

**EVINRUDE &
JOHNSON**

74



snowmobile

service manual

35 HP MODELS: E-134-A, J-134-A

40 HP MODELS: E-144-A, J-144-A

50 HP MODELS: E-164-A, J-164-A

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FUEL RECOMMENDATIONS

This is a two-cycle engine which requires lubricant mixed with the gasoline.

The correct fuel mixture ratio is 50 parts of a good grade premium or regular leaded gasoline to one part Evinrude or Johnson 50:1 Lubricant, or in Canada OMC 2-cycle motor oil.

In some gasolines the amount of lead has been replaced with phosphorus. Do not use this type of gasoline, since phosphorus is detrimental when used in 2-cycle engines.

If recommended lubricant is not available, use a BIA CERTIFIED SERVICE TC-W oil mixed at 24:1 ratio. Automotive oils and 24:1 premix fuels should not be used except in emergencies when the recommended oil is not available. It should be recognized that automotive oils are formulated to fit the needs of 4-cycle automotive engines and Evinrude or Johnson 50:1 Lubricant and OMC 2-cycle motor oils are formulated for the 2-cycle engine installed in your snowmobile. DO NOT use Evinrude or Johnson Rotary Combustion Lubricant in any OMC 2-cycle engine.

Use the following table to determine the 50:1 fuel and oil mixture for U.S. and Imperial measures:

50 TO 1 MIXTURE RATIO CHART
FOR EVINRUDE OR JOHNSON LUBRICANT AND OMC 2 CYCLE MOTOR OIL
U.S. MEASURE - 1 PINT - 16 OZ.
IMPERIAL MEASURE - 1 PINT - 20 OZ.

LUBRICANT	GASOLINE	
	U.S. MEASURE	IMP. MEASURE
1/2 U.S. pint . . Mix with	3 U.S. gal.	2.4 Imp. gal.
1/2 Imp. pint . . Mix with	3.7 U.S. gal.	3 Imp. gal.
1 U.S. pint . . . Mix with	6 U.S. gal.	4.8 Imp. gal.
1 Imp. pint . . . Mix with	7.5 U.S. gal.	6 Imp. gal.



SAFETY WARNING

Gasoline is extremely flammable and highly explosive under certain conditions. Always stop engine, and do not smoke or allow open flames or spark near the snowmobile when refueling or servicing the fuel system.

1. Always use a separate clean container for mixing fuel.
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 gasoline required and add all the required lubricant.



NOTE

To completely mix or blend the fuel, thoroughly shake this partial mixture. The lubricant adheres to the bottom and sidewalls of the container unless agitated. Next, add the balance of gasoline necessary to bring the mixture to the required ratio of 50:1. 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 temperatures 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 when possible.

Do not use kerosene or fuel oils for pre-mixing. When pouring fuel into vehicle tank, use a clean funnel equipped with a fine screen.

OMC 2+4 FUEL CONDITIONER

For added protection to your snowmobile engine, the use of OMC Fuel Conditioner is recommended. Available from your dealer.

- 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 freeze-up.
- Absorbs moisture and water in fuel system.
- Extends spark plug life by reducing fouling and misfire.



SECTION 1

INTRODUCTION AND SAFETY WARNINGS

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 this snowmobile. 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 Table of Contents on page i enables the reader to locate quickly any desired section. Section 2 lists complete specifications on the snowmobile. All general information, including 2 cycle engine theory, troubleshooting, and tune up procedures, are given in Sections 3 through 5 of this manual. 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.



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Figure 1-1

Read this manual carefully to become thoroughly familiar with the procedures as 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.

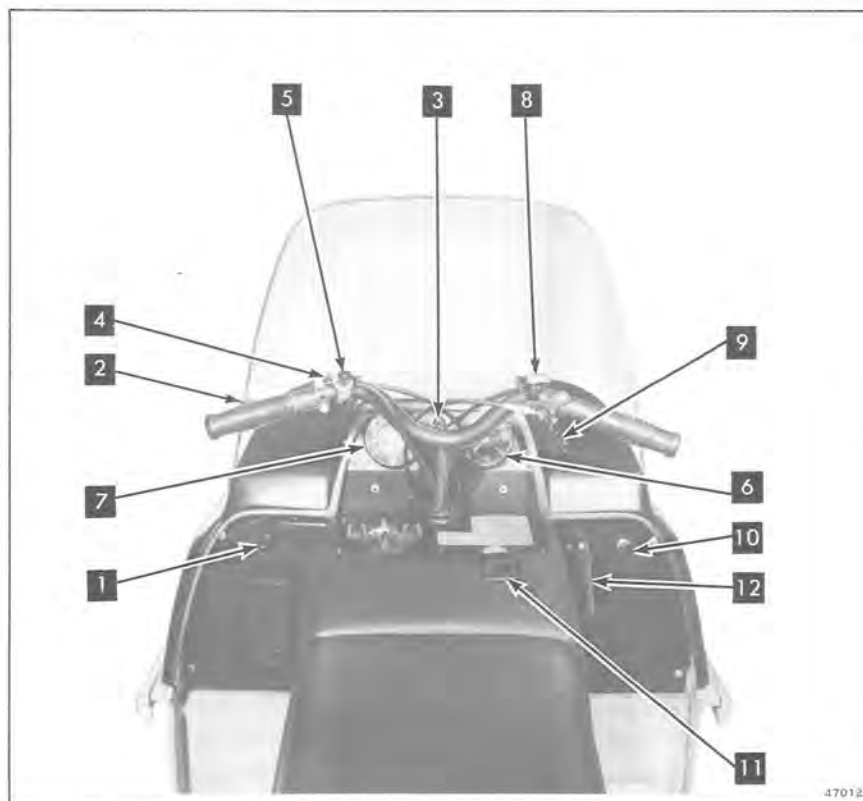


Figure 1-2

CONTROLS

Refer to Figure 1-2 for location of the following components:

1. NEUTRAL CONTROL KNOB

The neutral control locks the transmission in neutral when pulled out. When starting engine, neutral control knob must be pulled out. To engage transmission, reduce engine speed to idle and push neutral control knob in.



SAFETY WARNING

Engine RPM must be under 2000 RPM before transmission can be locked in neutral.

2. HAND BRAKE

To apply brake, squeeze brake lever.

3. IGNITION/LIGHTS SWITCH

The key operated ignition switch has four positions, 'OFF,' 'RUN/LIGHTS' (operate with lights), 'RUN' (operate without lights), and 'START' (for use with accessory electric start).

4. PARKING LOCK

To apply parking lock, with brake engaged, flip parking lock into position. To release, squeeze brake lever.

5. HI-LOW BEAM HEADLAMP SWITCH

The headlamp beam switch selects either high beam or low beam when ignition switch is in the RUN/LIGHTS position.

6. SPEEDOMETER/ODOMETER

The speedometer/odometer, which indicates MPH and miles traveled, is an accessory.

7. TACHOMETER

The tachometer, which indicates engine RPM, is an accessory.

8. SAFETY STOP SWITCH

This switch allows the operator to stop engine power instantly. Rotate switch to either side of "RUN" position to stop engine. Rotate switch to "RUN" position to allow restarting of engine.

9. THROTTLE

The thumb operated throttle lever is located on the right hand steering bar. Squeezing the throttle increases engine speed and power is transmitted to the track. When lever is released, engine returns to idle.

10. CHOKE CONTROL KNOB

The choke control is used during starting and engine warm-up to enrich the fuel-air mixture to the engine. Pull to choke.

11. PRIMER

Pushing the primer knob manually pumps fuel into the intake manifold. A cold engine should be primed prior to starting.

12. MANUAL STARTER HANDLE

Snowmobile is started by pulling the manual starter handle.



SAFETY WARNINGS

- All operators must be properly instructed in the operation of the vehicle. Many dangerous situations are created by negligence.
- When operating a snowmobile, wear protective clothing and headgear such as a brightly colored helmet as well as padded clothes. DO NOT WEAR LOOSE CLOTHING such as scarves, tassel caps, etc. Such clothing could get entangled with the machinery, branches or other objects and cause personal bodily injury. It is recommended that operator and passenger wear helmets which meet the requirements of ANSI Z90.1 - 1971 or equivalent.
- Do not overload vehicle with passenger.
- Keep feet on running board at all times.
- Use headlight for early morning, evening and night operation. Use headlight in heavily wooded areas during the day.
- Do not operate vehicle on or around sled, ski, and toboggan hills.
- Do not operate vehicle at maximum speeds in other than a supervised, charted area. Be certain no one is behind unit when making a fast start, as ice, stones, etc., may be thrown into the air by lugs on the track.

- Extra caution should be exercised when using vehicle on ice. Steering control is greatly reduced on ice. Beware of thin ice. Always use two hands for steering.
- When crossing plowed roads, approach with caution. Do not jump snow banks as you might find yourself in the path of oncoming traffic.
- Do not operate vehicle on bare ground or gravel as steering response may be reduced.
- Do not execute "blind jumps." Snow drifts can hide tree stumps, logs and excessive drop offs.
- Do not smoke while operating vehicle. Ashes can be dangerous to passengers as well as operator.
- Do not operate vehicle while under the influence of intoxicating beverages, narcotics or other habit forming drugs.
- Never leave the machine unattended while engine is running.
- Remove key from vehicle whenever it is not in use.
- Wear goggles to protect the eyes from lashing tree and shrub branches, and from wind and sun glare. Goggles should meet the requirements of Vehicle Equipment Safety Commission regulation VESCO - 8.
- Do not attempt to perform repairs on your vehicle while engine is running.
- Before servicing any part of the engine or drive unit: always disconnect spark plug wires to prevent accidental start of engine; and turn the ignition switch to "OFF" position to discharge the high voltage capacitor. A charged capacitor could give a severe electrical shock.
- Never remove a fuel hose without first removing the tie rap clamp. Never attempt to install a fuel hose with a tie rap preassembled. Always assemble the tie rap after the fuel hose is assembled to the nipple. Improper assembly could result in a leak. All reassembled tie raps should be located in the original assembled location.



PROHIBITED

- Operation on private property without owner's permission.
- Operation of vehicle on public roads, streets or highways unless it is legal to do so.

SECTION 2

SPECIFICATIONS AND SPECIAL SERVICE TOOLS

SPECIFICATIONS

 **PROHIBITED:** 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	103.2 inches
Width	35.4 inches
Height	43.4 inches with windshield 34.9 inches without windshield
Engine	OMC 2 - cycle Alternate Firing - 2 Cylinder
Rating	399CC 35 HP at 6750 RPM 436CC 40 HP at 6750 RPM 646CC 50 HP at 6750 RPM
Starter	Manual rewind
Variable speed drive	Centrifugal operated sheave engages V-belt
Overall ratio	4.43 to 1
Final drive	Silent Drive Chain
Sprocket ratio standard	134 - 17:39 144 - 19:39 164 - 19:39
Muffler	Tuned for maximum performance
Brake	Caliper - Flange on secondary
Throttle	Thumb operated
Track	Rubber - Polyester Cords fully adjustable
Width	15.5 inches
Skis	Formed steel equipped with shock-absorbing leaf springs and replaceable wear runners.
Seat	Vinyl coated cover, molded urethane foam cushion
Hood	Molded fiberglass
Headlamp	Sealed beam Westinghouse 7700
Taillamp/Stoplamp	GE 1157
Acc. Speedometer/Tachometer lamp	GE 1816
Fuel tank	Capacity - 5 Imperial gallons, 6 U.S. gallons
Fuel	Gasoline - regular leaded
Lubrication	OMC brand 50:1 lubricant
Carburetor needle adjustment	Tillotson HD diaphragm type
RPM Ratings	
Idle	1300 ± 100
Transmission belt engaging speed	3300 ± 300
Maximum RPM at which neutral control will operate	2000
Ignition	
Breakerless magneto C.D. (Capacitor Discharge) ignition	
Spark plug	Champion UL-77V
Advance sensor coil resistance	17 to 19 ohms
Retard sensor coil resistance	28 to 30 ohms
Charge coil resistance (2 coils) total of	600 ± 50 ohms
Ignition coil primary resistance	0.1 ± .05 ohms
Ignition coil secondary resistance	1900 ± 300 ohms
Lighting coil resistance headlight/taillight	1.3 ± .3 ohms
Stop light coil resistance	4.25 to 1 ohms
Bore and Stroke	399CC 2.75 x 2.05 inches 436CC 2.875 x 2.05 inches 646CC 3.25 x 2.375 inches

Piston displacement 35 HP 399CC	24.35 cu. in.
40 HP 436CC	26.62 cu. in.
50 HP 646CC	39.40 cu in.
Cylinder compression	100 to 120 psi
End gap	.007 - .017

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

TORQUE SPECIFICATIONS

PART	APPLICATION	SIZE	TORQUE	
			IN./LBS.	FT./LBS.
*Nut	Ball Joint to Steering Arm and Steering Column	3/8-24		18-20
*Nut	Rod End Mounting Jam Nuts			10-12
Screw	Steering Arm (Drag Link) Screw	3/8-24		18-20
Screw	Steering Column Arm Screw	3/8-24		18-20
Nut (4)	Ski and Spring to U-bolts	5/16-18		10-12
*Nut (2)	Runner to Ski	5/16-18	90-100	
*Nut (2)	Rear Axle Pivot	5/16-18		12-15
*Nut (4)	Track Adjusting Bracket to Frame	5/16-24		12-15
*Screws	Trucks to Frame	3/8-16		25-30
*Nuts	Engine Mounting to Main Frame	3/8-16		18-20
Screws	Fuel Pump	#10-24	25-35	
*Nut	Throttle Control		30-40	
Screws	Brake Hand Lever to Handle Bars		13-15	
Care should be used in tightening hardware against tie rod end ball to prevent distortion or binding.				
*Nut	Bearing Cup to Chassis			6-8
Nut	Cable to Solenoid		36-60	
*Screw	Connecting Rod			29-31
*Screw	Crankcase	3/8-16		18-20
*Screw	Crankcase	5/16-18		10-12
Nut	Crankcase Drain		25-30	
*Nut	Cylinder to Crankcase	3/8-24		18-20
Nut	Drive Sprocket	1/2-20		25-35
*Nut	Exhaust Manifold to Cylinder	5/16-24		10-12
*Nut	Flywheel			145-150
*Nut	Front and Rear Truck Axles	5/8-18		35-45
*Screw	Idler Axle to Frame	3/8-16		20-25
*Bolt	Primary End Cap to Crankshaft	3/4-16		90-100
*	Spark Plug			18-20
*Nut	Steering Arm to Ball Joint	3/8-24		18-20
*Nut	Steering Arm to Ski Column	3/8-24		18-20
*Screw	Truck to Frame	7/16-14		25-30
Nut	Saddle to Springs	3/8-24		25-35
Screw		#6	7-10	
Screw		#8	15-22	
Screw	General	#10	25-35	2-3
Screw	Torque	#12	35-40	3-4
Screw	Requirements	1/4	60-80	5-7
Screw		5/16	120-140	10-12
Screw		3/8	220-240	18-20
*Nut	Cylinder Head	5/16-24	145-150	
*Screw	Power Pack Cover	1/4-20	40-50	
*Screw	Power Pack Cover	#10-32	24-36	
Screw	Check Valve - Primer		25-30	

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

*Use Torque Wrench

SNOWMOBILE SPECIAL SERVICE TOOLS

PART NO.	DESCRIPTION
114595	Wrench - Flywheel Nut
318502	Screw - Use with Flywheel Puller #378103
114594	Retainer - Flywheel
263308	Sheave Holding Tool
312019	Rod
316613	Seal Installer - Front Bearing
114584	Disassembly Tool - Primary Drive
114585	Ring Compressor - 2.750 Bore
114586	Ring Compressor - 2.875 Bore
114587	Ring Compressor - 3.250 Bore
319924	Cone - Wrist Pin Retainer
114611	Wrench - Cylinder to Crankcase Nuts
378103	Flywheel Puller
263472	Truarc Pliers
380658	Slide Hammer Set
375632	Spark Plug Wrench
114146	Spline Wrench
317829	Driver

SECTION 3

GENERAL SNOWMOBILE INFORMATION

TWO-STROKE CYCLE ENGINE THEORY

As the piston leaves bottom dead center (BDC), it creates a depression in the crankcase causing air to flow in thru the carburetor. Fuel is added to this air in the proper proportion for combustion and the air-fuel mixture (charge) then passes thru the reed spring inlet valve to the crankcase. The next time the piston moves toward BDC it compresses the charge in the crankcase and as the top edge of the piston uncovers the transfer port the pressurized charge is forced into the cylinder on the combustion chamber side of the piston. The piston then reverses direction and in moving toward TDC it closes the transfer port and the exhaust port respectively. The secondary compression of the charge takes place at this time. As the piston nears the top of the stroke this charge is ignited by means of an electric spark. The pressure formed by the burning gases forces the piston back toward BDC. When the top edge of the piston uncovers the exhaust port, the burned gases begin to leave the cylinder. A little more travel of the piston opens the transfer port and the incoming charge forces the remaining burned gases out while the piston moves past BDC. As it moves back toward TDC closing the transfer port and subsequently the exhaust port it begins the secondary compression mentioned earlier.

This cycle repeats itself once each engine revolution which consists of two strokes of the piston, one from BDC to TDC and one from TDC to BDC. Consequently the engine utilizing this basic principle is called a two-stroke cycle engine.

It can be seen then that the two-stroke cycle engine achieves basically the same operation as the more commonly understood four-stroke cycle engine. The intake, compression, power and exhaust strokes of the four-stroke cycle engine become the induction, primary compression, transfer, secondary compression, power and exhaust all taking place during two strokes of the piston.

CARBURETION

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. A diaphragm and valve system allows a constant fuel supply to be maintained in the

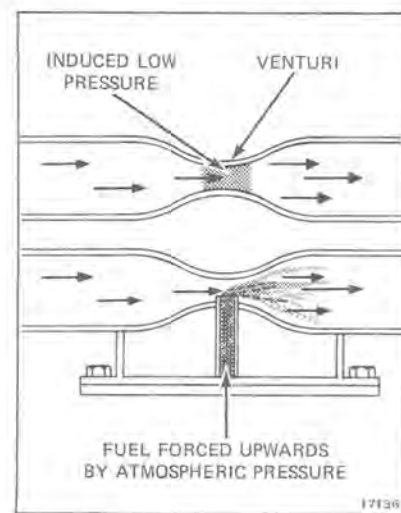


Figure 3-1

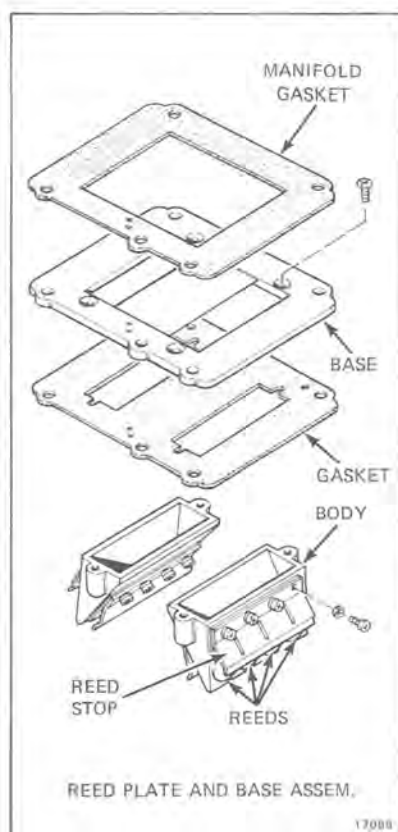


Figure 3-2

metering chamber at just slightly below atmospheric pressure. Needle valves permit a precise amount of fuel to flow from the metering 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 3-1). The venturi has the effect of reducing air pressure in the air stream, creating a partial vacuum which draws fuel from the discharge port. As it is rushed along to the firing chamber, the fuel is swirled about in the air stream and vaporized.

A throttle or butterfly valve in the throat regulates the amount of air drawn through the carburetor. To vary the speed of the engine, the throttle 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.

The system which controls the intake of the fuel-air mixture in the two cycle engine consists of a set of valves which serve the same purpose as the intake valves on a four cycle engine. The reed 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 reeds away from the body (see Figure 3-2), opening the passage between the carburetor and crankcase. When the piston is on the down-stroke, it compresses the crankcase charge, forcing the reeds against the passage opening, and sealing off the crankcase from the carburetor. Since the opening and closing may occur in excess of seven thousand times per minute, the reeds must be thin and flexible.

IGNITION

Two charge coils, are mounted on the alternator stator, located under the flywheel. The same flywheel magnets which induce current in the alternator stator also generate about 300 volts A.C. in the charge coils as the flywheel rotates. No external voltage source is required. The 300 volts A.C. is converted to D.C. in the Power Pack 2S, and is stored in the Power Pack 2S capacitor. One gap between the sensor magnets, part of the flywheel hub, passes the sensor coil, also under the flywheel.

NOTE

One thing to note in this system is that there are two sensor coils. Below the idle RPM range and up to approximately 900 RPM, the retard sensor turns on the electronic switch in the Power Pack 2S. At RPMs over 900 the advance sensor coil generates enough voltage to turn on the electronic switch in the Power Pack 2S before the retard sensor does. So, we have an automatic electronic advance built into the system.

The small voltage generated in the sensor coil activates one of two electronic switches in the POWER PACK 2S. This switch discharges the 300 volts stored in the capacitor into one of the ignition coils. The ignition coil steps the voltage up to 30,000 volts, which is fed to the spark plug. When the capacitor is discharged, the electronic switch opens and allows the charge coils to again charge the capacitor. The second sensor magnet gap, opposite in polarity from the first, generates a reverse polarity voltage in the sensor coil. This activates the second electronic switch in the POWER PACK 2S, and discharges the capacitor into the other ignition coil.

LIGHTING SYSTEM

The alternator coils produce alternating current which changes in frequency at approximately constant voltage in proportion to the engine speed.

The alternator A.C. output is used to operate lamps.

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 3000 - 3600 RPM. When the engine is rotating at idle speed or below 3000 - 3600 RPM, the transmission belt rides on a ball bearing between the halves of the primary sheave assembly (see Figure 3-3). The primary sheave assembly halves are separated by a compression spring in the hub of the movable sheave half.

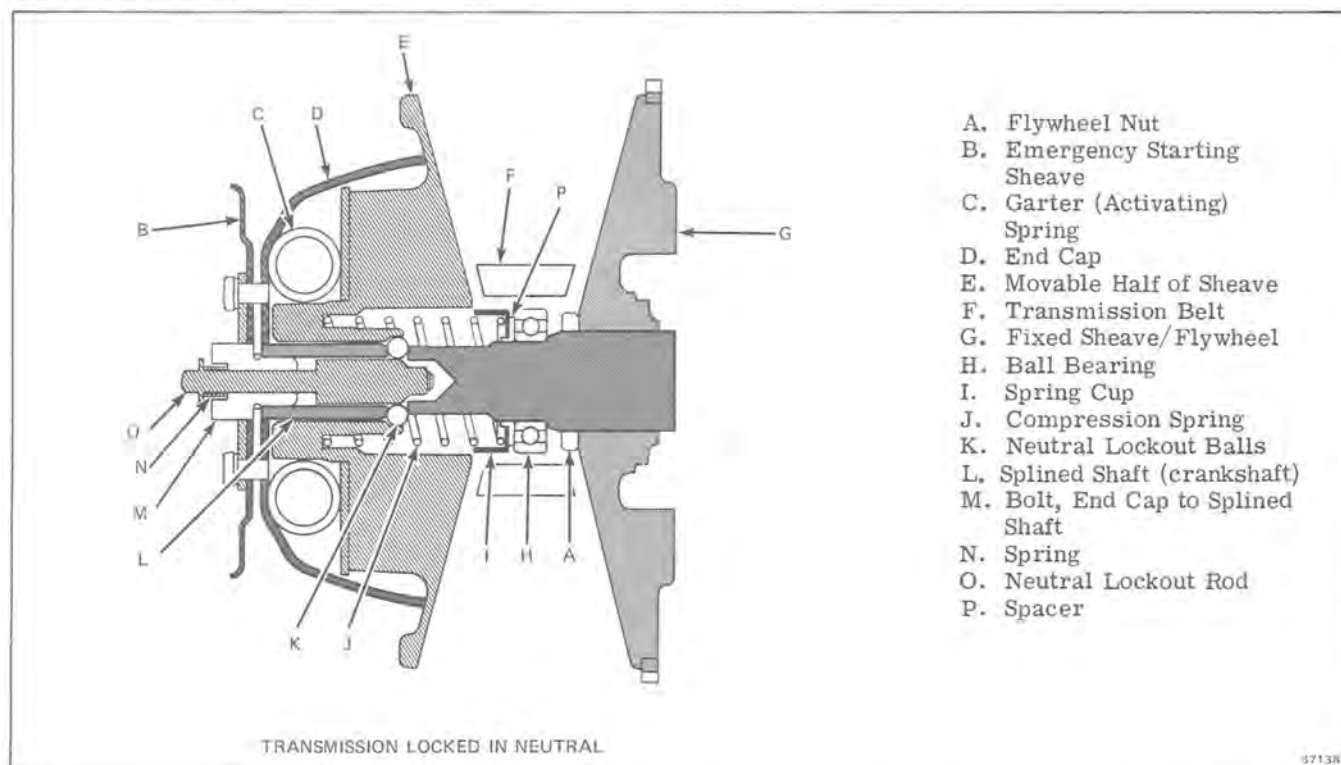


Figure 3-3

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 3-4). 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.

NEUTRAL CONTROL

A neutral control 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 control is spring actuated and will engage only when the engine is below approximately 2000 RPM.

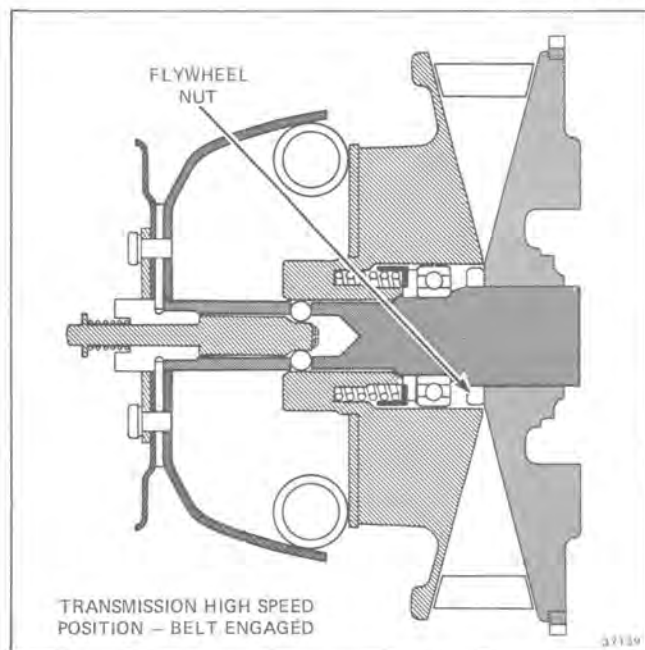


Figure 3-4

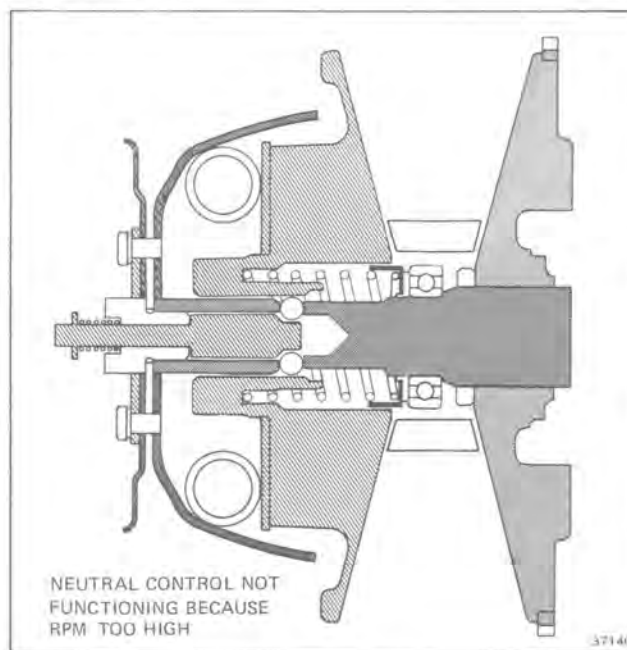


Figure 3-5

When the engine is running above approximately 2000 RPM the garter spring will expand by centrifugal effect. See Figure 3-5. 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 and the neutral lockout balls can not be pushed into the locked position. If the engine speed is now reduced to below 2000 RPM, the garter spring will close and allow the movable half of the sheave to move away from the fixed sheave.

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 to 1 in low to 1 to .68 in high which yields an overall drive range of approximately 4.4 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 17:39 or 19:39.

SECTION 4

TROUBLE SHOOTING

DESCRIPTION

This section provides trouble shooting procedures for the snow machine. Steps to be followed in determining causes of unsatisfactory performance are outlined.

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, ignition, and proper drive system adjustment. Engine theory, compression, carburetion, ignition and power flow are discussed in Section 3. Correct fuel mixture for this snowmobile is outlined on page iv, and fuel blending is discussed 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.

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. Preliminary inspection.
- 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.

A preliminary inspection should include the following checks.

- 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. Low speed needle bent or bowed
- k. Engine flooded
- l. Reed valves not functioning properly

- m. Faulty gaskets
- n. Spark plugs fouled, dirty or broken
- o. Loose or broken wire or frayed insulation in ignition system wiring
- p. Sheared flywheel key
- q. Faulty coils
- r. Key switch, connector or grounded switch wire
- s. Binding in engine
- t. Faulty sensor, charge coils, Power Pack 2S or connecting wiring.

2. Engine won't turn over

- a. Cylinder wall corrosion, seized piston or bearing
- b. Engine improperly assembled after repair

3. Cranks over extremely easily

- a. Spark plug(s) loose
- b. Cylinder or pistons scored
- c. Rings worn or carboned
- d. Faulty cylinder head gasket

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

- a. Spark plug leads crossed
- b. Reed valves broken or not seating
- c. Timing out of adjustment (check with timing light)
- d. Retard sensor faulty or out of adjustment
- e. Power Pack 2S faulty

5. No spark one cylinder

- a. Faulty ignition coil, wire, or connections
- b. Faulty Power Pack 2S

6. No spark both cylinders

- a. Faulty charge coil
- b. Faulty sensor coils
- c. Faulty Power Pack 2S
- d. Grounded ignition switch and/or wire
- e. Broken or poor ground

- f. Flywheel not properly charged
- g. Faulty ignition coils or leads
- 7. Weak spark both cylinders
 - a. Ignition switch or connection leakage
 - b. Weak charge coil output
 - c. Weak Power Pack 2S output
 - d. Weak ignition coil output
 - e. Poor ground
- 8. Engine can be started by using primer, but dies out when primer is not used
 - a. Fuel pump inoperative
 - b. Carburetor needle valves closed
 - c. Fuel line to carburetor clogged
 - d. Fuel filter screen in fuel pump or carburetor inlet screen clogged
 - e. Carburetor inoperative

STARTING - MANUAL STARTER

- 1. Manual starter pulls out, but starter does not engage flywheel
 - a. Friction spring bent
 - b. Pinion or rope pulley burred
 - c. Pinion frozen (water) in place
 - d. Roll pin fallen out or broken
- 2. Starter rope does not return
 - a. Return spring broken or binding
 - b. Grease on return spring
 - c. Not enough preload on return spring
- 3. Clattering manual starter
 - a. Bearing missing or worn
 - b. Pinion or rope pulley worn
 - c. Main spring improperly assembled
 - d. Pinion return spring broken

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 armature brushes or springs
- e. Faulty armature (shorted or open windings)
- 2. Starter will not crank engine
 - a. Weak battery
 - b. Loose or corroded connections
 - c. Broken wire in harness or connector
 - d. Faulty ignition key switch
 - e. Faulty starter solenoid or solenoid wiring
 - f. Moisture in starter motor or bendix
 - g. Broken or worn brushes or broken brush springs
 - h. Faulty armature (shorted or open windings)
 - i. Dirty bendix

RUNNING - LOW SPEED ONLY

- 1. Low speed miss
 - a. Incorrect gas - lubricant ratio
 - b. Carburetor idle adjustment too lean or too rich
 - c. Reed valve standing open or preloaded shut
 - d. Spark plugs dirty or broken
 - e. Loose or broken ignition coil wires
 - f. Spark plug terminal loose
 - g. Weak coil output
 - h. Cylinder gasket or reed plate gasket damaged
 - i. Leaking crankcase gaskets or crankshaft seal
 - j. Arcing around ignition coils or arcing in ignition switch
 - k. Loose connections or intermittent grounding of leads in the: ignition coil, Power Pack 2S, charge coils, sensor coils, and ignition switch

RUNNING - HIGH SPEED ONLY

- 1. High speed miss
 - a. Water in fuel

- b. Carburetor inlet needle sticking
 - c. Spark plugs dirty or cracked insulator
 - d. Ignition coil - weak output
 - e. Engine improperly timed
 - f. Exhaust ports or exhaust system carboned
 - g. Combustion chambers carboned
 - h. Arcing around ignition coils or arcing in ignition switch
 - i. Loose connections or intermittent grounding of leads in the: ignition coil, Power Pack 2S, charge coils, sensor coils, and ignition switch
 - j. Check valve needle sticking
2. Poor acceleration, top rpm is low
- a. Incorrect gas - lubricant ratio
 - b. Old fuel
 - c. Fuel hoses plugged or kinked
 - d. Fuel filter restricted (fuel pump or carburetor)
 - e. Fuel pump or pulse line faulty
 - f. Incorrect carburetor adjustments
 - g. Faulty check valve
 - h. Inlet needle and seat worn or sticky
 - i. No spark advance
 - j. Spark plugs dirty
 - k. Loose, broken, or badly insulated high tension leads
 - l. Ignition coil weak output
 - m. Reed valves not properly seated, or broken
 - n. Piston rings stuck or piston scored
 - o. Excessive carbon on pistons and cylinder head
 - p. Exhaust ports or exhaust system carboned up
 - q. Charge coils, Power Pack 2S faulty
3. Idles well, but acceleration poor, dies at full throttle
- a. Fuel lines or passages obstructed
 - b. Fuel filter clogged
 - c. Faulty fuel pump or pulse line
 - d. Faulty check valve
 - e. Fuel tank vent clogged
 - f. High speed nozzle clogged
 - g. Dirt behind needles and seats
 - h. Choke partly closed
 - i. High speed needle set too lean or rich
 - j. Advance sensor faulty
4. Engine runs at high speed only by using hand primer
- a. Fuel lines filters or passages obstructed
 - b. Fuel line leaks or fuel filter obstructed
 - c. Fuel pump not supplying enough fuel
 - d. Dirt behind needles or seats
 - e. Carburetor adjustments
 - f. Fuel cap vent clogged
- 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)
 - d. Cooling fan obstructed
 - e. Fan belt broken or slipping
2. Engine seizes (stops suddenly)
- a. No lubricant in gas, or no fuel
 - b. Rod or main bearing seized
 - c. Cylinder or piston scored or seized
 - d. Fan belt broken
 - e. Cooling fan obstructed
3. Engine knocks excessively
- a. Incorrect gas - lubricant ratio
 - b. Flywheel loose
 - c. Carbon in combustion chambers and exhaust ports, or on pistons

- d. Worn or loose bearings, or pistons
 - e. Loose assemblies, bolts, or screws
 - f. Manual starter pinion hitting the flywheel
4. Excessive fuel consumption
- a. Carburetor casting porous
 - b. Deteriorated carburetor gaskets
 - c. Carburetor improperly adjusted
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
 - e. Deteriorated engine mounts/washers
6. No power under heavy load
- a. Faulty carburetion
 - b. Faulty ignition coil(s)
 - c. Ignition timing off
 - d. Carbon build-up on piston head, exhaust ports, or exhaust system
 - e. Cylinder scored or rings stuck
 - f. High speed adjustment lean
 - g. Spark plugs fouled or misfiring
7. Engine misfires
- a. Spark plugs dirty, fouled
 - b. Grounding or leakage of secondary leads
 - c. Ignition coil faulty
 - d. Grounding or leakage of ignition switch, switch wire or connection
 - e. Loose connections at: ignition coils, charge coils, Power Pack 2S, and sensor coils
8. Spark on only one cylinder
- a. Ignition coils
 - b. Power Pack 2S output
9. Engine will start and idle, but quits on accelerating
- a. Check advance sensor coil and leads
 - b. Check Power Pack 2S output
 - c. Check timing
10. Transmission belt flips over in sheaves
- a. Sheaves are out of alignment (see Section 10)

SECTION 5

TUNE-UP PROCEDURES

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. Inadequate fuel delivery, as the result of a faulty fuel pump or clogged filter, will effect 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. See Section 3 for a discussion on carburetion.

IGNITION SYSTEM

A good ignition system is of prime importance for peak engine performance. A weak spark, which may be the result of faulty ignition system components, will cause hard starting, misfiring, or poor high-speed performance. The spark plugs and ignition system components are frequently checked first in a tune-up because of their importance to the operation of the engine. See Section 3 for a discussion on ignition theory, and Section 7 for complete ignition system analysis.

COMPRESSION

Compression must be well sealed by the piston and piston rings in the cylinder to realize maximum power and performance. 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.

NEW VEHICLE DELIVERY

Complete instructions for putting a new snowmobile into operation are included in the Owner's Manual and assembly instructions 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 torqued 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 control and choke.

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 control

Can transmission be locked in neutral when machine is at rest and engine at idle speed?
 2. Function of brake
 3. Engine performance
 4. Ski alignment and handling
 5. After running snowmobile, reduce engine speed to idle and pull neutral control knob out to lock transmission in neutral. Accelerate engine to see if transmission is in neutral. Neutral control cannot be engaged above approximately 2000 RPM.

- b. Check compression.
- c. If engine knocks, check for loose flywheel. Rock flywheel back and forth and listen for knocks.
- d. If compression is not satisfactory and there are no blown gaskets, engine overhaul is required (see Section 9).
- e. Test ignition system using spark checker and neon C.D. Tester. Inspect high tension leads. See Section 7.
- f. Check spark plugs to be sure they are the correct type. Clean spark plugs or replace as necessary.
- g. Remove and drain fuel tank, flush, and clean thoroughly (see Section 6). Install tank, refill with fresh fuel mixture, and check primer operation.
- h. Inspect fuel pump and hoses. Clean filter, or replace filter element and gasket.
- i. Inspect and clean fuel screen behind carburetor fuel inlet elbow.
- j. Thoroughly lubricate snow machine (see Section 12).
- k. Tighten all external bolts, nuts, and screws, and retorque spark plugs to specified torque.
- l. Check track tension and ski alignment (see Section 11).
- m. Start engine and allow to warm up. Check track alignment (see Section 11).
- n. Repeat test run on vehicle. Check carburetor needle adjustments.
- o. After engine has run sufficiently to indicate satisfactory condition, stop and restart it several times. Operate it at high and low speeds. Check acceleration from low to high speed.
- p. Clean and dry snow machine thoroughly, before returning it to customer. Fog motor for storage, using OMC Accessories Rust Preventative Oil (see Section 12).

COMPRESSION CHECK

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. Turn the engine over quickly three or four times with the manual starter. Compression should be 100 pounds per square inch minimum.

IGNITION TIMING CHECK

See Section 7 for procedure to check spark timing.



Figure 5-1

CARBURETOR ADJUSTMENTS

NEEDLE VALVES

1. Seat both the high and low speed needles lightly (see Figure 5-1), then open to the initial settings shown in the chart below.



NOTE

These carburetor settings are for HD 129A (650) and HD 130A (400 - 440) carburetors.

INITIAL CARBURETOR NEEDLE VALVE SETTINGS

Model	High Speed	Low Speed
400	3/4	1-1/16
440	1	1
650	1-1/4	1

2. Start the engine and adjust the idle speed screw for a 1300 ± 100 RPM idle. Allow the engine to warm up for two or three minutes.
3. Due to variations in manufacture of carburetors, it may be necessary to adjust the settings in the chart above by 1/8 of a turn.
4. If conditions permit adjust the high speed needle for maximum speed but never less than 3/4 turn open.

LINKAGE

1. Turn idle adjusting screw counterclockwise until it no longer contacts the throttle arm.
2. Check throttle cable to be sure there is slack and that the cable is not holding the throttle open.
3. Hold throttle control lever on the handle bar in the full throttle position and check to be sure that the carburetor is also in the full throttle position.
4. Adjust the nuts on the throttle cable at the carburetor to obtain proper travel if the carburetor does not open or close fully.

SPARK PLUGS

Using the correct spark plug is most important for efficient operation. The recommended spark plug for your engine is Champion UL-77V. Carrying a spare set of spark plugs is recommended.

Remove rubber covered spark plug terminal by pulling straight off, with a slight twist. See Figure 5-2. Remove spark plugs for inspection or replacement as necessary. Don't clean badly carboned plugs. Replace them.

When reinstalling spark plug, clean the spark plug seat in cylinder head. Be sure spark plug gasket is in place and tighten plug to 18 - 20 ft. lbs. (DO NOT EXCEED 20 FT. LBS.)

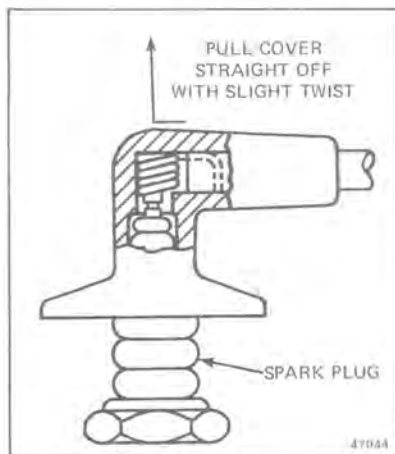


Figure 5-2

SECTION 6

FUEL SYSTEM

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 reed valve assembly. This section gives complete service procedures on all components of the fuel system, and carburetor adjustments. Principles of carburetion are discussed in Section 3.

FUEL FLOW

Fuel is drawn from the fuel tank by the fuel pump, which is operated by changes in crankcase pressure. These changes in crankcase pressure are transmitted to the fuel pump by the passage in the manifold. Fuel filter screens are located in the fuel tank, at the end of the fuel pick-up tube; at the inlet to the fuel pump and in the carburetor inlet. The filter elements remove water, dirt, or other impurities from the fuel before the fuel passes into the engine. The primer assembly injects raw fuel into the intake manifold.

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.

REMOVAL AND CLEANING

- a. Remove throttle cable using the following procedure: Depress thumb throttle lever. Hold throttle in open position. Slip end of throttle cable through nylon pivot pin. Remove jam nut from carburetor bracket and pull out throttle cable. See Figure 6-1.
- b. Remove electrical component bracket from intake manifold.
- c. Remove 2 manual starter bolts with speed handle long extension and 1/2" universal socket.
- d. Loosen screw, choke cable to choke shaft linkage.
- e. Loosen nut, choke cable to clamp.
- f. Remove fuel hose from carburetor, primer hose from manifold and inlet hose from fuel pump.
- g. Remove 2 nuts and 2 washers, carburetor to intake manifold and remove carburetor by working over studs and into air box.
- h. Select a clean work area. Dirt and carelessness are the cause of most carburetor trouble.

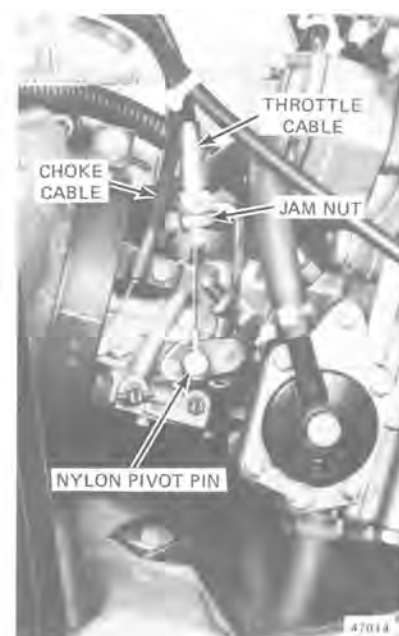


Figure 6-1

 NOTE

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.

- i. 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 and stripped threads.

DISASSEMBLY, REPAIR, REASSEMBLY AND INSTALLATION

 NOTE

Do not interchange carburetors.

- a. Remove the idle speed mixture screw, washer and tension spring. Inspect for damaged threads (see Figure 6-2).

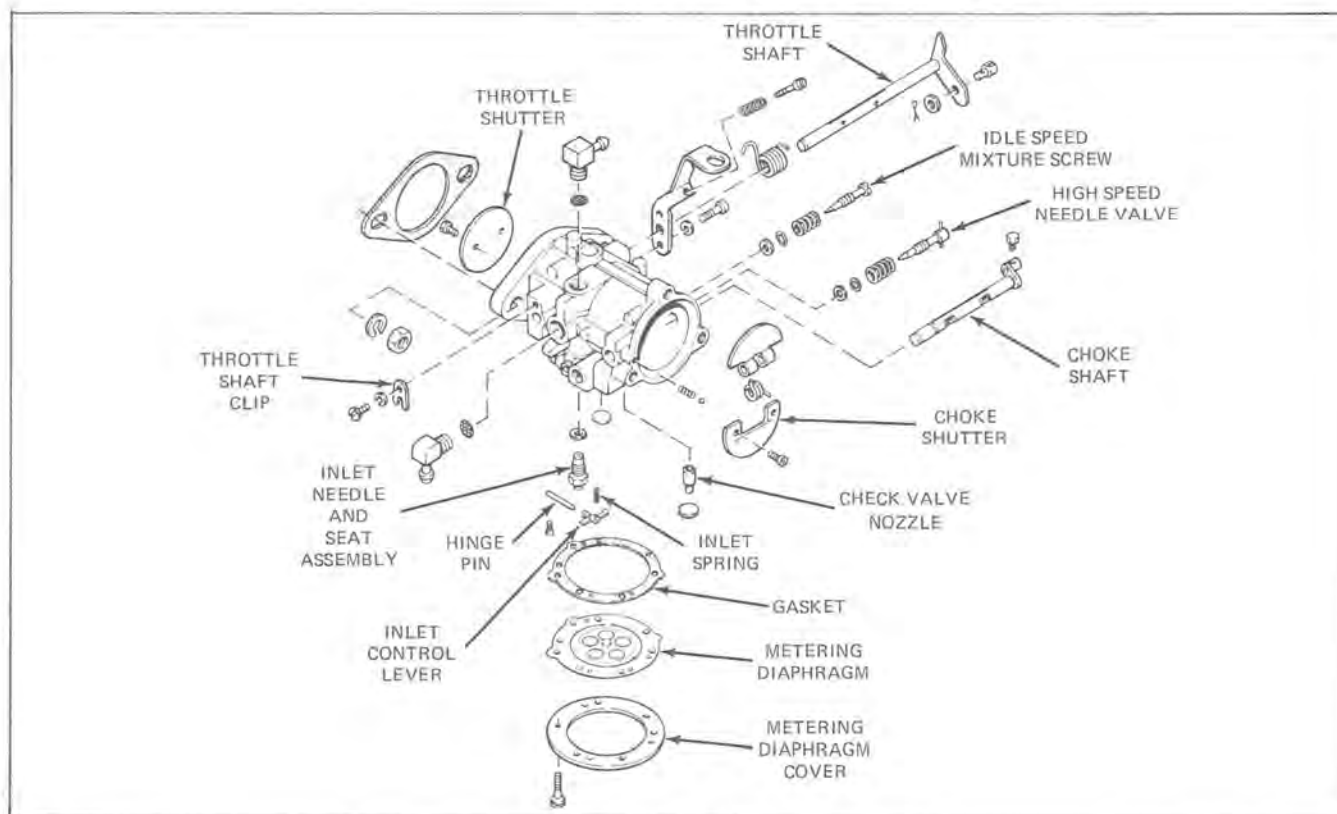


Figure 6-2

- b. Remove the metering diaphragm cover, the metering diaphragm, and gasket. 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, the hinge pin, inlet control lever and the inlet tension spring. 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. 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 low speed needle valves. Through misuse, either mixture screw point may be bent (extruded) from being forced into the casting seat or possibly broken off in the casting (see Figure 6-3). 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 parts and main nozzle ball check valve from the metering chamber. Accumulated dirt can usually be blown out through the mixture screwholes. However, an unusually dirty carburetor requires the removal of these plugs. Drill just through the welch plug carefully with a 1/8" drill. Drilling too deeply may ruin the casting or the ball check valve. Use a small punch to remove the plug.

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, 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 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 and choke 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 and pull the

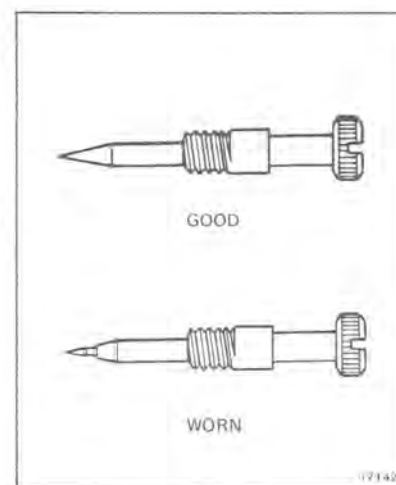


Figure 6-3



Figure 6-4

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 from the body carefully so that the friction ball and spring will not fly out of the casting. Inspect the shaft and bushings.

1. Adjust the inlet control lever so that the center of the lever that contacts the metering diaphragm is flush to the metering chamber wall. Check with straight edge. See Figure 6-4.
2. Install new welch plugs at the nozzle well and by-pass chamber if needed. Place the new welch plug into the casting counter-bore convex side up and flatten it to a tight fit, using flat end punch. The correctly installed welch plug is flat.
3. Assemble the gaskets, diaphragms and castings in the correct order.
4. 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.
5. 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.
6. Insert choke cable assembly through clamp on carburetor and insert cable through choke lever swivel pin. 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 nut on choke cable clamp just enough to hold cable firmly. Work choke knob to check for adjustment or possible binding.
7. Assemble the carburetor to the intake manifold using a new gasket. Install fuel lines and new fuel line tie straps. Assemble electrical component bracket to intake manifold.
8. Assemble throttle cable to carburetor in reverse order of removal. Adjust throttle cable so that carburetor butterfly valve is full open when thumb lever touches handle grip.

REED VALVES

- a. Remove reed plate assembly.
- b. Rinse reed valves and reed valve body in cleaning solvent. Do not blow dry with air pressure, as damage to reeds may result.
- c. Inspect the reed valve assembly and disassemble if necessary. Special caution is necessary in disassembling the reed valve assembly. DO NOT damage or interchange the reeds.
- d. The reeds must be flat to maintain a seal with the reed valve body. DO NOT under any circumstances bend or flex the reeds by hand. Clean, inspect, and immediately reassemble the reed valve assembly, rather than leave it apart for reassembly later.
- e. The reeds are designed to maintain contact with the reed valve body, and to spring away from the reed body when vacuum is applied. Inspect reed plate assembly and replace reed valve body assembly if damaged.



NOTE

Models 400 - 440 use .140 reed stops and 650 model use .110 reed stops.

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

INSTALLATION

- a. Secure reed plate assemblies to base, using a new reed plate gasket coated with Gasket Sealing Compound #317201. Align reed plate and base assembly on crankcase.

FUEL PUMP

REMOVAL

- a. Disconnect two hoses from fuel pump and filter assembly, (see Figure 6-5).
- b. Remove two screws attaching pump and filter assembly to manifold, 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. Clean the filter cover and fuel connectors in solvent and blow dry.



SAFETY WARNING

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. 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 clean 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 cap to fuel pump body.
- b. Install fuel pump in reverse order of removal.

FUEL PRIMER

- a. The primer is a simple pump which pumps raw fuel from the fuel line, through check valves, directly into the intake manifold above the reed valves.
- 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 pick up in fuel tank and fuel line fitting for leakage or sticking.
- c. Check for crimped hoses, dirt in check valve diaphragm or bad pump diaphragm.

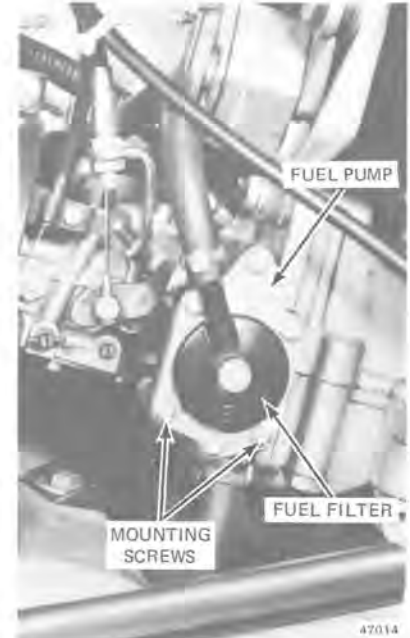


Figure 6-5



Figure 6-6



Figure 6-7

AIR SILENCER

The carburetor is equipped with dual polyurethane foam silencers (see Figure 6-6). Both silencers will require cleaning at least once during the operating year. If the vehicle is run in dirt or grass, the silencers should be checked weekly. If either silencer develops tears it should be replaced. When pores are plugged, engine will receive a rich fuel/air mixture and run rough and reduce fuel economy. To clean silencers, shake to dislodge dirt particles, blow with compressed air and shake, wash in warm water with a mild detergent.

FUEL TANK

- a. Remove fuel tank cover.
- b. Remove fuel hoses from tank. Mark fuel hoses for identification on reassembly.
- c. Disconnect taillight wire inside seat compartment.
- d. Remove two nuts, seat to chassis.
- e. Lift rear of seat and pull back.
- f. Remove three nuts from fuel tank hold down bracket.
- g. Fuel tank can now be removed for cleaning.
- h. Clean the tank with gasoline poured through a filtering funnel. Cover the fuel line opening and agitate the tank. Empty it through the fill opening. Then reinstall the tank and hoses. See following procedure to install new fuel line tie straps.
- i. 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 6-8.
- c. Snug up the head on the strap. See Figure 6-9.
- d. Tighten head on strap with pliers as illustrated in Figure 6-10.



Figure 6-8



Figure 6-9



Figure 6-10

SECTION 7

IGNITION AND ELECTRICAL SYSTEMS

DESCRIPTION

The ignition system is made up of the following major components:

1. Flywheel and sensor rotor assembly
2. Stator and charge coil assembly
3. Sensor plate assembly
4. Power Pack 2S assembly
5. Ignition coils

Because the engine is a two-cycle, 2 cylinder alternate firing engine, two ignition coils are used to supply spark alternately to both cylinders. An automatic spark retard/advance system has been incorporated to provide easier starting.

The electrical system consists of the alternator coils, headlamp and taillamp, light and ignition switches and wiring. The alternator coils produce alternating current which changes in frequency and voltage in proportion to engine speed. Alternating current is then used to power the headlamp, taillamp and brakelamp. See wiring diagram at end of manual.

This section gives complete service procedures on all components of the ignition and electrical systems. Principles of the magneto C.D. (capacitor discharge) ignition system are discussed in Section 3.

TEST EQUIPMENT

The test procedures outlined in this section require the use of the following equipment.

1. Multimeter (See Figure 7-2 and 7-3) or an ohmmeter.
2. Needle point spark checker, gap set to 7/16". See Figure 7-4.
3. Neon test light M-80 (Figure 7-5) or S-80 (Figure 7-6).
4. Power clamp on timing light. See Figure 7-7.
5. Ignition analyzer. See Figure 7-8, 7-9 and 7-10.

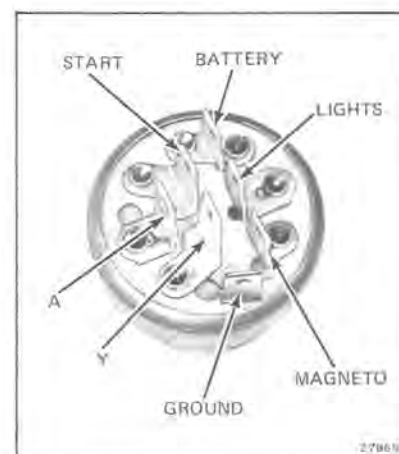


Figure 7-1



Figure 7-2



Figure 7-3



Figure 7-4



Figure 7-5

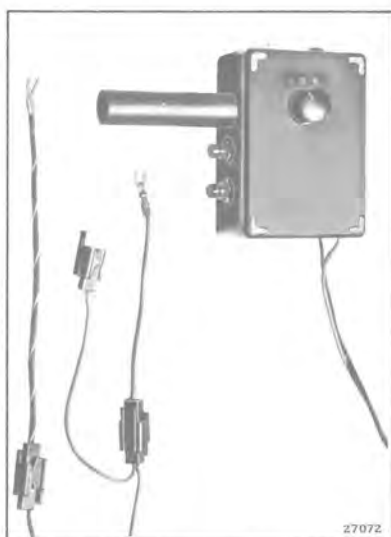


Figure 7-6



Figure 7-7



Figure 7-8



Figure 7-9



Figure 7-10

C. D. IGNITION SYSTEM

TROUBLE SHOOTING

INTRODUCTION

An understanding of the theory of the C.D. ignition system is an invaluable asset in following the C.D. ignition trouble shooting procedure. See Section 3 for a discussion of the C.D. ignition theory. All the following tests can be conducted without the removal of the flywheel.

C.D. IGNITION SYSTEM DO'S AND DON'TS

1. Do make sure that all connections are clean and tight, especially ground connections. Poor connections mean problems.
2. Do make sure that all plug-in connectors are fully engaged and free of corrosion. Loose or corroded connectors mean problems.
3. Do make sure that all wiring is located properly so there is no chance of rubbing against any edges that can cause wear and insulation breakdown. This can create a difficult service problem.
4. Do make sure test equipment is in good working order before troubleshooting the system. Poor test equipment will not solve a problem.
5. Do use proper tools when working on system components. Wrong tools could damage components.



SAFETY WARNINGS (6 AND 7)

6. Do return key switch to OFF position after each test before touching any system leads. This will discharge capacitor in Power Pack 2S and prevent a possible high voltage electric shock.
7. Don't hold spark plug wires in your hand while checking for spark. A severe electrical shock could result. Use insulated pliers designed for this purpose.
8. Don't remove potting compound from Power Pack, as this will void any warranty.
9. Don't pull on high tension leads at the ignition coils. You might break the insulation or connection.
10. Don't open or close any plug-in connectors while the engine is running. You might cause damage to the system.
11. Don't attempt any tests other than those listed in the troubleshooting procedure. You might cause damage to the system.
12. Don't connect an electric tachometer into ignition system. You might damage the system.
13. Don't connect this system to any voltage source other than what is specified. You might damage the system.



NOTE

When connecting neon test light lead to Power Pack 2S be sure to use spade terminal to ensure good connection.



NOTE

When connecting test equipment leads or reconnecting engine wiring leads to Power Pack 2S always refer to the diagram provided. You must hook leads in correct location or possible damage to system will result.

When removing Power Pack 2S cover plate, make sure you place it alongside Power Pack 2S in same direction it was removed. This will assure correct terminal identification. Also, replace black (ground) wire from terminal 5 and screw to Power Pack 2S after cover is removed before conducting following tests.

TEST #1 IGNITION COILS OUTPUT CHECK (Refer to wiring diagram at end of manual)

- A. Pull high tension leads off spark plugs.
- B. Connect spark gap checker with 7/16" gap. See Figure 7-11 (See optional Kilovolt test).

NOTE

Safety stop switch must be in "RUN" position.

- C. Remove spark plugs for easier cranking.
- D. Crank engine with manual starter (with ignition switch in "RUN" position).

1. Strong steady spark from both coils system is good.
2. Weak, erratic or no spark from one ignition coil, switch ignition coil leads on Power Pack - repeat test.

Spark on opposite cylinder erratic, replace coil.

Spark on same cylinder still erratic replace Power Pack.

3. Weak, erratic or no spark from both coils, go to test #2.

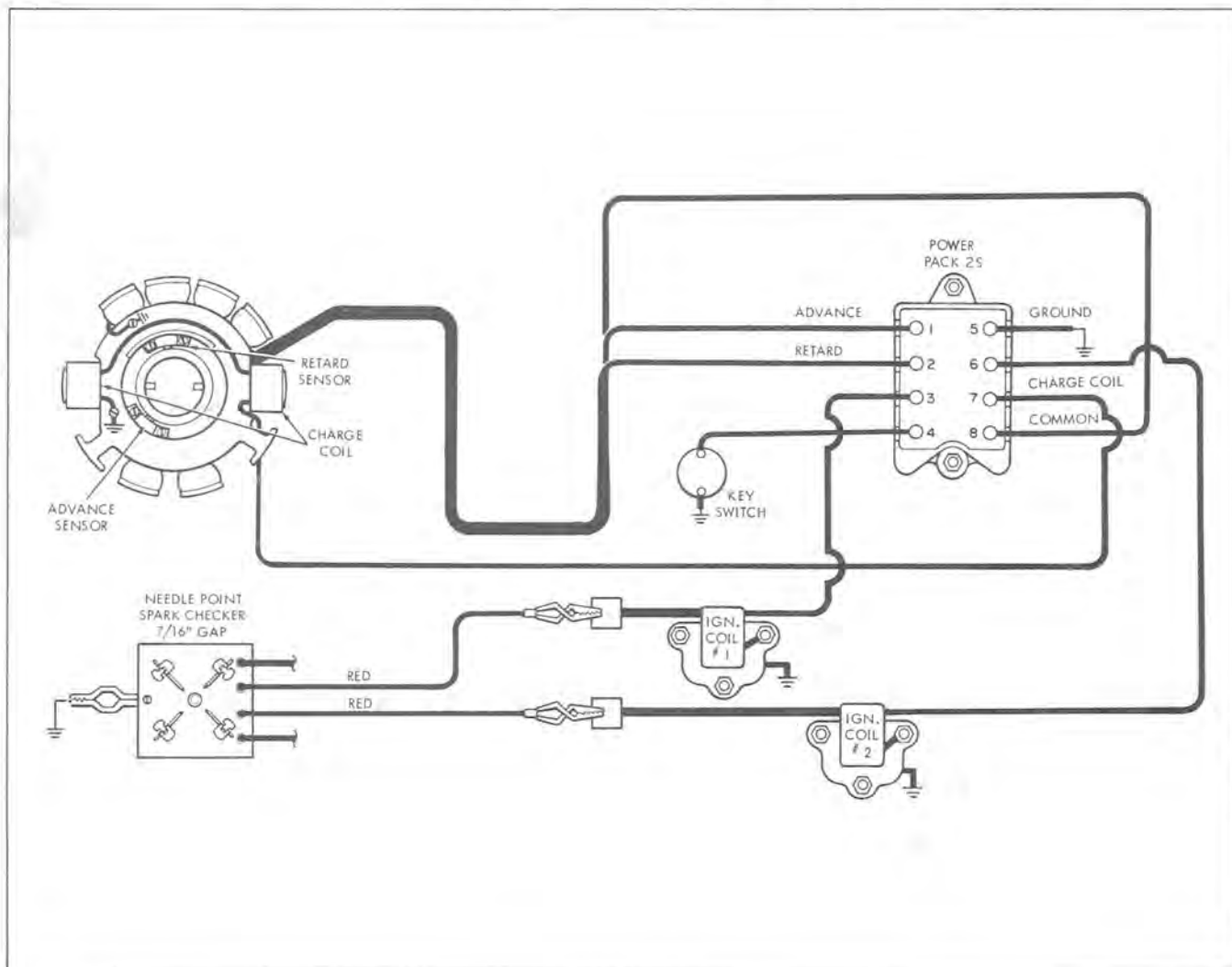


Figure 7-11

TEST #2 IGNITION AND SAFETY STOP SWITCH CHECK (Refer to wiring diagram at end of manual)

- A. If no spark present disconnect small black ground connector on ignition switch.
- B. Connect spark checker as per test #1.
- C. Cranking engine with manual starter.
- D. Spark present, replace ignition switch.
- E. No spark, disconnect ignition switch orange/black lead on terminal block, terminal #7. Repeat test, spark present, replace wiring harness to ignition switch.
- F. If no spark, disconnect orange/black lead from terminal block terminal #7 to safety stop switch.
- G. Repeat test. Spark present, replace safety stop switch and lead assembly.
- H. No spark, disconnect orange/black lead from Power Pack terminal #4. Repeat test. Spark present replace orange/black lead from Terminal Block to Power Pack.
- I. If no spark, go to test 2A.

TEST #2A IGNITION SWITCH CHECK

- A. Disconnect orange/black lead from Power Pack terminal #4. See Figure 7-12. Crank engine, if spark present go to step "B." If no spark go to Test #3.
- B. With ignition key in "RUN" position, check from orange/black lead to engine ground with ohmmeter set on HI ohm scale. There should be infinite reading on meter indicating ignition switch not shorted and lead not grounded.
- C. If less than 500K ohm reading, remove terminal connectors from ignition switch and remove ignition switch from dash panel. Turn ignition key to "RUN" position and take a resistance reading across the magneto and ground terminal of the ignition switch.
- D. If less than 500K ohm reading indicated, replace ignition switch.
- E. Reconnect key switch lead to terminal #4 on Power Pack.

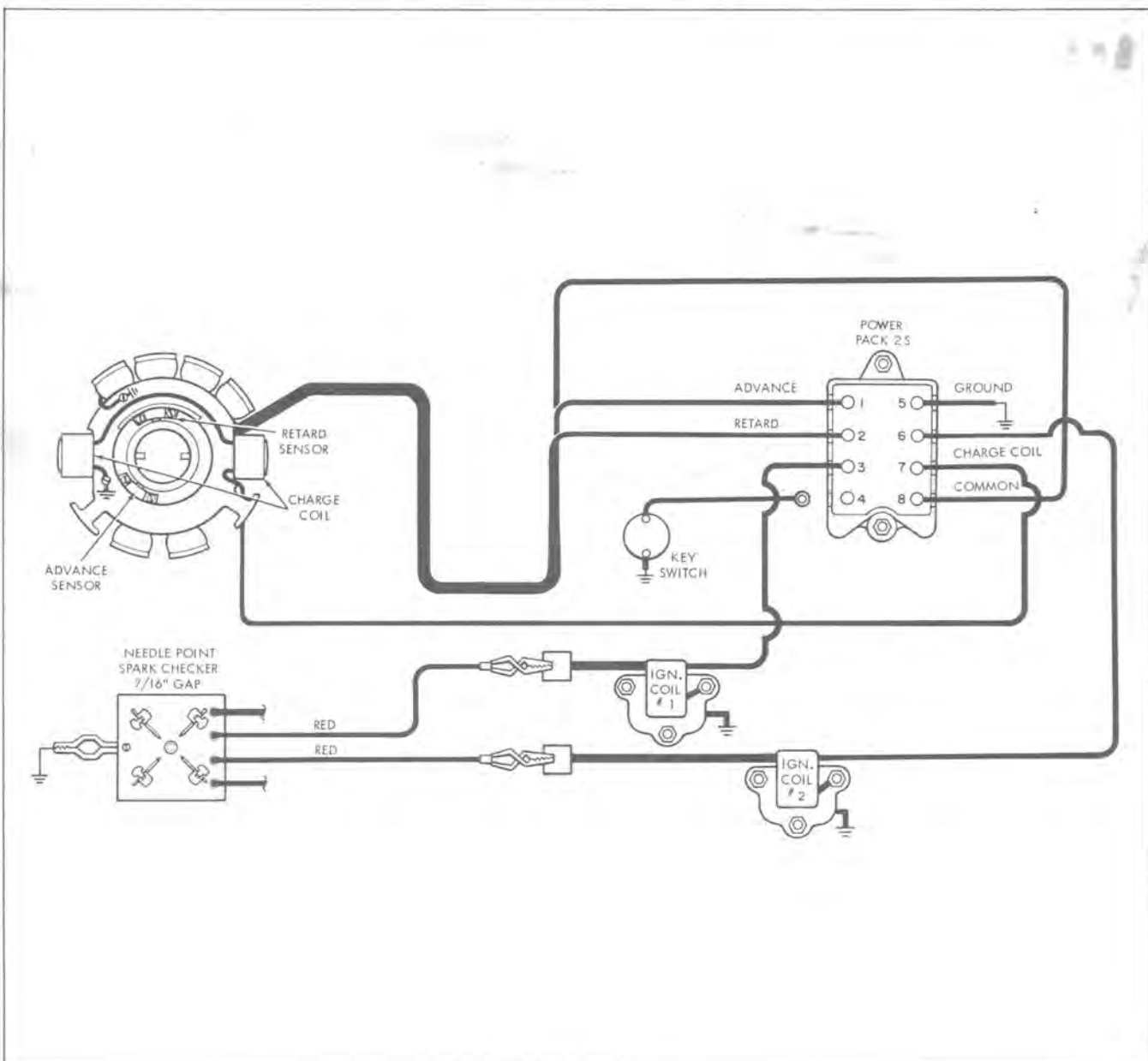


Figure 7-12

TEST #3 POWER PACK 2S OUTPUT CHECK

- A. Remove ignition coil orange primary leads from terminals #3 and #6 of Power Pack. See Figure 7-13.
- B. Use neon tester S80 or M80. Set rotary switch on tester to position #1. Hook tester black lead to Power Pack terminal #3 and tester blue lead to engine ground.
- C. Depress load button "A" and crank engine with electric starter or manual starter (with ignition and safety stop switch in "RUN" position) and observe light.
 1. If light, check ignition-coils, test #9.
 2. Repeat step "B" using Power Pack terminal #6.
 3. If no light, reconnect ignition coil primary leads to terminals #3 and #6 on Power Pack. Go to next Test #4.

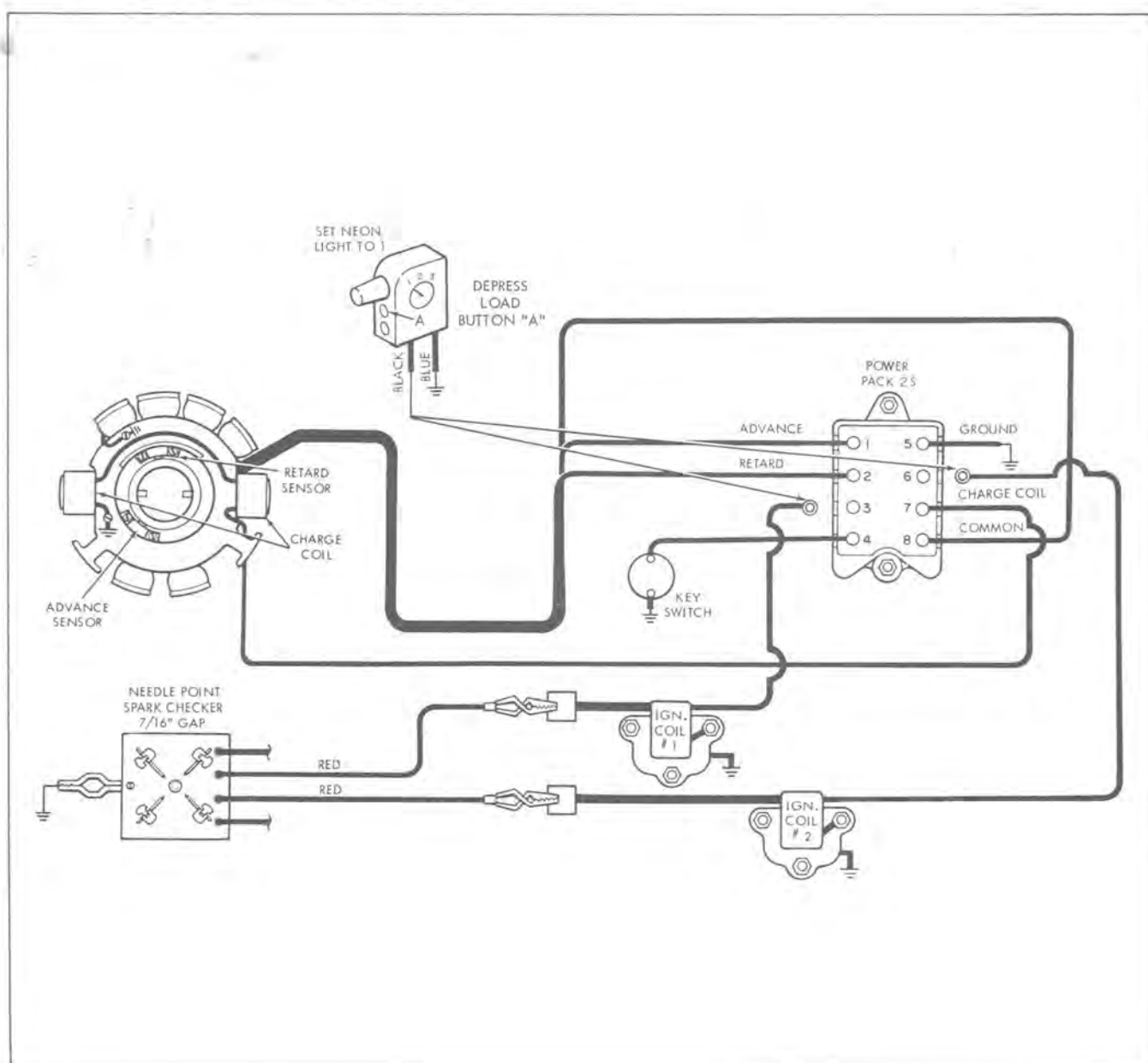


Figure 7-13

TEST #4 CHARGE COIL OUTPUT CHECK

- A. Use neon tester S80 or M80. Connect neon tester black lead to Power Pack charge coil terminal #7 brown/white stripe lead and tester blue lead to engine ground. See Figure 7-14.
- B. Set neon tester rotary switch to position #2.
- C. Crank engine with electric starter or manual starter (with ignition switch in "RUN" position) and observe neon tester light.
 1. If light, charge coils are good.
 2. If no light, remove charge coil lead from Power Pack terminal #7 and check for grounding or open leads to charge coils. Also check charge coils for correct resistance. (Test #8)
 3. Repeat steps A, B, and C with neon tester, black lead connected to brown/white lead. If light, charge coils are good.

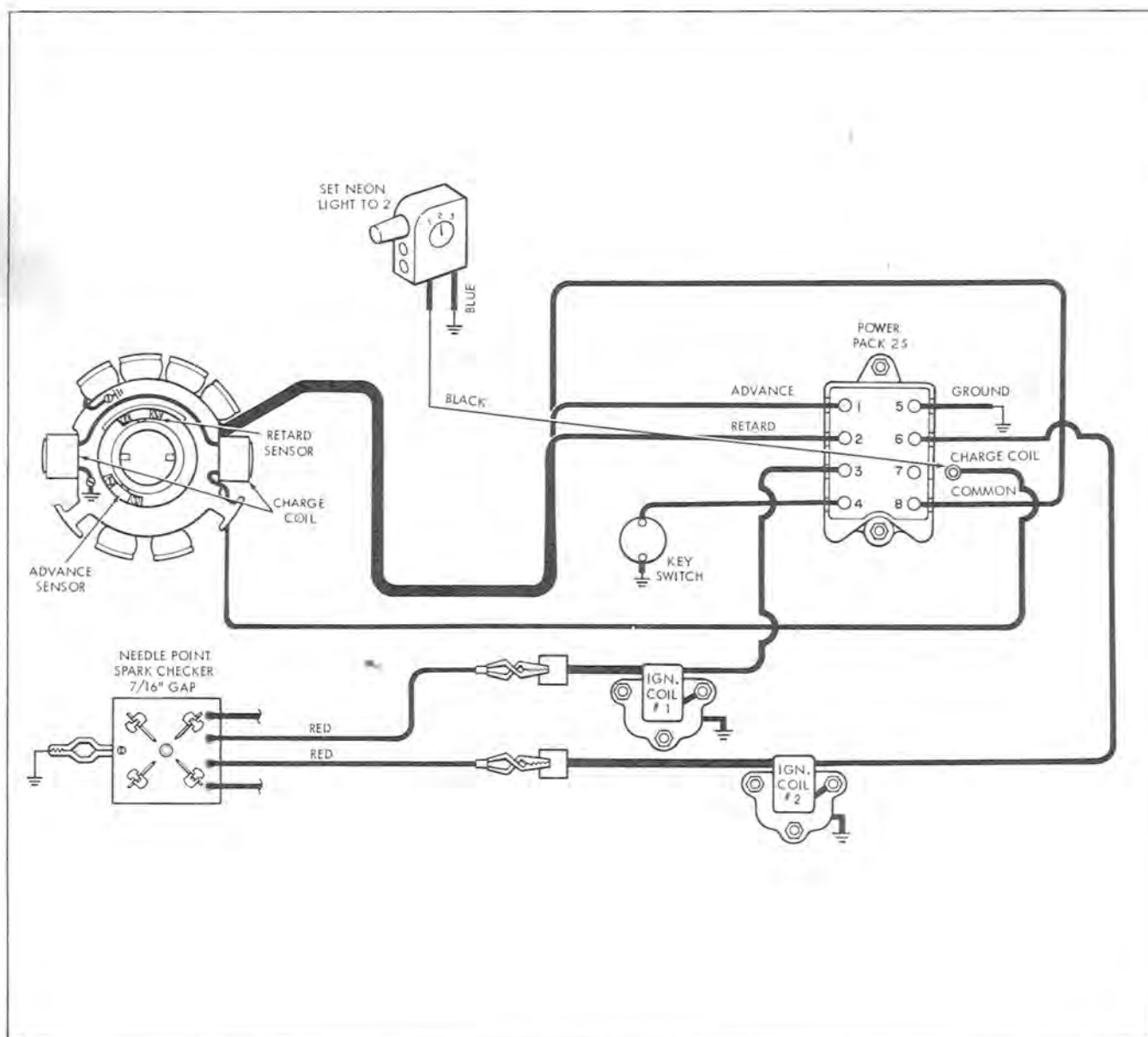


Figure 7-14

TEST #5 RETARD SENSOR COIL INPUT CHECK

- A. Remove retard sensor, white/green stripe lead; advance sensor, white/black stripe lead; and black/white stripe lead from Power Pack terminals #1, #2 and #8. (Do not allow leads to touch ground.) See Figure 7-15.



NOTE

Test voltage output of S80 or M80, Battery output must be above one volt.

- B. Connect neon tester S80 or M80 black lead to Power Pack terminal #2 and blue lead to sensor common (terminal #8). Set rotary switch to position #3.
- C. Crank engine with electric starter or manual starter (with ignition and safety stop switch in "RUN" position) and at same time rapidly tap neon tester load button "B." Observe spark. Reverse leads and repeat step C.
1. If there is spark across gaps, retard sensor is defective. Verify by test #7.
 2. If there is no spark on one coil or both coils, Power Pack is defective.
- D. Reconnect sensor leads #1, #2 and #8 on Power Pack.

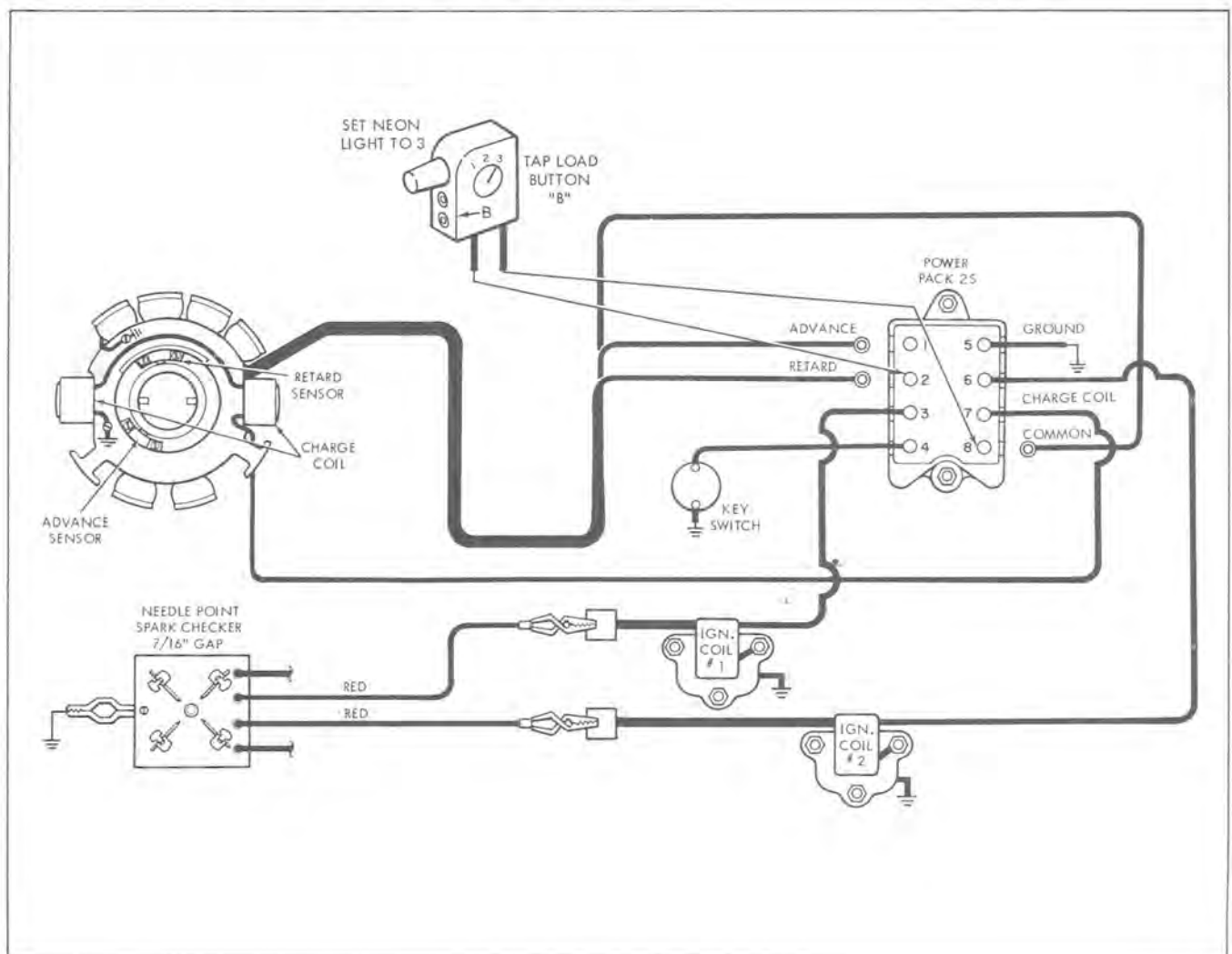


Figure 7-15



NOTE

S80 OR M80 INTERNAL BATTERY TEST

1. Set rotary switch to position #3.
2. Use a voltmeter.
3. Connect positive lead of voltmeter to black lead of S80 or M80.
4. Connect negative lead of voltmeter to blue lead of S80 or M80.
5. Depress load button "B" on S80 or M80 output must be above one volt.

TEST #5A ADVANCE & RETARD SENSOR TIMING CHECK

RETARD

- A. Connect spark checker. Remove spark plugs for easier cranking.
- B. Connect timing light to 12 volt battery.
- C. Connect timing light pick up to #1 cylinder high tension lead.
- D. Crank engine with manual starter (with ignition and safety stop switch in "RUN" position).
- E. Timing mark on flywheel should align with retard mark on the fan housing. If no timing mark on flywheel can be seen and timing light is flashing, check timing light pick up to be sure it's on cylinder #1 high tension lead.
- F. If timing marks don't align check for bad retard sensor or power pack or wires to the wrong terminals of the power pack.

ADVANCE

- A. Connect high tension leads to spark plugs.
- B. Connect timing light to #1 cylinder.
- C. Start engine.
- D. Timing mark on flywheel should align with advanced mark on the fan housing. If no timing mark on flywheel can be seen and timing light is flashing, check timing light pick up to be sure it's on cylinder #1 high tension lead.
- E. If timing marks don't align check for bad advance sensor or power pack or wire to the wrong terminals of the power pack.

An engine that will start and idle, but dies out when accelerating, and with timing light connected will show the retard timing mark and not the advance timing mark on fan housing, has a bad advance sensor or bad Power Pack.

TEST #6 ADVANCE SENSOR COIL RESISTANCE CHECK

- A. Remove the white/black stripe lead from terminal #1 of the Power Pack 2S, the black/white stripe lead from terminal #8, and the white/green stripe lead from terminal #2. Check for 17 to 19 ohms resistance between leads #1 and #8. If sensor coil resistance does not come within these tolerances, it must be replaced.
- B. Coil or leads must not be shorted to ground. On ohmmeter HI ohms scale, check for a reading of infinity from either coil lead to ground. If there is a leakage to ground, check coil and leads and insulate area of leakage with tape.

An engine that is hard starting, kicks back, and with timing light connected will show advance timing mark on fan housing when cranking, has a defective retard sensor coil.

TEST #7 RETARD SENSOR COIL RESISTANCE CHECK

- A. Remove the white/black stripe lead from terminal #1, the black/white stripe lead from terminal #8 and the white/green stripe lead from terminal #2. Check for 26 to 30 ohms resistance between leads #2 and #8. If retard coil resistance does not come within these tolerances, it must be replaced.
- B. Retard coil or lead must not be shorted to ground. On ohmmeter HI ohms scale, check for a reading of infinity from either coil lead to ground. If there is a leakage to ground, check retard coil and leads and insulate area of leakage with tape.

TEST #8 CHARGE COIL RESISTANCE CHECK

Remove the brown/white stripe lead from Power Pack terminal #7. Check for a total resistance of the two charge coils from lead to ground of 550 to 650 ohms. If resistance of the charge coils does not come within these tolerances, they must be replaced.

TEST #9 IGNITION COIL CONTINUITY, POWER AND INSULATION CHECKS

To determine accurately the condition of the ignition coil, an ignition analyzer should be used. Without the use of test equipment, coils may be replaced needlessly. A wide variety of ignition analyzers are available from various manufacturers. The use of the Graham, Merc-O-Tronic, or Stevens ignition analyzers, and their adapter for C.D. ignition are particularly recommended.

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.

The following values are provided for checking the ignition coils.

Graham Tester Model 51

Maximum Secondary	1900 $\pm$ 190 ohms
Maximum Primary	Resistance test too low for reading on recommended test equipment
Coil Index	60
Minimum Coil Test	9
Gap Index	50

Merc-O-Tronic

Operating Amperage	1.4
Secondary Continuity	22 to 26 (index number)

Stevens Tester Model MA75

Switch A Index Adjustment 20

**SAFETY WARNING**

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.

**NOTE**

Zero meter before performing the continuity test.

A. CONTINUITY TEST (using MERC-O-TRONIC TESTER)

Remove ignition coils. Connect meter leads to coil primary and secondary leads and turn meter selector switch to "Coil Continuity." See Figure 7-16. Index reading should be between 22 and 26.

B. POWER TEST (using MERC-O-TRONIC TESTER)

Connect meter leads to adapter, adapter red lead to coil ground lead, adapter black lead to coil primary. See Figure 7-17. Connect coil high tension lead to meter output lead. Turn meter selector to "Coil Power Test" and apply power to coil. Secondary voltage should produce a steady spark at meter spark gap at 1.4 amps (black figures on number 1 scale). Check insulation by probing the coil and entire secondary lead with the grounded test probe. See Figure 7-18. Arcing will be apparent wherever the insulation has broken down, due to moisture or carbon trails. Refer to manufacturers specifications.



Figure 7-16

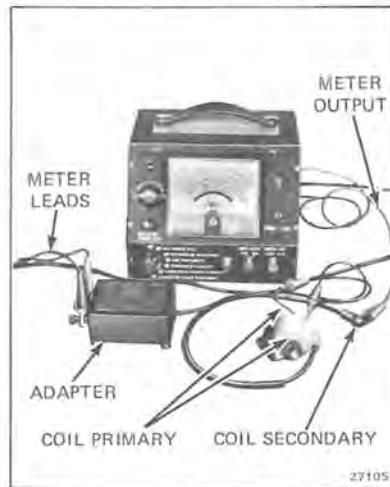


Figure 7-17

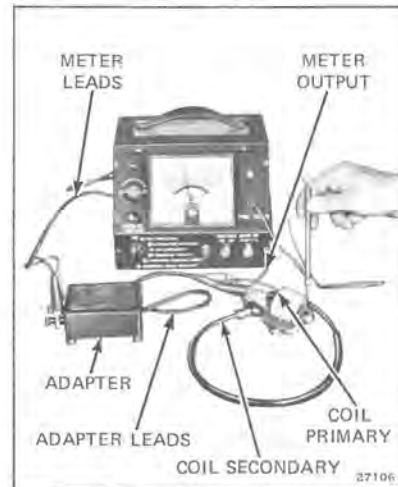


Figure 7-18

 NOTE

1. Do not permit test probe to linger too long at any point while conducting this test.
2. Complete test as rapidly as possible, as this is a severe test on a coil.

TEST #10 KILOVOLT CHECK (using MERC-O-TRONIC KILOVOLT METER MODEL 172)

- A. Remove spark plug.
- B. Connect high voltage probe to spark plug high tension lead and meter ground lead to a good engine ground. Set switch to -60 scale.
- C. Pull starter vigorously with ignition and safety stop switches in the run position. Observe meter reading.
- D. Reading should be 18 kilovolts (minimum) using manual starter.
- E. If the reading on the kilovolt meter is 18 kilovolts or above, the ignition system is functioning properly.
- F. If reading is lower than 18 kilovolts, trouble shoot the ignition system components.

LIGHTING SYSTEM**TROUBLE SHOOTING**

When a lighting failure occurs, first check the bulbs, then the electrical connections throughout the circuit before proceeding with electrical testing. A visual inspection may be all that is required to locate the trouble. Refer to wiring diagram at end of manual.

- a. 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.
- b. Connections. 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 lighting system is the cause of the trouble.

LIGHTING COILS

The lighting coils are replaceable along with the charge coils as an assembly. The lighting coils can be checked for their correct resistance without removal of the flywheel as shown in the following test.

LIGHTING COIL RESISTANCE TEST

- A. Remove terminal block cover.
- B. Set ohmmeter, low ohms scale.
- C. Meter red lead to terminal block terminal #8 (yellow wire) with the ignition switch in the "off" position. Meter black lead to engine ground. Resistance reading $1.3 \pm .3$ ohms.
- D. Remove green wire from terminal #2 and the green/white stripe wire from terminal #1 of terminal block.
- E. Connect ohmmeter leads to wires removed.
- F. Set ohmmeter to low ohm scale. Resistance reading 4.25 ± 1.0 ohms.
- G. Set ohmmeter to high ohm scale.
- H. Connect meter red lead to green wire from terminal #2 of terminal block.
- I. Connect meter black lead to engine ground.
- J. An infinite reading on high ohms scale indicates the windings are good.
- K. Repeat steps G, H, and I on green/white stripe wire removed from terminal #1.

DIMMER SWITCH TEST

- A. Remove dimmer switch wires from terminal block, terminals #3 (dark blue) #4 (light blue) #5 (red).
- B. Set ohmmeter, to HI ohms scale.
- C. Connect meter red lead to dimmer switch red wire.
- D. Connect meter black lead to dimmer switch light blue wire.
- E. Depress button - no continuity.
- F. Depress button (low beam position) second time - full continuity.
- G. Repeat test on dark blue wire.
- H. Depress button (high beam position) - full continuity.
- I. Depress button second time - no continuity.
- J. Reconnect dimmer switch wires.
- K. Disconnect headlamp connector.



Figure 7-19

- L. Turn ignition switch to off position.
- M. Set ohmmeter, to HI ohms scale.
- N. Connect meter black lead to black wire on connector.
- O. Connect meter red lead to light blue wire on connector.
- P. Follow steps E and F above.
- Q. Repeat test on dark blue wire.
- R. Follow steps H and I above.
- S. With ignition switch in "OFF" position, repeat test at headlamp connector. If test proves faulty disconnect red wire from terminal #5 leading to taillamp.
- T. Set ohmmeter HI ohms scale. Black lead to engine ground meter red lead to red taillamp lead - full continuity.
- U. No continuity - check for loose ground wires, or blown taillamp bulb.

BRAKELAMP SWITCH TEST

- A. Pull connectors apart (near brake switch). See Figure 7-19.
- B. Connect continuity meter to each of the terminals.
- C. Pull up on switch plunger - full continuity.
- D. Release plunger - no continuity.

NOTE

If brake or brake lamp switch is not properly adjusted brake switch will not function properly.

HEADLAMP TEST

- A. Disconnect headlamp connector.
- B. Set ohmmeter HI ohms scale.
- C. Check for continuity across headlamp terminals.

IGNITION TIMING

Ignition timing is fixed. Check timing as described in test 5A. If timing is OK, check for a sheared flywheel key by removing #1 spark plug and find T.D.C. of the piston. The timing mark on the flywheel should be adjacent to the advance mark on the fan housing.

SPARK PLUGS

The only spark plugs approved for use in your engine are the Champion UL-77V (Figure 7-20). To remove spark plugs for inspection, pull off rubber covered spark plug terminal with a slight counterclockwise twist. Remove spark plugs.

NOTE

Care should be taken to avoid over torquing the spark plugs when the engine is hot. Spark plugs installed in a hot engine at the torque figure below may be very difficult to remove when cold.

If center electrode is worn to a point or below insulator surface, or plug is badly carboned it must be replaced. Recommended torque is (18 - 20 ft. lbs. cold). Do not exceed 20 ft. lbs.



Figure 7-20

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.

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. Clean and inspect spark plug hole threads.

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 (ELECTRIC START KIT EQUIPPED MACHINES ONLY)

DESCRIPTION

The battery's only function is to provide power to operate the starting motor. 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 is recommended and is manufactured for snow vehicle use. Anchored elements reduce the possibility of vibration damage. This battery is manifold vented. It does not have vented cell caps, and vented caps should not be used on this battery. A vent tube from the battery manifold exits through the snowmobile chassis. The dangerously explosive hydrogen gases generated when charging or jump-

ing a battery are therefore vented a safe distance from the hazard of spark at the battery terminals. Check vent tube periodically to make sure that it is not pinched, clogged, or ruptured. The battery is shipped dry. It is activated with dry charge electrolyte available locally. Replacement battery is Prestolite Part No. 2920 in Canada and 9955X in the USA.

REMOVAL AND INSTALLATION

Filler caps must be tight and plastic tube outlet extended below battery for manifold system to function correctly. See Figure 7-21.

Prior to removing battery from compartment, disconnect vent tube. Pull tube straight down to remove it from the battery. Reconnect vent tube when battery is replaced in vehicle. Push tube straight up into battery until seated.



SAFETY WARNING

Battery Electrolyte is a strong acid solution and should be handled with care. If Electrolyte is spilled or splashed on any part of the body, **IMMEDIATELY** flush the exposed area with liberal amounts of water and obtain medical aid as soon as possible.

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.



NOTE

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 7-21.

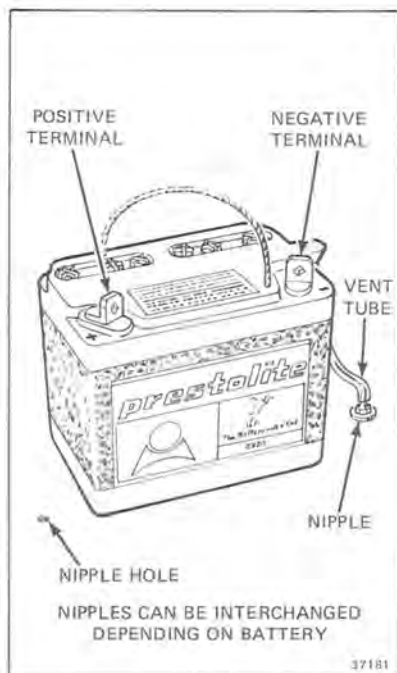


Figure 7-21

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 7-22). 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.

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.

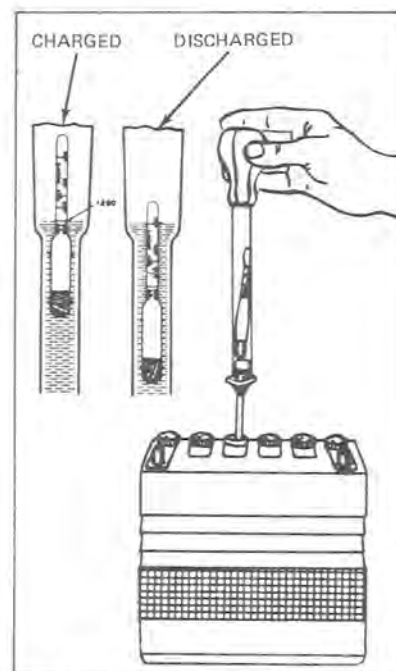


Figure 7-22

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 electrolyte 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



SAFETY WARNING

Gases given off by a battery being charged or jumped are highly explosive. Keep battery in a ventilated area and away from cigarettes and open flames when charging or jumping. Turn off battery charger before removing cables from battery. Remove cables from good battery first, when jumping.

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.



NOTE

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

SLOW CHARGING

Battery is kept charged by alternator coils located beneath flywheel. It may be necessary to use a separate 12 volt battery charger occa-



Figure 7-23

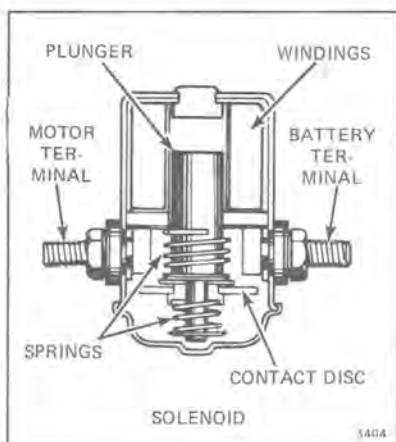


Figure 7-24

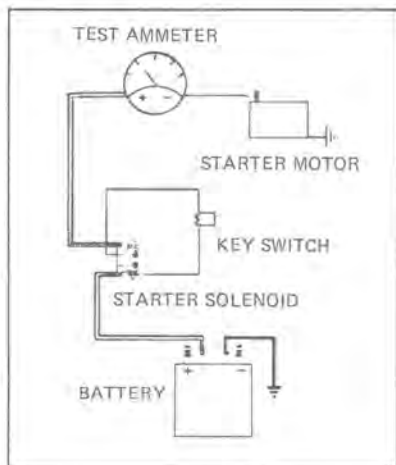


Figure 7-25

sionally to keep battery charged during long storage periods, or in extreme cold weather if engine is started repeatedly. Battery should be removed from compartment for charging and initial filling. Prior to removing battery from compartment, disconnect vent tube. Pull tube straight down to remove it from the battery. Reconnect vent tube when battery is replaced in vehicle. Push tube straight up into battery until it is seated. Adjust electrolyte to proper level by adding water, then charge battery at a maximum rate of 4 amperes until fully charged. Leave caps on battery while charging. Battery is fully charged when hydrometer scale shows a corrected reading of 1.260 and does not change after three hourly readings. Cells will gas freely when fully charged.

PRESTOLITE BATTERY WARRANTY

Warranty on Prestolite batteries used in this snowmobile is covered directly by Prestolite, through their authorized battery service stations, for a period of 18 months in the United States and 9 months in Canada. 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) in the U.S. and (6 months) in Canada will be replaced on a pro rata basis.

In Canada Prestolite warranty should be handled through the dealer from whom the snowmobile was purchased or through a Prestolite battery depot.

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 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 pro rata basis.

STARTER SYSTEM

DESCRIPTION (See Figure 7-23)

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 pinion gear. 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 7-24) 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.

MAINTENANCE

The outside of the starter motor and drive should be cleaned periodically. Every 50 hours of operation, the helix should be cleaned and lubricated with Lubriplate 777 on both sides of the drive gear. 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.

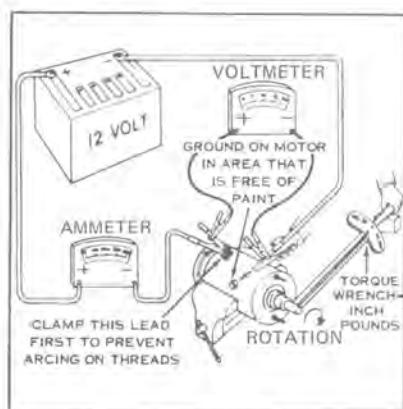


Figure 7-29

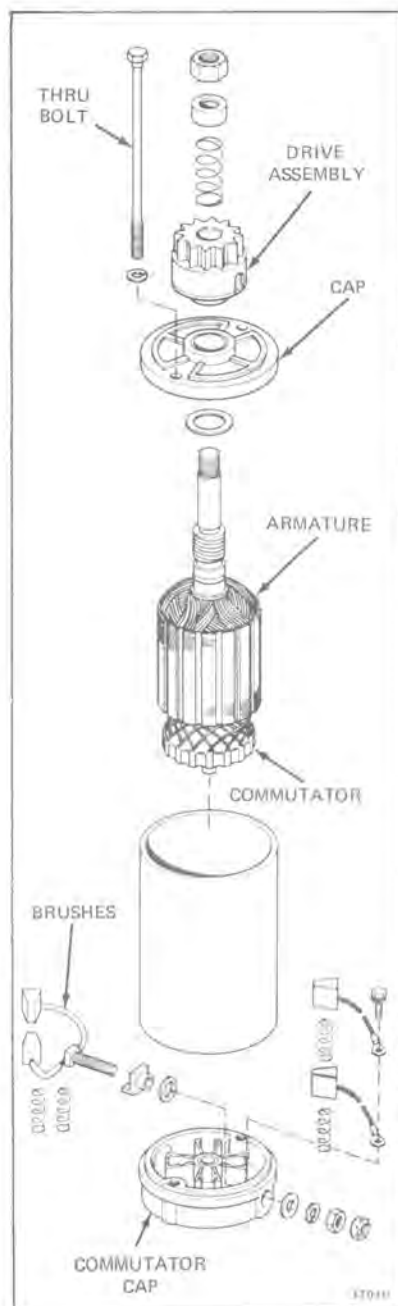


Figure 7-30

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.

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 12-volt source (see Figure 7-28). Use a tachometer or rpm indicator to indicate armature speed.
- b. Ammeter should indicate 32 amperes maximum; rpm indicator should indicate 5,750 to 8,000 RPM. 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 7-29), 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 4.0 ft. lbs. and current should be a maximum of 512 amperes.

NOTE

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.

INSPECTION OF STARTER MOTOR (See Figure 7-30)

- a. Check armature on a growler for shorted turns. 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. Rotate one lead of continuity tester (test light or meter) around circumference of commutator while holding other continuity meter leads 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.
- 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 and should extend beyond the brush contact area for the full length of each insulated groove (see Figure 7-31).
- 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 7-31

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.

HEADLAMP ADJUSTMENT

Headlamp is adjustable for elevation of beam and right or left throw of beam.

For elevation, turn top screws in or out equally. With high beam on, adjust elevation of beam so that center of high intensity zone is 2 inches below center of lamp at a distance of 25 ft. from headlamp. See Figure 7-32.

For right or left throw of beam, adjust outer screws until proper aim is obtained.

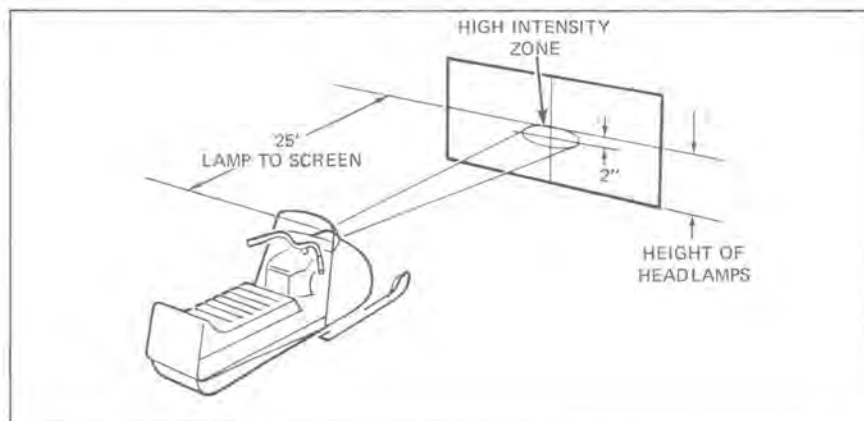


Figure 7-32

SECTION 8

MANUAL STARTER

DESCRIPTION

The manual starter converts straight line motion to rotary motion necessary to crank the engine. Pinion gear on the starter engages the ring on the flywheel. When the engine starts, centrifugal forces moves the pinion gear back into starter. A recoil spring is wound as the rope is pulled and unwinds as the starter handle is returned to the starter housing.

NOTE

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

REMOVAL AND DISASSEMBLY

SAFETY WARNING

It is good practice to wear safety glasses while disassembling and reassembling manual starters because of the rewind spring.

- a. Remove starter handle and tie knot in rope.
- b. Remove two bolts securing manual starter to blower housing using speed handle long extensions and 1/2" universal socket.
- c. Remove two bolts securing starter housings.
- d. Pull two housings apart and remove rope.

NOTE

The starter rope can be replaced at this point without disconnecting the rewind spring.

- e. Remove pinion return spring from pinion. Remove friction clip.
- f. Remove starter main spring by placing starter assembly in a vice and pull spring all the way out of the housing.
- g. Remove snap ring from shaft and remove pulley from casting. See Figure 8-1.

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 pinion gear for excessive wear.
- d. Inspect bushings.

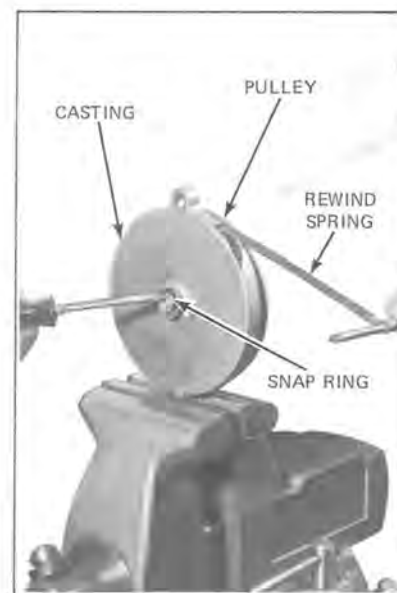


Figure 8-1



Figure 8-2



Figure 8-3

- e. Inspect rope and discard if frayed. Replace with starter rope cut length of 73-3/4 inches.
- f. Examine pulley and housing rope eye for sharp edges and rough surfaces that might cause rope fraying. File and polish as necessary.

REASSEMBLY

- a. Place end of rewind spring in pulley.
- b. Place pulley in housing and attach snap ring.
- c. Wind starter spring to the end of the housing.

NOTE

Wind spring solid and then let the spring relax and install it in the housing.

- d. Wind starter rope clockwise toward pulley so that the rope comes off the top of the pulley. See Figure 8-2.
- e. Install return spring on pinion. Install friction clip. Lubricate friction clip with small amount of Lubriplate 907.
- f. Align friction clip with detent in outer casting. Tie a knot approximately 10" to 12" from the end of the rope.
- g. Align two starter housing bolt holes. (Approximately 2 to 2-1/2 turns preload).
- h. Align notch with spring ends and bolt starter assembly. See Figure 8-3. Reinstall rope guide pulley with snap ring.
- i. Assemble starter to vehicle in reverse order of disassembly.

SECTION 9

ENGINE

DESCRIPTION

The snow machine is driven by a two-cycle, alternate firing air-cooled engine. This section gives instructions for removal and overhaul of the engine. Principles of two-cycle engine operation are discussed in Section 3. Troubleshooting procedures are given in Section 4.

REMOVAL

- a. Before removing hood, remove connector from headlamp.
- b. Remove headlamp wiring from clamps.
- c. Loosen hood hinge bolt nuts.
- d. Remove hood restraint cable from top of engine.
- e. Remove hood.
- f. Remove belt guard.
- g. Remove manual starter handle and tie knot in rope.
- h. Remove throttle cable using the following procedure: Depress thumb throttle lever. Hold throttle in open position. Slip end of throttle cable through nylon pivot pin. Remove jam nut from carburetor bracket and pull out throttle cable.
- i. Loosen screw, choke cable to choke shaft linkage.
- j. Loosen nut, choke cable to clamp.
- k. Remove choke cable from carburetor.
- l. Remove fuel hoses from engine.

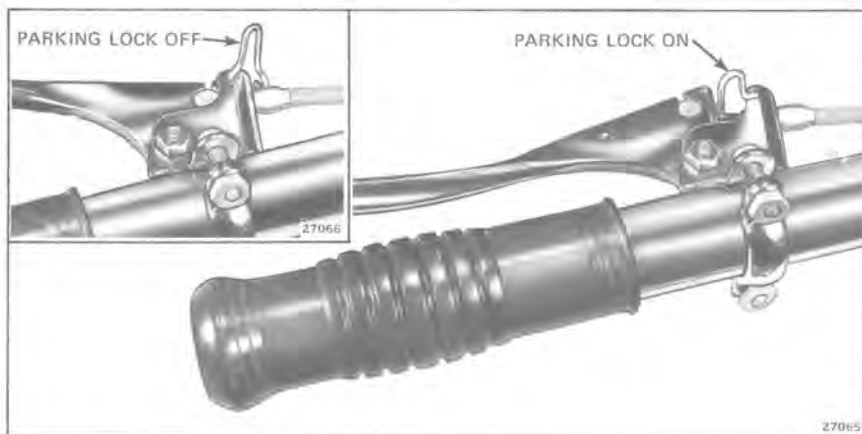


Figure 9-1

**SAFETY WARNING**

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

- m. Disconnect engine electrical wiring at terminal block.
- n. Apply brake and lock. See Figure 9-1.
- o. Spread secondary sliding sheave and remove drive belt.
- p. Remove 3 bolts, engine to chassis.
- q. Engine can now be removed from vehicle.
- r. Remove 2 muffler springs, and 2 manifold springs and remove muffler.

DISASSEMBLY

- a. Before disassembly, clean outside of engine to prevent dirt from getting on internal parts of engine and remove high tension leads from spark plugs.
- b. Remove five screws engine air shields to exhaust air outlet housing. See Figure 9-2.
- c. Remove four screws fan housing to air intake housing.
- d. Remove manual starter and install flywheel holding tool part no. 114594. See Figure 9-3.

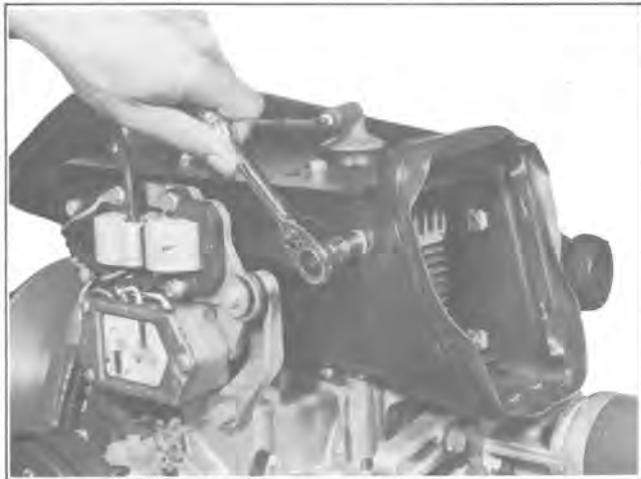


Figure 9-2

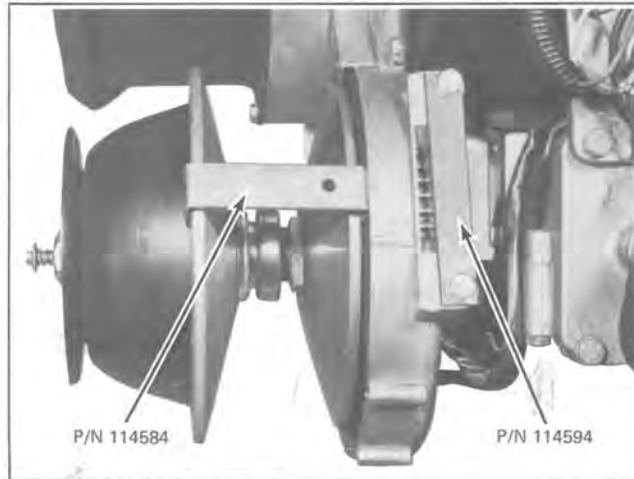


Figure 9-3

- e. Install primary drive clamp part no. 114584 over movable pulley and in belt groove of the flywheel.
- f. Remove primary lock plate and end cap bolt.
- g. Remove end cap assembly and activating spring.

**NOTE**

Activating spring with 49.5 turns (silver colored connector block) used on 400 and 440 models. Activating spring with 54.5 turns (green colored connector block) used on 650 model.

- h. Release primary drive clamp and remove sliding sheave, primary spring, spring cap, spacer and idler bearing. Primary drive is spring loaded.



NOTE

The position of spacer (Lip fits outward and into the spring cup. If spacer is not installed the drive belt will hit the fan housing.)

- i. Remove three screws attaching the fan and remove fan.
- j. Remove three bolts attaching outer fan guard housing to fan housing assembly.



NOTE

The two long bolts fit on the outside of the fan guard housing and the short bolt is located inside the housing.



NOTE

Fan guard housing has an extra hole for removing electric starter motor when engine is so equipped.

- k. Use a 15/16" open end wrench and 3/8" open end wrench to loosen the lock nut retaining the eccentric and shaft. Turn eccentric to its lowest position and remove fan belt from pulley. Be careful not to bend the belt sharply, as this can damage the cord.
- l. Remove flywheel nut (make sure flywheel holding tool is in place) and remove flywheel using the following special service tools. See Figure 9-4.

1 - 114595 Flywheel Wrench
 1 - 378103 Puller
 1 - 318501 Center Guide
 3 - 318502 Puller Screws
 Remove flywheel restraint.

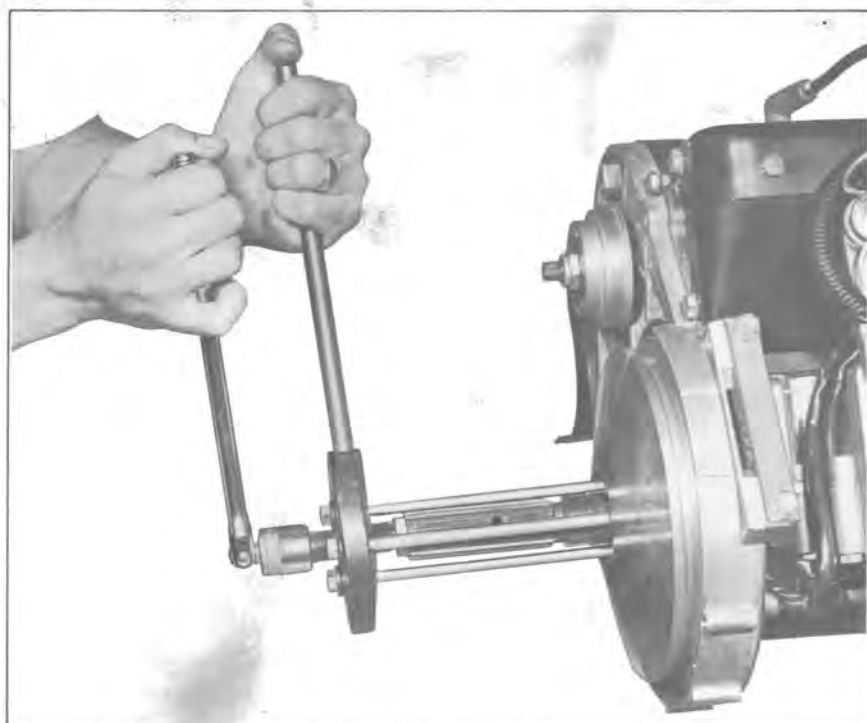


Figure 9-4



Figure 9-5



Figure 9-6



Figure 9-7

- m. Turn engine on work bench so carburetor is facing you.
- n. Remove two bolts holding ignition panel bracket to manifold and lay ignition panel to one side.
- o. Remove remaining manifold bolts, carburetor, manifold assembly and reed block assembly.
- p. Remove three screws attaching top cooling shield to cylinder heads and fan housing.
- q. Remove four bolts stator and charge coil assembly. See Figure 9-6.
- r. Pull stator and charge coil back.
- s. Remove three fan housing bolts. See Figure 9-7.
- t. Remove fan housing and ignition assembly from crankcase and slide it off the crankshaft.
- u. Remove exhaust manifold, screws on exhaust side cooling shield and slide shield over exhaust manifold studs. See Figure 9-5.
- v. After removing top and front cooling shields, remove screws holding rear cooling shield to cylinder heads.
- w. Remove cylinder heads.

 NOTE

Mark cylinder heads and cylinder so they are kept matched. Place engine upside-down on work bench. See Figure 9-8.

- x. Remove three bolts attaching engine mounting frame to crankcase and remove engine.

 NOTE

The two long engine frame bolts are placed front and center. The one short bolt is at the rear of engine frame.

- y. Remove six rubber dampeners on either end of mounts.
- z. Remove crankcase end cap and o-ring seal from crankcase.
- aa. Remove three crankcase bolts retaining engine mounts and mount retainers.
- ab. Remove three rubber engine mounts from crankcase.

 NOTE

Two softer mounts are color coded black and are at the center and rear positions. One green rubber mount fits flywheel side of crankcase.

- ac. Drive out tapered pin used to align upper and lower crankcase halves with a steel hammer and punch.
- ad. Remove four screws holding end-cap.
- ae. Remove eight 5/16" bolts holding crankcase halves together.
- af. Remove six 3/8" crankcase bolts from crankcase assembly.
- ag. Pry apart crankcase halves at mounting areas of crankcase to separate upper and lower crankcase halves. At this time, crankshaft, bearings, and connecting rod will be exposed.

- ah. Using 5/16", 12 point socket, remove connecting rod screws on each rod. See Figure 9-9.



NOTE

There are sixteen rollers used at each rod bearing.



NOTE

Pistons, connecting rods, and caps are matched parts and seat with the operation of the engine. Because of this, it is essential to maintain their original positions at reassembly. Mark each connecting rod and cap, piston, and bearing component to assure correct mating during reassembly. Also mark the cylinders and crankcase halves from which they are removed. See Figure 9-9.

- ai. Lift crankshaft from crankcase. Reinstall matched caps on connecting rods.
- aj. Remove piston and rod assemblies from both cylinders by pushing them upward towards the cylinder heads, freeing them from the cylinder and crankcase.
- ak. Remove eight nuts and washers that secure cylinders to crankcase.
- al. Remove upper crankcase half from both cylinders. A slight tap with a plastic hammer or mallet may be needed for this removal.
- am. If it is necessary to remove pistons from connecting rods, pry out retaining locks from the pocket at the lower end of the pistons using a screwdriver. See Figure 9-10. Press out wrist pins to free piston from connecting rods. Wrist pins are a loose fit in piston which allows wrist pins to be pressed out of the piston quite easily.
- an. Remove wrist pins.
- ao. Remove piston rings.

Remove the bearing and seal assembly from the power take-off end of the crankshaft by sliding it off of the shaft and splines. To remove the center main bearing, it will be necessary to remove the retaining ring. The center main bearing will split in half, allowing you to remove the shell and roller cages from the crankshaft. Now remove the retaining ring.

The ball type thrust bearing can be removed by first removing the snap ring and then with the use of a press, press the bearing from the crankshaft assembly. See Figure 9-11.

At this time the engine is now completely disassembled. Inspect all internal parts of the engine for wear or damage.

ASSEMBLY

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



NOTE

Use new gaskets and seals throughout when reassembling the engine. Apply OMC Gasket Sealing Compound #317201 to both sides of cylinder base gasket before assembly.



Figure 9-8

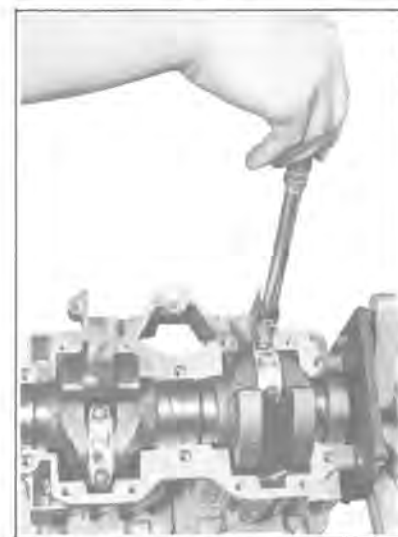


Figure 9-9

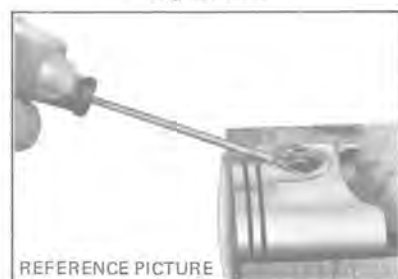


Figure 9-10

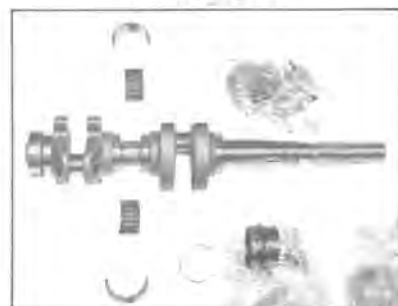


Figure 9-11

- a. Assemble the main crankshaft bearing by installing the two cages and shells and securing with the retaining ring.

NOTE

The center main bearing outer shell should be installed with the alignment hole farthest away from the power take-off side of the crankshaft.

- b. Attach connecting rods to pistons by installing wrist pins. The wrist pins are a slip fit into the pistons and can be installed quite easily.
- c. Install wrist pin retainers using (OMC Special Tools Part No. 317829 wrist pin driver and Part No. 319924 wrist pin cone). See Figure 9-12.
- d. 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. Be sure that the rings fit freely in the piston ring grooves.
- e. Be sure that piston rings are correctly positioned in piston ring grooves. Be sure dowel pins on piston are centered between ring gaps.
- f. Install upper crankcase half and gaskets to both cylinders, making sure intake passage of crankcase is on opposite side of exhaust ports of cylinders.

With the use of a straight edge, align both exhaust ports so that each cylinder is square to the other. This step is very important, if the cylinders are not square, damage to the cylinders from warpage could create a failure. See Figure 9-13.



Figure 9-12

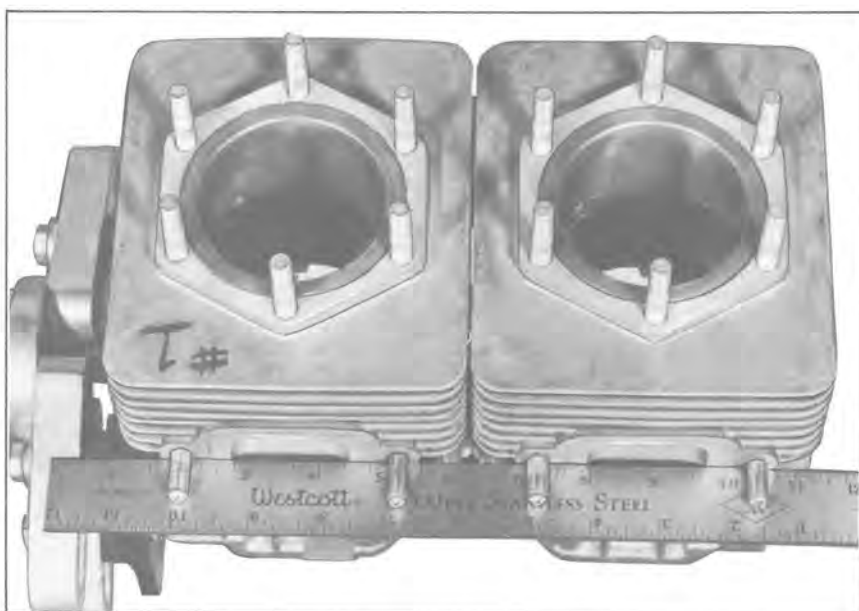


Figure 9-13

- g. Torque cylinder to crankcase nuts 18 to 20 ft. lbs.
- h. Coat pistons and cylinder bores with oil and install piston and connecting rod assemblies.

With the use of the appropriate OMC Ring Compressor, install the pistons into the cylinders. Be sure upon reassembly to get the correct piston into the correct cylinder, following your identification procedure during disassembly. Also, note that the dot on the dome of the piston should sit toward the exhaust port. See Figure 9-14.

- i. Install the cylinder head gaskets and cylinder heads, making sure that you follow the correct identification when marked from disassembly. Head gaskets are oriented with tab toward exhaust side.

With the cylinder head nuts and lock washers in place, torque the cylinder head nuts to 145 to 150 inch pounds in the pattern as shown in Figure 9-15.

With the use of the top air shield, check to make sure that the cylinder nut extensions are in their correct position on the cylinder studs.

- j. Apply OMC Needle Bearing Grease, Part Number 378642 to the connecting rod surfaces.

Install one half of the roller bearing cage to each of the connecting rods and install seven (7) roller bearings in each connecting rod. See Figure 9-16.

- k. Install the crankshaft to the crankcase, making sure that the dowel pins in the crankcase align with the alignment hole in the center and power take-off bearings.

- l. Lift each connecting rod up to the crankshaft throw, making sure not to force or cause a bind between the connecting rod and the crankshaft throw.

Once the connecting rod has made contact with the crankshaft throw, install the other half of the bearing cage and the remainder of the needle bearings. Note: 16 rollers in each rod.

Install the connecting rod cap and screws, making sure the two dots are on the same side. Leave the connecting rod cap screws finger tight at this time.

- m. Once both the connecting rod caps and screws are in place, align the connecting rod caps to match with the connecting rod and check for proper alignment by drawing a pencil over the chamfered corners on both sides of the rod. If not aligned properly, the chamfered corners can be felt with the pencil point. Misalignment will affect free normal action of the rollers and can result in major damage. See Figure 9-14.

After the caps and connecting rods are properly aligned, check to see that the rods float on the crankpin. Then torque the connecting rod cap screws to 29 to 31 foot pounds.

- n. With a steel hammer and punch, lightly seat the crankshaft roller bearing to the crankcase. See Figure 9-17.

- o. Apply a thin line of OMC adhesive M (OMC Part No. 318535) to the crankcase face. Do not over cement and allow the sealer to get into the oil holes or bearings. After the sealer is applied, be ready to assemble the crankcase lower half to the upper half. Work as quickly as possible so the adhesive will not harden before the crankcase halves are applied.

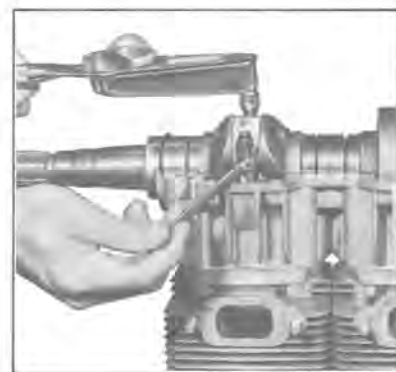


Figure 9-14

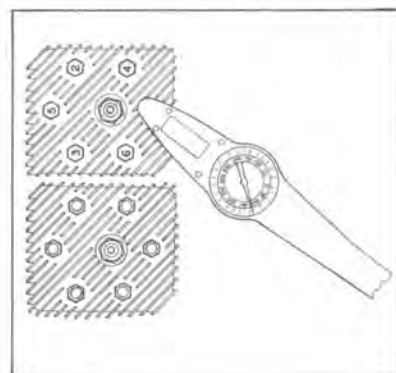


Figure 9-15

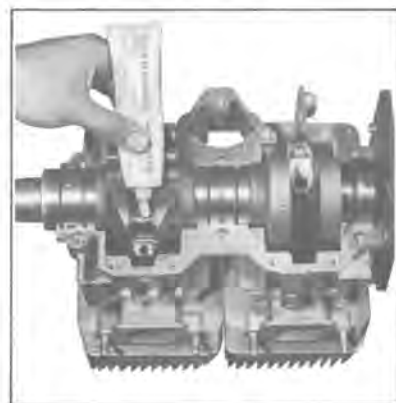


Figure 9-16



Figure 9-17

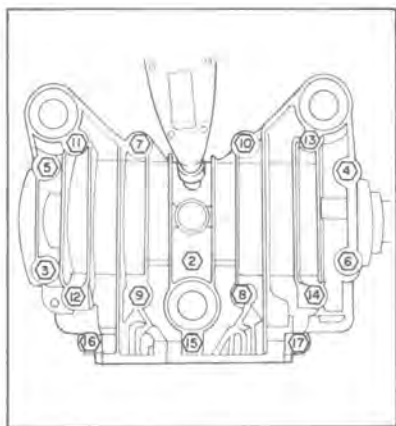


Figure 9-18



Figure 9-19



Figure 9-20

- p. Place the lower crankcase on the upper crankcase and install the dowel pin with a punch and steel hammer.

Now install all of the crankcase bolts finger tight.

- q. With the torque sequence as shown, torque bolts one through six, 220 to 240 inch pounds. See Figure 9-18.

Next, torque bolts seven through seventeen, 120 to 140 inch pounds. See Figure 9-18.

- r. Install the crankcase end cap and o-ring. Before installing, be sure that the o-ring is lubricated with OMC 2 Cycle Oil. Attach one end of ground wire under lower right hand bolt of cap.

- s. Remove the three (3) 5/16" crankcase bolts and install the mounts and retainers. Remember the green colored mount should be placed in position closest to the power take-off or flywheel side of the crankcase.

Torque the crankcase bolts for the mount retainers to 120 to 140 inch pounds.

- t. Install the rubber dampeners and frame spacers.

- u. Install the power frame and power frame bolts. The short bolt is the one that fits closest to the crankcase end cap and has the ground wire attached between the nut and washer.

- v. Install the three (3) rubber dampeners, washers, and nuts on the top side and torque the nut and bolt to 220 to 240 inch pounds.

- w. Install the spark plugs and torque to 18 to 20 foot pounds.

- x. Before installing the fan housing, check to see that the sensors are against the stops in the timer base plate. See Figure 9-19.

Slide the fan housing into position over the crankshaft and crankcase neck.

- y. Install the three (3) bolts securing the fan housing to the crankcase.

- z. Mount the stator with the four (4) attaching screws. Pull wiring harness tight to prevent flywheel from hitting loose wires.

NOTE

1. Apply (OMC Screw Lock Part No. 384848 in U.S.A. or OMC Lock 'N Seal Part No. 406225 in Canada) to sensor and shield mounting screws.
2. Apply (OMC Nut Lock Part No. 384849 in U.S.A. or OMC Lock 'N Seal Part No. 406225 in Canada) to stator, charge coil assembly and sensor mounting plate to fan housing.
3. Apply GE-RTV 102 to stator and charge coil leads. See Figure 9-20.
4. Apply OMC Adhesive Part No. 318535 to retard sensor to shield nuts (only necessary if sensor removed from shield).
- aa. Attach the exhaust gaskets, exhaust side shield, and exhaust manifold over the exhaust manifold studs and tighten the nuts and lock washers.
- ab. Place the reed block assembly into the crankcase. Note the positioning of the reed plate, as the reed plate and gaskets only fit one way.
- ac. Attach the fuel pump, carburetor, and intake manifold and torque the four bolts. Do not install the two (2) upper outside manifold bolts, as these are used for the ignition panel.

- ad. With the two (2) screws, attach the front air shield.
- ae. Install the top air shield and attach the three (3) fine threaded bolts to the top air shield mounting holes and the three (3) coarse threaded bolts to the side of the top and rear air shields and fan housing.

Next install the exhaust air duct and the rest of the quarter/twenty screws for the air shields at the front and the rear.

- af. Install the ignition panel with the two bolts.
- ag. Install the flywheel assembly making sure that the flywheel aligns with the flywheel crankshaft key.

Reinstall the OMC flywheel restraint tool, Part No. 114594, using the starter attaching bolts.

Apply locktite compound 40 to the threads of the flywheel nut.

With the flywheel wrench OMC Special Tool No. 114595, attach to the torque wrench at right angles; torque the flywheel nut 140 to 150 foot pounds torque. See Figure 9-21.

- ah. Install the fan belt over the flywheel and fan eccentric.

With the wrenches on the eccentric nut and eccentric adjusting shaft, adjust the eccentric so there is 1/16 inch deflection at the midpoint between the eccentric and the flywheel. See Figure 9-22.

After this adjustment is obtained, tighten the fan shaft nut, making sure that the eccentric adjusting shaft has not turned.

- ai. Install the outer fan guard with the three (3) screws. Remember the short screw fits at the top and at the inside of the guard housing. The two (2) longer screws fit at the bottom and outside of the fan housing.
- aj. Install the fan assembly to the eccentric and attach with the three (3) fan screws. Torque to specifications in Section 2.
- ak. Install the air intake housing and screen assembly to the fan guard.
- al. Install the primary drive idler bearing and the spacer with the lip fitting outward. Remember this spacer must be installed or the primary drive will hit the air intake housing.

Install the neutral lock out ball into the holes on the spline shaft. A slight amount of grease will help to retain the ball.

Coat the primary drive splines lightly with lubriplate 907, OMC Part No. 114154 and install the spring cup main spring and movable pulley to the primary splines.

- am. Attach primary drive clip, OMC Part No. 114584.
- an. Install the primary end cap over the splines and install the primary main shaft bolt.
- ao. Torque the primary end cap bolt 90 to 100 foot pounds. Note the restraint is still in place and holding the flywheel assembly.
- ap. Install the primary end cap bolt locking plate. If the holes do not line up with the end cap, turn the locking plate end for end.

After the screws holding the lock plate have been tightened, remove the primary drive clip and the flywheel restraint. Refer to PRIMARY DRIVE REASSEMBLY Page 10-3 for additional information.



Figure 9-21



Figure 9-22

- aq. Check to make sure the wire routing will not interfere when the manual starter is assembled.
- ar. Install the manual starter with the two (2) attaching bolts. After the starter is installed, pull the starter and see if it is meshing with the ring gear on the flywheel.
- as. Install the high tension leads to the spark plugs.

INSTALLATION OF ENGINE ASSEMBLY TO CHASSIS

- a. Assemble muffler to exhaust manifold and bracket.
- b. Attach muffler and manifold retaining spring.
- c. Install engine in chassis.
- d. Apply brake and lock.
- e. Spread secondary sliding sheave and install drive belt.
- f. Reconnect engine electrical wiring at terminal block.
- g. Reconnect fuel hoses to engine.
- h. Reconnect choke cable to carburetor.
- i. Insert choke cable assembly through clamp on carburetor and insert cable through choke lever swivel pin. 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 nut on choke cable clamp just enough to hold cable firmly. Work choke knob to check for adjustment or possible binding.
- j. Assemble throttle cable using the following procedure: Depress thumb throttle lever. Hold throttle in open position. Slip end of throttle cable over nylon pivot pin. Install jam nut from carburetor bracket to throttle cable. Adjust throttle cable so that throttle shutter is full open when throttle lever is in contact with handle grip.
- k. Assemble manual starter handle.
- l. Assemble belt guard.
- m. Install hood.
- n. Install hood hinge bolt nuts.
- o. Assemble hood restraint cable to top of engine.
- p. Connect headlamp wiring to clamps.
- q. Install connector to headlamp.

BREAK-IN PERIOD

For the first tank full of fuel, we suggest that you drive your vehicle at reduced speeds. This will allow the internal moving parts to seat themselves, thus greatly prolonging engine life. Treat this vehicle as you would any other piece of precision machinery. Always allow the engine to warm up before driving vehicle. Start out slowly and do not overspeed for load and operating conditions. Give it reasonable and periodic care and it will give you many hours of enjoyment.

SECTION 10 DRIVE TRAIN

DESCRIPTION

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

TRANSMISSION BELT INSPECTION & REPLACEMENT

A belt measuring less than 1-9/16" across the width or outer surface must be replaced with a new one. Worn belt may be retained and used as a spare. A spare belt should be carried at all times.



SAFETY WARNING

KEEP FINGERS FROM BETWEEN HALVES OF SECONDARY SHEAVE WHEN PERFORMING STEP 3. MOVABLE SHEAVE IS SPRING LOADED, AND COULD PINCH FINGERS.

PROCEDURE FOR REMOVING TRANSMISSION BELT

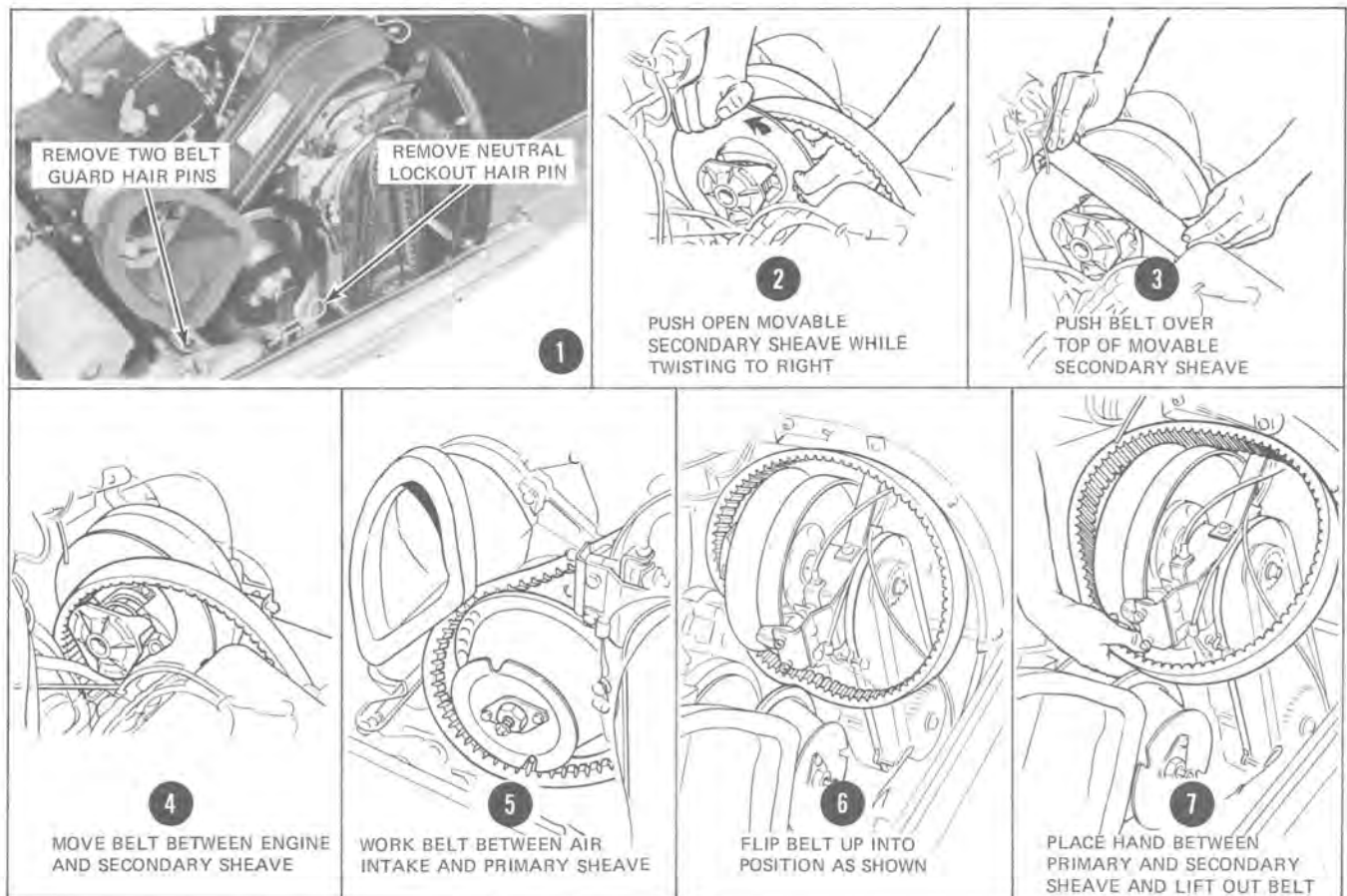


Figure 10-1

PROCEDURE FOR INSTALLING TRANSMISSION BELT

1. Block up rear of vehicle to take weight off track.
2. Reverse steps 7, 6, 5 and 4 as shown in Figure 10-1.
3. Hook belt around bottom of secondary sheave and roll backward. Belt will ride the sheave up and fall in place between the two halves.
4. Replace belt guard and neutral lockout hair pin.

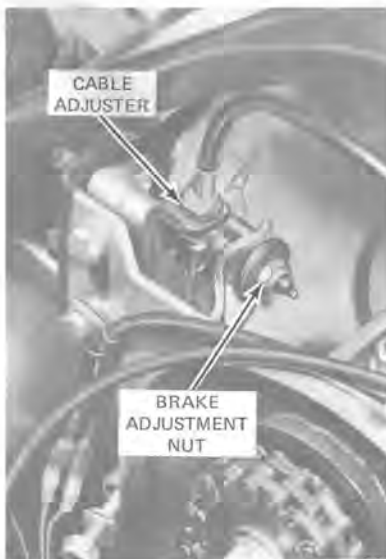


Figure 10-2

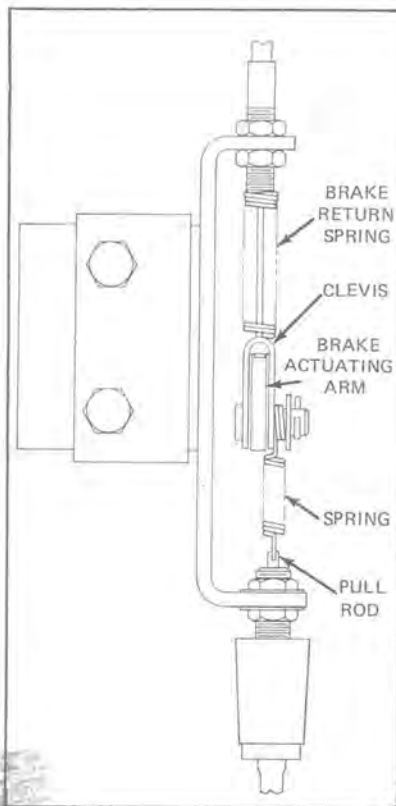


Figure 10-3

BRAKE

DESCRIPTION

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

REMOVAL

- Loosen brake adjustment screw lock nut. See Figure 10-2.
- Screw in adjusting screw full length of thread.
- Loosen cam adjustment nut 3 or 4 turns.
- Compress brake return spring and remove cable from pivot pin.
- Unscrew cable adjusting screw from brake bracket.
- Disconnect brake lamp switch from pivot pin.
- Remove brake bracket assembly from transmission.

REPAIR

- Disassemble brake assembly as required, noting relative positions of components to assure correct reassembly.
- 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.

NOTE

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

BRAKE CABLE AND CAM ASSEMBLY

Reassemble in reverse order of disassembly.

BRAKE ADJUSTMENT

- Tighten the adjustment nut until pins are seated properly at bottom of actuator cam.
- Back off adjustment nut about $1/4$ turn.
- Rotate sheave to see if there is any drag on brake pucks. When brake is released there should be no drag on brake pucks.
- Turn adjusting fitting located on brake bracket out until hand lever will just allow the parking brake lock to be engaged. When parking brake lock is released the hand lever must return to free position, without binding.
- Actuate hand lever and set parking brake lock to insure proper adjustment has been obtained.
- Tighten nut on cable adjusting fitting on the brake bracket.

After adjusting brake, check stoplamp to see if switch is adjusted properly. Adjust switch position by loosening and tightening lock nuts. See Figure 10-3.

PRIMARY DRIVE

DISASSEMBLY

- a. Remove belt. See Page 10-1.



SAFETY WARNING

Primary sheave is spring loaded. Compress primary drive sheaves and hold with special clamp, OMC Tool No. 114584 before proceeding with disassembly.

- b. Remove two screws securing lock plate to end cap assembly.
- c. Remove the end cap bolt and plunger and rod assembly. Hold flywheel with holding tool. See Page 9-2.
- d. Remove the end cap assembly.
- e. Remove clamp while pressing sliding sheave toward engine.
- f. Remove sliding sheave assembly, primary spring and cap, two neutral lockout balls and transmission belt bearing from crankshaft.

DISASSEMBLY OF FLYWHEEL FROM ENGINE (Refer to Page 9-3)

CLEANING, INSPECTION AND REPAIR



SAFETY WARNING

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.

- a. Clean all parts with a cleaning solvent such as Trichloroethylene 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.
- 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.

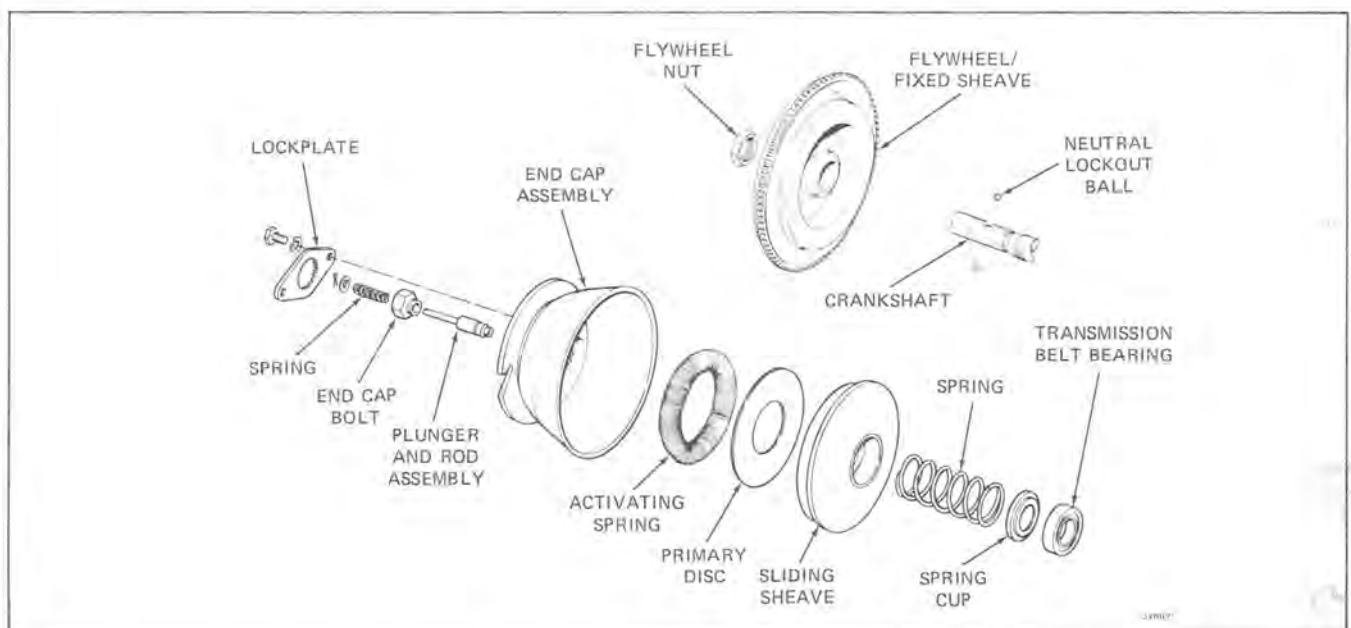


Figure 10-4

REASSEMBLY OF FLYWHEEL (Refer to Page 9-9)

1. Clean the tapered surface of the flywheel end of the eccentric shaft and the tapered bore of the flywheel with trichlorethylene or lacquer thinner.

PRIMARY DRIVE REASSEMBLY

1. Install the transmission belt idler bearing on eccentric shaft.
2. Use Lubriplate 907 (OMC Part No. 114154) to lightly coat splines and retain neutral lockout balls in holes.
3. Place primary spring on shaft with closed side of spring cup toward bearing.
4. Install the two neutral lockout steel balls.
5. Install the primary spring, the sliding sheave assembly, and hold in place using the special tool, OMC Tool No. 114584. (See note on Page 8-2).
6. Install end cap assembly on crankshaft spline. Insert the plunger and rod assembly and end cap bolt and thread into the eccentric shaft. Tighten the end cap bolt to 90 - 100 ft. lbs.
7. Install the lock plate and lock plate screws. If serrations do not allow alignment of holes in lock plate and end cap, turn lock plate over and rotate until aligned position is obtained.
8. Operate the neutral lockout plunger to see that it functions properly. When neutral lockout is pushed in, the sliding sheave must not slide on spline. When neutral lockout is out (normal operating position) the sliding sheave must slide freely on spline restricted only by the primary spring.
9. Replace transmission belt and belt guards. See Page 10-1.
10. Replace neutral lockout hair pin.

NEUTRAL LOCKOUT ADJUSTMENT

Two (2) types of neutral lockout plungers were used in 1974. The plungers can be identified by the size of cotter pin used. Early plungers used a 1/16" dia. cotter pin and the later types used a 3/32" dia. cotter pin.

a. EARLY MODELS:

With neutral lockout knob pulled out to detent, adjust cable by rotating cable end fitting so that washer on the plunger is 1/64" to 1/32" away from the primary end cap bolt. Tighten jam nut.

b. LATER MODELS:

With neutral lockout knob pulled out to detent, adjust cable by rotating cable end fitting until the plunger bottoms out in the crankshaft. Tighten jam nut.

SECONDARY DRIVE

DISASSEMBLY

- a. Remove manual starter.
- b. Remove guard and drive belt.
- c. Remove Allen screw in end cap end of shaft.
- d. Slide secondary sheaves off shaft.

SERVICING SECONDARY ASSEMBLY

- a. Remove lock ring from end cap.
- b. Slide end cap off of stationary shaft and sheave.



NOTE

End cap is spring loaded.

- c. End cap ramp shoes can now be removed with a punch.

CLEANING AND INSPECTION

Clean and inspect all secondary drive components.

REASSEMBLY

- a. Reassemble end cap ramp shoes if removed.
- b. Install sliding sheave to secondary shaft and sheave.
- c. Engage spring ends in holes in movable sheave and end cap.
- d. Align end cap keyway to stationary shaft keyway.
- e. Turn sliding sheave counterclockwise to next ramp 1/3 turn.
- f. Push down on end cap and install lock ring with sharp edge facing out.
- g. If adjusting collar and or spacers were removed or loosened, re-install adjusting collar and new set screw with flat side and or spacers toward chain case.
- h. Install key and secondary drive assembly to shaft.
- i. Primary - secondary alignment, measured from drive belt surface of flywheel at outside diameter and chain case side of fixed secondary sheave shall be 3.56 inches. See Figure 10-5.
- j. Rotate adjusting collar (if drive is so equipped) in direction of sheave rotation to achieve alignment. Add or delete spacers to achieve alignment on other models.
- k. Reinstall drive belt and belt guard.
- l. Reinstall manual starter.

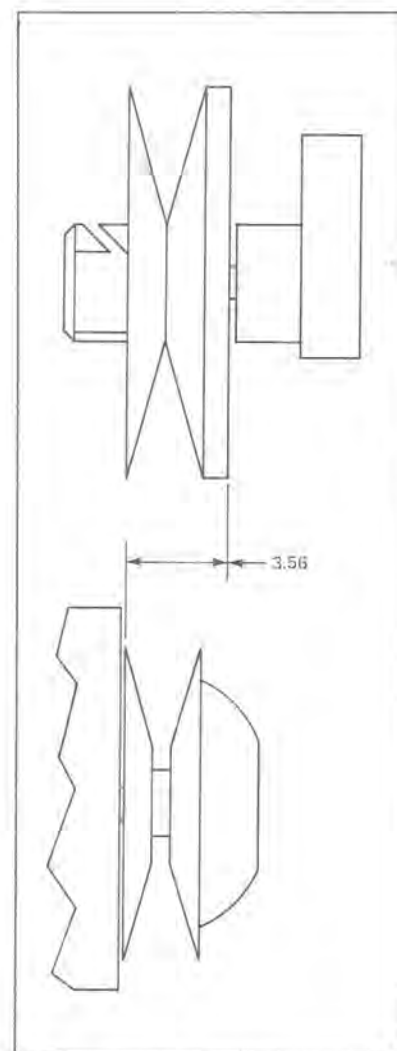


Figure 10-5

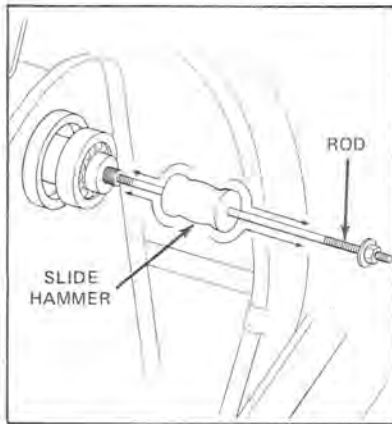


Figure 10-6

CHAIN CASE DISASSEMBLY

- a. Remove manual starter.
- b. Remove secondary assembly. Refer to page 10-4.
- c. Remove chain case cover.
- d. Remove 9/16" screw anchoring upper sprocket.
- e. Remove sprocket, chain and spacers behind sprocket.
- f. Remove secondary adjusting cam and, or spacers.
- g. Remove large lock ring securing upper shaft to chain case side.
- h. Secondary shaft must be removed through sprocket side of chain case. Slide hammer (OMC Part No. 380658) and rod (OMC Part No. 312019) can be used for this purpose. See Figure 10-6.
- i. Bearings and spacers can be removed by pressing off splined end of shaft.
- j. Drive upper chain case oil seal out sheave side. Large lock ring can now be removed from chain case.

CLEANING AND INSPECTION

- a. Clean bearing in trichlorethylene.



SAFETY WARNING

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

- b. Check bearings for wear or roughness.
- c. Check shaft, sheaves, key and Delrin ramp shoes for excessive wear.

REASSEMBLY

- a. Install large lock ring to oil seal side of chain case.
- b. Install chain case oil seal (with lip in) to chain case.
- c. Install bearings, spacers and shaft to upper chain case from sprocket side of chain case. Install lock ring sharp edge out. Apply Lubriplate 907 to both sides of bearings.
- d. Install sprocket, spacers and chain.
- e. Reinstall chain case cover and lubricate as per installation instruction on cover.
- f. Install spacers.
- g. Install key and secondary drive assembly.
- h. Primary - secondary alignment, measured from drive belt surface of flywheel at outside diameter and chain case side of fixed secondary sheave shall be 3.56 inches. See Figure 10-5.
- i. Shim as required to achieve alignment and tighten adjusting set screw.
- j. Secure secondary assembly to shaft with new 3/8" lock screw.

SECTION 11

STEERING, TRACK AND SUSPENSION

DESCRIPTION

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

STEERING COLUMN

DISASSEMBLY

- a. Disconnect drag link from steering column arm.
- b. Remove cotter pin, nut and washer from anchoring steering column arm.
- c. Disconnect safety stop switch and dimmer switch from terminal block.
- d. Disconnect brake cable at brake lever.
- e. Disconnect throttle cable from carburetor.
- f. Remove 2 1/4-20 bolts from steering column support below ignition switch.
- g. Remove 2 philips screws from dash panel to support.
- h. Steering column can now be removed.

REASSEMBLY

- a. Reassemble in reverse order of disassembly.
- b. Refer to throttle and brake cable adjustment on reassembly.
- c. To lubricate ski columns remove steering arms and also check ski column bushings for wear.
- d. There should be a .005 to .010 gap between steering arm and bushing.

SKI ALIGNMENT

The skis require alignment if they are not parallel with each other and the vehicle body when the steering bar is in the normal straight-driving position.

To align skis, proceed as follows:

- a. Open hood.
- b. Loosen jam nut on outside drag link rod end. See Figure 11-1.
- c. Remove 3/8 - 24 screw and lock nut at rod end to steering arm on drag link.

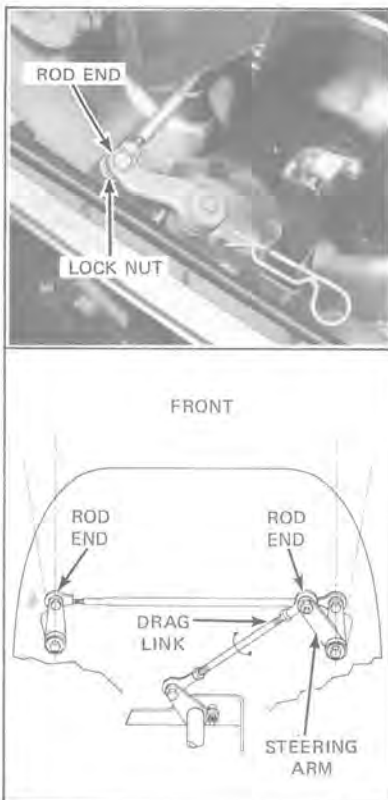


Figure 11-1

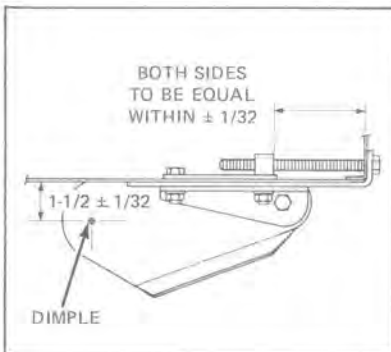


Figure 11-2



Figure 11-3

- d. Turn rod end clockwise to toe right ski in or counterclockwise to toe right ski out.
- e. Replace $\frac{3}{8}$ - 24 screw from underside and tighten lock nut to 18-20 ft. lbs.

**SAFETY WARNING**

Minimum thread engagement of rod ends with steering linkages shall be .50 inches, with skis in forward position. Outer housings of drag link rod ends must be in same plane when viewed from end after tightening jam nuts.

- f. Tighten jam nut.
- g. Remove $\frac{3}{8}$ - 24 screw and lock nut from the left hand tie rod end.
- h. Turn rod end clockwise to toe left hand ski in or counterclockwise to toe ski out.
- i. When left hand ski is set, reassemble rod end with hardware and tighten lock nut to 18-20 ft. lbs.

TRACK AND SUSPENSION**TRACK TENSION**

Proper track tension is essential to keep sprocket and track wear at a minimum. Track tension can be checked by first blocking up the snowmobile, so that the track hangs free, and placing the front edge of the skis against a stationary object. Check to see that rear pivot springs are in the center position of the three position bracket. Next measure as shown in Figure 11-2. Track tension is correct if the distance measured from the underside of the chassis to the dimple on the pivot arm is $1\frac{1}{2} \pm \frac{1}{32}$ ".

If track tension is not correct proceed as follows.

- a. Loosen track tension nuts. See Figure 11-2.
- b. Turn pivot arm adjusting screw clockwise to tighten, counterclockwise to loosen, to attain proper dimension.
- c. Now measure distance from bracket to the anchor, both sides. If measurements are not equal, move bracket closest to anchor forward until both sides are equal. This is done by turning the pivot arm adjusting screw counterclockwise.
- d. Tighten all retaining nuts.

TRACK ALIGNMENT

To check for proper track alignment, with snowmobile blocked up as described under TRACK TENSION, start engine and run track at slow speed. DO NOT RUN engine at speeds higher than necessary to put the track in motion. High speed operation of the engine while the snowmobile is blocked up could cause rapid track lug wear. There must be an equal clearance on each side of the track edge between the track edge and pivot arm as shown in Figure 11-3.

**SAFETY WARNING**

Do not run at high speed. Keep clothing and hair away from track to avoid becoming entangled.

- a. If track is not centered and track is too far to left side when viewed from the rear of vehicle, tighten left pivot arm adjusting screw and loosen right pivot arm on each side.
- b. If track is too far to the right side when viewed from the rear of vehicle reverse step (a) above.
- c. Run track at slow speed and check alignment.
- d. Repeat procedures until track is centered in vehicle.
- e. Torque nuts (4) track adjusting bracket to frame 12-15 ft. lbs.

REMOVAL OF TRUCKS AND TRACK

- a. Support snowmobile so that weight is removed from track.
- b. Release track tension.
- c. Release pivot springs from chassis brackets.
- d. Remove 6 bolts truck assemblies to chassis.
- e. Remove 3 truck assemblies.

NOTE

There are three different truck assemblies. The springs are different and are color coded.

Front - silver

Center - 1 silver, 1 blue

Rear - blue

Mark boggie assemblies so that on reassembly they are assembled in the correct position on the chassis.

- f. For disassembly of truck assemblies see Figure 11-4.
- g. Boggie wheel bearings are pressed in and held in place with lock ring.
- h. Remove lock ring and press out same side.
- i. Reassemble boggie wheels in reverse order of disassembly.

NOTE

On reassembly of boggie wheels be certain to press on inner race of bearing. Check wheel boggie bearings for binding or roughness.

- j. Removal of rear axle requires removal of one pivot arm by driving out a roll pin. Remove both pivot arms from chassis. Remove rear axle assembly from attached pivot arm side. See Figures 11-5 and 11-6.
- k. Press wheel off rear axle if required.
- l. To reassemble rear axle see Figure 11-6. Lubricate rear pivot arm bushings with Lubriplate 907 grease.
- m. Track must be held in position so that front axle can be turned freely.

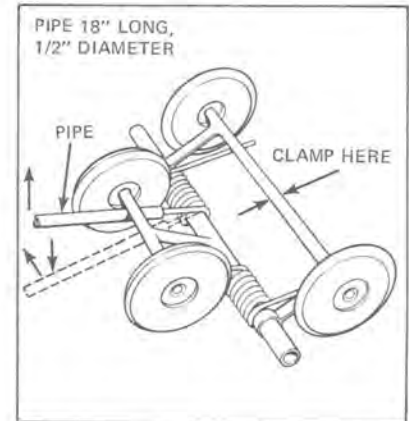


Figure 11-4

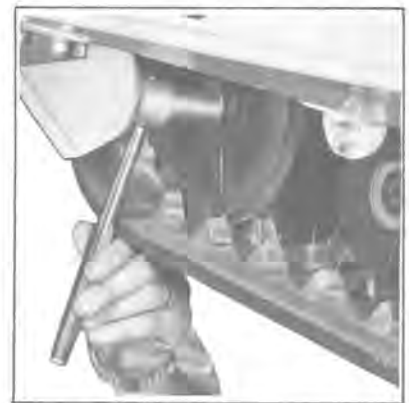


Figure 11-5



Figure 11-6

- n. Remove chain case cover, 9/16" bolt on lower sprocket, chain and lower sprocket.
- o. Remove large lock ring on sprocket end of front axle.
- p. For removal of front axle assembly slide toward chain case side until opposite bearing and seal are free. Track and axle can now be removed.
- q. Remove slip fit bearing and seal in sprocket end.
- r. Press off bearing on opposite end of axle and remove seal.
- s. Drive out roll pins to remove sprockets.
- t. Check bearings for binding or roughness.
- u. Drive seal from chain case using a punch.
- v. Install seal to front axle bore using Special Tool Part No. 316613 seal lip facing sprocket side.
- w. Install bearing cup seals one on each end of axle, lip facing sprockets.
- x. Press bearing on right end of axle.

 NOTE

Caution must be used when assembling left side of axle into chain case. Axle must be centered during entire assembly process until left bearing is in position. This is necessary to insure no damage to seal. It may be necessary to cover spline prior to sliding through seal to eliminate damage possibility.

- y. Assemble bearing cup and plate assembly to right side securing with screws and lock nuts. Screw heads to be on tunnel side of vehicle if cup was removed.
- z. Assemble left bearing, retaining ring, spacer and driven sprocket and secure with washer and lock screw.
- aa. Care must be taken to insure bearing cup seals are in position.
- ab. Reassemble suspension in reverse order of disassembly making sure the wide wheels of the truck assemblies are forward.
- ac. Adjust track tension. Refer to page 11-2.
- ad. Rear axle springs can be adjusted for load.

SECTION 12

LUBRICATION AND STORAGE

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.

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. See inside front cover for recommended fuel mixture.

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 freeze-up.
- Absorbs moisture and water in fuel system.
- Extends spark plug life by reducing fouling and misfire.

To avoid 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 50:1 or 1 pint of lubricant to 6 U.S. gallons (4.8 Imperial gallons) of gasoline. (See page iv.)

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 a good grade of regular leaded 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 50:1. 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.

50 to 1 lubricant is prediluted to provide excellent mixability with gasoline at low temperatures. The addition of this dilutant does not in any way affect the lubrication qualities of the lubricant.

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.

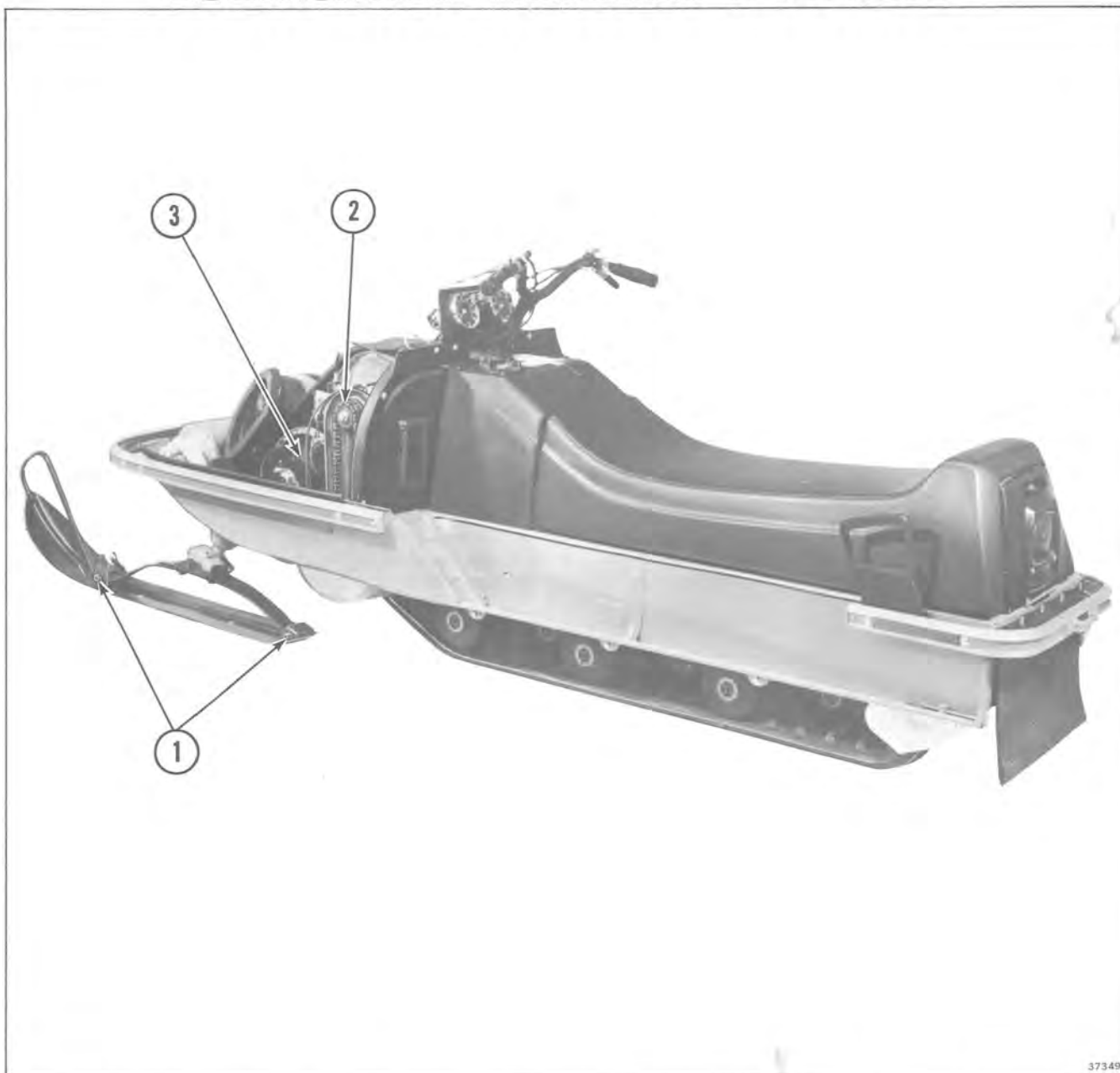
Do not use kerosene or fuel oils for pre-mixing.



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



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Figure 12-1

TIME	MAINTENANCE	LUBRICANT
① Every 25 hrs.	Ski Pivots (Leaf spring connections to skis)	SAE 10 Oil
② After 10 hrs. then every 25 hrs.	Drive Chain - oil bath	(OMC Sea-Lube Automatic in U.S.) (In Canada use OMC Type C) Transmission Fluid
③ Once a season (normal use) Twice a season (extended use)	Have dealer lubricate Primary Drive (1/3 to 1/2 teaspoon). Do not over lubricate.	OMC Part No. 114154

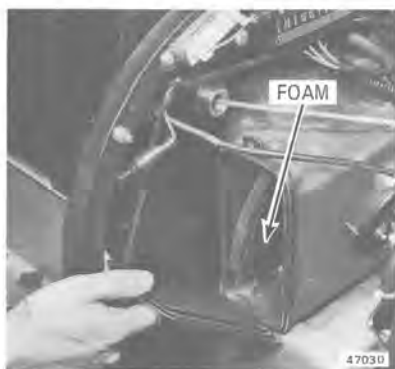


Figure 12-2



Figure 12-3

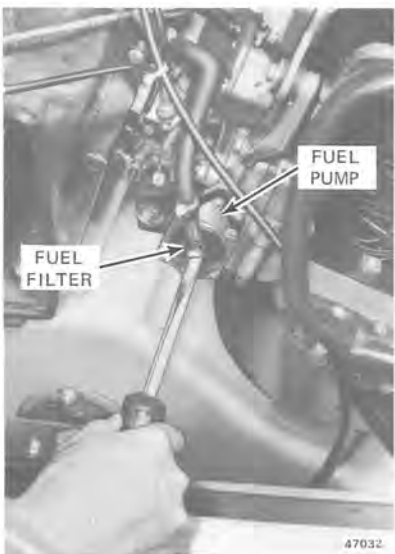


Figure 12-4

PREVENTIVE MAINTENANCE

TIME	MAINTENANCE
After first 10 hrs., then every 25 hrs. or as required	Adjust Track Tension Check Track Alignment
Once a season Under normal use	Clean Carburetor Air Silencer Foam
Once a season	Clean or install new Fuel Pump Filter Screen
Once a season	Clean Filter Screen under Carburetor Fuel Inlet Elbow

AIR SILENCER

The carburetor is equipped with dual polyurethane foam silencers (see Figure 12-2). Both silencers will require cleaning at least once during the operating year. If the vehicle is run in dirt or grass, the silencers should be checked weekly. If either silencer develops tears it should be replaced. When pores are plugged, engine will receive a rich fuel/air mixture and run rough and reduce fuel economy. To clean silencers, shake to dislodge dirt particles, blow with compressed air and shake, wash in warm water with a mild detergent.

FUEL FILTER SCREEN, FUEL PUMP



SAFETY WARNING

Exercise care to prevent fuel spillage while removing fuel filter when engine is hot. Fuel in filter could drip on hot engine or muffler and ignite.

The fuel filter is attached to the fuel pump. See Figure 12-4. To inspect for sediment or water accumulation, back off the mounting screw approximately three turns counterclockwise and remove the cover together with the screen, gasket and mounting screw. Remove and wash filter screen with solvent and brush. Replace filter screen if it is too badly varnished. Assemble filter as shown in Figure 12-5, being careful to assemble gasket and filter screen on fuel filter cover. Tighten mounting screw securely, (do not over-tighten).

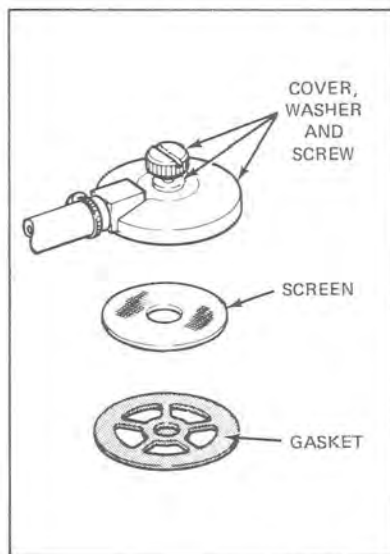


Figure 12-5

OFF SEASON STORAGE

1. Run engine and inject OMC Rust Preventative Oil (with oil can) rapidly into carburetor until engine stops. This oil is available at your Evinrude or Johnson Snowmobile dealer.
2. Turn off ignition and clean or replace air filter.
3. Remove fuel pump and carburetor filter screens and clean or replace. See "Preventive Maintenance".
4. If fuel is to be left in tank for extended periods, the addition of OMC 2+4 Fuel Conditioner is recommended, available from your Evinrude or Johnson Snowmobile dealer.
5. Remove transmission belt. (See page 10-1).
6. Rub bottom of skis, inside surfaces of primary and secondary sheaves, and other unprotected surfaces of vehicle with oily cloth.
7. Block entire vehicle off ground to take weight off track. Loosen track tension.
8. Store in dry, well-ventilated area.



SAFETY WARNING

To prevent possible explosion or ignition of vaporized fuel, do not store snowmobile with fuel in tank or carburetor in enclosure with open flame. (EXAMPLE: Furnace or water heater pilot light.)

AFTER STORING - BEFORE USING

1. Adjust track for proper tension and alignment. See section 11.
2. Wipe primary and secondary sheaves clean and replace transmission belt.
3. Lubricate all points as specified under "Lubrication."
4. Tighten all screws and nuts.
5. Thoroughly clean any surfaces that need refinishing, and touch-up. Obtain paint from your dealer.

