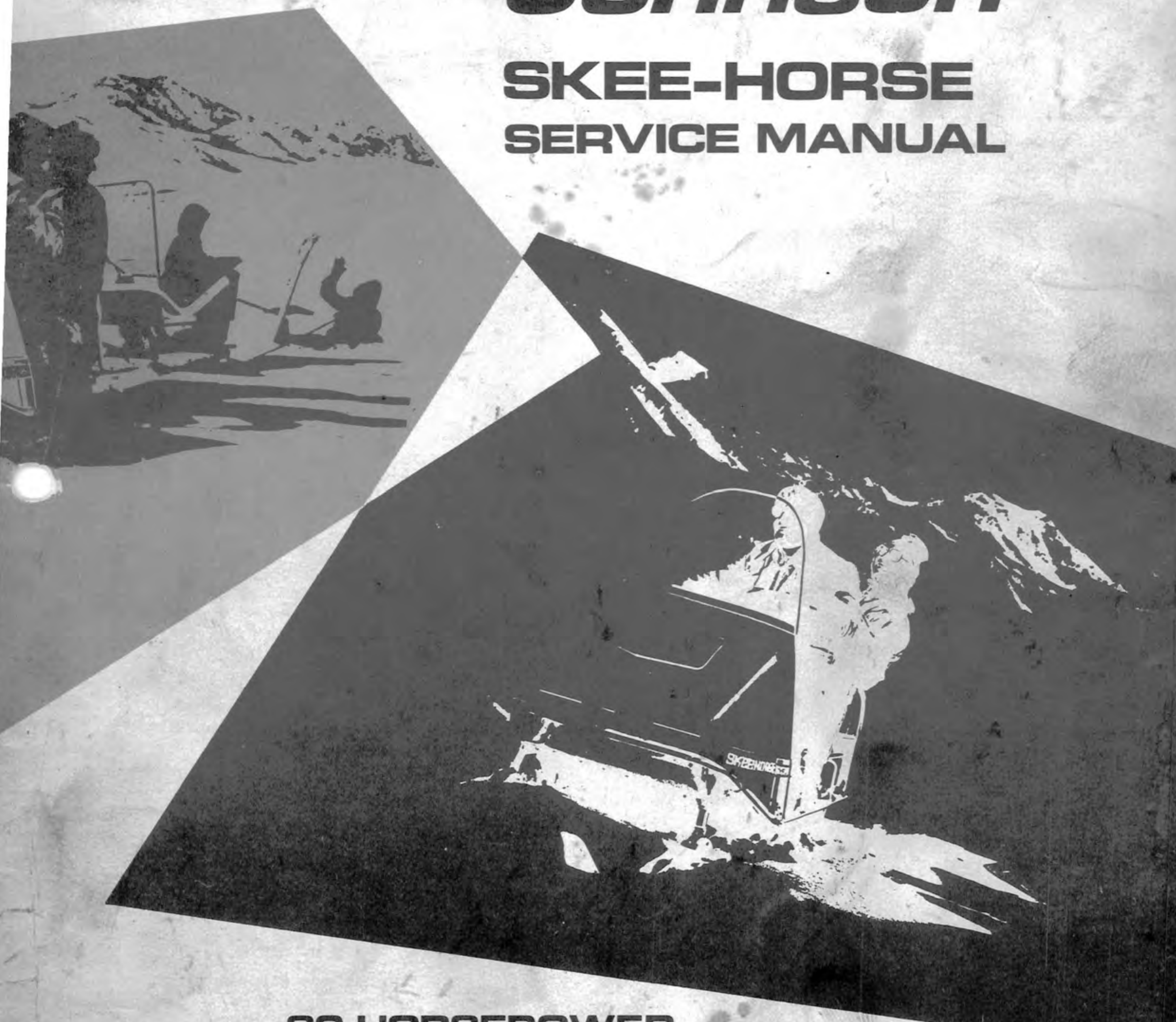
Johnson

SKEE-HORSE SERVICE MANUAL



30 HORSEPOWER
MODELS 25-201R 25-201RS 25-201RA 25-201RSA

11-70 PART NO. 261894 LITHO U.S.A.

FUEL RECOMMENDATIONS

The correct fuel mixture ratio is 24 parts of a good grade regular gasoline to one part lubricant. For ease of measurement, this is equivalent to one quart of lubricant to six gallons of gasoline, one pint of lubricant to three gallons of gasoline, or 1/3 pint of lubricant to each gallon of gasoline.

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

AVAILABLE IN ONE QUART CANS AND IN 6 PACKS FROM YOUR JOHNSON DEALER

17020

> *EVEN THOUGH JOHNSON 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 is 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 Skee-Horse snowmobiles. 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.

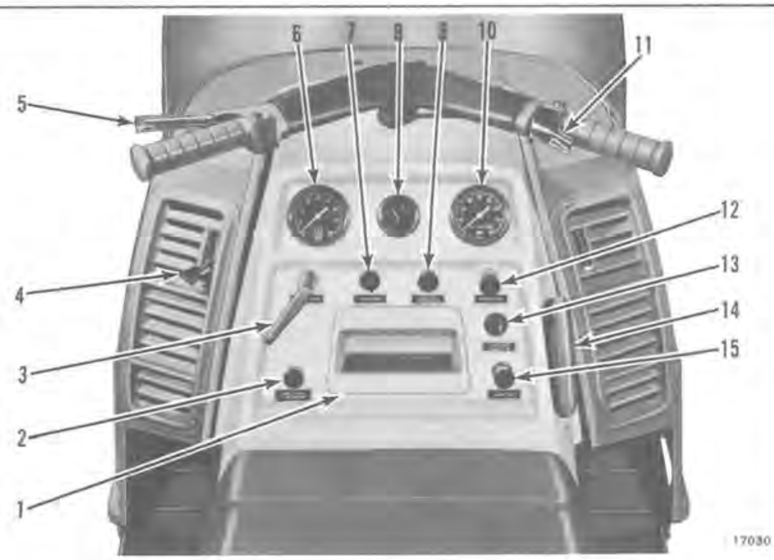
Figure 1-1

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 snowmobile owner, and thereby build and maintain a reputation for reliable service.

This service manual covers all phases of servicing the snowmobile, 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. Instrument Panel Door
2. Neutral Lockout
3. Reverse Control
4. Headlight Retracting Lever
5. Hand Brake and Parking Lock
6. Tachometer (Accessory)
7. Choke
8. Fuel Level Gauge
9. Compression Release
10. Speedometer/Odometer (Accessory)
11. Throttle
12. Primer
13. Ignition/Lights Switch
14. Manual Starter Handle
15. Lighter (Electric Start Models)

Figure 1-2

SECTION 2 SPECIFICATIONS

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SPECIFICATIONS

CAUTION: Snow Vehicles 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 . . . . 103 inches
Width . . . . 37 inches
Height . . . . 47-1/2 inches with windshield
37 inches without windshield
Engine . . . . OMC 2-cycle opposed twin
Rating . . . . Maximum 30 hp at 5800 rpm
Starter
Model 25-201R and 25-201RA . . . . Manual rewind
Model 25-201RS and 25-201RSA . . . . Electric and manual rewind
Variable speed drive . . . . Centrifugal operated sheave
Engages V-belt
Overall ratio . . . . 5.07 to 1
Final drive . . . . ASA 35 double chain
Sprocket ratio . . . . 16 to 42
Reverse transmission . . . . Dog clutch and bevel gears
Muffler . . . . Single, Tuned muffler for quiet operation
Brake . . . . Disc type, hand operated
Throttle . . . . Thumb operated
Track . . . . Specially designed fully adjustable
Width . . . . 20.5 inches
Skis . . . . Formed steel, equipped with shock-absorbing leaf springs and replaceable wear runners
Seating capacity . . . . Two adults. Vinyl coated cover, molded urethane foam cushion
Hood . . . . Molded polycarbonate
Lighting . . . . Retractable sealed beam headlight and taillight
Fuel tank . . . . Capacity 5 Imperial gallons, 6 U.S. gallons
Lubrication . . . . 24:1 using Johnson Skee-Horse Lubricant or SAE 30 SB or SD oil

Before proceeding with any repair or maintenance, for your own protection see

SAFETY PRECAUTIONS

on pages: 4-8, 5-6, 6-6, 7-6, 7-10, 8-2, 9-2, 9-6, 10-2 and 11-4.

Carburetor Needle Adjustment
High speed . . . . One turn off seat minimum
Low speed . . . . 1 to 1-1/4 turn off seat
RPM Ratings
Idle . . . . 1300 - 1600
Transmission belt engaging speed . . . . Approx. 2700
Maximum RPM at which neutral lockout will operate . . . . Approx. 2000
Ignition
Breaker point gap . . . . .020 to .022
Spark plug . . . . Champion J7J or equivalent
Spark plug gap . . . . .028 - .033 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 . . . . .562 to .678 ohm
Battery. . . . 12 volt Prestolite Type 9948X or equivalent with a minimum 32 ampere hour rating, and with a minimum of 2.2 minutes cold starting capacity at 150 amperes discharge, 0° Fahrenheit, and a 5-second voltage reading of 7.8 volts. Dimensions in inches are approximately 7-3/4 long, 5-1/8 wide and 7-1/4 high (to top of terminals). Weight dry 17 lbs., wet 21.4 lbs. Electrolyte to fill 0.44 U.S. gallons. Specific gravity 1.265
Engine
Bore and stroke . . . . 2-3/4 x 2-1/4 inches
Piston displacement . . . . 26.7 cubic inches (437 cc)
Compression ratio . . . . 6.8 to 1
Cylinder compression . . . . Minimum 105 PSI
Ring diameter . . . . 2-3/4 inches
Ring thickness . . . . 1/16 inch
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-.015
Bottom of piston to cylinder .006-.008

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.	TORQUE FT./ LBS.
*Nut	Ball Joint to Steering Arm and Steering Column	3/8-24		18-20
Nut	Cable to Solenoid		36-60	
Screw	Coil Clamp to Main Frame		35-45	
*Screw	Connecting Rod			29-31
*Screw	Crankcase		60-80	5-7
*Nut	Cylinder to Crankcase			16-20
*Screw	Engine to Engine Frame Assembly	3/8-16		18-20
*Nut	Exhaust Manifold to Cylinder	5/16-24		10-12
*Screw	Flangettes to Frame	3/8-16		20-25
*Nut	Flywheel			40-45
*Screw	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	3/8-16		20-25
Setscrew	Locking Collar	#10-32	25-35	
Bolt and Nut	Rear Axle Pivot	5/16-24		12-15
Setscrew	Rear Sprocket	3/8-16		18-20
Nut	Rear Suspension to Frame	5/16-24		12-15
*Nut	Runner to Ski	5/16-18	90-100	
*Nut	U Bolt to Saddle			10-12
	Spark Plug			20-20-1/2
*Nut	Throttle Cable Adjusting Screw	5/16-18	60-80	
*Nut	Tie Rod	3/8-24		18-20
*Screw	Truck to Frame	3/8-16		25-30
*Screw	Truck to Frame	7/16-14		25-30
*Screw	Secondary End Cap to Shaft	3/8-16		22-25
Screw	Drive Sprocket	1/4-20		15-17
*Screw	Shifter Clevis to Pinion Shaft	1/4-28	160-180	
*Screw	Primary Sliding Sheave to Hub	1/4-20		7-10
*Bolt	Primary End Cap to Main Shaft	3/4-16		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

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*Use Torque Wrench

SECTION 3
GENERAL SNOWMOBILE INFORMATION

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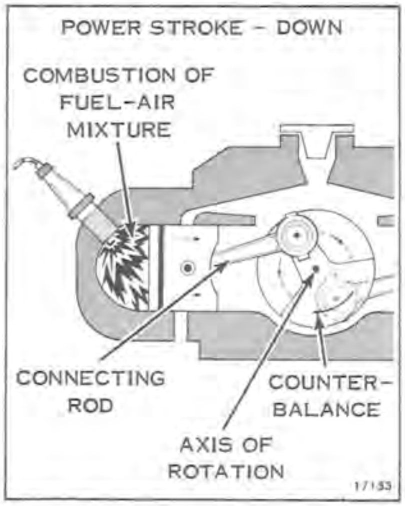

Figure 3-1

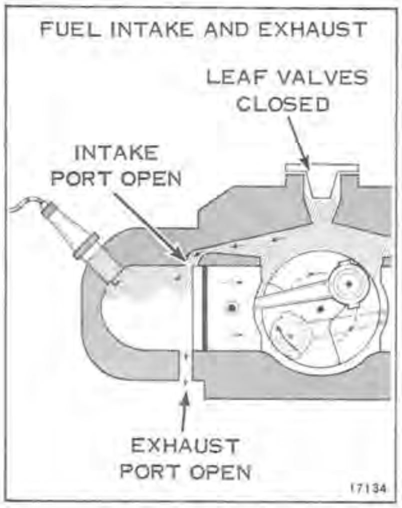

Figure 3-2

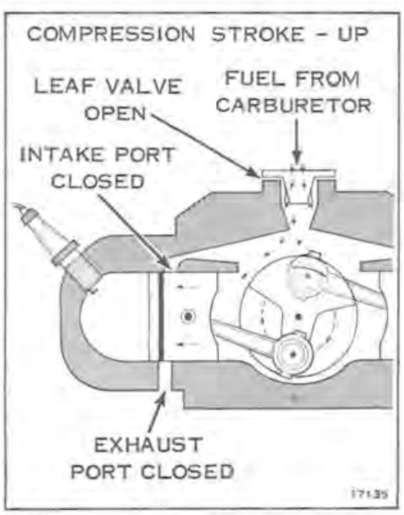

Figure 3-3

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.

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. The float chamber holds a limited quantity of fuel, regulated by a float valve. Needle valves permit a precise amount of fuel to flow from the float chamber 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 allowed to flow from the carburetor.

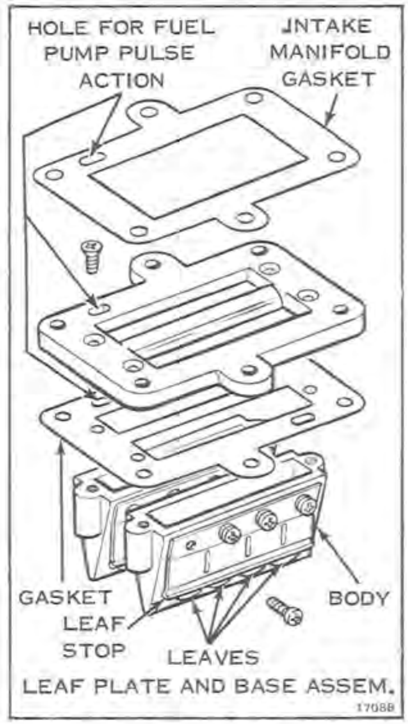

Figure 3-4

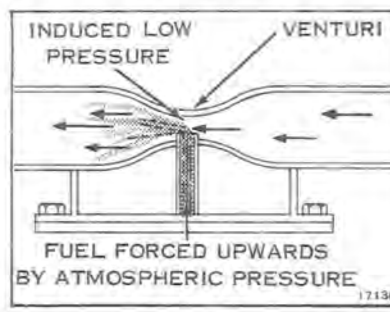

Figure 3-5

IGNITION

The ignition system provides a high voltage electric current which causes a spark to jump the spark plug gap within the cylinder and thus ignite the compressed fuel-air mixture in the cylinder. The ignition system consists of the magneto drive coils, breaker points, and condenser, and the ignition coil assemblies. Permanent magnets built into the flywheel revolve around the magneto drive coils. As the magnet moves past the coils, the direction of the magnetic flux through the coil is changed from one direction to the other (see Figure 3-6). Self-inductance of the magneto drive coil circuit, completed through the breaker points, prevents the flux in the coil laminations from changing until the breaker points open. When the points open, the flux changes direction very rapidly, inducing a current which flows through the ignition coils' primary windings. The ignition coils transfrom this current to a very high voltage which is sufficient to discharge across the spark plugs' gap.

The lighting system coils produce alternating current which changes in frequency and voltage in proportion to the engine speed. On models having electric starting, this alternating current output is converted to direct current by a diode bridge rectifier and used to charge the battery. Direct current from the battery is then used to power the headlight and taillight, and the electric starter motor.

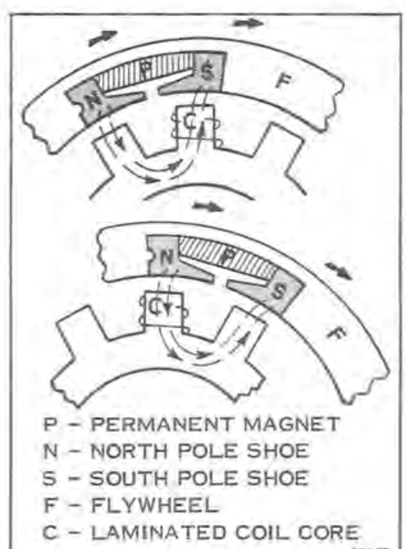

Figure 3-6

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 has its own mounting pedestal and is larger in diameter than the primary sheave assembly. The two are connected by a transmission belt.

PRIMARY DRIVE

The primary sheave is centrifugally operated and engages the transmission belt when the engine speed reaches approximately 2700 rpm. When the engine is rotating at idle speed or below 2700 rpm, the transmission belt rides on a 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 sheave half.

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 sheave half. 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.

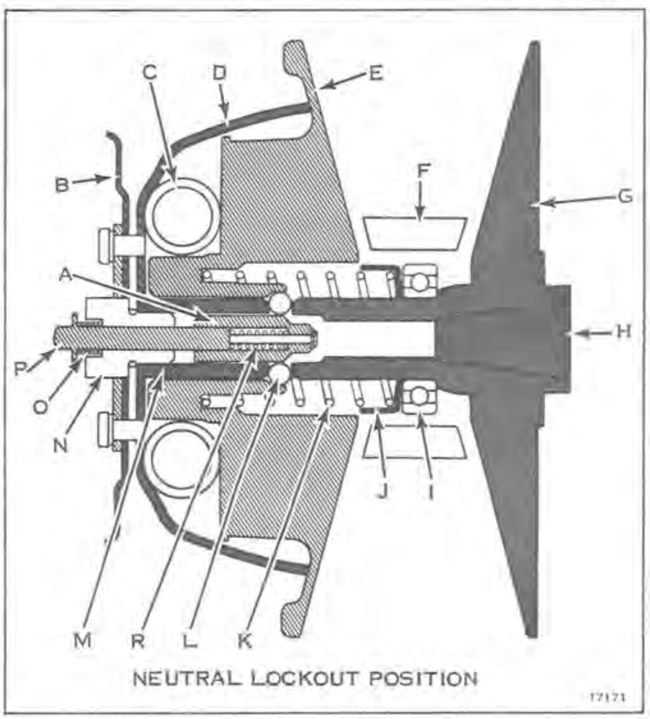

Figure 3-7

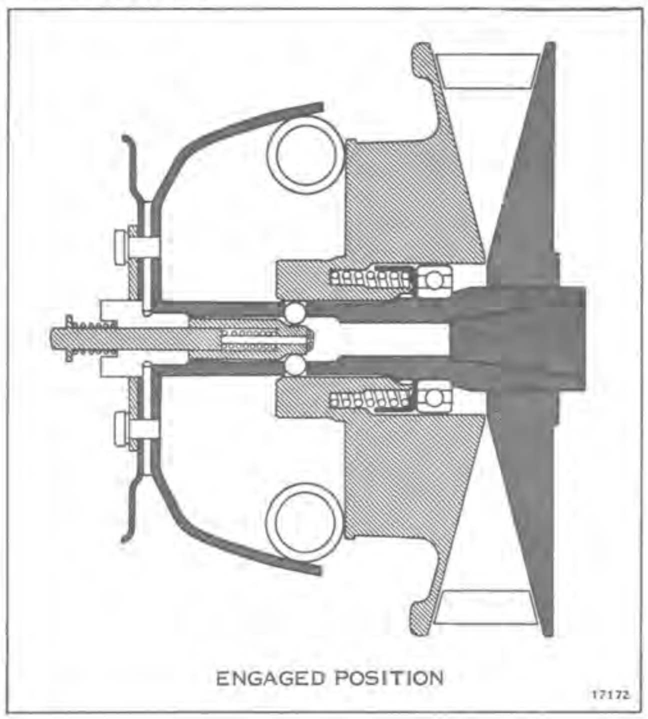

Figure 3-8

A. Neutral Lockout Plunger
B. Emergency Starting Sheave
C. Garter (Activating) Spring
D. End Cap
E. Movable Half of Sheave
F. Transmission Belt
G. Fixed Half of Sheave
H. Crankshaft
I. Ball Bearing
J. Spring Cup
K. Compression Spring
L. Neutral Lockout Balls
M. Splined Shaft
N. Bolt, End Cap to Splined Shaft
O. Spring
P. Neutral Lockout Rod
R. Spring

NEUTRAL LOCKOUT

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 is spring actuated and will engage only when the engine is below approximately 2000 rpm.

When the engine is running above approximately 2000 rpm, the garter spring will expand by centrifugal effect. See Figure 3-9. The garter spring will then ride up the ramp of the end cap and push the movable sheave toward the fixed sheave. In doing this, the movable sheave has covered the holes in the splined shaft. When the neutral lockout knob is now pushed in, the plunger cannot move in because of the interference by the neutral lockout balls. Spring (R) will therefore be compressed as shown in Figure 3-9. If the engine speed is now reduced to idle, 1300-1600 rpm, the garter spring will close and allow the movable half of the sheave to move away from the fixed sheave. Spring (R) will then push the plunger inward. The neutral lockout balls will then move outward, through the splined shaft. The movable sheave will now be locked out in the neutral position. See Figure 3-7.

SECONDARY DRIVE

The secondary drive mechanism incorporates a torque sensing device that detects the need for more power for steep inclines or deep snow. The mechanism immediately forces the secondary sheaves closer together to lower the transmission ratio and provide a higher torque to the drive chain and track.

The drive ratio varies from 3.3 to 1 in low to .67 to 1 in high which yields an overall drive range to approximately 5 to 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 16:42. Optional sprockets are available to change these ratios for special applications.

REVERSE TRANSMISSION

The reverse gear is designed as part of the secondary drive. In "Forward" gear, the input shaft drives the output shaft directly by means of a "dog" type clutch. In "Reverse" gear, the dog clutch is released while a gear set engages to reverse rotation of output shaft. Shifting must be done with the engine at idle and machine at rest.

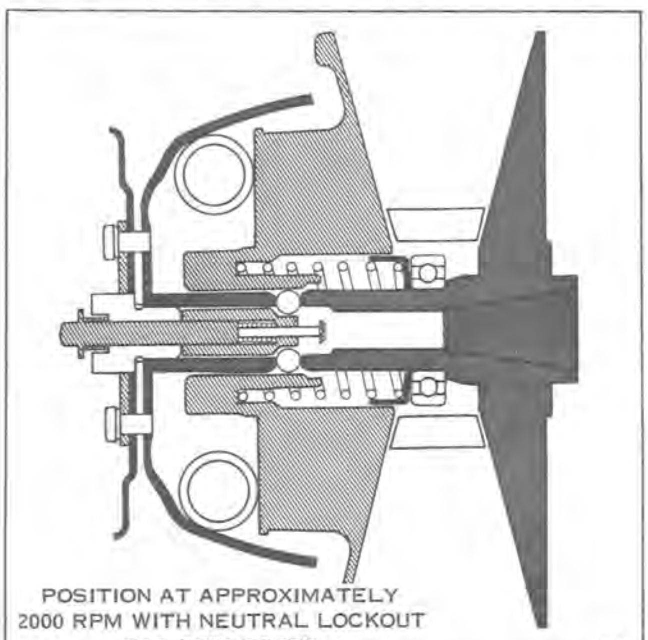

Figure 3-9

SECTION 4
TROUBLE SHOOTING

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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.

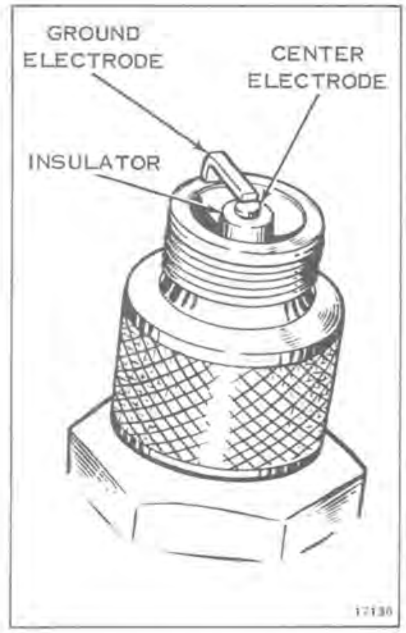


Figure 4-1

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 Ski-Horse snowmobile is the Champion J7J or equivalent. See page 7-8 for additional information on spark plugs.

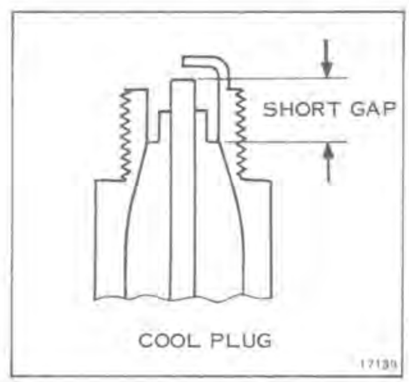


Figure 4-2

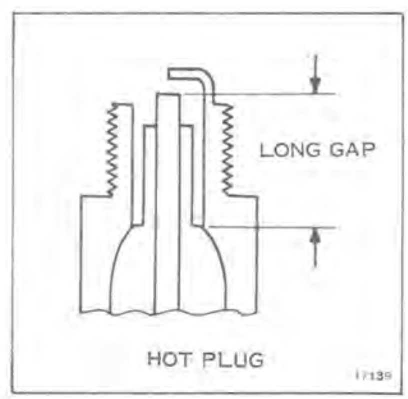


Figure 4-3

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. Compression. 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 filter

   h. Clogged check valve

   i. Carburetor adjustments too lean

   j. High speed needle bent or bowed

   k. Engine flooded

   l. Leaf valves not functioning properly

   m. Faulty gaskets

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

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

   p. Sheared flywheel key

   q. Faulty coils

   r. Faulty condenser

   s. Binding in engine

   t. Weak or reversed polarity of flywheel magnets

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

STARTING - ELECTRIC STARTER

1. Starter cranks too slowly

a. Weak battery

b. Loose or corroded connections

c. Faulty starter solenoid or solenoid wiring

d. Worn brushes or spring

e. Faulty field or armature (shorted or open windings)

2. Starter will not crank motor

a. Faulty ignition key switch

b. Faulty starter solenoid or solenoid wiring

c. Broken wire in harness or connector

d. Weak battery

e. Loose or corroded connections

f. Moisture in starter motor

g. Broken or worn brushes or broken brush spring

h. Faulty field or armature (shorted or open windings)

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 filter restricted

e. Fuel pump or pulse line faulty

f. Incorrect carburetor mixture adjustments

g. Float setting incorrect

h. Inlet needle and seat worn or sticky

i. Timing out of adjustment

j. Spark plugs dirty or improperly gapped

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

l. Coil or condenser weak

m. Breaker points worn or improperly gapped

n. Leaf valves not properly seated, or broken

o. Piston rings stuck or scored

p. Excessive carbon on pistons and cylinder head

q. Compression relief valve improperly adjusted or faulty

r. 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 filter clogged
   d. Faulty fuel pump or pulse line
   e. Fuel cap vent clogged
   f. High speed nozzle or jet clogged
   g. Dirt or packing behind needles and seats
   h. Choke partly closed
   i. High speed needle set too lean
   j. Breaker points burned, dirty, or improperly gapped
   k. Timing out of adjustment

4. Engine runs at high speed only by using hand primer
   a. Fuel lines or passages obstructed
   b. Fuel line leaks or fuel filter obstructed
   c. Fuel pump not supplying enough fuel
   d. Leaf block gasket reversed
   e. Dirt or packing behind needles or seats
   f. Carburetor adjustments
   g. Fuel cap vent clogged
   h. Reed 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)

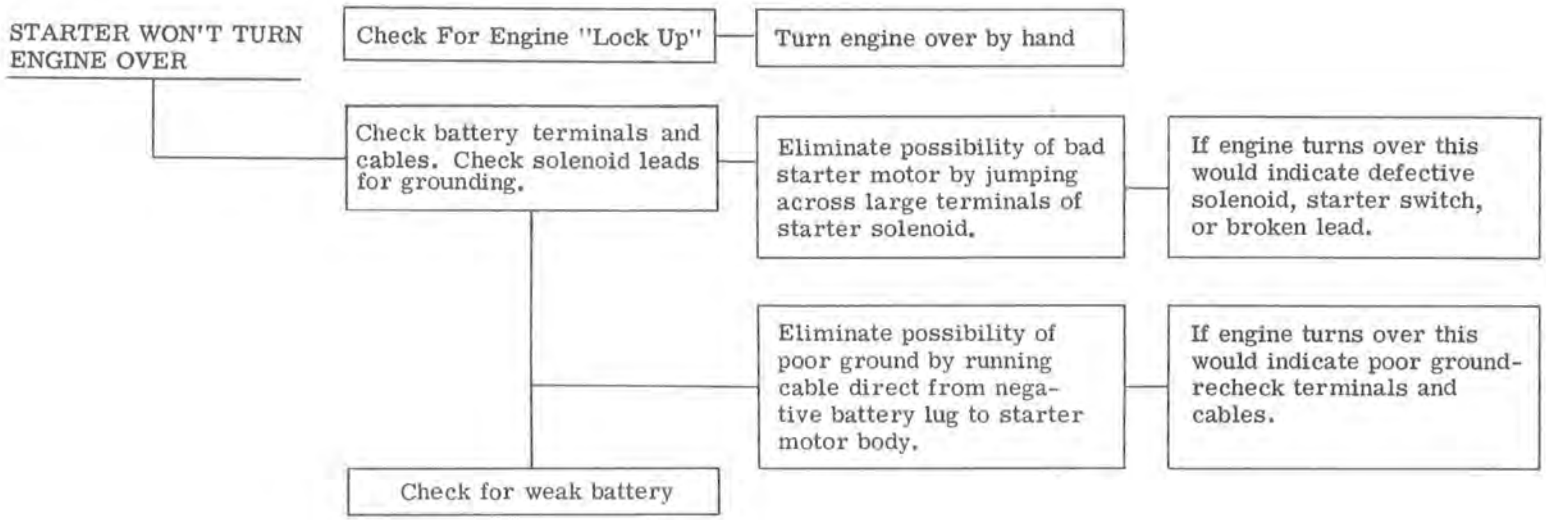
2. Engine stops suddenly, or freezes up
   a. No lubricant in gas, or no fuel
   b. Fuel connector faulty
   c. Cylinder or crankshaft scored
   d. Bent or broken rod, crankshaft, or stuck piston
   e. Ignition failure
   f. Frozen bearing

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. Carburetor improperly adjusted
   e. Hole in metering diaphragm

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 passage to carburetor 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
   f. Cylinder scored or rings stuck
   g. Compression relief valve open
   h. High speed adjustment lean
   i. Spark plugs fouled or misfiring


STARTER WON'T TURN ENGINE OVER
Check For Engine "Lock Up"
Turn engine over by hand
Check battery terminals and cables. Check solenoid leads for grounding.
Eliminate possibility of bad starter motor by jumping across large terminals of starter solenoid.
If engine turns over this would indicate defective solenoid, starter switch, or broken lead.
Eliminate possibility of poor ground by running cable direct from negative battery lug to starter motor body.
If engine turns over this would indicate poor ground-recheck terminals and cables.
Check for weak battery

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 filter.
    - 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. Recommended 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 hazard.
    - 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.

- **Has engine always done this?**
  - Choke opening fully?
- **Is this a new condition?**
  - Has operator recently changed:
    1. Brand or type fuel.
    2. Brand or type of lubricant.
    3. Spark plugs.

    Check for water in fuel.
    - Rectify problems and change spark plugs.
- **Did engine refuse to start after being run?**
  - Check ignition primary. Check spark plugs.
    - See Section 7
  - Check coil and condenser (these sometimes "break down" when they become warm). Check points and timing.
    - See No Ignition - High Tension.
- **Did engine run rough before it was shut off? Seem to load up?**
  - Run engine with air intake housing off. If carburetor blows excessive fuel back out venturi, pull leaf valve assembly and check for cracked, broken or badly seated leaves.
    - See Section 6, Fuel System.
- **Is fuel pump vapor locked?**
  - Clogged vents in fuel tank cap will cause a vacuum in fuel system, resulting in vaporizing of fuel in fuel pump.
    - Clean vents in gas cap.

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 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 PROCEDURES

5

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.

FUEL SYSTEM

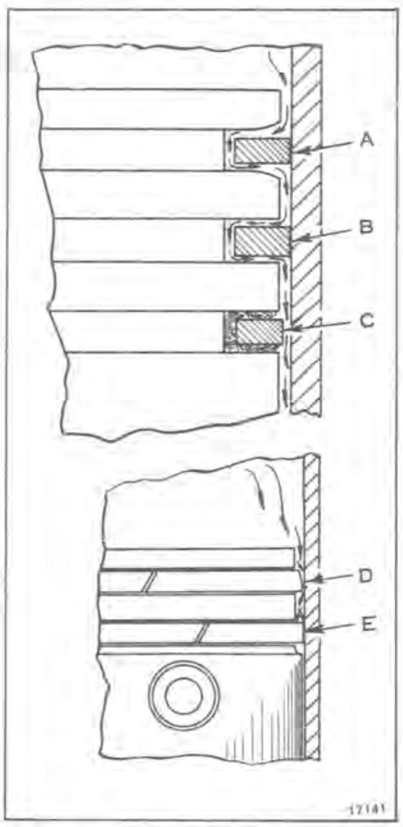
A fresh fuel mixture, with the correct ratio of lubricant and gasoline, is necessary for peak engine performance. The tank should be removed, emptied of old fuel, rinsed out, installed and refilled with a fresh supply at the beginning of the season and at every tune-up. A stale fuel mixture may cause 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 filter, 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 motor.

COMPRESSION

Compression must be well sealed by the piston and piston rings in the cylinder to realize maximum power and performance. See Figure 5-1. A compression check is important because an engine with low or uneven compression cannot be tuned successfully to give peak performance. It is essential that compression be checked before proceeding with an engine tune-up.



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

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.

NEW VEHICLE DELIVERY

Complete instructions for putting a new snowmobile into operation are included in the Owner's Manual and assembly instruction 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 snowmobile 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, compression release, choke, electric starting, and reverse shift lever.

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. Accelerate engine to see if transmission is in neutral. Neutral lockout is spring actuated, and cannot be engaged above approximately 2000 rpm.

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 and hoses. Clean filter, or replace filter element and gasket.

j. Inspect and clean fuel filter under carburetor fuel inlet elbow.

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

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

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

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

o. Repeat test run on vehicle. Check carburetor needle adjustments.

p. 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.

g. Clean and dry snow machine thoroughly, before returning it to customer. Fog motor for storage, using OMC Accessories Rust Preventative Oil.

IGNITION TIMING ADJUSTMENT

New or Readjusted Points

See magneto removal in Section 7. Set ignition points at .020 for used points in good condition or .022 for a new point set.

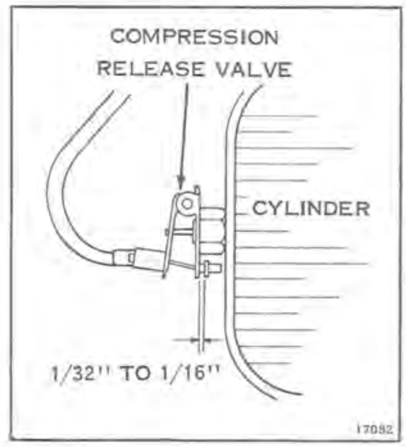


Figure 5-2

COMPRESSION RELEASE VALVE ADJUSTMENT

Check for 1/32" to 1/16" clearance when compression release knob is pushed in. See Figure 5-2. Turn out on jam nut and correct clearance with adjustment screw shown in Figure 5-3. Operate compression release knob to check for binding in cable. Lubricate the compression release actuator with Rykon EP #2 grease.

Figure 5-3

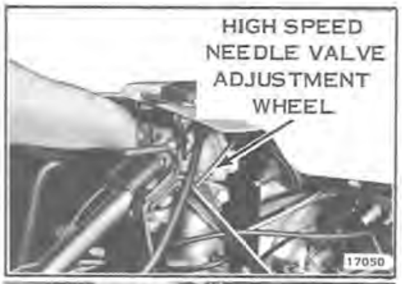
CARBURETOR ADJUSTMENTS

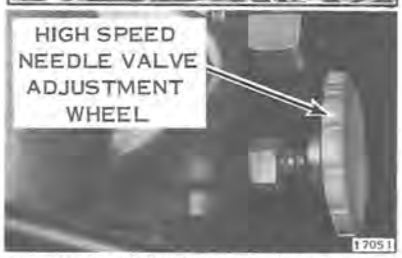
HIGH SPEED NEEDLE VALVE

CAUTION

"LEANING OUT" OF THE HIGH SPEED NEEDLE VALVE WILL RESULT IN SERIOUS DAMAGE TO THE ENGINE. NEVER SET THE HIGH SPEED NEEDLE 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.





ADJUSTING HIGH SPEED NEEDLE VALVE ON REAR OF CARBURETOR

Figure 5-4

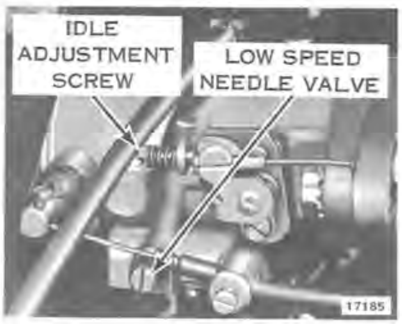


Figure 5-5

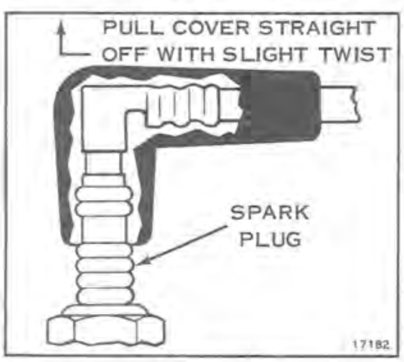


Figure 5-6

Figure 5-7

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 turn open.
3. Start and warm up engine with drive in neutral. Do not over speed engine when warming up 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). See Figure 5-4.
5. Turn needle valve back (clockwise) gradually until engine stops 4-cycling and smooths out. Be certain to give the engine time to respond. See Figure 5-4.

TO MAINTAIN ADEQUATE CYLINDER LUBRICATION THE HIGH SPEED NEEDLE VALVE SHOULD NEVER BE LESS THAN ONE TURN OPEN.

LOW SPEED NEEDLE VALVE

The low speed adjustment should be pre-set 1 turn open. Final adjustment should be made to engine as necessary. See Figure 5-5.

IDLE ADJUSTMENT SCREW

The "Idle Adjustment Screw," Figure 5-5, when turned to the right, or clockwise, will increase the engine idle speed. Recommended idle speed is 1300 to 1600 rpm. NOTE: This adjustment must be made with the neutral lockout knob out, or in the neutral position and engine warm.

SAFETY PRECAUTION

Operating above recommended idle rpm 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 your engine is Champion J7J or equivalent. The proper spark plug gap 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 7-8 for additional information on spark plugs.

SECTION 6
FUEL SYSTEM

6

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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 via 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, operated from the control panel, injects raw fuel into the crankcase before starting (see Figure 6-1).

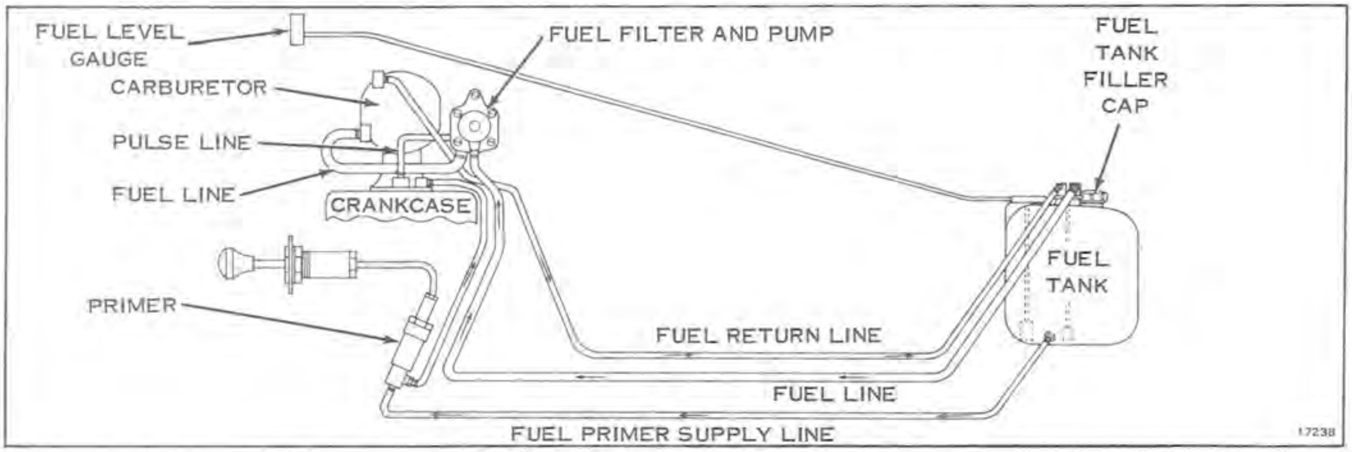


Figure 6-1

CARBURETOR

The carburetor used on this snowmobile is the diaphragm operated, HD series Tillotson. The carburetor should be cleaned and inspected at regular intervals, depending on service conditions.

Clean the entire carburetor by flushing with fuel and blow 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.

REMOVAL

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

b. Remove air filter, fuel lines and mounting screws from carburetor.

c. 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. Loosen jam nut on intake manifold and turn cable fitting out of manifold. See Figure 6-2.

d. Remove choke cable by loosening set screws on choke swivel pin and carburetor projection, and pulling cable through projection. See Figure 6-7.

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

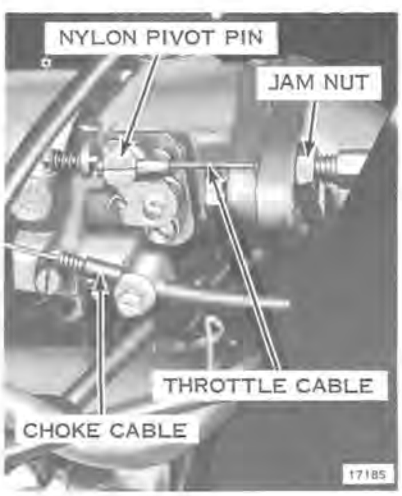


Figure 6-2

DISASSEMBLY, CLEANING, REPAIR AND REASSEMBLY

a. Remove the idle speed mixture screw (14), washer and tension spring. Inspect for damaged threads (see Figure 6-8).

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 6-5). 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 seal the idle by-pass ports 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.

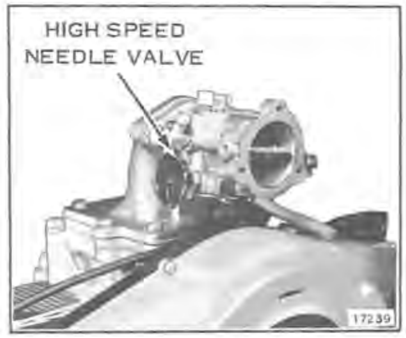


Figure 6-3

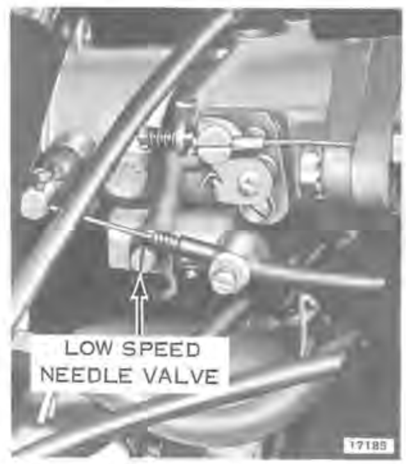


Figure 6-4

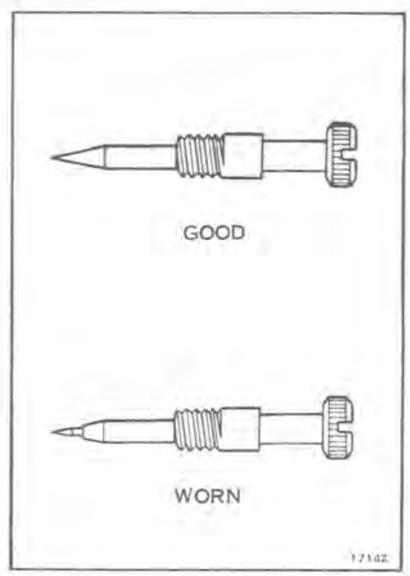


Figure 6-5

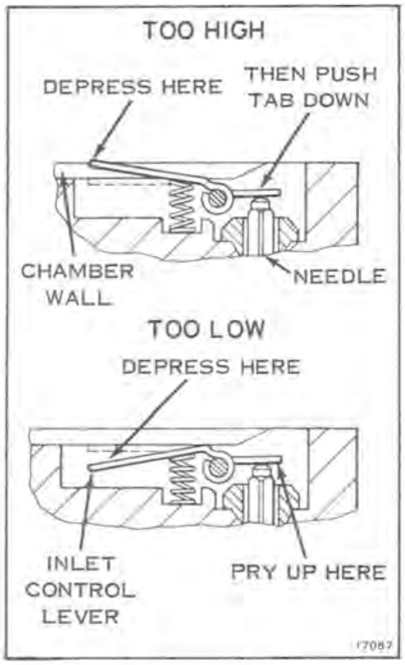


Figure 6-6

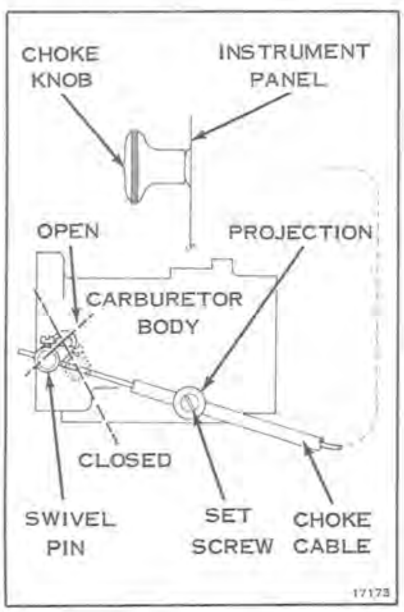


Figure 6-7

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.

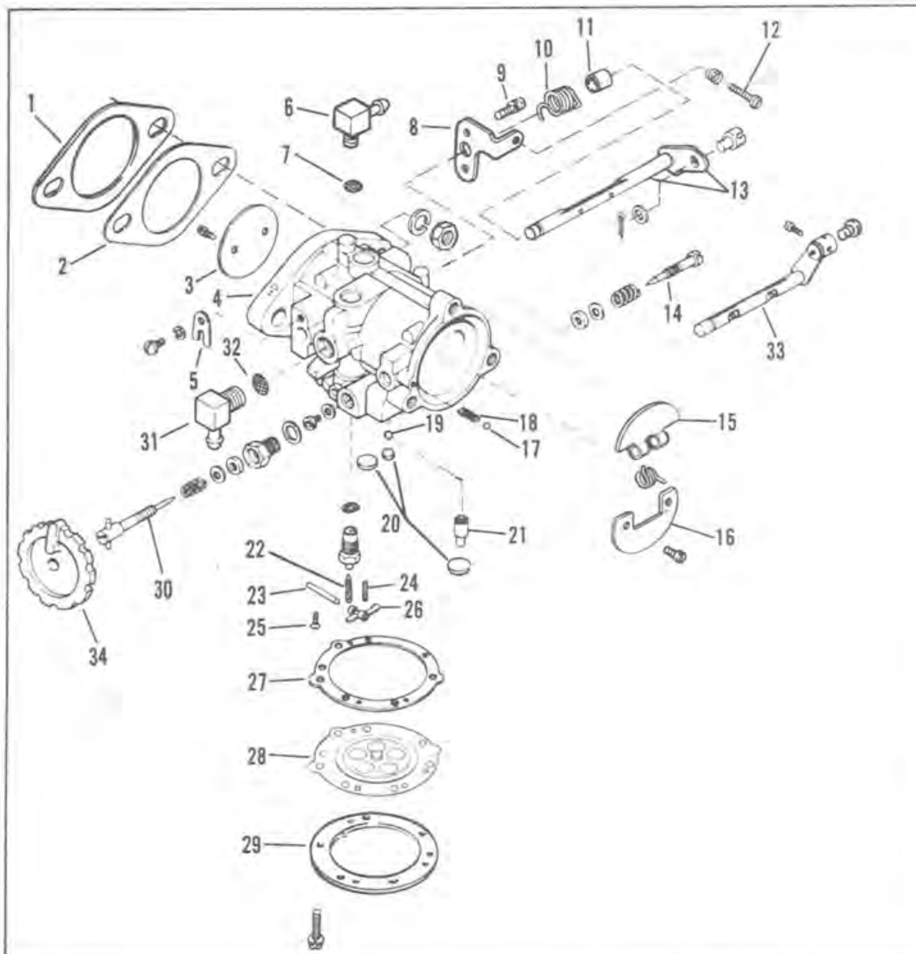
i. Remove any worn choke or throttle shafts before cleaning. Leave unworn shafts in and clean the whole assembly.

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 6-6).
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. 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.
7. Insert choke cable assembly through projection on carburetor and insert inner cable through choke lever swivel pin. See Figure 6-7 with choke knob flush against face plate on instrument panel, open choke butterfly valve full open and tighten screw to retain inner cable in swivel pin. Tighten set screw on carburetor projection just enough to hold cable firmly. Work choke knob to check for correct adjustment or possible binding.
8. Assemble the carburetor to the intake manifold. Install fuel lines and air filter to carburetor. See procedure on page 6-7 for installing new fuel line tie straps.
9. Assemble throttle cable to carburetor. See page 6-2-c. Adjust throttle cable so that carburetor butterfly valve is full open when thumb throttle lever touches handle grip.



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. Bracket Screw
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
34. High Speed Knob

Figure 6-8

When the lever on the carburetor is returned to the idle position, there must be 1/32" 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.

l. 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 6-9). 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.

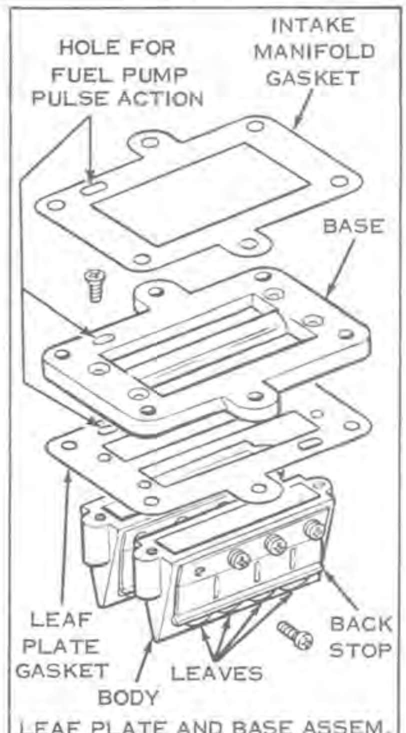


Figure 6-9

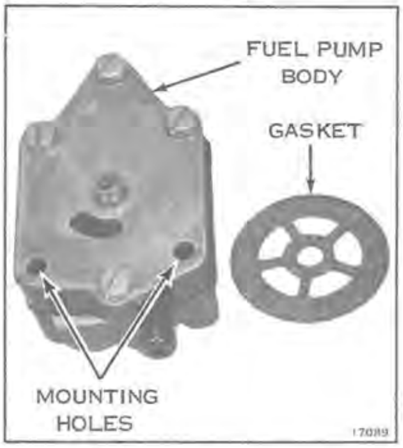


Figure 6-10

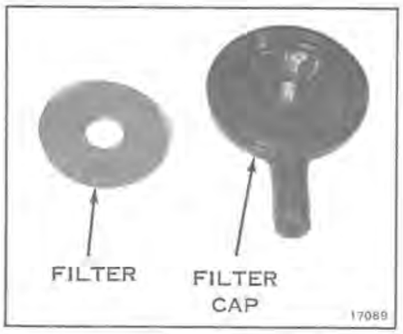


Figure 6-11

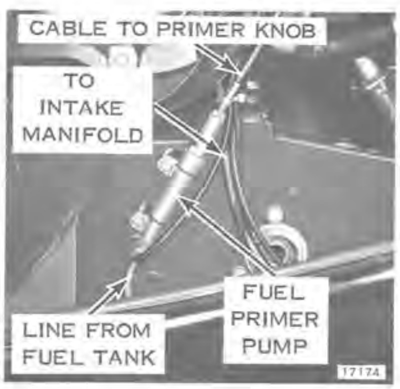


Figure 6-12

Figure 6-13

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.

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 6-10).

b. Remove two screws attaching pump and filter assembly to mounting plate (see Figure 6-10), 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 6-11).

SAFETY PRECAUTION

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

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 and secure with new tie straps per procedure below.

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 Figure 6-12).

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. Primer cable should be adjusted so that primer knob contacts the instrument panel face plate when knob is depressed and piston has traveled full stroke.

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 6-13).

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. To disconnect and remove the tank for cleaning, remove nuts and bolts from hold down straps, snap fuel gauge cap out with screw driver and remove cable. Tank can now be lifted out past the heat shield. See Figure 6-14.

d. Clean the tank by pouring some gasoline into the tank through a filtering funnel. Shake the tank and contents and empty the contents through the fill opening. Replace cable and cap in fuel tank. 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.

FUEL LINE TIE STRAP

a. Fuel line tie strap, part no. 262081 must be replaced with a new strap after its removal.

b. Assemble the new strap around the fuel line with the serrated side toward the inside. See Figure 6-15.

c. Snug up the head on the strap per Figure 6-16.

d. Tighten head on strap with pliers as illustrated in Figure 6-17.

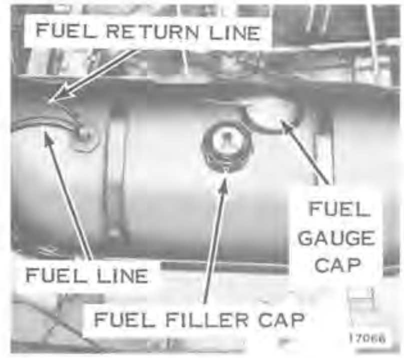


Figure 6-14

Figure 6-15

Figure 6-16

Figure 6-17

SECTION 7
IGNITION AND ELECTRICAL SYSTEMS

TABLE OF CONTENTS

7

DESCRIPTION

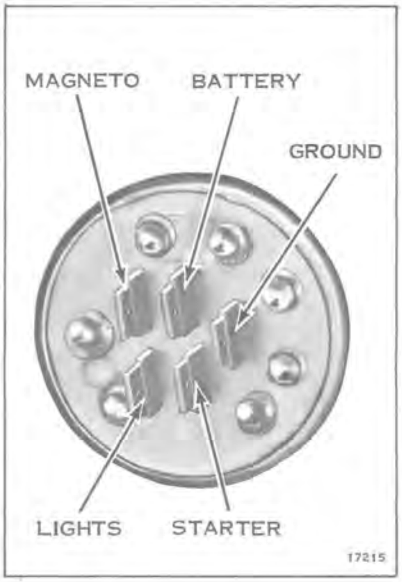


Figure 7-1

The ignition system consists of the magneto drive coils, condenser, breaker point assembly, ignition coils, ignition/light switch (see Figure 7-1), 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 tail-lights, light and ignition switches and wiring. In addition, on models equipped with electric starting, the electrical system includes the storage battery, electric starting motor, starter solenoid, and bridge rectifier. The alternator coils produce alternating current which changes in frequency and voltage in proportion to engine speed. On models having electric starting, this alternating current output is rectified (changed to direct current) by a diode bridge rectifier and used to charge the battery. Direct current is then used to power the head and taillight and the electric starter motor. See wiring diagrams at end of manual.

This section gives complete service procedures on all components of the ignition and electrical systems, breaker point adjustment, and starter motor belt adjustment. Principles of magneto operation are discussed in Section 3.

TEST EQUIPMENT

Figure 7-2

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 7-2).

CAUTION

DO NOT use a test instrument having more than a 12 volt source to check rectifier diodes.

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 are 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 are particularly recommended, since these units have provisions for checking all functions of the ignition system (see Figure 7-3).

Figure 7-3

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 #112931.

<u>Graham Tester Model 51</u>

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

<u>Merc-O-Tronic</u>

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

<u>Stevens Tester</u>

Switch B Index Reading	0.8 to 1.0

<u>Stevens Tester Model MA75</u>

Switch B Index Reading	22 using MA-12 Adapter

MAGNETO

REMOVAL

a. Pull starter rope out and tie knot. See Figure 7-4.

b. Remove one screw from bracket on both sides of instrument panel. See Figure 7-4.

c. Remove two screws from top steering column bracket. See Figure 7-4.

d. Remove three screws holding bottom rear of instrument panel.

e. Loosen jam nut on reversing lever. Screw handle out of lever. See Figure 7-5.

Figure 7-4

Figure 7-5

Figure 7-6

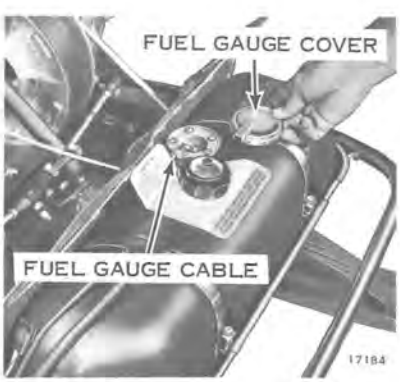


Figure 7-7

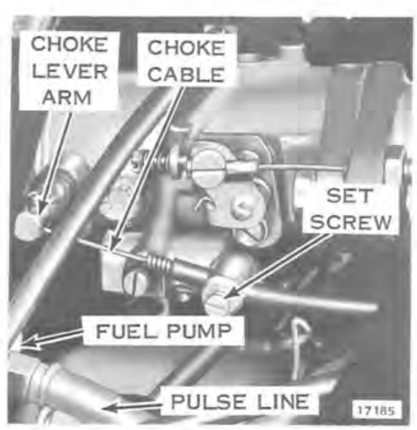


Figure 7-8

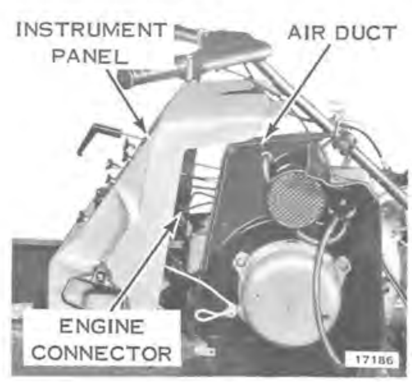


Figure 7-9

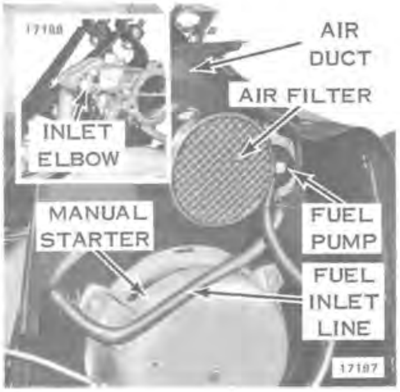


Figure 7-10

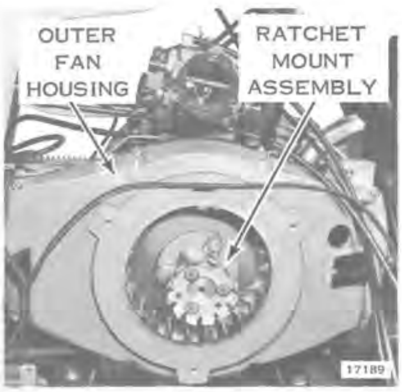


Figure 7-11

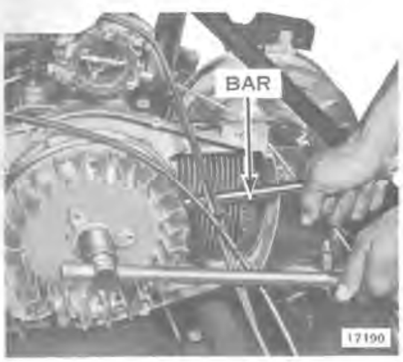


Figure 7-12

Figure 7-13

f. Remove two screws to disconnect primer from chassis. See Figure 7-6.

g. Remove cover from fuel gauge, then remove fuel gauge cable from fuel tank. See Figure 7-7.

h. Disconnect choke cable from choke lever arm at carburetor. Loosen set screw then pull cable through projection on carburetor. See Figure 7-8.

i. Instrument panel can now be pulled back from air duct. See Figure 7-9.

j. Remove pulse line from fuel pump. See Figure 7-8.

k. Remove fuel inlet line from carburetor inlet elbow, pull through air duct and drain. See Figure 7-10.

l. Remove fuel inlet line from fuel pump. See Figure 7-10.

m. Remove three bolts securing manual starter assembly. See Figure 7-10.

n. Remove three screws holding air filter. See Figure 7-10.

o. Air duct can now be removed.

p. Remove eight screws and separate outer fan housing from inner fan housing. See Figure 7-11.

q. Remove three bolts securing ratchet mount assembly to flywheel. See Figure 7-11.

r. Hold flywheel with bar from flywheel puller, and turn flywheel nut off crankshaft. See Figure 7-12.

s. Secure flywheel puller (Service Tool #378103) to flywheel with 5/16"-8 screws and remove flywheel from crankshaft. See Figure 7-13.

t. The magneto drive coils, alternator coils, breaker points and condenser are now accessible for servicing. See Figure 7-14.

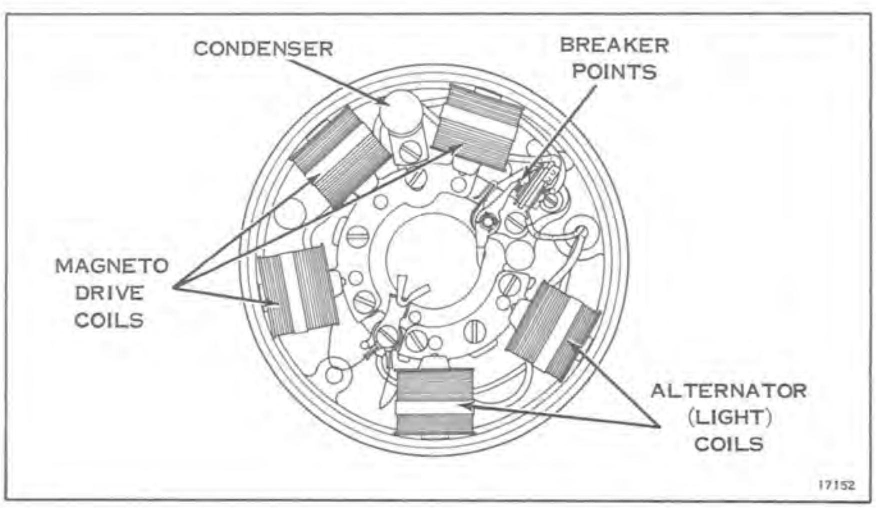


Figure 7-14

u. Disconnect primary leads from terminals on top of ignition coils. Pull high tension leads from ignition coils (see Figure 7-15). Loosen ignition coil clamp screw to remove ignition coils.

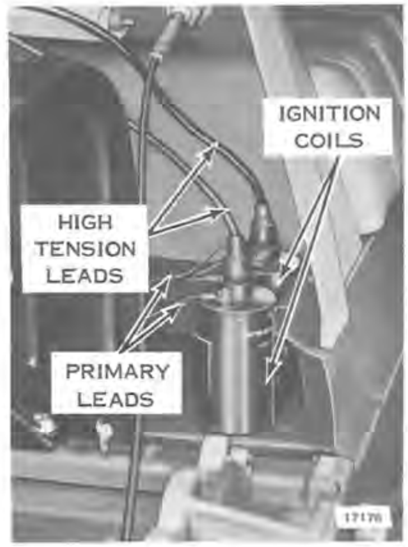


Figure 7-15

TESTING

For conclusive testing, the ignition coils should be removed. See Fig. 7-15. 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.

BREAKER POINTS

Breaker points can now be inspected and replaced if necessary. Under normal running conditions, breaker point contacts will appear slightly rough and gray in color. Abnormal points will appear excessively pitted, and 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.

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 7-16). Turn the eccentric adjusting screw into the plate until it bottoms so that there is adequate screw engagement to hold breaker point gap of .020 for used points in good condition or .022 for new points. 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.

Figure 7-16

CONDENSER

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

Figure 7-17

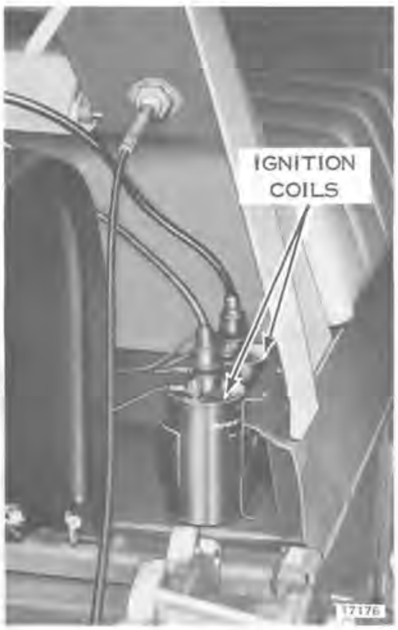


Figure 7-18

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 7-17) 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.

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.

NOTE

Magneto drive coils can be tested for correct resistance without removal of starter housing and flywheel. Separate engine connector (Ref. Figure 7-9). 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.

IGNITION COILS

Ignition coils (see Figure 7-18) should be tested for correct secondary resistance, correct primary resistance, coil polarity, and coil output. See Page 7-3. In addition, the coil insulation should be tested for leakage. The ignition coil should give a secondary reading between 18000 and 22000 volts at 200-500 RPM.

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 cannot be made to 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. See 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 7-19). 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 apparant wherever the insulation has broken down, due to moisture or carbon trails.

REASSEMBLY

a. Install magneto drive coils, making certain that coil laminations are flush with bosses on magneto plate (see Figure 7-20).

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 new oiler clip and wick in position on mounting boss (see Figure 7-21). Apply Delco #U-1901 1948792 distributor lubricant to oiler wick and to point cam follower on side toward cam rotation.

e. Install cam on crankshaft over Woodruff key and rotate to position shown in Figure 7-21.

f. Adjust breaker points, using a feeler gage and with the breaker cam and key installed on the crankshaft (see Figure 7-21). Point gap should be set to .020-.022 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. Remove cam from crankshaft and install correctly in the cam mechanism on the flywheel as shown in Figure 7-22. Place flywheel on crankshaft. When flywheel and cam are properly seated, outer edge of flywheel 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. Hold flywheel with bar and torque flywheel nut to 40 - 45 foot pounds. See Figure 7-23.

Figure 7-19

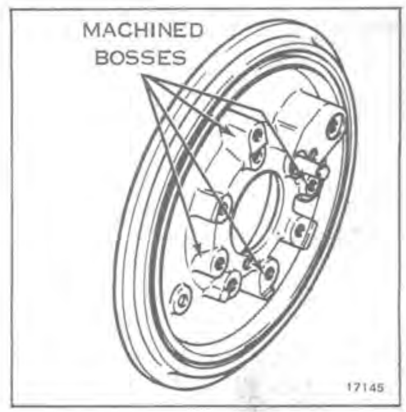


Figure 7-20

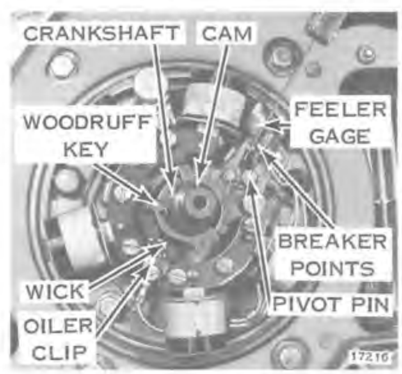


Figure 7-21

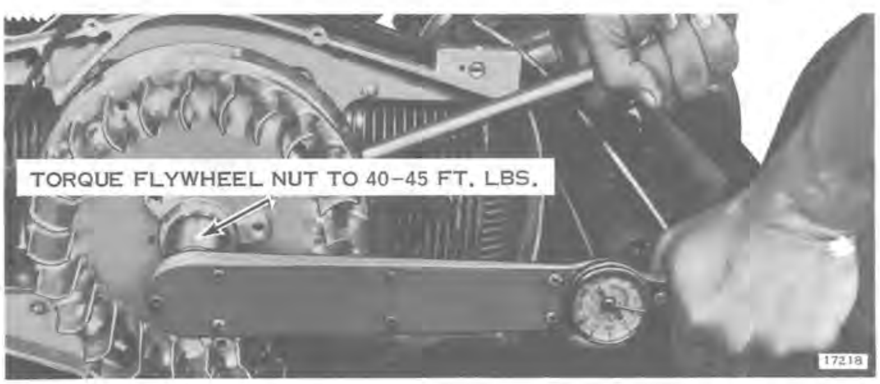


Figure 7-23

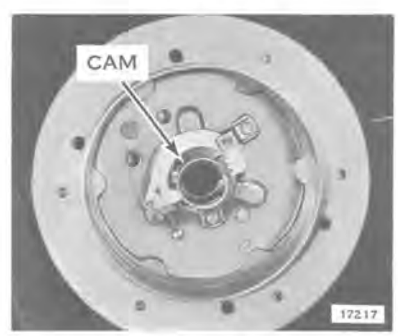


Figure 7-22

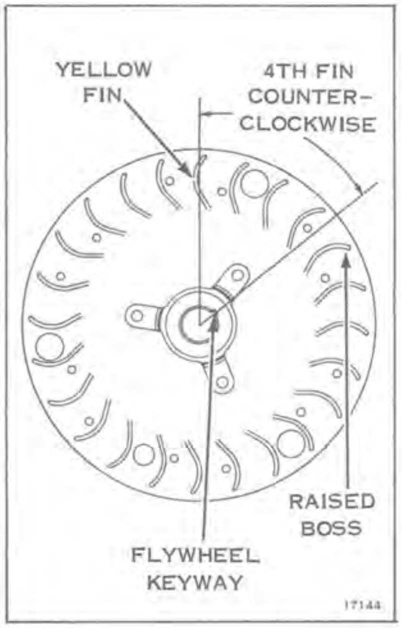


Figure 7-24

j. Reassemble remaining items in reverse order of disassembly.

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 (1300 to 1600 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 the 12 o'clock position) in the outer fan housing (see Figure 7-24).

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 7-25). 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.

Figure 7-25

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 7-26).

b. A dark, black or sootish coloration, or wet appearance, ordinarily indicates the heat range as being too cold (see Figure 7-27). 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 pre-ignition.

d. Oil fouling deposits wet, sludgy deposits and is a result of misfiring or of excessive oil in the fuel mixture (see Figure 7-28).

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.

Figure 7-26

Figure 7-27

Figure 7-28

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.

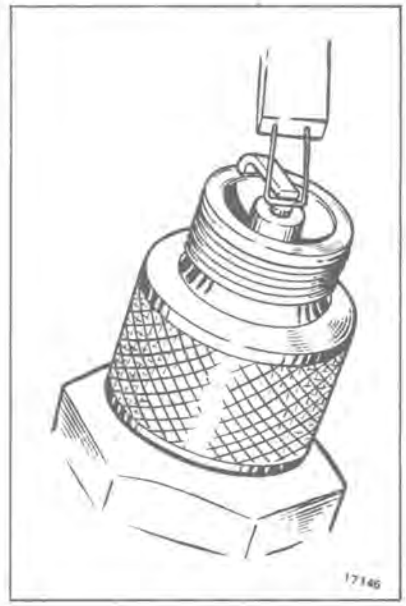


Figure 7-29

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 .033 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 7-29).

Figure 7-30

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 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.

BATTERY

CAUTION

Electric start model snowmobiles should not be started and operated with battery not connected in circuit. Operation without battery can damage rectifier. If snowmobile must be operated without battery, disconnect two yellow alternator leads from rectifier, and turn light switch to "ON."

DESCRIPTION

The battery's primary function is to provide power to operate the starting motor; however, the battery also supplies power to operate the

Figure 7-31

Figure 7-32

lights when the engine is not running at higher speeds. The storage battery is a secondary chemical generator - one that produces an electric current by chemical action after having been charged from an outside source. Each cell in the storage battery consists of a negative plate of sponge lead and a positive plate of lead peroxide immersed in a solution of water and sulphuric acid. After being charged, each cell will produce a voltage of about 2.1 volts. Six cells, connected in series, are assembled in a case to make up a 12-volt battery.

SPECIFICATIONS

Due to the extreme weather and temperature conditions under which the battery must operate, proper battery selection is very important. The battery recommended for best performance is a 12-volt, 32 ampere hour battery, or better, with a minimum of 2.2 minutes cold starting capacity at 150 amperes discharge, 0° Fahrenheit, and a 5-second voltage reading of 7.8 volts. It is important to remember that a customer's complaint of poor starting may be traceable to a battery not having these recommended specifications. The dimensions are 7-3/4" long x 5-1/8" wide x 7-1/4" high (to top of terminals).

The Prestolite Brand Battery Type 9948X which is included with electric start vehicles, is recommended and is manufactured for snow vehicle use. It has a one piece molded cover and anchored plates to reduce possibility of vibration damage. Battery is shipped dry and activated with an electrolyte.

INSTALLATION

To provide maximum protection from battery acid damage in the event of accidental upset, special spill-proof battery caps (see Figure 7-31) are supplied with the vehicle. Make certain the original caps are removed and these special caps are installed.

The hold down clamp should be tight enough to hold the battery, but should not exert undue force on the case. If the clamp is too tight, distortion and damage to battery case will result. The hold down bar should be installed as far forward as possible to enable the clamp to snap over battery caps. See Figure 7-32.

SAFETY PRECAUTION

Battery acid is dangerous and will burn the skin as well as cause damage to metal, clothing, or wood. If acid is spilled, flush it off at once with plenty of clear water, and neutralize with a solution of ammonia or baking soda.

Connect battery cables, making sure clamps are tight on battery posts to insure good contact. Apply a coat of petroleum jelly to exposed areas of the battery posts and clamp connectors to retard corrosion.

CAUTION

Correct battery polarity is extremely important. Battery must be connected with negative (-) post (black lead) to ground and positive (+) post (red lead) to starter solenoid. If positive (+) post is connected to ground, damage to the charging system will result. See Figure 7-31.

BATTERY SERVICING

Check outside of battery for damage or signs of abuse such as broken case or broken cover. Check inside of battery by removing vent caps and inspecting for low electrolyte level. If battery shows signs of serious damage or abuse, it should be replaced. Visually inspect the battery for the following:

1. Corrosion

2. Frayed or broken cables

3. Cracked case or cell covers

4. Loose hold down clamps

5. Low or overfilled electrolyte

BATTERY CARE

Check the following at regular intervals:

1. Clean battery top and terminals by washing with a solution of ammonia or baking soda. Keep vent plugs tight so that solution does not enter cells. After washing, flush top of battery with clean water.

2. Keep battery terminal connections tight and free from corrosion. If corroded, clean cable terminals and battery posts separately with a soda solution and a wire brush. Inspect cables for fraying or broken strands.

3. Keep electrolyte above the plates and separators at all times. Adhere to manufacturer's instructions for maintaining fluid level. Check electrolyte and add distilled water as necessary at weekly or semi-monthly intervals. Never add acid except when it is definitely known that some has been lost by spilling. If water is added in freezing weather, charge the battery to full charge at once. Charging the battery will mix the water with the electrolyte and prevent water freezing in the battery.

4. Keep the battery nearly fully charged at all times. Check the state of charge at frequent intervals by making specific gravity readings with a battery hydrometer (see Figure 7-33). Note that a hydrometer reading is not accurate if water has been added recently, due to the fact that the water may not be mixed with the electrolyte.

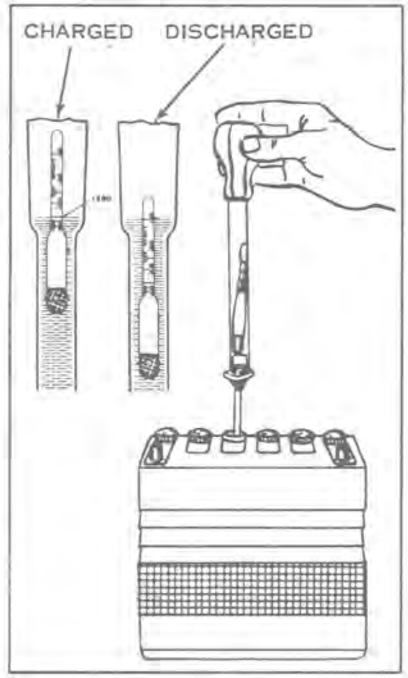


Figure 7-33

Self-discharge will cause storage batteries to become discharged and sulphated if they are not properly maintained in storage. To minimize self-discharge, store batteries in as cool a place as possible, so long as the electrolyte does not freeze. A battery which has been allowed to stand idle for a long period of time may be so badly damaged by sulphation that it can never be restored to a normal charge condition. Batteries should be recharged every 30 days to prevent this damage. Disconnect one of the battery leads before charging battery. If storage temperature is hot, more frequent charging will be necessary. Add water if necessary before charging, to bring electrolyte to proper level. Fully charged batteries have been known to withstand temperatures as low as -90° F.; a discharged battery will freeze at about -19° F., perhaps causing bursting of both the cell and battery cases.

BATTERY TESTING

a. Make sure battery is fully charged as described under SLOW CHARGING. Hydrometer readings taken on partially charged batteries are unreliable for the following test.

b. Measure specific gravity of electroyte in each cell and compare readings with the following; if cell readings are between 1.250 and 1.290, the battery is ready for use. Any variation in the specific gravity between cells within this range does not indicate a defective battery. Readings should be corrected to 80° Fahrenheit for comparison. If this specific gravity of any cell falls outside this range (1.250 to 1.290), replace the battery.

BATTERY CHARGING

For best performance a good battery should be fully charged before being returned to service. DO NOT recharge the battery by the fast charge method. This method does not restore the full charge and also shortens the life of the battery.

CAUTION

DISCONNECT one of the battery leads before attaching battery charger to battery.

SLOW CHARGING

Adjust electrolyte to proper level by adding water, then charge battery at a maximum rate of 5 amperes until fully charged. Full charge of the battery is indicated when all cell gravities do not increase when checked at three intervals of one hour and all cells are gassing freely. Due to this low rate during slow charging, plenty of time must be allowed. Charge periods of 24 hours or more are often required.

BATTERY WARRANTY

PRESTOLITE BATTERY WARRANTY

Warranty on Prestolite batteries is covered directly by Prestolite, through their authorized battery service stations, for a period of 18 months.

The warranty period starts on the date the snowmobile is delivered to the original owner.

Should a battery fail, due to inherent defects, during the first three (3) months of service, it will be replaced on a no-charge basis. Batteries that fail during the balance of the warranty period (15 months) will be replaced on a prorata basis.

STARTER SYSTEM

DESCRIPTION

The electric starter system consists of the starter motor, starter solenoid, and the necessary cables and wires with their connectors. The starter motor converts electrical energy from the battery into mechanical power which is transmitted to the engine through the starter belt. The starter switch controls the operation by activating the starter solenoid which makes and breaks the high current circuit between the battery and the starter motor.

The starter solenoid (see Figure 7-34) closes the circuit through a movable contact disc which strikes two terminal contacts that are connected to the starter motor circuit. The solenoid winding, when energized, exerts a magnetic pull on the solenoid plunger, causing it to move the contact disc against the terminal contacts.

The starter motor sheave is disengaged when at rest and when engine is running. The rotation of the starter motor drives the pin on the motor shaft against the cam on the movable half of the sheave, forcing it to move in a lateral direction toward the fixed half of the sheave, engaging the starter belt. When the engine starts, the sheave is driven faster than the motor and sheave halves separate to the disengaged position. See Figure 7-35.

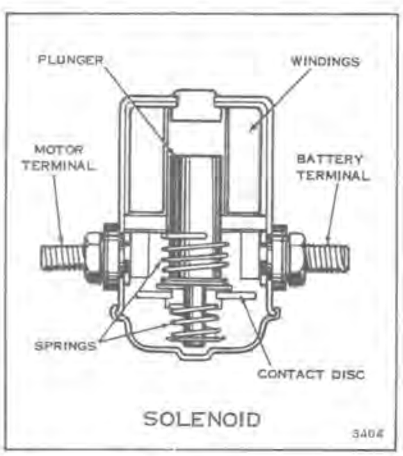


Figure 7-34

CAUTION

Starter belt tension must be set with sufficient slack to prevent the engine from driving the starter motor.

MAINTENANCE

The only starter motor maintenance required is periodic cleaning of the outside of the starter motor and drive and a check of the starter belt tension. No periodic lubrication of the starter motor or solenoid is required. Starter motor need be removed for reconditioning only every 1000 hours or if the following tests indicate that the starter is not operating properly. If the starter motor does not crank the engine or if it cranks too slowly, check the battery, cables, and connections. Inspect all wiring connections in the starter circuit to insure that they are clean and tight. Proceed with the following tests if additional troubleshooting is necessary.

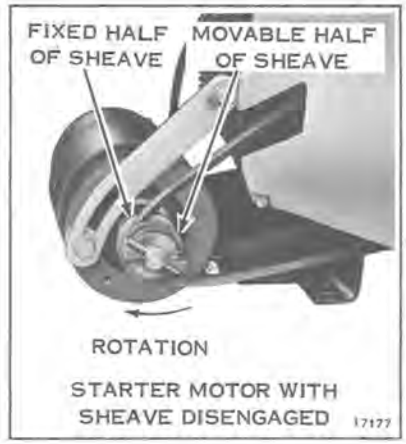


Figure 7-35

STARTER SYSTEM TESTING

The following tests fall into two groups, starter circuit tests and starter motor tests. Starter circuit testing is a quick means of pinpointing causes of hard starting which may result from a faulty electrical component in the starter circuit, and can be performed without removing any components from the engine. NOTE: All starter circuit testing must be done with a fully charged, 12-volt battery.

STARTER CIRCUIT TESTING

Starter Motor Amperage Draw Test

a. Ground spark plug high tension leads so that engine can be cranked without firing. Place clamp-on DC ammeter capable of reading at least 200 amperes around starter motor lead (see Figure 7-36).

b. Turn ignition switch to START and observe amperage reading with engine cranking. Current should be between 75 amperes minimum and 140 amperes maximum after initial surge.

CAUTION

DO NOT operate starter motor for more than thirty seconds at a time without pausing to allow motor to cool for at least two minutes.

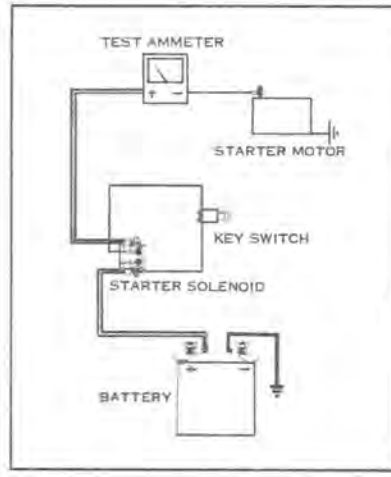


Figure 7-36

Starter Motor Available Voltage Test

a. Inspect battery and cables to make sure that battery has ample capacity for cranking. NOTE: Engine must be at normal operating temperature when test is made.

b. Ground spark plug high tension leads so that engine can be cranked without firing.

c. Connect a voltmeter across starter motor (see Figure 7-37), with positive (+) lead to starter motor terminal, and negative (-) lead to ground on starter frame.

d. Turn ignition switch to START to crank engine and observe voltmeter reading as quickly as possible.

CAUTION

Avoid running starter motor continuously for more than 30 seconds during test to prevent overheating. Allow ample time between tests for starter motor temperature to normalize. Voltmeter readings will rise as starter temperature increases.

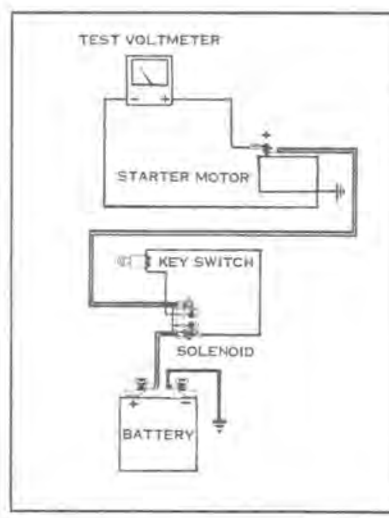


Figure 7-37

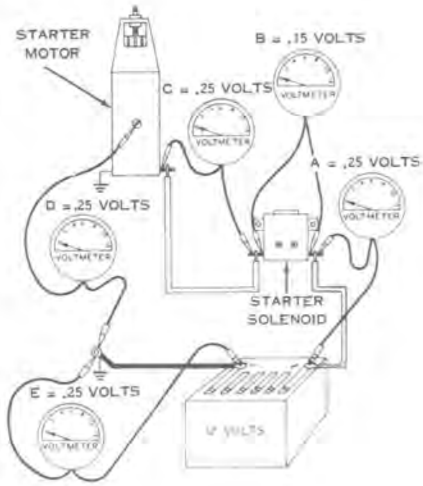


Figure 7-38

e. If starter motor turns engine at normal cranking speed with a voltage reading between 9.5 volts minimum and 10.5 volts maximum, starter motor is satisfactory. If available voltage reading at the starter motor is low, review the following chart for probable causes.

Starter System Voltage Drop Test

a. By making a systematic check from the positive battery terminal, through the starting circuit and back to the negative battery terminal, any component or electrical connection having excessive resistance, thus causing high voltage drop and subsequent hard starting, can be pinpointed (see Figure 7-38).

b. Ground spark plug high tension leads so that engine can be cranked without firing. Connect voltmeter and turn ignition switch to START to crank engine. NOTE: By placing voltmeter leads against battery, solenoid, and starter motor terminals rather than against connecting cable ends, each connection can be tested for high resistance along with component.

c. Clean and retighten, or replace, any connection, cable, or component having greater than specified voltage drop.

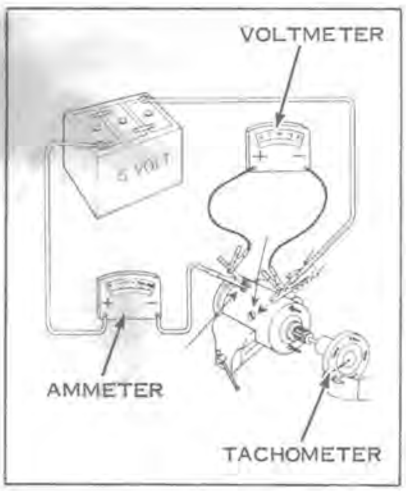


Figure 7-39

STARTER MOTOR TESTING

The no-load test is used to determine quickly the general mechanical and electrical condition of the starter motor. The stalled torque test is used to determine whether or not the starter motor has sufficient torque to crank the engine for fast starting.

No-Load Test

a. Connect starter, with an ammeter in series, to a 6-volt source (see Figure 7-39). Use a tachometer or rpm indicator to indicate armature speed.

b. Ammeter should indicate 60 amperes maximum; rpm indicator should indicate 4200 rpm minimum. If readings are not as specified, check for binding in starter or failure of windings. NOTE: If starter motor turns slowly, smokes after a very few seconds of running, or gets hot instantly, stop testing. Disassemble starter and check for shorts.

Stalled Torque Test

a. Connect a voltmeter between the starter terminal (+) and motor frame (-). Using a torque wrench to stall motor armature (see Figure 7-40), connect starter motor through an ammeter to a 12-volt battery.

b. Voltmeter reading should be approximately 10 volts during this test. Torque should be a minimum of 108 inch pounds or 9 foot pounds and current should be a maximum of 405 amperes.

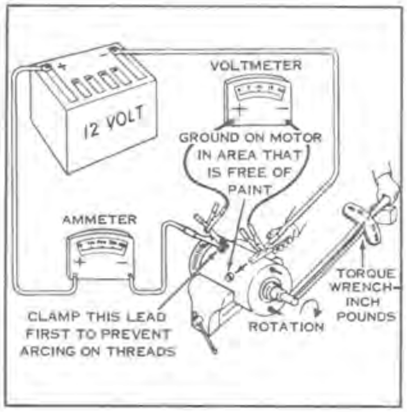


Figure 7-40

CAUTION

If motor smokes or gets hot instantly, stop testing, disassemble starter and check for shorts. Use only a fully charged 12-volt battery when making stalled torque test. Obtain readings as rapidly as possible to prevent starter overheating. Allow sufficient time for starter to return to room temperature if it is necessary to repeat stalled torque test.

c. Check each armature coil for open circuits by rotating torque wrench handle through a 180 degree arc after initial torque reading has been noted. This must be done quickly. Torque should be uniform through this arc, although reading will decrease slightly each time brush moves from one commutator segment to another. If an appreciably wide area is found in which torque is very low, disassemble starter and check armature.

Figure 7-41

INSPECTION OF STARTER MOTOR

a. Check armature on a growler for shorted turns (see Figure 7-41). NOTE: Follow operating instructions furnished with armature growler for proper test procedures. Clean between commutator segments of armature and recheck armature on growler. If shorted turns are still indicated, replace armature.

b. Check armature for grounded windings (see Figure 7-42). Rotate one lead of continuity tester (test light or meter) around circumference of commutator while holding other continuity meter lead on the armature core or shaft. An indication of continuity means that the armature windings are grounded and armature must be replaced.

c. Check armature for open windings by using an ohmmeter. Measure resistance between adjacent commutator segments, using LO OHMS scale. Rotate leads around entire circumference of commutator. An open winding is indicated if any one reading is much higher (three times higher or more) than the average reading.

Figure 7-42

d. Inspect commutator segments. If they are dirty or show signs of wear, turn commutator in a lathe until surface is clean and smooth.

e. After turning commutator, undercut insulation between commutator segments to a depth of approximately 1/32 inch. The undercut must be flat at the bottom (triangular groove cuts are unsatisfactory) and should extend beyond the brush contact area for the full length of each insulated groove (see Figure 7-43).

f. After commutator has been undercut, sand lightly with No. 00 sandpaper to remove burrs left during the undercutting process. After sanding, clean commutator thoroughly, removing all traces of metal chips or sanding grit, and recheck armature on growler.

g. Inspect armature insulation for indications of overheating or damaged windings. Clean off any deposits of carbon which may contribute to later failure of the windings. NOTE: Starter motor components should not be washed off in cleaning solvents. Most solvents will soften varnish insulation used on armature and field windings. All starter motor components can be cleaned adequately with a clean cloth or soft brush. Cleaning end heads in solvent may dissolve the oils that have impregnated into the armature shaft bearings. If these oils are removed, bearing or armature shaft wear can be expected. Cleaning of armature in solvent will leave oily residue on the commutator segments, causing arcing between the commutator and brushes.

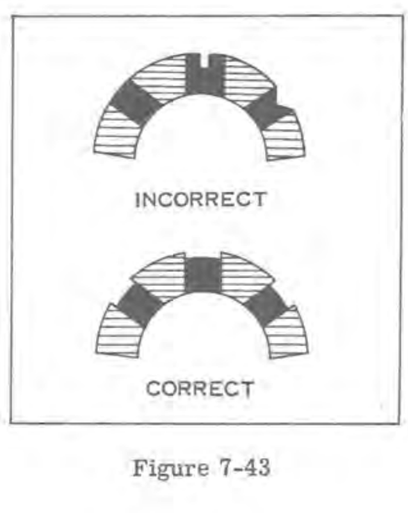


Figure 7-43

Brushes

a. Inspect the brushes; replace if worn to one-third their original 3/8" length, or if damaged or cracked. Replace brush springs if weak.

b. Inspect brush springs. Springs should have a pressure of 35 to 90 ounces when compressed to 9/32 inch. Measure brush tension with scale hook under brush screw or under bend in brush spring, and take reading as brush just leaves commutator. Pull off spring scale must be directly opposite line of force exerted by brush spring.

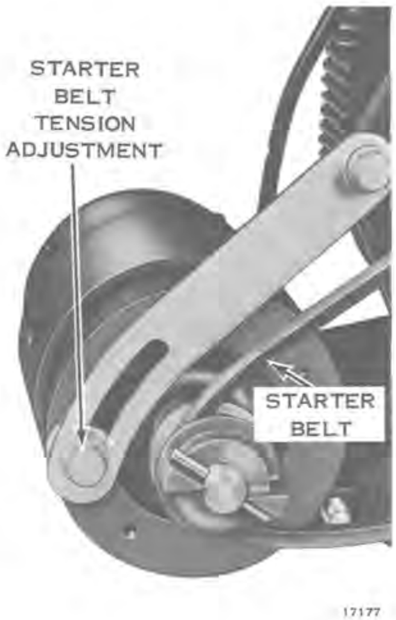


Figure 7-44

BELT TENSION

a. Correct starter motor drive belt tension is extremely important. A loose belt will cause slippage and a tight belt will result in a ruined starter when it is driven overspeed by the engine after starting. See Page 7-12.

b. Install starter belt between starter and flywheel pulleys.

c. Turn movable half of pulley counterclockwise to drive position. See Figure 7-44.

d. Move starter down to tighten belt. Be certain that pulley halves are CLOSED or in driving position when making the adjustment.

e. Belt must be free when pulley is turned fully clockwise (engine run position).

ALTERNATOR

TROUBLE SHOOTING

Failure in the alternator charging circuit will usually show up when the head and taillights do not function, or when the battery fails to retain a charge sufficient to start the engine consistently. To determine the cause of trouble, check the condition of the battery and electrical connections throughout the circuit, before proceeding with electrical testing. A visual inspection may be all that is required to locate the trouble.

CAUTION

Disconnect battery leads before tightening or changing any connections.

a. Battery. Check condition as described under Battery Testing, Battery Inspection, and Battery Care.

b. Wiring. The importance of connections which are good electrically and mechanically throughout the circuit cannot be overemphasized. The largest percentage of electrical system failures are caused by one or more loose or dirty connections. Check for corroded or loose connections, and for worn or frayed insulation. Check the battery cables for possible reverse polarity.

c. Connections. All electrical connections are readily accessible by opening the hood. Although connections are easily made, care must be used when fastening terminals together. If connectors are not assembled properly, one or more of the terminals may back out of the housing, preventing one or more of the electrical circuits from operating. To eliminate problems due to improper connections, examine the terminals on both halves of the connectors after assembly to be sure that all terminal ends are in place.

If a visual inspection of the electrical system shows all components to be in good condition, an electrical inspection will be necessary to determine which component of the charging system is the cause of trouble.

To check alternator coils, connect volt-ohmmeter (0-10 ohm range) to both yellow output leads of alternator. Meter should read .8 ohms ± .2 ohm.

CHECKING RECTIFIER DIODES

Two methods may be used to check for shorted or open diodes, an ohmmeter or 12 volt test lamp.

CAUTION

DO NOT use a 110 volt test lamp to test diodes. Diodes are checked with test meter selector in "OHMS" position ("HI OHMS" on the Stevens Model AT-100). This is basically a continuity test.

Disconnect all leads from rectifier assembly. Check a diode by connecting test leads to adjacent terminals on rectifier assembly and noting the reading (see Figure 7-45). Reverse the test leads and again note the reading. If both readings are very low, or if both readings are very high, the diode is defective. A good diode will give one low reading and one high reading.

Repeat the test procedure for the other diodes by connecting the test leads between adjacent terminals.

If a test light is used, light should show with connections in one direction only. If lamp lights or fails to light in both directions, the diode is defective.

Connect leads to correct terminals. See Figure 7-45, and wiring diagram at end of manual.

ALTERNATOR COIL REPLACEMENT

a. Remove flywheel as described under "Magneto Removal".

b. Disconnect alternator coil lead (see Figure 7-14).

c. Remove alternator coil assembly.

d. Install and connect new alternator coil assembly. Make certain that coil laminations are flush with bosses on fan housing.

e. Reassemble as described on page 7-7.

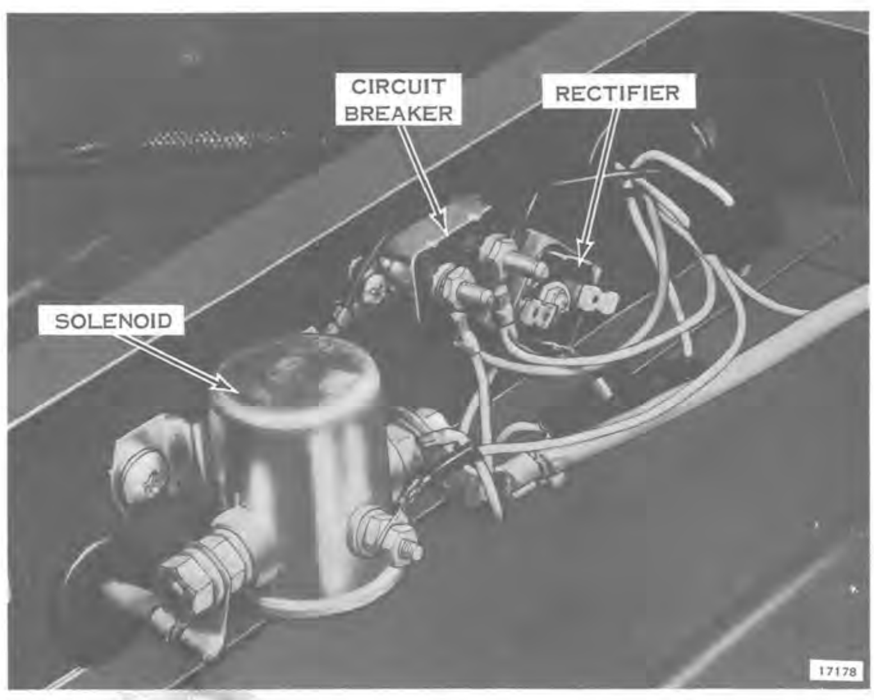


Figure 7-45

SECTION 8
MANUAL STARTER

TABLE OF CONTENTS

Figure 8-1

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

a. Raise hood.

b. Pull starter rope out and untie knot in handle while holding rope.

c. Ease rope back into starter until starter spring is fully unwound.

d. Remove three screws securing starter assembly to outer fan housing.

SAFETY PRECAUTION

Because of the rewind spring, it is good practice to wear safety glasses when disassembling and reassembling the manual starter.

e. Remove screw (pulley to housing) and remove all components of starter pulley spindle assembly. See Figure 8-2.

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

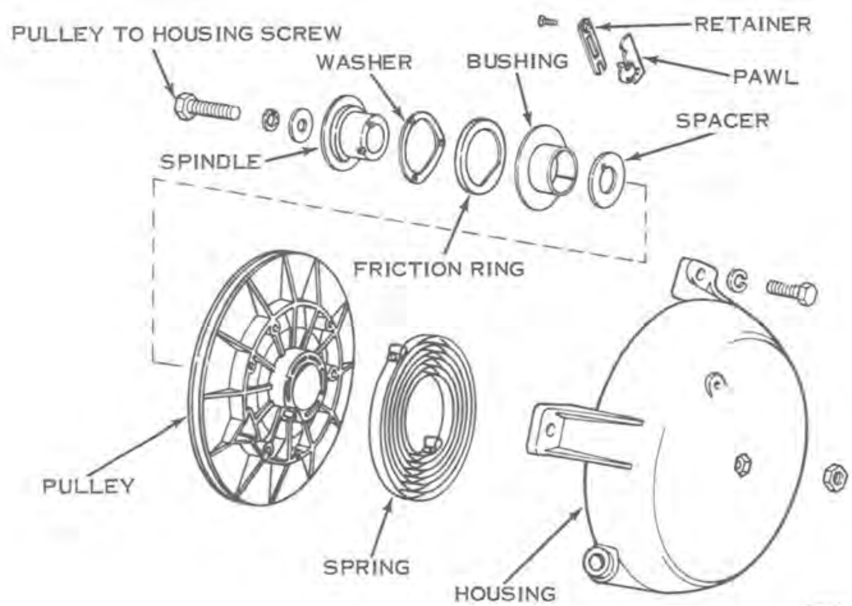


Figure 8-2

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 73-1/4 inches.

f. Examine bushing in instrument panel and starter housing for sharp edges and rough surfaces that might cause rope fraying. File and polish as necessary.

REASSEMBLY

a. Place inside spring end loop over pulley anchor pin. Place outside spring end loop between pins on fixture base.

b. Insert handle shaft with bushing through pulley bore and into fixture base.

c. Use fixture crank to wind spring counterclockwise until tight. Release at least one turn, continuing to release until loop end spring lines up with hole drilled through edge of pulley. Slide one end of pin through holes in pulley and spring loop.

d. Carefully remove the hand crank and bushing. Lift pulley off base plate, holding spring in pulley.

e. Place pulley and spring into starter housing, making certain that spring loop is lined up exactly with pin in starter housing. Press pulley into starter housing, forcing out pin which held spring.

f. Apply standard Oil Rykon EP #2 to spindle and spindle bushing.

CAUTION

Many lubricants, including OMC Type A, solidify in cold weather, and will make the starter inoperative.

Install spindle, spring washer, friction ring, and bushing. Fasten with screw, washers, and nut.

g. 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 end must be stiff to hold in pulley.

h. Turn starter pulley counterclockwise to make sure starter spring is fully wound. After spring is fully wound, allow it to unwind one turn so that pulley rope hole aligns with housing rope hole. 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.

i. Install pawls, retainers, and screws.

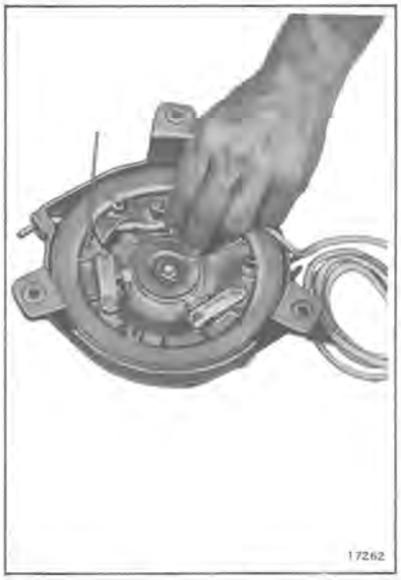


Figure 8-3

j. 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.

k. Attach manual starter assembly to fan housing with 3 screws.

STARTER ROPE REPLACEMENT

a. Remove starter assembly.

b. 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.

c. Untie knot and remove rope from rope handle. Remove rope from starter assembly.

d. Cut new starter rope to length of 73-3/4 inches. Fuse ends of rope over open flame for about one-half inch. Rope end must be stiff to hold in pulley. Tie knot in end of rope and thread through pulley and housing. See Figure 8-3.

e. Remove locking pin and allow starter to rewind.

f. Replace starter assembly.

g. Replace starter handle.

SECTION 9
ENGINE

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9

Figure 9-1

Figure 9-2

Figure 9-3

DESCRIPTION

The snow machine is driven by a two-cycle, twin-opposed cylinder, air-cooled engine (see Figure 9-1). 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

a. Remove shroud. Release two quarter turn wing fasteners and remove belt guard.

SAFETY PRECAUTION

Keep fingers from between halves of secondary sheave when removing belt. Movable half of sheave is spring loaded.

b. Spread the secondary sheaves by pulling the movable half of sheave toward the steering column. Work belt over top of movable half of sheave as shown in Figure 9-1.

c. Work belt between primary and secondary sheave. See Figure 9-2.

d. Disconnect neutral lockout cable from actuator arm and move belt between actuator arm and primary sheave. See Figure 9-3.

e. Disconnect throttle cable at carburetor. Loosen jam nut and turn out on throttle cable fitting. Pull cable through intake manifold. See Figure 9-4.

f. Disconnect choke cable from choke lever arm at carburetor. Loosen set screw then pull cable through projection on carburetor. See Figure 9-4.

g. Remove two screws securing brake caliper to secondary. See Figure 9-5.

h. Disconnect fuel lines and pulse line from fuel pump, carburetor and fuel tank.

i. Remove shift handle from reverse operating rod.

j. Remove neutral lockout cable from bracket. See Figure 9-5.

k. Disconnect compression relief cable from compression relief valve. See Figure 9-6.

l. Disconnect cigarette lighter and engine electrical connector. Remove connector to ignition/light switch.

m. Disconnect cables from speedometer and tachometer heads if these accessories are on snowmobile.

n. Remove three screws from lower steering column flange. Remove two screws holding steering column yoke and rubber bushing. See Figure 9-7. Remove steering column assembly.

o. Disconnect fuel lines from bottom of primer. Remove two bolts securing primer to chassis.

p. Grasp starter rope just behind starter and pull all the way out. Tie knot in rope. Remove knot in starter grip and pull rope through instrument panel. Remove manual starter assembly.

q. Remove one screw from instrument panel to chassis bracket on each side of snowmobile. Remove three screws from rear of instrument panel. Lift off instrument panel assembly.

r. Remove fuel lines from fuel pump.

s. Disconnect spark plug leads. See Figure 9-8. Disconnect red lead from electric starter motor.

t. Loosen two muffler clamps. See Figure 9-27. Loosen screws retaining muffler to chassis.

u. Remove four engine mounting bolts. Engine and electric starter assembly is now free to be removed from chassis.

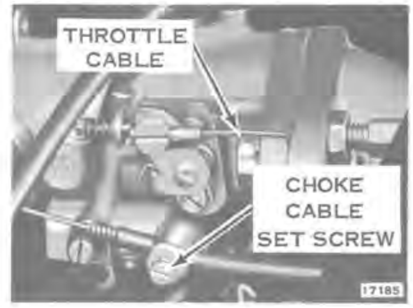

Figure 9-4

Figure 9-5

Figure 9-6

DISASSEMBLY

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

b. Remove fan housing.

c. On electric start models, loosen starter belt tension, remove belt tension bracket and starter.

d. Remove spark plugs. Remove electrical connector assembly. Remove flywheel and magneto cam. For detailed instructions, see Section 7.

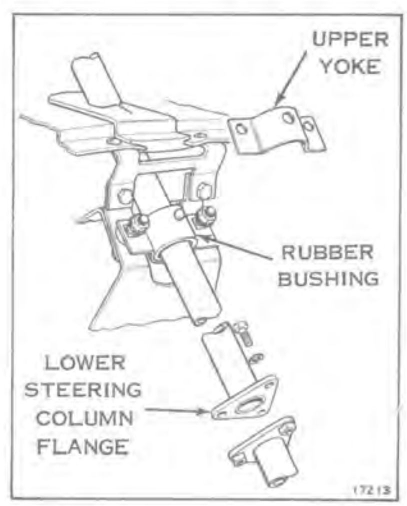

Figure 9-7

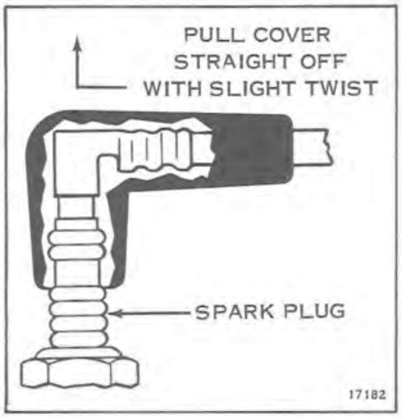

Figure 9-8

e. Remove primary drive assembly. See Section 10.

f. Remove exhaust manifolds.

g. Remove cylinder and crankcase group from engine frame assembly.

h. Remove compression relief valve.

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

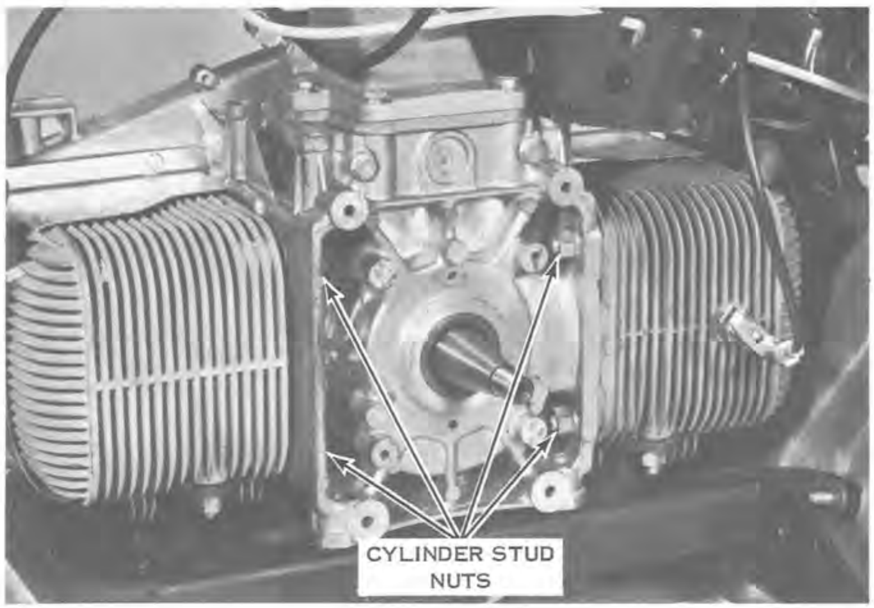

Figure 9-9

NOTE

Cylinders and pistons can be serviced with only the cylinder barrels removed.

j. Remove screws from crankcase halves and drive out two alignment roll pins from flywheel side. Heat up crankcase halves in bearing area to approximately 450°F. Tap crankcase with rawhide mallet to break seal and separate crankcase halves.

CAUTION

Pistons, connecting rods, and caps are matched parts. 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.

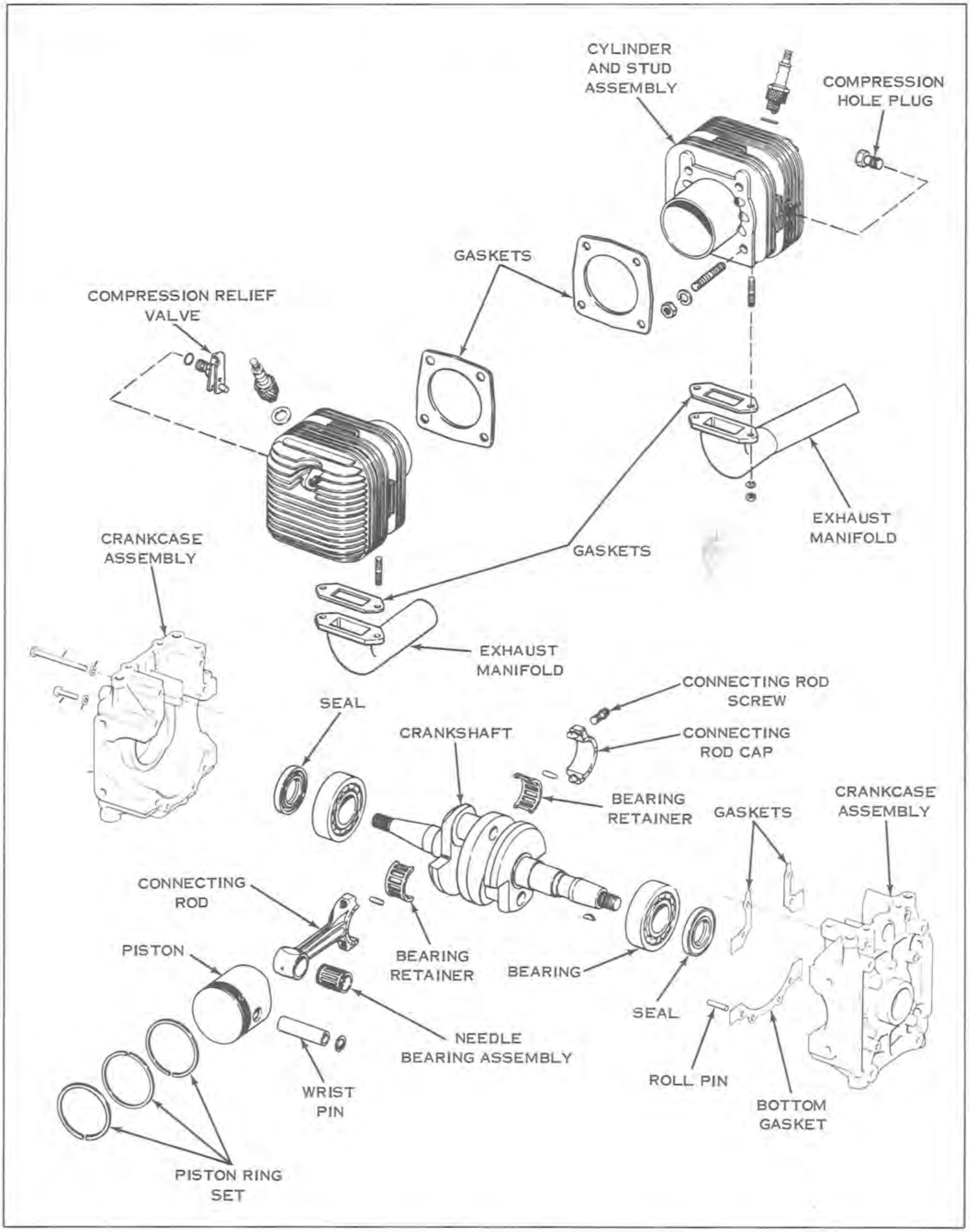
CYLINDER
AND STUD
ASSEMBLY
COMPRESSION
HOLE PLUG
GASKETS
COMPRESSION RELIEF
VALVE
EXHAUST
MANIFOLD
GASKETS
CRANKCASE
ASSEMBLY
EXHAUST
MANIFOLD
CONNECTING ROD
SCREW
SEAL
CRANKSHAFT
CONNECTING
ROD CAP
BEARING
RETAINER
GASKETS
CRANKCASE
ASSEMBLY
CONNECTING
ROD
PISTON
BEARING
RETAINER
BEARING
SEAL
NEEDLE
BEARING ASSEMBLY
ROLL PIN
WRIST
PIN
BOTTOM
GASKET
PISTON RING
SET

Figure 9-10

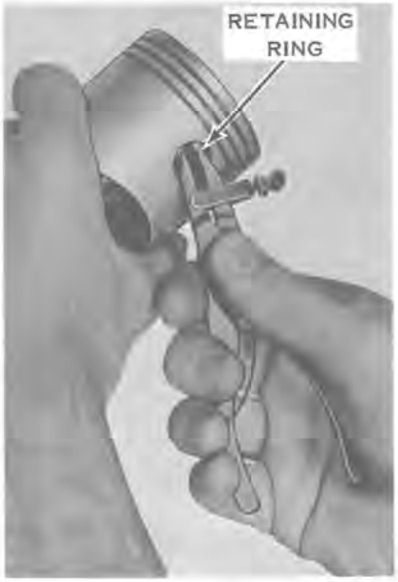

Figure 9-11

k. Remove connecting rod caps. Remove connecting rods from crankshaft.

l. Reinstall matched caps on connecting rods.

m. Remove rings from pistons. DO NOT try to save the rings. Install a complete set of new rings on every overhaul.

n. If necessary to remove connecting rods from pistons, remove wrist pin retaining rings, using Truarc No. 1 pliers (Service Tool #303857) (see Figure 9-11). Press out wrist pin to free piston from connecting rod. See Figure 9-12. Piston wrist pin hole marked "Loose" should be up when pressing out wrist pin to prevent piston damage.

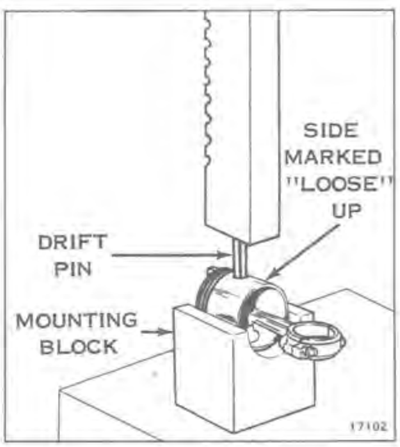

Figure 9-12

CLEANING, INSPECTION, AND REPAIR

SAFETY PRECAUTION

When using trichlorethylene as a cleaning agent, use in a well ventilated area at normal room temperatures, and under no circumstances 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.

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, badly scored, replace cylinders. Major portion of wear will be in port area and area covered by ring travel.

GASKETS AND GASKET SURFACES

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

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

Figure 9-13

c. Check gasket faces for flatness. Under certain conditions, gasket faces may warp or spring, particularly where thin sections are 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 9-13). 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 sprung, high spots marking 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 9-14

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 9-14, 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 9-15).

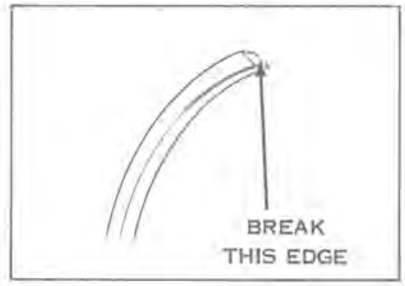

Figure 9-15

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 9-16). Check clearance between piston and cylinder before reinstalling piston (see Figure 9-17). Check tolerances on specification 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 9-18). Press ring down in bore slightly with bottom of piston to square it up. Discard and replace with new ring if gap is excessive (see Section 11, Specifications).

Figure 9-16

d. Check each ring in its respective ring groove for tightness or binding by rolling the ring around the piston groove (see Figure 9-19). Check for groove side clearance with feeler gage (see Figure 9-20) (see Section 2, Specifications).

BEARINGS

a. 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.

b. 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 in 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.

c. 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. Be careful not to spin bearings by force of air.

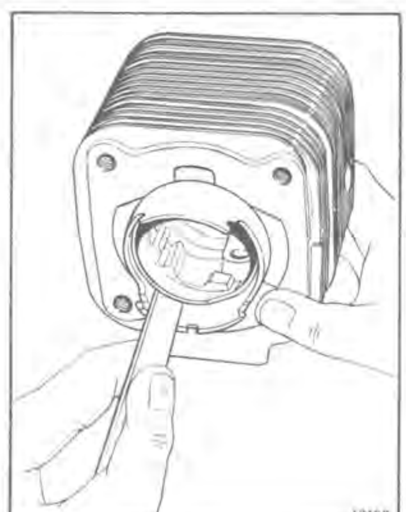

Figure 9-17

d. 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.

e. 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 heavy 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.

f. If bearings must be replaced, remove the old bearings using the following procedure: Use special bearing removal tool shown in Figure 9-21. 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.

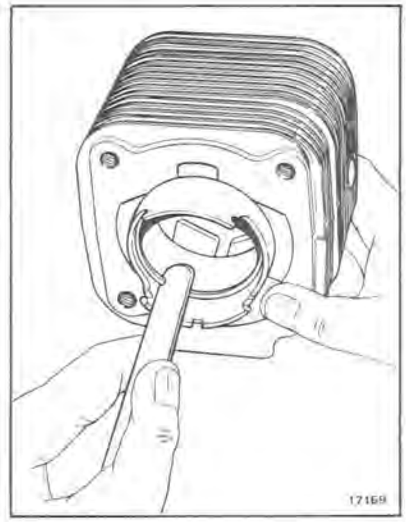

Figure 9-18

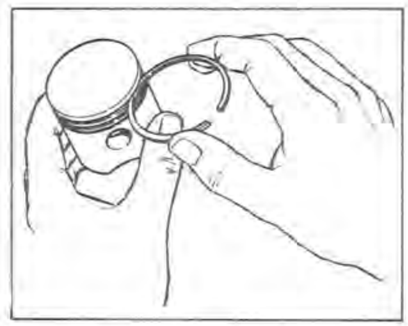

Figure 9-19

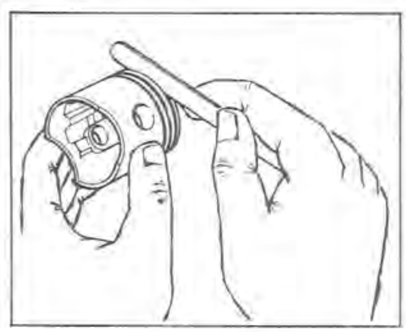

Figure 9-20

ASSEMBLY OF ENGINE

Refer to 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 the 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 in an arbor press.

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 9-22). 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. When installed on the piston, the ring gaps must be staggered to retard compression loss.

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 crankshaft, between the bearing and thrust face of crankshaft. Crankshaft end play should not exceed .025" after installation. Total dimension across bearing should be 4.930" ± .001". See Figure 9-23.

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 9-24). 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. Coat a new gasket with Perfect Seal #4. Place gasket 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.

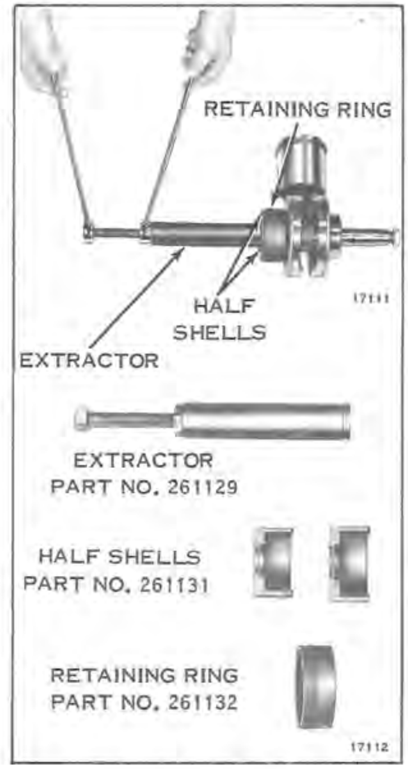

Figure 9-21

Figure 9-22

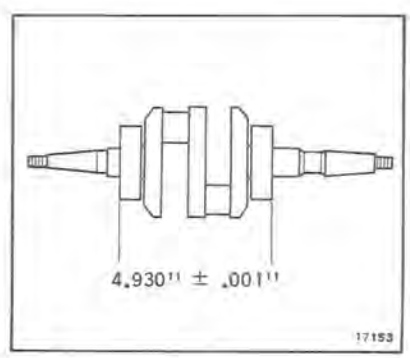

Figure 9-23

Figure 9-24

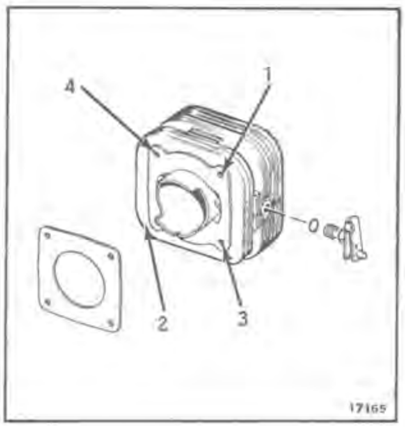

Figure 9-25

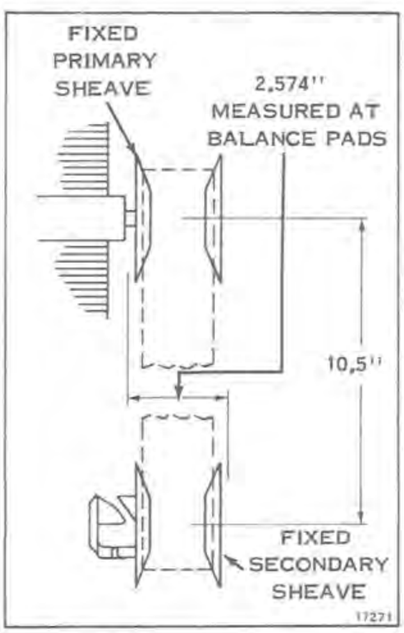

Figure 9-26

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

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

CYLINDERS

a. Install cylinders to crankcase using new gaskets. Use a ring compressor (Special tool 426020) to install pistons in cylinders. Tighten nuts in correct sequence to specified torque (see Figure 9-25). NOTE: Retorque cylinder screws after motor test has been completed and motor has cooled off.

b. Assemble exhaust manifolds to cylinder barrels if they were removed. The gasket surfaces on cylinders and manifolds must be clean and smooth. Place new exhaust manifold gaskets over cylinder studs and assemble exhaust manifolds. See Figure 9-10.

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

d. Attach cylinder and crankcase group to engine frame.

e. Install compression relief valve using Dupage High Temperature Thread Compound applied to the threads.

INSTALLATION

a. Install engine and frame to chassis. Work exhaust manifolds into exhaust pipe. Tighten clamps. Tighten screws retaining muffler to chassis.

b. Install primary sheave assembly. See Section 10.

c. Check primary to secondary dimensions as shown in Figure 9-26.

d. Install steering column assembly. Connect control linkages and adjust. Check ski alignment as described in Section 9.

e. Install transmission belt using the following procedure:

1. Move belt between neutral lockout actuating arm and primary sheave. See Figure 9-5.

2. Work belt between primary and secondary sheaves.

3. Move belt between end cap and engine.

4. Loop one end of belt around primary sheave.

5. Spread halves of secondary sheave by pulling movable half toward steering column.

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

f. Reconnect neutral lockout cable to bracket and actuating arm. See Figure 9-5.

g. Install belt guard.

h. Reconnect red lead to electric starter motor. Install starter belt. Adjust tension as described in Section 7.

i. Install spark plugs and connect leads.

j. Reconnect cable harness to air baffle.

k. Install fuel inlet and return lines to carburetor and pulse and primer lines to intake manifold on crankcase.

l. Reinstall instrument panel to chassis. Feed primer assembly forward under carburetor and install to chassis. See page 6-7 for adjustment procedure.

m. Secure instrument panel to chassis with three screws in rear of panel and one on either side at the instrument panel to chassis bracket.

n. Reinstall steering column. First replace three bolts in lower flange. Torque to specifications. Install rubber bushing and yoke. See Figure 9-7.

o. Reconnect speedometer and tachometer cables, engine, ignition/light switch, and cigarette lighter connectors.

p. Reconnect compression relief cable to compression relief valve. See page 5-5 for adjustment procedure.

q. Screw shift handle back onto reverse operating rod.

r. Reconnect fuel lines to bottom of primer and to fuel pump.

s. Reinstall brake caliper to secondary. Brake cable adjustment should not have been disturbed. See Section 10 if adjustment is required.

t. Reconnect fuel gauge cable and replace cap.

u. Reconnect throttle and choke cables to carburetor. See Section 6 for cable adjusting procedure.

v. Reinstall manual starter assembly to engine. Remove knot in rope and feed rope through opening in instrument panel. Feed through hole in grip and tie knot.

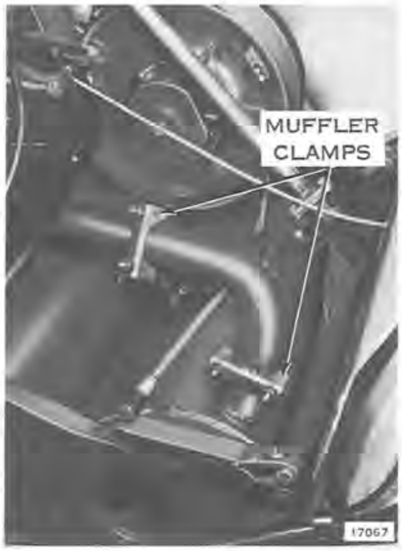

Figure 9-27

BREAK-IN

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

2. 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.

3. Observe fuel mixing precautions as described in inside front cover.

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 REMOVAL

1. Remove four muffler mounting screws.
2. Loosen muffler clamps.
3. Disconnect tie rods from steering column arm.
4. Remove steering limit bolt and swing arm up.
5. Muffler can now be removed from well.

MUFFLER REASSEMBLY

Reassemble muffler in reverse order making sure to take an equal number of turns on the muffler clamp nuts. Torque nuts to inch pounds.

SECTION 10
DRIVE TRAIN

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10

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:

a. Remove starter assembly.

b. Remove ratchet mount.

c. Attach Service Tool No. 113971 to flywheel with three bolts from ratchet mount (see Figure 10-1).

d. Use flat, open end wrench (Service Tool No. 404032) on the square nut on back side of the fixed sheave.

e. 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

a. Remove one screw, loosen other screw attaching neutral lockout bracket to chain case. Move bracket downward.

b. Remove belt (see Section 9).

c. Remove two screws securing lock plate to end cap assembly (see Figure 10-2).

d. With flat, open end wrench (Service Tool No. 404032) on inside, and 1-1/8" deep socket wrench on outside, loosen end cap bolt. (See Figure 10-3.)

SAFETY PRECAUTION

Primary sheave is spring loaded. Clamp primary sheaves together with strap (Service Tool No. 261906) before proceeding with disassembly. See Figure 10-4.

e. Remove end cap assembly. See Figure 10-4.

f. Remove strap while pressing movable half of sheave toward engine.

g. Remove sliding sheave and inspect main shaft spline, neutral lockout balls, bearing, compression spring and garter (activating) spring (see Figure 10-5).

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.

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

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

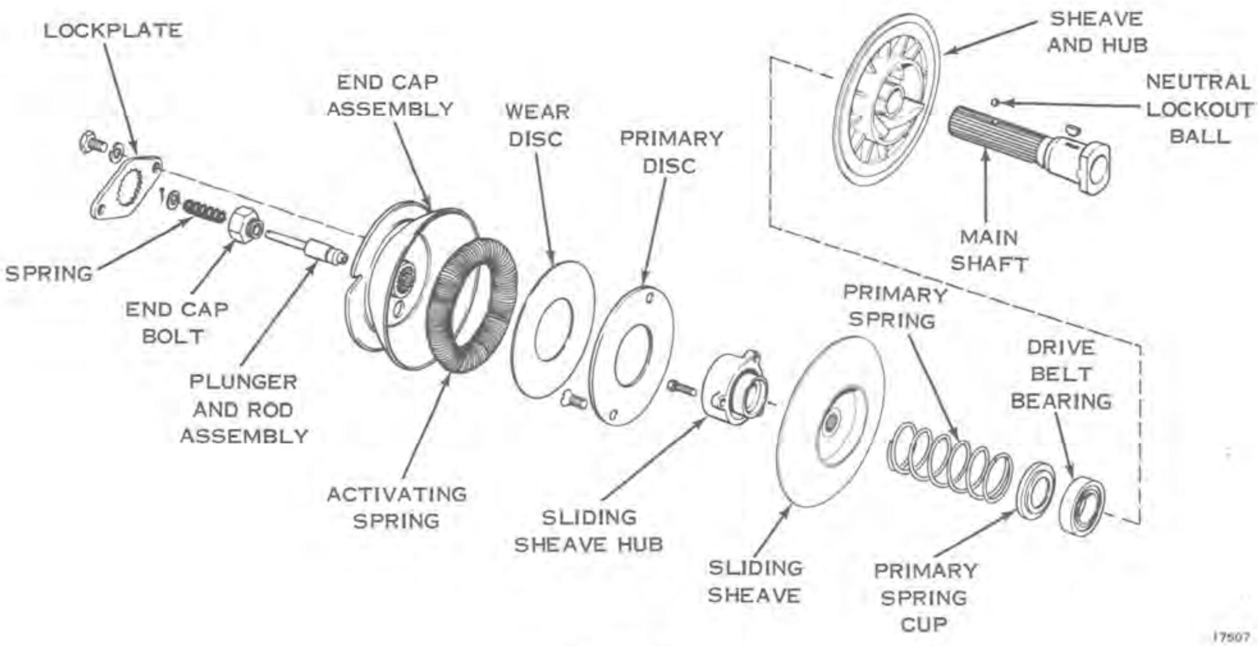


Figure 10-5

d. Inspect transmission belt. A glazed or burned belt, or one measuring less than 1-9/16" 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 primary spring on shaft with closed side of spring cup toward bearing. See Figures 10-5 and 10-6.
3. Place sliding sheave assembly on shaft, compress spring and lock in place with strap (Service Tool No. 261906).
4. Assemble activating spring, and end cap on shaft, making sure end cap splines engage shaft splines.
5. Before placing end cap bolt in shaft, check to see that neutral lockout balls have not fallen from their holes in main shaft.
6. Tighten end cap bolt to 90-100 ft. lbs. See Figure 10-7.
7. If serrations do not allow alignment of holes in lockplate and end cap, turn lockplate over and rotate until aligned position is obtained. Torque lockplate screws to 60-80 in. lbs.
8. Check the neutral lockout plunger to see that it snaps in and out properly. When neutral lockout is pushed in the sliding sheave must not slide on spline far enough to contact belt. When neutral lockout is out (normal operating position) the sliding sheave must slide freely on spline restricted only by the primary spring.
9. Clean inside of sheave halves of any grease that may have accumulated on them.
10. Reinstall transmission belt as described in Section 9.
11. Reassemble neutral lockout bracket to chain case.

Figure 10-6

Figure 10-7

DRIVE CHAIN

LUBRICATION

The drive chain and sprockets are lubricated by the chain running through an oil bath in the bottom of the chain case. Check oil level by removing oil fill plug. Oil should come up to bottom of oil fill hole. See Figure 10-8. Fill with OMC Type "C" oil or ESSO Gear Oil GX75-80. It will hold approximately 4 oz. Replace plug.

Figure 10-8

ADJUSTMENT

Total slack must be 1/4" ± 1/16" as shown in Figure 10-9. Remove chain case cover. (Note: Oil will drain when cover is removed.) Place a straightedge over chain at the sprockets, press on center of chain and measure slack at this point. If the chain requires adjustment, use the following steps:

1. Loosen jam nut, see Figure 10-9.
2. To tighten chain, turn adjusting screw clockwise.
3. To loosen chain, turn adjusting screw counterclockwise.
4. Retighten jam nut to 10-12 ft. lbs.
5. Apply EC1022 adhesive in groove of chain case prior to assembling seal. Insert seal into groove with joint in line with top right cover mounting screw hole. Replace chain case cover. Torque the 6 screws 60-80 inch lbs.
6. Replace oil in chain case. See "Drive Chain Lubrication" above.

Figure 10-9

REMOVAL AND INSTALLATION

a. Remove chain case cover.
b. Loosen chain (see "ADJUSTMENT" above).
c. Remove screw and washer from upper drive shaft.
d. Remove sprocket and chain from upper shaft. Remove retaining ring to release idler sprocket if additional clearance is required to remove chain. See Figure 10-9.
e. Chain can now be removed from lower sprocket.

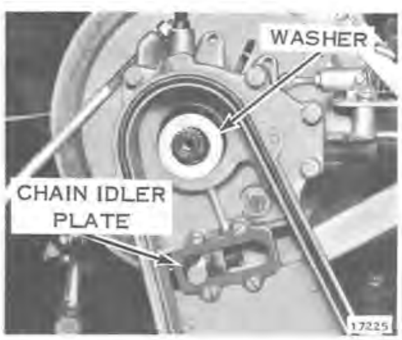


Figure 10-10

INSTALLATION

a. Assemble in reverse order of disassembly.
b. Adjust chain per "ADJUSTMENT" above.
c. Add chain lubricant per "LUBRICATION" above.

REPAIR

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

CHAIN CASE

IMPORTANT

If chain case or engine has been removed, care must be used to maintain the dimensions shown in Figure 10-11. Torque all screws and the tie rod nut to 18-20 ft. lbs.

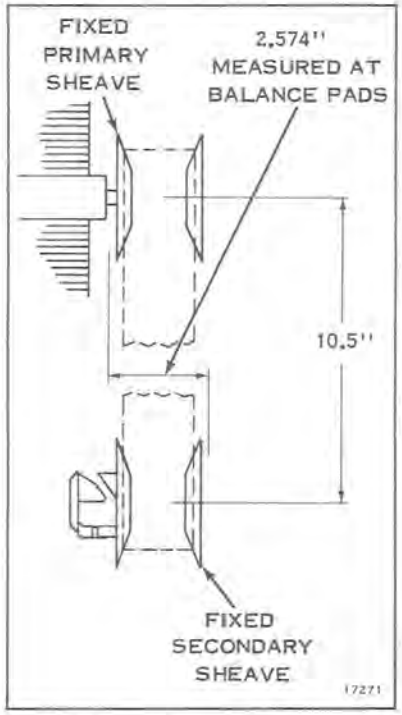


Figure 10-11

BRAKE

DESCRIPTION

The brake is caliper disc type with long lasting fibre pads (pucks).

ADJUSTMENT

Brake adjustments can be made by removing the cotter pin and turning the castellated nut clockwise to tighten brake. Turn the nut until there is a slight drag on the brake, then back the nut off one notch and reinstall the cotter pin. See Figure 10-12.

IMPORTANT

Be certain there is proper movement of the brake lever control to permit use of the parking lock. Loosen control cable locknut and adjust cable nut to obtain proper control lever movement. See Figure 10-12. Tighten locknut.

REMOVAL

a. Remove cotter pin and loosen castellated brake adjustment nut. See Figure 10-12.

b. Remove cotter pin and washer from brake control pivot pin. Compress brake return spring and remove pivot pin from control cable.

c. Remove brake bracket to transmission screws.

REPAIR

a. Disassemble brake assembly as required, noting relative positions of components to assure correct reassembly (see Figure 10-12).

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

CAUTION

Keep all oil and grease from puck surfaces.

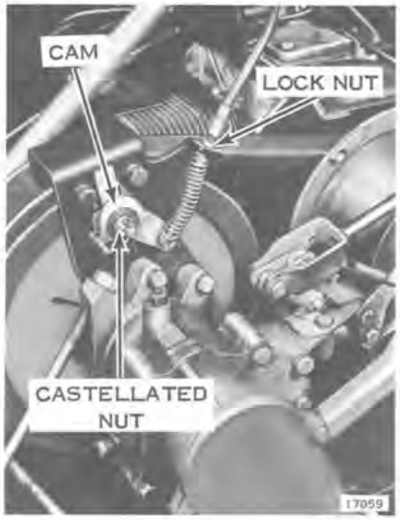
BRAKE CABLE AND CAM ASSEMBLY

a. Reassemble the brake and bracket assembly. Locknuts (2) on screws retaining the puck bodies must be tight.

b. Secure brake bracket screws to transmission.

c. Assemble brake control cable, lockwasher and nut to brake bracket. See Figure 10-12.

d. Install return spring and pivot pin on control cable. Insert pivot pin into brake cam arm and secure with washer and cotter pin.



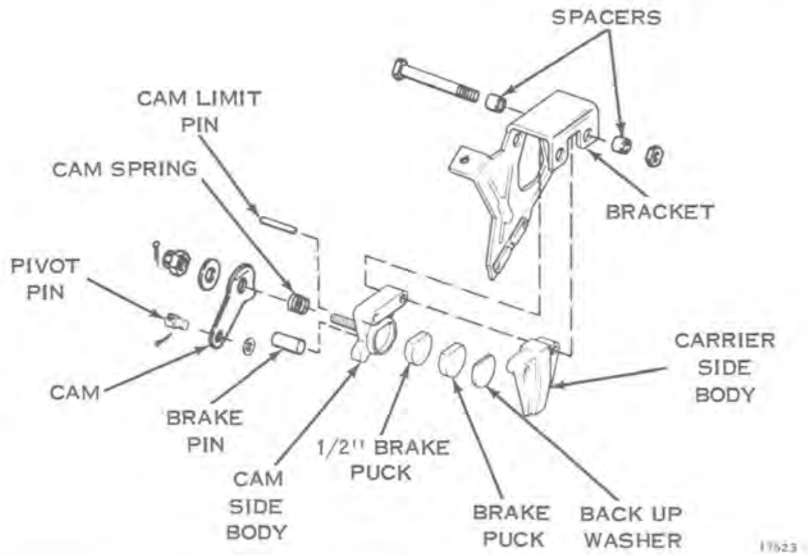


Figure 10-12

e. Adjust brake and control lever as described under "ADJUSTMENT." When brake is off, pucks should not drag on brake disc.

SECONDARY DRIVE

DISASSEMBLY

a. Remove transmission belt (see Section 9).

b. Remove brake assembly (2 screws).

c. Remove screw, tab lockwasher, secondary washer, spring cap, spring, and sleeve. See Figure 10-13.

d. Slide movable sheave, fixed sheave and brake disc assembly from transmission input shaft.

CAUTION

DO NOT strike sheaves with hammer. Cast aluminum sheaves will bend.

CLEANING AND INSPECTION

1. Clean all parts except movable sheave bushing in trichlorethylene. Bushing is oil impregnated. DO NOT clean with solvent. (See SAFETY PRECAUTION on part 9-6.)

2. Check bushing for wear.

3. Check shaft, sheaves, woodruff keys and Delrin ramp shoes for excessive wear. Check sleeves for burrs and nicks.

REASSEMBLY

a. Lubricate movable sheave bushing with Rykon #2 EP. Use a small amount (0.3cc) in groove in bushing.

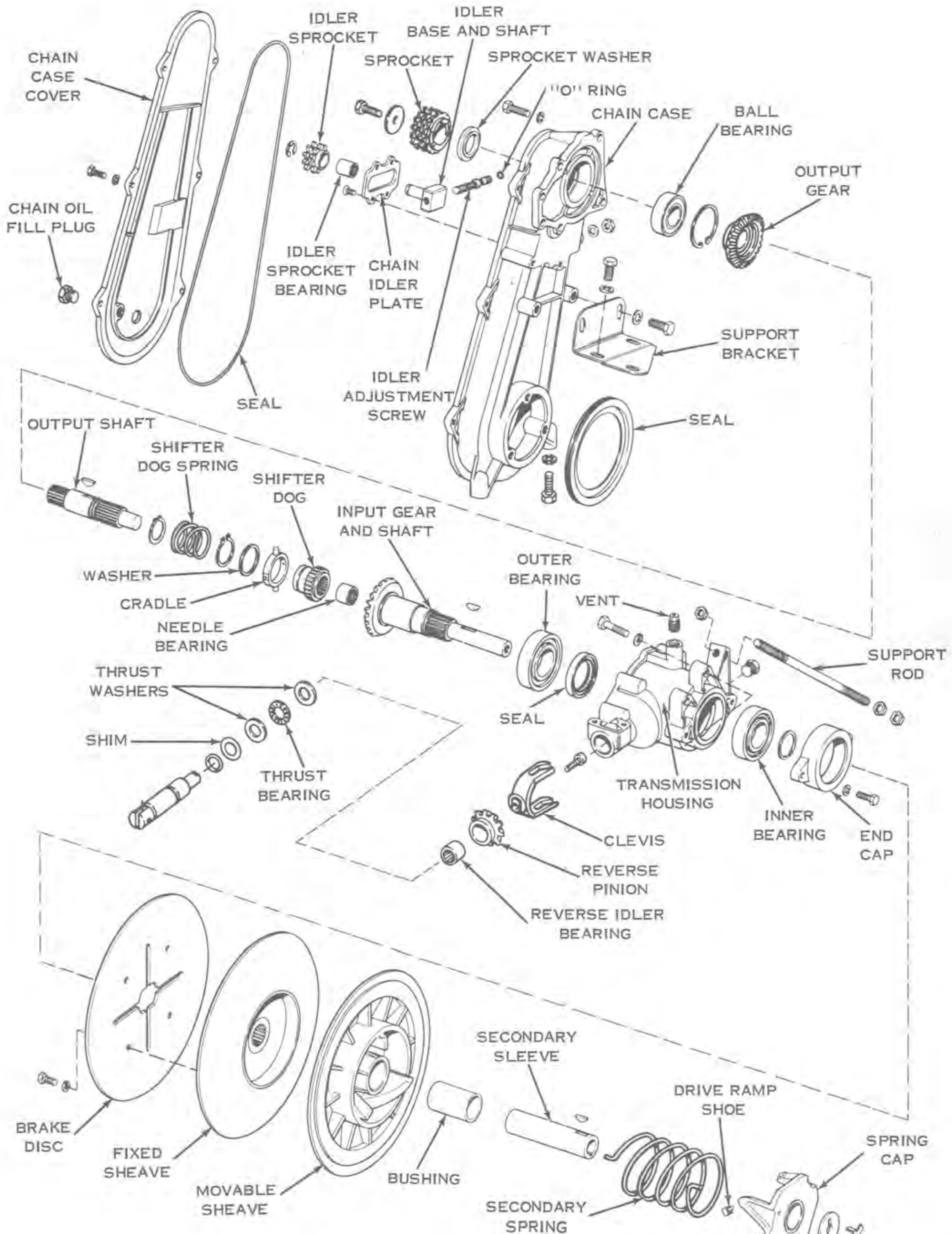

IDLER SPROCKET
IDLER BASE AND SHAFT
SPROCKET
SPROCKET WASHER
CHAIN CASE COVER
"O" RING
CHAIN CASE
BALL BEARING
OUTPUT GEAR
CHAIN OIL FILL PLUG
IDLER SPROCKET BEARING
CHAIN IDLER PLATE
SUPPORT BRACKET
IDLER ADJUSTMENT SCREW
SEAL
SEAL
OUTPUT SHAFT
SHIFTER DOG SPRING
SHIFTER DOG
INPUT GEAR AND SHAFT
WASHER
CRADLE
NEEDLE BEARING
OUTER BEARING
VENT
SUPPORT ROD
THRUST WASHERS
SEAL
SHIM
THRUST BEARING
TRANSMISSION HOUSING
INNER BEARING
END CAP
CLEVIS
REVERSE PINION
REVERSE IDLER BEARING
SECONDARY SLEEVE
DRIVE RAMP SHOE
SPRING CAP
BRAKE DISC
FIXED SHEAVE
MOVABLE SHEAVE
BUSHING
SECONDARY SPRING
17523

Figure 10-13

b. Assemble Secondary sheave assembly on transmission input shaft in reverse order of disassembly. Engage spring ends in holes in movable sheave and end cap. Preload spring by holding end cap stationary and rotating movable sheave clockwise to engage next ramp on end cap (approximately 1/3 turn). See Figure 10-13. Torque sleeve screw to 00-00 ft. lbs. torque and secure with lock-washer tabs.

REVERSING TRANSMISSION

DESCRIPTION

In forward operation, the power flow from the secondary sheave is transmitted to the input shaft and gear directly to external spline clutch dog with engages the output shaft gear. Therefore input and output shafts rotate in the same direction. See Figure 10-14. At this time, the pinion gear shaft and pinion gear are retracted from the thru-shaft gears.

In reverse operation, the power flow from the secondary sheave to the input shaft and gear is, because of the release of the dog clutch and the engagement of the pinion gear (see Figure 10-15), transferred to the output gear and shaft in reverse rotation.

Linkage adjustment is important for proper reverse performance. See "REVERSING TRANSMISSION LINKAGE ADJUSTMENT" for adjustment information.

LUBRICATION

Use the following procedure to check the oil level in the reversing mechanism. See Figure 10-15.

1. Remove the oil level plug. If oil runs out, or is up to the threads in the hole, the level is satisfactory.

2. If oil level is low, remove the oil fill plug, and slowly pour OMC Type "C" oil in this hole until it runs out the lower hole.

3. Replace plugs.

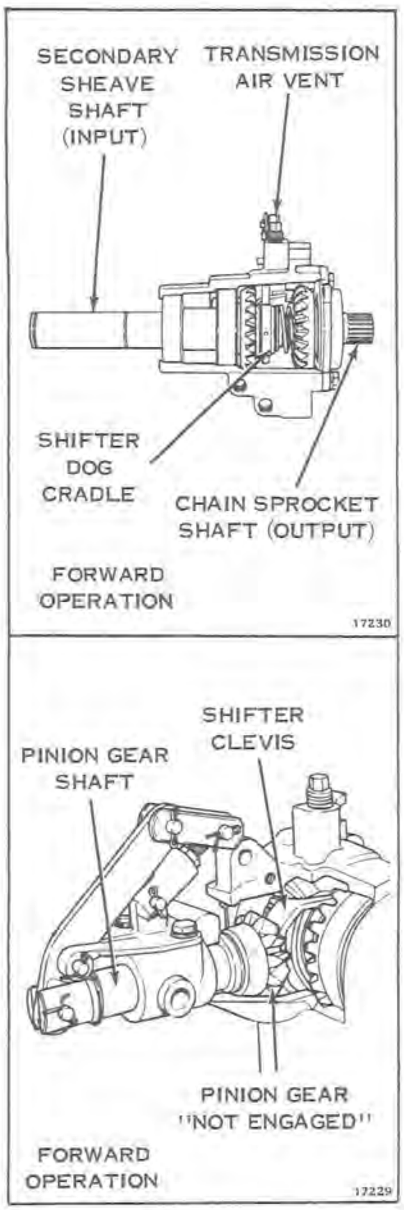


Figure 10-14

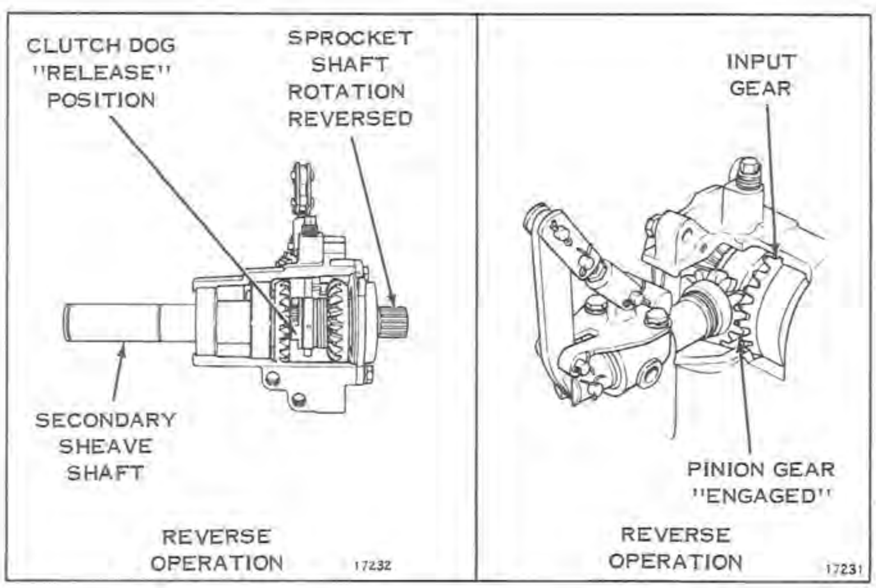


Figure 10-15

REMOVAL AND DISASSEMBLY

a. Remove secondary drive as described under "SECONDARY DRIVE."

b. Remove upper chain sprocket and key from output shaft as described under "DRIVE CHAIN."

c. Remove six transmission to chain case screws and lockwashers. See Figure 10-16.

d. Remove transmission housing from chain case. Output shaft assembly can now be removed.

e. Remove dog clutch assembly from shifter clevis.

f. Remove hex head socket screw from pinion gear shaft. See Figure 6-17. The shifter clevis, pinion gear, pinion bearing, thrust washers, thrust bearing and shims, if used, can be removed.

g. Remove end cap and bearing. Remove input shaft and gear. The pinion gear shaft and "O" ring can be removed when the linkage is disassembled from the shaft.

Figure 10-16

CLEANING, INSPECTION AND REPAIR

a. Clean all parts with a cleaning solvent such as Trichloroethylene and blow dry with compressed air.

b. Inspect shafts and output shaft splines for wear.

c. Turn bearings by hand; discard any which do not rotate smoothly or which have excessive play.

d. Inspect clevis, clutch dog, and cradle liner for wear or damage.

e. Inspect "O" ring on pinion gear shaft. Replace if required.

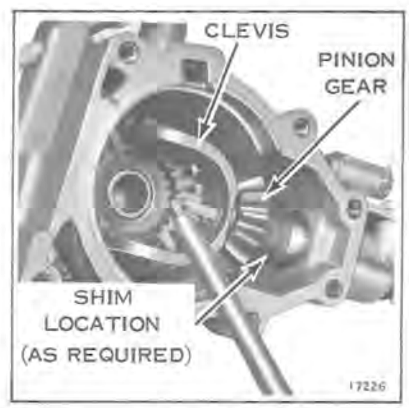


Figure 10-17

ASSEMBLY AND ADJUSTMENT

a. Install input shaft and gear. Use Loctite bearing mount on the O.D. and I.D. of the sealed bearings, see Figure 10-13.

b. Insert pinion shaft and assemble shim, thrust washer, thrust bearing, thrust washer, pinion gear and bearing assembly and shifter dog clevis.

c. Install output shaft, output gear and retaining ring. Install bearing in gearcase, using Loctite bearing mount on O.D. and I.D. Mount transmission to chain case with four screws. Gear backlash should be .000" when the pinion gear shaft retaining ring is held against the outside of pedestal housing. This may be adjusted by means of shims installed on the pinion shaft and these are available in .002, .003, .004, .005 thousandths. See Figure 10-17.

d. Remove housing, output shaft and gear. Apply Loctite stud lock to clevis socket screw. Complete pinion assembly.

e. Install clutch dog assembly and output gear on shaft splines and assemble transmission to chain case with six screws and lockwashers.

f. Install secondary sheave on input side as described under "SECONDARY DRIVE."

REVERSING TRANSMISSION LINKAGE ADJUSTMENT

DESCRIPTION

An "over center" type linkage is used to operate the reversing mechanism. This linkage, when correctly adjusted, provides an effect which locks the transmission firmly in the selected output rotation until the dash panel lever is moved.

ADJUSTMENT

a. Be sure that the linkage has been correctly assembled. See Figure 10-18.
b. Loosen or remove dash panel shift control handle so that it will not affect linkage adjustment.
c. Loosen lock nut on reverse lock clevis and eyebolt assembly.
d. With the transmission in reverse (pinion shaft in), adjust reverse lock clevis so that the threaded eyebolt touches the pinion shaft link.
e. Tighten eyebolt lock nut. Check reverse locking by visually checking center lines of reverse lock clevis and lock plates. These centerlines must cross as shown in Figure 10-19.

SHIFT CONTROL ROD ADJUSTMENT

a. Assemble control rod thru dash panel.
b. Place transmission in forward operating position.
c. Attach end of control rod to linkage. See Figure 10-18. Attach assist spring.
d. Adjust shift control rod at connector and handle so that forward rod movement is limited at the dash panel by the shift handle locknut, Figure 10-18.
e. Check operation of shift mechanism, moving from forward to reverse several times. Use a quick, abrupt action. Be certain that the reverse lock clevis goes "over center" (see Figure 10-19) each time.

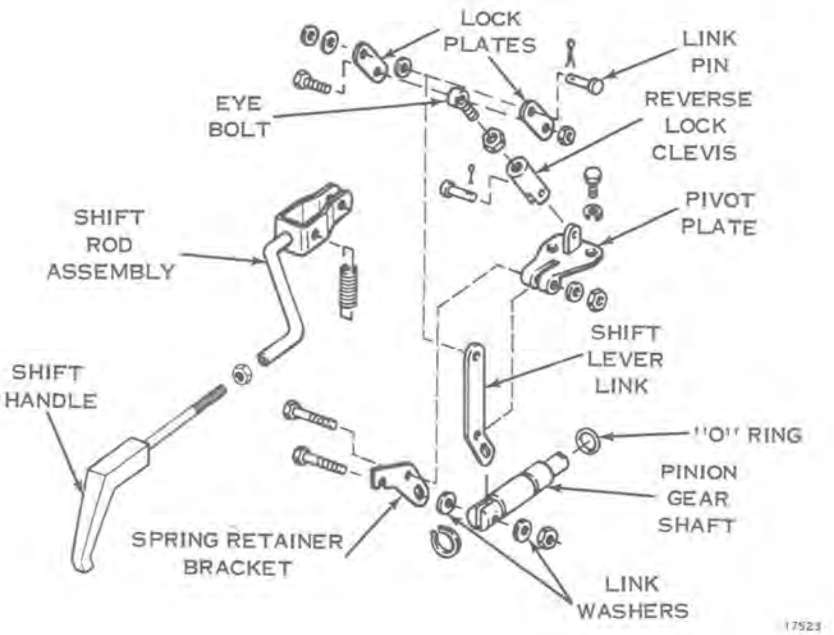


Figure 10-18

Figure 10-19

SECTION 11
STEERING, TRACK AND SUSPENSION

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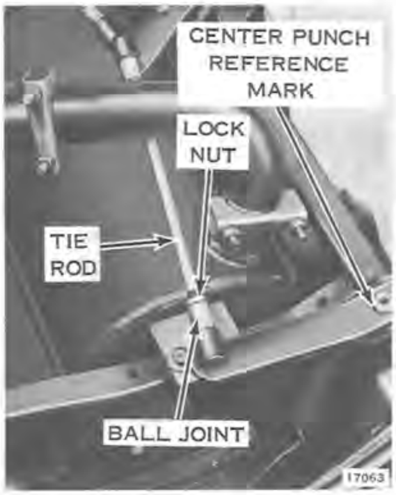

Figure 11-1

DESCRIPTION

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

STEERING

DISASSEMBLY

a. Support front end of snowmobile to remove weight from skis.

IMPORTANT

Mark ski column and steering arm with center punch as shown in Figure 11-1. Marking is required to assure correct steering geometry on reassembly.

b. Remove ski and leaf spring assembly. Disassemble leaf spring, if required, for servicing.

c. Remove steering arm from ski column. See Figure 11-2.

d. Remove ski columns.

CLEANING, INSPECTION, AND REPAIR

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

b. Inspect steering column bushing and replace if worn. See Figure 11-2.

c. Inspect ski column upper and lower rubber mounts and bushing for wear, damage, or deterioration.

d. Inspect ski runners and replace if worn.

e. Inspect leaf springs for cracks or weakness.

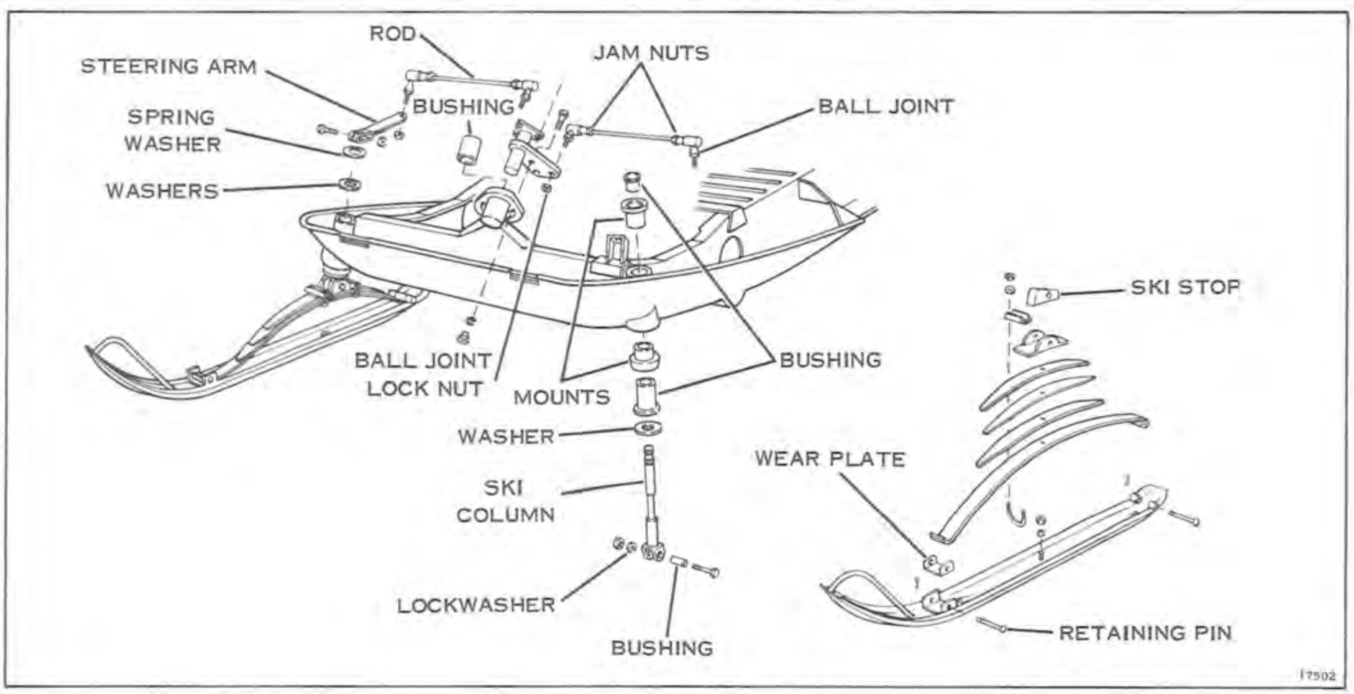

Figure 11-2

REASSEMBLY

a. Reassemble skis, spring, and columns, if these were disassembled. Refer to Section 2 for Torque.

b. Lubricate ski columns with Rykon #2 E.P. grease. Place ski and column assemblies in position in frame assembly. NOTE: DO NOT interchange right and left ski columns.

c. Attach steering arms to ski columns, using punch marks to obtain 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. Place steering bar in normal driving position.

c. Loosen jam nuts at outer end of tie rods. See Figure 11-2.

d. Remove lock nuts from outer ball joints.

e. Turn ball joint clockwise to toe skis out or counterclockwise to toe skis in.

f. Tighten jam nuts when skis are parallel with each other and snowmobile body. Install lock nut and ball joint in steering arm. Torque nut to 18-20 ft. lbs.

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 arms are pulled down.

Track tension is correct if the distance from the bottom of the pivot arm bearing bore to the bottom of the adjusting bracket is 2-7/8" ± 1/32". See Figure 11-3.

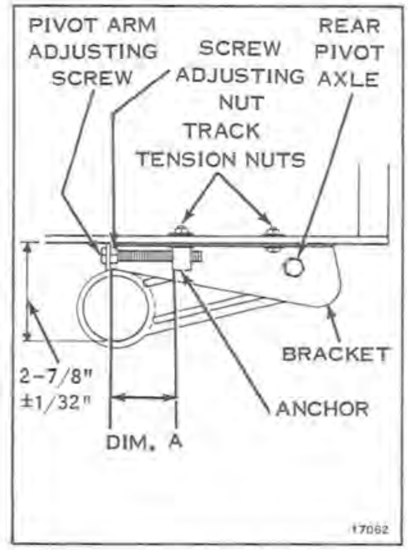

Figure 11-3

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.

c. Turn pivot arm adjusting screws to obtain the correct track tension as shown in Figure 11-3. Measure distance from bracket to anchor on each side, Figure 11-3, dimension A. If measurements are not equal, loosen adjustment on the side with longest dimension until measurement is equal within 1/32". This is done by turning the pivot arm adjusting screw counterclockwise. Tighten all retaining nuts.

TRACK ALIGNMENT ADJUSTMENT

Proper track alignment is essential to keep rubber sprocket and track wear at a minimum.

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 11-4.

Figure 11-4

Figure 11-5

REMOVAL OF TRUCKS AND TRACK

a. Support snowmobile so that weight is removed from track.

b. Release pivot axle spring. See Figure 11-5.

c. Remove rear axle pivot bolts. Complete rear axle assembly can now be removed.

d. Remove forward truck assembly cross shaft and truck assembly screws. Bring truck assembly out of chassis.

e. Remove chain case cover.

f. Remove retaining ring, sprocket and spacer from end of axle.

g. Loosen set screws from locking collars and rotate collars to free axle from bearings.

h. Remove three screws - flangette to chain case - on left side of vehicle and three screws - flangette to chassis - on right side of vehicle.

i. Remove front axle from chassis.

j. Remove idler assembly. Remove screw and washer from each end of axle.

FRONT AXLE DISASSEMBLY

a. Remove bearings and flangettes from axle.

b. Drive out roll pins from track drive sprockets.

SAFETY PRECAUTION

If heat is necessary to remove, or reassemble front sprockets or rear axle wheels, do not use open flame because of danger of igniting the magnesium metal.

c. Press drive sprockets off front axle after marking position for reassembly.

REAR AXLE DISASSEMBLY

a. Remove retaining ring and bearing retainer.

b. Push pivot arm towards wheel.

c. Remove bearings.

d. Loosen Allen set screws and remove wheels from axle.

TRUCK DISASSEMBLY

a. Remove nut from each end of front and rear truck axles.

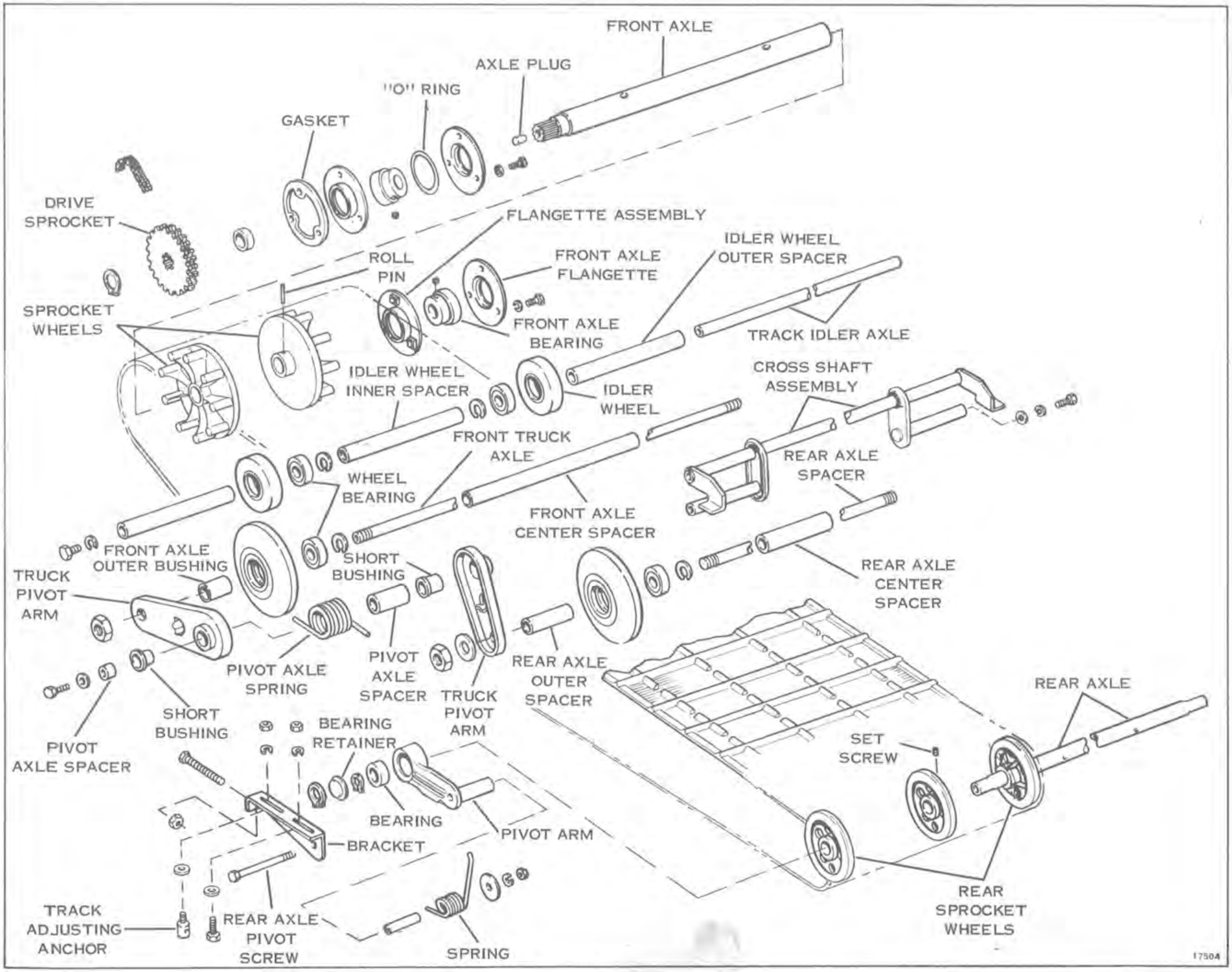
FRONT AXLE
AXLE PLUG
"O" RING
GASKET
DRIVE SPROCKET
FLANGETTE ASSEMBLY
ROLL PIN
FRONT AXLE FLANGETTE
IDLER WHEEL OUTER SPACER
SPROCKET WHEELS
FRONT AXLE BEARING
TRACK IDLER AXLE
IDLER WHEEL INNER SPACER
IDLER WHEEL
CROSS SHAFT ASSEMBLY
FRONT TRUCK AXLE
WHEEL BEARING
REAR AXLE SPACER
FRONT AXLE CENTER SPACER
FRONT AXLE OUTER BUSHING
SHORT BUSHING
TRUCK PIVOT ARM
REAR AXLE CENTER SPACER
PIVOT AXLE SPRING
PIVOT AXLE SPACER
TRUCK PIVOT ARM
REAR AXLE OUTER SPACER
REAR AXLE
SHORT BUSHING
BEARING RETAINER
PIVOT AXLE SPACER
SET SCREW
BEARING
PIVOT ARM
BRACKET
REAR SPROCKET WHEELS
TRACK ADJUSTING ANCHOR
REAR AXLE PIVOT SCREW
SPRING
17504

Figure 11-6

Figure 11-7

c. Remove pivot arms, spacers, bushings, and springs from pivot axles.

d. Wheels and spacers will now slide off front and rear truck axles.

CLEANING, INSPECTION, AND REPAIR

A torn track cannot be vulcanized, it must be replaced.

Liquid neoprene can be applied to a frayed track to help restore its original appearance.

Bearings are sealed, therefore require no greasing. Turn bearings in hand. Sealed bearings do not turn freely, but if they are rough, they must be replaced.

Axles - check for straightness by rolling one flat surface. Replace if bent.

Splines - inspect for excessive wear.

Sprockets - check for excessive wear, or Nylon peeling or worn off.

Oil plug must be in good condition, and in place on front axle spline to retain oil in chain case.

Check condition of seals.

Check nylon truck bushings for cracks or excessive wear. Replace if damaged.

FRONT AXLE ASSEMBLY

a. Refer to Figure 11-6 for assembly of sprocket wheels to front axle.

b. Assemble bearings, flangettes, gasket and O-ring to front axle assembly. See Figure 11-6. Lubricate O.D. of left front bearing with OMC Type "A" to help seat O-ring. Assemble front axle assembly to chassis.

c. Fasten flangettes to chain case and chassis. Torque six screws, flangettes to chain case and flangettes to chassis 20-25 ft. lbs. Axle must be free to slide through the bearings.

d. Assemble spacer, sprocket and retaining ring to left end of axle. Pull axle to right of vehicle to take up all clearance between the spacer sprocket retaining ring and bearing.

e. Lock bearing collars. Rotate in the direction of axle rotation (forward gear). Use a pin punch and hammer to make sure collar is tight.

f. Apply Loctite grade A to set screws for locking collars. Torque both set screws, collars to axle to 25-35 in. lbs.

g. Axle assembly must be free to rotate after assembly to chassis.

REAR AXLE ASSEMBLY

a. For sequence of assembly of sprockets, bearings, pivot arms, and brackets refer to Figure 11-6.

b. Lubricate the outside of the bushing and outside of pivot arm about 1/2 inch radius around pivot hole with Rykon grease No. 2EP.

c. Apply Loctite grade A to the set screws for sprockets or wheels prior to assembly. Torque set screws to 18-20 ft. lbs.

d. Torque rear axle pivot nuts to 12-15 ft. lbs. Axle must rotate freely when assembled to chassis. Pivot arms must rotate on bushings with no binding or other restriction.

IDLER ASSEMBLY

a. Assemble idler wheels to shaft with retaining rings to inside to chassis.

b. Place idler wheels on top of track. Torque idler axle screws to chassis 20-25 ft. lbs.

TRUCK 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 under nylon bushings and assemble to axles. Assemble pivot arms and springs. Assemble hanger to pivot axle.

SECTION 12
LUBRICATION AND STORAGE

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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 brand 24:1 lubricant or a reputable automotive engine oil, SAE 30 SD or SB, and a non-premium gasoline of like quality, is recommended. The oil container should be marked Service SB or Service SD. Additional markings, such as SA-SB, or CA indicate oils for other applications and should be avoided. Avoid the use of low-priced, light duty oil (container marked only with SA designation) or multiple viscosity oils such as SAE 10W30. EVEN THOUGH OMC BRAND OUTBOARD LUBRICANT IS ADVERTIZED AS A 50:1 RATIO LUBRICANT, IT IS IMPERATIVE FOR SNOWMOBILE USE THAT IT BE MIXED AT 24:1 GAS-LUBRICANT RATIO.

The use of higher priced, premium gasolines is not recommended; the compression ratio of the engine is not high enough to warrant the use of such fuel. In addition, the lead and other additives which are used to increase the octane rating of premium gasolines, or otherwise improve performance, may shorten spark plug life.

The use of additive compounds, such as tune-up compounds, tonics, friction reducing 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.

Figure 12-1

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.

Figure 12-2

1. Always use a separate, clean container for mixing fuel. See Figure 12-2.

2. Do not pour lubricant or gasoline separately into vehicle tank.

3. To prepare the snowmobile fuel properly, pour into a SEPARATE, clean container half the amount of regular grade 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 vehicle tank.

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

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.

LUBRICATION RECOMMENDATIONS

TIME	MAINTENANCE	LUBRICANT
After 25 hrs.	Ski Pivots (Leaf spring connections to skis)	SAE 10 Oil
Annually	Rear Axle pivot bushings - } Removal	Standard Oil Rykon EP#2
Annually	Truck Axles } Required	Standard Oil Rykon EP#2
Annually	Drive Chain - oil bath. See page 10-4	OMC Type "C"
Annually	Reversing Transmission. See page 10-9	OMC Type "C"
Annually (Normal Use) Semi-Annually (Extended Use)	Primary Drive-Disassembly Required (See your Dealer)	Standard Oil Rykon EP#2

Specified lubricants available from your dealer

Figure 12-3

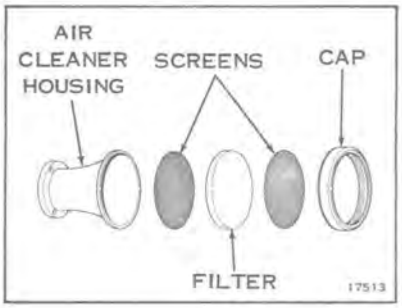

Figure 12-4

Figure 12-5

Figure 12-6

PREVENTIVE MAINTENANCE

TIME	MAINTENANCE
After first 3 hrs., then every 25 hrs. or as required	Adjust Chain Tension See Page 10-4
After first 10 hrs., then every 25 hrs. or as required	Adjust Track Tension Check Track Alignment (See Section 11)
Biannual (see below)	Clean Air Filter
Annually (see below)	Clean or install new Fuel Pump Filter Screen
Annually (see below)	Clean Filter Screen under Fuel Inlet Elbow

AIR FILTER

The carburetor is equipped with an air filter that should be cleaned during the operating season and at the end of the season for storage. To clean filter, remove air cleaner cap, screens and filter. See Figures 12-3 and 12-4. Wash filter in clean gas/lubricant mixture and shake. If compressed air is available, blow dry from the inside.

FUEL FILTER, FUEL PUMP

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 12-5. 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 12-6, being careful to assemble gasket and filter screen on fuel filter cover. Tighten mounting screw securely with screwdriver (do not over-tighten).

FUEL FILTER SCREEN, CARBURETOR

SAFETY PRECAUTION

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

The carburetor fuel inlet screen should be cleaned annually. To clean screen, remove fuel line and fuel inlet elbow. Do not remove screen. See Figure 12-7. See page 6-7 for replacement of fuel line tie straps.

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

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

g. Clean air filter. Wash with gasoline/lubricant mixture and shake dry. If compressed air is available, blow dry from the inside. See Figures 12-3 and 12-4.

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. Provide for proper battery maintenance, as described in Section 7.

l. Remove transmission belt.

m. Rub bottom of skis, and other unprotected surfaces of vehicle with cloth saturated in OMC Rust Preventative.

n. Store in dry, well-ventilated area.

o. Clean carburetor fuel filter screen. See Page 12-4.

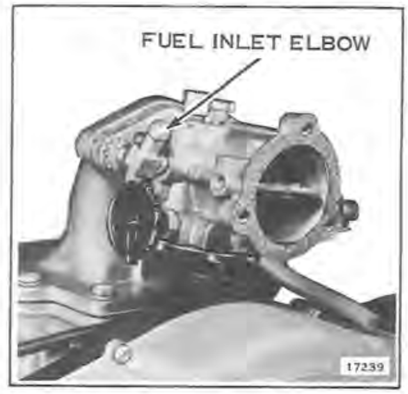

Figure 12-7

REMOVAL FROM STORAGE

a. Fill tank with fresh fuel mixture. Install battery.

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.

NOTES

NOTES

JOHNSON MOTORS,
WAUKEGAN, ILLINOIS U.S.A.