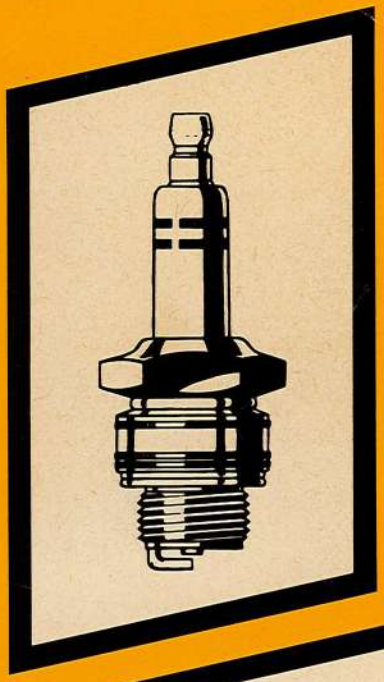
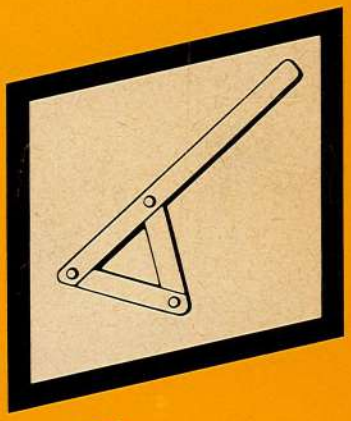
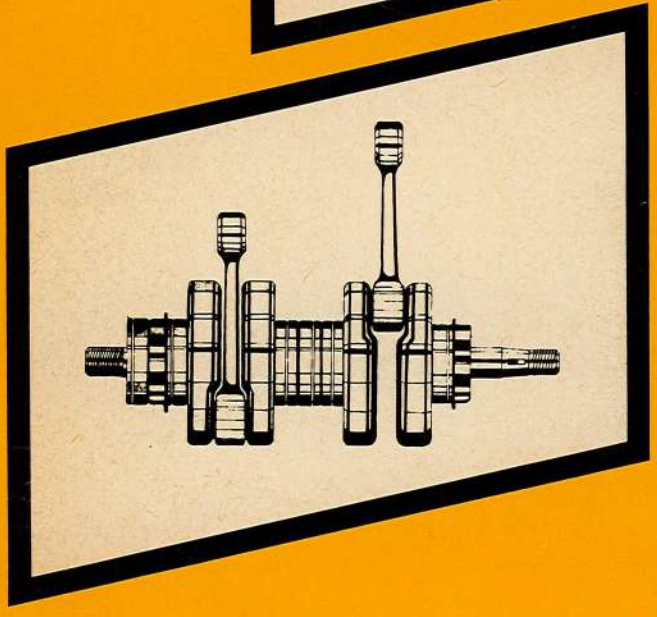
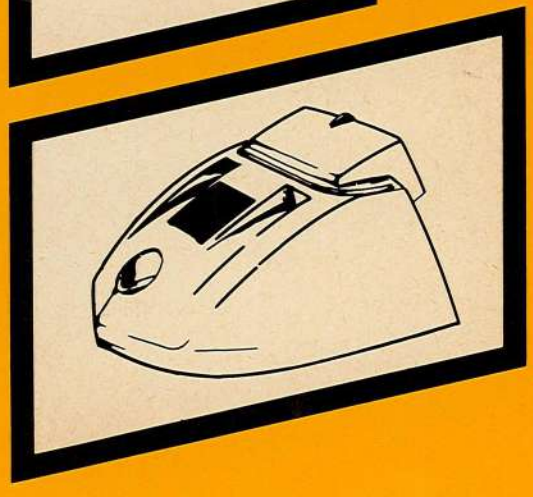
"72" Ski-Doo* Shop Manual

1 Suspension
Transmission
Steering & Ski System
2 Engine
3 Electrical
4 Body & Frame
5 Special Tools









BOMBARDIER

Élan·Olympique·Nordic· Skandic·T'NT·Valmont·Alpine·

*Trademark Bombardier Limited

Table of Contents

INTRODUCTION

FOREWORD

This Manual has been prepared by the Technical Information Center of Bombardier Limited, and contains the complete servicing of all Ski-Doo snowmobiles for 1972 except Blizzard and T'NT 400 snowmobiles. (Refer to code chart).

The Shop Manual is not intended to replace the Owner's Manual. The latter is basic maintenance, driving hints and/or warnings and we strongly recommend thorough reading of it before undertaking any shop manual procedure.

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

A number of procedures throughout the book require the use of special tools. Where a special tool is indicated, refer to section 5. Before commencing any procedure, be sure that you have on hand all of the tools required or approved equivalents.

ARRANGEMENT OF THE MANUAL

The Manual is divided into five (5) major Sections: (1) Suspension and Transmission, (2) Engine, (3) Electrical, (4) Body and Frame, (5) Special Tools.

Each Section includes a general description of the system/component, replacement procedures, and adjustment/alignment instructions; all adequately supported by numerous illustrations.

IMPORTANT: It is not necessary to carry out an entire procedure if your task can be completed by any of the intermediate steps. At any point, once you have accomplished your intentions, merely do the steps you have followed in reverse order to complete the assignment.

The sequence of the Sections has been arranged to conform with the established format of the Bombardier Parts Catalogue, to assist the user in cross-referring.

The Table of Contents on the first page of the Manual lists the Sections and Sub-sections, and indicates the general order of content.

DEFINITION OF NUMBERING SYSTEMS

The Manual makes use of a 3-part digital numbering system (i.e. 1-01-01), in which the first digit represents the Section (1), the second digit the Sub-section (1-01) and the third digit, the Page number (1-01-01).

Figure numbers accompanying the illustrations utilize the same system (i.e. 1-4-26). The first digit represents the Section (1), the second digit, the Sub-section (1-4) and the third digit, the Figure number (1-4-26).

ILLUSTRATIONS

The illustrations are conveniently located as close as possible to the written procedures and are meant to assist the user in identifying parts and components. In some cases, however, depending on model, they may not show the exact relation or arrangement of parts, as space within the Manual does not permit. The figure shown is that which relates to the greatest number of models and servicing methods detailed.

GENERAL

All of 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.

IDENTIFICATION

Warranty identification of the vehicle. The four first numbers indicate the year of the vehicle, the vehicle model and engine size. The remaining digits are actual serial numbers of production. (see code chart)

Engine serial numbers are used for tracing and identification. The numbers on the track are serial numbers for production and identification purposes.

All serial numbers become valuable in the event of warranty claims, loss, theft or dispute. They are prominently displayed and easy to locate.

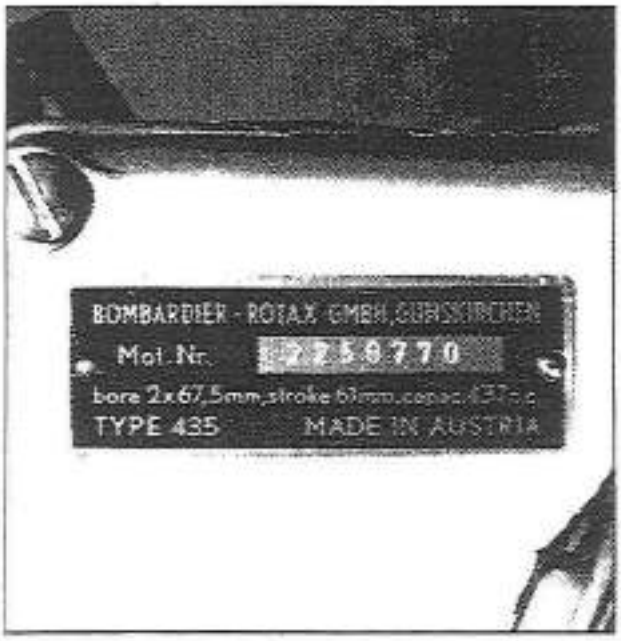
LOCATION OF SERIAL NUMBERS

FRAME (VEHICLE SERIAL) NUMBER: Located on right side of frame, at rear.

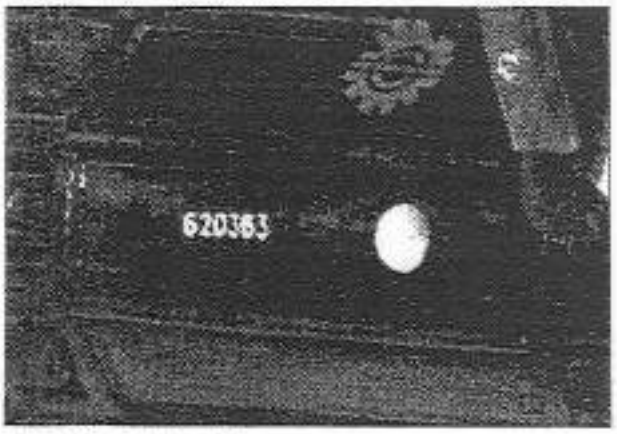
ENGINE: Located at the right side of engine, on the fan cowl, above the manual starter handle.

TRACK(S): Stamped directly into the track, at one of the recesses formed by the cross links. To locate, turn track slowly until number appears between the rear sprockets.

Typical Vehicle Identification

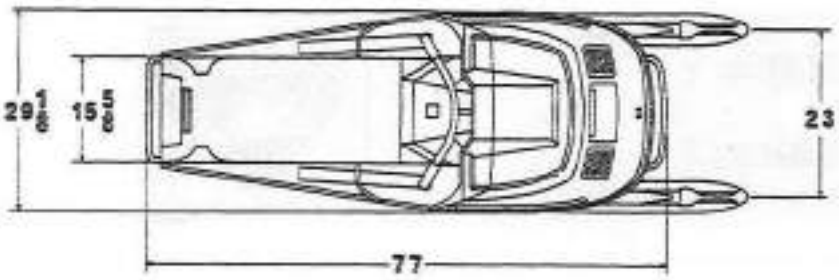


Engine Serial Number

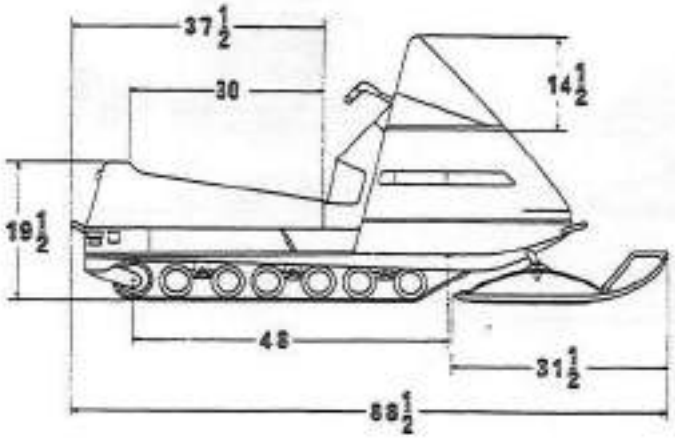


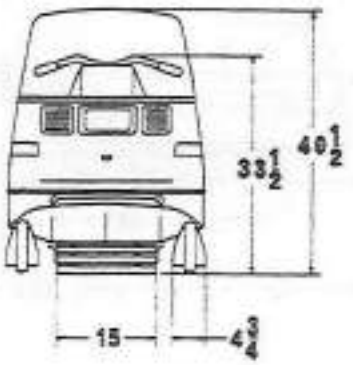
Track Serial Number

IMPORTANT – if vehicle is still under Warranty, read Warranty conditions and exclusions at back of manual carefully before commencing any procedure. Unrestricted tampering can invalidate your Warranty.

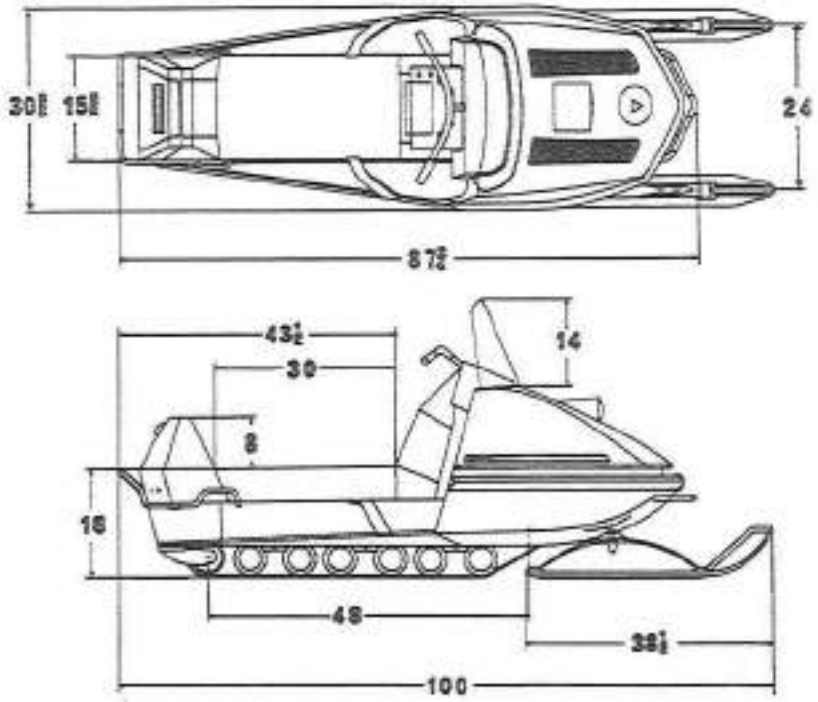


élan



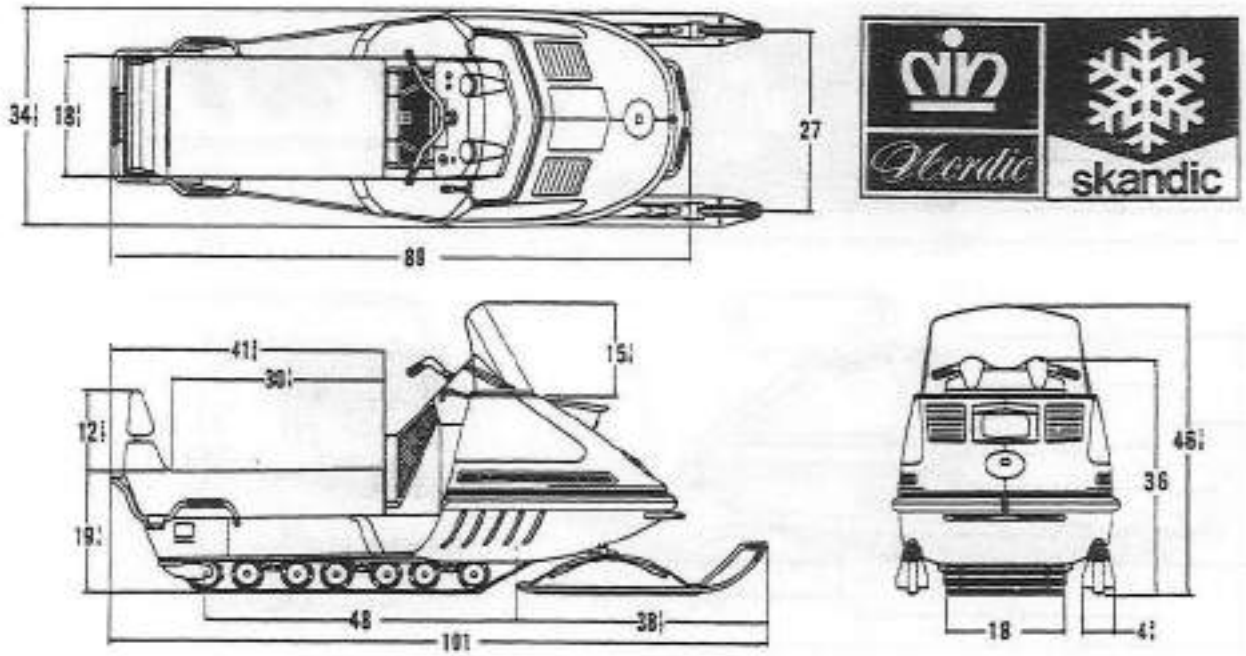


ITEM	ÉLAN	250	250E
ENGINE	No. of Cylinders	One	One
	Bore	69mm	69mm
	Stroke	66mm	66mm
	Displacement	246.8cc	246.8cc
	Horse Power	12	12
	Compression Ratio	7.5:1	7.5:1
	Starting	Manual	Electric
CHASSIS	Overall Length	88-1/2"	88-1/2"
	Overall Width	29-1/8"	29-1/8"
	Height w/o Windshield	33-1/2"	33-1/2"
	Weight (lb.)	252	288
	Bearing Area	1070 sq. in.	1070 sq.in.
	Ground Pressure (P.S.I.)	0.236	0.269
	Max. Load Capacity	200 lbs.	200 lbs.
POWER TRAIN	Track (Width)	15"	15"
	Standard Gear Ratio	10/25	10/25
ELECTRICAL SYSTEM	Lighting Coil (Watts)	40W	75W
	Spark Plug (Bosch)	M-240-T-1	M-240-T-1
	Spark Plug (Gap)	.020"	.020"
	Breaker Points (Gap)	.014" - .018"	.014" - .018"
FUEL	Tank Capacity – Imp.	3.5 gals.	3.5 gals.
	– U.S.	4.38 gals.	4.38 gals.
	Mixing Ratio (Gas/Oil)	20/1	20/1
BRAKE	Type	Pivoting	Pivoting
ACCESSORIES	Speedometer – Tachometer	Optional	Optional



OLYMPIQUE

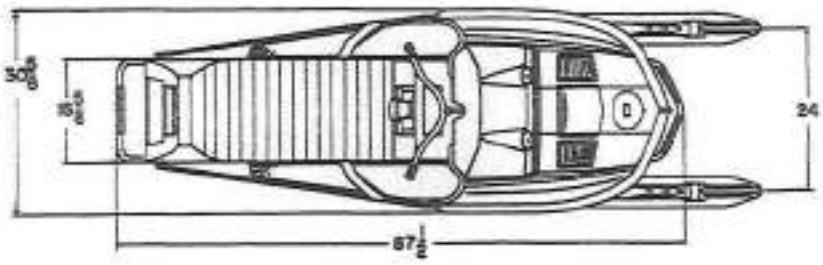
ITEM	OLYMPIQUE	300	335	335E	399	399E
ENGINE	No. of Cylinders	One	One	Two	Two	Two
	Bore	76mm	78mm	78mm	2x64.5mm	2x64.5mm
	Stroke	66mm	70mm	70mm	2x61mm	2x61mm
	Displacement	299cc	335cc	335cc	399cc	399cc
	Horse Power	15	20	20	24	24
	Compression Ratio	7:1	9:1	9:1	9:1	9:1
	Starting	Manual	Manual	Electric	Manual	Electric
CHASSIS	Overall Length	100"	100"	100"	100"	100"
	Overall Width	30-5/8"	30-5/8"	30-5/8"	30-5/8"	30-5/8"
	Height w/o Windshield	34-3/4"	34-3/4"	34-3/4"	34-3/4"	34-3/4"
	Weight (lbs.)	327	333	362	349	384
	Bearing Area	1070 sq.in	1070 sq.in.	1070 sq.in.	1070 sq.in.	1070 sq.in.
	Ground Pressure (P.S.I.)	0.299	0.305	0.332	0.320	0.352
POWER TRAIN	Track (Width)	15"	15"	15"	15"	15"
	Standard Gear Ratio	15/35	15/34	15/34	16/34	16/34
ELECTRICAL SYSTEM	Lighting Coil (Watts)	40W	40W	75W	75W	75W
	Spark Plug (Bosch)	M-240-T-1	M-240-T-1	M-240-T-1	M-240-T-1	M-240-T-1
	Spark Plug (gap)	.020"	.020"	.020"	.020"	.020"
	Breaker Points (gap)	.014" - .018"	.014" - .018"	.014" - .018"	.014" - .018"	.014" - .018"
FUEL	Tank Capacity — Imp.	5 gals.	5 gals.	5 gals.	5 gals.	5 gals.
	— U.S.	6.25 gals.	6.25 gals.	6.25 gals.	6.25 gals.	6.25 gals.
	Mixing Ratio (Gas/Oil)	20/1	20/1	20/1	20/1	20/1
BRAKE	Type	Drum	Drum	Drum	Drum	Drum
ACCESSORIES	Speedometer	Optional	Optional	Optional	Optional	Optional
	Tachometer	Optional	Optional	Optional	Optional	Optional

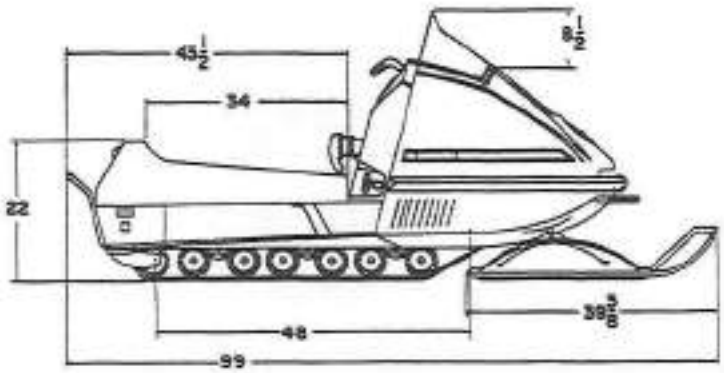


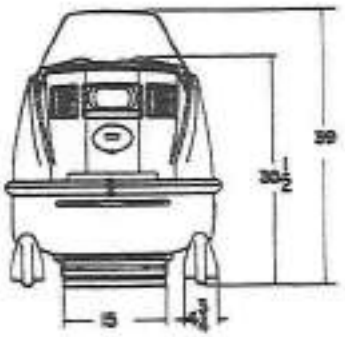
ILLUSTRATED MODEL NORDIC 440E

ITEM		NORDIC 440	NORDIC 440E	NORDIC 640ER	SKANDIC 335
ENGINE	No. of Cylinders	Two	Two	Two	One
	Bore	2x67.5mm	2x67.5mm	2x76mm	78mm
	Stroke	2x61mm	2x61mm	2x70mm	70mm
	Displacement	436.6cc	436.6cc	635.1cc	335cc
	Horse Power	28	28	35	20
	Compression Ratio	9:1	9:1	9:1	9:1
	Starting	Manual	Electric	Electric	Manual
CHASSIS	Overall Length	101"	101"	101"	98-3/4"
	Overall Width	34-1/2"	34-1/2"	34-1/2"	34"
	Height w/o Windshield	36"	36"	36"	33"
	Weight (lbs.)	405	440	474	335
	Bearing Area	1242 sq.in.	1242 sq.in.	1242 sq.in.	1242 sq.in.
	Ground Pressure (P.S.I.)	0.326	0.354	0.382	0.270
POWER TRAIN	Track (Width)	18"	18"	18"	18"
	Standard Gear Ratio	16/34	16/34	19/33	12/33
ELECTRICAL SYSTEM	Lighting Coil (Watts)	75W	75W	120W	40W
	Spark Plug (Bosch)	M-240-T-1	M-240-T-1	M-280-T-31	M-240-T-1
	Spark Plug (gap)	.020"	.020"	.020"	.020"
	Breaker Points (gap)	.014" - .018"	.014" - .018"	.014" - .018"	.014" - .018"
FUEL	Tank Capacity — Imp.	5.5 gals.	5.5 gals.	5.5 gals.	5 gals.
	— U.S.	6.875 gals.	6.875 gals.	6.875 gals.	6.25 gals.
	Mixing Ratio (gas/oil)	20/1	20/1	20/1	20/1
BRAKE	Type	Disc	Disc	Disc	Drum
ACCESSORIES	Speedometer	Optional	Optional	Standard	Optional
	Tachometer	Optional	Optional	Standard	Optional

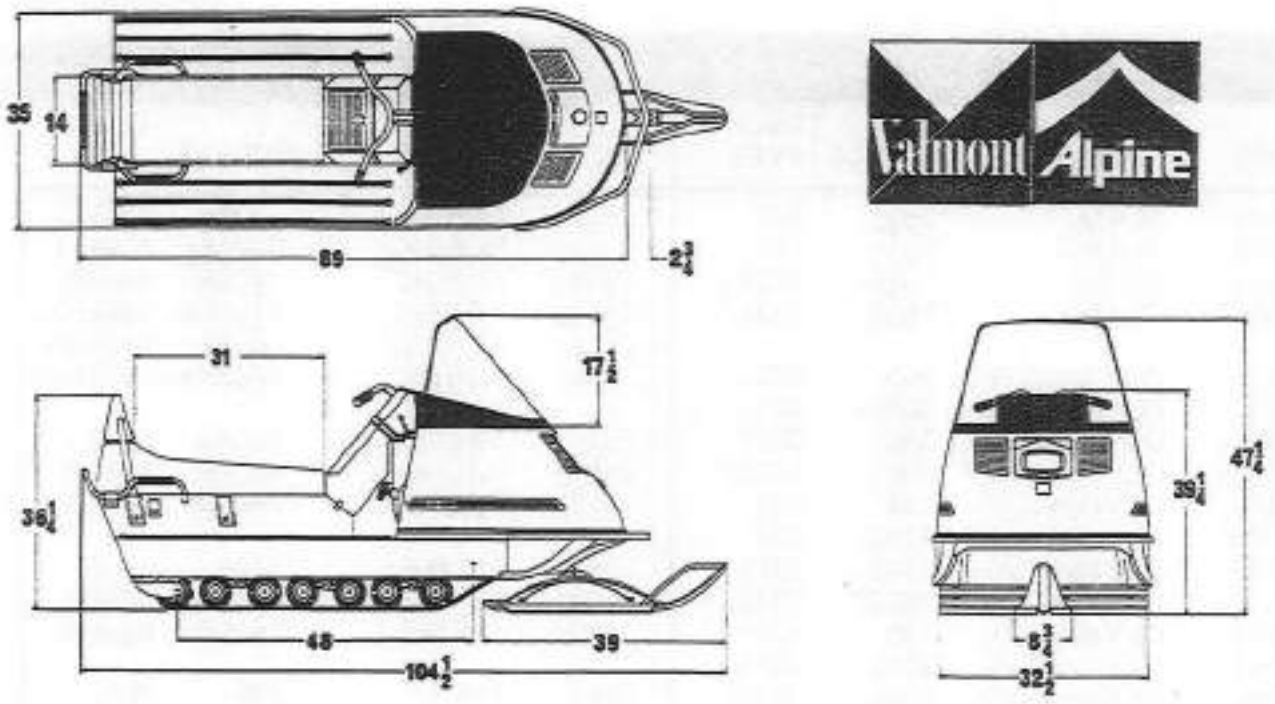
SPECIFICATIONS







ITEM	T'NT	292	340	440	640	775
ENGINE	No. of Cylinders	One	Two	Two	Two	Two
	Bore	75mm	2x59.5mm	2x67.5mm	2x76mm	2x82mm
	Stroke	66mm	2x61mm	2x61mm	2x70mm	2x72mm
	Displacement	291.6cc	339.2cc	436.6cc	635.1cc	771cc
	Horse Power	20	28	38	41	52
	Compression Ratio	10.5:1	11.8:1	11.8:1	10.0:1	10.5:1
	Starting	Manual	Manual	Manual	Manual	Manual
CHASSIS	Overall Length	99"	99"	99"	101"	101"
	Overall Width	30-5/8"	30-5/8"	30-5/8"	34-1/2"	34-1/2"
	Height w/o Windshield	35-1/2"	35-1/2"	35-1/2"	36-1/2"	36-1/2"
	Weight (lbs.)	316	328	356	400	440
	Bearing Area	1092 sq.in.	1092 sq.in.	1092 sq.in.	1242 sq.in.	2142 sq.in.
	Ground Pressure (P.S.I.)	0.289	0.300	0.326	0.322	0.354
POWER TRAIN	Track (Width)	15"	15"	15"	18"	18"
	Standard Gear Ratio	15/34	16/34	18/34	20/34	22/34
ELEC-TRICAL SYSTEM	Lighting Coil (Watts)	75W	75W	75W	75W	75W
	Spark Plug (Bosch)	M-280-T-31	W-260-T-1	M-280-T-1	M-280-T-31	M-310-T-31
	Spark Plug (gap) (except pre-gapped plug)	.020"	.020"	.020"	.020"	.020"
	Breaker Points (gap)	.014" - .018"	.014" - .018"	.014" - .018"	.014" - .018"	.014" - .018"
FUEL	Tank Capacity — Imp.	5 gals.	5 gals.	5 gals.	5.5 gals.	5.5 gals.
	— U.S.	6.25 gals.	6.25 gals.	6.25 gals.	6.875 gals.	6.875 gals.
	Mixing Ratio (gas/oil)	20/1	20/1	20/1	20/1	20/1
BRAKE	Type	Disc	Disc	Disc	Disc	Disc
ACCES-SORIES	Speedometer	Standard	Standard	Standard	Standard	Standard
	Tachometer	Standard	Standard	Standard	Standard	Standard



ILLUSTRATED MODEL 440 VALMONT

ITEM		VALMONT 440R	VALMONT 440ER	ALPINE 640ER
ENGINE	No. of Cylinder	Two	Two	Two
	Bore	2x67.5mm	2x67.5mm	2x76mm
	Stroke	2x61mm	2x61mm	2x70mm
	Displacement	436.6cc	436.6cc	635.1cc
	Horse Power	28	28	35
	Compression Ratio	9:1	9:1	9:1
	Starting	Manual	Electric	Electric
CHASSIS	Overall Length	104-1/2"	104-1/2"	113-1/4"
	Overall Width	35"	35"	35"
	Height w/o Windshield	39-1/4"	39-1/4"	39-1/4"
	Weight (lbs.)	496	531	596
	Bearing Area	1756 sq.in.	1756 sq.in	2160 sq.in.
	Ground Pressure (P.S.I.)	0.282	0.302	0.277
POWER TRAIN	Track (Width)	2 x 15"	2 x 15"	2 x 15"
	Standard Gear Ratio	13/39	13/39	13/29
	Reverse	Standard	Standard	Standard
ELECTRICAL SYSTEM	Lighting Coil (Watts)	75W	75W	120W
	Spark Plug (Bosch)	M-240-T-1	M-240-T-1	M-280-T-31
	Spark Plug (gap)	.020"	.020"	.020"
	Breaker Points (gap)	.014" - .018"	.014" - .018"	.014" - .018"
FUEL	Tank Capacity – Imp.	5 gals.	5 gals.	5 gals.
	– U.S.	6.25 gals.	6.25 gals.	6.25 gals.
	Mixing Ratio (gas/oil)	20/1	20/1	20/1
BRAKE	Type	Disc	Disc	Disc
ACCESSORIES	Tachometer	Standard	Standard	Optional

ENGINE CODE CHART – YEAR 1972

CODE	VEHICLE	MODELS	ENGINE TYPE
2001	ÉLAN	250	247
2051	ÉLAN	250	247*
2002	ÉLAN	250E	247E
2052	ÉLAN	250E	247E*
2101	OLYMPIQUE	300	302
2111	OLYMPIQUE	300S	302
2151	OLYMPIQUE	300	302*
2161	OLYMPIQUE	300S	302S*
2102	OLYMPIQUE	335	337
2103	OLYMPIQUE	335E	337E
2112	OLYMPIQUE	335S	337S
2113	OLYMPIQUE	335ES	337ES
2152	OLYMPIQUE	335	337*
2153	OLYMPIQUE	335E	337E*
2162	OLYMPIQUE	335S	337S*
2163	OLYMPIQUE	335ES	337ES*
2104	OLYMPIQUE	399	401
2105	OLYMPIQUE	399E	401E
2114	OLYMPIQUE	399S	401S
2115	OLYMPIQUE	399ES	401ES
2154	OLYMPIQUE	399	401*
2155	OLYMPIQUE	399E	401E*
2164	OLYMPIQUE	399S	401S*
2165	OLYMPIQUE	399ES	401ES*
2201	SKANDIC	335	337
2211	SKANDIC	335S	337S
2251	SKANDIC	335	337*
2261	SKANDIC	335S	337S*
2202	NORDIC	440	434
2203	NORDIC	440E	434E
2212	NORDIC	440S	434S
2213	NORDIC	440ES	434ES
2252	NORDIC	440	434*
2253	NORDIC	440E	434E*
2262	NORDIC	440S	434S*
2263	NORDIC	440ES	434ES*
2204	NORDIC	640ER	640ER
2214	NORDIC	640ERS	640ERS
2254	NORDIC	640ER	640ER*
2264	NORDIC	640ERS	640ERS*
2321	VALMONT	440R	434R
2322	VALMONT	440ER	434ER
2323	VALMONT	640ER	640ER
2301	ALPINE	440E	440E
2302	ALPINE	440ER	440ER
2303	ALPINE	640ER	640ER
2401	T'NT	292	292
2411	T'NT	292S	292S
2451	T'NT	292	292*
2461	T'NT	292S	292S*
2404	T'NT	400	398
2414	T'NT	400S	298S
2402	T'NT	340	343
2412	T'NT	340S	343S
2452	T'NT	340	343*
2462	T'NT	340S	343S*
2403	T'NT	440	435
2453	T'NT	440	435*
2463	T'NT	440S	435S*
2413	T'NT	440S	435S
2622	T'NT	640	641
2623	T'NT	775	771
2632	T'NT	640S	641S
2633	T'NT	775S	771S
2672	T'NT	640	641*
2682	T'NT	640S	640S*

* (Western)

NOTICE: Since preparation date of this manual other Ski-Doo snowmobile models have been developed and as time and space do not permit, we have not covered these latest model developments. These models are: Élan 292 SS and T'NT 340 and 440 SD.

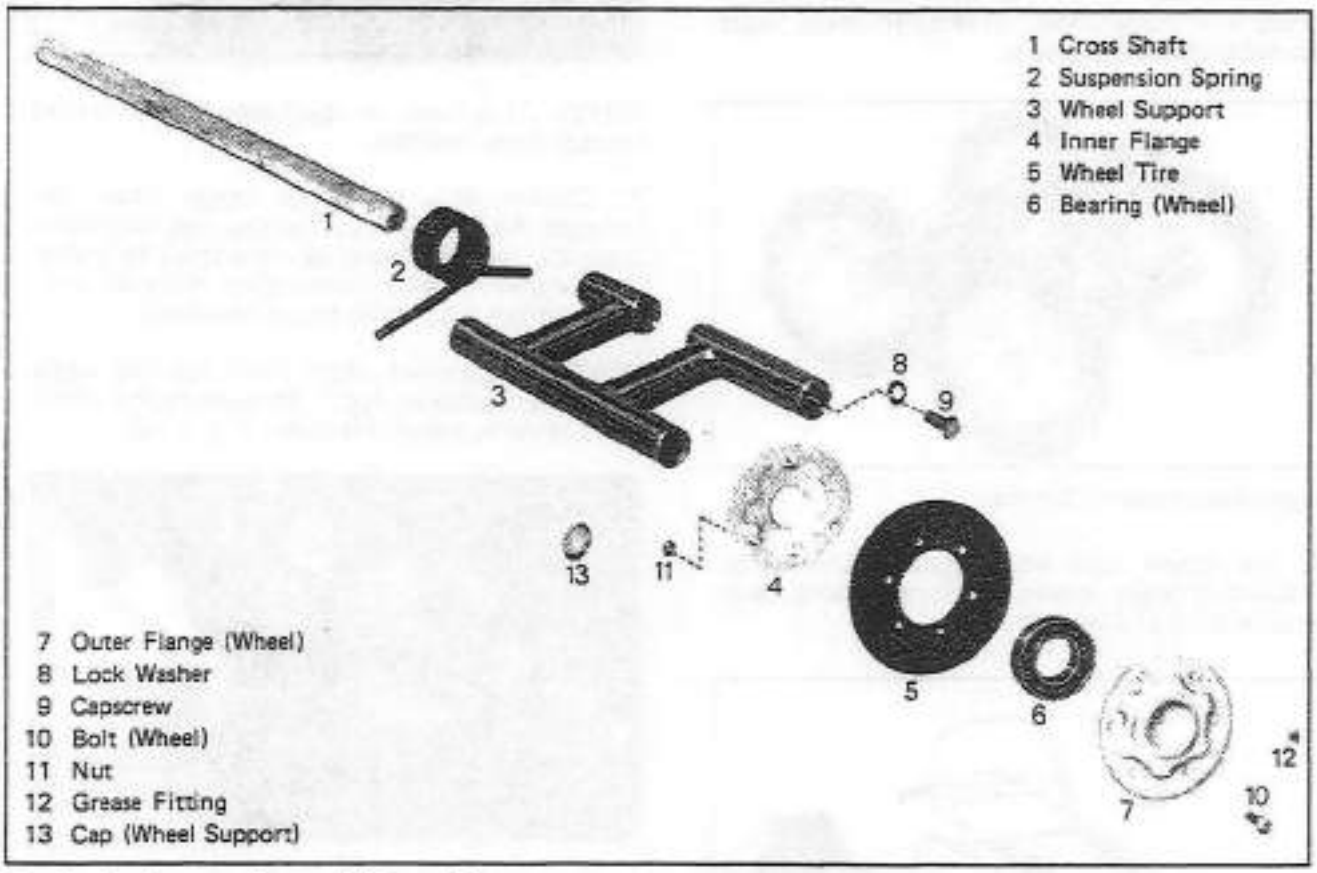
Table of Contents

Suspension

BOGIE WHEEL SYSTEM 1-1

GENERAL

The Ski-Doo snowmobile's ability to negotiate any snow covered terrain and to handle well at all speeds is the direct result of an especially designed bogie wheel system. Correct lubrication, maintenance, repair and overhaul procedure of this system will ensure smoother operation of the vehicle.

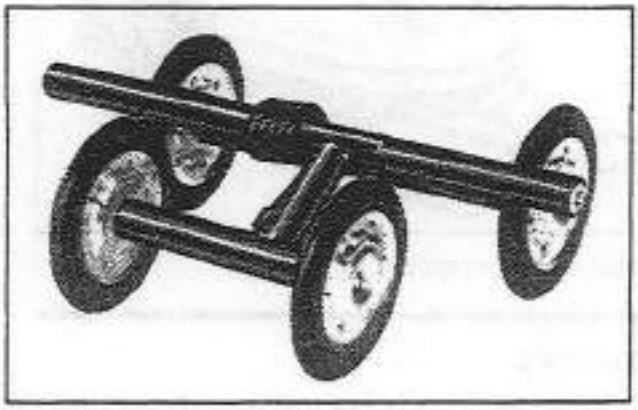


Bogie wheel set and legend (General)

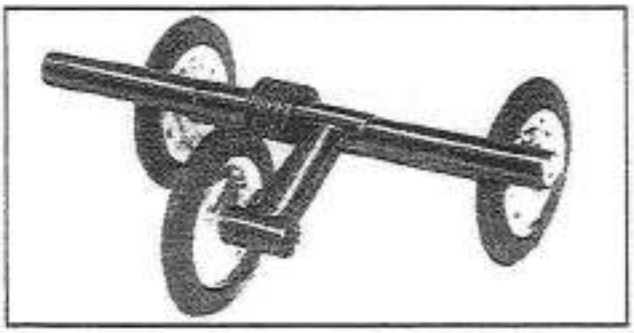
The bogie wheel system of all 1972 Ski-Doo snowmobile models is similar in design and fabrication, except for the following variations:

– The system of the Elan models consists of 3-sets of bogie wheels. The front and center sets incorporate 4-wheels while the rear set is made up of 3-wheels.

– Each system of the Olympique, Nordic, T'NT and Skandic models consists of 3-sets of bogie wheels, each set incorporating 4-wheels.

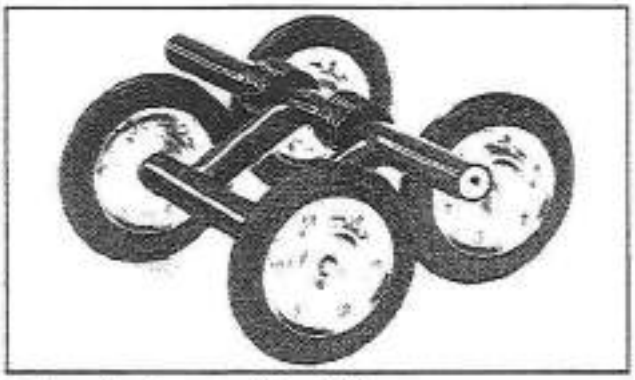


Bogie wheel set – Front and center (Elan only)



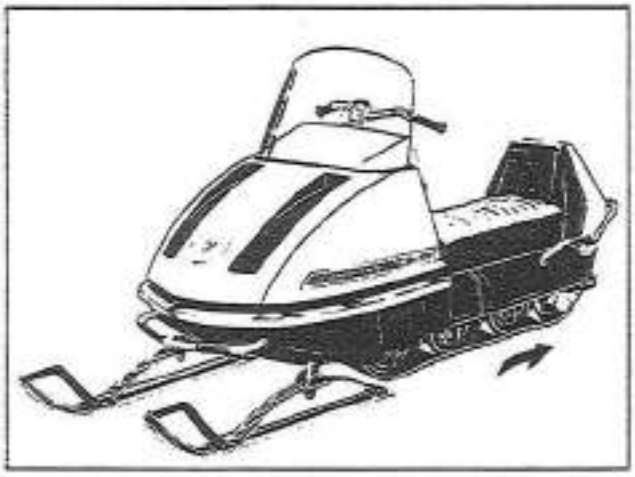
Rear bogie wheel set (Elan only)

– The system of the Valmont models consists of 6-sets of bogie wheels (3-sets per track), each set incorporating 4-wheels.



Bogie wheel system (Typical)

– The Alpine bogie wheel system is made up of 8-sets of bogie wheels (4-sets per track), each set consisting of 4-wheels.

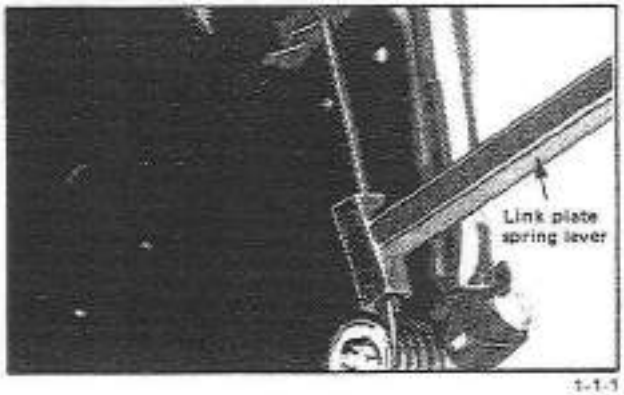


Bogie wheels in action

REMOVAL

1. Raise and block rear of vehicle off the ground.

2. Release track tension by unhooking the link plate springs using link plate spring lever (fig. 1-1-1).

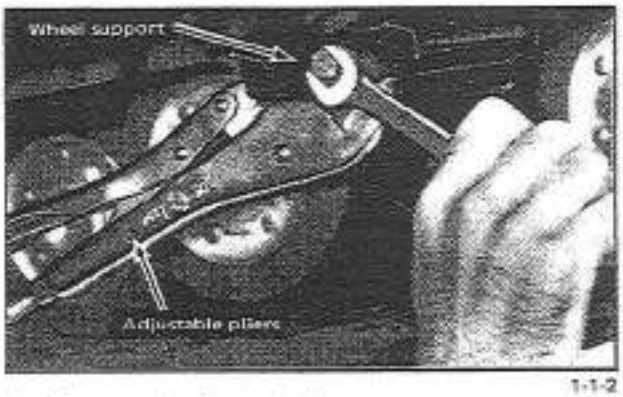


1-1-1

NOTE: The lever is applicable to all models except Élan models.

3. Commencing at center bogie wheel set (except Alpine model), remove the capscrews and lock washers securing cross shaft to frame. On Alpine model, commence removal with either of the two center bogie wheel sets.

NOTE: To prevent shaft from rotating while removing capscrew, apply pressure on the wheel support using adjustable pliers (fig. 1-1-2).



1-1-2

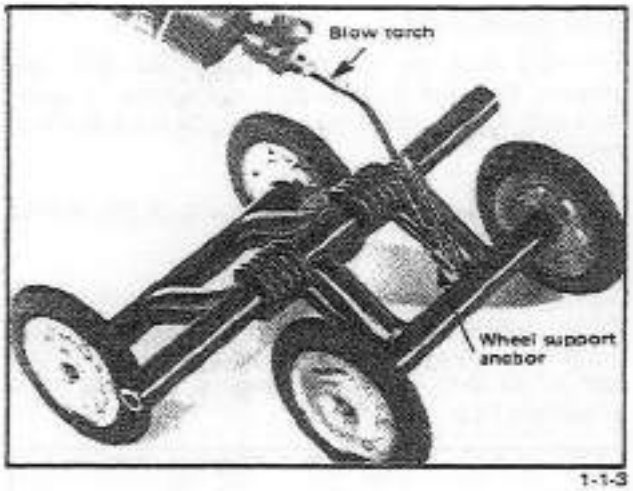
4. Remove bogie wheel set.

NOTE: Identify each set of bogie wheels as to installation position, (i.e. forward, center(s) and rear). Identification will assist you during installation procedures.

5. Repeat step 3 to remove remaining bogie wheel sets.

DISASSEMBLY

1. Heat wheel support anchor(s) then straighten. Unhook suspension spring(s) (fig. 1-1-3).



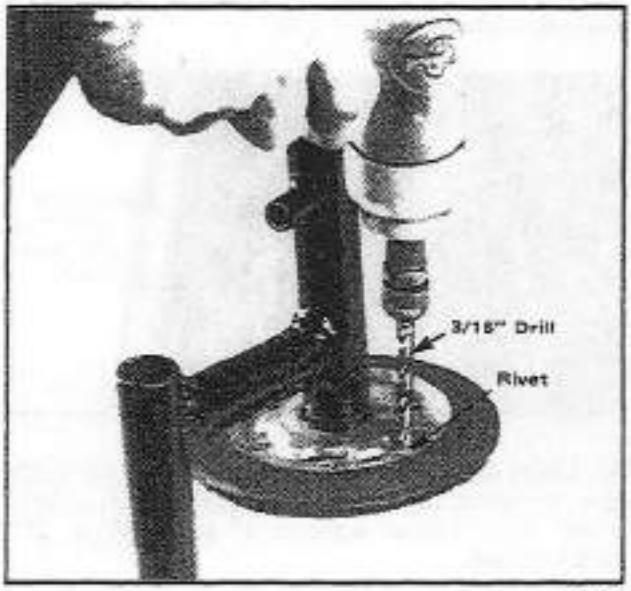
1-1-3

2. Pull out cross shaft from supports and remove the spring(s).

NOTE: Spring(s) must be retained with the bogie wheel set from which it has been removed. The gauge of the spring(s) varies in diameter.

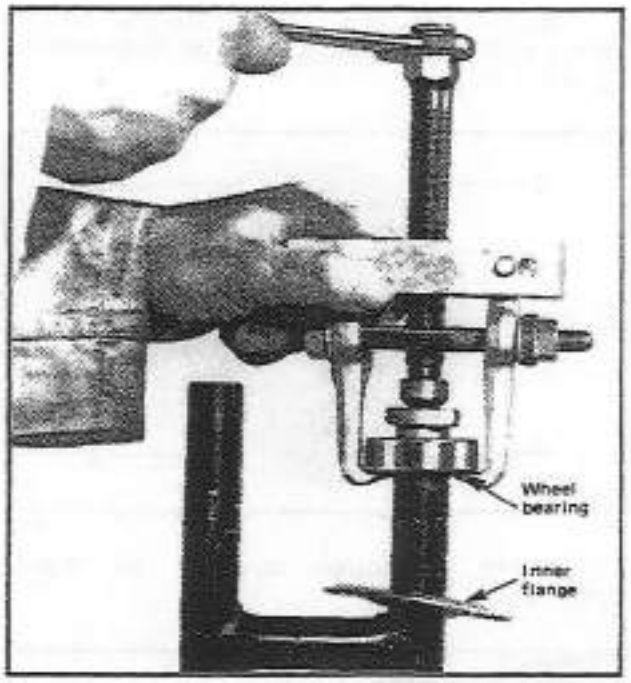
3. Using a 3/16 inch dia. drill, remove rivets securing outer flange and wheel tire to inner flange (fig. 1-1-4). It is important to remember that the back wheel of the rear bogie wheel set on the Elan models has a wider tire. Remove outer flange and wheel tire.

NOTE: Do not unscrew grease fitting from outer flange unless damaged, and replacement is necessary.



1-1-4

4. With an appropriate bearing puller, remove wheel bearing from support by pulling it by inner race (fig. 1-1-5). Remove inner flange.

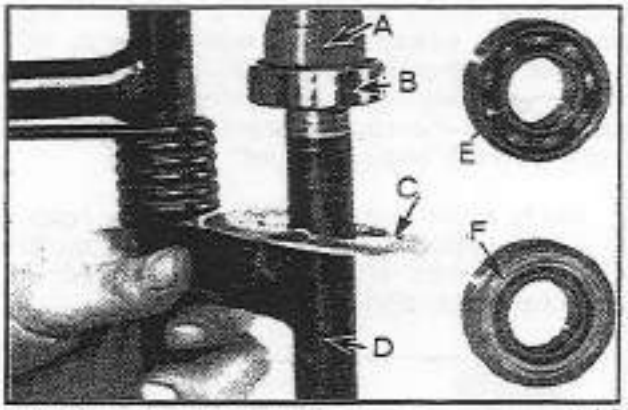


1-1-5

ASSEMBLY

1. Prior to Assembly procedure, ensure all components are clean and all defective parts have been repaired or replaced.

2. Place inner flange and wheel bearing on support. Ensure that bearing shield is facing towards inner flange, then press down on the inner race until bearing is sitting flush with support end (fig. 1-1-6).



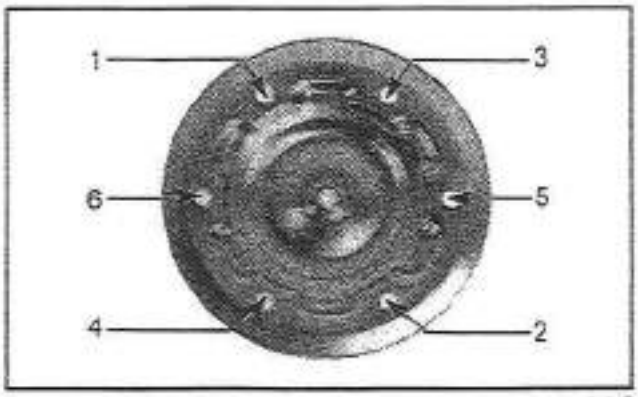
A Bearing pusher
B Wheel bearing
C Inner flange
D Wheel support
E Inner race
F Bearing shield

1-1-6

3. Position tire and outer flange on wheel support. Secure inner flange and wheel tire to outer flange with six (6) bolts and nuts.

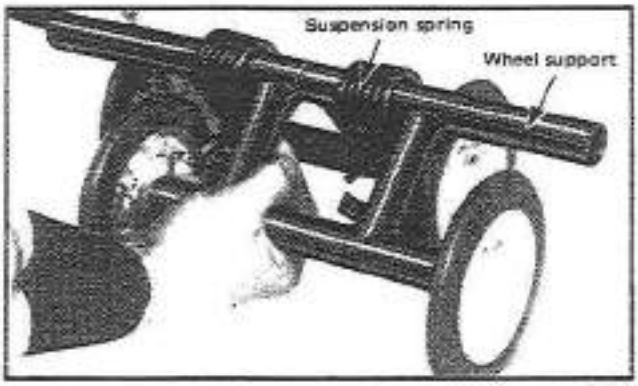
NOTE: On Elan models, ensure wider tire is installed on single wheel.

4. Tighten attaching parts securing wheel flanges and tire following the sequence shown in figure 1-1-7.



1-1-7

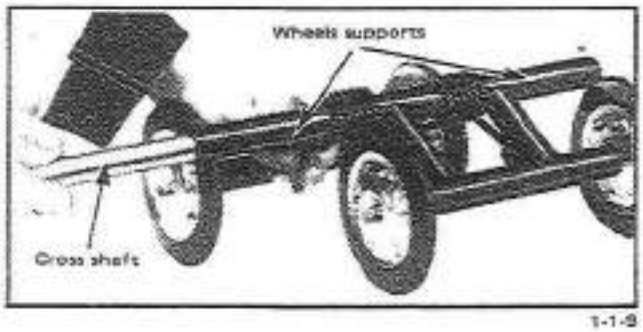
5. Position suspension spring(s) on wheel supports (fig. 1-1-8).



1-1-8

NOTE: On Elan models, the suspension springs are 9/32 inch diameter. On all other models, except the Alpine and Valmont, the front and center bogie wheels sets are equipped with 1/4 inch dia. springs and the rear bogie wheel set incorporates 9/32 inch dia. springs. The Alpine and Valmont incorporate two (2) 1/4 inch dia. springs on each bogie wheel set.

6. Apply a thin coat of low temperature grease on cross shafts and insert shafts into supports (fig. 1-1-9). Heat wheel support anchor(s) then close over suspension spring end(s).



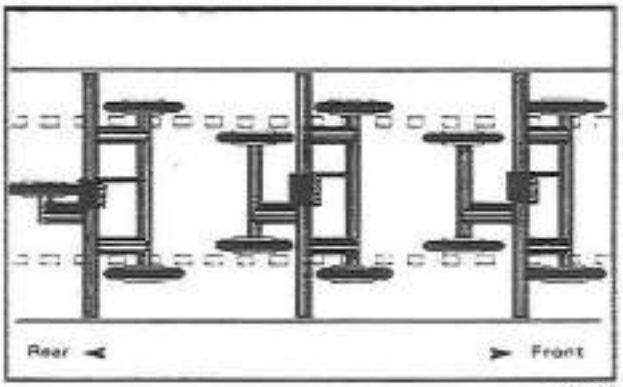
1-1-9

INSTALLATION

1. With rear of vehicle supported off the ground, position front bogie wheel set in location and secure to frame using lock washers and capscrews.

2. Secure rear and then remaining bogie wheel set(s) to frame.

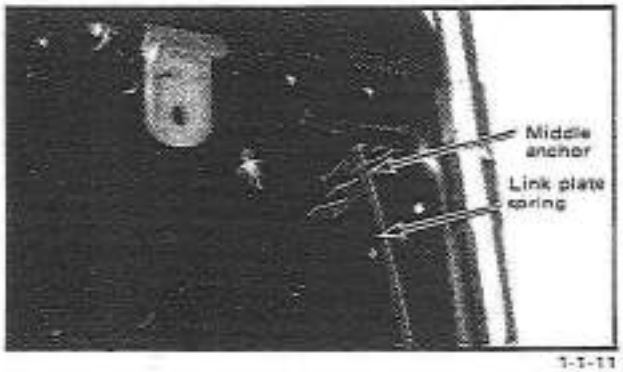
NOTE: On Elan models, position front and center bogie wheel sets so that wider wheel support is towards front of vehicle. Position the rear set so that the single wheel is towards back of vehicle (fig. 1-1-10).



1-1-10

3. Using link plate spring lever, apply track tension by hooking the link plate springs in the anchors.

NOTE: On all models except Elan, place link plate springs in middle position of 3-position slotted anchors (fig. 1-1-11).



1-1-11

4. Using a low pressure grease gun filled with low temperature grease, lubricate each bogie wheel until grease appears at joint. Wipe off excess grease.

5. Set vehicle on the ground.

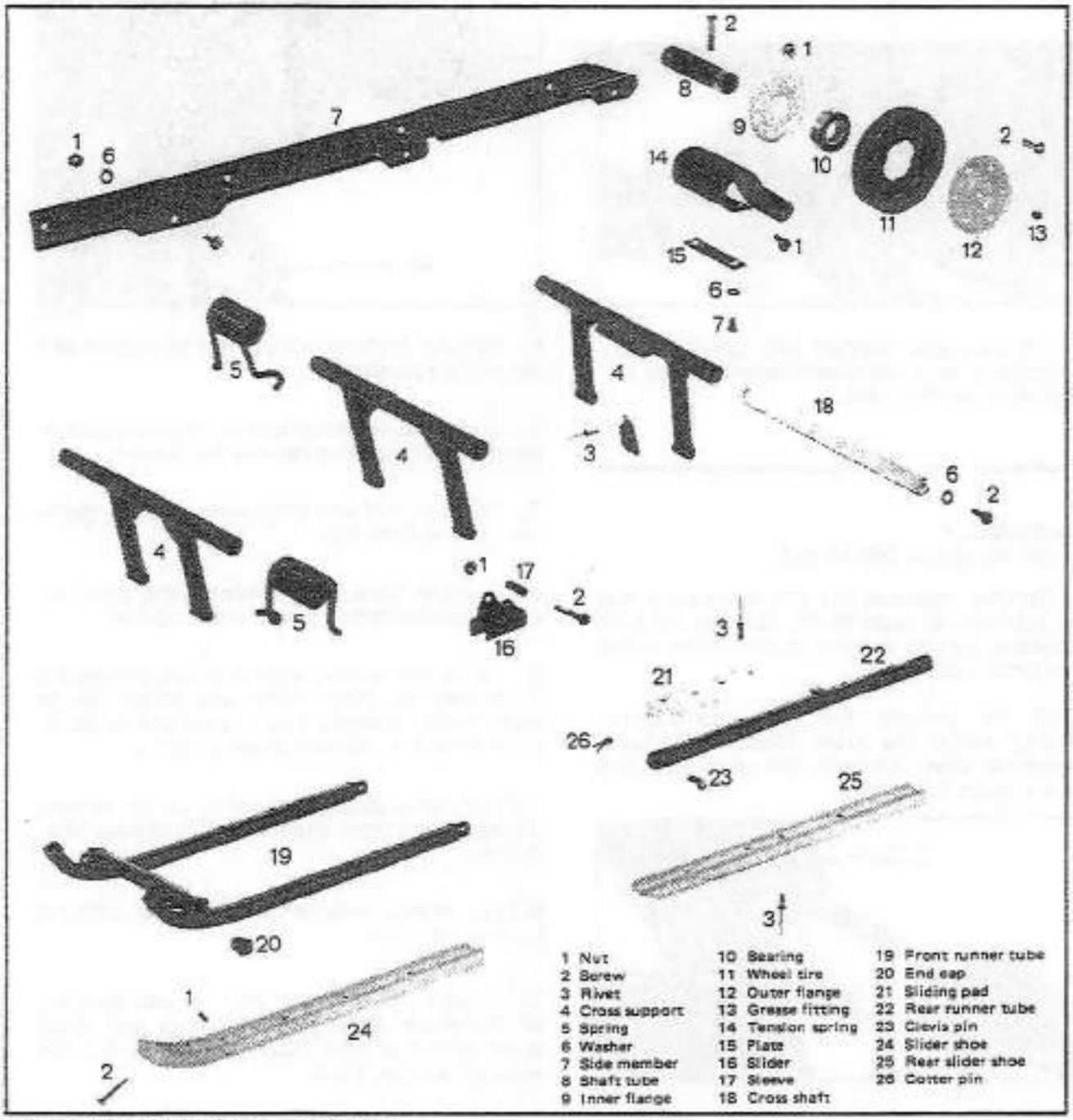
Suspension

SLIDE SUSPENSION 1-2

GENERAL

Basically, the principle of the slide suspension is to create uniform pressure over a maximum area of track giving the vehicle greatest possible contact with the underlaying snow surface.

The slide suspension is of a unit construction attached to the frame via side members.



Disassembled view of slide suspension

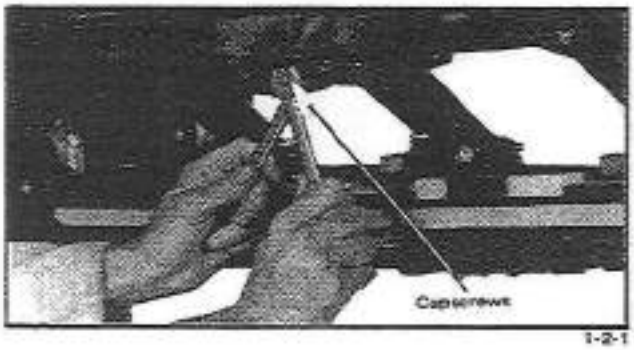
REMOVAL

1. Raise the rear of the vehicle and support it off the ground.

2. Using link plate spring lever, unhook link plate springs.

3. Release track tension by loosening link plate spring lock nuts and track adjuster bolts until ends of the bolts are flush with the side of the eye bolts.

4. Remove capscrews, washers and nuts securing side members to frame (fig. 1-2-1).



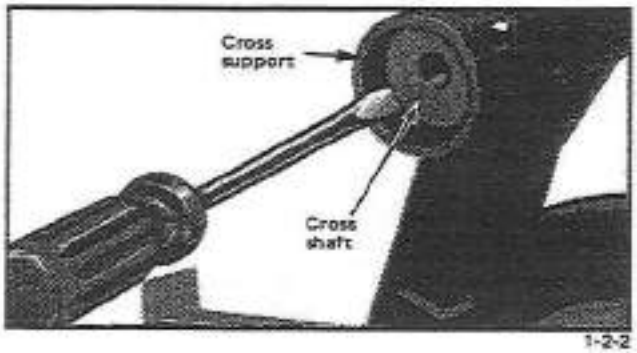
1-2-1

5. With capscrews, washers and nuts removed, the complete slide suspension assembly can be withdrawn from the track.

DISASSEMBLY
(Except Olympique 300 Model)

1. Remove capscrews and star washers securing side members to cross shafts. Remove eight (8) suspension springs and pull out the cross shafts from cross supports.

NOTE: To prevent the cross shafts from rotating within the cross supports, wedge a screwdriver blade between the cross shaft and cross support (fig. 1-2-2).



1-2-2

2. Remove the cotter pins and clevis pins attaching the front and rear runner tubes.

3. Slide the three (3) rear cross supports from the sliding pads.

4. Using a 1/8 inch dia. drill, remove the rivets attaching the stop bondings to the rear cross support (fig. 1-2-3).

1-2-3

5. Remove bolts securing sliders to support and remove the sleeves.

6. Remove bolts securing front cross support to front runner tube and remove the sleeves.

7. Remove nuts and bolts securing idler assembly to tension spring.

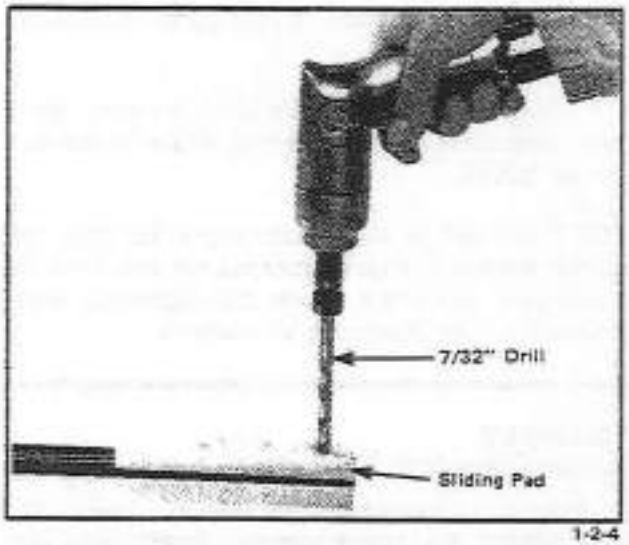
8. Remove bolts, star washers and plate securing tension spring to rear cross support.

9. To remove wheel, use a drill and remove the rivets securing outer flange and wheel tire to inner flange. Remove outer flange and wheel tire. If necessary, remove grease fittings.

10. With an appropriate bearing puller, remove wheel bearing from shaft tube and remove inner flange.

NOTE: Always remove the bearing by pulling it by the inner race.

11. Using a 7/32 inch dia. drill, remove the head of the rivets attaching slider pads and slider shoes to runner tube. Push out rivets with a flat head punch (fig. 1-2-4).



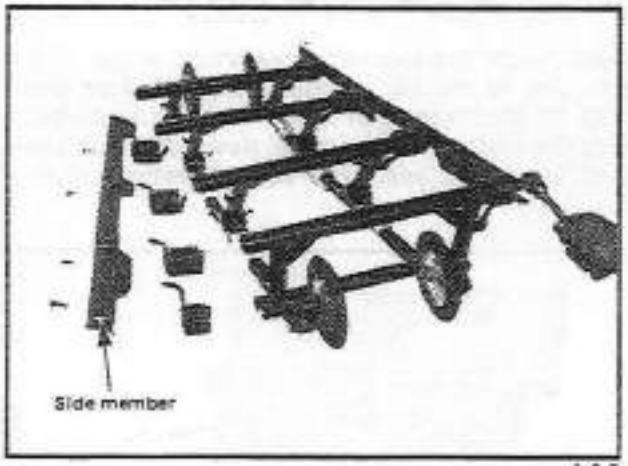
1-2-4

NOTE: If head of rivets securing slider shoe to runner tube is flush with contact surface, shoe is excessively worn and must be discarded and replaced during Assembly procedure.

DISASSEMBLY (Olympique 300 Models)

1. Remove capscrews and star washers securing side members to cross shafts. Heat support anchors then straighten. Remove eight (8) suspension springs and pull out the cross shafts from cross supports (fig. 1-2-5).

NOTE: To prevent the cross shafts from rotating within the cross supports, wedge a screwdriver blade between the cross shaft and cross support.

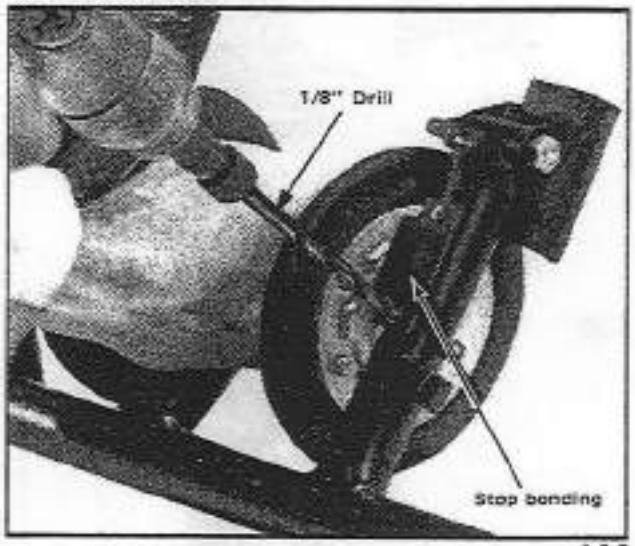


1-2-5

2. Remove the cotter pins and clevis pins attaching the front and rear runner tubes.

3. Slide the three (3) rear cross supports from the sliding pads.

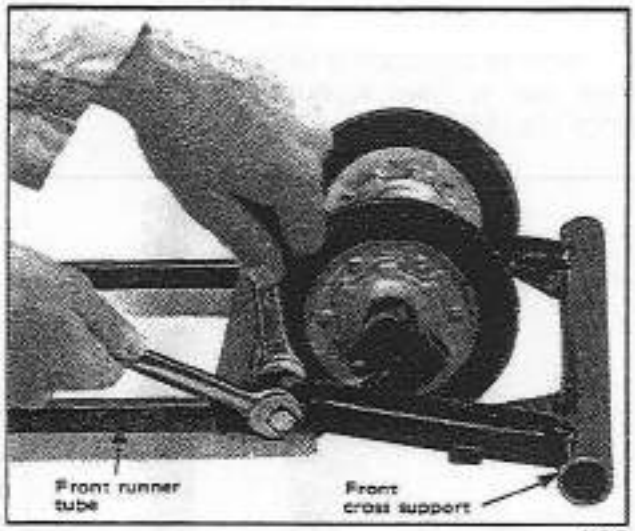
4. Using a 1/8 inch dia drill, remove the rivets attaching the stop bondings to the rear cross support (fig. 1-2-6)



1-2-6

5. Remove bolts securing sliders to support and remove the sleeves.

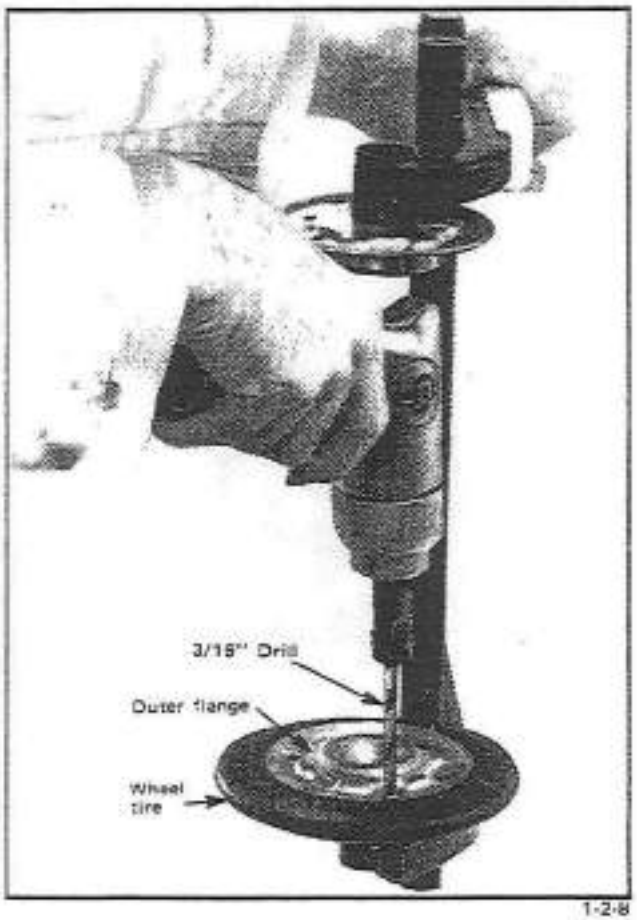
6. Remove bolts securing front cross support to front runner tube (fig. 1-2-7)



1-2-7

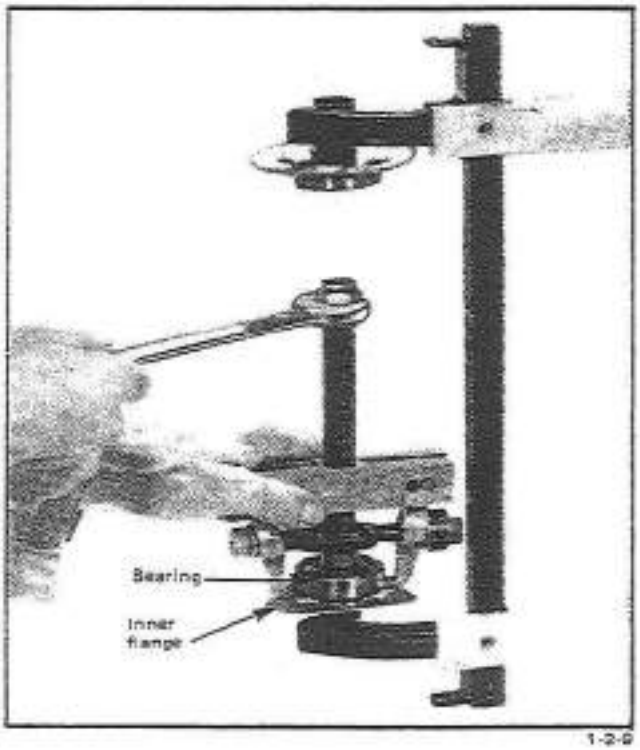
7. To remove the rear cross support wheels and front runner tube wheels, use a 3/16 inch dia drill and remove the rivets securing outer flange and wheel tire to inner flange (fig. 1-2-8). Remove outer flange and wheel tire.

NOTE: Do not unscrew grease fitting from outer flange unless damaged and replacement is necessary.



1-2-8

8. With an appropriate bearing puller, remove wheel bearing from support and remove inner flange (fig. 1-2-9).



1-2-9

NOTE: Always remove the bearing by pulling it by the inner race.

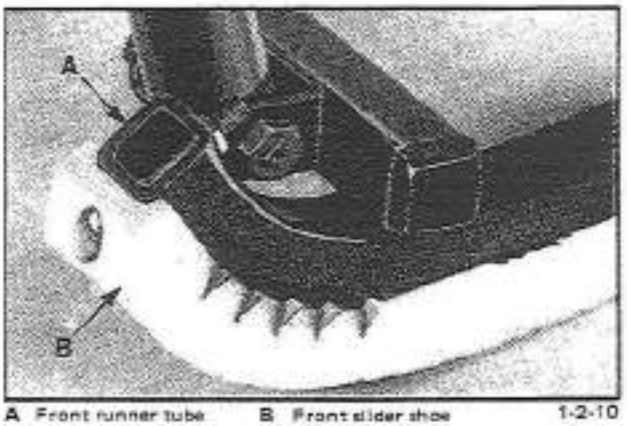
9. Using a 3/16 inch dia drill, remove the rivets attaching slider pads and slider shoes to runner tubes.

NOTE: If head of rivets securing slider shoe to runner tube is flush with contact surface, shoe is excessively worn and must be discarded and replaced during Assembly procedure.

ASSEMBLY
(Except Olympique 300 Model)

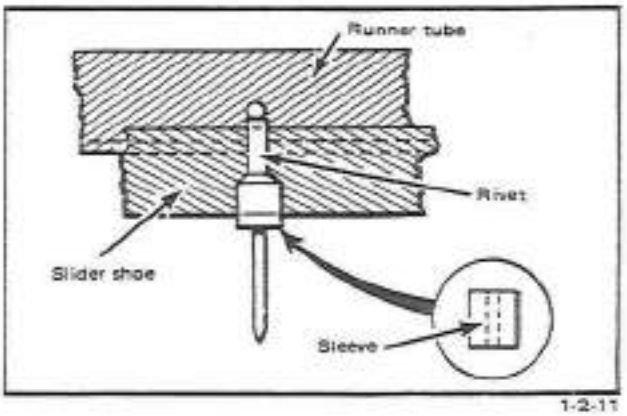
1. Prior to Assembly procedure, ensure all components are clean and all defective parts have been repaired or replaced.

2. Position slider shoes (angle of shoe must be facing forward) on rear and front runner tubes. Install two (2) bolts and nuts to secure front slider shoe to front runner tube (fig. 1-2-10).



A Front runner tube B Front slider shoe 1-2-10

Insert rivets and secure shoes firmly using a rivet gun. Due to the thickness of the slider shoe, the head of the rivet gun may not come in contact with the rivets. If so, a small sleeve seated on the rivet head will assist in easier riveting action (fig. 1-2-11)



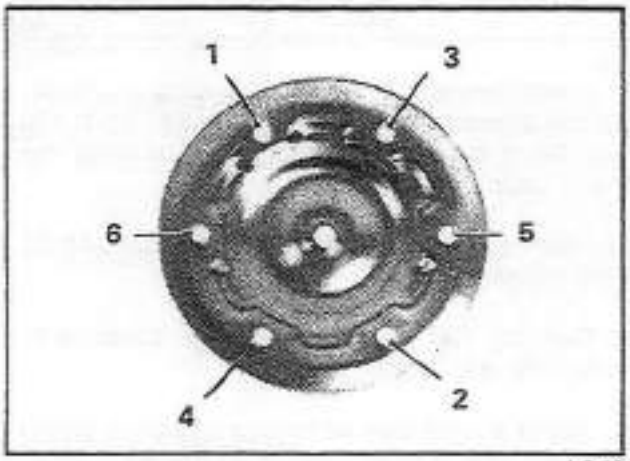
1-2-11

3. Position sliding pads on runner tubes, insert rivets and secure pads firmly.

4. Position inner flange and wheel bearing on the shaft tube. Ensure that the bearing shield is facing towards inner flange, then press down on the inner race until bearing is sitting flush.

5. Position wheel tire and outer flange on support. Secure the inner flange and wheel tire to outer flange with six (6) bolts and nuts.

6. Tighten attaching parts securing wheel flanges and tire following the sequence shown in figure 1-2-12.



1-2-12

7. Using a rivet gun, secure the stop bondings to rear cross support.

8. Install tension spring and plate on rear cross support. Secure using two (2) star washers and bolts.

9. Position idler wheel assembly on tension spring and secure with two (2) bolts and nuts.

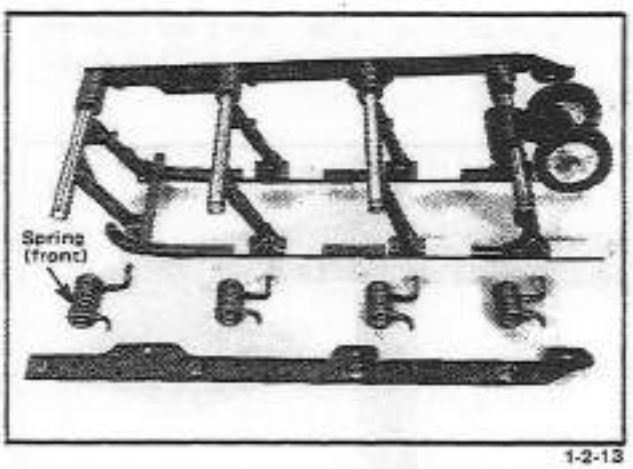
10. Insert sleeves in arms of cross supports. Secure cross supports to sliders by means of bolts and nuts. Slide the three (3) rear supports onto the sliding pads.

11. Insert sleeves and bolt front support to front runner tube.

12. Connect rear and front runner tubes with clevis pins and cotter pins.

13. Apply a light coat of low temperature grease on cross shafts and insert shafts into cross supports.

14. Position suspension springs, ensuring that the wider spring is installed on front cross support (fig. 1-2-13).



1-2-13

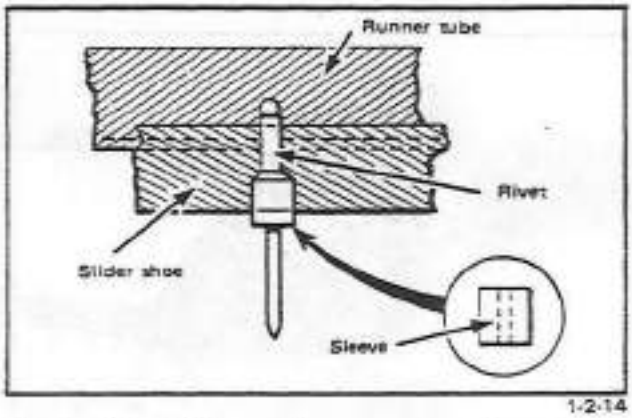
15. Secure the side members using washers and capscrews.

16. Lubricate idler wheels using a low pressure grease gun filled with low temperature grease until lubricant appears at joint. Wipe off excess.

ASSEMBLY (Olympique 300 Models)

1. Prior to Assembly procedure, ensure all components are clean and all defective parts have been repaired or replaced.

2. Position slider shoes (angle of shoe must be facing forward) on rear and front runner tubes and insert rivets. Secure shoes firmly using a rivet gun. Due to the thickness of the slider shoe, the head of the rivet gun may not come in contact with the rivets. If so, a small sleeve seated on the rivet head will assist in easier riveting action (fig. 1-2-14).

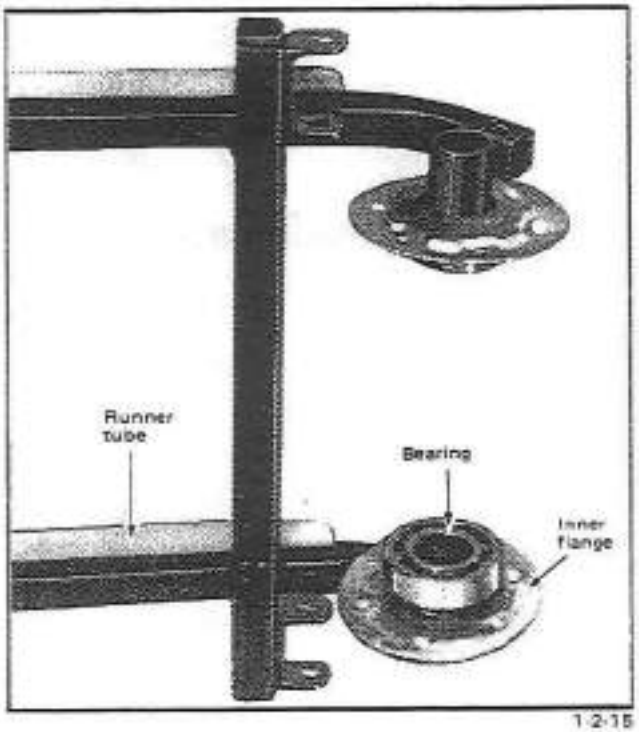


1-2-14

3. Position sliding pads on runner tubes, insert rivets and secure pads firmly.

4. Position inner flange and wheel bearing on the runner tube. Ensure that the bearing shield is

facing towards inner flange, then press down on the inner race until bearing is sitting flush. (fig. 1-2-15).

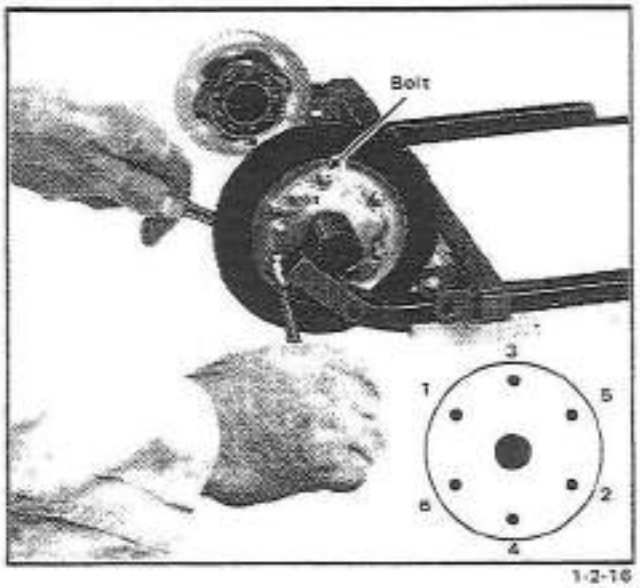


1-2-15

5. Repeat step 4 to install inner flange and wheel bearing on the rear cross support.

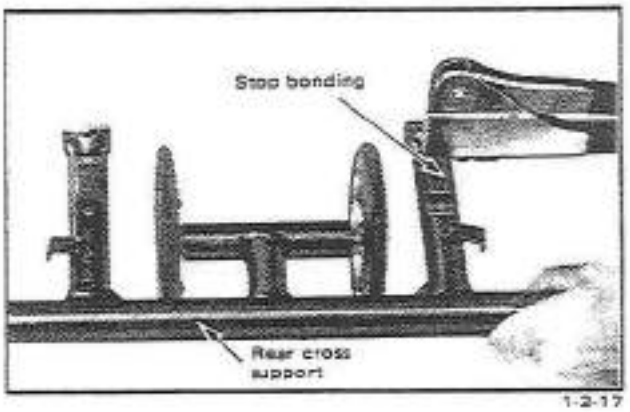
6. Position wheel tire and outer flange on support. Secure the inner flange and wheel tire to outer flange with six (6) bolts and nuts.

7. Tighten attaching parts securing wheel flanges and tire following the sequence shown in figure 1-2-16.



1-2-16

8. Using a rivet gun, secure the stop bondings to rear cross support (fig. 1-2-17).



1-2-17

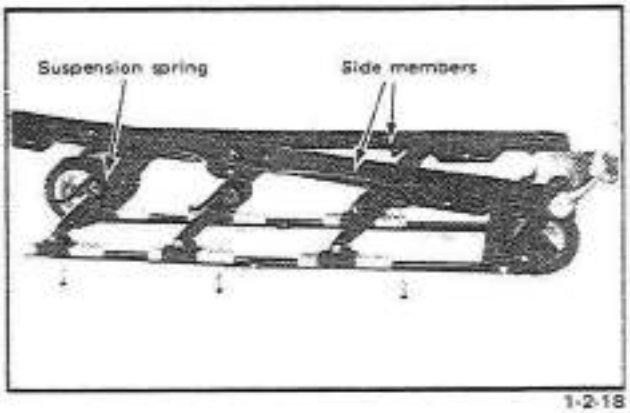
9. Insert sleeves in arms of cross supports. Secure cross supports to sliders by means of bolts and nuts. Slide the three (3) rear supports onto the sliding pads.

10. Insert sleeves and then bolt front support to front runner tube.

11. Connect rear and front runner tubes with clevis pins and cotter pins.

12. Apply a light coat of low temperature grease on cross shafts and insert shafts into cross supports.

13. Position suspension springs and close the cross support anchors over the spring ends. Secure the side members using washers and capscrews (fig. 1-2-18).

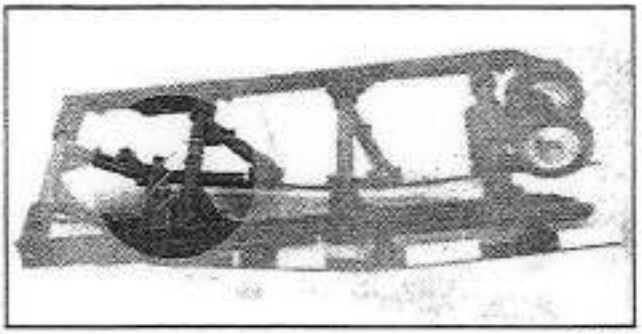


1-2-18

INSTALLATION

1. With rear of the vehicle still raised off the ground and track tension released, position slide suspension unit within the track.

NOTE: Due to the confines of the track and to ease installation procedures, collapse the slide suspension unit by applying downward pressure on the front cross support. Then using a fairly strong length of wire, tie the front cross support and the front runner tube together (fig. 1-2-19).



1-2-19

2. Secure the side members of the slide suspension to frame by means of capscrews, washers and nuts. Cut and discard the temporarily installed wire.

3. Using link plate spring lever, hook link plate springs into middle position of 3-position slotted anchors.

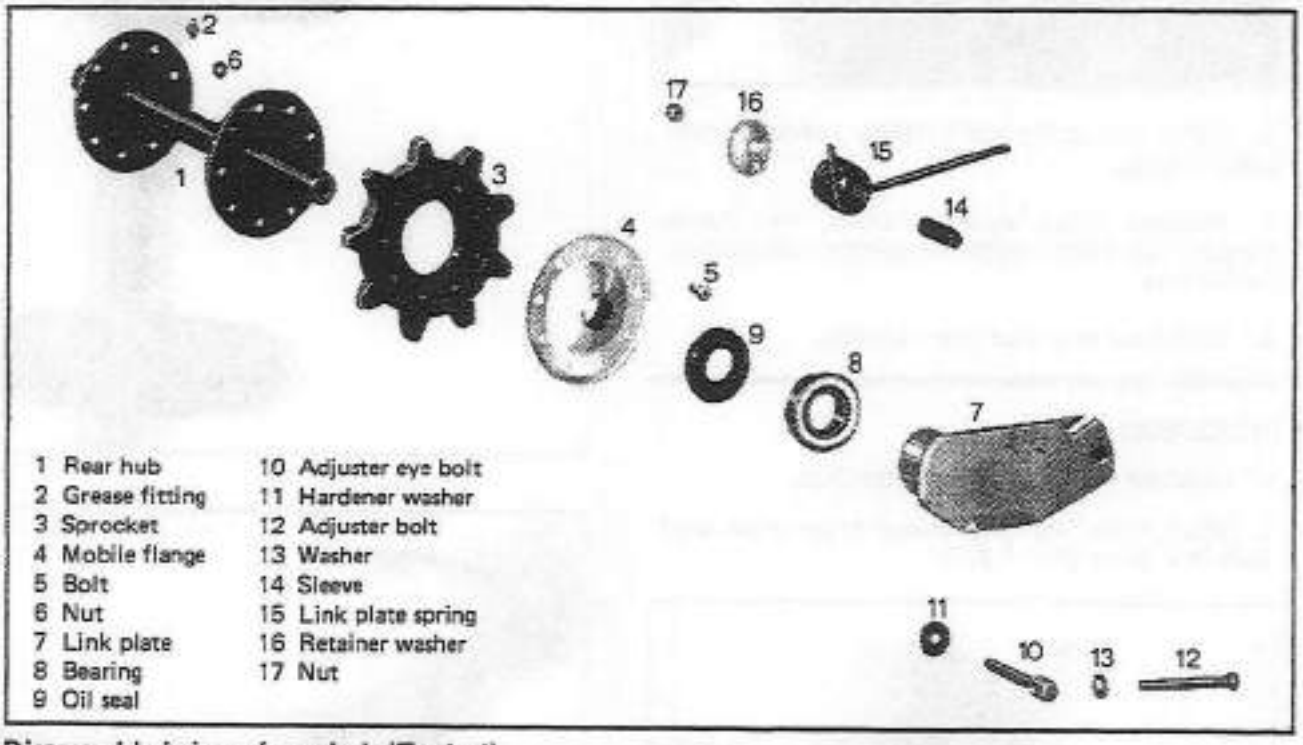
4. Carry out track tension and alignment procedure.

Suspension

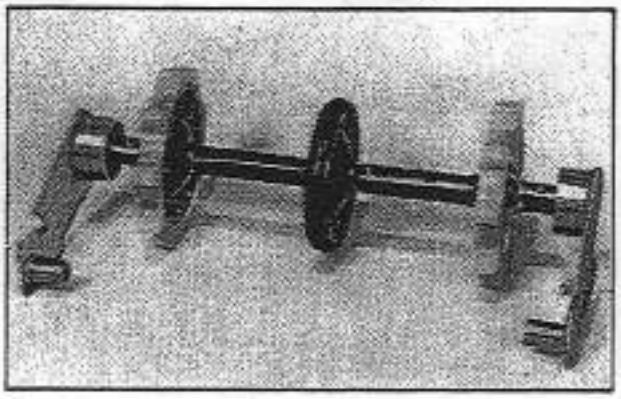
REAR HUB 1-3

GENERAL

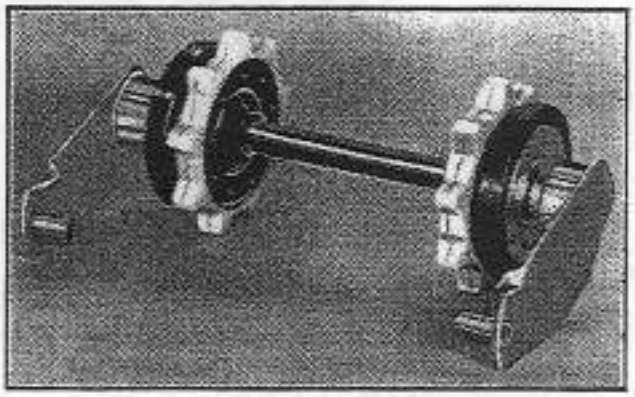
The flexible action obtained through the link plates and springs provide the rear hub with the endurance to hold the track in a straight and even plane. The link plate assemblies achieve surer handling and even track wear.



Disassembled view of rear hub (Typical)



Rear hub with idler (Nordic)

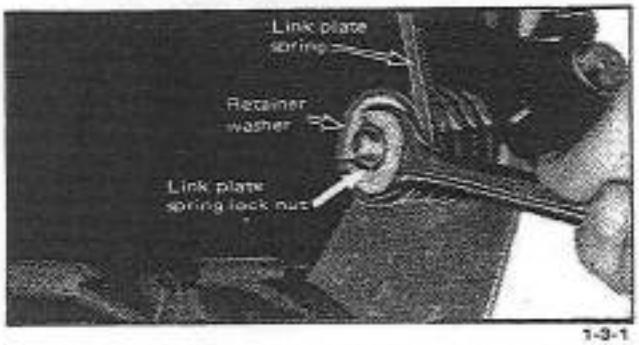


Rear hub with side idlers (T'NT)

REMOVAL

1. Lift and block rear of vehicle off the ground.

2. Remove the link plate spring lock nuts and retainer washers (fig. 1-3-1).



1-3-1

3. Using link plate spring lever, unhook link plate springs.

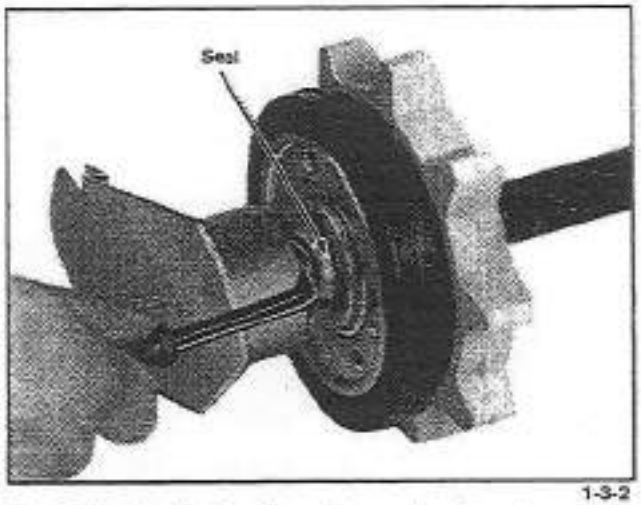
4. Remove track adjuster bolts, link plate springs, eye bolts, hardener washers and adjuster sleeves.

5. Withdraw rear hub from vehicle.

DISASSEMBLY

1. Unscrew grease fitting(s) from hub.

2. With a seal lever, pry seal from groove of each link plate (fig. 1-3-2).

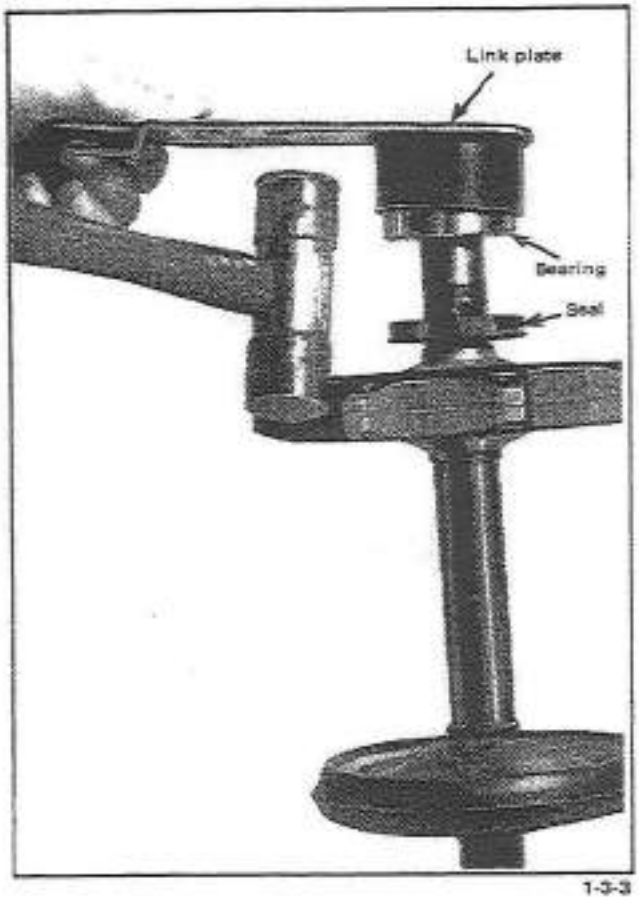


1-3-2

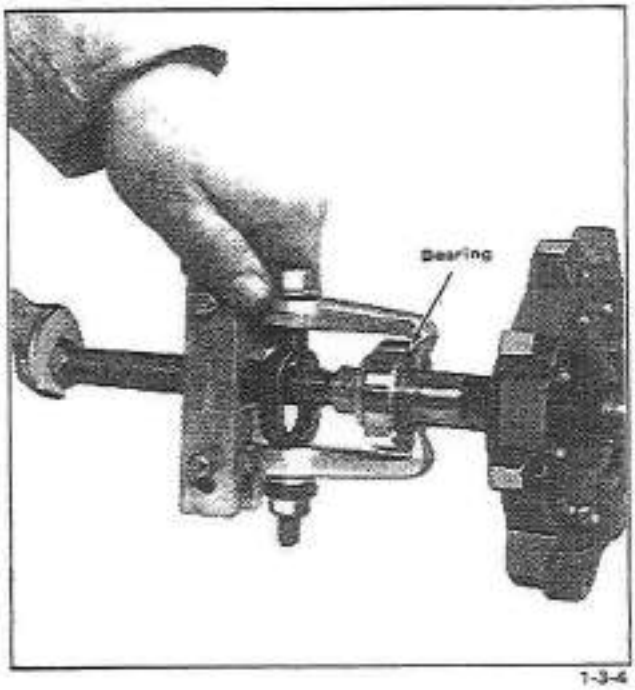
3. Pull the link plates from the bearings. To disengage link plates it may be necessary to use a soft faced hammer (fig. 1-3-3).

4. Using an appropriate bearing puller, remove bearings from the hub. Remove seals.

NOTE: Always remove the bearing by pulling it by the inner race (fig. 1-3-4).

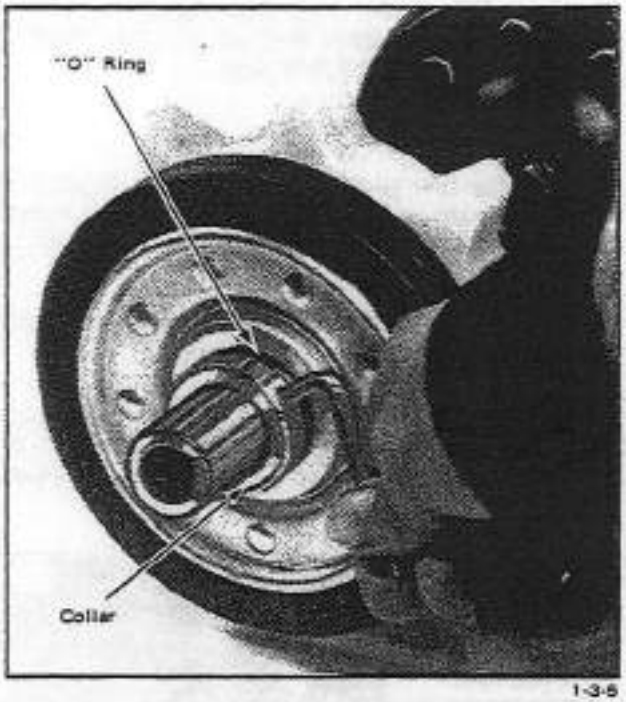


1-3-3



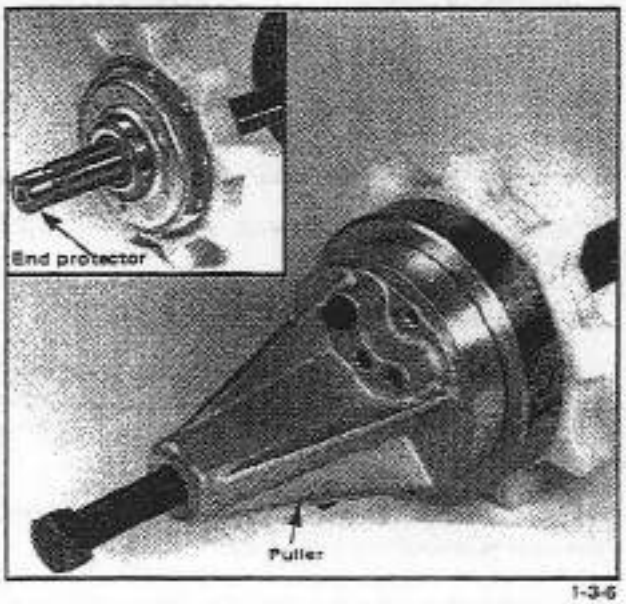
1-3-4

5. On T'NT models, slacken Allen head screw and remove locking collar and "O" ring (fig. 1-3-5). Remove idler wheel. To disassemble, remove rivets, separate flanges and remove tire and bearing.



1-3-5

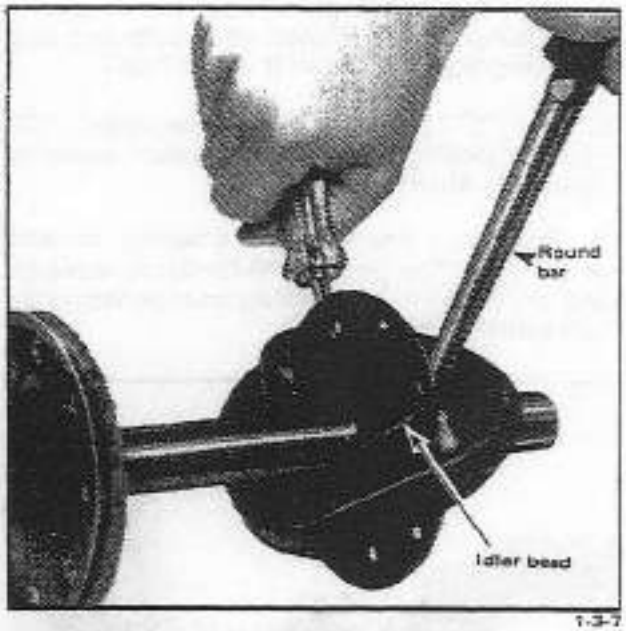
NOTE: If idler wheel is difficult to remove due to rust, remove rivets, outer flange and tire. Position an end protector on shaft. Using a special bearing puller, remove bearing and flange (fig. 1-3-6).



1-3-6

6. Remove nuts and bolts attaching each mobile flange and sprocket to the hub. Remove flanges and sprockets.

7. On models with rear hub equipped with center idler, remove bolts and nuts securing idler flanges. Apply liquid soap or petroleum jelly on bead of idler. Using two screwdrivers (round bars), pass idler over flanges (fig. 1-3-7).

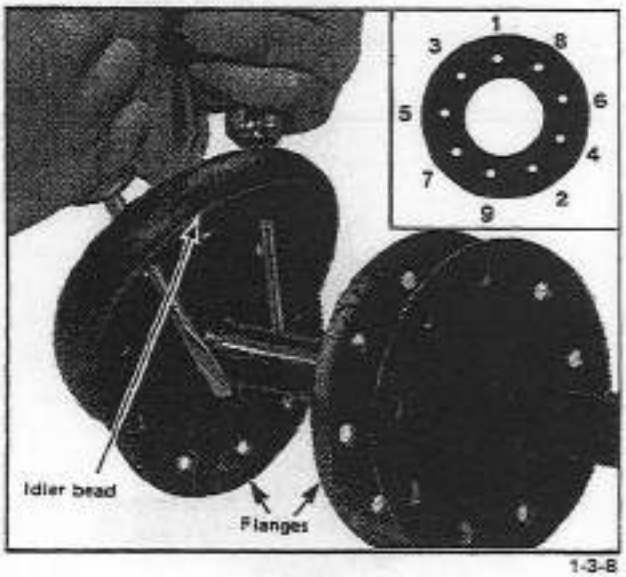


1-3-7

ASSEMBLY

1. Prior to Assembly procedure, ensure all components are clean and all defective parts have been repaired or replaced.

2. On models with rear hub equipped with center idler, apply liquid soap or petroleum jelly on bead of idler. Pass idler over flanges using two screwdrivers (round bars). Bolt idler flanges together following sequence of figure 1-3-8.



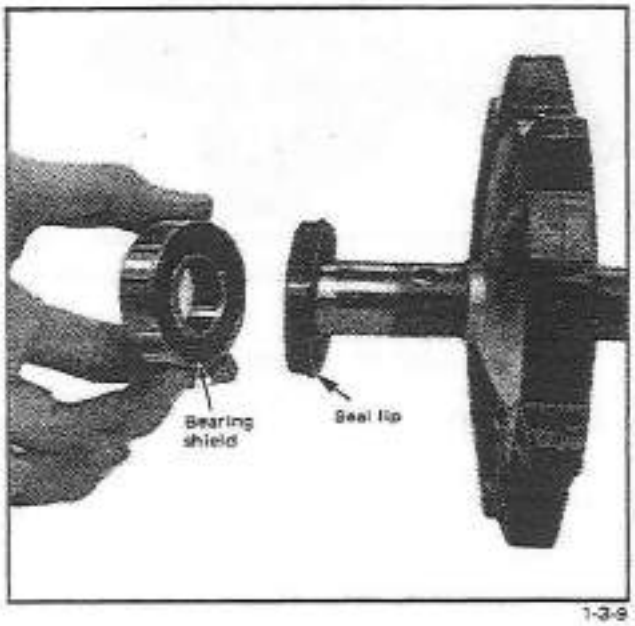
1-3-8

3. Secure sprocket and mobile flange to each fixed flange of hub. Ensure the bolts are tightened equally to eliminate the possibility of polyurethane or rubber distortion. Tighten attaching bolts following the sequence shown in figure 1-3-8.

4. On T'NT models, install idler tire on bearing and secure the two flanges with bolts and nuts following sequence shown in figure 1-3-8.

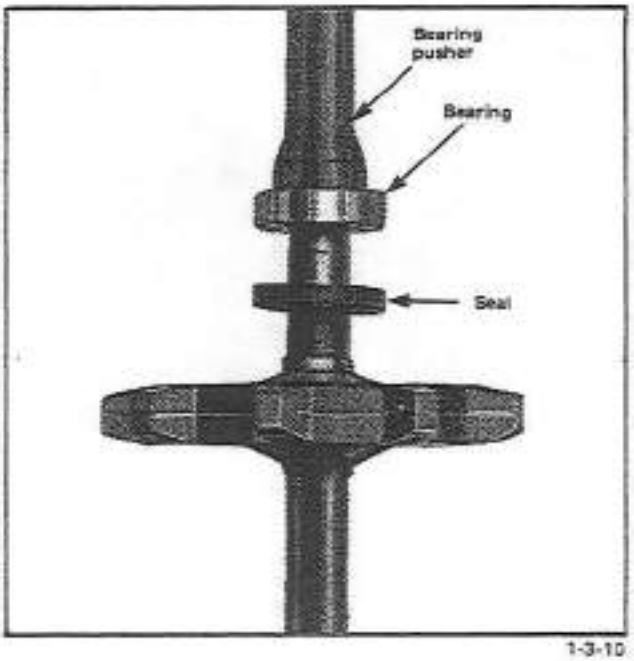
5. On T'NT models, position idler wheel, "O" ring and locking collar on hub. Secure collar by tightening Allen head screw.

6. Position a new seal and a bearing on each end of hub. The seal lip must be facing outward and the shield of the bearing must be facing the hub sprocket (fig. 1-3-9).



1-3-9

7. Correctly position bearing by pressing down on inner race until it is flush with end of hub (fig. 1-3-10).



1-3-10

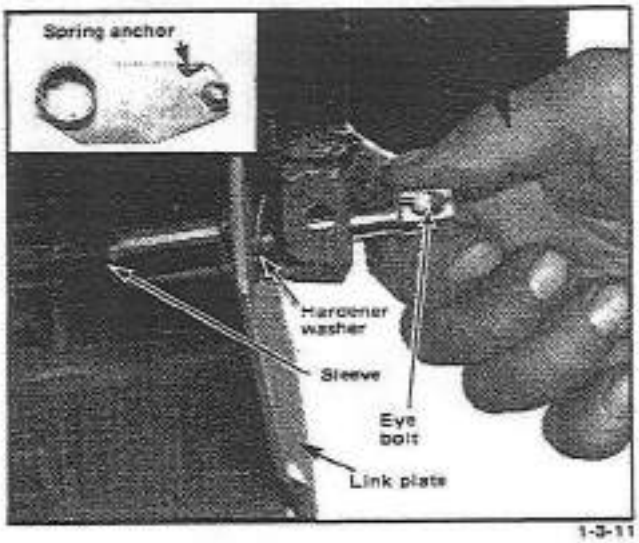
8. Press link plates onto bearings and insert oil seals into link plates. Rim of oil seal must sit correctly in groove of link plate.

9. Install grease fitting(s).

10. Using a low pressure grease gun filled with low temperature grease, lubricate the rear hub. After lubricating, ensure that seals remain in position.

INSTALLATION

1. With rear of vehicle off the ground, position the rear hub within the track. Ensure that the link plate spring anchors on the link plates are upward (fig. 1-3-11).



1-3-11

2. Install sleeves, hardener washers and eye bolts (fig. 1-3-11).

3. Partially screw in the track adjuster bolts.

4. Hook the link plate springs. On all models except Elan, hook springs into middle position of 3-position anchors. On all Elan models, hook springs into frame.

5. Install retainer washers and partially tighten the link plate spring lock nuts.

6. Carry out track tension and alignment.

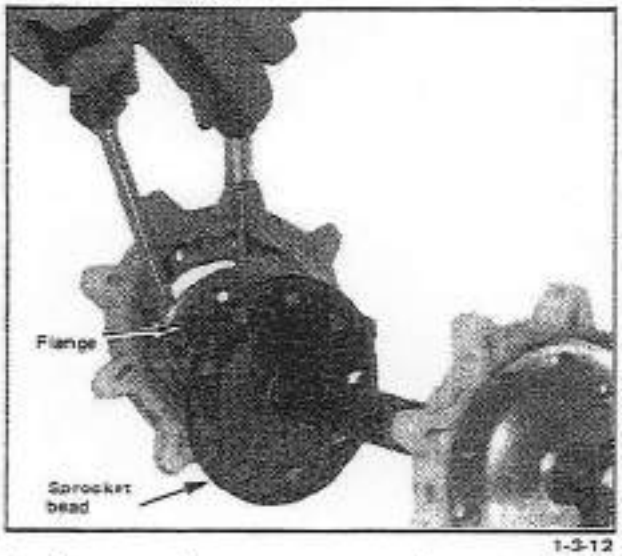
SPROCKET CHANGE OVER (Except T'NT Model)

1. Remove rear hub from vehicle.

2. Remove grease fitting on side of defective sprocket.

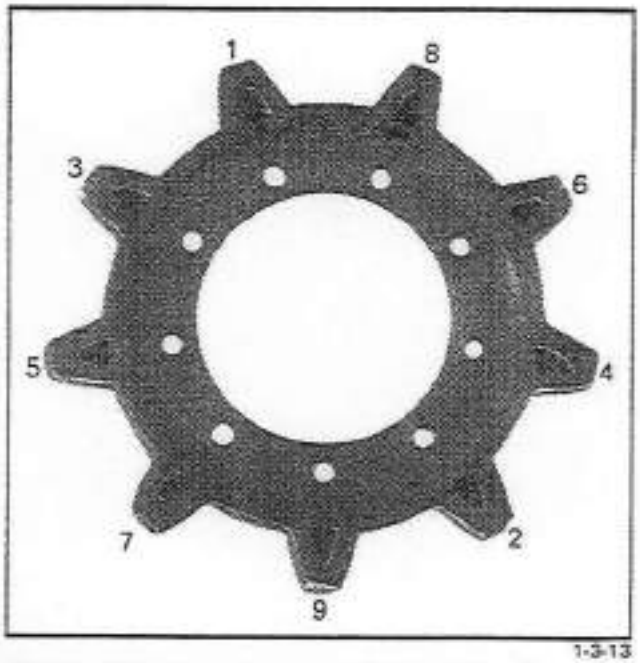
3. Remove the nine (9) bolts and nuts attaching the mobile flange and sprocket to the rear hub.

4. Apply liquid soap or petroleum jelly on sprocket bead and with two screwdrivers (round bars), pass the sprocket over flange and link plate (fig. 1-3-12).



1-3-12

5. Reverse change over procedure to install new sprocket.



1-3-13

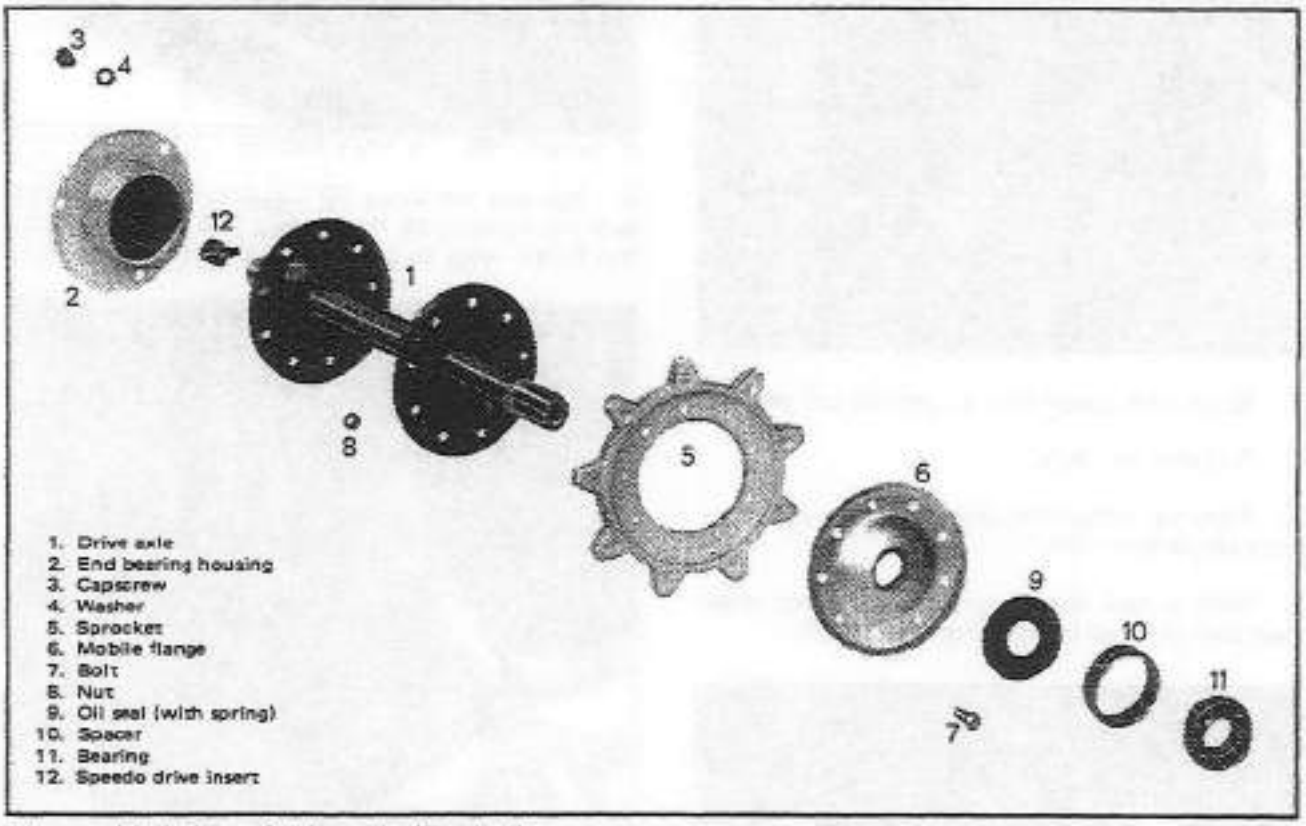
NOTE: Tighten attaching bolts following the sequence shown in figure 1-3-13. When attaching the sprockets, ensure that the bolts are tightened gradually and equally. This procedure will avoid possible polyurethane or rubber distortion.

Suspension

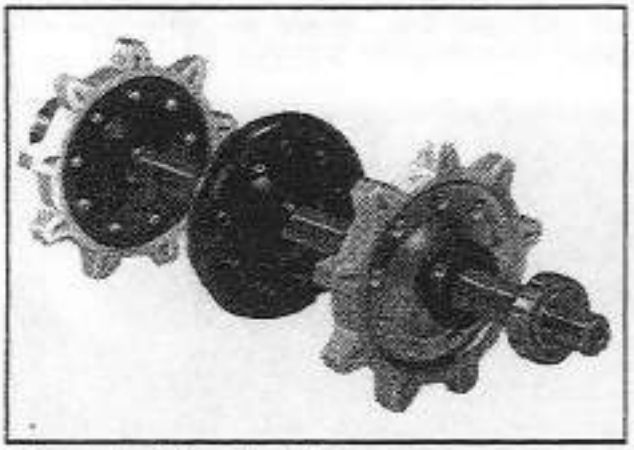
DRIVE AXLE 1-4

GENERAL

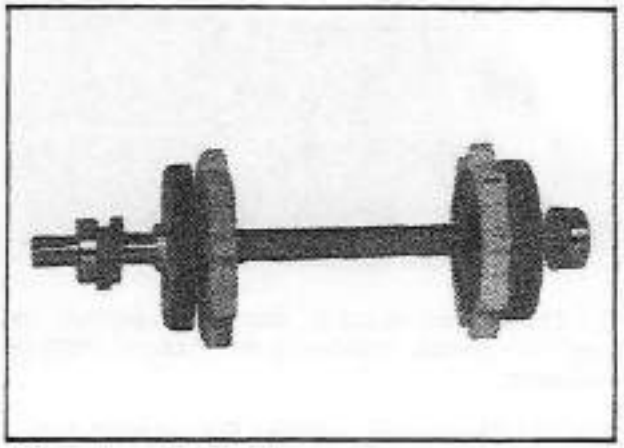
The function of the drive axle(s) is to transmit power from the drive chain to the track(s). This is achieved with two (2) sprockets affixed to the drive axle(s), the teeth of which mesh with the track notches thus entraining the track.



Disassembled view of drive axle (Typical)



Drive axle with center idler

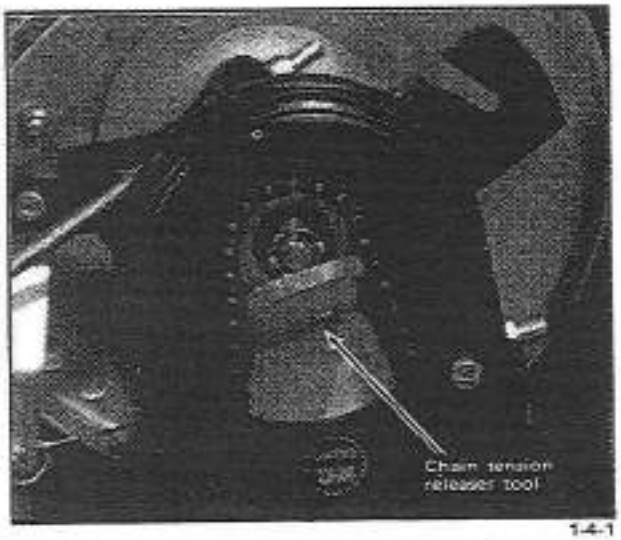


Drive axle with side idlers

REMOVAL (All Models, except Alpine and Valmont)

1. Drain oil from chain case or gear box.

2. Except Nordic models with gear box, release the drive chain tension by inserting tension releaser tool (fig. 1-4-1).



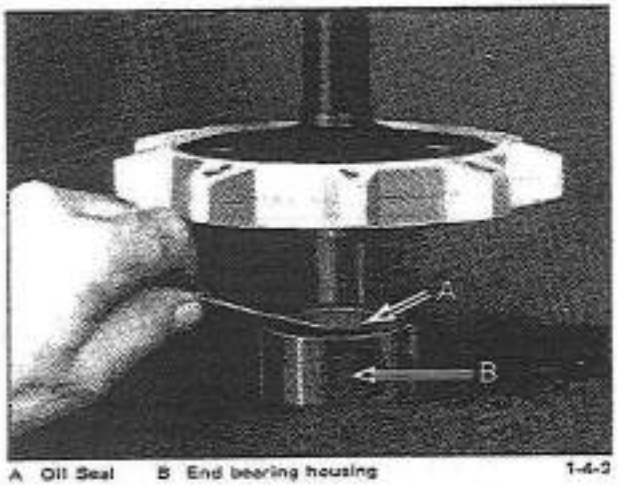
1-4-1

3. Raise and block rear of vehicle off ground.

4. Remove rear hub.

5. Remove either the bogie wheel system or slide suspension unit.

6. With a seal lever, pry oil seals from chain case and end bearing housing (fig. 1-4-2).

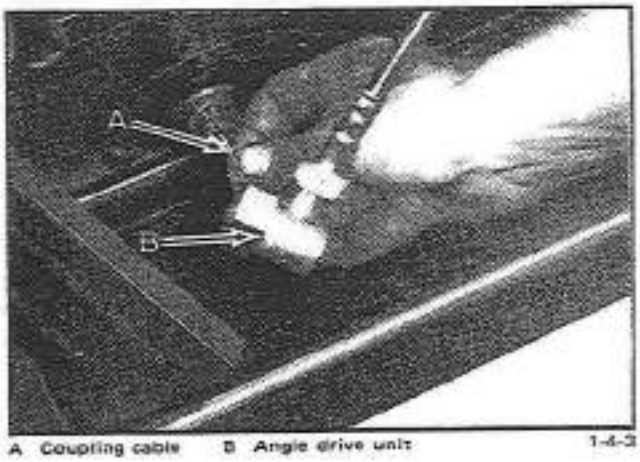


A Oil Seal B End bearing housing 1-4-2

7. On electric models, disconnect battery cables from posts, remove battery cover, battery and seat.

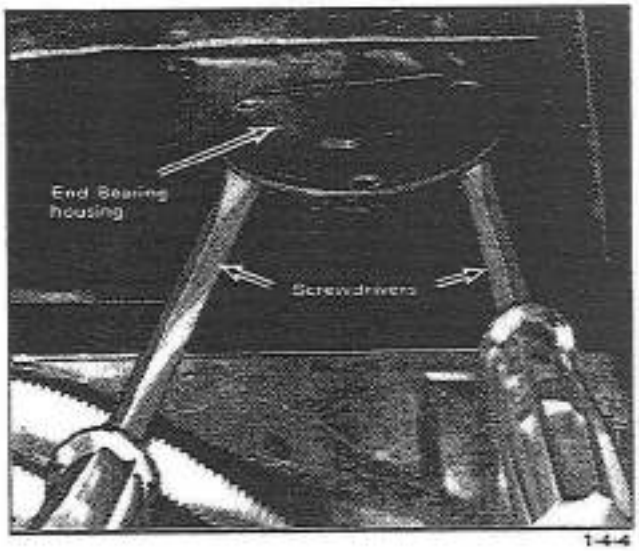
NOTE: The battery seat on Elan models is not removable.

8. If the vehicle is equipped with a speedometer, remove angle drive unit and coupling cable (fig. 1-4-3).



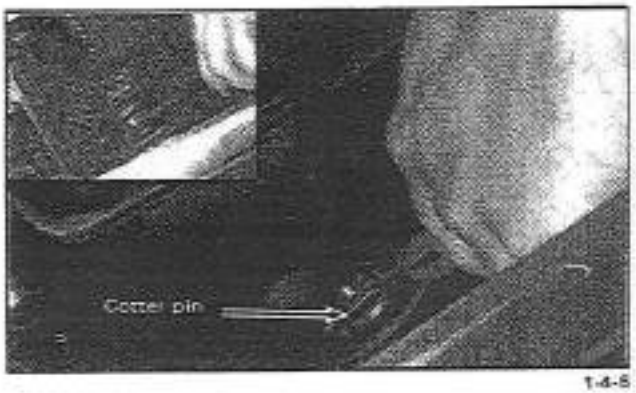
A Coupling cable B Angle drive unit 1-4-3

9. Remove the three (3) capscrews securing end bearing housing to frame. Pry the housing from the frame with two (2) screwdrivers (fig. 1-4-4).



1-4-4

10. On all vehicles except Nordic models equipped with gear box, remove the cotter pin and spacer from the chain case side (fig. 1-4-5).

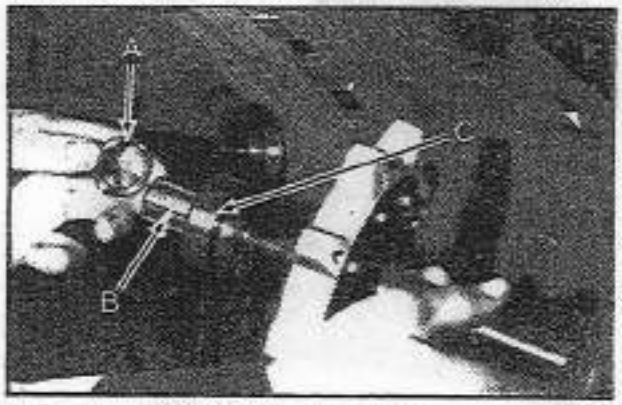


1-4-5

11. On Olympique 399, 399E and all T'NT models, remove the chain case assembly.

12. Release drive sprocket teeth from track notches at the same time pulling the drive axle towards the end bearing side of frame. This action will disengage the axle splines from the chain case lower sprocket.

13. Remove drive axle from vehicle and pull out spacer (fig. 1-4-6).



A Spacer B Spined end C Oil seal 1-4-6

REMOVAL

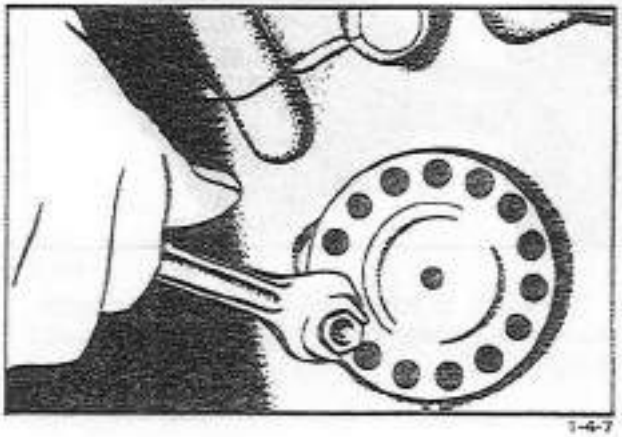
(All Alpine and Valmont models)

NOTE: The following procedure is applicable to removal of either one or both drive axles of vehicle.

1. Remove cab from vehicle.

2. Pry the inspection cover from the bottom right side of gear box.

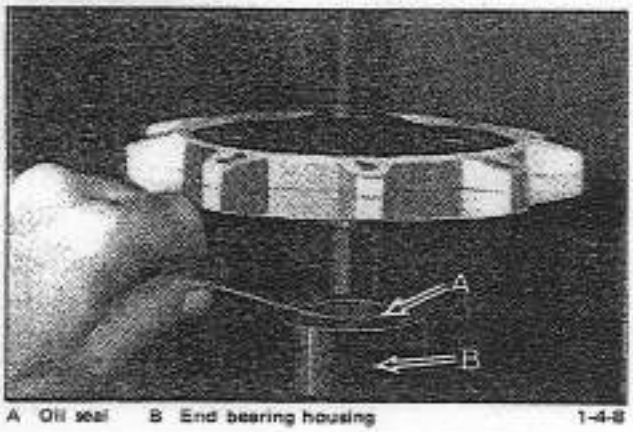
3. Release drive chain tension by removing tensioner capscrew at bottom left of gear box and rotating tensioner until maximum slackness is obtained (fig. 1-4-7).



1-4-7

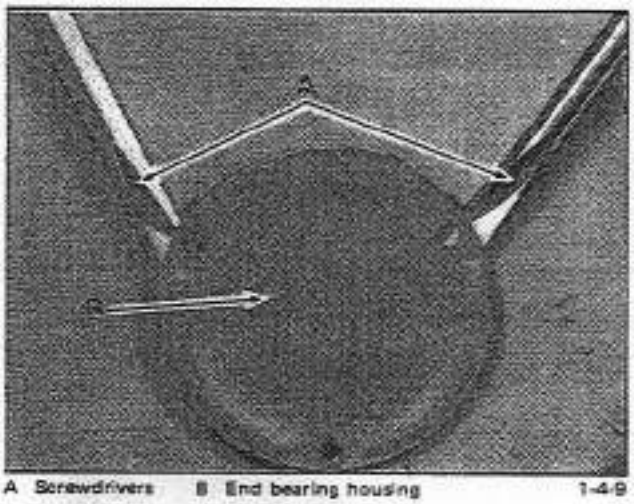
4. Remove rear hub and bogie wheel system.

5. Remove oil seals from end bearing housing and center frame (fig. 1-4-8).



A Oil seal B End bearing housing 1-4-8

6. Remove the three (3) capscrews securing end bearing housing to frame. With two (2) screwdrivers inserted between the housing and frame, pry out housing (fig. 1-4-9).



A Screwdrivers B End bearing housing 1-4-9

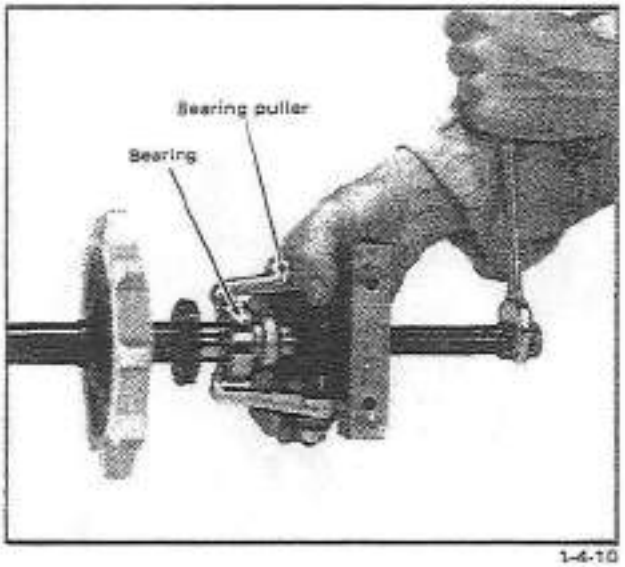
7. Release drive sprocket teeth from the track notches at the same time pulling the drive axle towards the end bearing side of frame. This action will disengage the axle from the gear box lower sprocket.

8. Remove drive axle from within the track.

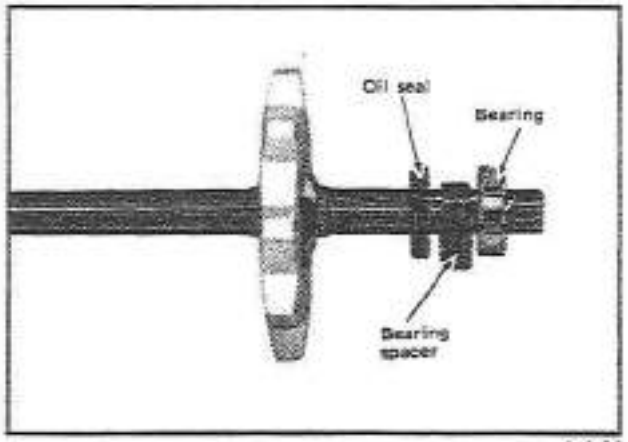
DISASSEMBLY (All models)

1. Using an appropriate bearing puller, remove bearings by pulling them by the inner race. Remove oil seals (fig. 1-4-10).

NOTE: On Olympique 399, 399E, T'NT 340 and 440 models, remove the bearing spacer and oil seals (fig. 1-4-11).

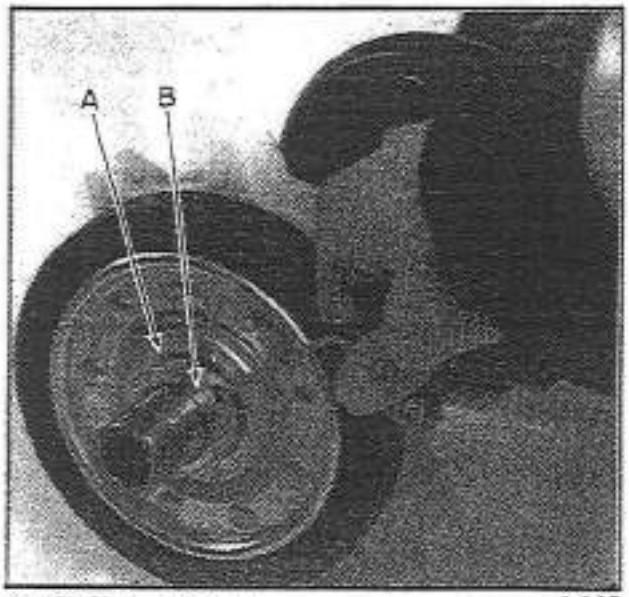


1-4-10



1-4-11

2. On T'NT models, slacken Allen head screw, remove locking collars and "O" rings (fig. 1-4-12). Remove side idler wheels.

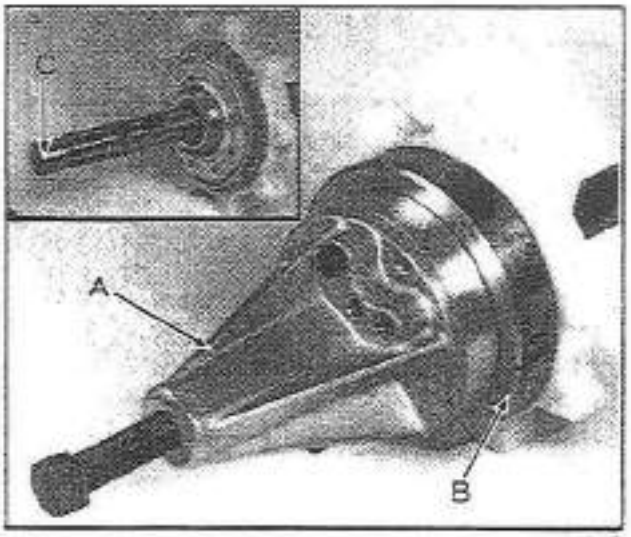


A "O" Ring B Collar 1-4-12

NOTE: If idler wheels are difficult to remove due to rust:

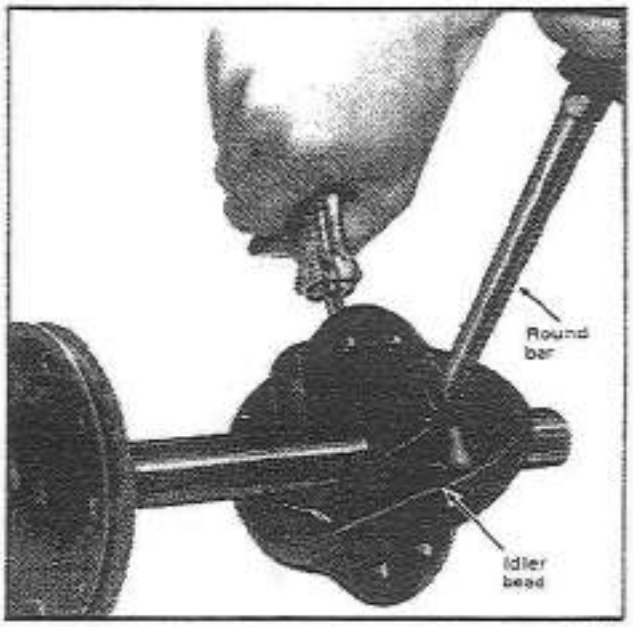
a) Remove rivets, outer flange and tire.

b) Position end protector on drive axle. Using side idler wheel special puller, remove bearings and flanges (fig. 1-4-13).



A Puller B Spacer C End protector 1-4-13

3. On models with drive axle equipped with a center idler, remove rivets securing mobile flange. Apply liquid soap or petroleum jelly on bead of idler and pass idler over flanges (fig. 1-4-14).



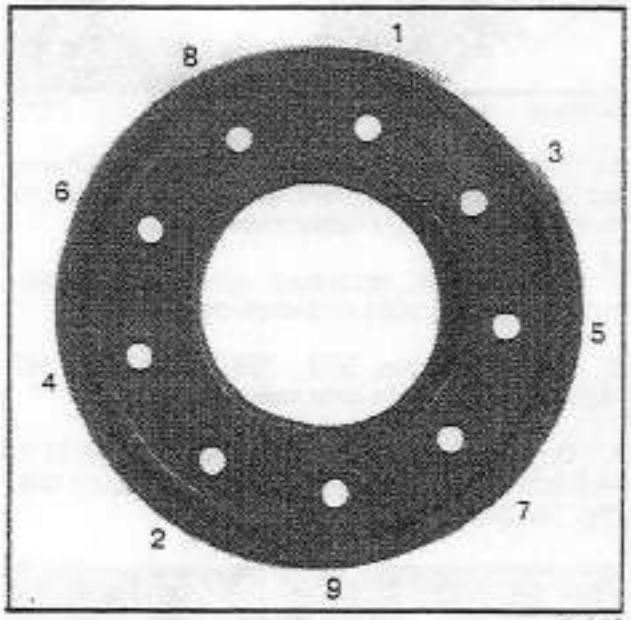
1-4-14

4. If vehicle is equipped with a speedometer, remove speedometer drive insert using a long rod (see fig. 1-4-20).

ASSEMBLY

1. Prior to Assembly procedure ensure all components are clean and all defective parts have been repaired or replaced.

2. On models with drive axle equipped with a center idler, apply liquid soap or petroleum jelly on bead of idler. Pass idler over flanges using two (2) screwdrivers (round bars). Bolt idler flanges together following the sequence shown in figure 1-4-15.



1-4-15

3. Secure sprocket and mobile flange to each fixed flange of hub by means of bolts and nuts. Tighten attaching bolts following the sequence shown in figure 1-4-15.

NOTE: When attaching an idler or sprocket, ensure that bolts are tightened equally. This procedure will avoid possible polyurethane or rubber distortion.

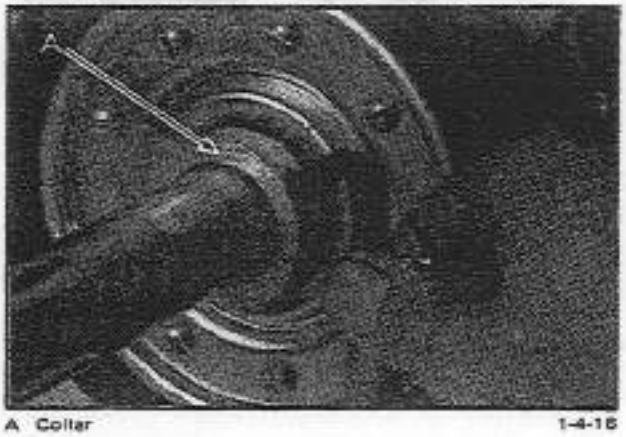
4. On T'NT models, install idler tires on bearings and secure to flanges with bolts and nuts following sequence shown in figure 1-4-15.

5. On T'NT models, position idler wheels, "O" rings and locking collars. Secure collars by tightening Allen head screws (fig. 1-4-16).

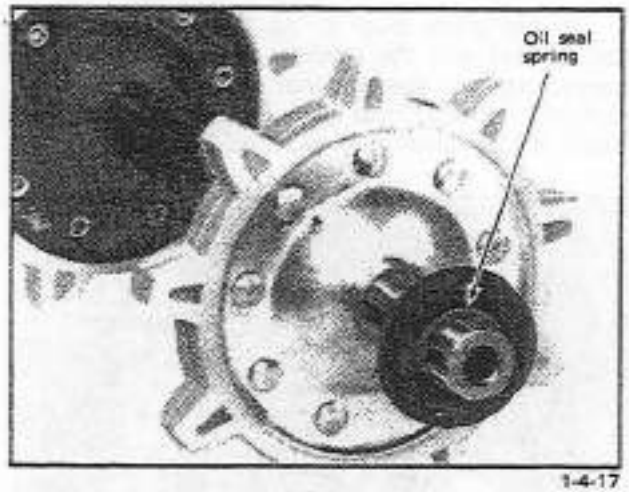
6. Position a new oil seal on each end of axle. The spring of oil seal must be facing towards end of axle (fig. 1-4-17).

7. On Olympique 399, 399E and T'NT 340 and 440 models, position bearing spacer on splined end of drive axle with chamfered side of spacer facing away from sprocket (fig. 1-4-18).

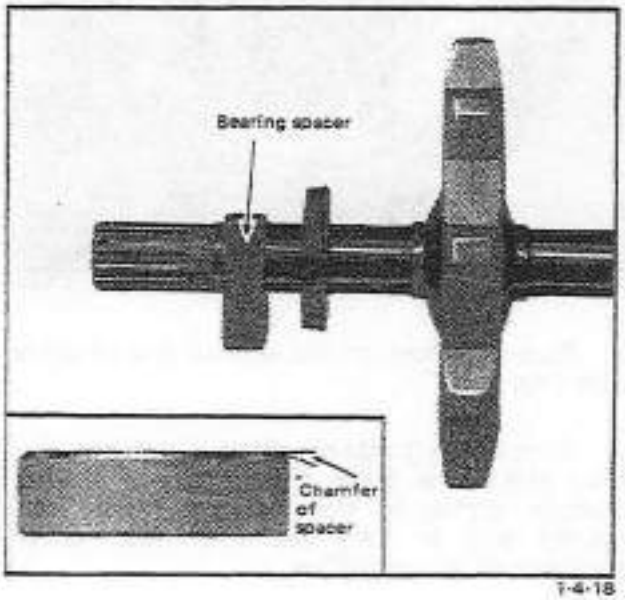
8. Place a bearing with shield facing sprocket on each end of axle. With an appropriate pusher, push the bearings into position. The bearing on the splined side of axle must be pushed until it is seated on bearing stop. The end housing bearing must be flush with end of drive axle (fig. 1-4-19).



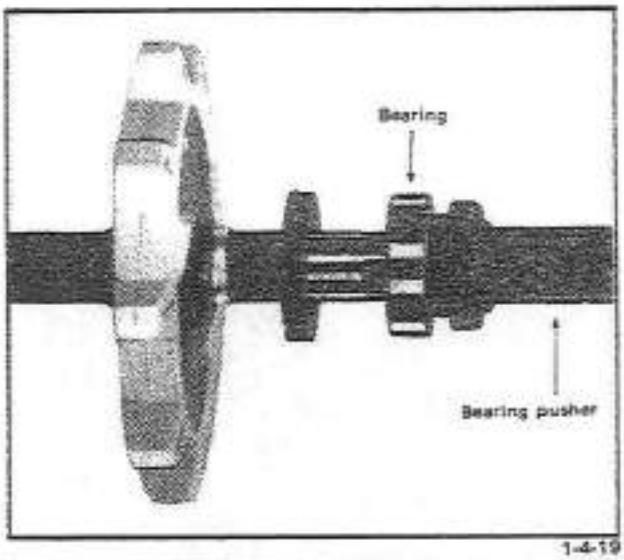
A Collar 1-4-16



1-4-17



1-4-18

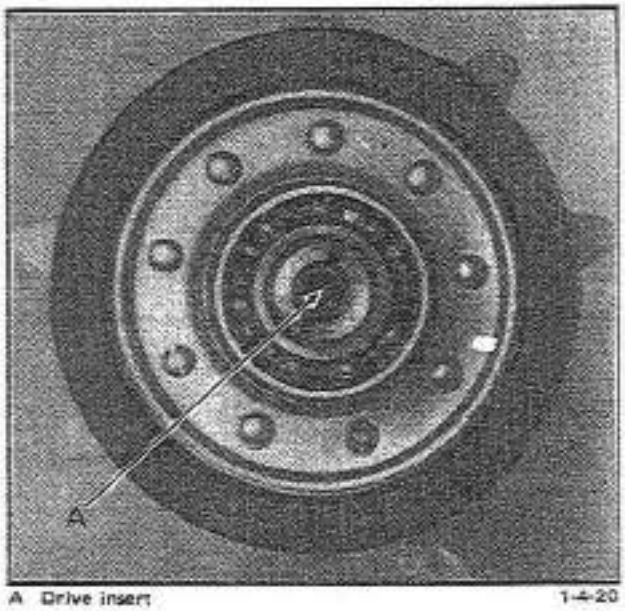


1-4-19

INSTALLATION

(All models except Alpine and Valmont)

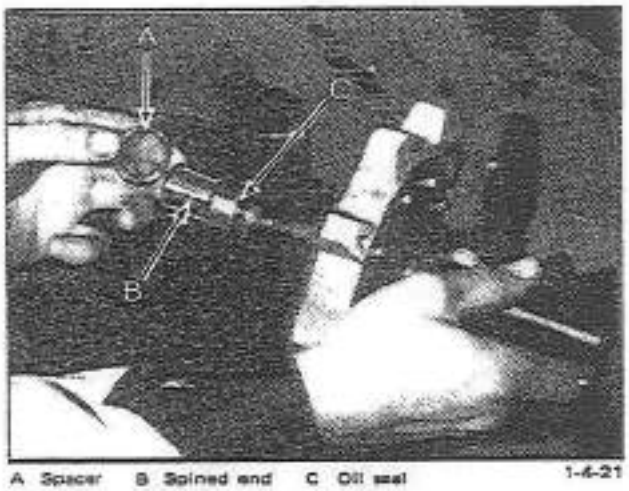
1. If the drive axle to be installed is a new component and the vehicle is equipped with a speedometer, a speedometer drive insert must be installed (driven) into the axle end. Ensure that insert is flush with axle end (fig. 1-4-20).



A Drive insert 1-4-20

2. Place a spacer on the splined end of drive axle (fig. 1-4-21).

3. From the left side of vehicle, insert the drive axle within the track. Push the end bearing through orifice in right side of frame. Pull splined end of axle into chain case lower sprocket or frame orifice.



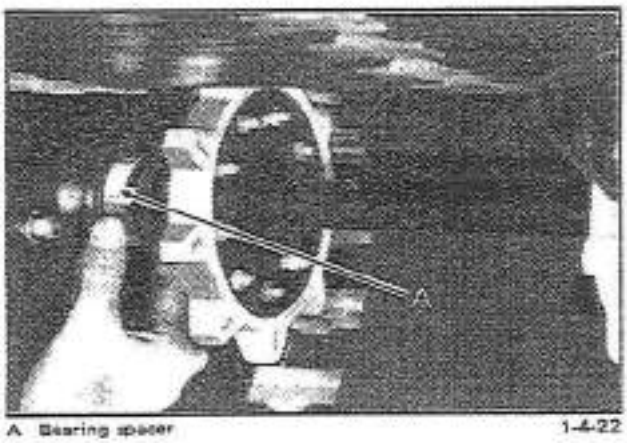
A Spacer B Splined end C Oil seal 1-4-21

4. Position the end bearing housing into frame and over axle bearing and secure the housing to frame with three (3) capscrews.

5. For vehicles equipped with speedometer, install coupling cable and angle drive unit.

6. On Olympique 399, 399E and all T'NT models, install chain case assembly.

7. On Olympique 399, 399E and T'NT 340 and 440 models, pull bearing spacer into chain case (fig. 1-4-22).



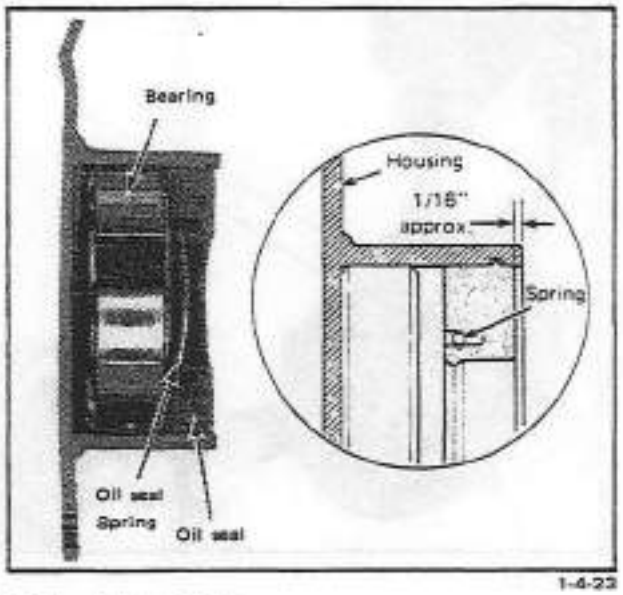
A Bearing spacer 1-4-22

8. Place a spacer on chain case side of axle and secure with a new cotter pin. (Not applicable on Nordic models equipped with gear box).

9. On electric models, install seat, battery and cover. Connect battery cables.

NOTE: Elan models do not incorporate a removable battery seat.

10. Install oil seals making sure that a gap of approximately 1/16 inch exist between end of bearing housing and each oil seal (fig. 1-4-23).



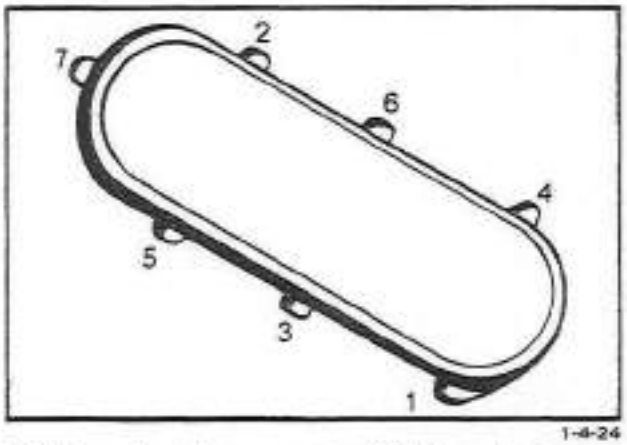
1-4-23

11. Install rear hub.

12. Install either the bogie wheel system or slide suspension unit.

13. Remove chain tension releaser tool.

14. Install access plug on Elan and Olympique models. On aluminum chain case, install cover and cross torque each screw to 5 ft/lbs. (following sequence shown in figure 1-4-24). On Nordic models equipped with gear box, install drain plug.



1-4-24

15. Pour the right amount of Ski-Doo chain case oil into chain case or gear box, see chart. Install inspection plug on Elan and Olympique models.

ELAN, OLYMPIQUE SKANDIC	Inspection Plug	8 ounces
T'NT 292, 340, NORDIC 440	Inspection Plug	12 ounces
T'NT 440, 640, 775	Inspection Plug	10 ounces
NORDIC 640 (gear box)	1" below insp. plug	10 ounces

16. Apply track tension and carry out track alignment procedure.

INSTALLATION (Alpine and Valmont models)

NOTE: The following procedure is applicable to installation of either one or both drive axles of vehicle.

1. With the rear of vehicle supported off the ground, position drive axle assembly within track. Insert splined end of axle into lower sprocket of gear box.

2. Push the end bearing housing into frame and over bearing. Secure housing to frame with three (3) capscrews.

3. Install oil seals.

NOTE: A gap of approximately 1/16 inch should exist between the end of the bearing housing and the oil seal (fig. 1-4-23).

4. Install rear hub and bogie wheel system.

5. Adjust chain tension by rotating gear box tensioner until 1/4 inch maximum free play is achieved (fig. 1-4-25).


1-4-25

NOTE: Ensure that gear box mounting nuts are well tightened before proceeding with chain tension.

6. Install inspection plug.

7. Remove the plug on top of gear box and fill the gear box with Ski-Doo chain case oil. See chart. Install plug.

VALMONT		
(Gear box)	2-1/4" on dipstick	12 ounces
ALPINE (Gear box)	3-1/4" on dipstick	16 ounces

8. Apply track tension and carry out track alignment.

SPROCKET CHANGE OVER

(Models with small sprocket and without side idlers)

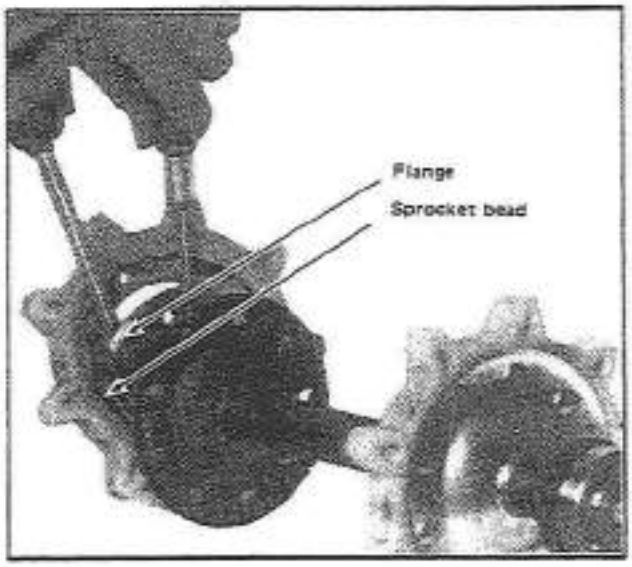
1. Remove drive axle from vehicle.

2. Remove the rivets attaching the mobile flange and sprocket to drive axle.

3. Apply liquid soap or petroleum jelly on sprocket bead and with two (2) screwdrivers (round bars) pass the sprocket over flange (fig. 1-4-26).

4. Reverse Change Over procedure to install new sprocket.

NOTE: Tighten attaching bolts following the sequence shown in figure 1-4-26.



Suspension

TRACK 1-5

GENERAL

The track has three (3) main functions:

(i) to provide a cushioning action to surface jolts or bumps.

(ii) to provide traction enabling the vehicle to drive itself forward.

(iii) to provide a means of greater stoppage.

Track inserts

The track inserts are designed to aid the sprocket teeth to correctly sit into the track notches. Without these inserts continual abrasion would wear and cut the track therefore, always replace a missing or damaged insert(s) as soon as noticed.

NOTE: Installation of insert(s) can be performed with either the track(s) installed on or removed from the vehicle.

REMOVAL OF TRACK

1. Raise and block rear of vehicle off the ground.

2. Remove either the bogie wheel system or slide suspension unit.

3. Remove rear hub.

4. Remove drive axle.

5. Withdraw the track from beneath the vehicle.

INSPECTION

1. Visually inspect track for large cuts and abnormal wear. Inspect track for broken rods (integral within track). If excessive damage is evident and rods are broken, replace track.

2. Inspect track for damaged or missing inserts. Replace defective insert(s).

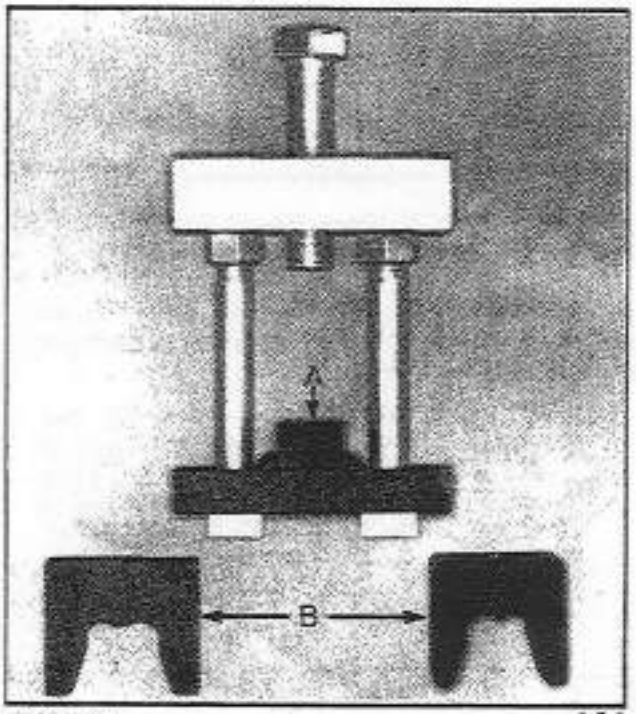
INSTALLATION OF TRACK INSERT(S).

1. Tilt vehicle on its side to expose the track notches and place insert into position.

NOTE: On T'NT models, ensure the larger edge of track insert is toward inside of track.

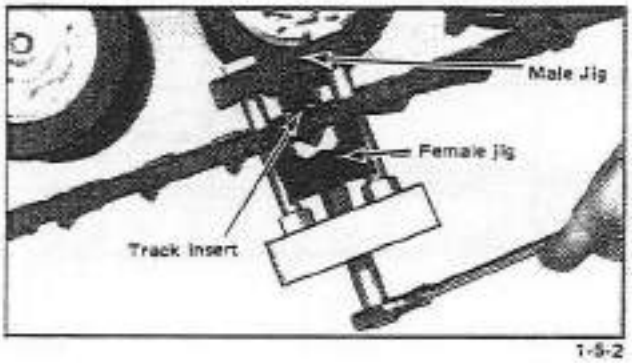
2. Place the track insert installer into track notches and position male jig on top of track insert (fig. 1-5-1).

3. Tighten installer bolt until track insert is locked in place (fig. 1-5-2).



A Male Jig
B Female Jigs

1-5-1

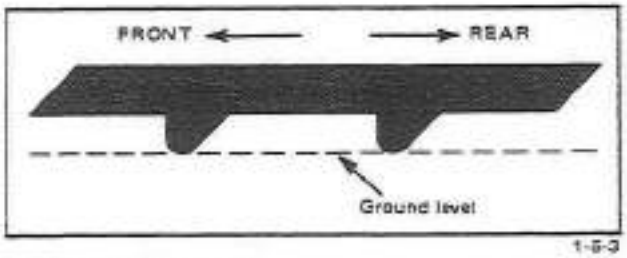


1-5-2

INSTALLATION OF TRACK

1. Raise and block rear of vehicle off the ground. Position track beneath the vehicle.

NOTE: When installing the track, ensure the right angle of the bearing surface of the track ribs is facing the front of vehicle (fig. 1-5-3).



1-5-3

2. Install drive axle.

3. Install rear hub.

4. Install either the bogie wheel system or the slide suspension unit.

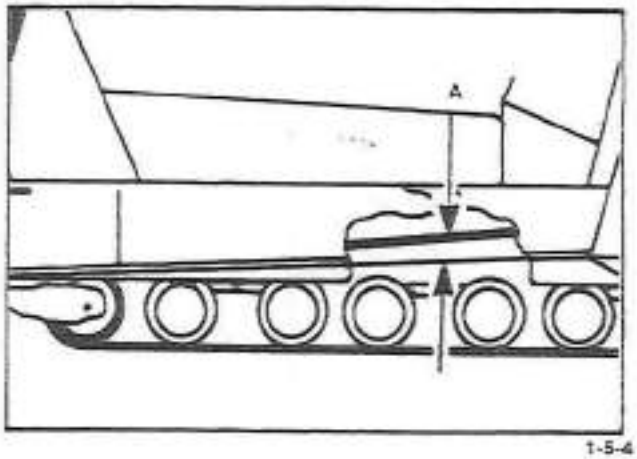
5. Apply track tension.

6. Carry out track alignment procedure.

TRACK TENSION (Bogie Wheel System) (All models except Alpine and Valmont)

1. To check track tension (free play) on all vehicles equipped with a bogie wheel system use the following procedure:

a) With rear of vehicle blocked off the ground, check the track tension at middle set of bogie wheels. The track tension (distance (A) between top inside edge of track and bottom of footboard), should be on Elan models; 1-3/8 ± 1/8 inch. On all other models; 2-1/4 ± 1/8 inch (fig. 1-5-4).



1-5-4

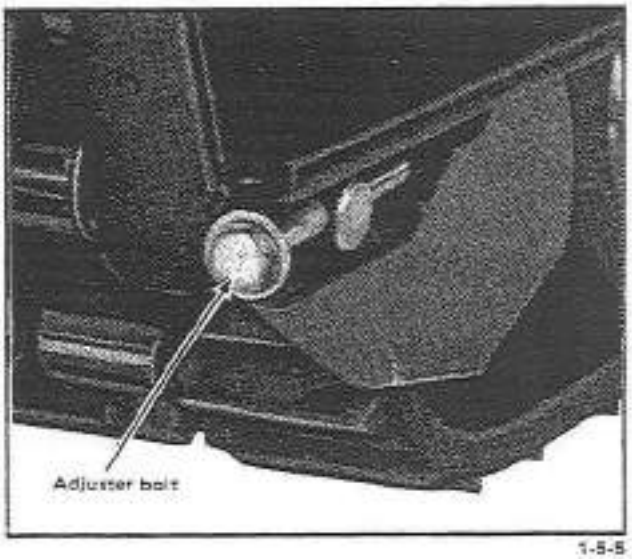
2. To adjust track tension (free play) use the following procedure:

a) On all models except Elan, ensure link plate springs are in the middle position of the 3-position slotted anchors.

NOTE: Do not attempt to correct track tension by advancing or retarding the link plate springs in their anchors.

b) Loosen link plate spring lock nuts located on inner side of link plate springs.

c) Turn adjuster bolts clockwise to tighten track and counter-clockwise to slacken track (fig. 1-5-5).



1-5-5

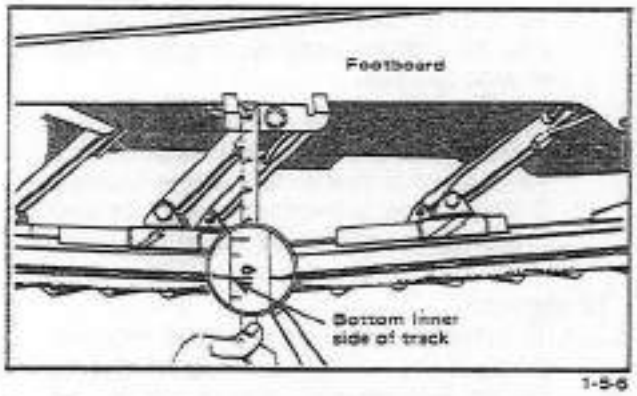
d) After track tension is adjusted equally, align the track.

TRACK TENSION (Slide Suspension)

1. To check track tension (free play) on vehicles equipped with slide suspension unit use the following procedure:

a) Raise and block rear of vehicle off the ground.

b) Using a rule, measure the distance from footboard to inside of track. The distance should be on Olympique 300 models; 5-3/4 to 6 inches on each side of track (fig. 1-5-6). On all other models; 6-1/2 to 6-3/4 inches.



1-5-6

2. To adjust, use the following procedure:

a) On all models except Élan, ensure link plate springs are in the middle position of the 3-position slotted anchors.

NOTE: Do not attempt to correct track tension by advancing or retarding the link plate springs in their anchors.

b) Loosen link plate spring lock nuts located on inner side of link plate springs.

c) Turn adjuster bolts clockwise to tighten track and counter-clockwise to slacken track (see fig. 1-5-5).

d) After track tension is adjusted equally, align the track

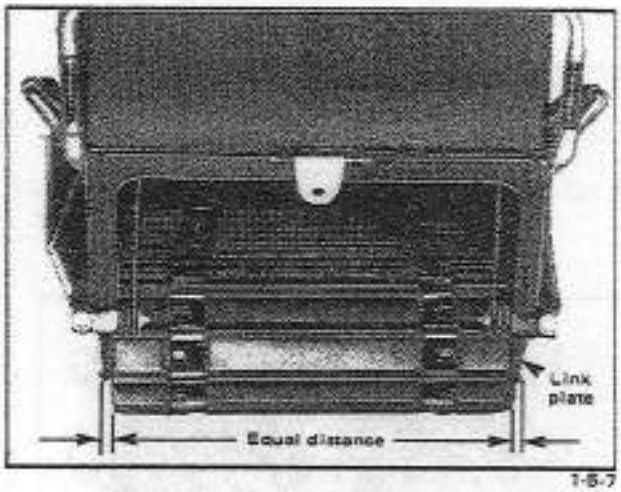
TRACK ALIGNMENT
(All models except Alpine and Valmont)

NOTE: Track tension (free play) and alignment are inter-related. Do not adjust one without the other. Track tension procedure must be carried out prior to track alignment. Never try to align the track by advancing or retarding the link plate springs in their anchors.

1. To check track alignment use the following procedure:

a) With rear of vehicle supported off the ground, start engine and allow the track to rotate **slowly**.

b) 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 (fig. 1-5-7).



1-5-7

2. To align track use the following procedure:

a) Loosen link plate spring lock nut on side where the track is closest to the link plate.

b) Turn track adjuster bolt on same side clockwise until the track realigns.

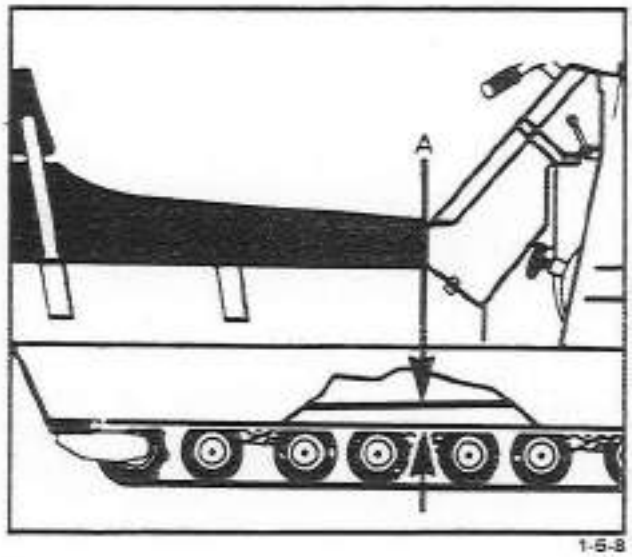
c) Tighten link plate spring lock nuts.

d) Rotate track **slowly** and recheck alignment.

TRACK TENSION AND ALIGNMENT
(Alpine and Valmont models)

Track tension and alignment procedures are closely inter-related on these vehicles.

The tension of each track should be 2-1/4 ± 1/8 inch (Distance (A) between top inside edge of track and bottom of footboard) (fig. 1-5-8).

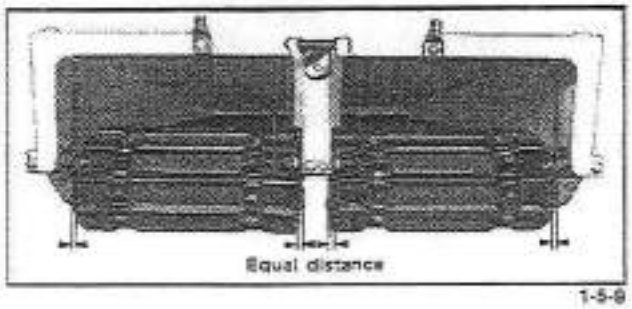


1-5-8

1. To adjust track use the following procedure:

NOTE: Do not attempt to correct track tension by advancing or retarding the link plate springs in their anchors.

(a) Loosen link plate spring lock nuts (4) located on inner side of link plate springs.



1-5-9

(b) Turn outer side adjuster bolt(s) clockwise to tighten track(s), counter-clockwise to slacken.

(c) Start engine and allow tracks to rotate slowly. Check if track(s) is well centered and turns evenly on rear sprockets. The distance between track edges and link plates should be equal (fig. 1-5-9).

2. To correct:

(d) Turn inner side adjuster bolt(s) counter-clockwise to bring track(s) closer to center link plate(s), turn clockwise to withdraw track(s) from link plate(s).

(e) Tighten link plate spring lock nuts (4).

(f) Rotate tracks slowly and recheck alignment.

Transmission

TORQUE CONVERTER 1-6

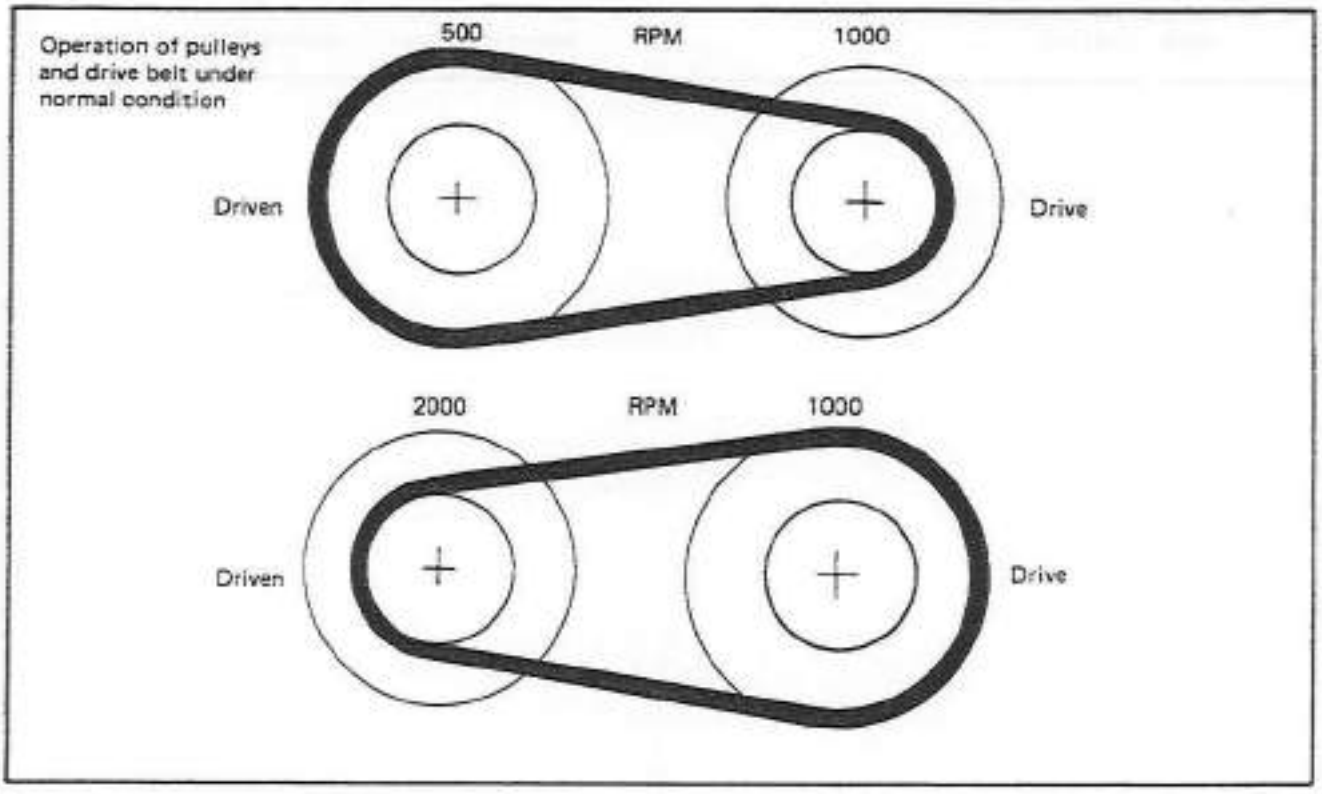
GENERAL

If engine power was transmitted directly to the drive axle, the Ski-Doo snowmobile would be able to move forward at a fairly reasonable speed. However, should the vehicle encounter bumps or rough terrain this method of transmitting power would be insufficient to drive the vehicle over the hazards. Therefore, to provide the additional power strength (torque), the Ski-Doo snowmobile incorporates a power transmittal assembly consisting of a drive pulley, driven pulley and drive belt. To explain the fundamentals of each component and the assembly operation, we will follow the power line which is defined as follows.

(a) Power line – direction of the power obtained from the engine.
(b) Power take-off – crankshaft end.
(c) Drive pulley – a pulley assembly connected to the engine crankshaft and consisting of a spring loaded pulley half, a fixed pulley half and a centrifugal governor incorporating pressure levers.

Piston movement rotates the crankshaft on which the drive pulley is affixed. The rotation (RPM) causes the pressure levers to apply pressure on the outer pulley half of drive pulley thus causing a pulling action on the drive belt (torque). An opposite reaction is caused during power cut-down or under torque load.

(d) Drive belt – a rubber and cloth belt installed over the drive pulley and driven pulley.
(e) Driven pulley – a pulley assembly mounted on a shaft with one of the pulley halves free and counter balanced with a loaded spring. When the drive belt

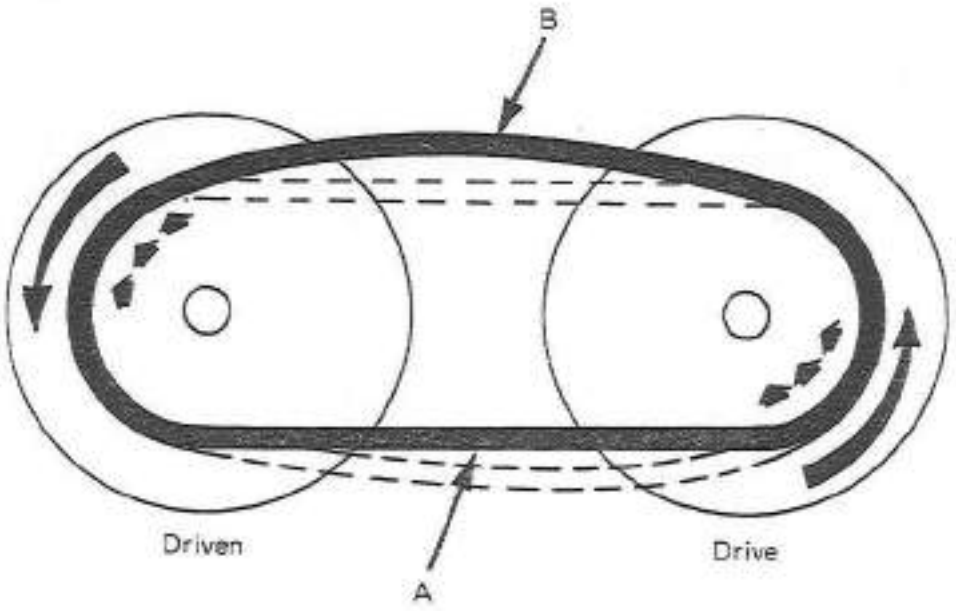


pulls against the pulley halves, the sliding pulley half opens against the loaded spring and the rotating belt pressure forces the pulley shaft to rotate. An opposite reaction is caused during power cut-down or under torque load.

(f) Driven pulley shaft – shaft on which the outer pulley half is fixed and connected to a drive chain by means of a sprocket incorporated within the chain case.

(g) Drive chain – an encased chain linked over sprockets affixed to the driven pulley shaft and drive axle.

Operation of pulleys and drive belt under torque load. (One side of belt under tension).



(A) Resulting from resistance of terrain condition, load, etc.

(B) Side is slack and thrown in direction of power line. Result = involved torque ability.

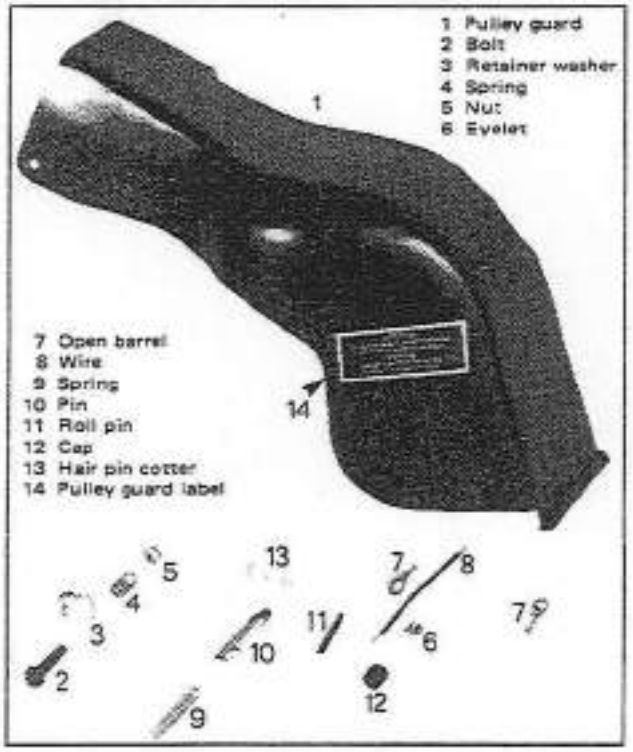
Transmission

PULLEY GUARD 1-6

GENERAL

All Ski-Doo snowmobiles incorporate a protective pulley guard. The guard prevents the driver from inadvertently catching his foot in the drive pulley and/or drive belt during operation of the vehicle. It protects the driver from possible injury due to flying segments of a broken drive belt or other loosened components.

WARNING: For safety reasons, it is imperative that the pulley guard is installed when the engine is running.



REMOVAL

NOTE: The following procedures are applicable to all vehicles except the Elan models. On Elan models, the pulley guard is an integral part of the console.

1. Pull out hair pin cotter and pull on spring bolt to disengage pin from frame bracket.

2. Move pulley guard toward front of vehicle to disengage it from upper bracket.

INSPECTION

The following points should be inspected and if necessary corrected prior to assembly.

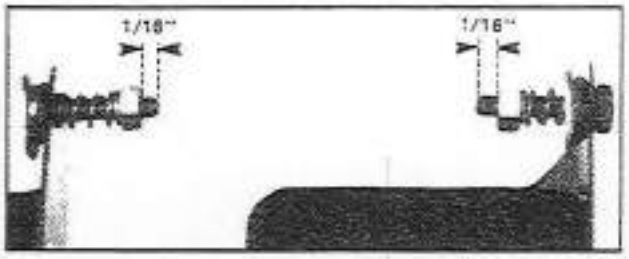
1. Size of the lower pin hole. Its diameter should be between .124 and .129 inch.

2. Condition of roll pin. If damaged, replace.

3. The length of lower spring. It should not be less than 1-7/8 inch.

4. Upper spring length should not be less than 13/16 inch.

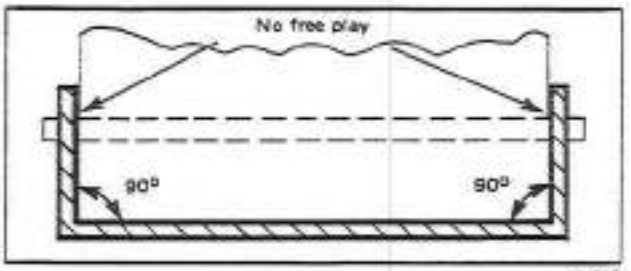
5. That 1/16 inch of thread is exposed on upper bolt after installation of retainer washer and spring (fig. 1-6-1).



1-6-1

INSTALLATION

NOTE: Prior to installation ensure that pulley guard/frame bracket is at 90° with frame (fig. 1-6-2).



1-6-2

1. Slide upper pulley guard bolt into upper bracket.

2. Pull on lower spring bolt, engage pin into frame bracket and install hair pin cotter.

WARNING: No lateral free-play should exist between pulley guard and frame bracket.

Transmission

DRIVE BELT 1-7

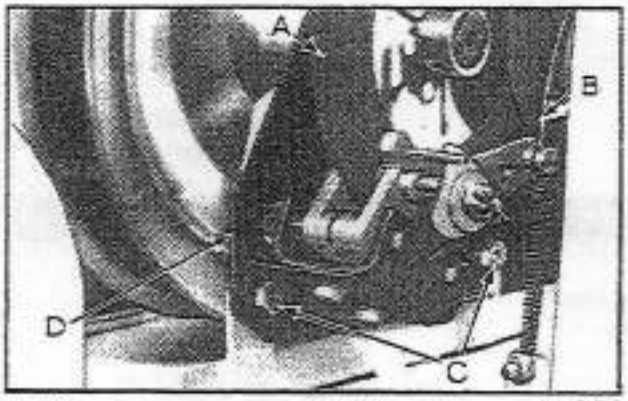
GENERAL

The function of the drive belt is to transmit power from drive pulley to driven pulley. Always inspect the drive belt whenever the vehicle is undergoing maintenance and repair procedures or when performance of vehicle is unsatisfactory.

REMOVAL

1. Remove pulley guard.

2. On Alpine and Valmont models, disconnect brake cable from lower cable retaining bracket and ferrule. Remove the two (2) bolts securing the brake assembly to the brake bracket and pivot brake bracket (fig. 1-7-1).

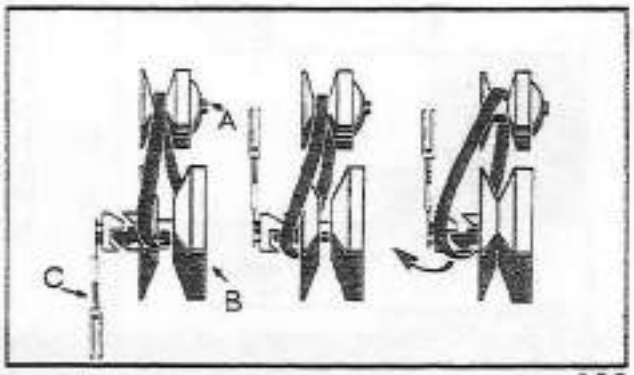


A Disc
B Brake cable
C Bolts
D Brake and bracket assembly

1-7-1

3. On all T'NT models except 292, pull out hair cotter pin and remove clevis pin of driven pulley support. Raise driven pulley support (fig. 1-7-2).

4. Open driven pulley and pass belt over top edge of the sliding half.



A Drive pulley
B Driven pulley
C Driven pulley support

1-7-2

5. Slip the belt out from the drive pulley and remove completely from vehicle.

DRIVE BELT TROUBLE SHOOTING CHART

To determine malfunctions of the transmission system due to improper installation and/or wear of drive belt, a trouble shooting chart has been drawn up to assist in detecting such troubles.

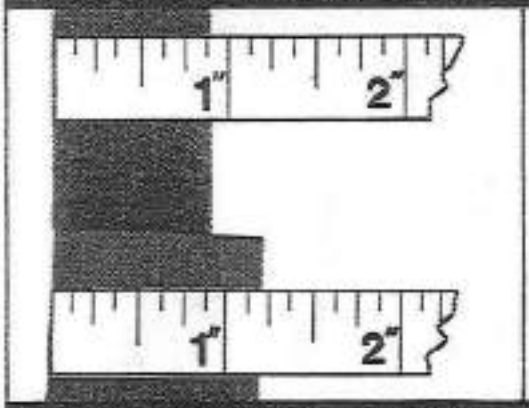
Research has proven that excessive wear and breakage of the drive belt can be eliminated by correct periodic inspection and maintenance. A drive belt of less than 7/8 inch width must be replaced.

1. Uneven belt wear on one side only.		
	**CAUSE** a) Loose engine mount b) Pulley mis-alignment	**REMEDY** a) Tighten engine mount nuts equally 22-23 ft/lbs b) Align pulleys

2. Belt glazed excessively or has baked appearance.

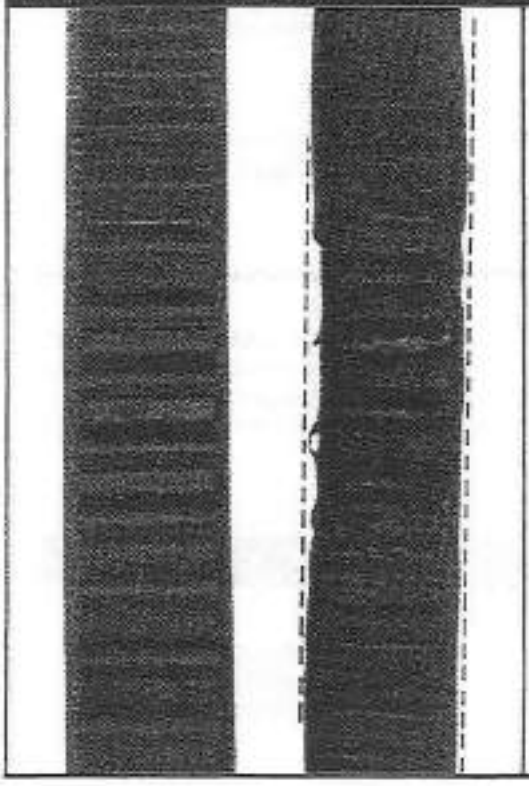
CAUSE	REMEDY
Excessive slippage caused by: a) Insufficient pressure on belt sides	a) Check drive pulley for worn or missing pressure lever.
b) Rusted drive or driven pulley shafts	b) Clean shaft with steel wool and lubricate with Ski-Doo clutch lube.
c) Oil on pulley surfaces	c) Clean pulley surfaces with fine emery cloth and clean cloth.
d) Incorrect centrifugal governor	d) Install correct governor.

3. Belt worn excessively in top width.

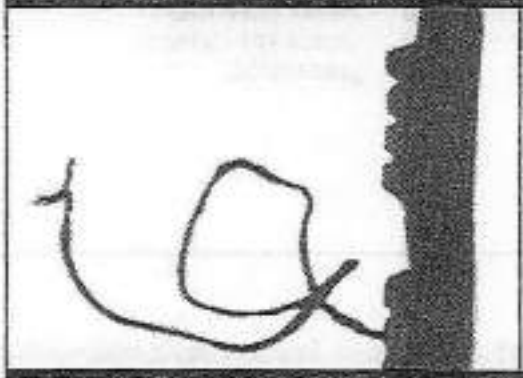
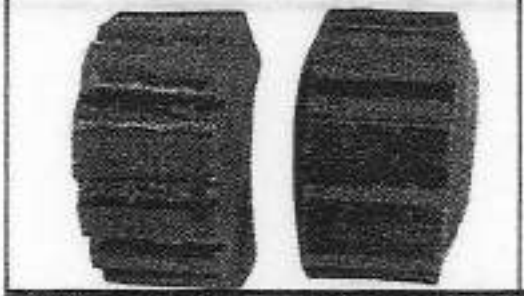
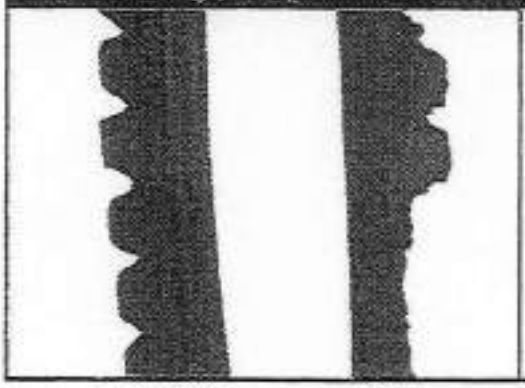


CAUSE	REMEDY
a) Excessive slippage due to irregular outward actuation movement of drive pulley	a) Carry out inspection as detailed in sub-section 1-8.
b) Rough or scratched pulley surfaces	b) Repair or replace pulley.
c) Improper belt angle	c) Using unspecified type of belt. Replace belt with correct Bombardier belt.

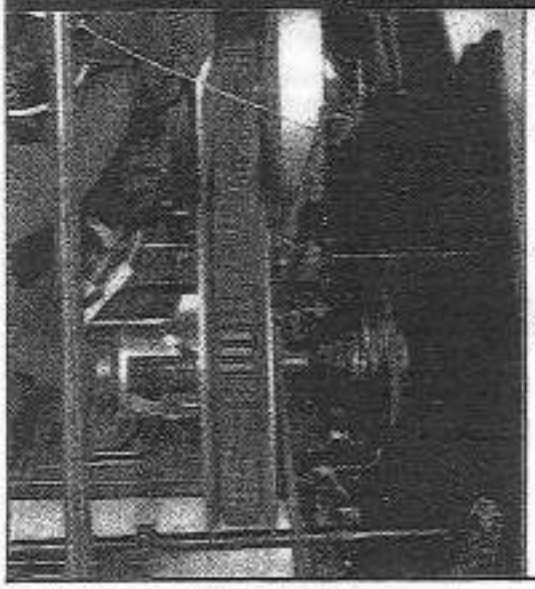
4. Belt worn narrow in one section.



CAUSE	REMEDY
Excessive slippage in drive pulley caused by: a) Frozen or too tight track	a) Liberate track from ice or check track tension and alignment.
b) Drive pulley (clutch) not functioning properly	b) Repair or replace drive pulley.
c) Engine idle speed too high	c) Reduce engine RPM.
d) Incorrect belt length	d) Using unspecified type of belt. Replace belt with correct Bombardier belt.
e) Incorrect pulley distance	e) Readjust to specifications, refer to sub-section 1-10.

5. Belt sides worn concave.		
	**CAUSE** a) Excessive ride out on drive pulley	**REMEDY** a) Check for proper distance between pulleys. b) Using unspecified type of belt. Replace belt with correct Bombardier belt.
6. Belt disintegration.		
	**CAUSE** a) Excessive belt speed b) Oil on pulley surfaces c) Incorrect gear ratio	**REMEDY** a) Using unspecified type of belt. Replace belt with correct Bombardier belt. b) Clean pulley surfaces with fine emery cloth and clean cloth. c) Install specified sprocket (correct gear ratio).
7. Belt edge cord breakage.		
	**CAUSE** a) Pulley mis-alignment	**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 fractured or torn.		
	**CAUSE** a) Improper belt installation b) Belt rubbing stationary object on pulleys c) Violent engage-ment of drive pulley (clutch)	**REMEDY** a) Refer to installation. b) Check drive components. c) Grease, replace spring or drive pulley.

10. Belt "Flip-Over" at high speed.



CAUSE	REMEDY
a) Pulley mis-alignment	a) Align pulleys.
b) Belt excessive speed	b) Using unspecified type of belt. Replace belt with correct Bombardier belt.
c) Excessive ride out on drive pulley	c) Check for proper distance between pulleys.
d) Incorrect sprocket ratio	d) Install specified sprocket (correct gear ratio).

INSTALLATION

1. Prior to installation procedure, ensure drive belt has been cleaned with a clean cloth and belt is in good condition.

2. Slip belt over drive pulley and pass it over the outer cam side of driven pulley.

3. Open the driven pulley by twisting and pushing the sliding half until belt is in position.

4. On Alpine and Valmont models, install brake assembly to brake bracket using two (2) bolts. Connect brake cable to lower retaining bracket and ferrule. Proceed with brake adjustment.

5. On all T'NT models except 292, lower driven pulley support, insert clevis pin and lock in place with hair cotter pin.

6. Install pulley guard.

Transmission

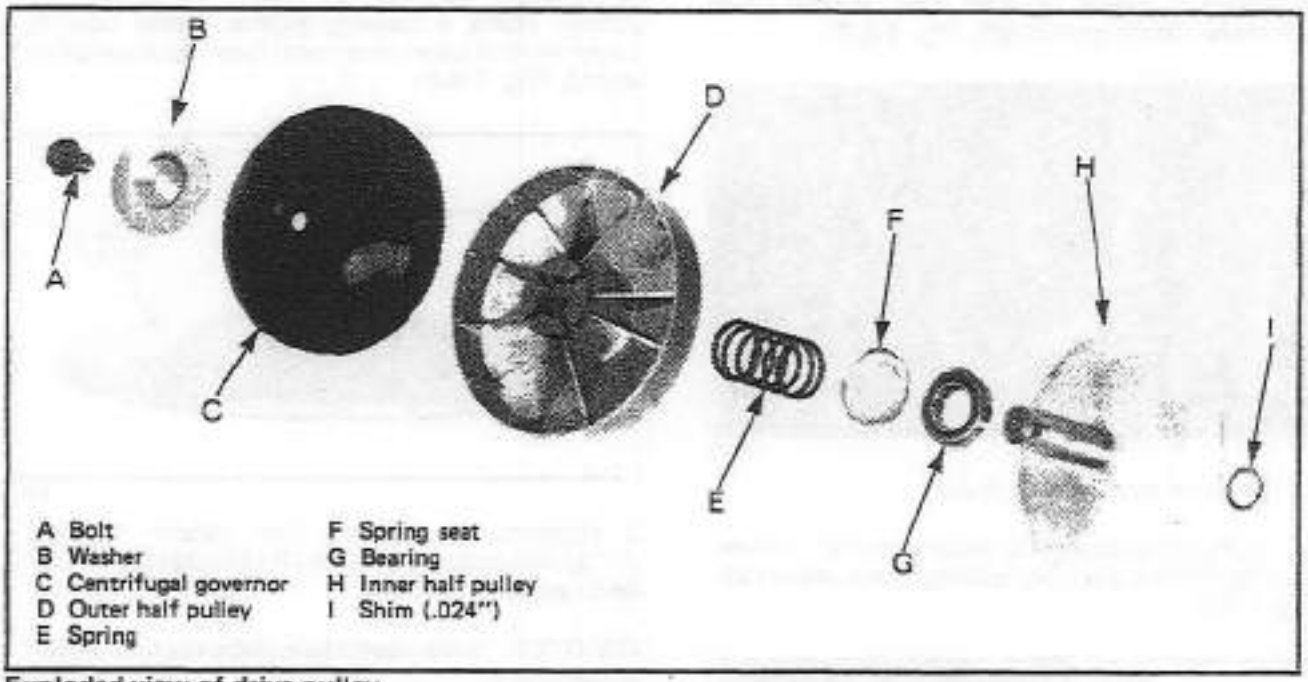
DRIVE PULLEY 1-8

GENERAL

The Drive Pulley is a variable pitch pulley which transmits power from the engine to the driven pulley by means of a drive belt.

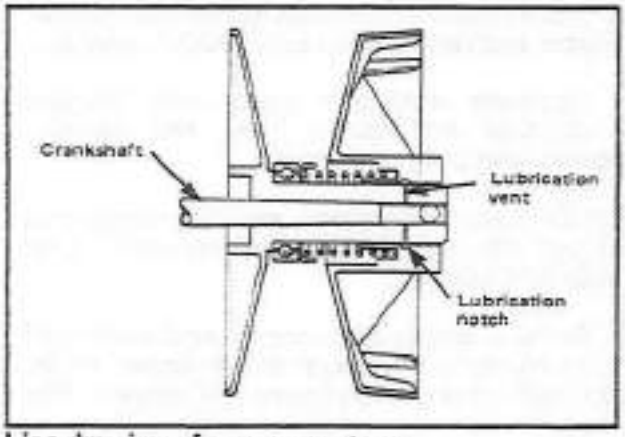
Both the inner and outer pulley halves of the drive pulley are made of aluminum. This metal is light weight, corrosion resistant and repels engine and belt heat during operation of the vehicle. The shaft of the pulley is made of steel.

A hollowed inner half pulley shaft contains a reserve of Ski-Doo clutch lube. During pulley operation this grease is forced through the lubrication vent in the shaft and becomes trapped within the lubrication notch of the outer half pulley. From there, outer half pulley activation distributes the grease along the pulley shaft and the pulley is lubricated. (See line drawing below).



A Bolt
B Washer
C Centrifugal governor
D Outer half pulley
E Spring
F Spring seat
G Bearing
H Inner half pulley
I Shim (.024")

Exploded view of drive pulley



Line drawing of grease aperture

REMOVAL

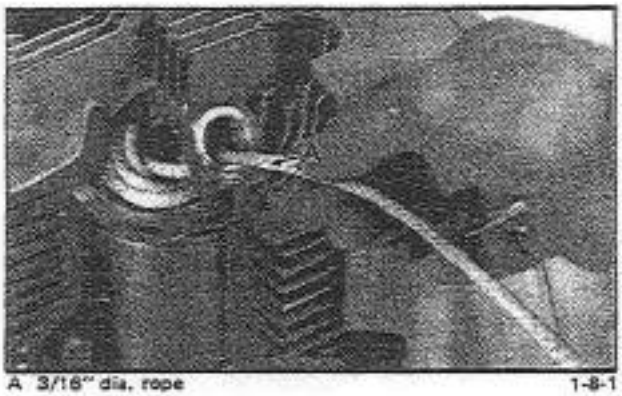
1. Remove pulley guard, drive belt and spark plug(s).

2. Position the piston (on double cylinder, P.T.O. side piston) 3/4 inch to 1-1/4 inches before top dead center.

CAUTION: Make sure the piston closes the exhaust port.

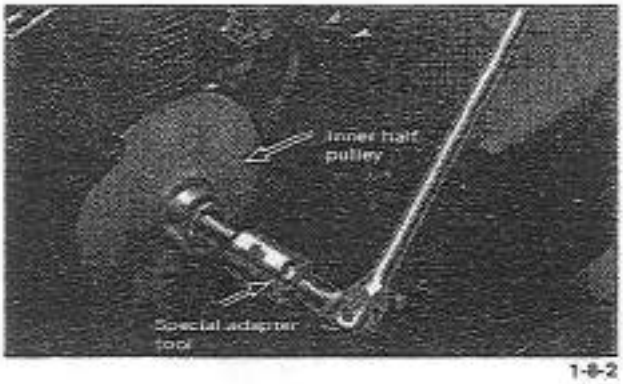
3. Lock crankshaft into position by inserting a 3/16 inch dia. rope into same cylinder. For final lock, pull rewind starter rope slightly until

piston bears against "cushioning" (fig. 1-8-1).


A 3/16" dia. rope 1-8-1

4. Remove centrifugal governor bolt, washer, centrifugal governor, outer half pulley, spring and spring seat from shaft of inner pulley half.

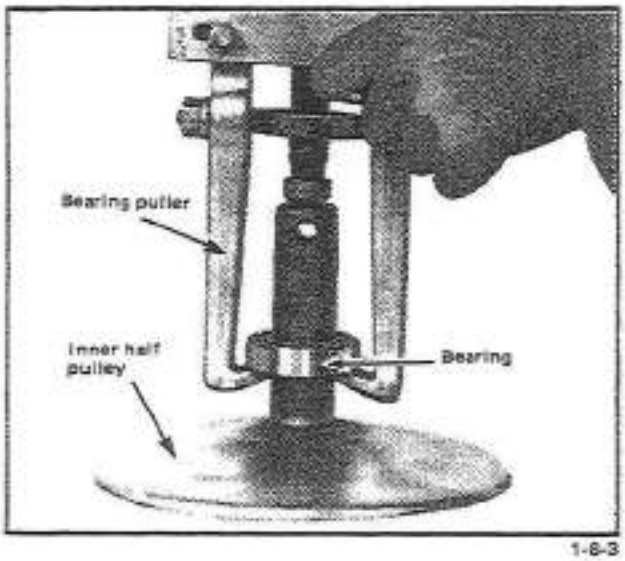
5. Using a special adapter tool, remove inner half pulley from crankshaft (fig. 1-8-2)



1-8-2

6. Remove rope from cylinder.

7. Using an appropriate bearing puller, remove bearing from pulley by pulling it by inner race (fig. 1-8-3).



1-8-3

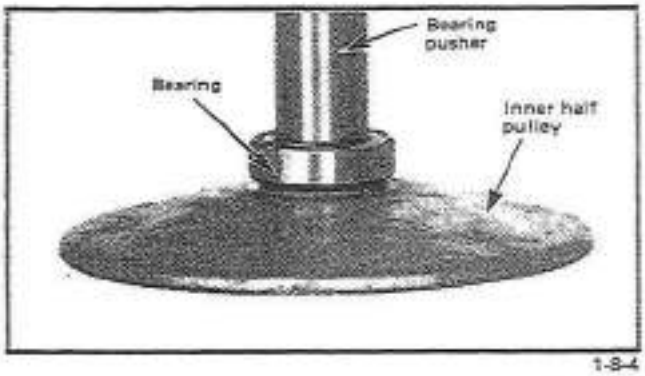
INSPECTION

1. Visually inspect inner and outer pulley halves for scratches, grooves and/or rough surfaces. Remove defects using fine emery cloth. Wipe pulley halves with a clean cloth.

2. Check the length of clutch spring.
On T'NT 340 and 440 models, spring length should be 2-15/16 inches.
On all other models, the spring length should be 2-13/16 inches.
If spring has been stretched or compressed, replace.

INSTALLATION

1. Position bearing on shaft of inner half pulley. Using a bearing pusher, press bearing down by the inner race until bearing is properly seated (fig. 1-8-4).



1-8-4

2. Position the piston (on double cylinder P.T.O. side piston) 3/4 to 1-1/4 inches **after top dead center.**

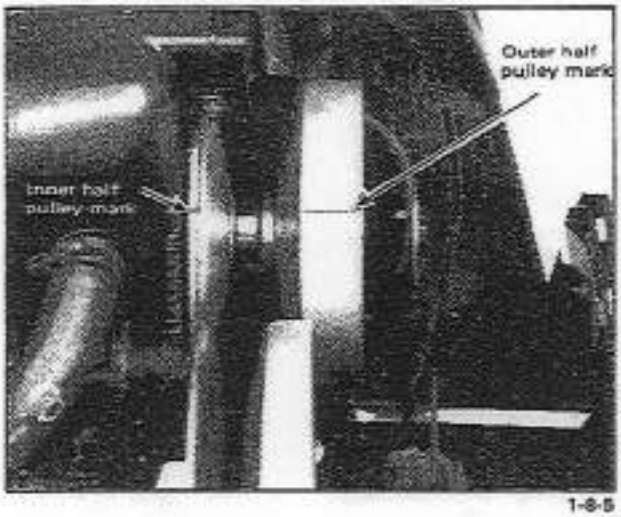
CAUTION: Make sure the piston is closing the exhaust port.

3. Insert a length of 3/16 inch dia. rope into spark plug hole, (P.T.O. side piston for double cylinder engines), to lock crankshaft in position.

4. Lubricate crankshaft thread with Ski-Doo clutch lube and install inner half pulley. Proceed with pulley alignment.

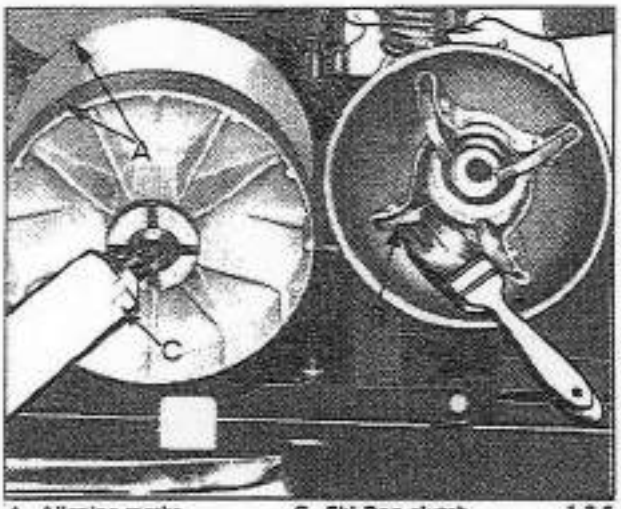
NOTE: Pulley alignment can be performed without the centrifugal governor and outer pulley half installed.

5. Position spring seat, spring and outer half pulley on shaft. Make sure that inner half pulley mark and outer pulley mark are aligned (fig. 1-8-5).



1-8-5

6. Pack Ski-Doo clutch lube into bolt hole of inner half pulley shaft. Apply a light coat of Ski-Doo clutch lube to the four (4) pressure levers of the centrifugal governor (fig. 1-8-6).



A Aligning marks
B Pressure levers
C Ski-Doo clutch lube

1-8-6

7. Lubricate threads of governor bolt with light machine oil. Install centrifugal governor, washer and bolt. **Torque governor bolt to 38 ft/lb.** Wipe off excess lubricant from drive pulley.

CAUTION: Excess lubricant on pulley shaft or misalignment of marks on pulley halves will cause the lubricant to penetrate drive belt creating slippage and deterioration.

8. Turn crankshaft slightly to liberate rope. Remove rope from cylinder. Install spark plug(s).

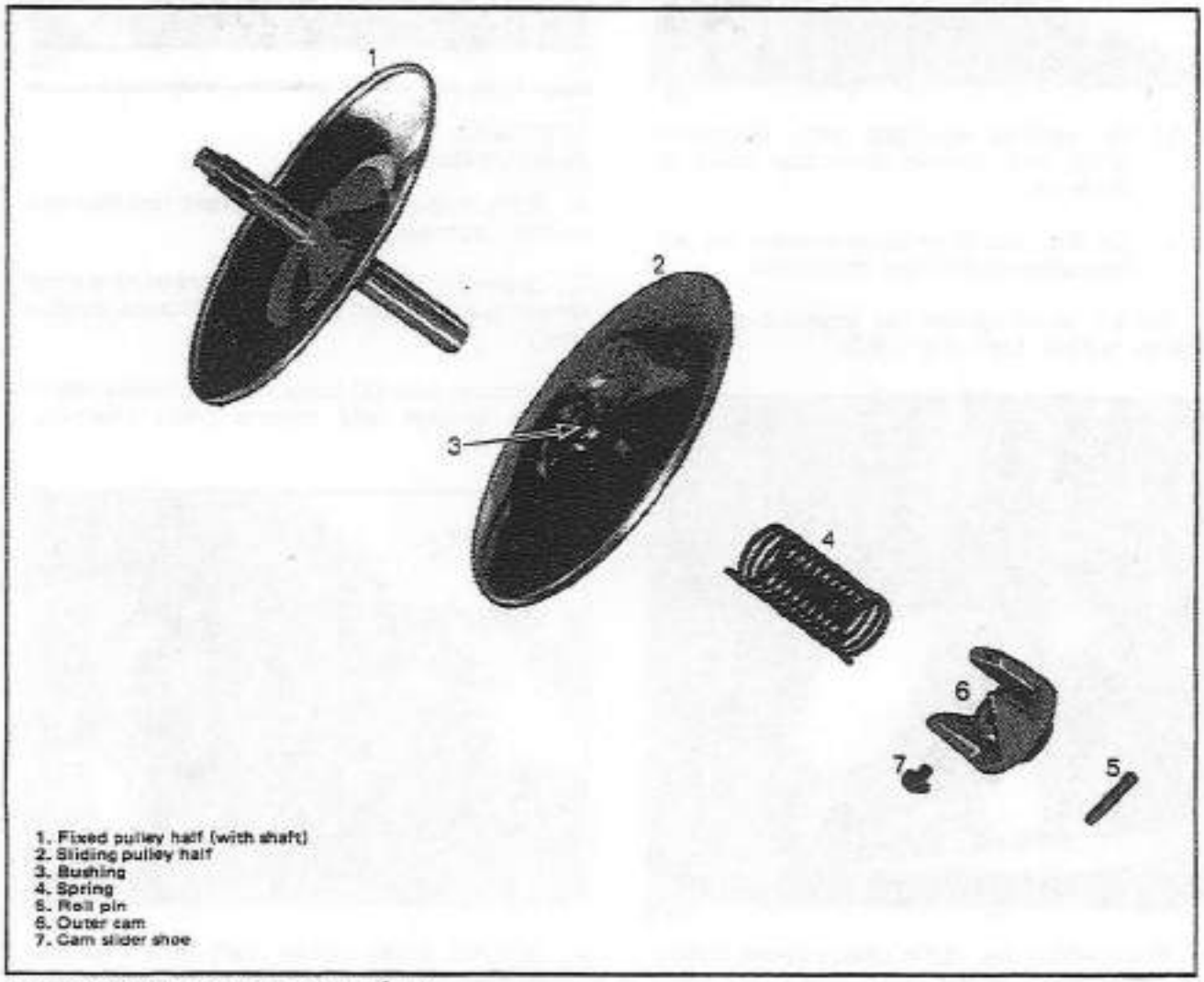
9. Install drive belt and pulley guard.

Suspension

DRIVEN PULLEY 1-9

GENERAL

The driven pulley is a variable pitch pulley which transmits power from the drive pulley to the drive axle sprocket by means of a drive chain mounted on sprockets. Belt engagement transmitting power to driven pulley causes chain entrainment. Spring pressure on the sliding pulley half maintains face contact with belt under all operating conditions.



Exploded view of driven pulley (Élan)

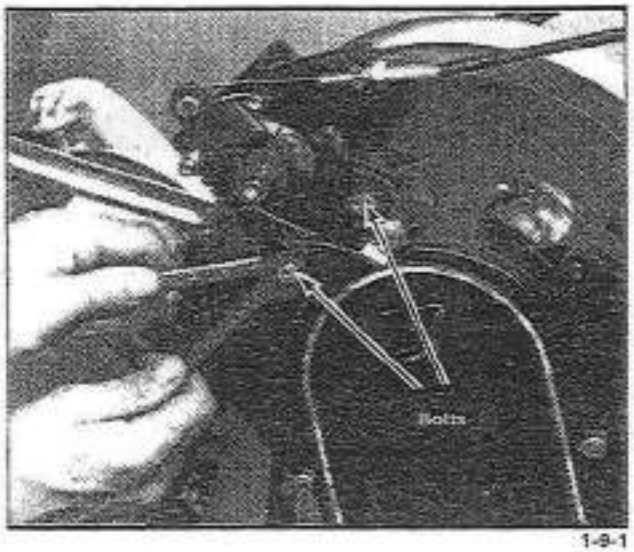
REMOVAL

(All models except Nordic 640ER, Alpine and Valmont).

1. Remove pulley guard, drive belt and muffler. On T'NT models equipped with tuned muffler, remove muffler grommet.

2. On Élan, Olympique and T'NT 292 models, remove bolts and nuts securing steering column upper bracket.

3. On vehicles equipped with disc brake, remove two (2) bolts securing brake assembly to bracket and remove brake assembly (fig. 1-9-1).

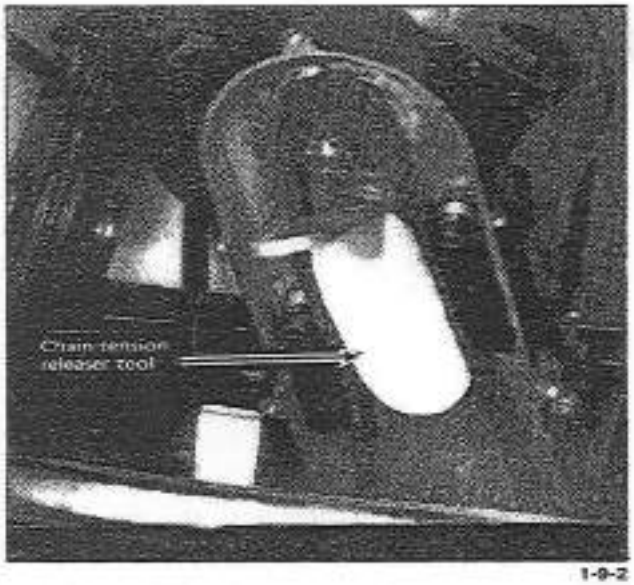


1-9-1

4. a) On vehicles equipped with aluminum chain case, remove chain case cover to drain oil.

   b) On Élan and Olympique models, pry out inspection cover from chain case.

5. Release chain tension by inserting a chain tension releaser tool (fig. 1-9-2).

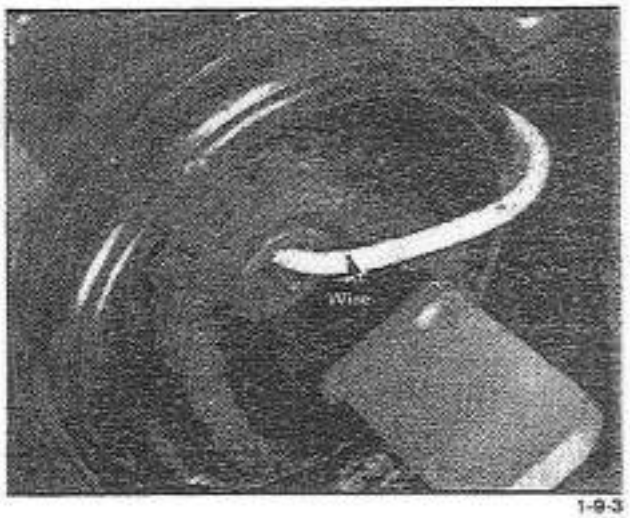


1-9-2

6. From within the chain case, remove cotter pin, castellated nut and spring washer from driven pulley shaft.

7. Hold upper sprocket with chain in position and pull driven pulley toward engine side.

8. On Élan and Olympique models, remove bearing cone then temporarily attach sprocket and drive chain with wire to prevent them from falling into chain case (fig. 1-9-3).



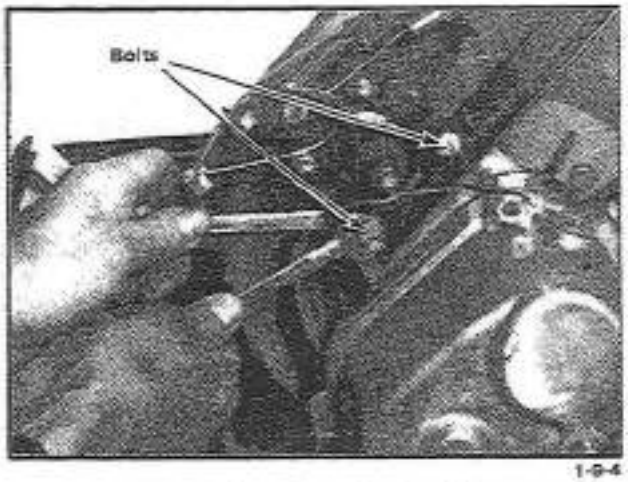
1-9-3

REMOVAL
(Nordic 640ER model).

1. Remove pulley guard, drive belt, muffler and muffler grommet.

2. Drain oil from transmission and with a small screwdriver, pry out drive axle seal (transmission side).

3. Remove two (2) bolts securing brake assembly to bracket and remove brake assembly (fig. 1-9-4).

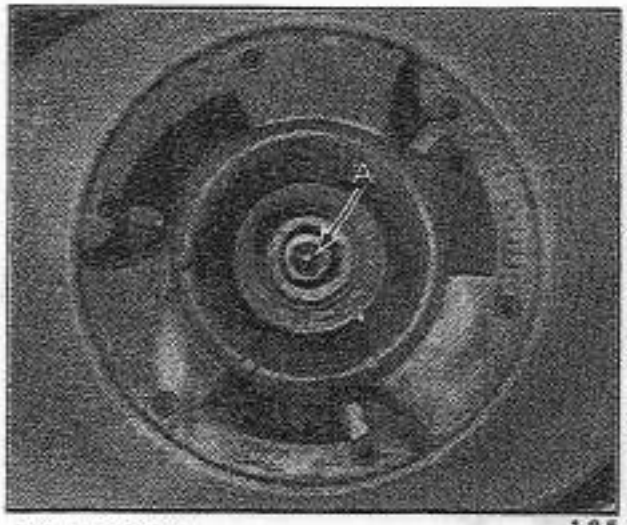


1-9-4

4. Support driven pulley shaft with a wooden block and drive out roll pin securing outer cam to driven pulley shaft. Remove outer cam and spring.

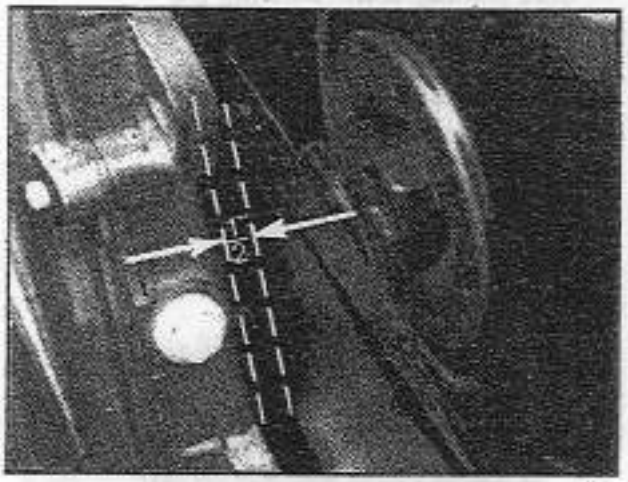
5. Remove Allen head screw (L.H.S. thread) securing driven pulley shaft to transmission drive shaft (fig. 1-9-5).

6. Remove upper bolts securing transmission to frame and slacken off lower bolts 1/2 inch.



A Allen head screw 1-9-5

7. Partially withdraw transmission (fig. 1-9-6).



1-9-6

8. Unscrew driven pulley shaft from transmission drive shaft and remove.

REMOVAL
(Alpine and Valmont models)

1. Remove pulley guard and drive belt.

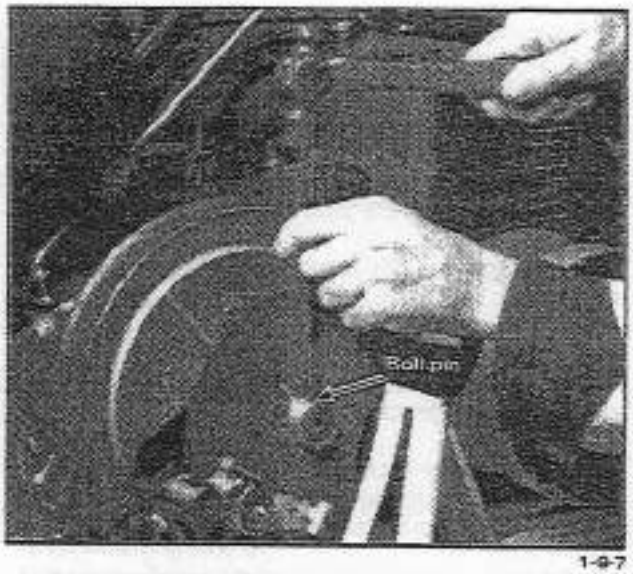
2. Remove pulley guard holder.

3. Position a block (5-3/8 x 3 x 1 inches) under drive shaft.

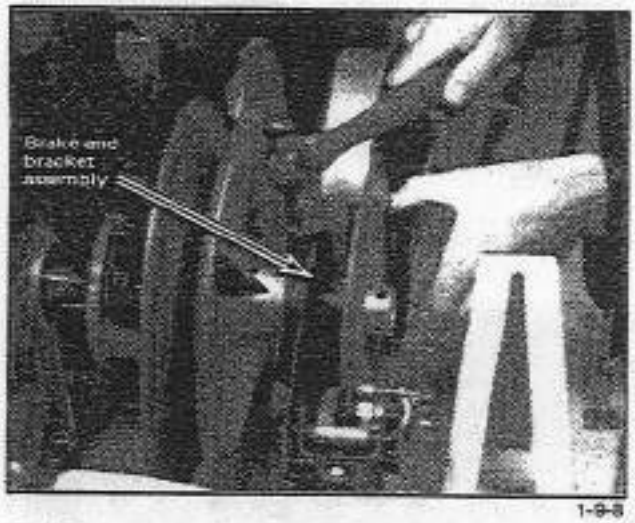
4. Using a hammer and a pin punch, remove roll pin locking disc in position (fig. 1-9-7).

5. With a hammer, tap on inner side of brake and bracket assembly to disengage it from the bearing (fig. 1-9-8).

6. Remove disc, spring washer, spacer and brake and bracket assembly.



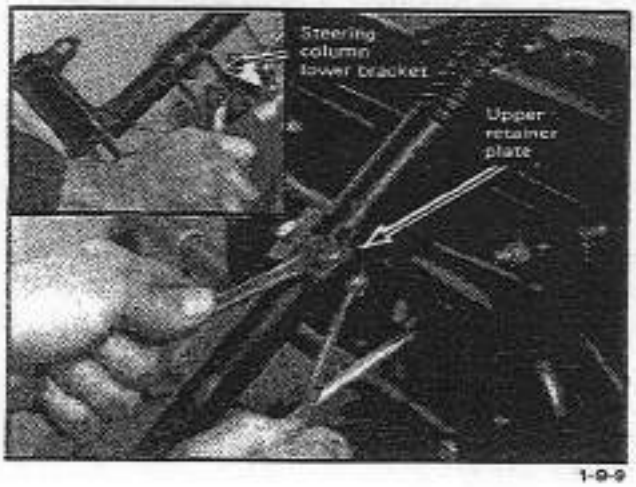
1-9-7



1-9-8

7. Remove muffler from engine.

8. Remove nuts securing steering column lower bracket to the gear box. Slacken bolts and nuts securing steering column upper retainer plate (fig. 1-9-9).



1-9-9

9. Disconnect brake and throttle cables at ferrule and pivoting slug of handlebar. Pull steering column rearwards to provide working space and allow removal of gear box housing.

10. Disconnect transmission rod from gear box by removing cotter pin, spring and washer.

11. Remove eight (8) nuts securing gear box upper housing. Loosen housing using a soft faced hammer.

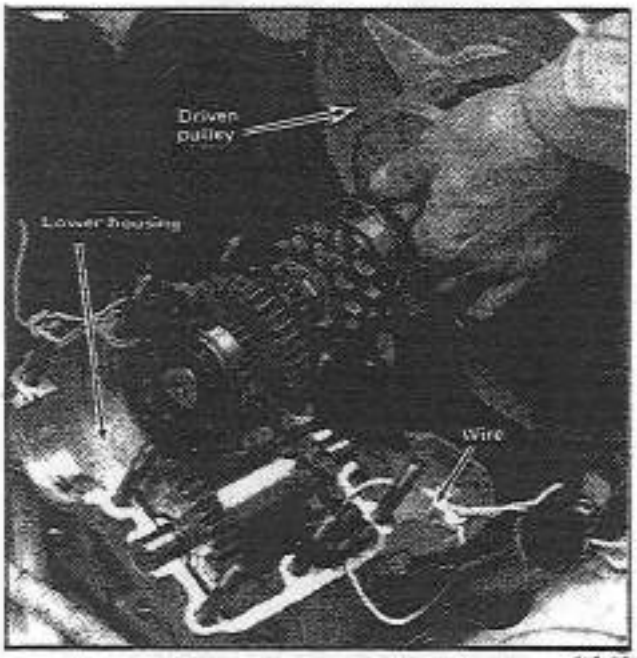
12. Release chain tension to maximum slackness by rotating eccentric tensioner.

13. Place a clean cloth beneath chain and in lower housing to prevent foreign matter and/or components from falling into gear box.

14. Separate chain at connecting link and remove cloth.

15. Insert two (2) pieces of wire through chain on each side of double link pins to be removed. Hook wires to lower housing studs to secure chain ends.

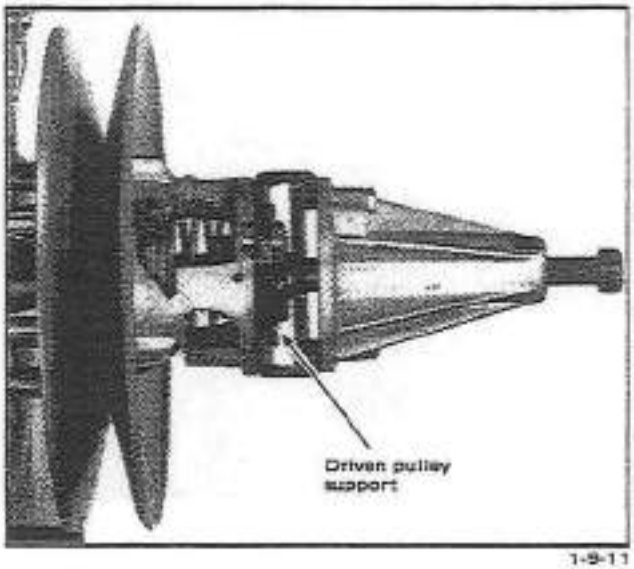
16. Withdraw driven pulley (fig. 1-9-10).



1-9-10

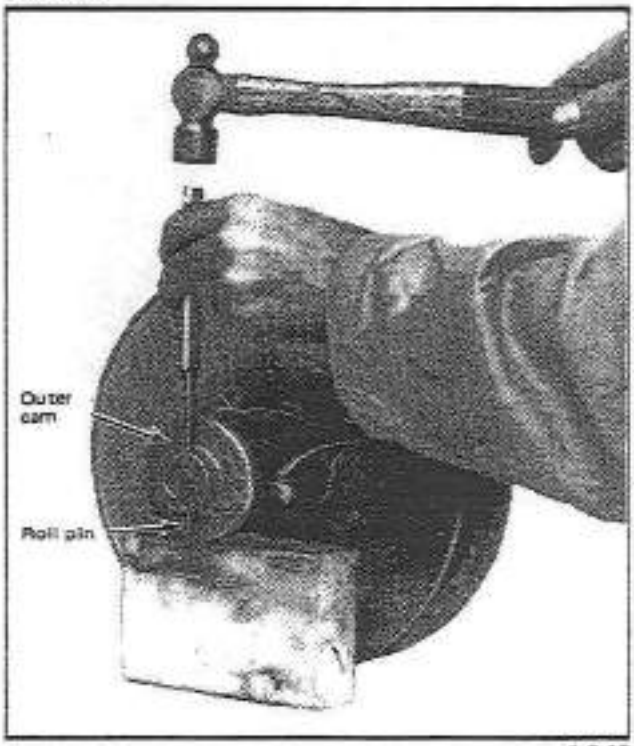
DISASSEMBLY
(All models except Alpine and Valmont)

1. On all T'NT models except 292, remove snap ring and using a driven pulley support puller, remove support from drive shaft (fig. 1-9-11). Remove spacer.



1-9-11

2. On all models except Nordic 640ER, place a support block under outer cam and using a pin punch, push roll pin locking cam to fixed pulley half shaft. Pull off outer cam and spring (fig. 1-9-12).



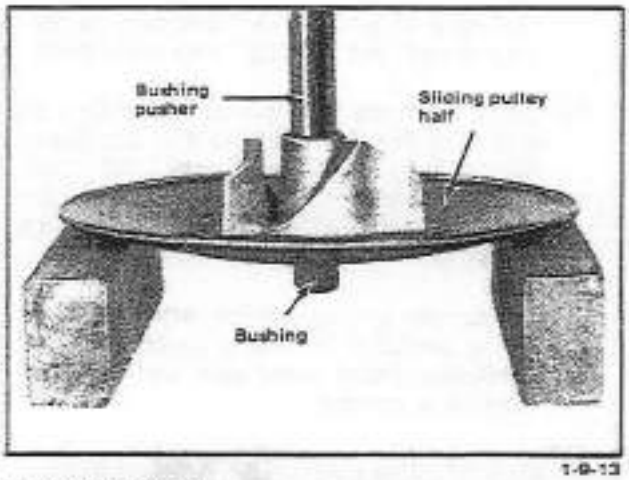
1-9-12

3. Pull off sliding half.

4. On T'NT and Nordic models, remove capscrews and washers securing brake disc to fixed pulley half.

5. Remove cam slider shoes from outer cam.

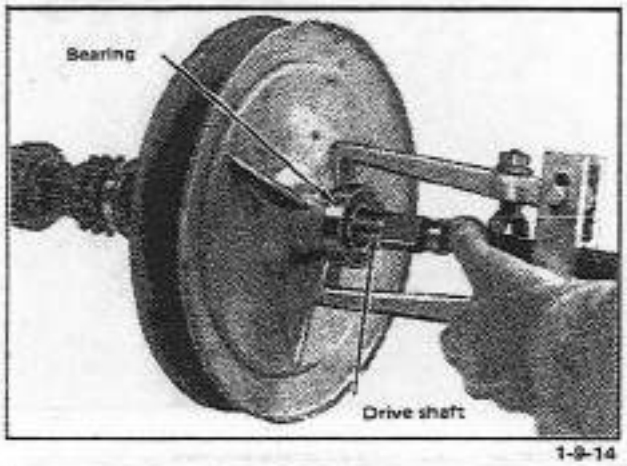
6. Using a bushing pusher, remove bushing from sliding pulley half (fig. 1-9-13).



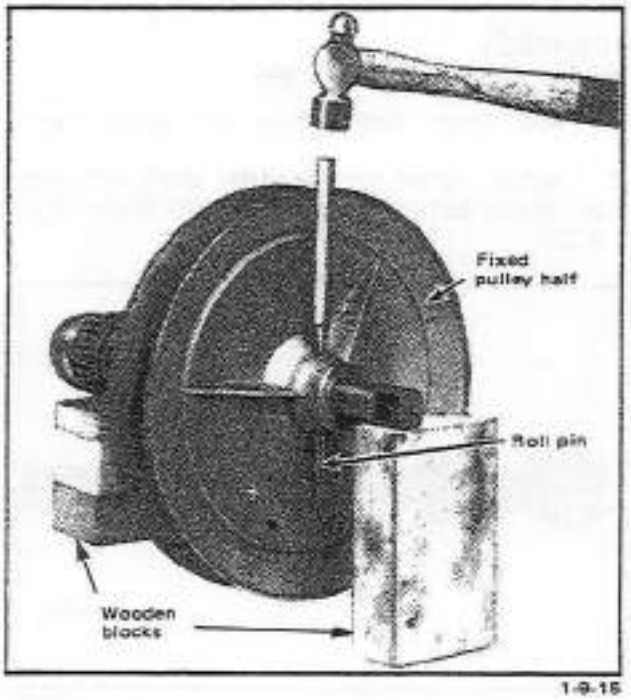
1-9-13

DISASSEMBLY
(Alpine and Valmont models)

1. Using a suitable bearing puller, remove bearing from drive shaft (fig. 1-9-14).



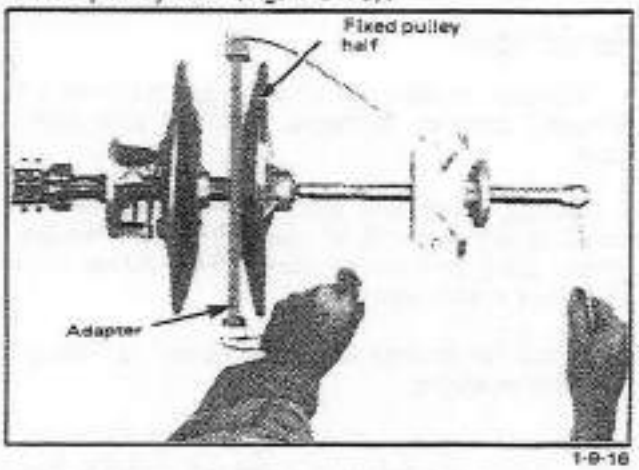
1-9-14



1-9-15

2. Place assembly on wooden blocks and using a pin punch and hammer, remove inner pin installed in larger roll pin securing fixed pulley half to shaft. Remove larger roll pin (fig. 1-9-15).

3. Open sliding pulley half and insert both halves of special puller adapter between pulley halves. Install C-clips. Install puller and remove fixed pulley half (fig. 1-9-16).

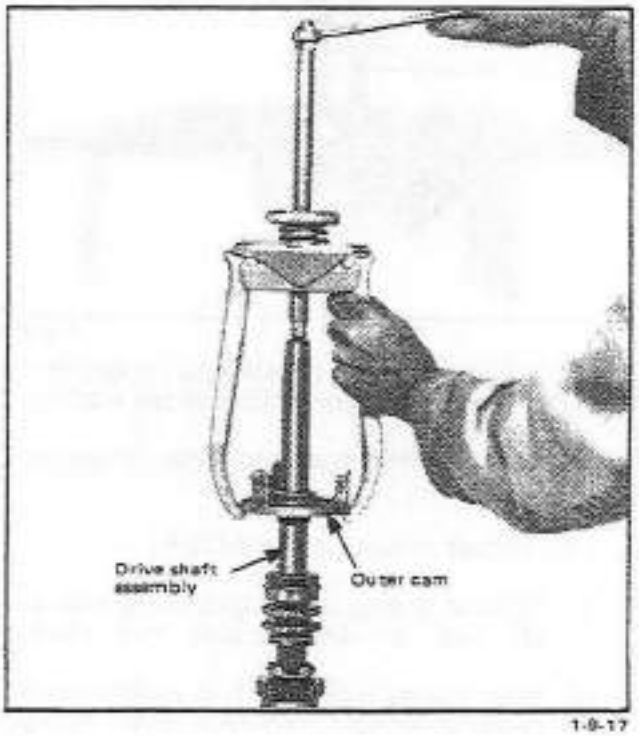


1-9-16

NOTE: If necessary, heat hub of fixed pulley half to facilitate removal.

4. Remove sliding pulley half and spring. Position drive shaft assembly on wooden blocks and with a pin punch and hammer, remove roll pins securing outer cam.

5. Install puller and remove outer cam from drive shaft (fig. 1-9-17).



1-9-17

NOTE: If necessary, heat outer cam to facilitate removal.

6. Remove cam slider shoes from outer cam.

7. Using an appropriate bushing pusher, press bushing from sliding pulley half (see fig. 1-9-13).

INSPECTION

1. Visually inspect cam slider shoes for worn or damaged contact surfaces. Replace defective shoes.

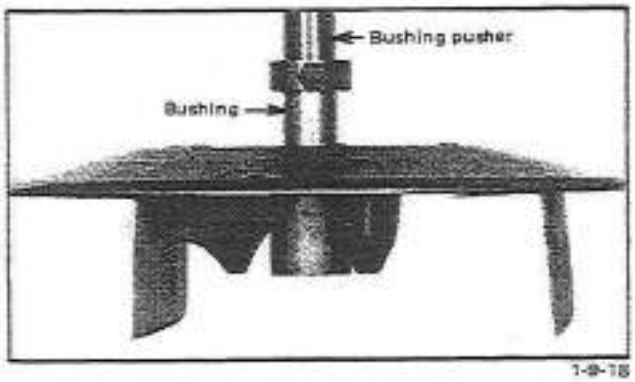
2. Inspect fixed and sliding pulley halves for scratches, grooves and/or rough surfaces. Remove defects using fine emery cloth. Wipe pulley halves with a clean cloth.

3. Check for broken or distorted spring. Replace defective spring.

4. Visually inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged components.

ASSEMBLY
(All models except Alpine and Valmont).

1. Press new bushing into sliding pulley half (fig. 1-9-18).



1-9-18

2. On vehicles equipped with disc brake, install disc using appropriate capscrews and washers.

3. Using a hammer, install cam slider shoes on outer cam.

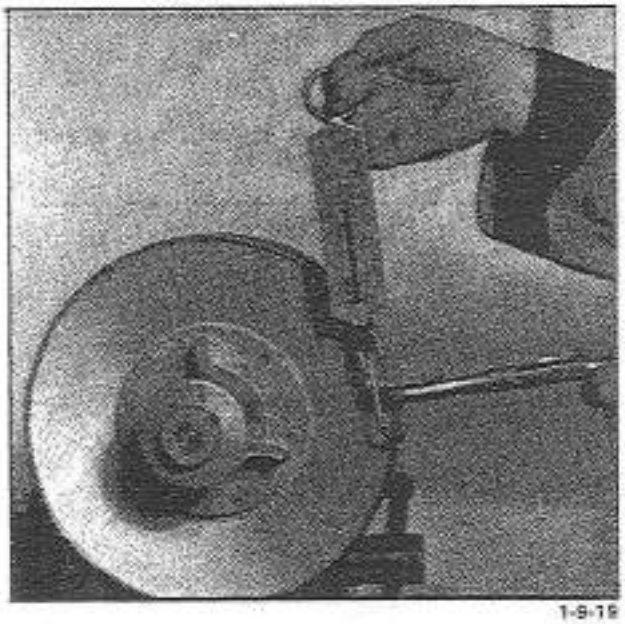
4. (All models except Nordic 640ER)

   a) Position sliding pulley half, spring and outer cam on fixed pulley half shaft.

   b) Hold sliding pulley half in position and rotate outer cam clockwise (when facing cam) 2/3 of a turn then lock cam by driving a roll pin through cam and shaft.

   c) Using a fish scale, check spring tension on sliding pulley half (fig. 1-9-19). On Élan, Olympique, Nordic 440 and T'NT 292 models, tension should be 8 ± 1 lb. On two cylinder T'NT models, spring tension should be 11 ± 1 lb.

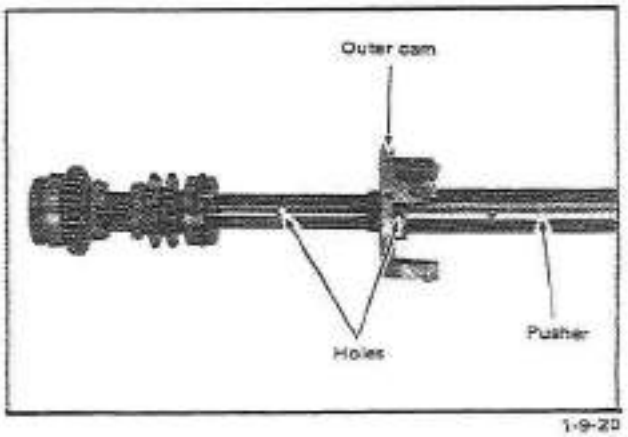
      To correct spring tension either change spring position in sliding pulley half or gradually rotate outer cam until spring tension is correct.


1-9-19

ASSEMBLY
(Alpine and Valmont models).

1. Install cam slider shoes on outer cam.

2. Position outer cam on drive shaft ensuring that hole in cam aligns with holes in shaft (fig. 1-9-20).

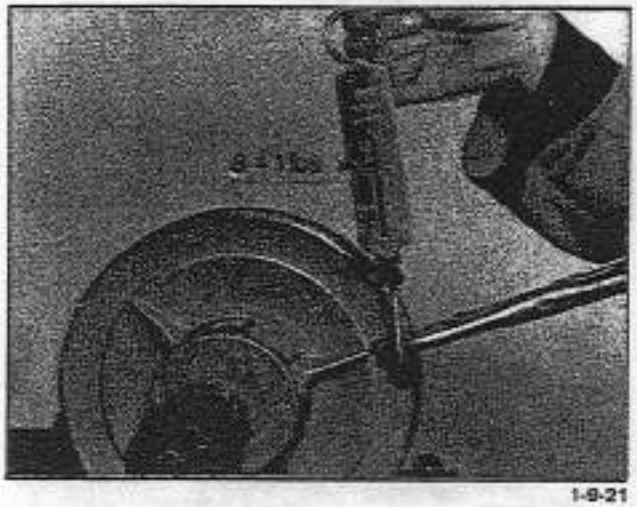


1-9-20

3. Using an appropriate pusher, press down on outer cam until hole in cam mates with third hole in shaft. Install larger roll pin then small roll pin to lock outer cam in position.

4. Position a new bushing in hole of sliding pulley half. Using bushing pusher, press down until bushing is flush with edge of pulley (fig. 1-9-18).

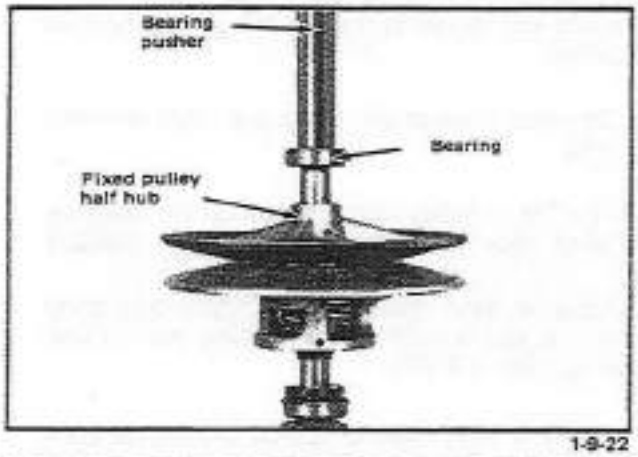
5. Place spring and sliding pulley half over shaft. Insert spring hook into hole of outer cam. Align hole in sliding pulley half with the other end of spring. Turn sliding pulley half counter-clockwise to obtain 8 ± 1 lbs. (when facing outer cam) and hold in position (fig. 1-9-21).



1-9-21

6. Holding sliding pulley half in position, align hole in fixed pulley half with holes in shaft. Position fixed pulley half on shaft and using a pusher, mate pulley half hole with second hole of drive shaft. Using a pin punch and hammer, install larger roll pin and then smaller roll pin.

7. Using an appropriate bearing pusher, press bearing until it sits on fixed pulley half hub (fig. 1-9-22).



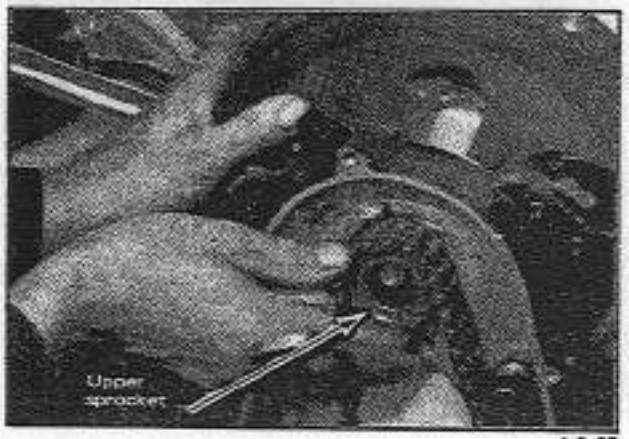
1-9-22

INSTALLATION
(All models except Nordic 640ER and Alpine and Valmont).

1. On Élan and Olympique models, position the bearing cone in the bearing cup.

2. With drive chain tension released, hold upper sprocket with chain in position and insert assembled driven pulley shaft through chain case and sprocket (fig. 1-9-23).

3. Install spring washer and castellated nut.



1-9-23

NOTE: Tighten castellated nut then back off nut 1/6 of a turn and lock in position with cotter pin. It is imperative that nut is backed off or damage may occur due to a burned or seized bearing. Remove releaser tool from chain case.

4. On T'NT and Nordic 440 models, install chain case cover and pour 12 ozs. of Ski-Doo chain case oil into chain case.

5. On Élan and Olympique models, install inspection cover.

6. Install muffler grommet and muffler.

7. Proceed with pulley alignment.

8. On Élan, Olympique and T'NT 292 models, bolt handlebar upper bracket in position.

9. On vehicles equipped with disc brake, install brake assembly to bracket using two (2) bolts and proceed with brake adjustment.

10. Install drive belt and pulley guard.

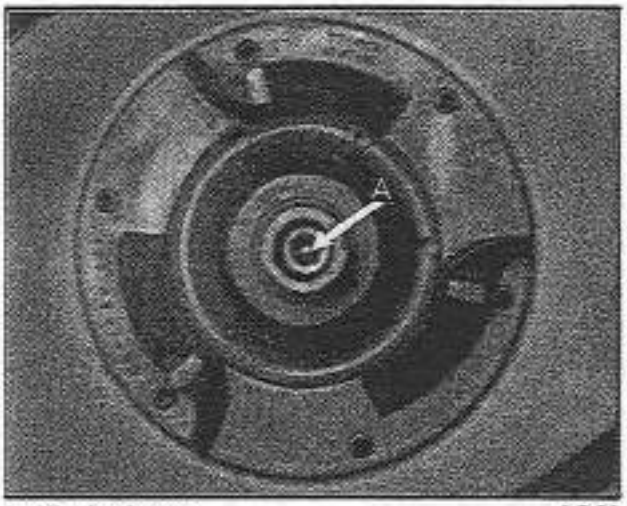
INSTALLATION
(Nordic 640ER model)

1. Screw driven pulley shaft onto transmission drive shaft.

2. Position sliding pulley shaft on driven pulley shaft.

3. Tighten four (4) bolts securing transmission to frame. Press in drive axle oil seal.

4. Fully tighten Allen head screw (L.H. side thread) to secure driven pulley shaft to transmission drive shaft (fig. 1-9-24).

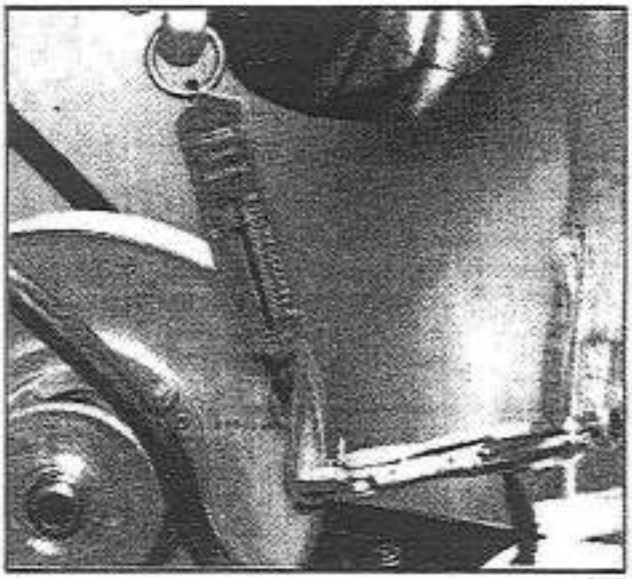


A Allen head screw 1-9-24

5. Position cam spring and cam on shaft.

6. Hold sliding pulley half in position and rotate outer cam 2/3 of a turn clockwise (when facing cam). Lock cam in position by driving a roll pin through cam and shaft.

7. Using a fish scale, check spring tension on sliding pulley half. Tension should be 8 ± 1 lb. To correct either change position of spring in sliding pulley half or gradually rotate outer cam (fig. 1-9-25).



1-9-25

8. Install brake assembly to brake bracket and proceed with adjustment.

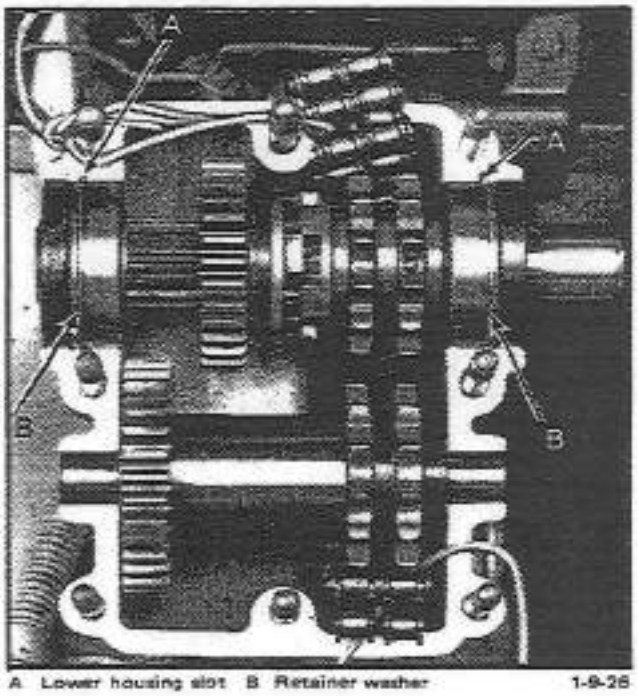
9. Install muffler grommet and muffler.

10. Check pulley alignment.

11. Install drive belt and pulley guard.

INSTALLATION
(Alpine and Valmont models)

1. Position drive shaft of assembled driven pulley so that retainer washers align with slots of gear box casing (fig. 1-9-26).



A Lower housing slot B Retainer washer 1-9-26

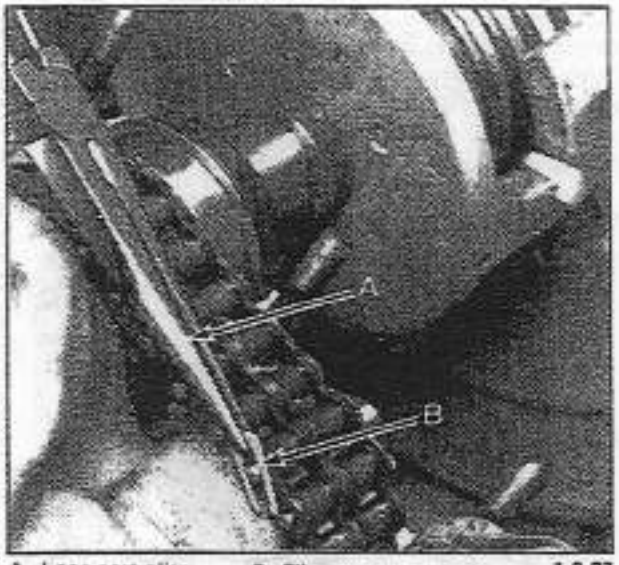
2. Place a clean cloth beneath drive shaft and in gear box casing to prevent foreign matter and/or removed components from falling into bottom of casing.

3. Connect drive chain using a double connecting link.

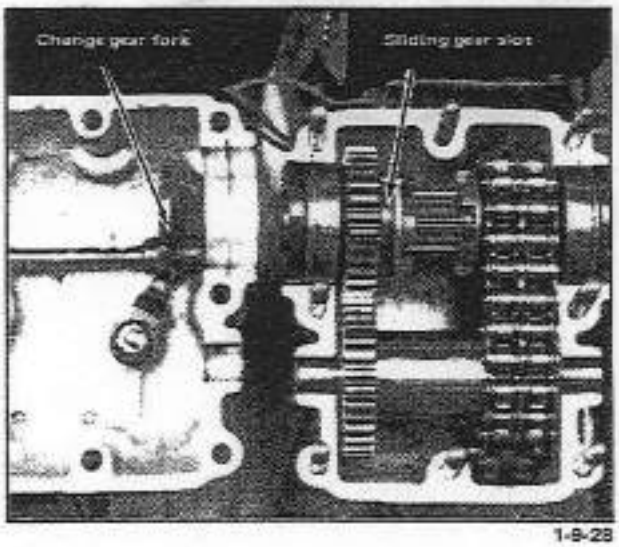
NOTE: The locking clip should be installed on opposite side of driven pulley (fig. 1-9-27).

4. Position gear change fork in gear box cover so that it aligns with slot of sliding gear in gear housing (fig. 1-9-28).

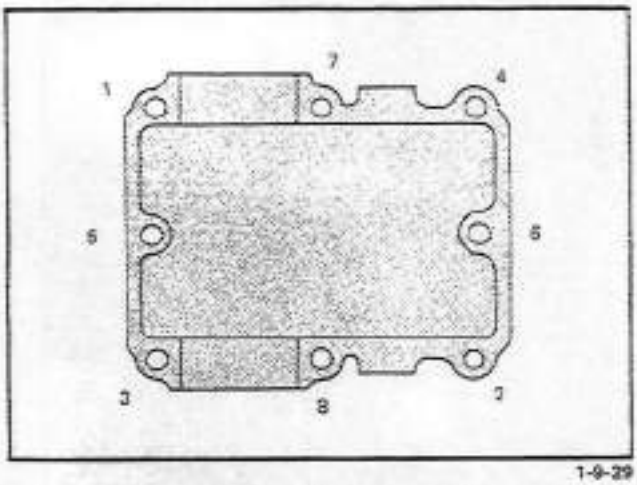
5. Apply a thin coat of L.700 Crankcase Glue on contact surface of gear box casing.



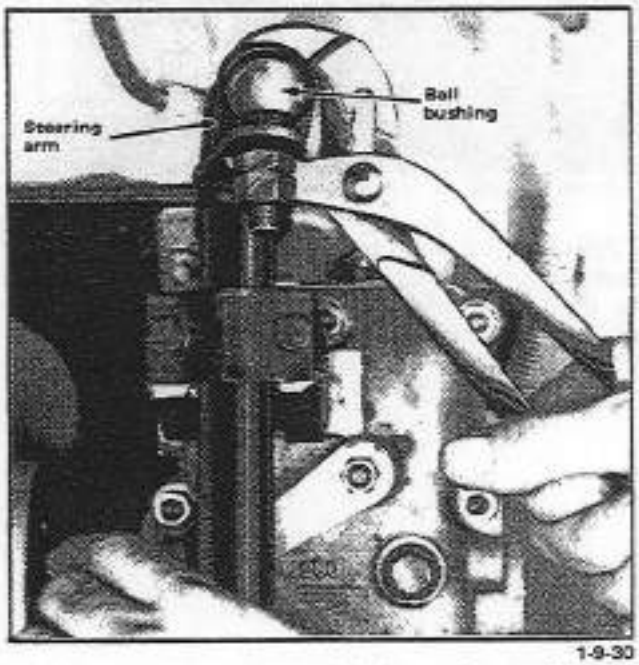
A Long nose pliers B Clip 1-9-27



1-9-28



1-9-29



1-9-30

6. Install gear box cover and secure with eight (8) nuts. Torque nuts to 250 inch-pounds following the sequence shown in figure 1-9-29.

7. Hook up gear box rod and secure with spring, washer and cotter pin.

8. Lower steering column and insert ball bushing into steering arm.

NOTE: If difficulty is encountered, use pliers to align column ball bushing and steering arm (fig. 1-9-30).

9. Secure bracket to gear box housing with two (2) nuts. Tighten bolts and nuts securing upper retainer plate.

NOTE: The distance between the upper retainer plate and the gear box bracket must be 15-1/2 inches.

10. Connect throttle and brake cables and housings at handlebar.

11. Install drive belt and muffler.

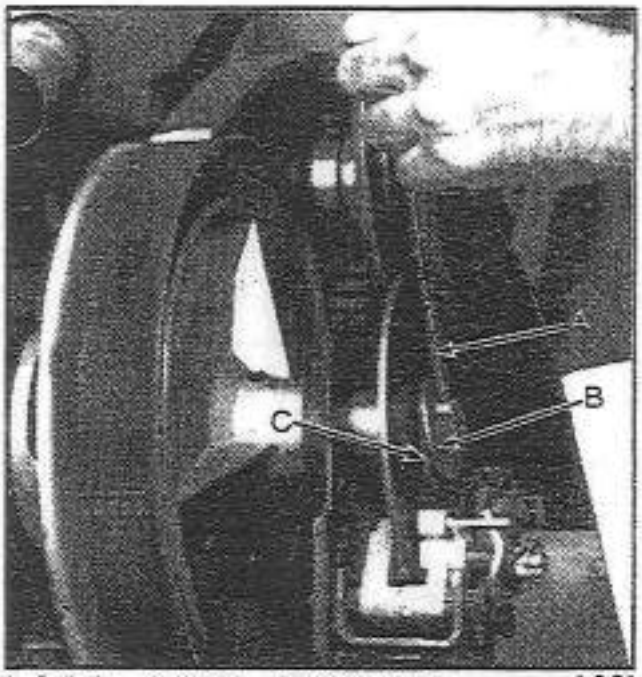
12. Position spacer and spring washer on drive shaft. Install brake and bracket on shaft with disc between brake shoes then push bracket until it sits on bearing.

13. Install bolts and nuts securing brake and bracket assembly to frame.

14. Using a pin punch and hammer, insert roll pin through disc and shaft (fig. 1-9-31).

15. Install pulley guard holder.

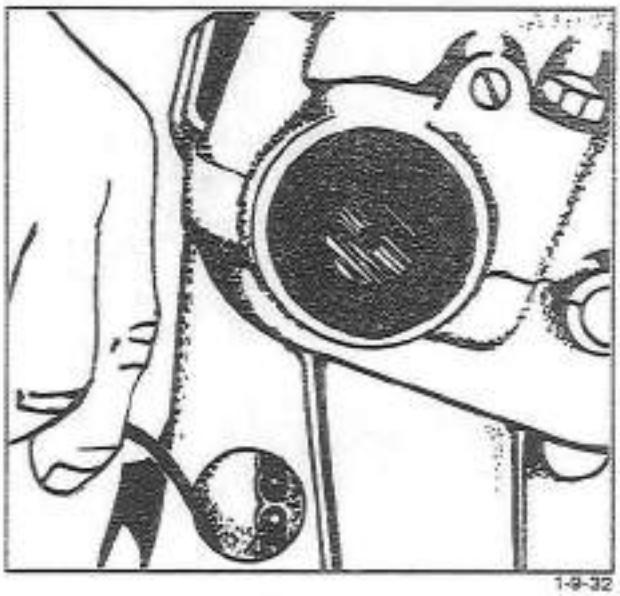
16. Remove capscrew and lock washer of gear box tensioner. Remove inspection cover.



A Roll pin B Washer C Spring washer 1-9-31

17. Adjust drive chain tension to obtain 1/4 inch free-play maximum by turning tensioner clockwise or counter-clockwise. Secure tensioner in position with lock washer and capscrew.

18. Check gear box oil level using a rigid wire as dipstick. Oil level in 440 models should be 2-1/4 inches on dipstick. On 640 models, oil level should be 3-1/4 inches (fig. 1-9-32). Replenish, if required with Ski-Doo chain case oil. Install inspection cover and vent plug.



1-9-32

19. Install pulley guard.

Transmission

PULLEY ALIGNMENT 1-10

ALIGNMENT OF DRIVE AND DRIVEN PULLEY (All models except Alpine and Valmont)

Reduced vehicle performance (loss of engine power) is often due to misalignment of drive and driven pulleys. Misalignment may also result in excessive drive belt wear. If alignment is suspect or if either one or both pulleys have been removed from vehicle during any overhaul procedure, drive and driven pulley alignment must be verified.

IMPORTANT

If pulley offset cannot be obtained through removal and/or installation of maximum permissible quantity of chain case (gear box) and/or drive pulley shims, check frame, chain case (gear box) and components for distortion and damage. Replace damaged or distorted component(s).

ALIGNMENT CHECK

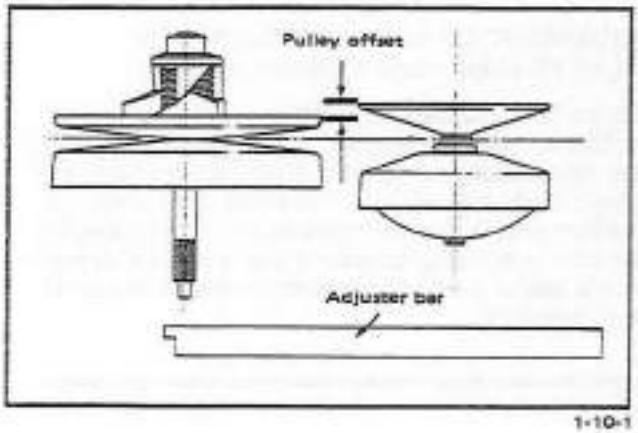
1. Remove pulley guard and drive belt.

2. Check tightness of engine mount nuts. Nuts must be torqued 33 to 35 ft/lbs.

3. Ensure the driven pulley halves are adjoined before checking pulley offset.

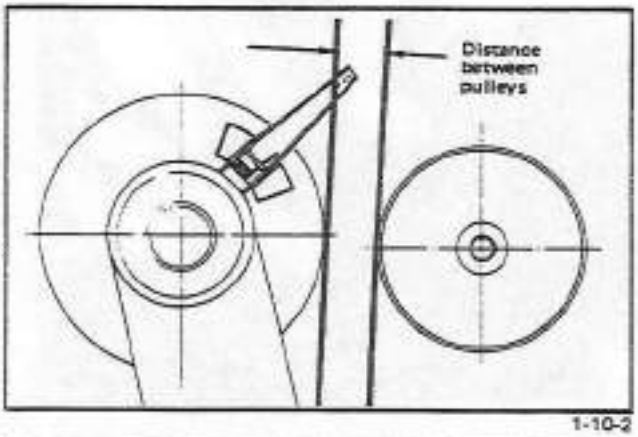
4. Using the appropriate adjuster bar, check for correct offset of pulleys as follows:

The pulley offset on all vehicles except T'NT 340 and 440 models should be: 1/2" ± 1/32". On T'NT 340 and 440 models the offset should be: 7/16" ± 1/32" (fig. 1-10-1).



1-10-1

5. Check that distance between drive and driven pulleys is as follows: on all vehicles except T'NT 340 and 440, the pulley distance should be: 1-7/8"+0" - 1/16". On T'NT 340 and 440 models the distance should be 1-5/8"+0"-1/16" (fig. 1-10-2).



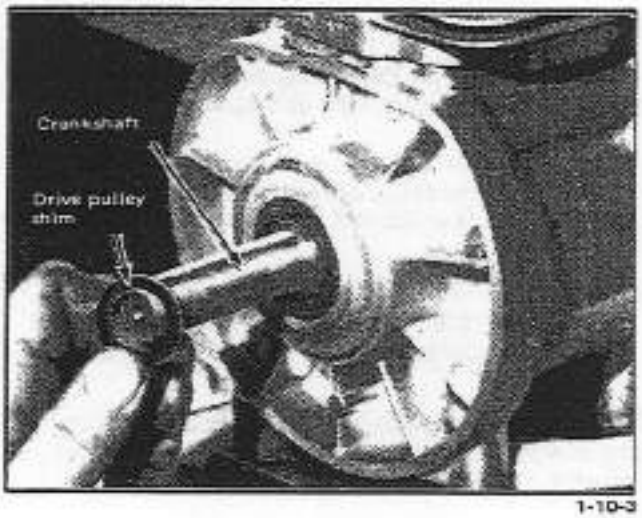
1-10-2

OFFSET ADJUSTMENT

If offset between drive and driven pulleys is greater than specifications adjust as follows:

1. Remove drive pulley assembly.

2. Install required thickness of aligning shims on crankshaft (fig. 1-10-3).



1-10-3

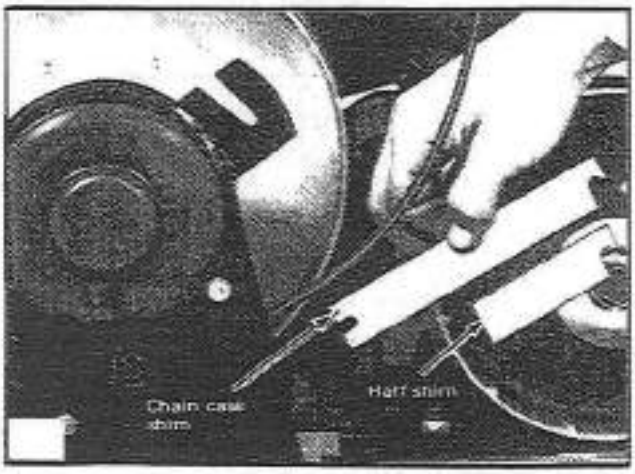
NOTE: Never install more than five (5) drive pulley shims on crankshaft.

3. Install drive pulley assembly.

If offset between drive and driven pulleys is less than specifications adjust as follows:

1. Loosen nuts securing chain case or gear box to frame.

2. Insert required thickness of aligning shims between chain case or gear box and frame. Total quantity of shims must not exceed three (3) (fig. 1-10-4).



NOTE: On steel chain case only, shims can be cut in half and installed to correct a bent chain case.

3. Tighten chain case or gear box and recheck pulley offset.

4. Check that pulley distance is within specifications.

DISTANCE ADJUSTMENT

If distance between drive and driven pulleys is not to specifications adjust as follows:

1. Loosen chain case or gear box. On two (2) cylinder T'NT models, make sure that the driven pulley support is unlocked and raised.

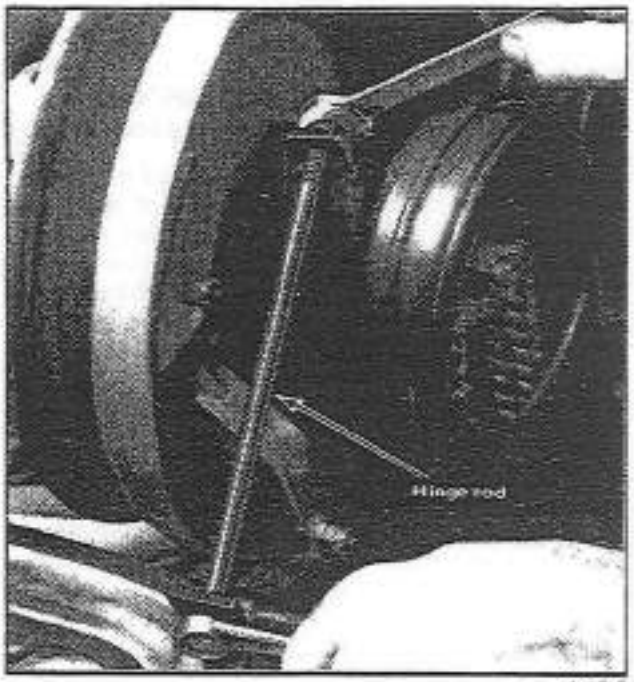
If distance is less.

(a) Tighten the nut on the hinge rod and push chain case forward until distance is correct.

NOTE: On Élan models, to increase distance between pulleys tighten nut securing hinge rod at reinforcing cross support of frame.

If distance is more.

(b) On Élan and Olympique models, loosen the hinge rod nut and tap the chain case rearward to decrease distance (fig. 1-10-5).



1-10-5

(c) On T'NT and Nordic models, pull chain case or gear box rearward.

2. Tighten chain case or gear box.

NOTE: On Élan models, check that brake applies fully when brake lever is 1/4 inch from handlebar.

3. Recheck pulley alignment.

4. Install drive belt and pulley guard.

5. On two (2) cylinder T'NT models, adjust driven pulley support turnbuckle and secure assembly with cotter pin and clevis pin.

ALIGNMENT OF DRIVE AND DRIVEN PULLEYS (Alpine and Valmont models).

Due to the installation position and method of attachment of the engine and gear box mountings, the distance between the drive and driven pulleys is not adjustable. Therefore, any distance misalignment is due to loosening of engine and/or gear box mounting attaching parts and/or damage to a major component sustained as a result of rough handling.

OFFSET ADJUSTMENT

If pulley offset is less than 1/2 ± 1/32 inch, inspect frame, gear box bottom plate and engine mounts for wear, damage, secureness of mounting, distortion and/or missing parts. Repair or replace defective part(s).

If offset between drive pulley is greater than specification, adjust as follows:

1. Remove drive pulley assembly.
2. Install required thickness of drive pulley aligning shims on crankshaft.

NOTE: Never install more than five (5) shims on crankshaft.

3. Install drive pulley assembly.
4. Recheck pulley alignment.

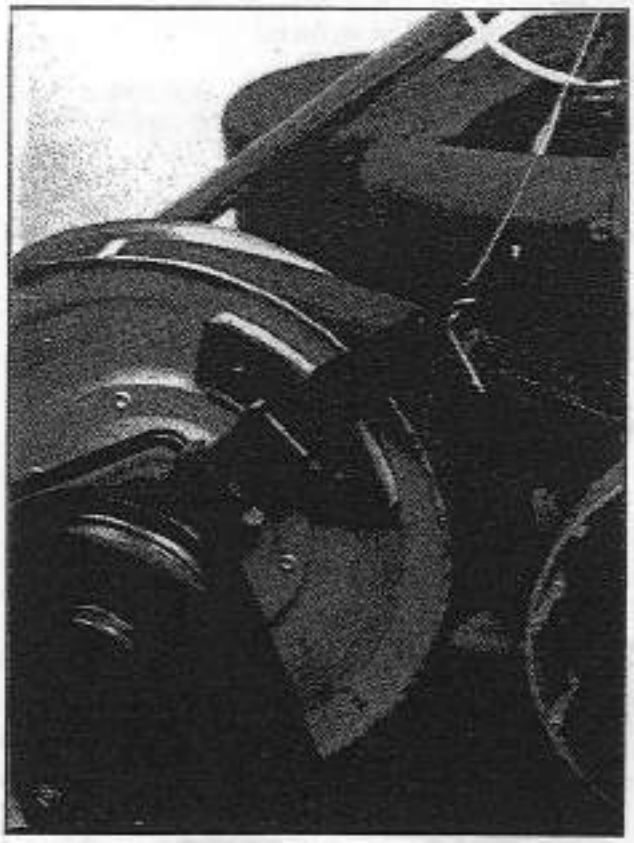
Transmission

BRAKE MECHANISM 1-11

GENERAL

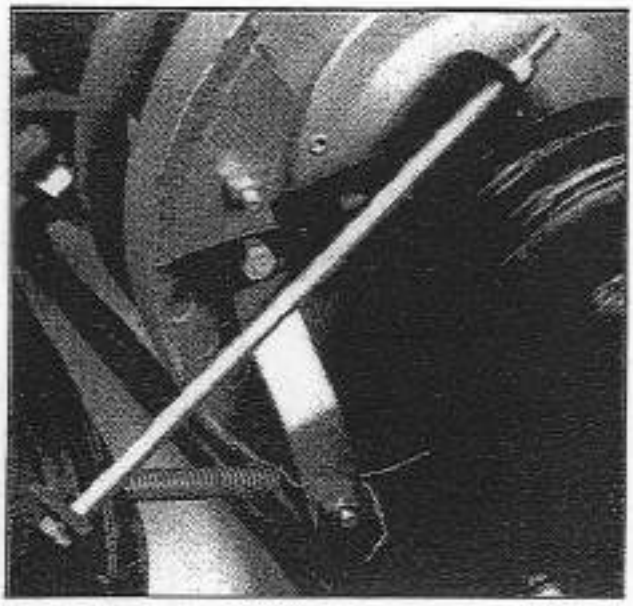
There are three (3) types of brakes installed on Ski-Doo snowmobiles; pivot, drum and disc type.

(a) Pivot: A mechanical pivoting arrangement consisting of a swivel plate and handle plate secured to the chain case bracket. The swivel plate which incorporates the brake lining, pivots to bear against the driven pulley when the brake cable is activated thereby decreasing vehicle speed.



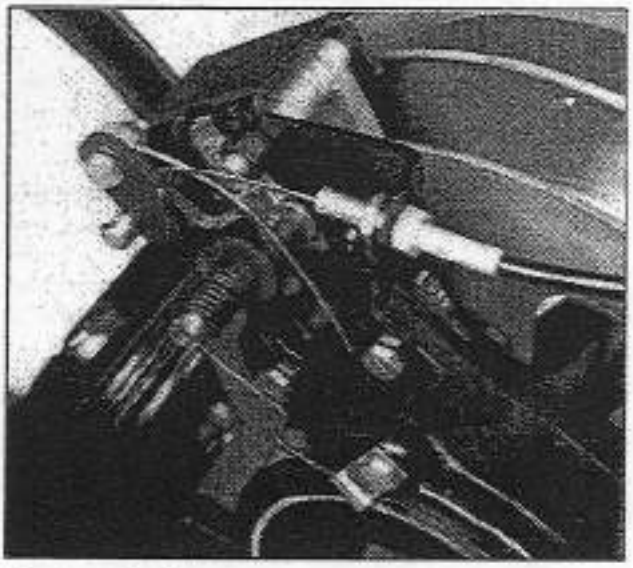
Pivot type brake

(b) Drum: A lever incorporating a brake shoe to which the brake lining is riveted. The brake shoe lever is attached to the chain case bracket. Applying the handlebar brake lever causes the brake lining to come in contact with the drum (driven pulley rim) effecting reduced speed.



Drum type brake

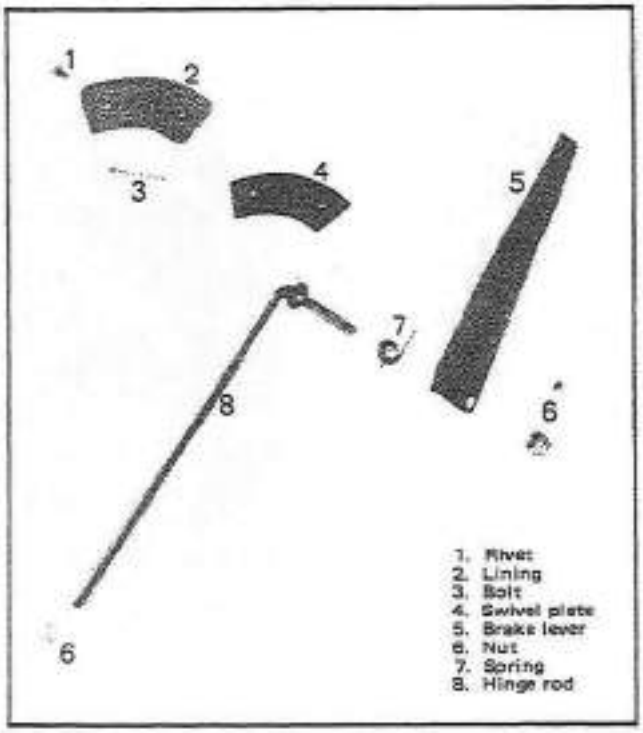
(c) Disc: a disc plate and caliper arrangement mounted on a bracket. The disc is secured to and rotates with the driven pulley during operation of the vehicle. Activating the handlebar brake lever causes the brake pucks to close and bear against both sides of the disc resulting in vehicle slowdown.



Disc type brake

Brake release is controlled by a spring either secured to the lever (handle plate) or incorporated on the brake cable.

PIVOT TYPE BRAKE (All Elan models)



Exploded view of pivot type brake

REMOVAL

1. Remove console and drive belt.

2. Disconnect the brake cable from the handle plate. Remove nut securing hinge rod to reinforcing cross support at frame.

3. Remove "U" clamp securing chain case, spacers and aligning shim(s). Loosen nut attaching chain case lower bracket to frame.

4. Disengage hinge rod from cross support by pulling chain case towards drive pulley.

5. Remove nut securing hinge rod to chain case bracket. Remove hinge rod, spring and brake mechanism.

DISASSEMBLY

1. Remove the bolt securing handle plate to swivel plate.

2. Using a 11/64 inch dia drill, remove the rivets attaching lining to swivel plate.

INSPECTION

1. Inspect brake lining for wear and oil-soakage. Rivet heads must be embedded below surface of lining. Replace worn or oil-soaked lining.

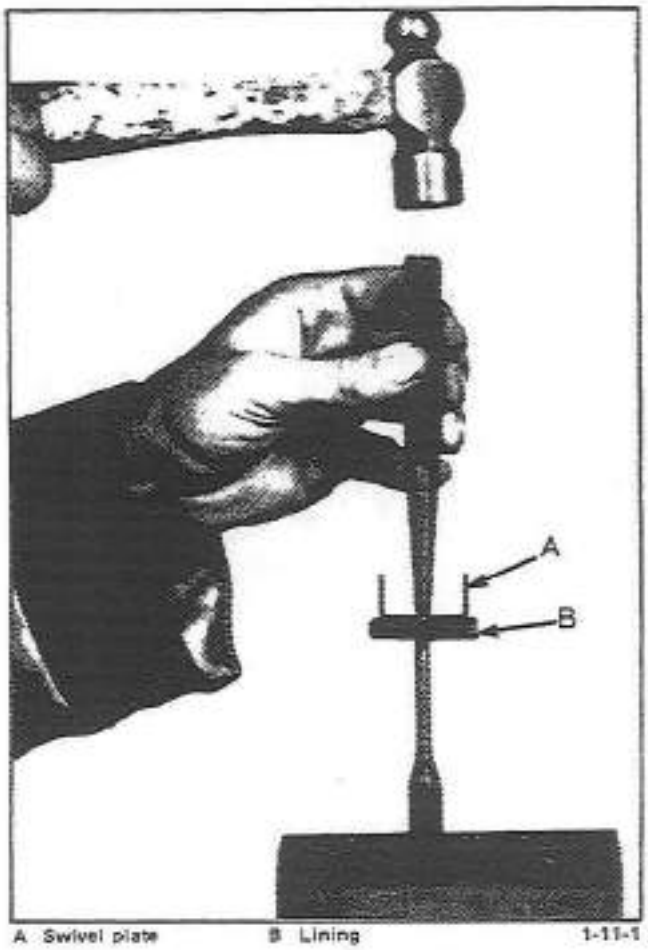
NOTE: If lining is oil-soaked, check chain case oil seal for correct installation position or damage. Replace if necessary. Wipe oil from pulley.

2. Check brake spring for distortion.

ASSEMBLY

1. Prior to Assembly procedure, ensure all components are clean and all defective parts have been repaired or replaced.

2. Using center and flat head punches and a hammer, secure the lining to the swivel plate using appropriate rivets (fig. 1-11-1). Secure rivets using a flat head punch.

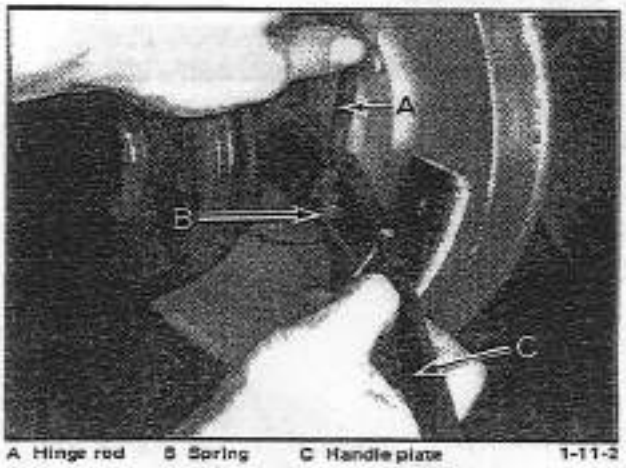


A Swivel plate B Lining 1-11-1

3. Position the swivel plate on the handle plate and secure the unit using bolt and nut.

INSTALLATION

1. Place the spring into handle plate with the long wire end beneath the bolt. Hold the spring in location and position the handle plate into chain case bracket. Insert hinge rod through bracket, loops of spring and handle plate. Secure rod to chain case bracket with nut (fig. 1-11-2).



A Hinge rod B Spring C Handle plate 1-11-2

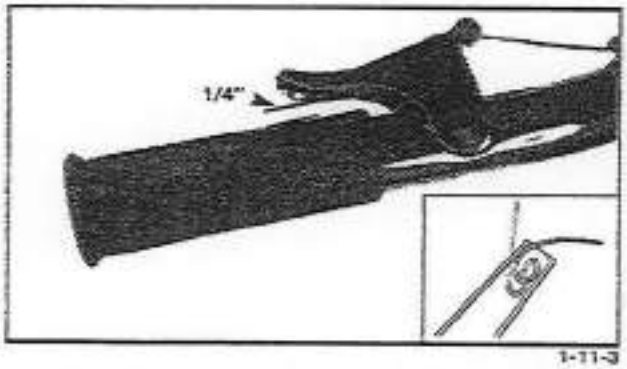
2. Pull the chain case forward until free end of hinge rod passes through appropriate hole in reinforcing cross support of frame. Install and finger tighten nut on hinge rod end.

3. Install chain case "U" clamp, spacers and previously removed aligning shim(s).

4. Proceed with pulley alignment.

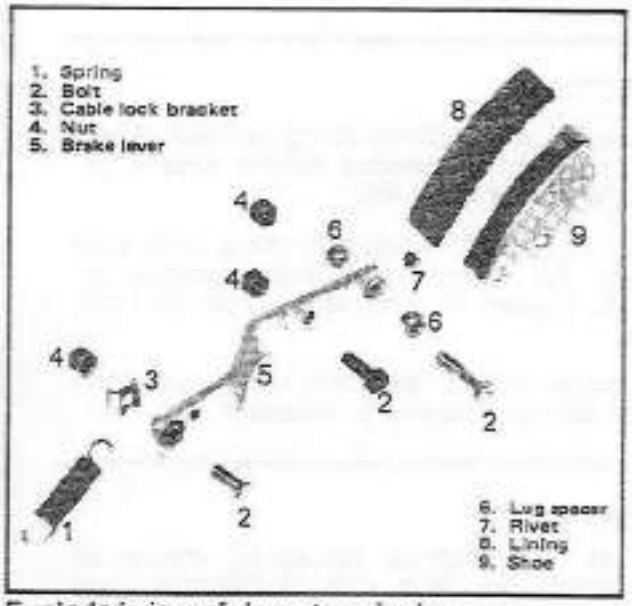
5. Connect brake cable to handle plate and adjust cable length until brake applies fully when brake lever is 1/4 inch from the handlebar (fig. 1-11-3).

6. Install drive belt and console.



1-11-3

DRUM TYPE BRAKE (All Olympique models)



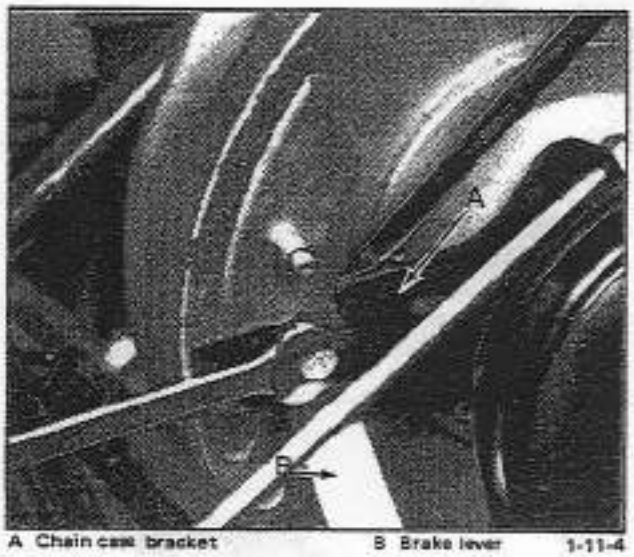
Exploded view of drum type brake

REMOVAL

1. Remove pulley guard and drive belt.

2. Disconnect brake lever spring. Remove nut, bolt and cable lock bracket securing brake cable to brake lever.

3. Remove bolt and nut securing brake lever to chain case bracket. Remove brake mechanism from vehicle (fig. 1-11-4).



A Chain case bracket B Brake lever 1-11-4

DISASSEMBLY

1. Remove brake shoe from brake lever by removing nut, lug spacers and bolt.

2. Using a 11/64 inch dia drill, remove rivets attaching lining to brake shoe.

INSPECTION

1. Visually inspect brake lining for wear. Rivet heads must be embedded below surface of lining. Replace worn lining.

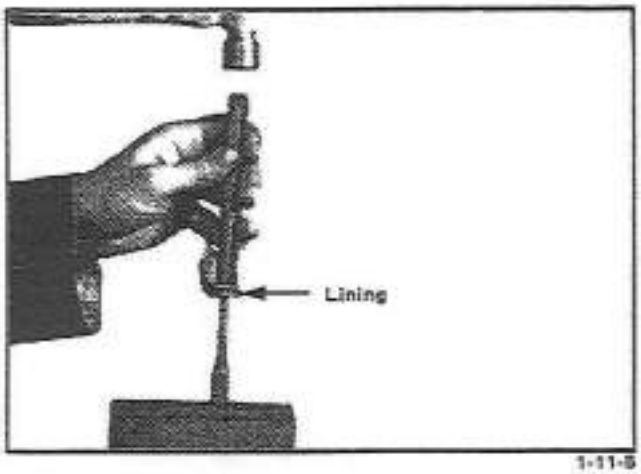
NOTE: If lining is oil-soaked, check chain case oil seal for correct installation position or damage. Replace if necessary. Wipe oil from pulley.

2. Visually inspect all other components for wear or damage. Replace as necessary.

ASSEMBLY

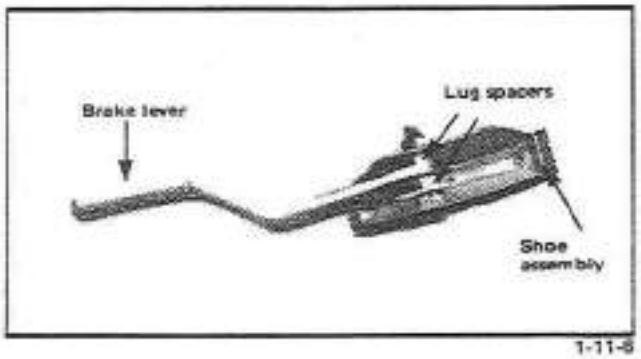
1. Prior to Assembly procedure, ensure all components are clean and all defective parts have been repaired or replaced.

2. Place the brake lining on the brake shoe. Using a center punch and hammer secure lining to shoe using appropriate rivets. Secure rivets using a flat head punch (fig. 1-11-5).



1-11-5

3. Secure the shoe assembly to the brake lever using a bolt, lug spacers and nut (fig. 1-11-6).



1-11-6

4. Position cable lock bracket on the brake lever and install bolt and nut. Finger tighten nut.

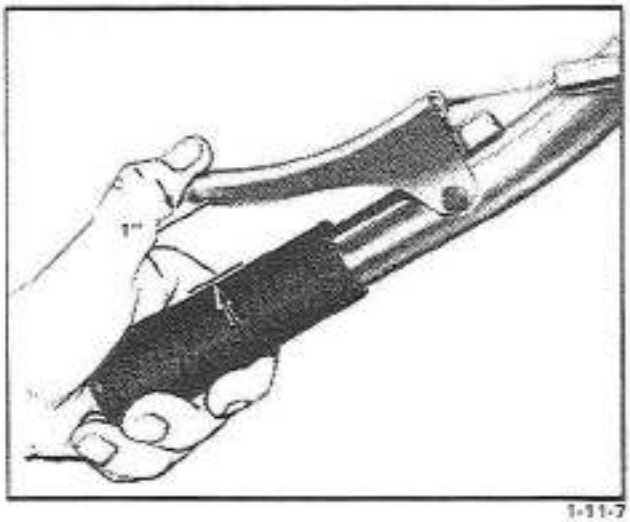
INSTALLATION

1. Attach the brake lever to the chain case bracket using a nut and bolt. Tighten nut until lever pivots freely but all side play is eliminated. Hook the brake lever spring into position.

2. Using light machine oil, lubricate all moving metal parts of brake.

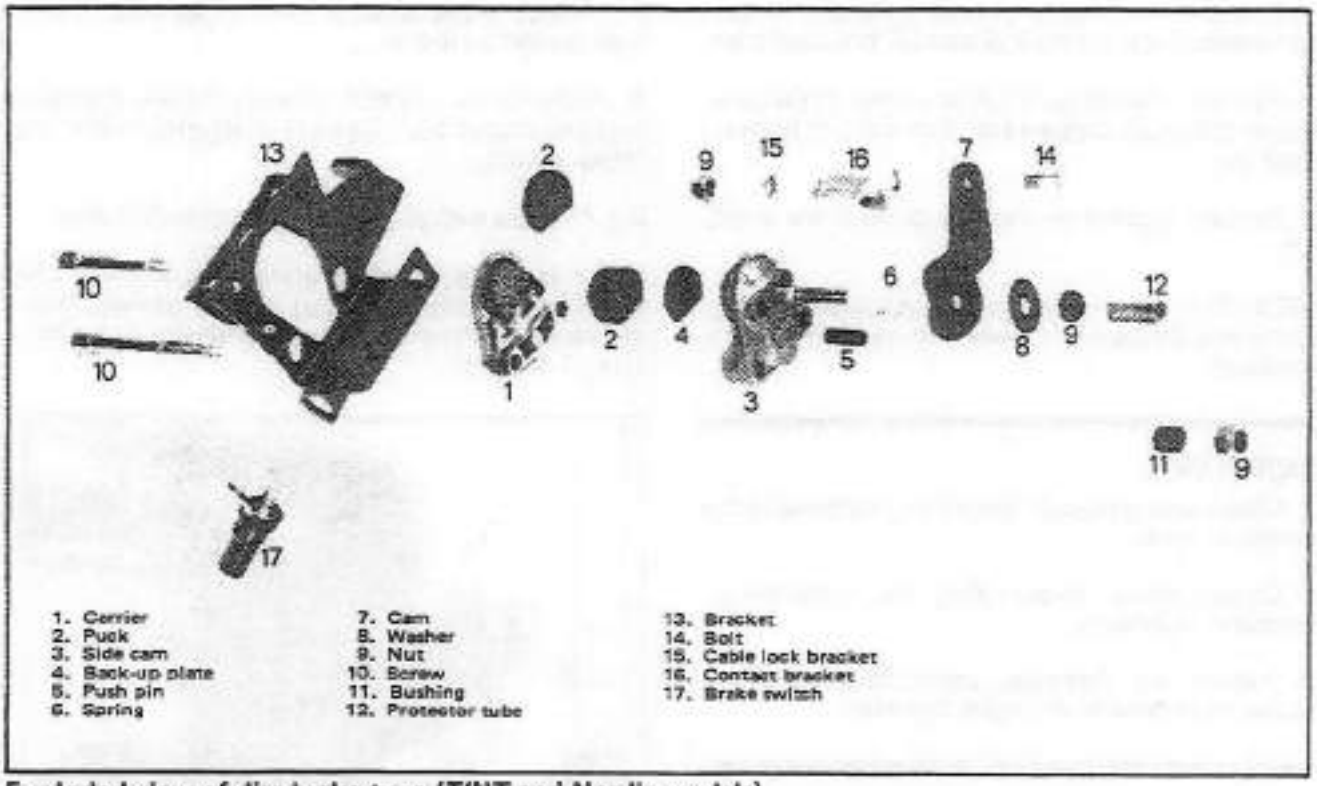
WARNING: Avoid getting oil on brake shoe.

3. Connect brake cable at brake lever, (between cable lock bracket and head of bolt). Adjust brake cable so that brake applies fully when lever is one (1) inch from handlebar grip. Tighten cable attaching nut (fig. 1-11-7).



1-11-7

4. Install drive belt and pulley guard.



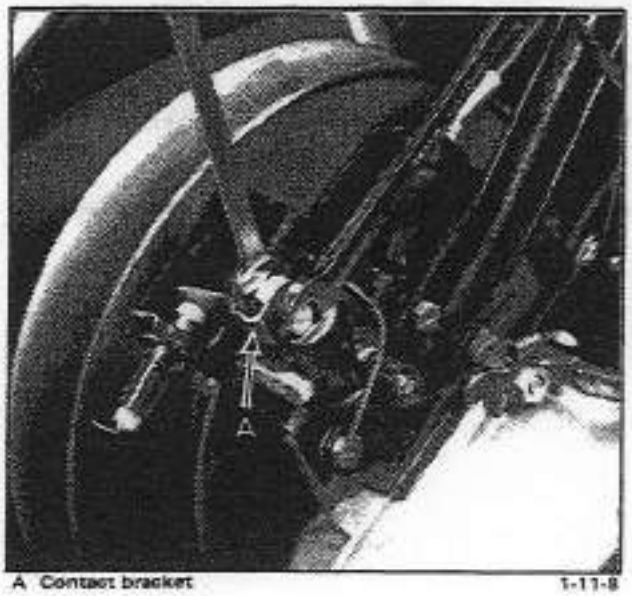
Exploded view of disc brake type (T'NT and Nordic models)

DISC BRAKE TYPE (T'NT and Nordic models)

REMOVAL

1. On Nordic 640ER model, disconnect electrical wires from brake switch.

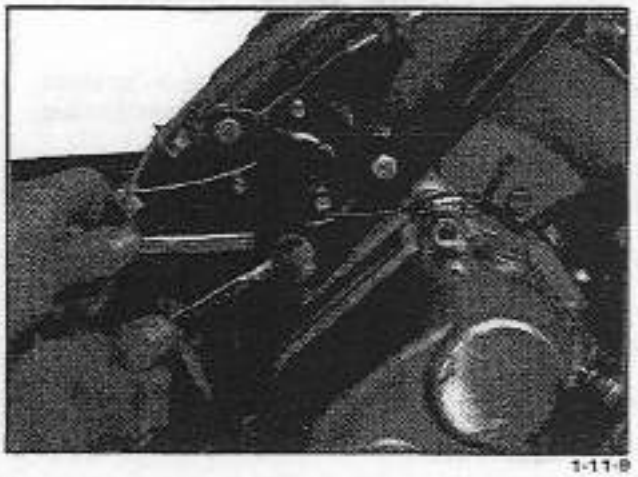
2. Remove bolt, cable lock bracket and nut securing brake cable to cam. On Nordic 640ER model, remove contact bracket (fig. 1-11-8).



A Contact bracket 1-11-8

3. Remove cable housing lock nut and pull housing from its bracket.

4. Remove the two (2) bolts securing brake assembly to chain case bracket and remove brake assembly and spring (fig. 1-11-9).



1-11-9

DISASSEMBLY

1. On Nordic 640ER model, remove brake switch if defective.

2. Remove plastic protector tubes.

3. Unscrew nut securing the cam and remove the washer, cam, spring and two (2) pin pushers.

4. Remove the two (2) Allen head bolts retaining the puck carrier and side cam. Remove bushings.

5. Remove puck and back-up plate from side cam.

NOTE: Do not remove glued puck from inner half unless damaged or worn and replacement is necessary.

INSPECTION

1. Check disc pucks (installed or removed) for damage or wear.

2. Check brake lever spring for distortion. Replace if necessary.

3. Inspect all threaded parts for stripped, crossed or otherwise damaged threads.

ASSEMBLY

1. Prior to Assembly procedure, ensure all parts are clean and all defective components have been repaired or replaced.

2. Install puck and back-up plate.

3. Position the puck carrier and side cam. Pass Allen head bolts through bracket, puck carrier, side cam and bushings. Secure with appropriate nuts.

4. Install the two (2) pin pushers in location with the round end facing towards lever of outer half.

5. Install spring, cam, washer and nut.

6. Install protector tubes

7. On Nordic 640ER model, if brake switch was removed install new switch.

INSTALLATION

1. Position brake assembly on chain case bracket and secure with two (2) bolts. Hook spring in lever and clip.

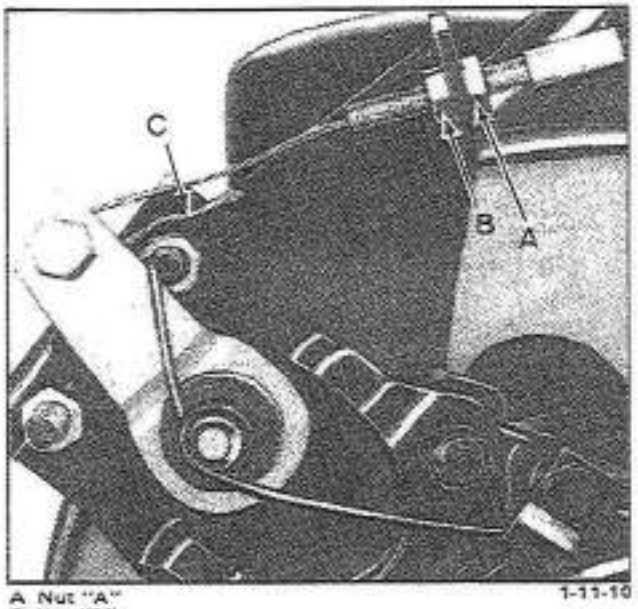
2. Pass cable housing through chain case bracket and temporarily install lock nut.

3. Attach brake cable to cam using bolt, cable lock bracket and nut.

4. On Nordic 640ER model, install contact bracket and bolt. Connect electrical wires to brake switch.

5. Proceed with brake adjustment as follows.

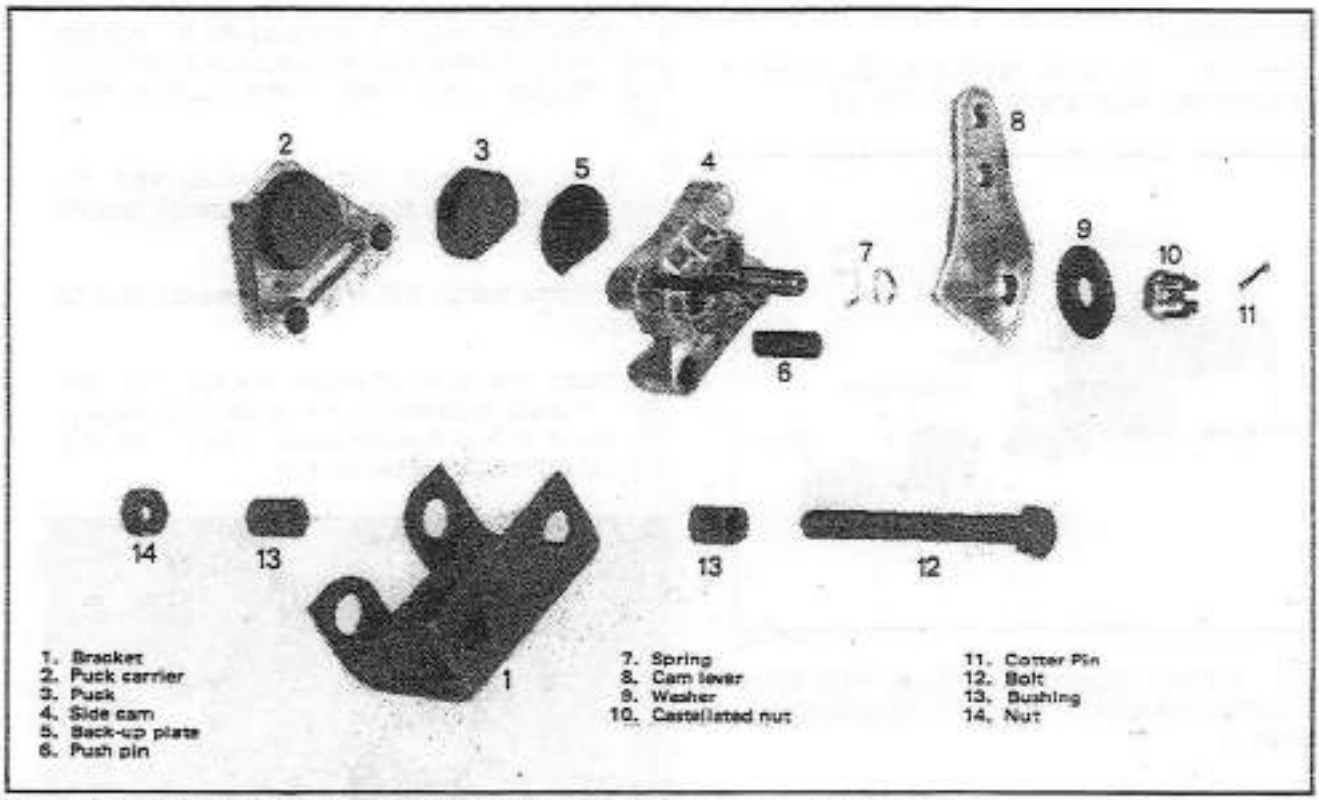
If a minor adjustment is indicated: Slacken off nut (A) and tighten nut (B) to increase lever clearance. Turn each nut vice versa to decrease (fig. 1-11-10).



A Nut "A"
B Nut "B"
C Brake cable
1-11-10

To proceed with major adjustment: Slacken off the nut retaining brake cable to lower brake lever. Adjust cable to required length and retighten nut. Ensure that minor adjustment nuts are located approximately half way on adjuster threads.

NOTE: Brake lever should be one (1) inch from handlebar grip when fully applied.



Exploded view of disc brake type (All Alpine and Valmont models)

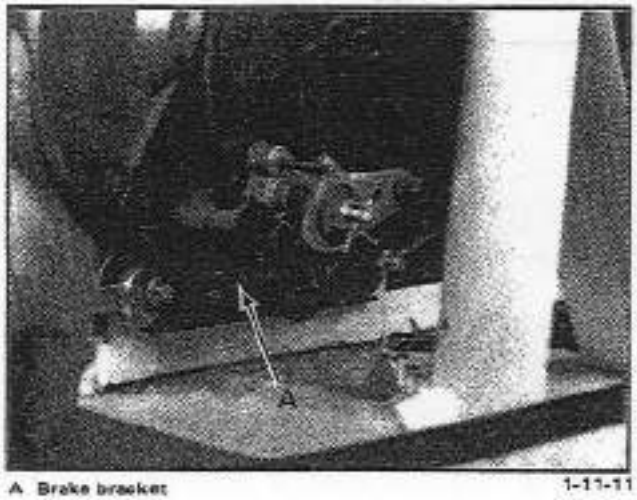
DISC BRAKE TYPE (All Alpine and Valmont Models)

REMOVAL

1. Remove pulley guard.

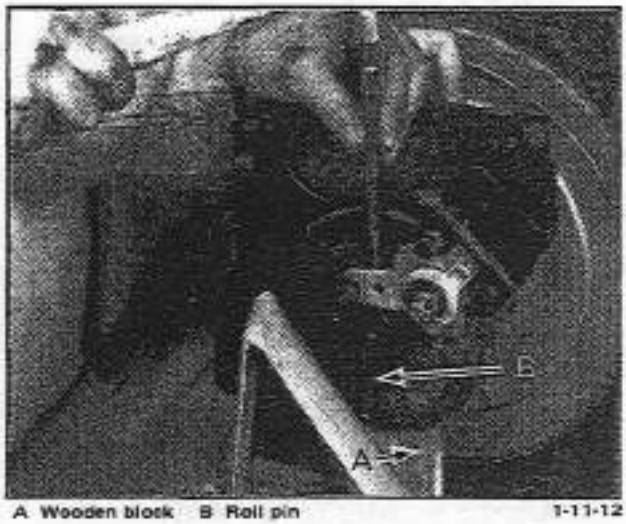
2. Disconnect brake cable from disc brake unit and frame by removing nut, washer and cable lock bracket. Remove spring from cable.

3. Remove bolts securing pulley guard holder to brake bracket (fig. 1-11-11).



A Brake bracket 1-11-11

4. Brace driven pulley shaft by positioning a wooden block (5-3/8 x 3 x 1 inches) under assembly. Using a hammer and pin punch, remove roll pin locking disc in position (fig. 1-11-12).

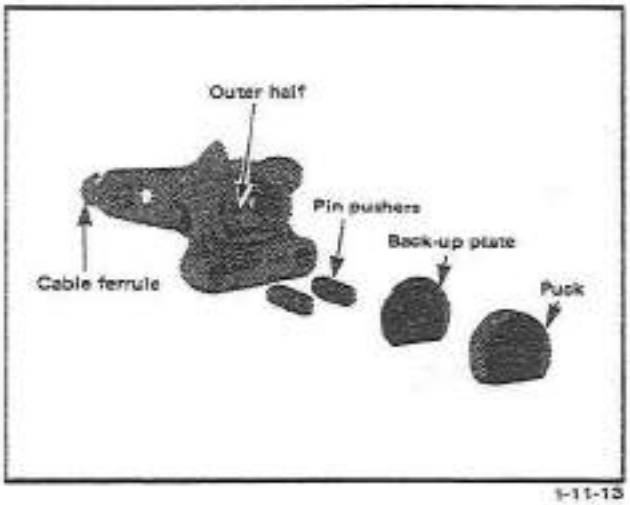


A Wooden block B Roll pin 1-11-12

5. Remove nuts and through bolts securing brake unit to support and remove spacers and disc brake unit halves. Remove disc, spring washer and spacer.

DISASSEMBLY

1. Remove puck, puck plate and pin pushers from outer half of disc unit (fig. 1-11-13).



1-11-13

NOTE: Do not remove glued puck from inner half unless damaged or worn and replacement is necessary.

2. Remove brake cable ferrule and nut.

INSPECTION

1. Check disc pucks (installed or removed) for damage or wear.

2. Check cam lever spring for distortion. Replace defective spring.

3. Inspect all threaded parts for stripped, crossed or otherwise damaged threads.

4. Visually check all other components for wear and/or damage. Replace defective parts(s).

ASSEMBLY

1. Prior to Assembly procedure, ensure all parts are clean and all defective components have been repaired or replaced.

2. Install spacer, spring washer and disc.

3. Using a pin punch and hammer, install roll pin securing the installed components to shaft.

4. Position the pulley guard holder in location and secure using bolts and nuts.

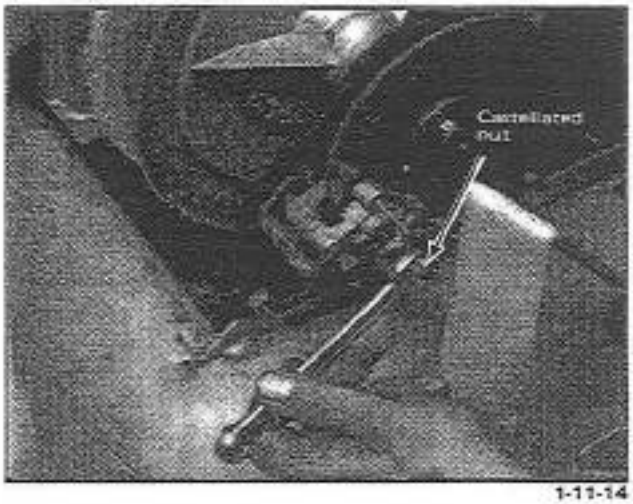
5. Secure brake cable ferrule with nut to cam lever.

6. Install the two (2) pin pushers in location with the round end facing towards lever of outer half. Position puck plate and puck into outer half.

7. Align inner and outer halves. Insert the through bolts with spacers. Secure with spacers and nuts.

8. Remove cotter pin from castellated nut on disc unit.

9. Check free play. If pucks are too far from disc, tighten castellated nut until a disc/puck friction is felt. Back off nut 1/6 of a turn (fig. 1-11-14). Install **new** cotter pin.

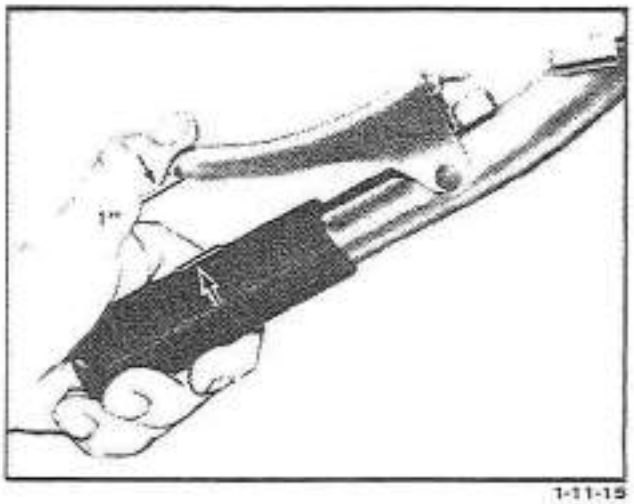


1-11-14

10. Insert brake housing through ferrule then install cable spring. Adjust and secure brake cable to frame.

NOTE: The brake handle must be one (1) inch from handlebar when fully applied (fig. 1-11-15).

11. Install pulley guard.



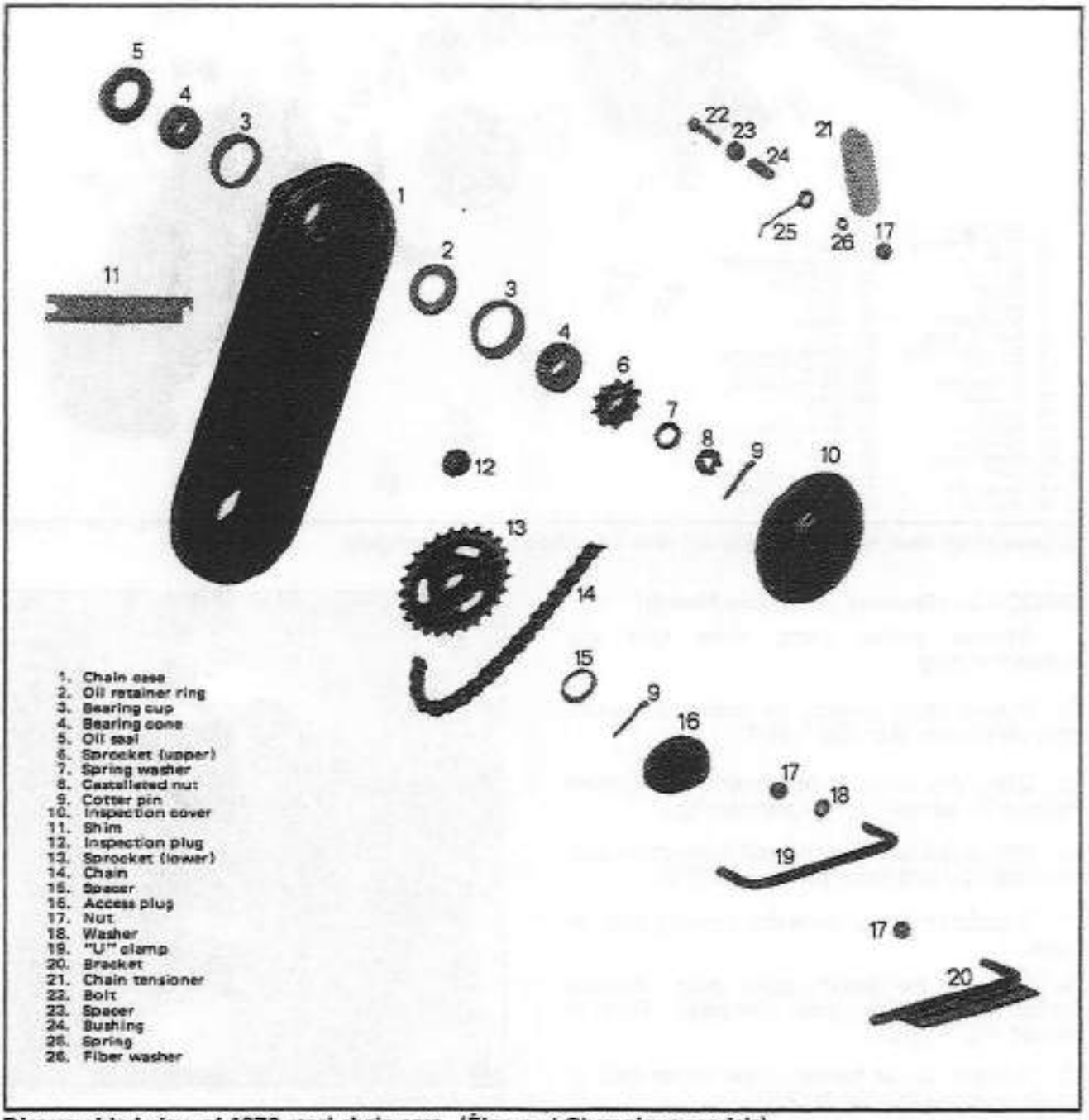
1-11-15

Transmission

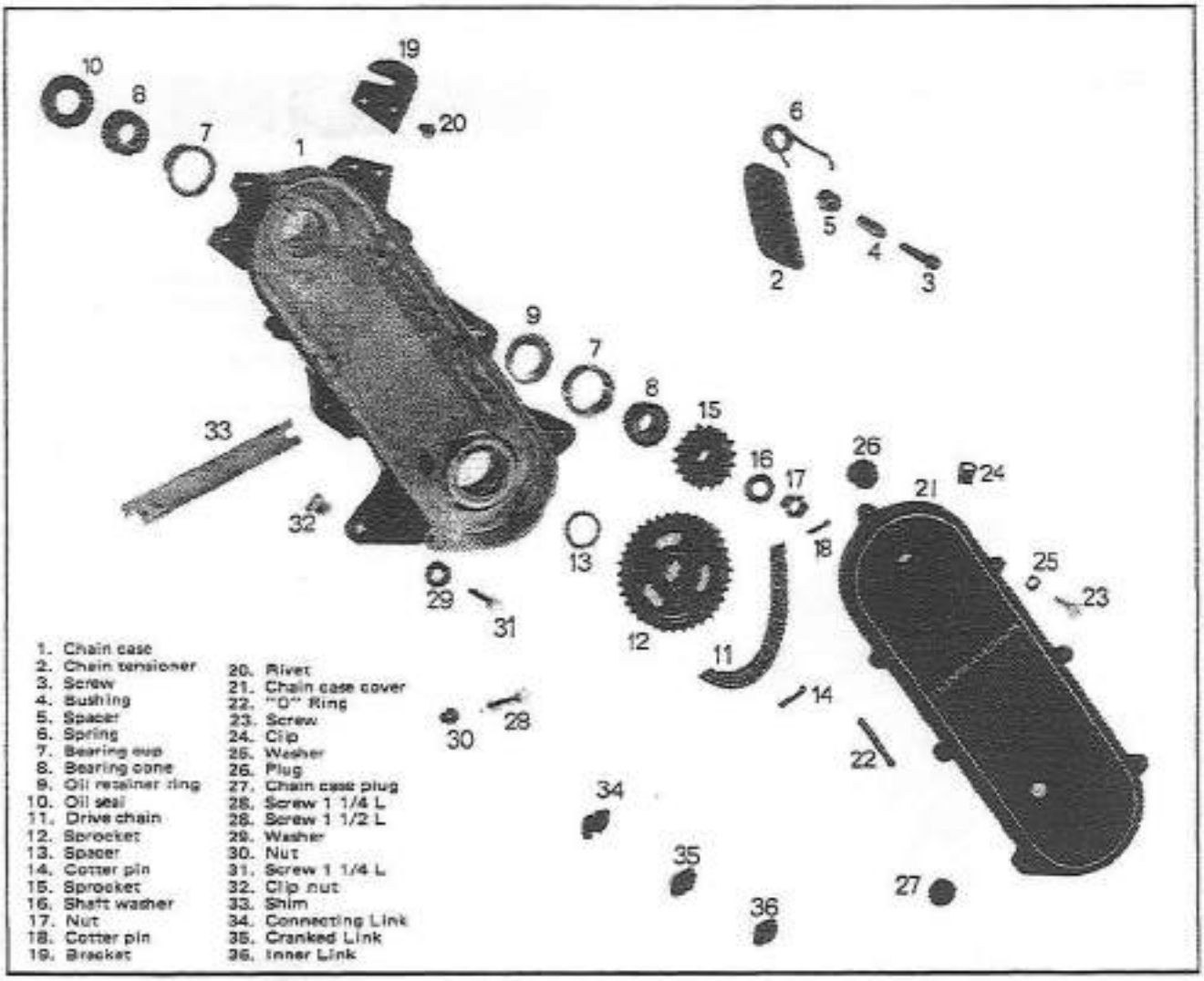
CHAIN CASE 1-12

GENERAL

The chain case mechanism of the Ski-Doo snowmobile is connected to the driven pulley shaft and drive axle. Incorporated within the case are upper and lower sprockets, a drive chain and chain tensioners. Oil contained within the case lubricates the chain and lower components. Chain rotation acts as an oil conveyor to lubricate the upper sprocket and bearings.



Disassembled view of 1972 steel chain case (Élan and Olympique models)



Disassembled view of 1972 steel chain case (Nordic and T'NT models)

REMOVAL (Elan and Olympique Models)

1. Remove pulley guard, drive belt and inspection plug.

2. Release chain tension by inserting a chain tension releaser tool (fig. 1-12-1).

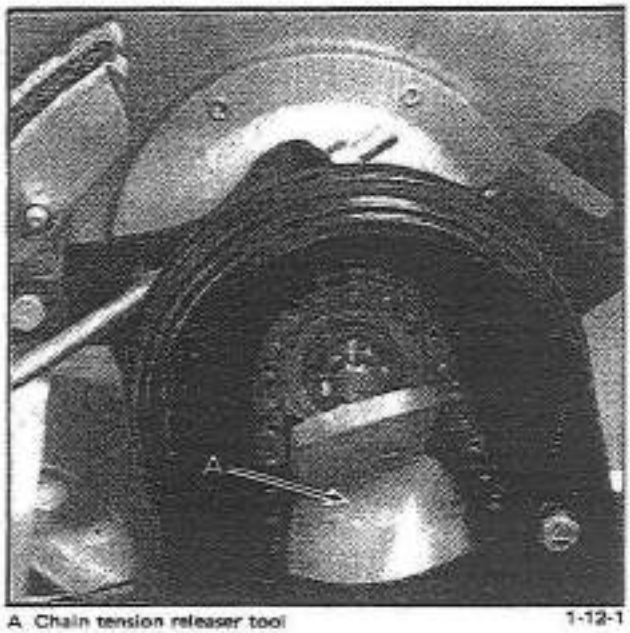
3. Using link plate spring lever, release track tension by unhooking link plate springs.

4. With a seal lever, pry oil seal from chain case and drain oil into catch pan (fig. 1-12-2).

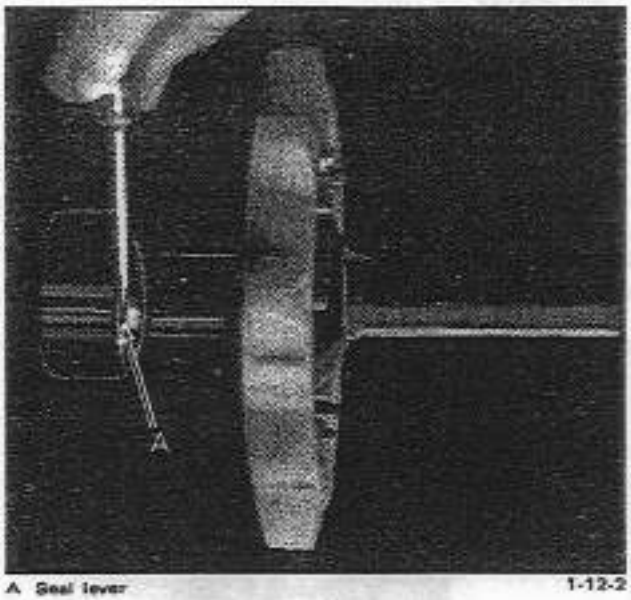
5. Disconnect brake cable and housing at brake lever.

6. Pry out the lower access plug. Remove cotter pin locking lower sprocket. Remove spacer (fig. 1-12-3).

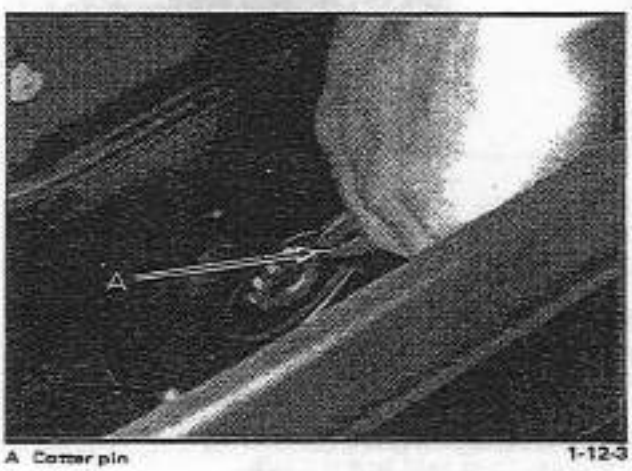
7. Remove nut on special screw (hinge rod) at chain case bracket (fig. 1-12-4).



A Chain tension releaser tool 1-12-1



A Seal lever 1-12-2



A Cotter pin 1-12-3

A Special screw 1-12-4

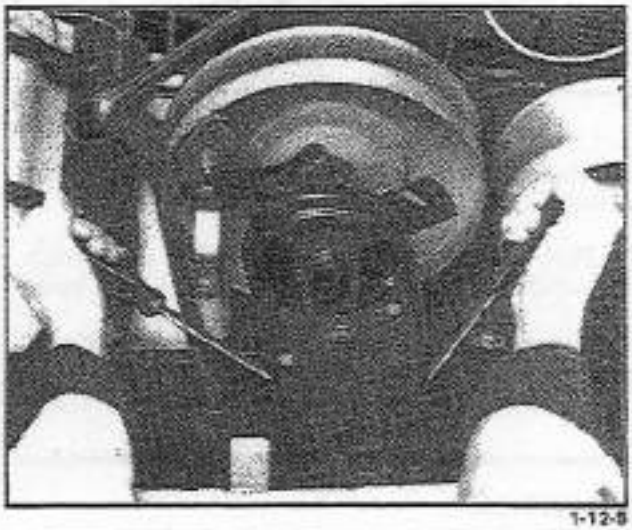
NOTE: On Elan models, remove nut securing hinge rod to reinforcing cross support.

8. From the inner side of frame, remove the nut securing chain case lower bracket and remove the bracket.

9. Remove nuts, washers and "U" clamp holding the chain case to the frame. Remove the chain case shim(s) if installed. Unhook brake lever spring. Move chain case towards drive pulley to disengage special screw (hinge rod).

10. On Elan models, remove the drive axle.

11. Using two (2) large screwdrivers inserted between chain case and frame, pry the complete assembly from vehicle (fig. 1-12-5).



1-12-5

DISASSEMBLY

1. Remove brake assembly.

2. Remove cotter pin, castellated nut and spring washer from driven pulley shaft.

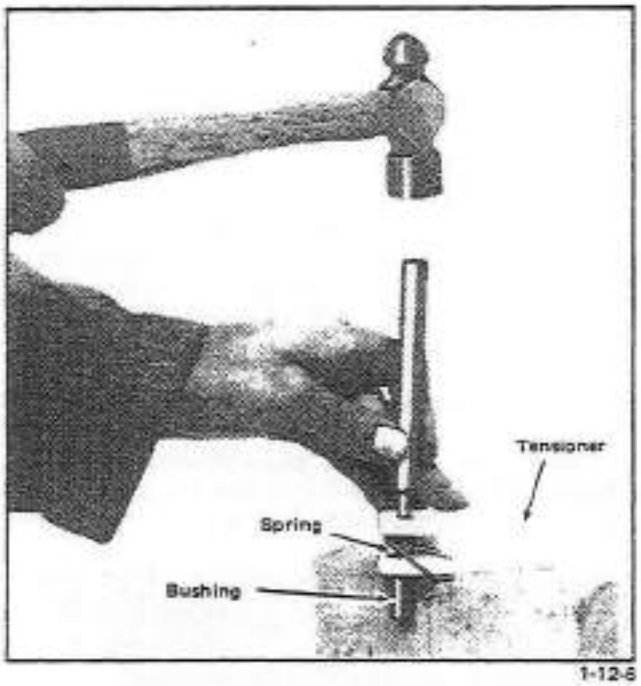
3. Pull the driven pulley assembly from the chain case and lay case on a worktable.

4. Remove bolts, fiber washers and nuts securing chain tensioners. Remove tensioners.

NOTE: On Elan models, there is only one (1) tensioner installed in chain case.

5. Using a pin punch, remove tensioner springs by pushing on one side of bushings. Remove springs and spacers (fig. 1-12-6).

6. Spread drive chain around inside of chain case and while restraining chain at inspection



1-12-6

port, tilt chain case so that upper sprocket, bearing cone and lower sprocket can be removed through inspection port.

7. Pull the drive chain towards the inspection port and remove the chain from the chain case.

8. Remove and discard bearing seal. Remove bearing cone, bearing cups and oil retainer ring. To remove cups, use a pin punch and a hammer.

INSPECTION

1. Visually inspect chain for cracked, damaged or missing link rollers. Replace defective chain.

2. Inspect for defective bearing cones, bearing cups and oil retainer ring.

3. Visually inspect sprockets for damage, wear, or distortion. If damage is evident replace sprockets.

4. Inspect bearing cones (removed or installed) for secureness of mounting (e.g. pitted or missing rollers and freedom of movement). Replace defective bearing cones.

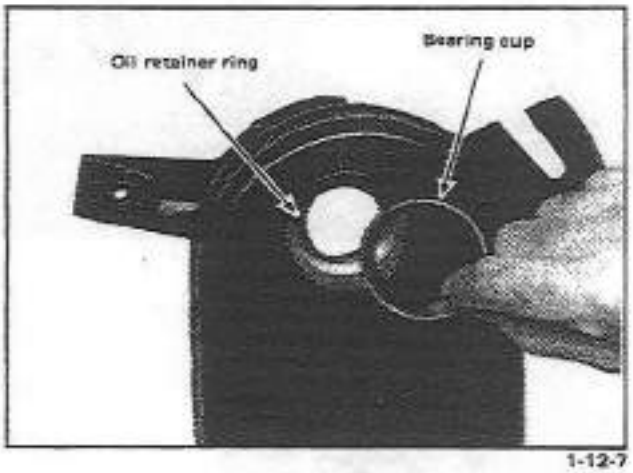
5. Inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged components.

6. Visually check all other components for signs of wear, cracks and other possible damage. Replace damaged parts.

ASSEMBLY

1. Prior to Assembly procedure, ensure all components are clean and all defective parts have been repaired or replaced.

2. Position oil retainer ring with concave side of ring seated on shoulder within the chain case. Sit bearing cup in chain case aperture. Cup must be seated so that wider tapered end is facing retainer ring (fig. 1-12-7).



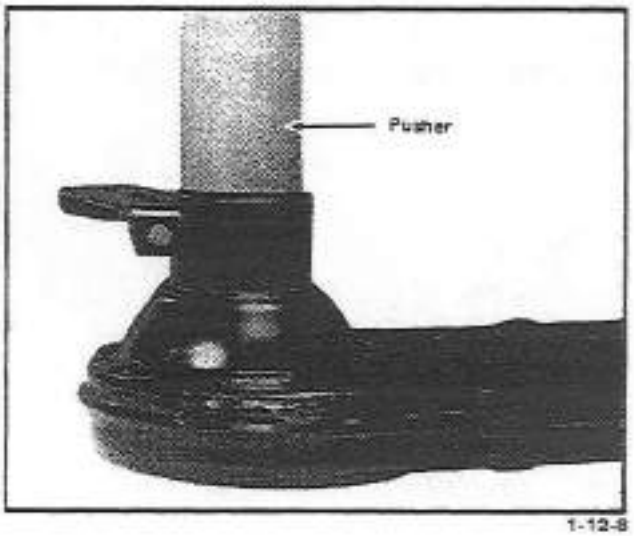
1-12-7

3. Using an appropriate bearing pusher, push bearing cup into chain case until it is seated on oil retainer ring.

4. Install second bearing cup into opposite aperture of chain case using procedure detailed in step (b), above.

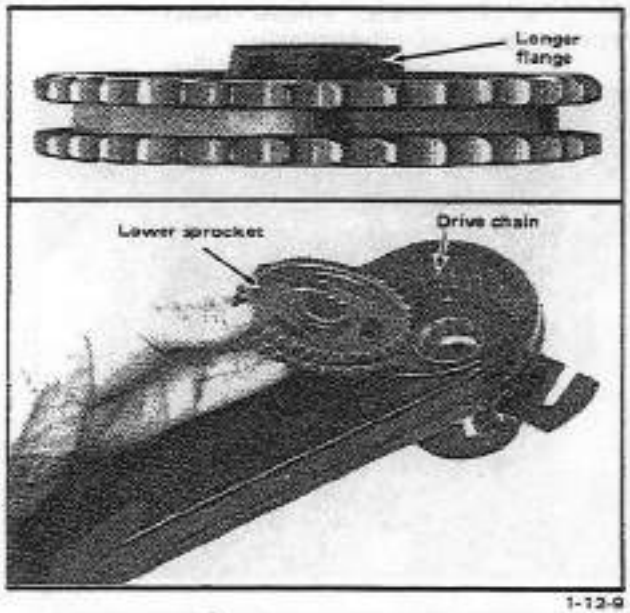
5. On opposite side of oil retainer ring, position a bearing cone into bearing cup.

6. Using an appropriate pusher, press a new oil seal into the chain case hub. Oil seal must sit flush with case hub edge (fig. 1-12-8).



1-12-8

7. Install and spread drive chain around inside of case and place lower sprocket (with longer flange towards inside of case) through inspection port (fig. 1-12-9). Holding chain, tilt case until sprocket slides down to its installation position.



1-12-9

8. Install springs, spacers and bushings into chain tensioners

9. Insert tensioners into chain case and secure with bolts, fiber washers and nuts. Tensioners must be installed with longer spring ends seated against sides of chain case.

10. Install bearing cone and position upper sprocket (longer flange towards inside of case) and drive chain in place.

11. Holding chain and upper sprocket in position, insert driven pulley shaft through chain case and sprocket. Install spring washer and castellated nut.

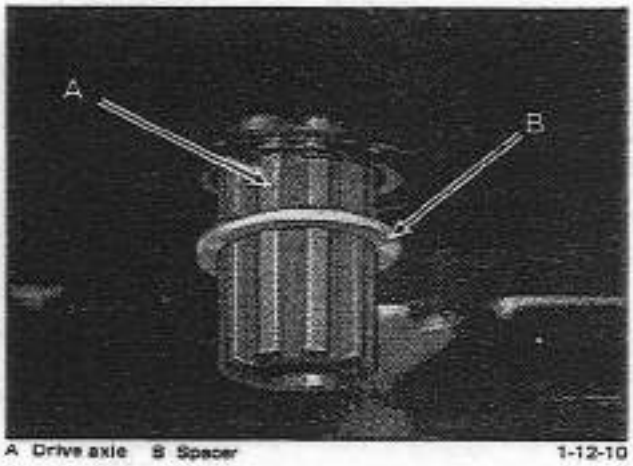
NOTE: Tighten castellated nut fully then back off 1/6 of a turn and lock in position with a new cotter pin. It is imperative that nut is backed off or damage may occur due to a burned or seized bearing cone on driven pulley shaft.

12. Install brake assembly.

13. Position chain tension releaser tool into chain case.

INSTALLATION

1. Prior to installing chain case, ensure that spacer has remained on drive axle (fig. 1-12-10).



A Drive axle B Spacer 1-12-10

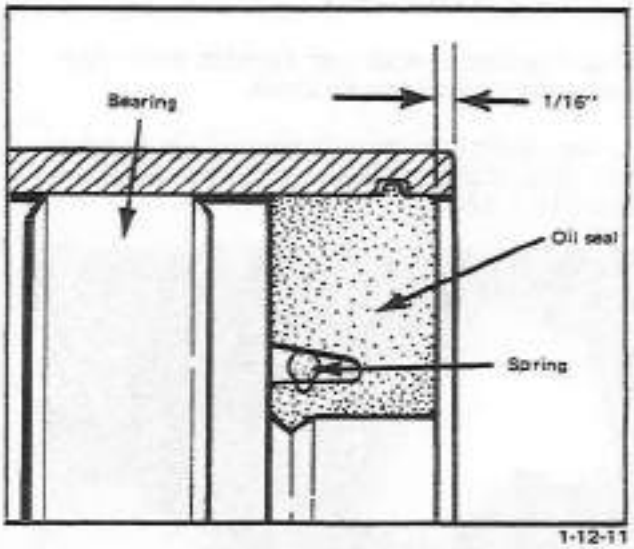
2. Position assembled chain case and driven pulley in location. On Olympique models, ensure that chain case lower sprocket is aligned with axle splines. Push chain case into frame.

NOTE: On Elan models, install drive axle.

3. Install spacer and cotter pin to secure lower sprocket to axle. Install lower access plug.

4. Install special screw (hinge rod), lower bracket, "U" clamp and previously removed aligning shims.

5. Install the oil seal into chain case flange (fig. 1-12-11).



1-12-11

NOTE: A gap of approximately 1/16 inch should exist between the end chain case flange and oil seal (fig. 1-12-11).

6. Carry out pulley alignment.

7. Remove chain tension releaser tool from chain case.

8. Pour 8 ounces of Ski-Doo chain case oil into chain case. Install inspection cover.

9. Connect brake cable and housing to brake lever and chain case. Connect brake lever spring. Proceed with brake adjustment.

NOTE: Brake lever spring is not installed on Elan models.

10. Using link plate spring lever apply track tension by hooking link plate springs in spring anchors.

11. Install drive belt and pulley guard.

REMOVAL

(NORDIC 440 AND ALL T'NT MODELS)

1. Remove pulley guard and drive belt.

2. Using link plate spring lever, release track tension by unhooking link plate springs.

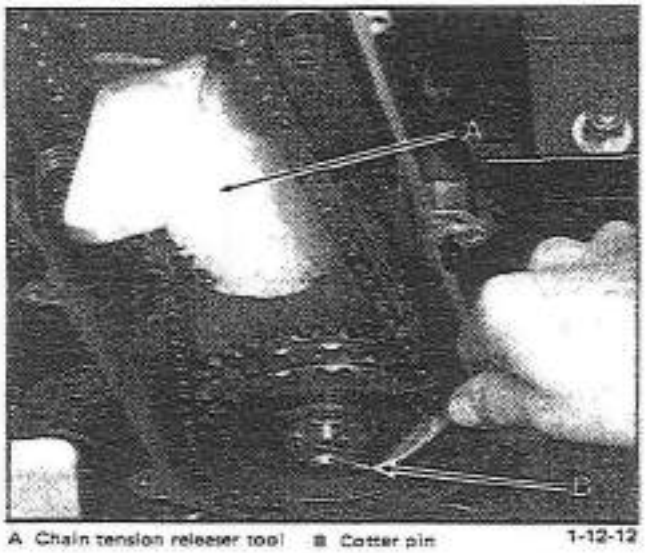
3. With a seal lever, pry oil seal from chain case (see fig. 1-12-02).

4. Unbolt brake assembly from chain case and remove spring.

5. Unbolt chain case cover and remove cover and "O" ring.

NOTE: Position a catch pan beneath chain case before unbolting chain case cover.

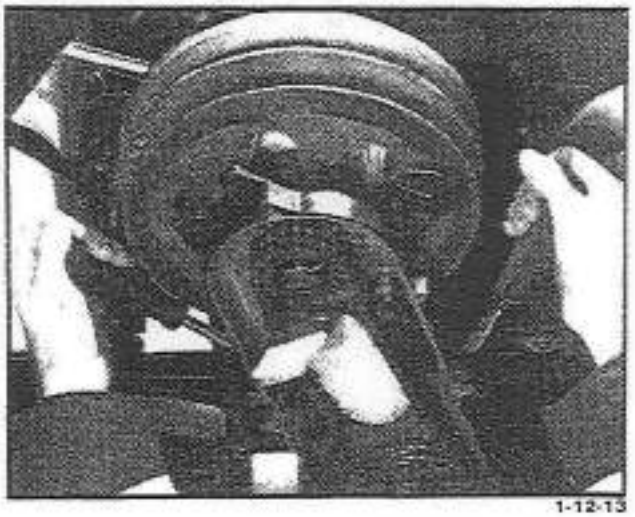
6. Insert chain tension releaser tool and remove cotter pin locking lower sprocket. Remove spacer (fig. 1-12-12).



A Chain tension releaser tool B Cotter pin 1-12-12

7. Remove four (4) bolts securing chain case to frame. Remove aligning shims, if installed.

8. Using two (2) large screwdrivers inserted between chain case and frame, pry the complete assembly from vehicle (fig. 1-12-13). On 15 inch track T'NT models, remove spacer located between frame and chain case.

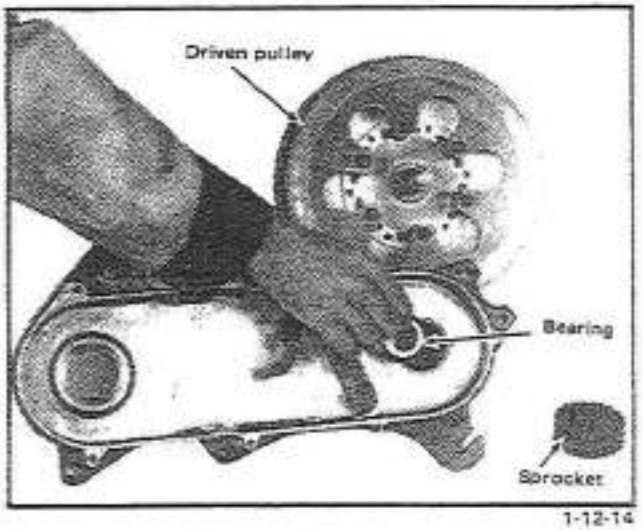


1-12-13

DISASSEMBLY

1. Remove drive chain and lower sprocket.

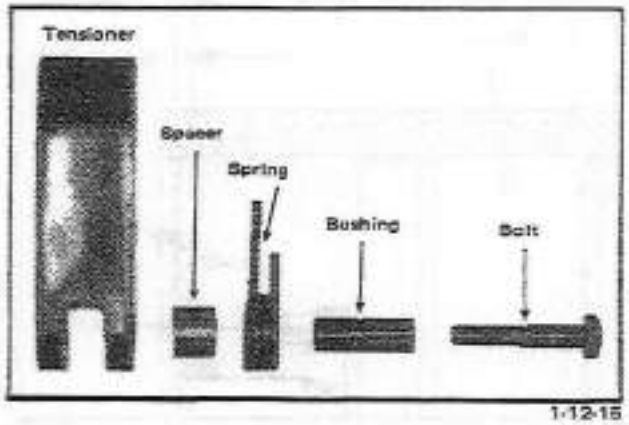
2. Remove cotter pin, castellated nut, spring washer and upper sprocket from driven pulley shaft. Remove driven pulley assembly from chain case. Remove bearing cone (fig. 1-12-14).



1-12-14

3. Remove oil seal and bearing cone from chain case hub.

4. Unbolt chain tensioners. Remove bushings, spacers and sleeve (fig. 1-12-16).



1-12-15

NOTE: Do not drill out rivets securing pulley guard bracket to chain case unless necessary.

5. Heat chain case in an oven to 250° F then drive bearing cups and oil retainer ring from casing.

INSPECTION

1. Visually inspect chain for cracked, damaged or missing link rollers. Replace defective chain.

2. Inspect for defective bearing cones, bearing cups and oil retainer ring.

3. Visually inspect sprockets for damage, wear, or distortion. If damage is evident, replace sprockets.

4. Inspect bearing cones for secureness of mounting (e.g. pitted or missing rollers and freedom of movement). Replace defective bearing cone.

5. Inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged components.

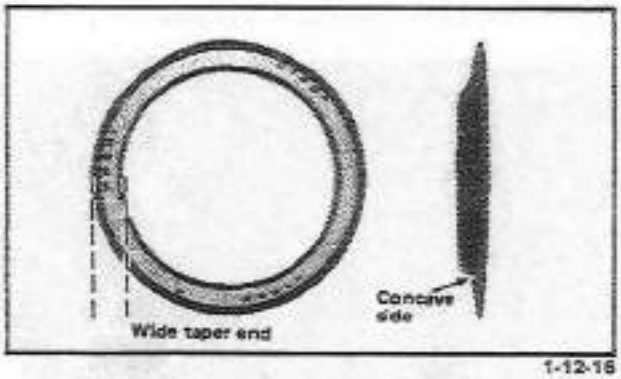
6. Visually check all other components for signs of wear, cracks and other possible damage. Replace damaged parts.

ASSEMBLY

1. Prior to Assembly procedure, ensure all components are clean and all defective parts have been repaired or replaced.

NOTE: If removed, secure pulley guard bracket to chain case using two (2) steel rivets.

2. Using an oven, pre-heat chain case to 250° F, install oil retainer ring making sure that the concave side is against chain case hub. Install two (2) bearing cups with the wider tapered ends facing retainer ring (fig. 1-12-16).



1-12-16

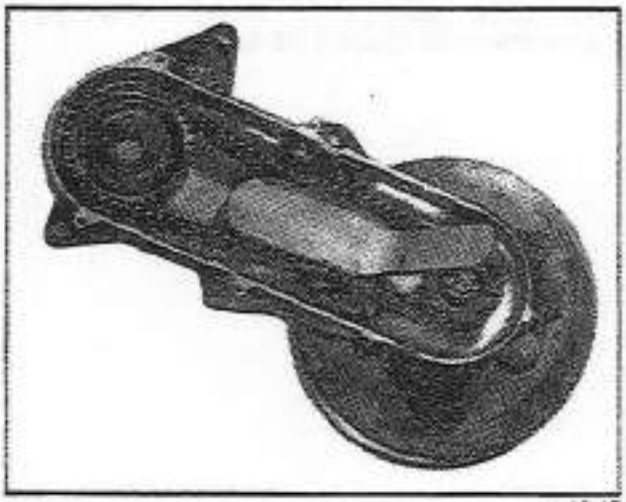
3. Install outer bearing cone. Press new oil seal into chain case hub. Oil seal must sit flush with case hub edge.

4. Install spring, spacer and bushing into each chain tensioner and secure tensioners to chain case.

5. Install inner bearing cone. Insert driven pulley shaft through oil seal and bearing. Install the upper sprocket, spring washer and castellated nut.

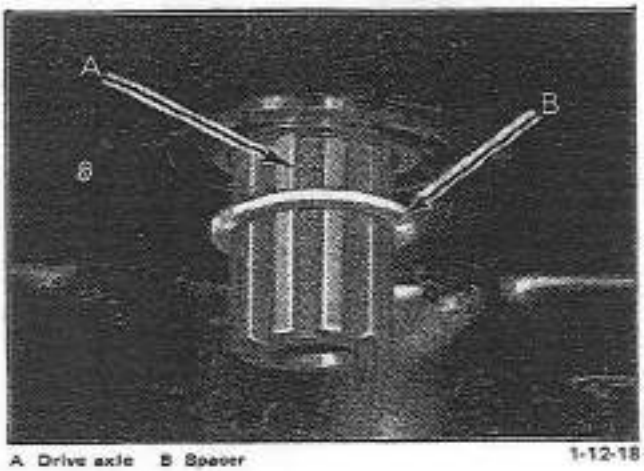
NOTE: Tighten castellated nut fully then back off 1/16 of a turn and lock in position with a cotter pin. It is imperative that nut is backed off or damage may occur due to a burned or seized bearing cone on driven pulley shaft.

6. Install drive chain and position lower sprocket with longer flange facing towards inside of case. Install a chain tension releaser tool (fig. 1-12-17).


1-12-17

INSTALLATION

NOTE: Prior to installation, ensure that the spacer has remained on drive axle (fig. 1-12-18). On 15 inch track models, ensure that spacer between frame and chain case is in position.



A Drive axle B Spacer 1-12-18

1. Position assembled chain case and driven pulley in location. Ensure that chain case lower sprocket is properly engaged with axle splines. Push chain case into frame.

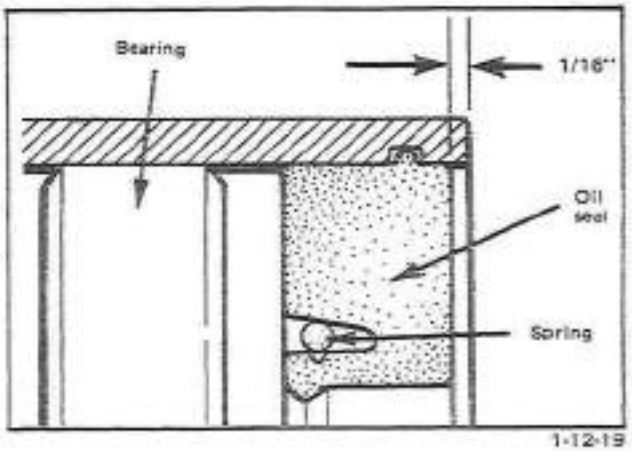
2. Install spacer and **new** cotter pin to secure lower sprocket to axle.

3. Temporarily, install the four (4) bolts which secure the chain case to the frame.

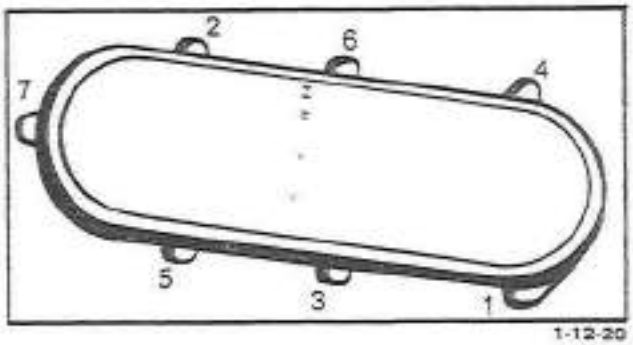
4. Install oil seal into chain case flange.

NOTE: A gap of approximately 1/16 inch should exist between the end chain case flange and oil seal (fig. 1-12-19).

5. Remove chain tension releaser tool and install chain case cover with **new** "O" ring. Torque cover bolts to 5 ft./lbs. following sequence shown in figure 1-12-20.



1-12-19



1-12-20

6. Proceed with pulley alignment.

7. Pour 12 ozs. of Ski-Doo chain case oil into T'NT 292, 340 and Nordic 440 models and 10 ozs. into T'NT 440, 640 and 775 models.

8. Install brake assembly to chain case bracket. Check brake adjustment.

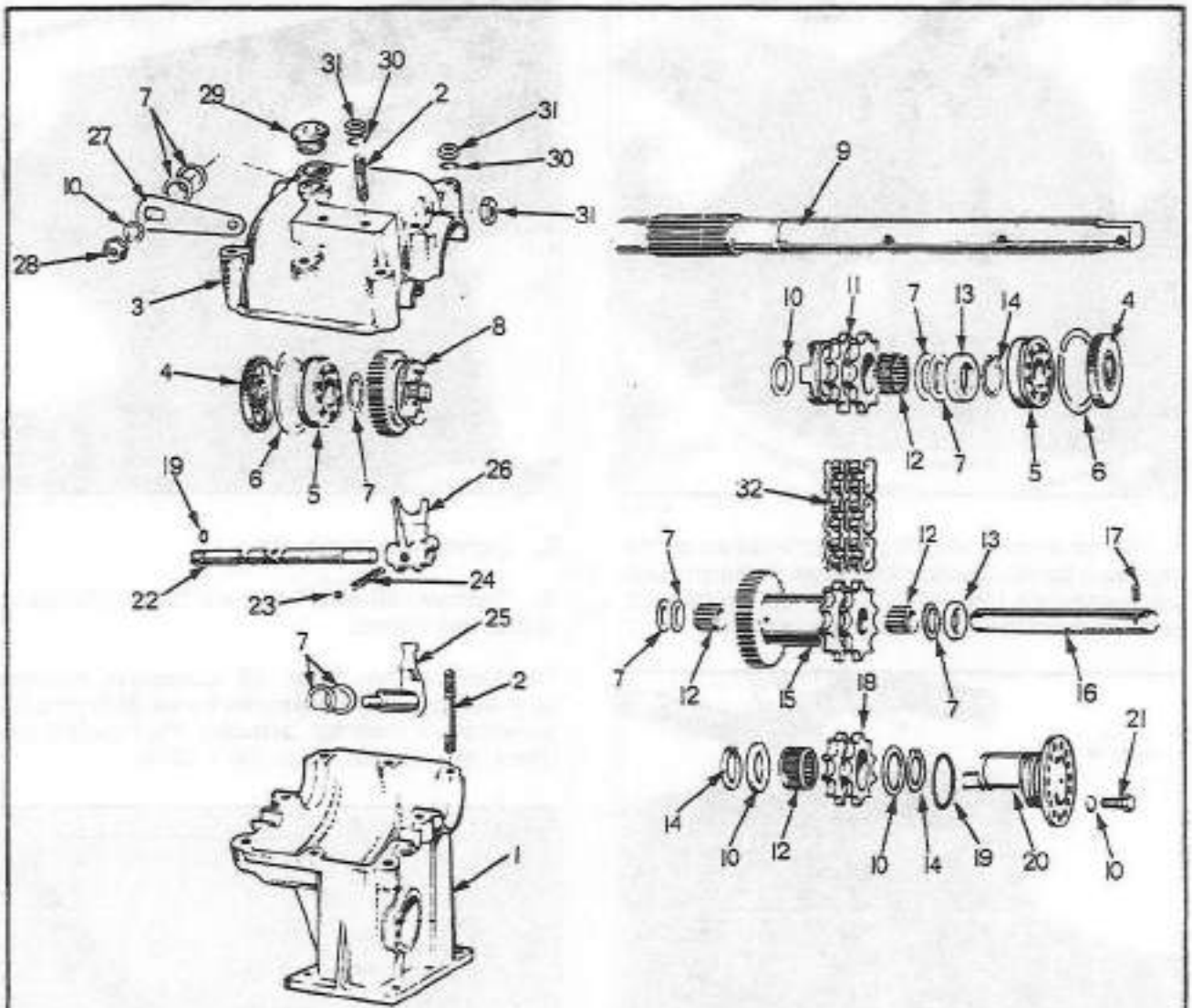
9. Install drive belt and pulley guard.

10. Using link plate spring lever, apply track tension by hooking link plate springs in spring anchors.

GEAR BOX (Alpine and Valmont) 1-13-1

GENERAL

All Alpine, Valmont and Nordic 640 ER models are equipped with a gear box. Power transmitted to the driven pulley is relayed to the gear box because of the common shaft passing through both assemblies. The method of interconnection and operation of the components of the gear box enables forward and reverse movement of the vehicle.



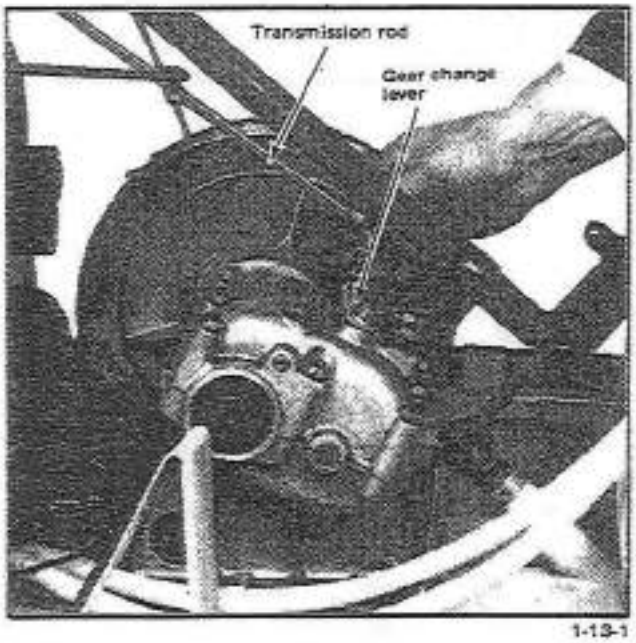
Disassembled view of Alpine and Valmont gear box

REMOVAL
(All Alpine and Valmont Models)

1. Remove cab, pulley guard, drive belt and muffler from vehicle.

2. Disconnect the brake and throttle cables and housings.

3. Disconnect the transmission rod from the gear change lever by removing a cotter pin, spring and washer (fig. 1-13-1).



1-13-1

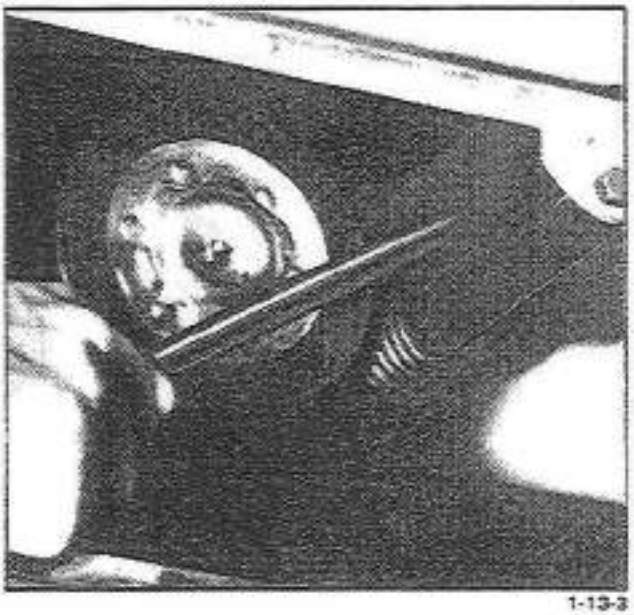
4. Remove nuts securing lower bracket to the gear box cover. Slacken the upper retainer plate bolts and nuts (fig. 1-13-2) and pull the steering column rearward out of gear box area.

1-13-2

5. Pry the inspection cover from gear box.

6. Remove the drive chain tensioner capscrew and washer. Rotate tensioner plate to obtain maximum chain slackness.

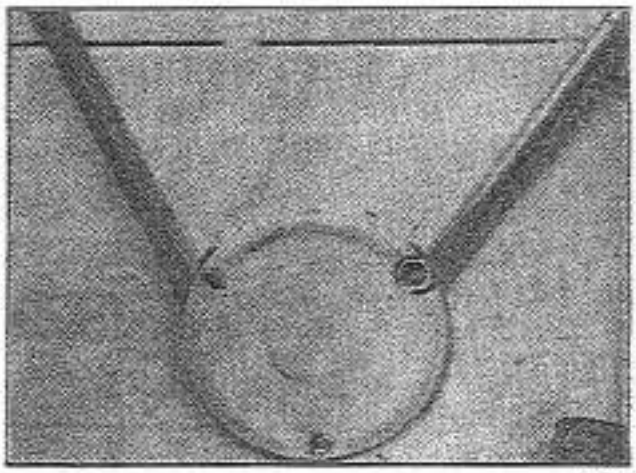
7. Using link plate spring lever, unhook link plate springs. Insert a pry bar between structural members of center(s) bogie wheel set and pry set upward to reversed installation position (fig. 1-13-3). Reverse front then rear bogie wheel sets.


1-13-3

8. Remove the rear hubs.

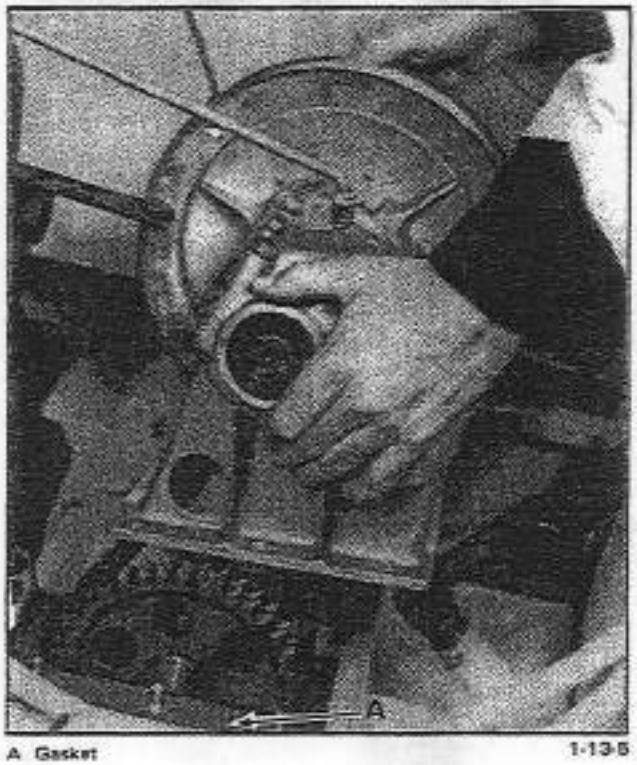
9. Remove oil seals from end bearing housings and center frame.

10. Remove the three (3) capscrews securing each end bearing housing to frame. With two (2) screwdrivers inserted between the housing and frame, pry out housings (fig. 1-13-4).


1-13-4

11. 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 gear box. Allow drive axles to remain within the track area.

12. Remove six (6) nuts securing gear box to frame. Remove gear box and gasket (fig. 1-13-5).



A Gasket 1-13-5

DISASSEMBLY

1. Remove gear box lower sprocket from the drive chain.

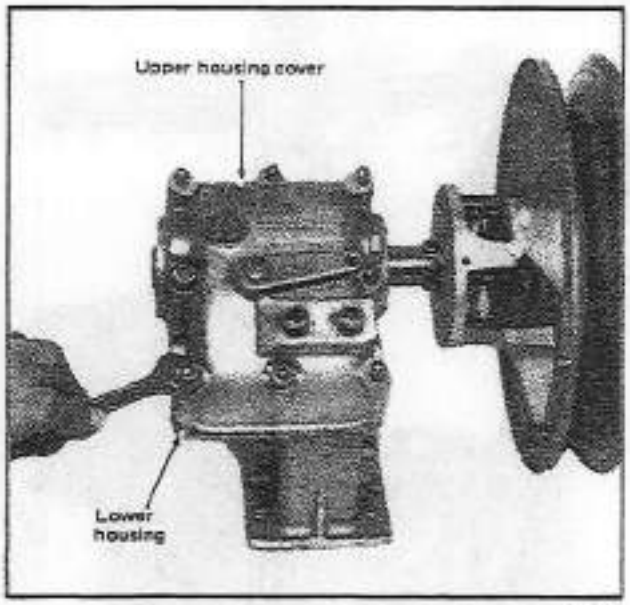
2. Remove the eight (8) nuts securing the upper housing (cover) to lower housing assembly (fig. 1-13-6).

3. To loosen the bonding between the upper and lower housings, tap the upper housing with a soft faced hammer and lift the cover free.

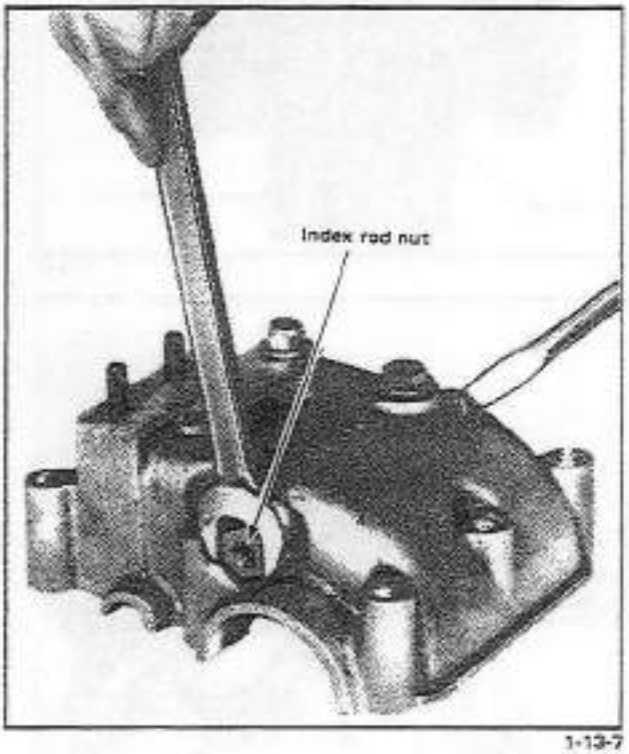
4. To disassemble the upper housing (cover), use the following procedure:

(a) Hold one end of the index rod with a screwdriver and remove the nut from the rod (fig. 1-13-7).

(b) Unscrew the index rod from the housing. Using a pin punch, drive the rod through the gear change fork until the threaded portion of the rod is approximately 1/4 inch into the fork. Firmly hold the fork and pull the rod from the fork and housing (fig. 1-13-8). Remove "O" ring from rod.



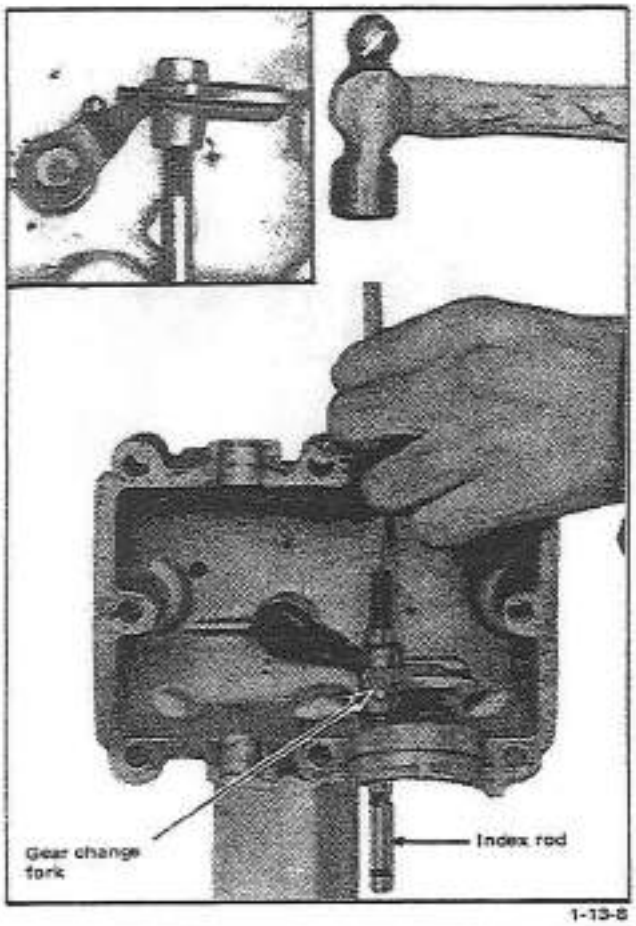
1-13-6



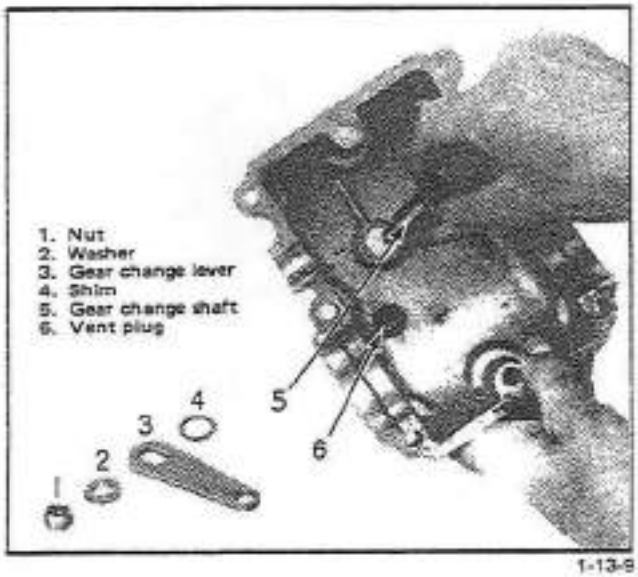
1-13-7

CAUTION: The gear change fork incorporates a spring-loaded ball. Ensure that spring and ball do not fly out during removal of index rod.

(c) Remove the nut, washer, gear change shaft assembly and shim(s). Pull the gear change shaft assembly from the housing cover. Remove vent plug (fig. 1-13-9).



1-13-8

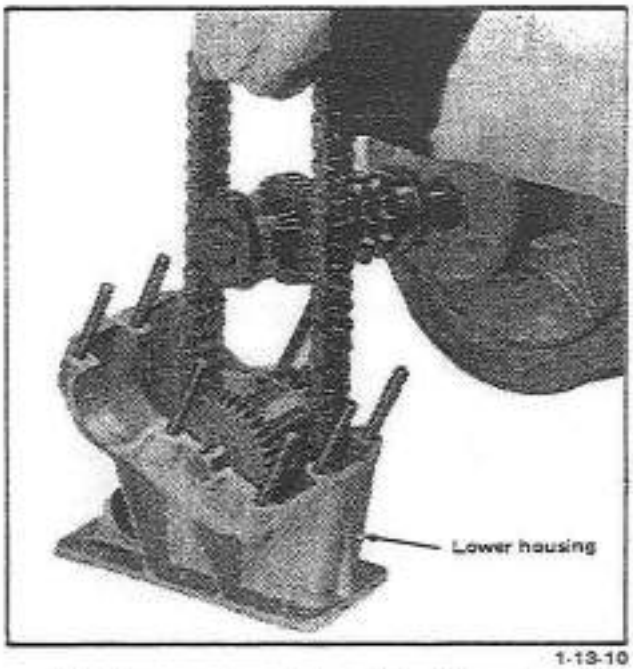


1-13-9

5. Lift the drive chain from the sprocket and remove the drive shaft assembly from the lower housing (fig. 1-13-10).

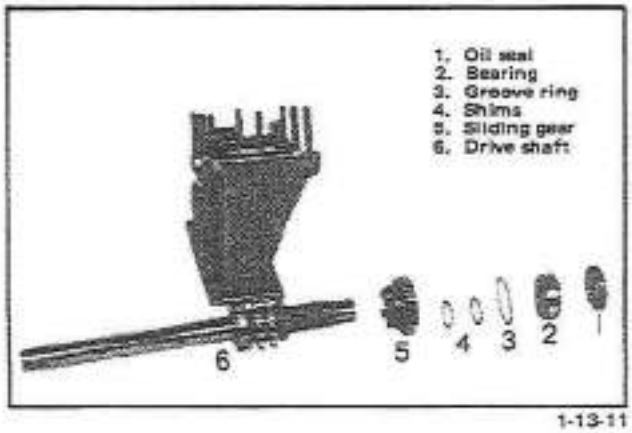
6. To disassemble the drive shaft assembly use the following procedure:

(a) Remove brake and bracket assembly and driven pulley.



1-13-10

(b) Remove the oil seal, ball bearing with groove ring, shim(s) and sliding gear from splined end of shaft (fig. 1-13-11). Remove groove ring from bearing.



1-13-11

(c) Remove the oil seal and groove ring from the driven pulley side of shaft. Remove groove ring from bearing (see fig. 1-13-12).

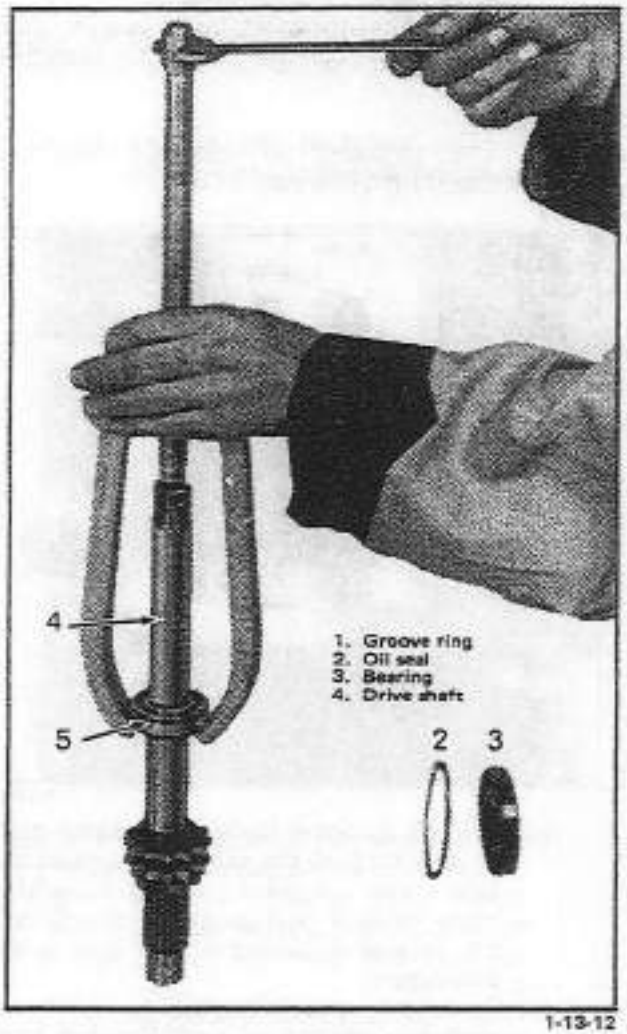
(d) Using an appropriate bearing puller, remove the bearing from the driven pulley side of shaft (fig. 1-13-12).

NOTE: The bearing must always be pulled by the inner race.

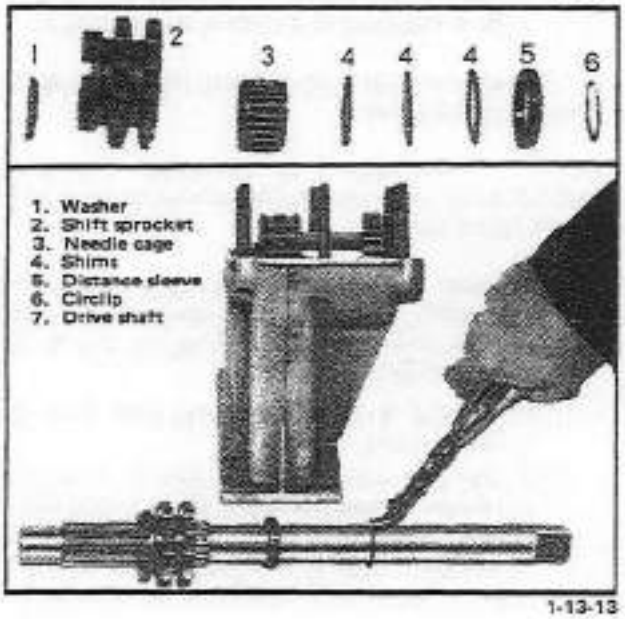
(e) Using needle pliers, remove a circlip from drive shaft. Remove the distance sleeve, shims, needle cage, shift sprocket and washer from the shaft (fig. 1-13-13).

7. Lift the drive chain and remove the lay shaft from the lower housing. Disassemble the lay

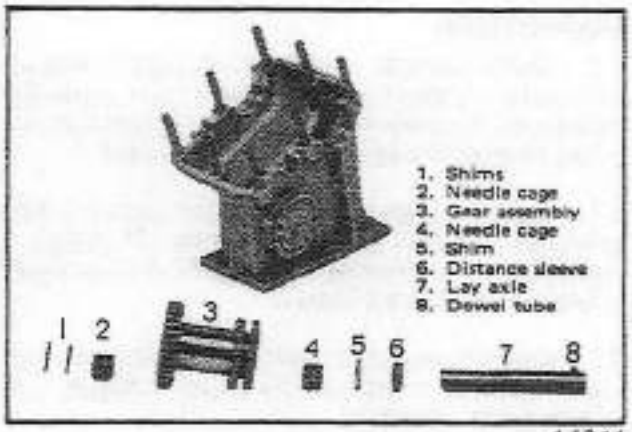
shaft by removing shims, needle cage, gear assembly, needle cage, shims and distance sleeve from lay axle (fig. 1-13-14). Remove the drive chain.



1-13-12



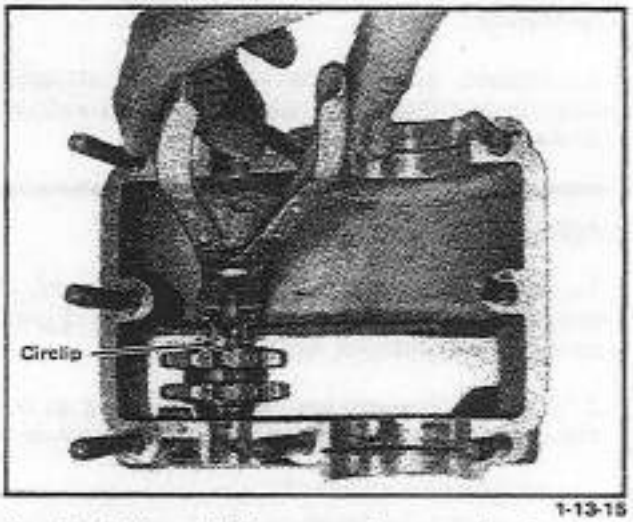
1-13-13



1-13-14

NOTE: Do not remove the dowel tube from lay axle unless damaged and replacement is necessary.

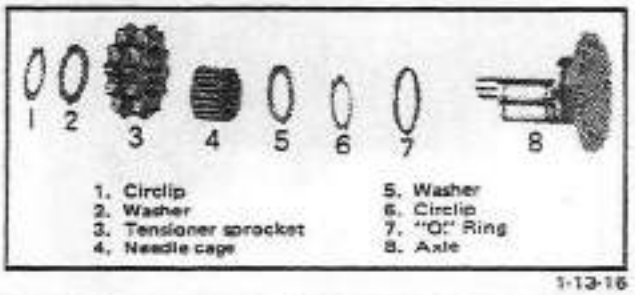
8. Using needle pliers, unlock two (2) circlips on the tensioner axle assembly (fig. 1-13-15).



1-13-15

9. Partially withdraw tensioner axle. Remove circlip, washer, tensioner sprocket, needle cage, washer and circlip. Pull the axle from lower housing and remove the "O" ring from axle of the tensioner (fig. 1-13-16).

NOTE: Do not unscrew studs from lower housing unless damaged and replacement is necessary.



1-13-16

INSPECTION

1. Check general condition of chain linkage. Visually inspect drive chain for cracked, damaged or missing link rollers. Inspect secureness of riveted heads of double link pins.

2. Visually inspect oil seals for cuts or other damage. Inspect oil seal spring. If spring is damaged or stretched, it must be replaced. Replace defective oil seals.

3. Inspect sprockets and gears for damage, worn teeth, or spline distortion. Replace defective component(s).

4. Inspect general condition of all bearings (e.g. pitted or missing roller bearings, freedom of movement and radial free play). Replace defective bearing(s).

5. Inspect drive shaft for deflection, worn or twisted splines. If drive shaft is damaged it must be replaced.

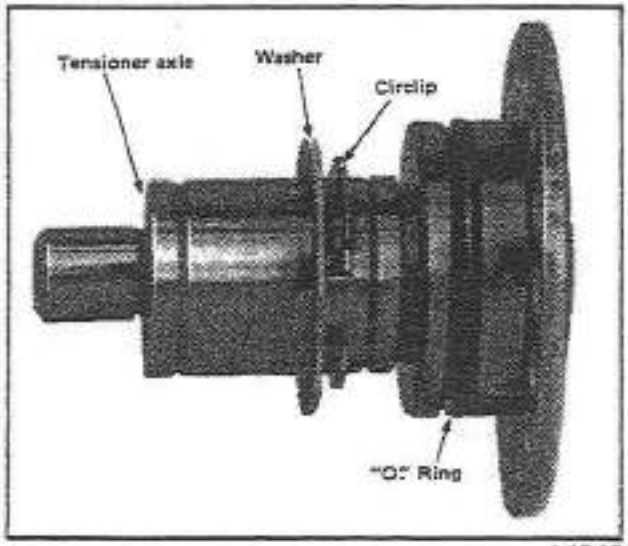
6. Inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged parts.

ASSEMBLY

1. Prior to Assembly procedure, ensure all components are clean and all damaged parts have been repaired or replaced.

2. To assemble and install the tensioner axle in the lower housing use the following procedure.

(a) Position a new "O" ring into appropriate groove of tensioner axle. Slide a circlip and washer on the axle (fig. 1-13-17).



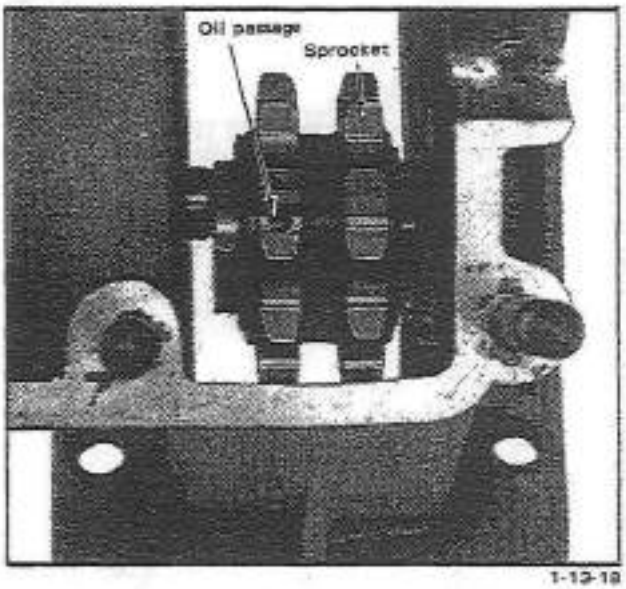
1-13-17

NOTE: Do not seat the circlip into its notch at this time.

(b) Insert the axle through the larger hole in side of lower housing assembly.

(c) Insert the sprocket with needle cage, washer and circlip onto the tensioner axle.

NOTE: The sprocket oil passage must be positioned as shown in figure 1-13-18.



1-13-18

(d) Pull the sprocket towards tensioner plate of axle and at the same time, push the axle into correct location within housing. This pull/push action will seat the axle and push the circlip into the axle notch.

(e) Place the sprocket washer on rim of eccentric portion of sprocket and position the second circlip into the notch.

3. To assemble and install the lay gear use the following procedure:

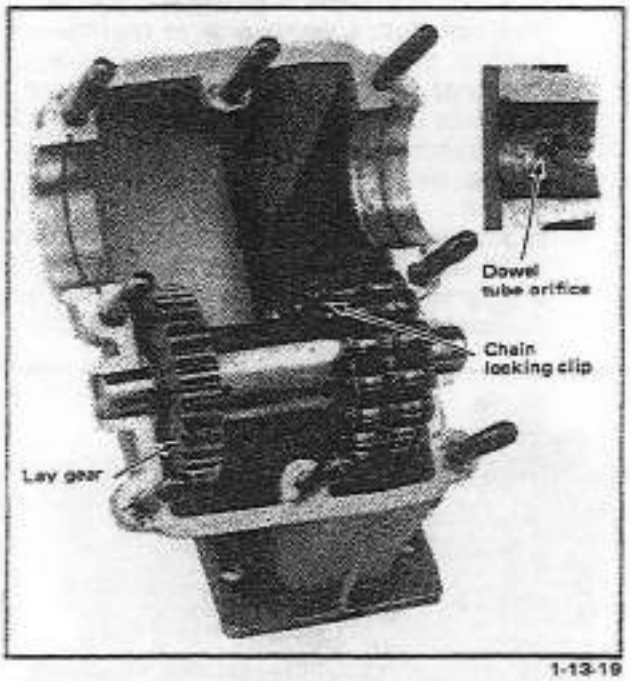
NOTE: If the dowel tube has been removed from the lay axle, install the tube into axle using a soft faced hammer.

(a) Slide the distance sleeve, shim (1mm), needle cage, lay gear assembly, needle cage and shims onto the lay shaft (See fig. 1-13-14).

(b) Place the assembled lay gear into the lower housing.

(c) Using a feeler gauge, check end play between assembled lay shaft and walls of lower housing. End play must be between 0.006 and 0.012 inch. If end play is not within tolerance, remove end

shim and add required thickness of shim(s) to take up end play. Reinstall previously removed end shim and place drive chain over sprocket teeth. Place the assembled lay gear into location making sure that the dowel tube sits in lower housing orifice (fig. 1-13-19).



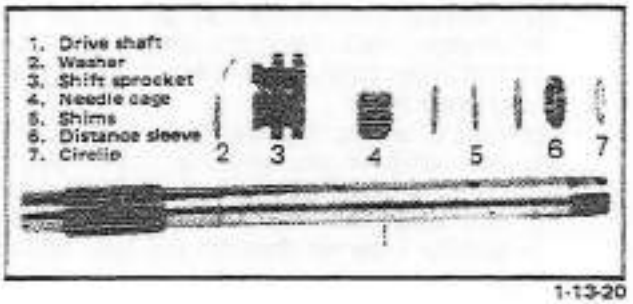
1-13-19

NOTE: Drive chain must be positioned on lay gear sprocket with the locking clip facing the lay gear.

4. To assemble and install the drive shaft assembly, use the following procedure:

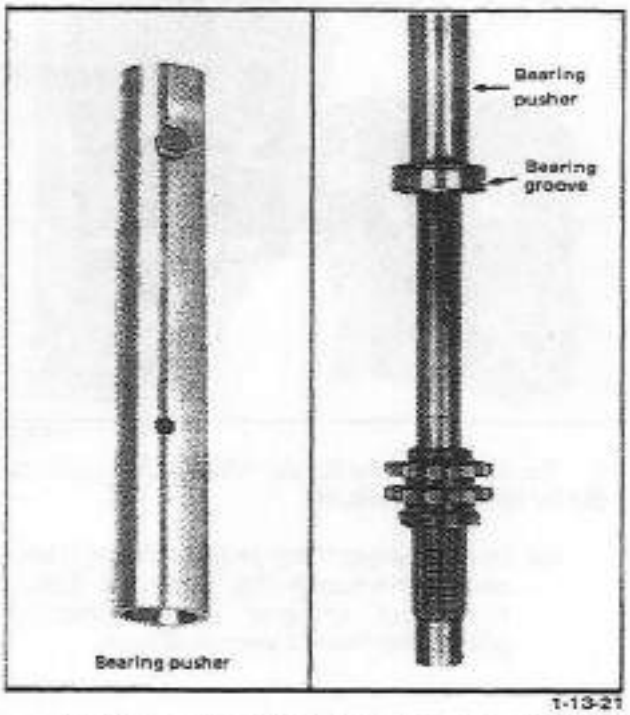
(a) Slide the washer, shift sprocket, needle cage, shims, distance sleeve and circlip onto the driven pulley side of shaft.

(b) Using a feeler gauge, check total free play between components installed on shaft. Free play must not exceed 0.006 to 0.012 inch. If free play is not within tolerance, remove circlip and distance sleeve from shaft. Add required thickness of shims to take up free play. Install distance sleeve and circlip on shaft (fig. 1-13-20).



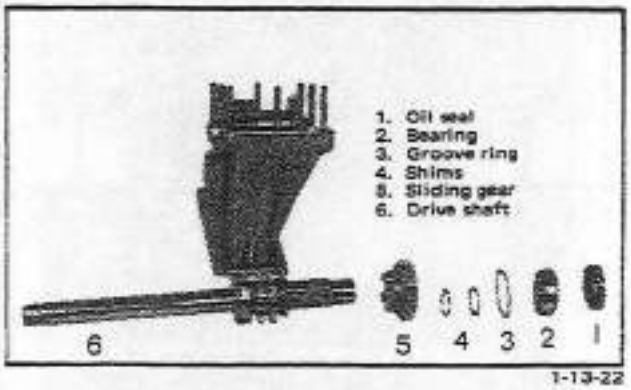
1-13-20

(c) Position the shift sprocket bearing on the drive shaft. Bearing groove must be on driven pulley side of shaft. Using a bearing pusher, push the bearing into place on shaft (fig. 1-13-21). Install the groove ring into bearing groove. Slide the oil seal onto shaft. Ensure that oil seal spring is facing bearing.



1-13-21

(d) Slide the sliding gear, shim, bearing with groove ring and oil seal on splined end of shaft (fig. 1-13-22).



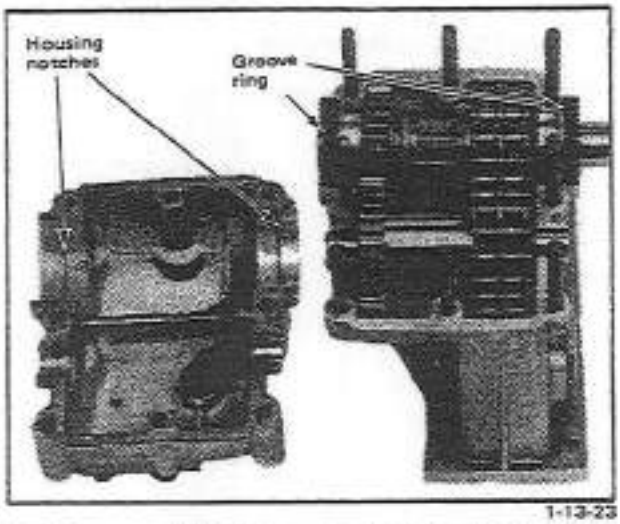
1-13-22

NOTE: Ensure bearing groove ring is farthest away from sliding gear and the oil seal spring is facing bearing.

(e) Install driven pulley and disc brake mechanism on the drive shaft.

(f) Lift the drive chain and place the geared end of shaft onto the lower housing. Ensure the groove ring on the bearings is correctly seated in the housing grooves.

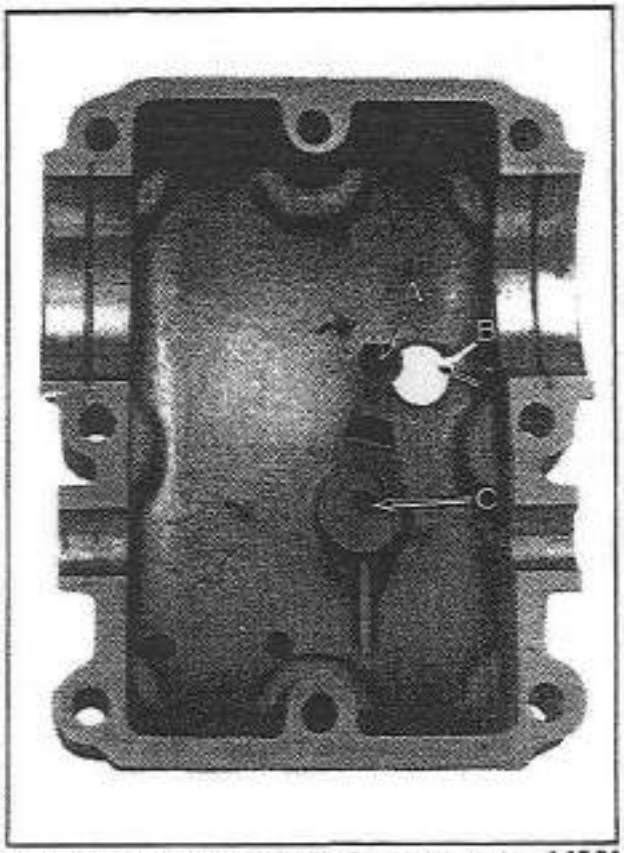
(g) Sit the drive chain over shift sprocket teeth.
(h) Apply hand pressure on outer side of oil seals to push seals against the bearings (fig. 1-13-23).



1-13-23

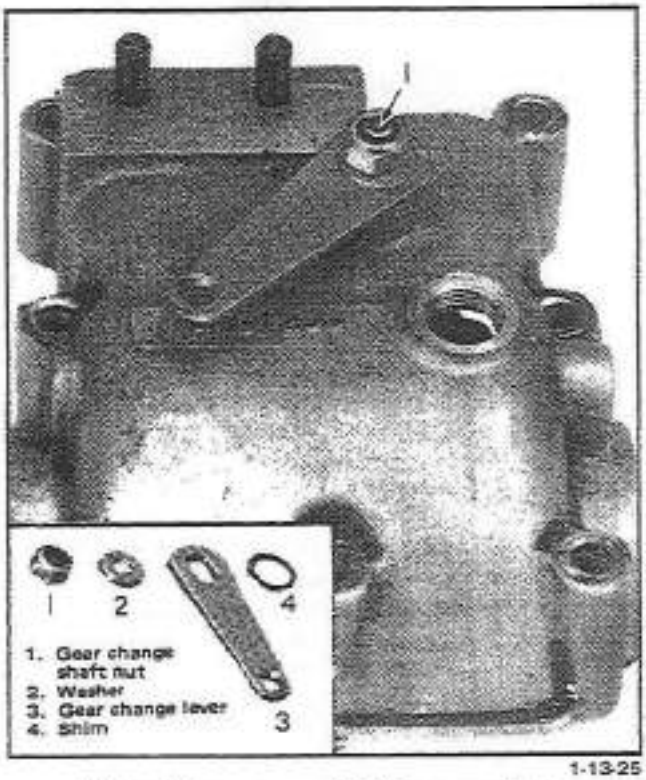
5. To assemble the upper housing (cover) use the following procedure:

(a) Insert the gear change shaft through hole of upper housing (fig. 1-13-24). Ensure that lever of gear change shaft is positioned toward vent plug hole.



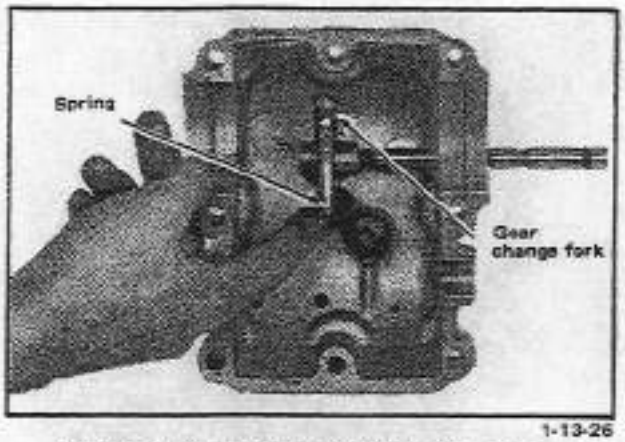
A. Lever B. Vent plug hole C. Gear change shaft 1-13-24

(b) Using a soft faced hammer, carefully tap shaft into position.
(c) Install shim, gear change lever, washer and nut. Torque nut to 17 ft/lbs.
(d) Using a feeler gauge, check that free play of gear change shaft is within tolerance of 0.006 to 0.012 inch. If free play is not within tolerance, record discrepancy. Remove nut, washer, gear change lever, shim and gear change shaft. Divide discrepancy by 2 and install that amount of shims on gear change shaft. Install shaft into upper housing. Install standard shim and balance of shim(s) on gear change shaft. Install gear change lever on shouldered end of change shaft so that lever and vent plug hole form a 45 degree angle. Install washer and nut. Torque nut to 16 ft/lb. (fig. 1-13-25).



1-13-25

(e) Position a new "O" ring on index rod. Partially insert the threaded end of index rod through hole adjacent to vent plug hole of upper housing.
(f) Position the gear change fork on the gear change shaft assembly. Push the index rod approximately 1/4 inch into the change fork.
(g) Insert the spring and ball bearing into hole of gear change fork (fig. 1-13-26). Using a suitable tool, depress the ball and spring so that the index rod can be totally inserted through the gear change fork.

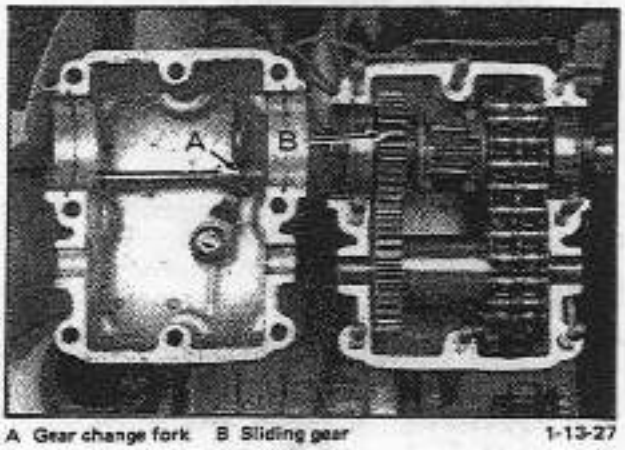


1-13-26

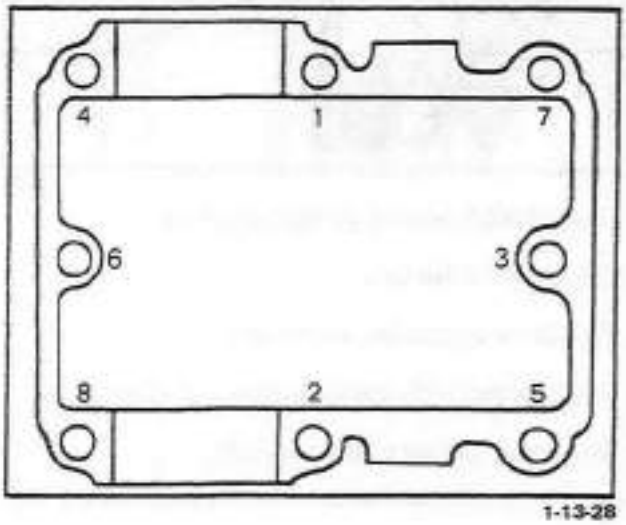
(h) Screw the index rod into threaded hole of upper housing. Secure assembly with appropriate nut.

6. Apply a light coating of L700 Crankcase Glue on contact surfaces of upper and lower housings.

7. Press the sliding gear against drive shaft bearing. Push the gear change fork towards the vent plug hole until ball engages with appropriate groove in index rod (fig. 1-13-27).



A Gear change fork B Sliding gear 1-13-27



1-13-28

8. Position the upper housing over studs of lower housing and using a soft faced hammer, carefully tap the upper housing into position.

9. Install the eight (8) lockwashers and nuts. Cross torque to 21 ft/lbs. following the sequence shown in figure 1-13-28.

INSTALLATION

1. Position gasket on frame studs.

2. Place lower sprocket in drive chain.

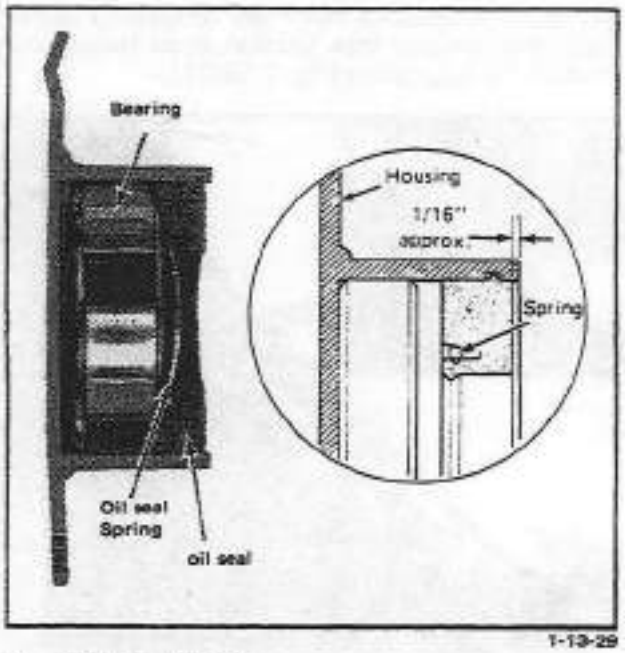
3. Secure gear box to frame with six (6) nuts. Torque nuts to 16 ft/lb.

4. From the left side of vehicle, place the drive axle within the track. Push the end bearing side of axle through the orifice in right side of frame. Pull the splined end of axle into gear box lower sprocket. Install opposite drive axle.

5. Press each end bearing housing into frame and over axle bearing. Secure the housings to frame with three (3) capscrews.

6. Install oil seals.

NOTE: a gap of approximately 1/16 inch should exist between the end of the bearing housing and the oil seal (fig. 1-13-29).



1-13-29

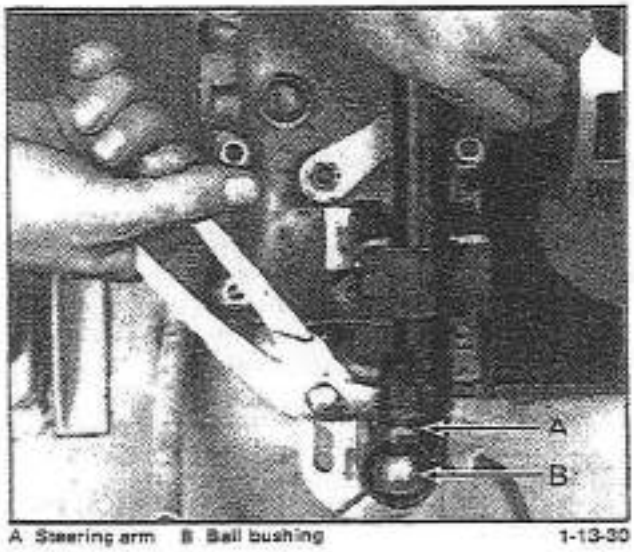
7. Install rear hubs.

8. Insert a pry bar between structural members of bogie wheel set and reverse each set to its original position.

9. Hook transmission rod to gear box lever and secure with spring, washer and a new cotter pin.

10. Lower steering column and insert ball bushing into steering arm.

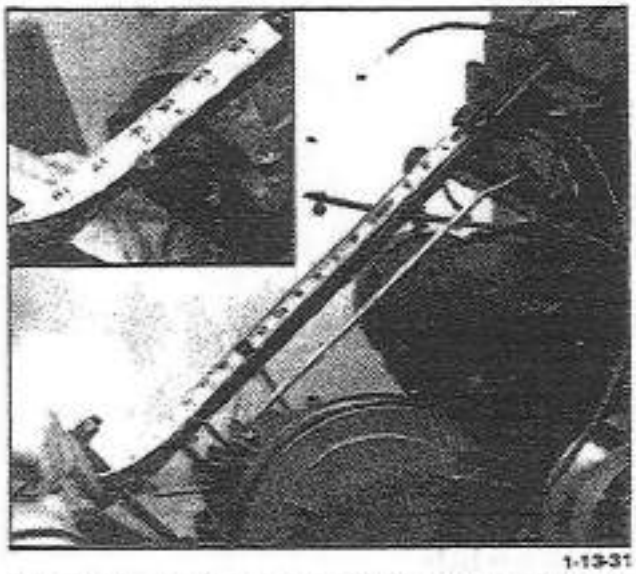
NOTE: If difficulty is encountered, use pliers to align column ball bushing and steering arm (fig. 1-13-30).



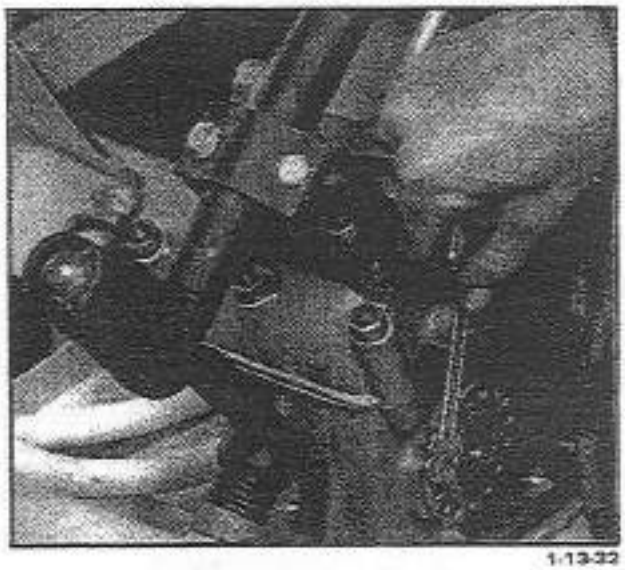
A Steering arm B Ball bushing 1-13-30

11. Secure steering column bracket to gear box cover with two (2) nuts. Tighten bolts and nuts securing upper retainer plate.

NOTE: The distance between the upper retainer plate and the gear box bracket must be approximately 15-1/2 inches (fig. 1-13-31).


1-13-31

12. Rotate the tensioner axle to obtain 1/4 inch maximum free play of drive chain. Install lockwasher and capscrew. Fully tighten capscrew (fig. 1-13-32).


1-13-32

13. Connect throttle and brake cables and housings at handlebar.

14. Install muffler to engine

15. Connect brake cable housing to brake lever ferrule of brake mechanism. Check that brake applies fully when brake lever is one (1) inch from handlebar grip.

16. Fill the gear box with Ski-Doo chain case oil.

NOTE: On 440R and 440ER models, the oil capacity of the gear box is 12 ounces or 2-1/4 inches when checked with a rigid dipstick. The gear box capacity of the 640ER model is 16 ounces or 3-1/4 inch level on dipstick (fig. 1-13-33).


1-13-33

17. Install filler and inspection plugs.

18. Install drive belt.

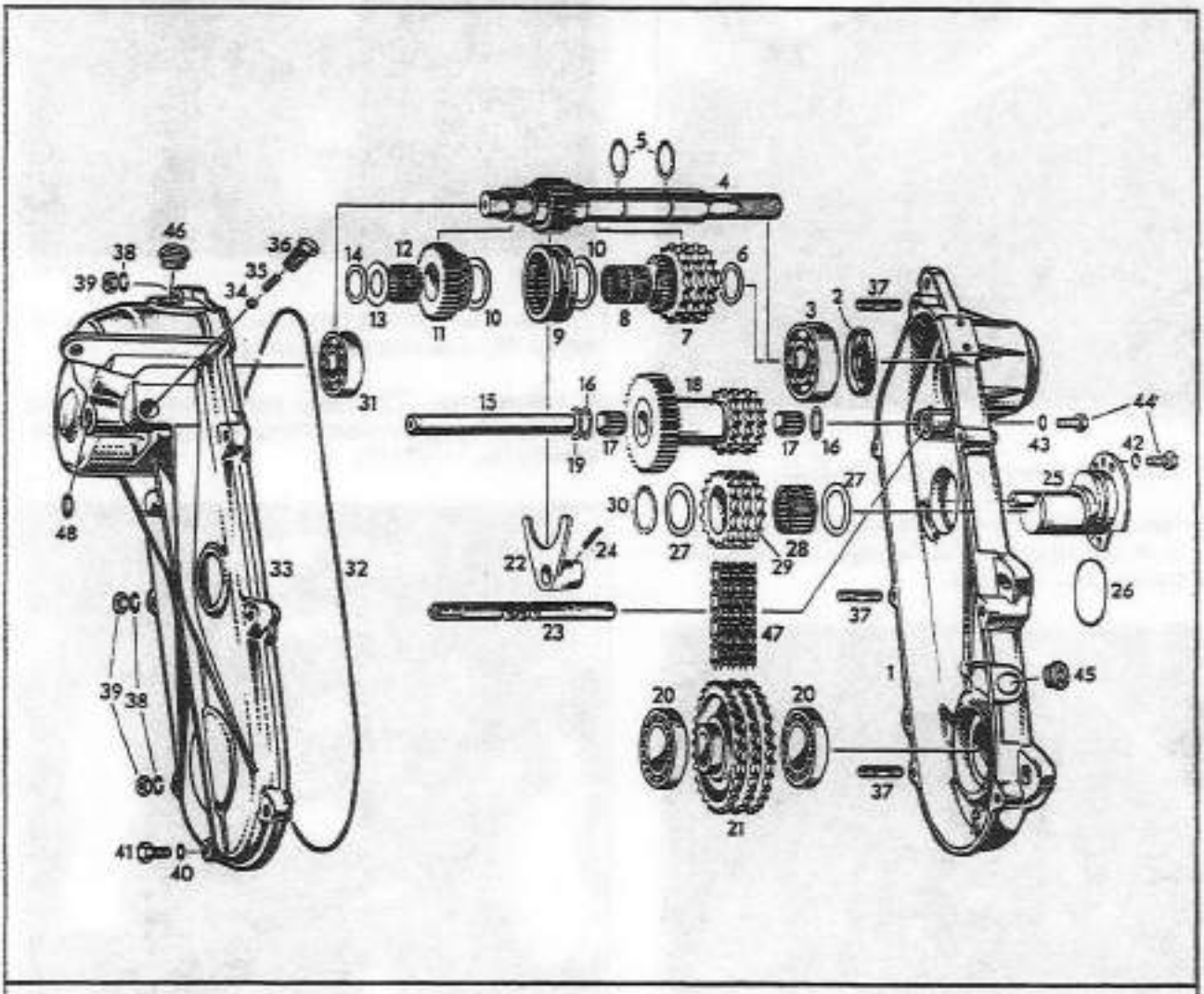
19. Carry out pulley alignment.

20. Proceed with track tension and alignment.

21. Install pulley guard and cab.

Transmission

GEAR BOX (Nordic 640ER)

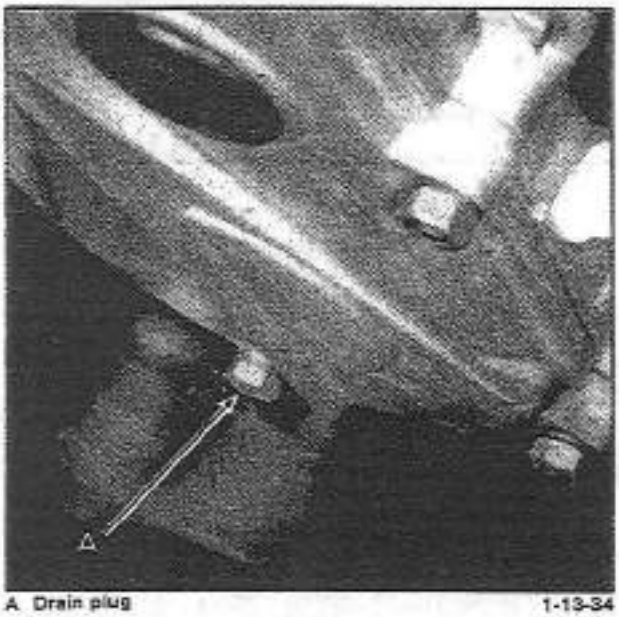


1. Housing
2. Oil seal
3. Ball bearing
4. Drive shaft
5. Circlip
6. Shim
7. Shift sprocket
8. Needle cage
9. Gear shift sleeve
10. Washer
11. Shift sprocket
12. Needle cage
13. Shim
14. Shim
15. Lay axle
16. Washer
17. Needle cage
18. Layshaft gear ass'y
19. Shim
20. Ball bearing
21. Sprocket
22. Gear change fork
23. Gear change rod
24. Helical pin
25. Tensioner axle ass'y
26. O-Ring
27. Washer
28. Needle cage
29. Tensioner sprocket
30. Circlip
31. Ball bearing
32. Sealing strip
33. Cover, housing
34. Ball
35. Spring
36. Plug
37. Stud
38. Lock washer
39. Hex. nut
40. Sealing ring
41. Hex. screw
42. Lock washer
43. Washer
44. Hex. screw
45. Plug
46. Vent plug
47. Triplex roller chain
48. O-Ring

Disassembled view of Nordic 640E gear box

REMOVAL

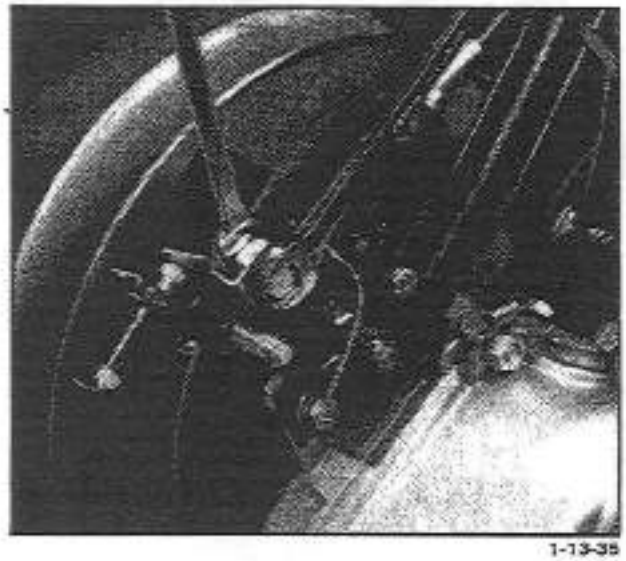
1. Drain gear box oil (fig. 1-13-34).



A Drain plug 1-13-34

2. Remove pulley guard and drive belt.

3. Remove two (2) bolts securing brake assembly to brake bracket and remove the assembly and spring (fig. 1-13-35).

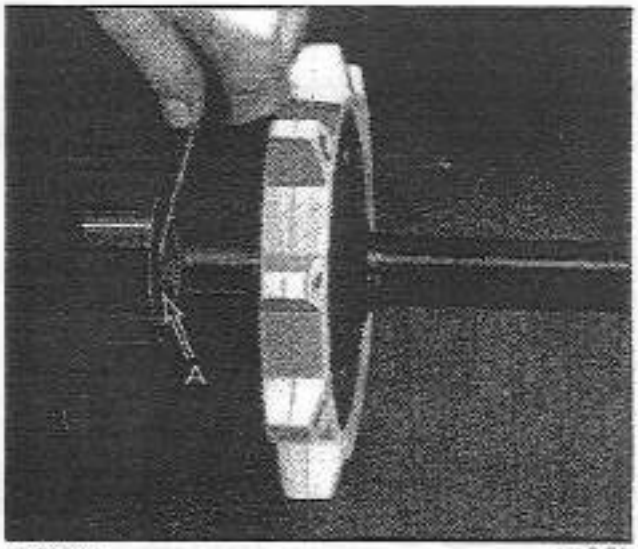


1-13-35

4. Remove bolt securing brace plate to shifter arm plate. Remove brace plate screw from console and remove plate.

5. Using link plate spring lever, unhook link plate springs.

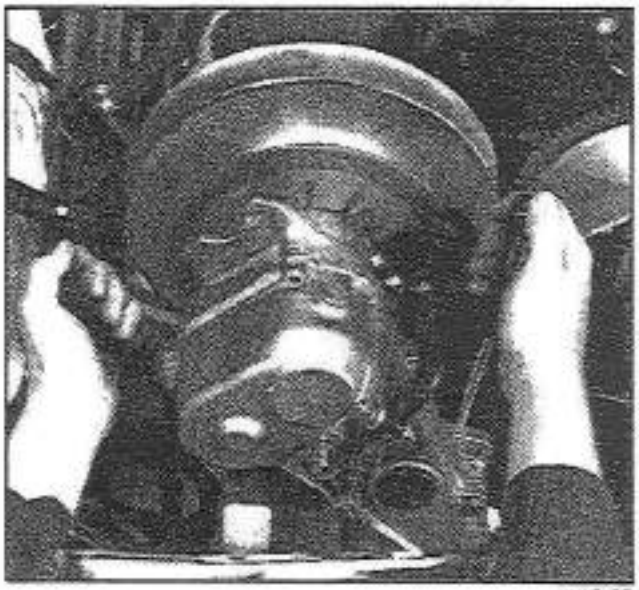
6. Using a seal lever, pry seal from gear box (fig. 1-13-36).



A Oil seal 1-13-36

7. Remove four (4) bolts securing gear box to frame. Remove aligning shim(s).

8. Using two (2) large screwdrivers inserted between frame and gear box, pry gear box from vehicle (fig. 1-13-37).



1-13-37

DISASSEMBLY

1. Disassemble driven pulley.

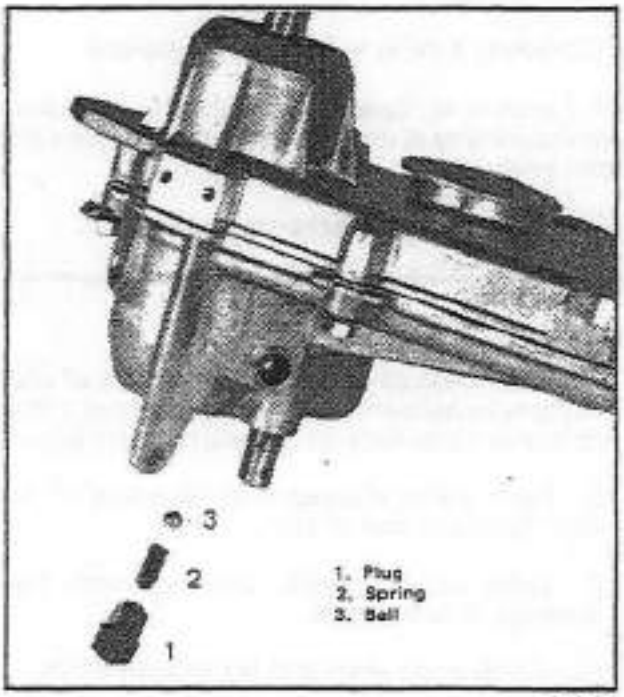
2. Using a drive punch and a hammer, drive out roll pin securing shifter arm plate to gear change rod. Remove nuts securing plate to gear box bracket. Remove washers, stud and shifter arm plate. Press sleeve from plate.

3. Unbolt pulley guard bracket.

4. Remove vent plug, inspection plug and rubber cover from gear box.

5. Remove tensioner axle capscrew and washer. Rotate tensioner to obtain maximum chain slackness.

6. Remove plug, spring and ball from left hand side cover (fig. 1-13-38).



1-13-38

7. Remove nuts and lock washers securing gear box halves.

8. With a soft faced hammer, gently tap on gear change rod and studs to separate gear box. Remove sealing strip.

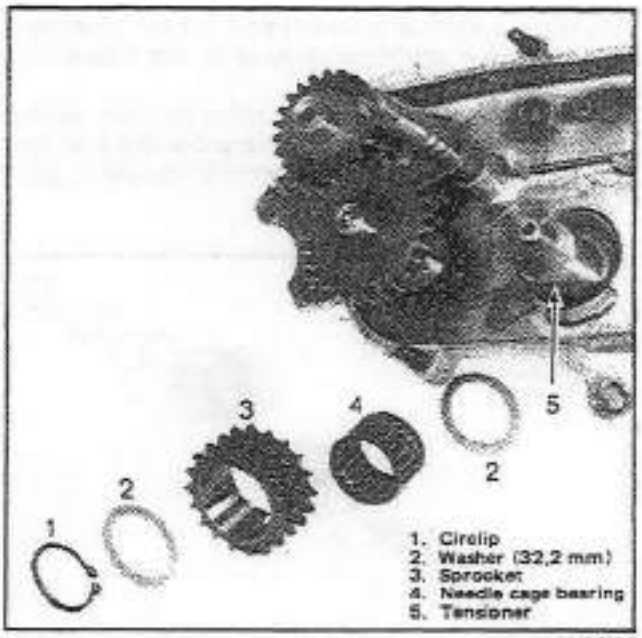
9. With a wooden block, tap the lower sprocket from its recess. Remove drive chain.

10. Remove circlip, washer (16.3mm dia.), tensioner sprocket, needle cage bearing and washer (32.2mm dia.), from tensioner (fig. 1-13-39).

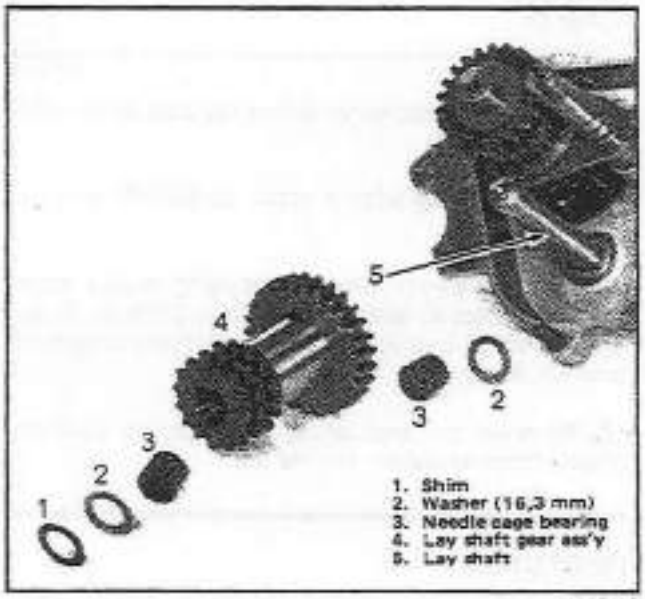
11. Push out tensioner and remove "O" ring.

12. Remove the shim(s), washer (16.3mm dia.), lay shaft gear assembly, two (2) needle cage bearings and a washer (16.3mm dia.), from lay shaft (fig. 1-13-40).

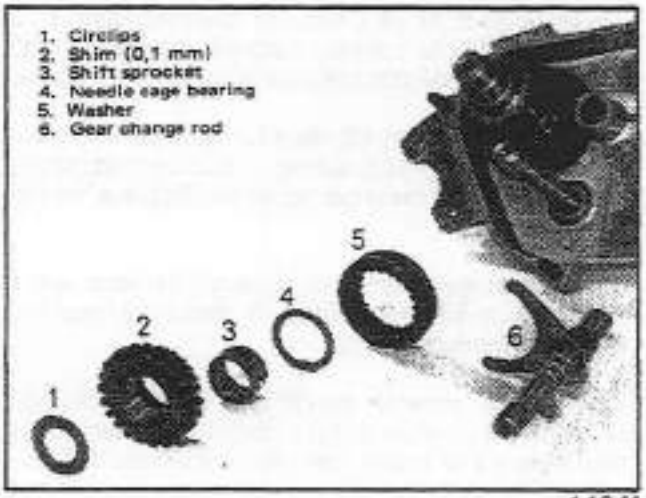
13. On drive shaft, remove shim(s), washer (20.5mm dia.), shift sprocket, needle cage bearing, washer (30.2mm dia.), gear shift sleeve and gear change rod (fig. 1-13-41). Remove gear change fork using a punch and hammer.



1-13-39



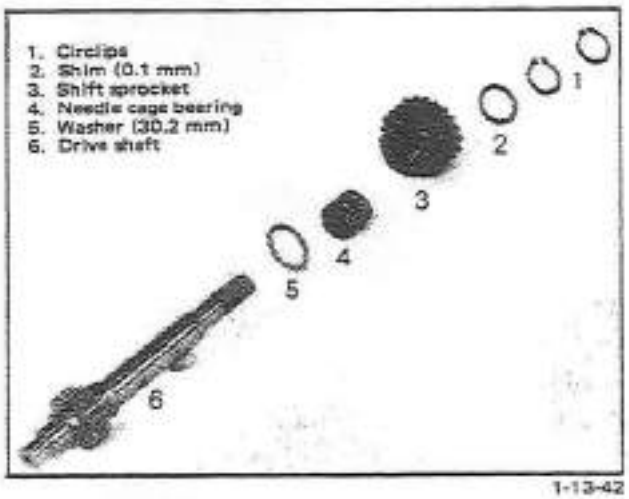
1-13-40



1-13-41

14. With a soft faced hammer, hit on threaded end of drive shaft to remove it from bearing.

15. Remove two (2) circlips, shim (0.1mm thickness), shift sprocket, needle cage bearing and the washer (30.2mm dia.), from drive shaft (fig. 1-13-42).



1-13-42

16. Remove capscrew securing lay axle and remove axle.

17. Heat housing with a torch to 350°F. and remove bearings.

CAUTION: When heating housing make sure that it is placed evenly on a flat surface. Also, use the torch in a rotary motion. If not observed, case could warp.

18. Remove oil seal using appropriate pusher, (Push from outside to inside).

INSPECTION

1. Check general condition of chain linkage. Visually inspect drive chain for cracked, damaged or missing link rollers. Inspect secureness of riveted heads of double link pins or single pins.

2. Visually inspect oil seals for cuts or other damage. Inspect oil seal spring. If spring is damaged or stretched, it must be replaced. Replace defective oil seal(s).

3. Inspect sprockets and gears for damage, worn teeth, or spline distortion. If damaged, replace defective component(s).

4. Inspect general condition of all bearings (e. g. pitted or missing roller bearings, freedom of movement and radial free play). Replace defective bearing(s).

5. Inspect drive shaft for deflection, worn or twisted splines. If splines are damaged drive shaft must be replaced.

6. Check free play between gear change fork and gear shift sleeve. If free play is more than .008", change fork.

7. Check groove in gear shift sleeve. If worn, replace sleeve.

8. Check if fork is bent, if so, replace.

9. Inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged part(s).

10. Visually inspect all other components.

ASSEMBLY

1. Prior to Assembly procedure, ensure all components have been inspected and cleaned and all defective parts have been repaired or replaced.

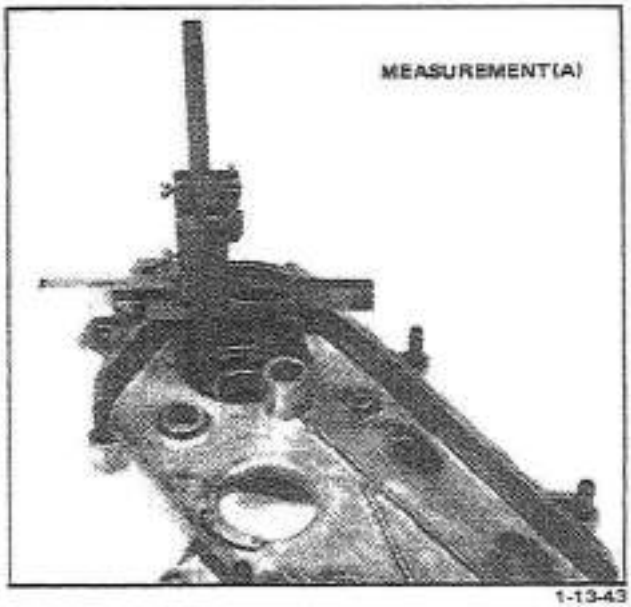
2. From inside of housing, press a new oil seal into right hand side of hub.

3. Using an appropriate bearing pusher, press bearings into housings.

4. Check drive shaft and lay axle free-play.

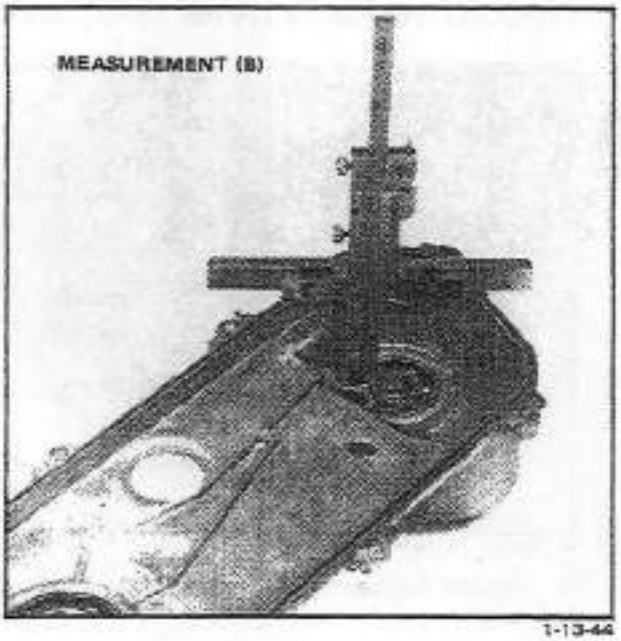
(A) DRIVE SHAFT

(a) Measure inside cavity of right hand side housing equals (A) (fig. 1-13-43).



1-13-43

(b) Measure inside cavity of left hand side housing equals (B) (fig. 1-13-44).

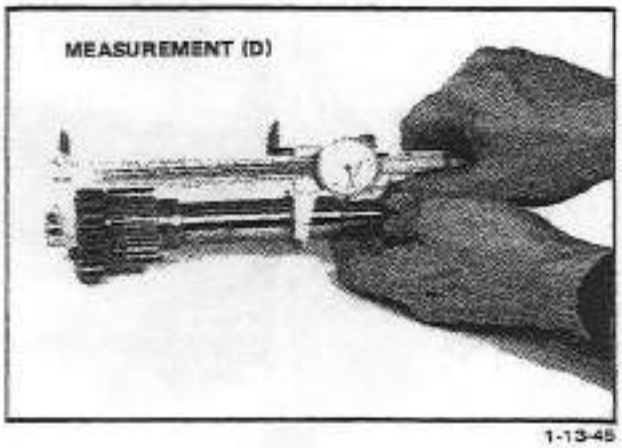


1-13-44

(c) Add A plus B equals C. (Total measurement)

(d) Position the washer (30.2mm dia.), sprocket, needle bearing, shim (20.5mm dia.) and circlip on the drive shaft.

(e) Measure distance between the shim (20mm dia.), and the circlip installed on drive shaft (fig. 1-13-45) equals D



1-13-45

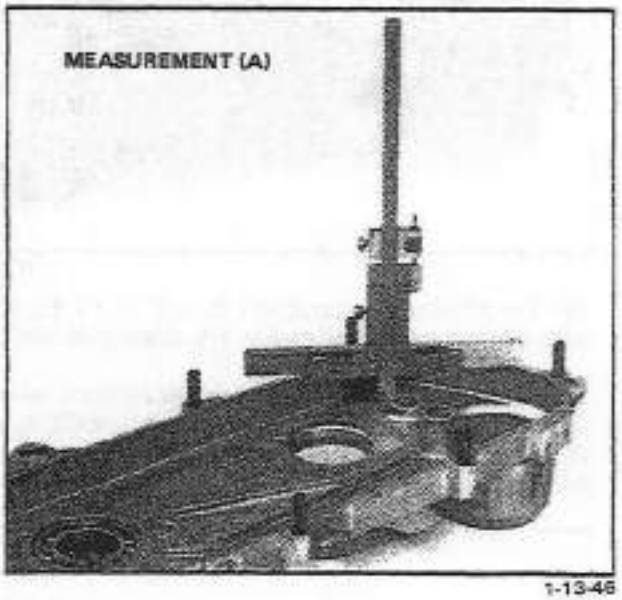
(f) Subtract C minus D equals E (total free-play on drive shaft).

(g) The final free-play (f) must be between .008 inch and .016 inch.

(h) To obtain this, subtract E – F = G (thickness of shims to be added to drive shaft).

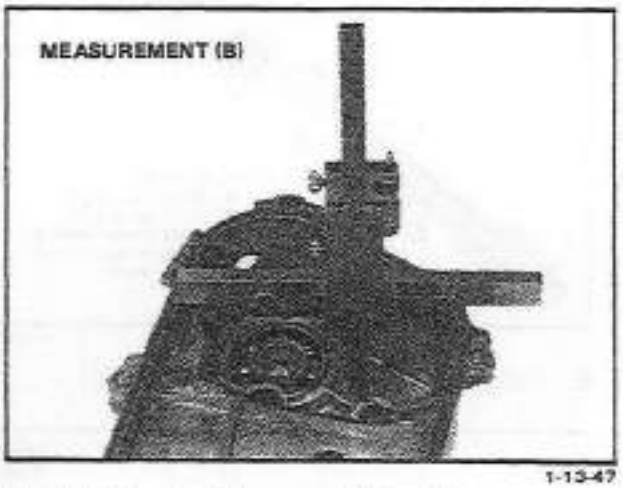
(B) LAY AXLE

(a) Measure inside cavity of right hand side housing, equals A. (fig. 1-13-46).



1-13-46

(b) Measure inside cavity of left hand side housing equals B. (fig. 1-13-47).



1-13-47

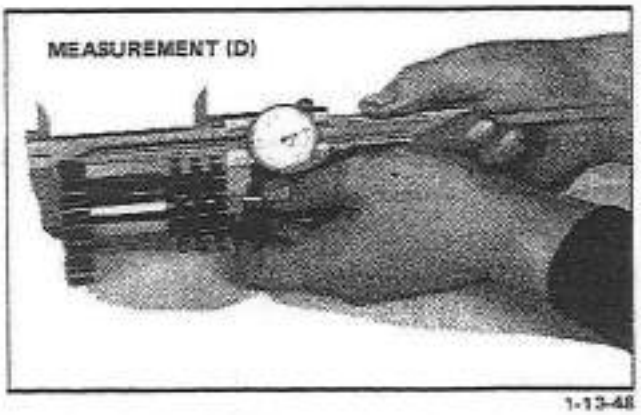
(c) Add A plus B to equal C (total measurement).

(d) Assemble the following components on lay axle, shim (0.1mm thickness), needle cage, lay shaft gear ass'y, needle cage and shim (0.1mm thickness).

(e) Measure length of assembly, equals D (fig. 1-13-48).

(f) Subtract C minus D equals E (Total free-play on lay axle).

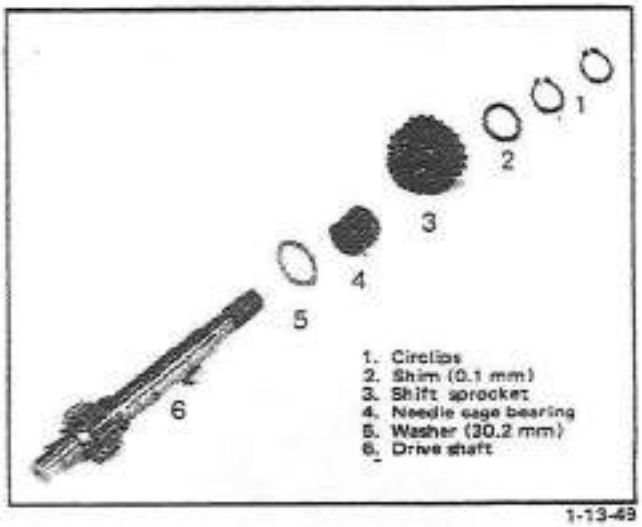
(g) The final free-play (F) must be between .008 inch and .016 inch.



1-13-48

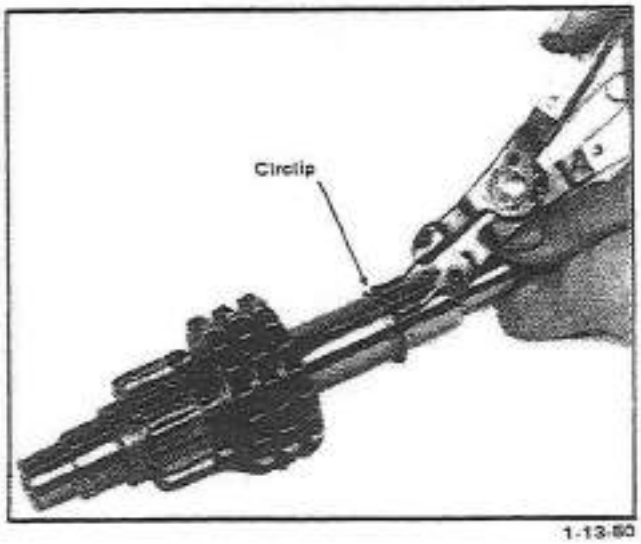
(h) To obtain this, subtract E – F = G (thickness of shims to be added to lay shaft gear ass'y).

5. On threaded end of drive shaft, slide a washer (30.2mm dia.), needle cage bearing, shift sprocket and a shim (1mm thickness). Lock assembly with circlip (fig. 1-13-49).



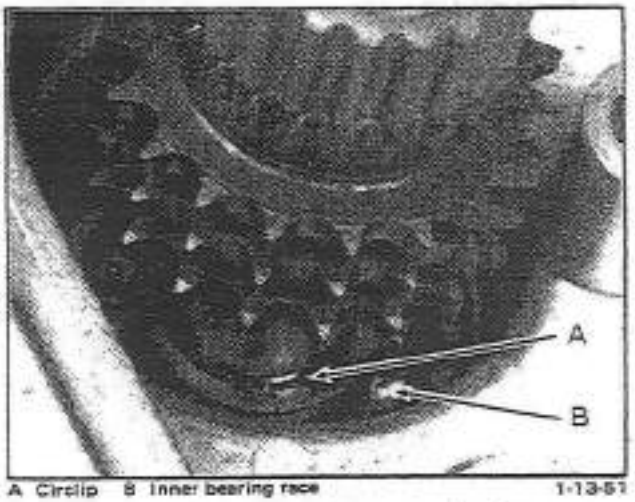
1-13-49

6. Install a second circlip (fig. 1-13-50).



1-13-50

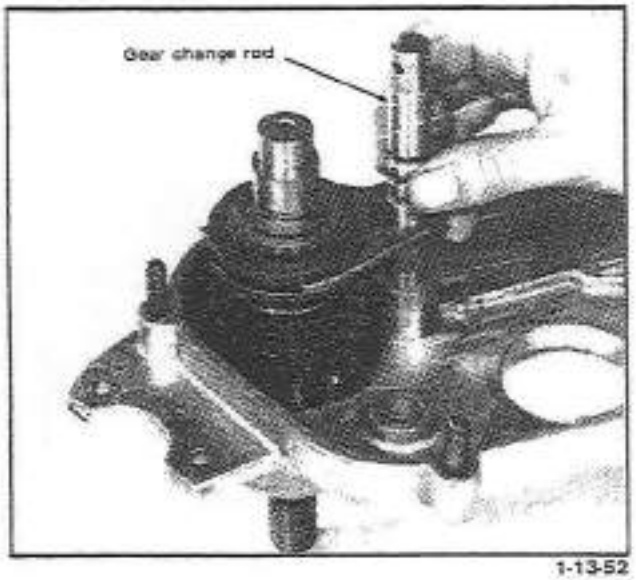
7. Install protective cap on threaded end of drive shaft. Using a soft face hammer, install drive shaft in gear box housing making sure that circlip touches inner race of bearing (fig. 1-13-51).



A Circlip B Inner bearing race 1-13-51

8. Secure fork to gear change rod using a new roll pin.

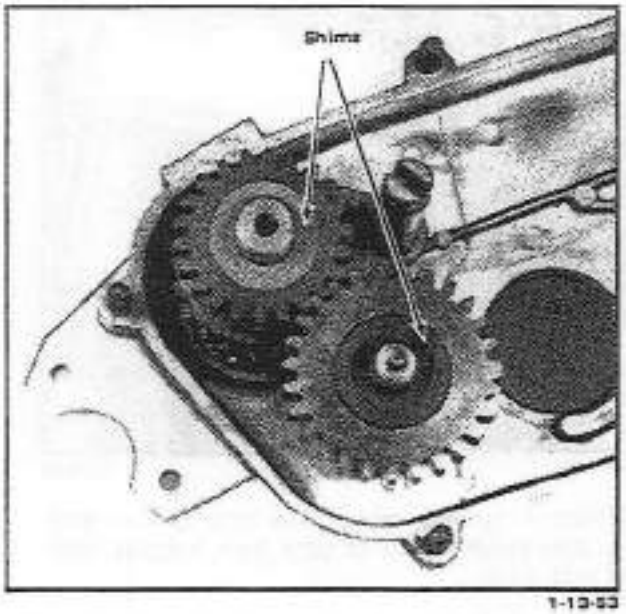
9. On drive shaft, install a washer (30.2mm dia.), gear shift sleeve and gear change rod ass'y, shift sprocket, needle cage bearing, shim (20.5 mm dia.), and the correct amount of shim(s). (Refer measurement G of drive shaft free-play) (fig. 1-13-52).



1-13-52

10. Install lay axle in housing and secure with capscrew.

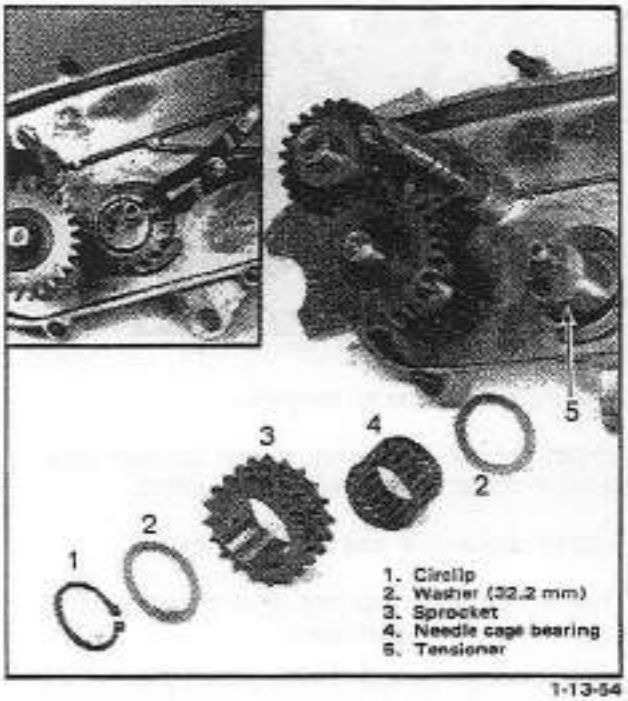
11. On lay axle, slide a washer (16.3mm dia.), needle cage bearing, lay shaft gear assembly, needle cage bearing, washer (16.3mm dia.), and the correct amount of shim(s). (Refer to measurement G of lay axle free-play) (fig. 1-13-53).



1-13-53

12. Install new "O" ring on tensioner and position tensioner into housing.

13. On tensioner, slide a washer (32.2mm dia.), needle cage bearing, tensioner sprocket and washer (32mm dia.). Lock assembly with circlip (fig. 1-13-54).

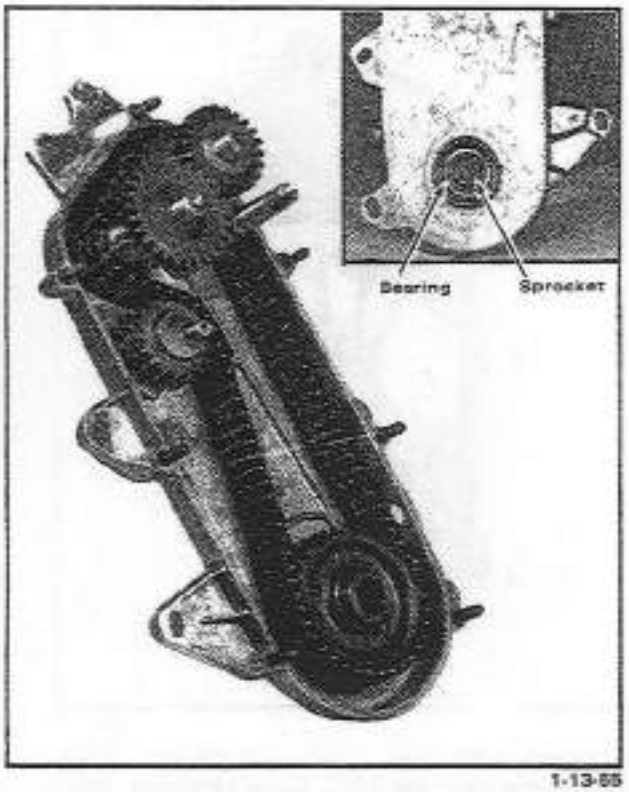


1-13-54

14. Position lower sprocket in housing and install chain (fig. 1-13-55).

15. Install pulley guard bracket to gear box housing.

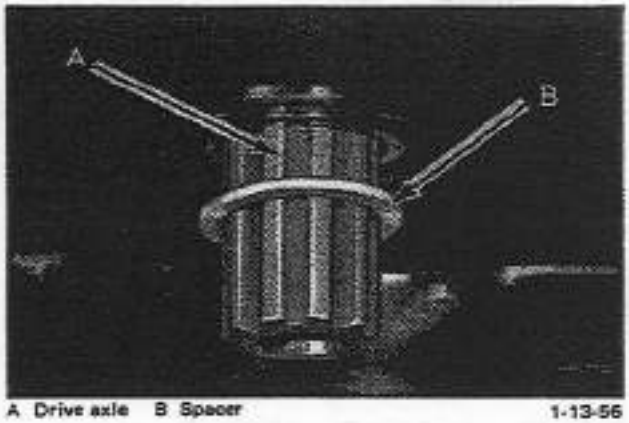
16. Install driven pulley assembly.



1-13-55

INSTALLATION

1. Prior to installing gear box on vehicle, ensure that spacer has remained on drive axle (fig. 1-13-56).

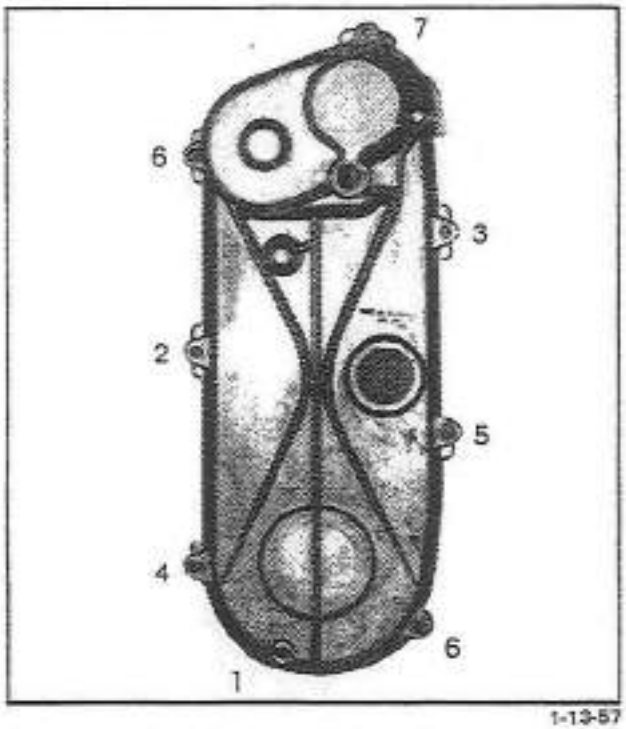


A Drive axle B Spacer 1-13-56

2. Place gear box in position ensuring that drive axle is correctly engaged into lower sprocket.

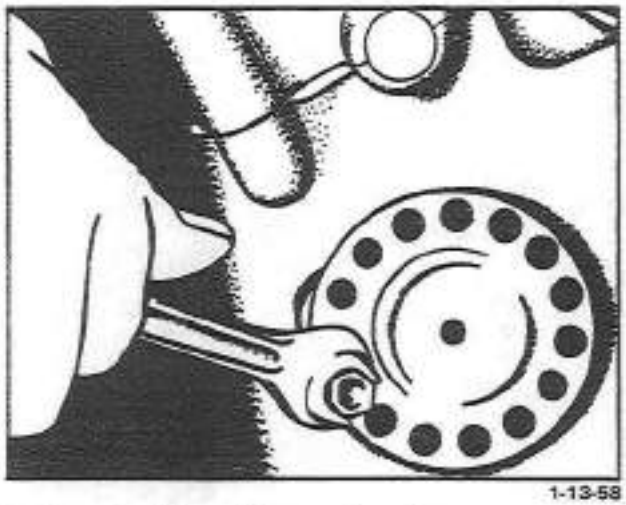
3. Install previously removed aligning shim(s) and secure gear box to frame with four (4) bolts. Proceed with pulley alignment.

4. Apply a light coat of grease over a new sealing strip. Position strip and secure cover with washers and nuts. Cross torque cover nuts to 15 ft/lbs. (fig. 1-13-57).



1-13-57

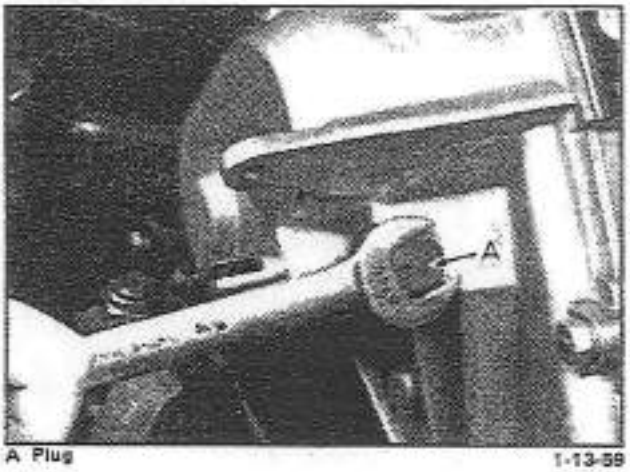
5. Proceed with drive chain adjustment. Free-play on chain must be 1/4". Lock tensioner with capscrew (fig. 1-13-58).


1-13-58

6. Install drain and inspection plugs.

7. Pour 10 ozs. of Ski-Doo chain case oil into gear box and install plug.

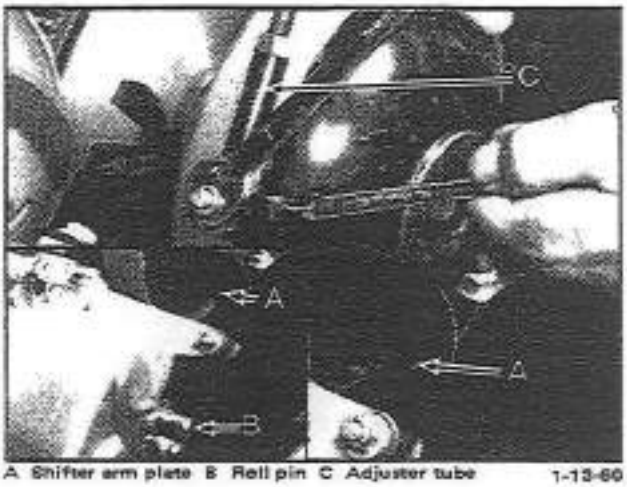
8. Install ball, spring and plug (fig. 1-13-59).



A Plug 1-13-59

9. Press a **new** spacer sleeve into shifter arm plate and secure plate to gear box bracket with stud and nuts.

10. Attach shifter arm plate to gear change rod using a **new** roll pin. Secure adjuster tube to plate (fig. 1-13-60).



A Shifter arm plate B Roll pin C Adjuster tube 1-13-60

11. Secure brace plate to console.

12. Install brake ass'y and spring to gear box bracket. Proceed with brake adjustment.

13. Install drive belt and pulley guard.

14. Hook link plate springs and proceed with track tension and alignment.

DRIVE CHAIN 1-14

GENERAL

The drive chain is installed in either the chain case or gear box. The Nordic 640ER, Alpine and Valmont models incorporate a gear box while a chain case is installed on all other models.

—There are four (4) types of the Bombardier drive chain, a single 1/2 inch pitch, a double 1/2 inch pitch, a double 3/8 inch pitch and a triple 3/8 inch pitch.

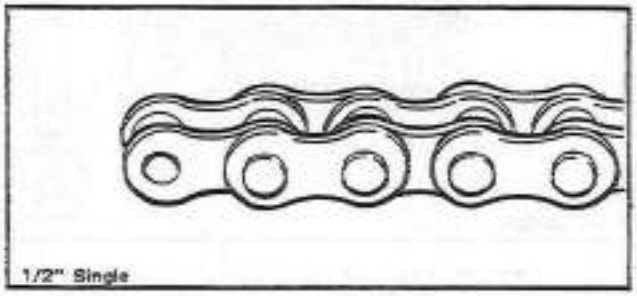
—There are also two (2) variations of chains—detachable and endless.

—The table below lists the type of drive chain installed on all 1972 Ski-Doo snowmobiles.

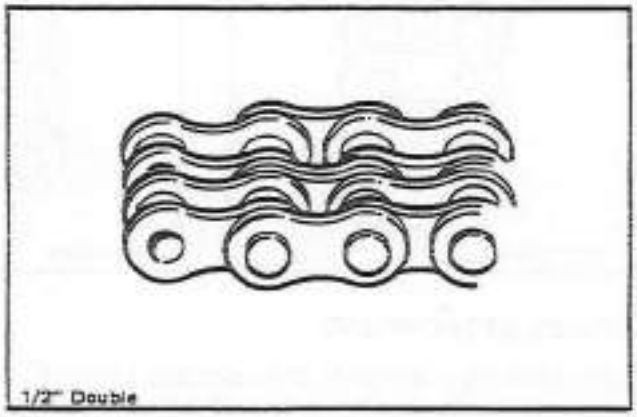
Due to the terminology of chain components we have simplified the separation and lengthening of the chain by utilizing the exploded view method.

TABLE OF APPLICABLE DRIVE CHAINS

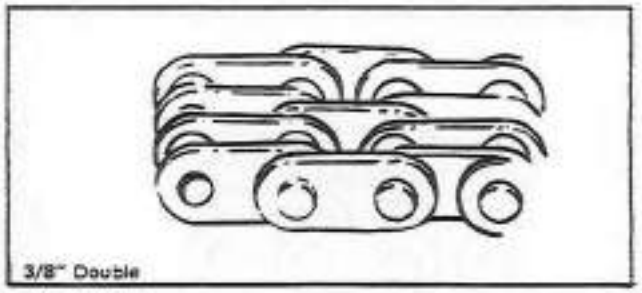
Type of Chain	Models
Single 1/2 inch pitch	ELAN 250 ELAN 250E
Double 1/2 inch pitch	ALPINE 640ER VALMONT 440R VALMONT 440ER
Double 3/8 inch pitch	OLYMPIQUE 300 OLYMPIQUE 335 OLYMPIQUE 335E OLYMPIQUE 399 OLYMPIQUE 399E NORDIC 440 NORDIC 440E T'NT 292 T'NT 340 SKANDIC 335
Triple 3/8 inch pitch	NORDIC 640ER T'NT 440 T'NT 640 T'NT 775



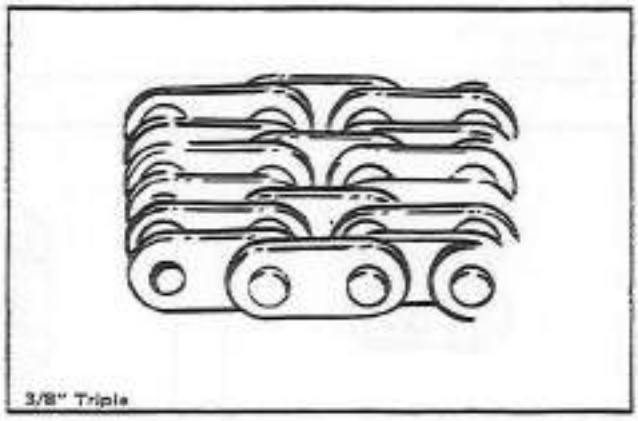
1/2" Single



1/2" Double



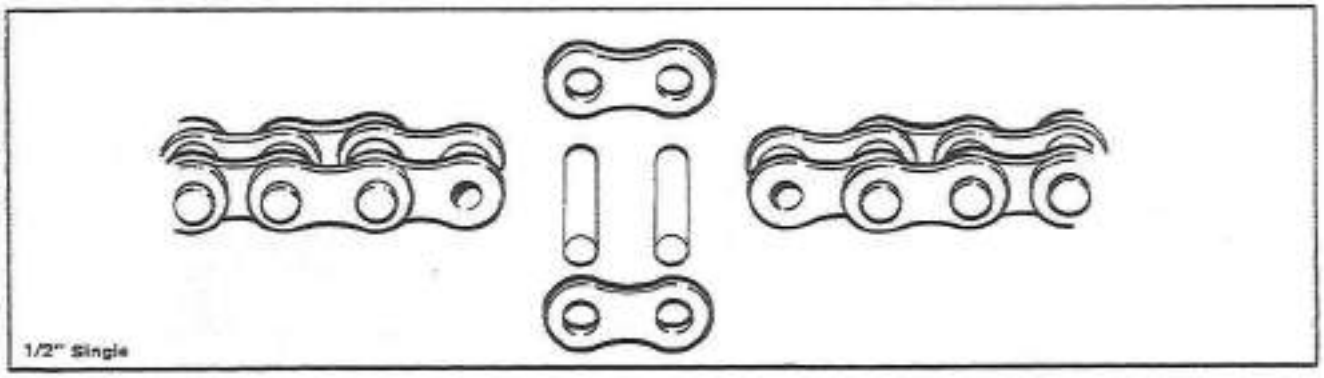
3/8" Double

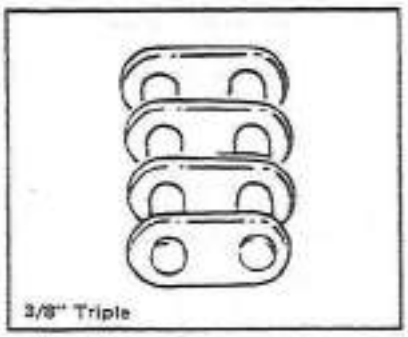


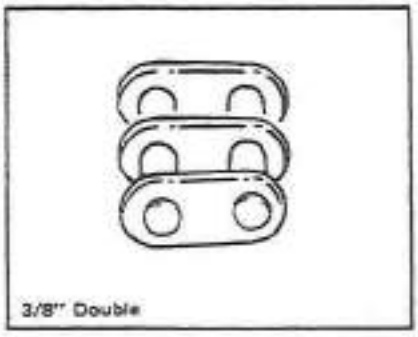
3/8" Triple

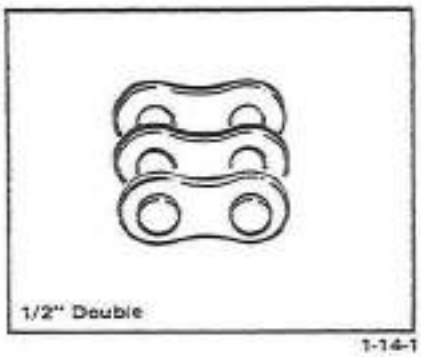
CHAIN SEPARATION

When separating any chain, always use a chain bearing pin extractor. Also, make sure to remove one complete outer link.





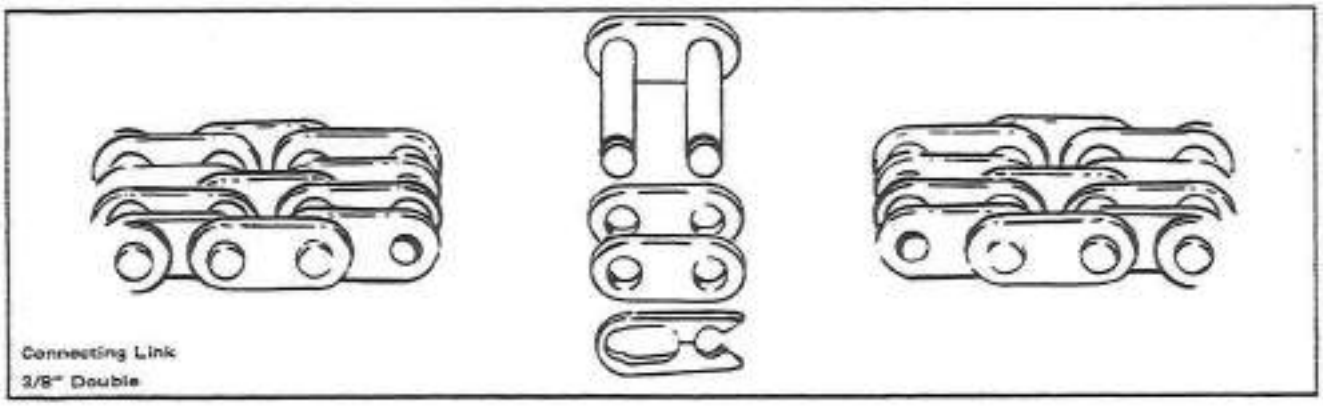


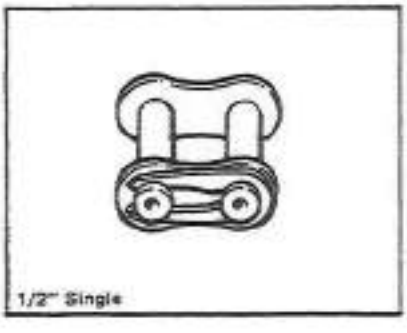


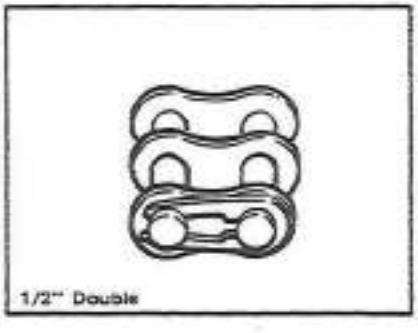
1-14-1

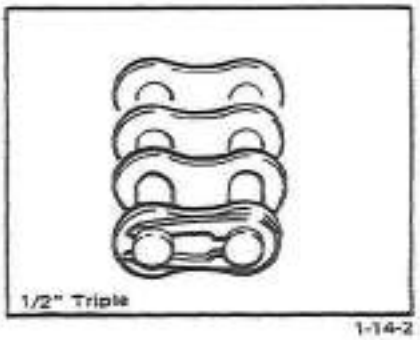
CHAIN ATTACHMENT

When joining chain ends, the open end of the circlip must be on opposite side of chain rotation, (counter - clockwise). The circlip should also be facing the outer side of chain case or gear box.



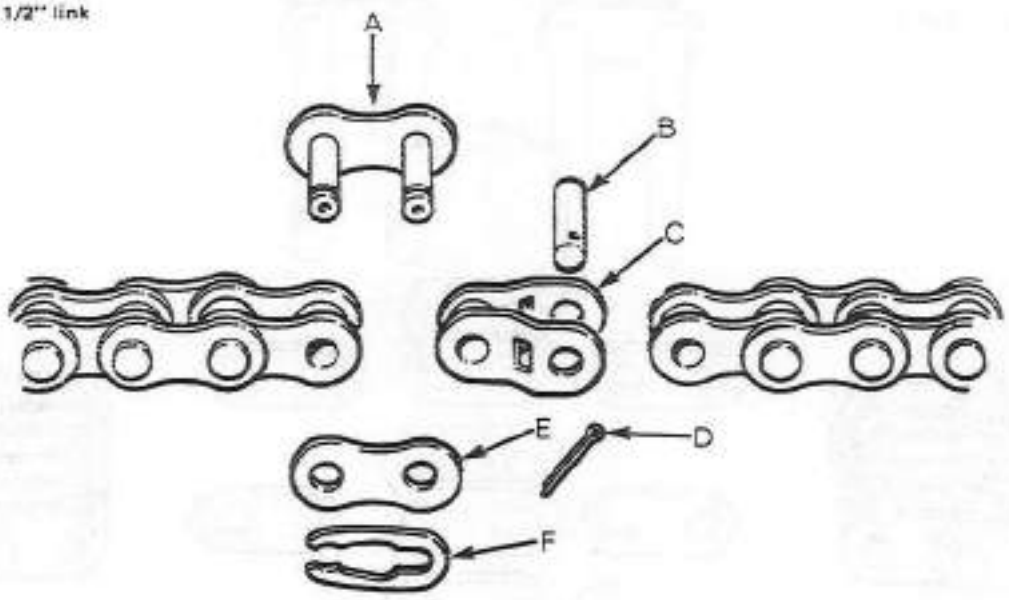


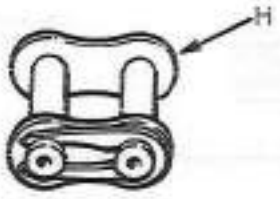




1-14-2

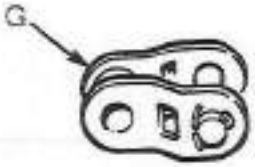
Lengthening 1/2" link

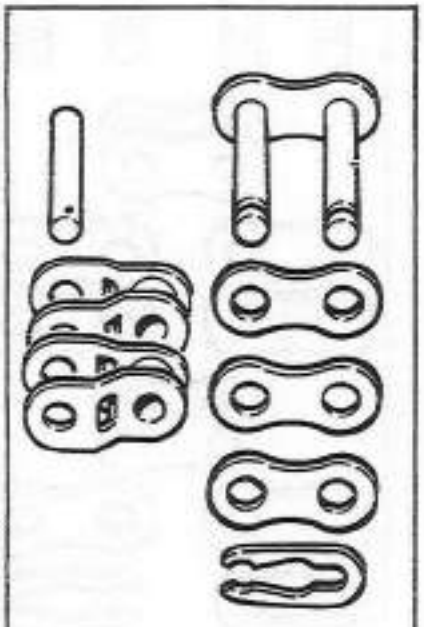




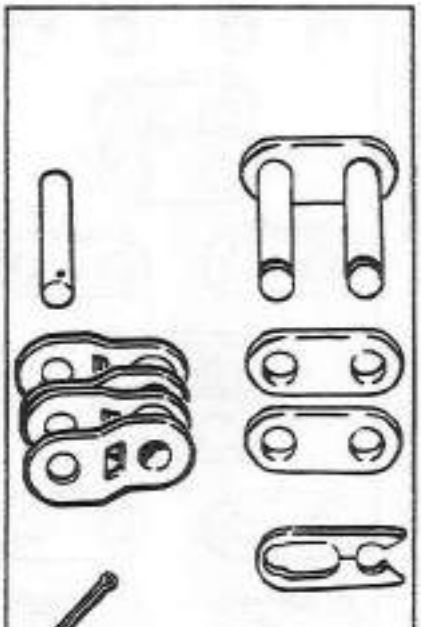
1/2" Single

A Double link pin
B Single link pin
C Cranked single link
D Cotter pin
E Outer link
F Clip
G Cranked single link
H Connecting link

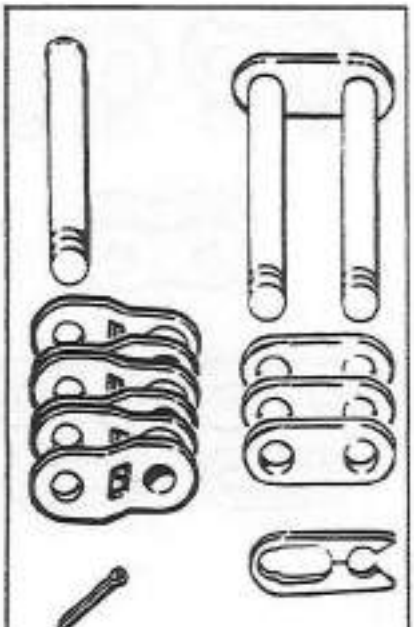




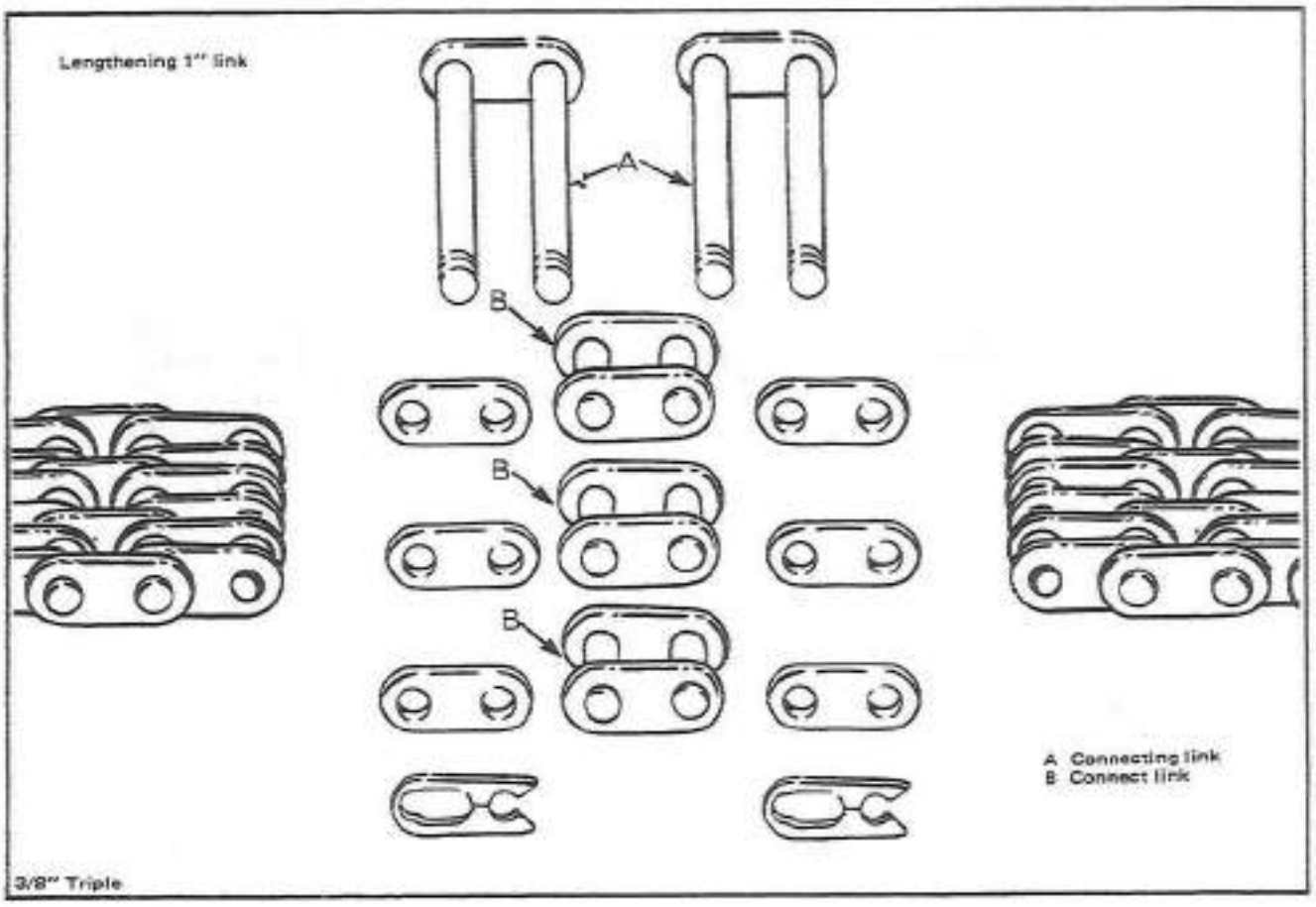
1/2" Double

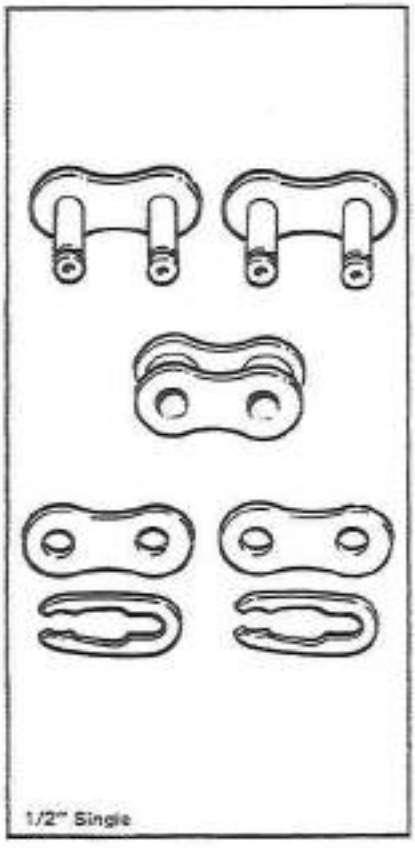


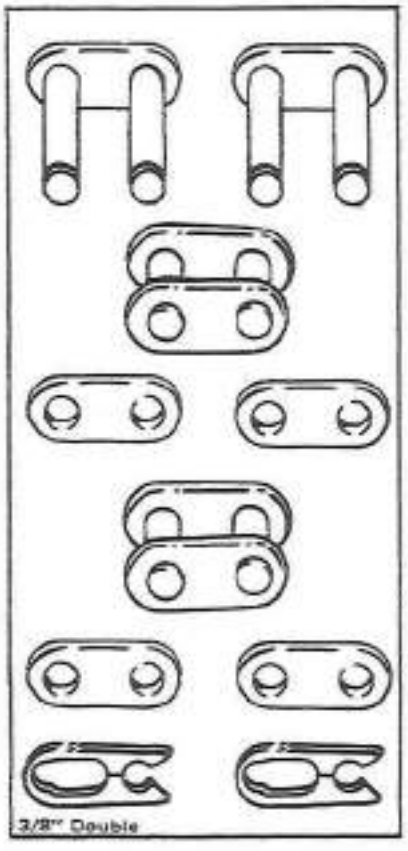
3/8" Double

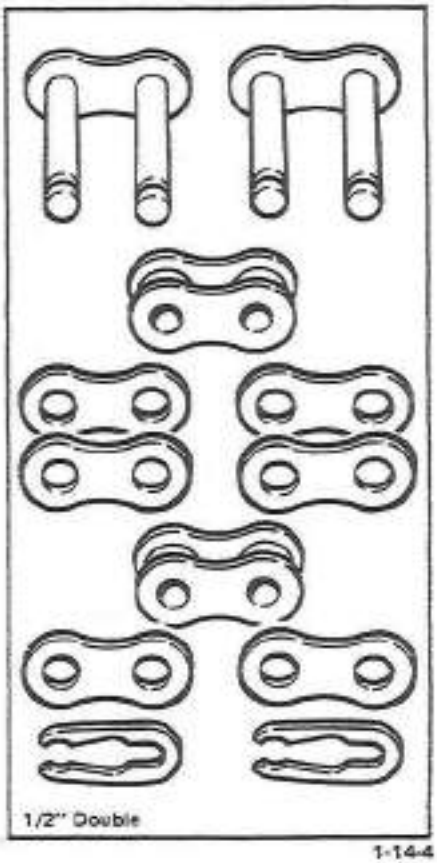


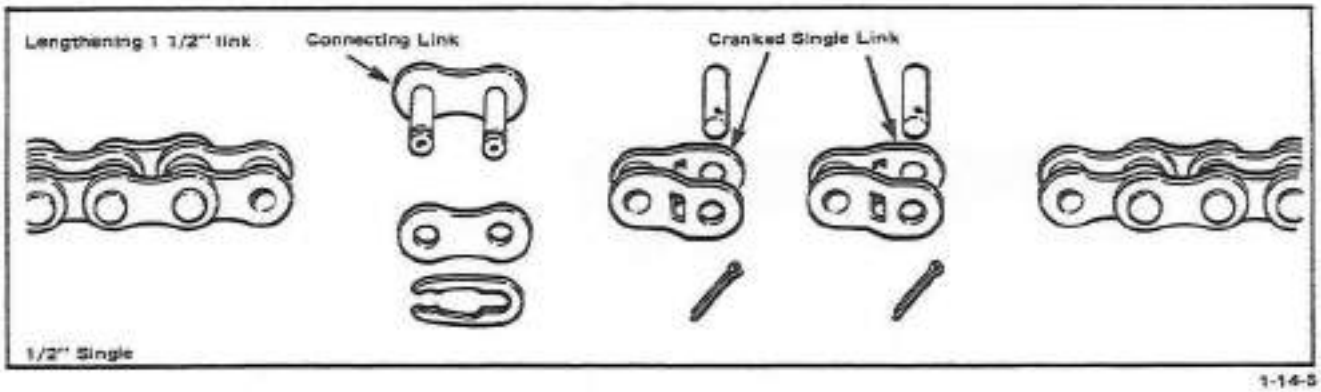
3/8" Triple


Lengthening 1" link
A
B
B
B
A Connecting link
B Connect link
3/8" Triple

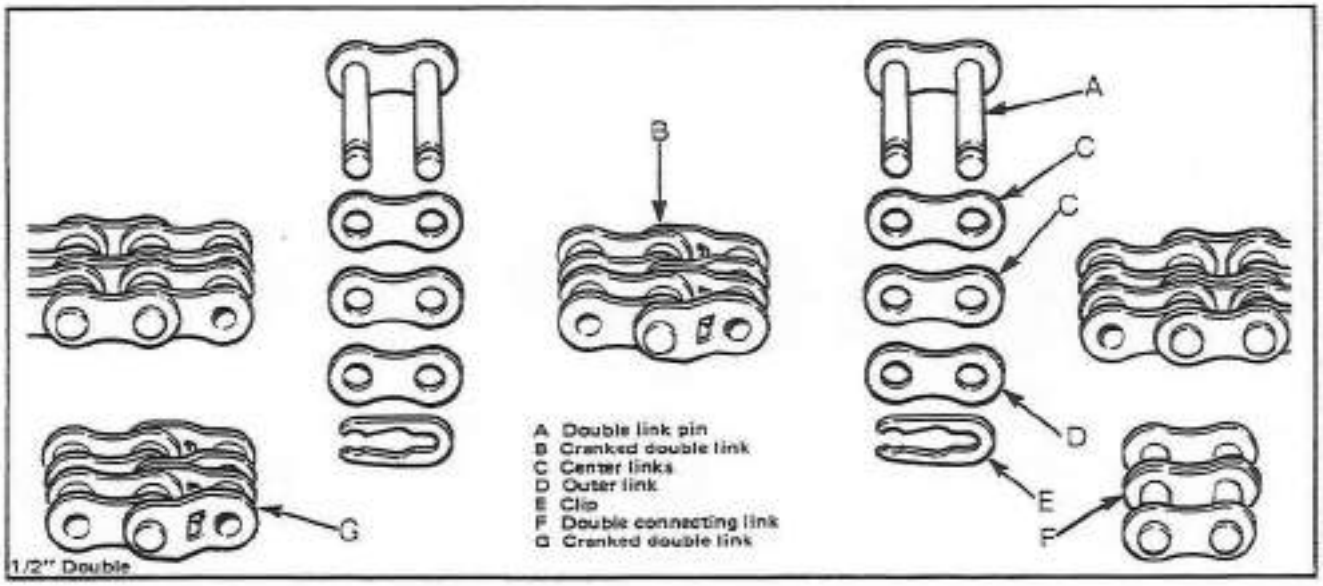

1/2" Single

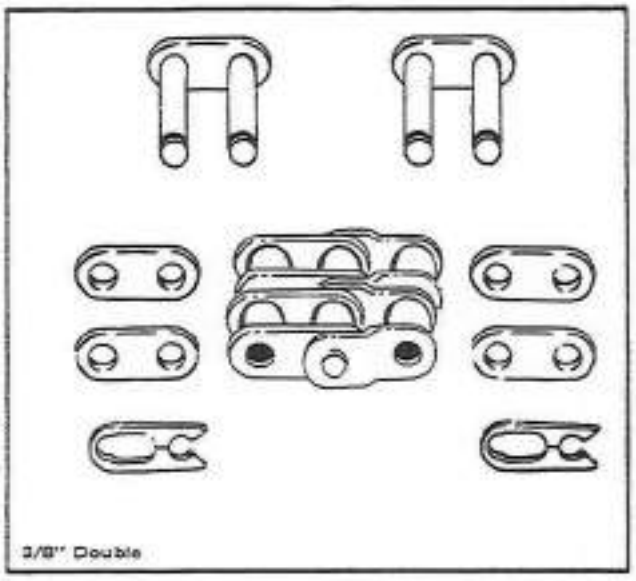

3/8" Double

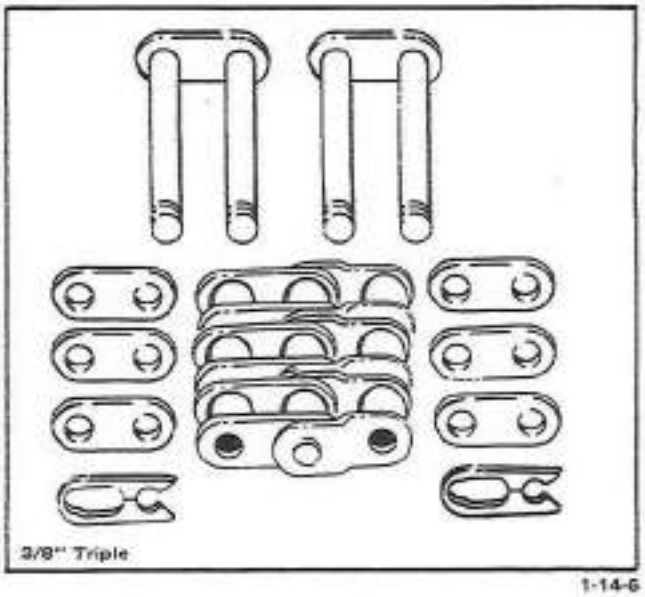

1/2" Double



1-14-5







1-14-6

When shortening the chain by removing **complete** links use a connecting link to join chain ends. When shortening the chain by **half** links remove the next even number of links and connect a cranked single link. Join chain ends using a connecting link (i.e. 1 1/2 links to be removed: — Remove two (2) links. Add cranked single link. Connect with connecting link).

Steering System

STEERING SYSTEM 1-15

GENERAL

The basic steering system of the Ski-Doo snowmobile is a handlebar affixed to a steering column. Rotation of the handlebar causes a push-pull action of the steering linkage of the lower steering column/steering arm(s). It is the pull and/or pushing forces on the steering arm(s) that cause the turning of the ski(s).

Exploded view of Elan steering

REMOVAL (Elan Models)

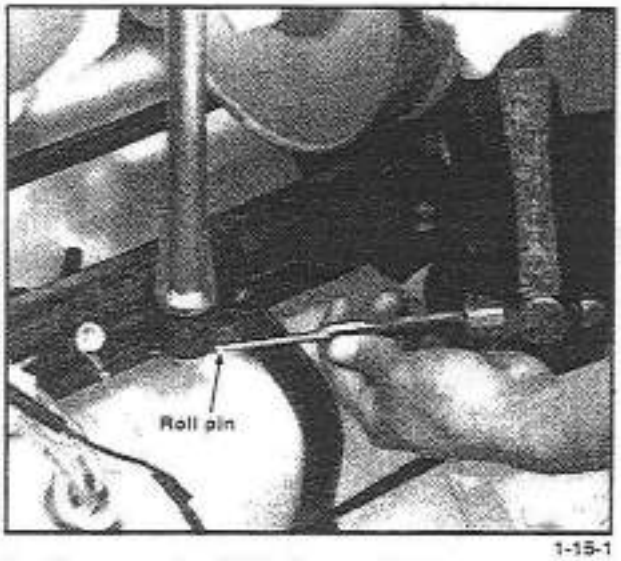
1. Remove console.

2. Disconnect throttle and brake cables. Remove housings.

NOTE: On electric models remove battery.

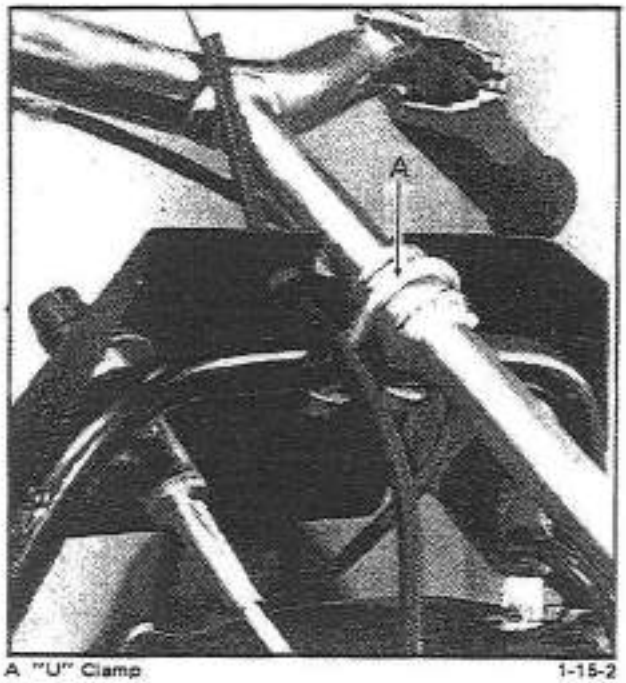
3. Remove cotter pin, washer and spring securing upper tie rod to steering column. Push the tie rod end from the column.

4. Using a pin punch and a hammer, drive the roll pin from the steering column. Remove shim(s), (if applicable), and washer (fig. 1-15-1).



1-15-1

5. Remove the "U" clamp affixing the steering column to upper column (fig. 1-15-2).



A "U" Clamp 1-15-2

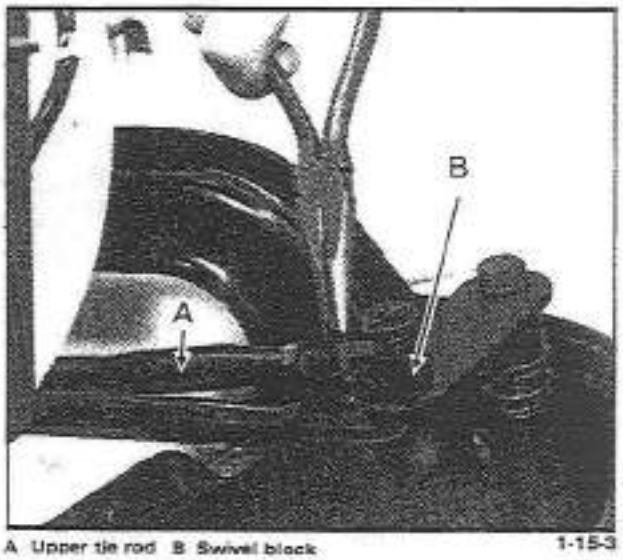
6. Pull the steering column from the steering bushing and remove the steering column from the vehicle.

NOTE: Do not remove steering bushing unless damaged or worn and replacement is indicated.

7. Disconnect all electrical connections and switch blocks from dash panel. Push the brake and throttle cables and housings through dash panel. Remove decompressor.

8. Unbolt the upper column from the frame and remove.

9. Remove cotter pin holding upper tie rod to swivel block (fig. 1-15-3). Pull upper tie rod from the block and remove it from the vehicle.



A Upper tie rod B Swivel block 1-15-3

10. Remove cotter pins, washers and springs from lower tie rod. Remove swivel block from tie rod end.

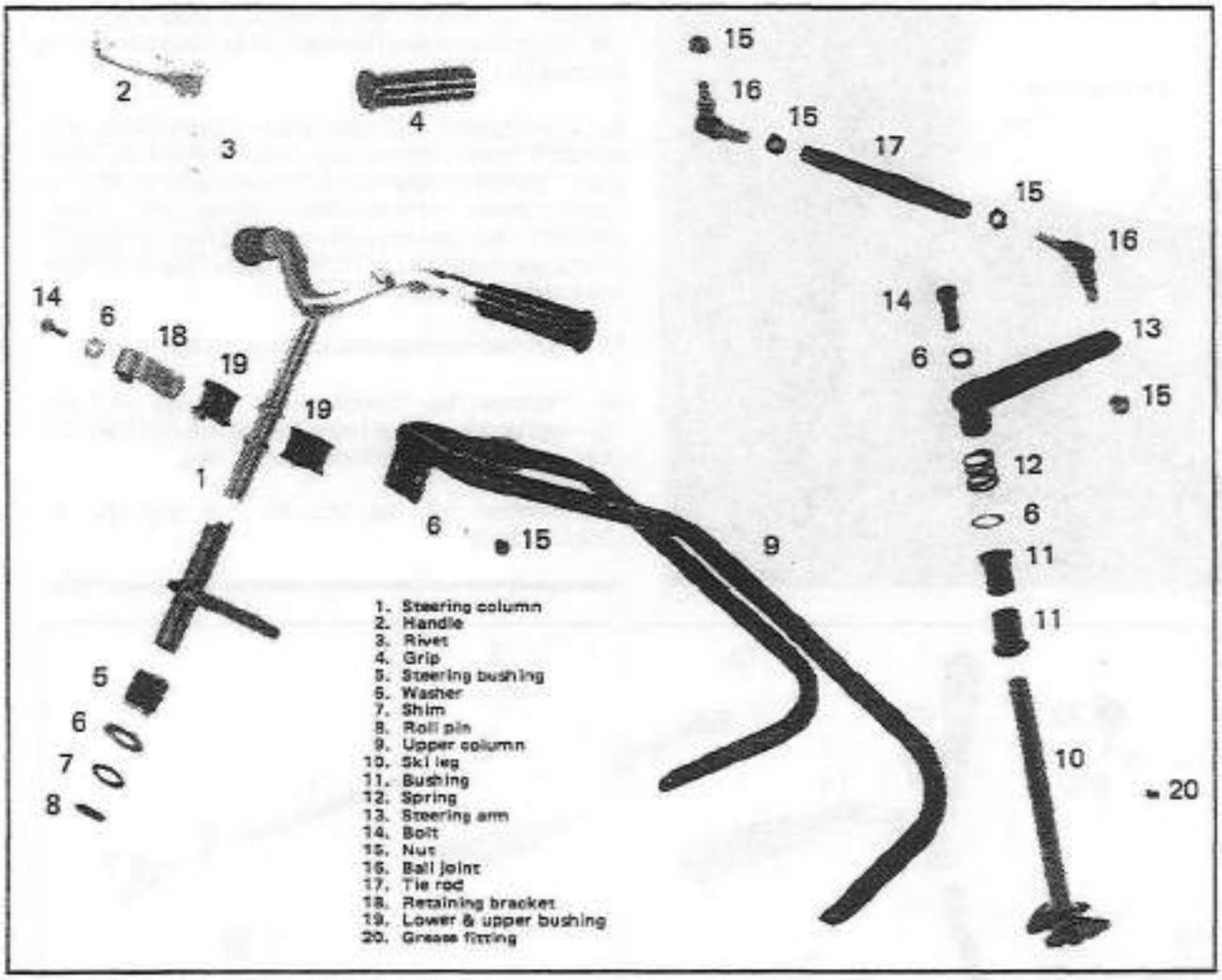
11. Remove bolts attaching steering arms to ski legs. Remove washer, steering arm and spring from ski leg splines.

NOTE: Should the steering arm be too tight on the ski leg splines, loosen bolt 3 to 4 turns and tap gently on the bolt head with a hammer. (Front of vehicle must be raised from the ground for this operation.)

12. Remove lower tie rod.

13. Pull the ski leg/ski assembly from the vehicle.

14. Remove ski leg coupler nut and ski leg coupler bolt.



Disassembled view of Olympique steering

REMOVAL (Olympique models)

1. Remove console.

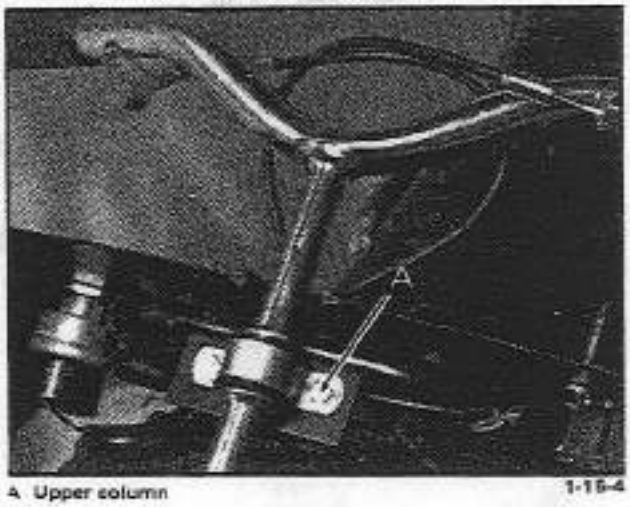
2. Disconnect throttle cable from lever, remove circlip and housing.

3. Disconnect brake cable and housing at lower brake lever.

4. Remove the two (2) bolts securing steering arms. Disengage steering arms from splines of ski legs.

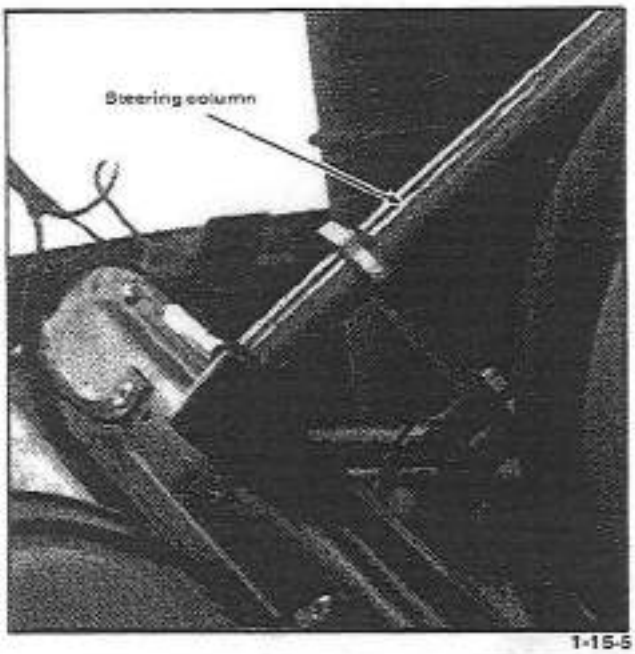
NOTE: Should the steering arms be too tight on the ski leg splines, loosen bolt 3 to 4 turns and tap gently on the bolt head with a hammer. (Front of vehicle must be raised off the ground while performing this operation.)

5. Remove the two (2) bolts and nuts affixing the steering column to the upper column (fig. 1-15-4).



A. Upper column 1-15-4

6. Using a pin punch and a hammer drive the roll pin from the steering column. Remove shim(s), (if applicable), and washer. Pull the steering column assembly from the vehicle (fig. 1-15-5).



1-15-5

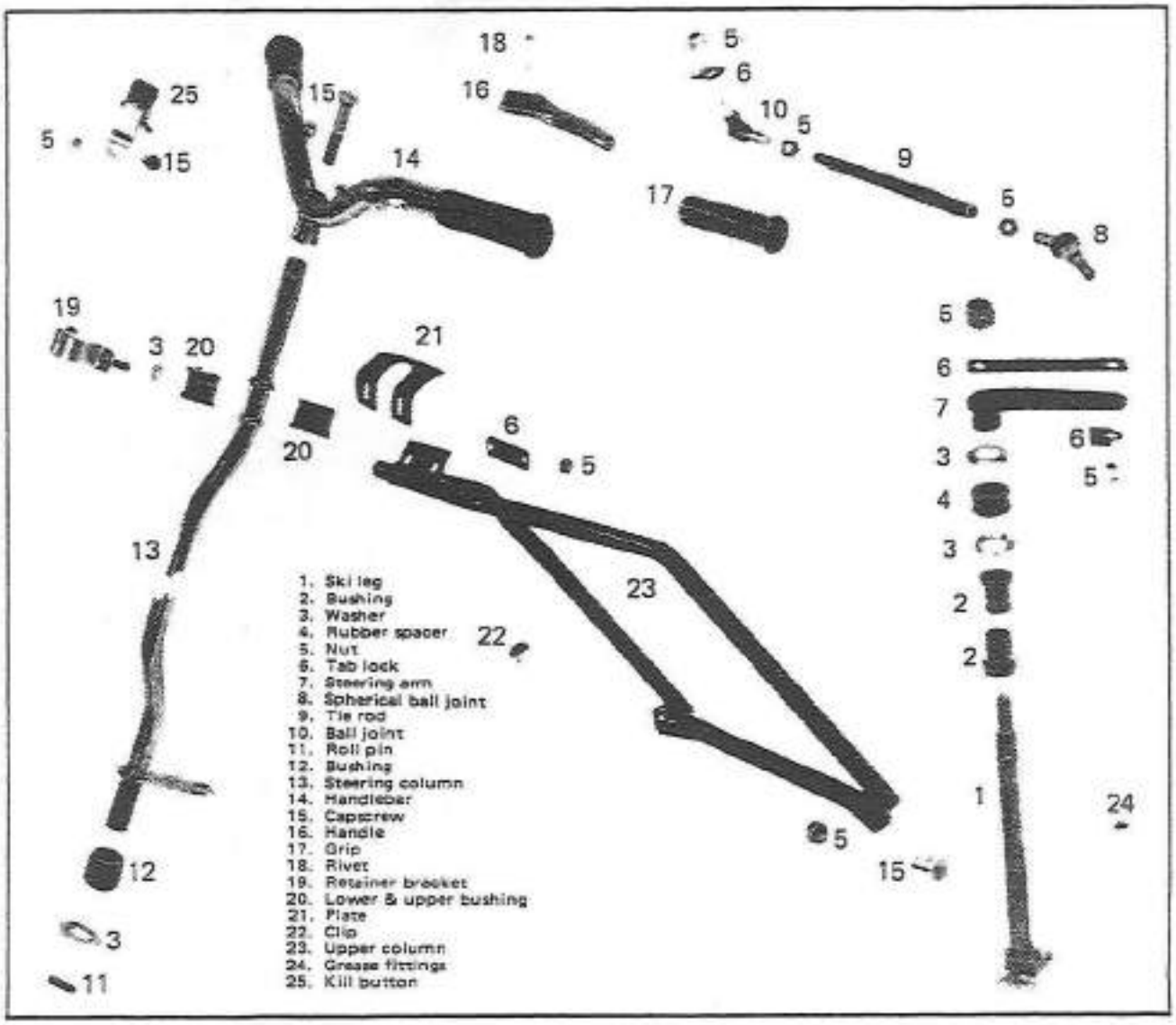
NOTE: Do not remove steering bushing from the vehicle unless damaged and replacement is necessary.

7. Disconnect all electrical connections and switch blocks from dash panel. Push the brake and throttle cables and housings through the dash panel. Unbolt dash panel from upper column and remove the two (2) engine mount nuts and washers. Lift the upper column from the carriage bolts.

8. Remove springs and washers from ski-legs.

9. Remove top bushing from ski leg. Pull the ski leg/ski assembly from the vehicle and remove the bottom bushing from the ski leg.

10. Remove ski leg coupler nut and ski leg coupler bolt.



Disassembled view of T'NT 18"

REMOVAL (T'NT Models)

NOTE: Release tab locks before removing bolts or nuts.

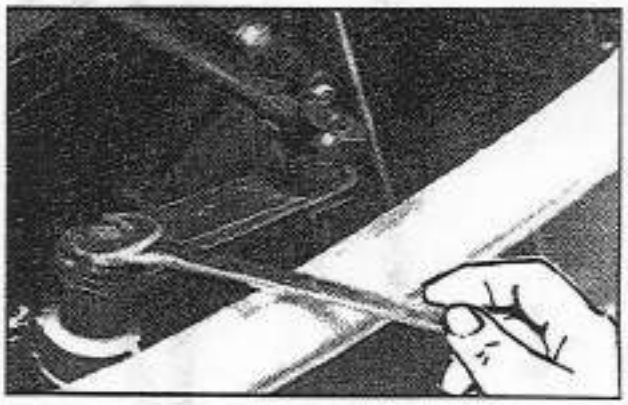
1. Remove console.

2. Disconnect throttle cable from lever, remove circlip and housing.

3. Disconnect brake cable and housing from disc unit and handlebar.

4. Remove kill button. On 18" track models, remove bolts securing handlebar to steering column and remove handlebar.

5. Remove the two (2) bolts or nuts securing steering arms and disengage steering arms from splines of ski legs (fig. 1-15-6).



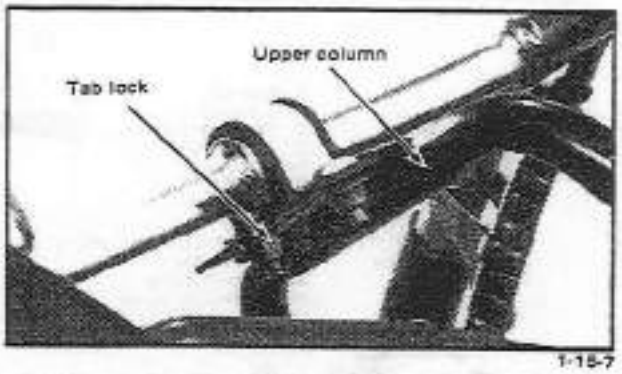
NOTE: Should the steering arms be too tight on the ski leg splines, loosen bolt 3 to 4 turns. (On 18" track models, unscrew nuts until flush with ski legs). Tap gently on the bolt head (or ski leg heads), with a soft faced hammer. (Front of vehicle must be raised off the ground while performing this operation).

6. Remove the two (2) nuts affixing the steering column to the upper column. Remove tab lock. On 18" track models, remove plate (fig. 1-15-7).

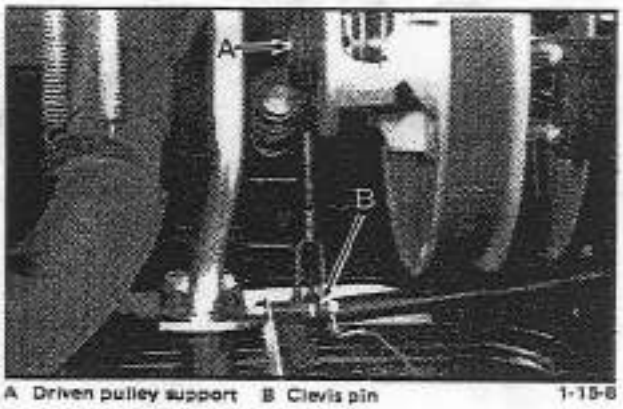
7. On all models except 292, remove locking pin and clevis pin and raise the driven pulley support (fig. 1-15-8).

8. Using a pin punch and a hammer, drive the roll pin from the steering column. Remove shim(s), (if applicable), and washer. Pull the steering column assembly from vehicle.

NOTE: Do not remove steering bushing from the vehicle unless damaged and replacement is necessary.



1-15-7



A Driven pulley support B Clevis pin 1-15-8

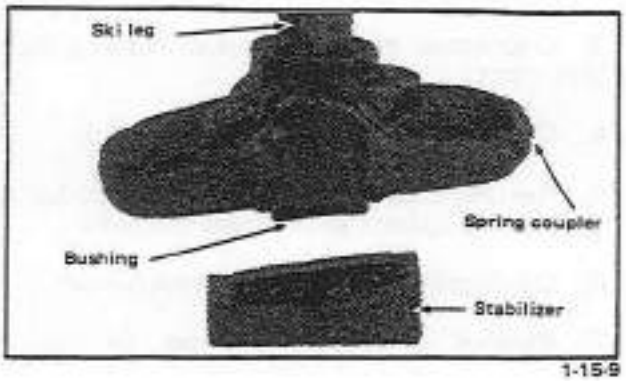
9. Remove the two (2) bolts and nuts securing upper column to frame and remove upper column.

10. Remove the washers, rubber spacers and washers from ski legs.

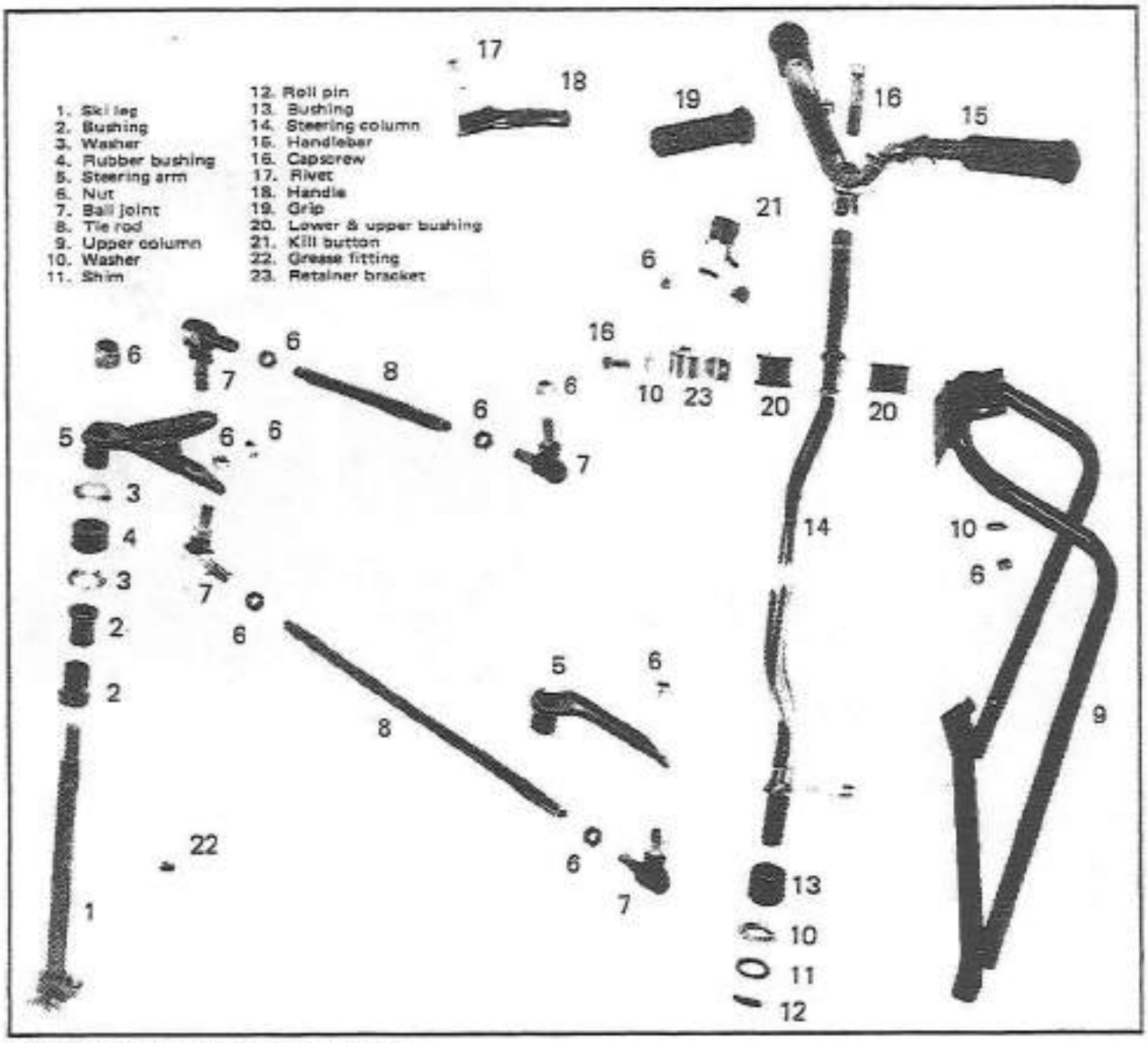
11. Remove the top bushing from ski leg, pull the ski leg/ski assembly from the vehicle. Remove bottom bushing.

12. On 15" track models, remove ski leg coupler nut and ski leg coupler bolt.

13. On 18" track models, secure leaf springs with a pair of adjustable pliers and remove spring coupler nuts and spring coupler bolts. Remove tab locks. Disassemble ski leg by removing stabilizer, spring coupler bushings and spring coupler (fig. 1-15-9).



1-15-9



Disassembled view of Nordic steering

REMOVAL (Nordic models)

1. Remove console.

2. Disconnect throttle cable from lever, remove circlip and housing.

3. Disconnect brake cable and housing from brake unit.

4. On 640ER model, remove kill button.

5. Remove capscrew securing the handlebar to the steering column and remove handlebar.

6. On electric start models, remove battery.

7. Remove nuts securing upper tie rod to steering arm and steering column.

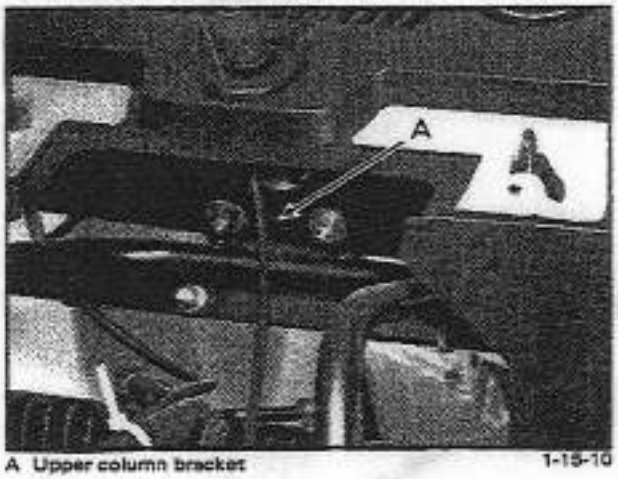
8. Unlock the tab locks and remove nuts and tab locks from steering arms.

9. Using a pin punch and a hammer, drive the roll pin from the steering column. Remove shim(s), (if applicable), and washer.

10. Unbolt the upper column bracket (fig. 1-15-10).

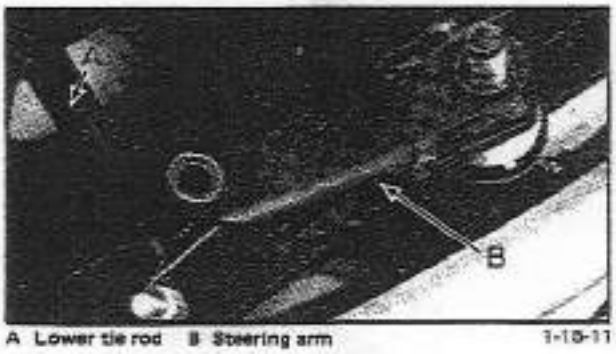
11. Pull the steering column from the steering bushing and remove the steering column from the vehicle.

NOTE: Do not remove steering bushing from vehicle unless damaged and replacement is indicated.



A Upper column bracket 1-15-10

12. Remove upper tie rod. Remove nuts securing lower tie rod to steering arms (fig. 1-15-11). Remove the rod.

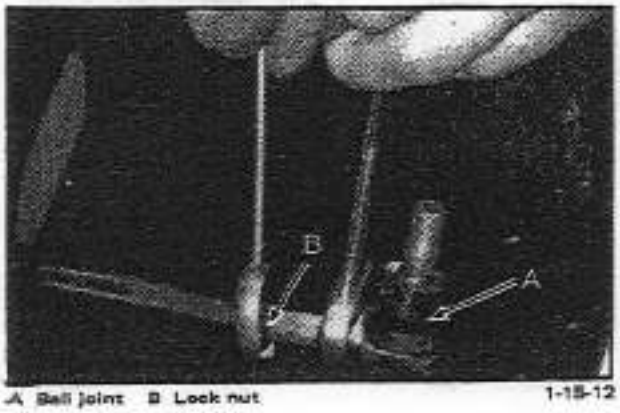


A Lower tie rod B Steering arm 1-15-11

13. Remove steering arms from ski legs. Remove washer, spacer and washer from ski leg splines.

NOTE: Should the steering arm be too tight on the ski leg splines, loosen nut until flush with ski leg thread and tap gently on the ski leg head using a soft faced hammer. (Front of vehicle must be raised from the ground for this operation).

14. Slacken lock nuts of lower tie rod. Remove ball joints and lower tie rod from vehicle (fig. 1-15-12).

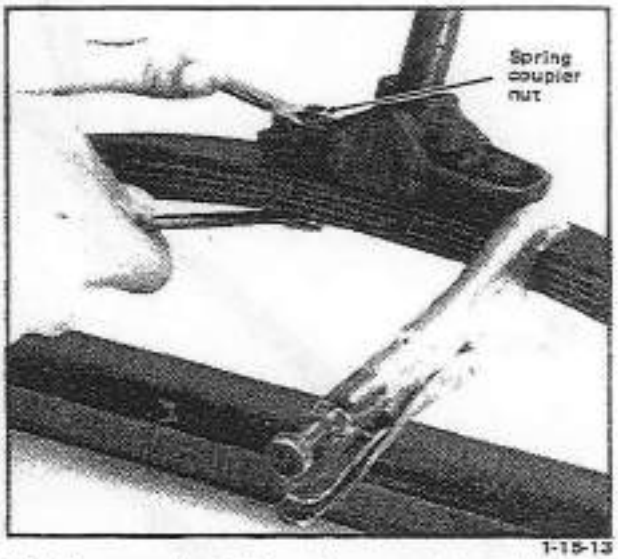


A Ball joint B Lock nut 1-15-12

15. Slacken lock nuts of upper tie rod, remove ball joints from tie rod.

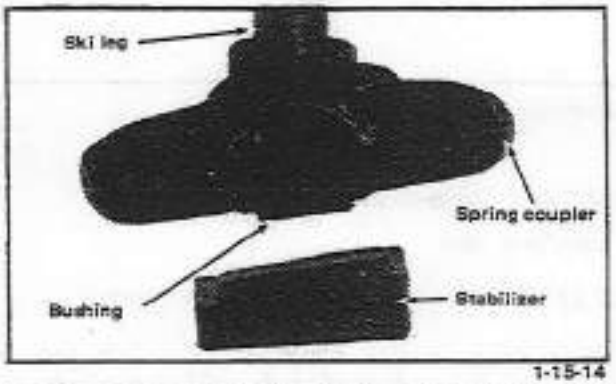
16. Remove ski leg top bushing. Pull ski leg/ski assembly from vehicle. Remove ski leg bottom bushing.

17. Using a pair of adjustable pliers secure leaf springs and remove spring coupler nuts and spring coupler bolts (fig. 1-15-13).



1-15-13

18. Disassemble ski legs by removing stabilisers, spring coupler bushings and spring couplers (fig. 1-15-14).

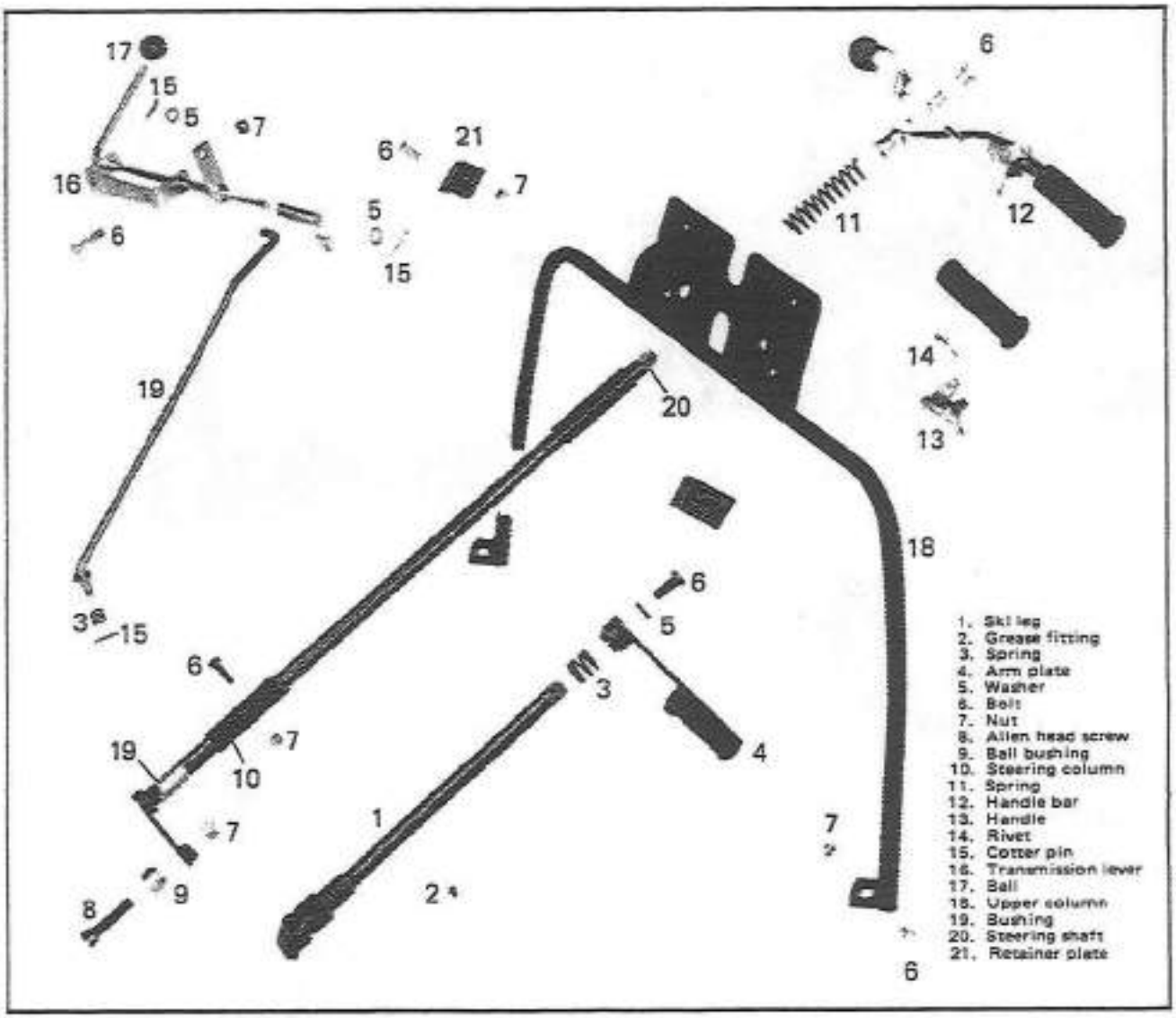


1-15-14

19. Disconnect all electrical connections and switch blocks. Remove speedometer cable and choke button.

20. On Nordic 640ER model, remove nut and washer securing shifter arm to side of dash and remove the bolt and nut securing the brace plate to dash panel.

21. Remove the two (2) bolts and nuts securing upper column to frame. Remove upper column.



Disassembled view of Alpine steering

REMOVAL (Alpine and Vaimont Models)

1. Remove cab.

NOTE: On Vaimont models, remove console.

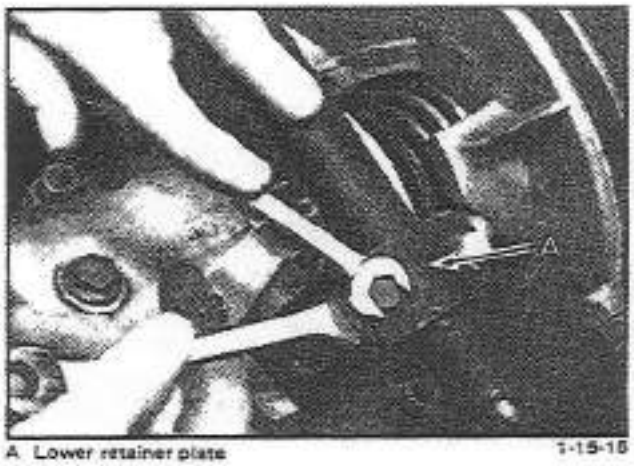
2. Disconnect brake cable at disc unit and brake lever. Disconnect throttle cable from lever and remove circlip securing housing.

3. Remove capscrew and washer attaching handlebar to steering column. Pull the handlebar from steering column splines and remove the spring.

4. Remove muffler from vehicle.

5. Remove the two (2) bolts attaching upper retainer plate to upper column bracket. Remove plate.

6. Remove the two (2) bolts affixing lower retainer plate to steering bracket. Remove plate (fig. 1-15-15).



A. Lower retainer plate 1-15-15

7. Lift the ball bushing from the steering channel and remove the steering column from vehicle.

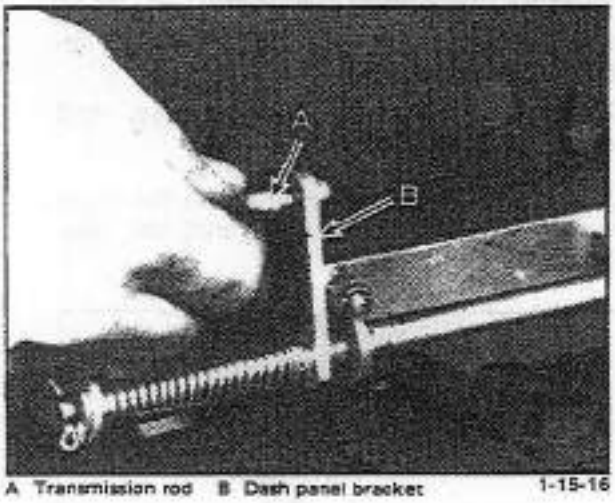
8. Remove cotter pin, washer and spring affixing the transmission rod to gear change lever. Disengage the rod from the lever.

9. Disconnect all electrical connections and switch blocks at dash panel.

10. Remove the brake and throttle cables from dash panel by passing them through appropriate orifice or anchor of panel.

11. Remove the four (4) nuts and cable bracket attaching dash panel to upper column and remove the dash panel and brackets from vehicle.

12. Remove cotter pin affixing transmission rod to dash panel bracket and disengage the rod from the bracket (fig. 1-15-16).



A Transmission rod B Dash panel bracket 1-15-16

13. Remove transmission rod from vehicle.

14. Remove the two (2) bolts affixing the upper column to frame and remove the column.

15. Remove the bolt, washer, steering arm and spring from ski leg splines.

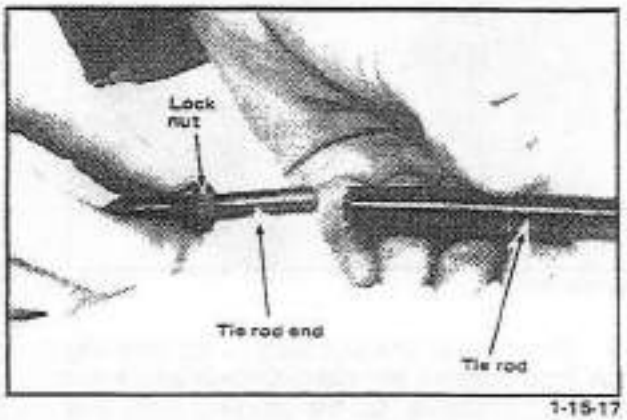
16. Lift the front of vehicle off the ground and pull the ski leg/ski assembly from the vehicle.

17. Remove the ski leg coupler nut and ski leg coupler bolt.

DISASSEMBLY (Elan Models)

1. Slacken the locknuts holding the tie rod ends.

2. Unscrew the tie rod ends from the tie rods (fig. 1-15-17).



1-15-17

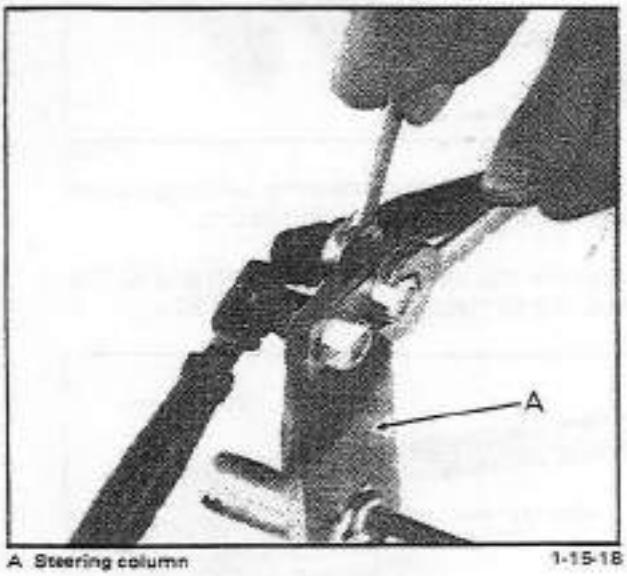
NOTE: The tie rod end attached to the steering column incorporates left hand threads while the tie rod end attached to the steering arms has right hand threads.

3. Remove the tie rod end locknuts.

DISASSEMBLY (Olympique & T'NT Models)

NOTE: On T'NT models, tab locks have to be released before removing bolts or nuts.

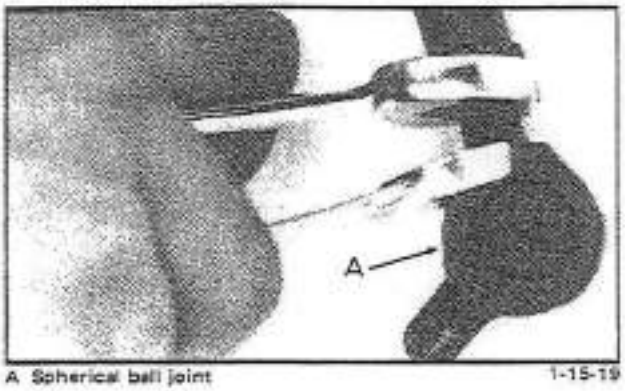
1. Remove nuts securing tie rod assembly to steering column bracket and remove tie rods. On T'NT models, remove tab locks (fig. 1-15-18).



A Steering column 1-15-18

2. Remove nuts securing tie rods to steering arms and remove tie rods. On T'NT models, remove tab locks.

3. Slacken ball joint lock nuts and remove ball joints (fig. 1-15-19).

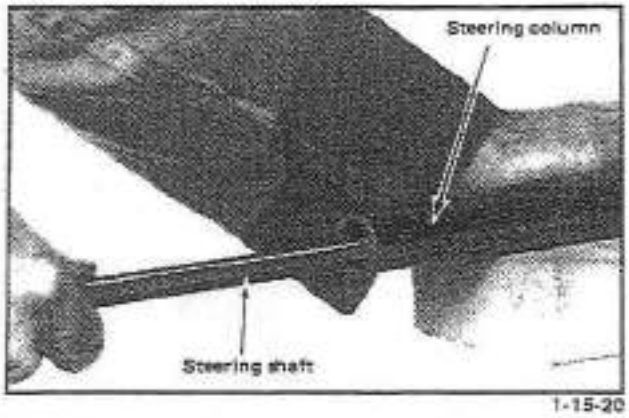


A Spherical ball joint 1-15-19

NOTE: The tie rod end attached to the steering column incorporates left hand threads while the tie rod end attached to the steering arms has right hand threads. All T'NT models incorporate spherical ball joints.

DISASSEMBLY (Alpine and Valmont Models)

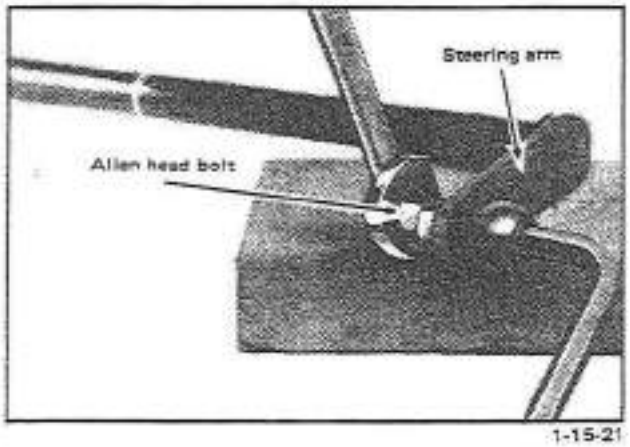
1. Slide the steering shaft from the steering column (fig. 1-15-20).



1-15-20

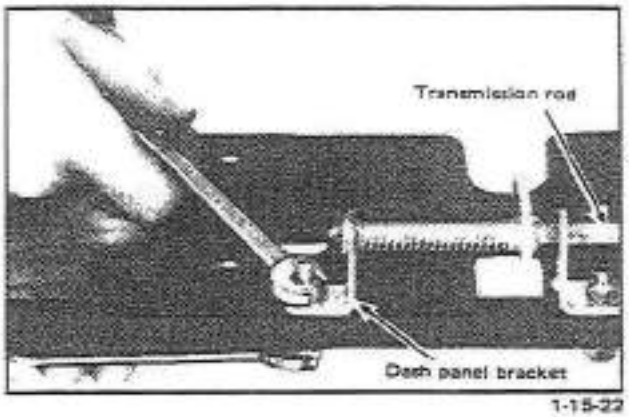
NOTE: Do not remove steering bushing unless damaged and replacement is indicated.

2. Remove the Allen head bolt attaching the ball bushing to steering arm (fig. 1-15-21).



1-15-21

3. Remove the bolt attaching transmission bracket to upper column and remove cotter pin, washer, bracket and spring from transmission rod (fig. 1-15-22).



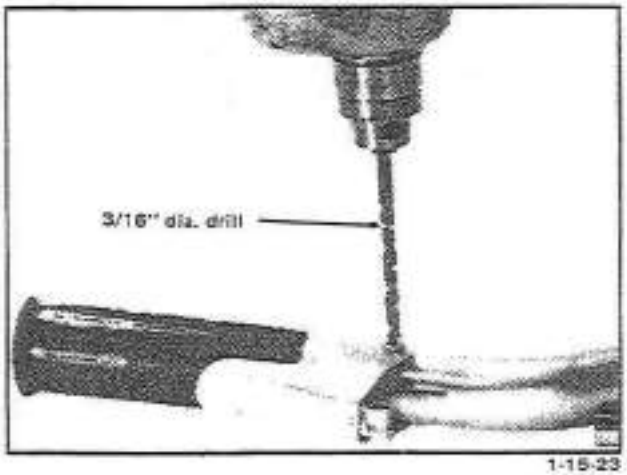
1-15-22

4. Remove the two (2) bolts attaching transmission rod to upper column and remove the rod. Remove transmission rod ball.

DISASSEMBLY AND ASSEMBLY OF HANDLEBAR (All Models)

1. Disconnect brake, throttle cable and housings from the handlebar.

2. Using a 3/16 inch dia. drill, remove the rivets securing the hand handles to handlebar (fig. 1-15-23).



1-15-23

3. Position the hand handle onto handlebar and insert the appropriate rivet through hand handle and handlebar.

4. Using a punch, secure rivet end until the rivet can no longer be passed back through handlebar.

WARNING: The hand handle must be free moving.

5. Connect brake and throttle cables and housings to handlebar.

6. Should the handlebar grip(s) be worn or damaged, replace grip(s).

INSPECTION

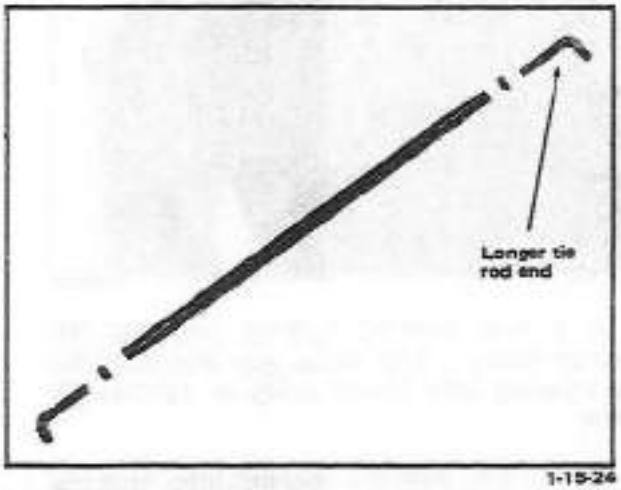
Inspect ball joints for wear or looseness, if excessive, replace.

ASSEMBLY (Elan Models)

1. Screw one (1) lock nut onto each of the four (4) tie rod ends.

2. Screw two (2) tie rod ends into each of the tie rods, ensuring that at least half of the total number of tie rod end threads are screwed into the lower tie rods.

NOTE: The longer tie rod end must be screwed into the lower tie rod (fig. 1-15-24).



1-15-24

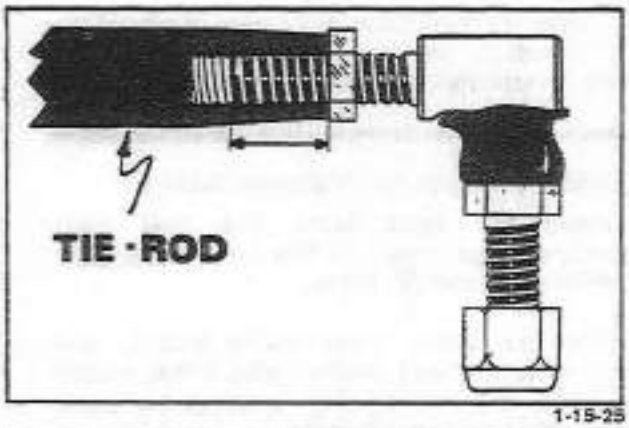
ASSEMBLY (Olympique and T'NT Models)

NOTE: On T'NT models, new tab locks must be installed where necessary.

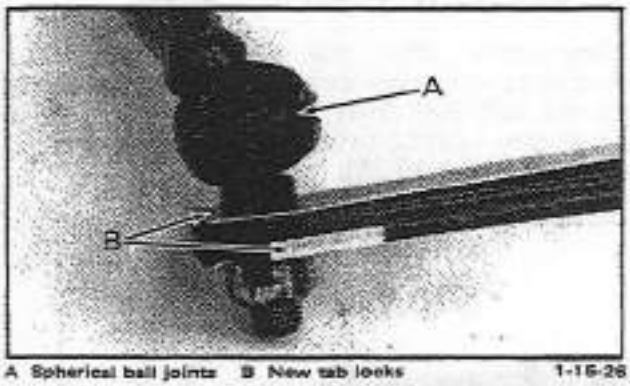
1. Screw one (1) locknut onto each longer threaded end of the tie rod end.

2. Screw two (2) tie rod ends, longer threaded end, into each of the tie rods, ensuring that total number of threads inserted into the tie rods are sufficient to hold firmly without the danger of thread stripping. Counter balance thread insertion by slackening off the tie rod ends to equal length (fig. 1-15-25).

NOTE: The T'NT tie rod ends at the steering arms are spherical ball joints (fig. 1-15-26).

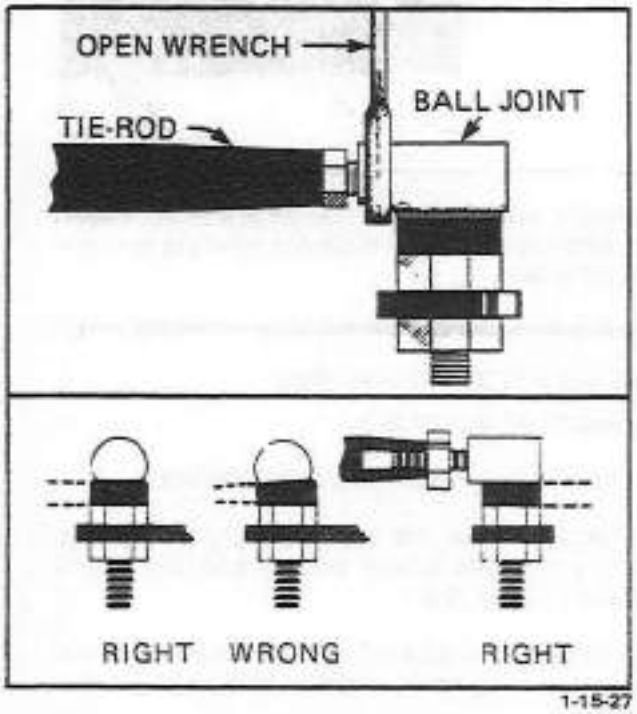


1-15-25



A Spherical ball joints B New tab locks 1-15-26

WARNING: The cut-off section of the joint must run parallel with the horizontal line of the steering arm when assembled on vehicle. The joint should be restrained when tightening tie rod end lock nut (fig. 1-15-27).



1-15-27

3. Attach the left hand ball joint to steering column. On T'NT models, install new tab locks.

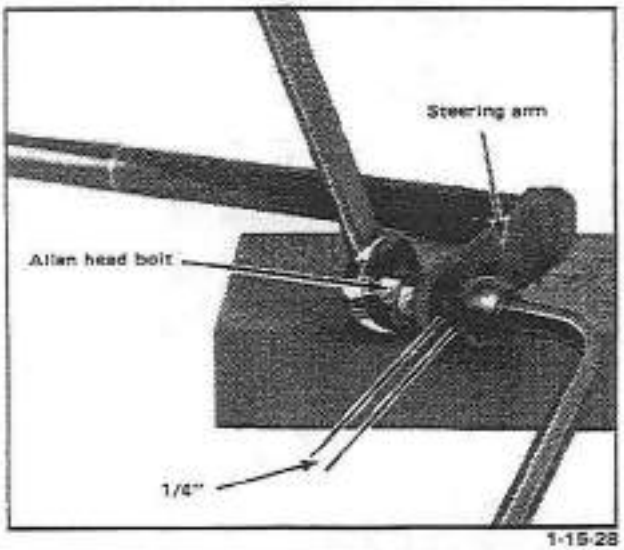
4. Attach the right hand ball joint (spherical on T'NT models), to steering arms. On T'NT models, install new tab locks.

ASSEMBLY (Alpine and Valmont Models)

1. Screw the transmission rod ball onto transmission rod. Position the rod in location and affix using two (2) bolts.

2. Slide the spring, transmission bracket and washer onto rod and secure using a new cotter pin. Affix the transmission bracket to upper column using appropriate bolt.

3. Temporarily affix the ball bushing to steering arms using appropriate Allen head bolt. Adjust the bolt until there is approximately 1/4 inch free play existing between ball bushing and steering arm (fig. 1-15-28).



1-15-28

4. Apply a light coat of low temperature grease over steering shaft and slide the steering column into the shaft.

INSTALLATION (Elan Models)

1. Secure ski legs to skis.

2. Insert the ski legs into ski leg holders.

3. Position lower tie rod assembly on vehicle ensuring that the longer tie rod end is at right hand side of the rod.

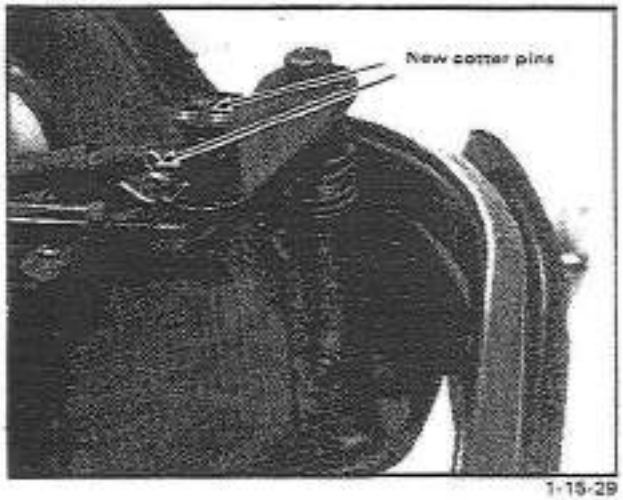
4. Position skis parallel with vehicle and place springs, steering arms, washers and bolts on the ski legs.

NOTE: Should the tie rod ends not align with steering arm orifices, turn each steering arm 1 to 2 splines so that tie rod ends are aligned with orifices. The steering arm angles should be equal on both sides when the skis are parallel with the vehicle.

5. Secure the left hand tie rod end in place using spring, washer and a new cotter pin.

6. Insert right hand tie rod into steering arm and place the swivel block, spring and washer on tie rod end. Secure in place using a new cotter pin.

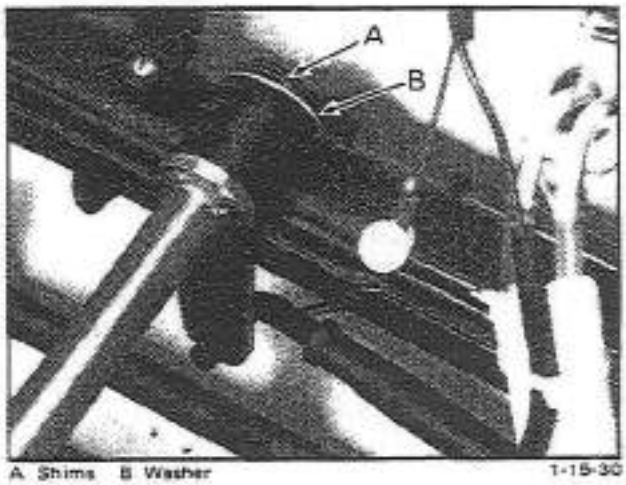
7. Insert the tie rod end of the upper tie rod through swivel block and secure using a new cotter pin (fig. 1-15-29).



1-15-29

8. If a new steering bushing was required, lubricate bushing with liquid soap and insert the new bushing into holder using an appropriate pusher.

9. Insert the steering column into steering bushing and affix in place using washer, shims (if applicable), and roll pin (fig. 1-15-30).



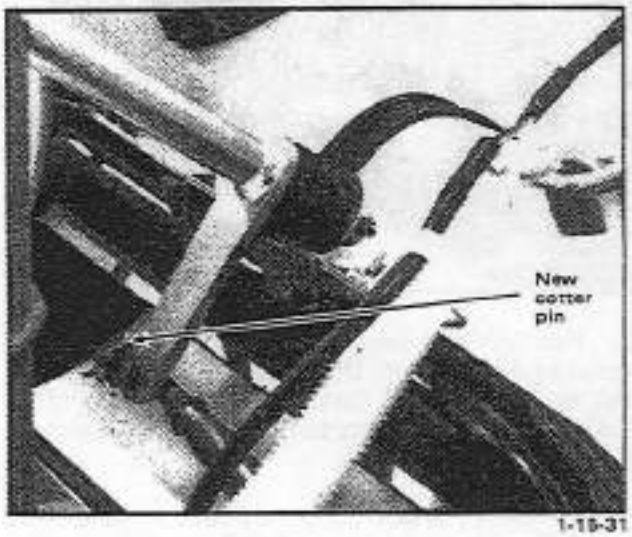
A. Shims B. Washer 1-15-30

NOTE: The free play in the steering column can be adjusted by inserting .025 inch shim(s) as required.

10. Position the upper column in location and attach it to the frame using two (2) bolts and washers.

11. Using the "U" clamp, affix the steering column to the upper column.

12. Insert tie rod end into steering column and secure using spring, washer and a **new** cotter pin (fig. 1-15-31).



1-15-31

13. Connect all electrical connections and switch blocks to dash panel. Install decompressor. Pass the brake and throttle cable and housings through dash panel. Connect each to handlebar. Secure throttle cable with circlip.

14. Secure brake cable to handle plate and proceed with brake adjustment.

15. Torque steering arm bolts to 45-50 ft/lbs.

16. Proceed with ski alignment. On electric models, install battery.

17. Grease ski leg at grease fittings. Install console.

INSTALLATION (Olympique Models)

1. Install ski legs to ski assemblies.

2. Install one bottom bushing on each ski leg. Insert ski legs into ski leg holders. Install one top bushing on each ski leg.

3. Install washers and springs on ski leg.

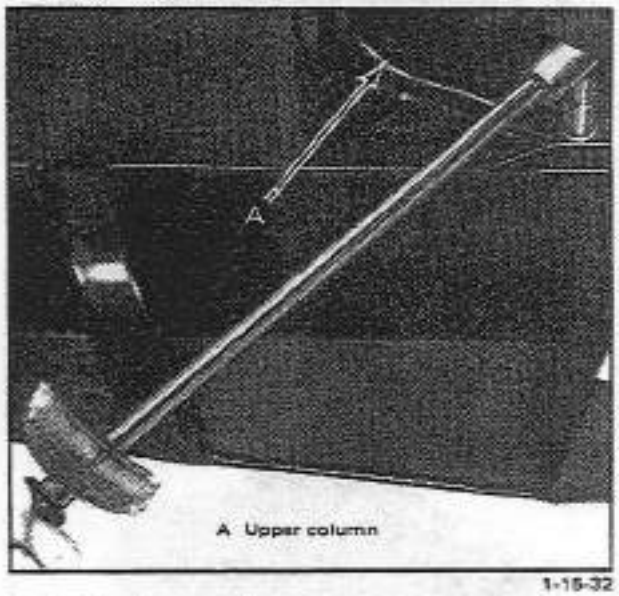
4. If a new steering bushing was required, lubricate with liquid soap and insert the new bushing into holder using an appropriate pusher.

5. Insert the steering column into steering bushing.

6. Affix the column in position using a washer, shim(s) (if applicable), and roll pin.

NOTE: If free play occurs at steering column, insert .025 inch shim(s) as required.

7. Place the upper column on the two (2) carriage bolts (nearest the seat), and install washers and engine mount nuts. Each nut must be torqued to 20-25 ft/lb. (fig. 1-15-32).



1-15-32

8. Affix the steering column to upper column by attaching the bracket to upper column using two (2) bolts and washers.

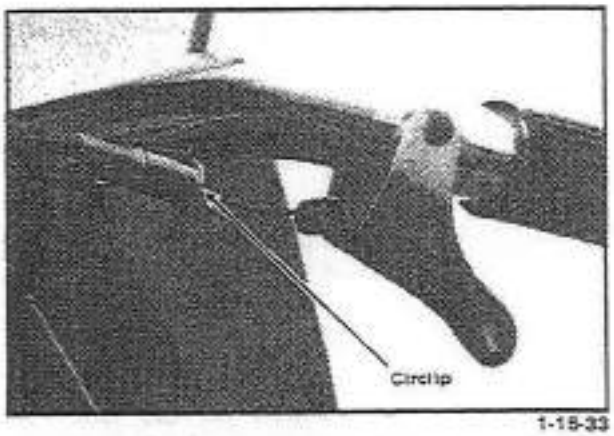
9. Position skis parallel with vehicle and place steering arms on ski legs. Install washers and bolts on ski legs. Check that angle of steering arms are equal. Torque each steering arm bolt to 45-50 ft/lbs.

10. Install dash panel to upper column. Connect all electrical connections and switch blocks. Pass the brake and throttle cable and housings through dash panel and connect each cable to handlebar. Adjust brake. Lock throttle cable with circlip (fig. 1-15-33).

11. Proceed with ski alignment.

12. Grease ski leg at grease fitting.

13. Install console.



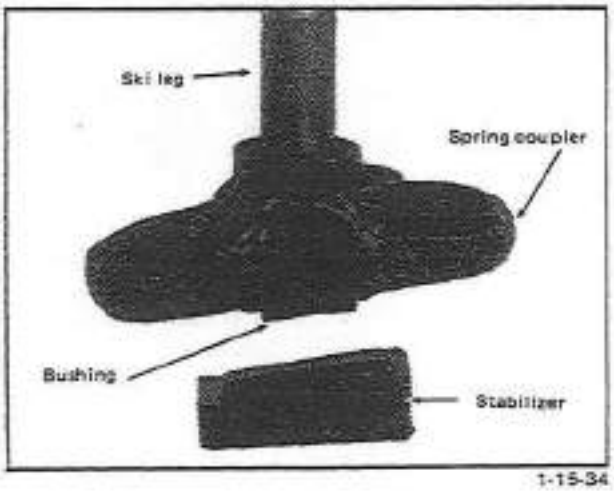
1-15-33

INSTALLATION (T'NT Models)

NOTE: Always install **new** tab locks.

1. On 15" track models, install ski leg to ski assembly.

2. On 18" track models, install bushings, spring coupler and stabilizer on the legs (fig. 1-15-34). Secure leaf springs with adjustable pliers, insert bolts, install **new** tab lock and torque each nut to 55-60 ft/lbs.



1-15-34

3. Install one bottom bushing on each ski leg. Insert the ski legs into the ski leg holders. Install one top bushing on each ski leg.

4. Install washers, rubber spacers and washers on ski legs.

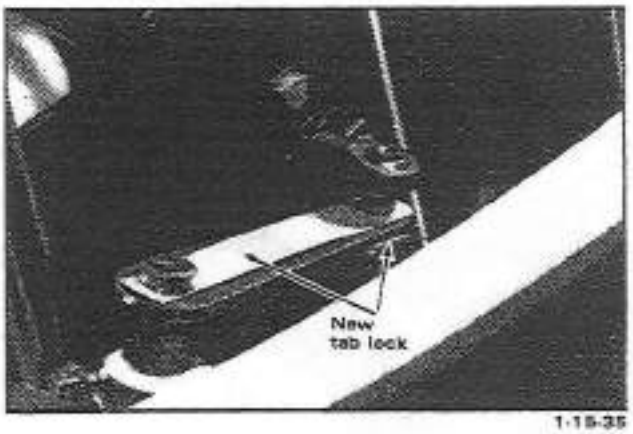
5. If a new steering bushing was required lubricate with soap and insert the new bushing into holder using an appropriate pusher.

6. Insert the steering column into steering bushing. Affix column in position using a washer, shim(s) (if applicable), and roll pin.

NOTE: If free play occurs at steering column, insert .025 inch shim(s) as required.

7. Position upper column and secure using two (2) bolts and nuts.

8. Affix the steering column to upper column by attaching the bracket to upper column using two (2) bolts and washers. Install new tab locks (fig. 1-15-35).



1-15-35

9. Position skis parallel with vehicle and place steering arms on ski legs. Install bolts or nuts on the ski legs. Check that angles of steering arms are equal. Torque bolts to 45-50 ft/lbs or nuts to 55-60 ft/lbs.

10. Connect brake and throttle cables to handlebar. Lock throttle housing with circlip. Install kill button. Connect and adjust brake.

11. On 18" track models, make sure skis are parallel with vehicle and that the steering column is in a vertical position, install handlebar. Torque capscrew to 33-35 ft/lbs.

12. On all T'NT models except 292, secure driven pulley support with clevis pin and locking pin.

13. Proceed with ski alignment.

14. Grease ski leg at grease fitting, install console.

INSTALLATION (Nordic Models)

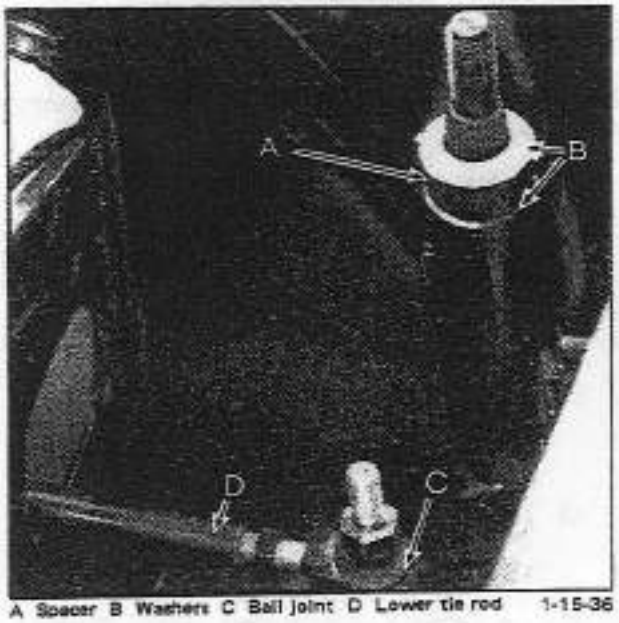
1. Install bushing, spring coupler and stabiliser on ski leg (see fig. 1-15-34).

2. Install ski legs to ski assembly and torque each nut to 55-60 ft/lbs.

3. Install one bottom bushing on each ski leg. Insert the ski legs into ski leg holders. Install one top bushing on each leg.

4. Position skis parallel with vehicle and place washer, rubber spacer and washer on the ski leg.

5. Position longer tie rod on vehicle. Install ball joints to tie rods (fig. 1-15-36).

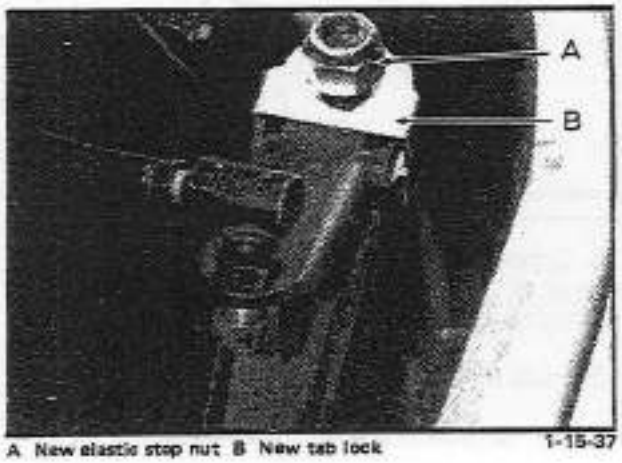


A Spacer B Washers C Ball joint D Lower tie rod 1-15-36

NOTE: The tie rod end attached to the steering column incorporates left hand threads while the tie rod ends attached to the right steering arm have right hand threads.

WARNING: The cut-off section of the joint must run parallel with the horizontal line of the steering arm and steering column when assembled on vehicle. Ball joint should be restrained when tightening tie rod lock nut (see fig. 1-15-27).

6. Position steering arm on ski leg. Install upper tie rod and secure ball joints to steering arms (fig. 1-15-37). Install new tab locks on steering arms and torque new nuts to 55-60 ft/lbs.



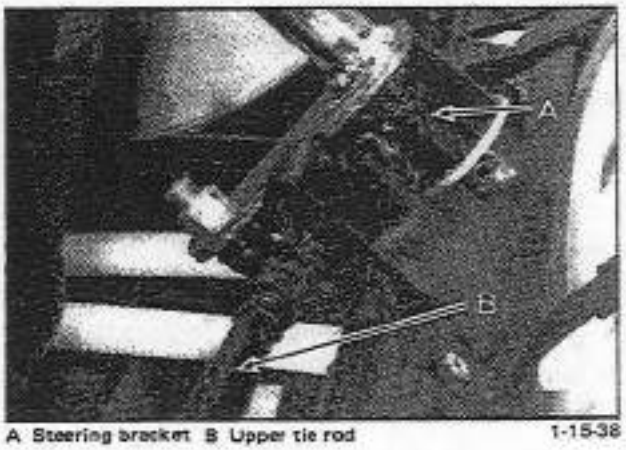
A New elastic stop nut B New tab lock 1-15-37

7. Install upper column and connect all electrical connections and switch blocks.

8. Install speedometer cable and dash panel grommet.

9. Insert steering column through dash panel grommet into the steering bushing.

10. Secure upper tie rod to steering column bracket (fig. 1-15-38).



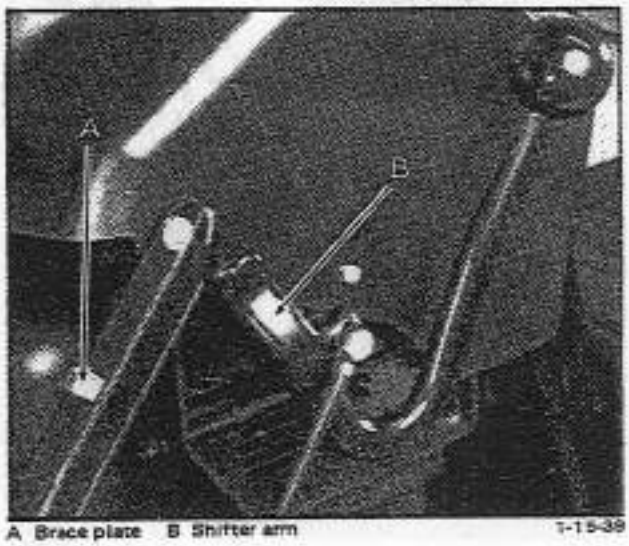
A Steering bracket B Upper tie rod 1-15-38

11. Making sure skis are parallel and steering column is in vertical position, install handlebar. Torque bolt to 33-35 ft/lbs.

12. Install washer, shim(s) (if applicable), and roll pin on steering column.

NOTE: If free play occurs at steering column, insert .025 inch shim(s) as required.

13. On models equipped with gear box, install screw and nut securing brace plate to dash. Install washer and nut securing shifter arm to dash panel (fig. 1-15-39).



A Brace plate B Shifter arm 1-15-39

14. On electric models, install battery.

15. Connect throttle cable to throttle lever. Lock throttle housing with a circlip.

16. On 640ER models, install kill button.

17. Install brake cable and adjust brake.

18. Proceed to ski alignment. Install console.

19. Grease ski legs at grease fittings.

INSTALLATION (Alpine and Valmont Models)

1. Install ski on ski leg.

2. Insert the ski leg into ski leg holder.

NOTE: Ensure the ski top pivot is facing towards the front bumper.

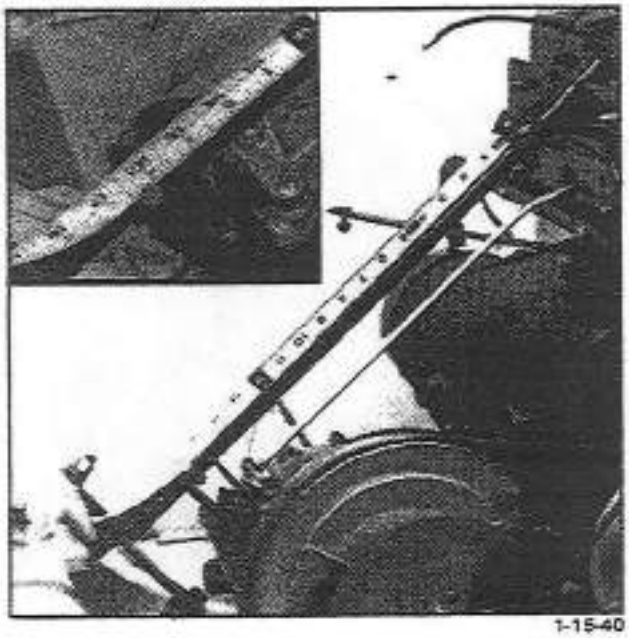
3. Position spring, steering arm and washer on ski leg splines and affix using bolt. Torque bolt to 45-50 ft/lbs.

4. Position the upper column in location and attach to frame using two (2) bolts.

5. Apply low temperature grease into the steering arm channel.

6. Position steering column in location with the ball bushing inserted into steering arm channel.

7. Place the lower retainer plate over steering column and affix the plate to the steering support using two (2) bolts.



1-15-40

8. Measure the distance from upper edge of lower retainer plate to the upper column bracket. The distance should be approximately 15-1/2 inches (fig. 1-15-40).

9. Position steering column in location. Affix upper retainer plate to upper column bracket with two (2) bolts.

10. On Valmont models, carry out the following procedures;

a) Position the dash panel in location using four (4) nuts and two (2) dash panel brackets.

NOTE: Ensure brake cable bracket is positioned on top left hand stud of dash panel.

b) Insert the appropriate end of transmission rod into transmission rod bracket. Insert a new cotter pin and secure rod.
c) Insert the transmission rod into gear change lever and affix using spring, washer and new cotter pin.

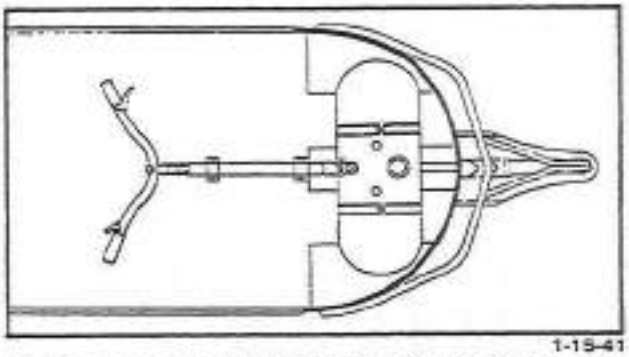
11. Pass the brake and throttle cables through the appropriate dash panel orifice or anchor.

12. Connect all electrical connectors and switch blocks to dash panel.

13. Position spring on steering column splines.

14. Position handlebar on steering column splines. Secure using washer and bolt.

NOTE: The handlebar must be perpendicular with vehicle seat with the ski parallel with vehicle (fig. 1-15-41).



1-15-41

15. Connect the brake and throttle cable and housings to handlebar. Lock throttle housing with circlip. Adjust brake.

16. Install muffler

17. On Valmont models, install console.

18. Grease ski leg at grease fitting.

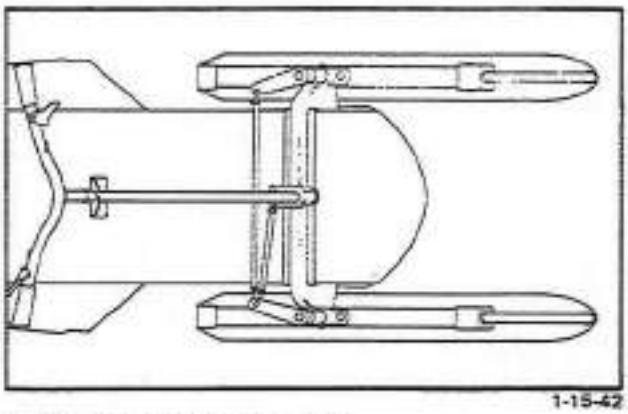
19. Install cab.

STEERING ADJUSTMENT (Elan and Nordic Models)

The skis must be parallel to each other and to the vehicle when the handlebar is horizontal. To check:

1. Using a metal tape, measure the distance between each ski at front and back of skis. If out of alignment (measurements not equal), carry out the following procedure:

a) Loosen the locknuts (2) locking the lower tie rod in place.
b) Turn tie rod manually, until skis are parallel to each other. Tighten the two (2) locknuts firmly.
c) Verify measurements between skis.
d) Check that skis are parallel to the vehicle when handlebar is horizontal (fig. 1-15-42).



1-15-42

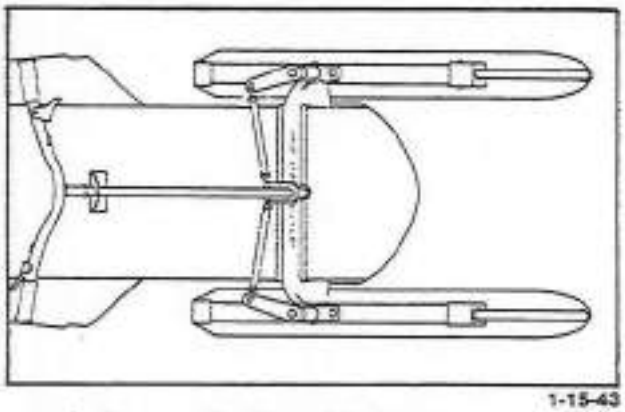
If readjustment is required:

a) Loosen the two (2) upper tie rod lock nuts.
b) Turn tie rod manually, until skis are parallel with vehicle.
c) Retighten the locknuts firmly against the tie rods.

STEERING ADJUSTMENT (Olympique & T'NT Models)

The skis must be parallel to each other and to the vehicle when the handlebar is horizontal. To check:

1. Using a metal tape, measure the distance between each ski at front and back of skis. If out of alignment (measurements not equal), carry out the following: (fig. 1-15-43).



1-15-43

a) Loosen the tie rod locknuts.
b) Manually turn one or both tie rods until skis are aligned. Tighten the locknuts firmly against the tie rod.

STEERING ADJUSTMENT (Alpine and Valmont Models)

Ski alignment of Alpine and Valmont models is accomplished during installation of steering mechanism.

Ski System

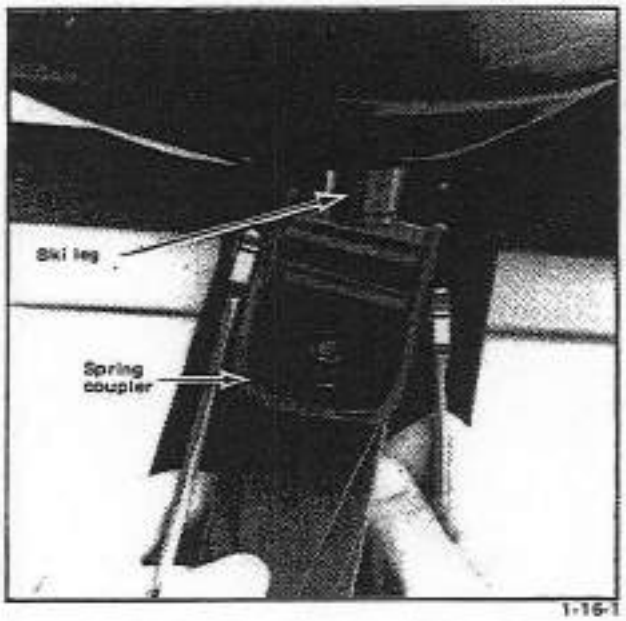
SKI SYSTEM 1-16

GENERAL

Ski design and fabrication is one of the reasons why the snowmobile can negotiate snowy conditions. The ski tip enables the ski to glide over the snow without "digging in". The ski runner cuts a path through the snow and at the same time compacts the path edges to provide a firmer steering surface. The impact of terrain, bumps or ruts is absorbed through the leaf spring assembly.

REMOVAL
(15" track and Valmont and Alpine models)

1. Remove ski-leg coupler nut and unscrew coupler bolt. Remove bolt from coupler (fig. 1-16-1).



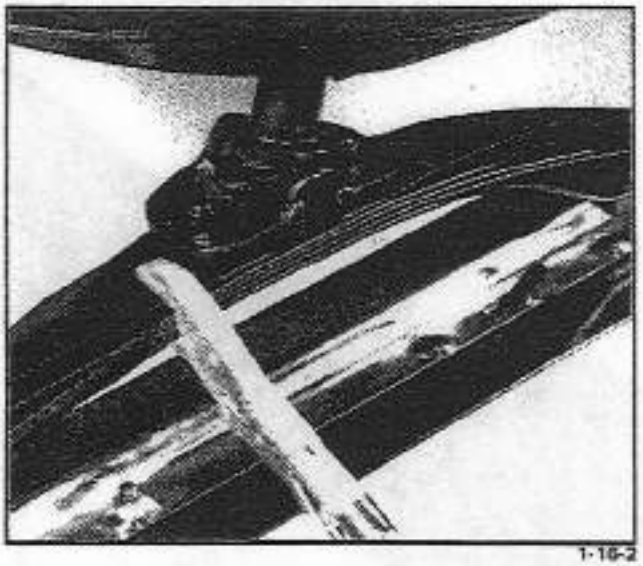
1-16-1

NOTE: On T'NT models, the tab locks have to be open before removing bolt or nut.

2. Remove ski from the vehicle.

REMOVAL
(18" track models).

1. Secure leaf springs with a pair of adjustable pliers (fig. 1-16-2).


1-16-2

2. Remove the spring coupler nuts and bolts.

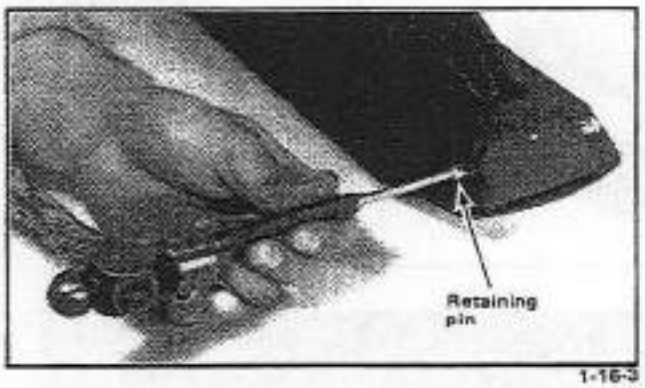
NOTE: On T'NT models, open nut and bolt tab locks.

DISASSEMBLY
(All models)

1. On 18" track models, release adjustable pliers to free the leaf springs.

2. Straighten and remove the cotter pins from retaining pins securing front and rear ends of the main leaf spring.

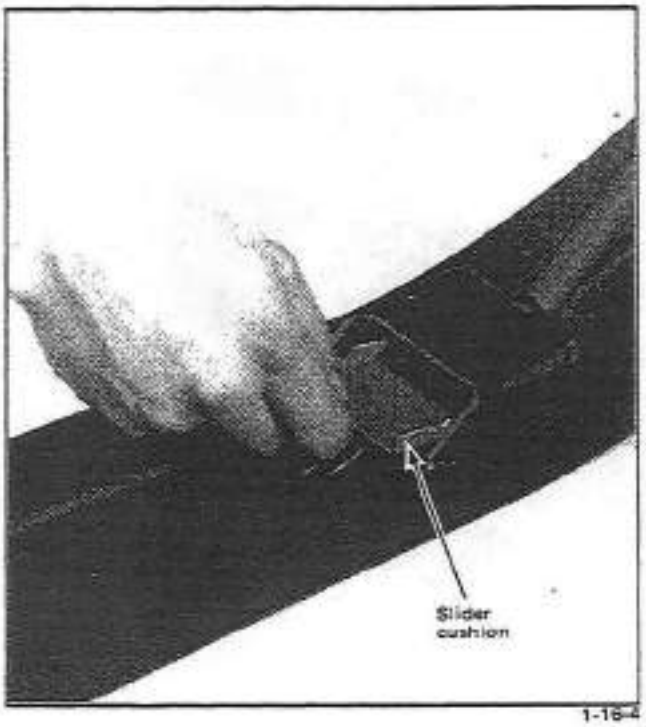
3. Using a punch and hammer, gently tap the retaining pins from the ski leaf spring brackets (fig. 1-16-3).



1-16-3

4. Remove the spring assembly from the ski. On 18" track models, remove main leaf spring.

5. Remove the spring slider cushion from the front bracket (fig. 1-16-4).

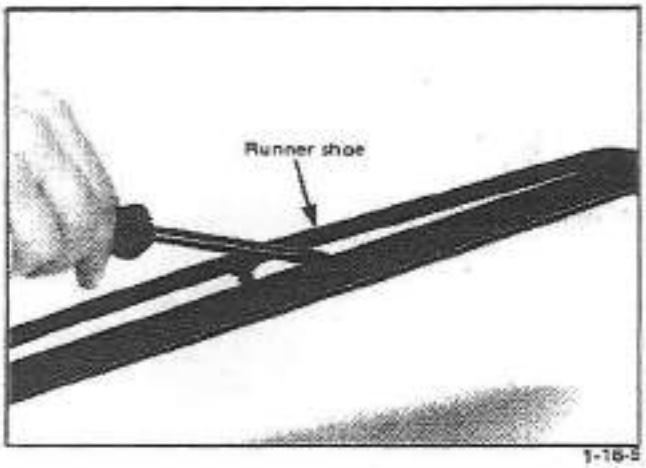


1-16-4

6. On 15" track and Valmont and Alpine models, remove the two (2) spring coupler bolts and nuts. Disassemble the leaf springs.

7. Remove the nuts affixing the runner shoe studs to ski.

8. Place ski on side and pry the runner shoe from its slots (fig. 1-16-5).



1-16-5

WARNING: Observe extreme caution while prying steel runner shoes from ski slots as the shoes are under tension.

INSPECTION

1. Check that ski runner shoes are not worn more than half (½) of their original thickness. If worn beyond that extent, replace the shoes.

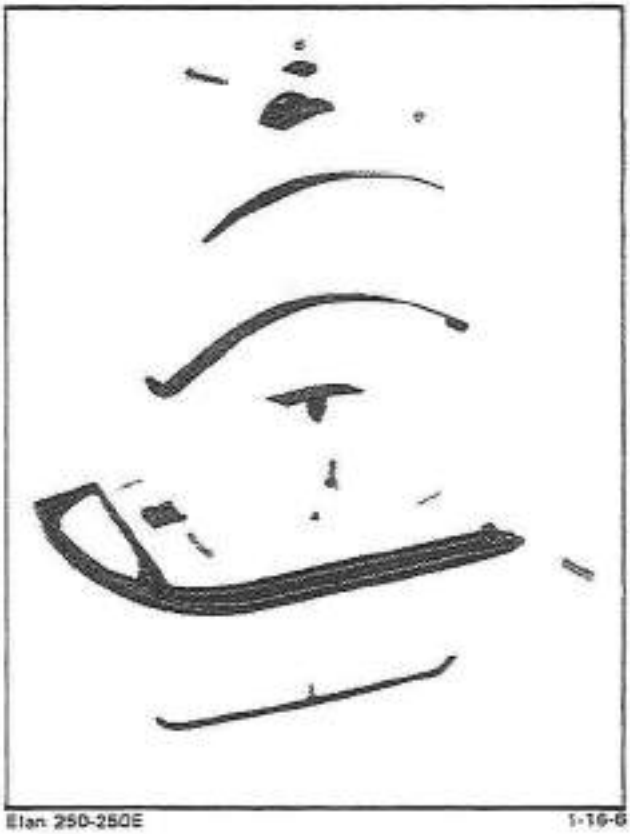
ASSEMBLY
(15" track and Valmont and Alpine models).

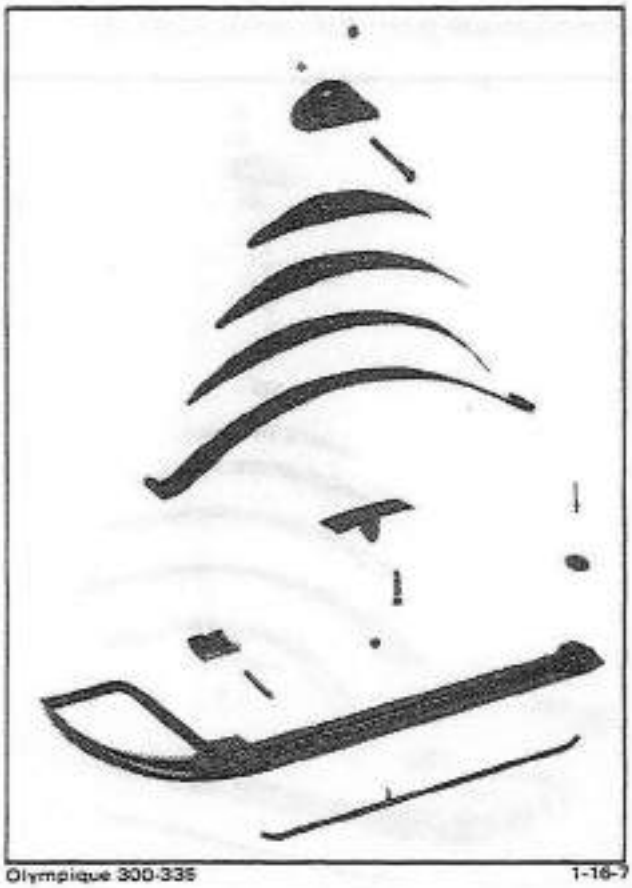
1. Prior to Assembly procedure, ensure all components are clean and all defective parts have been repaired or replaced.

2. On the keel side of ski, insert the runner ends into the ski slots. Push the runner shoe stud into hole of ski and secure shoe to ski with appropriate nut.

3. To assemble leaf springs refer to appropriate exploded view:
   - **Elan** – (fig. 1-16-6).
   - **Olympique** 300 & 335 – (fig. 1-16-7).
   - **Olympique** 335E, 399 and 399E – (fig. 1-16-8).
   - **T'NT** 15" – (fig. 1-16-9).
   - **Alpine** and **Valmont** – (fig. 1-16-10).

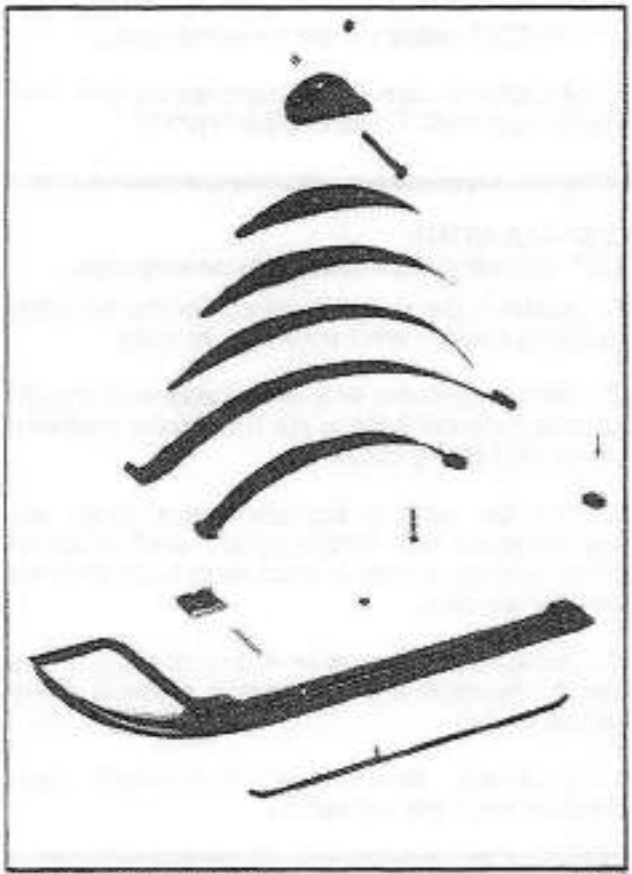
NOTE: On 15" track models except Valmont and Alpine, the spring coupler has a threaded hole. Therefore, the coupler must be positioned so that the thread is on the left side of the right hand ski and vice-versa for the left hand ski.


Elan 250-250E 1-16-6

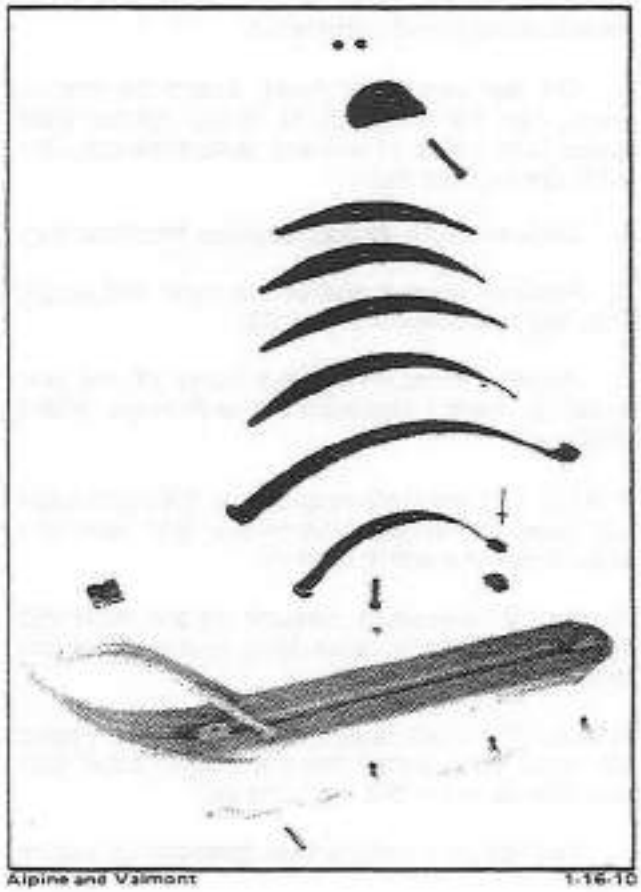


Olympique 300-335 1-16-7

15" track T'NT models 1-16-9



Olympique 335E-399-399E 1-16-8



Alpine and Valmont 1-16-10

4. Insert the spring coupler bolts through the leaf springs. Secure the assembly with two (2) new elastic stop nuts. On T'NT models, install new tabs locks. Torque each nut to 55-60 ft/lbs.

5. Slide the spring slider cushion into location.

6. Position looped end of the main leaf spring into the rear bracket of the ski.

7. Align the loop with the holes of the rear bracket. Insert a retaining pin and secure with a cotter pin.

8. Apply downward pressure on the leaf spring assembly and at the same time, insert the front retaining pin. Secure with a new cotter pin.

NOTE: Except for Valmont and Alpine models, the rear retaining pin of the right hand ski must be inserted from the left side and vice-versa for the left hand ski. The front retaining pin of the right hand ski must be inserted from the right hand side and vice-versa for the left hand ski.

ASSEMBLY/INSTALLATION
(18" track vehicles)

1. Prior to Assembly procedure, ensure all components are clean and all defective parts have been repaired or replaced.

2. On the keel side of ski, insert the runner ends into the ski slots. Push the runner shoe studs into holes of ski and secure shoe to ski with appropriate nuts.

3. Slide the spring slider cushion into location.

4. Position looped end of the main leaf spring into the rear bracket of the ski.

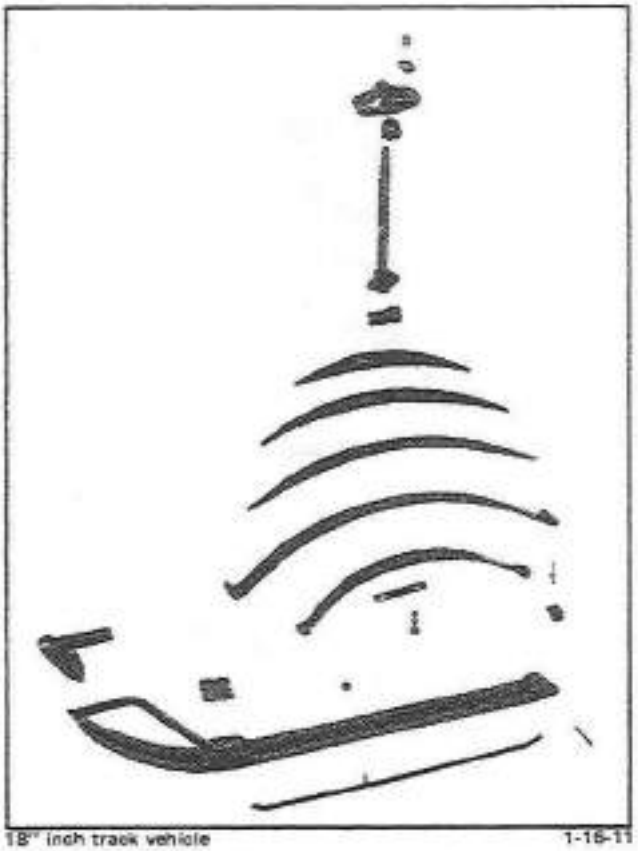
5. Align the loop with the holes of the rear bracket. Insert a retaining pin and secure with a cotter pin.

NOTE: The rear retaining pin of the right hand ski must be inserted from the left side and vice-versa for the left hand ski.

6. Apply downward pressure on the main leaf spring and at the same time insert the front retaining pin.

NOTE: The front retaining pin of the right hand ski must be inserted from the right hand side and vice-versa for the left hand ski.

7. Position leaf springs then temporarily secure with adjustable pliers (Ref. to fig. 1-16-11).



18" inch track vehicle 1-16-11

8. On T'NT models, install new tab locks.

9. Attach ski assembly using bolts and new elastic stop nuts. Torque to 55-60 lb/ft.

INSTALLATION
(15" track and Valmont and Alpine models).

1. Position the ski on vehicle, aligning the holes in spring coupler with the hole of ski leg.

2. From the outer side of ski, screw in the ski coupler bolt until there is no free play between ski leg and spring coupler.

NOTE: On vehicles equipped with single ski, insert coupler bolt through non-threaded side of coupler, align ski leg and screw bolt all the way through coupler.

3. Install the ski coupler nut until tight. Move the ski by hand and ensure that it pivots easily on the ski leg.

4. Lubricate ski coupler bolt with light machine oil. Wipe off excess.

CLEANING & INSPECTION 1-17

CLEANING

BEARINGS:

Immerse bearings in Kerosene and allow to soak for as long as necessary.

WARNING: Kerosene is flammable and explosive under certain conditions. Store in a well ventilated area. Do not smoke or allow open flames or sparks near the solvent.

Do not spin dirty bearings. While turning the bearings **slowly** in the solvent, use a soft brush and dislodge any stubborn particles. Once the bearing is clean, immerse it in light machine oil and remove the solvent. Lightly lubricate with low temperature grease. Too much lubricant will cause the bearings to overheat.

WARNING: When using compressed air in the cleaning of bearings be sure to hold bearings by the inner and outer race so bearings do not spin.

METAL

Clean in a container of cleaning solvent. Remove rust or other deposits using a firm bristle brush. If paint has been removed, apply a new coat using appropriate Ski-Doo paint.

PLASTIC & RUBBER:

Remove grease or dirt using a clean, dry cloth. (tire - idler - tensioner(s) - ski leg bushing - rubber spacer - slider shoes - stop bondings - sprockets - track - ball joint).

CAUTION: Do not use any cleaning solvent on rubber or plastic components as it could permanently damage the part(s).

INSPECTION

BALL JOINT:

Inspect ball joints for free-play. If free-play exsists, replace ball joints.

BEARING:

Inspect general condition of bearings. (Pitted or missing ball bearings, freedom of movement and radial free-play). Replace if in doubt.

METAL:

Inspect for distortion, cracks, excessive wear or other possible damage.

RUBBER:

Inspect for wear, cracks, distortion or other damage.

SLIDER SHOES:

If excessive wear is noticed, replace slider shoes.

SPLINES:

Inspect for cracked, worn and/or twisted splines.

SPROCKETS:

Inspect for damaged or worn teeth, cuts or distortion.

THREADED PARTS:

Inspect threaded parts for stripped, crossed or otherwise damaged threads.

Table of Contents

Engine

GENERAL 2-1

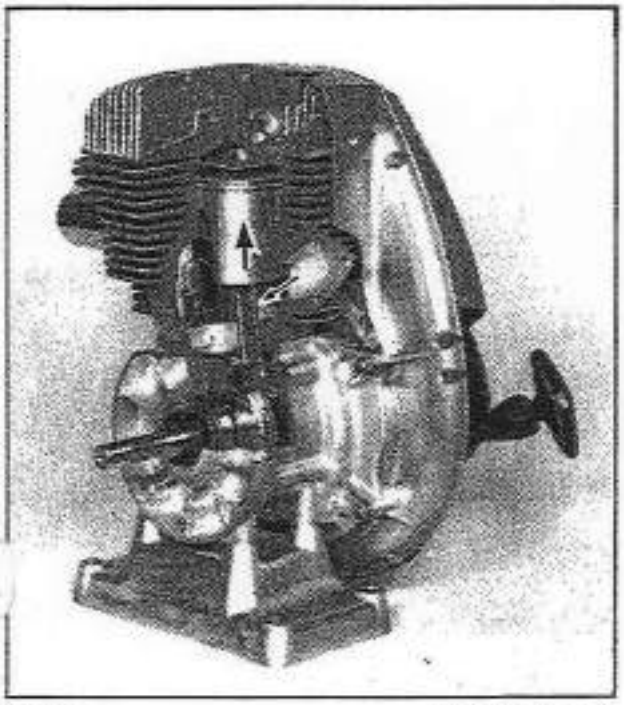
Today's public is demanding a more powerful and stronger engine than ever before. Bombardier Limited, fully realizes this and spends considerable efforts for the research of newer, more durable engines.

Because of this, and to supplement our dealer/ customer education program, the following Bombardier-Rotax two cycle engine operation is included in the Shop Manual.

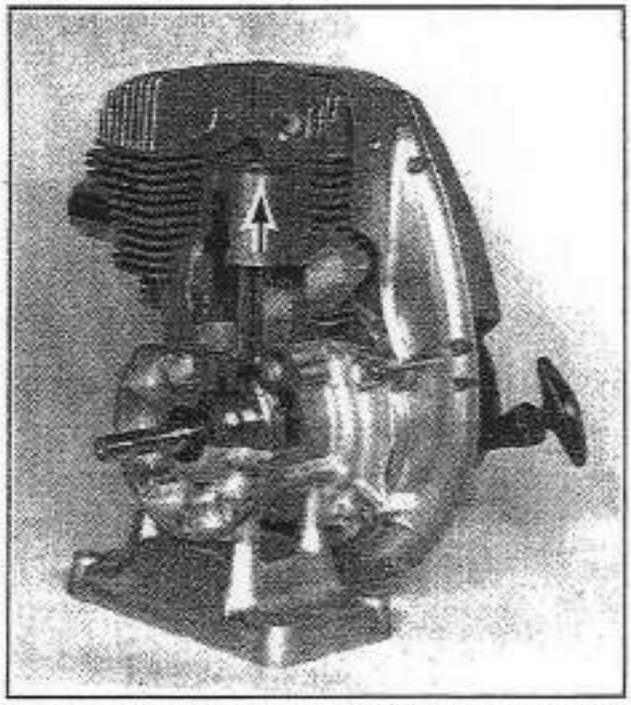
TWO CYCLE OPERATION

Basically, the two cycle engine achieves the same operation as a four cycle engine. In addition, the two cycle engine crankcase must be charged with the air-fuel mixture that is pumped into the combustion chamber. On the upward stroke of the piston, the crankcase must be charged and the fuel compressed and ignited while the downward stroke must permit the exhaust of the burnt gas and the intake of a fresh fuel charge. Figure 2-1-1 shows how this is possible.

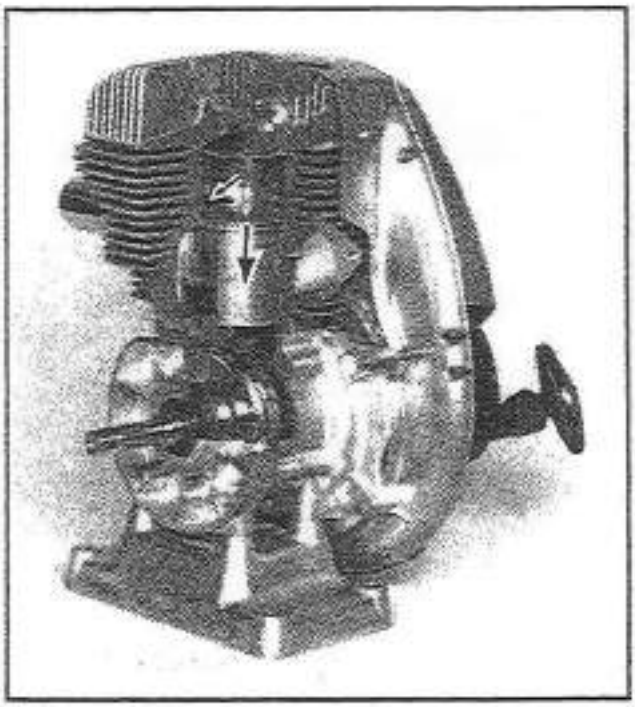
When the piston starts its upward stroke, a vacuum is created in the crankcase and the air-fuel mixture is sucked in from the carburetor. At the same time, the piston blocks the inlet and exhaust ports and compresses the fuel charge in the combustion chamber (secondary compression). When the piston arrives at the top of the cylinder, the fuel charge is ignited by the spark plug. The burning gas expands in the same way as in the four-cycle engine and pushes the piston downward, this causes the power stroke. When the piston descends, the entrance to the crankcase from the carburetor is blocked and pressure begins to build inside the crankcase (primary compression). The exhaust port is uncovered as the piston continues its course downward and the burnt gas is allowed to escape. Near the bottom of this downward stroke the inlet/transfer port is uncovered and the compressed air-fuel mixture in the crankcase rushes into the combustion chamber. To prevent some of the fuel charge escaping through the exhaust port, the engine manufacturer shapes the cylinder head to act as a barrier. This assists in clearing the combustion chamber of all the burnt gas and limits the escape of the fresh fuel charge to a minimum.



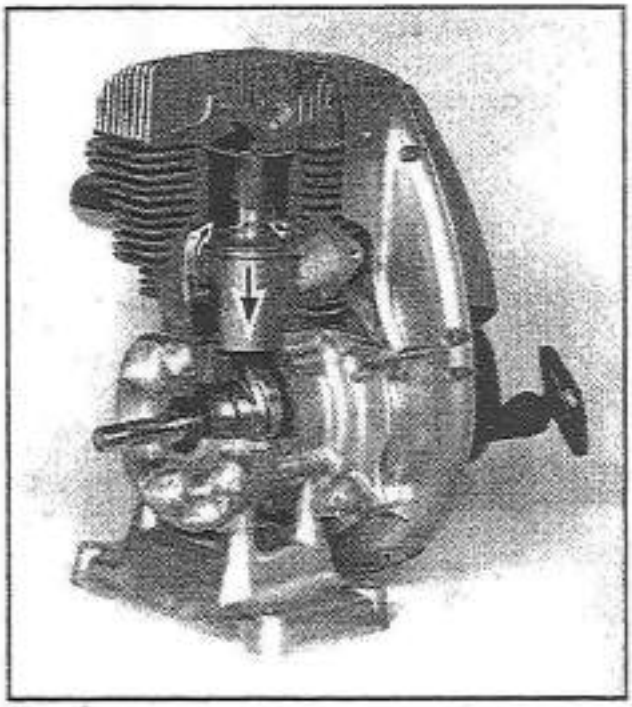
Intake Fig. 2-1-1 (1 of 4)



Secondary compression – Ignition Fig. 2-1-1 (2 of 4)



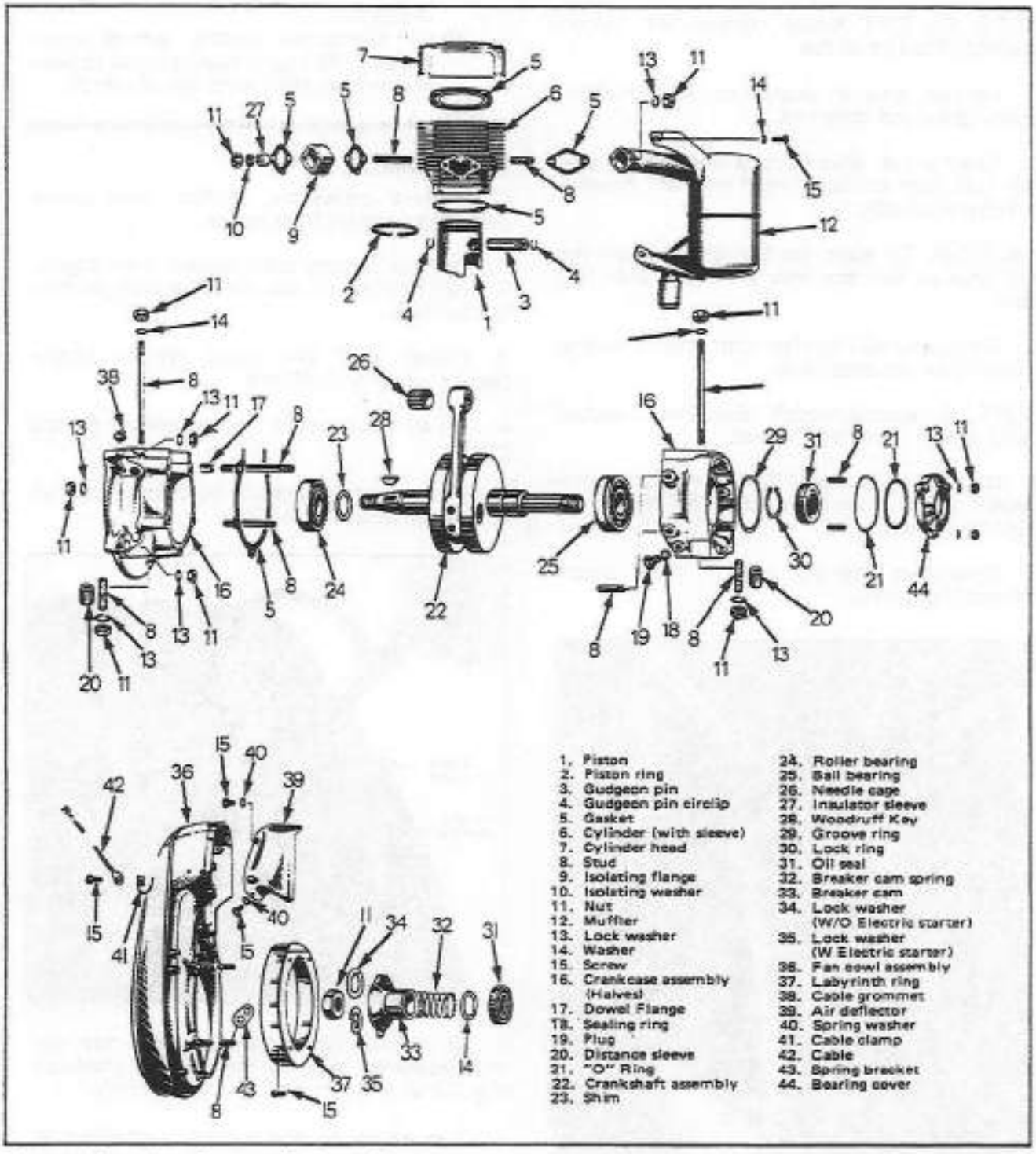
Exhaust — Primary compression Fig. 2-1-1 (3 of 4)



Transfer Fig. 2-1-1 (4 of 4)

Engine

SINGLE CYLINDER ENGINE 2-2



Disassembled view of one cylinder engine

IMPORTANT:

During engine removal and disassembly procedures, retain all attaching parts (e.g. screws, bolts, washers, nuts, etc.) with removed or disassembled components.

1. Disconnect brake and throttle cables and housings at handlebar and brake lever.

NOTE: On T'NT model , remove kill button assembly from handlebar.

2. Remove console (except on T'NT model), pulley guard and drive belt.

3. Remove fuel lines from carburetor and pull the fuel lines and isolating lines from beneath the engine support.

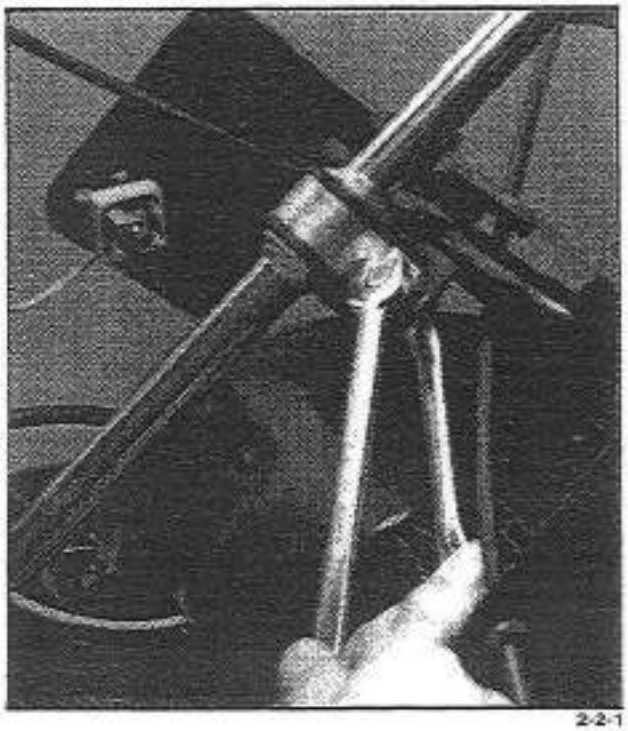
CAUTION: To avoid gas leakage, position the fuel lines so that the ends are higher than fuel tank.

4. Disconnect all electrical connections leading from engine and dash panel.

NOTE: On electric models, disconnect negative cable (black) from battery post.

5. On all models except T'NT, remove decompressor switch from dash panel. Reinstall components on switch.

6. Disconnect steering column from upper column (fig. 2-2-1).



2-2-1

7. Remove the four (4) engine mount nuts and washers.

8. Continue removal of engine as follows:

   (a) On Elan and T'NT models, tilt upper column towards seat, raise the steering column, lift the engine assembly and remove engine from right hand side of vehicle.
   (b) On Olympique models, remove upper column, lift engine assembly and remove engine from right hand side of vehicle.

DISASSEMBLY

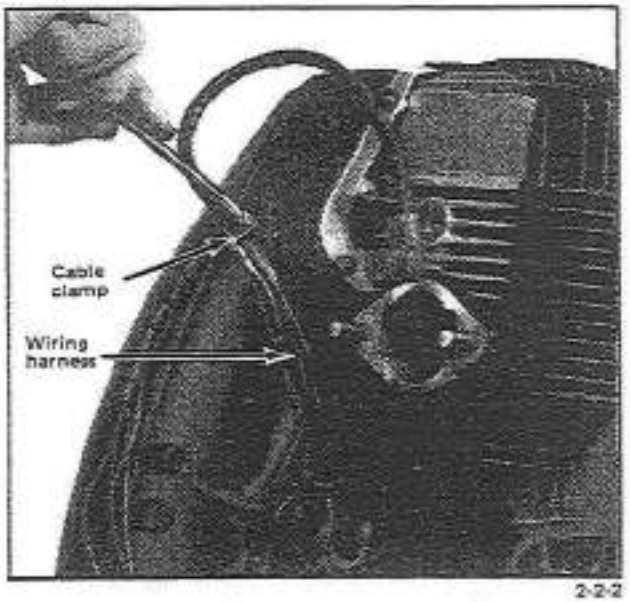
1. Remove carburetor, muffler, drive pulley and rewind starter from engine.

2. Remove throttle cable bracket from engine. On 247 engine type, remove brake cable bracket from engine.

3. Except T'NT 292 model, remove decompressor valve from cylinder.

4. On all electric start models, remove electric starter.

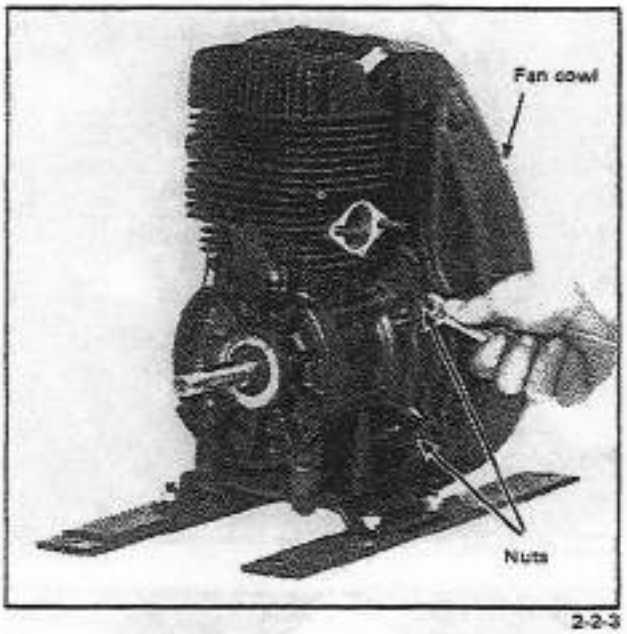
5. Remove cable clamp(s) holding wiring harness to fan cowl (fig. 2-2-2).



2-2-2

6. On manual start engines, remove nuts and lock washer(s) securing fan cowl to crankcase (fig. 2-2-3), and remove fan cowl assembly.

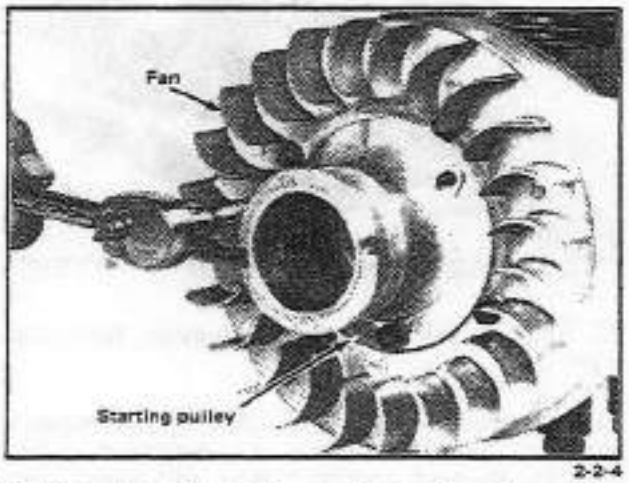
7. Turn engine on side and remove the four (4) nuts and washers securing engine mount to crankcase bottom. Remove engine mount.



2-2-3

8. On electric start engines, unscrew and remove the six (6) capscrews and lock washers securing fan cowl cover to fan cowl. Pull off fan cowl cover.

9. Remove the three (3) nuts and washers securing starting pulley to magneto plate. Pull pulley from magneto plate studs (fig. 2-2-4).

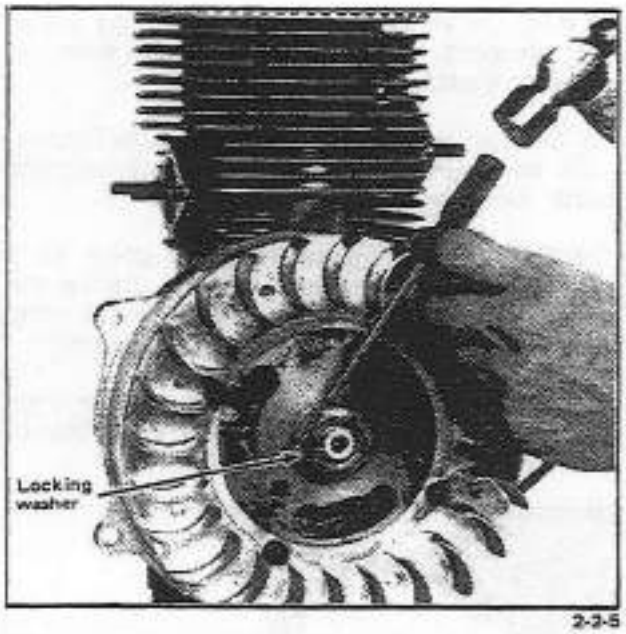


2-2-4

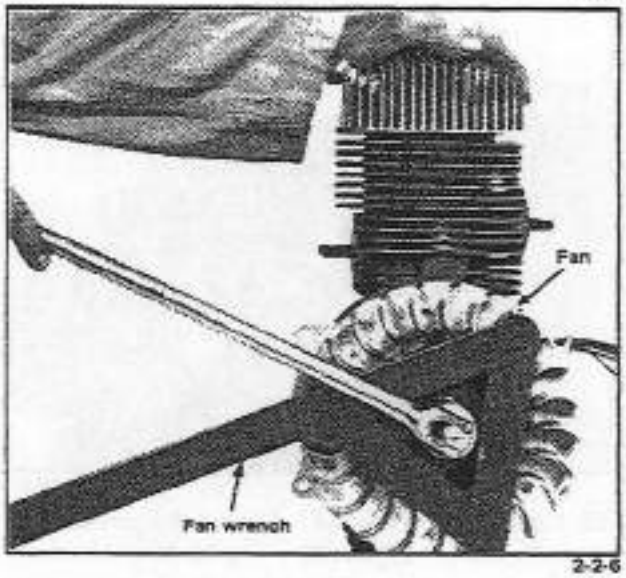
10. On manual start engines, straighten the locking washer located behind the magneto nut (fig. 2-2-5).

11. Position the appropriate fan wrench over fan blades. Hold in position. Unscrew magneto nut from crankshaft and remove locking washer (fig. 2-2-6).

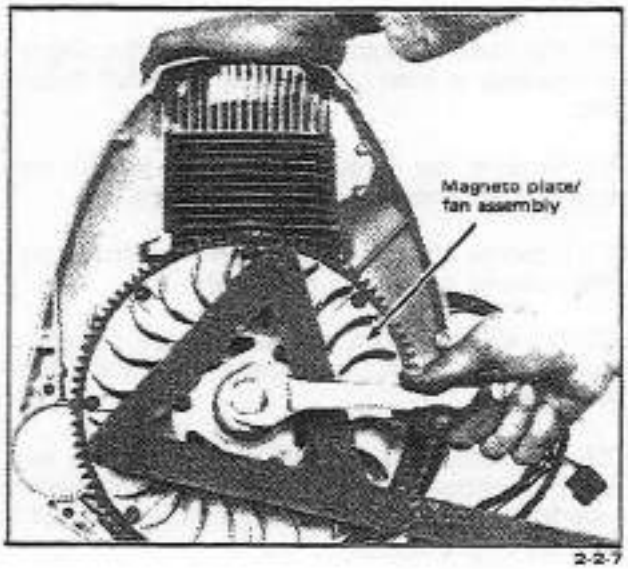
12. With the fan wrench in position, screw on the appropriate flywheel puller. Tighten the puller bolt until the magneto plate/fan assembly is released from the crankshaft (fig. 2-2-7).



2-2-5



2-2-6



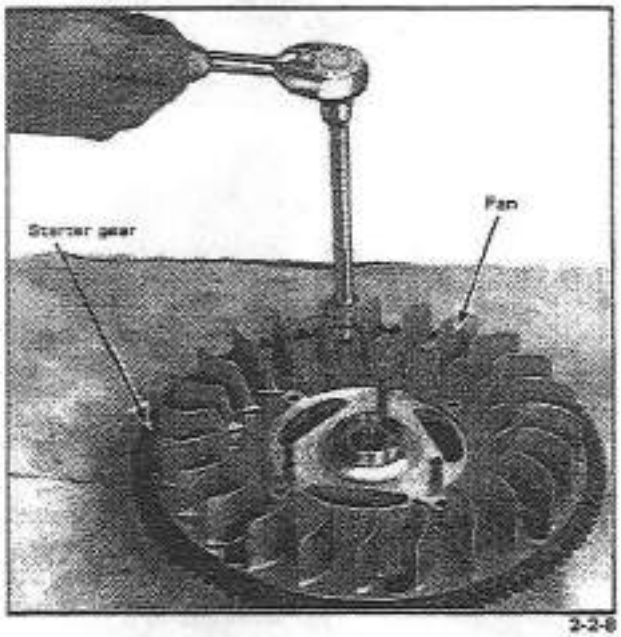
2-2-7

NOTE: On all electric start models, the starter gear becomes detached from engine with the magneto plate/fan assembly.

13. On manual start engines, remove the four (4) nuts and washers affixing the fan to magneto plate. Remove fan.

CAUTION: Never place magneto down on a bare surface as dirt and/or metal particles can affect the efficiency of the magneto ring. Always place magneto on a clean, dry cloth.

14. On electric start engines, remove the eight (8) capscrews and washers affixing starter gear to fan. Remove starter gear (fig. 2-2-8).



2-2-8

15. Remove the four (4) Allen head screws and washers securing magneto ring to magneto housing.

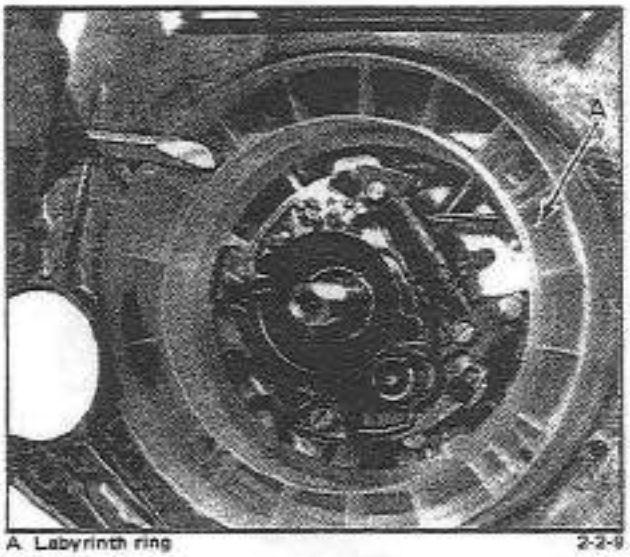
NOTE: On all electric start engines, the magneto housing is incorporated with the fan assembly.

16. Remove the screw, centrifugal weight and spring from inner side of magneto plate.

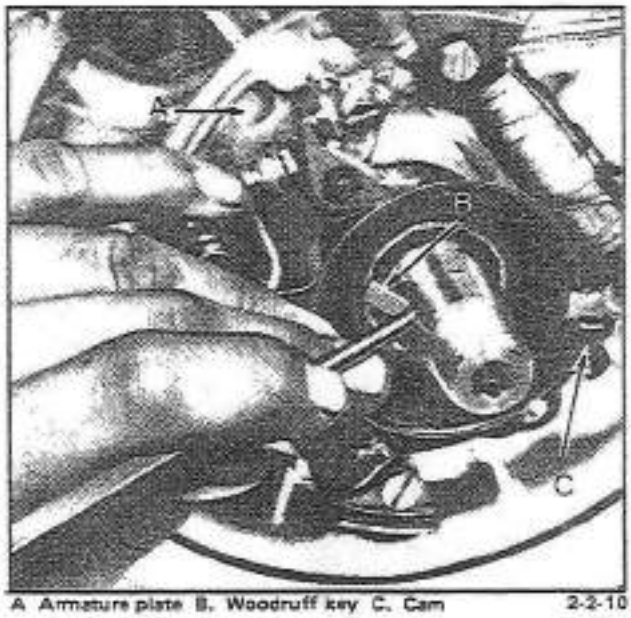
17. Unscrew the four (4) screws securing labyrinth ring to crankcase (fig. 2-2-9).

18. On electric start engines, remove nuts and washers attaching fan cowl to crankcase. Remove fan cowl.

19. Push the cam towards armature plate and using a punch and a small hammer, gently tap on woodruff key to remove it from the crankshaft keyway (fig. 2-2-10).



A. Labyrinth ring 2-2-9



A. Armature plate B. Woodruff key C. Cam 2-2-10

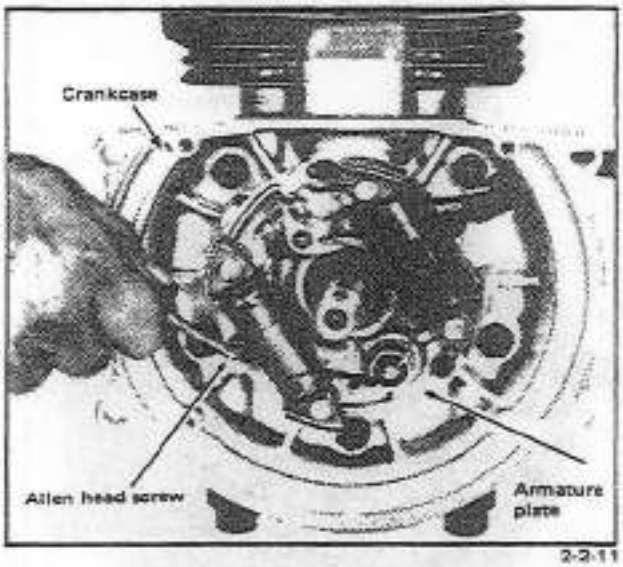
20. Remove cam, spring and washer from the crankshaft.

21. Remove the three (3) Allen head screws securing armature plate to crankcase (fig. 2-2-11). Remove special tubing and disconnect appropriate wire(s) from switch blocks. Pull the armature plate from crankcase.

22. On all electric start and T'NT 292 models, unscrew the two (2) nuts securing ignition coil and bracket to the engine. Remove coil and bracket.

23. Unscrew and remove the four (4) cylinder head nuts and washers (fig. 2-2-12).

24. Lift the cylinder head and cylinder head gasket from cylinder studs. Discard head gasket.



2-2-11

2-2-12

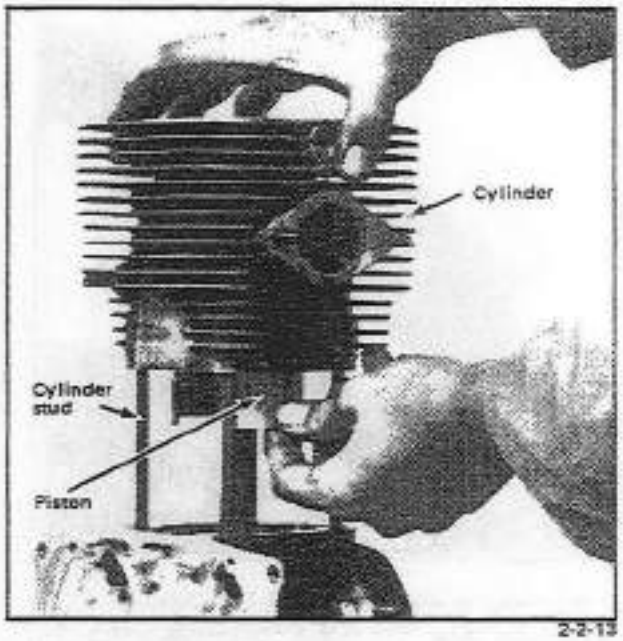
25. Gently lift the cylinder from the cylinder studs. While lifting cylinder, restrain piston to avoid damage to piston on studs (fig. 2-2-13).

26. Remove and discard the cylinder flange gasket from crankcase.

27. Using two of the previously removed head nuts, unscrew the four (4) studs from crankcase.

28. Place a clean, dry cloth over the crankcase allowing only connecting rod and piston to be exposed. The cloth will prevent foreign matter and/or small components falling into crankcase.

29. Gently spread open the piston rings with a piston ring expander tool until they can be slid from the piston grooves (fig. 2-2-14).



2-2-13


2-2-14

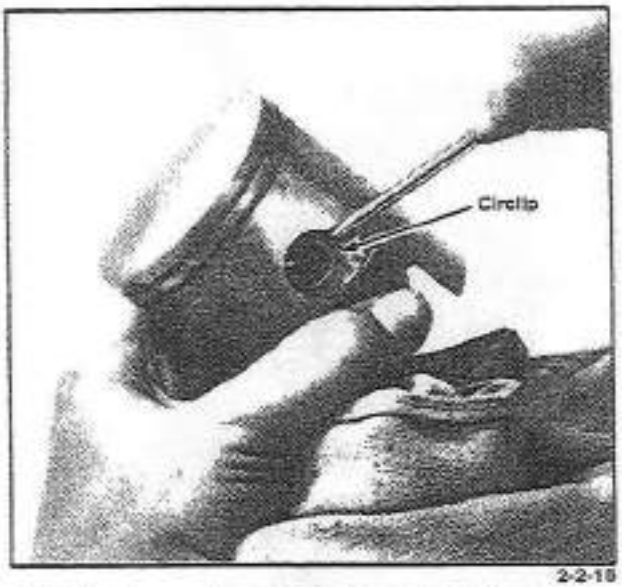
IMPORTANT: If piston rings are in good condition, identify each ring as to ring groove to facilitate installation procedure.

CAUTION: Do not spread open the rings too far apart as breakage can occur.

30. Using a suitable tool (i.e. an ice pick), pry the circlips from the piston (fig. 2-2-15).

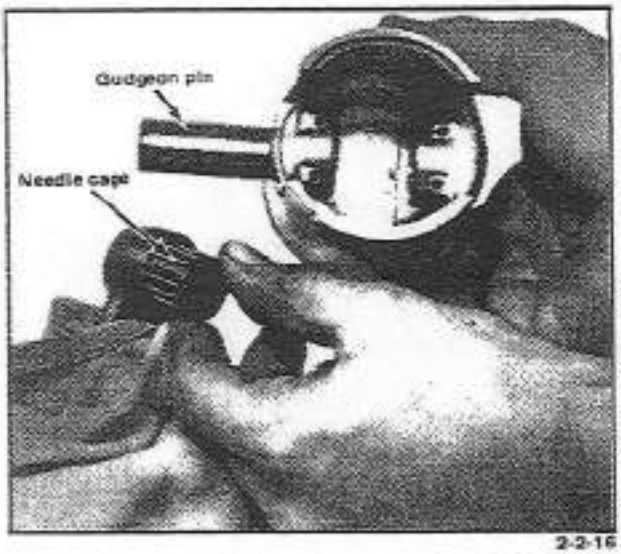
31. Position an appropriate mounting bar on the gudgeon pin. Using a soft faced hammer, drive the gudgeon pin through the piston. Once the gudgeon pin is sufficiently disengaged from the connecting rod and needle cage, lift off piston.

CAUTION: When tapping the gudgeon pin from the piston, hold the piston firmly in place to eliminate the possibility of transmitting shock and/or bending the connecting rod.



2-2-15

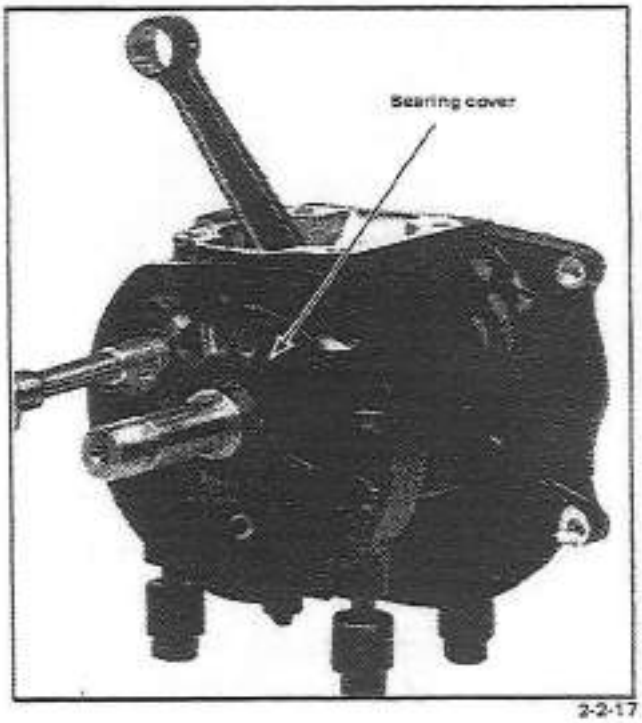
32. Pull the gudgeon pin from the piston. Slide the needle cage from the connecting rod (fig. 2-2-16).



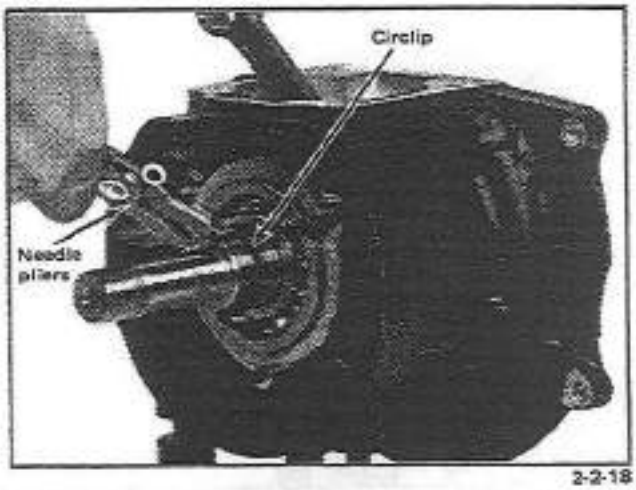
2-2-16

33. On 292 and 337 engine types (P.T.O. side), carry out the following procedure:

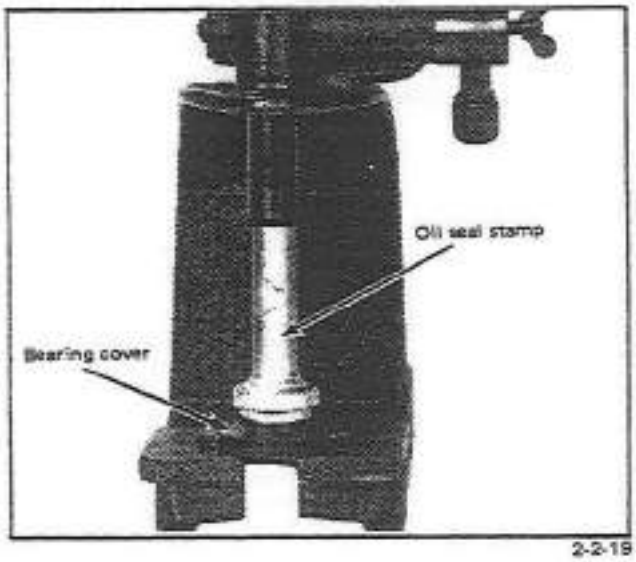
(a) Remove the three (3) nuts and lock washers securing bearing cover to crankcase (fig. 2-2-17).
(b) Remove cover from crankshaft.
(c) Slide the ball bearing groove ring from location.
(d) Using needle pliers, open and remove the circlip from crankshaft groove (fig. 2-2-18).
(e) Using the appropriate oil seal stamp, remove the oil seal from the bearing cover (fig. 2-2-19).
(f) Pry the bearing cover "O" rings from the cover grooves.



2-2-17

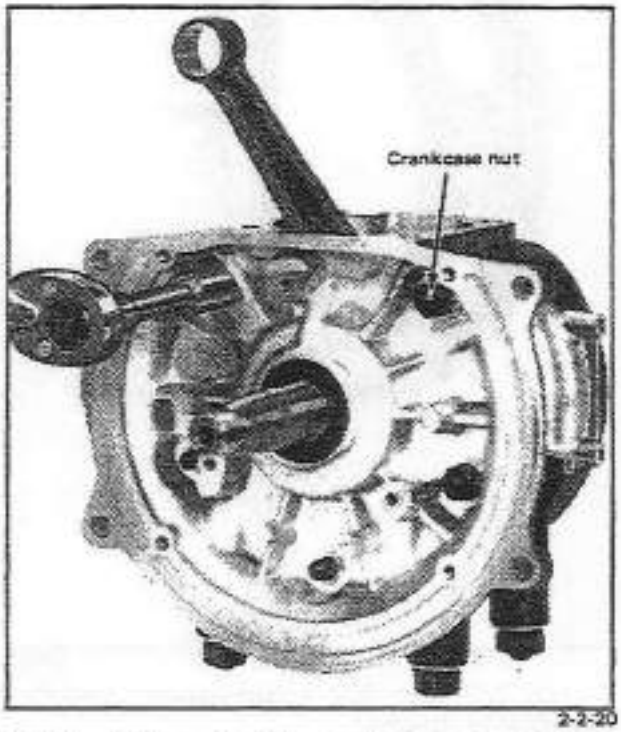


2-2-18



2-2-19

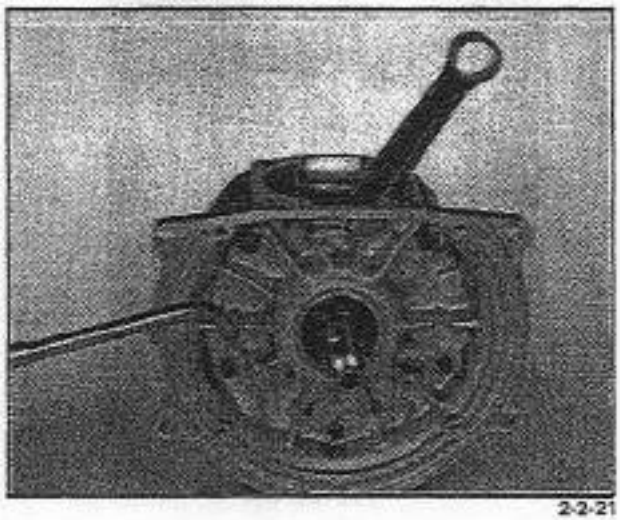
34. Remove the five (5) nuts and washers securing crankcase halves (fig. 2-2-20).



2-2-20

35. On 292 and 337 engine types, separate crankcase halves using a soft faced hammer. Remove crankcase gasket.

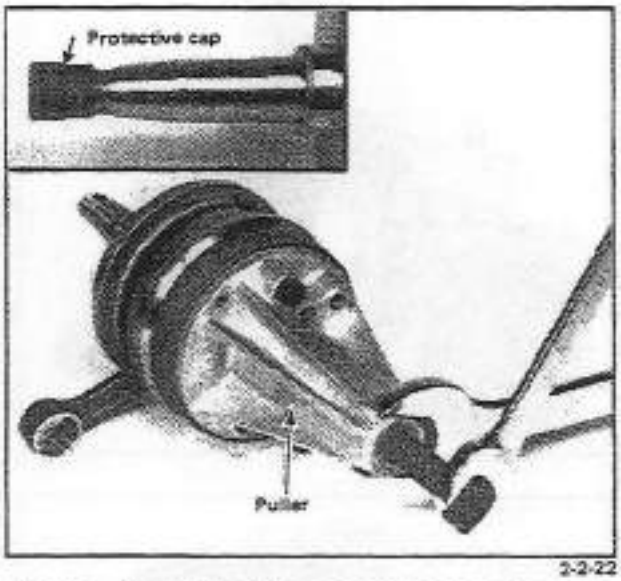
36. Using a oxyacetylene torch, heat the P.T.O. crankcase half to 250°-300° F. Using a soft faced hammer, tap the crankcase from the crankshaft assembly (fig. 2-2-21).


2-2-21

37. On 292 and 337 engine types, heat the magneto side of crankcase half to 250°-300° F. Invert the crankcase half and using a soft faced hammer, tap on the crankcase adjacent to bearing until bearing falls from the seating.

38. On 247 and 302 engine types, repeat step 36 to remove the magneto side crankcase half. Remove crankcase gasket.

39. On all engine types, remove the crankshaft bearings using the appropriate bearing puller (fig. 2-2-22).



2-2-22

NOTE: Always install protective cap on crankshaft end.

40. Using an oil seal stamp, remove oil seal from crankcase halves.

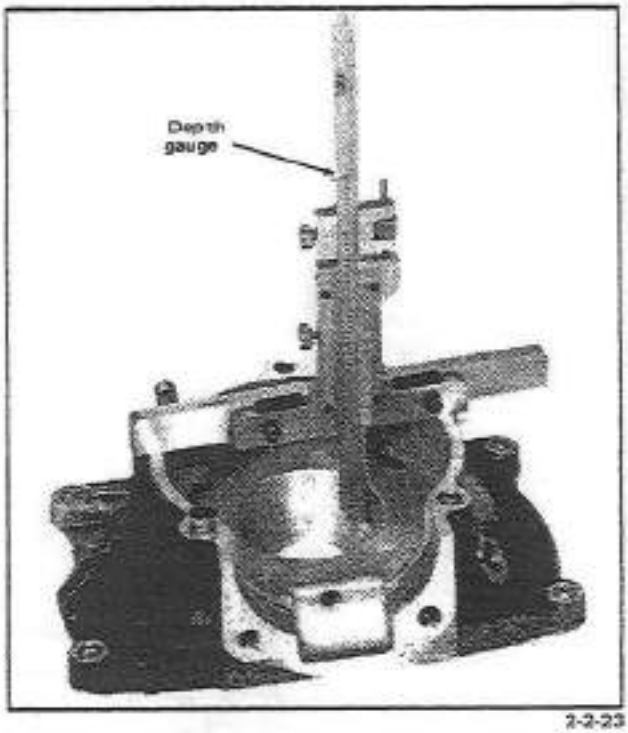
ASSEMBLY

IMPORTANT: Prior to Assembly procedure, ensure all components are clean of all dirt and all damaged parts have been replaced. Refer to sub-section 2-8 for Cleaning and Inspection procedure.

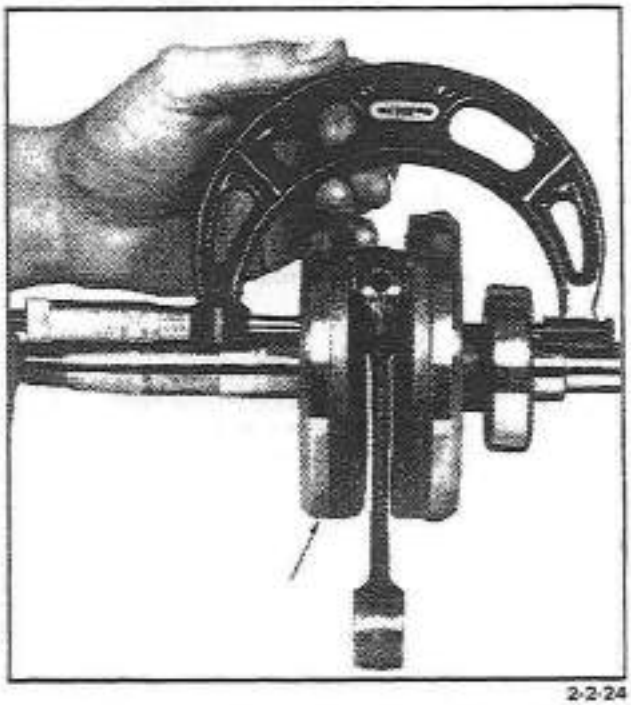
NOTE: Crankcases are fabricated as two (2) matched halves. For this reason, single crankcase halves are not interchangeable and are not purchasable as single halves.

1. On 247 and 302 engine types, determine crankshaft end play as follows:

(a) Measure distance from face of one crankcase half down to bottom of bearing seat = A (fig. 2-2-23).
(b) Place a new crankcase gaskat over the other half and measure from gasket to bottom of bearing seat = B. Add total of A plus B to obtain total C. Remove gasket.
(c) Measure the distance between the crankshaft blades = D (fig. 2-2-24).



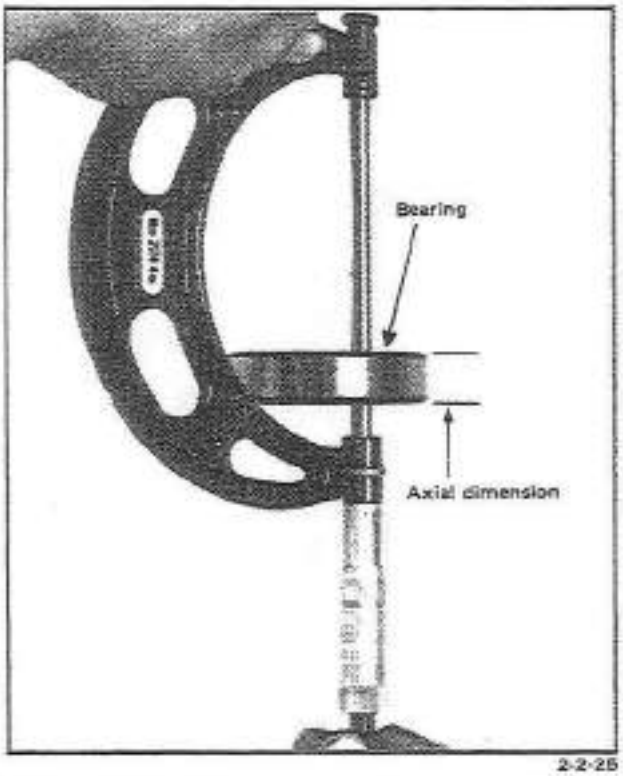
2-2-23


2-2-24

(d) Measure the axial dimension of each bearing and add measurements together = E (fig. 2-2-25). Add total of D plus E to obtain F.

(e) The measurement of F taken from C minus tolerance .006 to .016 inch is the distance to be covered by shims.

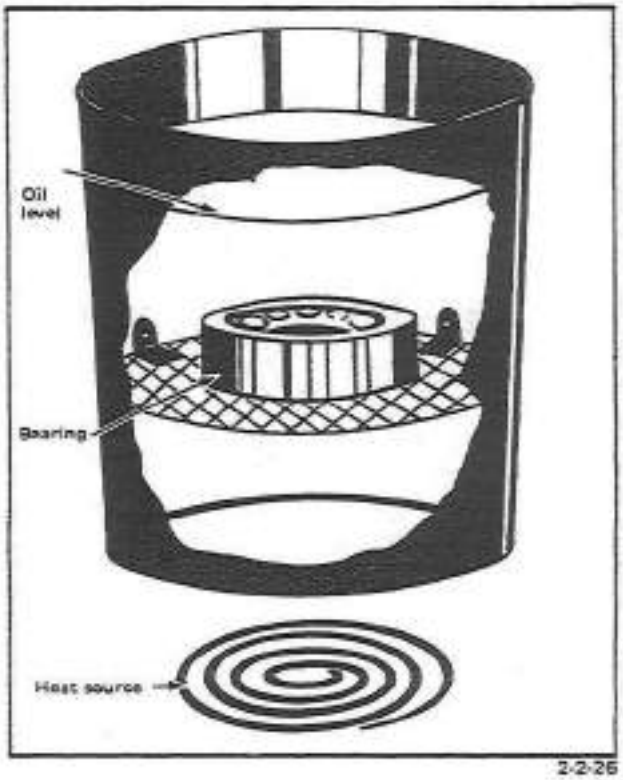
NOTE: The above procedure is not applicable to 292 and 337 engine types, since the crankshaft is held on P.T.O. side by the bearing.



2-2-25

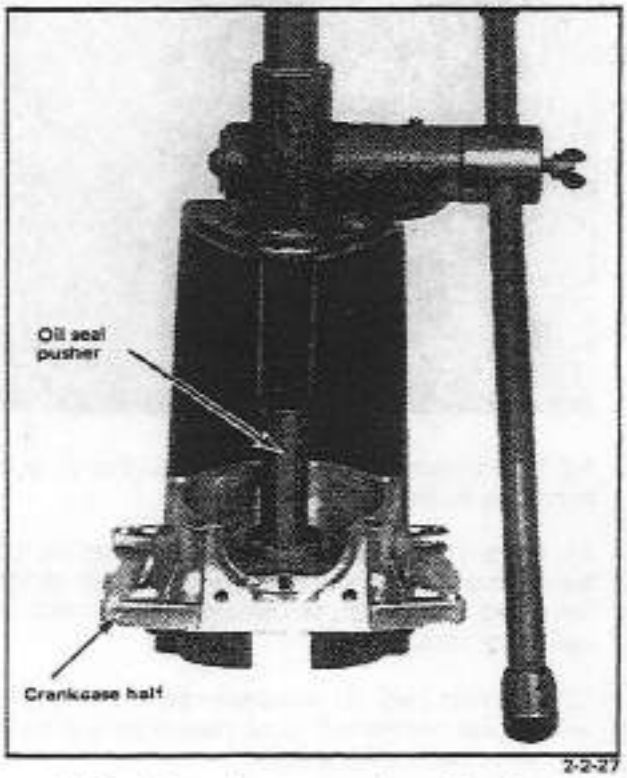
2 On 247 and 302 engine types, assemble crankcase as follows:

(a) Place crankshaft bearing into oil container and heat to 180°-190° F. Figure 2-2-26, shows the proper way of heating the bearing.



2-2-26

(b) Position shims equally on P.T.O. and magneto sides of crankshaft and push a **heated** ball bearing on each side of crankshaft.
(c) Heat crankcase halves to 250°-300° F.
(d) Using an appropriate oil seal pusher press a crankcase oil seal into each crankcase half (fig. 2-2-27).



2-2-27

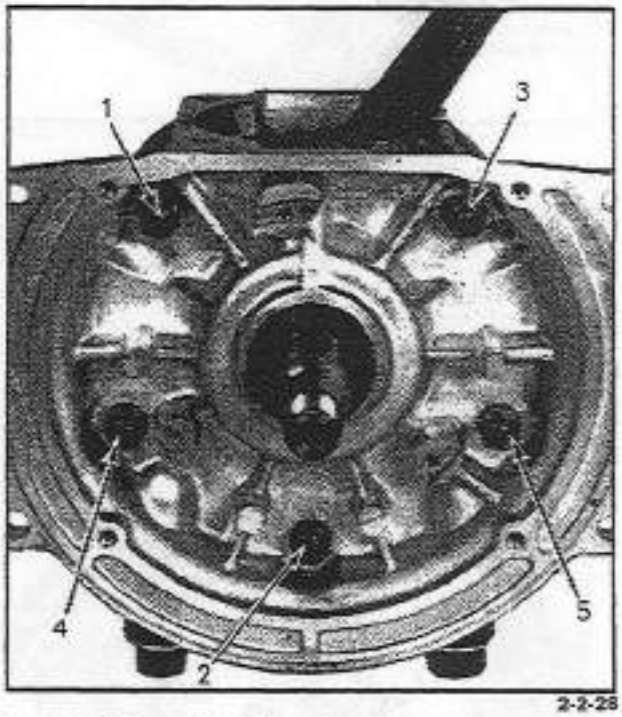
(e) Position the appropriate oil seal protection sleeves on crankshaft, install a new gasket on the crankcase studs and adjoin the two (2) crankcase halves. Remove oil seal protection sleeves.

NOTE: Apply a light coat of grease into the double lips of the oil seals prior to crankcase adjoinment.

3. On 292 and 337 engine types assemble crankcase as follows:

(a) Place crankshaft ball bearing and roller bearing inner race into an oil container and heat the oil to 250°-300° F. (See fig. 2-2-26, for method of heating bearings).
(b) Install the **heated** ball bearing on P.T.O. crankshaft extension and the roller bearing inner race on magneto crankshaft extension.
(c) Heat the magneto crankcase half to 250°-300° F. Press in the oil seal (see fig. 2-2-27), and roller bearing outer race until it sits against the crankcase.
(d) Install "O" rings. Press oil seal into bearing cover using the appropriate oil seal pusher.
(e) Heat the P.T.O. crankcase half to 250°-300° F. Position a new gasket on the crankcase studs. Position the appropriate oil seal protection sleeve on magneto crankcase oil seal and adjoin the two (2) crankcase halves. Remove oil seal protection sleeve.
(f) Install groove ring on ball bearing outer race and gently tap the outer race into P.T.O. crankcase half until the groove ring sits against the crankcase.

4. Position the crankcase nuts and washers and finger tighten each nut. Cross torque each nut to 16 ft/lbs. (fig. 2-2-28).



2-2-28

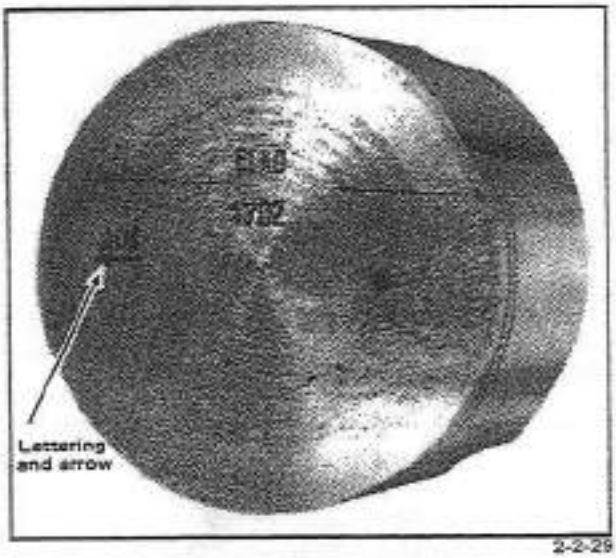
5. On 292 and 337 engine types, carry out the following:

(a) Slide the circlip over the crankshaft and into the locking notch in front of bearing.
(b) Place bearing cover in location and secure using the appropriate washers and nuts.

6. Insert needle cage into connecting rod.

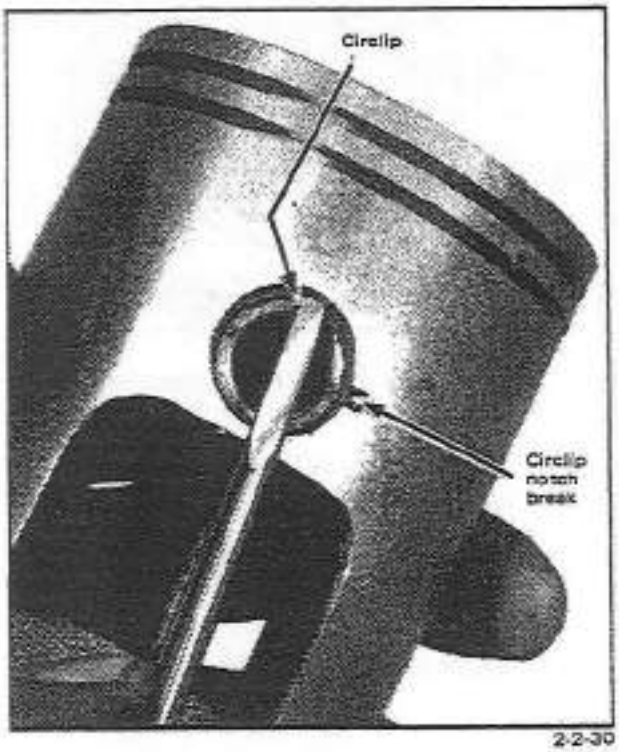
7. Heat the piston to 140°-150° F. and partially insert the gudgeon pin. Place the piston over connecting rod with the letters AUS over an arrow on the piston dome facing in direction of the exhaust side (fig. 2-2-29). Using a mounting

bar, align the gudgeon pin with the connecting rod. Once aligned, complete the insertion of the gudgeon pin until the circlip notch at each end of piston orifice is visible.



2-2-29

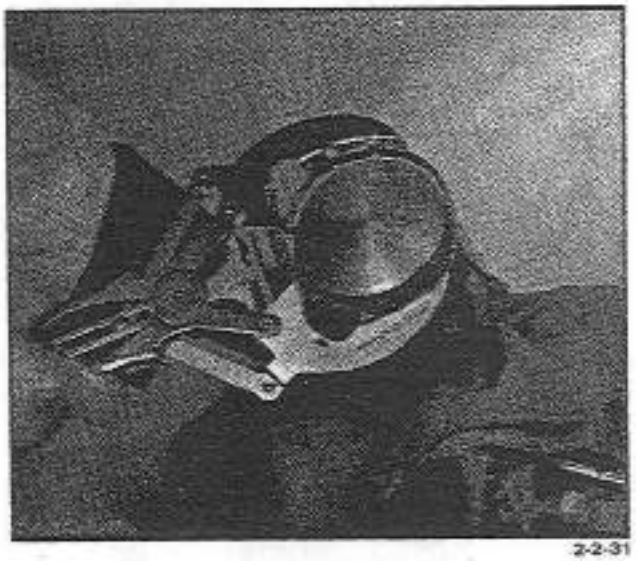
8. Place a dry, clean cloth over crankcase exposing only the piston. Press the circlips into location. Once the circlips are locked into appropriate grooves, turn each circlip so that the circlip break is not directly on circlip notch break of piston (fig. 2-2-30).



2-2-30

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

10. Place the appropriate piston rings on the piston. Using a piston ring expander tool, open and position rings in proper grooves (fig. 2-2-31).

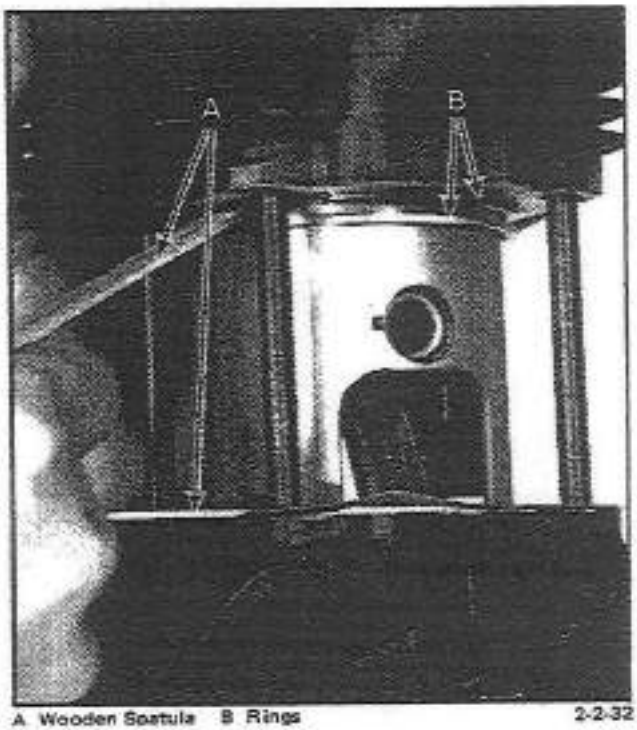


2-2-31

NOTE: Ensure the "V" ends of the rings sit correctly in the ring landings.

11. Place the crankcase/cylinder gasket in location. Screw the four (4) cylinder studs (longest threaded end) into crankcase until threads are well into crankcase.

12. Position two (2) spatulas over crankcase top and rotate crankshaft until the piston sits evenly on the spatulas (fig. 2-2-32).



A Wooden Spatula B Rings

2-2-32

NOTE: Ensure the piston is centered with crankcase.

13. Slide the cylinder on the four (4) cylinder studs. Ensure the exhaust port is facing exhaust side of engine.

14. While carefully pushing the cylinder down, close the piston rings over the piston until each ring is compressed sufficiently to allow the cylinder to pass over it. After passing the piston into cylinder continue pushing the cylinder down until it is seated on spatulas (see fig. 2-2-32).

15. Remove spatulas carefully to avoid crankcase/cylinder gasket damage. Lower cylinder onto crankcase.

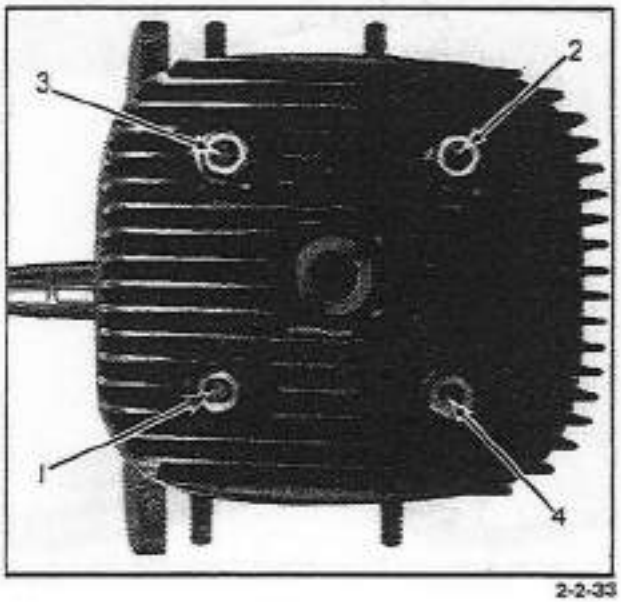
16. Rotate crankshaft until piston dome is approximately 1/4 inch above the exhaust port. Empty a tablespoon full of engine Ski-Doo oil onto piston and allow it to spread evenly over piston for 2 to 3 minutes.

17. Rotate crankshaft to allow even oil distribution over cylinder wall and piston. Wipe any oil spillage from cylinder top using a clean, dry cloth.

18. Position a new cylinder head gasket on cylinder.

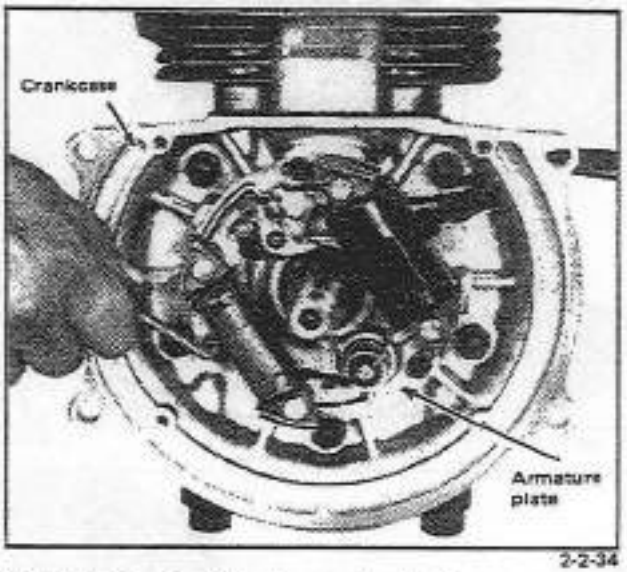
19. Correctly position cylinder head on cylinder ensuring the cooling fins of the head run evenly and horizontal with the cylinder cooling fins.

20. Place washers and cylinder head nuts on cylinder studs. Cross torque each nut to 10 ft/lbs. and then to 16 to 18 ft/lbs. (fig. 2-2-33).



2-2-33

21. Temporarily affix the armature plate to crankcase using three (3) Allen head screws and six (6) washers (fig. 2-2-34).



2-2-34

CAUTION: Avoid "squeezing" the armature plate wires against crankcase.

22. Connect wire(s) to appropriate switch blocks. (If necessary refer to electrical chart, section 3). Wind spiral tubing around wires.

23. On electric start and T'NT 292 model, install the ignition coil and bracket to engine using two (2) nuts and washers.

24. Slide the appropriate washer and cam spring on magneto crankshaft extension.

25. Using low temperature grease, lubricate the internal channel of the cam. Position cam in location and secure with the woodruff key.

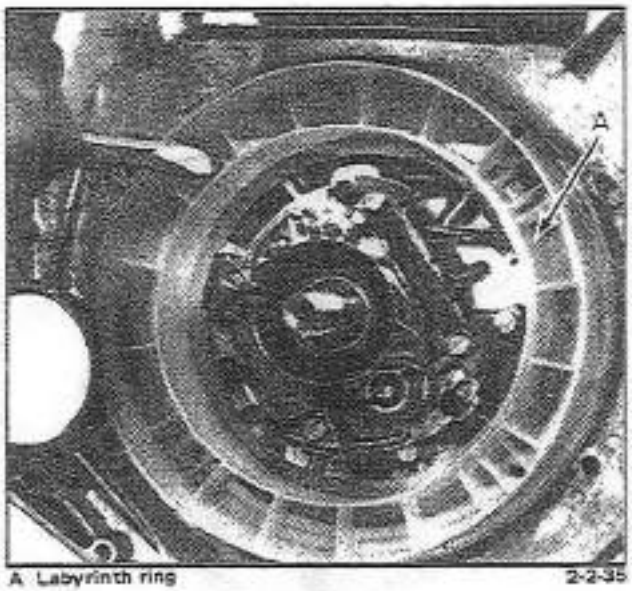
26. On electric start engines, position fan cowl on crankcase. Secure using three (3) washers and nuts.

NOTE: The lower nut on the exhaust side of fan cowl should not be installed at this time. Also, the console spring bracket should be installed on the carburetor side of cowl.

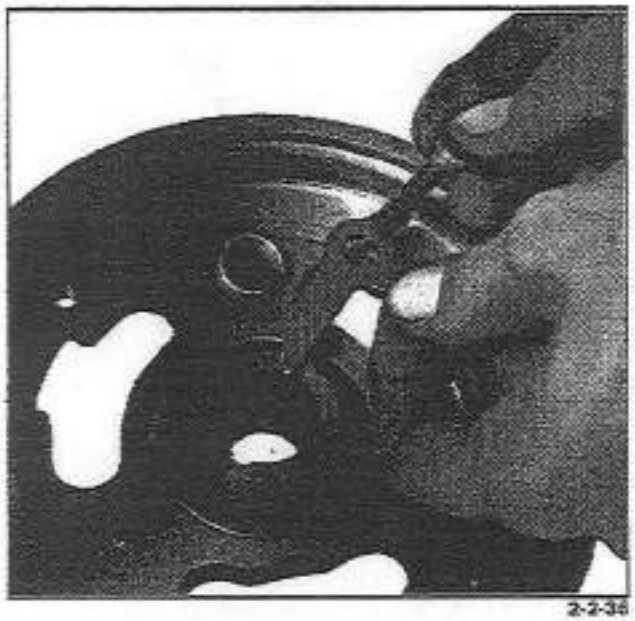
27. Position the labyrinth ring in location and secure using four (4) screws (fig. 2-2-35).

CAUTION: Ensure the bevelled side of labyrinth ring is on top.

28. Apply a small portion of low temperature grease into spring seating of magneto ring plate. Install spring and centrifugal lever using the correct flat end screw (fig. 2-2-36).



A Labyrinth ring 2-2-35



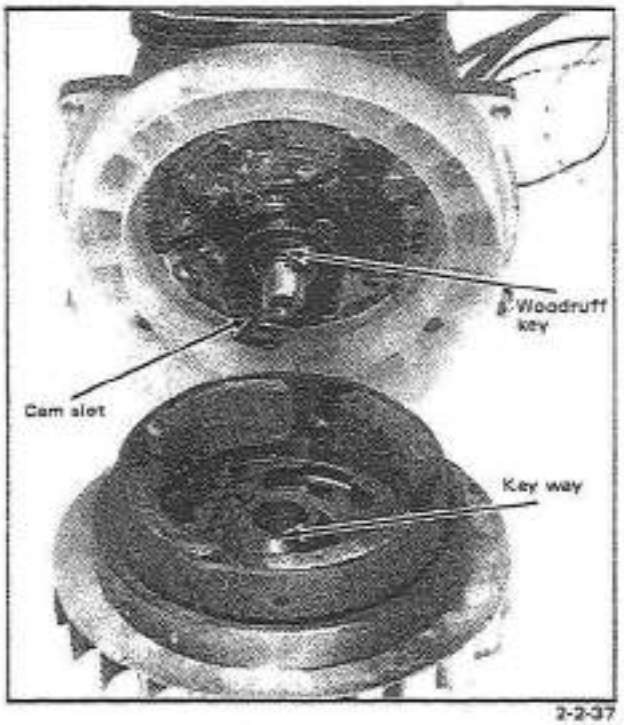
2-2-36

29. Position magneto ring onto magneto ring plate and secure using four (4) Allen head screws and washers. **Avoid placing magneto ring on a bare surface.**

30. On manual start engines, install fan blade assembly on magneto ring plate.

NOTE: On electric start engines, the magneto plate is incorporated with fan blade assembly. Install starter gear using eight (8) screws and washers.

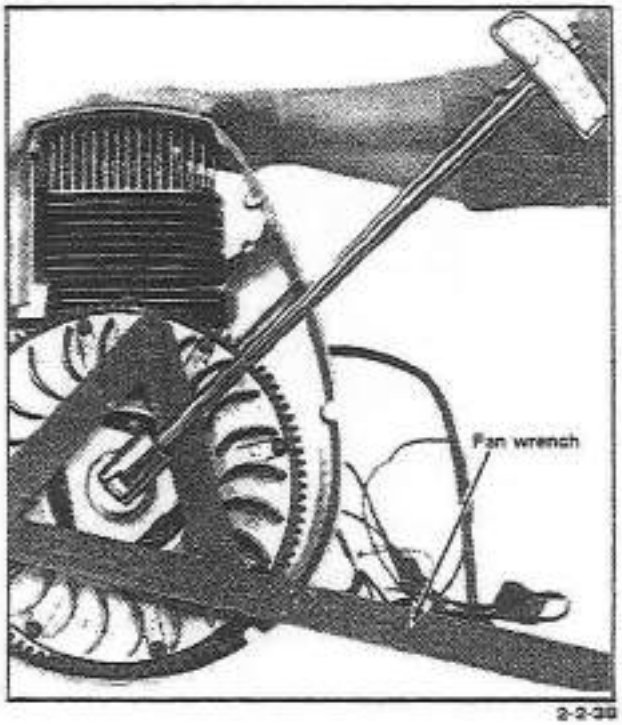
31. Turn crankshaft until woodruff key faces up. Rotate cam clockwise until cam slot is approximately 240° from woodruff key. Position magneto plate/fan assembly on crankshaft with the keyway aligned with the woodruff key (fig. 2-2-37).



2-2-37

32. Test automatic spark advance mechanism (centrifugal weight), by slightly rotating cam lobe to activate the centrifugal weight. The mechanism should operate freely without catching or binding.

33. Position lock washer and magneto nut on crankshaft. Place the appropriate fan wrench into fan blades. Using a torque wrench, tighten magneto nut to 50 ft/lbs. Remove fan wrench (fig. 2-2-38).



2-2-38

NOTE: On manual start engines bend the lockwasher over the nut in two different places using a pin punch and hammer.

34. Install fan cowl and/or fan cowl cover. Install wiring harness, throttle and/or brake cable brackets to fan cowl/engine.

35. Secure engine mount to crankcase studs using four (4) nuts and washers. Torque each nut to 50 ft/lbs.

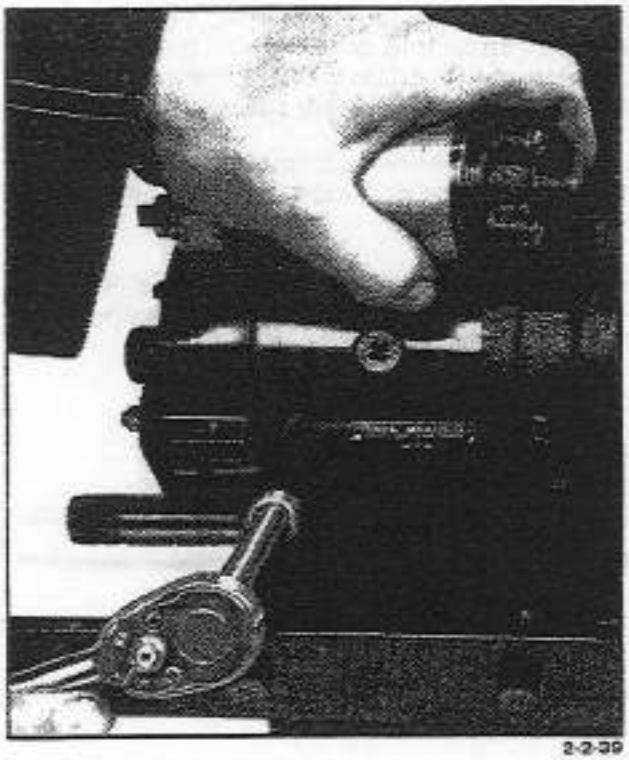
36. Carry out engine timing as detailed in sub-section 2-6.

37. Install starting pulley to magneto using three (3) washers and nuts.

38. Position rewind starter in location and secure to fan cowl using four (4) screws and washers.

NOTE: On Olympique 335E model, the lower left screw securing the rewind starter is also used to secure the battery cable clamp.

39. On electric start engines, install electric starter to fan cowl and crankcase (fig. 2-2-39).



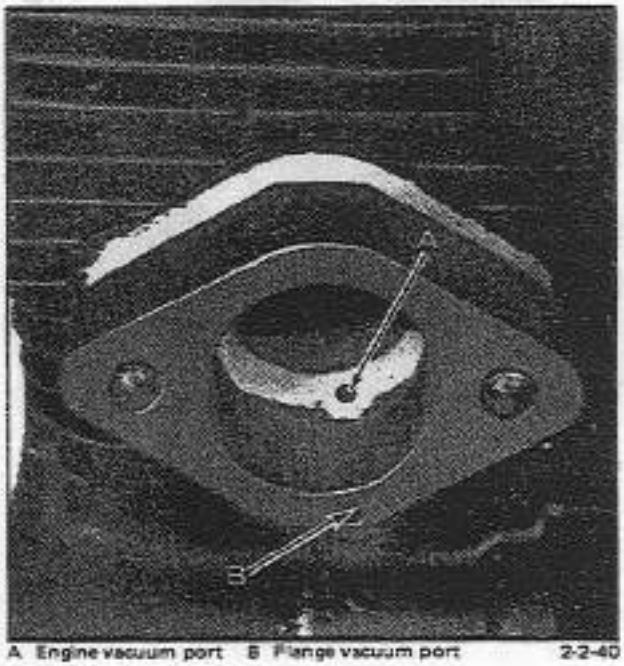
2-2-39

40. On engines equipped with decompressor install decompressor valve in cylinder, refer to sub-section 2-4.

41. Install drive pulley.

42. To install carburetor, use the following sequence, position a flange gasket, isolating flange, flange gasket, isolating sleeves, carburetor, isolating washers and nuts. Firmly tighten flange nuts.

CAUTION: The intake flange of the engine has a vacuum port on the bottom right hand side, ensure the plastic flange vacuum port orifice aligns with flange vacuum port of engine (fig. 2-2-40).



A. Engine vacuum port B. Flange vacuum port 2-2-40

43. Connect throttle cable at carburetor lever.

44. Position muffler gasket on exhaust port studs. Position muffler in location and secure using two (2) lock washers, two (2) rubber washers, two (2) retainer washers, three (3) nuts and a capscrew.

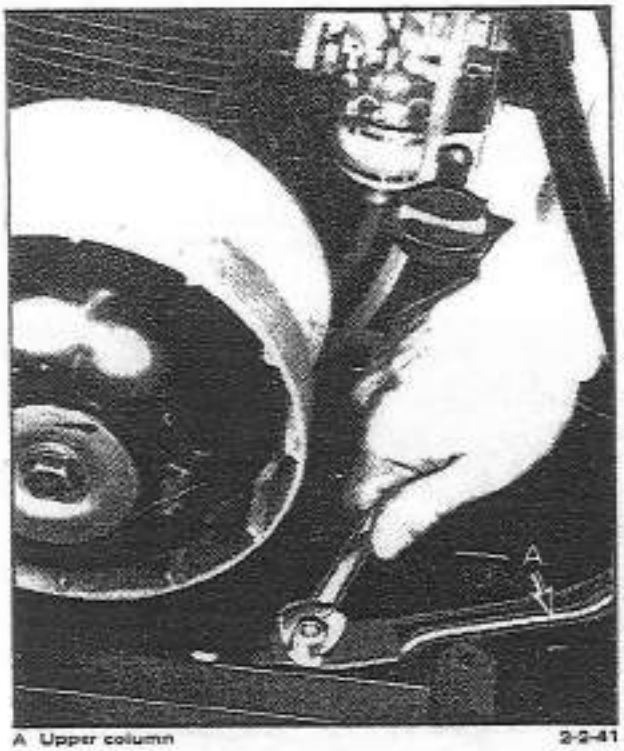
45. Inspect and install spark plug. Connect wire.

INSTALLATION

1. Position engine on vehicle carriage bolts using one (1) of the following procedures:

   (a) On all Elan and T'NT models, tilt upper column towards seat, raise the steering column and position the engine on the four (4) carriage bolts.
   (b) On all Olympique models, position engine and upper column on carriage bolts (fig.2-2-41).

2. Secure the engine assembly to frame using washers and four (4) engine mount nuts. Torque each nut to 22 ft/lbs.



A Upper column 2-2-41

3. Position the upper column and steering column in location. Secure retaining bracket to upper column using washers, bolts and nuts (fig. 2-2-42).

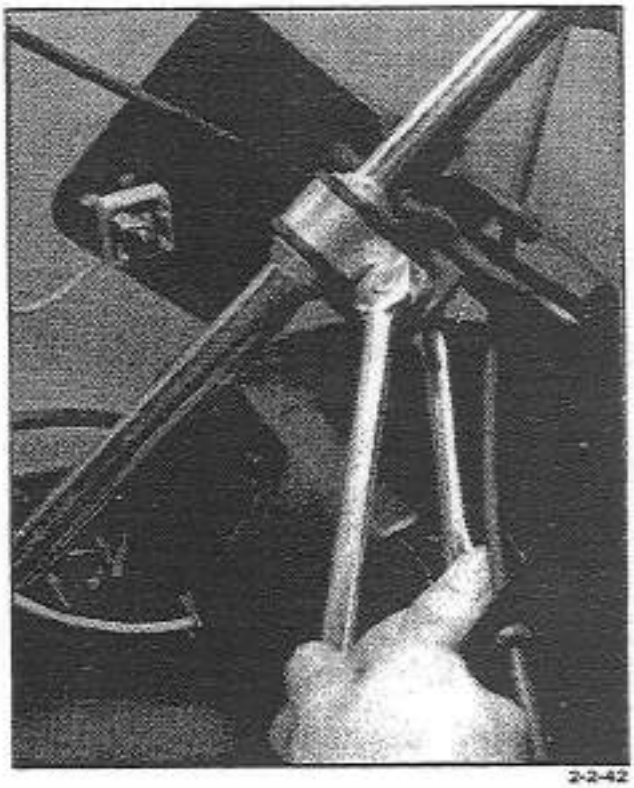
NOTE: The upper column and steering column on the Elan models are secured by a "U" clamp.

4. Connect brake and throttle cables and housings at handlebar and brake lever.

NOTE: On T'NT model, install kill button assembly on handlebar.

5. Except T'NT 292 model, install decompressor switch and flat washer in dash panel and secure using support nut. Install decompressor knob.

6. Complete all electrical connections. Refer to Section 3, Electrical Charts.



2-2-42

CAUTION: Make sure the wiring of the harness does not come into contact with muffler, drive or driven pulleys. On electric models refer to Battery Section for battery cable positioning.

7. Pass the fuel lines and isolating lines between crankcase and engine mount. Connect the fuel lines to carburetor.

NOTE: The longer length of fuel line is the return line. Always connect this line to outlet nipple of carburetor.

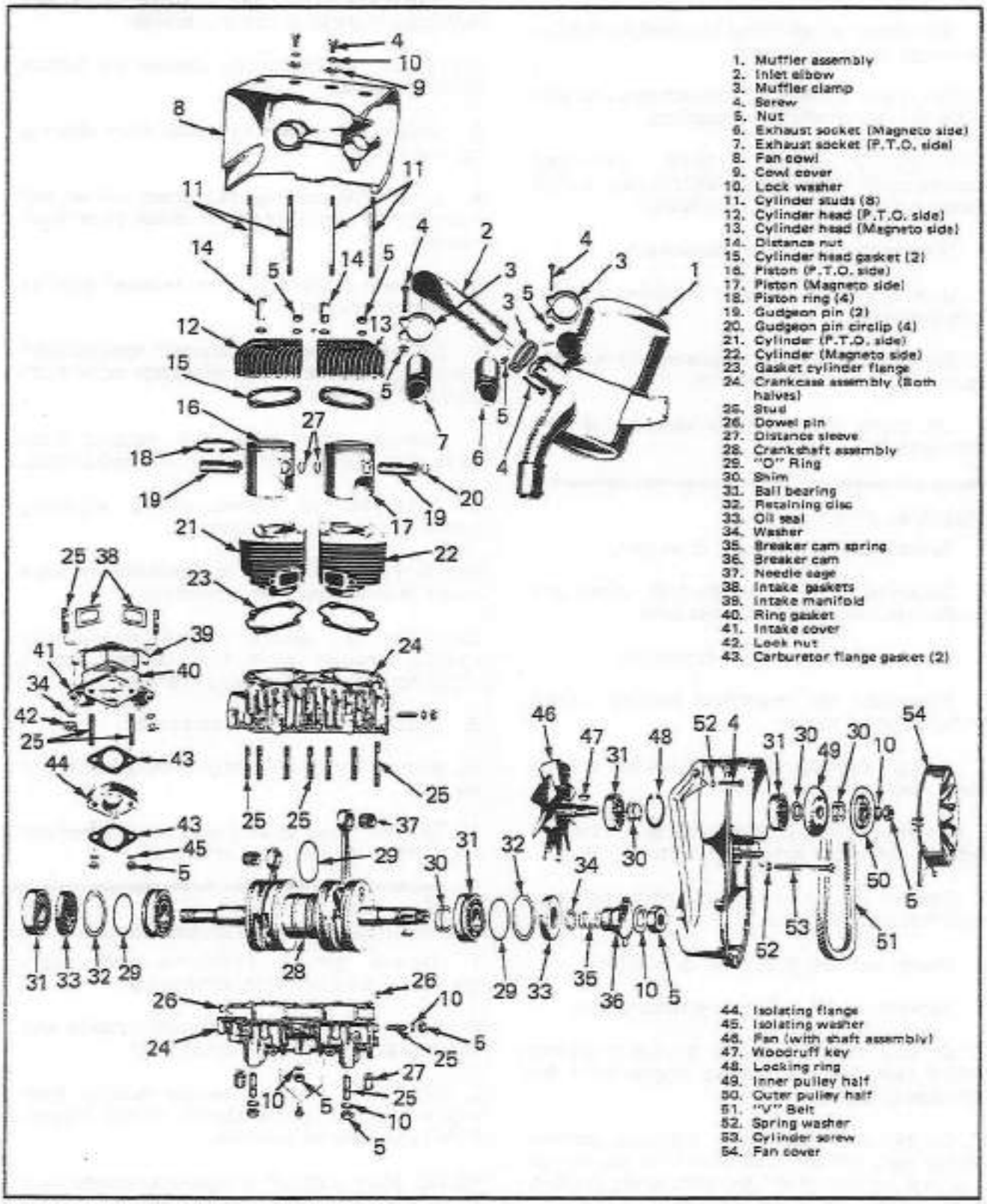
8. Check brake adjustment.

9. Check pulley alignment.

10. Install drive belt, pulley guard and console.

Engine

TWO CYLINDER 2-3



Disassembled view of two cylinder engine

REMOVAL (Olympique models)

1. Remove console, pulley guard and drive belt.

2. Disconnect brake and throttle cables and housings at handlebar and brake lever.

3. Disconnect all electrical connections leading from engine and dash panel.

NOTE: Make a sketch of connections and wire colors to ease installation procedure.

CAUTION: On electric model, disconnect negative cable (black) from battery post before disconnecting positive cable at starter.

4. Disconnect fuel lines at carburetor.

5. Unbolt steering column retaining bracket from upper column.

6. Remove the four (4) engine mount nuts and washers. Remove upper column.

7. Lift engine from carriage bolts and remove from vehicle.

REMOVAL (T'NT models)

1. Remove pulley guard and drive belt.

2. Disconnect brake and throttle cables and housings at handlebar and brake lever.

3. Remove kill button from handlebar.

4. Disconnect the receptacle housing located on right side of engine.

5. Unbolt steering column retaining bracket from upper column.

6. On 340 and 440 models, unhook the two (2) springs holding the tuned muffler to engine.

7. Remove the air silencer assembly and collar studs from carburetor(s).

8. Disconnect fuel lines from carburetor.

9. Remove the four (4) engine mount nuts.

10. On 640 and 775 models, tilt upper column toward seat, lift and remove engine from the right side of vehicle.

11. On 340 and 440 models, tilt upper column toward seat, lift and pull engine to the rear to disengage exhaust manifold from tuned muffler. Remove engine from the left side of vehicle.

REMOVAL (Nordic models)

1. Remove console, pulley guard and drive belt.

2. Disconnect brake and throttle cables and housings at handlebar and brake lever.

NOTE: On 640ER model, remove kill button from handlebar.

3. Unbolt and remove handlebar from steering column spline.

4. On 640ER models, disconnect shifter rod from shifter arm. Disconnect brace plate from console.

5. Separate steering column retainer bracket from upper column.

6. On 640ER model, disconnect speedometer cable at speedometer and disengage cable from clamp of fan housing.

7. Remove choke cable and housing from carburetor. Remove air silencer and collar stud.

8. Disconnect all electric wiring adjoining engine and electrical components.

NOTE: Make a sketch of connections and wire colors to ease installation procedure.

CAUTION: On electric models, always disconnect negative cable from battery before disconnecting positive cable at starter.

9. Disconnect fuel lines at carburetor.

10. Remove the four (4) engine mount nuts and washers.

11. Tilt dash panel toward seat, lift and remove engine from the right side of vehicle.

REMOVAL (Alpine and Valmont models)

1. Remove console (Valmont) and pulley guard. Slip drive belt from drive pulley.

2. Disconnect brake and throttle cables and housings at handlebar and brake lever.

3. Disconnect electrical wiring leading from engine and dash panel. Detach wiring harness from upper column assembly.

NOTE: Make a sketch of connections and wire colors to ease installation procedure.

CAUTION: On electric models, disconnect negative cable (black) from battery before disconnecting positive cable at starter.

4. Disconnect the fuel lines at carburetor.

5. Detach transmission rod from gear change lever by removing the cotter pin, washer and spring.

6. Remove the upper and lower retainer plates holding steering column.

7. Lift the steering arm ball joint from steering channel and pull handlebar toward rear of vehicle.

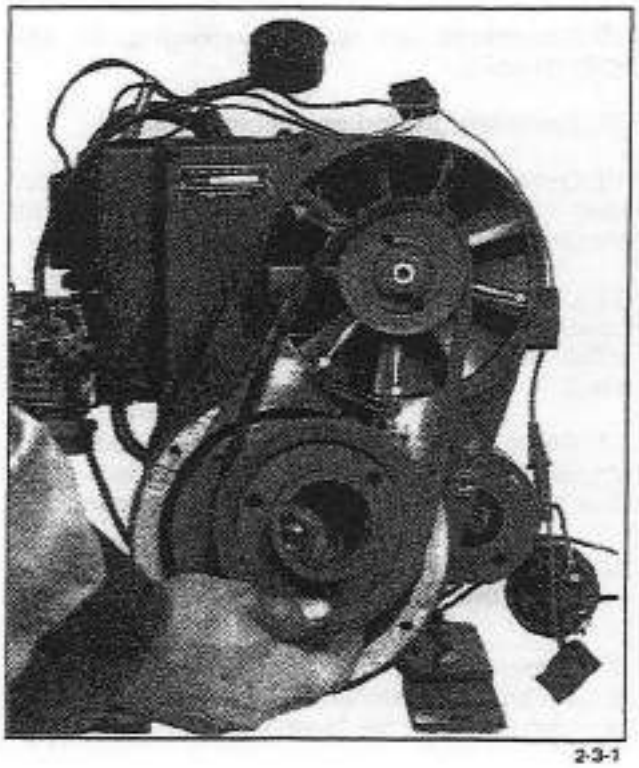
8. Remove the two (2) bolts securing upper column to frame. Remove upper column assembly from vehicle.

9. Remove the four (4) engine mount nuts and washers and lift engine from vehicle.

DISASSEMBLY

1. Remove muffler (if applicable), spark plugs, drive pulley, carburetor(s), fan protector and rewind starter.

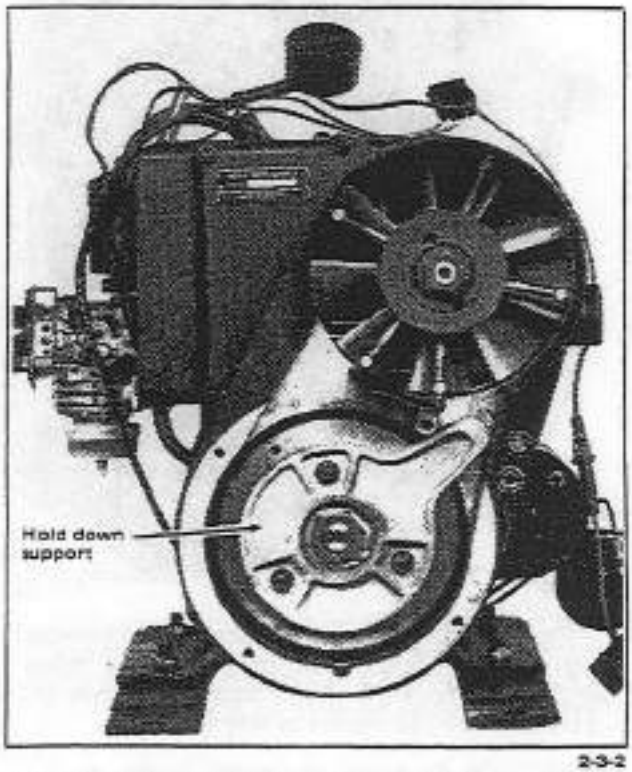
2. Remove the three (3) nuts and washers affixing "V" belt pulley to magneto ring plate studs. Remove "V" belt and the pulley (fig. 2-3-1).



2-3-1

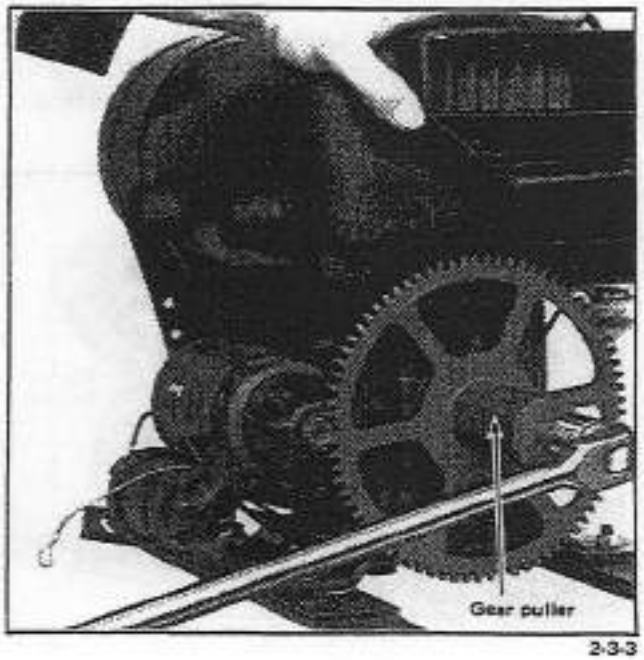
3. Straighten the locking washer located behind the magneto nut.

4. Position the crankshaft hold down support on the three (3) magneto ring plate studs. Secure the wrench in location using the three (3) nuts previously removed from the "V" belt pulley (fig. 2-3-2).



2-3-2

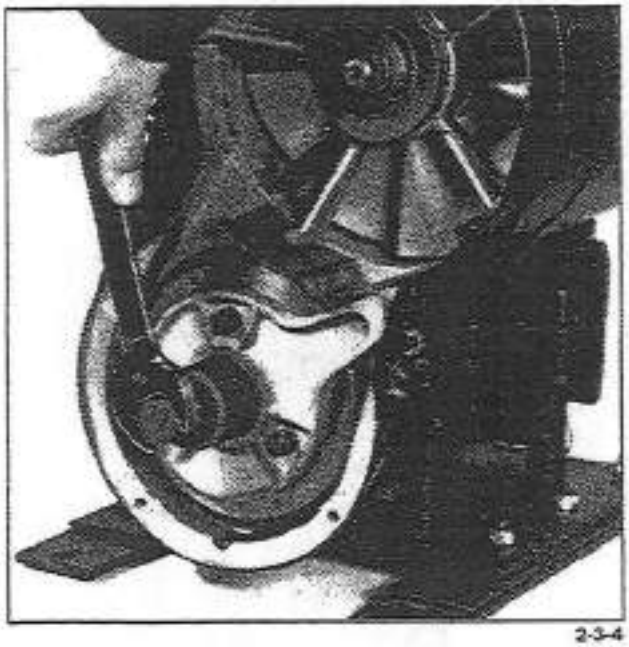
NOTE: On electric start engines, remove shim(s), spacer and starter gear using an appropriate starter gear puller (fig. 2-3-3).



2-3-3

5. Using a socket wrench, remove the magneto nut.

6. Using the appropriate flywheel puller, remove the magneto housing (fig. 2-3-4). Remove puller and wrench from magneto ring plate.

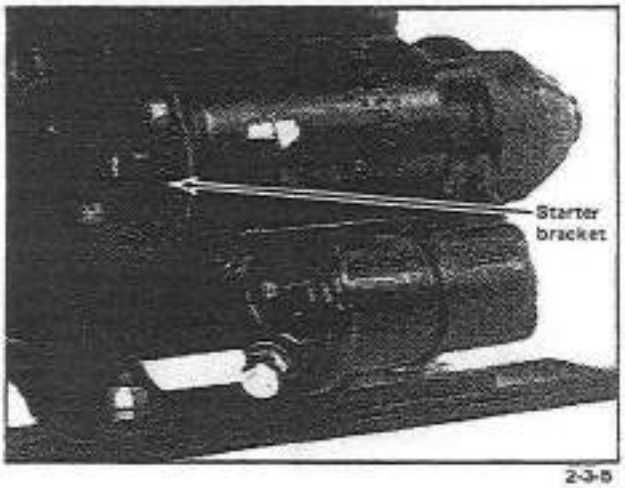


2-3-4

7. Remove the flat end screw, centrifugal weight and spring from magneto ring plate. Remove the four (4) Allen head capscrews and washers to remove magneto ring plate.

CAUTION: Never place magneto down on a bare surface as dirt and/or metal particles can affect the magneto ring efficiency. Always place the magneto on a dry, clean cloth.

8. On electric start engines, remove the nuts and washers affixing the electric starter and starter bracket to the engine. Remove starter and bracket (fig. 2-3-5).



2-3-5

9. On engines equipped with a single cylinder cowl, carry out the following procedure:

(a) Remove the bolt(s) and washer(s) securing cylinder cowl to cylinder head distance nut.

NOTE: On T'NT 440 model, remove the right side cylinder head distance nut.

(b) Remove the three (3) screws and washers attaching fan housing to cylinder cowl. Remove the cylinder cowl.

10. On engines equipped with double cylinder cowl, carry out the following procedure:

(a) Remove the bolt(s) and washer(s) securing the exhaust side cylinder cowl to cylinder head distance nut.
(b) Remove the two (2) screws and washers affixing fan housing to the exhaust side cylinder cowl.
(c) Remove the nut attaching cylinder cowl stud and remove the stud.
(d) Remove the exhaust side cylinder cowl from engine.

11. On vehicles equipped with engine console, remove console by removing the Allen head capscrews securing the console to cylinder cowl.

12. ON T'NT 340 and Olympique 399 models, remove the throttle cable bracket from cylinder cowl.

13. Disconnect all electrical wiring at the ignition coils.

14. Remove the ignition coils from engine.

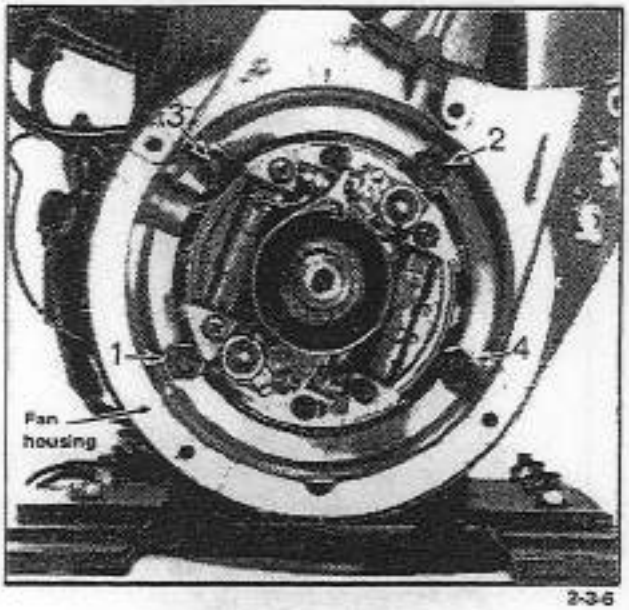
15. On engines equipped with a single cylinder cowl, remove the ignition coil bracket from crankcase.

16. On engine equipped with double cylinder cowls, remove the two (2) screws and washers affixing the fan housing to intake side cylinder cowl.

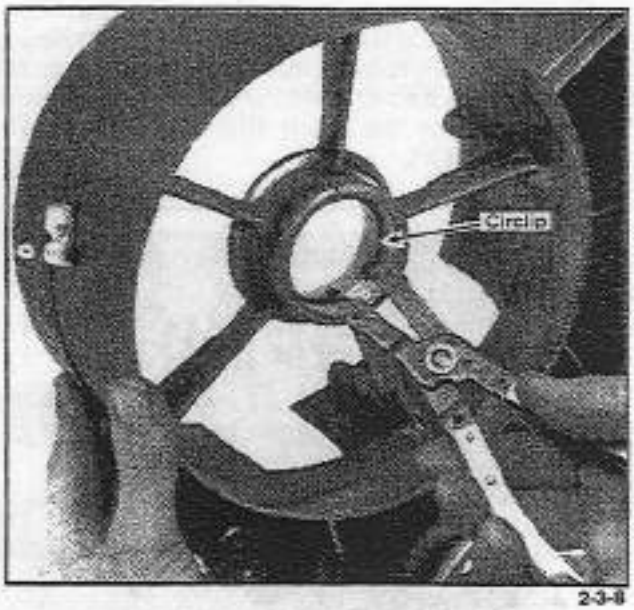
17. Remove the four (4) nuts and washers attaching fan housing to crankcase (fig. 2-3-6). Carefully remove fan housing from the engine.

18. Lock the fan in position using a fan holder wrench. Remove the fan nut (fig. 2-3-7).

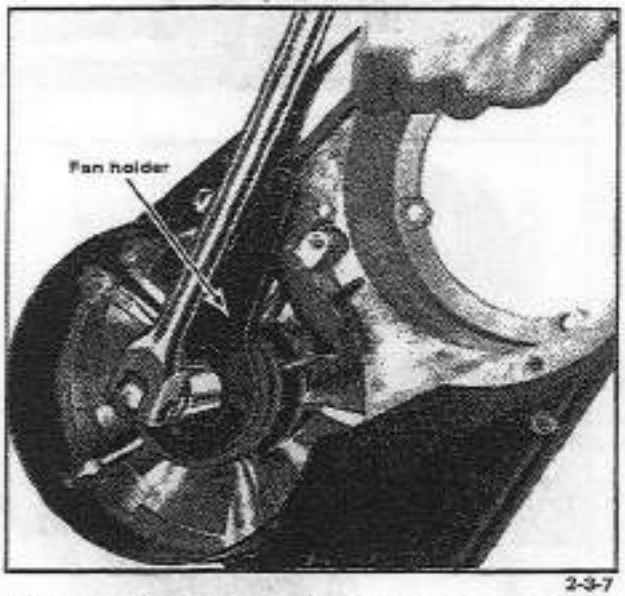
19. Remove the locking washer, outer half pulley, shims, inner half pulley, shims, woodruff key and fan from the fan housing.



2-3-6



2-3-8



2-3-7

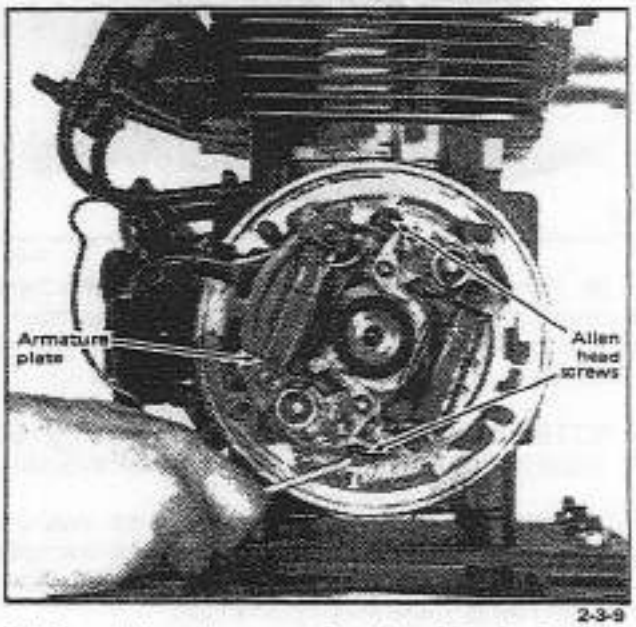
20. Heat the fan housing to 140° - 160° F. Remove the bearings from the fan housing.

NOTE: Two (2) shims positioned between the bearings are removed during bearing removal.

21. Using needle pliers, remove circlip from fan housing (fig. 2-3-8).

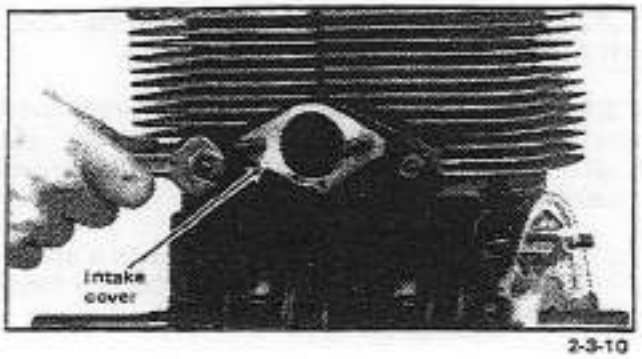
22. Remove the woodruff key from the magneto crankshaft extension. To do this, first press the cam towards the armature plate and hold it in position. Using a pin punch and a hammer, drive the woodruff key from the crankshaft. Remove cam, cam spring and washer from crankshaft.

23. Remove armature plate from crankcase by removing two (2) Allen head screws and four (4) washers (fig. 2-3-9).



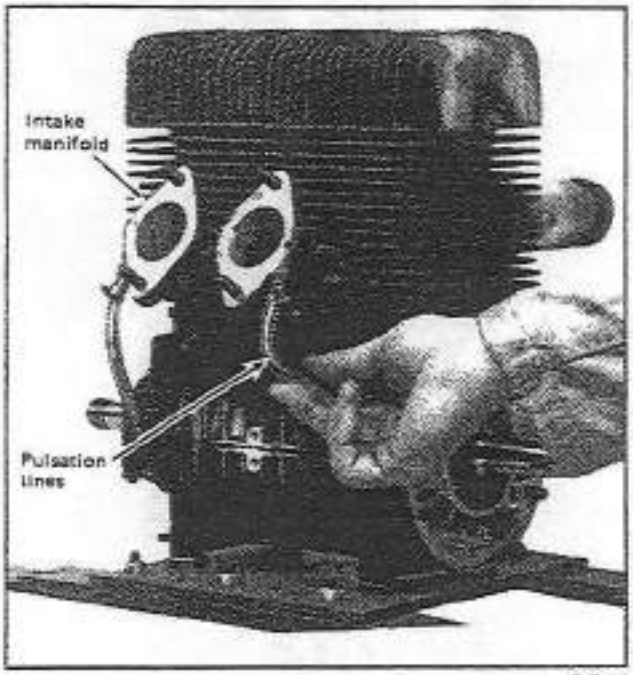
2-3-9

24. On all engines equipped with single carburetor, remove the two (2) nuts and washers affixing the intake cover and intake manifold to cylinder (fig. 2-3-10). Remove air baffle (440 models only), cover, manifold and gaskets from studs. Discard gaskets.



2-3-10

25. On engines equipped with twin carburetors, remove the two (2) nuts and washers affixing the intake manifold to cylinder. Disconnect the two (2) pulsation lines at the crankcase. Remove manifold from the studs (fig. 2-3-11). Discard manifold gasket.



2-3-11

26. Remove the four (4) nuts and washers securing the exhaust flanges to cylinders. Remove flanges and gaskets. Discard flange gaskets.

NOTE: On all 340, 399 and 440 engines, unscrew the exhaust sockets from the cylinder.

27. Remove the eight (8) nuts and washers holding the cylinder heads in position. Remove cylinder heads. Always loosen head nuts in a criss-cross pattern a sixth-turn each.

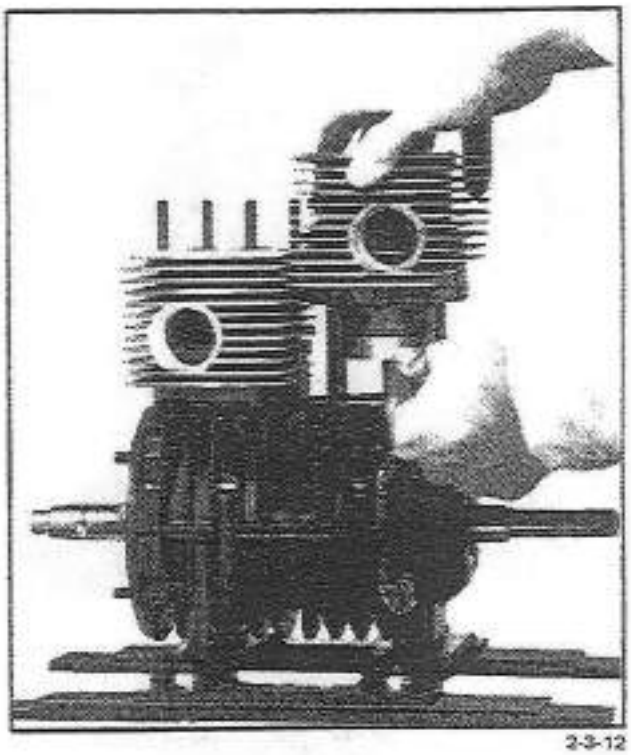
CAUTION: Identify the location of the distance nuts for Assembly procedure.

28. Remove and discard the cylinder head gaskets.

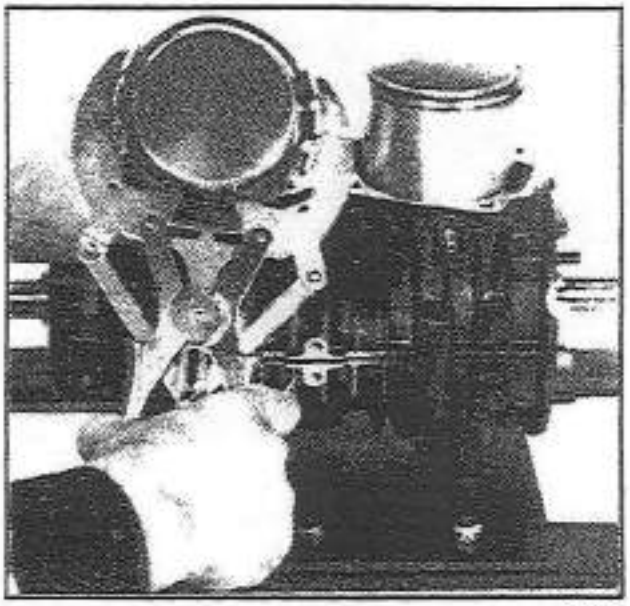
29. Carefully lift the cylinders from the studs (fig. 2-3-12).

30. Using two (2) of the previously removed cylinder head nuts, unscrew the eight (8) cylinder studs. Remove crankcase/cylinder gaskets and discard.

31. Gently open the piston ring(s) with a piston ring expander tool until they can be slid from the piston grooves (fig. 2-3-13).



2-3-12



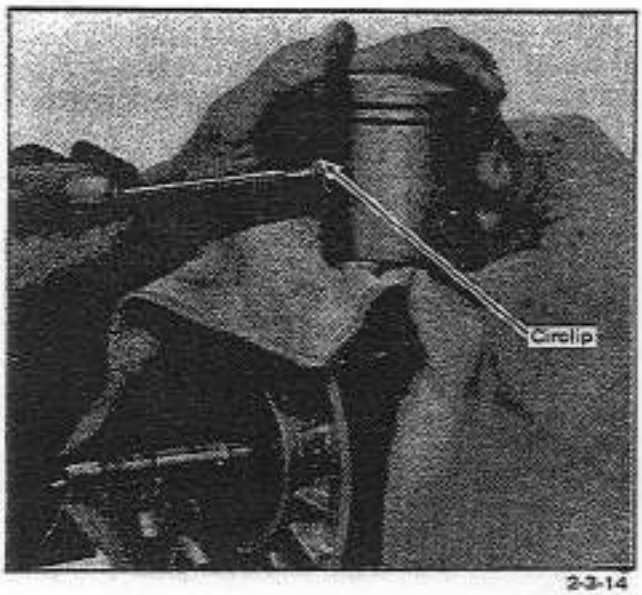
2-3-13

CAUTION: Do not spread the rings open too far as breakage can occur.

NOTE: Identify each piston ring as to location on which groove and which piston it is installed.

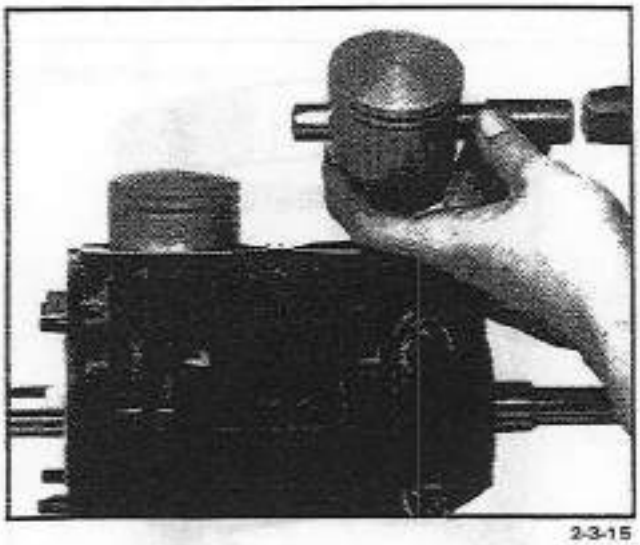
32. Using a pointed tool, remove the circlips from the pistons.

NOTE: During removal of circlips, a clean, dry cloth must be laid over the crankcase to prevent foreign matter falling inside the crankcase (fig. 2-3-14).



2-3-14

33. Using a suitable mounting bar and a hammer, drive the gudgeon pins through the needle cages and remove the pistons. Remove gudgeon pins (fig. 2-3-15).



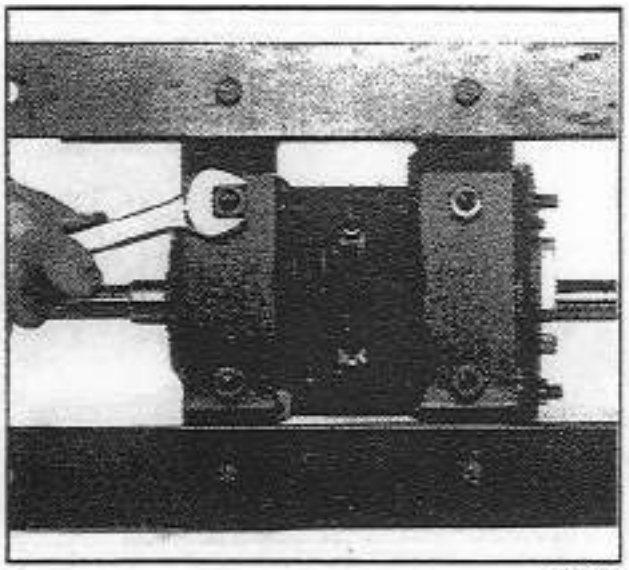
2-3-15

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

34. Slide the needle cages from the connecting rods.

35. Lay the crankcase on its side and remove the four (4) nuts and washers attaching the engine support to the crankcase (fig. 2-3-16). Remove the four (4) spacers (if applicable to engine).

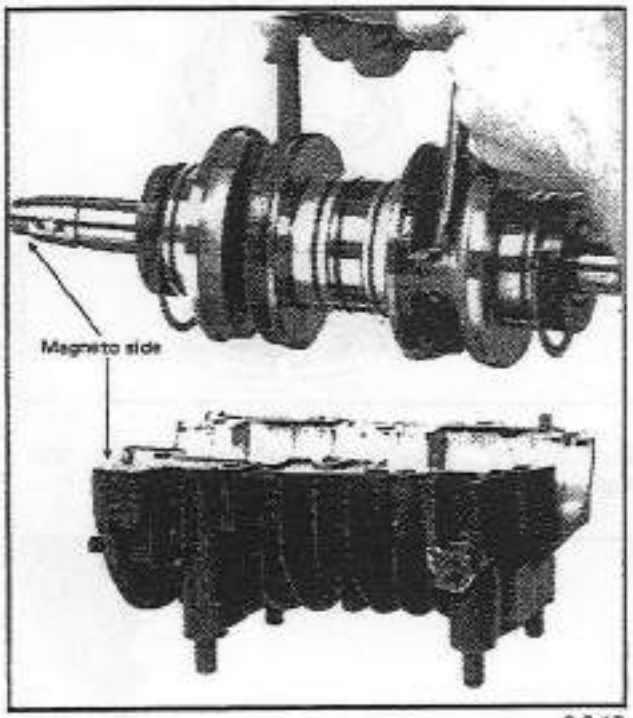
NOTE: Do not disassemble the engine support assembly unless warped or damaged and replacement is indicated.



2-3-16

36. Remove the nuts and washers from the crankcase base.

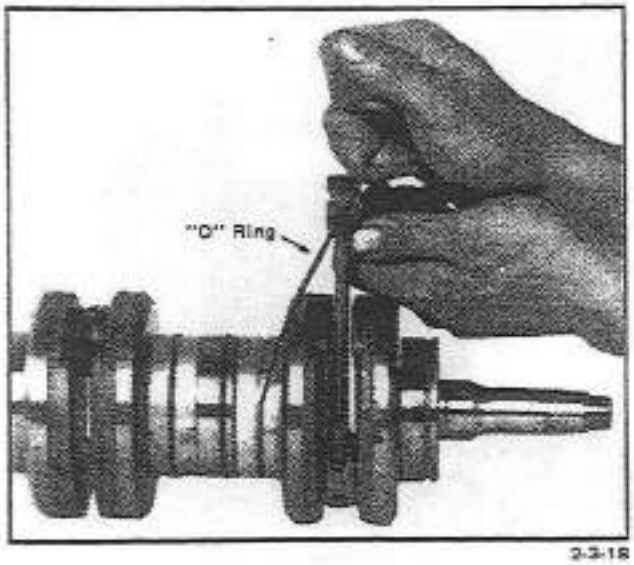
37. Using a soft faced hammer, gently tap the crankcase until the halves separate. Remove upper crankcase half and lift crankshaft from lower half (fig. 2-3-17).



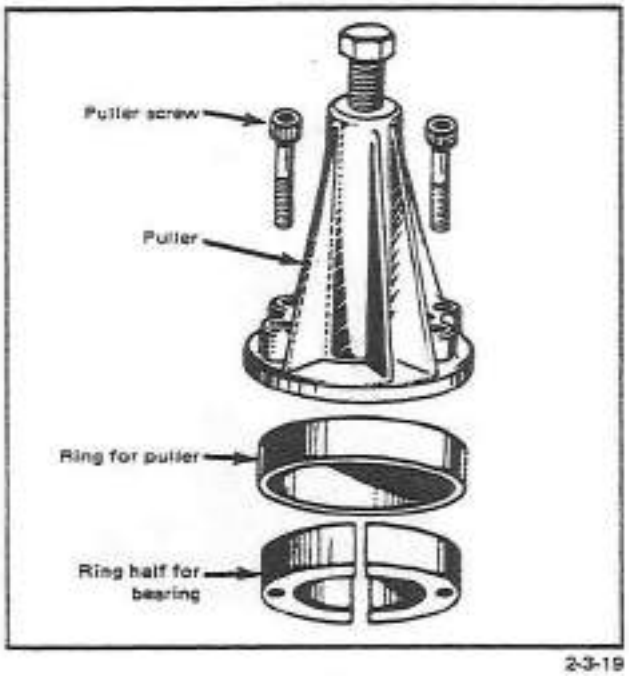
2-3-17

38. Remove oil seals, retainer rings, groove ring (440 models only) and "O" rings (fig. 2-3-18).

NOTE: To remove P.T.O. oil seal on 640 and 775 T'NT engines, the P.T.O. outer bearing must first be removed with the appropriate bearing puller (fig. 2-3-19).

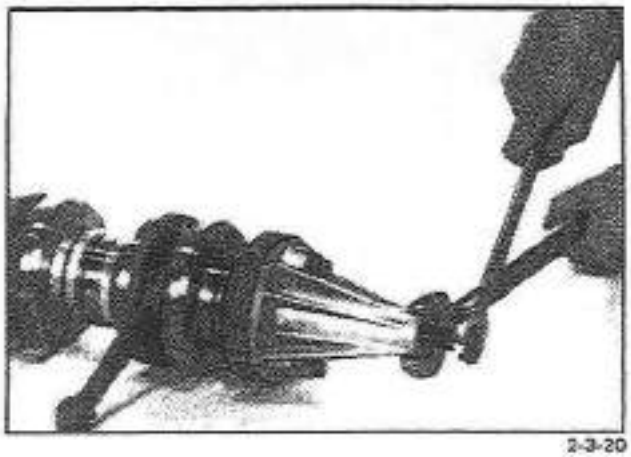


2-3-18



2-3-19

39. Remove crankshaft bearings using the appropriate puller (fig. 2-3-20).



2-3-20

NOTE: Do not remove crankcase studs unless damaged or worn. If replacement is necessary, remove studs using two (2) previously removed nuts.

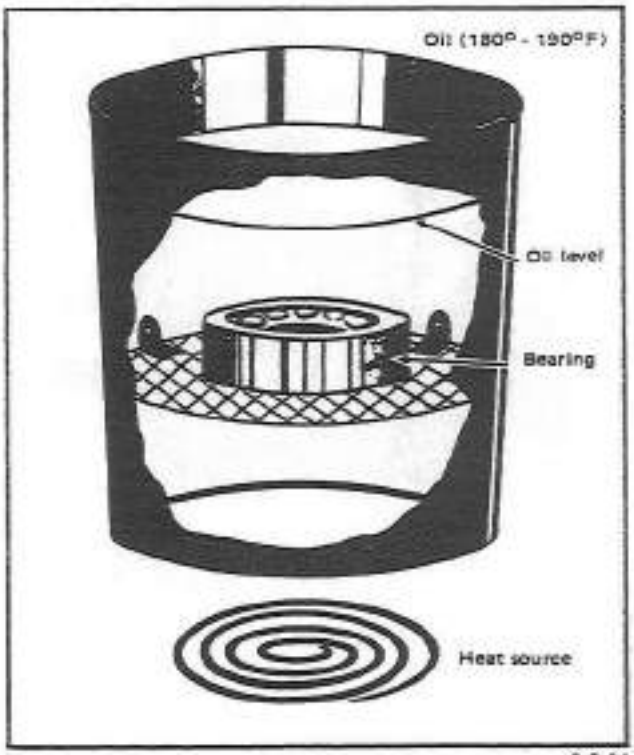
ASSEMBLY

1. Prior to Assembly procedure, ensure all components have been cleaned, inspected, repaired and/or replaced as detailed in sub-section 2-8.

NOTE: Crankcase are fabricated in two (2) matched halves. For this reason, single crankcase halves are not interchangeable and are not purchasable as single halves.

2. Assemble crankshaft and determine end play as follows:

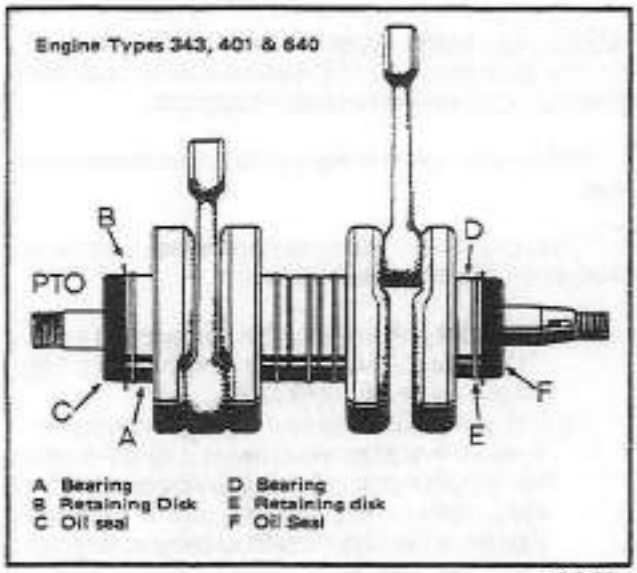
(a) Place crankshaft bearings into an oil container and heat the oil to 180°-190° F. Figure 2-3-21 shows the method of heating the bearing.



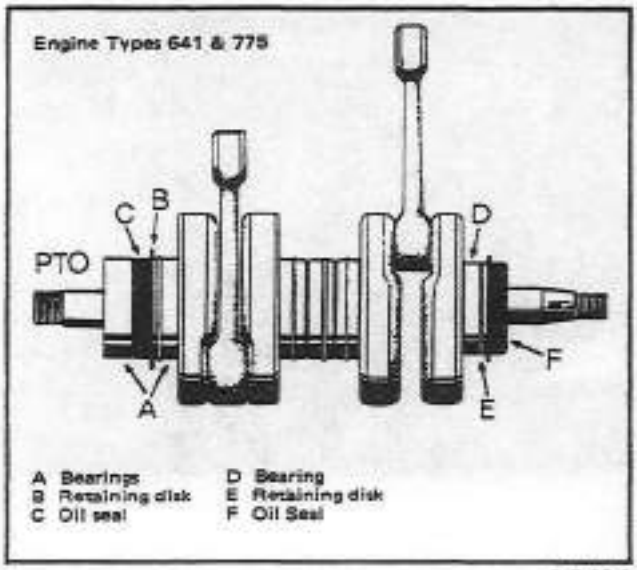
2-3-21

(b) Slide the appropriate bearings, retainer washers, new "O" rings and new oil seals onto the crankshaft extensions (fig. 2-3-22).

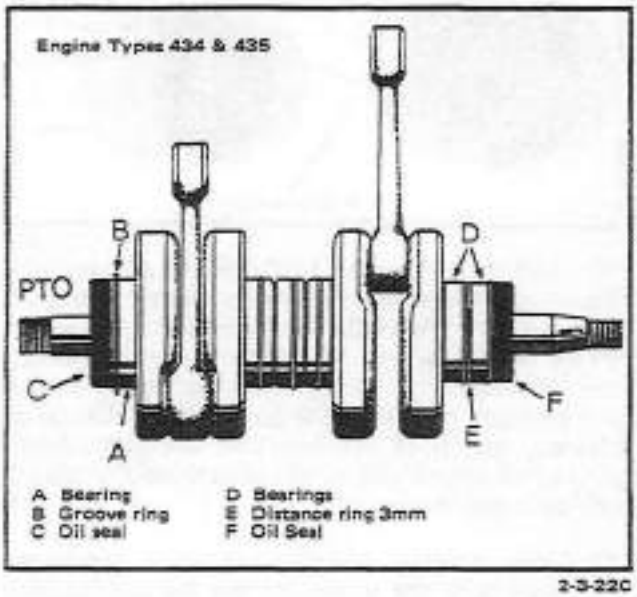
(c) Excluding the 440 engine, place the crankshaft into the lower crankcase half ensuring the P.T.O. extension is located at the P.T.O. side of crankcase.



2-3-22A



2-3-22-B

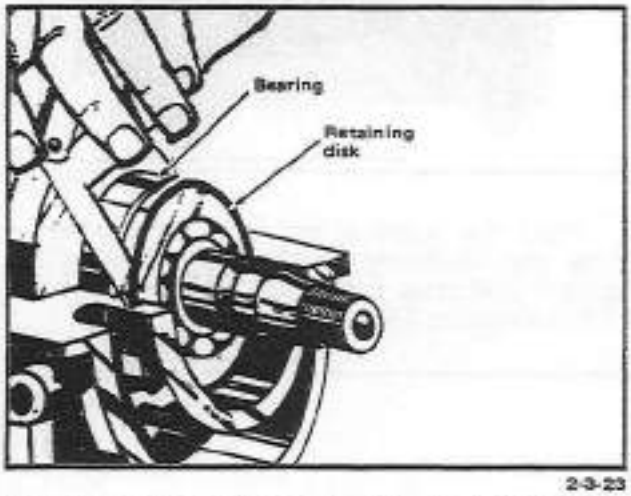


2-3-22C

NOTE: The following step is not applicable to 440 engines because of the crankshaft being held on P.T.O. side with a bearing thereby controlling crankshaft tolerance.

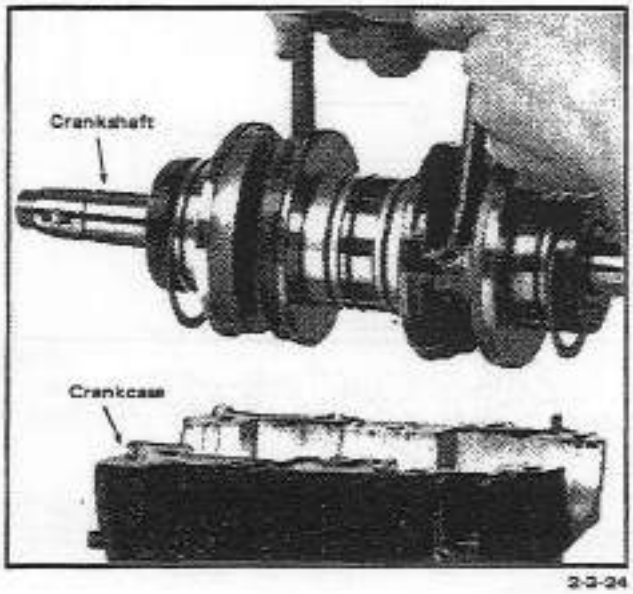
(d) Insert a screwdriver blade between magneto crankshaft blade and crankcase and push the crankshaft assembly toward P.T.O. side of crankcase.

Any free play between retaining disk and the leading edge of the bearing located between the retainer disk and magneto crankshaft blades, minus tolerance of .006 to .016 inch is the distance to be covered with shims. The shims must be equally positioned between magneto crankshaft blade and bearing and P.T.O. crankshaft and bearing (fig. 2-3-23).



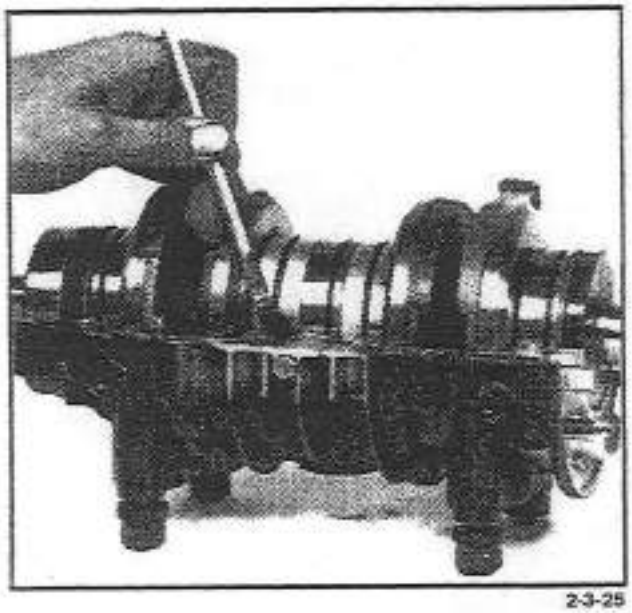
2-3-23

3. Heat the crankcase halves to 180°-200° F. Place the crankshaft assembly into crankcase with the magneto crankshaft extension on magneto side of lower crankcase half (fig. 2-3-24).



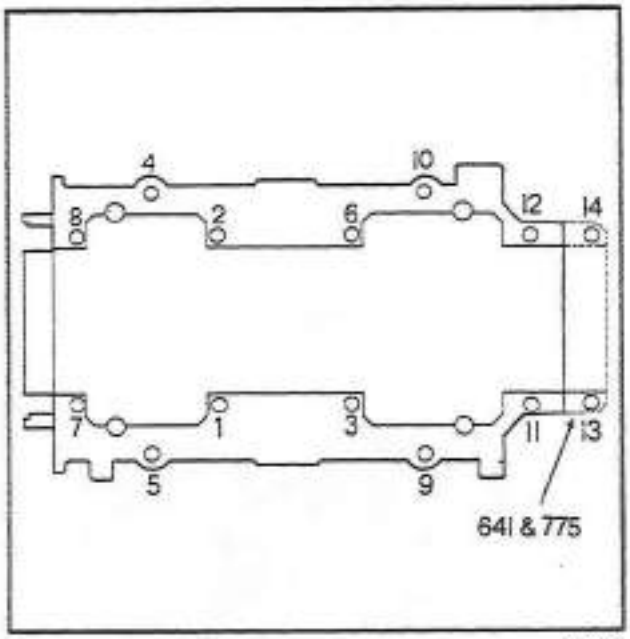
2-3-24

4. Apply L 700 adhesive over the contact surface of lower crankcase half and position upper half in location (fig. 2-3-25).



2-3-25

5. Place the washers and nuts on crankcase studs and following the sequence shown in figure 2-3-26 cross torque the crankcase nuts to 10 ft/lbs then to 16 ft/lbs.



2-3-26

6. On electric models, affix the starter and starter bracket to crankcase using the appropriate screws.

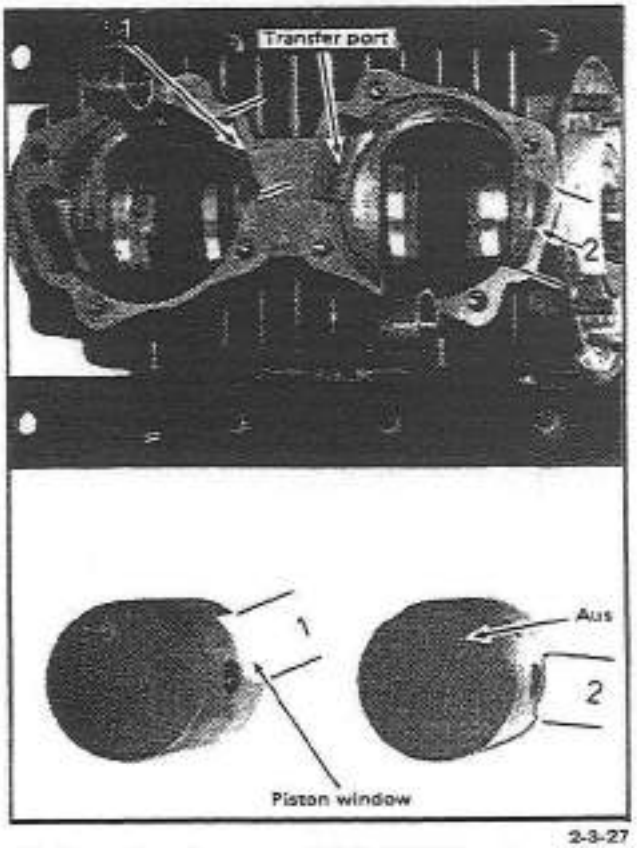
7. Affix the engine support to crankcase using four (4) nuts and washers. Torque M 10 stud nuts to 18 to 23 ft/lbs and M 12 stud nuts to 21 to 30 ft/lbs.

NOTE: On engine types equipped with spacers, ensure that the four (4) spacers are in position between crankcase and engine supports.

8. Slide the needle cages into the connecting rods.

9. Identify each piston as to correct cylinder installation position as follows:

(a) Place the piston on the connecting rod. The mark AUS must point to the exhaust side of crankcase.
(b) The piston is correct for that cylinder — when the piston window is aligned with the transfer port of the crankcase surface and when the gudgeon pin orifice is aligned with the needle cage/connecting rod (fig. 2-3-27).

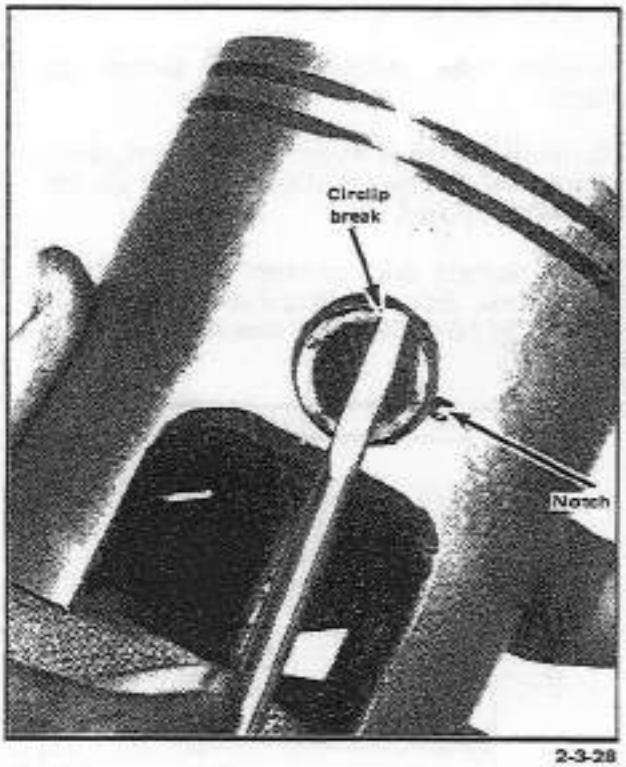


2-3-27

10. Heat the pistons to 140°-150°F and partially insert the gudgeon pins. Place the pistons over connecting rods with the letters AUS over an arrow on the piston dome facing in direction of the exhaust port. Using a mounting bar, align the gudgeon pins with the connecting rods. Once aligned, complete the insertion of the gudgeon pins until the circlip notch at each end of piston orifice is visible.

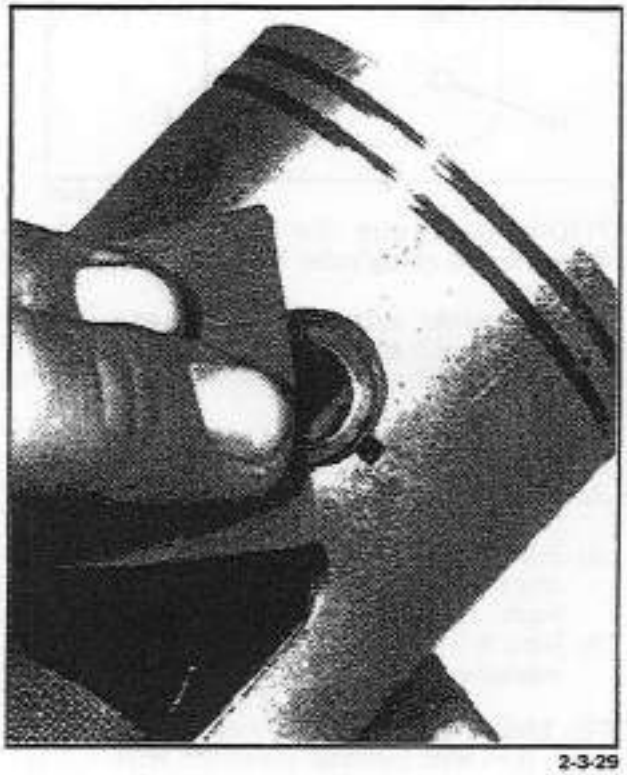
11. Place a dry, clean cloth over crankcase exposing only the pistons. Press the circlips into

location. Once the circlips are locked into the appropriate grooves, turn each circlip so that the circlip break is not directly on circlip notch break (fig. 2-3-28).



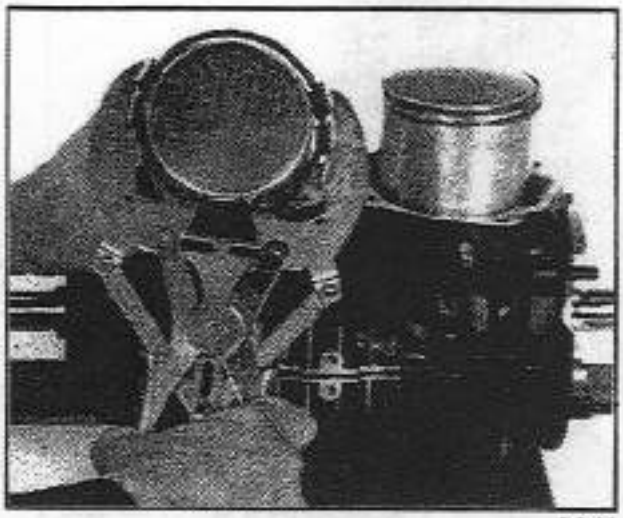
2-3-28

12. Using very fine emery cloth, remove any possible burrs on pistons caused through circlip installation (fig. 2-3-29).



2-3-29

13. Place the appropriate piston rings on the piston. Using a piston ring expander tool, open and position rings in proper grooves (fig. 2-3-30).



2-3-30

NOTE: Ensure the "V" ends of the rings sit correctly in the ring landings.

14. Place **new** crankcase/cylinder gaskets in location. Using two (2) engine head nuts, screw the eight (8) cylinder studs (longest threaded end) into crankcase until threads are well into crankcase.

15. Slide a cylinder on four (4) of the cylinder studs. Ensure the exhaust ports are facing exhaust side of engine.

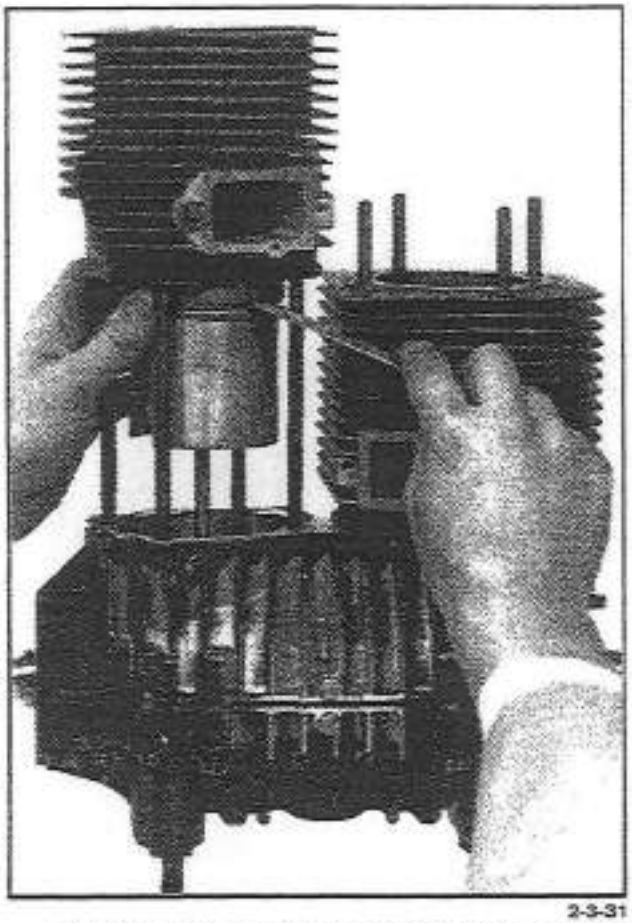
16. While carefully pushing the cylinder down, close the piston rings over the piston until each ring is compressed sufficiently to allow the cylinder to pass over it (fig. 2-3-31). After passing the piston into cylinder, continue pushing the cylinder down until seated on crankcase/cylinder gasket. Repeat steps 15 and 16 for other piston and cylinder.

17. Rotate crankshaft until piston domes are above the exhaust ports. Empty a tablespoon full of engine Ski-Doo oil onto pistons and allow it to spread evenly over pistons for 2 to 3 minutes.

18. Slowly rotate crankshaft to allow even oil distribution over cylinder walls. Wipe any spillage from cylinder tops using a clean, dry cloth.

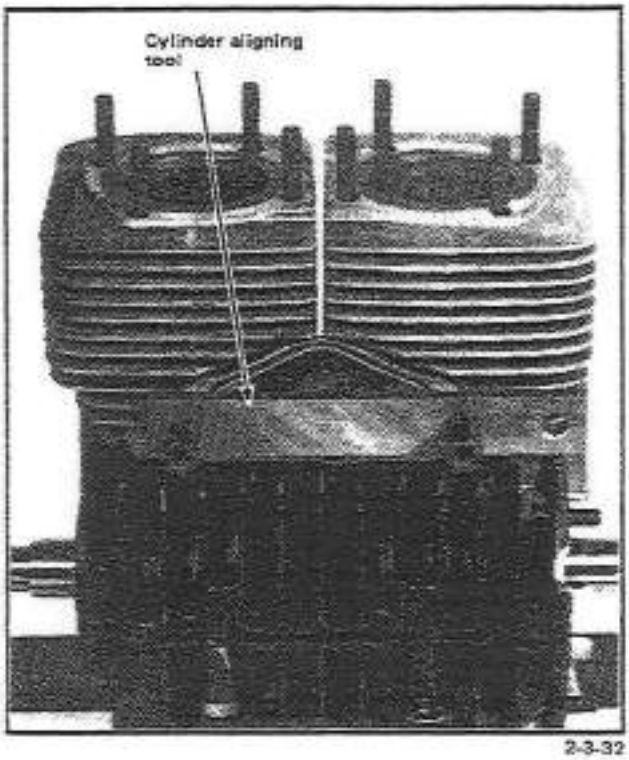
19. On all engines except T'NT 640 and 775, carry out the following:

(a) Position **new** intake gaskets on intake manifold. Place manifold on studs.



2-3-31

(b) Place the cylinder aligning tool on the studs and secure using the two (2) special distance nuts (fig 2-3-32).



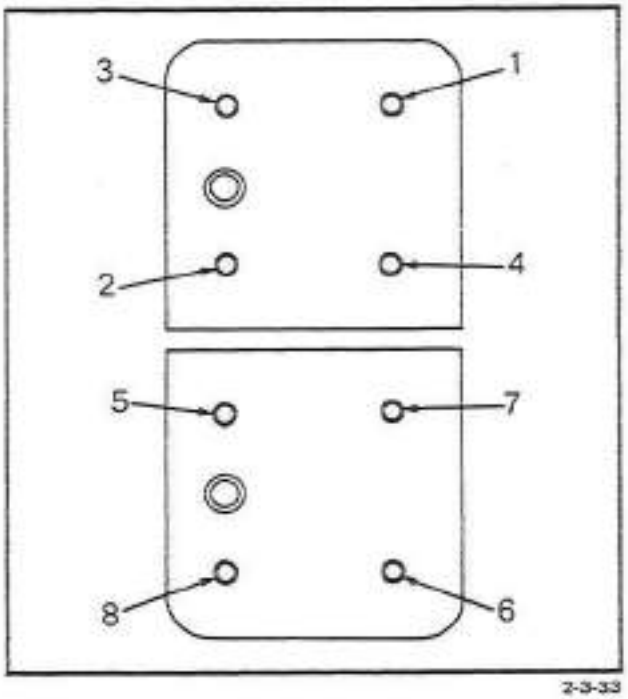
2-3-32

20. On T'NT 640 and 775 engines, position the intake manifold with the two (2) new intake geskets on cylinder studs. Secure using two (2) nuts and washers. Connect the two (2) pulsation lines to the crankcase.

21. Position new cylinder head gaskets on cylinders.

22. Correctly position cylinder heads on cylinders ensuring the spark plug holes are on the intake side of engine.

23. Place washers and cylinder head nuts on cylinder studs. Equally torque each nut to 10 ft/lbs then to 16 ft/lbs in the sequence shown in figure 2-3-33.



2-3-33

CAUTION: Make sure the distance nuts are correctly located on cylinder head(s).

24. On all engines except T'NT 640 and 775, unscrew the two (2) special distance nuts holding the cylinder aligning tool. Remove the aligning tool.

25. On 343, 401 and 640 engine types carry out the following:

(a) Press a new gasket ring into the intake manifold and place intake cover on studs.
(b) Secure in place using two (2) nuts and washers.

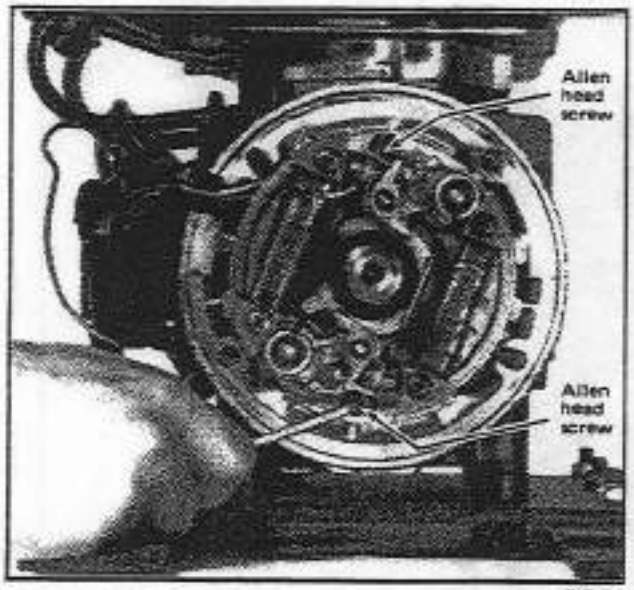
NOTE: Make sure to align intake manifold pulsation port with cylinder pulsation port.

26. Install the exhaust socket flanges to the cylinders using new exhaust gaskets and four (4) nuts and washers.

NOTE: On 340, 399 and 440 engines (with the incorporated socket/flange), firmly screw sockets into the cylinders.

CAUTION: Ensure the shorter socket is positioned on the P.T.O. side of engine.

27. Temporarily affix armature plate to crankcase using the appropriate screws (fig. 2-3-34).



2-3-34

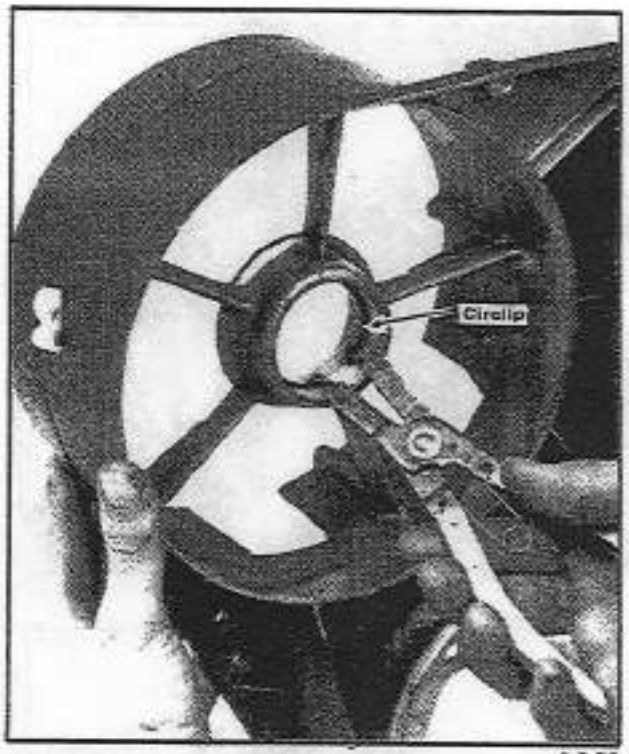
28. Using needle pliers, insert the circlip into the groove of the fan housing hub (fig. 2-3-35). Heat fan housing to 140°-160°F. Lubricate the fan bearings with light machine oil and press one of the bearings into the hub. Invert fan housing, position the two (2) washers on inner race of installed bearing and press the second bearing in location. Ensure that the bearing shields are faced outward. Slide the fan shaft into appropriate side of fan housing.

29. Position the fan housing on the crankcase and secure using four (4) nuts and washers (fig. 2-3-36).

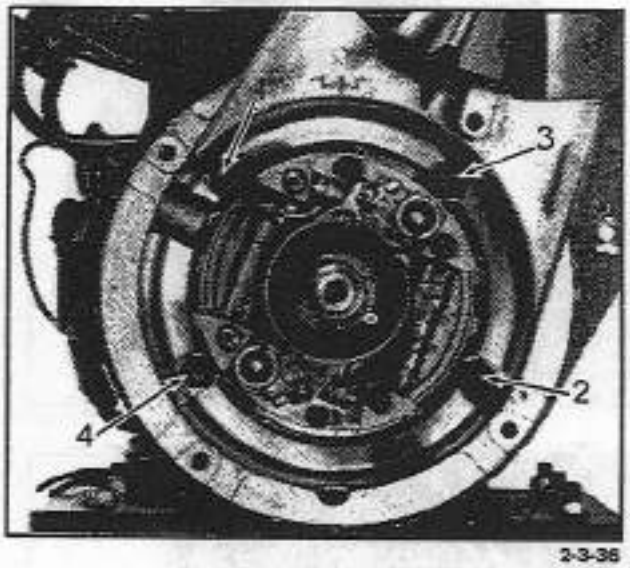
NOTE: Make sure that the armature plate wiring passes through the appropriate crankcase/fan housing notch without "squeezing" the wiring. Press in the rubber grommet.

30. Slide the washer and cam spring onto magneto crankshaft extension.

31. Using low temperature grease, lubricate the internal channel of the cam. Position cam in location and secure using a woodruff key.



2-3-35

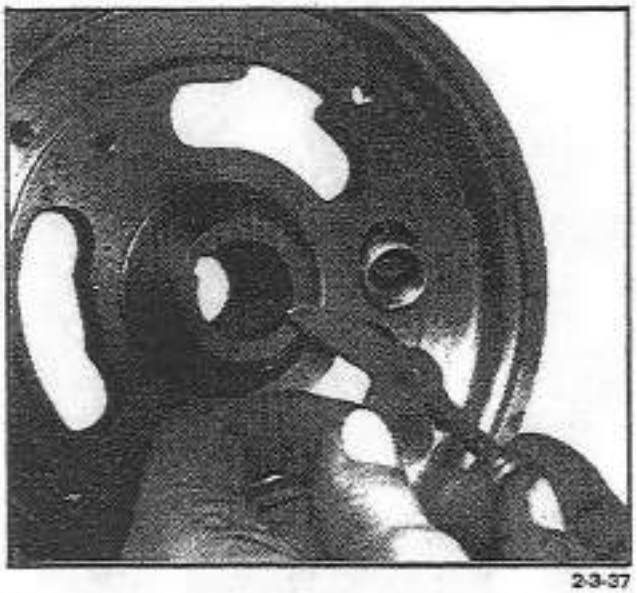


2-3-36

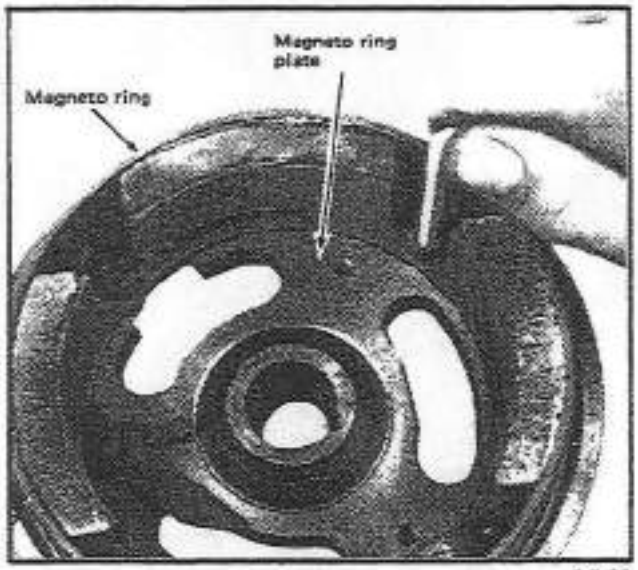
32. Apply a small amount of low temperature grease into spring seating of magneto ring plate. Install spring and centrifugal lever using appropriate flat end screw (fig. 2-3-37).

33. Position magneto ring onto magneto ring plate and secure using four (4) Allen head capscrews and washers (fig. 2-3-38). Avoid placing magneto ring on a bare surface.

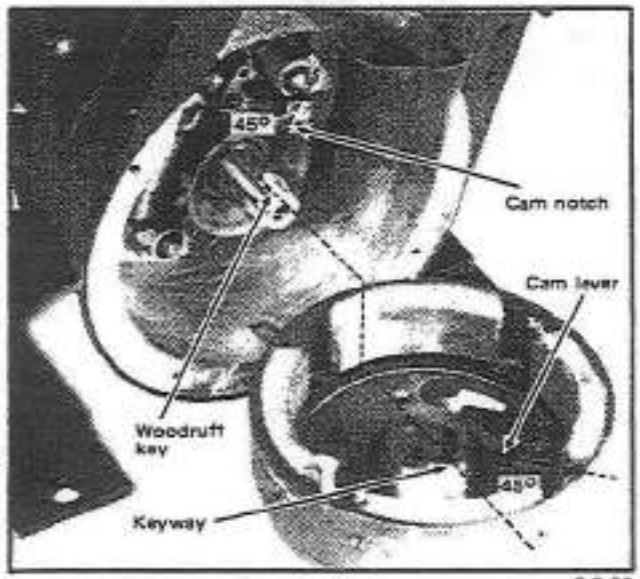
34. Turn crankshaft until woodruff key faces up. Rotate cam clockwise until cam notch is 45° from woodruff key. Position magneto ring on crankshaft with the keyway aligned with the woodruff key (fig. 2-3-39).



2-3-37



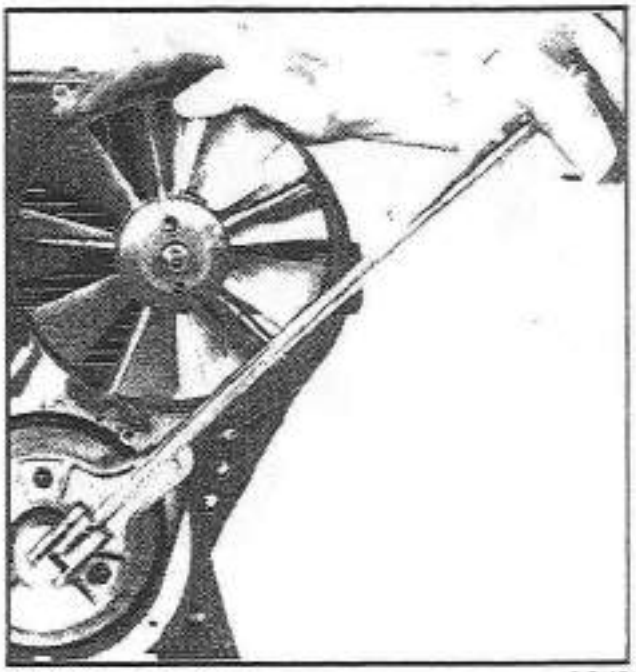
2-3-38



2-3-39

35. Test automatic spark advance mechanism (centrifugal weight) by slightly rotating cam lobe to activate the centrifugal weight. The mechanism should operate freely without catching or binding.

36. Position lock washer and magneto nut on crankshaft. Place crankshaft hold down support on magneto ring plate studs and temporarily secure using the three (3) starting pulley nuts. Using a torque wrench, tighten the magneto nut to 50 ft/lbs. Remove crankshaft hold down support (fig. 2-3-40).



2-3-40

37. Bend the lock washer over the magneto nut.

38. On engine equipped with a double cylinder cowl, install intake side carburetor cowl on engine using two (2) screws and washers.

39. Install the ignition coils to the engine using the appropriate screws and washers. Connect the electrical wiring to ignition coils.

NOTE: On engine equipped with single cylinder cowl, the ignition coil bracket must be installed on crankcase prior to ignition coil installation.

40. On 440 engines, carry out the following:

(a) Press a new gasket ring onto the intake manifold and place intake cover on studs.
(b) Place the air baffle on studs and fix the magneto side spark plug wire by installing a wire clamp over the right hand side stud.

(c) Secure in place using two (2) nuts and washers.

NOTE: Make sure to align intake manifold pulsation port with cylinder pulsation port.

41. On engine equipped with single cylinder cowl, position cowl and affix to engine with appropriate screws, bolts and washers.

NOTE: On T'NT 440 model, install spring, retainer bracket on cylinder head distance nut.

42. On all other engines, position exhaust side cylinder cowl in location and secure using two (2) screws and washers and the cylinder head/cylinder cowl bolt. Install cylinder cowl stud.

NOTE: On T'NT 340 model, install spring retainer bracket and spacer on cylinder head distance nut.

43. On T'NT 340 model, install throttle cable bracket to cylinder cowl with one (1) bolt and nut.

44. On vehicles equipped with an engine console, position console in location and secure using Allen head capscrews.

45. Carry out engine timing.

46. Install carburetor(s), drive pulley and spark plugs.

47. Install starting pulley on magneto ring plate studs using three (3) washers and nuts.

48. Place a shim, woodruff key, inner pulley half, shims, "V" belt, outer pulley half, locking washer and nut on fan shaft.

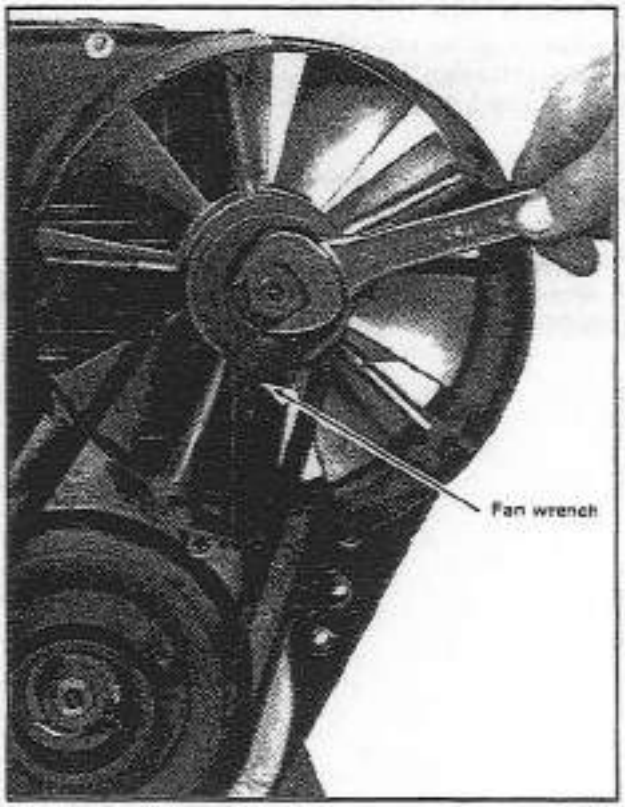
49. Install fan wrench and firmly tighten the fan shaft nut (fig. 2-3-41).

50. Check if the belt has 1/4 inch free play (fig. 2-3-42). Should the "V" belt have incorrect free play correction can be made by installing/or removing shims between the inner and outer pulley halves. Torque the fan shaft nut to 12 to 17 ft/lbs. using a torque wrench and fan holder wrench. Remove fan holder wrench.

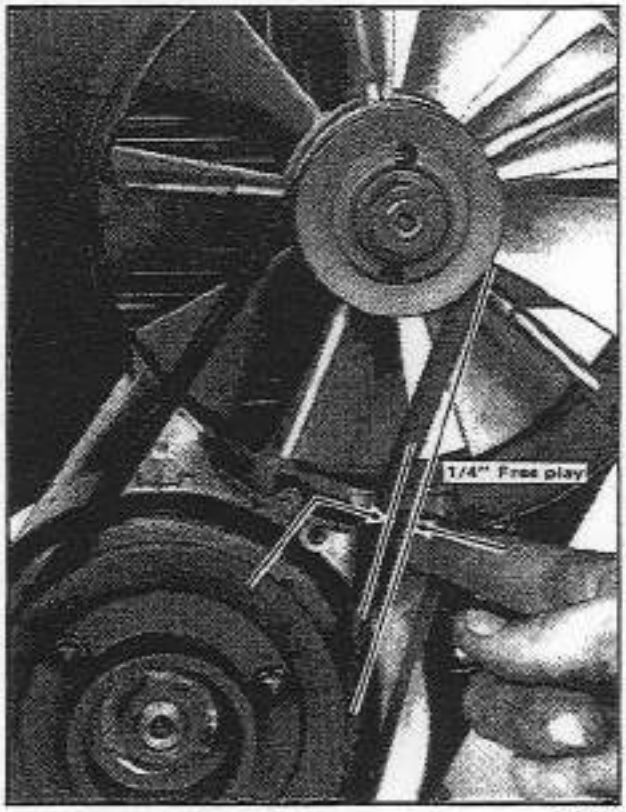
51. Press the fan protector onto fan housing.

52. On all models, except 340 and 440 T'NT, install muffler.

NOTE: On T'NT 340 and 440 models, install exhaust manifold on exhaust socket.



2-3-41



2-3-42

53. Install rewind starter using four (4) screws and washers.

INSTALLATION (All models)

To install engine on vehicle inverse removal procedure. However, special attention must be brought to the following:

1. Torque the engine mount nuts to 22 - 25 ft/lbs.

2. Position fuel lines between engine support and crankcase. The longest fuel line is used for the fuel return.

3. Check all electrical connection with the wiring diagrams included in this manual.

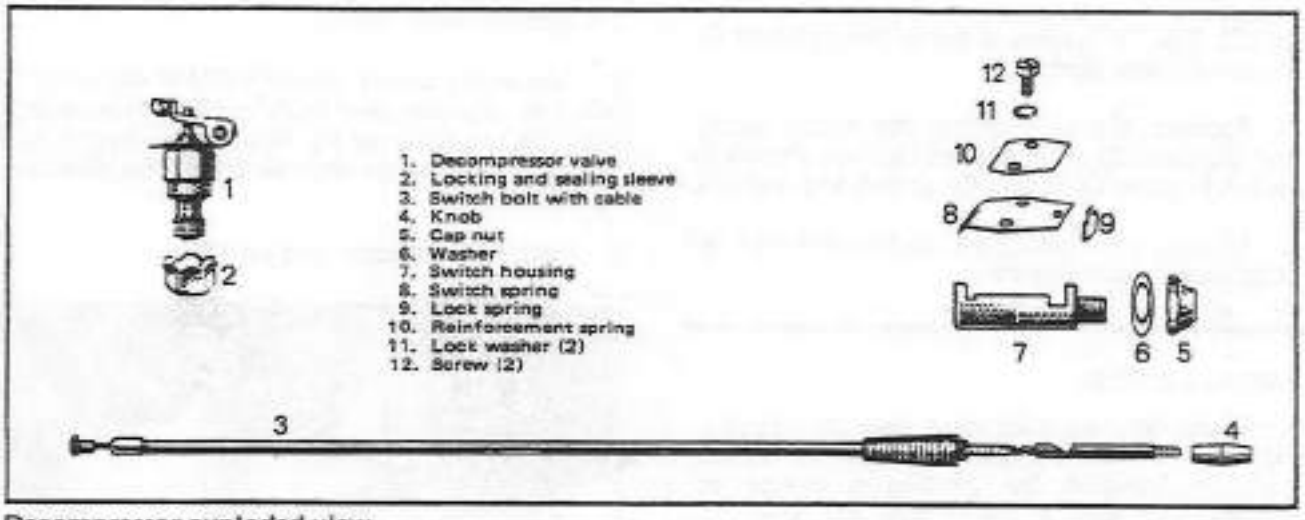
4. After brake cable installation proceed with brake adjustment.

5. Check pulley alignment.

6. On all T'NT models, always install new tab locks on the steering column retainer bracket nuts.

Engine

DECOMPRESSOR 2-4



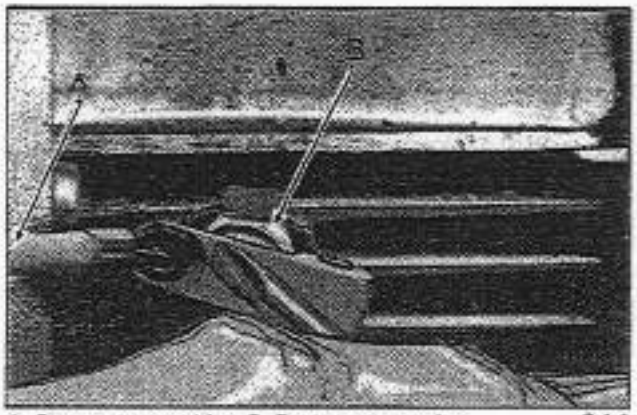
Decompressor exploded view

REMOVAL

1. Remove muffler.

2. Remove the two (2) screws and washers holding air deflector to fan cowl.

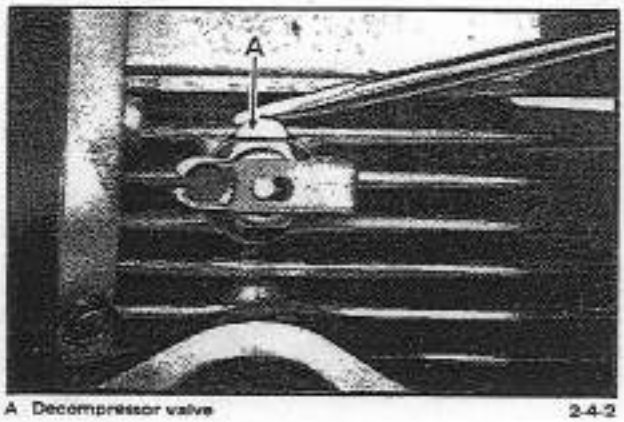
3. Push on decompressor valve and lift decompressor cable from valve lever notch (fig. 2-4-1).



A Decompressor cable B Decompressor valve 2-4-1

4. Lift cable ball from valve and remove decompressor cable. Remove air deflector from cable.

5. Unlock the locking and sealing sleeve and unscrew decompressor valve assembly from cylinder (fig. 2-4-2).



A Decompressor valve 2-4-2

6. Unscrew decompressor knob from decompressor switch.

7. Remove decompressor switch by unscrewing the nut. Remove washer.

DISASSEMBLY

1. Remove locking and sealing sleeve from decompressor valve assembly.

2. Remove the two (2) screws and washers attaching the two (2) reinforcement springs, the switch spring and the lock spring to the switch housing.

3. Unscrew switch bolt and cable from switch housing.

ASSEMBLY

1. Partially screw switch bolt and cable into switch housing.

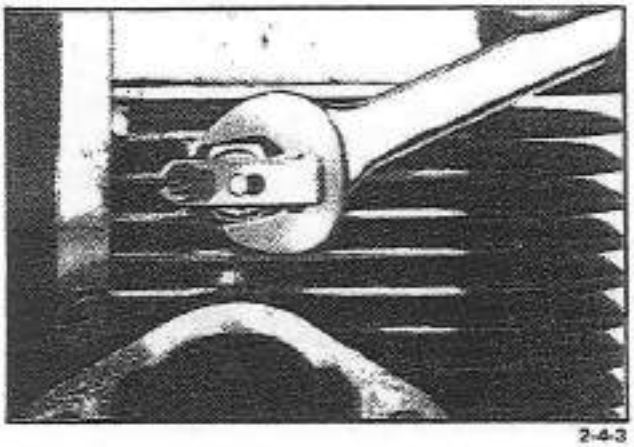
NOTE: The "V" recess of the switch bolt and cable should face upward.

2. Position the lock spring, the switch spring and the two (2) reinforcement springs. Secure to switch housing using two (2) screws and washers.

3. Install a new locking and sealing sleeve on decompressor valve assembly.

INSTALLATION

1. Screw decompressor valve assembly in cylinder (fig. 2-4-3). Torque valve to 10 ft/lbs. Lock in position by bending a section of locking and sealing sleeve over cylinder fin.



2-4-3

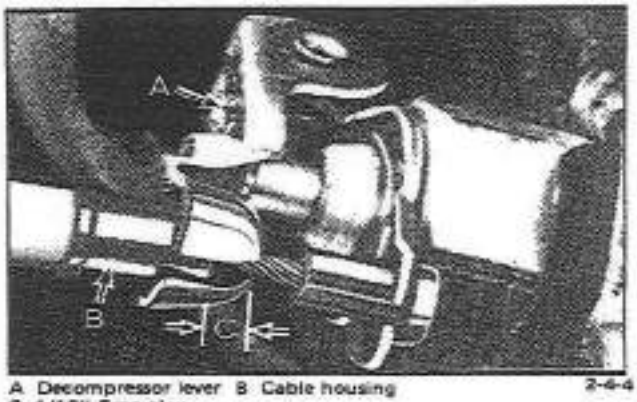
2. Insert decompressor cable through the air deflector.

3. Install cable ball in valve notch, and by pushing on lever, insert the cable housing in lever recess (see fig. 2-4-1).

4. Install decompressor switch and flat washer in dash panel and secure using support nut. Install decompressor knob.

5. Adjust the decompressor cable to obtain 1/16 inch free play between cable housing ferrule and lever. This is achieved by turning the switch cable in a clockwise or counter-clockwise direction (fig. 2-4-4).

6. Install air deflector and muffler.



A Decompressor lever B Cable housing
C 1/16" Free play

2-4-4

Engine

REWIND STARTER 2-5

For 1972 there are two (2) rewind starter models, one model incorporating a jam pin to lock the starter rope in the sheave the other, utilizing a key clamp. Identify the model installed on your vehicle and refer to the appropriate service procedure.

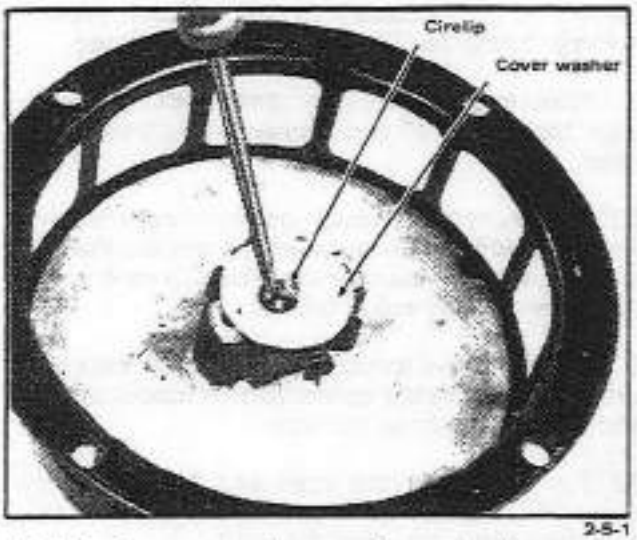
REMOVAL (jam pin model)

1. On one cylinder engines, remove plastic sieve from starter housing.

2. Remove the four (4) screws and washers attaching the rewind starter to fan cowl. Remove starter and place it on a worktable.

DISASSEMBLY

1. Using a small screwdriver, push the circlip holding the cover washer in location (fig. 2-5-1). Remove circlip, cover washer, friction spring, friction washer and pivoting arm assembly from the housing stud.



2-5-1

NOTE: Do not disassemble pivoting arm assembly unless damaged and replacement is indicated. If necessary to disassemble, press on spring and remove pawl spring stops, spring and pawls from pivot arm.

2. Pull the starter handle and remove rubber buffer from handle grip.

3. Dislodge the rope knot from the grip and cut the knot.

4. Slide the handle grip and rubber buffer from starting rope.

5. Remove "D" washer and rope sheave from the housing.

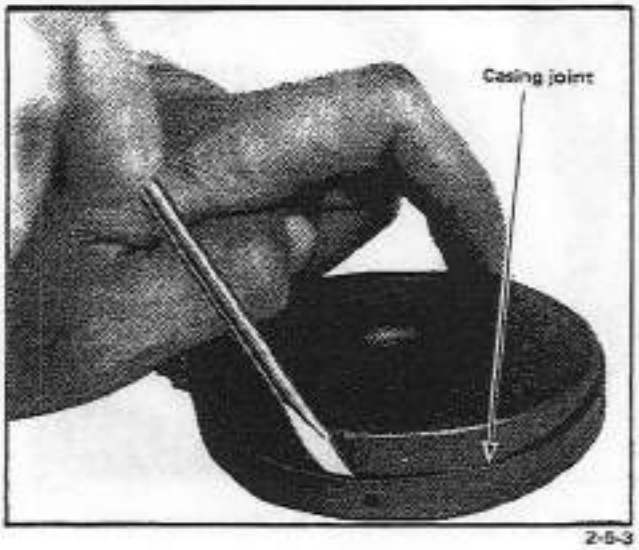
6. Unscrew the two (2) screws on the starter stop and remove the stop (fig. 2-5-2).

2-5-2

7. Unwind the starter rope and using a pair of long nose pliers, pull the rope from the sheave.

CAUTION: Take care not to loose the small jam pin that is enveloped in the rope end.

8. With a thin screwdriver inserted between casing halves of the spring cartridge assembly, pry the casing open (fig. 2-5-3).



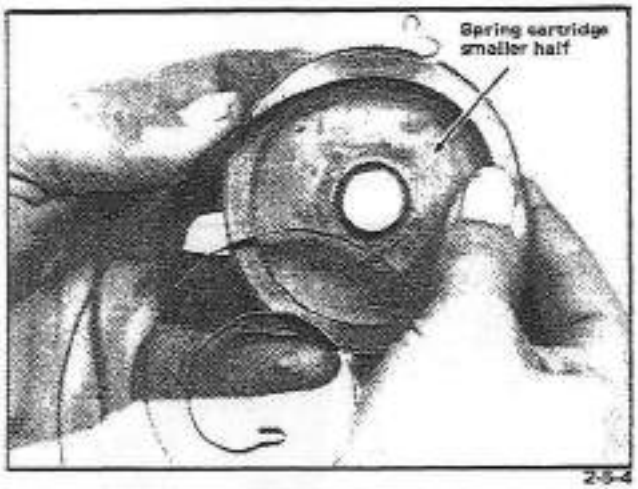
2-5-3

9. Remove the spring from the casing.

WARNING: The spring is wound tightly therefore, when removing it from the casing take great precaution as the spring will "fly open".

ASSEMBLY

1. Holding the smaller half of the cartridge casing in one hand, wind the spring into the casing notch (fig. 2-5-4).

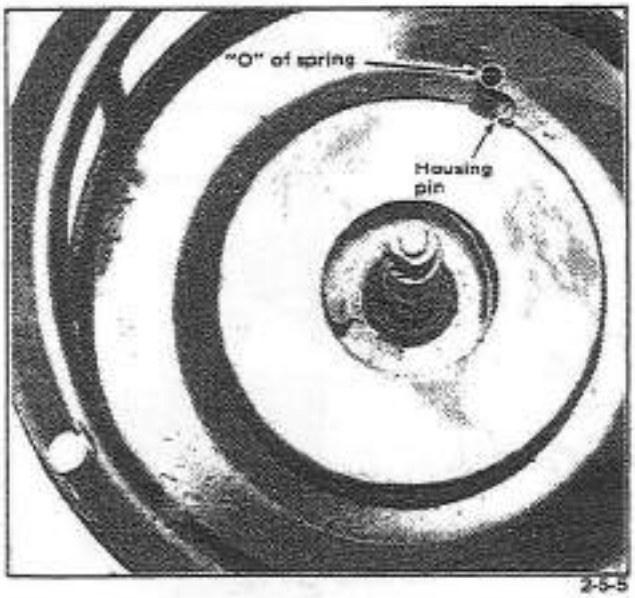


2-5-4

2. Apply low temperature grease on the rewind spring and spread it evenly with your fingers.

3. Reposition upper half of casing and with a soft faced hammer, gently tap on the casing until it snaps close.

4. Position spring cartridge assembly into housing ensuring the "O" of the spring is pointing counter-clockwise (fig. 2-5-5).

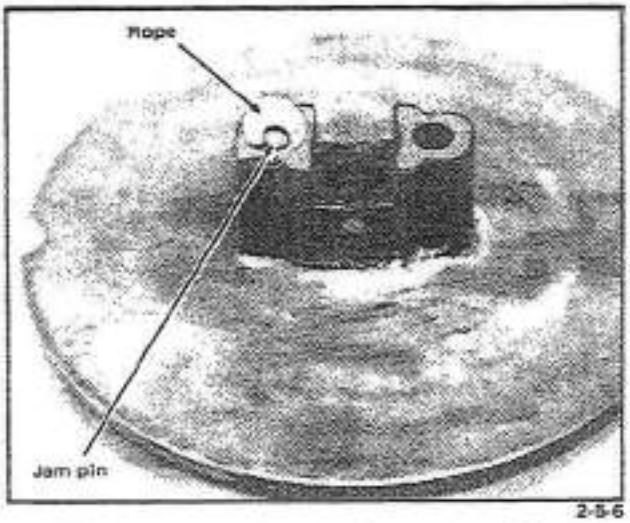


2-5-5

5. With a lite match, fuse the new rope ends.

6. Take the rope sheave in one hand and slide the end of the starter rope into the hole located between sheave rims and up through sheave hub.

7. With approximately 1-1/4 inches of rope protruding through the sheave hub, form a "U" shape with the rope end and position the small jam pin within the "U" (fig. 2-5-6).



2-5-6

8. Pull on rope to insert the enveloped jam pin into sheave hub so that the top of the rope "U" becomes flush with the sheave hub.

NOTE: To correctly sit the rope and pin in the sheave, it is necessary to use a soft faced hammer to tap the "U" flush with the sheave.

9. Place rope sheave into starter housing and align the notch of rope sheave with the spring hook.

10. Pass the rope through notch of rope sheave rim and holding the rope away from the sheave, turn the sheave counter-clockwise 3 or 4 turns to achieve proper recoil tension.

11. Pass the rope through starter stop recess and slide the starter stop (plate down), rubber buffer and handle grip onto the rope.

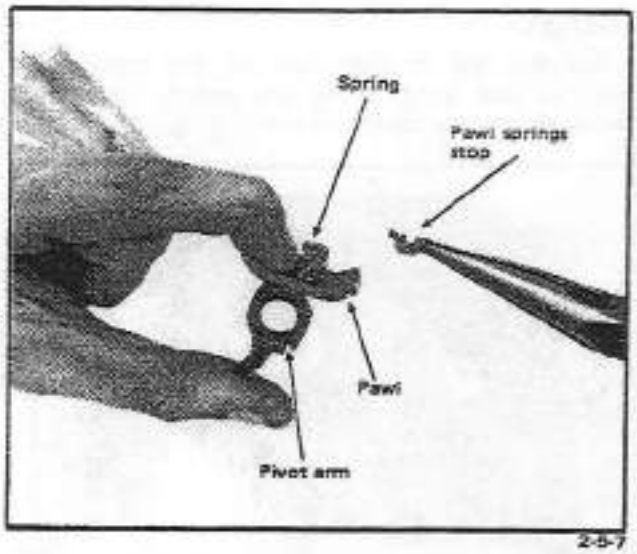
12. Tie a knot in the rope and fuse the knot using a lite match. Turn the rope knot down and pull the handle grip over the knot.

13. Secure starter stop to rewind starter housing using two (2) countersunk screws.

14. Press the rubber buffer over handle grip rim.

15. Position the "D" washer into location.

16. Assemble pawls, springs and pawl spring stops on pivot arm (fig. 2-5-7).

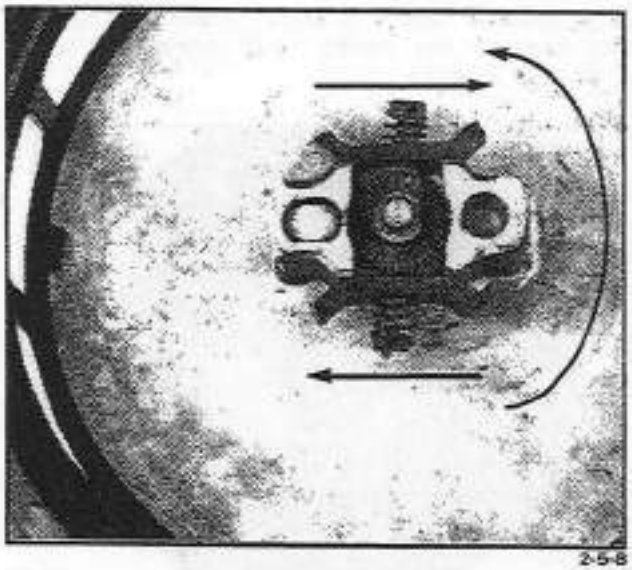


2-5-7

17. In the following sequence place the pivoting arm assembly, friction washer, friction spring and cover washer in location.

18. Holding the cover washer in location, test the operation of rewind starter.

CAUTION: Make sure the pivoting arm assembly is correctly positioned so that the arm can turn clockwise. Should the assembly rotate counter-clockwise, invert the arm assembly (fig. 2-5-8).


2-5-8

19. Secure rewind mechanism to starter housing using a circlip.

INSTALLATION.

1. Position the assembly in location on the fan cowl. Secure using four (4) washers and screws.

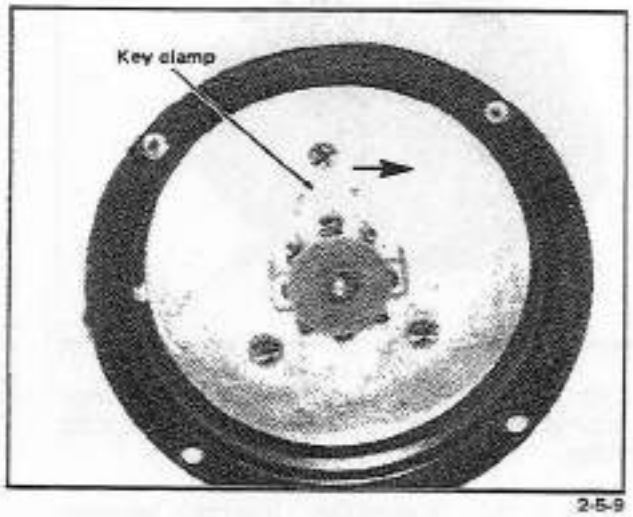
2. On one cylinder engines, install plastic sieve on starter housing.

REMOVAL (Key clamp model)

1. Remove the four (4) screws and washers attaching the rewind starter to fan cowl. Remove starter and place it on a worktable.

DISASSEMBLY

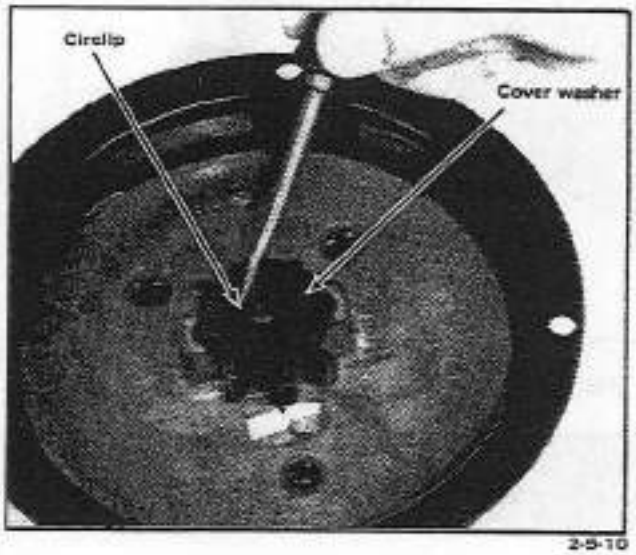
1. Pull out starter rope and hold rope sheave in position. Using an ice pick, disengage key clamp from rope by pushing it (fig. 2-5-9). Remove rope from sheave.



2-5-9

2. Remove rubber buffer from handle grip and dislodge the rope from the grip.

3. Using a small screwdriver, push the circlip holding the cover washer in location (fig. 2-5-10). Remove circlip, cover washer, friction spring, friction washer and pivoting arm assembly from the housing stud.

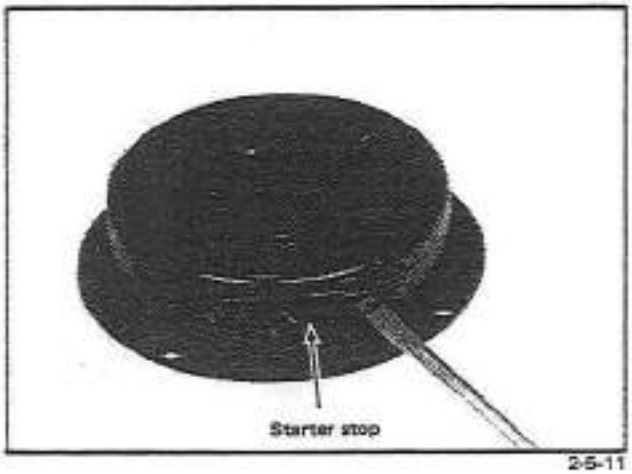


2-5-10

NOTE: Do not disassemble pivoting arm assembly unless damaged and replacement is indicated. If necessary to disassemble, press on spring and remove pawl spring stops, springs and pawls from pivot arm.

4. Remove "D" washer and rope sheave from the housing.

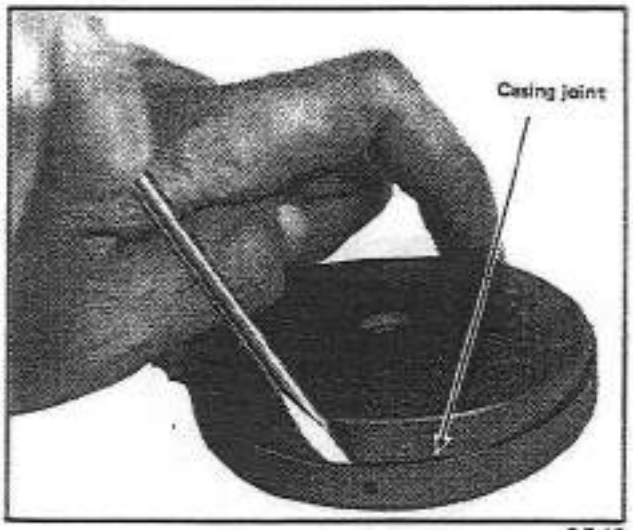
5. Unscrew the two (2) screws on the starter stop and remove the stop (fig. 2-5-11).



2-5-11

6. Using a soft faced hammer, tap on exterior of starter housing to disengage the spring cartridge.

7. With a thin screwdriver inserted between casing halves of the spring cartridge assembly, pry the casing open (fig. 2-5-12).



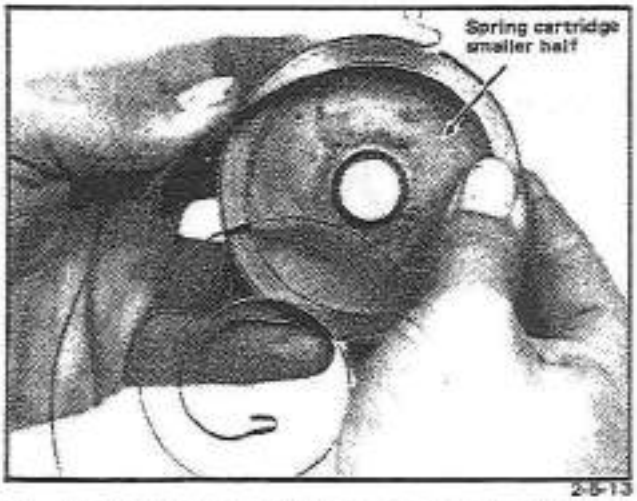
2-5-12

8. Remove the spring from the casing.

WARNING: The spring is wound tightly therefore, when removing it from the casing take great precaution as the spring will "fly open".

ASSEMBLY

1. Holding the smaller half of the cartridge casing in one hand, wind the spring counterclockwise into the casing notch (fig. 2-5-13).

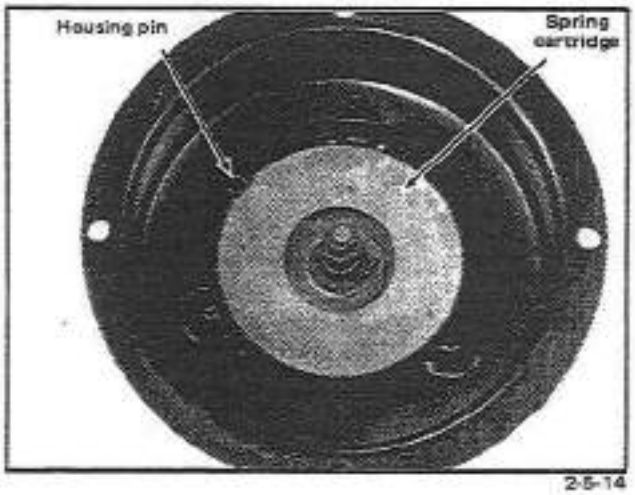


2-5-13

2. Apply low temperature grease on the rewind spring and spread it evenly with your fingers.

3. Reposition upper half of casing and with a soft faced hammer, gently tap on the casing until it snaps close.

4. Position spring cartridge in starter housing ensuring the large opening of the cartridge is facing upward. Using a soft faced hammer, gently tap on the casing until seated in its housing (fig. 2-5-14).

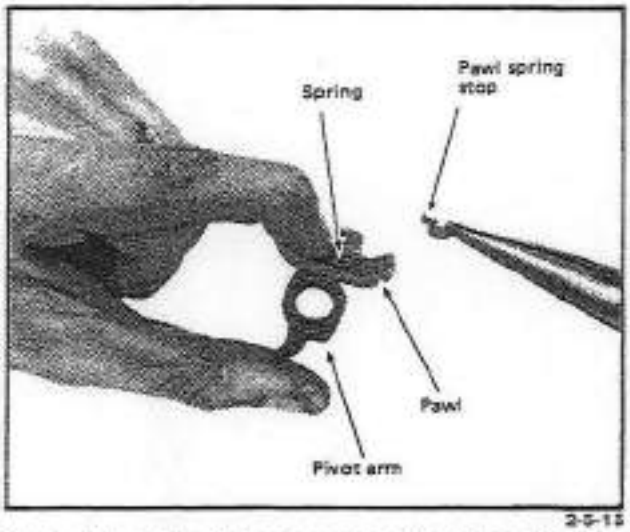


2-5-14

5. Place rope sheave into starter housing and align the notch of rope sheave with the spring hook.

6. Position the "D" washer into location.

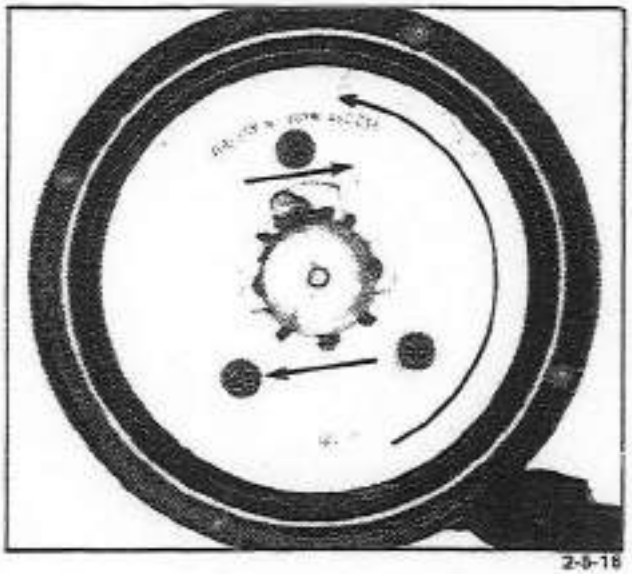
7. Assemble pawls, springs and pawl spring stops on pivot arm (fig. 2-5-15).



2-5-15

8. In the following sequence place the pivoting arm assembly, friction washer, friction spring, cover washer and circlip in location.

CAUTION: Make sure the pivoting arm assembly is correctly positioned so that the arm can turn clockwise. Should the assembly rotate counter-clockwise, invert the arm assembly (fig. 2-5-16).



2-5-16

9. Secure starter stop to rewind starter housing using two (2) countersunk screws.

10. With a lite match, fuse the new rope ends.

11. Pass the rope through rubber buffer and handle grip.

12. Tie a knot in the rope end and fuse the knot using a lite match. Turn the rope knot down and pull the handle grip over the knot.

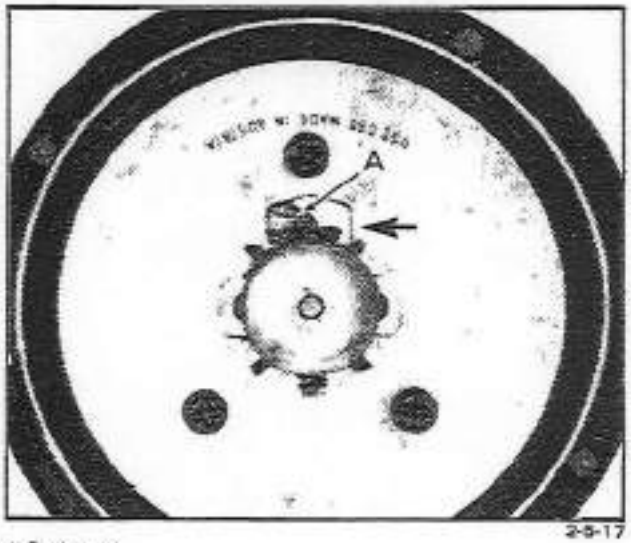
13. Press the rubber buffer over handle grip rim.

14. Turn the sheave counter-clockwise six (6) turns to achieve proper recoil tension. **Hold** in position.

15. Look through the starter stop orifice and rotate the sheave until the starter orifice and sheave orifice align.

16. Insert starter rope through starter stop orifice and sheave orifice until 3/4 inch of rope is visible in the cable key housing.

17. Insert cable key in housing and push the key to lock the starter rope (fig. 2-5-17).



2-5-17

A Cable key

INSTALLATION

1. Position the assembly in location on the fan cowl. Secure using four (4) washers and screws.

Engine

ENGINE TIMING 2-6

ONE CYLINDER

1. Disconnect spark plug wire and remove spark plug from cylinder head.

2. Remove rewind starter assembly from engine by removing four (4) capscrews and washers.

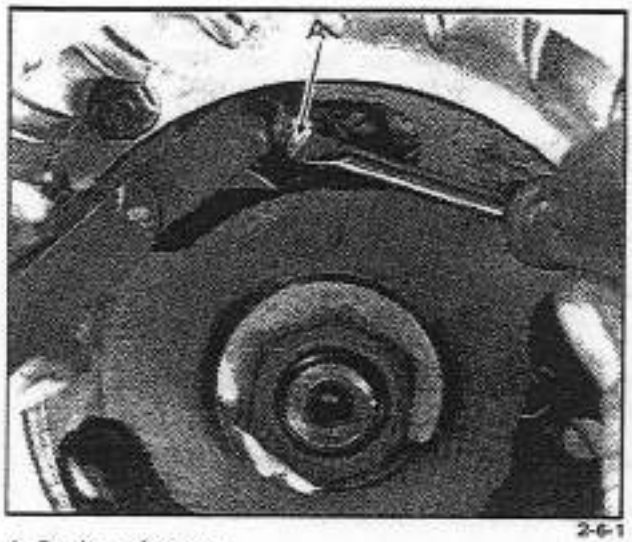
3. Remove the starting pulley from magneto ring plate.

NOTE: On electric start engines, the magneto ring plate incorporates the fan and starting gear.

4. Inspect breaker points condition, if pitted, burnt, or worn, replace.

NOTE: Breaker points can be cleaned by inserting a piece of paper between the points and moving it between the contact surfaces.

5. Rotate crankshaft until breaker points, visible through the magneto ring plate, are in fully open position. Adjust points setting to .018 inch using a feeler gauge and a screwdriver (fig. 2-6-1).



2-6-1

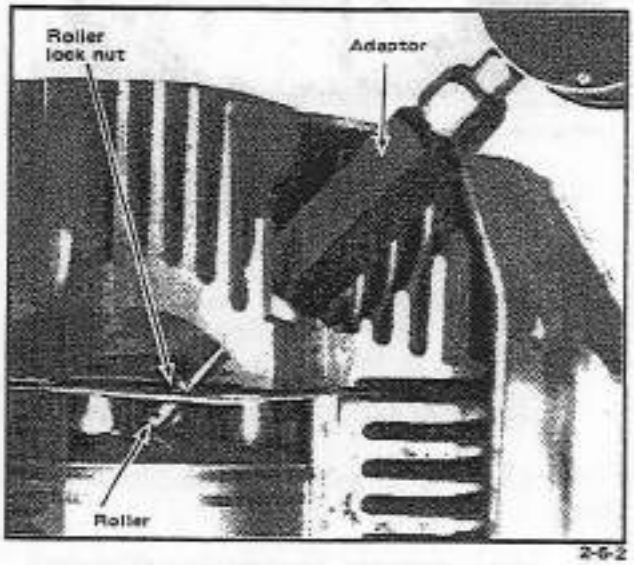
A Breaker points screw

6. Connect the red wire clip of timing light to black wire leading from armature plate. Connect black clip of timing light to fan cowl (ground).

NOTE: Do not allow red clip to touch engine.

7. When using a T.D.C. gauge, install and adjust the gauge as follows:

a) Rotate crankshaft until piston is just before T.D.C. (Top Dead Center).
b) With gauge in adaptor, adjust roller so that it is parallel with dial face. Tighten roller lock nut (fig. 2-6-2).



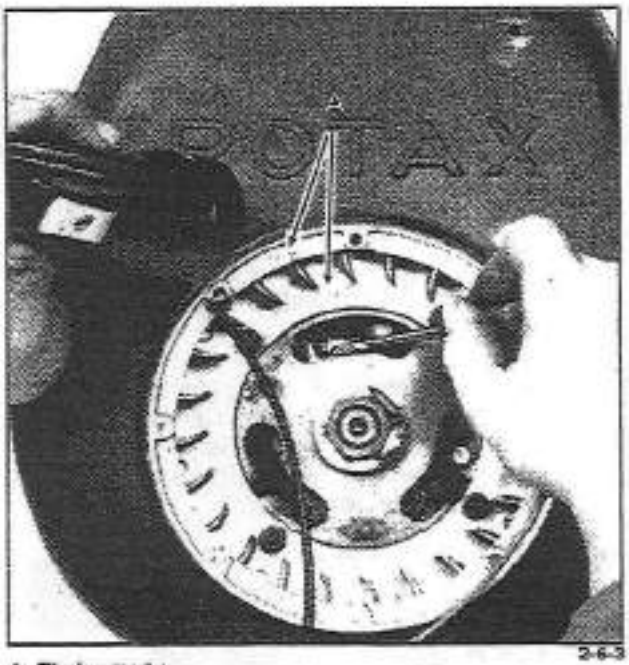
2-6-2

c) Loosen adaptor lock nut then holding gauge, screw adaptor into spark plug hole.
d) Position the face of dial towards magneto side and adjust gauge stem for precise reading. Finger tighten adaptor lock nut.
e) Rotate crankshaft until piston is at Top Dead Center.
f) Unlock outer ring of dial and turn it until "O" on dial aligns with pointer. Lock outer ring in position.

8. Turn timing light ON. Slightly loosen the breaker points screw.

9. When using the timing marks proceed as follows:

a) Align timing mark on fan cowl with timing mark on fan (fig. 2-6-3). At this point, twisting the breaker points set from one side to the other using a



2-6-3

A Timing marks

screwdriver blade, will cause the timing light to fluctuate. Retighten breaker points screw.

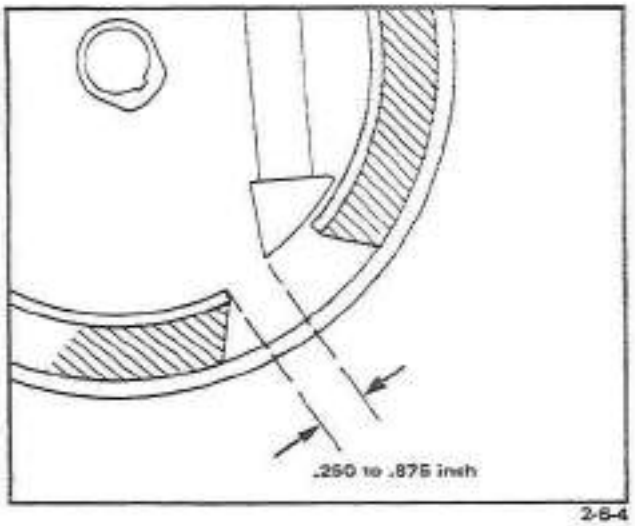
b) Rotate the magneto counter-clockwise 1/4 of a turn and slowly turn the magneto back in a clockwise direction. As soon as the timing marks align the breaker points should just begin to open and the timing light should fluctuate.

10. When the T.D.C. gauge is used, proceed as follows:

a) Rotate magneto counter-clockwise until specified piston position Before Top Dead Center is obtained. (Refer to indirect timing column of specifications). Hold centrifugal weight in fully advanced position. At this point, twisting the points from one side to the other will cause the timing light to fluctuate. Retighten breaker points screw.

b) Still holding centrifugal weight in full advanced position, rotate magneto counter-clockwise 1/8 of a turn and slowly turn magneto back in clockwise direction. As soon as pointer matches specified reading on dial, the timing light should fluctuate.

11. Hold centrifugal weight in fully advanced position. Rotate magneto clockwise 1/8 of a turn and slowly turn magneto back counter-clockwise until timing light fluctuates. At this point, check the edge gap, (distance between trailing edge of pole shoe and magnet). The distance should be .250 to .875 inch (fig. 2-6-4).



2-6-4

To adjust:

a) If the edge gap is less than .250 inch, loosen armature plate screws and rotate the armature plate assembly counter-clockwise until edge gap is correct. Retighten armature plate screws.

b) If the distance is more than .875 inch, slacken armature plate screws and rotate the plate clockwise to obtain specified edge gap. Retighten armature plate.

12. If the edge gap was corrected, reset the ignition timing and recheck breaker points gap.

NOTE: The breaker points gap should be between 0.14 to .018 inch.

13. Disconnect timing light. If T.D.C. gauge was used, unscrew adaptor lock nut, hold dial and unscrew adaptor from spark plug hole.

14. Inspect spark plug and replace if necessary. Adjust spark plug gap to .020 inch using a wire feeler gauge. Install spark plug and connect spark plug wire.

15. Install starting pulley to magneto ring plate with three (3) nuts and washers.

16. Install rewind starter assembly to engine with four (4) capscrews and washers.

TWO CYLINDER ENGINE

1. Disconnect spark plug wires and remove spark plugs from cylinder heads.

2. Remove rewind starter assembly from engine by removing four (4) capscrews and washers.

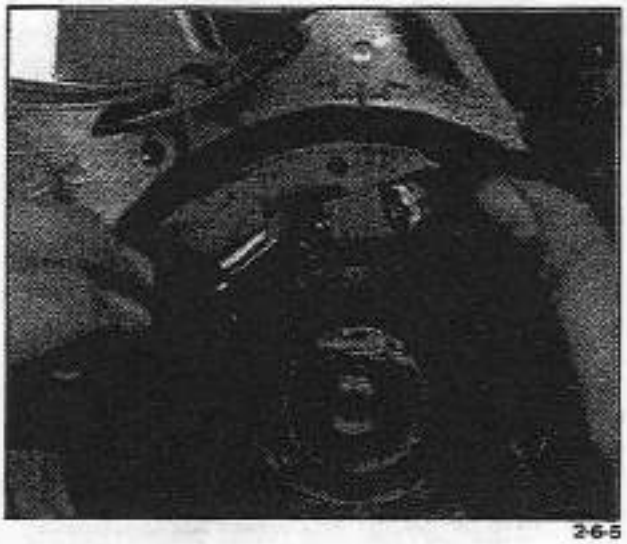
3. Remove fan protector.

4. Remove the three (3) starting pulley nuts and washers from magneto ring plate. Remove pulley and "V" belt.

5. Inspect breaker points condition. If pitted, burnt or worn, replace.

NOTE: Breaker points can be cleaned by inserting a piece of paper between the points and moving it between the contact surfaces.

6. Rotate crankshaft until breaker points (visible through the magneto ring plate) are in fully open position. Adjust points setting to .018 inch using a feeler gauge and a screwdriver. Repeat for other set of points (fig. 2-6-5).



2-6-5

NOTE: The upper breaker points set controls the timing of the magneto side piston and the lower breaker points set control the P.T.O. side piston.

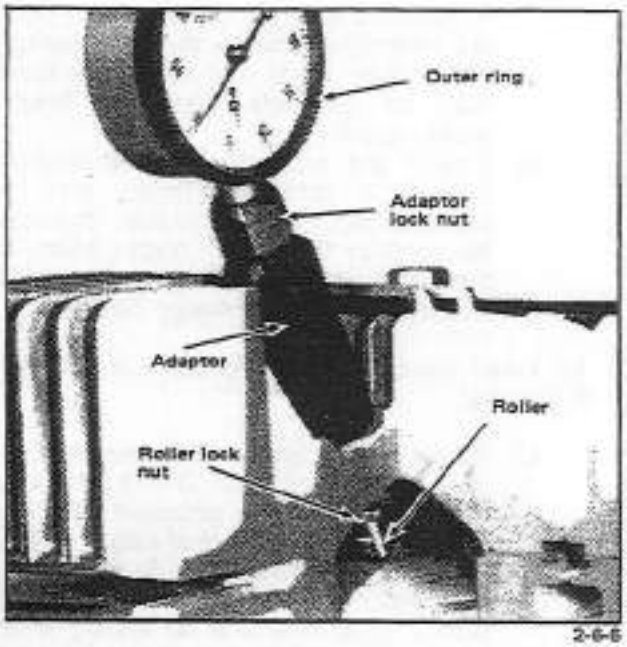
7. Connect the red wire clip of timing light to blue wire (magneto side) leading from armature plate and black wire clip to fan housing (ground).

NOTE: Do not allow red wire clip to touch engine.

8. Rotate crankshaft to bring the MAG piston just before T.D.C. (Top Dead Center).

9. When using a T.D.C. gauge, install and adjust the gauge as follows:

a) With gauge in adaptor adjust roller so that it is parallel with dial face then tighten roller lock nut (fig. 2-6-6).
b) Loosen adaptor lock nut then while holding gauge, screw the adaptor into spark plug hole.



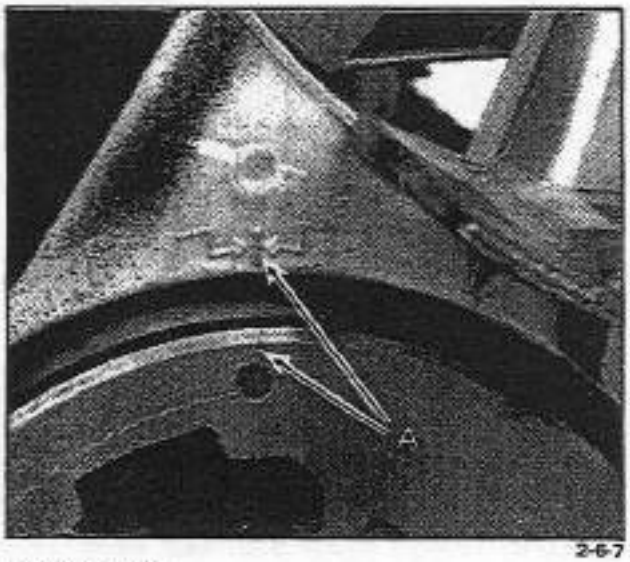
2-6-6

c) Position dial of gauge so that it faces magneto side of engine. Adjust length of gauge stem to obtain a precise dial reading and finger tighten adaptor lock nut.
d) Rotate crankshaft until piston is at T.D.C. Unlock outer ring of dial and turn it until "O" on dial aligns with pointer. Lock outer ring in position.

10. Turn timing light ON. Slightly loosen the breaker points screw.

11. When the T.D.C. gauge is not used, carry out the following:

a) Align timing mark on magneto with timing mark on fan housing (fig. 2-6-7).



2-6-7

A. Timing marks

At this point, twisting the breaker points set from one side to the other using a screwdriver blade will cause the timing light to fluctuate. Retighten breaker points screw.

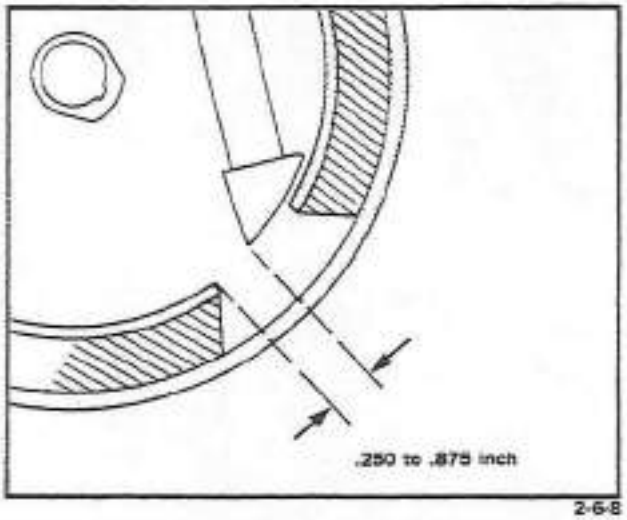
b) Rotate the magneto counter-clockwise 1/4 of a turn and **slowly** turn the magneto back in a clockwise direction. As soon as the timing marks align, the breaker points should just begin to open and the timing light should fluctuate.

12. When using the T.D.C. gauge, carry out the following:

a) Rotate crankshaft counter-clockwise until desired position B.T.D.C. (Before Top Dead Center) is obtained. (Refer to indirect column of specifications). Hold the centrifugal weight in fully advanced position. At this point, twisting the points from one side to the other will cause the timing light to fluctuate. Retighten breaker points screw.

b) Still holding centrifugal weight in full advanced position, rotate magneto counter-clockwise 1/8 of a turn and **slowly** turn magneto back in a clockwise direction. As soon as pointer matches specified reading on dial the timing light should fluctuate.

13. Hold centrifugal weight in fully advance position. Rotate magneto clockwise 1/8 of a turn and **slowly** turn magneto back counter-clockwise until timing light fluctuates. At this point, check the edge gap (distance between trailing edge of pole shoe and magnet). The distance should be .250 to .875 inch (see figure 2-6-8).



2-6-8

NOTE: Always check edge gap when timing mag. side piston. To adjust:

a) If the edge gap is less than .250 inch, loosen armature plate screws and rotate the armature plate assembly counter-clockwise until edge gap is correct. Retighten armature plate screws.

b) If the distance is more than .875 inch, slacken armature plate screws and rotate the plate clockwise to obtain specified edge gap. Retighten armature plate screws.

14. If the edge gap was corrected, reset breaker points to match the correct dial reading and recheck points gap.

NOTE: The breaker points gap should be between .014" - .018".

15. Disconnect the red wire clip of the timing light and connect it to the blue/red wire leading from the armature plate (P.T.O. side).

16. When the T.D.C. gauge is used, unscrew adaptor lock nut, hold dial and unscrew adaptor from spark plug hole.

17. Rotate crankshaft 180°. When the T.D.C. gauge is used, install and adjust as detailed in step 9.

18. When the T.D.C. gauge is not used, carry out the following:

a) Align the timing marks of magneto and fan housing (see fig. 2-6-7). Slightly slacken the tension of the breaker points screw. At this point, twisting the breaker points set from one side to the other using a screwdriver blade will cause the timing light to fluctuate. Retighten breaker points screw.

b) Rotate the magneto counter-clockwise 1/4 of a turn and **slowly** turn the magneto back in a clockwise direction. As soon as the timing marks align the breaker points should just begin to open and the timing light should fluctuate.

19. When the T.D.C. gauge is used, proceed as follows:

a) Loosen breaker points screw. Rotate crankshaft counter-clockwise until dial reading is the same as the previously timed cylinder. Hold the centrifugal weight in full advanced position. At this point, twisting the breaker points set from one side to the other using a screwdriver will cause the timing light to fluctuate. Retighten breaker points screw.

b) Rotate the magneto counter-clockwise

1/8 of a turn and **slowly** turn the magneto back in a clockwise direction. As soon as the pointer aligns with the correct reading, the breaker points should just begin to open and the timing light should fluctuate.

20. Recheck breaker points gap (.014" to .018").

21. Disconnect timing light. If T.D.C. gauge was used, unscrew adaptor lock nut, hold dial and unscrew adaptor from spark plug hole.

22. Inspect spark plug, replace if necessary. Adjust spark plug gap to .020 inch using a wire feeler gauge. Install spark plugs and connect spark plug wires.

23. Install starting pulley, "V" belt, rewind starter and fan protector.

TIMING SPECIFICATION CHART

ONE CYLINDER			TWO CYLINDERS		
Engine Type	**Direct**	**Indirect**	**Engine Type**	**Direct**	**Indirect**
247 – 247 E	.157" ± .010"	.157" ± .010"	343	.147" ± .010"	.169" ± .010"
292	.157" ± .010"	.205" ± .010"	401 – 401 E	.147" ± .010"	.156" ± .010"
302	.157" ± .010"	.205" ± .010"	434 – 434 E	.147" ± .010"	.156" ± .010"
337 – 337 E	.167" ± .010"	.239" ± .010"	435	.147" ± .010"	.156" ± .010"
			640 E	.167" ± .010"	.186" ± .010"
			641	.167" ± .010"	.179" ± .010"
			775	.177" ± .010"	.190" ± .010"

CARBURETOR 2-7

GENERAL

The Tillotson carburetor used on the Bombardier-Rotax engine is a complete fuel system incorporating carburetor, fuel pump and filter in the same unit.

A diaphragm controlled metering system allows precise fuel metering to the engine at extreme tilt angles and prevents fuel level changes due to vibration. The dual venturi multiplies the venturi pressure drop causing fine atomization of the fuel that is delivered from the main fuel nozzle so that the fuel reaches the engine as a combustible fog instead of a fluid stream.

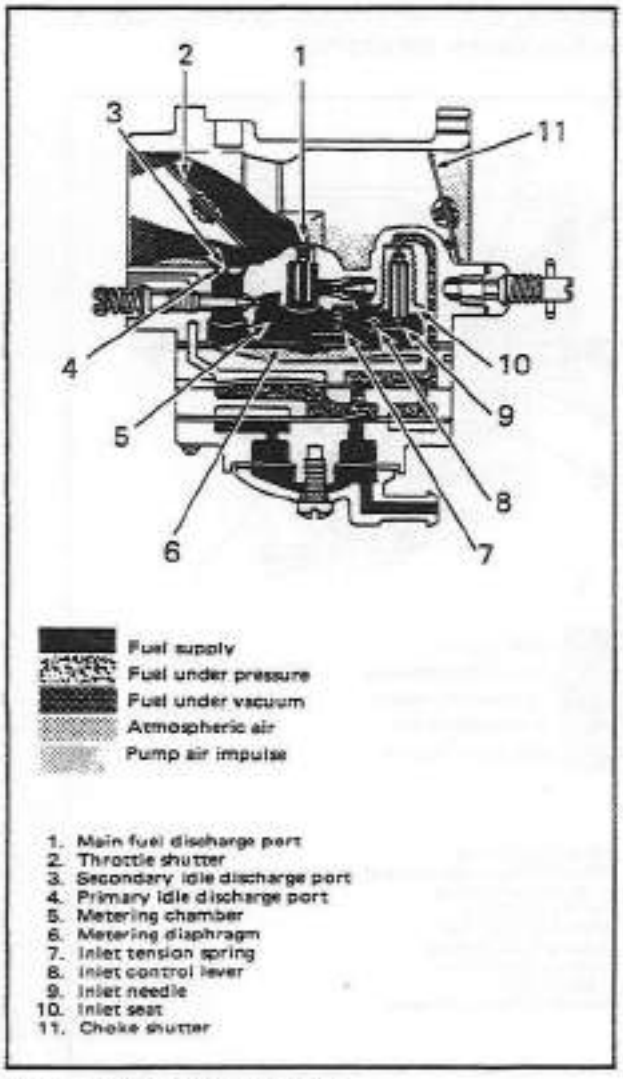
The venturi is a specially designed section of the carburetor throat where the area is reduced. Since the same volume of air flows through all sections of the carburetor throat, this reduction in area increases the velocity of the air passing through this section. This increase in velocity, produces a vacuum at its point of maximum restriction. Usually a fuel jet is installed at that point with the result that the fuel drawn from the jet mixes with the incoming air. This mixing of fuel and air is known as vaporization.

CARBURETOR OPERATION

NOTE: Before looking through the carburetor operating principles, bear in mind that the pump and the filter could be removed and the carburetor would still operate properly, providing the gasoline is gravity fed.

STARTING (CHOKE) OPERATION

Starting an engine with a Tillotson diaphragm carburetor involves the same methods as used in a conventional float type carburetor. When the engine is cranked with the choke in the closed position, the suction is transmitted to the diaphragm/fuel chamber through both primary and secondary idle discharge ports as well as main fuel discharge port, creating a low pressure area on the fuel side of the metering diaphragm. Atmospheric air pressure on the opposite side will force the metering diaphragm upward causing the diaphragm button to contact the inlet control lever and overcome the inlet tension spring pressure, permitting fuel under pressure to force the needle off its seat and enter the metering chamber. The fuel then travels from the metering chamber up through the idle and main fuel supply orifices and channels and out the discharge ports to the engine. Fuel is delivered from all of the discharge ports when the choke is closed to provide a full rich mixture for starting. A small amount of air is added to this rich mixture through a hole in the choke shutter.

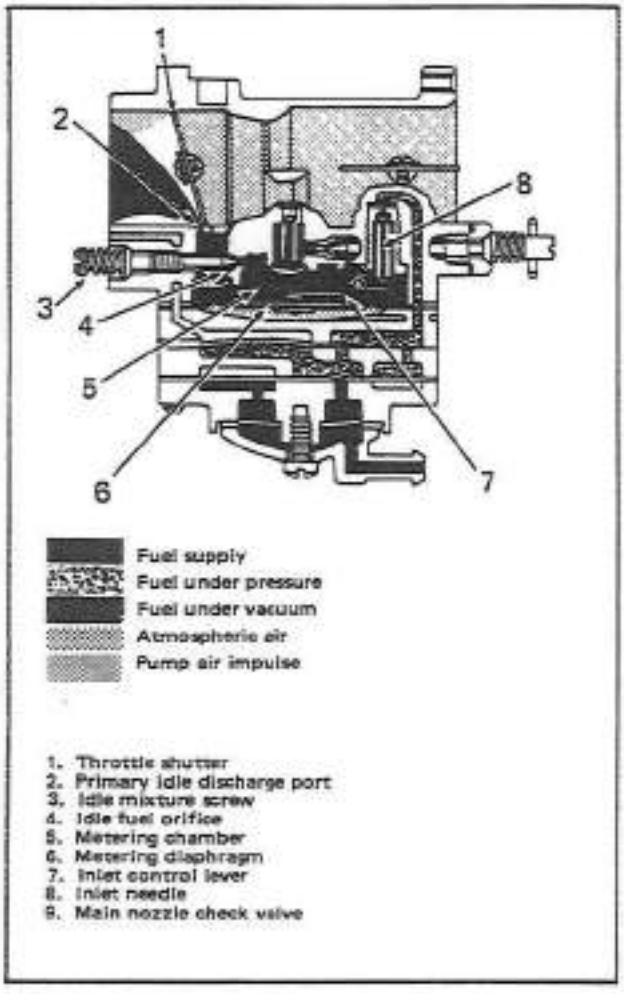


Starting (choke) operation

IDLING OPERATION

The throttle shutter is in a partially open position when the engine is idling. Engine suction is transmitted through the primary idle fuel discharge port to the fuel chamber side of metering diaphragm via the idle fuel supply channel. Again the metering diaphragm is forced upward by atmospheric pressure, depressing the inlet control lever and permitting fuel under pressure to force the inlet needle off its seat and enter the metering chamber. The fuel is then drawn up through the idle fuel adjustment orifice and delivered to the engine through the primary idle discharge port.

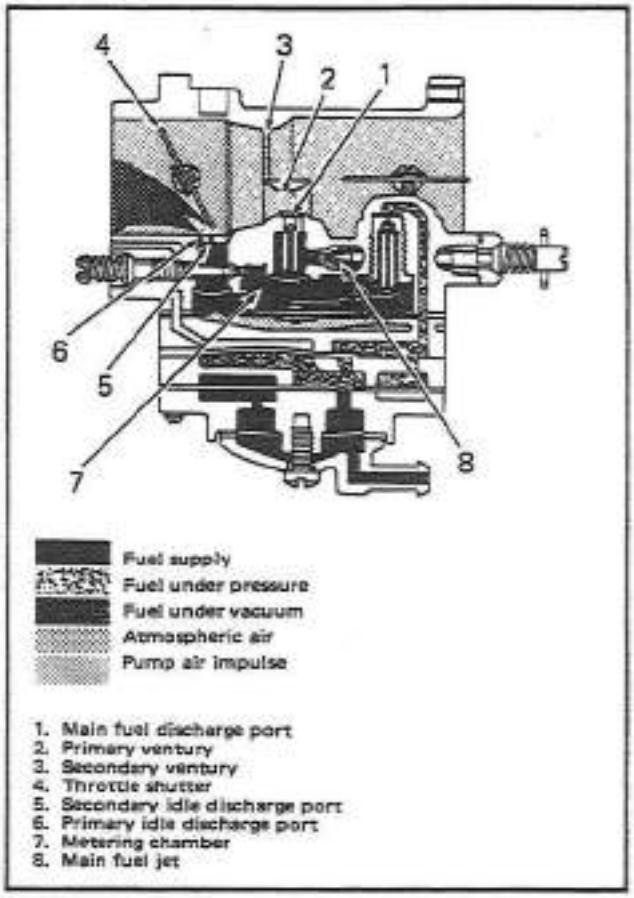
The entire carburetor bore from the air inlet to the back of the throttle shutter is at atmospheric pressure during idle operation. The ball check valve in the main fuel port is closed to prevent air from entering the metering chamber. In all phases of operation, the amount of fuel entering the metering chamber is equal to the amount of fuel being used by the engine.



Idling operation

INTERMEDIATE OPERATION

Fuel is delivered into and through the carburetor in the same manner as when the engine is idling. As the throttle opens and engine speed increases, more fuel is demanded from the carburetor and supplied to the engine by the secondary idle discharge port located immediately behind the throttle shutter. As the throttle shutter continues to open and the engine speed increases, the velocity of the air through the venturi creates a low pressure area at the venturi throat and diminishes the suction on engine side of the throttle shutter. When the pressure at the venturi throat is lower than the pressure existing within the metering diaphragm fuel chamber, the fuel is drawn up through the high speed mixture screw orifice and out through the main fuel discharge port.

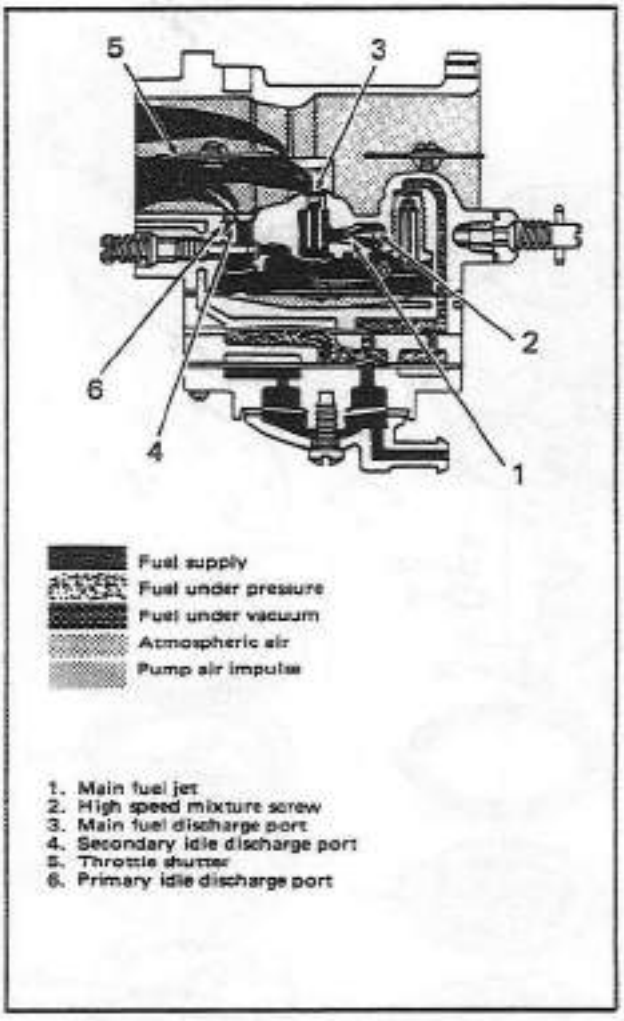


Intermediate operation

HIGH SPEED OPERATION

As the throttle shutter progressively opens from intermediate position to full open position, the air velocity through the venturi increases and fuel is metered up through the high speed mixture screw orifice and main fuel discharge port in accordance with the power requirements

of the engine. The action of the metering diaphragm is the same as previously described with suction required to operate the diaphragm being transmitted through the main fuel discharge port.



High speed operation

The primary and secondary idle discharge ports deliver comparatively little fuel at fully open throttle and most of the fuel used in this operating condition is supplied from the main fuel discharge port.

FUEL PUMP TYPES

The function of the fuel pump is to supply a constant, steady flow of liquid gas to the metering chamber. The two types of pumps on the Tillotson carburetors used on Bombardier Ski-Doo snowmobiles are:

- The Single Stage Pump: Used on small and medium sized carburetors having a fairly low fuel consumption.
- Duplex Pump: Used on large carburetors having a higher fuel consumption.

NOTE: When disassembling a carburetor, ascertain whether it is a single or duplex pump. Misplacement of diaphragms can lead to carburetor malfunction.

FUEL PUMP OPERATION

The fuel pump is a pulse operated diaphragm pump. The pressure-vacuum pulse is supplied from the engine crankcase where the pulse cycles are created by the reciprocating action of the engine piston. Crankcase pulse is transmitted to the pump pulse chamber through the fuel pump pulse port in the mounting flange of the carburetor body.

- Vacuum Action: The vacuum part of the pulse cycle causes the fuel pump diaphragm to move into the pump pulse chamber. The vacuum allows fuel to flow from the fuel filter through the fuel strainer screen, past the inlet check valve and into the fuel pump chamber. The outlet check valve closes during this part of the pumping cycle.
- Pressure Action: The pressure part of the pulse cycle forces the fuel pump diaphragm into the fuel pump chamber, creating a pressure that forces the fuel out through the outlet check valve and the fuel inlet supply channel to the inlet needle valve. The fuel pressure closes the inlet check valve during this part of the pumping cycle.

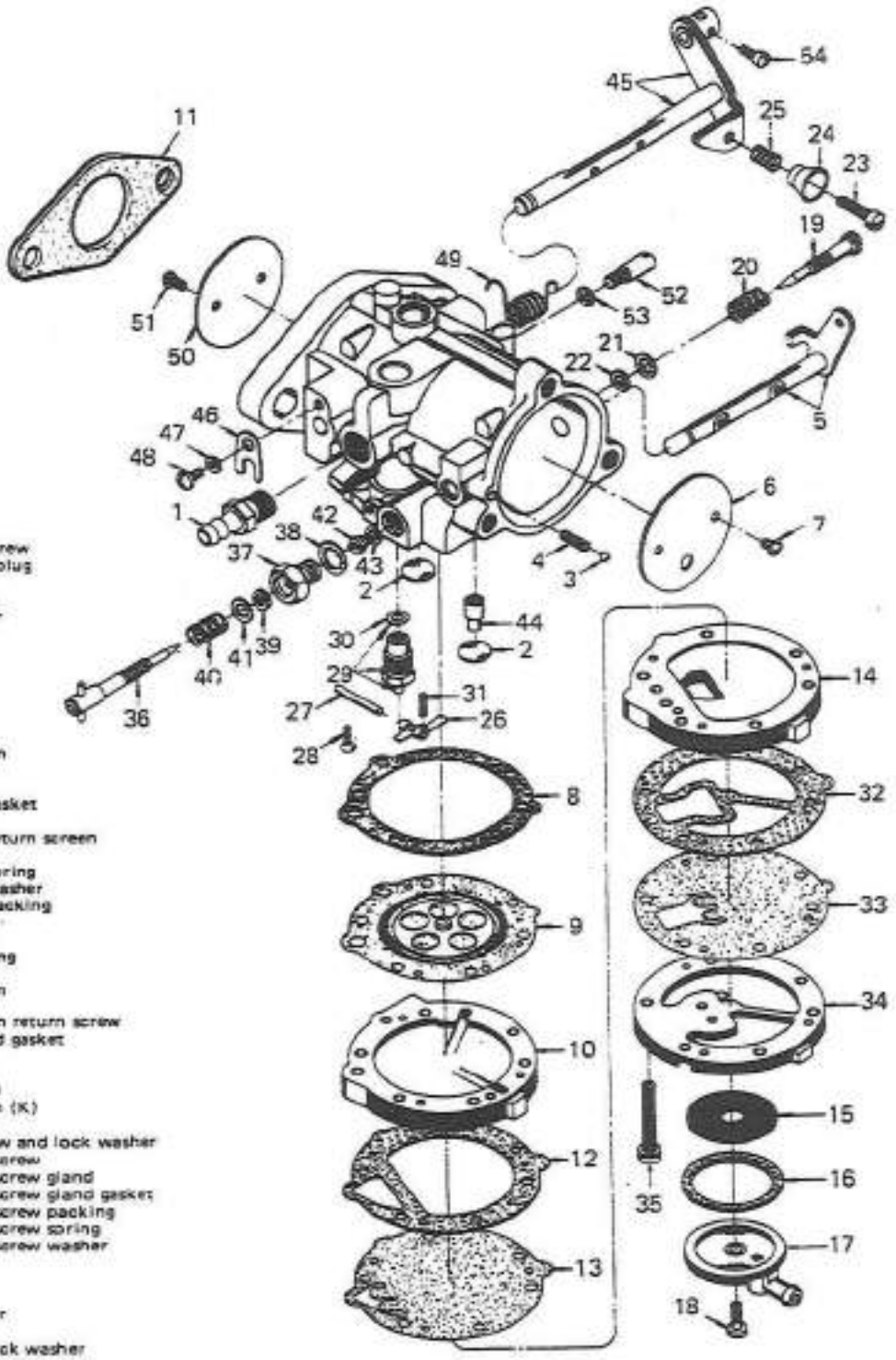
FUEL FILTER SYSTEM

The fuel filter system consists mainly of a fine mesh screen, a gasket and a screw on paper element cartridge.

FILTER CARE

- Paper Element Filter: The paper element is the most efficient type of filter. However, if it becomes clogged or if the flow slows down below the minimum required, it should be discarded and replaced by a new unit.
- Screen Type Filter: The screen type filter is serviceable and therefore reusable. To clean, flush with fuel or solvent and blow with compressed air.

NOTE: Varnish coated or extremely clogged screens should be replaced when servicing.



Disassembled view of carburetor

REMOVAL

1. On Elan and Olympique models, remove choke knob, funnel and choke bracket from carburetor.

2. On all vehicles, except Elan and Olympique models, remove air silencer from carburetor.

NOTE: On all T'NT models except 292, unscrew choke knob prior to silencer removal.

3. On Nordic and Valmont models, disconnect choke cable and housing from carburetor.

4. Disconnect throttle cable(s) from carburetor lever(s).

NOTE: If applicable, disconnect throttle cable housing(s) from carburetor(s).

5. Disconnect fuel lines from carburetor body.

6. Remove the two (2) carburetor flange nuts and isolating washers.

NOTE: On T'NT 640 and 775 models, remove air baffle.

7. Remove carburetor, isolating sleeves and gasket. If applicable, remove isolating flange and gasket from stud.

DISASSEMBLY

(Refer to disassembled view of carburetor)

Select a clean working area for Disassembly and Assembly procedures. A great deal of carburetor trouble can be caused by working in a dirty area and/or misplacement of small carburetor parts.

1. Unscrew the fuel cartridge from carburetor bottom. Remove screen filter.

2. Remove the six (6) body screws.

3. On single pump carburetors, carry out the following procedure:

   (a) Remove the fuel pump body, fuel pump diaphragm (valve), fuel pump diaphragm (pulse) and fuel pump gasket.
   (b) Remove the diaphragm cover, metering diaphragm and gasket.

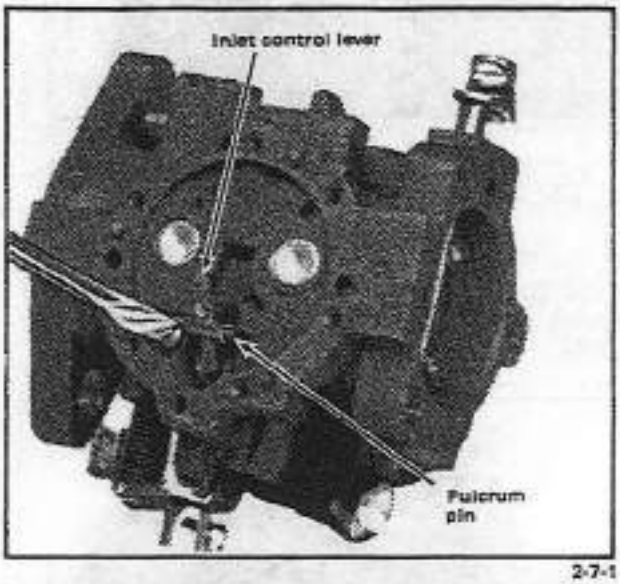
4. On double pump carburetors, carry out the following procedure:

   (a) Remove the inlet valve body, inlet valve diaphragm, inlet valve gasket, fuel pump body, fuel pump diaphragm and fuel pump gasket.
   (b) Remove the diaphragm cover, metering diaphragm and diaphragm gasket.

5. Remove the fulcrum pin retainer screw.

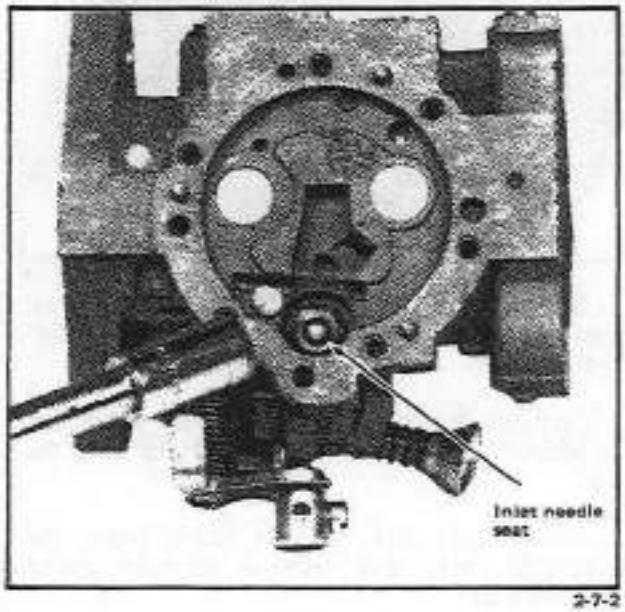
CAUTION: It is necessary to hold the inlet control lever while removing the retainer screw as the lever is spring loaded and can "fly out" of the casing.

6. Remove the inlet control lever assembly and the inlet tension spring from the carburetor body (fig. 2-7-1). Pull the fulcrum pin from the control lever.



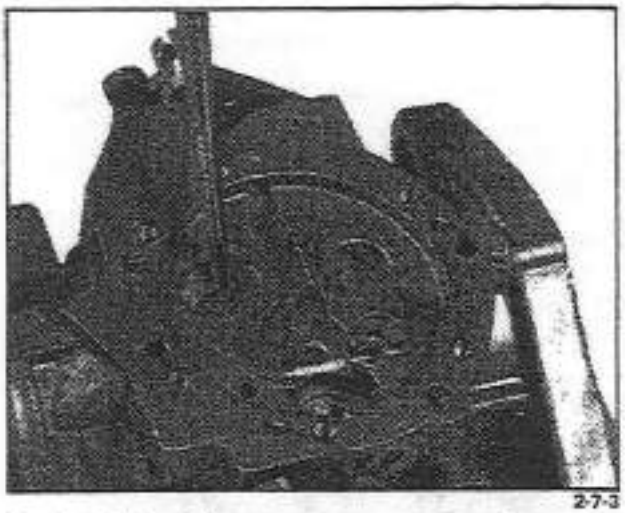
2-7-1

7. Remove the inlet needle seat assembly using a thin wall socket wrench (fig. 2-7-2). Remove the inlet seat gasket.



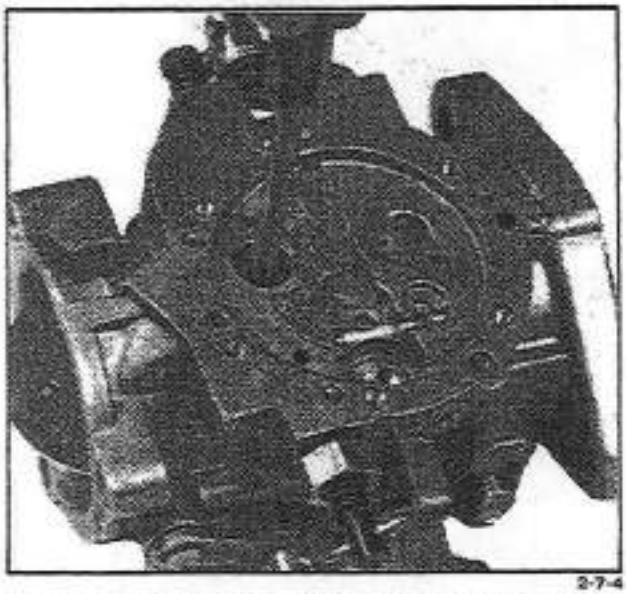
2-7-2

8. Using a pointed tool, puncture the welch plugs. Avoid puncturing the center of the plug. Pry the welch plugs from the seating (fig. 2-7-3).


2-7-3

9. On HR carburetor, unscrew the main nozzle check ball assembly.

10. On HD carburetor, remove the main nozzle check ball assembly by tapping it out of the casting using an appropriate drive punch (fig. 2-7-4).


2-7-4

11. Remove the two (2) throttle shutter screws. Open throttle shutter and remove from carburetor body.

12. Remove throttle shaft clip retainer screw and washer. Slide the throttle shaft clip from the slot.

13. Gently pull the throttle shaft from the carburetor body and remove throttle spring from the shaft.

NOTE: On HD carburetor, remove idle speed screw bracket from throttle lever.

14. Remove the two (2) choke shutter screws. Open choke and pull the shutter from choke shaft.

15. Carefully pull the choke shaft from carburetor body. Remove choke friction ball and spring.

WARNING: The choke friction ball and spring can "fly out" of the casing, therefore exercise care during removal of the choke shaft.

16. Remove idle mixture screw, spring, washer and packing from carburetor body.

17. On HR carburetor with high speed mixture adjustment, remove screw, spring, washer and packing from carburetor body.

18. On carburetor with fixed jet, remove main fuel jet plug screw and gasket. Remove main fuel jet and gasket.

19. On HD carburetor, remove high speed mixture screw, spring, washer and packing from high speed gland. Remove gland and gasket. Unscrew main fuel jet. Remove main fuel jet gasket.

NOTE: The main fuel jet has L.H.S. threads. To remove turn in a clockwise direction.

CLEANING

CAUTION: Some solvents and cleaners have a damaging effect on the synthetic rubber parts of the carburetor. It is best to use a petroleum product for cleaning. Do not use alcohol, lacquer, acetone, thinner, benzol or any solvent with a blend of these ingredients unless the rubber parts and gaskets are removed. If you are in doubt about your solvent, test a used part in it and observe the reaction.

1. The entire carburetor should be cleaned by flushing with fuel and dried with compressed air before disassembly.

2. After disassembly, if the carburetor is not very dirty, the parts can be cleaned with compressed air by carefully blowing out each channel and orifice in the casting.

INSPECTION

1. The carburetor should be inspected for cracks in the casting, bent or broken shafts,

loose levers or swivels and stripped threads.

2. Examine the shafts and the body bearings for wear. If the shafts show excessive wear, replace. If the body bearing areas are worn, replace the body casting.

3. Handle the inlet spring carefully. Do not stretch this spring or in any way change its compression characteristics. If in doubt about its condition, replace.

4. Inspect the cover casting for nicks, dents or cracks that could interfere with operation.

5. Inspect the metering diaphragm. The center plate must be riveted securely to the diaphragm and the diaphragm should be free of holes and imperfections. The gasket should be replaced if it has holes or creases.

6. Inspect the pumping diaphragm(s). It must be flat and free of holes. The gasket should be replaced if it has holes or creases.

7. The filter screen should be cleaned by flushing with fuel or solvent and dried with compressed air. It is advisable to replace the gasket whenever the filter screen is serviced. Flush all dirt from the plastic cover before assembly.

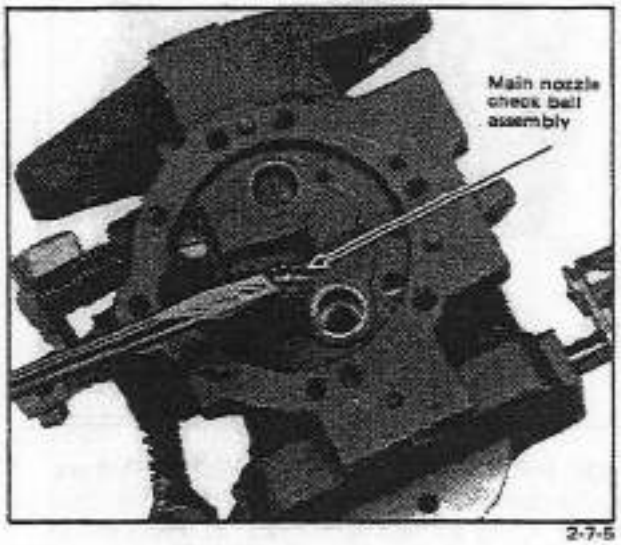
NOTE: The inlet needle and seat are a matched set and is tested for leaks at the factory. The parts should not be interchanged – they must be retained as a matched set. A carefully rebuilt carburetor should perform well. The two most likely causes of carburetor failure are dirt and careless repair job. A clean, carefully assembled unit is as good as new.

ASSEMBLY

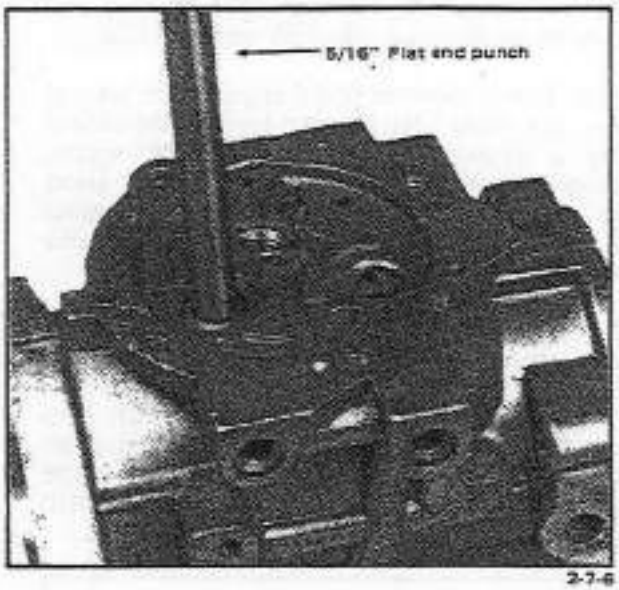
1. Prior to Assembly procedure make sure all parts are clean and defective parts have been replaced. Install main nozzle check ball assembly as follows:

   (a) On HR carburetor, screw the nozzle assembly into the carburetor casting (fig. 2-7-5).
   (b) On HD carburetor, push the nozzle assembly into the casting until nozzle shoulder is flush with the bottom of the nozzle well.

2. Position a new welch plug (with the convex side up), and using a 5/16 inch flat end punch and a hammer, gently tap the plug until it becomes flat (fig. 2-7-6). Install second plug using same procedure. The plugs must be correctly seated to avoid gasoline leakage.



2-7-5

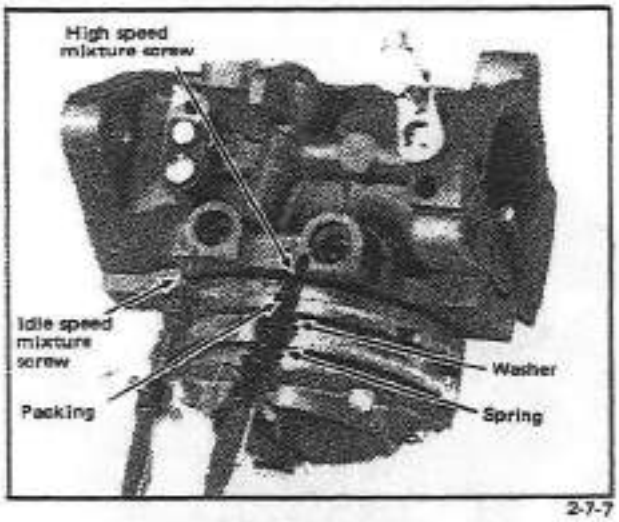


2-7-6

3. Leak test the carburetor by allowing controlled compressed air (max. 50 psi) into the idle and high speed mixture holes. The carburetor must be inverted, welch plugs up, and a drop or two (2) of oil laying over each plug. If the plug(s) are seated incorrectly, small air bubbles will appear around the plug diameter. In such a case, reseal the plug(s) using a punch and hammer. Leak test once again.

4. Position spring, washer and packing on idle speed mixture adjusting screw and screw the assembly into carburetor body.

5. On HR carburetor with high speed mixture adjustment, position spring, washer and packing on high speed screw and screw the assembly into high speed orifice of carburetor (fig. 2-7-7).



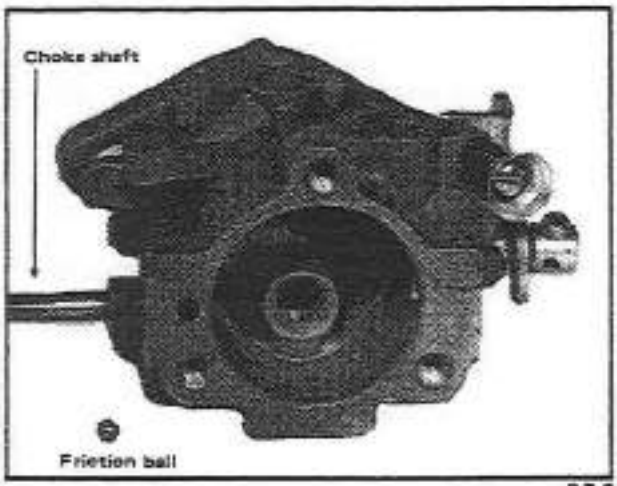
2-7-7

6. On HR carburetor equipped with a fixed jet, position gasket in location and screw in the main fuel jet using screwdriver blade of appropriate width. Place gasket on main fuel jet plug and firmly screw the plug into high speed orifice.

7. On HD carburetor position gasket on jet and screw the main fuel jet into high speed orifice using a screwdriver blade of correct width. Position gasket on gland and screw the gland into carburetor body. Position spring, washer and packing on high speed mixture screw and install the screw assembly into gland.

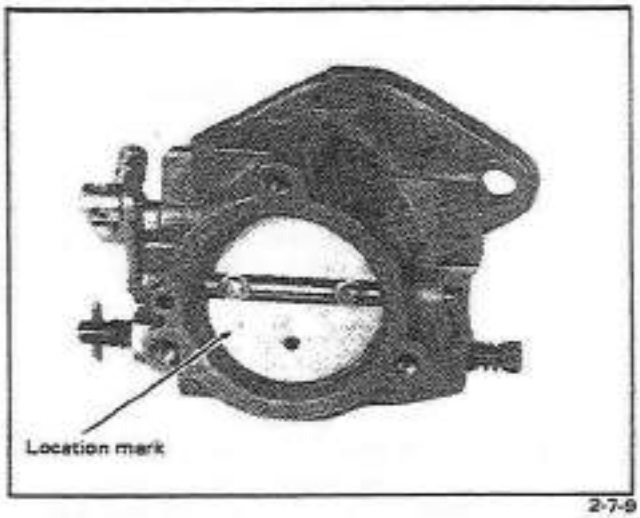
NOTE: The main fuel jet has L.H.S. threads. To install, turn in a counter-clockwise direction.

8. Insert choke spring and friction ball into carburetor body. Using a suitable tool, depress the friction ball and spring while at the same time, inserting the choke lever shaft into carburetor body (fig. 2-7-8).



2-7-8

9. Insert the choke shutter into choke shaft and secure using two (2) shutter screws (fig. 2-7-9).



2-7-9

CAUTION: Ensure the hole of the shutter faces downward and the location mark faces outward.

10. Install throttle lever spring on shaft and partially insert the shaft into carburetor body. Ensure the spring is engaged then rotate the assembly one (1) turn clockwise and complete the shaft insertion.

NOTE: Affix the idle speed screw bracket to HD carburetor body.

11. Position throttle shaft retainer clip and secure in position using appropriate screw.

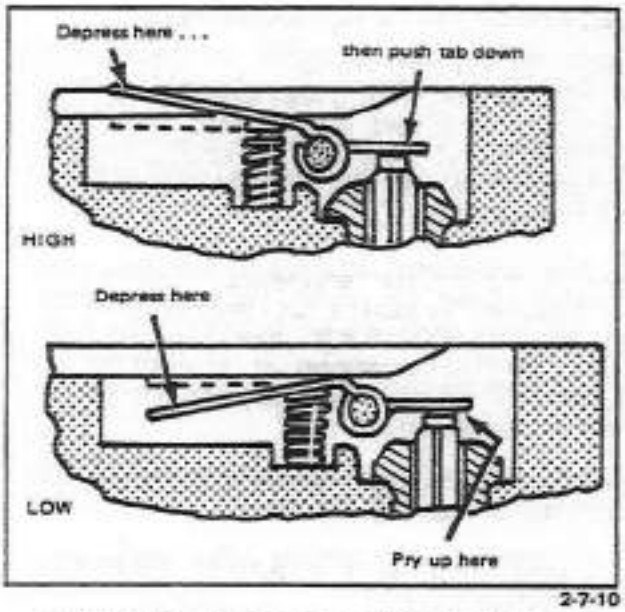
12. Rotate throttle shaft and insert the throttle shutter into shaft. Allow throttle to retract and secure the shutter to throttle shaft using two (2) throttle shutter screws. Check throttle lever operation.

CAUTION: Ensure the location mark on the shutter surface faces outward.

13. Using a thin wall socket, install the inlet needle seat. On HR carburetors, torque the inlet seat to 25 to 30 inch–pounds. On HD carburetors, torque the inlet seat to 40 to 45 inch–pounds. Insert needle into needle seat ensuring the needle point is down inside the seating. Position inlet tension spring in location. Insert inlet control lever fulcrum pin into inlet control lever and position the lever/pin assembly into inlet channel. Secure using fulcrum pin retaining screw.

14. Adjust the inlet control lever so that the center of the lever that contacts the metering diaphragm is flush with the metering chamber wall as shown in figure 2-7-10.

15. On double pump carburetors, carry out the following procedure:

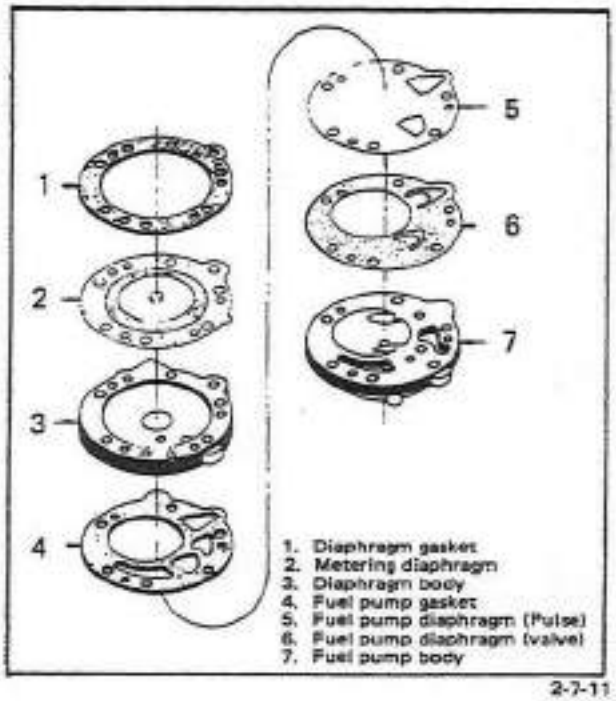


2-7-10

(a) Position diaphragm gasket, metering diaphragm, diaphragm cover, pump gasket, fuel pump diaphragm, fuel pump body, inlet valve gasket, inlet valve diaphragm and inlet valve body in location on carburetor base. (Refer to disassembled view of carburetor).

16. On single pump carburetor, carry out the following procedure:

(a) Position diaphragm gasket, metering diaphragm, diaphragm body, fuel pump gasket, fuel pump diaphragm (pulse), fuel pump diaphragm (valve) and fuel pump body on carburetor base (fig. 2-7-11).



2-7-11

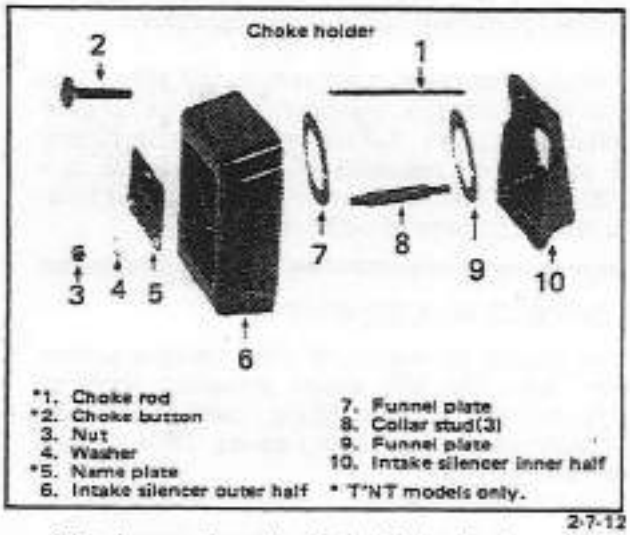
17. Using a cross sequence secure the fuel pump body in position using six (6) body screws.

18. Position screen filter and cartridge gasket and screw the filter cartridge onto carburetor.

INSTALLATION

To install carburetor on engine, inverse removal procedure. However special attention should be brought to the following:

– Refer to figure 2-7-12 for air silencer installation.



2-7-12

– The longer length of fuel line is the return line. Always connect this line to outlet nipple of carburetor.
– Make sure the pulsation port on the intake flange aligns with the orifice in the isolating flange.

CARBURETOR ADJUSTMENT MAXIMUM THROTTLE OPENING.

With engine OFF, depress the throttle lever at handlebar and **hold**. Throttle butterfly should be horizontal when the lever gently touches the handlebar grip.

To adjust for maximum opening, loosen screw at point where cable joins carburetor lever. Clamp throttle lever to handlebar. With finger, hold carburetor throttle lever in fully open position (UP), pull cable downward until taut and retighten screw. Unclamp throttle lever from handlebar.

NOTE: On double carburetors, use same procedure as with single carburetor. Check and adjust length of cable from first carburetor to second, if necessary.

WARNING: Before starting engine, make sure carburetor throttle lever returns to idle position when handlebar throttle lever is released.

IDLE MIXTURE ADJUSTMENT

A primary adjustment, engine OFF, should be made by first turning idle mixture screw(s) fully clockwise until closed. On all models, except 340 and 440 T'NT models, back off screw 3/4 of a turn counter-clockwise. On T'NT 340 model, back off screw 1-1/8 turns. On T'NT 440 model, back off screw 1-1/4 turns.

CAUTION: On T'NT 340 and 440 models, the primary adjustment is the **final** adjustment.

For final adjustment, start engine and allow it to warm up. Turn idle mixture screw until engine reaches maximum R.P.M. and obtain a steady idle and a fast response of the engine to the throttle. On twin carburetor models repeat final adjustment on second carburetor.

IDLE SPEED ADJUSTMENT

Allow engine to warm up then using a screwdriver, turn the idle speed adjusting screw(s) clockwise to increase idling speed, counter-clockwise to decrease idling speed. RPM should read 1200 to 1500.

HIGH SPEED MIXTURE ADJUSTMENT

A primary adjustment should be made, with engine OFF, by first turning high speed mixture screw(s) fully clockwise until closed. On all models except T'NT 340, back off screw 1-1/4 turns counter-clockwise. On T'NT 340 models, back off screw 1 turn.

For final adjustment, start engine and allow it to warm up. Drive the vehicle for approximately one (1) mile at 6000 R.P.M. min. (The high speed jet will be operational at this R.P.M. range). Stop the engine **immediately** and remove and inspect plug face(s).

The plug face will indicate whether the mixture is rich, normal or lean (fig. 2-7-13).

- A brownish tip reflects ideal carburetor adjustment.
- A black insulator tip indicates a rich mixture.
- Light grey insulator tip indicates a lean mixture.

If the mixture is incorrect, readjust 1/8 of a turn and recheck color of spark plug face.

NOTE: Turning screw clockwise produces a leaner mixture; (more air/less fuel); counter-clockwise, a richer mixture (less air/more fuel).

Engine

CLEANING & INSPECTION

CLEANING

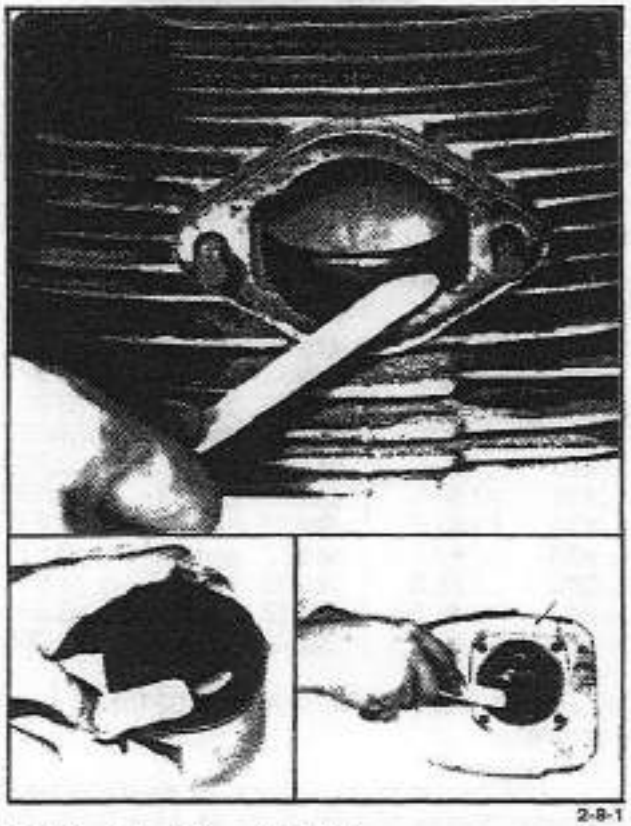
1. Discard all oil seals, gaskets and "O" rings as each of these items must be replaced during Assembly procedures.

2. Individually clean each metal component using cleaning solvent. Dry using a clean cloth.

CAUTION: Clean armature plate with a clean cloth only as cleaning solution can cause damage.

3. On engine equipped with a decompressor valve, immerse valve assembly in a container of cleaning solution and using a firm bristle brush, clean the valve seating area.

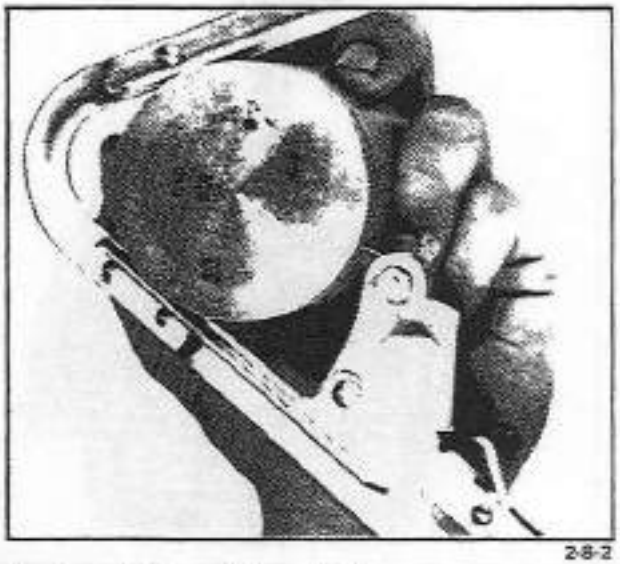
4. Using a wooden spatula, scrape off any carbon formation from cylinder exhaust port, cylinder head and piston dome (fig. 2-8-1).



2-8-1

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

5. Clean the ring grooves of the piston using a "piston groove cleaner tool". In case of "L" ring grooves or if "piston groove cleaner tool" is not available, use a broken ring to clean the grooves (fig. 2-8-2).



2-8-2

6. On all two (2) cylinder engines, remove crankcase glue from contact surfaces of crankcase halves using a suitable cleaning solvent and a cloth.

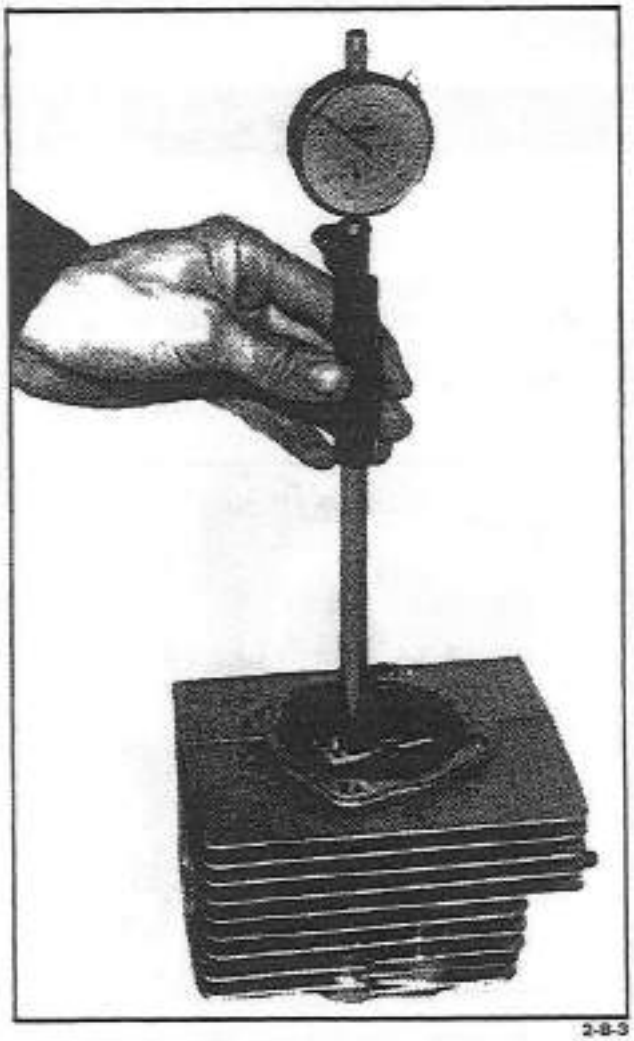
CAUTION: Never use a sharp object to scrape away the glue as score marks incurred are detrimental to crankcase adjoinment.

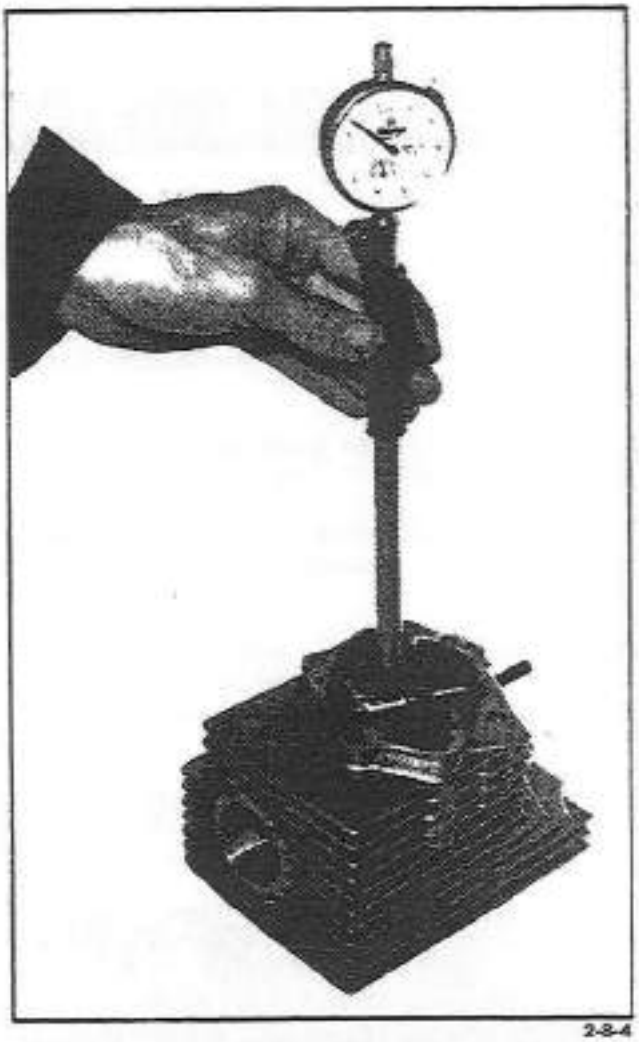
INSPECTION

1. On engine equipped with a decompressor valve, inspect decompressor valve assembly by activating lever manually. Check bearing area of plunger in valve.

2. Check the cylinder(s) for the following:

   (a) WEAR – Measuring 1/2 inch below the top of cylinder, check if cylinder bore is worn more than .004 inch above nominal dimension (fig. 2-8-3). Should bore exceed specifications, the cylinder should be re-bored and honed or replaced. Refer to Table 1 – Nominal


2-8-3


2-8-4

Dimension of Cylinder Bore. The piston(s) and rings must be replaced when re-boring and honing the cylinders.

(b) OUT OF ROUND – Measuring 1/2 inch below the top of cylinder, check if the cylinder bore is out of round more than .002 inch (see fig. 2-8-3). If the out of round exceeds this tolerance the cylinder should be rebored and honed or replaced. The piston(s) and rings must also be replaced after re-boring and honing.

(c) CYLINDER TAPER – Measuring vertically from below the intake port to 5/8 inch from top of the cylinder, check if taper is off more than .003 inch (fig. 2-8-4). Should the taper exceed this tolerance, re-bore and hone or replace cylinder. Always replace piston(s) and rings if cylinder requires re-bore and honing.

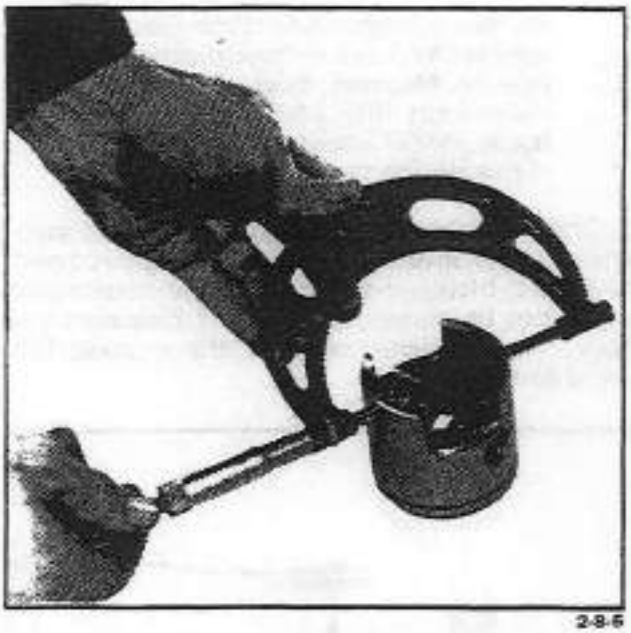
CAUTION: On all two cylinder engines, the specifications of one cylinder must meet the same specifications on the other.

1 – NOMINAL DIMENSION OF CYLINDER BORE

Engine	Standard		1st Oversize	
Type	mm	inches	mm	inches
247	69.0	2.716	69.5	2.736
292	75.0	2.952	75.5	2.972
* 302	76.0	2.992	76.5	3.011
337	78.0	3.070	78.5	3.090
343	59.5	2.342	60.0	2.362
401	64.5	2.539	65.0	2.559
434	67.5	2.657	68.0	2.677
435	67.5	2.657	68.0	2.677
640	76.0	2.992	76.5	3.011
641	76.0	2.992	76.5	3.011
775	82.0	3.228	82.5	3.248

*A 2nd Oversize at 77.0 mm (3.031") is also available

3. Check piston to cylinder wall clearance by measuring the piston diameter at a point 5/16 inch above piston skirt edge (fig. 2-8-5). Measure the cylinder diameter at a point 1/2 inch below

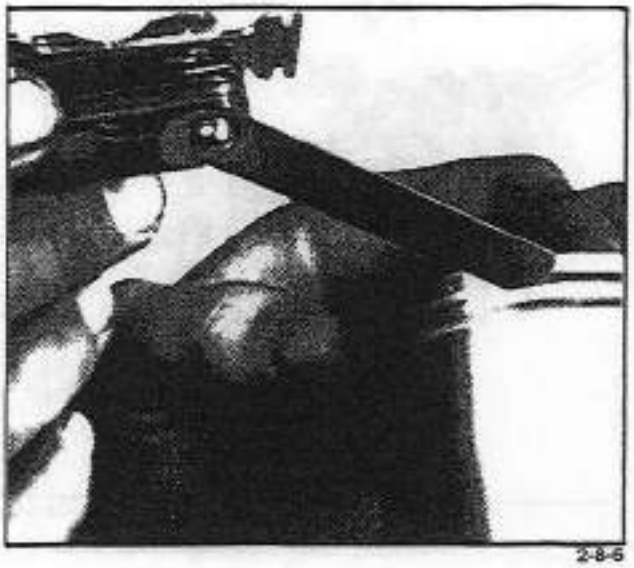

2-8-5

cylinder top (see fig. 2-8-3). Subtract the two (2) measurements to find clearance. It must be within dimensions shown in Table 2.

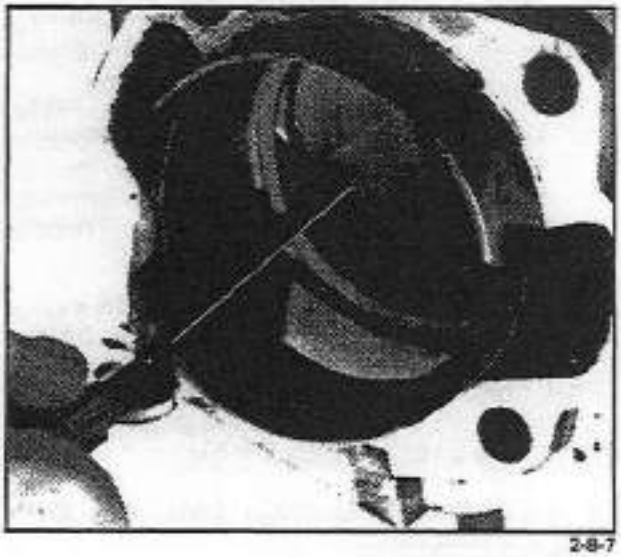
NOTE: The maximum wear limit is .007 inch.

Engine Type	Cleaning when reboring
247	.003 to .004 inch
302, 337, 343 and 401	.0035 to .004 inch
292, 434, 435, 640 and 641	.004 to .005 inch
775	.0047 to .0055 inch

4. Check vertical clearance of piston ring in piston ring groove. The minimum clearance must not be under .001 inch or over .0075 inch. To do this, insert a feeler gauge blade between piston ring and piston groove (fig. 2-8-6).

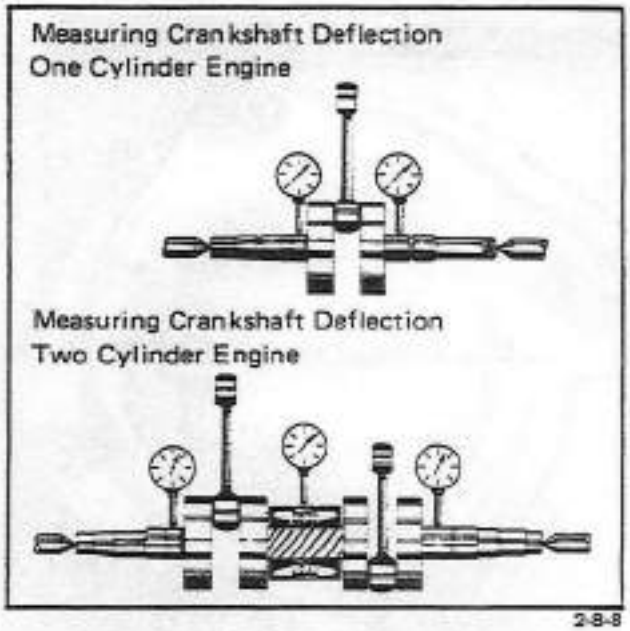

2-8-6

5. Check ring end gap. Place ring in cylinder half way between transfer port and intake port. Using a feeler gauge, measure clearance between ring ends (fig. 2-8-7). The ring end gap tolerance is .008 to .063 inch.


2-8-7

6. Measure crankshaft deflection as follows:

   (a) With the crankshaft positioned on a centre lathe, place a dial indicator on crankshaft at a point closest to the crankshaft blades (fig. 2-8-8). Crankshaft deflection should not exceed .003 inch. Should crankshaft need correction, adjust deflection using a wedge and a hammer or replace crankshaft.



2-8-8

7. Inspect piston eyes for burnt or scored sides. Replace piston as required.

8. Inspect gudgeon pin. Use the following procedure:

(a) If colour of gudgeon pin is brown or blue (burned), replace pin(s) and needle cage(s).
(b) Slide your fingers along gudgeon pin to locate possible wear. Replace gudgeon pin(s) and needle cage(s) as required.
(c) Insert the gudgeon pin(s) into cold piston(s) and inspect for noticeable radial clearance of the gudgeon pin in the piston eyes. If clearance is noticed, replace gudgeon pin(s) and needle cage(s).

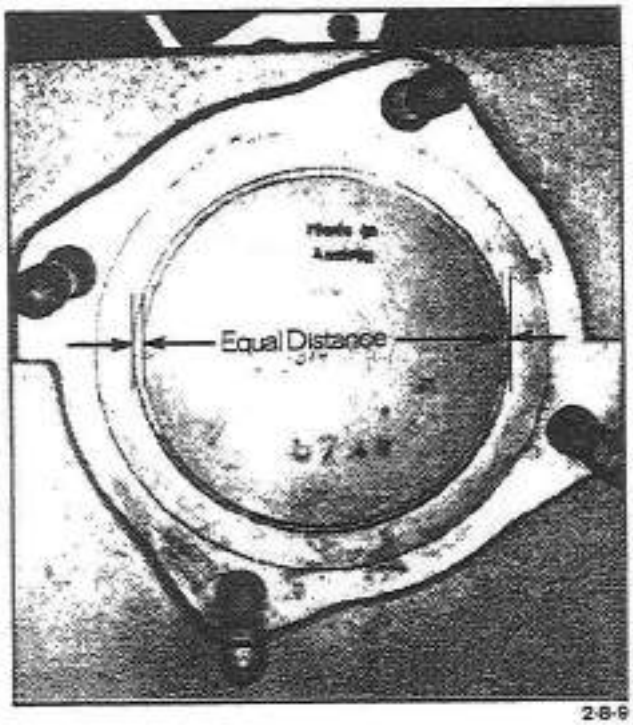
9. Check piston wear by measuring 5/16 inch above bottom of piston. Obtain distance from intake to exhaust side of piston. If measurement is below nominal diameter by .010 inch on 247 type engines or .0105 inch on the other engine types, replace piston (see fig. 2-8-5).

10. Check if connecting rod is bent using the following procedure:

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

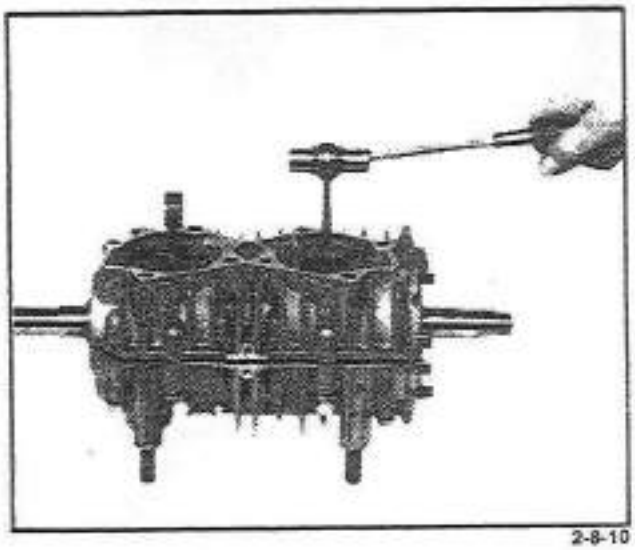
NOTE: The crankcase gasket must not be installed.

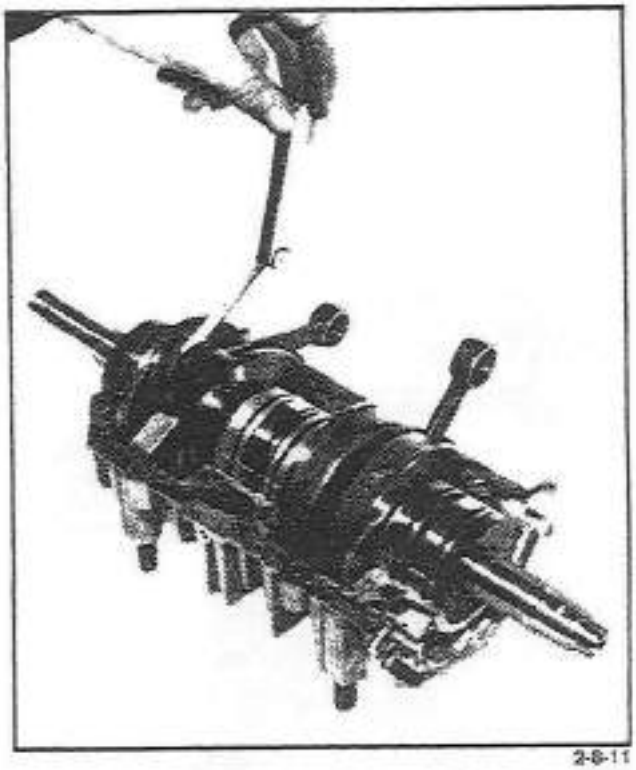
(b) Rotate the crankshaft slowly, at the same time, observing piston movement in the cylinder. Should the piston bear against the side of the cylinder (P.T.O. side or Magneto side), the connecting rod is bent (fig. 2-8-9). In such a case, figure 2-8-10 indicates the correct way of readjusting the rod.



2-8-9

11. Check connecting rod axial play by measuring the distance between connecting rod and crankshaft blade (fig. 2-8-11). The tolerance should not be above .040 inch. If clearance is above the specified tolerance the crankshaft should be changed.


2-8-10


2-8-11

Engine

TROUBLE SHOOTING 2-9

IRREGULARITIES	CAUSE
Rewind starter inoperative	1. Pawls bent, broken or worn 2. Friction spring broken or stretched 3. Starting pulley worn
Starter rope does not rewind	1. Recoil spring detached from pin or broken 2. Pulley shaft bent
Engine will not crank	1. Piston seized or rusted to cylinder wall 2. Crankshaft bearing seized 3. Broken connecting rod 4. Engine improperly assembled after repair
Engine backfires or doesn't start	1. Spark plug wires reversed (on twin cylinder) 2. Flywheel key sheared or missing 3. Improper timing 4. Faulty breaker points or condenser 5. Unhooked spark retarding mechanism (or spring broken) 6. Defective breaker cam
Engine cranks too easily (poor compression)	1. Scored cylinder 2. Blown head gasket 3. Loose spark plugs 4. Incorrect torque of cylinder head nuts 5. Defective piston rings 6. Decompressor valve stuck open 7. Warped or cracked cylinder head
Engine turns over but fails to start or starts with difficulty	1. No fuel to the carburetor 2. Water in fuel system 3. Fuel tank cap vent hole clogged 4. Incorrect fuel/oil ratio 5. Carburetor idle speed mixture adjustment incorrect 6. Inoperative carburetor diaphragm or flapper valve 7. No vacuum to carburetor fuel pump 8. Defective spark plug 9. Ignition system improperly set 10. Damaged spark plug wire or protector 11. Weak coil or condenser
Engine missing at low speed, doesn't idle smoothly or slowly	1. Carburetor idle adjustments incorrect 2. Improper fuel mixture 3. Defective spark plug 4. Head gasket blown or leaking 5. Ignition timing improperly set 6. Leaking crankshaft seal 7. Weak coil or condenser

IRREGULARITIES	CAUSE
Good spark but engine runs on (1) cylinder, (double cylinder engine)	1. Leaking head gasket 2. Vacuum line leak (T'NT 640 and 775) 3. Leaking crankshaft seal 4. Spark plug insulation cracked
Engine vibrates excessively or runs rough and smokes	1. Idle or high speed mixture adjustment too rich 2. Choke not opening properly (bent linkage) 3. Inlet control lever too high (carburetor floods) 4. Idle air bleed plugged 5. Welch plugs leaking 6. Engine mount loose 7. Water in gasoline
No acceleration. Idles well but dies down when put to full throttle	1. High speed mixture needle set too lean 2. High speed jet obstructed 3. Inlet lever set too low 4. Choke partly closed 5. Fuel line or fuel filter cartridge obstructed 6. Carburetor: Punctured diaphragm or flapper valves bent 7. Faulty ignition system 8. Main fuel check valve stuck 9. Welch plug leaking
Engine runs only when using choke	1. Leaking fuel line 2. Fuel line and fuel filter cartridge obstructed 3. Malfunctioning or punctured diaphragm 4. Leaking intake manifold gasket or crank shaft seals
Missing at high speed or intermittent spark	1. Spark plug dirty or defective 2. Heat range of spark plug incorrect 3. Magneto wire insulation broken 4. Ignition timing incorrectly set 5. Weak coil or condenser 6. Leaking head gasket
No power under heavy load	1. Ignition timing too far advanced 2. Faulty carburetion
High speed back-firing	1. Lean carburetor adjustment 2. Carbon formation on spark plug 3. Crankshaft oil seal leaking 4. Condenser defective 5. Breaker points improperly gapped
Engine runs too hot	1. Carburetor mixture too lean 2. Incorrect timing 3. Too much carbon formation 4. Spark plug range too hot 5. Improperly adjusted or broken fan belt 6. Broken or dirty engine fins

Table of Contents

Electrical

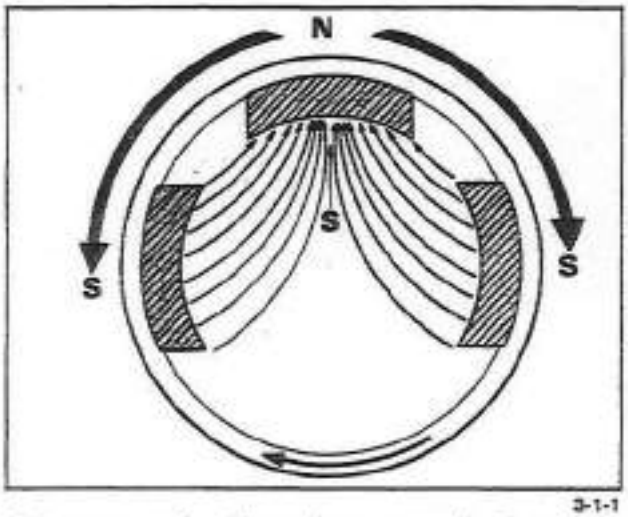
GENERAL 3-1

Electricity covers a wide and complicated range therefore a thorough coverage of electrical fundamental is not possible in this manual. However, a basic understanding of the electrical function of the Ski-Doo snowmobile is a must for any person owning and/or maintaining a vehicle.

OPERATING PRINCIPLES

In the Ski-Doo snowmobile, Bombardier Ltd. has utilized the theory of converting the energy of permanent magnets into electrical energy. A brief description of the operating principles of the magneto ignition system is as follows.

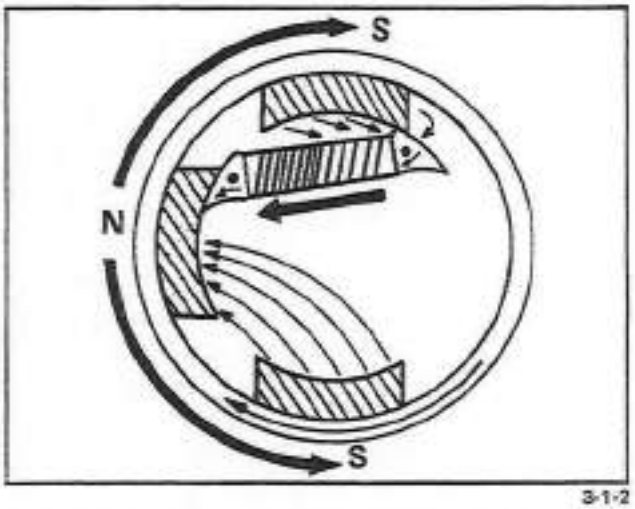
The magneto ring, incorporating four (4) permanently magnetized bars, is the primary source of magnetic energy. As shown in figure 3-1-1, this energy flow is concentrated in a set field. When the magneto ring is affixed to the engine crankshaft and an armature plate is positioned within the magneto ring, the energy flow can be directed through the coil windings of the armature plate. The energy flow then induces an electric current in the coils (fig. 3-1-2).



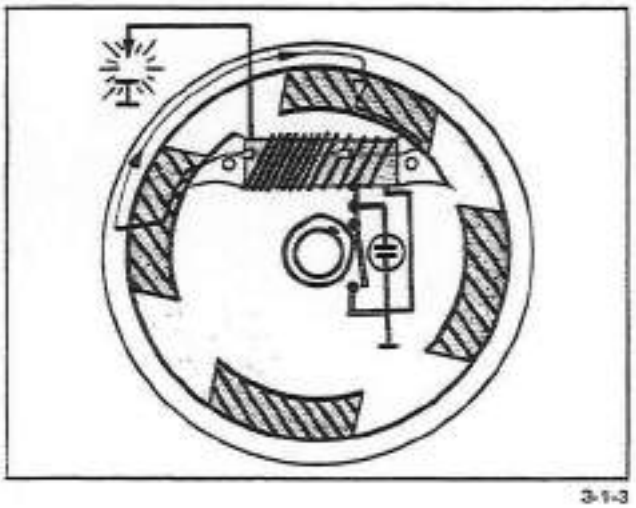
3-1-1

This current is directed to ground when the breaker points are closed. At a pre-determined magneto ring position a cam begins to open the breaker points. At this instant, current flows in the condenser and into the external high tension coil where the voltage is multiplied. This high voltage in the secondary winding of the high tension coil causes a spark to jump across the spark plug electrodes.

The purpose of the condenser is to reduce arcing at the points. The time required to charge the condenser, though very small, is sufficient to reduce the voltage rise at the points when they start to break open (fig. 3-1-3).



3-1-2



3-1-3

Electrical.

ELECTRICAL CHARTS 3-2

GENERAL

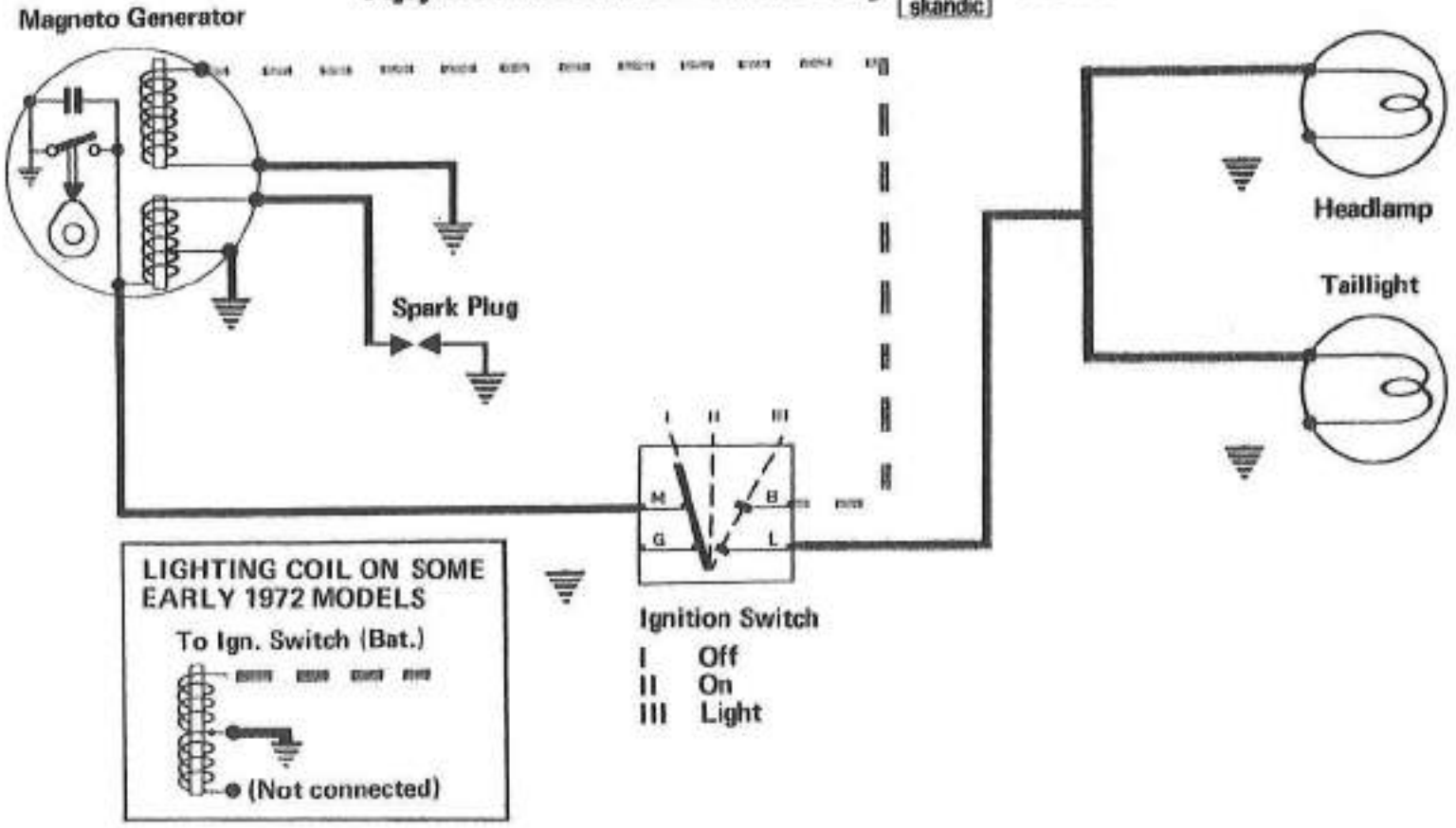
The following pages include the various electrical wiring diagrams of all 1972 Ski-Doo Snowmobiles.

IMPORTANT

It is important to remember that an electric circuit must be complete in order to have a current flow, and that there will be no current flow until the conducting circuit returns to its original starting point (Battery or Magneto).

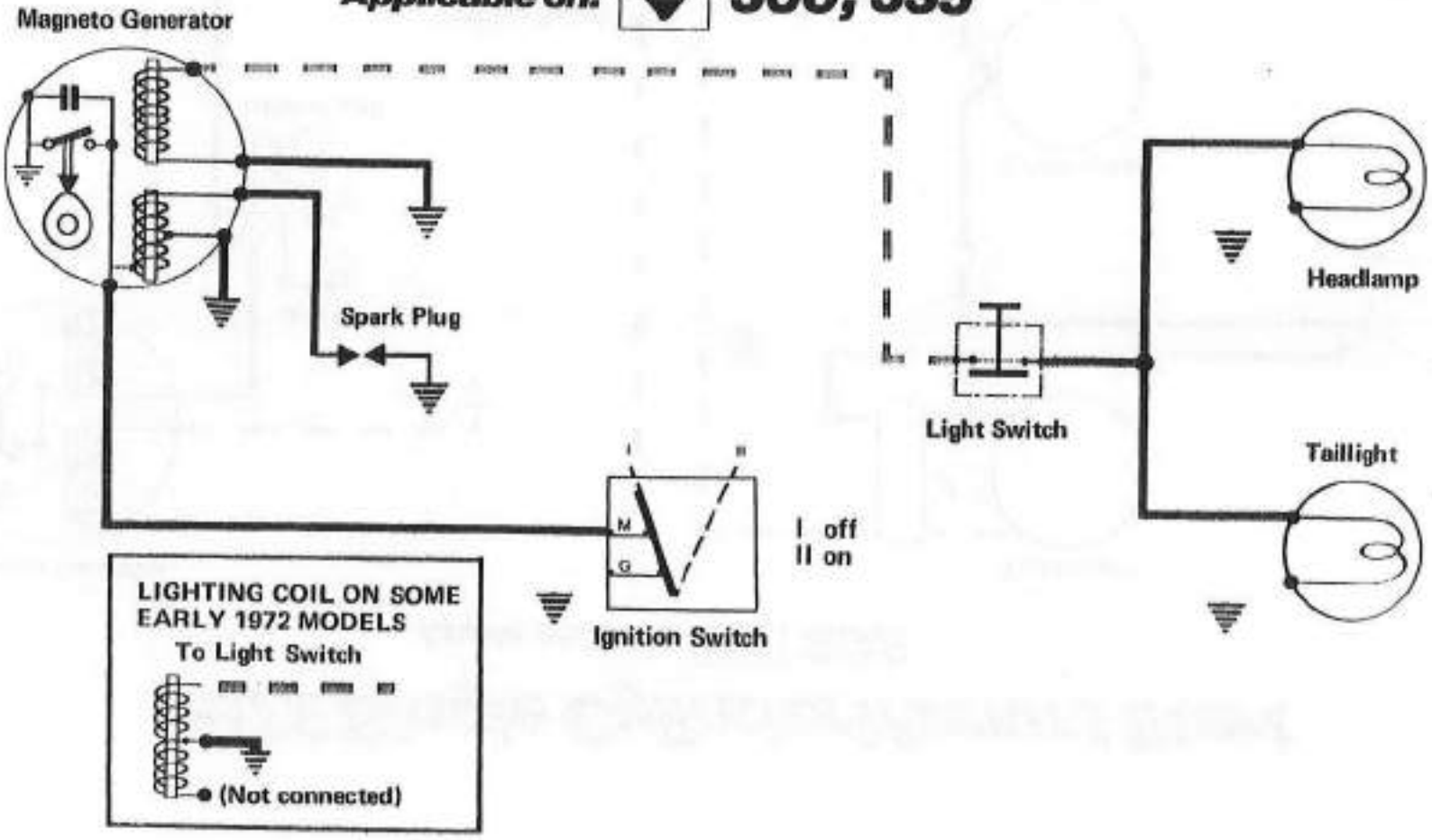
1972 Single Cylinder Manual Start

Applicable on: Etna 250, skandic 335



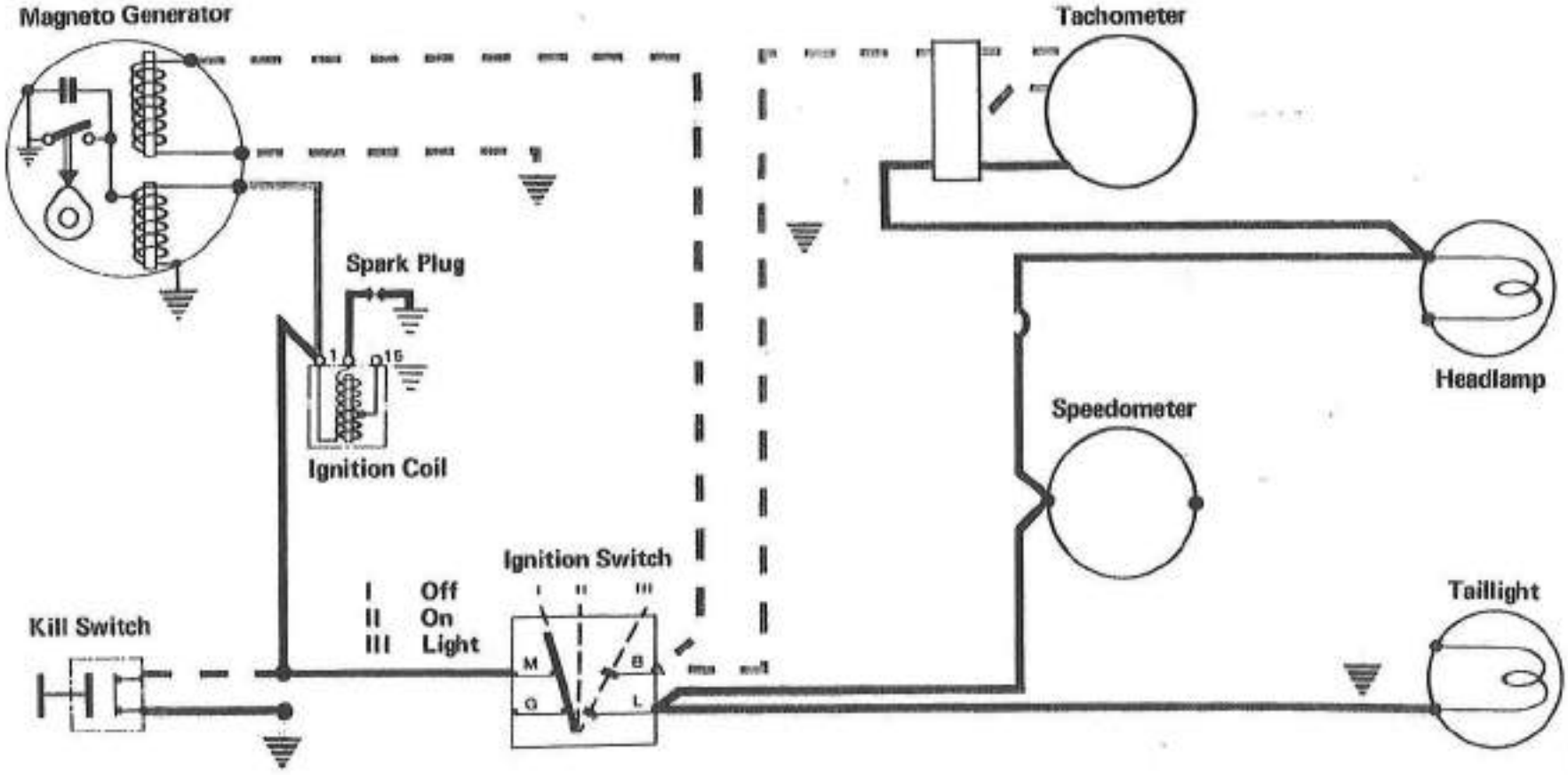
1972 Single Cylinder Manual Start

Applicable on: OLYMPIQUE **300, 335**



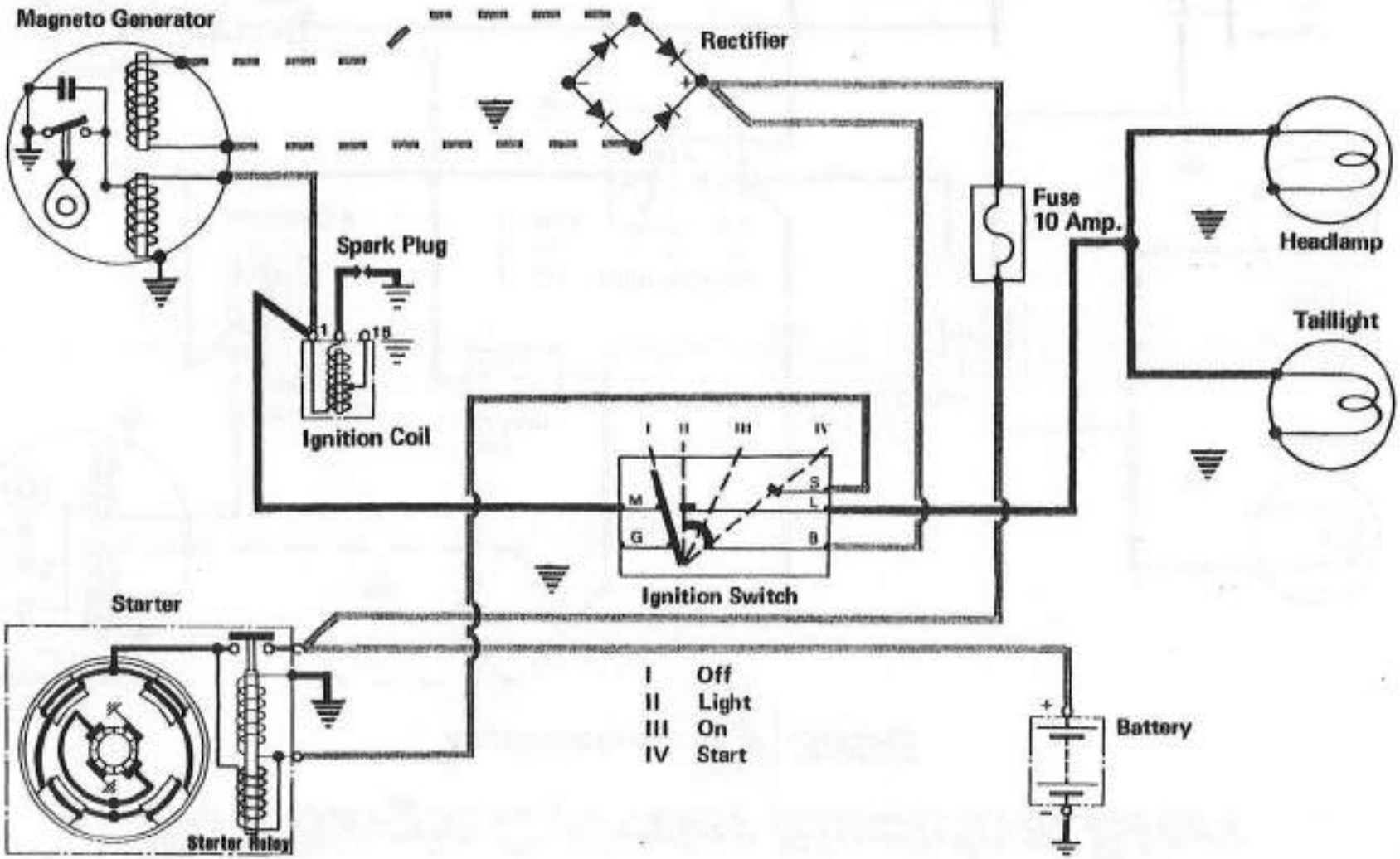
1972 Single Cylinder Manual Start

Applicable on: TNT 292



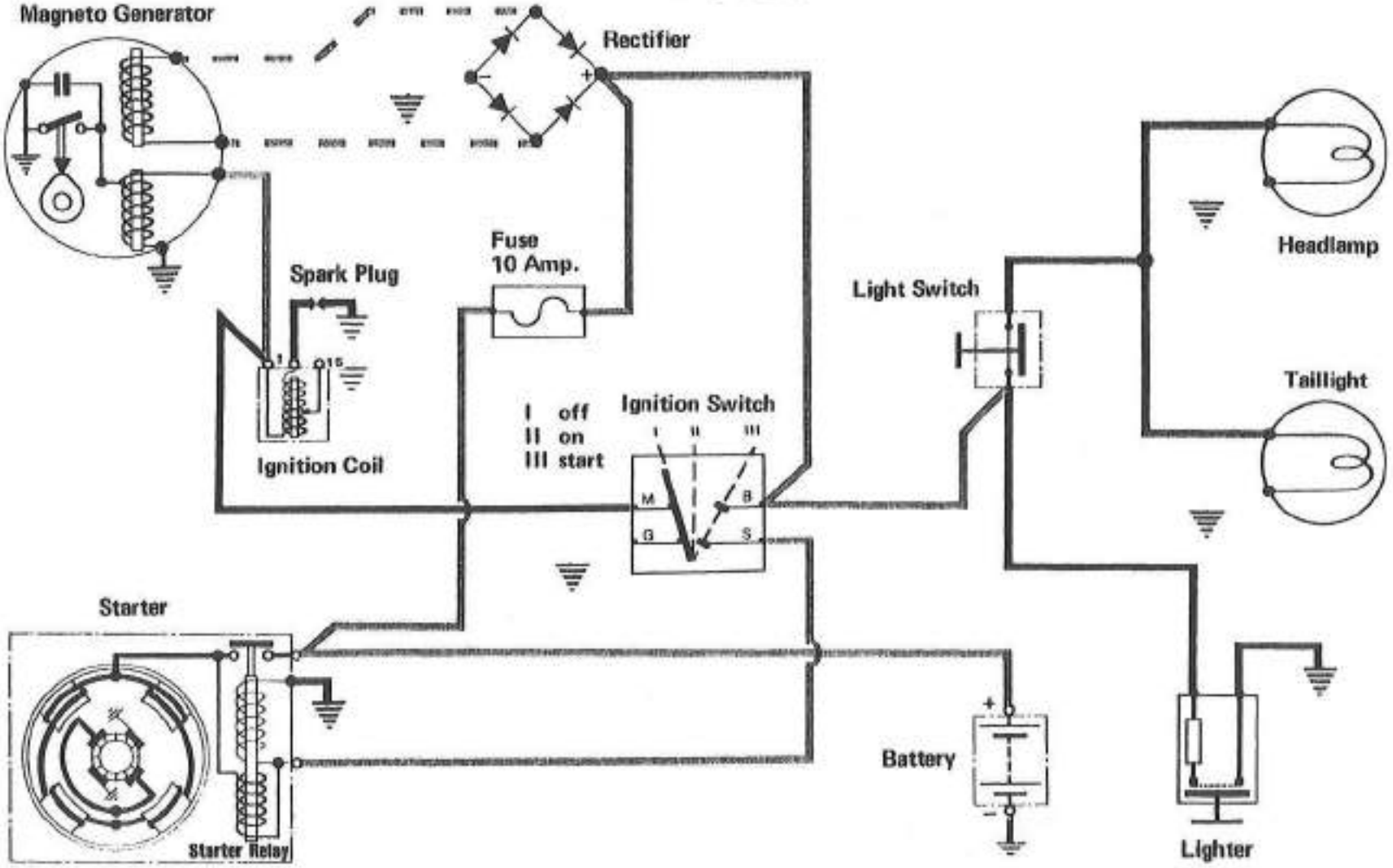
1972 Single Cylinder Electrical Start

Applicable on: elan 250E



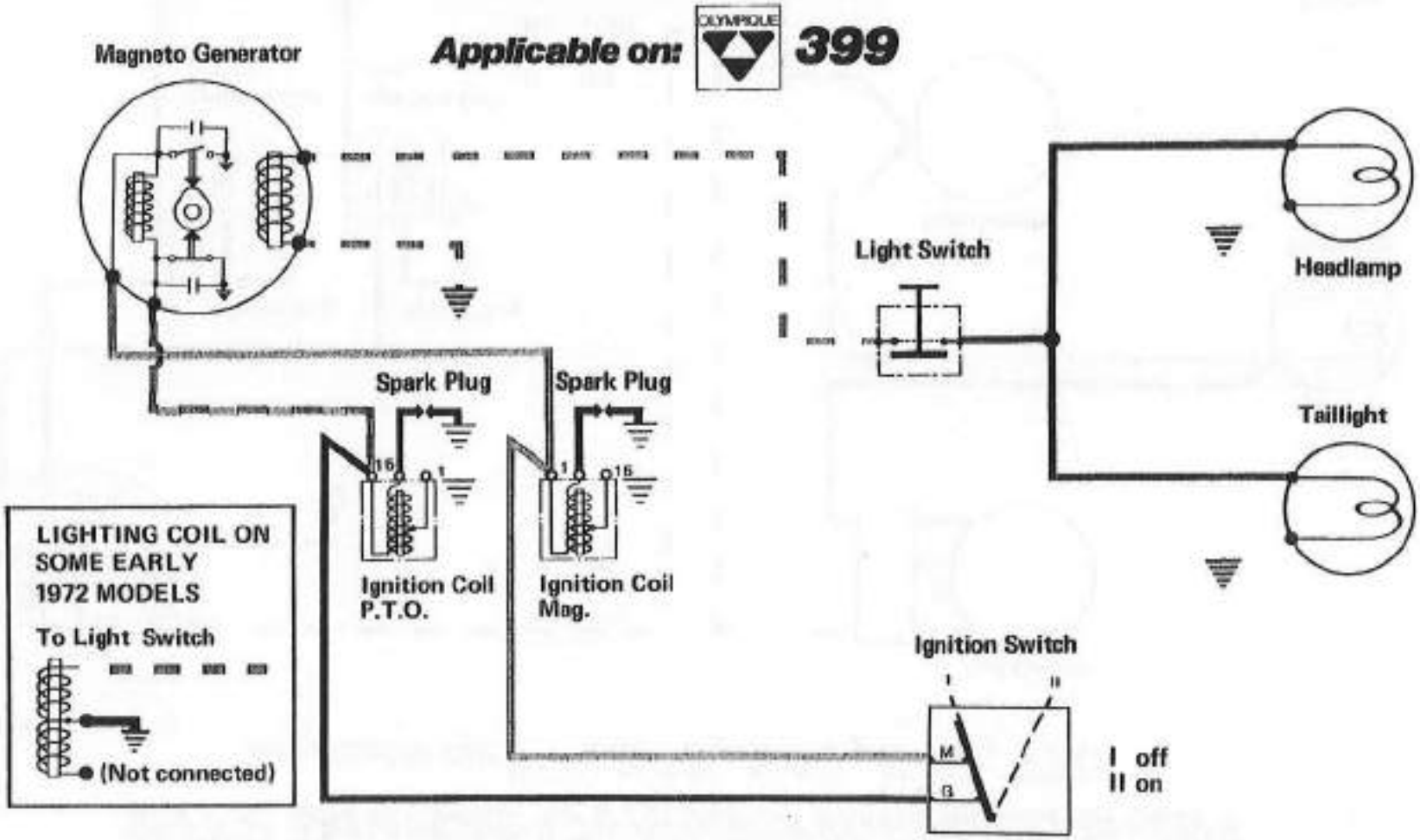
1972 Single Cylinder Electrical Start

Applicable on: 335E



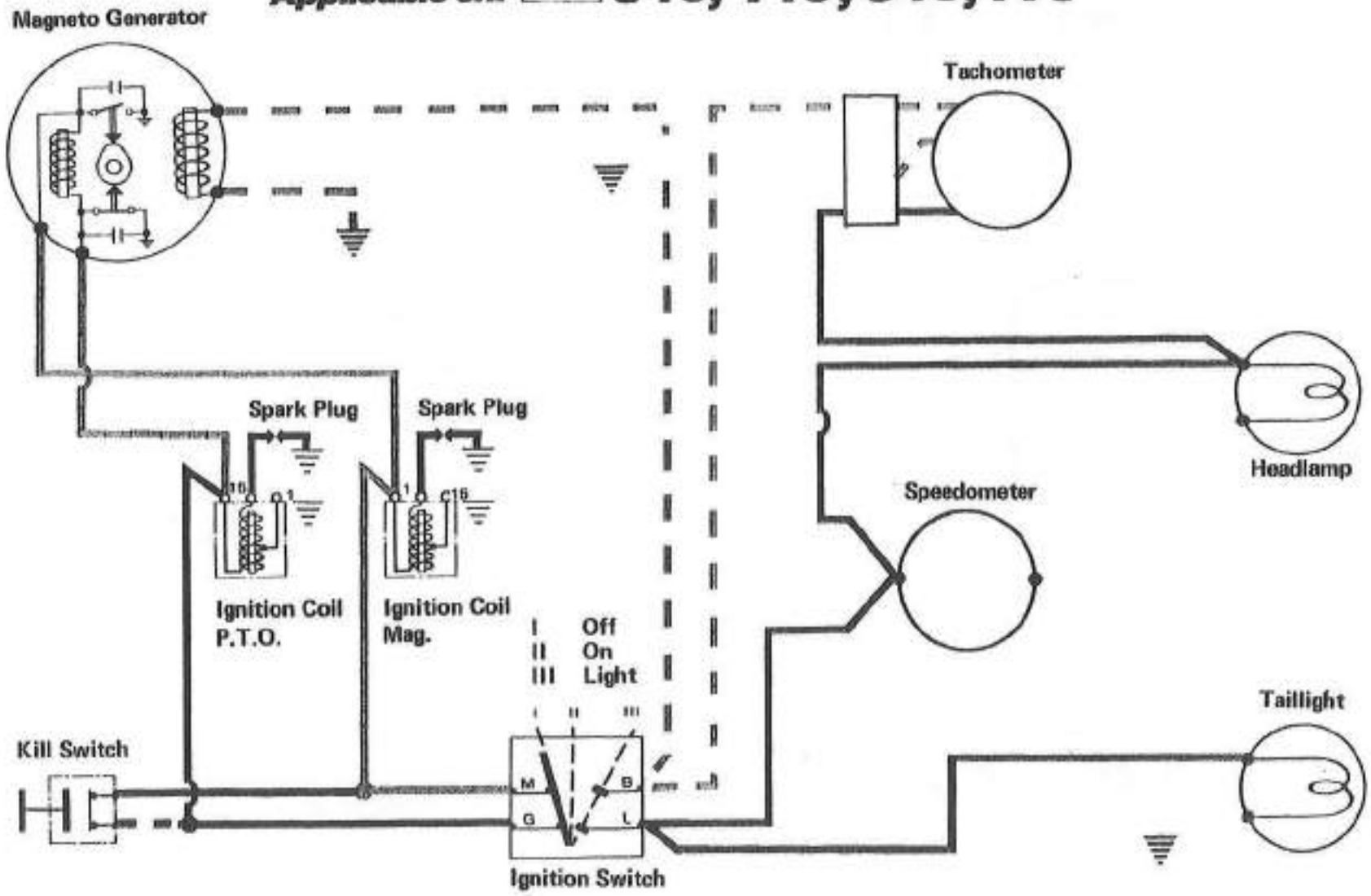
1972 Double Cylinder Manual Start

Applicable on: 399



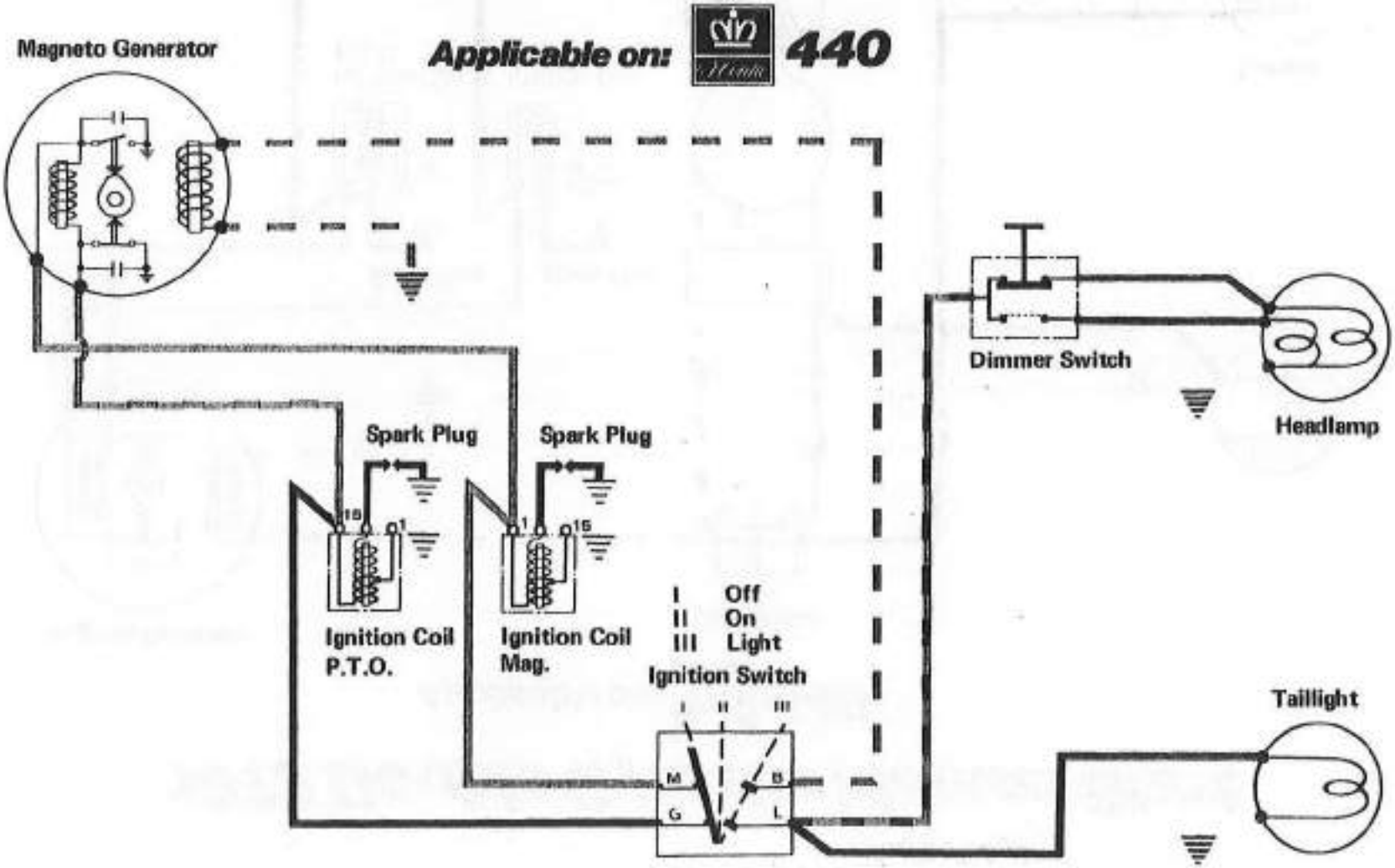
1972 Double Cylinder Manual Start

Applicable on: T'NT 340, 440, 640, 775



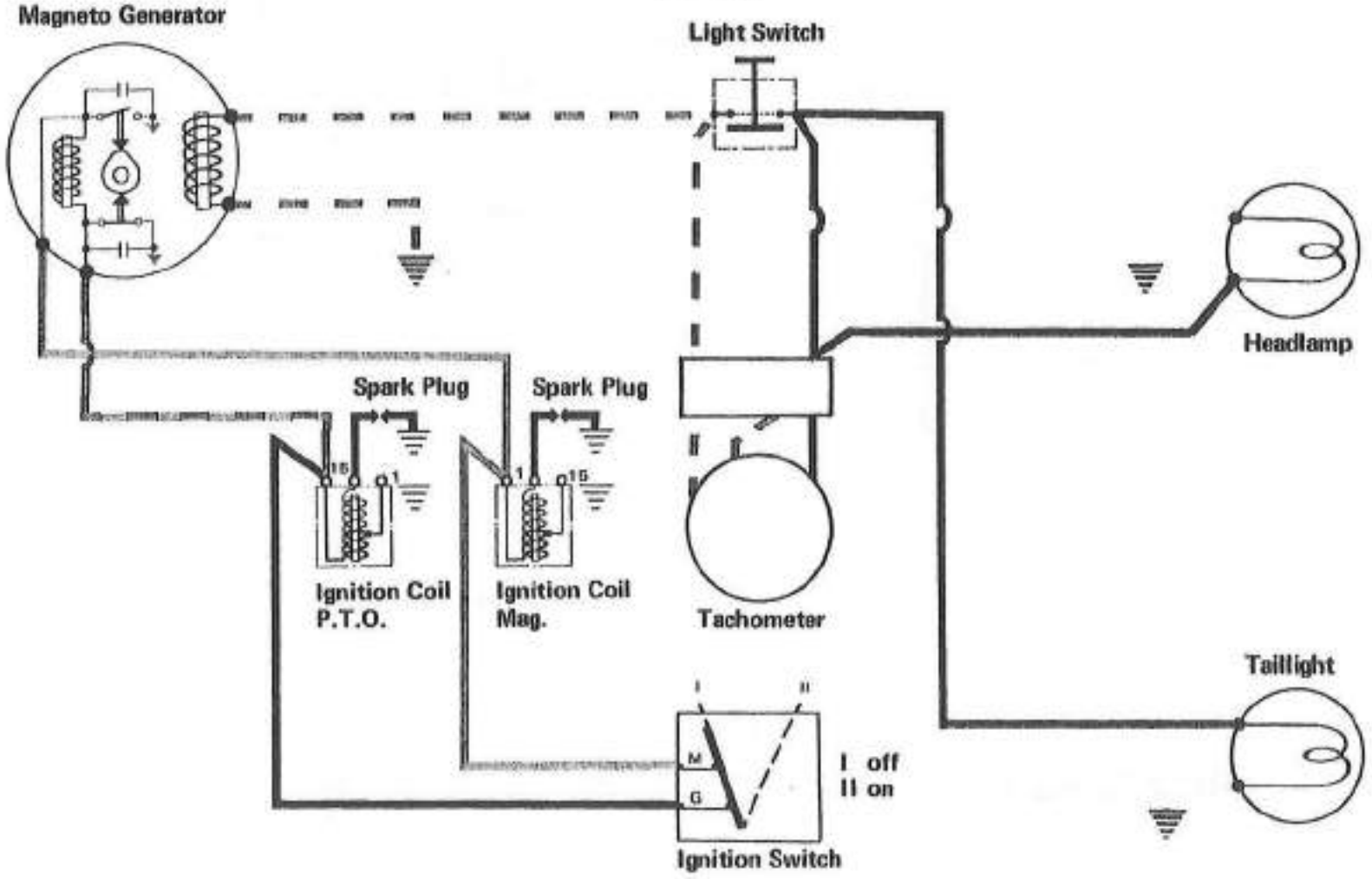
1972 Double Cylinder Manual Start

Applicable on: 440



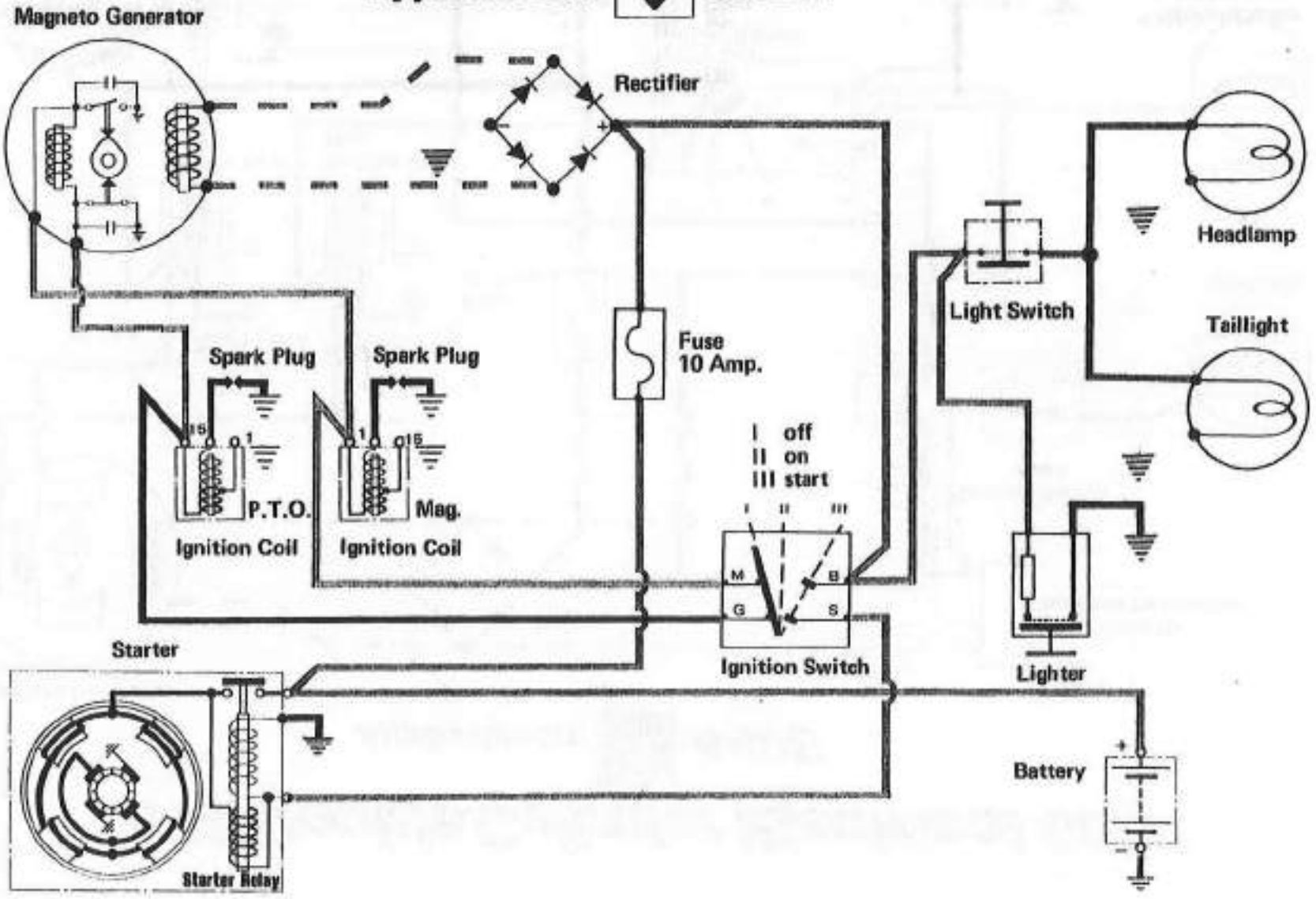
1972 Double Cylinder Manual Start

Applicable on: Valmont 440



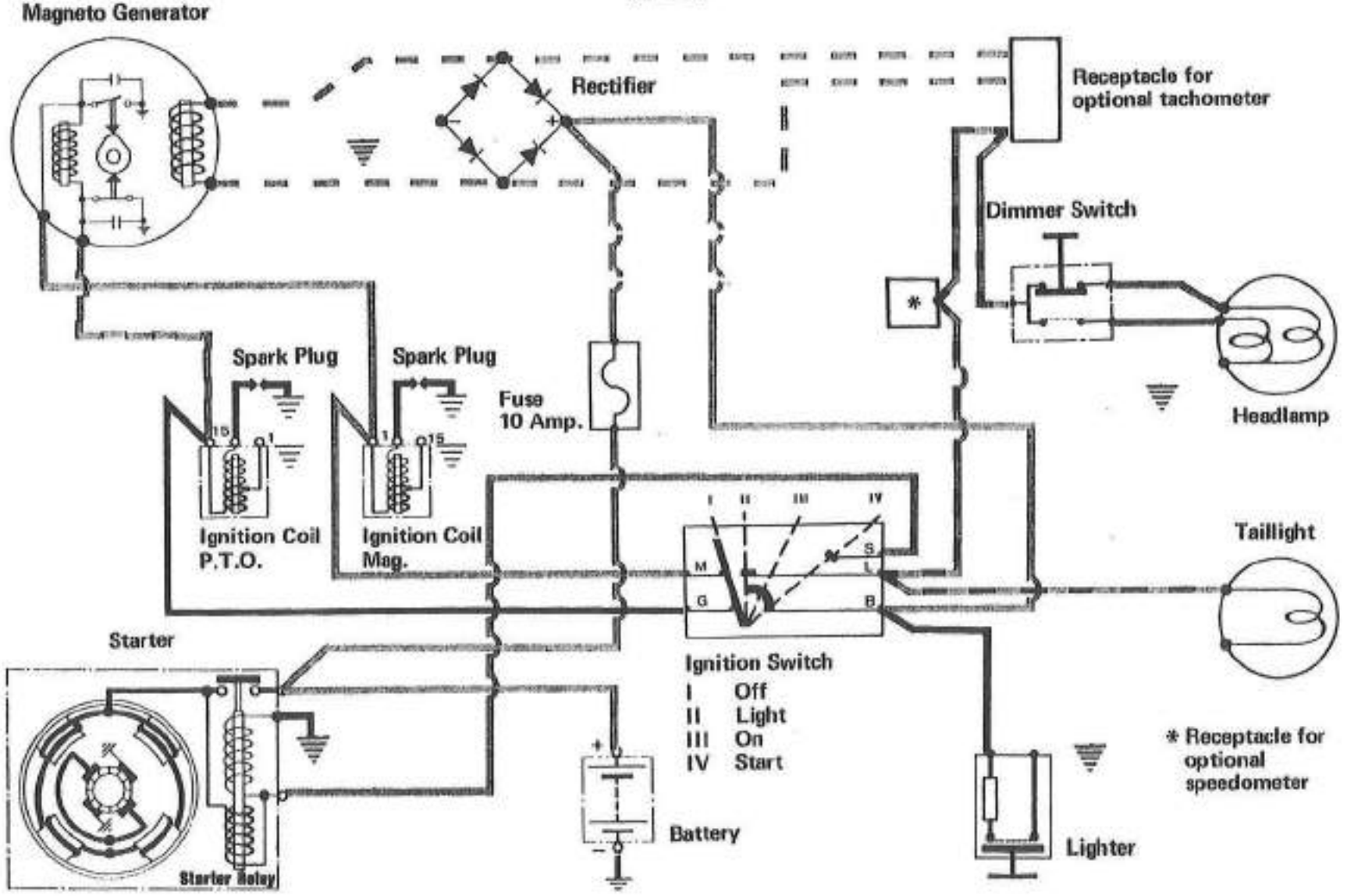
1972 Double Cylinder Electrical Start

Applicable on: OLYMPIQUE **399E**



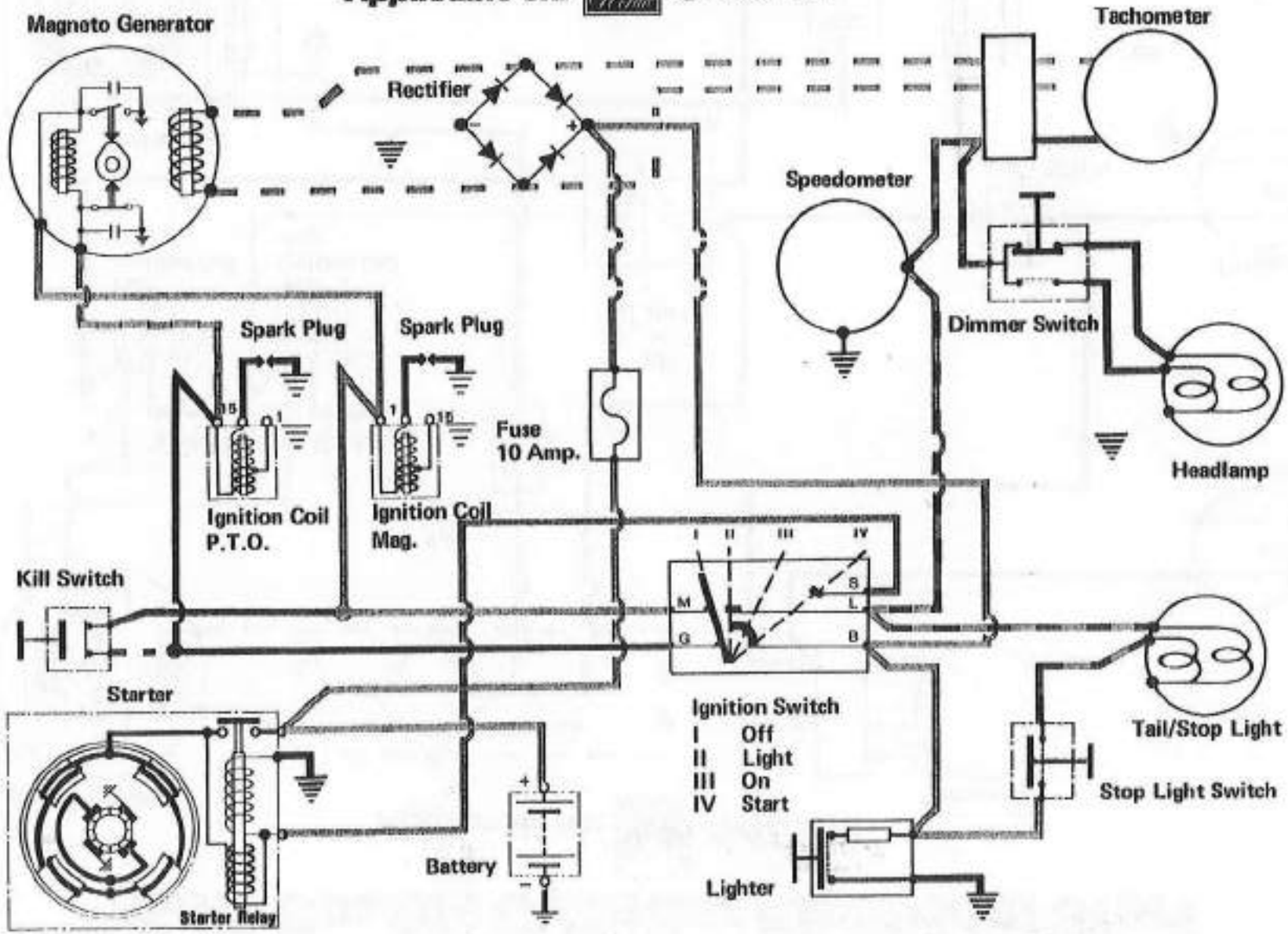
1972 Double Cylinder Electrical Start

Applicable on: 440E



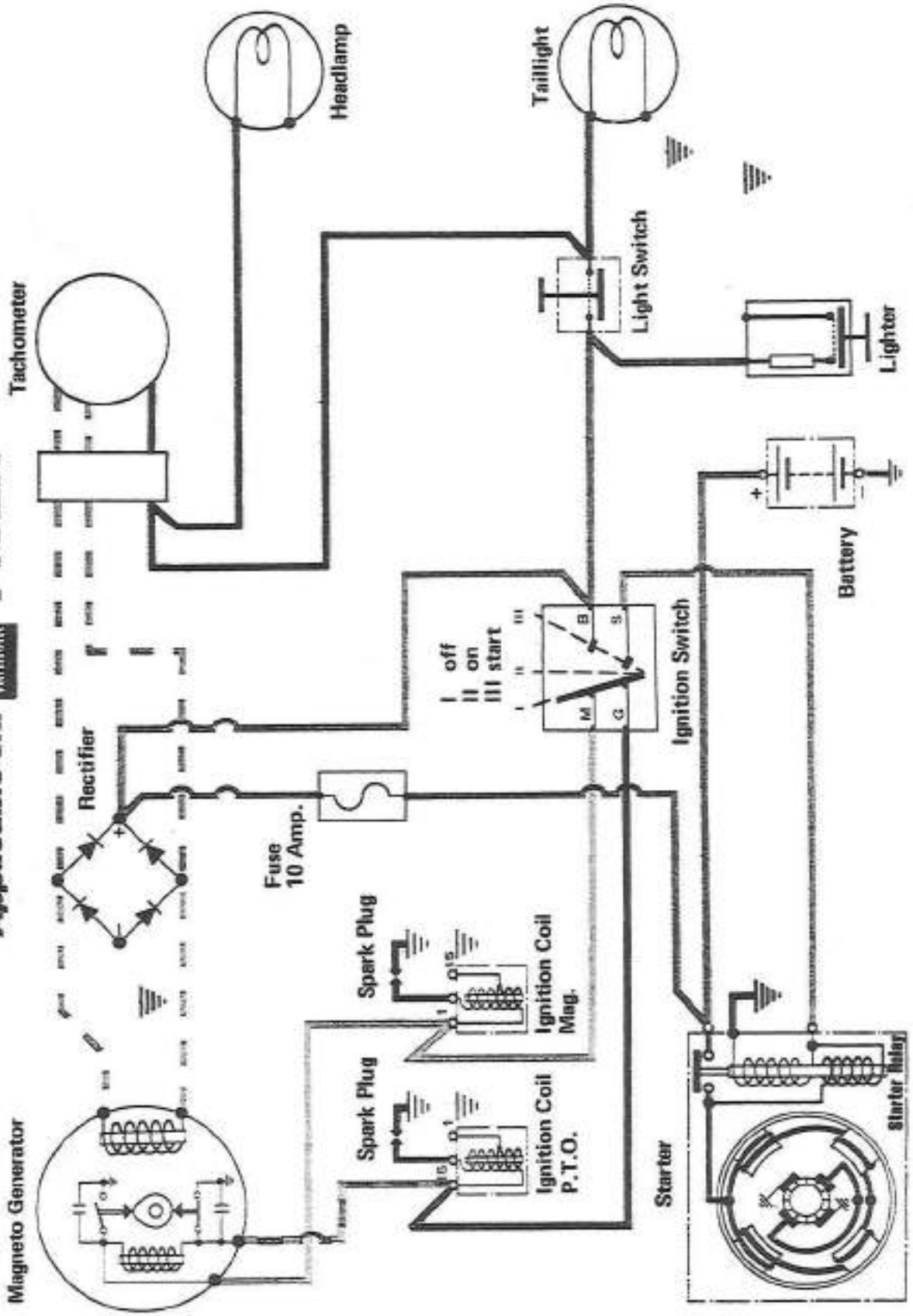
1972 Double Cylinder Electrical Start

Applicable on: 640ER



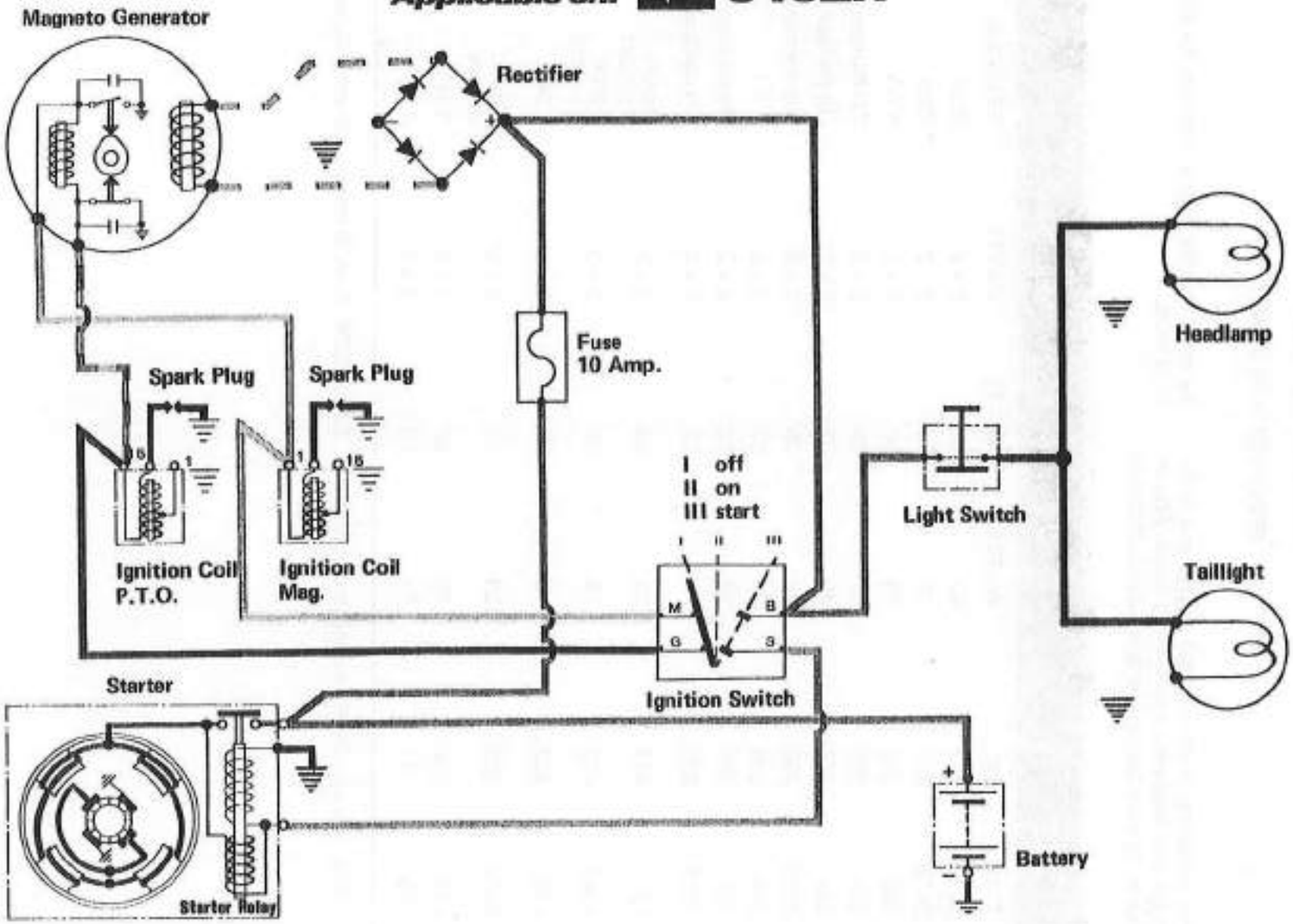
1972 Double Cylinder Electrical Start

Applicable on: 440ER



1972 Double Cylinder Electrical Start

Applicable on: Alpine 640ER



MAGNETO AND BULB

SPECIFICATION CHART

The following chart indicates voltage and wattage for the headlamp and taillight bulbs. Also indicated is the magneto wattage output. It should be noted that the magneto voltage for all models, is 12 volts.

ENGINE		MAG OUT	HEADLAMP	TAILLIGHT	
TYPE	**CC**	**WATTS**	**WATTS**	**WATTS**	**VEHICLE**
247	247	40	35	2 x 2	Élan
247E	247	75	35	2 x 2	Élan
292	292	75	60	2 x 2	T'NT
302	299	40	35	2 x 2	Olympique
337	335	40	35	2 x 2	Olympique
337E	335	75	35	2 x 2	Olympique
343	339	75	60	2 x 2	T'NT
401	399	75	60	2 x 2	Olympique
401E	399	75	35	2 x 2	Olympique
434	437	75	60	2 x 2	Nordic Valmont
434E	437	75	35	2 x 2	Nordic Valmont
435	437	75	60	2 x 2	T'NT
640E	635	120	60	2 x 2*	Nordic Alpine
641	635	75	60	2 x 2	T'NT
775	771	75	60	2 x 2	T'NT

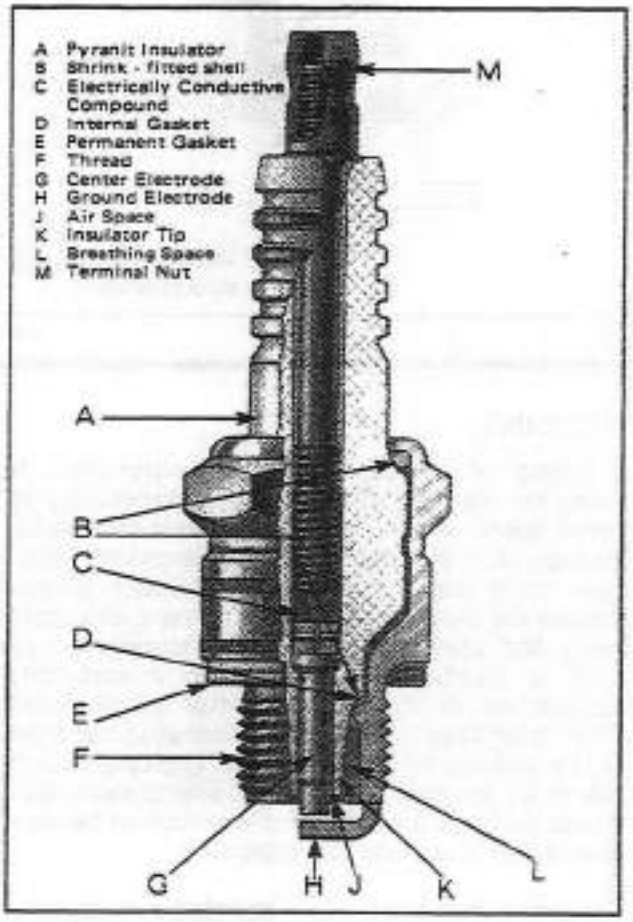
*The Nordic 640E model incorporates a 7.5W/26.2W twin filament tail/stop light.

Electrical

SPARK PLUGS 3-3

GENERAL

In the Bombardier-Rotax engine, the ignition voltage generated by the magneto ignites the air-fuel mixture contained in the combustion chamber. It is the function of the spark plug to introduce the ignition current into the combustion chamber and to initiate the combustion of the compressed air-fuel mixture by a spark jumping across the spark plug electrodes.



Exploded view of spark plug

OPERATING PRINCIPLE

The ignition current flows through the spark plug terminal and through the insulated center electrode (anode). It then sparks across the gap between the center and the ground (cathode) electrode and ignites the air-fuel mixture at a determined piston position.

PLUG DESIGN

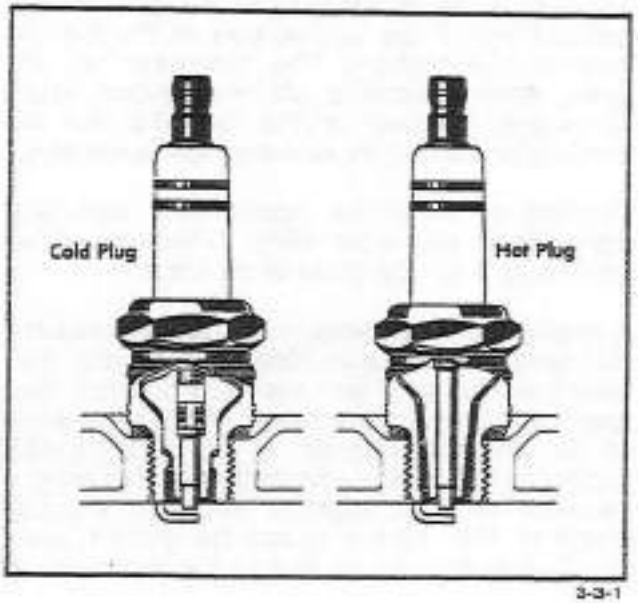
A design for a universal spark plug suitable for all engines is impossible because of the considerable differences in operating conditions; type of engine, compression ratio, rotational speed, cooling arrangements, carburetor setting and fuel.

A correctly selected spark plug is defined to a certain temperature range. This temperature range is sufficient to burn off any particles of oil or soot deposited on the plug tip without the occurrence of pre-ignition. It is only in cases where inevitable deposits form and become electrically conductive that the spark plug temperature range is impaired and misfiring and/or fouling occurs.

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 the 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 (fig. 3-3-1).



3-3-1

This is why Bombardier Ltd., as a result of exhaustive tests, specify a spark plug which is the most favourable when operating the vehicle at full throttle. However, when prevailing conditions do not permit such operation, a hotter plug (one heat range hotter) can be installed to prevent possible fouling. To prevent piston failure, always reinstall standard plug for high speed operation. (See Spark Plug Chart).

NOTE: Bombardier-Rotax engines are equipped with Bosch spark plugs therefore, it should be remembered that Bosch spark plugs with a low figure (W225T1) is a hotter plug than a spark plug with a high figure (W260T1).

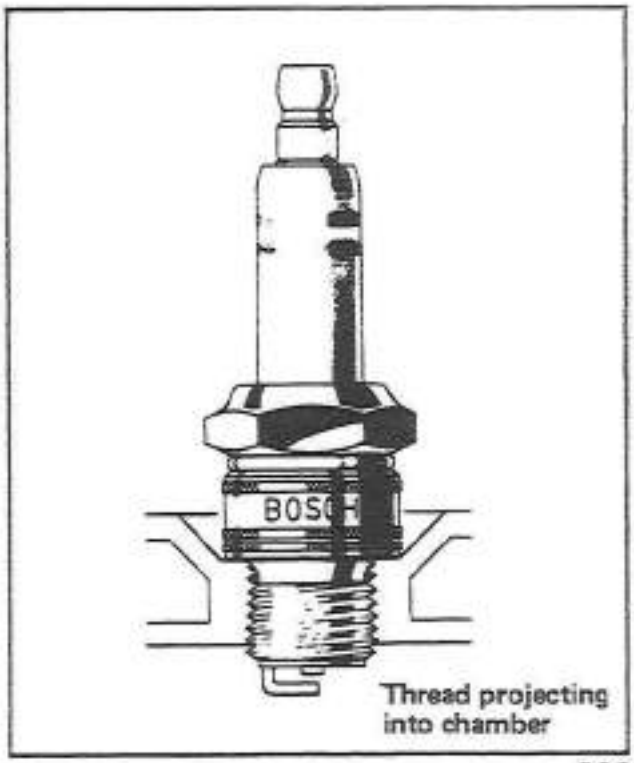
CAUTION: Under no circumstances should a spark plug with a hotter value be installed on the T'NT 340 and 440 engines. These units are highly tuned and are very sensitive to spark plug temperature.

PRE-IGNITION

Pre-ignition will result in poor engine performance because the prematurely ignited air-fuel mixture slows down the piston during the compression stroke. When pre-ignition becomes excessive, the ignited air-fuel mixture may "pop" through the open inlet port, thus producing power failure and overheating. The ignited gases create "popping" and spluttering in the carburetor and may even cause carburetor backfire. Pre-ignition, apart from being due to an overheated spark plug, may also be caused by residues from combustion. PRE-IGNITION MUST NOT BE MISTAKEN FOR KNOCKING OR PINGING which occurs only after the spark has ignited the charge in the combustion chamber. The cause of knocking is the spontaneous self-ignition of the last portion of the fuel-air mixture (Detonation). The running-on of engines, when switching off the ignition after prolonged full-load driving may be due to pre-ignition caused by an overheated spark plug.

Running-on sometimes occurs after part-load operation or even after idling; in these cases the spark plug is not the cause of the trouble.

Excessive plug temperature is not solely caused by too low a heat value. Where, for instance, the gasket on the plug seat has been omitted, the spark plug becomes overheated due to a blow-by of hot combustion gases, or the plug thread, projecting too far into the combustion chamber, becomes red hot together with the ground electrode and thereby causes pre-ignition. (fig. 3-3-2). Leaner mixture or a higher compression ratio, or excessively advanced ignition may also give rise to pre-ignition.



3-3-2

FOULING

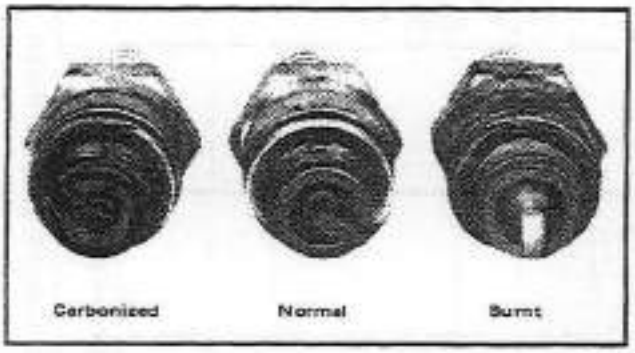
Fouling of the spark plug is indicated by irregular running of the engine, decreasing engine speed due to misfiring, reduced performance, and increased fuel consumption. This is due to a loss of compression. Other possible causes are prolonged idling or running the engine with the choke pulled out, or running on 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 of oil or oil with soot. Such coatings form a conductive connection between the center electrode and ground.

In some instances, "gap-bridging" may occur between the center and ground electrodes, or between insulator tip and plug shell so that the spark gap or the "scavenging area" becomes encrusted. (fig. 3-3-3). In either case, the trouble starts with occasional misfiring, which owing to increased cooling and fouling, eventually leads to a complete breakdown of the ignition. Plug firing also fails when the glazed surface of the upper part of the insulator is fouled or wet, forming a leakage path for the ignition current between terminal and plug shell.

3-3-3

PLUG FACE

The plug face reveals the condition of the engine, operating condition, method of driving and fuel mixing. For this reason, it is advisable to inspect the spark plug at regular intervals, examining in particular the "plug face" i.e. the part of the plug projecting into the combustion chamber. The plug face generally reveals trouble symptoms (fig. 3-3-4).



3-3-4

SPARK PLUG INSTALLATION

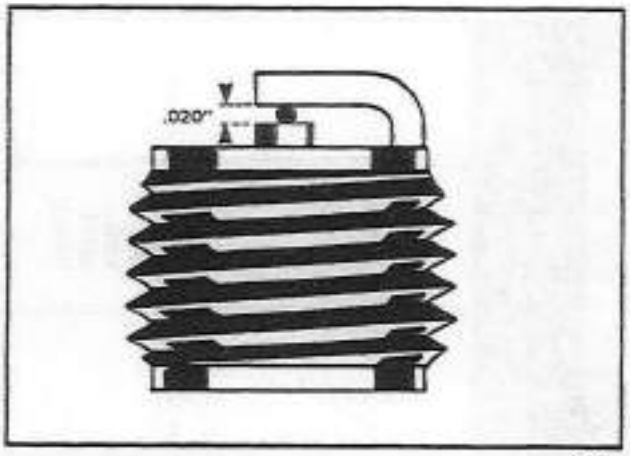
Prior to installation make sure that contact surfaces of the cylinder head and spark plug are free of dirt.

1. Using a wire feeler gauge, set electrodes gap to .020 inch (fig. 3-3-5).

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.

18mm (M)	30 ft/lbs.
14mm (W)	20 ft/lbs.

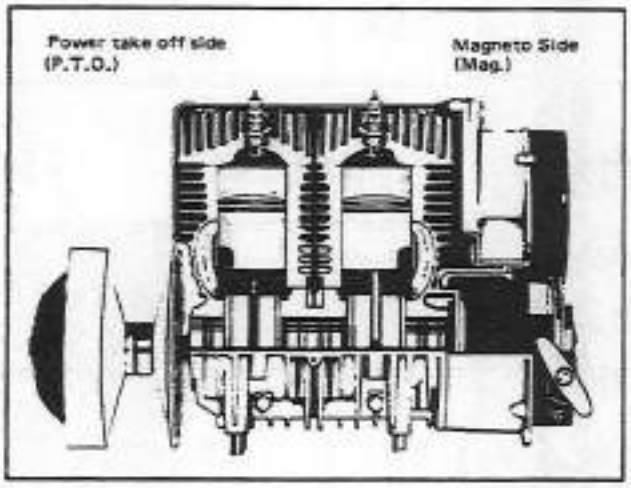


3-3-5

SPARK PLUG CHART

The following chart indicates the various spark plugs as they apply to individual vehicles for light and heavy duty operation.

Because the P.T.O. cylinder on double cylinder engines is further away from the cooling fan it has tendencies to run hotter than the magneto side cylinder (fig. 3-3-6). For this reason, the chart suggests an alternative (colder) plug for the P.T.O. side cylinder **when the vehicle is being used for light operation only. For heavy duty** operation the standard plug must be installed.



3-3-6

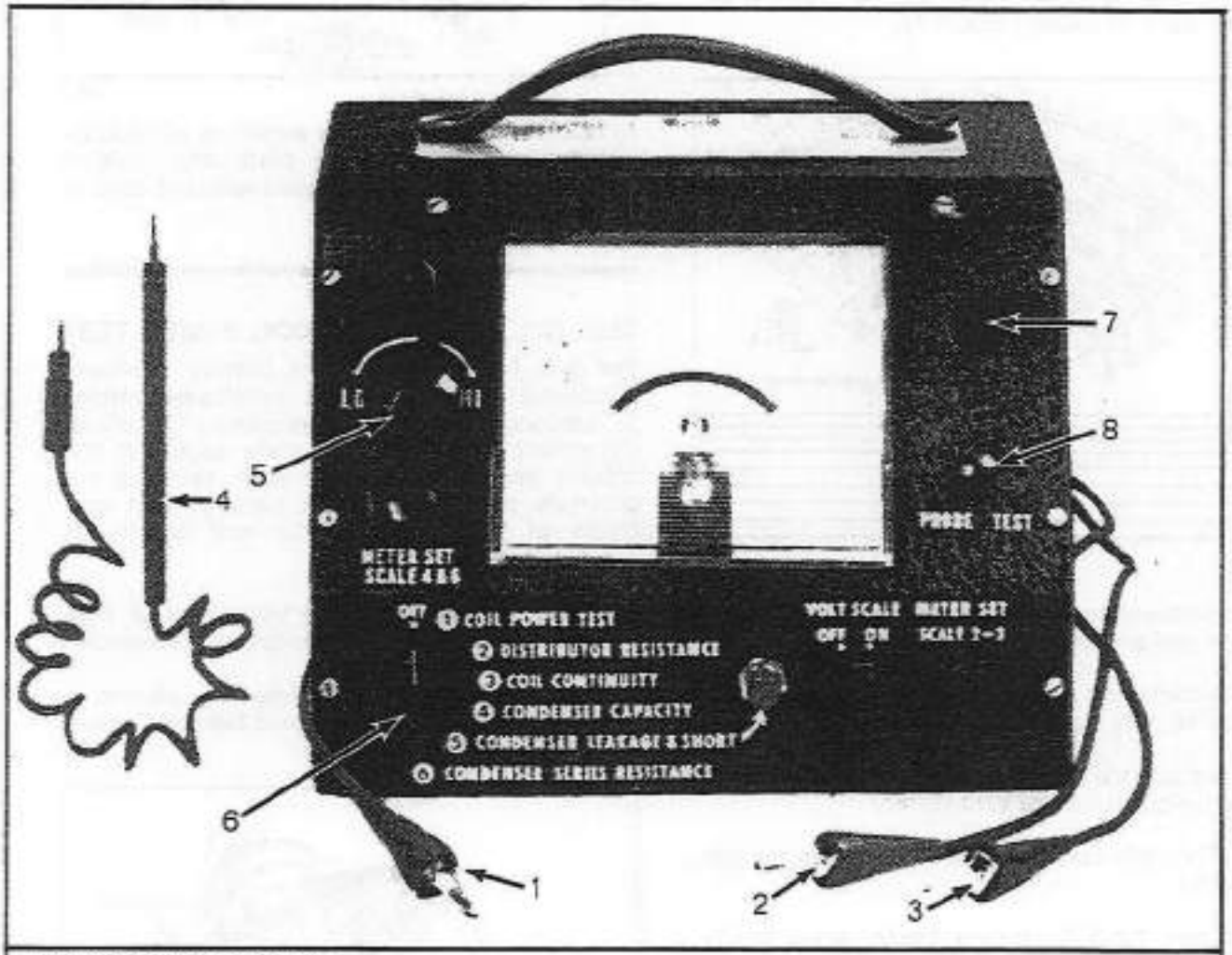
SPARK PLUG NUMBER	ELAN 250	OLYMPIQUE 300	OLYMPIQUE 335 •	OLYMPIQUE 399	NORDIC 440 *	NORDIC 640 ✱	T'NT 292	T'NT 340	T'NT 440	T'NT 640	T'NT 775
M-225 T1	Low speed	Low speed	Low speed		Low speed (Mag.)						
W-225 T1				Low speed (Mag.)							
M-240 T1	Standard	Standard	Standard		Standard Low speed (P.T.O.)	Low speed (Mag.)	Low speed			Low speed (Mag.)	
W-240 T1				Low speed (P.T.O.) Standard							
W-260 T1								Standard			
M-280 T31						Standard Low speed (P.T.O.)	Standard		Standard	Standard Low speed (P.T.O.)	Low speed (Mag.)
W 280 T13 S								Maximum peak performance			
M-310 T31 S							Maximum peak performance		Maximum peak performance	Maximum peak performance	Standard Low speed (P.T.O.) Maximum peak performance

• Also applicable to Skandic
• Also applicable to Valmont
✱ Also applicable to Alpine

NOTE: Include electric an manual models.

Electrical.

MERC-O-TRONIC ANALYSER (MODEL 98) 3-4



Merc-O-Tronic Analyser

1. Single red test lead
2. Red test lead
3. Black test lead
4. Insulation test probe
5. Current control knob
6. Selector switch
7. Spark gap indicator
8. Jack

GENERAL

The Merc-O-Tronic analyzer is actually one of the most precise test instruments available on the market to check the electrical components of the Ski-Doo snowmobile.

The following procedure explains the required steps to test each electrical component. At the end of each test, a specification chart will help you determine whether replacement of parts are necessary on the vehicle.

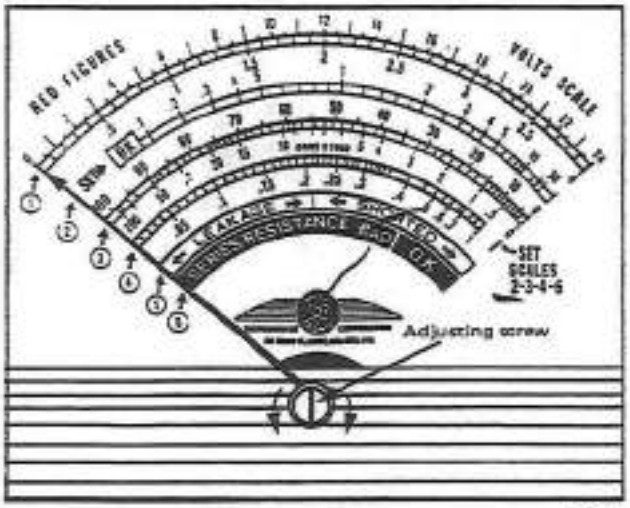
WARNING: When testing any components, place your Merc-O-Tronic analyzer as well as the components on an insulated or wooden table top. This will prevent any leakage or shock hazards.

CAUTION: Do not connect test leads together when selector switch is turned to position No. 1 as this will result in a direct battery short.

ANALYZER TEST

Prior to testing the circuitry or any electrical component, it is first necessary to test the operation and battery power of the analyzer. To do this, proceed as follows:

1. Turn the small adjustment screw located on the front of the analyzer meter so that the needle pointer aligns with the "0" reading on scale No. 1 of meter (fig. 3-4-1).



3-4-1

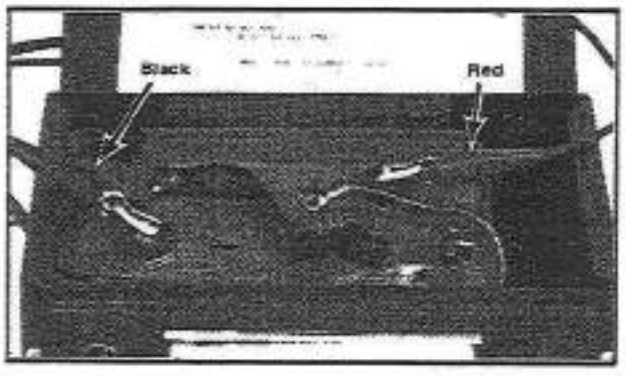
2. Remove the two (2) screws affixing analyzer cover and expose the analyzer battery.

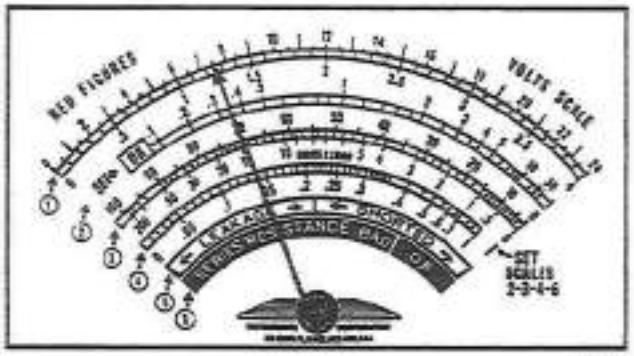
3. Attach the black test lead of analyzer to negative post of analyzer battery.

4. Attach the red test lead of the analyzer to positive post of analyzer battery.

5. Turn the volt scale No. 1 switch to the ON position.

6. Read RED figures on top of scale No. 1. Reading must not be less than 6.0 volts, if less, replace battery (fig. 3-4-2).





3-4-2

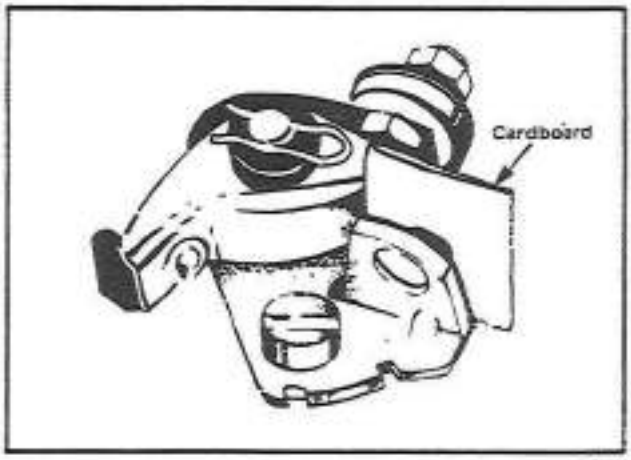
IMPORTANT: To test the armature plate components, remove armature plate and ignition coil(s) from engine and proceed with the tests in the following sequence.

TEST NO. 1 – IGNITION COIL POWER TEST

For test No. 1 and 2, the battery normally installed in the analyzer has insufficient voltage to produce exact readings required. Therefore, disconnect the analyzer battery cables at the battery posts and connect each cable to appropriate post of a 12 volt battery. Test condition of the connected 12 volt battery as detailed in analyzer test.

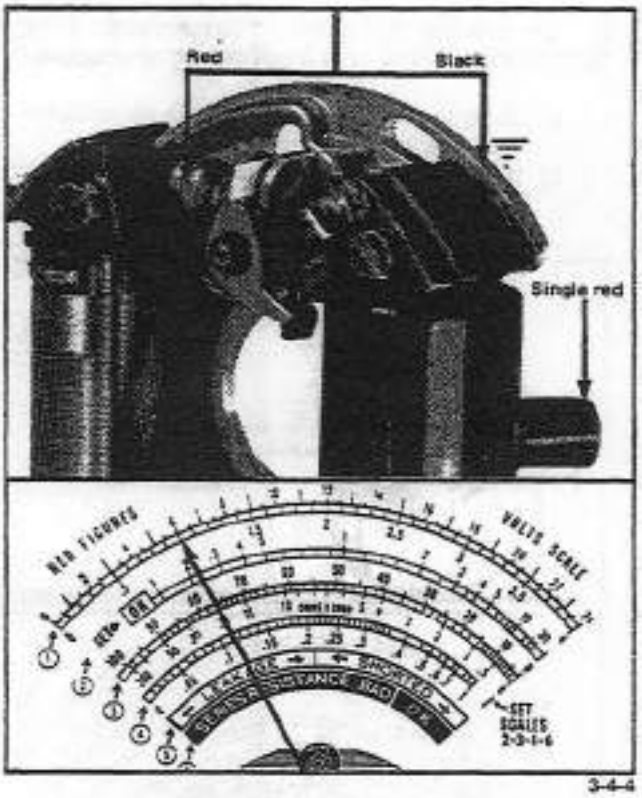
1. On all engine equipped with internal high tension coil carry out the following procedure:

a) Insulate breaker points by placing a small piece of cardboard between breaker points (fig. 3-4-3).



3-4-3

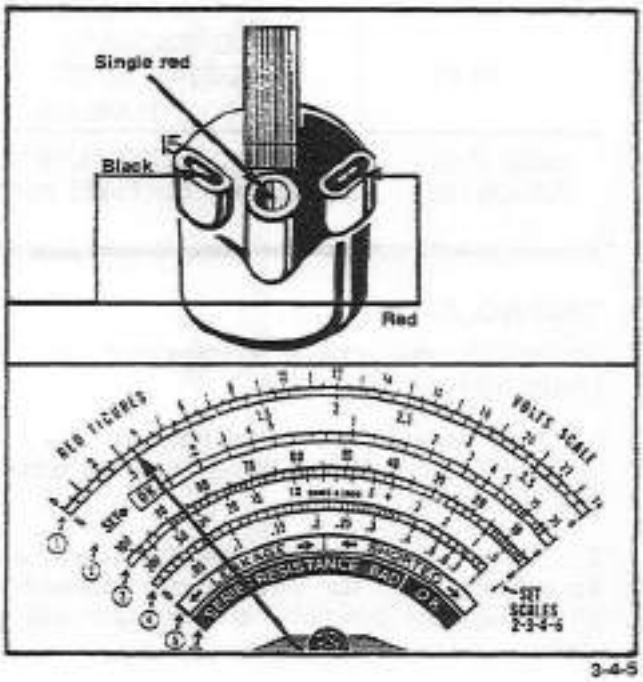
b) Connect the black test lead to the armature plate.
c) Connect the red test lead to breaker points terminal.
d) Connect the single red test lead to spark plug terminal (fig. 3-4-4).



3-4-4

2. On engines equipped with external high tension coil(s), carry out the following procedure:

a) Connect the black test lead to terminal # 15 of the ignition coil.
b) Connect the red test lead to terminal # 1 of ignition coil.
c) Connect the single red test lead to spark plug terminal (fig. 3-4-5).



3-4-5

3. With the current control knob at LO position, turn the selector switch to position No. 1 – coil power test.

4. Slowly turn the current control knob clockwise and note the current value on scale No. 1. When it reaches the operating amperage for that particular winding stop and note the spark gap indicator located on right hand side of analyzer. It should fire steadily. If the spark is faint, the coil is defective and should be replaced. If the coil is good, perform the high speed test as follows:

5. Continue turning the current control knob clockwise to obtain maximum meter reading. The spark gap should fire steadily. If the spark is faint, the coil is defective and should be replaced.

CAUTION: Complete the test as quickly as possible and immediately upon completion of test, turn selector switch to OFF position and current control knob to LO position.

TYPE	OPERATING AMPERAGE
Inside Coil	1.0 amp.
Outside Coil	0.6 amp.

TEST No. 2 –
IGNITION COIL INSULATION

NOTE: Connect the red and black test leads as detailed in test No. 1. Do not connect the single red test lead.

1. Plug the Insulation Test Probe into "jack" located at the front of analyzer.

2. Turn selector switch to position No. 1. Coil Power Test.

3. Turn current control knob to obtain maximum current reading.

CAUTION: Do not exceed maximum meter reading.

4. Pass the Insulation Test Probe tip over the insulating surface of the coil and spark plug wire. If coil insulation is cracked, leaking or damaged, a spark discharge will be noted at the cracked or leaking surface.

CAUTION: Do not allow test probe to linger at any one point during test operation. Complete test as fast as possible as this is a severe test for a coil.

NOTE: A faint spark occurring around coil insulation is a "corona spark" and does not mean a defective coil.

5. Disconnect 12 volt battery and reinstall the analyzer battery.

TEST NO. 3 – IGNITION COIL RESISTANCE TEST (SECONDARY)

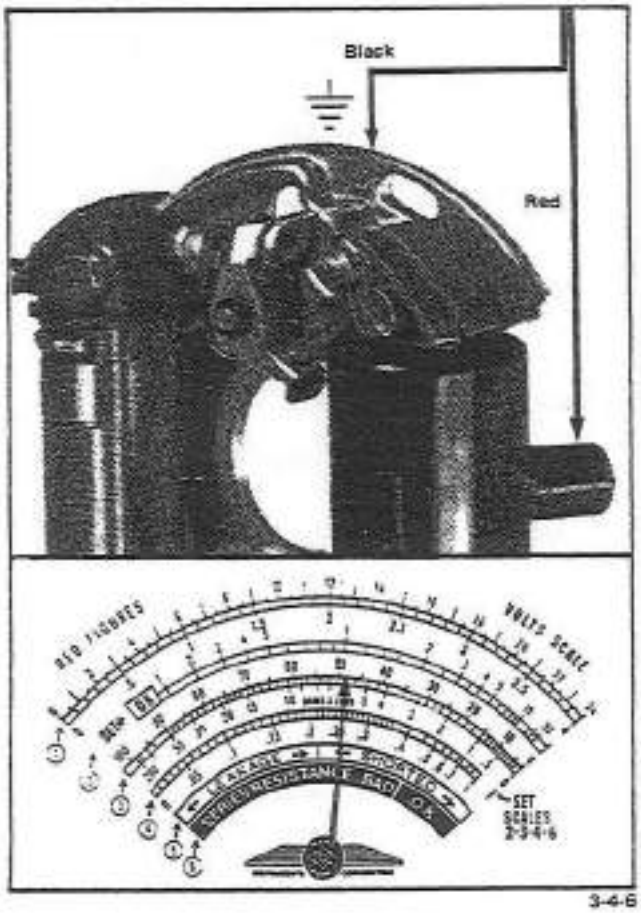
1. Turn selector witch to position No. 3 – COIL CONTINUITY.

2. Temporarily attach the red and black test leads together.

3. Turn meter adjustment knob for scale No. 3 until pointer aligns with set position "O" on right side of scale. Disconnect leads.

4. On models equipped with an internal high tension coil, carry out the following procedure:

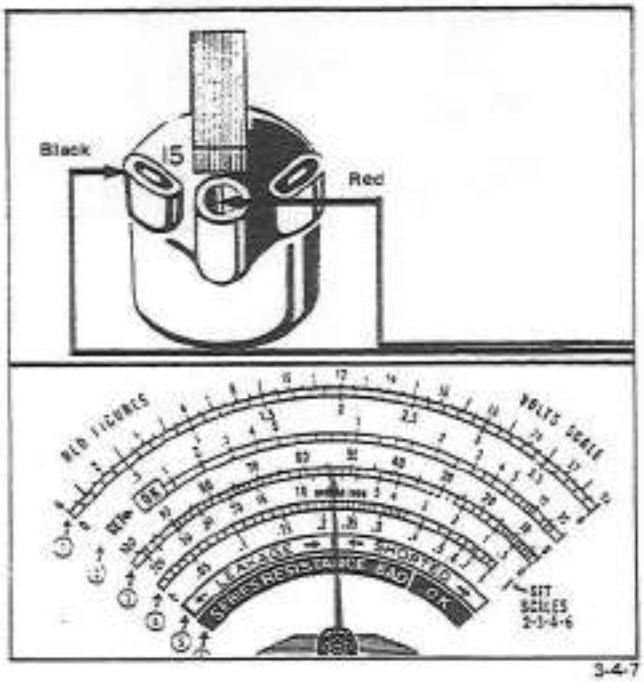
a) Connect black test lead to coil core (ground).
b) Connect red test lead to spark plug terminal (fig. 3-4-6).



3-4-6

5. On models equipped with an external high tension coil, carry out the following procedure:

a) Connect the black test lead to terminal # 15 of the external coil.
b) Connect the red test lead to the spark plug terminal of the coil (fig. 3-4-7).



3-4-7

6. Read the RED figures of Scale No. 3. Meter reading must be between specification limits. The values on red scale no. 3 are in OHM and must be multiplied by 1,000. If coil is not within specifications, replace the defective coil.

TYPE	SECONDARY RESISTANCE MIN.	MAX.
Inside Coil	4,500 ohms.	6,000 ohms.
Outside Coil	7,300 ohms.	8,500 ohms.

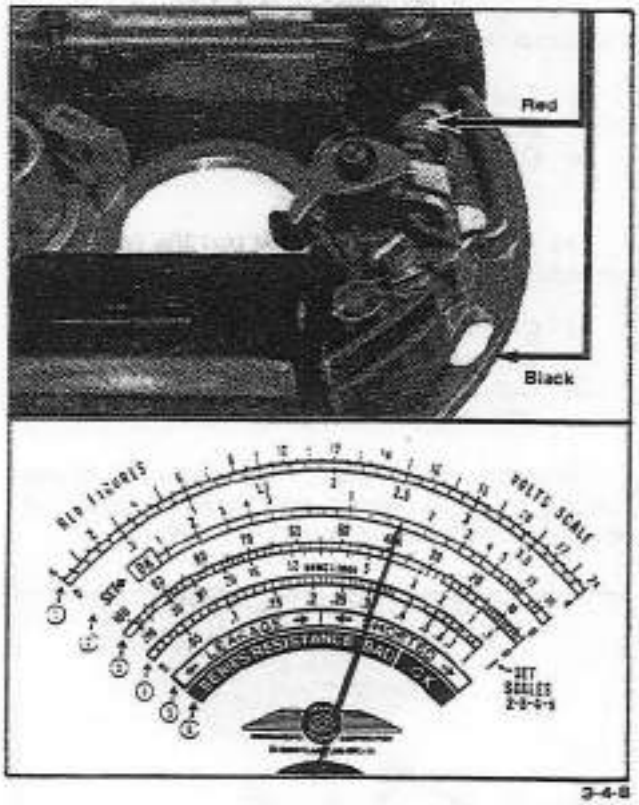
TEST NO. 4 – IGNITION COIL RESISTANCE TEST (PRIMARY)

1. Turn selector switch to position no. 2 – (DISTRIBUTOR RESISTANCE – for checking low ohm values.)

2. Do not clip test leads together. Turn meter adjustment knob for scale no. 2 until pointer aligns with set position "O" on right side of scale.

3. On models equipped with an internal high tension coil, carry out the following procedure:

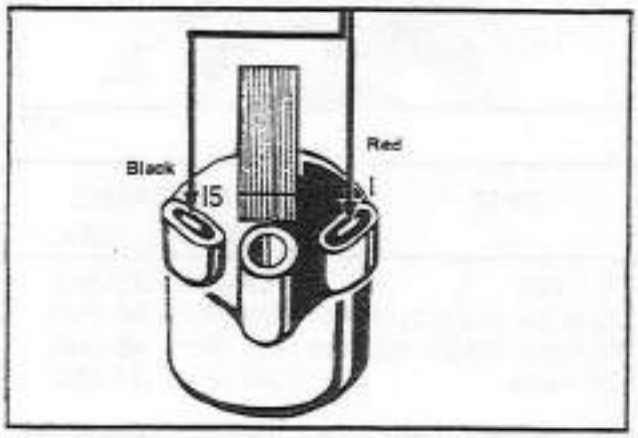
a) Insulate breaker points as detailed in test no. 1, step 1.
b) Connect the black test lead to coil core (ground).
c) Connect the red test lead to breaker points terminal (fig. 3-4-8).

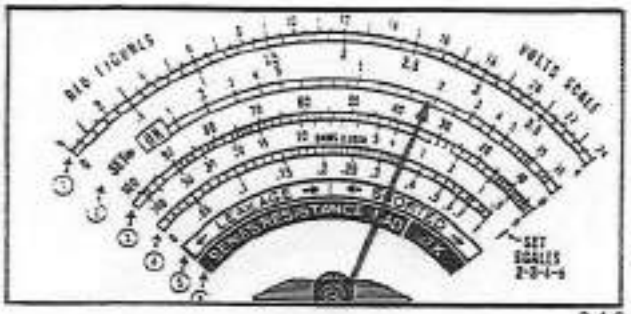


3-4-8

4. On models equipped with an external high tension coil, carry out the following procedure:

a) Connect the black test lead to no. 15 terminal.
b) Connect the red test lead to no. 1 terminal (fig. 3-4-9).





3-4-9

5. Read the RED figures on scale no. 2. Meter reading must be between specification limits. If not, replace the defective coil.

TYPE	PRIMARY RESISTANCE MIN.	MAX.
Inside Coil	1.5 ohms.	1.9 ohms.
Outside Coil	1.8 ohms.	2.0 ohms.

TEST NO. 5 – GENERATING COILS CONTINUITY IGNITION GENERATING COIL

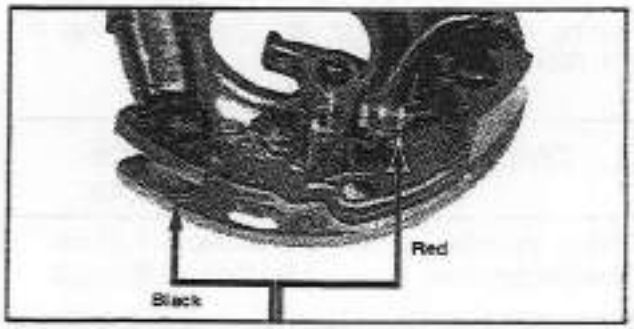
1. Turn selector switch to position no. 2 – (DISTRIBUTOR RESISTANCE for checking low ohm values).

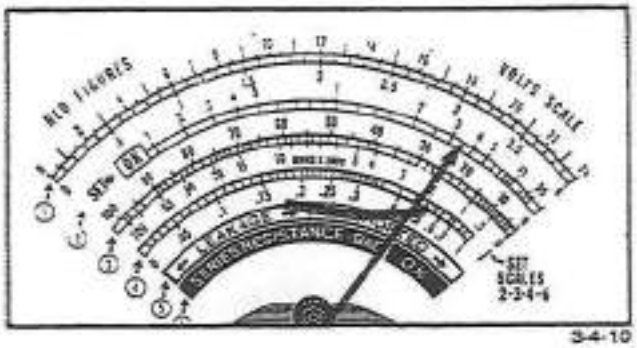
2. Turn meter adjustment knob for scale no. 2 until meter pointer aligns with set position on right side of scale.

3. Insulate breaker point(s) as detailed in Test no. 1, step 1.

4. On single cylinder engine equipped with an external high tension coil, carry out the following procedure:

a) Connect the black test lead to armature plate (ground).
b) Connect the red test lead to breaker points terminal (fig. 3-4-10).

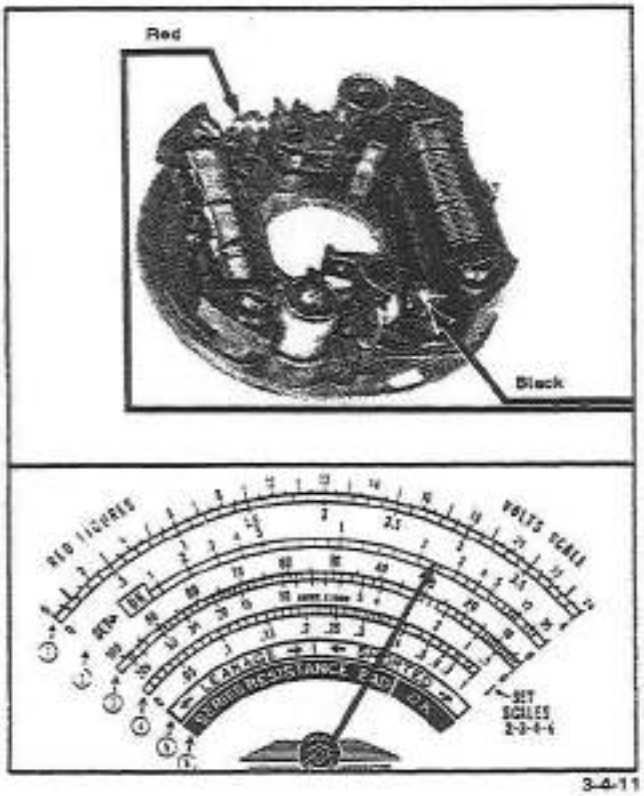




3-4-10

5. On double cylinder engine, carry out the following procedure:

a) Connect the black test lead to one breaker points terminal.
b) Connect the red test lead to the other breaker points terminal (fig. 3-4-11).



3-4-11

6. Read the RED figures on scale no. 2. Meter reading must be within specification limits. If not, replace the defective coil.

TYPE	RESISTANCE MIN.	MAX.
Single cylinder	2.7 ohms.	4.1 ohms.
Double cylinder	1.9 ohms.	2.8 ohms.

LIGHTING COIL

1. Turn selector switch to position no. 2 – (DISTRIBUTOR RESISTANCE – for checking low ohm values).

2. Turn meter adjusting knob for scale no. 2 until meter pointer aligns with set position on right side of scale.

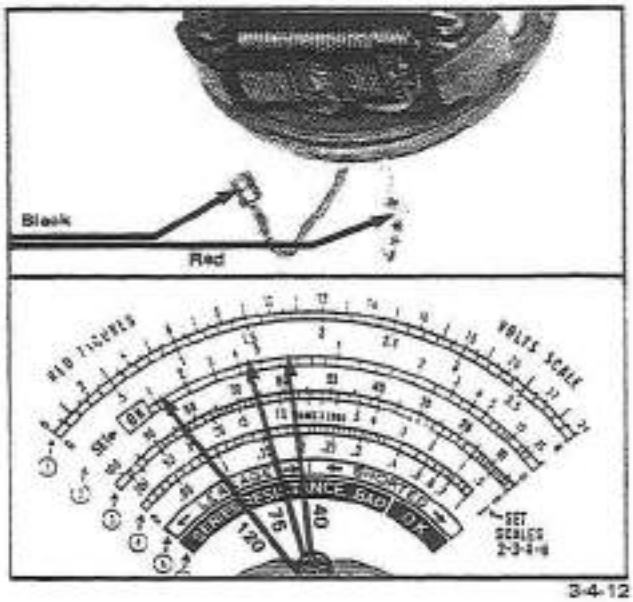
3. On engines equipped with a 40 watt lighting coil, proceed as follows:

a) Connect the black test lead to armature plate (ground).
b) Connect the red test lead to the yellow/green wire.

4. On all other engines, carry out the following procedure:

a) Connect the black test lead to one of the yellow/green wires.
b) Connect the red test lead to the other yellow/green wire.

5. Read the RED figures on scale no. 2. Meter reading must be within specification limits. If not, replace the defective coil (fig. 3-4-12).



3-4-12

TYPE	RESISTANCE MIN.	MAX.
40 watts	.52 ohm	.78 ohm
75 watts single cylinder	.36 ohm	.54 ohm
75 watts double cylinder	.32 ohm	.48 ohm
120 watts	.10 ohm	.14 ohm

TEST NO. 6 — CONDENSER CAPACITY TEST

1. Unsolder the wire(s) located on top of condenser.

2. Plug the analyzer cord into 115 volts, 60 cycle, AC outlet.

3. Place analyzer selector switch to position No. 4 — CONDENSER CAPACITY.

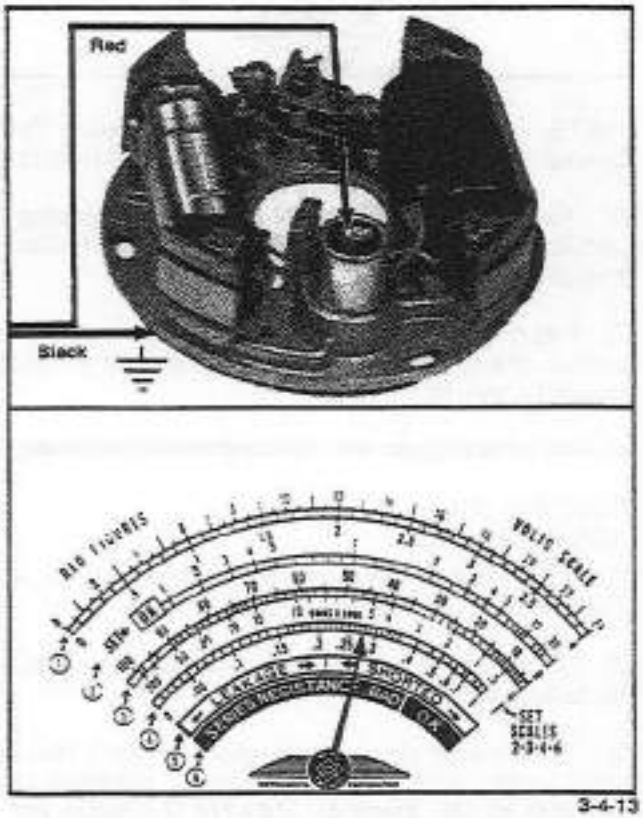
4. Temporarily attach the red and black test leads together.

5. Depress red button and turn meter adjustment of scale No. 4 to set pointer "O". Unclip test leads.

6. Connect the red test lead to condenser lead weldment.

7. Connect the black test lead to armature plate (ground).

8. Depress red button and read scale No. 4. Condenser capacity must be between .26 to 30 mfd. if not, replace the defective condenser. If condenser is within specification do not resolder wire(s) on condenser but proceed with test no. 7 (fig. 3-4-13).



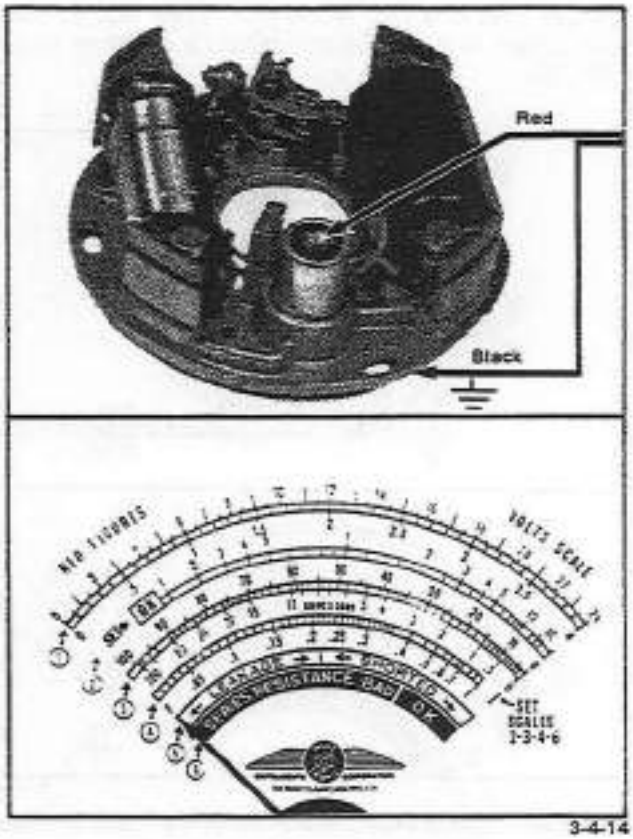
3-4-13

TEST NO. 7 — CONDENSER LEAKAGE AND SHORT

NOTE: For this test use the same hookup as in test No. 6. The analyzer plug should be kept in a 115 volts, 60 cycle, AC outlet.

1. Turn selector switch to position No. 5 — LEAKAGE AND SHORT.

2. Depress red button and hold for a minimum time of 15 seconds. Read scale No. 5. The meter pointer will move to the right and must return within range of the narrow black bar at the left. If not, read on scale No. 5 and check if condenser is shorted or leaking. In either case, replace condenser (fig. 3-4-14).



3-4-14

3. If condenser is good, disconnect analyzer cord and resolder wire(s) to the top of the condenser.

TEST NO. 8 CONDENSER SERIES RESISTANCE TEST

1. Insert a piece of cardboard between breaker point(s).

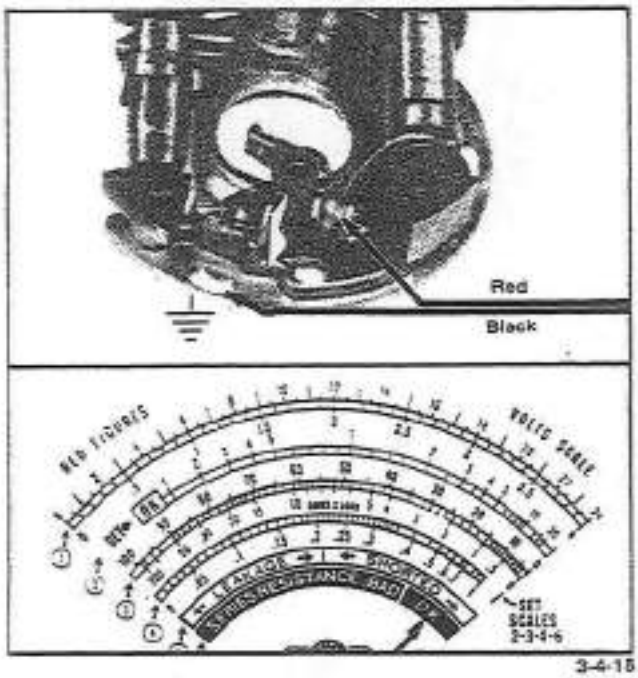
2. Place selector switch to position No. 6 — CONDENSER SERIES RESISTANCE.

3. Temporarily attach the red and black test leads together.

4. Adjust meter set scale No. 6 to set line on right side of dial. Unclip test leads.

5. Connect the red test lead to breaker points terminal.

6. Connect the black test lead to armature plate. Meter pointer must be within OK green block on scale No. 6 on right side of meter. While testing, move and "wiggle" the condenser lead. Observe meter pointer for movement. Loose connections can cause trouble if the condenser is subjected to vibration. If meter pointer remains within OK green bar on scale No. 6, the condenser is good. If meter pointer moves into the red section on scale No. 6, the condenser is defective and must be replaced (fig. 3-4-15).



3-4-15

TEST NO. 9—
TESTING FOR HIGH RESISTANCE IN PRIMARY CIRCUIT

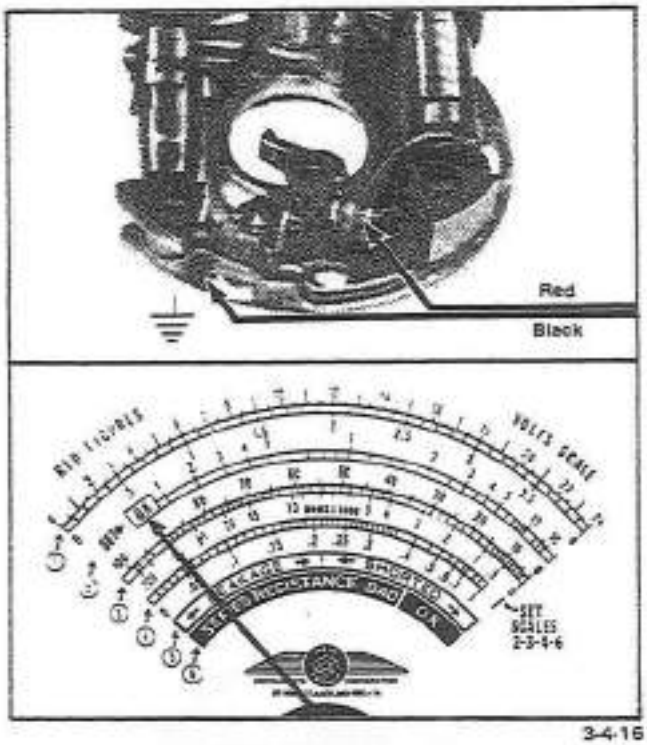
1. Turn selecto switch to position No. 2 — DISTRIBUTOR RESISTANCE.

2. Temporarily attach the red and black test leads together.

3. Turn meter adjustment knob for scale No. 2 until meter pointer aligns with set position on left side of OK block on scale No. 2. Unclip test leads.

4. Connect the red test lead to breaker points terminal.

5. Connect the black test lead to armature plate. The meter pointer must return within the OK block. If the meter pointer is in the high resistance band, this indicates that there is foreign matter between the breaker points (fig. 3-4-16).



3-4-16

NOTE: If resistance is too high, clean the breaker points tips to remove possible oil or dirt.

6. To check condenser for proper grounding, unclip red test lead from breaker points terminal and connect it to condenser body.

7. Read scale No. 2, meter pointer must be within the OK block. If not, condenser is not properly ground.

TEST NO. 10 —
SOLENOID TEST

1. Turn selector switch to position no. 2 — DISTRIBUTOR RESISTANCE.

2. Temporarily attach the red and black test leads together.

3. Turn meter adjustment knob for scale No. 2 until meter pointer aligns with set position on left side of OK block on scale No. 2. Unclip test leads.

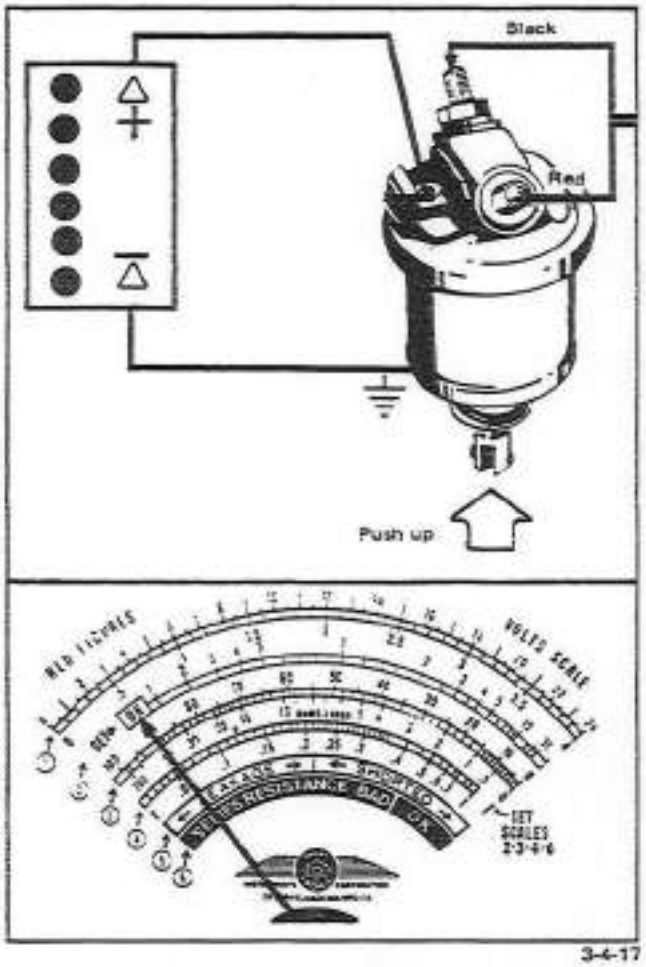
4. Connect the black test lead to one of the large terminals of solenoid.

5. Connect the red test lead to other large terminal of solenoid.

6. With a 12 volt battery, place two (2) jumper leads on battery posts. Connect the positive jumper lead to small terminal of solenoid.

7 Connect negative jumper lead to solenoid housing and at same time, push-in solenoid plunger until plunger holds itself.

8. The meter pointer must return within the OK block. If not replace solenoid (fig. 3-4-17).



3-4-17

TEST NO. 11 – RECTIFIER

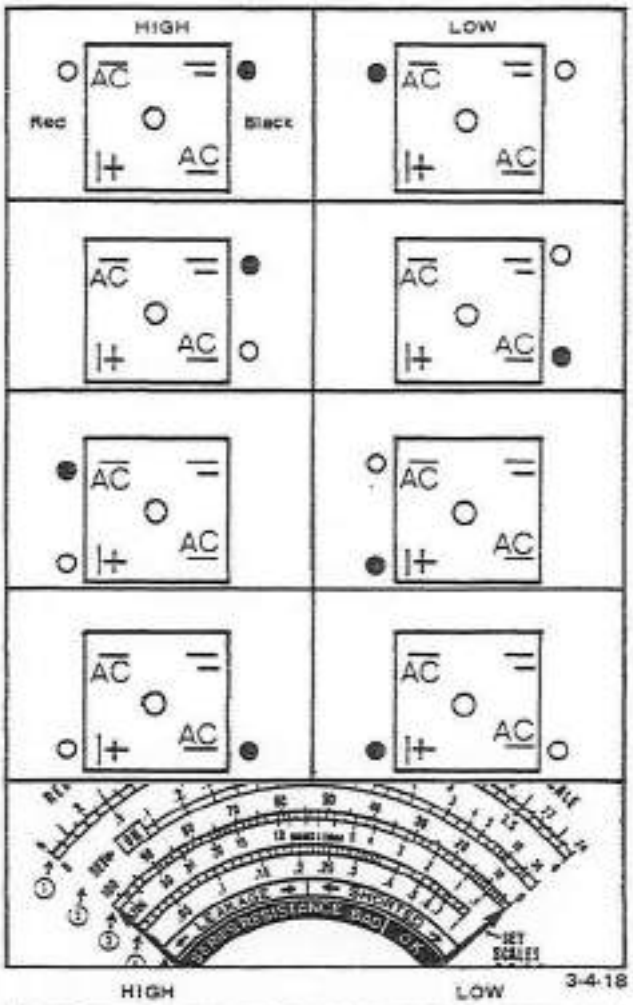
NOTE: The full wave rectifier use on the 1972 Ski-Doo snowmobile incorporates 4 diodes. To test diodes for shorts and open, each diode must be checked twice. These two checks are accomplished by reversing the polarity of the test leads.

1. Turn selector switch to position No. 3.

2. Temporarily attach small black and red test leads together.

3. Turn adjustment knob for scale No. 3 until meter pointer aligns with set position on right side of dial. Unclip test leads.

4. Connect the small test leads as shown in Figure 3-4-18. A normal diode will show a HIGH reading in one direction and a LOW reading in the opposite direction. A zero reading or infinite reading in both tests indicate a defective diode and the rectifier must be replaced.



HIGH LOW 3-4-18

TEST NO. 12 – CONTINUITY TEST (GENERAL)

To check any wire, connection or switch for continuity, use position No. 3 – COIL CONTINUITY. Any discontinuity in an electrical system will result in an infinite resistance (no reading).

Electrical.

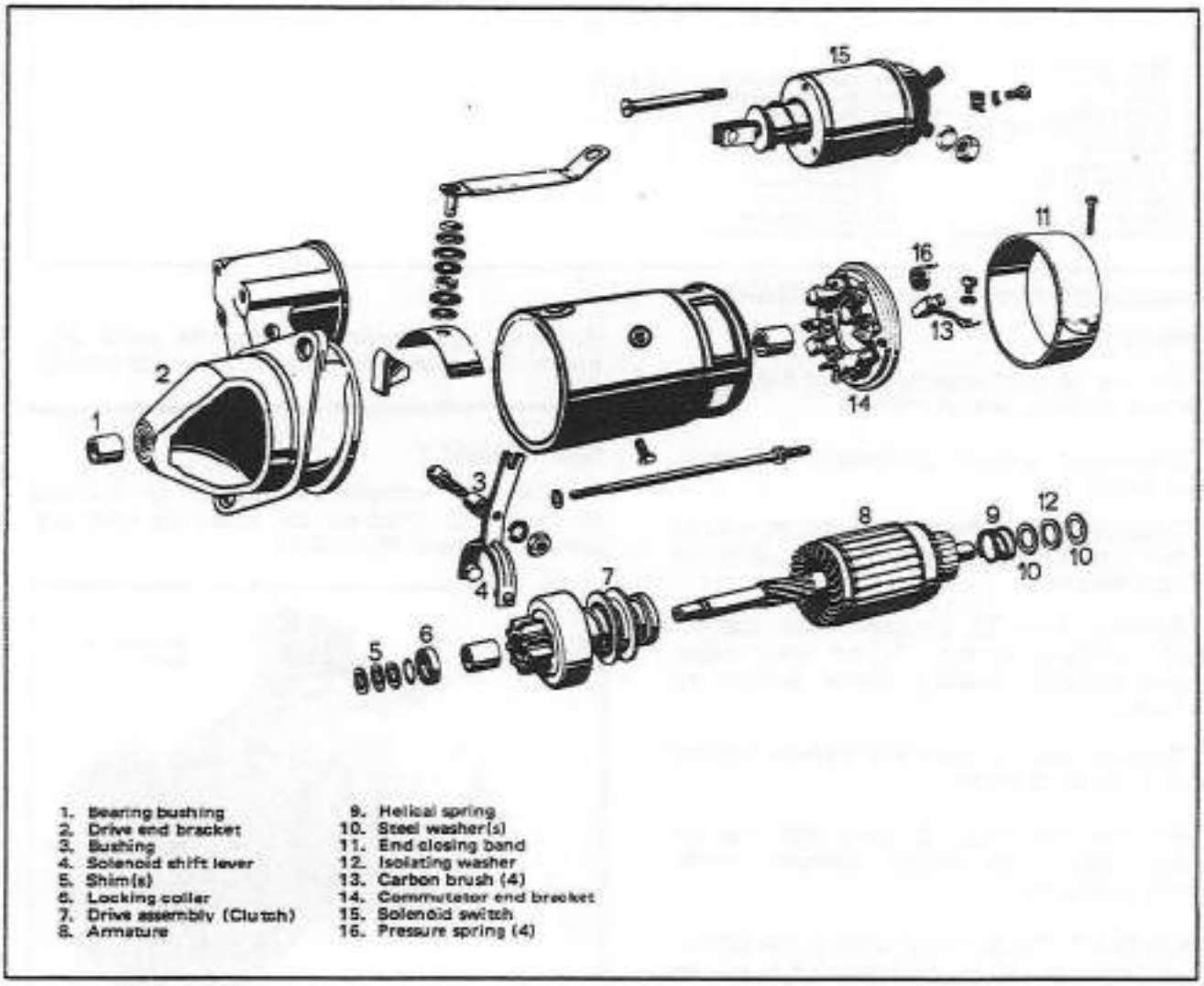
ELECTRIC STARTER 3-5

GENERAL

All internal combustion engines require an external source of power such as an electric starter or rewind starter. The starter mechanism provides the large torque required to initiate the first compression stroke and actuate the ignition system.

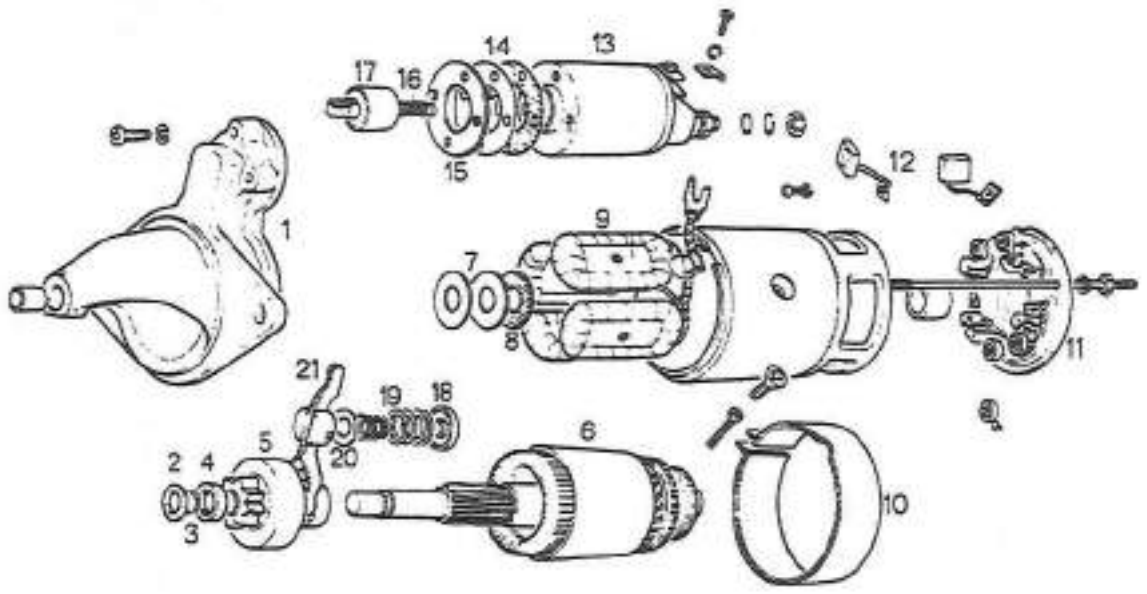
BASIC OPERATION

The basic operation of the Bosch and MAA electric starter used on the Ski-Doo snowmobile, is as follows: The solenoid shift lever is activated when the solenoid is energized with battery power through the ignition switch. The shift lever pushes the drive assembly (clutch) from the armature shaft to engage with the engine starter gear affixed to the engine crankshaft. As the drive assembly is pushed outward the armature shaft begins to rotate and entrains the engine starter gear. Once the engine has started, the crackshaft/engine starter gear revolutions exceed the drive assembly/armature shaft revolution and the drive assembly becomes free-running. At this point, releasing the ignition key from the START position opens the contact surfaces within the starter solenoid and the drive assembly retracts from the engine starter gear.



1. Bearing bushing
2. Drive end bracket
3. Bushing
4. Solenoid shift lever
5. Shim(s)
6. Locking collar
7. Drive assembly (Clutch)
8. Armature
9. Helical spring
10. Steel washer(s)
11. End closing band
12. Isolating washer
13. Carbon brush (4)
14. Commutator end bracket
15. Solenoid switch
16. Pressure spring (4)

Disassembled view of electric starter (Bosch)



1. Drive end bracket
2. Shim(s)
3. Lock ring
4. Locking collar
5. Drive unit (Clutch)
6. Armature
7. Steel washer(s)
8. Isolating washer
9. Field winding (4)
10. End closing band
11. Commutator end bracket
12. Carbon brush (2 Left) (2 Right)
13. Solenoid switch
14. Paper spacer(s)
15. Metal spacer
16. Spring
17. Plunger
18. Spring holder
19. Lever spring (2)
20. Spring retainer
21. Solenoid shift lever

Disassembled view of electric starter (MAA)

REMOVAL

1. On two cylinder engines, (except Alpine and Valmont models), remove muffler.

2. Disconnect ground connection at battery (black cable).

3. Disconnect red battery cable and red wire at solenoid switch. Disconnect green wire at solenoid switch.

4. Remove two (2) capscrews and washers (single cylinder) or one (1) nut and washer (double cylinder) holding starter bracket to crankcase.

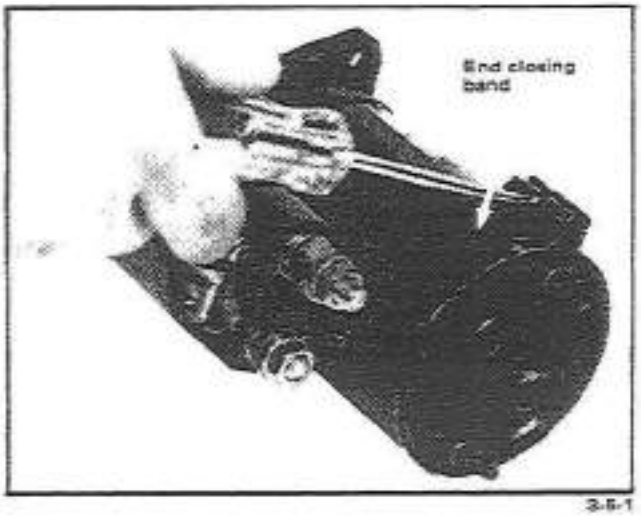
5. Remove two (2) nuts and washers holding starter bracket to starter.

6. Remove the two (2) nuts and washers holding starter to engine. Remove starter bracket and starter.

IMPORTANT: To carry out some of the following procedures, it is necessary that special equipment be available to the mechanic. If you do not possess this equipment, either replace the damaged components or have the parts overhauled in a workshop having the proper tooling.

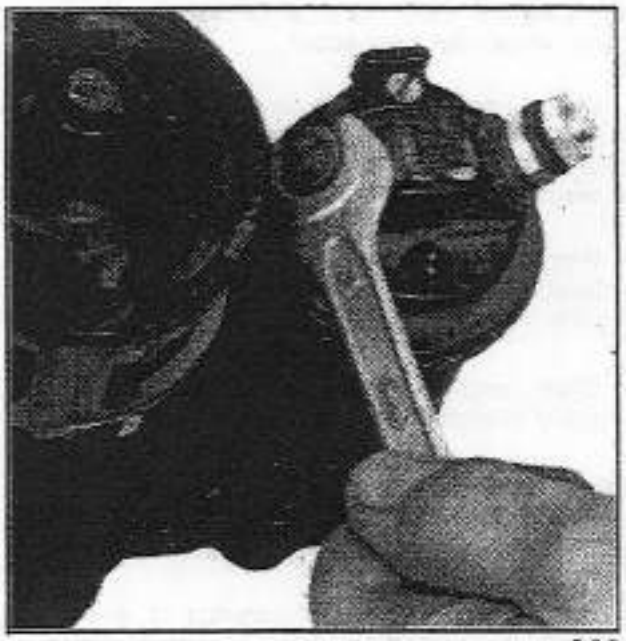
DISASSEMBLY

1. Mark the installation position of the end closing band. Unscrew the attaching bolt and remove the band (fig. 3-5-1).



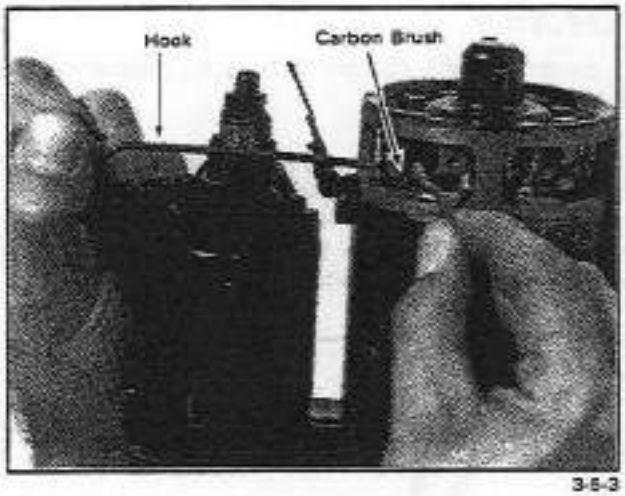
3-5-1

2. Disconnect the winding connection at the starter solenoid switch (fig. 3-5-2).



3-5-2

3. Disconnect carbon brush leads. Using a hook, lift the pressure springs and pull out the carbon brushes (fig. 3-5-3).

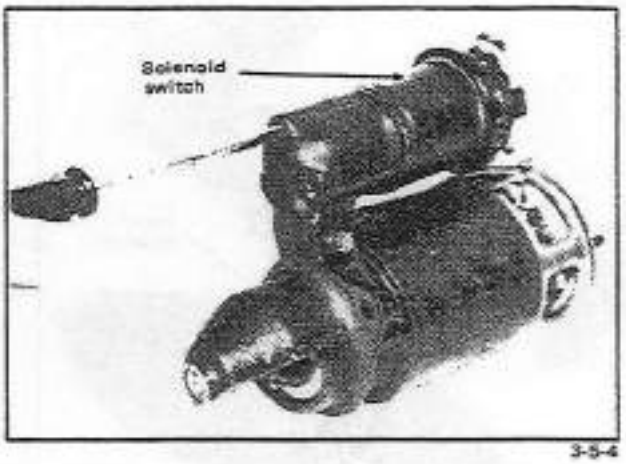


3-5-3

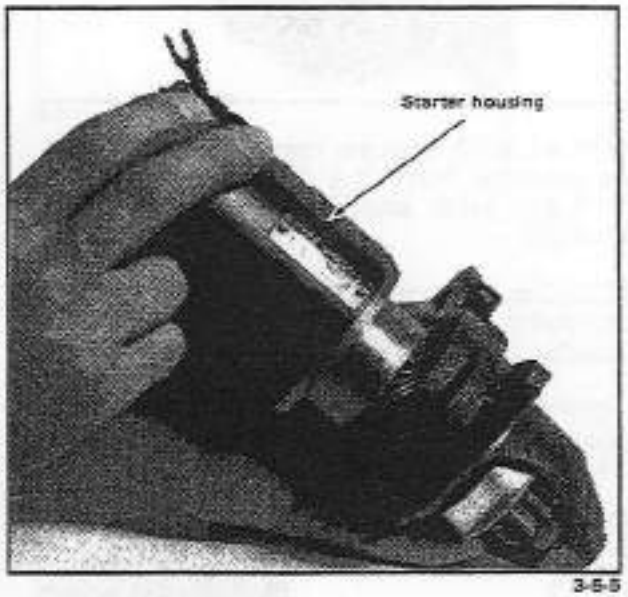
4. Remove the three (3) screws and washers attaching solenoid switch assembly to drive end bracket (fig. 3-5-4).

5. On MAA starter, remove solenoid switch, paper spacers, metal spacer and spring. Unhook plunger from shift lever and remove plunger. On BOSCH starter, unhook solenoid from shift lever and remove solenoid.

6. Unscrew and remove the two (2) through bolts from the commutator end bracket assembly. Remove commutator end bracket assembly and starter housing (fig. 3-5-5).



3-5-4



3-5-5

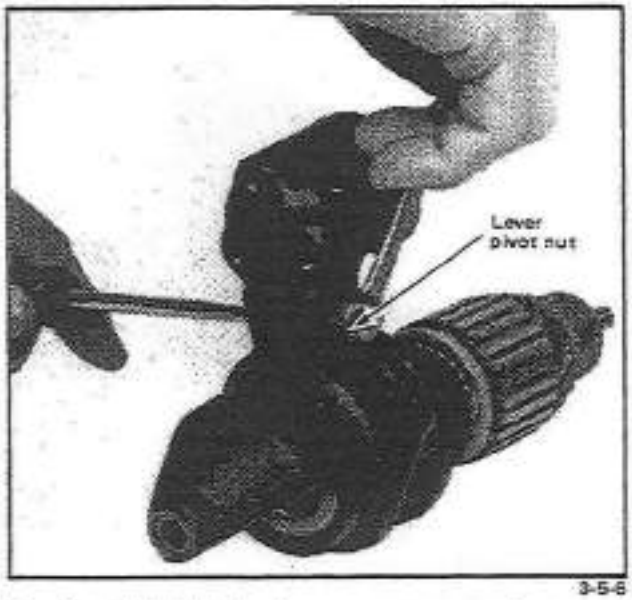
NOTE: On all MAA starters, the spring holder, lever springs (2) and retainer are held in location by the starter housing. After housing removal these components are free in the drive end bracket and can be removed.

7. Remove steel washers and isolating washer from commutator end bracket or from armature shaft. Note the position for reinstallation.

8. On all Bosch starters, remove armature assembly as follows:

(a) Remove profile rubber grommet from drive end bracket.
(b) Unscrew the lever pivot screw and remove nut, washer and bushing (fig. 3-5-6).

(c) Remove armature drive assembly (clutch) and shift solenoid lever assembly from drive end bracket. Remove shims installed on armature shaft. (Sometimes shims fall off armature shaft into drive end bracket).

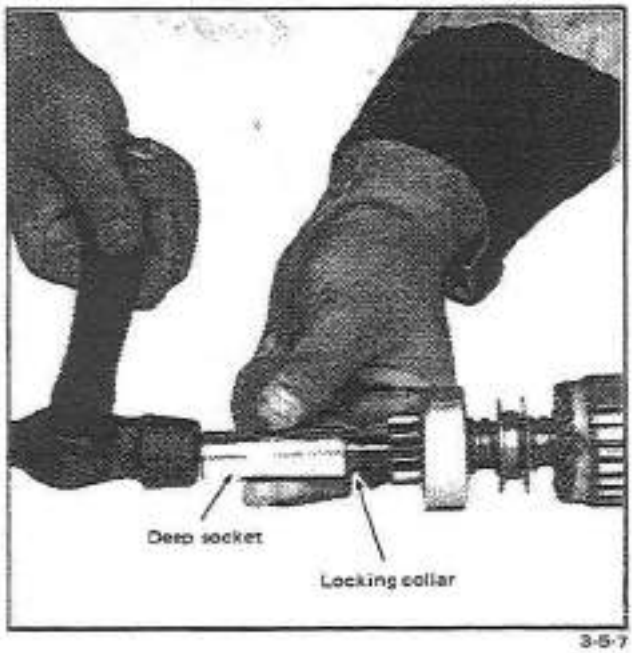


3-5-6

9. On all MAA starters, remove armature and lever assembly from drive end bracket. Lift the lever from clutch assembly and remove shims from shaft.

NOTE: Do not remove bushings from drive or commutator end bracket from either starter unless damaged and replacement is necessary.

10. Position a deep socket on armature shaft adjacent to locking collar and using a hammer, drive the collar from its seating (fig. 3-5-7).



3-5-7

11. Remove the stop ring from armature shaft. Slide the locking collar and the drive assembly (clutch) from the armature shaft.

CLEANING

CAUTION: Armature, field winding coils and drive assembly must not be immersed in cleaning solvent as damage may occur.

1. Clean carbon brushes and holders with a clean cloth soaked in gasoline. Brushes must be dried thoroughly with a clean cloth. Blow out the brush holders using compressed air.

2. Remove all dirt, oil or grease from commutator using a clean cloth soaked in gasoline. Dry well using a clean, dry cloth.

3. Clean engine starter gear teeth and drive assembly (clutch) with a clean, dry cloth.

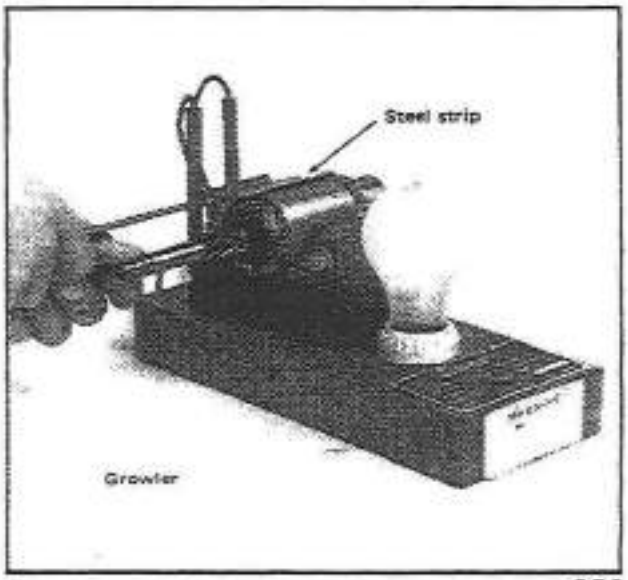
NOTE: Bearing bushings of the drive assembly must not be cleaned with grease dissolving agents.

4. Immerse all metal components in a clean container of cleaning solution. Dry using a clean, dry cloth.

INSPECTION

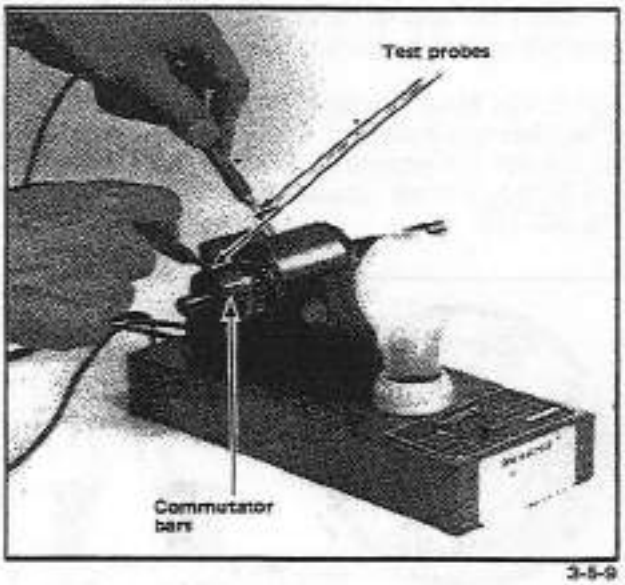
1. Examine all components for mechanical damage and wear.

2. Test armature for shorted windings with a growler (fig. 3-5-8). 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.



3-5-8

3. Test for grounds in the armature using growler test probes. Check between armature core and the commutator bars (fig. 3-5-9).

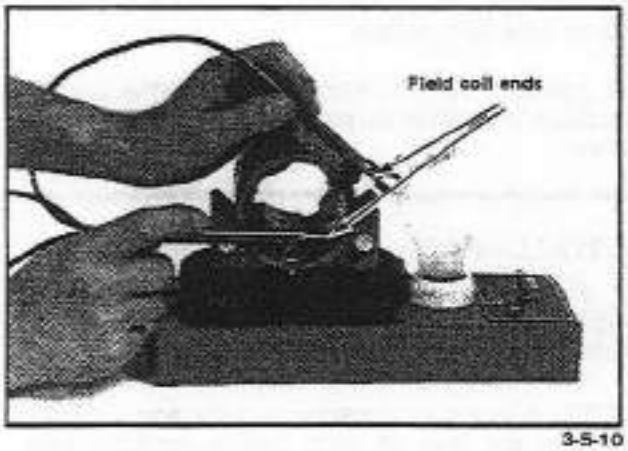


3-5-9

4. Check for good solder joints between commutator bars and solder lugs.

5. Visually check general condition of commutator. If commutator requires turning, contact a specialized workshop.

6. Inspect for opened field coils. Connect growler test probes to ends of field coils. If the lamp does not light, the field coils are open (fig. 3-5-10).



3-5-10

7. Check for grounded field coils by connecting growler test probes between housing and ends of field coils. If the lamp lights, the field coils are grounded.

8. Visually inspect field coils. The coils must not be burnt or unsoldered. Nor should they protrude over the pole shoes.

9. Check that carbon brushes move freely in the guides of the brush holders. Replace damaged or blued brush springs. Test brush pressure with spring scale (1.2 to 1.5 pounds).

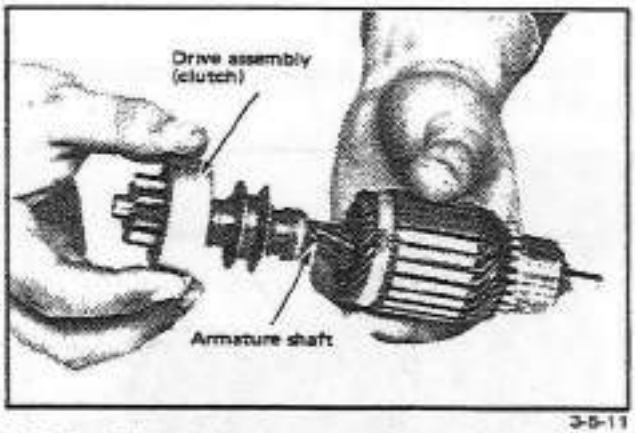
10. Replace drive assembly if damaged or worn.

11. Inspect starter solenoid for damage or wear. Test solenoid operation as detailed in sub-section 3-4. Replace as necessary.

ASSEMBLY

IMPORTANT: Prior to Assembly, apply a thin coat of light machine oil on armature shaft and splines. Also apply a thin coat of low temp. grease over solenoid switch plunger, shift lever ends, shift lever pivot, steel washers, shims and isolating washer.

1. Slide the drive assembly (clutch) onto the splined end of the armature shaft (fig. 3-5-11). Push the stop ring into location and place the retainer ring in the appropriate armature shaft groove.

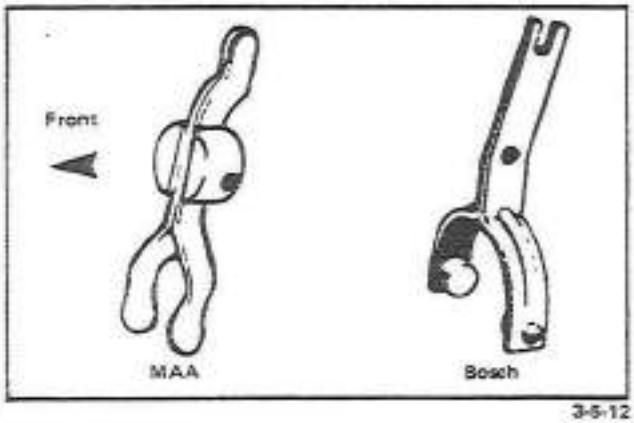


3-5-11

NOTE: The drive assembly (clutch) must sit correctly on the armature shaft and move freely without catching or binding.

2. On Bosch starters, install armature assembly as follows:

(a) Position the solenoid shift lever on drive assembly (clutch) with the lever angle facing the armature (fig. 3-5-12).
(b) Insert the appropriate number of shims into drive end bracket and position the lever, drive assembly and armature into drive end bracket.
(c) Affix the lever into the drive end bracket using pivot screw, bushing, washer and nut.
(d) Install profile rubber grommet into drive end bracket.

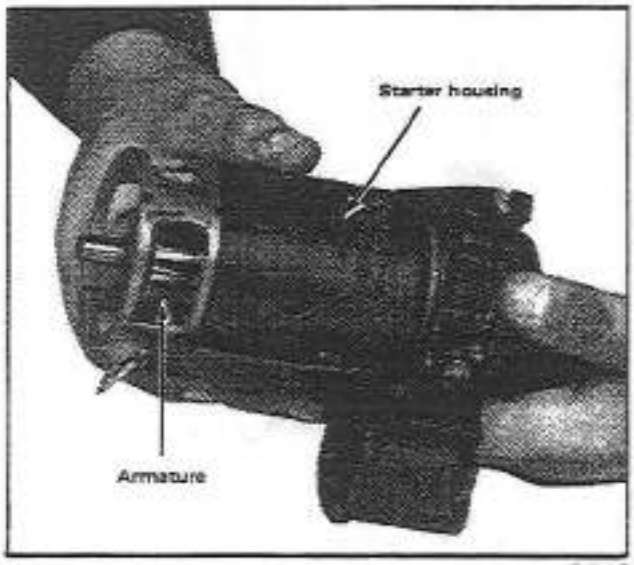


3-5-12

3. On MAA starters, install armature assembly as follows:

(a) Position the solenoid shift lever on the drive assembly with the lever angle facing the armature (see fig. 3-5-12).
(b) Place the appropriate washer on the clutch side of the armature shaft.
(c) Insert the lever and drive bracket into drive end bracket.
(d) Insert the spring retainer, two (2) lever springs and the spring holder into drive end bracket.

4. Position the starter housing over armature (fig. 3-5-13).



3-5-13

5. On Bosch starters, slide the helical spring onto armature shaft.

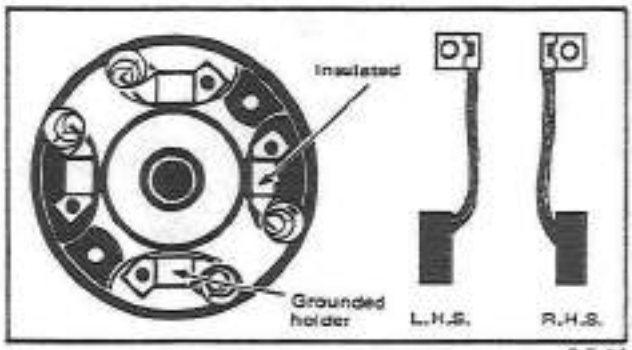
6. Correctly place the steel washer(s) and the isolating washer on armature shaft.

7. Place the commutator end bracket in location. Insert the through bolts and secure the assembly.

NOTE: Starter housing and commutator end bracket must adjoin at commutator end bracket nose and starter housing groove.

8. Insert the appropriate brushes into the brush holders and secure using screws and washers.

NOTE: On MAA starters, two (2) different sets of brushes are installed. The set with the L.H.S. tab are for the ground holders, the set with the R.H.S. tab, for the insulated holders (armature) (fig. 3-5-14).



3-5-14

9. On MAA starters; hook plunger on shift lever and install metal spacer, paper spacers, spring and solenoid switch on front end bracket. On Bosch starter, hook solenoid switch assembly on shift lever.

10. Secure solenoid switch assembly to front end bracket using three (3) screws. On MAA starters also install washers.

11. Connect the winding connection to the starter solenoid switch.

12. Position the end closing band in the correct location and affix in position using appropriate screw.

INSTALLATION

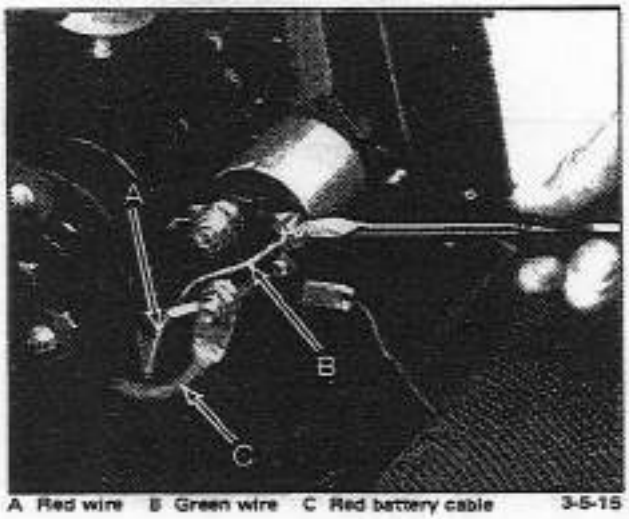
1. Position starter bracket and starter on engine. Secure starter to engine with two (2) nuts and washers.

NOTE: Make sure that starter and engine mating surfaces are free of dirt. Serious trouble may arise if starter is not properly aligned.

2. Secure bracket to crankcase with two (2) screws and washers (one cylinder) or with one (1) nut and washer (double cylinder).

3. Secure starter to bracket with two (2) nuts and washers.

4. Connect the red battery cable and the red wire to the large terminal of the solenoid. Connect green wire to small terminal of solenoid (fig. 3-5-15).



A Red wire B Green wire C Red battery cable 3-5-15

5. On two cylinder engines, install muffler.

6. Connect ground to battery (black cable).

TROUBLE SHOOTING

Causes of troubles are not necessarily in the starting system (starter) but may be due to a defective battery, switches, electrical cables and/or connections. The trouble may also be due to a malfunctioning of the ignition system and/or fuel system. The following trouble shooting table is limited to the starting system.

IMPORTANT

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 the battery.

SYMPTOM	CAUSE	REMEDY
When engaging, the starter shaft does not turn or turns too slowly	1 Battery discharged.	1. Charge battery and check rectifier.
	2. Battery defective (cracked casing, damaged or loose posts).	2. Replace battery.
	3. Loose or bad ground connection.	3. Tighten cable terminals.
	4. Battery poles and/or cable terminals oxidized.	4. Clean battery posts and cable terminals.
	5. Starter terminals or brushes shorted to ground.	5. Check as detailed in sub-section 3-4.
	6. Starter carbon brushes are not sitting on the commutator or clamped in their guides.	6. Check seating and security of carbon brushes.
	7. Starter carbon brushes worn, broken or dirty.	7. Clean or replace brushes and brush holders. Replace defective components.
	8. Ignition switch damaged or burnt (loose parts so that switch does not make contact).	8. Verify operation of switch.
	9. Starter solenoid damaged.	9. Check as detailed in sub-section 3-4.
	10. Voltage drop across battery cables.	10. Check condition and connections of cables.

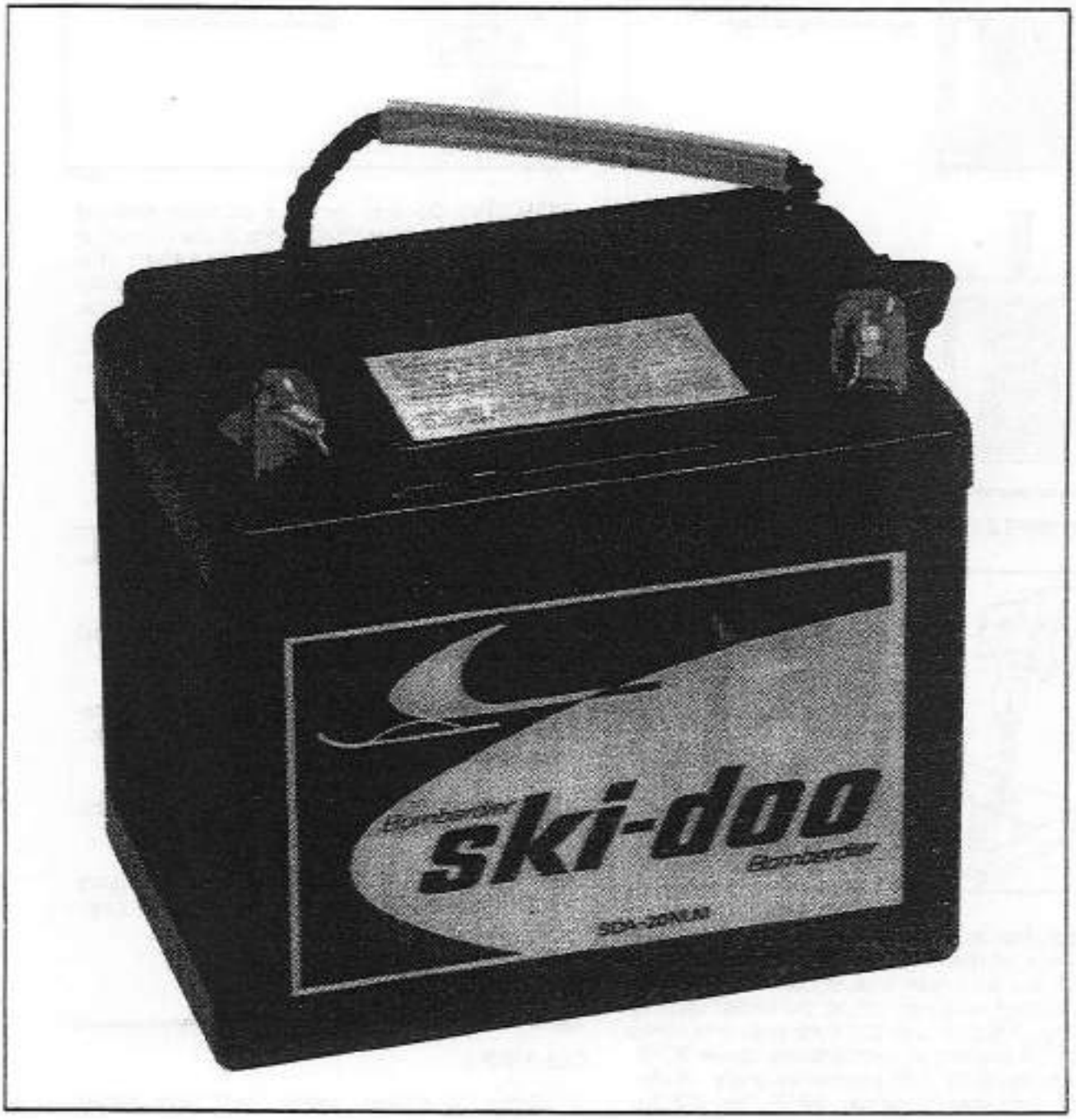
SYMPTOM	CAUSE	REMEDY
Starter continues to run after the switch is released.	1. Starter switch does not switch off or the solenoid is stuck.	1. Immediately disconnect the starter cable at the battery or starter. Repair or replace switch. If solenoid stuck, replace solenoid.
When switching on, the starter armature turns until it engages and then it stops	1. Battery is insufficiently charged.	1. Charge battery.
	2. Carbon brush spring pressure too low.	2. Check for worn or damaged carbon brushes and/or springs. Clean or replace defective brushes or springs.
	3. Starter solenoid switch defective	3. Check condition as detailed in sub-section 3-4.
	4. Voltage drop across battery cables or component wiring is too large.	4. Check condition and connection of cables and wiring.
	5. Drive assembly (clutch) slipping.	5. Repair or replace drive assembly (clutch).
Armature turns but drive assembly does not engage.	1. Defective solenoid.	1. Replace solenoid.
	2. Drive assembly (clutch) dirty.	2. Clean drive assembly (clutch)
	3. Drive assembly (clutch) or engine flywheel teeth chipped, burr formation.	3. File off burrs or replace.
Drive assembly (clutch) does not disengage when the engine starts.	1. Damaged drive assembly and engine starter gear or dirty helical spline.	1. Carefully clean or file the burrs on engine starter gear or drive assembly and clean helical spline.
	2. Return spring weak or broken.	2. Replace defective springs.

Electrical.

BATTERY 3-6

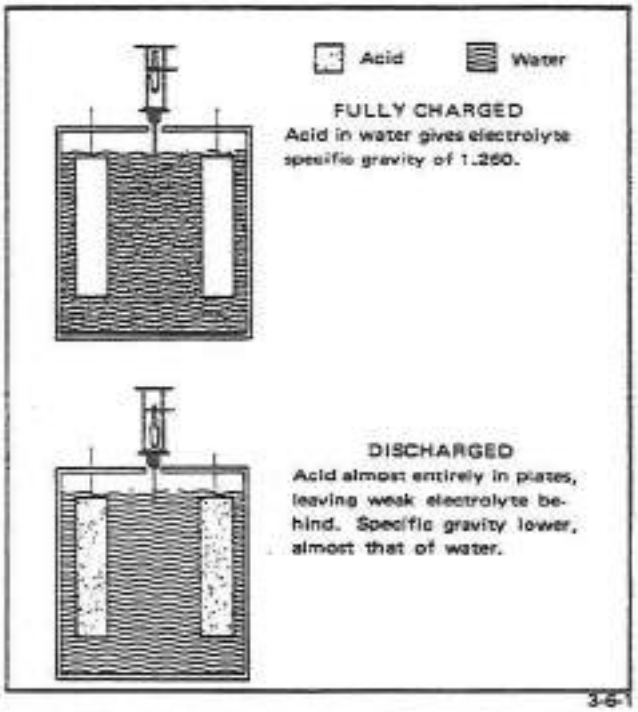
GENERAL

Because the battery serves a critical function on all electric models, Bombardier Ltd. has included a general discussion of battery theory as well as the "Seven Steps of Battery Storage" in the shop manual. Information on the use of a hydrometer and battery condition charts has also been included. Maintained correctly the snowmobile battery should provide a long service life.



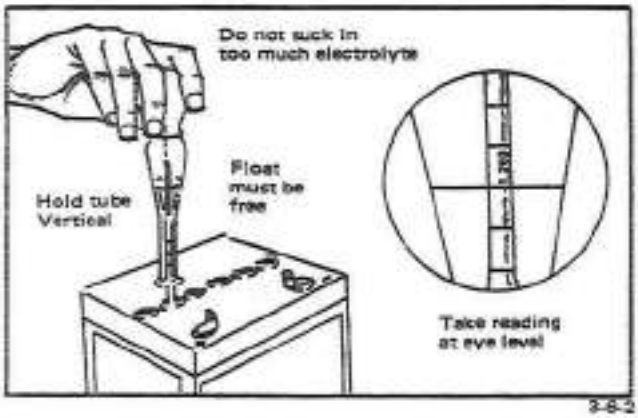
ELECTROLYTE

The electrolyte fluid solution is composed of sulphuric acid and water that varies in weight with the battery's charged state. As the rate of charge drops, the acid leaves the solution and enters the battery plates which in turn causes a decrease in electrolyte weight (fig. 3-6-1). To find the battery's state of charge, use a hydrometer.



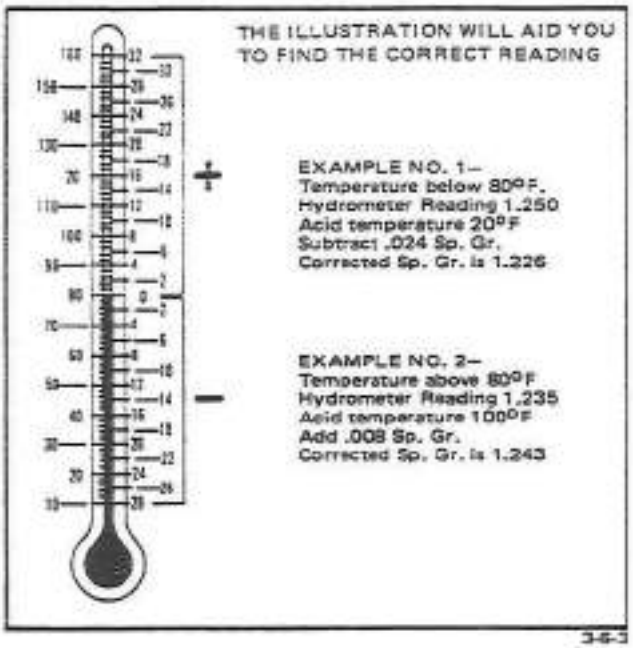
3-6-1

HYDROMETER



3-6-2

A hydrometer measures a battery's state of charge in terms of specific gravity (fig. 3-6-2). Most hydrometers only read true at 80°F. In order to obtain correct readings, adjust the initial reading by adding .004 points to the hydrometer readings for each 10 degrees of temperature above 80°F and by subtracting .004 points for every 10 degrees of temperature below 80°F (fig. 3-6-3).



3-6-3

CAUTION: Do not install a partially charged battery on a snowmobile since it may crack at freezing temperature. The following chart (fig. 3-6-4) 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	-74°F
1.230	3/4 Charged	-42°F
1.200	1/2 Charged	-16°F
1.170	1/4 Charged	0°F
1.110	Discharged	+19°F

3-6-4

REMOVAL

1. Disconnect the negative cable (black) and positive cable (red) from battery posts.

CAUTION: Care should be taken while disconnecting above mentioned cables otherwise battery post breakage could occur.

2. Remove the two (2) nuts and washers securing battery cover and remove cover.

NOTE: On Nordic models, remove cable clamp from negative post. Also disconnect battery overflow tube at bottom of chassis.

3. Lift battery out of vehicle.

CLEANING

1. Clean the battery casing, vent caps, cables

and battery posts with a solution of baking soda and water.

CAUTION: Do not allow cleaning solution to enter battery interior since it will destroy the electrolyte.

2. Remove corrosion from battery cable terminals and battery posts using a firm copper brush.

INSPECTION

1. Visually inspect battery casing for cracks or other possible damage. If casing is damaged replace the battery.

2. Inspect battery posts for security of mounting. Replace battery as required.

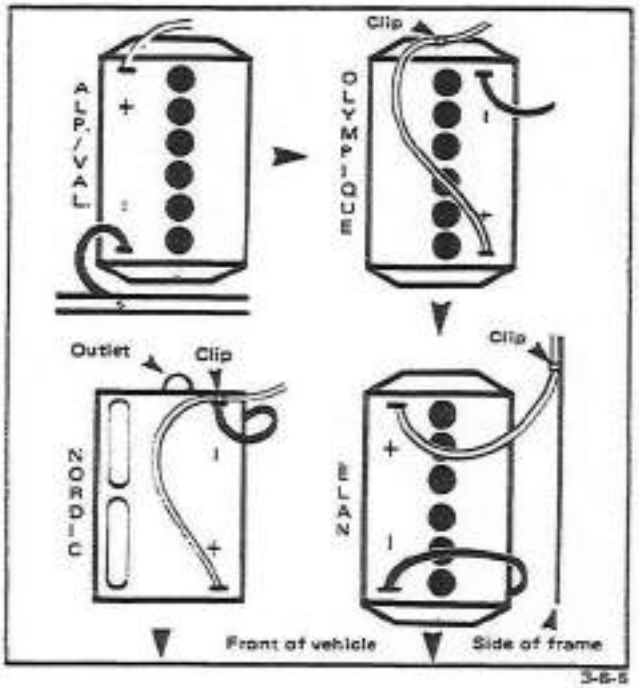
3. Inspect for cracked or damaged battery caps. Ensure that vent holes are unobstructed. Replace defective cap. If vent hole is blocked, clean using a firm strand of wire.

NOTE: The battery installed in the Nordic models do not incorporate caps with vent holes. Make sure that overflow tube is unobstructed.

4. Visually inspect electrolyte level in each cell. "Top up" to required level as detailed in step two of Battery Storage.

INSTALLATION

1. Position and secure battery and battery cables as illustrated in figure 3-6-5.



3-6-5

CAUTION: Ensure that neither the positive nor the negative cables touch the muffler.

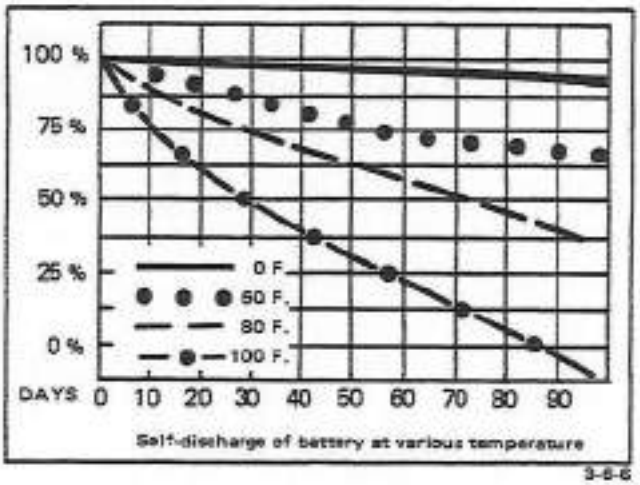
2. Apply L.P.S. No. 1 Metal Protector on battery terminals. If unavailable, use petroleum jelly.

BATTERY STORAGE

NOTE: The following information is provided for reference in determining battery condition.

A charged and unattended battery left in storage is perishable and can result in:

1. Self-discharging, brought upon by internal chemical reactions between the battery materials. A battery exposed to sunlight or heat of any sort while left unattended, will increase self-discharge proportionate to the increasing temperature as shown in figure 3-6-6.



3-6-6

2. Lead sulphate forms on the battery plates as a result of self-discharge. This condition is difficult to reconvert into active material. If lead sulphation continues, it becomes a hard, crystalline substance that requires half the normal rate of charge for 60 - 100 hours to reconvert into active material and even then the battery may still remain in a damaged condition.

3. Oxidation, because of cell fluid evaporation, the battery plates will become exposed to the air, thus causing greater sulphation.

4. Extreme acid concentration, that will burn through separator insulation.

SEVEN STEPS OF BATTERY STORAGE

Step one — After disconnecting and removing the battery from the vehicle, check specific gra-

vity of each cell with a hydrometer. Cells should give uniform reading of 1.260 if battery is fully charged at 80°F.

Step two – Check electrolyte in each cell and add distilled water (if unavailable, drinkable tap water), as necessary.

CAUTION: Do not over fill bottom of vent wells.

NOTE: Accurate electrolyte readings can only be taken after the cell fluids are thoroughly mixed, i.e. after charging.

Step three – Charge the battery fully. Using a 12 volt charger (5 amps) or trickle charger until 1.260 specific gravity readings are achieved.

CAUTION: Battery electrolyte must not exceed 120°F.

Step four – Clean battery terminals and cable connections with a copper brush and apply a light coat of L.P.S. No. 1 Metal Protector (if unavailable use petroleum jelly.)

Step five – Clean battery casing and vent caps with solution of baking soda and water (do not let cleaning solution enter battery, otherwise it will destroy the electrolyte). Rinse battery with clear water and dry well using a clean cloth.

Step six – Store battery in a cool, dry place as these conditions reduce self-discharging and fluid evaporation to a minimum.

Step seven – 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).

Table of Contents

Body & Frame

GENERAL 4-1

Due to the relative simplicity of the removal and disassembly of soft trim and body and frame attaching parts, we have limited this section to common serviceable components. The procedures given are basic outlines for removal and installation of the component(s).

4-1-1 WINDSHIELD

REMOVAL

1. Straighten the windshield anchor tabs and remove windshield, rubber strip and anchor tabs. Remove windshield protector.

NOTE: On T'NT models, remove the five (5) screws from under moulding edge. Remove rubber strips and moulding.

INSTALLATION

1. Insert windshield anchor tabs in holes of windshield.

2. Bend each tab at the middle until ends meet.

3. Lubricate windshield anchor rubber strip(s) with liquid soap.

4. Install windshield rubber strip on windshield base.

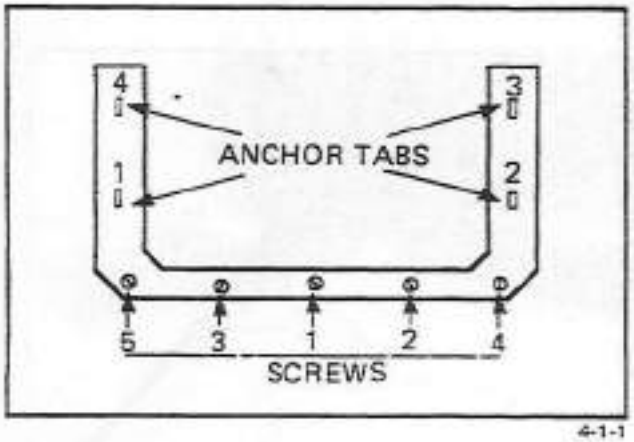
5. On T'NT models only, install windshield moulding in middle base of windshield.

6. Insert windshield into cab channel.

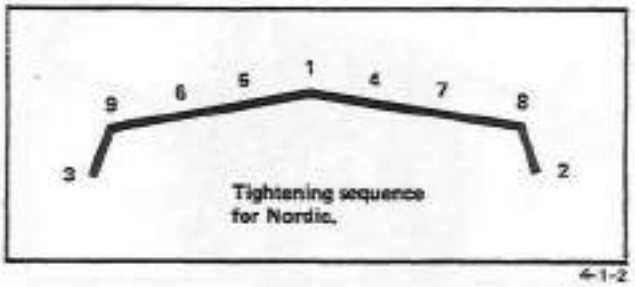
7. On T'NT models, lift moulding edge and insert screws into holes of windshield. (Follow tightening sequence shown in figure 4-1-1).

8. From within the cab, pull and open the anchor tabs. For T'NT models, follow installation sequence shown in figure 4-1-1. For Nordic models, follow sequence of figure 4-1-2.

9. Press windshield protector around top edge of windshield. Cut any excess.



4-1-1

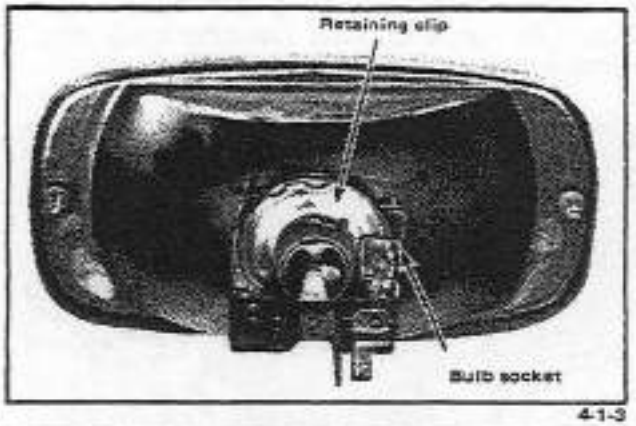


4-1-2

4-1-2 HEADLAMP HOUSING

Bulb replacement

NOTE: To change bulb, lift retaining clips and remove bulb socket. Twist and pull out bulb (fig. 4-1-3). Reverse procedure for Installation.



4-1-3

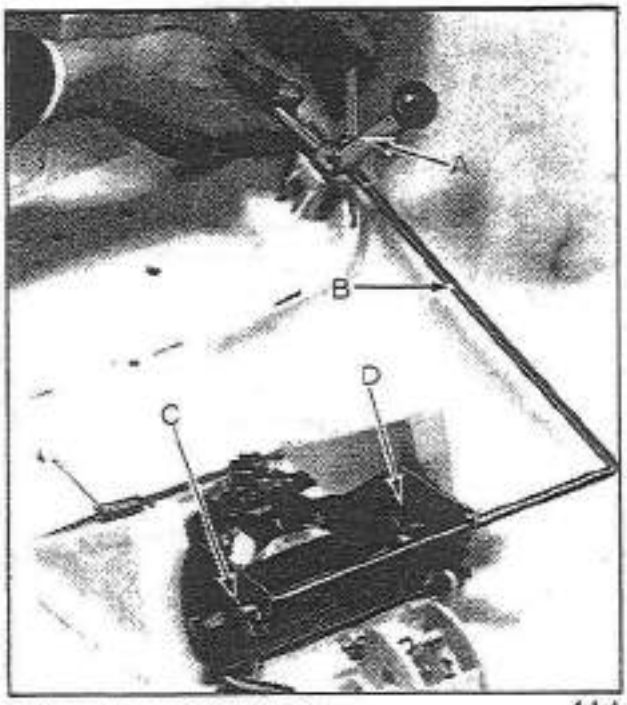
REMOVAL

(Olympique 300 Model)

1. Remove retaining clips and hinge rod to remove housing.

(Olympique 335 & 399 Models)

1. Unscrew nut and bolt at headlamp control rod. Remove lower hinge and spring. Remove headlamp assembly (fig. 4-1-4).



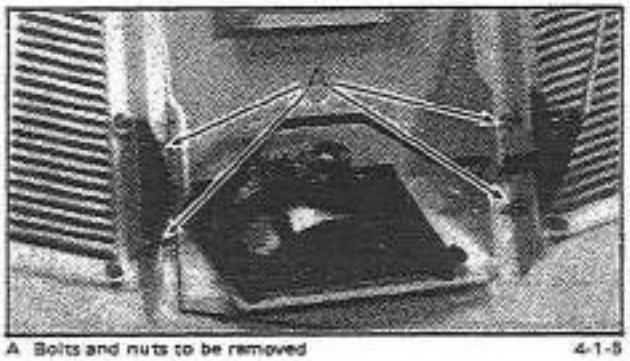
A Control lever B Control rod
C Cotter pin D Headlamp ring

4-1-4

2. Remove hinge pin, housing and spring. Remove bolt, spring and nut at insert. Remove insert and control lever.

(Nordic Models)

1. Remove headlamp knob and washer. Unscrew (4) nuts and bolts retaining lamp ring. Remove push nuts and hinge pin (fig. 4-1-5).



A Bolts and nuts to be removed

4-1-5

INSTALLATION (All Models)

1. Reverse removal procedure.

2. Proceed with headlamp adjustment.

WARNING: Before starting out or after adjustments, make sure lever and/or bolts are securely hooked or fastened.

4-1-3 HEADLAMP ADJUSTMENT

(A) Check headlamp adjustment using the following procedure:

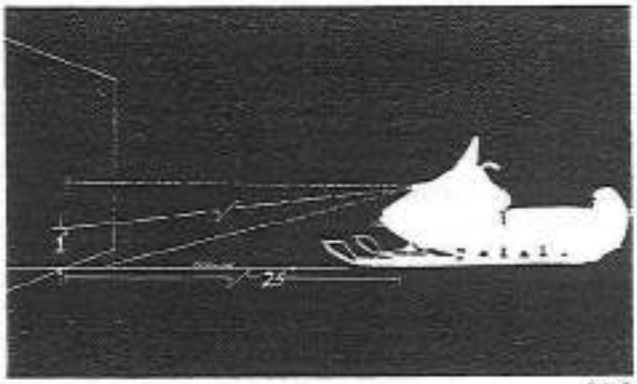
1. Position the vehicle twenty-five feet (25 ft.) from a wall or screen.

2. On manual start vehicles, start the engine.

3. Switch the lights to ON.

NOTE: On vehicles equipped with Hi/Lo beam, this procedure is carried out with the light switch in high beam position.

4. Check that the center of the headlamp beam (cast on wall or screen) is one foot (1 ft) from the ground and directly in front the vehicle (fig. 4-1-6).



4-1-6

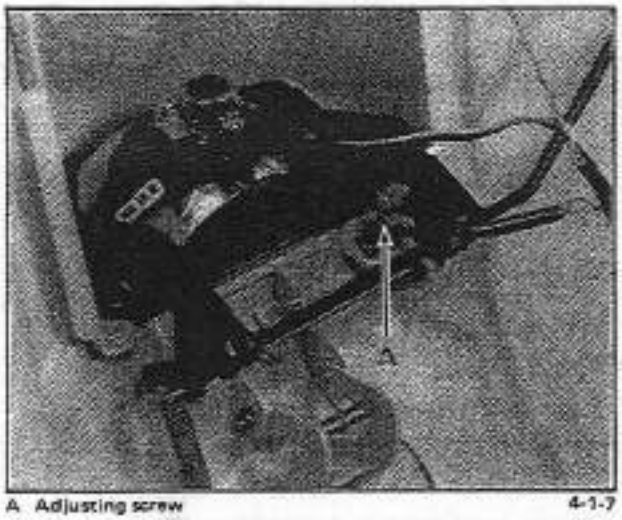
(B) On vehicles equipped with a retractable headlamp, adjust beam using following procedure.

(Olympique Models)

1. Turn the adjusting screw clockwise to raise beam.

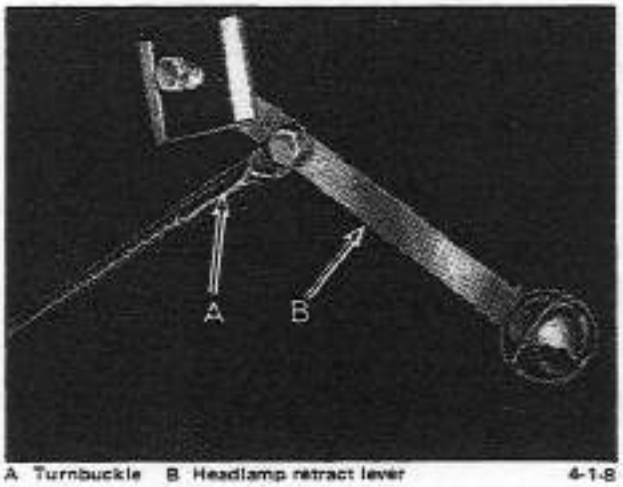
NOTE: The adjusting screw is installed in a bracket of the headlamp ring within the cab (fig. 4-1-7).

2. Turn the adjusting screw counter-clockwise to lower the beam.



A Adjusting screw 4-1-7

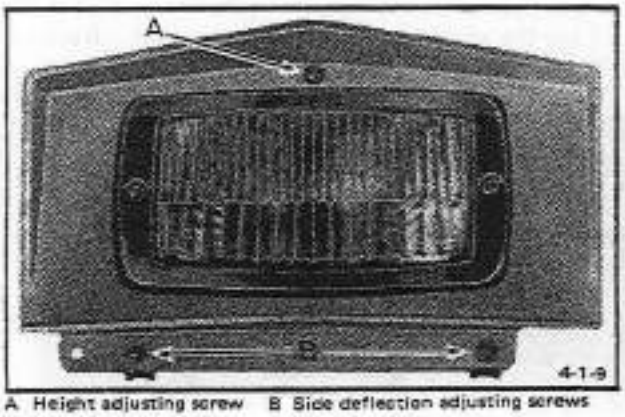
NOTE: If the adjuster screw is at its maximum and does not correct the beam height, remove the control rod from the control lever. Rotate the turnbuckle clockwise to lower the beam. or counter-clockwise to raise the beam. Connect control rod to control lever (fig. 4-1-8).



A Turnbuckle B Headlamp retract lever 4-1-8

(Nordic Models)

1. Turn adjusting screw clockwise to lower beam (fig. 4-1-9).



A Height adjusting screw B Side deflection adjusting screws 4-1-9

2. Turn adjusting screw counter-clockwise to raise beam.

(C) On vehicles equipped with a fixed headlamp, beam adjustment is as follows;

1. Loosen two (2) screws securing headlamp to cab.

2. Place a wedge between the top of the chrome ring and the cab to lower beam.

3. Place a wedge between bottom of chrome ring and cab to raise the beam.

4. Tighten headlamp screws.

(D) Side Deflection (All vehicles except Nordic)

1. On vehicles with retractable headlamp, expose headlamp.

2. Disconnect receptacle housing from terminals of headlamp socket.

3. Loosen housing screws and remove speed nuts holding assembly to cab. Remove headlamp from vehicle. On Elan models, remove retaining cable.

4. Place a washer on right hand screw of housing to correct right side deflection.

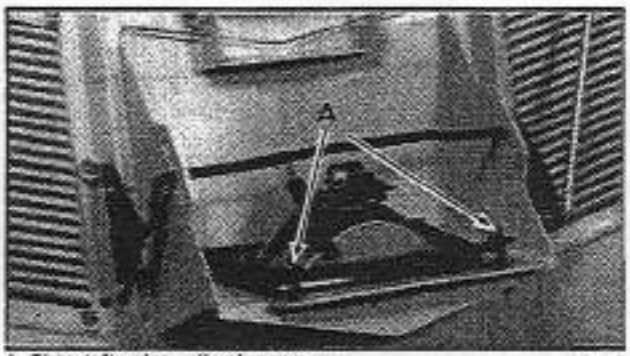
5. Place washer on left hand screw to correct a left side deflection.

6. Place assembled headlamp in location. Secure with two (2) new speed nuts. On Elan models, connect cab retaining cable to right hand screw.

7. Connect receptacle housing to terminal socket.

(On Nordic Models)

1. The deflection adjusting screws are located inside the cab on the headlamp housing (fig. 4-1-10).



A Side deflection adjusting screw 4-1-10

2. To correct a right side deflection, turn lower left adjusting screw clockwise or lower right adjuster screw counter-clockwise.

3. To correct a left side deflection, turn lower left adjusting screw counter-clockwise or lower right adjusting screw clockwise.

NOTE: When deflection has been corrected always verify beam height.

WARNING: Before starting out or after adjustments, make sure lever and bolts are securely hooked or fastened.

4-1-4 DECALS

1. To remove decal, pull.

2. Clean surface.

3. Apply liquid soap on **new** decal. Position decal on cab and pass a sponge over decal to remove air bubbles. Allow to air dry.

4-1-5 FRONT BUMPER

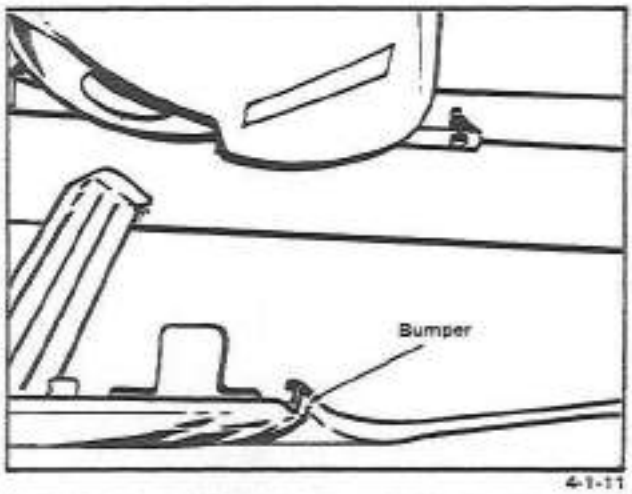
1. Remove nuts and cab guides securing bumper assembly to frame and remove bumper from vehicle.

2. Disassemble bumper halves by removing bolt and nut. Remove spacer.

3. To assemble, use a spacer, bolt and nut.

NOTE: Do not over-tighten the fasteners.

4. Install bumper to frame making sure the bumper ends overlap the frame contour (fig. 4-1-11).



4-1-11

4-1-6 FRONT BOTTOM PLATE

REMOVAL
(Alpine & Valmont Models)

NOTE: The front bottom plate is made of fiberglass and therefore is repairable.

1. Remove cab, front bumper and fuel tank.

2. Remove the ski assembly and ski leg.

3. Remove body moulding (rubber strips of frame).

4. Drill out pop rivets and tubular rivets attaching bottom plate to frame. Remove bottom plate.

5. Remove seal plate and seal from ski leg.

INSTALLATION

1. Install plastic sealer in seal plate then position ski leg seal plate in front bottom plate.

2. Position the front bottom plate in location. Secure with **new** tubular rivets.

3. Install body moulding.

4. Install ski leg and ski assembly.

5. Install the fuel tank, front bumper and cab.

4-1-7 CARRIAGE BOLTS

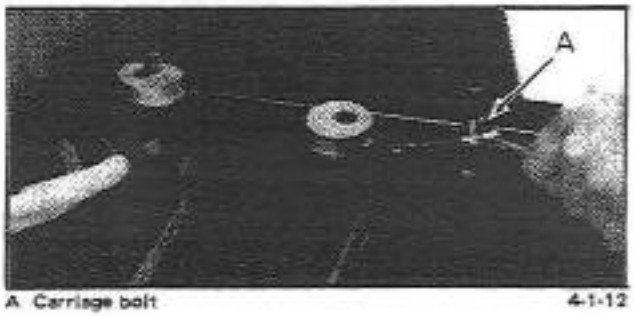
REMOVAL

1. Lift and block rear of vehicle off the ground.

2. Remove either the bogie wheel system or the slide suspension unit.

3. Remove the rear hub, drive axle and engine.

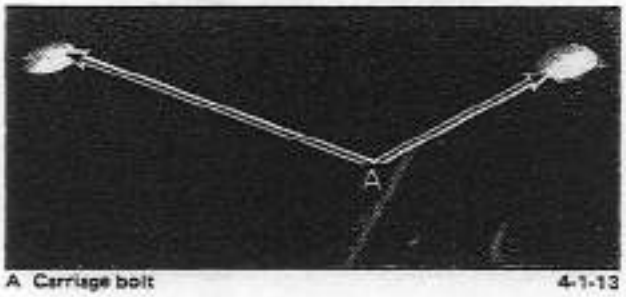
4. Remove the four (4) rubber mounts. Unscrew the threaded spacer bushings and push down on the carriage bolts to remove them from the frame (fig. 4-1-12).



A Carriage bolt 4-1-12

INSTALLATION

1. From underneath the frame, insert the four (4) carriage bolts (fig. 4-1-13). Screw the four (4) spacer bushings onto the bolts. Install rubber mounts.



A Carriage bolt 4-1-13

2. Reverse removal procedure to install components.

4-1-8 BACKREST

REMOVAL

(Olympique Models except 300)

1. Disconnect taillight quick connector.

2. Remove the four (4) bolts, retainer washers, washers and nuts securing backrest to frame.

NOTE: The taillight ground wire is connect to one (1) of the bolts.

(Nordic Models)

1. Using 1/8" dia drill, remove rivets and pull backrest from seat.

2. Install new backrest and secure with pop rivets.

4-1-9 SEAT

REMOVAL

(All models except Nordic, Alpine and Valmont)

1. On Olympique models, remove backrest.

2. Disconnect taillight quick connector.

3. Remove rear bumper (vehicles so equipped).

4. On Elan, T'NT and Olympique 300 models, remove (2) nuts and washers securing stud plate. Open compartment door and remove stud plate.

NOTE: The taillight ground wire is attached to the stud plate.

5. Push the seat towards rear of vehicle to disengage the seat hooks from the frame anchors. Remove seat from vehicle.

(Nordic Models)

1. Remove nut and bolt securing restraining cable to frame.

2. Remove the screws attaching the seat hinge to the seat. Remove seat.

(Alpine and Valmont Models)

1. Remove backrest.

2. Open seat and remove screw attaching the restraining cable to the seat.

3. Remove the screws attaching the seat hinge to the frame. Remove the seat from vehicle.

INSTALLATION (All models)

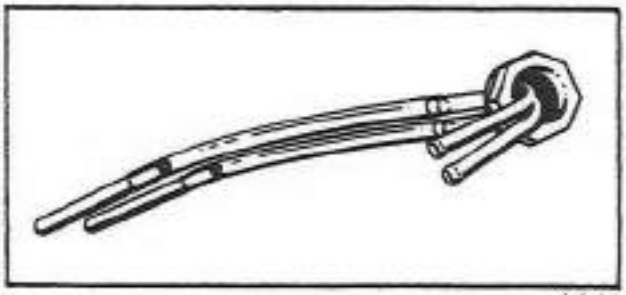
To install the seat, refer to the applicable removal procedure and reverse the steps.

4-1-10 FUEL TANK CONNECTOR

1. Remove gear clamp. Disconnect fuel lines and unscrew male connector.

2. Remove fuel lines from male connector.

3. Install **new** fuel lines on connector. One (1) of the fuel lines must be two (2) inches shorter than the other (fig. 4-1-14).



4-1-14

4. Apply pipe thread compound on connector threads and screw the connector into gas tank. Install gear clamp and connect fuel lines.

NOTE: The carburetor return fuel line should be connected to the adaptor of the shorter fuel line.

4-1-11 CAB HINGE (T'NT Models)

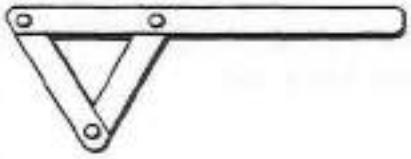
When removing cab hinge on T'NT 292, 340 and 440 models, there are spacer plates located between the hinge and the frame. When installing **new** hinges always reinstall the spacer plates.

Table of Contents

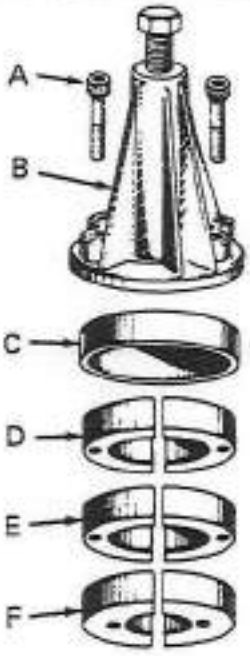
Special Tools

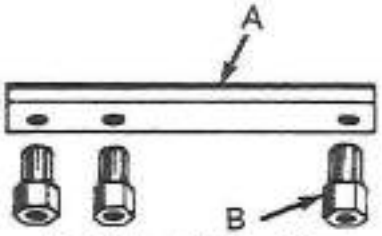
ITEM	APPLICABLE TO:
 Link Plate Spring Lever	All models except Élan
 Chain Tension Releaser Tool	All models (except Alpine, Valmont & Nordic 640ER)
 Track Insert Installer (Clip-O-Matic)	Élan & Olympique (bogie only)
 Heavy Duty Track Insert Installer	All models

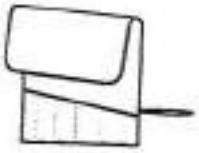
 Driven Pulley Support Puller	All T'NT models (except 292)
 Timing Light	All models
 Driven Pulley Puller Adaptor	Alpine and Valmont models
 Oil Seal Lever	All models
 Merc-O-Tronic (Analyser)	All models

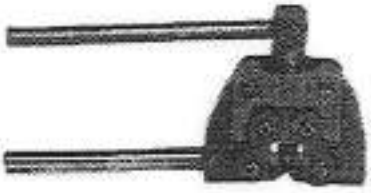
 Fan Wrench	1) A model available for all single cylinder electric models. 2) A model available for all single cylinder manual models.
 Spacer for Bearing Puller (drive axle)	All T'NT models
 Bearing Puller Adaptor (Rear Hub and Drive Axle)	All T'NT models
 End Protector	All T'NT models
 Flywheel Puller	1) A model available for all one cylinder models. 2) A model available for all two cylinder models.

 Adjuster Bar	1) A model available for all models (except T'NT 340 & 440) 2) A model available for T'NT 340 & 440.
 Oil Seal Pusher	A model available for: 1) 292 - 337 (mag.) 2) 292 - 337 (P.T.O.) 3) 247 - 302
 Oil Seal Protection Sleeve	A model available for: 1) All one cylinder (mag.) 2) 247 - 302 (P.T.O.)
 Crankshaft Hold Down Support	All two cylinder models
 Starter Gear Puller	All two cylinder electric models

 Fan Holder Wrench	All two cylinder models
 Crankshaft Ring	A model available for: 1) 343 - 401 2) 640 - 641 - 775
 A) Puller Screw B) Puller C) Ring for puller D) Ring half for ball bearing E) Ring half for ball bearing F) Ring half for roller bearing	A) All models B) All models C) 247 - 292 - 302 - 337 - 343 - 401 - 434 - 435 640 - 641 - 775 D) 247 - 302 - 343 - 401 - 434 - 435 E) 292 - 337 - 640 - 641 and 775 F) 292 - 337

 Connecting Rod Holder	247 - 292 - 302
 a) Cylinder Aligning Tool b) Nut 8 M for Alignment Tool	All two cylinder models
 Protection Cap	All engine types
 Fork Wrench 11/13 m.m.	All engine types
 Socket Wrench Pin	All engine types

 Socket Wrench 21/26 m.m.	All engine types
 Socket Wrench 11/13 m.m.	All engine types
 Angular Wrench 10/13 m.m.	All engine types
 Screwdriver	All engine types
 Tool Bag	All engine types

 Carburetor Leak Detector	All carburetor models
 Chain Bearing Pin Extractor	All models
 T.D.C. Gauge (Dial Indicator)	All engine types
 Tachometer (Merc-O-Tronic)	All models

WARRANTY 1972 SKI-DOO SNOWMOBILE – U.S.A. and CANADA

Bombardier Limited (Bombardier), as manufacturer, warrants every 1972 Ski-Doo snowmobile **sold as a new vehicle, by an authorized Ski-Doo Dealer,** to be free from defects in material, and workmanship under normal use and service, for a period of ninety (90) days from the date of the original retail purchase, subject to the following exceptions:

1. Should the date of said original retail purchase be within ninety (90) days immediately preceding March 31, the warranty period shall be for a period of ninety (90) days, beginning on the date of said retail purchase until March 31 and the balance of said warranty period shall be carried over into the following winter season beginning with the date of the first snowfall, but not later than the next 15th day of December.

2. Should the date of said original retail purchasing be on or after March 31, the said warranty period shall be for a period of ninety (90) days, beginning on the date of the first snowfall during the following winter season, but not later than the next 15th day of December.

3. This warranty does not apply to Ski-Doo snowmobiles used for racing purposes nor to Blizzard Ski-Doo snowmobile models.

An exception to the above warranty period is that transmission drive belts are warranted for thirty days from date of retail purchase of the Ski-Doo snowmobile subject to the aforementioned exceptions.

Bombardier's obligation under this warranty is strictly limited to the repair or replacement at its option, of any part or parts thereof which shall, within the specified warranty period, be returned to an authorized Ski-Doo dealer at such dealer's place of business and, which examination shall disclose to the satisfaction of Bombardier to have been thus defective. The repair or replacement of defective parts under this warranty will be made by such dealer, without charge for parts or labour, under the following conditions only:

1. That proof of ownership and warranty registration be submitted to the dealer by means of the Ski-Doo Service Card.

2. That warranty repairs be effected at the Dealer's place of business.

This warranty does not apply to normal maintenance services, (including but not limited to normal wear on rubber drive belts, slider shoes on transmission cams and slide rail suspensions, including all engine or other adjustments and alignments) or to replacement of service items (including but not limited to spark plugs, ignition points and condensers, filters, brake linings, light bulbs and lenses, ski-runner shoes, paints, lubricants or fasteners) made in connection with such services, or to normal deterioration of soft trim and appearance items due to wear and exposure.

This warranty does not apply to any defect which results from: I) misuse or accident; II) installation of repair parts other than genuine Bombardier replacement parts or; III) repairs by any person other than an authorized Ski-Doo snowmobile dealer; IV) lack of preventative maintenance; V) alterations or modifications other than those approved in writing by Bombardier.

Operating a Ski-Doo snowmobile in a race, or modifying it with high performance parts (whether or not such parts are supplied by Bombardier or are installed by an authorized Ski-Doo snowmobile dealer) or operating a Ski-Doo snowmobile on surfaces other than snow or ice, will be considered a misuse.

This warranty is expressly in lieu of all other expressed or implied warranties of Bombardier, its distributors and the selling dealer, including any implied warranty of merchantability or fitness for any particular purpose. Neither Bombardier, its distributors nor the selling dealer shall be responsible, under any circumstances, for any loss or damage as a result of hidden defects, accidents, misuses or other faults.

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.

This warranty does not apply to any losses resulting from:

- Traveling time, mileage, telephone calls, telegrams, taxi or towing charges or the rental of a vehicle during the period of repair.
- Transportation of the vehicle, engine, parts or accessories.

Bombardier Limited,
Valcourt, Quebec, Canada. May 1971.

Code No. 484-0082

Lith'd in Canada