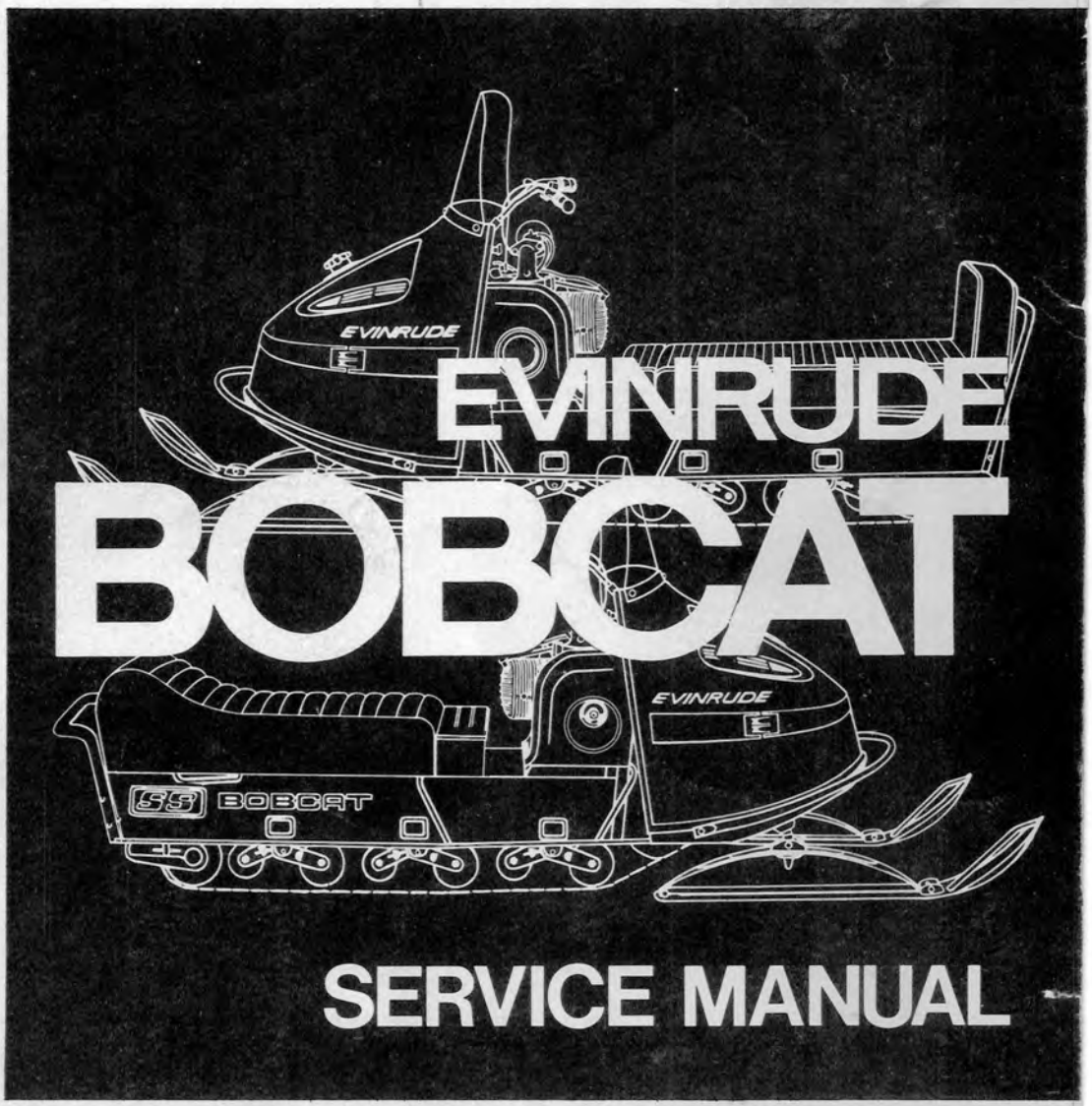


SERVICE MANUAL

25 HORSEPOWER · MODELS E251C E251M
32 HORSEPOWER · MODEL E251HP

743 10-70 PART NO. 261888 LITHO U.S.A.

FUEL RECOMMENDATIONS

The correct fuel mixture ratio is 24 parts of a good grade gasoline to one part oil. Use regular gasoline in Model 251 and premium gasoline in the 251 HP. For ease of measurement, this is equivalent to one quart of oil to six gallons of gasoline, one pint of oil to three gallons of gasoline, or 1/3 pint of oil to each gallon of gasoline.

Use only Evinrude Lubricant or a reputable automotive engine oil, SAE 30 MS or MM. Avoid use of low price third grade (ML light duty) oils. DO NOT USE MULTIPLE VISCOSITY OILS, SUCH AS 10W30, OR ANY OUTBOARD MOTOR OILS OTHER THAN EVINRUDE OUTBOARD LUBRICANT.*

AVAILABLE FROM YOUR EVINRUDE DEALER

*EVEN THOUGH EVINRUDE OUTBOARD LUBRICANT IS ADVERTISED AS A 50:1 RATIO LUBRICANT, IT IS IMPERATIVE FOR SNOWMOBILE USE THAT IT BE MIXED AT A 24:1 GAS-LUBRICANT RATIO.

DO NOT POUR GASOLINE OR LUBRICANT DIRECTLY INTO VEHICLE FUEL TANK. USE AN APPROPRIATE CONTAINER FOR MIXING AND STORING THE FUEL.

To prepare the snowmobile fuel properly, pour into a SEPARATE, clean container half the amount of gasoline required and add all the required lubricant.

Thoroughly shake this partial mixture. Next, add the balance of gasoline necessary to bring the mixture to the required ratio of 24:1. Again, thoroughly agitate the mixture. A clean funnel equipped with a fine screen should be used when pouring the fuel mixture into the vehicle tank.

24 to 1 lubricant is prediluted to provide excellent mixability with gasoline at low temperatures.

The addition of this dilutent does not in any way affect the lubrication qualities of the lubricant.

Whenever it is necessary to mix fuel and lubricant at temperatures below 0°F, the lubricant should be prediluted with gasoline to improve its mixability. The lubricant should be prediluted with approximately one part gasoline to one part lubricant. Predilution of the lubricant should take place with the lubricant temperature above 0°F.

Do not use kerosene or fuel oils for pre-mixing.

SECTION 1
INTRODUCTION

The snow machine has been designed and built for dependable, high performance. It is important to every snow machine owner to be able to receive skilled and thorough service for his vehicle when necessary. It is important to the service dealer to be able to offer the type of skilled service which will maintain the customer's satisfaction.

This manual, together with the regularly issued service bulletins and Parts Catalogs, provide the serviceman with all the literature necessary to service the 1971 model 251 and 251HP snowmobiles. Pictured below left is the model 251 and to the right, the high performance, 251HP. An effort has been made to produce a manual that will not only serve as a ready reference book for the experienced serviceman, but will also provide more basic information for the guidance of the less experienced man.

The Parts Catalogs contain complete listings of the parts required for replacement. In addition, the exploded views illustrate the correct sequence of all parts. This catalog can be of considerable help as a reference during disassembly and reassembly.

The Section Index on page 1-1 enables the reader to locate quickly any desired section. At the beginning of each Section is a Table of Contents which gives the page number on which each topic begins. This arrangement simplifies locating the desired information within this manual. Section 2 lists complete specifications on the 1971 snowmobiles. All general information, including 2 cycle engine theory, trouble shooting, and tune up procedures, are given in Sections 3 through 5 of this manual.

Figure 1-1

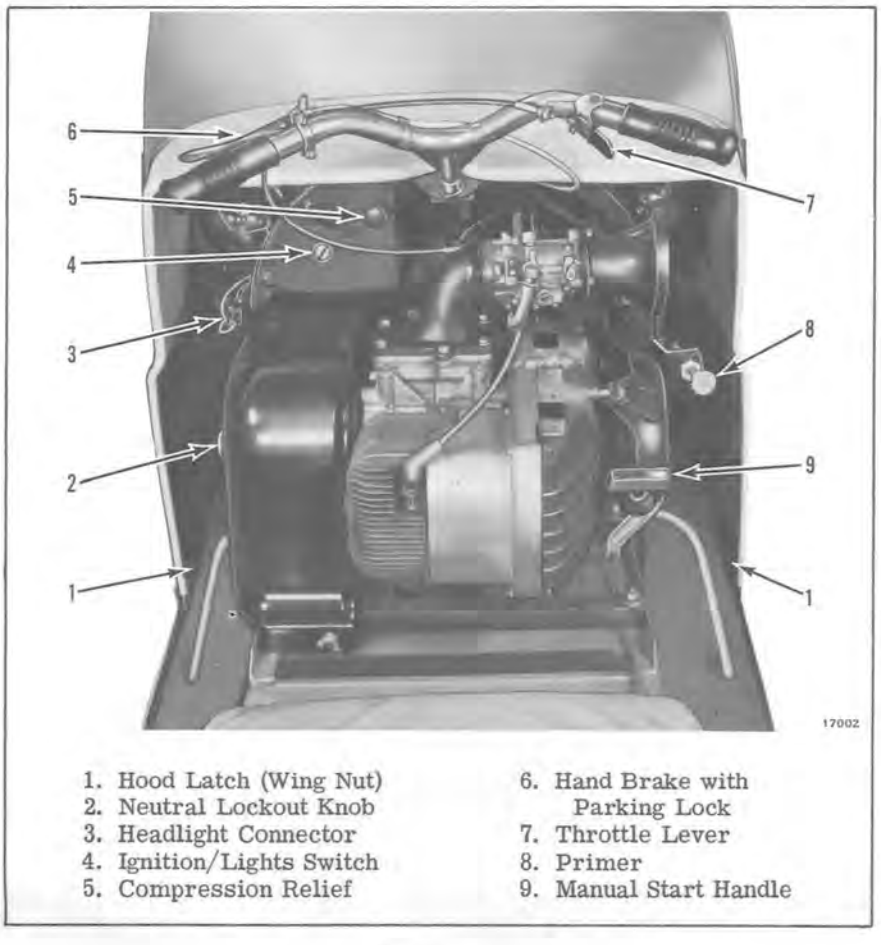
Figure 1-2

Sections 6 through 11 provide fully illustrated, detailed, step-by-step disassembly and reassembly instructions and adjustment procedures. Section 12 provides lubrication and storage information. In this way, the texts treat each topic separately; theory and practice are not intermixed. This makes it unnecessary for the experienced serviceman to reread discussions of theory along with specific service information. Illustrations placed in the margins provide unimpeded reading of explanatory text, and permit close relationship between illustration and text.

Read this manual carefully to become thoroughly familiar with the procedures described, then keep it readily available in the service shop for use as a reference. If properly used, it will enable the serviceman to give better service to the snow machine owner, and thereby build or maintain a reputation for reliable service.

This service manual covers all phases of servicing the 1971 snowmobiles, without reference to other information; however, new service situations sometimes arise. If a service question does not appear to be answered in this manual, you are invited to write to the Service Department for additional help. Always be sure to give complete information, including model number and vehicle serial number.

All information, illustrations, and specifications contained in this literature are based on the product information available at the time of publication. The right is reserved to make changes at any time without notice.



1. Hood Latch (Wing Nut)
2. Neutral Lockout Knob
3. Headlight Connector
4. Ignition/Lights Switch
5. Compression Relief
6. Hand Brake with Parking Lock
7. Throttle Lever
8. Primer
9. Manual Start Handle

Figure 1-3

SECTION 2 SPECIFICATIONS

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SPECIFICATIONS

CAUTION: Snowmobiles are not manufactured for highway use and the manufacturer does not represent that they are equipped with all the devices legally required for such use.

Length	Model 251	96 inches
	Model 251 HP	98 inches
Width		32-9/16 inches
Height	Model 251	42 inches
	Model 251 HP	37-1/2 inches
Engine		OMC 2-cycle opposed twin
Rating	Model 251	Maximum 25 HP at 5300 RPM
	Model 251 HP	Maximum 32 HP at 6200 RPM
Starter		Manual, rewind
Clutch		Centrifugal operated sheave engages belt
Drive		Variable-speed, V-belt and chain
Drive Sprocket Ratio (Standard)		16 to 30
	Options	11, 13, 15 or 18 to 30
Transmission		Variable speed, 3:1 to 1:1 ratio Forward only
Mufflers	Model 251	Single Tuned engine muffler for quiet operation
	Model 251 HP	Dual Tuned engine mufflers for maximum performance
Brake		Disc type, hand operated
Throttle		thumb operated
Track		Specially designed fully adjustable
Width:		15-3/8 inches
Skis		Formed steel, equipped with shock-absorbing leaf springs and replaceable wear runners
Seating capacity		Two adults. Vinyl coated twill cover, molded urethane foam cushion
Hood		Molded fiberglass with built-in headlights
Lighting		2 Headlights, and taillight
Fuel tank		6 U.S. gallons
Fuel	Model 251	good grade regular
	Model 251 HP	good grade premium
Lubrication		24:1 using Evinrude 24 to 1 lubricant or SAE 30 MM or MS oil
Carburetor Needle Adjustment		
High speed		1 turn off seat
Low speed		1 to 1-1/4 turns off seat
RPM Ratings		
Idle		1100 - 1300
Transmission Belt Engaging Speed	Model 251	2300 - 2400
	Model 251 HP	2600 - 2800
Ignition		
Breaker point gap		.022 to .024
Spark plug	Model 251	Champion J7J or equivalent
	Model 251 HP	Champion J4J or equivalent
Spark plug gap		.028 - .032 inch
Condenser capacity		.18 - .22 mfd
Magneto drive coil resistance		.8 ohm
Ignition coil primary resistance		1.5 ohm
Ignition coil secondary resistance		10,000 ohms
Lighting Coil resistance		.678 to .562 ohm
Engine		
Bore and stroke		2-3/4 x 2-1/4 inches
Piston displacement		437 cc or 26.7 cubic inches
Compression ratio	Model 251	7 to 1
	Model 251 HP	8 to 1
Ring diameter		2-3/4 inches
Ring thickness		1/16 inch
Cylinder Compression		
Model 251		minimum 105 PSI
Model 251 HP		minimum 120 PSI
Clearances		
Piston - wrist pin		Press fit
Piston ring gap		.007 - .017
Piston ring - ring groove		.002 - .004
Cylinder - piston	Top of piston to cylinder	.012 - .014
	Bottom of piston to cylinder	.006 - .010

For your own protection, before proceeding with any repair or adjustments on these snowmobiles, see

SAFETY PRECAUTIONS

on pages 4-7, 6-6, 7-7, 8-2, 9-2, 9-6 and 11-4.

Specifications and features may be changed at any time without notice and without obligation towards vehicles previously manufactured.

TORQUE SPECIFICATIONS

PART	APPLICATION	SIZE	TORQUE	
			IN./ LBS.	FT./ LBS.
Screw	Brake Hand Lever	#10-32	13-15	
Screw	Coil Clamp to Main Frame		35-45	
* Screw	Connecting Rod			29-31
* Screw	Crankcase		60-80	6-7
* Nut	Cylinder Base			16-20
* Screw	Engine to Engine Frame Assembly			33-38
* Nut	Flywheel			40-45
* Nut	Engine Frame to Main Frame	3/8-16		18-20
* Nut	Front and Rear Truck Axles	5/8-18		50-60
* Screw	Idler Axle to Frame	5/8-18		20-25
Bolt and Nut	Rear Axle Pivot			12-15
Setscrew	Rear Sprocket			18-20
Nut	Rear Suspension to Frame			12-15
* Nut	Runner to Ski		90-100	
* Nut	Saddle to Spring	3/8-24		25-30
	Spark Plug			20-20-1/2
Nut	Throttle Control Cable		30-40	
* Nut	Tie Rod	3/8-24		18-20
* Screw	Truck to Frame (Cleated Track Models)	3/8-16		25-30
* Screw	Truck to Frame (Molded Track Models)	7/16		25-30
* Nut	Steering Arm to Ski Column	3/8-24		18-20
* Bolt (Early Models)	Primary Bolt to End Cap			70-80
* Bolt (Later Models)	Primary Bolt to End Cap (Has annular groove in head). See Figure 2-1			90-100
Screw		#6	7-10	
Screw		#8	15-22	
Screw		#10	25-35	2-3
Screw		#12	35-40	3-4
Screw		1/4	60-80	5-7
Screw		5/16	120-140	10-12
Screw		3/8	220-240	18-20

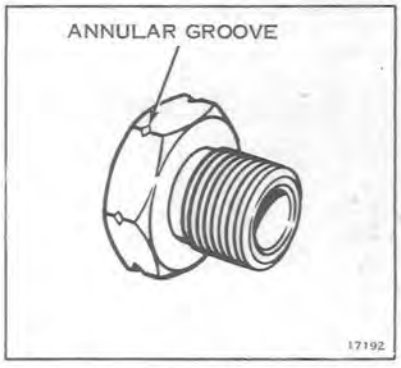

Figure 2-1

Specifications and features may be changed at any time without notice and without obligation towards vehicles previously manufactured.

*Use Torque Wrench

SECTION 3
GENERAL SNOWMOBILE INFORMATION

3

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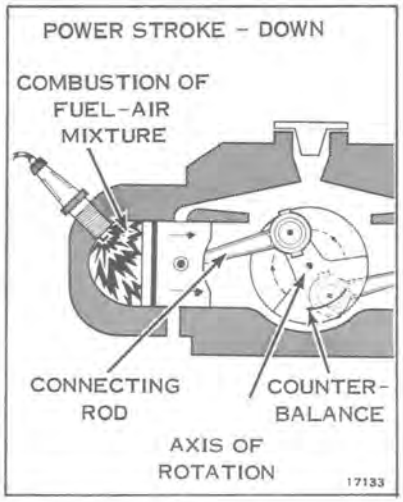

Figure 3-1

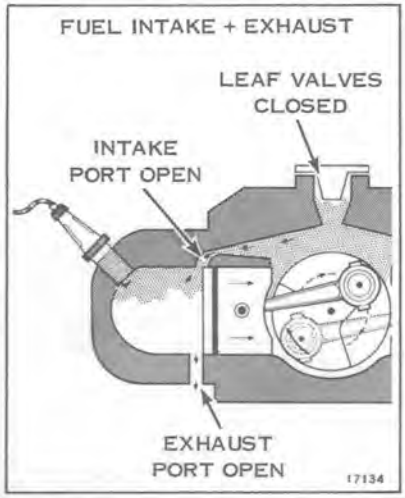

Figure 3-2

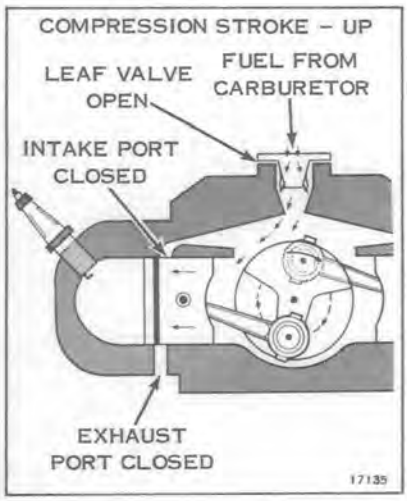

Figure 3-3

TWO CYCLE ENGINE THEORY

An internal combustion engine is one in which fuel is burned inside the engine: a charge of fuel is introduced into a combustion chamber (cylinder) within the engine and ignited. The energy released by the expansion of the burning fuel is converted to torque by the piston, connecting rod, and crankshaft.

Internal combustion engines are classified as either four-cycle or two-cycle engines. The "four" and the "two" refers to the number of piston strokes required to complete a power cycle of intake, compression, power, and exhaust. A piston stroke is piston travel in one direction only; up is one stroke, down is another. In a four-cycle engine, two crankshaft revolutions, or four strokes, are required for each power cycle. In a two-cycle engine only one crankshaft revolution is required per power cycle.

In a two-cycle engine, the ignition of the fuel-air mixture occurs as the piston reaches the top of each stroke. The expansion of gases drives the piston downward (see Figure 3-1). Toward the end of the downward stroke, ports which lead from the cylinder to the exhaust system are uncovered. The expanding exhaust gases flow into these ports, reducing pressure in the cylinder. Immediately after, intake ports are opened. These ports connect the cylinder with the crankcase where a mixture of fuel and air has been developed by carburetion. The downward motion of the piston compresses this mixture and forces it through the intake ports into the cylinder. (See Figure 3-2.)

The inrushing charge of the fuel-air mixture helps to eject (scavenge) the last of the exhaust gases from the cylinder. At this point, the momentum of the flywheel is required to return the piston to the top of the cylinder. As the piston begins its up-stroke, it closes the intake and exhaust ports and begins to compress the fuel-air mixture trapped in the cylinder (see Figure 3-3). The upward motion of the piston also reduces the pressure in the crankcase. The resulting crankcase suction opens leaf valves which admit a fresh charge of air and fuel from the carburetor into the crankcase, thus preparing for the next power cycle. Near the top of the piston stroke, the compressed fuel-air mixture is ignited, the piston is driven downward, and the power cycle is repeated. At full throttle, this cycle may be repeated more than five thousand times every minute.

CARBURETION

The system which controls the intake of the fuel-air mixture in the two cycle engine consists of a set of leaf valves which serve the same purpose as the intake valves on a four cycle engine. The leaf valves are thin, flexible metal strips mounted between the carburetor intake manifold and crankcase.

When the piston is on the up-stroke, it creates a partial vacuum in the crankcase. Atmospheric pressure forces the leaves away from the body (see Figure 3-4), opening the passage between the carburetor and crankcase. When the piston is on the down-stroke, it compresses the crankcase charge, forcing the leaves against the passage opening, and sealing off the crankcase from the carburetor. Since the opening and closing may occur in excess of five thousand times per minute, the leaves must be thin and flexible. In the snow machine engine, the leaves do not have to seat exactly flush with the body to permit normal operation.

Gasoline, in its liquid state, burns relatively slowly with an even flame. However, when gasoline is combined with air to form a vapor, the mixture becomes highly inflammable and burns with an explosive effect. To obtain best results, the fuel and air must be correctly proportioned and thoroughly mixed. It is the function of the carburetor to accomplish this.

Gasoline vapor will burn when mixed with air in a proportion from 12:1 to 18:1 by weight. Mixtures of different proportions are required for different purposes. Idling requires a relatively rich mixture; a leaner mixture is desirable for maximum economy under normal load conditions; avoid lean mixtures for high speed operation. The carburetor is designed to deliver the correct proportion of fuel and air to the engine for these various conditions.

The carburetor is essentially a simple metering device. Needle valves permit a precise amount of fuel to flow to the carburetor throat. The upstroke of the piston creates a suction which draws air through the leaf valves and the carburetor throat. At a particular point the throat is restricted by a venturi (see Figure 3-5). The venturi has the effect of reducing air pressure in the air stream, creating a partial vacuum which draws fuel from the jet nozzles. As it is rushed along to the firing chamber, the fuel is swirled about in the air stream and vaporized.

A shutter or butterfly valve in the throat regulates the amount of air drawn through the carburetor. To vary the speed of the engine, the throttle shutter opens or closes, regulating the amount of fuel-air mixture drawn into the engine.

A richer fuel mixture is required for starting a cold engine. A second shutter, called a choke, is placed into the throat forward of the jets, to restrict the flow of air. When the choke shutter is closed, more gasoline and less air is allowed into the air stream resulting in a richer fuel-air mixture. When normal operating temperature is reached, the choke is opened and the standard ratio of gasoline and air is allowed to flow from the carburetor.

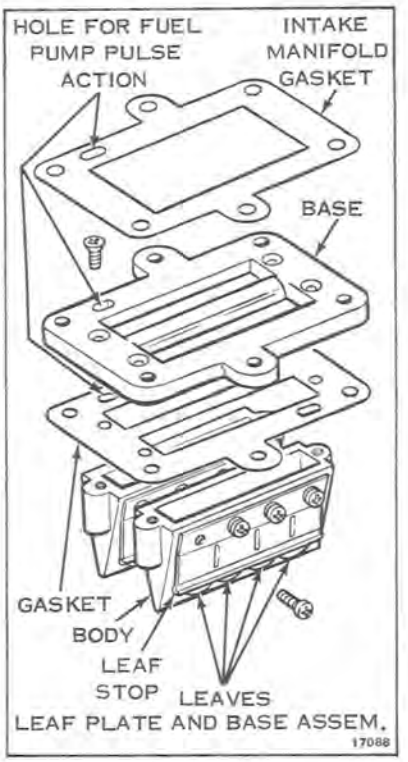

Figure 3-4

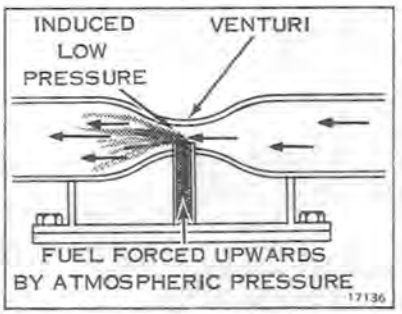

Figure 3-5

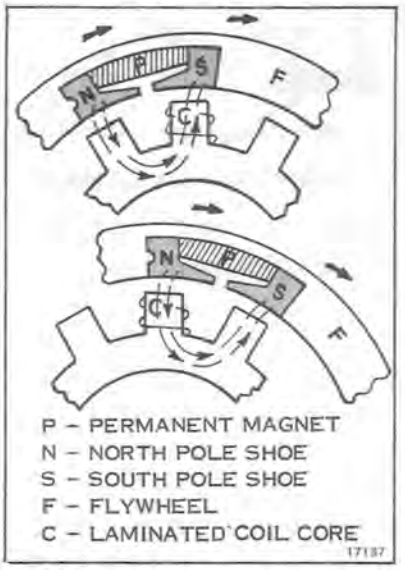

Figure 3-6

IGNITION

The ignition system provides the electrical energy which jumps the spark plug gap within the cylinder and ignites the compressed fuel-air mixture in the cylinder. The ignition system consists of the magneto drive coils, breaker points, condenser, and the ignition coil assemblies.

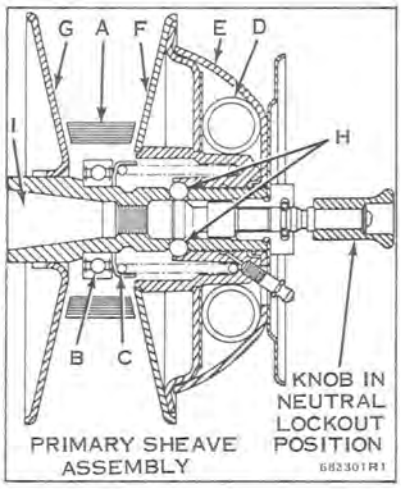

Figure 3-7

A - BELT
B - IDLER BALL BEARING
C - COMPRESSION SPRING
D - GARTER (ACTIVATING) SPRING
E - END CAP ASSEM
F - MOVABLE HALF OF SHEAVE
G - FIXED HALF OF SHEAVE
H - NEUTRAL LOCKOUT BALLS
I - CRANKSHAFT

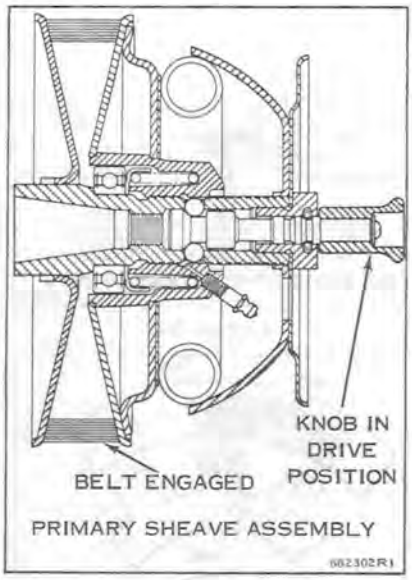

Figure 3-8

A permanent magnet is built into the flywheel. The magnet passes by the magneto drive coil inducing a current flow through the drive coil (see Figure 3-6). When the points open, the current flows into the primary of the ignition coil causing a magnetic flux build-up around the secondary windings of the ignition coil. When the points close, the flux field collapses cutting through the secondary windings resulting in a high voltage in the secondary. This high voltage is discharged across the spark plug gap.

The lighting system coils produce alternating current which changes in frequency and voltage in proportion to the engine speed.

POWER FLOW

The transmission assembly transmits power from the engine to the front axle which propels the vehicle along the track. The primary sheave assembly is attached directly to the crankshaft. The secondary sheave assembly is mounted on the chain case and is larger in diameter than the primary assembly. The two are connected by a transmission belt.

The primary sheave is centrifugally operated and engages when the engine speed reaches approximately 2300-2400 RPM for the Model 251 and 2600-2800 for the Model 251 HP. When the engine is rotating at idle speed or below the speed stated above, the transmission belt rides on a idler ball bearing between the halves of the primary sheave assembly (see Figure 3-7). The primary sheave assembly halves are separated by a compression spring in the hub of the movable half of the sheave.

As the engine speed increases, centrifugal effect forces a garter spring in the end cap outward against the contour of the end cap and axially against the movable half of sheave. As the sheaves are brought together the transmission belt is forced outward to ride on a larger diameter of the primary sheave assembly, increasing belt speed (see Figure 3-8). Since the belt length remains constant, the secondary sheave halves spread apart, allowing the belt to ride on a smaller diameter. In this way, the engine transmits power through a variable ratio, presenting the engine with a mechanical advantage most favorable for the speed at which it is operating.

A neutral lockout mechanism is used to prevent the drive from engaging during starting warm-up period, and idle. When the neutral lockout plunger is actuated, a cone on the end of the plunger raises two balls through the splines of the primary sheave assembly and into the path of the movable sheave half, preventing it from engaging the belt. The neutral lockout will operate only when the engine is at idle speed.

The secondary drive mechanism incorporates a torque sensing device that anticipates a need for more power for steep inclines or deep snow.

The overall ratio from the crankshaft of the engine to the secondary sheave is approximately variable from 3:1 to 1:1. Power is transmitted from the secondary sheave assembly through a drive chain to the front axle.

The ratio between the secondary sheave assembly and the front axle is 16:30. Optional sprockets are available to change these ratios for special applications (see page 2-2).

SECTION 4
TROUBLE SHOOTING

4

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DESCRIPTION

This section provides trouble shooting procedures for the snow machine. Steps to be followed in determining causes of unsatisfactory performance are outlined. A Trouble Check Chart at the end of this section lists causes of unsatisfactory performance.

Being able to locate the cause of trouble in an improperly operating snow machine is as important as being able to correct the trouble. A systematic approach to trouble shooting is important if the trouble is to be located and identified in minimum time.

Any service operation can be broken down into three steps:

1. Identifying the problem

2. Determining the cause of the problem, and

3. Correcting the problem.

Familiarity with the factors which affect two-cycle engine performance is important in making a correct service diagnosis. Factors which affect engine performance include the quality of the fuel and fuel mixtures, compression, spark and spark plug operation, and proper drive system adjustment. This section discusses compression and spark plugs and their relation to performance. A complete discussion of fuel mixtures is included in Section 12. Familiarity with factors which contribute to abnormal performance of an engine are similarly helpful. The skilled mechanic's experience is a great asset here. The Trouble Check Chart at the end of this section will assist in tracing symptoms of trouble to the source.

COMPRESSION

The pistons and piston rings perform two functions. They compress the mixture of fuel and air in the cylinders before ignition, and receive the force of the power after ignition. For maximum compression, the cylinder must be round and the piston and piston rings correctly fitted to it. The rings must be properly seated in the ring grooves and free to expand against the walls of the cylinder. The rings will not retain the force of combustion if the pistons and cylinder walls are excessively worn, scored, or otherwise damaged, or if the rings become stuck in grooves because of carbon accumulation. Escape of compression past the piston rings is referred to as "blow-by" and is indicated by discoloration or carbon formation on the piston skirt.

Cylinder bores normally wear with operation of the engine. The degree of wear will vary with length of operation, efficiency of lubrication, and general condition of the engine. Excessive cylinder wear results in loose fitting pistons and rings, causing blow-by, loss of compression, loss of power and inefficient performance.

Piston rings are formed in such a manner that when installed on the piston, they bear against the cylinder wall with a light, even pressure. Excessive ring pressure against the cylinder wall increases friction, causing high operating temperature, sluggish performance, and abnormal wear or scoring. Insufficient pressure allows blow-by, which reduces power, and causes overheating and carbon formation on the piston skirt.

Since the ring tends to flex as it follows the cylinder contour during engine operation, clearance or gap must be provided between the ring ends to prevent butting. The ring gap also allows the ring to expand (elongate) as engine temperature rises during operation. Insufficient

gap clearance will cause the ring to bend or warp as it flexes and expands; excessive gap clearance will permit loss of compression.

Compression leakage may also occur at the spark plugs. A cracked spark plug insulator will cause similar trouble. Although compression is primarily dependent on the piston, rings, and cylinder, these other sources of leakage should be investigated when compression loss is noted.

Compression leakage will occur if the compression relief valve linkage is adjusted with insufficient clearance on the cable ends. The relief valves vent combustion chamber pressure through a by-pass port into the exhaust system.

Compression may also be affected by the fuel induction and exhaust systems. Since the fuel vapor is first compressed in the crankcase, leakage here will affect engine performance. Possible trouble spots include leaf valve assemblies, seals between crankcase halves, and crankshaft bearing seals. Exhaust ports which have become clogged because of excessive deposits of carbon will hinder the efficient transfer of exhaust gases.

Excessive carbon build-up on piston heads or elsewhere in the cylinder walls can result in a loss of power.

Following the trouble check chart provided at the end of this section and the recommended tune-up procedures given in Section 5 will assure that all areas affecting fuel induction, compression, and exhaust will be considered as part of every trouble shooting procedure. An engine with low or uneven compression cannot be successfully tuned for peak performance. It is essential that improper compression be corrected before proceeding with an engine tune-up.

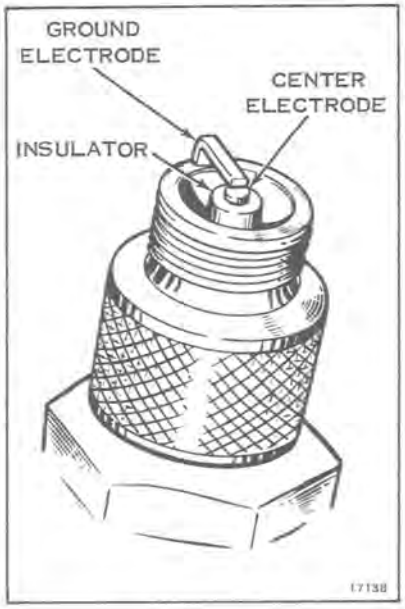


Figure 4-1

SPARK PLUGS

The spark plug provides a gap inside the combustion chamber across which the high voltage from the ignition coil can be discharged. The resulting spark ignites the compressed mixture of fuel vapor and air in the cylinder. See Figure 4-1.

Spark plugs are made in a number of heat ranges to satisfy a variety of operating conditions. The heat range of a spark plug refers to its ability to dissipate heat from its firing end to the cylinder head. The heat range established for any spark plug is determined in design by the length of the path which the heat from the tip must travel to the thread and seat area where it is transferred to the cylinder. Spark plugs having a short gap between the firing end of the center electrode and the thread and seat area are used for hot running engines (see Figure 4-2). Snowmobiles used in heavy load conditions (ie. deep snow or sled towing) will run the engine temperature higher, and in this case, a colder plug might be recommended. Spark plugs operating under these conditions must remain cool enough to avoid preignition and excessive gap erosion. Spark plugs having a long gap transfer heat slower and are used on cooler running engines. See Figure 4-3. Cooler running engines have a relatively low combustion chamber temperature, therefore a high spark plug temperature must be sustained in order to burn off normal combustion deposits and avoid fouling. For most effective sparking through any rpm range and under all conditions of operation, the electrode and insulator tip temperature must be kept high enough to vaporize or burn off particles of fuel mixture which collect on the insulator. Low plug temperatures result in electrode fouling by an accumulation of unburned fuel particles, carbon bits, sludge, etc. Selection of the correct spark plugs for an engine depends on the type of service to which it will be subjected. A cold running engine will require a hot plug and a hot running engine, a cold plug. Spark plug recommended for use on the Model 251 is the Champion J7J or equivalent. The Champion J4J or equivalent is recommended for use on Model 251 HP Snowmobile. See page 7-9 for additional information on spark plugs.

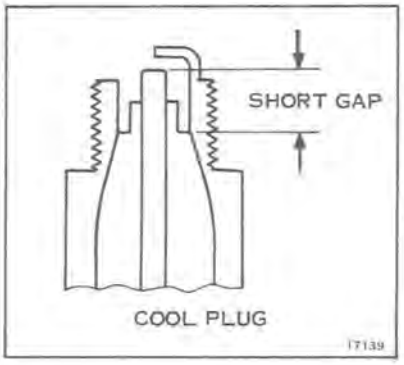


Figure 4-2

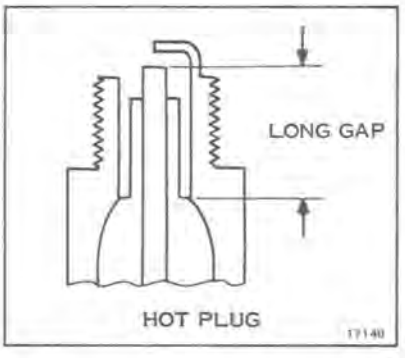


Figure 4-3

TROUBLE SHOOTING PROCEDURES

Trouble shooting to determine the cause of any operating problem may be broken down into the following steps:

a. Obtaining an accurate description of the trouble.

b. Quick tune-up.

c. Use of Trouble Check Chart to analyze engine performance.

An accurate description of the trouble is essential for trouble shooting. The owner's comments may provide valuable information which will serve as a clue to the cause of the problem. Find out pertinent facts such as:

a. Correct spark plugs

b. Throttle linkage properly adjusted

c. Tank filled with fresh, clean fuel of the proper mixture

d. Spark at each spark plug

e. Carburetor adjusted correctly

f. With compression relief valve closed, turn flywheel by hand or with recoil starter. If compression is present, it can be felt when turning through one complete revolution of the flywheel. If little or no compression exists in both cylinders, engine will spin very easily.

STARTING

1. Hard to start or won't start

   a. Empty gas tank

   b. Incorrect gas-lubricant ratio

   c. Old fuel, or water or dirt in fuel system

   d. Fuel line improperly connected

   e. Fuel line kinked or severely pinched

   f. Engine not primed

   g. Clogged fuel line or fuel pick up in tank

   h. Clogged check valve

   i. Carburetor adjustments too lean

   j. High speed needle bent or bowed

   k. Leaf valves not functioning properly

   l. Faulty gaskets

   m. Spark plugs fouled, improperly gapped, dirty or broken

   n. Loose or broken wire or frayed insulation in electrical system

   o. Sheared flywheel key

   p. Faulty coils

   q. Faulty condenser

   r. Binding in engine

   s. Weak or reversed polarity of flywheel magnets

   t. Engine flooded

2. Engine won't crank over

   a. Cylinder wall corrosion

   b. Broken connecting rod, crankshaft, or drive shaft

   c. Engine improperly assembled after repair

3. Cranks over extremely easily

   a. Spark plug loose

   b. Cylinder or pistons scored

   c. Hole burned in piston head

   d. Rings worn

4. Won't start, but kicks back and backfires

   a. Flywheel key sheared

   b. Timing out of adjustment

   c. Leaf valves broken or not seating

STARTING - MANUAL STARTER

1. Manual starter pulls out, but starter does not engage flywheel

   a. Friction spring bent or burred

   b. Excess or incorrect grease on pawls or spring

   c. Pawls bent or burred

   d. Pawls frozen (water) in place

2. Starter rope does not return

   a. Recoil spring broken or binding

   b. Starter housing bent

   c. Loose or missing parts

3. Clattering manual starter

   a. Friction spring bent or burred

   b. Starter housing bent

   c. Excess or incorrect grease on pawls or spring

   d. Dry starter spindle

RUNNING - LOW SPEED ONLY

1. Low speed miss

   a. Incorrect gas - lubricant ratio

   b. Carburetor idle adjustment too lean or too rich

   c. Leaf valve standing open or preloaded shut

   d. Spark plugs improperly gapped, dirty, or broken

   e. Loose or broken ignition wires

   f. Spark plug terminal loose

   g. Weak coil or condenser

   h. Breaker points burned, dirty or improperly gapped

   i. Cylinder gasket or leaf plate gasket blown

   j. Leaking crankcase seals

   k. Coil lead grounded on chassis

RUNNING - HIGH SPEED ONLY

1. High speed miss

   a. Water in fuel

   b. Spark plug heat range incorrect

   c. Spark plugs improperly gapped or dirty, cracked insulator

   d. Ignition wires loose or broken or faulty insulation

   e. Coil or condenser weak

   f. Breaker points burned, dirty, or improperly gapped

   g. Engine improperly timed

   h. Combustion chambers carboned or fouled

2. Poor acceleration, low top rpm

   a. Incorrect gas - lubricant ratio

   b. Old fuel

   c. Fuel hoses plugged or kinked

   d. Fuel pick up restricted

   e. Fuel pump faulty

   f. Incorrect carburetor mixture adjustments

   g. Inlet needle and seat worn or sticky

   h. Timing out of adjustment

   i. Spark plugs dirty or improperly gapped

   j. Loose, broken, or badly insulated high tension leads

   k. Coil or condenser weak

   l. Breaker points worn or improperly gapped

   m. Leaf valves not properly seated, or broken

   n. Piston rings stuck or scored

   o. Excessive carbon on pistons and cylinder head

   p. Compression relief valve improperly adjusted or faulty

   q. Carburetor high speed needle set too lean

3. Idles well, but acceleration poor, dies at full throttle

   a. Incorrect gas - lubricant ratio

   b. Fuel lines or passages obstructed

   c. Fuel pick up closed

   d. Faulty fuel pump

   e. High speed nozzle or jet clogged

   f. Dirt or packing behind needles and seats

   g. Choke partly closed

   h. High or low speed needle set too lean

   i. Breaker points burned, dirty, or improperly gapped

   j. Timing out of adjustment

   k. Fuel cap vent clogged

4. Engine runs at high speed only by using hand primer

   a. Fuel lines or passages obstructed

b. Fuel line leaks or fuel pick up obstructed

c. Fuel pump not supplying enough fuel

d. Dirt or packing behind needles or seats

e. Carburetor adjustments

f. Fuel cap vent clogged

g. Leaf block gasket reversed

RUNNING - HIGH AND LOW SPEED

1. Engine overheats

   a. Incorrect gas - lubricant ratio or improperly mixed fuel

   b. Engine not assembled correctly during repair (binding)

   c. Lean mixture (carburetor adjustment)

2. Engine stops suddenly, or freezes up

   a. No lubricant in gas, or no fuel

   b. Fuel connection faulty

   c. Cylinder or crankshaft scored

   d. Bent or broken rod, crankshaft, or stuck piston

   e. Ignition failure

   f. Frozen bearing

3. Engine knocks excessively

   a. Incorrect gas - lubricant ratio

   b. Spark plug - wrong heat range

   c. Flywheel loose

   d. Crankshaft end play excessive

   e. Carbon in combustion chambers and exhaust ports, or on pistons

   f. Worn or loose bearings, pistons, rods, or wrist pins

   g. Loose assemblies, bolts, or screws

   h. Manual starter not centered

4. Excessive fuel consumption

   a. Hole in fuel pump diaphragm

   b. Carburetor casting porous

   c. Deteriorated carburetor gaskets

   d. Hole in metering diaphragm

   e. Carburetor improperly adjusted

   f. Carburetor flooding

5. Vibrates excessively or runs rough and smokes

   a. Too much lubricant mixed with gas

   b. Idle or high speed needles too rich

   c. Air filter obstructed

   d. Faulty ignition

6. No power under heavy load

   a. Faulty carburetion

   b. Faulty ignition

   c. Breaker points improperly gapped or dirty

   d. Ignition timing too far retarded

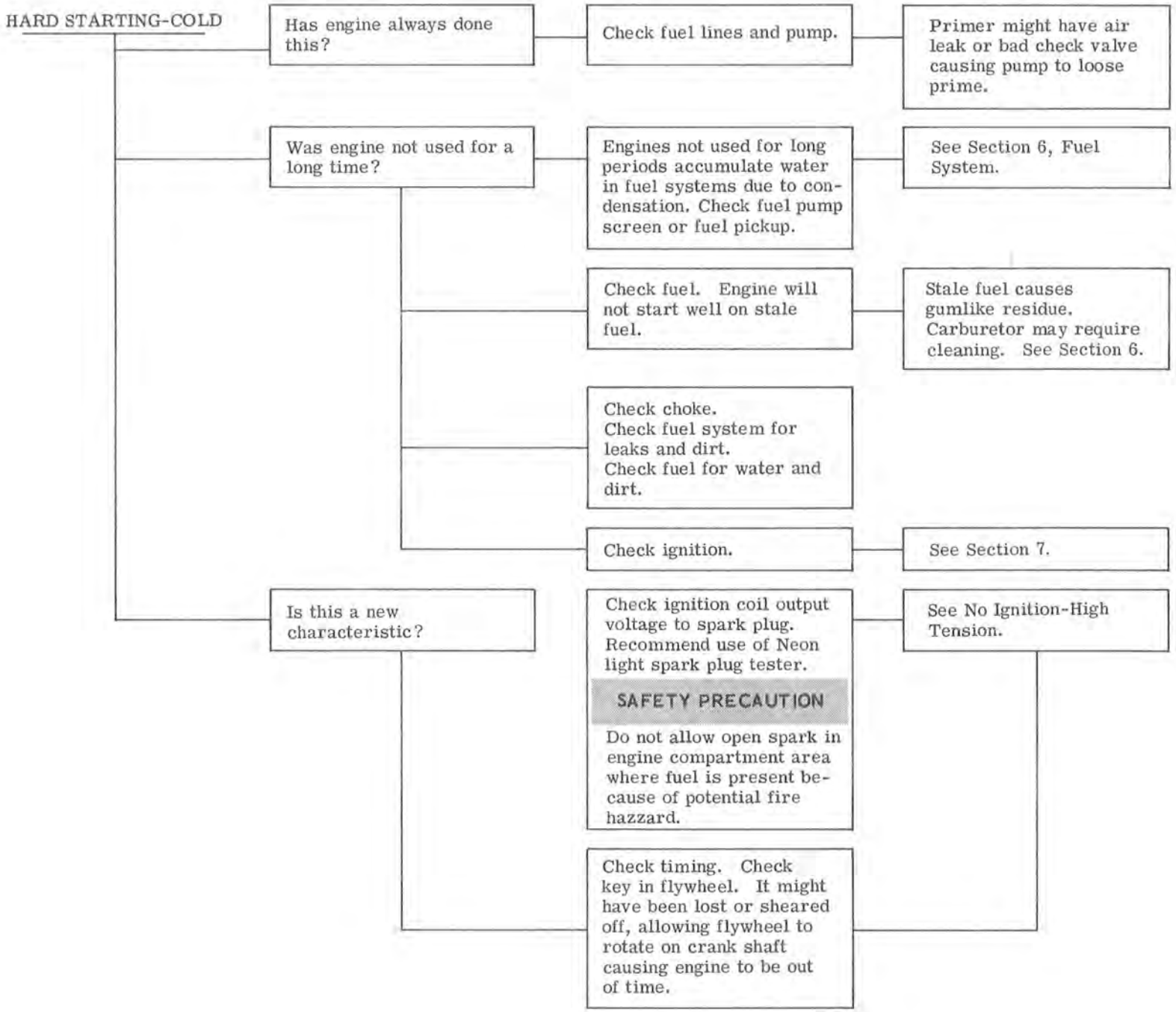
   e. Carbon build-up on piston head (see Engine Section)

   f. Cylinder scored or rings stuck

   g. Compression relief valve open

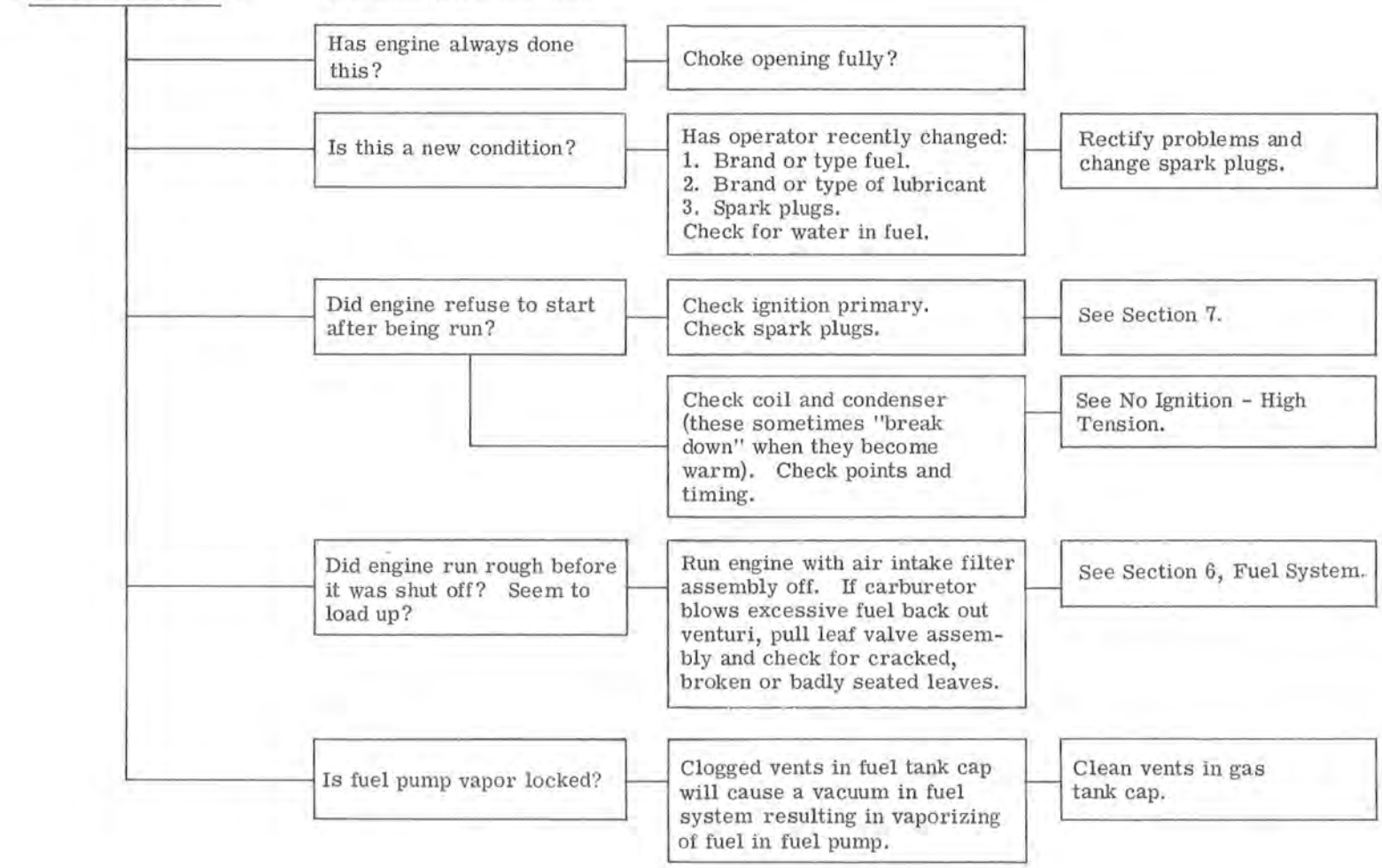
   h. High speed adjustment lean

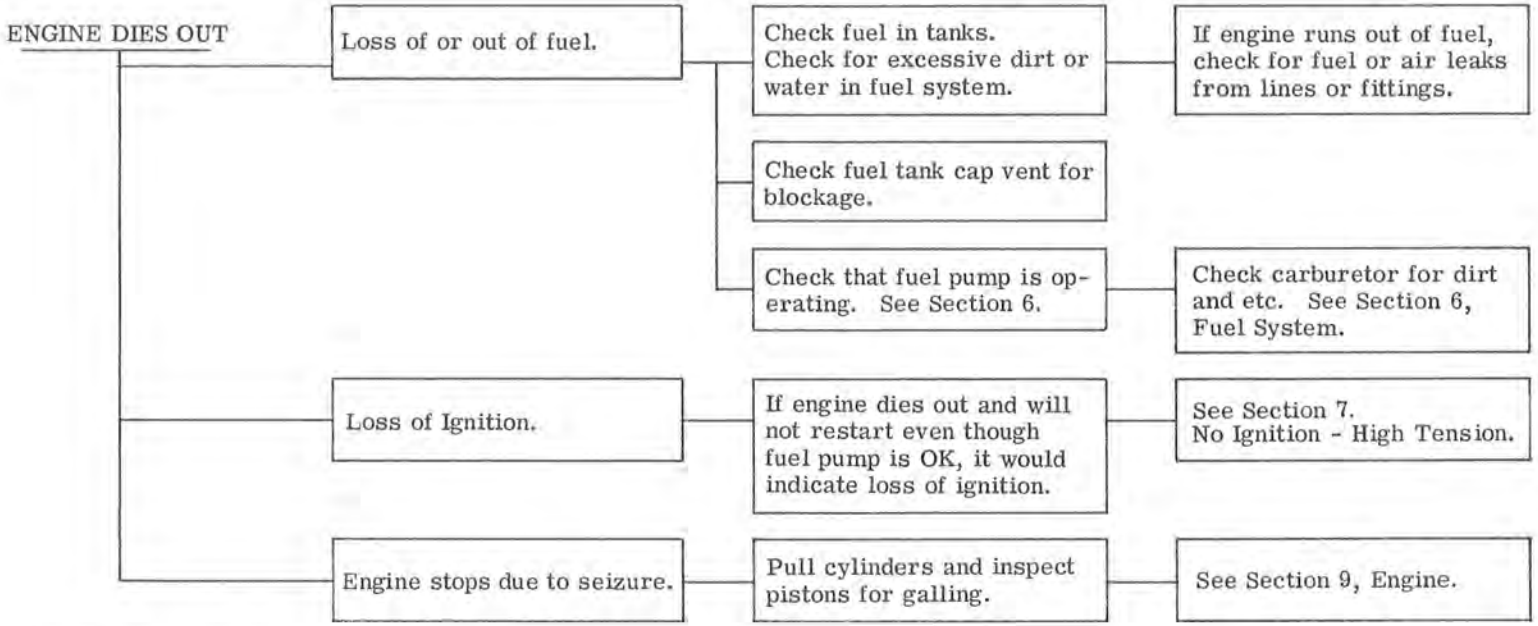
   i. Spark plugs fouled or misfiring


HARD STARTING-COLD
Has engine always done this?
Check fuel lines and pump.
Primer might have air leak or bad check valve causing pump to loose prime.
Was engine not used for a long time?
Engines not used for long periods accumulate water in fuel systems due to condensation. Check fuel pump screen or fuel pickup.
See Section 6, Fuel System.
Check fuel. Engine will not start well on stale fuel.
Stale fuel causes gumlike residue. Carburetor may require cleaning. See Section 6.
Check choke.
Check fuel system for leaks and dirt.
Check fuel for water and dirt.
Check ignition.
See Section 7.
Is this a new characteristic?
Check ignition coil output voltage to spark plug. Recommend use of Neon light spark plug tester.
SAFETY PRECAUTION
Do not allow open spark in engine compartment area where fuel is present because of potential fire hazzard.
See No Ignition-High Tension.
Check timing. Check key in flywheel. It might have been lost or sheared off, allowing flywheel to rotate on crank shaft causing engine to be out of time.

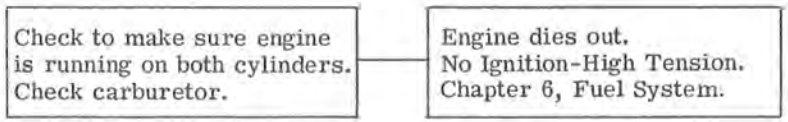
HARD STARTING-HOT

Ask these questions first.





NOTE: This engine can seize due to overheating, lack of lubrication, or improper break in, or hauling an exceptional load, then immediately re-start. This does not mean that engine is good. It can seize without external signs of overheating.



ENGINE WON'T TURN UP

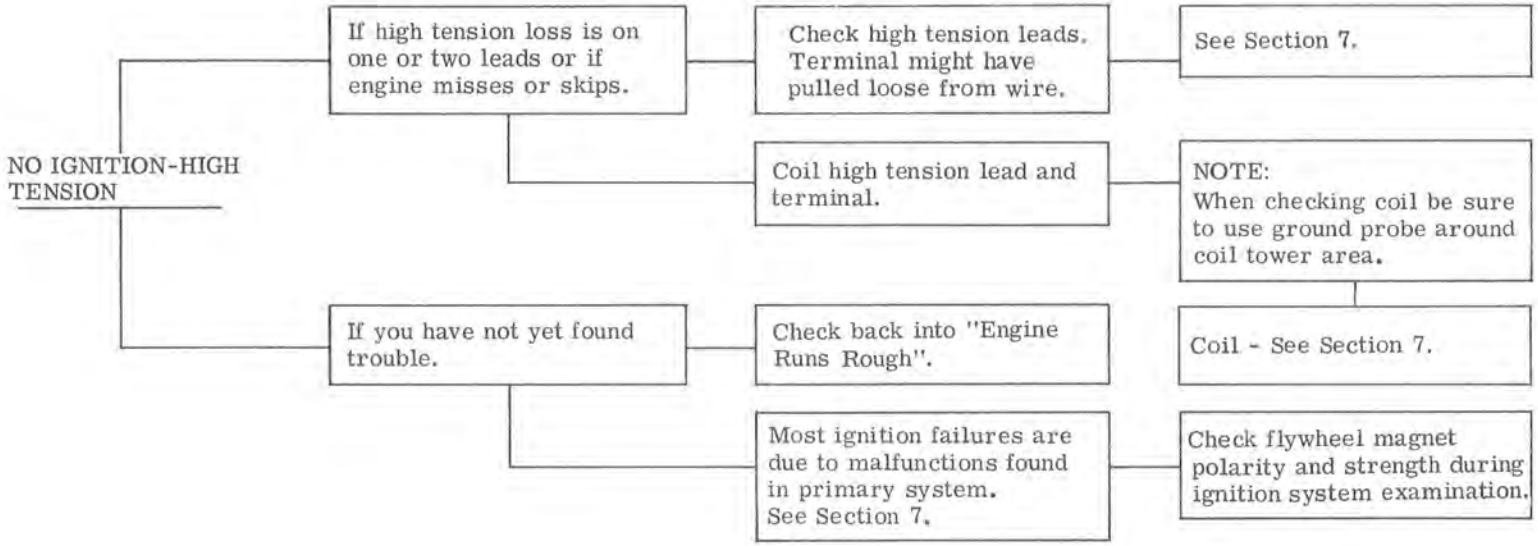
Ask operator as to conditions-was he hauling exceptional load-had he recently changed brand or type of fuel-was this condition apparent for some time or did it suddenly occur?

- Exhaust ports plugged with carbon.
- Compression relief valve not sealing.
  - Linkage may hold valve open. Carbon may also prevent closing.
    - Examine linkage for clearance. See Section 5.
- Could engine have seized up?
  - If engine seized due to overheating, lack of lubrication or improper break-in it might still run well yet not attain full efficiency.
    - Pull cylinders and look for galled pistons.
- Is this condition consistent or does rpm fluctuate? If so, inspect spark plugs.
  - If plugs are fouled the condition is probably caused by pre-ignition.
    - Pre-ignition itself is usually caused by:
      Wrong spark plugs for engine.
      Heavy load causing engine to lug.
      Carbon on pistons.

NOTE: If this condition is excessive, pull cylinders and clean carbon - correct cause and replace plugs.

ENGINE RUNS ROUGH

- If at slow speeds - check.
  - Slow speed mixture.
    Timing.
    Dirt or water in fuel.
    Spark plugs.
    - No Ignition - High Tension. See Section 7.
- Carburetor.
  - Leaf Valves.
    - See Section 6, Fuel System.
- If during acceleration.
  - IGNITION:
    Partial short or jumping, high tension wiring. Defective points or timing.
    Spark plugs.
    - See No Ignition - High Tension. See Section 7.
- If at high speed - check.
  - CARBURETION:
    Erratic rpm at high speed would indicate engine practically running out of fuel.
    - See Section 6, Fuel System. See Engine Dies Out.
  - COMPRESSION:
    Low in one or both cylinders.
  - WATER IN CYLINDER.
    - Check for water in fuel.


NO IGNITION-HIGH TENSION
If high tension loss is on one or two leads or if engine misses or skips.
Check high tension leads. Terminal might have pulled loose from wire.
See Section 7.
Coil high tension lead and terminal.
NOTE: When checking coil be sure to use ground probe around coil tower area.
Coil - See Section 7.
If you have not yet found trouble.
Check back into "Engine Runs Rough".
Most ignition failures are due to malfunctions found in primary system. See Section 7.
Check flywheel magnet polarity and strength during ignition system examination.

SECTION 5
TUNE-UP PROCEDURE

TABLE OF CONTENTS

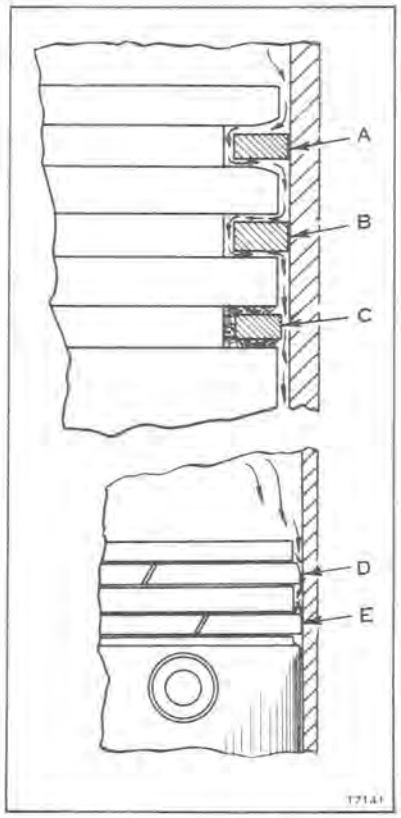
DESCRIPTION

The purpose of a tune-up is to restore power and performance which have been lost through wear or deterioration of one or more parts of the snow machine. The successful completion of a tune-up depends on an understanding of principles of two-cycle engine operation, and a familiarity with factors affecting performance. This section gives complete tune-up procedures. Refer to Section 3 for principles of operation, and to Section 4 for trouble shooting procedures. Lubrication procedures and instructions for storage are included in Section 12.

FACTORS AFFECTING PERFORMANCE

In the normal operation of an engine, the operator may not be fully aware of the decrease in performance which takes place slowly over a long period of time. Economical, trouble-free operation can best be assured if a complete tune-up is performed at least once each year, preferably at the start of the season.

It is seldom advisable to attempt to improve performance by correcting one or two items only. Time will be saved and more lasting results obtained by following a definite and thorough procedure of analysis and by correcting all items affecting power and performance.



A WORN RING GROOVES
B WARPED RING – INSUFFICIENT GAP
C CARBONED RING AND GROOVE
D WORN RING – ROUNDED EDGE
E SERVICEABLE RING – SQUARE EDGE

Figure 5-1

FUEL SYSTEM

A fresh fuel mixture, with the correct ratio of lubricant and gasoline, is necessary for peak engine performance. The tank should be removed, emptied of old fuel, rinsed out, installed and refilled with a fresh supply at the beginning of the season and at every tune-up. A stale fuel mixture may cause hard starting, stalling, and faulty operation. An alternative to the removal of fuel at the end of the season is the use of OMC 2+4 Fuel Conditioner. This additive stabilizes the fuel and prevents gumming and varnishing. Inadequate fuel delivery, as the result of a faulty fuel pump or clogged pick up, will affect high-speed performance. Incorrect carburetor needle adjustments may cause operating difficulties at any speed. Faulty choke operation or incorrect use of the manual choke by the operator may cause hard starting, rough running, or poor fuel economy.

IGNITION SYSTEM

Spark plugs having the proper heat range are very important for peak performance of the engine. See Section 7 for a complete description of spark plugs. A weak spark, which may be the result of faulty ignition system components, will cause hard starting, misfiring, or poor high-speed performance. The spark plugs and ignition system components are frequently checked first in a tune-up because of their importance to the operation of the engine.

COMPRESSION

It is essential that compression be checked before proceeding with an engine tune-up. An engine with low compression cannot be tuned satisfactorily to give peak performance. See Figure 5-1 for examples of worn piston rings and grooves which affect cylinder compression.

An automotive type compression gage may be used as follows: Make certain that choke is open, throttle is wide open, and both spark plugs are removed. THE COMPRESSION RELEASE KNOB MUST BE COMPLETELY IN. Turn the engine over quickly three or four times with the manual starter. Compression should be 105 pounds per square inch minimum for the Model 251 and 120 pounds per square inch for the Model 251 HP.

NEW VEHICLE DELIVERY

Complete instructions for putting a new snow machine into operation are included in the Owner's Manual and Assembly Sheet packed with each snowmobile. Be sure the customer receives this manual and understands the instructions given in it. The following list is a reminder of important things to check when putting a new snow machine into operation.

a. Be sure spark plugs are installed and tightened securely with spark plug gaskets in place.

b. Be sure spark plug wires are securely attached to spark plug terminals.

c. Be sure the correct gasoline and lubricant mixture is used. Pour mixture into tank through a fine mesh strainer.

d. Caution the customer not to operate a new engine at continuous full power until at least one tankful of fuel has been used. During this time, short periods of full power may be used. Instruct the customer to follow the break-in procedure described in the Owner's Manual.

e. Be sure that the customer understands how to operate the engine correctly, especially such things as the neutral lockout and compression release.

TUNE-UP PROCEDURES

Components which affect engine power and performance can be divided into three groups, namely:

1. items affecting compression,

2. items affecting ignition,

3. items affecting carburetion.

Any tune-up procedure should cover these groups in the order given. Correction of items affecting carburetion should not be attempted until all items affecting compression and ignition have been corrected satisfactorily. Attempts to overcome compression or ignition system deficiencies by altering carburetor settings will result in poor overall performance or increased fuel consumption. This section covers only those parts of a tune-up which involve adjustments, cleaning, and checking for performance. Trouble shooting procedures are covered in Section 4. Repair and replacement of parts, as determined through trouble shooting, is covered in Sections 6 through 11.

a. Test run vehicle, checking particularly the following:
   1. Neutral lockout
      (a) primary sheave locked in neutral
   2. Function of compression release
   3. Function of brake
   4. Engine performance
   5. Ski alignment and handling
   6. After running snowmobile, reduce engine speed to idle and pull neutral lockout knob out to lock transmission in neutral. Neutral lockout will not operate above idle speed, RPMS, see Page 3-4.

b. Check compression as described above.

c. If engine knocks or does not come up to speed, check for loose flywheel. Remove manual starter and fan housing (see Section 8). Rock flywheel back and forth, and listen for knocks. Excessive wear in crankshaft journal bearings can be detected by moving flywheel back and forth. Check for end play by pushing and pulling on flywheel. End play tolerance is .011 to .026.

d. If compression and bearing condition checks are not satisfactory, engine overhaul is required (see Section 9).

e. Test for adequate spark at each cylinder, using a spark checker. Inspect and test points, condenser, magneto coils, ignition coils, timing and spark plug high tension leads (see Section 7).

f. Check spark plugs to be sure they are the correct type. Clean spark plugs and regap, or replace as necessary.

g. Check breaker points, and clean or adjust as necessary.

h. Remove and drain fuel tank, flush, and clean thoroughly (see Section 6). Install tank, refill with fresh fuel mixture, and check primer operation.

i. Inspect fuel pump, fuel filter and hoses.

j. Thoroughly lubricate snow machine (see Section 12).

k. Tighten all external bolts, nuts, and screws, and retorque cylinder head nuts and spark plugs to specified torque.

l. Check track tension and ski alignment (see Section 11).

m. Start engine and allow to warm up. Check track alignment (see Section 11).

n. Repeat test run on vehicle. Check carburetor needle adjustments. See page 5-5.

o. After engine has run sufficiently to indicate satisfactory condition, stop and restart it several times. Operate it at high and low speeds. Check acceleration from low to high speed.

p. Clean and dry snow machine thoroughly, before returning it to customer.

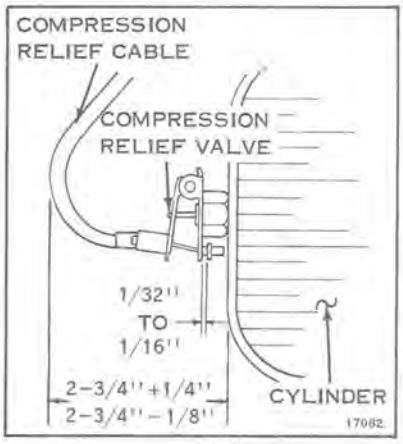


Figure 5-2

Figure 5-3

IGNITION TIMING ADJUSTMENT

New or Readjusted Points

Remove starter housing, front fan housing and flywheel. See Section 6. Set ignition points at .022" to .024".

COMPRESSION RELIEF VALVE ADJUSTMENT

With starter housing and front fan housing removed, check for 1/32" to 1/16" clearance when compression relief knob is pushed in (see Figure 5-2). Turn out on jam nut and correct clearance with adjustment screw shown in Figure 5-3.

CARBURETOR ADJUSTMENTS

HIGH SPEED NEEDLE VALVE

CAUTION

"LEANING OUT" OF THE HIGH SPEED NEEDLE VALVE WILL RESULT IN SERIOUS DAMAGE TO THE ENGINE. TO MAINTAIN ADEQUATE CYLINDER LUBRICATION THE HIGH SPEED NEEDLE VALVE SHOULD NEVER BE LESS THAN ONE TURN OPEN.

For average use, the engine will operate satisfactorily with the carburetor adjusted as it left the factory. If it becomes necessary to readjust due to altitude or climatic conditions follow these instructions carefully. See Figure 5-4.

The correct high speed needle valve setting is obtained by:

1. Blocking up the rear of the vehicle to free track.
2. Pre-set high speed needle approximately 1-1/8 turn open.
3. Start and warm up engine with drive in neutral. Do not over speed engine when in neutral.
4. Engage the neutral lockout and run engine at full throttle and turn needle valve counterclockwise permitting the engine to run rich to the point at which it begins to 4-cycle (load up).
5. Turn needle valve back (clockwise) gradually until engine stops 4-cycling and smooths out. Be certain to give the engine time to respond.

LOW SPEED NEEDLE VALVE

The low speed adjustment should be set between 1 and 1-1/4 turns open. See Figure 5-5.

IDLE ADJUSTMENT SCREW

The "Idle Adjustment Screw." See Figure 5-5, when turned to the right, or clockwise, will increase the engine idle speed. Recommended idle speed is 1100 to 1300 rpm. NOTE: This adjustment must be made with the neutral lockout knob out, or in the neutral position and engine warm.

SAFETY PRECAUTIONS

Operating above recommended idle RPMS can result in neutral lockout not operating. If it is necessary to idle at above recommended RPM, check operation of neutral lockout to insure it is functioning properly. See page 3-4.

SPARK PLUGS

Using the correct spark plug is most important for efficient operation. The recommended spark plug for use on the Model 251 is the Champion J7J or equivalent, and the Champion J4J or equivalent is recommended for use on the Model 251 HP snowmobile. The proper spark plug gap in either case is .028" - .033".

Remove rubber covered spark plug terminal by pulling straight off, with a slight twist, see Figure 5-6. Remove spark plugs for inspection or replacement as necessary. When reinstalling spark plug, clean the spark plug seat in cylinder head. Be sure spark plug gasket is in place and tighten plug securely. (Recommended torque, 20 to 20-1/2 ft. lbs.) See pages 4-3 and 7-9 for additional information on spark plugs.

Figure 5-4

Figure 5-5

Figure 5-6

SECTION 6
FUEL SYSTEM

TABLE OF CONTENTS

DESCRIPTION

The complete fuel system consists of the gas tank assembly and lines, the primer assembly, the fuel pump and filter assembly, the carburetor, and the leaf valve assembly. This section gives complete service procedures on all components of the fuel system, and carburetor adjustments. Principles of carburetion are discussed in Section 3.

FUEL FLOW

Fuel is drawn from the fuel tank by the fuel pump, which is operated by changes in crankcase pressure. These changes in crankcase pressure are transmitted to the fuel pump by the pulse line. The filter element removes water, dirt, or other impurities from the fuel before the fuel passes through the pump or carburetor. The primer assembly, injects raw fuel into the crankcase before starting (see Figure 6-1).

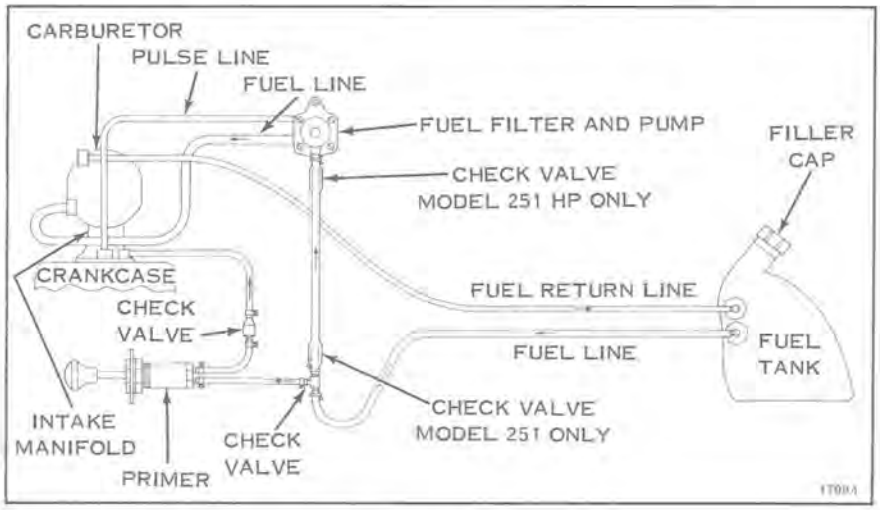


Figure 6-1

CARBURETOR

DISASSEMBLY, CLEANING, REPAIR AND REASSEMBLY - HD SERIES

The carburetor should be cleaned and inspected at regular intervals, depending on service conditions.

The entire carburetor should be cleaned by flushing with fuel and blown dry with compressed air before disassembly. The carburetor should be inspected for cracks in the casting, bent or broken shaft, loose levers or swivels and stripped threads.

Select a clean work area. Dirt and carelessness are the causes of most carburetor trouble.

Remove throttle cable using the following procedure: Depress thumb throttle lever. Hold throttle in open position. Slip end of throttle cable through nylon pivot pin. Remove jam nut on intake manifold and turn cable fitting out of manifold.

CAUTION

Some solvents and cleaners have a damaging effect on the synthetic rubber parts used in carburetors. It is best to use a petroleum product for cleaning. Do not use alcohol, lacquer, acetone thinner, benzol or any solvent with a blend of these in-

gredients unless the rubber parts and gaskets are removed. If you are in doubt about your solvent, test a used part in it and observe the reaction.

a. Remove the idle speed mixture screw (14), washer and tension spring. Inspect for damaged threads (see Figure 6-6).

b. Remove the metering diaphragm cover (29), the metering diaphragm (28), and gasket (27). Inspect the cover for nicks, dents, or cracks that might hamper operation. Inspect the metering diaphragm; the center plate must be riveted securely to the diaphragm and the diaphragm should be free of holes and imperfections. The gasket should be replaced if there are holes or creases on its sealing surface. The parts must be reassembled in the correct order. The gasket should be assembled onto the carburetor body casting first, then the metering diaphragm is assembled next to the gasket.

c. Remove the hinge pin retaining screw (25), the hinge pin (23), inlet control lever (26) and the inlet tension spring (24). Use caution in removing these parts. Spring pressure may push the inlet control lever out of the casting. Inspect the parts for wear or damage. The inlet control lever must rotate freely on the hinge pin.

d. Handle the inlet spring carefully. Do not stretch this spring or change its compression characteristics. If in doubt about its condition, replace it.

e. Remove the inlet needle (22). Remove the inlet seat assembly using a 3/8-inch thin wall socket. Remove the inlet seat gasket.

f. The inlet seat assembly consists of a brass cage and a rubber insert for the inlet needle seat. Assemble the insert into the cage with the molded rim side away from the inlet needle point.

Some HD carburetors are equipped with a rubber tipped needle, a brass inlet seat and a copper gasket. The installation instructions below apply to both types of inlet seats.

The inlet needles and seats are matched and tested for leaks at the factory and the parts must be kept in matched sets. When installing the insert cage into the carburetor body, use a new gasket. Do not force the cage, as you may strip the threads or distort the insert. Use a torque wrench to apply 40 to 50 inch-pounds torque. The needle and seat assembly must be clean to insure correct performance.

g. Remove and inspect the points of the high speed and idle mixture screws. See Figures 6-3 and 6-4. Through misuse, either mixture screw point may be bent (extruded) from being forced into the casting seat or possible broken off in the casting (see Figure 6-2). If either mixture screw is damaged, be sure to inspect the casting. If the adjustment seats are damaged, a new body casting is required. Check for clogged inlet and return line screen.

IMPORTANT

Do not alter return line elbow openings. This elbow controls inlet pressure and fuel flow to prevent vapor locking in carburetor and fuel pump.

h. Welch plugs seat the idle by-pass parts and main nozzle ball check valve from the metering chamber. Accumulated dirt can usually be blown out through the mixture screwholes. However, an unusually dirty carburetor requires the removal of these plugs. Drill just through the welch plug carefully with a 1/8" drill. Drilling too deeply may ruin the casting or the ball check valve. Use a small punch to remove the plug.

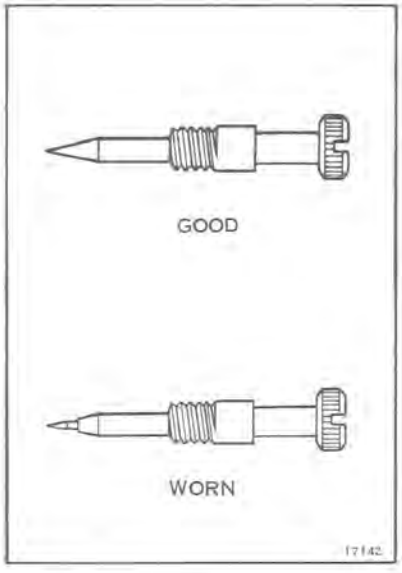


Figure 6-2

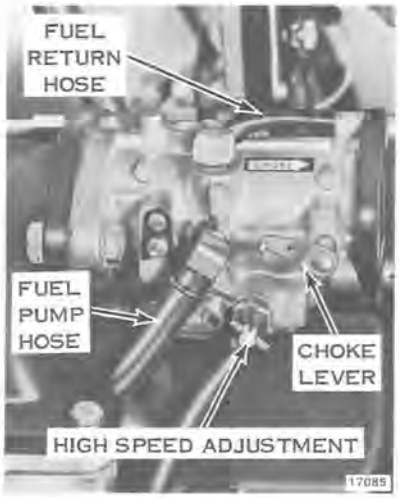


Figure 6-3

Figure 6-4

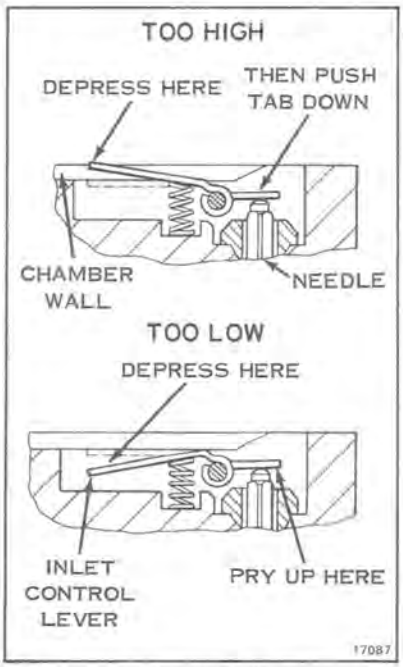


Figure 6-5

Inspect the idle by-pass holes to insure they are not plugged. Do not push drills or wires into the metering holes. This may alter carburetor performance. Blow plugged holes clean with compressed air. Remove the main nozzle ball check assembly (21), pressing it into the primary venturi. Press the new part in where required so its bottom surface is flush with the nozzle well surface. The nozzle pipe must be below the welch plug to receive enough fuel. An engine with a defective check ball (19) will not idle unless the high speed mixture screw is shut off. Replace the faulty parts.

i. Remove any worn choke or throttle shafts before cleaning. Leave unworn shafts in and clean the whole assembly.

Mark the throttle (3) and choke (16)shutters before removing them so that they can be reassembled correctly. The edges are tapered for exact fit into the carburetor bores. Remove two screws and pull the shutter out of the carburetor body. Remove the throttle shaft clip (5) and pull the shaft out of the casting. Examine the shaft and the body bearings for wear. If the shaft shows excessive wear, replace it. If the body bearing areas are worn, replace the body casting. Remove the choke shaft (33) from the body carefully so that the friction ball (17) and spring (18) will not fly out of the casting. Inspect the shaft and bushings.

j. Clean all parts before reassembly in a good carburetor solvent. Clean a slightly dirty carburetor with compressed air. Carefully blow out each channel and orifice in the casting.

k. Assemble the carburetor. Keep all parts clean before assembly to the body casting.

1. Tighten the inlet seat to 40-50 inch-pounds of torque.

2. Adjust the inlet control lever so that the center of the lever that contacts the metering diaphragm is flush to the metering chamber wall (see Figure 6-5).

3. Install new welch plugs at the nozzle well and by-pass chamber if needed. Place the new welch plug into the casting counterbore convex side up and flatten it to a tight fit, using a 5/16 inch flat end punch. If the installed welch plug is concave, it may be loose and cause an uncontrolled fuel leak. The correctly installed welch plug is flat. Stake plug at outer edge in three places to install.

4. Assemble the gaskets, diaphragms and castings in the correct order.

5. Assemble the throttle shaft into the carburetor body and attach the throttle shaft clip before assembling the throttle shutter. With the shaft secured in place, assemble the shutter into the shaft. Be certain that the shutter fits accurately into the throttle bore in the closed position.

6. Adjust throttle cable so that carburetor butterfly valve is full open when thumb throttle lever touches handle grip.

   When the lever on the carburetor is returned to the idle position, there must be 1/16" minimum over travel in hand lever. Slot in throttle lever must align with slot in cable support bracket. Torque nut on cable adjusting screw to 60-80 inch pounds.

7. Assemble the choke friction spring and ball into carburetor body and assemble the shaft into position. Assemble the shutter to the choke shaft. Be certain that the choke shutter fits tightly to the carburetor bore in the closed position.

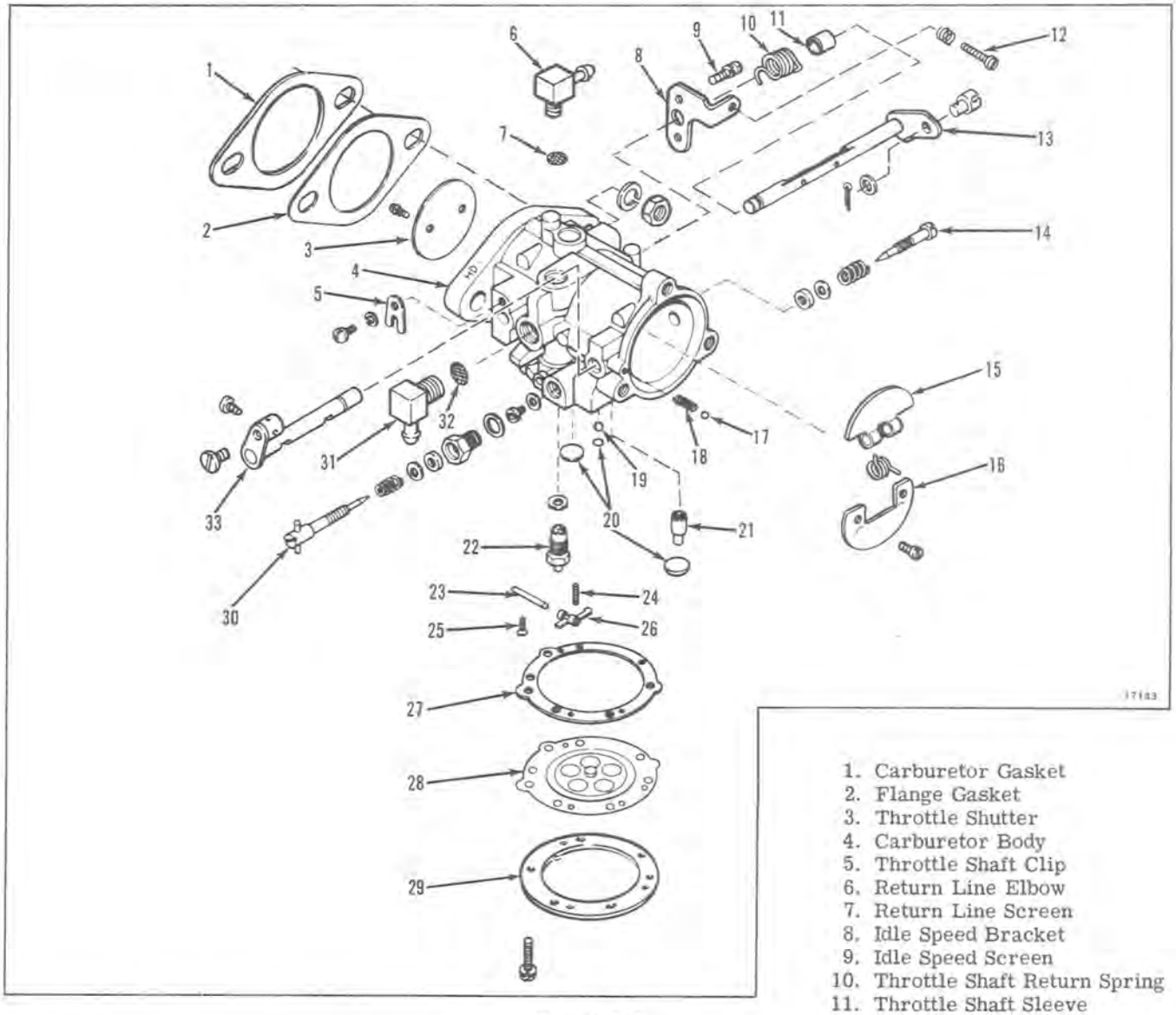


Figure 6-6

1. A carefully rebuilt HD model carburetor should perform well. The two most likely causes of carburetor failure are dirt and a careless repair job.

m. See page 5-5 for needle valve adjustment procedure.

LEAF VALVES

a. Separate the intake manifold from the crankcase body, removing the gasket and leaf plate and base assembly.

b. Rinse leaf valves and leaf valve body in cleaning solvent and blow dry with light air pressure to prevent leaf damage.

c. Inspect the leaf valve assembly and disassemble if necessary (see Figure 6-7). Special caution is necessary in disassembling the leaf valve assembly. DO NOT damage or interchange the leaves.

d. The leaves must be flat to maintain a seal with the leaf valve body. DO NOT under any circumstances bend or flex the leaves by hand.

1. Carburetor Gasket
2. Flange Gasket
3. Throttle Shutter
4. Carburetor Body
5. Throttle Shaft Clip
6. Return Line Elbow
7. Return Line Screen
8. Idle Speed Bracket
9. Idle Speed Screen
10. Throttle Shaft Return Spring
11. Throttle Shaft Sleeve
12. Idle Speed Screw
13. Throttle Shaft
14. Idle Speed Mixture Screw
15. Choke Valve
16. Choke Shutter
17. Choke Friction Ball
18. Choke Friction Spring
19. Check Ball
20. Welch Plugs
21. Check Valve Nozzle
22. Inlet Needle
23. Hinge Pin
24. Inlet Tension Spring
25. Hinge Pin Retaining Screw
26. Inlet Control Lever
27. Diaphragm Gasket
28. Metering Diaphragm
29. Diaphragm Cover
30. High Speed Mixture Screw
31. Fuel Hose Elbow
32. Inlet Line Screen
33. Choke Shaft

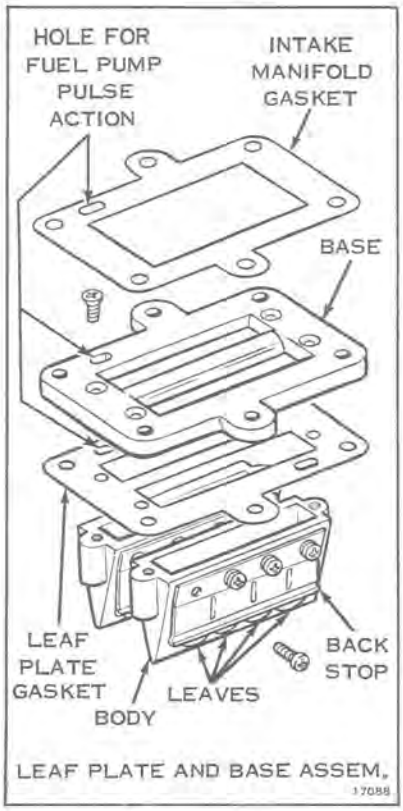


Figure 6-7

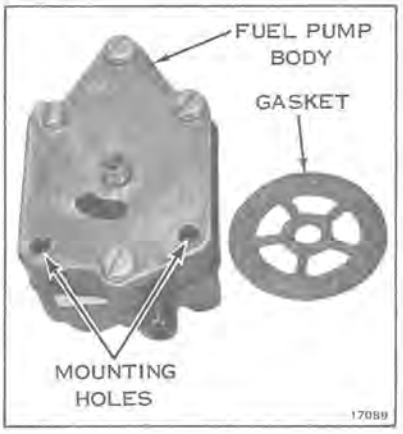


Figure 6-8

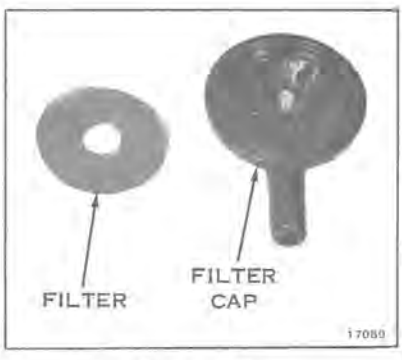


Figure 6-9

Clean, inspect, and immediately reassemble the leaf valve assembly, rather than leave it apart for reassembly later.

e. The leaves are designed to maintain contact with the leaf valve body, and to spring away from the leaf valve body when predetermined pressure is exerted against them. Attach the leaf valves and back stop to the leaf valve body, then examine leaves carefully to make certain that they lie flat against body.

f. Check tightness of leaf valve retaining screws and tighten any that appear loose. Tighten screws to torque specified in Section 2.

INSTALLATION

a. Secure leaf plate assemblies to base, using a new leaf plate gasket. Align leaf plate and base assembly on crankcase. Install intake manifold on crankcase using a new intake manifold gasket. Be certain that elongated hole in gasket and base plate aligns with passage in intake manifold. Obstruction of this passage will prevent fuel pump operation via the pulse line. Fasten with screws and lockwashers.

b. Attach primer check valve hose to check valve on manifold.

c. Attach assembled carburetor to intake manifold with screws, nuts, and lockwashers, using a new carburetor gasket.

FUEL PUMP

REMOVAL

a. Disconnect two hoses from fuel pump and filter assembly (see Figure 6-8).

b. Remove two screws attaching pump and filter assembly to mounting plate (see Figure 6-8), and remove pump and filter assembly. NOTE: Filter assembly may be removed for cleaning and inspection without removing pump assembly by removing filter cap screw (see Figure 6-9).

SAFETY PRECAUTION

Do not allow fuel to drip on hot engine or exhaust manifold because of potential fire hazzard.

CLEANING, INSPECTION, AND REPAIR

a. The fuel pump components are not serviced separately. If a malfunction occurs, replace the complete pump.

b. Inspect the filter for accumulation of sediment by removing the filter cap screw and the filter cap (see Figures 6-8 and 6-9). Clean the filter cover and fuel connectors in solvent and blow dry.

c. Check for a clogged filter element. The fuel filter element on an engine that has been in storage may be clogged without appearing to be. During storage, volatile agents as well as anti-gum and anti-varnish agents evaporate from the gasoline that remains in the fuel filter. The result is contamination of the filter element with a clear form of varnish. This varnish is not readily soluble in gasoline or cleaning solvent; therefore, the filter should be replaced at the start of each season. NOTE: Since the purpose of the filter is not only to trap dirt but also to prevent moisture from entering the carburetor, do not attempt to run the engine with the filter element removed.

REASSEMBLY

a. Reassemble the fuel filter. Do not overtighten filter cap to fuel pump body.

b. Attach fuel pump and filter assembly to plate with screws.

c. Reconnect fuel hoses.

FUEL PRIMER

a. The primer is a simple pump which pumps raw fuel from the fuel line, thru check valves, directly into the intake manifold above the leaf valves (see Figures 6-10 and 6-11).

b. To check operation of the primer, disconnect hose from manifold check valve. A spurt of fuel should be evident when the plunger is depressed. If little or no fuel is discharged, check the valves in the fuel line, and fuel line fitting for leakage or sticking (refer Figure 6-1).

c. Check valve above fuel primer "T" fitting must be in verticle position in order to operate.

AIR FILTER

The carburetor is equipped with a filter that should be cleaned during the operating season and at the end of the season for storage. To clean filter, wash with gas/lubricant fuel mixture and shake dry. If compressed air is available blow dry from the inside (see Figure 6-12).

FUEL TANK

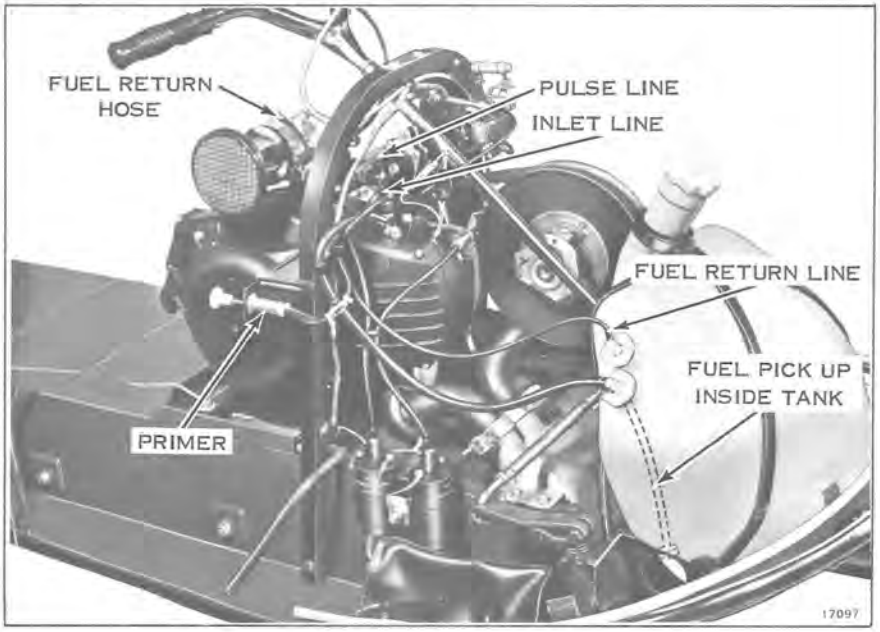
a. For correct fuel and lubricant mixtures and break-in instructions, see Section 12.

b. The importance of using a fresh clean fuel mixture cannot be overstressed. Gum will form in old fuel which will clog filter screens, fuel passages, carburetor orifices, leaf valves and check valves. Remove tank to empty old fuel. Reinstall it and begin with a fresh supply every season.

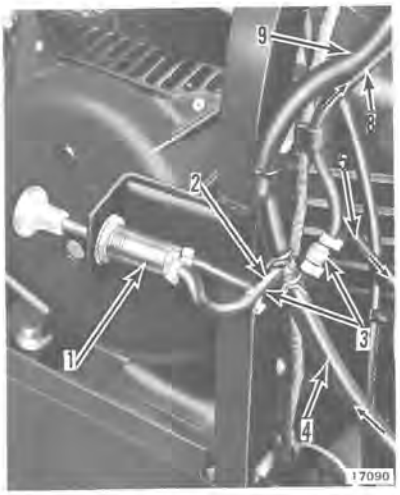
c. Drain and clean the fuel tank prior to off season storage. Disconnect the rubber straps at "s" hook end, and turn tank upside down. Remove fuel pick-up line in tank to clean and check screen.

d. Clean the tank with gasoline poured through a filtering funnel. Cover the fuel line opening and agitate the tank. Empty it through the fill opening. Use more gasoline to flush the fuel line opening. Then reinstall the tank and hoses.

e. Check to see there are no leaks at fuel hose connections.

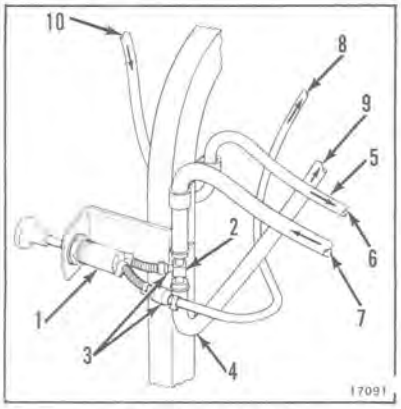


MODEL 251 PICTURED
Figure 6-13



FUEL PRIMER
(MODEL 251)
Figure 6-10

1. Primer
2. Tee-Fitting
3. Check Valve
4. Fuel Supply Line
5. Fuel Return Line
6. To Fuel Tank
7. From Fuel Tank
8. To Manifold
9. To Fuel Pump
10. From Carburetor



FUEL PRIMER
(MODEL 251 HP)
Figure 6-11

Figure 6-12

SECTION 7
IGNITION AND ELECTRICAL SYSTEMS

TABLE OF CONTENTS

DESCRIPTION

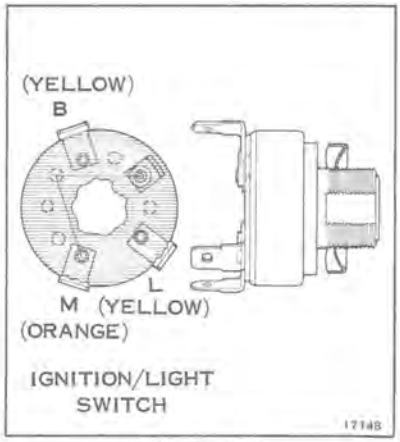


Figure 7-1

The ignition system consists of the magneto drive coils, condenser, breaker point assembly, ignition coils, ignition key switch, spark plugs, and the necessary wiring. Because the engine is a two-cycle, twin opposed cylinder design, a single breaker point assembly and single lobed cam are used, with two ignition coils, to supply spark simultaneously to both cylinders. An automatic spark retard/advance system has been incorporated to provide easier starting.

The electrical system consists of the alternator coils, head and taillights, light and ignition switches and wiring. The alternator coils produce alternating current which changes in frequency and voltage in proportion to engine speed.

This section gives complete service procedures on all components of the ignition and electrical systems, breaker point adjustment. Principles of magneto operation are discussed in Section 3. The wiring diagram is located at the end of the manual.

Figure 7-3

LIGHT PROTECTION CIRCUIT

In the event of a headlight failure, the voltage regulator will sense the higher voltage in the circuit and put a ballast resistor in the circuit to drop the voltage to its normal 12 volt operation. See Figure 7-3.

TEST EQUIPMENT

The test procedures outlined in this section require the use of a multitester called a volt-ohm-milliammeter, or an ohmmeter. These instruments can be obtained from local or national electronics supply houses (see Figure 7-4).

Figure 7-4

To determine accurately the condition of components of the ignition system, an ignition analyzer should be used. Without the use of test equipment, coils, condensers, or breaker point assemblies may be replaced needlessly. A wide variety of ignition analyzers is available from various manufacturers. In addition, some automotive testers having the proper specifications can be used. The use of the Graham, Merc-O-Tronic, or Stevens ignition analyzers is particularly recommended, since these units have provisions for checking all functions of the ignition system (see Figure 7-5).

Detailed instructions for the use of any tester are provided with the unit; therefore, only general information is given here. All components of the ignition system should be checked, even though replacing a single part seems to have corrected the trouble. For example, replacing points may have increased the spark (coil output), but further improvement may be realized if a condenser is found to be weak and is replaced.

The following values are provided for checking the ignition coil:

Graham Tester Model 51

Maximum Secondary	30,000 ohms
Maximum Primary	4.0 ohms
Coil Index	60
Minimum Coil Test	30
Gap Index	50

#3 Merc-O-Tronic

Operating Amperage	0.9
Primary Resistance	1.3 to 1.7 ohms
Secondary Resistance	60 to 70 (index number)

#1 Old Stephens Tester

Switch B Index Reading 0.8 to 1.0

#2 New Stephens Tester

Switch B Index Reading 22 using MA-12 Adapter

Figure 7-5

MAGNETO

REMOVAL

a. Remove starter housing (see Figure 7-6) and front fan housing.

b. Remove three screws attaching ratchet and ratchet mount to flywheel (see Figure 7-7). Remove ratchet mount.

c. Remove flywheel nut (see Figure 7-8). Use spark plug wrench handle in hole on rim of flywheel to keep flywheel from turning while removing nut.

d. Remove flywheel from crankshaft (see Figure 7-9), using flywheel puller (Service Tool #378103). Magneto drive coils, condenser, and breaker point assembly are now accessible for servicing (see Figure 7-10).

e. Disconnect primary leads from terminals on top of ignition coils. Pull high tension leads from ignition coils (see Figure 7-11). Loosen ignition coil clamp screw to remove ignition coils.

Figure 7-6

TESTING

For conclusive testing, the ignition coils should be removed. The breaker point assembly, condenser, and magneto drive and alternator coils, however, are tested in position and are removed only for replacement.

FLYWHEEL

Check charge polarity with a compass. Compass arrow should point in direction of arrow on flywheel.

Figure 7-7

BREAKER POINTS

Breaker points should be inspected at least once each season and replaced whenever necessary. Under normal running conditions, breaker

Figure 7-8

Figure 7-9

Figure 7-11

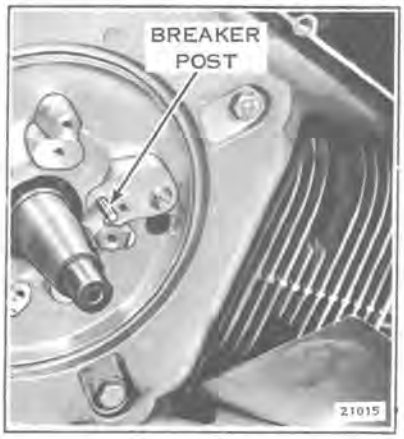


Figure 7-12

point contacts will appear slightly rough and gray in color. Abnormal points will appear excessively pitted, may have a considerable amount of material transferred from one contact surface to the other, and will generally be blue in color.

Severe pitting, burning, or bluing can usually be traced to such conditions as a faulty condenser, or deposits of foreign material, especially grease or oil, on the contact surfaces. Faulty condensers require replacement. Foreign deposits can be attributed to careless handling of points during installation, use of excessive lubricant on the oiler wick, or a leaky front crankcase seal.

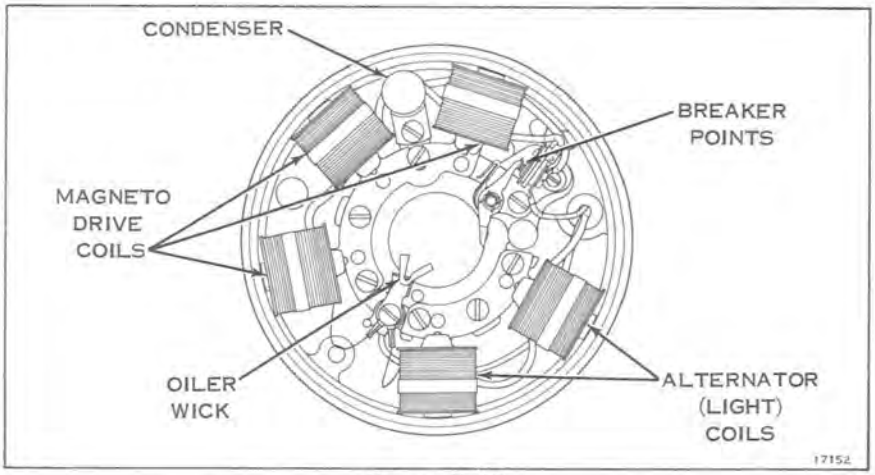


Figure 7-10

Wipe breaker point post clean before installing new breaker points to ensure a clean surface for the breaker point bushing to pivot on (see Figure 7-12). Turn the eccentric adjusting screw into the plate until it bottoms so that there is adequate screw engagement to hold breaker point gap of .022-.024. Set points on highest point of cam lobe.

Breaker point spring tension is predetermined and does not require adjustment.

Dirt, foreign particles, and oil are detrimental to contact performance. The oils and acids from a person's hand, even though clean, can affect contact resistance. Oil deposits on the points will cause them to burn after a very short period of operation. If points need cleaning, saturate a piece of bias tape in alcohol or trichlorethylene and work it up and down between the points. Finish with a clean, dry piece of hard finish paper card stock to remove any residue which might cause point burning.

NOTE

If points cannot be cleaned satisfactorily by this method, replace them. DO NOT use an abrasive stone or file to remove residue across new or old breaker contacts. If new breaker points have high resistance across their contact surfaces, making use of a continuity meter during breaker point adjustment difficult, snap the contacts open and closed manually several times.

CONDENSER

The following four factors affect condenser performance; each factor must be considered in making a complete condenser test.

1. Breakdown - A failure of the condenser insulation; a direct short between metallic elements in the condenser. This prevents any condenser action.

2. Low insulation resistance (leakage) - Prevents condenser from holding a charge. All condensers are subject to leakage which up to a certain limit is not objectionable.

3. High series resistance - Excessive resistance in the condenser circuit due to loose condenser mounting, broken strands or poor connections inside the condenser, or to defective lead connections. This will prevent normal condenser action, causing rapid breaker point burning or ignition failure.

4. Capacity - Determined by the design and condition of the condenser. For a complete check of the condenser, use a tester (see Figure 7-13) which will test the condenser for correct capacity, series resistance, and leakage resistance. Follow the instructions given by the manufacturer of the test equipment. The condenser should be replaced if it fails to meet any one of the three tests.

Figure 7-13

SAFETY PRECAUTION

High voltage is applied to the condenser in the leakage test. Handle leads carefully and turn selector switch to "DISCHARGE" before disconnecting leads from condenser.

MAGNETO DRIVE COILS

A good magneto drive coil will not function properly if incorrectly mounted or connected. If the coil heels are not properly aligned with the bosses on the magneto plate, the gap between the flywheel magnet and coil heels may be too great. Connections that are not clean and tight will cause high resistance which will limit current flow. Visually inspect the coil mounting and connections before condemning a coil. Test the coil for correct resistance, using the ignition analyzer.

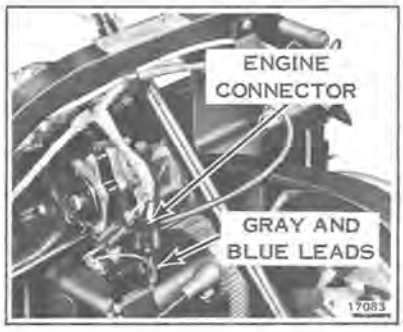


Figure 7-14

IGNITION COILS

Ignition coils (see Figure 7-11) should be tested for correct secondary resistance, correct primary resistance, coil polarity, and coil output. In addition, the coil insulation should be tested for leakage. See specification page for values.

SAFETY PRECAUTION

Perform all tests on a wooden or insulated bench top to prevent leakage or shock hazards. Follow the equipment manufacturer's instructions. A low reading on the tester indicates a weak coil which must be replaced. No attempt should be made to improve this spark by increasing primary current; a coil is defective if it does not give a good reading on the specified primary current.

Coils should be installed with primary terminals aligned fore and aft to avoid accidentally grounding primary circuit.

NOTE: Magneto drive coils can be tested for correct resistance without removal of starter housing and flywheel. Separate engine connector (Ref. Figure 7-14). Put ohmmeter leads across gray and light blue lead connector half. Set meter on low ohms scale. Reading should be .8 ohms. Points must be open or reading will be zero ohms. Points can be opened by rotating flywheel.

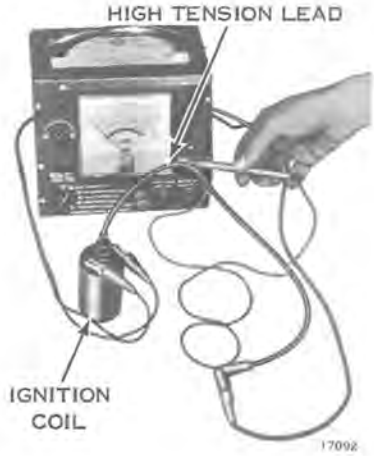


Figure 7-15

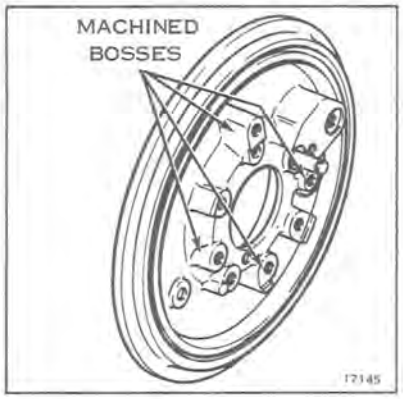


Figure 7-16

Figure 7-17

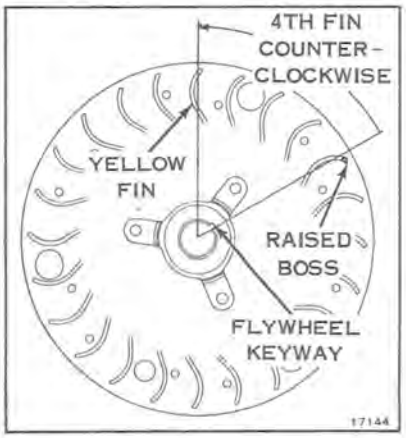


Figure 7-18

HIGH TENSION LEADS

Spark plug high tension leads may be tested for leakage or insulation failures by using the ignition analyzer and an ignition coil (see Figure 7-15). Connect the coil to the ignition analyzer as for the coil test. Connect a separate test lead with suitable clips to the secondary terminal of the coil and to the conductor of the spark plug lead. Probe the entire insulated surface of the spark plug lead with the grounded test probe. Arcing will be apparent wherever the insulation has broken down, due to moisture or carbon trails. Check leads for continuity.

REASSEMBLY

a. Install magneto drive coils, making certain that coil laminations are flush with bosses on magneto plate (see Figure 7-16).

b. Install breaker assembly over breaker post.

c. Install condenser. Connect magneto drive coil lead, condenser lead, and lead from electrical panel assembly to breaker point screw terminal.

d. Install cam Woodruff key and cam on crankshaft.

e. Install new oiler clip and wick in position on mounting boss (see Figure 7-10). Apply Delco #U-1901 1948792 distributor lubricant to oiler wick and to point cam follower on side toward cam rotation.

f. Cam must be removed from flywheel. Adjust breaker points, using a feeler gage and with the breaker cam and key installed on the crankshaft (see Figure 7-17). Point gap should be set to .022-.024 inch with the breaker arm on the high lobe of the cam (full open).

g. Rotate crankshaft so that crankshaft keyway is 180 degrees opposite breaker point pivot pin. This will bring low point on cam next to fiber block, facilitating assembly.

h. Place Woodruff key in crankshaft keyway. Place cam back in position on flywheel. Place flywheel on crankshaft. When flywheel and cam are properly seated, outer edge will be approximately 1/32 inch above shoulder on crankshaft. DO NOT use force. If it is impossible to position flywheel properly, remove it and repeat above procedure.

i. Place washer and flywheel nut in position. Torque flywheel nut to 40 - 45 foot pounds.

j. Install front fan housing.

k. When this procedure is followed, engine is timed correctly without further adjustment. To recheck, use an automotive timing light, either a 12 volt or 110 volt model. One of the cooling fins on the flywheel out from the keyway has a small raised boss. The fourth fin, counterclockwise after the fin with boss, should be painted yellow (if paint has deteriorated, repaint). With the engine operating at idle speed (1100 to 1300 rpm), this painted mark can be seen in center of timing hole when light is focused there. Timing slot is approximately 7/8 inch long, and is located above the manual starter (at about the 12 o'clock position) in the outer fan housing (see Figure 7-18).

Figure 7-19

Figure 7-20

Figure 7-21

Figure 7-22

SPARK PLUGS

The condition and appearance of spark plugs taken from an engine may be a guide to the type and source of engine trouble. Proper spark plug heat range and normal engine conditions will produce powdery deposits of a rust brown to grayish or tan color on the firing end of the insulator, and a minor degree of electrode wear (see Figure 7-19). Highly leaded fuels may produce white to yellowish powdery deposits on the firing end of the spark plug. These deposits will not interfere with normal spark plug performance if plugs are cleaned at regular service intervals. See page 4-3 for a discussion on spark plug heat range.

a. If the insulator tip is an exceptionally light tan or whitish color, or the center electrode burned away, the heat range may be too hot (see Figure 7-20).

b. A dark, black or sootlike coloration, or wet appearance, ordinarily indicates the heat range as being too cold (see Figure 7-21). Black, sooty deposits on the entire firing end of the spark plug result from incomplete combustion due to an overly rich air-fuel mixture, incorrect choke setting, or misfiring caused by faulty ignition components.

c. A definite white coloration may indicate the presence of moisture in the combustion chamber. Similar deposits are caused by preignition.

d. Oil fouling deposits wet, sludgy deposits and is a result of misfiring or of excessive oil in the fuel mixture (see Figure 7-22).

e. Burned or overheated spark plugs may be identified by a white, burned, or blistered insulator nose, and badly eroded electrodes. Excessive deposits in the combustion chamber, a lean fuel mixture or improperly installed spark plugs can cause overheating.

The condition of spark plugs may provide an indication of other conditions requiring attention. Inspect each plug and gasket as it is removed. Place the spark plugs in a holder in order of removal, to assist in locating trouble. Inspect each plug for worn electrodes, glazed, broken, or blistered porcelain, and replace plugs where necessary. Plugs that are severely carbon fouled, that have blistered or cracked insulator tips, or plugs that have eroded electrodes must always be replaced. Plugs that are slightly contaminated with deposits, or which have wider than recommended gap settings can be cleaned and regapped for further use. Plugs that appear slightly contaminated can be cleaned by careful scraping, using a small knife or similar instrument. After combustion deposits have been removed, bend the side electrode back slightly so that the center electrode can be filed flat.

DO NOT clean plugs on abrasive blasting machines. This type of cleaning tends to remove the hard, smooth finish from the insulator tip and reduces the tip's resistance to the formation of combustion deposits. Blasting also tends to pack the abrasive between the insulator top and the metal shell of the plug. If the abrasive is not removed before installing the plug, it may pass through the engine, causing piston or cylinder wall scoring.

After the plug has been cleaned, adjust the gap to .028 to .032 inch by bending the side electrode. Adjust only the side electrode, as attempting to bend the center electrode will crack the insulator. Use a round wire feeler gage to measure gap adjustment (see Figure 7-23).

Poor engine performance and premature spark plug failure may result from improper spark plug installation. Before installing the plug, be sure the plug seat in the cylinder head is cleaned and free from

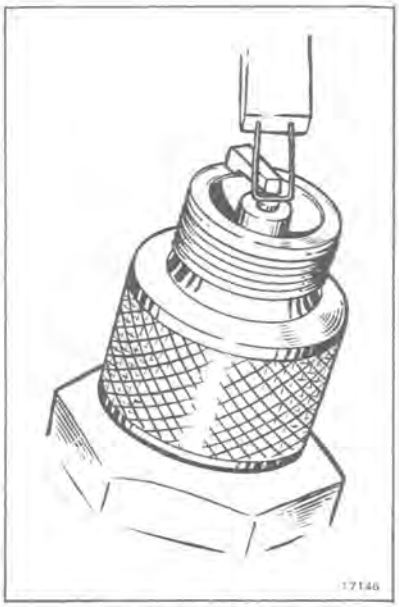


Figure 7-23

obstructions. Inspect spark plug hole threads, clean, and coat with DuPage high temperature thread compound before installing plugs. Always use new gaskets when installing spark plugs. Tighten spark plugs 20 to 20-1/2 foot pounds, using a torque wrench.

Improper installation is one of the greatest single causes of unsatisfactory spark plug performance. Improper installation is the result of one or more of the following:

1. Installation of plugs with insufficient torque to correctly compress the gasket.

2. Installation of plugs using excessive torque can strip the threads in the cylinder head.

3. Installation of plugs on dirty gasket seal.

4. Installation of plugs in corroded spark plug hole threads.

SECTION 8
MANUAL STARTER

TABLE OF CONTENTS

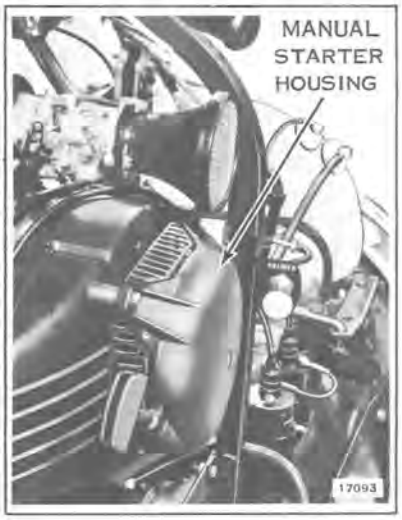


Figure 8-1

Figure 8-2

DESCRIPTION

The manual starter converts straight line motion to rotary motion necessary to crank the engine. Pawls on the starter pulley engage the flywheel ratchet when the starter rope handle is pulled. When the engine starts, centrifugal force moves the pawls outward, disengaging them from the ratchet. A recoil spring is wound as the rope is pulled and unwinds as the starter handle is returned to the starter housing.

CAUTION

Never release handle at end of stroke, allowing rope to snap back. Serious damage will result.

REMOVAL AND DISASSEMBLY

SAFETY PRECAUTION

It is good practice to wear safety glasses while disassembling and reassembling manual starters.

a. Remove four screws (see Figure 8-1) attaching manual starter assembly to fan housing. Remove starter assembly from fan housing.

b. Pull starter rope out far enough to tie a slip knot in rope. Pry rope anchor out of starter handle (see Figure 8-2). Remove rope from anchor, and remove starter handle from starter rope.

c. Release knot, and ease starter pulley back until starter spring is fully unwound.

d. Remove starter spindle screw, and remove all components of starter pulley spindle assembly (see Figure 8-3).

e. Jar the housing, pulley side down, on bench to dislodge spring washer and pulley from housing.

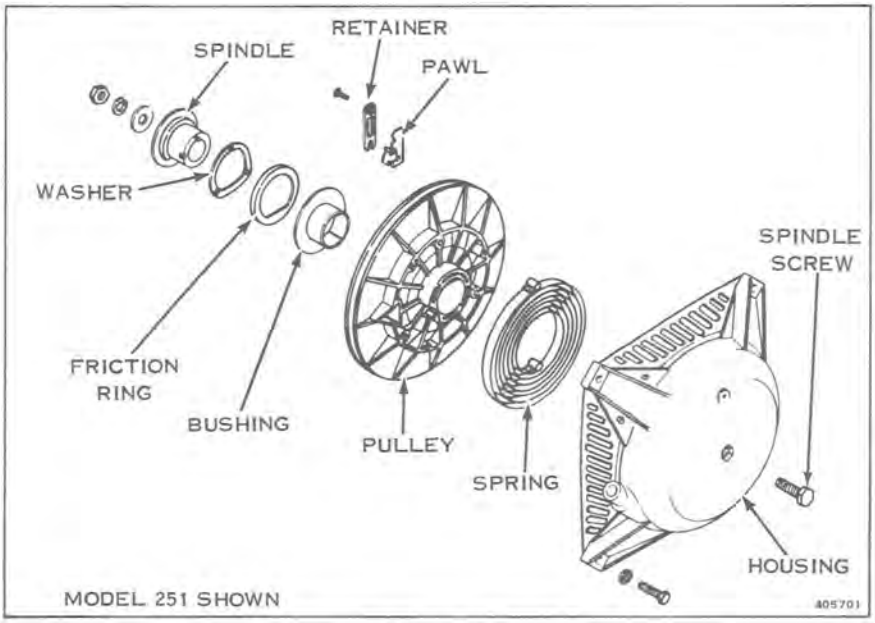


Figure 8-3

CLEANING, INSPECTION, AND REPAIR

a. Wash metal components in solvent and blow dry with compressed air.

b. Inspect spring for broken end loops or insufficient tension.

c. Examine starter pawls and ratchet for excessive wear.

d. Inspect friction ring and spring, spindle bushing, spindle, and retainers.

e. Inspect rope and discard if frayed. Replace with starter rope cut length of 73-3/4 inches.

f. Examine pulley and housing rope eye for sharp edges and rough surfaces that might cause rope fraying. File and polish as necessary.

REASSEMBLY

a. Rewind starter spring manually so it will fit inside starter housing.

b. Place outside spring end loop on starter housing anchor pin.

c. Grease spring. Use standard oil Rykon EP #2.

d. Replace starter pulley with inside spring end loop fitted on starter pulley pin.

e. Grease hub of pulley before installing bushing.

f. Grease inside of bushing and install spindle, spring washer and friction ring, in bushing. Fasten with screw, washers and nut.

g. Wind pulley counterclockwise until tight.

h. Unwind pulley clockwise until pulley anchor hole lines up (approx.) with starter rope hole in starter housing.

i. Lock starter pulley in position by aligning holes in pulley and housing and inserting a nail or pin through them.

j. Tie a knot in one end of starter rope. If installing a new rope, be sure length measures 73-3/4 inches. Fuse nylon strands over an open flame at each end for about one-half inch. Rope ends must be stiff to hold in pulley and in rope anchor.

k. Insert rope through pulley and starter housing. Seat rope knot firmly in pulley. Tie a slip knot in starter rope and allow pulley to rewind.

l. Install pawls, retainers, and screws, if they have been removed.

m. Thread starter rope through rope handle, using starter rope threading tool (Service Tool #378774) (see Figure 8-4). Thread rope through anchor, and press rope into channel in rope anchor (see Figure 8-2), with end of rope butting firmly against end of channel. Press rope anchor into handle. Remove knot in starter rope and allow pulley to rewind.

n. Pull on starter rope to make certain that pawls work properly. When starter rope is pulled, pawls should pivot to engage flywheel ratchet. On releasing rope, pawls should retract to starting positions.

o. Attach manual starter assembly to fan housing with four screws.

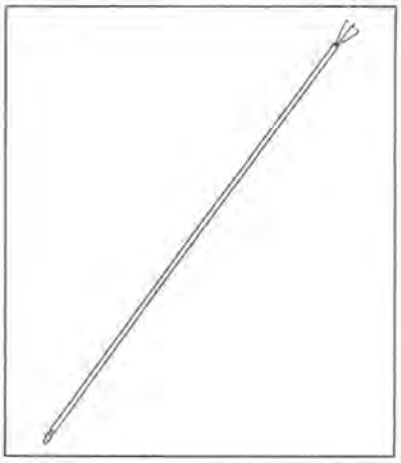


Figure 8-4

STARTER ROPE REPLACEMENT

Figure 8-5

a. Pull starter handle until rope is fully unwound. Lock starter pulley in position by aligning holes in housing and pulley and inserting a nail or pin through them.

b. Pry rope anchor out of starter rope handle. Disengage rope from anchor, and remove handle. Remove old rope from pulley.

c. Cut new starter rope to length of 73-3/4 inches. Fuse ends of rope over open flame for about one-half inch. Rope ends must be stiff to hold in pulley and rope anchor. Tie knot in end of rope and thread through pulley and housing.

d. Thread rope through starter handle, using starter rope threading tool (Service Tool #378774) (see Figure 8-4). Thread rope through rope anchor, and press rope into channel and rope anchor (see Figure 8-5), with end of rope butting firmly against end of channel. Press anchor into handle.

e. Remove locking pin and allow starter to rewind.

SECTION 9
ENGINE

Figure 9-1

DESCRIPTION

The snow machine is driven by a two-cycle, twin-opposed cylinder, air-cooled engine (see Figure 9-7). This section gives instructions for removal and overhaul of the engine. Principles of two-cycle engine operation are discussed in Section 3. Trouble shooting procedures are given in Section 4.

ENGINE REMOVAL

1. Before removing hood:

   a. Disconnect headlight wiring. Separate connectors by squeezing top and bottom tabs of connector and pull. See Figure 9-1.

   b. Remove gas cap and hood hold down nuts.

   c. Lift off hood.

   d. Replace gas cap.

Figure 9-2

2. Remove transmission belt using following procedure:

   a. Remove three wing nuts and lift off belt guard.

   b. Separate halves of secondary sheave by pulling movable half of sheave toward center of machine. This is most easily done from the right side of the snowmobile with a hand at top and bottom of the sheave as shown in Figure 9-2.

SAFETY PRECAUTION

Keep fingers from between halves of secondary sheave when performing next step. Movable half of sheave is spring loaded and will snap close when belt is removed.

Figure 9-3

   c. From left side of machine, work belt over top of movable half of secondary sheave. See Figure 9-3.

   d. Push bottom half of belt from between halves of sheave so they can move as close together as possible.

   e. Work belt out from under the movable half of sheave.

   f. Move the belt between the end cap and the steering column.

   g. Move the belt between end cap and engine.

   h. Pass the belt from around the primary, and the belt is free to be removed from the vehicle.

   i. Inspect transmission belt. A belt measuring less than 1" across width must be replaced with a new one. Worn belt should be returned to owner for use as a spare. A spare belt should be carried at all times.

Figure 9-4

3. Remove throttle cable (1) using the following procedure: Depress thumb throttle lever. Hold throttle in open position. Slip end of throttle cable through nylon pivot pin (2). Remove jam nut on intake manifold and turn cable fitting out of manifold. See Figure 9-4.

4. Remove spark plug leads from spark plugs and rear plug clamp. See Figure 9-5.

5. Disconnect two engine electrical connectors.

6. Disconnect primer hose at intake manifold. (Spread clamp to remove hose.)

7. Disconnect inlet hose from fuel pump. See Figure 9-6.

8. Disconnect fuel return hose at carburetor. See Figure 9-6.

9. Remove compression control from instrument panel. See Figure 9-6.

10. Loosen manifold to muffler clamps. Loosen muffler mounting bolts.

11. Remove four nuts and washers attaching engine frame to chassis. See Figure 9-6.

12. Remove engine assembly from chassis.

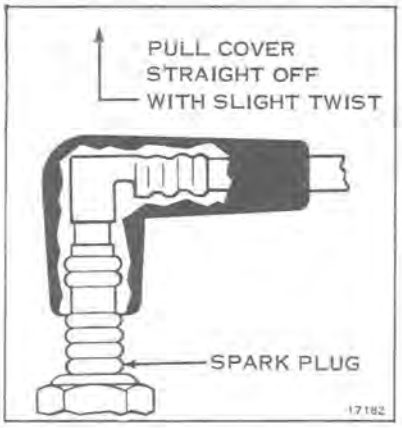


Figure 9-5

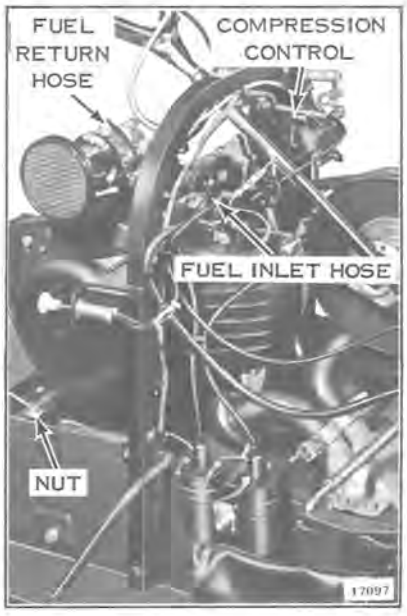


Figure 9-6

ENGINE DISASSEMBLY

a. Before disassembly, clean outside of engine to prevent dirt from getting on internal parts of engine.

b. Remove carburetor, intake manifold and leaf valve assembly. For detailed instructions, see Section 6.

c. Remove primary drive assembly. (See Section 10.)

d. Remove manual starter assembly and outer fan housing. Remove manual starter ratchet assembly, flywheel, magneto cam and inner fan housing. (See Sections 7 & 8.)

e. Remove compression relief valve.

f. Remove spark plugs.

g. Remove exhaust manifolds from cylinder barrels if maintenance is necessary.

h. Remove cylinders and crankcase group from engine frame assembly.

NOTE

Before performing next step, take note that cylinders must be replaced on side of crankcase from which they were removed.

i. Remove the eight cylinder stud nuts and lockwashers. The cylinder barrels can now be removed from the crankcase. See Figure 9-7.

NOTE

If it is necessary that only the cylinders and pistons be serviced, this can be accomplished with only the cylinder barrels removed.

j. Remove screws from crankcase halves and drive out two alignment roll pins. Heat up crankcase halves in bearing area to approximately 450°F. (IMPORTANT - when heating crankcase, be careful not to damage seals.) Tap crankcase with rawhide mallet to break seal, and separate crankcase halves. See Figure 9-10.

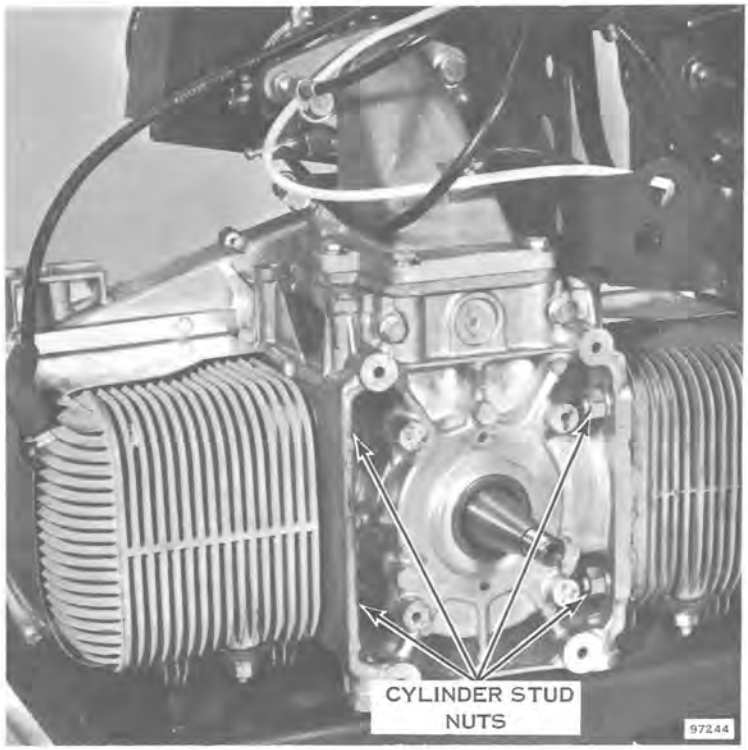


Figure 9-7

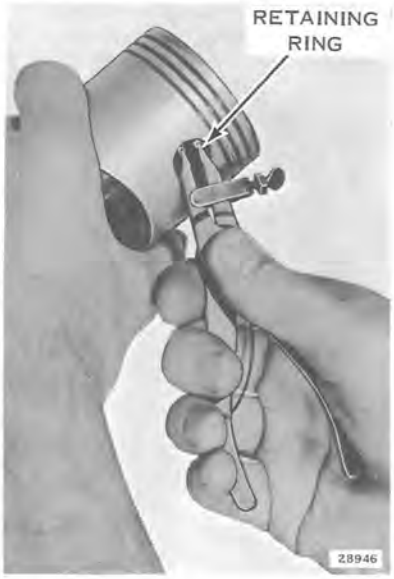


Figure 9-8

CAUTION

Pistons, connecting rods, and caps are matched parts and seat with the operation of the engine. Because of this, it is essential to maintain their original positions at reassembly. Mark each connecting rod and cap, piston, and bearing component to assure correct mating during reassembly. Also mark the cylinders and crankcase halves from which they are removed.

k. Remove connecting rod caps.

l. Remove connecting rods from crankshaft.

m. Reinstall matched caps on connecting rods.

n. Remove rings from pistons. DO NOT try to save the rings even when they are not stuck. Install a complete set of new rings on every overhaul.

o. If necessary to remove connecting rods from pistons, remove wrist pin retaining rings, using Truarc No. 1 pliers (Service Tool #303857) (see Figure 9-8). Press out wrist pin to free piston from connecting rod. See Figure 9-9. Piston wrist pin hole marked "Loose" should be up when pressing out wrist pin. This will prevent damage to piston.

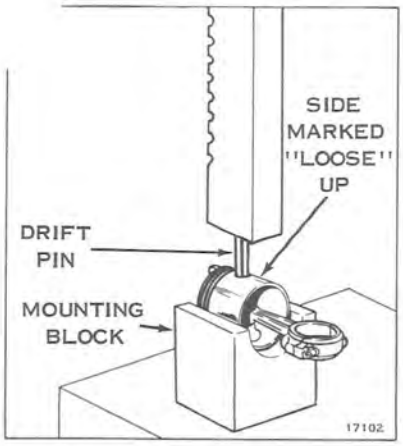


Figure 9-9

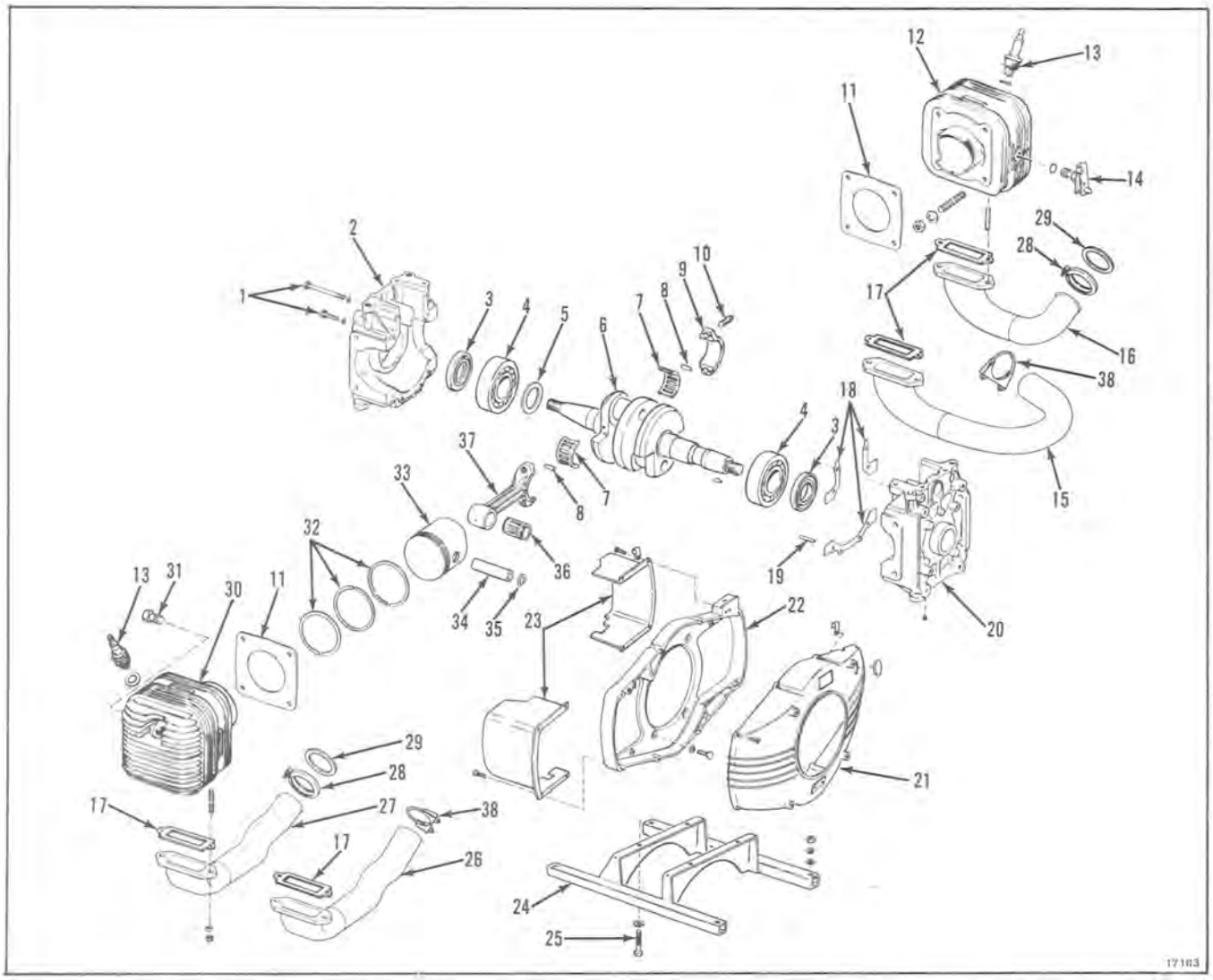


Figure 9-10

1. Crankcase Screws
2. Crankcase Half (Primary Drive Side)
3. Crankshaft Seal
4. Crankshaft Bearings
5. Shim
6. Crankshaft
7. Needle Bearing Retainer
8. Needle Bearing
9. Connecting Rod Cap
10. Connecting Rod Screw
11. Cylinder Gasket
12. Front Cylinder
13. Spark Plug
14. Compression Relief Valve
15. Front Exhaust Manifold (Model 251 HP)
16. Front Exhaust Manifold (Model 251)
17. Exhaust Manifold Gasket
18. Crankcase Gaskets
19. Roll Pin
20. Crankcase Half (Flywheel Side)
21. Fan Housing (Outer)
22. Fan Housing (Inner)
23. Cylinder Shrouds
24. Engine Frame
25. Engine Mounting Bolt
26. Rear Exhaust Manifold (Model 251 HP)
27. Rear Exhaust Manifold (Model 251)
28. Muffler Clamp (Model 251 Only)
29. Gasket (Model 251 Only)
30. Rear Cylinder
31. Compression Relief Plug
32. Piston Rings
33. Piston
34. Wrist Pin
35. Retaining Ring
36. Needle Bearing Assem.
37. Connecting Rod
38. Muffler Clamp (Model 251 HP Only)

CLEANING, INSPECTION AND REPAIR

SAFETY PRECAUTION

When using trichloroethylene as a cleaning agent, use in a well ventilated area at ambient temperatures. Under no circumstances should the solvent be heated. Trichlorethylene vapors are poisonous.

CYLINDERS

a. Remove carbon from exhaust ports and cylinder heads. Carbon accumulation in exhaust ports restricts flow of exhaust gases and has a considerable effect on motor performance. Carefully scrape carbon from cylinder heads and exhaust ports with scraper or other suitable tool. Exhaust ports and all exhaust passages must be free from carbon deposits to insure maximum performance. Clean compression relief valve and check for free action.

CAUTION

DO NOT scratch gasket surfaces. Scratches can cause compression losses.

b. Check cylinder walls for excessive wear. Measure cylinder bore for size and straightness by using an inside micrometer or dial bore indicator. If wear is excessive, or cylinder is badly scored, replace. Major portion of wear will be in port area and area covered by ring travel.

GASKETS AND GASKET SURFACES

Figure 9-11

a. Discard all gaskets, seals, and O-rings. Use new gaskets and seals in reassembly.

b. Remove all traces of dried cement and old gasket material, using trichlorethylene or lacquer thinner.

c. Check gasket faces for flatness. Under certain conditions, gasket faces may warp or spring, particularly where thin sections or flanges are employed and are subject to temperature changes. To check for flatness, lay a sheet of No. 120 emery cloth on a surface plate or piece of plate glass (see Figure 9-11). Place part to be surfaced on emery cloth and move slowly back and forth several times in a figure 8 motion, exerting evenly distributed, light pressure. Lift part from surface plate to observe results. If surface is actually warped or spring, high spots making contact with lapping surface will take on a dull polish, while low areas will retain their original state. To insure flatness over entire surface, continue surfacing until entire gasket surface has been polished to a dull luster. Finish surfacing with No. 180 emery cloth.

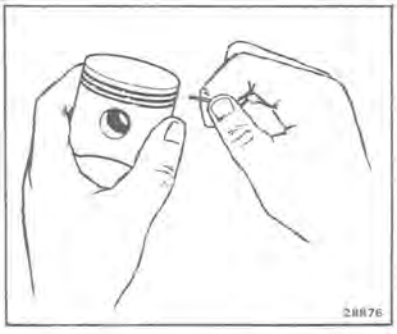


Figure 9-12

PISTONS

a. Carefully remove carbon deposits from piston head. Inspect ring grooves for carbon accumulation, excessive wear, or damage to ring seats. Carefully scrape carbon from ring grooves (see Figure 9-12), making certain that carbon clinging to bottom and sides of grooves has been thoroughly removed, without scratching or otherwise damaging the grooves. A suitable tool for cleaning ring grooves can be made by breaking a piston ring, grinding an angle

on the edge, and breaking the lower sharp edge to prevent damage to lower ring land (see Figure 9-13).

b. Check pistons for roundness, taper, excessive skirt wear, and scoring, Piston skirts must be perfectly round and unscratched to prevent entry of exhaust gases into crankcase chamber. Check piston size, taper, and roundness, using a micrometer (see Figure 9-14). Check clearance between piston and cylinder before reinstalling piston (see Figure 9-15). Check tolerances on spec. sheet page 2-2.

c. Before installing new piston rings, check gap between ends of ring by placing ring in its respective cylinder bore (see Figure 9-16). Press ring down in bore slightly with bottom of piston to square it up. Discard and replace with different ring if gap is too large or too small (see Section 2, Specifications).

d. Check each ring in its respective ring groove for tightness or binding by rolling the ring around the piston groove (see Figure 9-17). Check for groove side clearance with feeler gage (see Figure 9-18) (see Section 2, Specifications).

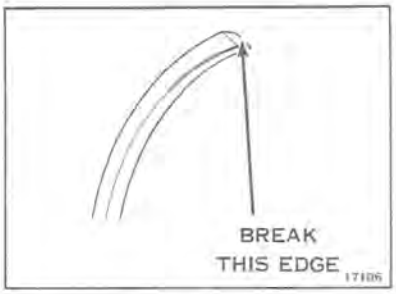


Figure 9-13

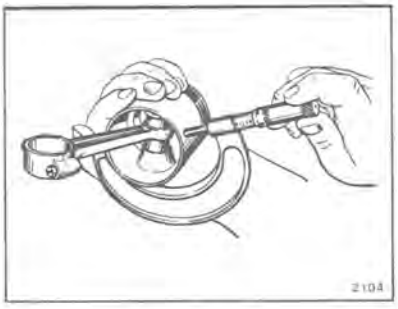


Figure 9-14

BEARINGS

NOTE

All areas where bearings are to be serviced must be free from oil and dirt. DO NOT spin ball or roller bearings before they are cleaned. Dirt in the races could cause serious damage.

a. Clean bearings while they are still on crankshaft by emersing them in a cleaning solvent and turning outer race of bearing. Flush all dirt from around balls and separators. Tank should be equipped with a screened false bottom to prevent settlings from being stirred up into the bearings. Agitate bearings frequently until all oil, grease, and sludge have been loosened and can be flushed out. Bearings with especially heavy carbon deposits or hardened grease should be soaked in a separate container of solvent.

b. Use a spray gun with air filter and a cleaning solvent to flush each bearing until all dirt and residue have been removed. Blow solvent out of bearings, using dry, filtered air. Do not spin bearings by force of air.

c. Since dry bearings rust rapidly, lubricate them immediately in light, clean oil. Rotate them a few times to spread the oil film and place them in a clean, covered container for inspection later.

d. Discard and replace any bearing that shows any of the following:

1. Rusted balls, rollers, or races.

2. Fractured ring. This may be caused by forcing a cocked bearing off a shaft or by too tight a press fit.

3. Worn, galled, or abraided surfaces. These may be caused by too loose a fit, or a bearing locked by dirt and turning on the shaft or in the housing.

4. Badly discolored balls, rollers, or races. This is usually due to an inadequate supply of lubricant. Moderate discoloration is not a cause for discard.

Figure 9-15

Figure 9-16

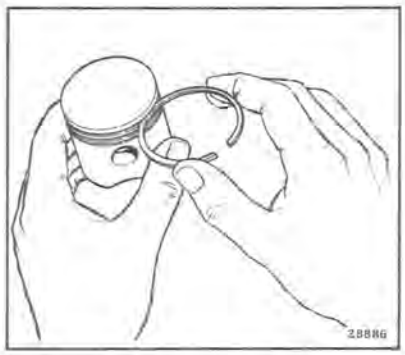


Figure 9-17

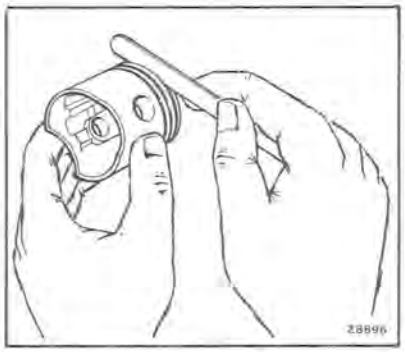


Figure 9-18

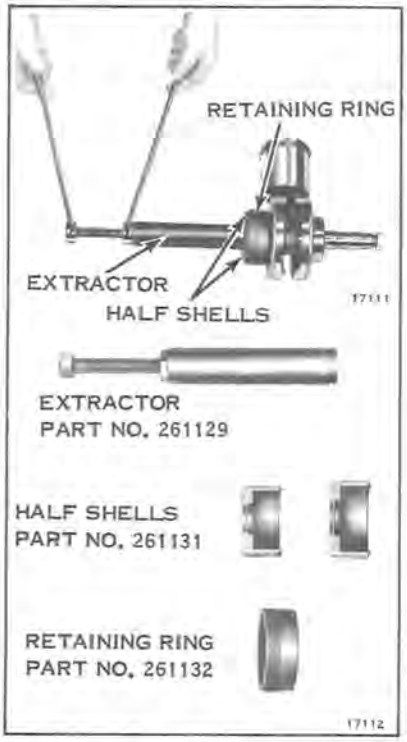


Figure 9-19

e. If bearings must be replaced, remove the old bearings using the following procedure: Use special bearing removal tool shown in Figure 9-19. Position lips of half shells behind bearing and over extractor. Slide retaining ring over half shells. Turn extractor center screw to remove bearing. This tool is a must if main bearing replacement is required. Do not lose shims between bearing and crankshaft throw.

ASSEMBLY OF ENGINE

Refer to Parts Catalog exploded views for correct sequence of assembly. Make no forced assemblies unless press fits are called for. Make no dry assemblies. Lubricate all moving parts with a light film of oil. Be sure all parts are clean and free from dirt and grit. Perfectly good cylinder walls, pistons, and rings can be ruined in a few minutes of operation if grit remains after assembly. Work in clean surroundings and with reasonably clean hands. Coat all bearing surfaces, cylinder walls, etc., with clean oil before assembly.

NOTE

Use new gaskets and seals throughout when reassembling the engine. Apply Perfect Seal #4 to both sides of crankcase gasket before assembly.

PISTONS, WRIST PINS, AND CONNECTING RODS

a. Install wrist pin needle bearing in connecting rod, using an arbor press.

b. Apply a coat of oil to wrist pin, making sure that surface is clean. Place a drop of oil in each pin hole in piston.

c. Oil wrist pin bearing in connecting rod. Heat piston in water, approximately 140°F. Insert wrist pin through hole in one side of piston. Place connecting rod in position in piston, then complete wrist pin installation.

d. Replace retaining rings, lettered side out, making certain they seat securely in the groove provided.

e. Check piston with micrometer to determine whether piston has been distorted during assembly. Maximum permissible distortion is .003 below wrist pin boss only.

PISTON RINGS

a. Install the piston rings on each piston. Spread each ring with a ring expander just enough to slip it over the head of the piston and into place (see Figure 9-20). Be sure that the rings fit freely in the piston ring grooves.

b. Be sure that piston rings are correctly positioned in piston ring grooves. Be sure dowel pins on piston are centered between ring gaps.

Figure 9-20

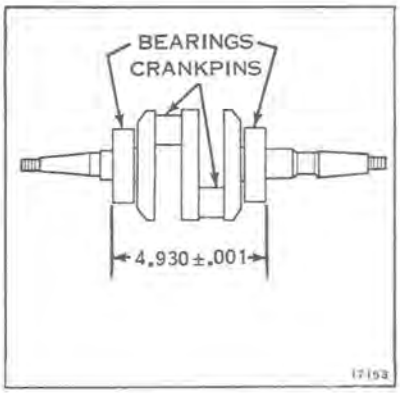


Figure 9-21

Figure 9-22

CRANKSHAFT

a. Install crankshaft shims and journal bearings on crankshaft, using an arbor press. Be sure to support properly to prevent distortion. Shims must be installed on primary drive side (not magneto side) of crankshaft, between the bearing and the thrust face of crankshaft. Crankshaft end play should not exceed .025" after installation. Total dimension across bearings should be 4.930" ± .001". See Figure 9-21.

b. Remove connecting rod caps from connecting rods. Apply a coat of OMC NEEDLE BEARING GREASE (Part No. 378642) to connecting rod bearing area. Assemble needle bearings (16) and retainer halves, with connecting rod and connecting rod cap, to crankpin.

NOTE

Bearing retainer halves are matched. DO NOT interchange retainer halves or turn them end for end.

c. Attach connecting rod to caps. Connecting rod caps are not interchangeable, neither may the caps of the same rod be turned end for end. Match marks are provided to assure correct assembly. Draw a pencil over edge surface on both sides of rod to make certain that cap and rod are correctly aligned (see Figure 9-22). If misaligned, offset edge will be felt with pencil point. Tighten connecting rod cap screws together. If alignment is satisfactory, tighten connecting rod cap screws to specified torque. If alignment is necessary, tap into alignment with drift punch. Check for binding. Bearings and retainers must float freely on crankpins.

d. Install crankshaft seals in crankcase halves.

e. Use a new crankcase gasket. Coat gasket with Perfect Seal #4 and place on one crankcase half. If gasket requires trimming, be sure to use a very sharp cutting tool. Uneven edges may result in crankcase leakage.

NOTE

It may be necessary to heat crankcase halves with a heat lamp for approximately 15 minutes. This allows easier installation of crankshaft.

f. Replace crankcase alignment roll pins, driving in carefully with a hammer. Replace all crankcase screws and tighten to specified torque.

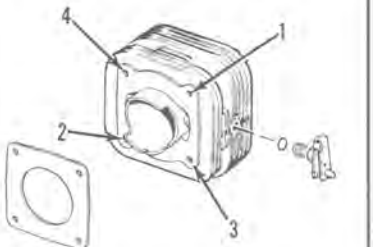
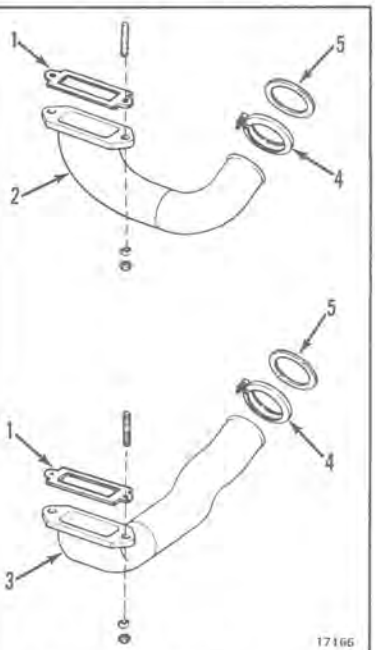


Figure 9-23

Figure 9-24



1. Manifold Gaskets
2. Front Exhaust Manifold
3. Rear Exhaust Manifold
4. Muffler Clamps
5. Gaskets

MODEL 251

Figure 9-25

g. Check crankshaft end play. It should not exceed .025".

h. Crankshaft tapered end must be kept clean (free of grease and finger prints) before assembly of primary sheave.

CYLINDERS

NOTE

251 and 251 HP cylinders are not interchangeable.

a. Install cylinders, using new gaskets. Use a ring compressor (Special tool 426020) to install pistons in cylinders. Tighten nuts in correct sequence to specified torque. See Figures 9-23 and 9-24.

b. Install compression relief valve to forward cylinder using Dupage high temperature thread compound applied to the threads.

NOTE

Retorque cylinder screws after motor test has been completed and motor has cooled off.

c. Attach cylinder and crankcase group to engine frame.

d. Install compression relief cable assembly and adjust. See Page 5-4.

e. Install inner fan housing with magneto and alternator, flywheel, and outer fan housing. See Figure 9-10.

f. Install manual starter (see Section 8).

g. Install leaf valve assembly, intake manifold, carburetor, and air horn. For detailed instructions, see Section 6.

INSTALLATION OF ENGINE ASSEMBLY TO CHASSIS

1. Assemble exhaust manifolds to cylinder barrels if they were removed. Use the following procedure:

a. Place new exhaust manifold gaskets over cylinder studs and then assemble front and rear exhaust manifolds. See Figures 9-25 & 9-26.

b. The gasket surfaces on cylinders and manifolds must be clean and smooth.

c. See page 2-3 for torque specifications.

2. Install engine and frame to chassis.

3. Install primary sheave assembly. See Section 10.

4. Install transmission belt using the following procedure:

a. Loop one end of belt around the primary sheave.

b. Move belt between end cap and engine.

c. Move belt between end cap and steering column.

d. Spread halves of secondary sheave as on page 9-2.

e. Work belt under and around the movable half of secondary sheave and roll sheave forward. Belt will ride up and into secondary sheave.

f. Replace belt guard.

5. Assemble exhaust pipes and muffler. See page 9-12.

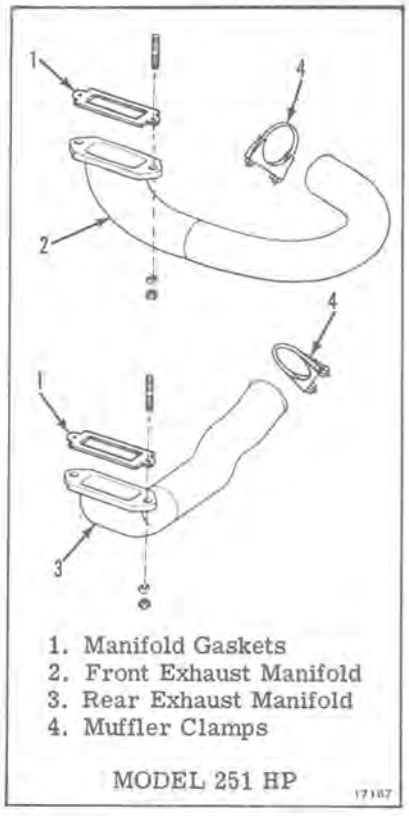
6. Connect throttle cable. Adjust with lever on carburetor fully advanced.

7. Reconnect electrical connectors.

8. Install spark plugs and connect leads.

9. Reconnect fuel lines and throttle cable. See Section 6.

10. Replace hood and reconnect headlight wiring.



1. Manifold Gaskets
2. Front Exhaust Manifold
3. Rear Exhaust Manifold
4. Muffler Clamps

MODEL 251 HP

Figure 9-26

BREAK-IN PROCEDURE

a. Be certain that when an engine is returned to service following an overhaul, the owner is advised to follow break-in procedures as described in the Owner's Manual exactly. This will allow the internal moving parts to seat themselves, thus greatly prolonging engine life.

b. For the first tankful of fuel the vehicle must be operated at reduced speeds.

c. Allow engine to warm up before putting vehicle in gear. Start out slowly; avoid jack-rabbit starts. DO NOT overspeed engine. Operation in extreme cold weather can cause a slow down in the drive and track mechanism. When this occurs, block up rear of snowmobile and place front edge of skis against stationary object and run to free mechanism. DO NOT over-speed or run vehicle for prolonged periods as this can damage drive lugs on track.

d. Observe fuel mixing precautions as described in Section 6.

IMPORTANT

Adjust drive chain tension after the first 3 hours of operation. Refer to Section 10 for drive chain adjustment instructions.

Adjust track tension after the first 10 hours of operation. Refer to Section 11 for track tension and track alignment adjustment instructions.

MUFFLER AND EXHAUST PIPES

REMOVAL

MODEL 251

1. Remove steering tie rods from steering column bracket.

2. Loosen muffler clamp screws and loosen exhaust pipe to muffler clamps. See Figure 9-27.

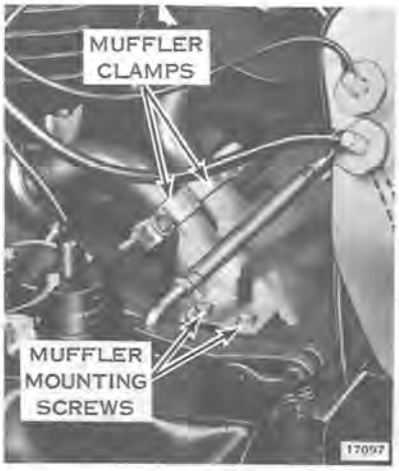


Figure 9-27

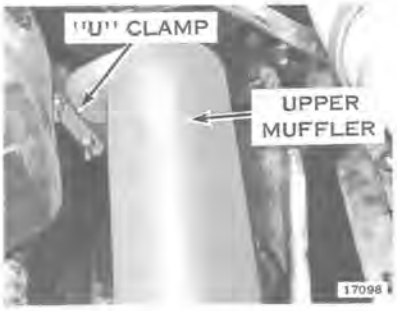


Figure 9-28

Figure 9-29

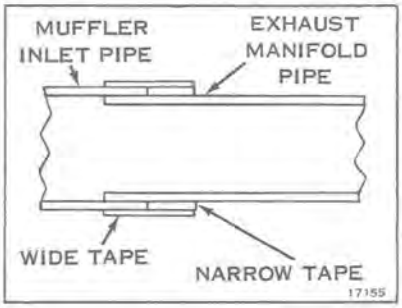


Figure 9-30

Figure 9-31

3. Remove four muffler mounting screws.
4. Loosen two exhaust pipe to exhaust manifold clamps.
5. Remove exhaust pipes.
6. Work muffler out of muffler well.

MODEL 251 HP

1. Note position of "U" clamp in upper muffler. Clamp must be re-installed in same position. See Figure 9-28.
2. Remove nut and washers indicated in Figure 9-29 to remove upper muffler and bracket from chassis.
3. Remove muffler clamps to remove upper muffler.
4. Remove two bolts securing lower muffler to chassis.
5. Loosen lower muffler clamp. Remove four engine mounting bolts and lift engine several inches so that lower muffler can be removed.

REASSEMBLY

MODEL 251

1. Reassemble in reverse order, first making sure mating surfaces are clean and smooth. Use new asbestos tape in the exhaust pipe to muffler connection as follows. See Figure 9-30.
2. Wrap the narrow tape around the exhaust pipe, butting against the muffler inlet pipe.
3. Wrap wide tape around the muffler inlet so that it covers the slots, and extends over the narrow tape. Locate joint in wide tape away from joint in narrow tape.
4. Install the muffler clamp so that it covers the slots in the muffler inlet and hangs over the inlet by 1/8". See Figure 9-27.
5. The clamp gap should be between the slots in the muffler inlet. The joints in the tape should be away from the clamp gap.

MODEL 251 HP

1. Reassemble in reverse order.
2. Maintain a minimum of 1/4" clearance between lower muffler and tie rod. See Figure 9-31.

SECTION 10
DRIVE TRAIN

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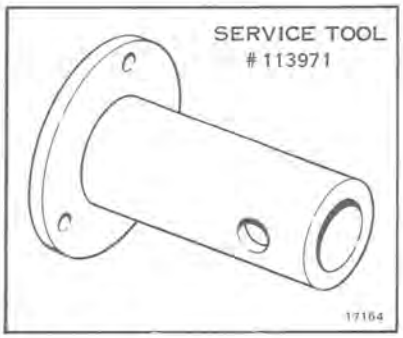

Figure 10-1

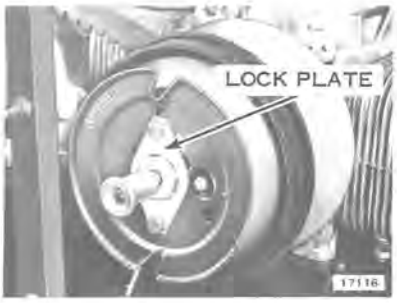

Figure 10-2

Figure 10-3

Figure 10-4

DESCRIPTION

This section gives complete service instructions on the snowmobile drive train system. A brief discussion of the power flow system is included in Section 3.

PRIMARY DRIVE

REMOVAL OF PRIMARY SHEAVE ASSEMBLY

After removing the transmission belt as described in Section 9, the primary sheave assembly can be removed using the following procedure:

1. Remove starter housing.
2. Remove ratchet mount.
3. Attach Service Tool No. 113971 to flywheel with three bolts (see Figure 10-1).
4. Use flat, open end wrench (Service Tool No. 404032) on the square nut on back side of the fixed sheave.
5. While holding the service tool attached to the flywheel, rap the open end wrench with a rawhide mallet in counterclockwise direction. (Power take-off end of crankshaft has right hand thread.) After nut is loosened, the primary sheave assembly can be turned off the crankshaft.

DISASSEMBLY OF SHEAVE WHILE ON ENGINE

1. Remove belt (see Section 9).
2. Remove two screws securing lock plate to end cap assembly (see Figure 10-2).

SAFETY PRECAUTION

Primary sheave is spring loaded. Clamp primary sheaves together with strap (Service Tool No. 261906) before proceeding with following steps.

3. With flat, open end wrench (Service Tool No. 404032) on inside, and socket wrench on outside, break loose end cap bolt from main shaft (see Figure 10-3).
4. Before completely removing bolt, assemble strap to hold halves of primary sheave together (see Figure 10-4).
5. Finish removing bolt with strap holding sheave halves together. Remove end cap assembly.
6. Remove strap while pressing movable half of sheave toward fixed half of sheave (see Figure 10-5).
7. Remove sliding sheave and inspect spline (Ref. 1), neutral lockout balls (Ref. 2), primary sheave bearing (Ref. 3), compression spring (Ref. 4) and garter (activating) spring (Ref. 5) (see Figure 10-6).

CLEANING, INSPECTION AND REPAIR

a. Clean all parts with a cleaning solvent such as Trichloroethylene (see SAFETY PRECAUTION page 9-6) and blow dry with compressed air.

Figure 10-5

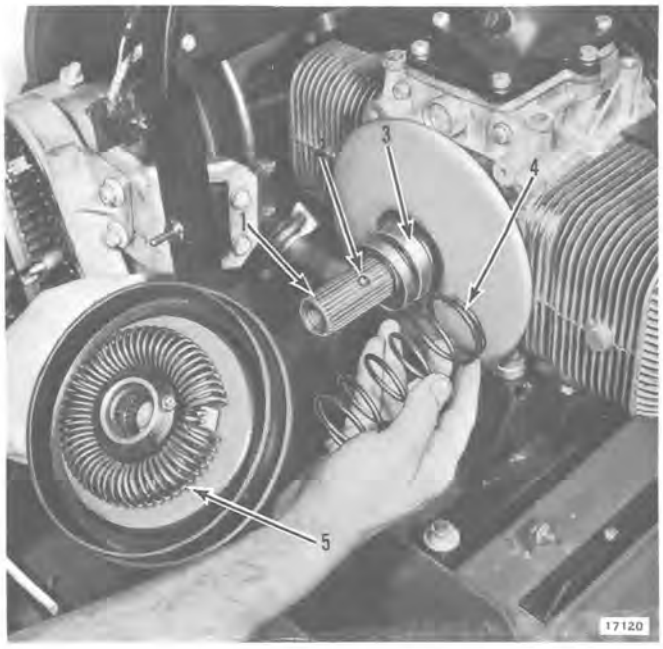

Figure 10-6

b. Inspect main shaft and sheave assembly splines for wear.

c. Inspect neutral lockout plunger for wear. Replace if required.

d. Inspect transmission belt. A belt measuring less than one inch across width or outer surface must be replaced with a new one. Worn belt should be returned to owner for use as a spare. A spare belt should be carried at all times.

REASSEMBLY

1. Align holes in main shaft spline in horizontal plane. Retain neutral lockout balls in holes with Rykon EP #2 grease.

2. Place compression spring on shaft with closed side of spring cup toward bearing.

3. Place movable half of sheave on shaft, compress spring and lock in place with strap (Service Tool No. 261906).

4. Assemble end cap on shaft, making sure end cap splines engage shaft splines.

5. Before placing bolt in shaft, check to see that neutral lockout balls have not fallen from their holes in shaft.

6. Tighten end cap bolt to correct torque. See Page 2-3.

7. Check the neutral lockout plunger to see that it snaps in and out properly.

8. Assemble lock plate to end cap. Locks on lock plate may engage bolt by turning lock plate over. Otherwise, a slight loosening or tightening of bolt may be necessary in order to align bolt with lock.

9. Clean inside of sheave halves of any grease that may have accumulated on them.

10. Reinstall transmission belt as described on page 9-10.

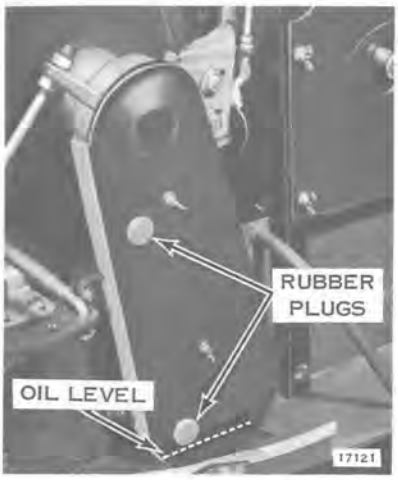

Figure 10-7

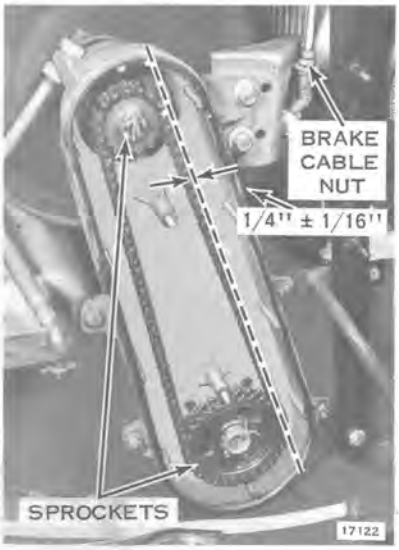

Figure 10-8

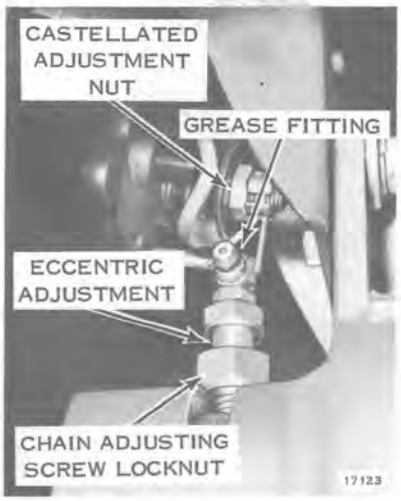

Figure 10-9

DRIVE CHAIN

LUBRICATION

The drive chain and chain bearings are lubricated by oil in the chain case. Should it be necessary to add oil use only ESSO Gear Oil GX75-80 or OMC Type "C" and follow these instructions.

Remove rubber plugs (top and bottom). Pour oil in top hole until it reaches level as shown in Figure 10-7. (It will hold approximately 4 oz.) Replace plugs.

ADJUSTMENT

Total slack must be 1/4" ± 1/16" as shown in Figure 10-8. To measure this distance, first remove the chain case cover. (Note: Oil will drain when cover is removed.) Place a straightedge over the chain at the sprockets, press in on the center of the chain and measure the slack at this point. If the chain requires adjustment, use the following steps:

1. Loosen adjusting screw lock nut (see Figure 10-9).
2. To tighten chain, pivot the eccentric adjustment downward (see Figure 10-9).
3. To loosen chain, pivot eccentric adjustment upward (see Figure 10-9).

REMOVAL

1. Remove chain case cover. Oil will drain from chain case when cover is removed.
2. Loosen chain (see "ADJUSTMENT" above).
3. Remove cotter pin and nut from upper drive sprocket (see Figure 10-8).
4. Remove sprocket and chain from upper shaft.
5. Chain can now be removed from lower sprocket.

INSTALLATION

1. Assemble in reverse order of disassembly.
2. Adjust chain per "ADJUSTMENT" above.
3. Add chain lubricant per "LUBRICATION" above.

REPAIR

A broken drive chain can be repaired with master links available from your dealer.

BRAKE

DESCRIPTION

The brake is positive acting disc type with long lasting fibre pads (Pucks).

ADJUSTMENT

The brake is tightened by turning the castillated nut, Figure 10-9, to the right, after the cotter pin has been removed. To obtain the correct adjustment, turn the nut until there is a slight drag on the brake disc. Then the nut should be turned to the left, one notch, and the cotter pin reinstalled.

If hand brake lever does not have proper amount of travel, it can be adjusted by moving inner wire in attachment bracket on brake (see Figure 10-8).

IMPORTANT

Before completing the adjustment, be certain there is sufficient movement of the lever to permit use of the parking lock.

REMOVAL

a. Remove cotter pin (1) and loosen castellated brake adjustment nut (2). See Figure 10-10.

b. Loosen brake body screws (3).

c. Remove mounting screws (4) from brake bracket (5).

d. Brake assembly can now be lifted off fixed half of secondary sheave.

REPAIR

a. Disassemble brake assembly as required, noting relative positions of components to assure correct reassembly (see Figure 10-10).

b. Inspect brake pucks. If the free floating puck (6) is one half of its original 1/2" thickness, it should be replaced. When the fixed puck (7) is worn so that there is only 1/32" protruding from the carrier (8), it should be replaced. Use a contact cement to secure new puck to carrier.

CAUTION

Keep all oil and grease from puck surfaces. Braking action could be impaired by contaminated puck slipping on brake disc surface.

BRAKE CABLE AND CAM ASSEMBLY

a. Reassemble the brake assembly in reverse order and assemble to bracket.

b. Install adjusting fitting (9) and nut (10) to brake body (11).

c. With cable installed in hand lever, insert brake end of cable (12) through adjusting fitting (9). Pull the cable through the casing as far as possible and install return spring (13).

d. Assemble clamp screw (14) and bushing (15) to the brake cable (12), insert screw thru hole in actuator cam (16) and secure with nut (17).

e. Pull brake cable through clamp screw (14) until the hand lever is fully extended and all cable end fittings are seated. Tighten nut (17) until screw makes contact with the cable. Tighten nut an additional 1 turn to clamp the cable (torque 30-35 in. lbs.). Bend excess cable up 90°.

f. Back off adjusting nut 2 or 3 segments.

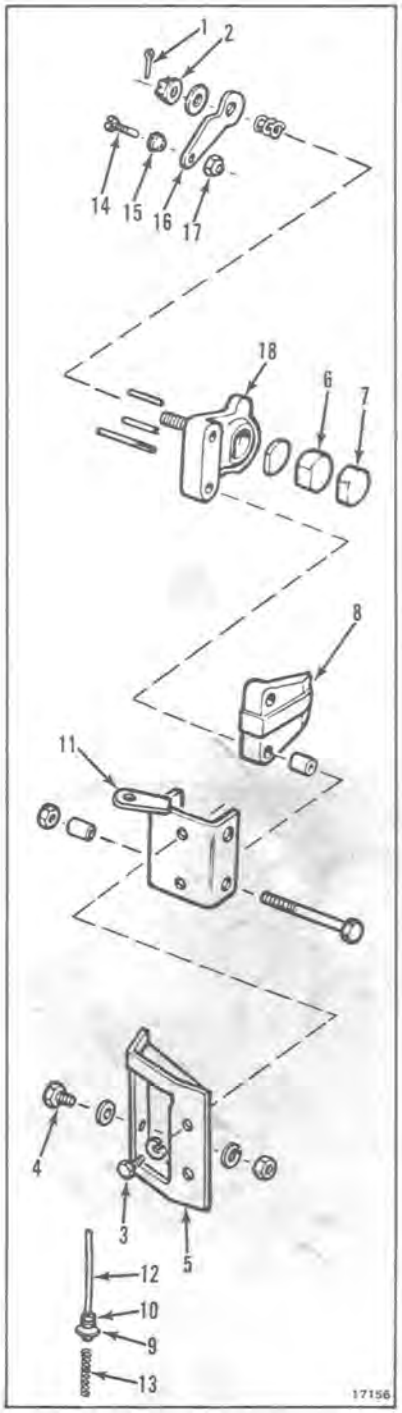

Figure 10-10

g. When properly adjusted, there should be no drag on brake pucks when brake is released. Rotate sheave to check.

h. If there is no drag install cotter pin and bend up tails approx. 45°.

i. Work brake lever several times to insure that there is no cable slip at clamp screw.

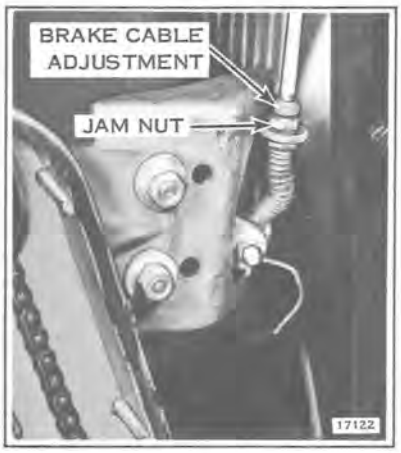

Figure 10-11

FINAL ADJUSTMENT BRAKE

a. Loosen jam nut then turn adjusting fitting located on brake bracket in until hand lever will just allow the parking brake lock to be engaged. When parking brake lock is released, the hand lever must return to free position without binding. See Figure 10-11.

b. Actuate hand lever and set parking brake lock to check for proper adjustment.

c. Release parking brake lock and check if the cable clamps retain cable in static position during brake operation.

d. Tighten nut on adjusting fitting down on the brake bracket.

e. When brake is off, pucks should not drag on brake disc.

SECONDARY DRIVE

Figure 10-12

DISASSEMBLY

1. HP Models only - The upper muffler must be removed before the secondary sheave can be removed (see Section 9).

2. Remove transmission belt (see Section 9).

3. Remove brake assembly (not necessary to disconnect cable) (see page 10-5).

4. See Figures 10-12 and 10-13 for following steps. Remove retaining ring (1) from secondary shaft (2).

5. Remove end cap (3), spring (4) and key (5).

6. Remove chain case cover (6).

7. Remove key (7), nut (8) and upper sprocket (9).

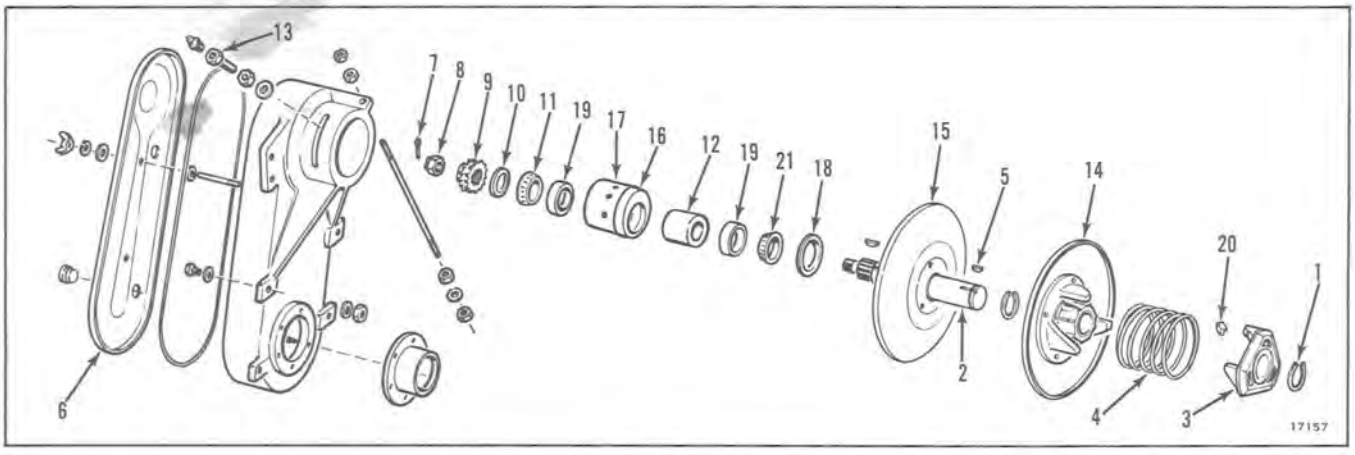

Figure 10-13

8. Remove outer bearing cone washer (10), outer bearing cone (11) (and bearing spacer (12) HP ONLY).

9. Remove eccentric adjusting screw (13).

10. Pull the movable half of sheave (14) off shaft. Figure 10-13.

11. Remove fixed half of sheave (15) only if replacement is necessary. It may be necessary to heat fixed half with a torch to remove. The fixed half of sheave (15), O-ring (16) and eccentric (17) will come off as a unit. Press shaft from sheave and eccentric by placing in arbor press and pressing on threaded end of shaft (see Figure 10-14). Note: Take caution not to damage threads.

12. Remove seal (18) and cone (21) from shaft.

13. Press cups (19) from eccentric.

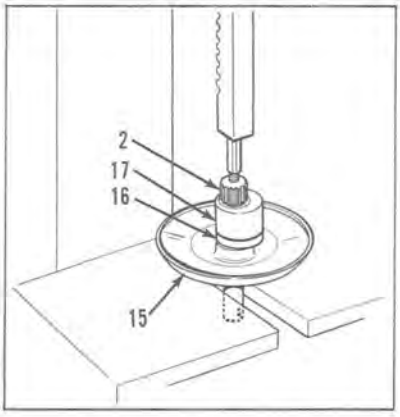

Figure 10-14

CLEANING AND INSPECTION

1. Clean bearing in trichloroethylene (see SAFETY PRECAUTION on page 9-6).

2. Check bearing for wear or roughness.

3. Check shaft, sheaves, woodruff keys and Delrin ramp shoes (20) for excessive wear.

REASSEMBLY

1. Press bearing cups into eccentric. See Figure 10-13.

2. Grease inner bearing cone with Rykon EP #2 and install on shaft.

3. Install seal. Note: A new seal must be used if shaft was pressed from eccentric.

4. Insert woodruff key in shaft.

5. Replace retaining ring.

6. Assemble fixed sheave to shaft.

7. Assemble eccentric to shaft.

8. Reinstall eccentric into chain case. Take care not to damage O-ring.

9. Assemble movable half of sheave to shaft.

10. Replace eccentric adjusting bolt.

11. Assemble brake assembly on sheave and secure with mounting bolts.

12. Model 251 HP only - Reinstall bearing spacer.

13. Assemble bearing cone to shaft.

14. Replace upper sprocket, nut and cotter key.

15. Model 251 only - Torque nut to 8 ft. lbs. to seat bearings. Back off one notch and insert cotter pin.

16. Model 251 HP only - Torque nut to 25 ft. lbs.. Continue torquing until cotter key can be inserted.

17. Engage spring ends in holes in movable sheave and end cap.

18. Preload spring by holding end cap stationary and rotating movable sheave clockwise to engage next ramp on end cap (approximately 1/3 turn).

19. Compress spring to allow installation of end cap retaining ring.

20. Reinstall brake assembly to chain case mounting boss.

21. Clean inner surfaces of sheave halves of grease.

22. Reinstall transmission belt.

23. Grease assembly thru fitting on eccentric adjustment.

24. Check for proper position of secondary drive assembly. Distance from center of primary drive shaft to center of secondary drive (top) sprocket must be 11-11/16" ± 1/16". See Figure 10-15.

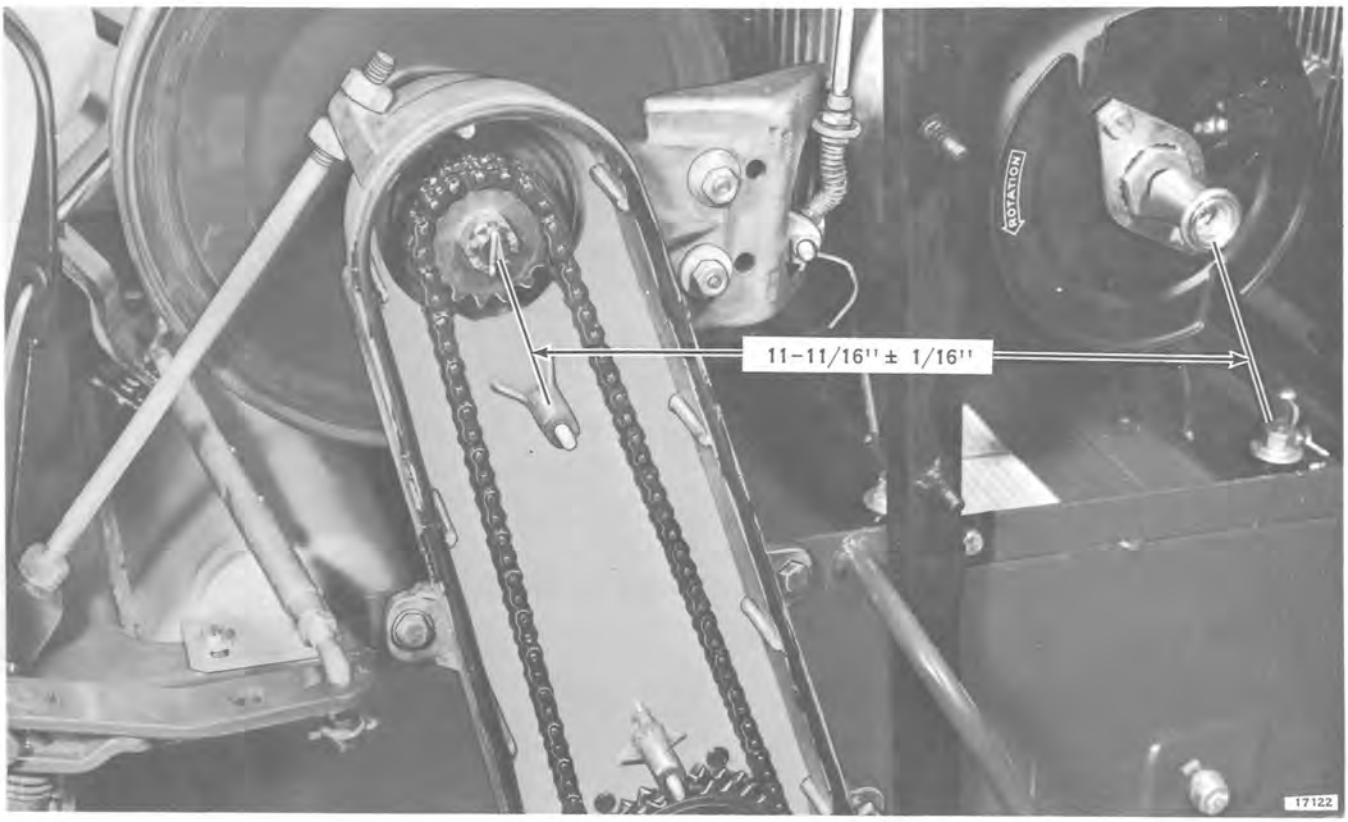

Figure 10-15

SECTION 11
STEERING, TRACK AND SUSPENSION

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Figure 11-1

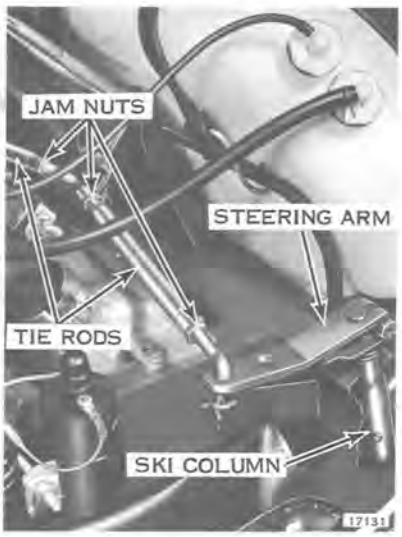

Figure 11-2

DESCRIPTION

This section gives complete service instructions on the snowmobile steering, tracks and suspension.

STEERING

DISASSEMBLY

1. Support front end of snowmobile to remove weight from skis.
2. Scribe ski column and steering arm to maintain original position for reassembly of skis. See Figure 11-1.
3. Remove ski and spring assembly from ski column.
4. Remove steering arms from ski column. See Figure 11-2.
5. Disassemble leaf springs, if required, for servicing.

CLEANING, INSPECTION, AND REPAIR

a. Remove all dirt and old grease from ski columns and from inside ski column tube.

b. Inspect ski column and bushing and replace if worn or bent.

c. Inspect ski runners and replace if worn. (See torque specs.)

d. Inspect leaf springs for cracks or weakness.

e. Inspect tie rod ends. Replace if worn or damaged.

f. Check for 1/16" end play in steering column. Correct by moving steering column support.

REASSEMBLY

a. Reassemble skis to leaf springs.

b. Replace ski column and assemble to steering arm. Lubricate ski columns. See Page 12-3. NOTE: DO NOT interchange right and left ski columns.

c. Attach steering arms to ski columns noting original position. Tighten to torque value shown in Section 2. Adjust ski alignment as described below.

SKI ALIGNMENT

a. Ski alignment is necessary when skis are not parallel with each other and the vehicle body, with the steering bar in the normal straight-driving position.

b. To align skis, remove hood. Place steering bar in normal straight-driving position.

c. Loosen jam nuts at both ends of tie rods. Turn tie rod to adjust. See Figure 11-2. NOTE: Steering arms are toed in when skis are in proper alignment. See Figure 11-1.

d. Reassemble when skis are parallel with each other and with vehicle body. Use Loctite Grade A on tie rod jam nuts when reassembling. See Section 2 for proper torque.

TRACK AND SUSPENSION

TRACK TENSION ADJUSTMENT

Track tension must be checked after the first ten hours of operation and then every 25 hours, or as required, to maintain efficient, economical operation. Improper adjustment will result in undue wear to the track and drive components.

Track tension is checked when the track is not supporting the weight of the snowmobile, and the pivot arm is pulled down.

Track tension on molded track snowmobiles is correct when the distance from the bottom of the pivot arm bearing bore to the bottom of the adjusting bracket is 2-1/4" ± 1/32". See Figure 11-3.

Track tension on cleated track snowmobiles is correct when the distance from the bottom of the pivot arm bearing bore to the underside of the running board is 2-1/2" ± 1/32". See Figure 11-4.

If adjustment is necessary, perform the following steps on both sides of the vehicle.

a. Vehicle should be in right side up position with track off the ground.

b. Loosen track tension lock nuts and lock nut on pivot arm adjusting screw. See Figure 11-4.

c. Adjust track so that the distances shown in Figures 11-3 and 11-4 are obtained.

d. Measure distance from front edge of adjusting bracket to anchor. If this distance is not equal on both sides, loosen the adjustment on the side nearest to the rear until the distance from front edge of the adjusting bracket to the anchor is equidistant within 1/32 inch. See Figure 11-4.

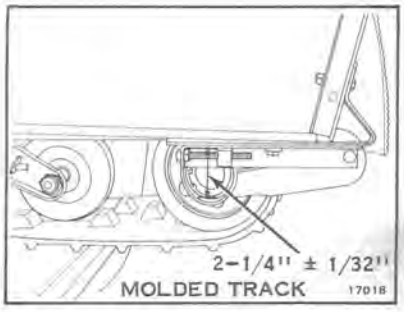

Figure 11-3

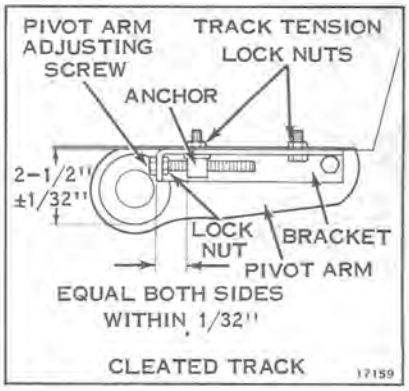

Figure 11-4

TRACK ALIGNMENT ADJUSTMENT

Proper track alignment is essential to keep sprocket and track wear at a minimum. Alignment can be seriously altered by improper adjustment of the track tension and rear axle location.

When aligning track, block up snowmobile so that track is off ground and place front edge of skis against stationary object. Start engine and run at idle allowing track to turn free. The track edges must be clear of pivot arms as shown in Figure 11-5. If alignment cannot be obtained, check for bent pivot arms, loose bearings in pivot arms, deformed slots in adjusting bracket, or bent running board in area of adjusting bracket.

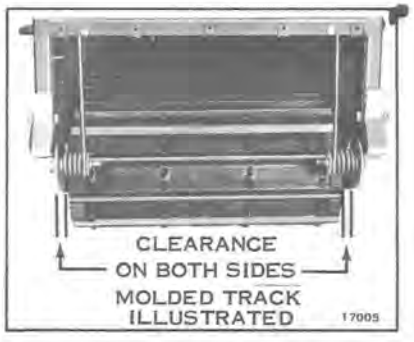

Figure 11-5

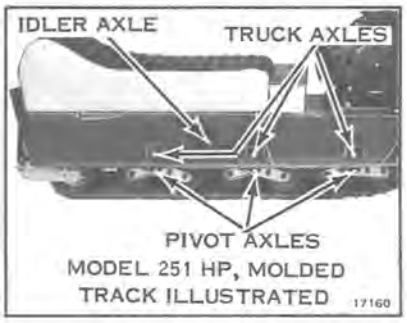

Figure 11-6

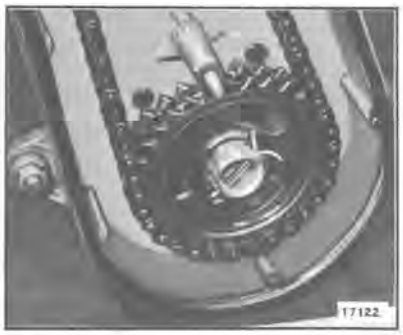

Figure 11-7

REMOVAL OF TRUCKS AND TRACK

1. Support snowmobile so that weight is removed from track.
2. Release track tension. See Page 11-3.
3. Remove pivot axle bolts and truck axle (molded track only) bolts. See Figure 11-6. Truck assemblies are now free of chassis.
4. Remove bearing cup from front axle on side opposite the drive sprocket. Remove 3 nuts and lockwashers.
5. Remove chain case cover.
6. Remove cotter pin, bottom sprocket and washer. See Figure 11-7.
7. Slide axle to right and drop left end of axle out bottom of chassis.
8. Front axle with bearings and seals is now free of chassis.
9. Remove four track tension locknuts. See Figure 11-4.
10. Rear axle can now be removed.
11. Molded Track Only. Remove idler assembly. Remove nut and washer from each end of axle as in Step 3. See Figure 11-6.
12. Trucks, axles and track are now free of the chassis.

FRONT AXLE DISASSEMBLY

1. Turn bearings in hand. If they do not turn freely, if there is excessive play, or if they are rough, they must be replaced. Remove bearings with bearing puller or arbor press. Take care not to damage seal which will come off with bearing.
2. Inspect drive sprockets. Check for excessive wear or peeling of coating. If they must be replaced, first drive out roll pins.

SAFETY PRECAUTION

If heat is necessary to remove, or reassemble front sprockets or rear axle wheels or sprockets, use heat lamp or hot air gun for heating. DO NOT use open flame.

3. Press drive sprockets off front axle after marking reassembly position.

REAR AXLE DISASSEMBLY

1. Remove retaining ring and bearing retainer.
2. Push pivot arm towards wheel (molded track) or sprocket (cleated track).
3. Check bearings as on front axle.
4. Remove bearings only if they must be replaced, or if wheels or sprockets must be replaced.
5. Inspect wheels or sprockets for excessive wear. Check for peeling of coating. If they must be replaced, loosen Allen set screws to remove wheels or sprockets from axle.

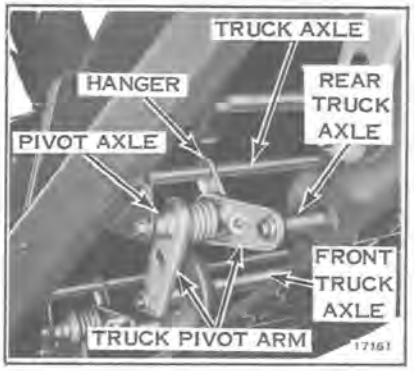

Figure 11-7

TRUCK DISASSEMBLY (See Figures 11-7, 11-8 and 11-9)

1. Remove lock nuts from front and rear truck axles and pivot axle.
2. Remove pivot arms, spacers, bushings, and springs from pivot axle.
3. Wheels and spacers will now slide off front and rear truck axles.

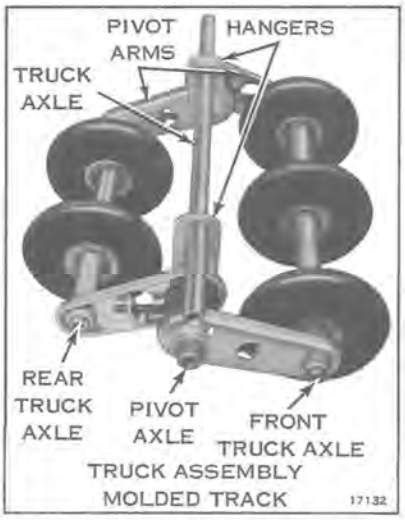

Figure 11-8

CLEANING, INSPECTION, AND REPAIR

Molded Track

1. A torn track cannot be volcanized. It must be replaced if torn beyond use.
2. Small cracks will not hamper the operation of the snowmobile.
3. Liquid neoprene can be applied to cracks or frays to help restore its original appearance.

Cleated Track

If track is badly cut through and belts separated, it can be repaired if the area is not too large. Repair kit No. 160937, available from your dealer, consists of a new section of track 18.4 inches long with hinges on each end, new hinge pins, tread bars, rivets and complete installation instructions.

Trucks And Axles

1. Axles - check for straightness by rolling on a flat surface. If drive axles are bent they must be replaced. Truck axles may be straightened.
2. Splines - inspect for excessive wear.
3. Check to see that oil plug in front axle is in place and does not leak.
4. Check condition of seals on front axle and replace if seal lip is not tight on axle.
5. Check nylon truck bushings for cracks or excessive wear. Replace if damaged.

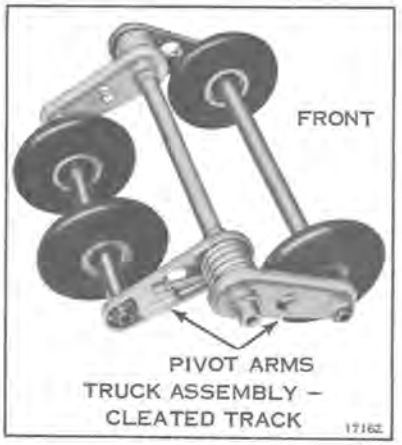

Figure 11-9

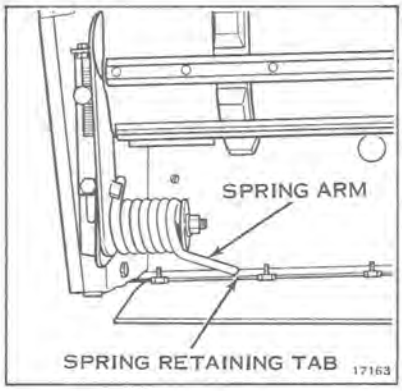

Figure 11-10

REASSEMBLY

1. Assemble wheels and spacers to their original positions on the front and rear truck axles. Application of a light oil on the axles will assist in this procedure. Apply Standard Oil Rykon EP #2 grease in bore of nylon bushings and assemble to pivot axles. Molded track only, assemble hanger and truck axle assembly to pivot axle. Assemble pivot arms and springs. See Figures 11-8 and 11-9.

2. Assemble drive sprockets to front axle. Fingers on sprockets must face outward, and line up with each other. Observe **SAFETY PRECAUTION** on Page 11-4. Drive roll pins in sprockets. Press bearings on axle. Apply a light oil to seals and assemble to front axle. Seat seals after axle is assembled to chassis.

3. Assemble sprockets (cleated track) or wheels (molded track), bearings, bearing retainer, retaining ring, pivot arms and brackets to rear axle. Use a clean light oil to assist in this assembly. Observe **SAFETY PRECAUTION** on Page 11-4. Apply Loctite grade A or Casco MLF-16 to set screws before installing. Note pads in axle for seating set screws. Apply Standard Oil Rykon EP #2 grease to pivot arm bushings before assembly.

4. Assemble idler wheels (molded track only) to shaft.

5. Assemble trucks, front and rear axle assemblies and idler assembly (molded track only) inside track and install to snowmobile chassis. The rear spring is loose when installing front and rear axles to bearing cups. Before adjusting track tension, place spring arms inside spring tabs. See Figure 11-10.

6. Adjust track tension as described on Page 11-3.

7. Install spacer, drive chain sprocket and cotter pin on front axle and replace drive chain. See Page 10-4.

SECTION 12
LUBRICATION AND STORAGE

TABLE OF CONTENTS

ENGINE LUBRICATION

Since fuel vapors are first compressed in the crankcase of the two-cycle engine, the most practical method of lubrication is by mixing the lubricant with the gasoline. As the mixture of lubricant and gasoline enters the crankcase, the gasoline is vaporized, leaving the lubricant to lubricate the bearings and other moving parts. Eventually the lubricant reaches the combustion chamber where it is burned and discharged through the exhaust ports. In this way the fuel mixture conveys to the engine's moving parts a metered amount of lubricant in proportion to the speed of the engine.

Both optimum performance and lubrication depend on maintaining the correct ratio between gasoline and lubricant in the fuel mixture. The use of too little lubricant leads to premature wear and early breakdown. A fuel mixture richer in lubricant than recommended is not only wasteful, but will contribute to faulty performance, and to excessive carbon accumulation in the cylinders and on the spark plugs. Frequent spark plug replacement can often be traced to an excess of lubricant in the fuel mixture. Instructions for the mixing of fuel during break-in and normal operation as given here and in the Owner's Manual should be followed exactly.

FUELS AND LUBRICANTS

The use of an OMC snowmobile brand 24:1 lubricant or a reputable automotive engine oil, SAE 30 MS or MM, and a good grade of gasoline is recommended. Use regular gasoline in Model 251 and 251M and premium gasoline in the 251 HP. The oil container should be marked Service MM or Service MS. Additional markings, such as ML-MM, DG, or DS indicate oils for other applications and should be avoided. Avoid the use of low-priced, light duty oil (container marked only with ML designation) or multiple viscosity oils such as SAE 10W30. EVEN THOUGH OMC BRAND OUTBOARD LUBRICANT IS ADVERTISED AS A 50:1 RATIO LUBRICANT, IT IS IMPERATIVE FOR SNOWMOBILE USE THAT IT BE MIXED AT A 24:1 GAS-LUBRICANT RATIO.

Use premium gasoline on the Model 251 HP snowmobile only. The compression ratio of the Model 251 is not high enough to warrant use of premium gasoline.

The use of additive compounds, such as tune-up compounds, tonics, friction reducing compounds, and de-icing compounds, etc., is discouraged. OMC Accessories Engine Cleaner and OMC Accessories Break-In Lubricant should be used as necessary according to instructions.

OMC 2+4 FUEL CONDITIONER

OMC 2+4 Fuel Conditioner is recommended for added protection to your snowmobile engine. It is especially recommended as an additive between extended periods of snowmobile use. OMC 2+4 Fuel Conditioner is available from your dealer. OMC 2+4 Fuel Conditioner features are as follows:

- Fuel Stabilizer - prevents formation of gum and varnish deposits in fuel system for one year of storage. Eliminates need for draining fuel for storage.
- Carburetor Cleaner - dissolves gum and varnish deposits in carburetor and fuel system.
- Corrosion Resistance - protects carburetor, fuel system and internal engine parts from corrosion.
- De-icer - prevents carburetor icing and gas line freezeup.
- Absorbs moisture and water in fuel system.
- Extends spark plug life by reducing fouling and misfire.

FUEL BLENDING

To avoid unnecessary cylinder scoring and premature engine wear, it is important that the gasoline and lubricant be properly mixed prior to putting the fuel in the tank. This is especially true in zero or sub-zero climates. Unless the fuel and lubricant are properly mixed, the engine could operate on a mixture which is too lean until the gasoline and lubricant have been agitated; by then, damage would have occurred and the engine would have to run on an excessively rich mixture.

The correct fuel mixture ratio is 24:1 or 1/3 pint of lubricant to each gallon of gasoline. Use regular gasoline in Model 251 and premium gasoline in the 251 HP.

DO NOT POUR GASOLINE OR LUBRICANT DIRECTLY INTO VEHICLE FUEL TANK. USE AN APPROPRIATE CONTAINER FOR MIXING AND STORING THE FUEL. SEE FIGURE 12-1.

To prepare the snowmobile fuel properly, pour into a SEPARATE clean container half the amount of gasoline required and add all the required lubricant. Thoroughly agitate this partial mixture. Next, add the balance of gasoline necessary to bring the mixture to the required ratio of 24:1. Again, thoroughly agitate the mixture. A clean funnel equipped with a fine screen should be used when pouring the fuel mixture into the snowmobile tank.

Whenever it is necessary to mix fuel and lubricant at temperature below 32°F (0°C), the lubricant should be prediluted with gasoline to improve its mixability. The lubricant should be prediluted with approximately one part gasoline to one part lubricant. Predilution of the lubricant should take place with the lubricant temperature above 32°F.

Do not use kerosene or fuel oils for pre-mixing.

NOTE

Thorough agitation is required to completely mix or blend the fuel; the lubricant adheres to the bottom and sidewalls of the container unless agitated. Simply pouring the gasoline onto the lubricant CANNOT accomplish thorough mixing.

Figure 12-1

Figure 12-2

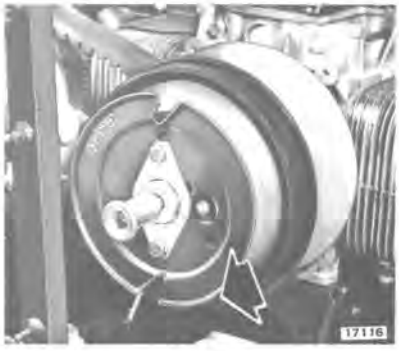

Figure 12-3

LUBRICATION RECOMMENDATIONS

TIME	MAINTENANCE	LUBRICANT
Annually	Ski Columns (See Figure 12-2)	Standard Oil Rykon EP #2
Annually	Drive Chain - See Page 10	OMC - Type "C"
After 25 hrs.	Pivot Points (Leaf spring connection to skis)	SAE 10 Oil
Every 15-20 hrs.	Primary Sheave (See Figure 12-3)	Standard Oil Rykon EP #2. Do not over-lubricate. 1/3 to 1/2 teaspoon is sufficient. Over-lubricating will damage transmission belt.
Annually	Secondary Sheave (See Figure 10-9)	Standard Oil Rykon EP #2

Specified lubricants available from your dealer.

Figure 12-4

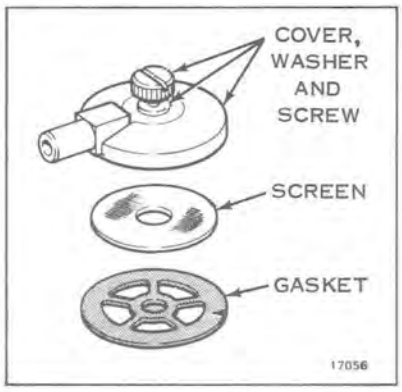

Figure 12-5

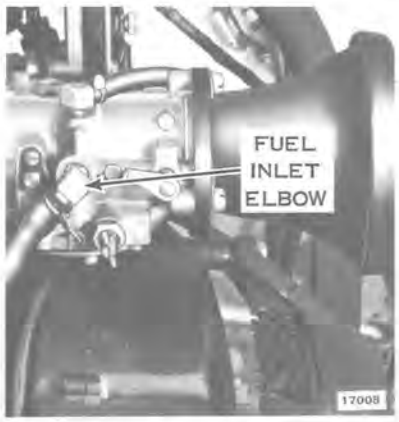

Figure 12-6

PREVENTIVE MAINTENANCE

TIME	MAINTENANCE
After first 3 hrs., then every 25 hrs. or as required	Adjust Chain Tension
After first 10 hrs., then every 25 hrs. or as required	Adjust Track Tension Check Track Alignment
Biannual (See Page 6-7)	Clean Air Filter
Annually (See Figure 12-6)	Clean filter screen under fuel inlet elbow
Annually (See Below)	Clean or install new fuel pump filter screen

FUEL FILTER

SAFETY PRECAUTION

Exercise care to prevent fuel spillage when removing fuel filter when engine is hot.

The fuel filter is attached to the fuel pump. See Figure 12-4. To inspect for sediment or water accumulation, back off the mounting screw approximately three turns (counterclockwise) and remove the cover together with the screen, gasket and mounting screw. Remove and wash filter screen with clean gasoline and brush. Assemble filter as shown in Figure 12-5, being careful to assemble gasket and filter screen on fuel filter cover. Tighten mounting screw securely with screwdriver (Do not overtighten).

STORAGE

PREPARATION FOR STORAGE

a. Add one ounce of OMC 2+4 fuel conditioner to each gallon of gasoline in tank and mix thoroughly. Run engine a few minutes until mixture is in fuel lines, and carburetor, where it can prevent gumming of check valves and carburetor jets.

b. Wash down machine. Be certain to hose out undercarriage. Clean seating with automotive foam type upholstery cleaner.

c. Treat engine with OMC Accessories Engine Cleaner.

d. Remove fuel pump filter screen and clean. See page 12-4.

e. Clean air filter. See page 6-7.

f. Run engine with neutral lockout knob pulled out and inject OMC Rust Preventative Oil (with oil can) rapidly into carburetor until engine stops.

g. Turn off ignition and replace fuel pump filter screen.

h. Block both ends of unit off ground to take weight off track and skis.

i. Loosen track tension (see Section 10).

j. Drain and clean fuel tank (see Section 6).

k. Remove transmission belt.

l. Rub bottom of skis, primary and secondary drive sheaves, and other unprotected surfaces of vehicle with cloth saturated in OMC Rust Preventative.

m. Store in dry, well-ventilated area.

REMOVAL FROM STORAGE

a. Fill tank with fresh fuel mixture.

b. Tune-up engine (see Section 5).

c. Lubricate all points, as described under "Lubrication."

d. Adjust track for proper tension, and check track alignment (see Section 11).

e. Align skis (see Section 11).

f. Check brake and throttle control adjustments.

g. Tighten all screws and nuts.

h. Clean inner surfaces of primary and secondary sheave halves of oil and grease. Replace transmission belt.

i. Test vehicle, checking particularly the following items:

1. Function of neutral lockout
2. Function of brake
3. Engine performance

j. Thoroughly clean any surfaces that need refinishing, and touch-up.