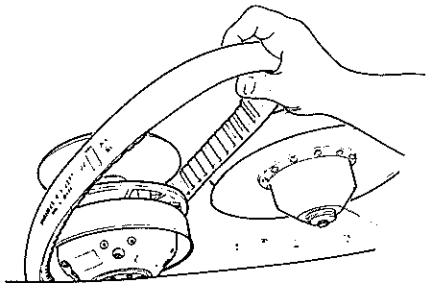
A. 4



B. 5



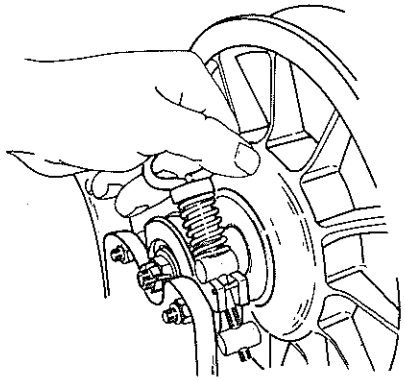
C. 6



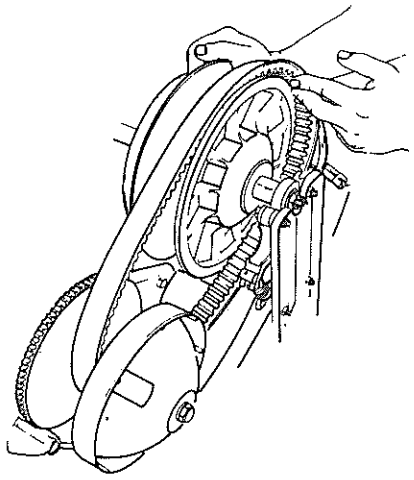
Mirage, Citation

1 — Remove the belt guard.

2 — Loosen the countershaft bearing retaining screw and open the bearing cage.

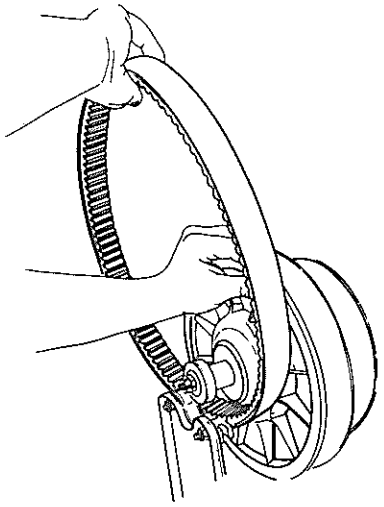


3 — Open the driven pulley by twisting and pushing the sliding half. Hold in fully open position.

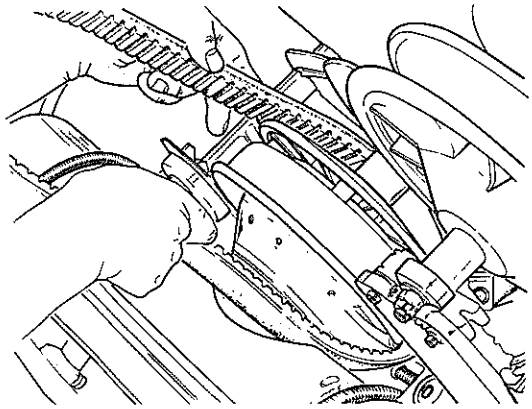


4 — Slip the belt over the top edge of the sliding half.

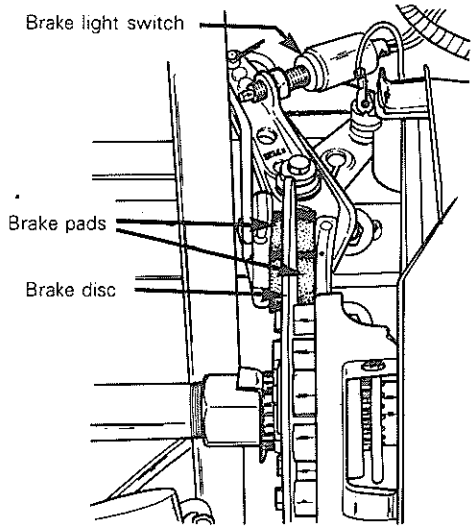
5 — Lift the countershaft upward approximately 50 mm (2 in.) and slip the belt between the shaft and the bearing cage.



6 — Slip the belt out from the drive pulley.



WARNING: It may be necessary to loosen the brake adjustment in order to easily lift the countershaft. Always check that the brake disc is correctly installed between the brake pads and that the brake is well adjusted.



To install: reverse the procedure

TENSION ADJUSTMENT

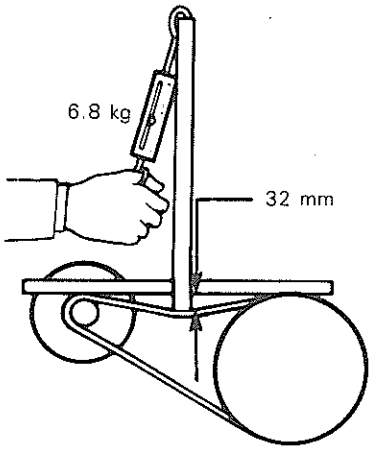
All models except Citation and Mirage

For proper drive belt use, See Technical Data.

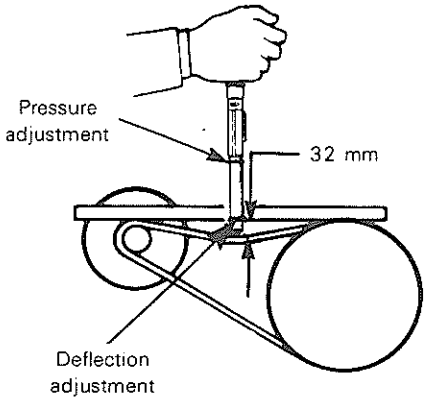
If a drive belt does not have the minimum recommended width, performance will be affected.

Adjust belt tension as follows:

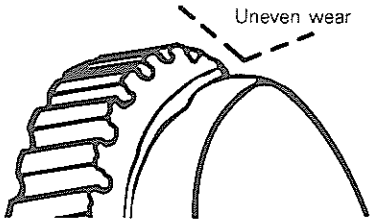
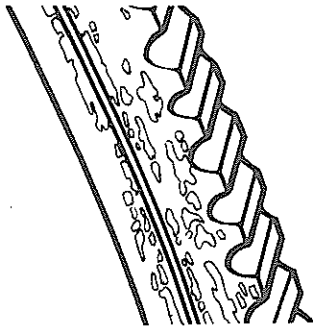
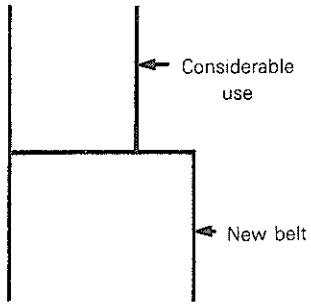
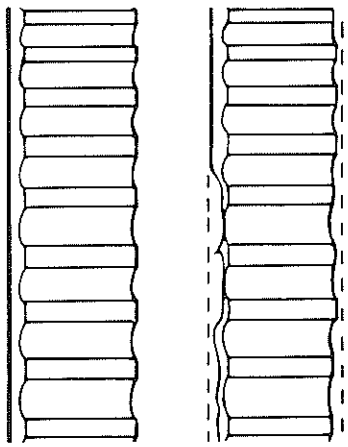
Position a reference rule on drive belt. Using a wooden stick and fish scale, apply a 6.8 kg (15 pounds) pressure on drive belt. Deflection must be 32 mm ($1\frac{1}{4}$''). To correct, decrease or increase distance between pulleys.

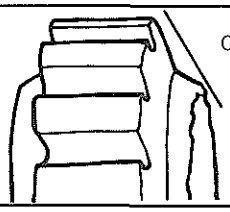
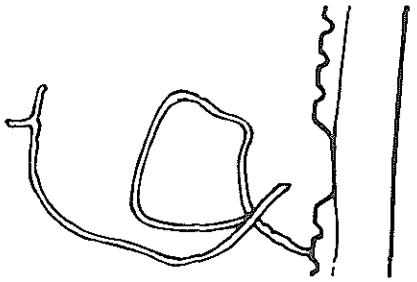
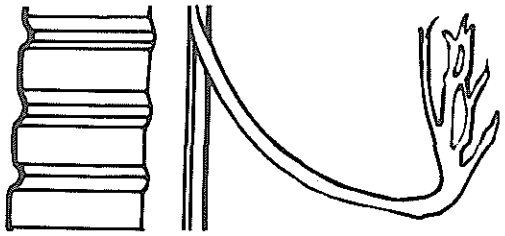
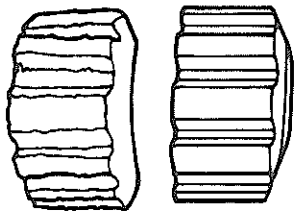
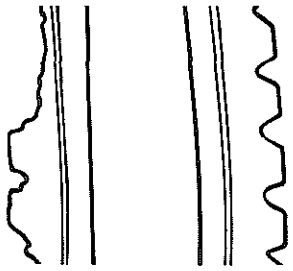


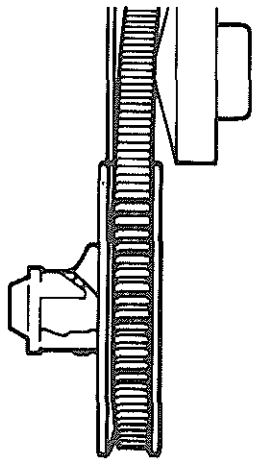
Or using tool no. 414 3482:



TROUBLE SHOOTING

1. Uneven belt wear on one side only.		
	CAUSE a) Loose engine mount. b) Pulley misalignment. c) Rough or scratched pulley surfaces.	REMEDY a) Tighten engine mount nuts equally. b) Align pulleys. c) Repair or replace pulley half.
2. Belt glazed excessively or having baked appearance.		
	CAUSE Excessive slippage caused by: a) Insufficient pressure on belt sides. b) Rusted drive or driven pulley shafts. c) Oil on pulley surfaces. d) Incorrect centrifugal governor.	REMEDY a) Check drive pulley for worn or missing flyweights/rollers. b) Clean shaft with steel wool and lubricate with low temperature grease. c) Clean pulley surfaces with fine emery cloth and clean cloth. d) Install correct governor.
3. Belt worn excessively in top width.		
	CAUSE a) Excessive slippage due to irregular outward actuation movement of drive pulley. b) Rough or scratched pulley surfaces. c) Improper belt angle. d) Considerable use.	REMEDY a) Carry out inspection. b) Repair or replace pulley. c) Using unspecified type of belt. Replace belt with correct Bombardier belt. d) Replace belt if 3 mm ($\frac{1}{8}$'') less than recommended width (see Technical Data).
4. Belt worn narrow in one section.		
	CAUSE Excessive slippage in drive pulley caused by: a) Frozen or too tight track. b) Drive pulley not functioning properly. c) Engine idle speed too high. d) Incorrect belt length. e) Incorrect pulley distance.	REMEDY a) Liberate track from ice or check track tension and alignment. b) Repair or replace drive pulley. c) Reduce engine RPM. d) Using unspecified type of belt. Replace belt with correct Bombardier belt. e) Readjust to specifications.

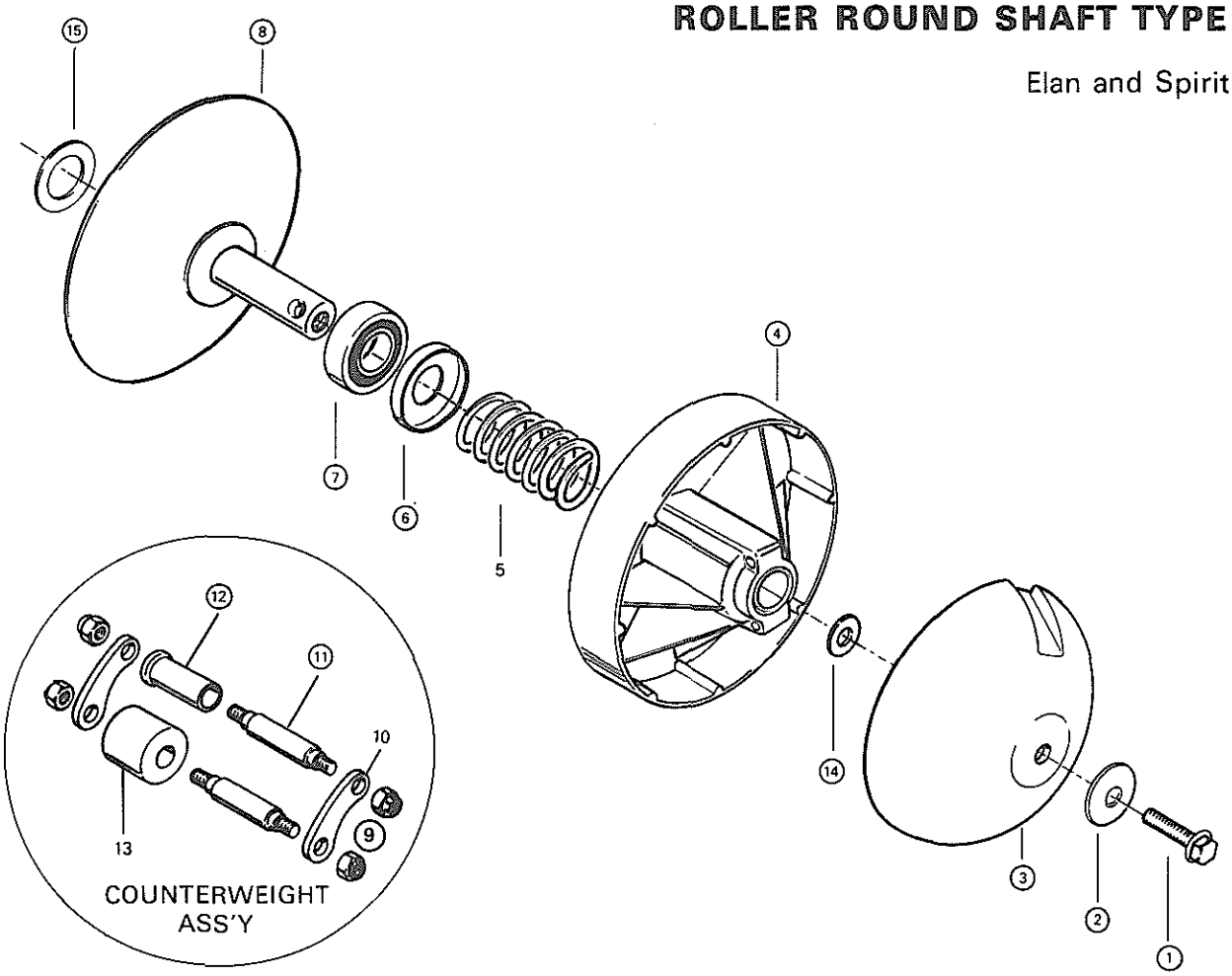
5. Belt sides worn concave.		
	CAUSE a) Rough or scratched pulley surfaces. b) Unspecified type of belt.	REMEDY a) Repair or replace. b) Replace belt with correct Bombardier belt.
6. Belt desintegration.		
	CAUSE a) Excessive belt speed. b) Oil on pulley surfaces.	REMEDY a) Using unspecified type of belt. Replace belt with proper type of belt. b) Clean pulley surfaces with fine emery cloth and lubricate with low temperature grease.
7. Belt edge cord breakage.		
	CAUSE a) Pulley misalignment.	REMEDY a) Align pulleys.
8. Flex cracks between cogs.		
	CAUSE a) Considerable use, belt wearing out.	REMEDY a) Replace belt.
9. Sheared cogs, compression section fracture or torn.		
	CAUSE a) Improper belt installation. b) Belt rubbing stationary object on pulleys. c) Violent engagement of drive pulley.	REMEDY a) Refer to Installation section. b) Check drive components. c) Grease, replace spring or drive pulley.

10. Belt "Flip-Over" at high speed.		
	CAUSE a) Pulley misalignment. b) Belt excessive speed.	REMEDY a) Align pulleys. b) Using unspecified type of belt. Replace belt with correct Bombardier belt.

DRIVE PULLEY

ROLLER ROUND SHAFT TYPE

Elan and Spirit



WARNING: Drive pulley repairs that include any dissassembly or assembly procedures must be performed by an authorized Bombardier dealer, or other such qualified person. Sub-component installation and assembly tolerances require strict adherence to procedures detailed.

1. *Retaining bolt*
2. *Washer*
3. *Governor cup*
4. *Sliding half ass'y*
5. *Spring*
6. *Spring seat*
7. *Bearing*
8. *Fixed half*
9. *Nut*
10. *Counterweight*
11. *Shouldered pin*
12. *Bushing*
13. *Roller*
14. *Shim*
15. *Shim*

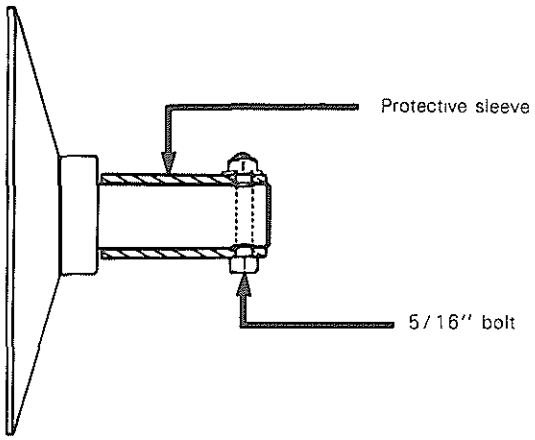
REMOVAL

With engine cold, remove spark plug(s) then bring P.T.O. (Power Take Off) piston at T.D.C. (Top Dead Center) position.

Rotate drive pulley 45° **clockwise** then insert enough starter rope into cylinder to fill it completely.

WARNING: Spring pressure can force assembly apart; therefore, it is imperative that the governor cup be held firmly during governor retaining bolt removal.

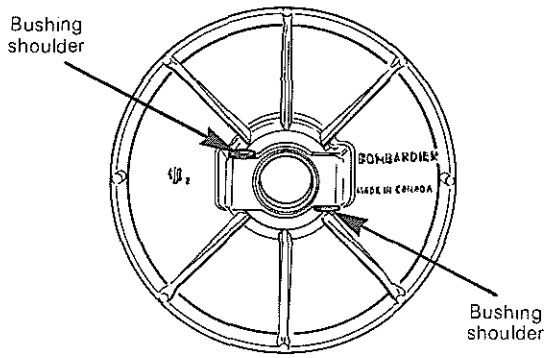
If necessary to remove fixed half, slide a length of steel pipe over shaft. Attach with a 5/16" nut and bolt, as illustrated. The fixed half can then be removed with a pipe wrench.



DISASSEMBLY & ASSEMBLY

①At assembly, torque bolt to 61 N•m (45 ft-lbs).

④⑫Shouldered pin bushings must be installed in sliding half as per illustration.



⑦Bearing is replaceable and can be removed and installed with a standard puller and pusher.

⑨⑪Apply Loctite 242 or equivalent on threads then torque nuts to 14N•m (10 ft-lbs).

CAUTION: Do not disassemble counterweitht unless replacement is necessary.

⑭As required, maximum of two (2). Used to obtain a neutral function of the drive pulley when engine is idling: refer to INSTALLATION.

⑮Used to obtain correct pulley alignment, refer to section 05-05.

CLEANING

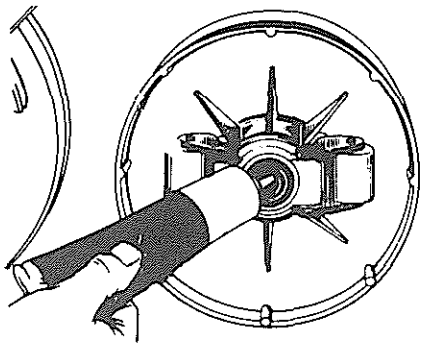
Clean pulley faces and shaft with fine steel wool and dry cloth. Clean sliding half bushing with clean dry cloth.

INSTALLATION

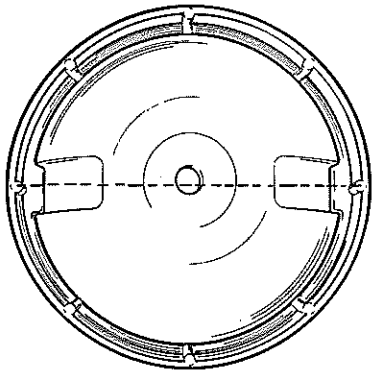
Lock crankshaft in position as explained in removal procedure. Make sure crankshaft is rotated 45° **counterclockwise** from T.D.C. position and that cylinder is completely filled with a starter rope.

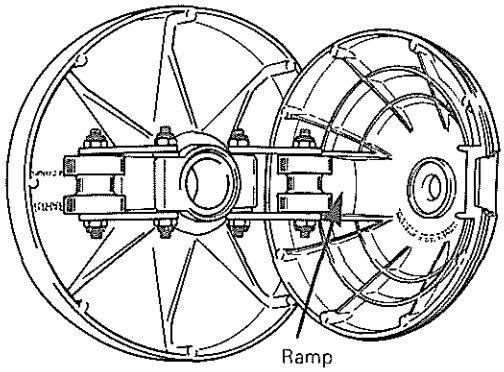
Clean crankshaft extension threads and apply Loctite 242 or equivalent then install fixed half on extension.

Pack inside of pulley shaft with High Performance Drive Pulley Lubricant.



Install governor cup correctly as per illustration making sure that the rollers are sliding on their ramp.

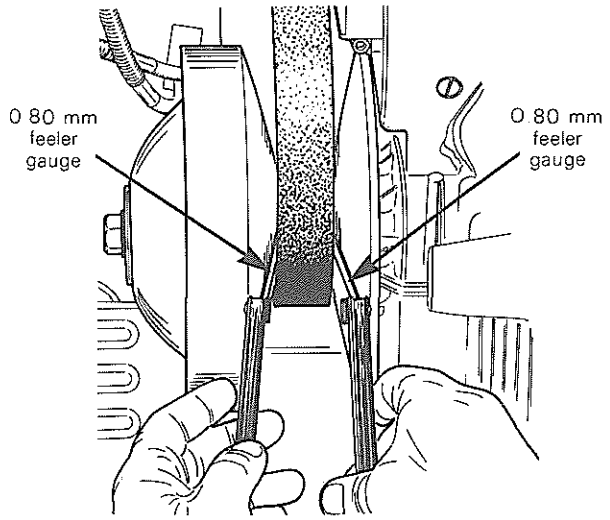




Position retaining bolt then lube torque to 61 N•m (45 ft-lbs).

WARNING: Shim(s) ⑭ is(are) used to obtain a neutral fonction of the drive pulley when engine is idling. Proceed as follows when retaining bolt is torqued:

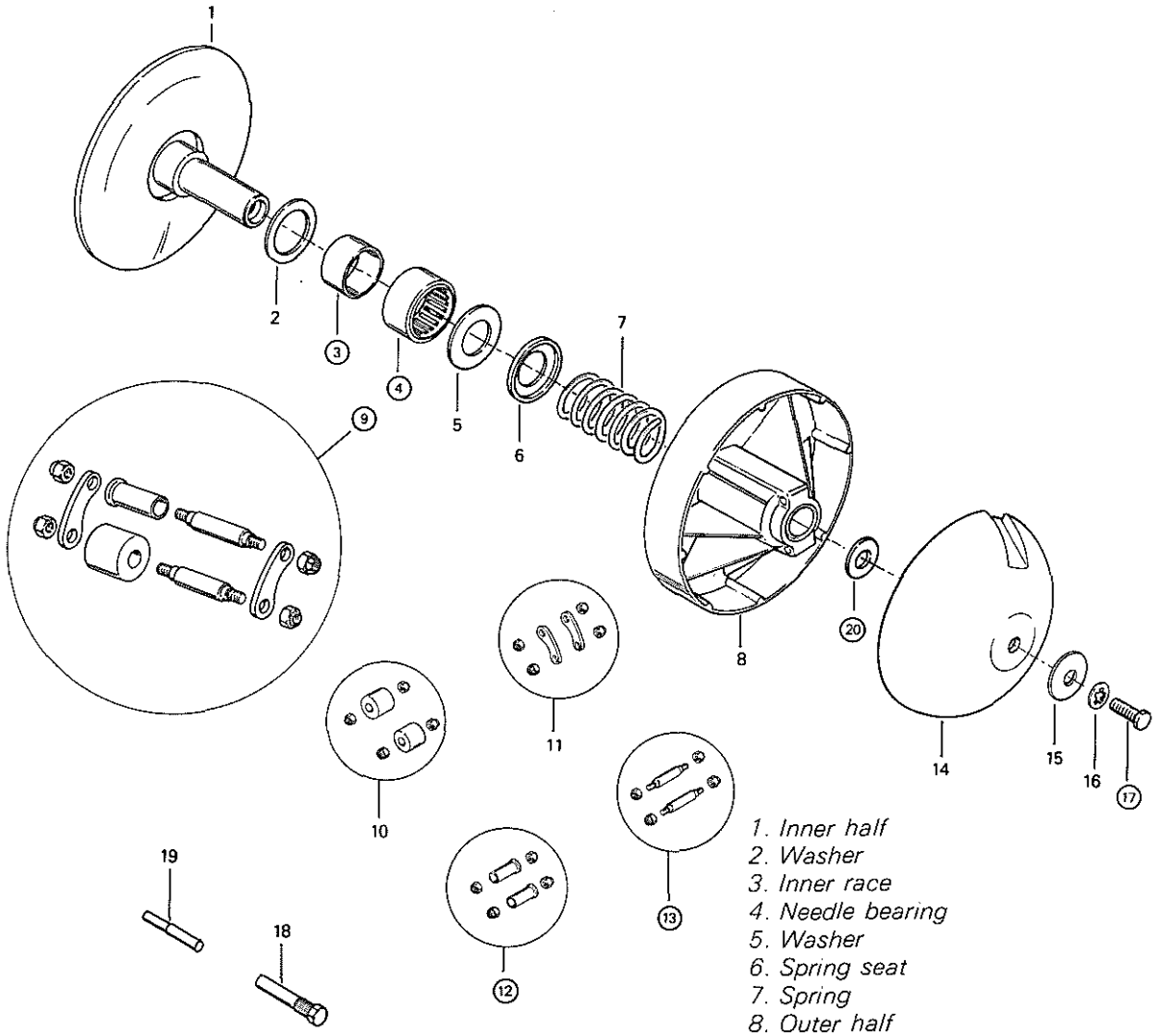
With a **new** drive belt installed, you should be able to insert a minimum of 0.80 mm (.030") thick feeler gauge on each side of the drive belt simultaneously when pushing drive belt to sit on bearing.



Shim⑭located between governor cup and drive pulley shaft will help you to obtain correct adjustment. Use not more then two (2) shims.

ROUND SHAFT (TAPER) TYPE

Mirage I, Mirage II/E
Citation 3500, Citation 4500/E



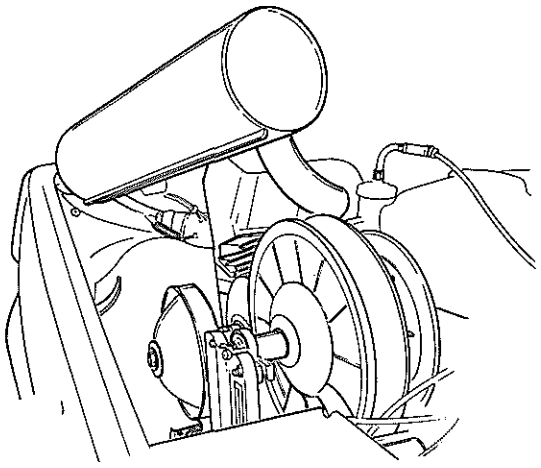
1. *Inner half*
2. *Washer*
3. *Inner race*
4. *Needle bearing*
5. *Washer*
6. *Spring seat*
7. *Spring*
8. *Outer half*
9. *Counterweitht ass'y*
10. *Roller ass'y*
11. *Lever ass'y*
12. *Bushing kit*
13. *Shouldered pin ass'y*
14. *Governor cup*
15. *Washer*
16. *Lock washer*
17. *Cap screw*
18. *Puller*
19. *Puller pin*
20. *Shim*

WARNING: Drive pulley repairs that include any dissassembly or assembly procedures must be performed by an authorized Bombardier dealer, or other such qualified person. Sub-component installation and assembly tolerances require strict adherence to procedures detailed.

CAUTION: Mirage and Citation models are equipped with drive pulleys of METRIC dimensions.

REMOVAL:

With engine cold, disconnect the two muffler springs and lift up the muffler until drive pulley can be easily removed.



Lock the crankshaft by using one of the following method:

Insert the crankshaft locking tool P / N 420 876 640 into the impulse hole of the engine. Slowly rotate the crankshaft until it locks into position.

CAUTION: Do not use any type of pin other than the tool P/N 420 876 640 supplied with the tool kit.

OR:

Remove spark plug(s) then bring P.T.O. piston at T.D.C. position.

Rotate drive pulley 45° **clockwise** then insert enough starter rope into cylinder to fill it completely.

WARNING: Spring pressure can force assembly apart; therefore, it is imperative that the governor cup be held firmly during governor retaining bolt removal.

If it is necessary to remove fixed half, use drive pulley puller no. 529-0028, 529-0030.

CAUTION: This pulley has metric threads. Do not use standard thread puller.

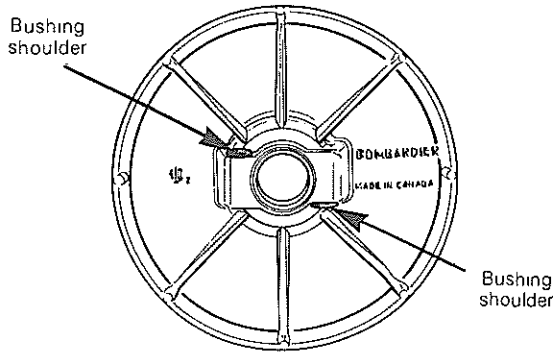
Remove starter rope blocking piston, then reblock piston after having turned 45° **counter-clockwise** from T.D.C. position; or install crankshaft locking tool.

Install puller in pulley shaft then tighten, at the same time knock slightly on puller head to disengage pulley from engine crankshaft.

DISASSEMBLY & ASSEMBLY

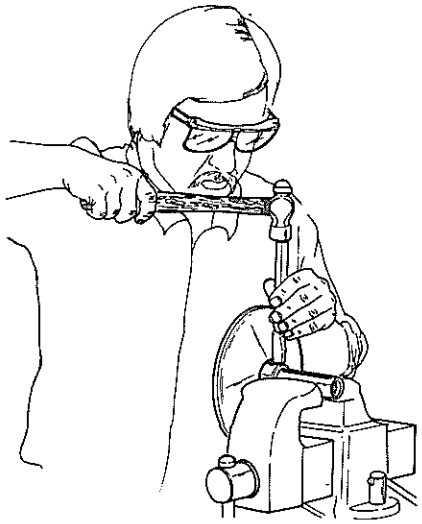
⑰ At assembly, torque bolt to 61 N•m (45 ft-lbs).

⑫ Shouldered pin bushings must be installed in sliding half as per illustration.



④ Bearing is replaceable.

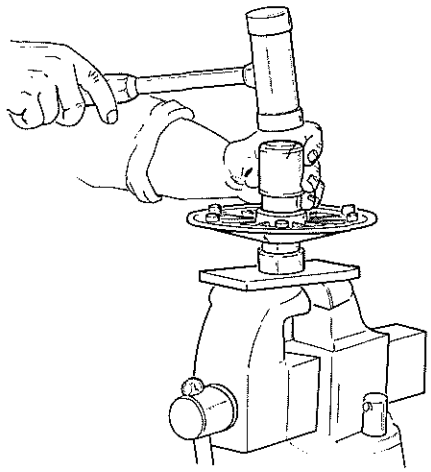
③ Bearing inner race can also be replaced. To remove the inner race: Secure inner race in a vice and break open using a chisel and hammer.



WARNING: Safety goggles must be worn as metal pieces may be projected.

To install a new inner race:

Use a press or plastic hammer as illustrated. Make sure the inner race is flush with the bearing seat.

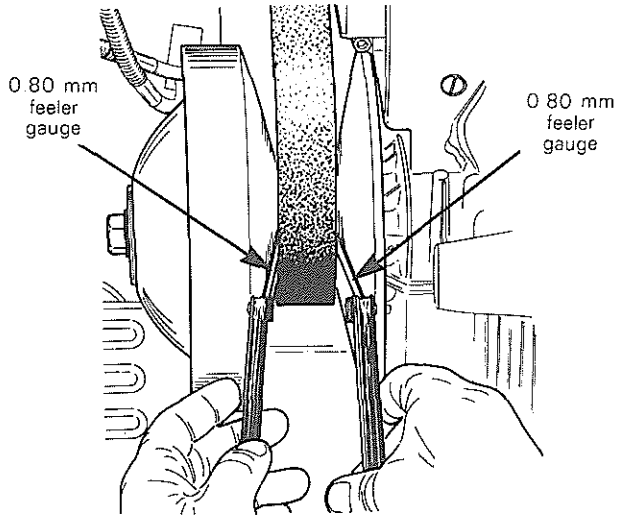


⑨⑬ Apply Loctite 242 or equivalent on threads then torque nuts to 14 N•m (10ft-lbs).

CAUTION: Do not disassemble counterweitht unless replacement is necessary.

WARNING: Shim(s)⑳is(are) used to obtain a neutral fonction of the drive pulley when engine is idling. Proceed as follows when retaining bolt is torqued:

With a **new** drive belt installed, you should be able to insert a minimum of 0.80 mm (.030") thick feeler gauge on each side of the drive belt simultaneously when pushing drive belt to sit on bearing.



Shim ⑳ located between governor cup and drive pulley shaft will help you to obtain correct adjustment. Use not more then two (2) shims.

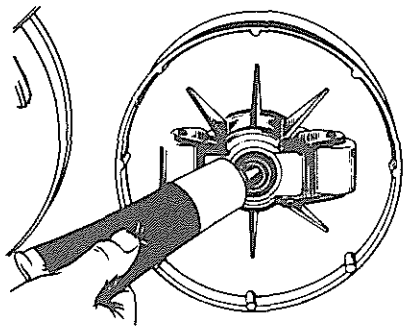
CLEANING

Clean pulley faces and shaft with fine steel wool and dry cloth. Clean sliding half bushing with clean dry cloth.

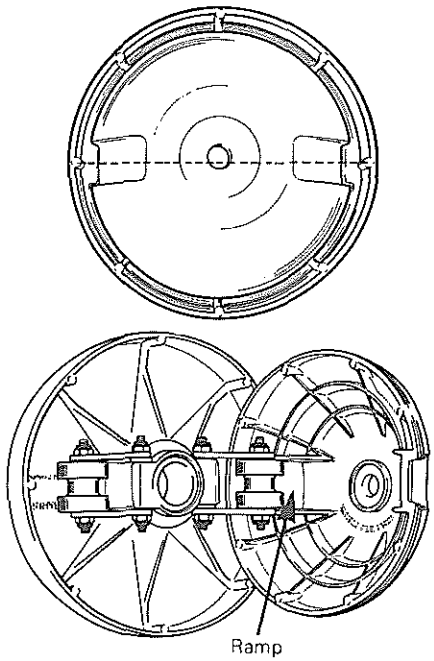
INSTALLATION

Lock crankshaft in position as explained in removal procedure. Make sure crankshaft is rotated 45° **counterclockwise** from T.D.C. position and that cylinder is completely filled with a starter rope.

Pack inside of pulley shaft with High Performance Drive Pulley Lubricant.



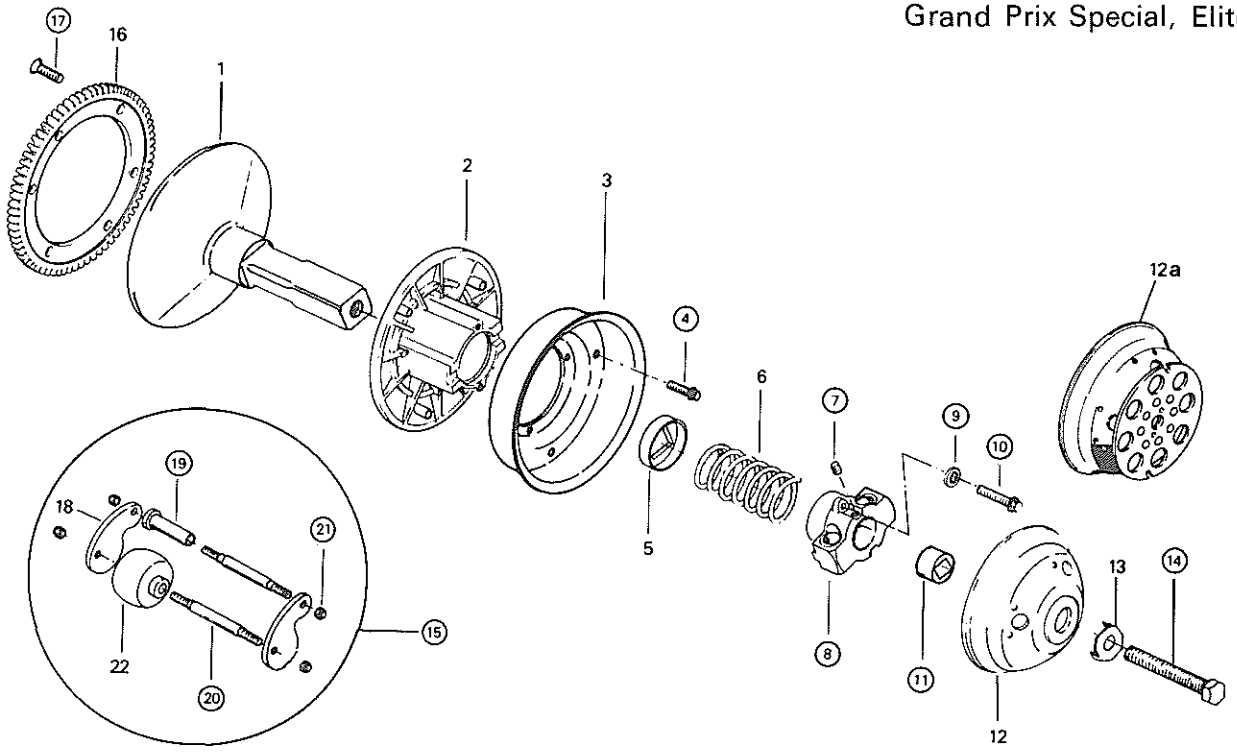
Install governor cup correctly as per illustration making sure that the rollers are sliding on their ramp.



Position retaining bolt then lube and torque to 61 N•m (45 ft-lbs).

ROLLER SQUARE SHAFT WITH DURALON BUSHING

Citation SS*, Mirage Special*,
Everest, Futura, Blizzard 5500,
Grand Prix Special, Elite



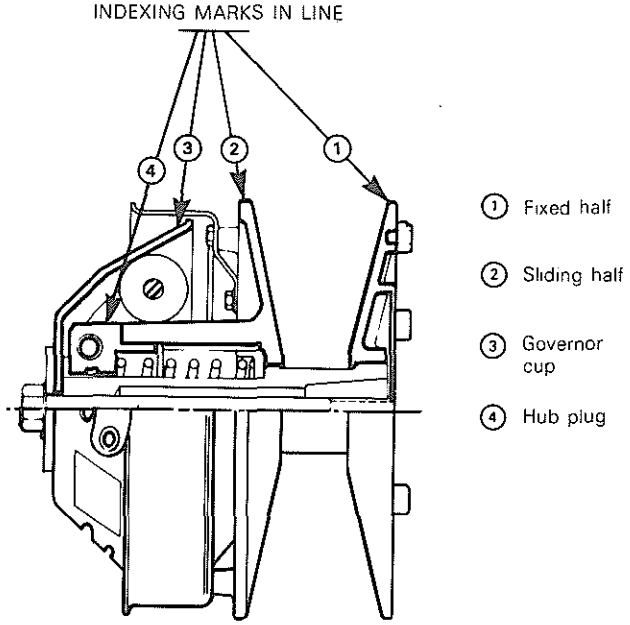
1. *Fixed half*
2. *Sliding half*
3. *Guard*
4. *Bolt*
5. *Spring seat*
6. *Spring*
7. *Allen screw*
8. *Hub plug*
9. *Internal tooth lockwasher*
10. *Bolt*
11. *"Duralon" bushing*
12. *Governor cup*
12a. *Elite model*
13. *Lock tab*
14. *Retaining bolt*
15. *Counterweight ass'y*
16. *Ring gear (electric models)*
17. *Screw*
18. *Counterweight*
19. *Bushing*
20. *Shouldered pin*
21. *Nut*
22. *Roller*

* These models are equipped with metric drive pulleys except for the shouldered pins that have standard threads.

WARNING: Drive pulley repairs that include any disassembly or assembly procedures must be performed by an authorized Bombardier dealer, or other such qualified person. Sub-component installation and assembly tolerances require strict adherence to procedures detailed.

REMOVAL

Some pulley components are marked to insure proper assembly. If components lack such marks, marking should be done manually before disassembly, as per illustration.



① Fixed half

② Sliding half

③ Governor cup

④ Hub plug

With engine cold, remove spark plugs then bring P.T.O. (Power Take Off) piston at T.D.C. (Top Dead Center) position. Rotate drive pulley 45° **clockwise** then insert enough starter rope into cylinder to fill it completely.

Open tab lock and remove retaining bolt.

Remove drive pulley assembly using appropriate puller.

P/N 529 0021 00 on all standard thread taper shaft pulleys

or

P/N 860 414 200 on Citation and Mirage models (metric threads)

Remove starter rope blocking piston, then reblock piston after having turned 45° **counter-clockwise** from T.D.C. position.

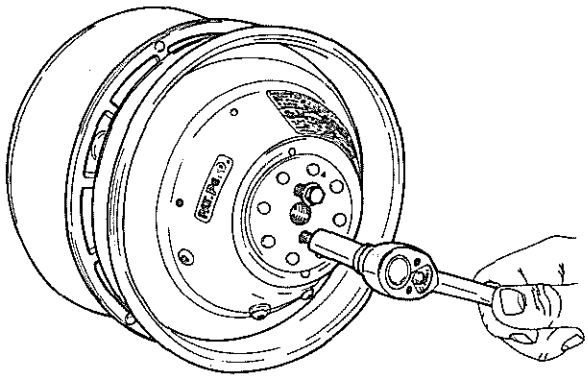
Install puller in pulley shaft then tighten, at the same time knock slightly on puller head to disengage pulley from engine crankshaft.

DISASSEMBLY & ASSEMBLY

Remove sliding half assembly and governor cup.

CAUTION: Do not tap on the governor cup.

The governor cup can be easily removed by inserting two (2) $\frac{1}{4}$" × 1" NC bolts and tightening alternately until cup pulls out.



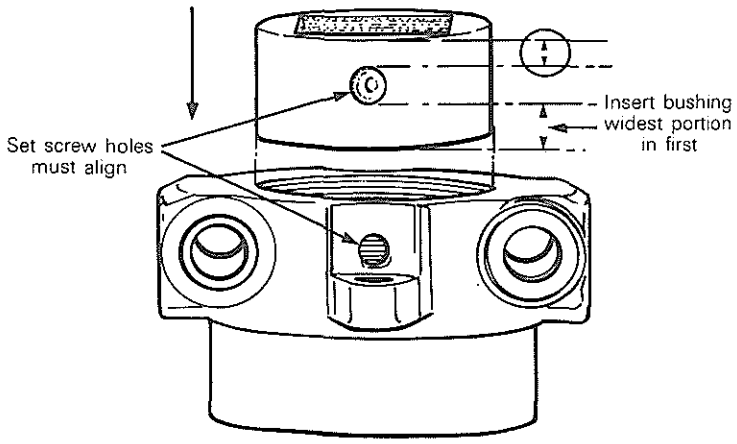
Some bolts of the drive pulley having "Loctite" on their threads, it is advisable to use a tool such as an impact to break the "Loctite" seal before attempting to unscrew.

④ Torque to 7 N•m (5 ft-lbs).

⑦ Apply "Loctite 242" on threads then screw in until head is **flush** with hub plug. Do not allow head to bite into hub plug.

⑧⑨⑩ At disassembly, hold hub plug firmly against sliding half until the two (2) bolts are completely removed. This will prevent damage of the sliding half threads. At assembly, apply "Loctite 242" on threads of bolts then torque to 16 N•m (12 ft-lbs).

⑪ To install or remove "Duralon" bushing from hub plug use a suitable pusher and hammer or press. Install bushing as per illustration.

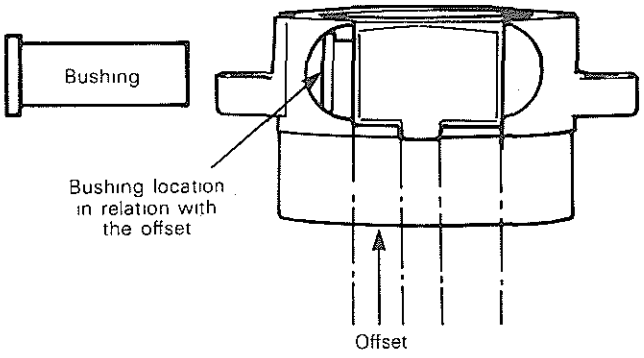


CAUTION: Be careful when installing sliding half assembly on square shaft of drive pulley to avoid scratches on "Duralon" bushing caused by square shaft edge.

⑭ Torque to 85 N•m (63 ft-lbs).

⑰ Apply "Loctite 242" on threads.

⑲ ⑧ Some drive pulleys have an offset in the hub plug. Shouldered pin bushings with shoulder must be installed in these hub plugs.



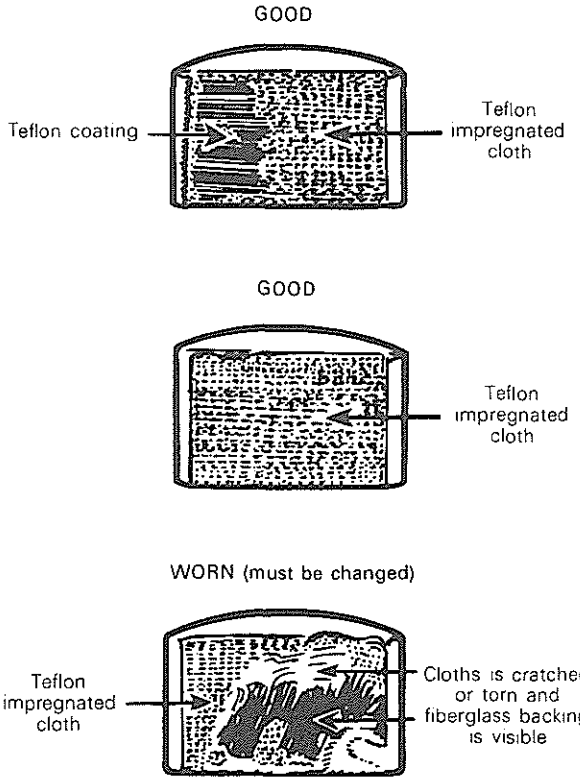
⑳ ㉑ Apply "Loctite 242" on threads and torque to 14 N•m (10 ft-lbs).

CAUTION: Do not disassemble counterweights unless replacement is necessary.

INSPECTION & CLEANING

Drive pulley should be inspected annually.

Check general condition of pulley and inspect "Duralon" bushing faces, as per illustrations.



Inside of sliding half should be cleaned with a clean cloth. The square shaft can be cleaned with fine steel wool and a clean cloth.

INSTALLATION

Clean crankshaft extension using fine steel wool and a clean cloth.

CAUTION: When installing drive pulley on engine, reference mark on fixed half, sliding half and governor cup must be in line.

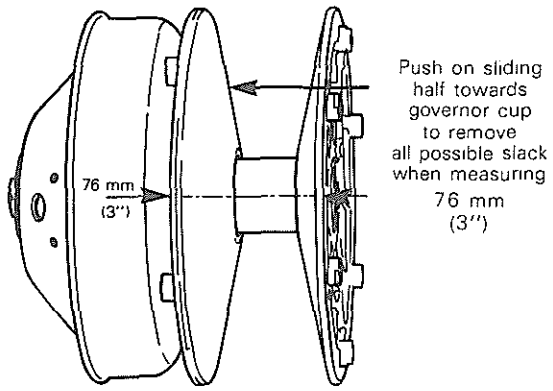
Lock crankshaft in position as explained in removal procedure. Make sure crankshaft is rotated 45° counterclockwise from T.D.C. position and that cylinder is completely filled with a starter rope.

Install fixed half on crankshaft extension then position sliding half assembly on fixed half square shaft.

CAUTION: Be careful when installing sliding half assembly on square shaft of drive pulley to avoid scratches on "Duralon" bushing caused by square shaft edge.

Install governor cup making sure that the shaft end rests in governor cup seating. Position retaining bolt with a new lock tab then torque to 85 N•m (63 ft-lbs).

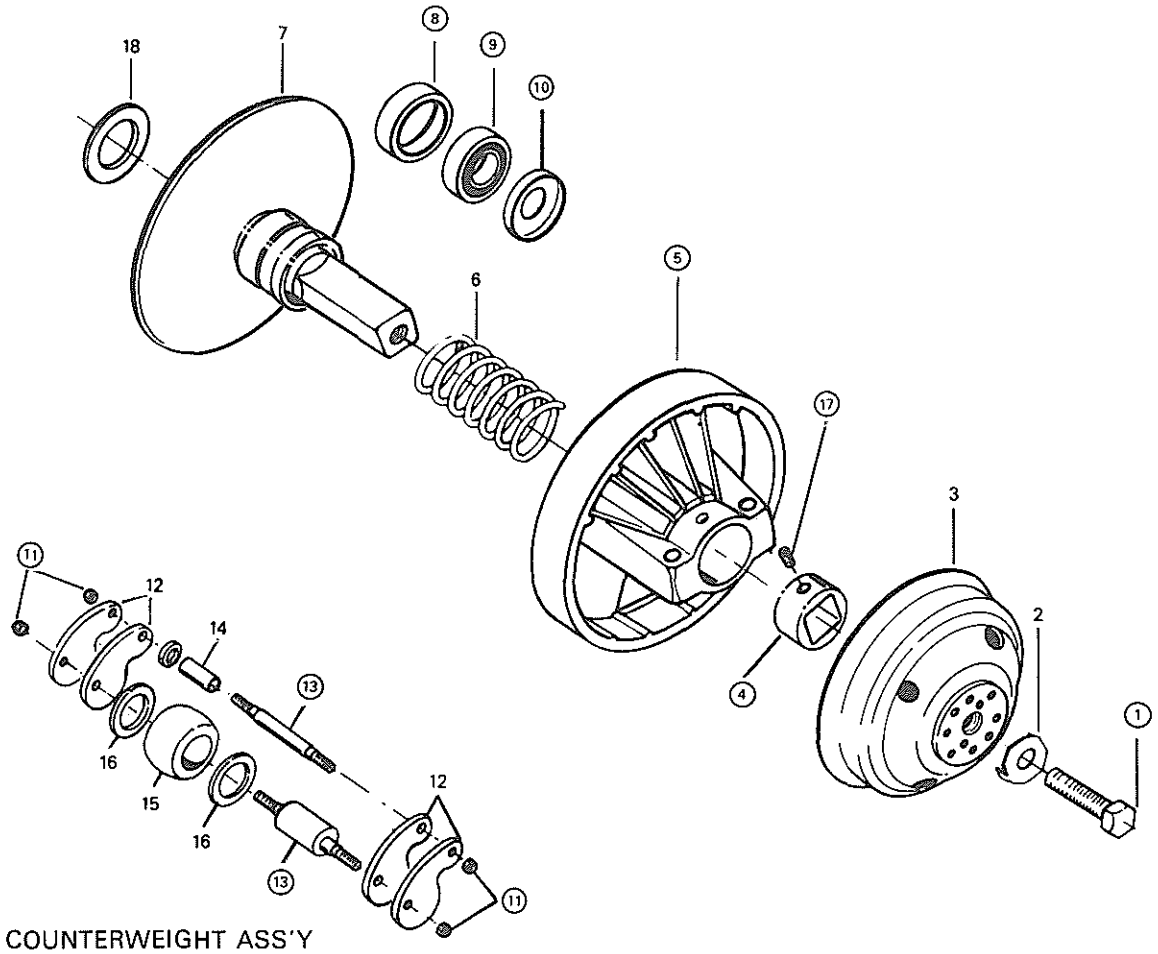
CAUTION: Incorrect seating of shaft end in governor cup can cause crankshaft bending. When pulley is completely assembled always measure distance of both pulley halves to make sure that the pulley is properly installed. Distance must be 76 mm (3").



Lift rear of vehicle off the ground. Install drive belt and pulley guard then start engine and apply throttle and brake, 2-3 times. Stop engine and retorque retaining bolt. Bend one side of lock tab over governor bolt.

ROLLER SQUARE SHAFT BEARING TYPE WITH DURALON BUSHING

Alpine



COUNTERWEIGHT ASS'Y

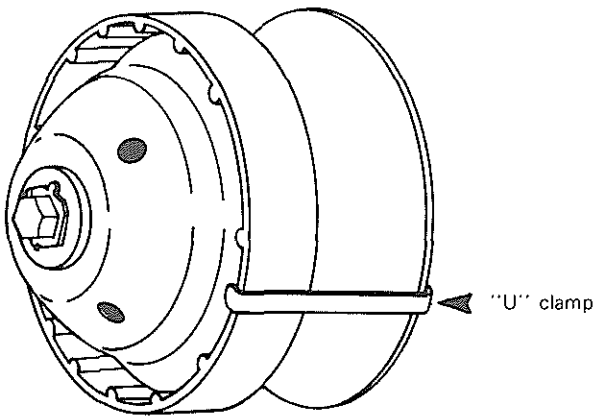
1. Retaining bolt
2. Tab washer
3. Governor cup
4. "Duralon" bushing
5. Sliding half
6. Spring
7. Fixed half
8. Ring
9. Bearing
10. Spring seat
11. Stop nut
12. Counterweight
13. Shouldered pin
14. Bushing
15. Roller
16. Spacer
17. Set screw
18. Shim

WARNING: Drive pulley repairs that include any disassembly or assembly procedures must be performed by an authorized Bombardier dealer, or other such qualified person. Sub-component installation and assembly tolerances require strict adherence to procedures detailed.

REMOVAL

With engine cold, remove spark plugs then bring P.T.O. (Power Take Off) piston at T.D.C. (Top Dead Center) position.

Rotate drive pulley 45° **clockwise** then insert enough starter rope into cylinder to fill it completely. Install "U" clamp (See Tools Section) over pulley halves. Open locking tab and remove retaining bolt.



Push and turn drive pulley to disengage "U" clamp then carefully remove sliding half.

WARNING: Spring pressure can force assembly apart; therefore, it is imperative that the governor cup be held firmly during sliding half removal.

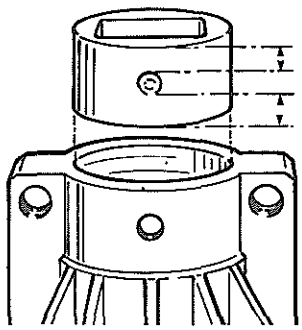
If it is necessary to remove half, use a $1\frac{1}{8}$" open-end wrench on the square section, closely held against hub.

DISASSEMBLY & ASSEMBLY

Some bolts of the drive pulley having "Loctite" on their threads, it is advisable to use a tool such as an impact to break the "Loctite" seal before attempting to unscrew.

①Torque to 118 N•m (87 ft-lbs).

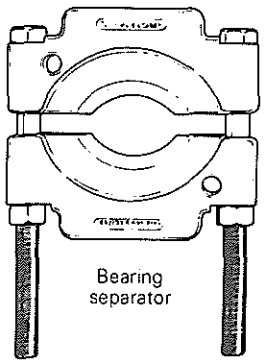
④⑤To install or remove "Duralon" bushing from hub plug use a suitable pusher and hammer or press. Install bushing as per illustration.



CAUTION: Be careful when installing sliding half assembly on square shaft of drive pulley to avoid scratches on "Duralon" bushing caused by square shaft edge.

⑧⑨⑩To remove and install use a bearing separator and afterwards a standard puller and pusher.

NOTE: Items ⑧⑨should be press-fitted together. Do not remove inner half bearing unless damaged and replacement is necessary.



Torque shouldered pin lock nut to 14 N•m (10 ft-lbs) after having applied "Loctite 242" or equivalent on threads.

CAUTION: Do not disassemble counterweights unless replacement is necessary.

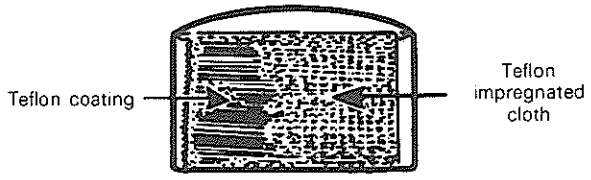
⑰Apply "Loctite 242" on threads then screw in until head is **flush** with sliding half.

INSPECTION & CLEANING

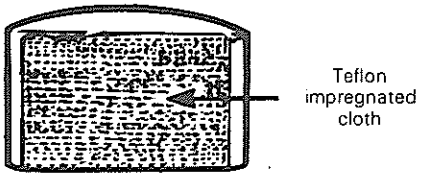
Drive pulley should be inspected annually.

Check general condition of pulley and inspect "Duralon" bushing faces, as per illustrations.

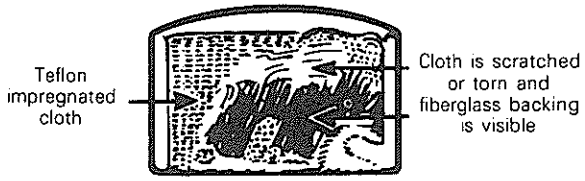
GOOD



GOOD



WORN (must be changed)

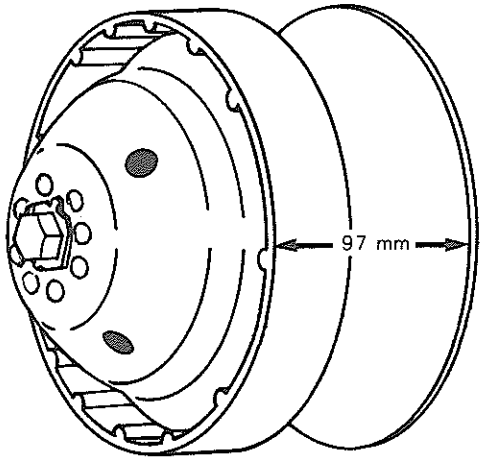


Inside of sliding half should be cleaned with a clean cloth. The square shaft can be cleaned with fine steel wool and a clean cloth.

INSTALLATION

Lock crankshaft in position as explained in removal procedure. Make sure crankshaft is rotated 45° **counterclockwise** from T.D.C. position and that cylinder is completely filled with starter rope.

Install fixed half on crankshaft extension then position sliding half assembly on fixed half square shaft.



CAUTION: Be careful when installing sliding half assembly on square shaft of drive pulley to avoid scratches on "Duralon" bushing caused by square shaft edge.

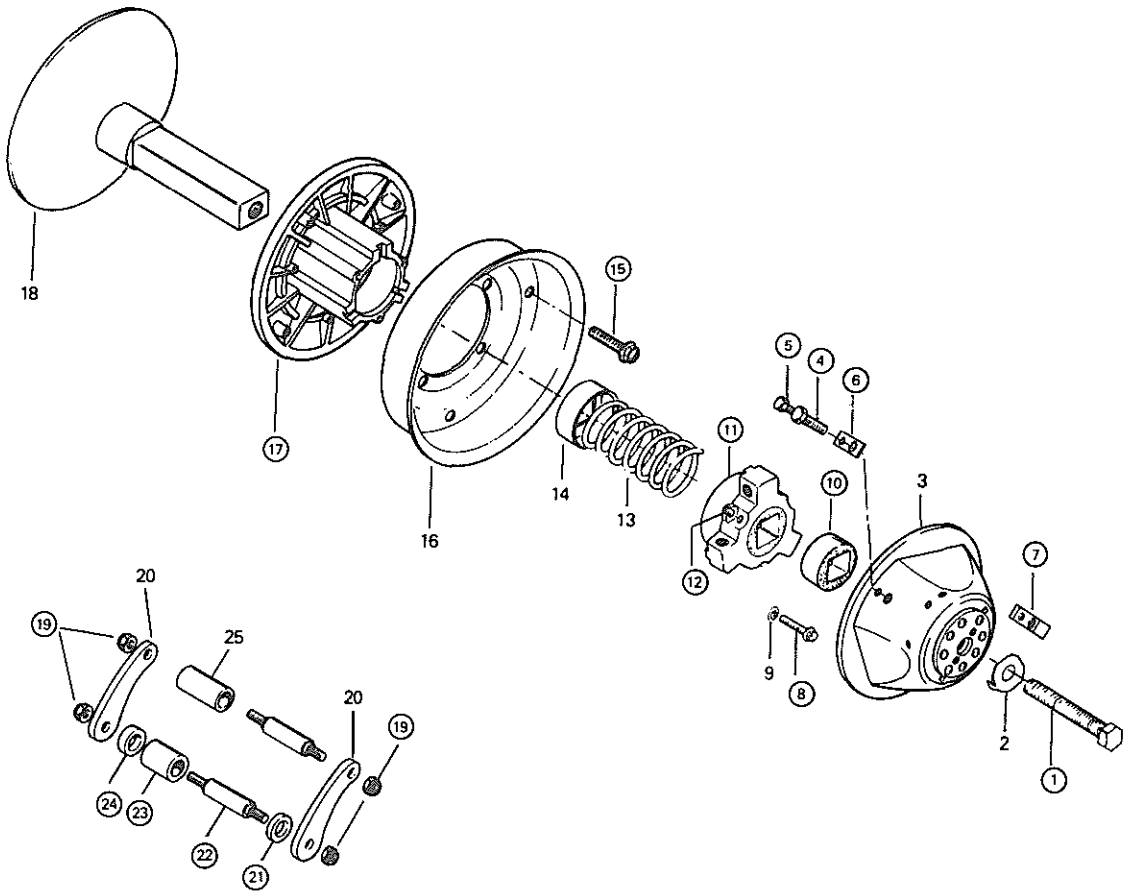
Install governor cup making sure that the shaft end rests in governor cup seating.

CAUTION: Incorrect seating of shaft end in governor cup can cause crankshaft bending. When pulley is completely assembled always measure distance of both pulley halves to make sure that the pulley is properly installed. Distance must be 97 mm (3 3/16").

Lubricate threads of retaining bolt with antiseizing lubricant. Position retaining bolt with a **new** locking tab then torque to 118 N•m (87 ft-lbs). Bend one side of locking tab over retaining bolt head.

SQUARE SHAFT WITH THREE COUNTERWEIGHT ASSEMBLIES

Blizzard 7500 plus,
Blizzard 9500 plus
Super Sonic
Ultra Sonic

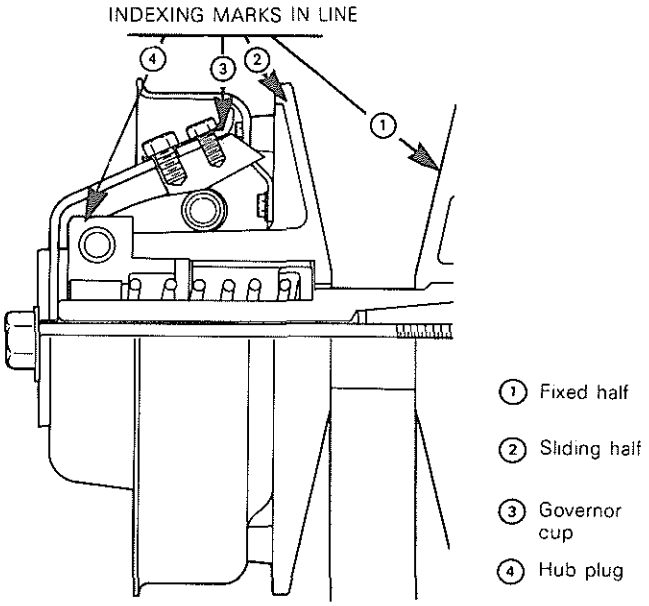


1. *Retaining bolt*
2. *Tab lock*
3. *Governor cup*
4. *Bolt*
5. *Bolt*
6. *Tab lock*
7. *Ramp*
8. *Bolt*
9. *Internal tooth lockwasher*
10. *"Duralon" bushing*
11. *Hub plug*
12. *Allen screw*
13. *Spring*
14. *Spring seat*
15. *Bolt*
16. *Guard (rollers)*
17. *Sliding half*
18. *Fixed half*
19. *Nut*
20. *Counterweight*
21. *Nylon washer 5.1 mm (.200")*
22. *Shouldered pin*
23. *Roller*
24. *Nylon washer 3.3 mm (.130")*
25. *Bushing*

WARNING: Drive pulley repairs that include any disassembly or assembly procedures must be performed by an authorized Bombardier dealer, or other such qualified person. Sub-component installation and assembly tolerances require strict adherence to procedures detailed.

REMOVAL

Some pulley components are marked to insure proper assembly. If components lack such marks, marking should be done manually before disassembly, as per illustration.



With engine cold, remove spark plugs then bring P.T.O. (Power Take Off) piston at T.D.C. (Top Dead Center) position.

Rotate drive pulley 45° **clockwise** then insert enough starter rope into cylinder to fill it completely.

Open tab lock and remove retaining bolt.

Remove sliding half assembly with governor cup.

To remove fixed pulley half, use drive pulley puller. (See Tools Section).

NOTE: Remove starter rope blocking piston, then reblock piston after having turned 45° **counterclockwise** from T.D.C. position.

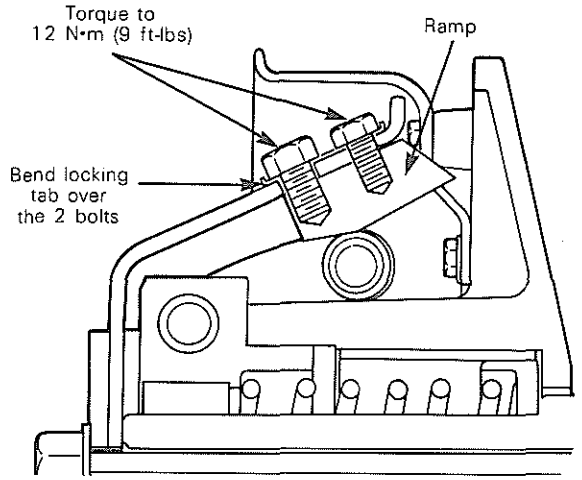
Install puller in pulley shaft then tighten, at the same time knock slightly on puller head to disengage pulley from engine crankshaft.

DISASSEMBLY & ASSEMBLY

Some bolts of the drive pulley having "Loctite" on their threads, it is advisable to break the "Loctite" seal before attempting to unscrew.

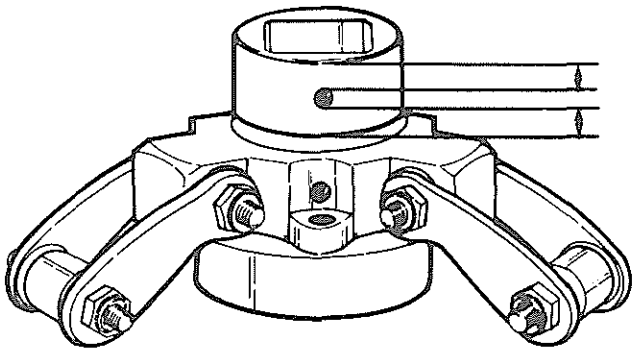
①Torque to 85 N•m (63 ft-lbs).

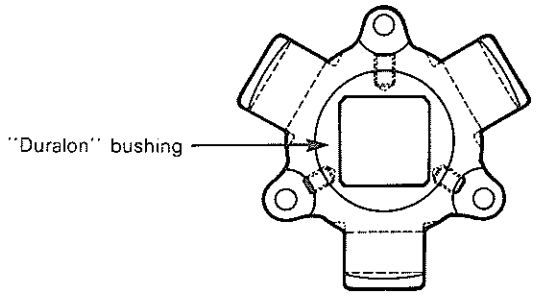
④⑤⑥⑦Install ramps and torque bolts as per illustration.



⑧⑪⑰At disassembly, hold hub plug firmly against sliding half until the three (3) bolts are completely removed. This will prevent damage of the sliding half threads. At assembly, apply "Loctite 242" on threads of bolts then torque to 16N•m (12 ft-lbs).

⑩⑪⑫To install or remove "Duralon" bushing from hub plug, use a suitable pusher and hammer or press. Install bushing as per illustration.





Apply "Loctite 242" on threads, then tighten until screw slightly rests against bottom of "Duralon" bushing hole.

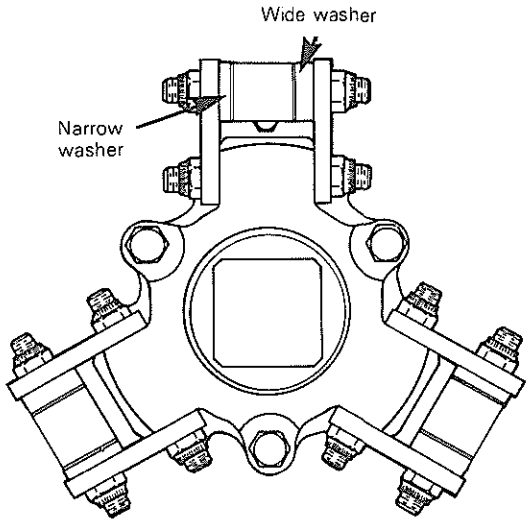
CAUTION: Be careful when installing sliding half assembly on square shaft of drive pulley to avoid scratches on "Duralon" bushing caused by square shaft edge.

⑮ Torque to 5 N•m (4 ft-lbs).

⑲ ㉒ At reassembly, apply "Loctite 242" on threads and torque to 16 N•m (12 ft-lbs).

CAUTION: Do not disassembly counterweight unless replacement is necessary.

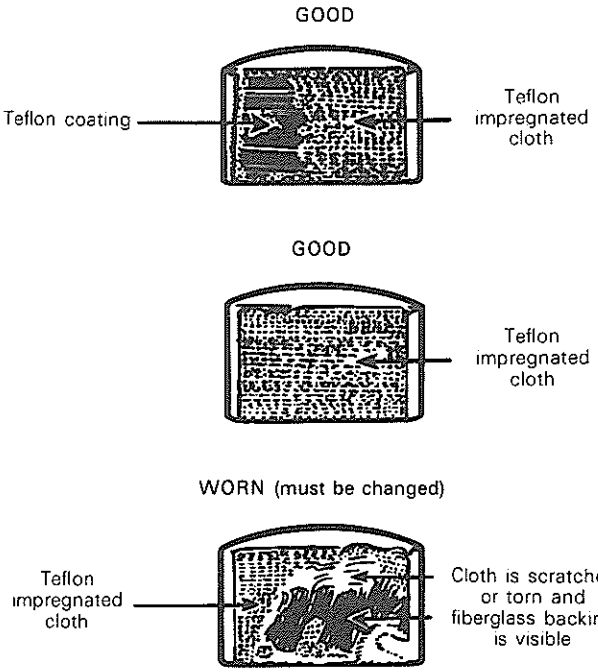
㉑ ㉓ ㉔ Rollers and nylon washers must move freely; install them as per illustration.



INSPECTION & CLEANING

Drive pulley should be inspected annually.

Check general condition of pulley and inspect "Duralon" bushing faces, as per illustration.



Inside of sliding half should be cleaned with a clean cloth. The square shaft can be cleaned with fine steel wool and a clean cloth.

INSTALLATION

Clean crankshaft extension using fine steel wool and a clean cloth.

CAUTION: When installing drive pulley on engine, reference mark on fixed half, sliding half and governor cup must be in line.

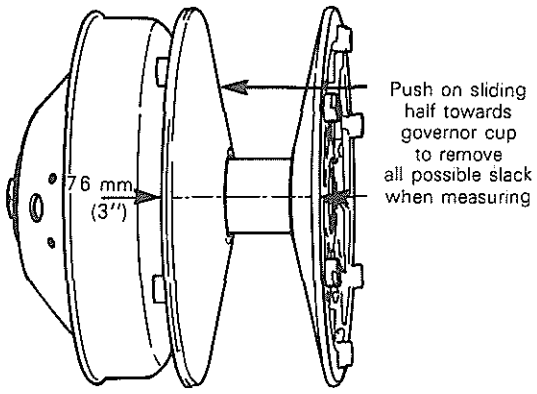
Lock crankshaft in position as explained in removal procedure. Make sure crankshaft is rotated 45° **counterclockwise** from T.D.C. position and that cylinder is completely filled with a starter rope.

Install fixed half on crankshaft extension then position sliding half assembly on fixed half square shaft.

CAUTION: Be careful when installing sliding half assembly on square shaft of drive pulley to avoid scratches on "Duralon" bushing caused by square shaft edge.

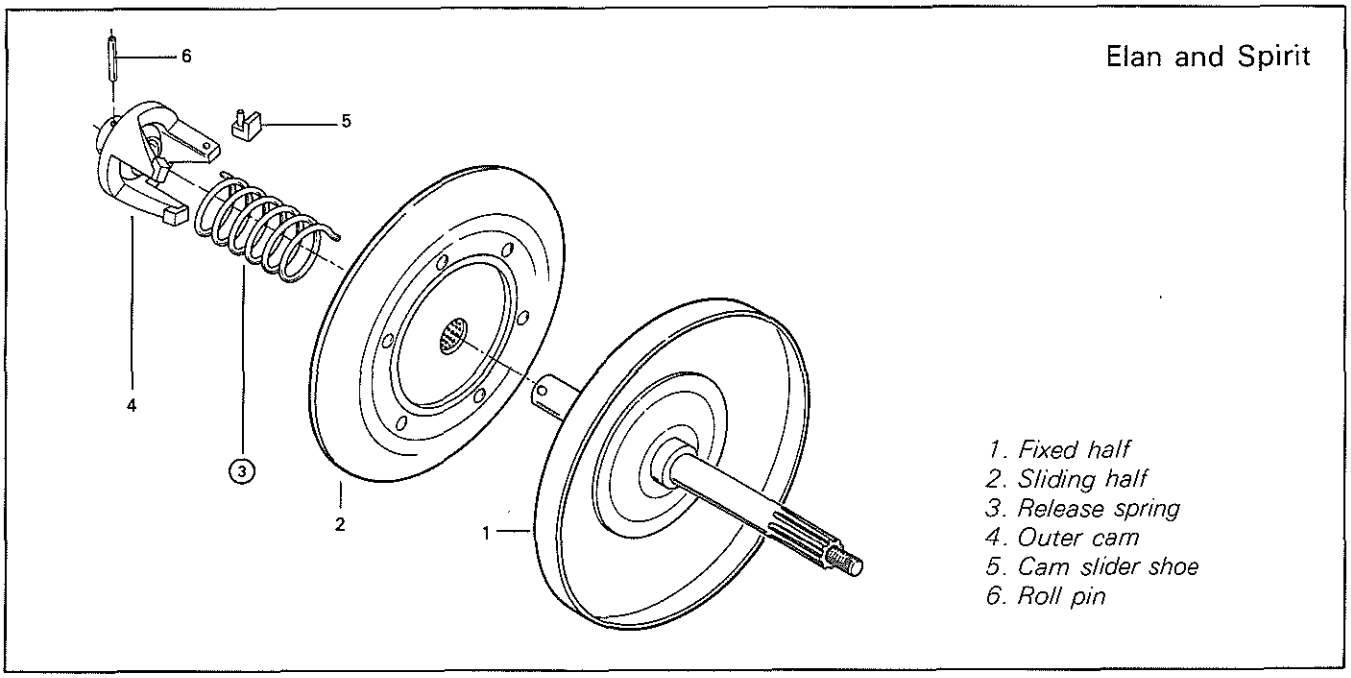
Install governor cup making sure that the shaft end rests in govenor cup seating. Position retaining bolt with a **new** locking tab then torque to 85 N•m (63 ft-lbs).

CAUTION: Incorrect seating of shaft end in governor cup can cause crankshaft bending. When pulley is completely assembled always measure distance of both pulley halves to make sure that the pulley is properly installed. Distance must be 76 mm (3").



Lift rear of vehicle off the ground. Install drive belt and pulley guard then start engine and apply throttle and brake, 2-3 times. Stop engine and **retorque** retaining bolt. Bend one side of locking tab over governor bolt.

DRIVEN PULLEY



REMOVAL

Remove pulley guard, drive belt and muffler.

Slacken steering column bolts.

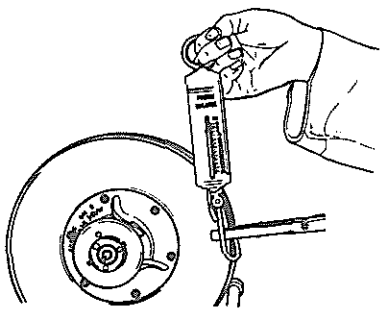
Release chain tension. Remove cotter pin and nut securing pulley drive shaft to chaincase.

NOTE: Attach to frame to prevent it falling inside of chaincase.

Pull driven pulley toward engine and remove from vehicle.

DISASSEMBLY & ASSEMBLY

③ In order to measure driven pulley spring tension, pulley halves must be separated. To do this, insert length of $\frac{1}{8}$'' dia. rod between the halves. Check tension using a fish scale positioned 90° with pulley axle.



Spring tension pre-load should be 3.6 kg (8 lbs)

To correct spring tension, either relocate spring end in sliding pulley half or gradually rotate outer cam.

INSTALLATION

With drive chain tension released, hold upper sprocket and chain in position then insert assembled driven pulley shaft through chaincase and sprocket.

Install spring washer and castellated nut.

Tighten castellated nut fully then back off nut 1/6 of a turn.

Lock in position with a new cotter pin.

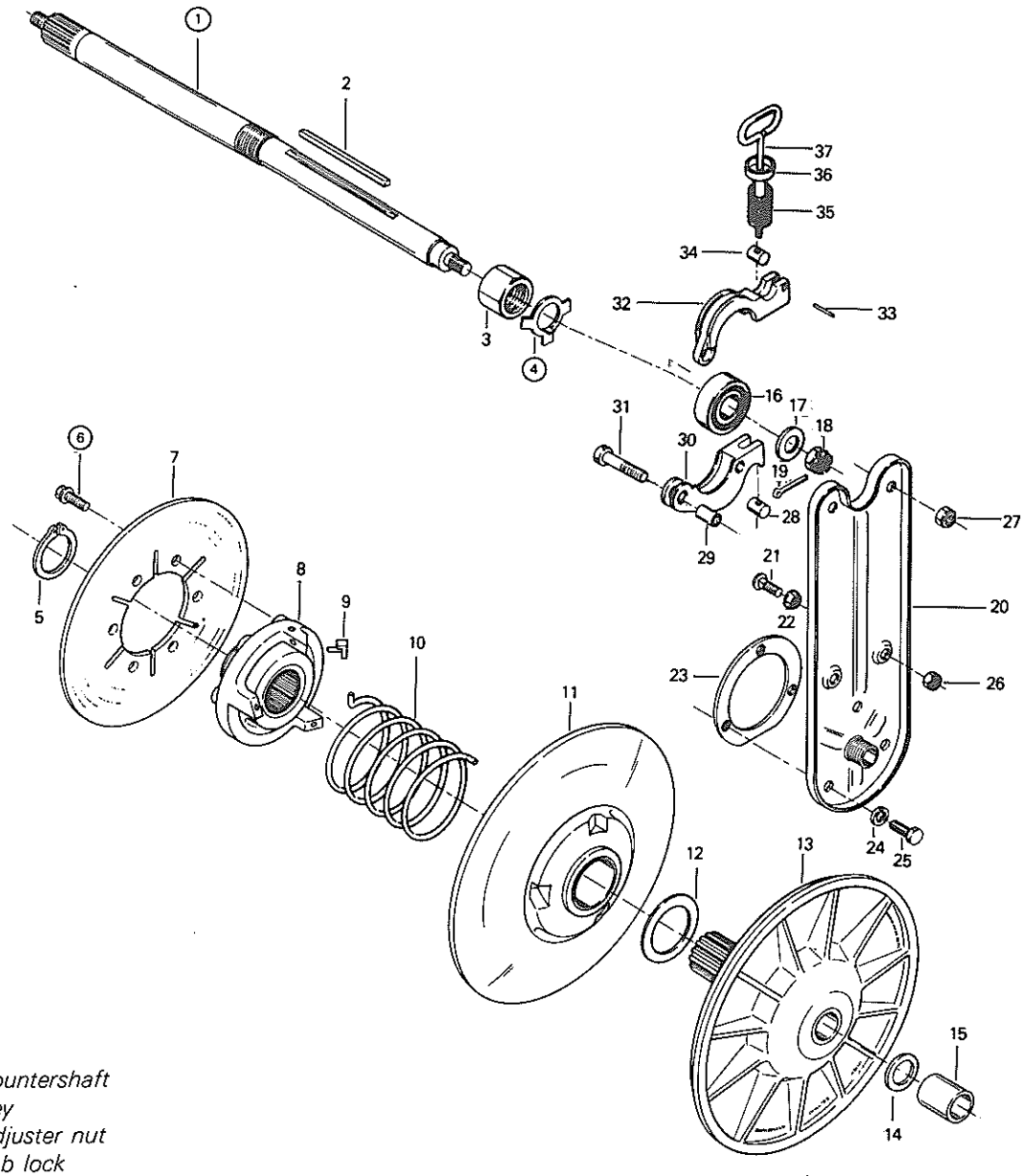
CAUTION: It is important that nut is backed off or damage may occur due to a burnt or seized bearing.

Apply chain tension.

Install muffler and tighten steering column bolts.

Install drive belt and pulley guard.

Citation, Mirage



1. *Countershaft*
2. *Key*
3. *Adjuster nut*
4. *Tab lock*
5. *Circlip*
6. *Screw (metric)*
7. *Brake disc*
8. *Outer cam*
9. *Shoe*
10. *Spring*
11. *Sliding pulley half*
12. *Shim*
13. *Fixed pulley half*
14. *Shim*
15. *Spacer*
16. *Bearing*
17. *Washer*
18. *Nut*
19. *Cotter pin*
20. *Support*
21. *Bolt*
22. *Nut*
23. *Retainer ring*
24. *Lockwasher*
25. *Screw*
26. *Elastic stop nut*
27. *Elastic stop nut*
28. *Bushing*
29. *Barrel*
30. *Lower bearing housing*
31. *Cap screw*
32. *Upper bearing housing*
33. *Roll pin*
34. *Barrel*
35. *Spring*
36. *Bushing*
37. *Bolt*

REMOVAL

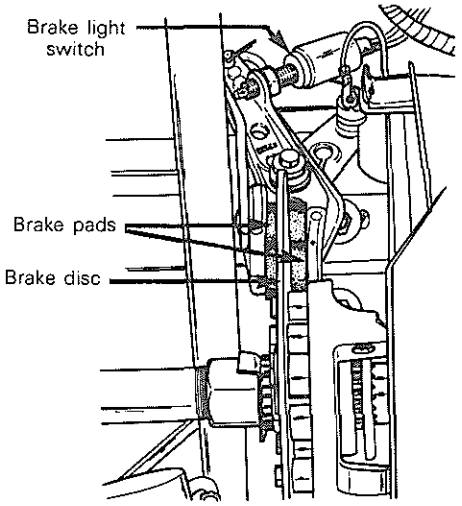
Remove the following items:

— belt guard and drive belt
— injection oil reservoir
— air silencer
— battery (electric start models only)
— chaincase cover
— upper chaincase sprocket

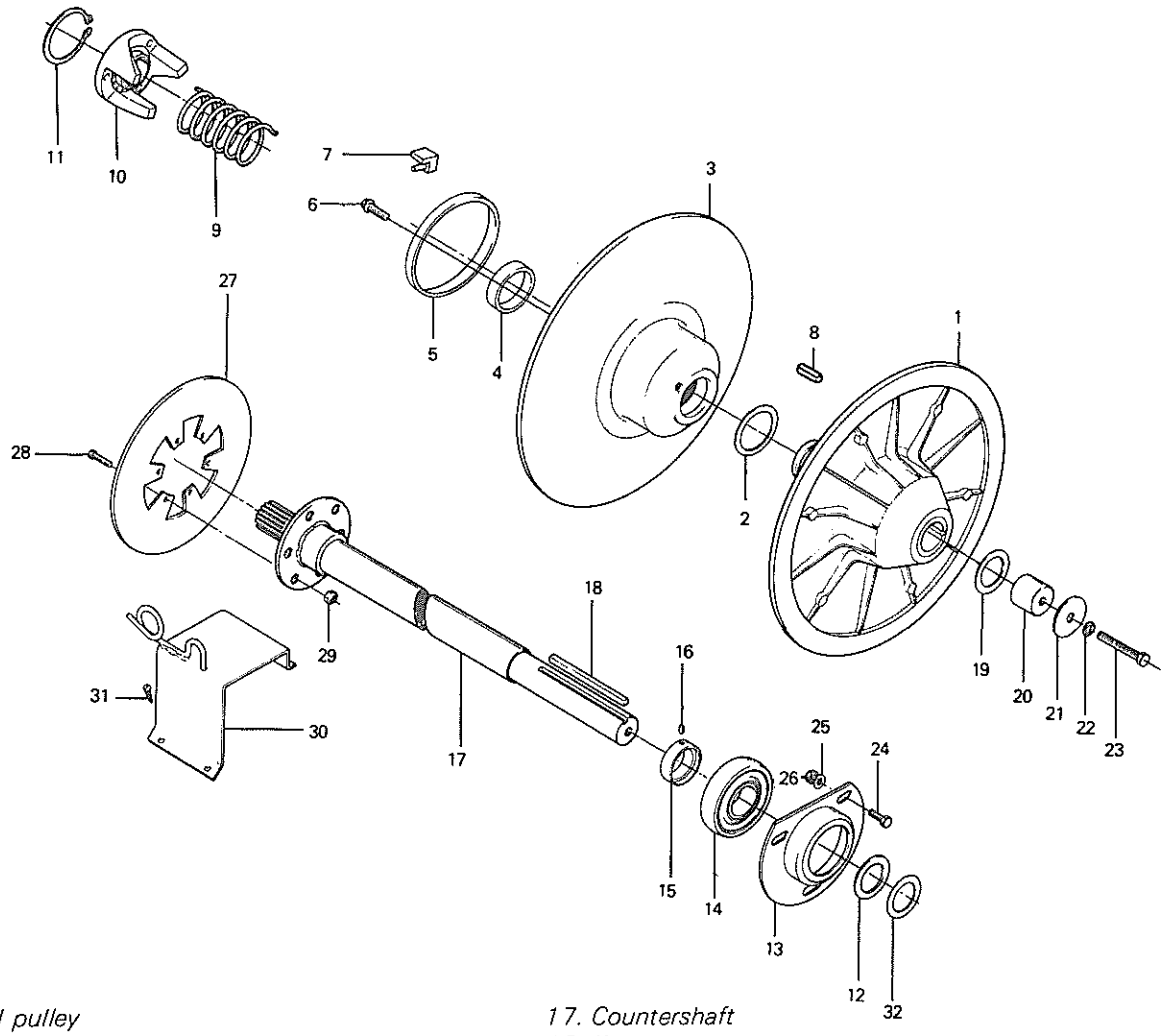
Open the bearing cage, lift up and pull out the countershaft assembly.

Remove the driven pulley assembly from the countershaft.

WARNING: It may necessary to loosen the brake adjustment in order to easily lift the countershaft. Always check that the brake disc is correctly installed between the brake pads and that the brake is well adjusted. Check brake light operation.



Everest, Futura,
Blizzard 5500, 7500, 9500
Super Sonic, Ultra Sonic

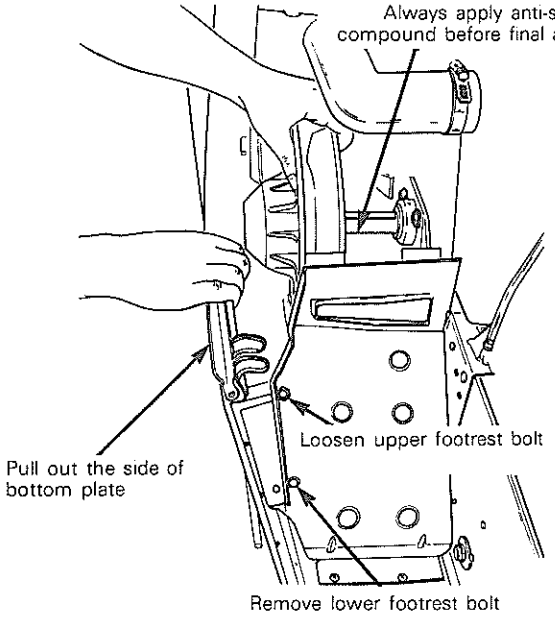


1. *Fixed pulley*
2. *Shim*
3. *Sliding pulley*
4. *Bushing*
5. *Bushing*
6. *Hexagonal washer head screw*
7. *Cam slider shoe*
8. *Key*
9. *Release spring*
10. *Cam*
11. *Snap ring*
12. *Spacer*
13. *Bearing flange*
14. *Bearing*
15. *Collar*
16. *Allen Screw*
17. *Countershaft*
18. *Key*
19. *Shim*
20. *Spacer*
21. *Washer*
22. *Lockwasher*
23. *Screw*
24. *Hexagonal washer head screw*
25. *Washer*
26. *Nut*
27. *Brake disc*
28. *Screw*
29. *Nut*
30. *Countershaft protector*
31. *Sheet metal screw*
32. *Shim*

REMOVAL

— Loosen upper footrest bolt and remove lower one.

— Pull out the side of the bottom plate. Remove pulley assembly

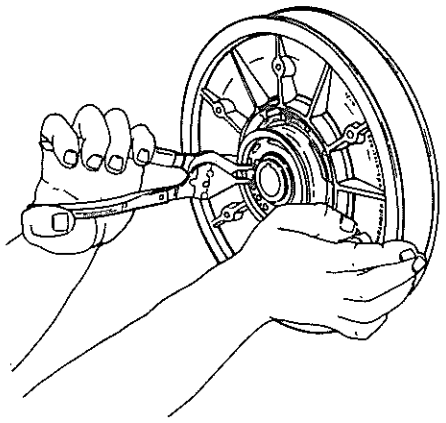


CAUTION: Always apply anti-seize compound on the countershaft before final pulley installation (Loctite anti-seize lubricant P/N 413 7010 00).

DISASSEMBLY & ASSEMBLY

All models equipped with a countershaft drive system.

WARNING: The driven pulley cam is spring loaded. Hold in place when removing the circlip.



DRIVEN PULLEY BUSHING REPLACEMENT

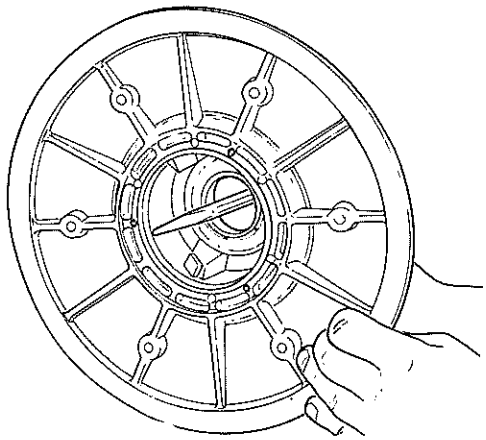
To replace the outer and inner bushings of the floating type driven pulley, proceed as follows:

Remove and disassemble driven pulley assembly.

Outer bushing:

Remove the three (3) screws on sliding half.

Remove the bushing with a pin punch, as illustrated.



Clean the bushing seat with Bombardier Stripper No 57.

Coat the seat with Loctite No 271 (high strength) red.

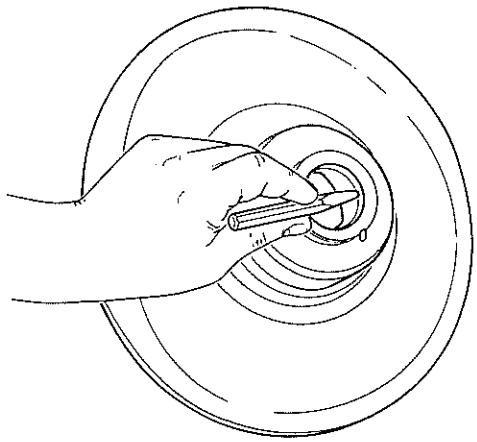
Install the new bushing (gently tap in place).

Reinstall screws, using Loctite 242 (medium strength) blue.

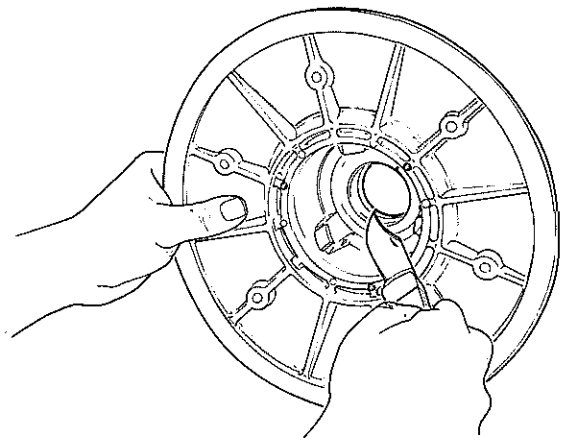
Reassemble pulley.

Inner bushing:

Remove the bushing with a pin punch, as illustrated.



Round out punch marks to permit new bushing to fit in.

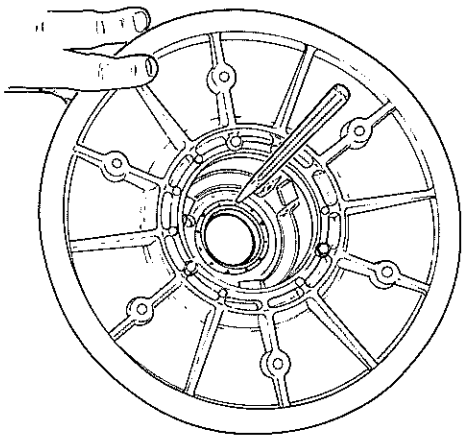


Clean the seat with Bombardier Stripper No 57.

Coat the seat with Loctite No 271 (high strength) red.

Install a new bushing (gently tap in place).

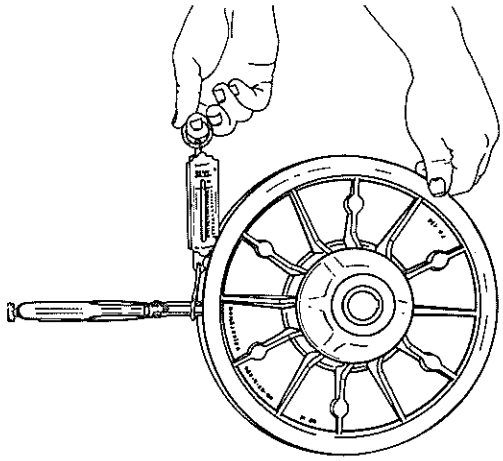
Secure bushing in place by punching the bushing shoulder rib (as illustrated).



Reassemble pulley:

Check tension using a fish scale positioned 90° with pulley axle

Citation, Mirage
3.6 Kg (8 lbs)
Everest, Futura, Blizzard, Grand Prix Special, Super Sonic, Ultra Sonic
5.9 Kg (13 lbs)



To correct spring tension either relocate spring end in sliding pulley half, or gradually rotate outer cam, or align in appropriate splines.

INSTALLATION

Citation, Mirage:

⑥ Torque to 9 N•m (6 ft-lbs)

① Always apply anti-seize compound (Loctite anti-seize lubricant P/N 413 7010 00) on unpainted surface of countershaft.

④ Make sure that the small tab of the tab lock is well inserted in the driven pulley keyway.

Reassemble driven pulley to countershaft and install by reversing the removal procedure.

Check pulley alignment

Everest, Futura, Blizzard, Grand Prix Special, Super Sonic, Ultra Sonic:

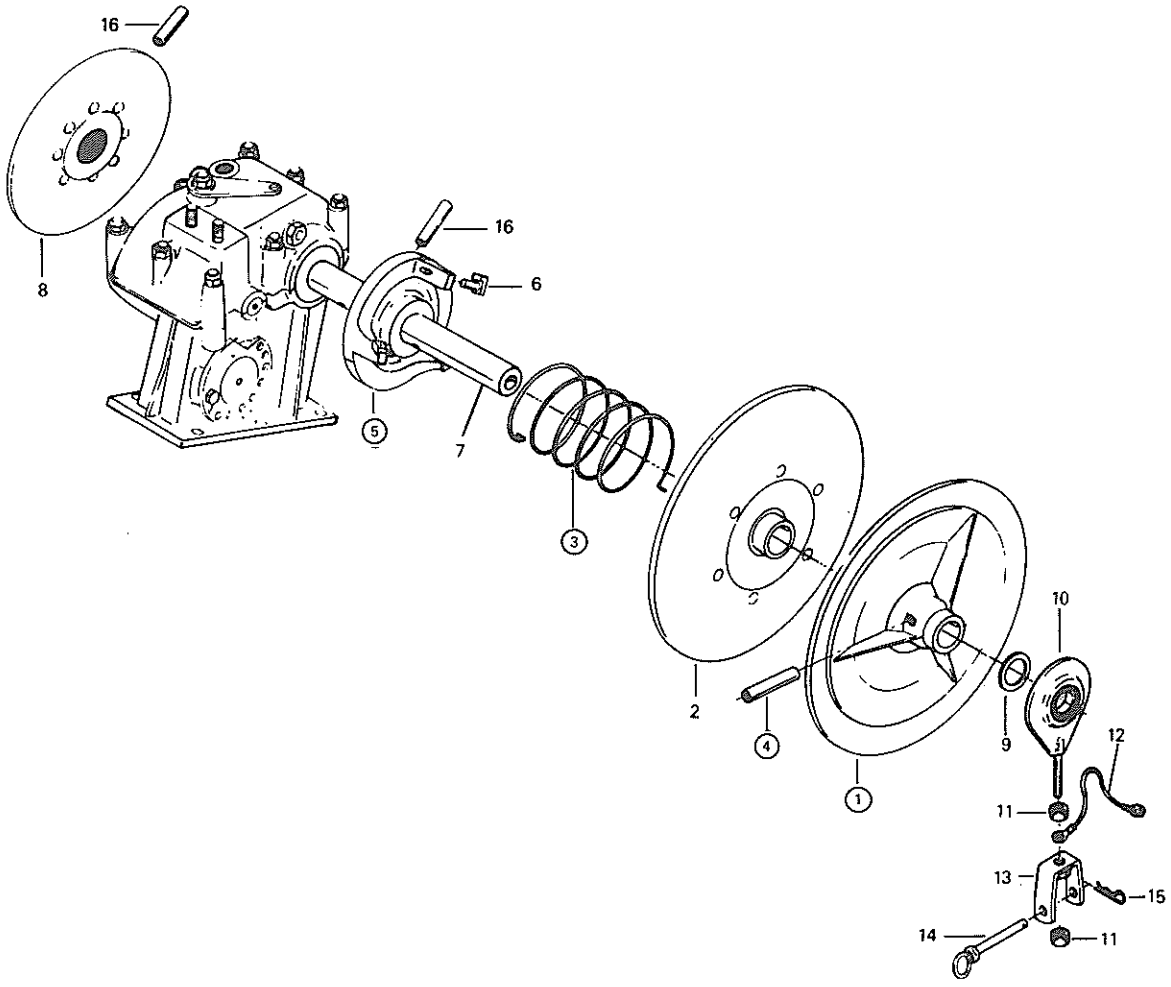
Reinstall pulley, outer shims, lockwasher and bolt.

⑥ Torque to 9 N•m (7 ft-lbs).

IMPORTANT: Maximum free-play should not exceed 3 mm ($\frac{1}{8}$").

CAUTION: ⑰ Always apply anti-seize (Loctite antiseize lubricant P/N 413 7010 00) compound on countershaft before final pulley installation.

Elite



1. Fixed half
2. Sliding half
3. Release spring
4. Roll pin
5. Outer cam
6. Cam slider shoe
7. Drive shaft (transmission)
8. Disc
9. Spacer
10. Support
11. Nut
12. Hair pin retaining wire
13. Support
14. Retainer pin
15. Hair pin cotter
16. Roll pin

REMOVAL

Remove pulley guard and drive belt.

Detach driven pulley support.

Remove exhaust manifold from engine.

Disconnect transmission rod from gearbox.

Remove gearbox upper housing.

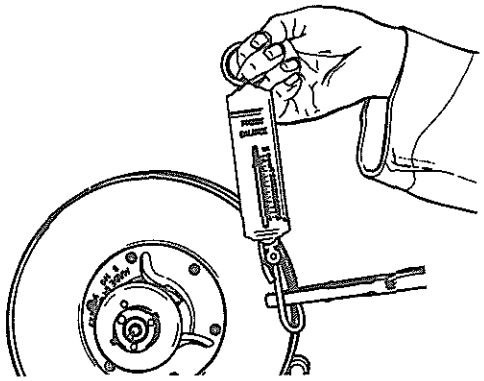
Release chain tension the separate chain at connecting link.

Withdraw driven pulley with drive shaft.

DISASSEMBLY & ASSEMBLY

①⑤ If necessary heat hub of fixed pulley and outer cam to facilitate removal.

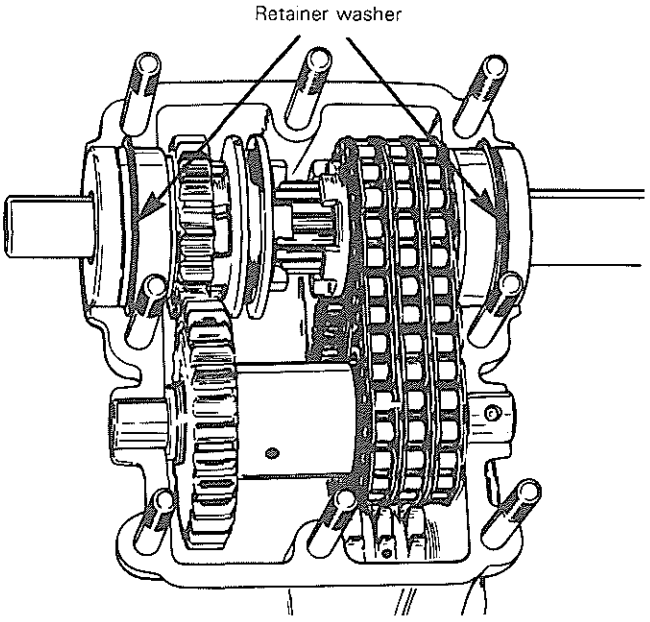
④ In order to measure driven pulley spring tension, the pulley halves must be separated. To do this, insert a length of $\frac{1}{8}$'' dia. rod between the halves, Check tension using a fish scale positioned 90° with pulley axle. (Refer to Technical Data for correct spring tension).



To correct spring tension either relocate spring end in sliding pulley half, or gradually rotate outer cam.

INSTALLATION

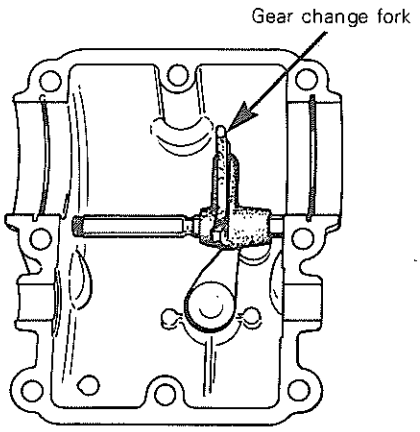
Position drive shaft of assembled driven pulley so that retainer washers align with slots of gearbox casing.

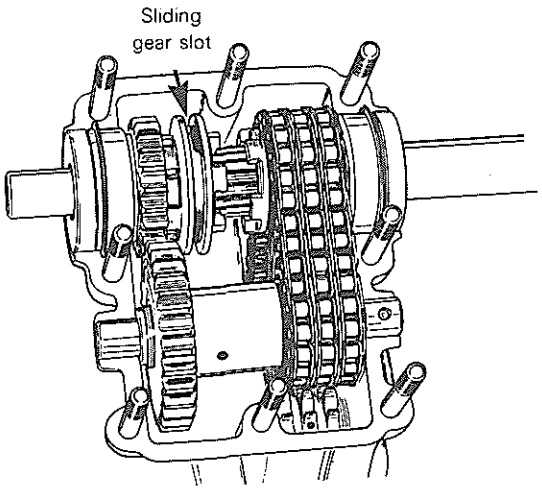


Connect drive chain using a connecting link.

The locking clip should be installed oppositely to driven pulley.

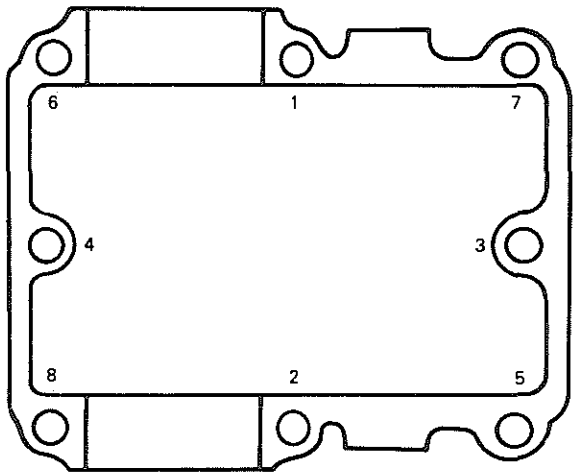
Position gear change fork in gearbox cover so that it aligns with slot of sliding gear in gear housing.





Apply a thin coat of "Loctite crankcase sealant", or equivalent, on contact surface of gearbox casing.

Instal gearbox cover and secure with eight nuts. Torque nuts to 27 N•m (20 ft-lbs) in the following sequence:



Adjust chain tension. Check gearbox oil level.

Install gearbox rod and adjust. (See Section 05-07).

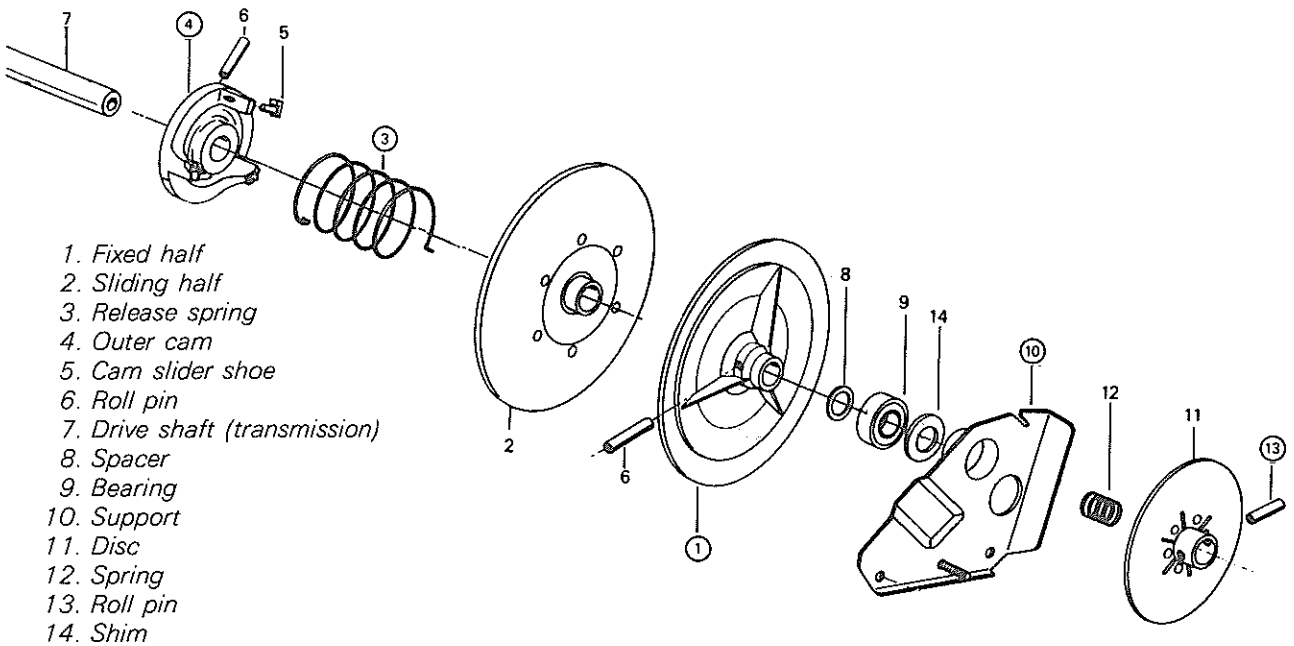
Install exhaust manifold to engine.

Install driven pulley support.

Install drive belt and check pulley alignment.

Install pulley guard.

Alpine



1. *Fixed half*
2. *Sliding half*
3. *Release spring*
4. *Outer cam*
5. *Cam slider shoe*
6. *Roll pin*
7. *Drive shaft (transmission)*
8. *Spacer*
9. *Bearing*
10. *Support*
11. *Disc*
12. *Spring*
13. *Roll pin*
14. *Shim*

REMOVAL

Remove pulley guard and drive belt.

Remove disc brake assembly.

Position a wooden block under the drive shaft then using a hammer and a pin punch, remove roll in ⑬ locking disc in position. Tap on inner side of brake and bracket assembly ⑩ to disengage it from bearing.

Remove exhaust manifold from engine.

Remove lower bracket of steering column attached to the gearbox. Slacken upper bracket of steering column. Disconnect transmission rod from gearbox.

Remove gearbox upper housing.

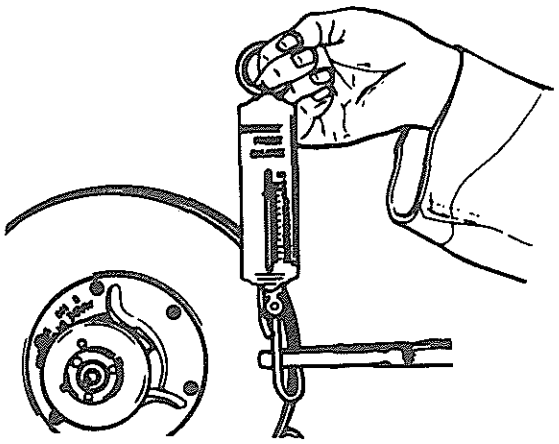
Release chain tension then separate chain at connecting link.

Withdraw driven pulley.

DISASSEMBLY & ASSEMBLY

①④ If necessary heat hub of fixed pulley and outer cam to facilitate removal.

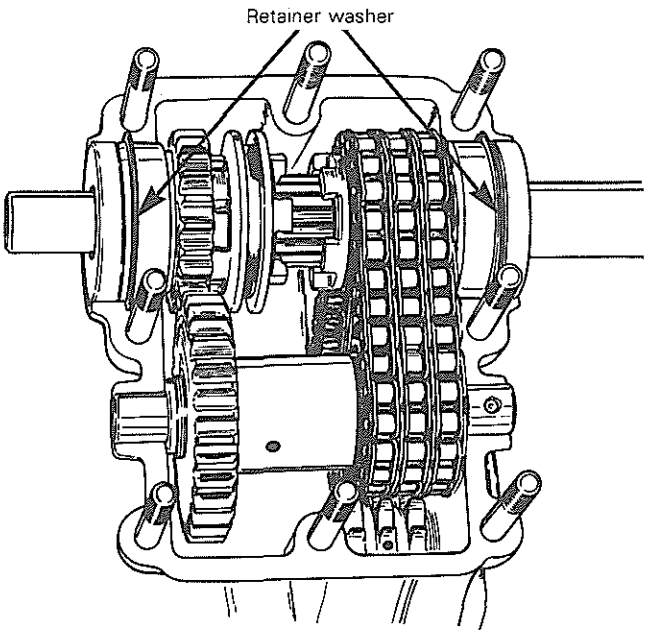
In order to measure driven pulley spring tension, the pulley halves must be separated. To do this, insert a length of $\frac{1}{8}$" dia. rod between the halves. Check tension using a fish scale positioned 90° with pulley axle. (Refer to Technical Data for correct spring tension).



To correct spring tension either relocate spring end in sliding pulley half, or gradually rotate outer cam.

INSTALLATION

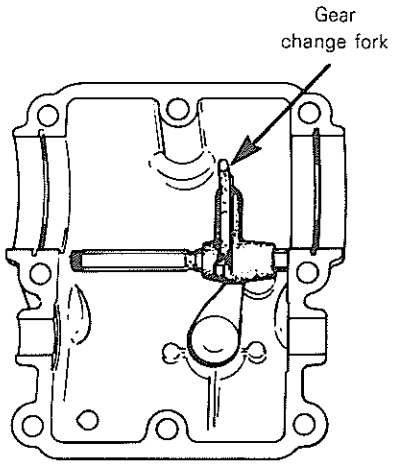
Position drive shaft of assembled driven pulley so that retainer washers align with slots of gearbox casing.

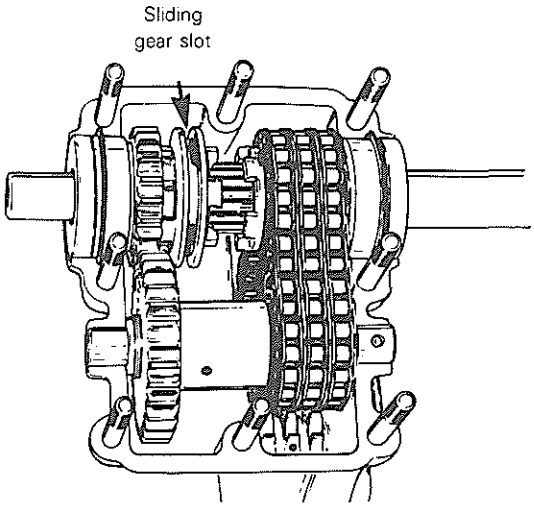


Connect drive chain using a connecting link.

The locking clip should be installed oppositely to driven pulley.

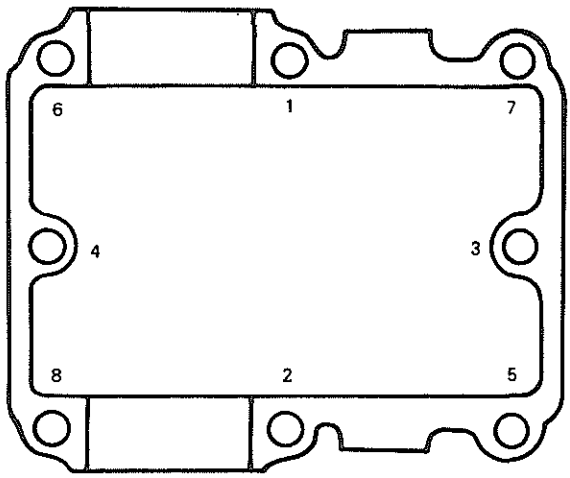
Position gear change fork in gearbox cover so that it aligns with slot of sliding gear in gear housing.





Apply a thin coat of "Loctite crankcase sealant", or equivalent, on contact surface of gearbox casing.

Install gearbox cover and secure with eight nuts. Torque nuts to 27 N•m (20 ft-lbs) in the following sequence:



Install gearbox rod and adjust. (See Section 05-07).

Install steering column.

Install drive belt and exhaust manifold.

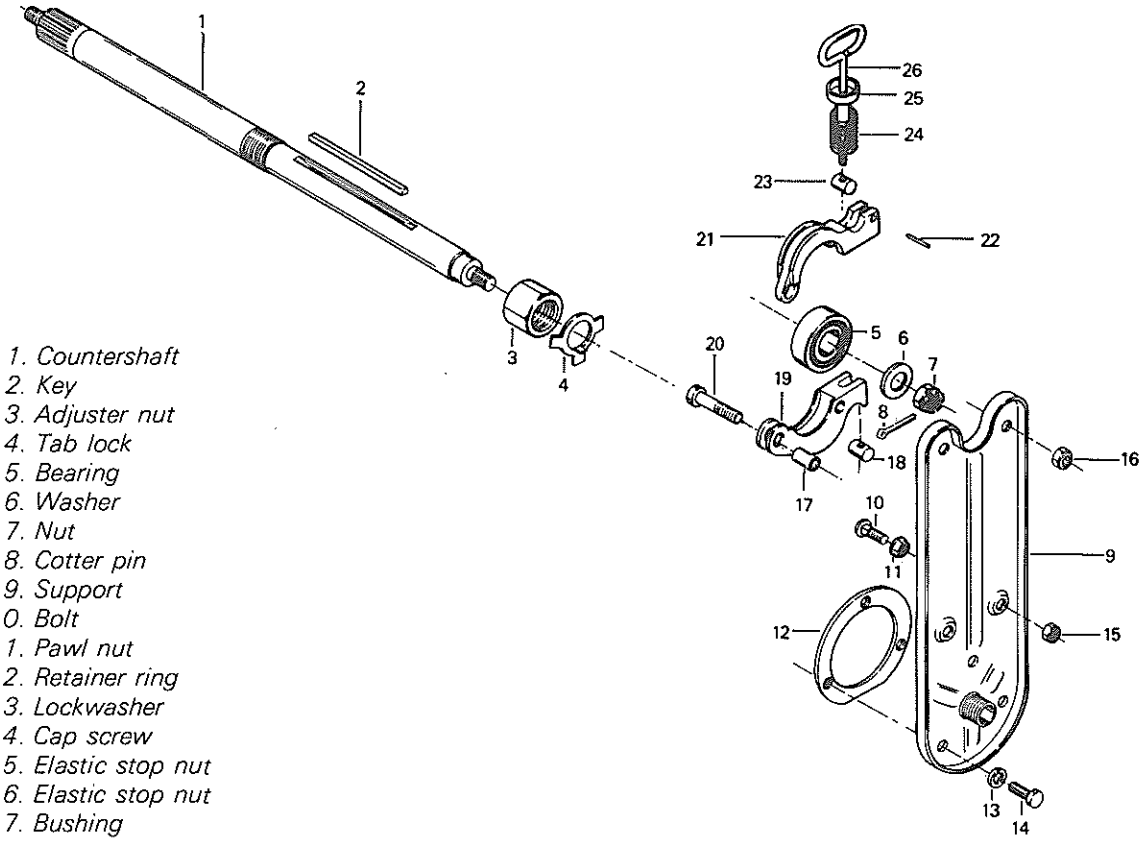
Install brake assembly and bracket. Install roll pin securing disc to shaft.

Adjust chain tension. Check gearbox oil level.

Check pulley alignment and install pulley guard.

COUNTERSHAFT

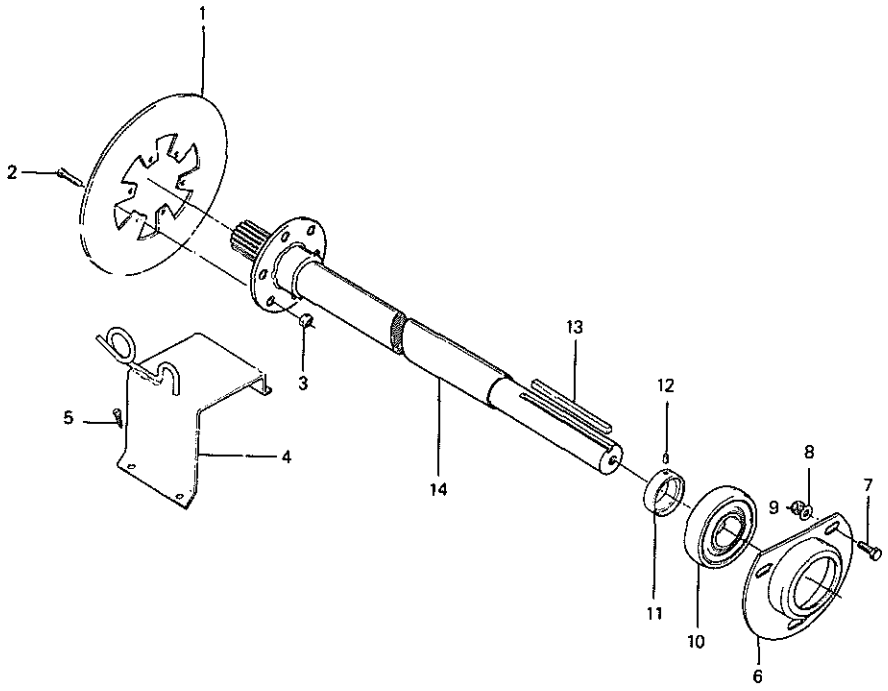
Mirage, Citation



1. *Countershaft*
2. *Key*
3. *Adjuster nut*
4. *Tab lock*
5. *Bearing*
6. *Washer*
7. *Nut*
8. *Cotter pin*
9. *Support*
10. *Bolt*
11. *Pawl nut*
12. *Retainer ring*
13. *Lockwasher*
14. *Cap screw*
15. *Elastic stop nut*
16. *Elastic stop nut*
17. *Bushing*
18. *Barrel*
19. *Bearing housing (lower)*
20. *Cap screw*
21. *Bearing housing (upper)*
22. *Roll pin*
23. *Barrel*
24. *Spring*
25. *Bushing*
26. *Eye bolt*

Removal and assembly:
Proceed as per driven pulley removal and assembly.

Everest, Futura,
Blizzard 5500, 7500, 9500
Grand Prix Special,
Super Sonic, Ultra Sonic



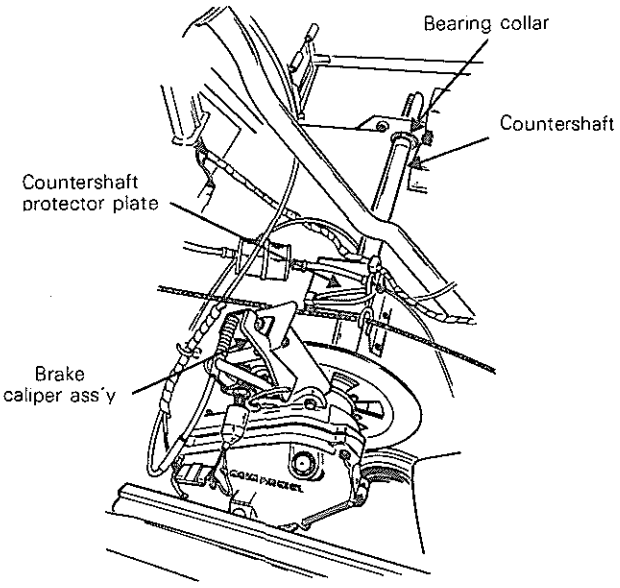
1. Disc
2. Screw
3. Elastic stop nut
4. Protector
5. Sheet metal screw
6. Bearing flange
7. Hexagonal head screw
8. Washer
9. Nut
10. Bearing
11. Collar
12. Set screw
13. Key
14. Countershaft

REMOVAL

Remove the suspension, brake caliper ass'y, air intake silencer, belt guard and drive belt.

Remove the shaft protector plate.

Remove the chaincase ass'y (chaincase cover, sprockets, chain, drive axle seal, chaincase).



Remove the driven pulley ass'y and all shims.

Remove the countershaft ass'y.

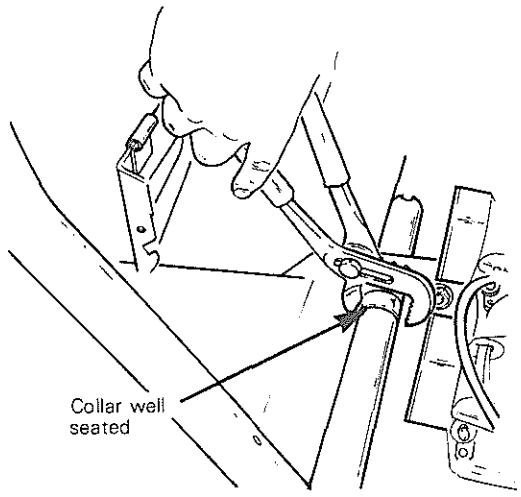
To remove the bearing (press fit type), unlock the countershaft bearing (loosen the Allen screw then turn counterclockwise).

Press out bearing.

INSTALLATION

- Reinstall the countershaft and bearing ass'y.
- Reinstall the chaincase, oil seal, sprockets, drive chain, tab locks. Torque sprocket retaining bolts to 9 N•m (7 ft-lbs). Bend tab locks.

Tighten bearing collar against bearing seat until well seated, then lock in place by tightening the Allen set screw. (Loctite 242 blue medium strength).



Lubricate the countershaft with antiseize lubricant.

Install the pulley ass'y and shims, chaincase cover, chaincase oil.

Reinstall the countershaft protector plate.

Install the air intake silencer and the brake caliper ass'y.

Check the pulley alignment.

Install the drive belt.

CAUTION: When adjusting the pulley alignment, never tamper or modify the countershaft adjustment. Use the engine support bolts to obtain correct pulley distance.

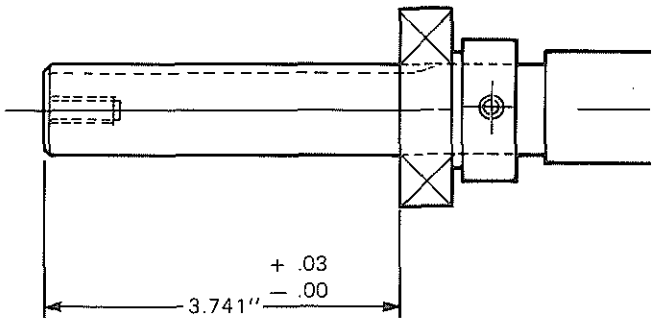
Install the belt guard.

Install the suspension.

Check the track tension and alignment.

BEARING INSTALLATION:

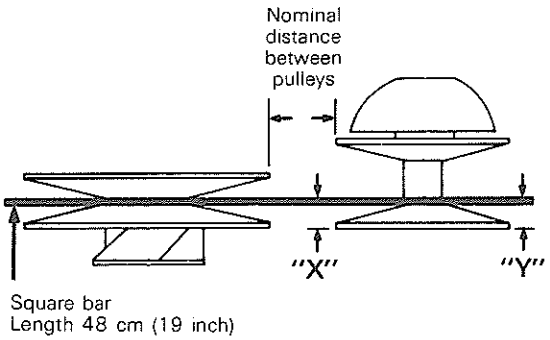
The bearing is of press fit design and must be installed with a press, as per the following specifications.



PULLEY ALIGNMENT

Remove pulley guard and drive belt. Check tightness of engine mounts nuts.

OFFSET ADJUSTMENT



— Dimension "X" must never exceed dimension "Y".

— Dimension "Y" can exceed dimension "X" by 1.6 mm (1/16").

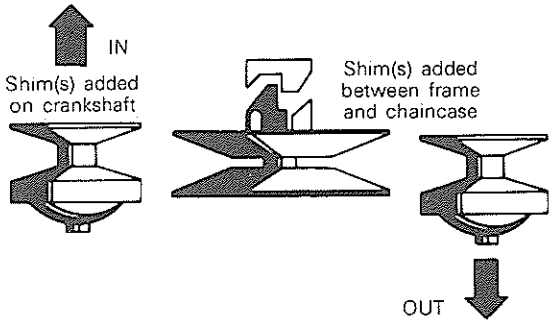
Offset X & Y 34 mm (1 11/32").

Elan, Spirit, Alpine

If drive pulley is too far in, remove drive pulley and add shim(s) on crankshaft.

CAUTION: Never use more than 5 shims on crankshaft.

If drive pulley is too far out, Alpine model excluded, add shim(s) between frame and chaincase.



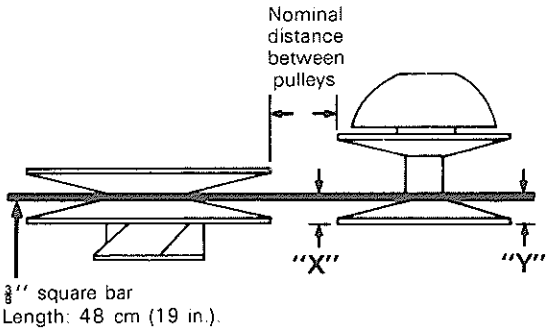
On Alpine model, check tightness of gearbox attaching bolts. If necessary, remove shim(s) from crankshaft. The engine can also be slid on either side by slackening the engine bracket from the support, for better adjustment.

WARNING: Always torque drive pulley bolt within specifications. (See Technical Data).

Citation, Mirage

Offset X & Y 34 mm (1 11/32").

Measure offset (usual method).



— Dimension "X" must never exceed dimension "Y".

— Dimension "Y" can exceed dimension "X" by 1.6 mm (1/16").

If the driven pulley is too far in or out, it can be corrected by sliding it toward appropriate side.

To adjust:

— Loosen the bearing retainer nut (remove cotter pin).

— Open the adjuster nut tab lock.

— Turn adjuster nut so as to move the pulley to proper alignment location (adjuster nut can be turned both ways). Make sure pulley alignment is checked with the adjuster nut resting against the driven pulley ass'y.

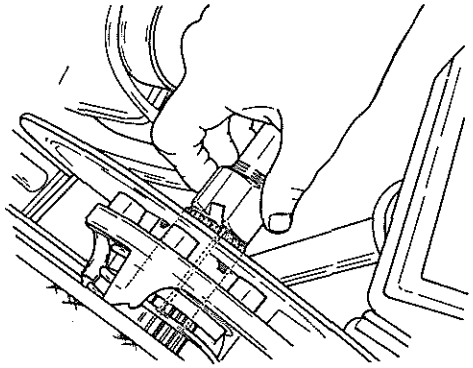
— If required, remove the bearing, bushing etc.

— Remove or add shims so that the bearing remains centered in the bearing cage. (Shims are .032" thick each P/N 504 1057 00).

— Reinstall bushing, bearing and outer washer.

— Firmly tighten bearing retainer nut and install a new cotter pin.

— Bend the tab lock of the adjuster nut.



CAUTION: Make sure the lock tab is secure in the driven pulley keyway.

Everest, Futura, Blizzard 5500, 7500, 9500, Grand Prix Special, Super Sonic, Ultra Sonic

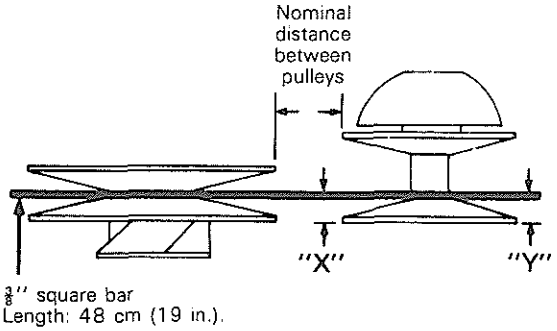
OFFSET X & Y 34 mm (1 11/32").

Floating type driven pulley requires a special procedure to correctly measure offset.

— Install a 1/16" gauge between pulley and bearing plate.

— Then measure offset (usual method).

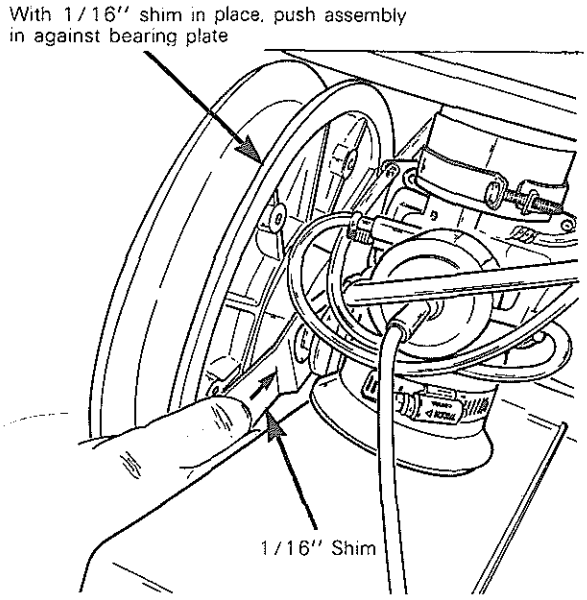
IMPORTANT: Make sure driven pulley assembly is fully seated against bearing flange when measuring offset.



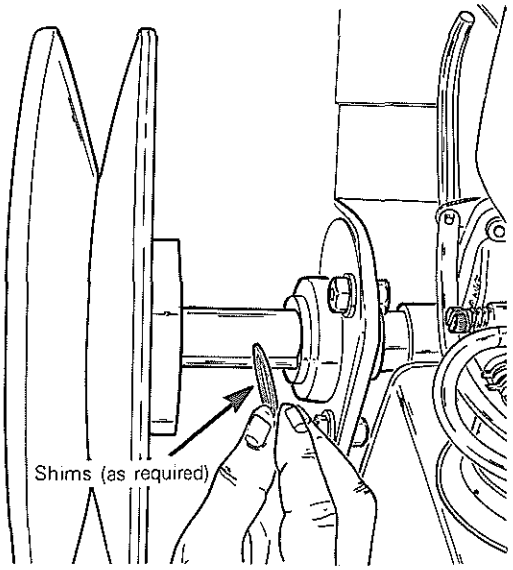
— Dimension "X" must never exceed dimension "Y".

— Dimension "Y" can exceed dimension "X" by 1.6 mm (1/16").

— Adjust the offset by adding or removing shims.



NOTE: To add or remove shims, pulley assembly must be removed as per driven pulley removal procedure.



— When alignment is completed, remove 1/16" gauge.

If pulley was removed:

Reinstall the pulley, outer shims, lockwasher and bolt. Torque to 9 N•m (7 ft-lbs).

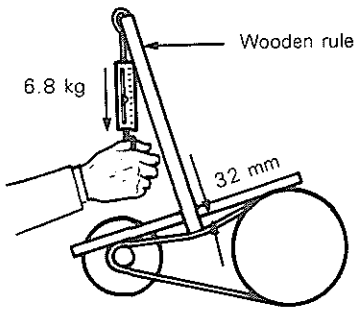
IMPORTANT: Maximum free-play should not exceed 3 mm (1/8").

CAUTION: Always apply anti-seize compound (Loctite anti-seize lubricant P/N 413 7010 00) on the countershaft before final assembly.

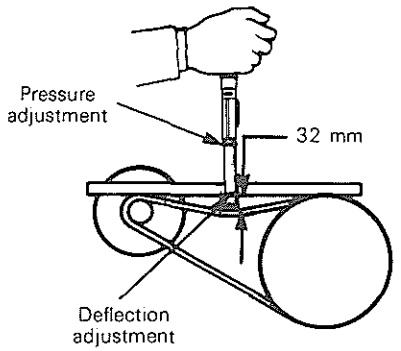
DISTANCE ADJUSTMENT
(except Citation and Mirage)

To obtain maximum vehicle performance, adjust pulley distance as follows:

1. Adjust pulley distance to **nominal** distance. (Refer to Technical Data).
2. Install a **new** drive belt on vehicle. Prior to final adjustment, the drive belt **must** have a break-in period time of one to two minutes.
3. The final adjustment of pulley distance should be performed by using the belt deflection method as follows:
   - Position reference rule on drive belt. Using wooden rule and fish scale, apply 6.8 kg (15 pounds) pressure on drive belt.
   - Deflection must be 32 mm (1 $\frac{1}{4}$").



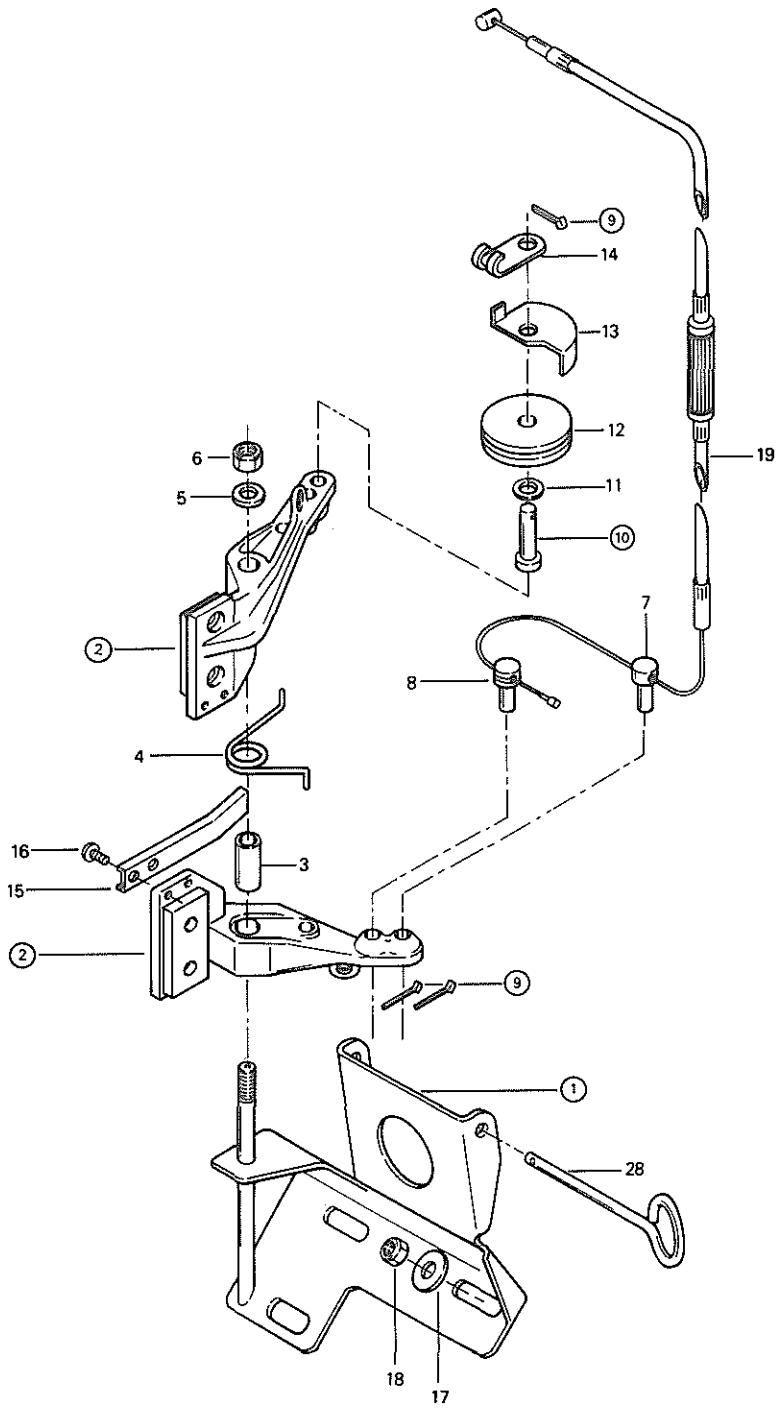
Or using No. 414 3482 Tool



To correct, decrease or increase distance between pulleys.

DISC BRAKE

Mirage, Citation



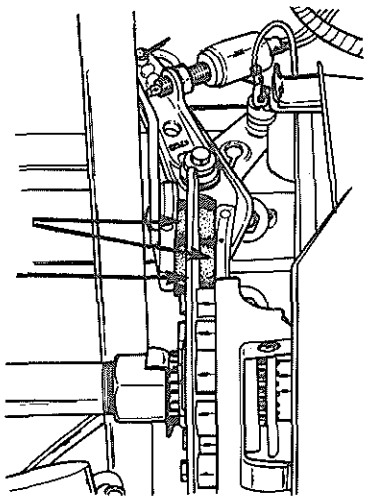
1. *Bracket*
2. *Brake lever and lining*
3. *Bushing*
4. *Spring*
5. *Flat washer*
6. *Nut*
7. *Barrel*
8. *Barrel*
9. *Cotter pin*
10. *Pin*
11. *Spring washer*
12. *Pulley*
13. *Stop plate*
14. *Cable bracket (Europe)*
15. *Brake switch bracket*
16. *Screw*
17. *Flat washer*
18. *Nut*
19. *Cable*

Remove the following:

air silencer,
brake retainer nut, then pull out brake assembly,
brake light switch,
pulley,
brake cable (disconnect and remove).

Assembly and installation, reverse the procedure.

①When reinstalling caliper brake ass'y, always align caliper ass'y so that the brake disc is well centered between the brake pads.



②Replace when pad thickness is less than 3 mm ($\frac{1}{8}$").

⑨Always reinstall a new cotter pin at assembly.

⑩Install pulley shaft in outer hole of the brake lever.

⑬Make sure the guard lock tab is inserted in the brake lever hole.

◆ WARNING: Always readjust the brake light switch after adjusting or removing the brake assembly.

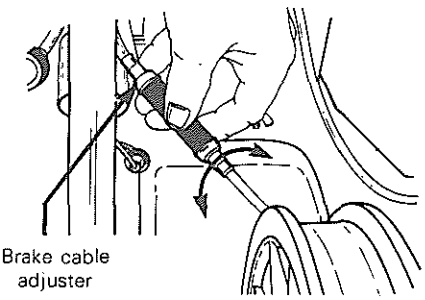
INSPECTION:

Measure the thickness of the brake pads. If less than 3 mm ($\frac{1}{8}$") the pad and lever assembly should be replaced.

ADJUSTMENT:

Brake should apply fully while the brake control lever is approximately 13 mm ($\frac{1}{2}$") from the handlebar grip.

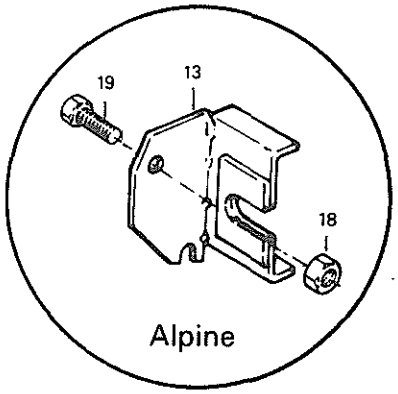
If adjustment is required, turn the brake cable adjuster counterclockwise until the brake disc can no longer turn then back off the adjuster approximately $1\frac{1}{2}$ turns. Re-check brake operation.



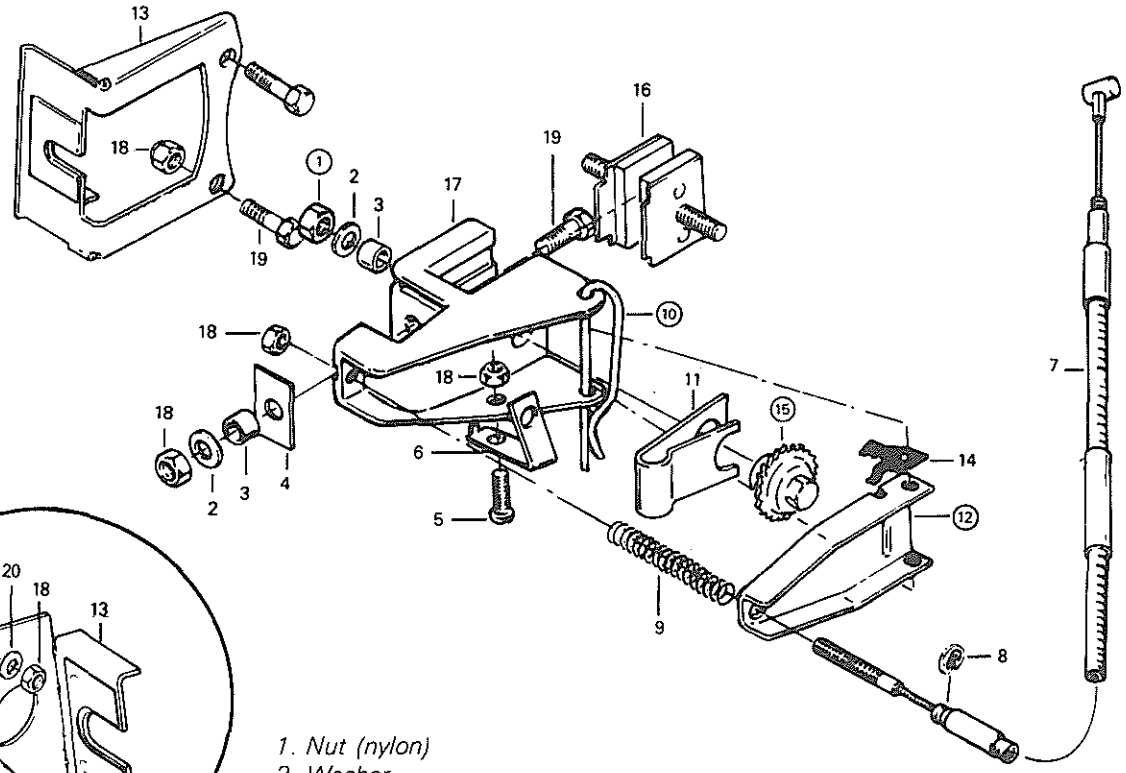
◆ WARNING: Whenever the brake is readjusted, the brake light switch operation must also be checked and adjusted.

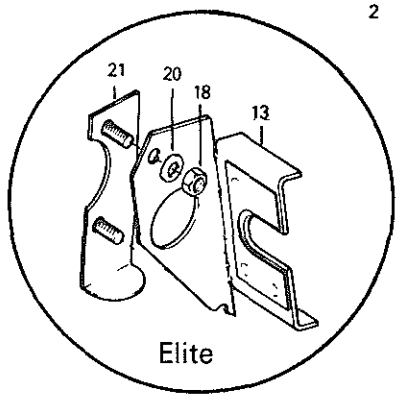
SELF ADJUSTING DISC BRAKE

Everest, Futura, Blizzard, Grand Prix Special, Super Sonic, Ultra Sonic, Alpine, Elite



Alpine





Elite

1. *Nut (nylon)*
2. *Washer*
3. *Spacer*
4. *Square washer*
5. *Bolt*
6. *Brake switch support*
7. *Brake cable and housing*
8. *Circlip*
9. *Spring*
10. *Hair pin cotter*
11. *Release spring*
12. *Lever*
13. *Brake support*
14. *Ratchet spring*
15. *Ratchet wheel*
16. *Brake pad*
17. *Caliper*
18. *Nut*
19. *Bolt*
20. *Washer*
21. *Retaining plate*

REMOVAL

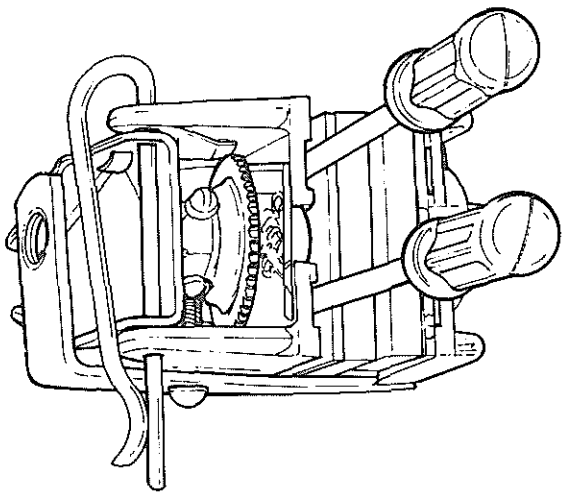
Disconnect brake switch and brake cable.

Remove nuts and/or bolts securing brake support to chaincase.

Slide brake caliper ass'y from brake support.

DISASSEMBLY & ASSEMBLY

⑩⑫ To ease hair pin cotter assembly, activate lever and wedge two (2) screwdriver blades between caliper and brake pad to release lever tension.



⑮ Apply low temperature grease on threads and spring seat prior to installation. At assembly, fully tighten then back off ½ turn.

① At assembly, torque to 20 N•m (15 ft-lbs).

CLEANING & INSPECTION

Measure thickness of brake pad. If less than 3 mm (⅛"), the pad should be replaced.

Clean all metal components in a general purpose solvent. Dry using clean cloth.

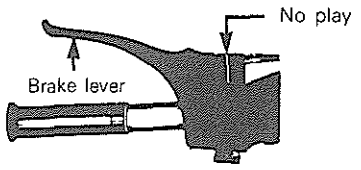
INSTALLATION & ADJUSTMENT

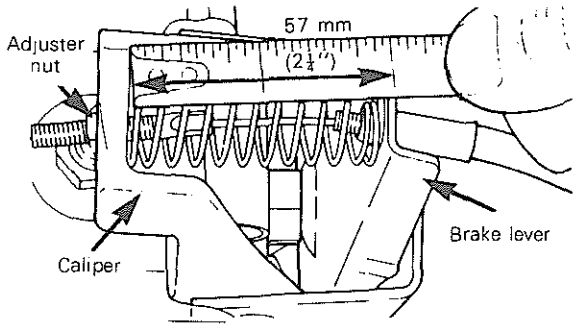
Slide caliper ass'y onto its support then secure support to vehicle.

— Activate lever by hand until ratchet klick is no longer heard.

— Secure brake cable housing to lever, slide spring over cable then attach cable to housing with adjuster nut.

— Using adjuster nut, adjust until there is no free-play between the brake lever and its housing, and there is a gap of 57 mm ± 3 (2¼" ± ⅛") between lever and caliper.

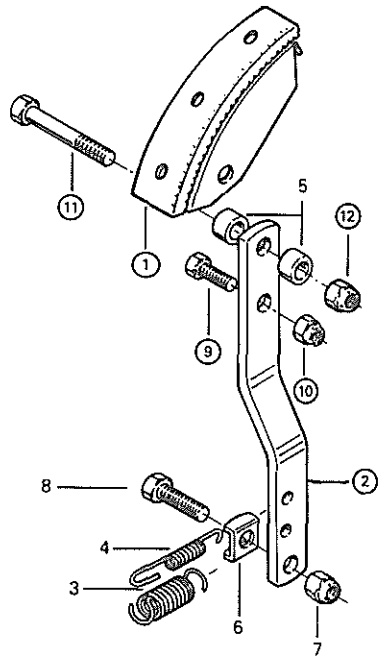




NOTE: It may be necessary to change brake light switch support position to obtain recommended gap between lever and caliper housing.

Connect brake light switch and check operation. Adjust if necessary using two (2) adjuster nuts.

DRUM BRAKE



Elan and Spirit

1. Brake shoe
2. Brake lever
3. Spring
4. Brake light switch spring
5. Spacer
6. Cable lock
7. Nut
8. Bolt (cable)
9. Bolt
10. Nut
11. Bolt (shoe)
12. Nut (shoe)

DISASSEMBLY & ASSEMBLY

①⑪⑫At assembly, torque shoe retaining nut. However shoe must be able to pivot when slight pressure is applied.

②⑨⑩When attaching brake lever assembly to chaincase bracket, tighten nut until lever pivots freely and all side play is eliminated.

NOTE: Lubricate all moving metal parts of brake with light machine oil.

WARNING: **Avoid getting oil on brake shoe.**

INSPECTION

Check brake lining for wear. If necessary, replace.

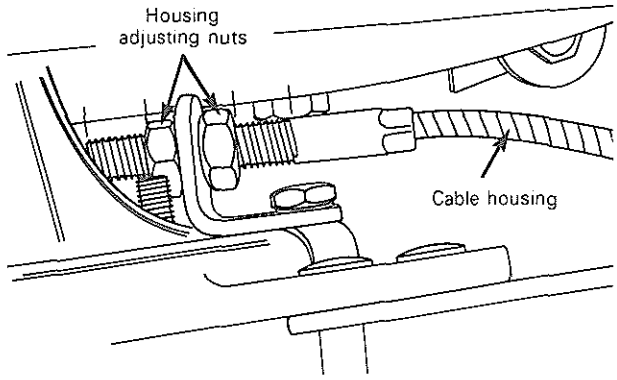
NOTE: If oil traces are found on lining or drum, check chaincase oil seal for correct installation position or damage. Replace as needed. Wipe oil from pulley and replace brake shoe.

INSTALLATION & ADJUSTMENT

Connect brake cable to brake lever and adjust so that brake applies fully when lever is 25 mm (1″) from handlebar grip.

NOTE: Prior to cable installation, make sure cable housing adjusting nuts are located half way on adjuster threads.

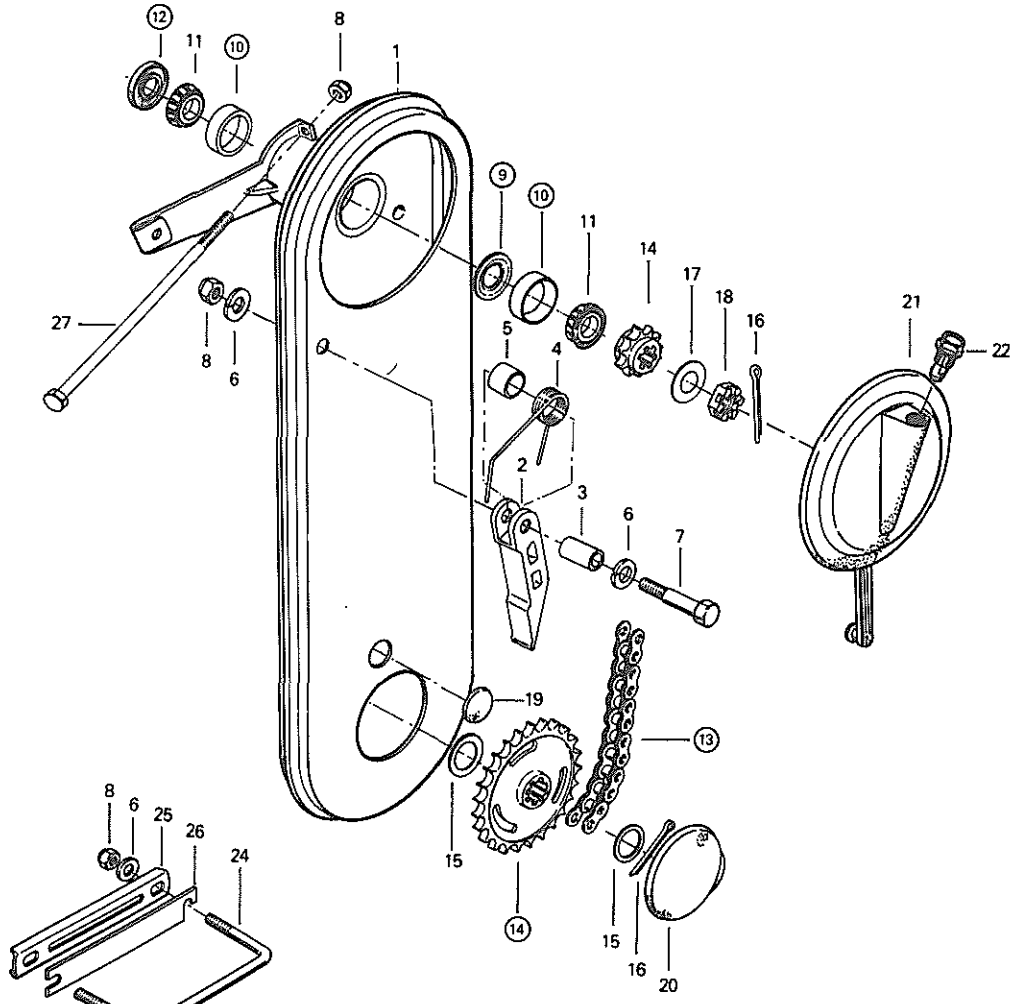
If a final adjustement is indicated, use housing adjusting nuts.



Check brake light operation. If necessary, loosen brake light switch lock nuts and adjust.

STEEL CHAINCASE

Elan, Spirit



1. Chaincase
2. Chain tensioner
3. Bushing
4. Spring
5. Spacer
6. Washer
7. Bolt
8. Nut
9. Oil retainer ring
10. Bearing cup
11. Cone bearing
12. Oil seal
13. Chain
14. Sprocket
15. Spacer
16. Cotter pin
17. Spring washer
18. Castellated nut
19. Oil level plug
20. Access plug (lower)
21. Access plug (upper)
22. Breather
23. Bracket
24. "U" clamp
25. Spacer plate
26. Shim
27. Hinge rod

REMOVAL

Remove pulley guard, drive belt and inspection cover.

Release chain tension.

Release track tension.

Pry oil seal from chaincase (lower part) and drain oil.

Disconnect brake cable.

Pry out lower access plug. Remove cotter pin and spacer.

Remove nut on hinge rod at chaincase bracket.

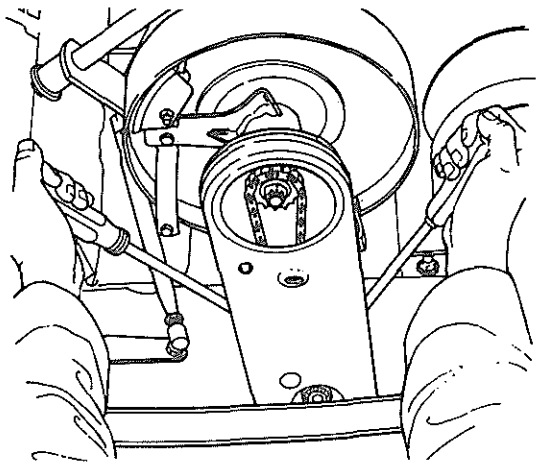
From the inner side of frame, remove the nut securing chaincase lower bracket. Remove bracket.

Remove nuts, washers and "U" clamp holding the chaincase to the frame.

Remove chaincase shim(s) if applicable. Move chaincase towards drive pulley to disengage hinge rod.

Remove drive axle.

Using two (2) large screwdrivers inserted between chaincase and frame, pry complete assembly from vehicle.

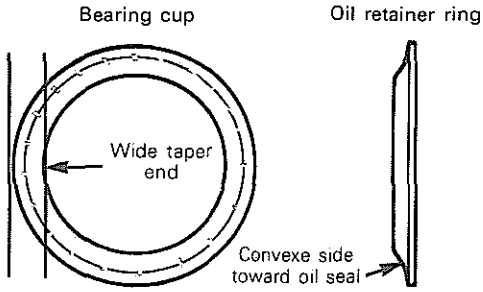


INSPECTION

Visually inspect chain for cracked, damaged or missing link rollers. Inspect for defective bearing cones, bearing cups and oil retainer ring. Inspect sprockets for damage, wear.

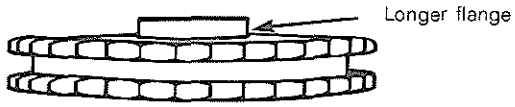
DISASSEMBLY & ASSEMBLY

⑨ ⑩ Position oil retainer ring then sit bearing cup in chaincase aperture. Cup must be seated so that wide taper end is facing oil retainer ring.



⑫ Using an appropriate pusher, press oil seal into chaincase hub. Oil seal must sit flush with case hub edge.

⑬ ⑭ Place lower sprocket with longer flange toward track side of chaincase. (For proper sprocket and chain use, see Technical Data.)

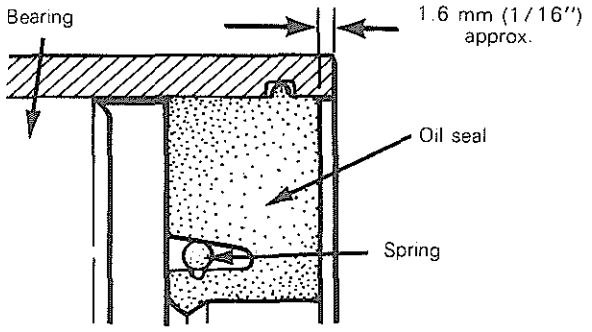


INSTALLATION

Position assembled chaincase and driven pulley in location. Install drive axle. (Ensure that spacer has remained on axle). Install spacer and cotter pin to secure lower sprocket to axle. Install lower access plug. Install hinge rod, lower bracket, "U" clamp and previously removed aligning shim(s).

Install oil seal into chaincase flange.

NOTE: A gap of approximately 1.6 mm (1/16") should exist between the end chaincase flange and oil seal.



Proceed with pulley alignment. Apply chain tension.

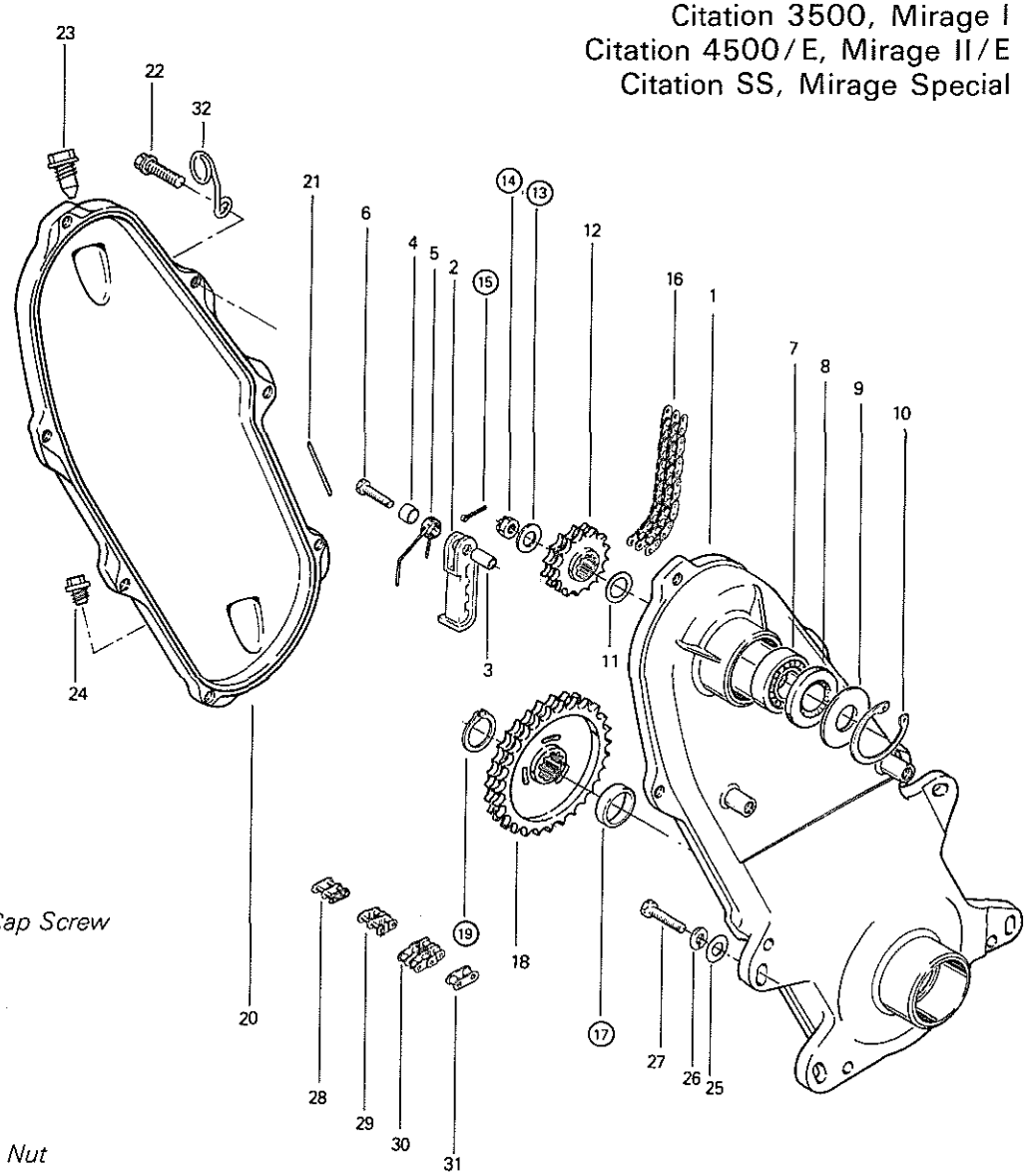
Pour Bombardier chaincase oil into chaincase until flush with oil level plug.

Connect and adjust brake. Apply track tension.

Install drive belt and pulley guard.

ALUMINUM CHAINCASE

Citation 3500, Mirage I
Citation 4500/E, Mirage II/E
Citation SS, Mirage Special



1. *Chaincase*
2. *Chain Tensioner*
3. *Bushing*
4. *Spacer*
5. *Spring*
6. *Hexagonal Head Cap Screw*
7. *Bearing*
8. *Seal*
9. *Stopper Spacer*
10. *Snap Ring*
11. *Spacer*
12. *Sprocket*
13. *Spring Washer*
14. *Hexagonal Slotted Nut*
15. *Cotter Pin*
16. *Driving Chain*
17. *Spacer*
18. *Sprocket*
19. *Snap Ring*
20. *Chaincase Cover*
21. *O'Ring*
22. *Hexagonal Washer Head Taptite Screw*
23. *Breather*
24. *Plug*
25. *Flat Washer 8 mm*
26. *Lockwasher 8 mm*
27. *Hexagonal Head Cap Screw M8 × 25*
28. *Connecting Link Single, $\frac{3}{8}$" Pitch Double*
29. *Cranked Link Single, $\frac{3}{8}$" Pitch Double*
39. *Cranked Link Double, $\frac{3}{8}$" Pitch Double*
31. *Inner Link, $\frac{3}{8}$" Pitch Double*
32. *Rope Guide*

REMOVAL

Remove:

— suspension
— injection oil reservoir (if applicable)
— battery and battery holder (if applicable)
— chaincase cover and drain the oil

Pry out drive axle oil seal from chaincase. Remove cotter pins, nuts, washers, sprockets and chain. Remove bolts and nuts securing chaincase to frame.

INSPECTION

Visually inspect the chain for cracked, damaged or missing link rollers. Inspect for defective bearing, sprockets.

DISASSEMBLY & ASSEMBLY

Remove the oil seal, snap ring and bearing from the chaincase.

INSTALLATION

Install the chaincase to the frame (do not tighten). Position the drive axle into location.

Prior to lower sprocket installation ensure that the spacer ⑰ is on the drive axle.

Reinstall the sprockets, chain, flat washers.

⑬⑭ Reinstall spring washer and slotted nut, torque to 10 N•m (7 ft-lbs).

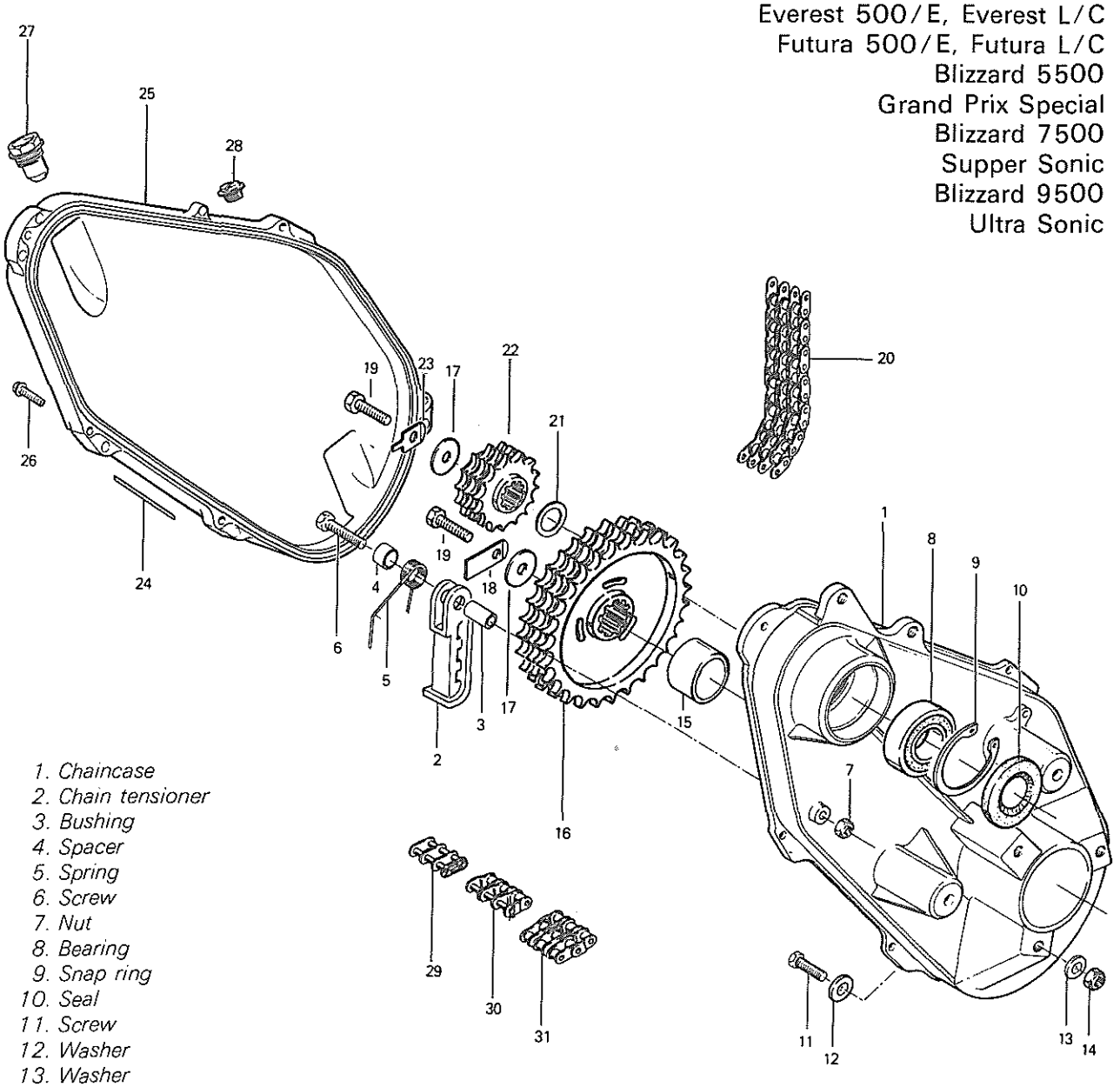
⑮ Install new cotter pin.

⑲ Reinstall snap ring (lower sprocket).

Reinstall the chaincase cover.

Refill with chaincase oil.

Everest 500/E, Everest L/C
Futura 500/E, Futura L/C
Blizzard 5500
Grand Prix Special
Blizzard 7500
Supper Sonic
Blizzard 9500
Ultra Sonic



1. *Chaincase*
2. *Chain tensioner*
3. *Bushing*
4. *Spacer*
5. *Spring*
6. *Screw*
7. *Nut*
8. *Bearing*
9. *Snap ring*
10. *Seal*
11. *Screw*
12. *Washer*
13. *Washer*
14. *Nut*
15. *Lower spacer*
16. *Sprocket*
17. *Washer*
18. *Lock tab*
19. *Screw*
20. *Drive chain, 3/8" pitch triple*
21. *Upper spacer*
22. *Sprocket*
23. *Lock tab*
24. *O'ring*
25. *Chaincase cover*
26. *Washer head hexagonal screw*
27. *Breather*
28. *Plug*
29. *Connecting link single, 3/8" pitch triple*
30. *Cranked link single, 3/8" pitch triple*
31. *Cranked link double, 3/8" pitch triple.*

REMOVAL

Remove the suspension.

NOTE: On the Blizzard 7500, Blizzard 9500, Super Sonic and Ultra Sonic disconnect the muffler and push it aside underneath the exhaust pipes.

Remove the chaincase cover and drain the oil.

Slacken the end bearing housing.

Pry out the drive axle oil seal from the chaincase.

Release chain tension then open the tab locks locking the sprockets. Remove the screws, washers, sprockets and chain.

Remove bolts and/or nuts securing the chaincase to the frame.

INSPECTION

Visually inspect the chain for cracked, damaged or missing link rollers. Inspect for defective bearing, sprockets.

DISASSEMBLY & ASSEMBLY

Remove the oil seal, snap ring and bearing from the chaincase.

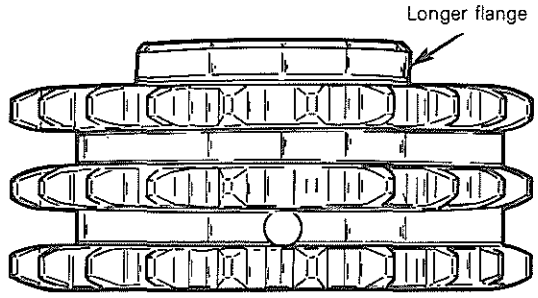
Using an appropriate pusher, press the oil seal into chaincase hub. Oil seal must fit flush with the case hub edge.

INSTALLATION

Install the chaincase to the frame (do not tighten). Position the drive axle into location. Tighten the end bearing housing. Prior to lower sprocket installation ensure that the spacer is on the drive axle.

Reinstall the sprockets, chain, flat washers.

Position the sprockets with the longer flanges facing inside the chaincase. (For proper sprocket and chain use, see Technical Data).

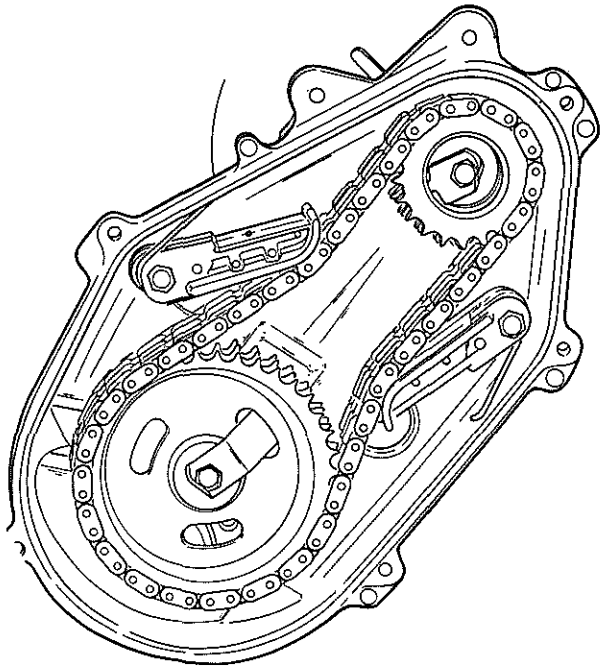


Install the tab locks as illustrated.

Install the screws and torque to 9.5 N•m (7 ft-lbs).

Bend the tab locks.

CAUTION: Lock tabs should be replaced if bent more than twice. If in doubt, replace.



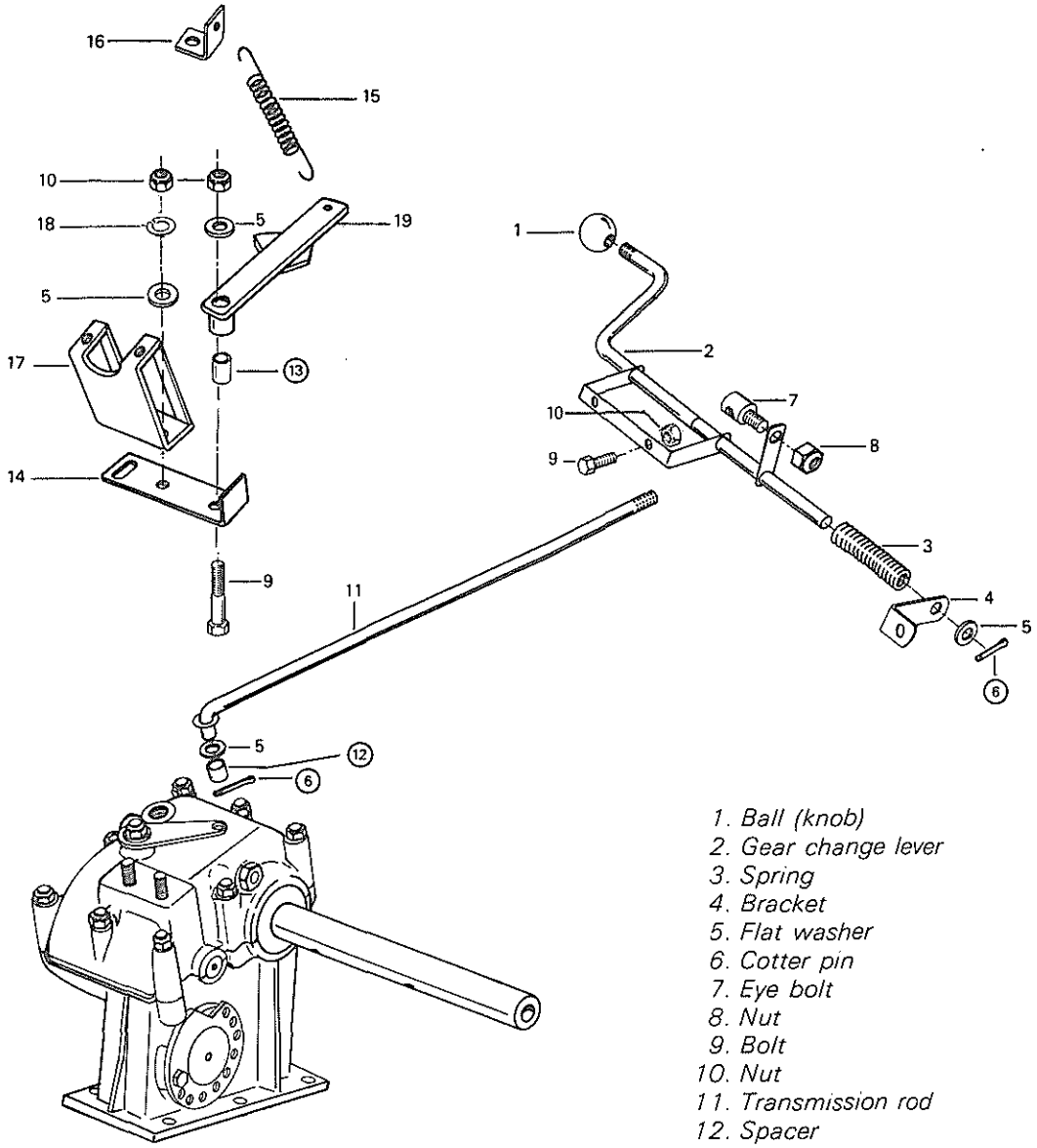
Reinstall the chaincase cover.

Refill with chaincase oil.

SHIFTER MECHANISM

TYPE 1

Alpine



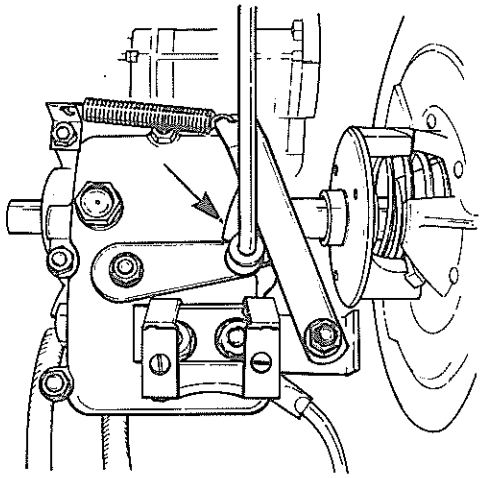
1. *Ball (knob)*
2. *Gear change lever*
3. *Spring*
4. *Bracket*
5. *Flat washer*
6. *Cotter pin*
7. *Eye bolt*
8. *Nut*
9. *Bolt*
10. *Nut*
11. *Transmission rod*
12. *Spacer*
13. *Bushing*
14. *Cam plate*
15. *Spring*
16. *Spring bracket*
17. *Steering bracket*
18. *Lockwasher*
19. *Cam*

DISASSEMBLY & ASSEMBLY

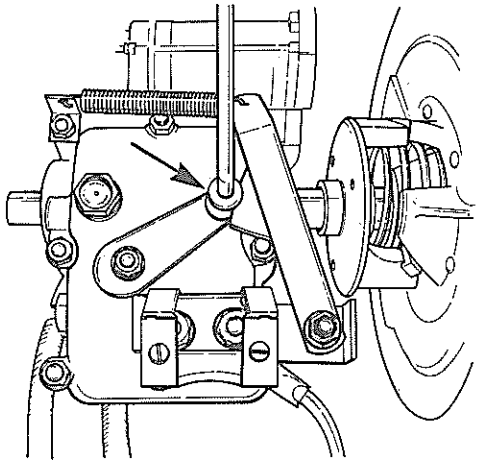
⑥When assembling shifter mechanism, always position new cotter pins.

⑫⑬A layer of grease should be applied for smoother operation of the mechanism.

SHIFTER MECHANISM ADJUSTMENT

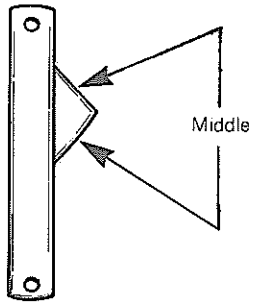


FORWARD POSITION

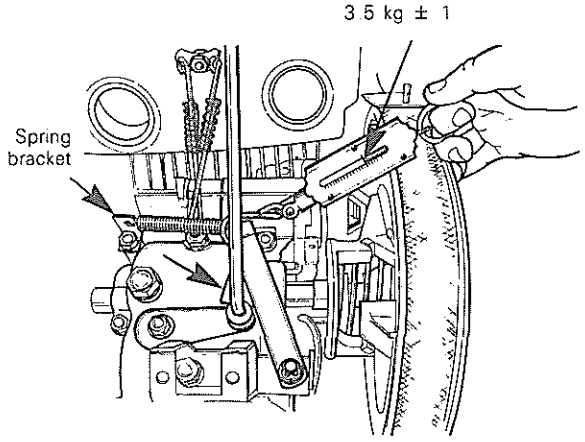


REVERSE POSITION

To adjust cam position as per above illustrations, move cam plate one side or the other: in the 2 cases, transmission rod bushing must rest in the middle of the cam.

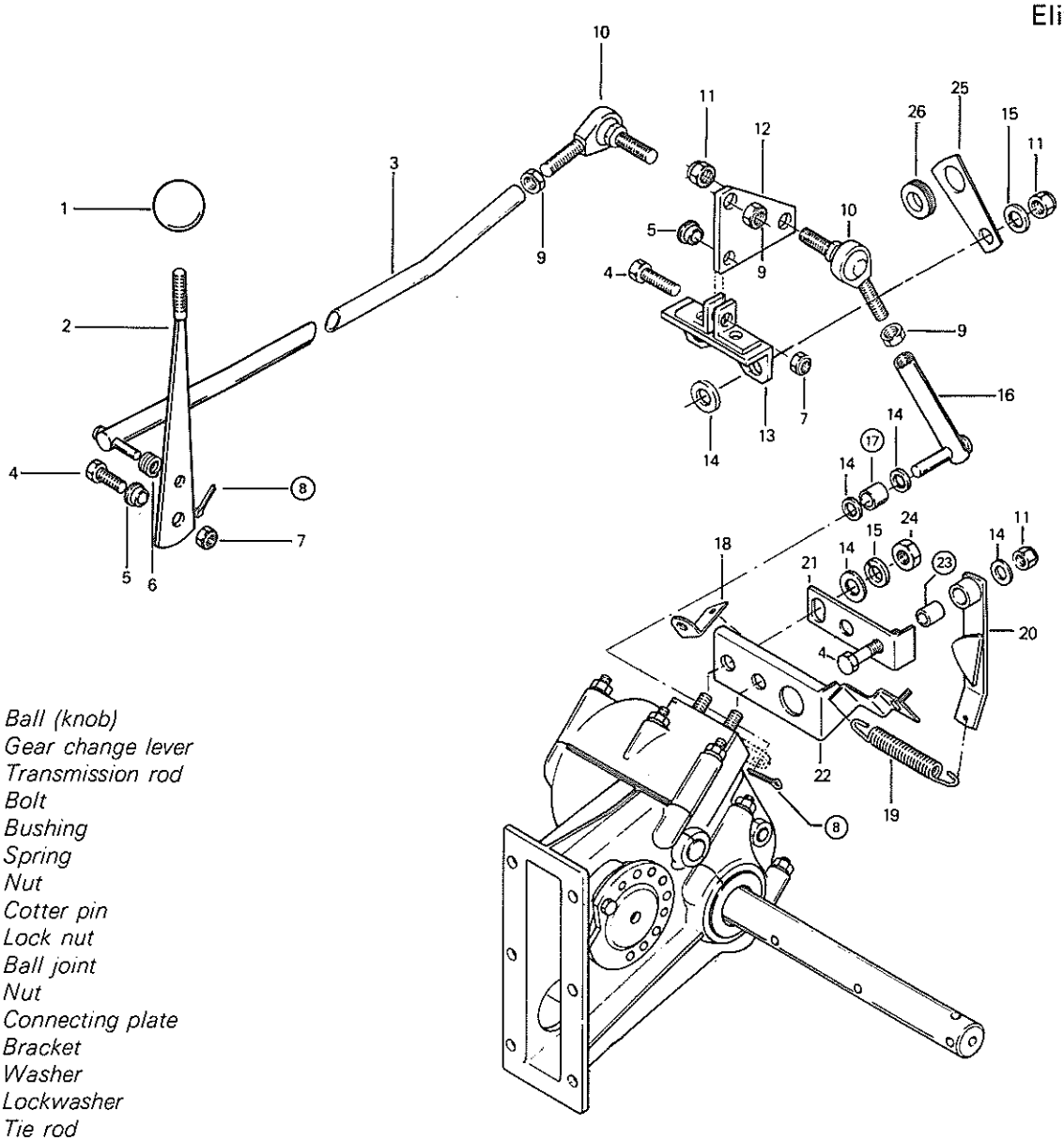


Using a fish scale, adjust spring bracket to obtain a spring tension of 3.5 kg ± 1 (8 lbs ± 2), when in forward position.



TYPE 2

Elite



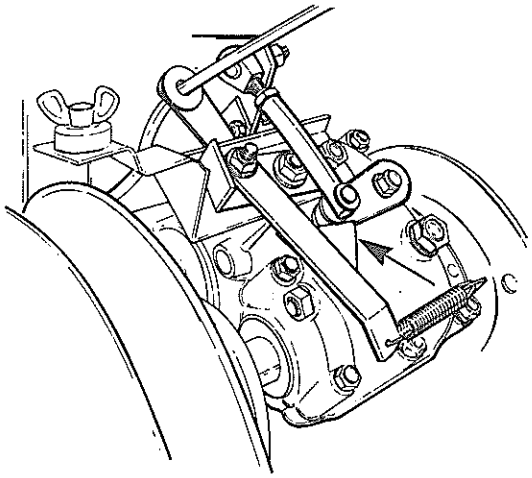
1. *Ball (knob)*
2. *Gear change lever*
3. *Transmission rod*
4. *Bolt*
5. *Bushing*
6. *Spring*
7. *Nut*
8. *Cotter pin*
9. *Lock nut*
10. *Ball joint*
11. *Nut*
12. *Connecting plate*
13. *Bracket*
14. *Washer*
15. *Lockwasher*
16. *Tie rod*
17. *Spacer*
18. *Spring bracket*
19. *Spring*
20. *Cam*
21. *Cam plate*
22. *Pulley guard bracket*
23. *Bushing*
24. *Nut*
25. *Cable bracket*
26. *Cable grommet*

DISASSEMBLY & ASSEMBLY

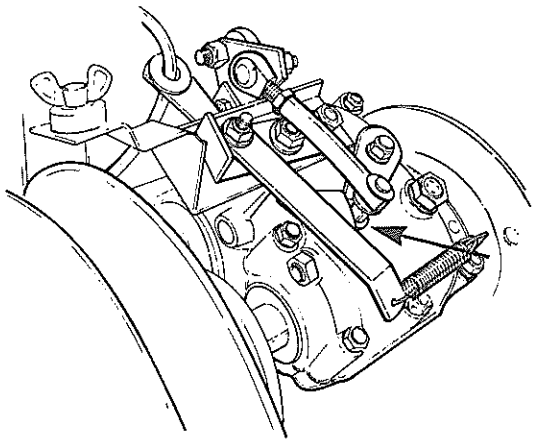
⑧ When assembling shifter mechanism, always position new cotter pins.

⑰ ㉓ A layer of grease should be applied for smoother operation of the mechanism.

SHIFTER MECHANISM ADJUSTMENT

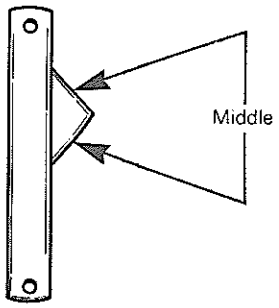


FORWARD POSITION

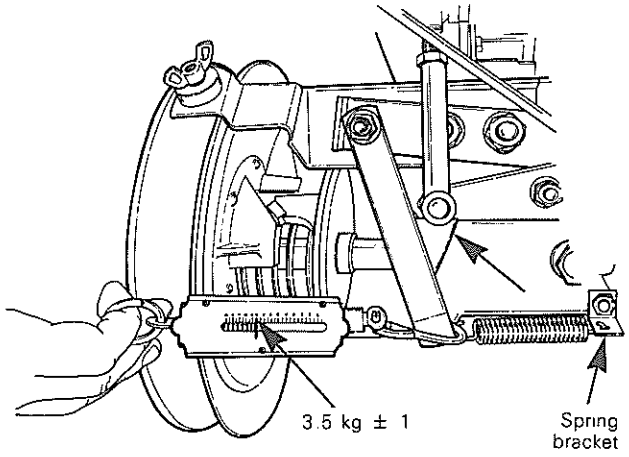


REVERSE POSITION

To adjust cam position as per above illustrations, move cam plate on one side or the other: in the 2 cases, transmission rod bushing must rest in the middle of the cam.

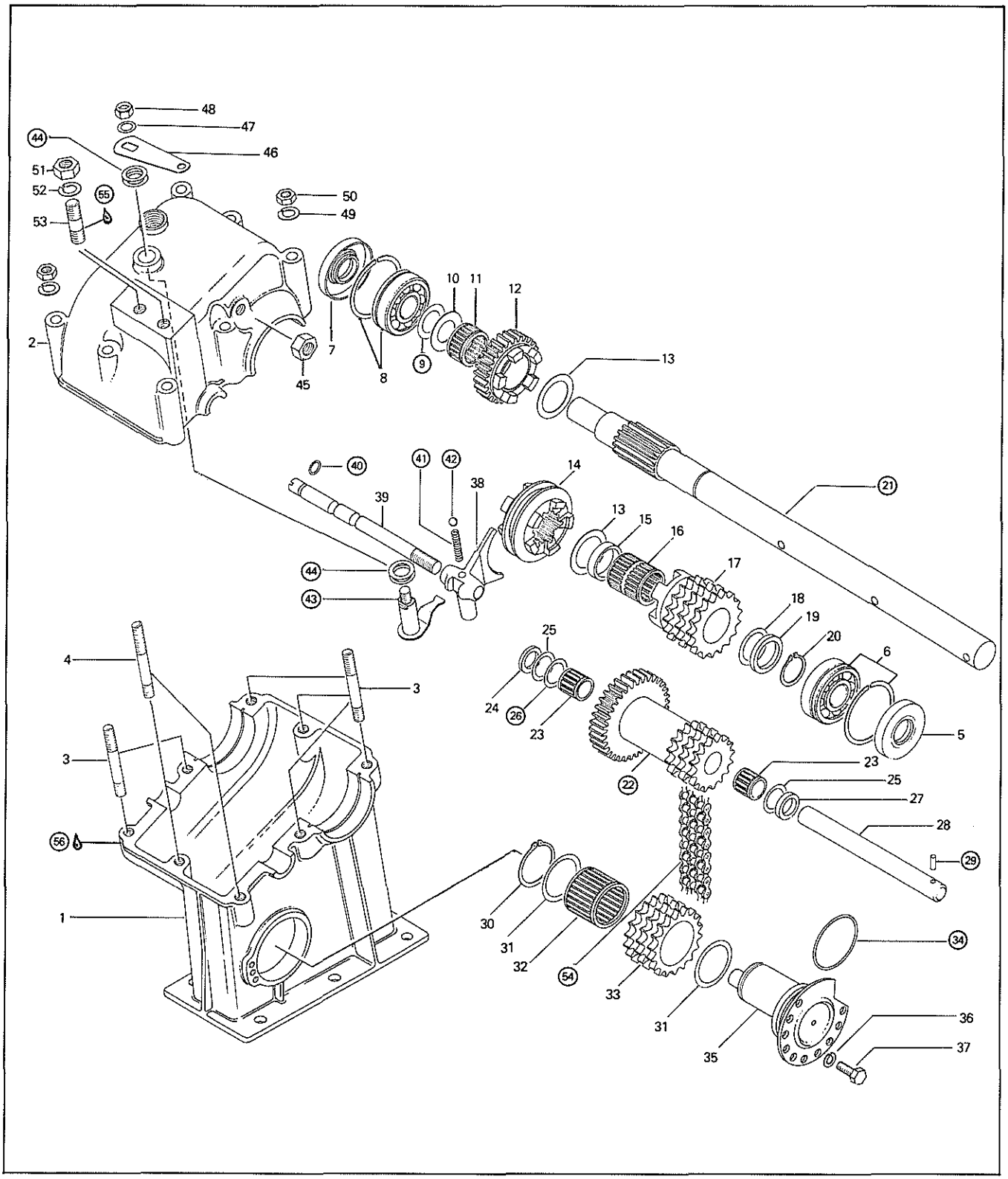


Using a fish scale, adjust spring bracket to obtain a spring tension of 3.5 kg ± 1 (8 lbs ± 2), when in forward position.



GEARBOX (FORWARD, REVERSE)

GEARBOX (FORWARD, REVERSE)



1. *Lower housing*
2. *Upper housing*
3. *Stud*
4. *Stud*
5. *Oil seal*
6. *Ball bearing/groove ring*
7. *Oil seal*
8. *Ball bearing/groove ring*
9. *Shim 0.15 to 0.80 mm*
10. *Washer 20.5 mm*
11. *Needle bearing*
12. *Reverse gear*
13. *Washer 30.2 mm*
14. *Gear shift sleeve*
15. *Distance sleeve*
16. *Needle bearing*
17. *Shift sprocket 17T*
18. *Washer 25.5 mm*
19. *Distance ring 3 mm*
20. *Circlip*
21. *Drive shaft*
22. *Layshaft gear ass'y*
23. *Needle bearing*
24. *Distance ring 2.9 mm*
25. *Shim 1 mm*
26. *Shim 0.15 to 1 mm*
27. *Distance ring 5.2 mm*
28. *Lay axle*
29. *Dowel tube*
30. *Circlip*
31. *Washer 32.2 mm*
32. *Needle bearing*
33. *Tensioner sprocket 18T*
34. *"O" ring*
35. *Tensioner axle ass'y*
36. *Lock washer*
37. *Bolt*
38. *Gear change fork*
39. *Index rod*
40. *"O" ring*
41. *Index spring*
42. *Ball 1/4 inch*
43. *Gear change shaft*
44. *Shim 0.3 to 1 mm*
45. *Nut*
46. *Gear change lever*
47. *Washer 8.4 mm*
48. *Lock nut*
49. *Lock washer*
50. *Nut*
51. *Nut*
52. *Lock washer*
53. *Stud*
54. *Chain*
55. *Loctite 242*
56. *Crankcase sealant*

REMOVAL

Alpine

Remove cab, pulley guard, drive belt and exhaust manifold from vehicle.

Remove brake assembly and shifter mechanism.

Remove steering lower bracket from the gearbox.

Slacken upper bracket.

Release chain tension using tensioner.

Release track tension by unlocking link plate springs. Insert a pry bar between structural members of center bogie wheel sets and pry sets upward to reverse installation position. Reverse front then rear bogie wheel sets. Remove rear axles.

Remove oil seals from end bearing housings and center frame (to drain the oil).

Remove end bearing housings. (Pry out housings with two (2) screwdrivers inserted between housing and frame).

Release drive axle sprocket teeth from track notches while at the same time, pulling the drive axle towards end bearing side of frame. (This action will disengage the axle splines from the lower sprocket of the gearbox).

Allow drive axles to remain within the tracks.

Remove gearbox and gasket from frame.

Elite

Remove pulley guard and drive belt.

Remove seat backs and seats then remove plates to allow access to engine compartment.

Remove engine from vehicle.

Remove brake assembly and detach driven pulley support.

Remove shifter mechanism.

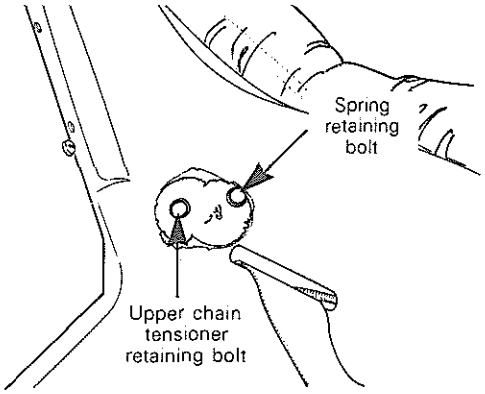
Release track tension. Remove suspension systems.

Drain oil from chaincase (incorporated with frame).

Remove end bearing housings.

Remove drive axle then pull back gearbox assembly until it is possible to enter the hand to remove the two (2) tensioners inside the housing between the track tunnels).

NOTE: It is necessary to cut a hole in fiberglass frame in order to be able to reach chain tensioner retaining bolts and nuts.



Remove gearbox, chain and lower sprocket from vehicle.

INSPECTION

Check general condition of chain linkage. Visually inspect drive chain for cracked, damaged or missing link rollers. Inspect security of riveted heads of link pins.

Visually inspect oil seals for cuts or damage.

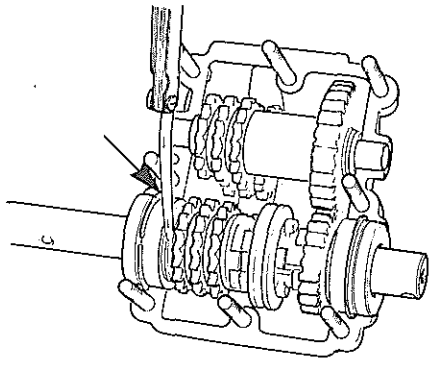
Inspect sprockets and gears for damage, worn teeth, or spline distortion.

Inspect general condition of bearings (pitted or missing roller bearings, freedom of movement and radial freeplay).

Inspect drive shaft for deflection, worn or twisted splines.

DISASSEMBLY & ASSEMBLY

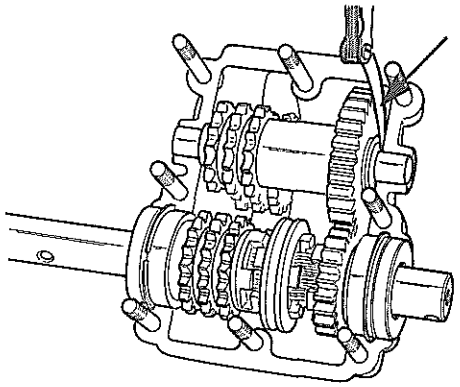
㉑⑨ **Drive shaft free-play:**



Install assembled drive shaft into lower housing then using a feeler gauge, check total free-play between components installed on the drive shaft side of sprocket ⑫.

Free-play must not exceed 0.15-0.30 mm (.006 to .012''). If free-play is not within tolerance, shim ⑨ to correct tolerance.

㉒㉖ **Layshaft gear free-play:**



Place the assembled lay gear into the lower housing.

Using a feeler gauge, check end play between assembled layshaft and walls of lower housing. End play must be between 0.15-0.30 mm (.006 and .012''). If end play is not within tolerance, remove or add ㉖ shims.

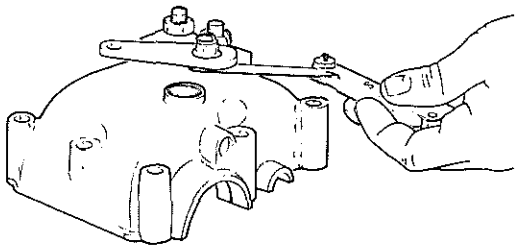
㉙ Do not remove the dowel tube from layshaft unless damaged and replacement is necessary.

㉞ When assembling, always position a **new** ''O'' ring into appropriate groove of tensioner axle.

㊵ When assembling gearbox, always position a **new** ''O'' ring on index rod.

㊶㊷ The gear change fork incorporates a spring loaded ball. Ensure that spring and ball do not fly out during removal of index rod.

㊸㊹ **Gear change shaft free-play:**



Install gear change shaft on upper housing then on outside of housing, position shim (44), gear change lever (46) washer (47) and nut (48). Torque to 23 N•m (17 ft-lbs).

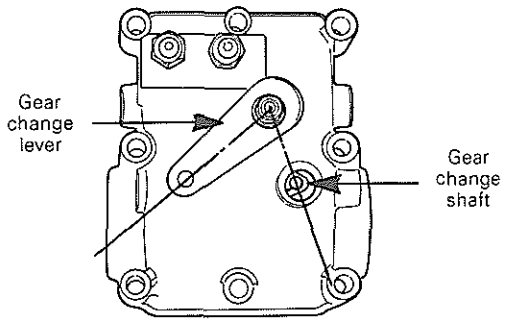
Using a feeler gauge, check that free-play of gear change shaft is within tolerance of 0.15-0.30 mm (.006 to .012''). If free-play is not within tolerance, record discrepancy. Remove nut, washer, gear change lever, shim, and gear change shaft.

Divide discrepancy by two and install that amount of shim (44) on gear change shaft (43) Install shaft into upper housing.

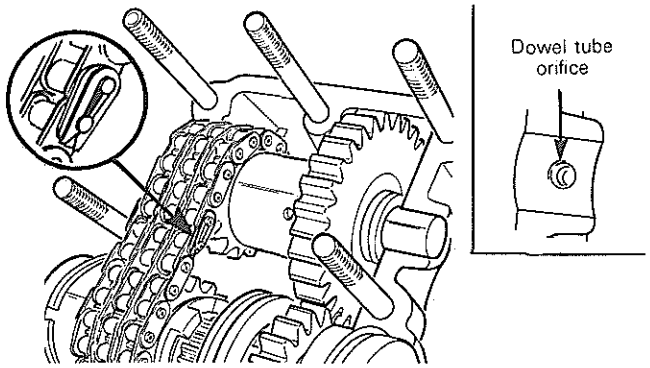
Install remaining shims (44) on gear change shaft.

Install gear change lever (46) as per following illustration.

Install washer (47) and nut (48). Torque to 23 N•m (17 ft-lbs).



(54) Chain locking clip must be installed as per following illustration, with its closed end towards the rotary motion direction when in ''Forward'' position.



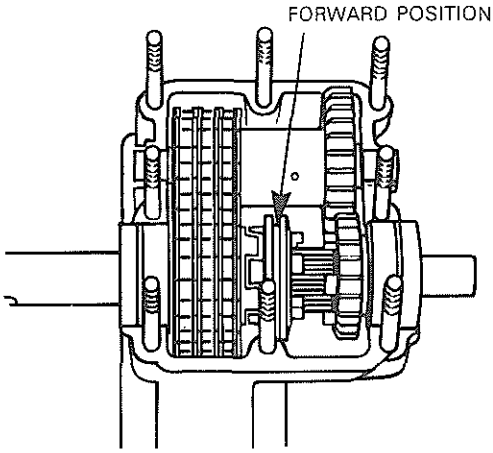
For correct chain selection, see Technical data.

(55) At the installation of the studs in the gearbox upper housing, apply Loctite 242 on threads.

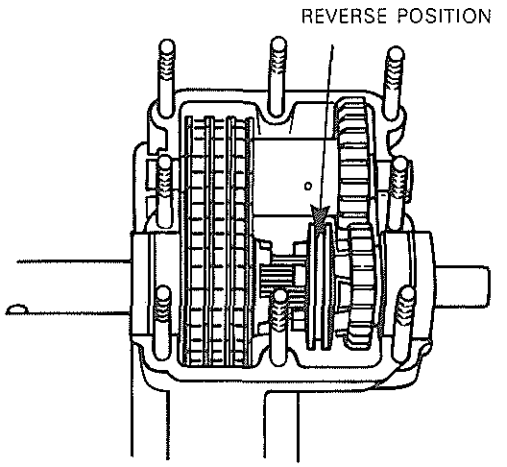
(56) Seal upper and lower gearbox housings with Loctite 515 or an equivalent such as silicone sealants.

INSTALLATION

Prior to installation, with the gearbox removed, adjust gearbox to obtain correct engagement. At ''**forward**'' position, sleeve must be as shown.



At ''**reverse**'' position, sleeve must be as shown.

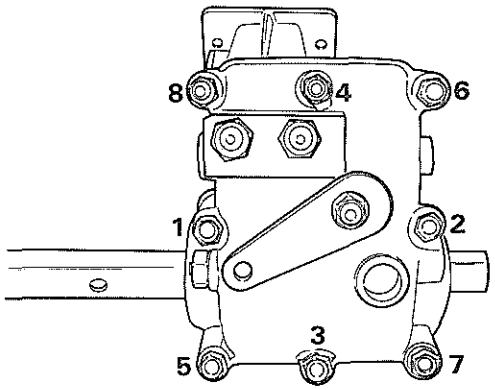


If any of these positions are unobtainable, use a screwdriver to turn index rod (39) and obtain proper meshing of teeth. Recheck sleeve engagement after adjusting index rod.

Lock index rod using a nut (45) with Loctite 242 on threads.

Position gear change fork in gearbox cover so that it aligns with slot of sleeve in gearbox housing.

Install gearbox cover on gearbox using "Loctite 515 crankcase sealant" or an equivalent such as silicone sealants. Torque nuts in the following sequence to 27 N•m (20 ft-lbs).



Alpine

Position gasket on frame studs.

Place lower sprocket in drive chain.

Secure gearbox to frame. Torque nuts to 22 N•m (16 ft-lbs).

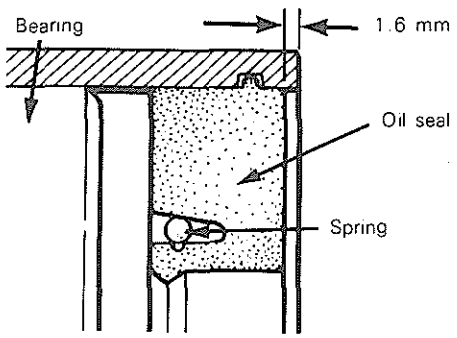
CAUTION: Check condition of drive axle oil seals; replace if necessary.

From the left side of vehicle, place the drive axle within the track. Push the end bearing side of axle through the orifice in left side of frame, then push the splined end of axle into gearbox lower sprocket. Install opposite drive axle.

Press each end bearing housing into frame and over axle bearing. Secure housings to frame.

Install oil seals.

NOTE: A gap of approximately 1.6 mm (1/16") should exist between the end of bearing housing and oil seal.



Install rear axle and bogie wheel sets to their original position.

Connect shifter mechanism to gearbox lever (46) and adjust. (See section 08-08, Shifter mechanism.)

Rotate the tensioner axle (35) to obtain 6 mm ($\frac{1}{4}$") maximum drive chain free-play.

Fill gearbox with 450 mL (16 Imp. ounces) of Bombardier chaincase oil.

Install exhaust manifold, drive belt and brake assembly. Proceed with pulley alignment.

Proceed with track tension and alignment.

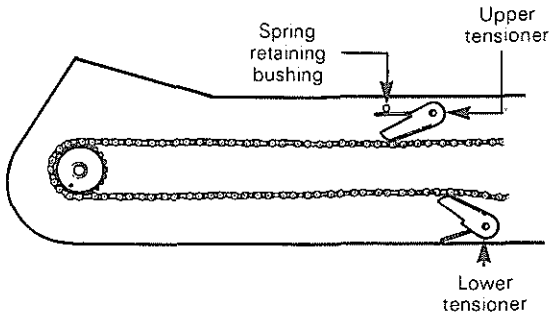
Install pulley guard and cab.

Elite

Position gaskets and spacer of gearbox on frame studs.

Place lower sprocket in drive chain and push it forward inside the housing (between the track tunnels).

Install chain tensioners.

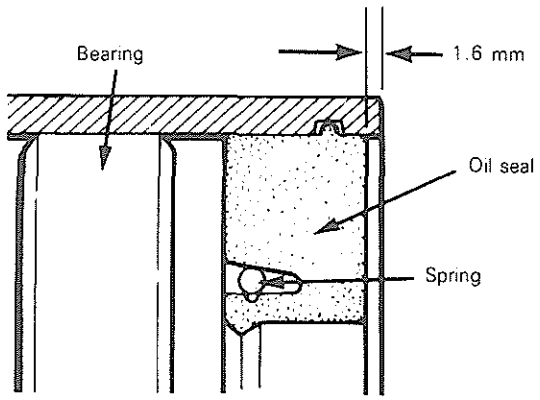


Secure gearbox to frame (torque nuts to 22 N•m (16 ft-lbs) and insert splined end of drive axles in the lower sprocket of the gearbox.

CAUTION: Check condition of drive axle oil seals; replace if necessary.

Press each end bearing housing into frame and over drive axle bearing. Secure housings to frame. Install oil seals.

NOTE: A gap of approximately 1.6 mm (1/16") should exist between the end of bearing housing and oil seal.



Install shifter mechanism and adjust (see section 02-08, Shifter mechanism).

Install brake and driven pulley support.

Apply chain tension by rotating tensioner axle (35) to obtain 6 mm ($\frac{1}{4}$") maximum chain free-play.

Pour .625 mL (22 Imp. ounces) of Bombardier chaincase oil into gearbox.

Install engine and carry out pulley alignment.

Install suspension systems. Proceed with track tension and alignment.

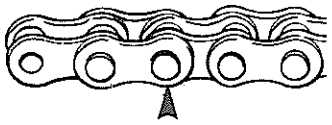
Install drive belt and pulley gard.

Install engine compartment access plates, seats and seat backs.

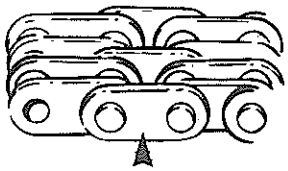
DRIVE CHAIN

GENERAL

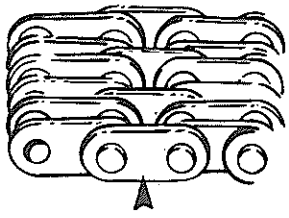
There are three (3) types of the Bombardier drive chains; a **single ½" pitch**, a **double ⅜" pitch**, and a **triple ⅜" pitch**. For proper use refer to Technical Data.



½" SINGLE



⅜" DOUBLE

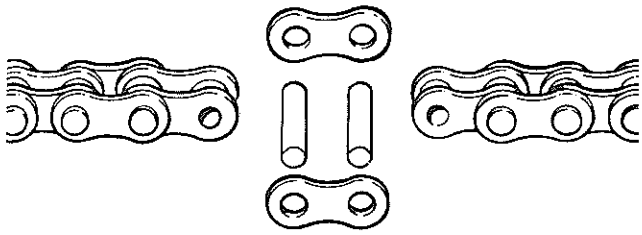


⅜" TRIPLE

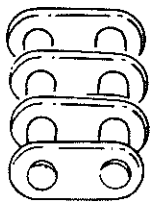
There are two (2) variations of chains; detachable and endless.

CHAIN SEPARATION

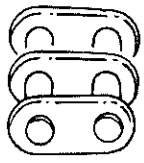
When separating an endless chain, always use a chain bearing pin extractor. Also, make sure to remove one complete link.



½" SINGLE LINK



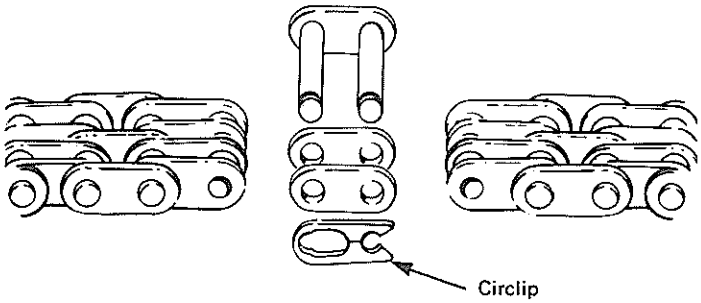
⅜" TRIPLE LINK



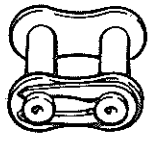
⅜" DOUBLE LINK

CHAIN ATTACHMENT

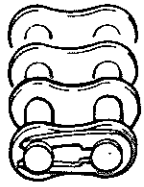
When joining chain ends, **the open end of the circlip must be on opposite side of chain rotation.** The circlip should also be facing the outer side of chaincase.



CONNECTING LINK ⅜" DOUBLE



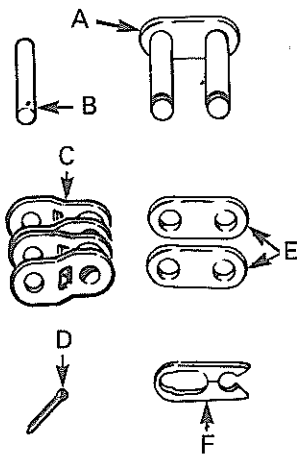
½" SINGLE



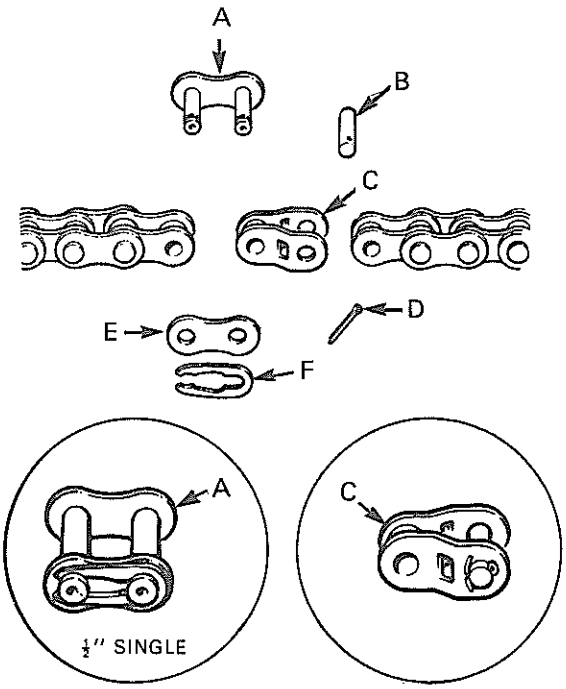
⅜" TRIPLE

LENGTHENING ½ LINK

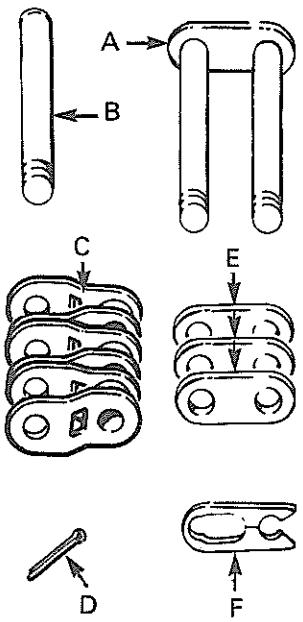
⅜" DOUBLE



½" SINGLE



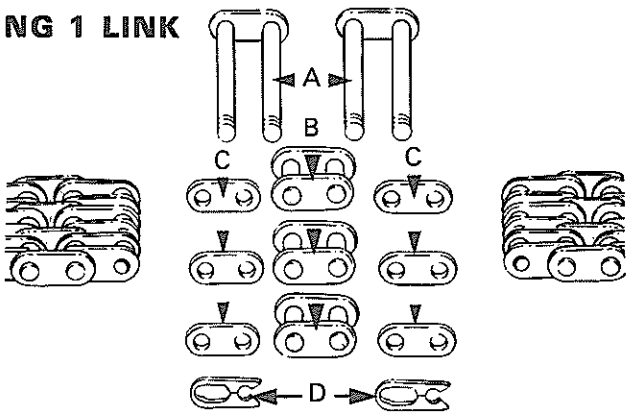
⅜" TRIPLE



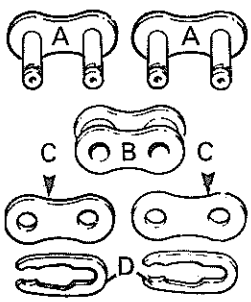
A. Connecting link
B. Link pin
C. Cranked link
D. Cotter pin
E. Outer link
F. Circlip

LENGTHENING 1 LINK

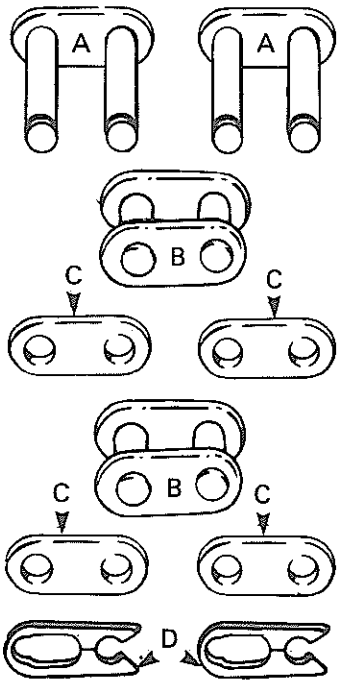
⅜" TRIPLE



½" SINGLE



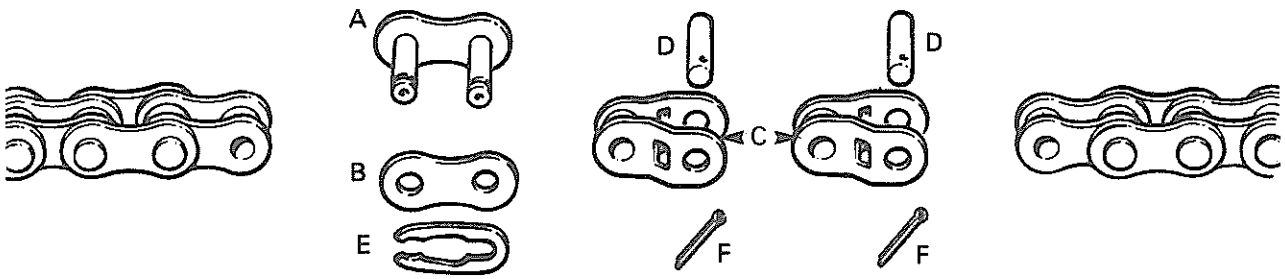
⅜" DOUBLE



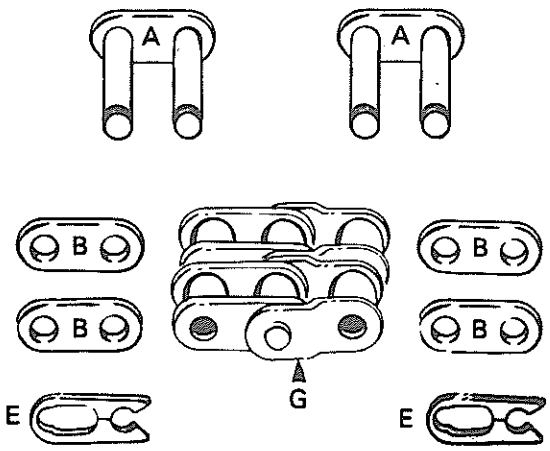
A. Connecting link
B. Inner link
C. Outer link
D. Circlip

LENGTHENING 1½ LINK

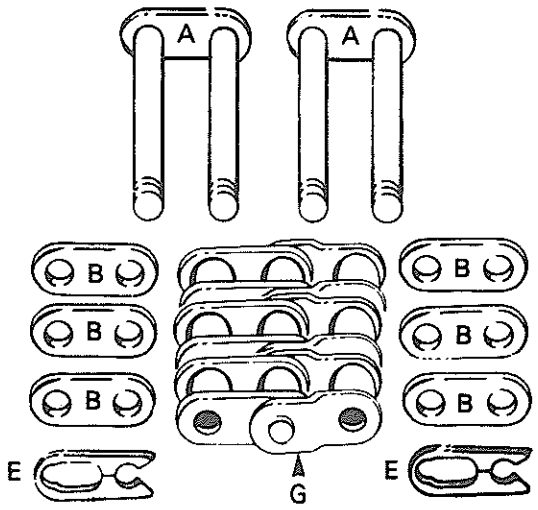
½" SINGLE



⅜" DOUBLE



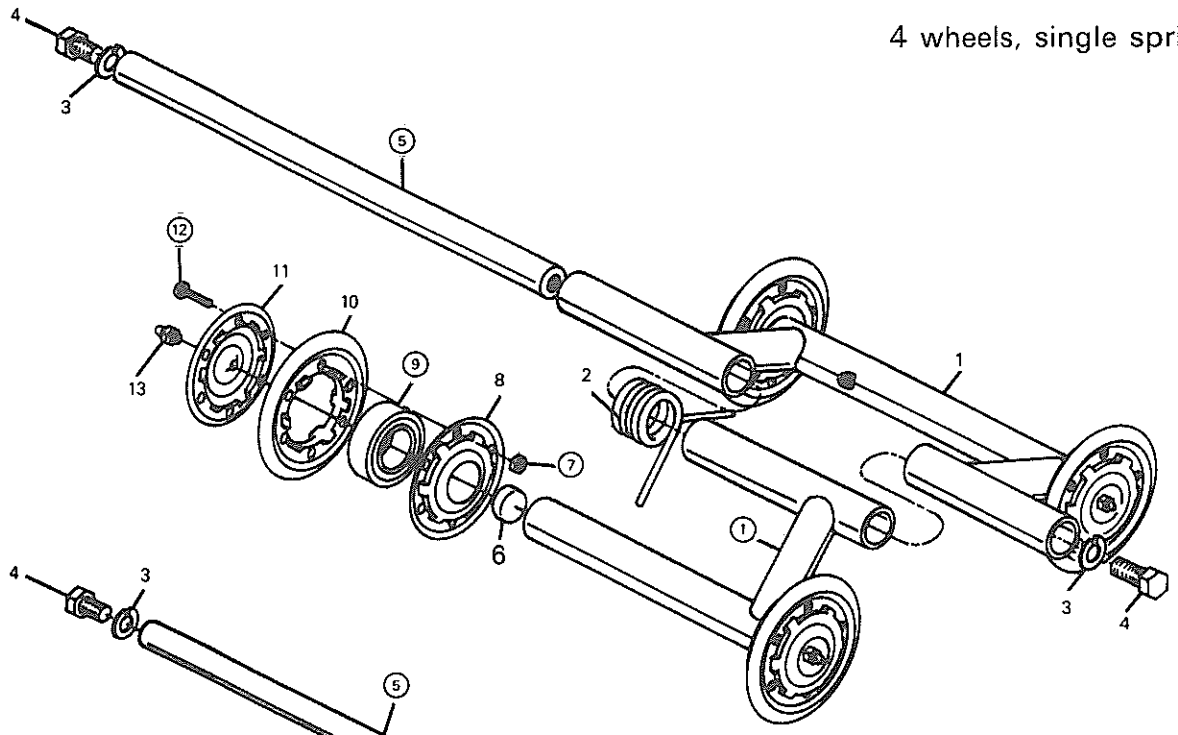
⅜" TRIPLE



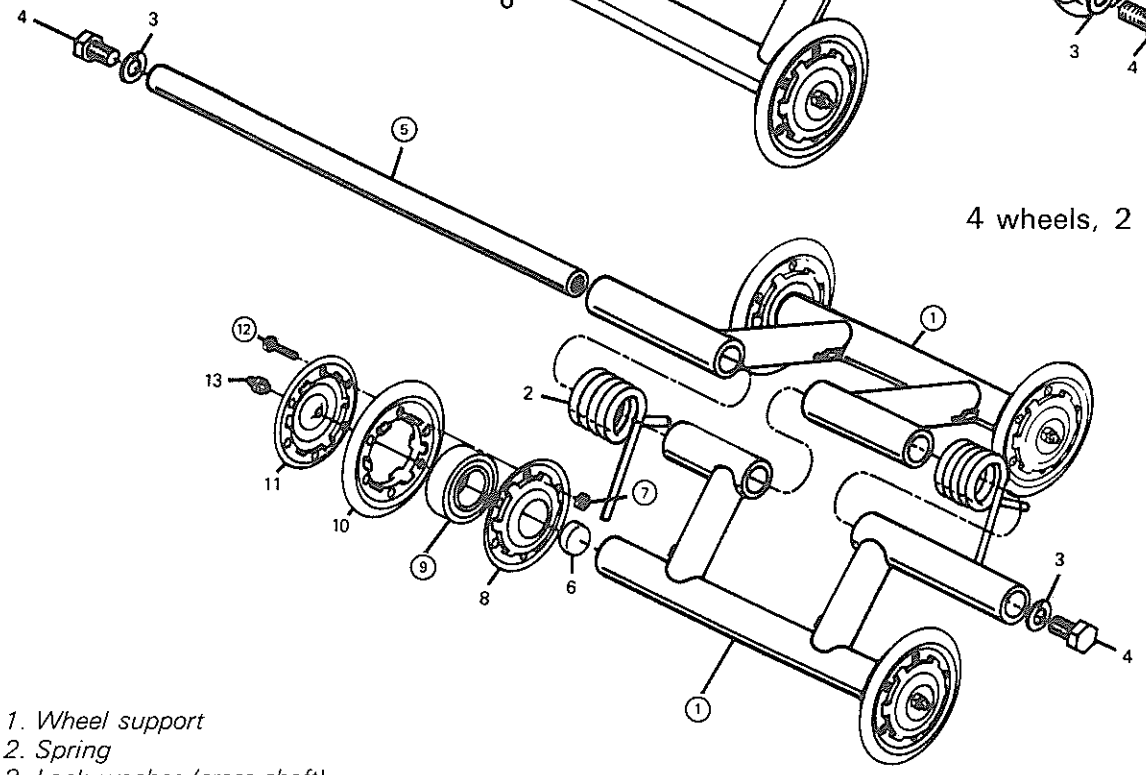
A. Connecting link
B. Outer link
C. Cranked link
D. Link pin
E. Circlip
F. Cotter pin
G. Double cranked link

BOGIE WHEELS

4 wheels, single spring



4 wheels, 2 springs

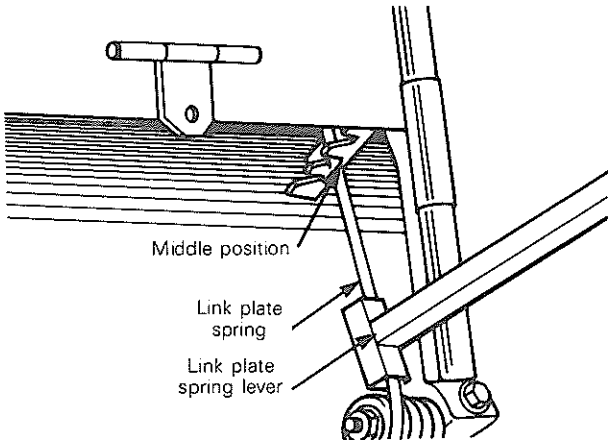


1. Wheel support
2. Spring
3. Lock washer (cross shaft)
4. Bolt (cross shaft)
5. Cross shaft
6. Grease cap
7. Nut (flange)
8. Inner flange
9. Bearing
10. Wheel tire
11. Outer flange
12. Bolt (flange)
13. Grease fitting

REMOVAL

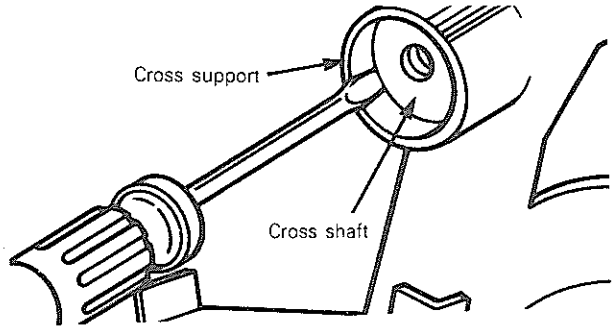
Raise and block rear of vehicle off the ground.

Release track tension by unlocking the link plate springs using link plate lever (See Tool Section).



Starting at center bogie wheel set, remove bolts and lock washers securing cross shaft to frame.

NOTE: To prevent the cross shaft from rotating within the cross support, wedge a screwdriver blade between the cross shaft and cross support.



Remove bogie wheel set.

NOTE: Since spring diameter may vary depending upon actual installation location, it is important to identify the installation of each bogie wheel set. Observe this position when reinstalling sets.

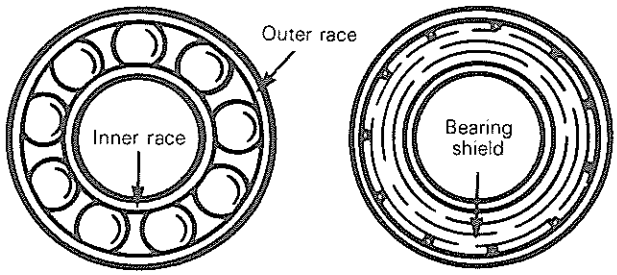
Repeat operation for remaining bogie wheel sets.

DISASSEMBLY & ASSEMBLY

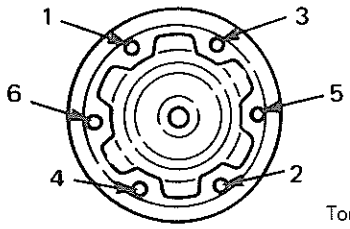
① Heat wheel support anchor before attempting to open or close anchor.

⑤ Clean, then lubricate cross shaft with low temperature grease before installation.

⑨ Always pull or push bearing by inner race. When installing bearing on wheel support, position bearing shield towards inner flange, then press down until bearing is sitting flush with support end.



⑦⑫ Bogie wheels are factory riveted. When separation is necessary, remove rivets securing wheel tire and flanges by using a 3/16" dia. Secure flanges and tire using bolts and nuts tighten in the following sequence to 38 N•m (28 ft-lbs).

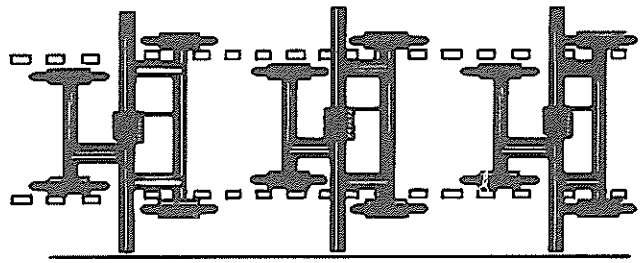


Torque sequence

INSTALLATION

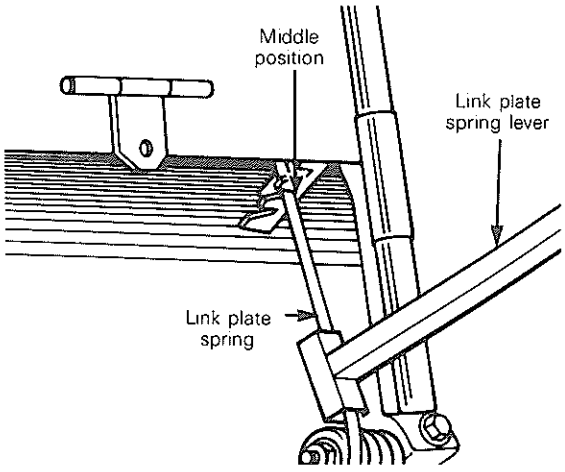
With rear of vehicle supported off the ground, position front bogie wheel set in location and secure to frame using lock washers and bolts. Secure rear set then remaining set(s) to frame.

NOTE: On a single bogie wheel set, position bogie wheel set so that wider wheel support is toward front of vehicle.



Using link plate spring lever, apply track tension by hooking the link plate springs into anchors.

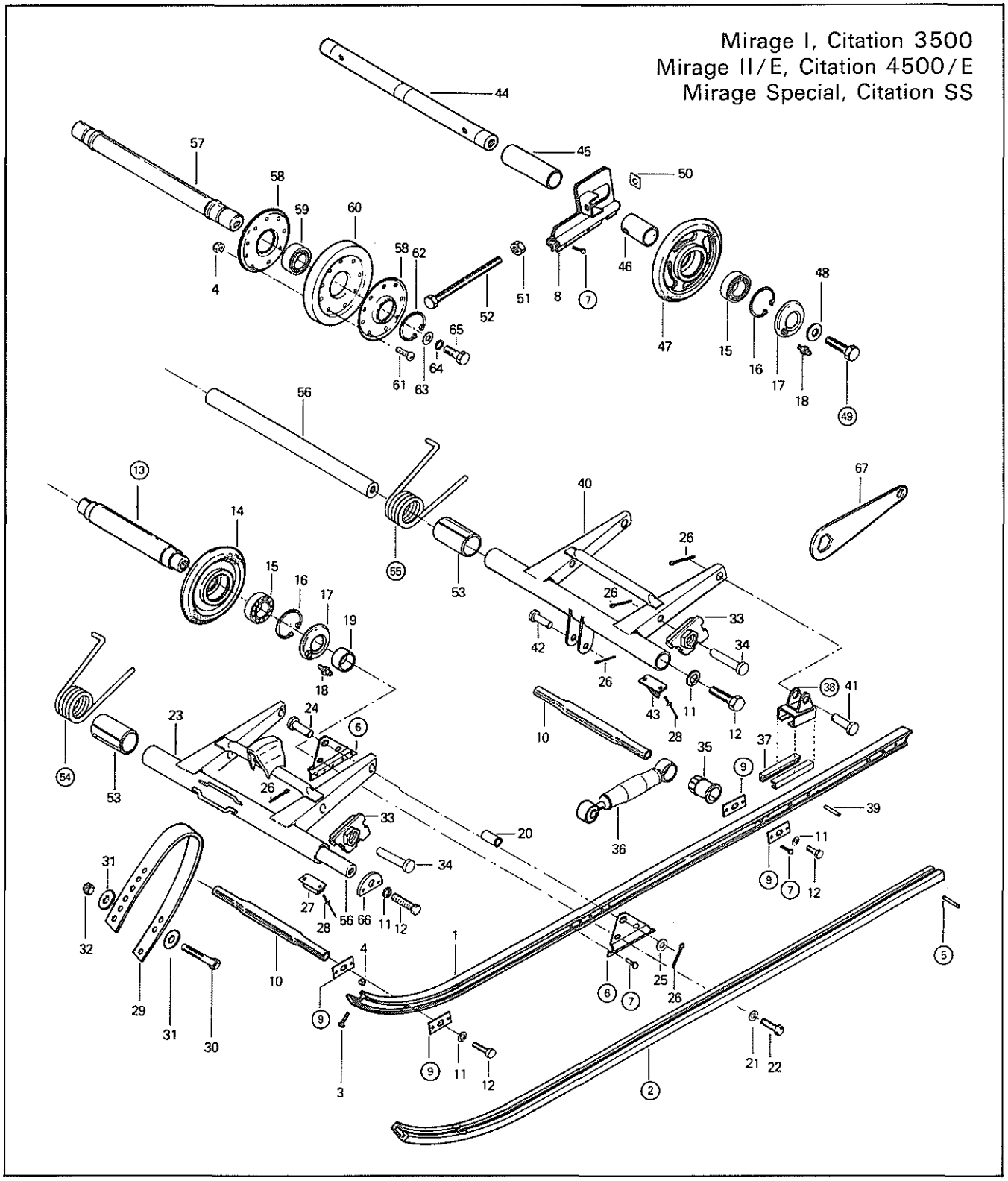
NOTE: If applicable, place spring ends in middle position of the 3 position slotted anchor.



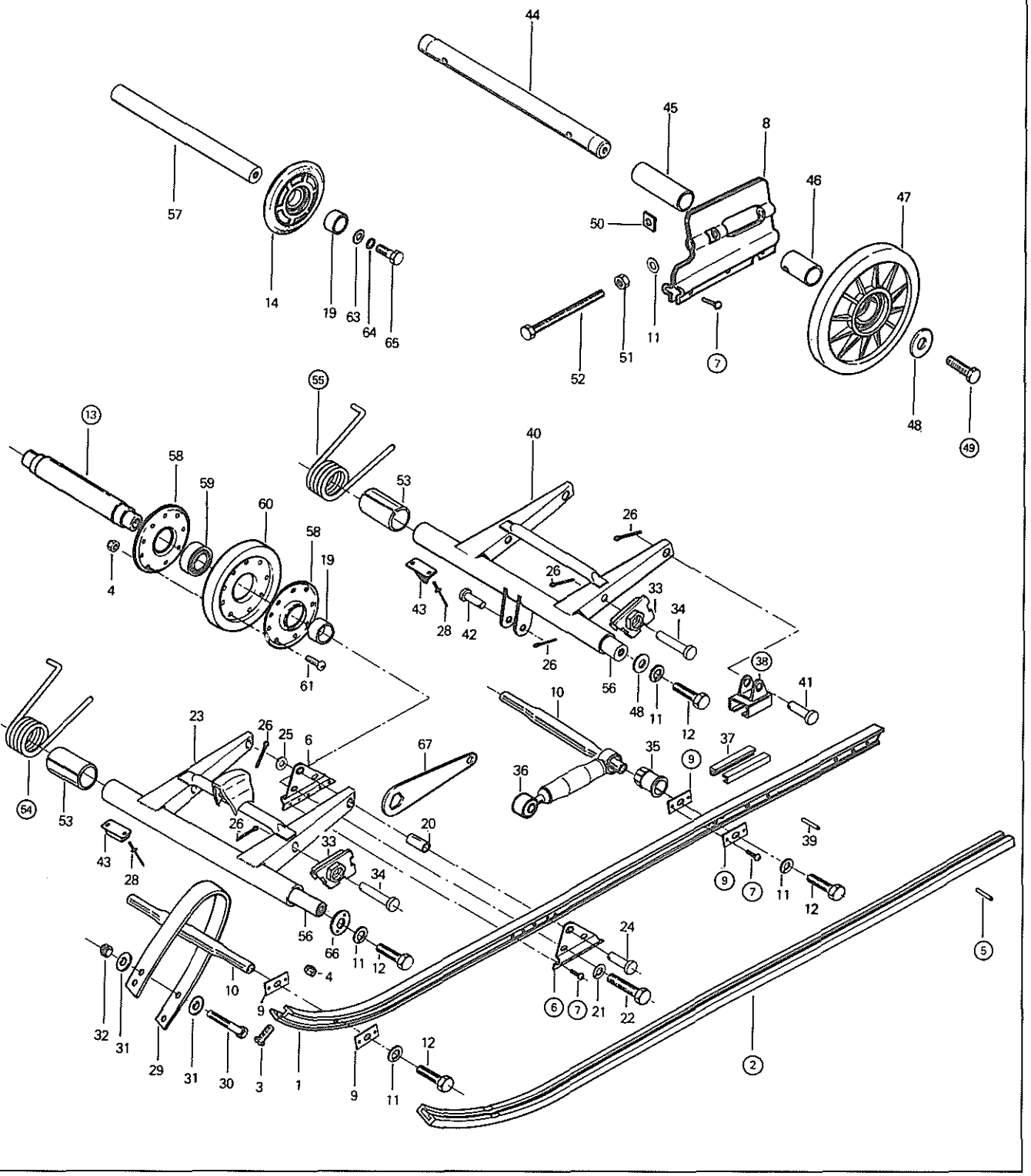
Lubricate each bogie wheel until new grease appears at joint. Wipe off excess grease.

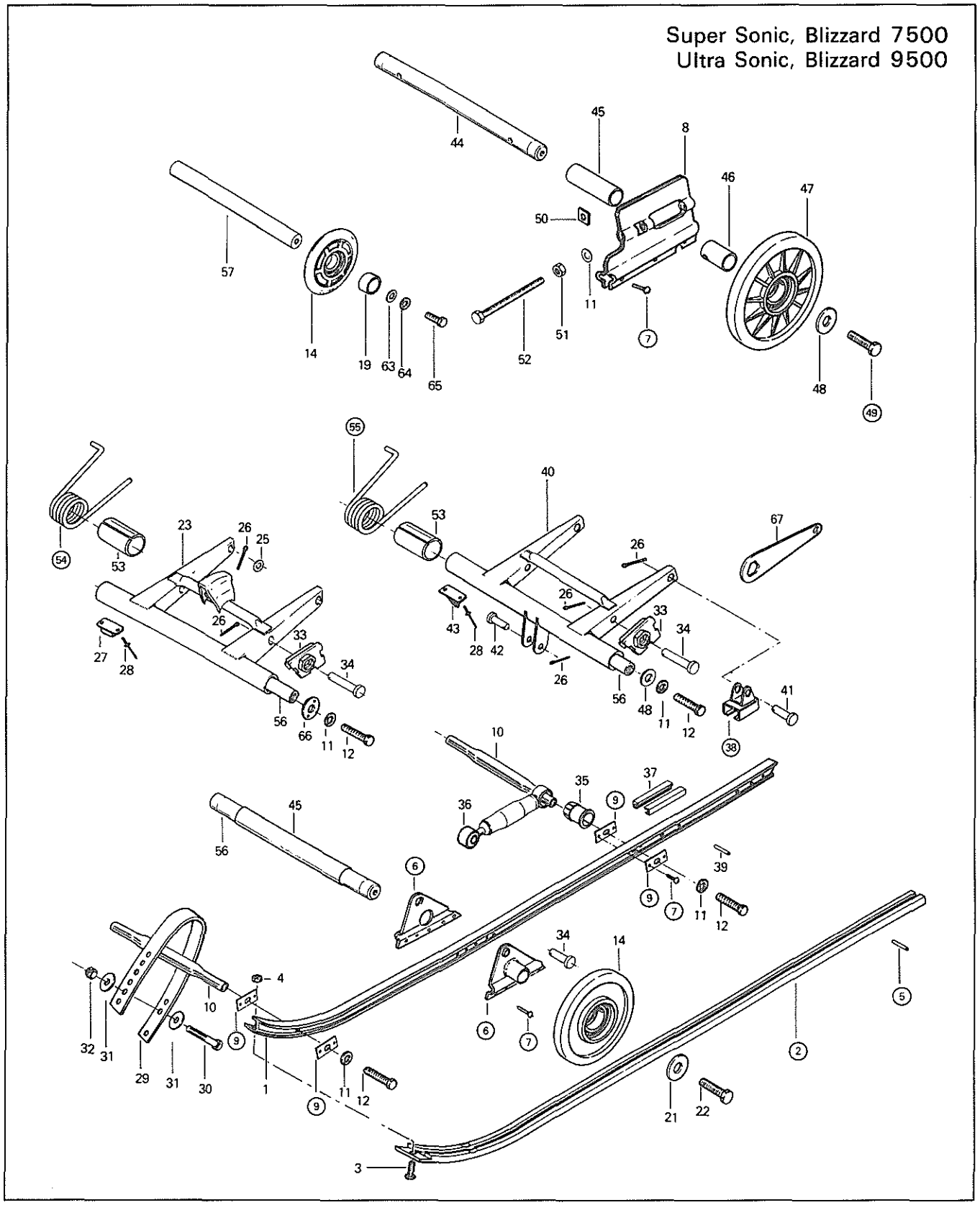
Check track tension and alignment.

"TORQUE REACTION" TYPE SUSPENSION

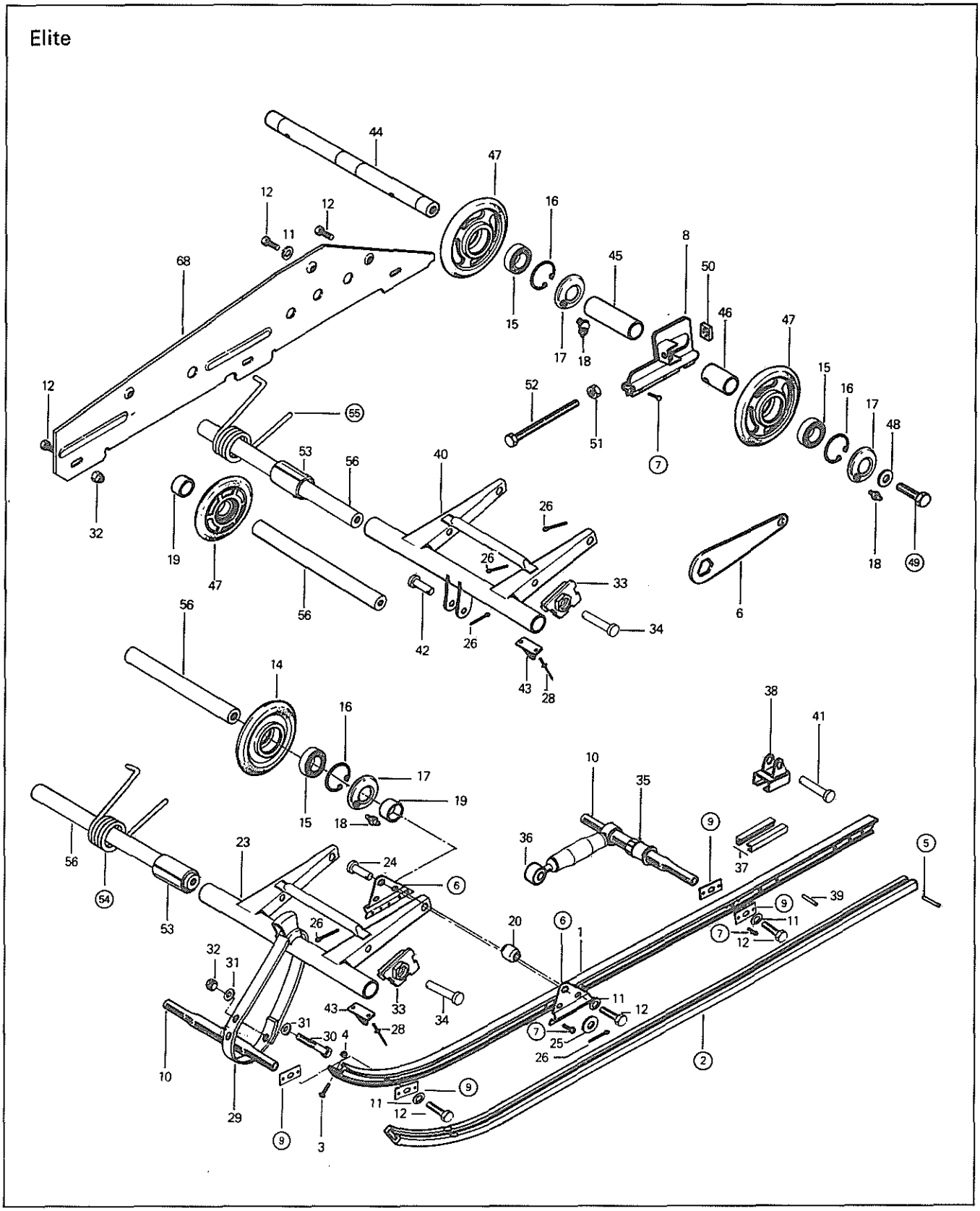


Futura 500/E, Everest 500/E
Futura L/C, Everest L/C
Grand Prix Special, Blizzard 5500




Super Sonic, Blizzard 7500
Ultra Sonic, Blizzard 9500

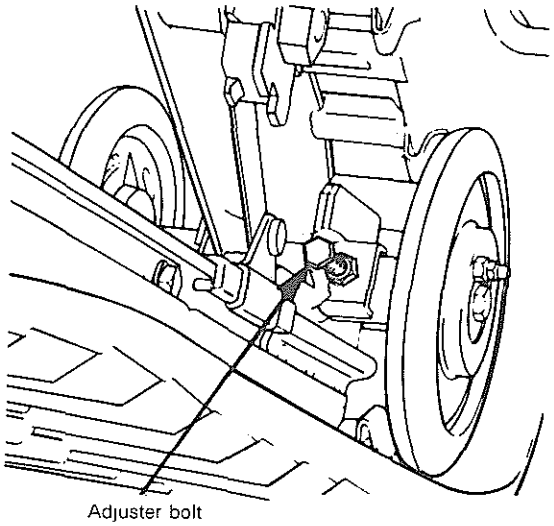
Elite


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1. *Runner*
2. *Slider shoe*
3. *Screw*
4. *Stop nut*
5. *Spiral pin*
6. *Front arm bracket*
7. *Rivet*
8. *Adjustment plate*
9. *Reinforcement bracket*
10. *Tube*
11. *Lockwasher*
12. *Screw*
13. *Front idler shaft*
14. *Idler*
15. *Bearing*
16. *Retainer ring*
17. *Cap*
18. *Grease fitting*
19. *Spacer*
20. *Spacer*
21. *Lockwasher*
22. *Screw*
23. *Front arm*
24. *Clevis pin*
25. *Flat washer*
26. *Cotter pin*
27. *Rubber stopper*
28. *Rivet*
29. *Stopper strap*
30. *Screw*
31. *Washer*
32. *Stop nut*
33. *Adjustment cam*
34. *Clevis pin*
35. *Bushing*
36. *Shock absorber*
37. *Slider pad*
38. *Slider support*
39. *Spiral pin*
40. *Rear arm*
41. *Clevis pin*
42. *Clevis pin*
43. *Rubber stopper*
44. *Rear axle*
45. *Tube*
46. *Tube*
47. *Idler*
48. *Washer*
49. *Screw*
50. *Nut*
51. *Nut*
52. *Adjustment screw*
53. *Bushing*
54. *Front spring*
55. *Rear spring*
56. *Cross shaft*
57. *Rear idler shaft*
58. *Flange*
59. *Bearing*
60. *Wheel tire*
61. *Screw*
62. *Retainer ring*
63. *Flat washer*
64. *Lock washer*
65. *Screw*
66. *Washer*
67. *Wrench*
68. *Side member*

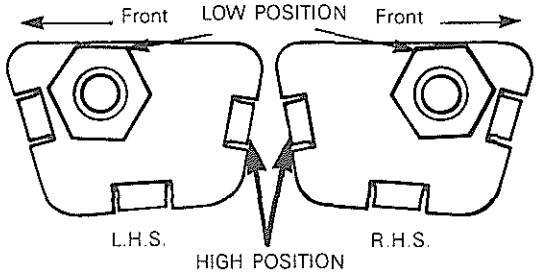
REMOVAL

Release track tension by loosening adjuster bolts located on inner side of rear idler wheels.



Adjuster bolt

Position the adjustment cams at the lowest elevation.



Remove the four (4) bolts securing suspension to frame.

On Elite model, remove bolts securing side members to chassis.

Lift rear of vehicle then withdraw suspension assy from track area.

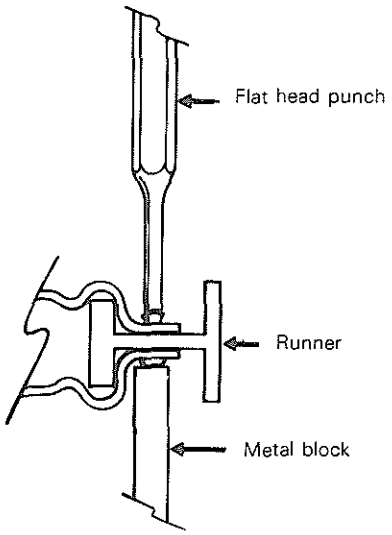
NOTE: To prevent cross shaft from turning within the suspension arm, wedge the blade of a small screwdriver between the shaft and suspension arm.

DISASSEMBLY & ASSEMBLY

②⑤To replace a worn slider shoe, remove the rear spirol pin. Slide the shoe rearwards out of the runner.

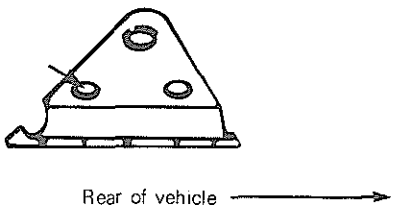
⑥⑦To remove the rivets securing the adjustment plate on the front arm supports, cut off the rivet heads using a cold chisel.

At assembly, position the rivet head on a suitable metal bloc and hold the assembly firmly in place. With a flat head punch and hammer secure the rivet in place.

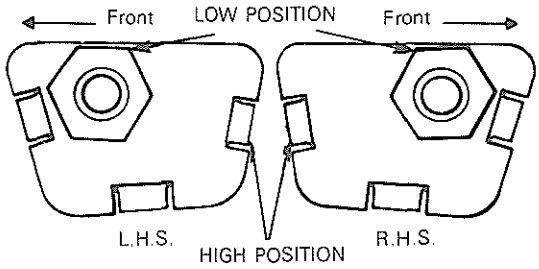


⑦⑨To remove rivet use a 3/16" dia. drill. At assembly, secure reinforcement bracket to runner with two (2) 10-32 × ½" bolts and nuts.

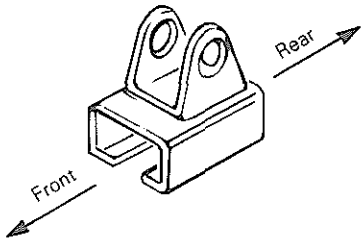
⑬⑥The front idler shaft must be positioned in the front hole of the front arm bracket. Elite model, install in rear hole.



㉝At assembly, adjustment cam must be installed that hexagonal projection on cam is located toward front of vehicle.



㊳Sliding support must be installed with offset toward front.



㊾Clean all traces of plastic from threads. Prior to assembly, apply a light coat of "Loctite" thread locking compound or equivalent, on threads.

⑭⑮.Prior to assembly, identify front and rear springs. Front spring coil diameter is smaller than rear.

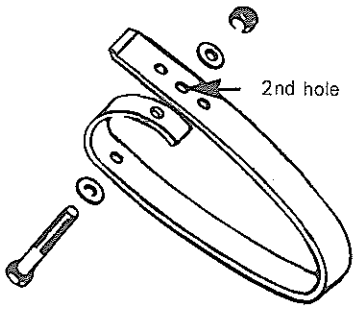
INSTALLATION

Detach front stopper strap and shock absorber of the suspension. Lift the rear of vehicle off the ground.

Place suspension within the track and align front arm of suspension with front holes of frame and secure using bolts and washers. Torque to 43 N•m (32 ft-lbs).

Raise the rear section of the suspension and track into the tunnel and align rear arm with rear holes in frame. Secure to frame using bolts and washers. Torque to 43 N•m (32 ft-lbs).

Reposition vehicle on the ground. Position the adjustment cams at the lowest elevation then apply downward pressure on the seat of vehicle and connect the shock absorber. Attach front stopper strap.

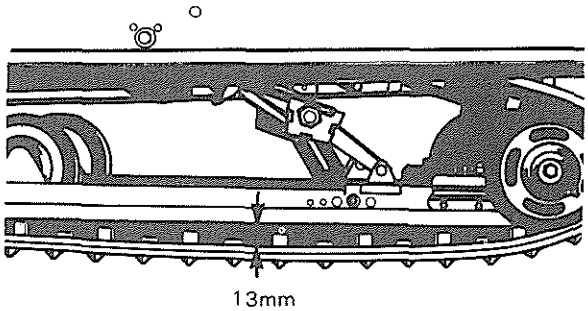


NOTE: There are many installation positions for the stopper strap. The recommended position provides maximum traction and steering efficiency for almost every snow condition. However, for very special purposes or snow condition, it may become necessary to alter this setting. Lengthening the strap (1st hole) has the same effect as shifting the weight toward rear of vehicle; as a result, traction is increased but steering efficiency is decreased. Inversely, by shortening the strap length (last hole), traction is decreased while steering efficiency and effort are increased.

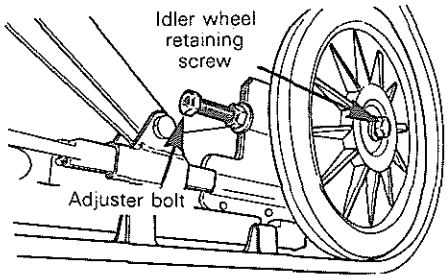
ADJUSTMENT

Track tension

Lift read of vehicle and support it off the ground. Allow track to extend normally. There must be a gap of 13 mm ($\frac{1}{2}$'') between slider shoe and bottom inside of track, on each side.



To adjust tension, loosen or tighten adjuster bolts located on inner side of rear idler wheels.

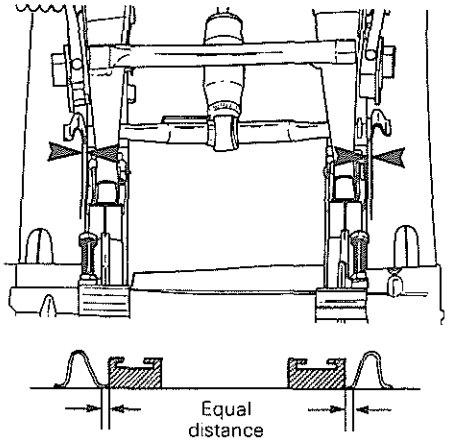


NOTE: Track tension, track alignment and ride adjustment are interrelated adjustments. The measurement given for ride adjustment is initial. When ride adjustment is finalized for snow condition and driver suitability, it may be necessary to readjust track tension and alignment to specifications.

Track alignment

After track tension has been corrected start the engine and accelerate slightly so that track turns **slowly**. Check that track is well centered.

The distance between the edges of the track guides and the slider shoes should be equal on both sides.



WARNING: Before checking track alignment, ensure that the track is free of all particles which could be thrown out while track is rotating. Keep hands, feet, tools and clothing clear of track.

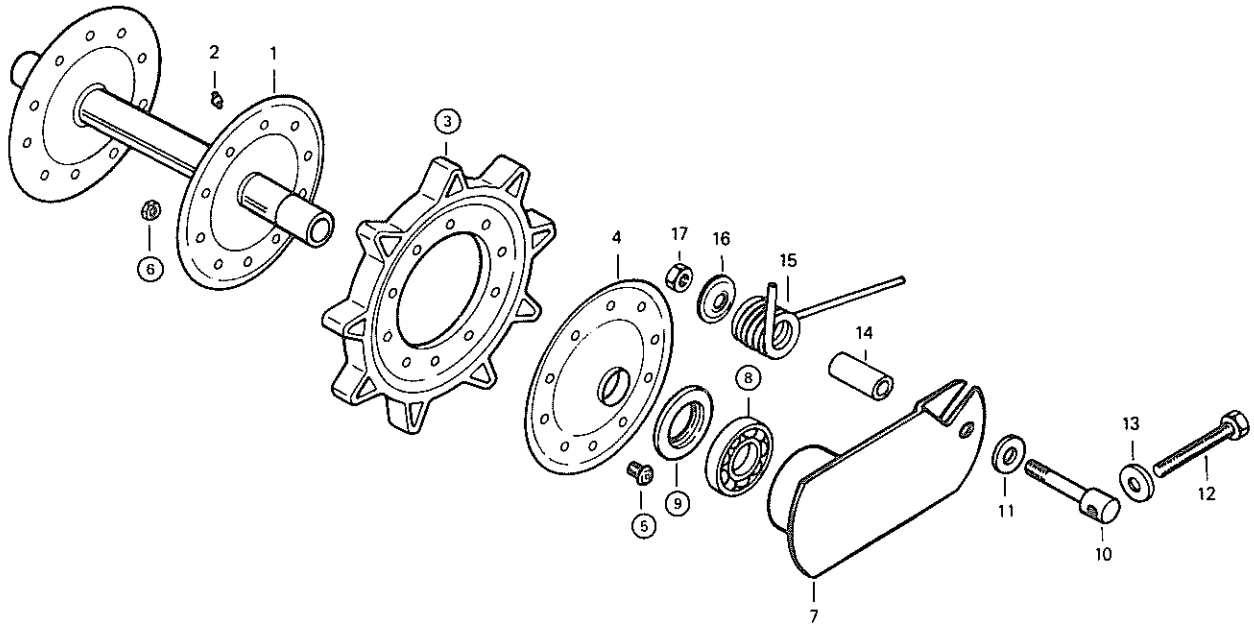
Ride adjustment

The front adjustment cams are used for snow condition, and the rear for driver's weight. The front adjustment cams should be positioned at the lowest elevation for deep snow conditions. A higher elevation is preferred when negociating icy snow.

The rear adjuster blocks should be adjusted to rider preference.

CAUTION: Always turn left side adjustment cams in a clockwise direction, the right side cams in a counter-clockwise direction. Left and right adjustment cams of each adjustment (front and rear), must always be set at the same elevation.

REAR AXLE



1. Rear axle
2. Grease fitting
3. Sprocket
4. Mobile flange
5. Bolt (flange)
6. Nut (flange)
7. Link plate
8. Bearing
9. Oil seal
10. Eye bolt
11. Hardener washer
12. Adjuster bolt
13. Washer (except for Alpine)
14. Sleeve
15. Link plate spring
16. Retainer washer
17. Lock nut

REMOVAL

Lift and block rear of vehicle off the ground.

Remove the link plate spring lock nuts and retainer washers.

Using link plate spring lever (See Tool Section), unlock link plate springs.

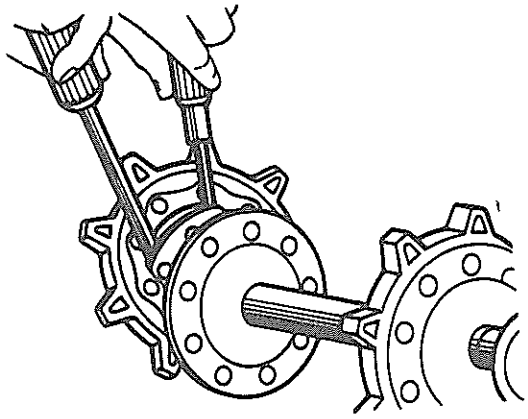
Remove track adjuster bolts, eye bolts, hardener washers and adjuster sleeves.

Withdraw rear axle from vehicle.

DISASSEMBLY & ASSEMBLY

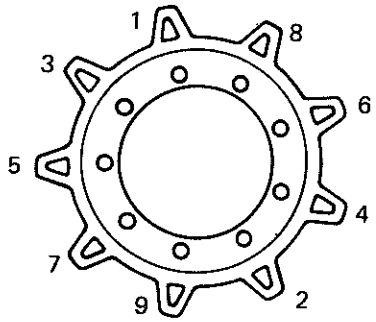
③ Idler wheels and sprockets are factory riveted. When separation is necessary, remove rivets securing idler with a $\frac{1}{4}$" dia. bit.

To remove sprocket, apply liquid soap or petroleum jelly on sprocket bead and flange then with two (2) screwdrivers (round bars), pass the sprocket over flange. Reverse change-over procedure to install sprocket.

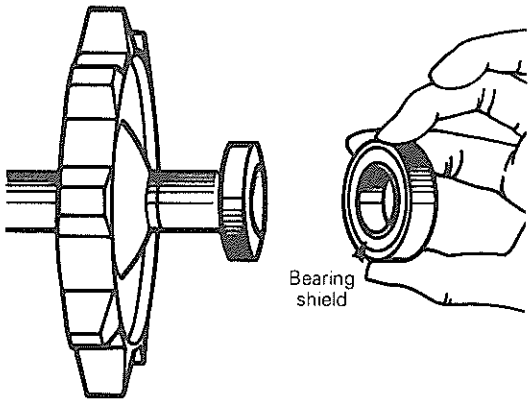


Secure idler wheel and flanges using bolts and nuts tightened in the following sequence to 3.5 N•m (3 ft-lbs).

⑤⑥ Tightening torques for sprockets are 3.5 N•m (3 ft-lbs).



⑧ Always pull or push the bearing by inner race. Install bearing with shield facing the sprocket.



⑨ When assembling, always position a new seal. When inserting seals into link plate, seal lip must sit correctly in groove of link plate. After lubricating the rear axle, ensure that seals remain in position.

INSTALLATION

With rear of vehicle off the ground, position the rear axle within the track.

Install sleeves, hardener washers and eye bolts.

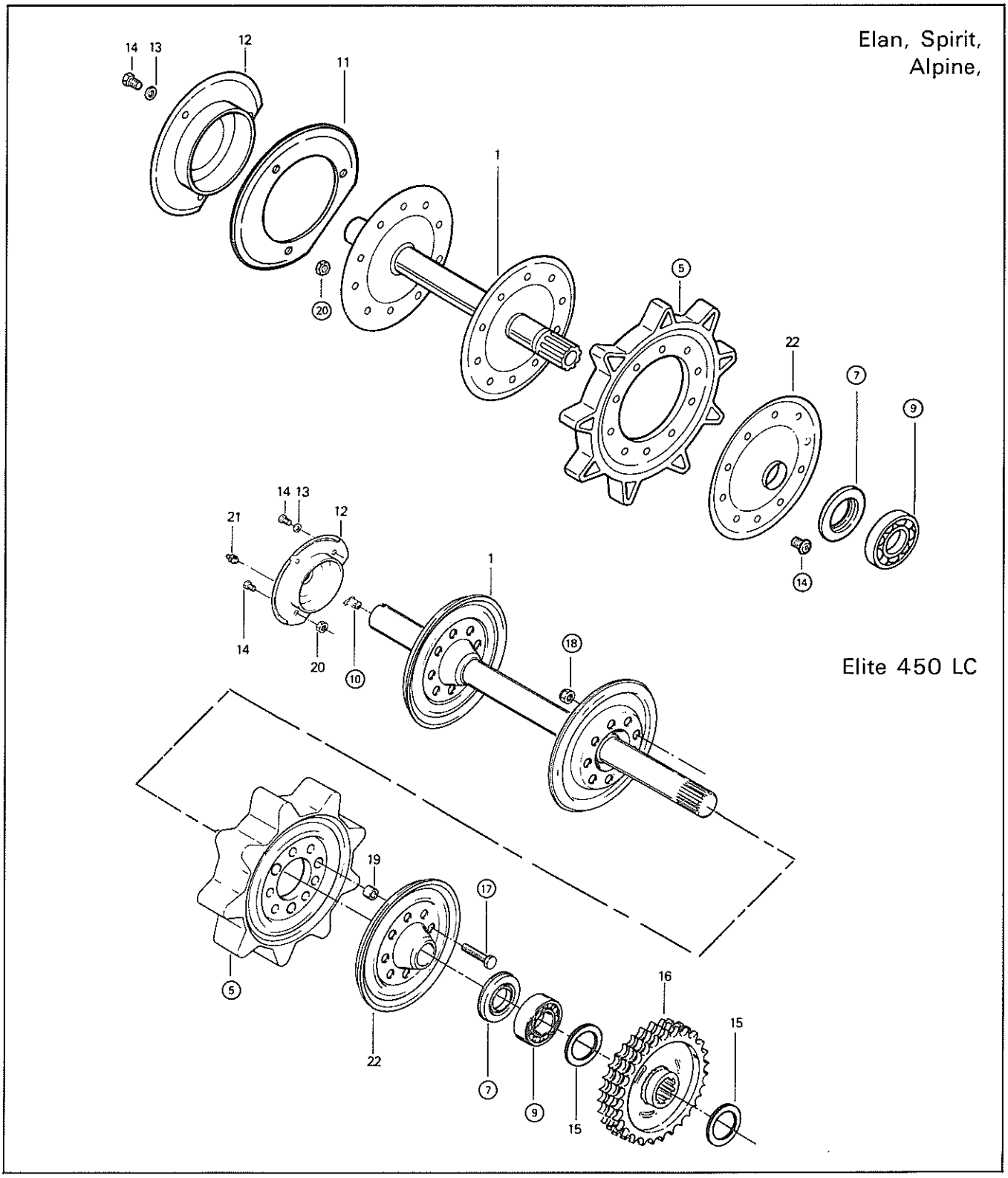
Partially screw-in the track adjuster bolts.

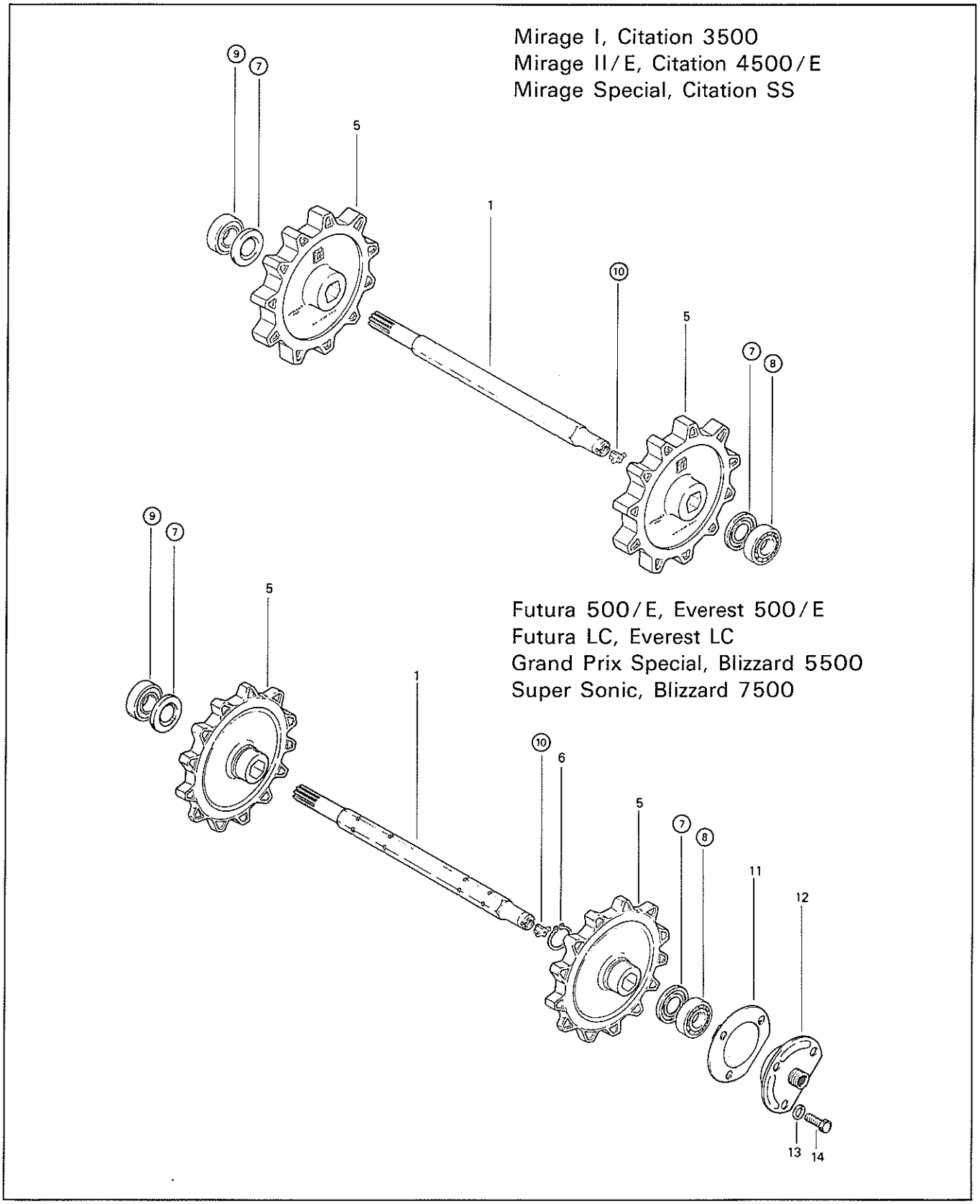
Hook the link plate springs. If applicable, hook springs into middle position of 3 position anchors.

Install retainer washers and partially tighten the link plate spring lock nuts.

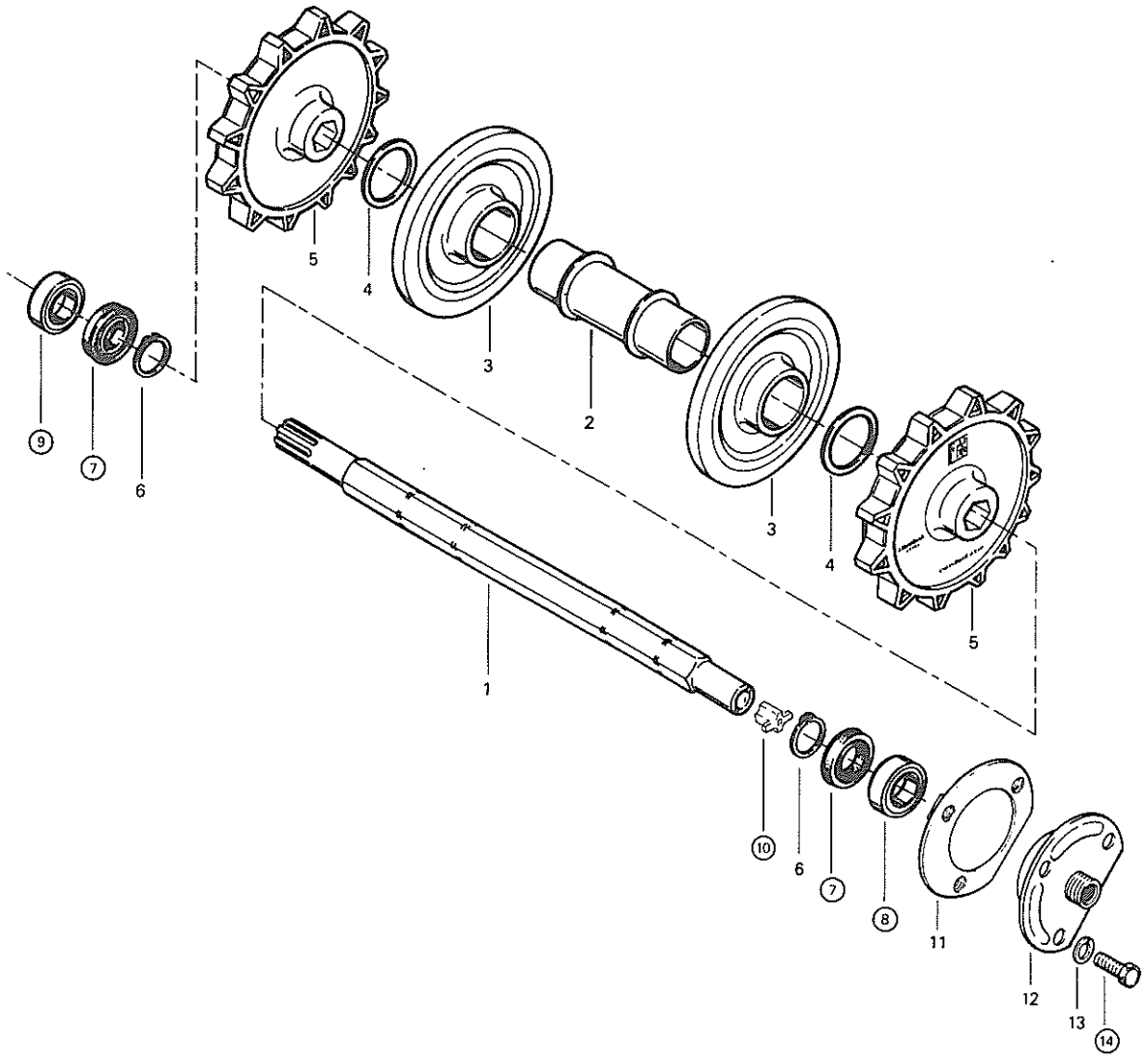
Carry out track tension and alignment.

DRIVE AXLE


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Alpine,
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Elite 450 LC
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Mirage I, Citation 3500
Mirage II/E, Citation 4500/E
Mirage Special, Citation SS
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Futura 500/E, Everest 500/E
Futura LC, Everest LC
Grand Prix Special, Blizzard 5500
Super Sonic, Blizzard 7500
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Ultra Sonic, Blizzard 9500



1. *Drive axle*
2. *Spacer tube*
3. *Idler*
4. *Washer*
5. *Sprocket*
6. *Circlip*
7. *Seal*
8. *Bearing*
9. *Bearing*
10. *Speedo drive insert*
11. *Retainer ring*
12. *Bearing housing*
13. *Lockwasher*
14. *Cap screw*
15. *Shim*
16. *Sprocket*
17. *Screw*
18. *Nut*
19. *Spacer*
20. *Nut*
21. *Grease fitting*
22. *Flange*

REMOVAL

Drain oil from chaincase or gear box. Release drive chain tension (if applicable).

Raise and block rear of vehicle off ground.

Remove suspension.

Pry oil seals from chaincase and end bearing housing.

Remove end bearing housing and chaincase if necessary.

NOTE: If applicable, remove battery and its seat. If vehicle is equipped with a speedometer, remove angle drive unit and coupling cable.

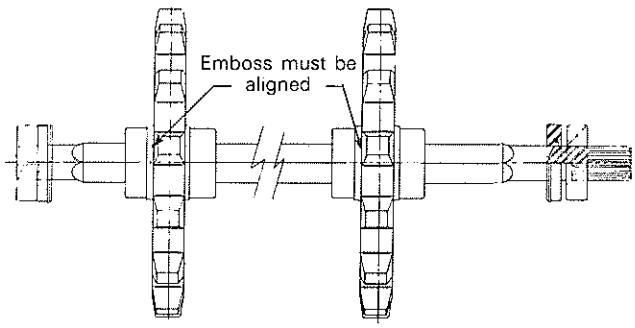
Release drive sprocket teeth from track notches, at the same time, pulling the drive axle towards the end bearing housing side of frame.

Remove drive axle from vehicle. If applicable, pull out shim located between bearing and lower chaincase sprocket.

DISASSEMBLY & ASSEMBLY

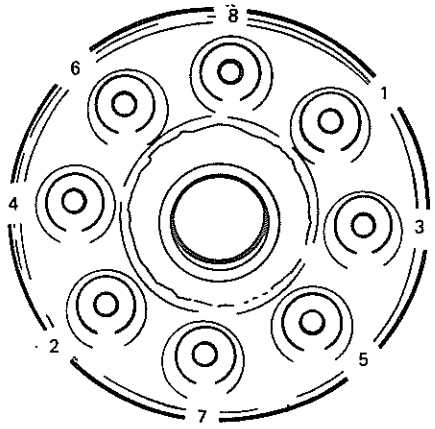
⑤ Before securing sprockets and flanges, place axle assembly on an even surface and check alignment of sprocket teeth.

NOTE: Some models have aligning marks that are to be aligned.



⑭⑳⑰⑱ Tightening torques for sprockets are: 3-4 N•m (2-3 ft-lbs).

When reassembling, install a new nut or apply "Loctite" (or equivalent) on old threads. Tighten in the following sequence.



⑦ When assembling drive axle, always position a new seal on each end of drive axle. The seal lip must face sprocket.

⑧⑨ Always pull or push bearing by inner race.

The bearing on the splined side of axle must be pushed until it is seated on bearing stop. The end bearing housing bearing must be flush with end of drive axle. Each bearing must have its shield facing the sprocket.

⑩ If the drive axle to be installed is a new component, and the vehicle is equipped with a speedometer, a correct size speedometer drive insert must be installed into the axle end. Ensure that insert is flush with end of axle.

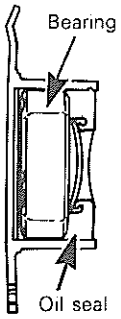
NOTE: Idler wheels must turn freely.

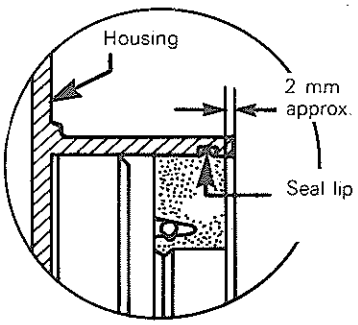
INSTALLATION

If the drive axle to be installed is a new component and the vehicle is equipped with a speedometer, a speedometer drive insert must be installed into the axle end. Ensure that insert is flush with end of axle.

Position drive axle assembly into location. Install shim between bearing and lower chaincase sprocket. Install end bearing housing.

Install chaincase and position seals, making sure that a gap of approximately 2 mm (1/16") exists between end of bearing housing and each seal.





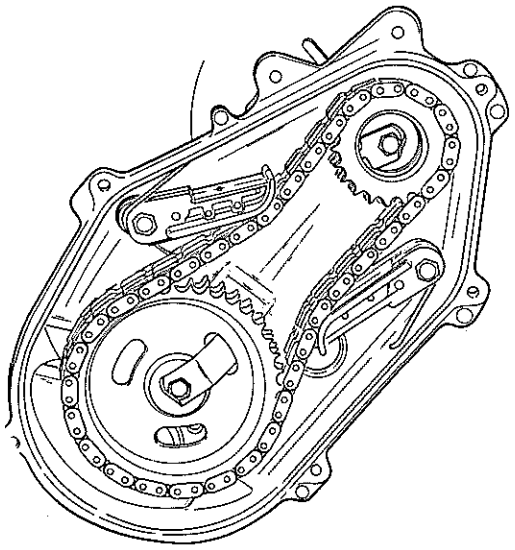
Everest 500/E, Futura 500/E
Everest LC, Futura LC
Blizzard 5500, Grand Prix Special
Blizzard 7500, Super Sonic
Blizzard 9500, Ultra Sonic

install new lock tabs.

Install the screws and torque to 9.5 N•m (7 ft-lbs).

Bend the tab locks.

CAUTION: Lock tabs should be replaced if bent more than twice. If in doubt, replace.



Reinstall the chaincase cover.

Refill with chaincase oil.

Install the suspension. Apply track tension and carry out track alignment procedure.

TRACK

TRACK TYPE APPLICATION

Refer to the "Technical Data" section 02, (05-06)

INSPECTION

Visually inspect track for cuts and abnormal wear. Inspect track for broken rods. If excessive damage is evident and rods are broken, replace track. Inspect track for damaged or missing inserts. Replace damaged insert(s).

WARNING: Never run a vehicle with a damaged track.

REMOVAL

Elan, Spirit

Remove the following items:

— tool box
— chaincase access plug
— drive axle cotter pin and washer
— suspension
— rear axle
— the two drive axle seals
— end bearing housing
— drive axle
— track

Citation, Mirage

Remove the following items:

— pulley guard and drive belt
— air silencer
— injection oil reservoir (if so equipped)
— battery and battery support (if so equipped)
— chaincase cover, sprockets and chain
— chaincase
— both drive axle seals
— suspension
— speedometer, angle drive (if so equipped)
— drive axle (outwards from chaincase side)
— center idler assembly
— track

Everest, Futura, Blizzard
Grand Prix Special, Super Sonic, Ultra Sonic

Remove the following items:

— belt guard and drive belt
— driven pulley assembly
— speedometer cable and angle drive (if applicable)
— chaincase cover, sprockets and chain
— drive axle oil seals

Release track tension (loosen the two rear tension bolts).

— Remove the suspension
— end bearing housing
— drive axle assembly
— suspension cross shaft
— track

INSTALLATION:

All models:

Reverse the removal procedure

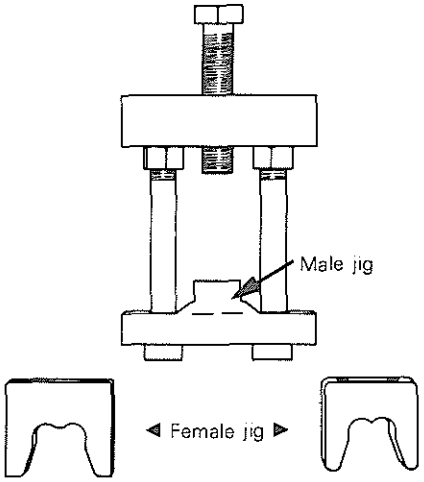
TRACK INSERT INSTALLATION

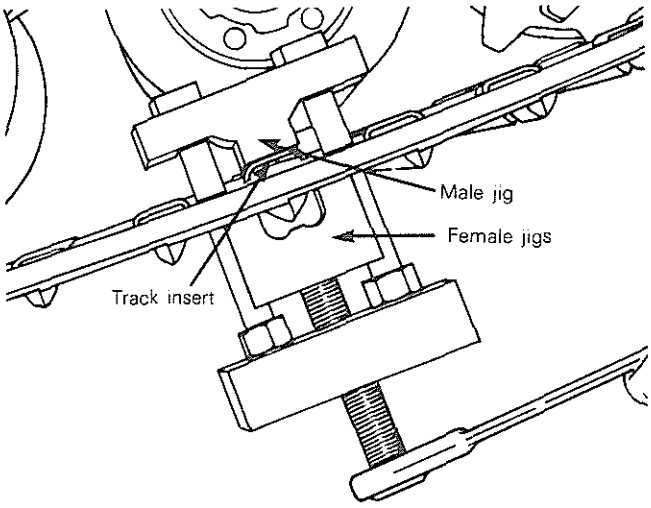
Using N°. 419 0027 Tool.

Tilt vehicle on its side to expose the track notches then place insert into position.

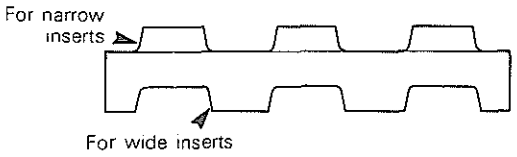
Place the track insert installer into track notches and position male jig on top of track insert.

Tighten installer bolt until track insert is locked in place.

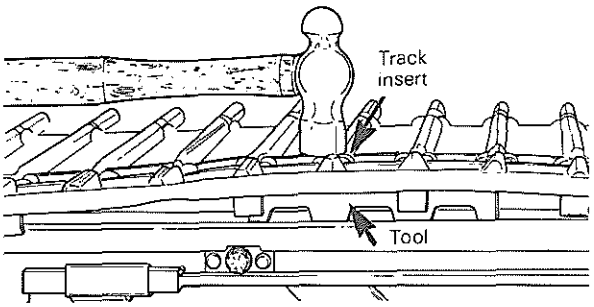




Using N°. 529 0026 Tool.



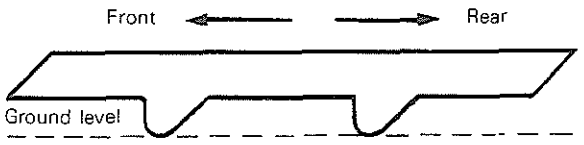
Place inserts into position and, with tool being under the inserts, tap them over the track using a hammer.



INSTALLATION

Raise and block rear of vehicle off the ground. Position track beneath the vehicle frame tunnel.

NOTE: When installing the track, ensure the right angle of bearing surface of the track rib is facing the front of vehicle.



Install drive axle.

If applicable, install rear axle. Install suspension system.

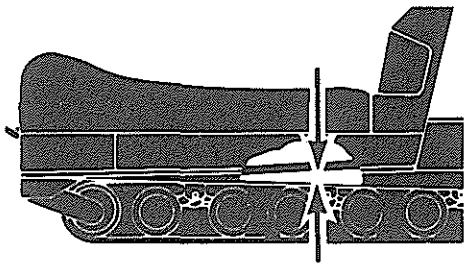
Carry out track tension and alignment procedure.

Track tension & alignment

Track tension and alignment are inter-related. Do not adjust one without checking the other. Track tension procedure must be carried out prior to track alignment.

Tension (bogie wheel), Elan, Spirit

With rear of vehicle blocked off the ground, check the track tension at middle set of bogie wheels: 35 mm ($1\frac{3}{8}$'') between top inside edge and bottom of foot board.



If applicable, ensure link plate springs are in the middle position of the 3 position slotted anchors.

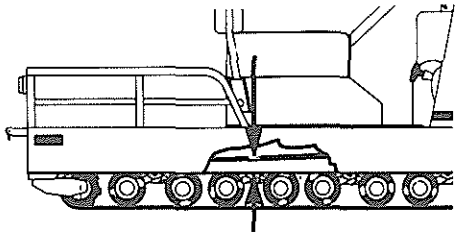
To correct track tension, loosen link plate spring lock nuts on inner side of link plate springs. Turn adjuster bolts clockwise to tighten track or counter-clockwise to slacken.

Tighten link plate spring lock nuts.

Tension (bogie wheel), Alpine

With rear of vehicle blocked off the ground, check the tension of each track: 57 mm ($2\frac{1}{4}$'') between top inside edge and bolt of center wheel set.

Deflection should be measured between top inside edge of track and center of bogie wheel set retaining bolt.

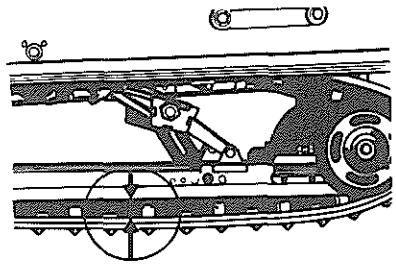


To correct track tension, loosen link plate spring lock nuts on inner side of link plate springs. Turn adjuster bolts clockwise to tighten track or counter-clockwise to slacken.

Tighten link plate spring lock nuts.

Tension (Slide Suspension)

With rear of vehicle blocked off the ground, check track tension. A 13 mm ($\frac{1}{2}$'') gap should exist between slider shoe and bottom inside of track.



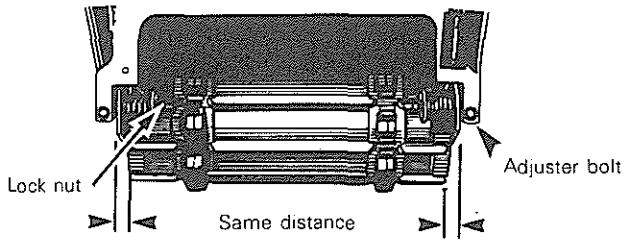
To adjust, loosen or tighten adjuster bolts located on inner side of rear idler wheels.

Alignment (Bogie Wheel)

With rear of vehicle supported off the ground, start engine and allow the track to rotate slowly.

Check if track is well centered and turns evenly on rear sprockets. Distance between edge of track and link plate must be equal on both sides. (If applicable, ensure link plate springs are in the middle position of the 3 position slotted anchors).

◆ **WARNING: Before checking track alignment, ensure that the track is free of all particles which could be thrown out while track is rotating. Keep hands, feet, tools and clothing clear of track.**



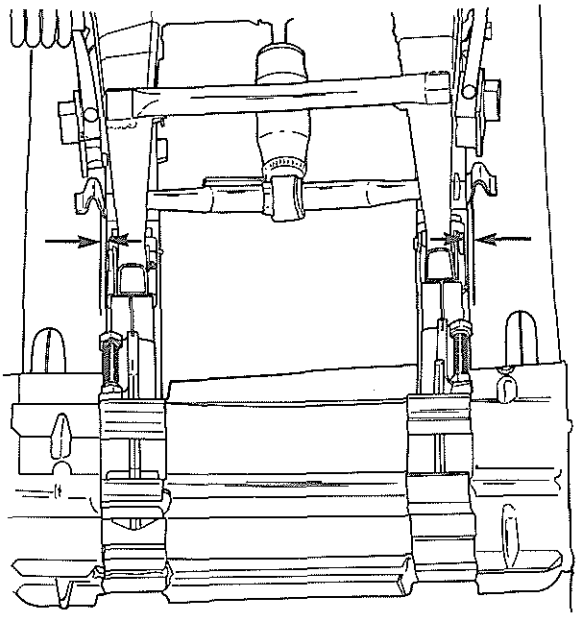
Rotate track slowly and recheck alignment and tension. To correct alignment, loosen link plate spring lock nut on side where track is closest to the link plate.
Turn track adjuster bolt on same side, clockwise until track re-aligns.

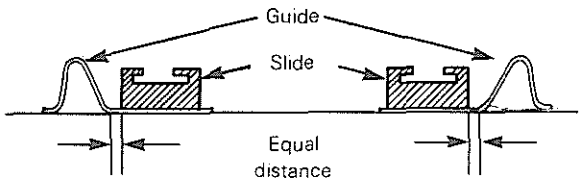
Tighten link plate spring lock nut.

Alignment (Slide Suspension)

With rear of vehicle supported off the ground, start engine and allow the track to rotate slowly.

Check that track is well centered and turns evenly. To correct, stop engine then loosen the lock nuts and tighten the adjuster bolt on side where guides are closest to slide. Tighten lock nuts and recheck alignment.

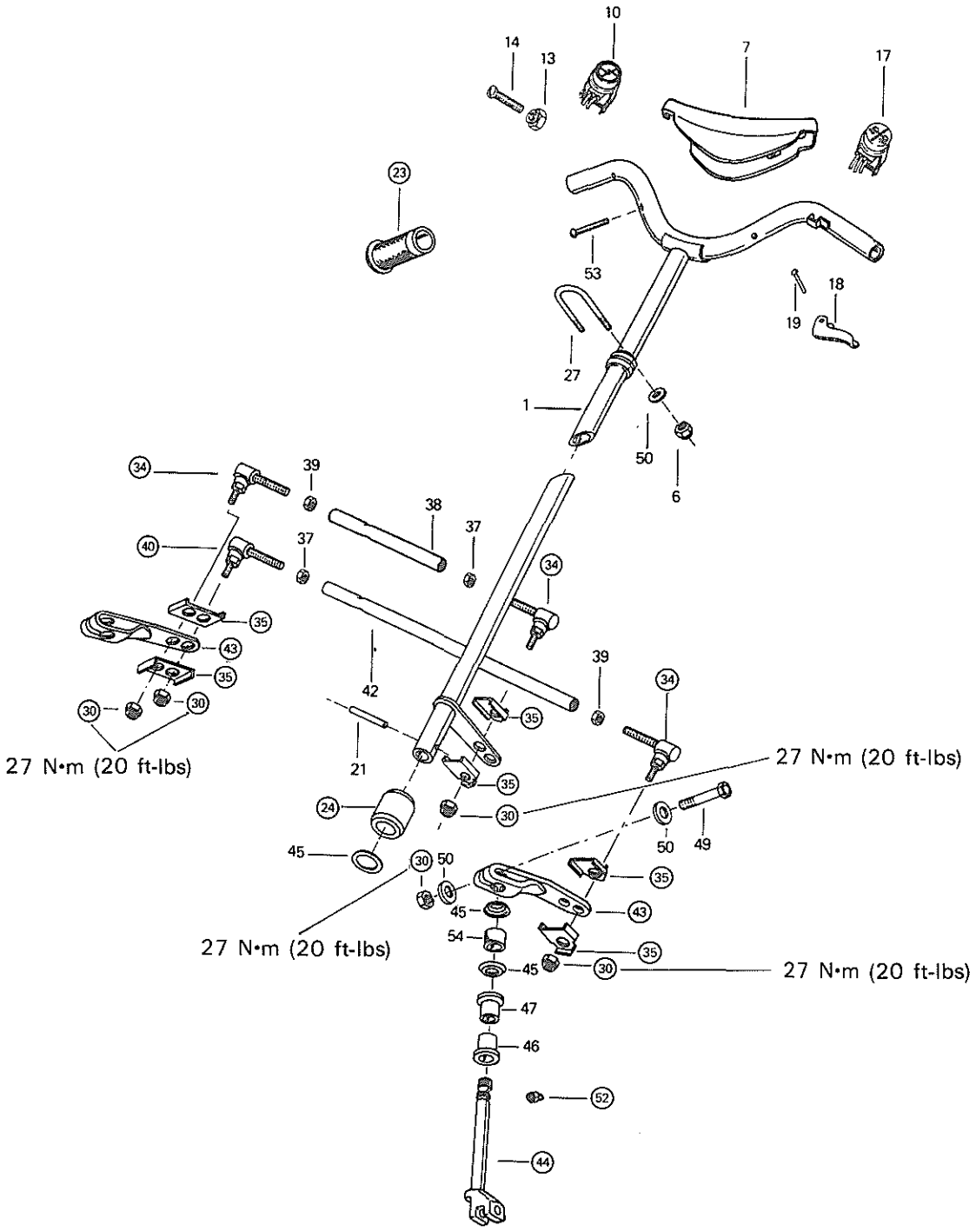




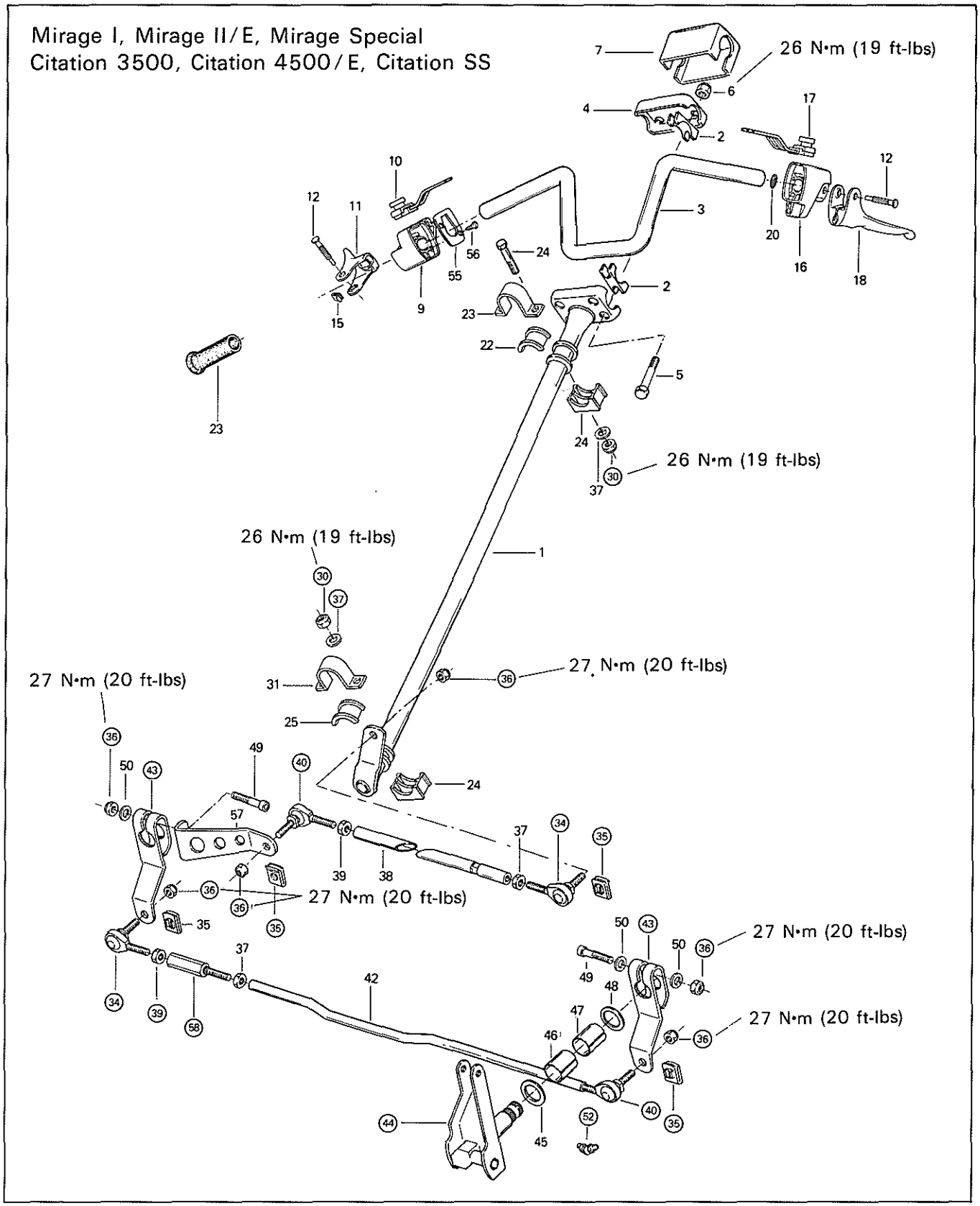
WARNING: Before checking track alignment, ensure that the track is free of all particles which could be thrown out while track is rotating. Keep hands, tools, feet and clothing clear of track.

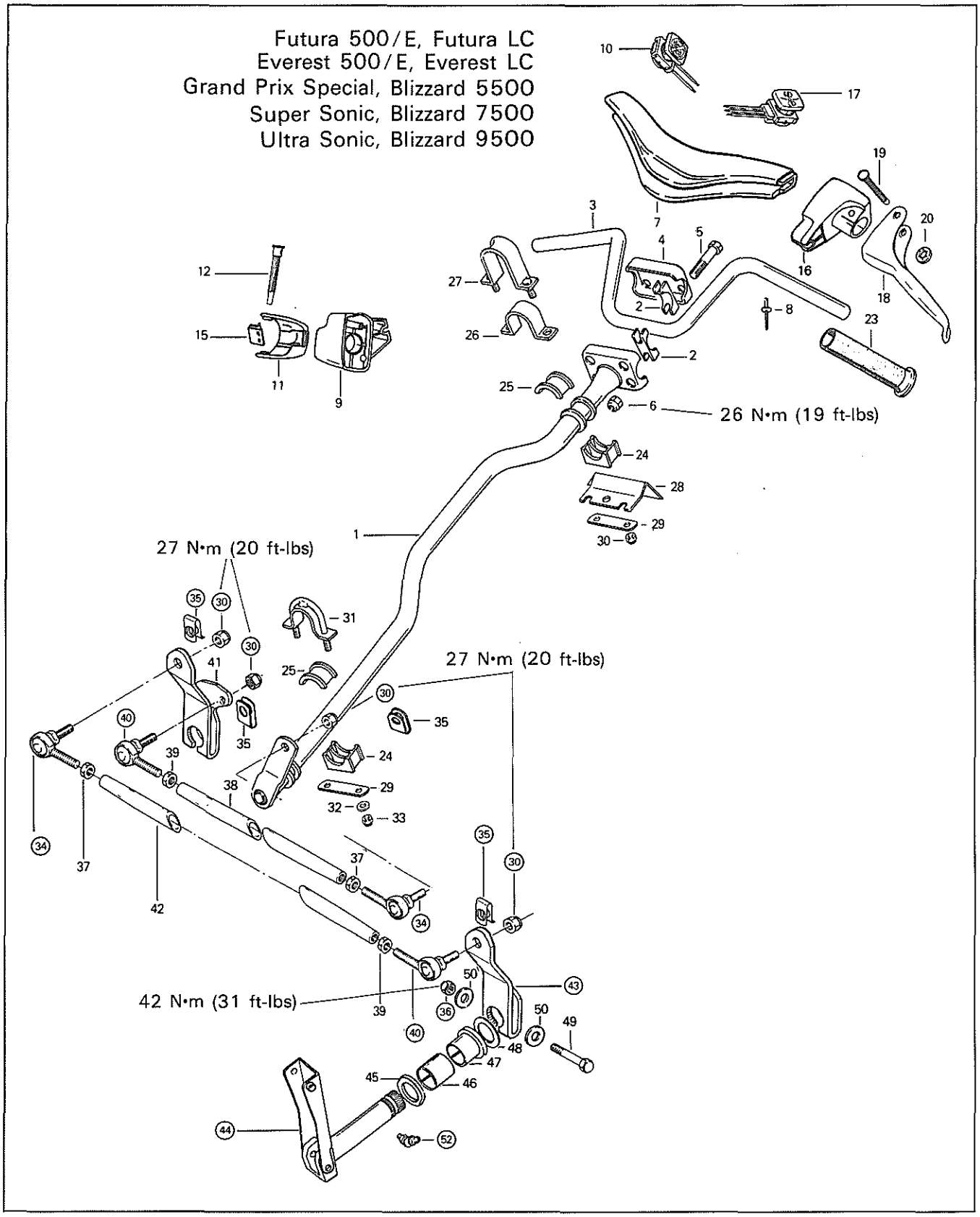
STEERING SYSTEM

Elan and Spirit

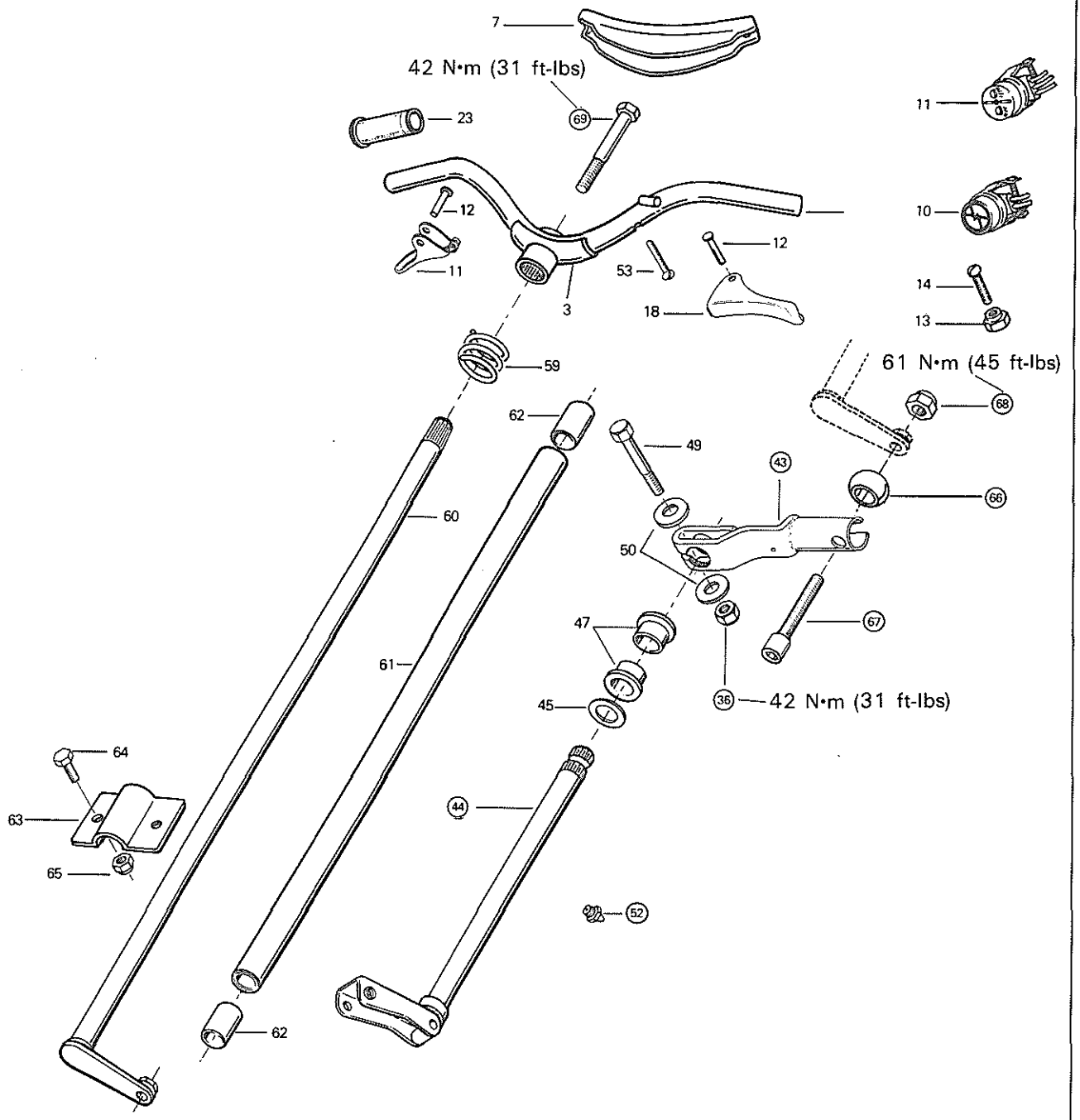


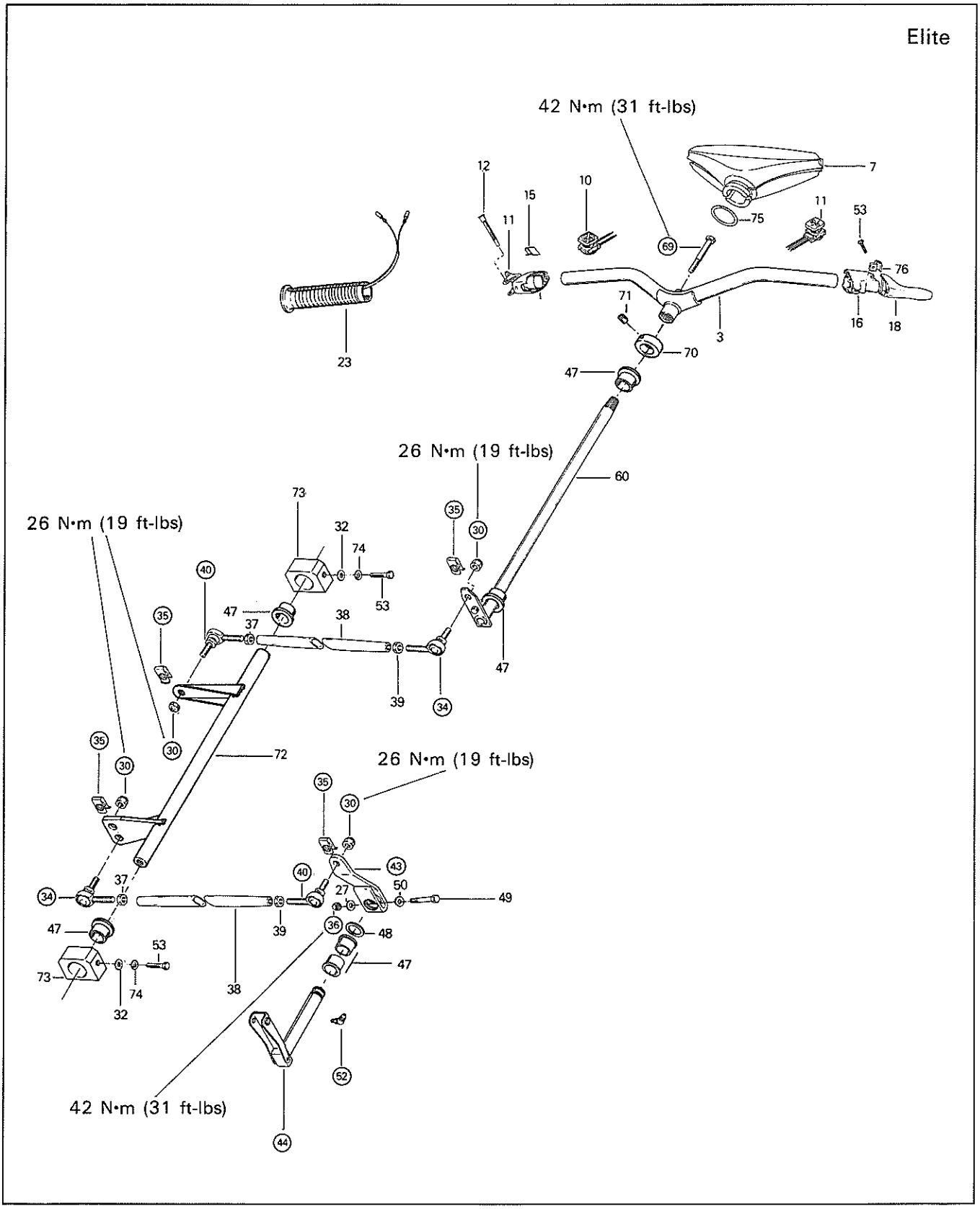
Mirage I, Mirage II/E, Mirage Special
Citation 3500, Citation 4500/E, Citation SS




Futura 500/E, Futura LC
Everest 500/E, Everest LC
Grand Prix Special, Blizzard 5500
Super Sonic, Blizzard 7500
Ultra Sonic, Blizzard 9500
26 N•m (19 ft-lbs)
27 N•m (20 ft-lbs)
27 N•m (20 ft-lbs)
42 N•m (31 ft-lbs)

Alpine


7
42 N•m (31 ft-lbs)
69
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61 N•m (45 ft-lbs)
68
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42 N•m (31 ft-lbs)
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44
52
62


Elite
42 N•m (31 ft-lbs)
26 N•m (19 ft-lbs)
26 N•m (19 ft-lbs)
26 N•m (19 ft-lbs)
42 N•m (31 ft-lbs)
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1. *Steering column*
2. *Handlebar support*
3. *Handlebar*
4. *Steering clamp*
5. *Cap screw*
6. *Elastic stop nut*
7. *Steering pad*
8. *Rivet*
9. *Throttle handle housing*
10. *Kill switch*
11. *Throttle handle*
12. *Pin*
13. *Nut*
14. *Screw*
15. *Retainer*
16. *Brake handle housing*
17. *Dimmer switch*
18. *Brake handle*
19. *Pin*
20. *Push nut*
21. *Spiral pin*
22. *Elastic stop nut*
23. *Grip*
24. *Lower bushing*
25. *Upper bushing*
26. *Retainer bracket*
27. *Retainer bracket with screws*
28. *Noise shield*
29. *Lock tab*
30. *Elastic stop nut*
31. *Retainer bracket*
32. *Flat washer*
33. *Elastic stop nut*
34. *Ball joint L.H.*
35. *Lock tab*
36. *Elastic stop nut*
37. *Jam nut*
38. *Tie rod*
39. *Jam Nut*
40. *Ball joint*
41. *Steering arm*
42. *Tie rod*
43. *Steering arm*
44. *Ski leg*
45. *Washer*
46. *Bushing*
47. *Bushing*
48. *Shim*
49. *Cap screw*
50. *Flat washer*
51. *Elastic stop nut*
52. *Grease fitting*
53. *Screw*
54. *Rubber spacer*
55. *Housing cap*
56. *Screw*
57. *Steering arm extension*
58. *Turnbuckle*
59. *Spring*
60. *Steering shaft (main)*
61. *Steering column*
62. *Bushing*
63. *Retainer bracket*
64. *Bolt*
65. *Nut*
66. *Ball bushing*
67. *Allen bolt*
68. *Nut*
69. *Cap screw*
70. *Collar*
71. *Allen screw*
72. *Secondary steering shaft*
73. *Block*
74. *Lockwasher*
75. *Retainer ring*
76. *End cap*

INSPECTION

Check skis and runner shoes for excessive wear, replace if necessary. (See section 07-02).

Make sure steering arm and ski leg splines interlock.

Check general condition of steering system.

Check general condition of steering system components for wear and replace if necessary.

DISASSEMBLY & ASSEMBLY

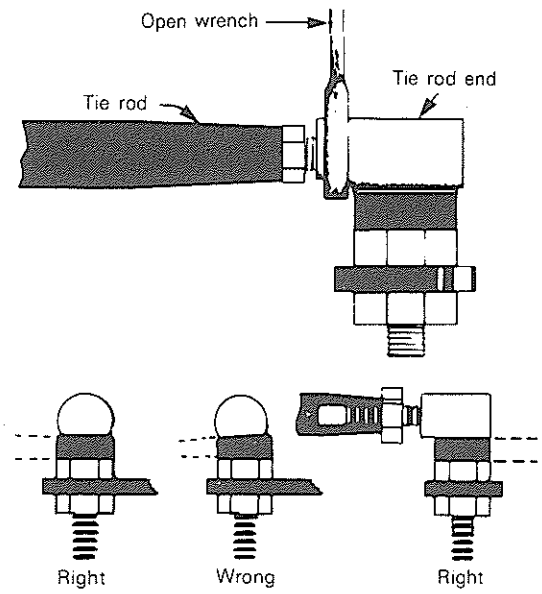
(23) Grips can be removed and installed without any damage by injecting compressed air into the handlebar.

Another way to install grips consists in soaking them in soapy water (detergent for dishes) and in pushing them onto the handlebar with a soft hammer.

(34) (40) Inspect ball joint ends for wear or looseness, if excessive, replace.

NOTE: Screw the longest threaded end of ball joint into the tie rod, ensure that half of the total number of threads are inserted into the tie rod.

The cut-off section of the tie rod end must run parallel with the horizontal line of the steering arm when assembled on vehicle. The tie rod end should be restrained when tightening tie rod end lock nut. For torque specifications see Technical Data.



㉟ When assembling components, always position new lock tabs.

㊶ ㊸ The steering arm angles should be equal on both sides when skis are parallel with vehicle.

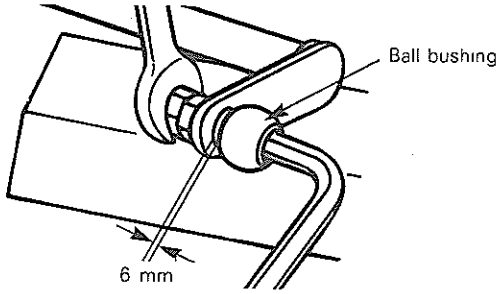
㉟ ㉚ Tighten to 27 N•m (20 ft-lbs) and bend lock tabs over nuts.

㉟ ㊱ Tighten to 42 N•m (31 ft-lbs) and bend lock tabs over nuts.

㊹ ㊷ Grease ski leg at grease fitting.

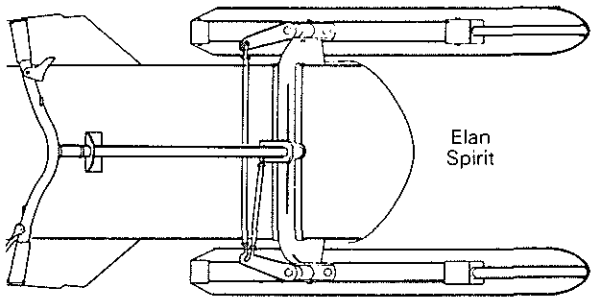
Alpine

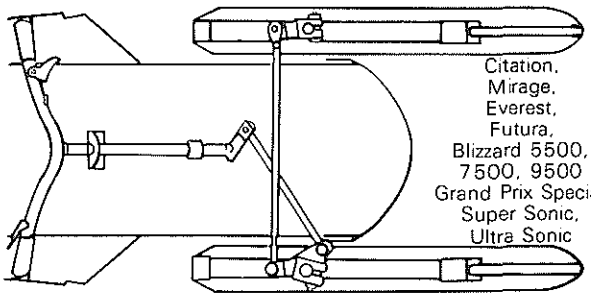
㊺ ㊻ ㊼ Affix the ball bushing to steering shaft using appropriate Allen head bolt. Tighten bolt until there is approximately 6 mm (1/4") free-play existing between ball bushing and steering shaft.



Torque nut to 61 N•m (45 ft-lbs).

STEERING ADJUSTMENT (SKIS)





Skis should have a toe out of 3 mm (1/8"). To check, measure distance between each ski at front and rear of spring leaves. The front distance should be 3 mm (1/8") more than the rear when the handlebar is horizontal. If adjustment is required:

Loosen the jam nuts locking the longer tie rod in place. Turn tie rod manually until alignment is correct. Tighten jam nuts firmly.

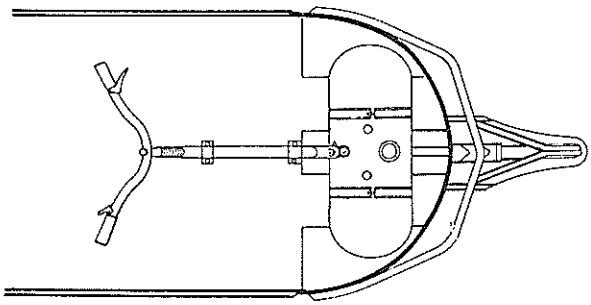
IMPORTANT: Close front of skis manually to take all slack from steering mechanism.

Check that handlebar is horizontal. To correct, loosen shorter tie rod jam nuts.

Turn tie rod manually until handlebar is horizontal.

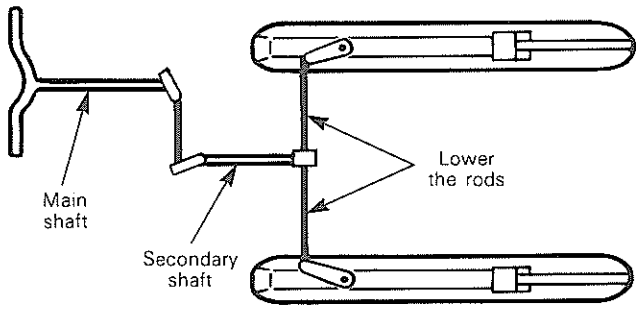
Tighten jam nuts firmly.

Alpine



When assembling steering arm (41) and ski leg (44) the handlebar must be horizontal with the ski parallel with vehicle.

Elite



Skis should have a toe out of 3 mm (1/8"). To check, measure distance between each ski at front and rear of leaf springs. The front distance should be 3 mm (1/8") more than the rear when the handlebar is horizontal. If adjustment is required:

Loosen the lower tie rod jam nuts. Turn one or both tie rods manually until alignment is correct.

IMPORTANT: Close front of skis manually to take all slack from steering mechanism.

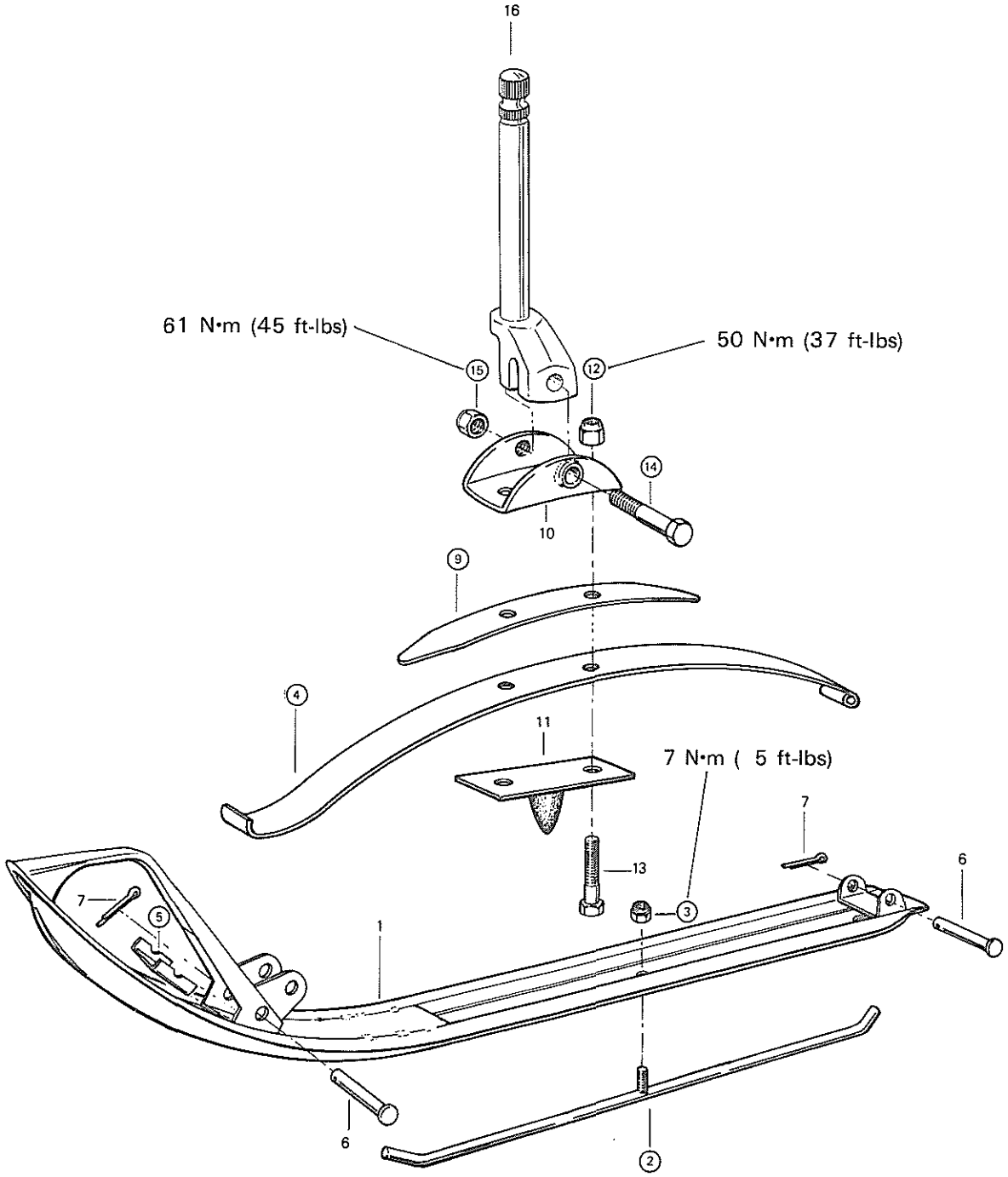
Tighten the jam nuts firmly.

Check that handlebar is horizontal while skis are parallel with vehicle.

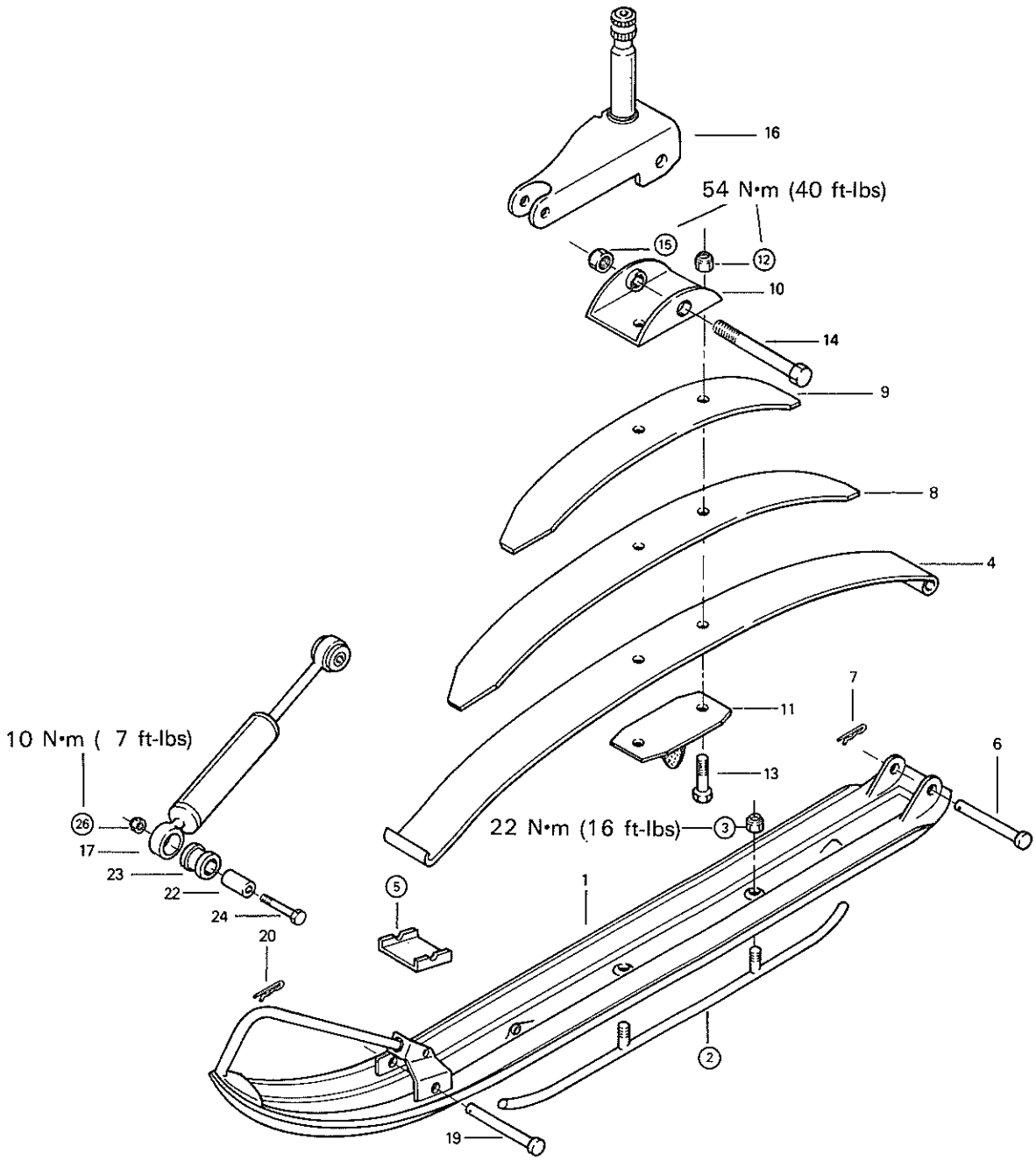
To correct handlebar position, loosen the jam nuts of the tie rod located between steering main shaft and steering secondary shaft. Turn tie rod until handlebar is horizontal. Tighten the jam nuts firmly.

SKI SYSTEM

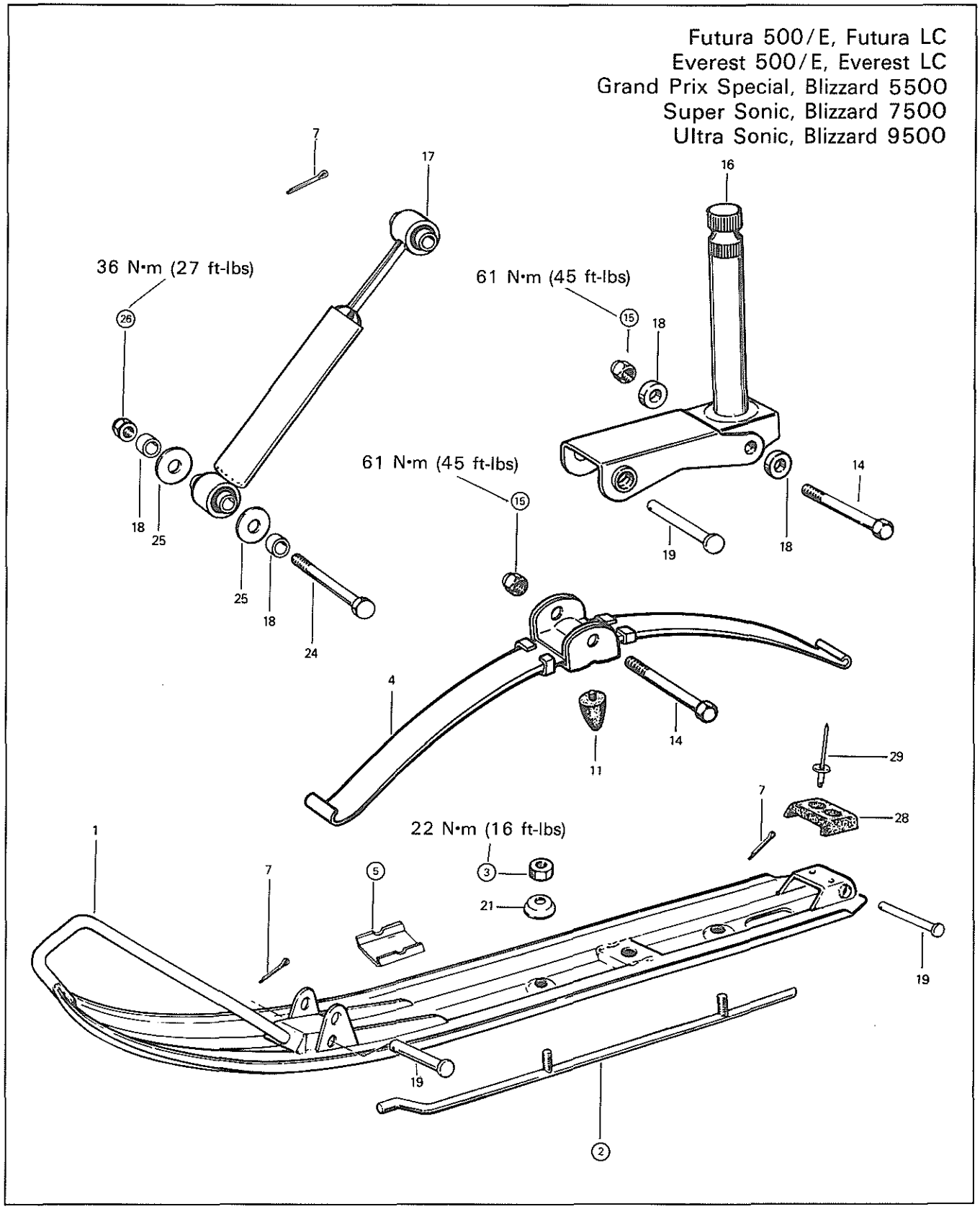
Elan and Spirit



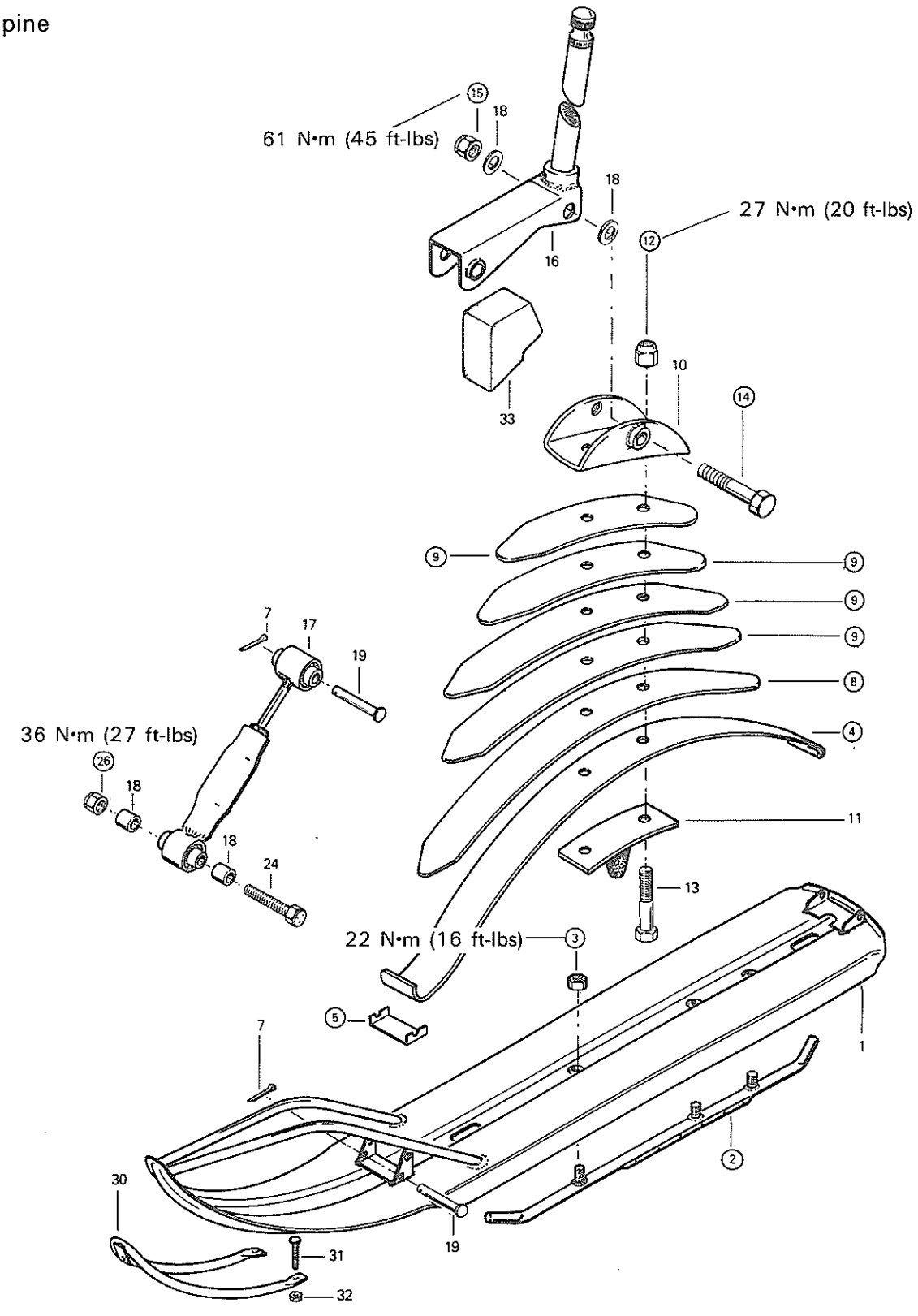
Citation, Mirage

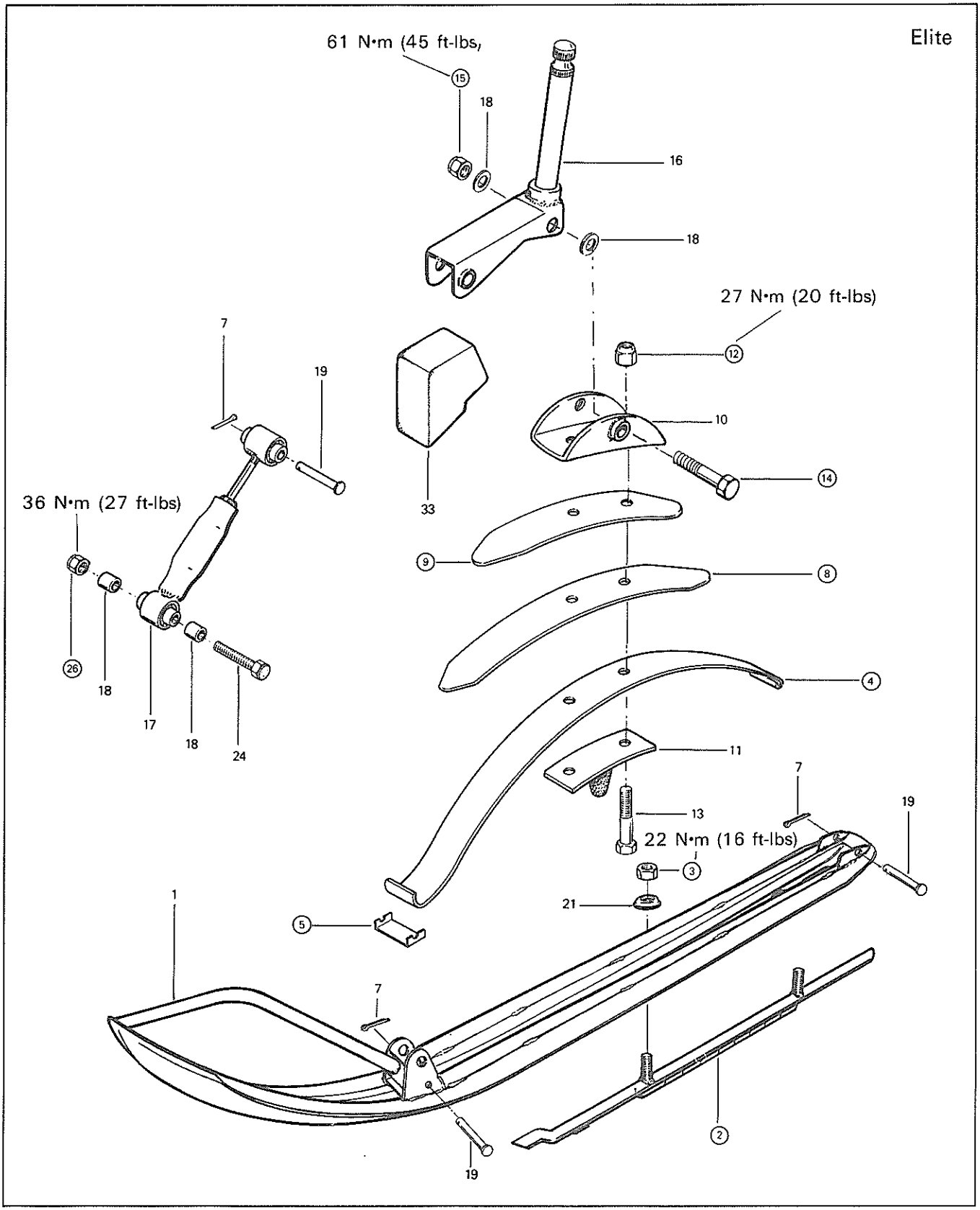


Futura 500/E, Futura LC
Everest 500/E, Everest LC
Grand Prix Special, Blizzard 5500
Super Sonic, Blizzard 7500
Ultra Sonic, Blizzard 9500



Alpine


61 N•m (45 ft-lbs)
27 N•m (20 ft-lbs)
36 N•m (27 ft-lbs)
22 N•m (16 ft-lbs)
15
18
16
12
10
14
33
9
8
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13
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Elite
61 N•m (45 ft-lbs)
15
18
16
18
27 N•m (20 ft-lbs)
12
10
14
33
7
19
36 N•m (27 ft-lbs)
26
18
17
18
24
9
8
4
11
7
19
13
22 N•m (16 ft-lbs)
3
21
5
1
7
19
2

1. *Ski*
2. *Runner shoe*
3. *Nut*
4. *Main spring leaf*
5. *Spring slider cushion*
6. *Retainer pin*
7. *Cotterpin*
8. *Auxiliary spring leaf*
9. *Auxiliary spring leaf*
10. *Spring leaf coupler*
11. *Rebound stopper*
12. *Nut*
13. *Bolt*
14. *Bolt*
15. *Nut*
16. *Ski leg*
17. *Shock*
18. *Spacer*
19. *Retainer pin*
20. *Hair pin*
21. *Cup*
22. *Bushing*
23. *Rubber spacer*
24. *Bolt*
25. *Washer*
26. *Nut*
27. *Rubber bumper*
28. *Rivet*
29. *Protector tube (Europe)*
30. *Screw*
31. *Nut*
32. *Ski bumber*

INSPECTION

Check skis and runner shoes for excessive wear, replace if necessary.

Make sure steering arm and ski leg splines interlock.

Check general condition of steering system components for wear and replace if necessary.

DISASSEMBLY & ASSEMBLY

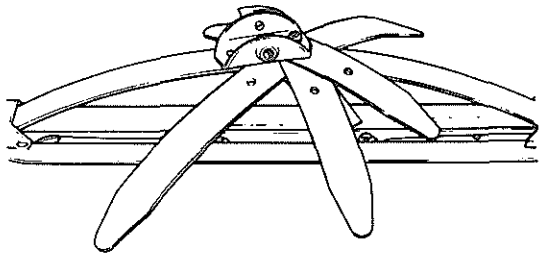
② WARNING: Observe caution while prying or removing steel runner shoes from ski slots as the shoes are under tension. Check that ski runner shoes are not worn more than half of their original thickness.

②Replace when half worn.

③ On Elan and Spirit vehicles, torque to 7 N•m (5 ft-lbs). On all others vehicles, torque to 22 N•m (16 ft-lbs).

④⑧⑨CAUTION: When disassembling leaf coupler from spring leaves be careful of the leaves tension.

When assembly spring leaves, cross the spring leaves and temporarily insert one (1) nut and bolt then position the spring leaves parallel to each other and install remaining bolt and nut. Tighten fully.

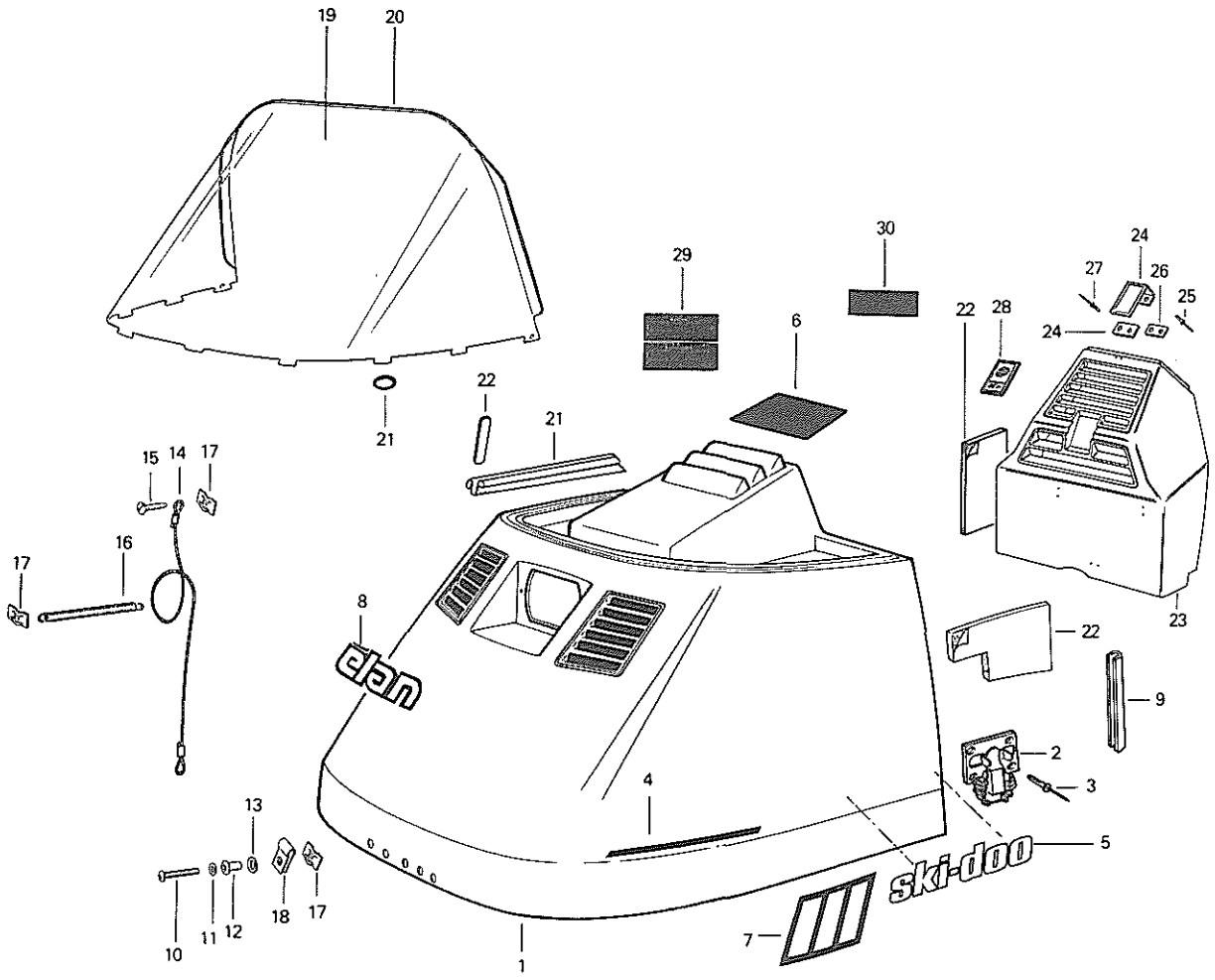


⑤ Apply Lithium grease at least once a year.

⑭⑮Torque bolt and move ski by hand to check that it pivots on ski leg. Torque locking nut to 61 N•m (45 ft-lbs).

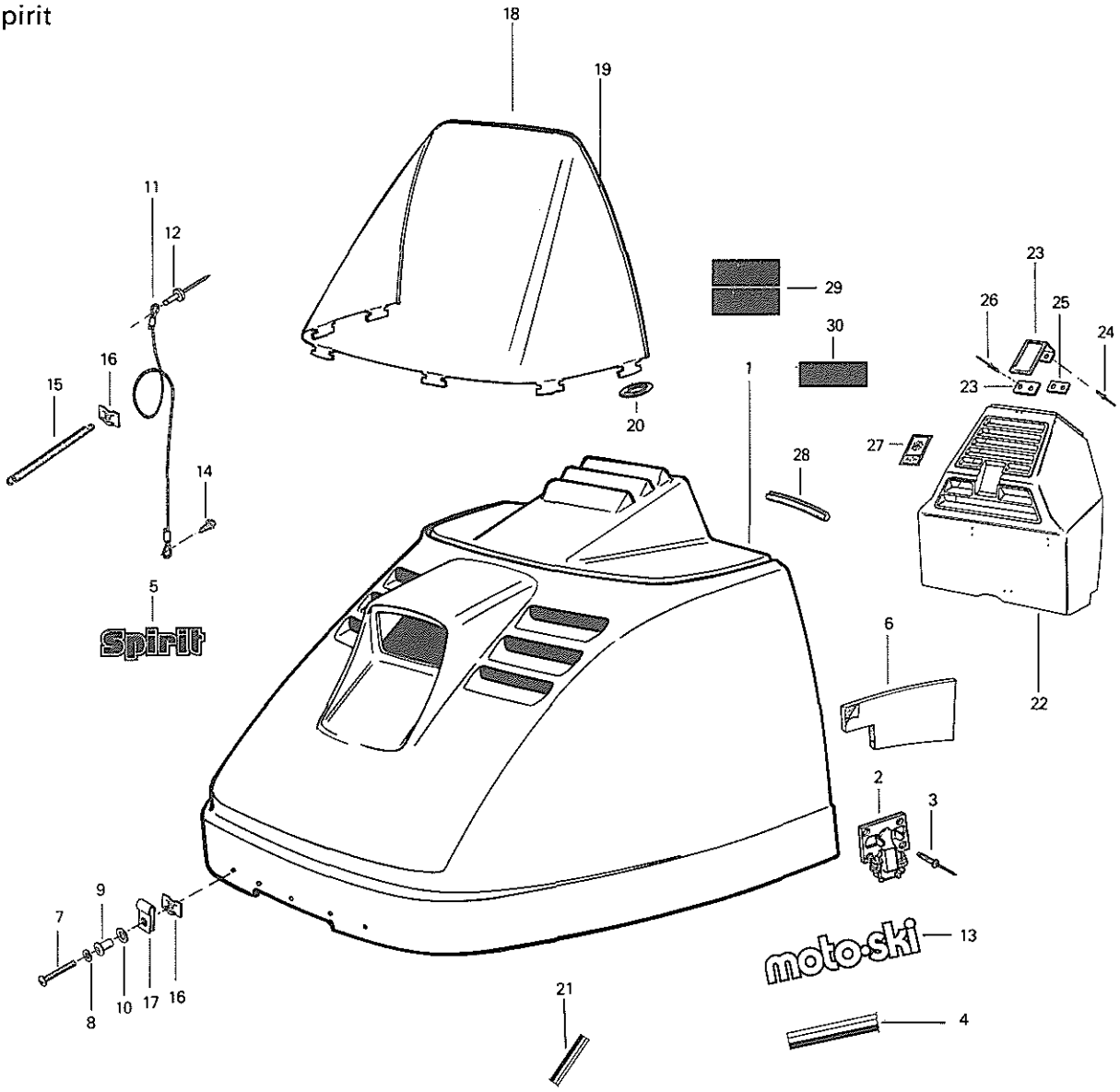
HOOD

Elan



1. *Hood*
2. *Hood latch*
3. *Rivet*
4. *Stripe*
5. *Label*
6. *Decal*
7. *Side decal set*
8. *Identification label*
9. *Hood trim*
10. *Screw*
11. *Washer (flat)*
12. *Weld nut*
13. *Washer (flat)*
14. *Retainer cable*
15. *Screw*
16. *Spring*
17. *Speed nut*
18. *Clip*
19. *Windshield*
20. *Trim (windshield)*
21. *O-ring*
22. *Foam*
23. *Console*
24. *Latch*
25. *Rivet*
26. *Plate*
27. *Rivet*
28. *Bombardier label*
29. *Instruction label*
30. *Warning label*

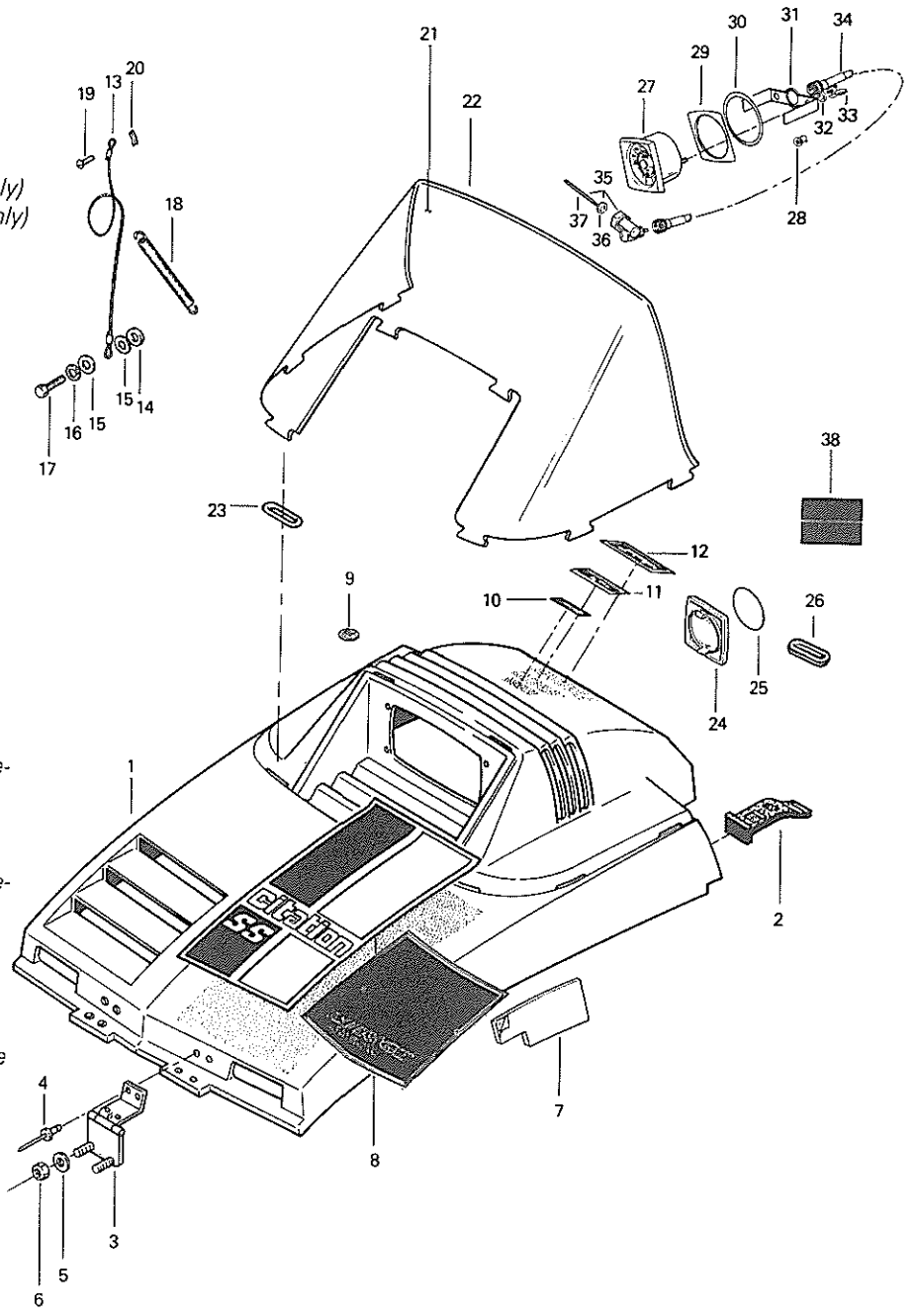
Spirit



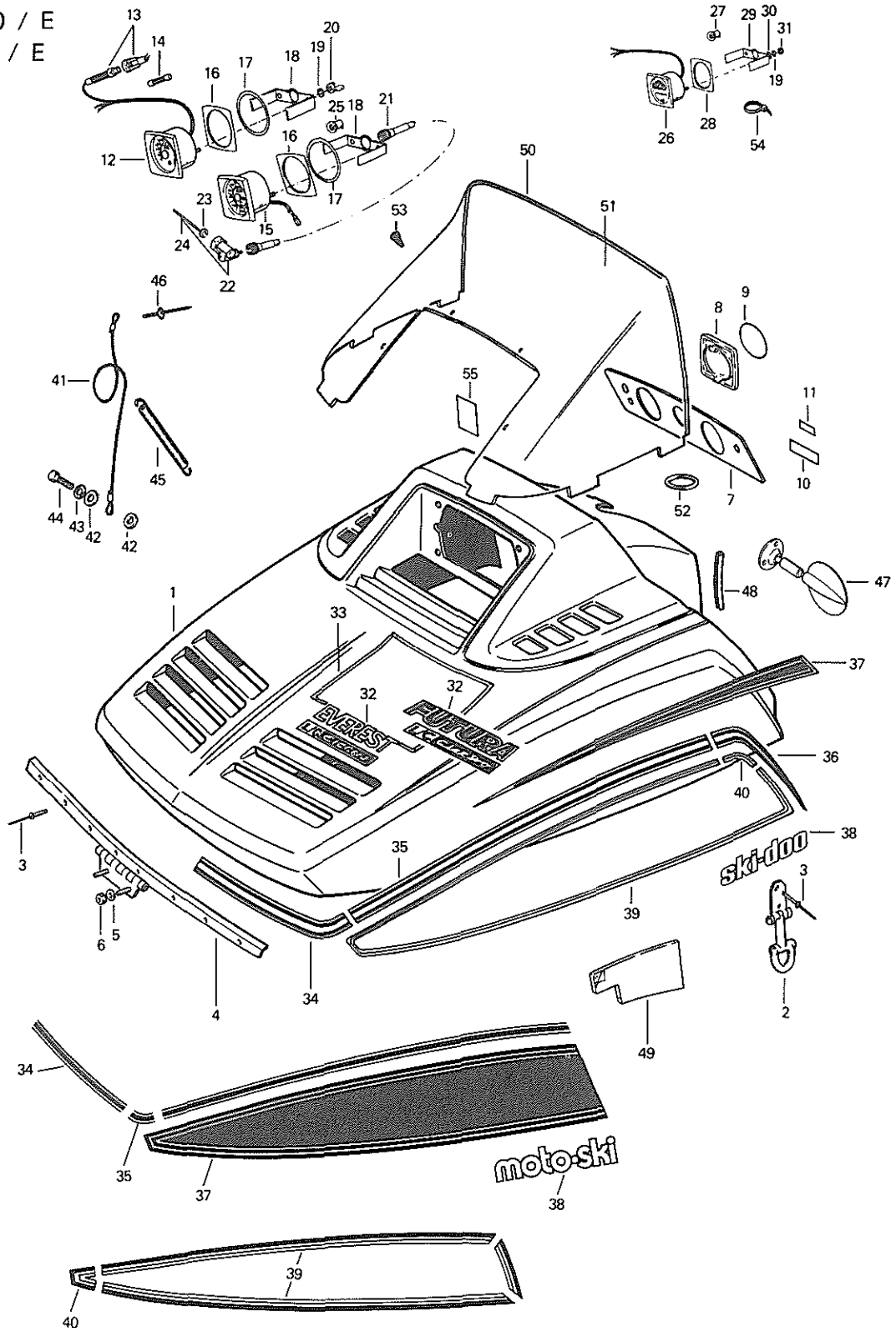
1. Hood
2. Hood latch
3. Rivet
4. Stripe
5. Identification label
6. Foam
7. Screw
8. Washer (flat)
9. Weld nut
10. Washer (flat)
11. Retainer cable
12. Rivet
13. Label
14. Metal screw
15. Spring
16. Speed nut
17. Clip
18. Windshield
19. Trim (windshield)
20. "O" ring
21. Stripe
22. Console
23. Latch
24. Rivet
25. Plate
26. Rivet
27. Label
28. Trim (hood)
29. Instruction label
30. Warning label

Citation
Mirage

1. *Hood*
2. *Hood latch*
3. *Hinge*
4. *Rivet*
5. *Flat washer*
6. *Elastic stop nut*
7. *Foam*
8. *Identification label*
9. *Decal patch*
10. *Label*
11. *Decal (oil injection models only)*
12. *Label (electric start models only)*
13. *Retainer cable*
14. *Spacer (single cylinder models only)*
15. *Flat washer*
16. *Lockwasher (twin cylinder models only)*
17. *Screw*
18. *Spring*
19. *Screw*
20. *Speed nut*
21. *Windshield*
22. *Trim (windshield)*
23. *"O" ring*
24. *Meter plug*
25. *Decal*
26. *Protector*
27. *Speedometer (Citation SS/Mirage Special only)*
28. *Buld (Citation SS/Mirage Special only)*
29. *Packing (Citation SS/Mirage Special only)*
30. *Ring (Citation SS/Mirage Special only)*
31. *Case-holder (Citation SS/Mirage Special only)*
32. *Lockwasher (Citation SS/Mirage Special only)*
33. *Wing nut (Citation SS/Mirage Special only)*
34. *Cable (Citation SS/Mirage Special only)*
35. *Angle drive (Citation SS/Mirage Special only)*
36. *Washer (Citation SS/Mirage Special only)*
37. *Branch key (Citation SS/Mirage Special only)*
38. *Instruction label*

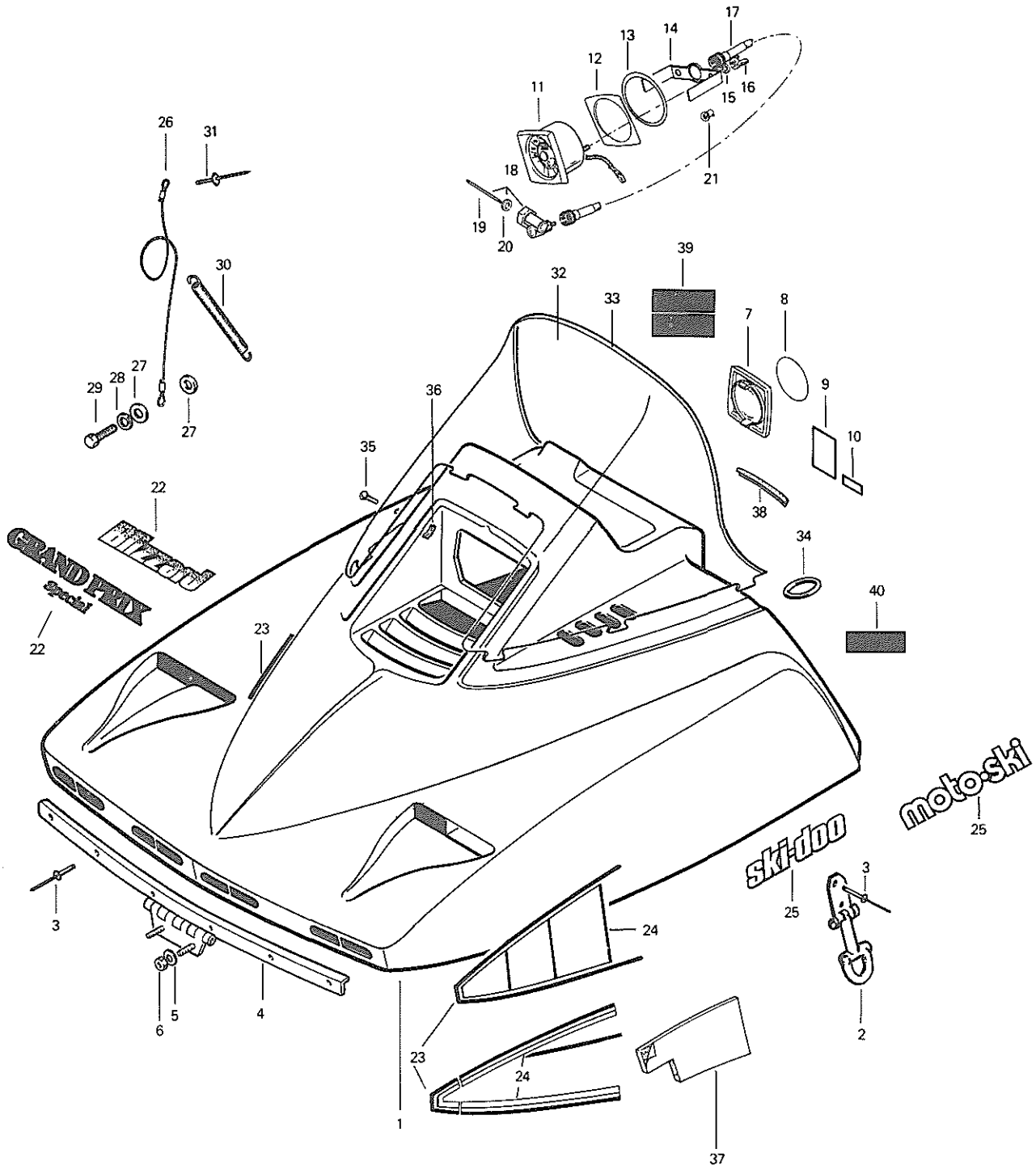


Everest 500 / E
Futura 500 / E
Everest LC
Futura LC



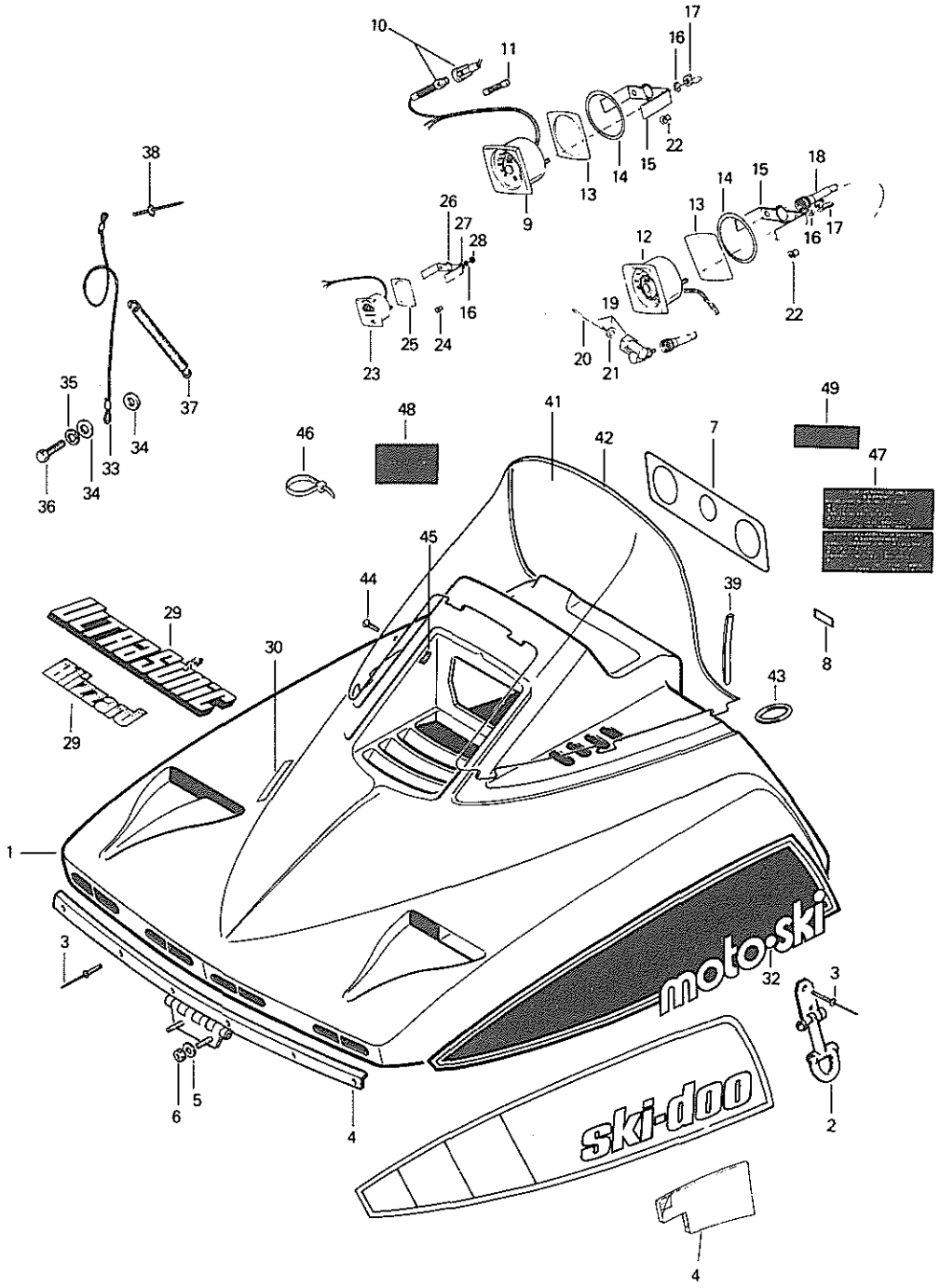
1. *Hood*
2. *Hood latch*
3. *Rivet*
4. *Hood hinge*
5. *Flat washer*
6. *Elastic stop nut*
7. *Dash decal*
8. *Meter plug*
9. *Decal (Everest 500/E, Futura 500/E only)*
10. *Bombardier label*
11. *Decal (LC models only)*
12. *Tachometer (LC models only)*
13. *Fuse-holder (LC models only)*
14. *Fuse .IA (LC models only)*
15. *Speedometer*
16. *Packing*
17. *Ring*
18. *Case holder*
19. *Lockwasher*
20. *Wing nut*
21. *Cable*
22. *Angle drive*
23. *Cable branch key*
24. *Washer*
25. *Bulb*
26. *Temperature gauge (LC models only)*
27. *Bulb (LC models only)*
28. *Packing (LC models only)*
29. *Case holder (LC models only)*
30. *Flat-washer (LC models only)*
31. *Nut*
32. *Label*
33. *Stripe (LC models only)*
34. *Front top stripe set (LC models only)*
35. *Top stripe (LC models only)*
36. *Rear top stripe set (LC models only)*
37. *Side decal set (Everest 500/E & Futura 500/E only)*
38. *Label*
39. *Stripe*
40. *Corner stripe (Everest 500/ E & Futura 500/E only)*
41. *Retainer cable*
42. *Flat washer (Everest 500/E & Futura 500/E only)*
43. *Lockwasher*
44. *Screw*
45. *Spring*
46. *Rivet*
47. *Mirror (LC models only)*
48. *Trim*
49. *Foam*
50. *Windshield*
51. *Trim*
52. *O'ring*
53. *Metal screw*
54. *Tie rap*
55. *Label*

Grand Prix Special
Blizzard 5500



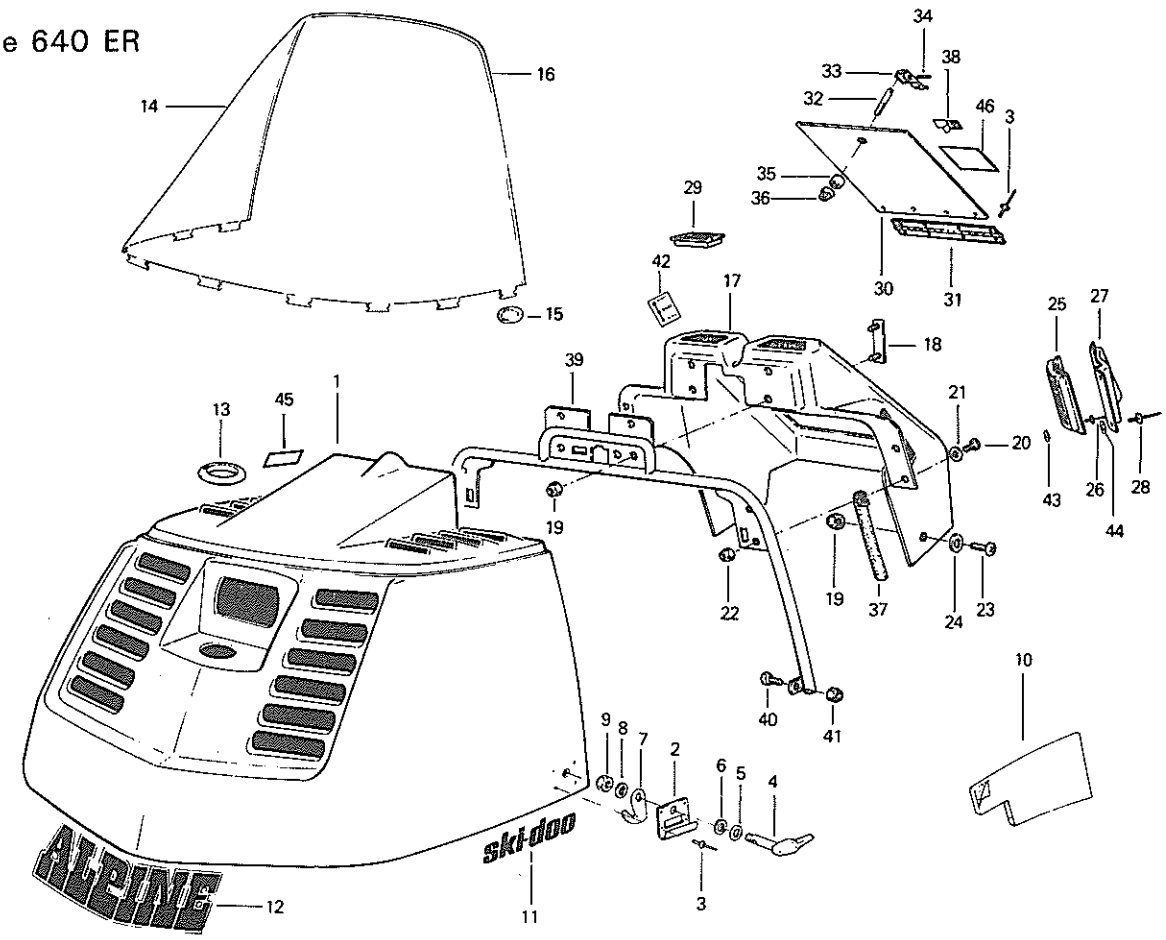
1. *Hood*
2. *Hood latch*
3. *Rivet*
4. *Hood hinge*
5. *Flat washer*
6. *Elastic stop nut*
7. *Meter plug*
8. *Decal*
9. *Dash decal*
10. *Bombardier label*
11. *Speedometer*
12. *Packing*
13. *Ring*
14. *Case holder*
15. *Lockwasher*
16. *Wing nut*
17. *Cable*
18. *Angle drive unit*
19. *Cable branch key*
20. *Washer*
21. *Bulb*
22. *Identification label*
23. *Stripe*
24. *Side decal set*
25. *Label*
26. *Retainer cable*
27. *Flat washer*
28. *Lockwasher*
29. *Hexagonal screw*
30. *Spring*
31. *Rivet*
32. *Windshield*
33. *Trim*
34. *O'ring*
35. *Screw*
36. *Speed nut*
37. *Foam*
38. *Trim*
39. *Label*
40. *Warning label*

Blizzard 7500
Super Sonic
Blizzard 9500
Ultra Sonic



1. *Hood*
2. *Hood latch*
3. *Rivet*
4. *Hood hinge*
5. *Flat washer*
6. *Elastic stop nut*
7. *Dash decal*
8. *Bombardier label*
9. *Tachometer*
10. *Fuse-holder*
11. *Fuse .IA*
12. *Speedometer*
13. *Packing*
14. *Ring*
15. *Case-holder*
16. *Lockwasher*
17. *Wing nut*
18. *Cable*
19. *Angle drive*
20. *Cable branch key*
21. *Washer*
22. *Bulb*
23. *Temperature gauge*
24. *Bulb*
25. *Packing*
26. *Case holder*
27. *Flat washer*
28. *Nut*
29. *Identification label*
30. *Stripe*
31. *Side decal set*
32. *Label*
33. *Retainer cable*
34. *Flat washer*
35. *Lockwasher*
36. *Screw*
37. *Spring*
38. *Rivet*
39. *Trim*
40. *Foam*
41. *Windshield*
42. *Trim (windshield)*
43. *O'ring*
44. *Screw*
45. *Speed nut*
46. *Tie rap*
47. *Instruction label*
48. *Warning label (performance)*
49. *Warning label (Operator only)*

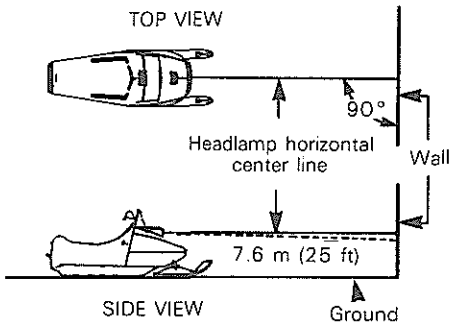
Alpine 640 ER



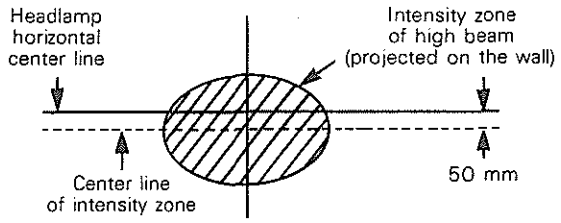
1. Hood
2. Hood latch bracket
3. Rivet
4. Hand lever
5. Washer
6. Spring washer
7. Hook
8. Washer
9. Nut
10. Aphonic Foam
11. Ski-Doo label
12. Identification label
13. Filler pipe grommet
14. Windshield
15. O'ring
16. Windshield trim
17. Console
18. Stud plate
19. Nut
20. Machine screw
21. Washer
22. Nut
23. Machine screw
24. Washer
25. Louvre
26. Rivet
27. Air deflector
28. Rivet
29. Louvre R.H.
    Louvre L.H.
30. Door
31. Hinge
32. Threaded screw
33. Latch
34. Pin
35. Rubber spacer
36. Plastic nut
37. Hood trim
38. Bombardier label
39. Upper column
40. Screw
41. Nut
42. Shifting label
43. Washer
44. Washer
45. Warning label
46. Instruction label

HEADLAMP BEAM AIMING

Place the vehicle on a flat surface 7.6 m (25') from a wall or screen.



With the suspension correctly adjusted, the rider seated on the vehicle and the high beam ON (engine must be running on manual start models), check that the center of the high intensity zone of the high beam is 50 mm (2") below the horizontal line of the headlamp height.



To adjust, on vehicles so equipped, remove the headlamp chrome ring, turn the upper or lower adjusting screws to obtain the desired beam position.

BULB REPLACEMENT

If headlamp is burnt, tilt cab, unplug the connector from the headlamp. Remove the rubber boot and unfasten the bulb retainer clips. Detach the bulb and replace. If the tailling bulb is burnt, expose the bulb by removing red plastic lens. To remove, unscrew the two (2) Phillips head screws. Verify all lights after replacement.

HOOD MAINTENANCE

Clean the vehicle thoroughly, removing all dirt and grease accumulation.

CAUTION: Plastic alloy components such as fuel tank, windshield, hood, etc. can be cleaned using mild detergents or isopropyl alcohol. Do not use strong soaps, degreasing solvents, abrasive cleaners, paint thinners, etc.

Inspect hood and repair damage. Repair kits are available at your authorized dealer.

NOTE: Apply wax on glossy finish of hood only. Protect the vehicle with a cover to prevent dust accumulation during storage.

CAUTION: If for some reason the snowmobile has to be stored outside it is necessary to cover it with an opaque tarpaulin. This caution will prevent the sun rays affecting the plastic components and the vehicle finish.

DECAL

To remove a decal, pull it off.

Clean the surface.

Apply liquid soap on the new decal. Position the decal and pass a sponge over it to remove air bubbles and water. Allow to air dry.

WINDSHIELD INSTALLATION

Elan, Spirit
Citation 3500, Mirage I
Citation 4500/E, Mirage II/E
Citation SS, Mirage Special

— Peel off the protective film from the windshield.

— Position the windshield on the hood then push it down until the tabs are fully inserted into the hood slots. Lock the windshield tabs in position using the "O" rings supplied in the kit.

— Install the windshield trim.

Everest 500/E, Futura 500/E
Everest LC, Futura LC

— Peel of protective film from windshield.

— Position windshield on hood then push down until tabs are fully inserted into hood slots. Lock windshield tabs in position using the "O" rings supplied in kit.

— Using the windshield holes as a guide, drill $\frac{1}{8}$" dia. holes through the hood. Install the four (4) screws.

— Install the windshield trim.

Grand Prix Special, Blizzard 5500
Super Sonic, Blizzard 7500
Ultra Sonic, Blizzard 9500

— Peel off protective film from the new windshield.

— Position windshield on hood then push until tabs are fully inserted into slots. Lock windshield tabs in position using the "O" rings supplied in kit.

— Using the windshield holes as a guide, drill 7/32" dia. holes through hood. Install retaining bolts and push nuts.

— Install windshield trim

Elite

— Align the windshield in position (in order to have the windshield deflector pleat on each side in line with the body side).

— Mark the body, and drill 17/64" holes. Secure the windshield in place.

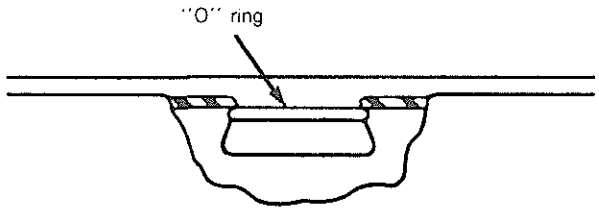
— Install windshield trim on outer edge.

— Install the hood stopper in place by drilling a $\frac{1}{8}$" hole in the center of the windshield at exactly 23 mm (9") from bottom edge of windshield and push the hood stopper in place.

Alpine

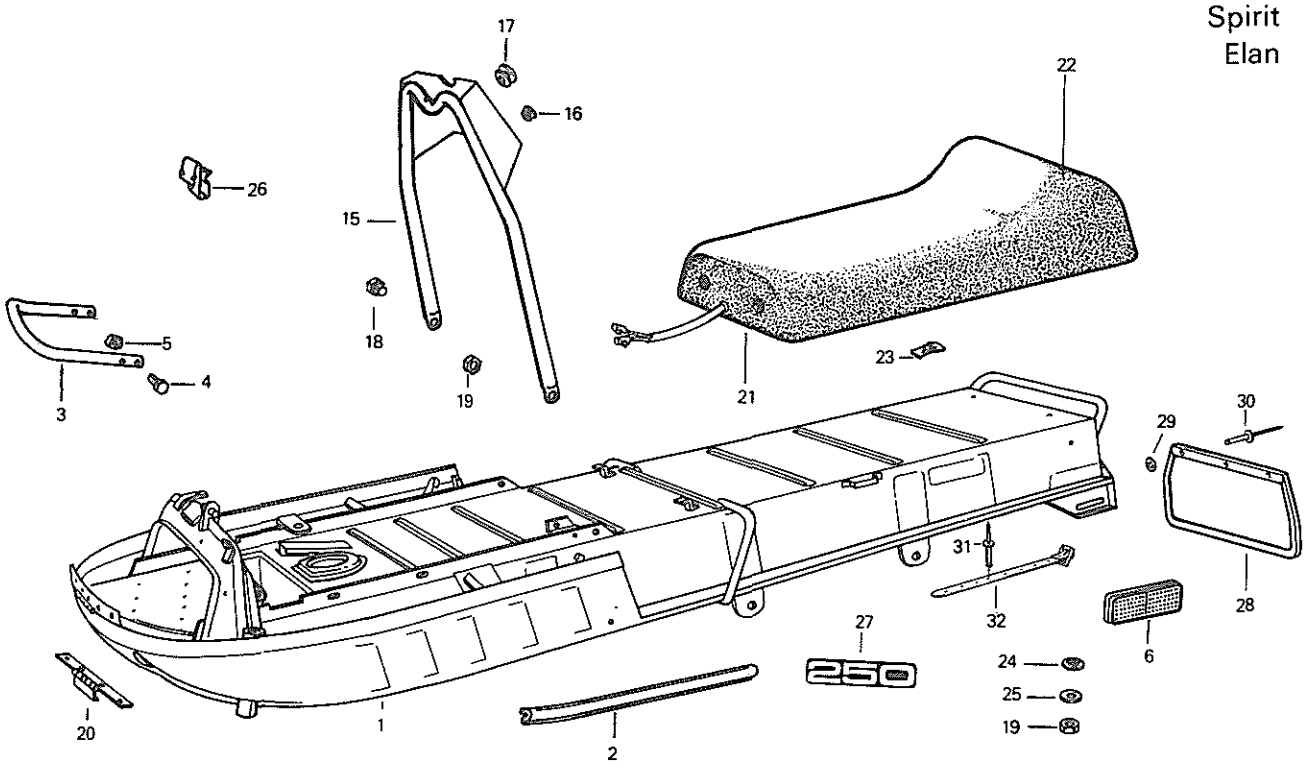
— Peel off protective film from the new windshield.

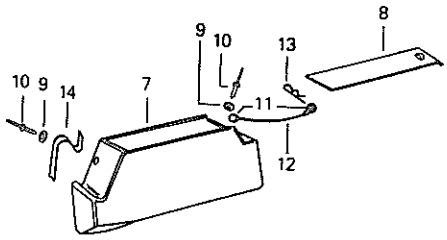
— Position windshield on hood then push until tabs are fully inserted into slots. Lock windshield tabs in position using the eleven (11) "O" rings supplied in kit (install two (2) "O" rings on outer tabs).



FRAME

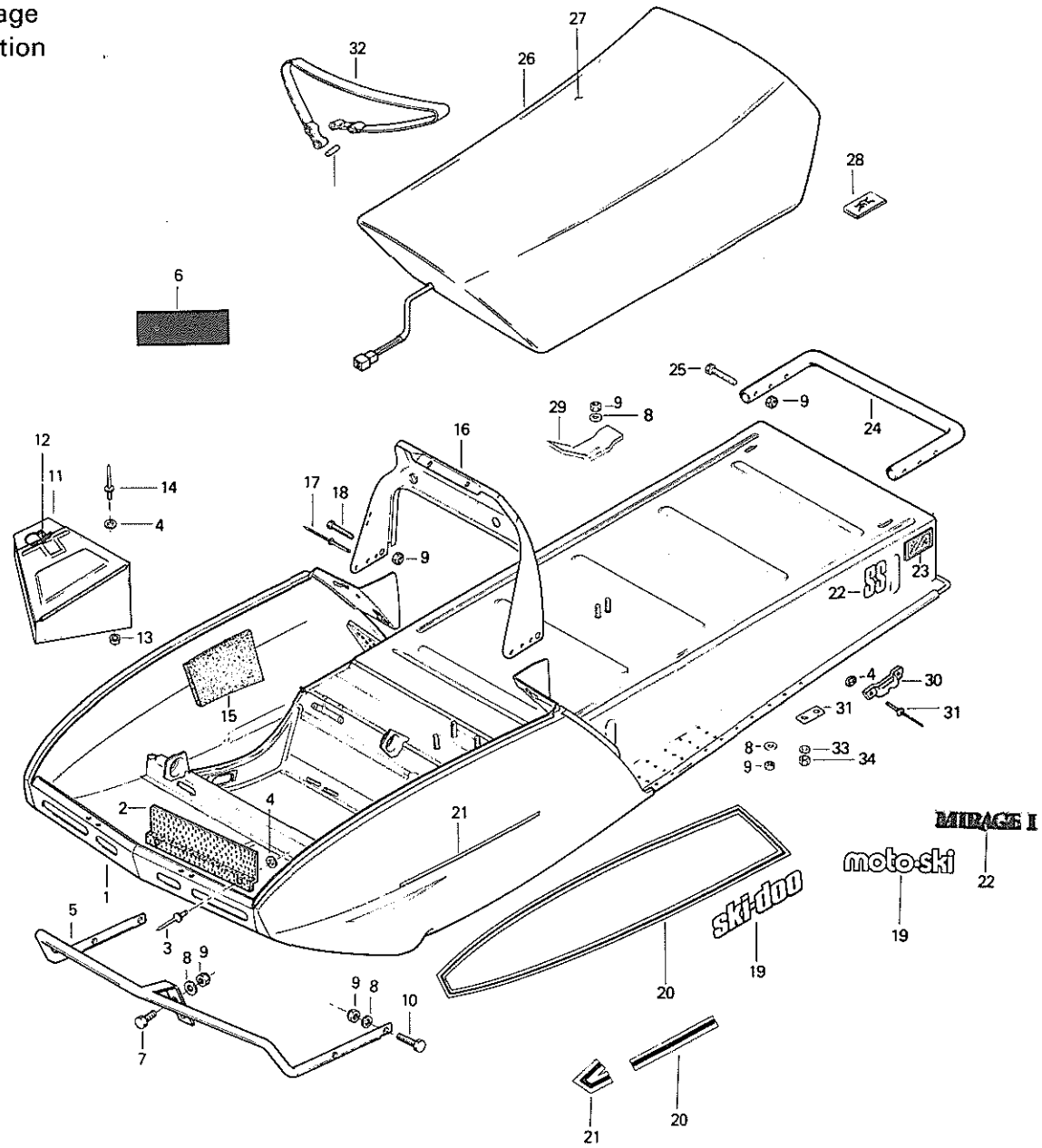
Spirit
Elan





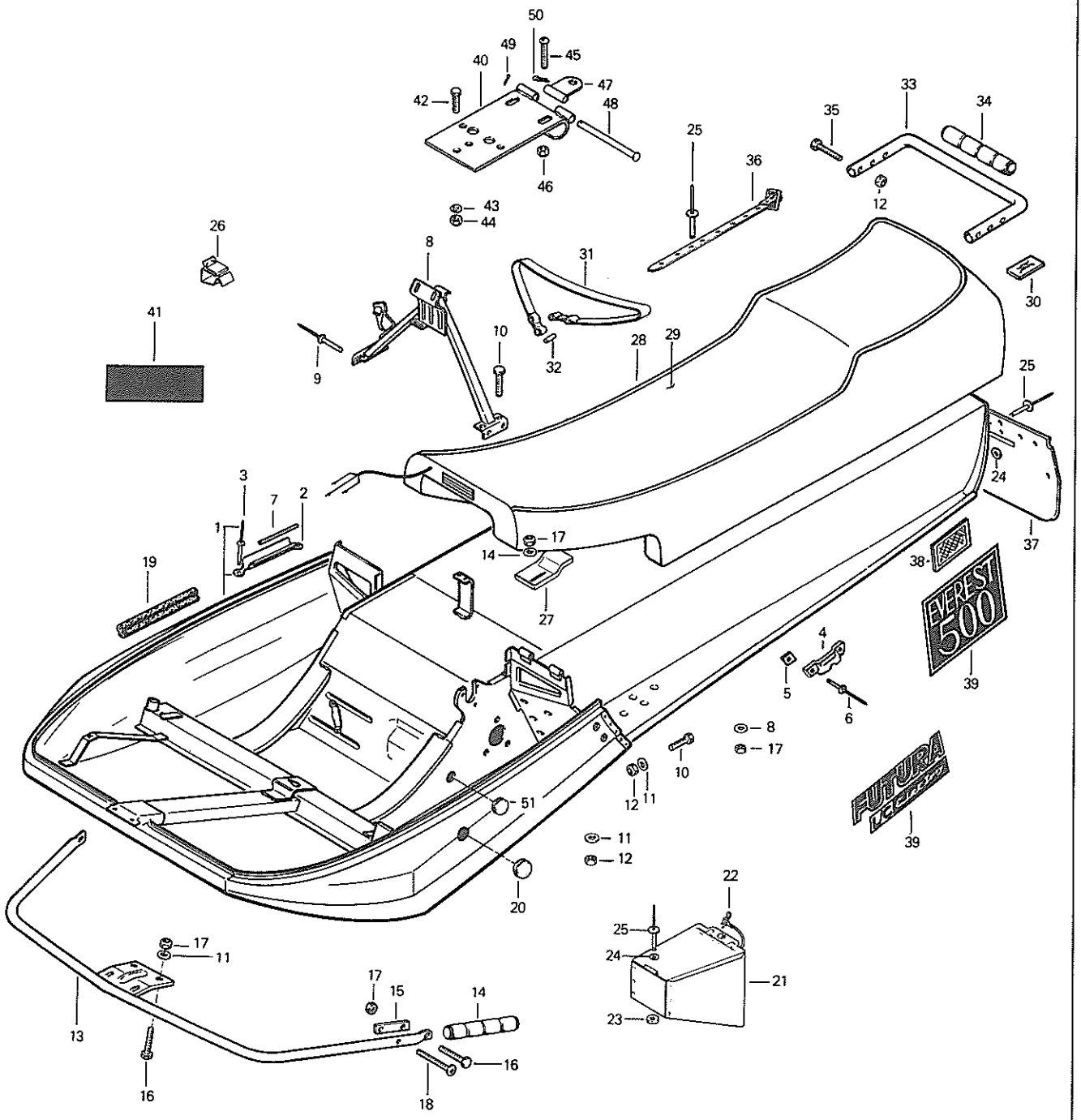
1. *Frame*
2. *Body moulding*
3. *Front handle*
4. *Cap screw*
5. *Clip nut*
6. *Reflector*
7. *Tool box assembly*
8. *Cover*
9. *Flat washer*
10. *Rivet*
11. *Barrel connector*
12. *Wire*
13. *Hair pin*
14. *Spring clip*
15. *Upper column*
16. *Grommet*
17. *Grommet*
18. *Cap screw*
19. *Elastic stop nut*
20. *Hinge assembly*
21. *Seat*
22. *Seat cover*
23. *Speed nut*
24. *Lockwasher*
25. *Flat washer*
26. *Clip*
27. *Decal*
28. *Snow guard*
29. *Flat washer*
30. *Rivet*

Mirage
Citation



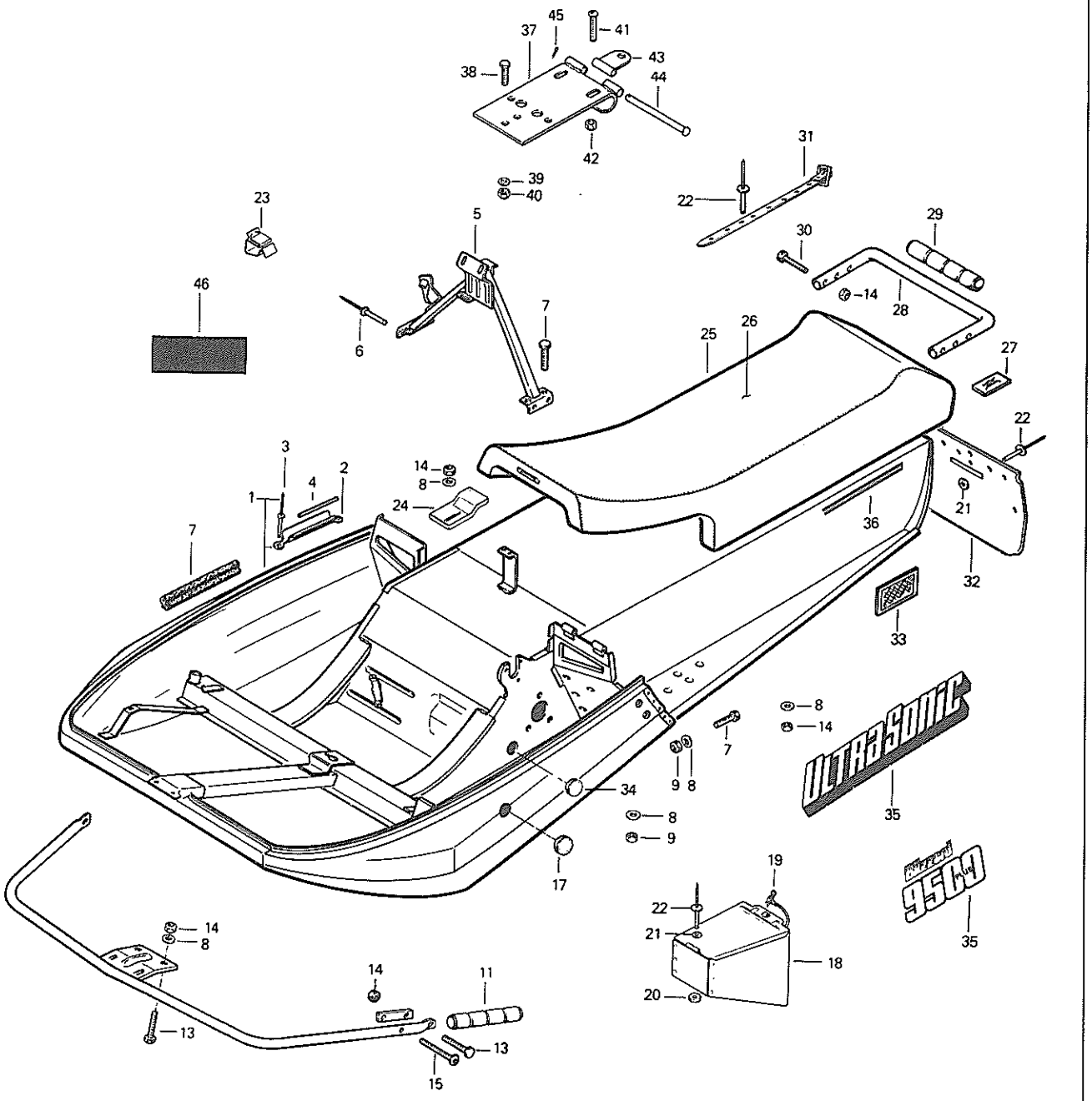
1. Frame
2. Front grill
3. Rivet
4. Flat washer
5. Front bumper
6. Warning label
7. Cap screw
8. Flat washer
9. Elastic stop nut
10. Cap screw
11. Tool box
12. Hair pin
13. Rubber spacer
14. Rivet
15. Foam
16. Upper column
17. Rivet
18. Cap screw
19. Label
20. Stripe
21. Stripe
22. Decal
23. Reflector
24. Rear bumper
25. Cap screw
26. Seat
27. Seat cover
28. Speed nut
29. Retainer
30. Seat belt bracket
31. Rivet
32. Seat belt
33. Pin

Everest 500 / E
Futura 500 / E
Everest LC
Futura LC



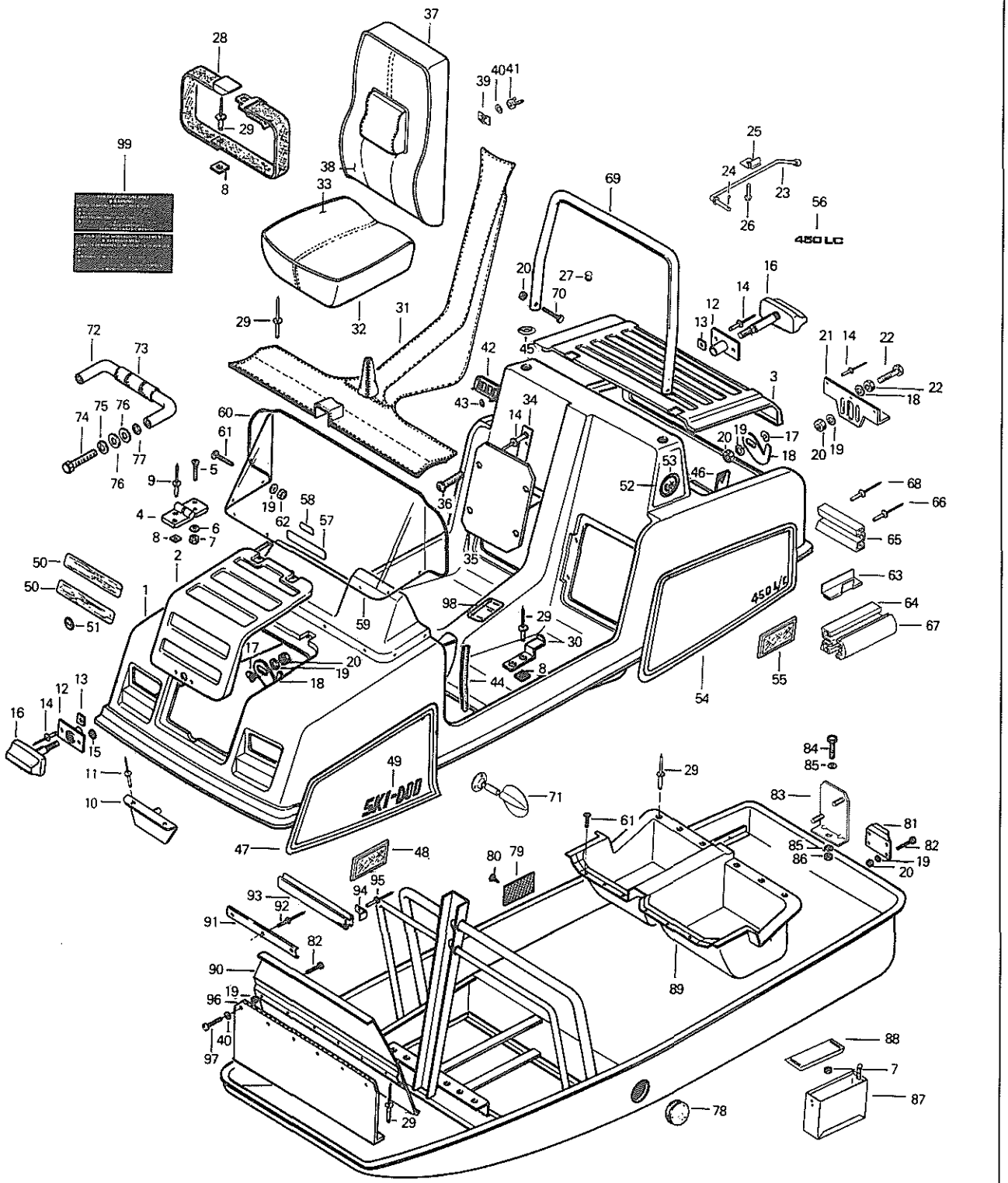
1. *To 6 Frame*
2. *Hood Guide*
3. *Rivet*
4. *Seat Belt Bracket*
5. *Square Washer*
6. *Rivet*
7. *Hood Seat*
8. *Upper Column*
9. *Rivet*
10. *Hexagonal Head Cap Screw*
11. *Flat Washer*
12. *Hexagonal Elastic Stop Nut*
13. *Front Handle*
14. *Grip optional*
15. *Retainer Plate*
16. *Hexagonal Head Cap Screw*
17. *Hexagonal Elastic Stop Nut*
18. *Oval Phillips Head Machine Screw*
19. *Hood seal*
20. *Cap*
21. *Tool Box*
22. *Hair Pin*
23. *Rubber Spacer*
24. *Flat Washer*
25. *Rivet*
26. *Clip*
27. *Retainer*
28. *Seat*
29. *Seat Cover*
30. *Speed Nut*
31. *Seat Belt*
32. *Pin*
33. *Rear Bumper*
34. *Grip optional*
35. *Hexagonal Head Cap Screw*
36. *Ski Tie Down optional*
37. *Snow Guard*
38. *Reflector*
39. *Frame Decal*
40. *Hitch Bracket*
41. *Warning label*
42. *Hexagonal Head Cap Screw*
43. *Flat Washer*
44. *Hexagonal Elastic Stop Nut $\frac{1}{4}$-20*
45. *Round Slotted Head Machine Screw*
46. *Hexagonal Elastic Stop Nut 10-24*
47. *Hitch Plate*
48. *Pin*
49. *Cotter Pin*
50. *Hair Pin*
51. *Plug*

Blizzard 5500
Grand Prix Special
Blizzard 7500, Super Sonic
Blizzard 9500, Ultra Sonic



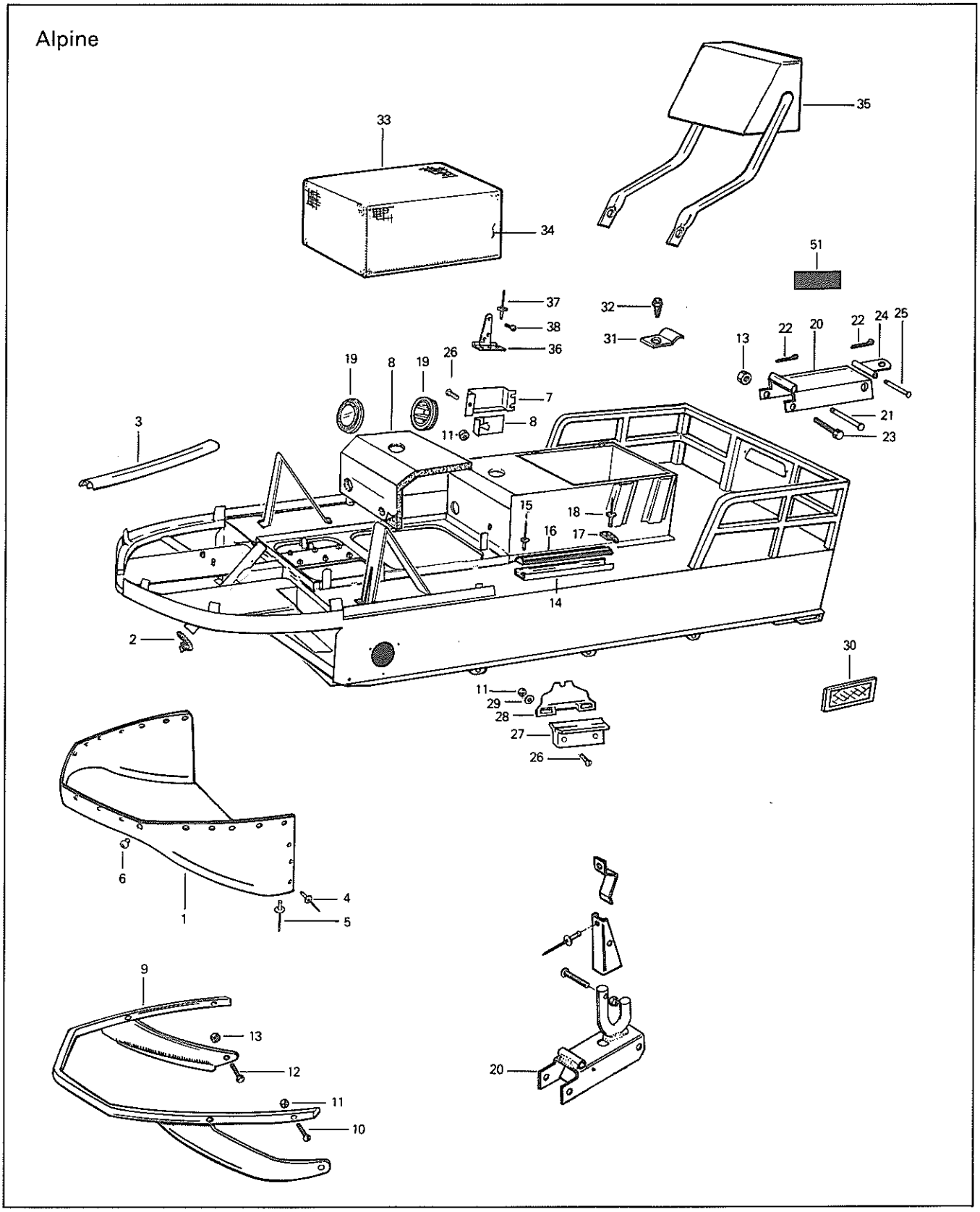
1. *Frame*
2. *Hood guide*
3. *Rivet*
4. *Hood seat*
5. *Upper column*
6. *Rivet*
7. *Screw*
8. *Flat washer*
9. *Elastic stop nut*
10. *Front handle*
11. *Grip (optional)*
12. *Retainer plate*
13. *Screw*
14. *Elastic stop nut*
15. *Screw*
16. *Hood seal*
17. *Cap*
18. *Tool box*
19. *Hair pin*
20. *Rubber spacer*
21. *Flat washer*
22. *Rivet*
23. *Clip*
24. *Retainer*
25. *Seat*
26. *Seat cover*
27. *Speed nut*
28. *Rear bumper*
29. *Grip (optional)*
30. *Screw*
31. *Ski tie down (optional)*
32. *Snow guard*
33. *Reflector*
34. *Plug*
35. *Frame decal*
36. *Stripe*
37. *Hitch bracket (optional)*
38. *Screw*
39. *Flat washer*
40. *Elastic stop nut*
41. *Screw*
42. *Elastic stop nut*
43. *Hitch plate*
44. *Pin*
45. *Cotter pin*
46. *Warning label (towing)*

Elite



1. *Upper Body*
2. *Trunk Door*
3. *Hood*
4. *Hinge*
5. *Machine Screw*
6. *Washer*
7. *Nut*
8. *Square Washer*
9. *Rivet*
10. *Front Latch Bracket*
11. *Rivet*
12. *Plate*
13. *Square Washer*
14. *Rivet*
15. *Flat washer*
16. *Knob*
17. *Spring washer*
18. *Hook*
19. *Washer*
20. *Nut*
21. *Rear Latch bracket*
22. *Screw*
23. *Stand Rod*
24. *Cotter Pin*
25. *Stand Rod Retainer*
26. *Metal Screw*
27. *Grommet*
28. *Seat Belt*
29. *Rivet*
30. *Seat Backet*
31. *Console Cover*
32. *Seat*
33. *Seat cover*
34. *Plate*
35. *Access Plate*
36. *Machine Screw*
37. *Backrest*
38. *Seat cover (backrest)*
39. *Speed Nut*
40. *Washer*
41. *Wing Nut*
42. *Louvre*
43. *Push Nut*
44. *Trim*
45. *Grommet*
46. *Foam*
47. *Side Decal Set (front)*
48. *Front Reflector*
49. *Ski-Doo Label*
50. *Decal Trunk Door*
51. *Elite Label*
52. *Decal*
53. *Elite Label*
54. *Side Decal Set (rear)*
55. *Rear Deflector*
56. *Label 450 L/C*
57. *Dash Decal*
58. *Bombardier Label*
59. *Windshield*
60. *Trim*
61. *Machine Screw*
62. *Nut*
63. *Body Retainer*
64. *Side Bumper*
65. *Rear Bumper*
66. *Rivet*
67. *Vinyl Trim*
68. *Rivet*
69. *Roll Bar*
70. *Screw*
71. *Mirror*
72. *73. Front Handle*
73. *Grip*
74. *Screw*
75. *Lock Washer*
76. *Washer*
77. *Washer*
78. *Cover (Drive Axle Access)*
79. *Grill*
80. *Machine Screw*
81. *Hitch Plate*
82. *Screw*
83. *Fuel Pump Bracket*
84. *Screw*
85. *Washer*
86. *Nut*
87. *Tool Box*
88. *Cover*
89. *Floor*
90. *Footrest*
91. *Footrest Guard*
92. *Rivet*
93. *Rubber Rib*
94. *Foot Rib Stop*
95. *Rivet*
96. *Trunk Shield*
97. *Machine Screw*
98. *Shifting Label*
99. *Label*

Alpine


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1. *Bottom Plate*
2. *Plastic Sealer*
3. *Body Moulding*
4. *Rivet*
5. *Rivet*
6. *Tubular Rivet*
7. *Deflector*
8. *Acoustic Foam*
9. *Front Bumper*
10. *Machine Screw*
11. *Nut*
12. *Screw*
13. *Nut*
14. *Side Guard*
    Side Guard
15. *Rivet*
16. *Rubber Rib*
17. *Foot Rib Stop*
18. *Rivet*
19. *Grille*
    Grille (Close)
20. *Attach Bracket (optional)*
21. *Retainer Pin*
22. *Cotter Pin*
23. *Screw*
24. *Hitch Plate*
25. *Pin*
26. *Machine Screw*
27. *Cushion*
28. *Latch Bracket*
29. *Washer*
30. *Reflector*
31. *Clip*
32. *Washer Head Screw*
33. *Seat*
34. *Leatherette seat cover*
35. *Padded Backrest*
36. *Hinge*
37. *Rivet*
38. *Machine Screw*
39. *Warning Label*

FRAME WELDING

Steel frame:

— Electric Welding

— Amperage: 70-110 Amp.

— Voltage: 20-24 volts

— Rod: E-7014 (3/32")

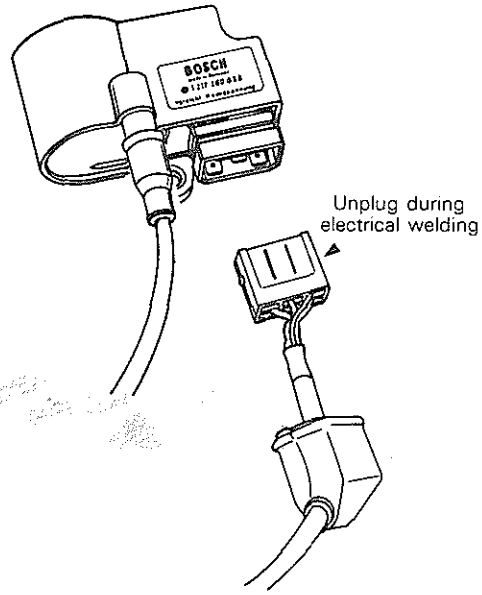
Aluminum frame: (refer to specialized welding shop)

— Argon-oxygen/acetylen welding

— Rod: ER-4043 (3/32")

CAUTION: When electrical welding is to be performed anywhere on the vehicle, unplug the multiple connector at the electronic box prior to connecting the welding wire to the vehicle. This will protect the electronic box against damage caused by flowing current when welding.

NOTE: This procedure applies to all electronic ignition systems.



FRAME CLEANING

Clean frame. For aluminum frame use only "Aluminum cleaner" and follow instructions on container. (Dursol cleaner or equivalent).

Touch up all metal spots where paint has been scratched off. Spray all bare metal parts of vehicle will metal protector.

SEATS

Elite model

To remove the backrest, unscrew the two (2) wing nuts located in the engine compartment.

WARRANTY

LIMITED WARRANTY SKI-DOO® SNOWMOBILES 1980

BOMBARDIER Limited as manufacturer, warrants FROM THE DATE OF FIRST CONSUMER SALE, every 1980 Ski-Doo® snowmobile, sold as NEW AND UNUSED, by an authorized SKI-DOO dealer, subject to the following limitations and conditions, for a period of:

- **two (2) seasons maximum** for models: Elan®, Citation*, Everest®, Elite®,

  Warranty STARTS on the date of sale to the first consumer and ENDS the SECOND APRIL 30TH following the date warranty coverage started.

or

- **Ninety (90) consecutive** days for the following models: BLIZZARD® 5500-7500-9500 and ALPINE® subject to the following:

1. When a sale is made after MARCH 31ST of a given year but before THE 1ST DAY OF DECEMBER of the same year, the warranty will start on DECEMBER 1ST following the date of sale and terminate 90 days later.
2. When a sale is made on/or after JANUARY 2ND of a given year, the unused portion of the 90 days warranty as of MARCH 31ST, of that year will be carried over to the next season, beginning the 1ST DAY OF DECEMBER.

Any 1980 model not listed is not warranted.

WHAT WE WILL DO

BOMBARDIER will repair and/or replace, at its option, components defective in **material and/or workmanship (under normal use and service,)** with a genuine BOMBARDIER component without charge for parts or labour at any authorized SKI-DOO dealer during said warranty period.

EXCLUSIONS

Items and components:

Any of the following expendable items and/or components that are damaged or worn due to normal use: variable speed drive belt, windshield, filters, ignition breaker points, condensers, spark plugs, light bulbs, protective lenses, brake linings, ski runner shoes, slider shoes on suspension and variable speed pulleys, labels, soft trim, appearance items, lubricants and paints and all tune-ups, seized, melted or holed piston and adjustments required.

Also excluded are:

- Damage resulting from installation of parts other than genuine BOMBARDIER parts.
- Damage caused by failure to provide **proper maintenance** as detailed in the **Operator Manual** supplied with each SKI-DOO snowmobile. The labour, parts and lubricants cost of all maintenance services, including tune-ups and adjustments will be charged to the owner.
- Damage resulting from improper servicing or adjustment of the drive pulley assembly. **The drive assembly is factory sealed, and can only be serviced by an authorized SKI-DOO dealer.**
- Vehicles used for racing purposes.
- Vehicle used for rental purpose or other business purposes.
- All optional accessories installed on the vehicle. **(The normal warranty policy for parts and accessories, if any, applies).**
- Damage resulting from operation of the snowmobile on surfaces other than snow.
- Damage resulting from accident, fire or other casualty, misuse, abuse or neglect.
- Damage resulting from modification to the snowmobile not approved in writing by BOMBARDIER.
- Losses incurred by the snowmobile owner other than parts and labour, such as, but not limited to, transportation, towing, telephone calls, taxis, or any other incidental or consequential damages.

Some states or provinces do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply.

* Trademark of Bombardier Limited
® Registered Trademark Bombardier Limited

CONDITION TO HAVE WARRANTY WORK PERFORMED

Present, to the servicing dealer, the hard copy of the BOMBARDIER Customer Registration card given by the selling dealer at time of purchase.

EXPRESSED OR IMPLIED WARRANTIES

This warranty gives you specific rights, and you may also have other legal rights which may vary from state to state, or province to province.

Where applicable this warranty is expressly in lieu of all other expressed or implied warranties of BOMBARDIER, its distributors and the selling dealer, including any warranty of merchantability of fitness for any particular purpose; otherwise the implied warranty is limited to the duration of this warranty. However, some states or provinces do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply.

Neither the distributor, the selling dealer, nor any other person has been authorized to make any affirmation, representation or warranty other than those contained in this warranty, and if made, such affirmation, representation or warranty shall not be enforceable against BOMBARDIER or any other person.

CONSUMER ASSISTANCE

If a servicing problem or other difficulty occurs, we suggest the following:

1. Try to resolve the problem at the dealership with the Service Manager or Owner.
2. If this fails, contact your area distributor listed in the Operator Manual.
3. Then if your grievance still remains unsolved, you may write to us:
   Bombardier Limited
   Customer Relations Department
   Recreational Product Group
   Valcourt, Quebec, Canada, J0E 2L0

Bombardier Limited reserves the right to modify its warranty policy at any time, being understood that such modification will not alter the warranty conditions applicable to vehicles sold while the above warranty is in effect.

November 1978

Bombardier Limited
Valcourt, Quebec, Canada, J0E 2L0

LIMITED WARRANTY
MOTO-SKI® SNOWMOBILES 1980

BOMBARDIER Limited as manufacturer, warrants FROM THE DATE OF FIRST CONSUMER SALE, every 1980 Moto-Ski® snowmobile, sold as NEW AND UNUSED, by an authorized MOTO-SKI dealer, subject to the following limitations and conditions, for a period of:

- **two (2) seasons maximum** for models: SPIRIT*, MIRAGE*, FUTURA®

  Warranty STARTS on the date of sale to the first consumer and ENDS the SECOND APRIL 30TH following the date warranty coverage started.

or

- **Ninety (90) consecutive** days for the following models: SUPER SONIC*, GRAND PRIX® SPECIAL, ULTRA SONIC* subject to the following:

1. When a sale is made after MARCH 31ST of a given year but before THE 1ST DAY OF DECEMBER of the same year, the warranty will start on DECEMBER 1ST following the date of sale and terminate 90 days later.
2. When a sale is made on/or after JANUARY 2ND of a given year, the unused portion of the 90 days warranty as of MARCH 31ST, of that year will be carried over to the next season, beginning the 1ST DAY OF DECEMBER.

Any 1980 model not listed is not warranted.

WHAT WE WILL DO

BOMBARDIER will repair and/or replace, at its option, components defective in **material and/or workmanship (under normal use and service,)** with a genuine BOMBARDIER component without charge for parts or labour at any authorized MOTO-SKI dealer during said warranty period.

EXCLUSIONS

Items and components:

Any of the following expendable items and/or components that are damaged or worn due to normal use: variable speed drive belt, windshield, filters, ignition breaker points, condensers, spark plugs, light bulbs, protective lenses, brake linings, ski runner shoes, slider shoes on suspension and variable speed pulleys, labels, soft trim, appearance items, lubricants and paints and all tune-ups, seized, melted or holed piston and adjustments required.

Also excluded are:

- Damage resulting from installation of parts other than genuine BOMBARDIER parts.
- Damage caused by failure to provide **proper maintenance** as detailed in the **Operator Manual** supplied with each MOTO-SKI snowmobile. The labour, parts and lubricants cost of all maintenance services, including tune-ups and adjustments will be charged to the owner.
- Damage resulting from improper servicing or adjustment of the drive pulley assembly. **The drive pulley assembly is factory sealed, and can only be serviced by an authorized MOTO-SKI dealer.**
- Vehicles used for racing purposes.
- Vehicle used for rental purpose or other business purposes.
- All optional accessories installed on the vehicle. **(The normal warranty policy for parts and accessories, if any, applies).**
- Damage resulting from operation of the snowmobile on surfaces other than snow.
- Damage resulting from accident, fire or other casualty, misuse, abuse or neglect.
- Damage resulting from modification to the snowmobile not approved in writing by BOMBARDIER.
- Losses incurred by the snowmobile owner other than parts and labour, such as, but not limited to, transportation, towing, telephone calls, taxis, or any other incidental or consequential damages.

Some states or provinces do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply.

* Trademark of Bombardier Limited
® Registered Trademark Bombardier Limited

CONDITION TO HAVE WARRANTY WORK PERFORMED

Present, to the servicing dealer, the hard copy of the BOMBARDIER Customer Registration card given by the selling dealer at time of purchase.

EXPRESSED OR IMPLIED WARRANTIES

This warranty gives you specific rights, and you may also have other legal rights which may vary from state to state, or province to province.

Where applicable this warranty is expressly in lieu of all other expressed or implied warranties of BOMBARDIER, its distributors and the selling dealer, including any warranty of merchantability of fitness for any particular purpose; otherwise the implied warranty is limited to the duration of this warranty. However, some states or provinces do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply.

Neither the distributor, the selling dealer, nor any other person has been authorized to make any affirmation, representation or warranty other than those contained in this warranty, and if made, such affirmation, representation or warranty shall not be enforceable against BOMBARDIER or any other person.

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