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FOREWORD

This Manual has been prepared by the Technical Publications Department of Bombardier Limited, and contains the complete servicing of all Ski-Doo snowmobiles for 1970 and 1971. Intended primarily for use by authorized Ski-Doo dealers, it is being made available for the first time this year to owners of Ski-Doo snowmobiles.

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

A number of procedures throughout the book require the use of special tools. Where a special tool is indicated, a cross-reference to its full description is immediately provided (i.e. Use special lever (refer Section 5, Item 1). 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. Handy Spot Locaters, placed in descending order on the first page of each Sub-section, also assist the user.

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).

Sub-section numbers are similarly coded, using two digits only (i.e. 1-2). The first digit represents the Section (1), the second digit, the Sub-section (1-2).

INTRODUCTION

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 and in cross-relating to the actual vehicle. 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 first two (2) numbers indicate the year of the vehicle. The second two (2) numbers identify 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.

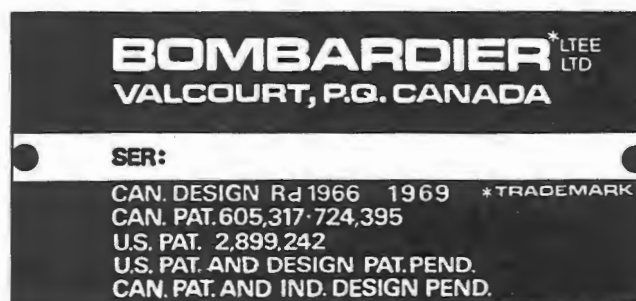
All serial numbers become valuable in the event of warranty claims, loss, theft or dispute. They are prominently displayed and easy to locate.

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

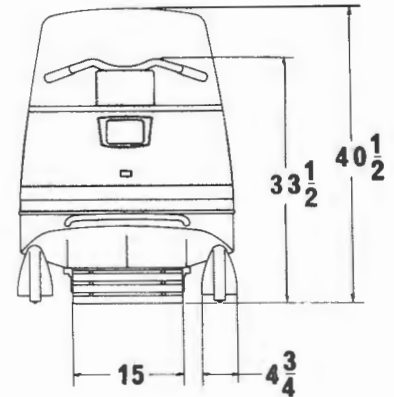
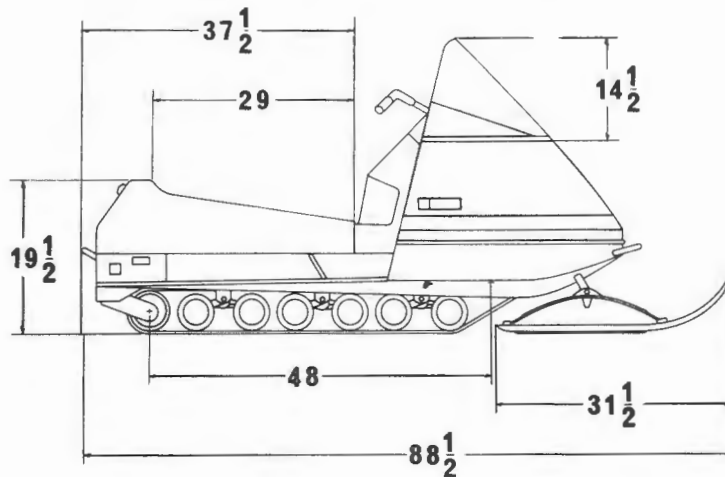
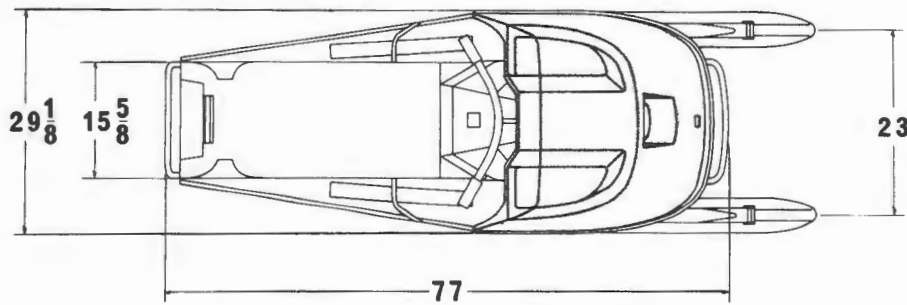
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IMPORTANT — If vehicle is still under Warranty, read Warranty conditions and exclusions, at back of manual, carefully before commencing any procedure. Unrestricted tampering can invalidate your Warranty.

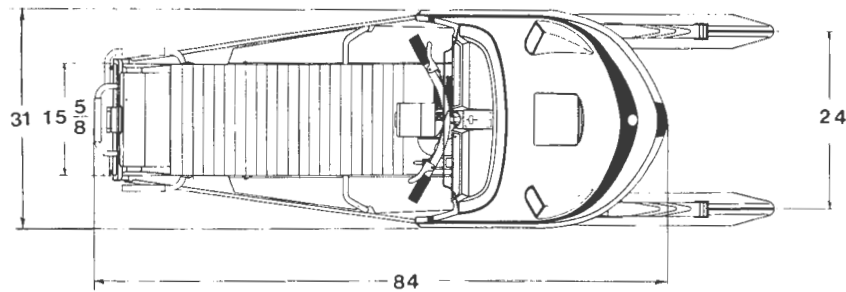
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1971 ELAN SPECIFICATIONS

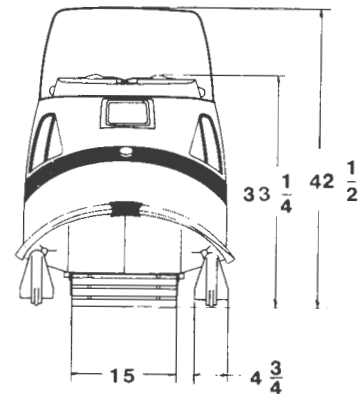
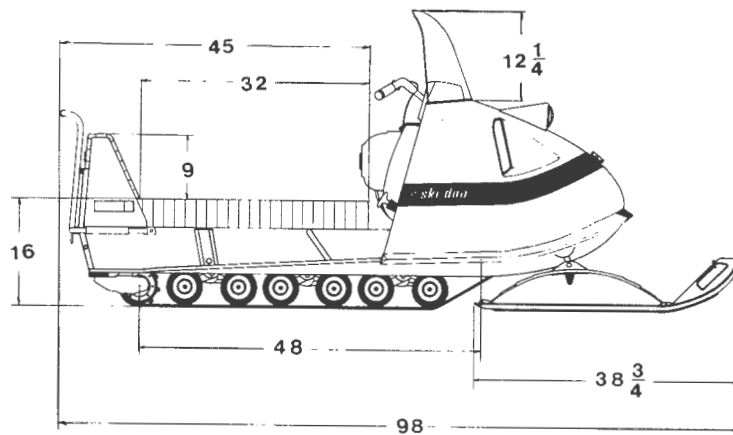


ITEM	ELAN	ELAN 250	ELAN 250E
ENGINE	No. of Cylinders	ONE	ONE
	Bore	69 M.M.	69 M.M.
	Stroke	66 M.M.	66 M.M.
	Displacement	247 c.c.	247 c.c.
	Horse Power	12	12
	Compression Ratio	7.5:1	7.5:1
CHASSIS	Overall Length	88.5"	88.5"
	Overall Width	29-1/8"	29-1/8"
	Height W/O Windshield	33.5"	33.5"
	Weight (Lbs.)	246	282
	Bearing Area	1070 sq. in.	1070 sq. in.
	Ground Pressure (P.S.I.)	0.230	0.263
POWER TRAIN	Track (Width)	15"	15"
	Standard Gear Ratio	10/25	10/25
IGNITION	Starting	Manual	Electric
	Lighting Coil (Watts)	40W	75W
	Spark Plug (Bosch)	M-240-T-1*	M-240-T-1*
	Spark Plug (Gap)	0.018"-0.022"	0.018"-0.022"
	Breaker Points (Gap)	0.014"-0.018"	0.014"-0.018"
FUEL	Tank Capacity — Imp.	3.5 gals.	3.5 gals.
	Tank Capacity — U.S.	4.38 gals.	4.38 gals.
	Mixing Ratio (Gas/Oil)	20:1	20:1
BRAKE	Type	Pivoting	Pivoting
ACCESSORIES	Speedometer	Optional	Optional
	Tachometer	Optional	Optional
*When ordering replacement spark plug(s), specify number shown above.			

INTRODUCTION

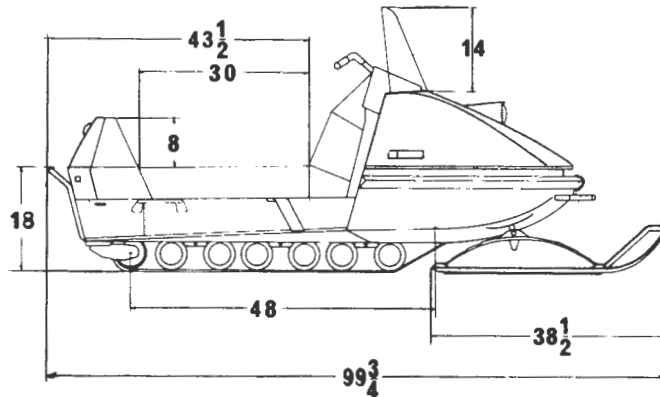
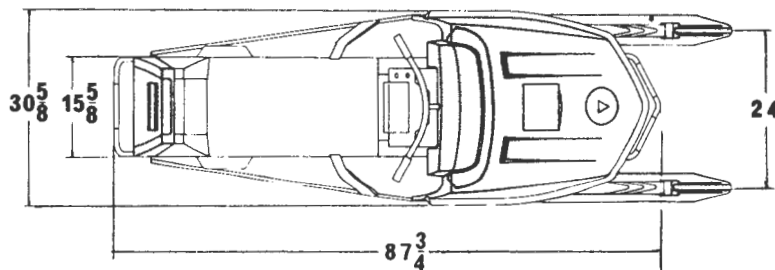


1970 OLYMPIQUE SPECIFICATIONS



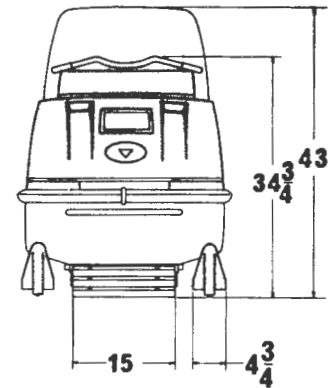
ITEM	OLYMPIQUE	12/3	335	335/E	399
ENGINE	No. of Cylinders	ONE	ONE	ONE	TWO
	Bore	76 M.M.	78 M.M.	78 M.M.	2x64.5 M.M.
	Stroke	66 M.M.	70 M.M.	70 M.M.	2x61 M.M.
	Displacement	299.4 c.c.	334.5 c.c.	334.5 c.c.	398.6 c.c.
	Horse Power	12	18	18	24
	Compression Ratio	6.5:1	7.5:1	7.5:1	8.75:1
CHASSIS	Overall Length	98"	98"	98"	98"
	Overall Width	31"	31"	31"	31"
	Height W/O Windshield	33-1/4"	33-1/4"	33-1/4"	33-1/4"
	Weight (Lbs.)	295	300	335	320
	Bearing Area	1092 sq. in.	1092 sq. in.	1092 sq. in.	1092 sq. in.
	Ground Pressure (P.S.I.)	.270	.275	.306	.293
POWER TRAIN	Track (Width)	15"	15"	15"	15"
	Standard Gear Ratio	10/25	11/25	11/25	16/34
IGNITION	Starting	Manual	Manual	Electric	Manual
	Lighting Coil (Watts)	40W	40W	75W	75W
	Spark Plug(s) Bosch	M-240-T-1*	M-240-T-1*	M-240-T-1*	W-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.	3 gal.	3 gal.	3 gal.	3 gal.
	Tank Capacity -- U.S.	3.75 gal.	3.75 gal.	3.75 gal.	3.75 gal.
	Mixing Ratio (Gas/Oil)	20:1	20:1	20:1	20:1
BRAKE	Type	Drum	Drum	Drum	Drum
ACCESSORIES	Speedometer	Optional	Optional	Optional	Optional
	Tachometer	Optional	Optional	Optional	Optional
*When ordering replacement spark plug(s), specify number shown above.					

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1971 OLYMPIQUE SPECIFICATIONS

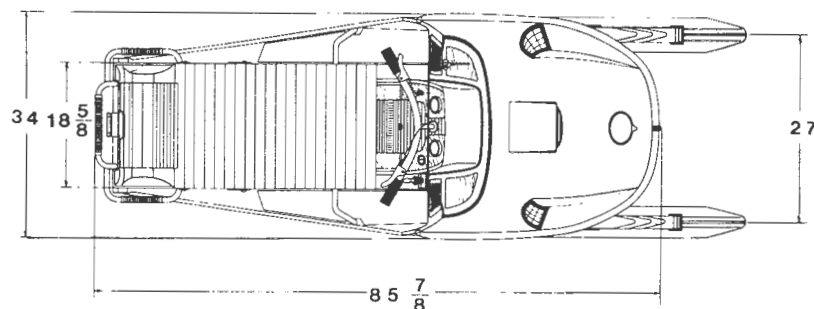
Illustrated
MODEL 335



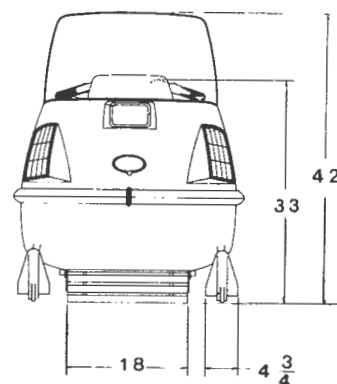
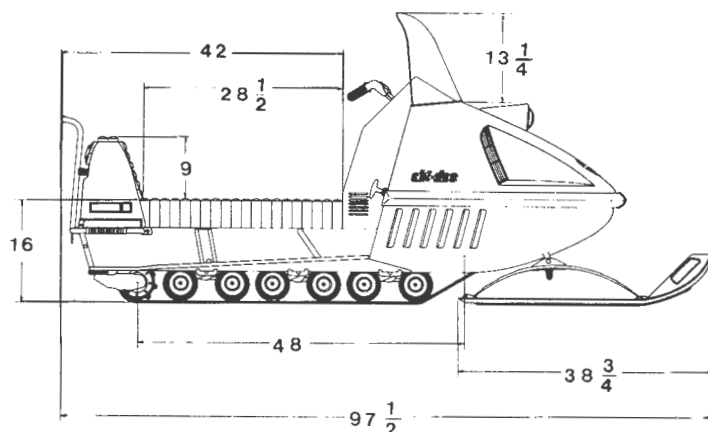
ITEM	OLYMPIQUE	300	335	335E	399	399E
ENGINE	No. of Cylinders	ONE	ONE	ONE	TWO	TWO
	Bore	76 M.M.	78 M.M.	78 M.M.	2x64.5 M.M.	2x64.5 M.M.
	Stroke	66 M.M.	70 M.M.	70 M.M.	2x61 M.M.	2x61 M.M.
	Displacement	299 c.c.	335 c.c.	335 c.c.	399 c.c.	399 c.c.
	Horse Power	15	20	20	24	24
	Compression Ratio	7:1	8:1	8:1	8.75:1	8.75:1
CHASSIS	Overall Length	99-3/4	99-3/4	99-3/4	99-3/4	99-3/4
	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	331	360	347	282
	Bearing Area	1092 sq. in.	1092 sq. in.	1092 sq. in.	1092 sq. in.	1092 sq. in.
	Ground Pressure (P.S.I.)	0.300	0.304	0.330	0.318	0.350
POWER TRAIN	Track (Width)	15"	15"	15"	15"	15"
	Standard Gear Ratio	15/35	15/34	15/34	16/34	16/34
IGNITION	Starting	Manual	Manual	Electric	Manual	Electric
	Lighting Coil (Watts)	40W	40W	75W	75W	75W
	Spark Plug (Bosch)	M-240-T-1*	M-240-T-1*	M-240-T-1*	W-240-T-1*	W-240-T-1*
	Spark Plug (Gap)	.018"-.022"	.018"-.022"	.018"-.022"	.018"-.022"	.018"-.022"
	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.
	Tank Capacity—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
ACCES- SORIES	Speedometer	Optional	Optional	Optional	Optional	Optional
	Tachometer	Optional	Optional	Optional	Optional	Optional

*When ordering replacement spark plug(s), specify number shown above.

INTRODUCTION

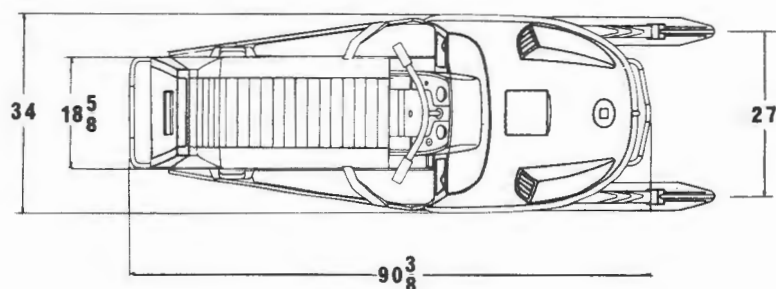


1970 NORDIC SPECIFICATIONS



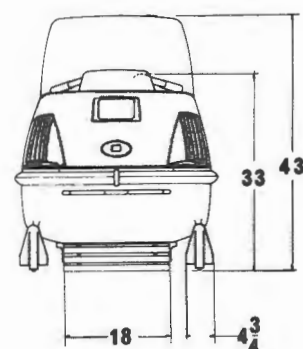
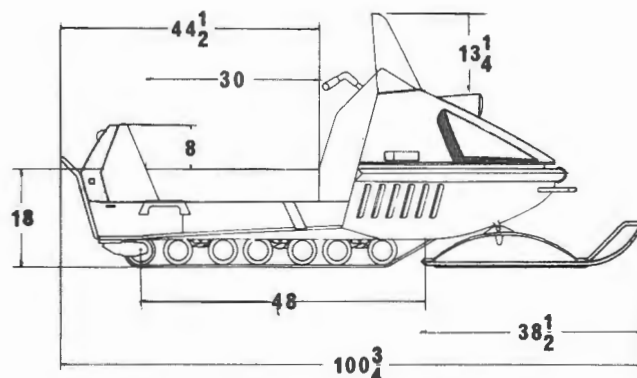
ITEM	NORDIC	399	399/E	640/E
ENGINE	No. of cylinders	TWO	TWO	TWO
	Bore	2x64.5 M.M.	2x64.5 M.M.	2x76 M.M.
	Stroke	2x61 M.M.	2x61 M.M.	2x70 M.M.
	Displacement	398.6 c.c.	398.6 c.c.	635.1 c.c.
	Horse Power	24	24	35
	Compression Ratio	8.75:1	8.75:1	9:1
CHASSIS	Overall Length	97-1/2"	97-1/2"	97-1/2"
	Overall Width	34"	34"	34"
	Height W/O Windshield	33"	33"	36"
	Weight (Lbs.)	360	395	430
	Bearing Area	1242 sq. in.	1242 sq. in.	1242 sq. in.
	Ground Pressure (P.S.I.)	.290	.319	.345
POWER TRAIN	Track (Width)	18"	18"	18"
	Standard Gear Ratio	16/34	16/34	20/34
IGNITION	Starting	Manual	Electric	Electric
	Lighting Coil (Watts)	75W	75W	75W
	Spark Plug(s) Bosch	W-240-T-1 *	W-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 gal.	5 gal.	5 gal.
	Tank Capacity—U.S.	6.25 gal.	6.25 gal.	6.25 gal.
	Mixing Ratio (Gas/Oil)	20:1	20:1	20:1
BRAKE	Type	Drum	Drum	Drum
ACCESSORIES	Speedometer	Optional	Optional	Optional
	Tachometer	Optional	Optional	Optional
*When ordering replacement spark plug(s), specify number shown above.				

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1971 NORDIC AND SKANDIC SPECIFICATIONS

Illustrated —
MODEL 399E

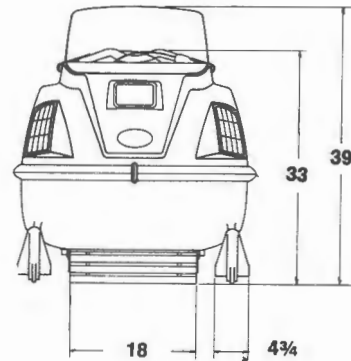
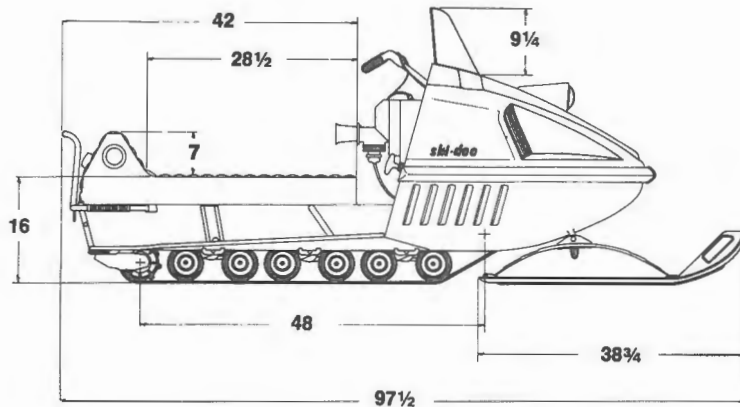
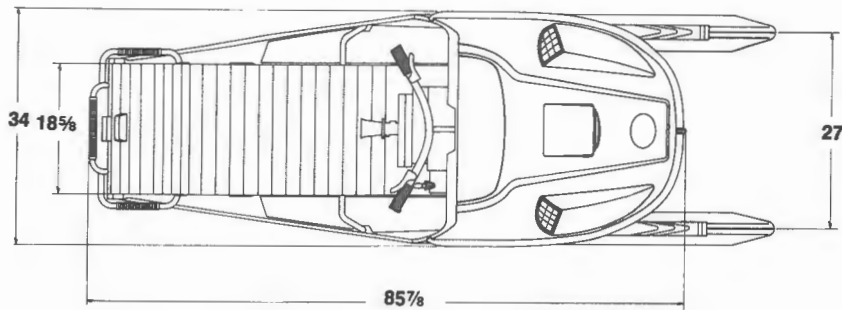


ITEM		NORDIC 399	NORDIC 399E	NORDIC 640E	SKANDIC
ENGINE	No. of Cylinders	TWO	TWO	TWO	ONE
	Bore	2x64.5 M.M.	2x64.5 M.M.	2x76 M.M.	78 M.M.
	Stroke	2x61 M.M.	2x61 M.M.	2x70 M.M.	30 M.M.
	Displacement	399 c.c.	399 c.c.	635 c.c.	335 c.c.
	Horse Power	24	24	35	20
	Compression Ratio	8.75:1	8.75:1	9:1	8:1
CHASSIS	Overall Length	100-3/4	100-3/4	100-3/4	98-3/4
	Overall Width	34	34	34	34
	Height W/O Windshield	33	33	33	33
	Weight (Lbs.)	360	395	430	335
	Bearing Area	1242 sq. in.	1242 sq. in.	1242 sq. in.	1242 sq. in.
	Ground Pressure (P.S.I.)	.291	.318	.346	.270
POWER TRAIN	Track (Width)	18"	18"	18"	18"
	Standard Gear Ratio	16/34	16/34	20/34	12/33
IGNITION	Starting	Manual	Electric	Electric	Manual
	Lighting Coil (Watts)	75W	75W	75W	40W
	Spark Plug (Bosch)	W-240-T-1*	W-240-T-1*	M-280-T-31*	M-240-T-1*
	Spark Plug (Gap)	.018"-.022"	.018"-.022"	.018"-.022"	.018"-.022"
FUEL	Breaker Points (Gap)	.014"-.018"	.014"-.018"	.014"-.018"	.014"-.018"
	Tank Capacity—Imp.	5 gals.	5 gals.	5 gals.	5 gals.
BRAKE	Tank Capacity—U.S.	6.25 gals.	6.25 gals.	6.25 gals.	6.25 gals.
	Mixing Ratio (Gas/Oil)	20:1	20:1	20:1	20:1
ACCESSORIES	Type	Drum	Drum	Drum	Drum
	Speedometer	Optional	Optional	Standard	Optional
TACHOMETER	Tachometer	Optional	Optional	Standard	Optional

*When ordering replacement spark plug(s), specify number shown above.

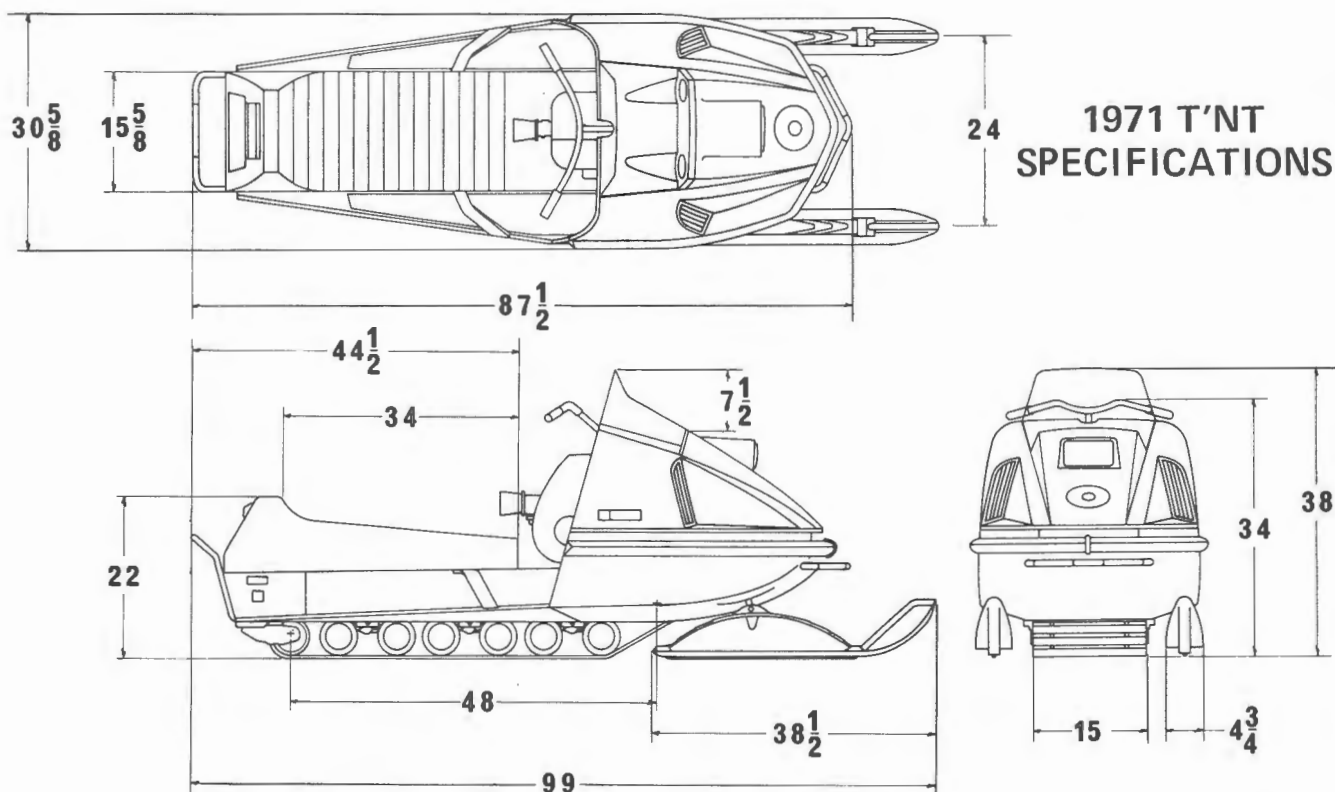
INTRODUCTION

1970 T'NT SPECIFICATIONS



ITEM	T'NT	292	340	399	640
ENGINE	No. of Cylinders	ONE	ONE	TWO	TWO
	Bore	75 M.M.	78 M.M.	2x64.5 M.M.	2x76 M.M.
	Stroke	66 M.M.	70 M.M.	2x61 M.M.	2x70 M.M.
	Displacement	291.6 c.c.	334.5 c.c.	398.6 c.c.	635.1 c.c.
	Horse Power	22	26	30	
	Compression Ratio	10:1	10:1	10:1	
CHASSIS	Overall Length	96"	98"	97-1/2"	97-1/2"
	Overall Width	29"	31"	34"	34"
	Height W/O Windshield	33"	33"	33"	33"
	Weight (Lbs.)	300	305	355	385
	Bearing Area	1092 sq. in.	1092 sq. in.	1242 sq. in.	1242 sq. in.
	Ground Pressure (P.S.I.)	.275	.279	.286	.309
POWER TRAIN	Track (Width)	15"	15"	18"	18"
	Standard Gear Ratio	10/25	16/34	16/34	20/34
IGNITION	Starting	Manual	Manual	Manual	Manual
	Lighting Coil (Watts)	40W	40W	75W	75W
	Spark Plug(s) Bosch	M-280-T-31*	M-280-T-31*	W-260-T-1*	M-280-T-31*
	Spark Plug (Gap)	.018"- .022"	.018"- .022"	.018"- .022"	.018"- .022"
	Breaker Points (Gap)	.014"- .018"	.014"- .018"	.014"- .018"	.014"- .018"
FUEL	Tank Capacity—Imp.	3 gal.	3 gal.	5 gal.	5 gal.
	Tank Capacity—U.S.	3.75 gal.	3.75 gal.	6.25 gal.	6.25 gal.
	Mixing Ratio (Gas/oil)	20:1	20:1	20:1	20:1
BRAKE	Type	Drum	Drum	Drum	Drum
ACCESSORIES	Speedometer	Standard	Standard	Standard	Standard
	Tachometer	Standard	Standard	Standard	Standard
*When ordering replacement spark plug(s), specify number shown above.					

INTRODUCTION

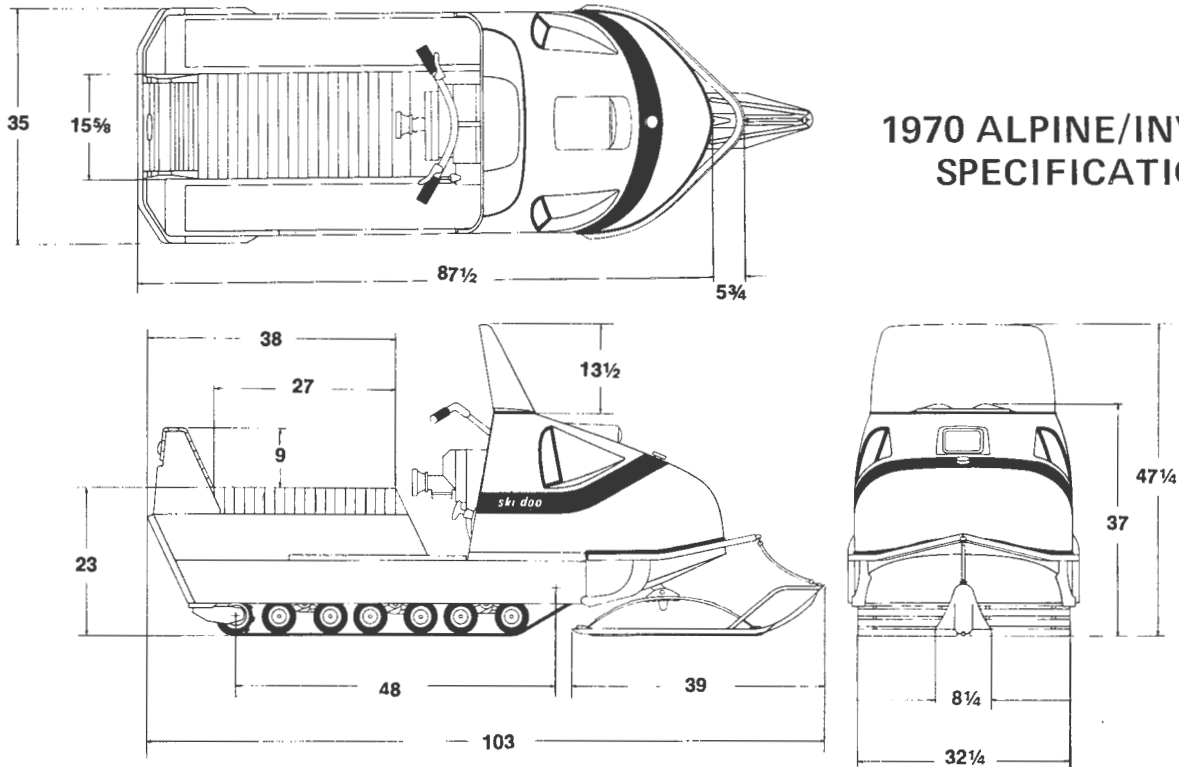


**1971 T'NT
SPECIFICATIONS**

ITEM	T'NT	292	340	440	640	775
ENGINE	No. of Cylinders	ONE	ONE	TWO	TWO	TWO
	Bore	75 M.M.	78 M.M.	2x67.5 M.M.	2x76 M.M.	2x82 M.M.
	Stroke	66 M.M.	70 M.M.	2x61 M.M.	2x70 M.M.	2x73 M.M.
	Displacement	292 c.c.	335 c.c.	437 c.c.	635 c.c.	771 c.c.
	Horse Power	22	26	35	40	65
	Compression Ratio	10.5:1	10.5:1	10.5:1	10.0:1	10.5:1
CHASSIS	Overall Length	99	99	100	100	100
	Overall Width	30-5/8	30-5/8	34	34	34
	Height W/O Windshield	34	34	36	36	36
	Weight (Lbs.)	310	315	360	390	430
	Bearing Area	1092 sq. in.	1092 sq. in.	1242 sq. in.	1242 sq. in.	1242 sq. in.
	Ground Pressure (P.S.I.)	0.285	0.289	0.291	0.314	0.346
POWER TRAIN	Track (Width)	15"	15"	18"	18"	18"
	Standard Gear Ratio	15/34	16/34	16/34	20/34	22/34
IGNITION	Starting	Manual	Manual	Manual	Manual	Manual
	Lighting Coil (Watts)	75W	75W	75W	75W	75W
	Spark Plug(s) (Bosch)	M-280-T-31*	M-280-T-31*	M-280-T-31*	M-280-T-31*	M-310-T-31*
	Spark Plug (Gap)	.018"-.022"	.018"-.022"	.018"-.022"	.018"-.022"	.018"-.022"
	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.
	Tank Capacity—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
ACCES- SORIES	Speedometer	Standard	Standard	Standard	Standard	Standard
	Tachometer	Standard	Standard	Standard	Standard	Standard

*When ordering replacement spark plug(s), specify number shown above.

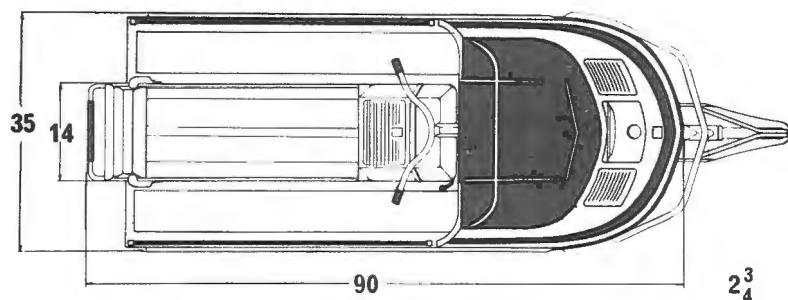
INTRODUCTION



1970 ALPINE/INVADER SPECIFICATIONS

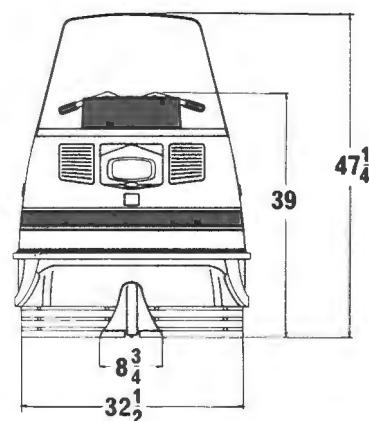
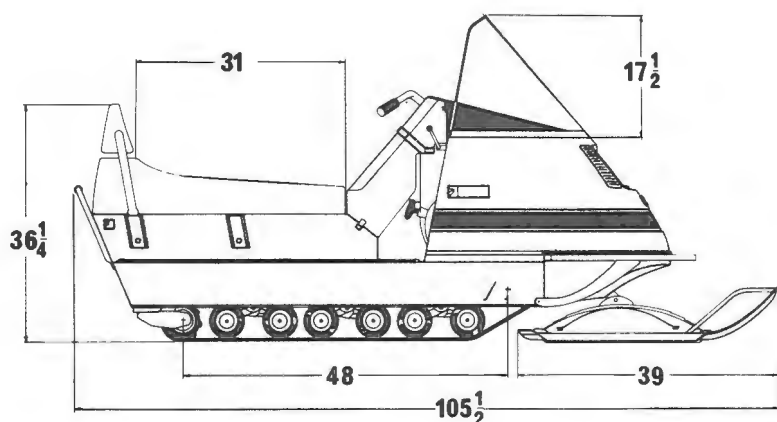
ITEM		ALPINE 399/R	ALPINE 399/ER	INVADER 640/ER
ENGINE	No. of cylinders	TWO	TWO	TWO
	Bore	2x64.5 M.M.	2x64.5 M.M.	2x76 M.M.
	Stroke	2x61 M.M.	2x61 M.M.	2x70 M.M.
	Displacement	398.6 c.c.	398.6 c.c.	635.1 c.c.
	Horse Power	24	24	35
	Compression Ratio	8.75:1	8.75:1	9:1
CHASSIS	Overall Length	103"	103"	103"
	Overall Width	35"	35"	35"
	Height W/O Windshield	37"	37"	37"
	Weight (Lbs.)	480	515	550
	Bearing Area	1756 sq. in.	1756 sq. in.	1756 sq. in.
	Ground Pressure (P.S.I.)	.274	.294	.314
POWER TRAIN	Track (Width)	2x15"	2x15"	2x15"
	Standard Gear Ratio	13/39	13/39	13/25
	Reverse	Standard	Standard	Standard
IGNITION	Starting	Manual	Electric	Electric
	Lighting Coil (Watts)	75W	75W	75W
	Spark Plug(s) Bosch	W-240-T-1*	W-240-T-1*	M-280-T-31*
	Spark Plug (Gap)	.018"-.022"	.018"-.022"	.018"-.022"
	Breaker Points (Gap)	.014"-.018"	.014"-.018"	.014"-.018"
FUEL	Tank Capacity – Imp.	5 gal.	5 gal.	5 gal.
	Tank Capacity – U.S.	6.25 gal.	6.25 gal.	6.25 gal.
	Mixing Ratio (Gas/Oil)	20:1	20:1	20:1
BRAKE	Type	Disc	Disc	Disc
ACCESSORIES	Speedometer	N/A	N/A	N/A
	Tachometer	Optional	Optional	Standard
*When ordering replacement spark plug(s), specify number shown above.				

INTRODUCTION



1971 ALPINE/VALMONT SPECIFICATIONS

Illustrated
VALMONT MODEL



ITEM	ALPINE/VALMONT	399R	399ER	640ER
ENGINE	No. of Cylinders	TWO	TWO	TWO
	Bore	2x64.5 M.M.	2x64.5 M.M.	2x76 M.M.
	Stroke	2x61 M.M.	2x61 M.M.	2x70 M.M.
	Displacement	399 c.c.	399 c.c.	635 c.c.
	Horse Power	24	24	35
	Compression Ratio	8.75:1	8.75:1	9:1
CHASSIS	Overall Length—Alpine	113-3/4"	113-3/4"	113-3/4"
	—Valmont	105-1/2"	105-1/2"	105-1/2"
	Overall Width	35"	35"	35"
	Height W/O Windshield	39"	39"	39"
	Weight (Lbs.)—Alpine	508	543	578
	—Valmont	450	485	520
	Bearing Area—Alpine	2160 sq. in.	2160 sq. in.	2160 sq. in.
	—Valmont	1756 sq. in.	1756 sq. in.	1756 sq. in.
POWER TRAIN	Grd. Press (P.S.I.)—Alpine	0.236	0.251	0.267
	—Valmont	0.256	0.276	0.296
IGNITION	Track (Width)	2x15"	2x15"	2x15"
	Standard Gear Ratio	13/39	13/39	13/29
	Reverse	Standard	Standard	Standard
FUEL	Starting	Manual	Electric	Electric
	Lighting Coil (Watts)	75W	75W	75W
	Spark Plug(s) (Bosch)	W-240-T-1*	W-240-T-1*	M-280-T-31*
	Spark Plug (Gap)	.018"-.022"	.018"-.022"	.018"-.022"
	Breaker Points (Gap)	.014"-.018"	.014"-.018"	.014"-.018"
BRAKE	Tank Capacity—Imp.	5 gals.	5 gals.	5 gals.
	Tank Capacity—U.S.	6.25 gals.	6.25 gals.	6.25 gals.
	Mixing Ratio (Gas/Oil)	20:1	20:1	20:1
ACCESSORIES	Type	Disc	Disc	Disc
	Tachometer—Alpine	Optional	Optional	Optional
	—Valmont	Standard	Standard	Standard

*When ordering replacement spark plug(s), specify number shown above.

ENGINE CODE CHART							
YEAR 1970				YEAR 1971			
CODE	VEHICLE	MODELS	ENGINE TYPE	CODE	VEHICLE	MODELS	ENGINE TYPE
10	Olympique	12/3	300	16	Olympique	335S	337
12	Olympique	335	335	17	Olympique	335ES	337E
13	Olympique	335E	335E	18	Olympique	399S	401
14	Olympique	399	401	19	Olympique	399ES	401E
20	Nordic	399	401	20	Nordic	399	401
21	Nordic	399E	401E	21	Nordic	399E	401E
22	Skandic	335	335	22	Skandic	335	337
23	Nordic	640E	640E	23	Nordic	640E	640E
30	Alpine	399R	401	24	Nordic	399S	401
31	Alpine	399ER	401E	25	Nordic	399ES	401E
35	Invader	640ER	640E	26	Skandic	335S	337
40	T'NT	292	290	27	Nordic	640ES	640E
41	T'NT	292S	290	30	Alpine	399R	401
42	T'NT	340	340	31	Alpine	399ER	401E
43	T'NT	340S	340	33	Valmont	399R	401
44	T'NT	399	400	34	Valmont	399ER	401E
45	T'NT	399S	400	35	Alpine	640ER	640E
46	T'NT	640	641	36	Valmont	640ER	640E
47	T'NT	640S	641	40	T'NT	292	292
49	T'NT	775S	775	41	T'NT	292S	292
YEAR 1971				42	T'NT	340	342
10	Olympique	300	302	43	T'NT	340S	342
11	Olympique	300S	302	44	T'NT	440	435
12	Olympique	335	337	45	T'NT	440S	435
13	Olympique	335E	337E	46	T'NT	640	641
14	Olympique	399	401	47	T'NT	640S	641
15	Olympique	399E	401E	48	T'NT	775	775
				49	T'NT	775S	775
				60	Elan	250	247
				61	Elan	250E	247E

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	4-1	Body	4-01-01
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		TOOLS	
	5-1	Special Tools	5-01-01

SECTION 1

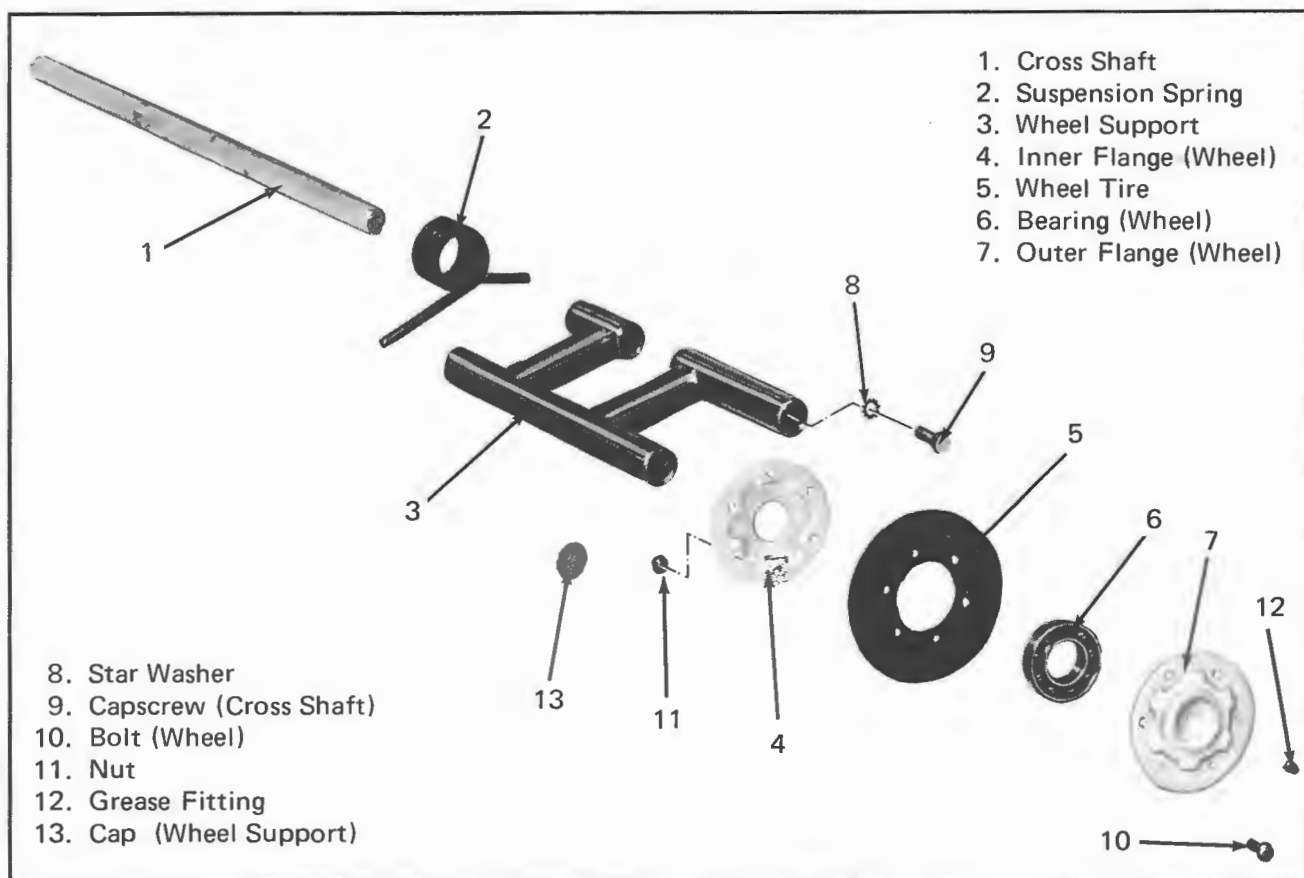
SUSPENSION

1-1

1-1 BOGIE WHEEL SYSTEM

(A) GENERAL

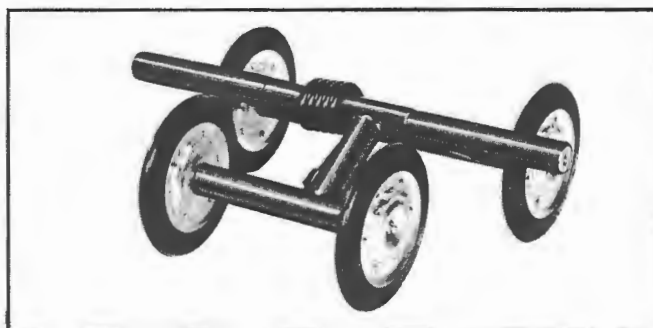
The Ski-Doo snowmobile's ability to negotiate any snow covered terrain and to handle well at all speeds is the direct result of an especially designed bogie wheel system. Correct lubrication, maintenance, repair and overhaul procedure of this system will ensure smoother operation of the vehicle.



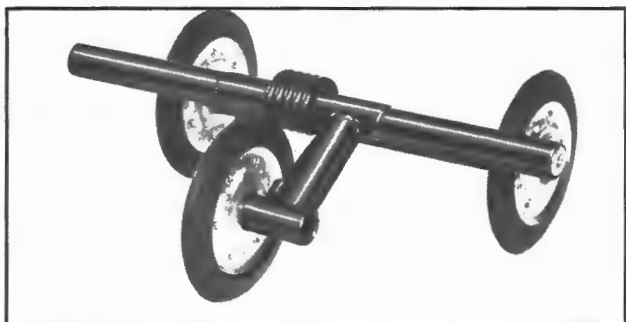
BOGIE WHEEL SET AND LEGEND (GENERAL)

The bogie wheel system of all 1970 and '71 Ski-Doo snowmobile models is similar in design and fabrication, except for the following variations:

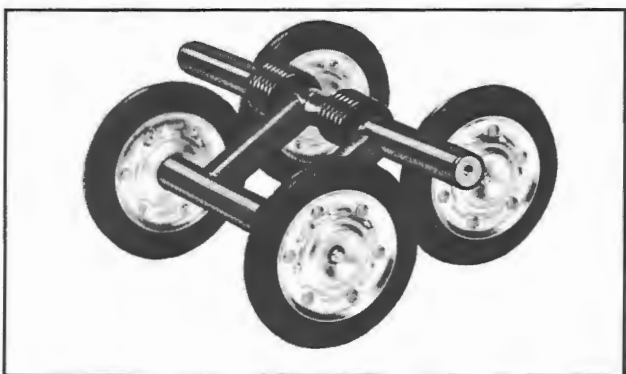
- The system of the Elan models consists of 3-sets of bogie wheels. The front set incorporates 4-wheels while the center and rear sets are made up of 3-wheels each.



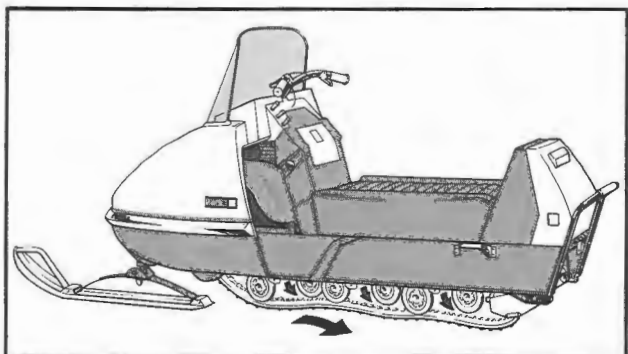
BOGIE WHEEL SET – FRONT (ELAN ONLY)

**BOGIE WHEEL SET (ELAN ONLY)**

- Each system of the 1970 and '71 Olympique, Nordic, T'NT and Skandic models consists of 3-sets of bogie wheels, each set incorporating 4-wheels.
- The system of the 1970 Alpine/Invader and the 1971 Valmont models consists of 6-sets of bogie wheels (3-sets per track), each set incorporating 4-wheels.

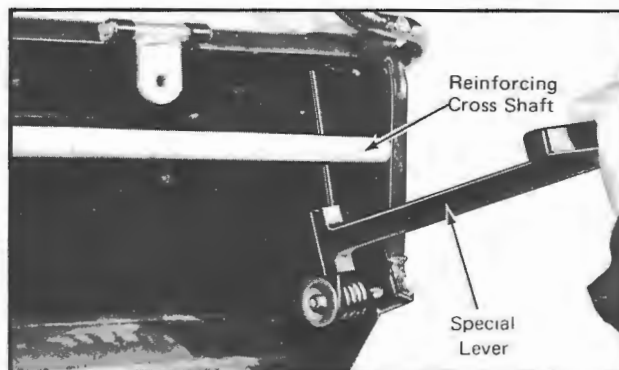
**BOGIE WHEEL SYSTEM (TYPICAL)**

- The 1971 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****(B) REMOVAL**

1. Raise and block the rear of vehicle off the ground.
2. On 1970 Nordic and T'NT models, remove the reinforcing cross shaft by removing capscrews and star washers securing shaft to frame.
3. Release track tension by unhooking the link plate springs using special lever (refer item 1, Section 5,) (fig. 1-1-1).

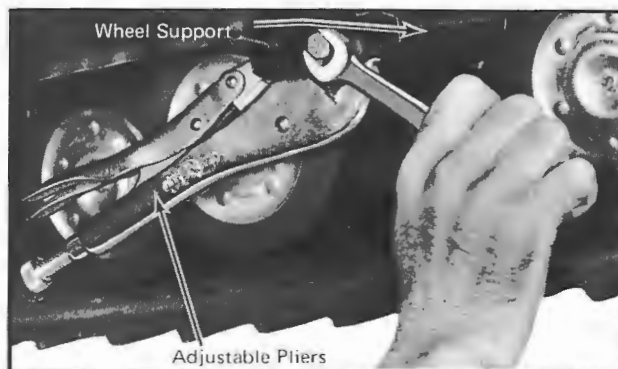
NOTE: Special lever (item 1) is applicable to all models except Elan models.



1-1-1

4. Commencing at center bogie wheel set (except 1971 Alpine models), remove the capscrews and star washers securing cross shaft to frame. On '71 Alpine models, 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

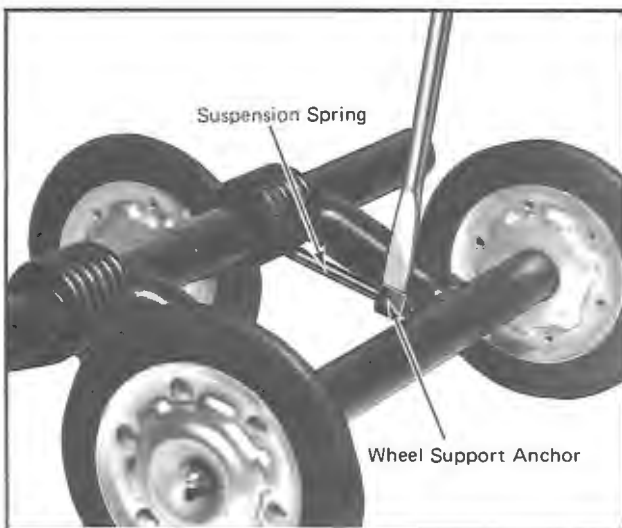
5. Remove bogie wheel set.

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.

6. Repeat step 4 to remove remaining bogie wheel sets.

(C) DISASSEMBLY

1. Straighten wheel support anchor(s) and unhook suspension spring(s) (fig. 1-1-3).



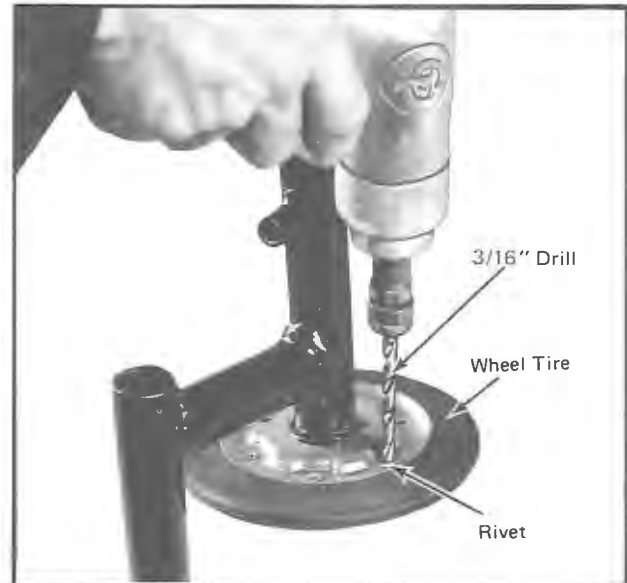
1-1-3

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 wire gauge of the spring(s) varies in diameter. See NOTE, Paragraph (F), step 5.

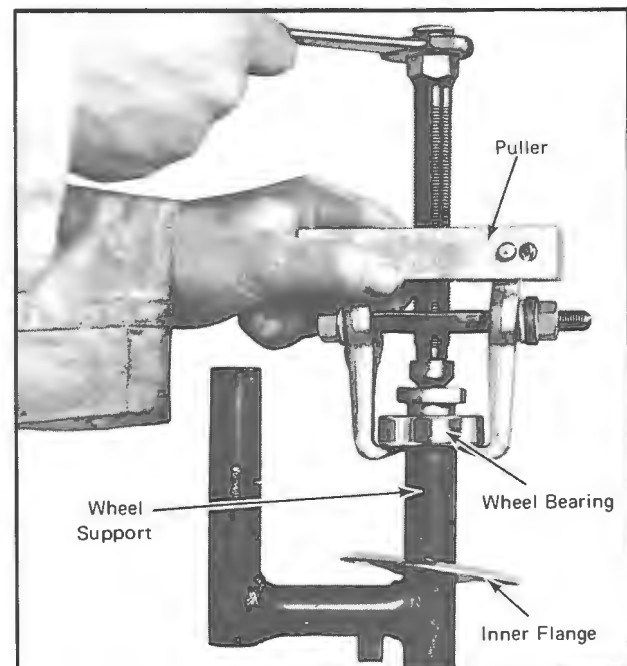
3. Using a 3/16 inch dia drill, remove rivets securing outer flange and wheel tire to inner flange (fig. 1-1-4). It is important to remember that the back wheel of the center and rear bogie wheel set on the Elan models has a wider tire. Remove outer flange and wheel tire.

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

(D) CLEANING

1. To clean bearings, remove grease and dirt using a soft paint brush. Immerse all bearings in a clean container of cleaning solution. Dry with a clean cloth and lubricate bearings by dipping in clean engine Ski-Doo Oil.

2. Clean grease and dirt from wheel tires with a clean cloth.

CAUTION: Do not use cleaning solvent on wheel tires as it may permanently distort the component.

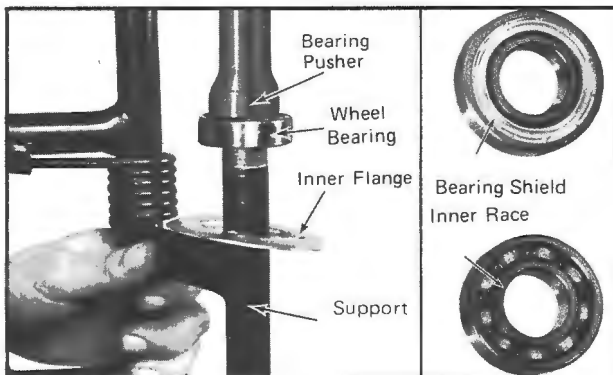
3. Place all other components in a container of cleaning solvent. Remove rust or any other deposits using a firm bristle brush. If paint has been removed, apply a new coat using appropriate Ski-Doo Paint.

(E) INSPECTION

1. Visually inspect all components for wear, cracks, distortion and other damage. Replace as necessary.
2. Inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged components.
3. Visually inspect general condition of all bearings (e.g. pitted or missing ball bearings), freedom of movement and radial free play. Replace defective bearing(s).

(F) 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).

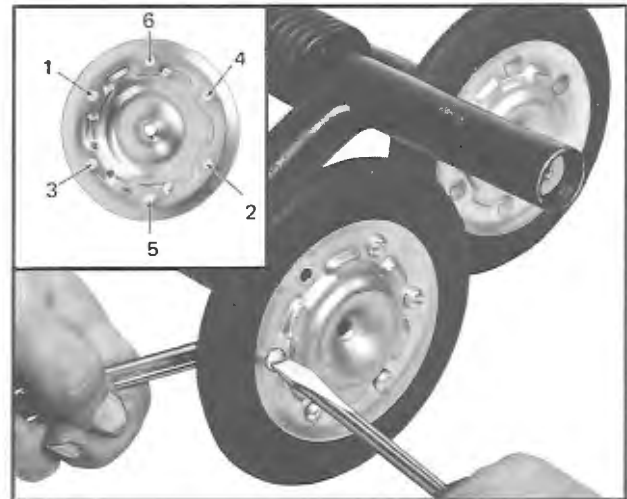


1-1-6

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 all 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).

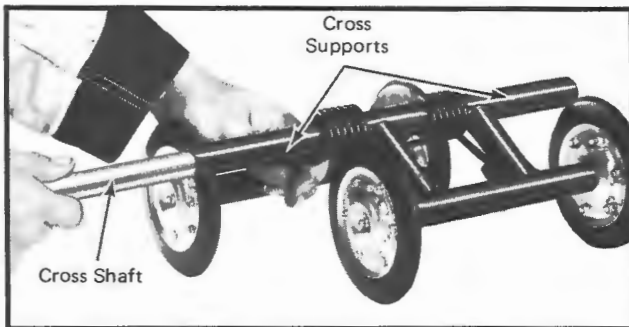


1-1-8

NOTE: On Elan models, the suspension springs are 9/32 inch diameter. On all other models, except the 1971 Alpine/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 1970 Alpine/Invader and 1971 Alpine/

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). Close wheel support anchor(s) over suspension spring end(s).



1-1-9

(G) INSTALLATION

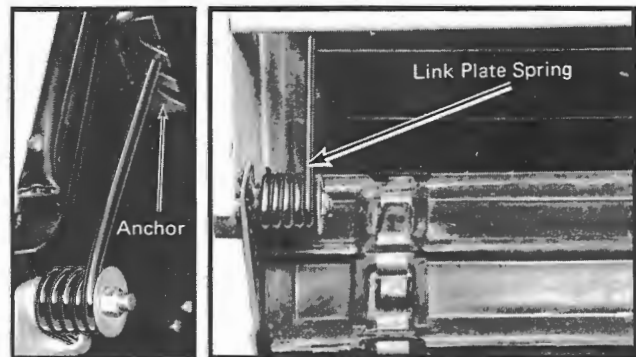
1. With rear of vehicle supported off the ground, position front bogie wheel set in location and secure to frame using star washers and capscrews.
2. Secure rear and then the remaining bogie wheel set(s) to frame.

NOTE: On Elan models, position front bogie wheel set so that wider wheel support is towards front of vehicle. Position

the rear and center sets so that the single wheel is towards back of vehicle.

3. Using special lever (item 1), apply track tension by hooking the link plate springs to the anchors.

NOTE: On all 1971 models except Elan, place link plate springs in middle position of 3-position slotted anchors (fig. 1-1-10).



1-1-10

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. On 1970 Nordic and T'NT models, install reinforcing cross shaft by securing shaft to frame with star washers and capscrews.
6. Set vehicle on the ground.

SUSPENSION

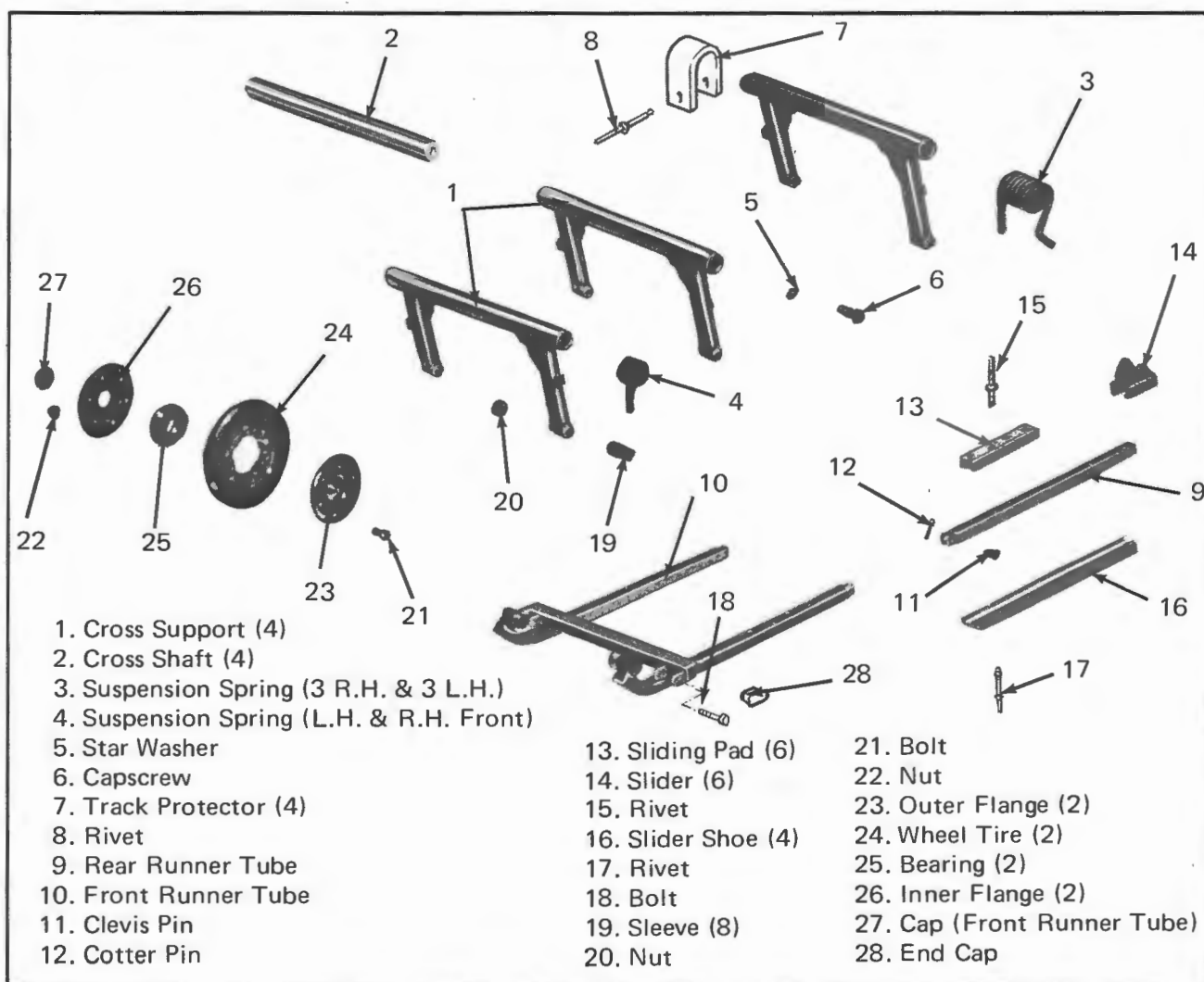
1-2 SLIDER SUSPENSION (1970 Models)

1-2

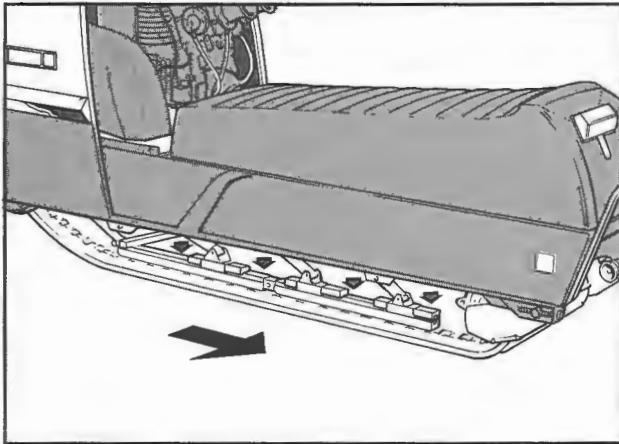
(A) GENERAL

Basically, the principle of the slider suspension is to create a uniform downward pressure acting over a maximum area of track. This gives the vehicle greatest possible contact with the underlaying snow surface.

- The 1970 slider suspension is secured to the frame of the vehicle while the 1971 system is of a unit construction attached to the frame via side members.
- Track "flapping" on the 1970 system is controlled by means of track protectors installed on the two rear cross supports. On the '71 vehicle, the track protectors are replaced by stop bindings and two wheels affixed to the rear cross support eliminate flapping.



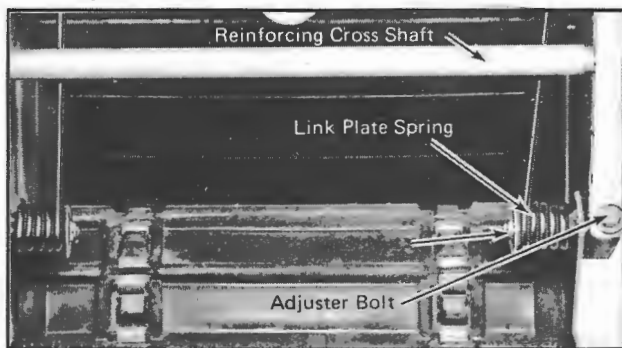
DISASSEMBLED VIEW OF SLIDER SUSPENSION (1970)



SLIDER SUSPENSION IN ACTION

(B) REMOVAL

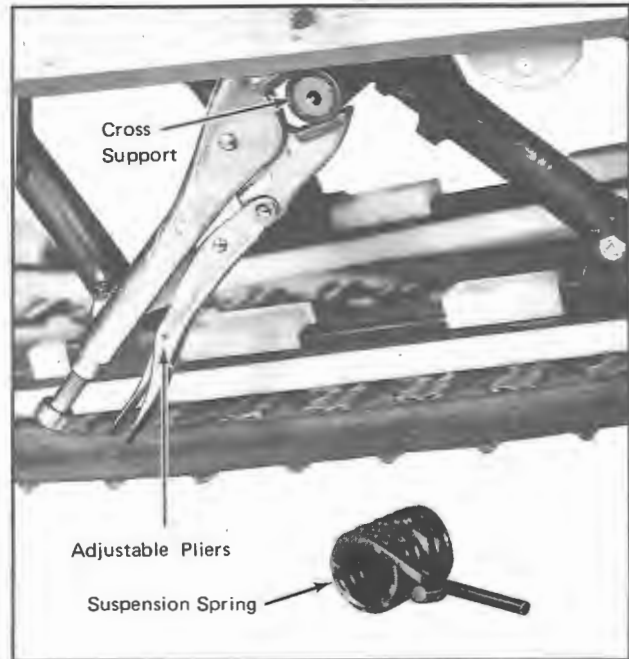
1. Lift and block the rear of the vehicle off the ground.
2. Remove the reinforcing cross shaft by removing capscrews and star washers securing shaft to frame (fig. 1-2-1).
3. Release track tension by loosening link plate spring lock nuts and unscrewing the track adjuster bolts until end of bolts are flush with the side of the eye bolts (fig. 1-2-1).



1-2-1

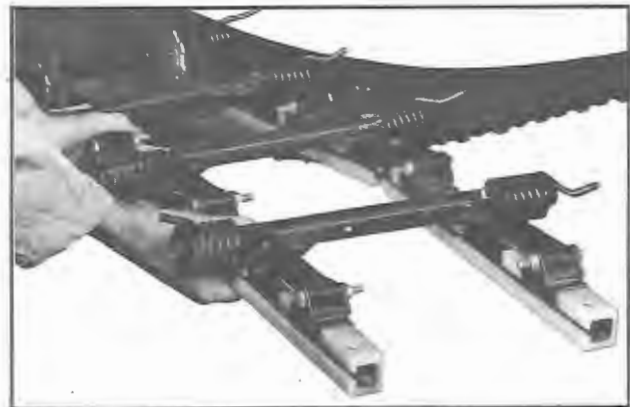
4. Using special lever (refer Section 5, item 1), unhook link plate springs.
5. Remove capscrews and star washers securing four (4) cross shafts to frame.

NOTE: To prevent cross shaft from rotating, remove suspension spring on side of removed capscrew and apply pressure on the cross support using adjustable pliers (fig. 1-2-2).



1-2-2

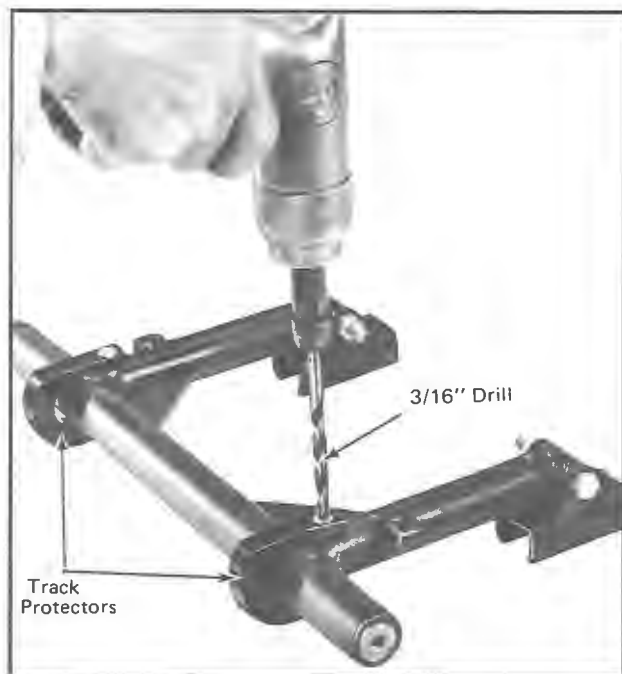
6. With attaching parts removed, the complete slider suspension will drop down allowing the assembly to be withdrawn from the track (fig. 1-2-3).



1-2-3

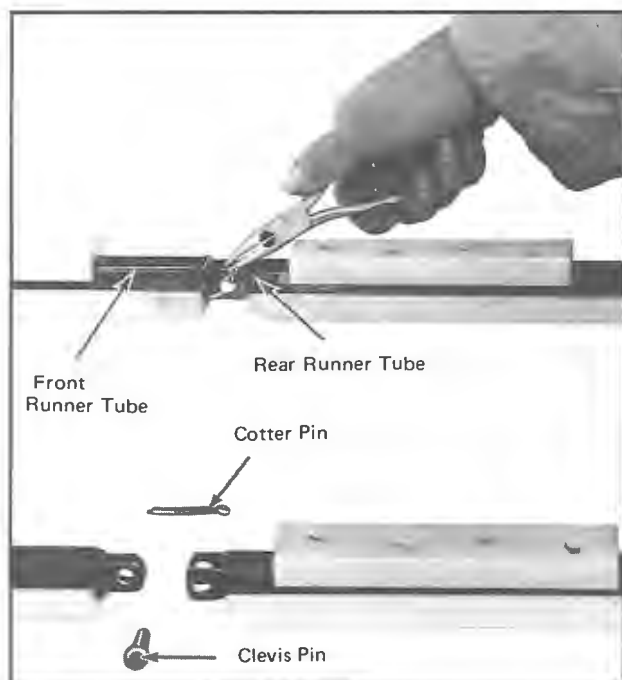
(C) DISASSEMBLY

1. Straighten spring anchors on cross supports and remove the suspension springs from the supports.
2. Slide the rear three cross supports from the sliding pads.
3. Using a 3/16 inch dia drill, remove rivets securing the track protectors to the rear, and second from the rear cross supports (fig. 1-2-4).



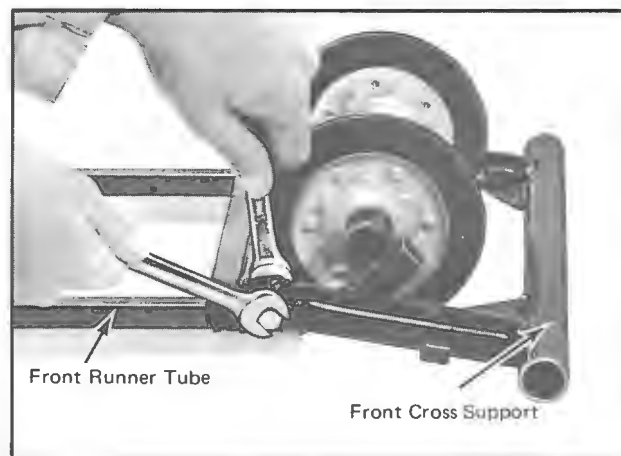
1-2-4

4. Remove bolts securing six (6) sliders to supports. Remove sleeves.
5. Separate the front and rear runner tubes by removing attaching cotter pins and clevis pins (fig. 1-2-5).



1-2-5

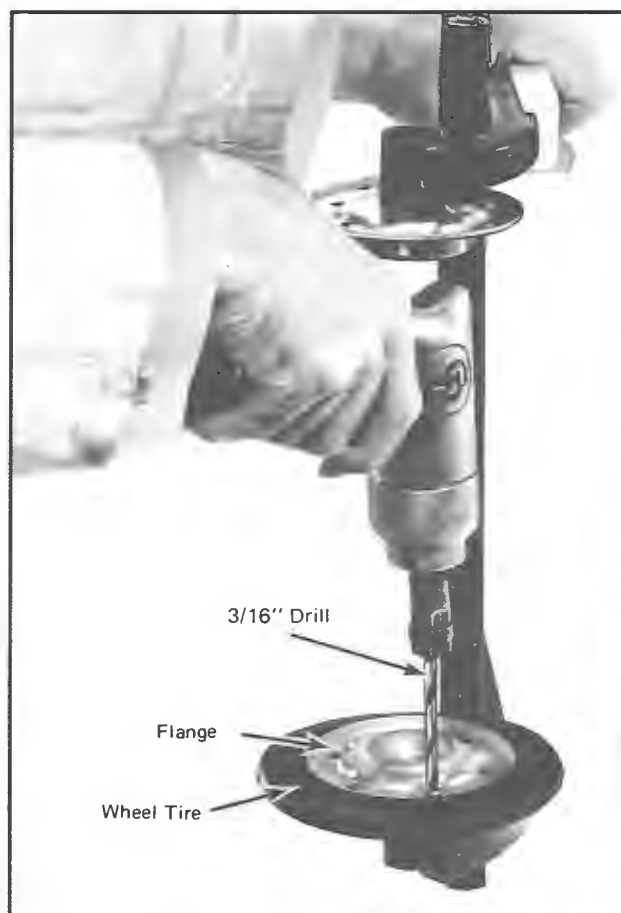
6. Remove bolts securing front cross support to front runner tube. Remove sleeves (fig. 1-2-6).



1-2-6

7. Using a 3/16 inch dia drill, remove rivets attaching outer flange and wheel tire to inner flange (fig. 1-2-7). Remove outer flange and wheel tire.

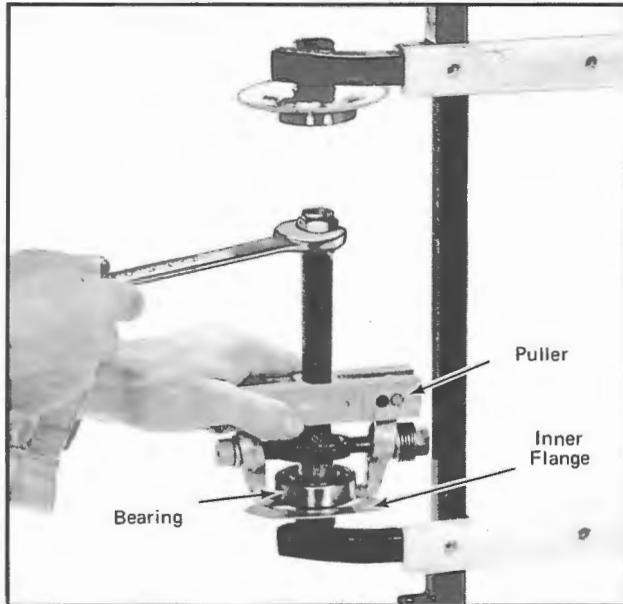
NOTE: Do not unscrew grease fitting from outer flange unless damaged, and replacement is necessary.



1-2-7

8. With an appropriate bearing puller, remove wheel bearing from front runner tube and remove the inner flange (fig. 1-2-8).

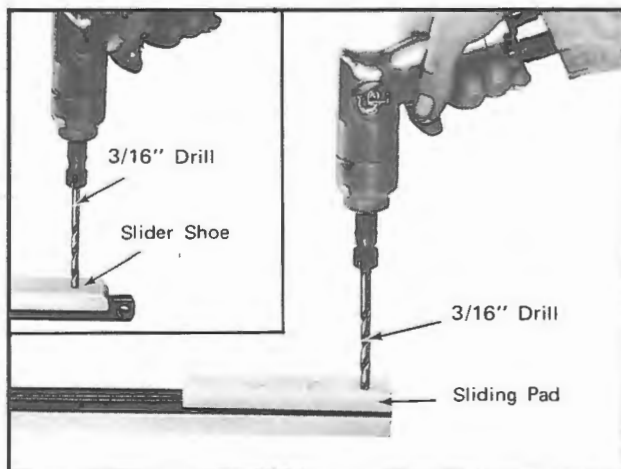
NOTE: Always remove the bearing by pulling it by the inner race.



1-2-8

9. Using a 3/16 inch dia drill, remove rivets securing sliding pads and slider shoes to the runner tubes (fig. 1-2-9).

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.



1-2-9

(D) CLEANING

1. Clean grease and dirt from sliding pads, slider shoes, rubber tires and track protectors with a clean cloth.

CAUTION: Do not use cleaning solvent on pads, shoes, tires or protectors as it may permanently damage the component.

2. To clean bearings, remove grease and dirt using a soft paint brush. Immerse all bearings in a clean container of cleaning solution. Dry with a clean cloth and lubricate bearings by dipping in clean engine Ski-Doo Oil.
3. Place all other components in a container of cleaning solvent. Remove rust or any other deposits using firm bristle brush. Dry using a clean cloth. If paint has been removed, apply a new coat using appropriate Ski-Doo Paint.

(E) INSPECTION

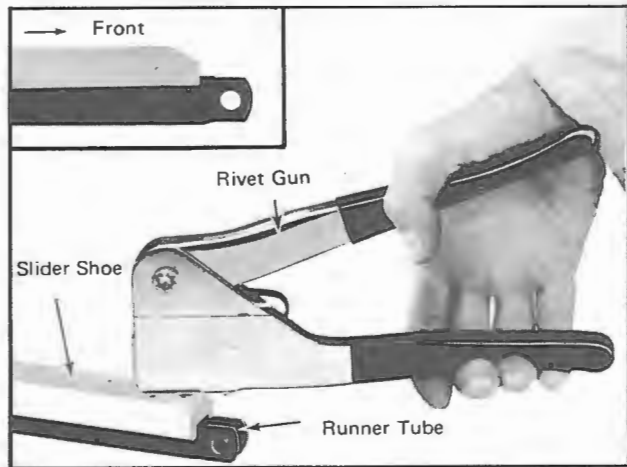
1. Visually inspect general condition of all bearings (e.g. pitted or missing ball bearings), freedom of movement and radial free play. Replace defective bearing(s).
2. Ensure that slider shoes are not worn to the extent mentioned in NOTE, Paragraph (C), step 9. If so, shoes must be replaced.
3. Inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged components.
4. Visually inspect all other components for wear, cracks, distortion and other possible damage. Replace as necessary.

(F) ASSEMBLY

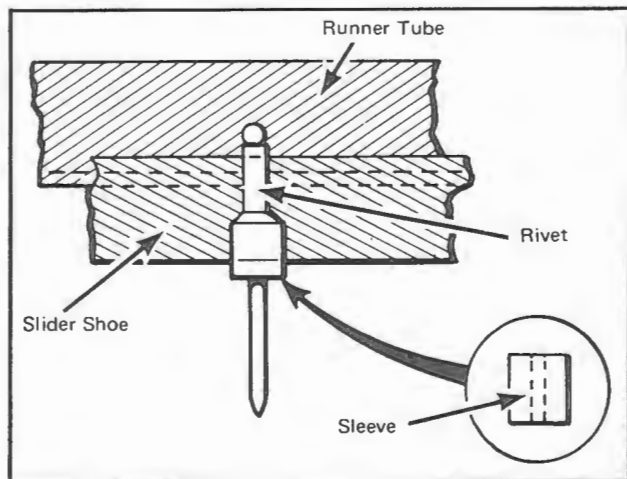
1. Prior to Assembly procedure, ensure all components are clean and all defective parts have been repaired or replaced.

2. Position slider shoes (angle of shoes must be facing forward) on rear and front runner tubes and insert rivets. Secure shoes firmly using a rivet gun (fig. 1-2-10).

NOTE: If slider shoes to be installed are new, the head of the rivet gun may not come in contact with the rivets due to the thickness of the new shoes. If so, a small sleeve seated on the rivet head will assist in easier riveting action (fig. 1-2-11).

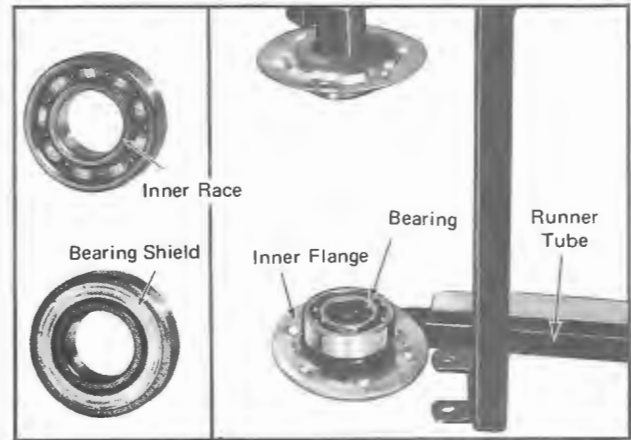


1-2-10



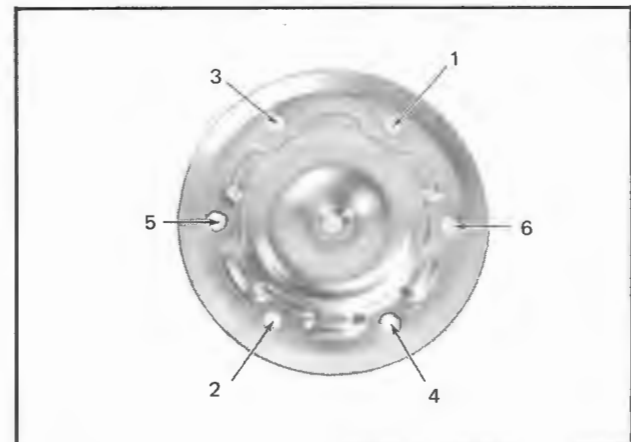
1-2-11

3. Position sliding pads on runner tubes, insert rivets and secure pads firmly.
4. Place inner flange and wheel bearing on front runner tube. Ensure that bearing shield is facing towards inner flange, then press down on the inner race until the bearing is sitting flush with support end (fig. 1-2-12).



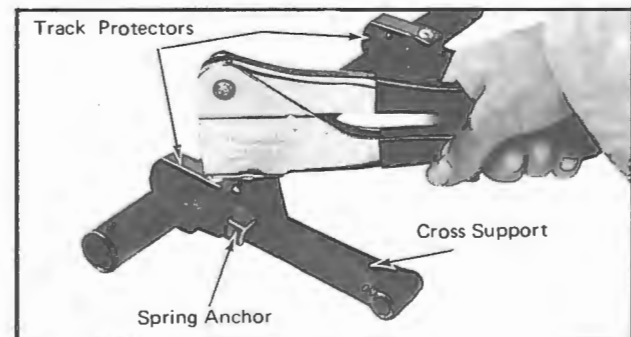
1-2-12

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. Tighten attaching parts securing wheel flanges and tire following the sequence shown in figure 1-2-13.



1-2-13

6. Using a rivet gun, secure track protectors to the rear and second from rear cross supports (fig. 1-2-14). Install protectors with flat surface on same side as spring anchor.

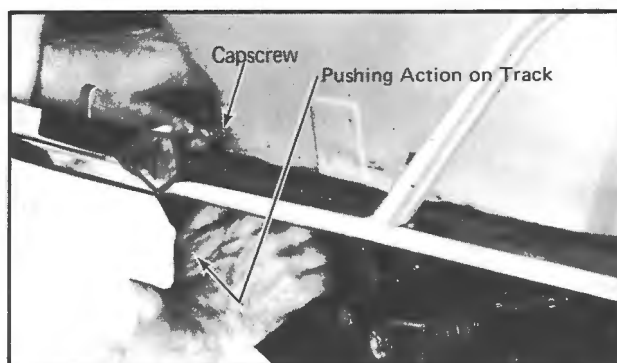


1-2-14

7. Join the rear and front runner tubes with clevis pins and cotter pins.
8. 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.
9. Insert sleeves and then bolt front support to front runner tube.
10. Apply a light coat of low temperature grease on cross shafts and insert the shafts into cross supports.
11. Position suspension springs and close the cross support anchors over the spring ends.

(G) INSTALLATION

1. With the rear of the vehicle still raised off the ground and track tension released, position slider suspension assembly within the track.
2. Start installation procedure by aligning the threaded hole of the first cross shaft with the first hole in the frame. Secure the cross shaft to frame (fig. 1-2-15).



1-2-15

3. Repeat step 2 to secure the second, third and rear cross shaft.
4. Using special lever (item 1), hook link plate spring to anchors. Install reinforcing cross shaft.
5. Lubricate front runner tube wheels using a low pressure grease gun filled with low temperature grease until lubricant appears at joint. Wipe off excess grease.
6. Apply track tension as detailed in sub-section 1-5, Paragraph (J).
7. Carry out track alignment procedure as described in sub-section 1-5, Paragraph (K).
8. Set vehicle on the ground.

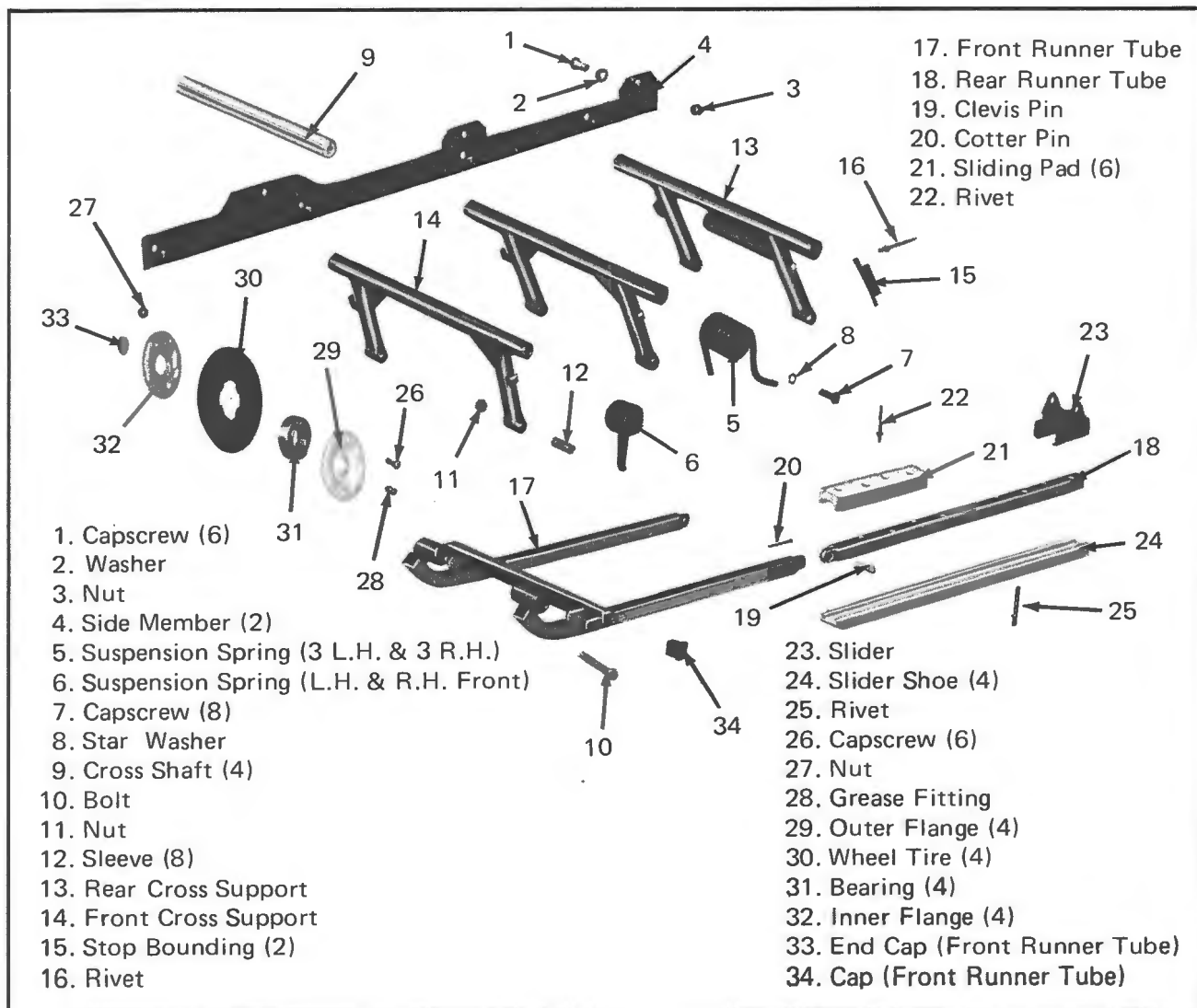
SUSPENSION

1-2-1 SLIDER SUSPENSION (1971 Models)

(A) GENERAL

Basically, the principle of the slider suspension is to create a uniform downward pressure acting over a maximum area of track. This gives the vehicle greatest possible contact with the underlying snow surface.

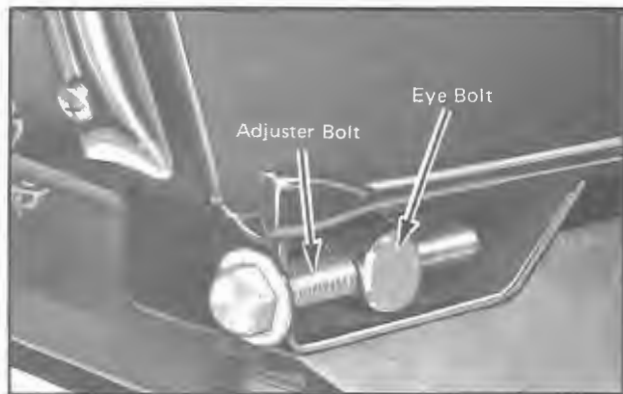
- The 1970 slider suspension is secured to the frame of the vehicle while the 1971 system is of a unit construction attached to the frame via side members.
- Track "flapping" on the 1970 system is controlled by means of track protectors installed on the two rear cross supports. On the '71 vehicle, the track protectors are replaced by stop boundings and two wheels affixed to the rear cross support eliminate flapping.



DISASSEMBLED VIEW OF SLIDER SUSPENSION (1971)

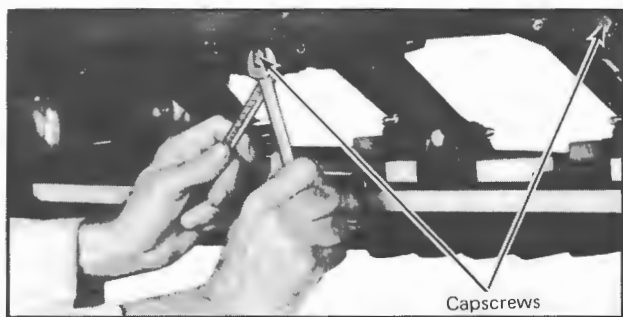
(B) REMOVAL

1. Raise the rear of the vehicle and support it off the ground.
2. Release track tension by loosening link plate spring lock nuts and track adjuster bolts until the ends of the bolts are flush with the side of the eye bolts (fig. 1-2-16).



1-2-16

3. Using special lever (item 1), unhook link plate springs.
4. Remove capscrews, washers and nuts securing side members to frame (fig. 1-2-17).



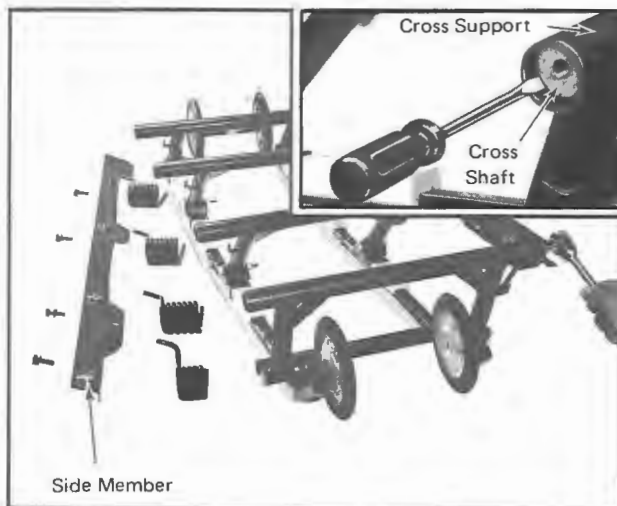
1-2-17

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

(C) DISASSEMBLY

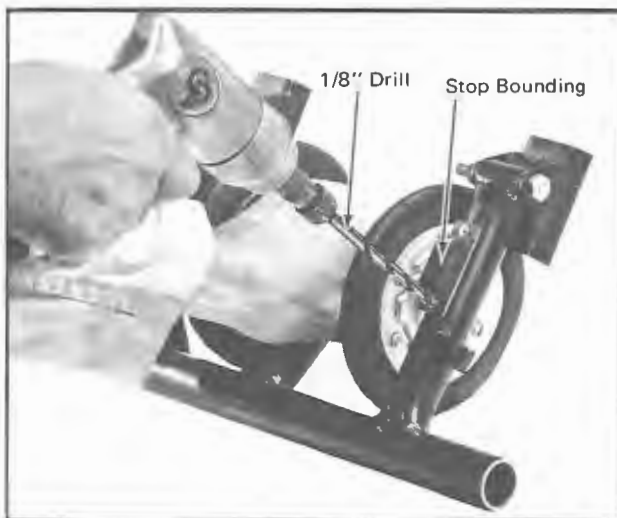
1. Remove capscrews and star washers securing side members to cross shafts. Remove eight (8) suspension springs and pull out the cross shafts from cross supports.

NOTE: To prevent the cross shafts from rotating within the cross supports, wedge a screwdriver blade between the cross shaft and cross support (fig. 1-2-18).



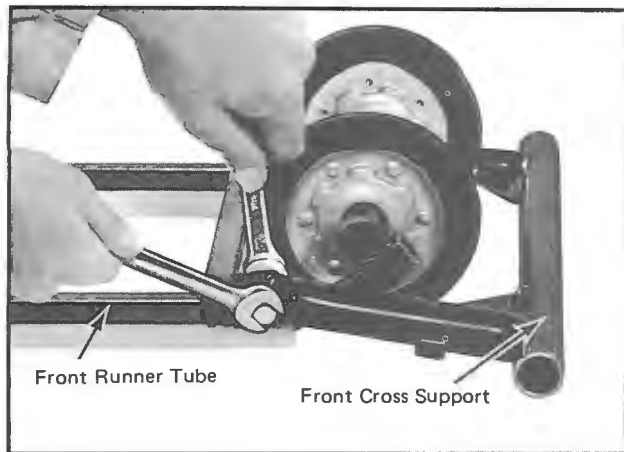
1-2-18

2. Slide the three (3) rear cross supports from the sliding pads.
3. Using a 1/8 inch dia drill, remove the rivets attaching the stop bounding to the rear cross support (fig. 1-2-19).



1-2-19

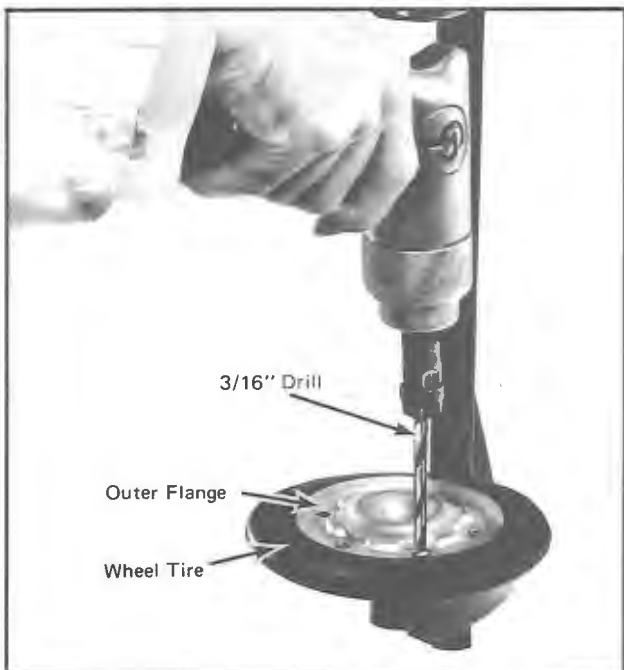
4. Remove bolts securing sliders to support and remove the sleeves.
5. Remove the cotter pins and clevis pins attaching the front and rear runner tubes.
6. Remove bolts securing front cross support to front runner tube (fig. 1-2-20).



1-2-20

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. 1-2-21). Remove outer flange and wheel tire.

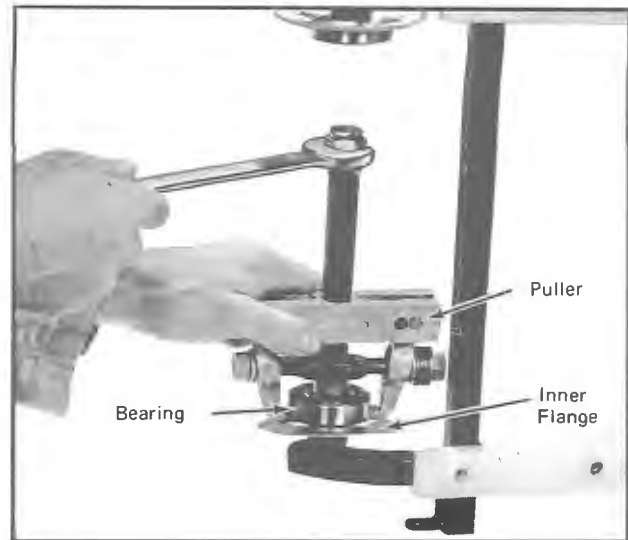
NOTE: Do not unscrew grease fitting from outer flange unless damaged, and replacement is necessary.



1-2-21

8. With an appropriate bearing puller, remove wheel bearing from support and remove inner flange (fig. 1-2-22).

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



1-2-22

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.

(D) CLEANING

1. Clean grease and dirt from sliding pads, slider shoes, rubber tires and stop boundings with a clean cloth.

CAUTION: Do not use cleaning solvent on pads, shoes, tires or boundings as it may permanently damage the component.

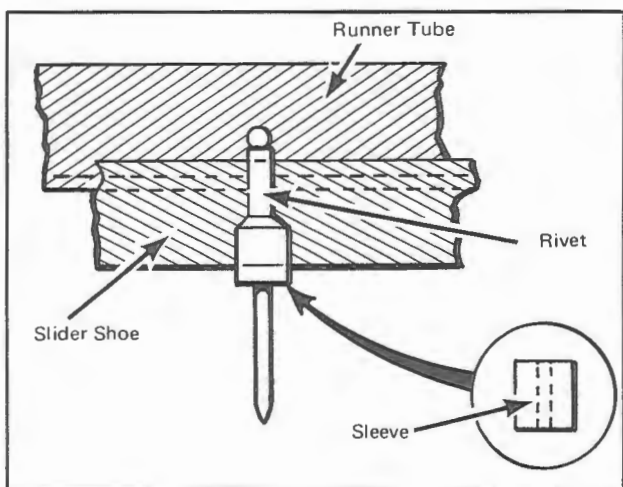
2. To clean bearings, remove grease and dirt using a soft paint brush. Immerse all bearings in a clean container of cleaning solution. Dry with a clean cloth and lubricate bearings by dipping in clean engine Ski-Doo Oil.
3. Place all other components in a container of cleaning solution. Remove rust or any other deposits using a firm bristle brush. Dry using a clean cloth. If paint has been removed, apply a new coat using appropriate Ski-Doo Paint.

(E) INSPECTION

1. Visually inspect general condition of all bearings (e.g. pitted or missing ball bearings), freedom of movement and radial free play. Replace defective bearing(s).
2. Ensure that slider shoes are not worn to the extent mentioned in NOTE of Paragraph (C), step 9. If so, shoes must be replaced.
3. Inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged components.
4. Visually inspect all other components for wear, cracks, distortion and other possible damage. Replace as necessary.

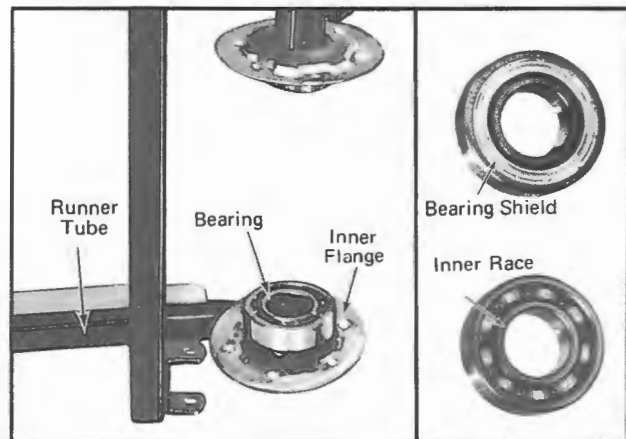
(F) ASSEMBLY

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. 1-2-23).



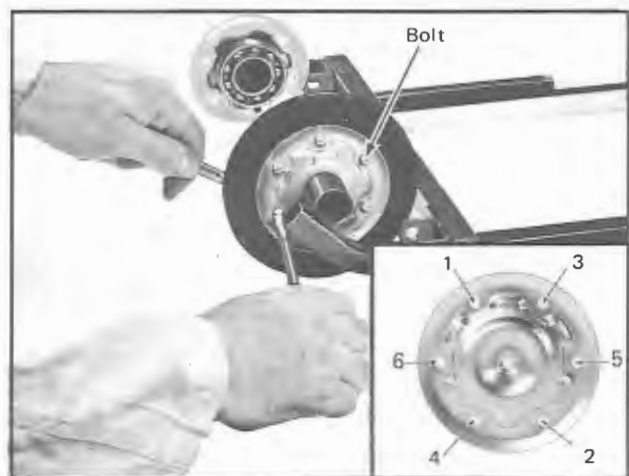
1-2-23

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. 1-2-24).



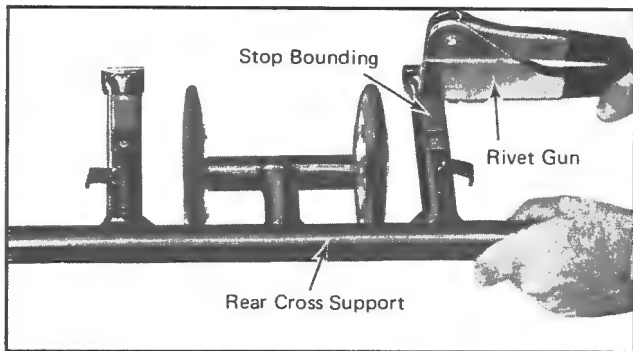
1-2-24

5. Repeat step 4 to install inner flange and wheel bearing on the 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 1-2-25.



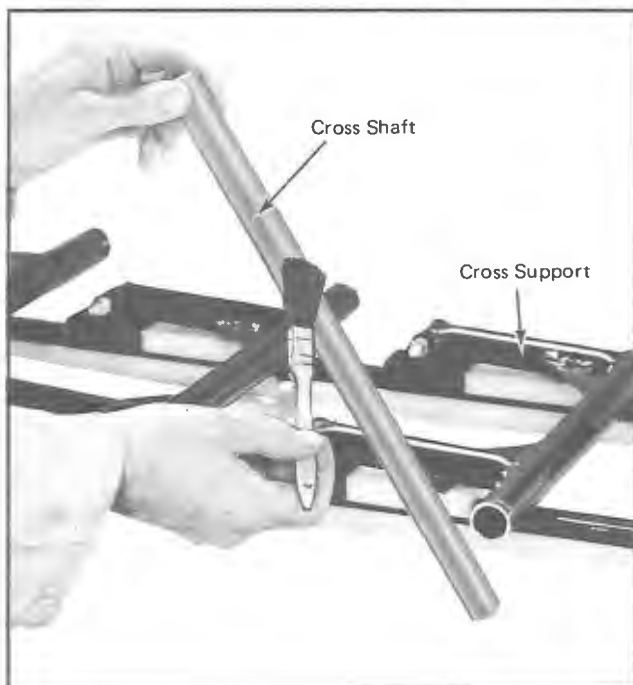
1-2-25

8. Using a rivet gun, secure the stop boundaries to rear cross support (fig. 1-2-26).



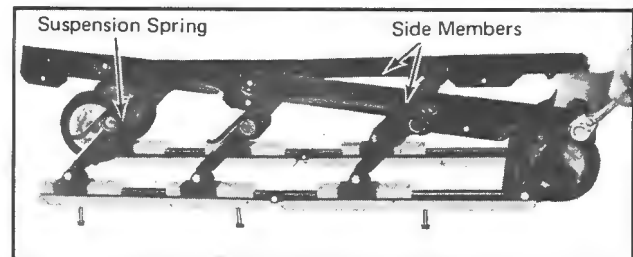
1-2-26

9. Connect rear and front runner tubes with clevis pins and cotter pins.
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 then bolt front support to front runner tube.
12. Apply a light coat of low temperature grease on cross shafts and insert shafts into cross supports (fig. 1-2-27).



1-2-27

13. Position suspension springs and close the cross support anchors over the spring ends. Secure the side members using washer and capscrews (fig. 1-2-28).

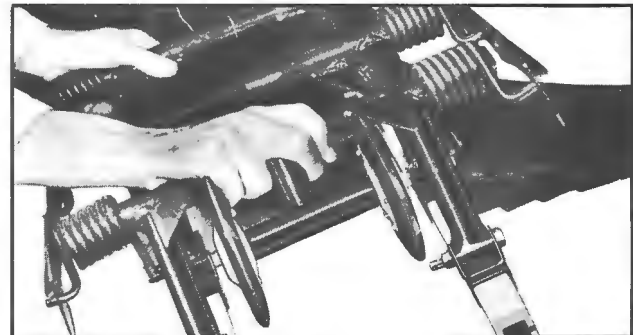


1-2-28

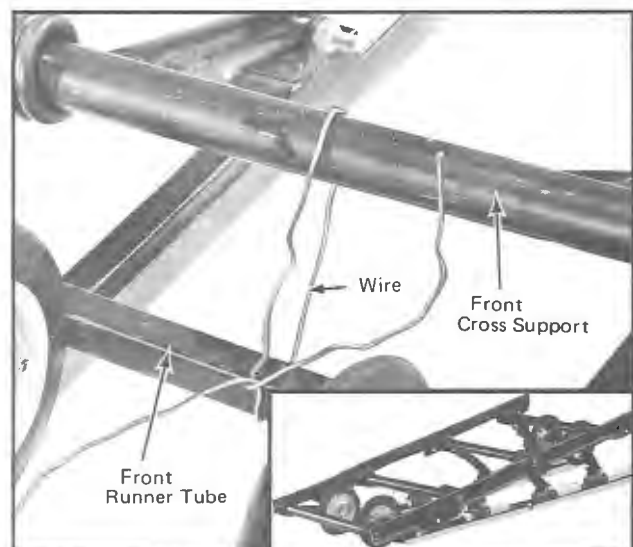
(G) INSTALLATION

1. With rear of the vehicle still raised off the ground and track tension released, position slider suspension unit within the track (fig. 1-2-29).

NOTE: Due to the confines of the track and to ease installation procedures, collapse the slider 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. 1-2-30).



1-2-29



1-2-30

2. Secure the side members of the slider suspension to frame by means of cap-screws, washers and nuts. Cut and discard the temporarily installed wire.
3. Using special lever (item 1), hook link plate springs into middle position of 3-position slotted anchors.
4. Lubricate front runner tube wheels and rear cross support wheels using a low pressure grease gun filled with low temperature grease until lubricant appears at joint. Wipe off excess grease.
5. Apply track tension as detailed in sub-section 1-5, Paragraph (J).
6. Carry out track alignment procedure as described in sub-section 1-5, Paragraph (K).
7. Set vehicle on the ground.

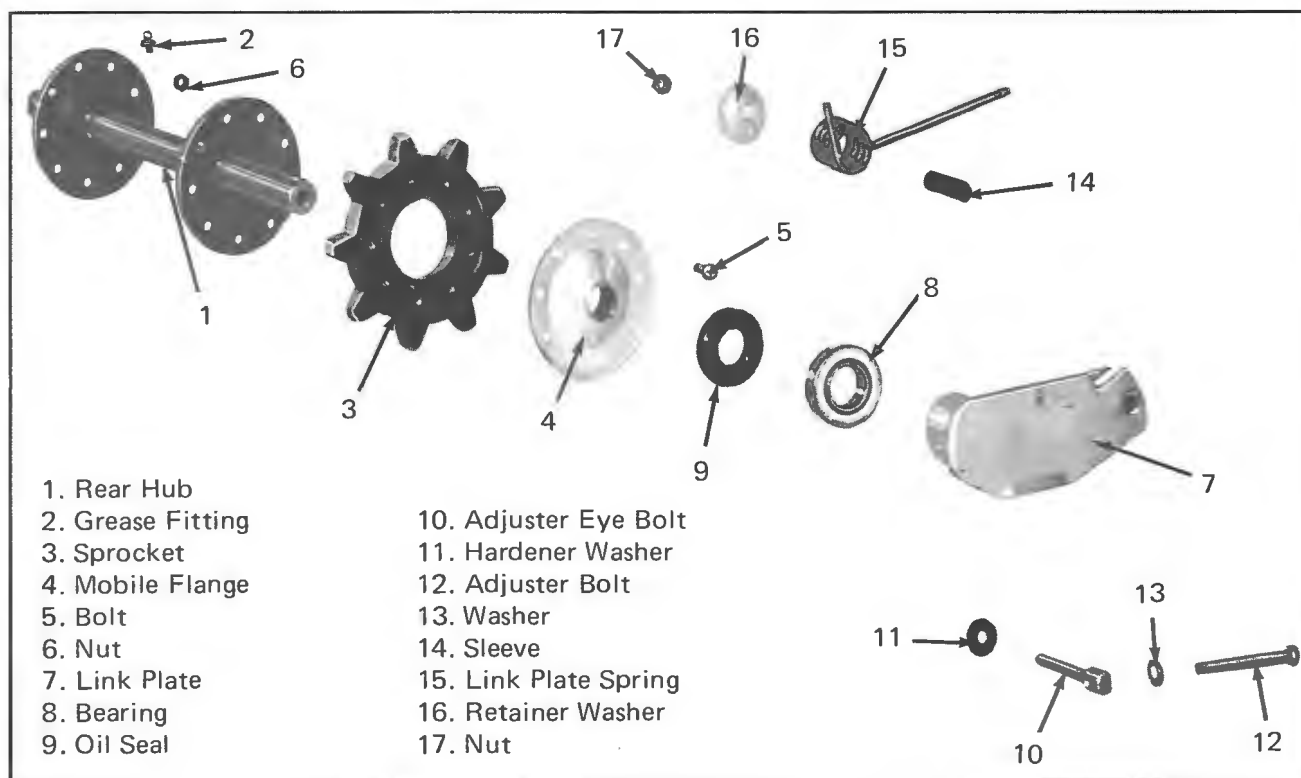
SUSPENSION

1-3 REAR HUB

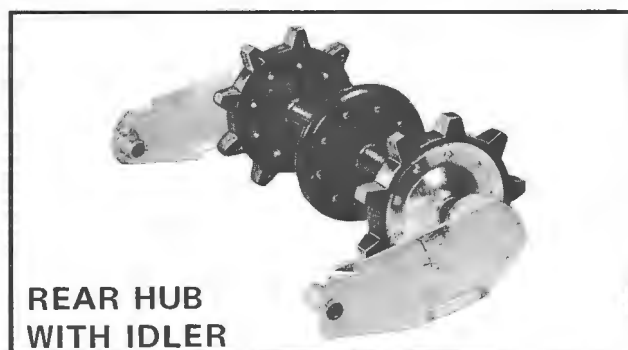
1-3

(A) GENERAL

The flexible action obtained through the link plates and springs provides 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.



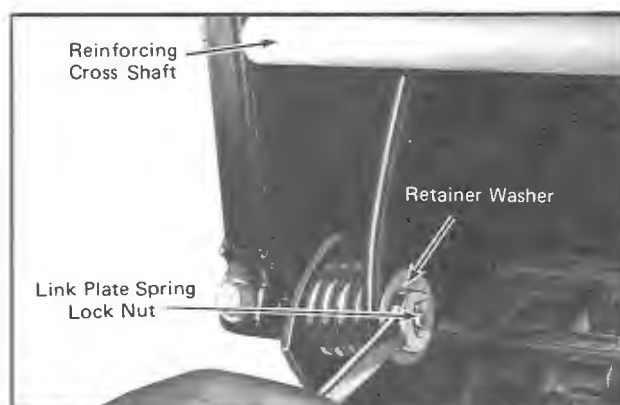
DISASSEMBLED VIEW OF 1971 REAR HUB



(B) REMOVAL

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

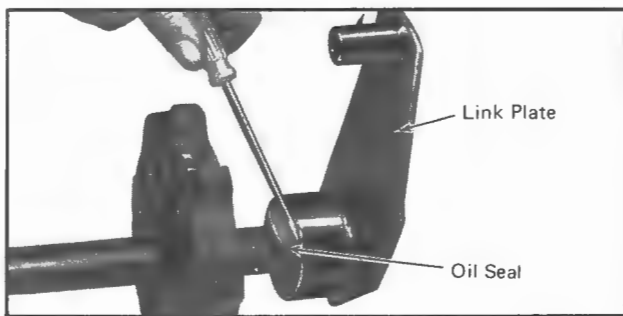
2. Remove the link plate spring lock nuts and retainer washers (fig. 1-3-1).



3. Using special lever (item 1), unhook link plate springs.
4. On 1970 Nordic and T'NT models, prior to unhooking the link plate springs, remove the reinforcing cross shaft by removing capscrews and star washers securing shaft to frame.
5. Remove track adjuster bolts, link plate springs, eye bolts, hardener washers and adjuster sleeves.
6. Withdraw rear hub from vehicle.

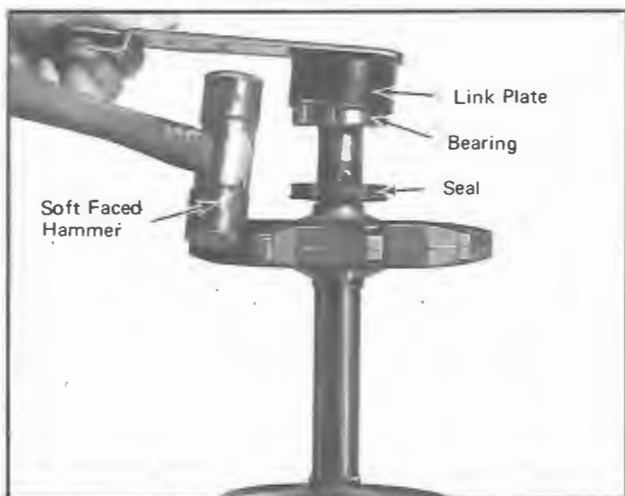
(C) DISASSEMBLY

1. Unscrew grease fitting(s) from hub.
2. With a small screwdriver, pry out oil seal from the groove of each link plate (fig. 1-3-2).



1-3-2

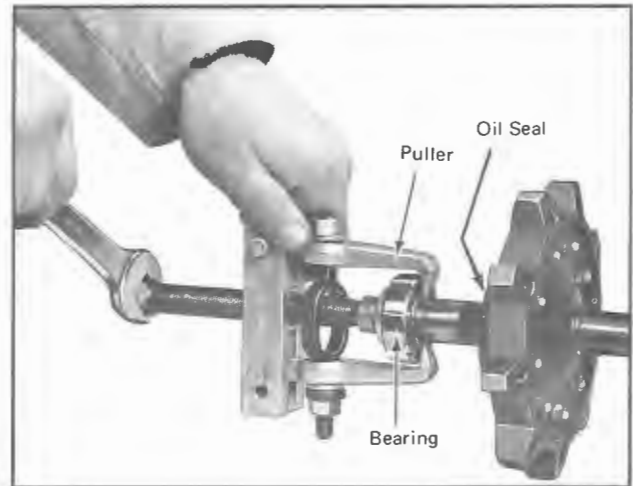
3. Pull the link plates from the bearings. To disengage the link plates it may be necessary to use a soft faced hammer (fig. 1-3-3).



1-3-3

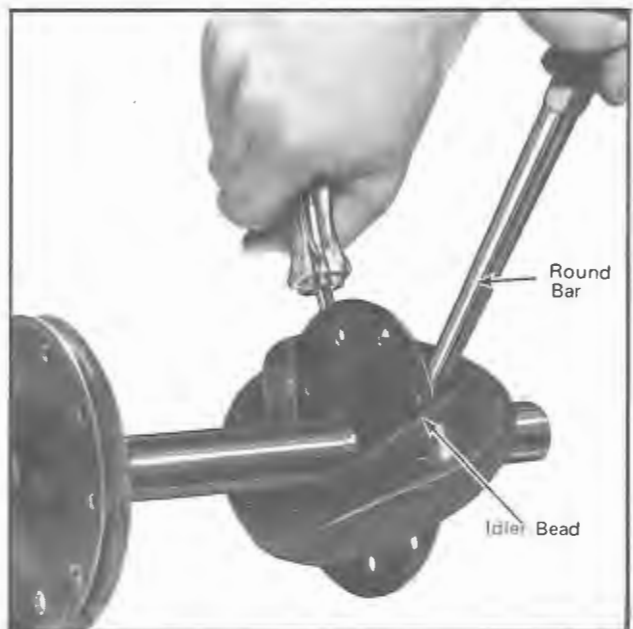
4. Using an appropriate bearing puller, remove bearings from the hub. Remove seals.

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



1-3-4

5. Remove nine (9) nuts and bolts attaching each mobile flange and sprocket to the hub. Remove flanges and sprockets.
6. On models with rear hub equipped with 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. 1-3-5).



1-3-5

(D) CLEANING

1. Clean grease and dirt from sprockets, oil seals and idler with a clean cloth.

CAUTION: Do not use cleaning solvent on sprockets, oil seals or idler as it may permanently damage the component(s).

2. To clean bearings, remove grease and dirt using a soft paint brush. Immerse all bearings in a clean container of cleaning solution. Dry with a clean cloth and lubricate bearings by dipping in clean engine Ski-Doo Oil.
3. Place all other components in a container of cleaning solvent. Remove rust or any other deposits using a firm bristle brush. Dry using a clean cloth. If paint has been removed, apply a new coat using appropriate Ski-Doo Paint.

(E) INSPECTION

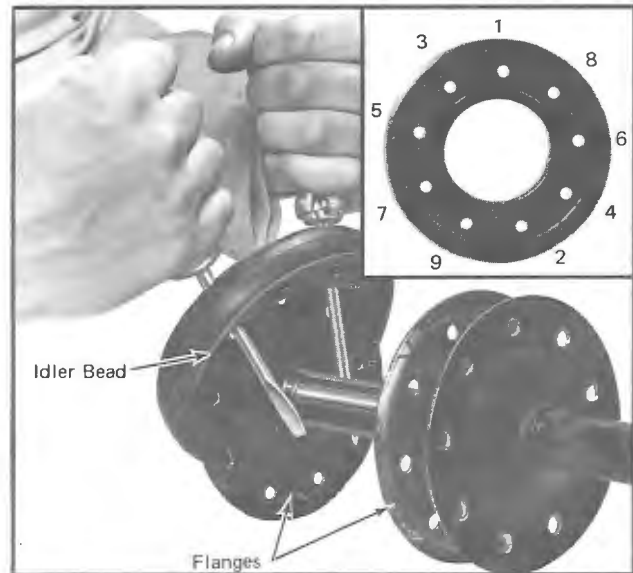
1. Visually inspect sprockets for damage or worn teeth, cuts or distortion. If damage is evident, replace sprocket(s). Refer to Paragraph (H) for Sprocket Change Over.
2. Visually inspect oil seals for cuts or other damage. Replace defective oil seal(s).
3. Visually inspect general condition of all bearings (e.g. pitted or missing ball bearings), freedom of movement and radial free play. Replace defective bearing(s).
4. Inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged components.
5. Visually inspect all other components for signs of wear, cracks and other possible damage. Replace damaged part(s).

(F) ASSEMBLY

1. Prior to Assembly procedure, ensure all

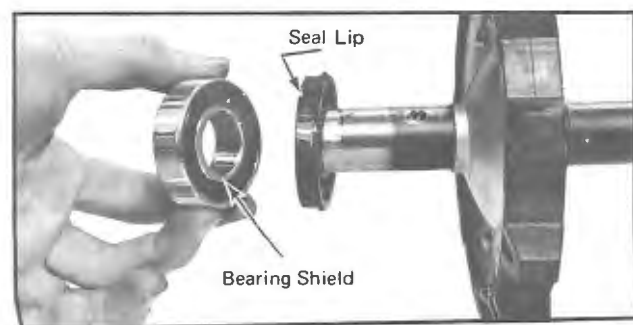
components are clean and all defective parts have been repaired or replaced.

2. On models with rear hubs equipped with 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 the sequence shown in figure 1-3-6.



1-3-6

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 1-3-6.
4. Position an oil seal and a bearing on each end of hub. The lip of the oil seal must be facing outward and the shield of the bearing must be facing the hub sprocket (fig. 1-3-7).



1-3-7

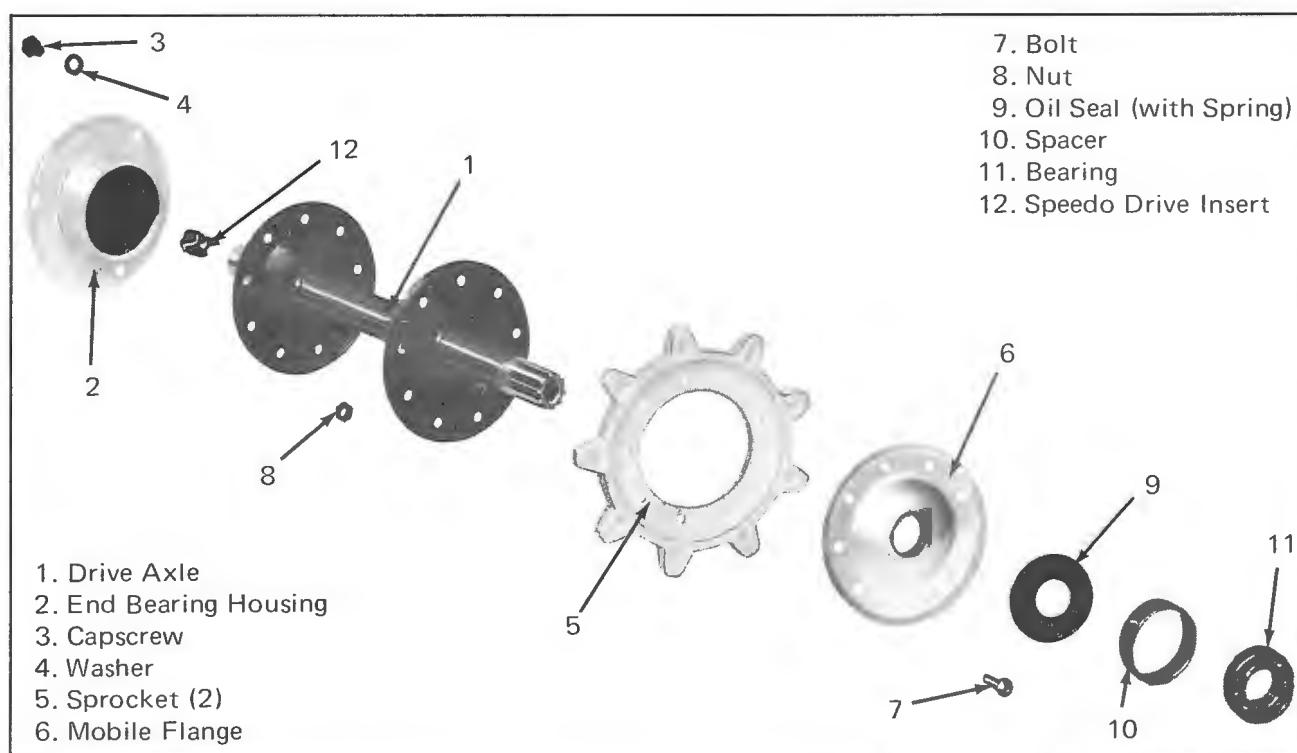
SUSPENSION

1-4 DRIVE AXLE

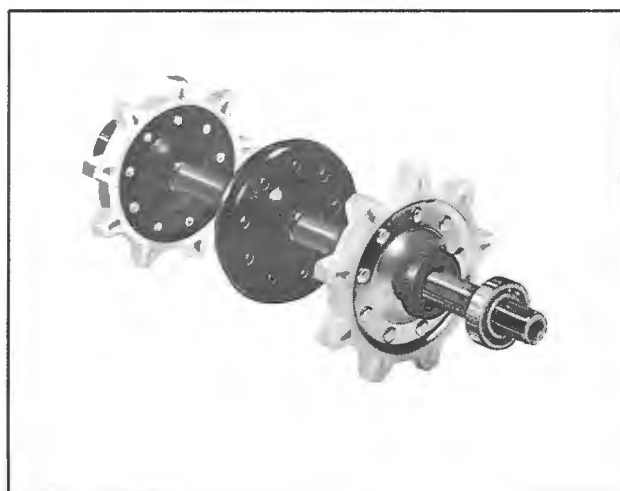
(A) GENERAL

1-4

The functions 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 engaging the track.



DISASSEMBLED VIEW OF 1971 DRIVE AXLE



GENERAL VIEW OF DRIVE AXLE (with Idler)

(B) REMOVAL

(All Models, except Alpine/Invader and Valmont)

1. Tilt or remove the cab.
2. Remove the pulley guard, refer to sub-section 1-6.
3. Remove lower access plug from chain case and drain the chain case oil into a catch pan by tilting the vehicle on its left side.
4. Pry the inspection cover (upper plug) from the chain case.

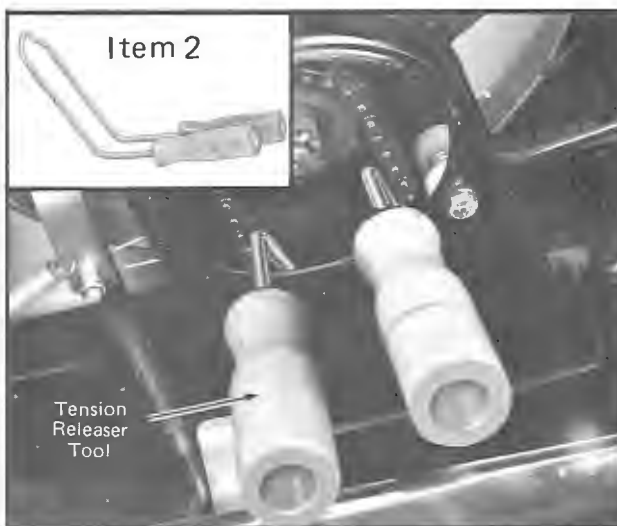
5. On 1970 models, release drive chain tension as follows.

- (a) Partially unscrew the tensioner lock nut.
- (b) Using a soft faced hammer, gently knock the tensioner bolt counter-clockwise (fig. 1-4-1).



1-4-1

NOTE: On 1971 models, drive chain tension is released by inserting tension releaser tool (refer Section 5, item 2), (fig. 1-4-2).

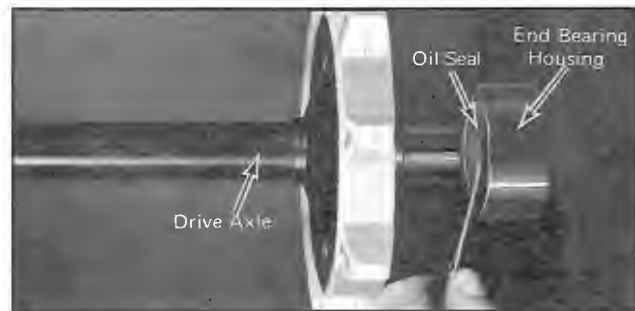


1-4-2

6. Raise and block rear of vehicle off the ground.
7. Remove either the bogie wheel system (refer sub-section 1-1) or the slider suspension assembly (refer sub-section 1-2).

8. Remove rear hub as detailed in sub-section 1-3.

9. With a small screwdriver, pry out oil seals from chain case and end bearing housing (fig. 1-4-3).

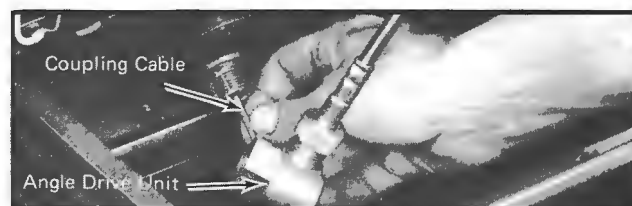


1-4-3

10. On 1971 Elan and Olympique electric models, disconnect battery cables from posts, remove battery cover, battery and seat.

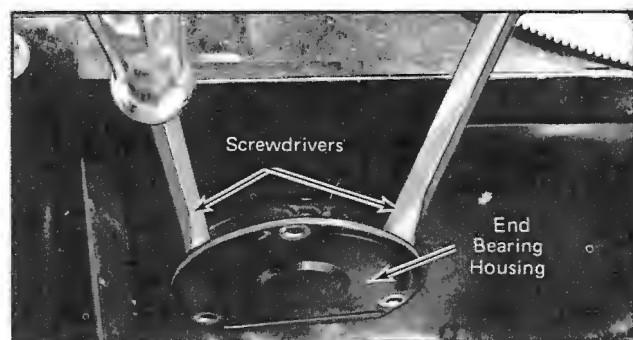
NOTE: The battery seat on Elan models is not removable.

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



1-4-4

12. Remove the three (3) capscrews securing end bearing housing to frame. Pry the housing from the frame with two screwdrivers (fig. 1-4-5).



1-4-5

13. Remove the cotter pin and spacer from the chain case side (fig. 1-4-6).



1-4-6

14. On Olympique models 1970 and '71 "399" and '71 "399E", remove the chain case assembly as described in sub-section 1-11.
15. Release drive sprockets 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.
16. Remove drive axle from vehicle and pull out spacer (fig. 1-4-7).

NOTE: There is no spacer installed on Elan models.



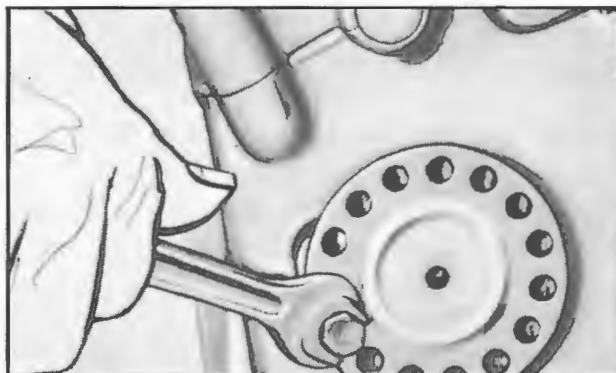
1-4-7

(C) REMOVAL

All Alpine/Invader and Valmont Models

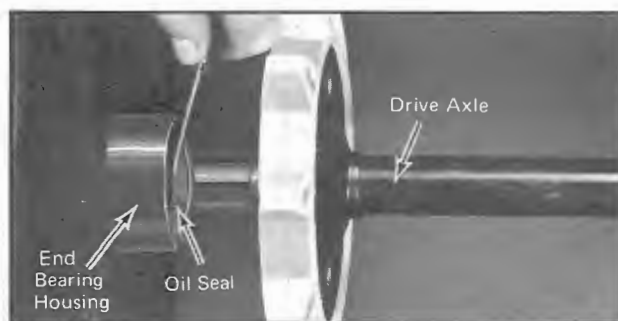
NOTE: The following procedure is applicable to removal of either one or both drive axles of vehicle.

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. 1-4-8).



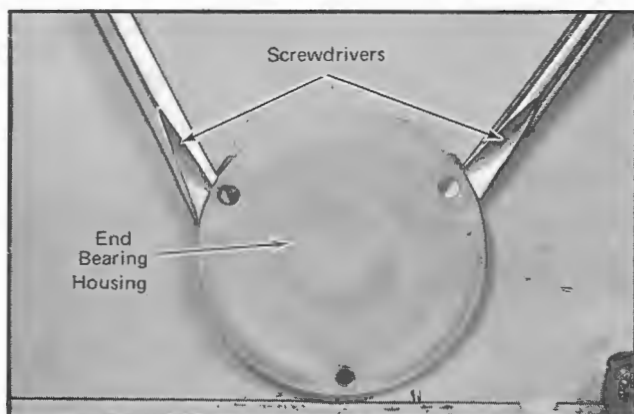
1-4-8

4. Remove the bogie wheel system (refer sub-section 1-1) and rear hub (refer sub-section 1-3).
5. Slightly tilt vehicle either on left or right side and place catch pan directly beneath end bearing housing oil seal.
6. With a small screwdriver, pry out oil seal from lowest end bearing housing and drain gear box oil (fig. 1-4-9).



1-4-9

7. Remove remaining oil seal from end bearing housing and center frame.
8. Remove the three (3) capscrews securing end bearing housing to frame. With two screwdrivers inserted between the housing and frame, pry out housing (fig. 1-4-10).



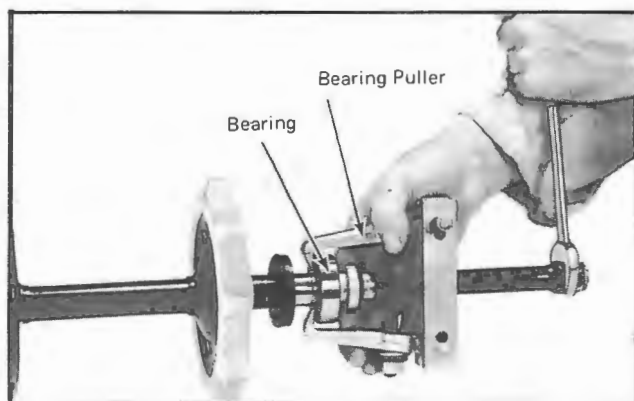
1-4-10

9. 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 from the gear box lower sprocket.
10. Remove drive axle from within the track.

(D) DISASSEMBLY

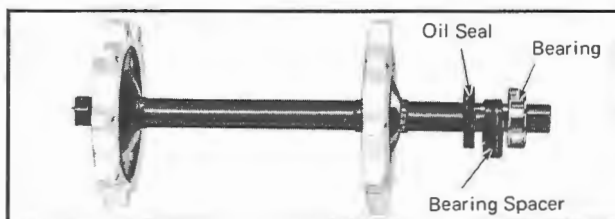
1. With an appropriate bearing puller, remove bearing from each end of axle. Remove oil seals.

NOTE: Always remove the bearings by pulling it by the inner race (fig. 1-4-11).



1-4-11

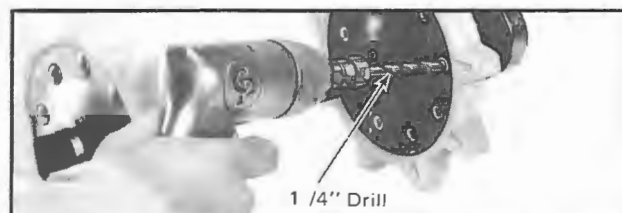
NOTE: On Olympique 399 and 399E models, remove the bearing spacers and oil seals (fig. 1-4-12).



1-4-12

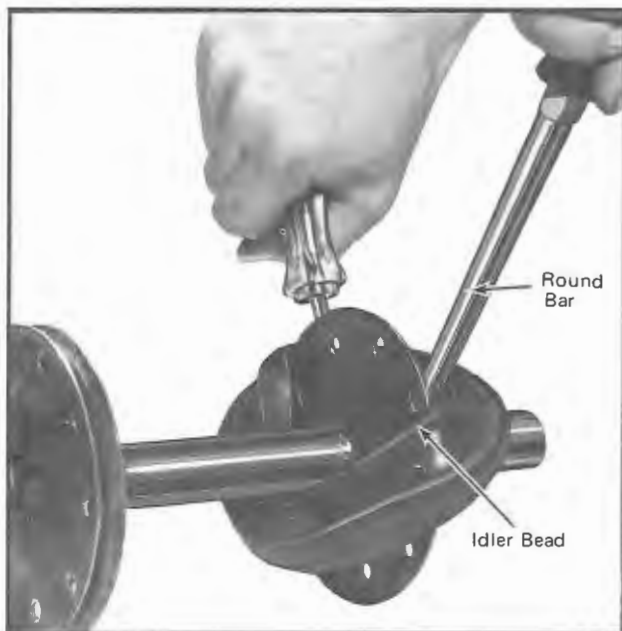
2. Detach and remove mobile flanges and sprockets from axle.

NOTE: On 1970 vehicles, the flanges and sprockets are secured with bolts and nuts. On all '71 models, they are attached with 1/4 inch dia rivets (fig. 1-4-13).



1-4-13

3. On models with drive axles equipped with an idler, remove bolts or rivets (whichever is applicable) securing mobile flange. Apply liquid soap or petroleum jelly on bead of idler and pass idler over the flanges (fig. 1-4-14).



1-4-14

(E) CLEANING

1. Clean grease and dirt from sprockets, oil seals and idler with a clean cloth.

CAUTION: Do not use cleaning solvent on sprockets, oil seals or idler as it may permanently damage the component(s).

2. To clean bearings, remove grease and dirt using a soft paint brush. Immerse all bearings in a clean container of cleaning solution. Dry with a clean cloth and lubricate bearings by dipping in clean engine Ski-Doo Oil.
3. Place all other components in a container of cleaning solvent. Remove rust or any other deposits using a firm bristle brush. Dry using a clean cloth. If paint has been removed, apply a new coat using appropriate Ski-Doo Paint.

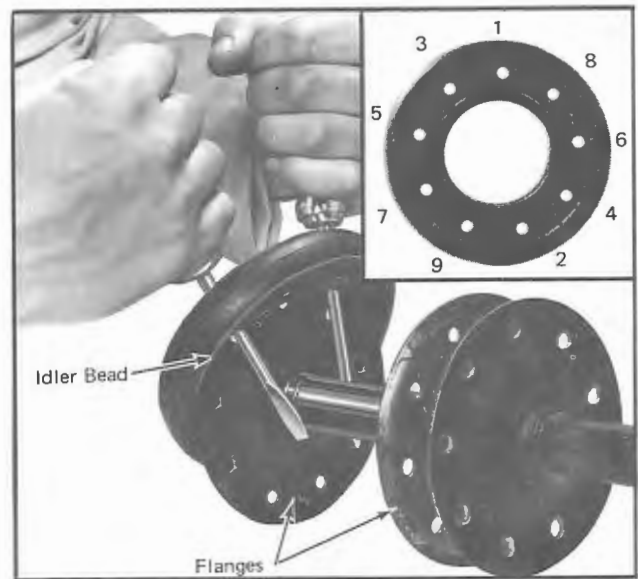
(F) INSPECTION

1. Visually inspect sprockets for damage or worn teeth, cuts or distortion. If damage is evident, replace sprocket. Refer to Paragraph (K) for Sprocket Change Over.
2. Visually inspect oil seals for cuts or other damage. Inspect oil seal spring. If damaged or stretched, spring must be replaced. Replace defective oil seals.
3. Visually inspect general condition of all bearings (e.g. pitted or missing ball bearings), freedom of movement and radial free play. Replace defective bearing(s).
4. Inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged components.
5. Visually inspect all other components for signs of wear, cracks and other possible damage. Replace damaged part(s).
6. Visually inspect drive axle for cracked,

worn and/or twisted splines. If splines are damaged drive axle must be replaced.

(G) ASSEMBLY

1. Prior to Assembly procedures ensure all components are clean and all defective parts have been repaired or replaced.
2. On models with drive axles equipped with an 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 the sequence shown in figure 1-4-15.



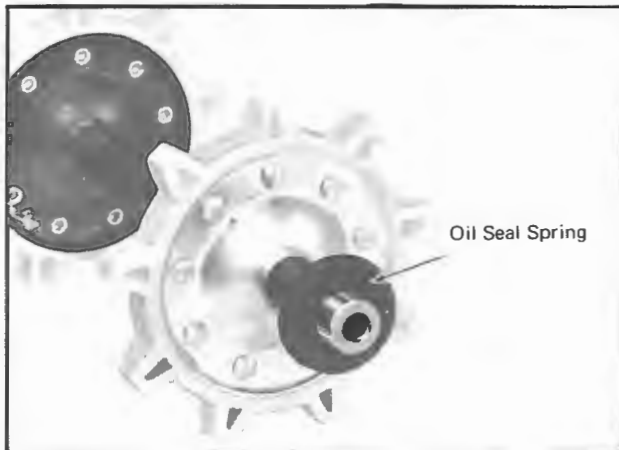
1-4-15

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 the idler or sprockets, ensure that bolts are tightened gradually and equally. This procedure will avoid possible polyurethane or rubber distortion.

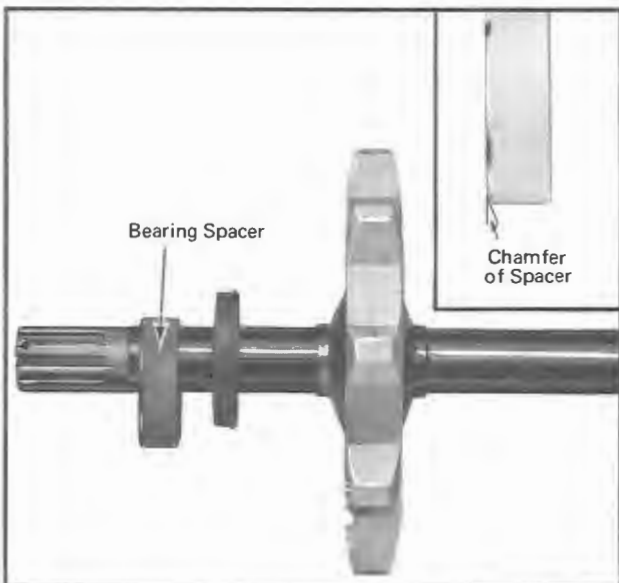
4. Position an oil seal on each end of axle.

The spring of the oil seal must be facing towards end of axle (fig. 1-4-16).



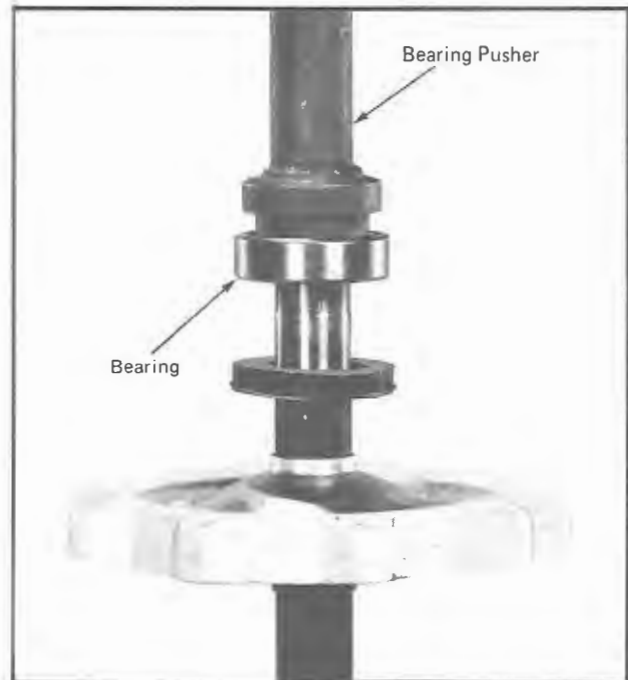
1-4-16

5. On Olympique 399 and 399E models, position bearing spacer on the splined end of drive axle with chamfered side of spacer facing away from sprocket (fig. 1-4-17).



1-4-17

6. Place a bearing with shield facing sprocket on each end of axle. With an appropriate pusher, push the bearings by the inner race 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 pushed until bearing becomes flush with end of drive axle (fig. 1-4-18).

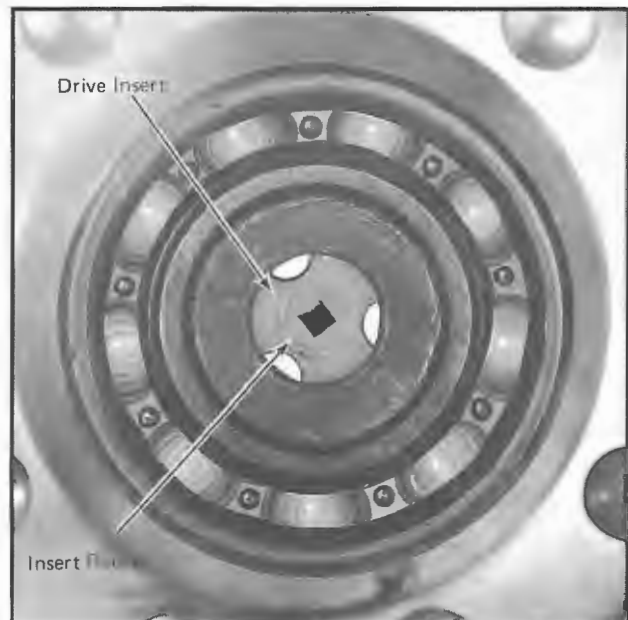


1-4-18

(H) INSTALLATION

(All Models except Alpine/Invader and Valmont)

1. If the drive axle to be installed is a new component and the vehicle is equipped with a speedometer, a new speedo drive insert must be installed (driven) into the axle end. Ensure that insert is flush with axle end and ensure that the insert recess is facing outward (fig. 1-4-19).



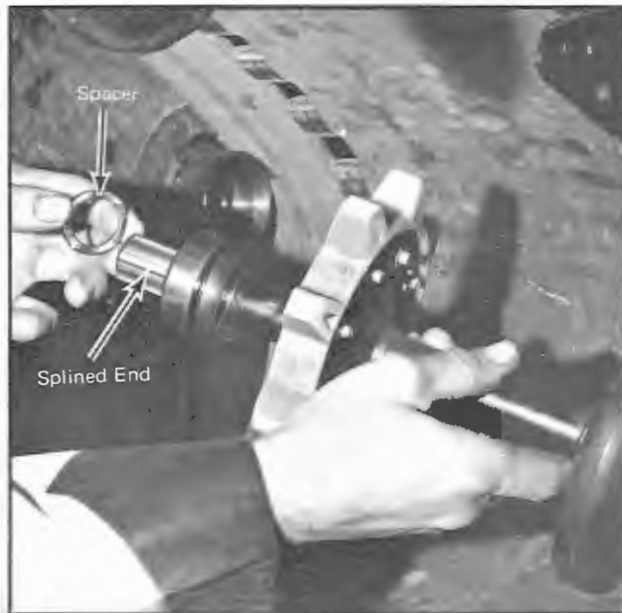
1-4-19

DRIVE AXLE

1-04-07

2. Place a spacer on the splined end of drive axle (fig. 1-4-20).

NOTE: The spacer is not installed on Elan models.

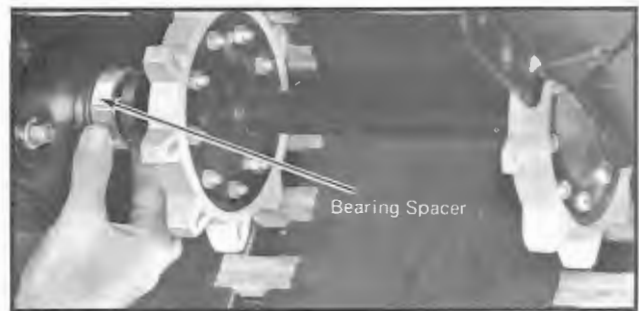


1-4-20

3. From the left side of vehicle, insert the drive axle within the track. Push the end bearing through the orifice in right side of frame. Pull the splined end of axle into chain case lower sprocket.
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 models 1970 and '71 "399" and '71 "399E", install the chain case assembly as described in sub-section 1-11.
7. On Olympique 399 and 399E models, push bearing spacer into chain case (fig. 1-4-21).
8. Place a spacer on chain case side of axle and secure with a new cotter pin.
9. On 1971 Elan and Olympique electric

models, install seat, battery and cover. Connect battery cables.

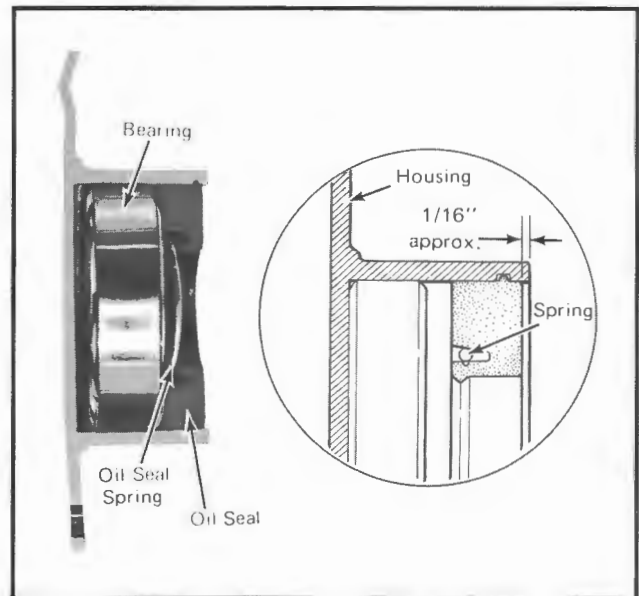
NOTE: Elan models do not incorporate a removable battery seat.



1-4-21

10. 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. 1-4-22).



1-4-22

11. Install rear hub as detailed in sub-section 1-3.
12. Install either the bogie wheel system (refer to sub-section 1-1) or the slider suspension unit (refer to sub-section 1-2).
13. On 1970 models, adjust drive chain tension to 1/4 inch maximum free play

and tighten tensioner lock nut (fig. 1-4-23).



1-4-23

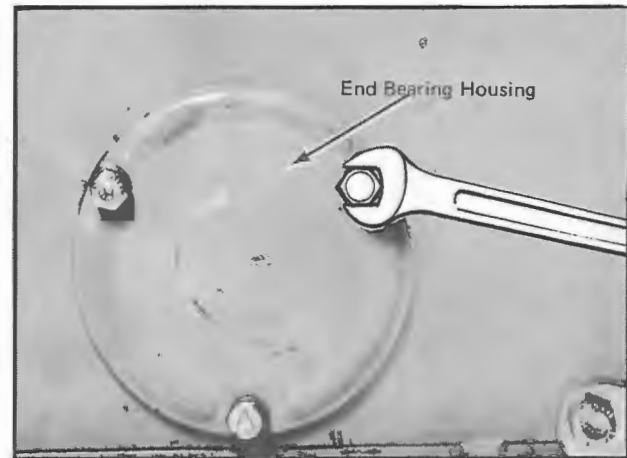
14. On 1971 models, remove tension releaser tool (item 2).
15. Install access plug and pour 8 ounces of Ski-Doo Chain Case Oil into chain case. Install inspection plug.
16. On 1970 and '71 Olympique models, refer to sub-section 1-9 and carry out pulley alignment. On all 1970 models, check brake adjustment and correct if necessary. Refer to sub-section 1-10.
17. Install pulley guard and cab.
18. Apply track tension as detailed in sub-section 1-5.
19. Carry out track alignment procedure as described in sub-section 1-5.
20. Set vehicle on the ground.

**(J) INSTALLATION
(1970 and '71 Alpine/Invader 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 end bearing. Secure housing to

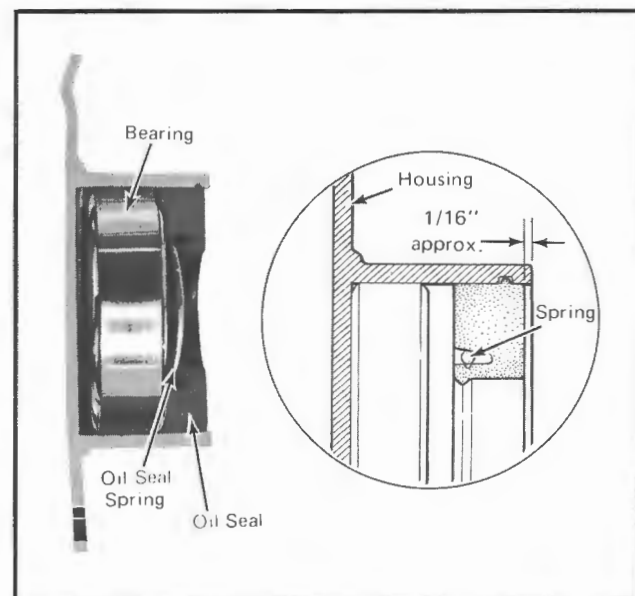
frame with three (3) capscrews (fig. 1-4-24).



1-4-24

3. Install oil seals.

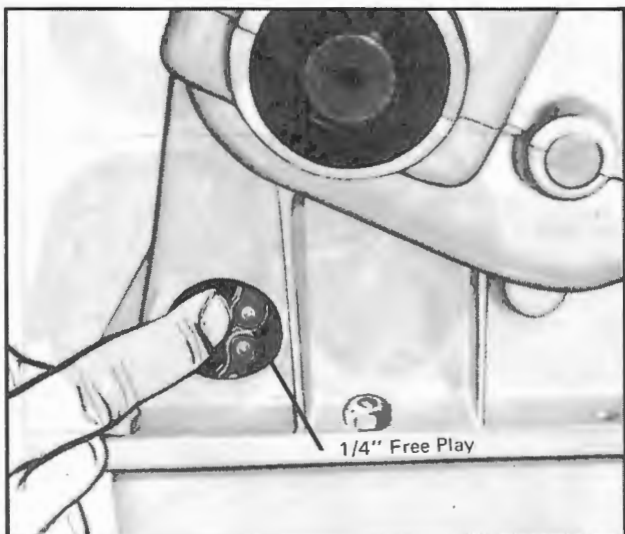
NOTE: A gap of approximately 1/16 inch should exist between the end of the bearing housing and the oil seal (fig. 1-4-25).



1-4-25

4. Install rear hub as detailed in sub-section 1-3.
5. Install bogie wheel system as described in sub-section 1-1.
6. Adjust chain tension by rotating gear box tensioner until 1/4 inch maximum free play is achieved (fig. 1-4-26).

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



1-4-26

7. Install inspection plug.
8. Remove the red plug on top of gear box and fill the gear box with Ski-Doo Chain Case Oil.

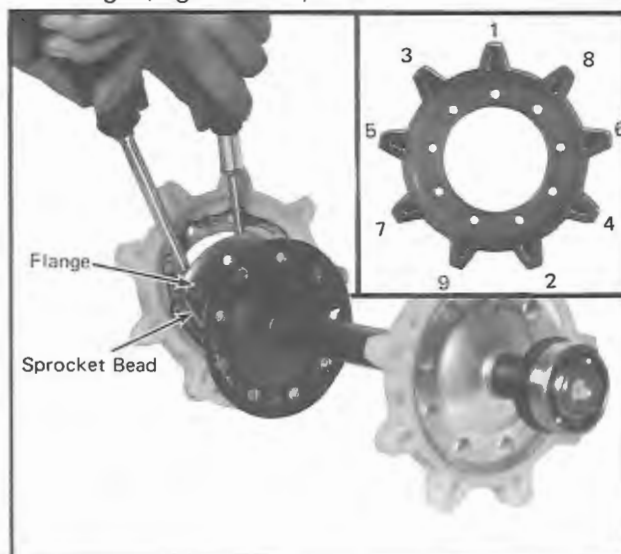
NOTE: On 399R and 399ER models, the oil capacity of the gear box is 12 ounces or 2-1/4 inches when checked with dip stick. The gear box capacity of the 640ER model is 16 ounces or 3-1/4 inch level on dip stick.

9. Install vent plug.
10. Install cab.
11. Apply track tension as detailed in sub-section 1-5.
12. Carry out track alignment procedure as detailed in sub-section 1-5.
13. Set vehicle on the ground.

(K) SPROCKET CHANGE OVER

1. Remove drive axle from vehicle, refer Paragraph (B) or (C), preceding.

2. Remove the nine (9) bolts and nuts or rivets attaching the mobile flange and sprocket to drive axle.
3. Apply liquid soap or petroleum jelly on sprocket bead and with two screwdrivers (round bars) pass the sprocket over flange (fig. 1-4-27).



1-4-27

4. Reverse Change Over procedure to install new sprocket.

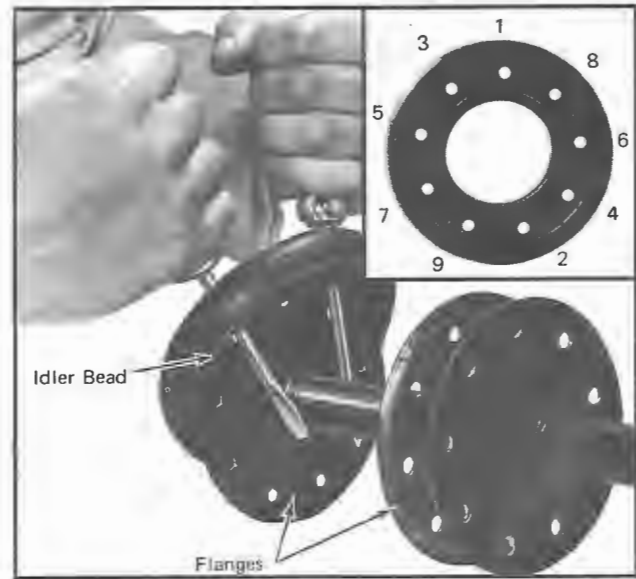
NOTE: Tighten attaching bolts following the sequence shown in figure 1-4-27.

(L) IDLER CHANGE OVER

1. Remove drive axle as detailed in Paragraph (B) or (C). Remove sprocket as described in Paragraph (K).
2. Remove the nine (9) bolts and nuts (or rivets) attaching the mobile flange and idler to drive axle.
3. Apply liquid soap or petroleum jelly on sprocket bead and with two screwdrivers (round bar) pass the idler over flange (fig. 1-4-28).
4. Reverse Change Over procedure to install new idler.

NOTE: Tighten attaching bolts following the sequence shown in figure 1-4-28. When attaching the idler, ensure that

bolts are tightened gradually and equally. This procedure will avoid possible rubber distortion.



1-4-28

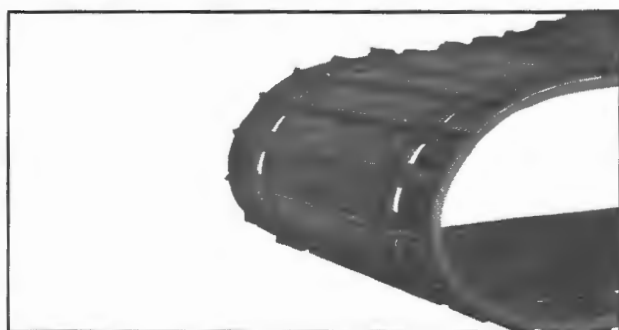
SUSPENSION

1-5 TRACK

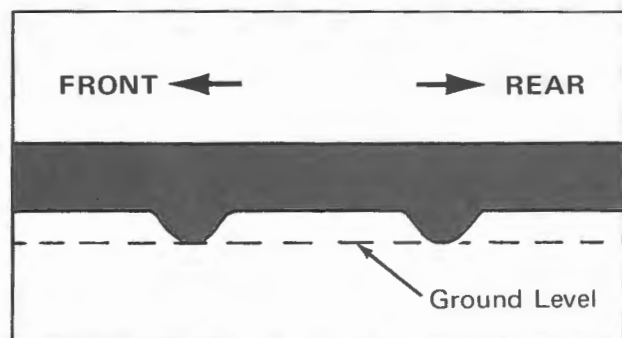
(A) GENERAL

The track has three (3) main functions:

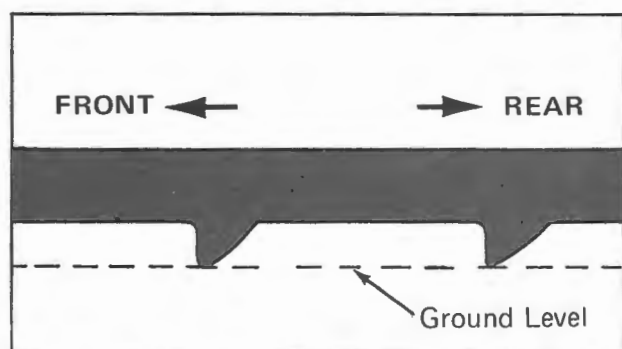
- (i) to provide a cushioning action to surface jolts or bumps.
- (ii) to provide traction enabling the vehicle to drive itself forward.
- (iii) to provide a means of greater stoppage.



GENERAL VIEW OF TRACK



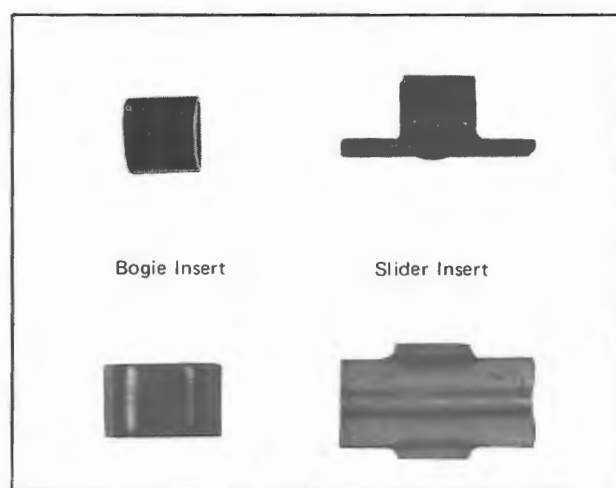
1-5-1 OLD PROFILE TRACK



1-5-2 NEW PROFILE TRACK

(B) 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.



1-5-3

(C) REMOVAL OF TRACK(S)

1. Raise and block rear of vehicle off the ground.
2. Remove either the bogie wheel system (refer sub-section 1-1) or slider suspension unit (refer sub-section 1-2).
3. Remove rear hub as detailed in sub-section 1-3.
4. Remove drive axle as described in sub-section 1-4.
5. Withdraw the track(s) from beneath the vehicle.

(D) CLEANING

1. Remove dirt and any other deposit on interior and exterior sides of track(s) with a clean cloth.

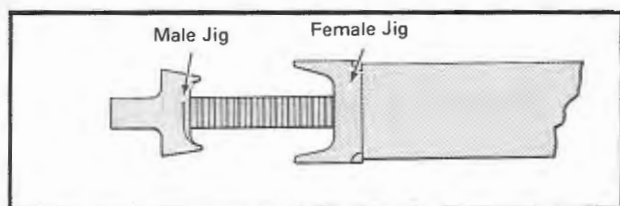
(E) INSPECTION

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).

(F) INSTALLATION OF TRACK INSERT(S)

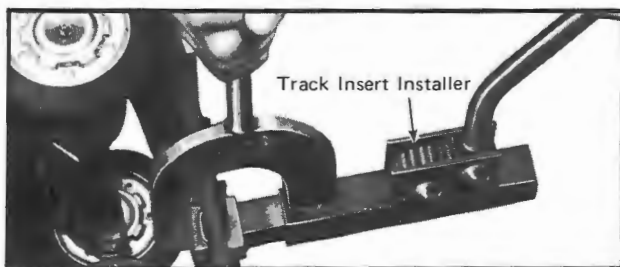
NOTE: Installation of insert(s) can be performed with either the track(s) installed on or removed from the vehicle.

1. Tilt vehicle or track on its side to expose the track notches and place insert into position.
2. Position the track insert installer (refer Section 5, item 3) with the male jig on top of track insert and the female jig below the insert (fig. 1-5-4).



1-5-4

3. Apply pressure on handles of track insert installer (Clip-O-Matic) to close and lock the insert onto track notch (fig. 1-5-5).



1-5-5

4. If track has been removed from vehicle, install track as detailed in Paragraph (G).

(G) INSTALLATION OF TRACK(S)

1. Raise and block rear of vehicle off the

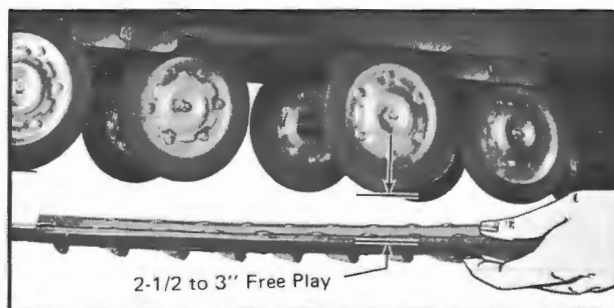
ground. Position track(s) beneath the vehicle.

NOTE: When installing the new profile track, ensure the right angle of the bearing surface of the track ribs is facing the front of vehicle (fig. 1-5-2)

2. Install drive axle as described in sub-section 1-4.
3. Install rear hub as detailed in sub-section 1-3.
4. Install either the bogie wheel system (refer sub-section 1-1) or the slider suspension assembly (refer sub-section 1-2).
5. Apply track tension as detailed in Paragraph (H) for vehicles equipped with bogie wheel system or (J) for models equipped with slider suspension unit.
6. Carry out track alignment procedure as detailed in Paragraph (K).

(H) TRACK TENSION (Bogie Wheel System)

1. To check track tension (free play) on all 1970 and '71 vehicles equipped with a bogie wheel system use the following procedure.
 - (a) With rear of vehicle blocked off the ground and the center(s) bogie wheel set(s) horizontal, apply a moderate downward hand pressure on middle position of track. Distance between bottom of wheel and inner side of track must be 2-1/2 to 3 inches on each side of track (fig. 1-5-6).



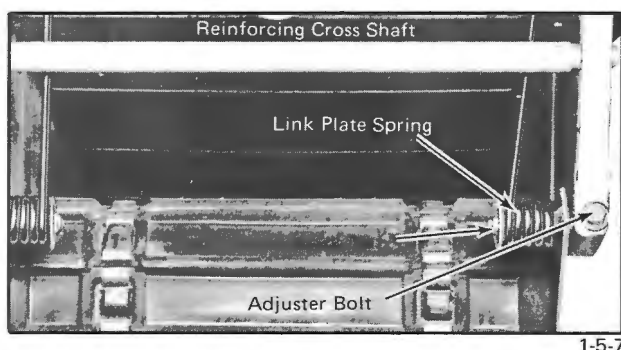
1-5-6

2. To adjust track tension (free play) on all 1970 and '71 vehicles equipped with a bogie wheel system use the following procedure.

- (a) On all 1971 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.

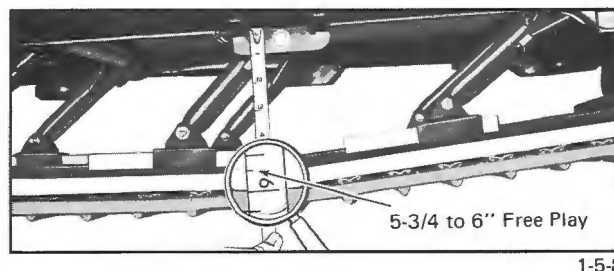
- (b) Loosen link plate spring lock nuts located on inner side of link plate springs.
- (c) Turn adjuster bolts clockwise to tighten track(s) and counterclockwise to slacken track(s) (fig. 1-5-7).



- (d) After track tension is adjusted equally, align the track(s) as detailed in Paragraph (K).

(J) TRACK TENSION (Slider Suspension)

1. To check track tension (free play) on vehicles equipped with slider 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 5-3/4 to 6 inches on each side of track (fig. 1-5-8).



1-5-8

2. To adjust track tension (free play) on all 1970 and '71 vehicles equipped with slider suspension, use the following procedure.

- (a) On all 1971 models 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.

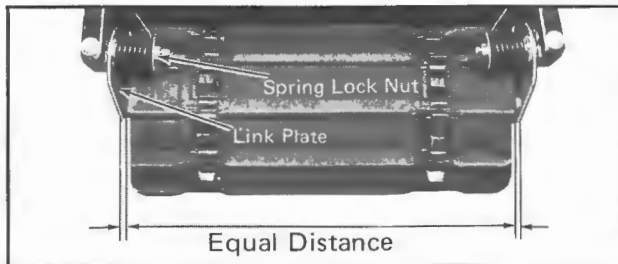
- (b) Loosen link plate spring lock nuts located on inner side of link plate springs.
- (c) Turn adjuster bolts clockwise to tighten track and counterclockwise to slacken track (see fig. 1-5-7).
- (d) After track tension is adjusted equally, align the track as detailed in Paragraph (K).

(K) TRACK ALIGNMENT

CAUTION: 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. On all 1971 vehicles, never try to align the track(s) 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(s) to rotate SLOWLY.

- (b) Check if track(s) is well centered and turns evenly on rear sprockets. The distance between edge of track and link plate must be equal on both sides (fig. 1-5-9).



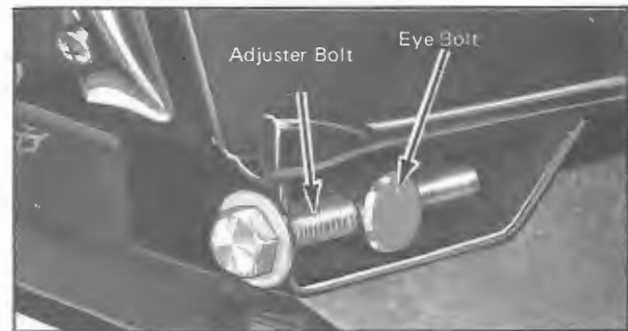
1-5-9

2. To align track(s) use the following procedure.

- (a) Loosen link plate spring lock nut

on side where the track is closest to the link plate (fig. 1-5-9).

- (b) Turn track adjuster bolt on same side clockwise until the track re-aligns. (fig. 1-5-10).



1-5-10

- (c) Tighten link plate spring lock nuts.

TRANSMISSION

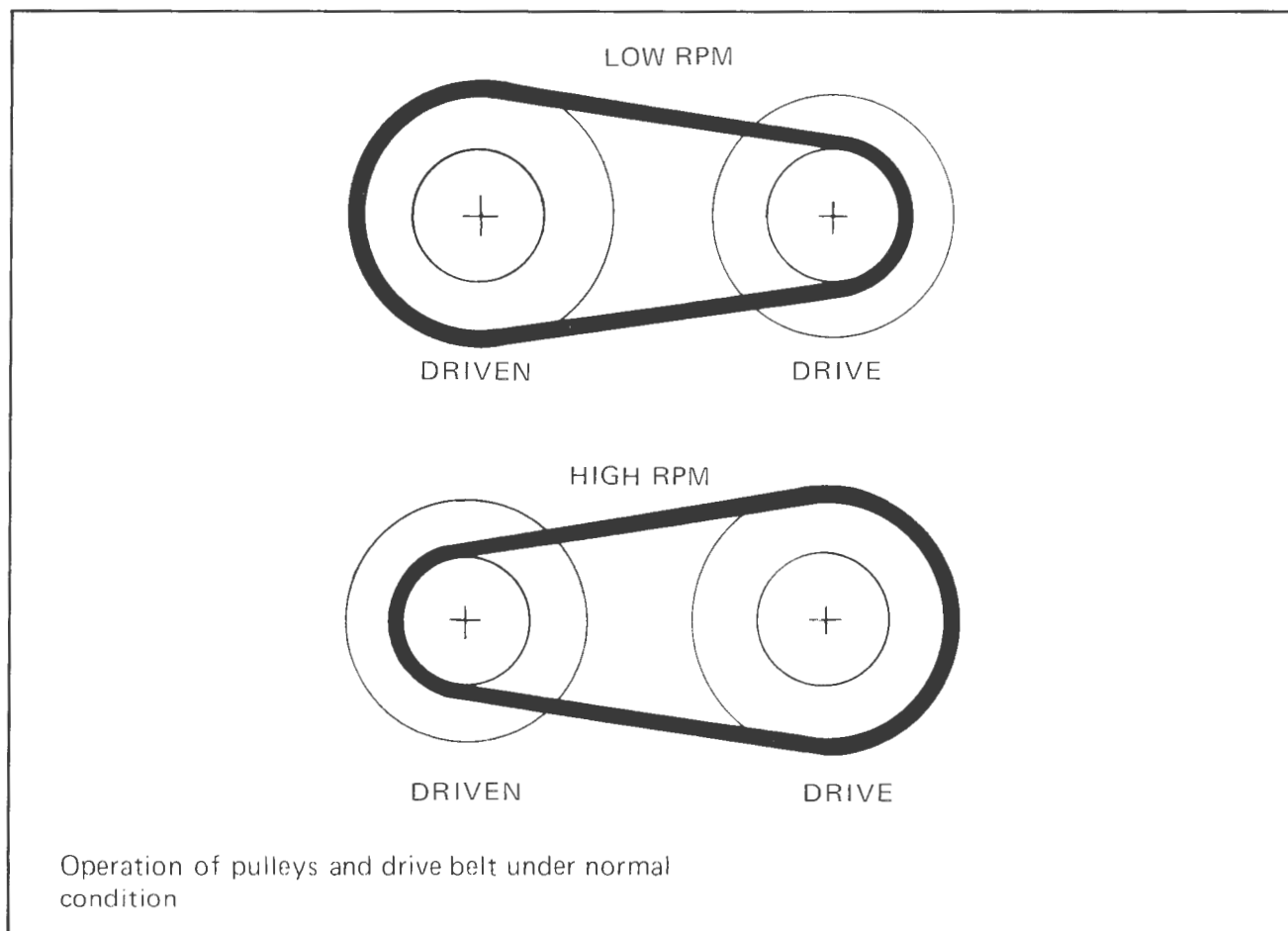
TORQUE CONVERTER

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.

1-6

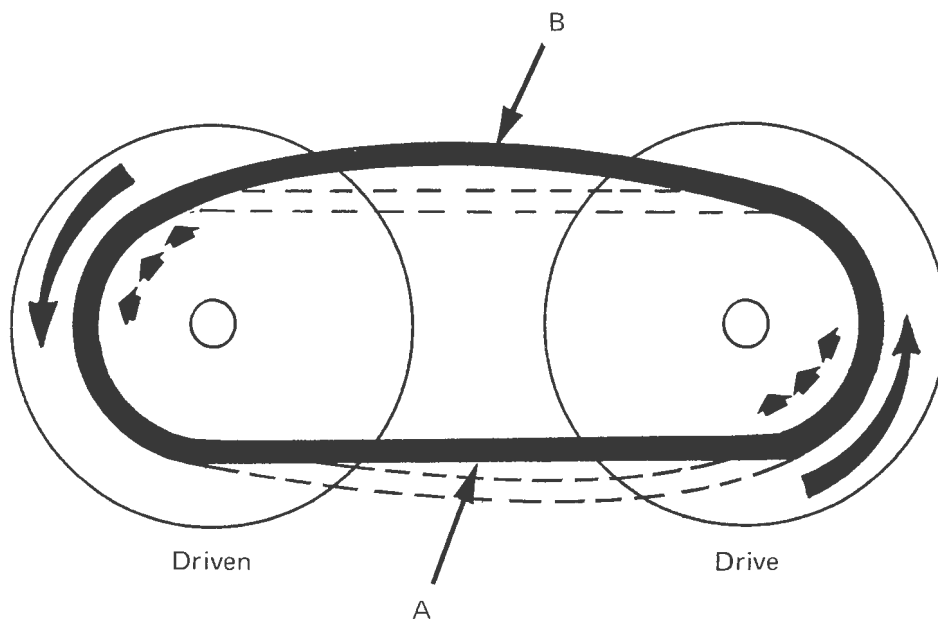
- (a) Power line — direction of the power obtained from the engine.
- (b) Power take-off — crankshaft.
- (c) Drive pulley — a pulley assembly connected to the engine crankshaft and consisting of a spring loaded pulley half, a fixed pulley half and a centrifugal governor incorporating pressure levers.



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.

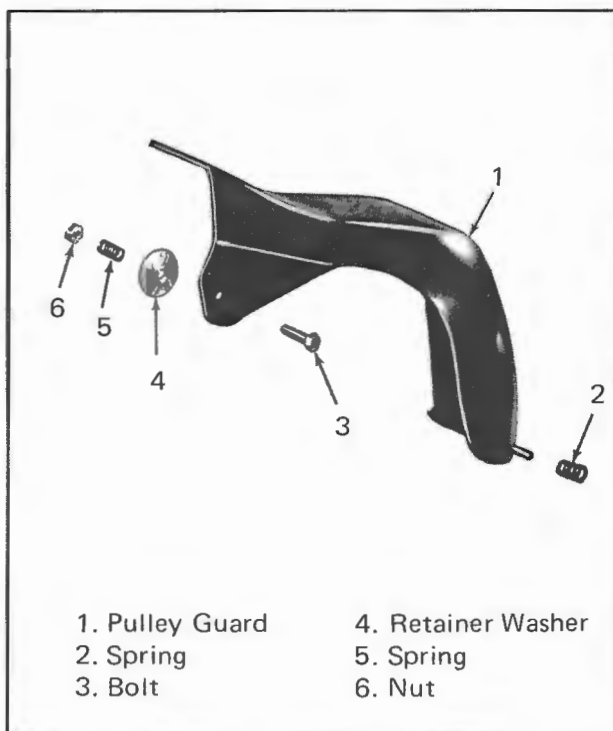
(B) Side is slack and thrown in direction of power line. Result = involved torque ability.

1-6 PULLEY GUARD

(A) 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: When engine is running, it is imperative that the pulley guard is installed in position for safety reasons.

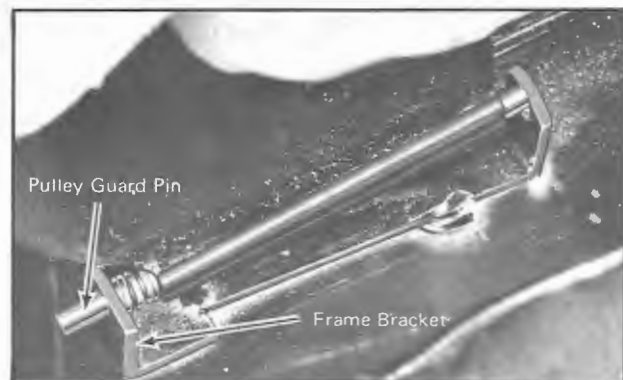


EXPLODED VIEW OF PULLEY GUARD

(B) REMOVAL

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

1. Remove or tilt the cab.
2. Disengage pulley guard pin (integral with guard) from bracket of frame (fig. 1-6-1).



1-6-1

3. Slide bolt out from chain case bracket or pulley guard holder and remove pulley guard.

(C) DISASSEMBLY

1. Remove spring from pulley guard pin.
2. Remove the nut securing the upper spring, retainer washer and bolt to pulley guard.

(D) CLEANING

1. Remove dirt and any other deposit on interior and exterior sides of guard with a clean cloth.

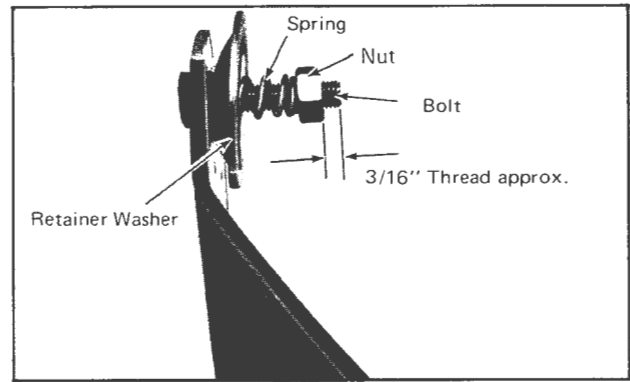
(E) INSPECTION

1. Visually inspect guard for cracks and other damage. If damaged, do not attempt to repair. Pulley guard must be replaced.

2. Check tension of lower spring by verifying engagement of pin. When installed, free play between guard and frame bracket should not be greater than 1/16 inch. If free play is exceeded, replace spring.
3. Inspect threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged components.

(F) ASSEMBLY

1. Prior to Assembly procedure ensure all components are clean and damaged parts have been repaired or replaced.
2. Insert bolt through pulley guard.
3. Place retainer washer and spring on bolt. Secure bolt by means of nut. Tighten nut until 3/16 inch of thread is visible through nut (fig. 1-6-2).



1-6-2

4. Position spring on pulley guard pin.

(G) INSTALLATION

1. Slide pulley guard bolt into bracket of chain case or pulley guard holder.
2. Engage pulley guard pin into bracket of frame.
3. Install or close cab.

TRANSMISSION

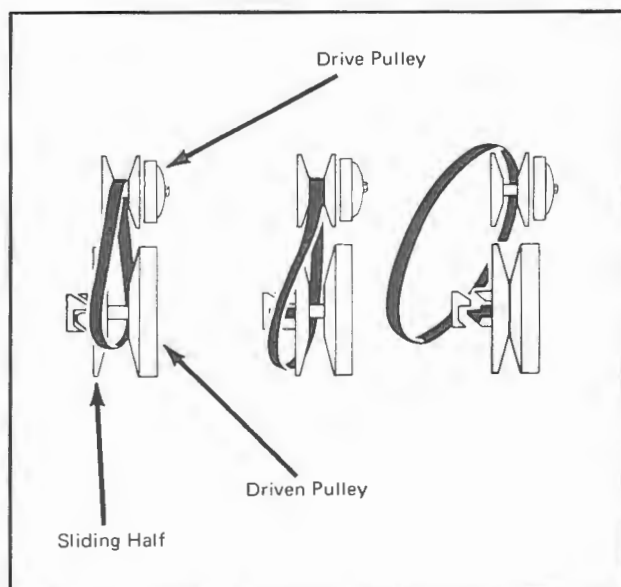
1-7 DRIVE BELT

(A) 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.

(B) REMOVAL (All Models except Alpine/Invader and Valmont)

1. Tilt or remove the cab.
2. Remove pulley guard as detailed in subsection 1-6.
3. Open the driven pulley by twisting and pushing the sliding half and hold in open position (fig. 1-7-1).



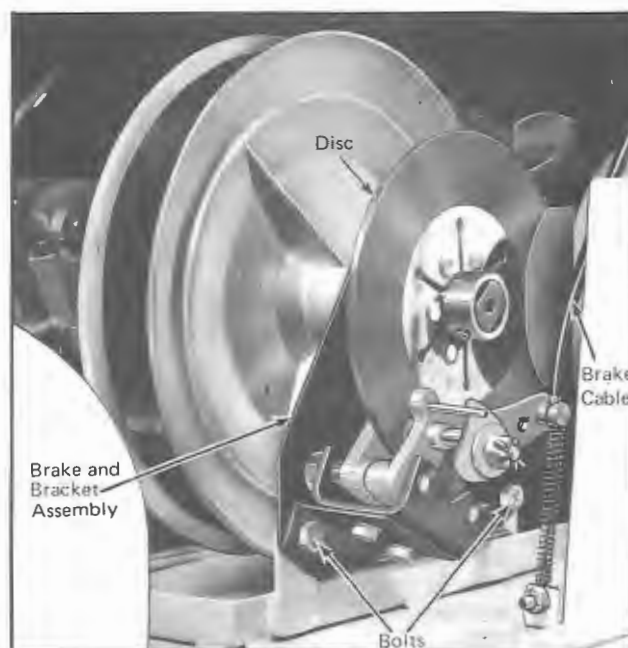
1-7-1

4. Slip the drive belt from the driven pulley and remove belt by passing it over the drive pulley.

(C) REMOVAL (All Alpine/Invader and Valmont Models)

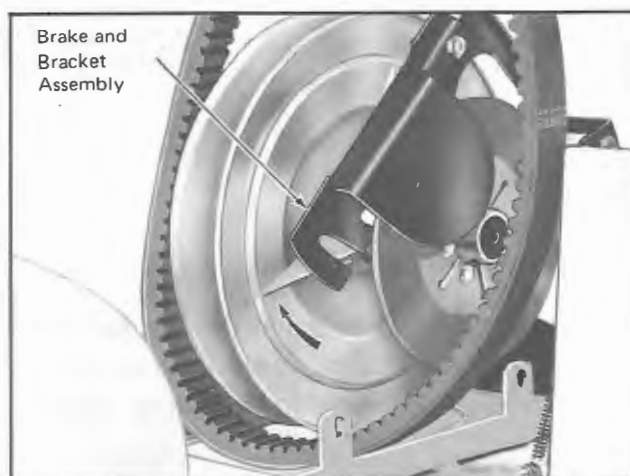
NOTE: Ensure transmission lever is in neutral position.

1. Remove cab.
2. Remove pulley guard as detailed in subsection 1-6.
3. Disconnect brake cable at cable ferrule on disc brake outer half.
4. Remove two (2) nuts and bolts securing the lower brake bracket to frame and pivot brake and bracket assembly 1/2 turn (fig. 1-7-2).



1-7-2

5. Open driven pulley by twisting and pushing sliding half and hold in open position.
6. Pull bottom of belt towards driven pulley and slip belt over top edge of fixed half.
7. Slip belt out from drive pulley (centrifugal governor).
8. Remove belt completely from vehicle by passing it under driven pulley and disc brake assembly (fig. 1-7-3).

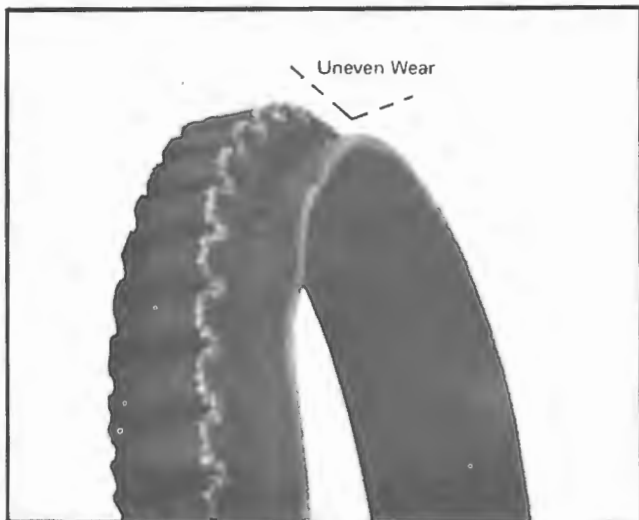


(D) DRIVE BELT TROUBLE SHOOTING CHART

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.

SYMPTOM	CAUSE	REMEDY
1. Uneven belt wear on one side only See Fig. 1-7-4	(a) Loose engine mount (b) Pulley misalignment	(a) Tighten engine mount nuts equally (400-420 inch-pounds) (b) Align pulleys
2. Belt glazed excessively or has baked appearance. See Fig. 1-7-5	Excessive slippage caused by (a) Insufficient pressure on belt sides (b) Rusted drive or driven pulley shafts (c) Oil on pulley surfaces (d) Incorrect centrifugal governor installed	(a) Check drive pulley for worn or missing pressure lever (b) Clean shaft with steel wool and lubricate with Ski-Doo Clutch Lube (c) Clean pulley surfaces with fine emery cloth and clean cloth (d) Install correct governor

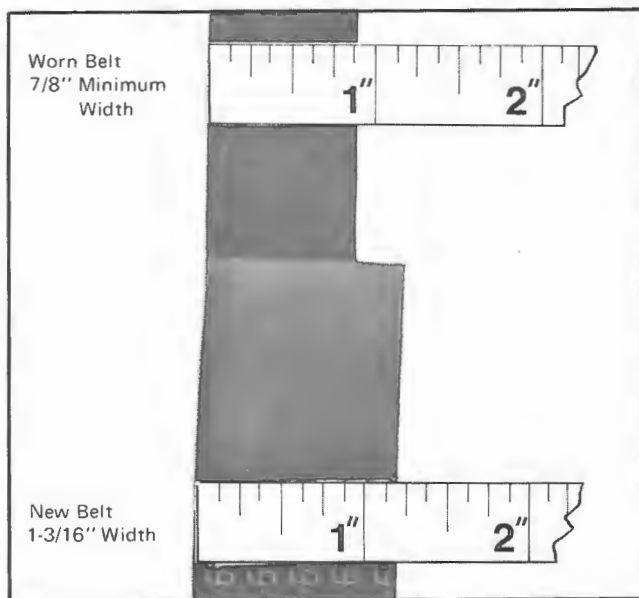
SYMPTOM	CAUSE	REMEDY
<p>3. Belt worn excessively in top width.</p> <p>See Fig. 1-7-6</p>	<p>(a) Excessive slippage due to irregular outward actuation movement of drive pulley</p> <p>(b) Rough or scratched pulley surfaces</p> <p>(c) Improper belt angle</p>	<p>(a) Carry out inspection as detailed in sub-section 1-8</p> <p>(b) Repair or replace pulley</p> <p>(c) Using unspecified type of belt. Replace belt with correct Bombardier belt</p>
<p>4. Belt worn narrow in one section.</p> <p>See Fig. 1-7-7</p>	<p>Excessive slippage in drive pulley caused by:</p> <p>(a) Frozen or too tight track</p> <p>(b) Drive pulley (clutch) not functioning properly</p> <p>(c) Engine idle speed too high</p>	<p>(a) Liberate track from ice or check track tension and alignment</p> <p>(b) Repair or replace drive pulley</p> <p>(c) Reduce engine RPM</p>
<p>5. Belt too tight during engine idle.</p>	<p>(a) Idle speed too high</p> <p>(b) Incorrect belt length</p> <p>(c) Incorrect pulley distance</p>	<p>(a) Reduce engine RPM</p> <p>(b) Using unspecified type of belt. Replace belt with correct Bombardier belt</p> <p>(c) Readjust to specifications, refer to sub-section 1-9</p>
<p>6. Belt sides worn concave.</p> <p>See Fig. 1-7-8</p>	<p>(a) Excessive ride out on drive pulley</p>	<p>(a) Check for proper distance between pulleys, refer to sub-section 1-9</p> <p>(b) Using unspecified type of belt. Replace belt with correct Bombardier belt</p>



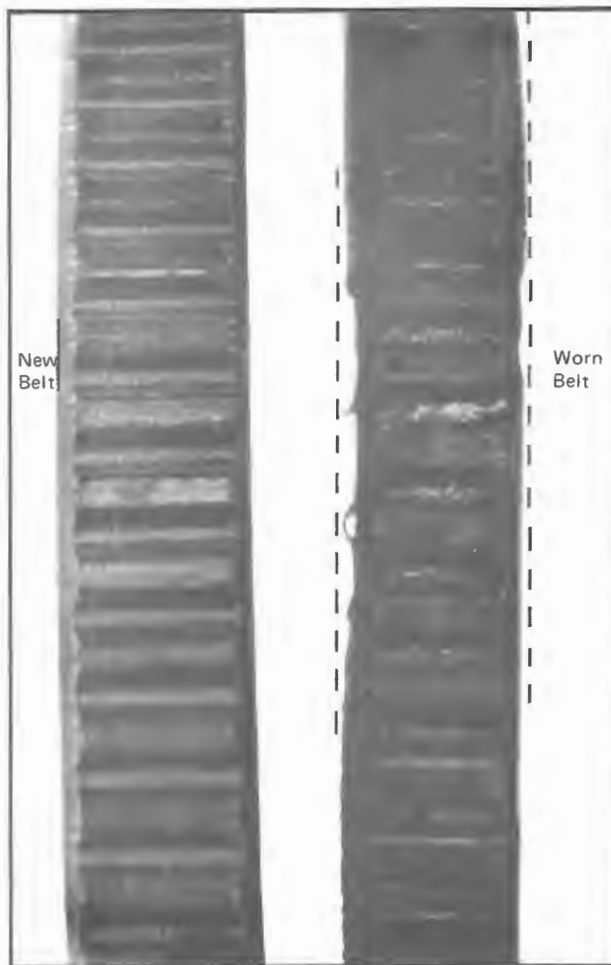
1-7-4



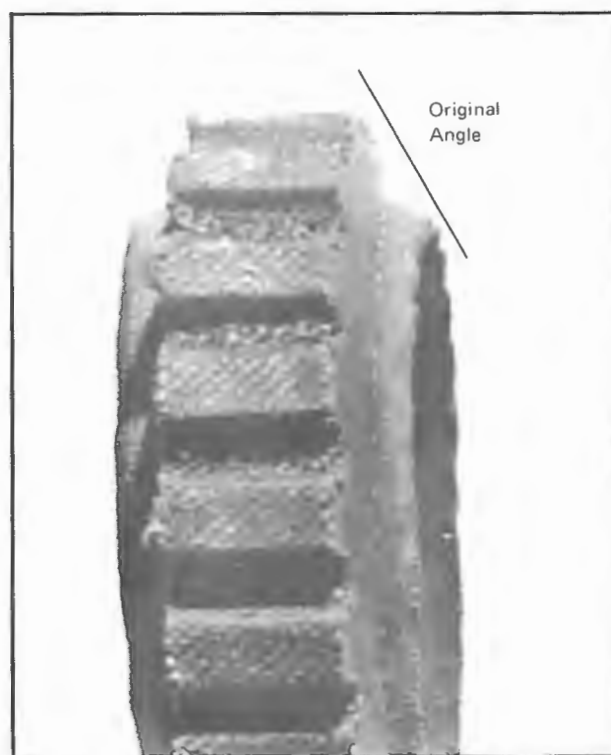
1-7-5



1-7-6

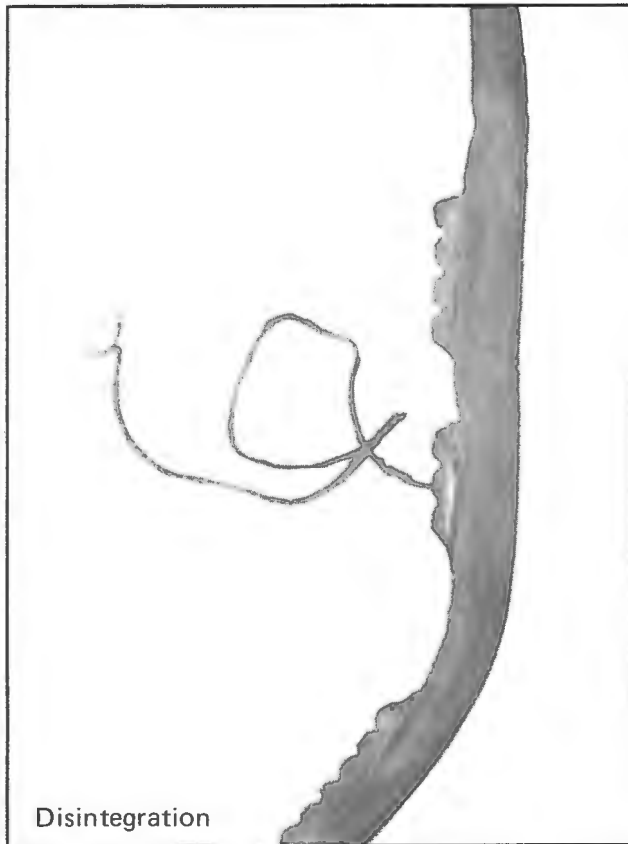


1-7-7

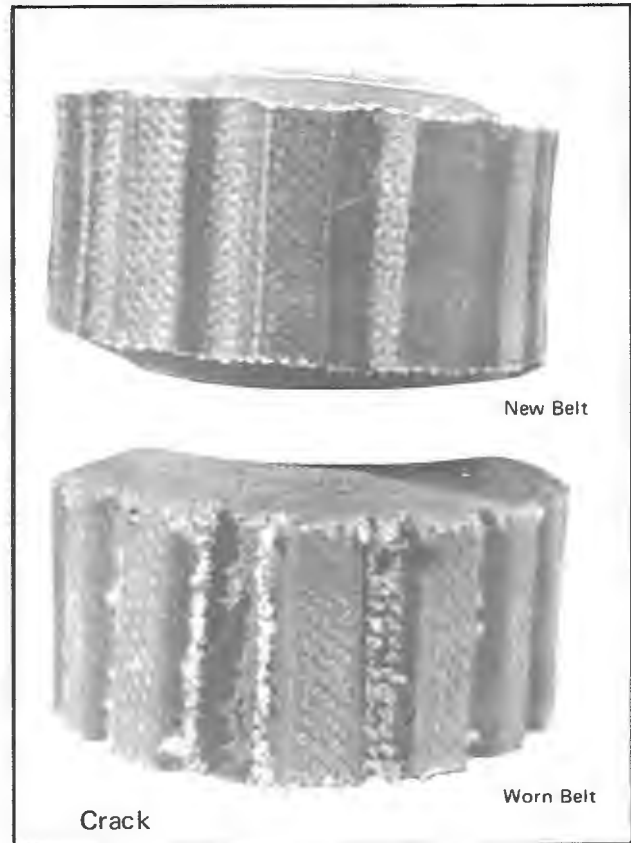


1-7-8

SYMPTOM	CAUSE	REMEDY
7. Belt disintegration. See Fig. 1-7-9	(a) Excessive belt speed (b) Oil on pulley surfaces (c) Incorrect gear ratio	(a) Using unspecified type of belt. Replace belt with correct Bombardier belt (b) Clean pulleys surfaces with fine emery cloth and clean cloth (c) Install specified sprocket (Correct gear ratio)
8. Belt "Flip-Over" at high speed.	(a) Pulley misalignment (b) Belt excessive speed (c) Excessive ride out on drive pulley (d) Incorrect sprocket ratio	(a) Align pulleys (b) Using unspecified type of belt. Replace belt with correct Bombardier belt (c) Check for proper distance between pulleys, refer to sub-section 1-9 (d) Install specified sprocket (Correct gear ratio)
9. Belt edge cord breakage. See Fig. 1-7-10	(a) Pulley misalignment	(a) Align pulleys
10. Flex cracks between cogs. See Fig. 1-7-11	(a) Considerable use, belt wearing out	(a) Replace belt
11. Sheared cogs, compression section fractured or torn. See Fig. 1-7-12	(a) Improper belt installation (b) Belt rubbing stationary object on pulleys (c) Violent engagement of drive pulley (clutch)	(a) Refer Paragraph (E) or (F) (b) Check drive components (c) Grease, replace spring or drive pulley



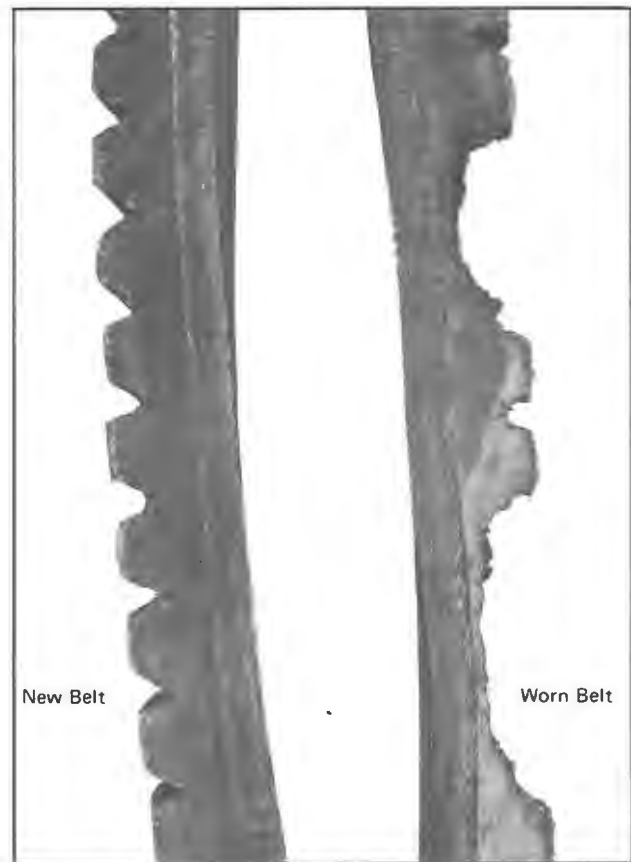
1-7-9



1-7-11



1-7-10



1-7-12

(E) INSTALLATION
(All Models except
Alpine/Invader and Valmont)

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 driven pulley from 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. Install pulley guard as detailed in sub-section 1-6. Install or close cab.

(F) INSTALLATION
(All Alpine/Invader
and Valmont Models)

1. Prior to Installation procedure, ensure

drive belt has been cleaned with a clean cloth and belt is in good condition.

2. With brake and bracket assembly rotated 1/2 turn, slip drive belt beneath driven pulley.
3. Slip belt over drive pulley.
4. Open driven pulley by twisting and pushing sliding half and hold in open position. Slip drive belt over fixed half.
5. Pivot brake and bracket assembly into position and install bolts to secure lower brake bracket to frame.
6. Insert brake cable into cable ferrule. Check brake cable adjustment as detailed in sub-section 1-10.
7. Install pulley guard as detailed in sub-section 1-6 and install cab.

TRANSMISSION

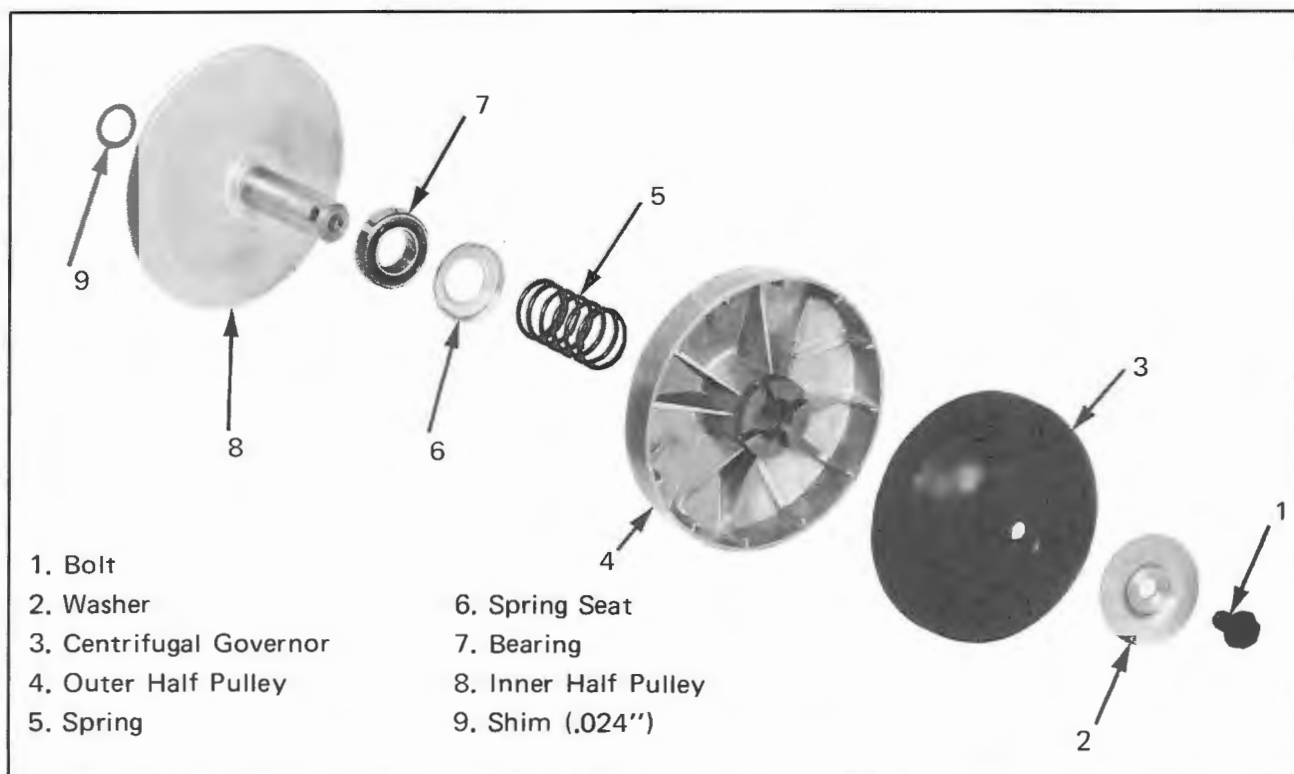
1-8 DRIVE PULLEY

(A) GENERAL

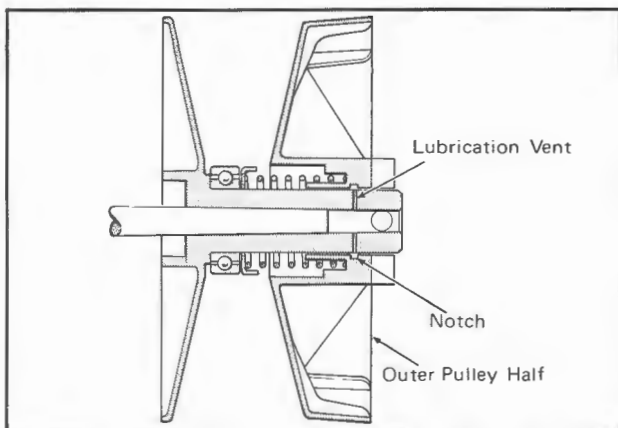
The Drive Pulley is a variable pitch pulley which transmits power from the engine to the driven pulley by means of a drive belt. The important changes in design and fabrication of the 1971 drive pulley are:

- 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 '71 pulley and the complete '70 pulley are 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 on page 1-08-02). On the 1970 pulley, lubrication is accomplished by manually distributing grease along shaft length.
- 1971 Pressure levers contained within the centrifugal governor are mounted on a lever holder. 1970 pressure levers are riveted directly to centrifugal governor brackets.

1-8



EXPLODED VIEW OF DRIVE PULLEY (1971 MODELS)



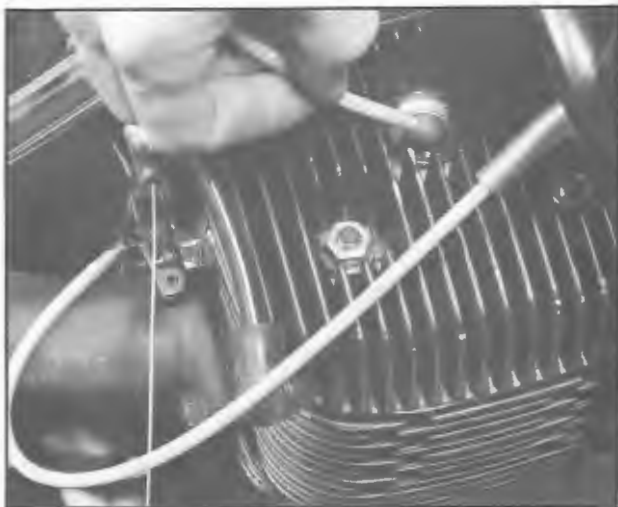
LINE DRAWING OF GREASE APERTURE

(B) REMOVAL
(All Models
with One Cylinder Engine)

1. Remove or tilt cab.
2. Remove pulley guard, refer to sub-section 1-6.
3. Remove drive belt, refer to sub-section 1-7.
4. Remove spark plug and position the piston 3/4" to 1-1/4 inches. **BEFORE TOP DEAD CENTER.**

NOTE: Make sure that the piston closes the exhaust port.

5. Lock crankshaft in position by inserting starter rope into spark plug hole (fig. 1-8-1). For final lock, pull rewind starter rope slightly.



1-8-1

6. Remove centrifugal governor bolt, washer, centrifugal governor, outer half pulley spring and spring seat from shaft of inner half pulley.
7. Using special adapter tool, remove inner half pulley (fig. 1-8-2).

NOTE: Do not remove bearing from inner half pulley unless bearing and/or inner half pulley is damaged, and replacement is necessary. Refer to Paragraph (D) for bearing replacement.



1-8-2

8. Remove starter rope from spark plug hole.

(C) REMOVAL
(All Models
with Two Cylinder Engine)

1. Remove or tilt cab.
2. Remove pulley guard as detailed in sub-section 1-6.
3. Remove drive belt, refer to sub-section 1-7.

NOTE: On 1970 and '71 T'NT 640, T'NT 775 and Nordic 640E models remove bolts attaching upper column bracket to frame to enable removal of drive pulley (fig. 1-8-3).



1-8-3

4. Remove spark plugs and position the Power Take Off side piston $3/4''$ to $1-1/4$ inches. **BEFORE TOP DEAD CENTER.**

NOTE: Make sure that the P.T.O. side piston completely closes the exhaust port.

5. Lock crankshaft in position by inserting starter rope into P.T.O. side spark plug hole (fig. 1-8-4). For final lock, pull rewind starter rope slightly.



1-8-4

6. Remove centrifugal governor bolt, washer, centrifugal governor, outer half pulley, spring and spring seat from inner half pulley.

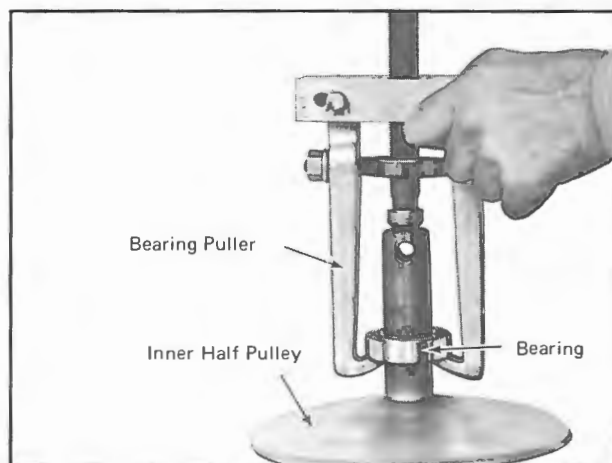
7. Using a special adapter tool, remove inner half pulley from crankshaft.

NOTE: Do not remove bearing from inner half pulley/unless bearing and/or inner half pulley is damaged, and replacement is necessary. Refer to Paragraph (D) for bearing replacement.

8. Remove starter rope from spark plug hole.

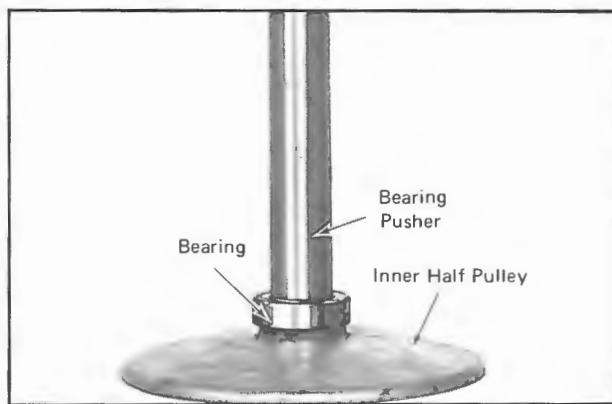
(D) Inner Half Pulley Bearing Replacement

1. Using an appropriate bearing puller, remove bearing from pulley by pulling it by inner race (fig. 1-8-5). Replace either bearing or inner half pulley.



1-8-5

2. 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. 1-8-6).



1-8-6

(E) CLEANING

1. To remove grease and dirt, place all components (except bearings) in a container of cleaning solvent. Dry using compressed air or a dry cloth.
2. Remove stationary objects (rust and/or rubber accumulation — belt wear) from inner half pulley shaft with fine steel wool. Wipe shaft with a clean cloth.

3. Remove stationary objects (rust and/or rubber accumulation) from inner and outer half pulleys with fine emery cloth. Wipe pulley halves with a clean cloth.
4. Remove any other deposits on all other components using a firm bristle brush.
5. If paint has been removed from centrifugal governor, apply a new coat using appropriate Ski-Doo Paint.

(F) 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 centrifugal governor for worn or missing pressure lever(s). Replace centrifugal governor if necessary.
3. Check for broken or distorted spring. Replace defective spring.
4. Visually inspect all other components for wear, cracks, distortion and other possible damage. Replace as necessary.
5. Inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged components.
6. Inspect general condition of bearing (installed or removed from pulley shaft) e.g. pitted or missing ball bearings, freedom of movement and radial free play. Replace defective bearing, refer to Paragraph (D), Bearing Replacement.

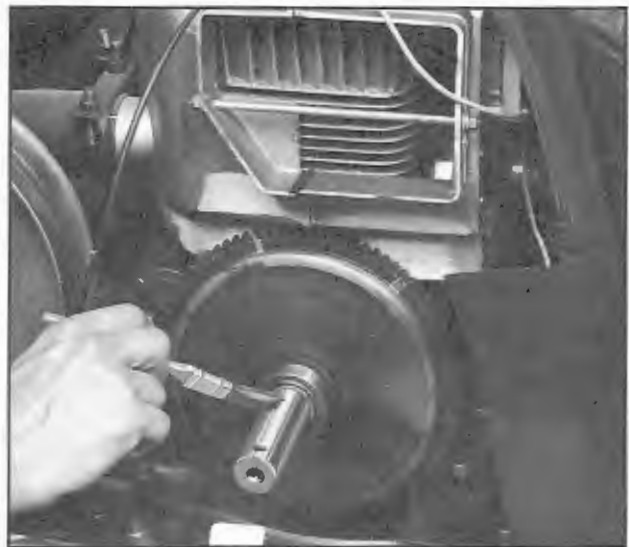
(G) INSTALLATION

1. Position the piston (on double cylinder P.T.O. side piston) 3/4 to 1-1/4 inches **AFTER TOP DEAD CENTER.**

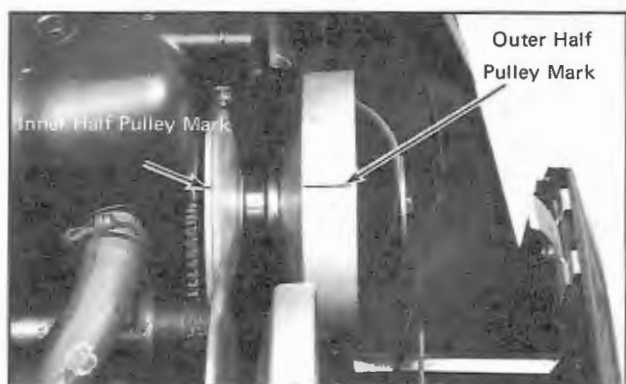
NOTE: Make sure that the piston is closing the exhaust port.

2. Insert a length of starter rope into spark plug hole (P.T.O. side for double cylinder) to lock crankshaft in position.
3. Lubricate crankshaft thread with Ski-Doo Clutch Lube and install inner half pulley.
4. On all 1970 models, apply a thin coat of Ski-Doo Clutch Lube on inner half pulley shaft (fig. 1-8-7). Position spring seat, spring and outer half pulley on shaft.

NOTE: On all 1971 models, make sure that the inner half pulley mark and the outer half pulley mark are aligned (fig. 1-8-8).

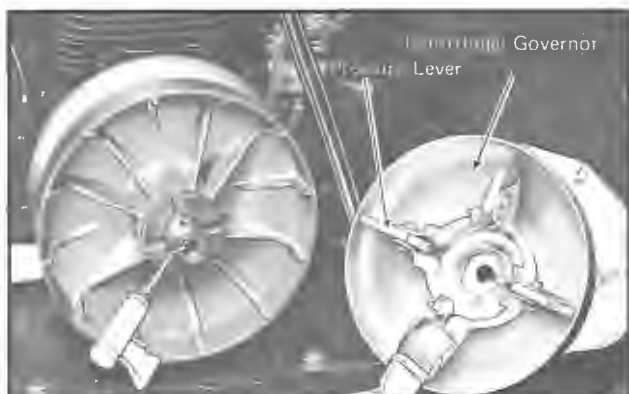


1-8-7



1-8-8

5. On all 1971 models, pack Ski-Doo Clutch Lube into bolt hole of inner half pulley shaft (fig. 1-8-9).
6. Apply a light coat of Ski-Doo Clutch Lube to the four (4) pressure levers of the centrifugal governor (See fig. 1-8-9).



1-8-9



1-8-10

7. Lubricate threads of governor attaching bolt with Ski-Doo Clutch Lube. Install centrifugal governor, washer and bolt.
8. Torque governor bolt to 400 to 475 inch-pounds (fig. 1-8-10).
9. Wipe off excess lubricant from drive pulley.

CAUTION: Excess of lubricant on pulley shaft or misalignment of mark on pulley halves can allow the lubricant to penetrate drive belt causing belt slippage and/or deterioration.

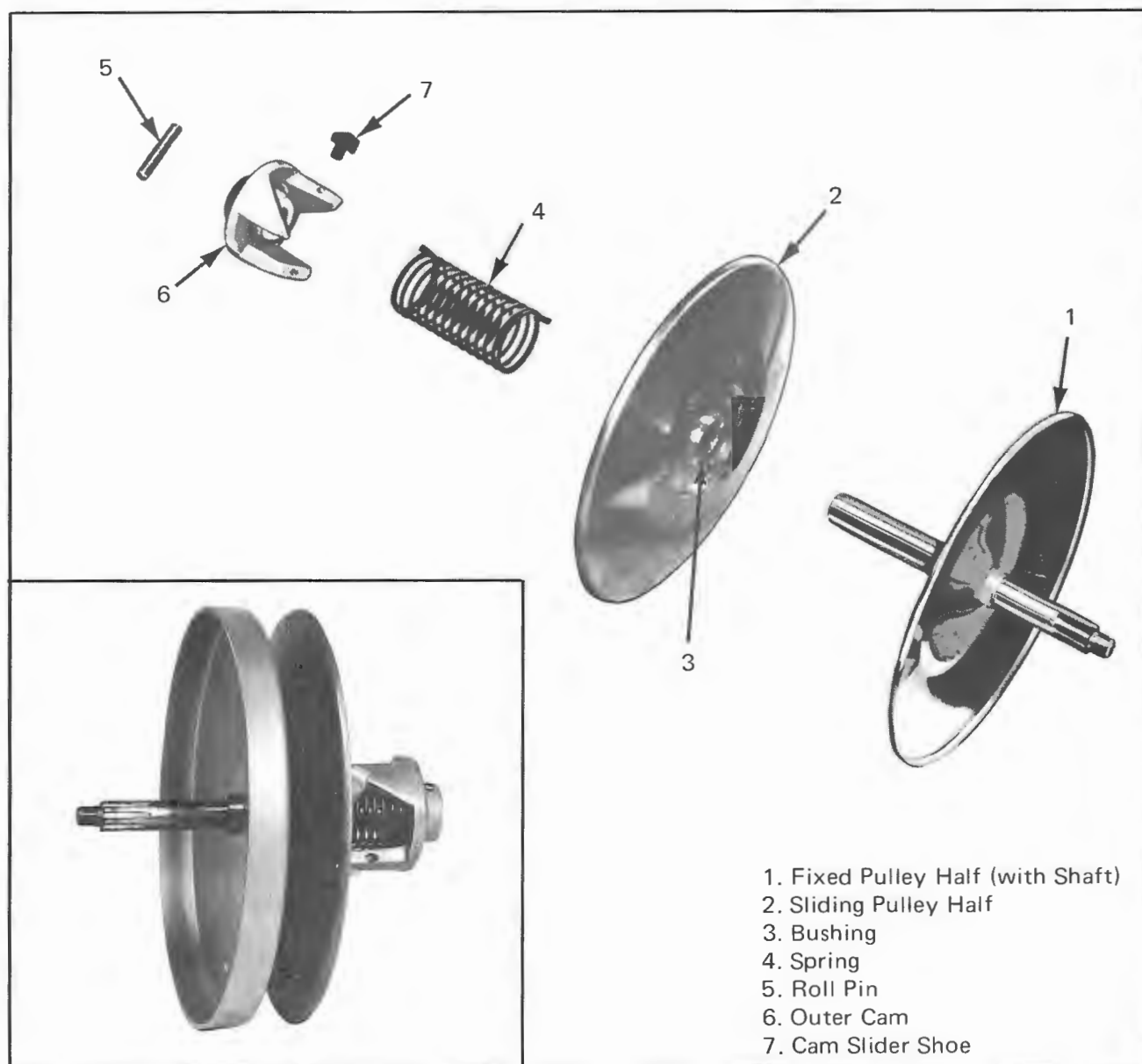
10. Unlock crankshaft by pulling out starter rope from spark plug hole.
11. Install spark plug(s).
12. Check pulley alignment, refer to sub-section 1-9.
13. Install drive belt (refer sub-section 1-7) and pulley guard (refer sub-section 1-6).
14. Install or close cab.

TRANSMISSION

1-9 DRIVEN PULLEY

(A) GENERAL

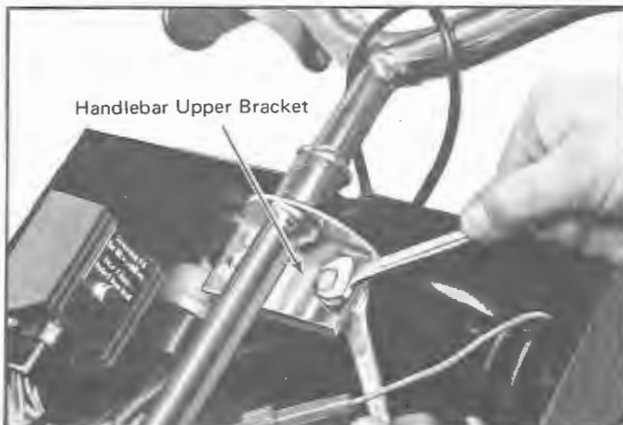
The driven pulley is a variable pitch pulley which transmits power from the drive pulley to the drive axle sprocket by means of the drive chain mounted on two sprockets. Belt engagement transmitting power to driven pulley cause the chain entrainment. Spring pressure on the sliding pulley half maintains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



EXPLODED VIEW OF DRIVEN PULLEY

(B) REMOVAL
(All Models except
Alpine/Invader and Valmont)

1. Tilt or remove the cab.
2. Remove pulley guard, refer to sub-section 1-6.
3. Remove drive belt, refer to sub-section 1-7.
4. Remove muffler from engine.
5. On vehicles equipped with 15 inch track, remove bolts and nuts securing steering column upper bracket (fig. 1-9-1).

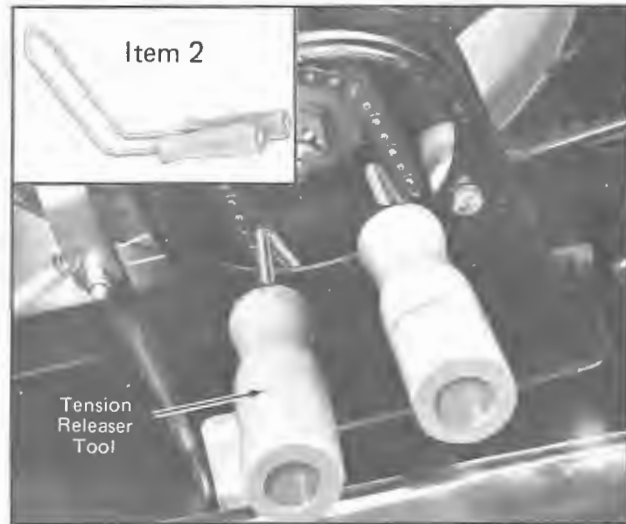


1-9-1

6. Pry out inspection cover from chain case.
7. On 1970 models, slacken drive chain tension by partially unscrewing tensioner lock nut. Using a soft faced hammer, gently knock tensioner bolt counter-clockwise (fig. 1-9-2). On 1971 models, release chain tension by inserting a chain tension releaser tool (item 2), (fig. 1-9-3).

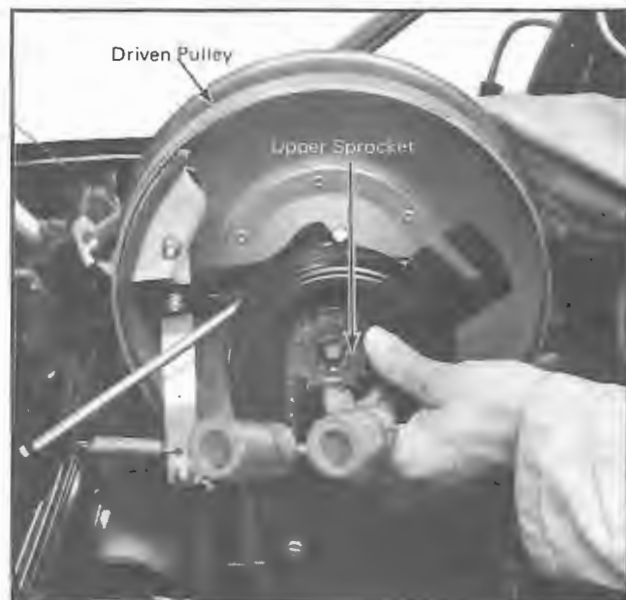


1-9-2



1-9-3

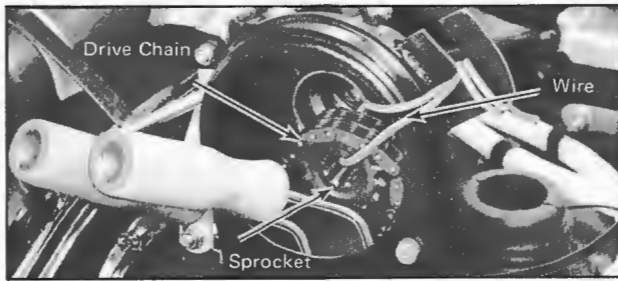
8. Remove cotter pin, castellated nut and spring washer from driven pulley shaft within chain case.
9. Hold upper sprocket with chain in position and pull out driven pulley towards engine side (fig. 1-9-4).



1-9-4

CAUTION: Exercise care while removing driven pulley to ensure that bearing cone does not fall into chain case.

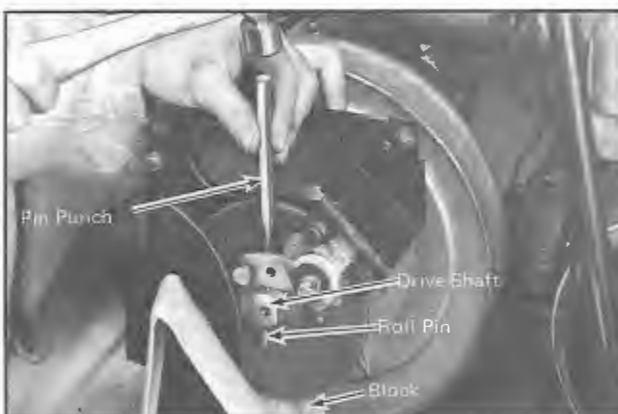
10. Remove bearing cone from bearing cup and attach sprocket and drive chain with a wire to prevent them from falling into chain case (fig. 1-9-5).



1-9-5

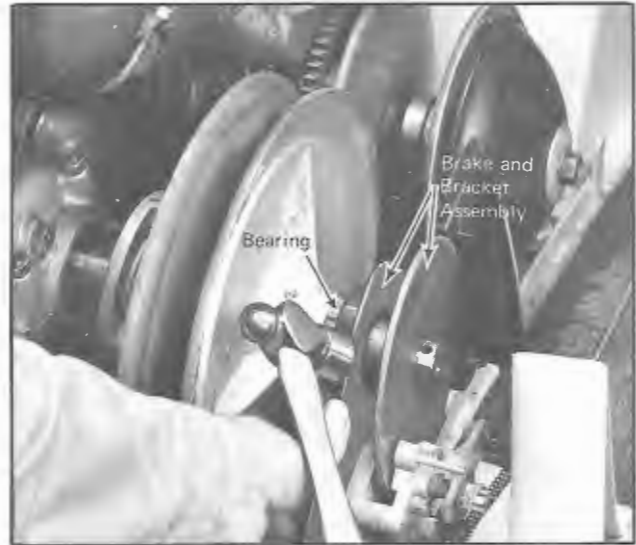
(C) REMOVAL (All Alpine/Invader and Valmont Models)

1. Remove cab.
2. Remove pulley guard, refer to sub-section 1-6.
3. Remove drive belt, refer to sub-section 1-7.
4. With brake and bracket assembly rotated 1/2 turn, support assembly by positioning a locally manufactured block (5-3/8 x 3 x 1 inches) under drive shaft.
5. Remove pulley guard holder.
6. Using a hammer and a pin punch, remove roll pin locking disc in position (fig. 1-9-6).
7. With a hammer, tap on inner side of brake and bracket assembly to disengage it from the bearing (fig. 1-9-7).
8. On all 1970 models, remove washer, spring washer, disc and spacer.



1-9-6

9. On all 1971 models, remove disc, spring washer and spacer.



1-9-7

10. Remove muffler from engine.
11. Remove nuts securing steering column lower bracket from the gear box. Slacken bolts and nuts securing steering column upper retainer plate.
12. Disconnect brake and throttle cables at ferrule and pivoting slug located on the handlebar. Pull steering column rearwards to provide working space and allow removal of gear box housing.
13. Disconnect transmission rod from gear box by removing cotter pin, spring and washer.
14. Remove eight (8) nuts securing gear box upper housing. Loosen housing using a soft faced hammer.
15. Release chain tension to maximum slackness by rotating eccentric tensioner.
16. Separate chain as detailed in sub-section 1-13.

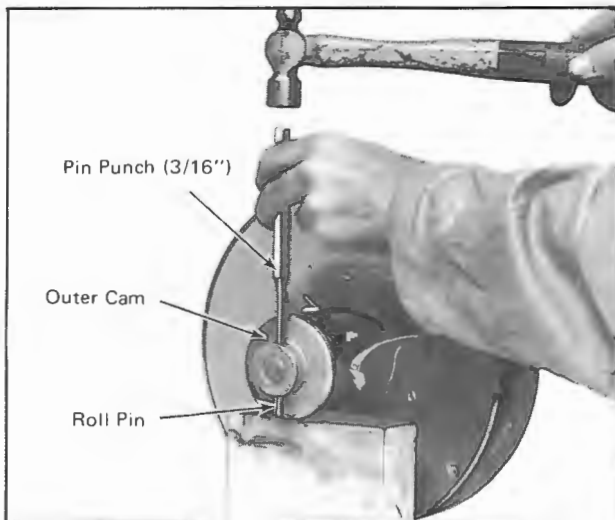
18. Withdraw assembled driven pulley (fig. 1-9-8).



1-9-8

(D) DISASSEMBLY
(All Models except
Alpine/Invader and Valmont)

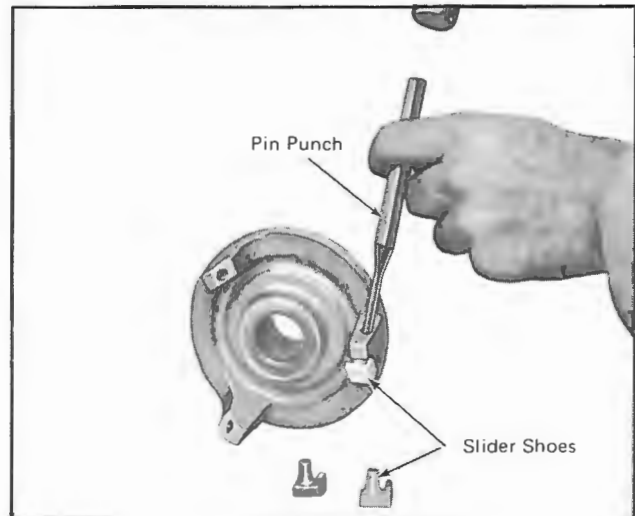
1. Place a support under outer cam and using a pin punch (3/16 inch), push roll pin locking cam to fixed pulley half shaft (fig. 1-9-9).



1-9-9

2. Pull off outer cam, spring and sliding pulley half from fixed pulley half shaft.
 3. Using a pin punch, remove outer cam slider shoes from outer cam (fig. 1-9-10).

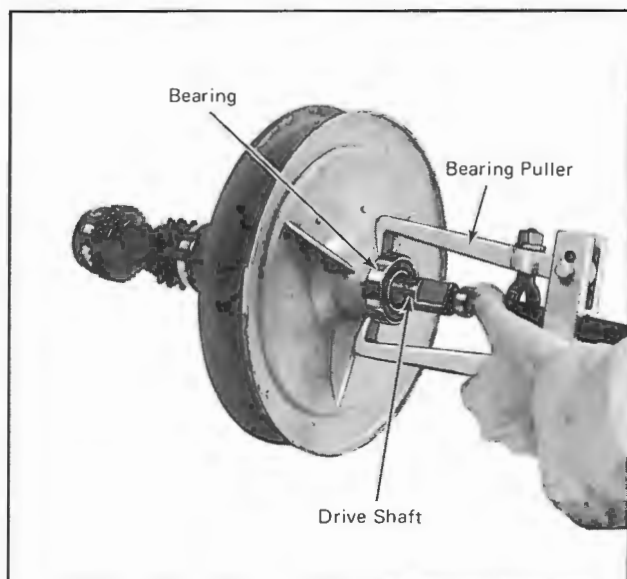
NOTE: Do not remove bushing from sliding pulley half unless bushing is damaged, and replacement is necessary. Refer to Paragraph (F), Bushing Replacement.



1-9-10

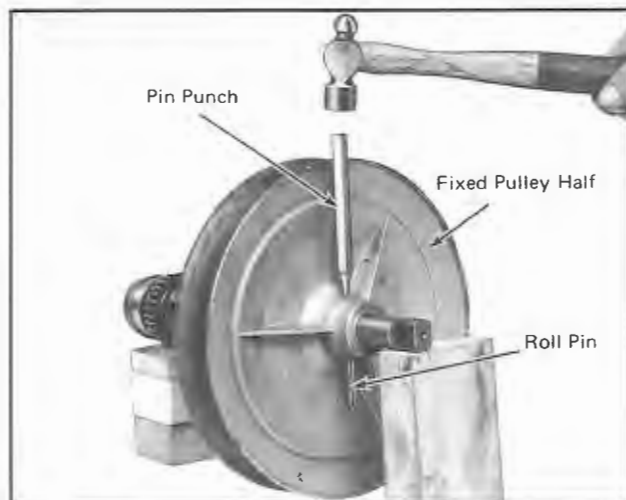
(E) DISASSEMBLY
(All Alpine/Invader
and Valmont Models)

1. Using a suitable bearing puller, remove bearing from drive shaft (fig. 1-9-11).



1-9-11

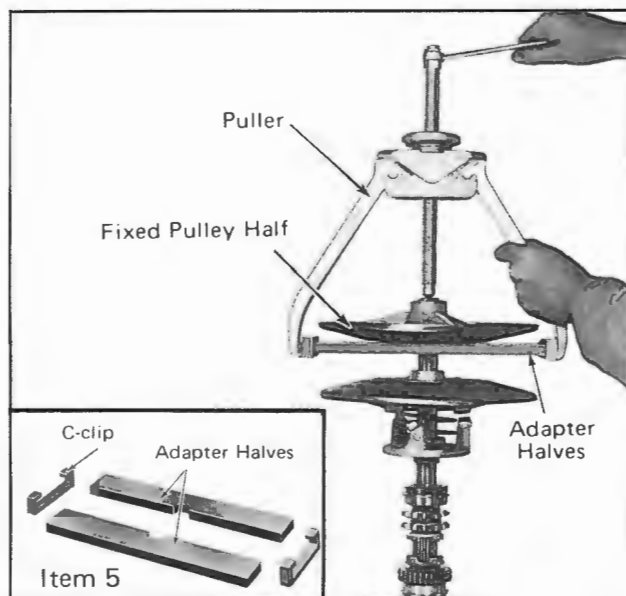
2. Using a pin punch and hammer, remove inner pins installed in larger roll pin securing fixed pulley half to shaft. Remove larger roll pin (fig. 1-9-12).



1-9-12

3. Open sliding pulley half and insert both halves of special puller adapter (item 5) between pulley halves. Install C-clips. Install puller and remove fixed pulley half (fig. 1-9-13).

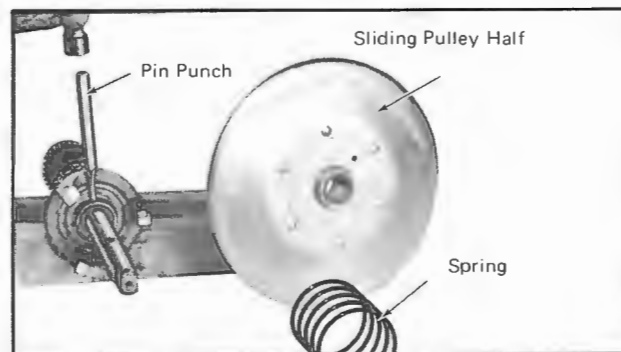
NOTE: If necessary, heat hub of fixed pulley half to facilitate removal.



1-9-13

4. Remove sliding pulley half and spring. With a pin punch and hammer, remove roll pins securing outer cam (fig. 1-9-14).

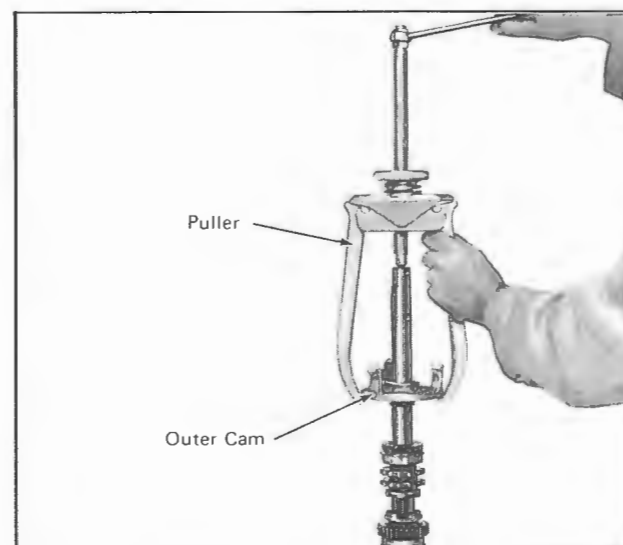
NOTE: Do not remove bushing from sliding pulley half unless damaged, and replacement is necessary. Refer to Paragraph (F), Bushing Replacement.



1-9-14

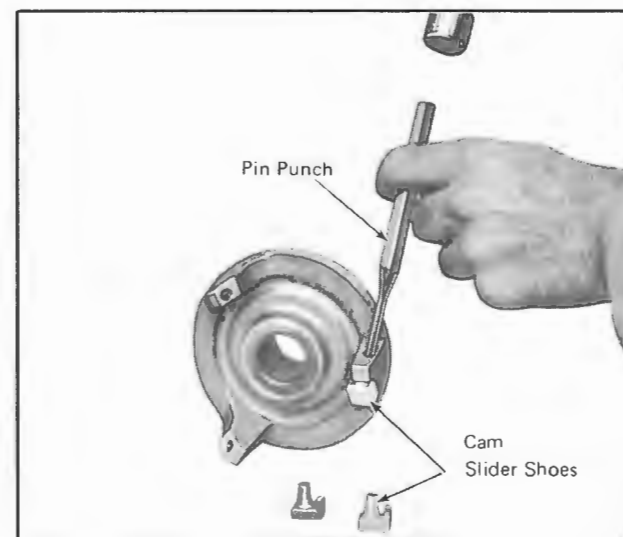
5. Install puller and remove outer cam from drive shaft (fig. 1-9-15).

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



1-9-15

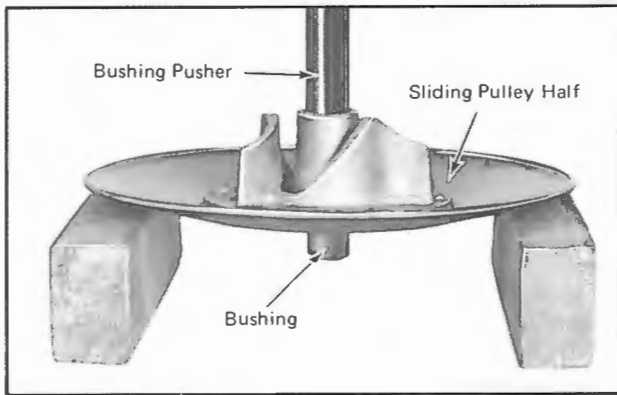
6. Using a pin punch, push cam slider shoes from outer cam (fig. 1-9-16).



1-9-16

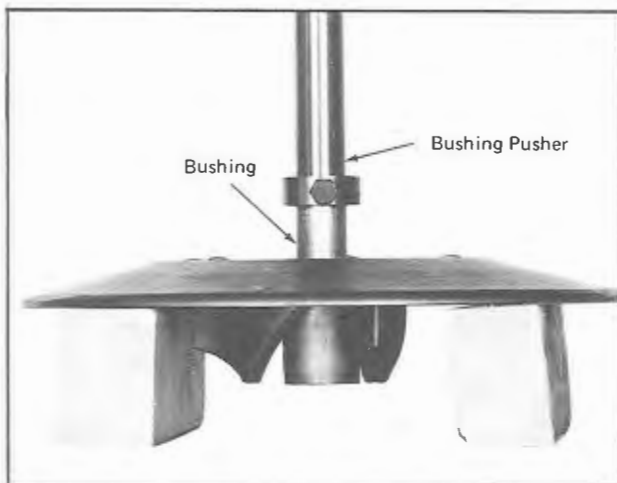
(F) Replacement of Sliding Pulley Half Bushing

1. Using an appropriate bushing pusher, press bushing from pulley (fig. 1-9-17).



1-9-17

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



1-9-18

(G) CLEANING

1. Clean grease and dirt from cam slider shoes with a clean cloth.

CAUTION: Do not use cleaning solvent on shoes as it may permanently damage the components.

2. To remove grease and dirt, place all

components in a container of cleaning solvent. Dry using compressed air or a dry cloth.

3. Remove stationary objects (rust and/or rubber accumulation – belt wear) from fixed pulley half shaft with fine steel wool. Wipe shaft with a clean cloth.
4. Remove stationery objects (rust and/or rubber accumulation) from fixed and sliding half pulleys with fine emery cloth. Wipe pulley halves with a clean cloth.
5. Remove any other deposits on all other components using a firm bristle brush.

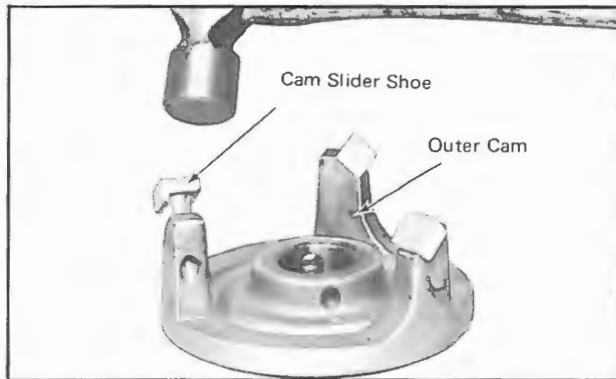
(H) INSPECTION

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.
5. Inspect internal surface of bushing (installed or removed) for off-center wear or other damage. Replace defective bushing as detailed in Paragraph (F), Bushing Replacement.

(J) ASSEMBLY

(All Models except Alpine/Invader and Valmont)

1. Prior to Assembly procedure, ensure all components are clean and all defective parts have been repaired or replaced.
2. Using a hammer, install cam slider shoes on outer cam (fig. 1-9-19).

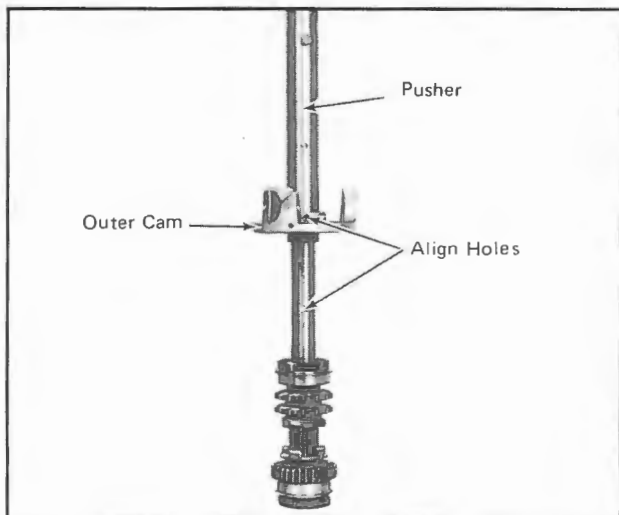


1-9-19

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

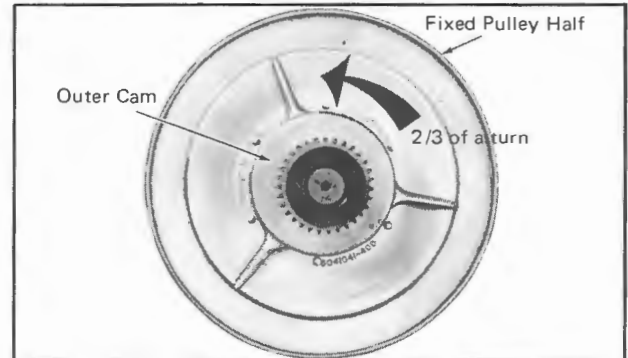
(K) ASSEMBLY
(All Alpine/Invader
and Valmont Models)

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.
3. Using an appropriate pusher, press down on outer cam until hole in cam mates with third hole in shaft (fig. 1-9-20). Install larger roll pin then small roll pins to lock outer cam in position.



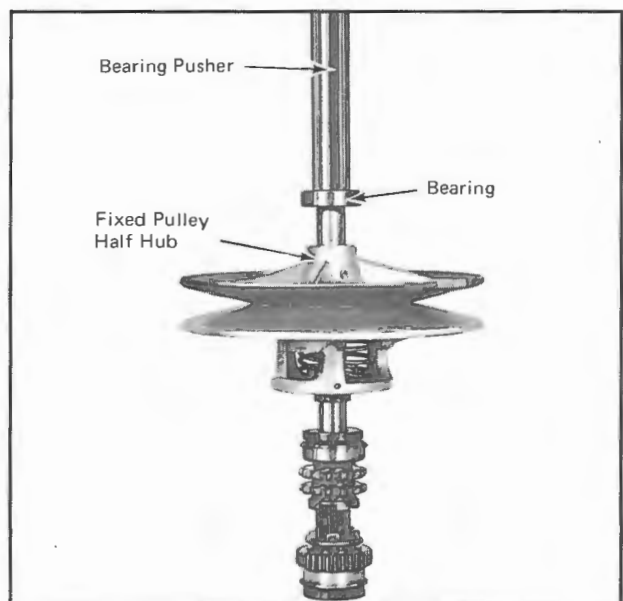
1-9-20

4. 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 counterclockwise 2/3 of a turn (when facing outer cam) and hold in position (fig. 1-9-21).



1-9-21

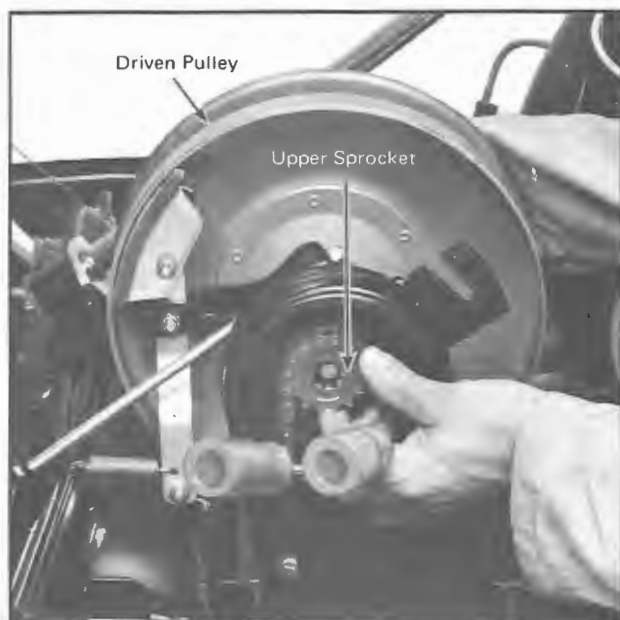
5. Align hole in fixed pulley half with holes in shaft. Position fixed pulley half on shaft and push using pusher until hole in pulley half mates with second hole of drive shaft. Using a pin punch and hammer, install larger roll pin and then small roll pins.
6. Using an appropriate bearing pusher, press bearing until it sits on fixed pulley half hub (fig. 1-9-22).



1-9-22

(L) INSTALLATION
(All Models except
Alpine/Invader and Valmont)

1. With the drive chain tension released, position the bearing cone in the bearing cup. Hold upper sprocket with chain in position and insert assembled driven pulley shaft through chain case and sprocket (fig. 1-9-23).



1-9-23

2. Install spring washer and castellated nut.

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 on drive pulley shaft.

3. On 1970 models apply drive chain tension by rotating eccentric tensioner until free play of 1/4 inch is obtained. Tighten tensioner lock nut.

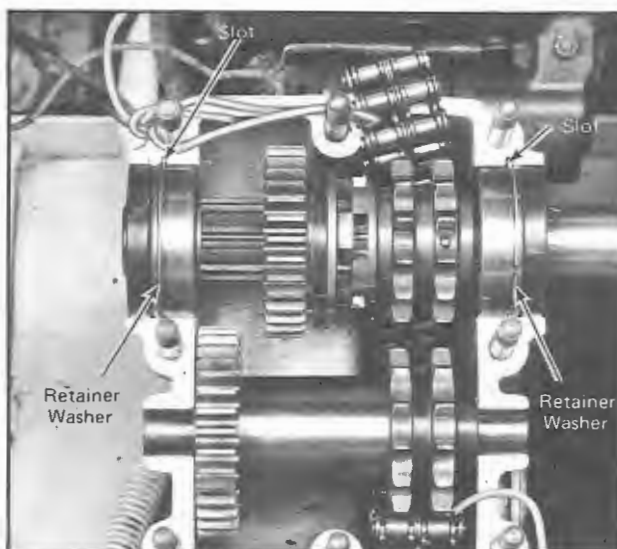
NOTE: On 1971 models apply chain tension by removing releaser tool from chain case.

4. Check chain case oil level, level off if necessary. Install inspection cover.
5. Install engine muffler.

6. On 15 inch track vehicles, bolt handle-bar upper bracket in position.
7. Check pulley alignment as detailed in Paragraph (M), following.
8. Install drive belt as described in subsection 1-7.
9. Install pulley guard as detailed in subsection 1-6.
10. Close or install cab.

(M) INSTALLATION
(All Alpine/Invader
and Valmont Models)

1. Position drive shaft of assembled driven pulley so that retainer washers align with slots of gear box casing (fig. 1-9-24).

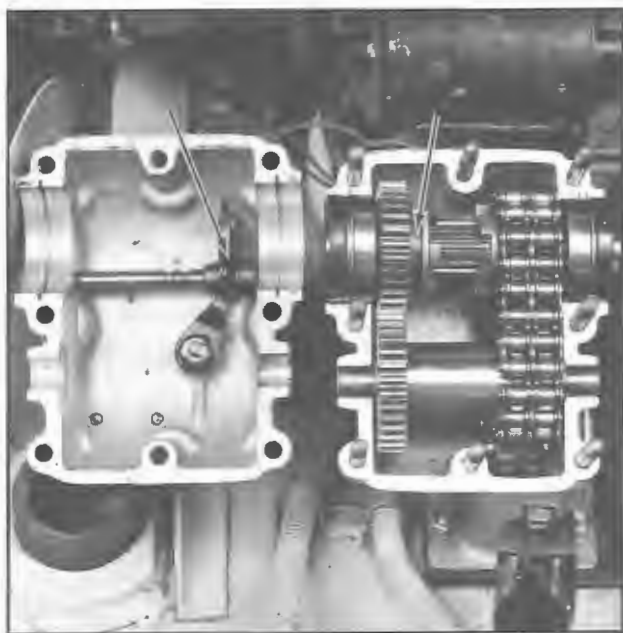


1-9-24

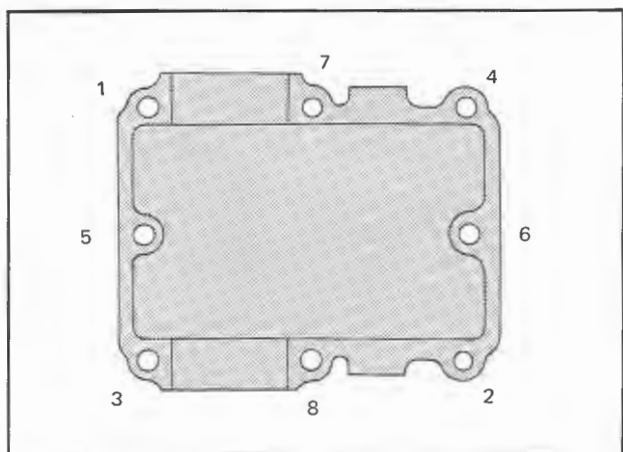
2. Place a clean cloth beneath drive shaft and in gear box casing to prevent foreign matter and/or removed components from falling into bottom of casing.
3. Connect drive chain using a double connecting link.

NOTE: The locking clip should be installed on opposite side of driven pulley.

4. Position gear change fork in gear box cover so that it aligns with slot of sliding gear in gear housing (fig. 1-9-25).

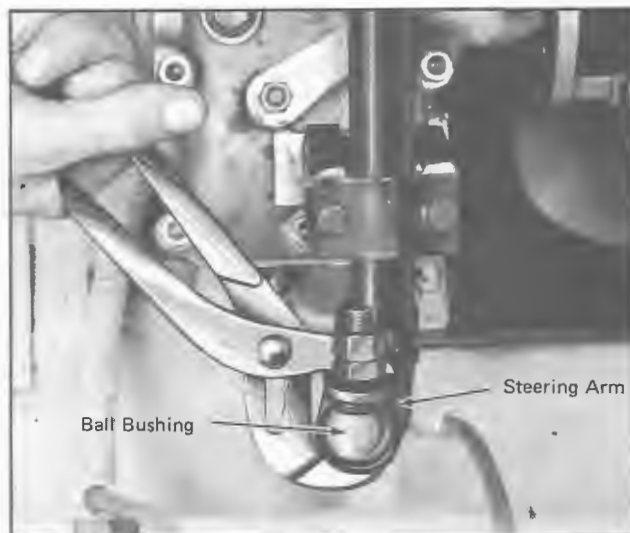


5. Apply a thin coat of L. 700 Crankcase Glue on contact surface of gear box casing.
6. Install gear box cover and secure with eight (8) nuts. Torque nuts to 250 inch-pounds following the sequence shown in figure 1-9-26.



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.

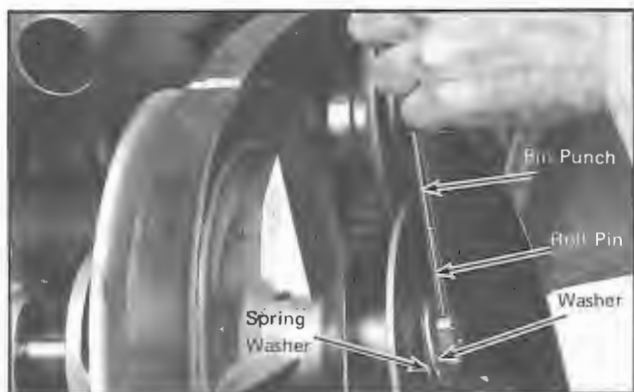
NOTE: If difficulty is encountered, use pliers to align column ball bushing and steering arm (fig. 1-9-27).



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

NOTE: On 1970 Alpine/Invader models, the distance between the upper retainer plate and the gear box bracket must be 17-3/4 inches. On 1971 Alpine/Valmont models, the distance must be 15-1/2 inches.

10. Connect throttle and brake cables and housings at handlebar.
11. Install drive belt as detailed in subsection 1-6.
12. Install muffler to engine.
13. Position spacer on drive shaft. On all 1971 models install spring washer. On all vehicles install brake and bracket on shaft with disc between brake shoes then push bracket until it sits on bearing.
14. Install bolts and nuts securing brake and bracket assembly to frame.
15. On 1970 models, install spring washer and washer.
16. Using a pin punch and hammer, install roll pin through disc and shaft (fig. 1-9-28).

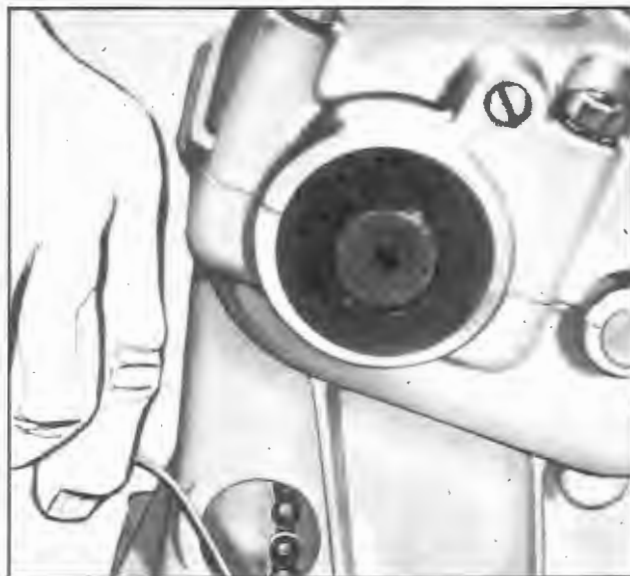


1-9-28

17. Install pulley guard holder.
18. Remove capscrew and lock washer locking gear box tensioner. Remove inspection cover.
19. Adjust drive chain tension to obtain 1/4 inch free play maximum by turning tensioner clockwise or counterclockwise. Secure tensioner in position with lock washer and capscrew.
20. Check gear box oil level using a rigid wire as dipstick. Oil level in 399 models

should be 2-1/4 inch on dipstick. On 640 models, oil level should be 3-1/4 inch (fig. 1-9-29). Replenish, if required, with Ski-Doo Chain Case Oil. Install inspection cover and vent plug.

21. Install pulley guard as detailed in subsection 1-6 and install cab.



1-9-29

TRANSMISSION

1-9-1 PULLEY ALIGNMENT

(A) ALIGNMENT OF DRIVE AND DRIVEN PULLEYS (All Models except Alpine/Invader and Valmont)

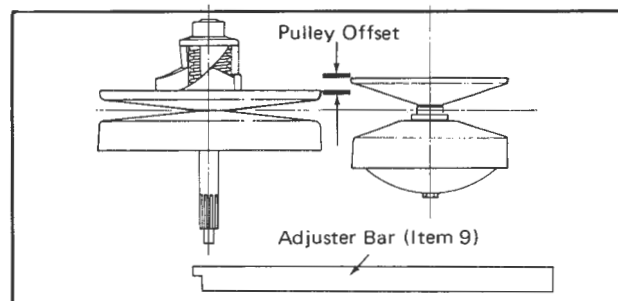
Reduced vehicle performance (loss of engine power) is often due to misalignment of drive and driven pulleys. Misalignment may also result in excessive drive belt wear. If alignment is suspect or if either one or both pulleys have been removed from vehicle during any overhaul procedure, drive and driven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

IMPORTANT

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

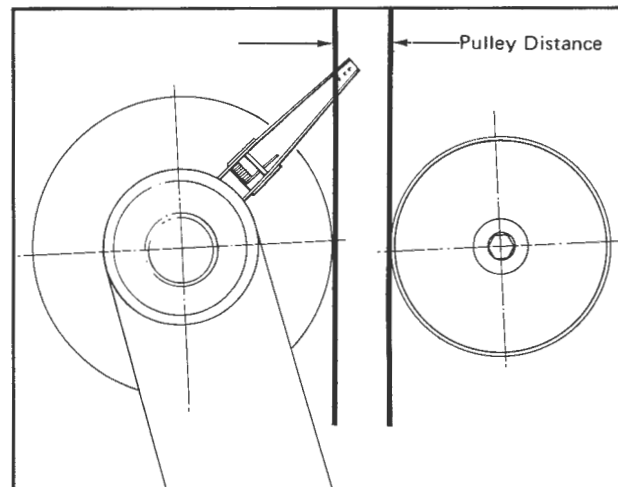
1. Alignment Check

- (a) Tilt or remove the cab.
- (b) Remove pulley guard as detailed in sub-section 1-6.
- (c) Remove drive belt as detailed in sub-section 1-7.
- (d) Check tightness of engine mount nuts. Nuts must be torqued to 400 to 420 inch-pounds.
- (e) Ensure the driven pulley halves are adjoined before checking pulley offset.
- (f) Using the appropriate adjuster bar (item 8) check for correct offset of pulleys as follows:(refer figure 1-9-30).



1-9-30

- (i) On all 1970 vehicles except T'NT 340, pulley offset must be 1/2 inch towards engine side.
 - (ii) On all 1970 T'NT 340 models, pulley offset must be 3/8 inch.
 - (iii) Pulley offset for all 1971 vehicles must be $1/2 \pm 1/32$ inch.
- (g) Check that distance between drive and driven pulleys is as follows: (fig. 1-9-31).



1-9-31

- (i) On all 1970 vehicles, pulley distance must be $1-7/8 + 0 - 1/16$ inch.
- (ii) On all 1971 models, pulley distance must be $1-7/8 \pm 1/32$ inch.

2. Alignment Offset Adjustment

- (a) If offset between drive and driven pulleys is GREATER than specifications adjust as follows:

- (i) Remove drive pulley assembly as detailed in sub-section 1-8.
- (ii) Install required thickness of aligning shims on crankshaft (fig. 1-9-32).



1-9-32

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

- (iii) Install drive pulley assembly as detailed in sub-section 1-8.
- (b) If offset between drive and driven pulleys is LESS than specifications adjust as follows:
 - (i) Loosen nuts securing chain case "U" clamp and lower bracket to frame.
 - (ii) On 1970 vehicles equipped with 18 inch track, loosen bolts securing footrest to chain case (fig. 1-9-33).



1-9-33

- (iii) Insert required thickness of aligning shims between chain case and frame. Total quantity of shims must not exceed three (3) (fig. 1-9-34).

NOTE: Shims may be cut in half and installed to correct a crooked chain case.



1-9-34

- (iv) Tighten chain case "U" clamp and lower bracket nuts. Verify pulley distance is within specifications.
- (v) On all 1970 vehicles equipped with 18 inch track, tighten bolts securing footrest to chain case.

3. Alignment Distance Adjustment

- (a) If distance between drive and driven pulleys is not to specifications adjust as follows:
 - (i) Loosen nuts securing chain case "U" clamp and lower bracket to frame.
 - (ii) On 1970 vehicles equipped with 18 inch track, slacken bolts securing footrest to chain case (see fig. 1-9-33).

- (iii) If the distance is LESS, tighten the nut on the special screw or hinge rod until distance is 1-7/8 inch between pulleys (fig. 1-9-35).



1-9-35

NOTE: On Elan models, to increase or decrease distance between pulleys tighten or loosen nut securing hinge at reinforcing cross support of frame.

- (iv) If the distance is MORE, loosen the nut on the special screw or hinge rod and gently tap the chain case rearward to decrease the distance. Retighten clamps.
- (b) After completing drive and driven pulley alignment check the following.
 - (i) On 1970 models, ensure that free play of drive chain tension is 1/4 inch maximum.
 - (ii) On 1970 and 1971 models, check that brake applies fully when brake lever is 1/4 inch from handlebar.
 - (iii) Recheck pulley alignment.

**(B) ALIGNMENT OF
DRIVE AND DRIVEN PULLEYS
(All Alpine/Invader
and Valmont Models)**

1. 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. There is no pulley offset adjustment if offset is less than specified tolerance ($1/2 \pm 1/32$ inch) due to the same technical reason mentioned above.

IMPORTANT: If distance between pulleys or if offset is less than specifications, 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).

2. Alignment Check

- (a) To check if offset between drive and driven pulleys is GREATER than specification ($1/2 \pm 1/32$ inch), refer to Paragraph (A), step 1 for procedure.

3. Alignment Offset Adjustment

- (a) If offset between drive pulleys is GREATER than specification, adjust as follows:
 - (i) Remove drive pulley assembly as detailed in sub-section 1-8.
 - (ii) Install required thickness of aligning shims on crankshaft.

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

- (iii) Install drive pulley assembly as detailed in sub-section 1-8.
- (iv) Check that brake applies fully when brake lever is 1/4 inch from handlebar grip.
- (v) Recheck pulley alignment.

TRANSMISSION

1-10-1 BRAKE MECHANISM

(A) GENERAL

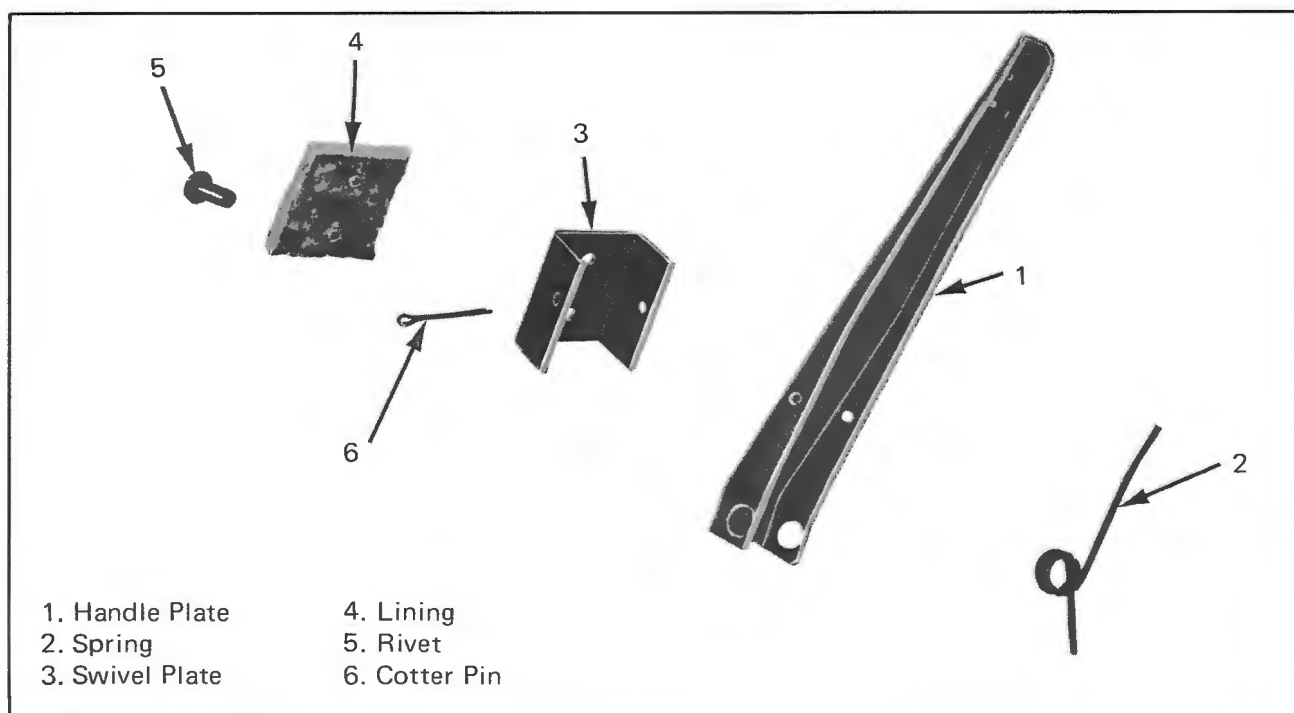
1. There are three (3) types of brakes installed on Ski-Doo snowmobiles; pivot, drum and disc type.

(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.

(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 shoe and lining to come in contact with the drum (driven pulley rim) effecting reduced speed.

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

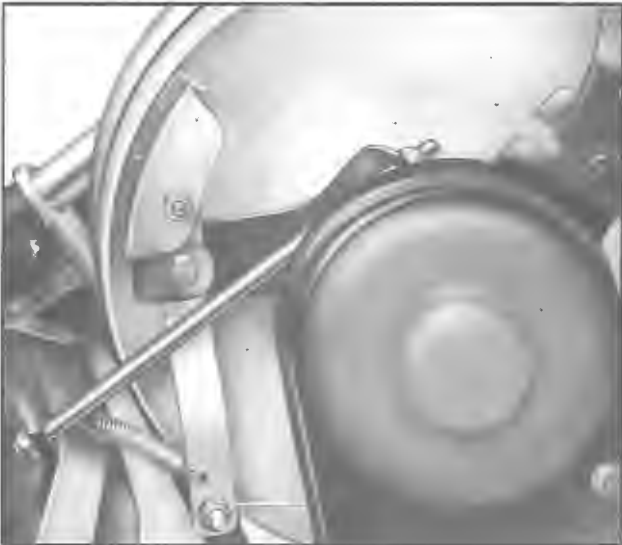
Brake release is controlled by a spring either secured to the lever (handle plate) or incorporated on the brake cable.



DISASSEMBLED VIEW OF ELAN BRAKE (PIVOT TYPE)



PIVOT TYPE BRAKE



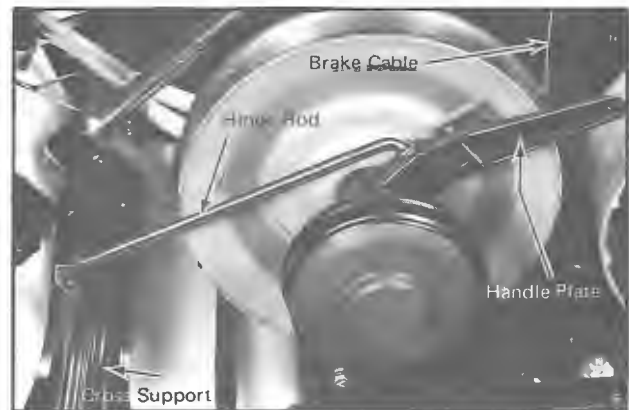
DRUM TYPE BRAKE



DISC TYPE BRAKE

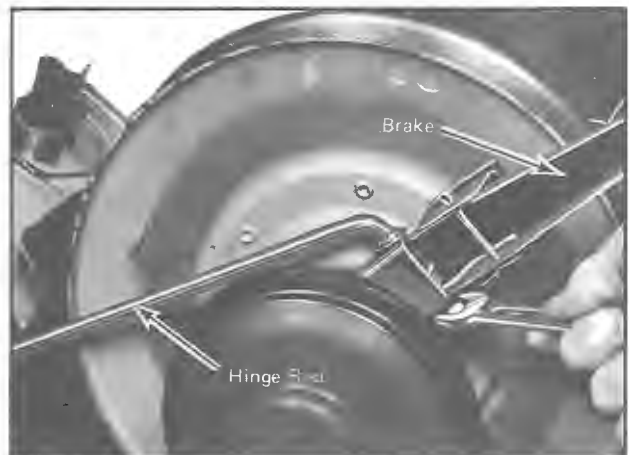
(B) REMOVAL (All Elan Models)

1. Tilt cab and remove the console.
2. Remove the drive belt as detailed in sub-section 1-7.
3. Disconnect the brake cable from the handle plate. Remove nut securing hinge rod to reinforcing cross support at frame (fig. 1-10-1).



1-10-1

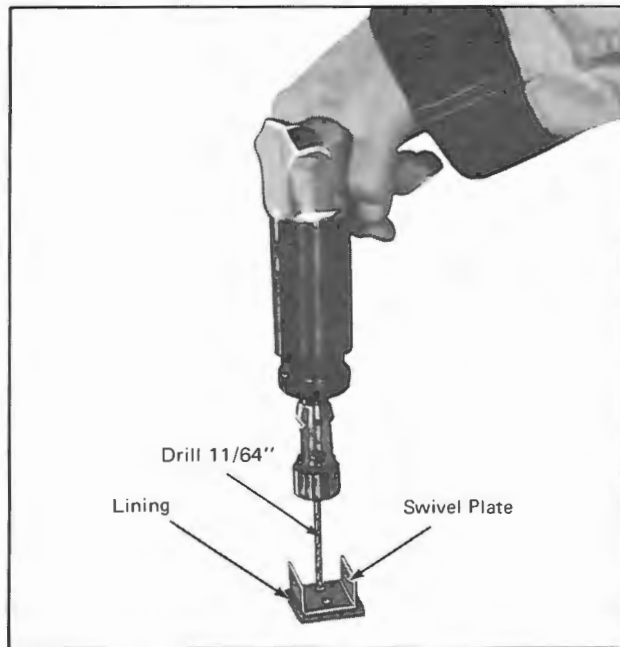
4. Remove "U" clamp securing chain case and remove aligning shims. Loosen nut attaching chain case lower bracket to frame.
5. Disengage hinge rod from cross support by pulling chain case towards drive pulley.
6. Remove nut securing hinge rod to chain case bracket. Remove hinge rod, spring and brake mechanism (fig. 1-10-2).



1-10-2

(C) DISASSEMBLY

1. Remove and discard the cotter pin securing handle plate to swivel plate.
2. Using a 11/64 inch dia drill, remove the rivets attaching lining to swivel plate (fig. 1-10-3).



1-10-3

(D) CLEANING

1. Clean grease and dirt from hinge rod, handle and swivel plates and spring using a firm bristle brush.
2. If paint has been removed, apply a new coat using appropriate Ski-Doo Paint.

(E) INSPECTION

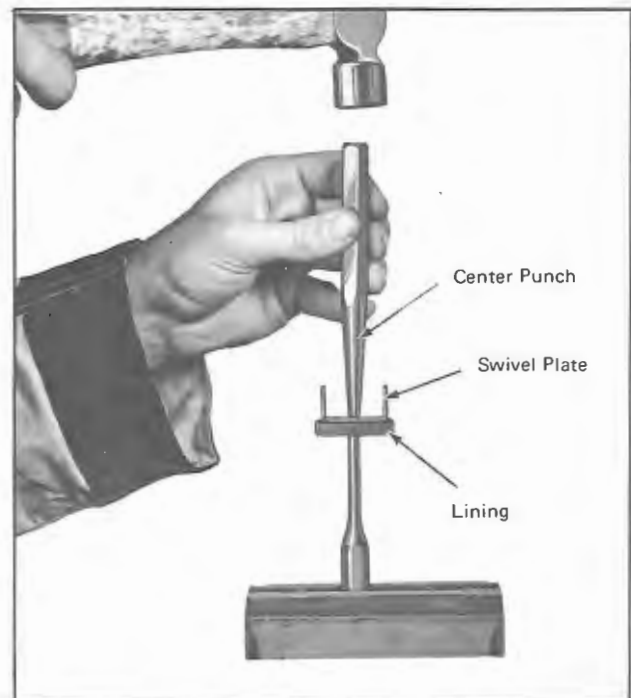
1. Visually inspect hinge rod, swivel and handle plates for wear or distortion. Replace defective component(s).
2. Inspect the hinge rod for stripped, crossed or otherwise damaged threads. Replace damaged rod.
3. Inspect brake lining for wear and oil-soakage. Rivet heads must be embedded below upper surface of lining. Replace worn or oil-soaked lining.

NOTE: If lining is oil-soaked, check chain case oil seal for correct installation position. Wipe off oil from pulley.

4. Check brake spring for weakness and/or distortion. Replace defective spring.

(F) 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. 1-10-4). Secure rivets using a flat head punch.



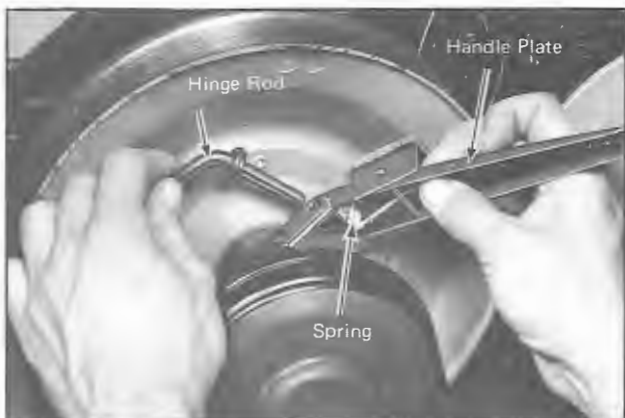
1-10-4

3. Position the swivel plate on the handle plate and secure the unit using a new cotter pin.

(G) INSTALLATION

1. Place the spring into handle plate with the long wire end beneath the cotter pin. Hold the spring in location and position the handle plate into chain case bracket. Insert hooked end of hinge rod through

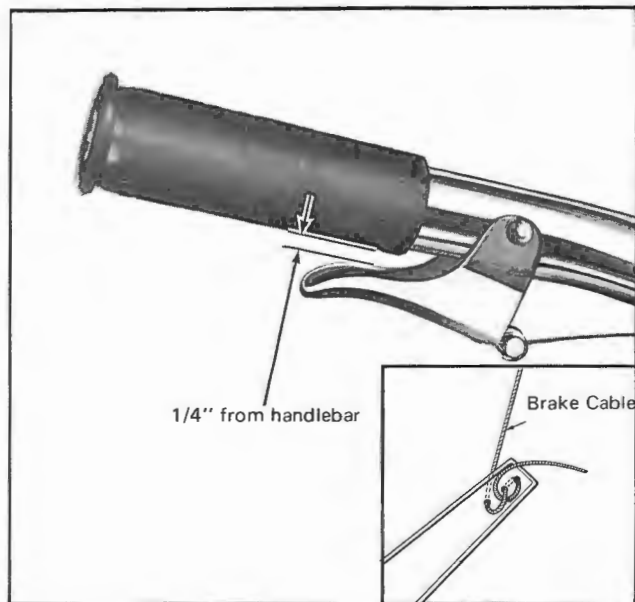
bracket, loops of spring and handle plate. Secure rod to chain case bracket with nut (fig. 1-10-5).



1-10-5

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 rod end.
3. Install chain case "U" clamp and previously removed aligning shims.
4. Check pulley alignment as detailed in sub-section 1-9.

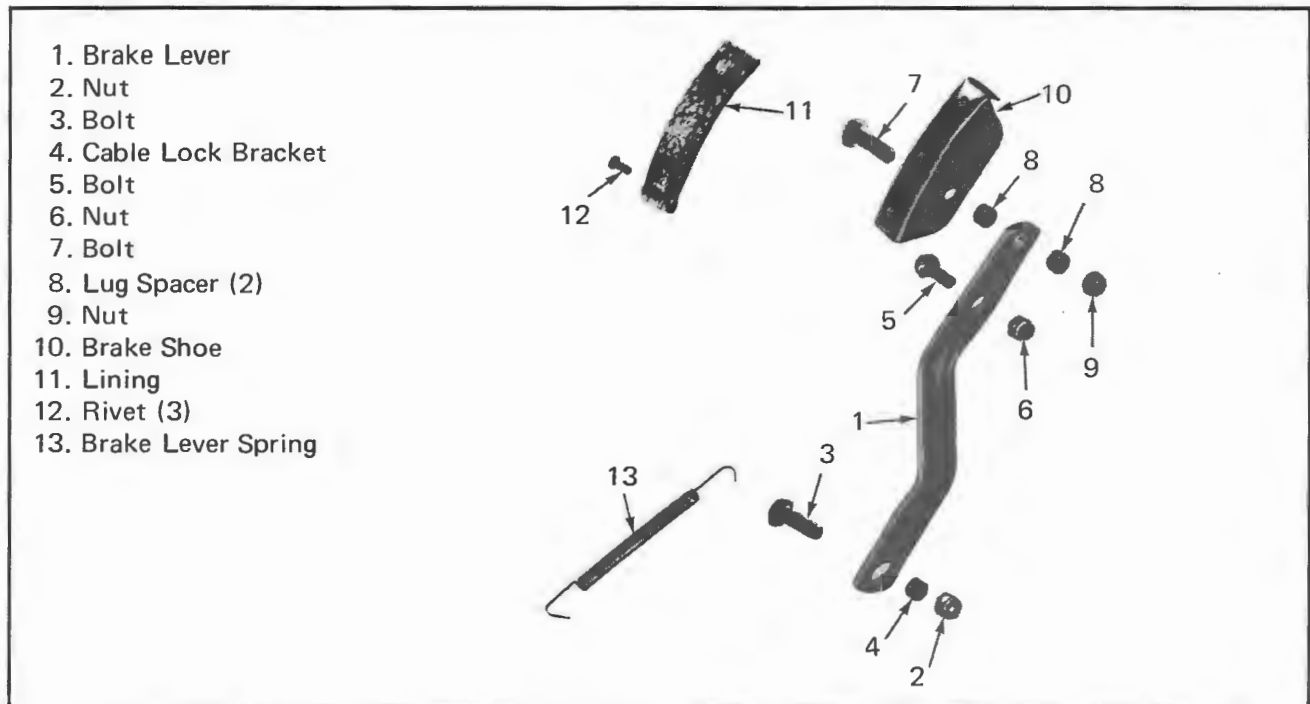
5. Connect brake cable to handle plate and adjust cable length until brake applies fully with brake lever is 1/4 inch from handlebar (fig. 1-10-6).



1-10-6

6. Install drive belt as detailed in sub-section 1-6.
7. Install console and close cab.

1-10-2 BRAKE (All T'NT, Olympique and Nordic Models)



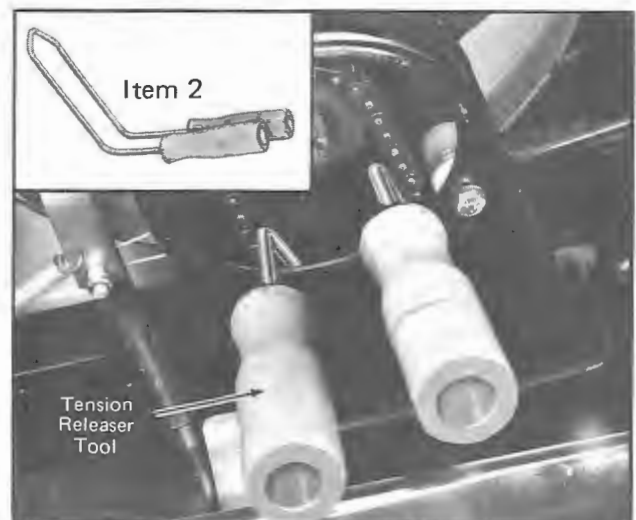
DISASSEMBLED VIEW OF DRUM TYPE BRAKE

(A) REMOVAL

1. Tilt or remove cab.
2. Remove pulley guard as detailed in sub-section 1-6.
3. On 1971 models, remove drive belt as detailed in sub-section 1-7.
4. Disconnect brake lever spring. Remove nut, screw, cable lock bracket securing brake cable to brake lever (fig. 1-10-7).
5. On 1970 models, remove nut and bolt attaching brake lever to chain case bracket. Remove brake mechanism from vehicle.
6. On 1971 models, carry out the following:
 - (a) Remove inspection cover. Insert chain tension releaser tool (item 2), (fig. 1-10-8).

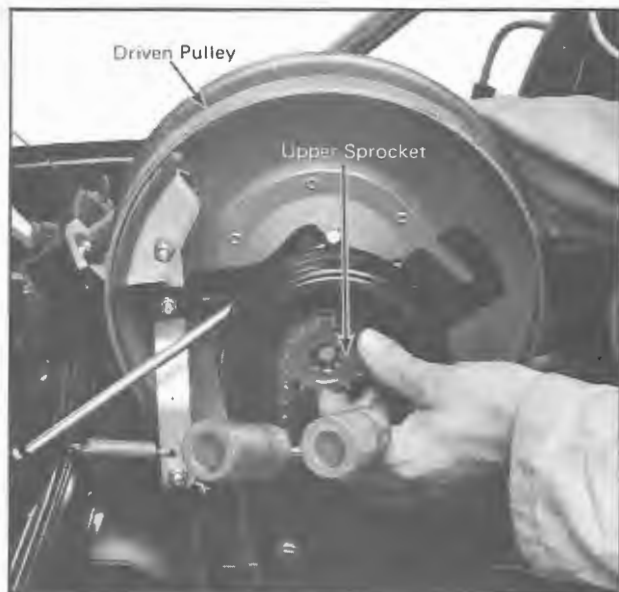


1-10-7



1-10-8

- (b) Remove cotter pin, castellated nut and washer securing upper sprocket to driven pulley shaft. Push driven pulley shaft inwards until shaft end is flush with outer flange of upper sprocket (fig. 1-10-9).



1-10-9

- (c) Remove bolt and nut securing brake lever to chain case bracket. Remove brake mechanism from vehicle (fig. 1-10-10).

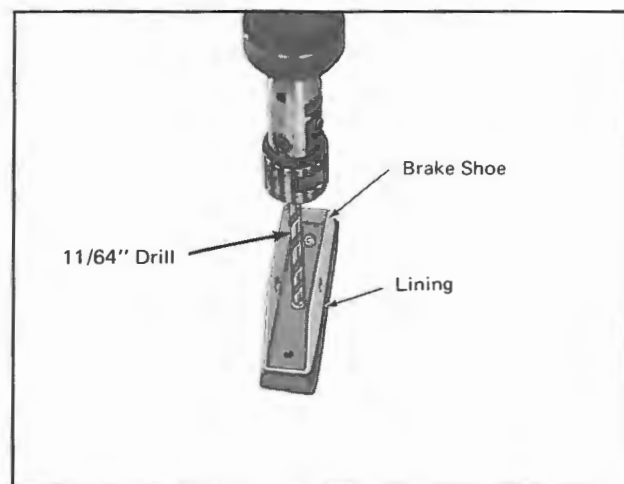


1-10-10

(B) DISASSEMBLY

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

2. Using a 11/64 inch dia drill, remove the rivets attaching lining to brake shoe (fig. 1-10-11).



1-10-11

(C) CLEANING

1. Clean grease and dirt from all components (except brake lining) using a firm bristle brush.
2. If paint has been removed apply a new coat using appropriate Ski-Doo Paint.

(D) INSPECTION

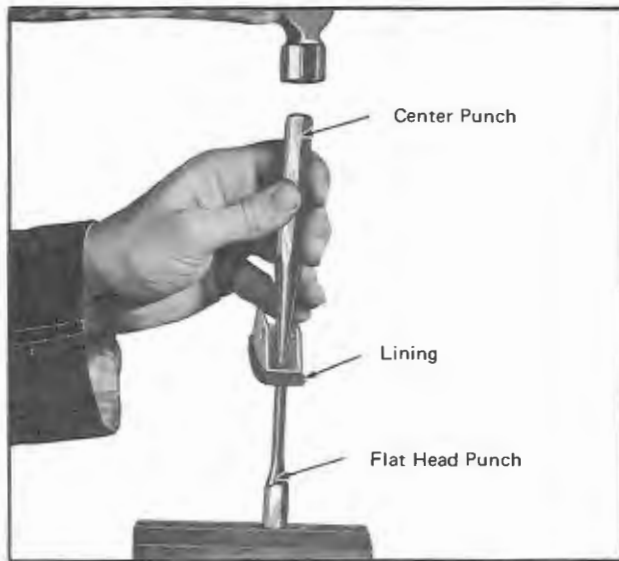
1. Visually inspect brake lining for wear. Rivet heads must be embedded below upper surface of lining. Replace worn lining.

NOTE: If lining is oil-soaked, check chain case oil seal for correct installation position. Wipe off oil from pulley.

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

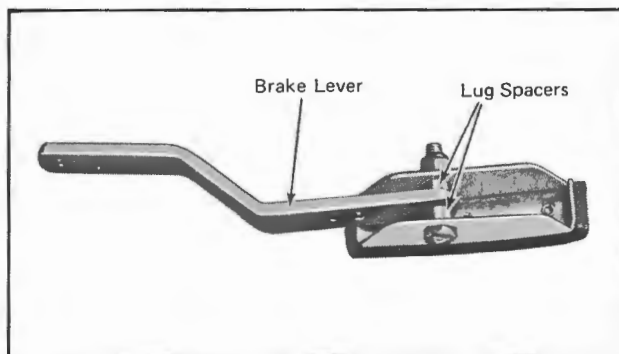
(E) ASSEMBLY

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 using appropriate rivets (fig. 1-10-12). Secure rivets using a flat head punch.



1-10-12

3. Secure the shoe assembly to the brake lever using a nut, screw and lug spacers (fig. 1-10-13).



1-10-13

4. Position cable lock bracket on the brake lever and install screw and nut. Tighten nut finger tight.

(F) INSTALLATION

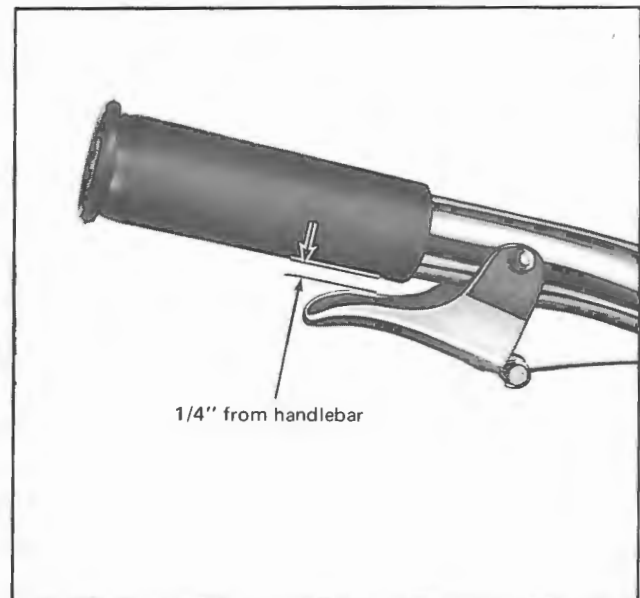
1. Attach the brake lever to the chain case bracket using a nut and bolt. Tighten nut until lever pivots freely but all side play is eliminated. Hook the brake lever spring into position.
2. Using light machine oil, lubricate all moving metal parts of brake.

NOTE: Avoid getting oil on brake shoe.

3. On 1971 models, push the driven pulley shaft through chain case sprocket. Install washer and castellated nut. Remove chain tension releaser tool (item 2) from chain case.

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

4. Connect brake cable between cable lock bracket and brake lever. Adjust brake cable so that brake applies fully when hand lever is 1/4 inch from handlebar. Tighten cable attaching nut (fig. 1-10-14).



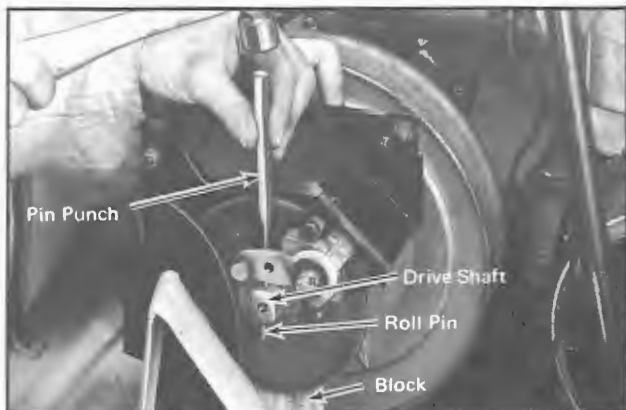
1-10-14

5. On 1971 models, install drive belt as detailed in sub-section 1-7.
6. Install pulley guard as detailed in sub-section 1-6.
7. Install or close cab.

1-10-3 BRAKE (All Alpine/Invader and Valmont Models)

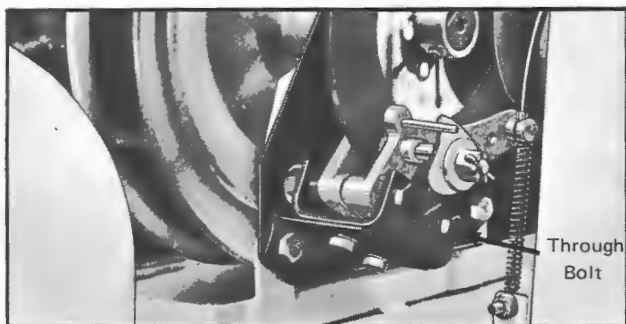
(A) REMOVAL

1. Remove cab. Remove pulley guard as detailed in sub-section 1-6.
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.
4. Brace driven pulley shaft by positioning a locally manufactured 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. 1-10-15).



1-10-15

5. Remove nuts and through bolts securing brake unit to support and remove spacers and disc brake unit halves (fig. 1-10-16).

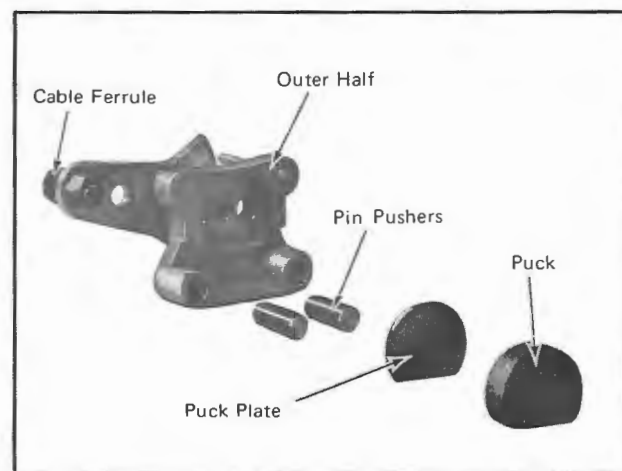


1-10-16

6. On 1970 models, remove washer, spring washer, disc and spacer.
7. On 1971 models, remove disc, spring washer and spacer.

(B) DISASSEMBLY

1. Remove puck (brake lining), puck plate and pin pushers from outer half of disc unit (fig. 1-10-17).



1-10-17

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

2. Remove brake cable ferrule and nut.

(C) CLEANING

1. Clean dirt and grease from all components using a firm bristle brush and a clean cloth. If paint has been removed, apply a new coat using appropriate Ski-Doo Paint.

(D) INSPECTION

1. Check disc pucks (installed or removed) for damage or wear.
2. Check brake lever spring for weakness and/or distortion. Replace defective spring.
3. Inspect all threaded parts for stripped, crossed or otherwise damaged threads.

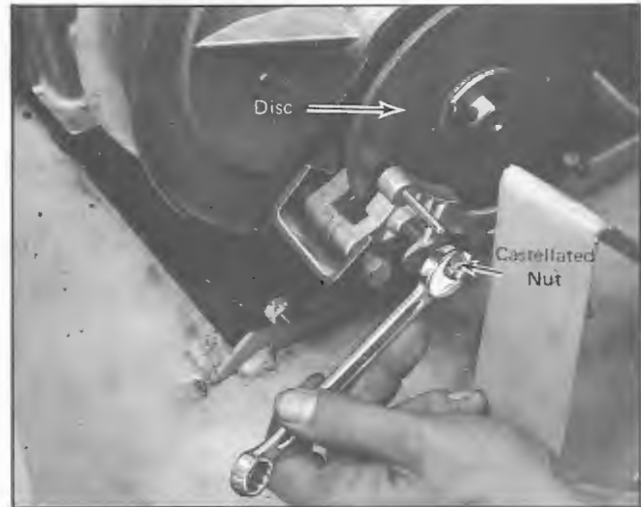
BRAKE MECHANISM

1-10-09

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

(E) ASSEMBLY

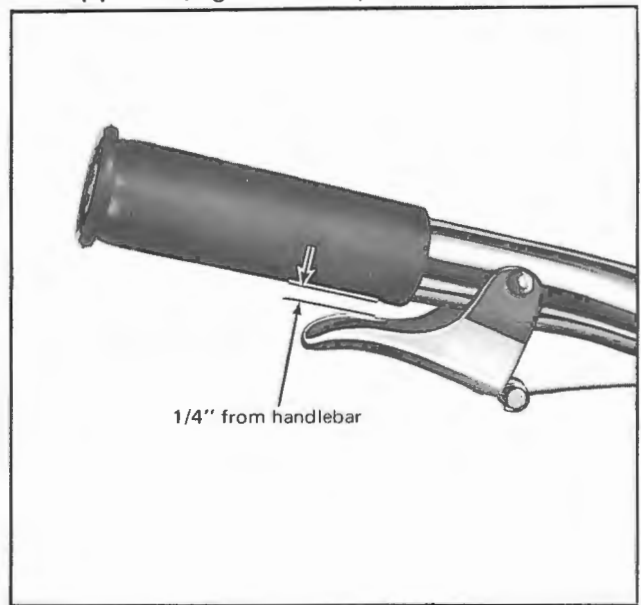
1. Prior to Assembly procedure, ensure all parts are clean and all defective components have been repaired or replaced.
2. On 1970 models, install spacer, disc, spring washer and washer on driven pulley shaft.
3. On 1971 models, install spacer, spring washer and disc.
4. Using a pin punch and hammer install roll pin securing the installed components to shaft.
5. Position the pulley guard holder in location and secure using bolts and nuts.
6. Secure brake cable ferrule with nut to lever of outer half.
7. Install the two (2) pin pushers in location with the round end facing towards lever of outer half. Position puck plate and place puck into outer half.
8. Align inner and outer halves in location. Insert the through bolts with spacers. Secure with spacers and nuts.
9. Remove cotter pin from castellated nut on disc unit.
10. Check free play. If pucks are too far from disc, tighten castellated nut until a disc/puck friction is felt (fig. 1-10-18). Back off nut $1/6$ of a turn. Install new cotter pin.



1-10-18

11. Insert brake housing through ferrule then install cable spring and adjust and secure brake cable to frame.

NOTE: The brake hand handle must be $1/4$ inch from handlebar when fully applied (fig. 1-10-19).



1-10-19

12. Install pulley guard as detailed in subsection 1-6. Install cab.

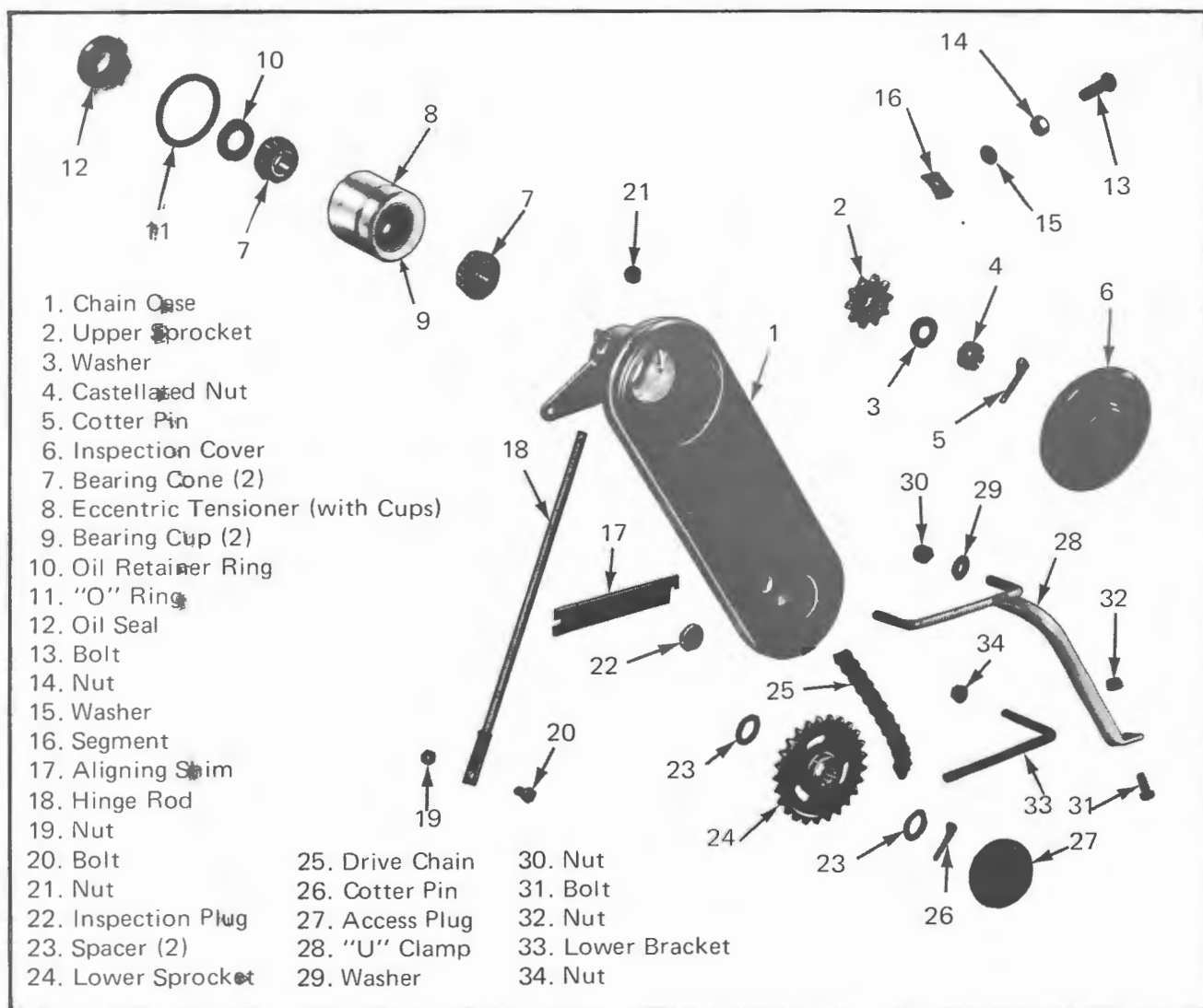
CHAIN CASE

1-11 CHAIN CASE (All Models except Alpine/Invader and Valmont)

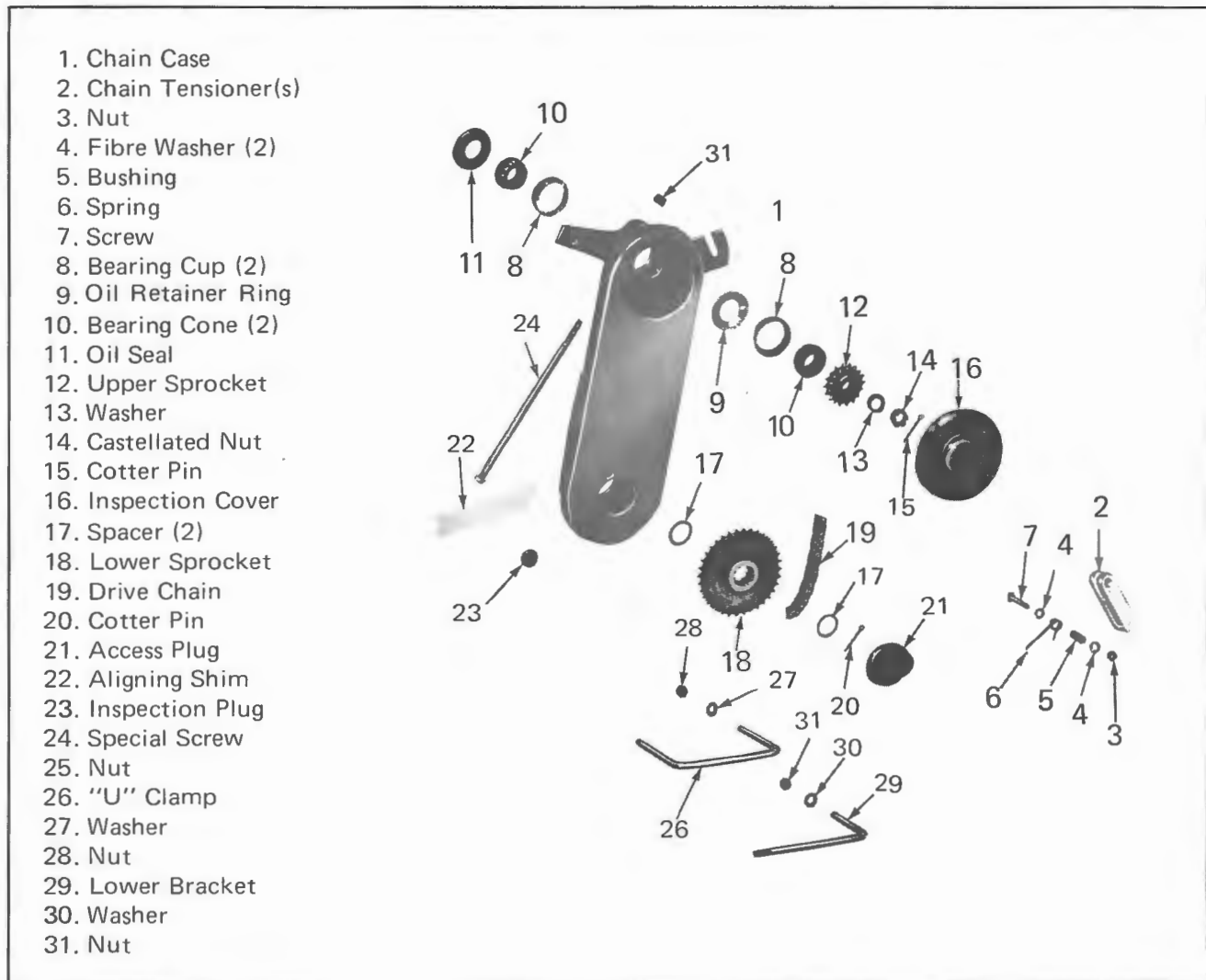
(A) GENERAL

The chain case mechanism of the Ski-Doo snowmobile is connected to the driven pulley shaft and drive axle. Incorporate within the case are upper and lower sprockets, a drive chain and a chain tensioner(s). On 1970 models, chain tension is controlled by an eccentric tensioner while chain tension on 1971 models is automatically applied by tensioner(s). 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.

1-11



DISASSEMBLED VIEW OF 1970 CHAIN CASE



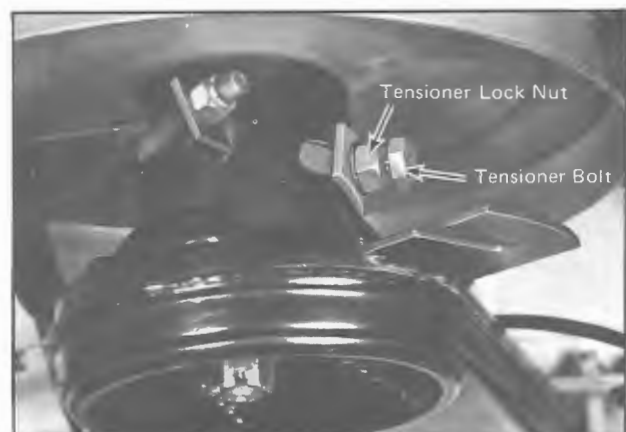
DISASSEMBLED VIEW OF 1971 CHAIN CASE

(B) REMOVAL

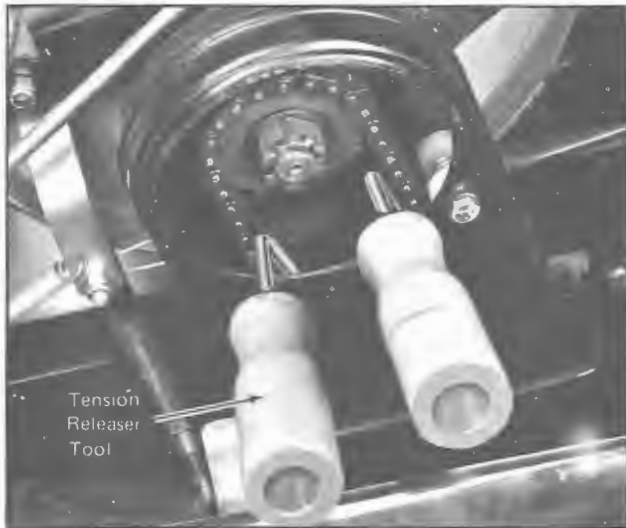
1. Tilt or remove the cab.
2. Remove pulley guard as detailed in sub-section 1-6.
3. On Elan models, remove console as detailed in Section 4.
4. Remove drive belt as described in sub-section 1-7. Remove inspection plug.
5. On 1970 models, release drive chain tension as follows:

- (a) Partially unscrew the tensioner lock nut.

- (b) Using a soft faced hammer, gently knock the tensioner bolt counter-clockwise (fig. 1-11-1).

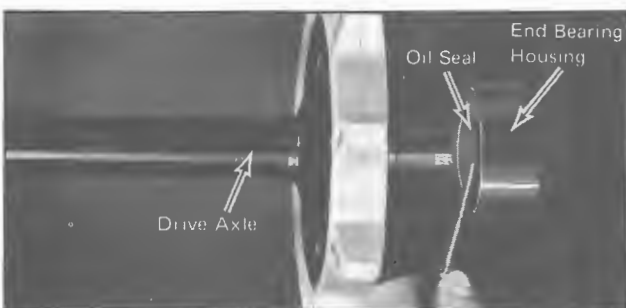


NOTE: On 1971 models, drive chain tension is released by inserting tension releaser tool (item 2), (fig. 1-11-2).



1-11-2

6. Raise and block rear of vehicle off the ground
7. Using special lever (item 1), release track tension by unhooking link plate springs.
8. On 1970 Nordic and T'NT models, prior to unhooking the link plate springs, remove the reinforcing cross shaft by removing capscrews and star washers securing shaft to frame.
9. Position a catch pan beneath the chain case. With a small screwdriver, pry out oil seal from chain case and drain oil into catch pan (fig. 1-11-3).



1-11-3

10. Disconnect brake cable and housing at brake lever.
11. On 1970 models equipped with 18 inch

track, remove footrest secured to the frame and chain case (fig. 1-11-4).



1-11-4

12. Pry out the lower access plug. Remove cotter pin locking lower sprocket and remove spacer (fig. 1-11-5).



1-11-5

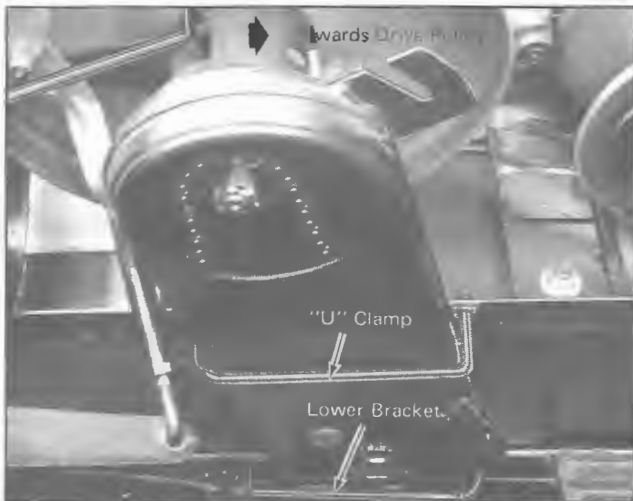
13. Remove nut on special screw (hinge rod) at chain case bracket (fig. 1-11-6).

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



1-11-6

14. From the inner side of frame, remove the nut securing chain case lower bracket and remove the bracket.
15. 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) (fig. 1-11-7).



1-11-7

16. Using two (2) large screwdrivers, inserted between chain case and frame, pry the complete assembly from vehicle (fig. 1-11-8).

NOTE: On 1971 models, remove chain tension releaser tool (item 2) from chain case.

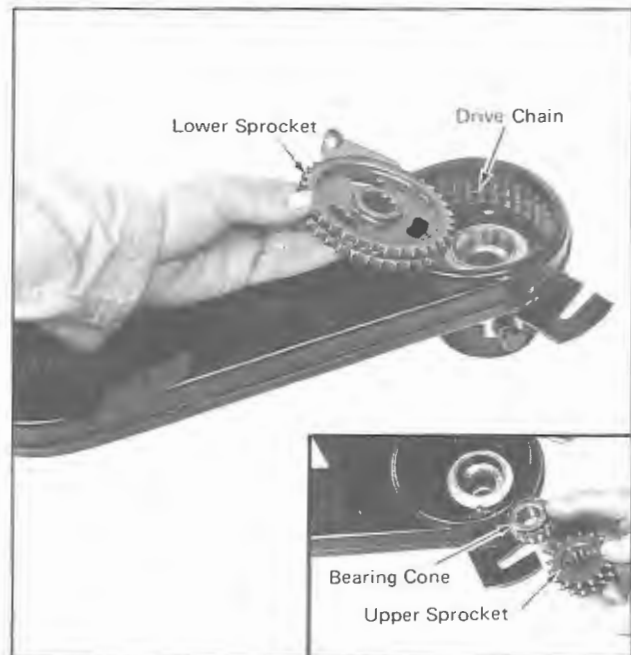


1-11-8

(C) DISASSEMBLY (All 1970 Models)

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

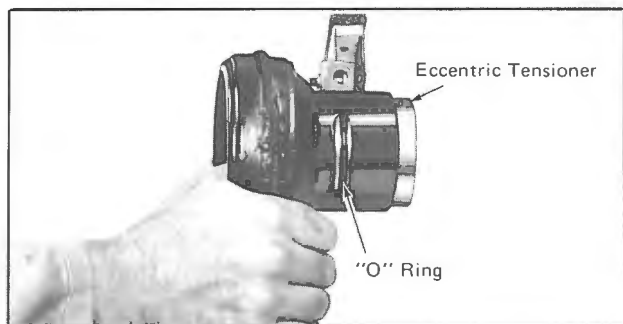
2. Pull the driven pulley assembly from the chain case and lay chain case on a worktable.
3. Spread drive chain around inside of chain case and while restraining chain at access port, tilt chain case to remove the upper sprocket, bearing cone and lower sprocket through inspection port (fig. 1-11-9).



1-11-9

4. Pull the drive chain towards the inspection port and remove the chain from the chain case.
5. Remove the chain tensioner bolt assembly from the eccentric tensioner. The bolt assembly consists of a bolt, nut, washer and segment.
6. Using your thumbs, carefully push the eccentric tensioner through the back of the chain case (fig. 1-11-10). Exercise care not to damage "O" ring while removing tensioner assembly.

NOTE: Do not disassemble eccentric tensioner, unless components show signs of damage or wear. If required to disassemble, refer to Paragraph (D).



1-11-10

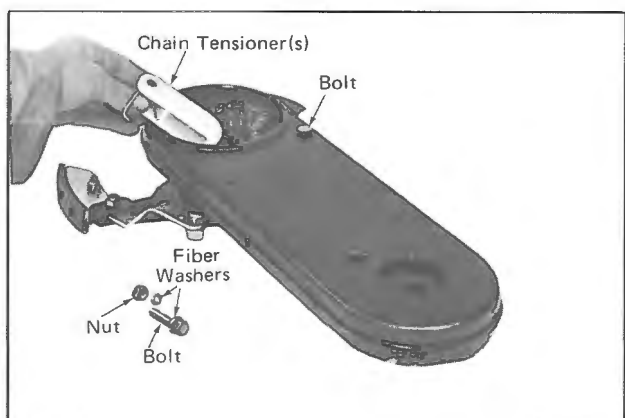
(D) DISASSEMBLY OF ECCENTRIC TENSIONER

1. With a suitable tool, remove the oil seal from tensioner.
2. Remove the rear bearing cone.
3. Should the bearing cups and/or oil retainer ring show signs of damage, remove cups from the tensioner using a drive punch and a hammer. Remove oil retainer ring.

(E) DISASSEMBLY (All 1971 Models)

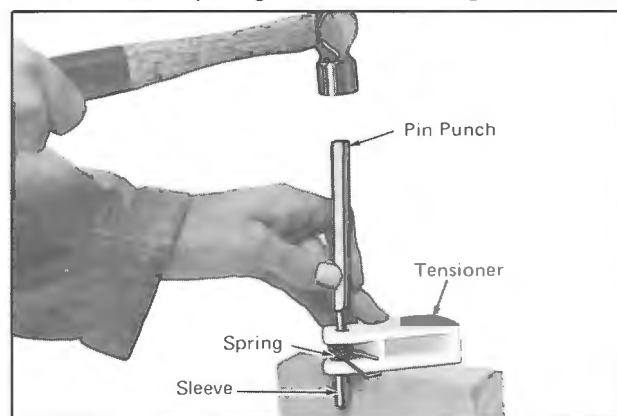
1. Remove cotter pin, castellated nut and spring washer from driven pulley shaft.
2. Pull the driven pulley assembly from the chain case and lay case on a worktable.
3. Remove bolt(s), fiber washers and nut(s) securing chain tensioner(s) located within the chain case. Remove tensioner(s) (fig. 1-11-11).

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



1-11-11

4. Using a pin punch, remove tensioner(s) spring by pushing on one side of sleeve. Remove spring and sleeve (fig. 1-11-12).



1-11-12

5. Spread drive chain around inside of chain case and while restraining chain at inspection port, tilt chain case so that upper sprocket, bearing cone and lower sprocket can be removed through inspection port (see fig. 1-11-9).
6. Pull the drive chain towards the inspection port and remove the chain from the chain case.

NOTE: Do not remove bearing seal, bearing cone, bearing cups or oil retainer ring unless damaged, and replacement is necessary. If required, remove and discard bearing seal. Remove bearing cones, bearing cups and oil retainer ring. To remove cups, use a pin punch and a soft faced hammer.

(F) CLEANING

1. Clean grease and dirt from tensioner(s) with a clean cloth.

CAUTION: Do not use cleaning solvent on tensioner(s) as it may damage the component(s).

2. Clean grease and dirt from sprockets in a separate container of cleaning solution. Use of a separate container is to prevent damage to sprocket teeth. Dry with compressed air or a clean cloth.

3. To clean bearing(s) and chain, remove grease and dirt using a soft paint brush. Immerse bearing(s) and chain in a clean container of cleaning solution. Dry with a clean cloth and lubricate the components by dipping in a clean engine Ski-Doo Oil.
4. Remove dirt and grease from interior of chain case with a clean cloth. Ensure that interior is completely dried out prior to Assembly procedure.

WARNING: When cleaning chain case, remove brake shoe from chain case bracket to prevent cleaning solvent from coming into contact with brake shoe and lining.

5. Place all other components in a container of cleaning solvent. Remove rust or any other deposits using a firm bristle brush. Dry using a clean cloth. If paint has been removed, apply a new coat using appropriate Ski-Doo Paint.

(G) INSPECTION

1. Visually inspect chain for cracked, damaged or missing link rollers. Replace defective chain.
2. On 1970 models, inspect eccentric tensioner assembly for defective oil seal, bearing cones, bearing cups, oil retainer ring and "O" ring. Disassemble, if required, and replace defective component(s). Refer to Paragraph (D).
3. On 1971 models, inspect for defective oil seal, bearing cones, bearing cups and oil retainer ring. Remove damaged component(s) from chain case, refer to Paragraph (E), NOTE of step 6.
4. Visually inspect sprockets for damaged or worn teeth, or distortion. If damage is evident, replace sprocket(s).
5. Inspect bearing cones (removed or in-

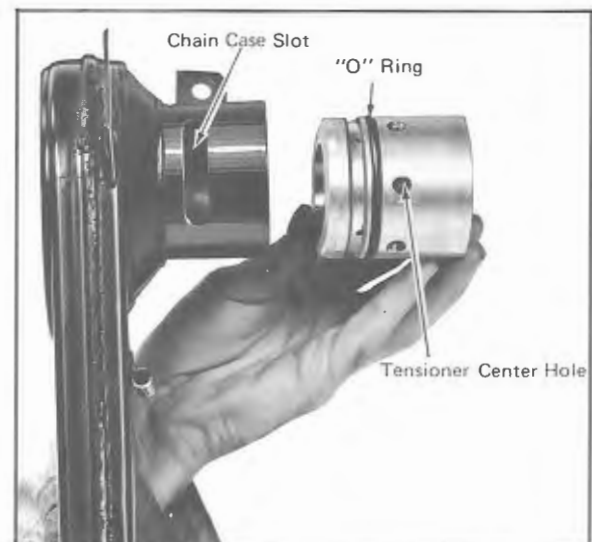
stalled) for secureness of mounting (e.g. pitted or missing roller bearings), freedom of movement and radial free play. Replace defective bearing cone(s).

6. Inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged component(s).
7. Visually check all other components for signs of wear, cracks and other possible damage. Replace damaged part(s).

(H) ASSEMBLY (All 1970 Models)

1. Prior to Assembly procedure, ensure all components are clean and all defective parts have been repaired or replaced. If chain case required cleaning, install brake shoe lever to chain case bracket.
2. Stretch "O" ring over eccentric tensioner and install in correct "O" ring groove. Position tensioner assembly so that center hole in tensioner aligns with middle of chain case slot (fig. 1-11-13).

NOTE: If eccentric tensioner has been disassembled, assemble as detailed in Paragraph (J).

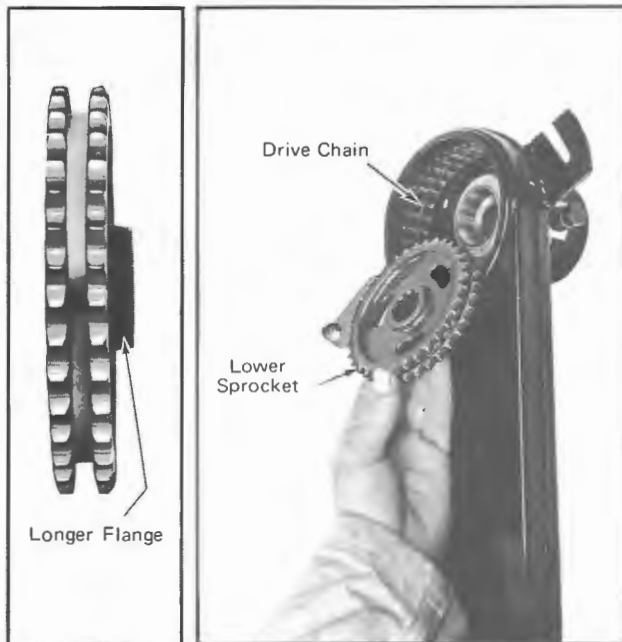


1-11-13

3. Apply a light coat of low temperature grease on eccentric tensioner. Insert tensioner into chain case until holes align

with chain case slot. Ensure that "O" ring is not damaged when passed at slot or rolls during installation.

4. Place and position chain around inside of chain case. Place lower sprocket (with longer flange towards inside of case) through inspection port and holding chain, tilt case until sprocket slides down to its installation position (fig. 1-11-14).



1-11-14

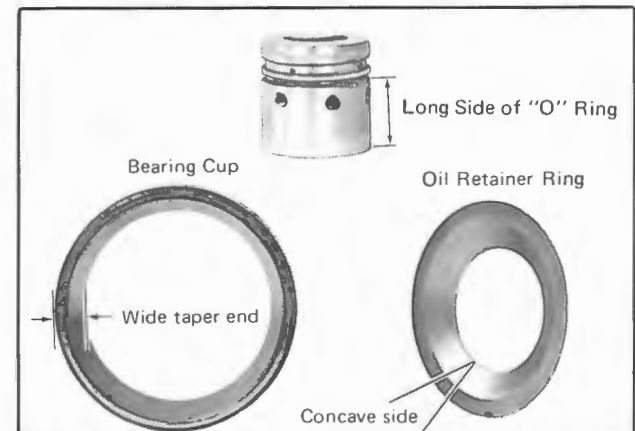
5. Install bearing cone and position upper sprocket (longer flange towards inside of case) and drive chain in place.
6. Holding chain and upper sprocket in position, insert driven pulley shaft through eccentric tensioner and sprocket. Install spring washer and castellated nut.

NOTE: Tighten castellated nut fully then back off 1/6 of a turn and lock in position with a 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.

7. Install tensioner bolt assembly through slot of chain case and into center hole of eccentric tensioner. Do not tighten bolt assembly.

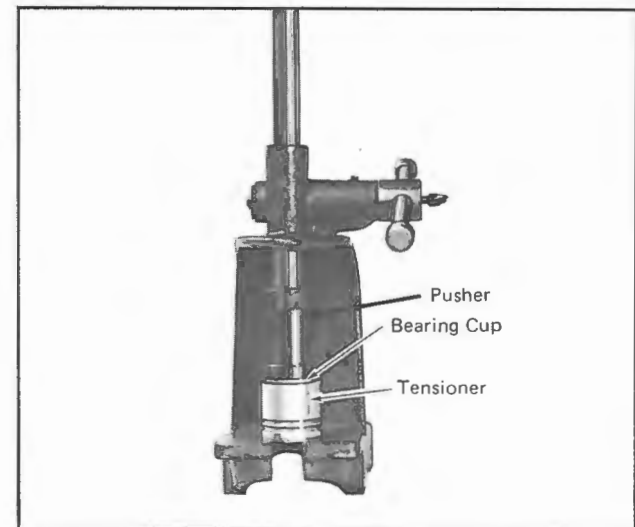
(J) ASSEMBLY OF ECCENTRIC TENSIONER (All 1970 Models)

1. On long side of "O" ring groove position oil retainer ring with concave side of ring seated on shoulder within the tensioner. Sit bearing cup in tensioner aperture. Cup must be seated so that wider taper end is facing oil retainer ring (fig. 1-11-15).



1-11-15

2. Using an appropriate bearing pusher, gently press down on cup until it is seated on oil retainer ring (fig. 1-11-16).



1-11-16

3. Install second bearing cup into aperture in tensioner using procedure detailed in step 2, above.
4. On side of oil retainer ring, position a bearing cone into bearing cup.

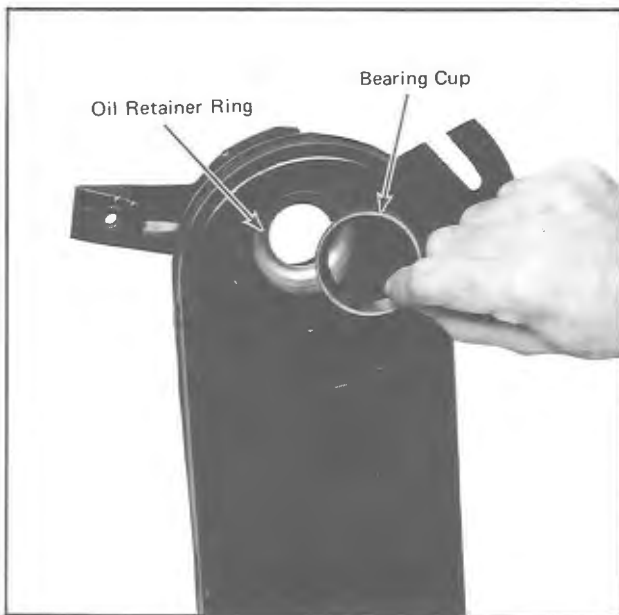
5. Position oil seal (Lip facing inside of tensioner) over bearing cone. Using an appropriate pusher, gently press oil seal down until it is seated flush with edge of tensioner.

(K) ASSEMBLY (1971 Models only)

1. Prior to Assembly procedure, ensure all components are clean and all defective parts have been repaired or replaced. If chain case required cleaning, install brake shoe lever to chain case bracket.

NOTE: If bearing cup(s) and oil retainer ring has been removed and replacement is necessary use the following procedure.

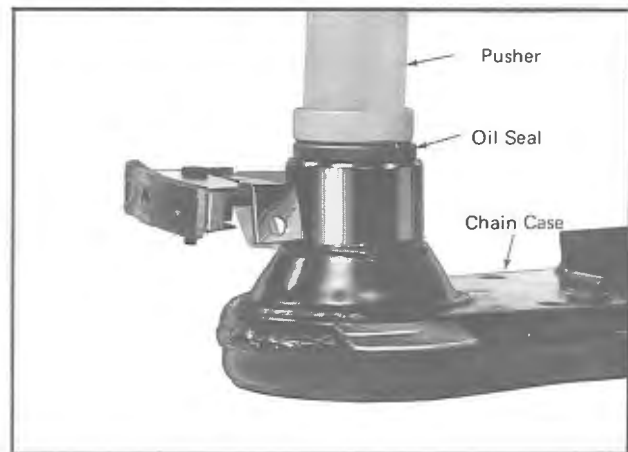
- (a) Position oil retainer ring with concave side of ring seated on shoulder within the chain case. Sit bearing cup in chain case aperture. Cup must be seated so that wider taper end is facing retainer ring (fig. 1-11-17).



1-11-17

- (b) Using an appropriate bearing pusher, push bearing cup into chain case until it is seated on oil retainer ring.
- (c) Install second bearing cup into opposite aperture in chain case using procedure detailed in step (b), above.

- (d) On opposite side of oil retainer side position a bearing cone into bearing cup.
- (e) Using an appropriate pusher, press a new oil seal into the chain case hub. Oil seal must sit flush with case hub edge (fig. 1-11-18).



1-11-18

2. Install and spread drive chain around inside of case and place lower sprocket (with longer flange towards inside of case) through inspection port. Holding chain, tilt case until sprocket slides down to its installation position (See fig. 1-11-14).
3. Install spring and sleeve into chain tensioner(s)
4. Insert tensioner(s) into chain case and secure with bolt(s), fiber washers and nut(s). Tensioner must be installed with spring end seated against side of chain case.
5. Install bearing cone and position upper sprocket (longer flange towards inside of case) and drive chain in place.
6. Holding chain and upper sprocket in position, insert driven pulley shaft through chain case and sprocket. Install spring washer and castellated nut.

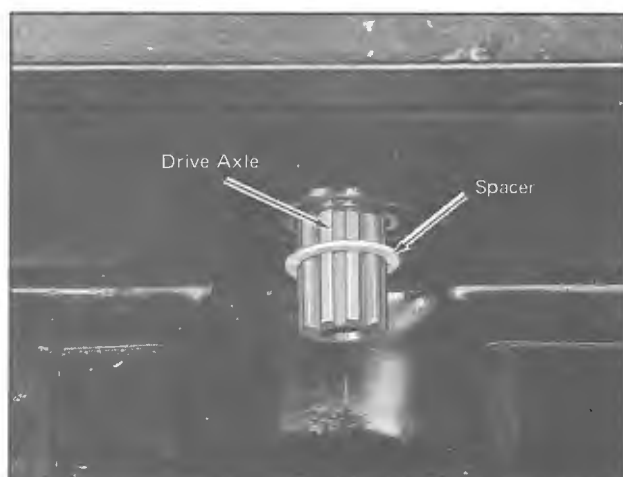
NOTE: Tighten castellated nut fully then back off 1/6 of a turn and lock in posi-

tion 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.

7. Install chain tension releaser tool (item 2) into chain case.

(L) INSTALLATION

1. With rear of vehicle off the ground and prior to installing chain case, ensure that spacer has remained on drive axle (fig. 1-11-19).



1-11-19

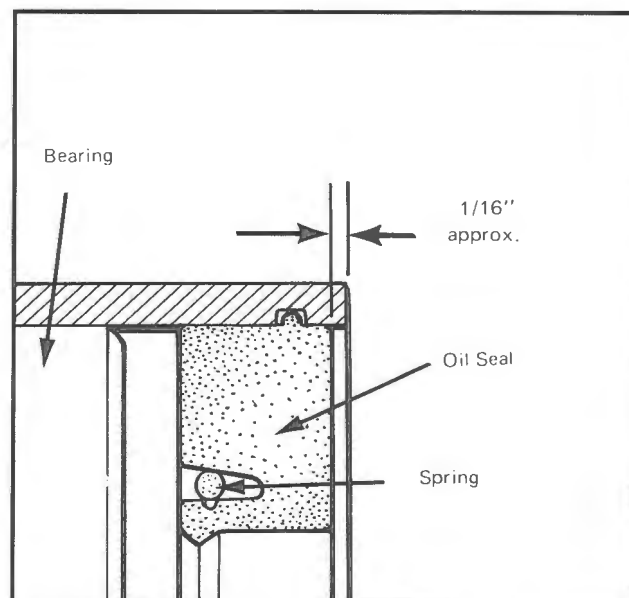
NOTE: The spacer is not installed on Elan models.

2. Position assembled chain case and driven pulley over drive axle. Ensure that chain case lower sprocket is properly engaged with axle splines. Push chain case onto frame.
3. Install spacer and cotter pin to secure lower sprocket to axle.
4. Install lower access plug.
5. Install special screw (hinge rod).
6. Install lower bracket, "U" clamp and previously removed aligning shims.

NOTE: Do not fully tighten attaching parts prior to carrying out pulley alignment.

7. 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. 1-11-20).



1-11-20

8. Carry out pulley alignment as detailed on page 1-9-11.

9. On 1970 models, adjust drive chain tension to 1/4 inch free maximum play and tighten tensioner lock nut (fig. 1-11-21.)

NOTE: On 1971 models, remove chain tension releaser tool (item 2), from chain case.



1-11-21

10. On 1970 models equipped with 18 inch track, install footrest and secure to frame and chain case.
11. Pour 8-ounces of Ski-Doo Chain Case Oil into chain case. Install inspection cover.

12. Connect brake cable and housing to brake lever and chain case. Connect brake lever spring.

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

13. On 1970 models, check brake adjustment as described in sub-section 1-10.
14. Using special lever (item 1), apply track tension by hooking link plate spring in spring anchors.
15. On 1970 Nordic and T'NT models, se-

cure reinforcing cross shaft to frame using star washers and capscrews.

16. Install drive belt as detailed in sub-section 1-7.
17. Install pulley guard as detailed in sub-section 1-6.
18. On Elan models, install console as described in Section 4.
19. Close or install cab.
20. Set vehicle on the ground.

TRANSMISSION

1-12 GEAR BOX (All Alpine/Invader and Valmont Models)

(A) GENERAL

All Alpine/Invader and Valmont models are equipped with a gear box. Engine power transmitted to the driven pulley is equally transmitted 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.

DESCRIPTION

The gear box consists of an upper and lower housing each incorporating various components which mesh together to permit forward or reverse vehicle motion. The upper housing (cover) incorporates a gear change lever, a gear change fork and an index rod. The gear change fork incorporates a spring-loaded ball which engages in one of three grooves of the index rod. The major components of the lower housing are a drive shaft assembly, a lay shaft assembly, a tensioner axle and a lower sprocket which are interconnected via a drive chain. The drive chain is seated on individual sprockets of each assembly.

1-12

PRINCIPLE OF OPERATION

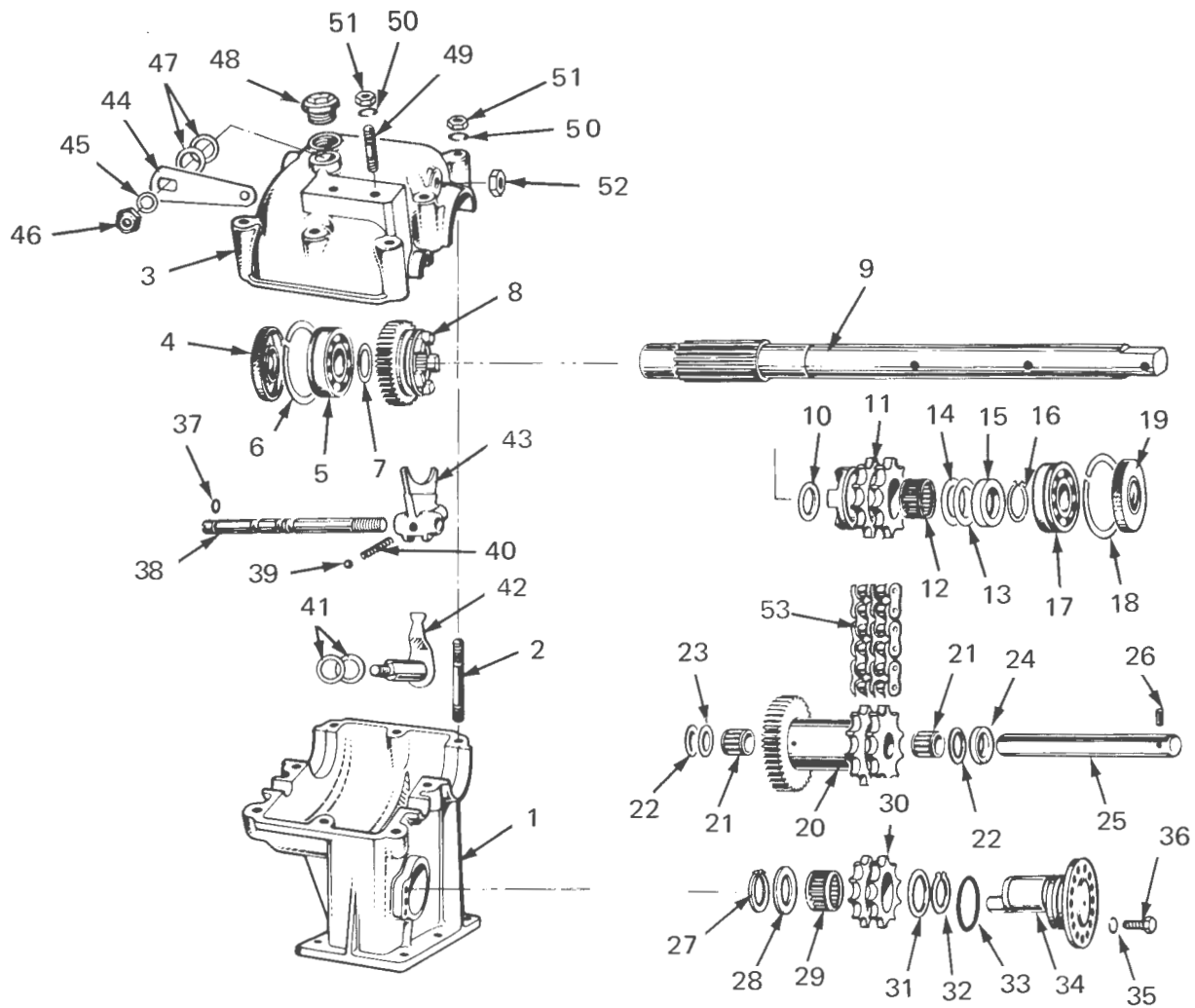
Positioning of the controlling transmission rod selects one three of operating positions of the gear box; Forward, Neutral or Reverse. The rotating direction of the chain entrainment is determined through the position of a sliding gear installed on the drive shaft. The position and engagement of the sliding gear is controlled by the gear change fork lever incorporated on the index rod of the upper housing (cover). Each groove in the index rod represents an operating direction of the vehicle, e.g. Forward, Neutral or Reverse.

Forward: the sliding gear is slid along the drive shaft to become interlocked with the drive notches of the sprocket.

Neutral: The sliding gear is positioned midway between the shift sprocket and the lay shaft gear.

Reverse: The sliding gear is slid to the extremity of the drive shaft and becomes engaged with the teeth of the lay shaft gear.

Drive chain tension is controlled through the eccentricity of the tensioner axle.



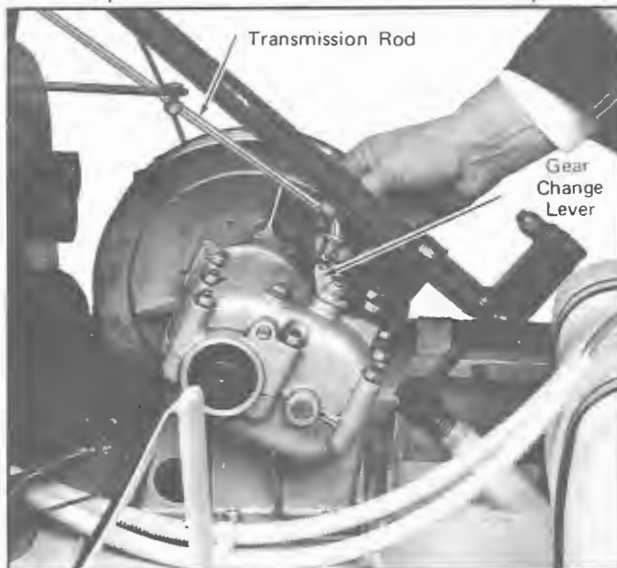
- | | | |
|--------------------------------------|------------------------|-----------------------|
| 1. Lower Housing Assembly | 18. Groove Ring | 36. Capscrew |
| 2. Stud | 19. Oil Seal | 37. "O" Ring |
| 3. Upper Housing
(Gear Box Cover) | 20. Lay Shaft Gear | 38. Index Rod |
| 4. Oil Seal | 21. Needle Cage | 39. Ball |
| 5. Ball Bearing | 22. Shim | 40. Spring |
| 6. Groove Ring | 23. Shim | 41. Shim |
| 7. Shim | 24. Distance Sleeve | 42. Gear Change Shaft |
| 8. Sliding Gear | 25. Lay Axle | 43. Gear Change Fork |
| 9. Drive Shaft | 26. Dowel Tube | 44. Gear Change Lever |
| 10. Washer | 27. Circlip | 45. Washer |
| 11. Shift Sprocket | 28. Washer | 46. Lock Nut |
| 12. Needle Cage | 29. Needle Cage | 47. Shim |
| 13. Shim | 30. Tensioner Sprocket | 48. Vent Plug |
| 14. Shim | 31. Washer | 49. Stud |
| 15. Distance Sleeve | 32. Circlip | 50. Lock Washer |
| 16. Circlip | 33. "O" Ring | 51. Nut |
| 17. Ball Bearing | 34. Tensioner Axle | 52. Nut |
| | 35. Washer | 53. Drive Chain |

DISASSEMBLED VIEW OF GEAR BOX

(B) REMOVAL

1. Remove cab. Remove console on Valmont models. Lift and block vehicle off the ground.
2. Remove pulley guard as detailed in subsection 1-6.
3. Remove drive belt as detailed in subsection 1-7.
4. Remove muffler from engine.
5. Disconnect the brake and throttle cables and housings from levers at handle bar.
6. Disconnect the transmission rod from the gear change lever by removing a cotter pin, spring and washer (fig. 1-12-1).

NOTE: On all 1970 Alpine/Invader models, pull the transmission rod rearward to permit removal of gear box from vehicle. On 1971 Alpine/Valmont models, lift disconnected end of rod upward.



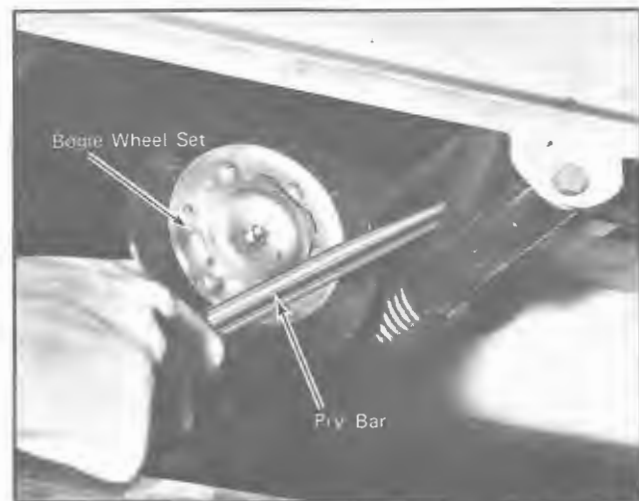
1-12-1

7. Disconnect the brake cable housing from the brake lever ferrule located at the disc brake mechanism.
8. Remove nuts securing lower bracket to the gear box cover. Slacken the upper retainer plate bolts and nuts (fig. 1-12-2) and pull the steering column rearward out of gear box area.



1-12-2

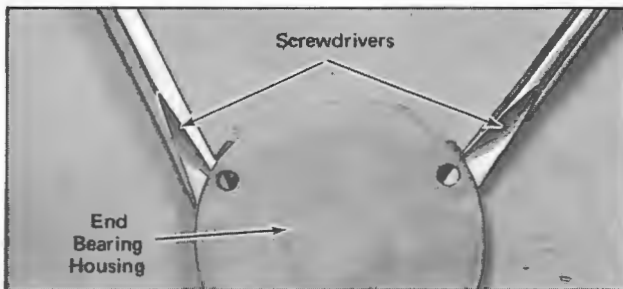
9. Pry the inspection cover from gear box.
10. Remove the drive chain tensioner cap-screw and washer and rotate tensioner plate to obtain maximum chain slackness.
11. Using special lever (item 1), unhook link plate springs to release track tension. Insert a pry bar between structural members of center(s) bogie wheel set and pry set upward to reversed installation position (fig. 1-12-3). Reverse remaining bogie wheel sets.



1-12-3

12. Remove the rear hubs as detailed in subsection 1-4.
13. Slightly tilt vehicle either on left or right side and place a catch pan directly beneath lowest end bearing housing oil seal.

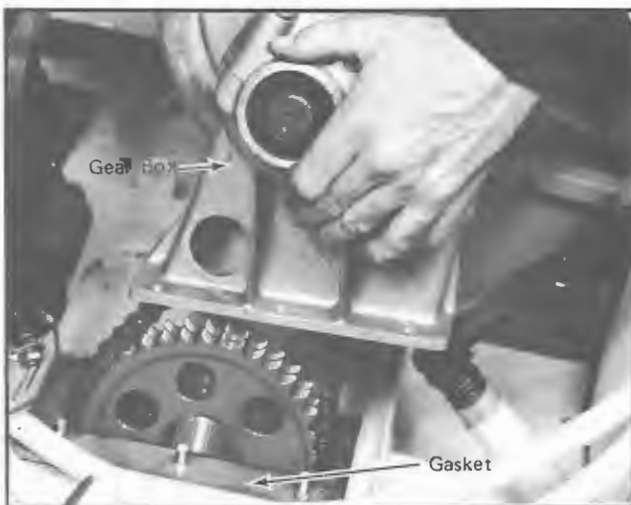
14. With a small screwdriver, pry out oil seal from lowest end bearing housing and drain gear box oil. Remove remaining oil seals from end bearing housing and center frame.
15. Remove the three (3) capscrews securing each end bearing housing to frame. With two (2) screwdrivers inserted between the housing and frame, pry out housings (fig. 1-12-4).



1-12-4

16. 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.
17. Remove the six (6) nuts securing the gear box to frame. Remove gear box and gasket (fig. 1-12-5).

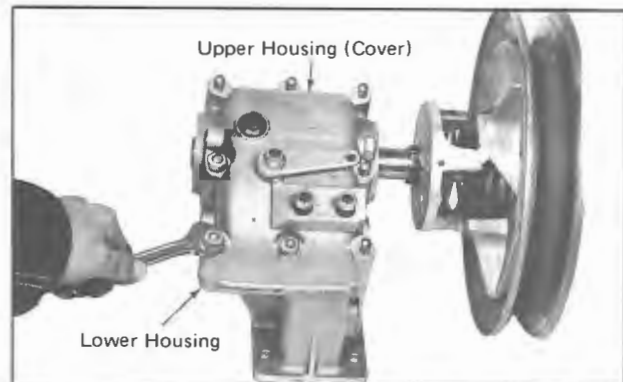
NOTE: On all 1970 models, remove bottom plate and gasket.



1-12-5

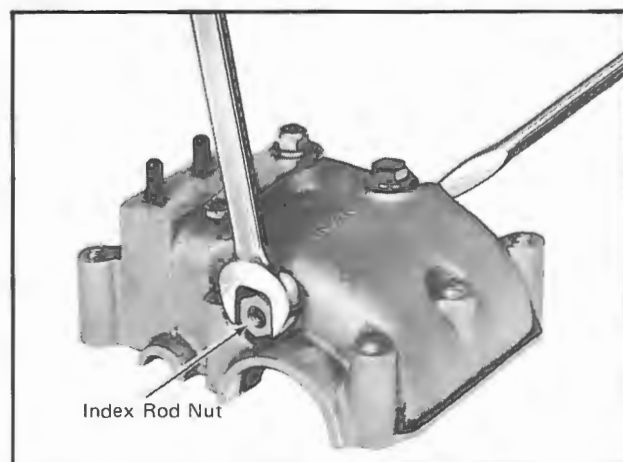
(C) DISASSEMBLY

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. 1-12-6).



1-12-6

3. To loosen the bonding between the upper housing and lower housing, tap the 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. 1-12-7).

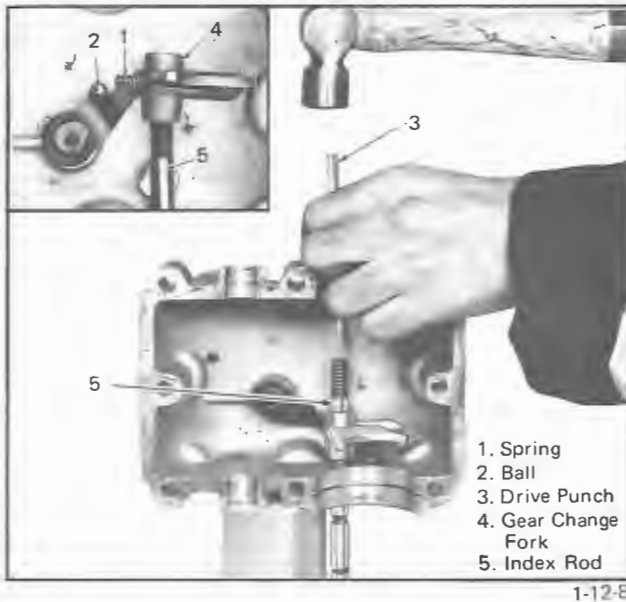


1-12-7

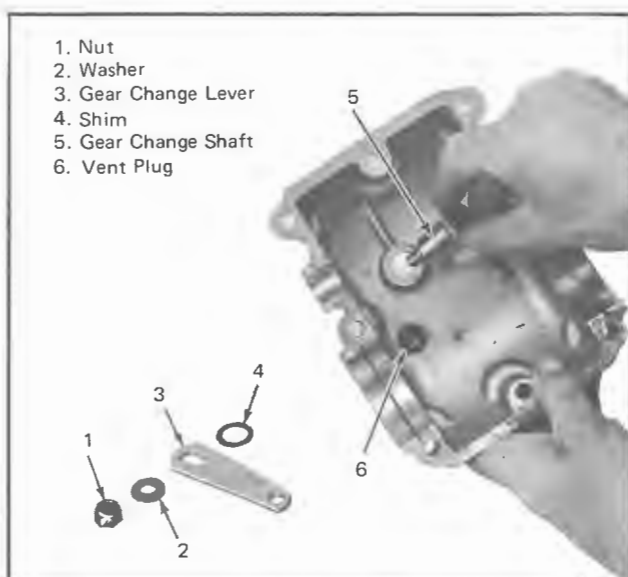
- (b) Unscrew the index rod from the housing. Using a pin punch, drive the rod through the gear change fork until the threaded portion of the rod is approximately 1/4" into the fork.

Firmly hold the fork and carefully pull the rod from the fork and housing (fig. 1-12-8).

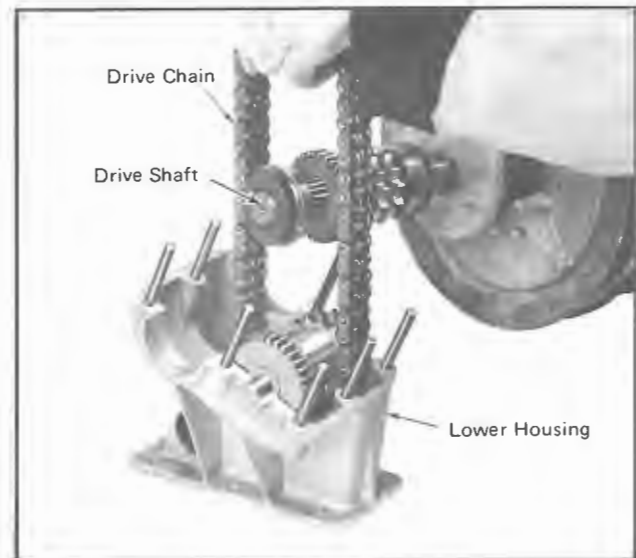
WARNING: The gear change fork incorporates a spring-loaded ball. Ensure that spring and ball do not fly out during removal of index rod. Remove "O" ring from rod.



(c) Remove the nut, washer, gear change shaft assembly and shim(s). Pull the gear change shaft assembly from the housing cover. Remove the vent plug (fig. 1-12-9).



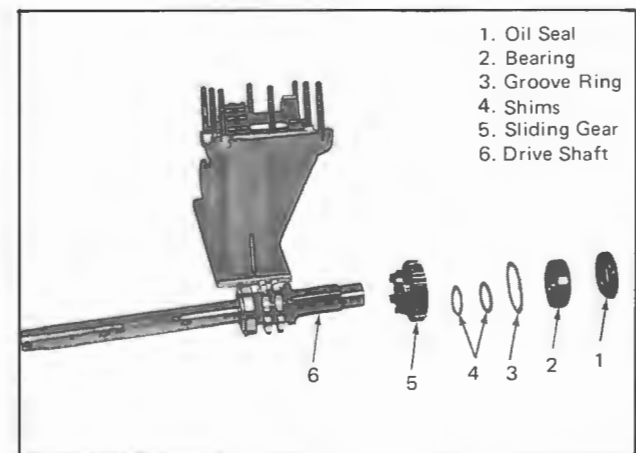
5. Lift the drive chain from the sprocket and remove the drive shaft assembly from the lower housing (fig. 1-12-10)



1-12-10

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

- Remove brake and bracket assembly (refer to sub-section 1-10) and driven pulley (refer to sub-section 1-9).
- Remove the oil seal, ball bearing with groove ring, shim(s) and sliding gear from splined end of shaft (fig. 1-12-11). Remove groove ring from bearing.

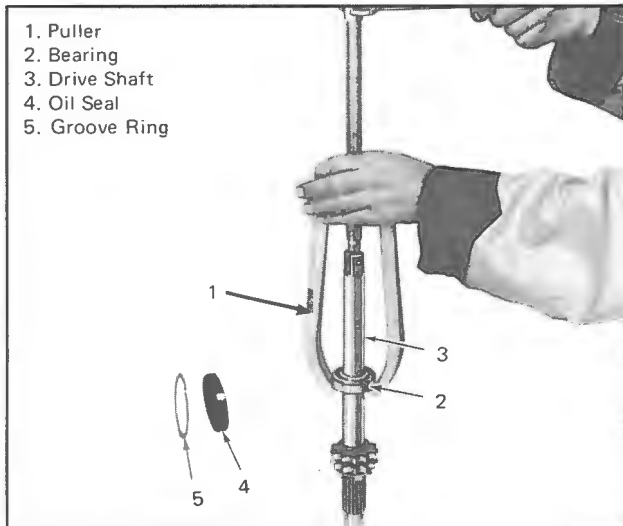


1-12-11

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

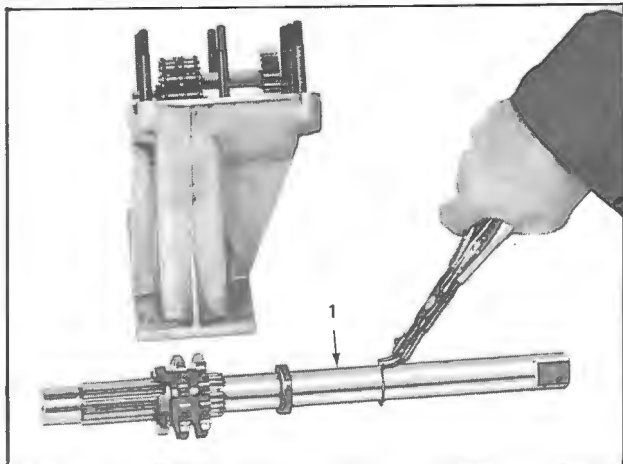
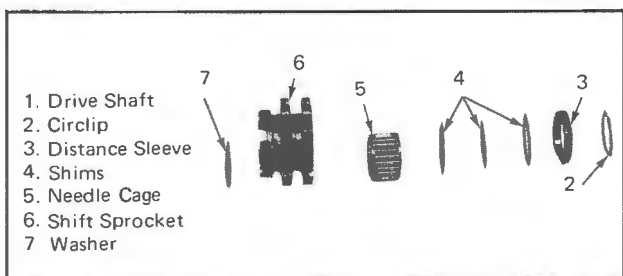
- (d) Using an appropriate bearing puller, remove the bearing from the driven pulley side of shaft (fig. 1-12-12).

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



1-12-12

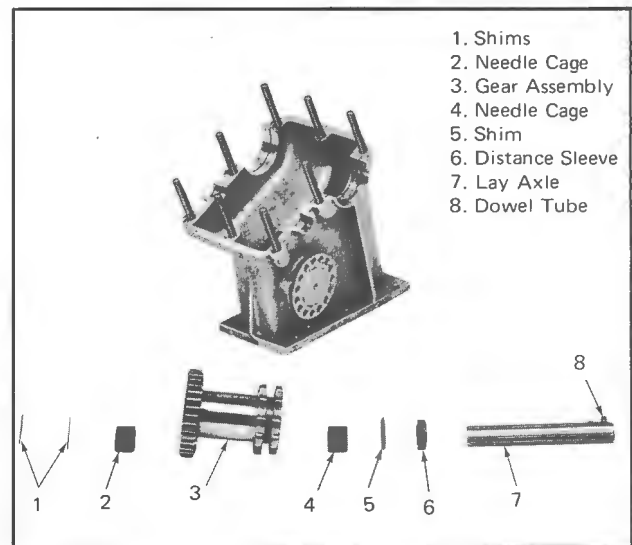
- (e) Using needle pliers, remove a circlip from drive shaft. Remove the distance sleeve, shims, needle cage, shift sprocket and washer from the shaft (fig. 1-12-13).



1-12-13

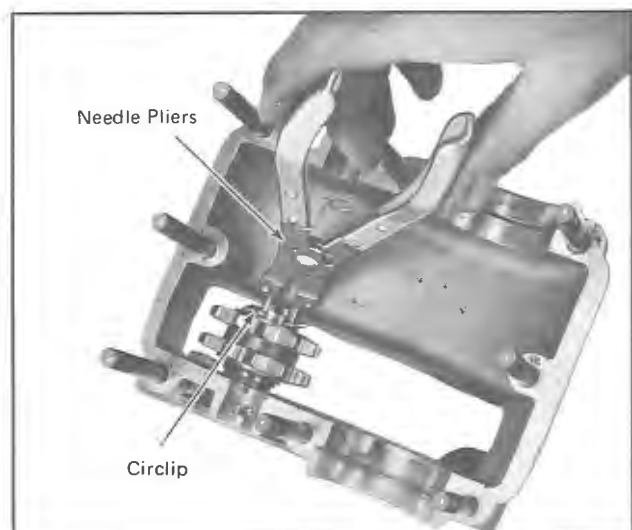
7. Lift the drive chain and remove the lay shaft from the lower housing. Disassemble the lay shaft by removing shims, needle cage, gear assembly, needle cage, shims and distance sleeve from lay axle (fig. 1-12-14). Remove the drive chain.

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



1-12-14

8. Using needle pliers, unlock two (2) circlips on the tensioner axle assembly (fig. 1-12-15).

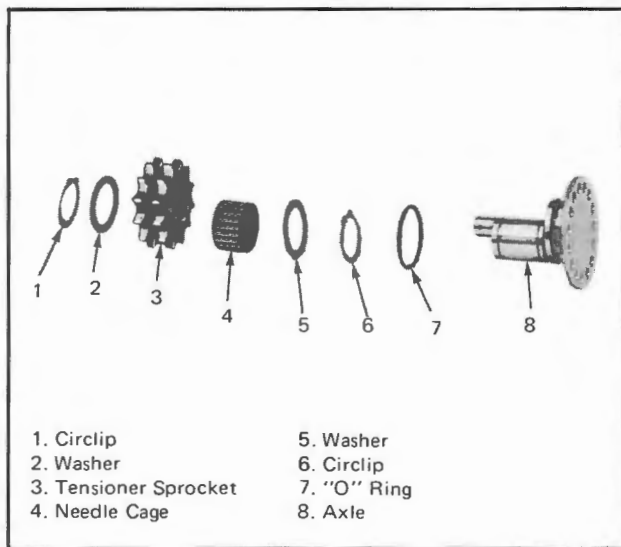


1-12-15

9. Partially withdraw tensioner axle. Remove circlip, washer, tensioner sprocket, needle cage, washer and circlip. Pull the

axle from the lower housing and remove the "O" ring from the axle of the tensioner (fig. 1-12-16).

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



1-12-16

(D) CLEANING

1. Immerse each gear and sprocket into a container of cleaning solvent. Dry using compressed air.
2. Remove dirt and grease from interior and exterior surfaces of upper and lower housings using a firm bristle brush. Ensure that interiors are completely dried out prior to Assembly procedure.
3. Remove rust formation or dirt on driven pulley shaft using fine steel wool. Wipe shaft using a clean dry cloth.
4. To clean bearings, remove grease and dirt using a soft paint brush. Immerse all bearings in a clean container of cleaning solution. Dry with a clean cloth and lubricate all bearings by dipping in clean engine Ski-Doo oil.

5. Clean drive chain with a soft paint brush and lubricate in clean engine Ski-Doo oil.
6. Clean dirt deposits from oil seals with a clean cloth.

CAUTION: Do not use cleaning solvent on oil seals as it may permanently damage the part(s).

7. Place all other components in a container of cleaning solvent. Remove rust or any other deposits using a firm bristle brush. Dry using a clean cloth.

(E) INSPECTION

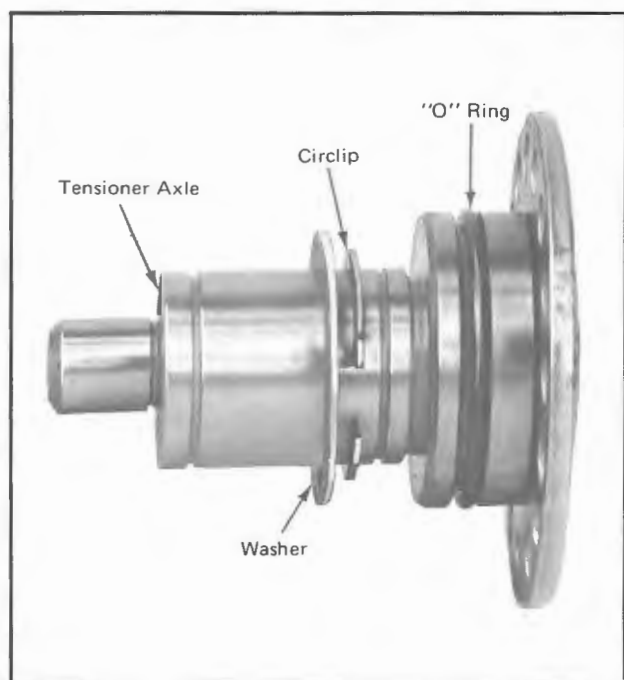
1. Check general condition of chain linkage. Visually inspect drive chain for cracked, damaged or missing link rollers. Inspect secureness of riveted heads of double link pins or single pins.
 2. Visually inspect oil seals for cuts or other damage. Inspect oil seal spring. If spring is damaged or stretched, it must be replaced. Replace defective oil seal(s).
- Inspect sprockets and gears for damage or 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. Inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged part(s).
 7. Visually inspect all other components

for signs of wear, cracks and other possible damage. Replace defective part(s).

(E) 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 in tensioner axle. Slide a circlip and washer on the axle (fig. 1-12-17).

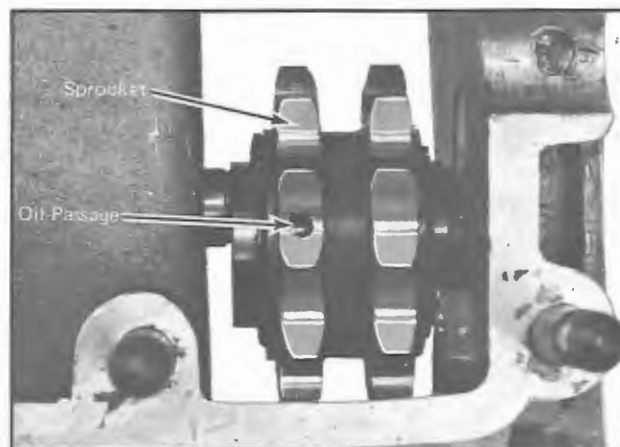
NOTE: Do not seat the circlip into its notch at this time.



1-12-17

- (b) Insert the axle through the larger hole in side of lower housing assembly.
- (c) Through upper aperture of lower housing insert the sprocket with needle cage, washer and circlip onto the tensioner axle.

NOTE: The oil passage in sprocket must be installed as shown in figure 1-12-18.



1-12-18

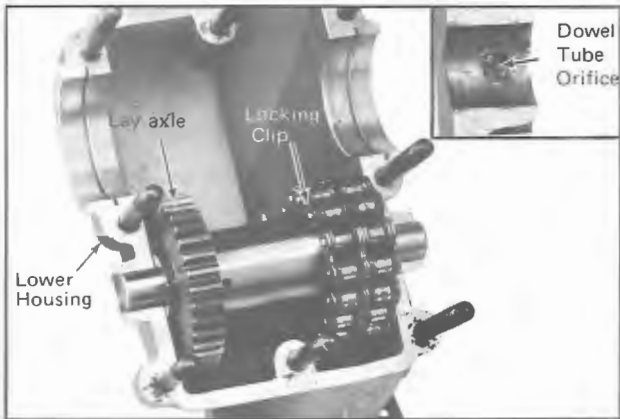
- (d) Pull the sprocket towards tensioner plate of axle and at the same time, push the axle into correct location within housing. This pull/push action will properly seat the axle in position and the circlip into the axle notch.
 - (e) Place the sprocket washer on rim of eccentric portion of sprocket and position the second circlip into the notch.
3. To assemble and install the lay gear into the lower housing 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. 1-12-14).
- (b) Place the assembled lay gear into position on lower housing.
- (c) Using a feeler gauge, check end play between assembled lay shaft and walls of lower housing. Endplay 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 the orifice in the lower housing (fig. 1-12-19).

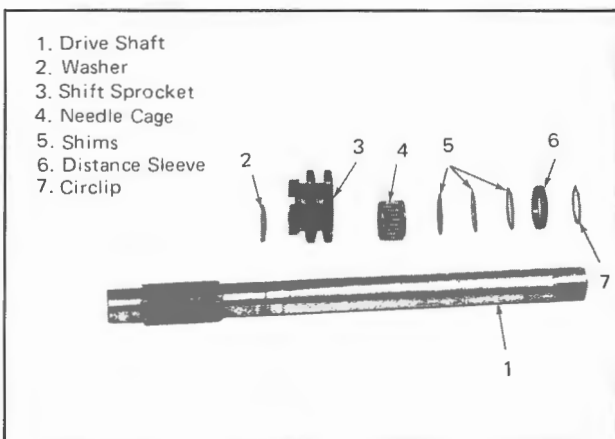
NOTE: Drive chain must be positioned on lay gear sprocket so that locking clip is facing the lay gear.



1-12-19

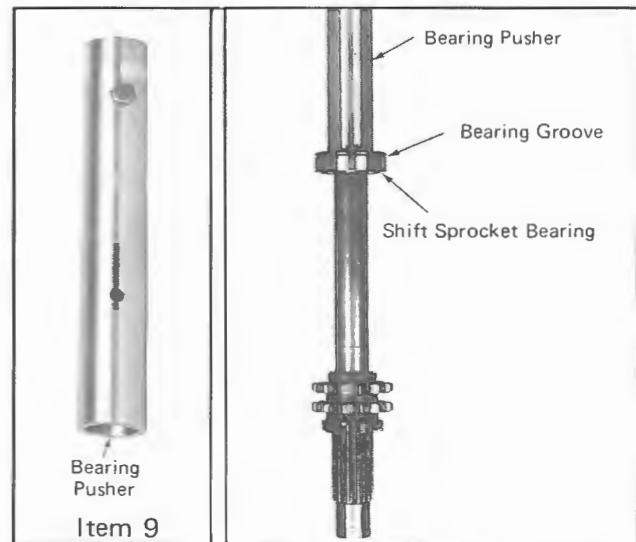
4. To assemble and install the drive shaft assembly into the lower housing, use the following procedure:

- (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 shim to take up free play. Install distance sleeve and circlip on shaft (fig. 1-12-20).



1-12-20

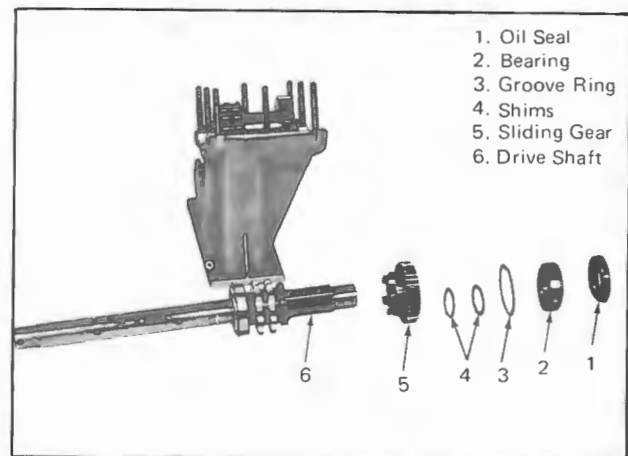
- (c) Position the shift sprocket bearing on the drive shaft with groove of bearing on driven pulley side of shaft. Using a special bearing pusher (item 9), push the bearing into place on shaft (fig. 1-12-21). Install the groove ring into location in bearing groove. Slide the oil seal onto shaft. Ensure that oil seal spring is facing bearing.



1-12-21

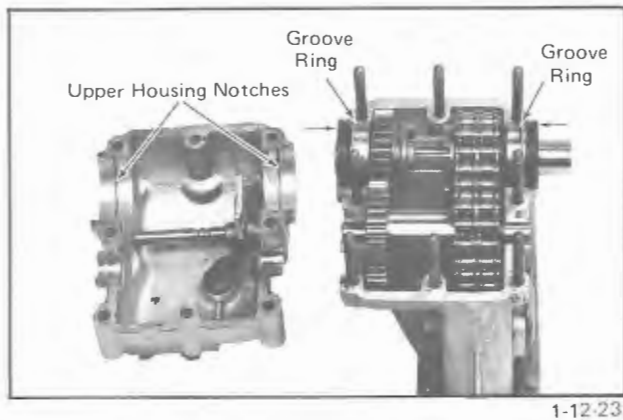
- (d) Slide the sliding gear, shim, bearing with groove ring and oil seal, on splined end of shaft (fig. 1-12-22).

NOTE: Ensure bearing is placed on shaft with groove ring farthest away from sliding gear and oil seal spring of oil seal is facing bearing.



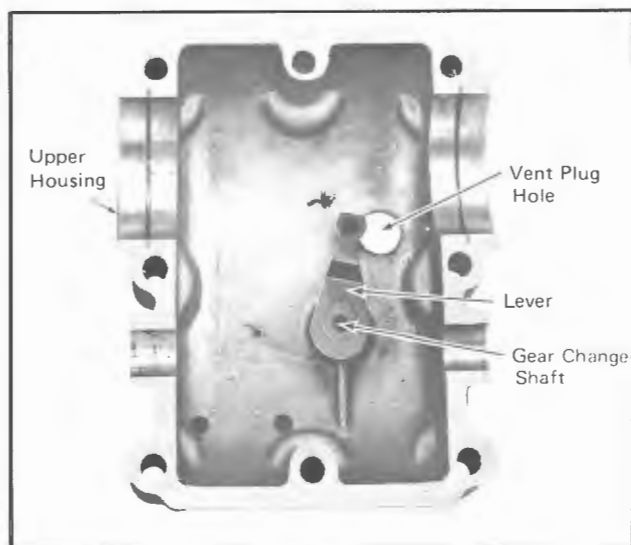
1-12-22

- (e) Install driven pulley (refer sub-section 1-9) and disc brake mechanism (refer sub-section 1-10) on the drive shaft.
- (f) Lift the drive chain and pass 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 and sit seals tight against the bearings (fig. 1-12-23).

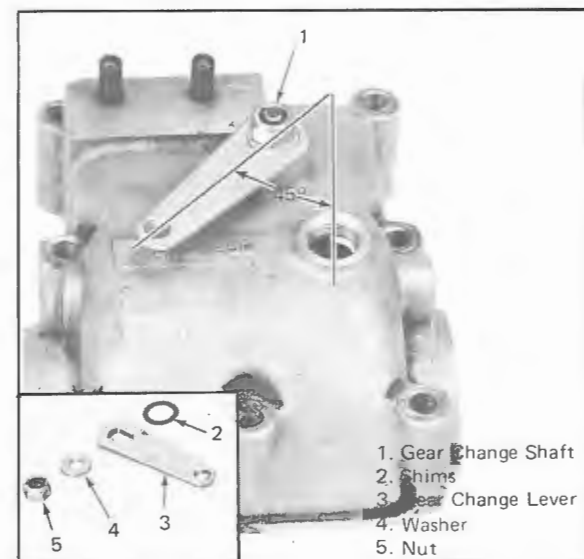


5. To assemble the upper housing (cover) use the following procedure:

- (a) Insert the gear change shaft through hole of upper housing (fig. 1-12-24). Ensure that lever of gear change shaft is positioned toward vent plug hole.

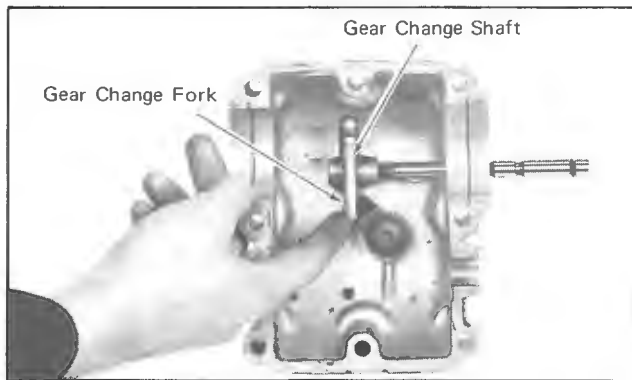


- (b) Using a soft faced hammer, carefully tap shaft into position.
- (c) Install shim, gear change lever, washer, gear shaft. Torque nut to 200 inch pounds.
- (d) Using a feeler gauge, check that free play of gear change shaft is within tolerance of 0.006 at 0.012 inch. If free play is not within tolerance, record discrepancy. Remove nut, washer, gear change lever, shim and gear change shaft. Divide discrepancy by 2 and install required thickness of shim on gear change shaft. Install shaft into upper housing. Install standard shim and additional thickness of shim 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 200 inch pounds (fig. 1-12-25).



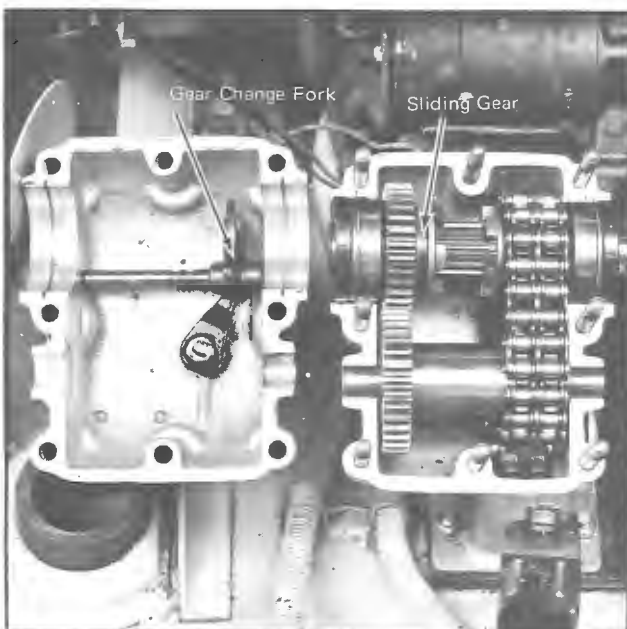
- (e) Position a new "O" ring on index rod. Partially insert the threaded end of index rod through hole adjacent to vent plug hole in upper housing.
- (f) Position the gear change fork on the gear change shaft assembly. Push the index rod approximately 1/4 inch into the change fork.

- (g) Insert the spring and ball bearing into hole of gear change fork (fig. 1-12-26). Using a suitable tool, depress the ball and spring so that the index rod can be totally inserted through the gear change fork.



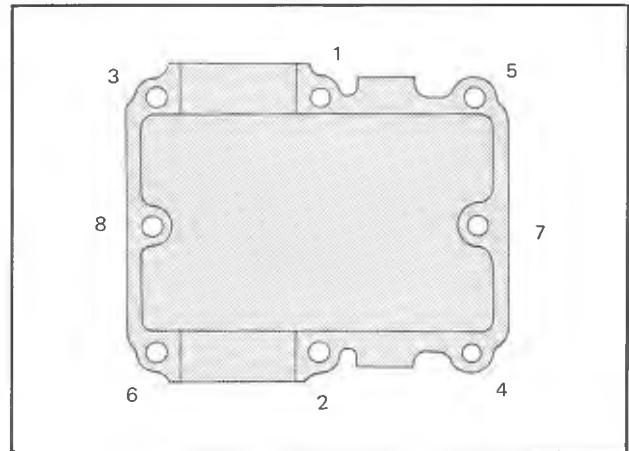
1-12-26

- (h) Screw the index rod into threaded hole of upper housing. Secure assembly with appropriate nut.
- (i) Apply a light coating of L700 Crankcase Glue on contact surfaces of upper and lower housings.
- (j) Push the sliding gear against drive shaft bearing and push the gear change fork towards the vent plug hole until ball engages with appropriate groove in index rod (fig. 1-12-27).



1-12-27

- (k) Position the upper housing over studs of lower housing and using a soft faced hammer, carefully tap the upper housing into position.
- (l) Install the eight (8) lockwashers and nuts. Securing nuts must be crossed torqued to 250 inch pounds in the sequence shown in figure 1-12-28.



1-12-28

(F) INSTALLATION

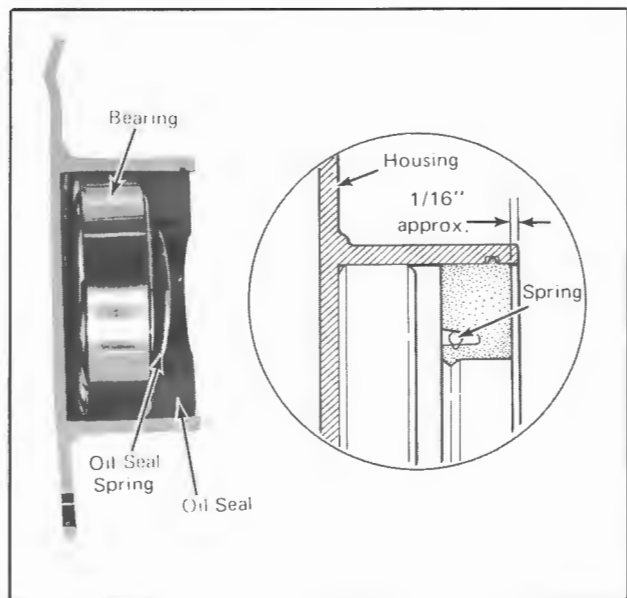
1. On all 1970 models, correctly position gasket and bottom plate over studs secured to frame. Place second gasket on bottom plate.

NOTE: On 1971 models, 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 180 to 200 inch pounds.
4. From the left side of vehicle, insert the drive axle within the track. Push the end bearing through the orifice in right side of frame. Pull the splined end of axle into chain case lower sprocket. Install opposite drive axle.
5. Position each end bearing housing into frame and over axle bearing and secure the housings to frame with three (3) cap screws.

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. 1-12-29).



1-12-29

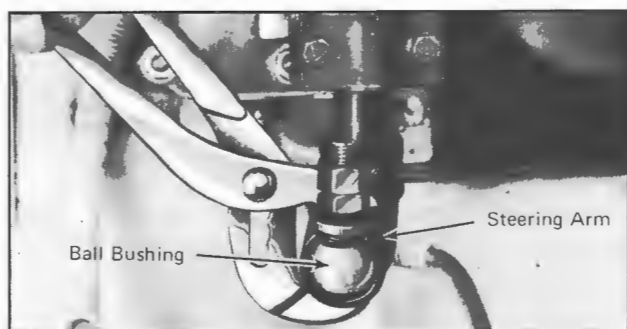
7. Install rear hubs as described in subsection 1-3.

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

9. Hook up 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.

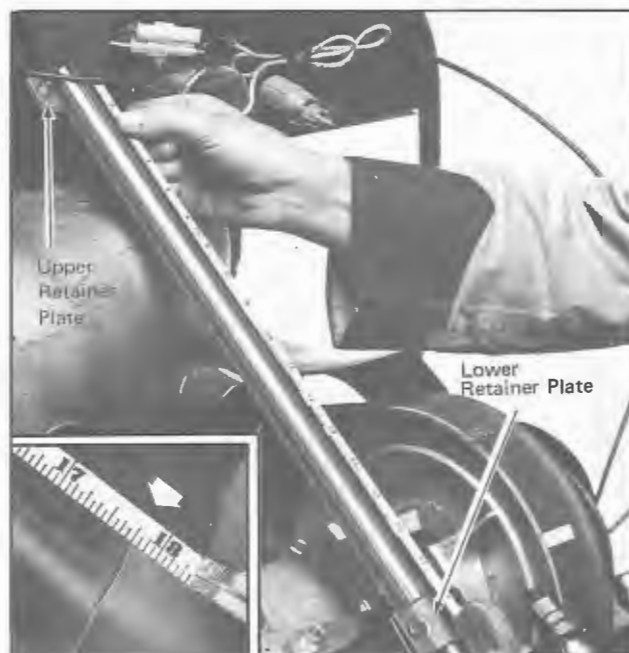
NOTE: If difficulty is encountered, use pliers to align column ball bushing and steering arm (fig. 1-12-30).



1-12-30

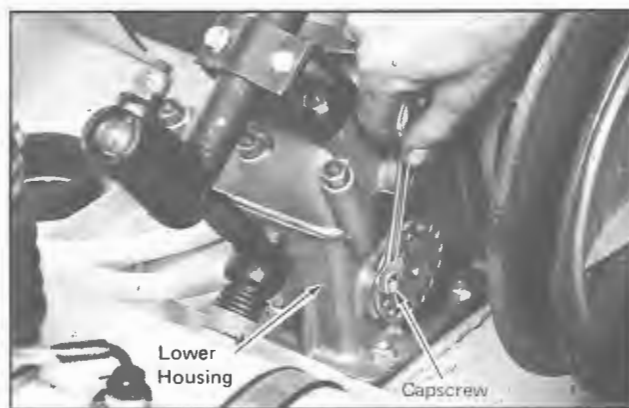
11. Secure steering column bracket to gear box cover with two (2) nuts. Tighten bolts and nuts securing upper retainer plate.

NOTE: On 1970 Alpine/Invader models, the distance between the upper retainer plate and the gear box bracket must be 17-3/4 inches. On 1971 Alpine/Valmont models, the distance must be 15-1/2 inches (fig. 1-12-31).



1-12-31

12. Remove capscrew and lock washer. Rotate the tensioner axle, clockwise or counterclockwise, to obtain 1/4 inch maximum free play of drive chain. Install lockwasher and capscrew. Tighten capscrew (fig. 1-12-32).

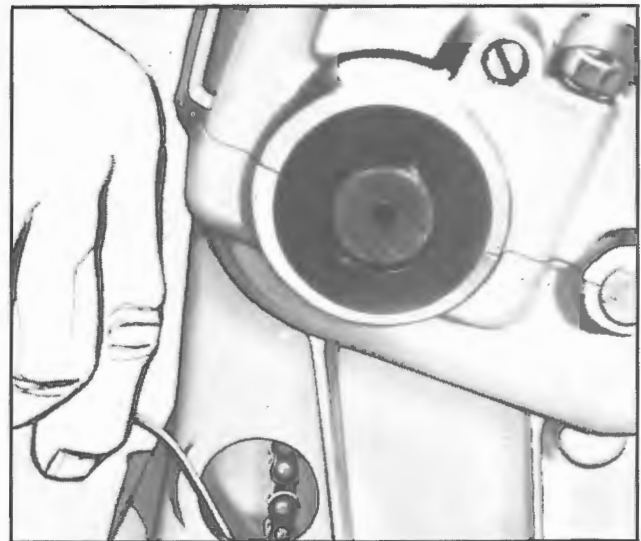


1-12-32

13. Connect throttle and brake cables and housings at handlebar.
14. Install muffler to engine.
15. Connect brake cable housing to brake lever ferrule located at the brake mechanism. Check that brake applies fully with brake lever 1/4 inch from handlebar grip.
16. Fill the gear box with Ski-Doo Chain Case Oil.

NOTE: On 399R and 399ER models, the oil capacity of the gear box is 12 ounces or 2-1/4 inches when checked with rigid dipstick. The gear box capacity of the 640ER model is 16 ounces or 3-1/4 inch level on dipstick (fig. 1-12-33).
17. Install filler and vent plug. Install rubber inspection plug.
18. Install drive belt as detailed in sub-section 1-7.
19. Carry out pulley alignment as detailed on Page 1-19-11.

20. Apply track tension as detailed in sub-section 1-5.
21. Carry out track alignment procedure as detailed in sub-section 1-5.
22. Install pulley guard as detailed in sub-section 1-6, and install cap.
22. Install pulley guard as detailed in sub-section 1-6. Install console on Valmont model. Install cab.
23. Set vehicle on the ground.



1-12-33

TRANSMISSION

1-13 DRIVE CHAIN

(A) GENERAL

The drive chain is installed in either the chain case or gear box. The Alpine/Invader and Valmont models incorporate a gear box while a chain case is installed on all other models.

- There are three (3) variations of the Bombardier drive chain — a single 1/2 inch pitch, a double 1/2 inch pitch and a double 3/8 inch pitch.
- There are also two (2) types of chains — detachable and endless.
- The table below lists the type of drive chain installed on all 1970 and '71 Ski-Doo snowmobiles.
- The information contained in this sub-section explains the procedures for separating, lengthening and shortening the drive chain.

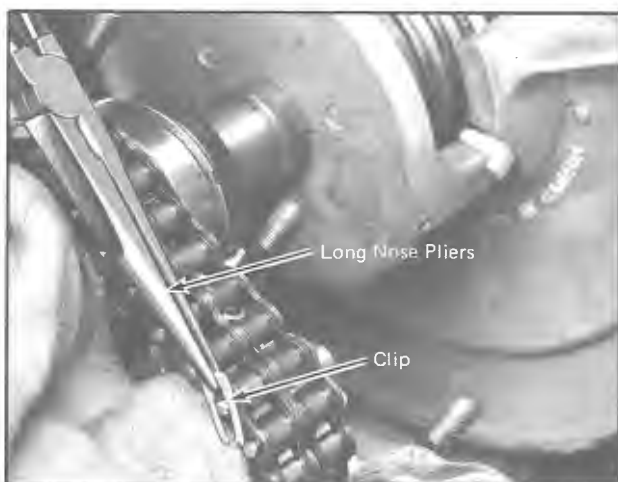
1-13

TABLE OF APPLICABLE DRIVE CHAINS

SINGLE 1/2 INCH PITCH			DOUBLE 3/8 INCH PITCH		
Year	Model		Year	Model	
1970	Olympique	12/3	1970	Olympique	399
	Olympique	335		T'NT	340
	Olympique	335E		Nordic	399
	T'NT	292		Nordic	399E
1971	Elan	250		Nordic	640E
	Elan	250E		T'NT	399
				T'NT	640
				Skandic	335
DOUBLE 1/2 INCH PITCH			1971	Olympique	300
Year	Model			Olympique	335
1970	Alpine	399R		Olympique	335E
	Alpine	399ER		Olympique	399E
	Invader	640ER		Olympique	399
1971	Alpine	339R		Nordic	399
	Alpine	339ER		Nordic	399E
	Alpine	640ER		Nordic	640E
	Valmont	399R		Skandic	335
	Valmont	399ER		T'NT	292
	Valmont	640ER		T'NT	340
				T'NT	440
				T'NT	640
				T'NT	775

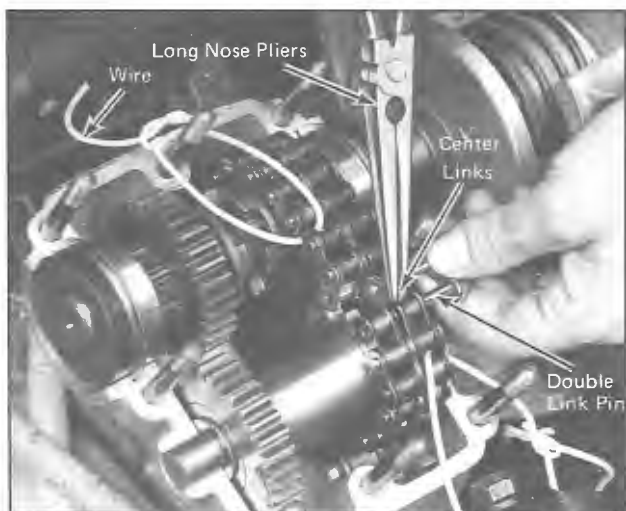
(B) SEPARATING DETACHABLE CHAIN
(On All Alpine/Invader and
Valmont Models — So Equipped)

1. Place a clean cloth beneath chain and in lower housing to prevent foreign matter and/or components from falling into bottom of housing.
2. Using long nose pliers, remove clip locking double link pin (fig. 1-13-1). Remove outer link.



1-13-1

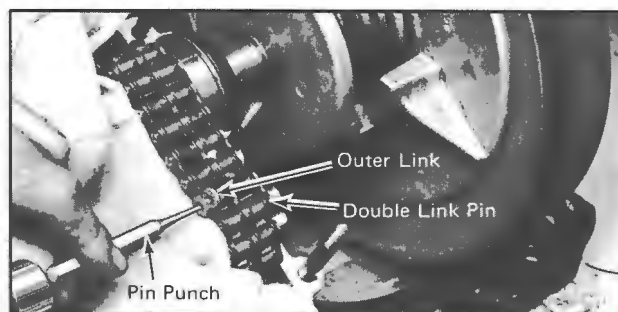
3. Insert two (2) pieces of wire through chain on each side of double link pin to be removed. Hook wires to lower housing studs to secure chain ends. With a pair of long nose pliers, hold center links and withdraw double link pin (fig. 1-13-2). Remove center links.



1-13-2

(C) SEPARATING ENDLESS
DOUBLE CHAIN
(On All Alpine/Invader and
Valmont Models — So Equipped)

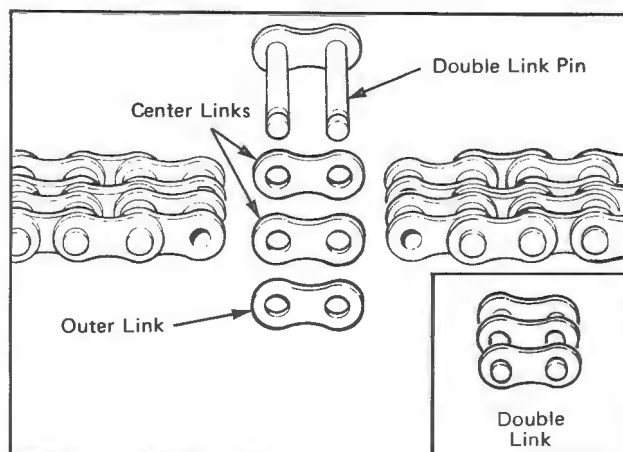
1. Place a clean cloth beneath chain and in lower housing to prevent foreign matter and/or other components from falling into bottom of housing.
2. Using a pin punch and hammer, tap gently on double link pin to disengage riveted heads of pin. Remove outer link. (fig. 1-13-3).



1-13-3

3. Insert two (2) pieces of wire through chain on each side of double link pin to be removed. Hook wires to lower housing studs to secure chain ends.
4. Using pin punch and hammer, tap gently on double link pin and remove two center links and link pin. (fig. 1-13-4).

NOTE: Connect drive chain using a double connecting link in place of previously removed components.



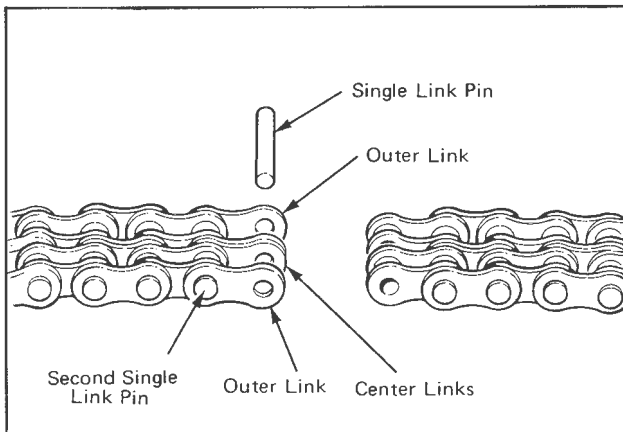
1-13-4

(D) SEPARATING ENDLESS DOUBLE CHAIN
(On All Models except Alpine/Invader and Valmont)

1. Removal chain case as detailed in sub-section 1-11.
2. Using a pin punch and hammer, tap gently on double link pin to disengage riveted heads of pin. Remove outer link.
3. Tap gently on double link pin and remove two center links and link pin (see fig. 1-13-4).

NOTE: If link pin removed was a single link pin, the outer link in step 2., the two center links and outer link in step 3. will not be detached without gently tapping out a second single link pin (see fig. 1-13-5).

NOTE: If the chain is to be lengthened, remove second link pin. Remove outer link, center links and outer link.



1-13-5

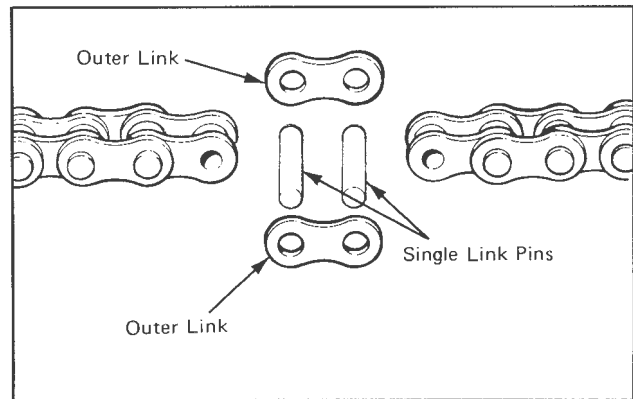
4. Carry out shortening or lengthening procedure and install chain case as detailed in sub-section 1-11.

(E) SEPARATING ENDLESS SINGLE CHAIN

1. Using a pin punch and hammer, gently tap on single link pin to disengage riveted head of pin. Remove pin to separate chain.

2. Remove second single link pin with a pin punch and hammer. Remove two (2) outer links (fig. 1-13-6).

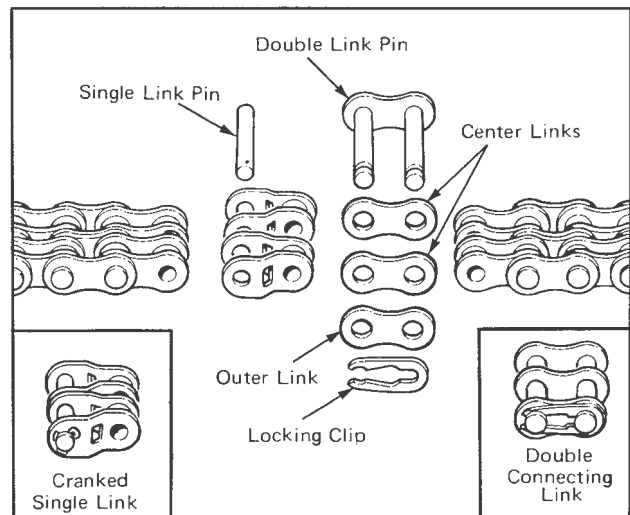
NOTE: Connect single chain using a single connecting link.



1-13-6

(F) LENGTHENING DOUBLE CHAIN

1. To lengthen a 1/2" or 3/8" inch pitch double chain 1/2 link, use the following procedure (fig. 1-13-7).



1-13-7

- (i) Separate drive chain as detailed in Paragraph (B), (C) or (D).

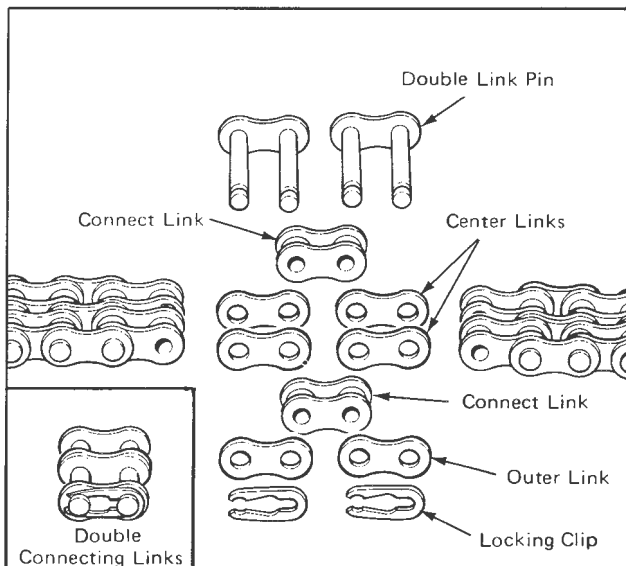
NOTE: If link pin removed in Paragraph C was a single link pin, remove second link pin. Remove outer link, center links and outer link.

- (ii) Remove a cotter pin and single link pin from a cranked single link.

- (iii) Connect the cranked single link to one free end of the chain with the removed pin and cotter pin.
- (iv) Join other free end of chain to cranked single link with a double connecting link.

NOTE: A double connecting link consists of a double link pin, two (2) center links, an outer link and a locking clip.

2. To lengthen 1/2 or 3/8 inch pitch double chain 1 link, use the following procedure (fig. 1-13-8).



1-13-8

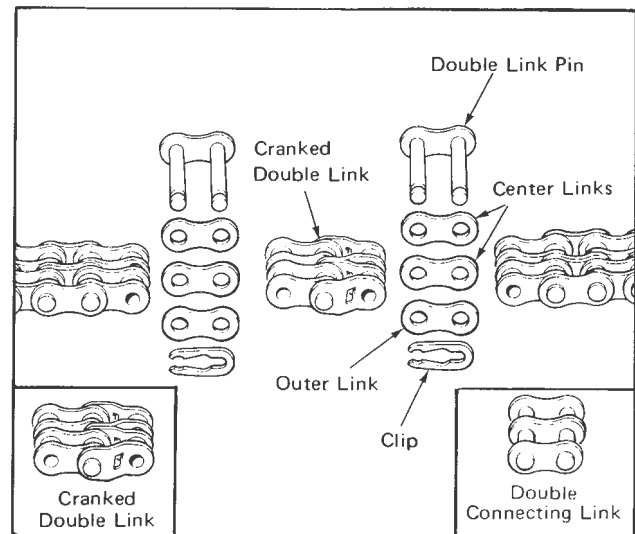
- (i) Separate drive chain as detailed in Paragraph (B), (C) or (D).

NOTE: If link pin removed in Paragraph (C) was a single link pin, remove second link pin. Remove outer link, center link and outer link.

- (ii) Secure two (2) connect links to each free end of chain with two (2) double connecting links.

NOTE: Each double connecting link consists of a double link pin, two (2) center links, an outer link and a locking clip.

3. To lengthen 1/2" or 3/8" inch pitch double chain 1-1/2 links, use the following procedure (fig. 1-13-9).



1-13-9

- (i) Separate drive chain as detailed in Paragraph (B) or (C).

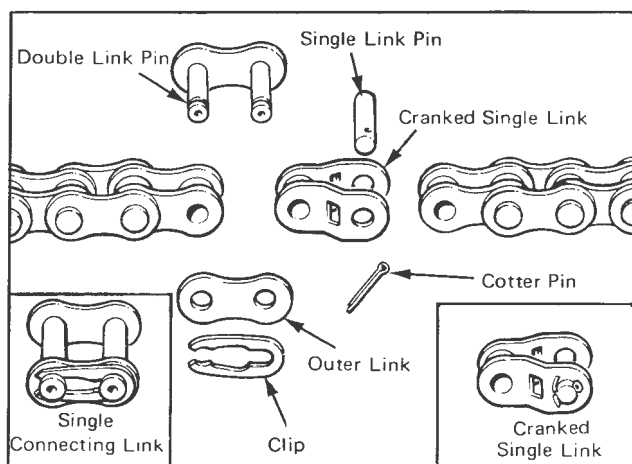
NOTE: If link pin removed in Paragraph (C) was a single link pin, remove second link pin. Remove outer link, center link and outer link.

- (ii) Secure a cranked double link to each free end of chain with two (2) double connecting links.

NOTE: Each double connecting link consists of a double link pin, two (2) center links, an outer link and a locking clip.

(G) LENGTHENING SINGLE CHAIN

1. To lengthen 1/2 inch pitch single chain 1/2 link, use the following procedure (fig. 1-13-10).

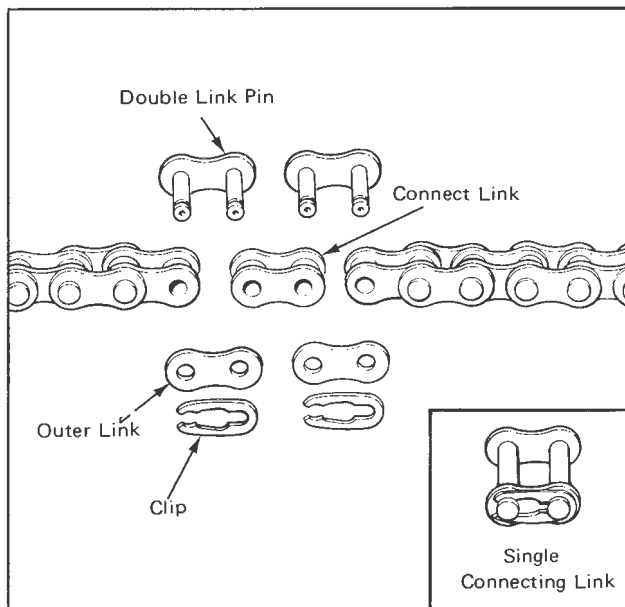


1-13-10

- (i) Separate drive chain as detailed in Paragraph (D).
- (ii) Remove a cotter pin and a single link pin from a cranked single link.
- (iii) Connect the cranked single link to one free end of the chain with the removed link pin and cotter pin.
- (iv) Join the other end of chain to cranked single link with a single connecting link.

NOTE: A single connecting link includes a double link pin, an outer link and a locking clip.

2. To lengthen 1/2 inch pitch single chain 1 link, use the following procedure (fig. 1-13-11).



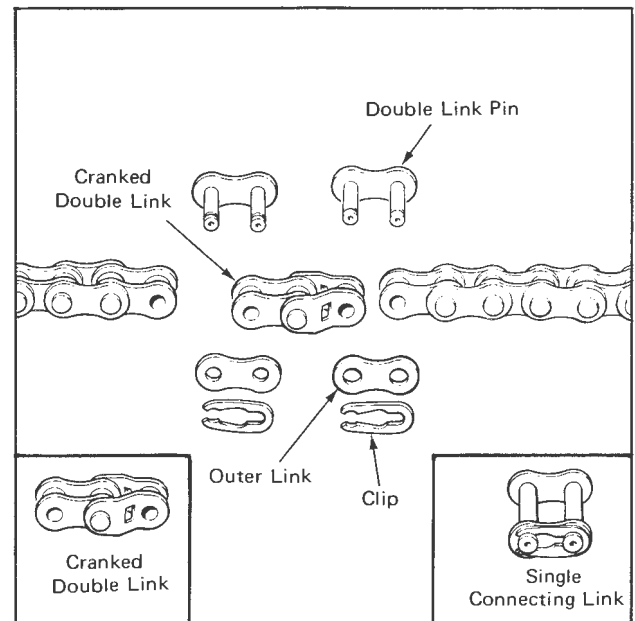
1-13-11

- (i) Separate drive chain as detailed in Paragraph (E).

- (ii) Secure one (1) connect link to each free end of chain with two (2) single connecting links.

NOTE: Each single connecting link consists of a double link pin, an outer link and a locking clip.

3. To lengthen 1/2 inch pitch single chain 1-1/2 links, use the following procedure (fig. 1-13-12).



1-13-12

- (i) Separate drive chain as detailed in Paragraph (E).
- (ii) Secure a cranked double link to each free end of chain with two (2) single connecting links.

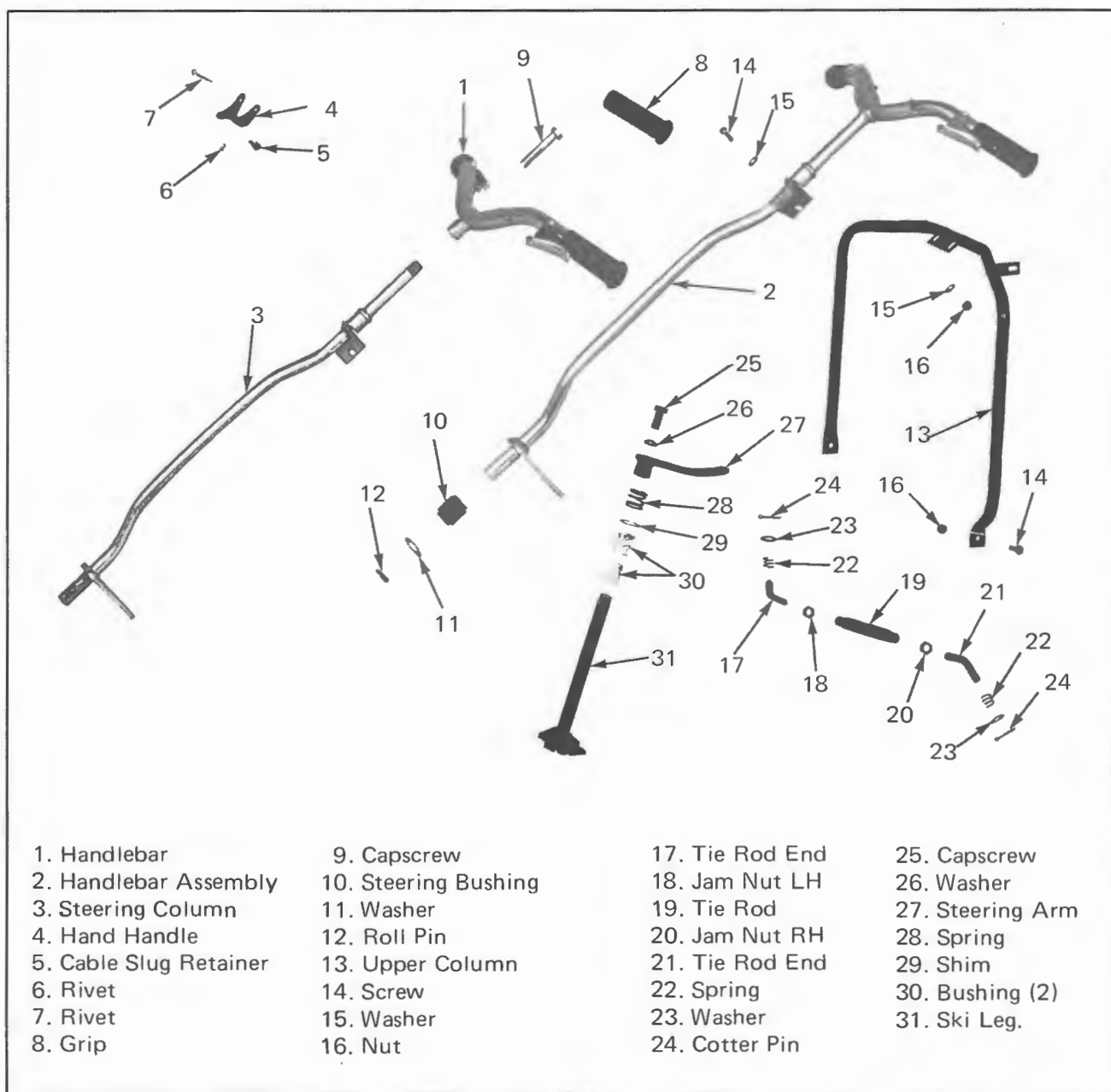
NOTE: Each single connecting link consists of a double link pin, an outer link and a locking clip.

STEERING SYSTEM

1-14 STEERING

(A) GENERAL

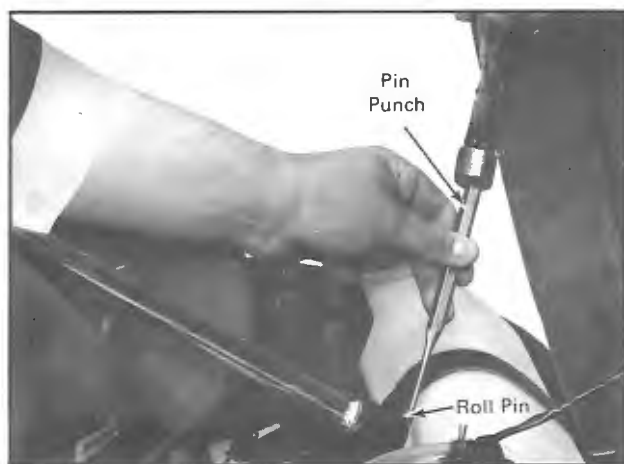
The basic steering system of the Ski-Doo snowmobile is a handlebar affixed to a steering column. Rotation of the handlebar causes a push-pull action of the steering linkage of the lower steering column/steering arm(s). It is the pull and/or pushing forces on the steering arm(s) that cause the turning of the ski(s).



DISASSEMBLED VIEW OF STEERING (TYPICAL)

(B) REMOVAL
(All Elan Models)

1. Tilt cab and remove console.
2. Disconnect brake and throttle cables and housing from the handlebar.
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 washer (fig. 1-14-1).



1-14-1

5. Remove the "U" clamp affixing the steering column to upper column.
6. Pull the steering column from the steering bushing and remove the steering column from the vehicle.

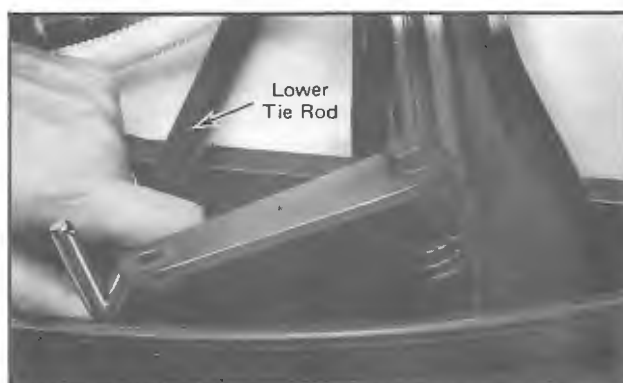
NOTE: Do not remove steering bushing unless damaged or worn and replacement is indicated.

7. Disconnect all electrical connections and switch blocks from dash panel. Push the brake and throttle cables and housings through dash panel. Unbolt the upper column from the frame and remove the column from the vehicle.
8. Remove cotter pin holding upper tie rod to swivel block. Pull upper tie rod from the block and remove it from the vehicle (fig. 1-14-2).



1-14-2

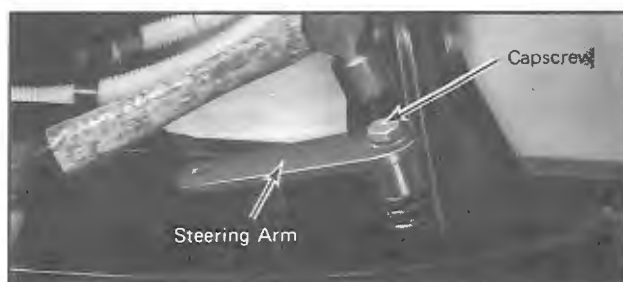
9. Remove cotter pins, washers and springs from lower tie rod. Remove swivel block from right hand steering arm tie rod end. Disengage tie rod from steering arms by turning skis in opposite direction of tie rod end disengagement (fig. 1-14-3).



1-14-3

10. Remove capscrews attaching steering arm to ski leg. Remove washer, steering arm and spring from ski leg splines.

NOTE: Should the steering arm be too tight on the ski leg spline, loosen cap-screw 3 to 4 turns and tap gently on the cap-screw head with a hammer (fig. 1-14-4). Vehicle must be lifted off the ground for this operation.



1-14-4

11. Pull the ski leg/ski assembly from the vehicle.
12. Remove ski coupler nut and ski coupler bolt.

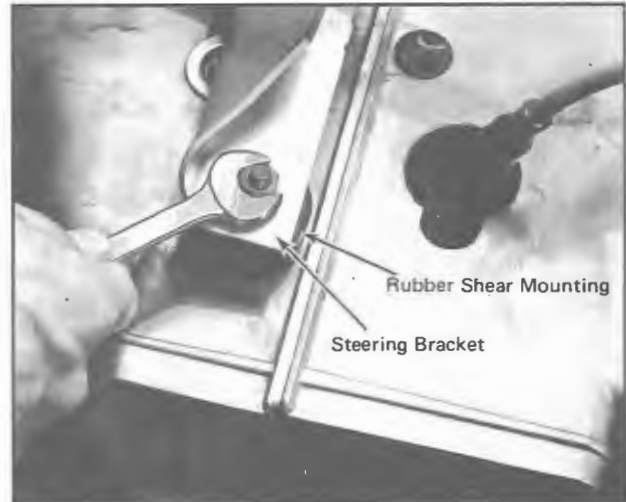
(C) REMOVAL (All Olympique Models)

1. Tilt or remove cab from vehicle..
2. On all 1971 models remove console as detailed in Section 4.
3. Disconnect brake and throttle cables and housings from handlebar.
4. Remove the cotter pins, washers and springs from the tie rod ends (steering column side) and pull the tie rods from the column.
5. Remove the two (2) bolts affixing the steering column to the upper column (fig. 1-14-5).

NOTE: On all 1970 "399" models, the upper column is replaced by a steering bracket affixed to the rubber shear mountings on the engine (fig. 1-14-6).



1-14-5



1-14-6

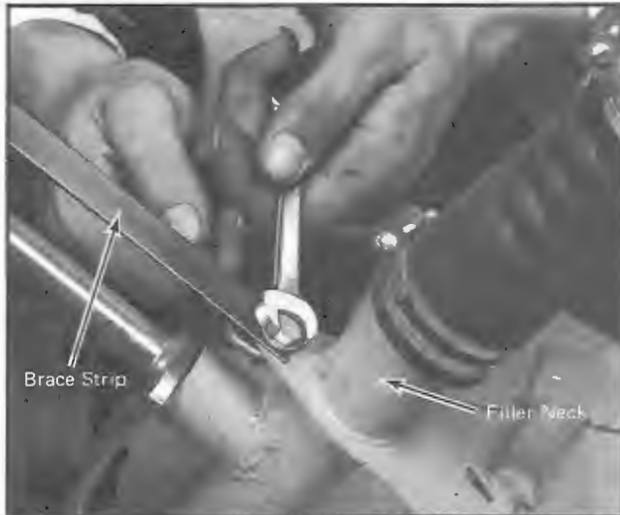
6. Remove steering column using the following procedure:
 - (a) On all 1970 vehicles, pull the steering column from the steering bushing and remove the steering column from the vehicle.

NOTE: Do not remove steering bushing from the vehicle unless damaged and replacement is indicated.

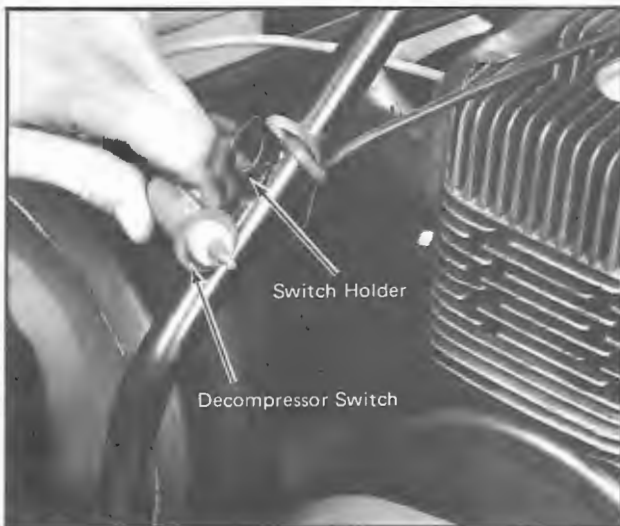
- (b) On all 1971 models, using a pin punch and a hammer, drive the roll pin holding the steering column to the frame reinforcing cross support. Remove washer. Pull the steering column from vehicle. Do not remove steering bushing from the vehicle unless damaged and replacement is necessary.
 - (c) On all 1970 "399" models with a steering bracket affixed to the cylinder head distance nuts carry out the following procedure:
 - (i) Remove the two (2) nuts and washers attaching the bracket to the studs and remove the bracket.
 - (ii) Unscrew the two (2) studs from the cylinder head distance nuts.
7. On all 1970 vehicles, remove bolt and washer affixing the brace strip to filler neck (fig. 1-14-7). Remove brace strip.

Remove the two (2) nuts attaching upper column to frame. Remove column from vehicle.

NOTE: On all 1970 models, except the "399" model, it is necessary to remove the decompressor switch/knob from upper column prior to upper column removal (fig. 1-14-8).

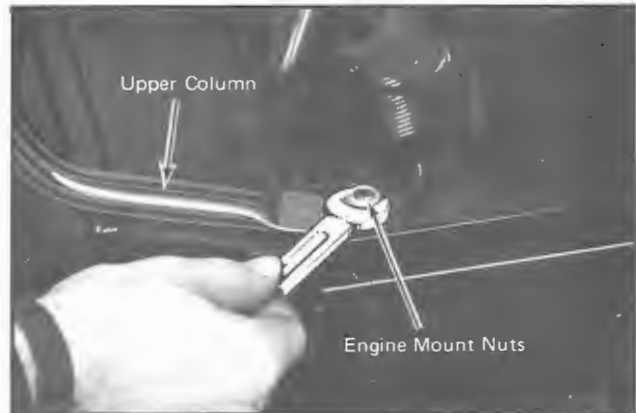


1-14-7



1-14-8

8. On all 1971 vehicles, 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 two (2) engine mount nuts and washers. Lift the column from the carriage bolts (fig. 1-14-9).



1-14-9

9. Remove the cotter pins, washers and springs from the tie rod ends (steering arm side). Push the rods from the steering arms. Remove tie rods from vehicle.

NOTE: On all 1971 models, the tie rod ends on the steering arm side are ball joint type. In this case, unscrew the nuts attaching the tie rod ends to the steering arms and remove the tie rods (fig. 1-14-10).



1-14-10

10. Remove capscrew attaching steering arm to ski leg. Remove washer, steering arm and spring from splines of the ski leg.

NOTE: Should the steering arm be too tight on the ski leg splines, loosen capscrew 1 to 2 turns and tap gently on the capscrew head with a hammer.

11. On all 1971 models, remove the ski leg top bushing (fig. 1-14-11).



1-14-11

12. Pull the ski leg/ski assembly from the vehicle.
13. On all 1971 models, remove ski leg bottom bushing (fig. 1-14-12).



1-14-12

14. Remove ski coupler nut and ski coupler bolt.
15. Repeat applicable steps 10 to 14 to remove opposite steering arm.

(D) REMOVAL (All T'NT Models)

1. Tilt or remove cab from vehicle.
2. Disconnect brake and throttle cables and housings from handlebar.
3. On all vehicles with detachable handlebar, remove capscrew and pull the handlebar from the steering column splines.
4. Remove the cotter pins, washers and springs from the tie rods (steering column side) and push the tie rods from the column.
5. Remove steering column using the following procedure:
 - (a) On all 1970 vehicles, remove the two (2) bolts affixing the steering column to the upper column and pull the steering column from the vehicle.

NOTE: Do not remove steering bushings from vehicle unless damaged and replacement is indicated.

- (b) On all 1971 models, using a pin punch and a hammer, drive the roll pin holding the steering column to the frame reinforcing cross support. Remove washer. Unbolt the steering column from the upper column and pull the steering column from the steering bushing and remove the steering column from the vehicle.

NOTE: On all 1970 models equipped with 18 inch track, the upper column is replaced by a steering bracket affixed to the rubber shear mountings on the engine.

- (c) On all 1970 models with a steering bracket affixed to the cylinder head distance nuts, carry out the following procedure:
 - (i) Remove the two (2) nuts and washers attaching the bracket to the studs and remove the bracket.
 - (ii) Unscrew the two (2) studs from the cylinder head distance nuts.
6. On all 1970 vehicles equipped with 18 inch track, remove bolt and washer affixing the brace strip to filler neck. Remove brace strip (See fig. 1-14-7).
7. Remove the two (2) bolts attaching the upper column to frame and lift the column from vehicle.
8. Remove the cotter pins, washers and springs from the tie rod ends (steering arm side) and push the rods from the steering arms.

NOTE: On all 1971 T'NT 15 inch track models, the tie rod ends on the steering arm side are ball joint type. In this case, unscrew the nuts attaching the tie rod ends to the steering arms and remove tie rods from vehicle. (See fig. 1-14-10).

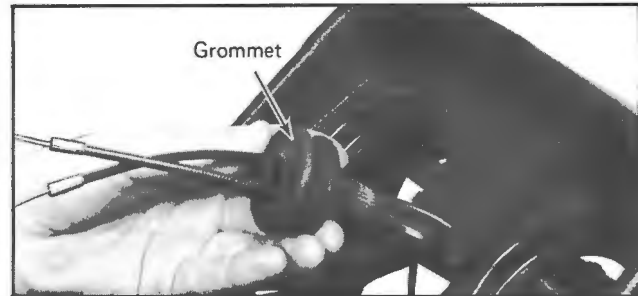
9. Remove capscrew attaching steering arm to ski leg. Remove washer, steering arm and spring from splines of the ski leg.

NOTE: Should the steering arm be too tight on the ski leg splines, loosen cap-screw 3 to 4 turns and tap gently on the capscrew head with a hammer. (Vehicle must be lifted off the ground for this operation).

10. On all 1971 models, remove the ski leg top bushing. (See fig. 1-14-11).
11. Pull the ski leg/ski assembly from the vehicle.
12. On all 1971 models, remove the ski leg bottom bushing. (See fig. 1-14-12).
13. Remove ski coupler nut and ski coupler bolt.
14. Repeat applicable steps 9 to 13 to remove opposite steering arm.

(E) REMOVAL (All Nordic Models)

1. Tilt cab.
2. Disconnect brake and throttle cables and housings from the handlebar.
3. Remove capscrew and pull the handlebar from the steering column splines.
4. Remove cotter pins, washers and springs from tie rods ends (steering column side) and pull the tie rods from the column.
5. Using a pin punch and a hammer, drive the roll pin holding the steering column to the frame reinforcing cross support. Remove washer.
6. On all 399 models, open lower access cover and remove upper access cover.
7. Pull the console grommet from the steering column (fig. 1-14-13).



1-14-13

8. On all 640 models, tilt console towards seat.
9. Unbolt the steering column from the upper column. On all 640 models, remove "V" bracket.

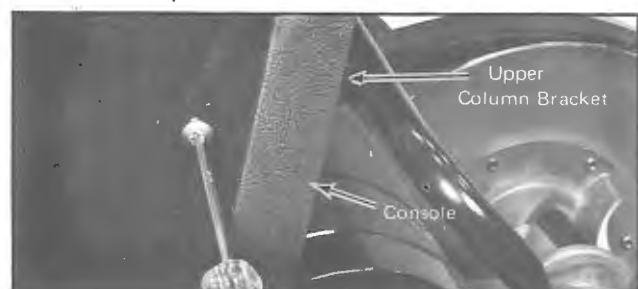
NOTE: On all 1970 models, the upper column is replaced by a steering bracket affixed to the rubber shear mountings on the engine.

10. On all 1970 models with a steering bracket affixed to the cylinder head distance nuts, carry out the following procedure:
 - (a) Remove the two (2) nuts and washers attaching the bracket to the studs and remove the bracket.
 - (b) Unscrew the two (2) studs from the cylinder head distance nuts.

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.

12. On all 1971 "399" models, unbolt console from upper column brackets (fig. 1-14-14).



1-14-14

13. Remove the two (2) bolts attaching upper column to frame and lift the column from the vehicle.
14. Remove the cotter pins, washers and springs from the tie rod ends (steering arm side) and push the rods from the steering arms. Remove tie rods from the vehicle.
15. Remove capscrew attaching steering arm to ski leg. Remove washer, steering arm and spring from ski leg splines.

NOTE: Should the steering arm be too tight on the ski leg splines, loosen cap-screw 3 to 4 turns and gently tap on the capscrew head with a hammer. (Vehicle must be lifted off the ground for this operation.)

16. On all 1971 models, remove ski leg top bushing.
17. Pull ski leg/ski assembly from vehicle.
18. On all 1971 models, remove ski leg bottom bushing. (See fig. 1-14-12).
19. Remove ski coupler nut and ski coupler bolt.
20. Repeat applicable steps 15 to 19 to remove second steering arm.

(F) REMOVAL (All Alpine/Invader and Valmont Models)

1. Remove cab as detailed in Section 4.

NOTE: On all 1971 Valmont models, remove console.

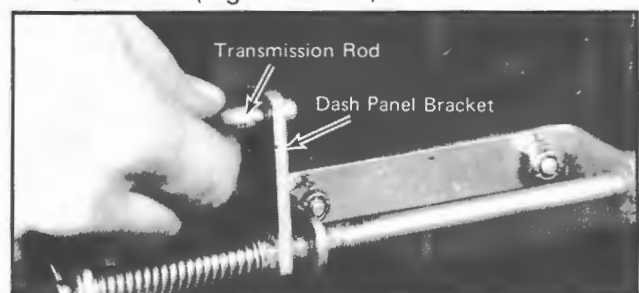
2. Disconnect brake and throttle cables and housings from handlebar.
3. Remove capscrew and washer attaching handlebar to steering column. Pull the handlebar from steering column splines and remove the spring.
4. Remove muffler from vehicle.

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 (fig. 1-14-15). Remove plate.



1-14-15

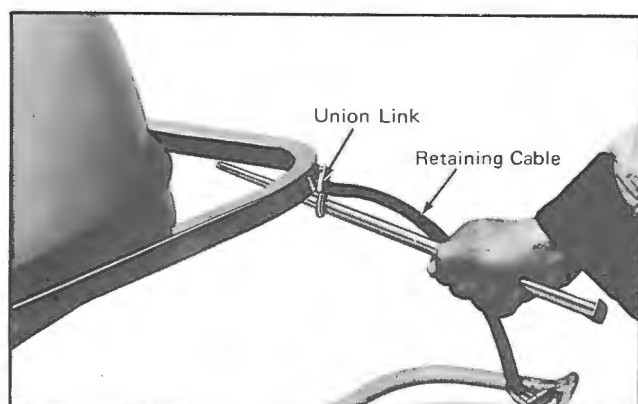
7. Lift the ball bushing from the steering channel and remove the steering column from vehicle.
8. Remove cotter pin, washer and spring affixing the transmission rod to gear change lever. Disengage the rod from the lever.
9. Disconnect all electrical connections and switch blocks from dash panel.
10. Remove the brake and throttle cables from dash panel by passing it through appropriate orifice or anchor of the panel.
11. On all 1971 models, remove the four (4) nuts and cable bracket attaching dash panel to upper column and remove the dash panel and brackets from vehicle.
12. On all 1971 models, remove cotter pin affixing transmission rod to dash panel bracket and disengage the rod from the bracket (fig. 1-14-16).



1-14-16

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 capscrew, washer, steering arm and spring from ski leg splines.

NOTE: On 1970 Alpine/Invader, open union link and disconnect retaining cable from the front bumper. (fig. 1-14-17).



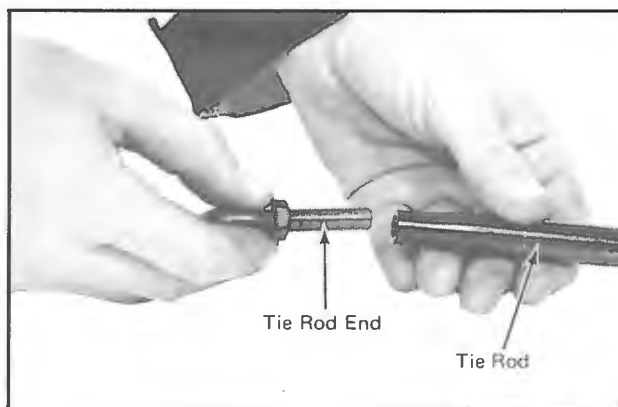
1-14-17

16. Lift the front of vehicle off the ground and pull the ski leg/ski assembly from the vehicle.
17. Remove the ski coupler bolt and remove ski leg from ski.

(G) DISASSEMBLY
(All Models except
Alpine/Invader and Valmont)

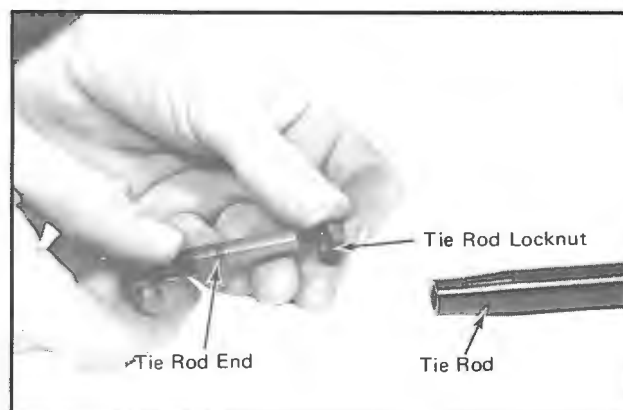
1. To disassemble the handlebar, refer to Paragraph (J).
2. Slacken the locknuts holding the tie rod ends in position.
3. Unscrew the tie rod ends from the tie rods (fig. 1-14-18).

NOTE: The tie rod ends have right hand and left hand threads. The tie rod end attached to the steering column incorporated left hand thread while the tie rod end attached to the steering arm has a right hand thread.



1-14-18

4. Remove the tie rod end locknuts (fig. 1-14-19).

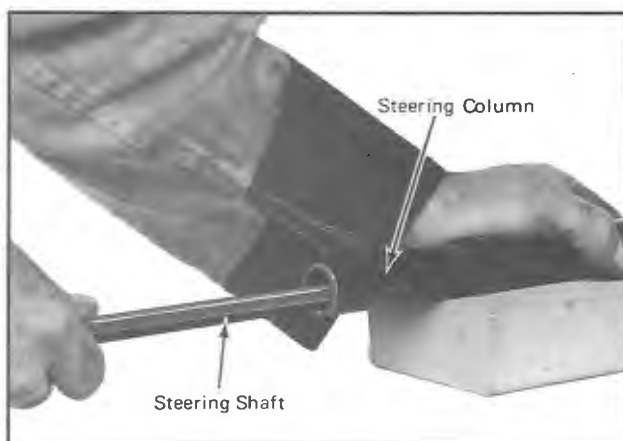


1-14-19

(H) DISASSEMBLY
(All Alpine/Invader
and Valmont Models)

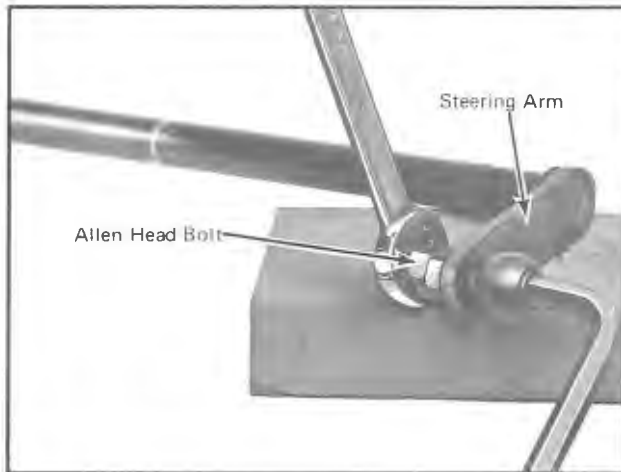
1. Slide the steering shaft from the steering column (fig. 1-14-20).

NOTE: Do not remove steering bushings unless damaged and replacement is indicated.



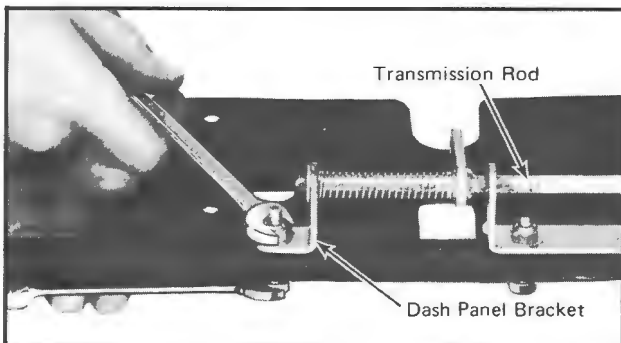
1-14-20

2. Remove the Allen head bolt attaching the ball bushing to steering arm (fig. 1-14-21).



1-14-21

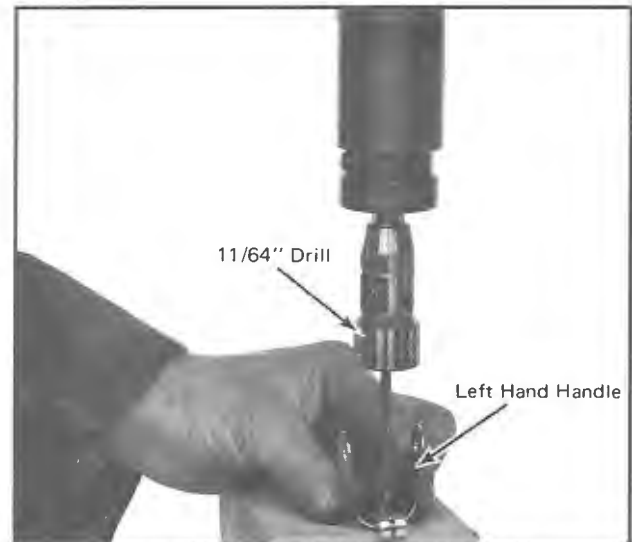
3. On all 1971 Alpine/Valmont models, carry out the following procedure:
 - (a) Remove the bolt attaching transmission bracket to upper column and remove cotter pin, washer, bracket and spring from transmission rod (fig. 1-14-22).



1-14-22

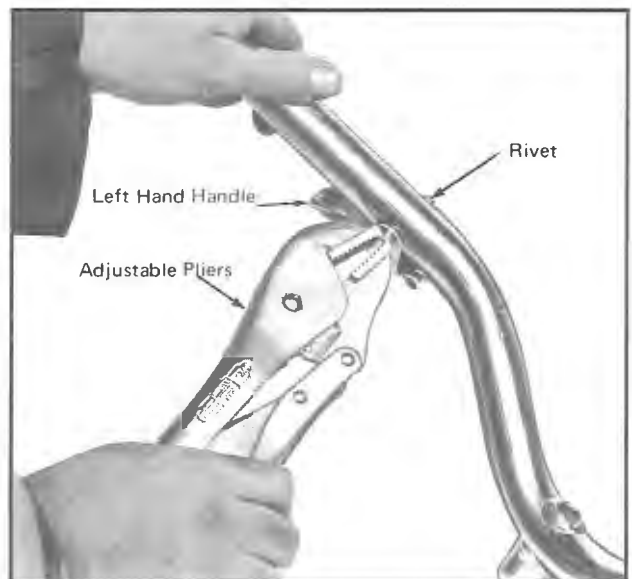
- (b) Remove the two (2) bolts attaching transmission rod to upper column and remove the rod. Remove transmission rod ball.
4. Disassemble the handlebar as detailed in Paragraph (J).
- (J) **Disassembly and Assembly of Handlebar (All Models)**
 1. Disconnect brake and throttle cables and housings from the handlebar.

2. Cut the rivets securing the hand handles to handlebar.
3. Using a 11/64 inch dia drill, remove the rivet holding cable slug retainer to hand handle (fig. 1-14-23).



1-14-23

4. Using the appropriate rivet, secure new cable slug retainer to new hand handle.
5. Position the hand handle onto handlebar and insert the appropriate rivet through hand handle and handlebar.
6. Using adjustable pliers, squeeze the rivet end until the rivet can no longer be passed back through the handlebar (fig. 1-14-24).



1-14-24

7. Connect brake and throttle cables and housings to handlebar.
8. Should the handlebar grip(s) be worn or damaged, replace grip(s) as follows:
 - (a) Using a sharp knife cut the grip(s) in a longitudinal direction.
 - (b) Remove and discard the grip(s).
 - (c) Position new grips, internally lubricated with oil, onto the handlebar and push them into location.

(K) CLEANING

1. Clean all metal components, using a suitable cleaning solvent and a clean cloth.
2. Clean the ski leg bushings using a clean, dry cloth.

CAUTION: Do not immerse bushings in cleaning solvent as it may distort the component.

3. The ball joint type tie rod ends must be cleaned of all dirt and grease using a clean, dry cloth.

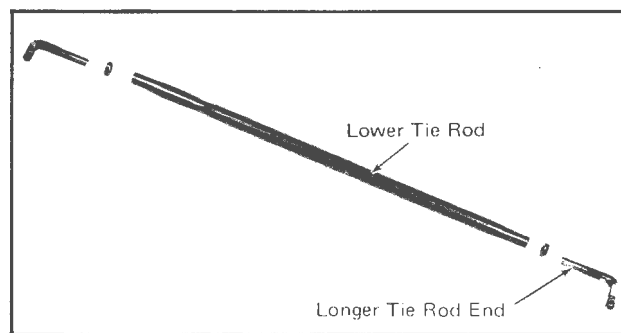
(L) INSPECTION

1. Inspect all threaded components for stripped, crossed or otherwise damaged threads. Replace damaged components.
2. Visually inspect ball joint type tie rod ends for excessive free play. Replace as required. Apply a drop of light machine oil inside ball rubber.
3. Visually inspect ski legs and steering column for cracked, worn and/or twisted splines. If splines are damaged, replace damaged component.
4. Inspect all other components for signs of wear, cracks and other possible damage. Replace damaged part(s).

(M) ASSEMBLY

1. On all models equipped with standard type tie rods, carry out the following procedure:
 - (a) Screw one (1) locknut onto each of the four (4) tie rod ends.
 - (b) 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 tie rods.

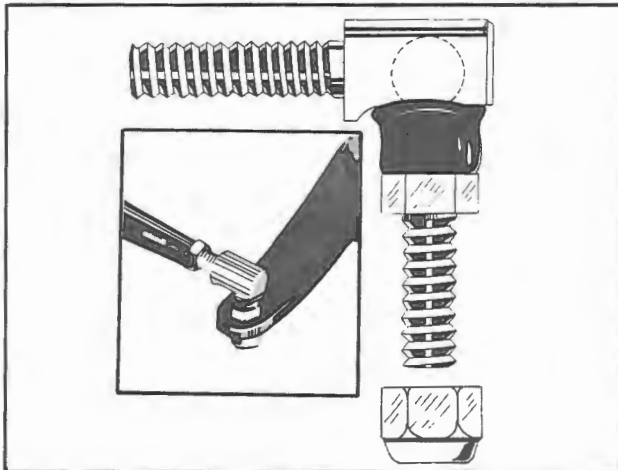
NOTE: On all Elan models, the longer tie rod end must be screwed into the lower tie rod (fig. 1-14-25).



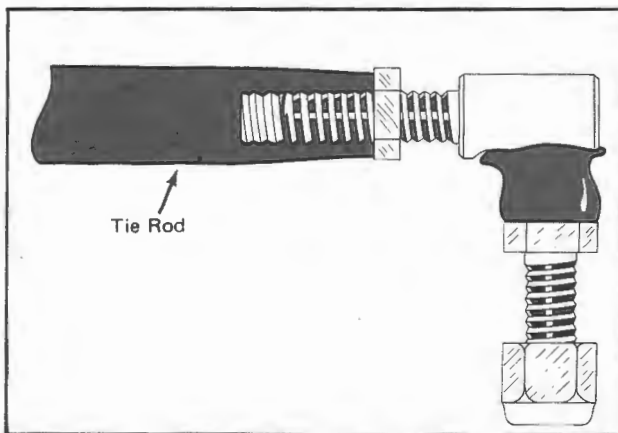
1-14-25

2. On all 1971 models incorporating ball joint type tie rod ends, carry out the following procedure:
 - (a) Screw one (1) of the locknuts onto each longer threaded end of the tie rod end.
 - (b) Screw two (2) tie rod ends with longer threaded end into each of the tie rods, ensuring that total number of tie rod end 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 lengths (fig. 1-14-26).

NOTE: The cut-off section of the joint must run parallel with the horizontal line of the steering arm when assembled on vehicle (fig. 1-14-27).



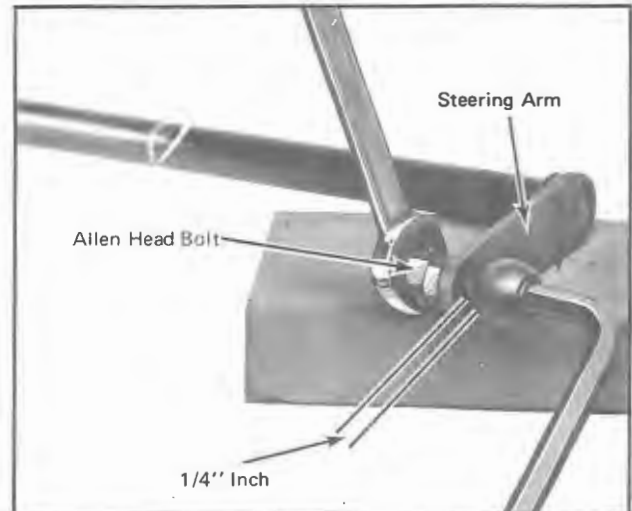
1-14-26



1-14-27

(N) ASSEMBLY
(All Alpine/Invader
and Valmont Models)

1. On all 1971 Alpine/Valmont models, carry out the following procedure:
 - (a) Screw the transmission rod ball onto transmission rod. Position the rod in location and affix using two (2) bolts.
 - (b) Slide the spring, transmission bracket and washer onto rod and securing using a new cotter pin. Affix the transmission bracket to upper column using appropriate bolt.
2. Temporarily affix the ball bushing to steering arm 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. 1-14-28).

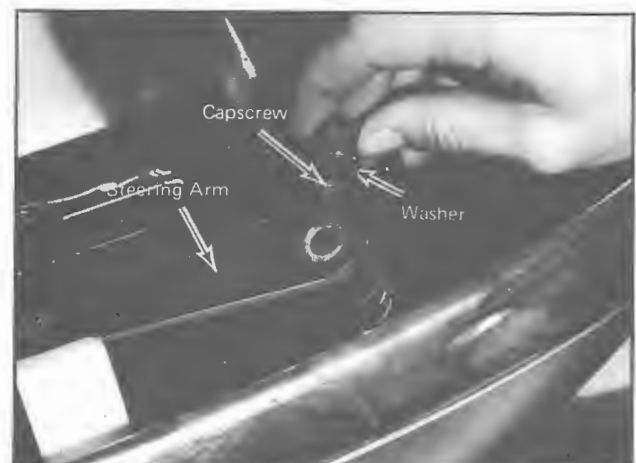


1-14-28

3. Apply a light coat of low temperature grease over steering shaft and slide the steering column onto the shaft.

(P) INSTALLATION
(All Elan Models)

1. Secure ski legs to ski assemblies as detailed in sub-section 1-15.
2. Insert the ski legs into ski leg holders.
3. Position skis parallel with vehicle and place springs, steering arms, washers and capscrews on the ski legs. (fig. 1-14-29).

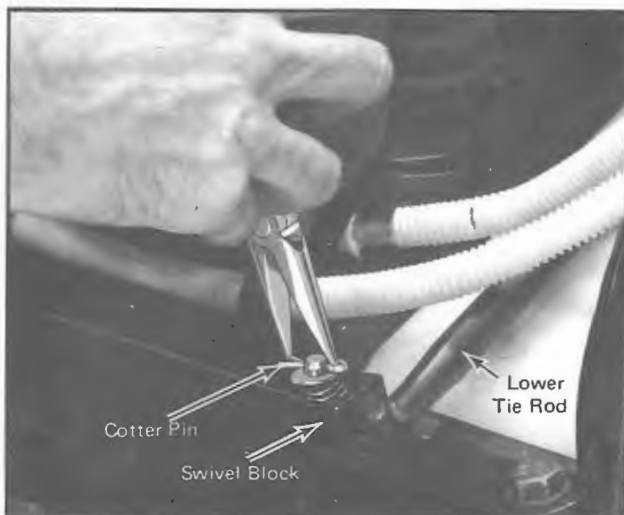


1-14-29

4. To check correct angle of steering arms, position lower tie rod in location ensuring that the longer tie rod end is at the right hand side of the rod when viewing it from the engine.

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 and the steering arm angles are equal on both sides when the skis are parallel with the vehicle.

5. Insert the left hand tie rod end into steering arm and secure in place using spring, washer and a new cotter pin.
6. Insert right hand tie rod end into steering arm and place the swivel block, spring and washer on tie rod end. Secure in place using a new cotter pin (fig. 1-14-30).



1-14-30

7. Insert a tie rod end of the upper tie rod through swivel block and secure using a new cotter pin.
8. If a new steering bushing was required, insert the new bushing into appropriate holder using an appropriate bushing pusher.
9. Insert the steering column into steering bushing and affix in place using washer and roll pin.
10. Position the upper column in location and attach it to the frame using two (2) bolts and washers.

11. Affix the steering column to the upper column using the "U" clamp.
12. Insert tie rod end into steering column and secure using spring, washer and a new cotter pin.
13. Connect all electrical connections and switch blocks to dash panel. Pass the brake and throttle cables and housings through dash panel and connect each cable to handlebar.
14. Align skis as detailed in Paragraph (U).
15. Close cab. Install console as detailed in Section 4.

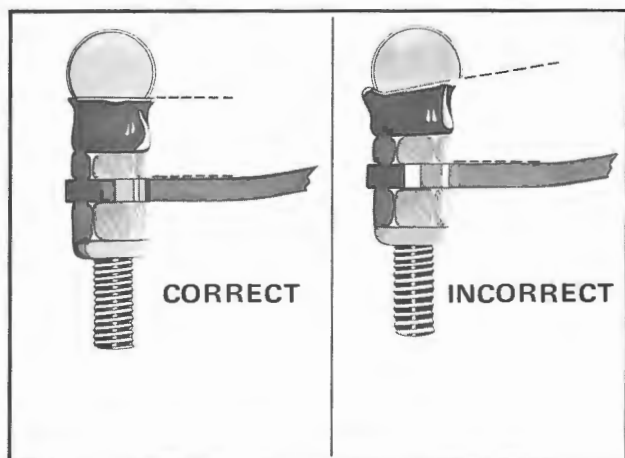
(Q) INSTALLATION (All Olympique Models)

1. Install ski legs to ski assemblies as detailed in sub-section 1-15.
2. On all 1971 models, 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.
3. On all 1970 models, insert the ski legs into the ski leg holders.
4. Position skis parallel with vehicle and place springs, steering arms, washers and capscrews on the ski legs. Check that angles of steering arms are equal. (See fig. 1-14-38).
5. Insert the tie rod ends into steering arms as follows:
 - (a) On all 1970 vehicles, insert tie rod ends into steering arms. Secure each tie rod end with a spring, washer and a new cotter pin.

STEERING

1-14-13

- (b) On all 1971 models, insert the shorter threaded end of the ball joint type tie rod ends into steering arms and secure using appropriate nut (fig. 1-14-31).

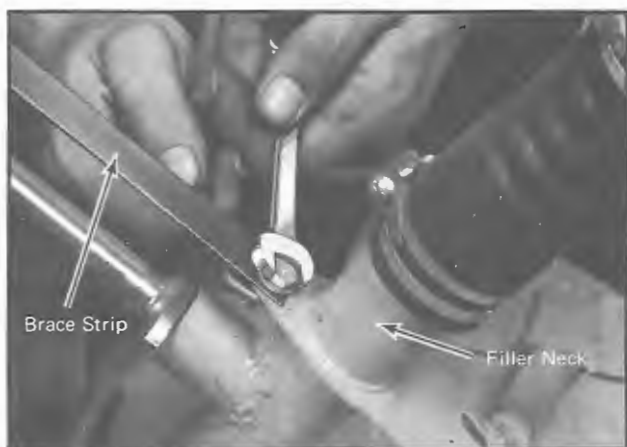


1-14-31

6. If a new steering bushing was required, insert the new bushing into holder using an appropriate bushing pusher.
7. Insert the steering column into steering bushing.

NOTE: On all 1971 models, affix column in position using a washer and roll pin.

8. Install upper column as follows:
- (a) On all 1970 vehicles, except 399 models, position the upper column in location and secure to frame using two (2) bolts and washers. Attach brace strip to filler neck using bolt and washer (fig. 1-14-32).



1-14-32

- (b) On all 1971 vehicles, 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 400 to 420 inch pounds (fig. 1-14-33).



1-14-33

- (c) On all 1970 "399" models, install rubber shear mountings into the cylinder head distance nuts. Position steering bracket on the rubber shear mountings. Secure using the nuts.
9. Affix the steering column to upper column as follows:
- (a) On all 1970 models except 399, attach the upper column, steering column and brace strip using two (2) bolts and washers.
- (b) On all 1970 "399" models, attach the steering column to the steering bracket mounted on the engine using washers and nuts.
- (c) On all 1971 models, attach the bar bracket to upper column using two (2) bolts and washers.

10. Insert the tie rod ends into steering column and secure using springs, washers and new cotter pins.
11. On all 1970 models except 399, attach decompressor switch to appropriate holder on upper column. Ensure the decompressor cable is connected to decompressor valve on the engine.
12. On all 1971 models, install dash panel to upper column and secure using two nuts. Connect all electrical connections and switch blocks to dash panel. Pass the brake and throttle cables and housing through dash panel and connect each cable to the handlebar.
13. Align skis as detailed in Paragraph (V).
14. Install or close cab.
15. On all 1971 models, install console as detailed in Section 4.

**(R) INSTALLATION
(All T'NT Models)**

1. Install ski legs to ski assemblies as detailed in sub-section 1-15.
2. On all 1970 models, insert the ski legs into ski leg holders.
3. On all 1971 models, install one bottom bushing on each ski leg. Insert the ski legs into ski leg holders. Install one top bushing on each ski leg.
4. Position skis parallel with vehicle and place springs, steering arms, washers and capscrews on the ski legs. Check that angles of steering arms are equal. (See fig. 1-14-40).
5. Insert the tie rod ends into steering arms as follows:
 - (a) On all 1970 models and all 1971 vehicles equipped with 18 inch tracks, insert the tie rod ends into steering arms. Secure each tie rod end with a spring, washer and a new cotter pin.

- (b) On all 1971 "292 and 340" models, insert the shorter threaded end of ball joint type tie rod ends into steering arms then secure using appropriate nut.

6. If a new steering bushing was required, insert the new bushing into appropriate holder using an appropriate bushing pusher.
7. Insert the steering column into steering bushing.

NOTE: On all 1971 models, affix steering column in location using washer and roll pin.

8. Position the upper column in location and secure to frame using two (2) bolts and washers.

NOTE: On all 1970 models, attach the brace strip to filler neck using bolt and washer.

9. On all 1970 "399" models, install rubber shear mountings into the cylinder head distance nuts. Position steering bracket on the rubber shear mountings. Secure using two nuts.

NOTE: On all 1970 models, the brace strip is attached to steering column/upper column with one of the attaching bolts.

CAUTION: Ensure the upper column bracket is positioned on top of the attachments.

10. Affix the steering column to upper column by using two (2) bolts.
11. Insert the tie rod ends into steering column and secure each tie rod end with a spring, a washer and a new cotter pin.
12. On vehicles with detachable handlebar, position handlebar on steering column

splines. Secure using appropriate cap-screw.

NOTE: The handlebar must be at 90° with vehicle.

13. Connect brake and throttle cables and housings to handlebar.
14. Align skis as detailed in Paragraph (V).
15. Install or close cab.

(S) INSTALLATION (All Nordic Models)

1. Install ski legs to ski assemblies as detailed in sub-section 1-15.
2. On all 1970 models, insert the ski legs into ski leg holders.
3. On all 1971 models, install one bottom bushing on each ski leg. Insert the ski legs into ski leg holders. Install one top bushing on each ski leg.
4. Position skis parallel with vehicle and place springs, steering arms, washers and capscrews on the ski legs. Check that angles of steering arms are equal (fig. 1-14-40).
5. Insert tie rod ends into steering arms. Secure each tie rod end with a spring, a washer and a new cotter pin.
6. If a new steering bushing was required, insert the new bushing into holder using an appropriate bushing pusher.
7. Insert the steering column into steering bushing. Affix in position using a washer and a roll pin (fig. 1-14-34).
8. Position the upper column in location and secure to frame using two (2) bolts and washers.

NOTE: On all 1970 models, the upper column is replaced by a steering bracket

affixed to the rubber shear mountings on the engine.



1-14-34

9. On all 1970 "399" models, install rubber shear mountings into the cylinder heads distance nuts. Position steering bracket on the rubber shear mountings. Secure using two nuts.
10. Affix the steering column to upper column as follows:
 - (a) On all 1970 models, attach the steering column to the steering bracket mounted on the engine using washers and nuts.
 - (b) On all 1971 models, attach the bar bracket to upper column using two (2) bolts and washers.
 - (c) On all 640 models, the "V" bracket must be positioned between upper column bracket and bar bracket.
11. Insert the tie rod ends into steering column and secure using springs, washers and new cotter pins.
12. On all 1971 "399" models, bolt the console to the two (2) upper column brackets. On 640 models, tilt the console towards engine.

13. Slide the console grommet onto the column.
14. Position handlebar on steering column splines and using a soft faced hammer, tap the handlebar in location. Secure using appropriate capscrew. Ensure the handlebar is at a 90° angle with vehicle.
15. Connect brake and throttle cables and housings to handlebar. Ensuring the cables pass through the console grommet.
16. On all 399 models, install upper access cover and close lower access cover.
17. Align skis as detailed in Paragraph (V).
18. Close Cab.

(T) INSTALLATION
(All Alpine/Invader
and Valmont Models)

1. Install ski to ski leg as detailed in sub-section 1-15.
 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 capscrew.
 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.
 8. Measure the distance from upper edge of lower retainer plate to the upper column bracket. The distance on all 1970 models must be 17-3/4 inches (fig. 1-14-35)

while on all 1971 models the distance must be 15-1/2 inches (fig. 1-14-36).



1-14-35

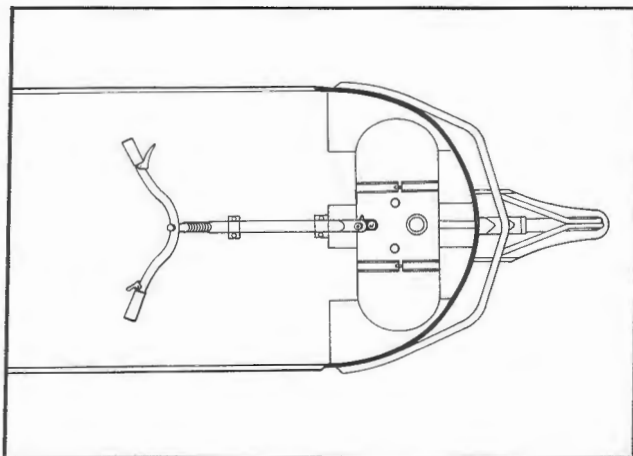


1-14-36

9. Secure steering column in location with the upper retainer plate affixed to upper column bracket with two (2) bolts.
10. On all 1971 Valmont models, carry out the following procedure:
 - (a) Position the dash panel in location using four (4) nuts and two (2) dash panel brackets.

NOTE: On all 1971 Valmont models, 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 to secure rod in position.
 - (c) Insert the transmission rod into gear charge lever and affix using spring, washer and a new cotter pin.
11. On all 1970 models, insert the transmission rod through dash panel orifice and connect the rod to the gear charge lever using spring, washer and new cotter pin.
 12. Pass the brake and throttle cables through the appropriate dash panel orifice or anchor.
 13. Connect all electrical connectors and switch blocks to dash panel. (Refer section 3, Electrical Charts).
 14. Position spring on steering column splines.
 15. Position handlebar on steering column splines. Secure using washer and capscrew.
- NOTE:** The handlebars must be perpendicular with vehicle seat with the ski parallel with vehicle (fig. 1-14-37).



1-14-37

16. Connect the brake and throttle cables and housings to handlebar.
17. Install muffler.
18. On all 1970 vehicles, connect the retaining cable to front bumper using the appropriate union link.

19. On all 1971 Valmont models, install console.
20. Install cab as detailed in Section 4.

(U) STEERING ADJUSTMENTS (All Elan Models)

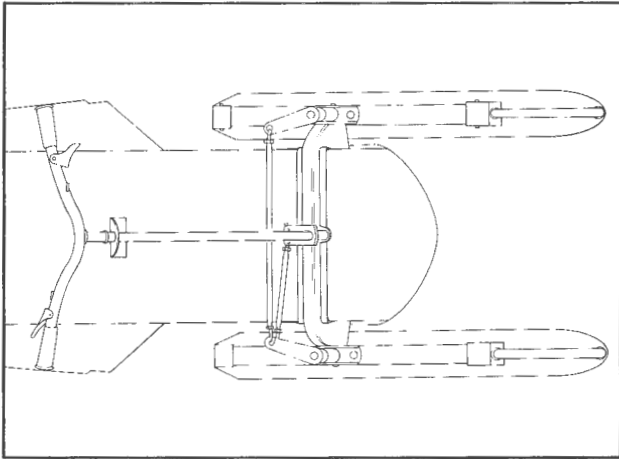
The skis must be parallel to each other and to the vehicle when the handlebar is horizontal. Check alignment of skis using the following procedure:

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 (fig. 1-14-38). Tighten the two (2) locknuts firmly.



1-14-38

- (c) Tighten the two (2) capscrews installed in steering arms. Verify measurements between skis.
- (d) Check that skis are parallel to the vehicle when handlebar is horizontal (fig. 1-14-39).



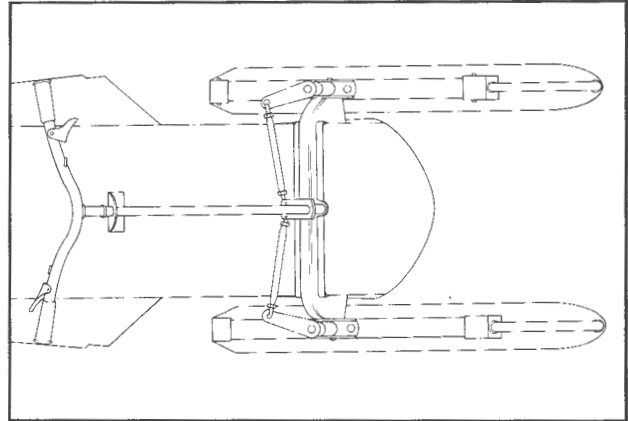
1-14-39

If readjustment is required, carry out the following procedure:

- (a) Loosen the two (2) locknuts the upper tie rod in place.
- (b) Turn tie rod manually, until skis are parallel with vehicle.
- (c) Retighten the locknuts firmly against the tie rods.

(V) STEERING ADJUSTMENTS (All Models except Elan, Alpine/Invader and Valmont)

The skis must be parallel to each other and to the vehicle when the handlebar is horizontal. Check alignment of skis using the following procedure: (fig. 1-14-40).



1-14-40

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 locking the tie rods in place.
- (b) Manually turn one or both tie rods until skis are aligned. Tighten the locknuts firmly against the tie rod. Firmly tighten the capscrews installed in the steering arms.

(W) STEERING ADJUSTMENTS (All Alpine/Invader and Valmont models)

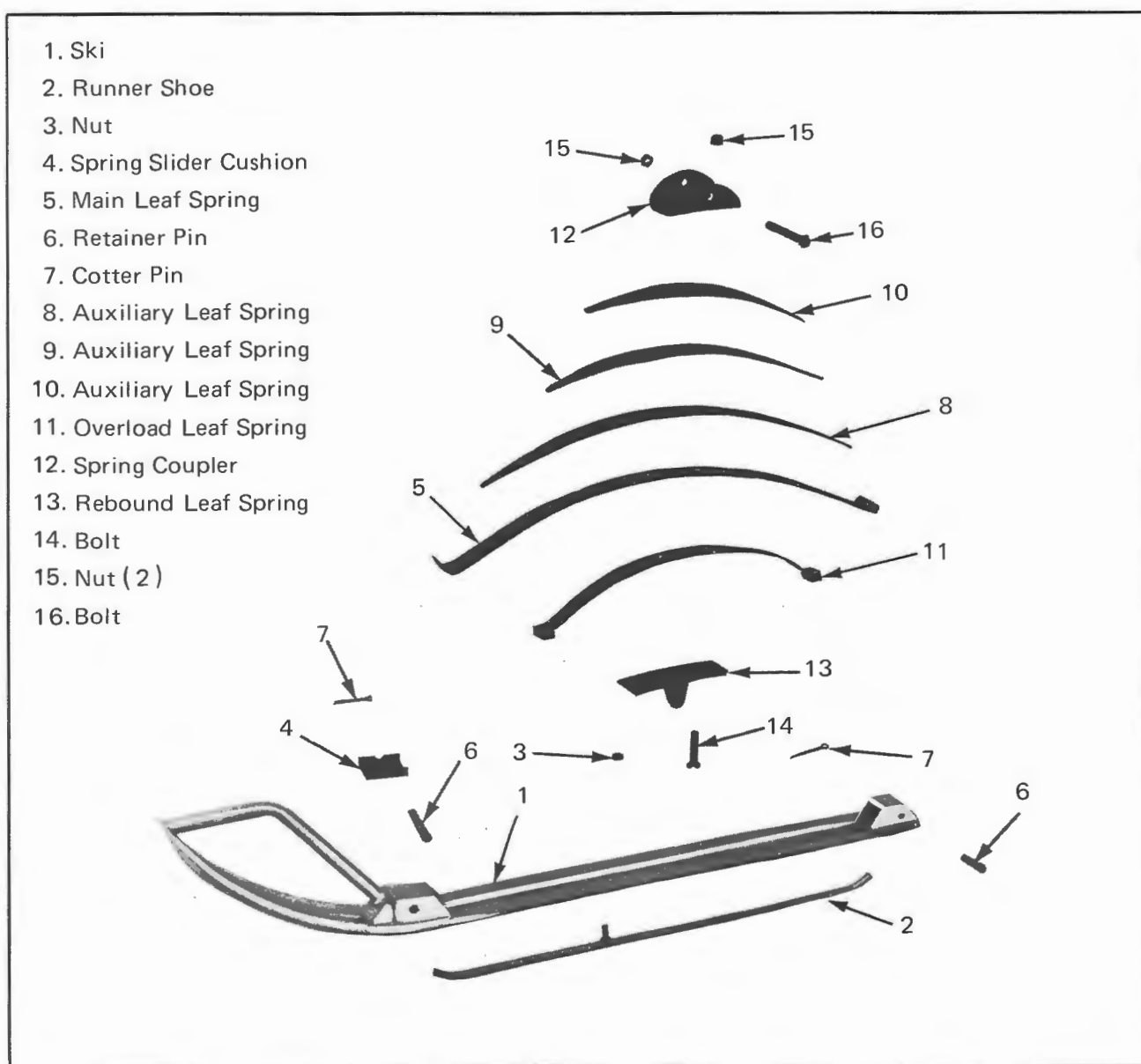
NOTE: Ski alignment of all Alpine/Invader and Valmont models is accomplished during installation of steering mechanism.

SKI SYSTEM

1-15 SKI SYSTEM

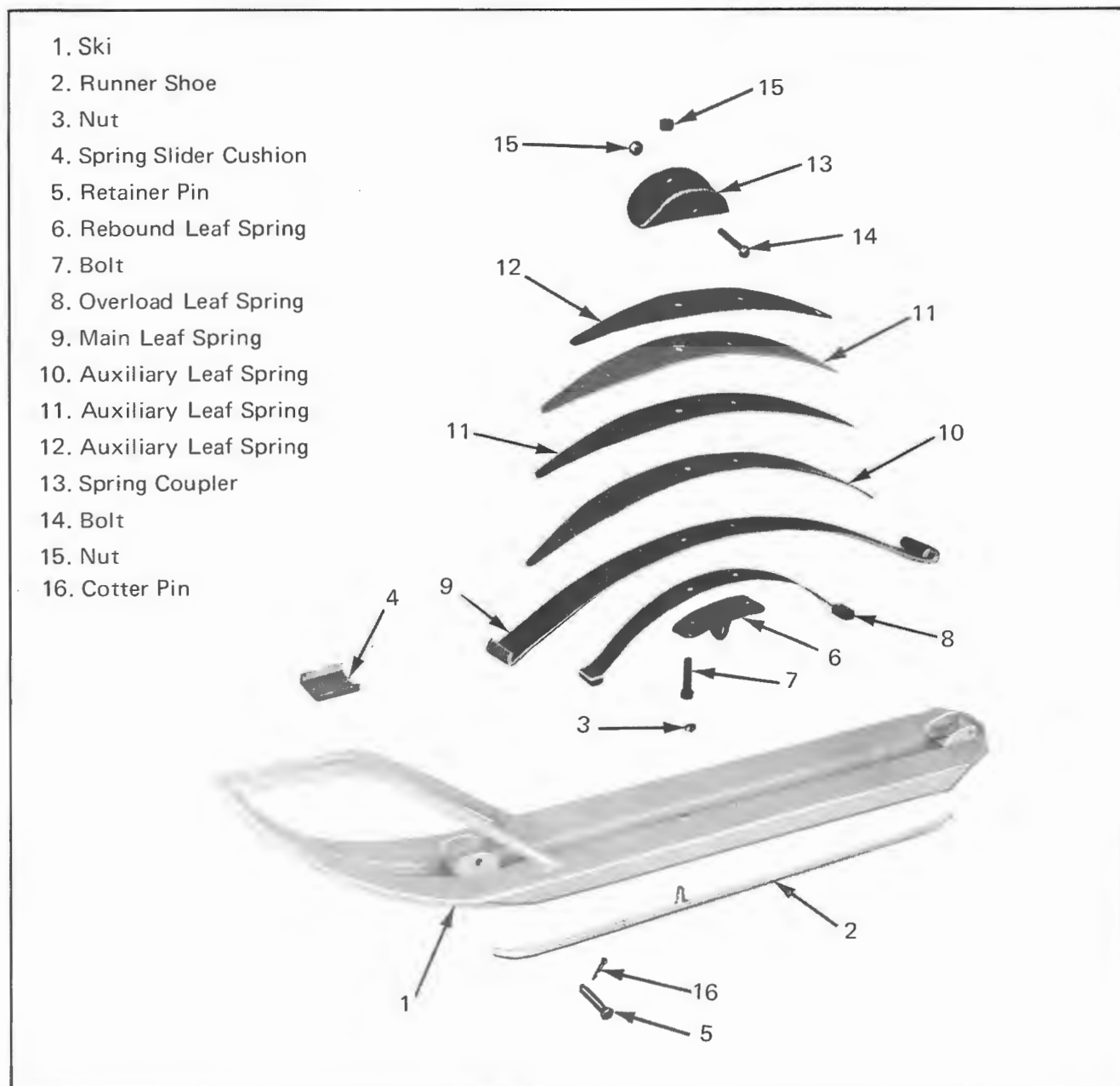
(A) GENERAL

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 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.



1-15

DISASSEMBLED VIEW OF 1971 SKI (TYPICAL)

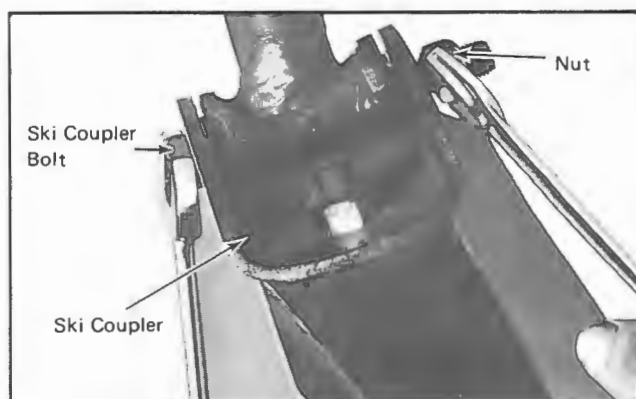


DISASSEMBLED VIEW OF 1971 ALPINE/VALMONT SKI

(B) REMOVAL

(All Models except
Alpine/Invader and Valmont)

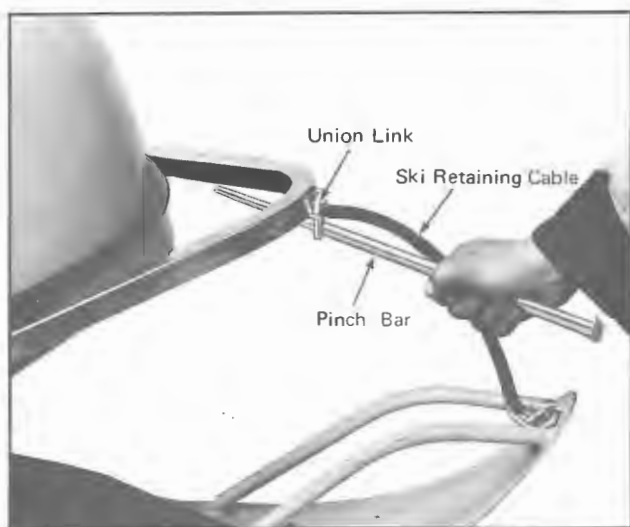
1. Tilt the vehicle on the opposite side of the ski to the removed.
2. Remove the ski coupler bolt nut and unscrew the coupler bolt. Remove bolt from ski coupler (fig. 1-15-1).
3. Remove the ski from the vehicle.



4. Repeat steps 1. to 3. to remove second ski.

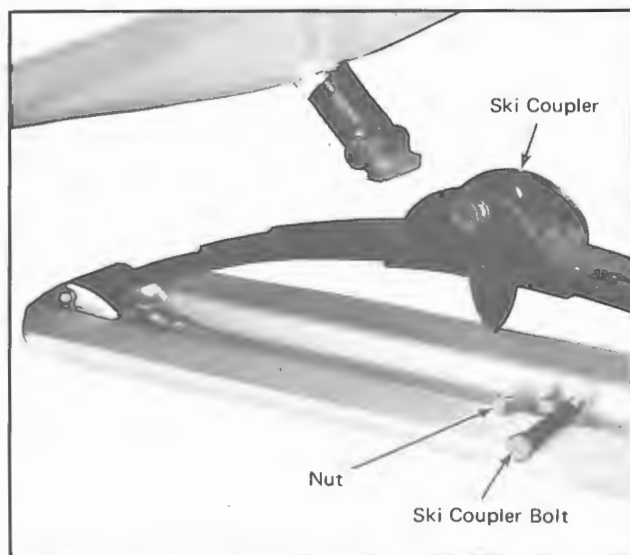
(C) REMOVAL
(All Alpine/Invader
and Valmont Models)

1. On all 1970 Alpine/Invader models, pry open the union link with a pinch bar (fig. 1-15-2). Remove union link and ski retaining cable from bumper.



1-15-2

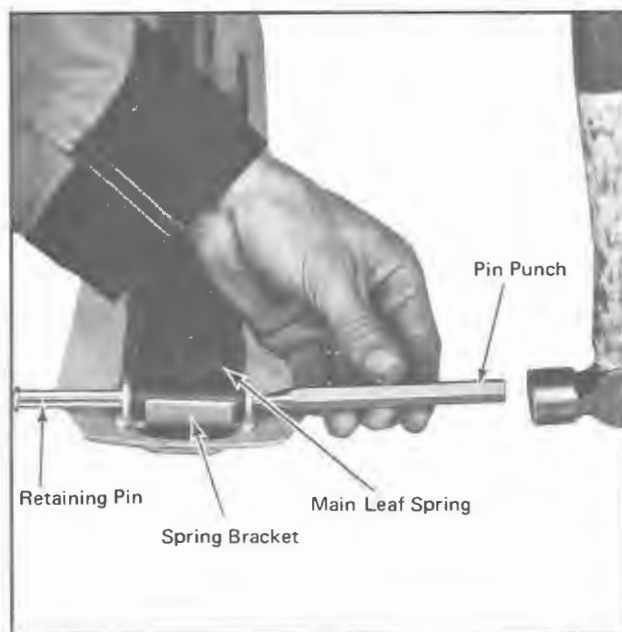
2. Lift front of vehicle off the ground.
3. Remove the ski coupler bolt nut and unscrew the coupler bolt. Remove bolt from ski coupler. Remove the ski from the vehicle (fig. 1-15-3).



1-15-3

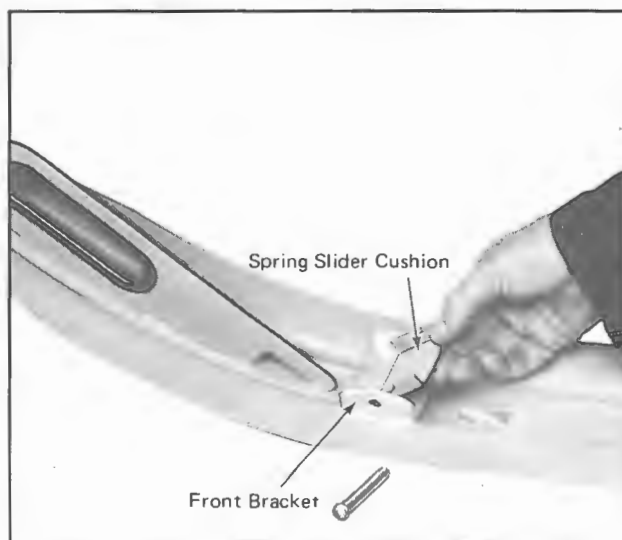
(D) DISASSEMBLY

1. Straighten and remove the cotter pin from the retaining pin securing rear end of the main leaf spring.
2. Using a pin punch and hammer, gently tap the retainer pin from the ski/leaf spring bracket (fig. 1-15-4).



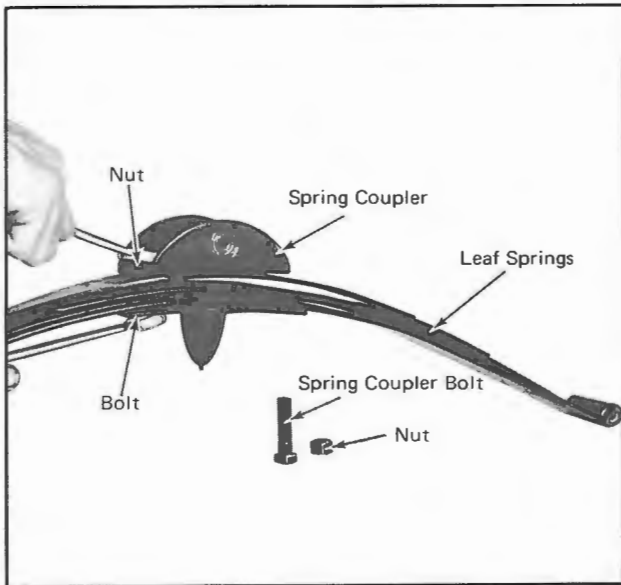
1-15-4

3. Repeat steps 1 and 2 and remove front retaining pin. Remove the spring assembly from the ski.
4. Remove the spring slider cushion from the front bracket (fig. 1-15-5).



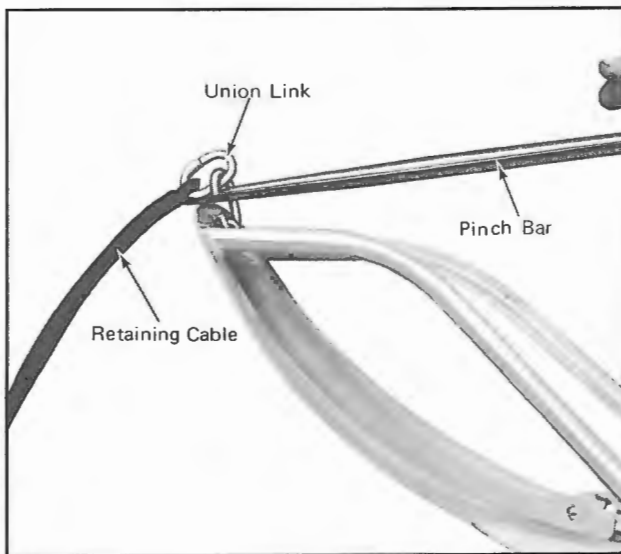
1-15-5

- Remove the two (2) spring coupler bolts and nuts securing spring coupler to the leaf springs. Disassemble the leaf springs (fig. 1-15-6).



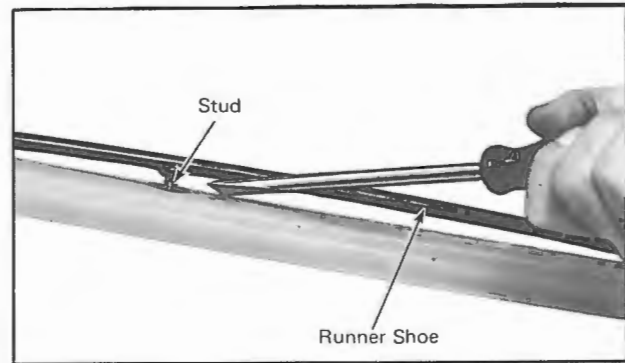
1-15-6

- On all 1970 Alpine/Invader models, use a pinch bar and pry open the union link holding the retaining cable to the ski (fig. 1-15-7).



1-15-7

- On top side of ski, remove the nut affixing the runner shoe stud to ski.
- Turn the ski over and pry the runner shoe until the shoe ends come out of their slots (fig. 1-15-8).



1-15-8

(E) CLEANING

- Remove grease and dirt from all components with cleaning solvent and a clean cloth. Remove rust formation or other deposits with a firm bristle brush. If paint has been removed, apply a coat of appropriate Ski-Doo Paint.

(F) INSPECTION

- Visually check all components for wear, cracks, distortion and other damage. Replace or repair defective part(s).
- Check that ski runner shoes are not worn more than half (1/2) of their original thickness. If worn beyond that extent, replace the shoes.
- Inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged component(s).

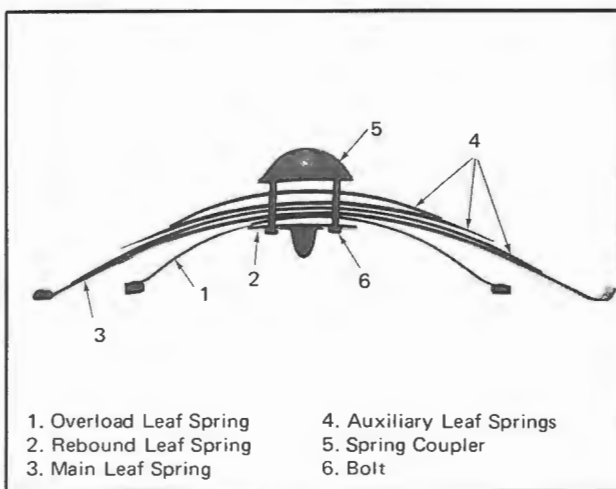
(G) ASSEMBLY

- Prior to Assembly procedure, ensure all components are clean and all defective parts have been repaired or replaced.
- On the keel side of ski, insert the ends of the ski runner shoe into the ski slots. Push the runner shoe stud into hole of ski and secure shoe to ski with appropriate nut.
- On all 1970 Alpine/Invader models, install retaining cable to ski using union link. Close the link.

4. Lay the rebound leaf spring on its side and assemble the following components to the rebound leaf spring in the following order.

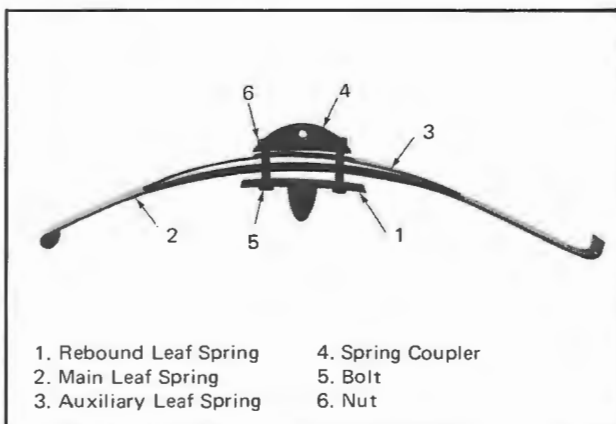
- (a) Overload Leaf Spring*
- (b) Main Leaf Spring
- (c) Auxiliary Leaf Spring(s)**
- (d) Spring Coupler

*The overload leaf spring is installed on all 1971 Nordic 640, T'NT and Alpine/Valmont models (fig. 1-15-9).



1-15-9

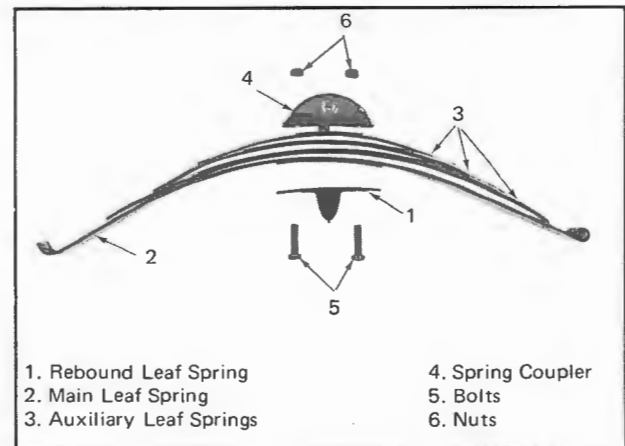
** All Elan models incorporate one (1) auxiliary leaf spring (fig. 1-15-10).



1-15-10

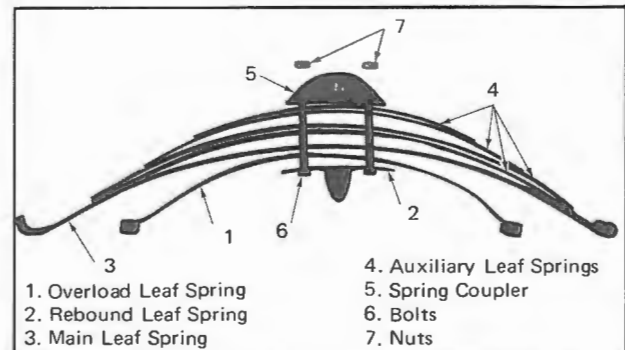
All Olympique models have two (2) auxiliary leaf springs (fig. 1-15-11).

All Nordic and T'NT models incorporate three (3) auxiliary leaf springs (see fig. 1-15-11).



1-15-11

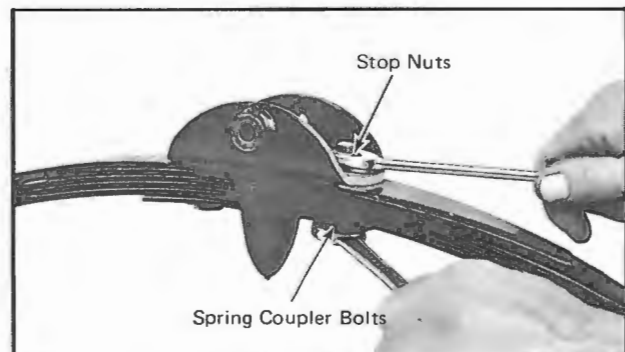
All Alpine/Invader and Valmont Models have four (4) auxiliary leaf springs (fig. 1-15-12).



1-15-12

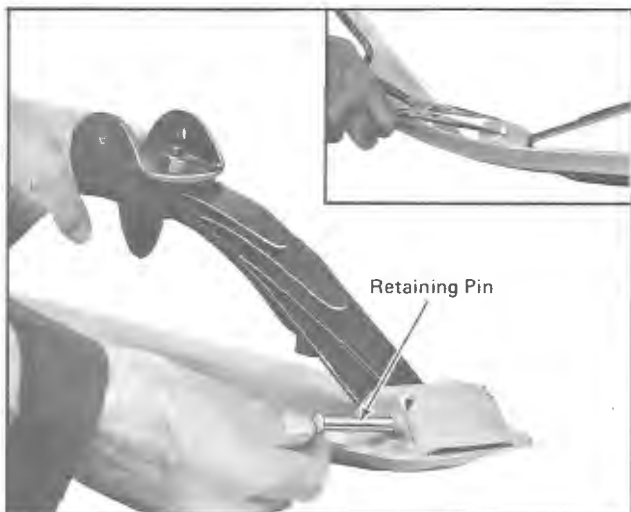
NOTE: The spring coupler has a threaded hole. The coupler must be positioned so that the thread is on the left side of the right hand ski and vice-versa for the left hand ski.

5. Insert the spring coupler bolts through the rebound leaf spring and align the holes of each unit. Secure the assembly with two (2) elastic stop nuts (fig. 1-15-13).



1-15-13

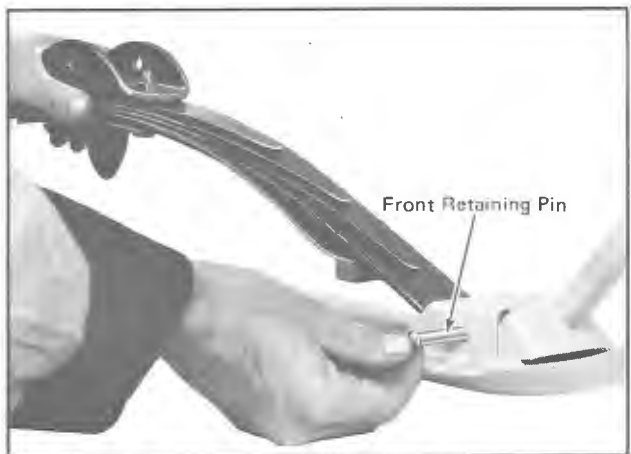
6. Slide the spring slider cushion into location.
7. Position looped end of the leaf spring onto the rear bracket of the ski.
8. Align the loop with the holes of the rear bracket. Insert a retaining pin and secure with a cotter pin (fig. 1-15-14).



1-15-14

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. The front retaining pin of the right hand ski must be inserted from the right hand side and vice-versa.

9. Apply downward pressure on the leaf spring assembly and at the same time, insert the front retaining pin. Secure with a cotter pin (fig. 1-15-15).



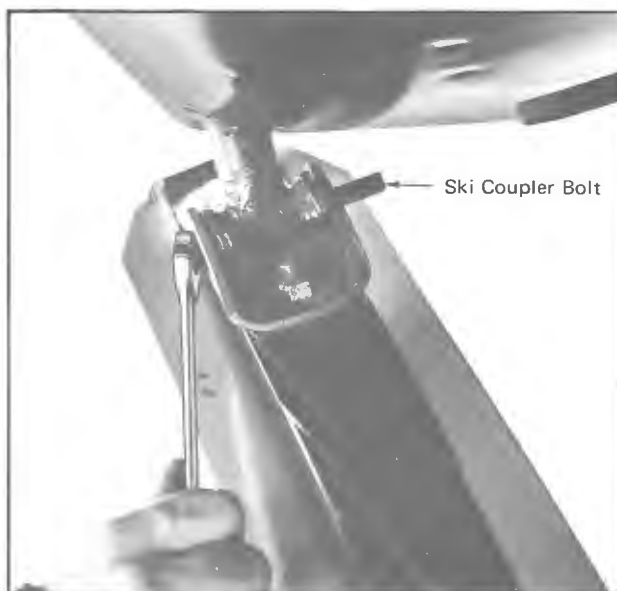
1-15-15

10. On all models repeat the above procedure, steps 1 to 9 to assemble the second ski.

(H) INSTALLATION

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 (fig. 1-15-16).

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.



1-15-16

3. Install the ski coupler nut until tight. Move the ski by hand and ensure that it pivots easily on the ski leg.
4. Repeat steps 1 to 3 to install second ski.
5. On 1970 Alpine/Invader models, connect the union link to the front bumper.
6. Lubricate ski coupler bolts with light machine oil. Wipe off excess.
7. Place the vehicle on the ground.

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ENGINE

2-1 GENERAL

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 burned gas and the intake of a fresh fuel charge. Figure 2-1-1 shows how this is possible.

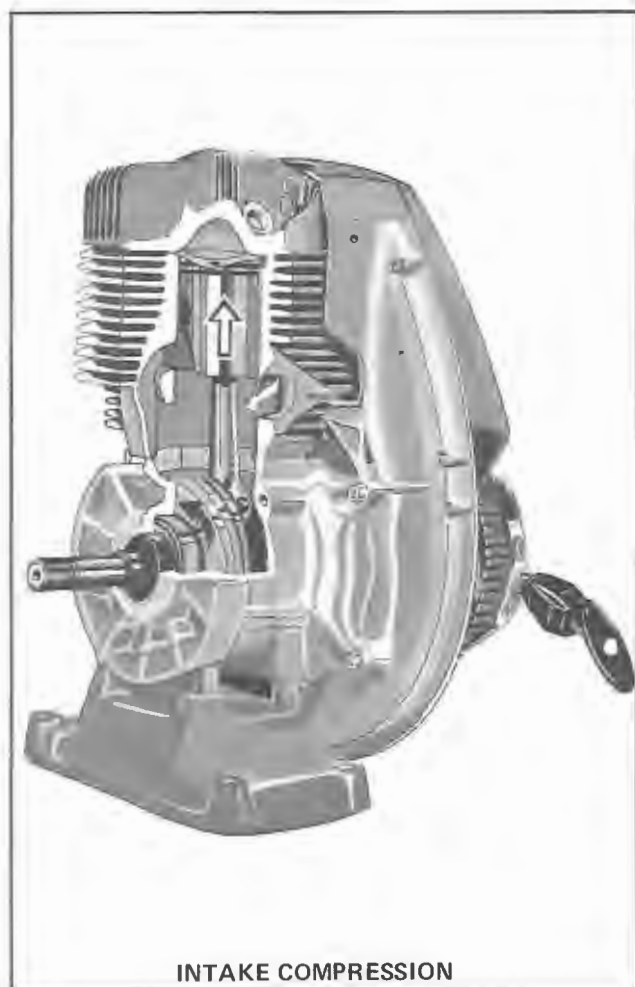


Fig. 2-1-1 (1 of 4)

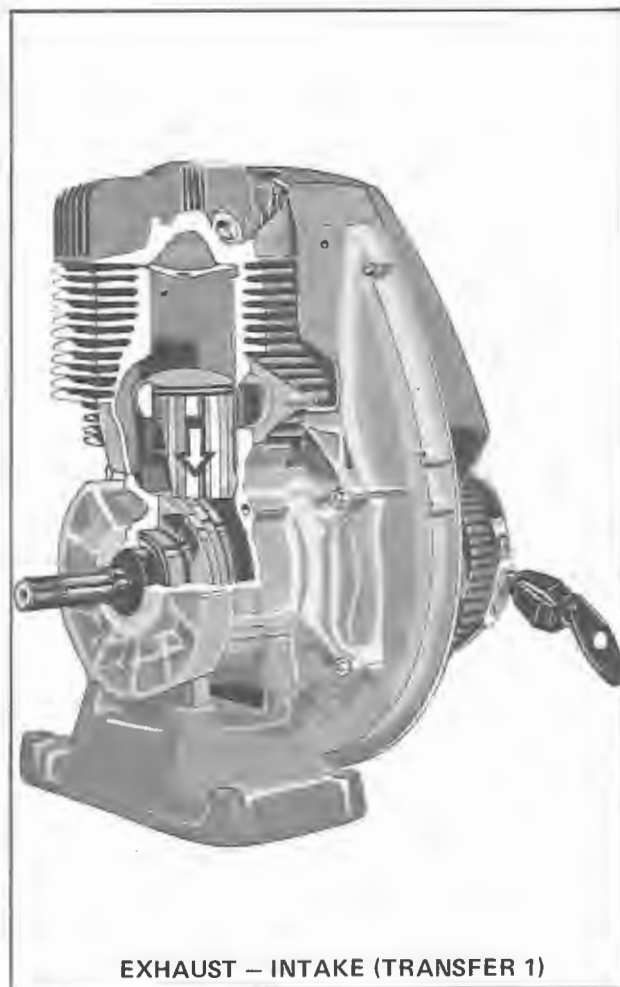


Fig. 2-1-1 (2 of 4)

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. 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. The exhaust port is uncovered as the piston continues its course downward and the burned gas is allowed to escape. Near the bottom of this downward stroke the inlet 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 top of the piston to act as a barrier. This turbulence assists in clearing the combustion chamber of all the burned gas and limits the escape of the fresh fuel charge to a minimum.

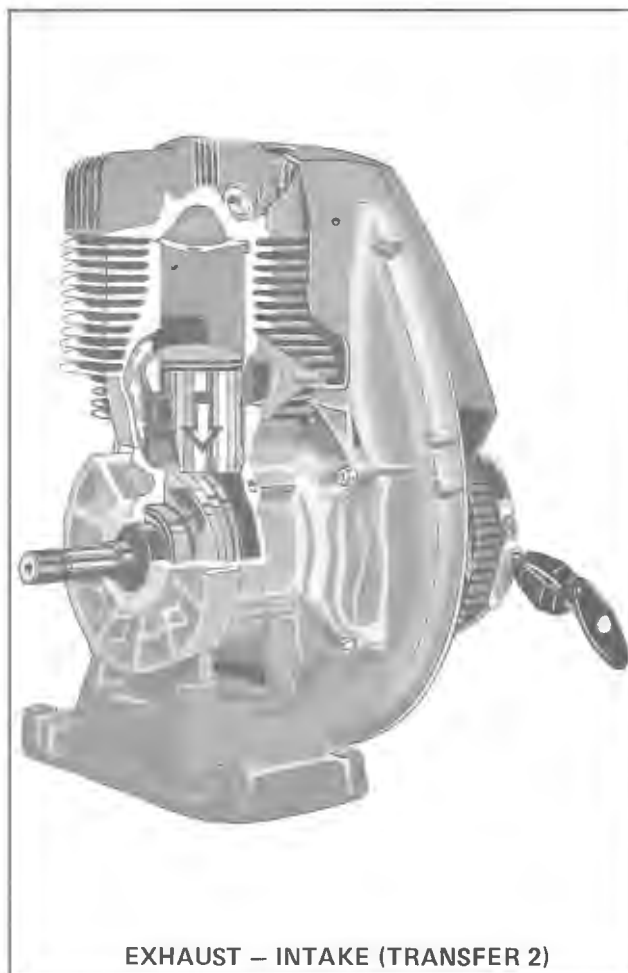


Fig. 2-1-1 (3 of 4)

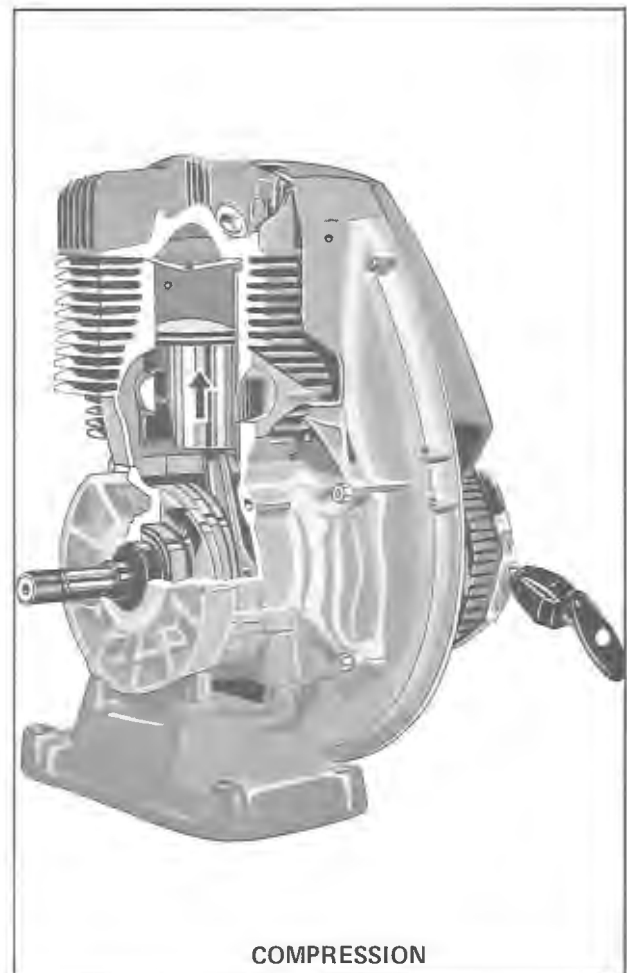


Fig. 2-1-1 (4 of 4)

ENGINE — SINGLE CYLINDER

2-2 SINGLE CYLINDER ENGINE

(A) REMOVAL

(All 1970-'71 Single Cylinder Engines)

IMPORTANT:

During engine removal and disassembly procedures, retain all attaching parts (e.g. screws, bolts, washers, nuts, etc.) with removed or disassembled components.

1. Tilt or remove cab.
2. Remove console, if applicable to vehicle.
3. Remove pulley guard as detailed in subsection 1-6.
4. Remove drive belt as detailed in subsection 1-7.
5. On all models except Elan, disconnect brake and throttle cables and housings at handlebar and brake lever.

NOTE: On all Elan models, detach brake cable from handle plate and pull cable housing from bracket on engine. Disconnect throttle cable at carburetor.

6. Disconnect the front tail-light connector.
7. On all models except 1971 T'NT, disconnect engine/tail-light connector.
8. On all models without an air silencer, remove fuel lines from carburetor and pull the fuel lines and housings from frame clips.

NOTE: On models equipped with an air silencer, remove inlet line from carburetor and outlet line from fuel tank. Remove lines and housings from frame clips.

CAUTION: To avoid gas leakage, position the fuel line(s) so that the line end(s) are higher than fuel tank.

9. Disconnect ignition switch block from ignition switch.

NOTE: On 1971 T'NT models, disconnect wiring harness bracket from engine and remove all but the black cable receptacle from ignition block.

10. On vehicles equipped with a separate light switch, disconnect switch block from light switch.
11. On all electric models, carry out the following:
 - (a) Disconnect negative cable (black) from battery post.
 - (b) Disconnect rectifier quick connector.
 - (c) Unscrew lighter wire. (If vehicle is so equipped).
 - (d) Disconnect positive cable (red) and solenoid wires (green and red) from electric starter. Reinstall nuts to starter.
12. On all models except T'NT, remove decompressor knob, support nut and shim from decompressor. Remove decompressor switch from holder and reinstall components on switch.
13. On all models, disconnect steering column from upper column (fig. 2-2-1).



14. On Elan and 1971 Olympique models, pass the brake and throttle cables and slugs through top hole(s) of upper column dash panel.
15. Remove the four (4) engine mount nuts and washers.
16. Continue removal of engine as follows:
 - (a) On Elan 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 all 1971 Olympique models, remove upper column, lift engine assembly and remove engine from right hand side of vehicle.
 - (c) On all other models, tilt upper column towards front of vehicle, lift and remove engine assembly towards seat.

(B) DISASSEMBLY
(Refer to Figure 2-2-2)

1. Pull the protection sieve from the rewind starter unit.
2. Remove drive pulley as detailed in sub-section 1-8.
3. Remove carburetor using the following procedure:

- (a) Disconnect fuel return line and throttle cable from carburetor.
- (b) Remove nut securing carburetor bracket to engine.
- (c) Remove carburetor flange nuts and pull carburetor from flange and bracket studs.
- (d) Remove sleeves, gasket, isolating flange and isolating flange gasket from studs.
- (e) Remove throttle cable housing from engine bracket.

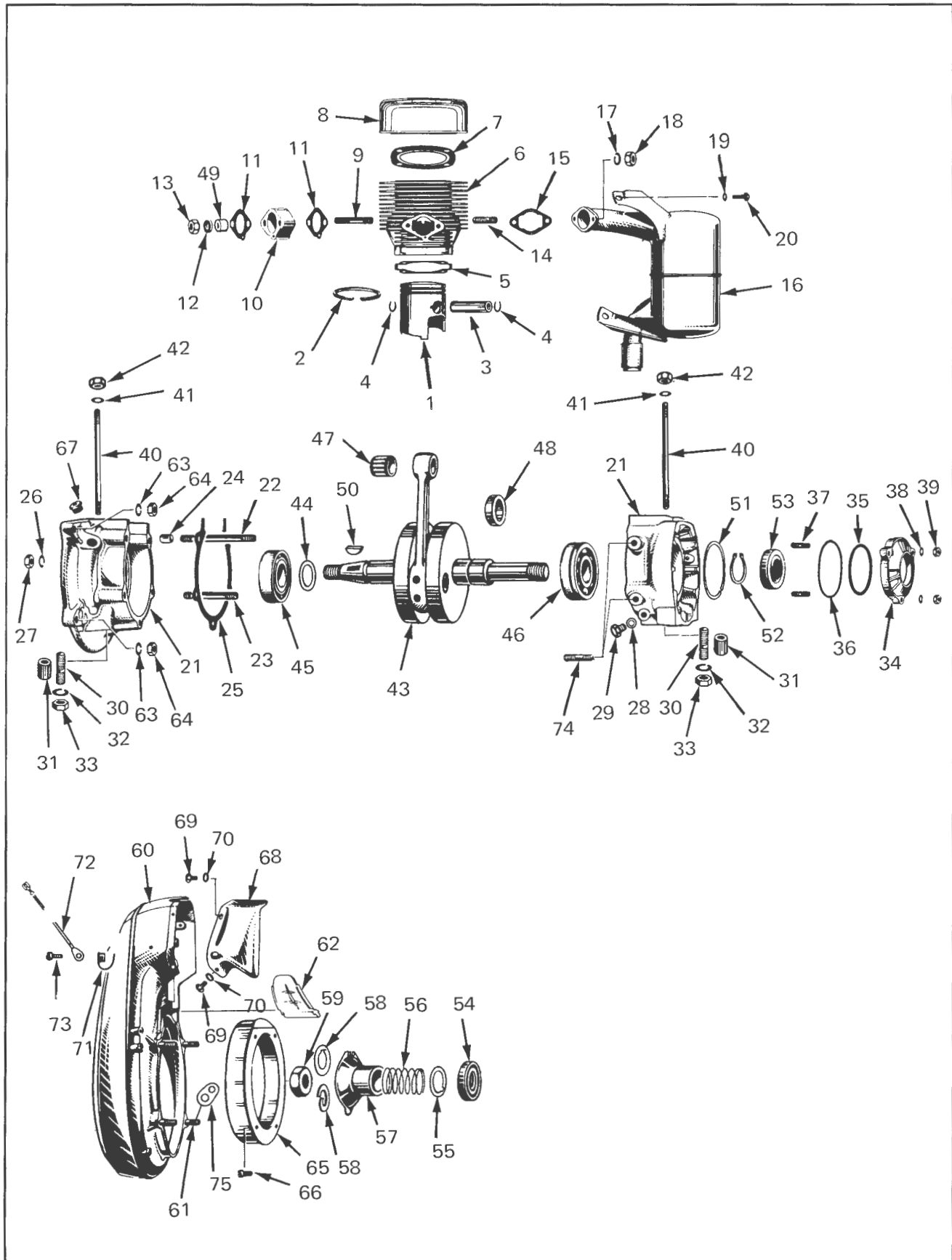
NOTE: On models equipped with an air silencer, remove silencer according to section 2-3.

4. Remove four (4) hexagonal head screws securing rewind starter unit to engine. Remove rewind starter.
5. Unscrew three (3) nuts, one (1) capscrew and remove four (4) washers holding muffler to engine. Remove muffler and gasket.
6. On all 247 engine type, remove brake cable bracket from engine. On all other engines, remove throttle cable bracket from engine.

1. Piston
 2. Piston Ring
 3. Gudgeon Pin
 4. Gudgeon Pin Circlip
 5. Cylinder Flange Gasket
 6. Cylinder (with Sleeve)
 7. Cylinder Head Gasket
 8. Cylinder Head
 9. Stud
 10. Isolating Flange
 11. Carburetor Flange Gasket
 12. Isolating Washer
 13. Carburetor Flange Nut
 14. Stud
 15. Muffler Gasket
 16. Muffler
 17. Lock Washer
 18. Nut
 19. Washer
 20. Screw
 21. Crankcase Assembly (Halves)
 22. Stud
 23. Stud
 24. Dowel Flange
 25. Crankcase Gasket

26. Lock Washer
 27. Nut
 28. Sealing Ring
 29. Plug
 30. Stud
 31. Distance Sleeve
 32. Lock Washer
 33. Nut
 34. Bearing Cover
 35. "O" Ring
 36. "O" Ring
 37. Stud
 38. Lock Washer
 39. Nut
 40. Cylinder Stud
 41. Washer
 42. Nut
 43. Crankshaft Assembly
 44. Shim
 45. Roller Bearing
 46. Ball Bearing
 47. Needle Cage
 48. Distance Sleeve
 49. Insulator Sleeve
 50. Woodruff Key

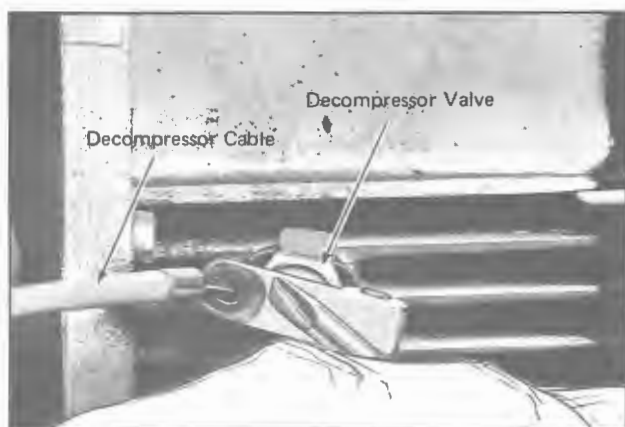
51. Groove Ring
 52. Lock Ring
 53. Oil Seal
 54. Oil Seal
 55. Washer
 56. Breaker Cam Spring
 57. Breaker Cam
 58. Lock Washer (W/O Electric Starter)
 Lock Washer (W Electric Starter)
 59. Nut
 60. Fan Cowl Assembly
 61. Stud
 62. Plastic Baffle
 63. Lock Washer
 64. Nut
 65. Labyrinth Ring
 66. Cylinder Screw
 67. Cable Grommet
 68. Air Deflector
 69. Screw
 70. Spring Washer
 71. Cable Clamp
 72. Cable
 73. Screw
 74. Stud
 75. Spring Bracket.



DISASSEMBLED VIEW OF ONE CYLINDER ENGINE

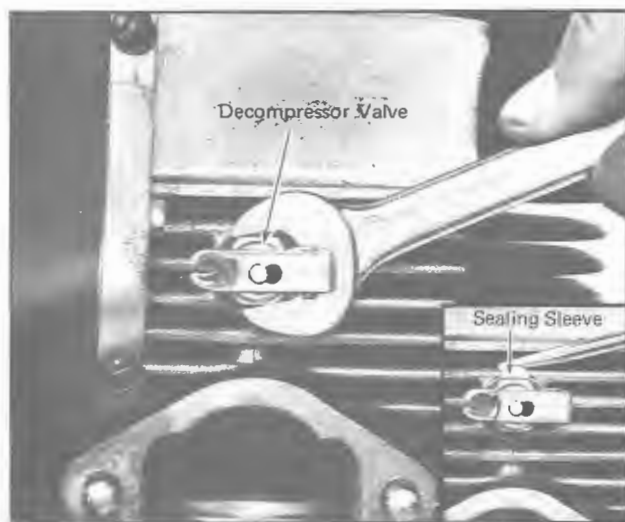
7. On engines equipped with a decompressor, carry out the following:

- (a) Remove two (2) screws and washers holding air deflector to fan cowl. Re-install screws and washers.
- (b) Push on decompressor valve and lift decompressor cable from valve lever notch. Lift cable ball from valve and remove decompressor cable (fig. 2-2-3).



2-2-3

- (b) Unlock the locking and sealing sleeve and unscrew decompressor valve assembly from cylinder (fig. 2-2-4).



2-2-4

8. On all electric start models, carry out the following:

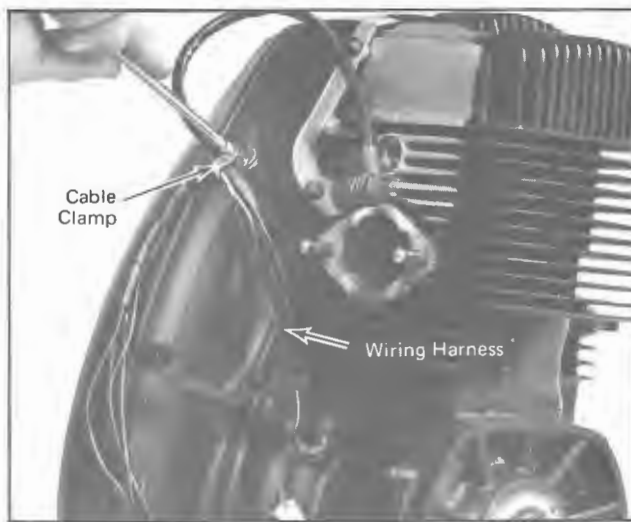
- (a) Tilt engine on muffler flange side.
- (b) Remove two (2) nuts and washers securing starter to fan cowl.

- (c) Remove two (2) capscrews and washers holding starter bracket to crankcase (fig. 2-2-5). Remove electric starter.



2-2-5

9. On all 1971 engines, if the console was detached from console spring, unhook spring from crankcase.
10. Disconnect spark plug wire from spark plug.
11. On all engines except 1971 T'NT models, remove cable clamp holding wiring harness to fan cowl (fig. 2-2-6).

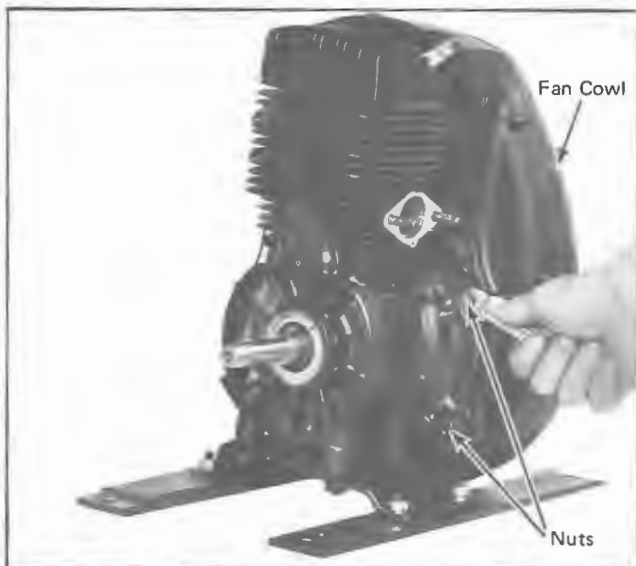


2-2-6

12. On manual start engines, remove nuts and lock washer(s) securing fan cowl to crankcase (fig. 2-2-7).

NOTE: On all 247 engine type, remove console cable bracket from upper stud.

On all 1971 Olympique models (engine types 302 and 337), remove console cable bracket from lower stud. On all 1970 engines, remove bracket holding tail-light wire to fan cowl assembly.



2-2-7

13. On manual start engines, hold the sides of fan cowl assembly and pull assembly from fan assembly.

NOTE: Unless plastic baffle is damaged, do not separate fan cowl cover from fan cowl.

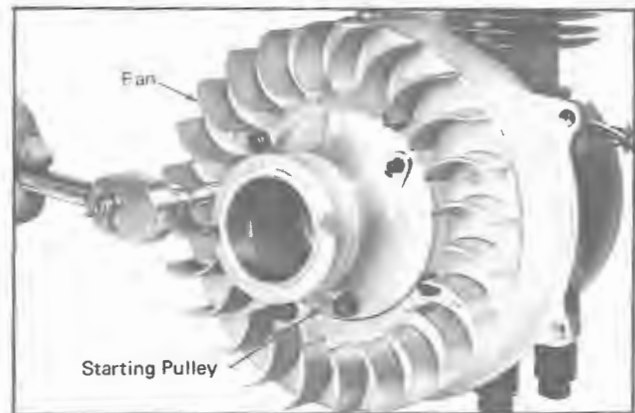
14. Turn engine on side and remove the four (4) nuts and washers securing engine bracket and support to crankcase bottom. Remove bracket and support.

15. Remove four (4) bolts attaching engine bracket to support.

NOTE: If applicable to engine, remove support brace bar.

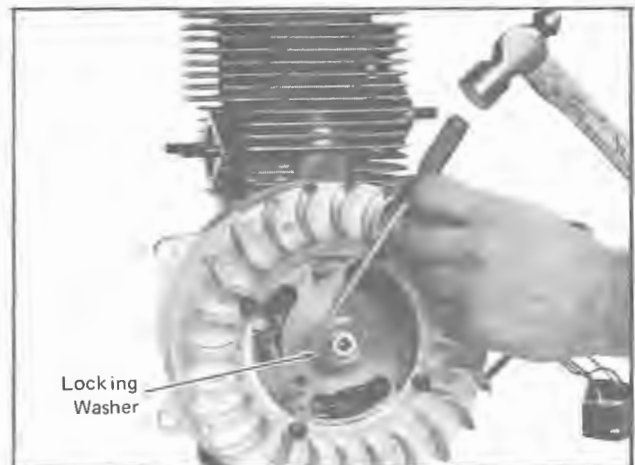
16. On all electric start engines, unscrew and remove the six (6) capscrews and lock washers securing fan cowl cover to fan cowl. Pull off fan cowl cover.

17. Remove the three (3) nuts and washers securing starting pulley to magneto plate. Pull the pulley from the magneto plate studs (fig. 2-2-8).



2-2-8

18. On all manual start engines, straighten the locking washer located behind the magneto nut using a screwdriver, a pin punch and hammer (fig. 2-2-9).



2-2-9

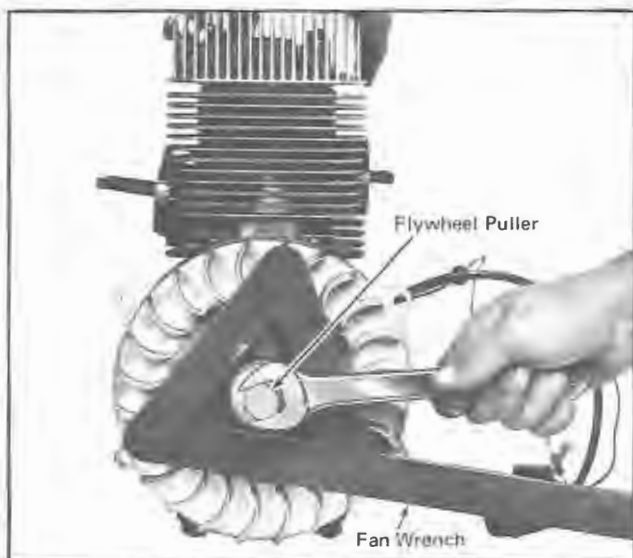
19. Position the appropriate fan wrench (item 7) over the fan blades. Hold in position. Unscrew the magneto nut from crankshaft and remove locking washer (fig. 2-2-10).



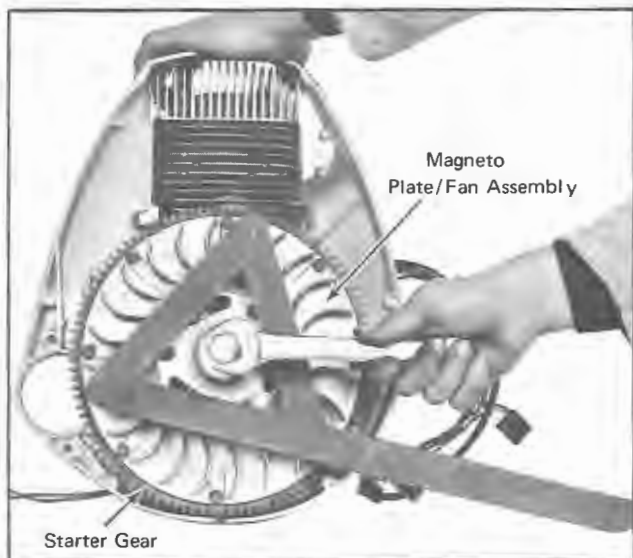
2-2-10

20. With the appropriate fan wrench in position, screw on the appropriate flywheel puller (refer Section 5, item 8). Screw in the puller bolt until the magneto plate/fan assembly is released from the crankshaft. Remove flywheel puller from magneto plate (fig. 2-2-11).

NOTE: On all electric start models, the starter gear becomes detached from engine with the magneto plate/fan assembly (fig. 2-2-12).



2-2-11

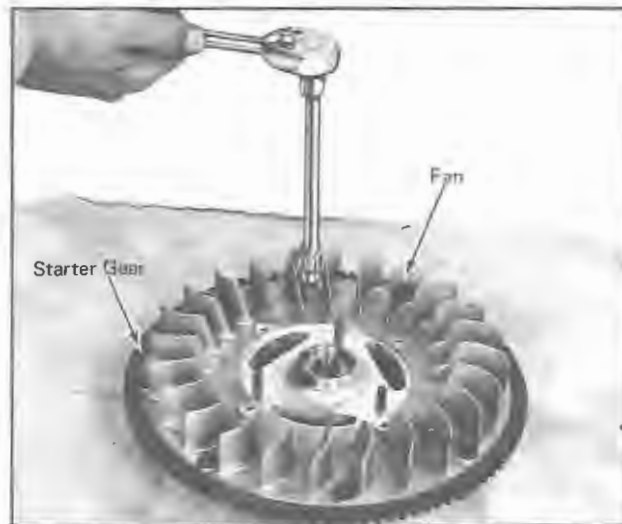


2-2-12

21. 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.

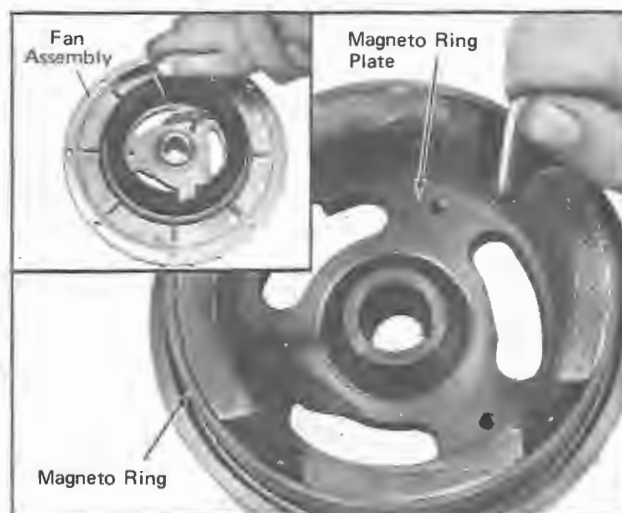
22. On electric start engines, remove the eight (8) capscrews and washers affixing starter gear to fan. Remove starter gear (fig. 2-2-13).



2-2-13

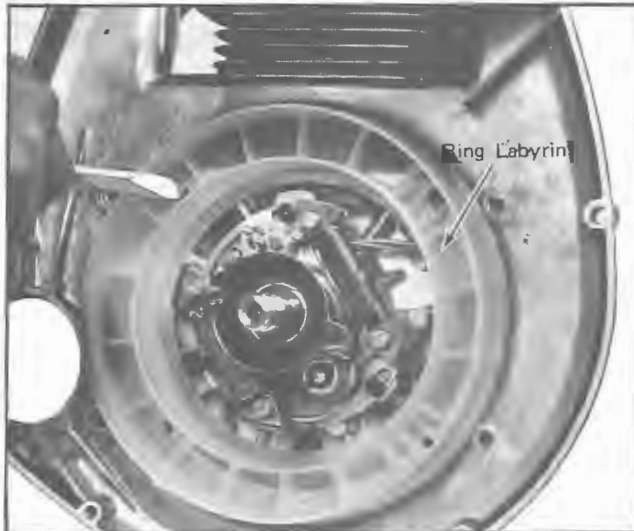
23. Remove the four (4) Allen head capscrews and washers securing magneto ring to magneto housing. Lift the magneto ring from the housing (fig. 2-2-14).

NOTE: On all electric start engines, the magneto housing is incorporated with the fan assembly (see figure 2-2-14).



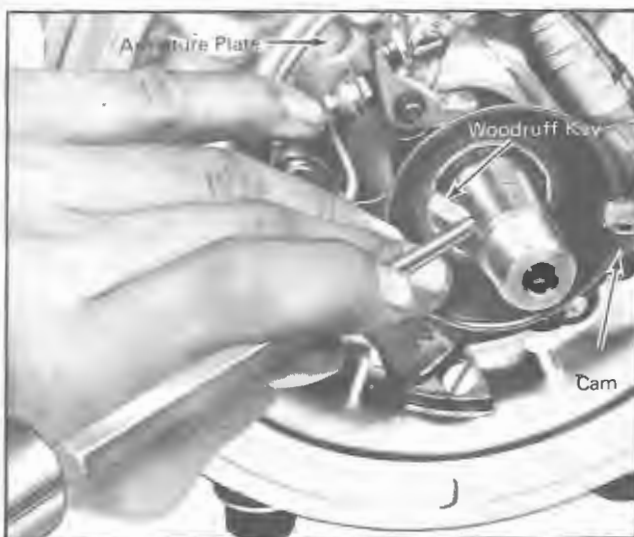
2-2-14

24. Remove the screw, centrifugal weight and spring from inner side of magneto plate.
25. Unscrew the four (4) screws securing labyrinth ring to crankcase (fig. 2-2-15).



2-2-15

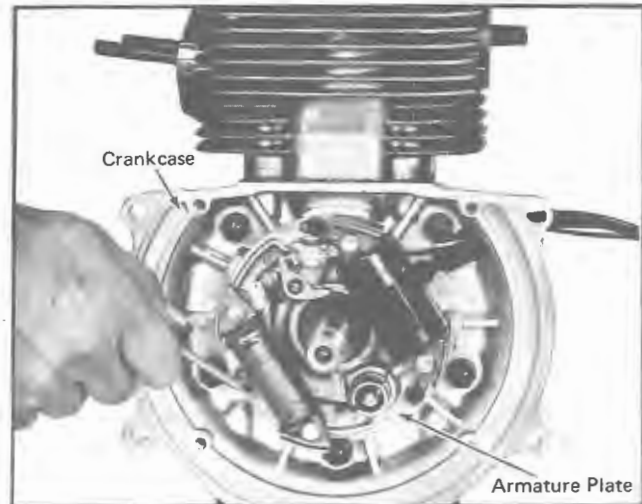
26. On electric start engines, remove nuts and washers attaching fan cowl to crankcase.
27. Push the cam towards armature plate and using a punch and a hammer, gently tap on woodruff key to remove it from the crankshaft (fig. 2-2-16).



2-2-16

28. Remove cam, spring and washer from the crankshaft.
29. On all manual start engines, carry out the following:

- (a) Using a thin blade screwdriver, push the cable receptacles from the switch block(s).
- (b) Unscrew the spark plug terminal cap from the spark plug wire.
- (c) Remove the screws or nuts affixing the armature plate to crankcase (fig. 2-2-17). Pull the armature plate from the crankshaft and position it in front of engine.



2-2-17

- (d) Pull the spark plug wire through grommet in crankcase side. Push the crankcase grommet up through crankcase orifice.
 - (e) Unscrew spark plug wire from ignition coil.
 - (f) From crankshaft side, pull the ignition wires through grommet and crankcase. Remove armature plate.
30. On electric start engines, carry out the following:
 - (a) Remove the electrical tape from the wiring harness.
 - (b) Push the two (2) yellow/red wires from the rectifier connector.
 - (c) Disconnect the blue wire from breaker points terminal. Reinstall nut and washer on points terminal.
 - (d) Remove the three screws or nuts attaching armature plate to the crankcase (see figure 2-2-17).

- (e) Push the crankcase rubber grommet from crankcase notch.
- (f) Pull the armature plate from the crankshaft.
- (g) Unscrew the two (2) nuts securing ignition coil to the engine. Remove coil.

- 31. Remove spark plug.
- 32. Unscrew and remove the four (4) cylinder head nuts and washers (fig. 2-2-18).



2-2-18

- 33. Lift the cylinder head and cylinder head gasket from cylinder studs. Discard head gasket.
- 34. Gently lift the cylinder from the cylinder studs. While lifting cylinder, restrain piston to avoid damage to piston on studs (fig. 2-2-19).



2-2-19

- 35. Remove and discard the cylinder flange gasket from crankcase.
- 36. Using two of the previously removed head nuts, unscrew the four (4) studs from crankcase.
- 37. Place a clean, dry cloth over the crankcase allowing only connecting rods and piston to be exposed. The cloth will prevent foreign matter and/or small components falling into crankcase.
- 38. Gently spread open the piston rings until they can be slid from the piston grooves.

IMPORTANT: If piston rings are in good condition, identify each ring as to ring groove to facilitate installation procedure (fig. 2-2-20).

CAUTION: Do not spread open the rings too far apart as breakage can occur.



2-2-20

- 39. Using a suitable tool (i.e. an ice pick), pry the circlips from the pistons (fig. 2-2-21).



2-2-21

40. 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 the piston.

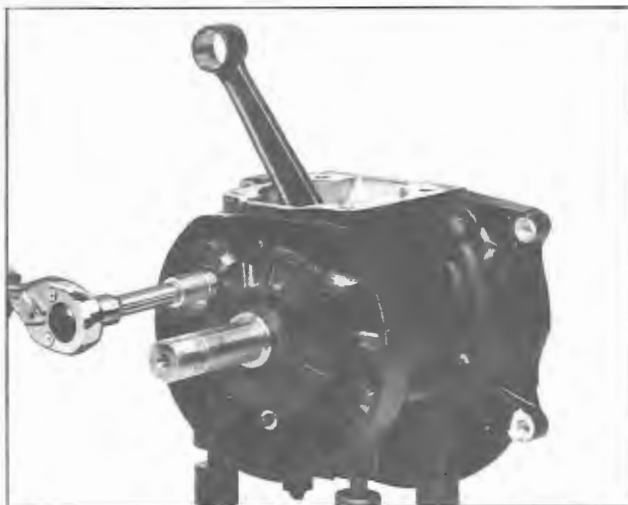
CAUTION: When tapping the gudgeon pin from the piston, hold the piston firmly in place to eliminate the possibility of transmitting shock and/or bending the connecting rod.

41. Pull the gudgeon pin from the piston. Slide the needle cage from the connecting rod (fig. 2-2-22).



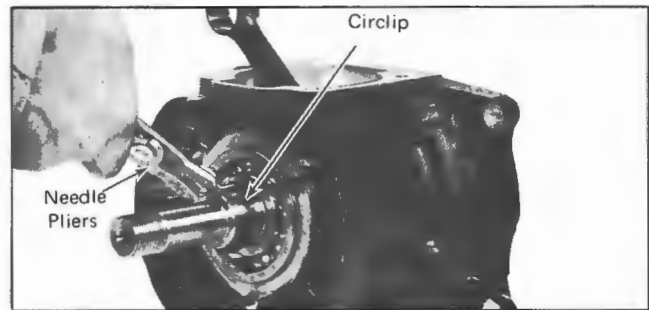
2-2-22

42. On all 247 and 302 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. 2-2-23).



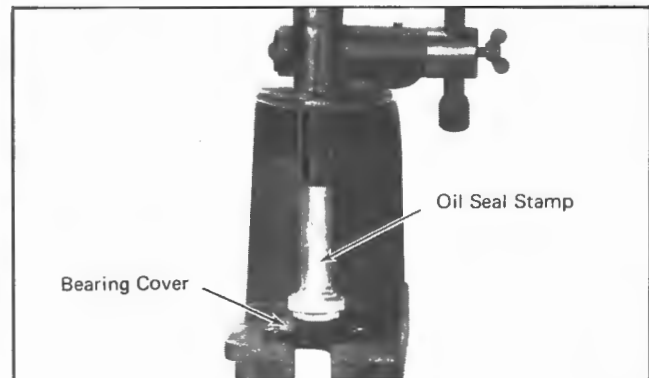
2-2-23

- (b) Using a small screwdriver, pry the bearing cover from crankcase.
(c) Remove cover from crankshaft.
(d) Slide the ball bearing groove ring from location.
(e) Using needle pliers, open and remove the circlip from crankshaft groove (fig. 2-2-24).



2-2-24

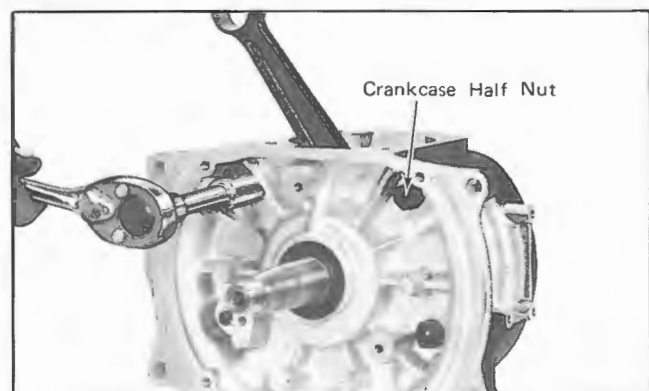
- (f) Using the appropriate oil seal stamp (item 11), remove the oil seal from the bearing cover (fig. 2-2-25).



2-2-25

- (g) Pry the bearing cover "O" rings from the cover grooves.

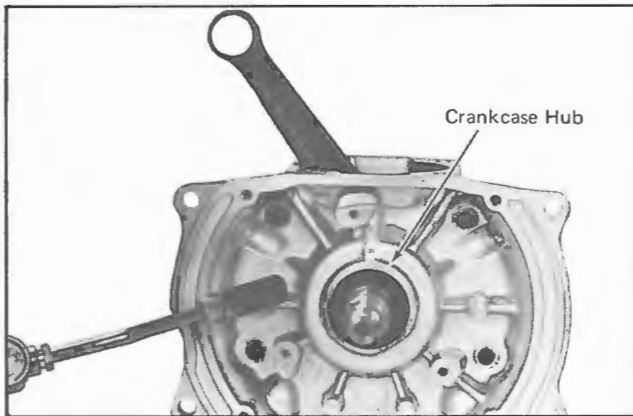
43. Remove the five (5) nuts and washers securing crankcase halves (fig. 2-2-26)



2-2-26

44. Using a blow torch, heat the crankcase hub on magneto side, to 180° (fig. 2-2-27).

CAUTION: On 292, 337 and 342 engine types with roller bearing on magneto side, apply heat on crankcase P.T.O. side. Avoid direct contact of flame on oil seal.



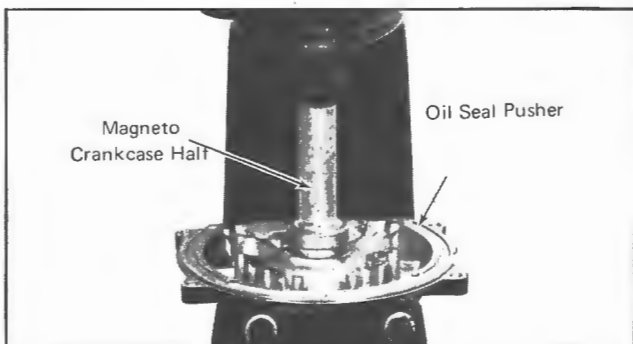
2-2-27

45. Using a soft faced hammer, separate the crankcase halves. Remove crankcase shims.

CAUTION: Tap gently on the crankcase/fan cowl bolt reinforced sections only.

46. Using an appropriate oil seal pusher remove oil seal from magneto crankcase half (fig. 2-2-28).

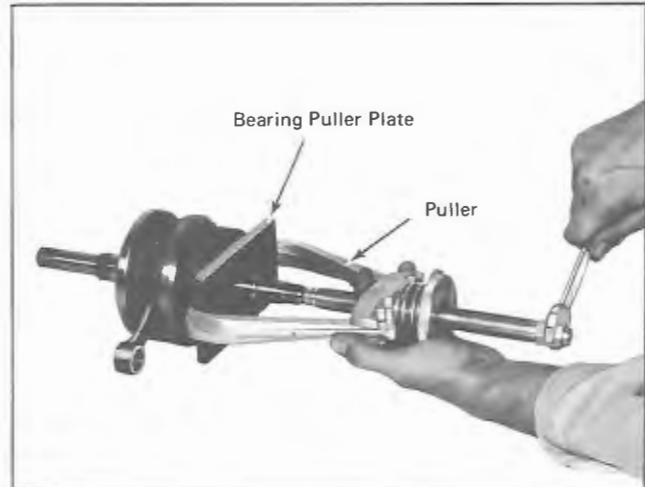
NOTE: Use item 10 for all engines with ball bearing. Use item 11 for engines with roller bearing.



2-2-28

47. On all 247 and 302 engine types, install the appropriate bearing puller plate (item 12) on ball bearing. Using a puller, remove bearing from crankshaft. Remove puller plate from bearing (fig. 2-2-29).

NOTE: Should the bearing remain within the magneto crankcase half, follow step 48 for removal.



2-2-29

48. Using a blow torch, heat the magneto side of crankcase half to 180°. Invert the crankcase half and using a soft faced hammer, tap on the crankcase adjacent to bearing until bearing falls from the seating.

49. Using a blow torch, heat the P.T.O. crankcase half to 180°. Using a soft faced hammer, tap the crankcase from the crankshaft assembly.

50. Repeat step 47 or 48 to remove P.T.O. crankcase bearing.

51. Repeat step 46 to remove P.T.O. crankcase oil seal.

52. Using an appropriate bearing plate puller (item 12) and puller, remove the distance sleeve(s) from crankshaft. Remove crankshaft shims.

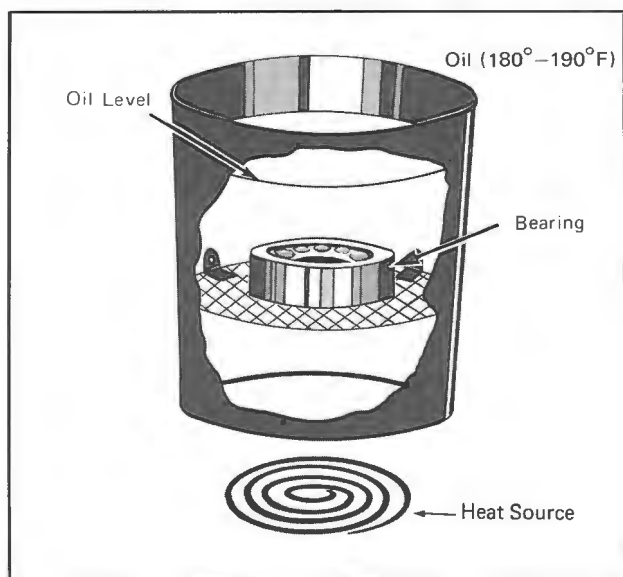
(B) ASSEMBLY

1. 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 procedures.
2. Carry out Inspection procedures as detailed in sub-section 2-9.

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.

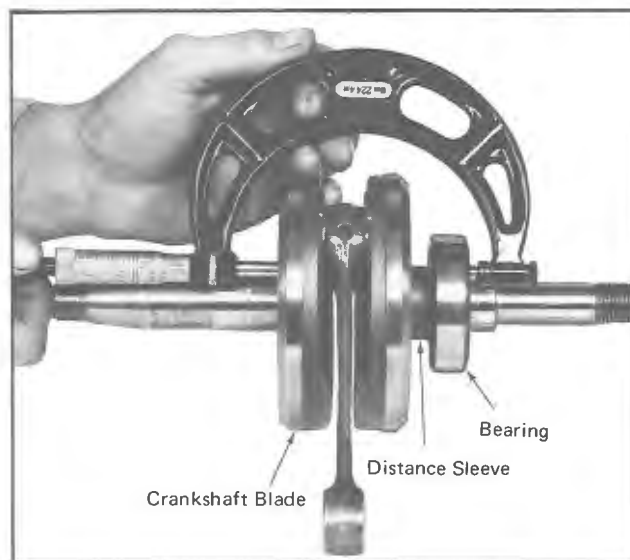
3. ON ALL 247, 290, 300 and 302 ENGINE TYPES, determine crankshaft end play as follows:

- (a) Measure distance from face of one crankcase half down to bottom of bearing seat = A.
- (b) Place a new crankcase gasket 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) Place crankshaft bearing into oil container and heat the oil to 180° - 190° F. Figure 2-2-30, shows the proper way of heating the bearing.

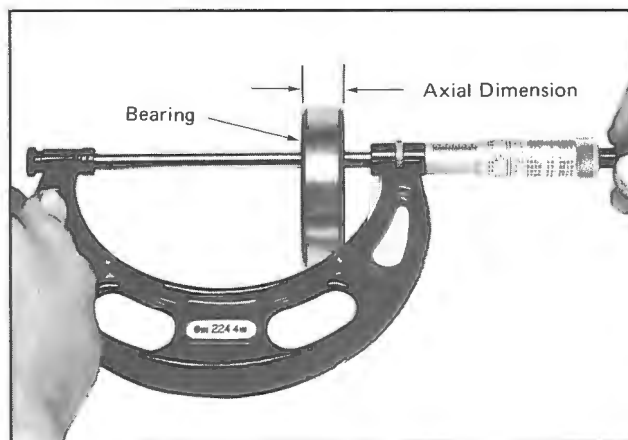


2-2-30

- (d) Position a distance sleeve on P.T.O. side of crankshaft and push a HEATED deep groove ball bearing in location.
- (e) Measure the distance from crankshaft blade to the bearing = D (fig. 2-2-31).
- (f) Measure axial dimension of other bearing = E (fig. 2-2-32). Heat bearing to 180° - 190° F. Add total of D plus E to obtain F.



2-2-31



2-2-32

- (g) The measurement of F taken from C minus tolerance .006 to .016 inch is the distance to be covered by shims.
- (h) Install correct amount of crankshaft shims and a HEATED ball bearing on magneto crankshaft extension.

ON ALL 335 AND 340 ENGINE TYPES, determine crankcase end play as follows:

- (a) Measure distance from face of one crankcase half down to bottom of bearing seat = A.
- (b) Place a new crankcase gasket over the other half and measure from top of gasket to bottom of bearing seat = B. Add total of A plus B to obtain total C. Remove gasket.
- (c) Place crankshaft bearing inner race into a container of oil and heat the oil to 180° – 190° F (see fig. 2-2-30).
- (d) From the crankshaft P.T.O. side, push the HEATED inner race in location.
- (e) Measure the distance from crankshaft blade to bearing inner race = D (see fig. 2-2-31).
- (f) Measure axial dimension of other roller bearing inner race = E (see fig. 2-2-32). Heat the bearing inner race to 180° – 190° F (see fig. 2-2-30). Add total of D plus E to obtain F.
- (g) The total of F taken from C minus the tolerance of .006 to .016 inch is the distance to be covered by shims.
- (h) Install correct amount of crankshaft shims and the HEATED inner race on magneto crankshaft extension.

ON ALL 292, 337 AND 342 ENGINE TYPES, determine crankcase end play as follows:

NOTE: Since the crankshaft is held on P.T.O. side by the bearing, no shims are required when assembling crankshaft.

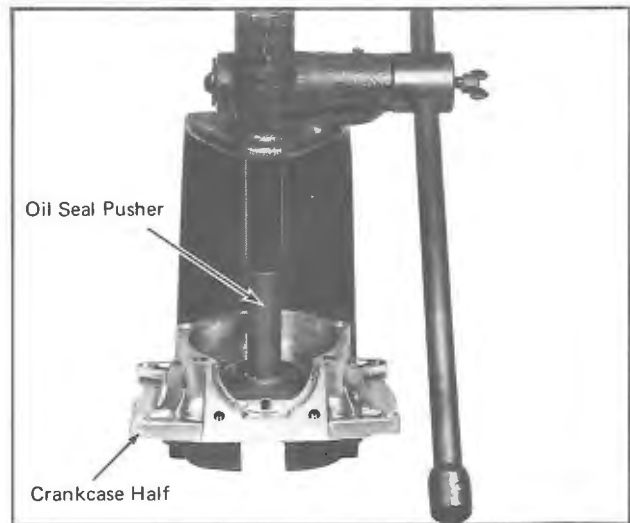
- (a) Place crankshaft ball bearing and roller bearing into an oil container and heat the oil to 180° – 190° F. (See fig. 2-2-30 for method of heating bearings).
- (b) Install the HEATED ball bearing on magneto crankshaft extension and

the roller bearing inner race on P.T.O. crankshaft extension.

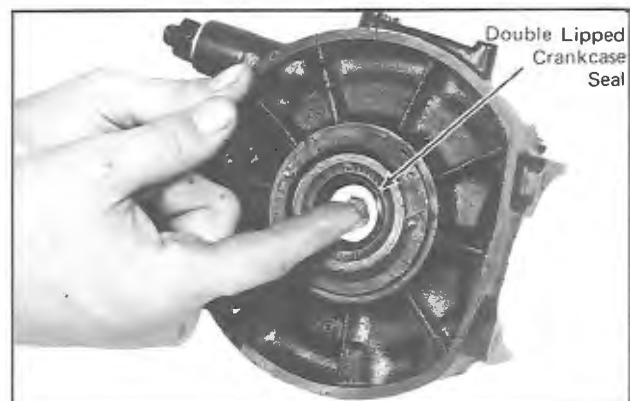
4. ON ALL 247, 290, 300 AND 302 ENGINE TYPES, assemble crankcase as follows:

- (a) Using an appropriate oil seal pusher (item 12), press a crankcase oil seal into each crankcase half (fig. 2-2-33).
- (b) Position the appropriate oil seal protection sleeves (refer Section 5, items 13 and 14) on crankshaft, install a new gasket on the crankcase studs and adjoin the two (2) crankcase halves. Remove oil seal protection sleeves.

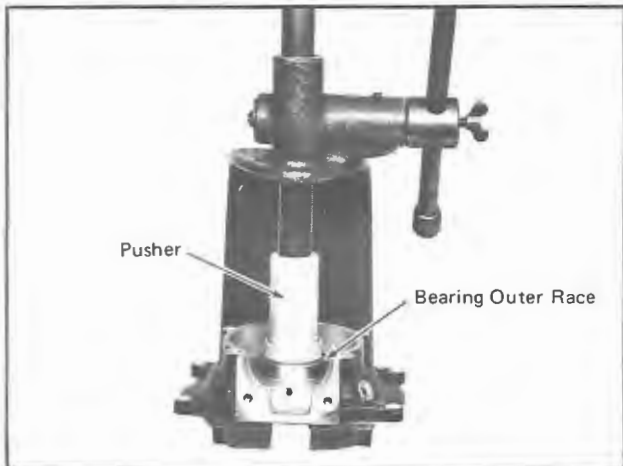
NOTE: On engines equipped with double lipped crankcase oil seals, apply a light coat of grease into the double lip prior to crankcase adjoinment (fig. 2-2-34).



2-2-33



2-2-34



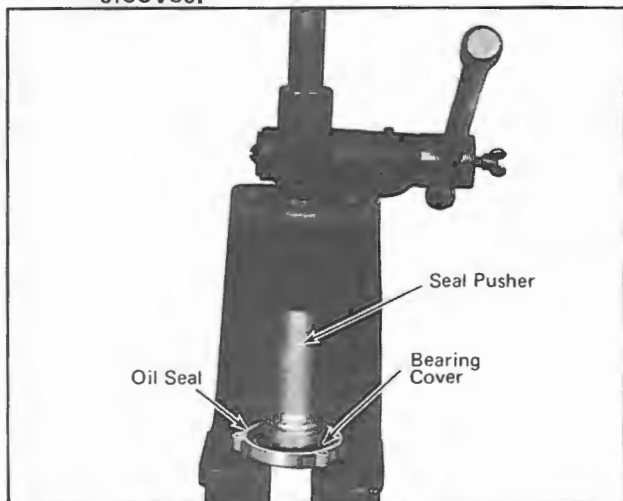
2-2-35

ON ALL 335 AND 340 ENGINE TYPES, assemble crankcase as follows:

- (a) Using an appropriate oil seal pusher (refer Section 5, item 10 or 11), press a crankcase oil seal into each crankcase half (see fig. 2-2-33).
- (b) Position outer races in location and press them into crankcase halves using an appropriate pusher (fig. 2-2-35).

CAUTION: Always press the bearing by the outer race and not on the rollers.

- (c) Position the appropriate oil seal protection sleeves (refer Section 5, items 13 and 14) on crankshaft, install a new gasket on the crankcase studs and adjoin the two (2) crankcase halves. Remove oil seal protection sleeves.



2-2-36

NOTE: On engines equipped with double lipped crankcase oil seals, apply a light coat of grease into the double lip prior to crankcase adjoinment (fig. 2-2-34).

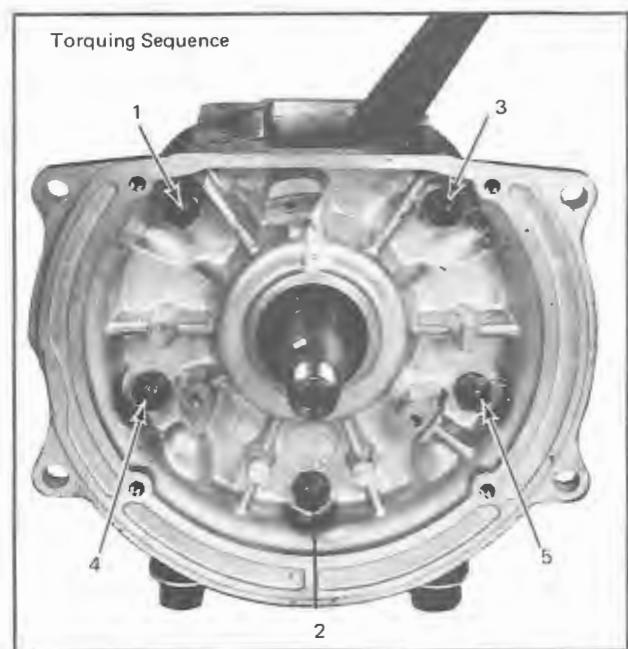
ON ALL 292, 337 AND 342 ENGINE TYPES assemble crankcase as follows:

- (a) Press the appropriate oil seal into magneto crankcase half and P.T.O. bearing cover (fig. 2-2-36 and see fig. 2-2-34).
- (b) Install groove ring on roller bearing outer race and press the outer race into P.T.O. crankcase half until the groove ring sits against the crankcase.

CAUTION: Always press the bearing by the outer race and not by the rollers.

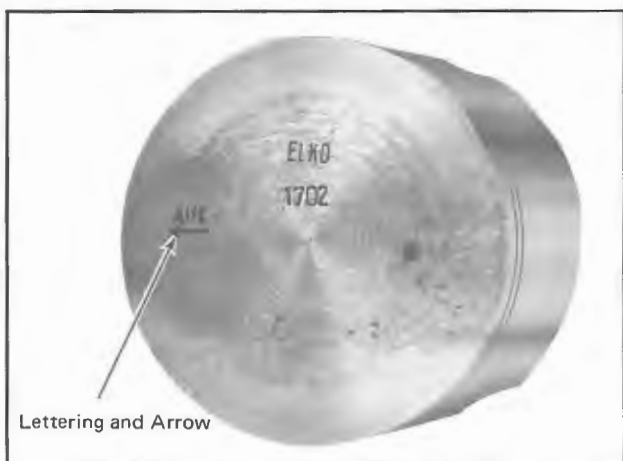
- (c) Position a new gasket on the crankcase studs. Position the appropriate oil seal protection sleeve on magneto crankcase oil seal and adjoin the two (2) crankcase halves. Remove oil seal protection sleeve.

5. Position the crankcase nuts and washers and finger tighten each nut. Cross torque each nut to 16 ft/lbs (fig. 2-2-37).



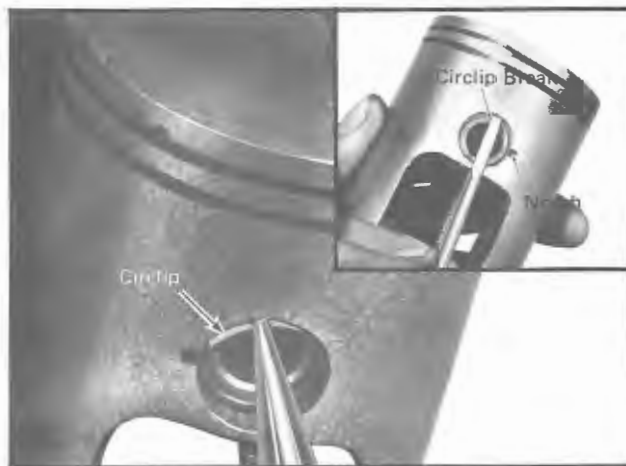
2-2-37

6. Trim any exposed crankcase gasket from crankcase head.
7. ON ALL 292, 337 AND 342 ENGINE TYPES carry out the following:
 - (a) Slide the circlip over the crankshaft and into the locking notch in front of bearing.
 - (b) Position a new "O" ring onto bearing cover.
 - (c) Place bearing cover in location and secure using the appropriate washers and nuts.
8. Insert needle cage into connecting rod.
9. 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. 2-2-38). 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.



2-2-38

10. Place a dry, clean cloth over crankcase, exposing only the piston. 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. 2-2-39).



2-2-39

11. Using very fine emery cloth, remove any possible burrs on piston caused through circlip installation (fig. 2-2-40).



2-2-40

12. Place the appropriate piston rings on the piston. Gently pull the rings open and position them in proper grooves (fig. 2-2-41).

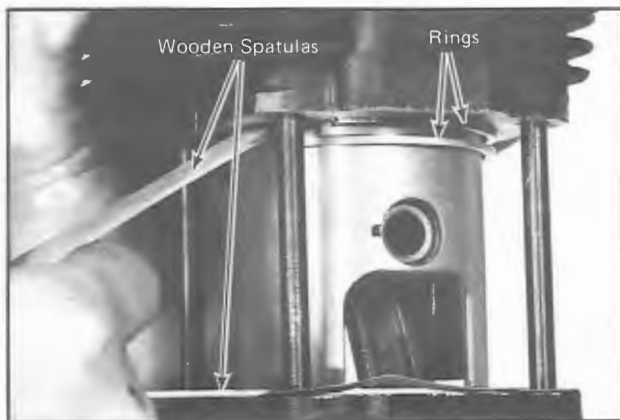
NOTE: Ensure the "V" ends of the rings sit correctly in the ring landings.



2-2-41

13. Place the crankcase/cylinder gasket in location. Screw the four (4) cylinder studs (longest threaded end) into crankcase until threads are well into crankcase.
14. Position two (2) spatulas over crankcase top and rotate crankshaft until the piston sits evenly on the spatulas (fig. 2-2-42).

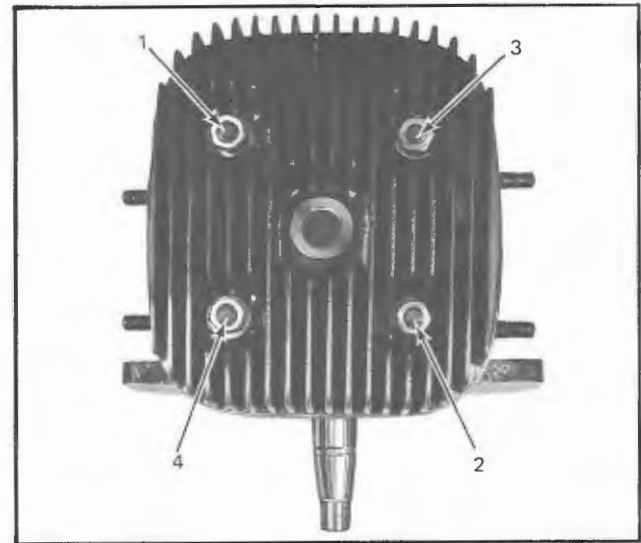
NOTE: Ensure the piston is centered with crankcase.



2-2-42

15. Slide the cylinder on the four (4) cylinder studs. Ensure the exhaust port is 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. After passing the piston into cylinder continue pushing the cylinder down until it is seated on spatulas (see fig. 2-2-42).
17. Remove spatulas carefully to avoid crankcase/cylinder gasket damage. Lower cylinder onto crankcase.
18. 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.

19. Rotate crankshaft to allow even oil distribution over cylinder walls and piston. Wipe any oil spillage from cylinder top using a clean, dry cloth.
20. Position a new cylinder head gasket on cylinder.
21. Correctly position cylinder head on cylinder ensuring the cooling fins of the head run evenly and horizontal with the cylinder cooling fins (see fig. 2-2-43).
22. 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. 2-2-43).

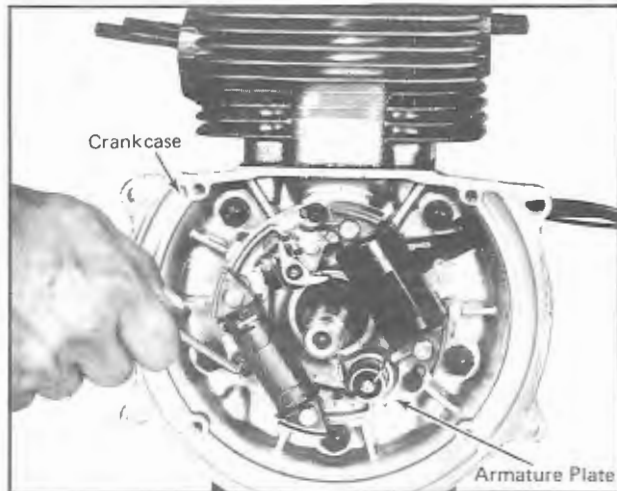


2-2-43

23. On all electric start engines, carry out the following:
 - (a) Place armature plate in front of magneto crankshaft extension and pass (from inside-out) the two (2) yellow/red wires leading from armature plate through the notch of crankcase.
 - (b) From the outside-in, pass the blue wire of wiring harness through notch of crankcase.
 - (c) Position armature plate on crankshaft and pass blue wire through armature plate. Connect blue wire terminal to breaker points terminal using appropriate washer and nut.

- (d) Temporarily affix armature plate to crankcase using the appropriate screws or nuts. The attachments of armature plate/crankcase must be in the center of the armature plate slots (fig. 2-2-44).

CAUTION: Avoid “squeezing” the armature plate wires against crankcase.



2-2-44

- (e) Affix the ignition coil to engine bracket using two (2) screws and washers.
 - (f) Connect the blue wire and black wire terminal to terminal No. 1 of ignition coil. Secure the terminal by pressing down the terminal rubber cap.
 - (g) Screw the spark plug wire into ignition coil. Secure protection cap.
 - (h) Press the two (2) yellow/red wire terminals into appropriate recess of rectifier quick connector.
 - (j) Press the rubber grommet into crankcase notch.
24. On manual start engines, carry out the following:
- (a) Press rubber grommet into crankcase notch.
 - (b) From the inside-out, pass the black wire and red/yellow wire through rubber grommet.
 - (c) From the inside out, pass the spark

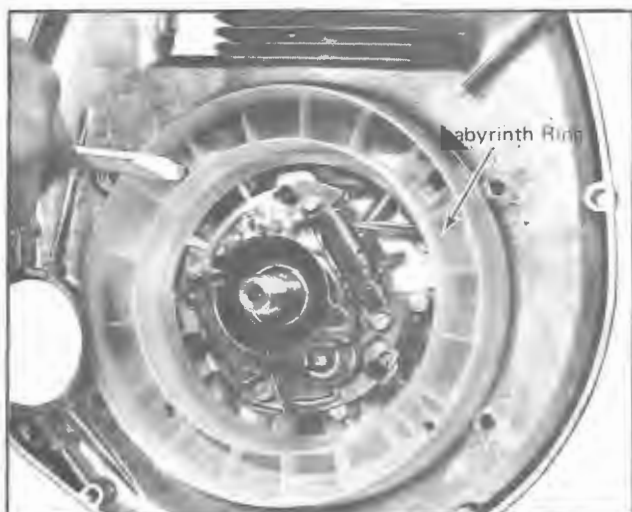
plug wire through rubber grommet.

- (d) Position the armature plate on crankshaft and pull any slack wiring through the grommet.
- (e) Temporarily affix the armature plate to crankcase using the appropriate nuts or screws and washers. Ensure the screws are located in the center of armature plate slots (see fig. 2-2-44).

CAUTION: Avoid “squeezing” the armature plate wires during assembly.

- (f) Install the black wire leading from the armature plate to MAG terminal of ignition switch block.
 - (g) Install spark plug cap to spark plug wire.
 - (h) Press the yellow/red wire terminal into light switch block.
25. Slide the appropriate washer and cam spring on magneto crankshaft extension.
26. Using low temperature grease, lubricate the internal channel of the cam. Position cam in location and secure using a woodruff key.
27. On electric start engines, position fan cowl on crankcase studs. Secure using three (3) washer and nuts.
- NOTE:** The lower stud on the exhaust side of fan cowl should not be installed at this time. Also, the console spring bracket (if applicable to vehicle), should be installed on the carburetor side of fan cowl.
28. Position the labyrinth ring in location and secure using four (4) washers and screws (fig. 2-2-45).

CAUTION: Ensure the bevelled side of labyrinth ring is on top.



2-2-45

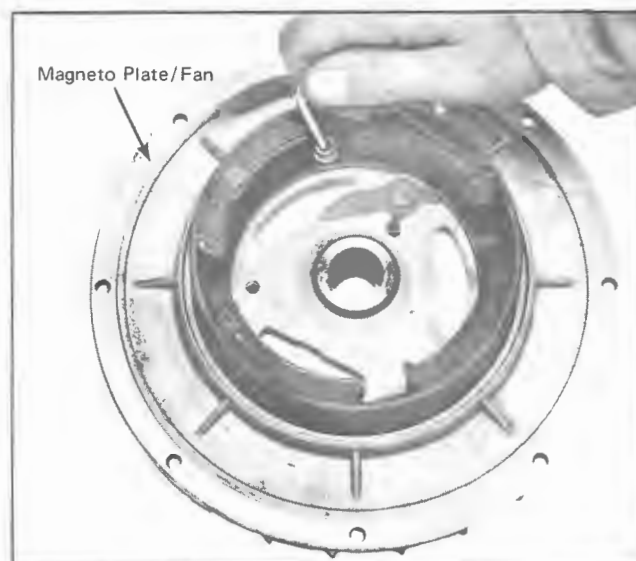
29. Apply a small portion of low temperature grease into spring seating of magneto ring plate. Install spring and centrifugal lever using appropriate flat end screw (fig. 2-2-46).



2-2-46

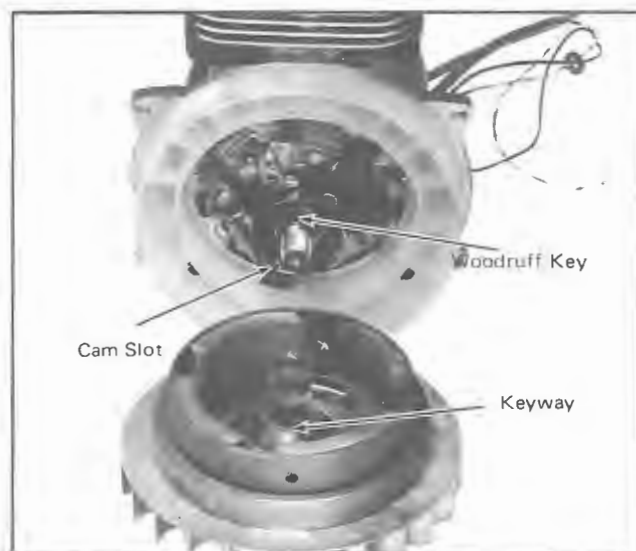
30. Position magneto ring onto magneto ring plate and secure using four (4) Allen head capscrews and washers. Avoid placing magneto ring on a bare surface.
31. On manual start engines, position and secure fan blade assembly on magneto ring plate.

NOTE: On electric start engines, the magneto plate is incorporated with fan blade assembly (fig. 2-2-47). Install starter gear using eight (8) screws and washers.



2-2-47

32. Turn crankshaft until woodruff key faces up. Rotate cam clockwise until cam slot is 240° from woodruff key. Position magneto plate/fan assembly on crankshaft with the keyway aligned with the woodruff key (fig. 2-2-48).

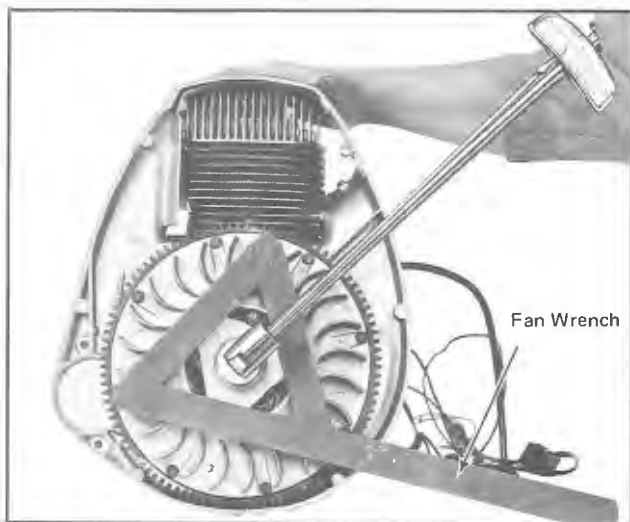


2-2-48

33. Test automatic spark retarding mechanism (centrifugal weight) by slightly rotating cam lobe to activate the centrifugal weight. The mechanism should operate freely without catching or binding.
34. Position lock washer and magneto nut on crankshaft. Place the appropriate fan

wrench (refer Section 5, item 7) into fan blades. Using a torque wrench, tighten magneto nut to 50 ft/lbs. Remove fan wrench (fig. 2-2-49).

NOTE: On manual start engines, use screwdriver, pin punch and hammer to bend the lock washer over the magneto nut. The washer should bend over the nut in two different places.



2-2-49

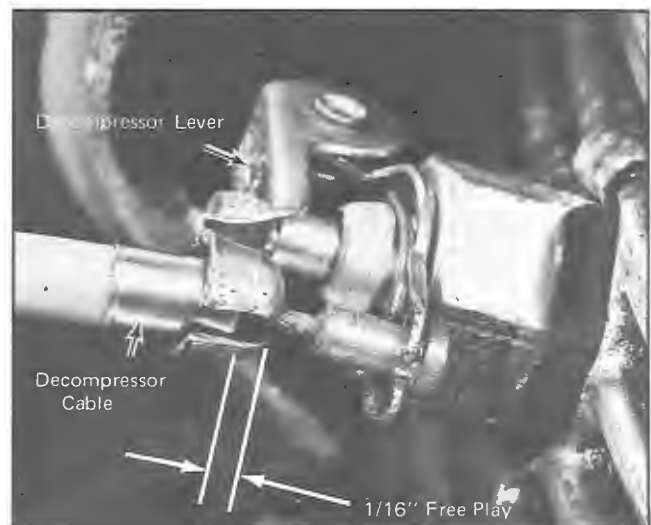
35. Install fan cowl and/or fan cowl cover. Install wiring harness, throttle and/or brake cable brackets to fan cowl/engine.
36. Carry out engine timing as detailed in sub-section 2-5.
37. Inspect spark plug condition, refer to figure 3-3-1 of Section 3. Replace spark plug if burnt. If necessary, adjust the plug gap using a feeler gauge. The gap must be .018 to .022 inch. Install spark plug and connect spark plug wire.
38. Install starting pulley to magneto using three (3) washers and nuts.
39. Position rewind starter in location and secure to fan cowl using four (4) screws and washers.
40. On electric start engines, install electric starter to fan cowl and crankcase. (fig. 2-2-50).

ENGINE – ONE CYLINDER



2-2-50

41. On engines equipped with decompressor, carry out the following:
 - (a) Install a new locking and sealing sleeve on decompressor valve ass'y.
 - (b) Screw decompressor valve ass'y into appropriate orifice. Torque the valve to 10 ft/lbs and lock in position by using a pin punch and a hammer to bend back one of the locking sleeves.
 - (c) Slip the decompressor cable ball and cable through valve clips. Adjust cable free play to 1/16 inch when decompressor knob is on the OFF position (fig. 2-2-51). Cable adjustment is performed by turning decompressor switch counterclockwise or clockwise. Install air deflector to engine and fan cowl using two (2) screws and washers.



2-2-51

42. Position muffler gasket on exhaust port studs. Position muffler in location and secure using four (4) lock washers, three (3) nuts and a capscrew.
43. Install the carburetor, installing components in the following sequence; position the plastic flange gasket, plastic flange, carburetor gasket, sleeves, carburetor body, lock washers and carburetor flange nuts on intake flange studs. 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. 2-2-52).



2-2-52

44. On vehicles equipped with an air silencer, install the silencer as detailed in sub-section 2-3.
 45. Secure engine supports to crankcase studs using four (4) nuts and washers. Torque each nut to 500 to 600 inch/lbs.
- NOTE:** If the support is equipped with a support brace bar, ensure the bar is on exhaust side of engine.
46. Install drive pulley as detailed in Section 1, sub-section 1-6.
 47. Push rewind starter sieve in location. Ensure the sieve recess is aligned with starter stop.

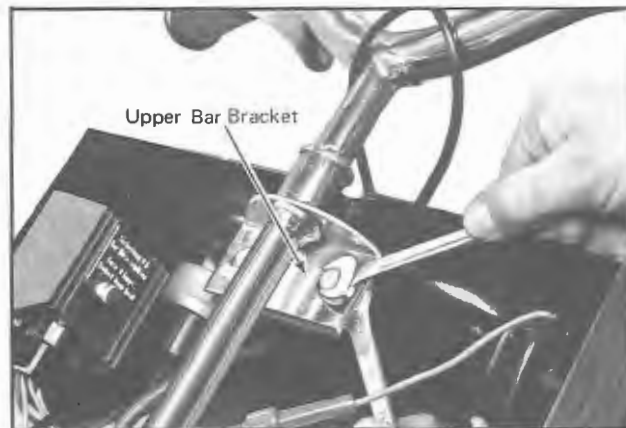
(C) INSTALLATION

1. Position engine on vehicle carriage bolts using one (1) of the following procedures:
 - (a) On all Elan models, tilt the upper column towards seat, raise the steering column and position the engine on the four (4) carriage bolts.
 - (b) On all 1971 Olympique models, position engine and upper column on carriage bolts (fig. 2-2-53).



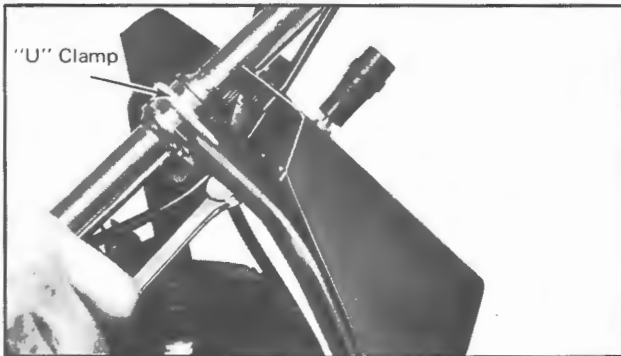
2-2-53

- (c) On all other models, tilt engine towards front of vehicle and position the engine assembly on carriage bolts.
2. Secure the engine assembly to frame using washers and four (4) engine mount nuts. Torque each nut to 400 to 420 inch pounds.
3. Position the upper column and steering column in location. Secure the bar bracket using two (2) bolts and nuts (fig. 2-2-54).



2-2-54

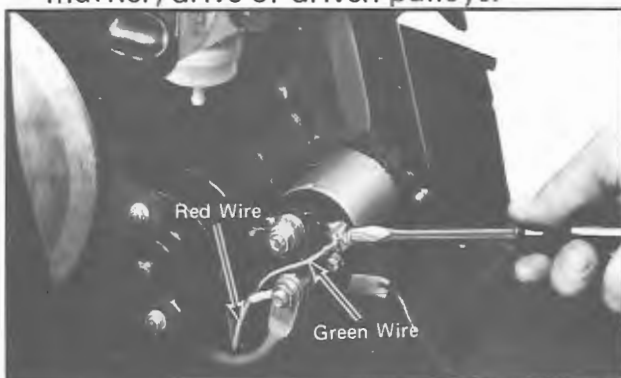
NOTE: The upper column and steering column on the Elan models, are secured by a "U" clamp (fig. 2-2-55).



2-2-55

4. On all 1971 Elan and Olympique models, pass the brake and throttle cables and slugs through top hole(s) of upper column dash panel.
5. On all vehicles except T'NT models, install decompressor switch in the appropriate holder (dash panel or upper column) using a shim, support nut and decompressor knob.
6. On all electric models, connect the following wiring. Refer to relevant Electrical Chart in Section 3, sub-section 3-2.
 - (a) Connect the positive cable (red) and solenoid wires (green and red), leading from wiring harness and battery, to the electric starter using the appropriate washers and nuts (fig. 2-2-56).

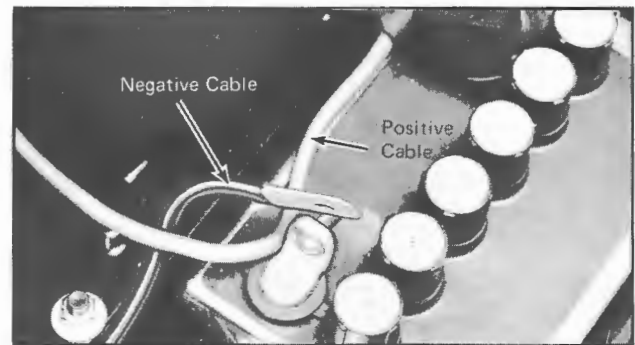
CAUTION: Make sure the wiring of the harness does not come into contact with muffler, drive or driven pulleys.



2-2-56

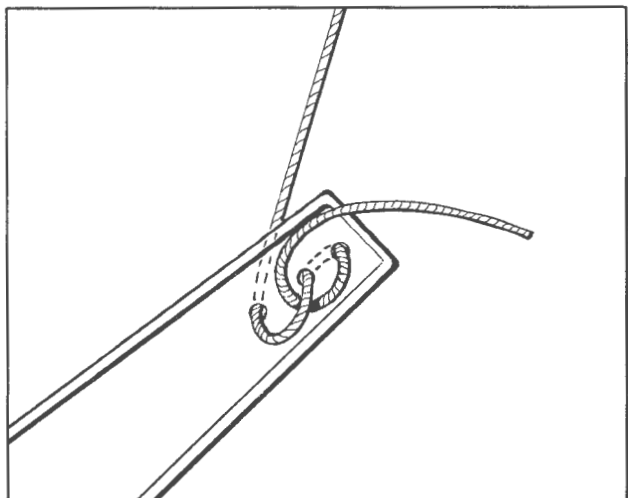
- (b) Connect lighter wire (if vehicle so equipped).
- (c) Connect rectifier quick connector.
- (d) Connect the negative cable (black) to battery post marked (-).

CAUTION: On all 1971 models, to avoid the battery positive cable (red) touching the muffler, etc., pass the battery negative cable around it. Figure 2-2-57 will assist you in cable positioning.



2-2-57

7. On all 1971 T'NT models, install cable clamp to engine and connect the ignition block wiring to ignition block. Refer to sub - section 3-2.
 8. Connect light switch and ignition switch block to appropriate switches.
 9. Pass the fuel line(s) and housing(s) through frame clips. Connect the fuel line(s) to carburetor.
- NOTE:** The longer length of fuel line is the return line. Always connect this line to outlet nipple of carburetor.
10. On all models equipped with an air silencer, connect fuel outlet line to fuel tank and inlet line to carburetor filter.
 11. Connect the front taillight quick connector.
 12. On all vehicles except 1971 T'NT models, connect the engine/taillight connector.
 13. On all Elan models, connect brake cable to handle plate (fig. 2-2-58).



2-2-58

NOTE: On all other models, connect the brake and throttle cables and housings to handlebar. On all Elan models, connect throttle cable to carburetor.

14. Check pulley alignment as detailed in Section 1, sub-section 1-9.
15. Install drive belt as detailed in Section 1, sub-section 1-7.
16. Install pulley guard as detailed in Section 1, sub-section 1-6.
17. Install console, if applicable. Install or close cab.

ENGINE — ONE CYLINDER

2-3 AIR SILENCER

(A) REMOVAL / DISASSEMBLY

1. Using a small screwdriver, pry the intake silencer cap from the upper half intake silencer (fig. 2-3-1).



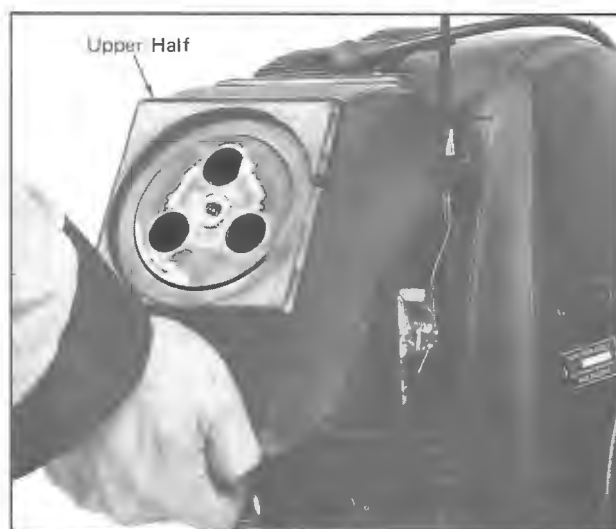
2-3-1

2. Unscrew choke knob from the choke rod.
3. Pull out the jet wrench.
4. Remove the three (3) nuts securing the retainer disc to collar studs. Remove disc (fig. 2-3-2).



2-3-2

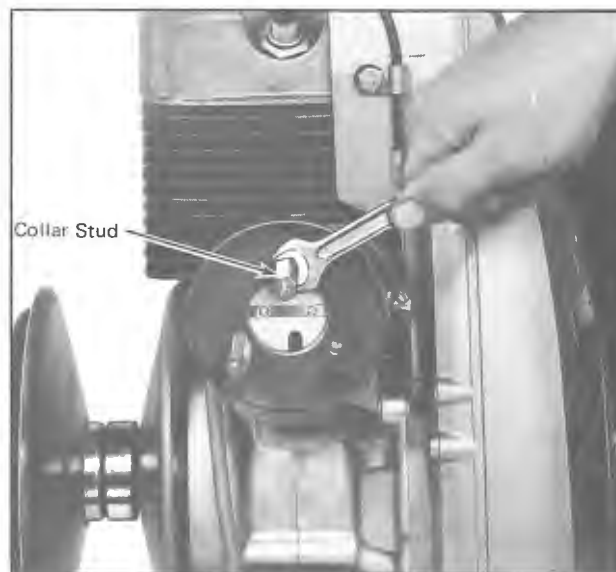
5. Lift upper half from lower half intake silencer (fig. 2-3-3).



2-3-3

6. Pull lower half intake from silencer socket assembly. Remove silencer socket.
7. Unhook choke rod from the choke lever.
8. Unscrew the three (3) collar studs from silencer bottom and carburetor body (fig. 2-3-4).

2-3

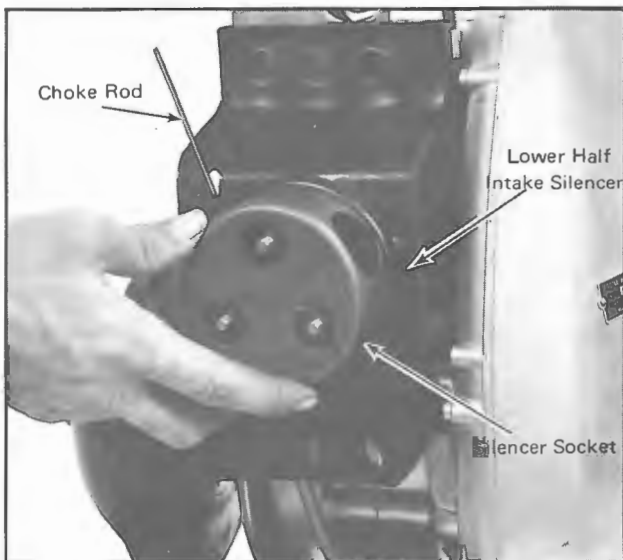


2-3-4

9. Remove the screw affixing carburetor bracket to silencer bottom.

(B) ASSEMBLY / INSTALLATION

1. Prior to Assembly procedure, ensure all components are thoroughly cleaned and dried and any damaged parts have been repaired or replaced.
2. Secure the carburetor bracket to silencer bottom using the appropriate screw.
3. Attach the silencer bottom to the carburetor using the three (3) collar studs.
4. Hook the choke rod into choke lever.
5. Position the silencer socket and lower half intake silencer in location. Ensure the choke rod passes through the appropriate orifice of the lower half (fig. 2-3-5).



2-3-5

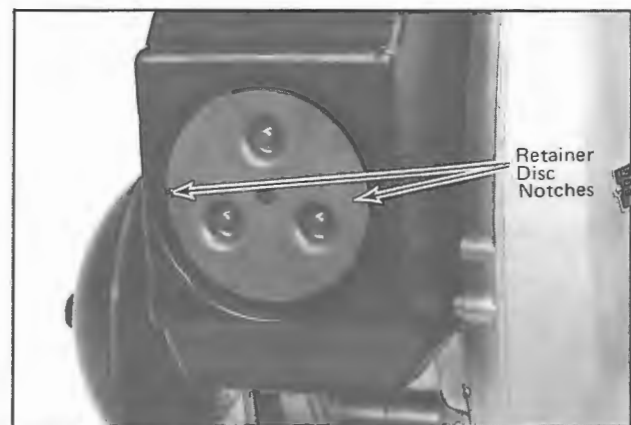
6. Align the choke rod orifice of upper half intake silencer with choke rod and position the upper half in location (fig. 2-3-6).



2-3-6

7. Position the retainer disc on collar studs and secure using three (3) elastic stop nuts.
8. Install choke knob and jet wrench (fig. 2-3-7).

NOTE: The retainer disc notches have to be positioned horizontally for proper mounting of the intake silencer cap.



2-3-7

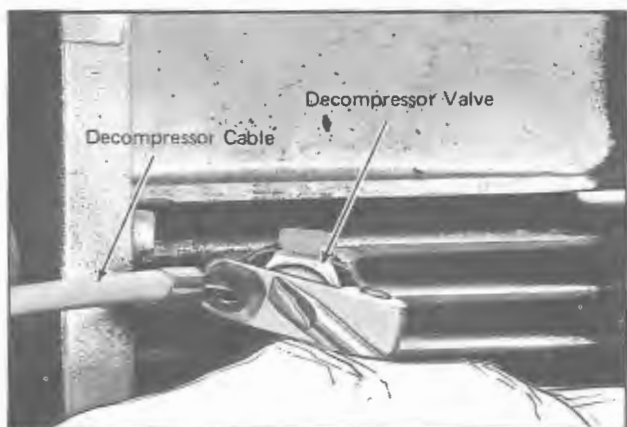
9. Press the intake silencer cap over the retainer disc.

ENGINE — ONE CYLINDER

2-4 DECOMPRESSOR

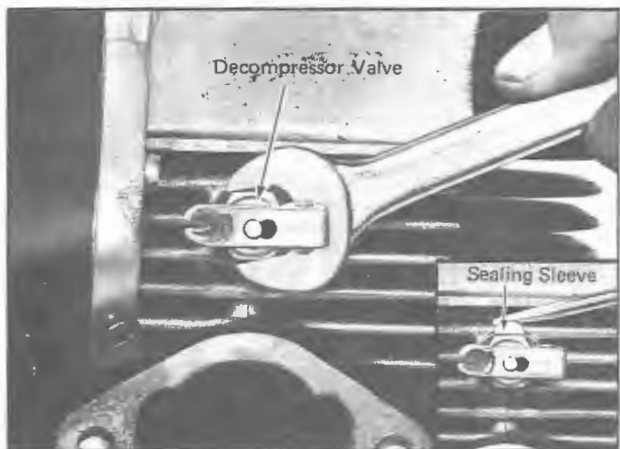
(A) REMOVAL

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).



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).



2-4-2

6. Unscrew decompressor knob from decompressor switch.
7. Remove decompressor switch by unscrewing the knurled nut. Remove washer.

(B) DISASSEMBLY

1. Remove locking and sealing sleeve from decompressor valve assembly.
2. Remove the two (2) screws and washers attaching the reinforcement spring, the switch spring and the lock spring to the switch housing.
3. Unscrew switch bolt with cable from switch housing.

(C) CLEANING

1. Immerse the decompressor valve assembly in a container of cleaning solution. Using a firm bristle brush, clean the valve seating area.
2. Using a clean cloth, clean and dry all components.

(D) INSPECTION

1. Inspect operation of decompressor valve assembly by activating lever manually. Check bearing area of plunger in valve.
2. Check condition of cable and lubricate with light machine oil.
3. Inspect switch components for cracks, distortion and wear.

(E) ASSEMBLY

1. Partially screw switch bolt with cable into switch housing.

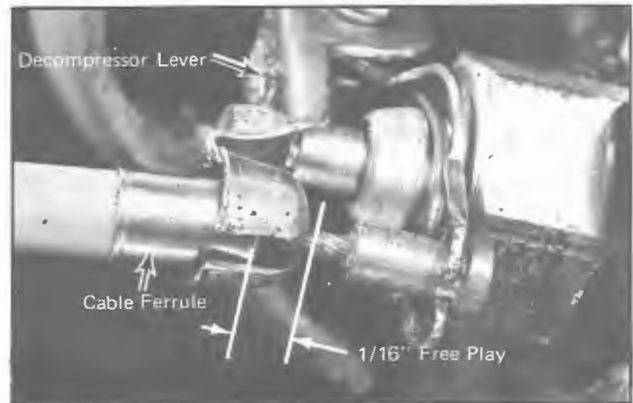
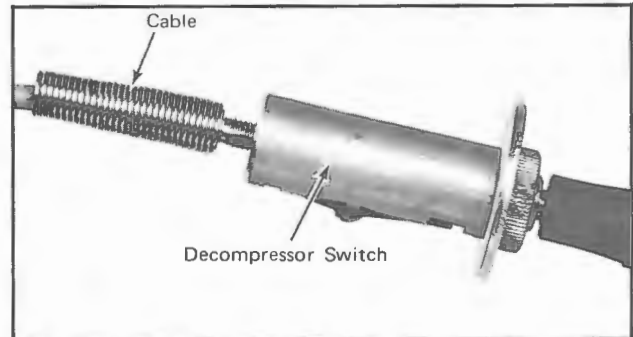
NOTE: The "V" recess of the switch bolt with cable should face upward.

2. Position the lock spring, the switch spring and the reinforcement spring and secure to the switch housing using two (2) screws and washers.
3. Install a new locking and sealing sleeve on decompressor valve assembly.

(F) INSTALLATION

1. Screw decompressor valve assembly in cylinder torque valve to 10 ft/lbs, and lock in position by bending a section of the locking and sealing sleeve over cylinder fin.
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 in position using washer and knurled nut. Install decompressor knob.
5. Adjust the decompressor cable to obtain 1/16 inch free play between decompres-

sor housing ferrule and lever. This is achieved by turning the cable in the switch housing in a clockwise or counter-clockwise direction (fig. 2-4-3).



2-4-3

6. Install air deflector and muffler.

ENGINE — ONE CYLINDER

2-5 ENGINE TIMING

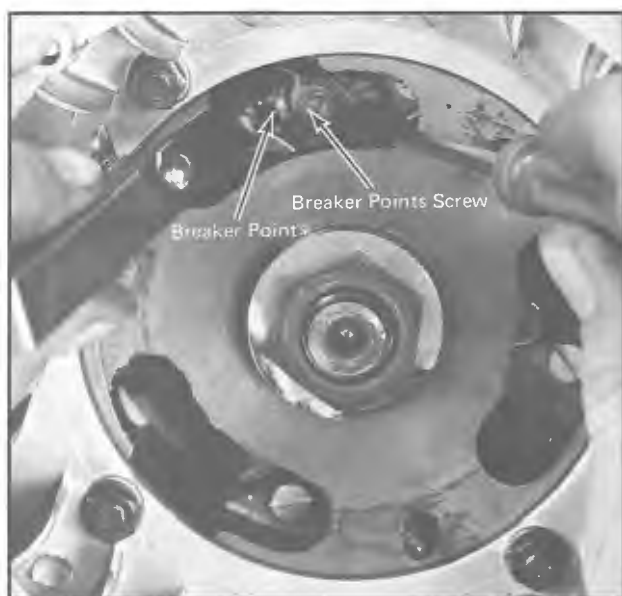
1. Remove rewind starter assembly from engine by removing four (4) capscrews and washers.
2. Remove the three (3) starting pulley nuts and washers from magneto ring plate.

NOTE: On electric start engines, the magneto ring plate incorporates the fan and starting gear.

3. Disconnect spark plug wire and remove spark plug from cylinder head.
4. Inspect breaker points condition, if pitted, burned or worn, replace.

NOTE: Breaker points can be cleaned by inserting a piece of paper between the points and moving it between the points.

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. 2-5-1).



2-5-1

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 wire clip to touch engine.

7. Turn timing light ON. Slightly slacken the tension of breaker points screw.
8. Align timing mark on fan cowl with timing mark on fan (fig. 2-5-2). 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.



2-5-2

9. Rotate the magneto counterclockwise 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. Slightly rotate the cam lobe clockwise until centrifugal weight is visible through the magneto ring plate. Hold the centrifugal weight in FULLY advanced posi-

tion and rotate magneto counterclockwise 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. 2-5-3).

(a) If the edge gap is less than .250 inch, loosen armature plate screws and rotate the armature plate assembly counterclockwise until edge gap is correct. Retighten armature plate screws.

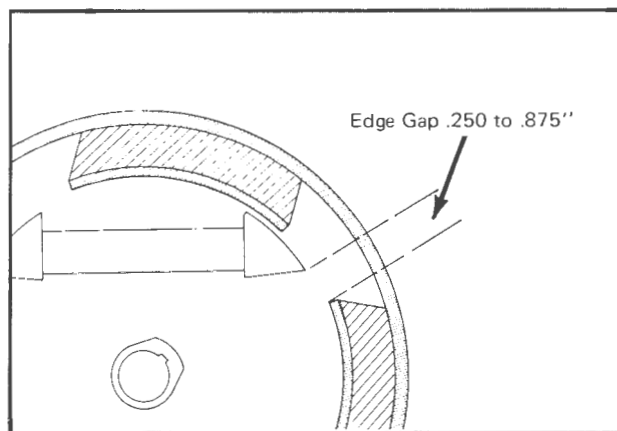
(b) If the distance is more than .875 inch, slacken armature plate screws and rotate the plate clockwise to obtain specified edge gap. Retighten armature plate.

11. Reset breaker points to match the timing marks and recheck breaker points gap.

NOTE: The breaker points gap should be between .014 to .018 inch.

ENGINE TIMING – ONE CYLINDER

12. Inspect spark plug condition, refer to figure 3-3-1 of Section 3. Replace spark plug if necessary. Adjust the spark plug gap using a feeler gauge. The gap must be .018 to .022 inch. Install spark plug and connect spark plug wire.
13. Install starting pulley to magneto ring plate with three (3) nuts and washers.
14. Install rewind starter assembly to engine with four (4) capscrews and washers.



2-5-3

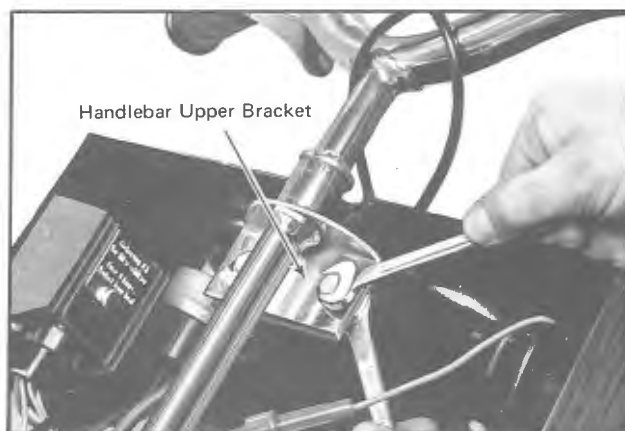
ENGINE — TWO CYLINDER

(A) REMOVAL (All Olympique 399 and 399E Models)

1. Tilt or remove the cab.
2. Remove pulley guard, refer to Section 1, sub-section 1-6.
3. Remove drive belt, refer to Section 1, sub-section 1-7.
4. Disconnect brake and throttle cables and housings from handlebar.
5. On all 1971 models, pass the cables and housings through dash panel of steering column.
 - (a) Remove console as detailed in Section 4.
 - (b) Remove all electrical connectors and switch blocks from dash panel. Disconnect brown wire from light switch block.
6. On all 1970 models, disconnect wiring harness quick connector.
7. On electric models, carry out the following:
 - (a) Disconnect negative cable (black) from battery post.
 - (b) Disconnect positive cable (red) from starter.
 - (c) Disconnect green and red wires from starter.
 - (d) Separate rectifier quick connector.
8. Remove the fuel lines from carburetor and pull the fuel lines and housings from frame clips.

CAUTION: To avoid gasoline leakage, position the fuel lines so that the line ends are stowed higher than fuel tank.

9. Unbolt bar bracket from steering column (fig. 2-6-1).



2-6-1

10. Remove the four (4) engine mount nuts and washers.
11. On all 1971 models, remove upper column from carriage bolts.
12. Lift engine from carriage bolts and remove from vehicle.

(B) REMOVAL (All Nordic 399, 399E and 640E Models)

1. Tilt cab.
2. Remove pulley guard, refer to Section 1, sub-section 1-6.
3. Remove drive belt, refer to Section 1, sub-section 1-7.
4. Disconnect brake and throttle cables and housings from handlebar.
5. Remove console, refer to Section 4.
6. Disconnect fuel lines from carburetor and pull the fuel lines and housings from frame clips.

CAUTION: To avoid gas leakage, position the fuel lines so that the line ends are stowed higher than fuel tank.

7. Disconnect front taillight connector.
8. On 399 and 399E models, pass the brake cable and housing through steering column grommet.
9. On electric models, carry out the following:
 - (a) Disconnect ground wire (yellow) from fan housing.
 - (b) Push positive wires (red) from rectifier quick connector.
 - (c) Remove negative cable (black) from battery post.
 - (d) Disconnect positive cable (red) from electric starter.
 - (e) Remove the green and red wires from electric starter.
10. On 640E models, carry out the following:
 - (a) Disconnect the yellow wire and black wire leading from ignition coil at ignition switch block.
 - (b) Disconnect red/yellow wire leading from lighting coil at rectifier block.
11. Unbolt the bar bracket from upper column.

NOTE: On 640E models, remove “V” bracket from bar bracket upper column.

12. Push the upper column toward front of vehicle and remove the four (4) engine mount nuts and washers.
13. Lift engine from carriage bolts and remove from vehicle.

(C) REMOVAL
(All T'NT Models)

1. Tilt or remove cab.
2. Remove pulley guard, refer to Section 1, sub-section 1-6.
3. Remove drive belt, refer to Section 1, sub-section 1-7.
4. Disconnect brake and throttle cables and housings from handlebar.

5. Disconnect front taillight connector.
6. Remove fuel lines from carburetor and pull the fuel lines and housings from frame clips.

NOTE: On 775 models, remove the fuel lines at carburetors and “T” junction.

CAUTION: To avoid gasoline leakage, position the fuel lines so that the line ends are stowed higher than the fuel tank.

7. On all 1971 models, disconnect ignition switch block from ignition switch.
 8. On all 1970 models, disconnect wiring harness quick connector.
 9. Disconnect steering column from upper column.
- NOTE:** On all 1970 models, the steering column is attached to steering bracket affixed to the cylinder head distance nuts.
10. Remove the four (4) engine mount nuts and washers.
 11. On all 1971 models, tilt upper column towards front of vehicle.
 12. Lift and remove engine assembly towards seat.

(D) REMOVAL
(All Alpine/Invader
and Valmont Models)

1. Remove cab.
2. Remove pulley guard, refer to Section 1, sub-section 1-6.
3. Engage transmission and slip the drive belt from driven and drive pulleys, refer to Section 1, sub-section 1-7.
4. Disconnect brake and throttle cables and housings from handlebar.

NOTE: On Valmont models, pass cables and housings through dash panels.

5. Remove console, refer to Section 4.
6. Remove fuel lines from carburetor and pull fuel lines and housings from frame clips.

WARNING: To avoid gasoline leakage, position the fuel lines so that the line ends are stowed higher than fuel tank.

7. On electric models, carry out the following:
 - (a) Open seat cover and disconnect negative cable (black) from battery post. Close seat cover.
 - (b) Disconnect positive cable (red) from electric starter. Disconnect green wire and red wire from starter.
 - (c) Disconnect quick connector from rectifier block.
8. Remove ground cable (yellow) and wiring harness bracket from fan cowl.

NOTE: Ensure that all electrical wires in the wiring harness are disconnected from engine, dash panel, upper bracket, etc.

9. Remove upper retainer plate from upper bracket.
10. Remove lower retainer plate.
11. Remove cotter pin attaching transmission rod to gear change lever of gear box. Remove washer and spring. Disengage transmission rod from gear change lever.
12. On all 1970 models, pull the transmission rod up through the dash panel.
13. Lift the steering arm ball joint from steering channel.
14. Pull handlebar toward rear of vehicle until steering shaft stops against upper column.
15. Remove the two (2) bolts securing upper column to frame. Remove upper column and set the assembly beside vehicle.

NOTE: If required, detach brake cable from frame and disc brake ferrule.

16. Remove the four (4) engine mount nuts and washers and lift the engine from vehicle.

(E) DISASSEMBLY

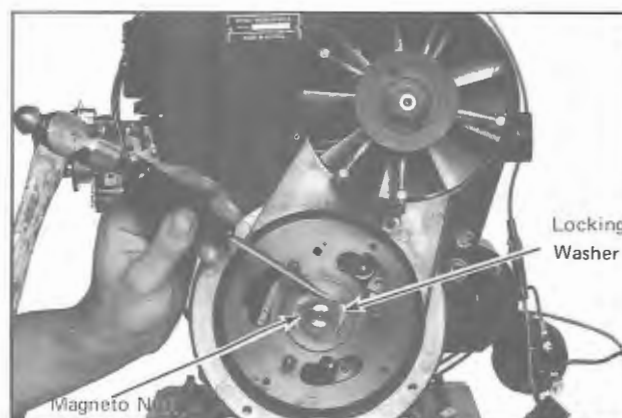
NOTE: Refer to figure 2-6-6 for disassembled view of two cylinder engines.

1. Remove muffler from engine.
2. Slightly bend back the fan protector tabs and remove the fan protector from fan housing.
3. Remove the four (4) capscrews and washers securing the rewind starter to fan housing. Remove rewind starter.
4. Remove the three (3) nuts and washers affixing "V" belt pulley to magneto ring plate studs. Remove "V" belt and the pulley (fig. 2-6-2).



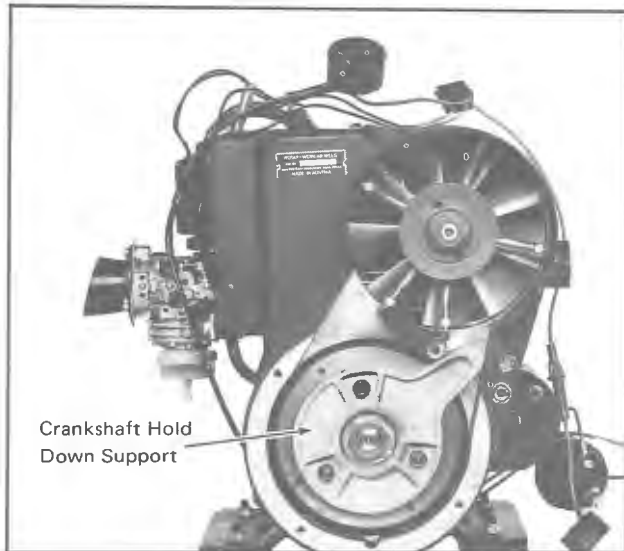
2-6-2

5. Using a screwdriver and a hammer, straighten the locking washer located behind magneto nut (fig. 2-6-3).



2-6-3

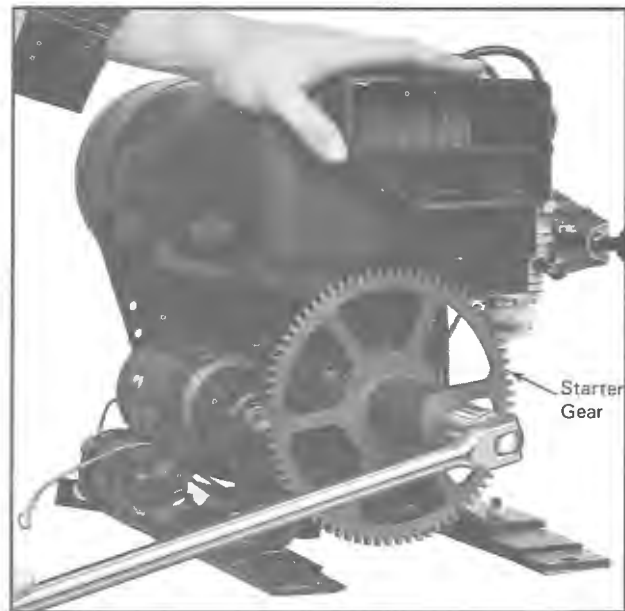
6. Remove drive pulley as detailed in Section 1, sub-section 1-9.



2-6-4

7. Position the crankshaft hold down support (refer Section 5, item 15) 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. 2-6-4).

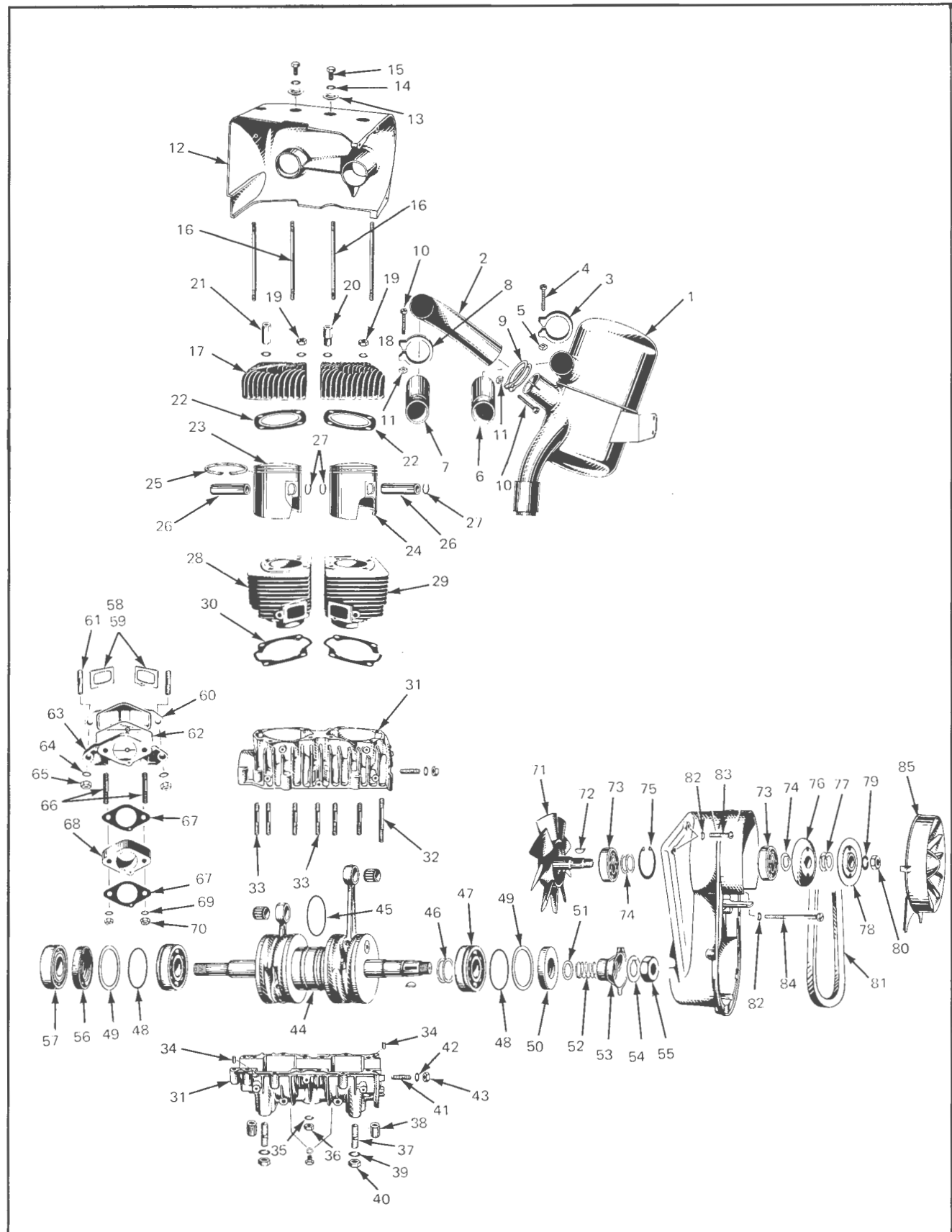
NOTE: On electric start engines, remove shim(s), spacer and starter gear using an appropriate starter gear puller (refer Section 5, item 16), (fig. 2-6-5).



2-6-5

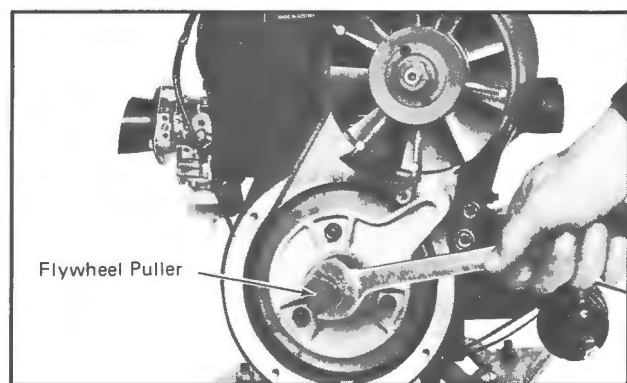
8. Using a socket wrench, remove the magneto nut.

- | | | |
|----------------------------------|--------------------------------------|----------------------------------|
| 1. Muffler Assembly | 24. Piston (Magneto Side) | 55. Nut |
| 2. Inlet Elbow | 25. Piston Ring (4) | 56. Oil Seal |
| 3. Muffler | 26. Gudgeon Pin (2) | 57. Ball Bearing |
| 4. Screw | 27. Gudgeon Pin Circlip (4) | 58. Intake Gasket (P.T.O. Side) |
| 5. Nut | 28. Cylinder (P.T.O. Side) | 59. Intake Gasket (Magneto Side) |
| 6. Exhaust Socket (Magneto Side) | 29. Cylinder (Magneto Side) | 60. Intake Manifold |
| 7. Exhaust Socket (P.T.O. Side) | 30. Gasket Cylinder Flange | 61. Stud |
| 8. Muffler Clamp | 31. Crankcase Assembly (Both Halves) | 62. Ring Gasket |
| 9. Muffler Clamp | 32. Stud | 63. Intake Cover |
| 10. Screw | 33. Stud | 64. Washers |
| 11. Nut | 34. Dowel Pin | 65. Lock Nut |
| 12. Fan Cowl | 35. Lock Washer | 66. Stud |
| 13. Cowl Cover | 36. Nut | 67. Carburetor Flange Gasket (2) |
| 14. Lock Washer | 37. Stud | 68. Isolating Flange |
| 15. Screw | 38. Distance Sleeve | 69. Isolating Washer |
| 16. Cylinder studs (8) | 39. Lock Washer | 70. Nut |
| 17. Cylinder Head (P.T.O. Side) | 40. Nut | 71. Fan (with Shaft Assembly) |
| 18. Cylinder Head (Magneto Side) | 41. Stud | 72. Woodruff Key |
| 19. Nut (4) | 42. Locking Washer | 73. Ball Bearing (2) |
| 20. Distance Nut (3) | 43. Nut | 74. Shim(s) |
| 21. Distance Nut | 44. Crankshaft Assembly | 75. Shim |
| 22. Cylinder Head Gasket (2) | 45. "O" Ring | 76. Inner Pulley Half |
| 23. Piston (P.T.O. Side) | 46. Shim | 77. Shims |
| | 47. Ball Bearing | 78. Outer Pulley Half |
| | 48. "O" Ring | 79. Lock Washer |
| | 49. Retaining Disc | 80. Nut |
| | 50. Oil Seal | 81. "V" Belt |
| | 51. Washer | 82. Spring Washer |
| | 52. Breaker Cam Spring | 83. Screw |
| | 53. Breaker Cam | 84. Cylinder Screw |
| | 54. Lock Washer | 85. Fan Cover |



DISASSEMBLED VIEW OF TWO CYLINDER ENGINE

9. Using the appropriate flywheel puller (refer Section 5, item 8), remove the magneto housing (fig. 2-6-7). Remove puller and wrench from magneto ring plate.

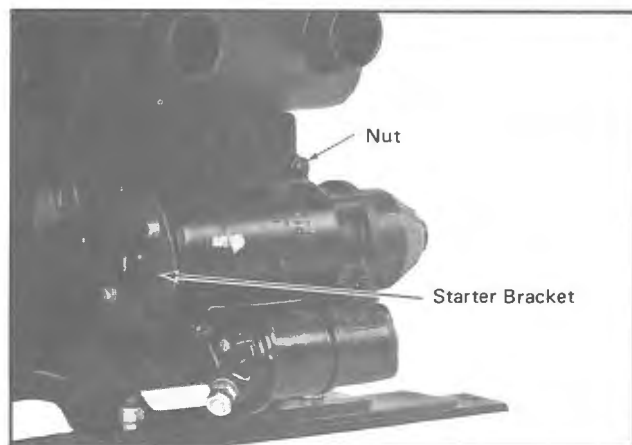


2-6-7

10. 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.

11. Remove carburetor(s) as detailed in subsection 2-11.
12. On electric start engines, remove the nuts and washers affixing the electric starter and starter bracket to the engine. Remove starter and bracket (fig. 2-6-8).



2-6-8

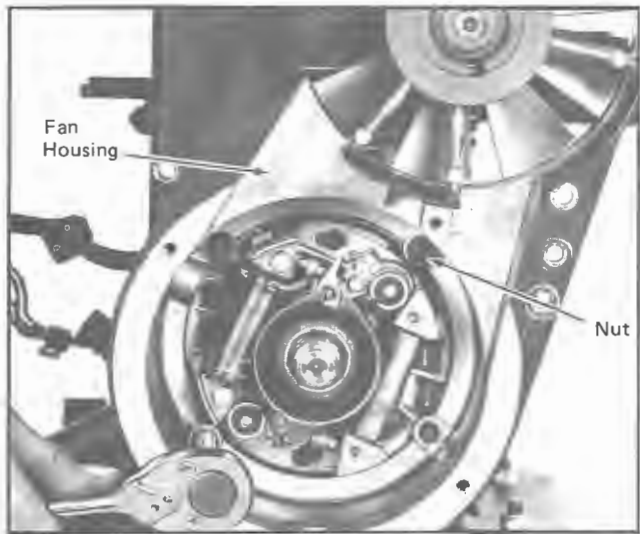
13. On all 1971 T'NT engines, carry out the following procedure:
- (a) Remove the two (2) cylinder head/cylinder cowl bolts.
 - (b) Remove the three (3) screws and washers attaching fan housing to cylinder cowl. Remove the cylinder cowl.
14. On all other engines, carry out the following:
- (a) Remove the cylinder head/cylinder cowl bolt.
 - (b) Remove the two (2) screws and washers affixing fan housing to the cylinder cowls.
 - (c) Remove the nut attaching cylinder cowls stud and remove the stud.

NOTE: If the engine is equipped with an air deflector (all 1970 "399" models, except Nordic), remove air deflector assembly.

- (d) Remove the left cylinder cowl from engine.
15. Disconnect spark plug wires and remove spark plugs.
16. On vehicles equipped with engine console, remove console by removing the four (4) Allen head capscrews securing the console to cylinder cowl.
17. Disconnect all electrical wiring from the ignition coils.
18. Remove the ignition coils from engine.

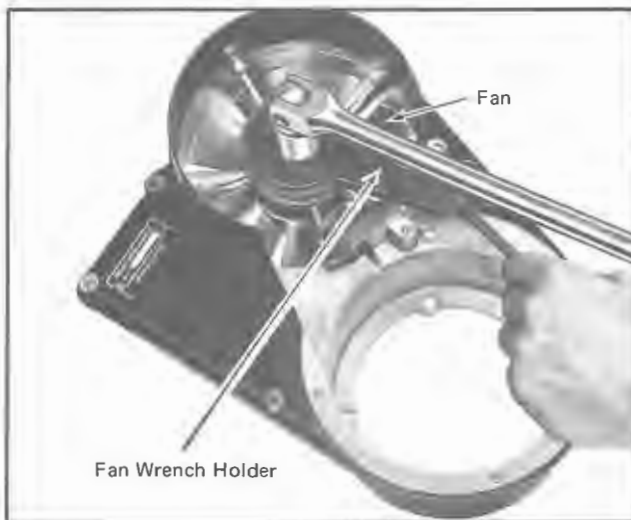
NOTE: On all 1971 T'NT models, remove the ignition coil bracket from crankcase.

19. On all models except 1971 T'NT, remove the two (2) screws and washers affixing right cylinder cowl to the engine. Remove cylinder cowl.
20. Remove the four (4) nuts and washers attaching fan housing to crankcase (fig. 2-6-9). Carefully remove fan housing from the engine.



2-6-9

21. Lock the fan in position using a fan holder wrench (refer Section 5, item 17). Remove the fan nut (fig. 2-6-10).



2-6-10

22. Remove the locking washer, outer half pulley, shims, inner half pulley, shim, woodruff key and fan from the fan housing.
23. Heat the fan housing to 140°–160°F. Remove the bearings from the fan housing.

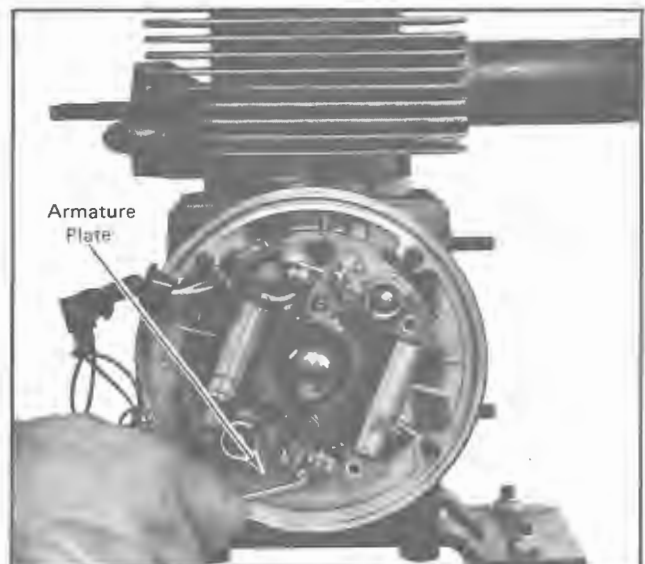
NOTE: Two (2) shims are positioned between the bearings. The shims are removed during bearing removal.

24. Using needle pliers, remove circlip from fan housing (fig. 2-6-11).



2-6-11

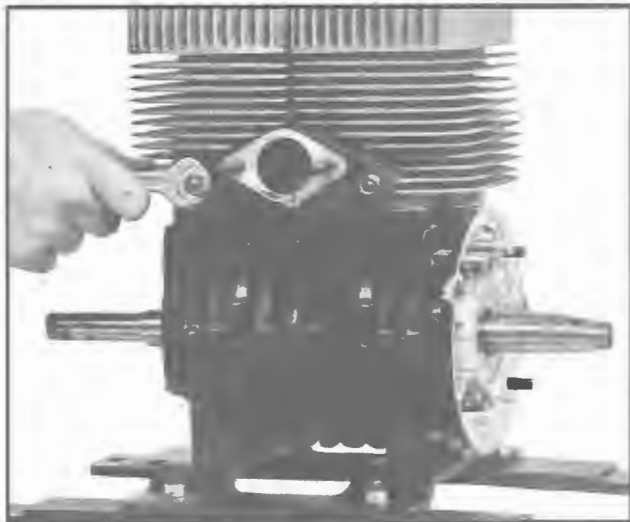
25. Remove the woodruff key from the magneto crankshaft extension. To do this, first press the cam towards the armature plate and hold it in position. Using a pin punch and a hammer, drive out the woodruff key from the crankshaft. Remove cam, cam spring and washer from crankshaft.
26. Remove armature plate from crankcase by removing the two (2) nuts or screws (fig. 2-6-12).



2-6-12

27. On all engines (except 775 type), remove the two (2) nuts and washers affixing the intake cover and intake manifold to

cylinder (fig. 2-6-13). Remove cover, manifold and intake gaskets from the studs. Remove gasket ring from the intake manifold. Discard manifold gasket.



2-6-13

NOTE: On all 775 engine types, remove the two (2) nuts and washers affixing the intake manifold to cylinder. Disconnect the two (2) vacuum lines at the crankcase. Remove manifold from the studs (fig. 2-6-14). Discard manifold gasket.



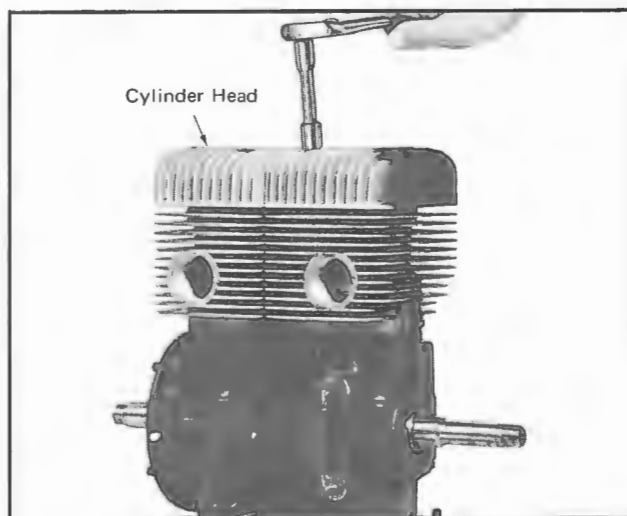
2-6-14

28. Remove the four (4) nuts and washers securing the exhaust flanges to cylinders. Remove flanges and gaskets. Discard flange gaskets.

NOTE: On all 399 and 440 engine types, unscrew the exhaust sockets from the cylinder.

29. Remove the eight (8) nuts and washers holding the cylinder heads in position. Remove cylinder heads (fig. 2-6-15). Always loosen head nuts in a criss-cross pattern a sixth-turn each.

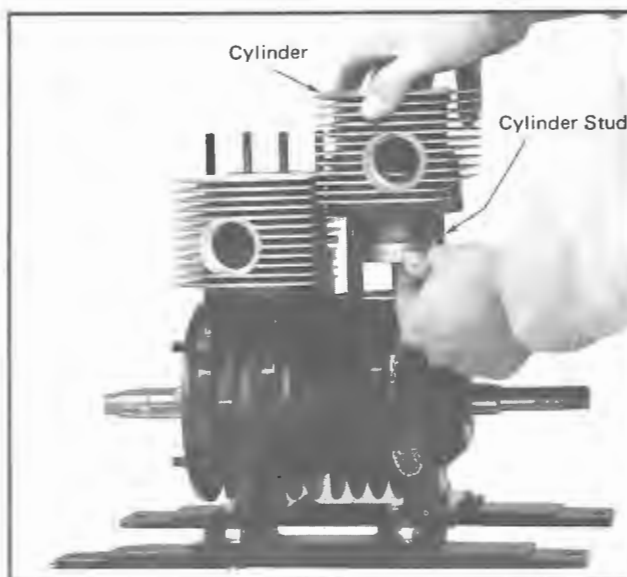
CAUTION: Identify the location of the distance nuts for assembly procedure.



2-6-15

30. Remove and discard the cylinder head gaskets.

31. Carefully lift the cylinders from the crankcase/cylinder studs (fig. 2-6-16).



2-6-16

32. Using two (2) of the previously removed cylinder head nuts, unscrew the eight (8) cylinder studs. Remove crankcase/cylinder gaskets and discard.
33. Carefully spread open the piston rings until they can be slid from the piston (fig. 2-6-17).

CAUTION: Do not spread the rings open too far as breakage can occur.

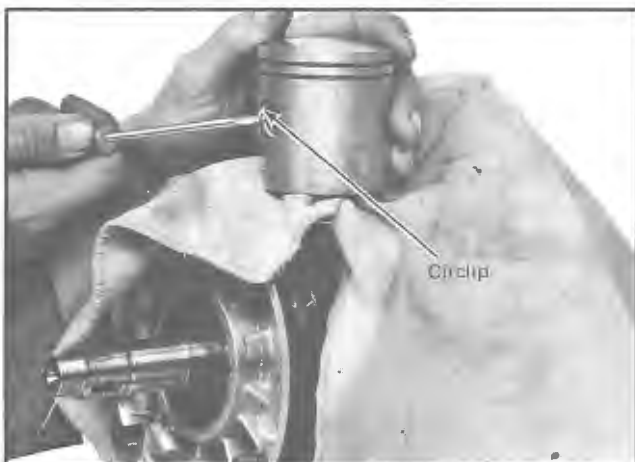
NOTE: Identify each piston ring as to location on which groove and which piston it is installed on.



2-6-17

34. Using a pointed tool, remove the circlips from the pistons.

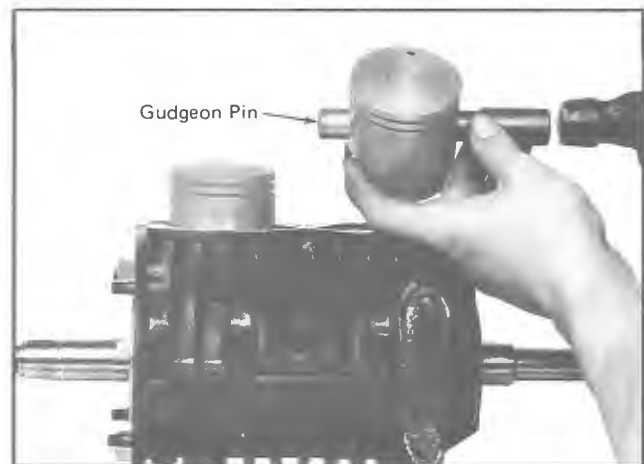
NOTE: During removal of circlips, a clean, dry cloth must be laid over the crankcase to prevent foreign matter falling inside the crankcase (fig. 2-6-18).



2-6-18

35. Using a suitable mounting bar and a hammer, drive the gudgeon pins through the needle cages and remove the pistons. Remove gudgeon pins (fig. 2-6-19).

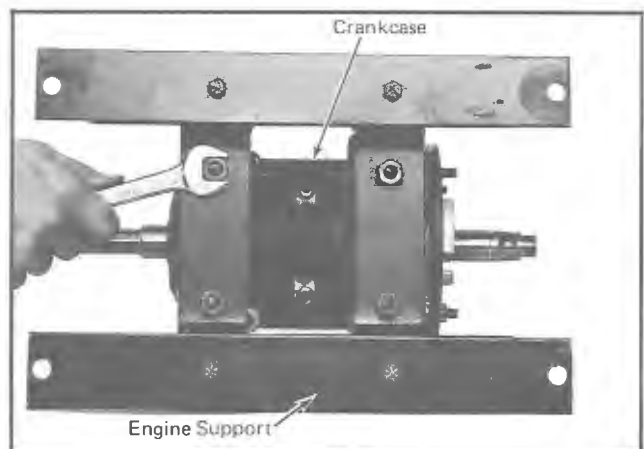
CAUTION: When tapping gudgeon pins out of pistons, hold piston firmly in place to eliminate the possibilities of transmitting shock and pressure to the connecting rods.



2-6-19

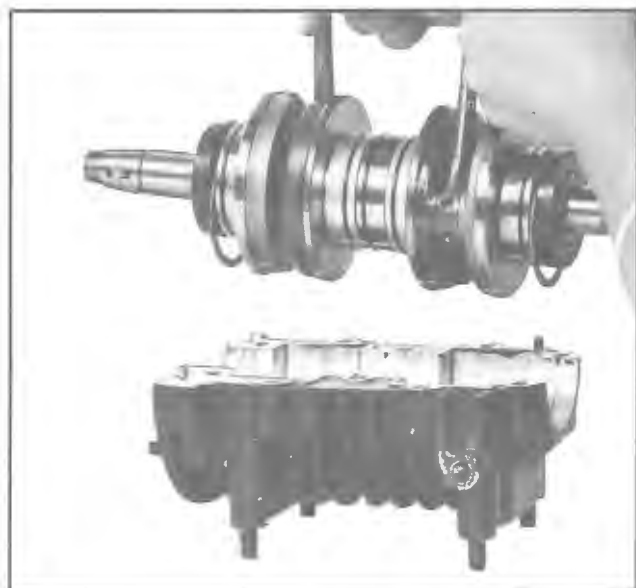
36. Slide the needle cages from the connecting rods.
37. Lay the crankcase on its side and remove the four (4) nuts and washers attaching the engine support to the crankcase (fig. 2-6-20). Remove the four (4) spacers (if applicable to engine).

NOTE: Do not disassemble the engine support assembly unless warped or damaged and replacement is indicated.



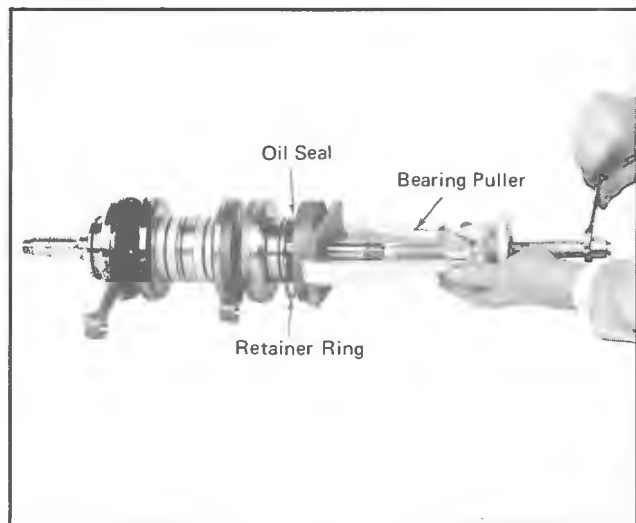
2-6-20

38. Remove the nuts and washers from the crankcase base.
39. Using a soft faced hammer, gently tap the crankcase, until the crankcase halves separate. Remove upper crankcase half and lift crankshaft from lower half (fig. 2-6-21).



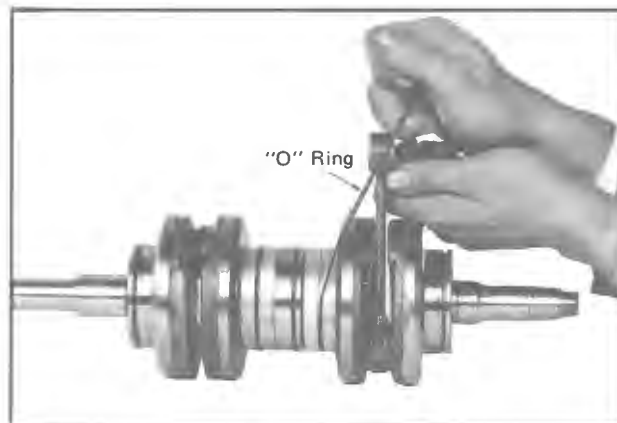
2-6-21

40. On all 775, 640 and 440 T'NT engines, using appropriate bearing puller (refer Section 5, item 12), remove the P.T.O. crankshaft bearing (fig. 2-6-22).



2-6-22

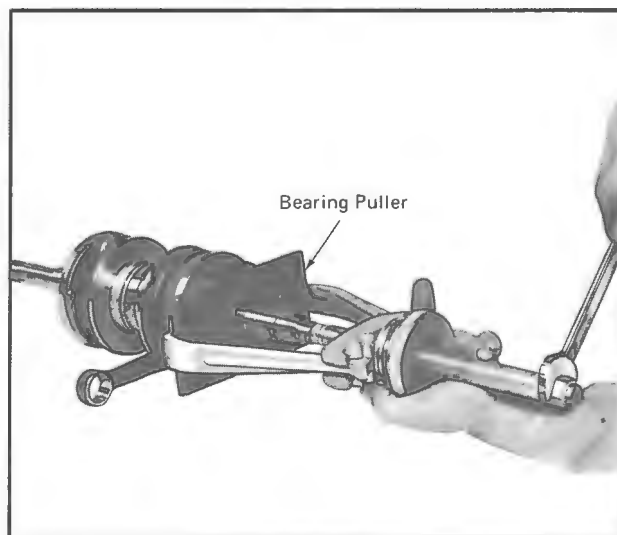
41. Remove oil seals, retainer rings and crankshaft "O" rings (fig. 2-6-23).



2-6-23

42. Using an appropriate puller (refer Section 5, item 12), remove magneto and P.T.O. crankshaft bearings (fig. 2-6-24).

NOTE: Do not remove crankcase studs unless damaged or worn. If replacement is necessary, remove studs using two (2) previously removed nuts.



2-6-24

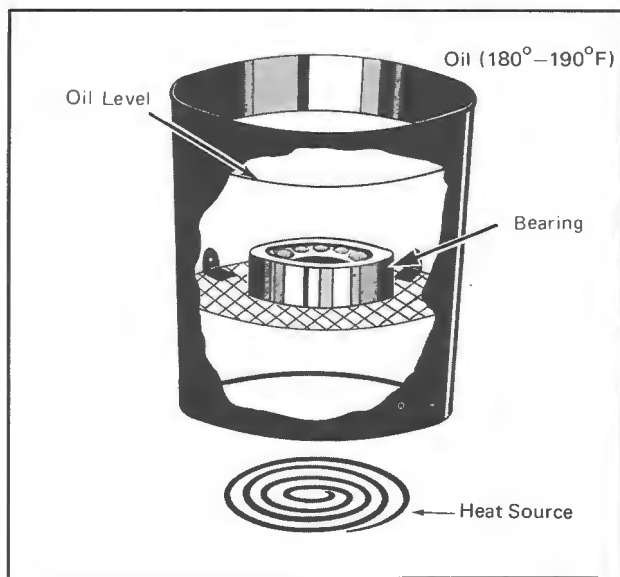
(F) ASSEMBLY

1. Prior to Assembly procedure, ensure all components have been cleaned, inspected, repaired and/or replaced as detailed in sub-section 2-8 and 2-9.

NOTE: Crankcase are fabricated in two (2) matched halves. For this reason, single crankshaft halves are not interchangeable and are not purchasable as single halves.

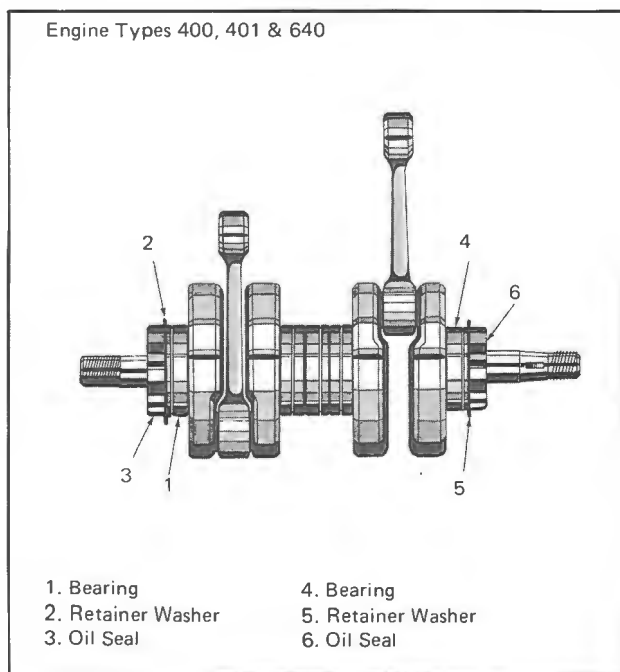
2. Assemble crankshaft and determine end play as follows:

- (a) Place crankshaft bearings into an oil container and heat the oil to 180°–190°F. Figure 2-6-25 shows the method of heating the bearing.

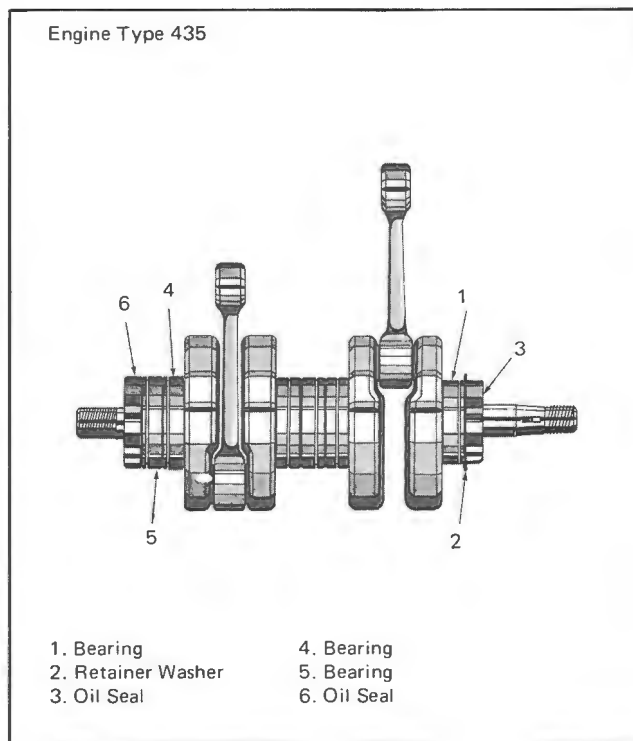


2-6-25

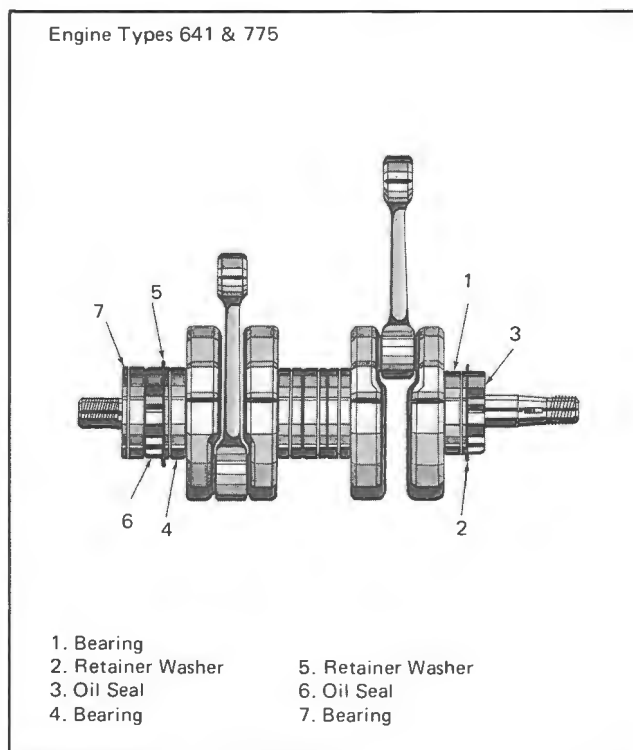
- (b) Slide the appropriate bearings, retainer washers, new "O" rings and new oil seals onto the crankshaft extensions (fig. 2-6-26)



2-6-26



2-6-26



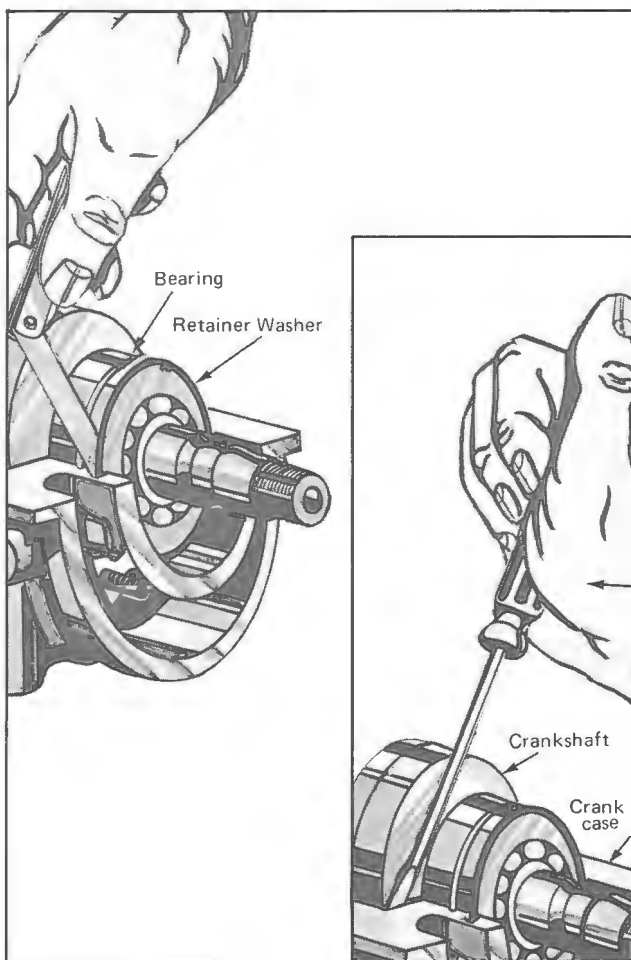
2-6-26

- (c) Excluding the 435 engine type, place the assembly into the lower crankcase half ensuring the P.T.O. extension is located at the P.T.O. side of crankcase.

NOTE: The following step is not applicable to type 435 engines because of the crankshaft being held on P.T.O. side with a bearing thereby controlling crankshaft tolerance.

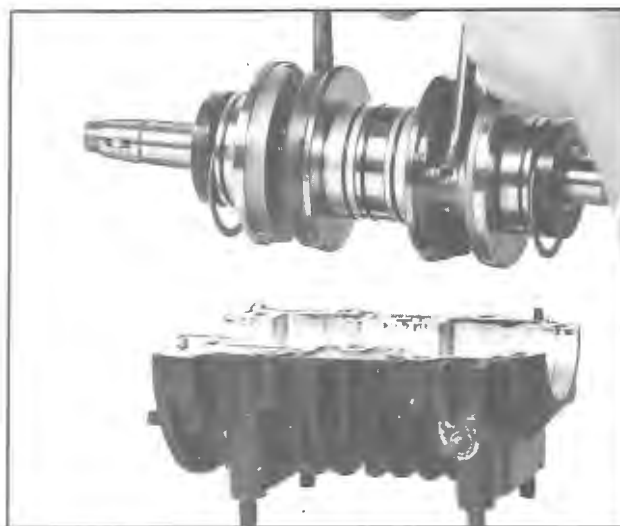
- (d) Insert a screwdriver blade between magneto crankshaft blades and crankcase and push the crankshaft assembly toward P.T.O. side of crankcase.

Any free play between retaining washer and the leading edge of the bearing located between the retainer ring 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. 2-6-27)



2-6-27

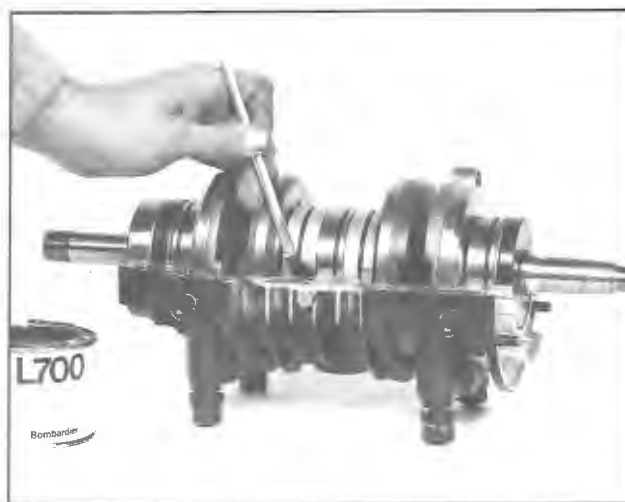
3. Heat the crankcase half to 180°–200° F. Place the crankshaft assembly into crankcase with the magneto crankshaft extension on magneto side of lower crankcase half (fig. 2-6-28).



2-6-28

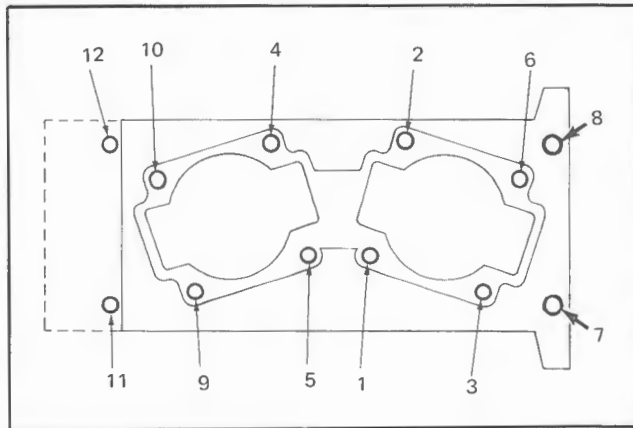
4. Apply L 700 adhesive over the contact surface of lower crankcase half and position upper half in location (fig. 2-6-29).

NOTE: Magneto side of upper crankcase half must be on magneto side of lower crankcase half.



2-6-29

5. Place the washers and nuts on crankcase studs and following the sequence shown in figure 2-6-30, cross torque the crankcase nuts to 10 ft/lbs then to 16 ft/lbs.

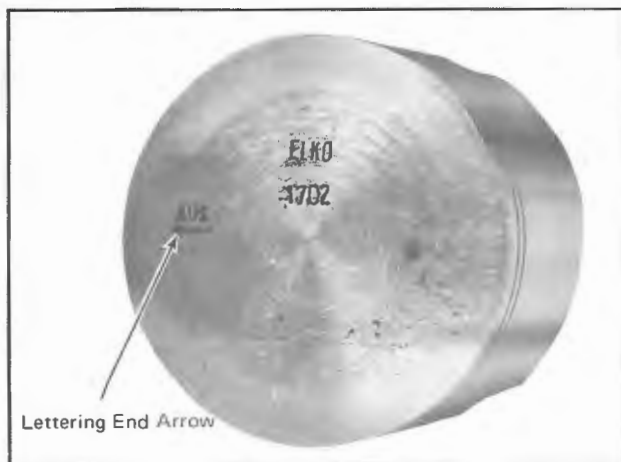


2-6-30

6. 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 M8 studs to 75 to 100 in/lbs, M10 studs to 150 to 200 in/lbs and M12 studs to 175 to 225 in/lbs.

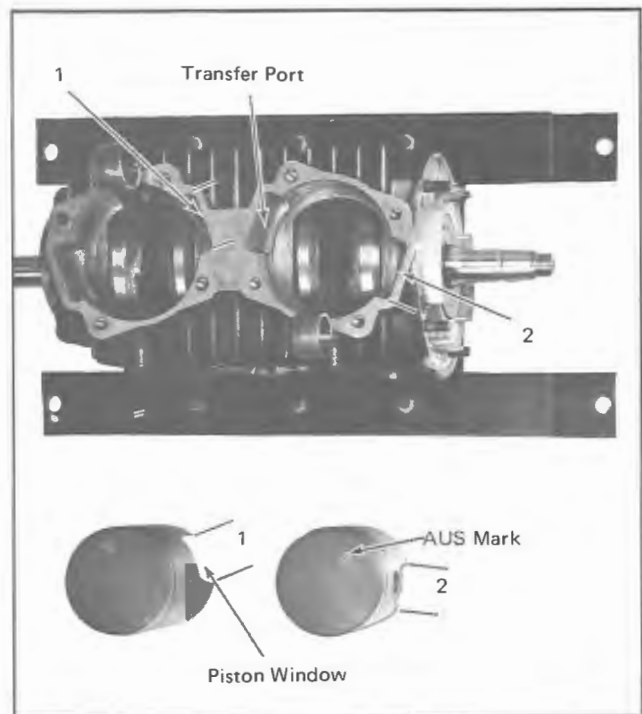
NOTE: On engine types equipped with spacers, ensure that the four (4) spacers are in position between crankcase and engine supports.

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 (fig. 2-6-31).



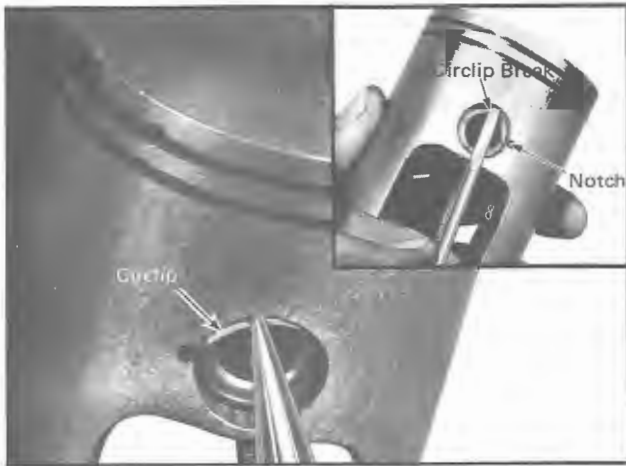
2-6-31

- (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. 2-6-32).



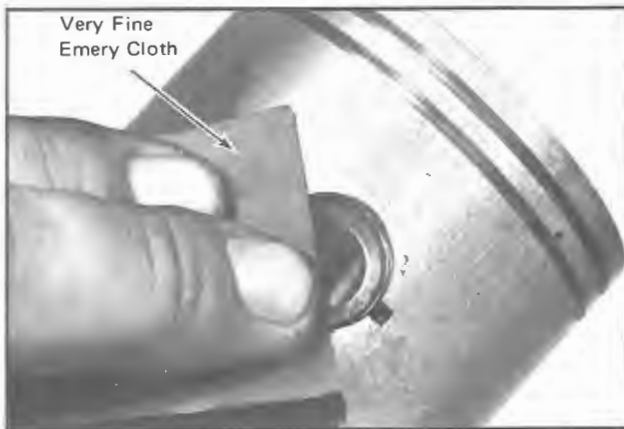
2-6-32

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. 2-6-33).



2-6-33

12. Using very fine emery cloth, remove any possible burrs on pistons caused through circlip installation (fig. 2-6-34).



2-6-34

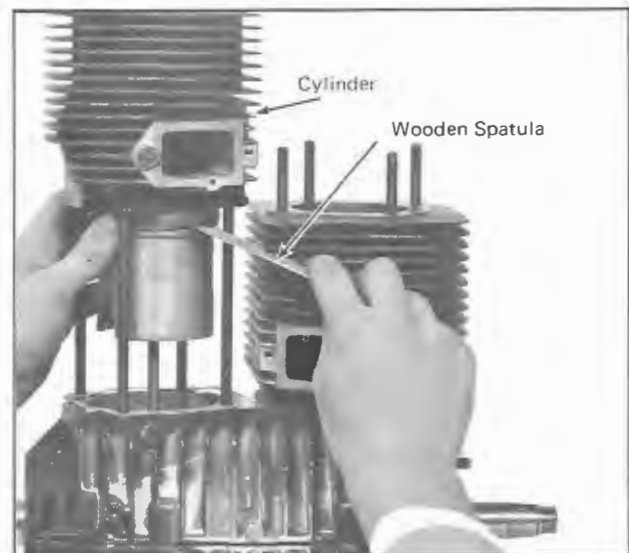
13. Place the appropriate piston rings on the piston domes. Gently pull the rings open and position them in proper ring grooves (fig. 2-6-35).

NOTE: Ensure the "V" ends of the rings sit correctly in the ring landings.



2-6-35

14. Place the 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. 2-6-36). 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.



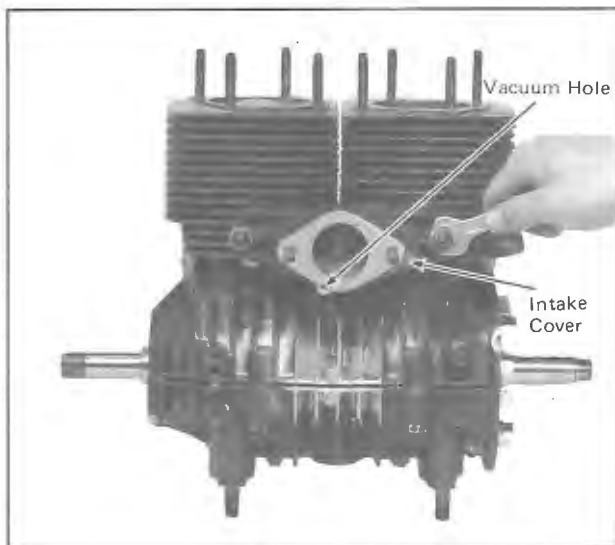
2-6-36

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 oil spillage from cylinder tops using a clean, dry cloth.
19. On all engines except 775, carry out the following:

- (a) Position new intake gaskets in intake manifold. Place manifold on studs.
- (b) Press a new gasket ring into the intake manifold and place intake cover on studs.
- (c) Secure in place using two (2) nuts and washers (fig. 2-6-37).

NOTE: Make sure to align intake manifold vacuum port with cylinder vacuum port.

NOTE: On 775 engines, position the intake manifold with the two (2) new intake gaskets on cylinder studs. Secure using two (2) nuts and washers. Connect the two (2) vacuum lines to the crankcase (fig. 2-6-38).



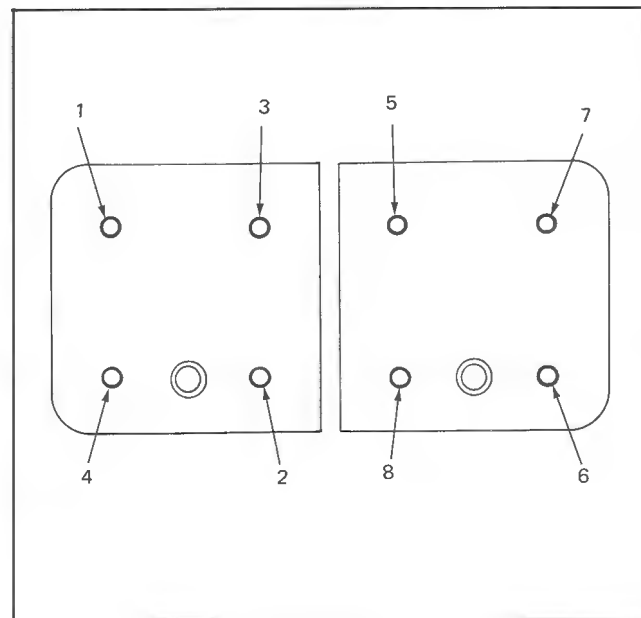
2-6-37



2-6-38

20. Position new cylinder head gaskets on cylinders.
21. Correctly position cylinder heads on cylinders ensuring the spark plug holes are on the intake side of engine.
22. 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 2-6-39). ^{120 in lbs} ^{192 in lbs}

CAUTION: Make sure the distance nuts are correctly located on cylinder head(s).



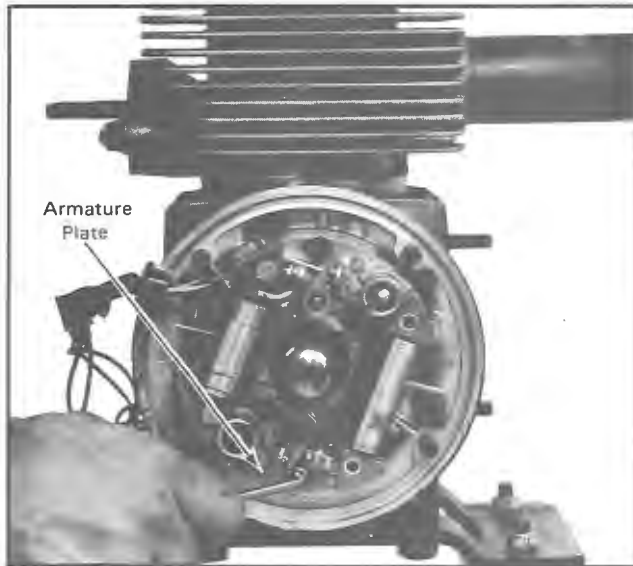
2-6-39

23. Install the exhaust socket flanges to the cylinders using new exhaust gaskets and four (4) nuts and washers.

NOTE: On 400, 401 and 435 engine types (with the incorporated socket/flange), firmly screw the sockets into the cylinders.

CAUTION: Ensure the shorter socket is positioned on the P.T.O. side of engine.

24. Temporarily affix armature plate to crankcase using the appropriate screws or nuts. The attachments of armature plate/crankcase must be in the center of the armature plate slots (fig. 2-6-40).



2-6-40

25. Using needle pliers, insert the circlip into the groove of the fan housing hub (fig. 2-6-41). 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 facing outward. Slide the fan shaft into appropriate side of fan housing.



2-6-41

26. Position the fan housing on the crankcase and secure using four (4) nuts and washers (fig. 2-6-42).



2-6-42

27. Slide the washer and cam spring onto magneto crankshaft extension.
28. Using low temperature grease, lubricate the internal channel of the cam. Position cam in location and secure using a woodruff key.
29. 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. 2-6-43).

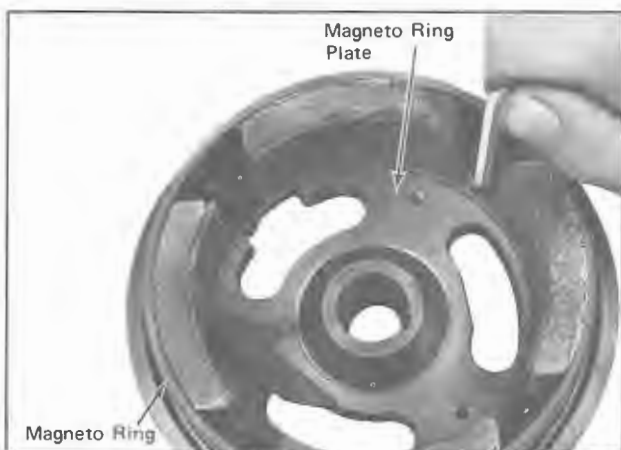


2-6-43

30. Position magneto ring onto magneto ring plate and secure using four (4)

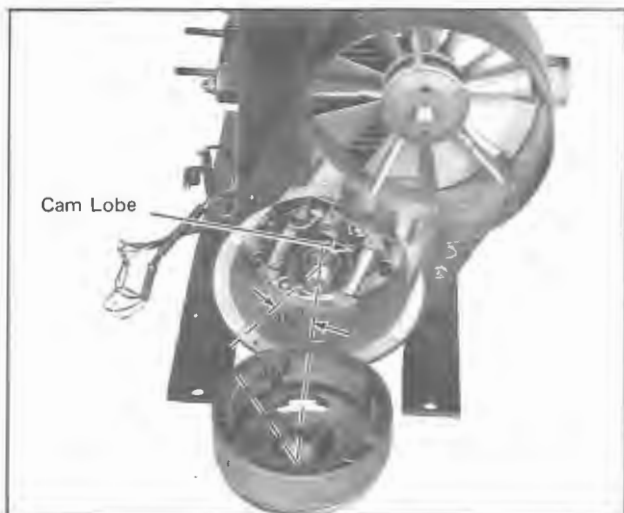
NOTE: Make sure that the armature plate wiring passes through the appropriate crankcase/fan housing notch without "squeezing" the wiring. Press in the rubber grommet.

Allen head capscrews and washers (fig. 2-6-44). Avoid placing magneto ring on a bare surface.



2-6-44

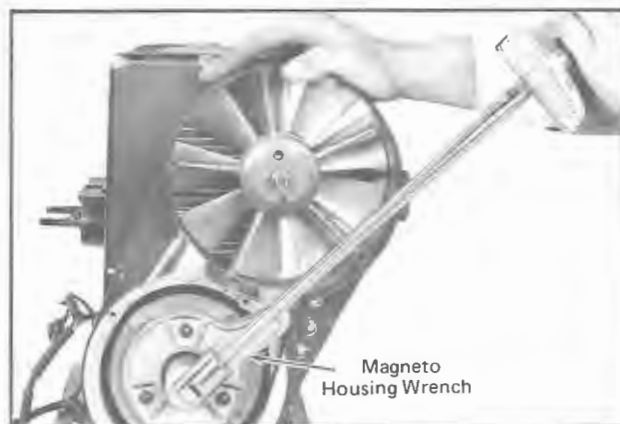
31. Turn crankshaft until woodruff key faces down. Rotate cam clockwise until cam lobe is 240° from woodruff key. Position magneto ring on crankshaft with the keyway aligned with the woodruff key (fig. 2-6-45).



2-6-45

32. Test automatic spark retarding 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 crankshaft hold down support (refer Section 5, item 15) on magneto ring plate studs and tempo-

rally 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. 2-6-46).

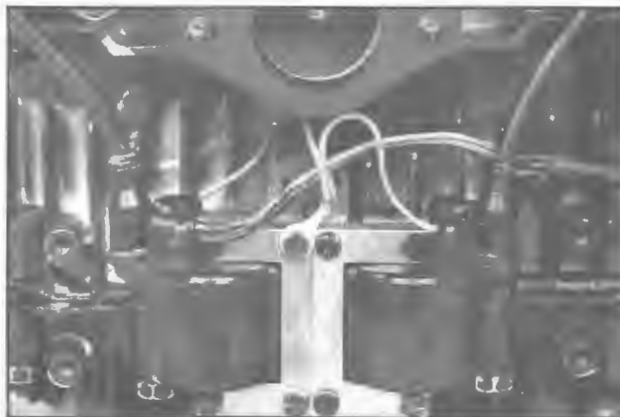


2-6-46

34. Bend the lock washer over the magneto nut.
35. On all engines except 1971 T'NT types, install right cylinder cowl on engine using two (2) screws and washers.
36. Install the ignition coils to the engine using the appropriate screws and washers. Connect the electrical wiring to ignition coils (fig. 2-6-47).

NOTE: On all 1971 T'NT engines, the ignition coil bracket must be installed on crankcase prior to ignition coil installation.

37. Carry out engine timing as detailed in sub-section 2-7.

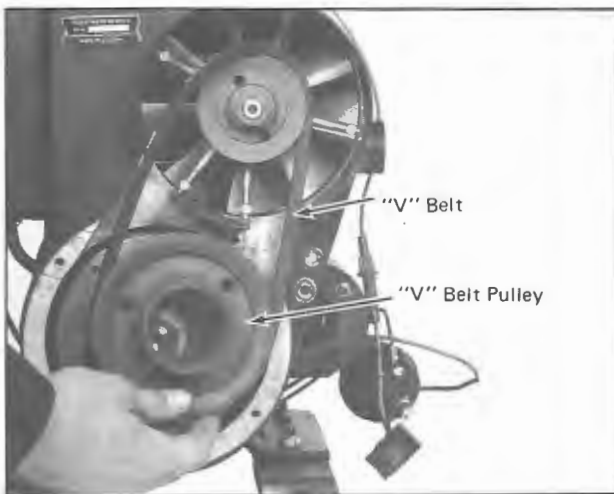


2-6-47

38. On all 1971 T'NT engines, position cylinder cowl and affix to engine and fan housing using five (5) screws and washers.
39. On all other engines, position left cylinder cowl in location and secure using two (2) screws and washers and the cylinder head/cylinder cowl bolt. Install cylinder cowl stud.

NOTE: If the engine is equipped with an air deflector, position the deflector and sleeve in location before installing cylinder cowl stud.

40. On vehicles equipped with an engine console, position console in location and secure using four (4) Allen head capscrews.
41. Inspect spark plugs condition, refer to figure 3-3-1 of Section 3. Replace spark plugs if burnt. If necessary, adjust the plug gap using a feeler gauge. The gap must be .018 to .022 inch. Install spark plugs and connect spark plug wires.
42. Install carburetor(s) as detailed in sub-section 2-11.
43. Install drive pulley as detailed in Section 1, sub-section 1-6.
44. Install starting pulley on magneto ring plate studs using three (3) washers and nuts (fig. 2-6-48).



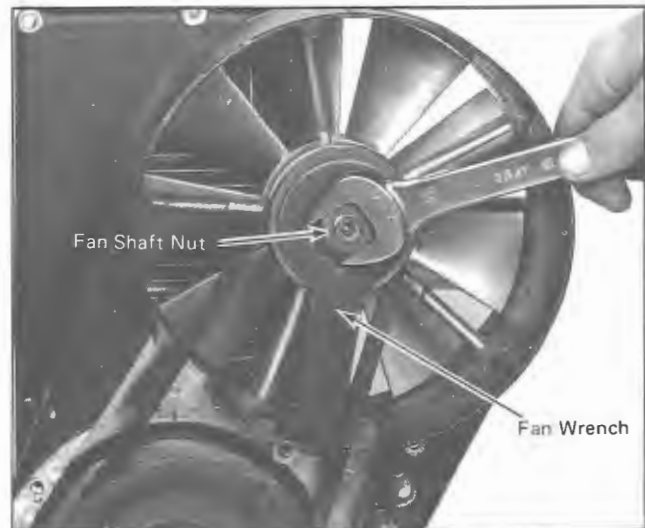
2-6-48

45. Place a shim, inner pulley half, shims*, outer pulley half, woodruff key and locking washer on fan shaft (fig. 2-6-49).



2-6-49

46. Firmly screw on the fan shaft nut (fig. 2-6-50).



2-6-50

47. Install "V" belt and check if the belt has 1/4 inch free play (fig. 2-6-51).

NOTE: 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 150 to 200 in/lbs using a torque wrench and fan holder wrench (Section 5, item 17). Remove fan holder wrench.



2-6-51

48. Press the fan protector onto fan housing.
49. Install muffler using "U" clamps, washers and nuts (screws).
50. Install rewind starter using four (4) screws and washers.

(G) INSTALLATION
(All Olympique 399
and 399E Models)

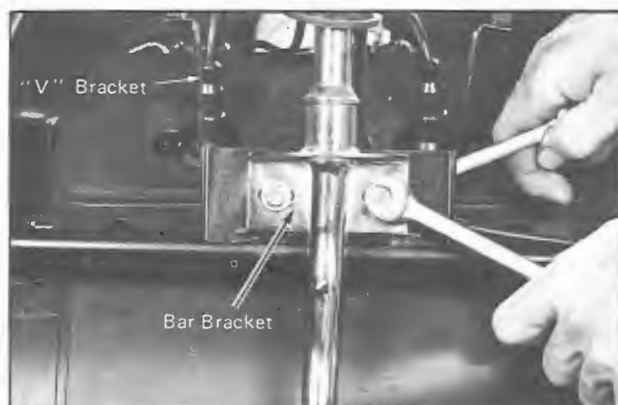
1. Place the engine on the four (4) carriage bolts.
2. On all 1971 models, position the upper column on the two (2) carriage bolts nearest the seat.
3. Position washers and engine mount nuts and torque each nut to 400 to 420 in/lbs.
4. Bolts the bar bracket to the upper column.
5. Pass the fuel lines and housings through frame clips and between engine crankcase and engine mount support. Connect the fuel lines to the carburetor.
6. On electric models, carry out the following:
 - (a) Connect the rectifier quick connector.
 - (b) Connect the positive cable (red) and red and green wires to electric starter.
 - (c) Affix the negative cable to battery post.

7. Connect brown wire to light switch block.
8. Connect all electrical connectors and switch blocks to dash panel.
9. On all 1971 models, install console as detailed in Section 4.
10. Pass the brake and throttle cables and housings through dash panel orifice and connect the cables and housings to the handlebar.
11. Check pulley alignment as detailed in Section 1, sub-section 1-9.
12. Install drive belt as detailed in Section 1, sub-section 1-7.
13. Install pulley guard as detailed in Section 1, sub-section 1-6.
14. Install or close cab.

(H) INSTALLATION
(All Nordic 399,
399E and 640E Models)

1. Correctly position the engine on the four (4) carriage bolts. Place washers and engine mount nuts and torque each nut to 400 to 420 in/lbs.
2. Temporarily affix the bar bracket to the upper column.

NOTE: On all 640E models, the "V" bracket must be installed between the bar and upper column (fig. 2-6-52).



2-6-52

3. On electric models, carry out the following procedure:
 - (a) Connect positive cable (red) to electric starter.
 - (b) Connect green wires to electric starter solenoid.
 - (c) Attach negative cable (black) to battery post marked (—).
 - (d) Connect ground wire (yellow) to fan cowl using appropriate screw.
 - (e) Push positive wire (red) into appropriate terminal recesses of rectifier quick connector.
4. On all 640E models, carry out the following procedure:
 - (a) Connect the red/yellow wire leading from generating coil to the rectifier block.
 - (b) Attach the yellow/black wire and yellow wire leading from lighting coil to ignition switch block.
5. On all 399 and 399E models, pass the brake and housing through steering column grommet.
6. Connect the front taillight connector.
7. Pass the fuel lines and housing through the frame clips and under the front engine support bar. Connect the fuel lines to the carburetor.
8. Install console, refer to Section 4.

NOTE: On all 640E models, adjust the “V” bracket so that the console sits correctly in position. Secure the bolts affixing the bar bracket/upper column.

9. Connect brake and throttle cables and housings to the handlebar.
10. Check pulley alignment as detailed in Section 1, sub-section 1-9.
11. Install drive belt, refer to Section 1, sub-section 1-7.

12. Install pulley guard, refer to Section 1, sub-section 1-6.
13. Close cab.

(J) INSTALLATION (All T'NT Models)

1. Tilt upper column towards front of vehicle and correctly position the engine on the four (4) carriage bolts.
2. Place a washer and engine mount nut on each of the carriage bolts and torque the nuts to 400 to 420 in/lbs.
3. Bolt the steering column to upper column, ensuring the upper column bracket is on top.
4. Connect wiring harness connector.
5. Connect front taillight connector.
6. On all 1970 models, attach ignition switch block to ignition switch.
7. Pass the fuel lines and housings through frame clips and under the front engine support bar. Connect the fuel lines to carburetor.

NOTE: On all 775 engine type, connect the fuel lines to carburetor and “T” junction.

8. Connect brake and throttle cables and housings to handlebar.
9. Check pulley alignment as detailed in Section 1, sub-section 1-9.
10. Install drive belt, refer to Section 1, sub-section 1-7.
11. Install pulley guard, refer to Section 1, sub-section 1-6.
12. Install or close cab.

(K) INSTALLATION (All Alpine/Invader and Valmont Models)

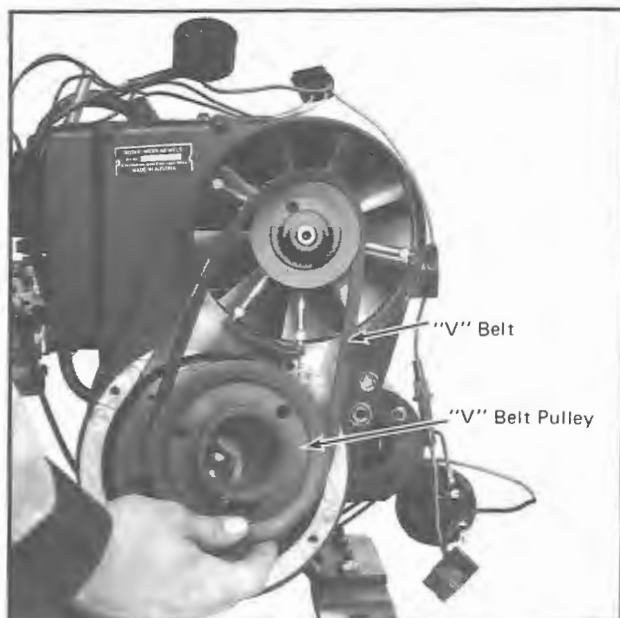
1. Correctly position the engine on the

- four (4) carriage bolts. Secure in place by installing the appropriate washers and engine mount nuts. Torque nuts to 400 to 420 in/lbs.
2. Position the upper column in location and secure to frame using two (2) bolts.
 3. Slide the steering column towards front of vehicle and insert the steering arm ball joint into steering channel using a pry bar or pliers.
 4. Bolt the bar bracket to upper column.
 5. On 1970 models, insert the transmission rod through the appropriate hole of dash panel and push the rod towards gear box.
 6. Connect the transmission rod to gear change lever by pressing the rod into lever orifice. Position a spring and washer on rod end and secure in place using a cotter pin.
 7. Affix the lower and upper retainer plates in location and secure using the appropriate bolts. (Refer to Section 1, sub-section 1-14, figures 1-14-35 and 1-14-36.
 8. Attach the ground cable (yellow) and wiring harness bracket to far cowl.
 9. On electric models, carry out the following procedure:
 - (a) Connect positive cable (red) to electric starter. Connect green and red wire to starter solenoid.
 - (b) Connect rectifier quick connector.
 - (c) Open seat cover and connect negative cable (black) to the battery post. Close seat cover.
- NOTE:** Ensure all electrical connections and switch blocks are connected properly as detailed in Section 3, Electrical Charts.
10. Pass the fuel lines and housings through frame clips and under the front engine support bar. Connect the fuel lines to carburetor.
 11. Connect brake and throttle cables and housings to handlebar. If the brake cable was detached at brake mechanism, correct and adjust brake cable as detailed in Section 1, sub-section 1-10.
 12. Install console as detailed in Section 4.
 13. Install drive belt (refer Section 1, sub-section 1-7) and pulley guard (refer Section 1, sub-section 1-6).
 14. Install cab.

ENGINE — TWO CYLINDER

2-7 ENGINE TIMING

1. Remove rewind starter assembly from engine by removing four (4) capscrews and washers.
2. Remove fan protector.
3. Remove the three (3) starting pulley nuts and washers from magneto ring plate. Remove pulley and "V" belt (fig. 2-7-1).

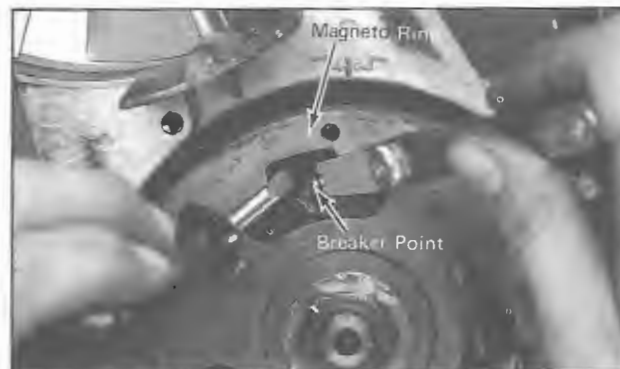


2-7-1

4. Disconnect spark plug wires and remove spark plugs from cylinder heads.
5. Inspect breaker points condition. If pitted, burned or worn, replace.

NOTE: Breaker points can be cleaned by inserting a piece of paper between the points and moving it between the points.

6. Rotate crankshaft until breaker points set (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. 2-7-2). Repeat operation for other set of points.



2-7-2

7. Connect the red wire clip of timing light to blue wire leading from armature plate.

NOTE: Do not allow red wire clip to touch engine.

8. Turn timing light ON and while observing piston movement through the spark plug holes, turn the crankshaft until timing light fluctuates. At this point, the piston at T.D.C. (top dead center) is the cylinder that is being timed.

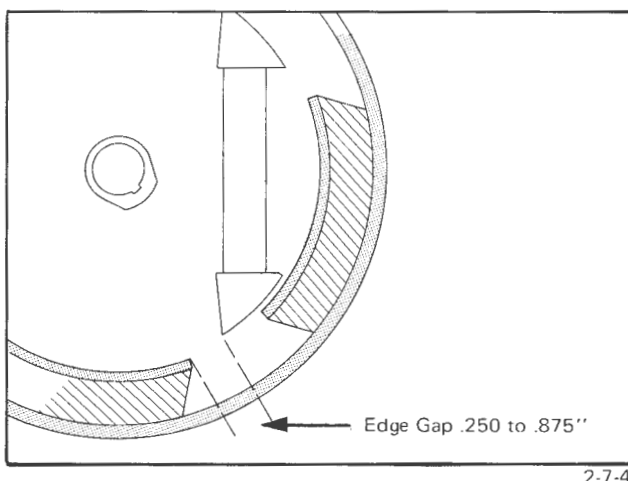
NOTE: The upper breaker points set controls the timing of the magneto side piston and the lower breaker points set control the P.T.O. side piston.

9. Align timing mark on magneto with timing mark on fan housing (fig. 2-7-3). Slightly slacken the tension of 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.



2-7-3

10. Rotate the magneto counterclockwise 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.
11. Slightly rotate the cam lobe clockwise until centrifugal weight is visible through the magneto ring plate. Hold the centrifugal weight in **FULLY** advanced position and rotate magneto counterclockwise 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. 2-7-4).



- (a) If the edge gap is less than .250 inch, loosen armature plate screws and rotate the armature plate assembly counterclockwise until edge gap is correct. Retighten armature plate screws.
- (b) If the distance is more than .875 inch loosen armature plate screws and rotate the armature plate assembly

clockwise to obtain specified edge gap. Retighten armature plate.

12. Reset the previously adjusted breaker points to match the timing marks and recheck breaker points gap.
 13. Disconnect the red wire clip of the timing light and connect it to the other blue wire leading from the armature plate.
 14. Rotate the magneto 180° and align the timing marks of magneto and fan housing (see fig. 2-7-3). 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.
 15. Rotate the magneto counterclockwise 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.
 16. Recheck breaker points gap and edge gap.
- NOTE:** The breaker points gap should be between .014 to .018 inch.
17. Inspect spark plugs condition, refer to figure 3-3-1 of Section 3. Replace spark plug(s) if necessary. Adjust spark plug gap using a feeler gauge. The gap must be .018 to .022 inch. Install spark plugs and connect spark plug wires.
 18. Install starting pulley "V" belt, rewind starter and fan protector.

CLEANING

(ALL ENGINE TYPES)

2-8 CLEANING

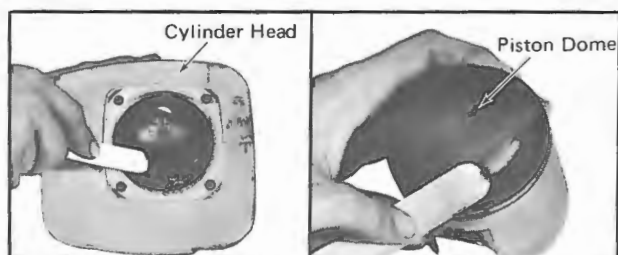
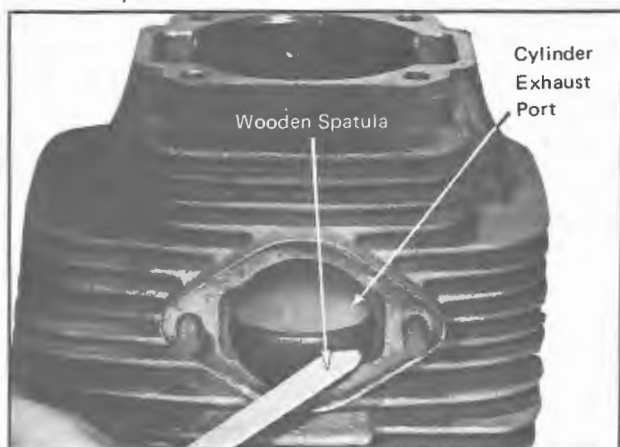
1. Discard all oil seals, gaskets and "O" rings as each of these items must be replaced during Assembly procedures.

For engine type equipped with a decompressor, refer to sub-section 2-4 for cleaning procedure.

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. Using a wooden spatula, scrape off any carbon formation from cylinder exhaust port, cylinder head and piston dome (fig. 2-8-1).

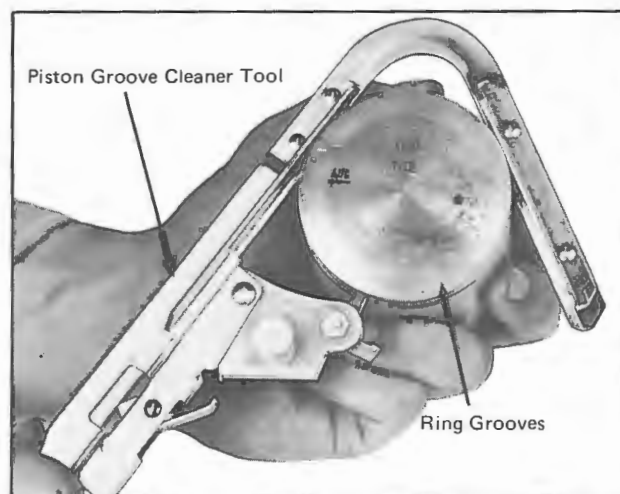


2-8-1

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

4. 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 and a cloth to clean the grooves (fig. 2-8-2).
5. Remove any other deposits on all other components using a soft bristle brush.
6. On all 1971 models, if paint has been removed, apply a new coat using appropriate Ski-Doo paint.
7. 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 are detrimental to crankcase adjointment.



2-8-2

INSPECTION

(ALL ENGINE TYPES)

2-9 INSPECTION

1. Visually inspect all threaded parts for stripped, crossed or otherwise damaged threads. Tap, die or replace damaged components.
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. 2-9-1). Should bore exceed specifications, the cylinder should be re-bored and honed or replaced. Refer to Table 1 — Nominal Dimension of Cylinder Bore. The piston(s) and rings must be replaced when re-boring and honing the cylinders.



2-9-1

- (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. 2-9-1). If the out of round exceeds this tolerance the cylinder should be re-bored 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 ports to 5/8 inch from top of the cylinder, check if taper is off more than .003 inch (fig. 2-9-2). 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.



2-9-2

TABLE 1 NOMINAL DIMENSION OF CYLINDER BORE

Engine Type	Vehicle Models	Year	Standard		1st Oversize		2nd Oversize		3rd Oversize		4th Oversize	
			mm	inches	mm	inches	mm	inches	mm	inches	mm	inches
290	T'NT 292	1970	75.0	2.952	75.5	2.972						
300	Olym 12/3	1970	76.0	2.992	76.5	3.011	77.0	3.031	77.5	3.051	78.0	3.070
335	Olym 335-335E	1970	78.0	3.070	78.5	3.090						
340	T'NT 340	1970	78.0	3.070	78.5	3.090						
400	T'NT 399	1970	64.5	2.539	65.0	2.559						
401	Nordic 399-399E	1970	64.5	2.539	65.0	2.559						
401	Olym 399	1970	64.5	2.539	65.0	2.559						
401	Alpine 399R-399ER	1970	64.5	2.539	65.0	2.559						
640	Nordic 640E	1970	76.0	2.992	76.5	3.011						
640	Invader 640ER	1970	76.0	2.992	76.5	3.011						
641	T'NT 640	1970	76.0	2.992	76.5	3.011						
775	T'NT 775	1970	82.0	3.228	82.5	3.248						
247	Elan 250-250E	1971	69.0	2.716	69.5	2.736						
292	T'NT 292	1971	75.0	2.952	75.5	2.972						
302	Olym 300	1971	76.0	2.992	76.5	3.011	77.0	3.031				
337	Olym 335-335E	1971	78.0	3.070	78.5	3.090						
342	T'NT 340	1971	78.0	3.070	78.5	3.090	79.0	3.110				
401	Olym 399-399E	1971	64.5	2.539	65.0	2.559						
401	Nordic 399-399E	1971	64.5	2.539	65.0	2.559						
401	Val. 399R-399ER	1971	64.5	2.539	65.0	2.559						
401	Alpine 399R-399ER	1971	64.5	2.539	65.0	2.559						
435	T'NT 440	1971	67.5	2.657	68.0	2.677						
640	Nordic 640E	1971	76.0	2.992	76.5	3.011						
640	Valmont 640ER	1971	76.0	2.992	76.5	3.011						
640	Alpine 640ER	1971	76.0	2.992	76.5	3.011						
641	T'NT 640	1971	76.0	2.992	76.5	3.011						
775	T'NT 775	1971	82.0	3.228	82.5	3.248						

3. Check piston to cylinder wall clearance by measuring the piston diameter at a point 5/16 inch above piston skirt edge (fig. 2-9-3). Measure the cylinder diameter at a point 1/2 inch below cylinder top (see fig. 2-9-1). Subtract the two (2) measurements to find clearance. It must not exceed dimensions shown in Table 2.

ENGINE TYPE	PERMISSIBLE CLEARANCE
247	.003 to .004 inch
300,302,335,337,401 and 640	.0035 to .004 inch
290,292,340,342,400 435,641 and 775	.004 to .005 inch
TABLE 2 – PISTON TO WALL CLEARANCE	



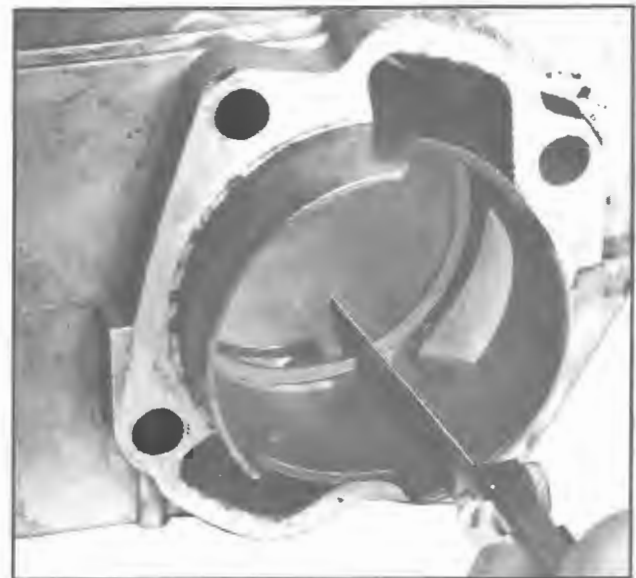
2-9-3

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. 2-9-4).



2-9-4

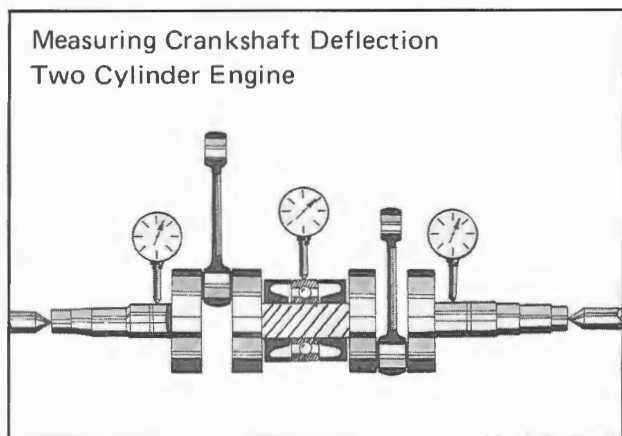
5. Check ring end gap. Place ring in cylinder half away between transfer port and intake port. Using a feeler gauge, measure clearance between ring ends (fig. 2-9-5). The ring end gap tolerance is .008 to .063 inch.



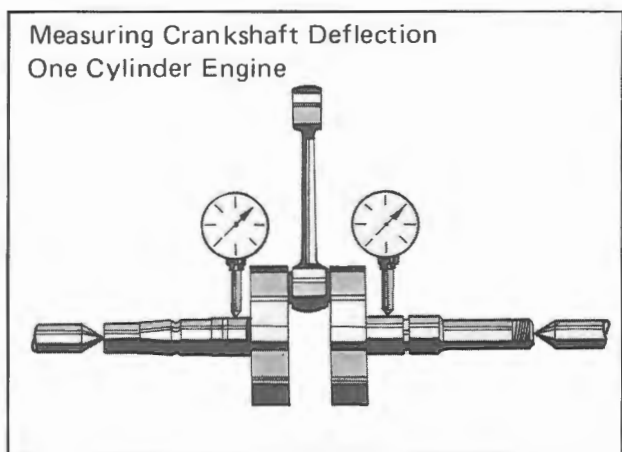
2-9-5

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. 2-9-6). Crankshaft deflection should not exceed .003 inch. Should crankshaft

need correction, adjust deflection using a wedge and a hammer or replace crankshaft.



2-9-6



2-9-6

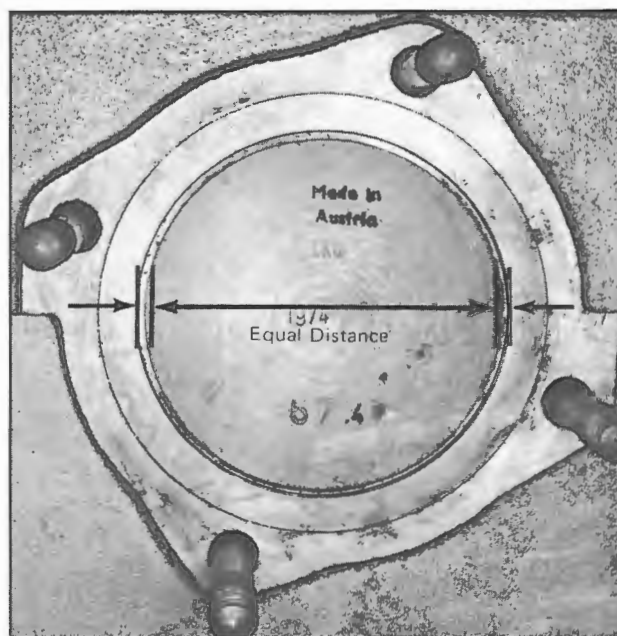
7. Inspect piston eyes for burnt or scored sides. Replace piston as required.
8. Inspect gudgeon pin, use the following procedure.
 - (a) If colour of gudgeon pin is brown or blue (burned), replace pin(s) and needle cage(s).
 - (b) Slide your fingers along gudgeon pin to locate possible wear. Replace 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. 2-9-3).

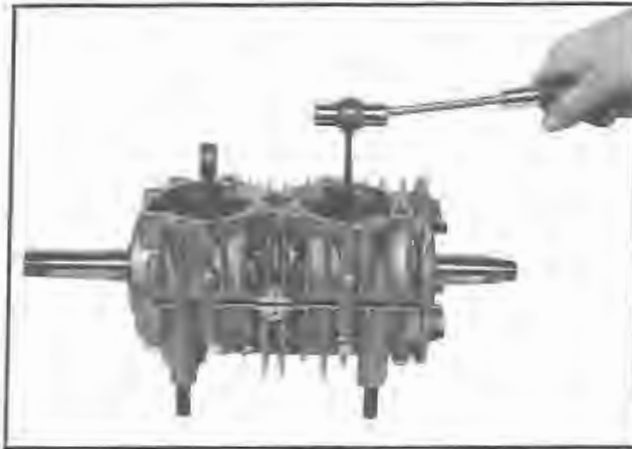
10. Check if connecting rod is bent using the following procedure:
 - (a) Carry out steps 1 to 9 inclusive of Assembly procedure, sub-section 2-6.
 - (b) Clean contact surfaces of crankcase and cylinder.
 - (c) With the piston mounted on connecting rod without piston rings, position cylinder on piston.

NOTE: The crankcase gasket must not be installed.

- (d) 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. 2-9-7). In such a case, figure 2-9-8 indicates the correct way of re-adjusting the rod.



2-9-7



2-9-8

11. Check connecting rod axial play by measuring the distance between connecting rod and crankshaft blade (fig. 2-9-9). The tolerance should be above .040 inch. If clearance is above the specified tolerance the crankshaft should be changed.



2-9-9

For engine type equipped with decompressor refer to sub-section 2-4 for inspection procedure.

REWIND STARTER

(ALL ENGINE TYPES)

2-10 REWIND STARTER

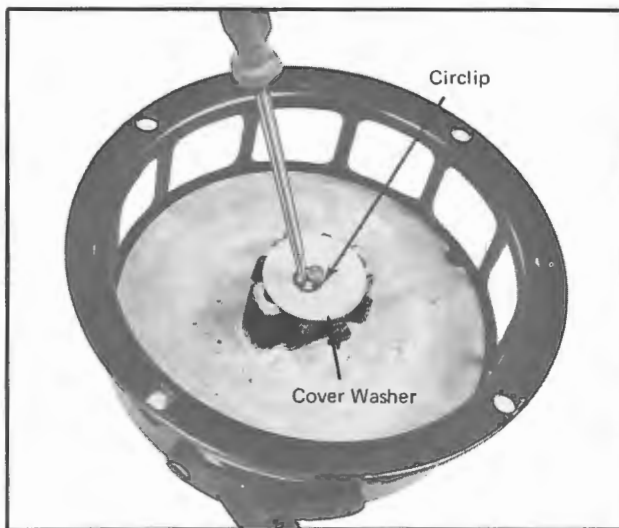
(A) REMOVAL

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 work-table.

(B) DISASSEMBLY

1. Using a small screwdriver, push the circlip holding the cover washer in location (fig. 2-10-1). Remove circlip, cover washer, friction spring, friction washer and pivoting arm assembly from the housing stud.

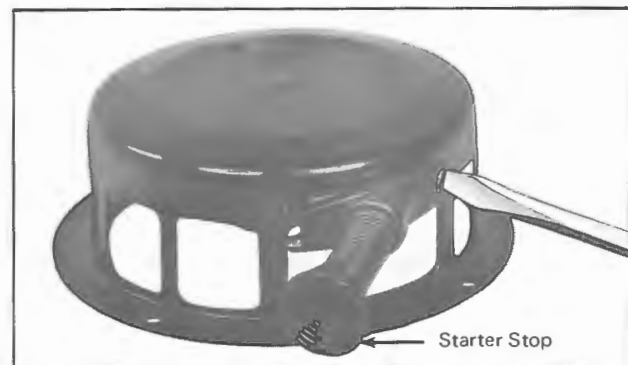
NOTE: Do not disassemble pivoting arm assembly unless damaged and replacement is indicated. If necessary to disassemble, press on spring and remove pawl spring stops, spring and pawls from pivot arm.



2-10-1

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. Unscrew the two (2) screws on the starter stop and remove the stop (fig. 2-10-2).



2-10-2

6. Remove "D" washer and rope sheave from the housing.
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. 2-10-3).



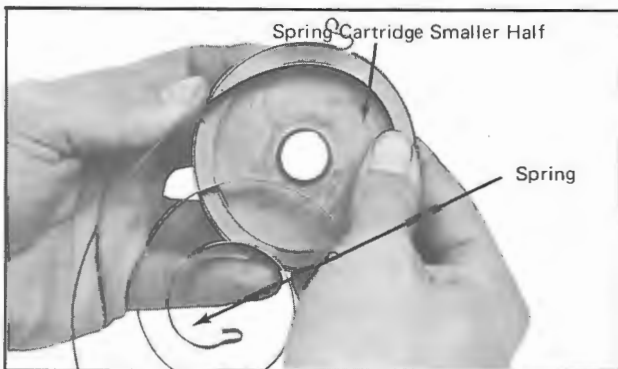
2-10-3

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".

(C) ASSEMBLY

1. Holding the smaller half of the spring cartridge casing in one hand, wind the spring into the casing notch (fig. 2-10-4).



2-10-4

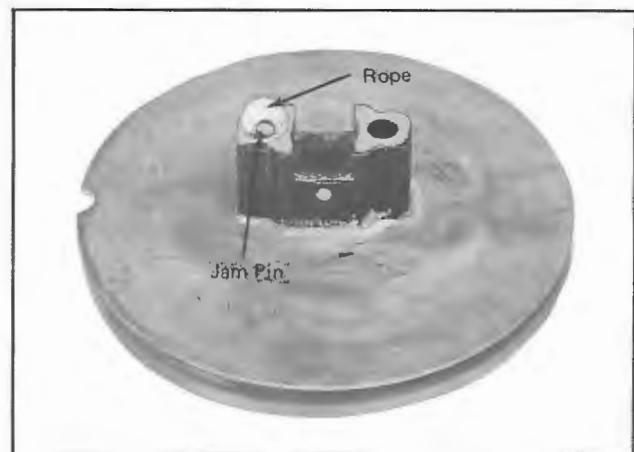
2. Apply low temperature grease on the rewind spring and spread it evenly with your fingers.
3. Reposition upper half of casing and with a soft faced hammer, gently tap on the casing until it snaps close.
4. Position spring cartridge assembly into housing ensuring the "O" of the spring is pointing counterclockwise (fig. 2-10-5).



2-10-5

REWIND STARTER

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 side.
7. With approximately 1-1/4 inches of rope protruding through the sheave side, form a "U" shape with the rope end and position the small jam pin within the "U" (fig. 2-10-6).



2-10-6

8. Pull on rope to insert the enveloped jam pin into sheave side so that the top of the rope "U" becomes flush with the sheave side.

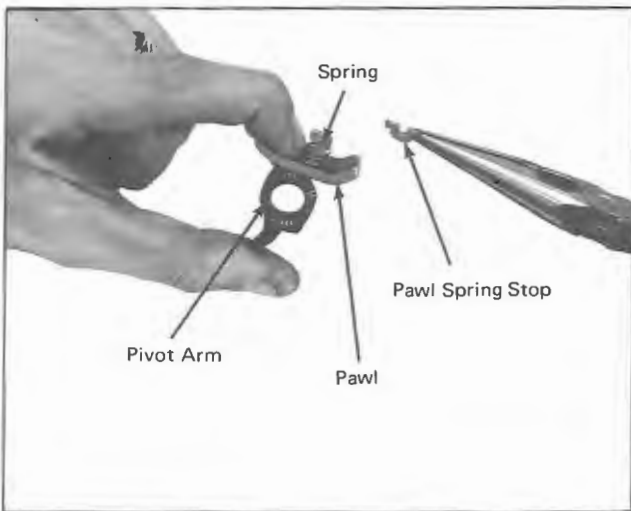
NOTE: To correctly sit the rope and pin in the sheave, it is necessary to use a soft faced hammer to tap the "U" flush with the sheave.

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 counterclockwise 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.

REWIND STARTER

2-10-03

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. Secure starter stop to rewind starter housing using two (2) countersuck 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. 2-10-7).

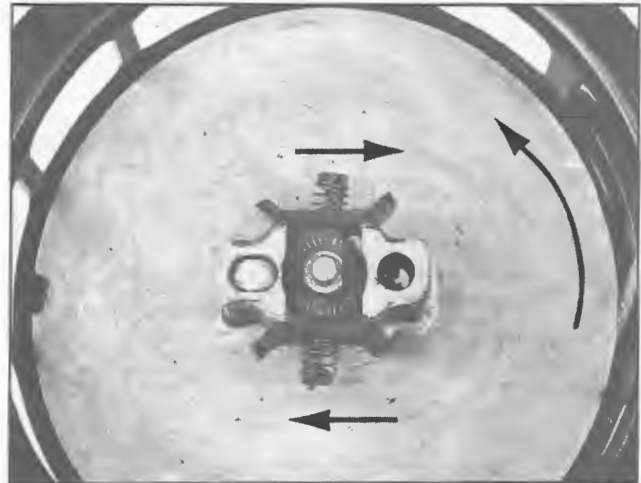


2-10-7

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 assembly can turn clockwise. Should the assembly rotate counter-clockwise, invert the arm assembly (fig. 2-10-8).



2-10-8

19. Secure rewind mechanism to starter housing using a circlip.

(F) INSTALLATION

1. Position the assembly in location on the fan cowl. Secure using four (4) washers and nuts.
2. On one cylinder engines, install plastic sieve on starter housing.

ENGINE

2-11 CARBURETOR

(A) GENERAL

The two important characteristics of gasoline, as used for fuel in automotive engines, are volatility and anti-knocking properties. The volatility of a liquid is its vaporizing ability. Gasoline, as used for motor fuel, boils in a range of approximately 110° to 400°F. The fuel mixture should remain liquid until it enters the air stream in the carburetor bore. Then, it must vaporize and mix uniformly with the incoming air.

(B) EFFECTS OF VOLATILITY

The volatility of gasoline affects the starting facility, the length of the warm-up period and the engine performance during normal operation. In other words, fuel must vaporize easily for cold weather starting. If the percentage of volatile element is too high, it will produce vapor lock. Vapor lock is caused by fuel which vaporizes in the system before entering the carburetor throat. Vapor lock, in the case of a two-cycle engine, could result in a lack of fuel (improper lubrication), overheating and possible piston seizure. In addition to the highly volatile fuel needed for easy starting, less volatile fuel is needed during the warm-up period. A portion of the fuel must be sufficiently volatile to insure proper vaporization during periods of acceleration. If, during acceleration, the fuel does not vaporize immediately as the throttle shutter opens, a lean mixture will result and create a situation known as flat-spot.

NOTE: For maximum performance, fuel with low volatility and high lead content should be used. Overchoking or too rich a mixture will cause carbon buildup and varnish deposit on the piston and rings.

(C) FUEL FILTER

Fuel Filtering: A fuel filter removes dirt particles and residues from the fuel system.

The fuel filter consists mainly of a fine meshed screen, a gasket and a cover with a built-in inlet fitting. On some other models, the cover and the filter are incorporated in one unit.

1. Filter Care

The filter can either be a fine meshed screen or a paper element enclosed in a plastic casing located underneath the pump or any where in the fuel line. The purpose of the filter is to stop any dirt coming from the fuel tank.

- Paper Element Filter: The paper element is the most efficient type of filter that can be installed. 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: When servicing the filter, it is advisable to replace the gasket and the components as indicated with an asterick (*)

in figure 2-11-5. Varnish coated or extremely clogged screens should be replaced when servicing.

(D) FUEL PUMP

Fuel Pumping: A fuel pump supplies gasoline to the carburetor.

The pump consists of a pump cover and gasket, a pumping diaphragm and a valving diaphragm. In the case of the duplex pump, these above mentioned elements have been doubled.

1. 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.

2. 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 inlet through the fuel strainer screen, pass 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.

(E) CARBURETOR

Fuel Metering: A carburetor or metering device injects the proper quantity of fuel into the engine.

The carburetor includes the main body, adjusting screws, shutters, needle and seat, metering diaphragm and related parts.

NOTE: On all carburetors equipped with a duplex pump, the inlet and outlet surge chambers diminish the pressure surges of the fuel and provide steady fuel flow through the pump system.

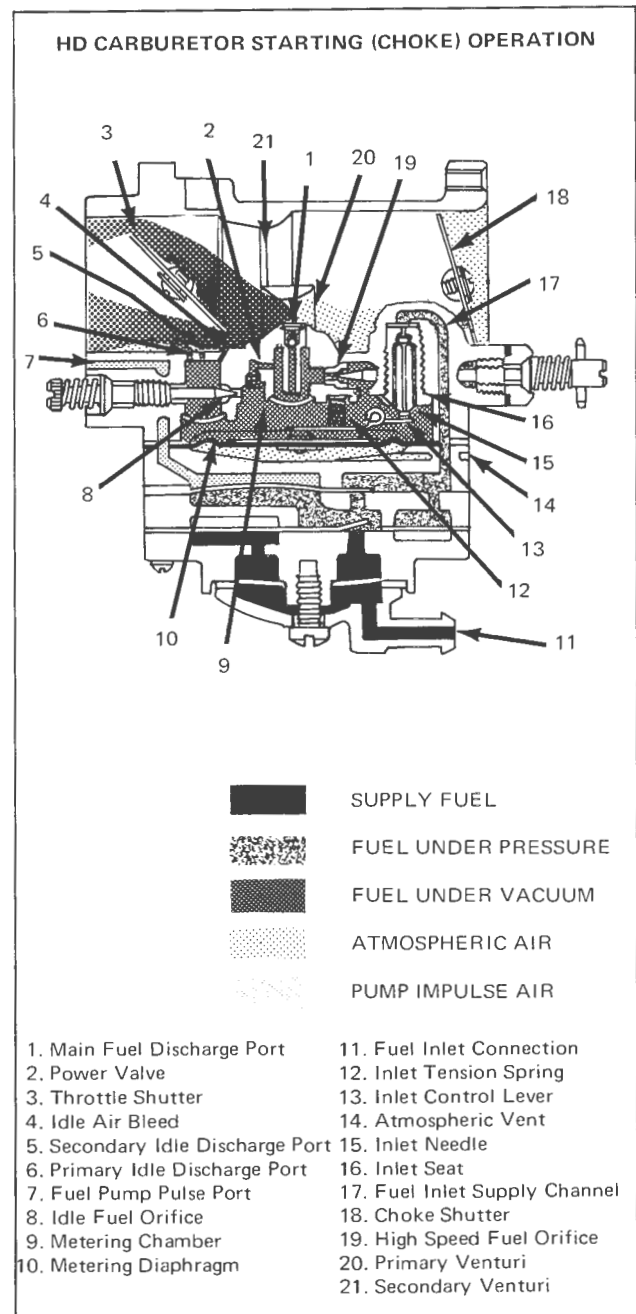
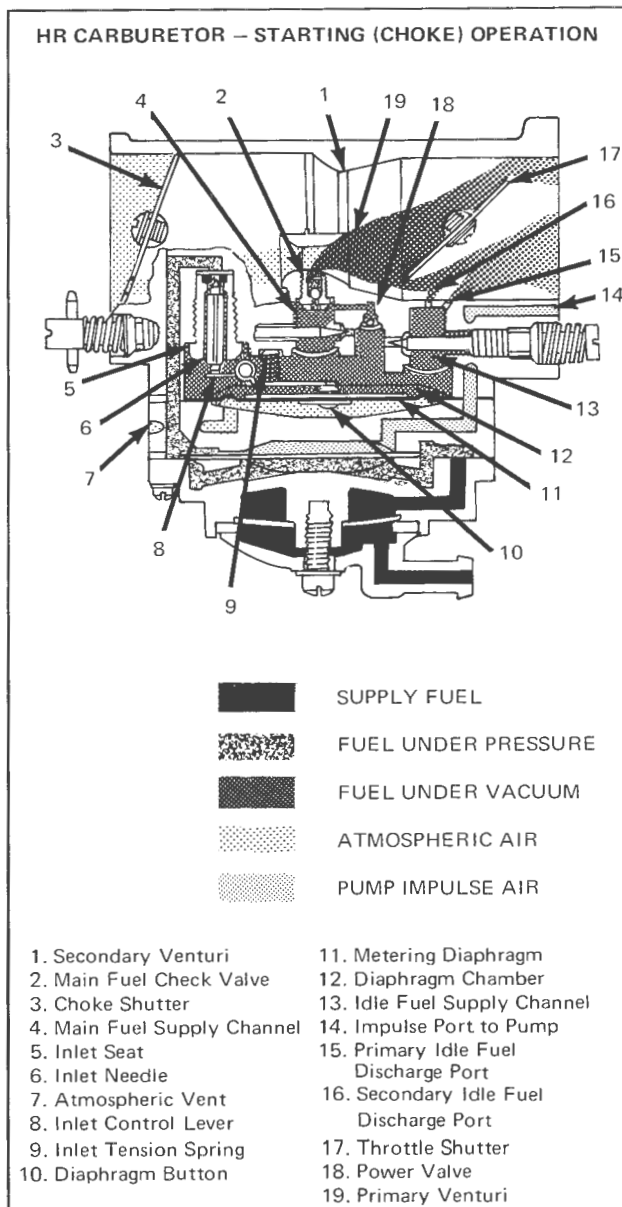
1. Carburetor Operation

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.

2. 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

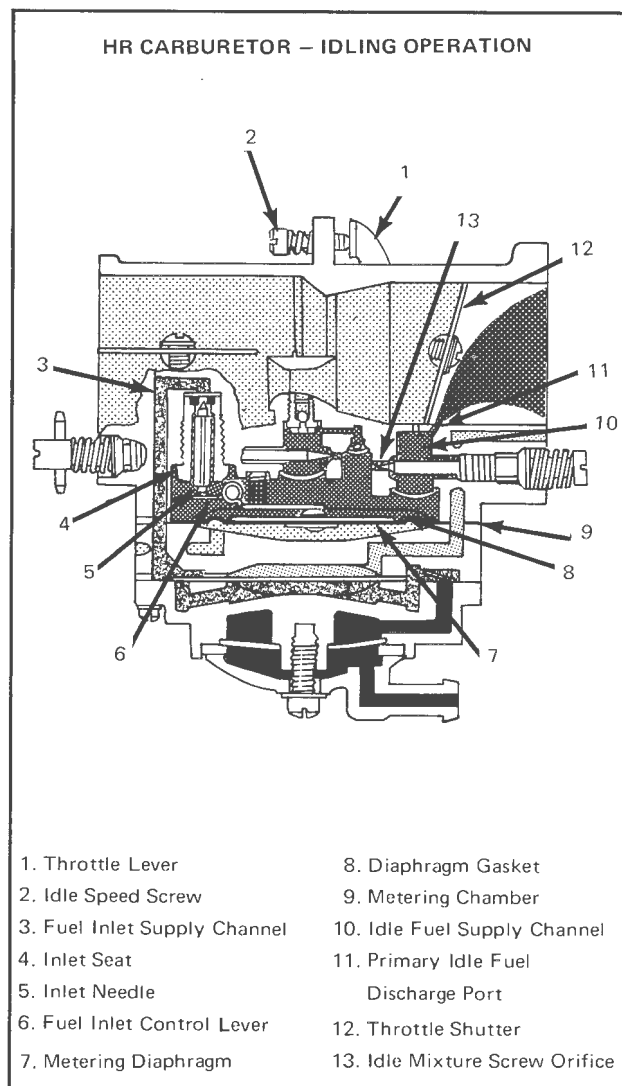
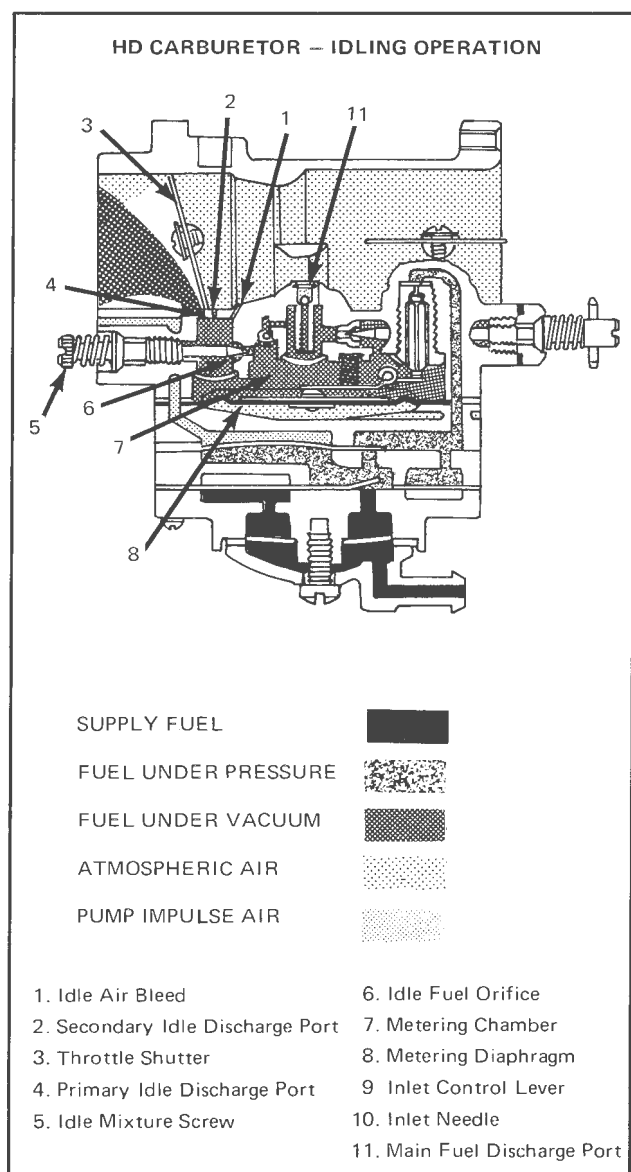
causing the diaphragm button to contact the inlet control lever and overcome the inlet tension spring pressure, permitting fuel under pressure to force the needle off its seat and enter the metering chamber. The fuel then travels from the metering chamber up through the idle and main fuel supply orifices 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 fuel, rich mixture for starting. A small amount of air is added to this rich mixture through a hole or port in the choke shutter.



3. 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

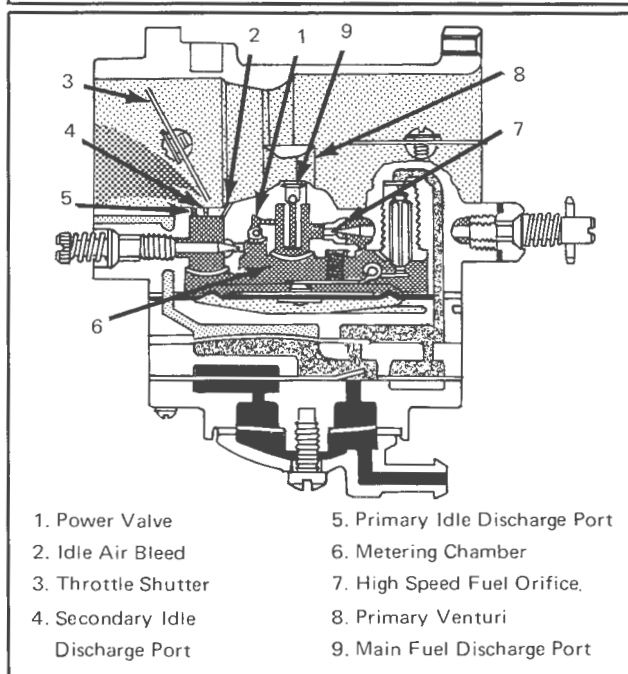
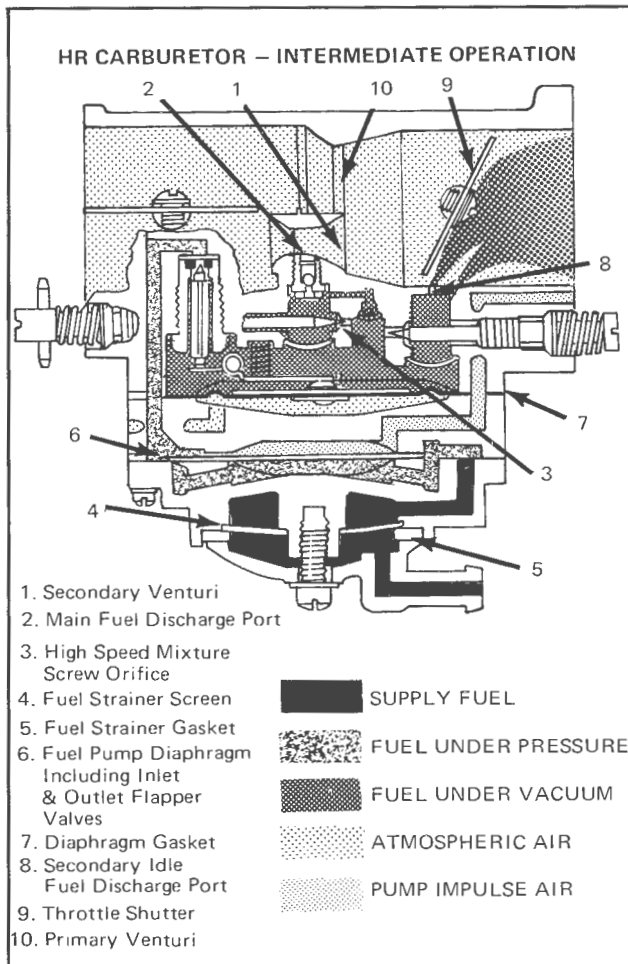
the inlet needle off its seat and enter the metering chamber. The fuel is then drawn up through the idle fuel adjustment orifice and delivered to the engine through the primary idle discharge port. The entire carburetor bore from the air inlet to the back of the throttle shutter is at atmospheric pressure 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.



4. 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 on the engine slide 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

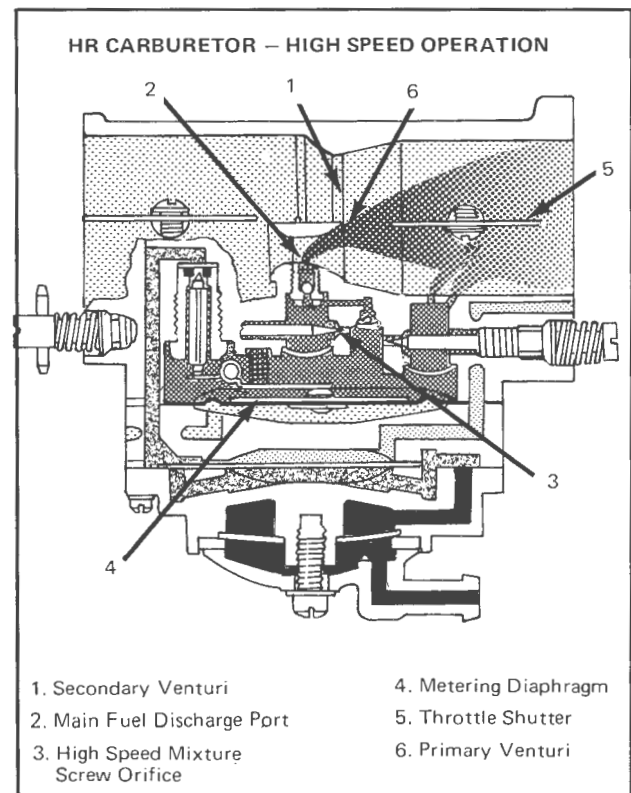
drawn up through the high speed mixture screw orifice and out through the main fuel discharge port.

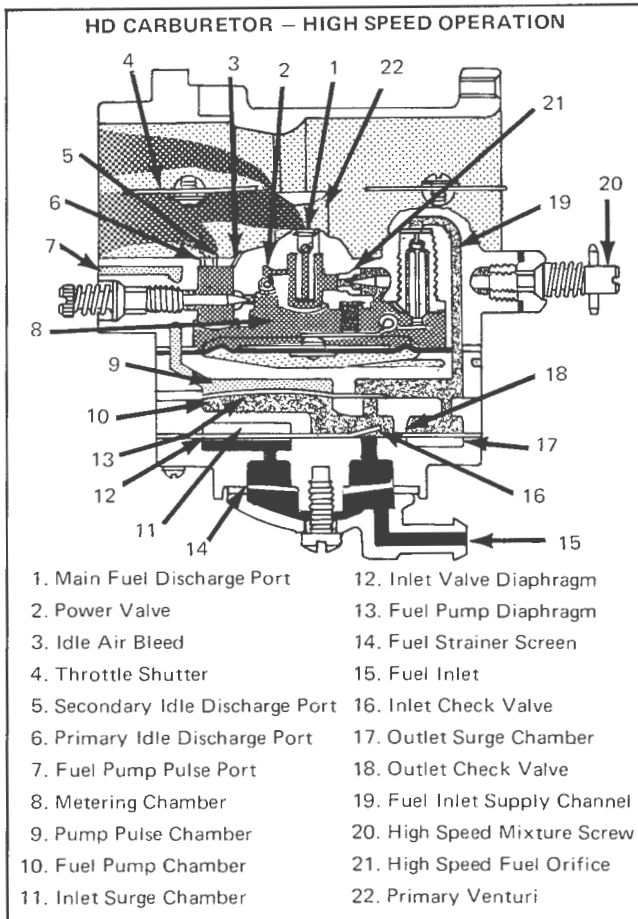


On the HD carburetor fuel is also supplied to the main fuel discharge port from the power valve during intermediate speed operation. The power valve adds fuel to the high speed fuel system, for acceleration at part throttle and conditions and automatically closes at high speeds, when fuel from the high speed fuel orifice can provide adequate fuel for an economical mixture.

5. 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.





On the HD carburetor the power valve is closed during high speed full throttle operation and the amount of fuel flowing from the main fuel discharge port is determined by the position of the high speed mixture screw.

In the operating condition of fully open throttle and low engine speed, the power valve will deliver fuel to the main fuel discharge port to provide the rich mixture needed for this full load lugging operation. This is an operating situation such as, running a vehicle on a steep slope where the vehicle moves slowly at fully open throttle. When high speed is resumed as at the end of a slope, the power valve will automatically close to maintain an economical fuel mixture.

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.

High Speed Mixture Screw Gland on HD Carburetors: An air leak in the thread of the high speed mixture adjustment could possibly be responsible for a loss of engine performance.

In order to avoid this possibility, the carburetor high speed screws have been mounted with a gland, a device which gives greater wearing resistance. Should it become worn, it can easily be replaced by screwing it off the carburetor body.

Adjusting Screws: The Tillotson carburetors have two different types of adjusting screw, with different thread and points size. Both high speed and low speed mixture adjustment screws have cross bars for easier and more precise adjustments.

Venturi: A venturi is a device which has the property of increasing the differential of pressure between the inside of the carburetor throat and the outside air. This to allow better atomization of the fuel in the carburetor and therefore, better engine operation at all speeds. 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. Besides increasing the velocity, the venturi 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 fuel and air is known as vaporization.

All the Tillotson carburetors used by Bombardier are sufficient to supply engines from 250cc to 776cc.

Needle Valve Rubber Tip: The rubber tip on the needle valve is designed to hold the higher pressure built by the new duplex fuel pump. It also reduces wear in this area of the carburetor.

(F) REMOVAL

1. On various models, expose the carburetor as stated below:
 - (a) On all 1971 Elan and Olympique models, remove console as detailed in Section 4.
 - (b) On all 399 and 399E Nordic models, open lower access cover.
 - (c) On all 640E Nordic models, open cab and tilt console towards seat.
 - (d) On vehicles equipped with an air silencer, remove air silencer as detailed in sub-section 2-3.
2. Disconnect fuel line(s) from carburetor body.
3. Disconnect throttle cable from carburetor.
4. Remove the two (2) carburetor flange nuts and washers.
5. Remove carburetor body sleeves, gasket, isolating flange and isolating flange gaskets from the intake flange studs.

NOTE: The isolating plastic flange is not installed on 775 engine type.

(G) DISASSEMBLY (Refer to Figure 2-11-5)

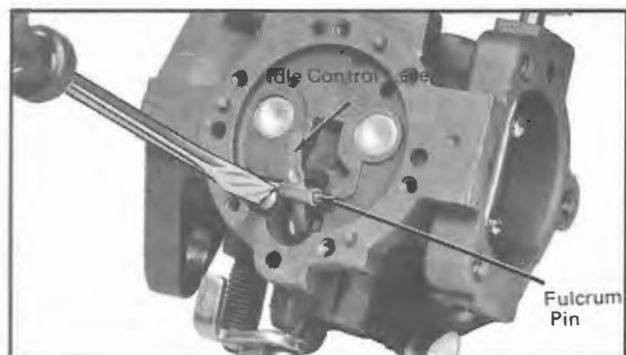
Select a clean working area for Disassembly and Assembly procedures. A great deal of carburetor trouble can be

caused by working in a dirty area and/or misplacement of small carburetor parts.

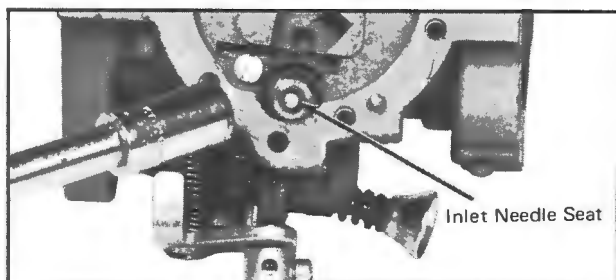
1. Unscrew the fuel filter cartridge from carburetor bottom. Remove cartridge gasket and filter.
2. Remove the six (6) body screws.
3. On single pump carburetors, carry out the following procedure:
 - (a) Remove the fuel pump body, fuel pump diaphragm (valve), fuel pump diaphragm (pulse) and fuel pump gasket.
 - (b) Remove the diaphragm cover, diaphragm 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, the diaphragm and diaphragm gasket.
5. Remove the fulcrum pin retainer screw.

CAUTION: It is necessary to hold the idle control lever while removing the retainer screw as the lever is spring loaded and can "fly out" of the casing.

6. Remove the idle control lever and inlet control lever fulcrum pin from the carburetor body (fig. 2-11-1). Pull the fulcrum pin from the control lever.

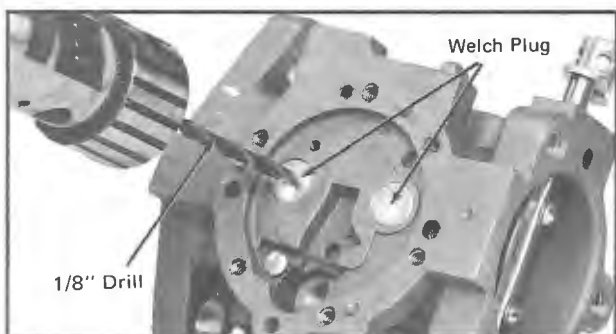


- 7 Remove the inlet needle seat assembly using a thin wall socket wrench (fig. 2-11-2). Remove the inlet seat gasket.



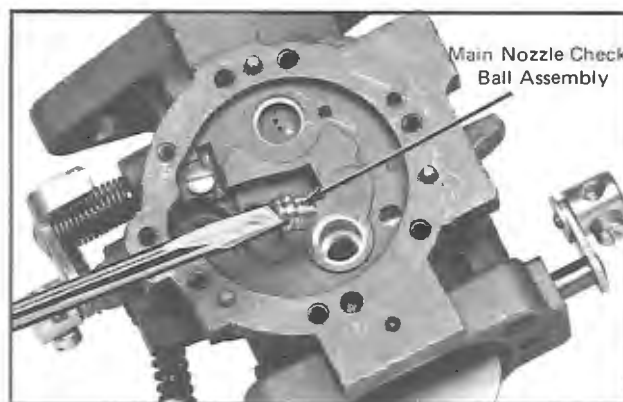
2-11-2

- 8 With a 1/8 inch dia drill, perforate the welch plug, allowing ONLY the drill tip to break through the plug (fig. 2-11-3).



2-11-3

9. Pry the welch plugs from the seating using a small drive punch.
10. Using a screwdriver blade of correct width, unscrew the main nozzle check ball assembly (fig. 2-11-4).

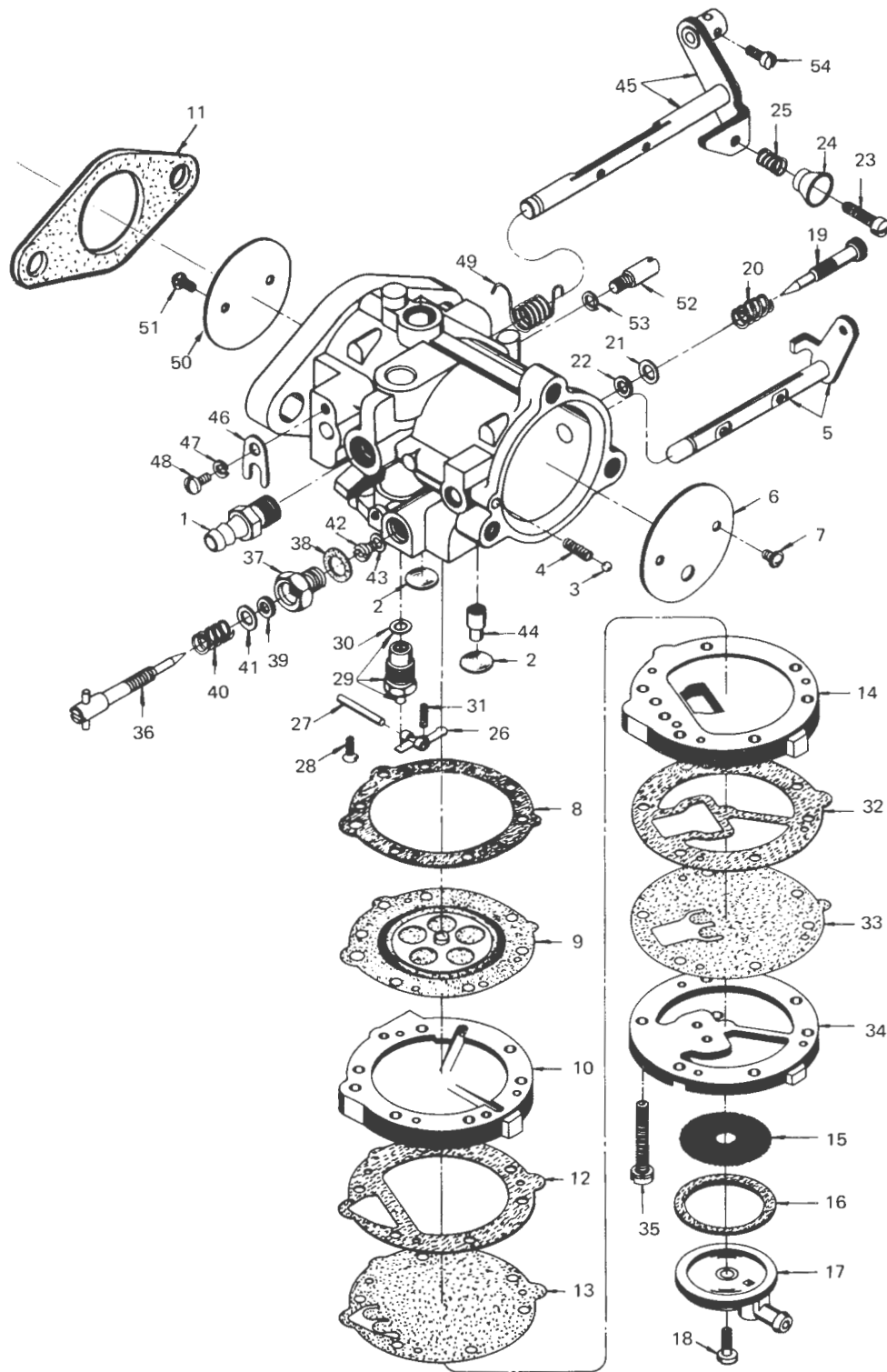


2-11-4

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.

1. Body Channel Plug Screw	*23. Idle Speed Screw	45. Throttle Shaft & Lever
2. Body Channel Welch Plug	24. Idle Speed Screw Cup	46. Throttle Shaft Clip
3. Choke Friction Ball	*25. Idle Speed Screw Spring	47. Throttle Shaft Clip Lock Washer
4. Choke Friction Spring	*26. Inlet Control Lever	48. Throttle Shaft Clip Return Screw
5. Choke Shaft and Lever	*27. Inlet Control Lever Pin	*49. Throttle Shaft Return Spring
6. Choke Shutter	*28. Inlet Control Lever Pin Return Screw	50. Throttle Shutter
7. Choke Shutter Screw	*29. Inlet Needle, Seat and Gasket	*51. Throttle Shutter Screw
8. Diaphragm Gasket	30. Inlet Seat Gasket	52. Throttle Stop Pin
*9. Diaphragm	*31. Inlet Tension Spring	53. Throttle Stop Pin Lock Washer
10. Diaphragm Cover	32. Inlet Valve Gasket (K)	*54. Throttle Wire Return Screw
11. Flange Gasket	*33. Inlet Valve Diaphragm (K)	
12. Fuel Pump Gasket	34. Inlet Valve Body	
*13. Fuel Pump Diaphragm	35. Inlet Valve Body Screw and Lock Washer	
14. Fuel Pump Body	*36. High Speed Mixture Screw	
*15. Fuel Strainer Screen	37. High Speed Mixture Screw Gland	
16. Fuel Strainer Cover Gasket	38. High Speed Mixture Screw Gland Gasket	
17. Fuel Strainer Cover	39. High Speed Mixture Screw Packing	
*18. Fuel Strainer Cover Return Screen	*40. High Speed Mixture Screw Spring	
*19. Idle Mixture Screw	41. High Speed Mixture Screw Washer	
*20. Idle Mixture Screw Spring	*42. Main Fuel Jet (.120)	
21. Idle Mixture Screw Washer	43. Main Fuel Jet Gasket	
22. Idle Mixture Screw Packing	44. Nozzle Check Valve	

* Replacement Parts During Servicing



DISASSEMBLED VIEW OF CARBURETOR

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 lever 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 carburetors with high speed mixture adjustment, remove screw, spring, washer and packing from carburetor body.
18. On carburetors with fixed jet, remove main fuel jet plug screw and gasket. Remove main fuel jet and gasket.
19. On HD carburetors, remove high speed mixture screw, spring, washer and packing from high speed gland. Remove gland and gasket. Unscrew and remove main fuel jet.

(H) CLEANING

CAUTION: Some solvents and cleaners have a damaging effect on the synthetic rubber parts installed in the carburetors. 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 and carefully blowing out each channel and orifice in the castings.

(J) 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 it.
4. Inspect the cover casting for nicks, dents or cracks that might interfere with operation.
5. Inspect the metering diaphragm. The center plate must be riveted securely to the diaphragm and the diaphragm should be free from holes and imperfections. The gasket should be replaced if there are holes or creases on its sealing surface.
6. Inspect the diaphragm. It must be flat and free from holes. The gasket should

be replaced if there are holes or creases on its sealing surface.

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.

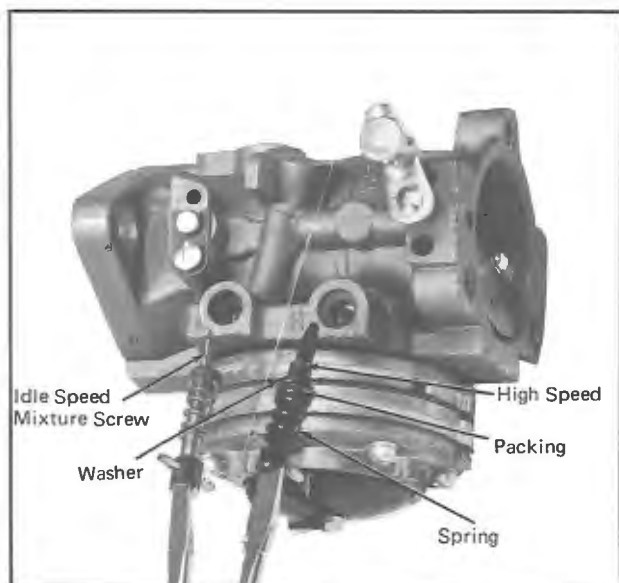
8. The inlet needle and seat are a matched set and is tested for leaks at the factory. The parts should not be interchanged — they must be retained as matched sets.

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 should be nearly as good as new.

(K) ASSEMBLY

1. Install high speed mixture screw using the following procedure:

- (a) On HR carburetors, position spring, washer and packing on high speed screw and screw the assembly into high speed orifice of carburetor (fig. 2-11-6).



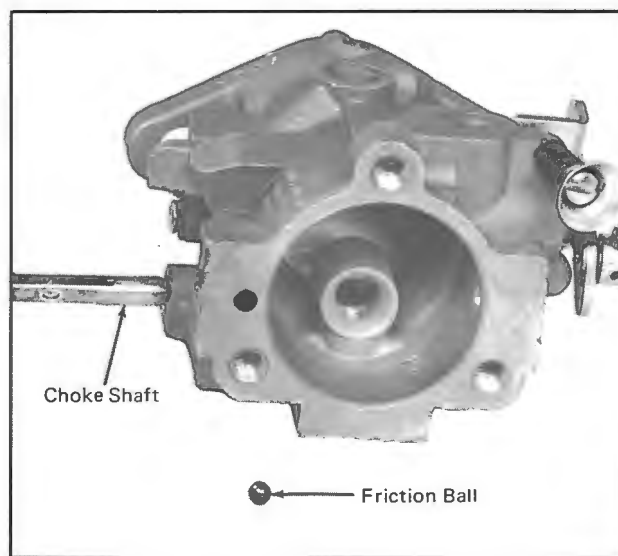
2-11-6

- (b) On HR carburetors equipped with a fixed jet, position gasket in location and screw in the main fuel jet using screwdriver blade of appropriate width.

- (c) Place gasket on main fuel jet plug screw and firmly screw in the plug screw into high speed orifice.

NOTE: On HD carburetors, screw in 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.

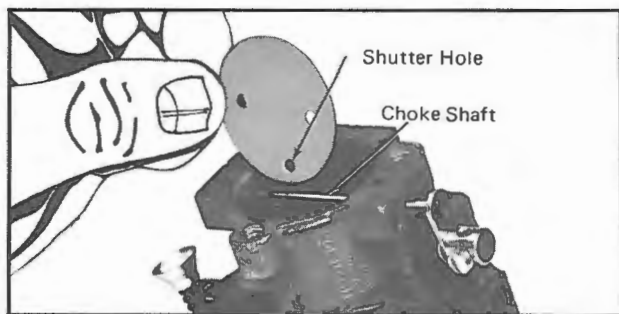
2. Insert choke spring and friction ball into carburetor body. Using a suitable tool, depress the friction ball and spring while at the same time inserting the choke lever shaft into carburetor body (fig. 2-11-7).



2-11-7

3. Insert the choke shutter into choke shaft and secure using two (2) shutter screws (fig. 2-11-8)

CAUTION: Ensure the hole of the shutter faces downward.

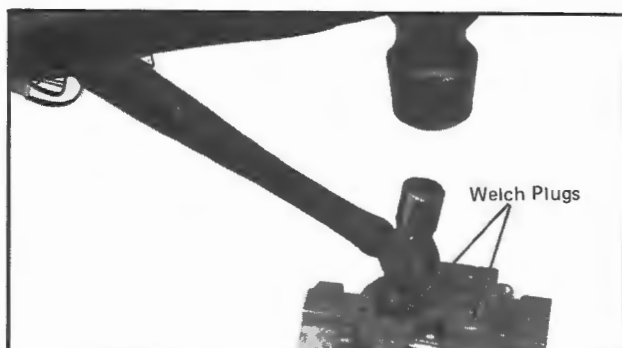


2-11-8

4. Install throttle lever spring on shaft and partially insert the shaft into carburetor body. Ensure the spring is engaged and rotate the assembly one (1) turn clockwise and complete the shaft insertion.

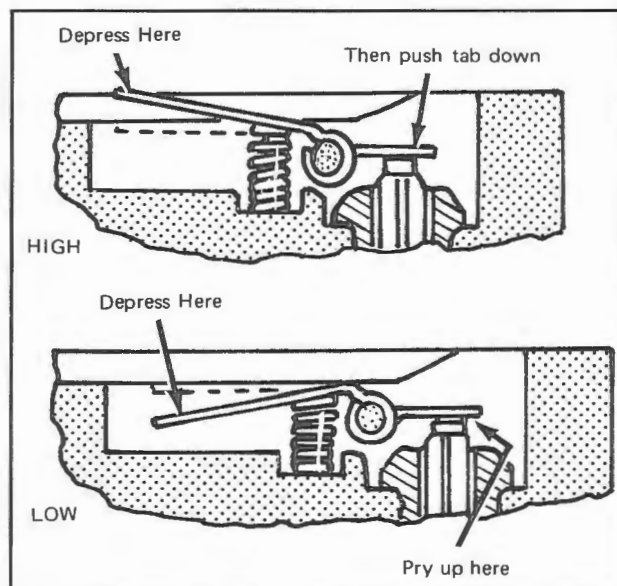
NOTE: Affix the idle speed screw bracket to HD carburetor body.

5. Position throttle shaft retainer clip and secure in position using appropriate screw.
6. Rotate throttle shaft and insert the throttle shutters into shaft. Allow throttle to retract and secure the shutter to throttle shaft using two (2) throttle shutter screws. Check throttle lever operation.
7. Install the main nozzle check ball ass'y.
8. Position a new welch plug (with the convex side up) and using two (2) ball peen hammers gently tap the plug until it becomes concaved (fig. 2-11-9). Install second plug using same procedure. The plugs must be correctly seated to avoid gasoline leakage.



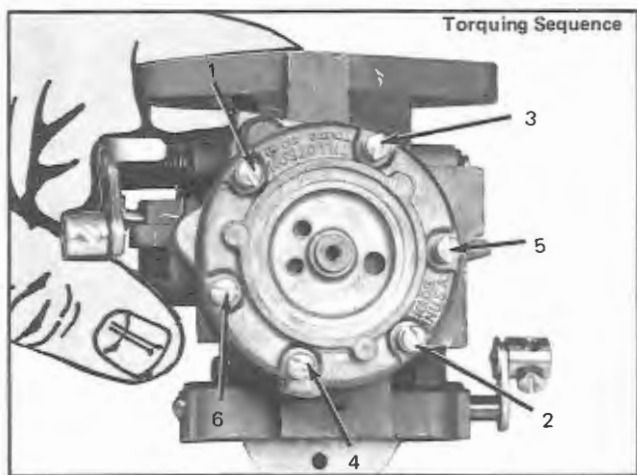
2-11-9

9. Leak test the carburetor by allowing controlled compressed air (max. 50 psi) into the idle hole and into the high speed mixture hole. 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 the ball peen hammers and leak test once again.
10. 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.
11. Adjust the inlet control lever so that the center of the lever that contacts the metering diaphragm is flush to the metering chamber wall as shown in figure 2-11-10.



2-11-10

12. On double pump carburetors, carry out the following procedure:
 - (a) Position diaphragm gasket, diaphragm, diaphragm cover, fuel pump diaphragm, fuel pump body, inlet valve gasket, inlet valve diaphragm and inlet valve body in location on carburetor base. (Refer to exploded view of carburetor, figure 2-11-5).
13. On single pump carburetors, carry out the following procedure:
 - (a) Position diaphragm gasket, diaphragm, diaphragm cover, fuel pump gasket, fuel pump diaphragm (pulse), fuel pump diaphragm (valve) and fuel pump body on carburetor base. (Refer to exploded view of carburetor, figure 2-11-5).
14. Using a cross sequence secure the fuel pump body in position using six (6) body screws (fig. 2-11-11).



2-11-11

15. Position filter and cartridge gasket and screw on the filter cartridge or fuel strainer cover.

(L) INSTALLATION

1. Position isolating flange gasket, isolating plastic flange, gasket, sleeves and carburetor body on intake flange studs. Secure using two (2) washers and carburetor flange nuts.

NOTE: On 775 engine type, install one (1) gasket between intake manifold and carburetor flange.

2. Connect throttle cable to carburetor.
3. Connect fuel lines to carburetor body with the longer fuel line attached to return nipple of carburetor.
4. Complete installation on various models as follows:
 - (a) On vehicles equipped with an air silencer, install silencer as detailed in sub-section 2-3.
 - (b) On all 640E Nordic models, tilt console towards engine and close cab.
 - (c) On all 399 Nordic models, install upper access cover and close lower access cover.
 - (d) On all 1971 Elan and Olympique models, install console as detailed in Section 4.

(M) CARBURETOR PRIMARY ADJUSTMENTS

1. Perform primary adjustments by closing adjustment screws.

CAUTION: Do not close screws too tightly or the needle and/or seat may be damaged.

2. Reset idle speed mixture screw 3/4 of turn.
3. Reset high speed mixture screw 1-1/4 turns.
4. Raise and support the rear of the vehicle off the ground.
5. Start engine and allow it to run 2 to 3 minutes.

CAUTION: Assure that the pulley guard is installed on vehicle.

(N) SINGLE CARBURETOR ADJUSTMENTS

1. Maximum Throttle Opening – The maximum throttle opening adjustment is

correct when the accelerator is gently touching the handlebar grip. If adjustment is required, slacken screw at carburetor pivot slug and adjust length of throttle cable.

2. Idle Speed Mixture — Adjust the idle speed mixture screw to obtain a steady idle and a fast response of the engine to the accelerator.
3. Idle Speed Adjustment — Set the idle speed screw to obtain 1200 to 1500 RPM.
4. High Speed Mixture — Carry out the following procedure:
 - (a) Depress the accelerator and obtain full speed.
 - (b) Adjust the high speed mixture screw to maximum RPM.
 - (c) At the point of maximum RPM, come back 1/8 of a turn counterclockwise to obtain a richer fuel mixture.
 - (d) Release accelerator and apply brake.

CAUTION: To adjust the high speed mixture screw on models equipped with slider suspension, the vehicle must be raised off the ground and the slider shoes water-cooled when the track is revolving.

(P) TWIN CARBURETOR ADJUSTMENTS (All 775 Models)

Primary adjustments are the same as performed on a single carburetor, refer Paragraph (M).

1. Maximum Throttle Opening (Engine OFF) — The maximum throttle opening adjustment is correct when the accelerator is gently touching the handlebar grip. If adjustment is required, slacken screws and adjust throttle cable to both carburetors.
2. Idle Speed Mixture — Carry out the following procedure:

- (a) On one of the carburetors, turn idle speed mixture screw clockwise until engine reaches maximum RPM.
- (b) On the second carburetor, turn idle speed mixture screw clockwise to obtain maximum RPM. At that point, back-off the screw 1/8 of a turn counterclockwise. (Tachometer reading should be higher than with one adjusted carburetor).
- (c) On the first carburetor, back off screw 1/8 of a turn counterclockwise. Check the accelerator for a quick response from the engine.

3. Idle Speed Adjustment — Using a screwdriver, turn the idle speed adjusting screws clockwise to increase idling speed, counterclockwise to decrease idling speed. RPM should read 1200 to 1500.

4. High Speed Mixture (Engine ON) — Carry out the following procedure:
 - (a) Start engine and accelerate to full throttle. Turn the high speed mixture screw on one of the carburetors clockwise until engine reaches maximum RPM.
 - (b) With engine at full throttle, turn high speed mixture screw on the second carburetor clockwise to obtain maximum RPM.
 - (c) Back-off the high speed mixture screw 1/8 of a turn counterclockwise. Back-off screw on second carburetor 1/8 of a turn counterclockwise.
 - (d) Return engine to idle at once by releasing accelerator and applying brake.

CAUTION: To adjust the high speed mixture screws on models equipped with slider suspension, the vehicle must be raised off the ground and the slider shoes water-cooled when the track is revolving.

On all models, stop engine and lower the vehicle on the ground.

ENGINE

12-1 TROUBLE SHOOTING

IRREGULARITIES	CAUSE
Rewind starter inoperative	<ol style="list-style-type: none"> 1. Pawls bent, broken or worn 2. Friction spring broken or stretched 3. Starting pulley worn 4. Recoil spring detached from pin or broken 5. Pulley housing warped
Electric starter inoperative	<ol style="list-style-type: none"> 1. Loose connections 2. Dead or discharged battery 3. Faulty ignition switch 4. Broken wires or coils 5. Poor ground 6. Faulty starter solenoid 7. Moisture in starter housing 8. Worn or broken carbon brushes
Engine will not crank	<ol style="list-style-type: none"> 1. Piston seized or rusted to cylinder wall 2. Crankshaft seized to bearing 3. Broken connecting rod 4. Engine improperly assembled after repair
Engine backfires or doesn't start	<ol style="list-style-type: none"> 1. Spark plug wires reversed (on two set points) 2. Flywheel key sheared or missing 3. Bad condenser 4. Improper timing 5. Faulty breaker points 6. Unhooked spark retarding mechanism (or spring broken) 7. Adjustment needles stuck in seating of carburetor body
Engine cranks easily on one or both cylinders	<ol style="list-style-type: none"> 1. Scored piston 2. Blown head gasket 3. Loose spark plugs 4. Incorrect torque of cylinder head nuts 5. Defective piston ring

IRREGULARITIES	CAUSE
Engine turns over but fails to start or starts with difficulty	<ol style="list-style-type: none"> 1. Empty gas tank 2. Incorrect fuel oil ratio 3. Water in fuel system 4. Blocked fuel lines or fuel filter cartridge 5. Carburetor idle speed mixture adjustment incorrect 6. Flooded engine 7. Inoperative carburetor diaphragm or flapper valve 8. Spark plug incorrectly gapped, dirty or broken. 9. Incorrect engine timing 10. Breaker points out of adjustment, dirty or worn 11. Weak coil or condenser 12. Secondary wire disconnected or defective spark plug protector
Impossible to adjust idle. Missing at low speed, doesn't idle smoothly or slowly	<ol style="list-style-type: none"> 1. Carburetor idle speed mixture adjustment incorrect 2. Improper fuel mixture 3. Defective spark plug 4. Head gasket blown or leaking 5. Loose magneto plate 6. Leaking crankshaft seal 7. Weak coil or condenser
Good spark but engine runs on (1) cylinder, (double cylinder engine)	<ol style="list-style-type: none"> 1. Leaking head gasket 2. Magneto wires broken (coil ground broken) 3. Cracked cylinder wall 4. Defective spark plug 5. Seized piston
Vibrates excessively or runs rough and smokes	<ol style="list-style-type: none"> 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. Silencer obstructed 7. Engine mount loose 8. Water in gasoline

IRREGULARITIES	CAUSE
No acceleration. Idles well but dies down when put to full throttle	<ol style="list-style-type: none"> 1. High speed mixture needle set too lean 2. High speed jet obstructed 3. Inlet lever set too low 4. Choke partly closed 5. Silencer obstructed 6. Fuel line or fuel filter cartridge obstructed 7. Carburetor: Punctured diaphragm or Flapper valves bent 8. Breaker points improperly gapped or dirty 9. Engine improperly timed 10. Welsh plug leaking
Hard to start, no acceleration; low top R.P.M.	<ol style="list-style-type: none"> 1. Spark plugs improperly gapped or dirty 2. Magneto points improperly gapped or dirty 3. Faulty coil or condenser 4. Loose or broken magneto wires 5. Poor engine compression 6. Inlet lever adjustment too low 7. Idle speed and/or high speed mixture too rich
Engine runs by using choke at high speed	<ol style="list-style-type: none"> 1. Leaking fuel line 2. Dirt behind needle and seat 3. Fuel line and fuel filter cartridge obstructed 4. Malfunctioning or punctured diaphragm
Missing at high speed or intermittent spark	<ol style="list-style-type: none"> 1. Spark plugs improperly gapped, dirty or defective 2. Loose or broken magneto wires 3. Magneto points improperly gapped or dirty 4. Weak coil or condenser 5. Heat range of spark plug incorrect 6. Leaking head gasket
No power under heavy load	<ol style="list-style-type: none"> 1. Magneto points improperly gapped or dirty 2. Ignition timing too far advanced 3. Faulty carburetion

IRREGULARITIES	CAUSE
High speed back-firing	<ol style="list-style-type: none">1. Lean carburetor adjustment2. Carbon formation on spark plug3. Crankshaft oil seal leaking4. Condenser defective5. Breaker points improperly gapped6. Loose armature plate
Engine runs too hot	<ol style="list-style-type: none">1. Carburetor mixture too lean2. Incorrect timing3. Too much carbon formation4. Spark plug range to hot5. Air deflector not installed or broken fan belt6. Broken or dirty engine fins

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ELECTRICAL

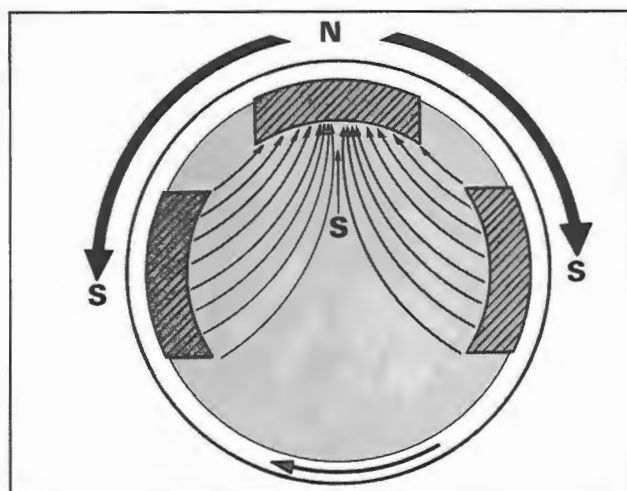
3-1 GENERAL

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.

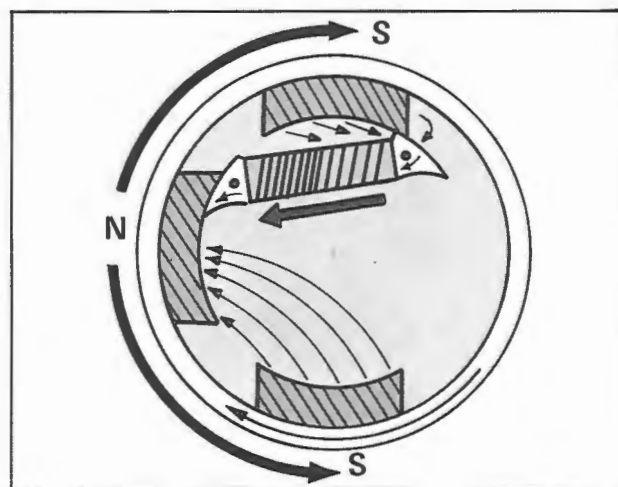
The magneto ring, incorporating four (4) permanently magnetized bars, is the primary source of magnetic energy. As shown in figure 3-1-1, this energy flow is concentrated in a set field. When the magneto ring is affixed to the engine crankshaft and an armature plate is positioned within the magneto ring, the energy flow can be directed through the coil windings of the armature plate. The energy flow then induces an electrical current in the coils (fig. 3-1-2).



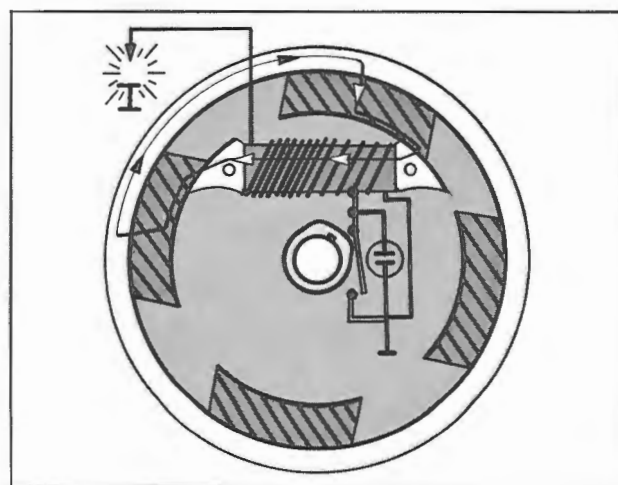
3-1-1

The electrical current flows through the coil and is stored in an electrical reservoir

(condenser). At a pre-determined magneto ring position the breaker points open and the condenser releases the reserve into the primary and secondary circuits of the vehicle (fig. 3-1-3). It is important to note that the condenser releases the reserve several hundred times per minute, therefore, sustaining an almost constant electric flow through the Ski-Doo snowmobile circuitry.



3-1-2



3-1-3

ELECTRICAL

3-2 ELECTRICAL CHARTS

(A) GENERAL

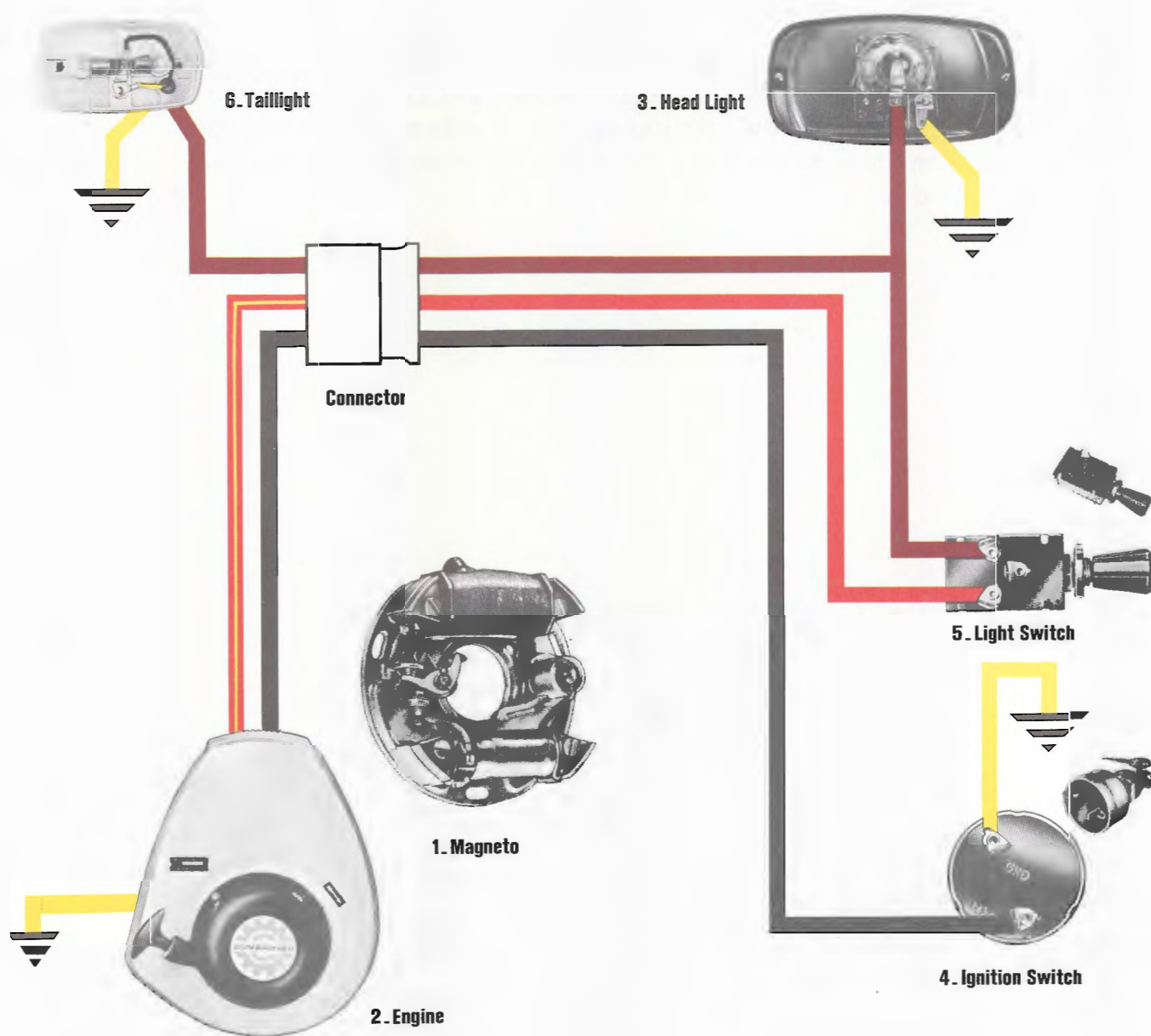
The following pages include the various electrical wiring diagrams of all the 1970 and '71 Ski-Doo Snowmobile vehicles.

IMPORTANT

It is important to remember that no current is complete unless there is a complete circuit, and no current is complete until the conducting circuit returns to the original starting point where the difference of potential or voltage occurs.

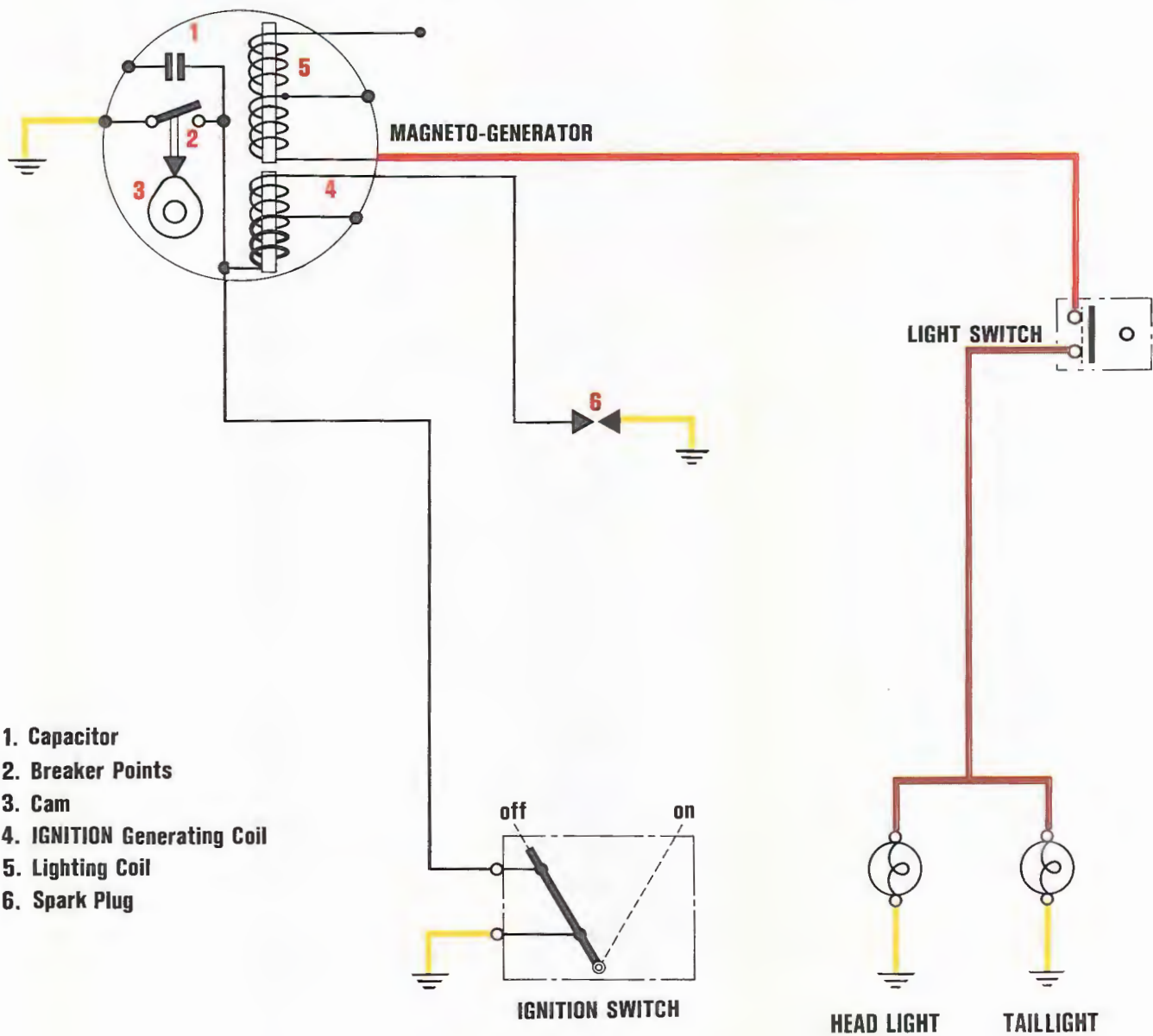
1970 SINGLE CYLINDER MANUAL START

Applicable on Olympique 12/3, 335, TN'T 292, 340



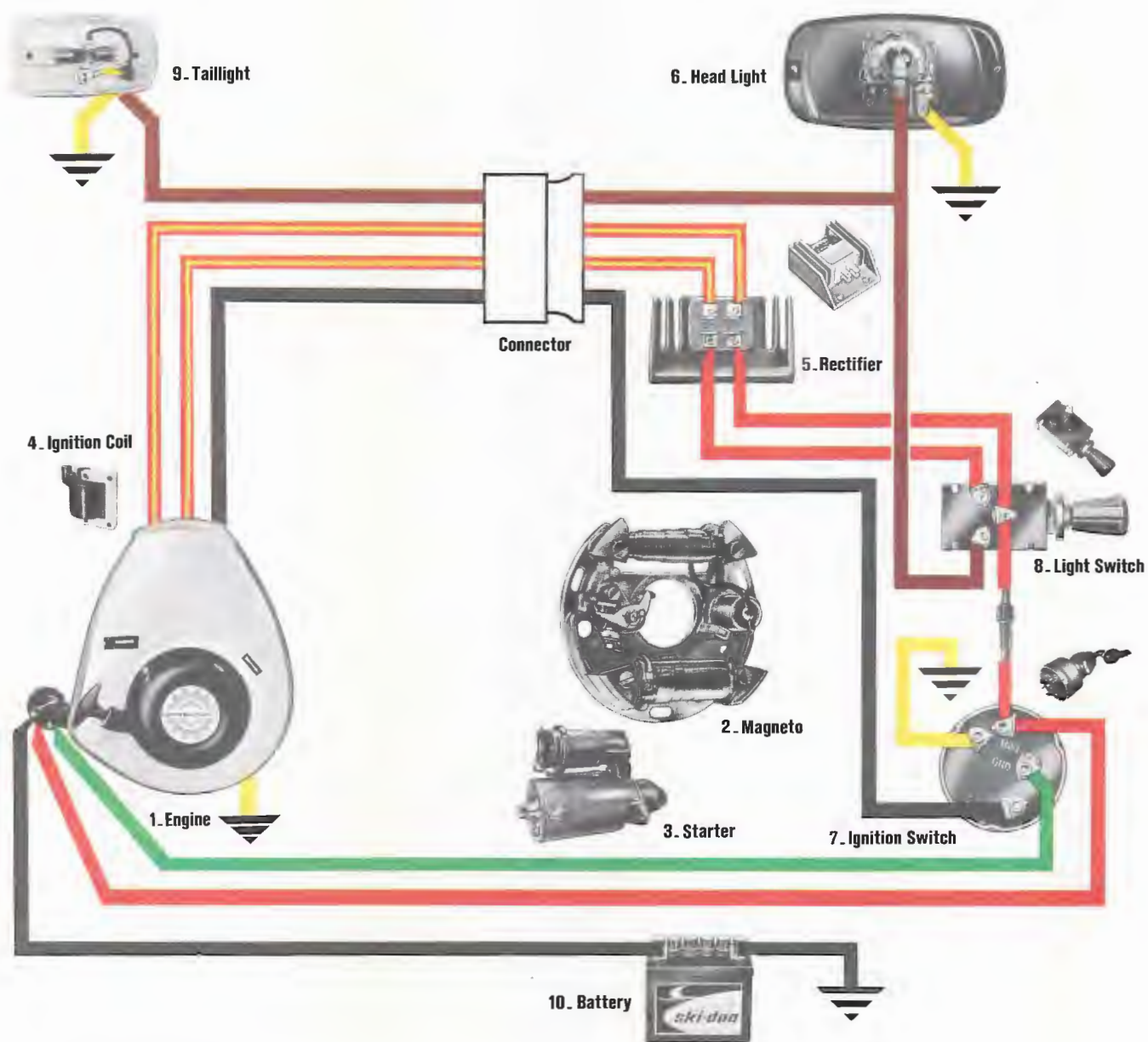
1970 SINGLE CYLINDER MANUAL START

Applicable on Olympique 12/3, 335, TN'T 292, 340



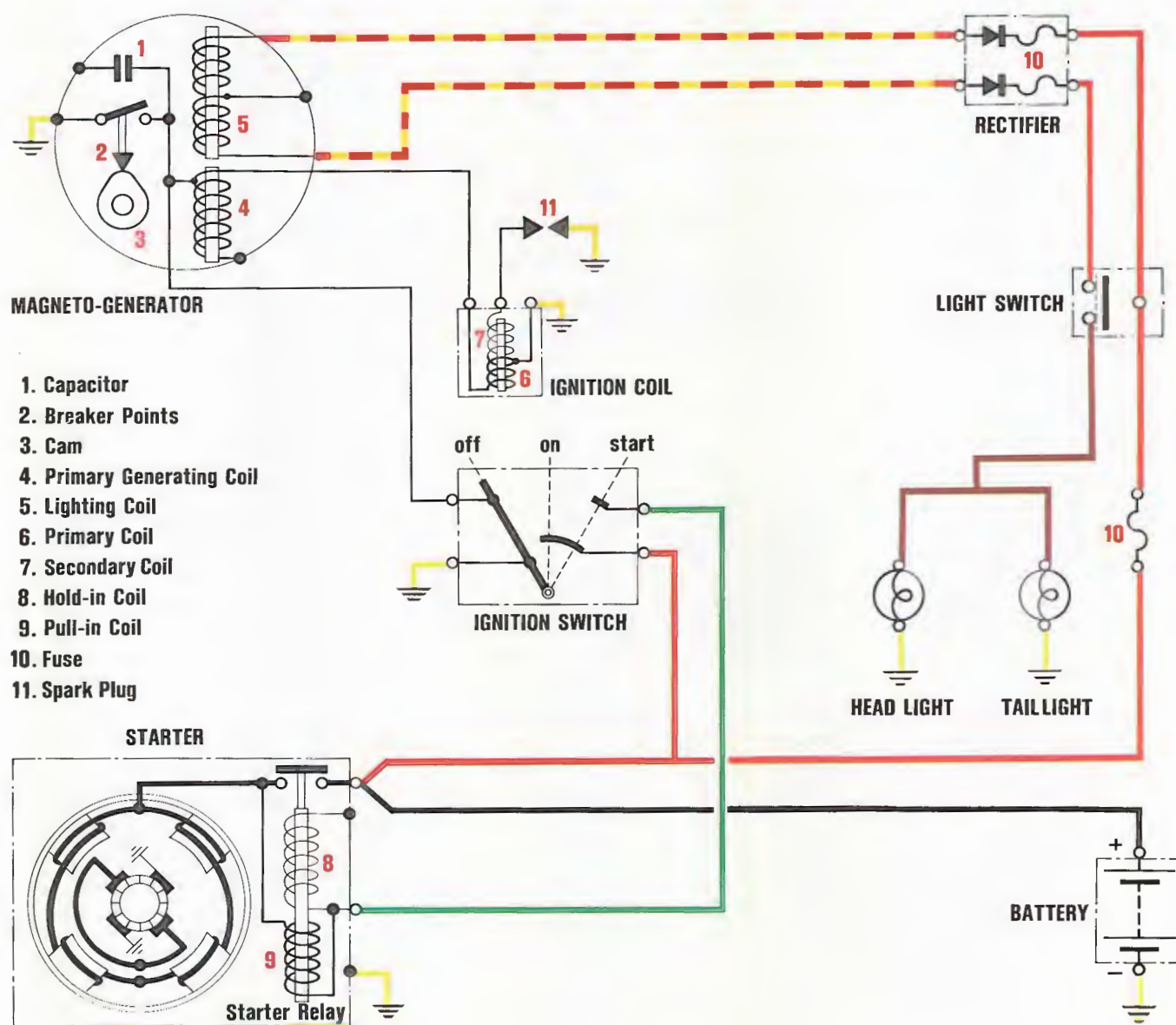
1970 SINGLE CYLINDER ELECTRICAL START

Applicable on Olympique 335E



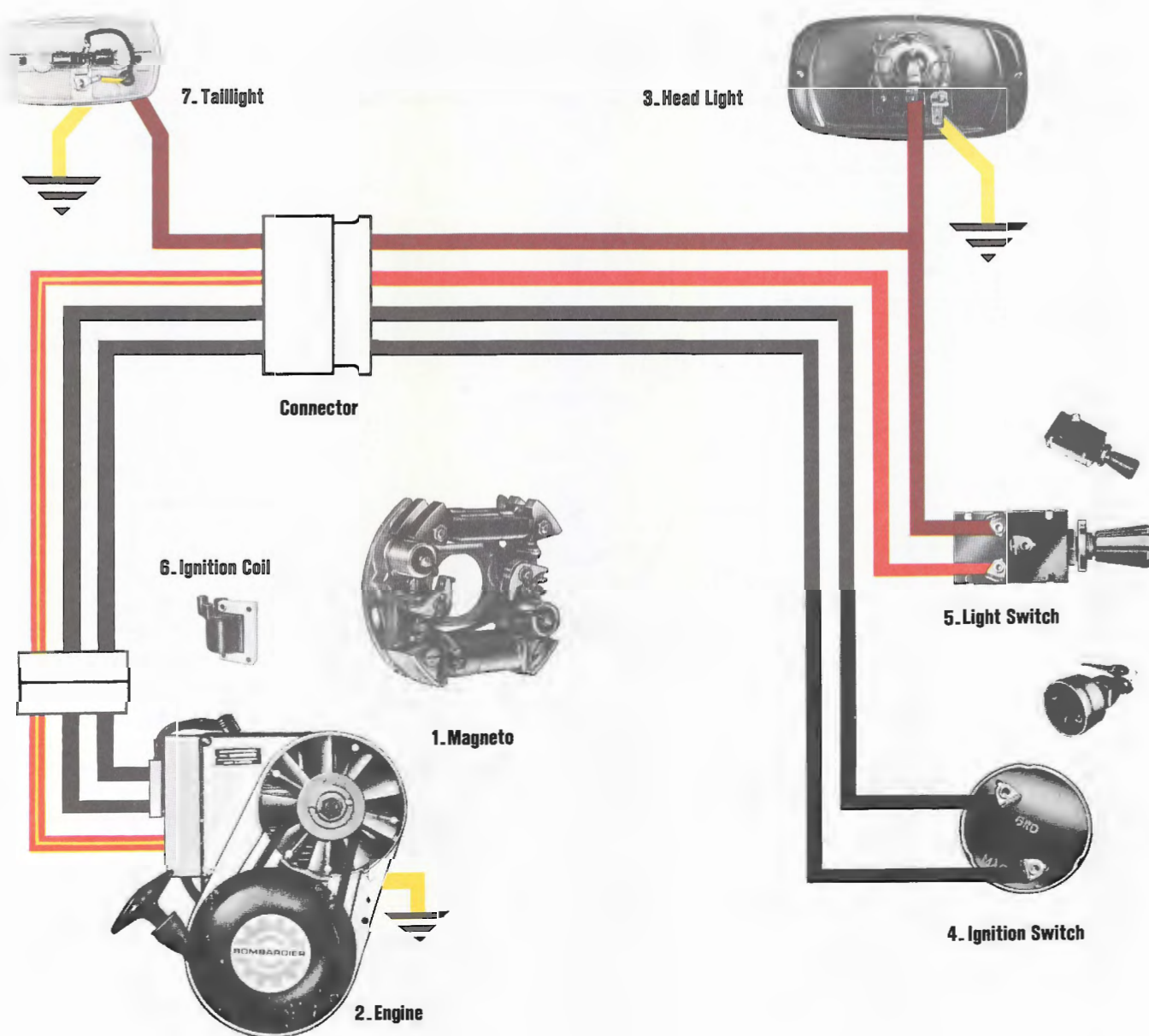
1970 SINGLE CYLINDER ELECTRICAL START

Applicable on Olympique 335E



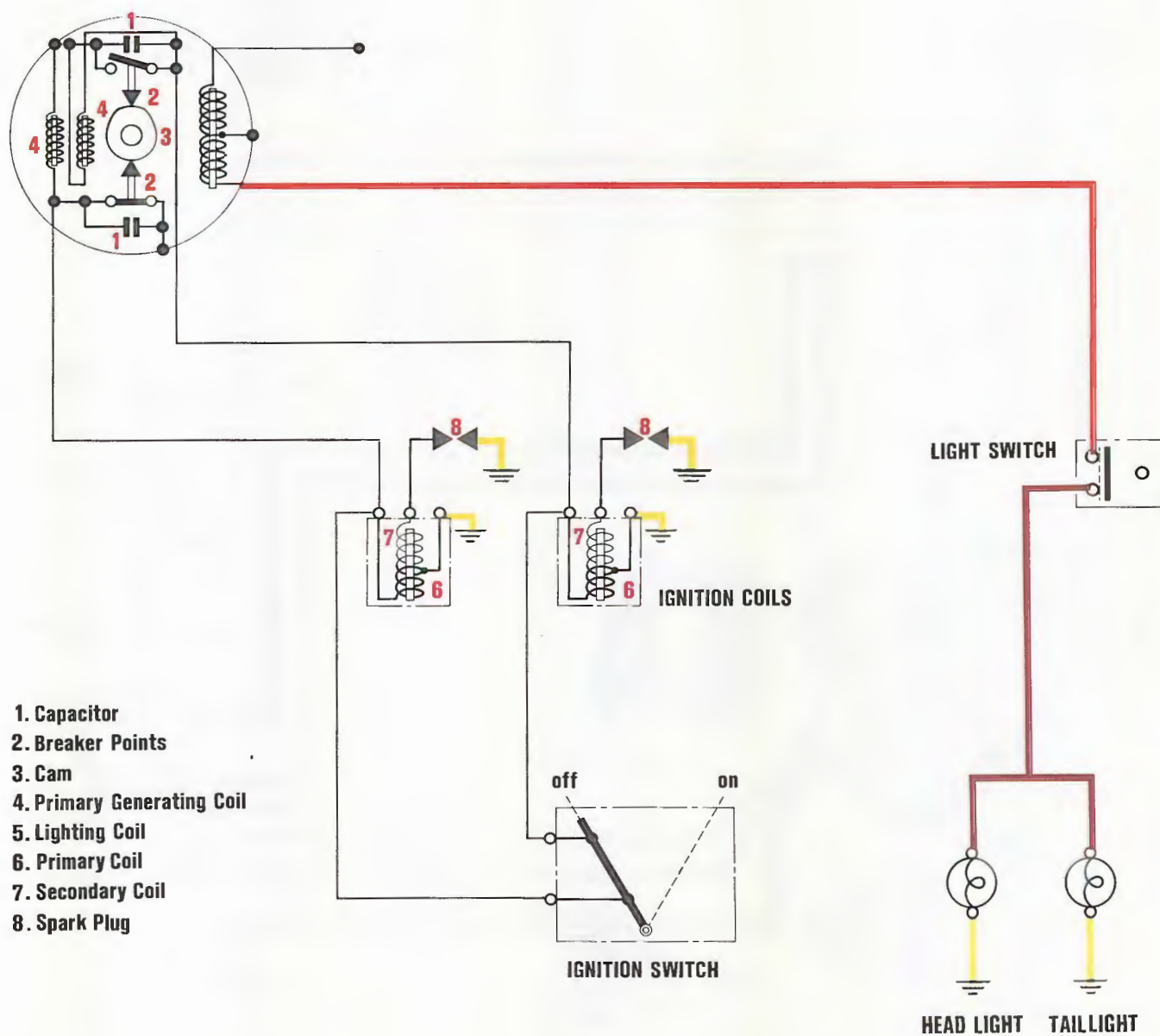
1970 DOUBLE CYLINDER MANUAL START

Applicable on Olympique 399, Nordic 399, Alpine 399, TN'T 399, 640



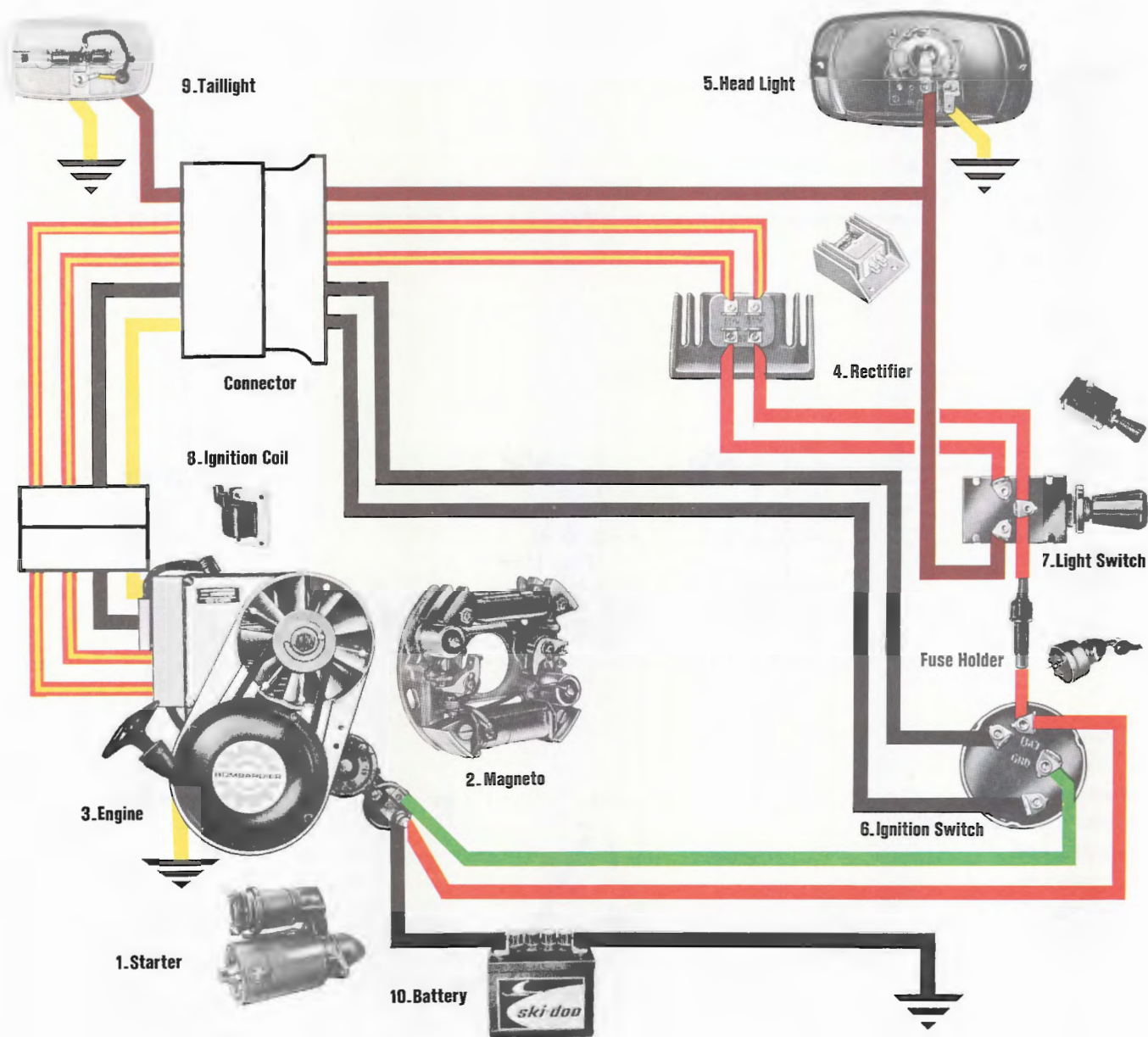
1970 DOUBLE CYLINDER MANUAL START

Applicable on Olympique 399, Nordic 399, Alpine 399, TN'T 399, 640



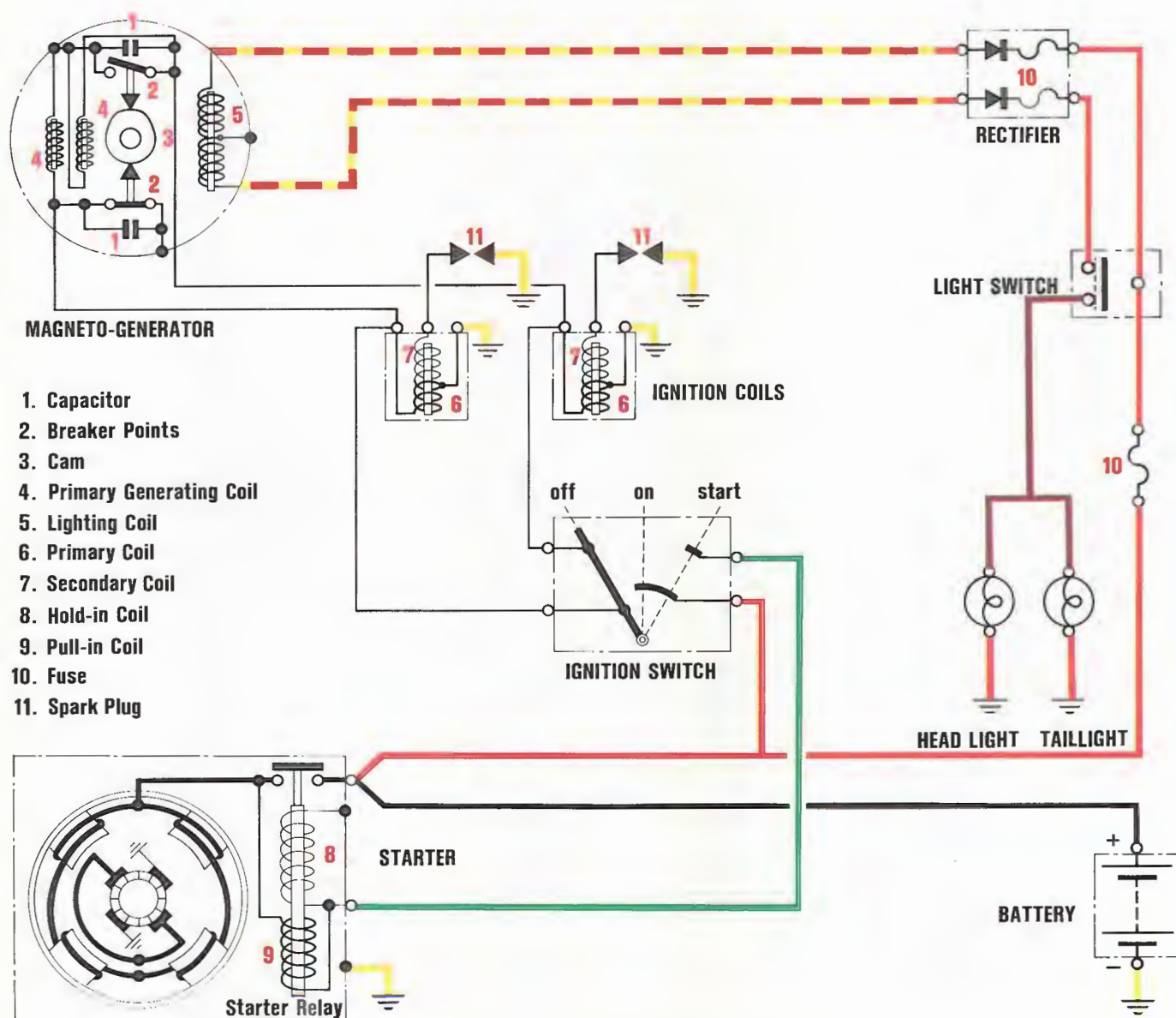
1970 DOUBLE CYLINDER ELECTRICAL START

Applicable on Nordic 399E, 640E, Alpine 399ER, Invader 640ER



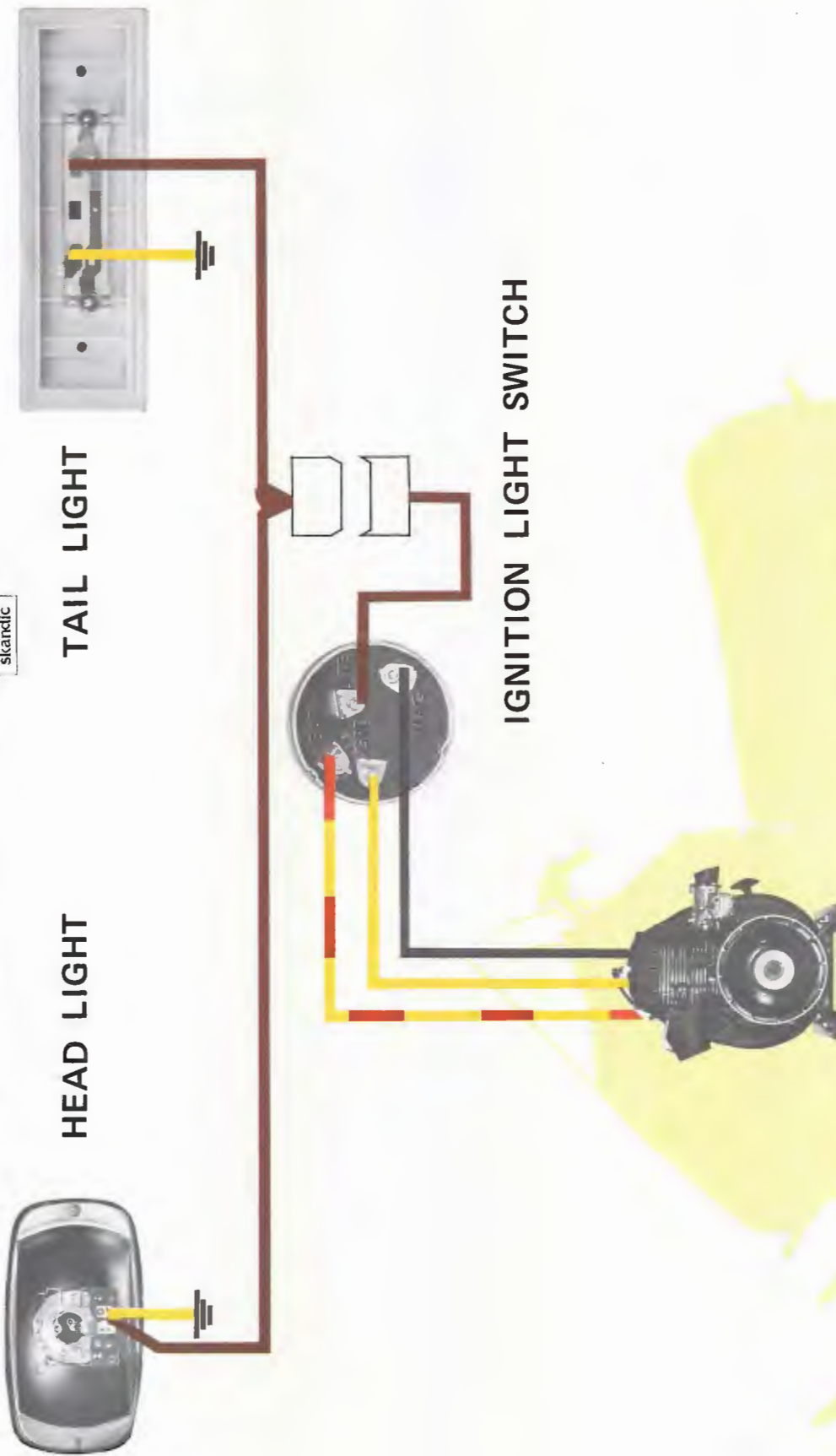
1970 DOUBLE CYLINDER ELECTRICAL START

Applicable on Nordic 399E, 640E, Alpine 399ER, Invader 640ER

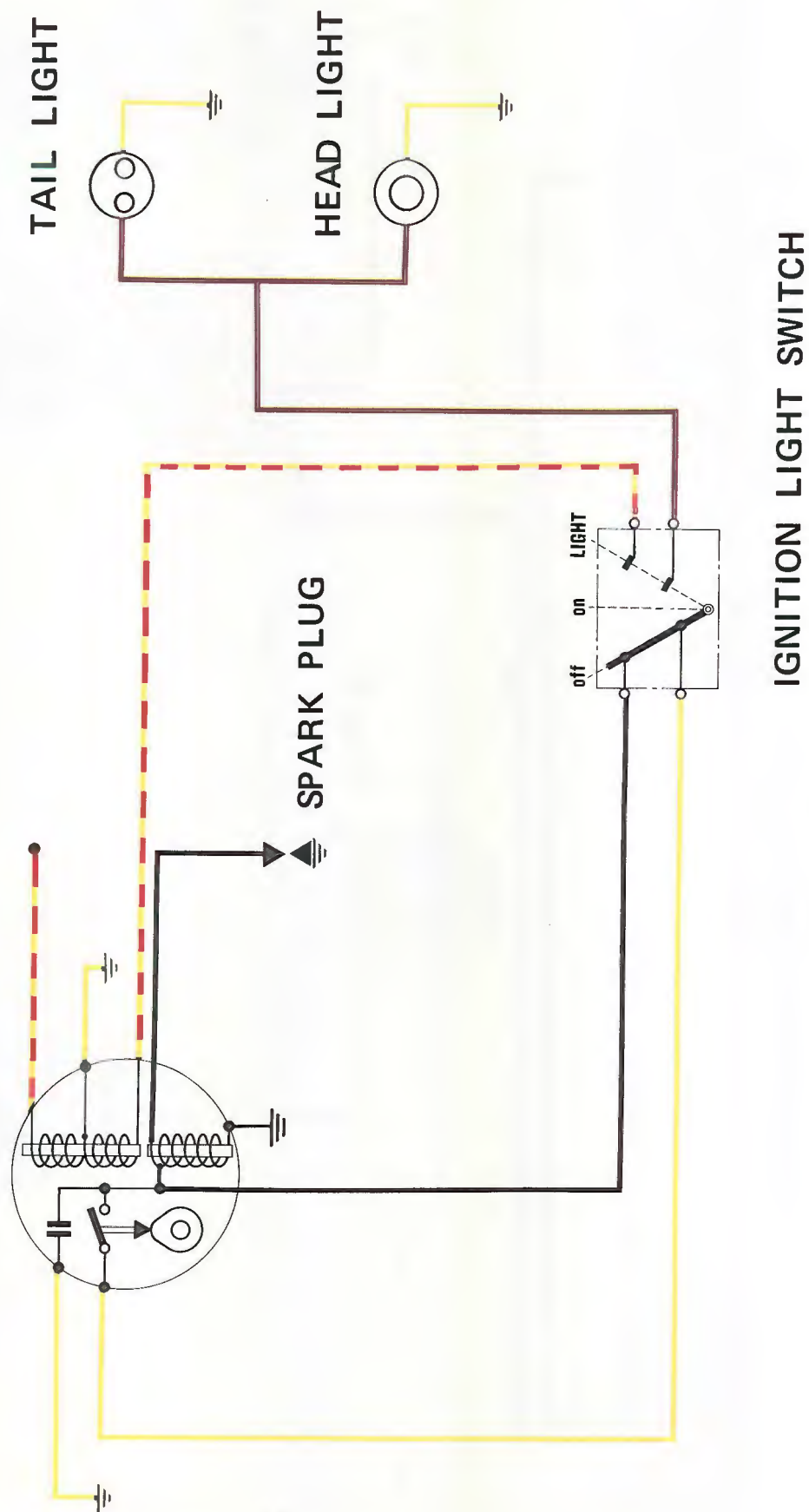


1971 SINGLE CYLINDER MANUAL START

Applicable on:  250,  335

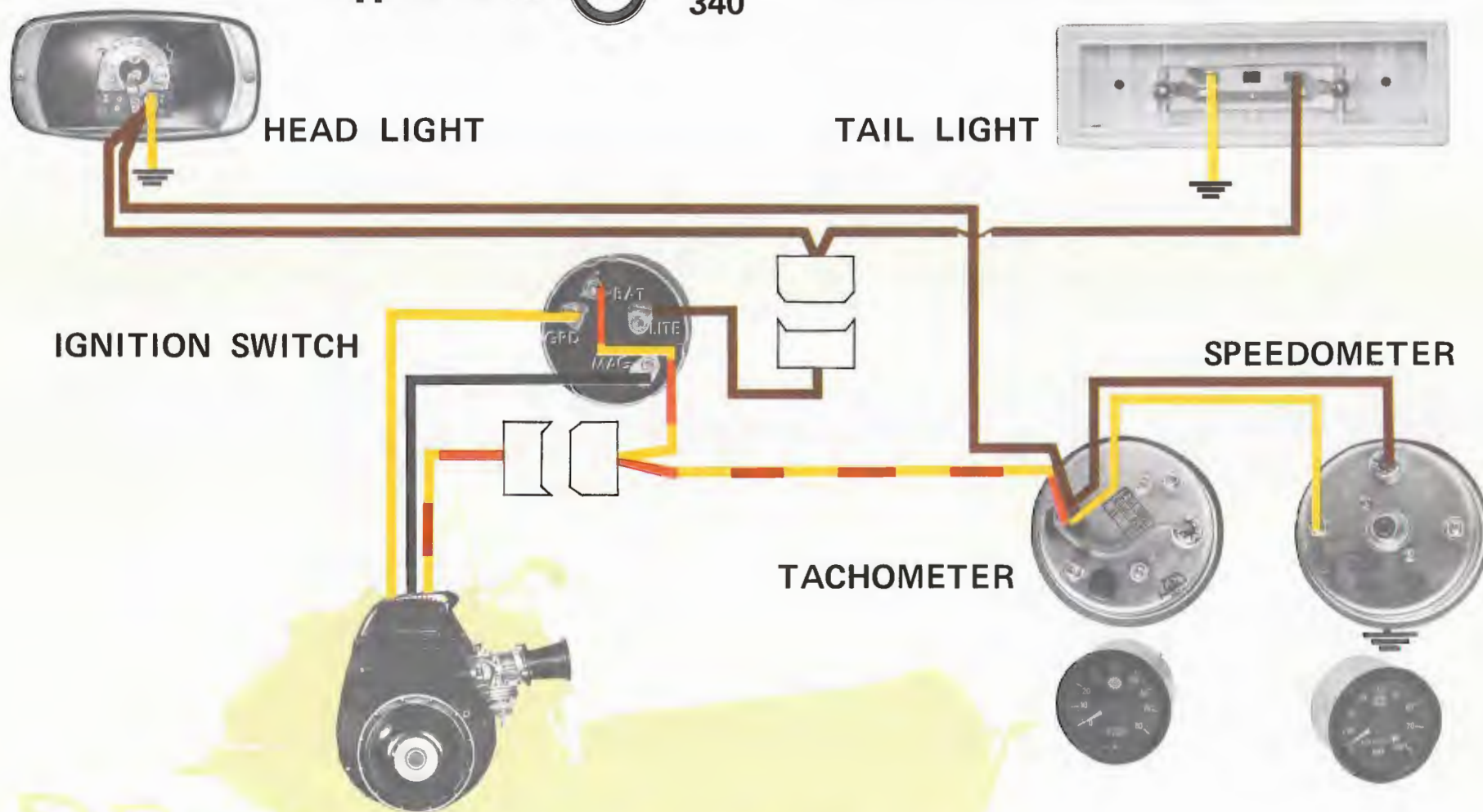


1971 SINGLE CYLINDER MANUAL START

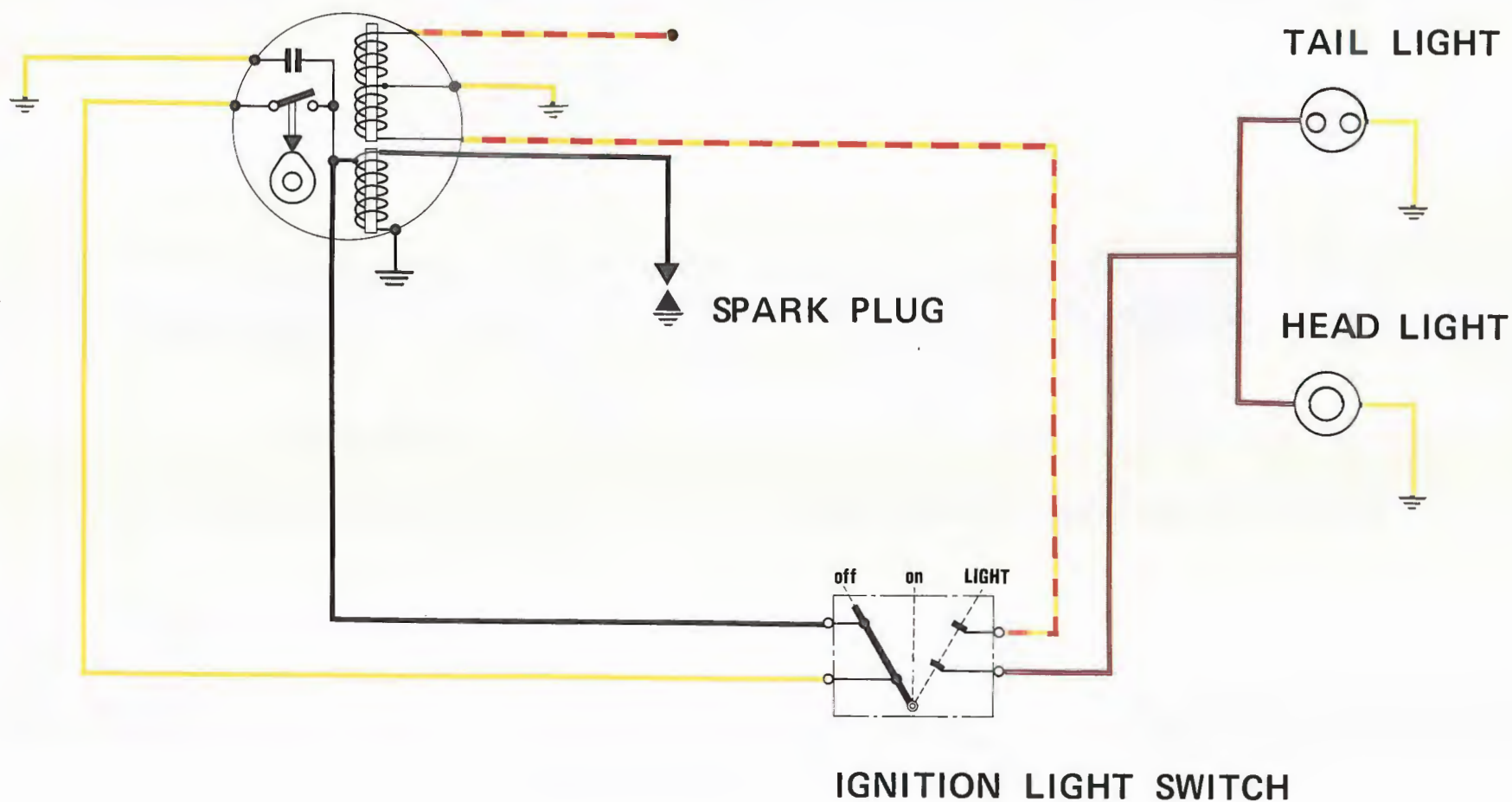


1971 SINGLE CYLINDER MANUAL START

Applicable on:  292
340



1971 SINGLE CYLINDER MANUAL START

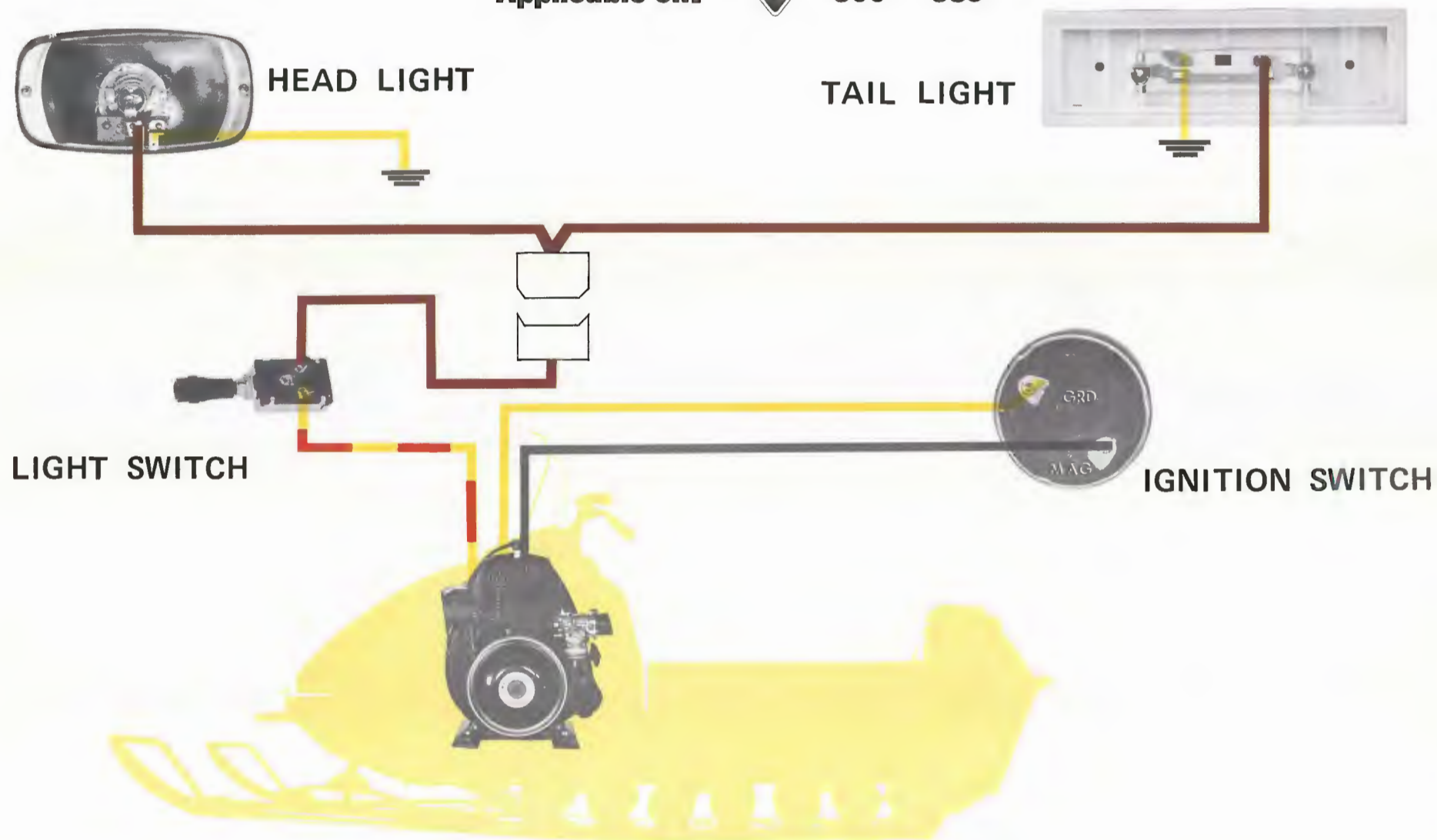


1971 SINGLE CYLINDER MANUAL START

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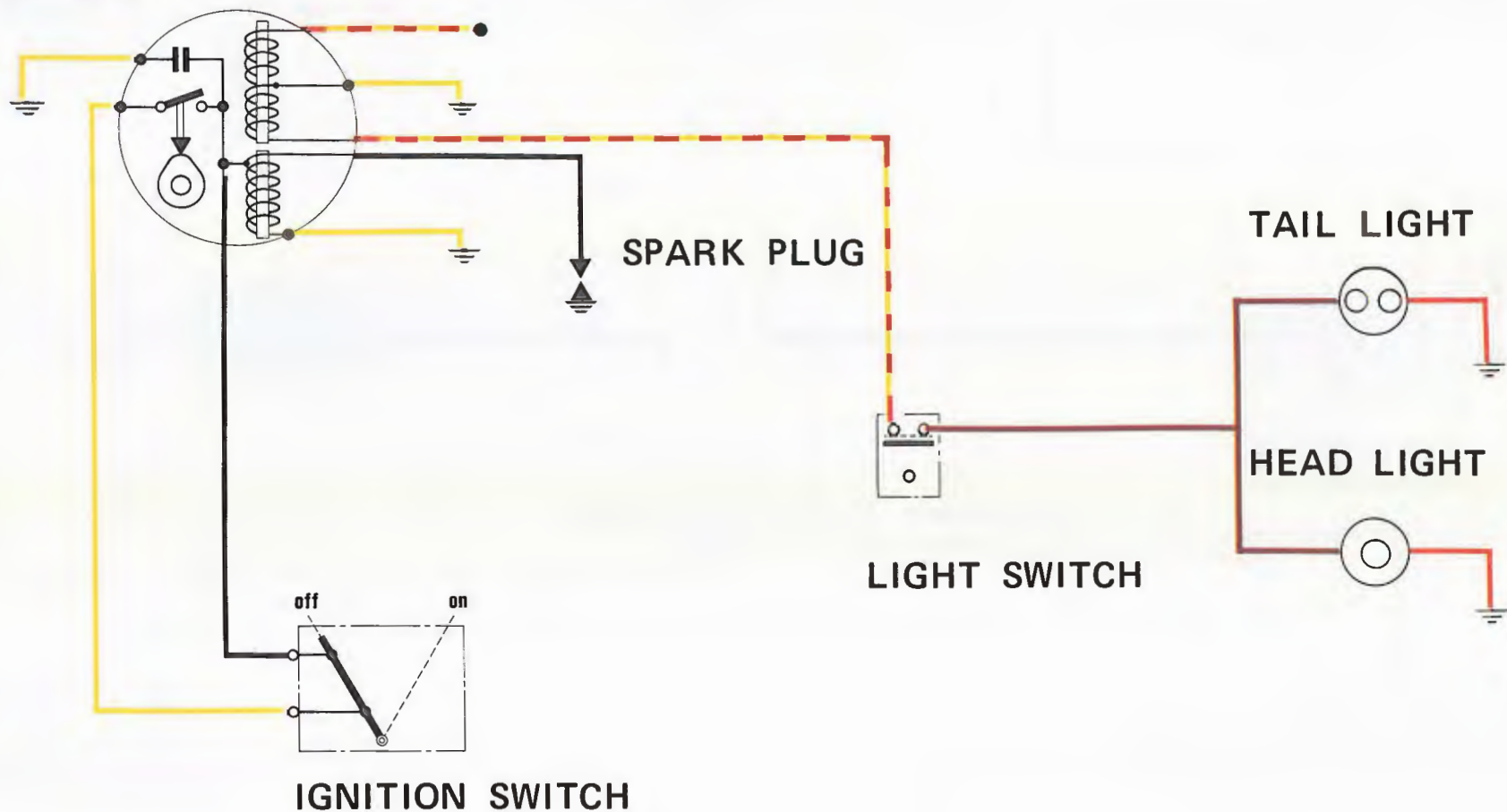


300 - 335



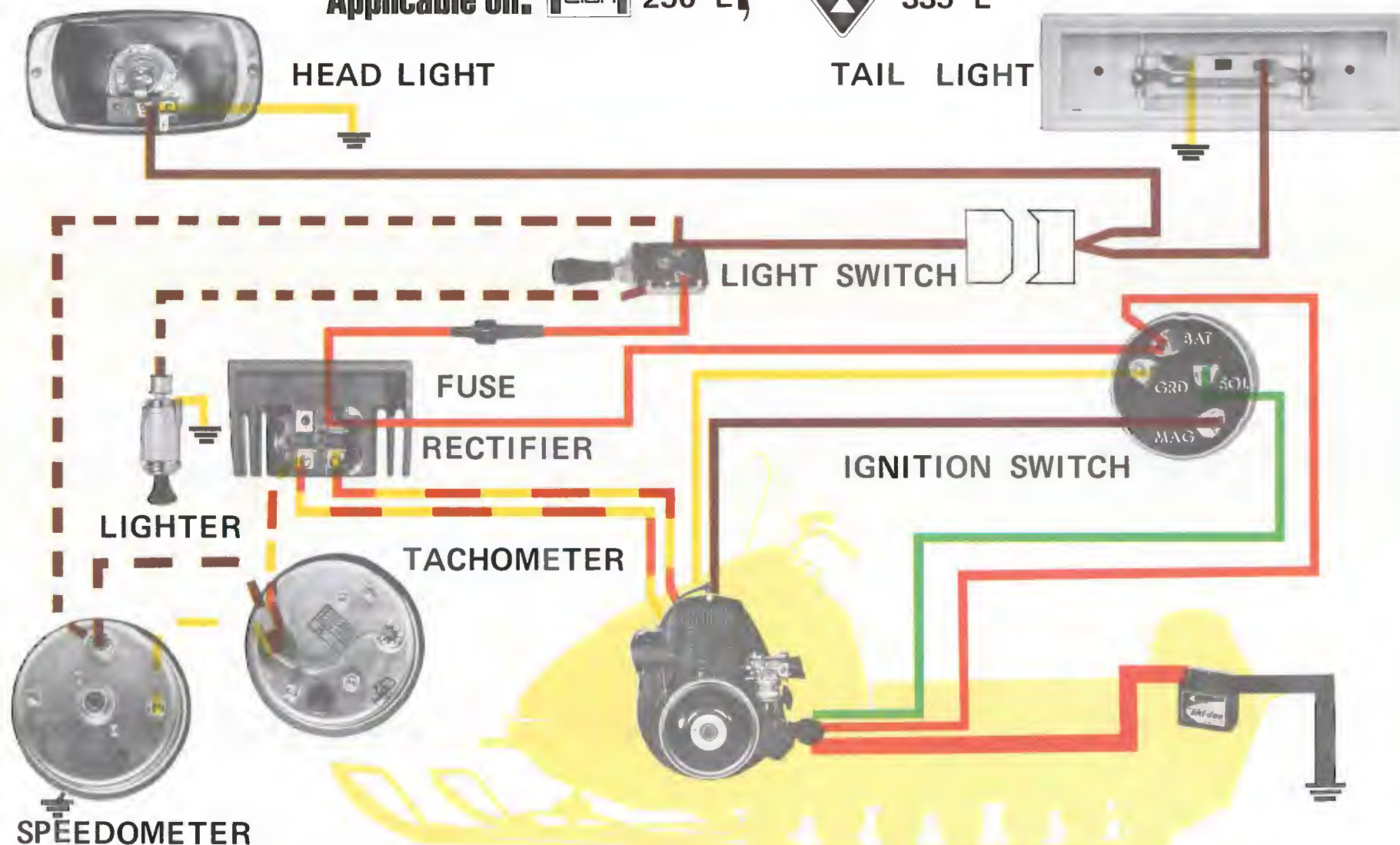
1971 SINGLE CYLINDER MANUAL START

MAGNETO-GENERATOR

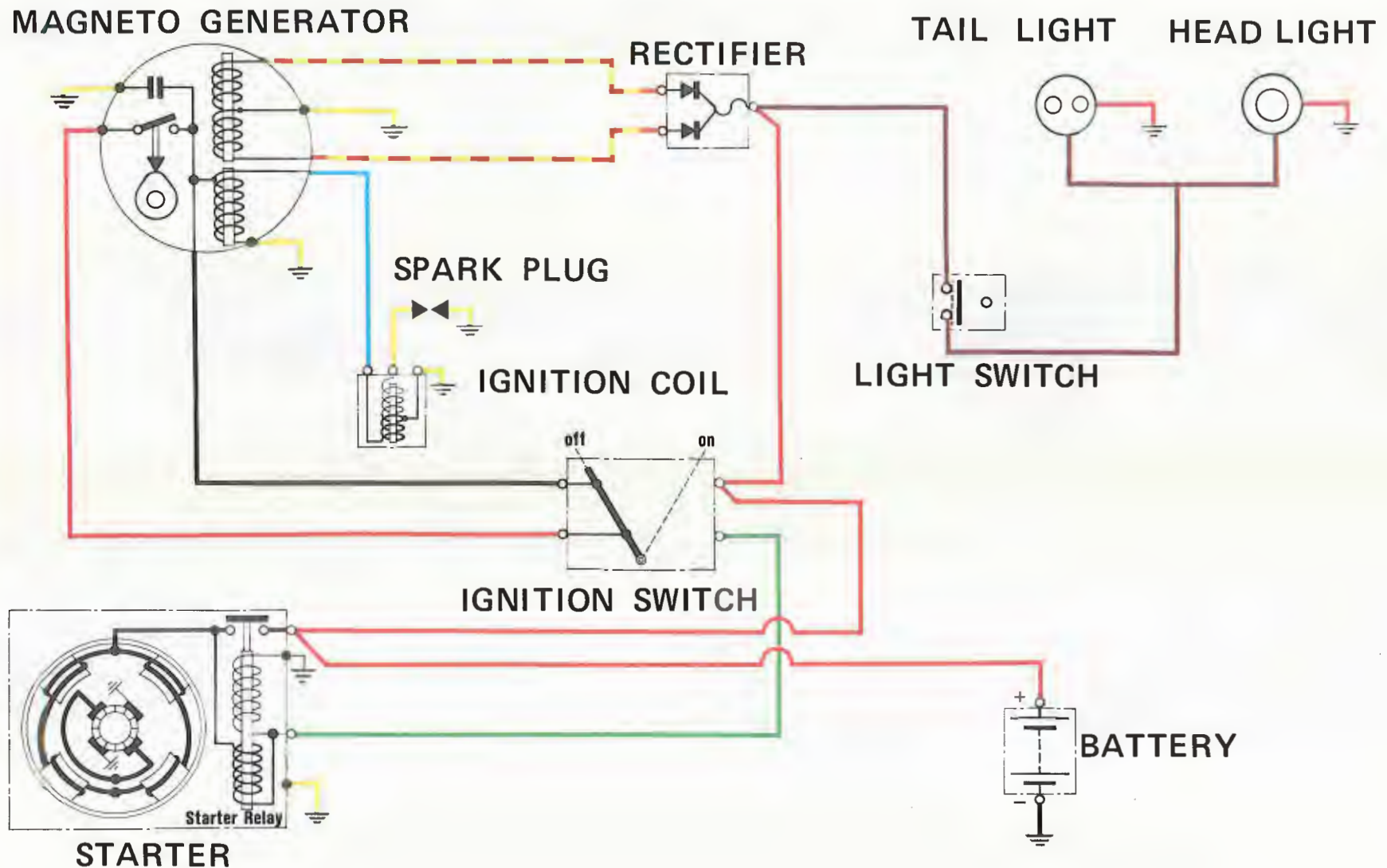


1971 SINGLE CYLINDER ELECTRICAL START

Applicable on:  250 E,  335 E



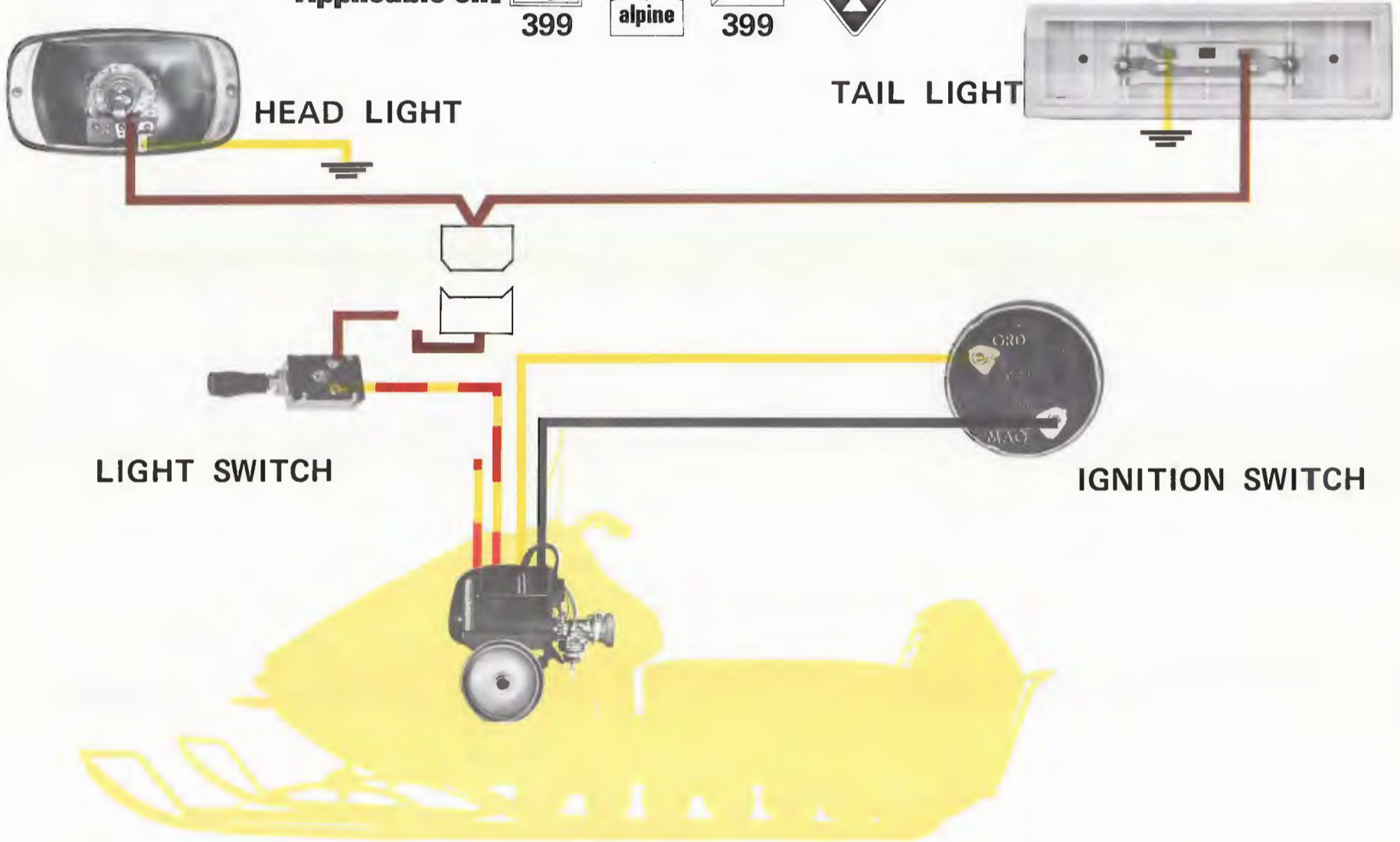
1971 SINGLE CYLINDER ELECTRICAL START



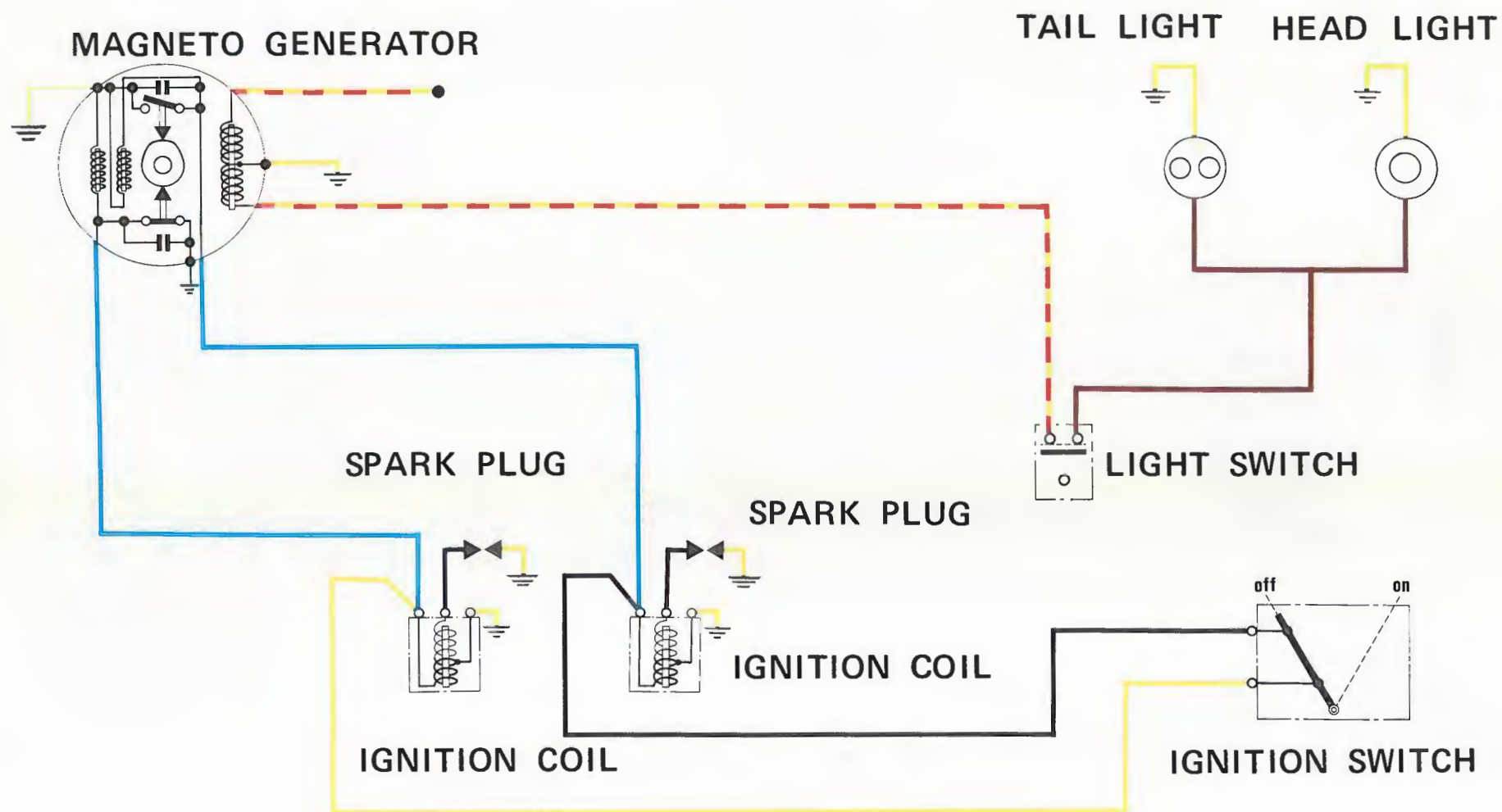
1971 DOUBLE CYLINDER MANUAL START

Applicable on:

			
399	399	399	399



1971 DOUBLE CYLINDER MANUAL START

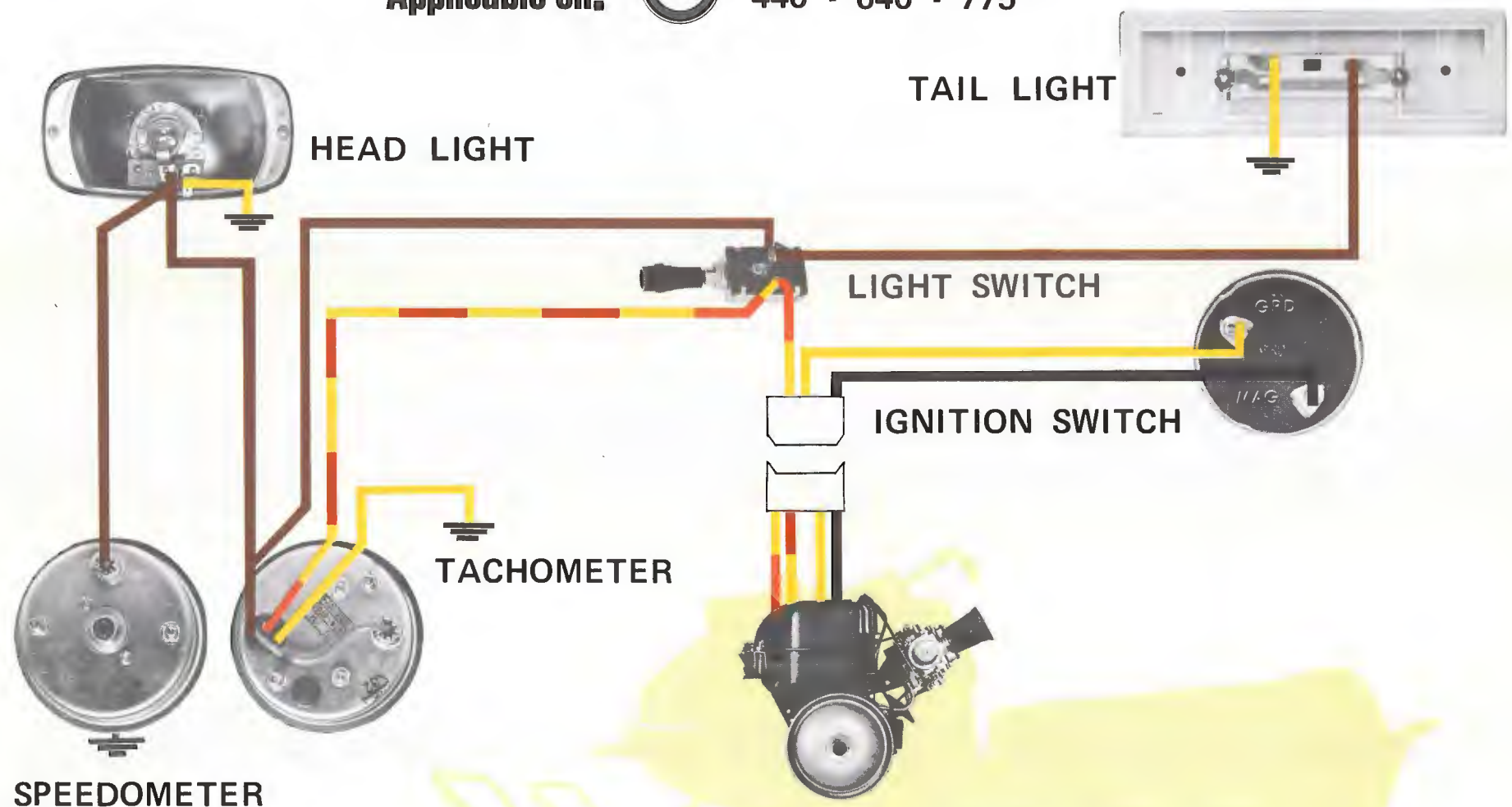


1971 DOUBLE CYLINDER MANUAL START

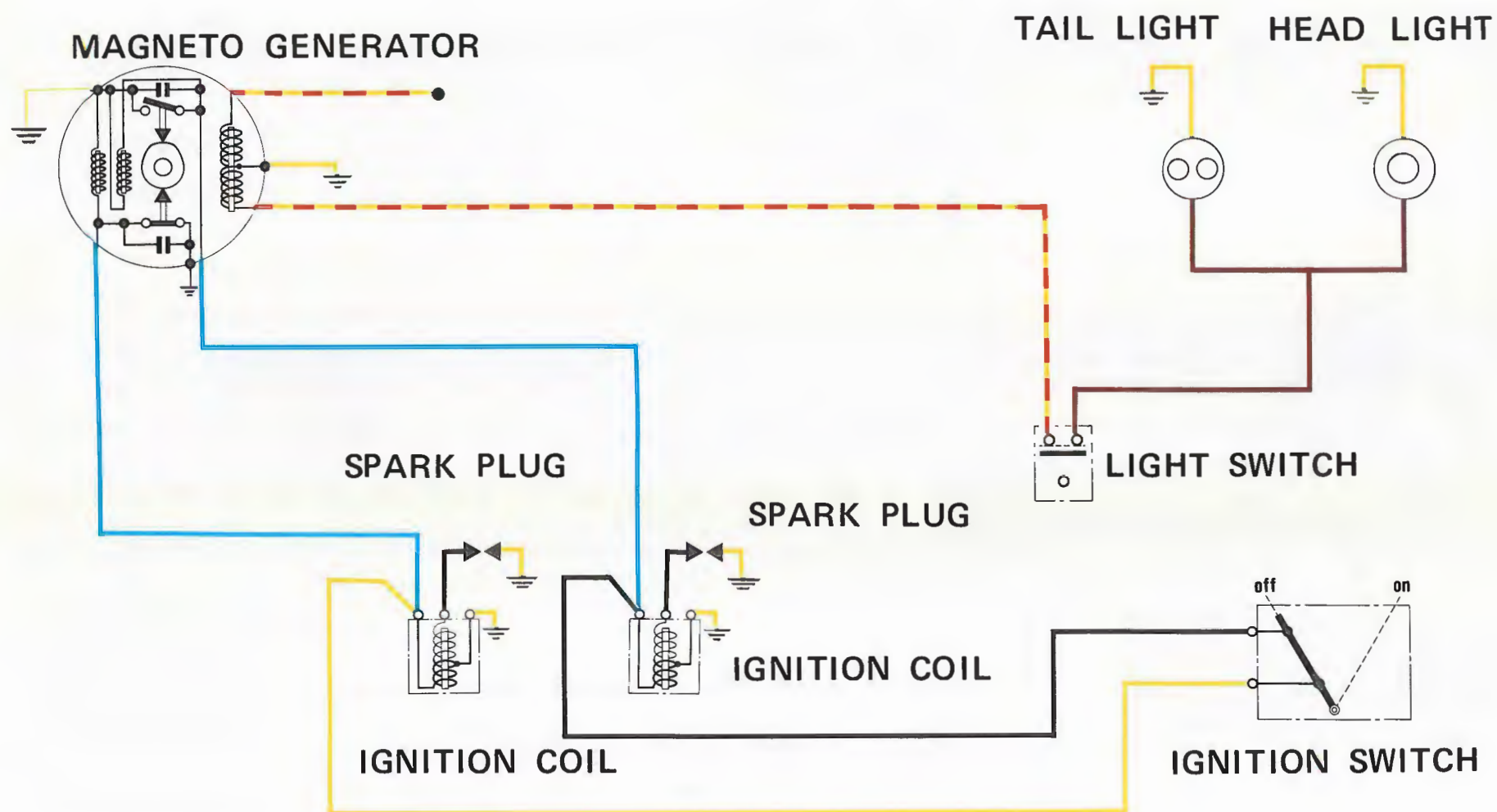
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440 - 640 - 775



1971 DOUBLE CYLINDER MANUAL START



1971 DOUBLE CYLINDER ELECTRICAL START

Applicable on:



399 E - 640 E



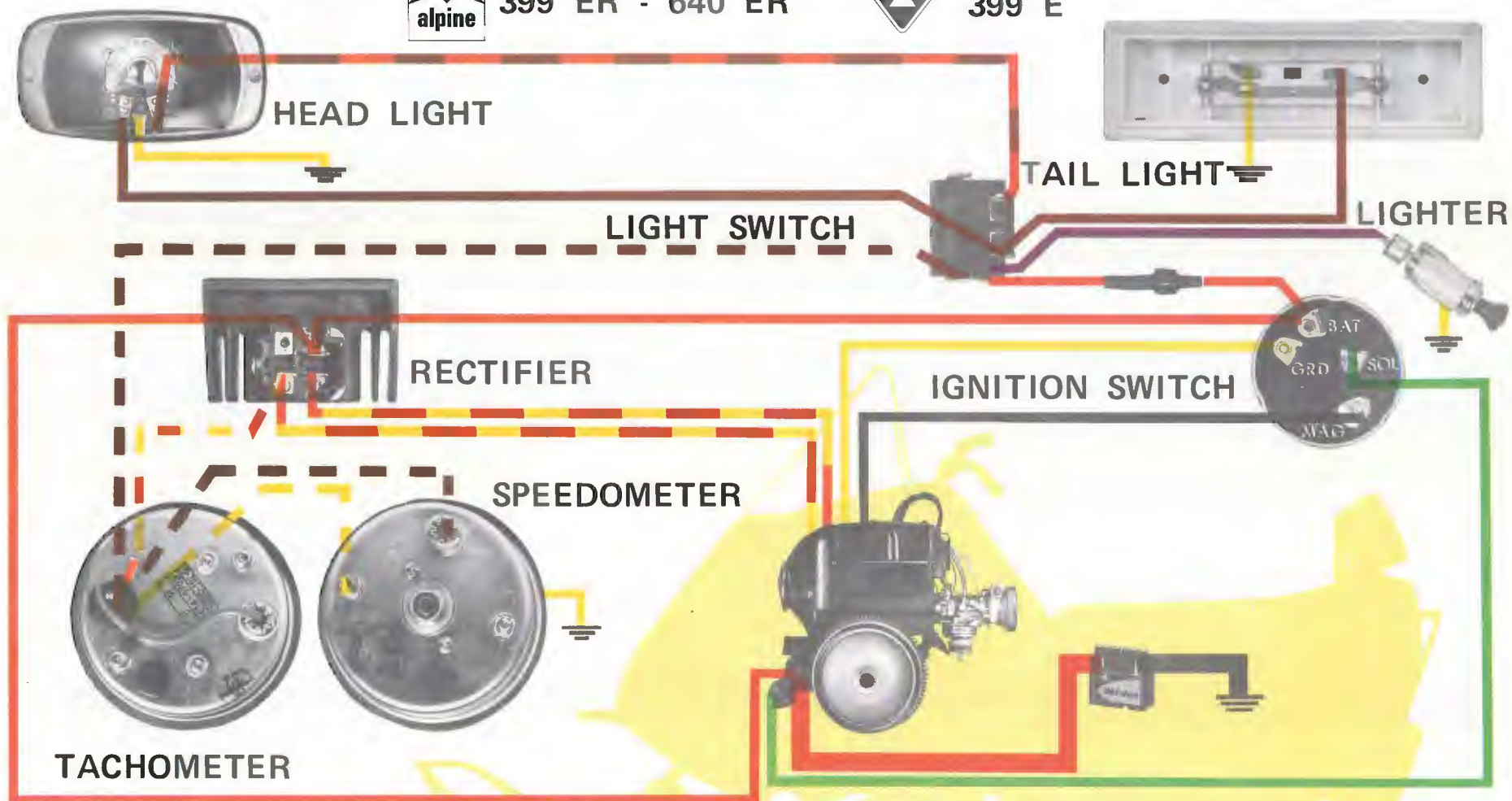
399 ER - 640 ER



399 ER - 640 ER



399 E



1971 DOUBLE CYLINDER ELECTRICAL START

MAGNETO GENERATOR

RECTIFIER

LIGHT SWITCH

SPARK PLUG

IGNITION COIL

IGNITION COIL

off on start

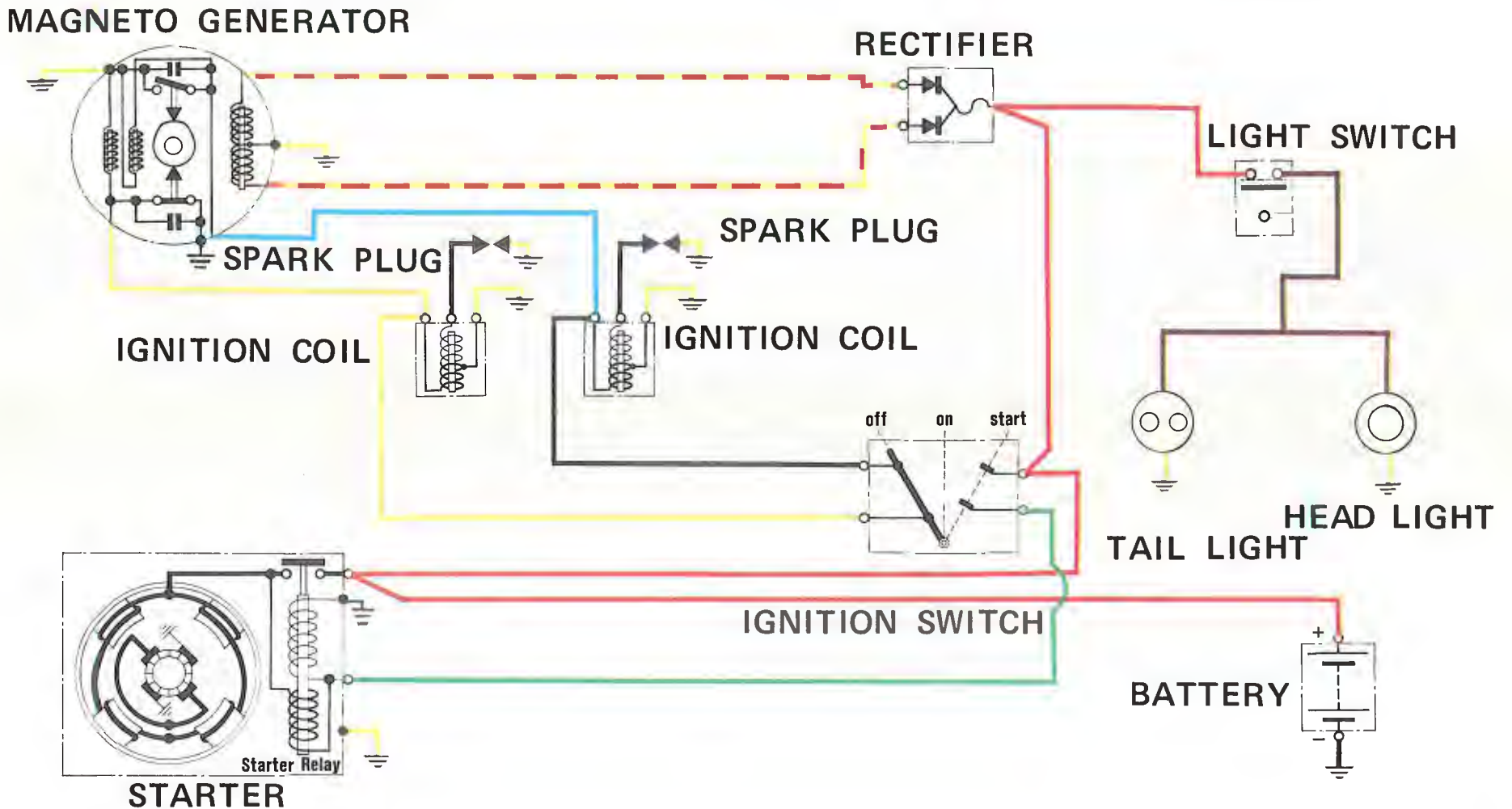
HEAD LIGHT
TAIL LIGHT

IGNITION SWITCH

BATTERY

Starter Relay

STARTER



MAGNETO AND BULB SPECIFICATION CHART

The following chart indicates the voltage and wattage for the headlight and tail light bulbs. Also indicated is the magneto wattage output. It should be noted that the magneto output is 75 watts for all one cylinder engines equipped with electric starter and for all two cylinder engines. All electric models incorporate 35 watt headlight, the surplus wattage being used to maintain the battery charged.

YEAR 1970

ENGINE		HEAD LIGHT		MAGNETO OUTPUT	TAIL LIGHT*
Type	C.C.	Voltage	Watts	Watts	Voltage
290	292	12	35	40	12
340	335	12	35	40	12
300	299	12	35	40	12
335	335	12	35	40	12
335E	335	12	35	75	12
400	399	12	60	75	12
401	399	12	60	75	12
401E	399	12	35	75	12
641	635	12	60	75	12
640	635	12	60	75	12
640E	635	12	35	75	12
775	771	12	60	75	12

YEAR 1971

ENGINE		HEAD LIGHT		MAGNETO OUTPUT	TAIL LIGHT*
Type	C.C.	Voltage	Watts	Watts	Voltage
247	247	12	35	40	12
247E	247	12	35	75	12
292	292	12	35	40	12
342	335	12	35	40	12
302	299	12	35	40	12
337	335	12	35	40	12
337E	335	12	35	75	12
401	399	12	60	75	12
401E	399	12	35	75	12
640	635	12	60	75	12
641	635	12	60	75	12
640E	635	12	35	75	12
440	435	12	60	75	12
775	771	12	60	75	12

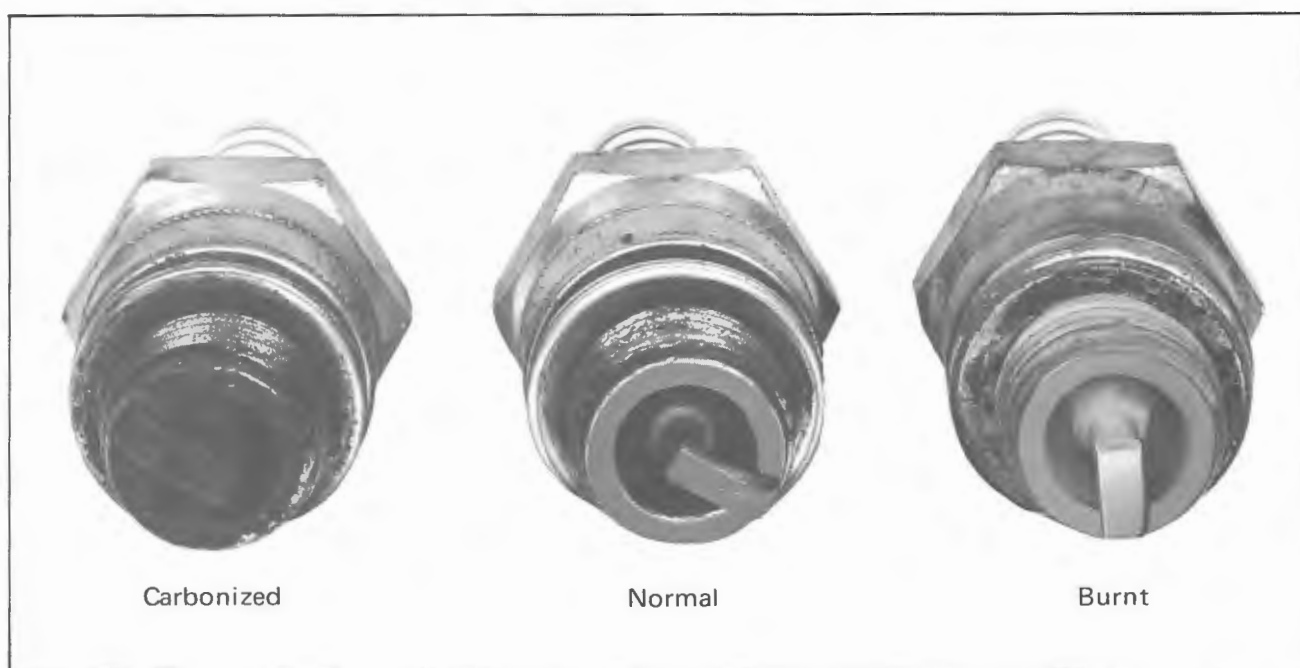
*Tail Light Wattage 2 x 2

ELECTRICAL

3-3 SPARK PLUGS

(A) 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.



3-3-1

(B) 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 side) electrode and ignites the air-fuel mixture at a determined piston position.

(C) 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. This is why Bombardier Ltd., as a result of exhaustive tests, specify a spark plug which is the most favourable under all operating conditions. 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 such as lead oxide, sulphate of lead, lead chloride, lead bromide and lead compounds from leaded fuels, form and become electrically conductive that the spark plug

temperature range is impaired and misfiring and/or fouling occurs.

(D) PLUG FACE

The plug face reveals the condition of the engine, operating condition, methods 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. 3-3-1).

(E) 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 valve, thus producing power failure and overheating. The ignited gases create "popping" and spluttering in the carburetor and may even cause carburetor fire. 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 temperatures 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 the 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. Leaner mixture or a higher compression ratio, or excessively advanced ignition may also give rise to pre-ignition.

(F) 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 protracted 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.

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.

SPARK PLUG SPECIFICATION CHART					
YEAR 1970			YEAR 1971		
ENGINE		SPARK PLUGS (BOSCH)	ENGINE		SPARK PLUGS
Type	C.C.	Number*	Type	C.C.	Number*
290	292	M-280-T-31	247	247	M-240-T-1
340	335	M-280-T-31	247E	247	M-240-T-1
300	299	M-240-T-1	292	292	M-280-T-31
335	335	M-240-T-1	342	335	M-280-T-31
335E	335	M-240-T-1	302	299	M-240-T-1
400	399	W-260-T-1	337	335	M-240-T-1
401	399	W-240-T-1	337E	335	M-240-T-1
401E	399	W-240-T-1	401	399	W-240-T-1
641	635	M-280-T-31	401E	399	W-240-T-1
640	635	M-280-T-31	640	635	M-280-T-31
640E	635	M-280-T-31	641	635	M-280-T-31
775	771	M-310-T-31	640E	635	M-280-T-31
*Spark Plug Gap .018 to .022 inch			435	435	M-280-T-31
			775	771	M-310-T-31

ELECTRICAL

3-4 MERC-O-TRONIC ANALYZER (MODEL 98)

(A) GENERAL

The Merc-O-Tronic analyzer is actually one of the most precise testers 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. A Specification Chart, Page 3-04-09, will help you determine whether replacement of parts are necessary on the vehicle.

(B) 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.

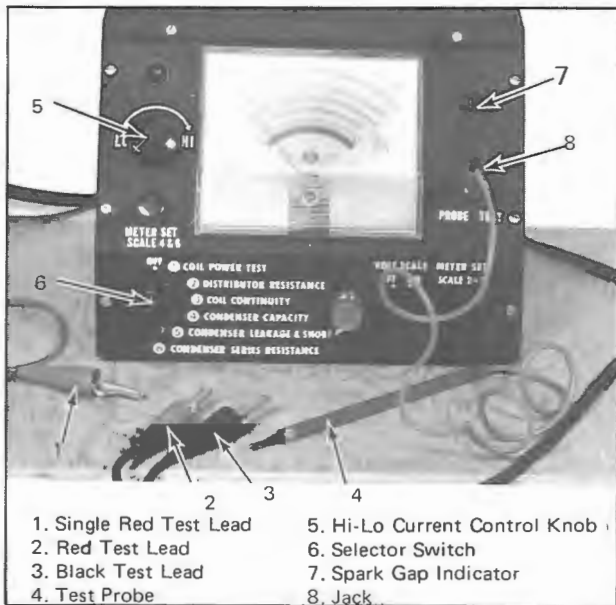
4. Attach the red test lead of the analyzer to positive post of analyzer battery.
5. Turn the volt scale No. 1 switch to the ON position.
6. Read RED figures on top of scale No. 1. Reading must not be less than 6.0 volts; if less, replace battery (fig. 3-4-2).

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.

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 (fig. 3-4-3).



3-4-2



3-4-3

IMPORTANT: To test the armature plate components, remove armature plate and ignition coil(s) from engine as detailed in Section 2, and proceed with the tests in the following sequence.

(C) TEST NO. 1 – IGNITION COIL TEST

1. 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 the appropriate post of a 12 volt battery. Test the condition of the connected 12 volt battery as detailed in Paragraph (B), Analyzer Test.
2. Insulate each breaker point by placing a small piece of cardboard between breaker points (fig. 3-4-4).



3-4-4

3. Connect the black test lead to the armature plate.
4. Connect the red test lead to breaker points terminal.
5. Connect the single red test lead to the terminal of spark plug wire.
6. Connect the No. 15 terminal of the ignition coil to the armature plate using an extension wire incorporating "crocodile" clips.
7. Connect the blue and black wires leading from armature plate to No. 1 terminal of the ignition coil.
8. With the current control knob at LO position, turn the selector switch to position No. 1 (coil power test) (fig. 3-4-5).



3-4-5

9. 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 (refer Specifications, Page 3-04-09), stop and note the spark gap indicator located on right hand side of analyzer. It should fire steadily.
10. 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:

11. Continue turning the current control knob clockwise to obtain maximum meter reading. The spark gap should fire steadily.
12. 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 and power control knobs to OFF position.

**(D) TEST NO. 2 –
COIL AND INSULATION**

1. Insulate breaker points as detailed in Test No. 1, step 2.
2. Connect the black test lead to armature plate.
3. Connect the red test lead to breaker points terminal.
4. Connect the blue and black wires leading from armature plate to the No. 1 terminal of the ignition coil.
5. Connect the No. 15 terminal of the ignition coil to armature plate using an extension wire incorporating "crocodile" clips.
6. Plug the Insulation Test Probe into "jack" located at the front of analyzer.
7. Turn selector switch to position No. 1.
8. Turn current control knob to No. 1 and obtain the maximum current reading.

CAUTION: Do not exceed maximum meter reading.

9. 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 (fig. 3-4-6).

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.

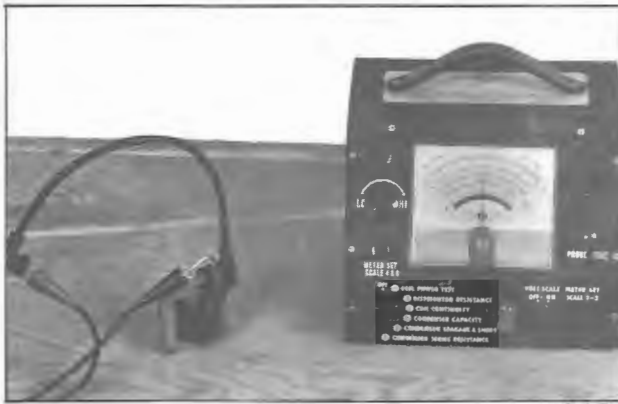
10. Disconnect 12 volt battery and reinstall the analyzer battery.



3-4-6

**(E) TEST NO. 3 –
COIL CONTINUITY TEST
(IGNITION COIL)**

1. Turn selector switch to position No. 3 – COIL CONTINUITY.
2. Temporarily attach the red and black test lead together.
3. Turn meter adjustment knob for scale No. 3 until pointer aligns with set position "0" on right side of scale. Disconnect leads.
4. Connect the black test lead to terminal No. 15 of ignition coil.
5. Connect the red test lead to spark plug wire (fig. 3-4-7). The meter reading must be between the two (2) values given for that particular coil shown in the Specification Chart.
6. In OHMs, read the lower number of the scale. If value is not within specifications, replace the defective coil.



3-4-7

**(F) TEST NO. 4 –
PRIMARY RESISTANCE TEST
(IGNITION COIL)**

1. Turn selector switch to position No. 2 (distributor resistance for checking low OHM resistance specification).

CAUTION: Do not clip test leads together as analyzer damage may occur.

2. Turn meter adjustment knob for scale No. 2 until meter pointer aligns with set position "0" on right side of scale.
3. Attach the red test lead to primary positive side of coil, on terminal No. 1.
4. Connect the black test lead to primary negative side of coil, on terminal No. 15.
5. Read the RED figures of scale No. 2 (fig. 3-4-8). Meter reading must be between specification limits. If not, replace the defective coil.

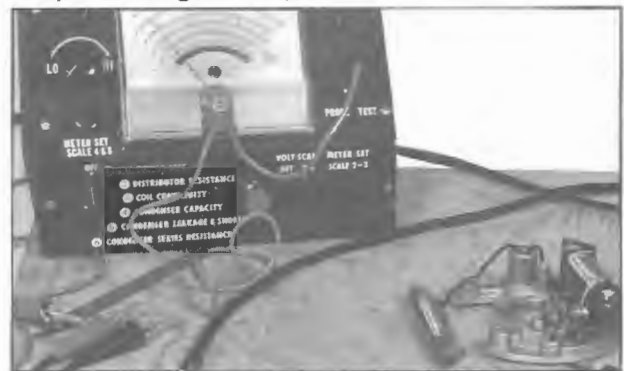


3-4-8

**(G) TEST NO. 5 –
CONDENSER CAPACITY TEST**

1. Insulate breaker points as detailed in Test No. 1.
2. Remove the lighting coil by unscrewing two (2) screws securing the coil to the armature plate.

CAUTION: Do not remove lighting coil wire from either the coil or condenser. Do not allow coil to touch armature plate (fig. 3-4-9).



3-4-9

3. Plug the analyzer cord into 115 volts, 60 cycle, AC outlet.
4. Place analyzer selector switch to position No. 4 – CONDENSER CAPACITY.
5. Temporarily attach the red and black test leads together.
6. Depress red button and turn meter adjustment of scale No. 4 to set pointer "0". Unclip test leads (fig. 3-4-10).



3-4-10

7. Connect the red test lead to condenser lead weldment.
8. Connect the black test lead to armature plate. Place selector switch to position No. 4 – CONDENSER CAPACITY.
9. Depress red button and read scale No. 4. Condenser must be within specification limits if not, replace the defective condenser.

**(H) TEST NO. 6 –
CONDENSER LEAKAGE
AND SHORT TEST**

1. Remove the lighting coil by unscrewing the two (2) screws attaching it to the armature plate.
2. Insulate breaker points as detailed in Test No. 1.
3. Connect the black test lead to armature plate.
4. Connect red test lead to condenser lead weldment.
5. Plug the analyzer cord into 115 volts, 60 cycles, AC outlet.
6. Turn selector switch to position No. 5 – LEAKAGE AND SHORT (fig. 3-4-11).



3-4-11

7. 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 is leaking. In either case, replace condenser.

**(J) TEST NO. 7 –
CONDENSER SERIES
RESISTANCE TEST**

1. Insert a piece of cardboard between breaker points.
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 (fig. 3-4-12). 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. If by wiggling the condenser lead, the pointer moves into red section, the condenser is defective.



3-4-12

**(K) TEST NO. 8 –
TESTING FOR HIGH RESISTANCE
IN PRIMARY CIRCUIT**

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 to scale No. 2 until meter pointer aligns with set position "0" on left side of OK block of scale No. 2. Unclip the red and black test leads.
4. Connect the red test lead to breaker points terminal.
5. Connect the black test lead to armature plate.
6. 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.

NOTE: If resistance is too high, clean the breaker points tips to remove possible oil or dirt.

7. To check condenser for proper grounding, connect the black test lead to armature plate.
8. Connect the red test lead to condenser body.

9. Read scale No. 2, meter pointer must be in the OK block. If not, condenser is not properly ground.
10. Check the breaker points in the same manner.

**(L) TEST NO. 9 –
ELECTRIC STARTER
(Removed from Vehicle)**

1. Pull ground brushes from brush holders.

CAUTION: Ensure that wire soldering is not damaged and that the brushes are not touching commutator.

2. Turn selector switch to position No. 3 – COIL CONTINUITY.
3. Temporarily attach the red and black test leads together.
4. Set the meter pointer to right end of scale No. 3. Disconnect test leads.
5. Attach the red test lead to the insulated terminal of solenoid and connect the black test lead to starter housing (fig. 3-4-13). If analyzer shows continuity, i.e. meter pointer moves to the right, there is a ground. In this case, check Armature, step (a), and/or Field Winding, step (b).



3-4-13

(a) Field Winding

- (i) Turn selector switch to position No. 3 – COIL CONTINUITY.
- (ii) Attach the black test lead to the grounded brush and the red test lead to starter housing. Meter pointer must move to the right, if not, there is a poor ground connection (fig. 3-4-14). Therefore, if a poor ground connection exists, replace the brushes, check the connections and the brush holders.



3-4-14

(b) Armature (Disassembled Starter)

- (i) Turn selector switch to position No. 3 – COIL CONTINUITY.
- (ii) Attach the black test lead to armature shaft.
- (iii) Use the red test lead to probe the commutator (copper) bars. If pointer moves across the meter to the right, as the bars are contacted, armature is grounded and must be repaired or replaced. (fig. 3-4-14).



3-4-15

(M) TEST NO. 10 –
SOLENOID TEST

1. Turn selector switch to position No. 3 – COIL CONTINUITY.
2. Connect the red test lead to large terminal of solenoid.
3. Connect the black test lead to the other large terminal of solenoid.
4. With a 12 volt battery, place two (2) jumper leads on battery posts.
5. Connect positive jumper lead to small terminal of solenoid.
6. Connect negative jumper lead to solenoid housing. Meter pointer must move fully to right of meter, if not replace solenoid (fig. 3-4-16).



3-4-16

(N) TEST NO. 11 –
IGNITION SWITCH
(Installed on vehicle
with switch block removed)

1. Turn selector switch to position No. 3 – COIL CONTINUITY.
2. Connect the red test lead to MAG terminal of ignition switch.
3. Connect the black test lead to GRD terminal of ignition switch.
4. When the dash panel ignition switch is at the OFF position, the meter pointer should be fully to the right. When the switch is at the ON position, the meter pointer should be fully to the left.

5. Connect the red test lead to LITE terminal of ignition switch.
6. Connect the black test lead to BAT terminal of ignition switch.
7. If ignition switch is selected to OFF or ON position, meter pointer should be fully left. If switch is in LIGHT position, meter pointer should be fully right.
8. Connect the black test lead to SOL terminal of ignition switch.
9. Connect the red test lead to BAT terminal of ignition switch.
10. When ignition switch is turn to OFF or ON position, pointer should be fully left. When switch is in START position, pointer should be fully right.
11. If the requirements of steps 4., 7. and/or 10. are not fulfilled, the ignition switch must be replaced.



3-4-17

**(P) TEST NO. 12 —
RECTIFIER (Diode check)**

1. Connect the red test lead to the fuse terminal.
2. Connect the black test lead to one of the male terminals on the rectifier (fig. 3-4-17). The meter pointer should be at fully left on scale.
3. Inverse the connection and the meter pointer should be at fully right of scale (fig. 3-4-18).

(Q) GENERAL

Check any wire, connection, or continuity by using the ohmmeter (position No. 3 — COIL CONTINUITY). Any discontinuity in an electrical system will result in an infinite resistance (Nil reading of meter).



3-4-18

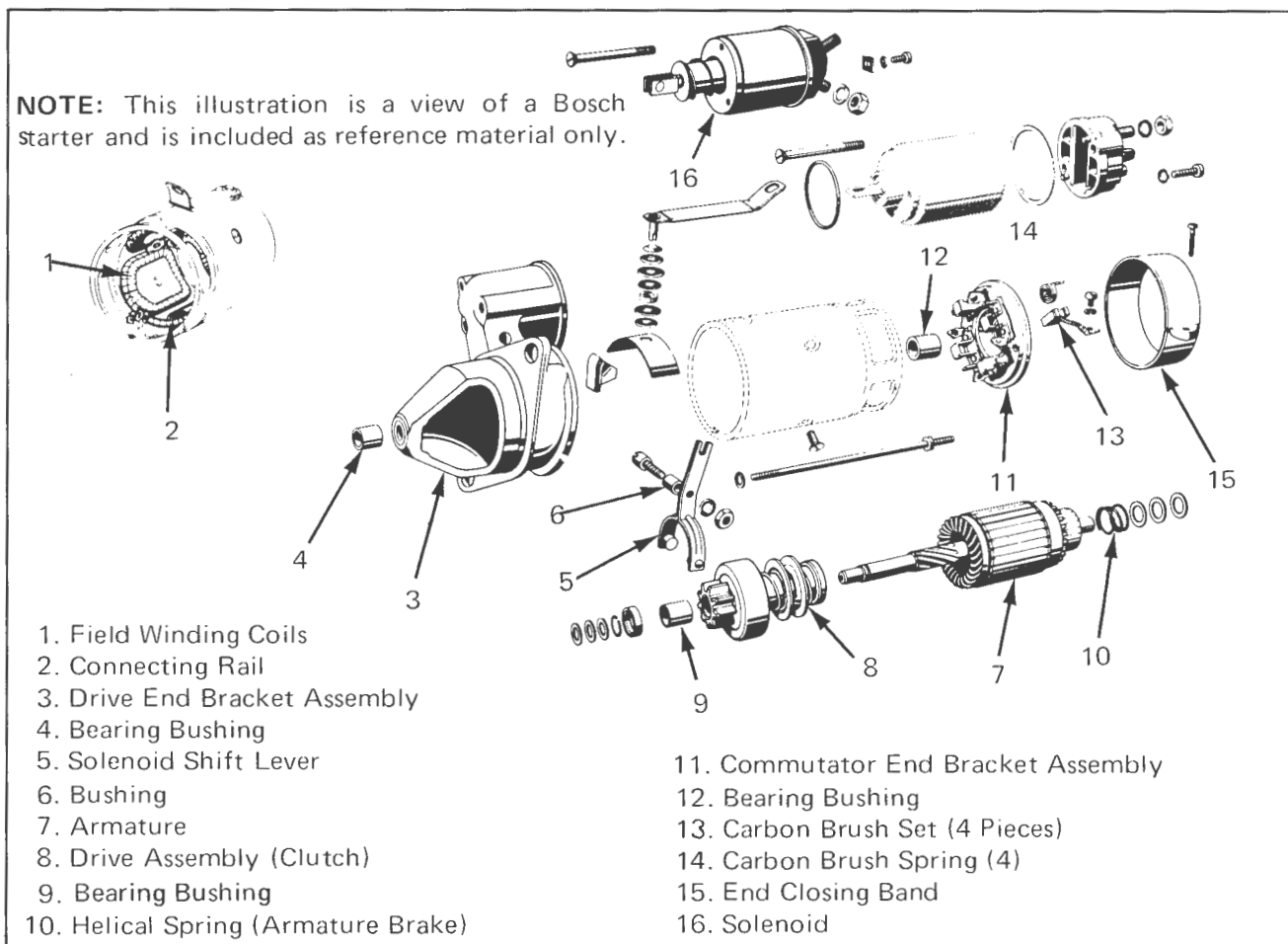
ENGINE		GENERATING COIL		IGNITION COILS PRIMARY RESISTANCE		SECONDARY CONTINUITY		LIGHTING COIL
TYPE	C.C.	RESISTANCE	AMPERAGE	MIN	MAX	MIN	MAX	RESISTANCE
290	292	—	0.6	1.5	1.9	40	50	1.2
340	335	—	0.6	1.5	1.9	40	50	1.2
300	299	—	0.6	1.5	1.9	40	50	1.2
335	335	—	0.6	1.5	1.9	40	50	1.2
335E	335	3.5	0.6	1.6	2.0	50	60	1.7
400	399	3.0	0.6	1.6	2.0	50	60	1.7
401	399	3.0	0.6	1.6	2.0	50	60	1.7
401E	399	3.0	0.6	1.6	2.0	50	60	1.7
641	635	3.0	0.6	1.6	2.0	50	60	1.7
640	635	3.0	0.6	1.6	2.0	50	60	1.7
640E	635	3.0	0.6	1.6	2.0	50	60	1.7
775	771							
247	247	—	0.6	1.6	2.0	35	45	—
247E	247	3.5	0.6	1.6	2.0	35	45	—
292	292	—	1.0	1.5	1.9	40	50	—
342	335	—	1.0	1.5	1.9	40	50	—
302	299	—	1.0	1.5	1.9	40	50	—
337	335	—	1.0	1.5	1.9	40	50	—
337E	335	3.5	0.6	1.6	2.0	35	45	—
401	399	3.0	0.6	1.6	2.0	35	45	1.7
401E	399	3.0	0.6	1.6	2.0	35	45	1.7
640	635	3.0	0.6	1.6	2.0	35	45	1.7
641	635	3.0	0.6	1.6	2.0	35	45	1.7
640E	635	3.0	0.6	1.6	2.0	35	45	1.7
435	435	3.0	0.6	1.6	2.0	35	45	1.7
775	771							
All Condenser Microfarads .26—.30								

ELECTRICAL

3-5 ELECTRIC STARTER

(A) 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.



DISASSEMBLED VIEW OF ELECTRICAL STARTER

(B) 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 (clutch) is pushed outward, the armature shaft begins to rotate and entrains the engine starter gear. Once the engine has started, the crankshaft/engine starter gear revolutions exceed the drive assembly/armature shaft revolution and the drive assembly is

back from the engine starter gear. At this point, releasing the ignition key from the START position opens the contact surfaces within the starter assembly and the drive assembly retracts on the armature shaft.

(C) REMOVAL

1. Remove engine as detailed in Section 2.
2. On two cylinder engines, remove engine mount from crankcase lower housing as detailed in Section 2.
3. Remove starter and bracket from engine as detailed in Section 2.

IMPORTANT

To carry out some of the procedures on the following pages, it is necessary that special equipment is available to the mechanic. If you do not possess this equipment, either replace the damaged component(s) or have the part(s) overhauled in a workshop having the proper tooling.

(D) DISASSEMBLY

1. Mark the installation position of the end closing band. Unscrew the attaching bolt and remove the band (fig. 3-5-1).



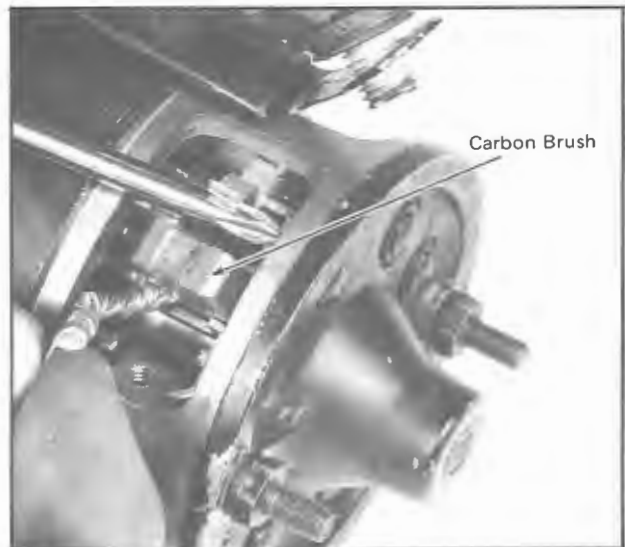
3-5-1

2. Disconnect the winding connection at the starter solenoid switch (fig. 3-5-2).



3-5-2

3. Use a hook and lift the springs pressing the carbon brush onto the commutator. Pull the carbon brushes from the holders (fig. 3-5-3).



3-5-3

WARNING: Do not bend the springs to either side nor pull the brushes out more than necessary or the soldering may be damaged.

4. Remove the three (3) screws and washers attaching solenoid switch assembly to drive end bracket (fig.3-5-4).

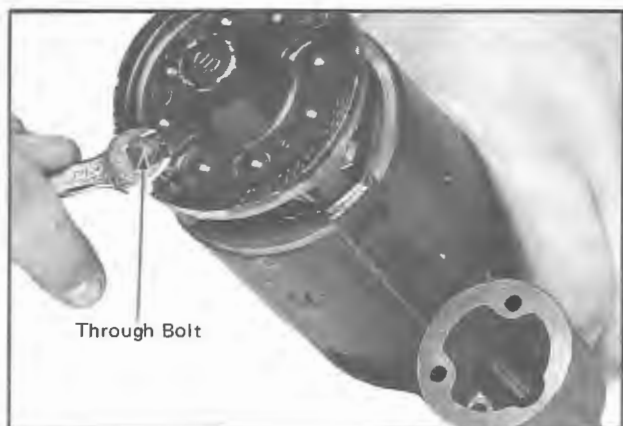


3-5-4

5. Unhook the solenoid from the solenoid shift lever and remove the solenoid.

6. Unscrew and remove the two (2) through bolts from the commutator end bracket assembly (fig. 3-5-5). Remove commutator end bracket assembly and starter housing.

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.



3-5-5

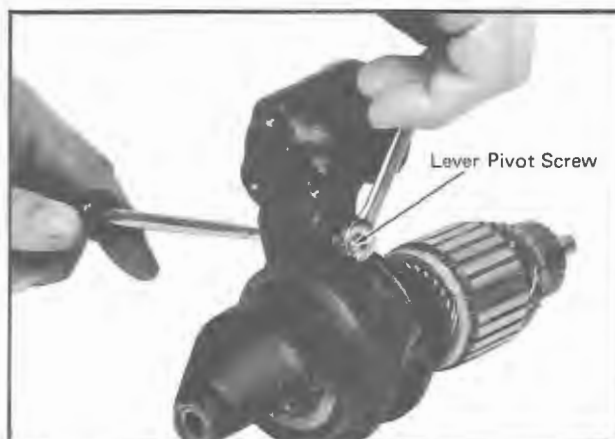
7. Remove the three (3) washers from commutator end bracket.

NOTE: On Bosch starters, remove helical spring prior to washer removal.

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).



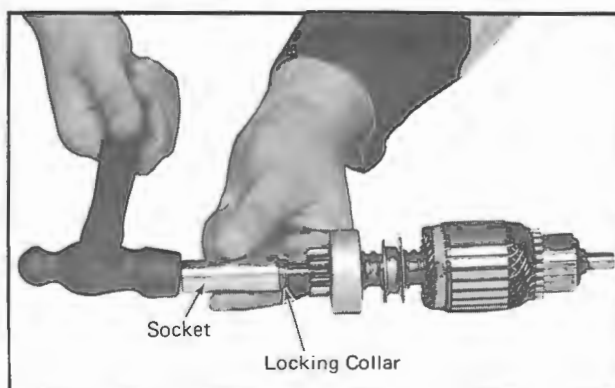
3-5-6

(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).

9. On all MAA starters, remove armature and lever assembly from drive end bracket. Lift the lever from clutch assembly and remove shims from clutch.

NOTE: On both models of starters, do not remove bushings from drive or commutator end bracket, unless damaged and replacement is necessary.

10. Position a socket on the armature shaft adjacent to the 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 drive assembly (clutch) from the armature shaft.

(E) CLEANING

WARNING: 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 with dry, 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 cleaning agents.

4. Immerse all metal components in a clean container of cleaning solution. Dry using a clean, dry cloth.

(F) INSPECTION

1. Examine all components for mechanical damage and wear.
2. Test armature as detailed in sub-section 3-4.
3. Visually check general condition of commutator. If commutator requires turning, cut down the insulation between bars with a commutator under-cutter, then finish to turn the commutator.
4. Check for good solder joints between commutator bars and solder lugs.

5. Test armature again for grounding and winding shorts as detailed in sub-section 3-4.

6. Test field windings and the insulated brush holders for ground shorts as detailed in sub-section 3-4. The windings must not be burnt or unsoldered. Nor should they protrude over the pole shoes.

7. Test field winding for continuity. Check in particular all connections as detailed in sub-section 3-4. Replace damaged field coil.

8. 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).

9. Replace drive assembly if damaged or worn.

10. Inspect starter solenoid for damage or wear. Test solenoid operation as detailed in sub-section 3-4. Replace as necessary.

(F) 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 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.

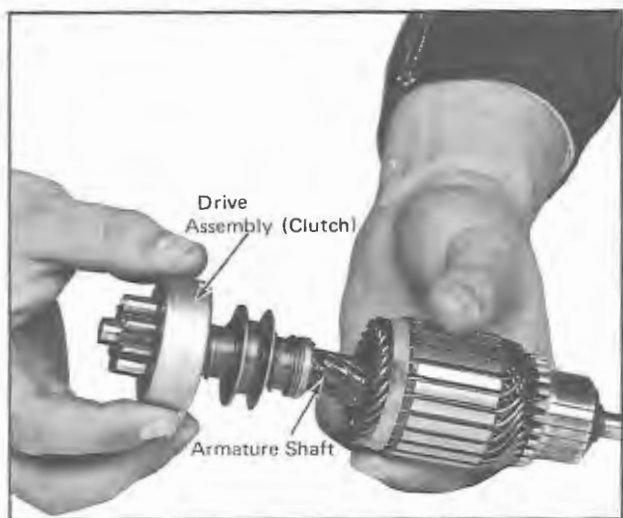
SYMPTOM	CAUSE	REMEDY
When starting, the starter shaft does not turn or turns too slowly.	<ol style="list-style-type: none"> 1. Battery discharged. 2. Battery defective (cracked casing, damaged or loose posts). 3. Loose or bad ground connection. 4. Battery poles and/or cable terminals oxidized. 5. Starter terminals or brushes shorted to ground. 6. Starter carbon brushes are not sitting on the commutator or clamped in their guides. 7. Starter carbon brushes worn, broken or dirty. 8. Ignition switch damaged or burnt (loose parts so that switch does not make contact). 9. Starter solenoid damaged. 10. Voltage drop across battery cables. 	<ol style="list-style-type: none"> 1. Charge battery, refer to sub-section 3-6 and check rectifier (fuse, diode) sub-section 3-4. 2. Replace battery. 3. Tighten cable terminals. 4. Clean as detailed in sub-section 3-4. 5. Check as detailed in sub-section 3-4. 6. Check seating and security of carbon brushes. 7. Clean or replace brushes and brush holders, refer to Paragraph (E). Replace defective component(s). 8. Verify operation of switch as detailed in sub-section 3-4. 9. Check as detailed in sub-section 3-4. 10. Check condition and connections of cables.
Armature turns, but drive assembly does not engage.	<ol style="list-style-type: none"> 1. Defective solenoid. 2. Drive assembly (clutch) dirty. 3. Drive assembly (clutch) or engine fly-wheel teeth chipped, burr formation. 	<ol style="list-style-type: none"> 1. Replace solenoid 2. Clean drive assembly (clutch) 3. File off burrs.

SYMPTOM	CAUSE	REMEDY
When switching on, the starter armature turns until it engages and then it stops.	<ol style="list-style-type: none"> 1. Battery is not sufficiently charged. 2. Carbon brush spring pressure too low. 3. Starter solenoid switch defective. 4. Voltage drop across the battery cables or component wiring too large. 5. Drive assembly (clutch) slipping. 	<ol style="list-style-type: none"> 1. Charge battery, refer to sub-section 3-6. 2. Check for worn or damaged carbon brushes and/or springs. Clean or replace defective brushes or springs as detailed in Paragraph (E). 3. Check condition as detailed in sub-section 3-4. 4. Check condition and connection of cables and wiring. 5. Repair or replace drive assembly (clutch)
Starter continues to run after the switch is released.	<ol style="list-style-type: none"> 1. Starter switch does not switch off or the solenoid is stuck. 	<ol style="list-style-type: none"> 1. Immediately disconnect the starter cable at the battery or starter. Repair or replace switch. If solenoid stuck, replace solenoid.
Drive assembly (clutch) does not disengage when the engine starts.	<ol style="list-style-type: none"> 1. Drive assembly or engine starter gear teeth very dirty or damaged. 2. Return spring weak or broken. 	<ol style="list-style-type: none"> 1. Carefully clean or file off the burrs on engine starter gear or drive assembly. 2. Replace defective spring(s).

(G) ASSEMBLY

1. Slide the drive assembly (clutch) onto the appropriate end of the armature shaft (fig. 3-5-8). Push the stop ring into location and place the locking collar in the appropriate armature shaft groove.

NOTE: The drive assembly (clutch) must sit correctly on the armature shaft and move freely without catching or binding.



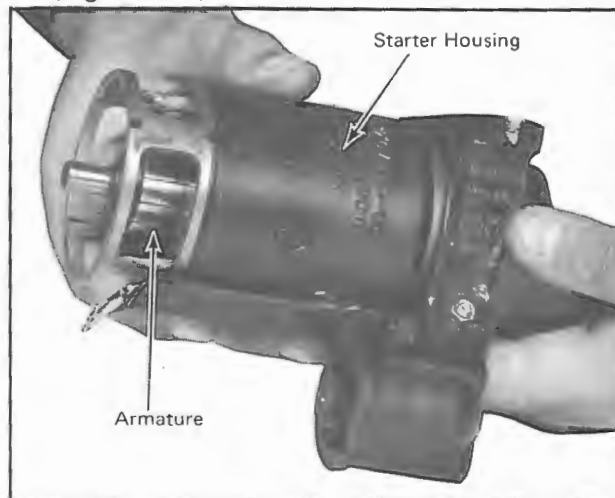
3-5-8

2. On Bosch starters, install armature assembly.
 - (a) Position the solenoid shift lever on drive assembly (clutch) assembly with the lever angle facing the armature.
 - (b) Insert the appropriate number of washers into drive end bracket and position the lever and drive assembly and armature into drive end bracket.
 - (c) Affix the lever to the drive end bracket using pivot screw, washer, bushing and nut.
 - (d) Install profile rubber grommet into drive and bracket.
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.
 - (b) Push the appropriate washer on the clutch side of the armature shaft.

- (c) Insert the lever/drive assembly into drive end bracket.

- (d) Insert the spring holder, two (2) lever springs and the retainer to drive end bracket.

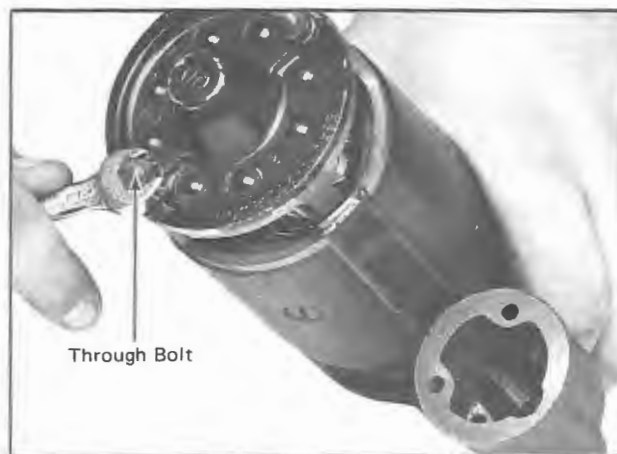
4. Position starter housing over armature (fig. 3-5-9).



3-5-9

5. Correctly place the three (3) washers into commutator end bracket.
6. On Bosch starters, slide the helical spring onto armature shaft.
7. Place the commutator end bracket in location. Insert the through bolts and secure the assembly (fig. 3-5-10).

NOTE: The starter housing and commutator end bracket must adjoin at the commutator end bracket nose and the starter housing groove.



3-5-10

8. Position the solenoid switch in location and affix to the drive end bracket using three (3) screws (fig. 3-5-11). Ensure the solenoid shift lever connects with solenoid.

NOTE: Insert the spring holder, two (2) lever springs and the retainer to drive end bracket.

9. Insert the carbon brushes into the appropriate holders (fig. 3-5-12). Ensure the brush assembly moves freely without catching or binding against the brush wires.

NOTE: When installing the carbon brushes, do not snap the spring onto the brushes.

10. Connect the winding connection to the starter solenoid switch.
11. Position the end closing band in the correct location and affix in position using appropriate screw (fig. 3-5-13).

(H) INSTALLATION

1. Install starter bracket and starter as detailed in Section 2.
2. On two cylinder engines, install engine mount as described in Section 2.
3. Install engine as explained in Section 2.



3-5-11



3-5-12



3-5-13

ELECTRICAL

3-6 BATTERY

(A) GENERAL

Because the battery serves a critical function on all electrical 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.



(B) BATTERY MAINTENANCE

NOTE: The following information is provided for reference in determining battery condition.

A "live", idle and unattended battery is perishable and can result in:

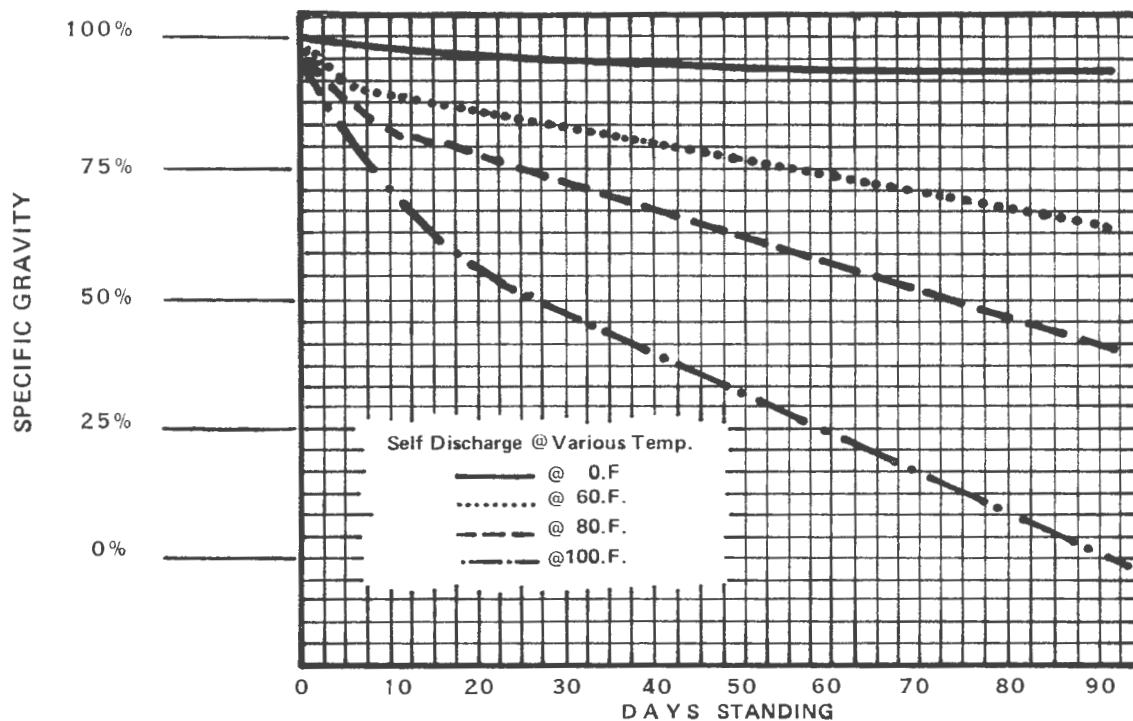
1. Self-discharging, brought upon by internal chemical reactions between the battery materials. A battery exposed to sunlight or heat of any sort while left unattended, will increase self-discharge proportionate to the increasing temperature as shown in figure 3-6-1.
2. Lead sulphate forms on the battery 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.

(C) 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

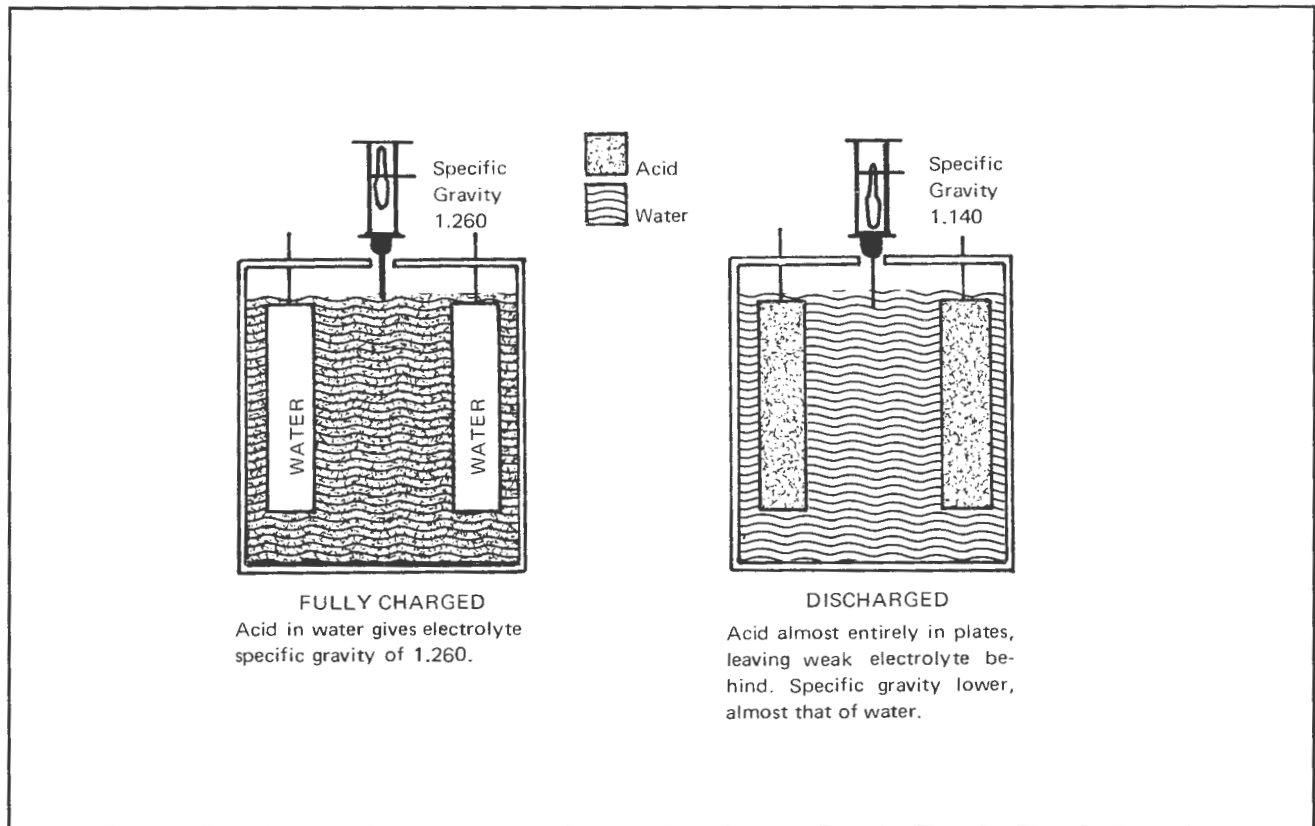


Self-discharge of batteries at various temperatures. The four curves indicate the self-discharge of four batteries kept for 90 days at 0, 60, 80, and 100°F.

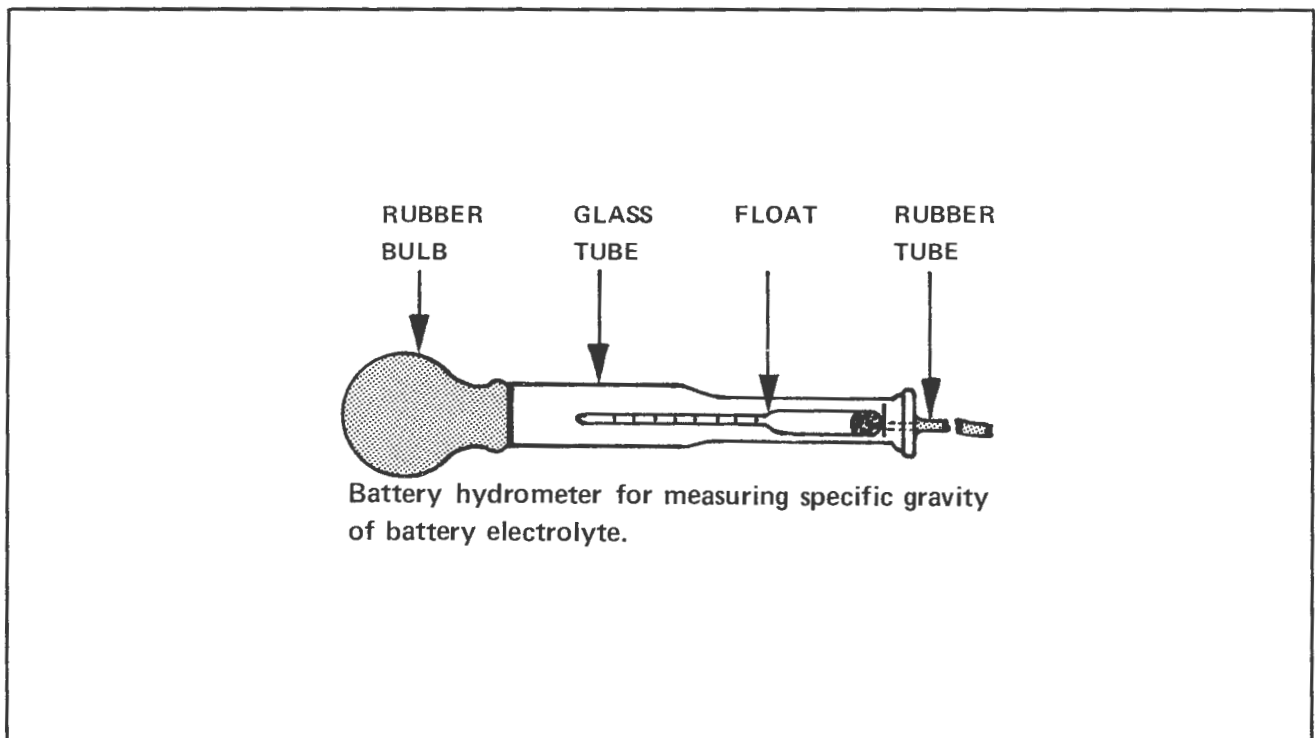
in turn causes a decrease in electrolyte weight. To find the battery's state of charge, use a hydrometer (fig. 3-6-2).

(D) HYDROMETER

A hydrometer measures a battery's state of charge in terms of specific gravity (fig. 3-6-3).



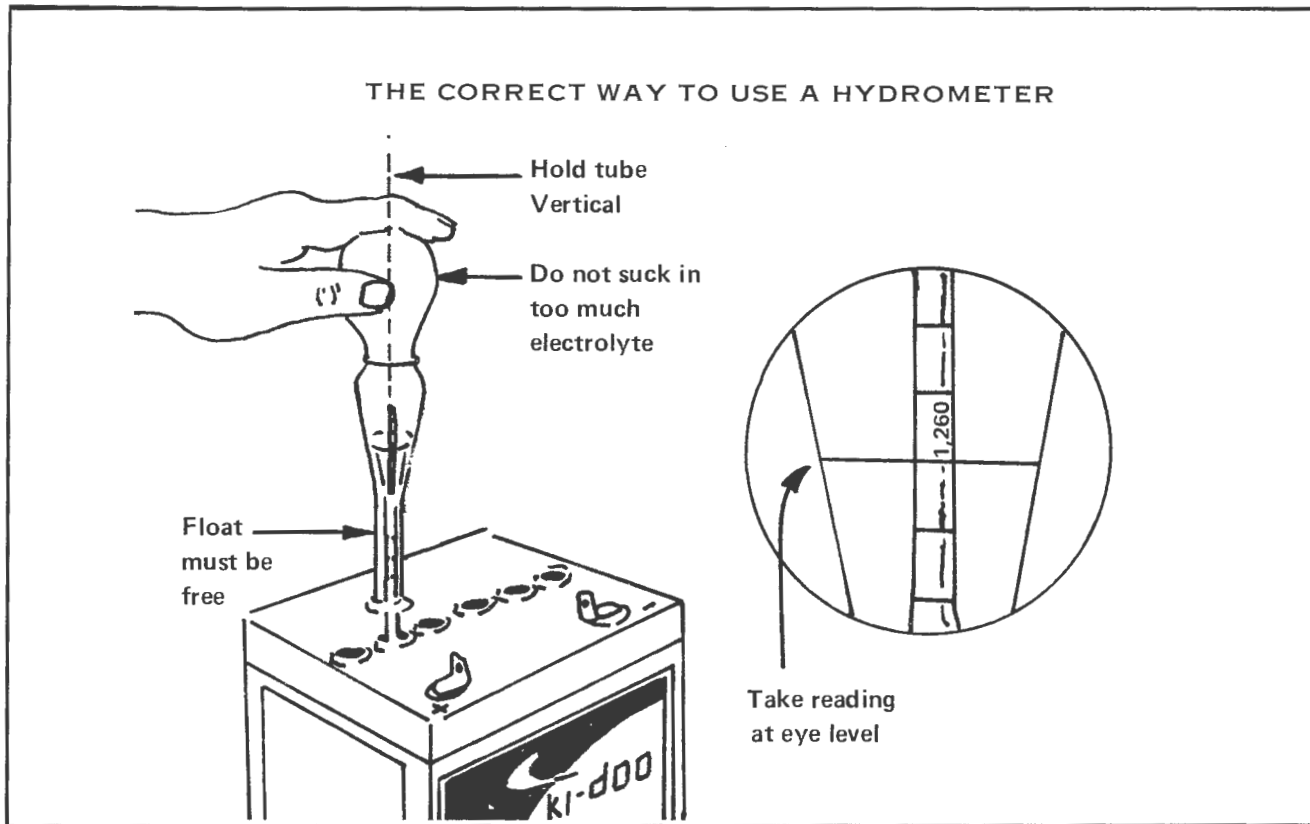
3-6-2



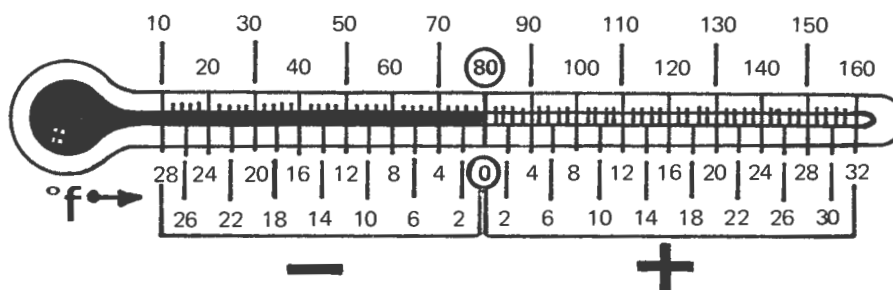
3-6-3

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. 3-6-4).



THIS ILLUSTRATION WILL AID YOU TO FIND THE CORRECT READING



EXAMPLE NO. 1 —
 Temperature below 80°F.
 Hydrometer Reading 1.250
 Acid Temperature 20°F.
 Subtract .024 Sp. Gr.
 Corrected Sp. Gr. is 1.226

EXAMPLE No. 2 —
 Temperature above 80°F
 Hydrometer Reading 1.235
 Acid Temperature 100°F
 Add .008 Sp. Gr.
 Corrected Sp. Gr. is 1.243

CAUTION: Do not install a partially charged battery on a snowmobile since it may crack at a freezing temperature. The following chart (fig. 3-6-5) shows the freezing point of the electrolyte in relation to the battery's state of charge.

(E) 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. On all Nordic and 1970 Olympique models, push the positive cable through the appropriate orifice in backrest.
3. Remove the two (2) battery screw nuts and bolts. Lift the battery cover from the battery and remove battery from vehicle.

NOTE: On models with removable battery seat, remove battery screws and washers and lift the battery seat from vehicle.

4. Disconnect positive cable from electric starter, disconnect negative cable from vehicle frame.

(F) CLEANING

1. Clean the battery cover and seat of all external grease and grime using a clean, dry cloth.

2. Clean 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.

3. Remove corrosion from battery cable terminals and battery posts using a firm copper brush.

(G) INSPECTION

1. Inspect battery cables for damage, bare or poorly connected terminals. Replace or resecure as required.
2. Visually inspect battery casing for cracks or other possible damage. If casing is damaged replace the battery.
3. Inspect battery posts for security of mounting. Replace battery as required.
4. Inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace defective part(s).
5. 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.
6. Visually inspect battery cover and/or seat for corrosion or distortion. Straighten or replace as required.
7. Test battery using a Merc-O-Tronic Analyzer as detailed in sub-section 3-4

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

8. Visually inspect electrolyte level in each cell. "Top up" to required level as detailed in Paragraph (J) step Two.

(H) INSTALLATION

1. On vehicles incorporating a removable battery seat, insert the two (2) battery screws through battery seat. Position the seat in location and bolt battery seat to the frame using two bolts.
2. Connect negative cable to frame.
3. Position battery on battery seat as follows:
 - (a) On vehicles where the battery is located in backrest, position the battery so that the negative post is on right hand side of backrest.
 - (b) On vehicles where the battery is positioned on the front of frame, the negative post must be on vehicle seat side of battery seat.
4. Position battery cover in location and secure using two (2) washers and nuts.
5. Attach the positive cable to electric starter and battery post marked plus (+).

NOTE: On vehicles with battery installed in backrest, the positive cable must pass through appropriate orifice in the backrest prior to battery post attachment.

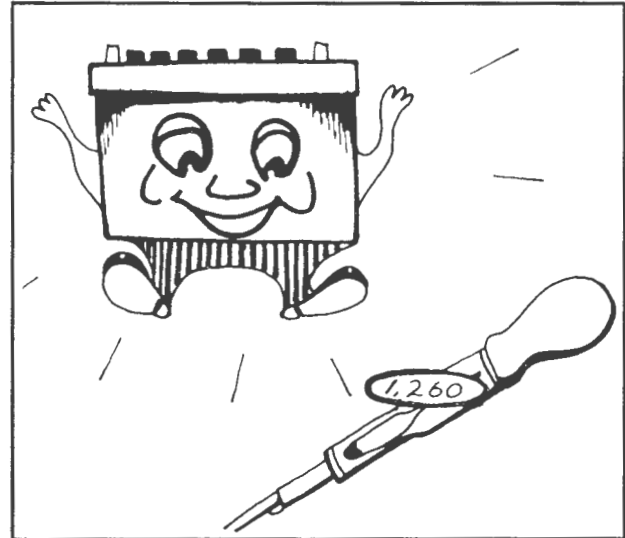
6. Pass the negative cable around positive cable as illustrated in Section 2., figure 2-2-57, and connect the negative cable to battery post marked minus (-).

CAUTION: Ensure that neither the positive or negative cables touch the muffler.

7. Apply L.P.S. No. 1 Metal Protector on battery terminals. If unavailable, use petroleum jelly.

(J) SEVEN STEPS OF BATTERY STORAGE

Step One — After disconnecting and removing the battery from the vehicle refer Paragraph (E), check specific gravity of each cell with a hydrometer. Cells should give uniform reading of 1.260 if battery is fully charged (fig. 3-6-6).

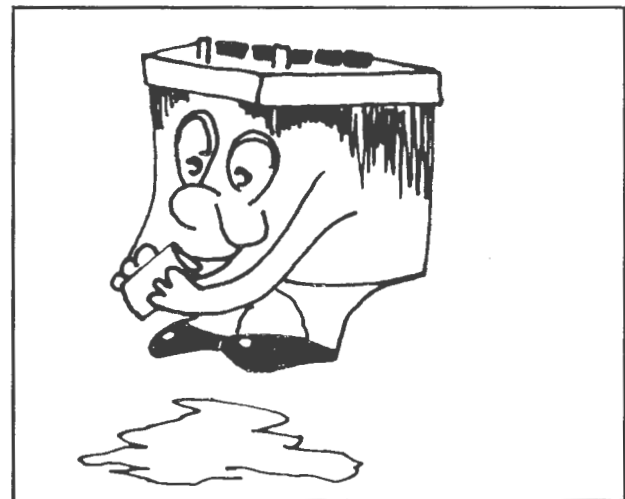


3-6-6

Step Two — Check electrolyte in each cell and add distilled water (if unavailable, drinkable tap water), as necessary (fig. 3-6-7).

CAUTION: Do not over fill bottom of vent wells.

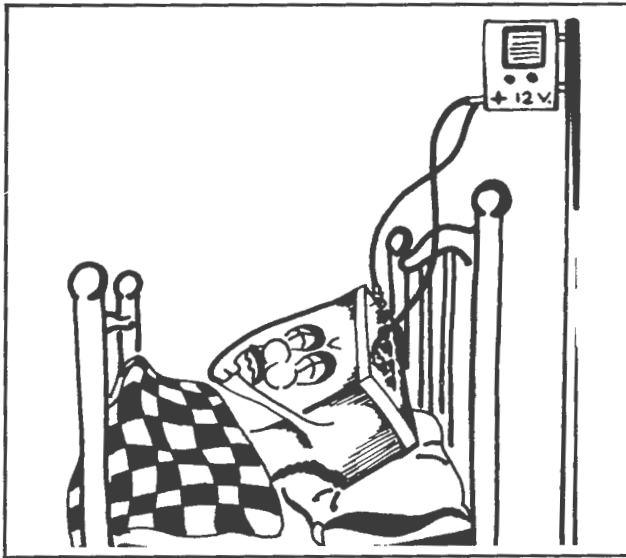
NOTE: Accurate electrolyte readings can only be taken after the cell fluids are thoroughly mixed, i.e. after charging.



3-6-7

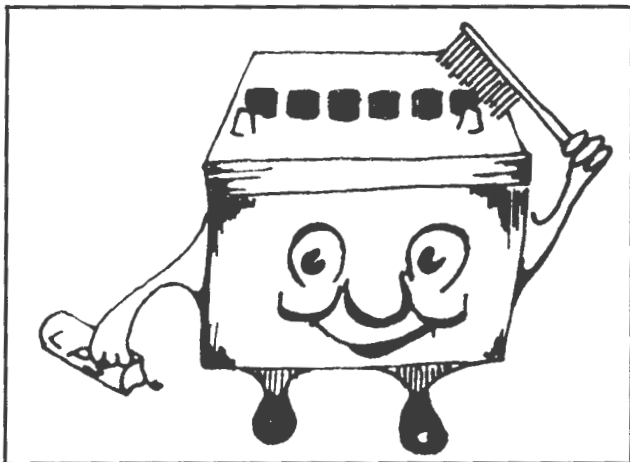
Step Three — Charge the battery fully. Using a 12 volt charger (5 amps) or trickle charger until 1.260 specific gravity readings are achieved (fig. 3-6-8).

CAUTION: Battery electrolyte must not exceed 120°F.



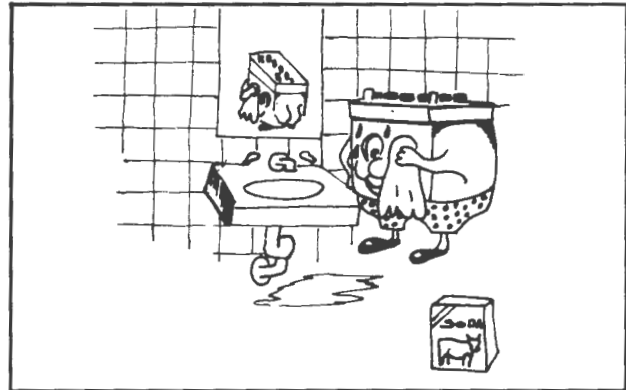
3-6-8

Step Four — Clean battery terminals and cable connections with a copper brush then apply light coat of L.P.S. No. 1 Metal Protector (if unavailable use petroleum jelly (fig. 3-6-9).



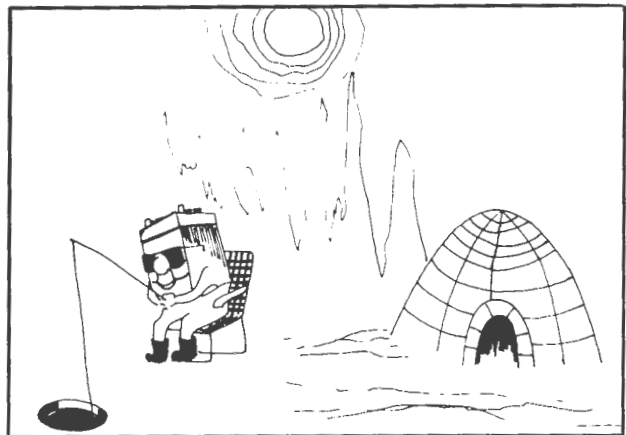
3-6-9

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 (fig. 3-6-10).



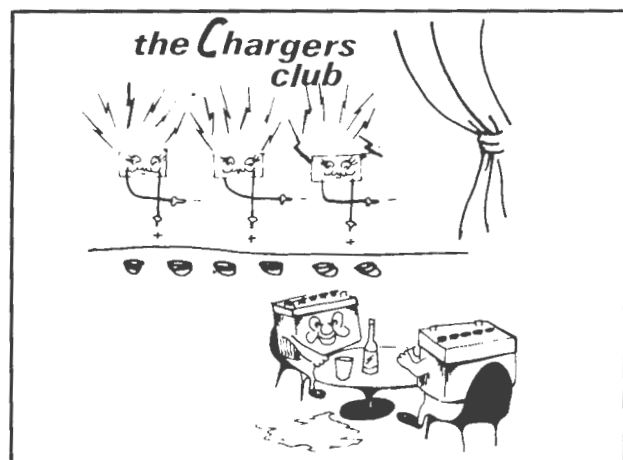
3-6-10

Step Six — Store battery in a cool, dry place as these conditions reduce self-discharging and fluid evaporation to a minimum (fig. 3-6-11).



3-6-11

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) (fig. 3-6-12).



3-6-12

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BODY AND FRAME

GENERAL

This section is divided into two (2) sub-sections: Components included in sub-section 4-1 (Body) are the cab, the console, the backrest and the seat. Although all vehicles incorporate a cab and a seat, not all Ski-Doo snowmobiles have a console or a backrest. Table 1 lists the vehicles on which these components are standard equipment and are considered removable items for repair and replacement.

Table 1 — APPLICABLE COMPONENT LIST

MODEL	YEAR	COMPONENT			
		CONSOLE	BACKREST	RETRACTABLE	TILT CAB
Olympique 12/3	1		✓		
335 & E		✓	✓	✓	
399		✓	✓	✓	
Nordic 399 & E	9	✓	✓	✓	✓
640E		✓	✓	✓	✓
Skandic 335					
T'NT 292	7				
T'NT 340				✓	
399				✓	
640	0			✓	
Alpine 399 & E					
Invader 640E					
Elan 250 & E	1	✓			✓
Olympique 300		✓		✓	✓
335 & E		✓	✓	✓	✓
399 & E	9	✓	✓	✓	✓
Nordic 399 & E			✓	✓	✓
640E			✓	✓	✓
Skandic 335	7				✓
T'NT 292					✓
340					✓
440	1				✓
640					✓
775					✓
Valmont/ 399 & E		✓	✓		
Alpine 640E		✓	✓		

Also included in this sub-section are polycarbonate and fiberglass repair procedures which are applicable to either the cab, the console and the backrest. All retractable headlight housings are fabricated of polycarbonate material. Table 2 details the type of material of which each cab is manufactured.

Table 2 — CAB MATERIAL

MODEL	YEAR	MATERIAL
Nordic 399 and 399E	1970	Polycarbonate
All Other Models	1970	Fiberglass
Elan	1971	Fiberglass
Olympique	1971	Polycarbonate
Nordic 399 and 399E	1971	Polycarbonate
Nordic 640E	1971	Fiberglass
Skandic 335	1971	Fiberglass
T'NT	1971	Fiberglass
Alpine/Valmont	1971	Fiberglass

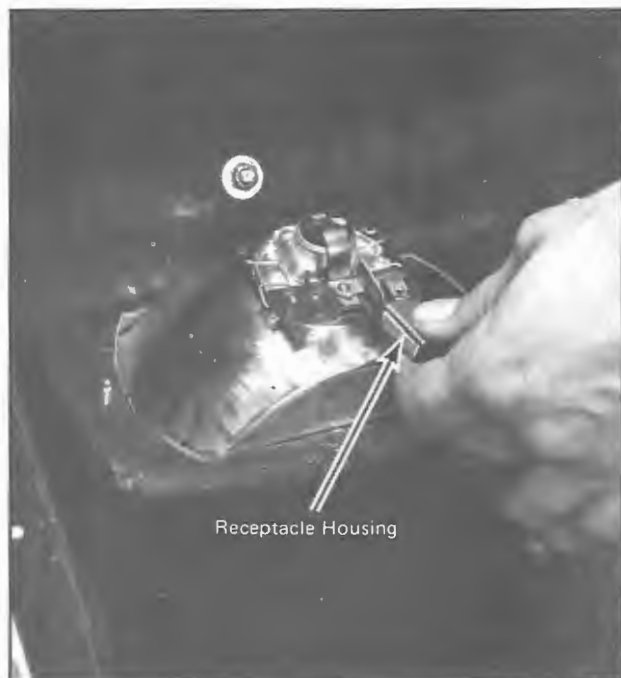
The sub-section titled "Frame" encompasses such components as the fuel tank, handles, bumpers, reflectors, engine carriage bolts and similar items.

4-1 BODY

4-1-1 CAB (All Elan Models)

(A) REMOVAL

1. Open cab latches and tilt cab forward.
2. Disconnect receptacle housing from terminals of headlight socket (fig. 4-1-1).



4-1-1

3. Remove the three (3) bolts, washers and nuts attaching cab to vehicle (fig. 4-1-2). Remove cab from hinge and place cab beside vehicle.



4-1-2

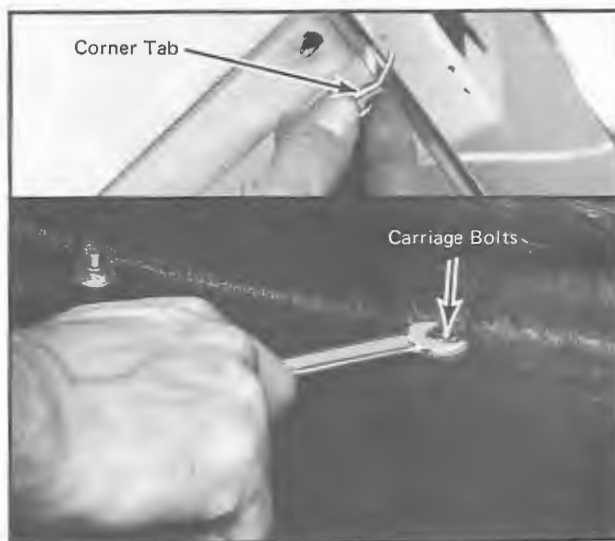
4. From exterior side of cab, turn right hand screw attaching headlight assembly and retaining cable to cab (fig. 4-1-3). Remove speed nut and cable on interior of cab. Place detached cable on vehicle.



4-1-3

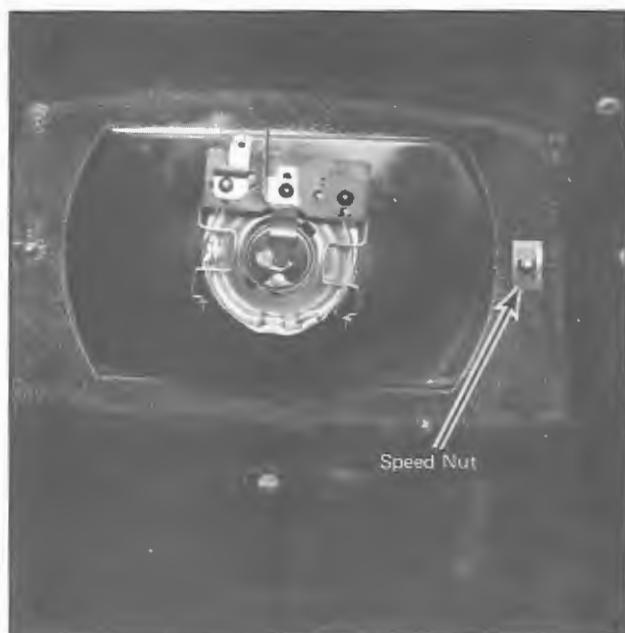
(B) DISASSEMBLY

1. Remove the windshield assembly from cab by unscrewing nine (9) nuts. Remove nuts washers, carriage bolts and two (2) corner tabs (fig. 4-1-4).



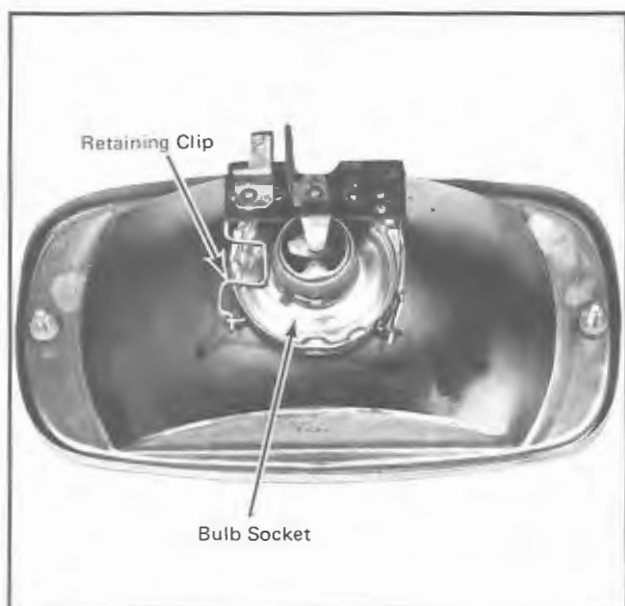
4-1-4

2. Remove the protector from windshield.
3. From exterior side of cab, turn screw and remove remaining installed speed nut. Remove nut from interior of cab. Remove assembled headlight (fig. 4-1-5).



4-1-5

4. Remove the bulb socket from reflector by lifting the retaining clips (fig. 4-1-6).



4-1-6

5. Remove light bulb from socket with a slight counterclockwise twist and pull out light bulb.
6. Remove two (2) washers installed on each screw securing headlight. Remove screws.

NOTE: The components of the headlight assembly consisting of a chrome ring, a

lens with a rubber ring and a reflector are attached together with two (2) sleeve rivets. Rivets can be drilled out to replace defective component(s).

7. The following table includes components that need not be removed from the cab during disassembly procedure unless damaged and/or disfigured. If replacement is required, refer to table for method of attachment and removal operation.

COMPONENT	ATTACHMENT	REMOVAL OPERATION
Louvre (2)	Speed nuts	Use pliers
Identification plate	Speed nuts	Use pliers
Identification label	Adhesive back	Pull off
Plate and reflector (2)	Speed nuts	Use pliers
Ski-Doo label	Adhesive back	Pull off
Stripe (2)	Adhesive back	Pull off
Latch (2)	Pop rivets	Use 1/8" drill
Hinge	Pop rivets	Use 1/8" drill

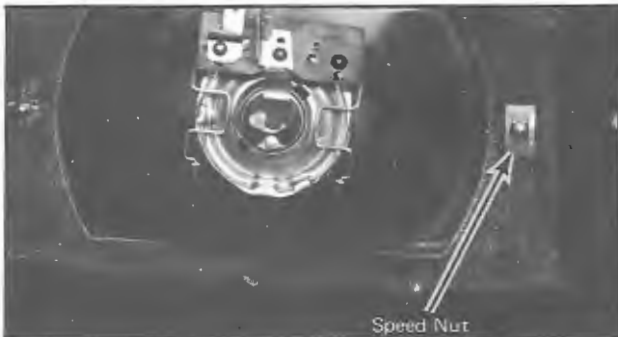
(C) ASSEMBLY

1. Prior to Assembly procedure ensure all components are clean of all dirt and all damaged parts have been repaired or replaced. Refer to Paragraph 4-1-11 for Cleaning procedures.
2. Carry out Inspection procedures as detailed in Paragraph 4-1-12.
3. Install the light bulb into the socket with a slight push and clockwise twist.
4. Install socket assembly into reflector and secure by closing the retaining clips. Ensure that socket terminals are pointed in opposite direction to word TOP on lens.
5. Install two (2) washers on each of the two (2) headlight attachment screws.

NOTE: If any component (lens, rings and/

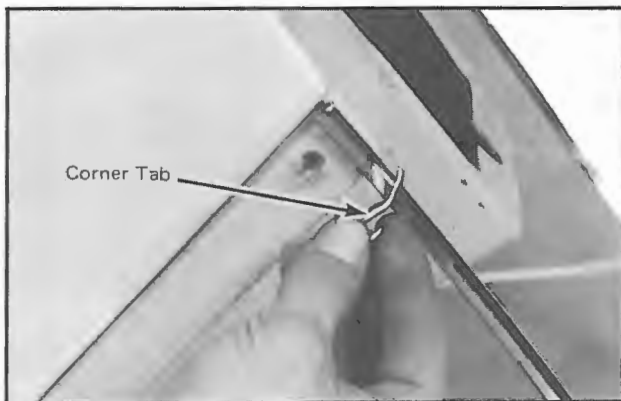
or reflector) of the headlight assembly was replaced and sleeve rivets were drilled out, assemble lens with rubber ring and reflector to chrome ring using previously removed screws and four (4) washers.

Position headlight assembly in cab aperture. Secure with one (1) speed nut installed on screw on left hand side of headlight mounting location (fig. 4-1-7).



4-1-7

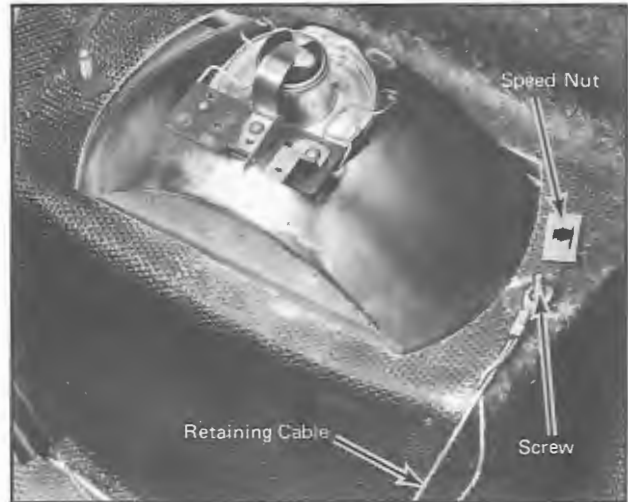
6. Install protector on windshield. Secure windshield to the cab with nine (9) carriage bolts, washers, nuts and two (2) corner tabs (fig. 4-1-8).



4-1-8

(D) INSTALLATION

1. Position cab in location on vehicle. Secure cab hinge to vehicle hinge using three (3) bolts, washers and nuts.
2. Attach the retaining cable on screw on the right hand side of headlight mounting location and secure with a new speed nut (fig. 4-1-9).



4-1-9

3. Connect the receptacle housing to the headlight socket terminals.
4. Close the cab and hook the cab latches.
5. Check headlight adjustment as detailed in Paragraph 4-1-13.

4-1-2 CAB (All 1970 Olympique 12/3 and T'NT 292 Models)

(A) REMOVAL

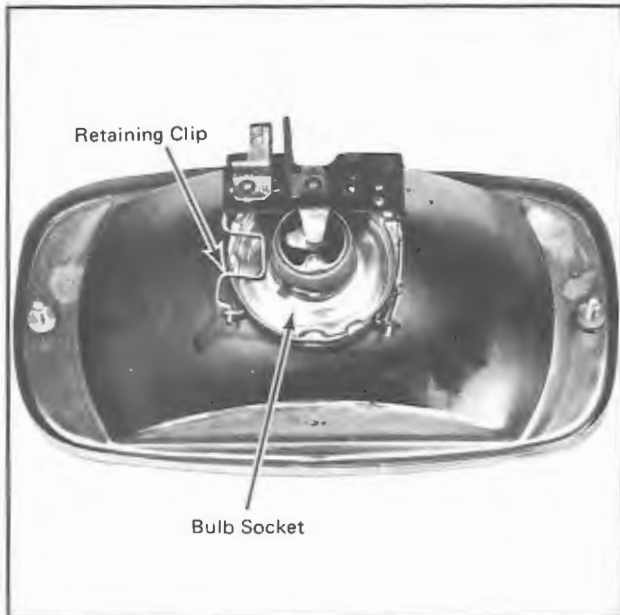
1. Remove fuel tank filler cap.
2. Disconnect the electrical quick connector.
3. On T'NT 292 models disconnect speedometer cable from instrument.
4. Unhook four (4) side latches and remove cab from vehicle.

(B) DISASSEMBLY

1. Using pliers, straighten the windshield anchor tabs from under the cab and remove windshield from cab. Remove the rubber strip and anchor tabs from the windshield. Remove the windshield protector.
2. Disconnect the receptacle housing from terminals of headlight socket.
3. From exterior side of cab, turn screws

attaching headlight assembly to cab. Remove speed nuts from interior of cab and remove headlight.

4. Remove the bulb socket from reflector by lifting the retaining clips (fig. 4-1-10).

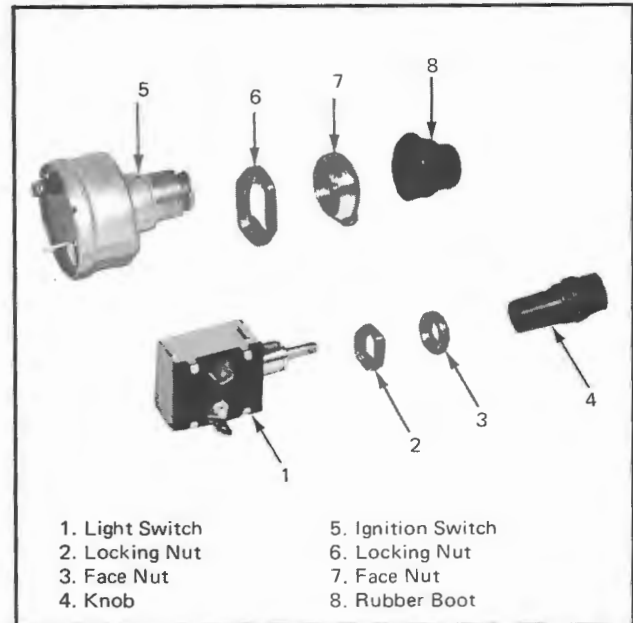


4-1-10

5. Remove light bulb from socket with a slight counterclockwise twist and pull out light bulb.
6. Remove two (2) washers installed on each screw securing headlight. Remove screws.

NOTE: The components of the headlight assembly consisting of a chrome ring, a lens with a rubber ring and a reflector, are attached together with two (2) sleeve rivets. Rivets can be drilled out to replace damaged component(s).

7. Disconnect the switch blocks from ignition and light switches. Remove knob, loosen rear locking nut and remove face nut attaching light switch to dash panel. Remove switch. Remove rubber boot, loosen rear locking nut and remove face nut securing ignition switch to dash panel. Remove ignition switch (fig. 4-1-11).



4-1-11

8. On T'NT 292 model, remove the nut securing the tachometer "U" clamp to cab. Remove "U" clamp and push out the instrument from the dash panel.
9. On T'NT 292 model, remove the nut securing the speedometer "U" clamp to cab. Remove "U" clamp, inner ring and push out the instrument from the dash panel.

NOTE: Do not remove speedometer shock absorber from dash panel unless damaged and replacement is necessary.

10. The following table includes components that need not be removed from the cab during disassembly procedure unless damaged and/or disfigured. If replacement is required, refer to table for method of attachment and removal operation.

COMPONENT	ATTACHMENT	REMOVAL OPERATION
Latch (4)	Pop rivets	Use 1/8" drill
Filler tank neck grommet	Slotted edge	Pull out
Louvre (2)	Speed nuts	Use pliers
Stripe	Adhesive back	Pull off

(C) ASSEMBLY

1. Prior to Assembly procedure ensure all components are clean of all dirt and all damaged parts have been repaired or replaced. Refer to Paragraph 4-1-11 for Cleaning procedures.
2. Carry out Inspection procedures as detailed in Paragraph 4-1-12.
3. On T'NT 292 model, insert the tachometer into appropriate hole of dash panel. Secure instrument and "U" clamp in location with a nut.
4. On T'NT 292 model, insert the speedometer into hole of dash panel. Position inner ring and "U" clamp. Secure instrument and "U" clamp with a nut.
5. Place the ignition and light switches in appropriate holes of dash panel. Tighten each front face nut and secure each switch with a rear locking nut. Screw knob onto light switch. Install rubber boot on ignition switch.
6. Connect switch blocks to ignition and light switches.
7. Install two (2) screws and four (4) washers on headlight assembly.

NOTE: If any component (lens, rings and/or reflector) of the headlight assembly was replaced and sleeve rivets were drilled out, assemble lens with rubber ring and reflector to chrome ring using previously removed screws and four (4) washers.

8. Install the light bulb into the socket with a slight push and clockwise twist.
9. Install socket assembly into the reflector and secure by closing the retaining clips. Ensure that socket terminals are pointing in opposite direction of word TOP on lens.

10. Position headlight assembly in cab aperture. Secure with two (2) speed nuts.
11. Connect the receptacle housing to the terminals of the headlight socket.
12. Install anchor tabs to windshield. Install protector and rubber strip to windshield.
13. Apply liquid soap into cab groove and position the windshield in location on cab.
14. Starting at center section, secure the windshield by bending the anchor tabs.

(D) INSTALLATION

1. Position the cab on the vehicle.
2. Connect the electrical quick connector.
3. On T'NT 292 model, connect speedometer cable to instrument.
4. Close interior side latches and install fuel tank filler cap.
5. Check headlight adjustment as detailed in Paragraph 4-1-13.

4-13 CAB (All 1970 Olympique 335, 335E, 399 and T'NT 340 Models)**(A) REMOVAL**

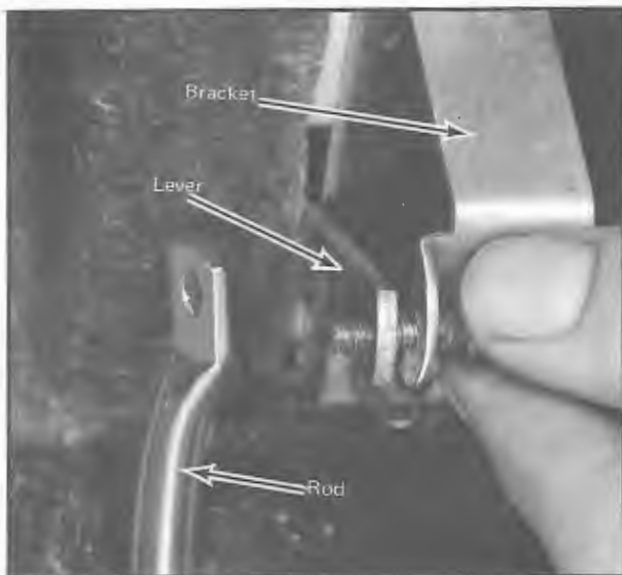
1. Remove fuel tank cap.
2. Disconnect the electrical quick connector.
3. On T'NT 340 model, disconnect the speedometer cable at instrument.
4. Open the four (4) cab latches and remove cab from vehicle.

(B) DISASSEMBLY

1. Using pliers, straighten the nine (9)

windshield anchor tabs from under the cab and remove windshield from cab.

2. Remove the rubber strip and anchor tabs from the windshield. Remove the windshield protector.
3. Remove headlight mechanism using the following procedure:
 - (a) Disconnect receptacle housing from terminals of headlight socket.
 - (b) Remove screw and nut securing control rod to control lever. Remove screw and nut securing control lever to control bracket. Remove control lever from cab. (fig. 4-1-12).

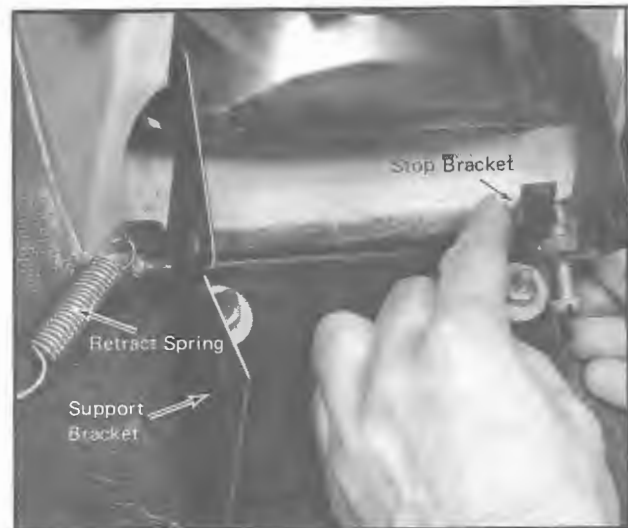


4-1-12

- (c) Remove two (2) cotter pins from other end of control rod and remove control rod from headlight ring.

NOTE: Do not remove adjuster tube from control rod end unless damaged and replacement is necessary.

- (d) Disconnect retract spring from headlight ring support bracket. Remove screws and nuts securing headlight ring to support bracket. Remove stop bracket and assembled headlight from cab (fig. 4-1-13). Remove nut and adjusting screw from ring.



4-1-13

- (e) Lift the retaining clips and remove the socket and bulb from the reflector (fig. 4-1-14). Twist the bulb counterclockwise to remove it from the socket.

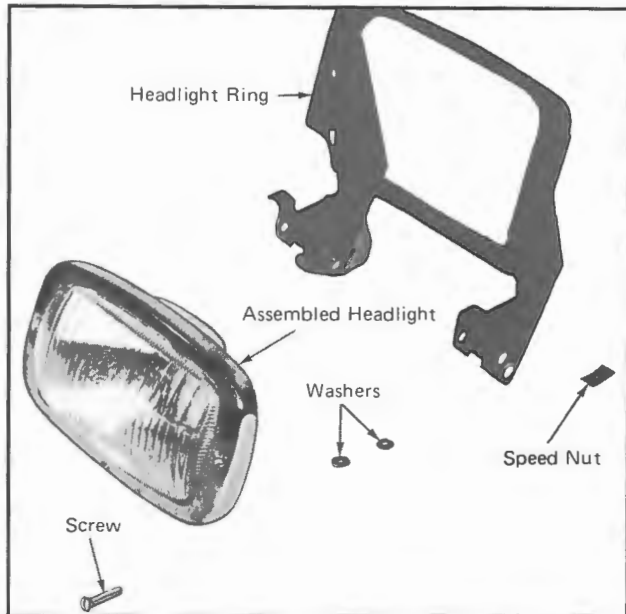


4-1-14

- (f) Remove assembled headlight from ring by removing two (2) screws and speed nuts. Remove two (2) washers from each screw (fig. 4-1-15).

NOTE: The components of the headlight assembly consisting of a chrome ring,

a lens with a rubber ring and reflector are attached by two (2) sleeve rivets. Rivets can be drilled out to replace damaged component(s).



4-1-15

4. Disconnect the switch blocks from ignition and light switches. Using a screwdriver, remove terminals from headlight socket (fig. 4-1-16). Pull harness through hole in headlight housing and from cable clip installed in windshield groove. Remove harness and cable clip.

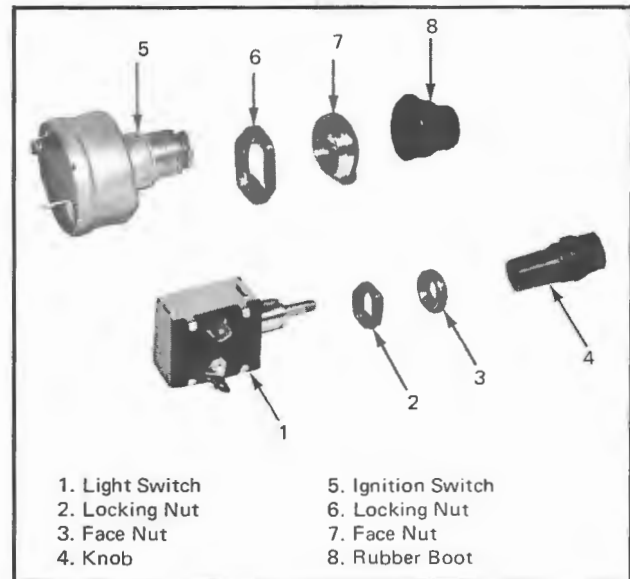
NOTE: On all electric models, disconnect quick connector from rectifier prior to removing harness from cab.



4-1-16

5. Remove light switch by removing knob, loosen rear locking collar and remove front collar. Remove ignition switch by

removing rubber boot. Loosen rear locking nut and remove front face nut (fig. 4-1-17).

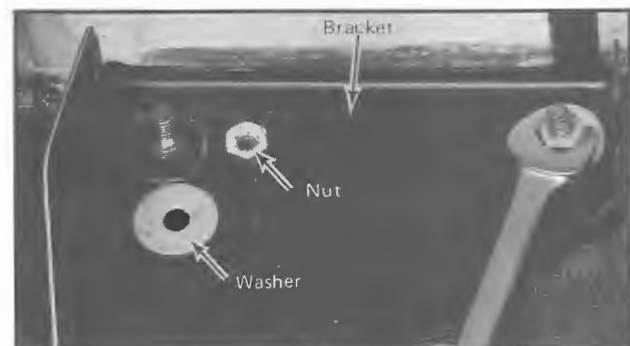


4-1-17

6. On T'NT 340 model, remove the nut securing the tachometer "U" clamp to cab. Remove "U" clamp and push out the instrument from the dash panel.
7. On T'NT 340 model, remove the nut securing the speedometer "U" clamp to cab. Remove "U" clamp inner ring and push out the instrument from the dash panel.

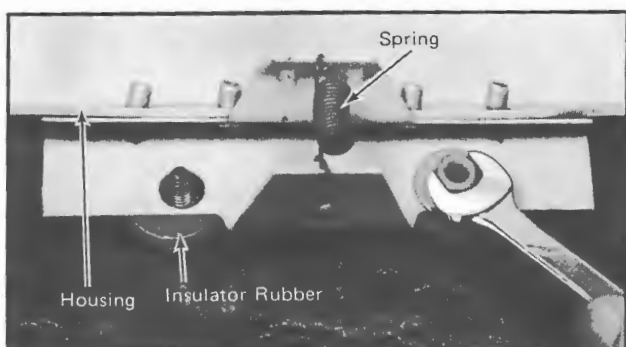
NOTE: Do not remove speedometer shock absorber from dash panel unless damaged and replacement is necessary.

8. Remove headlight ring bracket by removing three (3) nuts and washers. Remove bracket and six (6) insulator rubbers (fig. 4-1-18).



4-1-18

9. Remove the headlight retractable housing by removing two (2) nuts and washers. Remove housing and four (4) insulator rubbers. Disconnect spring connected to housing and hinge (fig. 4-1-19).



4-1-19

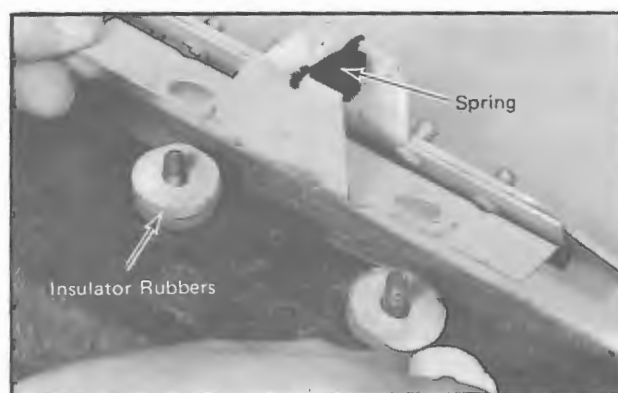
10. The following table includes components that need not be removed from the cab during disassembly procedure unless damaged and/or disfigured. If replacement is required, refer to table for method of attachment and removal operation.

COMPONENT	ATTACHMENT	REMOVAL OPERATION
Latch (4)	Pop rivets	Use 1/8" drill
Side Louvre (2)	Slotted edge	Pull out
Lower Louvre (2)	Speed nuts	Use pliers
Filler neck gap grommet	Slotted edge	Pull out
Stripe	Adhesive back	Pull off
Rectifier (Electric models only)	Two (2) nuts, washers and insulator rubbers	Remove nuts and washer
Control bracket	Pop rivets	Use 1/8" drill
Guide plate	Pop rivets	Use 1/8" drill
Headlight retractable housing hinge	Pop rivets	Use 1/8" drill
Dash panel (2)	Adhesive back	Pull off

(C) ASSEMBLY

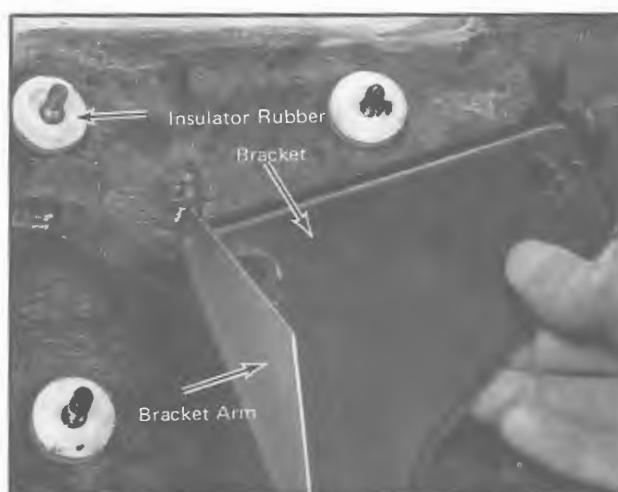
1. Prior to Assembly procedure ensure all components are clean of all dirt and all damaged parts have been repaired or replaced. Refer to Paragraph 4-1-11 for Cleaning procedures.

2. Carry out Inspection procedures as detailed in Paragraph 4-1-12.
3. Connect spring to headlight retractable housing and cab hinge. Position the housing in place on cab. Ensure that housing is seated on lip of cab. Install four (4) insulator rubbers on cab studs (fig. 4-1-20). Secure housing with two (2) washers and nuts. Do not over tighten nuts.



4-1-20

4. Install three (3) insulator rubbers on studs of cab. Place headlight ring bracket in position ensuring that arm of bracket is on left hand side. Secure with three (3) washers and nuts (fig. 4-1-21). Do not over tighten nuts.



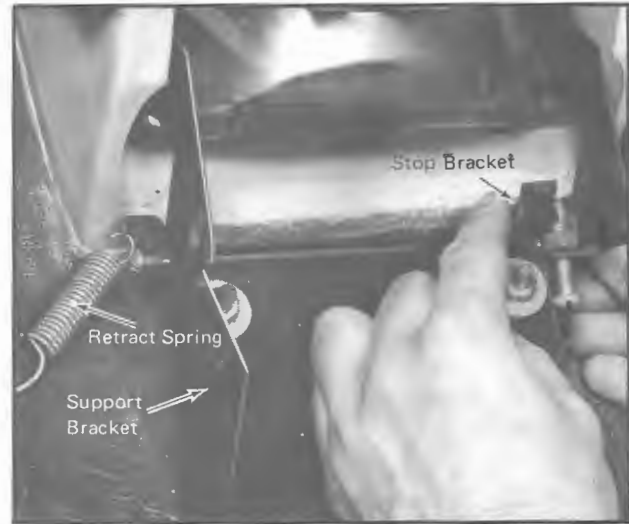
4-1-21

5. On T'NT 340 model, insert the tachometer into appropriate hole of dash panel. Secure instrument and "U" clamp in location with a nut.

6. On T'NT 340 model, insert the speedometer into hole of dash panel. Position inner ring and "U" clamp. Secure instrument and "U" clamp with a nut.
7. Place the ignition and light switches in dash panel. Tighten front face nut and secure with rear locking collar. Screw knob onto light switch. Install rubber boot on ignition switch.
8. Connect switch blocks to ignition and light switches. Install cable clip into groove of cab and pass the electrical harness through the clip and hole in headlight housing. Insert harness terminals into headlight receptacle housing.
9. Install the headlight mechanism using the following procedure:
 - (a) Install two (2) screws and four (4) washers on headlight.

NOTE: If any components (lens, ring and/or reflector) of the headlight was replaced and sleeve rivets were drilled out, assemble lens with rubber ring and deflector to chrome ring using previously removed screws and four (4) washers.

- (b) Install the light bulb into the socket with a slight push and clockwise twist.
- (c) Install socket assembly into reflector and secure by closing the retaining clips. Ensure that socket terminals are pointing in opposite direction of word TOP on lens.
- (d) Secure headlight to headlight ring with two (2) speed nuts.
- (e) Position headlight ring into location on cab.
- (f) Install retract spring into headlight support bracket and headlight ring. Align bracket, ring and stop bracket. Secure the components with two (2) screws and nuts (fig. 4-1-22). Install adjusting screw and secure with a nut.



4-1-22

- (g) Insert control rod through appropriate holes in headlight ring. Rod must be inserted from the left hand side. Secure control rod with two (2) new cotter pins.
- (h) Insert control lever through slot in cab and secure to control bracket with a screw and a nut. Attach control rod to control lever with a screw and a nut (fig. 4-1-23).



4-1-23

10. Connect the receptacle housing to the headlight socket terminals.

11. Install anchor tabs to windshield. Install protector and rubber strip to windshield.
12. Apply liquid soap into cab groove and position the windshield assembly in location on cab.
13. Starting at center section, secure the windshield by bending the anchor tabs.

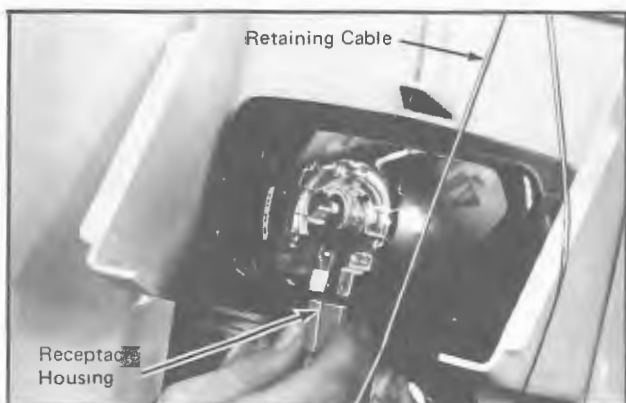
(D) INSTALLATION

1. Position cab on vehicle.
2. On T'NT 340 model, connect the speedometer cable.
3. Connect the electrical quick connector.
4. Close four (4) interior side latches and install fuel tank cap.
5. Check headlight adjustment as detailed in Paragraph 4-1-13.

4-1-4 CAB (All 1971 Olympique Models)

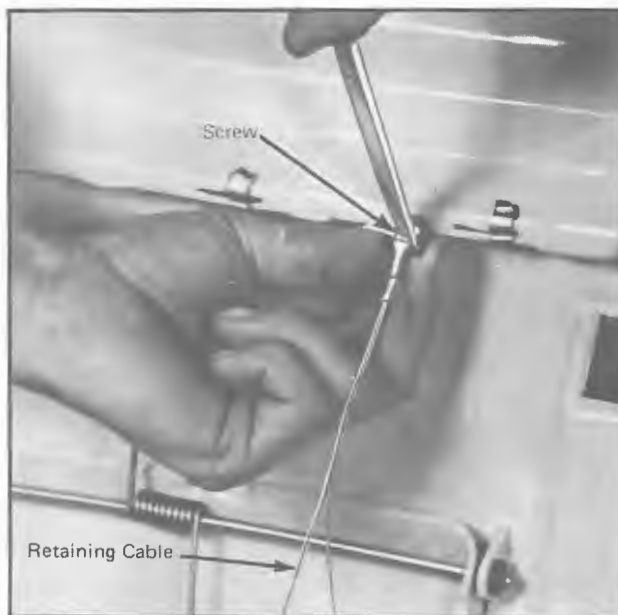
(A) REMOVAL

1. Open cab latches and tilt the cab forward.
2. Disconnect receptacle housing from terminals of headlight socket. Unhook the spring from the retaining cable.
3. Remove the spiral tubing from the retaining cables and brown electrical wiring (fig. 4-1-24).



4-1-24

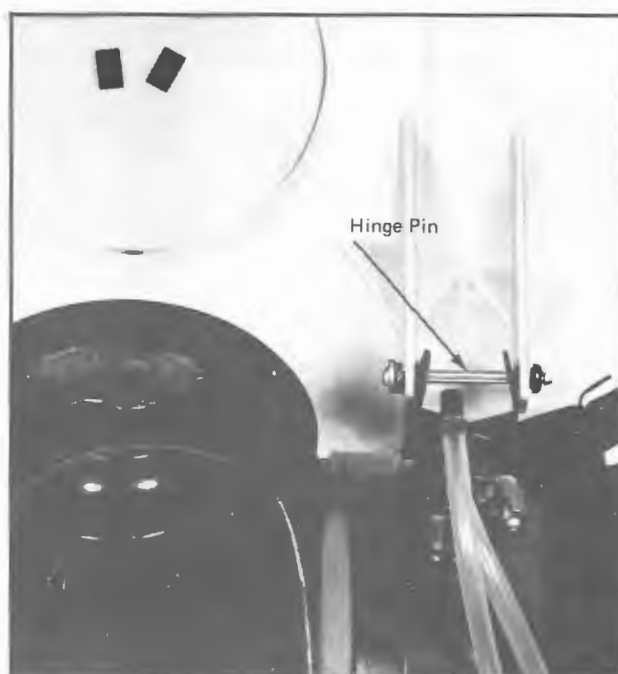
4. Remove the screw securing the retaining cable to retainer pin installed in cab groove (fig. 4-1-25).



4-1-25

5. Remove one (1) retaining clip from each hinge pin. While holding the cab in position, remove the two (2) hinge pins and cab from vehicle (fig. 4-1-26).

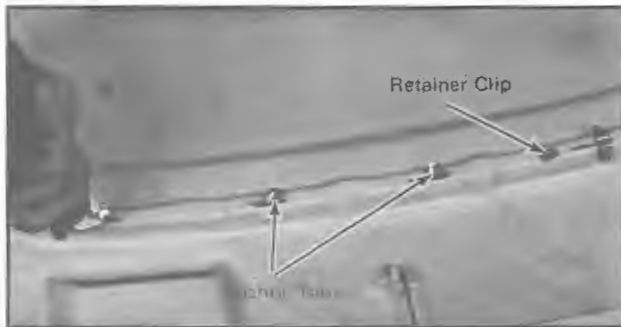
NOTE: Do not remove the four (4) grommets from cab unless damaged and replacement is necessary.



4-1-26

(B) DISASSEMBLY

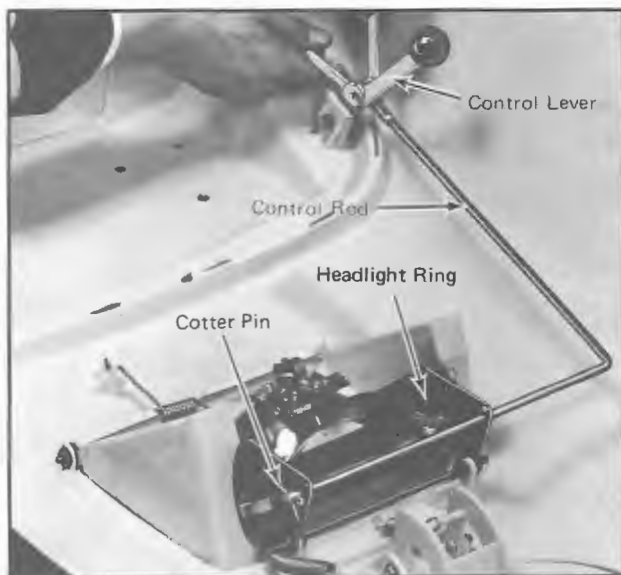
1. Using pliers, straighten the windshield anchor tabs from under the cab and remove windshield from cab (fig. 4-1-27). Remove cable retainer clip from cab groove.



4-1-27

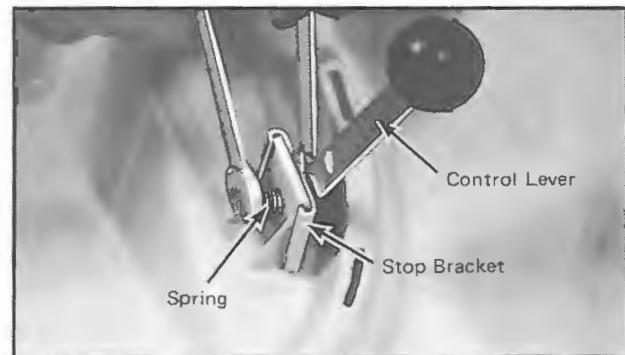
2. Remove the rubber strip and anchor tabs from the windshield. Remove the windshield protector.
3. Remove light mechanism using the following procedure:
 - (a) Remove nut, washer and screw securing control rod to control lever. Remove cotter pins securing control rod to headlamp ring. Remove control rod (fig. 4-1-28).

NOTE: Do not remove adjuster tube from control rod end unless damaged and replacement is necessary.



4-1-28

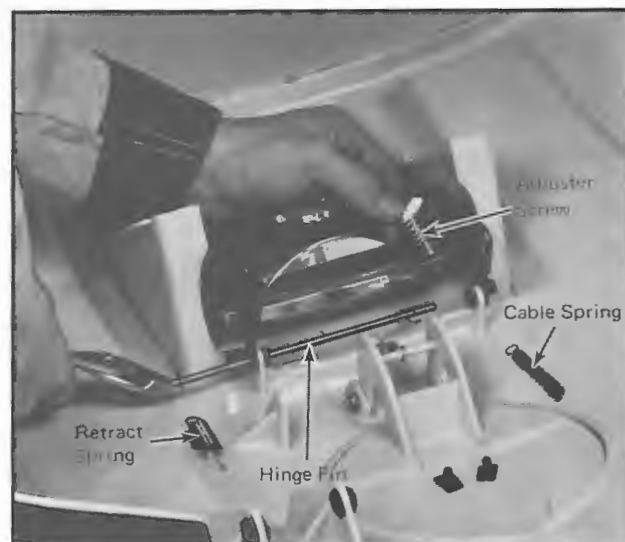
- (b) Remove nut, stop bracket, spring and bolt securing control lever to cab bracket. Remove lever (fig. 4-1-29).



4-1-29

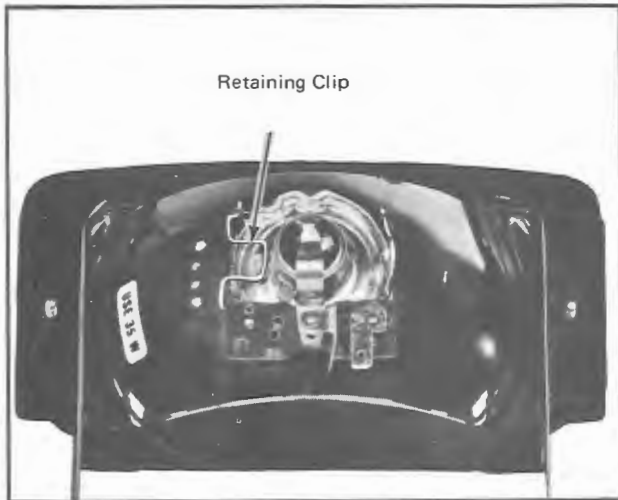
- (c) Disconnect housing retract spring from headlight ring and cab bracket. Remove adjusting screw. Remove one (1) speed nut and withdraw hinge pin from headlight ring. Disconnect retaining cable spring from cab bracket (fig. 4-1-30). Remove headlight assembly and ring from cab.

NOTE: Do not remove rubber grommets from headlight ring unless damaged and replacement is necessary.



4-1-30

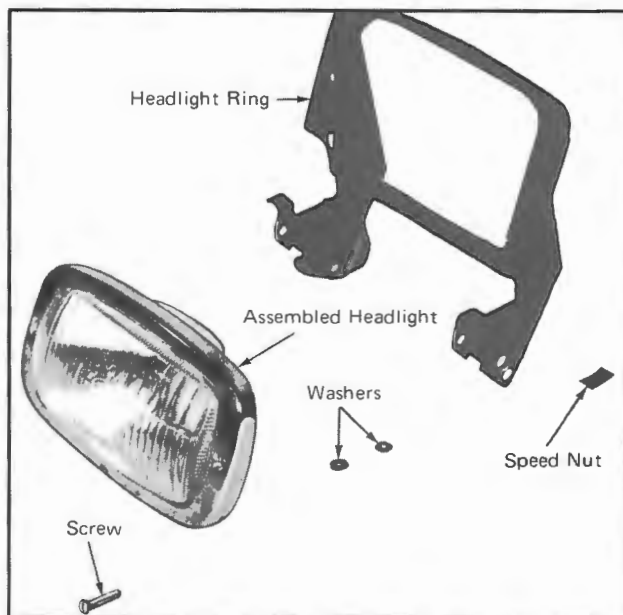
- (d) Lift the retaining clips and remove the socket and bulb from the reflector (fig. 4-1-31). Twist the bulb counterclockwise to remove it from the socket.



4-1-31

- (e) Remove screws and speed nuts securing chrome ring and deflector to the headlamp ring. Remove the four (4) washers (fig. 4-1-32).

NOTE: The components of the headlight assembly consisting of a chrome ring, a lens with a rubber ring and a reflector, are attached together with two (2) sleeve rivets. Rivets can be drilled out to replace damaged component(s).



4-1-32

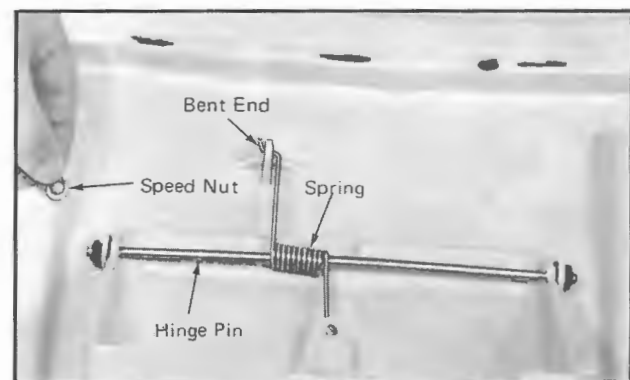
4. Unhook the spring at the filler door and at the cab bracket. Remove the two (2) screws and nuts from the filler door and remove door from cab (fig. 4-1-33).



4-1-33

5. Remove speed nuts from each end of hinge rod securing the headlight housing. Remove hinge rod and spring (fig. 4-1-34). Remove housing from cab.

NOTE: Do not remove grommets from housing unless damaged and replacement is necessary.



4-1-34

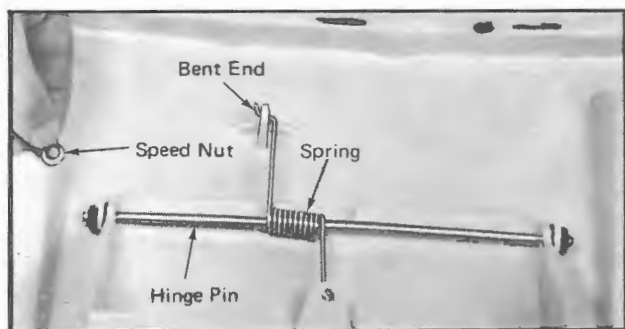
6. The following table includes components that need not be removed from the cab during disassembly procedure unless damaged and/or disfigured. If replacement is required, refer to table for method of attachment and removal operation.

COMPONENT	ATTACHMENT	REMOVAL OPERATION
Identification plate	Speed nut	Use pliers
Identification label	Adhesive back	Pull off
Plate and reflector	Speed nuts	Use pliers
Ski-Doo label	Adhesive back	Pull off
Stripe (2)	Adhesive back	Pull off
Latch (2)	Pop rivets	Use 1/8" drill

(C) ASSEMBLY

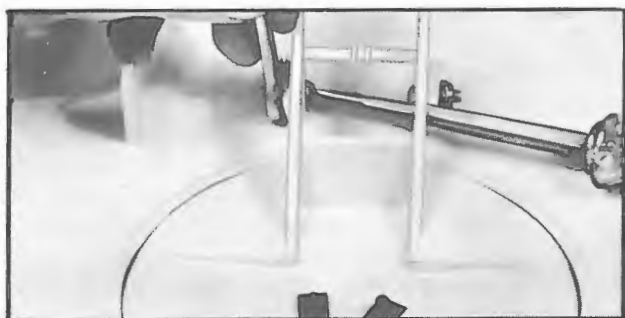
1. Prior to Assembly procedure ensure all components are clean of all dirt and all damaged parts have been repaired or replaced. Refer to Paragraph 4-1-11 for Cleaning procedures.
2. Carry out Inspection procedures as detailed in Paragraph 4-1-12.
3. Position the headlight retractable housing in location on cab. Ensure that housing is seated on lip of cab. Insert the hinge pin through one side of housing. Place spring on hinge rod and insert pin through other side of housing. Secure hinge pin with two (2) new speed nuts (fig. 4-1-35).

NOTE: Spring must be positioned on hinge pin so that bent end can be installed in cab bracket closest to windshield installation position.



4-1-35

4. Hook up the spring to the cab brackets.
5. Secure the filler door to cab brackets with two (2) screws and nuts. Hook retainer spring to door and cab bracket (fig. 4-1-36).



4-1-36

6. Install headlight mechanism using the following procedure:

(a) Install two (2) screws and four (4) washers on headlight assembly.

NOTE: If any component (lens, ring and/or reflector) of the headlight assembly was replaced and sleeve rivets were drilled out, assemble lens with rubber ring and reflector to chrome ring using previously removed screws and four (4) washers.

(b) Install the light bulb into the socket with a slight push and clockwise twist.

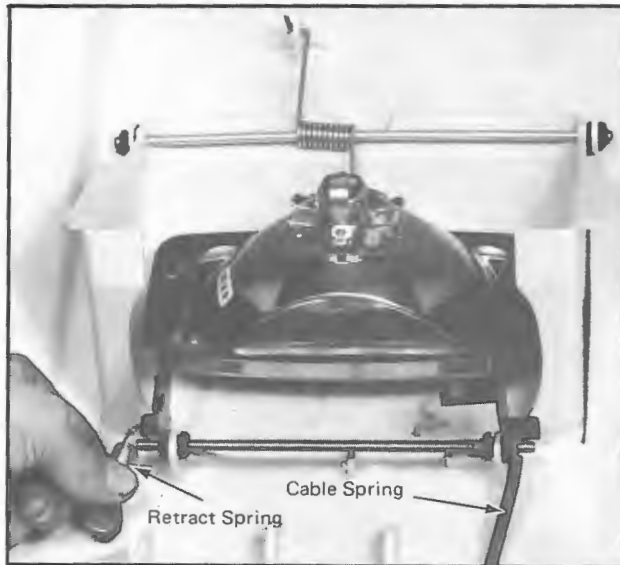
(c) Install socket assembly into reflector and secure by closing the retaining clips. Ensure that socket terminals are pointing in opposite direction of word TOP on lens.

(d) Secure headlight to headlight ring by turning two (2) screws and securing with speed nuts (fig. 4-1-37).



4-1-37

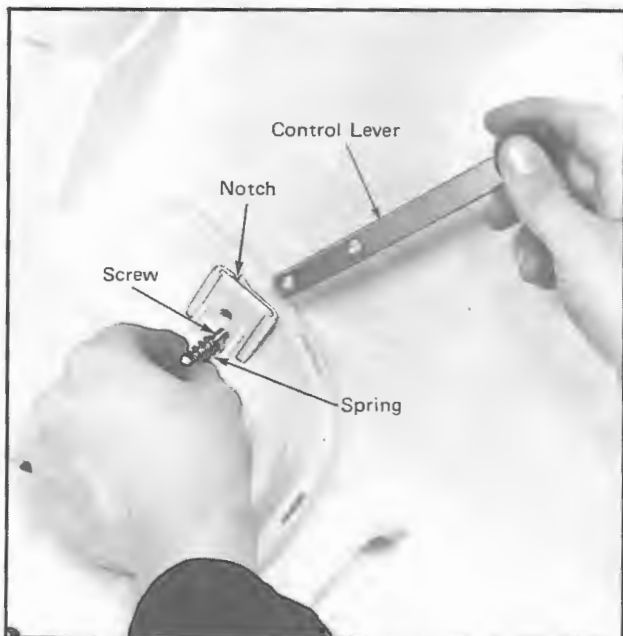
(e) Position headlight ring into location on cab. Insert hinge rod through cab brackets and ring. Install retaining cable spring on right side of hinge rod and housing retract spring on left hand side of hinge rod. Connect retract spring to cab brackets (fig. 4-1-38). Secure rod with two (2) new speed nuts. Install adjusting screw with spring into headlight ring.



4-1-38

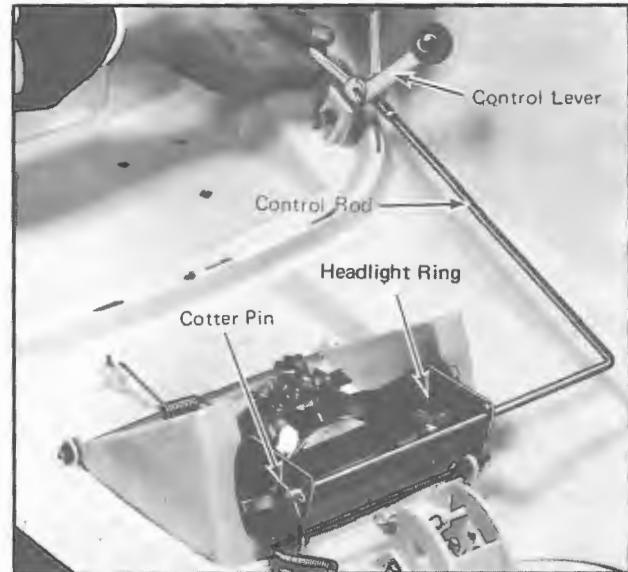
6. Secure control lever to cab bracket with a screw, a spring, a stop bracket and a nut.

NOTE: Position stop bracket on cab bracket with notch on right hand side facing rearward (fig. 4-1-39).



4-1-39

7. Position control rod into appropriate hole of headlight ring and secure with two (2) new cotter pins. Secure rod to control lever using a screw, washer and nut. Do not overtighten nut. Lever must pivot freely (fig. 4-1-40).



4-1-40

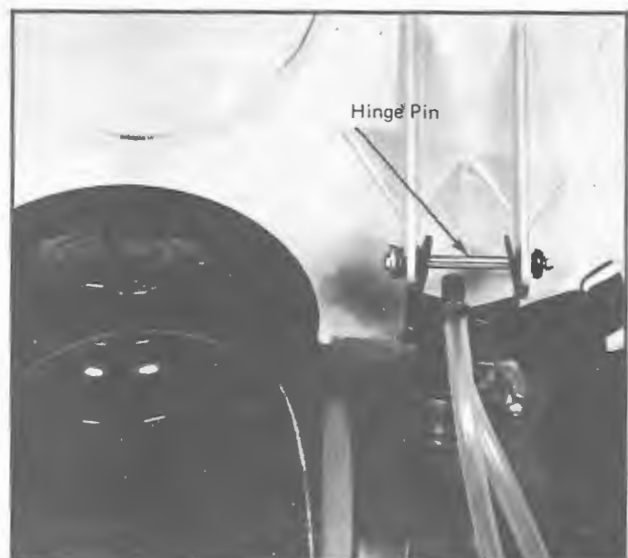
8. Install anchor tabs to windshield. Install protector and rubber strip to windshield. Position retainer clip in groove of cab.

9. Apply liquid soap into cab groove and position the windshield assembly in location on cab.

10. Starting at center section, secure the windshield by bending the anchor tabs.

(D) INSTALLATION

1. Position the cab in location on the vehicle and insert the hinge pins. Secure hinge pins with retainer clips (fig. 4-1-41).



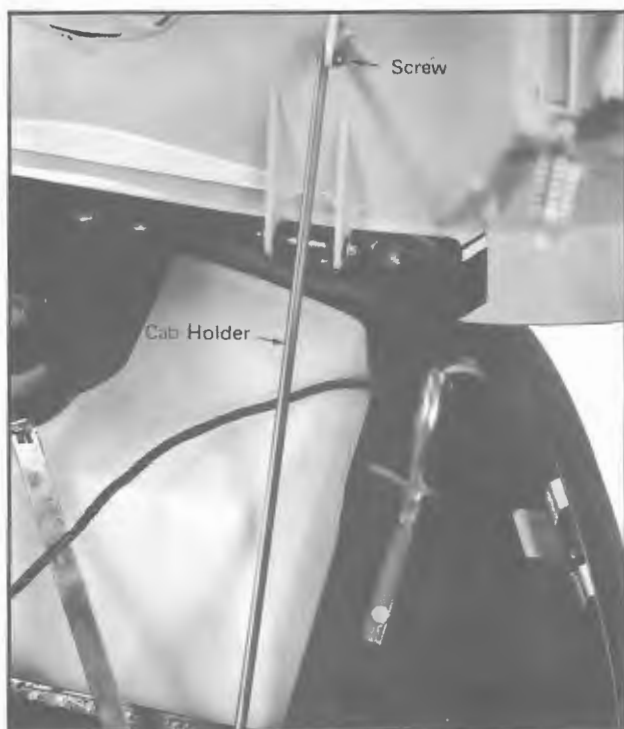
4-1-41

2. Secure retaining cable to cab retainer clip with a screw and washer.
3. Install spiral tubing on cable and brown electrical wiring.
4. Connect receptacle housing to terminals of headlight socket. Hook the spring to the retaining cable.
5. Hook side latches to secure cab.
6. Check headlight adjustment as detailed in Paragraph 4-1-13.

4-1-5 CAB (All Nordic 399 and 399E Models)

(A) REMOVAL

1. Open cab latches and tilt the cab forward.
2. Disconnect receptacle housing from terminals of headlight socket. Place wiring harness on vehicle:
3. Remove screw and nut securing cab holder to cab (fig. 4-1-42). Remove holder from vehicle.



4-1-42

4. Remove retaining clip from each hinge pin and slide out hinge pins (fig. 4-1-43). Remove cab from vehicle.

NOTE: Do not remove rubber grommets from cab brackets unless damaged and replacement is necessary.

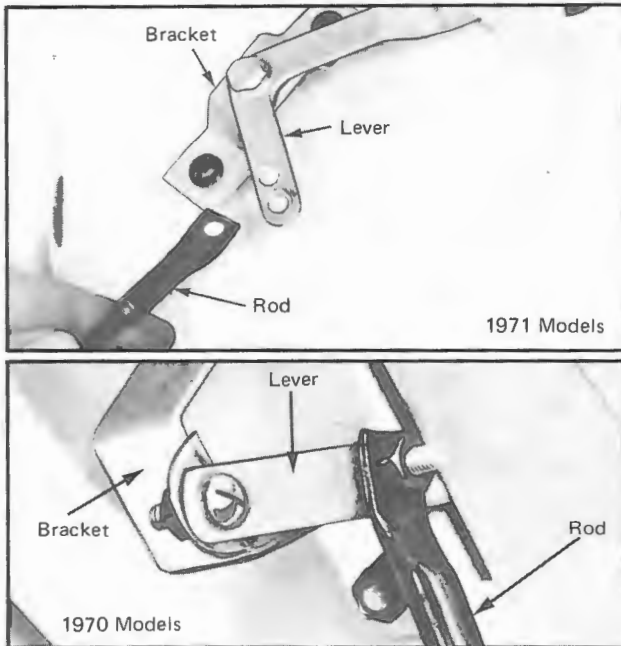


4-1-43

(B) DISASSEMBLY

1. Using pliers, straighten the nine (9) windshield anchor tabs from under the cab and remove windshield from cab.
2. Remove the rubber strip and anchor tabs from the windshield. Remove the windshield protector.
3. Remove headlight mechanism using the following procedure:
 - (a) Remove screw, spring washer and nut securing the control rod to the control lever (fig. 4-1-44). Remove screw, spring washer and nut attaching control lever to control bracket. Remove control lever. Remove screws and nuts securing control bracket to cab.

NOTE: The spring washers are not installed on 1971 models.



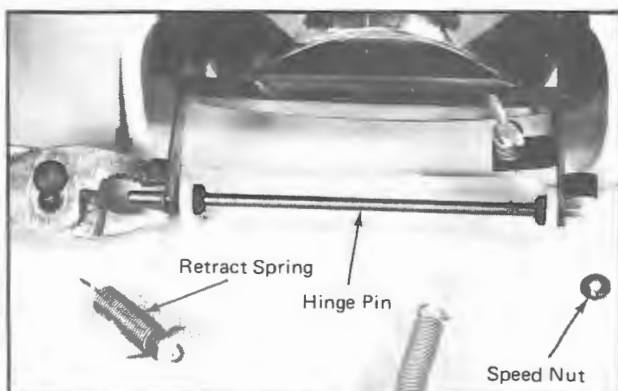
4-1-44

- (b) Remove two (2) cotter pins from other end of control rod and remove control rod from headlight ring.

NOTE: Do not remove adjuster tube from control rod end unless damaged and replacement is necessary.

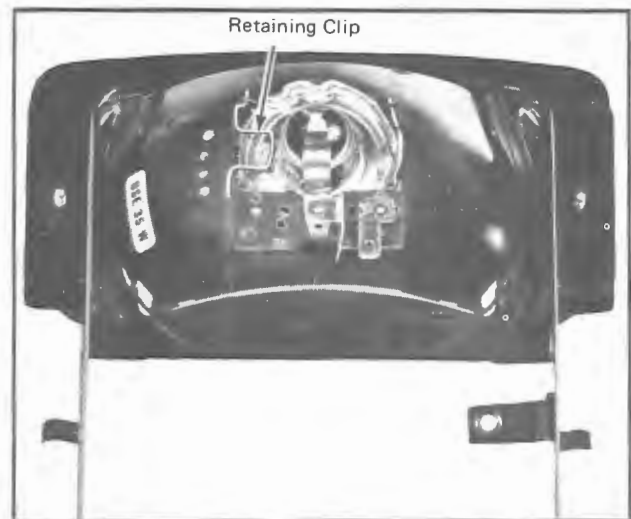
- (c) Disconnect housing retract spring from headlight ring and cab bracket. Remove one (1) push nut and withdraw hinge pin from ring (fig. 4-1-45). Remove headlight assembly and ring from cab. Remove the adjusting screw and spring from ring.

NOTE: Do not remove rubber grommets from cab brackets unless damaged and replacement is necessary.



4-1-45

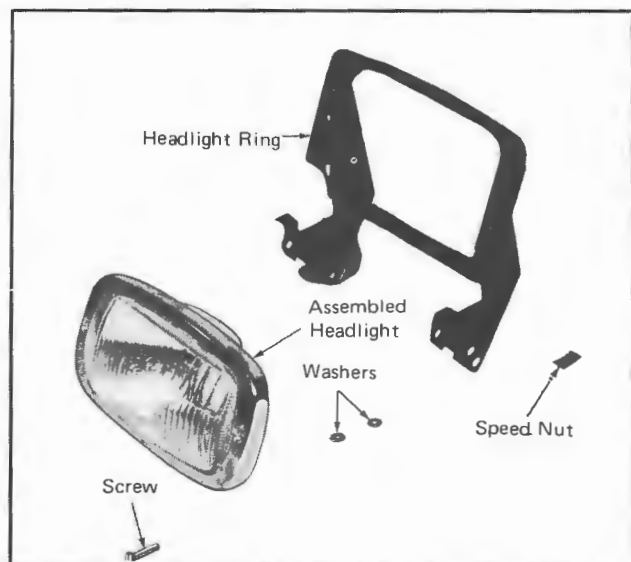
- (d) Lift the retaining clips and remove the socket and bulb from the reflector (fig. 4-1-46). Twist the bulb counterclockwise to remove it from the socket.



4-1-46

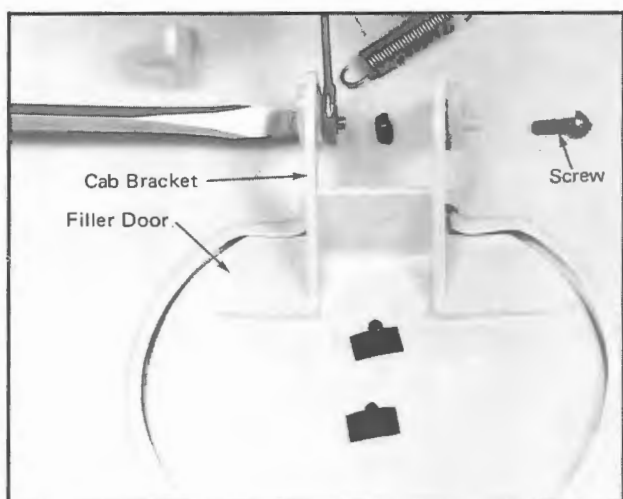
- (e) Remove assembled headlight from ring by removing two (2) screws and speed nuts. Remove two (2) washers from each screw (fig. 4-1-47).

NOTE: The components of the headlight assembly consisting of a chrome ring, a lens with a rubber ring and a reflector are attached by two (2) sleeve rivets. Rivets can be drilled out to replace damaged component(s).



4-1-47

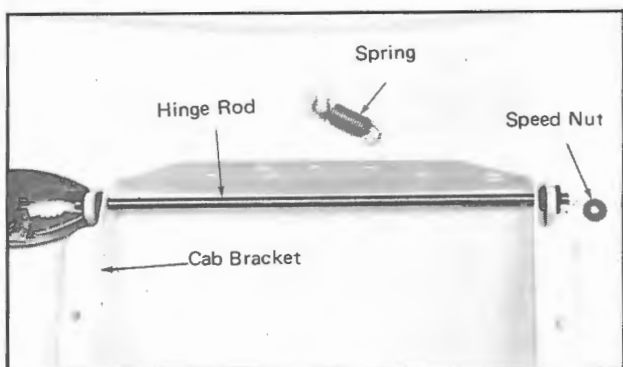
4. Unhook the spring attached to the filler door and cab bracket. Remove the two (2) screws and nuts securing the filler door. Remove door and spring from cab (fig. 4-1-48).



4-1-48

5. Remove speed nuts from one end of hinge rod. Withdraw rod from headlight housing and cab brackets. Disconnect spring from housing and cab bracket (fig. 4-1-49). Remove housing from cab.

NOTE: Do not remove grommets from cab brackets unless damaged and replacement is required.



4-1-49

6. The following table includes components that need not be removed from the cab during Disassembly procedure unless damaged and/or disfigured. If replacement is required, refer to table for method of attachment and removal operation.

COMPONENT	ATTACHMENT	REMOVAL OPERATION
Stripe	Adhesive back	Pull off
Latch (2)	Pop rivets	Use 1/8" drill
Plate and reflector (2) (on 1971 models)	Push nuts	Use pliers
Nameplate (on 1970 Models)	Speed nuts	Use pliers
Contour cab moulding	Adhesive back	Pull off
R.H. Deflector	Slotted edge	Pull out
L.H. Deflector	Slotted edge	Pull out
Identification plate (on 1971 Models)	Push nuts	Use pliers
Identification label (on 1971 Models)	Adhesive back	Pull off
Identification crest (on 1970 Models)	Push nuts	Use pliers
R.H. Dash panel (on 1970 Models)	Adhesive back	Pull off
L.H. Dash panel (on 1970 Models)	Adhesive back	Pull off
L.H. Scoop decal (on 1970 Models)	Adhesive back	Pull off
R.H. Scoop decal (on 1970 Models)	Adhesive back	Pull off
L.H. Bottom scoop decal (on 1970 Models)	Adhesive back	Pull off
R.H. Bottom scoop decal (on 1970 Models)	Adhesive back	Pull off
L.H. Side inlay (on 1970 Models)	Adhesive back	Pull off
R.H. Side inlay (on 1970 Models)	Adhesive back	Pull off

(C) ASSEMBLY

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

replaced. Refer to Paragraph 4-1-11 for Cleaning procedures.

2. Carry out Inspection procedures as detailed in Paragraph 4-1-12.
3. Position the headlight retractable housing in location on cab. Ensure that housing is seated on lip of cab. Insert hinge pin through grommet installed in cab bracket, housing and other bracket. Secure hinge pin with two (2) push nuts. Hook spring into housing and cab bracket.
4. Secure filler door to cab bracket with two (2) screws and nuts. Do not overtighten nuts. Hook spring to filler door and cab bracket.
5. Install headlight mechanism using the following procedures:
 - (a) Install two (2) screws and four (4) washers in headlight assembly.

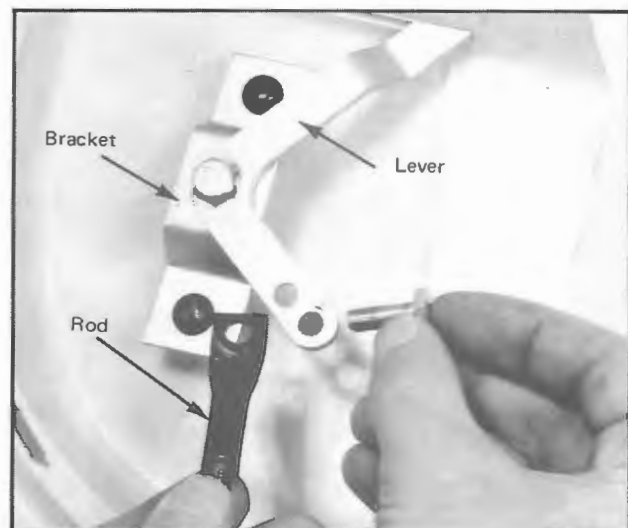
NOTE: If any component (lens, rings and/or reflector) of the headlight assembly was replaced and sleeve rivets were drilled out, assemble lens with rubber ring and reflector to chrome ring using previously removed screws and four (4) washers.

- (b) Install the light bulb into the socket with a slight push and clockwise twist.
- (c) Install socket assembly into reflector and secure by closing the retaining clips. Ensure that socket terminals are pointing in opposite direction of word TOP on lens.
- (d) Secure headlight to headlight ring with two (2) speed nuts.
- (e) Position headlight ring into location on cab. Install hinge rod through grommets installed in cab brackets and headlight ring. Secure hinge rod with two (2) speed nuts. Connect spring into headlight ring and cab bracket.
- (f) Position spring on adjusting screw

and install screw into headlight ring.
(g) Insert control rod from left hand side into appropriate holes of headlight ring and secure with two (2) new cotter pins.

- (h) Attach control bracket to cab with two (2) screws and nuts. Insert control lever through slot in cab and secure lever to control bracket with a spring washer, screw and nut. Secure loosen end of control rod to lever with a screw and nut (fig. 4-1-50).

NOTE: The spring washers are not installed on 1970 models. Ensure that the parts attaching the control lever and rod are not overtightened. Mechanism must pivot freely.



4-1-50

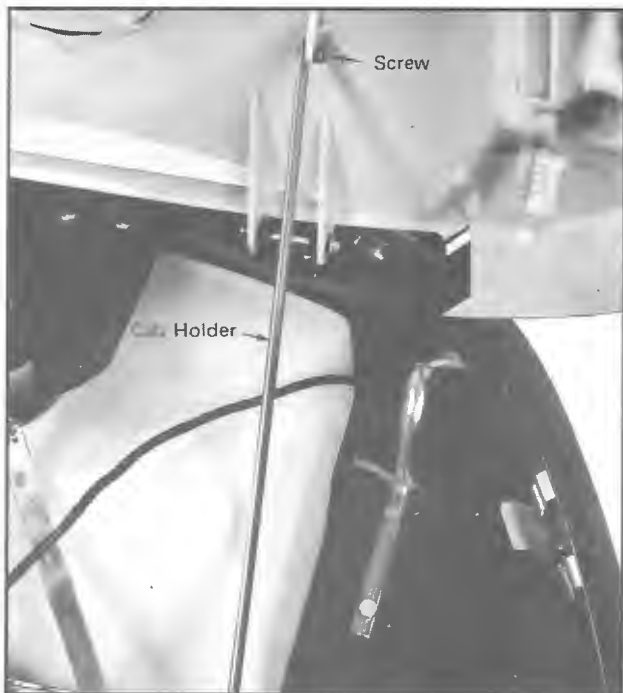
6. Install the anchor tabs on the windshield. Install protector and rubber strip to windshield.
7. Apply liquid soap into groove of cab and position the windshield assembly in location.
8. Starting at center section, secure the windshield by bending the anchor tabs.

(D) INSTALLATION

1. Position the cab in location on the ve-

hicle and insert two (2) hinge pins through cab and frame brackets. Secure each hinge pin with a retainer clip.

2. Insert the cab holder into the slotted bracket and secure to cab bracket with a screw and nut (fig. 4-1-51).



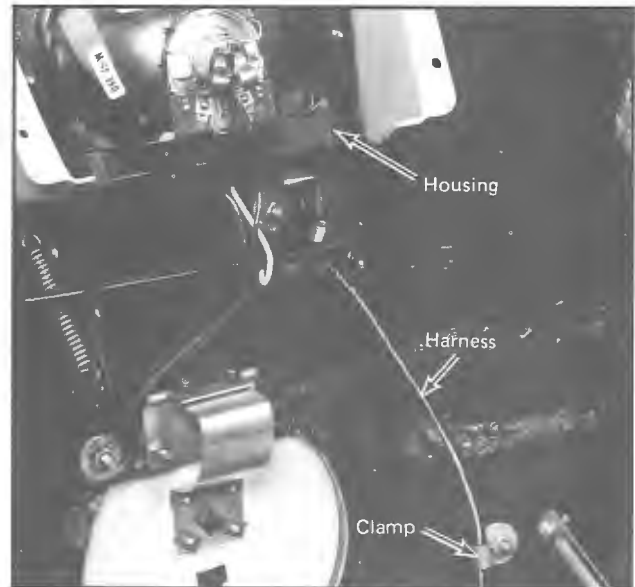
4-1-51

3. Connect receptacle housing to terminals of headlight socket.
4. Hook side latches to secure cab.
5. Check adjustment of headlight as detailed in Paragraph 4-1-13

4-1-6 CAB (All Nordic 640E Models)

(A) REMOVAL

1. Open cab latches and tilt the cab forward.
2. Loosen the upper ring hand nut securing the clamp and hinge bracket. Disconnect receptacle housing from terminals of headlight socket (fig. 4-1-52). Remove harness from clamp and place on vehicle.



4-1-52

3. Remove screw and nut securing cab holder to hinge bracket. Remove holder from vehicle (fig. 4-1-53).



4-1-53

4. Remove retaining clip from each hinge pin and slide out hinge pins. Remove cab from vehicle (fig. 4-1-54).

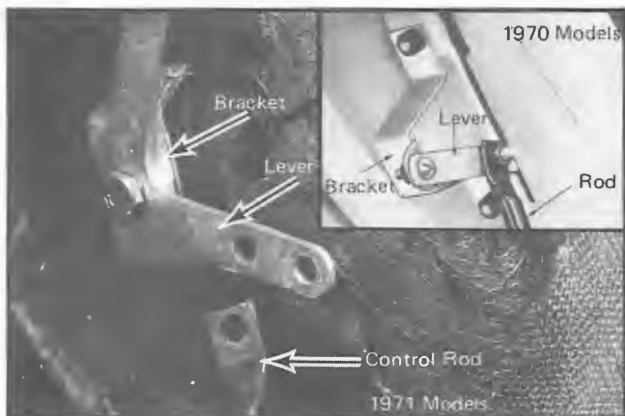


4-1-54

(B) DISASSEMBLY

1. Using pliers, straighten the nine (9) windshield anchor tabs from under the cab and remove windshield from cab.
2. Remove the rubber strip and anchor tabs from the windshield. Remove the windshield protector.
3. Remove headlight mechanism using the following procedure:
 - (a) Remove screw and nut securing the control rod to the control lever. Remove screw, spring washer and nut attaching control lever to control bracket. Remove control lever (fig. 4-1-55).

NOTE: On 1970 models, remove screw, spring washer and nut securing control bracket to cab. (See fig. 4-1-55).



4-1-55

- (b) Remove two (2) cotter pins from other end of control rod and remove control rod from headlight ring.

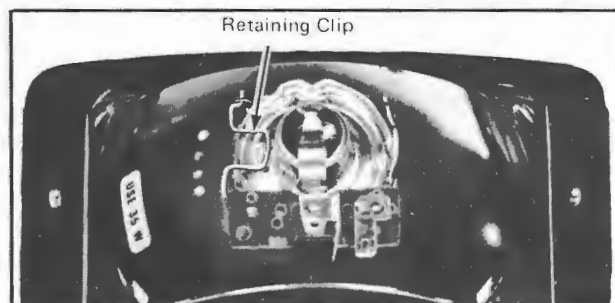
NOTE: Do not remove adjuster tube from control rod end unless damaged and replacement is necessary.

- (c) Disconnect retract spring from headlight ring support bracket. Remove screws and nuts securing headlight ring to support bracket. Remove stop bracket and headlight from cab (fig. 4-1-56). Remove adjusting screw from ring.



4-1-56

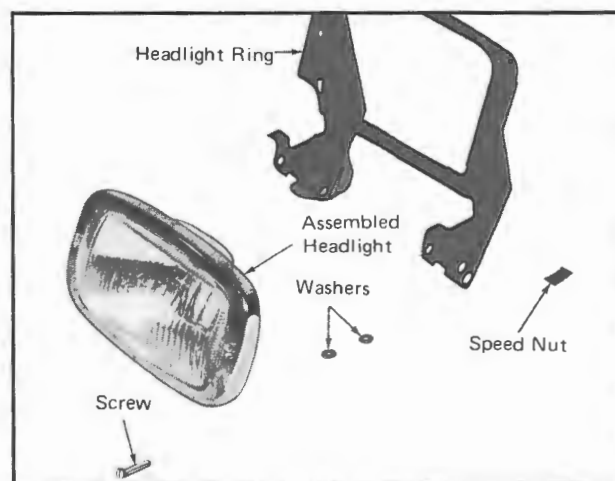
- (d) Lift the retaining clips and remove the socket and bulb from the reflector (fig. 4-1-57). Twist the bulb counterclockwise to remove it from the socket.



4-1-57

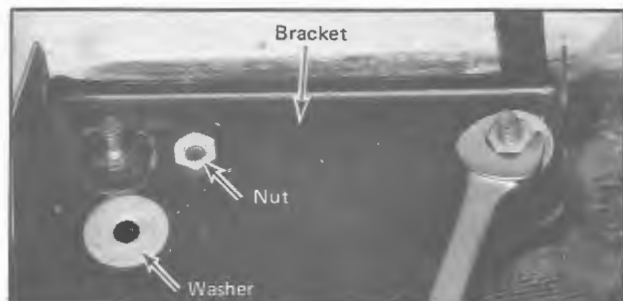
- (e) Remove assembled headlight from ring by removing two (2) screws and speed nuts. Remove two (2) washers from each screw (fig. 4-1-58).

NOTE: The components of the headlight assembly consisting of a chrome ring, a lens with a rubber ring and a reflector and attached together with two (2) sleeve rivets. Rivets may be drilled out to replace defective component(s).



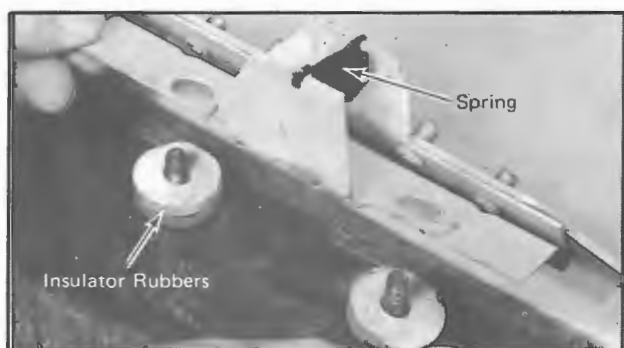
4-1-58

4. Remove headlight ring bracket by removing three (3) nuts and washers. Remove bracket and six (6) insulator rubbers (fig. 4-1-59).



4-1-59

5. Remove the headlight retractable housing by removing two (2) nuts and washers. Remove housing and four (4) insulator rubbers. Disconnect spring from housing and hinge (fig. 4-1-60).



4-1-60

6. Remove the two (2) nuts securing the filler door bracket to cab hinge. Remove spring plate and filler door from vehicle.
7. Remove two (2) nuts and washers from each hinge bracket. Remove a cable clamp from right hand upper stud and remove the brackets (fig. 4-1-61). Remove the insulator rubbers.



4-1-61

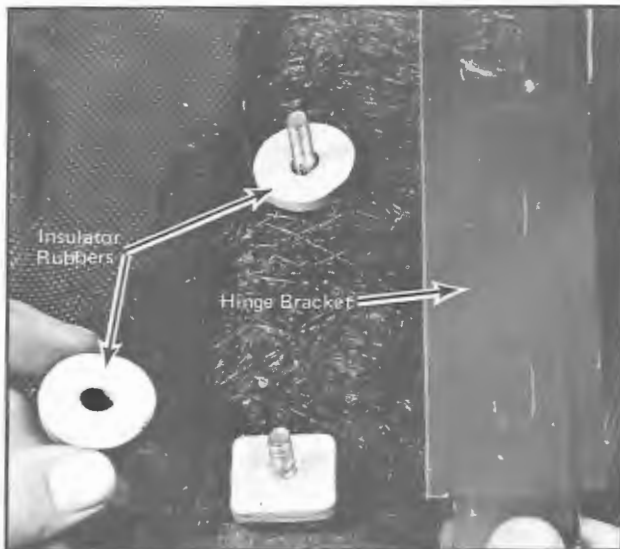
8. The following table includes components that need not be removed from the cab during disassembly procedure unless damaged and/or disfigured. If replacement is required, refer to table for method of attachment and removal operation.

COMPONENT	ATTACHMENT	REMOVAL OPERATION
Strip (2)	Adhesive back	Pull off
Latch (2)	Pop rivets	Use 1/8" drill
Filler door bracket	Speed nuts	Use pliers
Filler door bracket hinge	Two (2) screws and nuts	Remove screws and nuts
Identification crest (All 1970 Models)	Speed nuts	Use pliers
Identification plate (All 1971 Models)	Speed nuts	Use pliers
Identification label (All 1971 Models)	Adhesive back	Pull off
Name plate (All 1970 Models)	Speed nuts	Use pliers
Plate and reflector (All 1971 Models)	Speed nuts	Use pliers
Ski-Doo label	Adhesive back	Pull off
Deflector (2)	Slotted edge	Pull out
Side scoop decal (4) (All 1970 Models)	Adhesive back	Pull off
Lower grill (All 1970 Models)	Pop rivets	Use 1/8" drill
Bombardier crest (All 1971 Models)	Adhesive back	Pull off

(C) ASSEMBLY

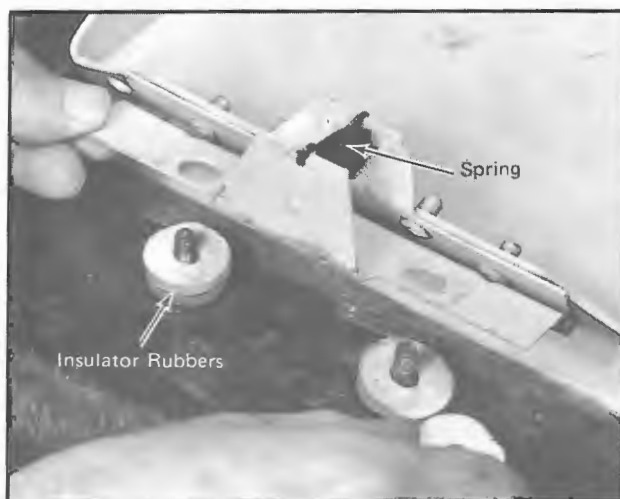
1. Prior to Assembly procedure, ensure all components are clean of all dirt and all damaged parts have been repaired or replaced. Refer to Paragraph 4-1-11 for Cleaning procedures.
2. Carry out Inspection procedures as detailed in Paragraph 4-1-12.

3. Correctly position the hinge bracket insulator rubbers on studs of cab (fig. 4-1-62). Place two (2) brackets on studs and secure with washers and nuts. Install a cable clamp on upper right hand stud. Do not tighten this attaching nut until electrical harness is installed on cab.



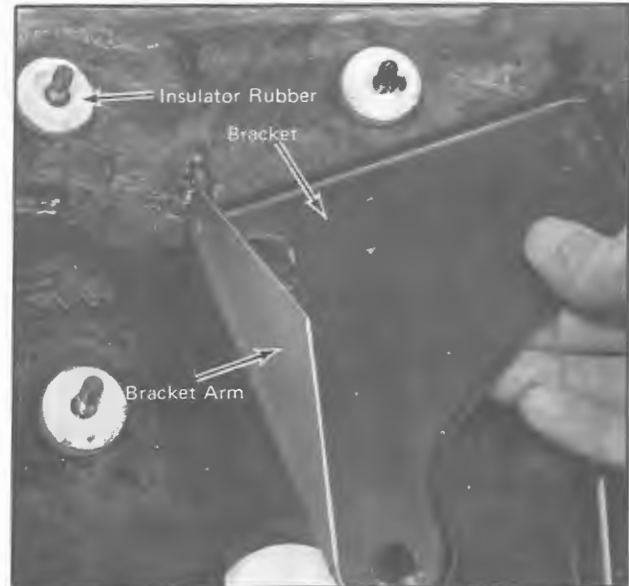
4-1-62

4. Secure filler door bracket to cab hinge with a spring plate and two (2) nuts.
5. Connect spring to headlight retractable housing and cab hinge. Place the housing in location on cab. Ensure that housing is seated on lip of cab. Install four (4) insulator rubbers on cab studs (fig. 4-1-63). Secure housing with two (2) washers and nuts. Do not overtighten the nuts.



4-1-63

6. Install three (3) insulator rubbers on studs of cab. Place headlight ring bracket in position ensuring that arm of bracket is on left hand side (fig. 4-1-64).



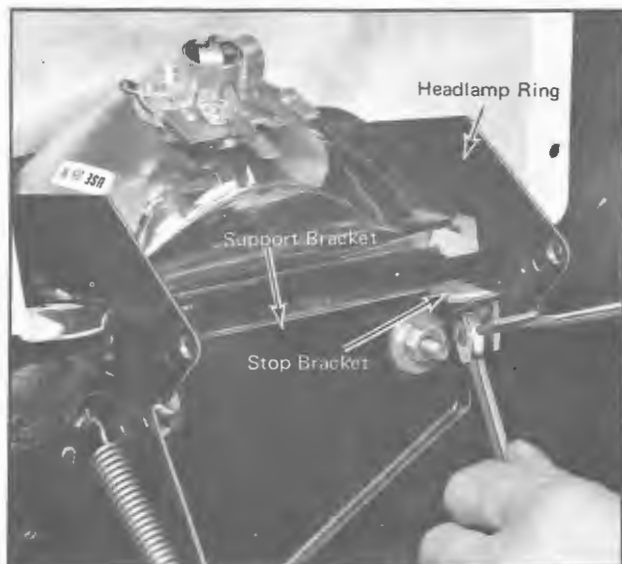
4-1-64

7. Install the headlight mechanism using the following procedure:
 - (a) Install two (2) screws and four (4) washers on headlight.

NOTE: If any component (lens, rings and/or reflector) of the headlight was replaced and sleeve rivets were drilled out, assemble lens with rubber ring and reflector to chrome ring using previously removed screws and four (4) washers.

- (b) Install the light bulb into the socket with a slight push and clockwise twist.
- (c) Install socket assembly into reflector and secure by closing the retaining clips. Ensure that socket terminals are pointing in opposite direction of word TOP on lens.
- (d) Secure headlight to headlight ring with two (2) speed nuts.
- (e) Position headlight ring in location on cab.
- (f) Install retract spring into headlight support bracket and headlight ring.

Align bracket, ring and stop bracket. Secure the components with two (2) screws and nuts (fig. 4-1-65). Install adjusting screw.



4-1-65

- (g) On all 1970 models, position control bracket on cab studs and secure with spring washers and nut.
 - (h) Insert control rod through appropriate holes in headlight ring. Rod must be inserted from the left hand side. Secure control rod with two (2) new cotter pins. Insert control lever through slot in cab and secure to control bracket with a screw and a nut. Attach control rod to control lever with a screw and nut.
8. Install anchor tabs in windshield. Place rubber strip on windshield. Apply liquid soap into cab groove and position the windshield in location on cab.
 9. Starting at center section, secure the windshield by bending the anchor tabs. Install windshield protector.

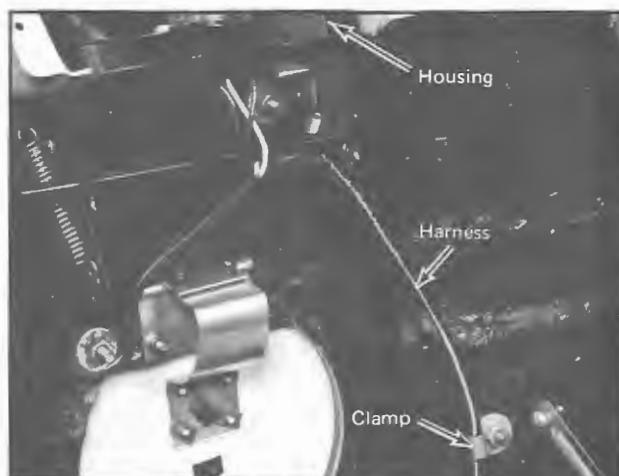
(D) INSTALLATION

1. Position cab in location on vehicle and insert two (2) hinge pins. Secure hinge pins with retaining clips (fig. 4-1-66).



4-1-66

2. Insert the cab holder into the slotted bracket on the frame and secure to cab bracket with a screw and a nut.
3. Connect receptacle housing to terminals of headlight socket. Place the electrical harness under clamp and tighten nut (fig. 4-1-67).



4. Hook side latches to secure cab.
5. Check headlight adjustment as detailed in Paragraph 4-1-13.

4-17 CAB (All Skandic Models)

(A) REMOVAL

1. Unhook side latches and lift cab forward.
2. Loosen upper nut securing clamp and hinge bracket to cab. Disconnect receptacle housing from socket terminals of headlight. Remove harness from clamp and stow on vehicle.

3. Remove screw and nut securing cab holder to cab. Remove holder from vehicle (fig. 4-1-68).



4-1-68

4. Remove retaining clip from each hinge pin and slide out hinge pins (fig. 4-1-69). Remove cab from vehicle.



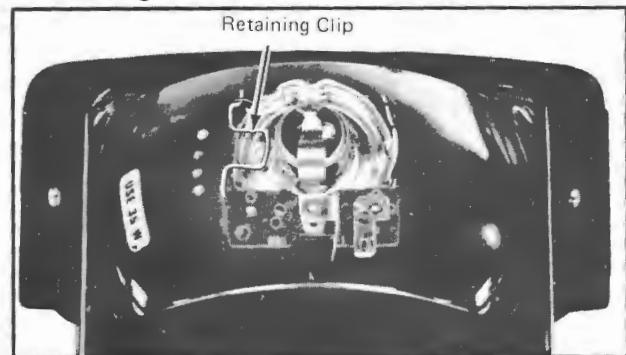
4-1-69

(B) DISASSEMBLY

1. Using pliers, straighten the windshield anchor tabs from under the cab and remove windshield from cab. Remove rubber strip anchor tabs and protector from windshield.
2. From exterior of cab, turn screws attaching headlight assembly to cab. On interior of cab, remove two (2) speed nuts. Remove headlight from cab.

3. Disassemble the headlight assembly using the following procedure:

- (a) Remove the bulb socket from reflector by lifting the retaining clips (fig. 4-1-70).



4-1-70

- (b) Remove light bulb from socket with a slight counterclockwise twist and pull out light bulb.
- (c) Remove two (2) washers installed on each screw securing headlight. Remove screws.

NOTE: The components of the headlight assembly consisting of a chrome ring, a lens with a rubber ring and a reflector are attached together with two (2) sleeve rivets. Rivets can be drilled out to replace damaged component(s).

4. Remove the two (2) nuts and washers securing the filler door hinge to the filler door bracket. Remove the door assembly.
5. Remove two (2) nuts and washers securing each hinge bracket to cab (fig. 4-1-71). Remove bracket, clamp on right hand bracket and rubber spacers.



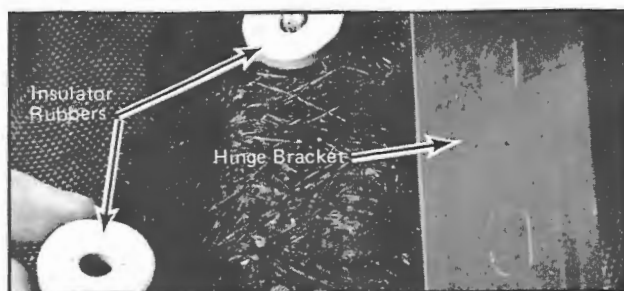
4-1-71

6. The following table includes components that need not be removed from the cab during Disassembly procedure unless damaged and/or disfigured. If replacement is required, refer to table for method of attachment and removal operation.

COMPONENT	ATTACHMENT	REMOVAL OPERATION
Latch (2)	Pop rivets	Use 1/8" drill
Filler door hinge	Two (2) screws and nuts	Remove screws and nuts
Filler door hinge bracket	Two (2) screws and nuts	Remove screws and nuts
Identification plate and reflector	Speed nuts	Use pliers
Identification label	Adhesive back	Pull off
Skandic identification plate	Speed nuts	Use pliers
Skandic Identification label	Adhesive back	Pull off
L.H. Stripe	Adhesive back	Pull off
R.H. Stripe	Adhesive back	Pull off

(C) ASSEMBLY

1. Prior to Assembly procedure ensure all components are clean of all dirt and all damaged parts have been repaired or replaced. Refer to Paragraph 4-1-11 for Cleaning procedures.
2. Carry out Inspection procedures as detailed in Paragraph 4-1-12.
3. Place two (2) insulator rubbers on each of the four (4) studs. Correctly position the two (2) hinge brackets (fig. 4-1-72). Secure with washers and nuts. Install a clamp on the upper right hand stud.



4-1-72

4. Secure the filler door assembly to the filler door bracket with two (2) washers and nuts.
5. Assemble the headlight using the following procedure:
 - (a) Insert two (2) screws through the assembled headlight. Install two (2) washers on each screw.
 - (b) Install the light bulb into the socket with a slight push and clockwise twist.
 - (c) Install socket assembly into reflector and secure by closing the retaining clips. Ensure that socket terminals are pointing in opposite direction of word TOP on lens.
6. Position headlight assembly into location on cab and secure with two (2) speed nuts.
7. Install anchor tabs to windshield. Install protector and rubber strip on windshield.
8. Apply liquid soap into cab groove and position windshield in location.
9. Starting at center section, secure the windshield by bending the tab anchors.

(D) INSTALLATION

1. Position the cab in location on the vehicle and insert the two (2) hinge pins. Secure each hinge pin with a retaining clip.
2. Insert the cab holder into the slotted bracket of frame and secure to cab bracket with a screw and nut. Install a clamp under right hand nut.
3. Connect receptacle housing to terminals of headlight socket. Place the harness under the clamp and tighten nut.
4. Hook side latches to secure cab. Install fuel tank cap.

4-18 CAB (All 1970 T'NT Models equipped with 18 inch Track)

(A) REMOVAL

1. Unhook the latches and open the cab forward.
2. Disconnect the electrical harness from quick connector.
3. Disconnect the speedometer cable from instrument.
4. Remove screw and nut securing cab holder to cab (fig. 4-1-73). Remove holder from vehicle.



4-1-73

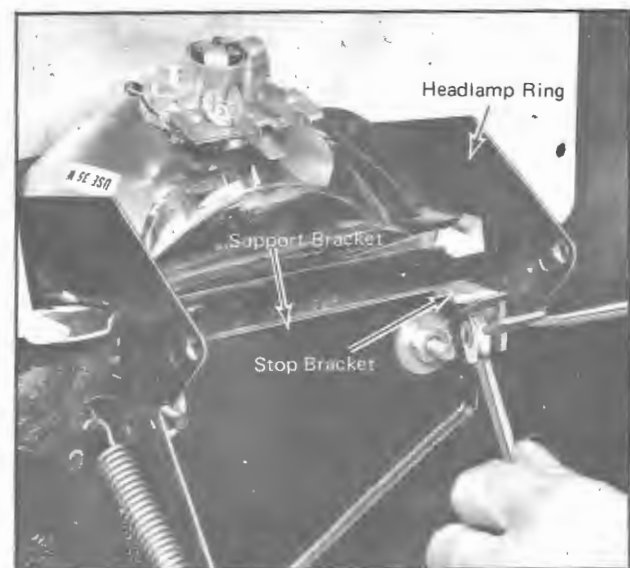
5. Remove retaining clip from each hinge pin and slide out hinge pins (fig. 4-1-74). Remove cab from vehicle.



4-1-74

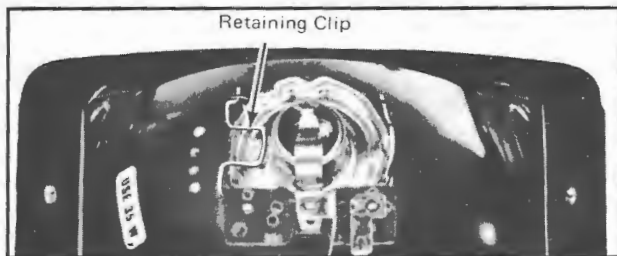
(B) DISASSEMBLY

1. Disconnect and/or remove the following components:
 - (a) Strap tubing on wiring harness.
 - (b) Quick connector from tachometer.
 - (c) Quick connector (brown wire) from speedometer.
2. On interior of cab, straighten the windshield anchor tabs and remove windshield from cab. Remove protector and rubber strip.
3. Remove the headlight mechanism using the following procedure:
 - (a) Unscrew knob halves from control rod. Remove cotter pin attaching control rod to headlight ring. Pull rod from dash panel and remove from vehicle.
 - (b) Disconnect retract spring from headlight ring support bracket. Remove screws and nuts securing headlight ring to support bracket. Remove stop bracket and assembled headlight from cab (fig. 4-1-75). Remove adjusting screw from ring.



4-1-75

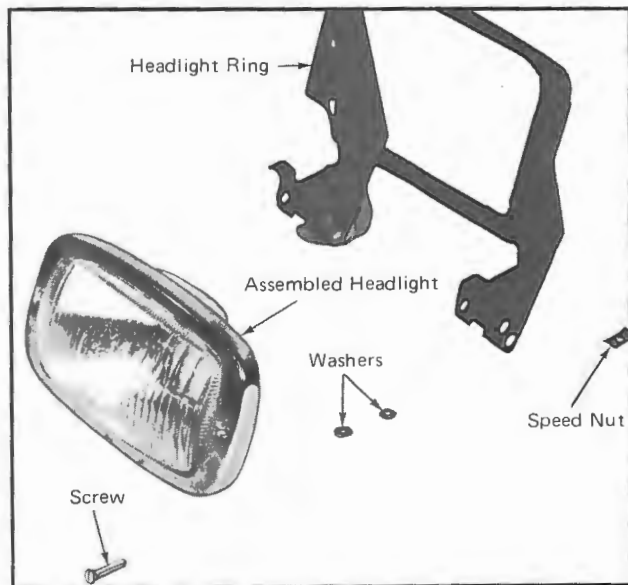
- (c) Lift the retaining clips and remove the socket and bulb from the reflector (fig. 4-1-76). Twist the bulb counterclockwise to remove it from the socket.



4-1-76

- (d) Remove assembled headlight from ring by removing two (2) screws and speed nuts. Remove two (2) washers from each screw (fig. 4-1-77).

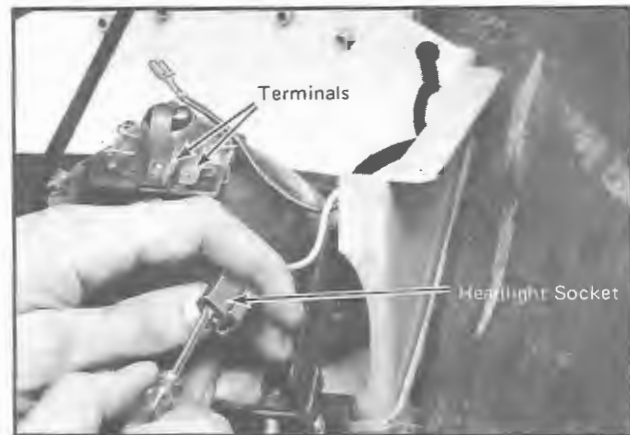
NOTE: The components of the headlight assembly consisting of a chrome ring, a lens with a rubber ring and reflector are attached by two (2) sleeve rivets. Rivets can be drilled out to replace damaged component(s).



4-1-77

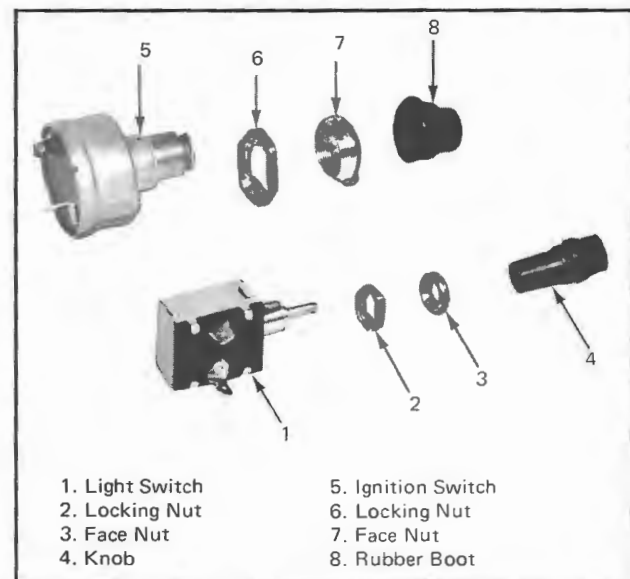
4. Disconnect the switch blocks from ignition and light switches. Using a screwdriver, remove terminals from headlight socket (fig. 4-1-78). Pull harness through hole in headlight housing and cable loop

installed in windshield groove. Remove harness from vehicle.



4-1-78

5. Remove light switch by removing knob, loosening rear locking nut and removing face nut. Remove ignition switch by removing rubber boot. Loosen rear locking nut and remove front face nut (fig. 4-1-79).

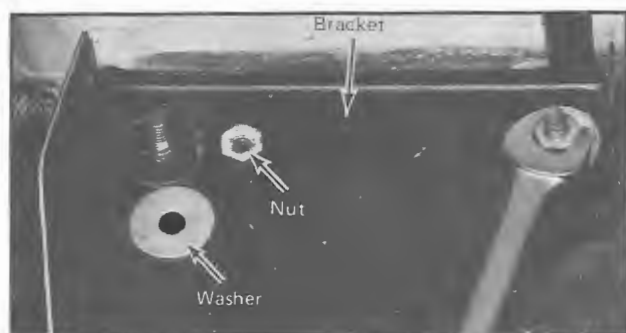


4-1-79

6. Remove the nut securing the tachometer "U" clamp to cab. Remove "U" clamp and push the instrument from the dash panel.
7. Remove the nut securing the speedometer "U" clamp to cab. Remove "U" clamp inner ring and push out the instrument from the dash panel.

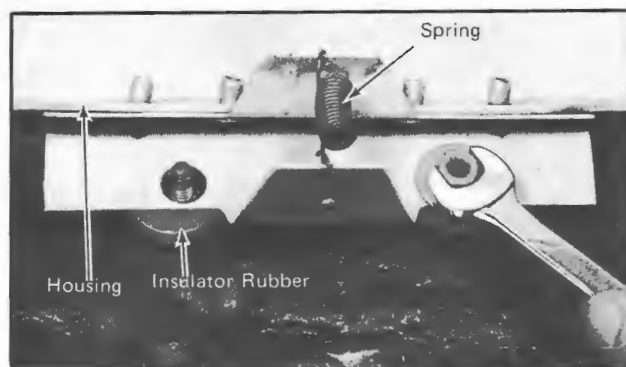
NOTE: Do not remove speedometer shock absorber from dash panel unless damaged and replacement is necessary.

8. Remove headlight ring support bracket by removing three (3) nuts and washers. Remove bracket and six (6) insulator rubbers (fig. 4-1-80).



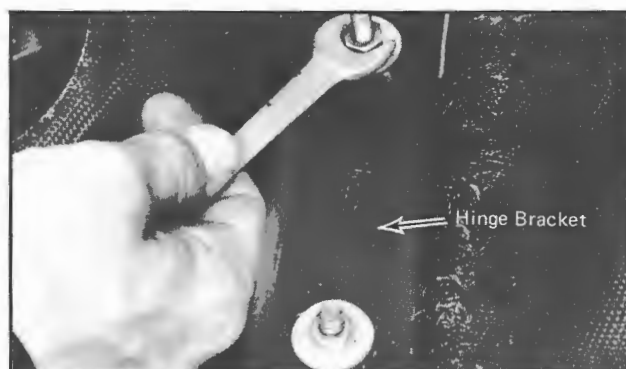
4-1-80

9. Remove the headlight retractable housing by removing two (2) nuts and washers. Remove housing and four (4) insulator rubbers. Disconnect spring connected to housing and hinge (fig. 4-1-81).



4-1-81

10. Remove two (2) nuts and washers from each hinge bracket (fig. 4-1-82). Remove the brackets and insulator rubbers.



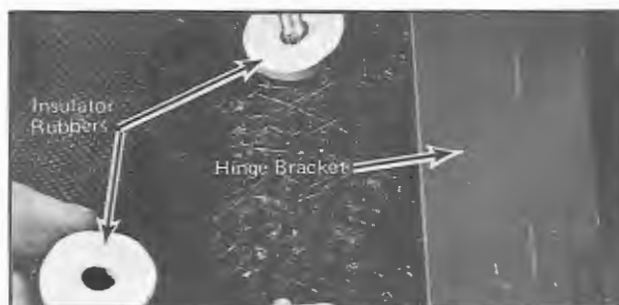
4-1-82

11. Remove the two (2) nuts securing the filler door to filler door hinge bracket. Remove the door assembly.
12. The following table includes components that need not be removed from the cab during disassembly procedure unless damaged and/or disfigured. If replacement is required, refer to table for method of attachment and removal operation.

COMPONENT	ATTACHMENT	REMOVAL OPERATION
Filler door hinge bracket	Two (2) nuts and screws	
Louvre (2)	Slotted edge	Push out
Stripe (2)	Adhesive back	Pull off
Latch (2)	Pop rivets	Use 1/8" drill
Filler door bracket	Speed nuts	Use pliers
Ski-Doo name plate	Speed nuts	Use pliers

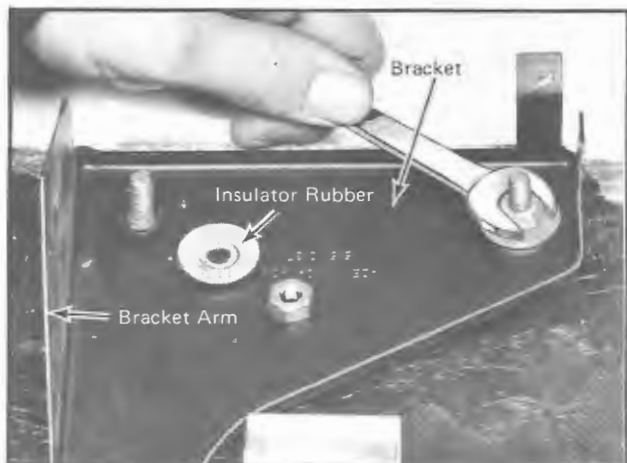
(C) ASSEMBLY

1. Prior to Assembly procedure ensure all components are clean of all dirt and all damaged parts have been repaired or replaced. Refer to Paragraph 4-1-11 for Cleaning procedures.
2. Carry out Inspection procedures as detailed in Paragraph 4-1-12.
3. Secure the filler door to filler door hinge bracket with two (2) screws and nuts.
4. Correctly position the hinge bracket insulator rubbers on studs of cab (fig. 4-1-83). Place two (2) brackets on studs and secure with washers and nuts.



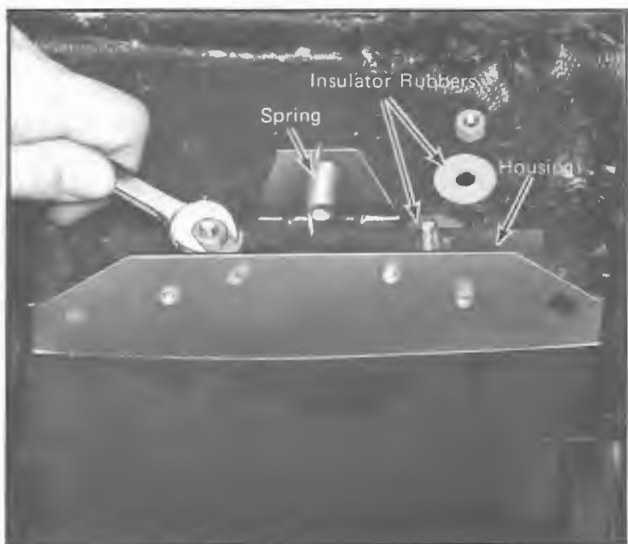
4-1-83

5. Install three (3) insulator rubbers on studs of cab. Place headlight ring bracket in position ensuring that arm of bracket is on left hand side (fig. 4-1-84).



4-1-84

6. Connect spring to headlight retractable housing and cab hinge. Place the housing in location on cab. Ensure housing is seated on lip of cab. Install four (4) insulator rubbers on cab studs. Secure housing with two (2) washers and nuts (fig. 4-1-85). Do not overtighten the nuts.



4-1-85

7. Place the ignition and light switches in dash panel. Tighten front face nuts and secure with rear locking nuts. Screw knob onto light switch. Install rubber boot on ignition switch.

8. Connect switch blocks to ignition and light switches. Install harness clamp into groove of cab and pass the electrical harness through the loop and hole in headlight housing. Insert harness terminals into headlight receptacle housing.

9. Install the light mechanism using the following procedure:

- (a) Install two (2) screws and four (4) washers in headlight.

NOTE: If any component (lens, ring and/or reflector) of the headlight was replaced and sleeve rivets were drilled out, assemble lens with rubber ring and reflector to chrome ring using previously removed screws and four (4) washers.

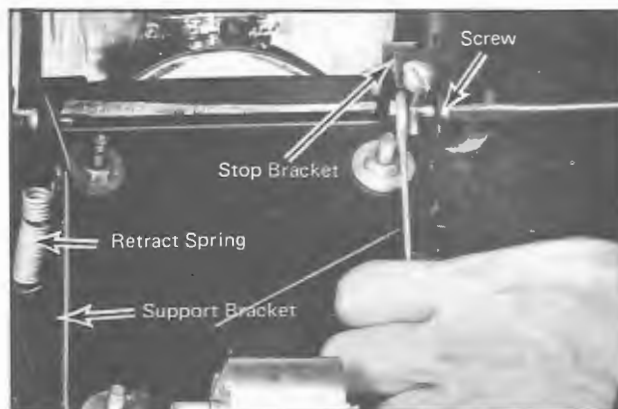
- (b) Install the light bulb into the socket with a slight push and clockwise twist.

- (c) Install socket assembly into reflector and secure by closing the retaining clips. Ensure that socket terminals are pointing in opposite direction of word TOP on lens.

- (d) Secure headlight to headlight ring with two (2) speed nuts.

- (e) Position headlight ring into location on cab.

- (f) Install retract spring into headlight support bracket and headlight ring. Align bracket, ring and stop bracket (fig. 4-1-86). Install adjusting screw into hole in headlight ring.

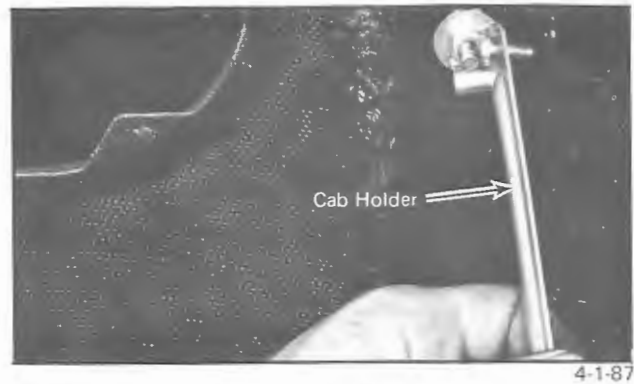


4-1-86

- (g) Insert control rod into appropriate hole in dash panel. Secure rod to headlight ring with two (2) new cotter pins. Install knob halves into other end of control rod.
10. Insert the tachometer into proper hole in dash panel. Secure instrument and "U" clamp in location with a nut.
11. Insert the speedometer into hole in dash panel. Position inner ring and "U" clamp. Secure instrument and "U" clamp with a nut.
12. Connect the receptacle housing to the headlight socket terminals.
13. Install anchor tabs to windshield. Install protector and rubber strip to windshield. Install protector and rubber strip to windshield.
14. Apply liquid soap into cab groove and position the windshield assembly in location on cab.
15. Starting at center section, secure the windshield by bending the anchor tabs.
16. Connect and/or install the following components:
 - (a) Quick connector (brown wire) to speedometer.
 - (b) Quick connector to tachometer.
 - (c) Strap tubing on wiring harness.

(D) INSTALLATION

1. Place cab on vehicle and insert two (2) hinge pins through cab and frame brackets. Secure each hinge pin with a retainer clip.
2. Insert the cab holder into the slotted bracket in frame and secure to cab bracket with a screw and a nut (fig. 4-1-87).



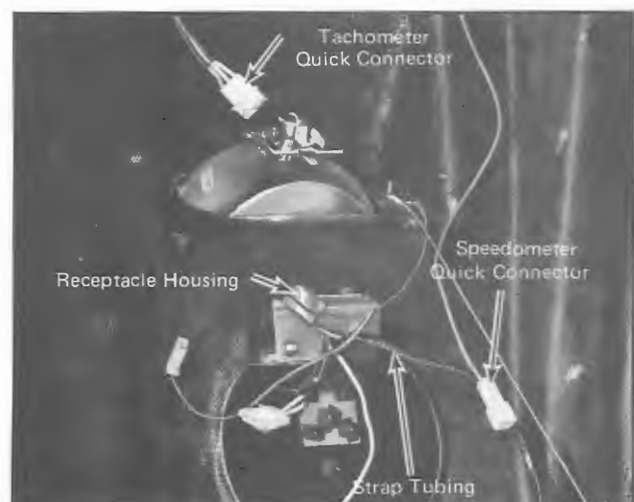
4-1-87

3. Connect cable to speedometer.
4. Connect electrical harness quick connector.
5. Hook side latches to close cab.
6. Check headlight adjustment as detailed in Paragraph 4-1-13.

4-1-9 CAB (All 1971 T'NT Models)

(A) REMOVAL (All Models equipped with 15 inch Track)

1. Unhook the latches and open the cab forward.
2. Remove and/or disconnect the following components (fig. 4-1-88),



4-1-88

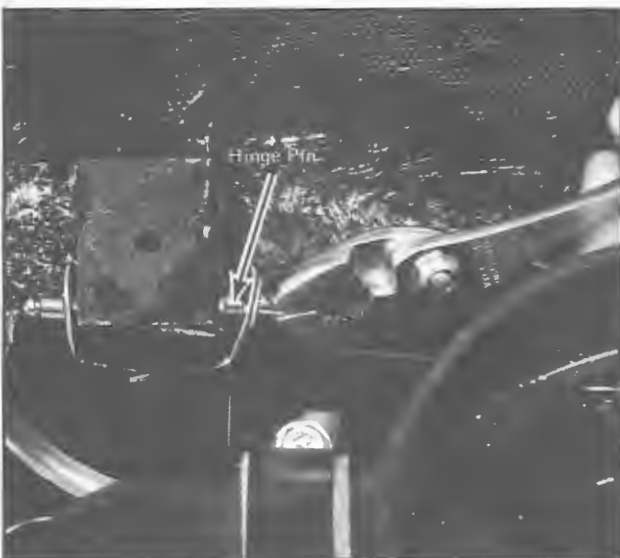
- (a) Strap tubing on wiring harness and retaining cable.
- (b) Cable spring from cab hinge pin.

- (c) Receptacle housing from terminals of headlight socket.
 - (d) Quick connector from tachometer.
 - (e) Quick connector (brown wire) from speedometer and yellow wire.
 - (f) Cable from speedometer.
3. From exterior of cab, turn left hand screw attaching headlight assembly and retaining cable to cab (fig. 4-1-89). Remove speed nut and cable on exterior of cab. Place detached cable on vehicle.



4-1-89

4. Remove retaining clip from each hinge pin and slide out hinge pins (fig. 4-1-90). Remove cab from vehicle.



4-1-90

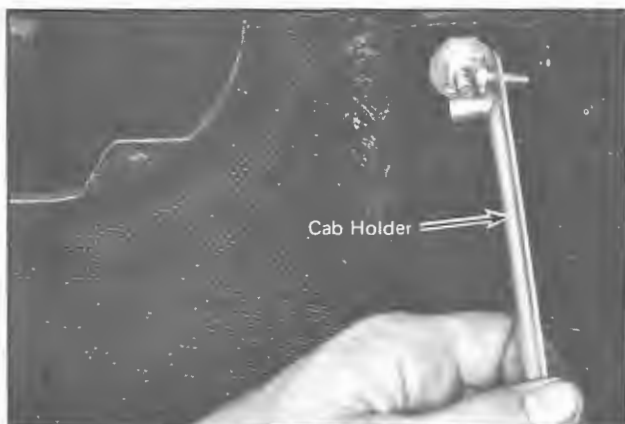
(B) REMOVAL (All Models equipped with 18 inch Track)

1. Unhook the latches and open the cab forward.
2. Remove and/or disconnect the following components (fig. 4-1-91):
 - (a) Receptacle housing from terminals of headlight socket.
 - (b) Quick connector from tachometer.
 - (c) Quick connector (brown wire) from speedometer.
 - (d) Cable from speedometer.
 - (e) Switch block from light switch.
 - (f) Switch block from ignition switch.



4-1-91

3. Loosen the upper right hand nut securing the clamp and hinge bracket. Remove harness from clamp and place harness on vehicle.
4. Remove screw and nut securing cab holder to cab (fig. 4-1-92). Remove holder from vehicle.
5. Remove retaining clip from each hinge pin and slide out hinge pins (fig. 4-1-93). Remove cab from vehicle.



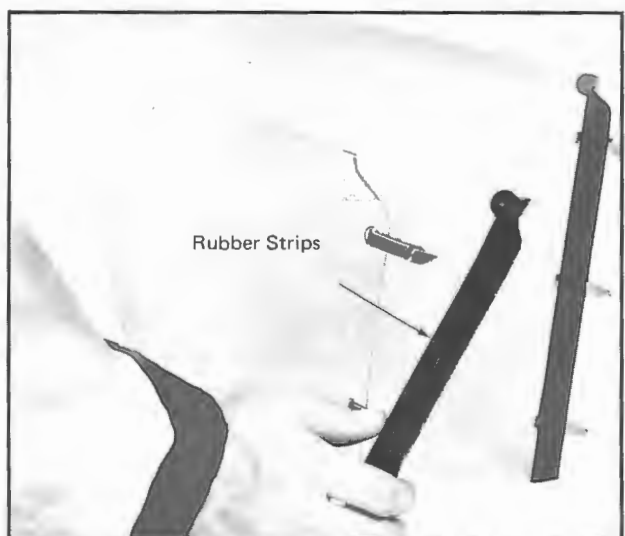
4-1-92



4-1-93

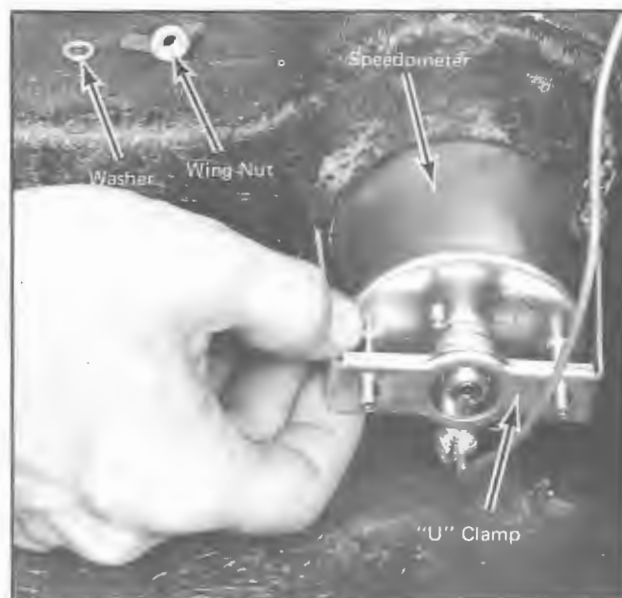
(C) DISASSEMBLY

1. Remove five (5) screws securing windshield to cab. On interior of cab, straighten the windshield anchor tabs and remove windshield from cab. Remove protector and two (2) rubber strips (fig. 4-1-94).



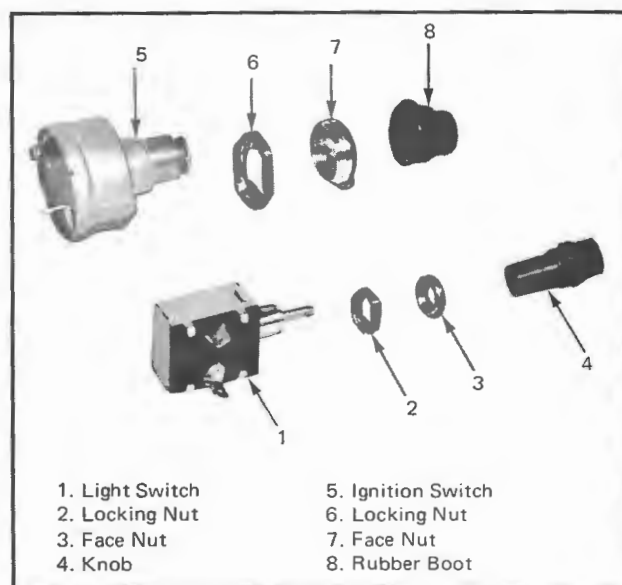
4-1-94

2. Remove the wing nuts and washers securing the speedometer and tachometer "U" clamps to cab (fig. 4-1-95). Remove the inner ring from speedometer and push out the instruments from cab.



4-1-95

3. On all models equipped with 18 inch track, remove light switch by removing light knob, loosening rear locking nut and removing front face nut. Remove ignition switch by removing rubber boot, loosening rear locking nut and front face nut (fig. 4-1-96).



4-1-96

4. On all 18 inch track vehicles, remove two (2) nuts and washers securing each hinge bracket to cab (fig. 4-1-97). Remove brackets, clamp on right hand bracket and insulator rubbers.

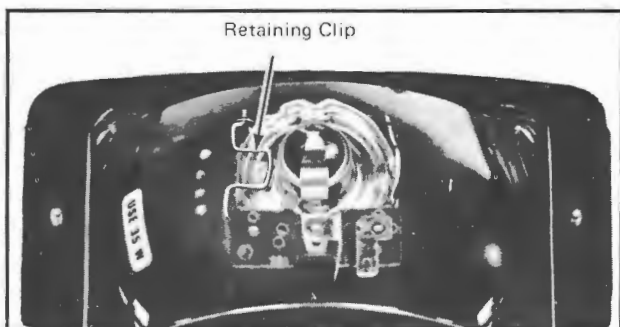


4-1-97

5. On all models equipped with 15 inch track, remove the headlight assembly from cab by removing the remaining installed speed nut.

NOTE: On all models equipped with 18 inch track, remove two (2) speed nuts.

6. Remove the bulb socket from reflector by lifting the retaining clips (fig. 4-1-98).



4-1-98

7. Remove light bulb from socket with a slight counterclockwise twist and pull out light bulb.
8. Remove two (2) washers installed on each screw securing headlight. Remove screws.

NOTE: The components of the headlight assembly consisting of a chrome ring, a lens with a rubber ring and a reflector are attached together with two (2) sleeve rivets. Rivets can be drilled out to replace defective components.

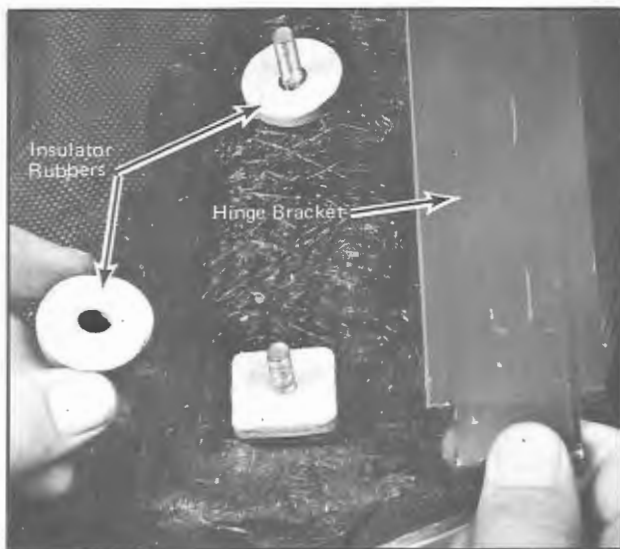
9. Remove the two (2) nuts securing the filler door to filler door hinge bracket. Remove the door assembly.
10. The following table includes components that need not be removed from the cab during disassembly procedure unless damaged and/or disfigured. If replacement is required, refer to table for method of attachment and removal operation.

COMPONENT	ATTACHMENT	REMOVAL OPERATION
Filler door hinge bracket	Two (2) nuts and screws	Remove and replace, if damaged
Louvre (2)	Speed nuts	Use pliers
Identification plate	Speed nuts	Use pliers
Identification label	Adhesive back	Pull off
Plate and reflector	Speed nuts	Use pliers
Ski Doo label	Adhesive back	Pull off
Stripe (2)	Adhesive back	Pull off
Latch (2)	Pop rivets	Use 1/8" drill
Filler door bracket	Speed nuts	Use pliers
T'NT identification plate	Speed nut	Use pliers
T'NT identification label	Adhesive back	Pull off

(D) ASSEMBLY

1. Prior to Assembly procedure ensure all components are clean of all dirt and all damaged parts have been repaired or replaced. Refer to Paragraph 4-1-11 for Cleaning procedures.
2. Carry out Inspection procedures as detailed in Paragraph 4-1-12.

3. Secure the filler door to filler door hinge bracket with two (2) nuts.
4. On all models equipped with 18 inch track, correctly position four (4) insulator rubbers and two (2) hinge brackets on studs of cab (fig. 4-1-99). Place a harness clamp on right hand stud. Secure component with a washer and nut. Do not tighten harness clamp nut until harness is installed on cab.



4-1-99

5. Install two (2) screws and four (4) washers in headlight assembly.

NOTE: If any component (lens, ring and/or reflector) of the headlight assembly was replaced and sleeve rivets were drilled out assemble lens with rubber ring and reflector to chrome ring using previously removed screws and four (4) washers.

6. Install the light bulb into the socket with a light push and clockwise twist.
7. Install socket assembly into reflector and secure by closing the retaining clips. Ensure that socket terminals are pointing in opposite direction of word TOP on lens.
8. Position headlight assembly in cab aperture. On models equipped with 15 inch

track, secure headlight to cab by installing one (1) speed nut on left hand screw.

NOTE: On models equipped with 18 inch track secure headlight with two (2) speed nuts.

9. On all models equipped with 18 inch track, place the ignition and light switches in appropriate holes of dash panel. Tighten front face nuts and secure with rear locking nuts. Screw knob onto light switch. Install rubber boot on ignition switch.
10. Insert speedometer into appropriate hole in dash panel. Position inner ring and "U" clamp. Secure with washers and wing nuts.
11. Insert tachometer into appropriate hole in cab. Position "U" clamp and secure with washers and wing nuts.
12. Install anchor tabs in windshield. Place two (2) rubber strips on windshield. Apply liquid soap into cab groove and position the windshield in location on cab. On interior of cab, starting at center, secure the cab by bending the anchor tabs on each side and installing five (5) screws. Install windshield protector.

(E) INSTALLATION (All Models equipped with 15 inch Track)

1. Position the assembled cab in location on vehicle.
2. Insert hinge pins through frame and cab brackets. Secure each hinge pin with a retaining clip.
3. Place the cab retaining cable on right hand screw of headlight. Install speed nut.
4. Install or connect the following electrical components:

- (a) Cable to speedometer.
 - (b) Quick connector (brown wire) to speedometer and yellow wire.
 - (c) Quick connector to tachometer.
 - (d) Receptacle housing to terminals of headlight socket.
 - (e) Cable spring to cab hinge pin.
 - (f) Strap tubing on wiring harness and retaining cable.
5. Hook the side latches to lock cab.
 6. Check headlight adjustment as detailed in Paragraph 4-1-13.

(F) INSTALLATION (All Models equipped with 18 inch Track)

1. Position the assembled cab in location on vehicle.
2. Insert hinge pins through frame and cab brackets. Secure each hinge pin with a retaining clip.
3. Insert the cab holder into the slotted bracket in frame and secure to cab bracket with a screw and a nut.
4. Connect or install the following electrical components:
 - (a) Ignition switch block to ignition switch.
 - (b) Switch block to light switch.
 - (c) Cable to speedometer.
 - (d) Quick connector (brown wire) to speedometer.
 - (e) Quick connector to tachometer.
 - (f) Receptacle housing to terminals of headlight socket.
5. Position harness under hinge bracket nut and tighten nut.
6. Hook the side latches to lock cab.
7. Check headlight adjustment as detailed in Paragraph 4-1-13.

4-1-10 CAB (All Alpine/Invader and Valmont Models)

(A) REMOVAL

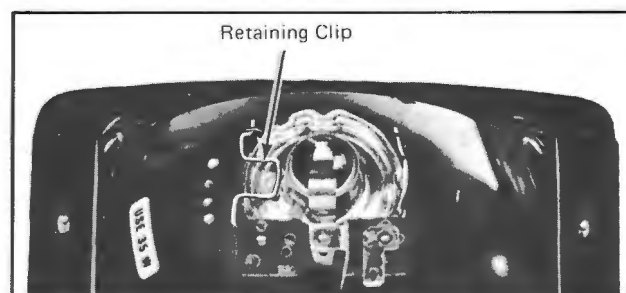
1. Remove fuel tank cap.
2. Disconnect the quick connectors.
3. Unhook side latches and remove cab from vehicle.

(B) DISASSEMBLY

1. On all 1970 Alpine/Invader models, remove windshield using following procedures:
 - (a) Using pliers, straighten the windshield anchor tabs from under the cab and remove windshield from cab.
 - (b) Remove the rubber strip and anchor tabs from the windshield. Remove the windshield protector.

NOTE: On all 1971 Alpine/Valmont models, remove nine (9) nuts, washers, carriage bolts and two (2) corner tabs to remove windshield from cab. Remove protector from windshield.

2. Disconnect receptacle housing from terminals of headlight socket.
3. Remove the headlight assembly from cab by removing the speed nuts.
4. Disassemble headlight using the following procedure:
 - (a) Remove the bulb socket from reflector by lifting the retaining clips (fig. 4-1-100).



- (b) Remove light bulb from socket with a slight counterclockwise twist and pull out the light bulb.
- (c) Remove two (2) washers installed on each screw securing headlight. Remove screws.

NOTE: The components of the headlight assembly consisting of a chrome ring, a lens with a rubber ring and a reflector are attached together with two (2) sleeve rivets. Rivets can be drilled out to replace damaged components.

- 5. The following table includes components that need not be removed from the cab during disassembly procedure unless damaged and/or disfigured. If replacement is required, refer to table for method of attachment and removal operation.

1970 ALPINE/INVADER MODELS		
COMPONENT	ATTACHMENT	REMOVAL OPERATION
Side Louvre (2)	Pop rivets	Use 1/8" drill
Front Louvre (2)	Pop rivets	Use 1/8" drill
Tank filler neck grommet	Groove grommet	Pull out
Latch (2)	Pop rivets	Use 1/8" drill
Identification strips	Self adhesive	Pull off

1971 ALPINE/VALMONT MODELS		
COMPONENT	ATTACHMENT	REMOVAL OPERATION
Louvre (2)	Pop rivets	Use 1/8" drill
Tank filler neck grommet	Grooved grommet	Pull out
Latch (2)	Pop rivets	Use 1/8" drill
Identification plate and reflector	Speed nuts	Use pliers
Identification label	Adhesive back	Pull off
Stripe	Adhesive back	Pull off
Identification plate	Speed nuts	Use pliers

(C) ASSEMBLY

- 1. Prior to Assembly procedure ensure all components are clean of all dirt and all damaged parts have been repaired or replaced. Refer to Paragraph 4-1-11 for Cleaning procedures.
- 2. Carry out Inspection procedures as detailed in Paragraph 4-1-12.
- 3. Assemble headlight using the following procedure:
 - (a) Install two (2) screws and four (4) washers in assembled headlight.

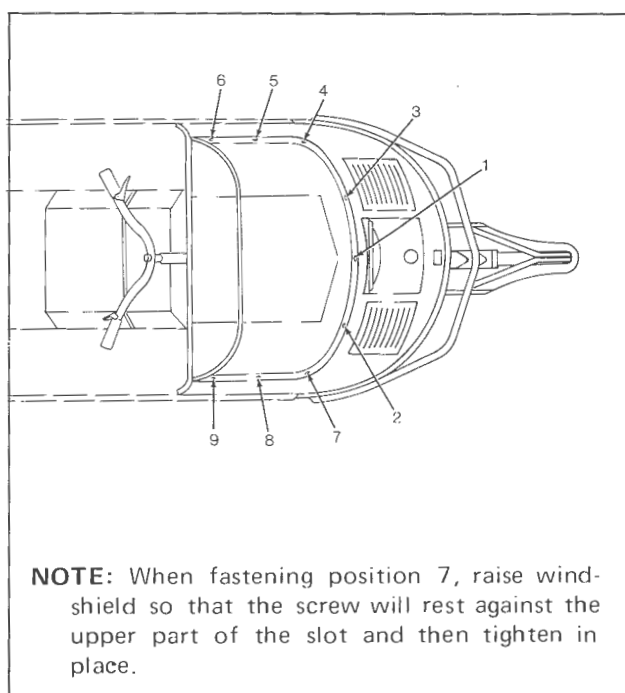
NOTE: If any component (lens, ring and/or reflector) of the headlight was replaced and sleeve rivets were drilled out, assemble lens with rubber ring and reflector to chrome ring using previously removed screws and four (4) washers.

- (b) Install the light bulb into socket with a slight push and clockwise twist.
- (c) Install socket assembly into reflector and secure by closing the retaining clips. Ensure that socket terminals are pointing in opposite direction of word TOP on lens.
- 4. Connect receptacle housing to terminals of headlight socket.
- 5. On all 1970 Alpine/Invader models, Install windshield using following procedure:
 - (a) Install anchor tabs in windshield. Place rubber strip on windshield.
 - (b) Apply liquid soap into cab groove and position the windshield in location on cab.

- (c) Starting at center section, secure windshield by bending the anchor tabs. Install windshield protector.

NOTE: On all 1971 Alpine/Valmont models, secure windshield to cab with two (2) corner tabs, nine (9) carriage bolts, washers and nuts. Install windshield protector (fig. 101).

NOTE: To properly attach windshield to cab, begin securing at center section of windshield.



4-1-101

(D) INSTALLATION

1. Position assembled cab in location on cab.
2. Connect electrical quick connectors.
3. Hook side latches and install fuel tank cap.
4. Check headlight adjustment as detailed in Paragraph 4-1-13.

4-1-11 CLEANING

1. Clean grease and dirt from cab surfaces

using a mild detergent or isopropyl alcohol.

CAUTION: Do not clean with strong soaps, detergents, abrasive cleaners or paint thinners.

2. Clean the windshield by soaking accumulated dirt (salt and calcium, etc.) with clean tap water and a cloth. When sediment has loosened, again apply clean water and remove dirt with a clean cloth.
3. Clean all metal parts with a cleaning solvent and a clean cloth.
4. Lubricate pivoting components of light mechanism and springs with a light coat of low temperature grease.
5. Polycarbonate and fiberglass surfaces can be waxed for protection and for resistance to dirt and grim.

4-1-12 INSPECTION

1. Visually inspect interior and exterior surfaces of cab and check for cracks, breakage and other damage. Repair polycarbonate cab and/or retractable headlight housing as detailed in Paragraph 4-1-14. Repair fiberglass cab as described in Paragraph 4-1-15.

NOTE: Pieces that have been broken off must be collected and retained as they are re-usable for repair procedure.

2. Check condition and secureness of assembled lens, chrome ring and reflector including retaining clips. Replace damaged component(s).
3. Inspect bulb socket for damaged or broken terminals. Replace damaged socket. Replace broken bulb.
4. Inspect windshield for scratches, cuts and abrasion damage. Replace if damaged.

5. Visually inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged component(s).
6. Inspect all other components for wear, damage and/or blemished appearance. Replace, if necessary.
7. Inspect condition of control rod, control lever, headlight ring and stop bracket for mounting hole wear and other damage. Ensure that notch on insert is not broken or cracked. Replace damaged component(s).
8. Visually inspect condition of springs. Ensure springs are not stretched or damaged. Replace as required.

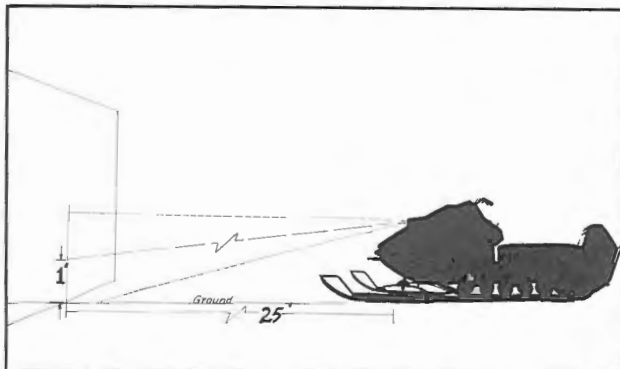
4-1-13 HEADLIGHT ADJUSTMENT

(A) Check headlight 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 ON.

NOTE: This procedure is carried out with light switch at high beam position, on vehicles equipped with Hi/Lo beam.

4. Check that the center of the headlight beam (cast on wall or screen) is one foot (1 ft) from the ground and directly in front of vehicle (fig. 4-1-102).



4-1-102

(B) On vehicles equipped with a RETRACTABLE HEADLIGHT, expose light and adjust beam height using the following procedure.

1. Turn the adjuster screw clockwise to lower beam.

NOTE: The adjuster screw is installed in a bracket of the headlight ring within the cab.

2. Turn the adjuster screw counterclockwise to raise the beam.

NOTE: If maximum adjustment of the adjuster screw does not correct the headlight beam height, remove the control rod from the control lever. Turn the rod adjuster tube clockwise to lower the beam and counterclockwise to raise the beam. Connect control rod to control lever.

(C) On vehicles equipped with a FIXED HEADLIGHT, adjust beam height using the following procedure.

1. Loosen two (2) screws securing headlight to cab.
2. Place a wedge at top of headlight between the chrome ring and cab to lower light beam.
3. Place a wedge at bottom of headlight between chrome ring and cab to raise light beam.
4. Tighten headlight screws.

(D) Side Deflection

1. On **RETRACTABLE HEADLIGHT**, adjust beam side deflection using the following procedure:

- (a) Operate control lever to expose headlight assembly.
- (b) Disconnect receptacle housing from terminals of headlight socket.

- (c) From exterior of cab, turn screws and remove speed nuts from interior of cab securing headlight to headlight ring. Remove headlight from vehicle.
 - (d) Place an extra washer on right hand screw to correct side deflection of the light beam to the right side.
 - (e) Place an extra washer on left hand screw to correct side deflection of light beam to the left side.
 - (f) Place assembled headlight into location on headlight ring. Secure headlight to ring with two (2) new speed nuts.
 - (g) Connect receptacle housing to headlight terminal socket.
2. On **FIXED HEADLIGHT**, adjust beam side deflection using the following procedure:
- (a) From exterior of cab, turn screws and remove speed nuts and cab retaining cable from interior of cab.
 - (b) Place an extra washer on right hand screw to correct side deflection of the light beam to the right side.
 - (c) Place an extra washer on left hand screw to correct side deflection of light beam to the left side.
 - (d) Position cab retaining cable on right hand screw and secure headlight to cab with two (2) new speed nuts.

4-114 POLYCARBONATE

(A) GENERAL

Since a certain amount of abuse and/or damage due to collision is possible on any vehicle, Bombardier Limited has developed a polycarbonate repair kit. This kit, available to all snowmobile owners, is specifically designed for all types of repair.

- The kit can be used to repair all damaged polycarbonate/fiberglass components on

the Ski-Doo snowmobile.

- The kit is simple to use and the materials are easy to apply.
- It is inexpensive thereby enabling all Ski-Doo snowmobile owners to properly maintain the condition of the cab and all other polycarbonate and fiberglass parts.

(B) POLYCARBONATE/ FIBERGLASS KIT

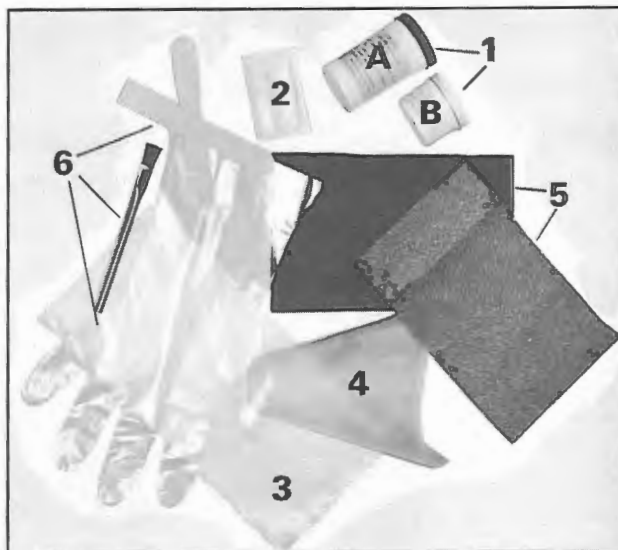
The repair kit includes the materials and accessories shown in figure 4-1-103.

Materials

1. Adhesive (Parts A and B)
2. Spot Putty
3. Dacron Cloth
4. Plastic Film
5. Sandpaper (80 grit and 220 grit — wet or dry)

Accessories

6. Glove
- Spatulas
- Brush



4-1-103

Special equipment and materials (not included in the kit) required during repair procedures are as follows:

- Methyl hydrate (wood alcohol) available from most hardware stores.

- Disc sander
- Pad sander
- Heat lamp (infra red) or electric heater
- Sandpaper (400 grit — wet or dry)
- Masking tape

(C) TYPES OF DAMAGE

Basically, there are three (3) types of damage for which a specific repair procedure is required. The types are namely: GROOVES, CRACKS and BREAKAGE. The following procedures detail kit applications for repair of vehicle cab. However, the instructions outlined also apply to repair of backrest, console and other polycarbonate or fiberglass components.

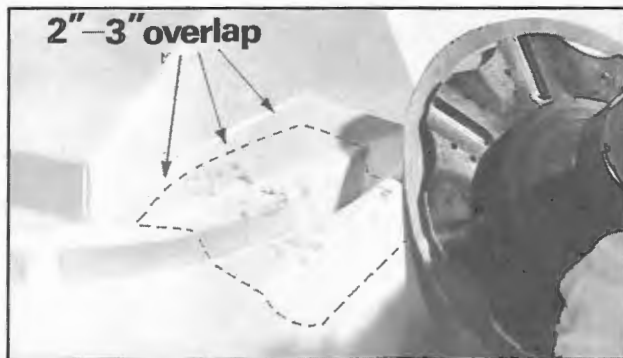
NOTE: It is very important that one adheres strictly to the following procedures while carrying out repairs.

(D) GROOVES

1. Remove the cab from the vehicle.
2. Use methyl hydrate (wood alcohol) to clean all grease and dirt in an area of at least 12 inches surrounding damage.

CAUTION: Do not use acetone or any solvent that will cause etching of polycarbonate.

3. Using a disc sander, scuff-sand the damaged surface with 2 to 3 inches overlap (fig. 4-1-104).



4-1-104

4. Wipe the roughened area clean with methyl hydrate and allow to air dry.

5. Remove adhesive container seals. Following instructions given on container "A", pour contents of parts "B" into container "A" and stir for three (3) minutes.

NOTE: The bottom and sides of container must be scraped during the mixing to thoroughly combine the ingredients of the adhesive. Do not allow air to become trapped in the mixture by stirring too vigorously.

6. Let the mixture set for ten (10) minutes to allow it to thicken to a paste.
7. Using a spatula, apply a generous coating of the mixture to the damaged area (fig. 4-1-105).



4-1-105

8. Cut a piece of plastic film 1-1/2 times the size of the area covered with adhesive mixture.
9. Place the film on the mixture and gently apply pressure to the film.
10. Working from the center towards the film edges, slide the spatula over the plastic film. This spreads the mixture evenly over the damaged area (fig. 4-1-106).



4-1-106

11. Wipe off all excess mixture from edges of the film.
12. Secure the plastic film to the cab with masking tape and allow the reworked area to harden for twelve (12) hours.
13. To complete the hardening process, place a heater or infra red lamp 1 to 1-1/2 feet from the repair **FOR THE LAST HOUR** of hardening.

CAUTION: Never allow the repaired surface to heat beyond "hand holding" temperature. If a heat source is not available, allow the repair to harden for a further twelve (12) hours.

14. After complete hardening, remove the plastic film from the repaired area.
15. Remove excessive mixture build-up on cab exterior surface with 80 grit sandpaper.

CAUTION: Avoid over-sanding with the 80 grit sandpaper as the removal of too much mixture will leave ridges in the repair surface.

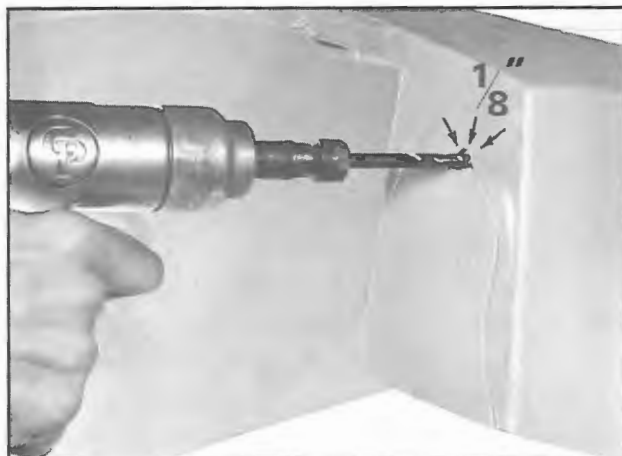
16. Further smoothen surface with 200 grit sandpaper and finalize finish with 400 grit sandpaper.
17. Clean the surface with a clean, dry cloth and inspect for air bubbles or holes.
18. Refer to Paragraph (G) for repair procedure of air bubbles or holes.

(E) CRACKS

1. Remove cab from vehicle.
2. Use methyl hydrate (wood alcohol) to clean all grease and dirt from an area of at least 12 inches surrounding damage on interior and exterior surfaces of cab.

CAUTION: Do not use acetone or any solvent that will cause etching of polycarbonate.

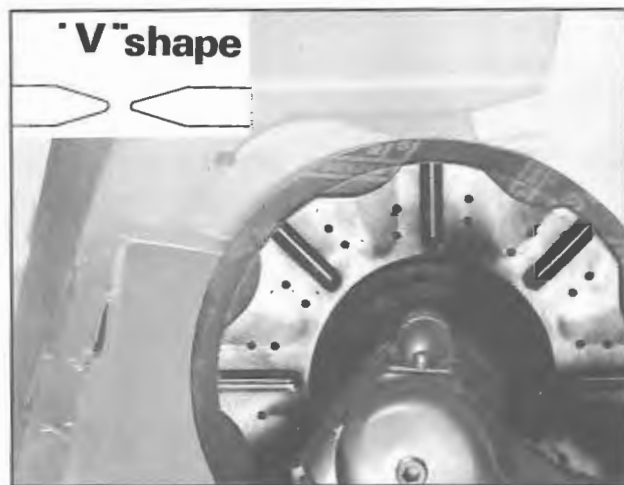
3. Drill 1/8 inch dia holes at the ends of the crack. This will avoid further splitting (fig. 4-1-107).



4-1-107

4. Using a disc sander, scuff-sand all sides of damaged areas with a 2 to 3 inches overlap on the exterior surface and 3 to 6 inches overlap on the interior surface.

NOTE: Edges of cracks must be sanded to form a "V" shape (fig. 4-1-108).



4-1-108

5. Wipe all reworked areas clean with methyl hydrate and allow to air dry.
6. Commence mixing application on interior surface by first cutting a piece of dacron cloth allowing 3 to 6 inches overlap on all sides of interior damage.
7. Remove adhesive container seals. Following the instructions given on con-

tainer "A", pour contents of part "B" into container "A" and stir for three (3) minutes.

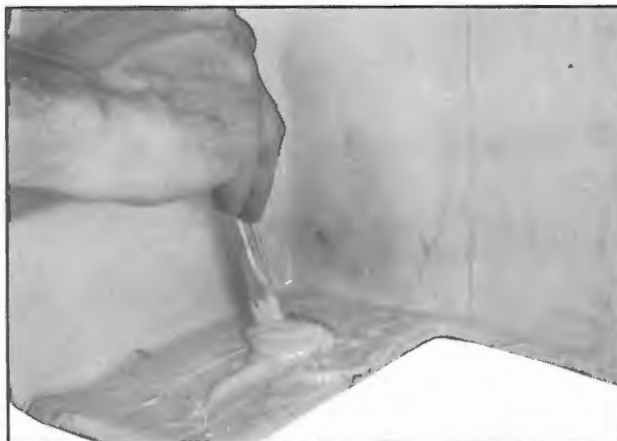
NOTE: The bottom and sides of container must be scraped during the mixing to thoroughly combine the ingredients of the adhesive. Do not allow air to become trapped in the mixture by stirring too vigorously.

8. Using the brush contained in the kit, apply the mixture with a scrubbing action to damaged area.
9. Position the cloth on the pasted area and using the brush, dab the cloth on the mixture (fig. 4-1-109). Allow mixture to harden for 3 to 5 minutes.



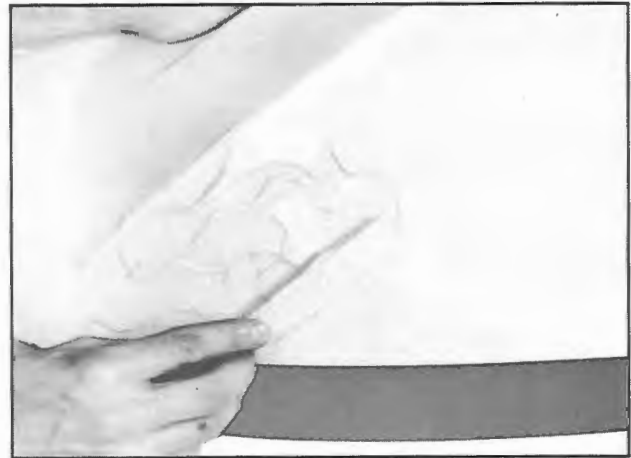
4-1-109

10. Apply another generous and even amount of mixture over the entire surface of the cloth (fig. 4-1-110).



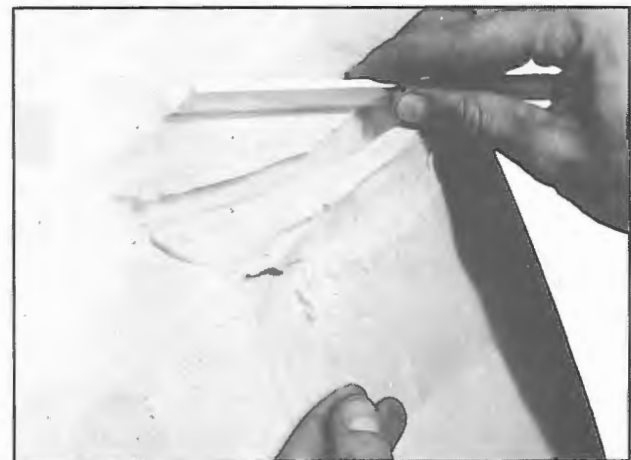
4-1-110

11. Using a spatula, apply a generous coating of the mixture to the damage area (fig. 4-1-111).



4-1-111

12. Cut a piece of plastic film 1-1/2 times the size of the area covered with adhesive mixture.
13. Place the film on the mixture and gently apply pressure to the film.
14. Working from the center towards the film edges, slide the spatula over the plastic film. This spreads the mixture evenly over the damaged area (fig. 4-1-112).



4-1-112

15. Remove any excess mixture from edges of the film.
16. Secure the plastic film with masking tape and allow the reworked area to harden for twelve (12) hours.

17. To complete the hardening process, place a small heater or infra red lamp 1 to 1-1/2 feet from the repair **FOR THE LAST HOUR** of hardening.

CAUTION: Never allow the repaired surface to heat beyond "hand holding" temperature. If a heat source is not available, allow the reworked area to harden for a further twelve (12) hours.

18. After complete hardening, remove the plastic film from both the interior and exterior surfaces of repaired area.
19. Remove excessive mixture build-up with 80 grit sandpaper.

CAUTION: Avoid over-sanding with the 80 grit sandpaper as the removal of too much mixture will leave ridges on the repair surface.

20. Further smoothen surface with 220 grit sandpaper and finalize finish with 400 grit sandpaper.
21. Clean the surface with a clean, dry cloth and inspect the surface for air bubbles or holes.
22. Refer to Paragraph (G) for repair procedure of air bubbles or holes.

(F) BROKEN PIECES

NOTE: Polycarbonate pieces that have been broken off must be collected as they are essential for the repair procedure.

1. Refer to Paragraph (E) and carry out steps 1. to 10. inclusive, for the first layer of cloth and then steps 6. to 10. for second layer of dacron cloth.
2. Place a piece of plastic film over the cloth. Hold plastic film in place using masking tape (fig. 4-1-113). This is to provide support while positioning the broken piece(s).

NOTE: Make sure you have sufficient film to cover the required area of the exterior surface damage.



4-1-113

3. Roughen both sides of the broken pieces. Apply the mixture to the edges of the broken sections (broken cab and pieces edges) and over the exposed cloth. Insert and match the piece(s) in the broken section. Make sure that the mixture completely fills the crack between the piece(s) and the section (fig. 4-1-114).
4. Refer to Paragraph (E) and carry out steps 11. to 22., inclusive.



4-1-114

(G) AIR BUBBLES OR HOLES

To fill air bubbles or holes, carry out the following procedure:

1. Using a putty knife, fill bubbles or holes with spot putty.

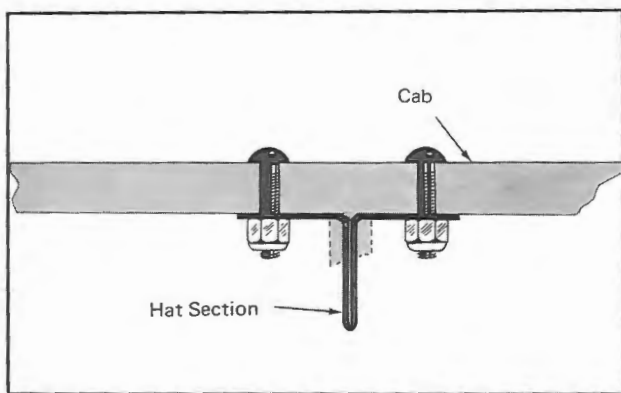
2. Allow the putty to harden for ten (10) minutes. Then smooth with wet or dry 400 grit sandpaper.
3. Wipe the area free of dust particles and spray the repair with appropriate Ski-Doo paint. Refer to Paragraph (J) for Paint.

(H) BROKEN BRACKET

To replace a broken bracket use the following procedure:

NOTE: A broken bracket is an integral part of a polycarbonate cab. A piece of sheet metal bent to form a hat section can be used to replace a broken bracket. Both flats of the formed section must be roughened with a coarse file.

1. Drill holes in cab and bracket and bolt the bracket to the cab.
2. The following illustration will serve to clarify the above step (fig. 4-1-115).



4-1-115

(J) PAINT

The following indicates the paint for 1970 and '71 vehicles. Be sure to use the correct paint for each vehicle as there are slight variations in shades of yellow for the different years. Paint is available in 16 oz. aerosol spray can or 40 oz. can liquid.

(K) PAINT APPLICATION

After completing repairs, prepare area for

local paint application by ensuring a clean, dry surface and using the following procedure:

1. Apply three (3) or four (4) thin coats of acrylic paint of the correct year and colour code at intervals of 15 to 20 minutes.
2. When paint is dry, use rubbing compound to polish the newly painted surface until it matches the surrounding area.

(L) CLEANING AND WAXING

1. Cleaning

Polycarbonate surfaces may be cleaned using mild detergent or isopropyl alcohol.

CAUTION: Strong soaps, detergents, abrasive cleaners, paint thinners and most solvents should not be used to clean polycarbonate surfaces.

2. Waxing

Polycarbonate surfaces may be waxed for protection and polished for resistance to dirt and grime build-up.

4-1-15 FIBERGLASS REPAIR

(A) GENERAL

Since a certain amount of abuse and/or damage due to collision is possible on any vehicle, Bombardier Limited has included specific repair procedures in this manual.

(B) MATERIALS AND ACCESSORIES REQUIRED

Materials

- Fiberglass Resin
- Resin Catalyst (Hardener)
- Fiberglass Cloth
- Sandpaper (280 grit and 400 grit – wet and dry)
- Methyl Hydrate (Wood Alcohol)

Accessories

Disc Sander
Pad Sander
Gloves
Spatulas
Brush

(C) TYPES OF DAMAGE

Basically, there are three (3) kinds of damage for which a specific repair procedure is required. The kind of damages are namely: GROOVES, CRACKS and BREAKAGE. The following procedures detail specific repair procedure for each type of damage.

NOTE: It is very important that one adheres strictly to the following procedures while carrying out repairs.

(D) GROOVES

To repair groove type damage, use the following procedure:

1. Remove the cab from the vehicle.
2. Use methyl hydrate (wood alcohol) to clean all grease and dirt in an area of at least 12 inches surrounding damage (fig. 4-1-116).

CAUTION: Do not use acetone or any solvent that will cause etching of fiberglass.



4-1-116

3. Using a disc sander, scuff-sand the damaged surface and immediate surrounding area to provide adhesion.
4. Wipe the roughened area cleaned with methyl hydrate and allow to air dry (fig. 4-1-117).



4-1-117

5. Prepare a quantity of plastic putty (putty and hardener), sufficient to fill the groove and fair edges, by adding two (2) drops of catalyst (hardener) for each ounce of resin used.

NOTE: More or less catalyst will not affect the basic characteristics of the plastic putty; it will only prolong or shorten the hardening time.

6. Using a spatula work quickly and apply a generous coating of plastic putty to the damaged area (fig. 4-1-118).



4-1-118

7. Allow the reworked area to dry for twenty (20) minutes.
8. Once dried, use a body file to level out the repaired area to the contour of the surrounding surface.
9. Prepare surface for finishing by sanding the repaired area initially with 280 grit sandpaper until the surface is smooth and level with surrounding contour.
10. Using a pad sander, polish the repair to a smooth even surface using 400 grit wet paper (fig. 4-1-119).

NOTE: In the above step, make sure paper is kept wet throughout the polishing and finishing sequence.



4-1-119

11. Clean the surface with a clean dry cloth and inspect for air bubbles and other imperfections.
12. Refer to Paragraph (H) for repair procedure of air bubbles or holes.

(E) CRACKS

To repair cracks use the following procedure:

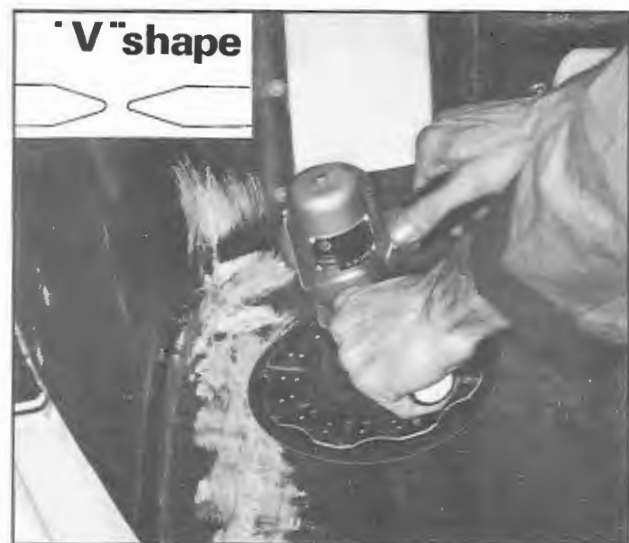
1. Remove cab from vehicle.
2. Use methyl hydrate to clean all grease and dirt in an area of at least 12 inches

surrounding damage. Both interior and exterior surfaces of cab must be cleaned.

CAUTION: Do not use acetone or any solvent that will cause etching of fiberglass.

3. Using a disc sander, scuff-sand all sides and areas with 2 to 3 inches overlap on the exterior surface and 3 to 6 inches overlap on the interior surface.

NOTE: Edges of cracks must be sanded to form a "V" shape (fig. 4-1-120).



4-1-120

4. Wipe all reworked areas clean with methyl hydrate and allow to air dry.
5. For interior surface application, cut two (2) or three (3) layers of fiberglass cloth about twice the size of the area to be repaired.
6. Prepare a quantity of fiberglass resin sufficient for three (3) brush coat applications to the repair area.
7. Mix fiberglass resin with catalyst in a ratio of two (2) drops of catalyst for each ounce of resin used.
8. Prepare a fiberglass "mat" of two (2) or three (3) layer thickness by coating each layer of fiberglass cloth with resin using a paint brush.

9. Apply the resin coated mat on the back of the area being repaired (fig. 4-1-121).



4-1-121

10. Use a small roller (or dab with the end of the paint brush) to press the newly applied mat to the existing part (fig. 4-1-122).



4-1-122

11. Continue rolling or dabbing action to smooth out and remove all air entrapped between the repaired area and the newly applied mat.

NOTE: Ensure all air pockets are removed or weak spots may result.

12. Allow the reworked area to dry for 25 to 45 minutes.
13. With the application of the fiberglass mat a previous crack is now essentially a groove type repair and can be reworked as described in Paragraph D, steps 6. through 11. inclusive.

(F) BROKEN AREA (Pieces not retained)

To accomplish repair when broken pieces have not been retained use the following procedure:

NOTE: The installed fiberglass mat provides the necessary support for resin putty to be applied.

1. Carry out steps 6. through 11., Paragraph (D). Considerably more putty must be prepared for this application.
2. Select and apply paint to the repaired area as detailed in Paragraphs (H) and (J).

(G) BROKEN AREA (Pieces retained)

To accomplish repair when broken pieces have been retained use the following procedure:

NOTE: The installed fiberglass mat provides the necessary support for broken piece(s) installation and resin putty to be applied.

1. Brush coat the surface of the mat (where broken piece is to be applied) with resin hardener.
2. Prepare broken piece and surrounding repair area of structure as detailed in steps 3. and 4. of Paragraph (E).
3. Brush coat inner surface and sides of the piece to be applied with resin.
4. Install piece in place on mat leaving sufficient room on all sides to "trowel-in" putty. Allow to set for 40 minutes.
5. Complete the repair of the installed piece as detailed in Paragraph (D), steps 6. through 11., inclusive.
6. Select and apply paint to be repaired area per Paragraphs (J) and (K).

(H) AIR BUBBLES OR HOLES

1. Air bubbles or holes can be repaired by applying additional plastic putty and repeating steps 6. through 11. of Paragraph (D).
2. When the surface is free from damage, wipe the area clean of dust particles and spray with Ski-Doo paint. Refer Paragraph (J).

(J) PAINT

The following indicates paint code numbers for 1970 and 1971 vehicles. Be sure to use the correct paint for each vehicle as there are slight variations in shades of yellow for the different years. Paint is available in 16 oz. aerosol spray can or 40 oz. can liquid.

(K) PAINT APPLICATION

After completing repairs, prepare area for local paint application by ensuring a clean, dry surface and use the following procedure:

1. Apply three (3) or four (4) thin coats of acrylic paint of the correct year and colour code at intervals of 15 to 20 minutes (fig. 4-1-123).



4-1-123

2. When paint is dry, use rubbing compound to polish the newly painted surface until it matches the surrounding area.

4-1-16 CONSOLE**(A) REMOVAL
(All Elan Models)**

1. Push downward on console to disengage console from under dash panel.
2. Pull and slide the manual starter rope out through slot on right side of console.
3. Disconnect the spring attached to console. Remove console.

**(B) INSTALLATION
(All Elan Models)**

1. Connect spring to console and position console in location.
2. Slip manual starter rope through slot of console.
3. Push downward on console to engage console under dash panel.

**(C) REMOVAL
(All 1971 Olympique Models)**

1. Pull console rearward and disconnect spring attached to console.
2. Pull and slide the Manual starter rope out through slot on right side of console. Remove console.

**(D) INSTALLATION
(All 1971 Olympique Models)**

1. Position console in location on vehicle.
2. Slip manual starter handle rope through sole of console.
3. Connect spring to console and position console in location.

**(E) REMOVAL
(All Valmont Models)**

1. Open console latches and remove console from vehicle.

NOTE: Do not drill out pop rivets securing grill or latches to console unless damaged and replacement is necessary.

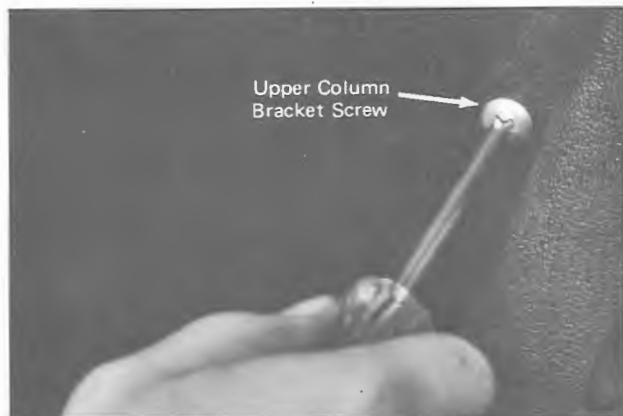
(F) INSTALLATION
(All Valmont Models)

1. Position console in location on vehicle and close latches.

(G) REMOVAL
(All Nordic 399 and 399E Models)

1. Unhook and tilt cab forward.
2. Disconnect brake and throttle cables and housing from handlebar.
3. Remove capscrew from handlebar. Pull handlebar from splines of steering column.
4. Open lower access cover and remove upper access cover.
5. Remove cotter pin from choke knob lever. Remove choke knob from carburetor.
6. Disconnect all electrical connections and switch blocks.
7. Remove the four (4) screws and nuts attaching the console to the frame brackets (fig. 4-1-124).

NOTE: On 1971 models, remove two (2) screws and nuts attaching console to upper column bracket.



4-1-124

8. Pass the rubber buffer and manual starter handle through slotted hole and remove the console.

(H) DISASSEMBLY
(All Nordic 399 and 399E Models)

1. The following table includes components that need not be removed from the console unless damaged and/or disfigured. If replacement is required, refer to following table for method of attachment.

COMPONENT	ATTACHMENT
Lower access door	Pop rivets
Lower access door hinge	Pop rivets
Door push button	Locking washer
Push button bracket	Two (2) screws and nuts
Upper access door	Pop rivets
Anchor clips	
Upper access door	Retaining stud
Anchor screws	
Rectifier (on Electric models only)	Two (2) nuts, washers and screws
Ignition switch	Rubber boot locking nut and face nut
Headlight switch	Switch knob, locking nut and face nut
Headlight switch	Adhesive back
Nameplate	
Lighter	Inserted into socket
Dash panel	Adhesive back

(J) INSTALLATION
(All Nordic 399 and 399E Models)

1. Position the console in location on vehicle. Push the manual starter handle and buffer through slot of console.
2. Secure the console to the frame with four (4) bolts.
3. Connect all electrical connections and switch blocks.
4. Insert choke knob through aperture in left side of console and secure to carburetor with a new cotter pin.
5. Install upper access door.

6. Correctly position handlebar on steering column splines and secure handlebar with a capscrew.
7. Connect brake and throttle housings and cables.
8. Close cab.

(K) REMOVAL
(All Nordic 640E Models)

1. Unhook and tilt cab forward.
2. Pull the console towards rear of vehicle.
3. Disconnect all electrical connections and switch blocks.
4. Unscrew choke knob from choke cable. Remove nut and washer.
5. Remove the two (2) bolts and nuts attaching the console to the frame bracket. Remove console from vehicle.
6. Disconnect speedometer cable from instrument.

(L) DISASSEMBLY
(All Nordic 640E Models)

1. The following cable includes components that need not be removed from the console unless damaged and/or disfigured. If replacement is required, refer to following table for method of attachment.

COMPONENT	ATTACHMENT
Bombardier crest	Adhesive back
Console bracket	Pop rivets and washers
Tachometer (1970 Models)	Washer, Nut and "U" clamp
Tachometer (1971 Models)	Wing nuts, washers and "U" clamp
Speedometer (1970 Models)	Washer, nut, ring and "U" clamp
Speedometer (1971 Models)	Wing nuts, washers and "U" clamp
Rectifier	Two (2) nuts, washers and screws
Headlight switch	Switch knob, locking nut and face nut
Lighter	Inserted into socket
Dash panel	Pop rivets

(M) INSTALLATION
(All Nordic 640E Models)

1. Position the assembled console in location on vehicle.
2. Connect all electrical connections and switch blocks.
3. Insert choke cable through appropriate aperture in console and secure with a washer and nut. Install choke knob.
4. Secure the console to the frame bracket with two (2) bolts and nuts.
5. Push the console forward and snap into place.
6. Connect speedometer cable to instrument.
7. Close cab.

BODY AND FRAME

4-2 FRAME

(A) GENERAL

This sub-section includes such components as the fuel tank, front and rear handles, bumpers, reflectors, engine carriage bolts and similar items. Some of the variations between models are as follows:

- All 1970 Olympique and T'NT models equipped with 15 inch track, have a fuel tank integral with the frame.
- All Elan, Alpine/Invader and Valmont models incorporate translucent fuel tanks.
- All Olympique and T'NT models equipped with 15 inch track, have a graduated dipstick.
- All 18 inch track vehicles have a fuel gauge installed in the fuel tank.
- The side handles on all 1970 Olympique models (except the 12/3 model) are integral with the rear bumper.
- A fiberglass front bottom plate is secured to the underside of the Alpine/Invader and Valmont models.

The components included in Table 1 are parts which are considered readily removable items and of which no detailed procedures have been included in this manual. The checks (✓) indicate the various components which are applicable to a specific model. Where it is necessary detailed procedures have been included in this sub-section.

		Front Handle	Front Bumper	Muffler Grommet	Foot Pads	Side Reflectors	Hitch	Rear Bumper	Tail Light
1970									
Olympique	12/3			✓	✓	✓	✓		✓
	335 & E		✓	✓	✓	✓	✓	✓	✓
	399		✓	✓	✓	✓	✓	✓	✓
Nordic	399 & E		✓	✓	✓	✓	✓	✓	✓
	640E		✓	✓	✓	✓	✓	✓	✓
Skandic	335		✓	✓	✓	✓	✓	✓	✓
T'NT	292		✓	✓	✓		✓	✓	✓
	340		✓	✓	✓		✓	✓	✓
	399		✓	✓	✓		✓	✓	✓
	640		✓	✓	✓		✓	✓	✓
Alpine/Invader	399 & E		✓	✓	✓	✓	✓		✓
	640E		✓	✓	✓	✓	✓		✓
1971									
Elan	250 & E			✓	✓				✓
Olympique	300	✓	✓	✓	✓		✓	✓	✓
	335 & E	✓	✓	✓	✓		✓	✓	✓
	399 & E	✓	✓	✓	✓		✓	✓	✓
Nordic	399 & E	✓	✓	✓	✓		✓	✓	✓
	640E	✓	✓	✓	✓		✓	✓	✓
Skandic	335	✓	✓	✓	✓		✓	✓	✓
T'NT	292	✓	✓	✓	✓		✓	✓	✓
	340	✓	✓	✓	✓		✓	✓	✓
	440	✓	✓	✓	✓	✓	✓	✓	✓
	640	✓	✓	✓	✓	✓	✓	✓	✓
	775	✓	✓	✓	✓	✓	✓	✓	✓
Alpine/Valmont	399 & E		✓	✓	✓	✓	✓	✓	✓
	640E		✓	✓	✓	✓	✓	✓	✓

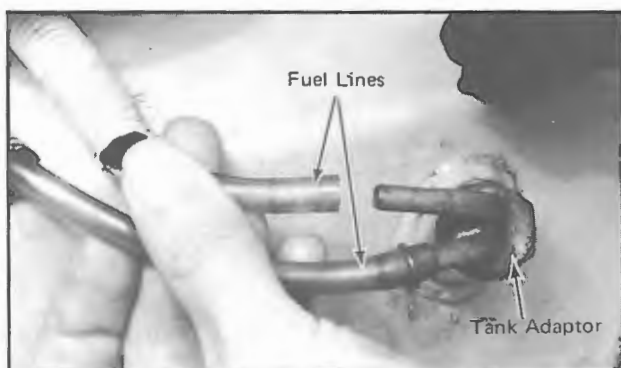
4-2-1 FUEL TANK

(A) REMOVAL (All 1970 Olympique T'NT 292 and T'NT 340)

NOTE: The above vehicles incorporate a built-in fuel tank equipped with a drain plug.

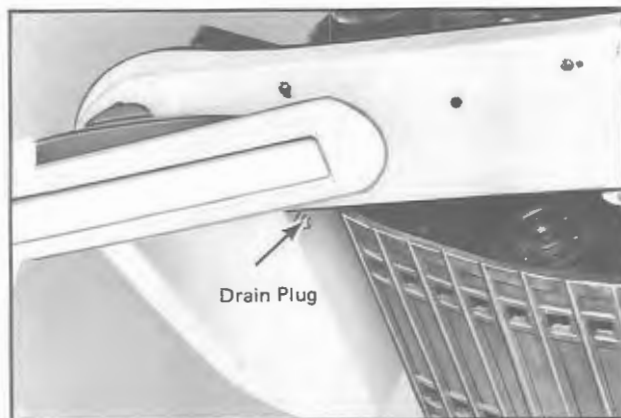
1. Remove cab as detailed in sub-section 4-1. Remove fuel tank cap.
2. Disconnect the fuel lines from the fuel line adaptor. Unscrew and remove adaptor (fig. 4-2-1).

NOTE: Do not remove short fuel lines from adaptor unless line(s) or adaptor is damaged and replacement is necessary.



4-2-1

3. To drain residual fuel from tank use the following procedure:
 - (a) Lift and block front of vehicle off the ground.
 - (b) Using a 1/4 inch Allen key, remove drain plug and drain fuel.



4-2-2

4. Loosen clamp securing filler pipe extension to the filler pipe tube. Remove filler neck from extension.

(B) INSTALLATION (All 1970 Olympique, T'NT 292 and T'NT 340 Models)

1. Prior to Assembly procedure ensure all components are clean of all dirt and all damaged parts have been repaired or replaced. Refer to Paragraph 4-2-2 for Cleaning procedures.
2. Carry out Inspection procedures as detailed in Paragraph 4-2-3.
3. Lift and block the front of vehicle off the ground.
4. Using a 1/4 inch Allen key, install drain plug into bottom of fuel tank.
5. Secure the filler neck to the filler neck extension with a clamp. Position and secure extension to filler pipe tube.
6. Screw the fuel line adaptor into the fuel tank.

NOTE: Position lower end of extension pipe approximately 2-1/4 inches from end of tube.

7. Connect the fuel lines to the fuel tank adaptor and secure with spring clips.
8. Install cab as detailed in sub-section 4-1.

(C) REMOVAL (All 1970 and '71 Nordic, Skandic and T'NT Models equipped with 18 inch Tracks)

1. Tilt cab forward and remove fuel tank cap.
2. Disconnect the fuel lines from the fuel tank adaptor (fig. 4-2-3).

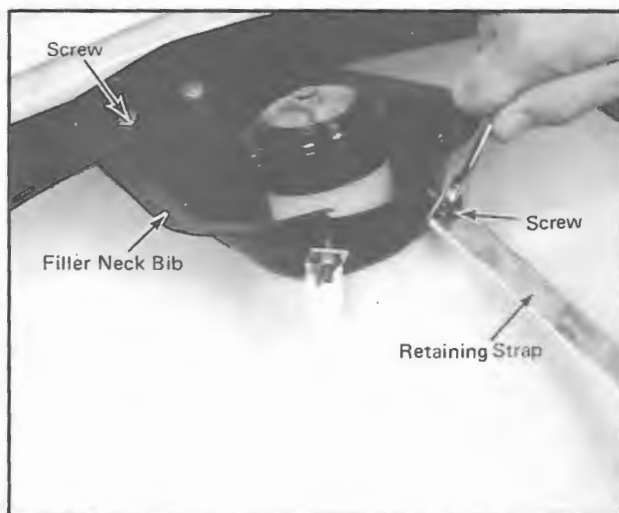
CAUTION: To prevent gasoline spillage, install a short fuel line to both nipples of adaptor.



4-2-3

3. Remove the two (2) screws and nuts attaching the fuel tank retaining straps to the filler neck bib. Remove the two (2) screws and nuts attaching the bib to the frame (fig. 4-2-4). Remove the bib and fuel tank from vehicle.

NOTE: Do not drill out rivets securing retaining straps to frame, unless straps are damaged and replacement is required.

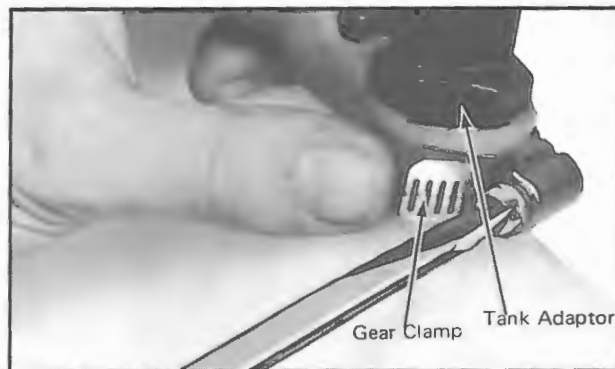


4-2-4

(D) DISASSEMBLY (All 1970 and '71 Nordic, Skandic and T'NT Models equipped with 18 inch Track)

1. Loosen the gear clamp and unscrew the tank adaptor from tank (fig. 4-2-5).

NOTE: Do not remove short fuel lines from adaptor unless line(s) or adaptor is damaged and replacement is necessary.



4-2-5

(E) ASSEMBLY (All 1970 and '71 Nordic, Skandic and T'NT Models equipped with 18 inch Track)

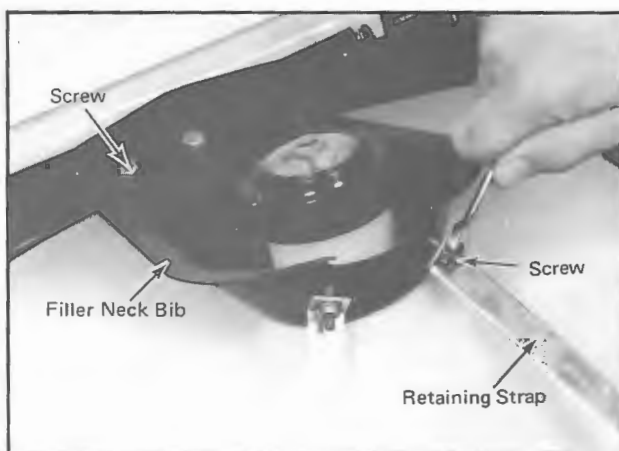
1. Prior to Assembly procedure ensure all components are clean of all dirt and all damaged parts have been repaired or replaced. Refer to Paragraph 4-2-2 for Cleaning procedures.
2. Carry out Inspection procedures as detailed in Paragraph 4-2-3.
3. Position the gear clamp on the fuel tank adaptor and insert the short fuel lines (connected to adaptor) into the tank.
4. Insert the fuel tank adaptor into the tank. Adaptor nipples must be facing aft when all the way in tank. Secure adaptor by tightening gear clamp (fig. 4-2-6).



4-2-6

(F) INSTALLATION (All 1970 and '71 Nordic, Skandic and T'NT Models equipped with 18 inch Track)

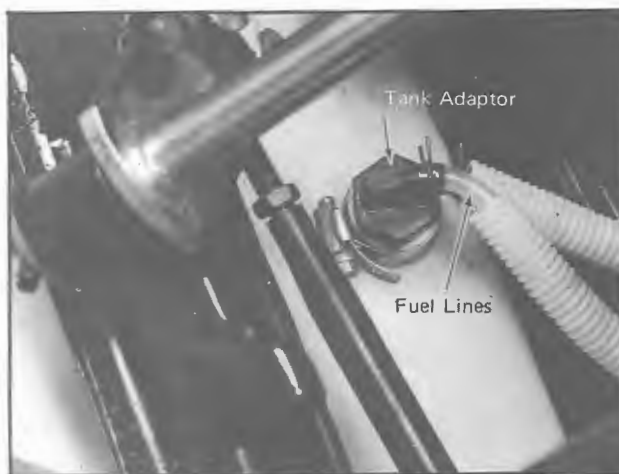
1. Install the assembled tank into position on the vehicle.
2. Position the filler neck bib on the tank and attach the bib to the frame with two (2) screws and nuts. Correctly position the retaining strips and secure strips to bib using two (2) screws (fig. 4-2-7).



4-2-7

3. Remove temporarily installed fuel line. Connect the fuel lines to the tank adaptor and secure with spring clips.

NOTE: Always connect longest fuel line to lower nipple of fuel tank adaptor (fig. 4-2-8).



4-2-8

4. Install the fuel tank cap and close cab.

(G) REMOVAL (All Elan Models)

1. Tilt cab forward and remove fuel tank cap.
2. Disconnect the fuel lines from the fuel line adaptor (fig. 4-2-9).

CAUTION: To prevent gasoline spillage, connect a short fuel line to both nipples of adaptor.



4-2-9

3. Remove the screw attaching the retaining strap to reinforcing cross support. To free the hooked end of the strap from the frame, push down on the front of the strap and remove strap.

NOTE: Do not remove protector strip from tank unless damaged and replacement is necessary.

4. Remove the fuel tank from the vehicle.

(H) DISASSEMBLY (All Elan Models)

1. Loosen the gear clamp and remove the fuel tank adaptor.

NOTE: Do not remove short fuel lines from adaptor unless lines or adaptor is damaged and replacement is necessary.

(J) ASSEMBLY (All Elan Models)

1. Prior to Assembly procedure ensure all components are clean of all dirt and all

damaged parts have been repaired or replaced. Refer to Paragraph 4-2-2 for Cleaning procedures.

2. Carry out inspection procedures as detailed in Paragraph 4-2-3.
3. Position the gear clamp on the fuel tank adaptor and insert the short fuel lines (connected to adaptor) into the tank.
4. Install the fuel tank adaptor into the tank. Adaptor nipples must be facing aft when installed all the way into tank. Secure adaptor by tightening gear clamp (fig. 4-2-10).



4-2-10

(K) INSTALLATION (All Elan Models)

1. Install the assembled tank into position on the vehicle.
2. Hook the end of the retaining strap between the frame wall and the front of the tank. Secure other end of strap to reinforcing cross support with a screw.
3. Remove the temporarily installed fuel line. Connect the fuel lines to the fuel tank adaptor and secure with spring clips.

NOTE: Always connect longest fuel line to lower nipple of fuel tank adaptor (fig. 4-2-11).



4-2-11

4. Install fuel tank cap and close cab.

(L) REMOVAL (All 1971 Olympique and T'NT Models equipped with 15 inch Track)

1. Tilt cab forward and remove fuel tank cap.
2. Disconnect the fuel overflow line from the filler neck bib. Remove the two (2) screws and washers attaching the retaining straps to frame (fig. 4-2-12).

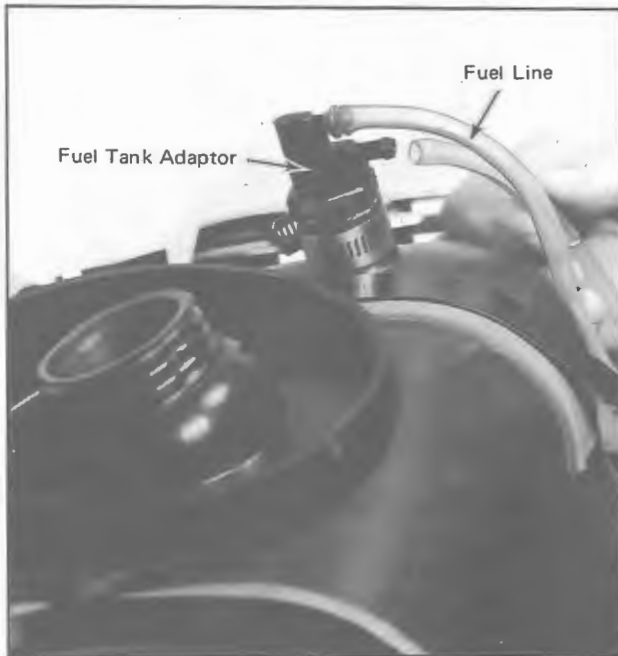
NOTE: Do not drill out pop rivets securing other end of straps to reinforcing cross support unless damaged and replacement is necessary.



4-2-12

3. Disconnect the fuel lines from the fuel tank adaptor (fig. 4-2-13).

CAUTION: To prevent gasoline spillage, installed short fuel line to both nipples of adaptor.



4-2-13

4. Remove the fuel tank from the vehicle.

(M) DISASSEMBLY (All 1971 Olympique and T'NT Models equipped with 15 inch Track)

1. Loosen the gear clamp and remove the fuel tank adaptor.

NOTE: Do not remove short fuel lines from adaptor unless line(s) or adaptor is damaged and replacement is necessary. Do not remove protector strip from tank unless damaged and replacement is necessary.

(N) ASSEMBLY (All 1971 Olympique and T'NT Models equipped with 15 inch Track)

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

replaced. Refer to Paragraph 4-2-2 for Cleaning procedures.

2. Carry out Inspection procedures as detailed in Paragraph 4-2-3.
3. Position the gear clamp on the fuel tank adaptor and insert the fuel lines (connected to adaptor) into the tank.
4. Screw the fuel tank adaptor into the tank. Adaptor nipples must be facing aft when screwed all the way into tank. Secure adaptor by tightening gear clamp (fig. 4-2-14).



4-2-14

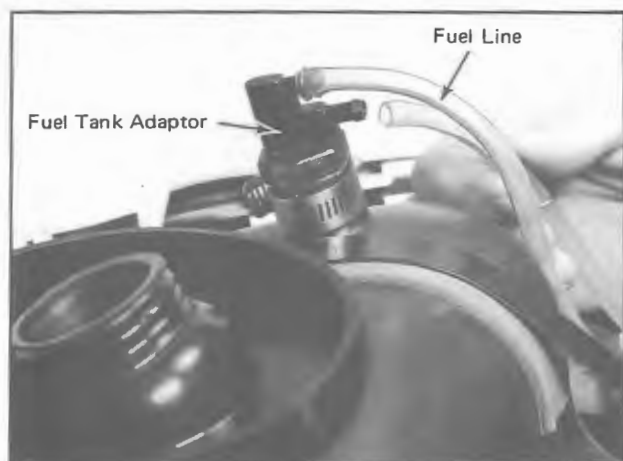
5. Place the filler neck bib on the fuel tank with the overflow tube facing forward. Install the fuel tank cap.

(P) INSTALLATION (All 1971 Olympique and T'NT Models equipped with 15 inch Track)

1. Install the assembled tank into position on the vehicle.
2. Correctly position the tank retaining straps and secure to frame with two (2) screws and washers.
3. Remove temporarily installed fuel line.

Connect the fuel lines to the fuel tank adaptor and secure with spring clips.

NOTE: Always connect longest fuel line to lower nipple of fuel tank adaptor (fig. 4-2-15).



4-2-15

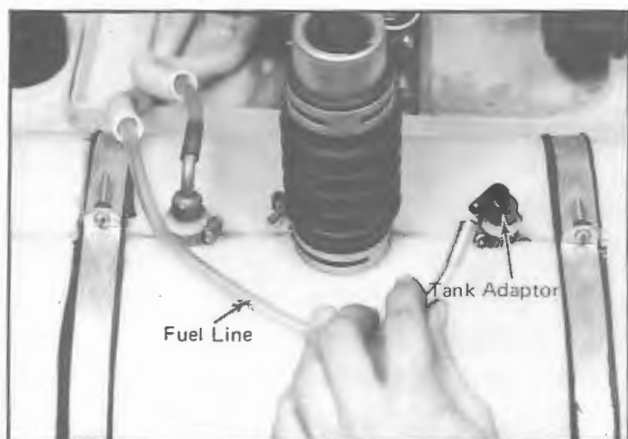
4. Connect the overflow fuel line to bib tube and secure with a spring clip.

5. Install fuel tank cap and close cab.

(Q) REMOVAL (All 1970 and '71 Alpine/Invader and Valmont Models)

1. Remove the fuel tank cap and remove the cab.
2. Disconnect each fuel line from the fuel tank adaptors (fig. 4-2-16).

CAUTION: To prevent gasoline spillage install a short fuel line to both nipples of adaptor.



4-2-16

2. On all 1970 Alpine/Invader models, remove two (2) nuts and screws securing the tank retaining straps. It is not necessary to drill out rivets securing retaining strap halves. Pivot, strap halves sideways to enable removal of tank.

NOTE: On all 1971 Alpine/Invader models, remove the two (2) bolts and nuts securing the fuel tank retaining straps.

4. Remove the fuel tank from the vehicle.

(R) DISASSEMBLY (All 1970 and '71 Alpine/Invader and Valmont Models)

1. Unscrew adaptors from tank.

NOTE: Do not disconnect the short fuel lines from the adaptors unless line(s) or adaptor is damaged and replacement is necessary. On all 1970 Alpine/Invader models, do not remove fuel filter from fuel line unless damaged or dirty and replacement is necessary.

2. Loosen the hose upper and lower clamps and remove the filler neck and filler pipe.

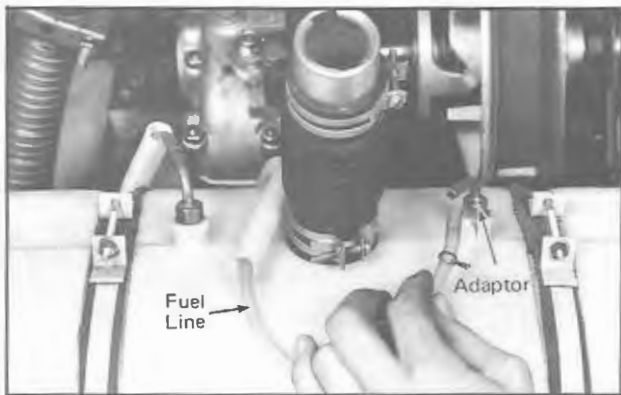
NOTE: Do not remove protector strips from tank unless damaged and replacement is necessary.

(S) ASSEMBLY (All 1970 and '71 Alpine/Invader and Valmont Models)

1. Prior to Assembly procedure ensure all components are clean of all dirt and all damaged parts have been repaired or replaced. Refer to Paragraph 4-2-2 for Cleaning procedures.
2. Carry out Inspection procedures as detailed in Paragraph 4-2-3.
3. Insert the short fuel lines (connected to adaptor) into the fuel tank.

NOTE: On all 1970 Alpine/Invader models, install adaptor incorporating a fuel filter into the right hand tank aperture.

4. Screw the fuel tank adaptors into the tank. Adaptor must be positioned as shown in figure 4-2-17.



5. Position a hose clamp on each end of the filler pipe. Install filler pipe onto the filler pipe. Install filler pipe onto the fuel tank and secure by tightening lower clamp. Insert filler neck into filler pipe and tighten upper clamp.

(T) INSTALLATION (All 1970 and '71 Alpine/Invader and Valmont Models)

1. Position the assembled fuel tank onto frame of vehicle.
2. Secure the fuel tank into location by correctly positioning the retainer straps. Attach straps with screws and nuts.
3. Remove temporarily installed fuel line. Connect the fuel lines to the fuel tank adaptors and secure with spring clips.

NOTE: The longest fuel line should be positioned around front of filler pipe and connected to right hand (facing aft) adaptor.

4. Install the cab and close latches. Install fuel tank cap.

4-2-2 CLEANING

(A) BUILT-IN TANK

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

2. On all 1970 Olympique, T'NT 292 and T'NT 340 models, use a 1/4 inch Allen key and remove drain plug to drain fuel from tank.

3. Using pure gasoline, flush inside of fuel tank and drain once more.
4. Remove cab as detailed in sub-section 4-1.
5. Remove filler neck extension. Spray Metal Protector through filler neck tube.

NOTE: This is to coat internal surfaces and to prevent rust formation.

6. Install filler neck extension to filler neck tube with a clamp.
7. Install cab as detailed in sub-section 4-1.
8. Using a 1/4 inch Allen key, install drain plug into bottom of fuel tank.
9. Set vehicle on the ground.

(B) REMOVAL

1. Remove fuel tank as detailed in Paragraph 4-2-1.
2. Using pure gasoline, flush inside of fuel tank and drain.
3. Install fuel tank as detailed in Paragraph 4-2-1.

4-2-3 INSPECTION

1. Visually inspect fuel tank for damage such as punctures or cuts.

NOTE: On vehicles equipped with built-in tank, damage can be repaired. On all other vehicles, replace damaged tank.

2. Inspect fuel tank adaptor(s) for damaged threads and/or obstructed passages. Ensure passages are not clogged with dirt or sediment. Replace damaged adaptor.
3. Inspect fuel lines for deterioration and

secureness to adaptor. Replace damaged fuel line(s).

4. Check general condition of fuel tank cap and gasket. If gasket is broken or cut, replace gasket. Ensure that vent hole in cap is unobstructed.
5. Inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged component(s).
6. Inspect fuel tank retainer straps for wear and/or damage. Replace as necessary.
7. Inspect all other components for wear, cracks and/or other damage. Replace damaged part(s).

4-2-4 FRONT BOTTOM PLATE (All Alpine/Invader and Valmont Models)

NOTE: The front bottom plate is fabricated of fiberglass and is repairable.

1. REMOVAL

- (a) Remove the front bumper.
- (b) Remove the fuel tank cap.
- (c) Unhook the side latches and remove the cab.
- (d) Remove the fuel tank as detailed in Paragraph 4-2-1.
- (e) Remove the ski assembly (refer to Section 1, sub-section 1-15) and ski leg (refer to section 1, sub-section 1-14).
- (f) Remove the body moulding (rubber strips seated on frame).
- (g) Drill out pop rivets and tubular rivets attaching bottom plate to frame. Remove bottom plate.
- (h) Remove ski leg seal plate and plastic seal from plate.

2. REPAIR

- (a) For repair procedures, refer to Sub-section 4-1, Fiberglass Repairs.

3. INSTALLATION

- (a) Install plastic seal in seal plate and position ski leg seal plate in front bottom plate.
- (b) Correctly position the front bottom plate in location on vehicle. Secure with new tubular rivets and new pop rivets.
- (c) Install body moulding.
- (d) Install ski leg (refer Section 1, sub-section 1-14) and ski assembly (refer Section 1, sub-section 1-15).
- (e) Install the fuel tank as detailed in Paragraph 4-2-1.
- (f) Install cab as detailed in sub-section 4-1.
- (g) Install the front bumper.

4-2-5 CARRIAGE BOLTS

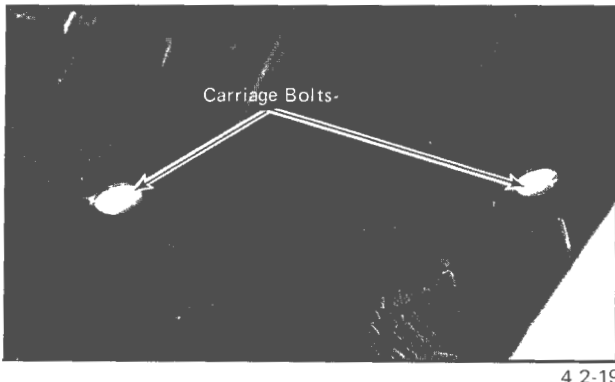
(A) REMOVAL

1. Lift and block rear of vehicle off the ground.
2. Remove either the bogie wheel system (refer Section 1, sub-section 1-1) or the slider suspension unit (refer Section 1, sub-section 1-2).
3. Remove the rear hub as detailed in Section 1 sub-section 1-3.
4. Remove the drive axle as detailed in Section 1, sub-section 1-4.
5. Remove the engine as described in Section 2, sub-section 2-2 or 2-6.
6. Remove the four (4) rubber mounts. Unscrew the threaded spacer bushings and remove the carriage bolts from underneath the frame (fig. 4-2-18).



(B) INSTALLATION

1. Insert the four (4) carriage bolts from underneath the frame (fig. 4-2-19). Screw the spacer bushings onto the bolts. Install the rubber mounts.



2. Reverse the disassembly procedure, refer to step 1, preceding.

4-1-17 BACKREST**(A) REMOVAL
(All 1970 Olympique Models)**

1. On all electric models, remove battery as detailed in Section 3.
2. Disconnect taillight quick connector.
3. Remove two (2) upper bolts, rubber spacers, washers and nuts securing bumper to backrest.

NOTE: The taillight ground wire is connected onto one of the bolts.

4. Push backrest forward to disengage from reinforcing support. Remove backrest.

(B) REMOVAL (All 1970 Nordic and Alpine/Invader Models)

1. On all Nordic electric models, remove battery as detailed in Section 3.
2. Disconnect taillight quick connector.
3. On all Nordic Models, remove two upper bolts, rubber spacers, washers and nuts securing bumper to backrest.

NOTE: The taillight ground wire is connected onto one of the bolts.

4. On all Alpine/Invader models, push out the rubber grommet from bottom of backrest and pass quick connector through hole.
5. Remove the six (6) bolts and nuts attaching the backrest to frame.

NOTE: On all Alpine/Invader Models, the ground wire is attached to a bolt securing backrest to frame.

6. Remove backrest from vehicle.

(C) REMOVAL (All 1971 vehicles equipped with a backrest)

1. On all Nordic electric models, remove battery as detailed in Section 3.
2. Disconnect taillight quick connector.
3. Remove the four (4) bolts, retainer washers, washers and nuts securing backrest to frame.

NOTE: The taillight ground wire is connected onto one of the bolts.

4. Remove backrest from vehicle.

(D) DISASSEMBLY

The following table lists the components that need not be removed from the backrest unless damaged and/or disfigured. If replacement is required, refer to the table for method of attachment.

ALL 1970 VEHICLES	
COMPONENT	ATTACHMENT
Taillight lens	Press fit
Taillight assembly	Elastic stop nuts
Nameplate	Speed nuts
Backrest cover	Screws
Backrest strip	Adhesive back
Leatherette	Staples
Taillight ground wire	Screws

ALL 1971 VEHICLES	
COMPONENT	ATTACHMENT
Backrest door	Hinge and Hinge Pin
Door hinge	Pop rivets
Taillight lens	Press fit
Taillight assembly	Speed nuts
Padded Half	Speed nuts
Nameplate and reflector	Speed nuts
Leatherette	Staples
Taillight ground wire	Screws

(E) REPAIRS

Refer to Paragraph 4-1-14 for Polycarbonate material repair procedures.

(F) INSTALLATION (All Models)

To install the backrest, refer to the applicable removal procedure and reverse the steps.

4-1-18 SEAT**(A) REMOVAL (All Models except Alpine/Invader and Valmont Models)**

1. On models equipped with a backrest, remove as detailed in Paragraph 4-1-116.
2. Disconnect the taillight front quick connector.
3. Remove rear bumper on vehicles so equipped.
4. On Elan, T'NT and Olympique 300 models, remove two (2) nuts and washers (underneath frame) securing stud plate.

Open seat 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.

(B) REMOVAL (All Alpine/Invader and Valmont Models)

1. Open seat and remove screw attaching the restraining cable to the seat.
2. Remove the screws attaching the seat hinge to the frame. Remove the seat from vehicle.

(C) DISASSEMBLY

The following table lists the components that need not be removed from the seat unless damaged. If replacement is required, refer to the table for method of attachment.

COMPONENT	ATTACHMENT
Seat Leatherette	Staples
Offset cover	Rivets
Seat hinge	Pop rivets
Restraining cable	Pop rivet

(D) INSTALLATION (All Models)

To install the seat, refer to the applicable removal procedure and reverse the steps.

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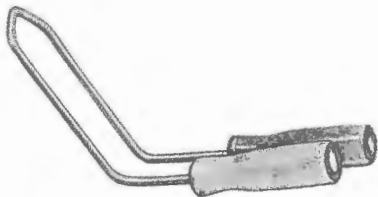
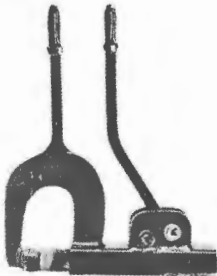
SPECIAL TOOLS

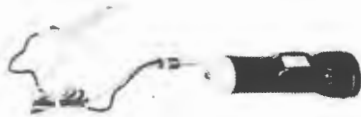


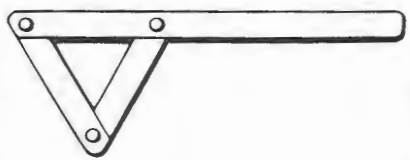

GENERAL



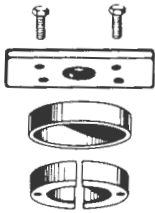

Many of the overhaul procedures contained in this manual can be performed with the aid of "common" tooling. However, certain procedures will require special tooling that is exclusive to Bombardier Ltd. for use on the Ski-Doo snowmobile.




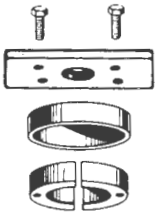
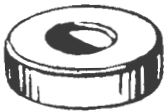
This tooling, available to the consumer from authorized Ski-Doo dealers, should prevent component damage and will release you from arduous tasks that previously took away precious time.


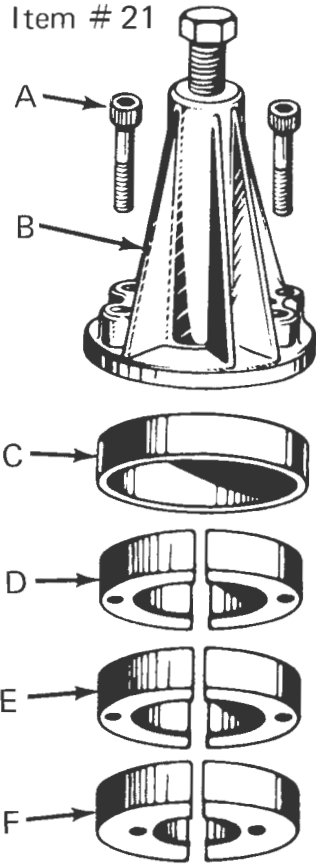
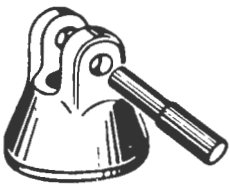
In some procedures of the manual, we indicate to use a tool that is not shown in this Section. The reason for this is that, in some cases, the tools are in the manufacturing design stages and may not become available to the dealer or consumer until several weeks after the manual publication.

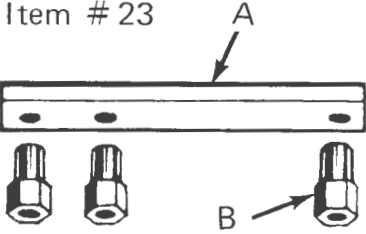




REFERENCE CHART		
ITEM	CODE NUMBER	APPLICABLE TO
Item # 1  Special Lever	529-0006	All models (except Elan)
Item # 2  Tension Releaser Tool	Available soon	All 1971 Elan, Olympique, Nordic, Skandic and T'NT models
Item # 3  Track Insert Installer	414-0678	All models

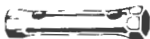


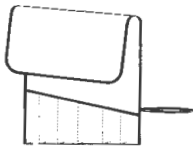


ITEM	CODE NUMBER	APPLICABLE TO
Item # 4  Timing Light	414-0122	All models
Item # 5  Special Puller Adaptor	Available soon	All 1970 Alpine/ Invader and 1971 Alpine/ Valmont models
Item # 6  Merc-O-Tronic (Analyser)	414-0192	All models
Item # 7  Fan Wrench	402-8034 (Electric models)	Engine types 247E, 335E and 337E
	402-8008 (Manual start models)	Engine types 247, 290, 292, 300, 302, 335, 337, 340 and 342
Item # 8  Flywheel Puller	402-8004 (One cylinder)	Engine types 247, 290, 292, 300, 302, 335, 337, 340 and 342
	402-8044 (Two cylinder)	Engine types 400, 401, 435, 640, 641 and 775


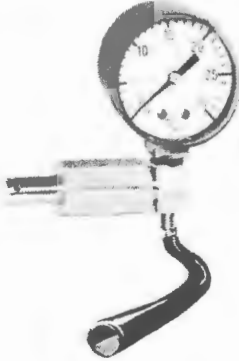
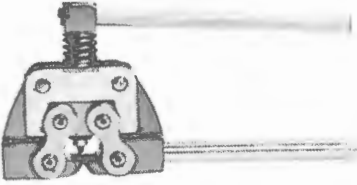

ITEM	CODE NUMBER	APPLICABLE TO
Item # 9 	529-0005	All 1970 models except 340 T'NT
Adjuster Bar	529-0004	All 1971 models
Items # 10-11 	402-8067 (Magneto side)	Engine types 292, 337 and 342
	402-8037	Engine types 292, 337 and 342
	402-8028	Engine types 247, 290, 300, 302, 335 and 340
Item # 12 	402-8001	Engine types 290, 300, 335, 340, 400 and 401
Bearing Puller Plate		
Items # 13-14 	402-8010 (Magneto side)	Engine types 247, 290, 292, 300, 302, 335, 337, 340 and 342
	402-8011 (P.T.O. side)	Engine types 247, 290, 300, 302, 335 and 340
Oil Seal Protection Sleeve		


ITEM	CODE NUMBER	APPLICABLE TO
Item # 15  Crankshaft Hold Down Support	402-8045	Engine types 400, 401, 435, 640, 641 and 775
Item # 16  Starter Gear Puller	402-8055	Engine types 401E and 640E
Item # 17  Fan Holder Wrench	402-8053	Engine types 400, 401, 435, 640, 641 and 775
Item # 18  Bearing Puller Plate	402-8002	Engine types 640, 641 and 775
Item # 19  Crankshaft Ring	402-1207	Engine types 400 and 401
	402-1208	Engine types 640, 641 and 775

ITEM	CODE NUMBER	APPLICABLE TO
<p>Item # 20</p>  <p>Ring Half (Roller Bearing)</p>	402-8051	Engine types 290, 300, 335 and 340
<p>Item # 21</p>  <p>A=Puller Screw B=Puller C=Ring for Puller D=Ring Half for Bearing E=Ring Half for Bearing F=Ring Half for Bearing</p>	A) 402-2287	Engine types 247, 292, 302, 337, 342, 401 440, 640, 641 and 775
	B) 402-8065	Engine types 247, 292, 302, 337, 342, 401, 440, 640, 641 and 775
	C) 402-8070	Engine types 247, 292, 302, 337, 342, 401 and 440
	D) 402-8071	Engine types 292, 337 342,
	E) 402-8068	Engine types 247, 302, 401 and 440
	F) 402-8069	Engine types 292, 337, 342, 640, 641 and 775
<p>Item # 22</p>  <p>Connecting Rod Holder</p>	402-8013	Engine types 247, 290, 292, 300, 302, 335, 337, 340 and 342

ITEM	CODE NUMBER	APPLICABLE TO
<p>Item # 23</p>  <p>Cylinder Aligning Tool</p>	<p>A) 402-8057</p>	<p>Engine types 400, 401</p>
	<p>B) 402-8056</p>	<p>440, 640, 641 and 775</p>
<p>Item # 24</p>  <p>Protection Cap</p>	<p>A) 402-8005</p>	<p>All engine types</p>
	<p>B) 402-8072</p>	<p>Engine types 401, 640, 641 and 775</p>
<p>Item # 25</p>  <p>Fork Wrench 11/13 m.m.</p>	<p>402-8062</p>	<p>All engine types</p>
<p>Item # 26</p>  <p>Socket Wrench Pin</p>	<p>402-8039</p>	<p>All engine types</p>
<p>Item # 27</p>  <p>Socket Wrench 21/26 m.m.</p>	<p>402-8060</p>	<p>All engine types</p>

ITEM	CODE NUMBER	APPLICABLE TO
Item # 28  Socket Wrench 11/13 m.m.	402-8059	All engine types
Item # 29  Angular Key 10/13 m.m.	402-8049	All engine types
Item # 30  Screwdriver	402-8061	All engine types
Item # 31  Tool Bag*	402-8058 *Tool set 402-8063 (include item 25, 26, 27, 28, 29, 30 and 31)	All engine types
Item # 32  Fork Wrench 10/13m.m.	402-8023	Engine types 290, 300, 335 and 340
Item # 33  Carburetor Wrench 13m.m.	402-8042	Engine types 290, 300, 335 and 340

ITEM	CODE NUMBER	APPLICABLE TO
<p>Item # 34</p>  <p>One-End Wrench 11 m.m.</p>	402-8046	Engine types 400, 401, 640 and 641
<p>Item # 35</p>  <p>Carburetor Leak Detector</p>	404-0163	All carburetor models
<p>Item # 36</p>  <p>Chain Bearing Pin Extractor</p>	414-0148	1970 Olympique 12/3, 335, 335E and T'NT 292. 1971 Elan 250 and 250E
<p>Item # 37</p>  <p>T.D.C. Gauge (Dial Indicator) (Starrett or equivalent)</p>		All engine types

ITEM	CODE NUMBER	APPLICABLE TO
<p>Item # 38</p>  <p>Tachometer (Merc-O-Tronic)</p>	<p>414-0308</p>	<p>All models</p>

Warranty - 1970 Ski-Doo Snowmobiles

BOMBARDIER LIMITED, as manufacturer, warrants to the original retail purchaser that each new Ski-Doo snowmobile is free of defects in material and workmanship from the date of the retail purchase to the first day of the following month of May. Should the date of retail purchasing be within or less than the period of ninety (90) days immediately preceding the 1st day of May 1970, the warranty period shall then be for a period of ninety (90) days beginning on the date of said retail purchase until the 1st day of May 1970, and the balance of said warranty period shall be carried over into the following winter season beginning with the date of the first snowfall.

BOMBARDIER LIMITED also warrants to the original retail purchaser that any 1970 Ski-Doo snowmobile purchased new at retail level after May 1, 1970, shall be subject to the above 90-day warranty period beginning on the date of the first snowfall during the following winter season. Original rubber parts and battery are included under the terms of this warranty for a period of ninety (90) days, the 90-day period being applied as above in case of Ski-Doo snowmobiles being purchased less than 90 days before May 1, 1970, or after May 1, 1970.

An exception to this warranty is that all TNT models are warranted for a period of only thirty (30) days from date of first use by the original purchaser. Said warranty does not apply to machines manufactured and sold for racing purposes.

Manufacturer's obligation under this warranty is strictly limited to the repair or replacement of any defective part which has been returned to the manufacturer, shipping costs prepaid, and which part has been determined by the manufacturer to be defective.

THIS WARRANTY DOES NOT APPLY IF THE SKI-DOO SNOWMOBILE HAS BEEN SUBJECTED TO ANY ACCIDENT OR MISUSE, OR IF IT HAS BEEN REPAIRED WITH PARTS OTHER THAN GENUINE BOMBARDIER REPLACEMENT PARTS, OR IF SUCH REPAIRS HAVE BEEN CARRIED OUT BY ANYONE OTHER THAN AN AUTHORIZED BOMBARDIER SKI-DOO DEALER. A

SKI-DOO SNOWMOBILE WILL NOT BE WARRANTED IF MODIFIED IN ANY WAY, UNLESS SUCH MODIFICATION HAS BEEN PREVIOUSLY APPROVED IN WRITING BY THE MANUFACTURER. OPERATING A SKI-DOO SNOWMOBILE IN A RACE, OR MODIFYING IT WITH HIGH PERFORMANCE PARTS, WHETHER SUCH PARTS BE SUPPLIED BY SUPPLIER BY MANUFACTURER OR NOT, OR OPERATING A SKI-DOO SNOWMOBILE ON SURFACES OTHER THAN SNOW OR ICE WILL BE CONSIDERED MISUSE AND THE WARRANTY WILL NOT APPLY.

This warranty does not apply if a Ski-Doo snowmobile has been used by an authorized Ski-Doo dealer or any other person prior to the original retail sale.

This contractual warranty, limited to the aforementioned periods, replaces all other legal warranties, and the manufacturer will not be responsible, under any

circumstances, for any loss or damage as a result of any hidden defects, accidents, misuses or other faults. No one is authorized to modify the conditions of this warranty.

Bombardier Limited
Valcourt, Quebec, Canada
February, 1970



Warranty - 1971 Ski-Doo Snowmobiles

Bombardier Limited ("Bombardier"), as manufacturer, warrants to the original retail purchaser that every 1971 Ski-Doo snowmobile sold as a new vehicle, by an authorized Ski-Doo dealer, will 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 purchasing be within or less than the period of ninety (90) days immediately preceding the next 1st day of May, the warranty period shall then be for a period of ninety (90) days beginning on the date of said retail purchase until said next 1st day of May, 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 1st day of December.

2. should the date of said original retail purchasing be on or after the 1st day of May, 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 1st day of December.

3. this warranty does not apply to Ski-Doo snowmobiles used for racing purposes nor to Blizzard Ski-Doo snowmobile models.

4. this warranty does not apply to any Ski-Doo snowmobile which has been used, either by an authorized Ski-Doo dealer or by any other person prior to the original retail sale.

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 AFORE-MENTIONED 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, if made at such 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) nor 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, nor to normal deterioration of soft trim and appearance items due to wear and exposure.

THIS WARRANTY DOES NOT APPLY TO ANY SKI-DOO SNOWMOBILE WHICH;
I) HAS BEEN SUBJECTED TO ANY MISUSE, ALTERATION, MODIFICATION OR ACCIDENT; II) HAS BEEN REPAIRED WITH PARTS OTHER THAN GENUINE BOMBARDIER REPLACEMENT PARTS OR; III) HAS BEEN REPAIRED BY ANY PERSON OTHER THAN AN AUTHORIZED SKI-DOO SNOWMOBILE DEALER.

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 OF FITNESS FOR ANY PARTICULAR PURPOSE, NEITHER BOMBARDIER, ITS DISTRIBUTORS NOR THE SELLING DEALER SHALL BE RESPONSIBLE, UNDER ANY CIRCUMSTANCES, FOR ANY LOSS OR DAMAGE INCURRED 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.

Bombardier Limited
Valcourt, Quebec, Canada
November, 1970



WARRANTY ON GENUINE ACCESSORIES AND REPLACEMENT PARTS

BOMBARDIER LIMITED ("Bombardier") warrants to the original retail purchaser that any of the following genuine Bombardier accessories: Ski-Boose or Carry-Boose trailer, tachometer, speedometer, front bumper, rear bumper and side handles and/or genuine Bombardier replacement parts which are normally covered under the new product warranty, sold as new by an authorized Ski-Doo dealer, will be free from defects in material and workmanship under normal use and service for a period of 90 consecutive days from the date of original retail purchase or from the date of the first snowfall, if purchase took place before, in which case the date of the first snowfall shall be deemed to be no later than the 1st of December 1970.

AN EXCEPTION TO THE ABOVE WARRANTY PERIOD IS THAT TRANSMISSION DRIVE BELTS ARE WARRANTED FOR THIRTY DAYS FROM DATE OF RETAIL PURCHASE OR FROM THE DATE OF FIRST SNOWFALL AS HEREINABOVE DESCRIBED AND SUBJECT TO THE EXCEPTIONS HEREIN CONTAINED.

ANY OF THE SAID REPLACEMENT PARTS REPLACED UNDER THE ORIGINAL 1971 SKI-DOO WARRANTY NOT BE COVERED UNDER THE PRESENT WARRANTY.

Bombardier's obligation under this warranty is strictly limited to the repair or replacement at its option, of any part(s) thereof which shall, within the specified warranty period, be returned to an authorized Ski-Doo dealer at such dealer's place of business with the original Bill of Sale and which examination shall disclose to the satisfaction of Bombardier to have been thus defective, BEING CLEARLY ESTABLISHED THAT THE PRESENT WARRANTY APPLIES ONLY TO SAID ACCESSORIES AND/OR REPLACEMENT PARTS WHICH HAVE BEEN SOLD AND INSTALLED, WHEN THE CASE MAY BE, BY AN AUTHORIZED SKI-DOO DEALER. The repair or replacement of defective parts under this warranty will be made by such dealer without charge for parts or labour for Ski-Boose and Carry-Boose trailers and without charge for parts for the above-mentioned accessories and replacement parts, if made at such dealer's place of business.

THIS WARRANTY DOES NOT APPLY to any accessories and/or replacement parts which:

- a) have been subjected to any misuse, alteration, modification, or accident;
- b) have been repaired with parts other than genuine Bombardier replacement parts, or;
- c) have been repaired by any person other than an authorized Ski-Doo dealer.

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 INCURRED 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.

**Bombardier Limited
Valcourt, Quebec, Canada
November, 1970**

