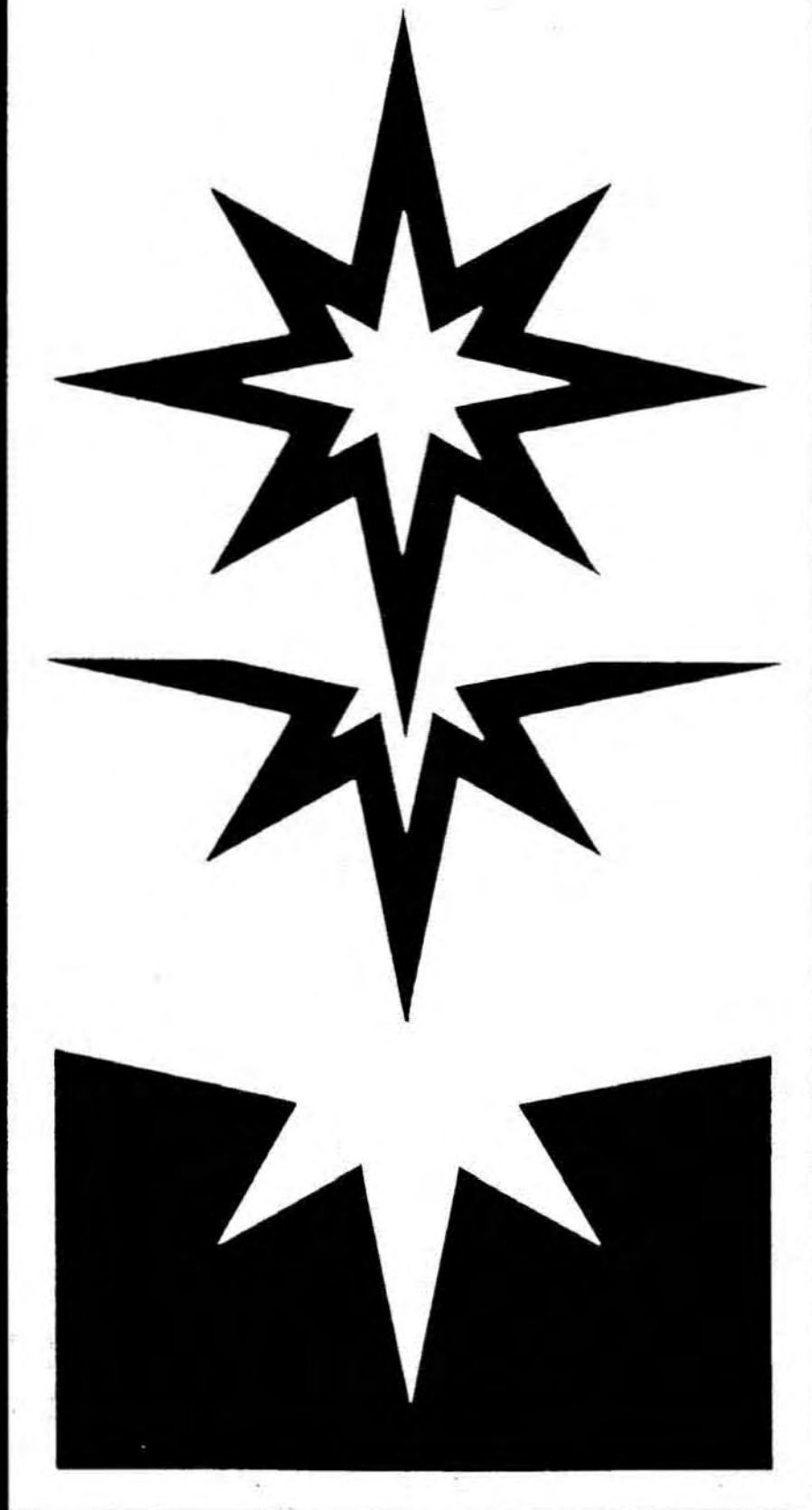




1978
POLARIS

TO ALL POLARIS RXL OWNERS

Today, as in the past, Polaris' competitive snowmobiles are designed and built for general racing applications. In order to achieve that extra 'competitive edge' needed to be a winner, you will want to fine tune your machine to your individual preferences and operating conditions.

To assist you in this area, Polaris has assembled into this technical manual some of the more critical areas you should consider when setting up your 1978 RXL. This technical information reflects the latest engineering developments at Polaris and is made available to you with the compliments of the Polaris Competitive Engineering Department.

To be truly competitive requires knowing the capability of your machine so that you can make small corrections in your RXL to compensate for any differences. Likewise, local track conditions, weather and other variables will require you to adjust your machine accordingly. As new information becomes available in these areas, the Polaris Competitive Engineering Department will share this information with you provided you complete and return the registration card supplied with this manual.

The enclosed agreement and RXL registration form when completed and sent to Polaris will ensure that you will be kept up-to-date with technical support.

Good Luck to you and may you have a successful racing season on your 1978 POLARIS RXL!

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CHAINCASE AND BRAKE	Section VII
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SECTION I

GENERAL INFORMATION

The Rider	1
The Support Crew	2
At The Race	3
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THE RIDER

You, the rider, are one of the main ingredients in making your machine win or lose. Your self discipline and conditioning are very important.

Since physical conditioning varies among people, we recommend that you develop a program of regular physical exercises suited to your endurance. Directing a machine around an oval track is strenuous work. Therefore, we strongly urge that you consider the following exercises in your program: running, push-ups, sit-ups and deep knee bends. Start your conditioning early in the season at a gradual pace and work up to a vigorous program designed to keep you ahead of the pack!

Self discipline will show to a great extent on the race track. Many races are lost because of "night before the race" parties. The following are recommended for the night before the race:

1. eight hours sleep for a clear head
2. balanced meals
3. good self confidence — have faith in yourself and your equipment

Proper dress and safety equipment are imperative, both at the track and the test site. We recommend the following:

1. Knee and shin pads — wear childrens hockey pads with the inner padding removed. These are lightweight and not bulky so they fit under the snowmobile suit. Tape in place a protective vest.
2. Ear plugs
3. Approved safety helmet — full face type
4. Goggles or shield
5. Above ankle leather topped boots — lace type give better support
6. Leather gloves or mittens — be certain gloves fit properly. A tight glove will cause cramps in your hand and will also get colder faster. Choose a glove that doesn't "bunch up" making it harder to operate the throttle. On warmer days a motorcycle moto-cross glove is desirable.

NOTE: Make sure your shirt, sweater, and jacket are not tight at the wrist. If they are, it will squeeze your forearm as you stretch out for the corner, resulting in an early "tiring arm."

THE SUPPORT CREW

Your support crew is one of your biggest assets at the race track. Teach them the same self discipline as yourself and give them credit when due.

Their clothing should be clean and neat. Know what they look like in a crowd, as there may be a time you will need to find them in a hurry. A good way to do this is with special clothing for you and your team, or even with a certain style or color of hat. Recommended clothing for support crew:

1. A good snowmobile suit with plenty of pockets
2. Knee and shin pads
3. Ear plugs
4. Good lightweight gloves

Having your crew or mechanic totally familiar with the mechanics of your machine is very important for race wins because many races are won in the paddock between heats. Your mechanic should have the following items with him when you go to the paddock:

1. Tool box with the necessary wrenches, sockets, etc.
2. Small roll of tape
3. 2-3" pieces of mechanic's wire
4. Spare belt
5. Spare spark plugs
6. Handful of track studs
7. Exhaust springs
8. Gas can and funnel
9. Gears and chain — 1 ratio up and 1 ratio down
10. Chaincase cover gasket
11. Chaincase oil
12. Clean goggles
13. Spare tether switch end
14. Assortment of main jets
15. Spare skis, or fresh skags
16. Spare clutch and puller with different weights
17. Rags
18. Extra gloves for rider

AT THE RACE SITE

Arrive at the race track as early before races as possible (day before).

1. Make your entries (advance entries are best)
2. Find a good location to park your equipment:
Locate as close to paddock as possible
Be as close to the PA system and electrical outlets as possible
3. Walk the track and check — keeping in mind that it might be different when you race on it
4. Attend drivers' meetings and recap what happens to your support crew

In the pits:

1. Do not "pit race." Check your machine only in designated areas
2. Do not start or run machine with shields and guards removed
3. Do not run machine unless warm-up stand is in place
4. Keep bystanders clear of machine during maintenance and warm-up
5. Keep a fire extinguisher handy at all times
6. Never move machine through pits with tether switch removed from operator
7. Always use ski protectors to protect carbide runners

SUPER STOCK RACING

Snowmobile super stock racing is a very competitive sport. It is very demanding on you and Polaris. Specifications on each machine must be filed by Polaris with all racing associations. The various associations have different rules pertaining to the legality of parts and modifications. With this in mind, Polaris cannot be liable for the information and ideas in this manual in regard to the legality in your particular area. KEEPING YOUR MACHINE LEGAL IS YOUR RESPONSIBILITY. Read and know your rule books.

SAFETY

Your 1978 RXL is designed and built for competition use. It does not conform to any federal, state, or provincial regulations regarding consumer snowmobiles. Do not operate this machine for any purpose other than in sanctioned competition events.

When operating this machine familiarize yourself with it before any full throttle runs. Get the feel of the braking system and always connect the cord for the tether switch to yourself before starting.

Always wear protective clothing and safety equipment when operating your RXL.

SAFETY



Polaris E-Z-Go Division of Textron Inc.

MFD. DATE:

THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL AND STATE REQUIREMENTS IN EFFECT ON THE DATE OF MANUFACTURE.

SERIAL NO.

MODEL NO. MADE IN U.S.A.

PATENT NOTICE

Mfd. by Polaris E-Z-Go Division of Textron Inc.
in Roseau, MN under one or more of the following patents:

U.S. Patents	3,605,511	3,533,662	3,613,811	3,867,991
	3,580,647	3,613,810	3,605,510	
	3,483,766	3,545,821	3,525,412	
Patented Canada	882,491/71	883,694/71	864,394/71	
Canadian Rd.	34,573/71	34,572/71		



CAUTION:
ATTENTION:

RELEASE PRESSURE BEFORE
REMOVING CAP.
REFER TO OWNERS MANUAL.

FAITES ÉCHAPPER LA PRESSION
AVANT D'ENLEVER LE COUVERCLE.
VOIR GUIDE DE L'OPÉRATEUR.

FLUID LEVEL
NIVEAU DE FLUIDE



WARNING

STAY CLEAR
OF TRACK.

AVERTISSEMENT

DEMEUREZ À L'ÉCART
DE LA CHENILLE.



WARNING

DO NOT OPERATE ENGINE WITH HOOD REMOVED.
DO NOT ATTEMPT ADJUSTMENT WITH ENGINE RUNNING.
DO NOT OPERATE ENGINE WITH THIS GUARD REMOVED.
NEVER RUN ENGINE WITH DRIVE BELT REMOVED.
NEVER SERVICE CLUTCHES YOURSELF — SEE YOUR DEALER.

AVERTISSEMENT

N'OPÉREZ PAS LE MOTEUR LORSQUE LE CAPOT EST OUVERT.
N'EFFECTUEZ AUCUN AJUSTEMENT LORSQUE LE MOTEUR EST EN MARCHÉ.
NE FAITES PAS FONCTIONNER LE MOTEUR LORSQUE LA COURROIE D'ENTRAÎNEMENT
EST ENLEVÉE.
NE RÉPAREZ JAMAIS L'EMBRAYAGE VOUS-MÊMES, VOIR VOTRE CONCESSIONNAIRE.

SECTION II

MACHINE SPECIFICATIONS

RXL Specifications	1
Instruments	2

1978 RXL SPECIFICATIONS



Engine:

EC34PL-03 — 333cc twin cylinder liquid cooled — model no. 0781537

Drive and Brake:

Drive Belt	30" 11.5 C.D., part no. 3211043
Brakes	hydraulic disc
Sprocket Ratio	16/40
Drive Chain	66 pitch internal tooth silent

Track and Suspension:

Track Type	Involute with arballoy cleats
Width	15"
Length	111.86"
Suspension Type	Polaris sliderail
Number of Cleats	34

Steering and Skis:

Steering Type	Polaris independent suspension
Skis	Width = 4.00"; Length = 27"; Center Distance = 37.5"

Handlebars:

Controls	Brake and throttle
Grips	Right — standard; left — taped with hook

Electrical:

Switches	tether
Instruments	tachometer and temperature gauge

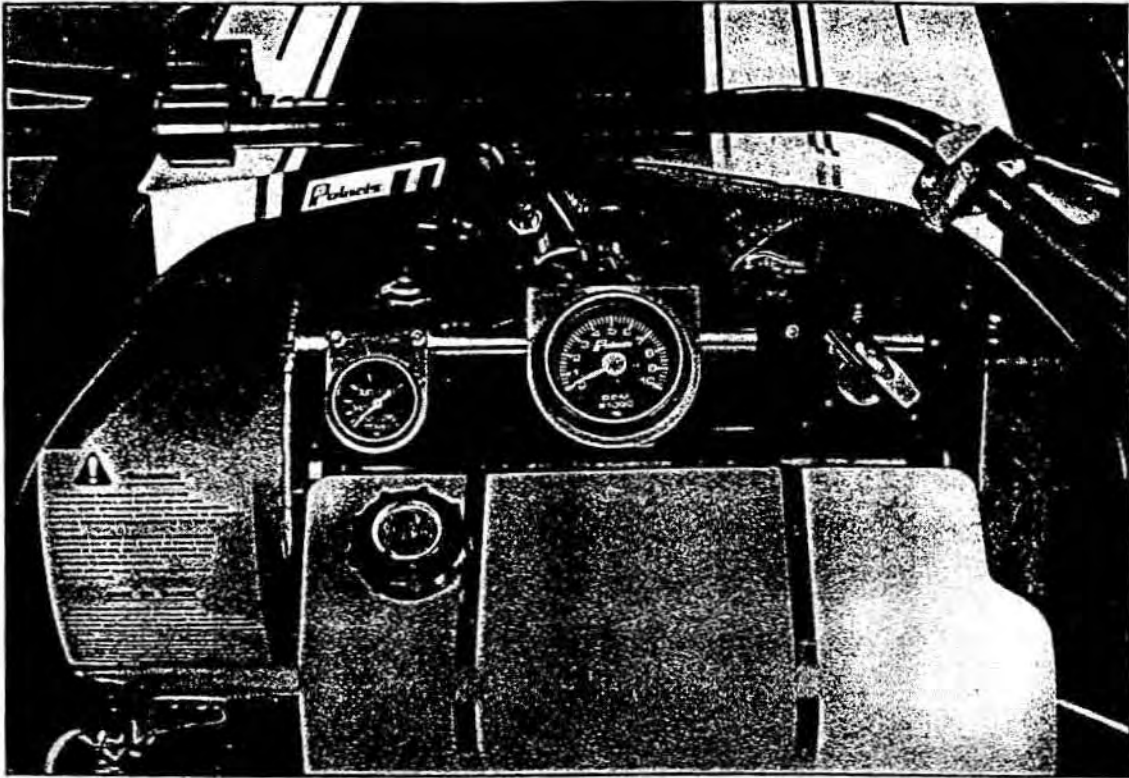
Body and Trim:

Chassis	
type	aluminum
gas tank	2.3 gallon with sump pump
stirrup	included, not installed, RH only
Hood	
type	fiberglass
seat cushion	polyurethane foam — custom design
	snap vinyl cover

Dimensions and Weight:

Height	30"
Length with skis	95.5"
Width	41.5"
Approximate Dry Weight	320 lbs.

INSTRUMENTS



The controls on your 1978 RXL are located in the position we feel is most convenient. We do recommend, however, that each person relocate the throttle and brake levers to a position suitable to the individual's driving style for maximum control and safety.

⚠ WARNING: The brake lever is part of the master cylinder assembly and it will not function properly if rotated more than 10° up or down from the level position.

SECTION III

STEERING AND SKIS

Adjustments	1-3
Handling Characteristics	4

STEERING AND FRONT END ADJUSTMENTS

The proper setup and maintenance of the various front end adjustments on the RXL is one of the most critical items in determining how your machine handles on the oval. Read the following section with care and make sure you understand all aspects of front end adjustments before driving this machine.

ALWAYS TRY CHANGES MADE IN FRONT END ADJUSTMENTS CAUTIOUSLY, BECAUSE A SLIGHT CHANGE WILL GREATLY AFFECT THE HANDLING CHARACTERISTICS OF THIS MACHINE!

DO NOT ATTEMPT TO SUBSTITUTE ANY PART ON THE FRONT END WITH THOSE OF LESSER QUALITY!

WITH THE EXISTING CARBIDES AND SKIS, THE RXL WILL BE DIFFICULT TO DRIVE IN SNOW. THE CARBIDES ARE TOO SEVERE AND THE SKIS ARE TOO NARROW FOR THE MACHINE TO HANDLE PROPERLY IN SNOW. ALL TESTING SHOULD BE PERFORMED ONLY ON SOLID ICE.

NOTE: On a warm day soft ice will make the steering very heavy — positive.

BEFORE DRIVING THE RXL, MAKE THE FOLLOWING CHECKS ON THE STEERING MECHANISM:

1. The handlebar must be straight or parallel with the steering support brace.
2. The center steering arm (A) must be exactly centered in the steering stop (B) with the handlebars parallel to the steering support brace. Adjust tie rod accordingly to obtain proper steering arm center adjustments, Fig. 1.

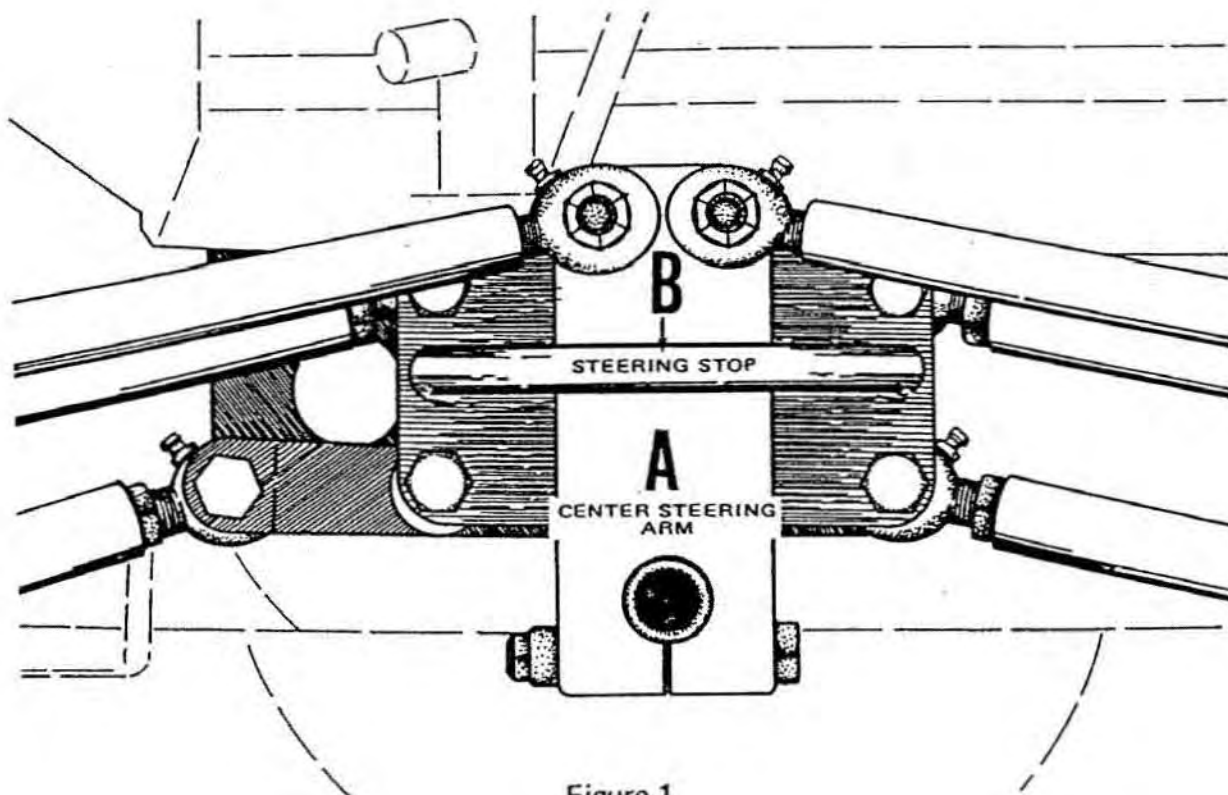


Figure 1

ADJUSTMENTS (Con't.)

3. With a straight edge placed alongside the track, measure the distance from both ends of one ski. The distance at both the front and back of the ski should be equal, Fig. 2. When one ski is parallel with the track, measure across to the opposite ski to ensure that it is also parallel with the track. If adjustment is needed, the tie rods, Fig. 3, should be adjusted accordingly.

NOTE: The tie rod ends have left or right hand threads. Thus only the lock nuts need to be loosened and the tie rod rotated in the direction required to make adjustments.

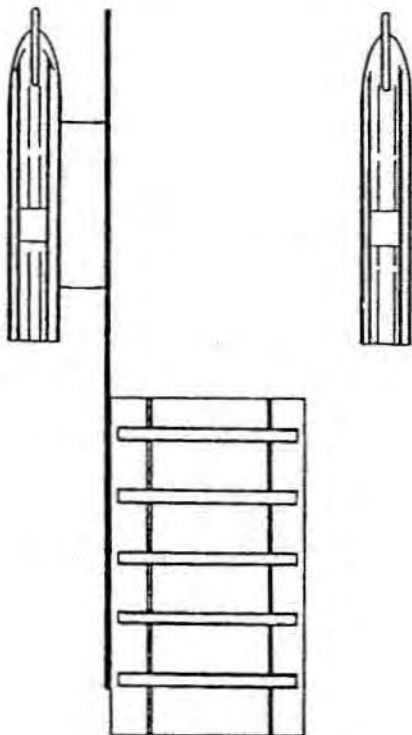


Figure 2

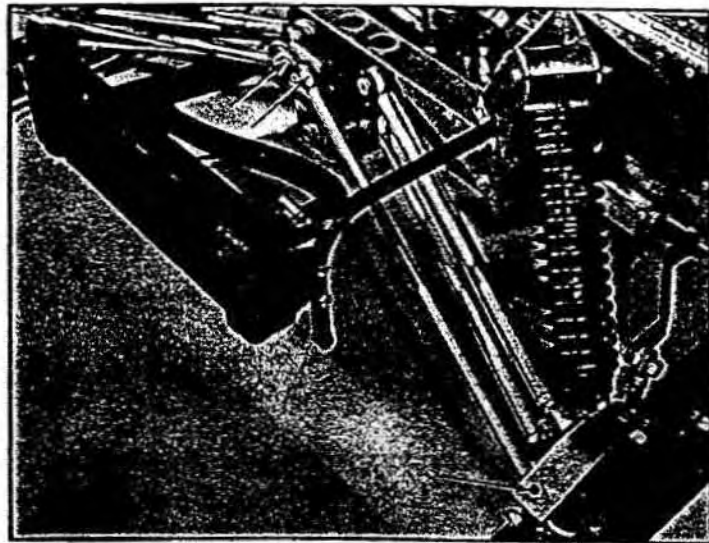


Figure 3

⚠ THERE SHOULD BE A MINIMUM OF 3/4" OF THREAD REMAINING IN THE TIE RODS FOR MAXIMUM SAFETY.

ADJUSTMENTS (Con't.)

4. The castor is pre-set on the RXL and no adjustments can be made.
5. The camber of the skis should be flat for initial setup. To measure the camber lay the ski lineup bar, part no. 5332606, across the skis, Fig. 4, as shown and adjust the radius rods accordingly.

NOTE: The radius rods have left and right hand threads, so only the lock nuts need to be loosened and the radius rods adjusted accordingly.

NOTE: Make sure skis are pointed straight forward (parallel with track) for proper camber adjustment.

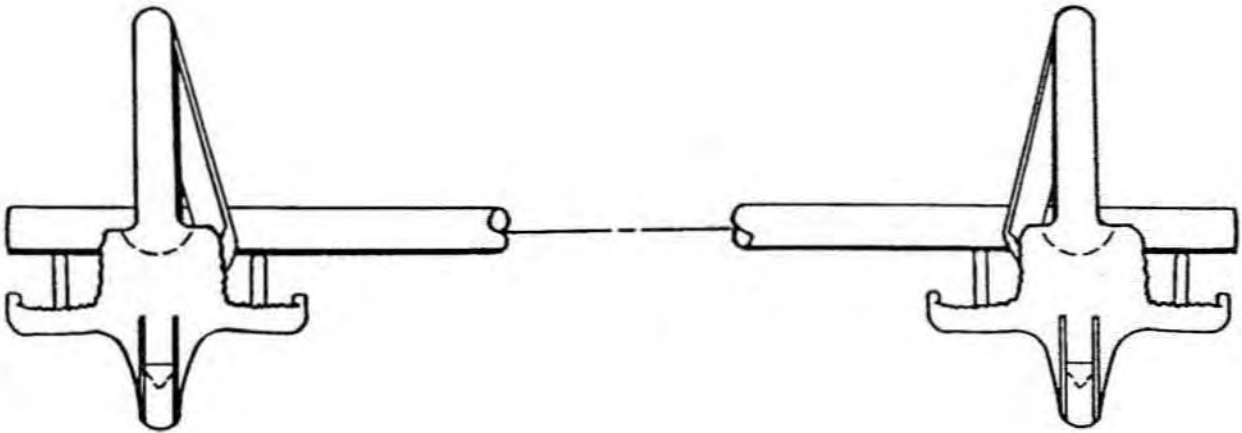


Figure 4

⚠ THERE SHOULD BE A MINIMUM OF 3/4" OF THREAD REMAINING IN THE RADIUS ROD TO ENSURE MAXIMUM SAFETY.

6. The torsion bar should be set so there is slight up pressure, approximately 1/8" — 1/4", to the left hand torsion arm. To adjust the torsion bar tension so there is slight up pressure on the left hand torsion arm, shorten the left hand torsion adjustment, Fig. 5, or lengthen the right hand torsion adjustment.

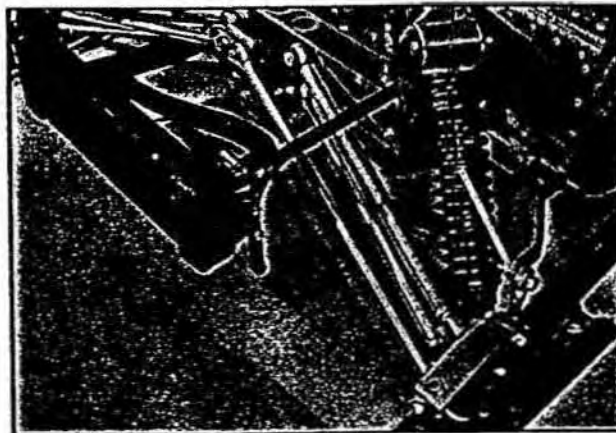


Figure 5

HANDLING CHARACTERISTICS AND ADJUSTMENTS TO CORRECT

1. Should the front end tend to push while cornering, take the following corrective action:
 - a. Check carbide sharpness; they must be as sharp as possible. This is extremely important to maintain proper handling. Sharpen the carbides if necessary and check the cornering ability again.
 - b. Adjust the camber so the skis are tipped slightly to the inside of the track, Fig. 6. Only a small amount at first, as too much can get grabby.

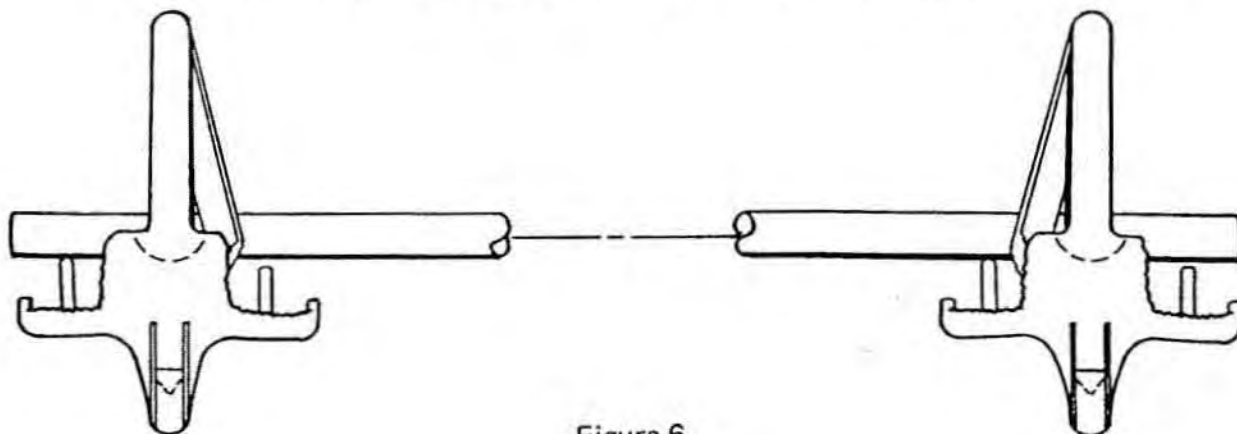


Figure 6

2. Front end is too severe or grabby (left ski comes off the ground too much) when cornering.

The camber is too severe and the skis should be flattened out some.

3. Shock spring adjustment — Fig. 7, the shock springs are adjustable and should be tailored to individual preference.

NOTE: The left hand shock spring is softer than the right hand spring.
DO NOT INTERCHANGE THE SHOCK SPRINGS.

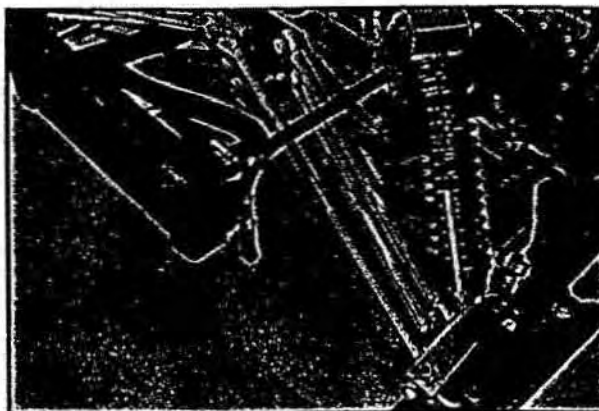


Figure 7

4. The final check and adjustment, after all the above adjustments are complete is to insure that the skis are in correct alignment.

WITH THE STEERING POST IN THE STRAIGHT AHEAD POSITION, THE SKIS SHOULD BE PARALLEL TO 1/8" TOE OUT.

NOTE: NEVER, NEVER, NEVER ALLOW TOE-IN.

SECTION IV

ENGINE AND ELECTRICAL

RXL Engine Specifications	1
CDI Timing Chart	2
Wiring Diagram	3
CDI Timing Procedure	4 – 6
2–Cycle Operation	7
Engine Break-In Procedure	8
Spark Plug Information	8 – 13
Torque Specifications	14
Cylinder Head Volume	15
Crankshaft Run-Out	16
Engine Removal	17

Engine R & R

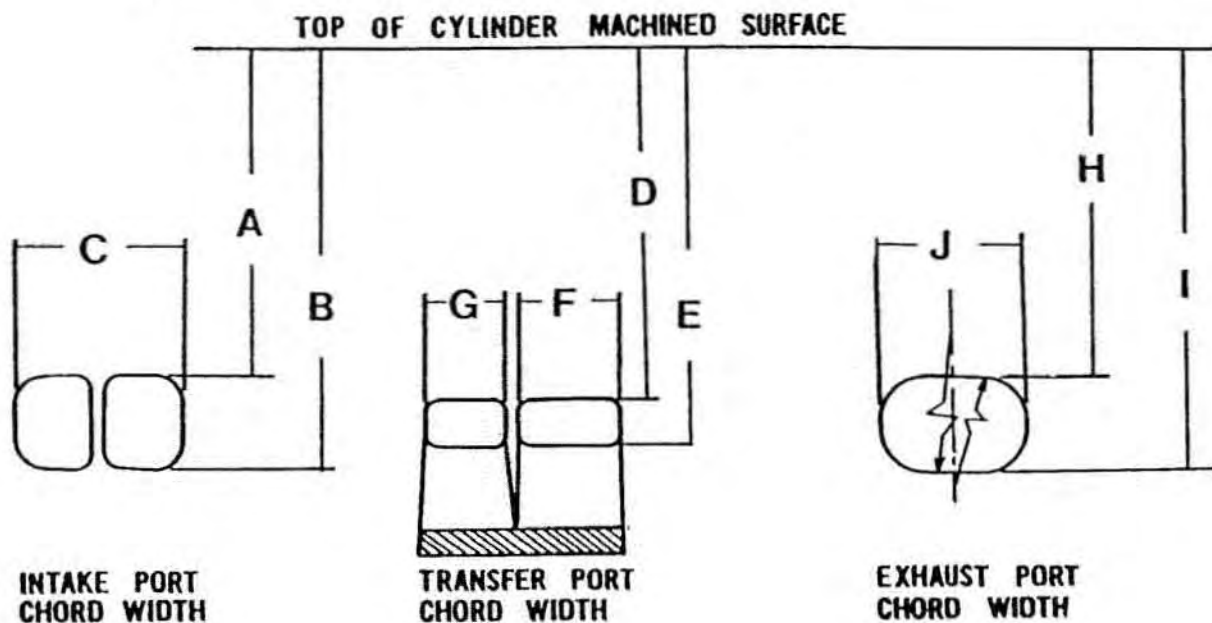
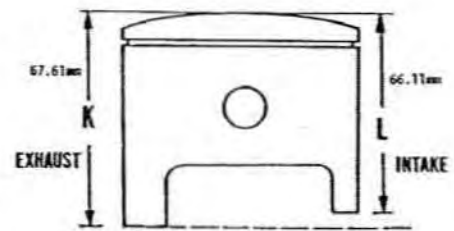
See 1978 Polaris Shop Manual, PN 9910513
Pages 28 - 35, Section V

RXL ENGINE SPECIFICATIONS

Engine Model	No. of Cylinders	Bore	Stroke	Cyl. Disp. CC's	Cyl. Head Vol. CC's/ Uninstalled	No. of Rings	Ring Type	Ring Face Material
EC34PL-03	2	61.78mm	55.6mm	333	16.6	1	Upperside Keystone	Chrome
Ring Face Width	Ring End Gap							
1.2mm	0.15-0.30mm with 61.78 Bore							

Port Dimension, Fig. 1

Intake:	(A) — From top of cylinder to top of intake	61.5mm
	(B) — From top of cylinder to bottom of intake	92.0mm
	(C) — Intake chord width	45.0mm
Transfer:	(D) — From top of cylinder to top of transfer	42.8mm
	(E) — From top of cylinder to bottom of transfer	55.3mm
	(F/G) — Transfer chord width	25.0mm/ 22.0mm
Exhaust:	(H) — From top of cylinder to top of exhaust	27.0mm
	(I) — From top of cylinder to bottom of exhaust	55.6mm
	(J) — Exhaust chord width	42.5mm



TIMING CHART

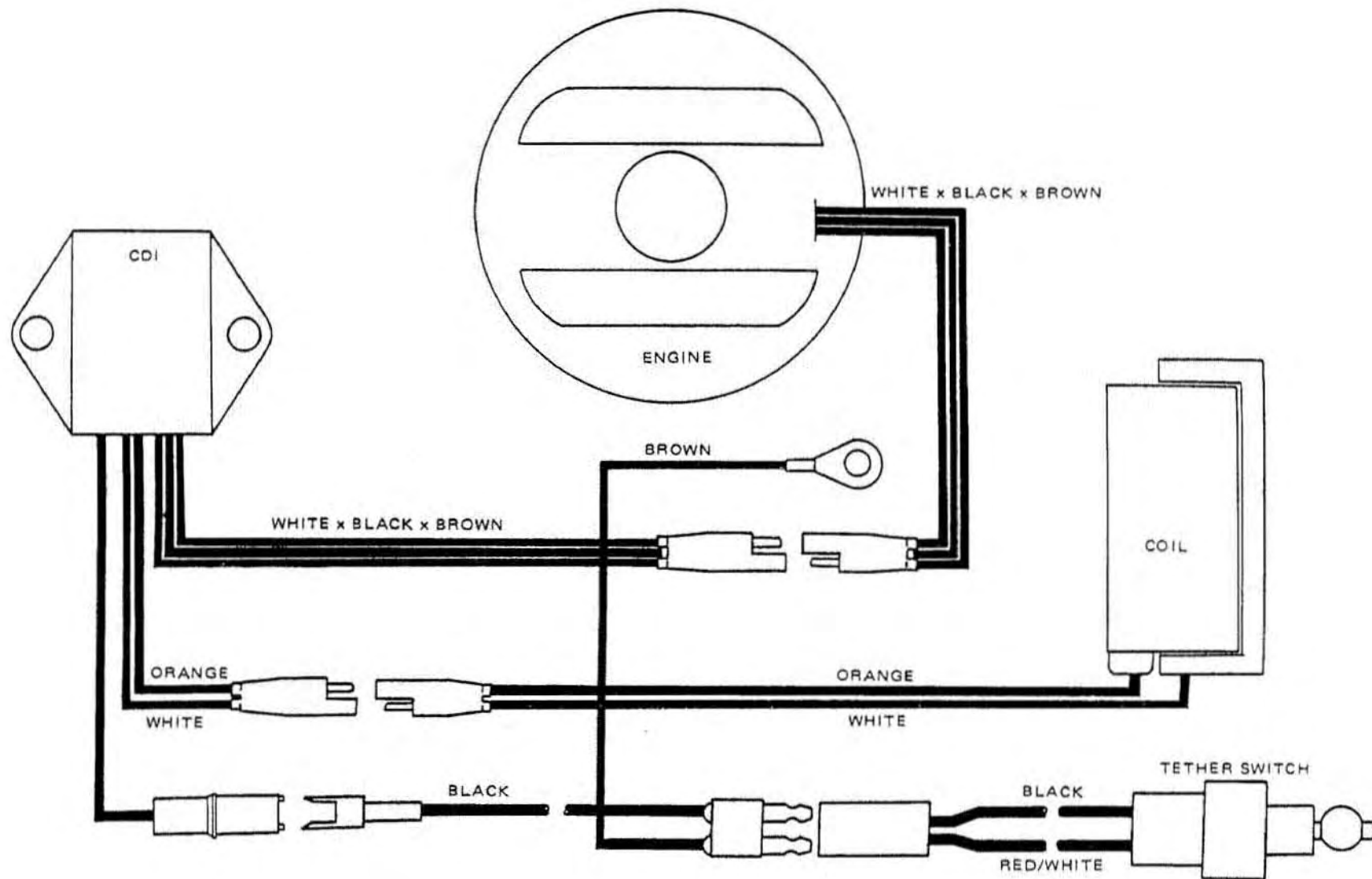
55.6 MM Stroke

<u>Degrees BTDC</u>	<u>MM</u>	<u>Inches</u>	<u>Degrees BTDC</u>	<u>MM</u>	<u>Inches</u>
1	.0052	.0002	18	1.6929	.0665
2	.0211	.0008	19	1.8835	.0740
3	.0476	.0018	20	2.0837	.0818
4	.0846	.0033	21	2.2936	.0901
5	.1321	.0051	22	2.5130	.0987
6	.1902	.0074	23	2.7417	.1077
7	.2588	.0101	24	2.9798	.1171
8	.3378	.0132	25	3.2270	.1268
9	.4273	.0167	26	3.4833	.1368
10	.5271	.0207	27	3.7485	.1473
11	.6373	.0250	28	4.0226	.1580
12	.7578	.0297	29	4.3053	.1692
13	.8884	.0349	30	4.5966	.1806
14	1.0293	.0404	31	4.8963	.1924
15	1.1802	.0463	32	5.2044	.2045
16	1.3412	.0527	33	5.5205	.2169
17	1.5121	.0594	34	5.8447	.2296
			35	6.1767	.2427

<u>Machine Model</u>	<u>Engine Model</u>	<u>Ignition Type</u>	<u>Spark Plug</u>	<u>Plug Gap (Inches)</u>	<u>Ignition Timing Dynamic @4000 RPM</u>		
					<u>MM</u>	<u>Inches</u>	<u>Degrees</u>
RXL	EC34PL-03	CDI	NGK/B10EV Champion/N82G	.020	3.88	.152	27.5

<u>COIL</u>	<u>PART NO.</u>	<u>WIRES</u>	<u>OHMS</u>
Pulser coil	3082904	White & Brown	180
Exciter coil	3082903	White & Black/Red	246
Lighting coil	3082905	Pink	8V @3000

+ - 10% Pulser and Exciter Variable Ohms Resistance



CDI TIMING

Capacitor Discharge Ignition:

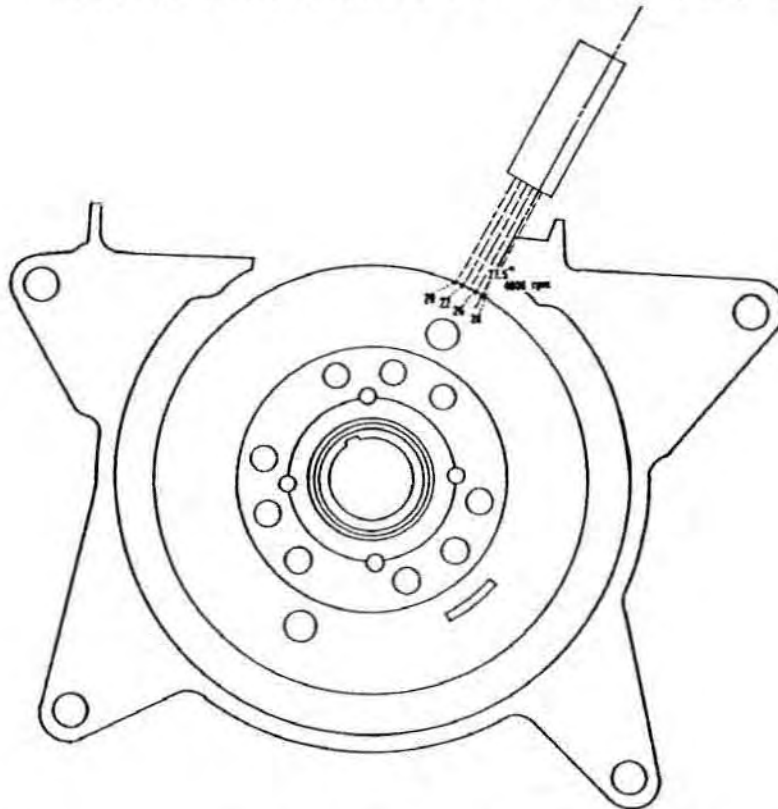
1. On the EC34PL-03 engine with CD ignition, each spark plug fires twice per revolution of the crankshaft (each 180° of crankshaft rotation, firing occurs just before TDC and BDC of each engine revolution).
2. The spark advance mechanism is controlled electrically, therefore, there is no cam on the flywheel, nor any governor weights in the flywheel.
3. Because both spark plugs fire at the same time it is only necessary to time one of the two cylinders and it follows that the remaining one must be the same.
4. A strobe light is needed to time engines with CD ignition. Use a strobe light that can withstand high CD voltage.
5. The EC34PL-03 engine is timed in the full advance position with the engine running at 4000 RPM.

Do not exceed 4000 RPM when checking engine timing. Exceeding 4000 RPM will result in a false reading.

Procedure:

1. Remove the drive belt or safely support the rear of the machine in a secured area prior to performing any checks.
2. Connect positive and negative leads from timing light to power source and clamp the remaining lead to a spark plug wire.

NOTE: EC34PL-03 timing is checked from the engine front side using the machined surface provided after the water pump cover is removed.



3. Start the engine and slowly accelerate to 4000 RPM. Check the timing with the light (A) perpendicular to the machined surface provided when the water pump cover is removed.

CDI TIMING (Con't.)

4. Noting the timing mark position from the dynamic check, refer to the timing mark diagram for proper mark identification and allowable variance range, Fig. 1.

5. If the timing marks are within the variance range shown, engine timing is correct.

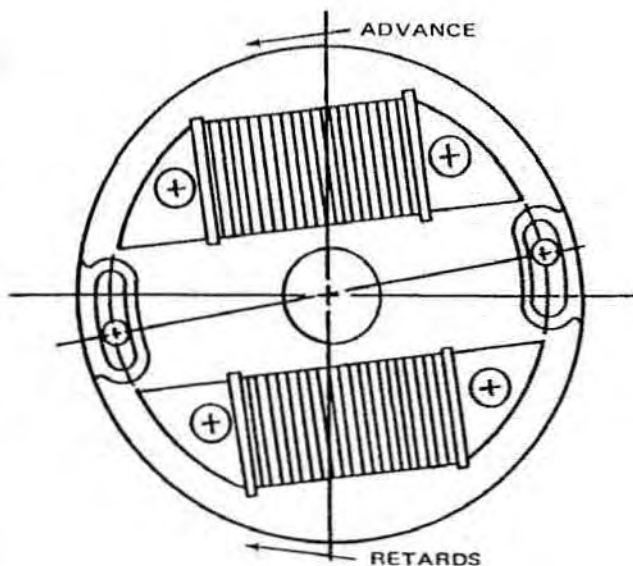
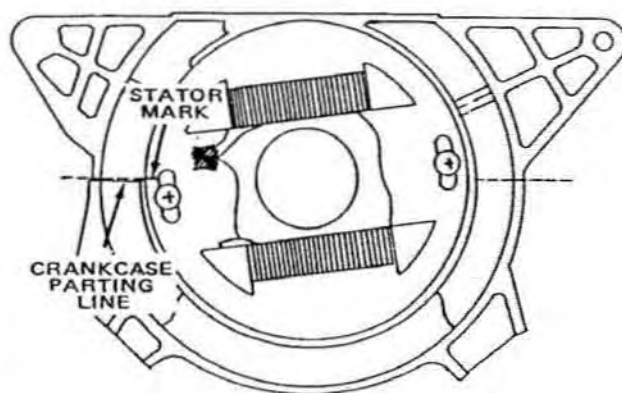
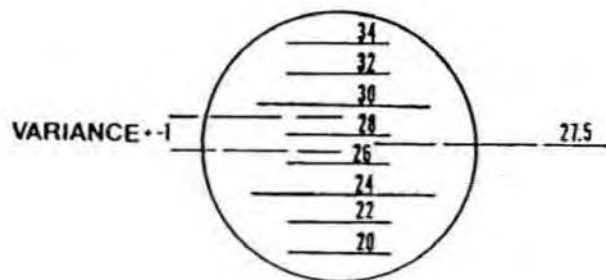
6. If it is necessary to change the timing, it will be necessary to remove the engine from the chassis. See engine removal, page 16.

- A. Remove the recoil housing.*
- B. The CDI system on the RXL engine incorporates a pre-determined static timing setting. Align the stator plate mark with the crankcase half parting line.* Fig. 2.

*This setting must be performed very carefully, as engine must be placed back in chassis or suitable engine stand where water system, clutch, exhaust system and electrical can be connected again before checking.

- C. Further adjustment is accomplished by rotating the stator plate. Loosen the two stator plate fastening screws, Fig. 3, and rotate the plate in the direction required. (Approximately the amount the marks were off.) Clockwise retards timing, counterclockwise advances timing.
- D. When timing is properly adjusted, recheck the stator plate mounting screws for tightness and re-assemble engine.
- E. Install engine in chassis using procedure in reverse of removal.

*Modification Recoil Housing, see page 6



RECOIL HOUSING MODIFICATION

The object of this modification is to make timing adjustments easier.

Remove the recoil and recoil housing from the engine.

At points 'A' and 'B', mark the recoil housing $1/2'' \times 1\ 1/2''$.

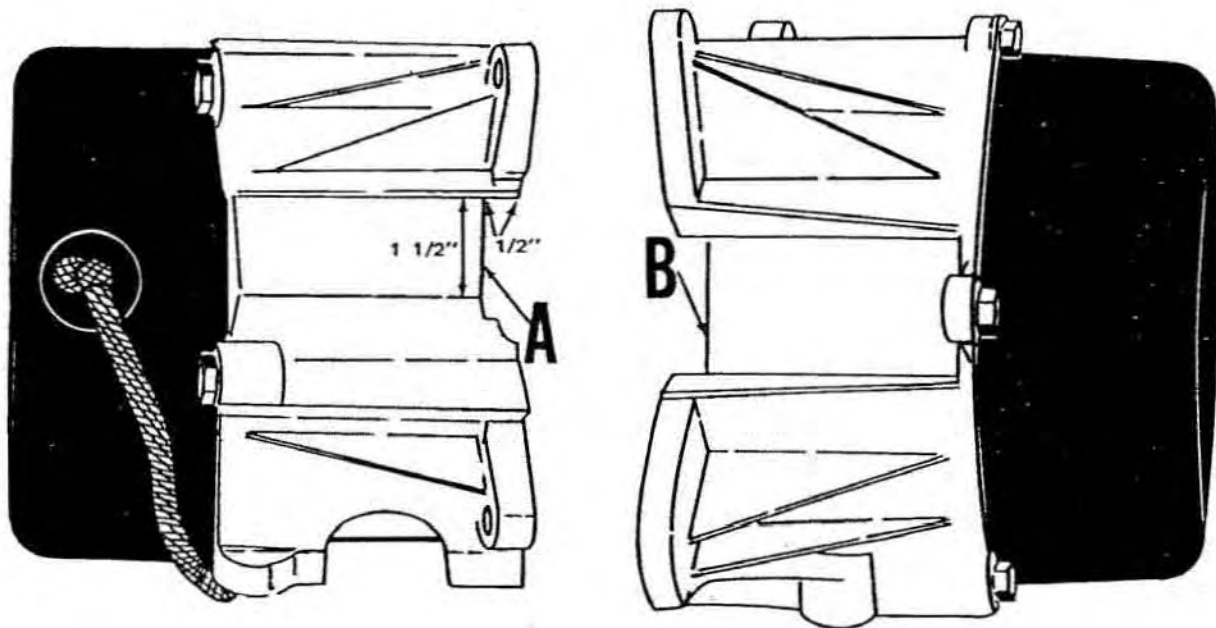
Use an appropriate cutting tool and remove the material previously marked out.

Remove the flywheel, using puller part number 2870384.

Replace the stator holddown screws with 6mm hex head screws, 20mm long, part number 3080288.

Install flywheel and retorque to 60-65 ft. lbs.

See CDI timing for proper procedure.



TWO-CYCLE OPERATION

Your Polaris snowmobile is equipped with a dependable, high-performance two-cycle engine. Treat it right . . . give it reasonable care. The first step is to have a basic comprehension of the mechanics involved in its operation. Understanding your two-cycle engine and how it functions will enable you to better maintain your engine, resulting in longer and better performance and life at less cost to you.

A basic component of the two-cycle engine is the piston. When the piston moves upward in the cylinder (1st stroke), it draws fuel into the crankcase while also compressing fuel in the combustion chamber. The spark plug then ignites the fuel, which expands and forces the piston downward.

The down-stroke provides the power which turns the crankshaft. It also compresses the fuel in the crankcase, clears the transfer ports, and releases a new supply of fuel through the ports and into the combustion chamber. This forces the burned gases out through the exhaust ports. See sketches of 2-cycle principle.

When you realize that at 6,000 rpm, this happens 100 times a second, you can appreciate the importance of proper lubrication, fuel mixture, and carburetor adjustments.

Oil provides the only lubrication your engine gets. Keep in mind the manufacturer's recommendations:

1. Use a good grade of both oil and gasoline.
2. Always mix them in proper proportions — thoroughly — and in a clean container.
3. Keep surplus fuel tightly capped to prevent evaporation, loss of volatility and power.

Too little oil means inadequate lubrication; too much oil means spark plug fouling, rapid carbonization, and over-heated pistons, all which may lead to engine damage and costly repairs.

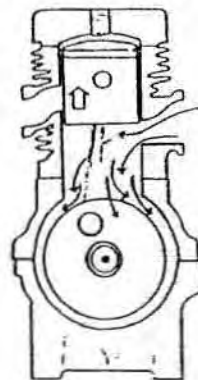
The carburetor feeds the gas-oil mixture to the engine, mixing fuel and air to obtain the correct volatile mixture, thus providing fuel for combustion, a lubricant, and a coolant for internal surfaces.

POWER:

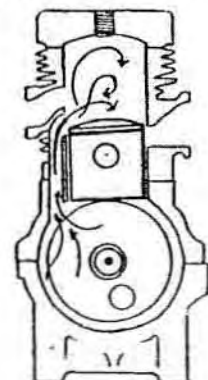
Immediately after the piston starts downward, peak combustion pressure from the burning gases is applied against the piston, driving it downward with maximum force. This inline motion is transmitted thru the connecting rod to radial motion by the crankshaft. The force of combustion continues until the piston is further down in the cylinder when the exhaust port becomes exposed.

EXHAUST:

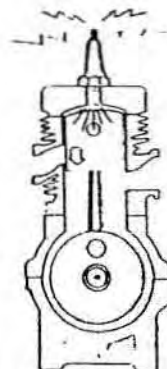
Actually, several functions take place simultaneously during the exhaust phase. When the piston moves downward far enough to expose the exhaust port, most of the burned exhaust gases are expelled from the cylinder . . . complete exhaust takes place after the piston drops low enough to expose the transfer ports which completes one cycle.



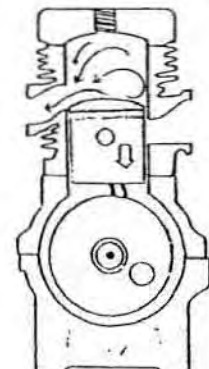
INTAKE



FUEL TRANSFER



POWER



EXHAUST

ENGINE BREAK-IN PROCEDURE

Initial break-in of your new engine is the most critical period to insure maximum performance and engine life.

Proper break-in can be accomplished by following these procedures closely.

1. Always use a thoroughly mixed high grade of premium gas and oil (Polaris High Performance Oil) at the recommended 40:1 ratio.
2. Remove drive belt, start engine and allow the engine to idle at a moderately low idle for approximately 3–5 minutes (do not exceed 4500 RPM). Be sure to check coolant level in surge tank to insure it is circulating and at the proper level.

Caution: If idled too long, the engine may overheat.

3. On the first running of the machine avoid sustained full throttle acceleration. Short bursts, three to five seconds in length at full throttle is ideal. Gradually increase this procedure until acceleration period is approximately 10 seconds. Ten to fifteen minutes of this type of running should be adequate.

NOTE: Be sure that clutch is functioning properly and that the engine RPM does not exceed recommended level. Be sure cooling system is functioning properly.

WARNING: This is a race machine designed for oval track racing. Full throttle running over long roads or lakes could result in damage to both engine and machine.

SPARK PLUGS

The 1978 RXL is equipped with NGK B10EV spark plugs. Because our testing has been done with NGK spark plugs, we recommend that you stay with this brand of plug.

For those of you that prefer another brand, we have qualified a Champion equivalent.

Spark Plug Specification Information

<u>Engine Model</u>	<u>Recommended Spark Plug</u>
EC34PL-03	NGK B10EV Champion N82G

Spark Plug Gap: .020"

SPARK PLUGS (Con't.)

The appearance of the firing end of your spark plugs can relate to you what is happening in the combustion chamber of your engine in regard to fuel mixture and ignition.

Knowing how to read and analyze your plugs will enable you to more closely tune your engine. Refer to the chart showing spark plug appearance.

1. A normal or proper looking plug should show the following:

- A. Insulator tip tan or light brown in color
- B. Electrodes not burned or eroded

2. Overheated plugs will show the following:

- A. Electrodes burned
- B. Insulator tip light gray or chalk white
- C. Knocking or detonation

Causes:

1. Plug heat range too hot
2. Main jet size too small
3. Air leaks
4. Over advance timing
5. Octane rating of fuel too low

3. Melted electrode on plug causing pre-ignition

Causes:

1. Air leaks
2. Foreign material in combustion chamber

4. Wet or fouled plugs will show the following:

- A. Black insulator tip
- B. Damp oily film over firing end
- C. Carbon layer over entire nose
- D. Electrodes not worn

Causes:

1. Plugs heat range too cold
2. Excessive or non-recommended oil in fuel
3. Too large main jet
4. Excessive idling
5. Trouble with ignition system



NORMAL

Insulator tip gray, tan or light brown. Few combustion deposits. Electrodes not burned or eroded. Proper type and heat range for the engine and service.



WORN OUT

Corrosive gases formed by combustion and the high voltage spark have eroded the electrodes. Spark plugs in this condition require more voltage to fire — often more than the ignition system can produce. Replace with new Champions.



OVERHEATED

Electrodes burned. Insulator tip light gray or chalk white.

CAUSES: Plug heat range too hot. Lean carburetor setting. Engine overloading. Loose carburetor mounting. Over advanced basic timing.



PREIGNITION

If a plug has a melted electrode, preignition is likely; check for intake manifold air leaks, possible crossfire, or worn distributor parts (lobes-bushing), which might alter timing. Be sure that the plug is of proper heat range. Find the cause of preignition before placing the engine back in service, or damage could result.



WET FOULED

Black insulator tip. Damp oily film over firing end. Carbon layer over entire nose. Electrodes not worn.

CAUSES: Wrong spark plug heat range (too cold). 4-stroke Engines — Worn oil control ring. Worn valve guides. Over-filled crankcase. 2-stroke Engines — Excessive oil or use of non-recommended oil in fuel. Idle speed too low. Idle adjustment too rich. Badly clogged air filter. Weak ignition output. Excessive idling. Oil injection not set properly on models so equipped.



SPARK PLUG HEAT RANGE

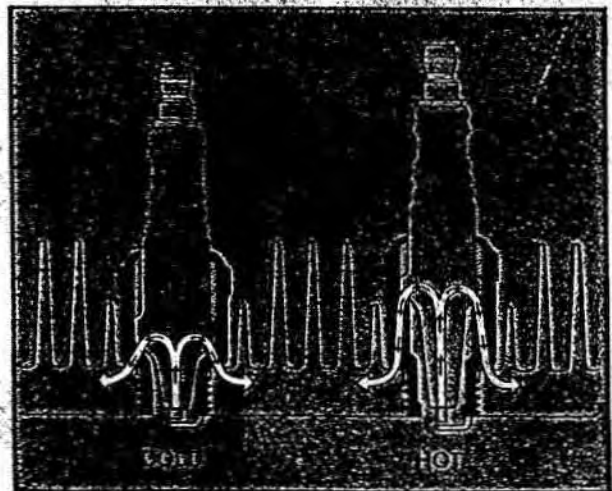
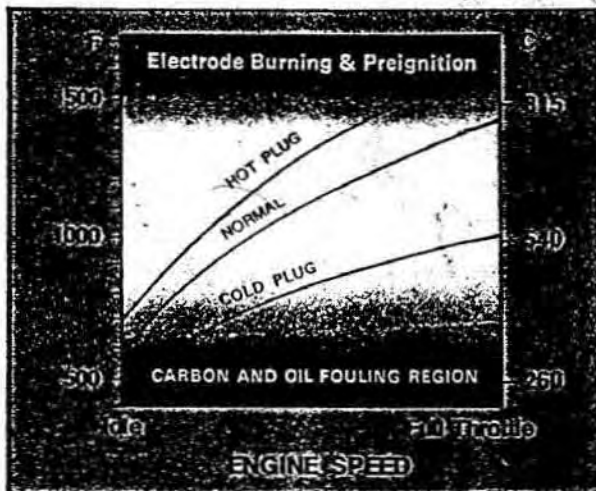
The term "heat range" refers to the classification of spark plugs according to their ability to transfer heat from the firing tip of the insulator to the cylinder head. The rate of heat transfer is controlled basically by the distance the heat must travel to reach the cylinder head.

Since each engine has different temperature characteristics, typical temperature readings with hot and cold running plugs are illustrated.

A 'cold' type plug has a relatively short insulator nose and transfers heat very rapidly into the cylinder head. Such a plug is used in heavy duty or continuous high speed operation to avoid overheating.

The 'hot' type plug has a longer insulator nose and transfers heat more slowly away from its firing end. It runs hotter and burns off combustion deposits which might tend to foul the plug during prolonged idle or low speed operation.

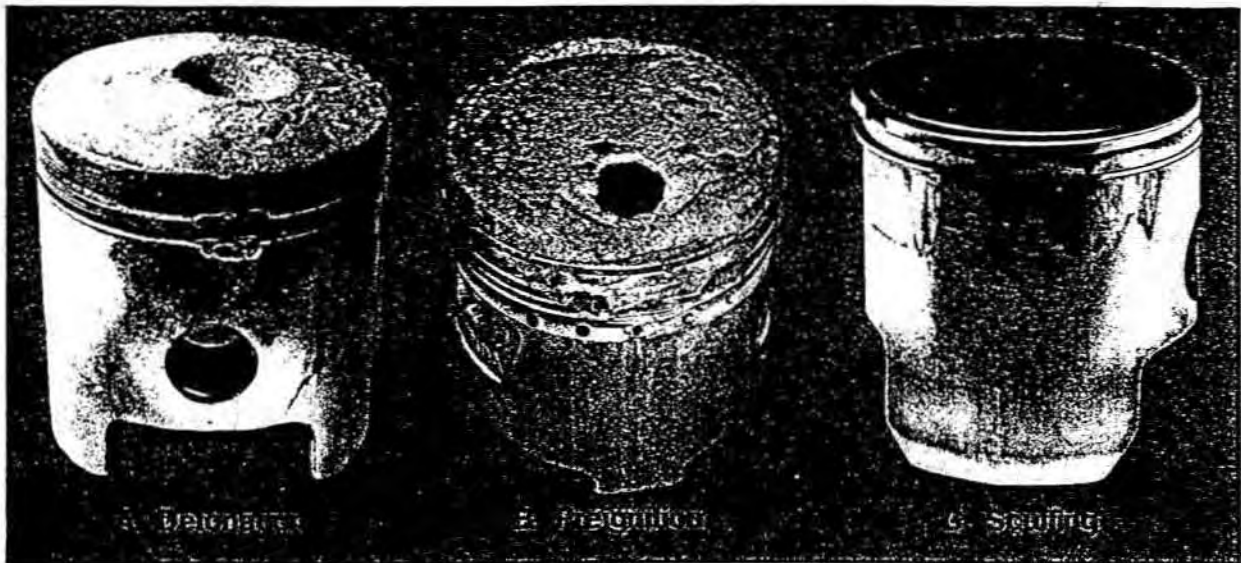
Because plug temperatures vary in different engines, and under different engine service conditions, spark plugs are made in several "heat ranges" to meet these requirements and to provide satisfactory, dependable engine performance.



COMBUSTION — NORMAL and ABNORMAL

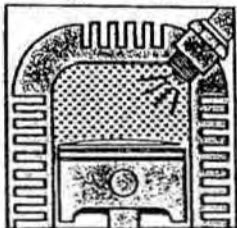
The power in an internal combustion engine is developed by expanding gases resulting from the burning of the air/fuel charge. If you have the proper air/fuel mixture, timing is correct, and the anti-knock (octane rating) quality of the fuel meets the engine requirements, the burning process should occur evenly and steadily. This is normal combustion . . . a cycle which will be repeated many thousands of times every minute the engine is in operation.

There are, however, various forms of abnormal combustion which are not only troublesome, but can be expensive with occasional failures to pistons, spark plugs and other engine parts. Abnormal combustion has always been a problem to contend with in all types of engines . . . two or four-cycle. Engine manufacturers are aware of these problems and caution against indiscriminate use of fuels, oils, oil mixes and poor maintenance practices.

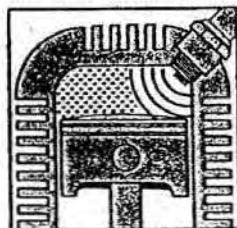


NORMAL COMBUSTION

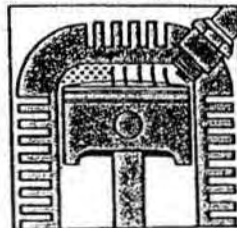
Spark occurs . . .



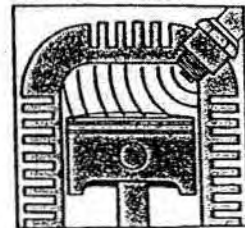
. . . combustion begins . . .



. . . continues rapidly . . .



. . . and is completed.



The spark plug is rarely the cause, but, rather, the victim of abnormal combustion. Because the spark plug is positioned in the combustion chamber, it is readily exposed to the damaging effects of preignition and detonation. The responsibility for piston damage is often unfairly placed on the spark plug simply because it may show evidence of damage similar to the piston. There are many times, however, that piston failure does occur with no damage to the spark plug.

In any case, damaged engine parts, after thorough examination, can almost always be attributed to some form of abnormal combustion revealing that preignition or detonation is the real cause. Because preignition and detonation are so closely related, it is difficult to determine where one ends and the other begins.

COMBUSTION — NORMAL and ABNORMAL (Con't.)

Detonation occurs when the anti-knock value of the fuel does not meet the engine requirements. A portion of the air/fuel charge begins to burn spontaneously from increased heat and pressures just after ignition. The two flame fronts meet and the resulting "explosion" (as illustrated) applies extreme hammering pressures on the piston and other engine parts. Piston damage occurs from the pounding pressures of severe detonation, and the increased heat factor can cause preignition.

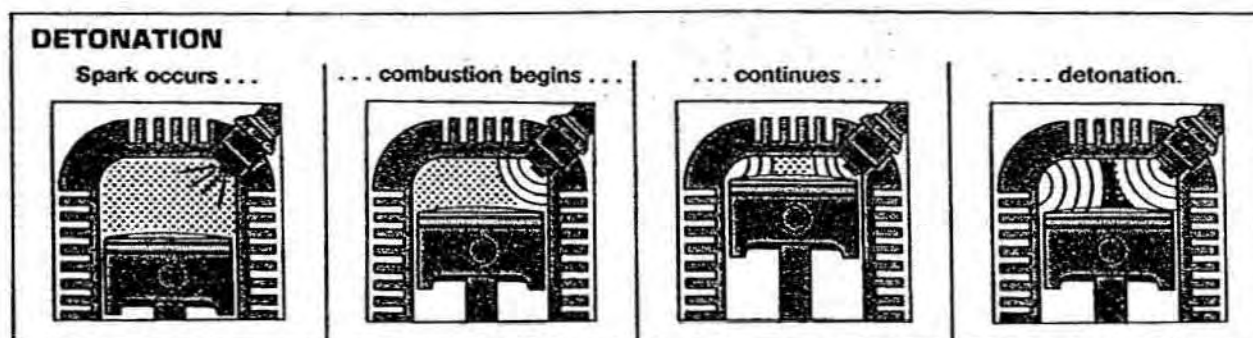
Preignition is just what the term implies. As illustrated, it is the ignition of the air/fuel charge prior to the timed spark. Any hot spot within the combustion chamber can cause preignition.

Detonation and preignition are usually the result of one or a combination of the following conditions.

DETONATION:

1. Ignition timing advanced too far.
2. Fuel octane rating too low.
3. Lean mixtures. Poor carburetion and/or leaks in manifolds—crankcase and/or intake.
4. Compression ratio increase due to combustion chamber deposits or engine modification.
5. Excessive intake manifold temperatures.
6. Lugging the engine.

The piston in Figure A, on Page 11, has been damaged by detonation. Because of the hammering pressures of detonation, piston damage usually appears as fractures on or through the crown, or in the skirt and wrist pin areas.



PREIGNITION:

1. Combustion chamber deposits which become incandescent.
2. Hot spots in the combustion chamber due to poor heat dissipation.
3. Scuffing — due to inadequate lubrication or improper clearance on engine parts.
4. Detonation or conditions leading to it.
5. Head gasket protrusion into the combustion chamber. (Thin edges on valves in 4 cycles).
6. Cross firing (electrical induction between spark plug wires).
7. Spark plug heat range too high for engine operating situation.

The piston in Figure B, on Page 11, was damaged by preignition. This is evidenced by the burned and melted effect produced from the high temperatures of preignition. Damage may appear on and through the crown, through the ring lands, or both.

Another DANGER sign that preignition has been encountered, is evidenced by aluminum throw-off from the piston onto the spark plug.

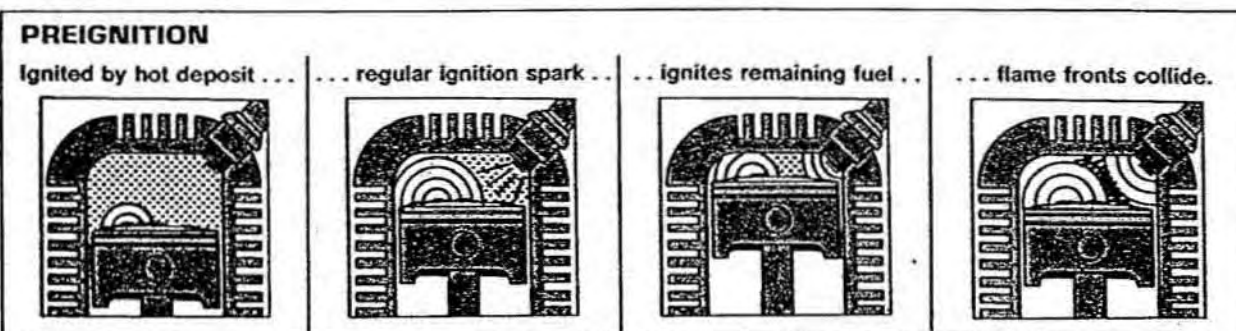
COMBUSTION — NORMAL and ABNORMAL (Con't.)

The piston in Figure C, on Page 11, is the victim of a scuffing condition which, almost without fail, will appear on the piston when severe detonation or preignition is encountered. It can, however, occur singly because of a loss of lubricant, improper piston to bore clearance or abnormally high combustion temperatures. It, too, can cause preignition.

Effects of high temperature on the spark plug is usually indicated by a clean white insulator core nose, and/or excessive electrode erosion.

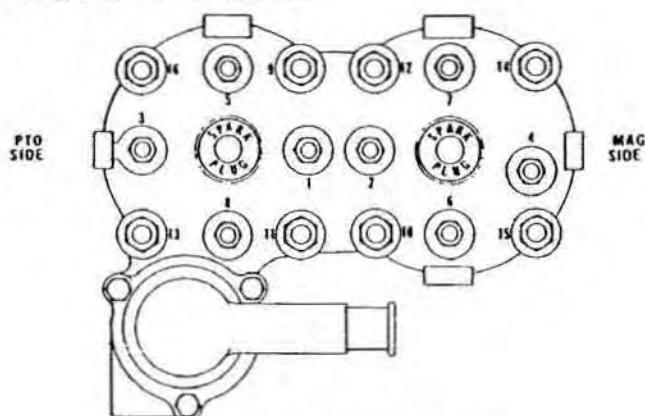
In almost all cases, abnormal combustion can be completely eliminated by: (1) a regular maintenance schedule which includes a proper tune-up with particular attention to spark timing; (2) using spark plugs of the correct heat range for the engine and the type of running situation; (3) using a suitable grade of lubricant in the crankcase for 4 cycles and a proper 2-cycle oil in 2-cycle mixtures; (4) selecting a proper octane-rated fuel and maintaining correct mixtures in 2-cycle engines; and (5) keeping ALL cooling fins functional . . . free from dirt, mud, oil, and grease.

Abnormal combustion can be troublesome and expensive . . . but it can be averted with proper care and attention given to the engine, the fuel, and engine adjustments.

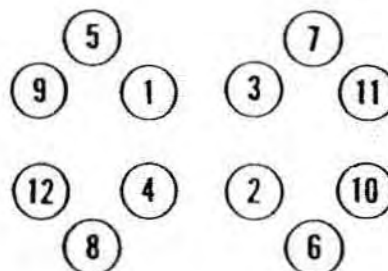


TORQUE SPECIFICATIONS

TORQUE PATTERNS



EC34PL-03 Cylinder Head



Twin Cylinder Crankcase

Engine Bolt Torque – FT./LBS. and KG.-M—Cold

Engine	Cylinder Head	Crankcase		Flywheel
		8MM	10MM	
EC34PL-03 Liquid Cooled	8MM 16-17 Ft./Lbs. 2.2-2.3 KG.-M	18-20 Ft./Lbs. 2.5-2.8 KG.-M	23-25 Ft./Lbs. 3.2-3.5 KG.-M	60-65 Ft./Lbs. 8.3-9.0 KG.-M
	10MM 26-29 Ft./Lbs. 3.6-4.0 KG.-M			

When tightening bolts, nuts, or screws, a torque pattern should be followed to insure uniform equal tension is applied to all fasteners. Proper torque application prevents fasteners from loosening or breaking in critical service. It also minimizes wear and eliminates premature or needless repair costs. Following uniform torque application sequence patterns assures optimum performance from precision machined close tolerance assemblies. On vital engine parts, torquing negligence could be costly.

Torque is a force which tends to produce rotation. The measurement of this force is expressed in units of force and length. There are at present two basic systems of units used to express torque: the English and the Metric. The English, wherein the units of force are the pound or ounce and the length is the foot or inch.

In the Metric System, the unit of force is expressed in grams (GM.) or Kilograms (KG.) and length as Centimeters (CM.) or Meters (M.). The most common units of torque in the English System are the FT./LB. or the IN./LB. In the Metric System, torque is commonly expressed in units of KG./M.

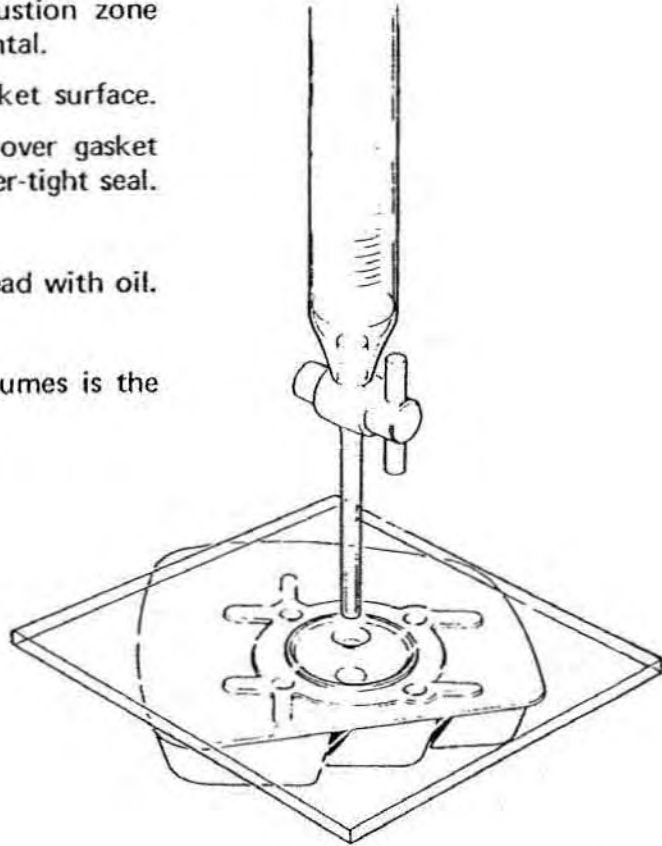
Multiply	by	To Obtain
IN.-LBS.	.0834 1150 .01150	FT.-LBS. GM.-CM. KG.-M.
FT.-LBS.	12 13,800 .138	IN.-LBS. GM.-CM. KG.-M.
KG.-M.	86.8 7.24	IN.-LBS. FT.-LBS.

CYLINDER HEAD VOLUMES

Cylinder head volumes are given in cubic centimeters, with cylinder head removed. To measure the volume of the cylinder head, replace the air in the combustion zone with 10W oil, then measure the volume of oil used. There are several ways to do this. Our shop uses a burette to fill the combustion zone through a hole drilled in a plastic sheet (3/8" thick). The procedure for doing this is as follows:

1. Plug spark plug hole. An old spark plug can be used for this purpose.
2. Place cylinder head so that combustion zone faces up and gasket surface is horizontal.
3. Apply a light film of grease to gasket surface.
4. Place sheet of thick, clear plastic over gasket surface. Press firmly to form a water-tight seal.
5. Record volume of oil in burette.
6. Fill combustion zone of cylinder head with oil.
7. Record volume of oil in burette.

The difference in the two recorded volumes is the volume of the head.



To find engine compression ratio:

1. With the engine assembled, turn crankshaft until piston just closes exhaust port.
2. Using beaker or burette, fill cylinder with 10W oil through spark plug hole. Measure and record volume (1) of oil.
3. Drain oil from cylinder.
4. Turn crankshaft until piston is TDC.
5. Using beaker or burette, fill cylinder with oil through spark plug hole. Measure and record volume (2) of oil.
6. Drain oil from cylinder.
7. To find compression ratio, divide volume (1) by volume (2).

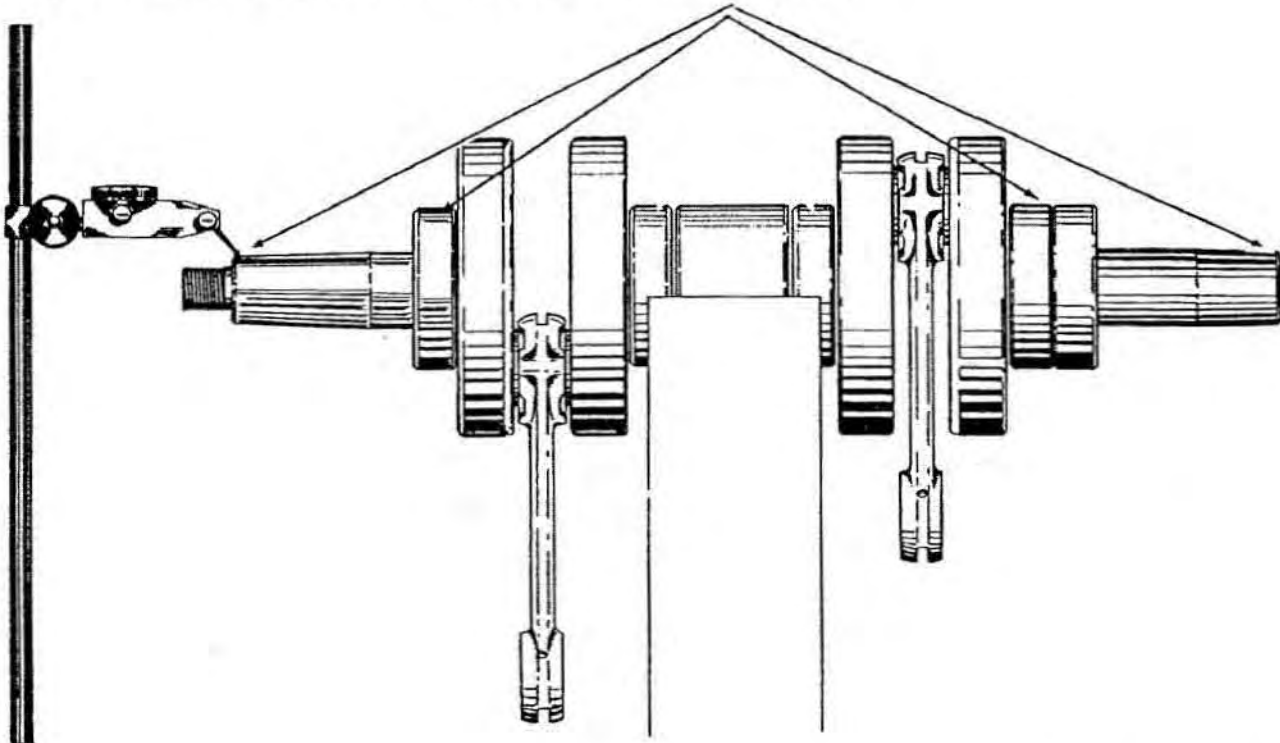
CRANKSHAFT RUN-OUT

Checking crankshaft run-out is a definite must when engines are disassembled and when new crankshafts are installed or rebuilt.

Crankshafts can be bent or twisted due to a slight blow, out of balance clutches, or even by blowing a belt.

Precision equipment must be used to check a crankshaft. Most adequately equipped machine shops can do this job.

Crankshafts must be set in a "vee" block and checked with a dial indicator, at PTO, at flywheel ends, and at the outboard main bearing. See diagram.

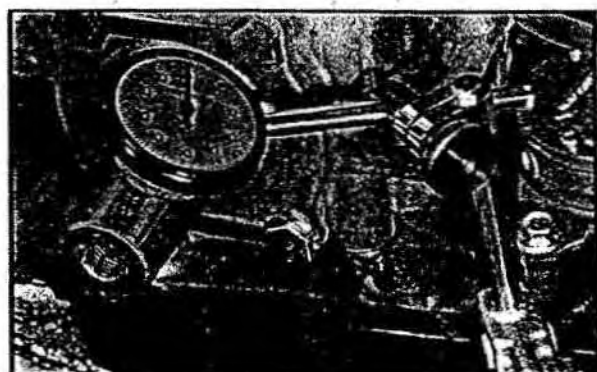


If the crankshaft is out of tolerance, it should be straightened by a fully equipped and reputable machine shop or modification shop.

If the crankshaft bearings have abnormal noise or excessive play, the crankshaft should be rebuilt or replaced.

With the crankshaft installed and case halves torqued, polish the PTO end of shaft with fine emery cloth to remove nicks or foreign material which will result in inaccurate readings. Measure indicated crankshaft runout 1/2" from the PTO end as shown.

NOTE: Serviceable shaft total runout reading should not exceed .004".



ENGINE REMOVAL

NOTE: Because of the tight tolerances incorporated in the RXL, extreme care should be taken in the removal of the engine.

1. Remove the drive belt. Mark the movable and stationary faces of the drive clutch. Remove the clutch retaining bolt.
2. Using the clutch puller, part number 2870353, remove the clutch.
3. Remove the exhaust system.
4. Remove the tachometer cable from the recoil case.
5. Disconnect all electrical connections.
6. Drain the coolant from the radiator and engine. Disconnect all hoses from the engine and remove the temperature gauge sensing unit.
7. Remove the four (4) engine mounting bolts. Lift the engine straight up until the PTO end of the crankshaft comes in contact with the left-hand bulkhead brace. Then raise the magneto side of the engine up and remove the engine from the chassis.

For engine disassembly and reassembly procedures, refer to the 1978 Polaris Shop Manual, Part Number 9910513, Section V, pages 28 - 35.

With the engine disassembled inspect the following items:

Item	Procedure
1. Crankshaft Bearings	Spin by hand and check for roughness.
2. Crankcase	Check bearing mating surfaces and labyrinth seal area. In some instances the labyrinth seal rings gouge into the case halves and cause a small amount of metal to flare to each side. This condition is not necessarily damaging to the engine. In most instances the rough edges can be sanded by hand with a grit wet sandpaper; however, if the case halves are severely gouged (1/16" or more) the cases should be replaced.
3. Crankshaft Seals	Inspect for hardness or cracking. Always install new seals upon reassembly.
4. Connecting Rod Small End Bearings	Check for roughness.
5. Connecting Rod Large End Bearings	Check by rotating the rod and moving from side to side.
6. Magneto Breaker Points	Inspect for pitting, install new points.
7. Cylinder Bore	Inspect for scoring or distortion. Refer to cylinder service in this section for detailed procedures.
8. Piston and Rings	Check for stuck rings and signs of piston damage from detonation.
9. Cylinder Heads and Gaskets	Check for leakage. Always install new gaskets and torque the heads according to the torque chart in this section.

SECTION V

CARBURETION

Carburetion Specifications	1
Carburetor Systems	2 – 3
Component Functions	4 – 7
Problem Diagnosis	8 – 9

1978 RXL CARBURETION SPECIFICATIONS

Engine Model	EC34PL-03
Carburetor Model	VM38SS
Stock Main Jet	320 Hex
Pilot Jet	45
Jet Needle	6DH4-3
Needle Jet	Q-4
Air Screw Setting	1 turn
Cutaway	1.5
Valve Seat Diameter	1.5mm
Starter Jet Diameter	1.5mm
Pilot Outlet Diameter	0.8mm
Air Set Diameter	2.5mm
Bypass Hole Diameter	1.4mm
Float Level	Parallel to body with carburetor inverted
Choke Type	Lever on carburetor
Fuel	40:1 — Fuel/Oil Mixture Use a high grade of premium leaded gasoline or equivalent
Oil	Polaris High Performance Oil

CARBURETOR SYSTEMS

Carburetion is one of the biggest factors in tuning for racing. Knowing the function and adjustments of the carburetor is an absolute must.

Functions of a carburetor

The function of a carburetor is to produce combustible air-fuel mixture, by breaking fuel into tiny particles (in the form of vapor) and by mixing the fuel with air in a proper ratio, and to deliver the mixture to the engine. A proper ratio (mixture ratio or air fuel ratio) means an ideal air-fuel mixture that can burn without leaving an excess of fuel or air. Whether the proper mixture ratio is maintained or not holds the key to the efficient engine operation. The Mikuni carburetor has varying operations depending upon varying driving conditions.

FLOAT SYSTEM — No. 1

The float system is designed to maintain a constant height of gasoline during operation. When the fuel flowing from the fuel pump into the float chamber through the needle valve reaches the constant fuel level, the floats rise. When the buoyancy of the float and the fuel pressure of the fuel pump balance, the needle valve sticks fast to the needle seat preventing further delivery of gasoline, thereby holding the standard level of gasoline.

The fuel level in the bowl controls the amount of fuel in the fuel mixture. Too high a level allows more fuel than necessary to leave the nozzle, enriching the mixture. Too low a level results in a leaner mixture, as not enough fuel leaves the nozzle. Therefore, the pre-determined fuel level should not be changed arbitrarily.

STARTER SYSTEM — No. 2

Starting device (starter system) — In place of the choke, the starter system is employed for Mikuni carburetors. In the starter type, fuel and air for starting the engine are metered with entirely independent jets. The fuel metered in the starter jet is mixed with air and is broken into tiny particles in the emulsion tube. The mixture then flows into the plunger area, mixes again with air coming from the air intake port for starting and is delivered to the engine in the optimum air fuel ratio through the fuel discharge nozzle. The starter is opened and closed by means of the starter plunger. Since the starter type is constructed so as to utilize the negative pressure of the inlet pipe, it is important that the throttle valve is closed when starting the engine.

PILOT SYSTEM — No. 3

The pilot system's main function is that of a low speed jet, to meter fuel at idle and low speed driving. Though its main function is to supply fuel at low speed, it does feed fuel continuously throughout the entire operating range.

Fuel for pilot jet is drawn from the float bowl, mixed with air regulated by the air screw, and delivered to the engine through the pilot outlet.

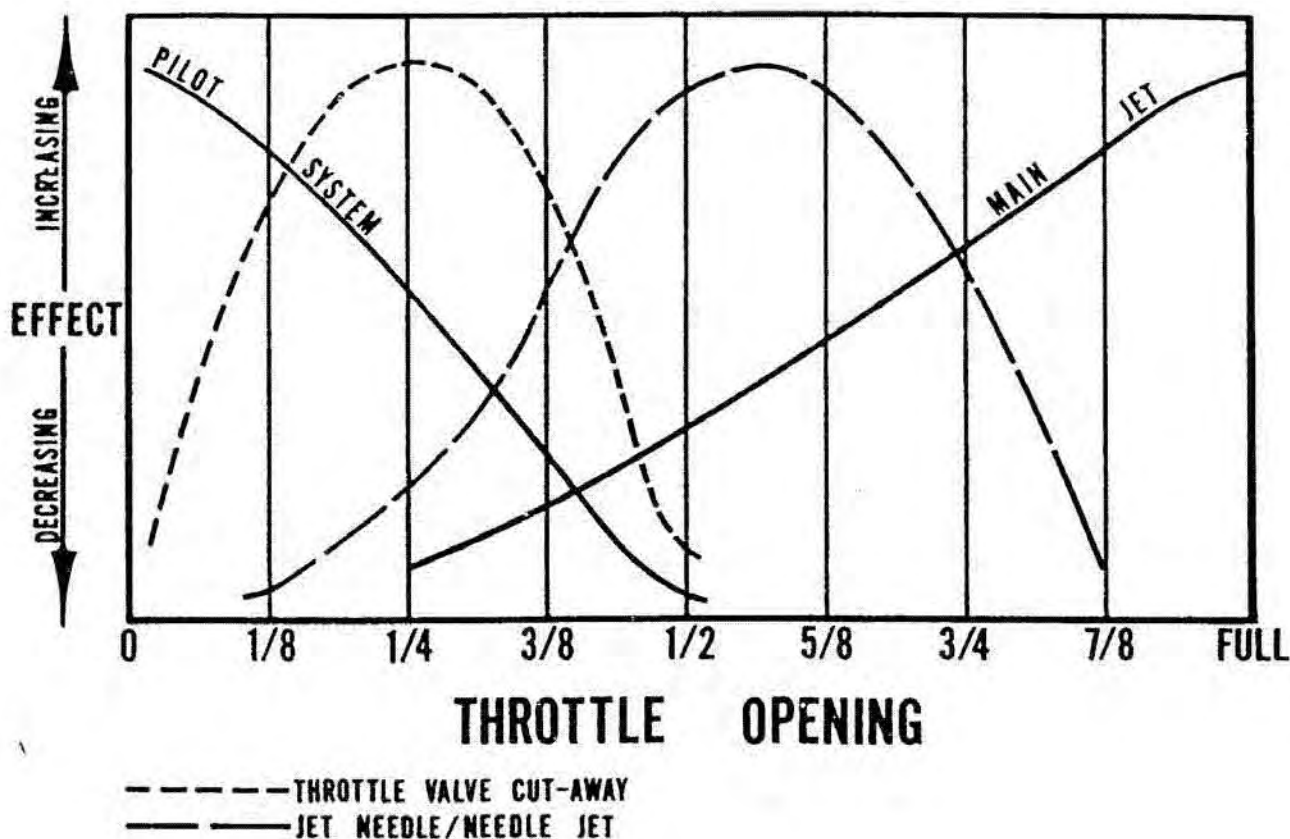
The mixture is regulated to some degree by adjusting the air screw. When the air screw is closed, the fuel mixture is made richer as the amount of air is reduced. When the air screw is opened, the mixture is leaned as the amount of air is increased.

MAIN SYSTEM — No. 4

The main system is designed for delivering fuel between low speed and high speed operation. This system is made up of the jet needle, needle jet, and main jet. The main system begins to take effect as soon as there is enough air flow into the carburetor venturi to draw fuel up through the main jet and needle jet assembly.

During low speed driving there is very little clearance between the jet needle and the needle jet; therefore, very little fuel from the main jet can pass between the jet needle and the needle jet. As the throttle valve opening is increased, the tapered jet needle is raised further out of the needle jet, allowing greater fuel flow. Under full throttle opening, the cross sectioned area of clearance between the jet needle and the needle jet becomes greater than the cross sectioned area of the main jet. Thus the main jet is now controlling the amount of fuel flow.

COMPONENT EFFECT VS THROTTLE OPENING



The preceding throttle opening chart demonstrates component relationship to fuel flow versus throttle valve opening.

———— Pilot System

The pilot system's main function is that of a low speed jet. Its most effective range of fuel delivery is from idle to approximately 3/8 throttle valve opening.

----- Throttle Valve Cutaway

The throttle valve controls the rate of engine air by its movement up and down in the carburetor venturi. At small throttle openings the air flow is regulated chiefly by the valve cutaway as shown, with its greatest effectiveness at 1/4 throttle opening. Throttle valves are number 1.0, 1.5, 2.0, etc., according to the size of the cutaway. Decreasing the cutaway number will increase the amount of fuel delivered in its effective range.

——— Jet Needle/Needle Jet

The jet needle and needle jet have an effective operating range from approximately 1/8 to 7/8 throttle opening. The amount of fuel delivered during this range relies upon the jet needle clip position, as well as the needle jet size and other specifications.

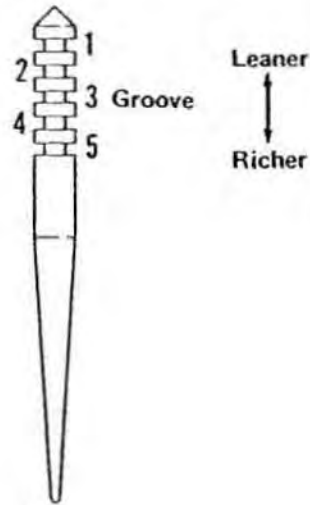
———— Main Jet

The main jet affects fuel delivery at 1/4 throttle and consistently increases to full throttle opening.

COMPONENT FUNCTIONS

JET NEEDLE

The jet needle has 5 grooves for adjustment cut in the upper portion, and is tapered from approximately the middle of the needle to the lower end. The top is fixed to the center of the throttle valve by the needle clip, and the tapered end extends into the needle jet. Fuel flows through the space between the needle jet and jet needle, which space is unvarying until the throttle reaches the 1/4 open point. At this time the tapered portion of the needle begins to move out of the jet and affect fuel flow as the opening enlarges. It follows that taper wear, and the position of the needle clip in the grooves also affect fuel flow rate. If the needle clip is changed from the standard position to a lower groove, the needle taper starts coming out of the jet sooner, resulting in a richer mixture; moving the clip higher produces a leaner mixture.



NEEDLE JET

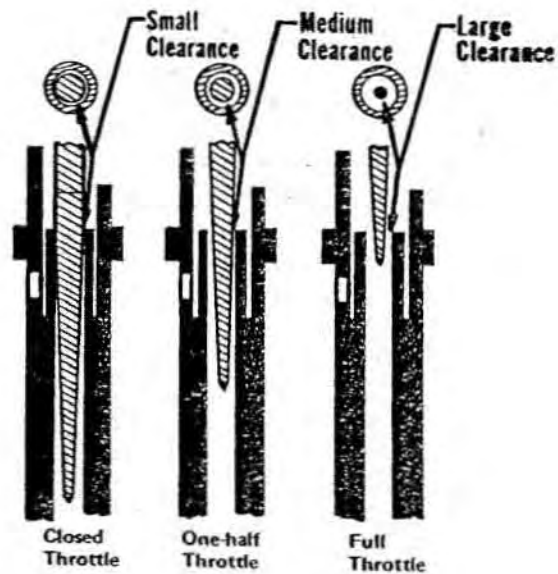
The needle jet works in conjunction with the jet needle to regulate fuel flow rate. In the side of the needle jet, there is an air bleed opening which brings in air measured by the air jet. This air initiates the mixing and atomizing process inside the needle jet, and mixing is augmented by a projection at the needle jet outlet, called the primary choke.

The letter number code stamped on the jet indicates jet inside diameter.



THROTTLE OPENING VS FUEL FLOW

In the full throttle condition, the cross-sectioned area between the jet needle and the needle jet is larger than the cross-sectioned area of the main jet; therefore, the main jet has greater control over fuel flow.



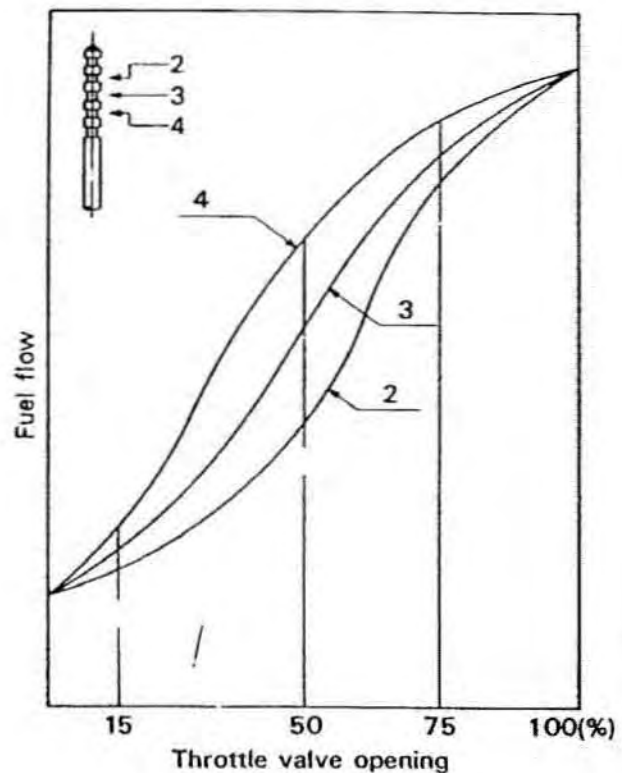
COMPONENT FUNCTIONS (Con't.)

Adjustments — Jet Needle & Float Level

FINE TUNING THE MIKUNI CARBURETOR

Selection of the Needle Jet and the Jet Needle—

A carburetor with a piston-type throttle valve is also called a variable venturi-type carburetor. In this type of carburetor, the needle jet and the jet needle serve to control a proper air-fuel mixture ratio during the so-called medium throttle valve opening (between 1/4 and 3/4 opening). Whether or not the right size of these parts is used gives a big bearing on the engine performance at partial load. The jet needle tapers off at one end and the clearance between the jet needle and the needle jet increases as the throttle valve opening gets wider. The air-fuel mixture ratio is controlled by the height of "E" ring that is inserted into one of the five slots provided in the head of the jet needle. The variation of fuel flow based on the height of "E" ring is shown on chart to the right.



ADJUSTMENT OF FLOAT LEVEL

To adjust the float level on a Mikuni carburetor, it is necessary to remove the float bowl. With the carburetor in an inverted position the float arm (A) should be parallel with the body (B) on the carburetor as indicated in Fig. 1. NOTE: To adjust the float arm never bend the arm itself, always bend the tang which contacts the inlet needle.

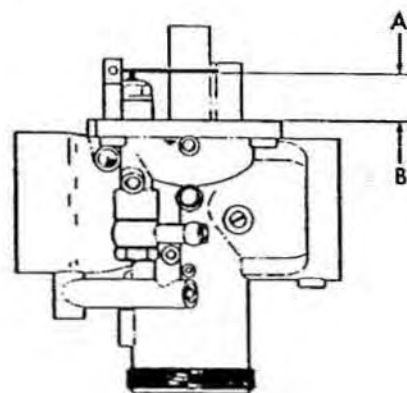


Figure 1

COMPONENT FUNCTIONS (Con't.)

ADJUSTMENTS — JETTING

JETTING IN ACCORDANCE WITH ALTITUDE

The amount of the incoming air in relation to meteorological conditions. The amount of air drawn into the cylinders is influenced by such factors as; the altitude, temperature, humidity, etc. Suppose that the amount of air drawn into the cylinders at an elevation of zero is taken as 100 (the temperature and humidity in this case are considered constant). The amount of air in question decreases in proportion to a rise in elevation as shown in Chart A. Reduction in the amount of air drawn into the cylinders changes the air-fuel mixture ratio, with the result that the power output drops markedly. Chart B shows the relations between a rise in temperature and the amount of air drawn into the cylinders. In this case, the atmospheric pressure (elevation) and the humidity are considered unchanged and the amount of air going into the cylinders at 32 degrees F (0 degrees C) is taken as 100.

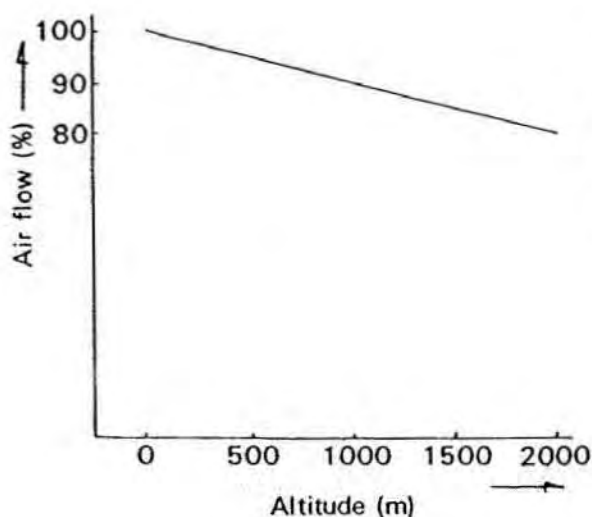


Chart A

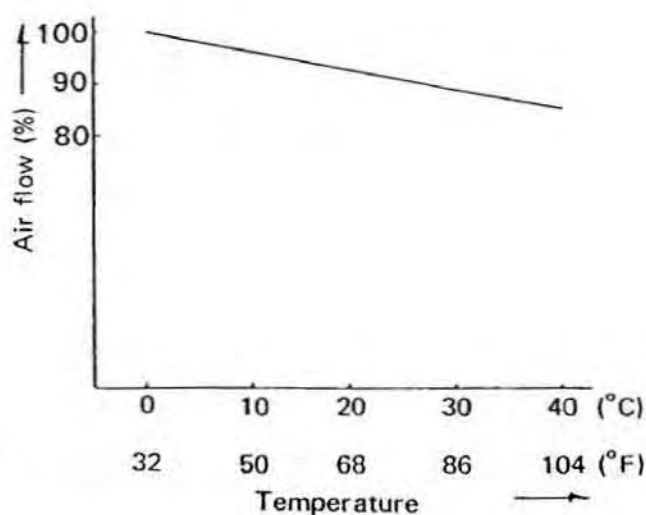


Chart B

On Mikuni VM-type carburetors, the pilot system and the main system are of independent construction. The fuel flow in these two systems is shown on Chart C.

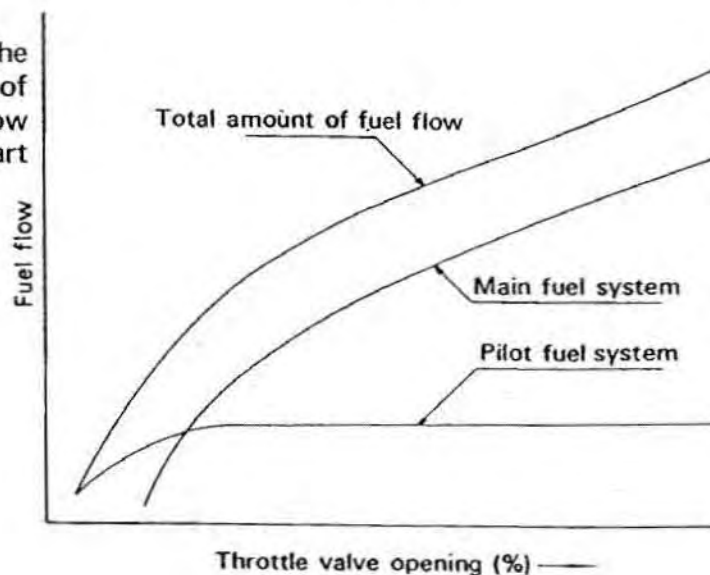


Chart C

COMPONENT FUNCTIONS (Con't.)

Each engine has slightly different characteristics, therefore, two engines of one particular cc may not necessarily be jetted exactly the same.

Pilot jets are instrumental in low rpm performance. If the fuel flow is too great at low rpm, the excess fuel will build up in the crankcase, and only with increased rpm will the fuel be transferred to the combustion chamber.

CAUTION: Too small a main jet and too small a pilot jet can cause serious engine damage. Jet the carburetors carefully.

It is the racer's responsibility to insure that the correct jets are installed in a machine. Be very careful when jetting down in warm weather, as the weather turns colder it will be necessary to rejet upwards to prevent engine damage.

The following chart lists all main and pilot jets and the part number of each that are presently available.

<u>PILOT JET NO.</u>	<u>PART NO.</u>	<u>HEX HEAD MAIN JET NO.</u>	<u>PART NO.</u>
25	3082253	240	3081666
30	3080631	250	3080698
35	3080632	260	3080714
40	3081673	270	3080365
45	3081672	280	3080715
50	3081671	290	3080416
<u>HEX HEAD MAIN JET NO.</u>	<u>PART NO.</u>	300	3080612
		310	3080623
80	3082771	320	3080624
85	3082772	330	3082334
90	3082773	340	3082335
95	3082774	350	3082336
100	3082775	360	3081769
105	3082776	380	3081770
110	3082777	400	3081771
120	3082778	420	3081772
130	3082779	430	3082344
140	3082780	440	3082345
150	3082577	450	3082343
160	3082578	460	3082346
170	3082579	470	3082347
180	3082580	490	3082398
190	3082581	500	3082401
200	3082573	530	3082400
210	3082582	560	3082593
220	3080171	590	3082594
230	3081667	620	3082583

PROBLEM DIAGNOSIS

When the fuel-air mixture is diagnosed as improper due to spark plug readings, possible correction may result if the carburetor is cleaned and its passages blown clear with compressed air.

When the problem exists, further determine whether the mixture is too rich or too lean, again using the spark plug firing end condition as a guide.

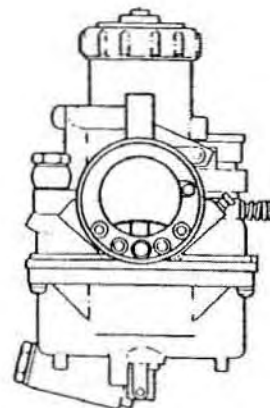
Next use the throttle lever to determine at what degree of throttle valve opening the problem exists.

Mixture Too Rich
Black spark plug tip
Heavy exhaust smoke
Engine runs worse after warm-up
Runs better without air silencer
Combustion chamber has heavy deposits of carbon

Mixture Too Lean
Spark plug electrodes white
Fluctuation in engine speed
Power loss
Engine overheats
Cylinder scoring
Black firing — detonation
Throttle diagnostic opening check points

0 — 1/4 THROTTLE

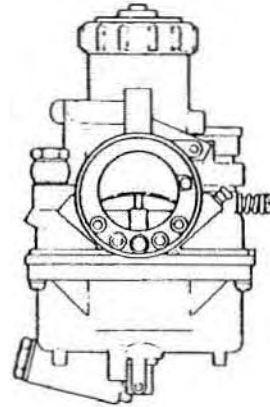
- Pilot air screw misadjusted
- Pilot jet of wrong size
- Obstruction of pilot jet
- Pilot jet loose
- Choke plunger not seating (rich)
- Carburetor mounting air leak (lean)



PROBLEM DIAGNOSIS — (Con't.)

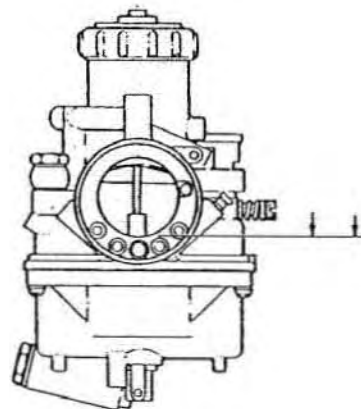
1/4 — 3/8 THROTTLE

Obstruction in main jet or needle jet
Jet needle worn or out of adjustment
Pilot system malfunction



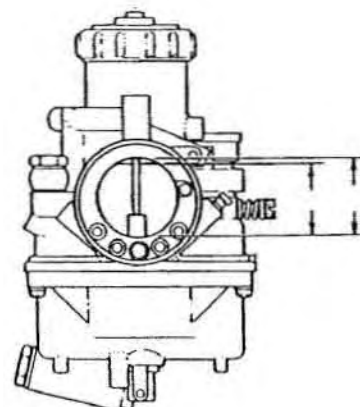
3/8 — 3/4 THROTTLE

Main jet incorrect size — clogged
Needle jet setter O-ring damaged or loose



3/4 — FULL THROTTLE

Main jet size — rich or lean
Fuel filter blocked — lean



SECTION VI

CLUTCHING

Clutch Specifications — Service Tools	1
Drive Clutch Disassembly and Reassembly	2
Clutch Tuning	3 — 7
Driven Clutch Disassembly and Reassembly	8 — 9
Offset Alignment	10

1978 RXL CLUTCH SPECIFICATIONS

<u>Engine Model</u>	<u>Sprocket Ratio</u>	<u>Chain Pitch/Type</u>	<u>Center Distance</u>	<u>Clutch Part No.</u>	<u>Weight Letter</u>	<u>Weight Gram</u>	<u>Spring Part No.</u>
EC34PL-03	16/40	66/Silent	11.5"	1321319	L-1 Ground	33-34.5	7041083

<u>Spring Color & Wire Dia.</u>	<u>Drive Belt Part No.</u>	<u>Drive Belt Length Nominal</u>	<u>Operating RPM</u>
Red .192	3211043	46 1/8" outside circumference	9,500-9,750

Because of the critical nature and precision balance incorporated into the drive clutch, it is absolutely essential that no attempt at clutch disassembly and/or repair be made without factory authorized tools and service procedures.

DRIVE CLUTCH TOOLS

- | | | |
|----|---|--------------------------|
| 1. | Clutch Puller <u>or</u>
T Handle Clutch Puller | PN 2870130
PN 2870353 |
| 2. | Clutch Pin Punch | PN 2870402 |

Optional Weights

<u>Part No.</u>	<u>Weight ID</u>	<u>Grams</u>
5630147	R-1	36
5630148	T-1	32.5

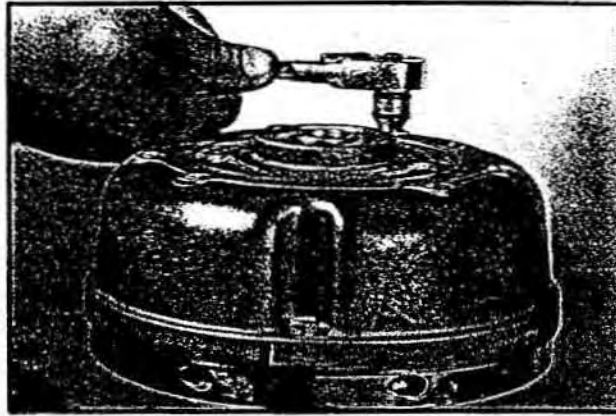
Optional Springs

<u>Part No.</u>	<u>Color Code</u>	<u>Wire Diameter</u>
7041060	Orange	.196
7041061	Brown	.200
7041062	Silver	.207
7041080	Blue	.207

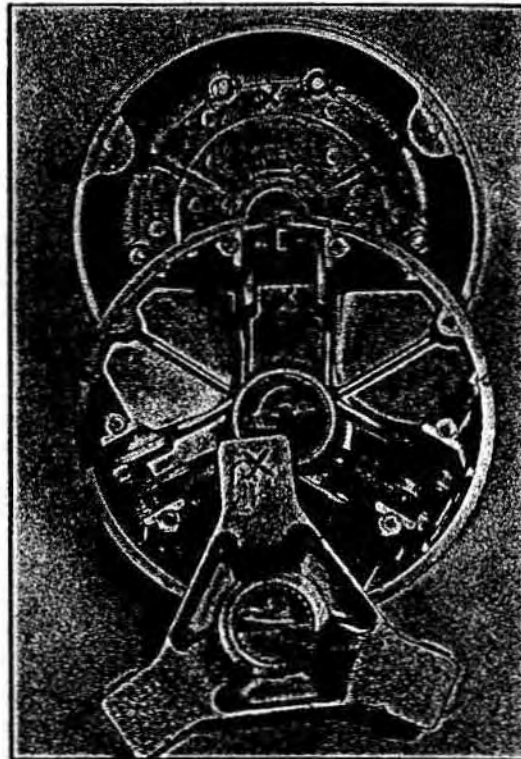
CLUTCH DISASSEMBLY

Remove the drive clutch retaining bolt. **IMPORTANT:** Before disassembly of the clutch, it is very important to mark the stationary and movable faces with a marking pen or scribe. Remove the movable portion of the drive clutch from the engine.

⚠ CAUTION: KEEP IN MIND THERE IS SPRING TENSION ON THE COVER. Mark the cover and movable face and remove the six (6) 10-32 screws and the three (3) 1/4 x 20 cover attaching cap screws.



With the cover removed, note the "X" balance mark under the cover and under a shift weight. On the spider, the word "Alcoa" is used as a balance reference mark. During reassembly, the "X" under a shift weight, the "Alcoa" on the spider, and the "X" on the cover must all be aligned to ensure proper balance.



CLUTCH TUNING

SOME RACING ASSOCIATIONS ALLOW CHANGES TO THE INTERNAL CLUTCH PARTS AND SOME DO NOT. BEFORE MAKING ANY CHANGES, REFER TO YOUR RULE BOOK AND CONFORM TO THEM. KEEPING YOUR MACHINE LEGAL IS YOUR RESPONSIBILITY.

Clutch Tuning: Initial Setup

1. The ideal belt slack is $1\frac{1}{4}"$, Fig. 1. To change the slack in the belt, thrust washers in the driven clutch can be added or subtracted. By the addition or subtraction of one washer in the driven clutch, the belt slack can be changed $\pm \frac{1}{8}"$.

NOTE: One thrust washer should always be left between the driven clutch sheaves.

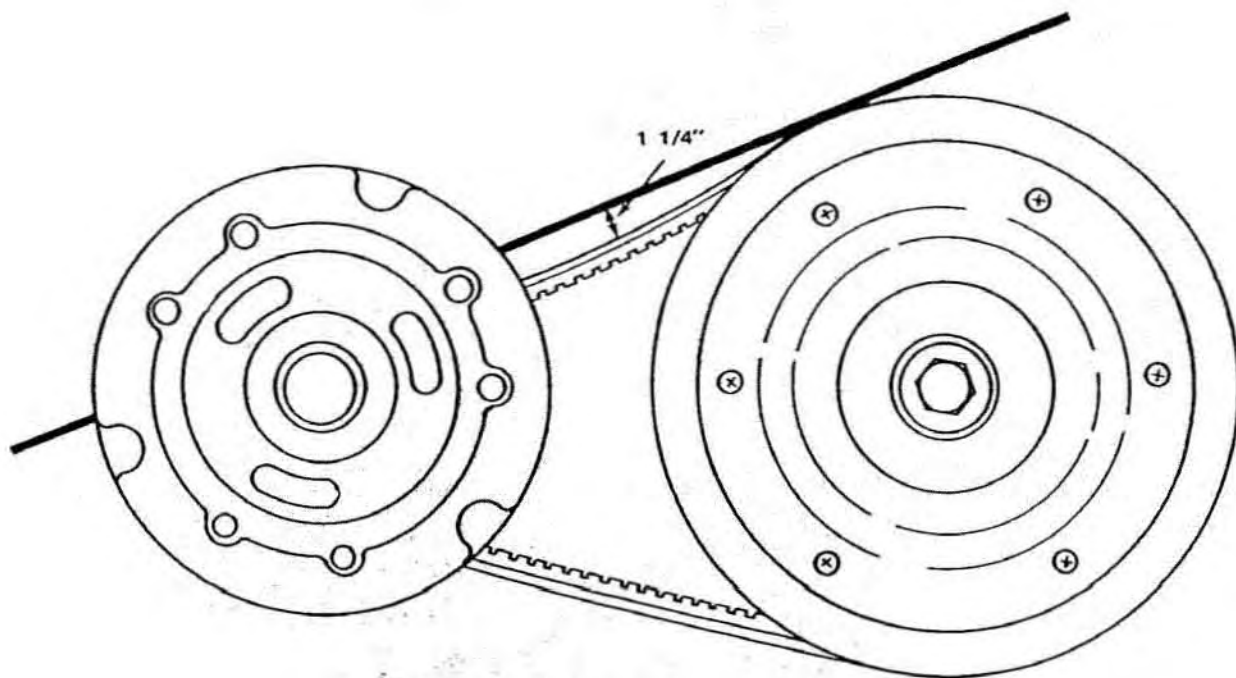


Fig. 1

CLUTCH TUNING (Con't.)

2. Drive Clutch Engagement RPM Adjustments. The RXL drive clutch has three (3) set screws located on the movable face. These set screws control the positioning of the three shift weights in their relationship to the center of gravity.

▲ Before the machine is run, the position of the set screws and shift weights must be checked to ensure they are all equal, Fig. 2. Measure from the tail of the shift weights to a reference point on the movable face. Adjust the set screws so that the distances from the tail of all weights to the reference point are equal, Fig. 2, A.

Clutch engagement should be as low as possible without creating an engine bog, usually approximately 5,500 – 6,000 RPM. When the engagement is as low as possible, the track will have a chance to "hook up" and initial acceleration off the starting line will be increased.

To adjust the engagement RPM, turn all three set screws in or out an equal amount. Turning the screws in will decrease the engagement and adjusting the screws out will increase the clutch engagement RPM, Fig. 2. NOTE: As the set screws are turned in, the neutral position of the clutch is decreased and further adjustments may be required. (See Adjustment of Clutch/Belt Neutral Position, Page 5)

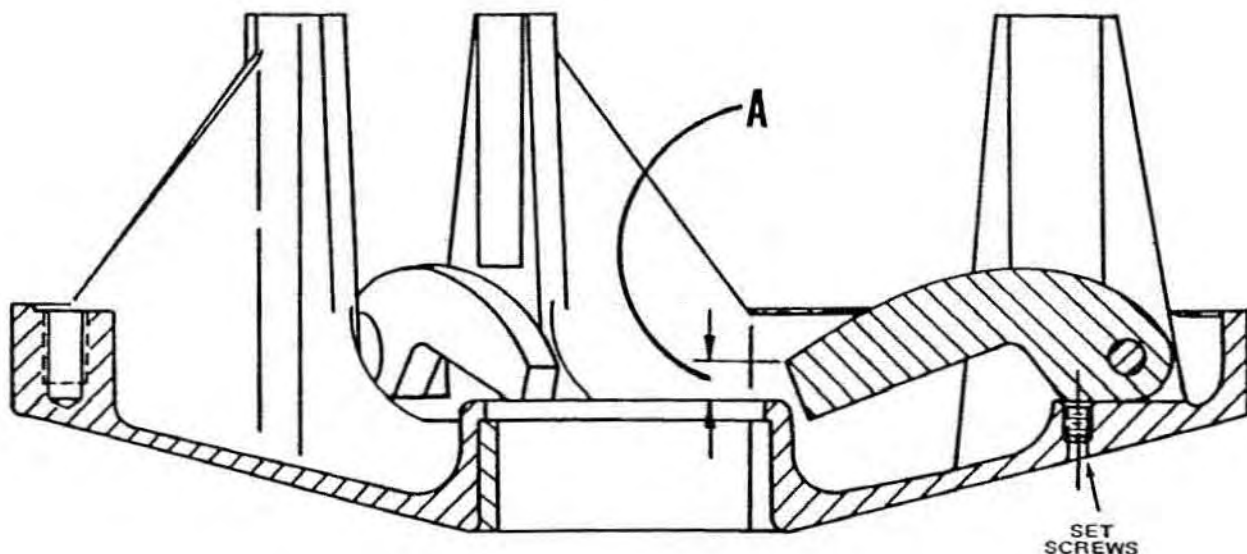


Fig. 2

CLUTCH TUNING (Con't.)

3. Adjustment of Clutch/Belt Neutral Position. The distance between the belt and the movable sheave on the drive clutch is very critical. This distance controls the starting ratio (lowest starting ratio is preferable) and also controls the position of the clutch weight to engine RPM. The distance between the belt and movable sheave should be approximately .020", Fig. 3. This adjustment is controlled by the set screws on the movable face and the spacers under the spider.

The drive clutch will be assembled with a .250" spacer, part number 5010139, under the spider. The thickness and part numbers of the additional spacers are:

.270"	5010140
.290"	5010141
.310"	5010142
.330"	5010143

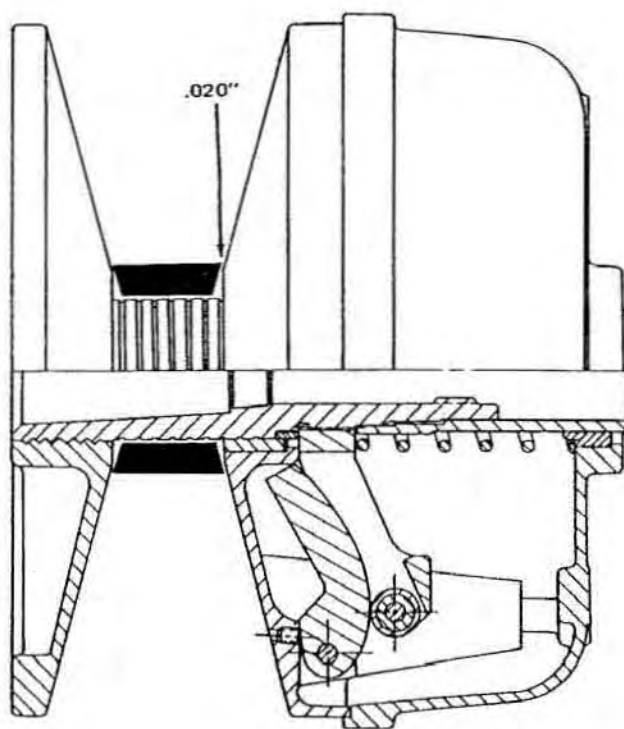


Fig. 3

Final Engagement and Neutral Position Adjustment

1. When the set screws are turned to lower or raise engagement, check the movable sheave/drive belt clearance. If the set screws are turned in to lower engagement, a thicker spider spacer may be required to maintain the .020" desired sheave/belt clearance. If the set screws are turned out to raise the engagement, a thinner spacer may be required. When making the above adjustments, it would be to your advantage to use a belt with the same outside circumference and width. This will always be of some benefit to you as less fine tuning will be required if a belt of the same dimension is used every time a belt is replaced.

NOTE: Measure a number of belts and maintain a supply of belts with the same dimensions. Know which belt length and width to use if you change spacer thickness.

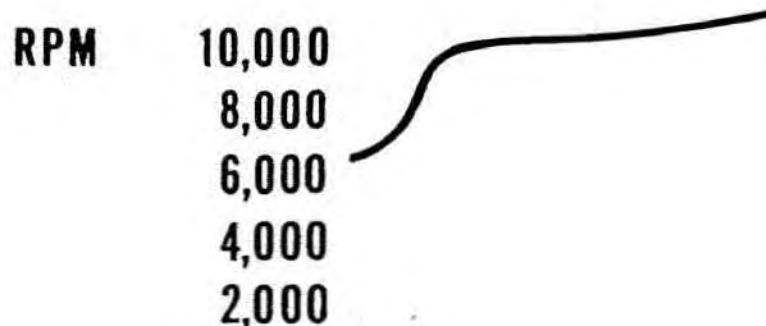
CLUTCH TUNING (Con't.)

Drive Clutch Weights/Spring Relationship to Obtain Maximum Operating RPM.

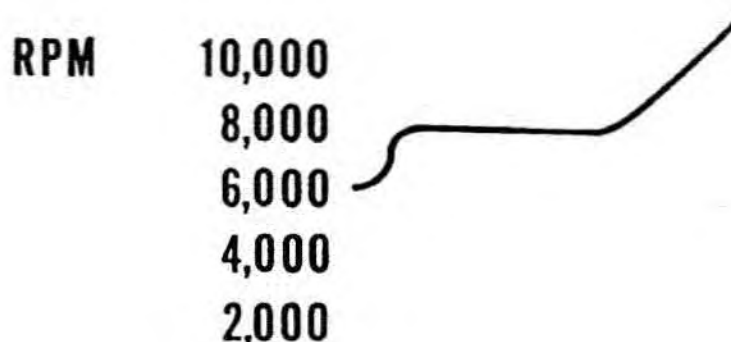
The drive clutch is an RPM and torque sensing unit designed to transfer the maximum amount of horsepower from the engine to the ground. This is accomplished by weights and a spring inside the unit reacting to the centrifugal force applied to it from the engine RPM.

The spring and weights work in combination. In a properly setup clutch, the maximum desired operating RPM will be reached immediately after clutch engagement (full throttle conditions). This RPM should be maintained to gain optimum power. As centrifugal force pushes the weights against the rollers, the movable sheave will force the belt to climb up the drive clutch sheave to increase vehicle speed.

If the weights are too light (not heavy enough), the maximum RPM will be too great and the drive belt will not go into high gear (top of the clutch).



If the weights are too heavy (too much weight), the engine RPM will be low and the drive clutch will go into high gear too fast. Then the RPM will gradually increase.



CLUTCH TUNING (Con't.)

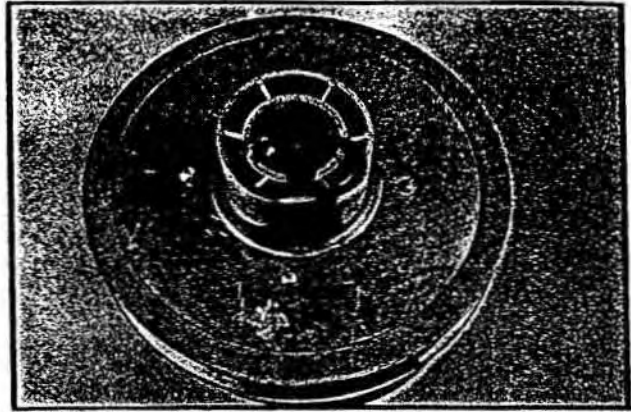
If the weights and spring are matched properly, the engine RPM will immediately go to the desired RPM and stay there on both upshift and backshift.



NOTES

DRIVEN CLUTCH DISASSEMBLY AND REASSEMBLY

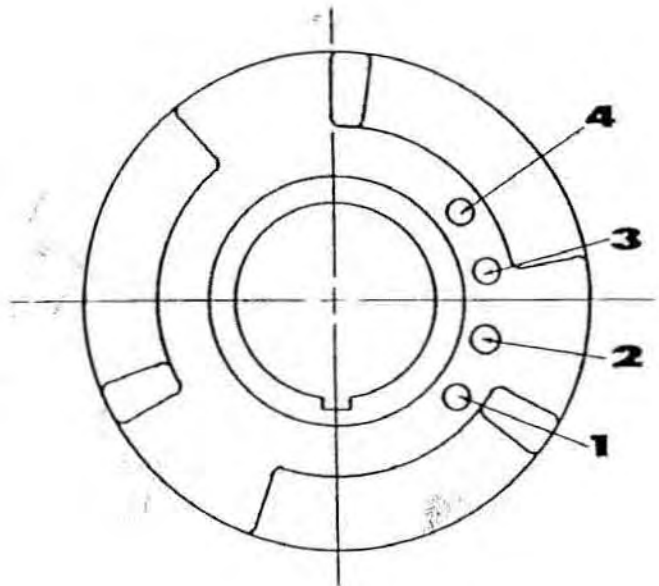
1. Remove the snap ring and washer.



2. Remove the helix, spring and key. The correct tension of the spring is 1/3 turn counterclockwise on the movable sheave.

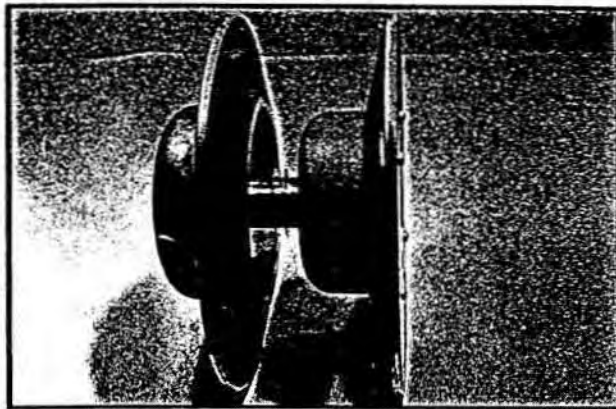
The driven clutch helix (ramp) has four (4) spring locations which also allow adjustments in the specified engine RPM. The production setting is in the No. 2 hole.

If the engine operating RPM is lower than the specified RPM, the driven clutch spring can be placed in the No. 3 or No. 4 holes. Conversely, if the engine operating RPM is higher than the specified RPM, the spring can be moved to the No. 1 hole.

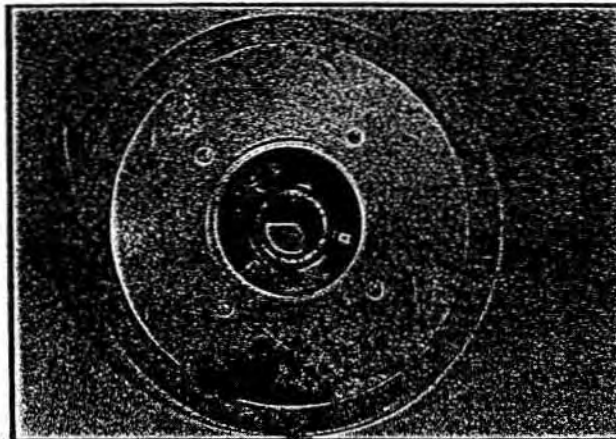


DRIVEN CLUTCH DISASSEMBLY AND REASSEMBLY (Con't.)

3. Separate the stationary and movable sheaves, noting the placement of two thrust washers. The thrust washers are used to change the effective center distance.



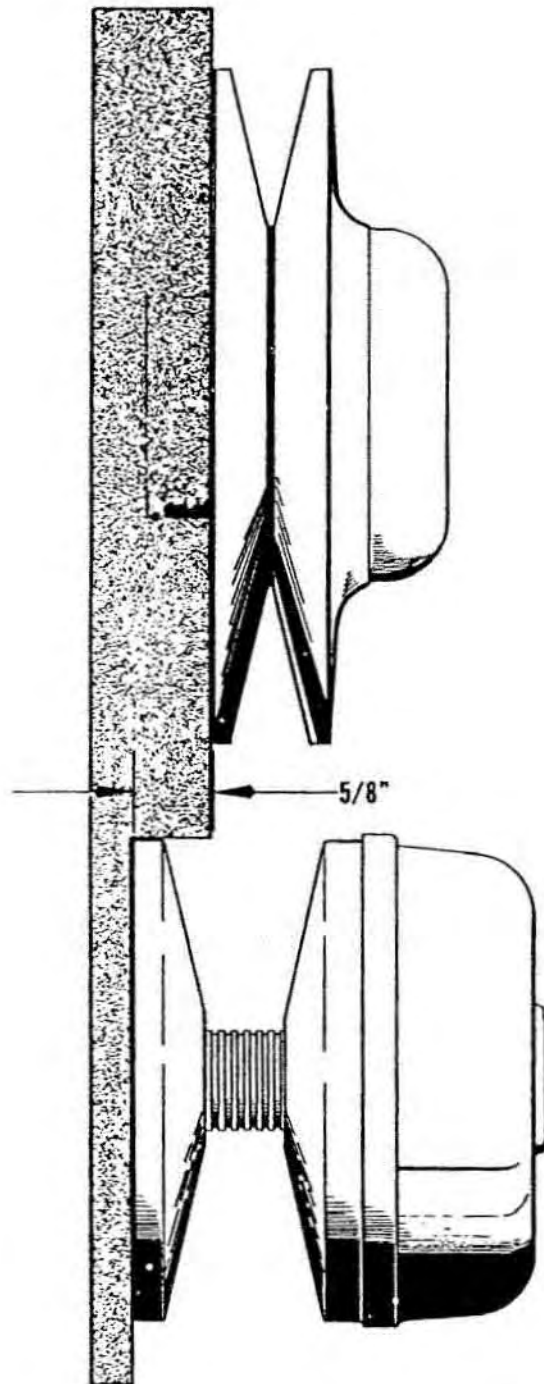
4. Inspect the ramp buttons and bushings for wear; clean all parts prior to reassembly.



NOTE: It is essential for proper drive and driven clutch operation that both clutches be disassembled and cleaned before each race. Always check the clutches for wear.

OFFSET ALIGNMENT

NOTE: The drive belt must be removed when this measurement is made.



The correct clutch offset for the RXL is $5/8''$ measured across both the top and bottom of the drive and driven clutches. The correct center distance is 11.5\".

Belts will be installed at the factory so that the numbers can be read when standing on the clutch side of the machine. It would be advantageous to always reinstall the belt in this manner.

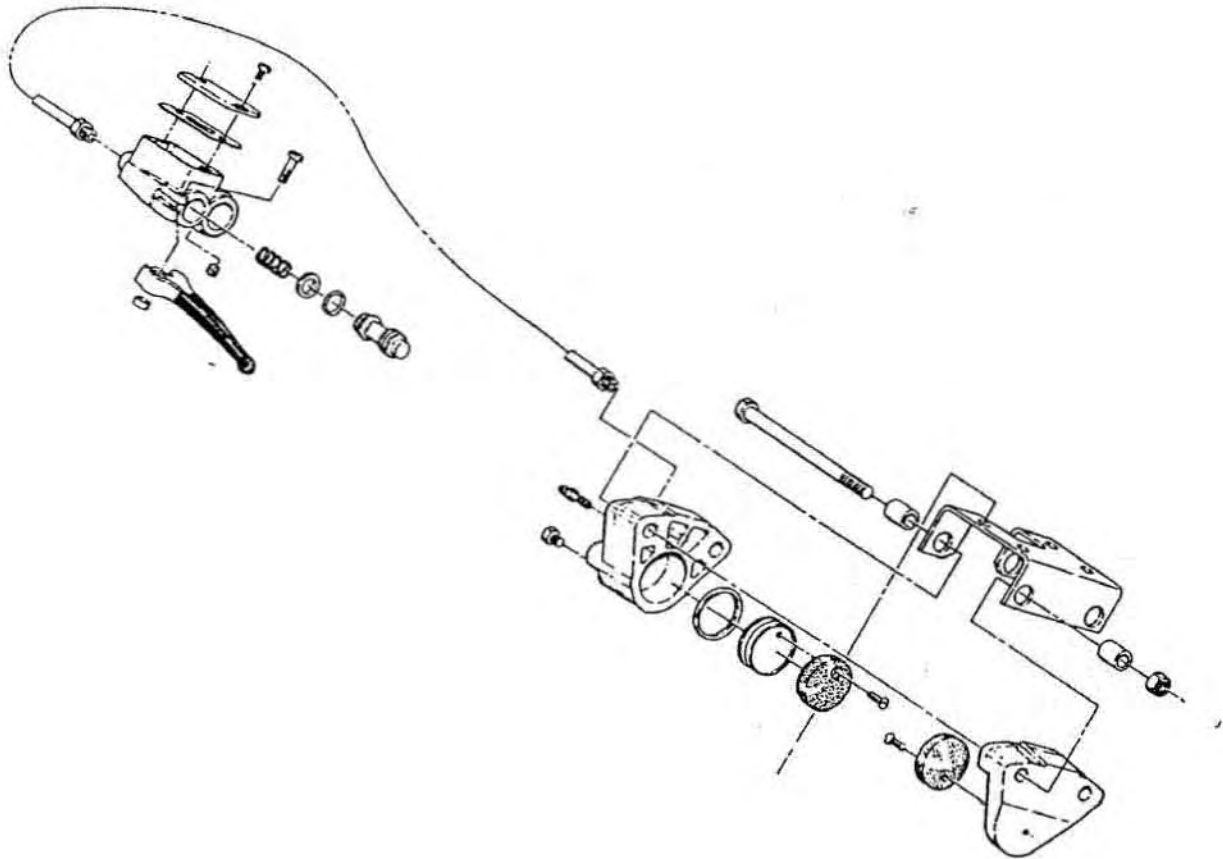
SECTION VII

CHAINCASE AND BRAKE

Sequence of Assembly	1
Brake Inspection and Bleeding Process	2
Chain Tension	3
Calculating MPH	4
Drive Chain Sprocket Alignment	5
Jackshaft Removal and Installation	6 — 8

SEQUENCE OF ASSEMBLY

HYDRAULIC BRAKE — EXPLODED VIEW



Overhaul and service data is covered in the 1978 Polaris Shop Manual, Section VIII, Pages 10 - 13.

BRAKE INSPECTION AND MAINTENANCE

The RXL has self-adjusting brake friction pads. At reasonably frequent intervals, the brakes should be inspected for brake lever reserve. This is the clearance between the lever and handlebar grip. Inspection should be made with the lever firmly depressed. Lever reserve should not be less than 1/2".

As the friction pads wear and self adjust, brake fluid is displaced from the brake master cylinder reservoir to the brake caliper piston bore. Therefore it is recommended that the fluid level in the master cylinder be maintained to 1/8" below the cover on a periodic basis. It is also important to check the condition and remaining thickness of the friction pads regularly. When the friction pads are worn to less than one half of their original thickness (approximately .225"), the pads should be replaced.

BRAKE TROUBLE INDICATIONS AND CORRECTIONS

A. Excessive lever travel

1. Fluid reservoir low or empty
If master cylinder reservoir is empty or low, remove cover and add fluid as required to bring level 1/8" below lip of reservoir opening.
2. Spongy brake lever when reservoir is filled to proper level
Brake system air bleeding will be necessary.
3. Upon applying brakes and a squealing or scraping noise emits from brake caliper area, brake friction pads are excessively worn and friction pad brass retaining screws are most likely making contact with the disc. Replace pads if necessary.

B. Bleeding Instructions

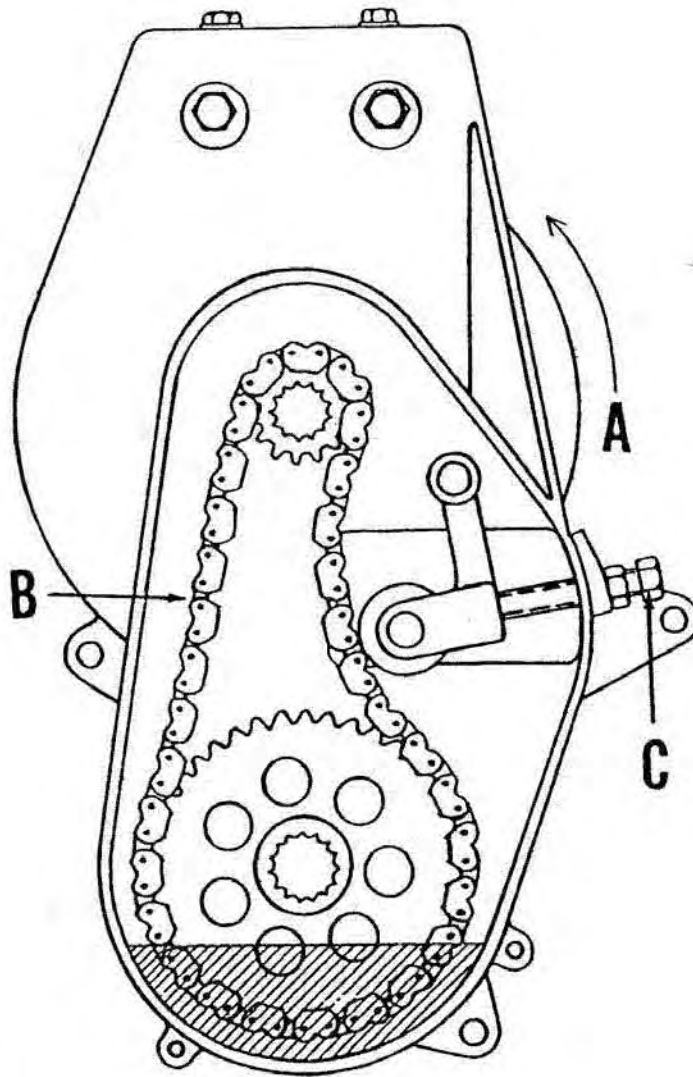
1. Remove master cylinder reservoir cover, fill to required level. Replace reservoir cover without installing retaining screws; this is done so that the brake fluid will not splash upon painted surfaces.
2. Attach a flexible bleeder tube to the nipple of the bleeder valve. Place the other end of the tube in a jar containing a little clean fluid. The end of the tube must be below the surface of the fluid to prevent ingestion of air. Loosen the valve one turn.
3. Depress the brake lever slowly. Observe air bubbles rising in the fluid in the jar as the air is expelled. When the brake lever is nearly fully depressed, close bleeder valve. Then release the brake lever.
4. Repeat step 3 above until all air bubbles disappear and only fluid escapes, indicating that no more air is left in the brake system. Check reservoir fluid level every few times this procedure is followed through so that the level does not deplete and pump air into the line at the master cylinder.
Do not pour any of the purged fluid back into the reservoir since it is aerated and the air trapped within it will again enter the system.

CAUTION: When performing brake maintenance, be careful not to get fluid in eyes.

CHAIN TENSION

Specifications/Gear Ratio Chart

<u>Engine Model</u>	<u>Sprocket Ratio</u>	<u>Drive Chain Type/Pitch</u>	<u>Chaincase Lubricant</u>	<u>Brake Fluid</u>
EC34PL-03	16/40	Silent/66	Polaris PN 2870337	Polaris PN 2870251 Silicone Brake Fluid



Drive Chain Tension

To obtain correct chain tension, remove the chaincase cover with a slight reverse tension on the chain by turning driven clutch as indicated (A). There should be approximately 1/4" – 3/8" free play deflection on the chain at point (B). Chain adjustment is achieved by loosening the adjusting bolt locknut and turning adjusting bolt (C) until correct chain deflection is obtained. Lock the adjusting bolt locknut while holding a wrench on the adjusting bolt at the same time to prevent it from turning and changing your desired chain tension. Install the chaincase cover and add Polaris chaincase lubricant (Part No. 2870337) through the cover upper plug hole to the lower check plug level.

FORMULA TO CALCULATE MPH

To calculate the exact MPH of your snowmobile, many factors have to be known. These factors are listed as follows:

1. Maximum RPM — refer to engine specification sheet.
2. Percent of jackshaft speed or ratio between drive and driven clutches.

$$\text{RXL} \quad .99:1$$
3. Root diameter of front sprockets.

$$\text{RXL} \quad 7.150$$
4. Gear ratio — refer to gearing specifications.

Formula

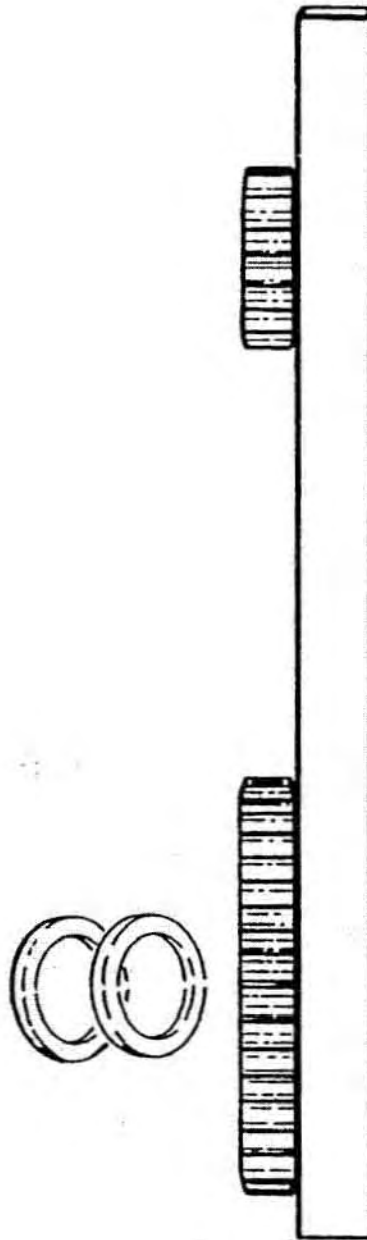
1. $\text{RPM} \times \% \text{ of jackshaft speed} = \text{speed of top gear.}$
2.
$$\frac{\text{Root dia. of sprocket} \times \text{TT (3.1416)}}{12} = \text{ft. per revolution.}$$
3.
$$\frac{\text{Speed of top gear (answer No. 1)}}{\text{gear ratio}} = \text{drive shaft speed.}$$
4. $\text{Drive shaft speed (answer No. 3)} \times \text{ft. per rev. (answer No. 2)} = \text{ft. per min.}$
5.
$$\frac{\text{Ft. per min. (answer No. 4)}}{5,280} \times 60 = \text{MPH}$$

Example:

1. $9,500 \text{ (RPM)} \times .99 \text{ (\%)} = 9,405 \text{ (speed of top gear).}$
2.
$$\frac{7.150 \text{ (root dia.)} \times 3.1416}{12} = 1.872 \text{ (ft. per rev.)}$$
3.
$$\frac{9,405 \text{ (speed of top gear)}}{2.50 \text{ (gear ratio)}} = 3,762 \text{ (drive shaft speed)}$$
4. $3,762 \text{ (drive shaft speed)} \times 1.87 \text{ (ft. per rev.)} = 7,042.5 \text{ (ft. per min.)}$
5.
$$\frac{7,042.5 \text{ (ft. per min.)}}{5,280} \times 60 = 80.0 \text{ MPH}$$

NOTE: MPH is under ideal conditions assuming and engine operating RPM of 9,500.

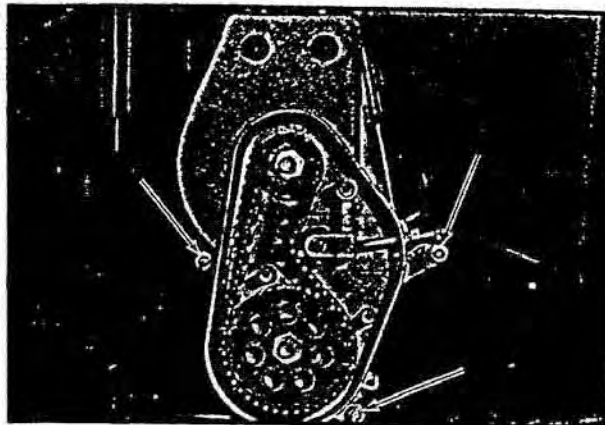
DRIVE CHAIN SPROCKET ALIGNMENT



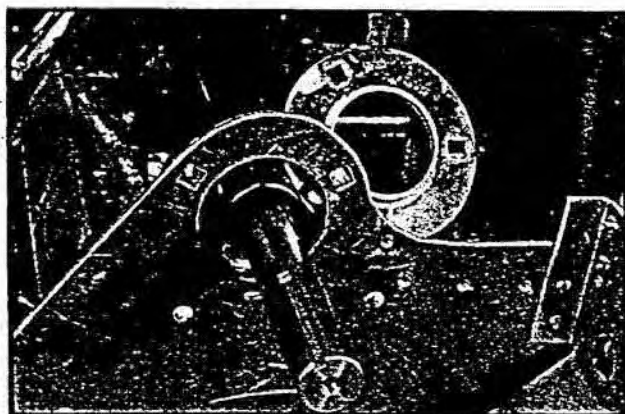
Maximum sprocket and chain life are directly related to proper sprocket alignment. Before installing the drive chain, place a straight edge against the upper and lower installed sprockets. The edge should contact equally on both sprockets. If misalignment is evident, the addition or subtraction of washers (Part No. 7556509) is necessary behind the bottom sprocket to correct the problem.

JACKSHAFT REMOVAL AND INSTALLATION

1. Remove chaincase cover and sprockets. Remove the three (3) case attaching bolts and the four (4) brake caliper cap screws. Remove the chaincase.



2. Remove the driven clutch, loosen the lock collar, remove the flangette and bearing on the left side. The jackshaft and disc may now be removed from the machine.

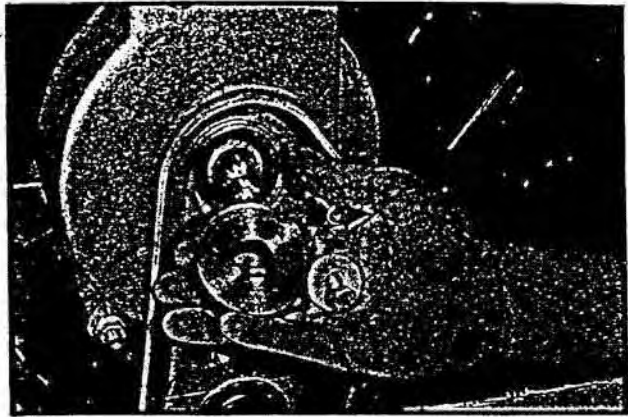


JACKSHAFT INSTALLATION

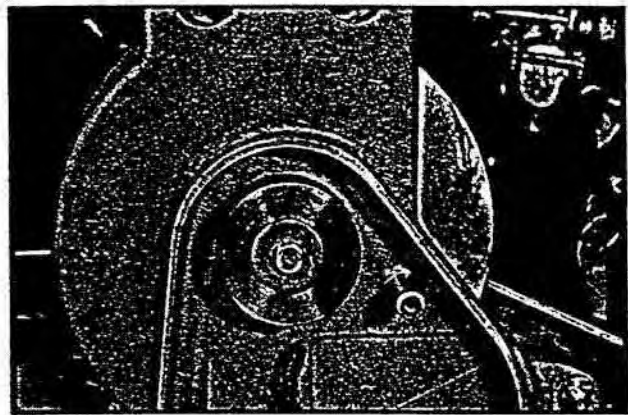
Any time the chaincase and jackshaft are removed, it is necessary that the following steps are followed upon reinstallation of the jackshaft to insure proper alignment into the left bearing and flangette.

JACKSHAFT REMOVAL AND INSTALLATION (Con't.)

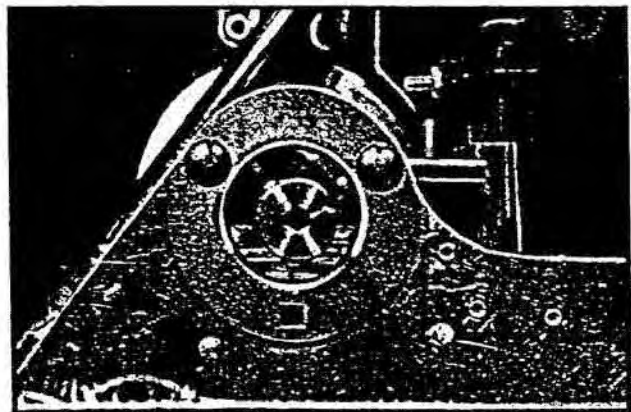
1. Install the chaincase to the chassis with the jackshaft. Do not install the sprockets. Alignment tool (Part No. 2870399) shown prior to installation.



2. Install the alignment tool to the jackshaft, torquing the cap screw to 5-6 ft./lbs.

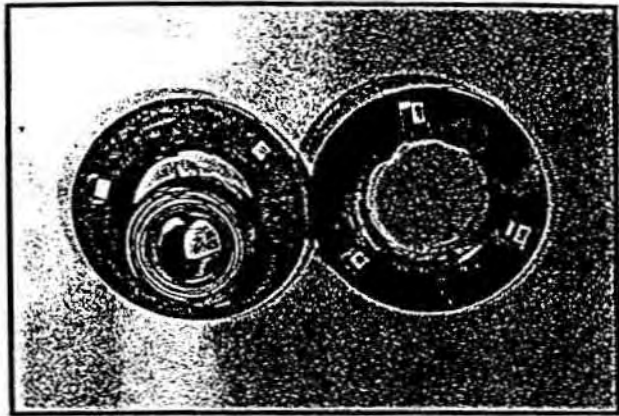


3. Install a flangette into the left bearing support hole. The shaft should center in the flangette. If not, the chaincase will have to be shimmed between the tunnel and case accordingly, using shim kit (Part No. 2200126) as needed to position the shaft on center.

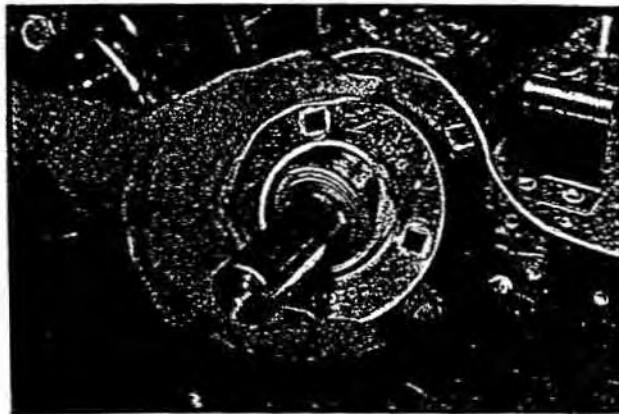


JACKSHAFT REMOVAL AND INSTALLATION (Con't.)

4. Following centering of the jackshaft, the left bearing and flangettes must be greased prior to installation.

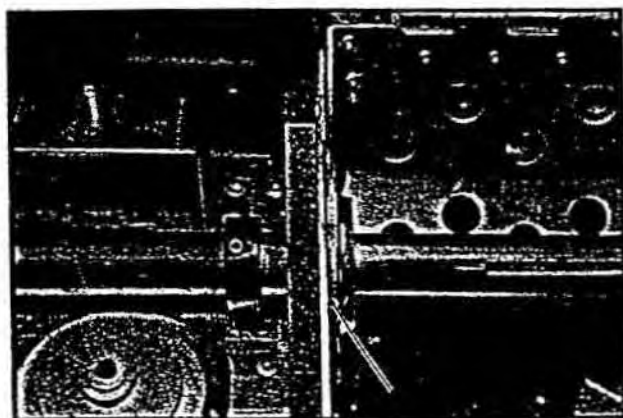


5. Slide the bearing onto the shaft, rotate the flangettes as shown to check for any binding which may cause bearing misalignment upon reassembly.



6. After the flangettes have been tightened, lay a straight edge along the support plate as shown and rotate the shaft, noting any movement of the plate.

IMPORTANT: If the bearing has not centered in the flangettes and movement is evident, it will be necessary to loosen the flangette mounting bolts slightly and gently tap the flangette while rotating the shaft until no movement exists.



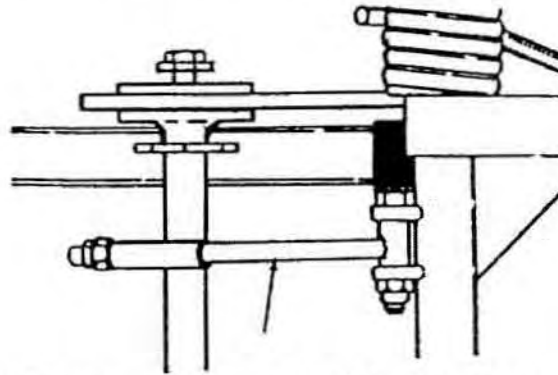
SECTION VIII

SUSPENSION AND TRACK

Front Torque Arm Limiter	1
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Front Torque Arm Mounting Bracket	2
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Track Tension and Alignment	4
Stud Locations	5

FRONT TORQUE ARM LIMITER

The front torque arm limiter can be adjusted to work in conjunction with the front torque arm to provide varying degrees of ski lift and weight transfer.



If the adjusting nut is tightened, the amount of front torque arm travel will be limited, which will decrease ski pressure upon initial acceleration.

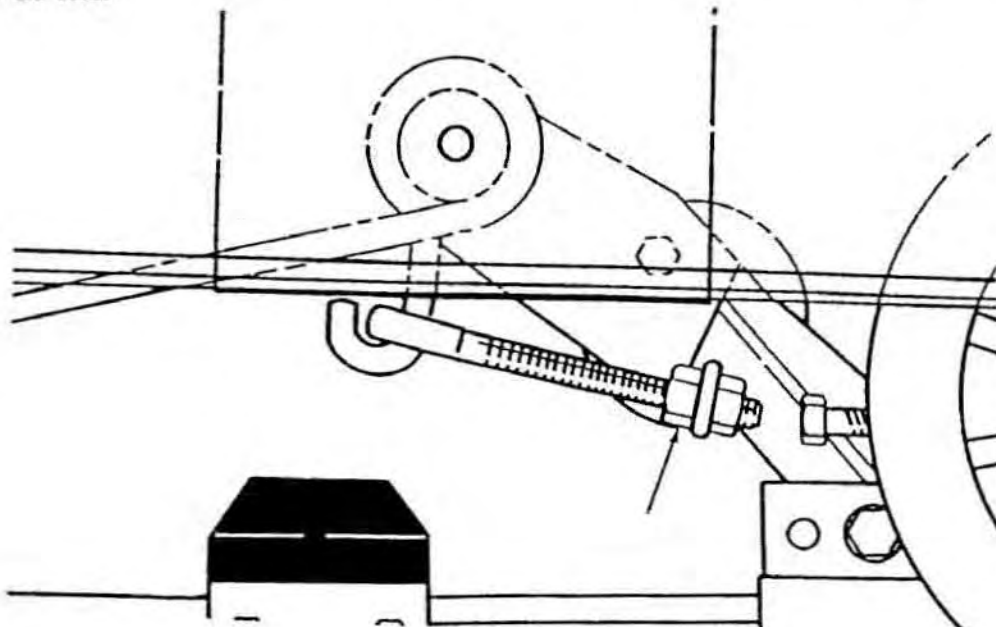
If the adjusting nut is loosened, front torque arm travel will be increased, resulting in less ski pressure upon initial acceleration.

Front Torque Arm Limiter Position	Traction	Ski Pressure
Shorter (Adjusting nut tightened)	Decreased	Increased
Longer (Adjusting nut loosened)	Increased	Decreased

REAR SPRING ADJUSTMENT

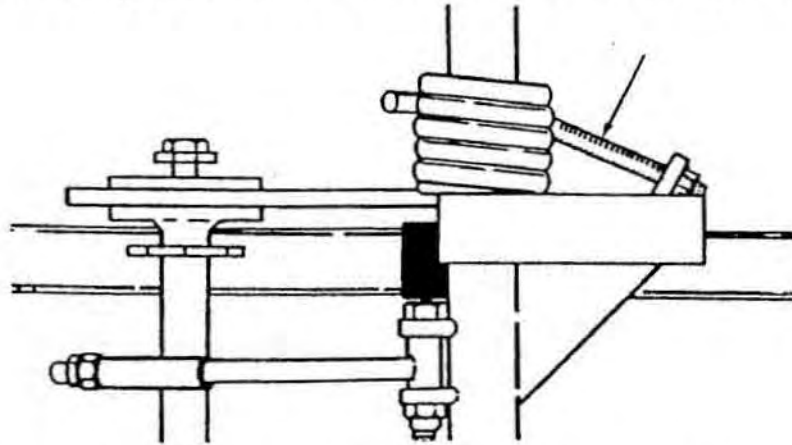
The rear spring tension must be set for the individual driver. With the rider sitting on the machine, the driver weight should slightly collapse on the rear torque arm.

A tight rear suspension will provide a more responsive weight shift forward for cornering. A loose rear suspension will provide good weight shift on acceleration, but transfer to the skis will be less.



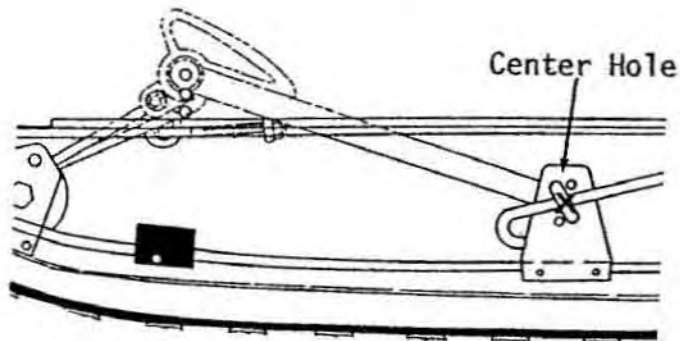
FRONT ARM SPRING TENSION

Increasing the front spring tension will result in a less active front torque arm.

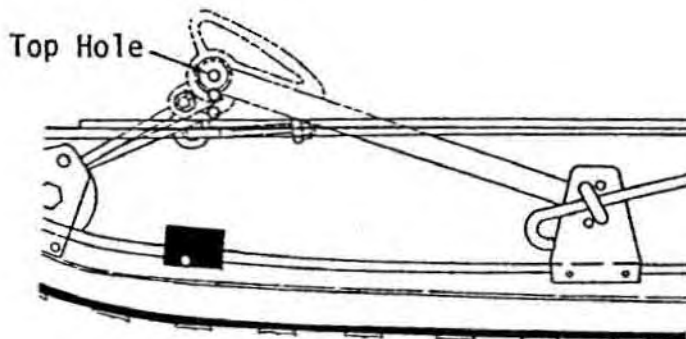


FRONT TORQUE ARM MOUNTING BRACKET
AND SUSPENSION LOCATION IN THE TUNNEL

There are three mounting positions on the front torque arm mounting bracket. The production mounting will be in the middle hole.



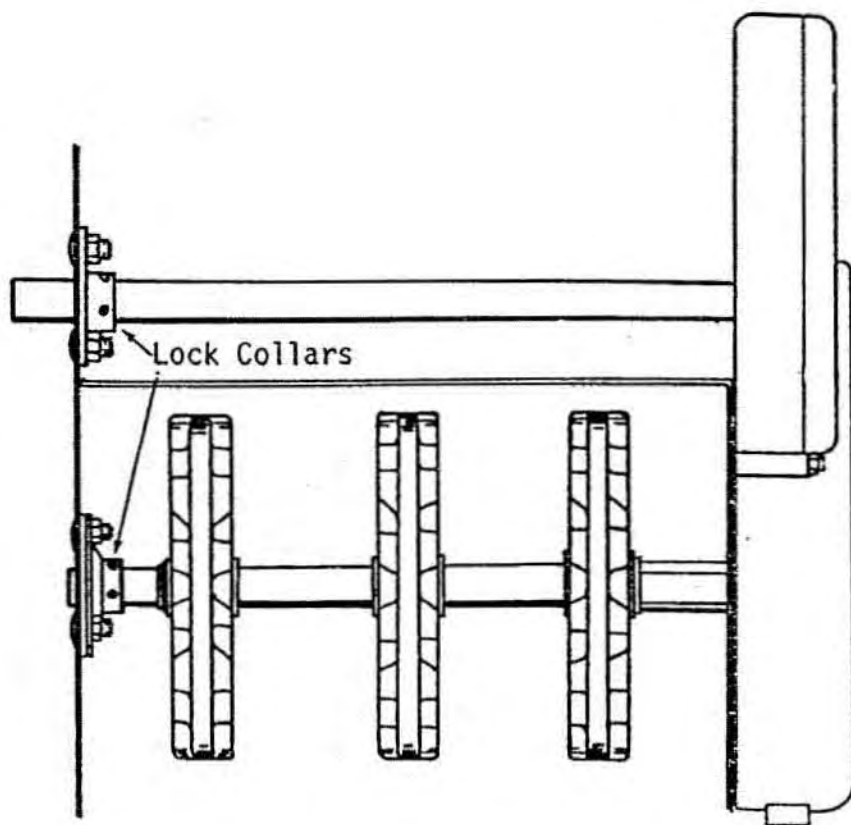
There are three suspension mounting holes in the front of the chassis. The production mounting will be in the top hole.



As the front torque arm is raised in the mounting bracket and lowered in the chassis mounting holes, the front torque arm becomes less active. Conversely, as the torque arm is lowered in the mounting bracket and raised in the chassis, it will become more active.

TRACK REMOVAL

1. Remove slide rail suspension.
2. Remove chaincase cover, chain and gearing.
3. Remove driven clutch.
4. Release the tension on lock collar set screws and loosen the lock collar. The lock collars are the eccentric type. It may help to loosen the bearing flangette bolts also.
5. Remove the chaincase steering bracket bolts (top chaincase).
6. Remove the chaincase mounting bolts.
7. Slide chaincase and jackshaft from bearing mounts.
8. This gives ample space to remove drive shaft and track.
9. Reverse this procedure for assembly. Tighten lock collars in direction of rotation of the drive shaft.
Make absolutely sure the jackshaft and drive shaft are centered before use.



TRACK TENSION AND ALIGNMENT

Proper track tension and alignment are very important to maintain good suspension action. Too tight a track tension will act as though the suspension is binding, as there will be little or no action.

If the track tension is too loose the drive sprockets will "ratchet" slip on the track, and the studs may scratch the inside top of the tunnel. The track may also derail if the tension is too loose.

PROPER TENSION

The track should be tensioned enough so the track will not derail, but not so tight that the suspension will not have proper action. With the rear of the sled suspended, there should be 1/4" clearance between points A and B, Fig. 1. The track alignment should be adjusted so there is equal distance on both sides of track and suspension at point A, Fig. 2.

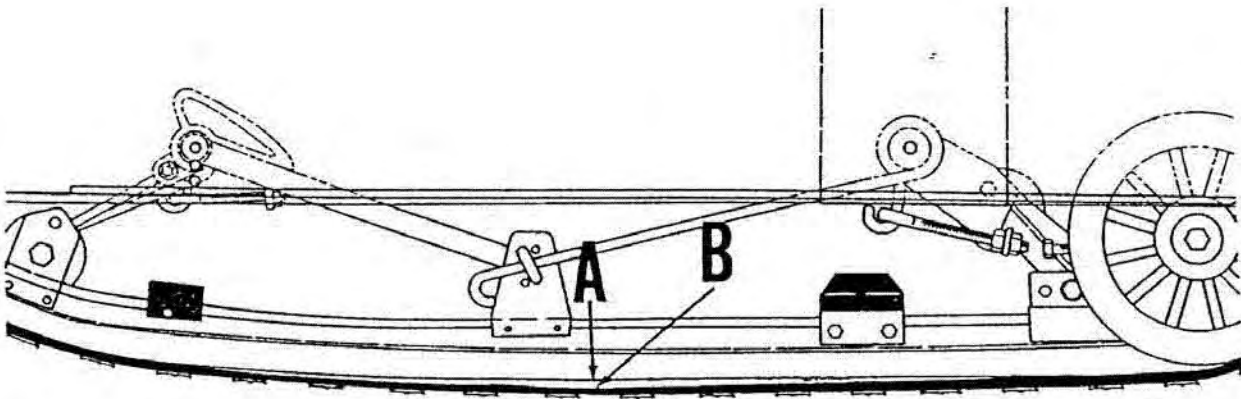


Figure 1

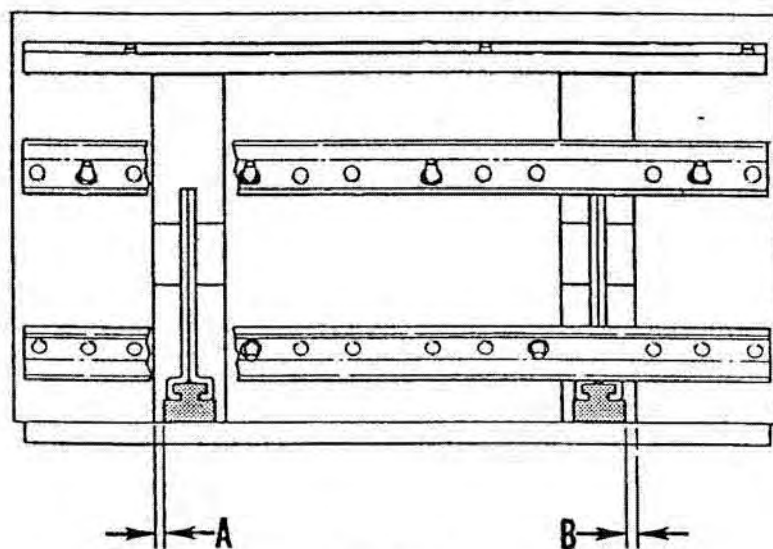


Figure 2

STUD LOCATIONS

○ • ▨		○		○ • ▨
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▨ • ○		▨ • • • ○		• • ○
4 5 6 7 8 9	Slide Nail		Slide Nail	10 11 12

 Grabber
  Klaw
  Peg Location
  Directional Stud

This is a pattern for putting in additional pegs. They can be easily added to the existing pattern, according to driver preference.

SECTION IX

GLOSSARY

GLOSSARY

Air Gap Spark Test:	A good check for ignition voltage and general ignition system condition. Spark should arc 3/8" minimum from end of high tension lead to ground (several testers are available).
Alternator:	Electrical generator producing voltage alternating current.
BTDC:	Before top dead center.
CDI:	Capacitor discharge ignition. Ignition system which stores voltage generated by the stator plate exciter coil in a capacitor or condenser (in CDI box). At the proper moment a voltage, generated by the stator plate pulser coil, closes an electronic switch (thyristor) in the CDI box and allows the voltage in the capacitor to discharge into the primary windings of the ignition coil.
Chain Pitch:	Distance between center of crankshaft and center of driven clutch shaft.
Clutch Button:	Plastic bushing which transmits rotations of the clutch to the movable sheave in the drive and driven clutches.
Clutch Offset:	Drive and driven clutches are offset so that drive belt will stay nearly straight as it moves along the clutch face.
Clutch Weight:	Three levers in the drive clutch which, relative to their weight, profile, and engine RPM, cause the drive clutch to close.
Coil:	A winding of wire around an iron core which has the ability to generate an electrical current when a magnetic current passes through it.
Crankshaft Run-Out:	Run-out or "bend" of crankshaft measured with a dial indicator while crankshaft is supported between centers of V blocks or resting in lower half of crankcase. Measure at various points especially at PTO.
Detonation:	The spontaneous ignition of the unburned fuel/air mixture after normal spark ignition. Piston looks "hammered" through, rough appearance around hole. Causes: 1) too high a compression ratio for the fuel octane; 2) low octane fuel; 3) over-advanced ignition timing.
Dial Bore Gauge:	A cylinder measuring instrument which used a dial indicator. Good for showing taper and out-of-round in the cylinder bore.
Effective Compression Ratio:	Compression ratio measured from after the piston closes the exhaust port.
Electrical Open:	(Open Circuit) An electrical circuit which isn't complete. Example: Poor connections or broken wire at hi-lo beam switch. Result: No headlights.

GLOSSARY (Con't.)

Electrical Short:	(Short Circuit) An electrical circuit which is completed before the current reaches the intended component. Example: A bare wire touching the snowmobile chassis under the seat. Result: No taillights or brake lights.
Engagement RPM:	Engine RPM at which the drive clutch engages to make contact with the drive belt.
Foot Pound:	Ft./lb. or lb./ft. A force of one pound at the end of a lever one foot in length, applied in a rotational direction.
g.:	Gram. Unit of weight in the metric system.
Head Volume:	Cylinder head capacity in cc, head removed from engine with spark plug installed.
Hi-fax:	The special slide material which fits onto the bottom of the suspension rails.
High Tension Wire:	The heavy insulated wire which carries the high secondary voltage from the coil to the spark plug.
Holed or Vented Piston:	Piston which a hole has formed on the dome. Causes: 1) detonation; 2) pre-ignition
Inch Pound:	12 in./lbs. = 1 ft./lb.
Kg/cm ² :	Kilograms per square centimeter.
Keystone Ring:	A piston ring with bevel on upper inside surface.
Labyrinth Seal:	A pressure-type center seal identified by a series of grooves and lands. Polaris engines use this type of seal to separate the cylinders in the crankcase halves.
mm:	Millimeter. Unit of length in the metric system. 1 mm = .040"
No. 1 Cylinder:	Cylinder on flywheel side of engine.
No. 2 Cylinder:	Cylinder on PTO side of engine.
Ohm:	() The unit of electrical resistance opposing current flow.
Piston Clearance:	Total distance between piston and cylinder wall.
Piston Erosion:	Piston dome melts. Usually occurs at the exhaust port area. Causes: 1) Lean fuel/air mixture; 2) improper spark plug heat range.
Pre-ignition:	A problem in combustion where the fuel/air mixture is ignited before normal spark ignition. Piston looks melted at area of damage. Causes: 1) too hot a spark plug; 2) spark plug not properly torqued; 3) "glowing" piece of head gasket, metal burr, or carbon in the combustion chamber; 4) lean fuel/air mixture.

GLOSSARY (Con't.)

Primary Circuit:	This circuit is responsible for the voltage build-up in the primary windings of the coil. In the CDI system the parts include the exciter coil, the trigger coil, the wires from stator plate to CDI box and to the low resistance primary windings in the ignition coil.
Primary Clutch:	Drive clutch on engine.
Primary Compression:	Pressure built up in the crankcase of a two stroke engine.
psi.:	Pounds per square inch.
R & R:	Remove and replace.
RPM:	Revolutions per minute.
Resistance:	In the mechanical sense, friction or load. In the electrical sense, ohms. Both result in energy conversion to heat.
Right Side & Left Side:	Always referred to based on normal operating position of the driver.
Running Timing:	Ignition timing when fully advanced or at specified RPM.
Secondary Circuit:	This circuit consists of the large secondary coil windings, high tension wire and to ground through the spark plug air gap.
Secondary Clutch:	Driven clutch on chaincase or jackshaft.
Seized Piston:	Galling of the sides of a piston. Usually there is a transfer of aluminum from the piston onto the cylinder wall. Causes: 1) improper lubrication; 2) excessive temperatures; 3) insufficient piston clearance; 4) stuck piston rings.
Stator Plate:	The plate mounted under the flywheel supporting the primary ignition components and lighting coil.
Surge Tank:	The fill tank in the liquid cooling system.
TDC:	Top dead center. Piston's most outward travel from crankshaft.
Transfer:	The movement of fuel/air from the crankcase to the combustion chamber in a two stroke engine.
Trigger Coil:	(Pulser coil) Generates the voltage for triggering (closing) the thyristor and timing the spark in CDI systems. Small coil mounted at the top of the stator plate next to the ignition generating coil.
ACV:	Alternating current voltage.
DCV:	Direct current voltage.

GLOSSARY (Con't.)

Venturi:

An area of air constriction. A venturi is used in carburetors to increase velocity pressure (speed up air flow) which decreases static pressure (lowers pressure in venturi to below atmospheric pressure) causing fuel to be pushed through jets, etc., and into the venturi to be mixed with air and form a combustible air/fuel mixture.

Volt:

The unit of measure for electrical pressure or electromotive force. Measured by a voltmeter in parallel with the circuit.

SECTION X

SERVICE PARTS

RXL MODEL NUMBER 0781537

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BODY

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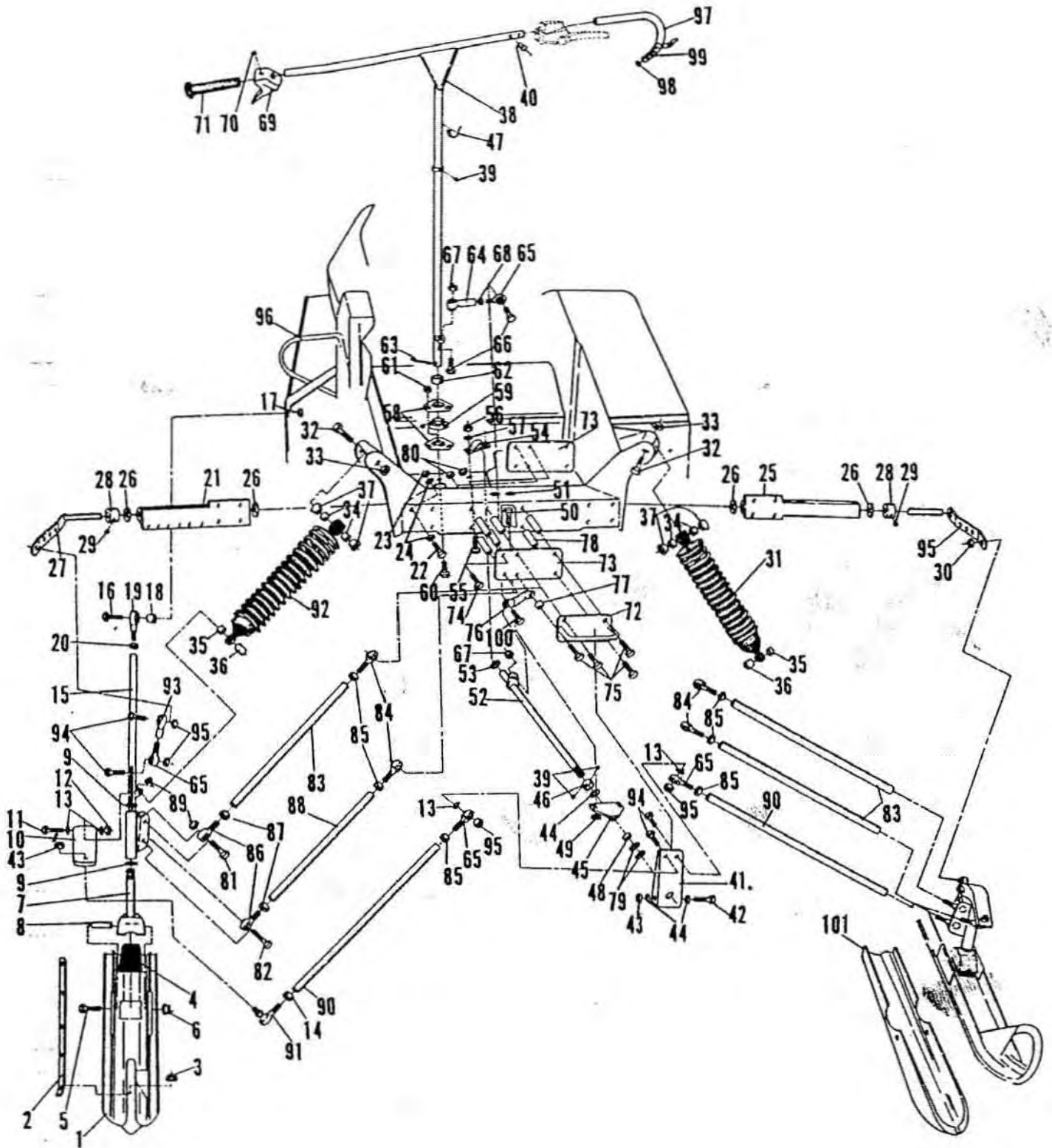
‘



STEERING

ITEM NO.	PART NO.	PART DESCRIPTION	ITEM NO.	PART NO.	PART DESCRIPTION
1	1820216	Ski	51	7080181	Plug
2	1820215	Skag	52	1823112	Steering Shaft Weldment
3	7542423	Nut - 3/8-16 Flange	53	5020357	Steering Shaft Bushing
4	5410250	Ski Stop	54	N/A	Rear Steering Shaft Bracket
5	7515406	Bolt - 3/8-24 x 3 1/4"	55	N/A	Bolt - 5/16-18 x 3/4"
6	7542403	Nut - 3/8-24 Flex Loc	56	7542320	Nut - 5/16-18 Flex Loc
7	1821021	Spindle	57	N/A	Washer - 1/4" Wrought
8	5010148	Ski Pivot Bushing	58	5221172	Flangette
9	3573905	Bushing	59	3514202	Bearing w/Lock Collar
10	5510102	Steering Arm	60	7512394	Bolt - 5/16-18 x 3/4"
11	7512410	Bolt - 3/8-24 x 1 3/4"	61	7542320	Nut - 5/16-18 Flex Loc
12	7542411	Nut - 3/8-24 Flex Loc	62	N/A	Spacer
13	7555801	Washer - 3/8" Wrought	63	N/A	Cotter Pin
14	N/A	Nut - 3/8-24 Jam	64	7060119	Rod End LH
15	1820218	Trailing Arm RH	65	7060118	Rod End RH
	1820217	Trailing Arm LH	66	7512404	Bolt - 3/8-24 x 1 1/2"
16	7512638	Bolt - 1/2-13 x 2 1/2"	67	7542403	Nut - 3/8-24 Flex Loc
17	7542704	Nut - 1/2-13 Lock	68	7542432	Nut - 3/8-24 Jam
18	5020362	Trailing Spacer	69	2010013	Throttle Control Assembly
19	7060115	Rod End	70	7512465	Set Screw
20	7542706	Nut - 1/2-20 Jam	71	5410272	Handle Bar Grip
21	5510098	Torsion Bar Bracket RH	72	1823110	Plate - Steering Stop Weld
22	N/A	Bolt - 1/4-20 x 2 1/2"	73	5210813	Plate - Mount Radius
23	7542101	Nut - 1/4-20 Lock	74	N/A	Bolt 7/16-20 x 2 3/4"
24	N/A	Washer - 1/4" Wrought	75	7512504	Bolt - 7/16-20 x 3 1/2"
25	5510097	Torsion Bar Bracket LH	76	5220073	Radius Rod Bracket
26	5020360	Torsion Tube Bushing	77	N/A	Spacer
27	1011385	Torsion Bar Weld	78	5020355	Radius Rod Bushing
28	5020365	Lock Collar	79	7556304	25/32" Machinery Bushing
29	7512162	Set Screw	80	7542513	Nut - 7/16-20 Flex Loc
30	5220068	Torsion Bar Arm	81	7512540	Bolt - 7/16-20 x 1 1/2"
31	1822033	Shock Asm. - LH	82	7512551	Bolt - 7/16-20 x 3 1/4"
32	7512435	Bolt - 3/8-24 x 3"	83	5330119	Radius Rod
33	7542403	Nut - 3/8-24 Flex Loc	84	7060116	Rod End RH
34	N/A	Top Shock Spacer	85	7542432	Nut - 3/8-24 Jam RH
35	N/A	Short Shock Spacer	86	7060117	Rod End LH
36	N/A	Long Shock Spacer	87	7542516	Nut - 7/16-20 Jam LH
37	5430264	Shock Bushing	88	5330120	Radius Rod
38	1823111	Steering Post Weld	89	7542513	Nut - 7/16-20 Flex Loc
39	7512162	Set Screw	90	5330118	Tie Rod
40	7621429	Rivet - 3/16 x .412 Cherry 'Q'	91	7060120	Rod End LH
41	5510101	Center Steering Arm	92	1822032	Shock Asm. - RH
42	N/A	Bolt - 3/8-24 x 2 1/2" 2 3/4"	93	7060112	Rod End RH
43	7542415	Nut - 3/8-24 Flex Loc	94	7512404	Bolt - 3/8-24 x 1 1/2"
44	7555801	Washer - 3/8" Wrought	95	7542415	Nut - 3/8-24 Flex Loc
45	N/A	Front Steering Shaft Bracket	96	1011379	Stirrup Weld
46	5020359	Lock Collar	97	5330128	Hoop
47	7080138	Strap	98	N/A	Hoop Cap
48	5020357	Steering Shaft Bushing	99	N/A	Tape
49	7542101	Nut - 1/4-20 Flex Loc	100	7512547	Bolt - 7/16-20 x 3 3/4"
50	N/A	Bolt - 1/4-20 x 3/4"	101	5430507	Ski Protector

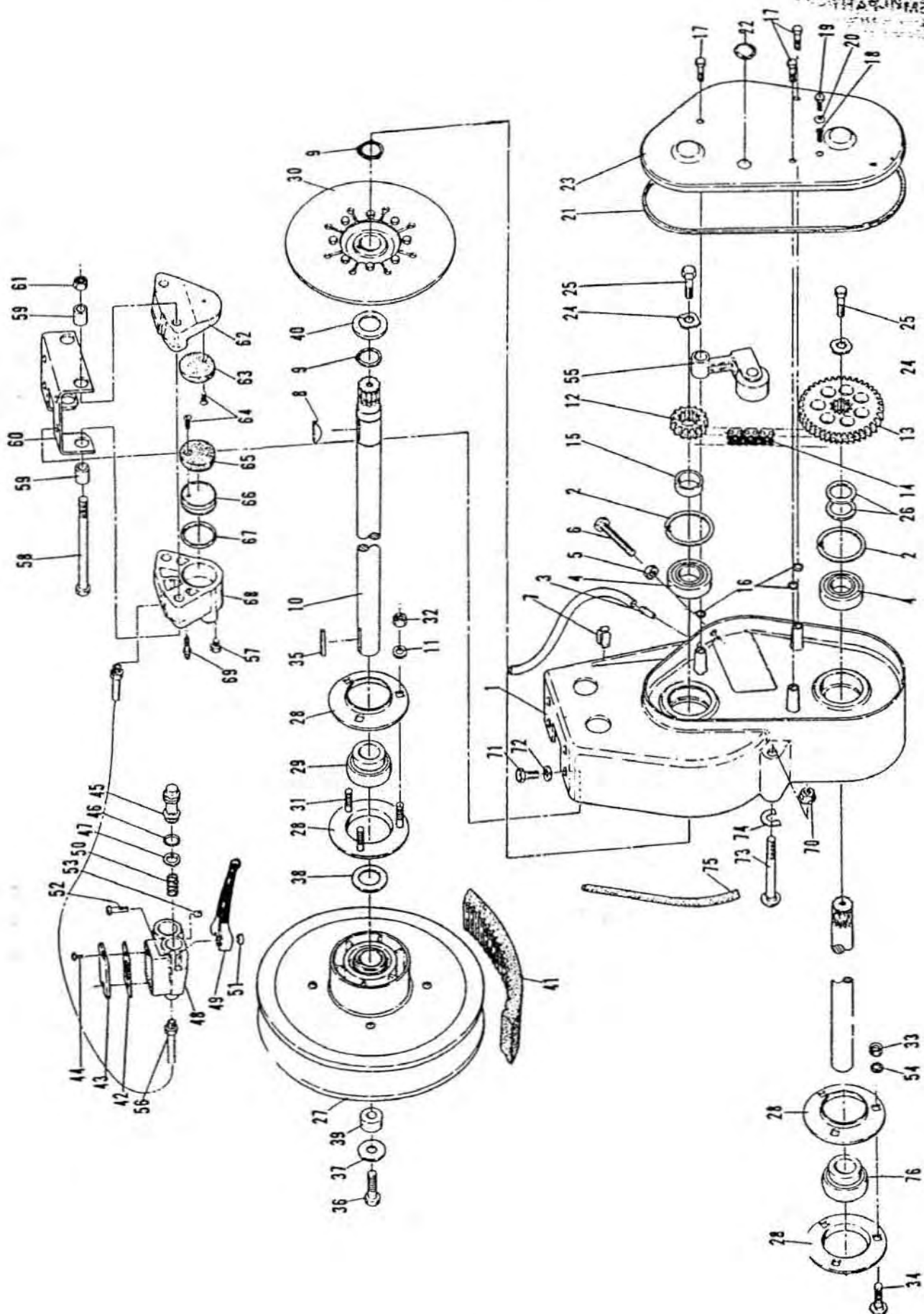
STEERING



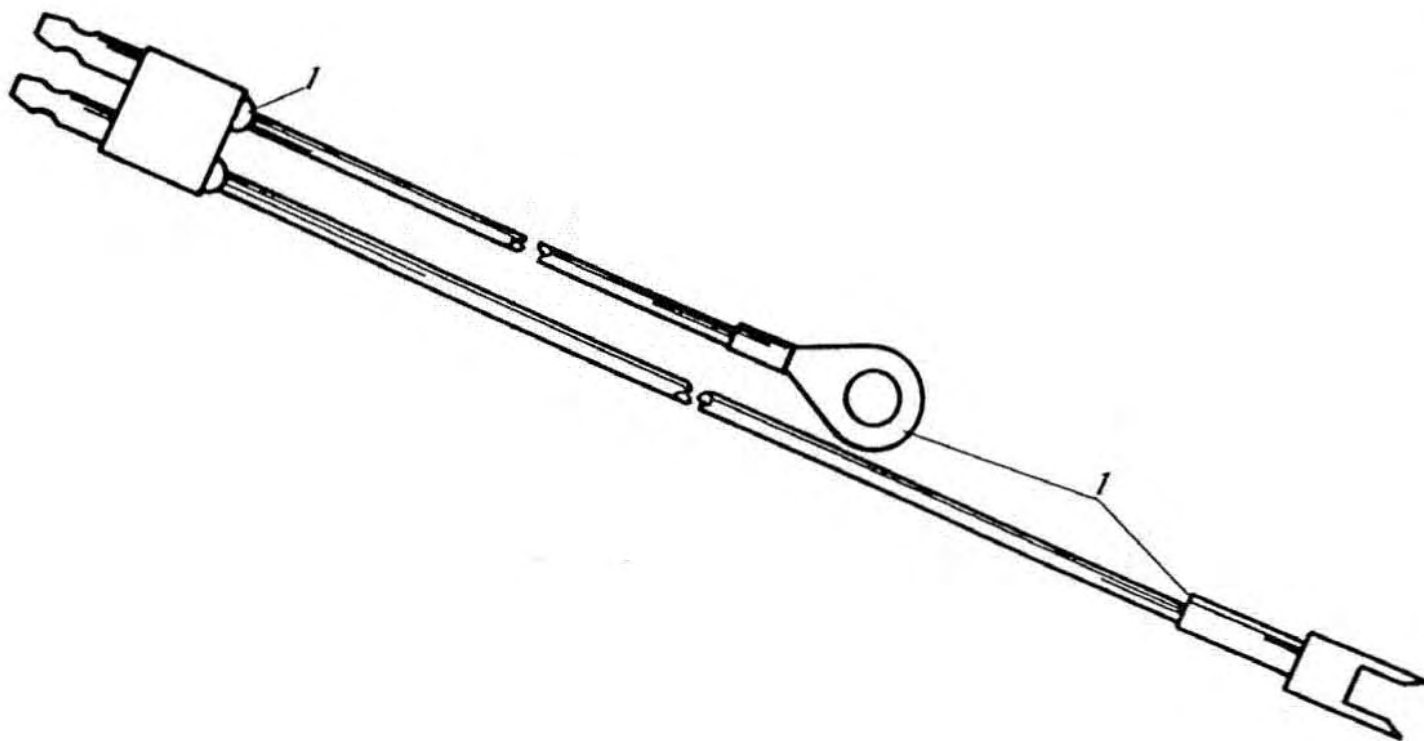
CHAINCASE

ITEM NO.	PART NO.	PART DESCRIPTION	ITEM NO.	PART NO.	PART DESCRIPTION
1	5630186	Chaincase	39	5020291	Spacer
2	7718406	Retaining Ring	40	5020363	Spacer
3	5020303	Vent	41	3211043	Drive Belt
4	3514303	Bearing	42	5410176	Cover Gasket
5	7542404	Nut	43	5630127	Reservoir Cover
6	7512470	Bolt	44	7511841	Screw
7	7670037	Tinnerman	45	5020319	Master Cyl. Piston
8	7727003	Key	46	5410163	'O' Ring
9	7713901	Snap Ring	47	5410164	'U' Pack Seal
10	5020323	Jackshaft	48	5630125	Master Cyl. Housing
11	7558402	Washer	49	5630126	Brake Lever
12	3221032	Sprocket - 16 Tooth	50	7041067	Spring
13	3222038	Sprocket - 40 Tooth	51	5332326	Bushing
14	3224024	Chain - 66 Pitch	52	7511975	Screw
15	5010128	Spacer	53	7512308	Set Screw
16	5410193	'O' Ring	54	7555708	Washer
17	7512232	Bolt	55	5630122	Tightener Block
18	7541918	Well Nut	56	5420114	Brake Line
19	7511909	Cap Screw	57	N/A	Pipe Plug
20	7558212	Washer	58	1930553	Bolt
21	5420140	Gasket	59	1930531	Spacer
22	5410012	Rubber Plug	60	1930551	Bracket
23	5223775	Chaincase Cover	61	1930554	Nut
24	7577908	Lock Washer	62	1930533	Casting
25	7512325	Bolt	63	1930534	Puck
26	7556509	Machinery Bushing	64	1930536	Screw
27	1322093	Driven Clutch	65	1930535	Puck
28	5221172	Flangette	66	1930548	Piston Assembly
29	3514501	Bearing	67	1930546	"O" Ring
30	1332074	Brake Disc Assembly	68	1930552	Casting
31	7515428	Bolt	69	1930550	Bleeder Fitting
32	7542423	Nut	70	7542423	Nut
33	7542320	Nut	71	7512240	Bolt
34	7512394	Bolt	72	7552804	Lock Washer
35	7721204	Key	73	7515428	Bolt
36	7515301	Bolt	74	2200126	Shim Kit
37	7555701	Washer	75	5510071	Hose Guard - Chaincase
38	7556501	Machine Bushing	76	3514501	Bearing

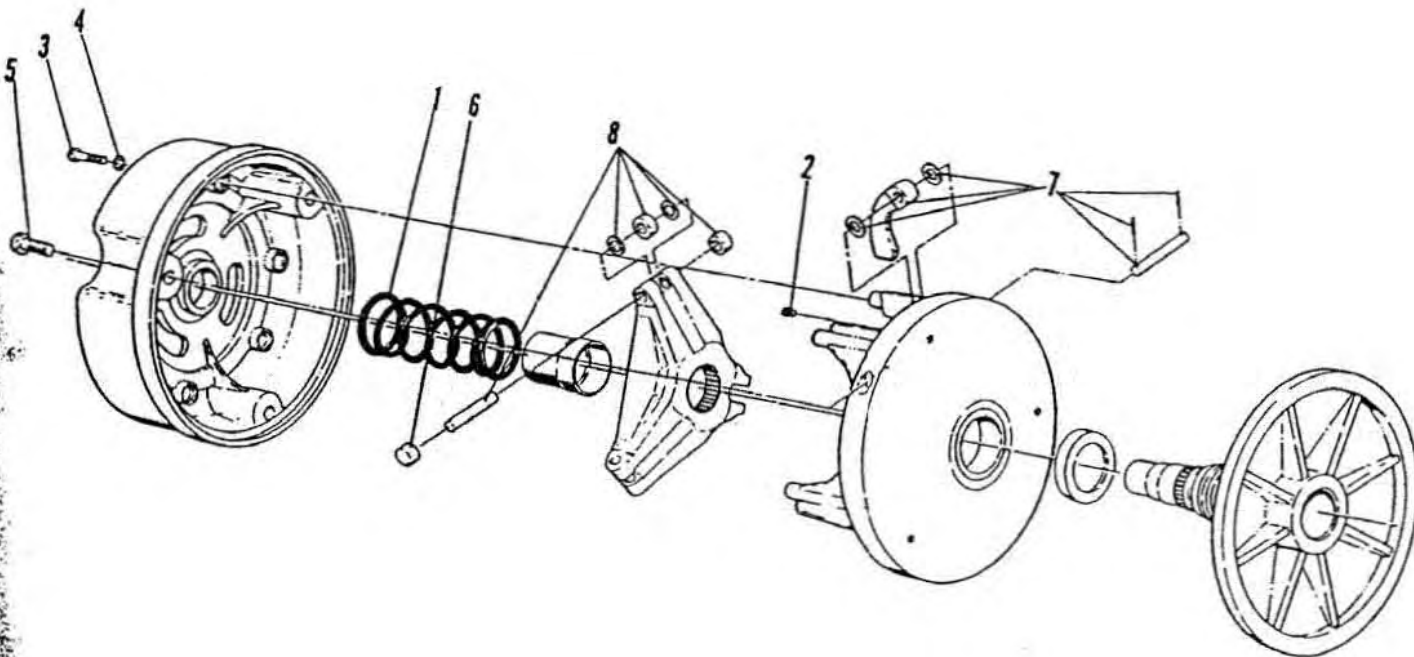
CHAINCASE ASSEMBLY



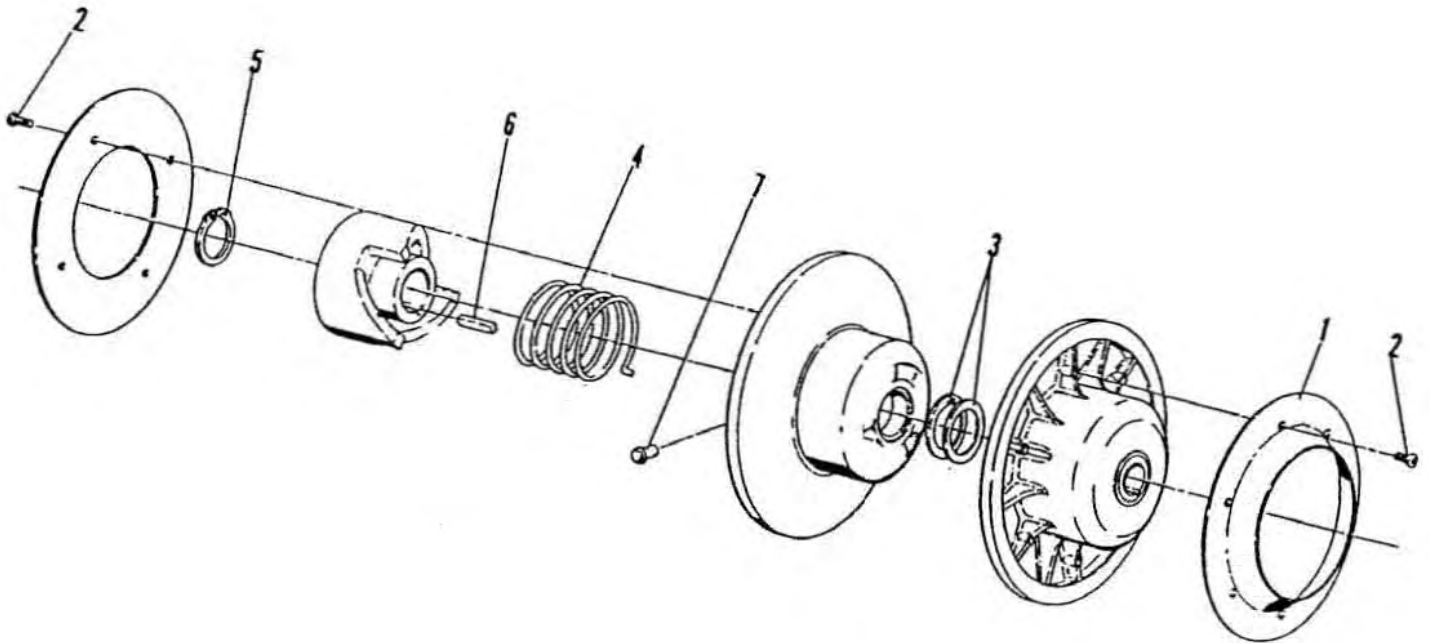
MAIN WIRE HARNESS

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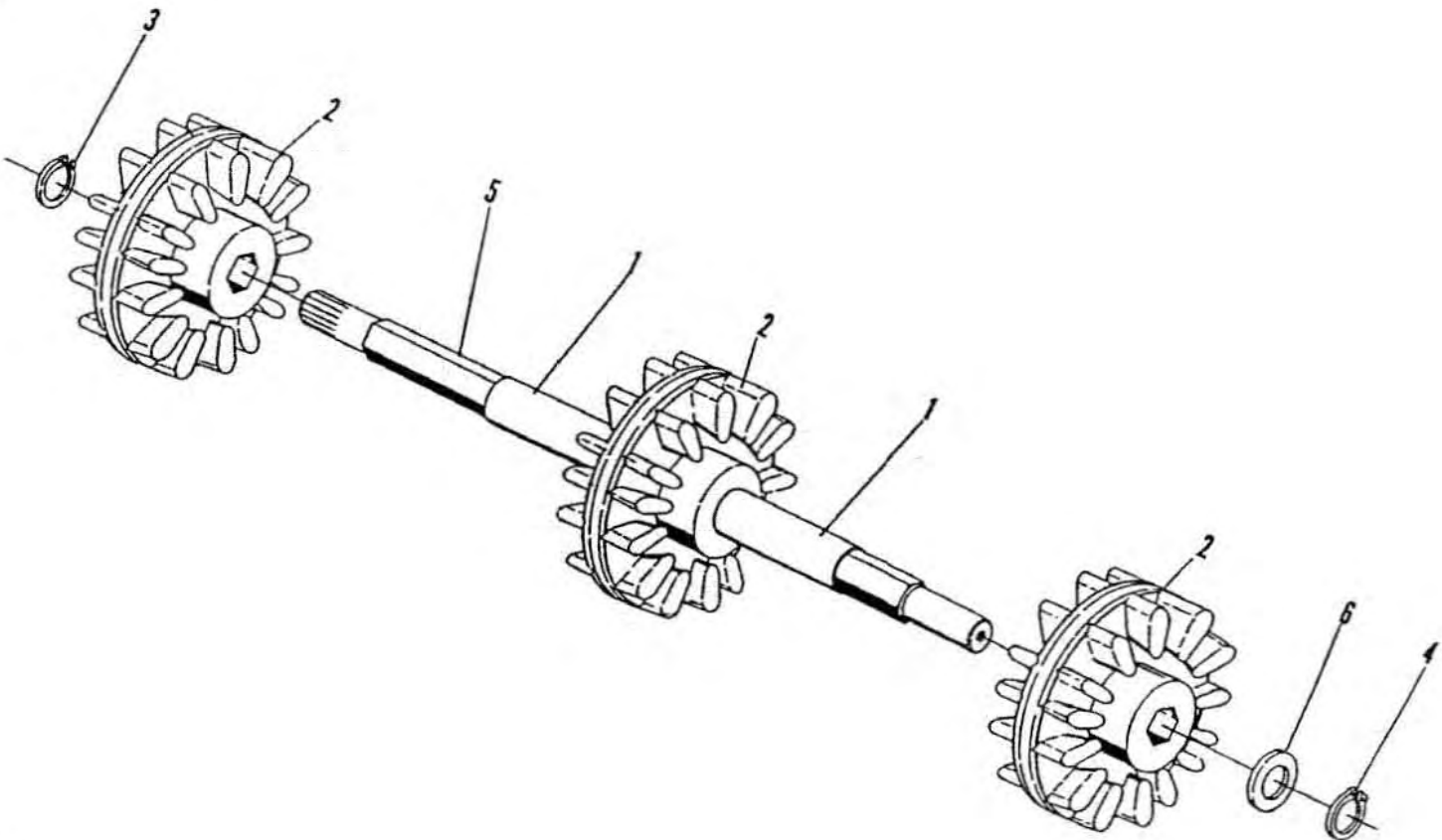
DRIVE CLUTCH

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DRIVEN CLUTCH

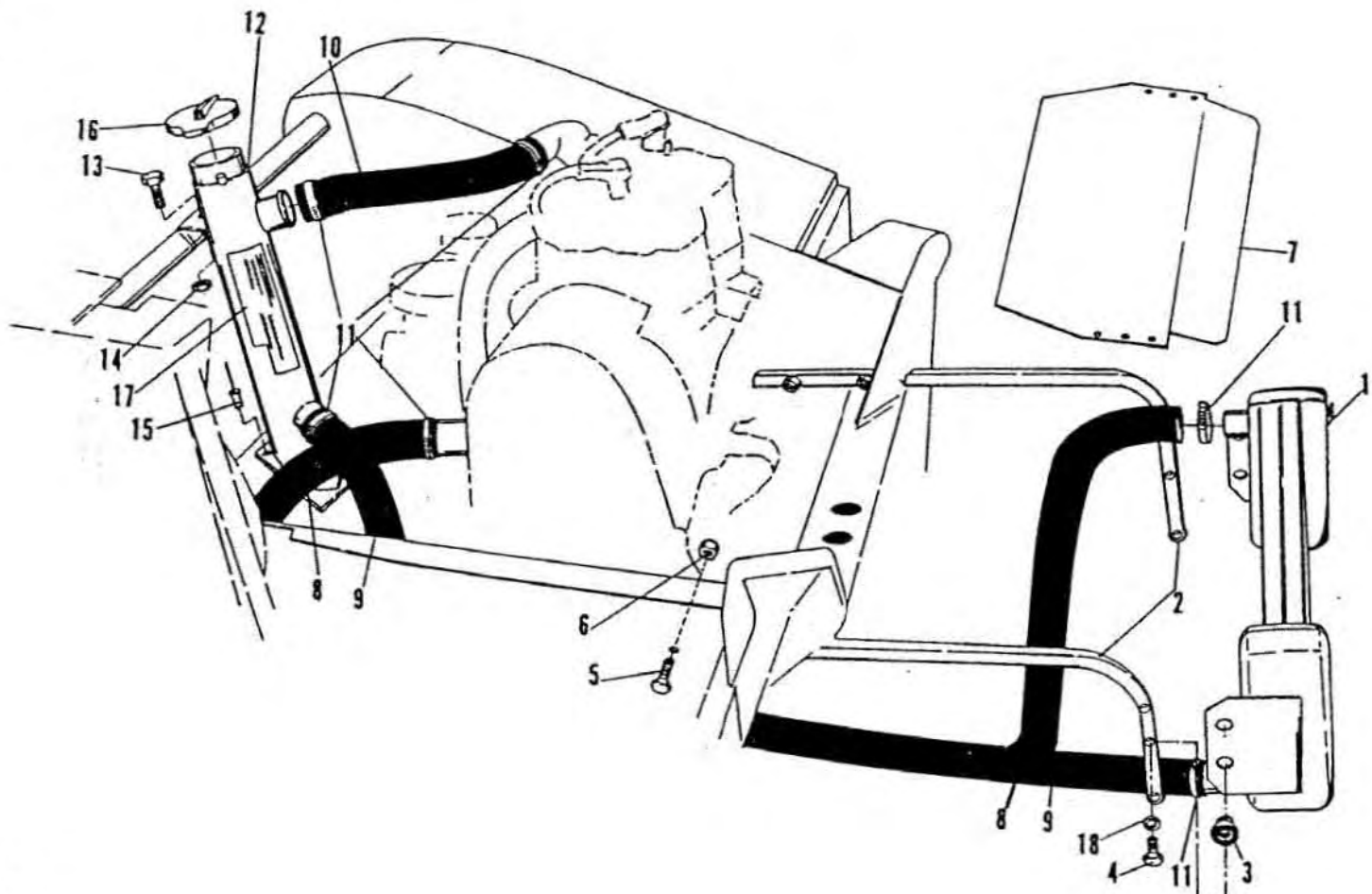
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DRIVE SHAFT

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COOLING

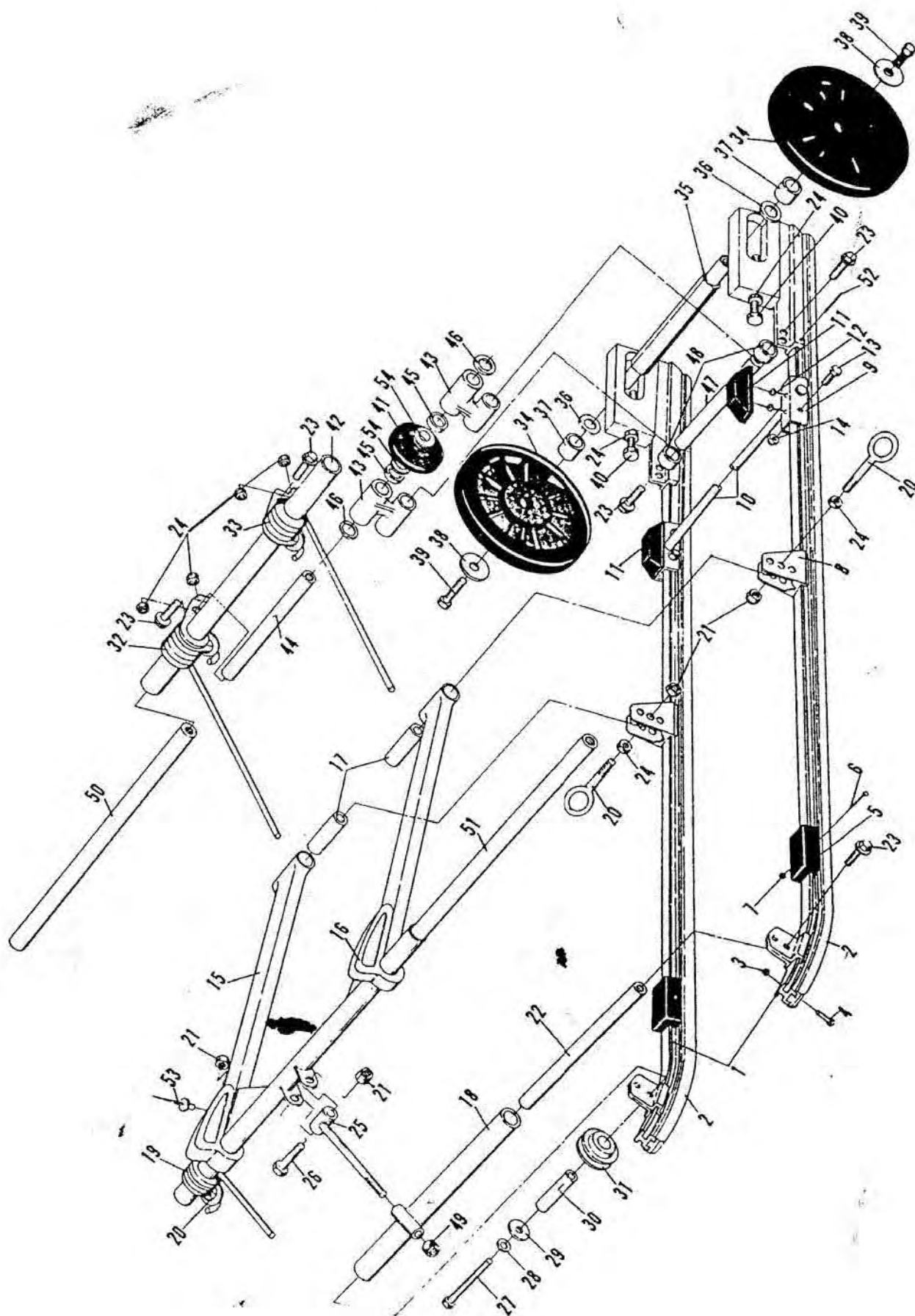
ITEM NO.	PART NO.	PART DESCRIPTION	ITEM NO.	PART NO.	PART DESCRIPTION
1	2511129	Radiator	10	5410289	Outlet Engine Hose
2	1011383	Radiator Mount	11	7080183	Clamp
3	7542104	Well Nut	12	2511130	Surge Tank
4	7512222	Bolt - 1/4-20 x 1 1/4"	13	N/A	Screw No. 10-32 x 1 1/4"
5	N/A	Bolt - 1/4-20 x 1"	14	7541904	Nut - No. 10-32 Flex Loc
6	7542101	Nut - 1/4" Hex Loc	15	7621324	Rivet - 5/32 x .389 Cherry
7	N/A	Radiator Shield	16	2511116	Pressure Cap
8	5410288	Inlet Radiator Hose	17	7071520	Surge Tank Decal
9	5410287	Outlet Radiator Hose	18	7552804	Lock Washer - 6mm



SUSPENSION

ITEM NO.	PART NO.	PART DESCRIPTION	ITEM NO.	PART NO.	PART DESCRIPTION
	1540443	Slide Rail Asm.	26	7512409	Bolt
	1540441	Rail Weld L. H.	27	7512476	Bolt
	1540442	Rail Weld R. H.	28	7553001	Washer
1	N/A	Slide Rail	29	7555801	Wrought Washer
2	5521064	Hi-Fax L. H.	30	N/A	Bushing Tube
	5521065	Hi-Fax R. H.	31	5430503	Spring Roller
3	7542101	Nut	32	7041087	Spring - R. H. Rear
4	7512130	Bolt	33	7041088	Spring - L. H. Rear
5	N/A	Bumper	34	5430499	Idler Wheel
6	N/A	Rivet	35	5020347	Idler Shaft
7	N/A	Push Nut	36	N/A	Machinery Bushing
8	N/A	Front Torque Arm Mount	37	5332598	Spacer Idler
9	N/A	Bumper Bracket	38	7555706	Machinery Bushing
10	N/A	Spacer Tube	39	7512325	Bolt
11	N/A	Bumper Pad	40	7515430	Bolt
12	7621425	Rivet	41	5430502	Track Guide Wheel
13	7512163	Bolt	42	N/A	Rear Suspension - Arm Weld
14	7542101	Nut	43	5630180	Rear Torque Arm
15	1540438	Torque Arm Weld	44	5020352	Shaft - Rear Torque Upper
16	N/A	Front Slide	45	5330106	Spacer Tube
17	5010144	Pivot Tube	46	N/A	Machinery Bushing
18	1540437	Pivot Arm Weld	47	5020353	Shaft - Rear Torque Lower
19	7041089	Spring	48	N/A	Spacer Tube
20	7080176	Eye Bolt	49	7542403	Nut
21	7542402	Nut	50	5020354	Mounting Shaft
22	5020351	Shaft - Pivot Arm	51	5010108	Mounting Shaft
23	7515432	Bolt	52	7661602	Spring Pin
24	7542404	Nut	53	7621419	Rivet
25	1540436	Limiter Weld	54	N/A	Insert Wheel

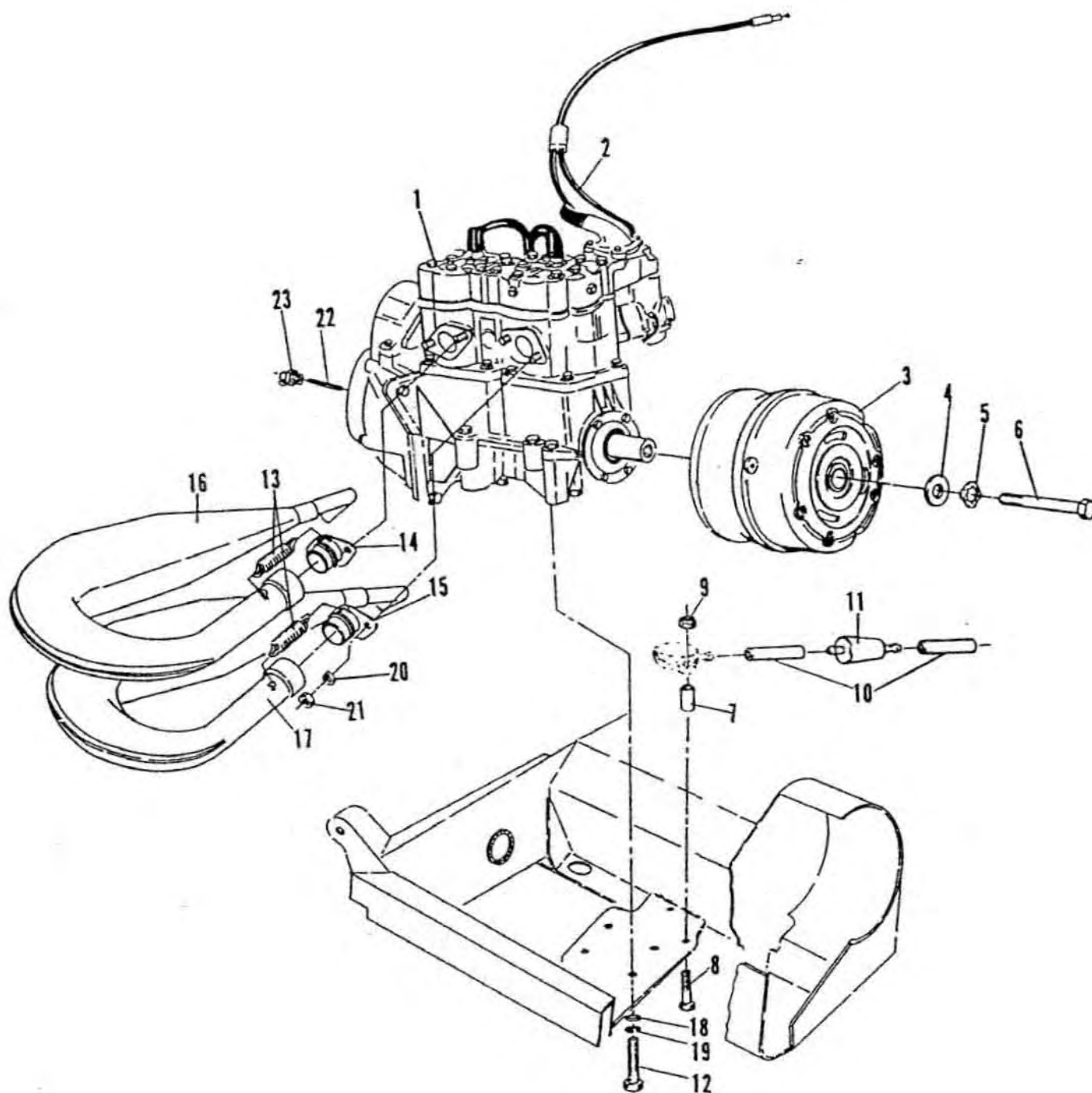
SUSPENSION



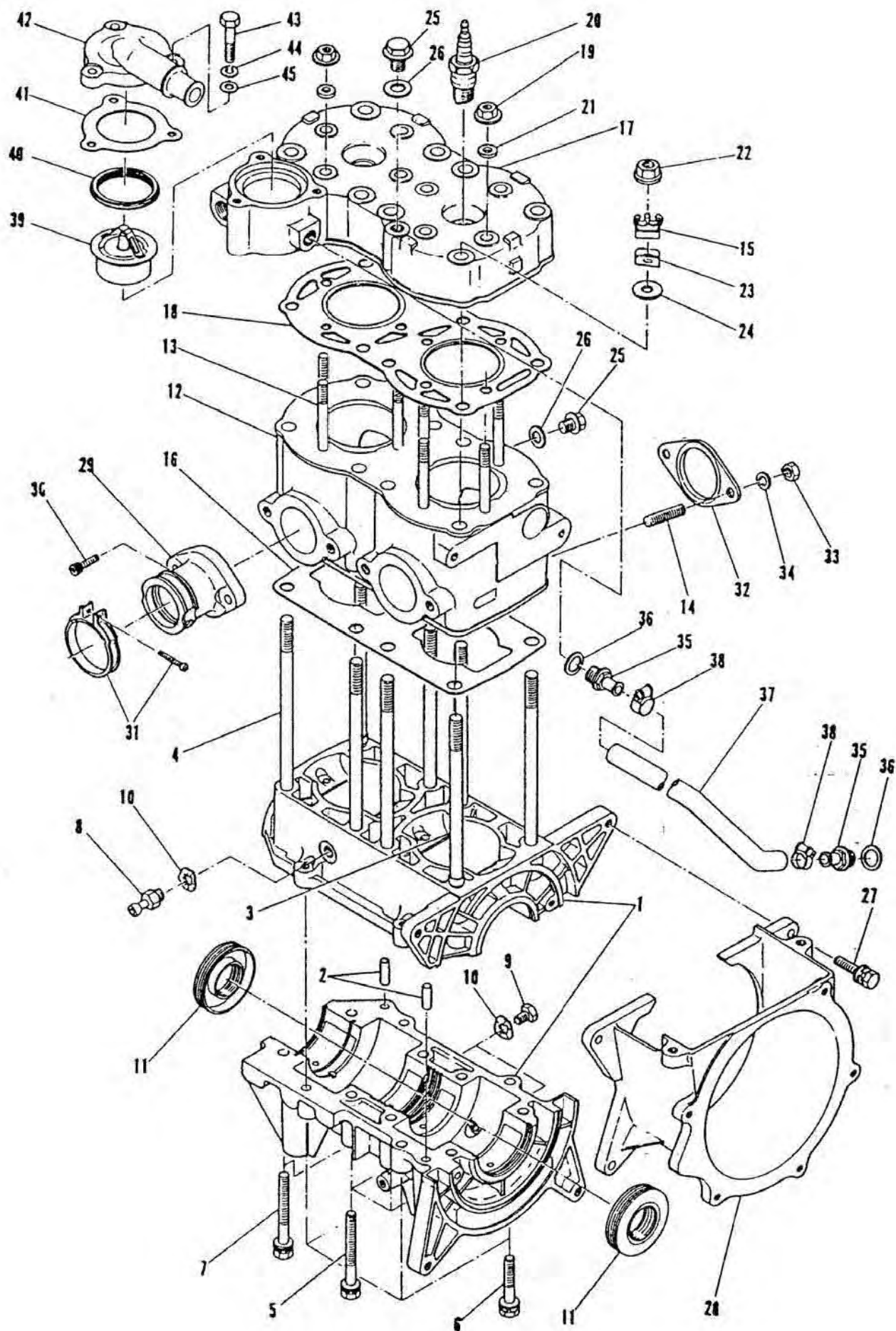
ENGINE MOUNTING

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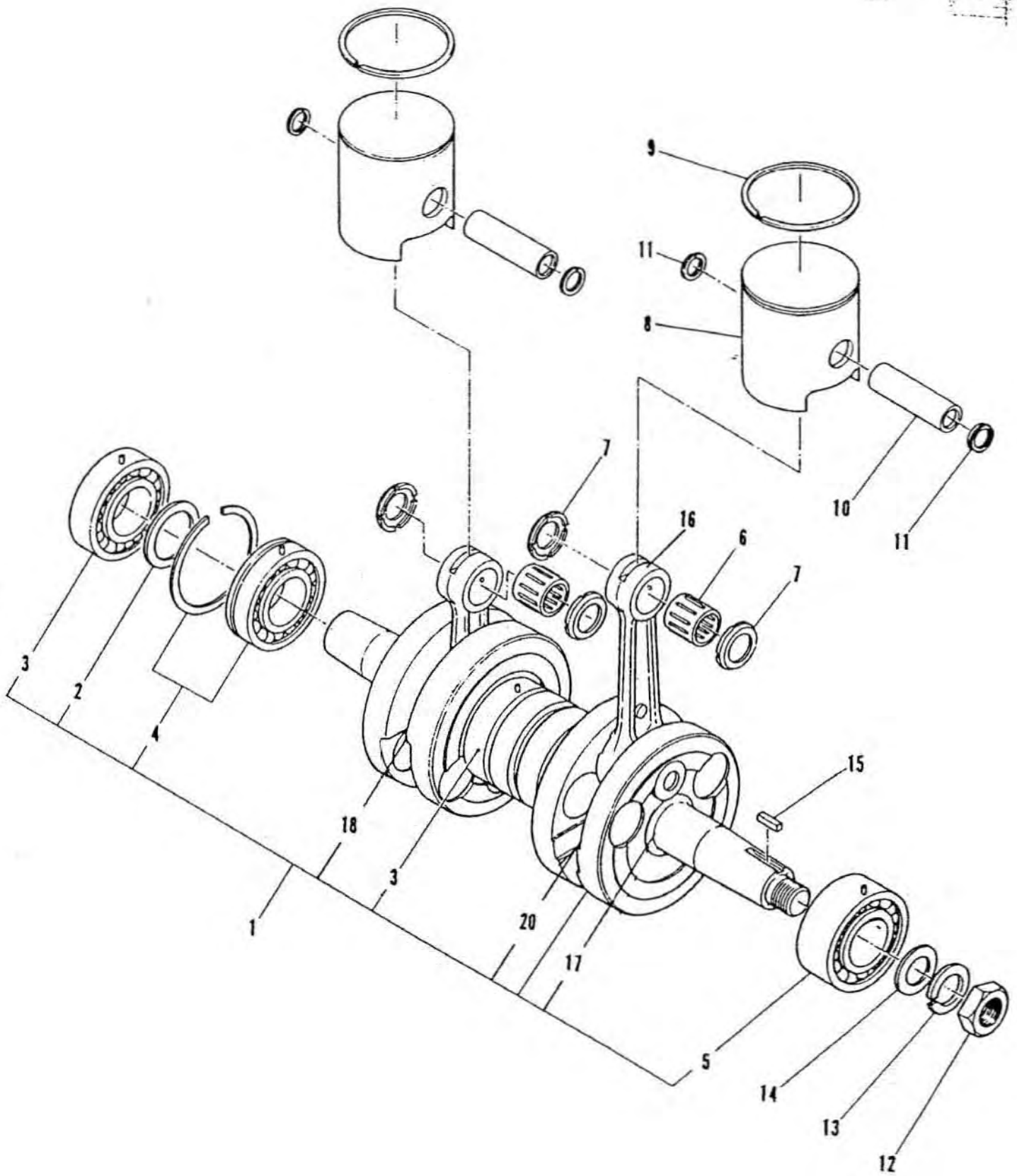
ENGINE MOUNTING



CRANKCASE AND CYLINDER



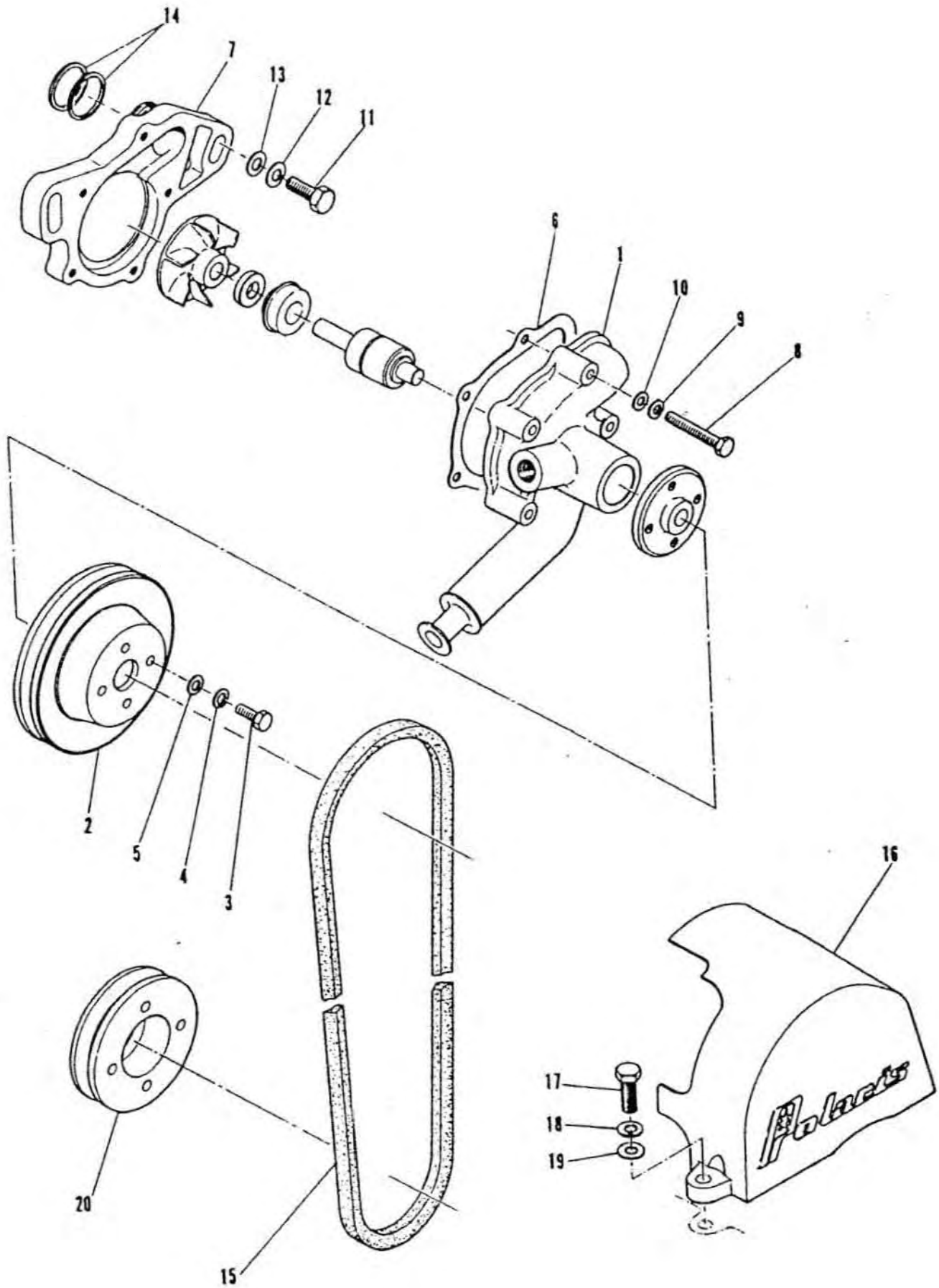
CRANKSHAFT AND PISTON



WATER PUMP

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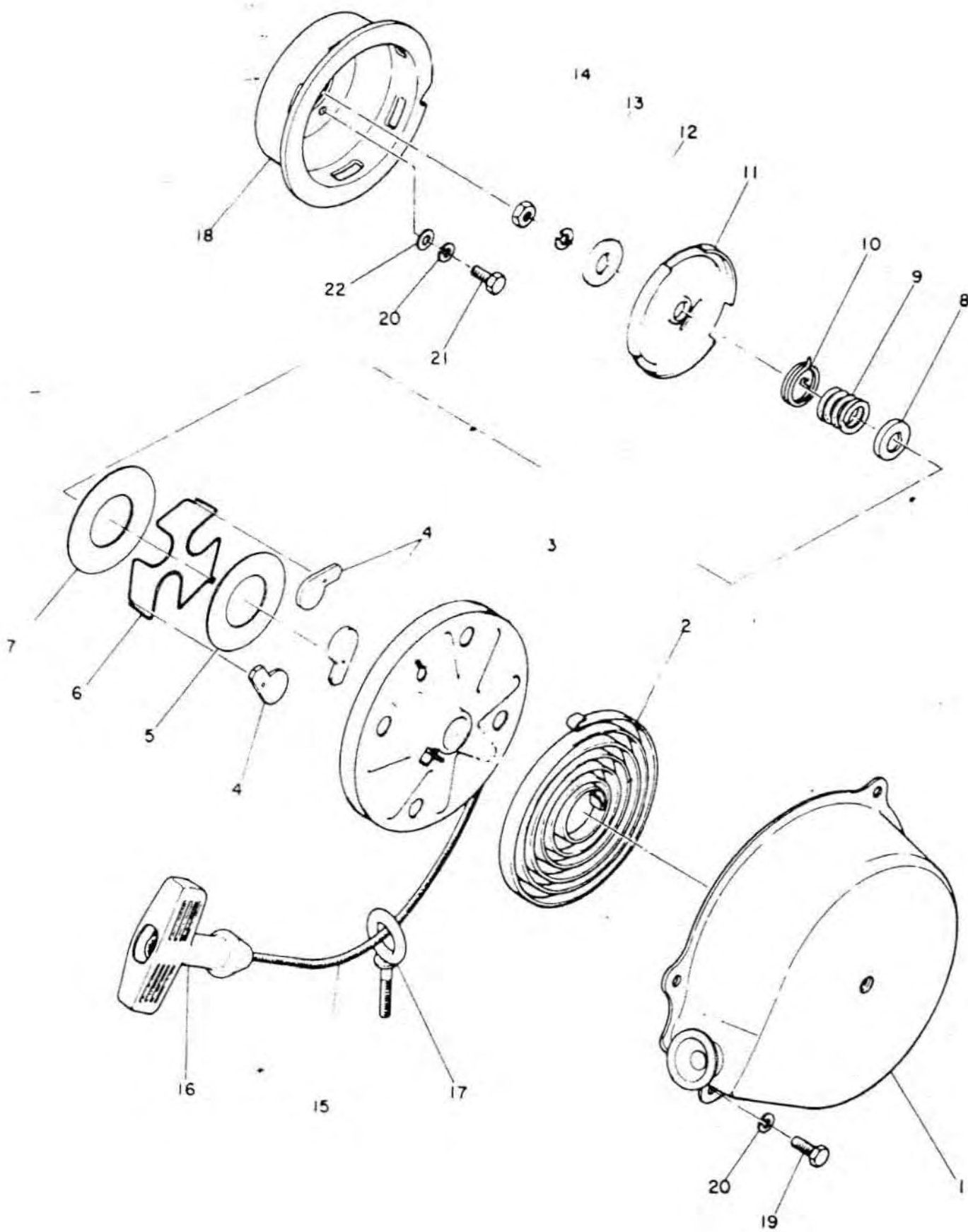
WATER PUMP



RECOIL STARTER

[illegible]

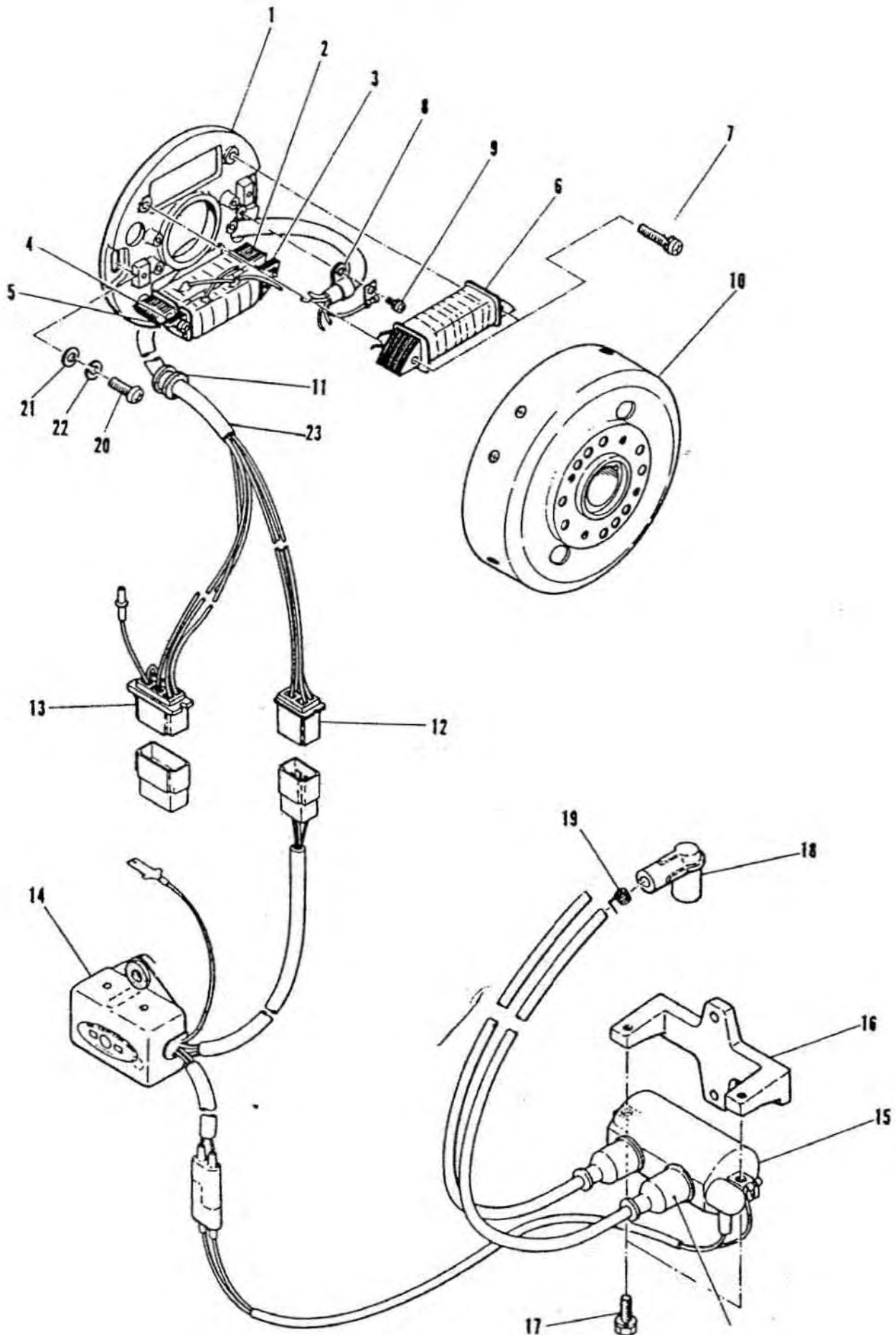
RECOIL STARTER



MAGNETO

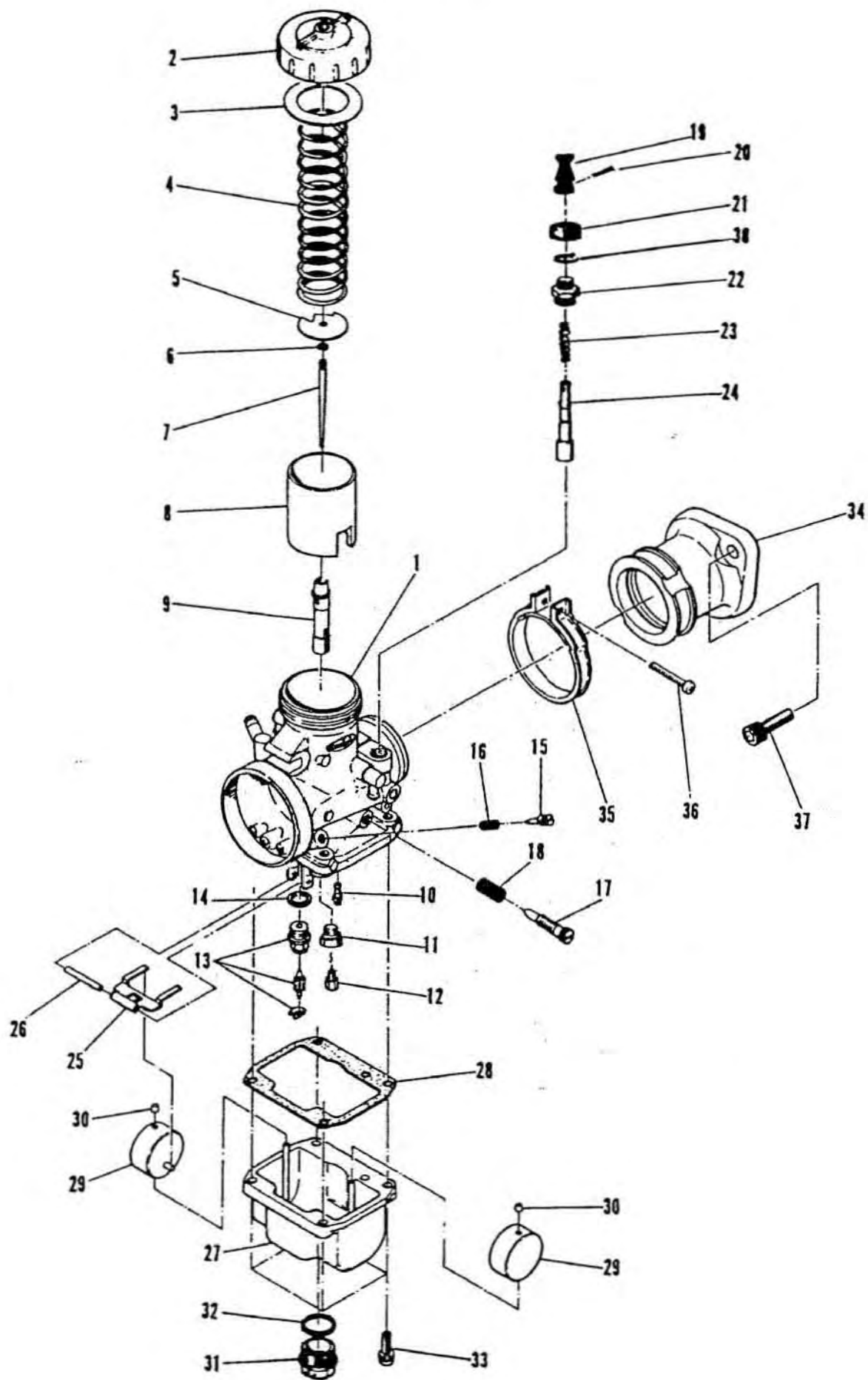
[illegible]

MAGNETO





CARBURETOR





FUEL PUMP

