JOHN DEERE CYCLONE® AND LIQUIFIRE® SNOWMOBILES

Service Manual SM-2108 (Aug-77)

CONTENTS

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

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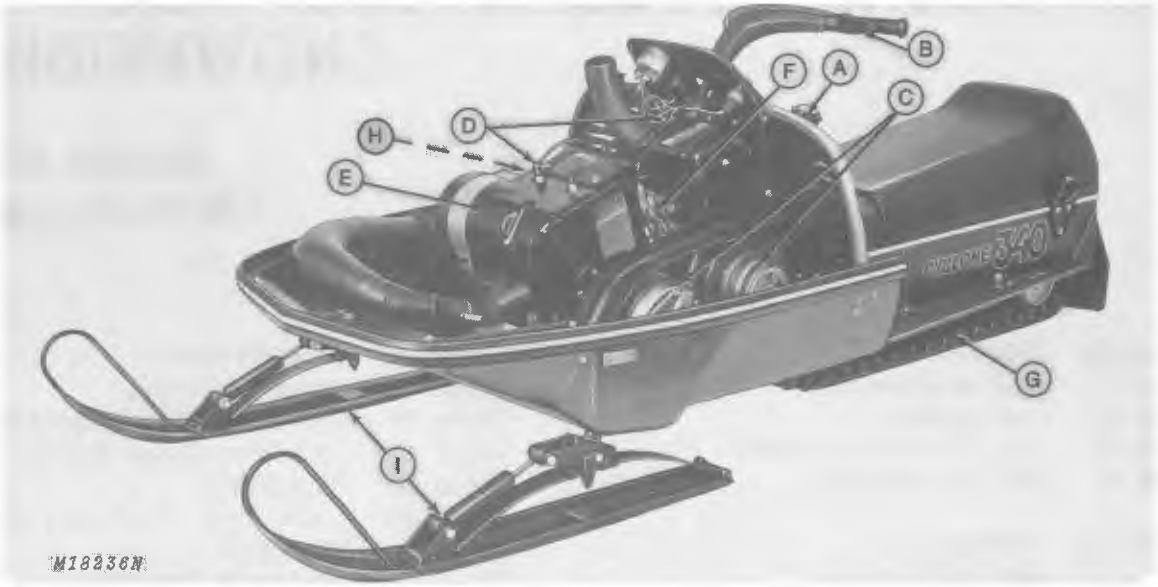
INTRODUCTION



A—Section 30 - Fuel System
B—Section 50 - Brakes
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Fig. 1-Components Covered in this Service Manual

This service manual contains service and maintenance information for John Deere 340 and 440 Cyclone and 340 and 440 Liquifire snowmobiles.

The manual is divided into sections, with each section pertaining to a certain component or operational system. The information is divided into groups within each section.

Emphasis is placed on diagnosing malfunctions, analysis and testing. Diagnosing malfunctions lists possible troubles, their causes, and how to correct them. These troubles are analyzed to help you understand what is causing the problem, so it can be corrected rather than just replace parts.

Specifications are found in the last group of each section. Special service tools are in Section 70.

Hood, console, tunnel and pan repair are not covered in this service manual. Minor cracks and holes in hood, console or fiberglass pans can be repaired using plastic patching kits or fiberglass repair kits. These kits are available at local auto supply stores.

On snowmobiles with aluminum pans, minor tunnel and pan damage can be repaired by pop-riveting soft 0.060-inch (1.524 mm) aluminum over the tear, crack or puncture. If the pan and tunnel are damaged extensively, a complete assembly is available.

A pan reinforcement for aluminum pans is available and can be pop-riveted over the damaged pan.

⚠ This safety alert symbol identifies important safety messages in this manual. When you see this symbol, be alert to the possibility of personal injury and carefully read the message that follows.

NOTE: Metric equivalents have been included, where applicable, throughout this service manual.

This manual may be kept in its own cover, or it may be removed and filed in your service manual rack or Consumer Products Service Information Binder.

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Section 10
GENERAL
Group 5
MACHINE IDENTIFICATION

CONTENTS

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SERIAL NUMBERS

Machine Serial Number

Fig. 1-Snowmobile Serial Number Location

Each snowmobile is assigned an individual machine serial number. This serial number is located on the right-hand side of the tunnel, Fig. 1.

Engine Serial Number

Each snowmobile engine is assigned an individual serial number. John Deere (Kioritz) engines have the serial plate on the flywheel housing, Fig. 2.

Fig. 2-Fan-Cooled Engine
Serial Number Plate Location

Fig. 3-Liquid-Cooled Engine
Serial Number Plate Location

VINTAGE INFORMATION

1976 Model Year

Snowmobile Model	340 Cyclone	440 Cyclone	340 Liquifire	440 Liquifire
Serial No.	(55,001-70,000)	(55,001-70,000)	(55,001-70,000)	(55,001-70,000)
Code No. (type)*	J34FE	J44FE	J34LE	J44LE
Engine Manufacturer	Kioritz**	Kioritz**	Kioritz**	Kioritz**
Engine Model No.	340/22A Reed Valve	440/22A Reed Valve	340/23LC Reed Valve	440/23LC Reed Valve

1977 Model Year

Snowmobile Model	340 Cyclone	440 Cyclone	340 Liquifire	440 Liquifire
Serial No.	(70,001-80,000)	(70,001-80,000)	(70,001-80,000)	(70,001-80,000)
Code No. (type)*	J34FF	J44FF	J34LF	J44LF
Engine Manufacturer	Kioritz**	Kioritz**	Kioritz**	Kioritz**
Engine Model No.	340/22B Reed Valve	440/22B Reed Valve	340/23ALC Reed Valve	440/23ALC Reed Valve

1978 Model Year

Snowmobile Model	340 Cyclone	440 Cyclone	340 Liquifire	440 Liquifire
Serial No.	(80,001-)	(80,001-)	(80,001-)	(80,001-)
Code No. (Type)*	J34FG	J44FG	J34LG	J44LG
Engine Manufacturer	Kioritz**	Kioritz**	Kioritz*	Kioritz**
Engine Model No.	340/22C Reed Valve	440/22C Reed Valve	340/23 BLC Reed Valve	440/23BLC Reed Valve

**The first four letters and numbers signify the model number. "J" indicates the snowmobile family and the next three numbers or letters the model number. EXAMPLE: J34FE or J34FF is a 340 Cyclone Snowmobile, with a 340 fan-cooled engine. "J34" indicates engine cc; "F" meaning fan-cooled. J44LE or J44LF is a Liquifire Snowmobile, with a 440 liquid-cooled engine. "44L" indicates engine cc; "L" meaning liquid-cooled. The last letter signifies year manufactured. EXAMPLE: "E" = 1976, "F" = 1977 etc.*

***Manufactured for John Deere by Kioritz Corp., Japan.*

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Group 10
SPECIFICATIONS

MACHINE SPECIFICATIONS

FUEL SYSTEM

Capacity (-80,000)	8 gal. (30.3 l)
Capacity (80,001-)	6-1/2 gal. (24.6 l)
Mixing Ratio	
All Snowmobiles	50:1
Filters	Two located in pickup line
Fuel Pump:	
Mikuni Carburetor	Impulse-type located in the inlet line

LIQUID COOLING SYSTEM

Capacity (-80,001)	4-1/2 qts. (4.25 l)
Capacity (80,001-)	4 qts. (3.78 l)
Type	Pressurized system with centrifugal pump
Engine Temperature Control	One thermostat
Pump Output	12 U.S. gal. (45.4 l) @ 7250 engine rpm
Coolant Filler Cap	15 psi (1 bar)

ELECTRICAL SYSTEM

Charge System	Flywheel Alternator
Capacity	120 Watts
Ignition System:	
340 and 440 Cyclone and Liquifire	Capacitor Discharge
Ignition Timing:	
340 and 440 Cyclone and Liquifire (Engine Running)	0.096 in. BTDC (2.438 mm)
Electric Start, Optional on Liquifires (70,001-80,000) and Cyclones (55,001-)	12-Volt DC

POWER TRAIN

340 and 440 Cyclone and Liquifire	John Deere (Comet)
Final Drive	Enclosed chain
Standard Ratio:	
340 Cyclone and Liquifire	1.86:1
440 Cyclone and Liquifire	1.67:1
Optional Ratio:	
340 and 440 Cyclone and Liquifire	2.47:1 2.06:1
Brakes:	
340 and 440 Cyclone and Liquifire	Mechanical disk
Stop Light	Standard

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MACHINE SPECIFICATIONS—Continued

SUSPENSION

340 and 440 Cyclone ..... Slide rail suspension
340 and 440 Liquifire..... Slide rail suspension
Drive Sprockets .....Molded polyethelene
Track Material:
340 and 440 Cyclone ..... Rubber
340 and 440 Liquifire ..... Rubber

Track Width .....15.5 in. (39.37 cm)
Track Drive .....Involute

CHASSIS AND BODY

Tunnel and Pan.....Aluminum
Hood and Console ..... Fiberglass
Windshield .....Polycarbonate
Overall Length:
340 and 440 Cyclone and
Liquifire ..... 104.0 in. (264.2 cm)
Overall Width:
340 and 440 Cyclone and
Liquifire .....39.0 in. (99.0 cm)
Overall Height:
340 and 440 Cyclone and
Liquifire .....41.0 in. (104.1 cm)

ENGINE SPECIFICATIONS

Cyclone Snowmobiles (Serial No. 55,001-70,000)

Item	340 Cyclone	440 Cyclone
Engine Model	KEC 340/22A Reed Valve	KEC 440/22A Reed Valve
Manufacturer	John Deere (Kioritz)*	John Deere (Kioritz)*
Type of Engine	Two-Stroke, Air-Cooled	Two-Stroke, Air-Cooled
Number of Cylinders	Two	Two
Cyliner Sleeve	Cast-Iron	Cast-Iron
Bore (mm)	58	66
Stroke (mm)	64	64
Displacement (cc)	339	438
Compression Ratio	7.5:1	7.9:1
Horsepower	34 @ 6750 rpm	46 @ 6750 rpm
Ignition Type	Capacitor Discharge	Capacitor Discharge
Ignition Manufacturer	Wico	Wico
Lighting Coil Output	120 Watt	120 Watt
Carburetor Manufacturer	Mikuni	Mikuni
Carburetor Model No.	VM 34-83	VM 34-84
Starting System	Recoil Start (12-Volt Electric, Optional)	Recoil Start (12-Volt Electric, Optional)

**Manufactured for John Deere by Kioritz Corp., Japan*

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ENGINE SPECIFICATIONS—Continued

Liquifire Snowmobiles (Serial No. 55,001-70,000)

Item	340 Liquifire	440 Liquifire
Engine Model	KEC 340/23LC Reed Valve	KEC 440/23LC Reed Valve
Manufacturer	John Deere (Kioritz)*	John Deere (Kioritz)*
Type of Engine	Two-Stroke, Liquid-Cooled	Two-Stroke, Liquid-Cooled
Number of Cylinders	Two	Two
Cylinder Sleeve	Cast-Iron	Cast-Iron
Bore (mm)	58	66
Stroke (mm)	64	64
Displacement (cc)	339	438
Compression Ratio	7.5:1	7.9:1
Horsepower	45 @ 7250 rpm	55 @ 7250 rpm
Ignition Type	Capacitor Discharge	Capacitor Discharge
Ignition Manufacturer	Wico	Wico
Lighting Coil Output	120 Watt	120 Watt
Carburetor Manufacturer	Mikuni (Dual)	Mikuni (Dual)
Carburetor Model No.	VM 34-79	VM 34-80
Starting System	Recoil Start (12-Volt Electric, Optional)	Recoil Start (12-Volt Electric, Optional)

**Manufactured for John Deere by Kioritz Corp., Japan*

Cyclone Snowmobiles (Serial No. 70,001-)

Item	340 Cyclone	440 Cyclone
Engine Model	KEC 340/22B Reed Valve	KEC 440/22B Reed Valve
Manufacturer	John Deere (Kioritz)*	John Deere (Kioritz)*
Type of Engine	Two-Stroke, Air-Cooled	Two-Stroke, Air-Cooled
Number of Cylinders	Two	Two
Cylinder Sleeve	Cast-Iron	Cast-Iron
Bore (mm)	58	66
Stroke (mm)	64	64
Displacement (cc)	339	438
Compression Ratio	6.9:1	7.2:1
Horsepower	34 @ 6500 rpm	44 @ 6500 rpm
Ignition Type	Capacitor Discharge	Capacitor Discharge
Ignition Manufacturer	Wico	Wico
Lighting Coil Output	120 Watt	120 Watt
Carburetor Manufacturer	Mikuni	Mikuni
Carburetor Model No.	VM34 - 123	VM34 - 124
Starting System	Recoil Start (12-Volt Electric, Optional)	Recoil Start (12-Volt Electric, Optional)

**Manufactured for John Deere by Kioritz Corp., Japan*

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Liquifire Snowmobiles (Serial No. 70,001-)

Item	340 Liquifire	440 Liquifire
Engine Model	KEC 340/23ALC Reed Valve	KEC 440/23ALC Reed Valve
Manufacturer	John Deere (Kioritz)*	John Deere (Kioritz)*
Type of Engine	Two-Stroke, Liquid-Cooled	Two-Stroke, Liquid-Cooled
Number of Cylinders	Two	Two
Cylinder Sleeve	Cast-Iron	Cast-Iron
Bore (mm)	58	66
Stroke (mm)	64	64
Displacement (cc)	339	438
Compression Ratio	7.2:1	6.7:1
Horsepower	47 @ 7250 rpm	58 @ 7250 rpm
Ignition Type	Capacitor Discharge	Capacitor Discharge
Ignition Manufacturer	Wico	Wico
Lighting Coil Output	120 Watt	120 Watt
Carburetor Manufacturer	Mikuni (Dual)	Mikuni (Dual)
Carburetor Model No.	VM34 - 122	VM34 - 125
Starting System	Recoil Start (12-Volt Electric Optional [-80,000])	Recoil Start (12-Volt Electric Optional [-80,000])

Manufactured for John Deere by Kioritz Corp., Japan.

BOLT TORQUE CHART

Grade of Bolt		SAE-2	SAE-5	SAE-8		
Min. Tensile Strength		64,000 PSI	105,000 PSI	150,000 PSI		
Grade Marking on Bolt					Socket or Wrench Size	
U.S. Standard					U.S. Regular	
Bolt Dia.	U.S. Dec. Equiv.		TORQUE IN FOOT POUNDS		Bolt Head	Nut
1/4	.250	6	10	14	7/16	7/16
5/16	.3125	13	20	30	1/2	1/2
3/8	.375	23	35	50	9/16	9/16
7/16	.4375	35	55	80	5/8	11/16
1/2	.500	55	85	120	3/4	3/4
9/16	.5625	75	130	175	13/16	7/8
5/8	.625	105	170	240	15/16	15/16
3/4	.750	185	300	425	1-1/8	1-1/8
7/8	.875	*160	445	685	1-5/16	1-5/16
1	1.000	250	670	1030	1-1/2	1-1/2

Multiply readings by 12 for inch pound values.

**"B" Grade bolts larger than 3/4-inch are sometimes formed hot rather than cold which accounts for the lower recommended torque.*

NOTE: Allow a tolerance of plus or minus 10% on all torques given in this chart.

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Group 15
TUNE-UP AND ADJUSTMENT

TUNE-UP GUIDE

Operation	Specification	Reference
*Replace Spark Plugs	Testing for spark Champion QN-1	Sec. 40, Group 10
Time Ignition System	Kioritz Engines 0.096 in. BTDC (2.438 mm) (with engine running)	Sec. 40, Group 10
Adjust Carburetor	Select main jet Synchronize the carburetors Adjust choke slide Adjust float height Adjust idle screw Adjust air jet	Sec. 30, Group 10
Recondition Carburetor	Clean carburetor and install carburetor kit	Sec. 30, Group 10

ADJUSTMENTS

Adjustment	Specification	Reference
Brake	.....	Section 50, Group 30
Sheave Alignment	.....	Section 50, Group 20
Track	.....	Section 60, Group 10 Section 60, Group 12
Skis	.....	Section 60, Group 20
Fan Belt	.....	Section 20, Group 15
Coolant Pump Belt	.....	Section 20, Group 30

SPARK PLUG RECOMMENDATION

*The spark plug recommended for use in the 340 and 440 Cyclone and Liquifire Snowmobile engines is a Champion QN-1 AM54324.

IMPORTANT: For sustained high-speed running, use surface gap plugs N-19V or QN-19V.

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Group 20
FUEL AND LUBRICANTS

BREAK-IN PERIOD

Do not exceed 40 mph for the first 25 miles, or force the machine at full throttle in deep snow. An occasional burst of power on hard-packed snow will not be harmful.

For the first tank of fuel used in the snowmobile, mix gasoline and oil in a 40 to 1 ratio. After this break-in period, mix gasoline and oil in a 50 to 1 ratio.

FUEL

The 2-cycle snowmobile engines require that oil be mixed with gasoline. It is important that quality gasoline and oil are used and mixed thoroughly in the proper ratio. Too little oil results in engine damage, while too much oil will cause spark plug fouling and excessive smoking.

NOTE: Some gasoline anti-freeze additives could cause fuel pump diaphragm damage.

IMPORTANT: Gasoline must be premium grade with an anti-knock index of 92 or higher on snowmobiles (Serial No. 55,001-70,000). Snowmobiles (Serial No. 70,001-) must use regular or premium grade with an anti-knock index of 88 or higher. DO NOT use non-leaded gasoline. Mix gasoline with John Deere 2-Cycle Oil, which is an ashless, 2-cycle oil without metallic additives. John Deere 2-cycle Oil meets Boating Industry Association (BIA) test qualification TC-W and test procedure BIA-312-69. It is available in 1-pint and 1-quart "pop-top" cans.

Mix fuel according to the following procedure:

Pour the required amount of John Deere 2-Cycle Oil into a clean container, add one-half the necessary gasoline and shake vigorously. Add the remainder of the gasoline and agitate the mixture thoroughly. The Snowmobile Gasoline Can, Fig. 1, is ideal for snowmobile use. Mix gasoline and oil in a separate container. Never mix in the snowmobile tank.

Fig. 1-Correct Gasoline-to-Oil Mixture Ratio

LUBRICANTS

Oil used in the chain case should be a good grade of SAE 90.

A—Lower Plug **B—Fill Plug**

Fig. 2-Checking Oil Level in Chain Case

Remove plug (A, Fig. 2) from the lower part of the chain case. If oil flows from this hole, the oil level is satisfactory.

If oil must be added, remove fill plug (B) and add SAE 90 oil until it flows from the lower hole.

Remove oil from chain case with a syringe.

CAPACITIES

Fuel Tank (-80,000) . . . . . 8.0 U.S. gal. (30.3 l)
Fuel Tank (80,001-) . . . 6-1/2 U.S. gal. (24.6 l)

SERVICE INTERVALS

Chain Case (Oil Change) . . . . . 200 hours, 2 years or 1000 miles.

Section 20
ENGINE
Group 5
GENERAL INFORMATION

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DESCRIPTION

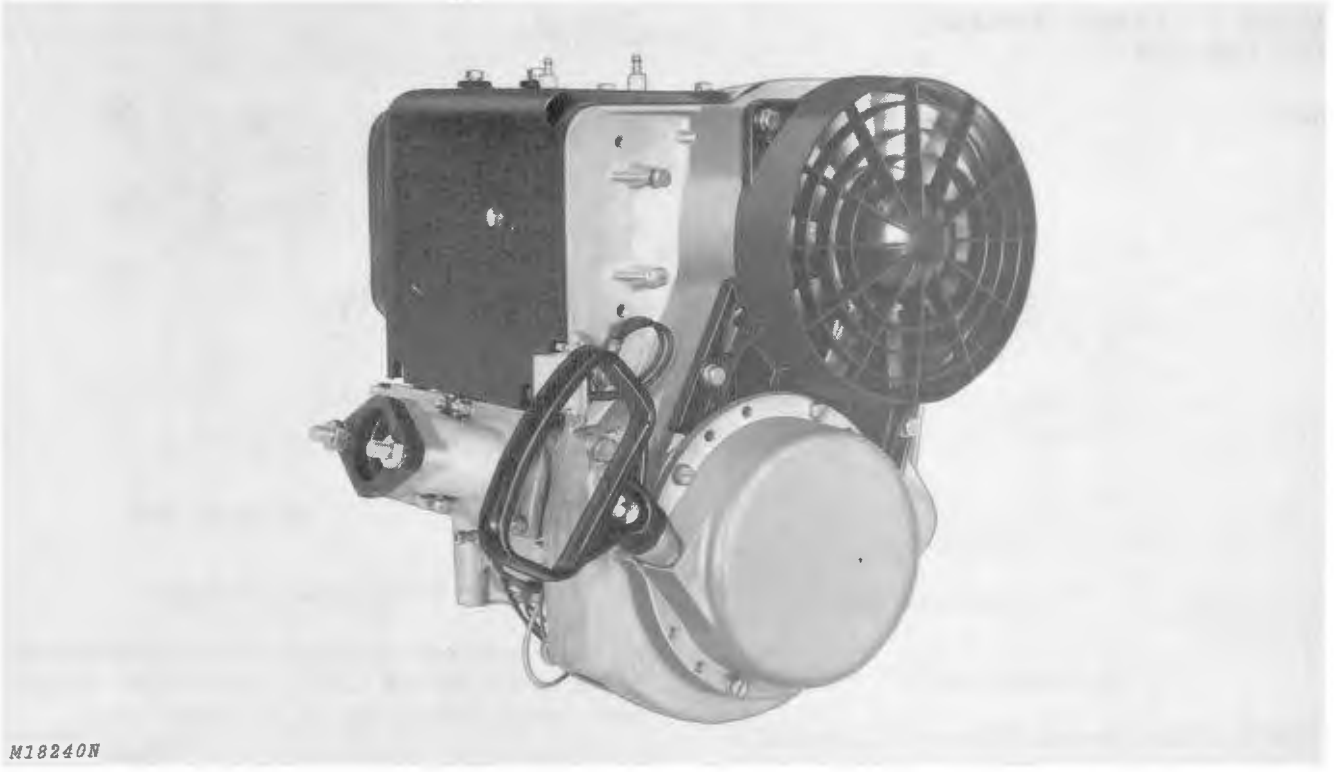


Fig. 1-John Deere Fan-Cooled Snowmobile Engine

The engines used in the John Deere 340 and 440 Cyclone Snowmobiles are 2-cylinder, 2-cycle, air-cooled engines.

The engines used in John Deere 340 and 440 Liquifire Snowmobiles are 2-cylinder, 2-cycle, liquid-cooled engines.

The 2-cycle engine is especially adaptable for snowmobile use because it offers a relatively small and lightweight package with high power output. The 2-cycle engine also can be operated at extreme angles without loss of lubrication. Design simplicity is another point in favor of the 2-cycle engine. No valves, tappets or camshaft are required.

The 2-cycle engine provides a power stroke for every revolution of the crankshaft as opposed to a power stroke for every other revolution in a conventional 4-cycle engine. This accounts for the high horsepower-to-weight ratio of the 2-cycle engine.

See "Principle of Reed Valve Engine Operation" on page 20-5-4 for basic fundamentals of 2-cycle reed valve engine operation.

Four sequences are shown under "Principle of Operation". Remember, however, that two sequences must take place with every stroke of the piston.

Example: As the piston moves upward, compression of the previous charge occurs in addition to fuel mixture intake into the crankcase.

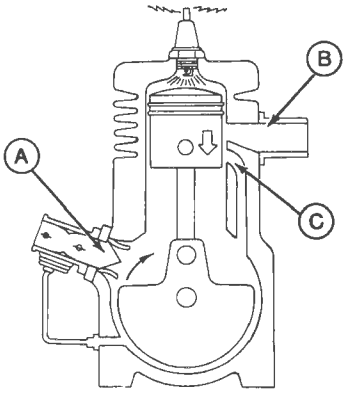
The engines feature ball bearings for crankshaft support and needle bearings at crankpin and piston pin locations.

Detailed specifications for the engines are covered in Section 10 and in Group 35 of this section.

PRINCIPLE OF REED VALVE ENGINE OPERATION

Stroke 1 - Power, Exhaust, Fuel Transfer

Power



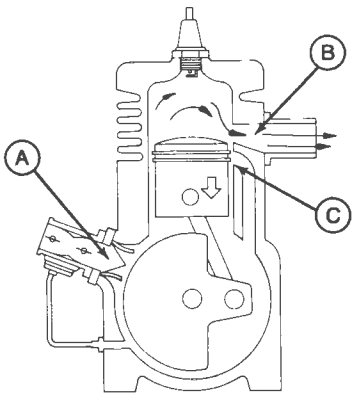
A—Reed Valves **C—Transfer Port**
B—Exhaust Port

Fig. 2-Power Stroke

Slightly before top dead center (TDC), ignition occurs, Fig. 2. Pressure on the burning gases, caused by combustion, pushes the piston downward. This action provides power to turn the crankshaft through the connecting rod.

Before the piston reaches the end of its downward movement, it exposes the exhaust port (B) and the transfer port (C). The reed valves (A) remain closed. The intake (reed valve) and exhaust ports are located on opposite sides of the cylinder.

Exhaust



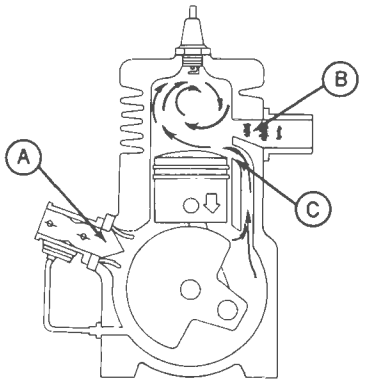
A—Reed Valves **C—Transfer Port**
B—Exhaust Port

Fig. 3-Power Stroke and Exhaust

The exhaust port (B, Fig. 3) is uncovered first. Hot gases, which are still under pressure from combustion, escape through the open exhaust port.

PRINCIPLE OF REED VALVE ENGINE OPERATION—Continued

Fuel Transfer



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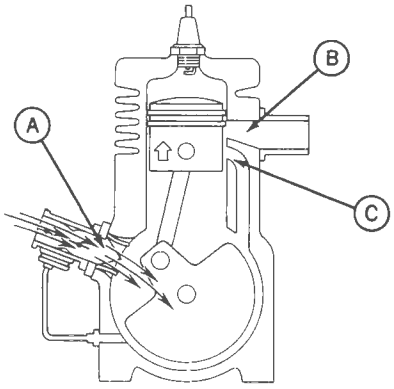
A—Reed Valves **C—Transfer Port**
B—Exhaust Port

Fig. 4-Power Stroke and Fuel Transfer

After uncovering the exhaust port (B, Fig. 4), the fuel transfer port (C), is uncovered. As the piston moves downward, it exposes the transfer port. The piston moving downward pressurizes the crankcase. This pressure holds the reed valves (A) closed and causes the fuel-air mixture in the crankcase to move up and out the transfer port (C) into the combustion chamber. The pressure developed in the crankcase is only slight pressure, but it is enough to force the new charge of fuel and air into the combustion chamber. This new charge also helps to drive out the remaining exhaust gases.

Stroke 2 - Compression, Intake

Compression and Intake



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A—Reed Valves **C—Transfer Port**
B—Exhaust Port

Fig. 5-Compression Stroke and Intake

As the piston moves upward, it closes the transfer port (C, Fig. 5) and exhaust port (B). Upward movement of the piston creates a partial vacuum (low pressure) in the crankcase. Atmospheric pressure forces a new charge of fuel and air from the carburetor through the reed valves, Fig. 9, into the crankcase.

The piston moves upward, compressing the fuel-air mixture. Just before the piston reaches TDC, a spark from the spark plug ignites the mixture, and it starts to burn. This begins another power stroke.

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Group 10
ENGINE ANALYSIS AND INSPECTION

ANALYSIS

Most engine trouble is of a minor, non-chronic nature due to electrical or fuel system difficulties. Make the following two checks to help isolate the cause of engine problems.

Spark Test

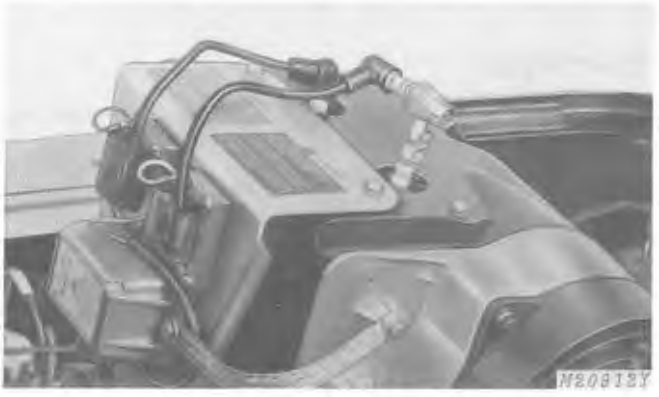

Fig. 1-Checking for Spark at Plug

Use JDM-74A-5 Ignition Tester Plug for checking spark. Install JDM-74A-5 tester plug on the plug in the engine. Connect high tension lead to the tester plug, Fig. 1. Start and run the engine. If the electrical system cannot fire the test plug and runs on only the one cylinder not being tested, electrical system difficulties exist. See Section 40. Check both cylinders.

⚠ CAUTION: High energy ignition systems can produce injurious electrical shock. DO NOT hold spark plugs, leads or connectors in your hand to check for spark.

If spark is good but engine will not start, check to see if fuel is getting to carburetor. If fuel is available and engine will not start, make compression test. See also "Diagnosing Malfunctions," page 20-10-5.

Compression Test

Fig. 2-Testing Engine Compression

Remove spark plugs and place a compression gauge in one of the spark plug holes, Fig. 2.

With choke "OFF", hold throttle in open position.

Hold compression gauge firmly in spark plug hole and crank engine vigorously as often as required until maximum reading of gauge is obtained. Test both cylinders for compression. For Snowmobiles (Serial No. 55,001-70,000) pressures should be 120 to 130 psi (8.2 to 8.9 bar) for liquid-cooled engines and 135 to 145 psi (9.3 to 9.9 bar) for air-cooled engines. For Snowmobiles (Serial No. 70,001 and up) pressures should be 120 to 130 psi (8.2 to 8.9 bar) for liquid-cooled engines and 125 to 135 psi (8.6 to 9.3 bar) for air-cooled engines.

Pressure should not vary by more than 10 psi (0.68 bar) between cylinders.

If compression pressure is low, check cylinder head gaskets for leakage. If head gaskets are not leaking it is a good possibility that pressure is leaking by worn or stuck piston rings, damaged pistons or damaged cylinder walls.

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Analysing Causes of Engine Failure

The majority of 2-cycle engine failures are due to excessive heat. Following is a list of the primary causes of snowmobile engine failure.

Fuel

Because the 2-cycle engine relies on a gasoline-oil mixture for lubrication, the mixture ratio and the quality of oil used are very important. The oil must retain its lubrication properties at extremely high temperatures. The oil must have an ashless base so it will not cause deposit build-up from burning with the gasoline.

The gasoline must have a minimum anti-knock index rating of 92 (Serial No. 55,001-70,000) and 88 (Serial No. 70,001-) to prevent "knocking" or "detonation" from high temperatures, high compression and advanced ignition timing.

Fuel-Air Mixture

Regardless of the quality of fuel used, the fuel-air mixture must be correct to maintain good, reliable engine performance.

The high speed main jet on the carburetor is probably the most common cause of engine failure. Often a "too lean" fuel mixture will appear to the inexperienced customer as making his 2-cycle engine run "better."

A lean fuel-air mixture also can be caused by air leakage at the following points:

1. Between crankcase halves
2. Around crankshaft seals
3. Between intake manifold and engine
4. Between carburetor and intake manifold

Dirt

The silencer used on the snowmobile is not intended to filter incoming air. The snowmobile is designed to operate on clean snow-covered areas, not in dirty, dusty conditions. Operation in conditions other than snow is not recommended.

Pistons coming from a snowmobile engine which has been run in dirt appear shot-peened. This type of failure is considered non-warranty, because the snowmobile was not designed for use under these conditions.

Ignition Timing

Overadvanced timing causes combustion temperatures to rise to the detrimental point. Overadvanced timing also causes "knocking" or "detonation."

Retarded timing can cause excessive heat in the exhaust port area of the cylinder.

Spark Plugs

Champion QN-1 spark plugs are recommended for use in the John Deere snowmobiles with CD ignition. It is an extremely cold plug.

IMPORTANT: For sustained high-speed running, use surface gap plugs QN-19V or N-19V.

It is important that the spark plug be properly seated with its gasket against the cylinder head. If not, the spark plug can run hot due to improper heat conduction to the cylinder head and cooling fins.

Heat

Although excessive heat can be attributed to most of the preceding causes of engine failure, lack of cooling on the engine exterior is also an important factor to consider when viewing an engine damaged from excessive heat.

Lack of engine cooling can be caused by one of the following:

1. Snow-plugged louvers in the hood
2. Dirty or damaged cylinder or cylinder head cooling fins
3. Damaged cooling fan
4. Slipping fan belt or coolant pump belt
5. Broken fan belt or coolant pump belt
6. Operating in "hot" weather
7. Plugged or restricted exhaust system
8. Liquid cooling system low on coolant.
9. Thermostat inoperative (liquid cooled system).

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The following pictures show engine components damaged from excessive heat. The cause of the excessive heat could be almost any of the preceding, except dirt damage.

With the exception of a broken defective fan or coolant pump belt, the conditions caused by excessive heat would be non-warranty items attributed to customer misuse or improper adjustments.

Fig. 3-Ring Breakage Damage

Fig. 3 illustrates a piston damaged from pre-ignition or detonation caused by excessive heat. When part of the piston broke away, a piece of exposed ring also broke away and caused extensive damage to the cylinder head and the head of the piston.

The piston pin color gives an indication of the excessive heat involved.

Ring and piston land breakage as shown in Fig. 3, without the indication of heat, would be caused by improper assembly of the engine.

The arrow on the head of the piston must point toward the exhaust port side of the engine. If not, ring end gaps will pass over the exhaust port, open slightly and catch, causing breakage.

Fig. 4 illustrates a piston which became excessively hot, started to melt and eventually scuffed and seized to the cylinder.

Notice how the severe melting and scuffing occurred on the exhaust port side of the piston and cylinder. Also notice the aluminum throw-off (from melting) adhering to the cylinder head.

Fig. 4-Piston and Cylinder Scuffing

Fig. 5-Cylinder Scuffing

Fig. 5 illustrates a close-up view of a scuffed cylinder. Note how the aluminum piston material transferred to and adhered to the cast iron cylinder wall from the excessive heat.

NOTE: Damaged cylinders can often be salvaged by scraping aluminum off the cylinder bore with a knife or bearing scraper. Use care in doing this to prevent additional marring of the cylinder. Light honing will remove score marks. A solution of Caustic Soda (Sodium Hydroxide) is excellent for removing aluminum from steel and is available at most pharmacies.

Analysing Causes of Engine Failure—Continued

Fig. 6-Melted and Scuffed Piston

Excessive heat due to pre-ignition caused the piston, Fig. 6, to melt away, freeze the rings and scuff the cylinder wall.

Notice how the top of the piston is starting to melt away in the center. Continued usage would cause complete burn-through.

Pre-Ignition

Pre-ignition is the igniting of the fuel-air mixture in the combustion chamber before the spark plug fires.

The most common causes of pre-ignition are:

1. Wrong heat range of spark plugs (too hot).
2. Deposits in the combustion chamber.

Pre-ignition causes the fuel-air mixture to burn longer than was intended which creates excessive heat on the piston dome. If the situation is not corrected, the piston dome will start to melt and eventually burn through the dome and/or scuff the piston wall.

Knock (Detonation)

Knock is indicated by a high frequency "ping" and is very hard to distinguish in high-speed, high-output, 2-cycle engines (especially liquid-cooled engines). It occurs when the fuel-air mixture is compressed to a point where spontaneous ignition of the entire mixture occurs.

The most common causes of knock in a 2-cycle engine are:

1. Fuel of too low an anti-knock index rating self-ignites at too low a temperature.
2. Over-advanced timing creates excessive combustion chamber heat. A portion of the unburned fuel mixture can be compressed in the combustion chamber and self-ignited due to this excessive heat.
3. Excessive compression caused by heavy deposit build-up. The compression exceeds the anti-knock capability of the fuel and the fuel mixture ignites prematurely.
4. A lean fuel-air mixture results in high combustion chamber heat. A portion of the unburned fuel mixture can be compressed in the combustion chamber and self-ignited due to this excessive heat.

Knock damage is indicated by a cratered piston dome and eroded ring lands.

Fig. 7-Piston Burn-Through

Piston burn-through, Fig. 7, is usually caused by spark plugs with too "hot" a heat range. This is generally referred to as spark plug induced pre-ignition.

Always locate and correct the cause of the problem before putting an engine back into service. Warn and advise the customer of the dangers of tampering with carburetor settings, using poor quality gasoline and oil, and of using spark plugs other than those recommended for use in his machine.

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DIAGNOSING MALFUNCTIONS

Engine

Engine Will Not Start

Carburetor and/or fuel pump faulty.

Spark plugs faulty.

Fuel lines obstructed.

Head gasket leaking.

Electrical connections loose.

Engine Starts With Difficulty

Carburetor out of adjustment.

Choke not functioning properly.

Spark plugs fouled.

Ignition coil weak.

Fuel mixture incorrect.

Ignition out of time.

Water in fuel system.

Faulty reed valve.

Engine Won't Crank

Piston seized.

Crankshaft seized to bearings.

Connecting rod broken.

Faulty recoil starter.

Engine Will Not Idle Properly

Carburetor idle adjustments incorrect.

Air screw on carburetor not adjusted.

Head gasket leaking.

Fuel mixture incorrect.

Crankshaft seal leaking.

Impulse tube to fuel pump obstructed or leaking.

Engine Misses At High Speeds

Ignition out of time.

Fuel pump faulty.

Head gasket leaking.

Ignition coil weak.

Incorrect main jet in carburetor.

Impulse tube to fuel pump obstructed or leaking.

Engine Overheated

Wrong main jet in carburetor.

Ignition out of time.

Air leak in intake system or crankcase.

Coolant pump drive belt broken or slipping.

Coolant pump damaged.

Coolant leak in cooling system.

Cooling fan drive belt broken or slipping.

Cooling fins obstructed or damaged.

Cooling fan broken or damaged.

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DIAGNOSING MALFUNCTIONS—Continued

Engine—Continued

Engine Runs Rough and Smokes

Improper fuel mixture.

Choke plunger not seated.

Muffler obstructed.

Water in fuel.

Engine Kicks Back and Backfires

Ignition out of time.

Engine Loses Power or Acceleration

Carburetor out of adjustment.

Engine overheating.

Ignition out of time.

Ignition coil weak.

Fuel mixture incorrect.

Muffler obstructed.

Reed valves not closing properly.

Running on one cylinder.

Restricted in-line fuel filter.

Recoil Starter

Pawls Not Extending When Rope Is Pulled

Friction spring broken allowing friction plate to rotate.

Retaining nut loose.

Pawls Not Returning When Rope Is Released

Return spring broken.

Return spring not assembled properly.

Rope Not Returning

Main spring broken or unhooked.

No lubrication between friction plate and washer.

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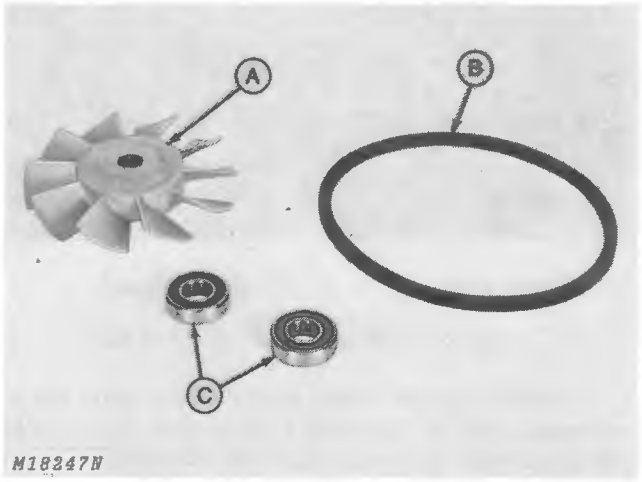
INSPECTION

NOTE: Normally, "Inspection" would be located in each group after disassembly. To keep from being repetitious in each of the engine groups, inspection has been grouped with analysis.

Clean all parts except stator assembly with cleaning solvent.

Inspecting Fan and Fan Belt



A—Cooling Fan **C—Fan Bearings**
B—Fan Belt

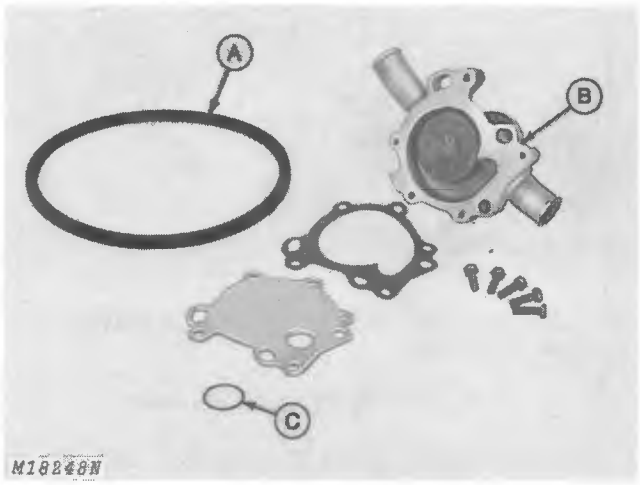
Fig. 8-Inspecting Fan and Fan Belt

Inspect fan (A, Fig. 8) for cracked, broken or damaged fins. Dress nicks or dents with a file. If fins are cracked or broken, fan must be replaced.

Inspect fan bearings (C) for wear or looseness. Replace if necessary.

Replace fan belt (B), if frayed, stretched, or deteriorated.

Inspecting Coolant Pump and Coolant Pump Belt



A—Coolant Pump Belt **C—O-Ring**
B—Coolant Pump

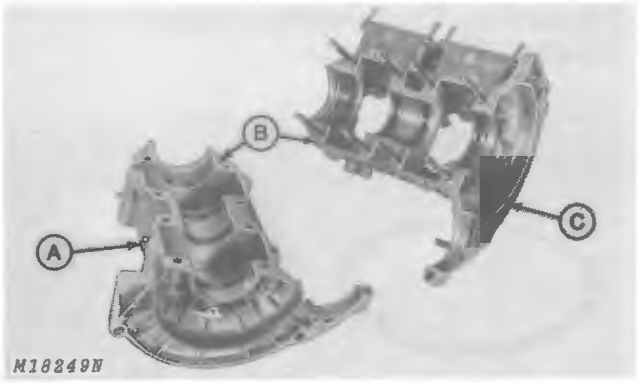
Fig. 9-Inspecting Cooling System Components

Inspect O-ring (C, Fig. 9), for damage, cracks or breaks. Replace if necessary.

Inspect coolant pump (B, Fig. 9), for internal wear caused by cooling system contamination or dirt.

Replace coolant pump belt (A, Fig. 9), if frayed, stretched, or deteriorated.

Inspecting Crankcase



A—Lower Crankcase **C—Upper Crankcase**
B—Sealing Surfaces

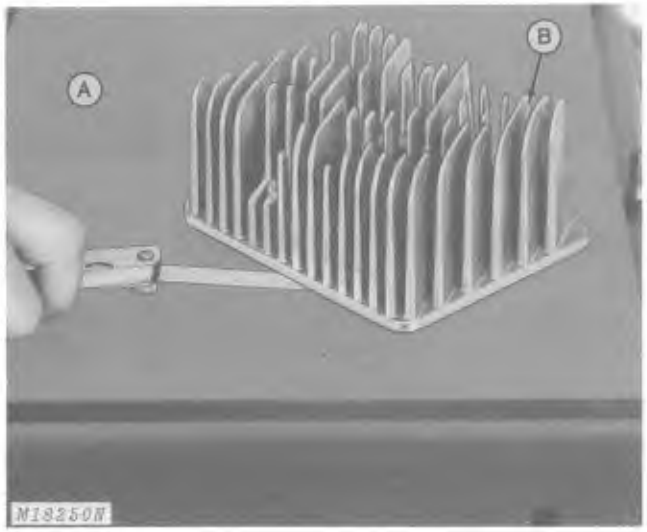
Fig. 10-Inspecting Crankcase Halves

Visually inspect crankcase sealing surfaces, (B, Fig. 10) for deep scratches, scoring or pitting. Inspect bearing and oil seal retaining inserts for wear, scoring or conditions that could cause leaks.

NOTE: Minor indication of crankshaft bearing outer race "rotation" in the crankcase halves can be considered normal.

Replace crankcase halves if damaged. Crankcase halves are available only in a matched set.

Inspecting Fan-Cooled Cylinder Head



A—Surface Plate **B—Cylinder Head**

Fig. 11-Checking Cylinder Head Flatness

Carefully scrape carbon from cylinder head (B) and exhaust ports of cylinders. Use a soft metal (nonferrous) scraper to avoid damage. A wooden spatula works well for cleaning exhaust ports.

Use a spark plug tap (14 mm) to clean carbon from spark plug threads in cylinder head, if required.

Place cylinder head (B) on a surface plate (A, Fig. 11) and measure at various points between head (B) and surface plate (A) with a 0.001 inch (0.025 mm) feeler gauge.

There should be no clearance in any area.

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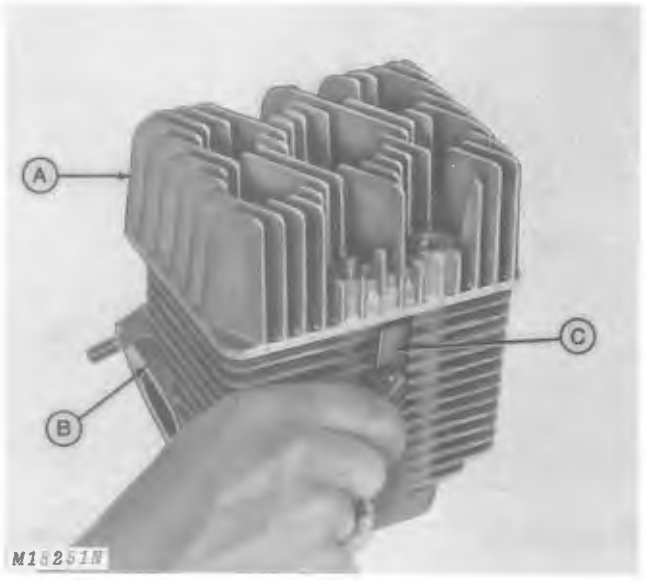
Inspecting Fan-Cooled Cylinder



A—Cylinder **C—Feeler Gauge**
B—Cylinder Head

Fig. 12-Checking Cylinder Distortion

Install a serviceable cylinder head (B, Fig. 12) on cylinders (A). Install without gasket or hold-down nuts.

Measure for distortion between studs with a feeler gauge, (C, Fig. 12). Maximum allowable distortion is 0.002 inch (0.05 mm).

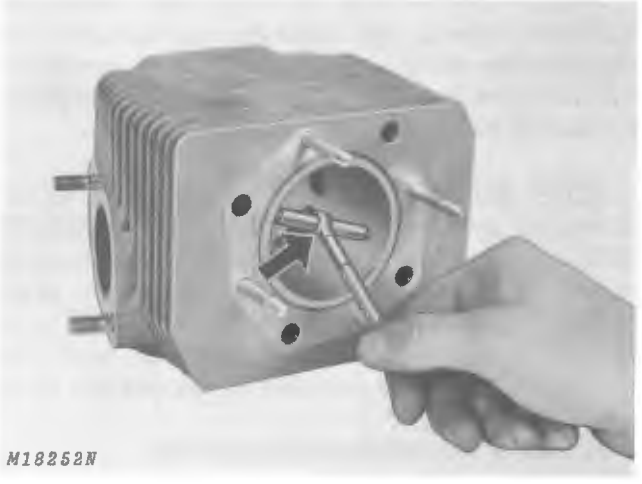


Fig. 13-Measuring Cylinders

Measure cylinders with an inside micrometer, Fig. 13. Measure parallel with the crankshaft and at right angles to crankshaft at both top and bottom of ring travel. If at all possible, salvage cylinder as explained on page 20-10-10.

Inspecting Liquid-Cooled Cylinder Head Assembly

Fig. 14-Inspecting Cylinder Head Assembly

Inspect liquid-cooled cylinder head (Fig. 14, for excessive carbon build-up within the combustion chamber. Check that all coolant ports are open to permit adequate coolant flow.

Inspecting Liquid-Cooled Cylinder Assembly

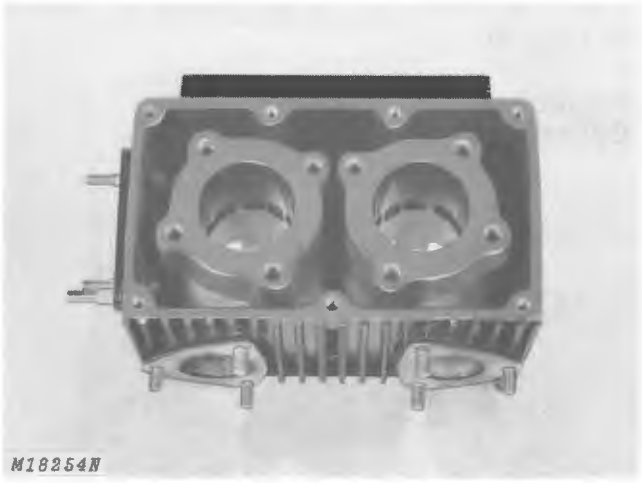
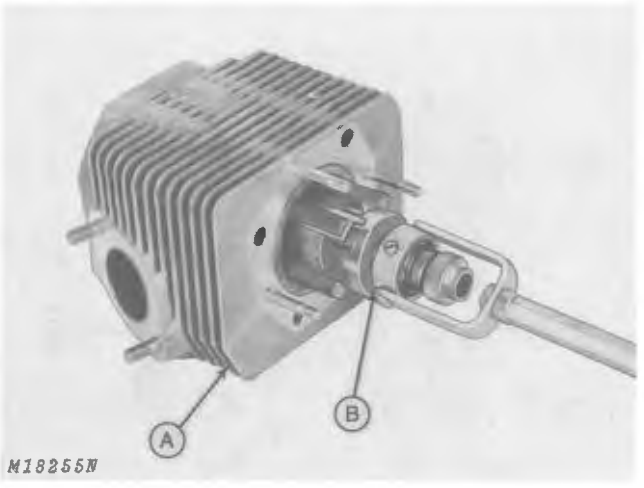


Fig. 15-Inspecting Cylinder Assembly

Inspect cylinder assembly, Fig. 15, for scuffing or scoring. Inspect mating surfaces for nicks which could cause improper sealing of the cylinder head to the cylinder assembly.

NOTE: Damaged cylinders can often be salvaged by scraping aluminum off the cylinder bore with a knife or bearing scraper. Use care in doing this to prevent additional marring of the cylinder. Light honing will remove score marks. A solution of Caustic Soda (Sodium Hydroxide) is excellent for removing aluminum from steel and is available at most pharmacies.

Honing Cylinders



A—Cylinder **B—Fine Stone Cylinder Hone**

Fig. 16-Honing Cylinders

If cylinder (A) is within wear tolerance, but lightly scored, hone by running a fine stone cylinder hone (B) lightly in cylinder, Fig. 16. Follow manufacturer's recommendations.

IMPORTANT: Use only a fixed four-stone hone.

Clean thoroughly with detergent and water to remove all particles.

Reboring Cylinders

Measure cylinder bore for wear. Using inside micrometer or bore gauge, check the area just below top of bore. Wear will be indicated by a "step" worn in the wall. Measure at right angles (90 degrees) to the piston pin axis at the top where most wear occurs.

NOTE: Machine bore or use a rigid hone for reboring the cylinder. Use a coarse stone (AMMCO-3952) for removing the first 0.008 inch (0.2032 mm) of material from the bore. Change to a less coarse stone (AMMCO-3954) for finishing the final 0.002 inch (0.0508 mm). Use hones for cast iron. BE SURE the correct stone is used and that stones are not worn.

1. Anchor the cylinder before reboring.

2. Set the drill press to operate from 450 to 700 rpm.

3. Lower the hone to the point where the lower end extends 1/2 to 3/4 inch (1.2 cm to 1.9 cm) past the end of the cylinder.

4. Rotate the adjusting nut on the hone until the stones come in contact with the cylinder wall at the narrowest point.

5. Turn the hone by hand. If you cannot turn it, the hone is too tight. Loosen hone until it can be turned by hand.

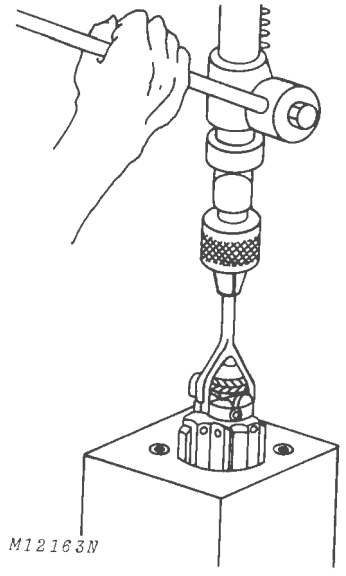


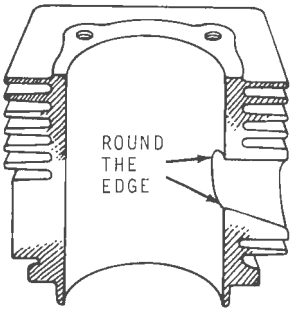
Fig. 17-Honing the Cylinder

6. Start the drill. Move the hone up and down in the cylinder approximately 40 cycles per minute, Fig. 17. Follow the hone manufacturer's recommendations.

NOTE: Some hones require oil and some will not work with even a small amount of oil on the cylinder wall.

7. Check the diameter of the cylinder regularly during honing. (Stop the drill before measuring and remove the hone from the cylinder.)

8. When the cylinder is approximately 0.002-inch (0.050 mm) within the desired bore specification, change to a less coarse stone (AMMCO-3954) and finish the bore. Finish should not be smooth, but have a 45-degree cross-hatch pattern.



M12164N

Fig. 18-Rounding Edges of Ports

9. After reboring, remove any burrs that may have formed at edges of all ports. Use a pencil grinder or emery cloth and just round the edges of the ports, Fig. 18.

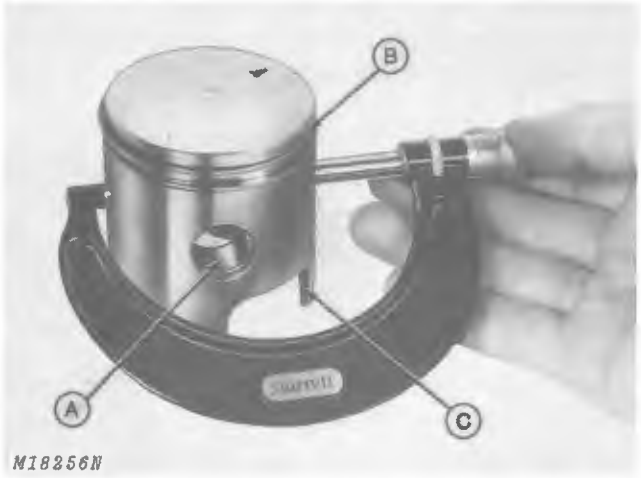
IMPORTANT: Be careful when rounding the ports. Take off only enough to allow the rings to pass the port freely. If the port is rounded too much, hot exhaust gases may blow by the rings on the piston down-stroke, burning the rings.

10. Clean the cylinder thoroughly. Use soap, warm water and clean rags. Clean the cylinder wall for a "white glove" inspection. A clean white rag should not show soil from the cylinder wall.

IMPORTANT: DO NOT use solvent or gasoline because these fluids only wash all the oil from the cylinder wall. They do not remove metal particles produced during honing.

11. Dry the cylinder and coat it with 2-cycle engine oil.

Inspecting Piston and Piston Pin



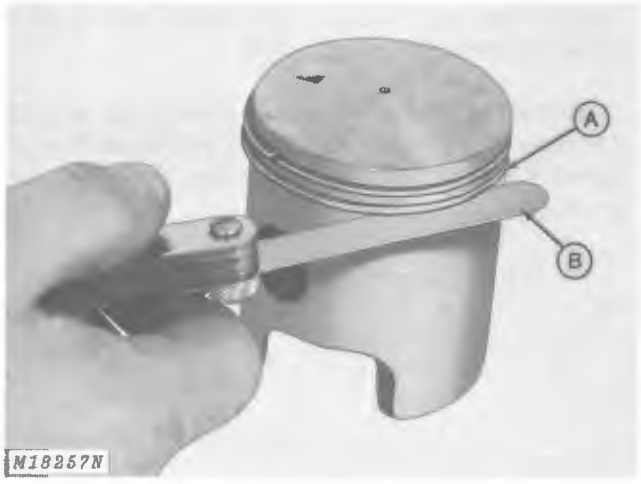
A—Piston Pin Bore **C—Piston Skirt**
B—Top Land

Fig. 19-Measuring Piston

Clean piston ring grooves with a ring groove cleaner or the broken section of an old ring if proper tool is not available.

Inspect piston for evidence of scoring, pitting, or corrosion.

Measure piston at right angles to piston pin for wear at top land (B, Fig. 19) and at skirt (C). Measure piston pin bore (A) with an inside micrometer.



A—New Ring **B—Feeler Gauge**

Fig. 20-Measuring Ring Side Clearance

Install a new ring (A) into ring groove and measure side clearance (1976 engines, lower ring only) with a feeler gauge (B) as shown in Fig. 20.

Fig. 21-Measuring Piston Pin

Measure piston pin with a micrometer, Fig. 21.

Checking Ring End Gap

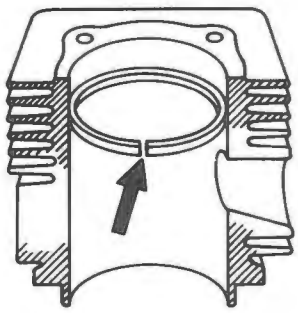


Fig. 22-Checking Ring End Gap

Place ring in piston bore just below the top of piston travel. Measure the ring end gap with a feeler gauge, Fig. 22.

NOTE: Use a piston to position the ring in the bore to insure that the ring is squarely placed for measurement.

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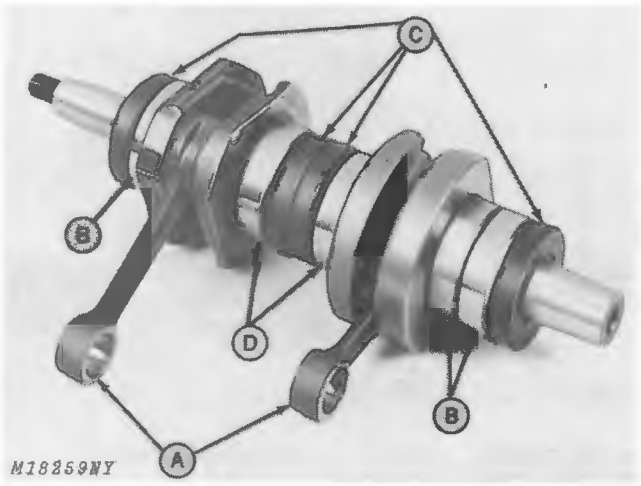
Inspecting Crankshaft and Connecting Rod



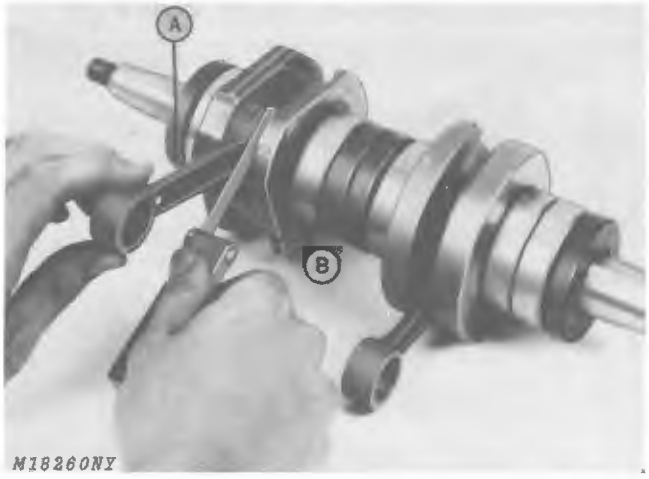
A—Connecting Rods **C—Seals**
B—Outer Bearings **D—Inner Bearings**

Fig. 23-Inspecting Crankshaft and Connecting Rod

Inspect threads on each end of crankshaft, Fig. 23. Inspect keyway on flywheel end and taper on each end of crankshaft for scoring or wear.

Inspect ball bearings for wear, free movement, and security. The outer bearings (B) are replaceable. If inner bearings (D) are worn, the crankshaft assembly must be replaced.

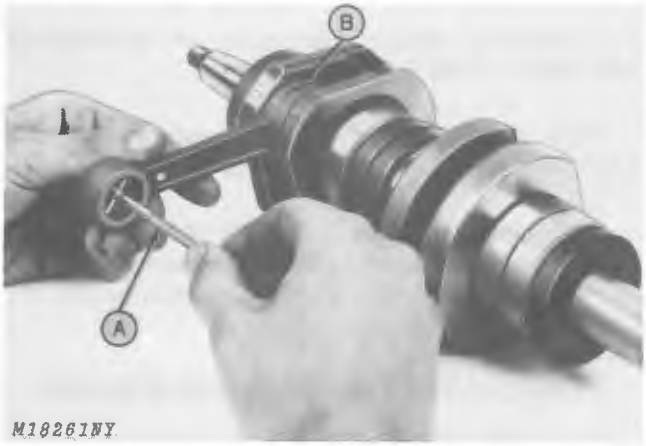
Inspect seals (C) for wear or damage. Outer seals (B) are replaceable, while inner seals (D) are available only with the complete crankshaft assembly.



A—Connecting Rod **B—Feeler Gauge**

Fig. 24-Measuring Connecting Rod Side Clearance

Measure connecting rod side clearance with a feeler gauge (B, Fig. 24).



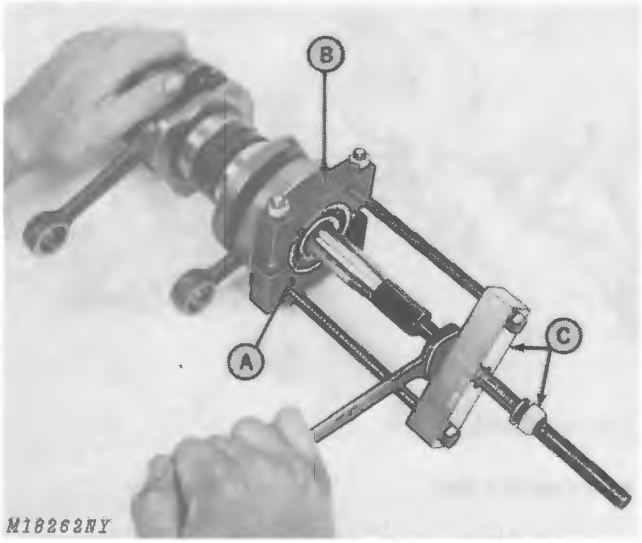
A—Inside Micrometer **B—Crankpin Bearing**

Fig. 25-Measuring Connecting Rod Small End

Inspect crankpin, and piston pin needle bearings (B, Fig. 25) for wear or looseness. Piston pin bearings are available for service while crankpin bearings are available with the complete crankshaft assembly only.

Measure connecting rod small end diameter with an inside micrometer, (A, Fig. 25). Replace crankshaft assembly if not within tolerance, or if badly scored or discolored.

Removing Crankshaft Outer Bearings



A—Outer Bearing **C—JDM-8-3 Puller**
B—JDM-8-3

Fig. 26-Removing Crankshaft Outer Bearings

If inspection reveals outer seals and bearings (A) are defective, they can be replaced.

Remove Woodruff key from flywheel end of crankshaft and slide seals off crankshaft.

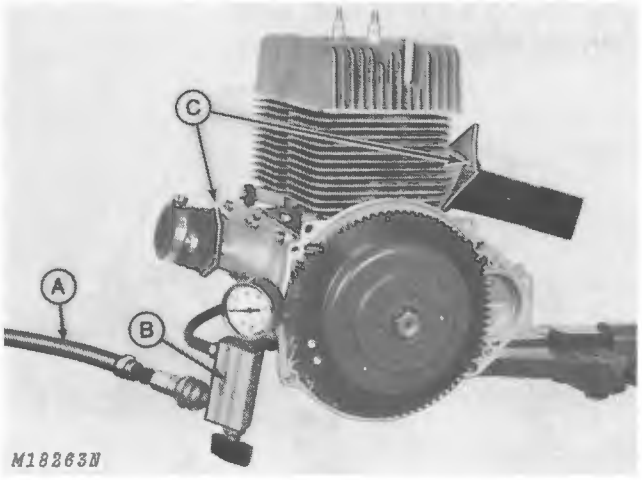
Remove outer bearings (A) as shown in Fig. 26 using crankshaft bearing tool (B). Thread other end of puller (C) into PTO end of crankshaft to remove PTO end bearings.

PRESSURE TESTING THE ENGINE

If detonation-type piston failures have been experienced and a fuel lean-out is suspected, the following precedure should be performed:

JDM-44 Pressure Regulator comes complete with the necessary items to seal the intake and exhaust system and pressure test the crankcase on both liquid-cooled and fan-cooled engines. Pressure test the engine as follows.

1. Seal the exhaust system by placing a rubber sheet (C, Fig. 27) (supplied with JDM-44) between exhaust manifold and cylinders. Use manifold gaskets as templates to cut stud holes in rubber sheet.



A—Air Supply **C—Rubber Sheets**
B—JDM-44 Pressure Regulator

Fig. 27-Pressure Testing the Engine

2. Seal intake system by placing rubber sheet (C) between carburetor and intake manifold. Use carburetor gasket as a template to cut stud holes in rubber sheet.

3. Install and torque spark plugs to 15 to 20 ft-lbs (20 to 27 Nm).

4. Connect pressure regulator (B) to impulse fitting. Close valve (clockwise) on regulator.

5. Connect shop air (A) to pressure regulator. Open valve until gauge reads 7 psi (0.48 bar). Close valve.

6. Gauge needle should not drop below 5 psi (0.34 bar) for at least 10 seconds.

7. If needle drops too rapidly, open valve on regulator (B) to maintain 7 psi (0.48 bar). A water and liquid soap solution applied to seals and seams will help to locate leakage. Correct leakage before putting engine back in service.

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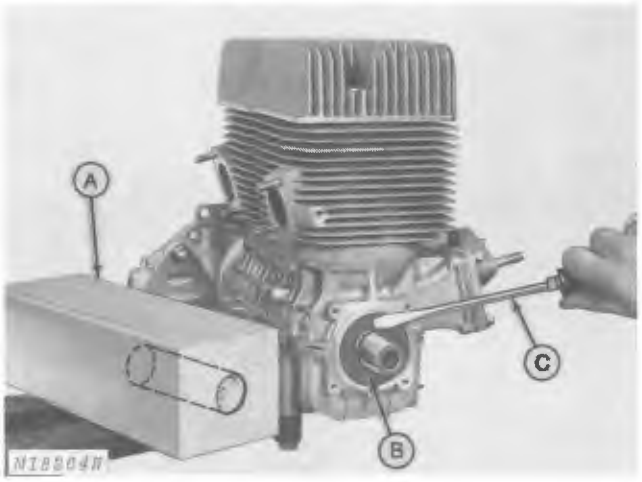
REPLACING PTO END BEARING SEAL



A—Wooden Block
B—PTO End Bearing Seal
C—Screwdriver

Fig. 28-Replacing PTO End Bearing Seal

To replace PTO end bearing seal, proceed as follows:

1. Remove clutch.

2. Remove PTO end seal guard.

3. Use a cold chisel to make a slot in old seal. Pry old seal out with a long screwdriver blade (C, Fig. 28).

IMPORTANT: Use care not to chisel too deep or damage to crankshaft and/or bearing may result.

4. Clean crankshaft surface.

5. Coat inner and outer seal surfaces with STP or equivalent for ease of installation. Do not use snowmobile oil as a lubricant.

6. Install new seal by using a 4 x 4-inch (10.1 x 10.1 cm) block of hard wood, 12 inches (30.5 cm) long with a 1-1/4-inch (3.14 cm) diameter hole drilled 3 inches (7.6 cm) deep in end of block. Place tool over crankshaft, align seal, and drive seal into place until flush with crankshaft. Be careful not to cock seal.

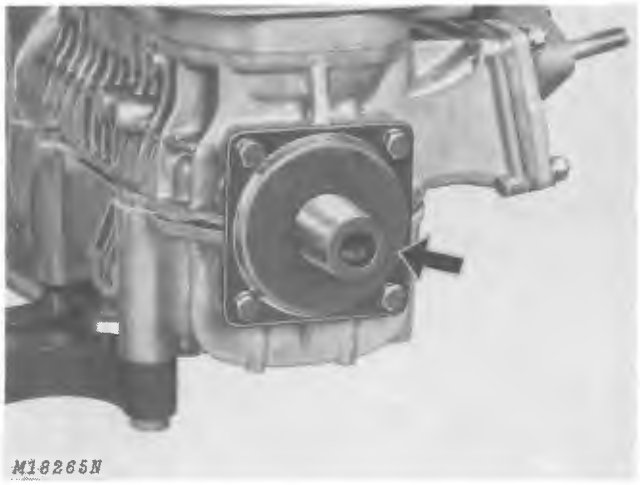


Fig. 29-PTO End Seal Guard

NOTE: Some engines have a PTO end seal guard, Fig. 29, which prevents a failed drive belt from damaging the PTO end seal.

When installing seal guard, center hole in guard around crankshaft before tightening screws. This will prevent guard from contacting crankshaft.

Litho in U.S.A.

Group 15
FAN-COOLED REED VALVE ENGINE OVERHAUL

GENERAL INFORMATION

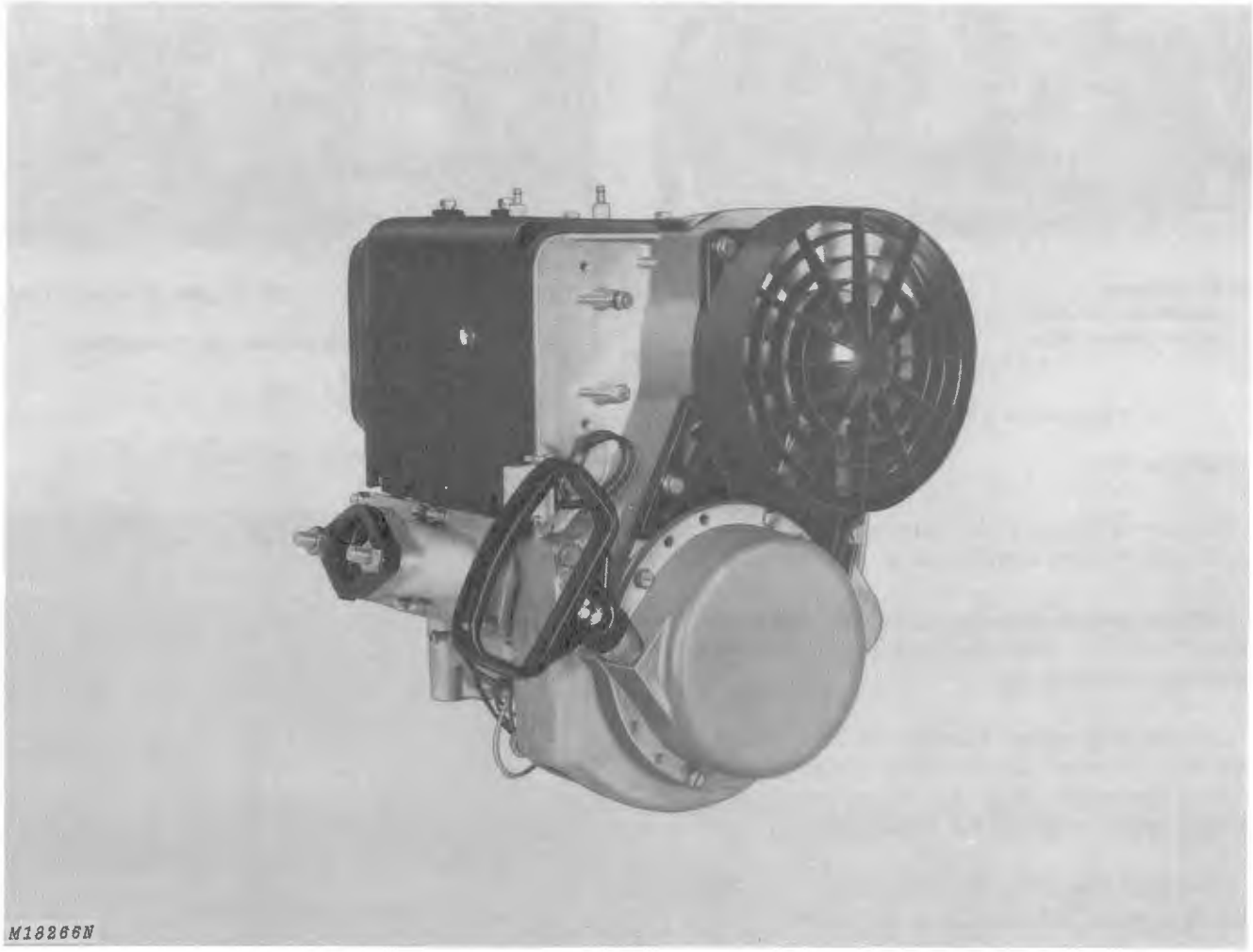


Fig. 1-Fan-Cooled Reed Valve Engine

Fan-cooled reed valve engines, Fig. 1, have five ball bearings; two between crank-throws, one on the flywheel end, and two on the PTO end of the crankshaft. Needle bearings are used at both crankpin and piston pin locations.

The crankshaft, inner ball bearings and seals, connecting rods and crankpin bearings are available only as a complete assembly. If any of these parts are worn or damaged an entire crankshaft assembly must be installed. The complete assembly also includes outer seals and bearings which may, however, be purchased separately. The crankcase upper and lower halves are available only as a matched set.

The reed valve engine has metric handware. Always use proper tools when servicing the engine.

See Group 5 for "Principle of Reed Valve Engine Operation".

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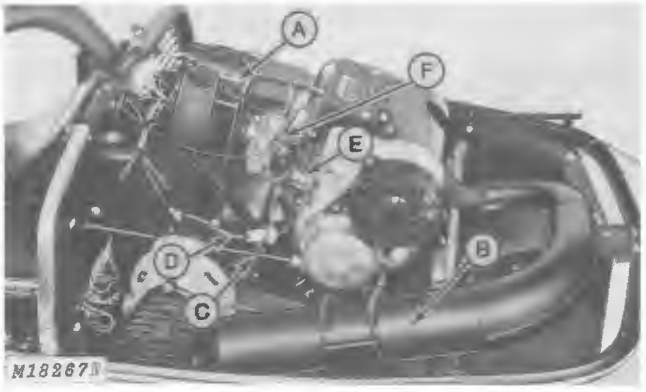
REMOVING ENGINE



A—Air Silencer
B—Expansion Chamber
C—Recoil Starter Rope
D—Fuel Line
E—Engine Coupler
F—Choke Plunger and Cable

Fig. 2-Disconnecting Engine from Snowmobile

Remove hood.

Remove spring on air silencer strap, loosen clamps on carburetor boots and remove air silencer (A, Fig. 2).

Remove springs securing expansion chamber (B) to exhaust manifold and supporting bracket and remove expansion chamber (B).

Untie knot in starter handle and allow the starter rope (C), to rewind into the starter housing. Tie a slip knot in the starter rope (C), to prevent rope from winding all the way into the starter housing.

Close fuel shut-off valve (Serial No. -80,000) and disconnect fuel line (D), to fuel pump.

Disconnect electrical coupler (E), by removing plastic strap lock.

Remove choke plunger and cable (F).

A—Drive Belt **B—Throttle Valve and Cable**

Fig. 3-Disconnecting Engine from Snowmobile

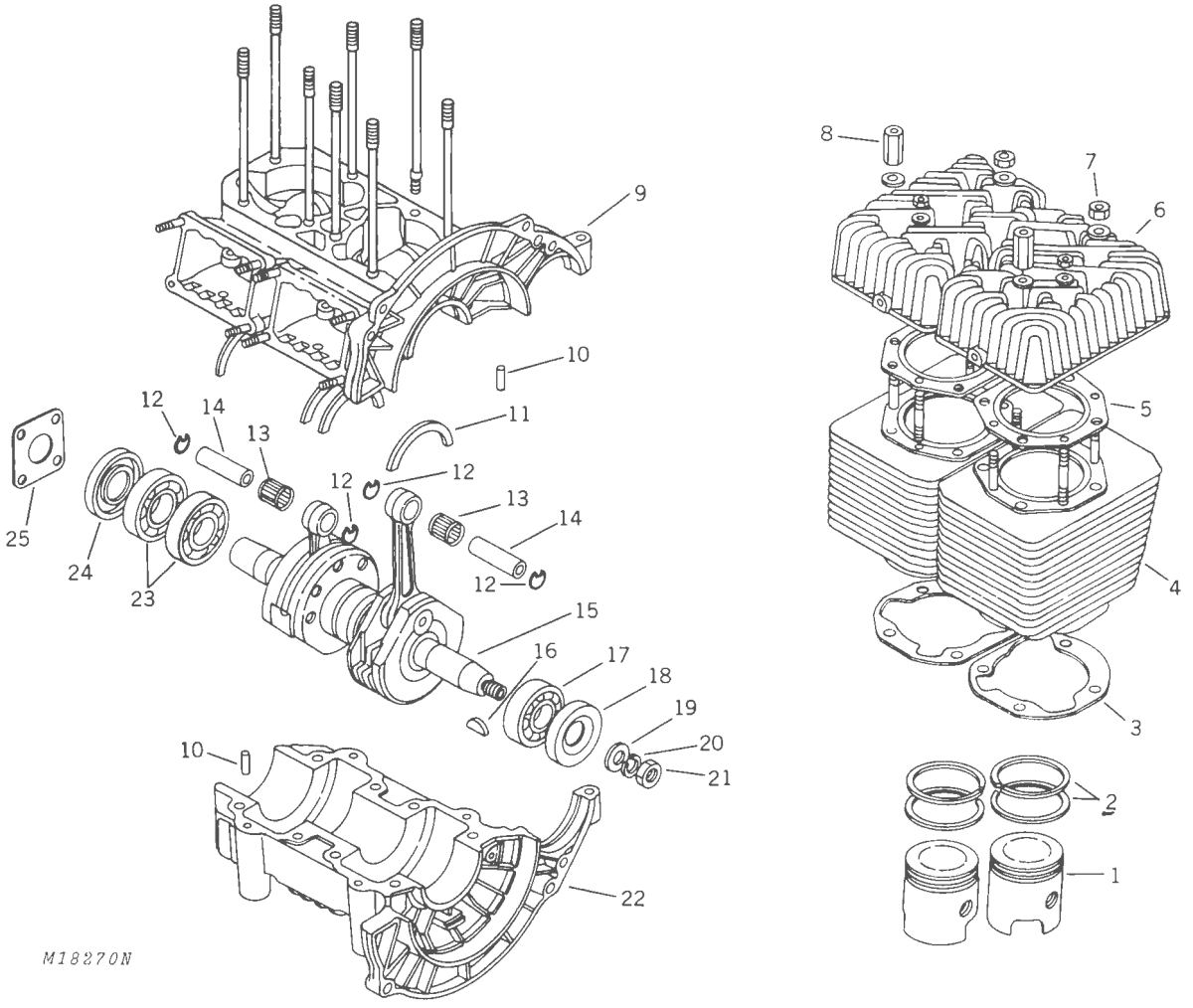
Remove drive belt (A, Fig. 3).

Remove throttle valve and cable (B, Fig. 3).

Fig. 4-Removing Engine

Remove four lock nuts securing engine base assembly to rubber mounts. Lift engine and base from snowmobile.

DISASSEMBLY

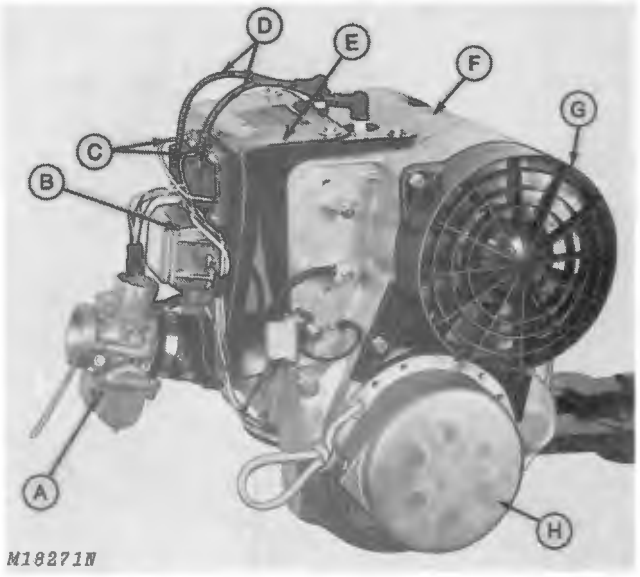


1—Piston
2—Rings
3—Cylinder Base Gasket
4—Cylinder
5—Head Gasket
6—Cylinder Head
7—Nut
8—Special Long Nut
9—Upper Crankcase Half
10—Dowel
11—Bearing Retaining Clip
12—Circlip
13—Connecting Rod Needle Bearings
14—Piston Pin
15—Crankshaft Assembly
16—Woodruff Key
17—Crankshaft Bearing (fan end)
18—Oil Seal (fan end)
19—Washer
20—Lock Washer
21—Nut
22—Lower Crankcase Half
23—Crankshaft Bearing (PTO end)
24—Oil Seal (PTO end)
25—PTO Seal Guard

Fig. 5-Exploded View of Fan-Cooled Reed Valve Engine

Removing Exterior Components

NOTE: To prevent loss and to aid in assembly, keep attaching hardware with each part as it is removed.



A—Carburetor
B—Electronic Pack
C—Ignition Leads
D—Spark Plug Cables
E—Coil Bracket
F—Cylinder Cover
G—Fan Guard
H—Recoil Starter Assembly

Fig. 6-Removing Exterior Components

Remove carburetor (A, Fig. 6).

Disconnect ignition leads (C) from coils. Disconnect electronic pack coupler and remove electronic pack (B).

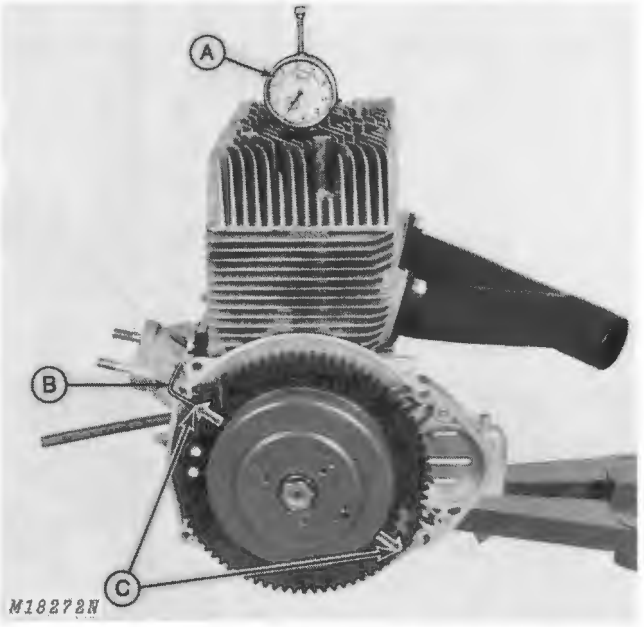
Remove spark plug cables (D) and coil bracket (E).

Remove bolts securing cylinder cover (F) to engine and remove cylinder cover.

Remove bolts securing fan guard (G) to engine and remove fan guard.

Remove recoil starter assembly (H).

Checking Crankshaft for Twist



A—Dial Indicator
B—Pointer
C—Marks on Flywheel

Fig. 7-Checking Crankshaft for Twist

Set up dial indicator (A, Fig. 7) in No. 1 cylinder to determine TDC (Top Dead Center). With piston at TDC, fasten a brass pointer (B) on the intake manifold stud and direct it to a mark (C) on a tooth of the ring gear on the flywheel.

Set up dial indicator (A) in No. 2 cylinder. Rotate flywheel 180 degrees to align with a mark (C) on flywheel ring gear with pointer (B).

With pointer (B) aligned to mark, dial indicator (A) should indicate No. 2 piston is at TDC or within 0.003-inch (0.0762 mm) either way of TDC.

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Disassembling Fan Cover

If inspection reveals damaged cooling fan blades or worn fan shaft bearings, further disassembly is necessary to replace parts.

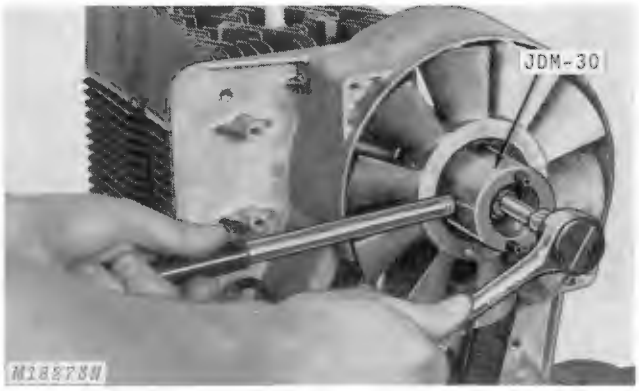
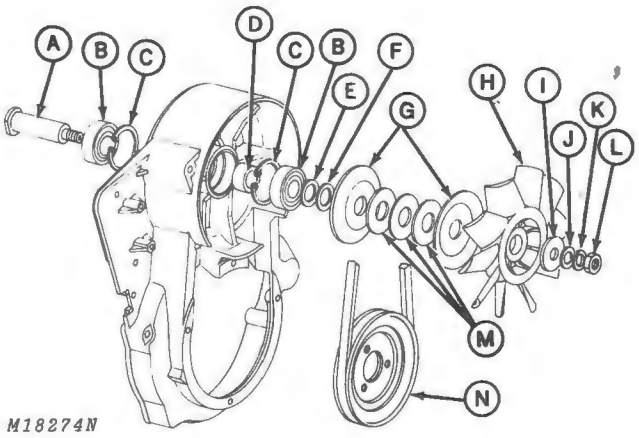


Fig. 8-Removing Retaining Nut

Use JDM-30 Spanner Wrench to remove retaining nut, Fig. 8.



A—Fan Shaft
B—Bearings (2 used)
C—Snap Ring (2 used)
D—Spacer
E—Thick Washer
F—Thin Washer
G—Sheave Halves
H—Fan
I —Spacer
J —Plain Washer
K—Lock Washer
L —Retaining Nut
M—Spacing Washers
N—Pulley

Fig. 9-Fan Assembly

Remove retaining nut (L, Fig. 9), washers (E, F, I, J, K and M), sheave halves (G) and spacers (D) from fan shaft (A). Drive fan assembly out of bearings by tapping it lightly with a soft mallet. Inner bearing should remain on shaft, and can be pulled off shaft. Carefully drive outer bearing out of fan cover with a soft drift.

Replace parts as necessary.

Removing Flywheel

Fig. 10-JDM-64-1 Flywheel Holding Tool

Install JDM-64-1 Flywheel Holding Tool, Fig. 10. Remove retaining nut, lock washer and flat washer securing flywheel to crankshaft.

Fig. 11-Removing Flywheel

NOTE: Flywheel housing must be removed before flywheel can be removed.

Install JDM-9, Flywheel Puller, Fig. 11, using the three tapped holes in the flywheel. Hold flywheel with JDM-64-1 Holding Tool and tighten puller center bolt to 35 to 40 ft-lbs (47 to 54 Nm).

NOTE: Do not overtorque center bolt of flywheel puller. Do not hammer on end of puller bolt because damage to crankshaft or bearings may result.

If flywheel does not break loose, leave puller in place and strike flywheel with a plastic or wood mallet in line with flywheel keyway.

IMPORTANT: Do not strike flywheel with a steel mallet, because this can cause permanent damage to the flywheel.

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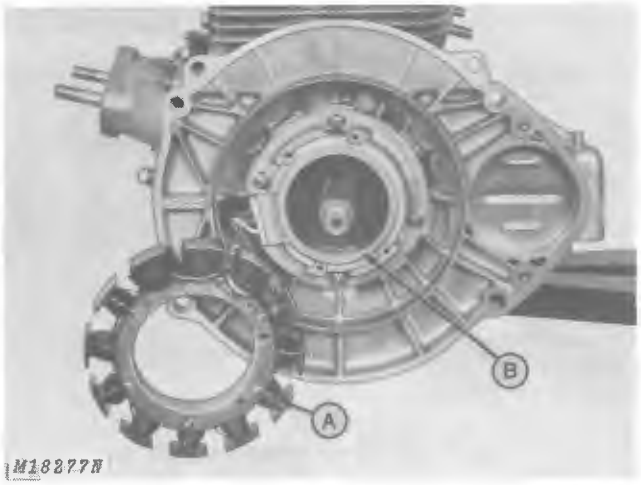
Removing Stator Assembly



A—Stator Assembly **B—Trigger Ring**

Fig. 12-Removing Stator Assembly

Remove stator assembly (A, Fig. 12) by removing four attaching screws. Remove the four screws securing trigger ring (B) to the crankcase and remove trigger ring.

See Section 40 - Electrical System to test ignition components.

Removing Cylinder Heads

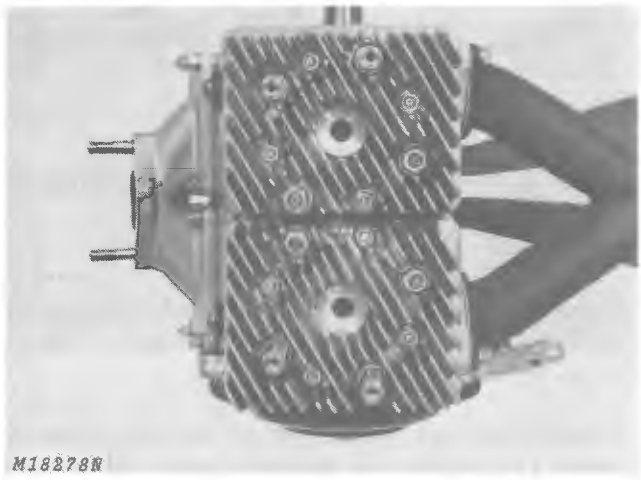
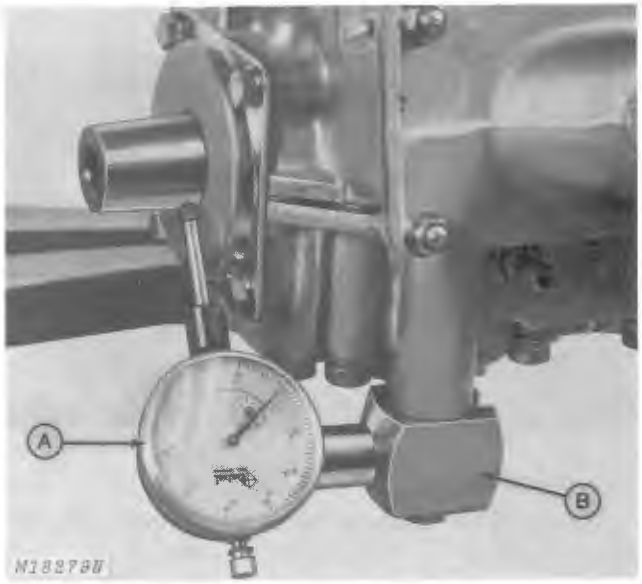


Fig. 13-Removing Cylinder Heads

Remove eight cylinder head retaining nuts, Fig. 13. Remove cylinder heads and discard gaskets.

Checking Crankshaft Runout

Before proceeding further with engine disassembly, check crankshaft runout.



A—Dial Indicator **B—JDM-10 Mounting Bracket**

Fig. 14-Checking Crankshaft Runout

Set up a dial indicator (A) against crankshaft using the JDM-10 Dial Indicator Mounting Bracket (B, Fig. 14).

Rotate crankshaft. Maximum permissible runout is 0.0008 to 0.0020 inch (0.020 to 0.050 mm). Replace crankshaft assembly if not within limits. Check both ends of crankshaft.

Removing Cylinders

Remove cylinder assembly by lifting the cylinders upward. A slight tap with a rubber hammer may be necessary to loosen cylinders from the upper crankcase. Remove and discard cylinder base gaskets.

Removing Pistons

A—Circlip **C—No. 1 Piston**
B—Mark **D—No. 2 Piston**

Fig. 15-Mark on Piston Crown Exhaust Port Side

Before removing pistons, be sure piston crowns are marked (B) on the exhaust port side, Fig. 15. If no mark is legible, inscribe pistons accordingly. Mark pistons "1" and "2" and scribe mark on piston toward the exhaust port side.

NOTE: Pistons "1" and "2" are not interchangeable. Install correctly during reassembly.

Remove circlips (A) from each end of piston pin.

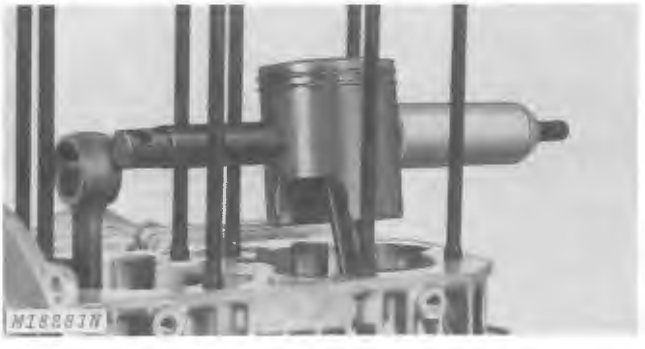


Fig. 16-Removing Pistons

Use the piston pin tool and guide furnished with the JDM-7 Tool Set to remove piston pins, Fig. 16.

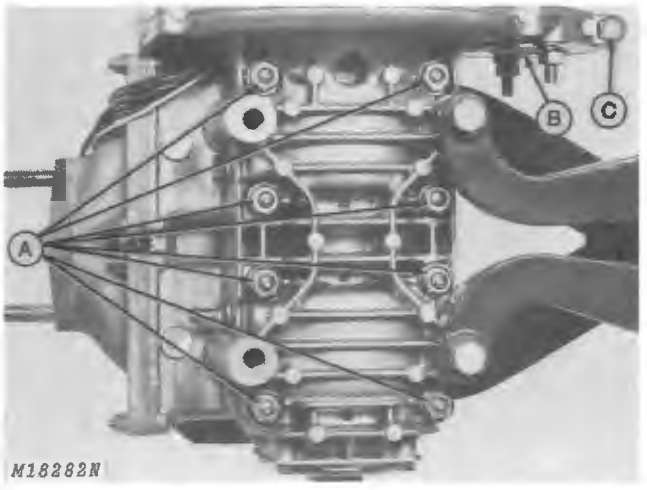
NOTE: Because 340 and 440 Liquifire Snowmobile engines have larger piston pins, use the piston guide from the JDM-7 Tool Set only for removal.

IMPORTANT: Do not damage connecting rod needle bearings when removing piston pins.

Remove needle bearings from connecting rods. Leave old rings on pistons to protect ring grooves.

Removing Crankshaft

Remove reed valve assembly.



A—Nuts on Bottom of Crankcase **C—Cap Screw**
B—Starter Motor Cover Plate

Fig. 17-Removing Nuts from Bottom of Crankcase

Remove eight nuts (A) and washers from bottom of crankcase, Fig. 17. Remove starter motor cover plate (B), cap screw (C) by cover plate before separating crankcase halves. Use a soft hammer and lightly tap the halves to separate.

IMPORTANT: Do not pry crankcase halves apart with a screwdriver. This will damage crankcase sealing surfaces.

Remove crankshaft by lifting upward. Note the four bearing retaining clips located in the UPPER or TOP half of the crankcase.

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Reed Valve Service

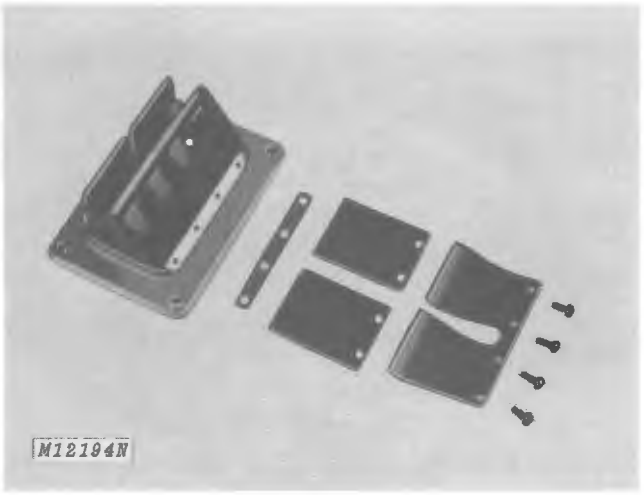

Fig. 18-Reed Valve Assembly

Disassemble and clean reed valve assembly, Fig. 18.

A faulty reed valve can usually be detected by excessive fuel "spit-back" through the carburetor, causing a "popping" noise.

Inspect reeds for cracking or warpage. Inspect reed seating surfaces for damage or wear.

IMPORTANT: Prolonged running of an engine with a faulty reed valve could cause a seized piston. This is due to the lean fuel mixture caused by improper fuel transfer on the pistons downstroke.

INSPECTION

Prior to inspection, clean all parts except crankshaft assembly and ignition parts in a suitable cleaning solvent.

For analysis and inspection of parts refer to Group 10 of this section.

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ASSEMBLY

Assembling Fan Cover

Assemble fan as shown in Fig. 9 if previously disassembled to replace worn parts.

Torque retaining nut to 28 to 31 ft-lbs (38 to 42 Nm).

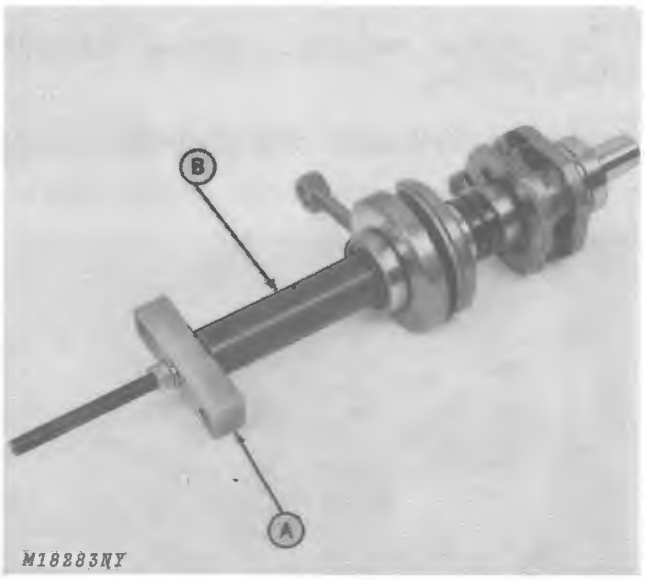
Replacing Crankshaft Bearings

Removing Crankshaft Outer Bearings

NOTE: Refer to page 20-10-14 for proper procedure for removing outer bearings.

Installing Outer Crankshaft Bearings and Seals

Apply a light film of 2-cycle engine oil to crankshaft and inner race of ball bearing.



A—JDM-8-2 Tool **B—JDM-8-3 Tool**

Fig. 19-Installing Outer Crankshaft Bearing

Assemble JDM-8-2 and JDM-8-3 Tool as shown in Fig. 19 to install outer bearings. Press bearings onto crankshaft until bearing is firmly seated against counterweight. Be sure bearing is started true and is not cocked on shaft.

Thread other end of crankshaft bearing tool into PTO end of crankshaft for installing PTO end bearings.

NOTE: Reed valve engines use two ball bearings on PTO end of crankshaft.

Lubricate and install seals, lip inward, on each end of crankshaft.

IMPORTANT: Cover keyway on flywheel end of crankshaft with tape to prevent damage to new seal.

Installing Crankshaft

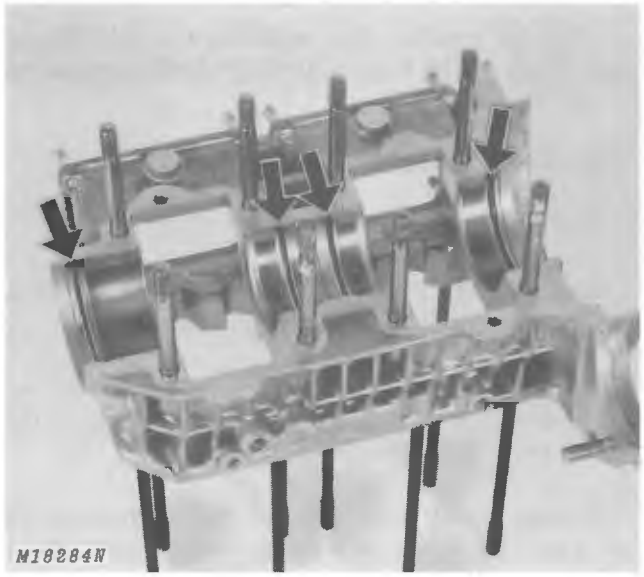


Fig. 20-Bearing Retaining Clips

Stand upper crankcase half on studs and install bearing retaining clips, Fig. 20. Liberally coat crankshaft and bearings with 2-cycle oil and install in upper crankcase half. Check to be sure bearing retaining clips do not become dislodged.

IMPORTANT: Apply an even coat of M64850 (Silicone Rubber Adhesive) to sealing surfaces of both crankcase halves.

NOTE: DO NOT permit sealer to run into interior of crankcase halves.

Install stator assembly over crankshaft. Be sure rubber grommet on stator assembly wiring leads is positioned in the recess between upper and lower crankcase halves. Install the lower crankcase half to the upper half. Be sure the two dowel pins are properly engaged with mating holes in opposite half of crankcase.

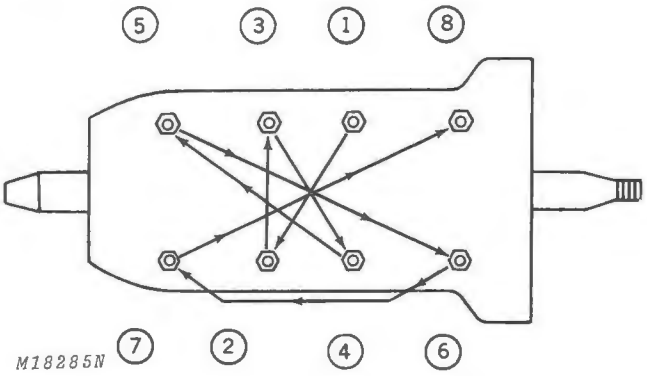


Fig. 21-Nuts on Lower Crankcase Half

Install flat washers, lock washers and nuts. Torque nuts to 15 to 18 ft-lbs (20 to 24 Nm) in sequence shown in Fig. 21.

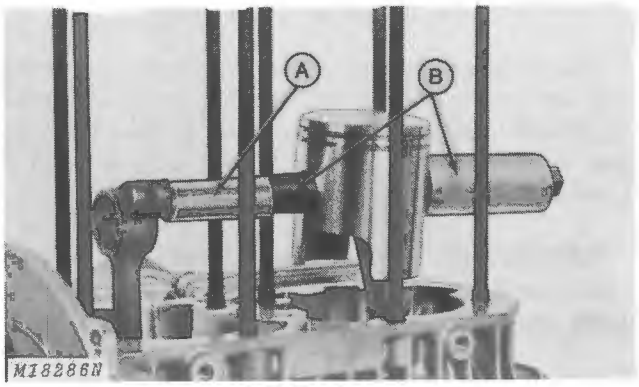
Installing Pistons and Piston Rings

NOTE: Check ring end gap.

Lubricate connecting rod needle bearings with 2-cycle engine oil and install in connecting rods.

Place piston over connecting rod. Be sure port areas of piston skirt and crankcase align. No. 1 and No. 2 pistons are not interchangeable.

Be sure scribe mark (marked during disassembly) on piston crown is toward the exhaust port side.



A—Piston Pin **B—JDM-7 Tool**

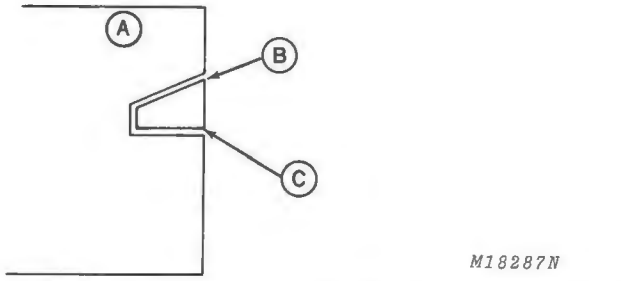
Fig. 22-Installing Piston Pin

Use the piston pin tool and guide furnished with the JDM-7 Tool Set and pull piston pin into position, Fig. 22.

Install four new piston pin circlips. Be sure clips have adequate tension to remain in place during engine operation.

If necessary, remove old rings and install new piston rings as follows:

Use your fingers or a ring expander tool and install a HALF-KEYSTONE ring in top groove. When using your fingers, spread rings with thumbs. Install half-keystone rings in both grooves on some snowmobiles (Serial No. 70,001-)



A—Top of Piston **C—Flat Side of Piston Ring**
B—Slant Side of Piston Ring

Fig. 23-Proper Installation of a Half-Keystone Ring

Fig. 23 shows the proper installation of a HALF-KEYSTONE ring.

Installing Cylinders and Cylinder Heads

Install new base gaskets over cylinder studs.

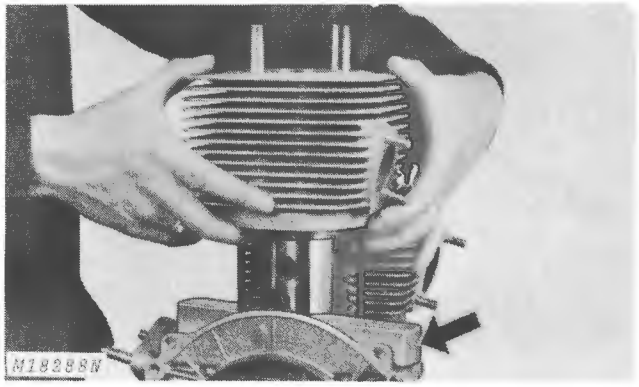


Fig. 24-Installing Cylinders

Lubricate pistons, rings and cylinders with 2-cycle engine oil. Place a suitable wood block between piston and crankcase to steady piston, Fig. 24. Compress rings with fingers and gently slide cylinder over each ring.

IMPORTANT: Be sure rings are centered on locating pins to prevent ring breakage.

Install exhaust manifold with new gaskets. Use M64850 Silicone Rubber Adhesive on the exhaust manifold gaskets. Install exhaust manifold and tighten securely. This aligns cylinders.

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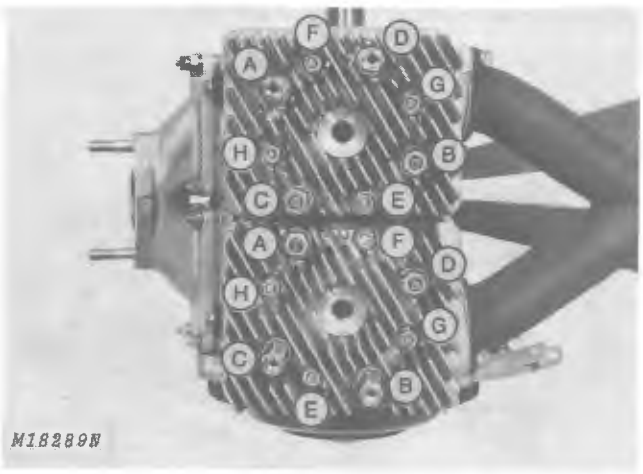

Fig. 25-Cylinder Head Torquing Sequence

Install NEW cylinder head gaskets (no sealant) and cylinder heads. Use flat washers under nuts and install nuts. Use special long nuts in locations shown in Fig. 25. Torque cylinder stud nuts A, B, C, and D in sequence to 11.5 to 14.5 ft-lbs (15.6 to 19.7 Nm). Complete torquing sequence by tightening cylinder head stud nuts E, F, G, and H in sequence shown, to 5.0 to 6.5 ft-lbs (6.8 to 8.8 Nm).

Installing Reed Valve Assembly

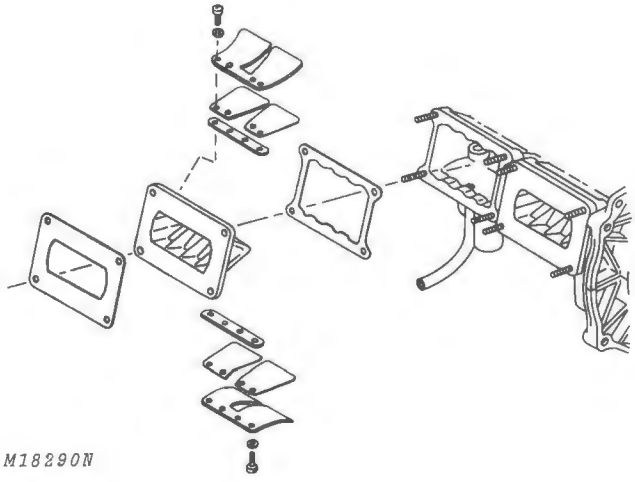

Fig. 26-Installing Reed Valves

Assemble reed valves carefully, Fig. 26 Maximum allowable "hang open" between reed valve and body is 0.060 inch (1.524 mm). Reed valve and body should form a "light-tight" seal when pinched together with finger pressure. If reeds are warped beyond allowable clearance or cracked, they must be replaced.

Use new gaskets and install reed valve assembly on crankcase. Tighten nuts securely.

Installing Flywheel

NOTE: Be sure stator plate is securely in place before installing flywheel.

Wipe crankshaft clean and install Woodruff key. Position flywheel and install flat washer, lock washer and nut. Install fan cover and secure with four cap screws, lock washers and flat washers.

Fig. 27-Installing Flywheel

Using JDM-64-1 Holding Tool and a torque wrench, tighten flywheel nut, Fig. 27, to 45 to 50 ft-lbs (61 to 67 Nm).

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Adjusting Fan Belt Tension

Install fan belt, belt sheave and starter cup. Secure to flywheel with three 6 x 15 mm cap screws and lock washers.

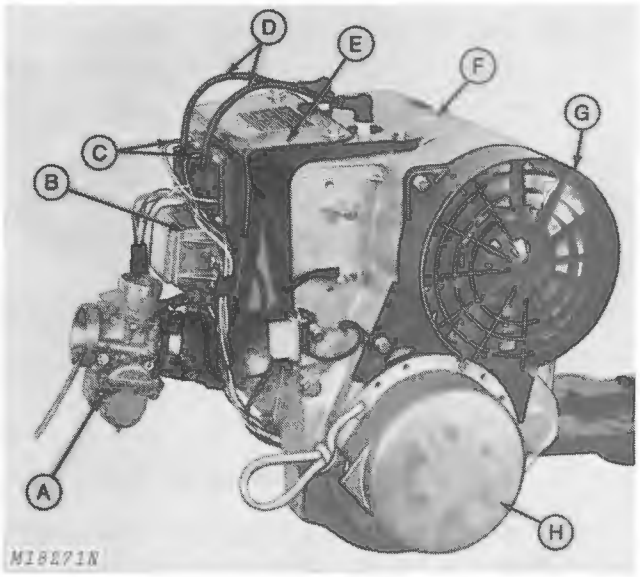
Fig. 28-Checking Fan Belt Tension

Check fan belt for proper tension, Fig. 28. A properly adjusted fan belt should deflect approximately 3/8-inch (9 mm) when flexed by hand at a point near center of belt span.

To adjust belt, remove fan retaining nut, using JDM-30 Spanner Wrench to keep fan from turning.

Remove fan, belt and outer sheave half. Remove one of the larger spacers from between pulley halves and place it outside outer pulley half. Reassemble and torque retaining nut to 28 to 31 ft-lbs (38 to 42 Nm).

Installing Exterior Components



A—Carburetor
B—Electronic Pack
C—Ignition Leads
D—Spark Plug Cables
E—Coil Bracket
F—Cylinder Cover
G—Fan Guard
H—Recoil Starter

Fig. 29-Installing Exterior Components

Install recoil starter assembly (H, Fig. 29.)

Locate fan guard (G) and install bolts to secure it.

Install coil bracket (E) and sttach spark plug cables (D), to spark plugs.

Install cylinder cover (F) to engine.

Install electronic pack (B) to coil mounting bracket (E) and ground to engine. Connect electronic pack coupler to coupler coming from stator. Connect high tension ignition leads (C) to coils.

Install carburetor (A) to intake manifold.

INSTALLING ENGINE

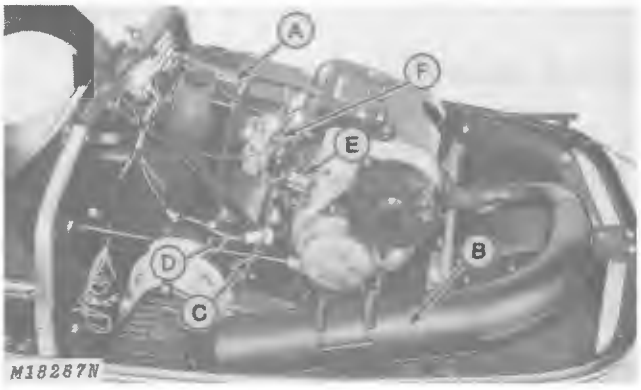
Fig. 30-Installing Engine

Install engine with base on rubber mounts and secure with four lock nuts Fig. 30.

A—Drive Belt **B—Throttle Valve and Cable**

Fig. 31-Installing Engine

Install throttle valve cable and throttle valve (B, Fig. 31).



A—Air Silencer
B—Expansion Chamber
C—Recoil Starter Rope
D—Fuel Line
E—Engine Coupler
F—Choke Plunger and Cable

Fig. 32-Making Connections to Snowmobile

Install choke plunger and cable (F, Fig. 32).

Connect engine coupler (E) and install plastic strap lock.

Connect fuel line (D) to fuel pump and open fuel shut-off valve. (Serial No. -80,000).

Route recoil starter rope (C) through firewall and attach starter handle.

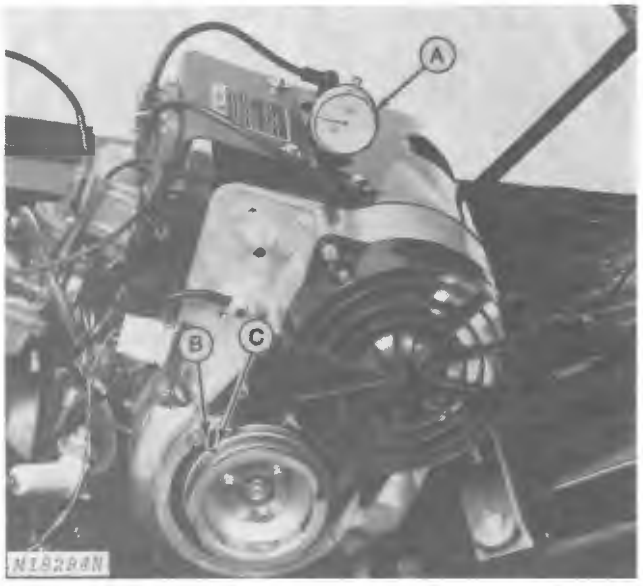
Install springs securing expansion chamber (B) to supporting bracket and springs securing expansion chamber to exhaust manifold.

Install intake air silencer (A) with boot over carburetor and secure with springs. Install and tighten clamp securing boot to carburetor bore.

Install and align snowmobile hood by attaching it with two cap screws on hinge plate. Install hood support.

CHECKING IGNITION TIMING

Check Ignition Timing as Follows:



A—Dial Indicator
B—Brass Pointer
C—Mark on Flywheel Sheave

Fig. 33-Checking Ignition Timing

1. Remove recoil starter. Bend a loop in a brass rod and secure pointer (B, Fig. 33), to flywheel housing with screw. Pointer should just miss flywheel sheave.

2. Install dial indicator (A, Fig. 33), in No. 1 spark plug hole.

3. Rotate crankshaft to locate TDC (Top Dead Center), and "zero" dial indicator.

4. Rotate crankshaft counterclockwise (opposite normal rotation) until dial indicator reads 0.096 inch (2.44 mm) BTDC (before top dead center).

5. With flywheel in this position, place a mark (C) with a felt-tip pin on sheave rim corresponding with pointer (B).

6. Remove dial indicator (A) and reinstall spark plug.

A—Timing Light
B—Clamp-on Pick-up
C—Pointer
D—Mark on Flywheel

Fig. 34-Checking Ignition Timing

7. Connect a timing light (A, Fig. 34), to No. 1 spark plug lead and to a 12-volt battery.

8. Raise snowmobile so track is clear of the ground. Start and run engine at approximately 4000 rpm.

9. Aim timing light (A) at pointer (C) and mark on flywheel (D) sheave. Mark on flywheel sheave should align with pointer.

10. If not, remove flywheel housing, flywheel and alternator-stator. Loosen four screws securing timing ring and rotate it as necessary to advance or retard timing. Turning ring counterclockwise advances timing-turning ring clockwise retards timing. Re-tighten screws securely.

Reassemble parts and recheck timing.

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Group 20
LIQUID-COOLED REED VALVE ENGINE OVERHAUL

GENERAL INFORMATION

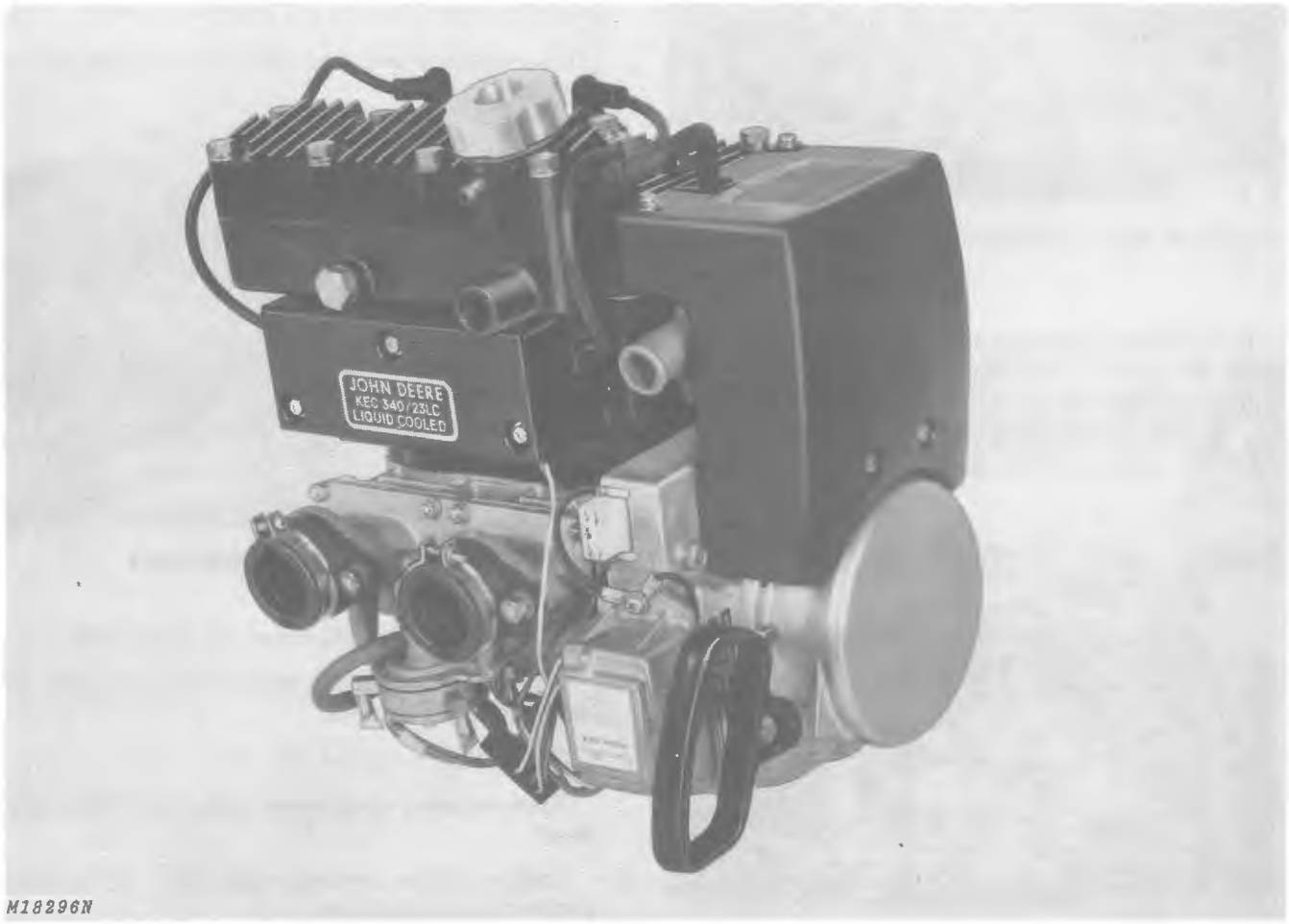


Fig. 1-Liquid-Cooled Engine

The liquid-cooled engines, Fig. 1, feature ball bearing supported crankshafts. These engines have five ball bearings; two between crankthrows, one on the flywheel end, and two on the PTO end of the crankshaft. Needle bearings are used at both crankpin and piston pin locations.

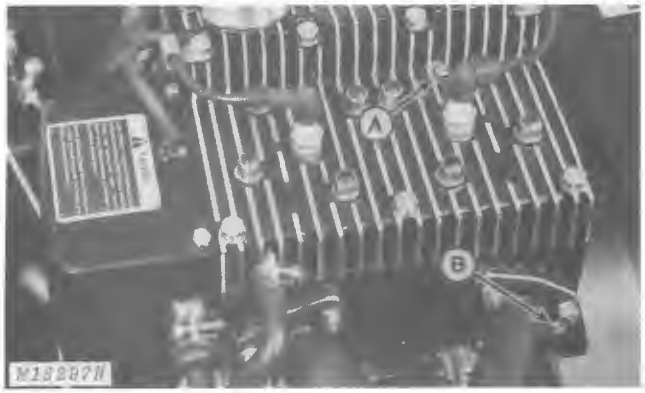
The crankshaft, inner ball bearings and seals, connecting rods and crankpin bearings are available only as a complete assembly. If any of these parts are worn or damaged, an entire crankshaft assembly must be installed. The complete assembly also includes outer seals and bearings, which may, however, be purchased separately. The crankcase upper and lower halves are available only as a matched set.

The cooling system is pressurized and thermostatically controlled. Coolant is circulated by a centrifugal pump mounted on the engine.

Oversize pistons of 0.010 (0.254 mm) inch are available.

Litho in U.S.A.

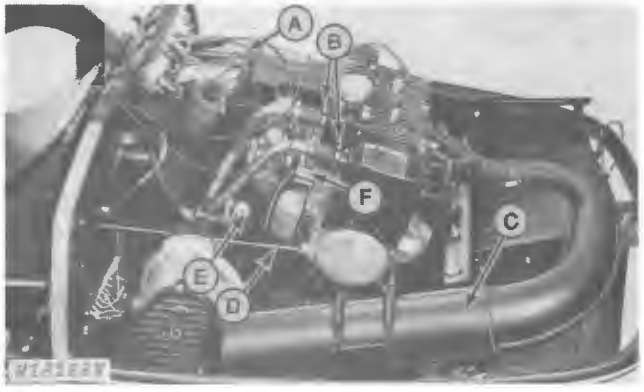
REMOVING ENGINE



A—Cylinder Head Vent Screw **B—Drain Screw**

Fig. 2-Draining Coolant

Prior to removing the engine from the snowmobile, drain the coolant from the engine block into a suitable container. Do so by removing drain screw (B, Fig. 2) and cylinder head vent screw (A, Fig. 2). This will allow the coolant to drain from the drain screw opening.



A—Air Silencer
B—Hose Clamps
C—Expansion Chamber
D—Rewind Starter Rope
E—Fuel Line
F—Electrical Coupler

Fig. 3-Disconnecting Engine from Snowmobile

Remove hood by removing hood support and two attaching cap screws on hinge plate.

Remove spring on air silencer strap, loosen clamps on carburetor boots and remove air silencer (A, Fig. 3).

Loosen hose clamps (B) on coolant hoses.

Remove springs securing expansion chamber (C) to exhaust manifold and supporting bracket and remove expansion chamber (C).

Untie knot in starter handle and allow the starter rope (D) to rewind into the starter housing. Tie a slip knot in the starter rope (D) to prevent rope from winding all the way into the starter housing.

Close fuel shut-off valve (Serial No. -80,000) and disconnect fuel line (E) from fuel pump.

Disconnect electrical coupler (F) by removing plastic strap lock.

Untape and disconnect kill switch lead.

A—Drive Belt
B—Water Temperature Sender
C—Carburetors

Fig. 4-Disconnecting Engine from Snowmobile

Mark direction of drive belt so that it can be reinstalled in same direction.

Remove drive belt (A, Fig. 4).

Remove water temperature sender (B) from cylinder head.

Loosen clamps securing carburetors (C) to mounts and remove carburetors.

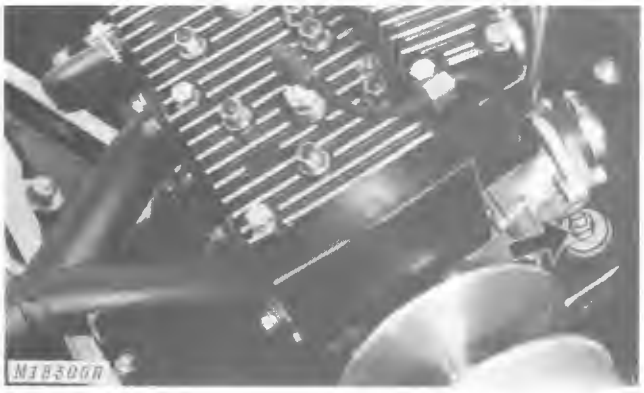
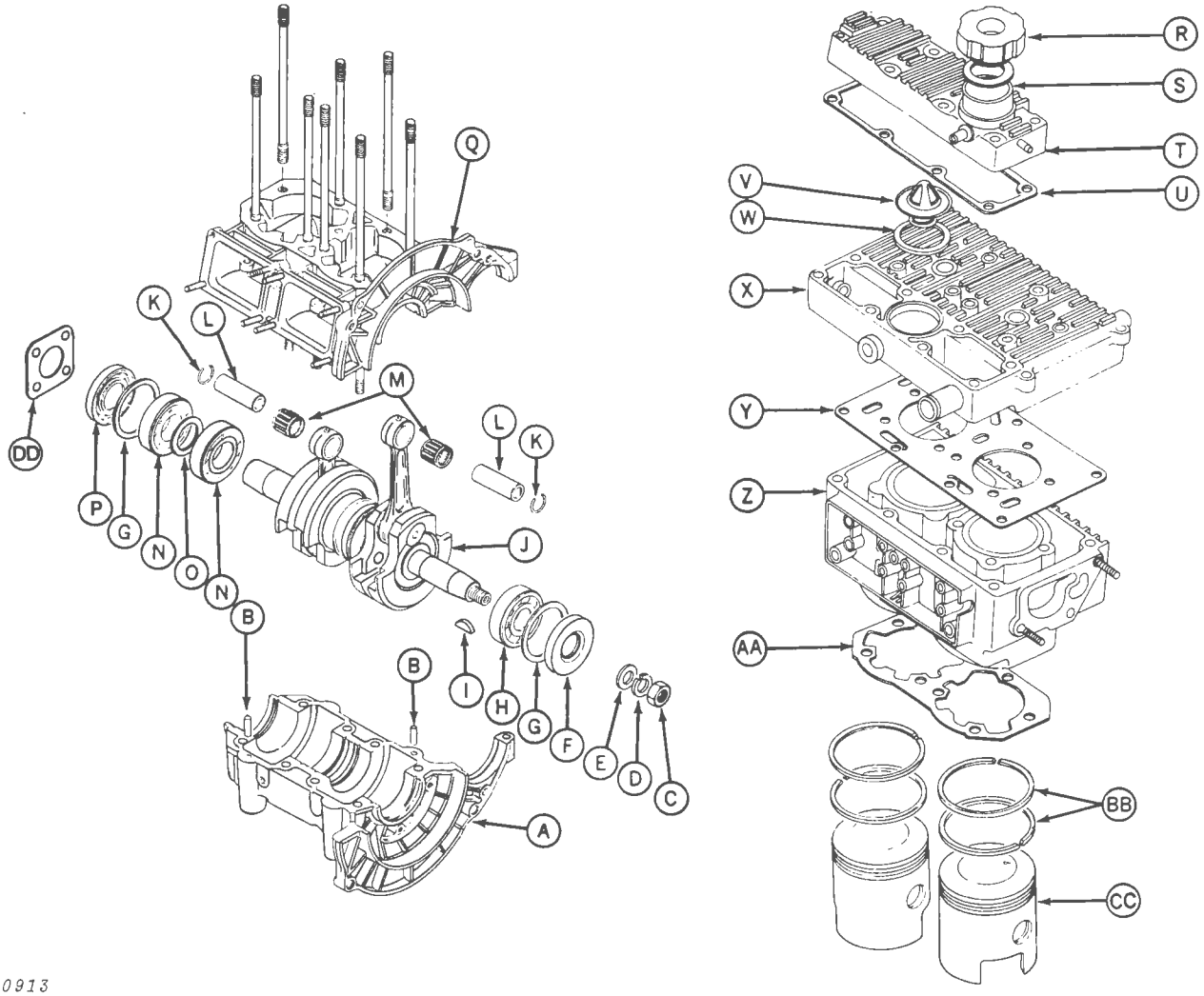


Fig. 5-Removing Engine

Remove four lock nuts, Fig. 5, securing engine base assembly to rubber mounts. Lift engine and base from snowmobile.

DISASSEMBLY



M20913

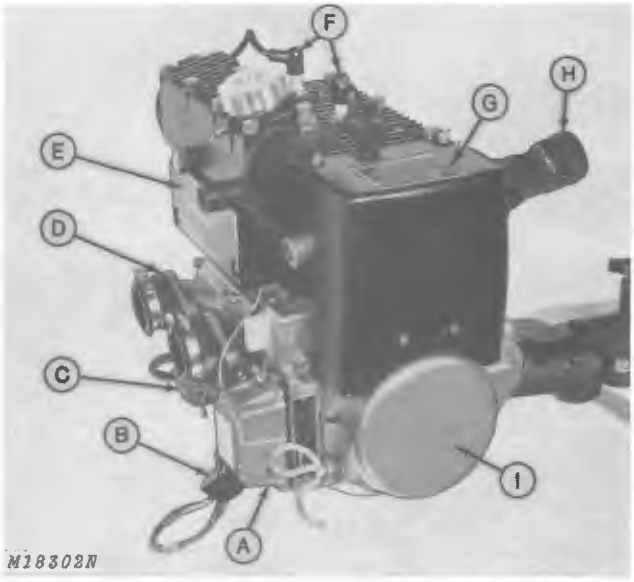
A—Lower Crankcase Half
B—Dowel
C—Nut
D—Lock Washer
E—Washer
F—Oil Seal (pump end)
G—Bearing Retaining Clip
H—Crankshaft Bearing (pump end)
I —Woodruff Key
J —Crankshaft Assembly
K—Circlip
L—Piston Pin
M—Connecting Rod Needle Bearings
N—Crankshaft Bearing (PTO end)
O—Shim
P—Oil Seal (PTO end)
Q—Upper Crankcase Half
R—Filler Cap
S—Filler Cap Packing
T —Top Tank
U —Gasket
V —Thermostat
W —Gasket
X —Cylinder Head
Y —Cylinder Head Gasket
Z —Cylinder
AA—Cylinder Base Gasket
BB—Piston Rings
CC—Piston
DD—Oil Seal Protector

Fig. 6-Exploded View of Liquid-Cooled Engine

Removing Exterior Components

Place engine on a workbench and thoroughly clean exterior surfaces, using cleaning solvent. The JDM-16 Bench-Mounted Service Fixture is ideal for servicing snowmobile engines.

NOTE: To prevent loss and to speed assembly, keep attaching hardware with each part as it is removed.



A—Electronic Pack
B—Coupler
C—Fuel Pump
D—Intake Manifold
E—Coil Cover and Coils
F—Spark Plug Cables
G—Pump Cover
H—Exhaust Manifold
I —Recoil Starter

Fig. 7-Removing Exterior Components

Disconnect coupler (B, Fig. 7) and remove electronic pack (A).

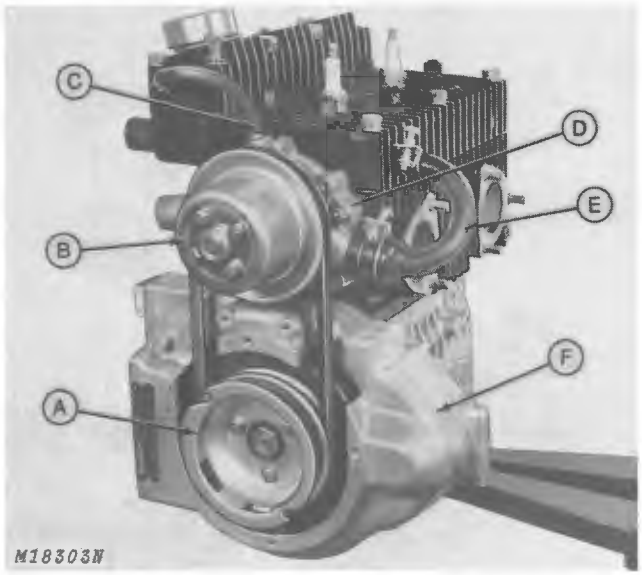
Remove coil cover (E), (Serial No. -80,000), disconnect ignition leads, and remove coils along with the spark plug cables (F).

Remove coolant pump cover (G). Remove the six nuts securing the exhaust manifold (H) to the cylinder assembly and remove exhaust manifold.

Remove recoil starter (I).

Remove intake manifold (D) and fuel pump (C). Fuel pump is secured to intake manifold and is removed with manifold as an assembly.

Removing Coolant Pump and Flywheel Housing



A—Starter Cup
B—Pump Pulley
C—Bleed Hose
D—Coolant Pump
E—Head-to-Pump Hose
F—Flywheel Housing

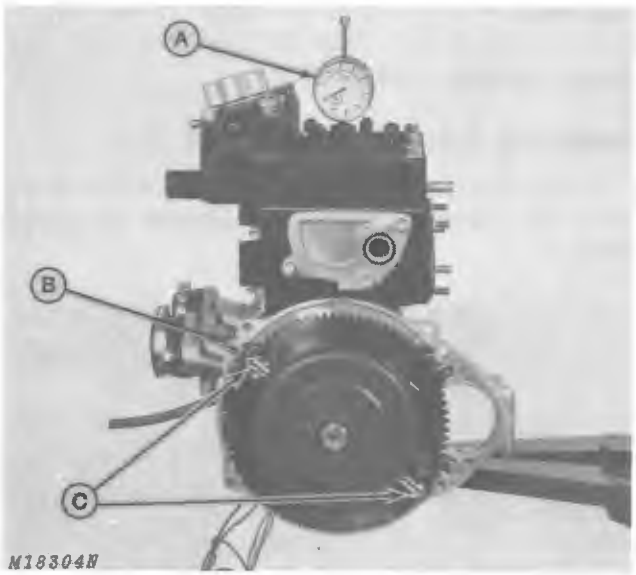
Fig. 8-Removing Coolant Pump and Flywheel Housing

Remove the three screws securing the starter cup (A, Fig. 8) and lower pulley to the flywheel. Remove starter cup (A), lower pulley and drive belt. Remove four screws securing coolant pump drive pulley (B) and remove pulley. Remove bleed hose (C, Fig. 8) and head-to-pump hose (E).

Remove the three nuts securing the coolant pump (D, Fig. 8) and remove coolant pump.

Remove flywheel housing (F, Fig. 8).

Checking Crankshaft for Twist



A—Dial Indicator **C—Marks on Flywheel**
B—Pointer

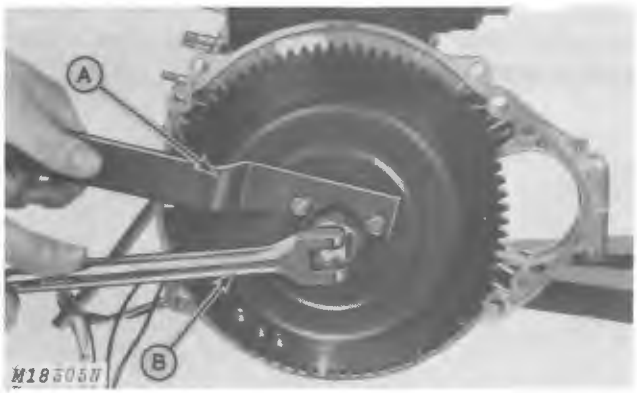
Fig. 9-Checking Crankshaft Twist

Set up dial indicator (A, Fig. 9) in No. 1 cylinder to determine TDC (Top Dead Center). With piston at TDC, fasten a brass pointer (B) on the intake manifold stud and direct it to a mark (C) on a tooth of the flywheel ring gear.

Set up dial indicator (A) in No. 2 cylinder. Rotate flywheel 180 degrees to align mark (C) on flywheel ring gear with pointer (B).

With pointer (B) aligned to mark (C), dial indicator (A) should indicate No. 2 piston is at TDC or within 0.003-inch (0.762 mm) either way of TDC.

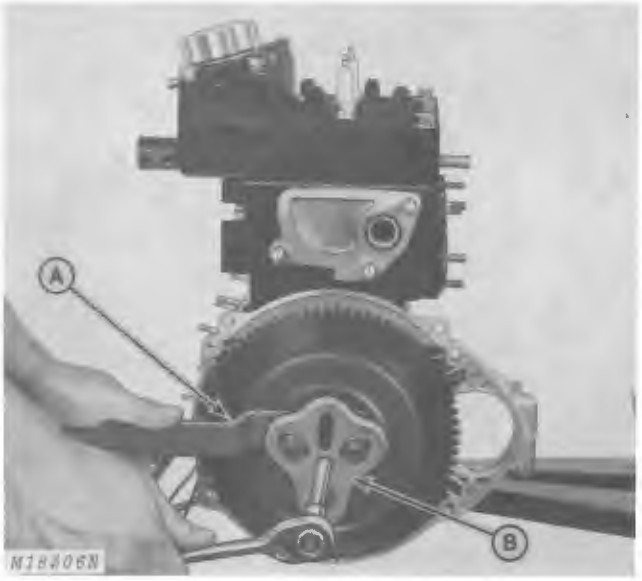
Removing Flywheel



A—JDM-64-1 Flywheel Holding Tool **B—Breaker Bar**

Fig. 10-Loosening Flywheel Nut

Loosen flywheel retaining nut using JDM-64-1 Flywheel Holding Tool (A, Fig. 10) and a breaker bar (B) with socket.



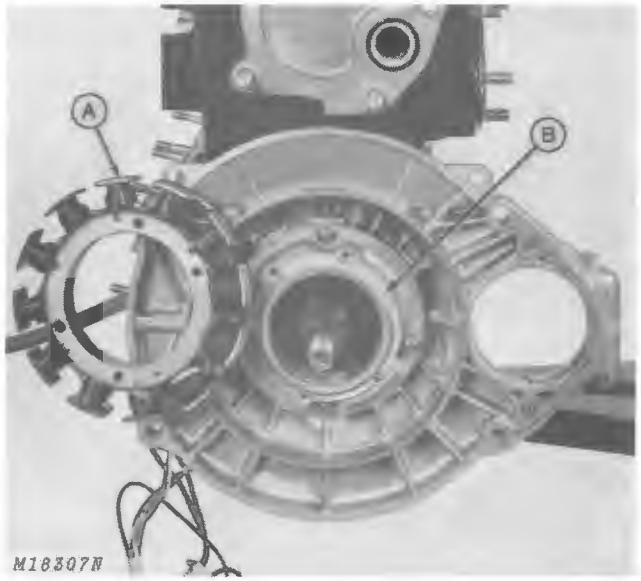
A—JDM-64-1 Flywheel Holding Tool
B—JDM-9 Flywheel Puller

Fig. 11-Using Flywheel Puller

Remove flywheel using JDM-9 Flywheel Puller (B, Fig. 11) in conjunction with the JDM-64-1 Flywheel Holding Tool (A).

IMPORTANT: Do not strike flywheel with mallet because this can cause permanent damage.

Removing Stator Assembly



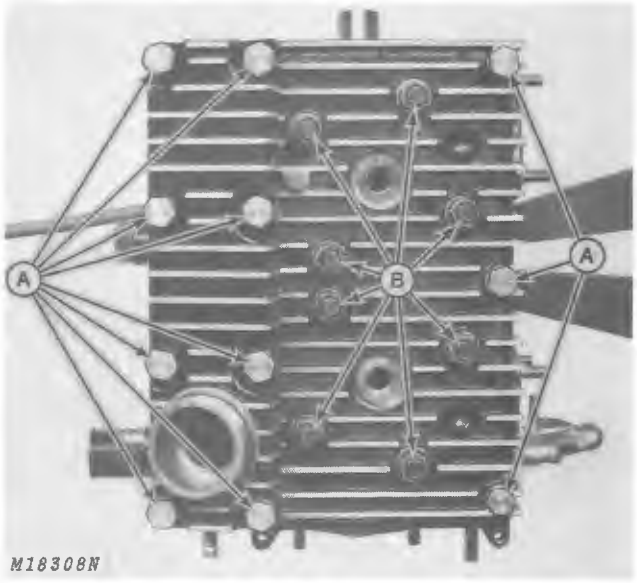
A—Stator Assembly **B—Trigger Ring**

Fig. 12-Removing Stator Assembly

Remove stator assembly (A, Fig. 12) by removing four attaching screws. Remove the four screws securing trigger ring (B) to the crankcase and remove trigger ring.

See Section 40 Electrical System to test ignition components.

Removing Cylinder Heads



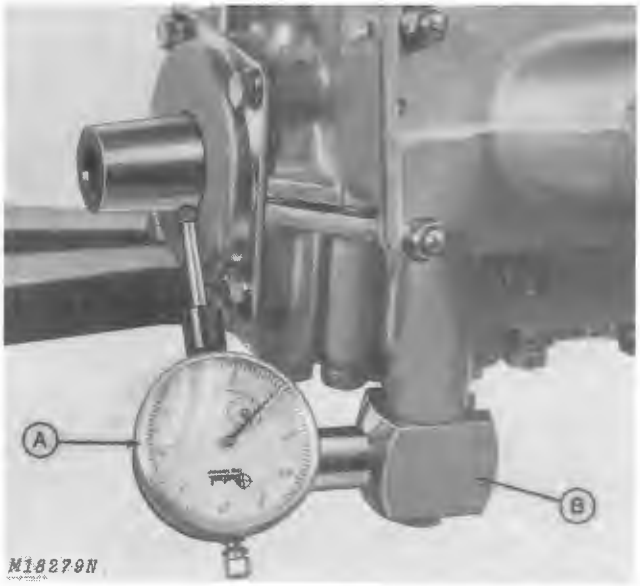
A—Head Bolts **B—Cylinder Stud Nuts**

Fig. 13-Removing Cylinder Head

Remove eleven head bolts (A, Fig. 13). Remove eight cylinder stud nuts (B, Fig. 13) and remove cylinder head. A slight tap with a rubber mallet may be necessary to loosen head from cylinder assembly. Discard cylinder head gaskets.

Checking Crankshaft Runout

Before proceeding further with engine disassembly, make the following check to determine crankshaft condition.



A—Dial Indicator **B—JDM-10 Mounting Bracket**

Fig. 14-Checking Crankshaft Runout

Set up a Dial Indicator (A, Fig. 14) against the crankshaft using the JDM-10 Dial Indicator Mounting Bracket (B).

Rotate crankshaft. Maximum permissible runout is 0.0008 to 0.0020 inch (0.020 to 0.050 mm). Replace crankshaft assembly if not within limits. Check both ends of crankshaft.

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Removing Cylinder Assembly

Fig. 15-Removing Cylinder Assembly

Remove cylinder assembly Fig. 15, and discard base gaskets. It may be necessary to loosen cylinder assembly with a slight tap with a rubber mallet.

Removing Pistons

A—Circlip
B—Mark
C—No. 1 Piston
D—No. 2 Piston

Fig. 16-Mark on Piston Crown Exhaust Port Side

Before removing pistons, be sure piston crowns are marked on the exhaust port side (B, Fig. 16). If no mark is legible, scribe pistons accordingly. Mark pistons (C and D) "1" and "2" with scribe mark on piston toward the exhaust port side.

NOTE: Pistons "1" and "2" are not interchangeable. Install them correctly during reassembly.

Remove circlips (A) from each end of piston pin.

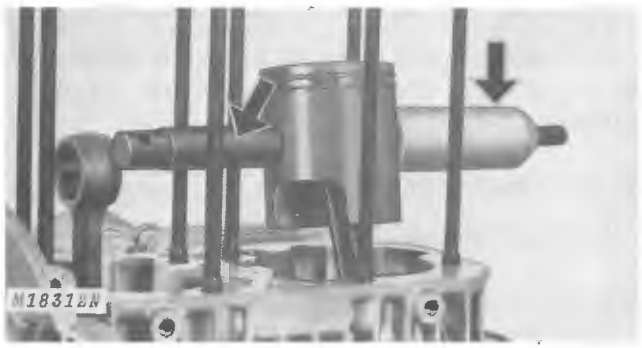


Fig. 17-Removing Pistons

Use the piston pin tool and guide furnished with the JDM-7 Tool Set to remove piston pins, Fig. 17.

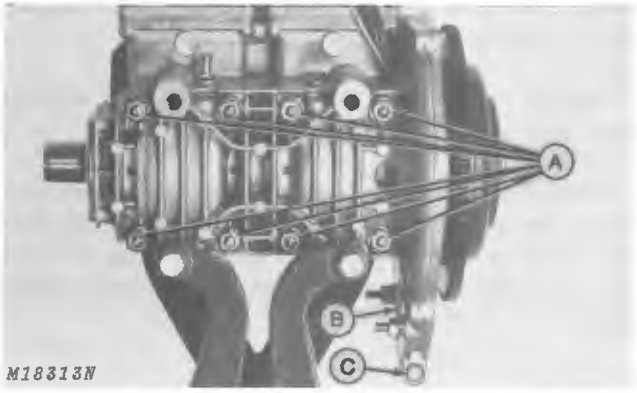
NOTE: Because 340 and 440 Liquifire Snowmobile Engines have larger piston pins, use the piston guide from the JDM-7 Tool Set only for removal.

IMPORTANT: Do not damage connecting rod needle bearings when removing piston pins.

Remove needle bearings from connecting rods. Leave old rings on pistons to protect ring grooves.

Removing Crankshaft

Remove reed valve assembly.



A—Crankcase Nuts
B—Starter Motor Cover Plate
C—Cap Screw

Fig. 18-Removing Crankshaft

Remove eight nuts (A, Fig. 18) and washers from bottom of crankcase. Remove starter motor cover plate (B), cap screw (C) by cover plate, and two screws securing stator plate, before separating crankcase halves. Use a soft hammer and lightly tap the halves to separate.

IMPORTANT: Do not pry crankcase halves apart with a screwdriver. This will cause damage to the crankcase sealing surfaces.

Removing Crankshaft—Continued

Remove crankshaft by lifting upward. Note the four bearing retaining clips located in the upper half of the crankcase.

Reed Valve Service

Disassemble and clean reed valve assembly.

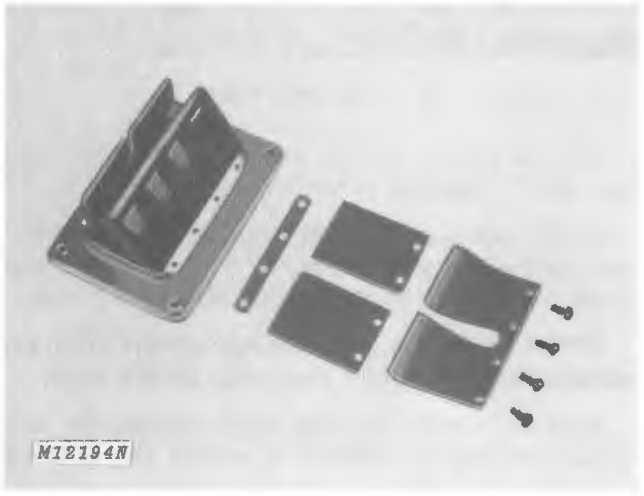


Fig. 19-Reed Valve Assembly

A faulty reed valve, Fig. 19, can usually be detected by excessive fuel "spit-back" through the carburetor, causing a "popping" noise.

Inspect reeds for cracking or warpage. Inspect reed seating surfaces for damage or wear.

IMPORTANT: Prolonged running of an engine with a faulty reed valve could cause a seized piston. This is due to the lean fuel mixture, caused by improper fuel transfer, on the pistons down stroke.

INSPECTION

Prior to inspection, clean all parts except crankshaft assembly and ignition parts in a suitable cleaning solvent.

For analysis and inspection of parts refer, to Group 10 of this section.

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ASSEMBLY

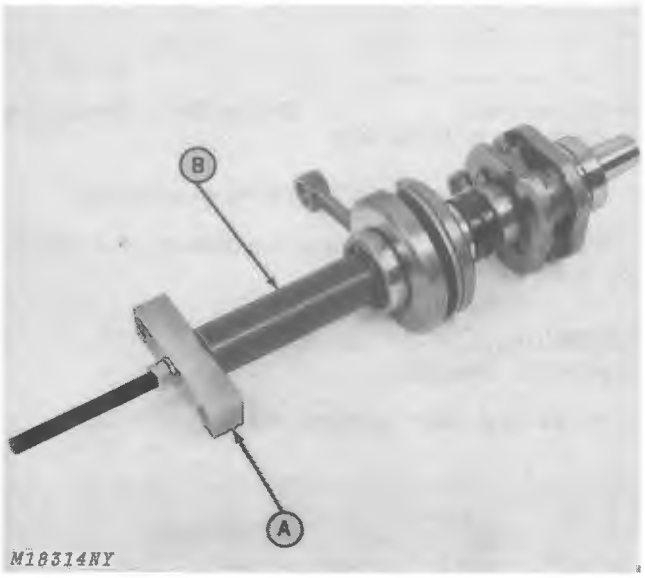
Replacing Crankshaft Bearings

Removing Crankshaft Outer Bearings

NOTE: Refer to page 20-10-14 for proper procedure for removing outer bearings.

Installing Outer Crankshaft Bearings and Seals

Apply a light film of 2-cycle engine oil to crankshaft and inner race of ball bearing.



A—JDM-8-2 Tool **B—JDM-8-3 Tool**

Fig. 20-Replacing Outer Crankshaft Bearing

Assemble JDM-8-2 and JDM-8-3 Tools as shown in Fig. 20 to install outer bearings. Press bearings onto crankshaft until bearing is firmly seated against counterweight. Be sure bearing is started true and is not cocked on shaft.

Thread other end of crankshaft bearing tool into PTO end of crankshaft for installing PTO end bearings.

Lubricate and install seals, lip inward, on each end of crankshaft.

IMPORTANT: Cover keyway on flywheel end of crankshaft with tape to prevent damage to new seal.

Installing Crankshaft

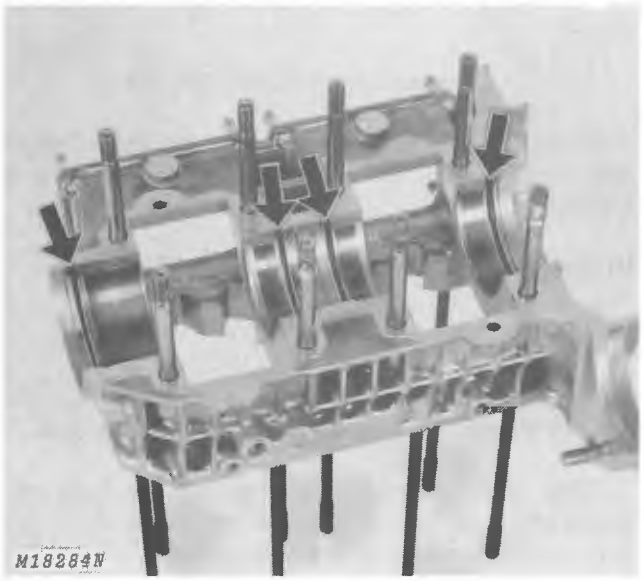


Fig. 21-Bearing Retaining Clips

Stand upper crankcase half on studs and install bearing retaining clips, Fig. 21. Liberally coat crankshaft and bearings with 2-cycle oil and install in upper crankcase half. Check to be sure bearing retaining clips do not become dislodged.

IMPORTANT: Apply an even coat of M64850 (Silicone Rubber Adhesive) to sealing surfaces of both crankcase halves.

NOTE: DO NOT permit sealer to run into interior of crankcase halves.

Install stator assembly over crankshaft. Be sure rubber grommet on stator assembly wiring leads is positioned in the recess between upper and lower crankcase halves. Install the lower crankcase half to the upper half. Be sure the two dowel pins are properly engaged with mating holes in opposite half of crankcase.

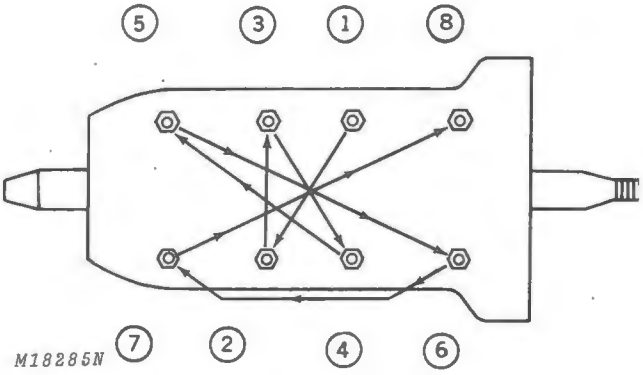


Fig. 22-Nuts on Lower Crankcase Half

Install flat washers, lock washers and nuts. Torque nuts to 15 to 18 ft-lbs (20 to 24 Nm) in sequence shown in Fig. 22.

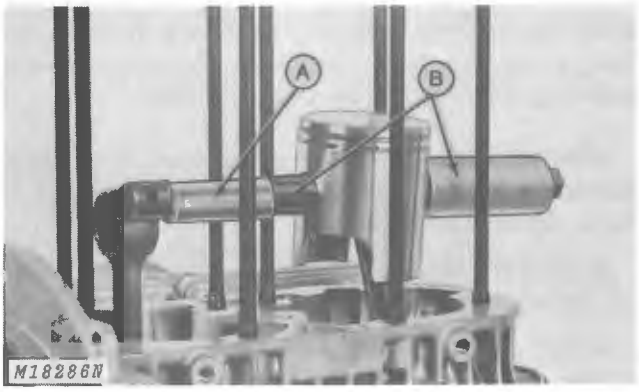
Installing Pistons and Piston Rings

NOTE: Check ring end gap.

Lubricate connecting rod needle bearings with 2-cycle engine oil and install in connecting rods.

Place piston over connecting rod. Be sure port areas of piston skirt and crankcase align. No. 1 and No. 2 pistons are not interchangeable.

Be sure scribe mark (marked during disassembly) on piston crown is toward the exhaust port side.



A—Piston Pin **B—JDM-7 Tool Set**

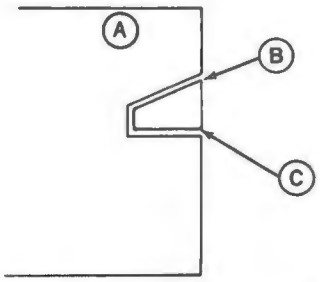
Fig. 23-Installing Piston Pin

Use the piston pin tool and guide (B) furnished with the JDM-7 Tool Set and pull piston pin (A) into position, Fig. 23.

Install four new piston pin circlips. Be sure clips have adequate tension to remain in place during engine operation.

If necessary, remove old rings and install new piston rings as follows:

Use your fingers or a ring expander tool and install a HALF-KEYSTONE ring in the top groove. When using your fingers, spread rings with thumbs.



A—Top of Piston **C—Flat Side of Piston Ring**
B—Slant Side of Piston Ring

Fig. 24-Proper Installation of a Half-Keystone Ring

Fig. 24 shows the proper installation of a HALF-KEYSTONE ring.

Installing Cylinders and Cylinder Heads

Install new base gaskets over cylinder studs.

Fig. 25-Installing Cylinder Assembly

Lubricate pistons, rings and cylinders with 2-cycle engine oil. Compress rings with fingers and gently slide cylinder over each ring Fig. 25.

IMPORTANT: Be sure rings are centered on locating pins to prevent ring breakage.

Install exhaust manifold with new gaskets. Use M64850 Silicone Rubber Adhesive on the exhaust manifold gaskets. Install exhaust manifold and tighten securely. This aligns cylinders.

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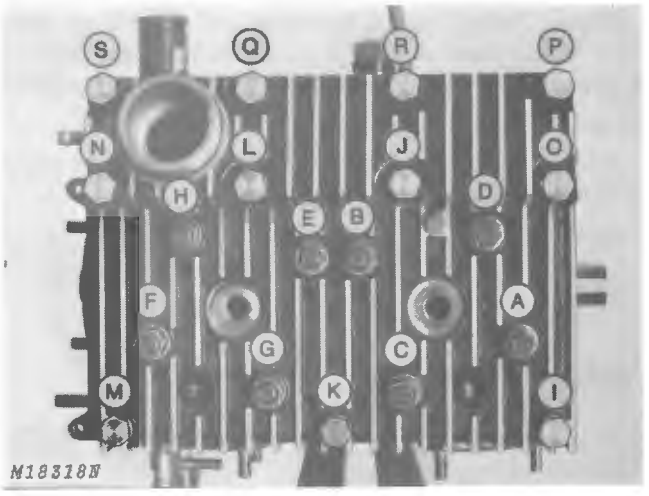


Fig. 26-Cylinder Head Torquing Sequence

IMPORTANT: Measure the cylinder head size to make sure it matches the size of the cylinder bore.

Install NEW cylinder head gaskets (no sealant) and cylinder heads. Use flat washers under nuts and install nuts. Torque nuts A, B, C, D, E, F, G, and H in sequence to 21 to 23 ft-lbs (28 to 31 Nm), I, J, K, L, M, N, and O to 14 to 16 ft-lbs (18 to 21 Nm) and P, Q, R, and S to 13 to 14 ft-lbs (17 to 18 Nm).

Installing Reed Valve Assemblies

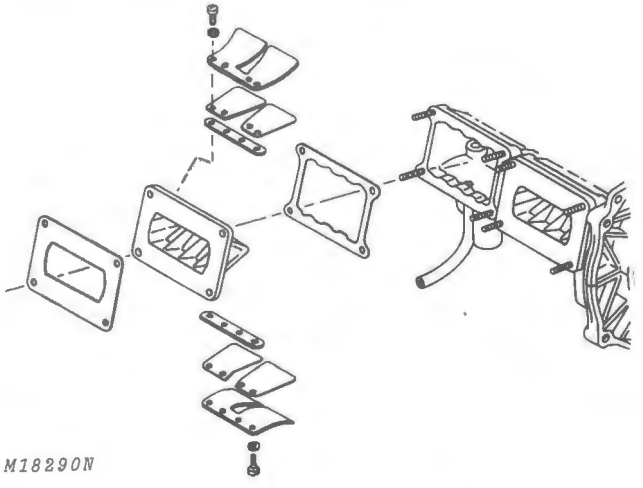


Fig. 27-Installing Reed Valves

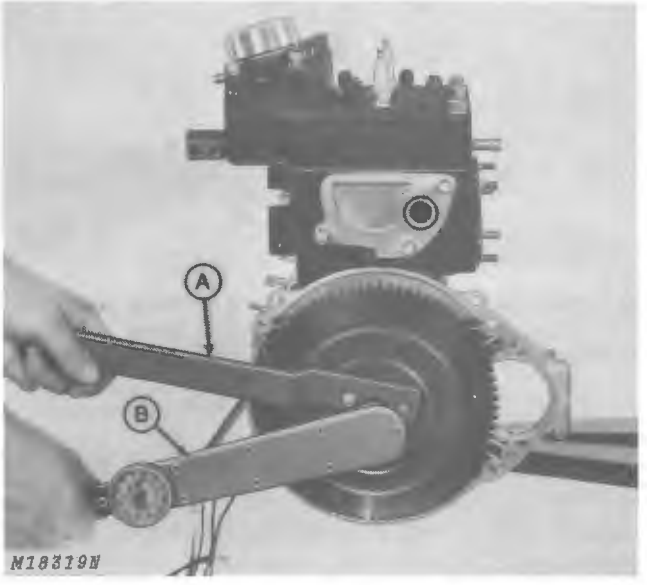
Assemble reed valves carefully, Fig. 27. Maximum allowable "hang open" between reed valve and body is 0.060 inch (1.524 mm). Reed valve and body should form a "light-tight" seal when pinched together with finger pressure. If reeds are warped beyond allowable clearance or cracked, they must be replaced.

Use new gaskets and install reed valve assembly on crankcase. Tighten nuts securely.

Installing Flywheel

NOTE: Be sure stator plate is securely in place before installing flywheel.

Wipe crankshaft clean and install Woodruff key. Position flywheel and install flat washer, lock washer and nut.



A—JDM-64-1 **B—Torque Wrench**

Fig. 28-Installing Flywheel

Use JDM-64-1 holding tool (A, Fig. 28) and a torque wrench (B) to tighten flywheel nut. Torque nut to 45 to 50 ft-lbs (61 to 67 Nm).

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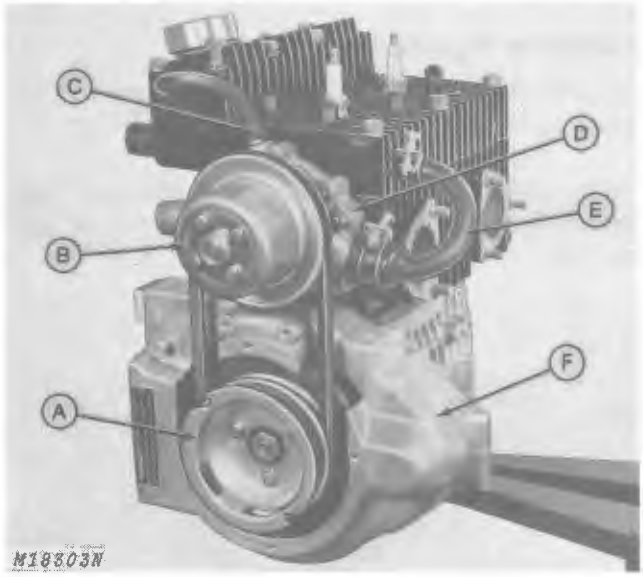
Installing Coolant Pump



A—Starter Cup
B—Pump Pulley
C—Bleed Hose
D—Head-to-Pump Hose
E—Coolant Pump
F—Flywheel Housing

Fig. 29-Installing Coolant Pump and Flywheel Housing

Install flywheel housing (F, Fig. 29) and secure it with four cap screws. Attach starter cover plate with two nuts. With O-ring in place, locate coolant pump (E) on studs and tighten nuts. Install bleed hose (C) from pump to top tank and head-to-pump hose (D). Install pump pulley (B) and starter cup (A) with lower pulley and backup plate to flywheel.

Tensioning Coolant Pump Belt

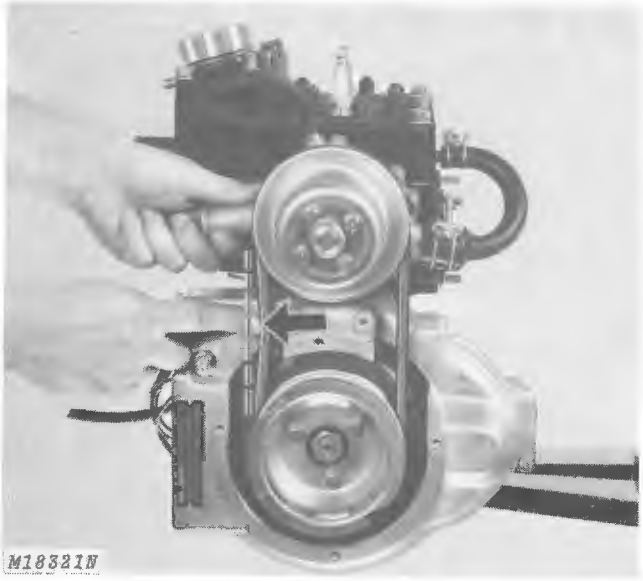


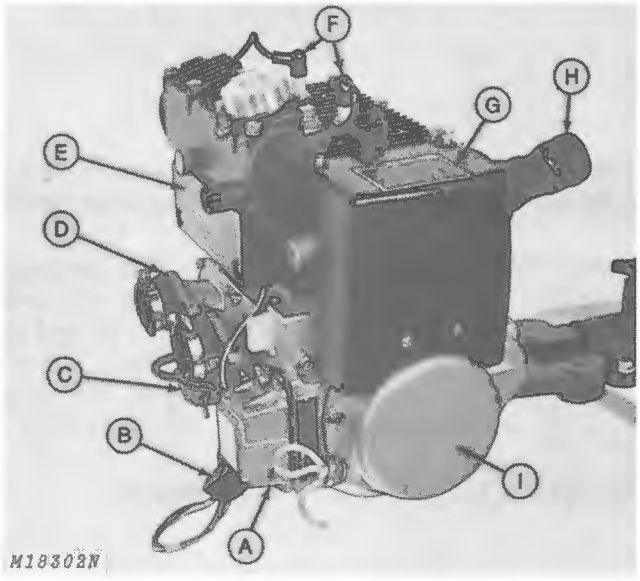
Fig. 30-Tensioning Coolant Pump Belt

Adjust coolant pump belt, Fig. 30, for proper tension. A properly adjusted pump belt should deflect approximately 3/8 inch (9 mm) when flexed by hand at a point near center of belt.

To adjust belt, tighten three nuts on pump once proper tension is obtained.

NOTE: It may be necessary to use a cone wrench or a wrench that has been ground down thin enough to tighten nuts behind upper pump sheave.

Installing Exterior Components



A—Electronic Pack
B—Coupler
C—Fuel Pump
D—Intake Manifold
E—Coil Cover and Coils
F—Spark Plug Cables
G—Pump Cover
H—Exhaust Manifold
I —Recoil Starter

Fig. 31-Installing Exterior Components

Install recoil starter (I, Fig. 31). Install coolant pump cover (G). Install exhaust manifold (H) to the cylinder assembly.

Install coils (E) and connect ignition leads and spark plug cables (F) and install coil cover (E) (Serial No. -80,000).

Connect coupler (B) and install electronic pack (A). Install intake manifold (D) to engine and attach fuel pump (C). Connect impulse line from engine crankcase to fuel pump.

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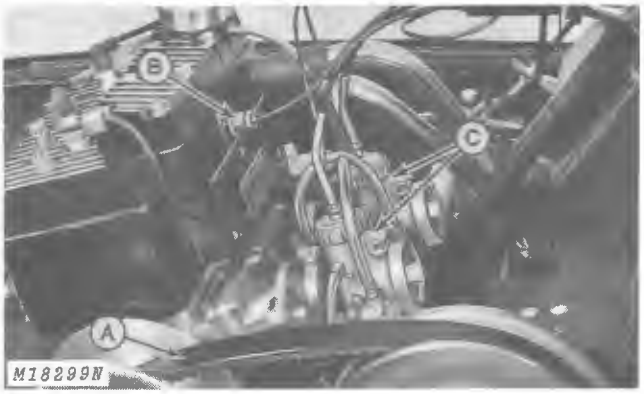
INSTALLING ENGINE

Fig. 32-Installing Engine

Lift engine and base into snowmobile. Install four lock nuts, Fig. 32, to secure engine base assembly to rubber mounts.



A—Drive Belt
B—Water Temperature Sender
C—Carburetors

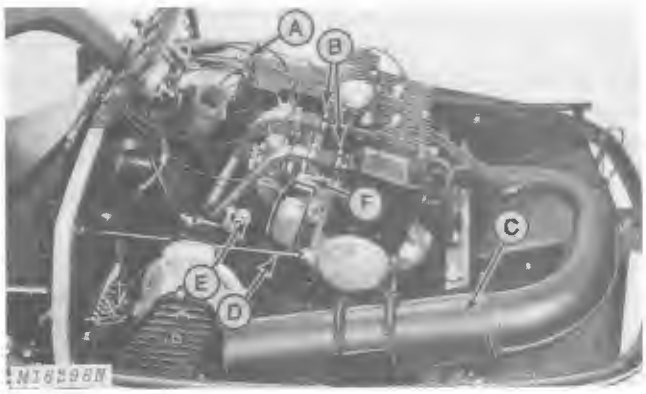
Fig. 33-Making Connections to Snowmobile

Install carburetors (C, Fig. 33) to rubber intake mounts and secure clamps. Connect fuel lines to fuel pump.

Install water temperature sender (B) to cylinder head.

Install drive belt (A).

IMPORTANT: Always install drive belt so it operates in same direction as it did before being removed.



A—Air Silencer
B—Hose Clamps
C—Expansion Chamber
D—Rewind Starter Rope
E—Fuel Line
F—Electrical Coupler

Fig. 34-Connecting Engine to Snowmobile

Connect and tape kill switch lead.

Connect electrical coupler (F, Fig. 34) to engine and install plastic strap lock to prevent coupler from vibrating loose.

Connect fuel line (E) to fuel pump and open fuel shut-off valve (Serial No. -80,000)

Untie slip knot in starter rope (D) and route starter rope through rope guide and install starter rope handle.

Position expansion chamber (C) and secure with springs to exhaust manifold and supporting bracket.

Tighten hose clamps (B) on coolant hoses.

Position air silencer (A) and tighten clamps on carburetor boots. Install spring on silencer strap.

Install hood support and hood with two attaching cap screws on hinge plate.

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Filling Cooling System

Fill cooling system to bottom of filler neck with a 50/50 mixture of ethylene glycol base anti-freeze and water. Place cap on filler neck and run engine until it reaches operating temperature. Shut off engine. See Group 30 of this Section for proper method of filling cooling system.

Checking Ignition Timing

Check ignition timing as follows:

A—Dial Indicator
B—Brass Pointer
C—Mark on Flywheel Sheave

Fig. 35-Checking Ignition Timing

1. Remove recoil starter. Bend a loop in a brass rod and secure pointer (B, Fig. 35) to flywheel housing with screw. Pointer should just miss flywheel sheave.

2. Install dial indicator (A, Fig. 35) in No. 1 spark plug hole.

3. Rotate crankshaft to locate TDC (Top Dead Center), and "zero" dial indicator.

4. Rotate crankshaft counterclockwise (opposite normal rotation) until dial indicator reads 0.096-inch (2.44 mm) BTDC (before top dead center).

5. With flywheel in this position, place a mark (C) with a felt-tip pen on sheave rim corresponding with pointer (B).

6. Remove dial indicator (A) and reinstall spark plug.

A—Timing Light
B—Clamp on Pick-up
C—Pointer
D—Mark on Flywheel Sheave

Fig. 36-Checking Ignition Timing

7. Connect a timing light (A, Fig. 36), to No. 1 spark plug lead and to a 12-volt battery.

8. Start and run engine at approximately 4000 rpm.

9. Aim timing light (A) at pointer (C) and mark (D) on flywheel sheave. Mark (D) on flywheel sheave should align with pointer (C).

10. If not, remove flywheel housing, flywheel and alternator-stator. Loosen four screws securing timing ring and rotate ring as necessary to advance or retard timing. Rotating ring counterclockwise advances timing—rotating ring clockwise retards timing. Retighten screws securely.

Reassemble and recheck timing.

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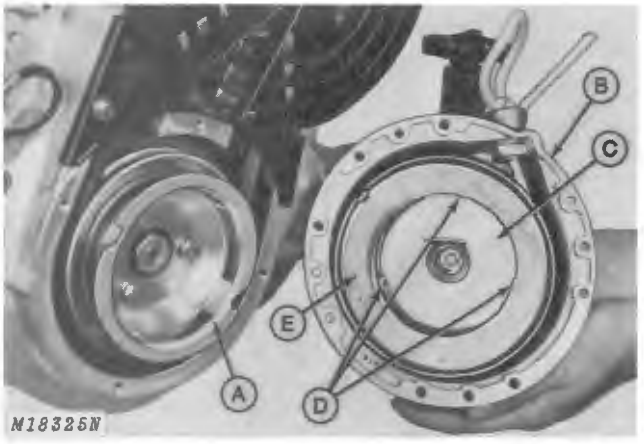
Group 25
RECOIL STARTERS

PRINCIPLE OF OPERATION



A—Starter Cup
B—Recoil Starter
C—Friction Plate
D—Pawls
E—Reel

Fig. 1-Recoil Starter

When the starter rope is pulled, the friction plate (C, Fig. 1) does not turn, thus forcing the pawls (D) out and into contact with the starter cup (A). After the pawls are extended, the friction plate rotates with the reel (E).

When the rope is released, the recoil spring retracts the rope back onto the reel (E). The return spring (G, Fig. 2) rotates the friction plate to retract the pawls (D) when the rope is retracted.

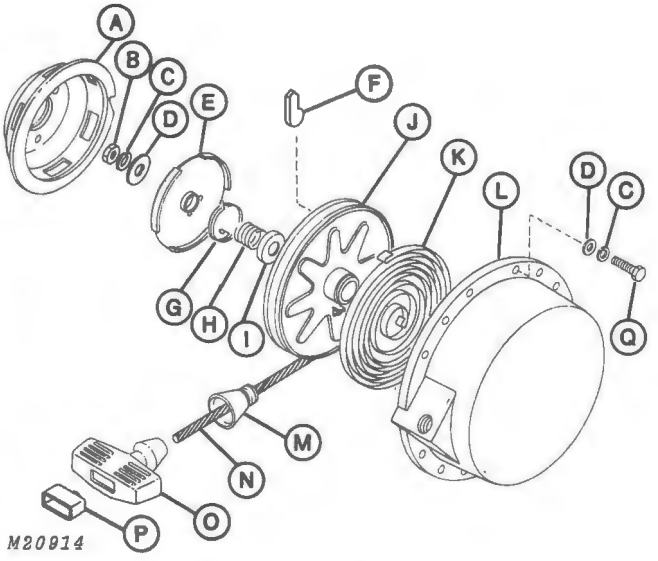
Pull handle slowly until pawls engage with starter cup; then pull vigorously.

Hold handle during recoil. Do not let rope snap back on recoil.

In the event of recoil starter failure, it is possible to start the engine by removing the recoil starter and winding a rope around the starter cup.

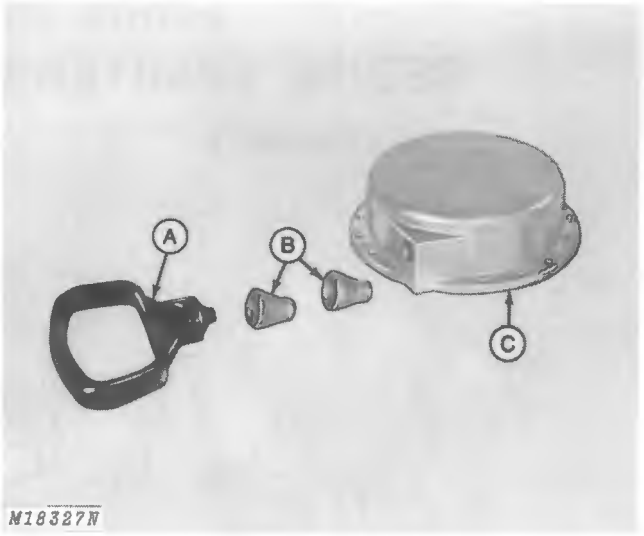
Refer to "Diagnosing Malfunctions" in Group 5 of this section for trouble-shooting hints.

DISASSEMBLY



A—Starter Cup
B—Nut
C—Lock Washer
D—Washer
E—Friction Plate
F—Pawl (3 used)
G—Return Spring
H—Friction Spring
I —Cup Washer
J —Reel
K—Recoil Spring
L —Case
M—Rope Guide
N—Rope
O—Handle
P —End Piece
Q—Cap Screw

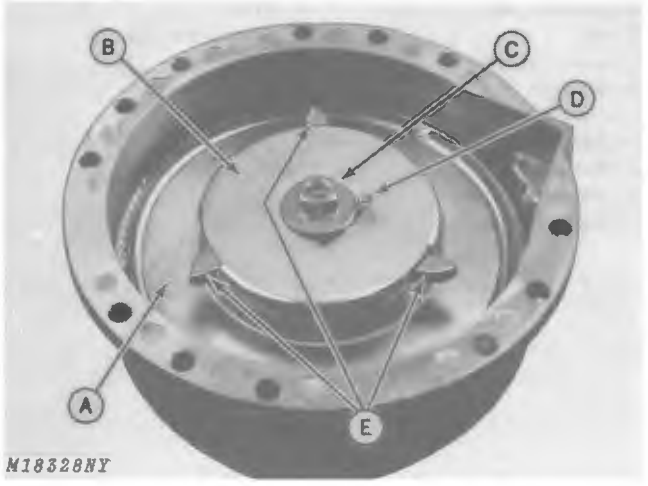
Fig. 2-Exploded View of Recoil Starter



A—Handle **B—Rope Guides** **C—Case**

Fig. 3-Removing Handle and Rope Guides

Untie knot in recoil starter handle (A, Fig. 3) and let rope recoil into case (C). Thread rope guides out of case.



A—Reel
B—Friction Plate
C—Retaining Nut
D—Return Spring
E—Pawls

Fig. 4-Disassembling Recoil Starter

Remove the retaining nut, (C, Fig. 4), and the lock washer, and washer from the reel shaft. Remove friction plate (B), return spring (D), friction spring and cupped washer. Remove the three pawls (E).

Lift reel (A), with rope, out of case. Remove recoil spring from case. Remove rope from reel if rope replacement is necessary.

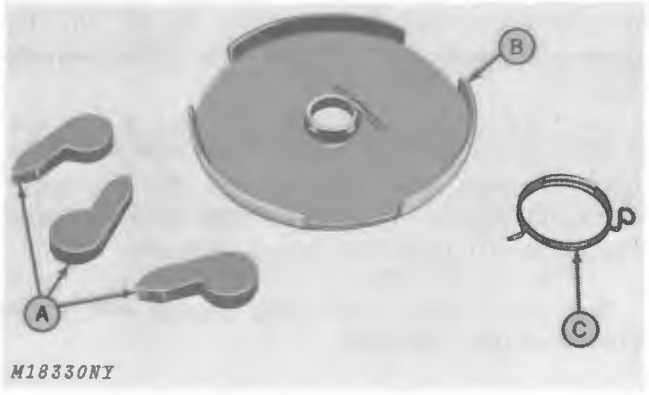
INSPECTION

Thoroughly clean all parts except rope in cleaning solvent prior to inspection.

A—Starter Cup **B—Worn Slots**

Fig. 5-Inspecting Starter Cup

Inspect the recoil starter cup (A, Fig. 5) on engine for excessively worn rectangular slots (B). Replace if necessary.



A—Pawls
B—Friction Plate
C—Return Spring

Fig. 6-Inspecting Pawls, Friction Plate and Return Spring

Inspect the three pawls (A, Fig. 6) and friction plate (B) for wear. Inspect the return spring (C) and friction spring and replace if cracked, broken, or distorted.

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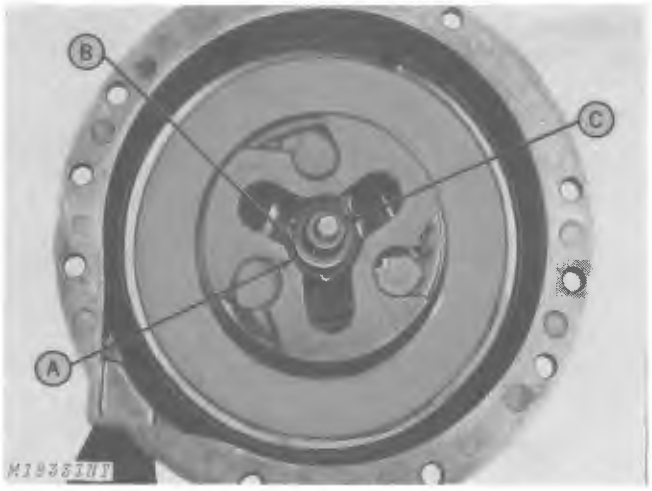
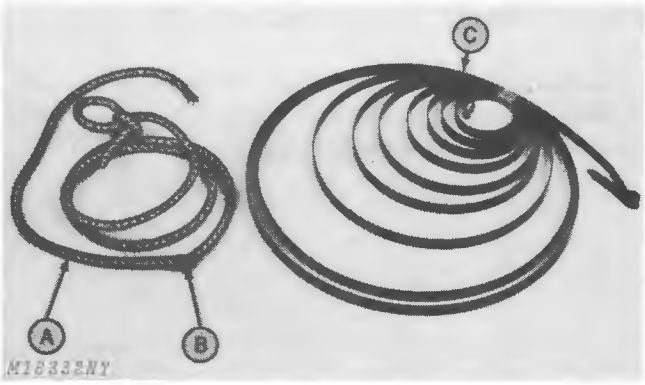


A—Reel Hub **C—Reel Shaft**
B—Excessive Clearance

Fig. 7-Inspecting Reel and Reel Shaft

Inspect reel hub (A, Fig. 7) and reel shaft (C) for excessive clearance. Replace parts if necessary.



A—Rope **C—Recoil Spring**
B—Frayed

Fig. 8-Inspecting Rope and Recoil Spring

Replace rope (A, Fig. 8) if frayed (B), or broken. Replace recoil spring (C) if it is broken or distorted. Inspect condition of spring ends, and bend them if necessary, so spring properly engages the tabs on reel and case when installed.

ASSEMBLY

Installing Rope

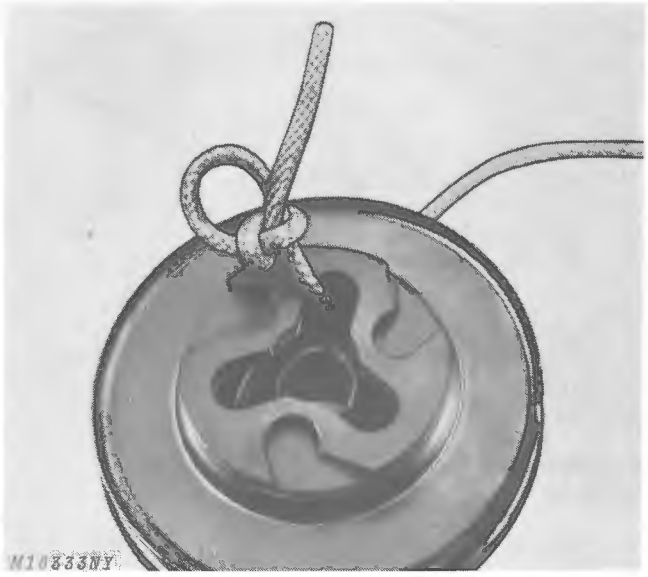
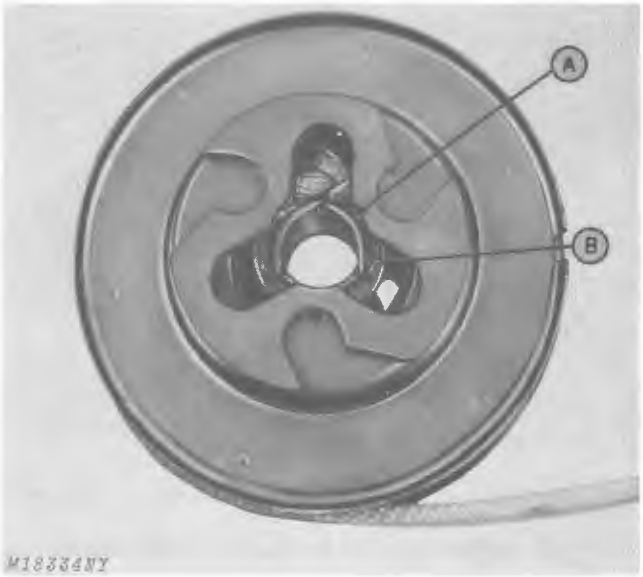


Fig. 9-Installing Rope into Reel

Install rope through hole in reel. Loop and tie knot as shown, Fig. 9.

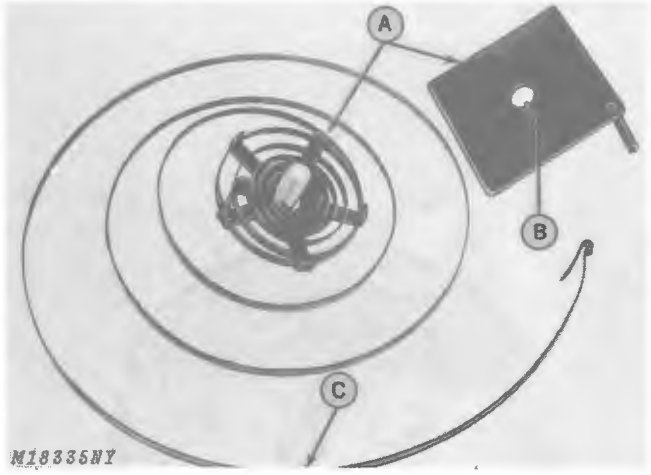


A—Reel Hub **B—Loop**

Fig. 10-Installing Rope Around Reel Hub

Place loop (B, Fig. 10) around reel hub (A) and pull tight. Wind rope counterclockwise around reel when viewed as shown.

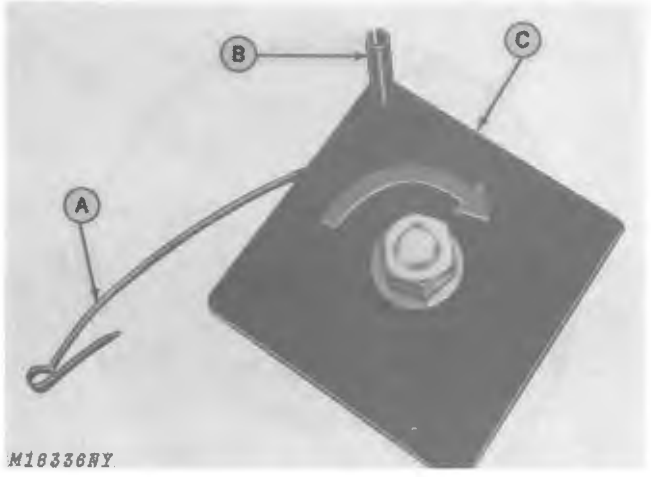
Installing Recoil Spring



A—Spring Winding Tool **C—Recoil Spring**
B—Spring Pin

Fig. 11-Installing Recoil Spring Into Winding Tool

Place recoil spring (C, Fig. 11) into spring winding tool (A) as shown, so spring will be wound into tool by winding clockwise.

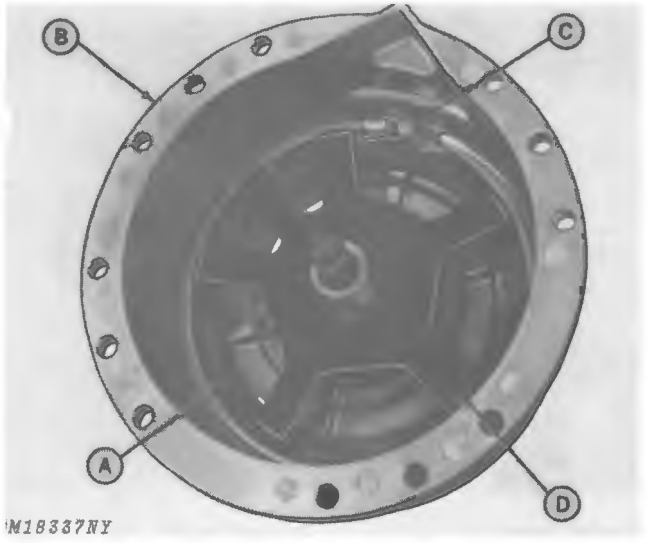


A—Recoil Spring **B—Handle** **C—Plate**

Fig. 12-Winding Recoil Spring Into Winding Tool

Assemble winding tool and wind plate, with handle, clockwise to wind spring (A, Fig. 12) into tool.

Let plate (C) with handle (B) unwind and remove bolt and plate.



A—Recoil Spring **C—Dowel Pin**
B—Case **D—Spring Winding Tool**

Fig. 13-Installing Recoil Spring Into Case

Set spring winding tool (D, Fig. 13) with spring (A) into place in case (B) with loop on spring end positioned as shown, around dowel pin (C).

Carefully pull winding tool (D) off recoil spring (A), leaving spring in position in case (B). Lightly coat spring with low temperature grease.

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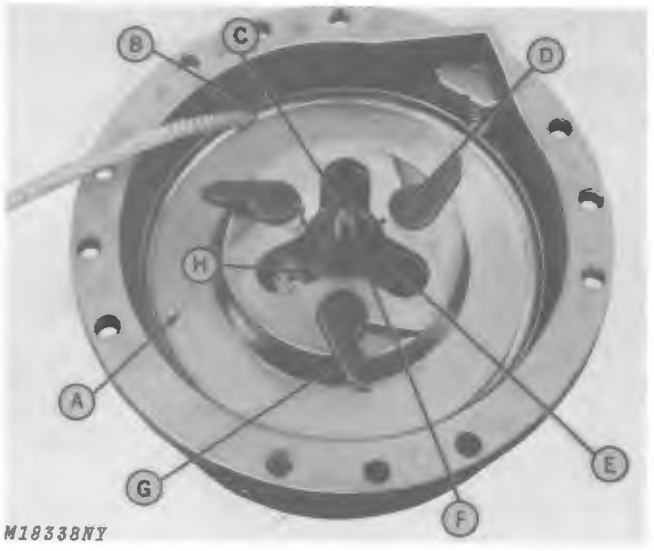
Installing Reel Assembly



A—Reel
B—Notch
C—Reel Shaft
D—End of Return Spring in Retaining Hole
E—Return Spring
F—Friction Spring
G—Pawl
H—Cupped Washer

Fig. 14-Installing Reel, Pawls, and Springs

Apply a light film of low-temperature grease to the reel shaft (C, Fig. 14).

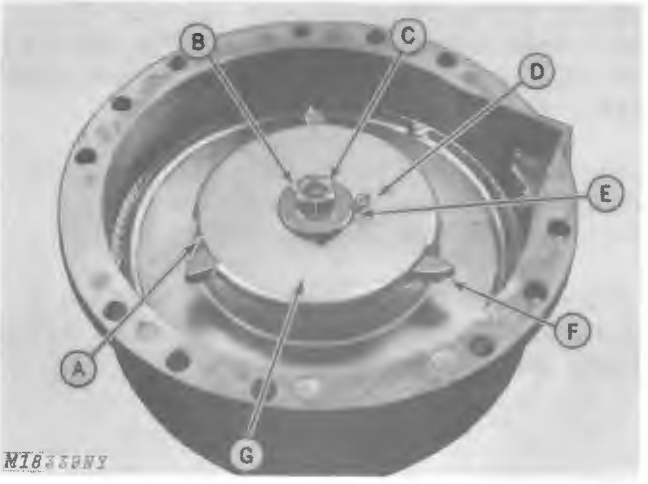
Place end of rope through notch (B) in reel (A) and place reel in position on reel shaft (C).

NOTE: Position inner end of recoil spring away from reel shaft (C) or reel (A) will not drop into position properly.

Place cupped washer (H), cup up, onto reel shaft (C). Place friction spring (F) and return spring (E) into place, Fig. 14.

IMPORTANT: End of return spring must be placed into retaining hole (D) in reel, Fig. 14, or pawls (G) will not retract properly.

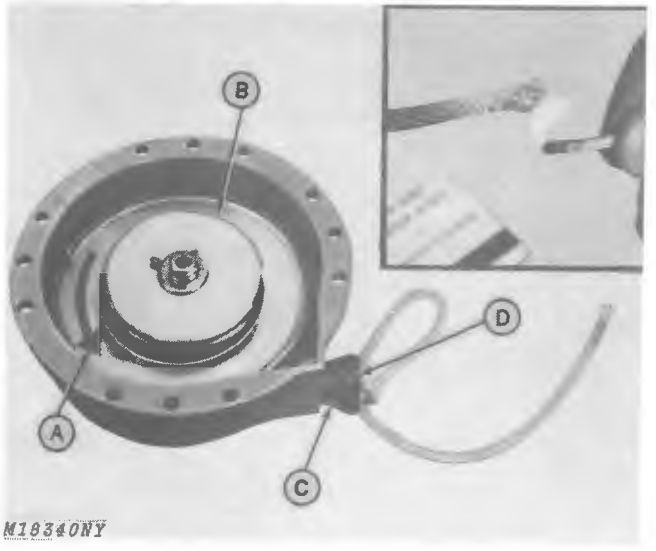
Apply a light film of low-temperature grease to the three pawls (G) and position them as shown, Fig. 14.



A—Notch
B—Washer
C—Nut
D—Return Spring Eye
E—Slot
F—Pawl
G—Friction Plate

Fig. 15-Installing Friction Plate

Slip eye of return spring (D, Fig. 15), through slot in friction plate (G) and position friction plate so notches (A) line up with pawls (F). Install washer (B), lock washer and nut (C) and tighten securely. Lubricate washer with PT569 Never-Seez between the washer and the friction plate.



A—3 Turns
B—Reel
C—Rope Guide
D—Slip Knot

Fig. 16-Installing Rope Guide and Handle

Tension reel by winding it three turns (A, Fig. 16) counterclockwise. Insert rope through eye of case and rope guide (C) and tie a slip knot (D). Thread rope guide into case.

NOTE: It may be necessary to heat end of rope with a match to fuse strands (see inset, Fig. 16). This will enable rope to be threaded easily through rope guide and handle.

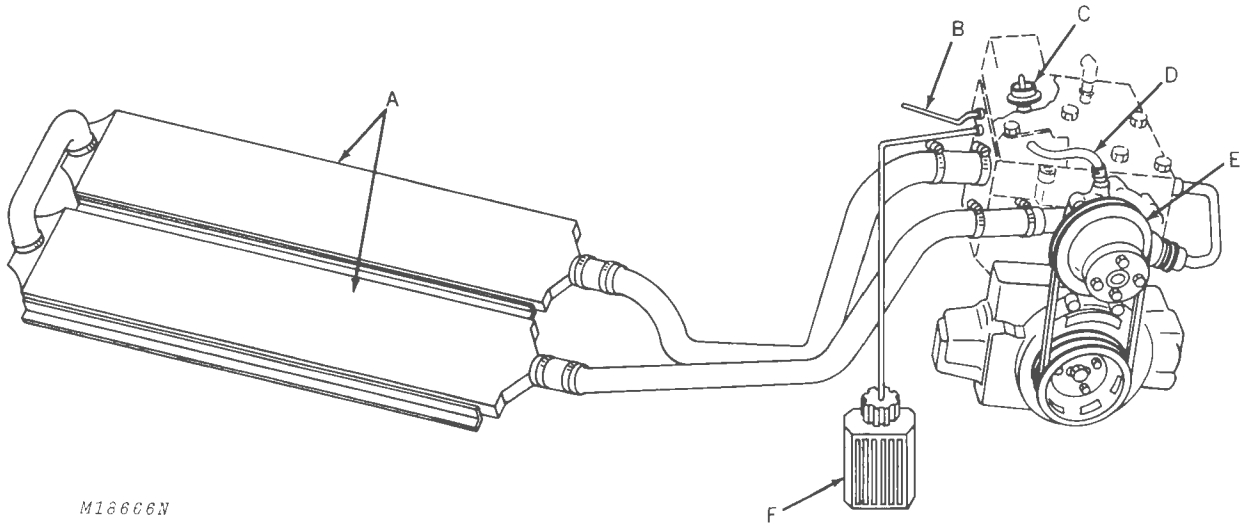
Insert end of rope through rope guide in firewall and handle. Tie a knot in rope and pull knot into handle. Check operation of recoil starter.

Pawls should extend when rope is pulled and retract when rope is released. Rope should recoil sharply back into case.

Litho in U.S.A.

Group 30
LIQUID-COOLING SYSTEM
(Serial No. -80,000)

GENERAL INFORMATION



A—Heat Exchangers
B—To Coolant Temperature Gauge
C—Thermostat
D—Bypass Hose
E—Coolant Pump
F—Coolant Recovery Container

Fig. 1-Schematic View of Liquid-Cooling System

The liquid-cooling system, Fig. 1, is a pressurized, thermostatically controlled system, having a centrifugal pump (E) and one thermostat (C). Capacity of the cooling system is approximately 4-1/2 quarts (4.25 l). Temperature is controlled by the thermostat (C) located in the engine top filler tank. A bypass hose (D) from the engine top filler tank to the centrifugal pump insures fast engine warm-up and provides more uniform cooling temperature through-out the engine during the warm-up period.

The filler cap is equipped with a pressure valve that is set to release when cooling system pressure reaches 15 pounds-per-square-inch (psi).

⚠ CAUTION: Do not remove the filler cap until the system has had sufficient time to cool. Then, loosen cap to relieve pressure before removing it.

The centrifugal-type coolant pump is attached to the engine and is driven by a belt. Pump output is 12 gpm (gallons-per-minute) at 7250 engine rpm. The thermostat used in conjunction with the centrifugal pump and fixed bypass, regulates the flow of coolant through the cooling system.

During the warm-up period, the thermostat remains closed and directs the coolant through the bypass system which recirculates coolant in the engine, thus resulting in a uniform and quicker warm-up period.

When the engine reaches operating temperature (approximately 144°F [61°C]) the thermostat opens, admitting heated coolant to the heat exchangers in the tunnel. The system relies on snow against the exchangers for cooling. Proper engine operating temperature is then maintained by the thermostat.

Litho in U.S.A.

GENERAL INFORMATION—Continued

IMPORTANT: Running the 340 and 440 Liquifire Snowmobiles on hard packed snow or ice or pulling loads may cause a heating condition. If the coolant temperature gauge goes into the red zone, reduce load and immediately run snowmobile in loose snow or shut off the engine.

If the engine should overheat slightly, coolant will run out the overflow tube into a coolant recovery container (F, Fig. 1). This container prevents loss of coolant from the system and as the engine cools, a siphoning takes place and coolant is redrawn from the container back into the system.

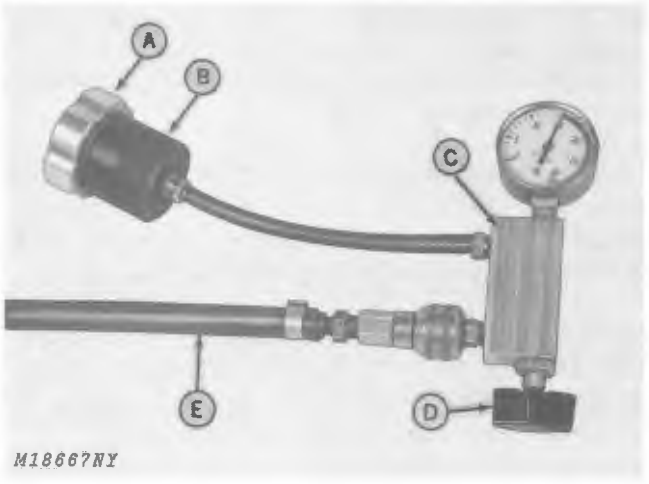
The coolant in the liquid-cooling system is a 50-50 solution of ethylene glycol anti-freeze and water. DO NOT exceed the recommended 50-50 solution. Never add anti-freeze to fill the system until checking the solution with a hydrometer. A 50-50 solution should give approximately a −40°F (−40°C) reading. Check solution when engine is completely warmed up.

IMPORTANT: DO NOT use anti-freeze containing a radiator stop leak. NEVER add radiator stop-leak to the cooling system.

INSPECTION AND TESTING

NOTE: Remove seat before inspecting and testing system. This allows visual inspection of heat exchangers and all connections.

Testing Filler Cap



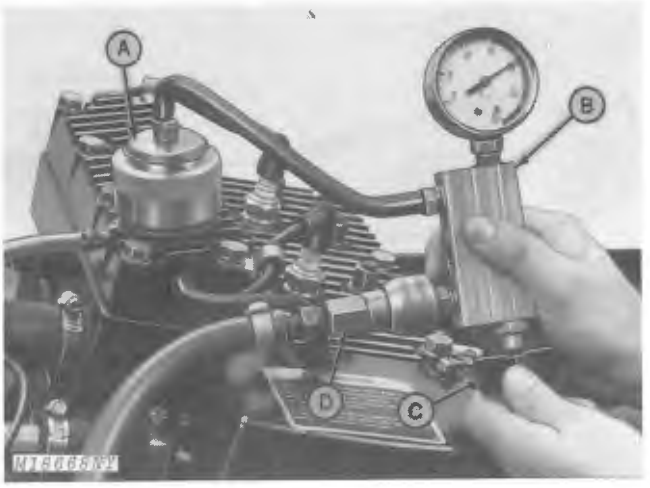
A—Filler Cap
B—JDM-73-1 Tester
C—JDM-44 Testing Tool
D—Control Valve
E—Shop Air Supply

Fig. 2-Pressure Testing Filler Cap

IMPORTANT: Set JDM-73-3 Adapter in JDM-73-1 Tester (flat side down) before connecting filler cap on snowmobiles (Serial No. 70,001-).

Remove filler cap. Tighten filler cap (A, Fig. 2) to JDM-73-1 Cooling System Tester (B). Connect JDM-44 Pressure Testing Tool (C) to JDM-73-1. Connect shop air supply (E) to JDM-44 and open control valve (D). Pressure should rise to 15 psi and remain constant. If pressure drops off, filler cap is bad and should be replaced.

Testing Cooling System



A—JDM-73-2 Tester
B—JDM-44 Testing Tool
C—Control Valve
D—Shop Air Supply

Fig. 3-Pressure Testing Cooling System

Remove filler cap. Install JDM-73-2 Cooling System Tester (A, Fig. 3) to top filler tank. Install JDM-44 Pressure Testing Tool (B) to cooling system tester. Connect shop air supply (D) to pressure testing tool. Open control valve (C) until 20 psi registers on the gauge. Close control valve and observe gauge. Pressure should hold steady. If pressure falls off there is a leak in the system.

Open control valve as necessary to maintain 20 psi on the system. Coolant leaks should be visible with 20 psi on the system.

NOTE: Use soapy water around the filler neck of the top tank. Air is sometimes present at this point in the system and soapy water will help detect leaks in this area.

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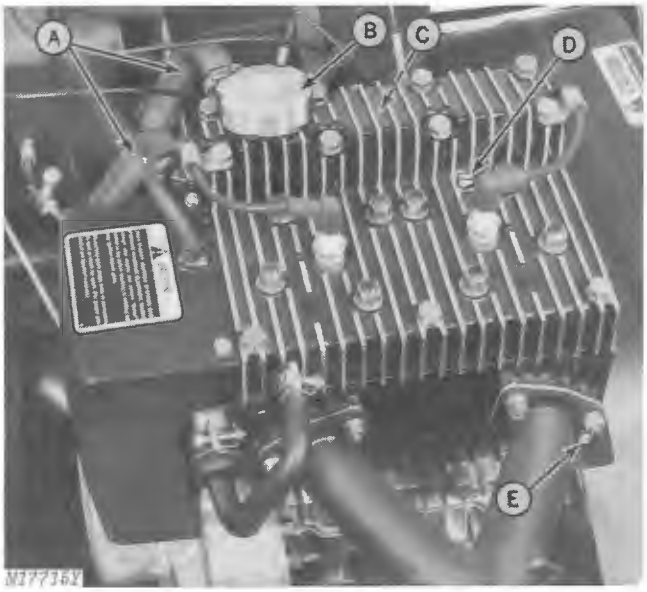
DRAINING AND FILLING COOLING SYSTEM

Draining Cooling System

NOTE: Normally the system needs to be drained and refilled every two years only.



A—Hoses to Heat Exchangers
B—Filler Cap
C—Thermostat
D—Cylinder Head Air Vent Screw
E—Drain Screw

Fig. 4-Draining and Filling Cooling System

1. Remove drain screw (E, Fig. 4) and filler cap (B).

2. Remove hoses (A) from engine.

3. Raise rear of snowmobile to completely drain system.

4. Wash engine and compartment with clean water.

Filling Cooling System

1. Position snowmobile on a level surface.

2. Remove air vent screw (D) from engine cylinder head. Do not lose screw.

3. Remove filler cap (B).

4. Start filling the system with a 50-50 solution of ethylene glycol anti-freeze and water until solution flows from the cylinder head air vent (D). Install air vent screw (D) and washer.

5. Continue filling system until top tank is full. System capacity is approximately 4-1/2 U.S. quarts (4.25 l). Check coolant recovery container. Add solutions as necessary until container is half full.

6. Remove seat. Check hose fittings (A) and heat exchangers for leaks.

7. Install filler cap (B). Block up track so engine can be run safely. Start the engine and again check system for leaks.

8. Shut off engine and replace seat.

DISASSEMBLY AND REPAIR

Thermostat

A—Top Tank
B—Thermostat

Fig. 5-Removing Thermostat

If the engine has been running too cold or has been overheating, remove and check thermostat, (B, Fig. 5).

Remove drain screw and filler cap and allow coolant to drain out until top tank (A) is empty. Remove top tank and thermostat.

If visual inspection of the thermostat fails to disclose any defects, test thermostat in hot water to make sure it opens and closes at the proper temperatures. Thermostat should open at 144°F. (61°C.).

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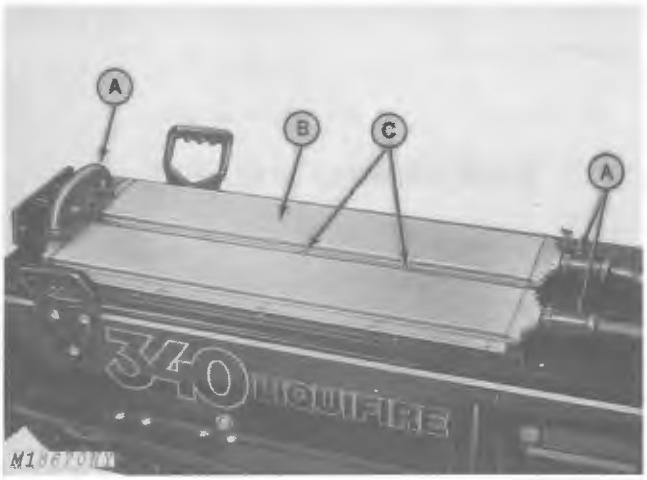
Heat Exchangers

Drain the system as explained on page 20-30-3.

To replace heat exchangers, proceed as follows:

1. Tip the snowmobile on its side and remove slide suspension.



A—Hoses **C—Rivets**
B—Heat Exchanger

Fig. 6-Heat Exchangers

2. Disconnect hoses (A, Fig. 6) from heat exchangers (B).

3. Use a cold chisel and cut off rivets (C). Remove heat exchangers.

4. Install new heat exchangers to tunnel with pop rivets. Rivets should be installed from bottom of tunnel.

5. Connect hoses to heat exchangers. Reinstall slide suspension and track.

6. Fill and bleed the cooling system. See page 20-30-3.

Cooling System Pump

Removal

1. Remove drain plug and filler cap and drain coolant from engine.

NOTE: It is not necessary to drain heat exchangers for pump removal.

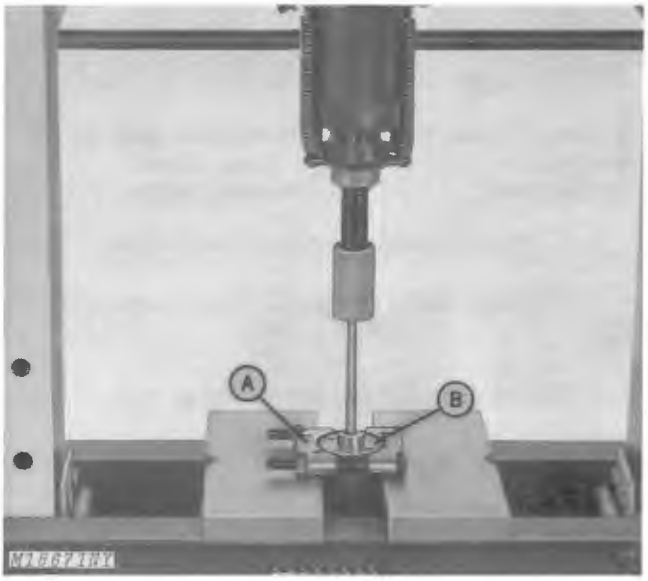
2. Remove drive belt cover. Loosen pump adjusting screws and remove drive belt.

3. Remove bypass hose from pump to top filler tank, hose from pump to cylinder head, and hose from heat exchanger to the pump.

4. Remove pump pulley from pulley bracket.

5. Remove pump from engine.

Disassembling Pump



A—Puller **B—Pulley Bracket**

Fig. 7-Removing Pulley Bracket

Use a puller (A, Fig. 7) and press to remove pulley bracket (B).

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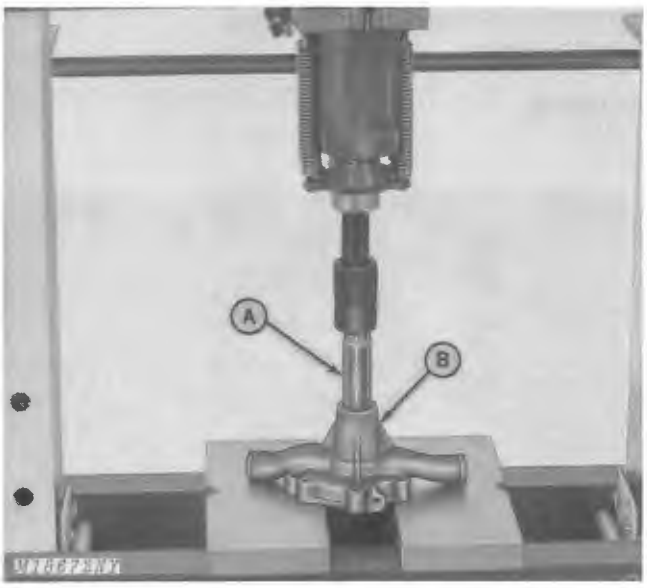


A—Pipe **B—Housing**

Fig. 8-Removing Bearing, Seal and Impeller

Use a piece of tubing or pipe (A, Fig. 8) the exact diameter of the bearing. The pipe or tubing should contact the outer race of bearing only. Press the bearing, seal and impeller from the housing.

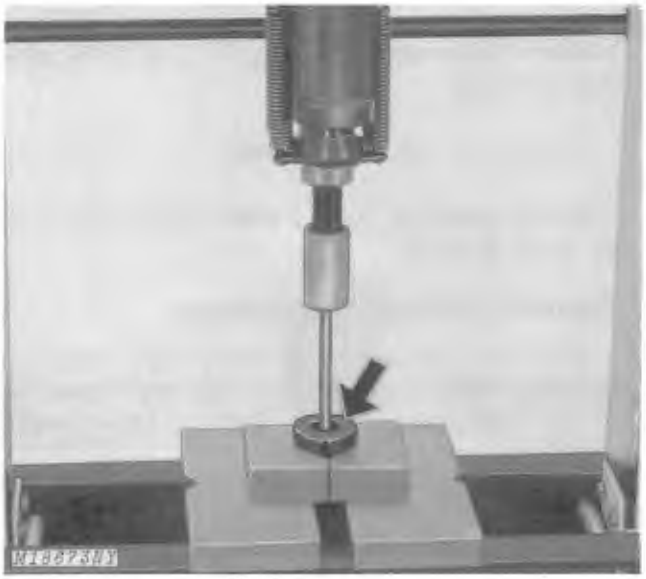


Fig. 9-Removing Bearing From Impeller

Press the bearing from the impeller, Fig. 9.

Assembling Pump

Fig. 10-Installing Seal

Use a piece of tubing or pipe the exact diameter of the seal and press seal in place, Fig. 10.

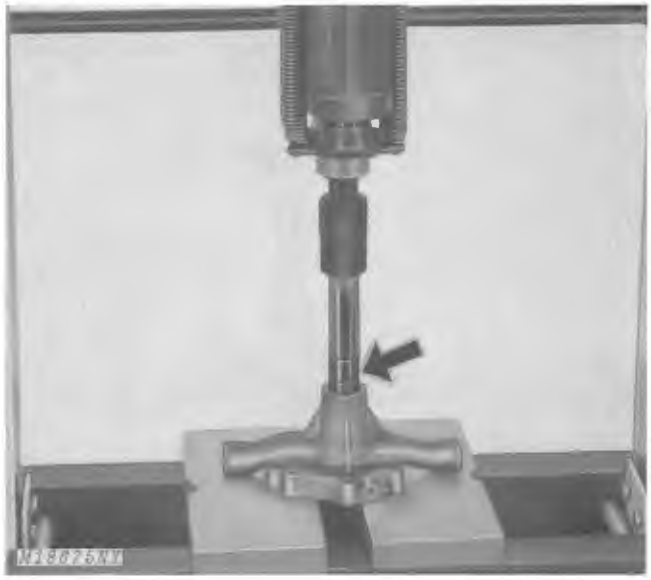


Fig. 11-Installing Bearing

Coat bearing with a light coat of clean SAE 10W engine oil and press bearing into housing, Fig. 11, until bearing outer race is flush with (not below) edge of housing. Use a piece of tubing or pipe that contacts outer bearing race only.

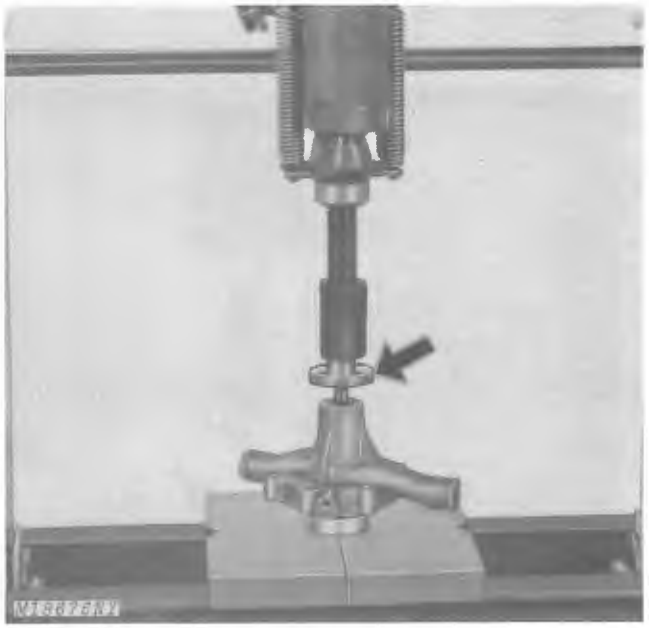


Fig. 12-Installing Pulley Bracket

Support bearing shaft (not the housing) and press pulley bracket on bearing shaft, Fig. 12, until the bracket is flush with end of shaft.

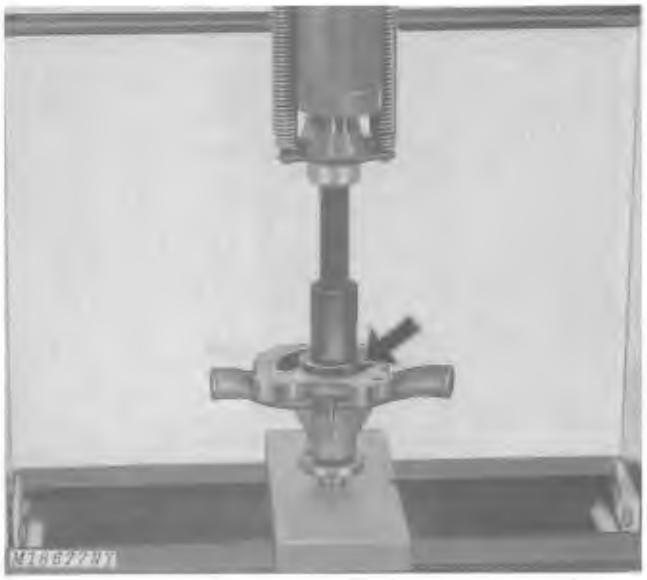


Fig. 13-Installing Impeller

Press the impeller into place with the pump resting on pulley bracket, Fig. 13. Ceramic insert of impeller should be toward seal. Press impeller into place until it is flush with end of bearing shaft.

NOTE: After impeller is correctly installed, there should be approximately 0.009 inch (0.228 mm) clearance between the impeller and housing.

Installing Pump and Adjusting Belt Tension

Install pump on engine. Do not tighten nuts at this time.

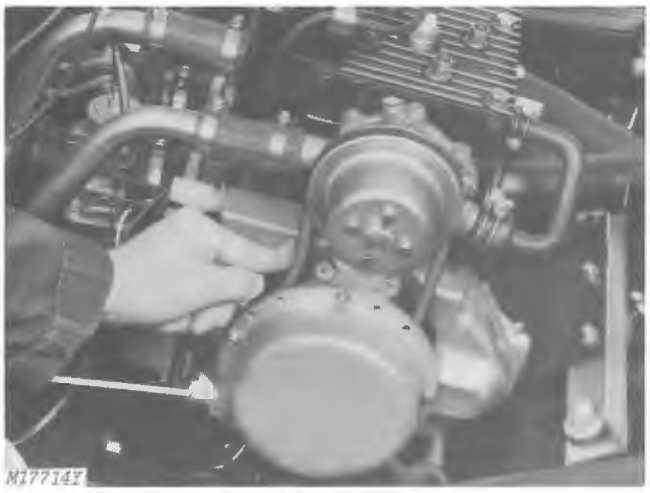


Fig. 14-Adjusting Belt Tension

Install pulley on pulley bracket. Place drive belt on pulley. Install bypass hose from top tank to pump, hose from heat exchanger to pump and hose from cylinder head to pump.

Pry up gently on pump until drive belt has about 3/8-inch (9.52 mm) deflection, Fig. 14, then tighten nuts securely.

Install pump drive belt cover.

Fill and bleed the cooling system as recommended on page 20-30-3.

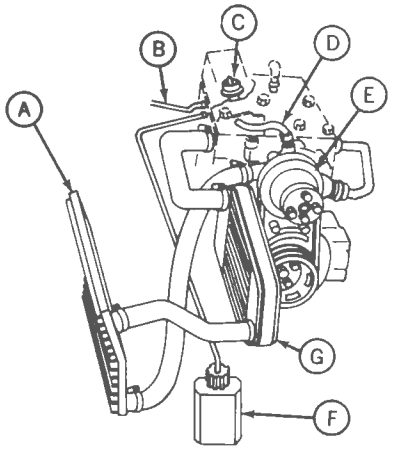
Coolant Temperature Gauge

If coolant temperature gauge is faulty it must be replaced. Remove gauge from instrument panel and sender from cylinder head. Replace as a complete unit.

Litho in U.S.A.

Group 32
LIQUID-COOLING SYSTEM (Serial No. 80,001-)

GENERAL INFORMATION



M22251

A—Heat Exchanger
B—Temperature Gauge Lead
C—Thermostat
D—By-pass Hose
E—Coolant Pump
F—Coolant Recovery Tank
G—Radiator

Fig. 1-Schematic View of Liquid-Cooling System

The liquid-cooling system, Fig. 1, is a pressurized thermostatically-controlled system, having a centrifugal pump (E) and one thermostat (C). Capacity of the system is approximately 4 quarts (3.78 l). Temperature is controlled by the thermostat (C).

The filler cap has a pressure relief valve that releases when cooling system pressure reaches 15 psi.

The pump (E) is attached to the engine and driven by a belt. Pump output is 12 gallons-per-minute at 7250 engine rpm.

During the warm-up period, the thermostat remains closed to divert coolant through the by-pass hose (D) and recirculate the coolant in the engine. This provides a uniform and quicker warm-up period.

When the engine reaches operating temperature (approximately 144°F (61°C)), the thermostat opens to allow coolant through the radiator and heat exchanger. Cool air passing through the radiator and snow against the heat exchanger cools the coolant. Proper engine operating temperature is maintained by the thermostat.

IMPORTANT: Running on hard-packed snow or ice or pulling loads may cause overheating. If coolant temperature gauge goes into the red zone, reduce load and immediately run in loose snow or shut off engine.

If the engine overheats slightly, coolant will run out through the overflow tube to the coolant recovery tank (F). It will be redrawn back into the cooling system when the engine cools down.

Litho in U.S.A.

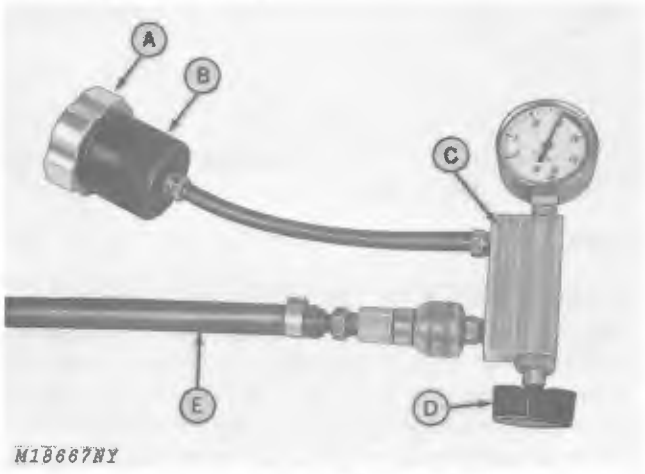
GENERAL INFORMATION—Continued

The coolant in the liquid-cooling system is a 50-50 mixture of ethylene glycol anti-freeze and water. Do not exceed the 50-50 mixture. Check the solution with a hydrometer before adding anti-freeze to the system. A 50-50 mixture should give approximately a −40°F (−40°C) reading. Check only when the engine is completely warmed-up.

IMPORTANT: Do not use anti-freeze containing a radiator stop leak or add stop leak to the cooling system.

TESTING

Testing Filler Cap



A—Filler Cap
B—JDM-73-1 Tester
C—JDM-44 Testing Tool
D—Control Valve
E—Shop Air Supply

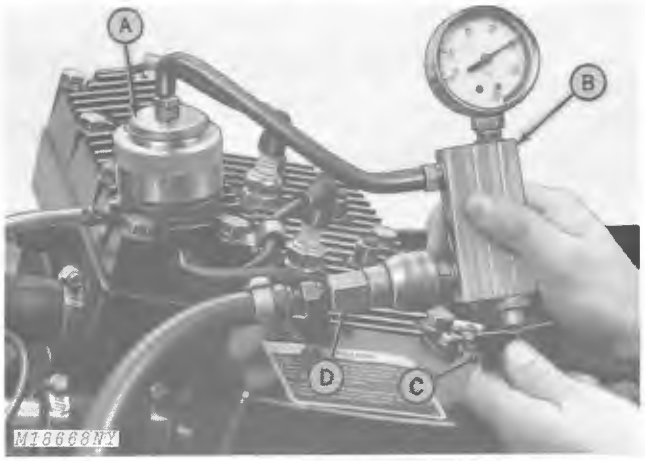
Fig. 2-Pressure Testing Filler Cap

CAUTION: Allow system time to cool. Then, loosen filler cap to relieve pressure before removing it.

IMPORTANT: Set JDM-73-3 Adapter (flat side down) in JDM-73-1 Tester before connecting filler cap.

Tighten filler cap (A), Fig. 2 on JDM-73-1 Tester. Connect JDM-44 Testing Tool to JDM-73-1 Tester. Connect shop air supply (E) to JDM-44 and open control valve (D). Pressure should rise to 15 psi and remain constant. If pressure drops off, filler cap must be replaced.

Testing Cooling System



A—JDM-73-2 Tester
B—JDM-44 Testing Tool
C—Control Valve
D—Shop Air Supply

Fig. 3-Pressure Testing Cooling System

Connect JDM-73-2 Tester (A), Fig. 3, to top filler tank. Connect JDM-44 Testing Tool (B) to JDM-73-2 Tester. Connect shop air supply (D) to JDM-44. Open control valve (C) until gauge reaches 20 psi, then close valve. Pressure should hold steady. If pressure falls there is a leak in the system.

Use the control valve to maintain 20 psi on the system while you look for leaks.

NOTE: Use soapy water around the filler neck to detect leaks in that area.

DRAINING AND FILLING COOLING SYSTEM

NOTE: Normally the system needs to be drained and refilled every two years only.

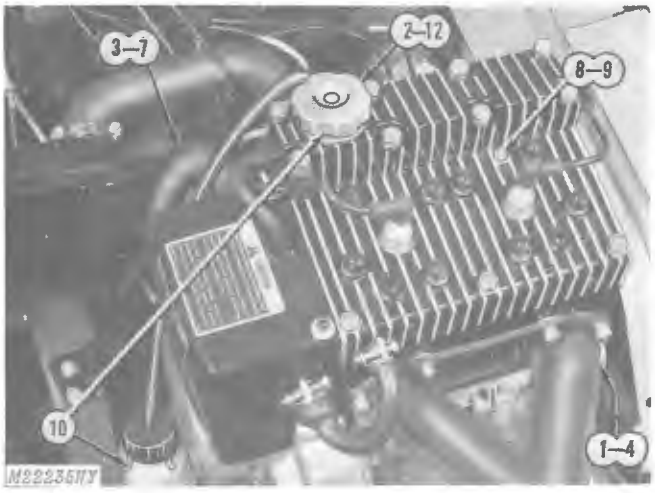


Fig. 4-Draining and Filling Cooling System

Draining System

1. Remove drain screw.
2. Remove filler cap.
3. Disconnect bottom hose from heat exchanger.
4. Raise rear of snowmobile to completely drain system. Reinstall drain screw.
5. Wash engine and compartment with clean water.

Filling System

6. Level snowmobile.
7. Connect hose to engine.
8. Remove vent screw and washer.

IMPORTANT: Use a 50-50 solution of ethylene glycol anti-freeze and water.

9. Add coolant until it flows from vent screw hole, then install vent screw and washer.
10. Continue to add coolant until system is full to bottom of filler neck and approximately one inch of coolant is in coolant recovery container.
11. Check cooling system for leaks.
12. Install filler cap.
13. Start engine and idle it until outlet hose is warm. Then, recheck coolant level.

REPAIR

Thermostat

Fig. 5-Removing Thermostat

1. Remove drain screw and filler cap. Allow coolant to drain out until top tank is empty. Tighten drain screw.
2. Remove top tank.
3. Remove thermostat.
4. Visually inspect thermostat.
5. Suspend thermostat in a pan of water. Heat water and observe thermostat. It should open at 144°F (61°C).
6. Install thermostat and top tank.
7. Follow Steps 10 through 13 at left.

Temperature Gauge

If temperature gauge is faulty, replace gauge and sender as a unit.

Cooling System Pump and Belt

Follow procedure on pages 20-30-4 through 20-30-6 for pump and belt service.

Radiator

NOTE: Repairs should not be attempted except by an experienced radiator repair person.

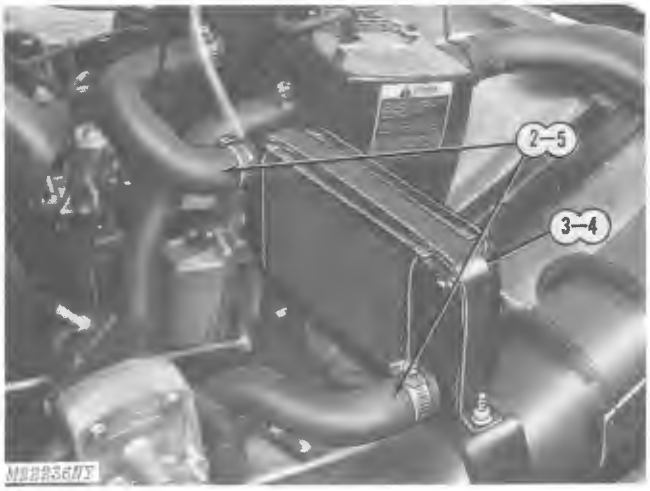


Fig. 6-Replacing Radiator

1. Drain system as instructed on page 20-32-3.
2. Disconnect hoses from radiator.
3. Remove radiator.
4. Install radiator.
5. Connect hoses to radiator.
6. Fill cooling system as instructed on page 20-32-3.

Heat Exchanger

Replacing Heat Exchanger

Drain the cooling system as instructed on page 20-32-3.

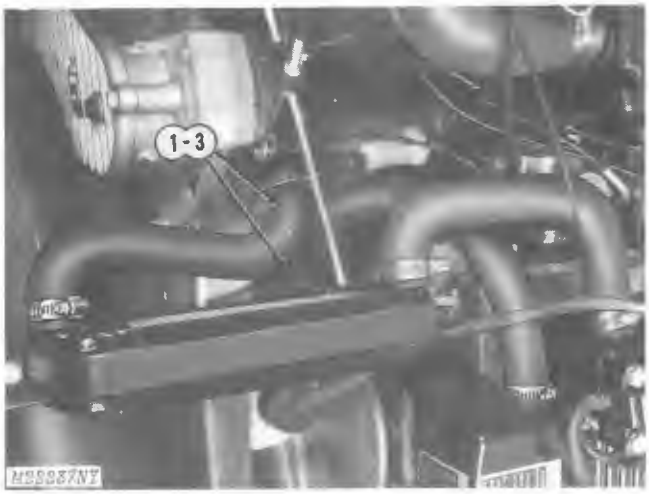


Fig. 7-Disconnecting Hoses

1. Disconnect hoses, Fig. 7.

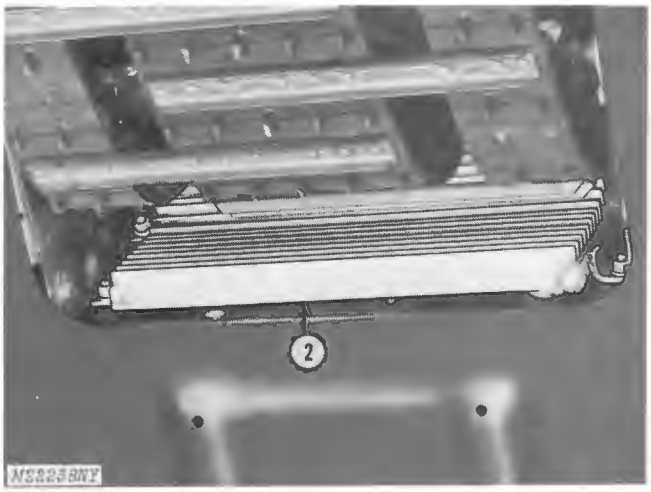


Fig. 8-Replacing Heat Exchanger

2. Replace heat exchanger, Fig. 8.
3. Connect hoses, Fig. 7.
4. Fill cooling system as instructed on page 20-32-3.

Cooling System Pump

Follow procedure on page 20-30-4 for pump repair.

Group 35
SPECIFICATIONS

SPECIFICATIONS

	New Part Dimension		
Item	**340 Cyclone**	**440 Cyclone**	**Wear Tolerance**
Cylinder Bore	2.2843 in. to 2.2850 in. (58.00 to 58.01 mm)	2.5998 in. to 2.6006 in. (66.03 to 66.05 mm)	0.005 in. (0.127 mm)
Connecting Rod Small End	0.8664 in. to 0.8669 in. (22.00 to 22.01 mm)	0.8664 in. to 0.8669 in. (22.00 to 22.01 mm)	0.0008 in. (0.0203 mm)
Connecting Rod Side Clearance	0.0078 in. to 0.0118 in. (0.198 to 0.298 mm)	0.0078 in. to 0.0118 in. (0.198 to 0.298 mm)	----
Crankshaft Runout	0.0008 in. to 0.0020 in. (0.020 to 0.050 mm)	0.0008 in. to 0.0020 in. (0.020 to 0.050 mm)	----
Crankshaft Twist	----	----	0.003 in. (0.076 mm) off TDC
Crankshaft End Play	0.0098 in. to 0.0197 in. (0.249 to 0.500 mm)	0.0098 in. to 0.0197 in. (0.249 to 0.500 mm)	----
Piston at Top Land	2.2699 in. to 2.2711 in. (57.65 to 57.69 mm)	2.5850 in. to 2.5858 in. (65.66 to 65.68 mm)	----
Piston at Skirt (0.255 in.* [6.5 mm] up from bottom)	2.2780 in. to 2.2787 in. (57.86 to 57.87 mm)	2.5929 in. to 2.5937 in. (65.86 to 65.88 mm)	0.008 in. (0.203 mm)
Piston Pin Bore	0.7084 in. to 0.7087 in. (17.00 to 18.00 mm)	0.7084 in. to 0.7087 in. (17.99 to 18.00 mm)	----
Piston Pin	0.7083 in. to 0.7087 in. (17.99 to 18.00 mm)	0.7083 in. to 0.7087 in. (17.99 to 18.00 mm)	----
Ring Groove Clearance (Top)	0.0012 in. to 0.0028 in. (0.030 to 0.071 mm)	0.0012 in. to 0.0028 in. (0.030 to 0.071 mm)	+0.004 in. (0.102 mm)
Ring Groove Clearance (Bottom)	0.0012 in. to 0.0028 in. (0.030 to 0.071 mm)	0.0012 in. to 0.0028 in. (0.030 to 0.071 mm)	+0.004 in. (0.102 mm)
Crankshaft O.D. (PTO) End	30 mm	30 mm	----

**0.001 inch (0.0254 mm) oversize pistons are available for service.*

Litho in U.S.A.

SPECIFICATIONS—Continued

	New Part Dimension		
Item	340 Liquifire	440 Liquifire	Wear Tolerance
Cylinder Bore	2.2843 in. to 2.2850 in. (58.02 to 58.03 mm)	2.5990 in. to 2.6000 in. (66.02 to 66.04 mm)	0.005 in. (0.127 mm)
Connecting Rod Small End	0.9058 in. to 0.9063 in. (23.00 to 23.02 mm)	0.9058 in. to 0.9063 in. (23.00 to 23.02 mm)	0.0008 in. (0.0203 mm)
Connecting Rod Side Clearance	0.0078 in. to 0.0118 in. (0.198 to 0.298 mm)	0.0078 in. to 0.0118 in. (0.198 to 0.298 mm)	----
Crankshaft Runout	0.0008 in. to 0.0020 in. (0.020 to 0.050 mm)	0.0008 in. to 0.0020 in. (0.020 to 0.050 mm)	----
Crankshaft Twist	----	----	0.003 in. (0.076 mm) off TDC
Crankshaft End Play	0.0079 in. to 0.0197 in. (0.201 to 0.500 mm)	0.0079 in. to 0.0197 in. (0.201 to 0.500 mm)	----
Piston at Top Land	2.2699 in. to 2.2711 in. (57.65 to 57.69 mm)	2.5850 in. to 2.5858 in. (65.66 to 65.68 mm)	----
Piston at Skirt (0.020 in. [6.5 mm] from bottom)	2.2780 in. to 2.2787 in. (57.86 to 57.87 mm)	2.5929 in. to 2.5937 in. (65.86 to 65.88 mm)	0.008 in. (0.203 mm)
Piston Pin Bore	0.7084 in. to 0.7087 in. (17.99 to 18.00 mm)	0.7084 in. to 0.7087 in. (17.99 to 18.00 mm)	----
Piston Pin	0.7083 in. to 0.7087 in. (17.99 to 18.00 mm)	0.7083 in. to 0.7087 in. (17.99 to 18.00 mm)	----
Ring Groove Clearance (Top)	0.0012 in. to 0.0028 in. (0.030 to 0.071 mm)	0.0012 in. to 0.0028 in. (0.030 to 0.071 mm)	+0.004 in. (0.102 mm)
Ring Groove Clearance (Bottom)	0.0012 in. to 0.0028 in. (0.030 to 0.071 mm)	0.0012 in. to 0.0028 in. (0.030 to 0.071 mm)	+0.004 in. (0.102 mm)
Ring End Gap	0.012 in. to 0.016 in. (0.305 mm to 0.406 mm)	0.012 in. to 0.016 in. (0.305 mm to 0.406 mm)	
Crankshaft O.D. (PTO) End	30 mm	30 mm	----

Litho in U.S.A.

TORQUE FOR HARDWARE

	Torque	
Location	**Cyclone**	**Liquifire**
Crankcase	15 to 18 ft-lbs (20 to 24 Nm)	15 to 18 ft-lbs (20 to 24 Nm)
Cylinder-to-Crankcase	15 to 18 ft-lbs (20 to 24 Nm)	15 to 18 ft-lbs (20 to 24 Nm)
Cylinder Head	11.5 to 14.5 ft-lbs (15.6 to 19.7 Nm)	21 to 23 ft-lbs (28 to 31 Nm)
	5.5 to 6.5 ft-lbs (6.8 to 8.8 Nm)	14 to 16 ft-lbs (18 to 21 Nm)
	See page 20-15-11	13 to 14 ft-lbs (17 to 18 Nm) See page 20-20-11
Intake and Exhaust Manifold	10 to 12 ft-lbs (13 to 16 Nm)	10 to 12 ft-lbs (13 to 16 Nm)
Flywheel-to-Crankshaft	60 ft-lbs (81 Nm)	60 ft-lbs (81 Nm)
Fan Pulley Retaining Nut	28 to 31 ft-lbs (38 to 42 Nm)	---- ----
Spark Plug	14 ft-lbs (19 Nm)	14 ft-lbs (19 Nm)

Litho in U.S.A.

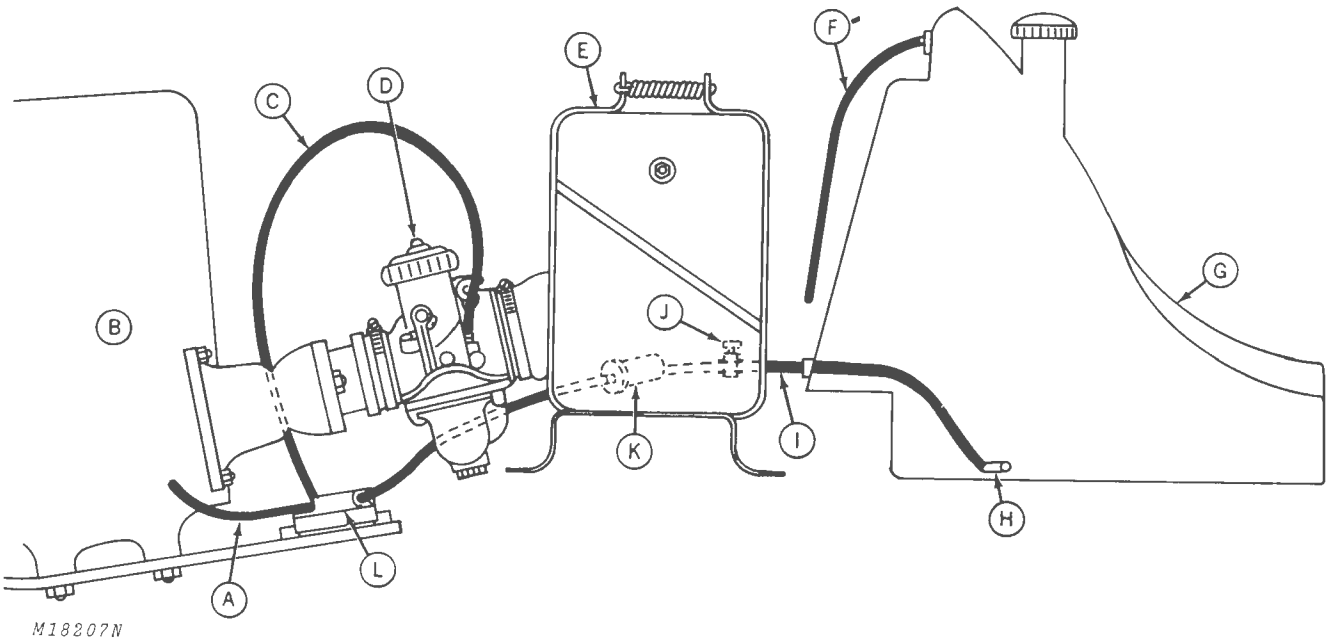
Litho in U.S.A.

Section 30
FUEL SYSTEM
Group 5
GENERAL INFORMATION

CONTENTS

Litho in U.S.A.

PRINCIPLE OF OPERATION



A—Impulse Line
B—Engine Crankcase
C—Fuel Pump-To-Carburetor Line
D—Carburetor
E—Silencer
F—Vent Line
G—Fuel Tank
H—Screen
I —Fuel Line to Fuel Pump
J —Fuel Shut-Off Valve (-80,000)
K—In-Line Fuel Filter
L—Fuel Pump

Fig. 1-Fuel System

The fuel system, Fig. 1, consists of a fuel tank, fuel lines, fuel shut-off valve (Serial No. -80,000), in-line fuel filter, fuel pump and carburetor.

Gasoline must be mixed with a good quality oil that is suitable for use in 2-cycle, air cooled, snowmobile engines. See page 10-20-1 for gasoline and fuel specifications. The oil in the fuel is the only lubrication the engine receives.

IMPORTANT: Too lean a fuel mixture starves the engine of lubrication and causes severe engine damage.

The plastic fuel tank has a fuel gauge-type cap. A spill ledge prevents fuel from spilling onto the seat. The fuel pickup line in the tank has a screen.

The nylon screen in the in-line filter has a self-cleaning action. Pulsation of the screen shakes loose contamination such as dirt, rust and small fibers. Loose contamination collects at the base of the cone.

The chart below shows the Serial No., Snowmobile Model and carburetor number used.

Serial No. (55,001 to 70,000)

SNOWMOBILE MODEL	MIKUNI CARBURETOR	JOHN DEERE PART NO.
340 Cyclone	VM34-83	AM53950
440 Cyclone	VM34-84	AM53951
340 Liquifire	VM34-79 (2 used)	AM53806
440 Liquifire	VM34-80 (2 used)	AM53808

Serial No. (70,001 and up)

SNOWMOBILE MODEL	MIKUNI CARBURETOR	JOHN DEERE PART NO.
340 Cyclone	VM34-123	AM54243
440 Cyclone	VM34-124	AM54244
340 Liquifire	VM34-122 (2 used)	AM54242
440 Liquifire	VM34-125 (2 used)	AM54245

DIAGNOSING MALFUNCTIONS

Carburetor Too Rich

Float level incorrect.

Dirt under inlet needle valve.

Silencer restricted.

Wrong main jet.

Choke system adjusted incorrectly.

Jet needle clip positioned incorrectly.

Air jet restricted.

Carburetor Too Lean

In-line fuel filter plugged or restricted.

Dirty fuel pickup strainer in fuel tank.

Debris on top of needle valve.

Fuel pump impulse lined plugged.

Hole in fuel impulse line.

Jet needle clip positioned incorrectly.

Wrong main jet.

Faulty fuel pump.

Pinched fuel lines.

Hole in intake silencer boot.

Head gasket leaking.

Operating with air intake silencer removed.

Air leakage at carburetor mounting gasket, heat spacer gasket or intake manifold gaskets.

Air leakage at crankshaft seals or crankcase mating surfaces.

Litho in U.S.A.

IDENTIFYING LEAN OR RICH CARBURETOR MIXTURES

There is no substitute for experience in recognizing whether an engine is running rich or lean. The following list of symptoms will aid in determining rich and lean conditions.

When the fuel mixture is *lean*, the following conditions may be present:

1. The engine heats rapidly and overheating is common under load.
2. Performance improves when the choke is applied.
3. Acceleration is slow; "flat spots" are also noted.
4. Inside exhaust ball joints are pale or white in color.
5. Engine rpm fluctuates at full throttle running.
6. Lack of power is evident.

NOTE: When the main jet is just slightly lean, the engine will run better when cold and lose power as it heats up.

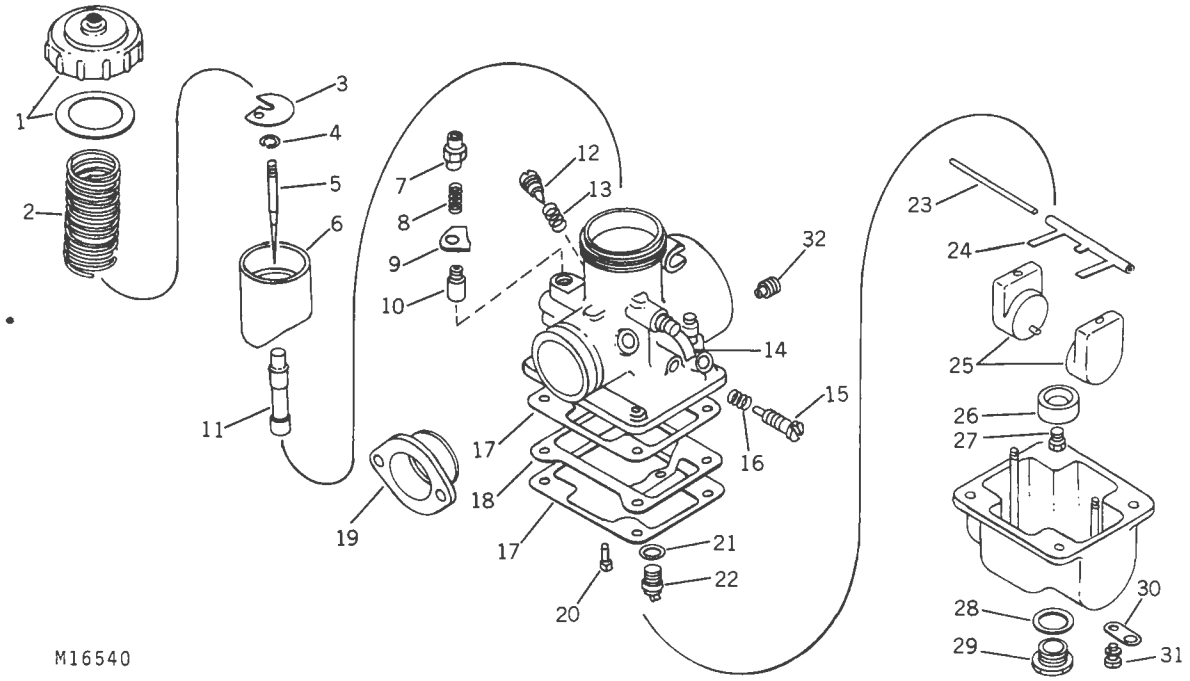
When the fuel mixture is too *rich*, the following conditions may be present:

1. Exhaust noise is dull or muted and intermittent.
2. Excessive exhaust smoke is more visible as throttle is advanced.
3. Spark plug fouling.
4. Engine misses under load.
5. Condition should worsen when the choke is applied.
6. As engine heats up, condition becomes worse.

Litho in U.S.A.

Group 10
MIKUNI CARBURETOR

GENERAL INFORMATION



1—Mixing Chamber Cap	**9—Washer**	**17—Gasket**	**25—Float (2 used)**
2—Throttle Valve Spring	**10—Choke Plunger**	**18—Baffle Plate**	**26—Ring**
3—Plate	**11—Needle Jet**	**19—Mount**	**27—Main Jet**
4—E-Ring	**12—Air Screw**	**20—Pilot Jet**	**28—Washer**
5—Jet Needle	**13—Air Screw Spring**	**21—Washer**	**29—Drain Plug**
6—Throttle Valve	**14—Vent Tube**	**22—Needle Valve**	**30—Plate**
7—Choke Plunger Cap	**15—Throttle Stop Screw**	**23—Float Arm Pin**	**31—Screw**
8—Choke Plunger Spring	**16—Stop Screw Spring**	**24—Float Arm**	**32—Air Jet**

Fig. 1-Exploded View of Mikuni Carburetor

The Mikuni Carburetor, Fig. 1, is a twin-float, fixed-jet, throttle-valve carburetor. It consists of four systems: The choke system, float system, pilot system and main system.

Choke System

The choke system consists of the starter jet and choke plunger. This system eliminates the need for a choke apparatus in the carburetor bore, thereby increasing efficiency and making rapid acceleration possible.

Float System

The float system consists of two independent floats and a needle valve. This system maintains fuel at a constant level in the float chamber. A baffle plate is used to prevent rippling of the fuel during varying engine speeds or when traveling over rough terrain.

Pilot System (Idle and Slow Speed)

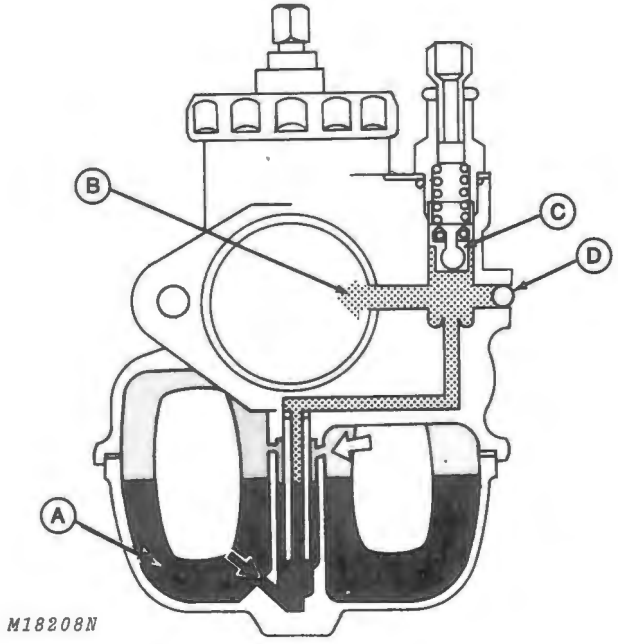
The pilot system consists of the pilot jet, air screw, pilot outlet and bypass. The ratio of fuel-air mixture for idling and slow speed is controlled by the pilot jet and air screw.

Main System

The main system consists of the jet needle, needle jet, main jet, air jet and throttle valve. The fuel-air mixture ratio is controlled by a combination of these components of which the main jet is very important.

PRINCIPLE OF OPERATION

Choke System



A—Fuel
B—Fuel-Air Mixture
C—Choke Plunger
D—Air

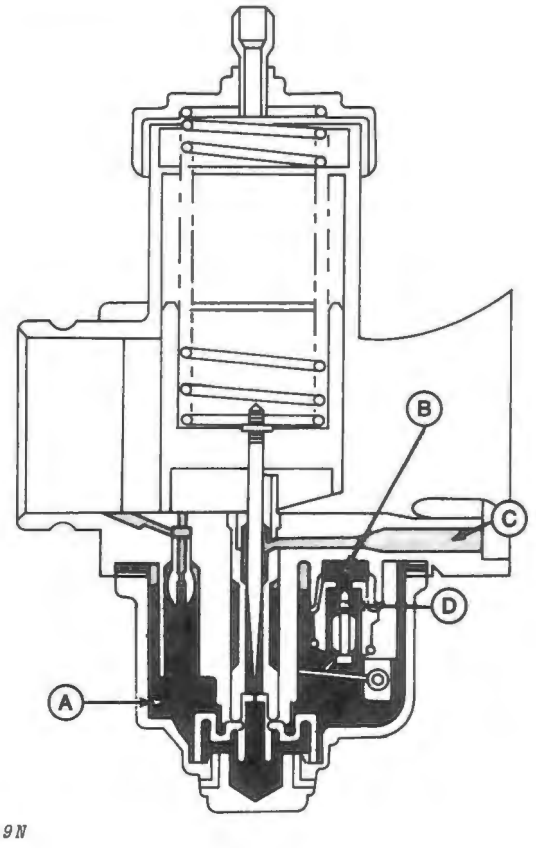
Fig. 2-Choke System

NOTE: The throttle valve must be closed. The choke system requires negative pressure in the inlet pipe in order to function.

The choke system, Fig. 2, is opened and closed by the choke plunger (C). Moving the choke lever on the dash up lifts the choke plunger (C) and opens the choke system.

Fuel is metered through the starter jet and mixed with air (B) in the emulsion tube. This mixture flows into the plunger area, mixes with more air from the air intake (D) and is then drawn into the engine through the carburetor throat.

Float System



A—Fuel
B—Fuel Inlet
C—Air
D—Needle Valve

Fig. 3-Float System

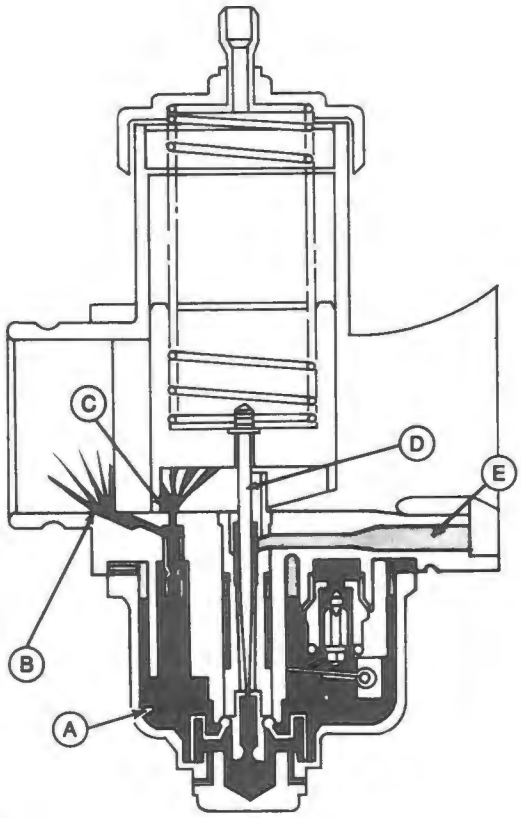
The function of the float system, Fig. 3, is to maintain the correct level of fuel in the float chamber under all operating conditions. The float system consists of two floats. This design aids in maintaining the proper fuel level under high-angle operating conditions.

When the fuel level drops in the float chamber, the floats and float arm with actuating tab drop. Fuel under pressure from the fuel pump is forced through the needle valve seat, around the needle valve (D) and into the float chamber. As fuel (A) in the float chamber approaches the correct level, the floats raise contacting the float arm with actuating tab which in turn contacts the needle valve (D). The needle valve is seated against the valve seat, stopping fuel flow (B) into the float chamber.

Under actual operating conditions, the fuel level and floats automatically position themselves so that the inward flow of fuel to the carburetor is equal to the outward flow of fuel to the engine.

Litho in U.S.A.

Pilot System (Idle and Slow Speed)



M18210N

A—Fuel
B—Pilot Bypass
C—Pilot Outlet
D—Jet Needle
E—Air

Fig. 4-Pilot System (Idle and Slow Speed)

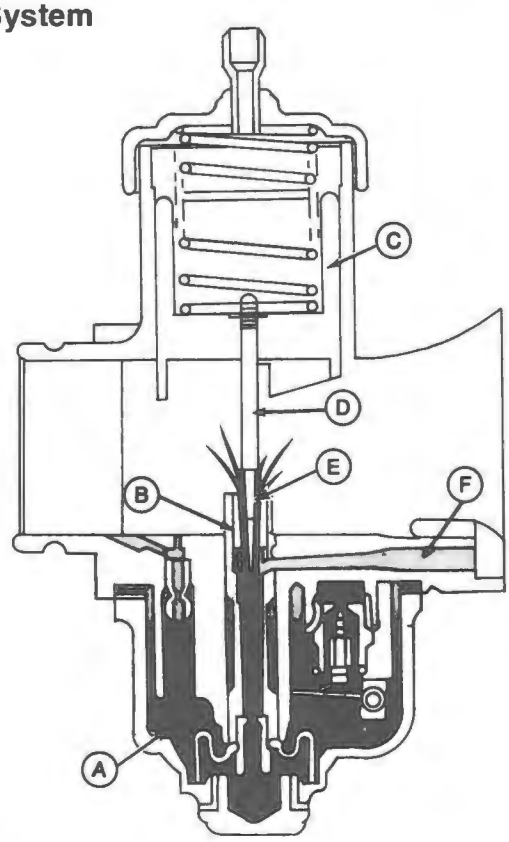
The pilot system, Fig. 4, controls the fuel-air mixture from idle or closed throttle position until the throttle valve is opened sufficiently to allow the main metering system to function.

At idle speed the throttle valve is closed and the velocity of air flowing through the needle jet is low. This low negative pressure is not strong enough to draw fuel from the needle jet of the main system.

Fuel during idle is supplied by the pilot outlet (C) and bypass (B). Fuel metered by the pilot jet is mixed with air (E) from the air intake and bypass before the fuel enters the carburetor bore.

As the throttle valve is opened wider for low-speed operation, the pilot outlet (C) cannot supply the required fuel. The fuel then enters the carburetor bore through the bypass (B) as well as the pilot outlet (C).

Main System



M18211N

A—Fuel
B—Needle Jet
C—Throttle Valve
D—Jet Needle
E—Metered Here
F—Air

Fig. 5-Main Metering System

The main metering system, Fig. 5, starts to function when the throttle valve (C) is opened about 1/4 of the way. Opening the throttle valve also causes the jet needle (D) to move up. This causes the air flowing through the needle jet (B) to increase, thereby increasing negative pressure which causes a sucking action to take place.

From 1/4 to 3/4 open throttle, the fuel passes through the main jet and is metered in the clearance between the needle jet (B) and jet needle (D). The fuel is then mixed with air that is metered through the air intake (E), thereby atomizing the fuel. This mixture is then mixed with air flowing through the main bore before entering the engine.

During this operation the cutaway (slant) of the throttle valve (C) controls the negative pressure on the needle jet (B), thereby regulating the amount of fuel that is injected into the engine.

When the throttle valve is fully opened for high-speed operation, fuel is metered entirely by the main jet.

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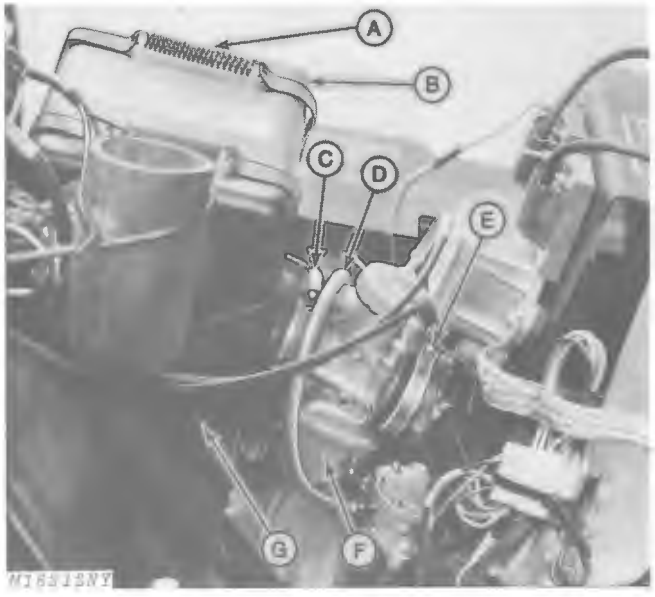
REMOVAL



A—Spring **D—Fuel Line** **G—Lower Half**
B—Top Half **E—Clamp**
C—Clamp **F—Carburetor**

Fig. 6-Removing Carburetor

1. Remove air silencer springs (A, Fig. 6) and silencer top half (B).

2. Loosen clamp (C) on rubber boot securing air silencer to carburetor (F) and remove silencer lower half (G).

3. Remove fuel line (D) from carburetor.

4. Loosen clamp (E) securing carburetor to mount and remove carburetor.

Fig. 7-Removing Choke Plunger

5. Loosen lock nut on choke cable and remove choke plunger assembly from mixing chamber body, Fig. 7.

Fig. 8-Removing Mixing Chamber Cap

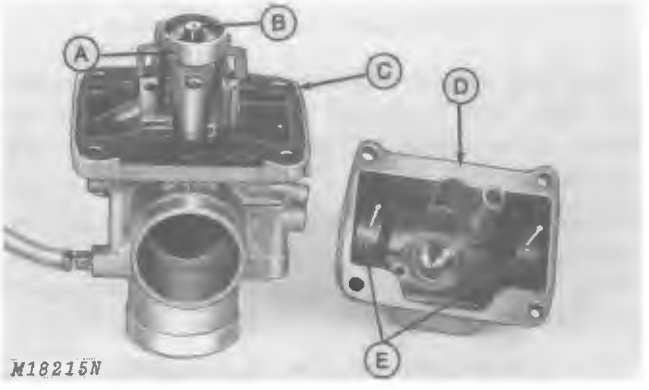
6. Remove mixing chamber cap, throttle valve spring, plate, E-ring, jet needle and throttle valve. These components come out as an assembly, Fig. 8.

DISASSEMBLY

Remove drain plug and drain the fuel from the float chamber.

⚠ CAUTION: Use care when draining fuel from the carburetor. Gasoline is dangerous, even when mixed with oil. Avoid fires due to smoking or careless maintenance practices.

Remove throttle stop screw with spring and air screw with spring.

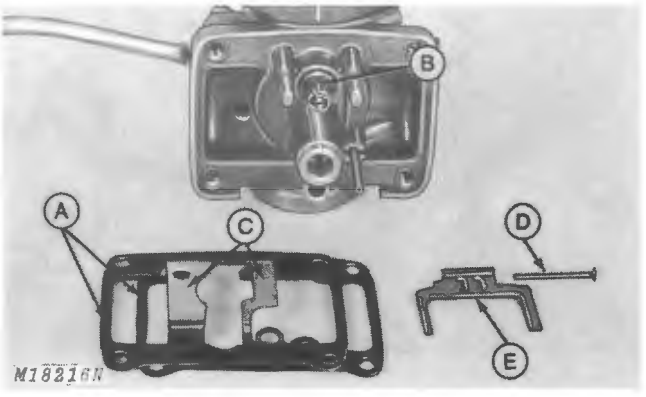


A—Ring **C—Mixing Chamber Body** **E—Floats**
B—Main Jet **D—Float Chamber**

Fig. 9-Removing Float Chamber and Floats

Remove float chamber (D, Fig. 9) with floats (E) from mixing chamber body (C).

Remove main jet (B) and ring (A). Use a 6 mm (15/64-inch) socket or box end wrench to remove main jet (B).



A—Gaskets
B—Inlet Needle Valve Assembly
C—Baffle Plate
D—Float Air Pin
E—Float Arm

Fig. 10-Removing Float Arm Assembly and Baffle Plate

Remove float arm pin (D, Fig. 10), float arm (E), baffle plate (C), gaskets (A) and inlet needle valve assembly (B).

A—Needle Jet **B—Awl**

Fig. 11-Removing Needle Jet From Mixing Chamber

Remove needle jet (A, Fig. 11) carefully from the mixing chamber by pushing from the bottom with an awl (B).

INSPECTION AND REPAIR

Cleaning Carburetor

IMPORTANT: Never clean jets or passages with small drills or wire. A slight enlargement or burring of jets or passages will change the performance of the carburetor.

Place carburetor parts in carburetor cleaner (PT503) or its equivalent. Do not place gaskets in cleaner.

Allow parts to remain in cleaner for one to two hours. Remove and rinse parts with solvent. Dry parts with compressed air, making sure all holes are open and free of dirt. Never use rags or paper to dry the parts. Lint may plug jets or passages and affect operating efficiency of the carburetor.

NOTE: Rinse mixing chamber body and float chamber in hot water. This will neutralize the corrosive action of the carburetor cleaner on the aluminum of these parts.

Inspecting Carburetor

Inspect mixing chamber body and float chamber for cracks or damage that might cause fuel leaks.

Check all springs for damage or distortion.

Inspect throttle stop screw and air screw for seating surface damage or stripped threads.

Inspect main jet and pilot jet for damage or stripped threads.

NOTE: Main jet and pilot jet should be clean and shiny. Any abrasions will cause a lean fuel-air mixture and possible engine damage.

Remove retainer and inlet valve from inlet valve seat. Inspect seating surface on inlet valve and seat for damage. Be sure retainer is not binding or hindering movement of inlet valve.

Inspect needle jet and jet needle for damage. Jet needle should slide freely within the needle jet.

NOTE: The E-ring on the jet needle should be installed in the following grooves depending on snowmobile model and serial number.

JET NEEDLE POSITION CHART

Model	340 Cyclone	440 Cyclone	340 Liquifire	440 Liquifire
(Serial No. 55,001-70,000)	2nd Groove	2nd Groove	4th Groove	4th Groove
(Serial No. 70,001-80,000)	3rd Groove	3rd Groove	4th Groove	3rd Groove
(Serial No. 80,001-)	3rd Groove	3rd Groove	4th Groove	4th Groove

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Install floats in float chamber. Move floats up and down to be sure they are not binding on guides. Floats must work freely to maintain a constant fuel level in the float chamber.

Inspect float pin and float arm. Float arm should not bind on pin.

Check choke plunger. Plunger should move freely in passage of mixing chamber.

Place throttle valve in mixing chamber body and move it up and down to check for sticking or wear. Be sure guide pin in mixing chamber body is not broken off. This would allow throttle valve to rotate, causing erratic carburetor operation.

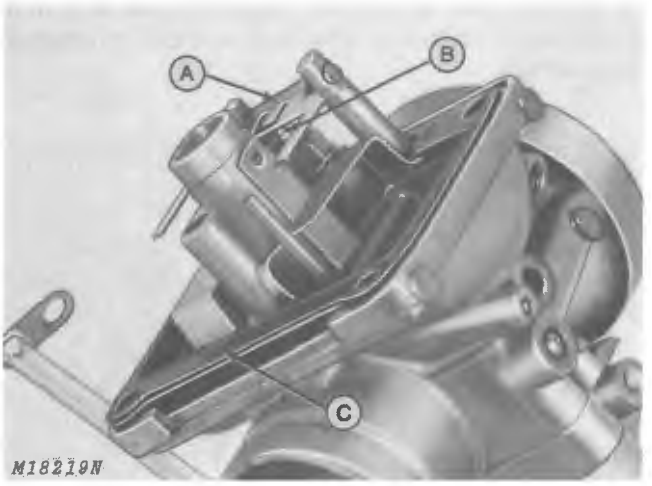
ASSEMBLY

Installing Pilot Jet

Fig. 12-Installing Pilot Jet

Use a small screwdriver and install pilot jet, Fig. 12. Tighten jet by turning it clockwise.

Installing Baffle Plate, Needle Valve and Float Arm



A—Float Arm
B—Inlet Valve
C—Baffle Plate and Gaskets

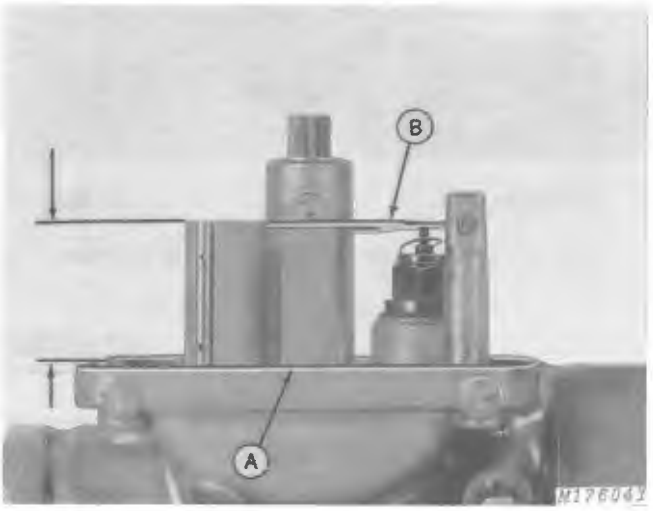
Fig. 13-Installing Baffle Plate, Needle Valve and Float Arm

Install gaskets and baffle plate (C) on mixing chamber. Install the second gasket on top of baffle plate, Fig. 13.

Install new washer on inlet needle valve seat and install seat in mixing chamber body. Install inlet valve (B) (point down) and retainer, Fig. 13.

Install float arm (A) and secure with float arm pin, Fig. 13.

Float Level Adjustment



A—Mixing Chamber **B—Float Arm**

Fig. 14-Float Level Adjustment

With the carburetor inverted, the edge of the mixing chamber (A, Fig. 14) should be parallel with the float arm (B). If adjustment is necessary, bend only the float arm actuating tab.

Installing Needle Jet

A—Pin **C—Needle Jet**
B—Notch

Fig. 15-Installing Needle Jet

Install needle jet (C) making sure notch (B) on needle jet is correctly aligned with pin (A) in bore in mixing chamber, Fig. 15. Place ring over needle jet bore, (recess in ring next to bore) and screw main jet into needle jet.

Installing Floats

Fig. 16-Positioning Pins When Installing Floats in Float Chamber

Install floats over float pins. Pins on floats must be down and pointing to the inside of float chamber, Fig. 16.

Attach float chamber to mixing chamber with four screws.

Refer to Fig. 1 and install air screw spring (13) and air screw (12). Turn the screw in until it just seats. DO NOT force it. As a preliminary adjustment, refer to charts on page 30-10-11 and back screw out accordingly.

Install throttle stop screw (15) and spring (16), Fig. 1, until screw is just flush with the inside of the bore.

INSTALLATION

Position carburetor in rubber mount and secure with clamp. Install fuel line from pump to carburetor.

Installing Throttle Valve

Fig. 17-Installing Throttle Valve

See page 30-10-5 and install E-ring in the proper groove of the jet needle, Fig. 17 (Inset).

NOTE: Groove No. 1 provides leaner midrange operation; groove No. 5 provides richer midrange operation.

Guide throttle cable end button through cap, spring and slot in throttle valve, Fig. 17. Slide cable into narrow part of slot in throttle valve. Install plate between spring and throttle valve with tab on plate in the slot of the throttle valve. This locks the cable to the throttle valve.

Compress throttle valve spring and tighten cap to mixing chamber.

IMPORTANT: Move throttle lever and observe throttle valve travel. Throttle valve must have full travel up and down. If not, check to insure that guide pin and slot in throttle valve are properly aligned.

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Installing Choke Plunger

Fig. 18-Installing Choke Plunger

Be sure choke lever on instrument panel is down. Guide choke cable end button through cap and spring. Hook end button in choke plunger, Fig. 18. Place washer on mixing chamber body. Install the assembly and tighten cap.

Adjust and synchronize carburetor as explained below.

ADJUSTMENTS

Choke System (All Snowmobiles)

The choke system is opened and closed by the choke plunger and operates by negative inlet pipe pressure. The throttle valve must be closed when starting the engine; otherwise, the fuel-air mixture will be too lean for starting.

The fuel-air mixture for starting is metered through independent jets.

Adjust the choke plunger as follows:

A—JDM-75 Carburetor Choke Gauge **C—Jam Nut**
B—Adjusting Sleeve

Fig. 19-Adjusting Choke Plunger

1. Place the choke lever on the dash in the "UP" position.

2. Loosen jam nut (C) and turn adjusting sleeve (B) clockwise to fully seat choke plunger.

3. Insert JDM-75 Carburetor Choke Gauge (A, Fig. 19), with the flat "UP" into the plunger air hole as shown.

4. Turn adjusting sleeve (B) counterclockwise to bring the choke plunger "UP". Continue to do so until the carburetor choke gauge slides further into the plunger air hole indicating that the choke plunger has raised approximately one half the diameter of the plunger air hole.

5. Tighten jam nut (C).

NOTE: When the choke lever on the dash is down, the choke plunger should be all the way down in the bore. There should be slight freeplay between the lever and the dash.

IMPORTANT: If the choke plunger is not down tight in the bore, the carburetor will run "RICH" and will affect the main jet system. This could cause a problem when attempting to find the correct main jet for top engine performance.

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Adjusting Throttle Cable (All Snowmobiles)

A—Throttle Stop Screw **C—Adjusting Sleeve**
B—Jam Nut **D—Pilot Air Screw**

Fig. 20-Adjusting Throttle Cable

1. Use a strong rubber band or clamp and lock the throttle lever tightly against the handgrip. Remove air silencer.
2. Place your finger in the throat of the carburetor. Loosen jam nut (B, Fig. 20) and turn adjusting sleeve (C) clockwise (in) until the cut-out portion of the throttle valve can be felt flush with the inside of the bore.
3. After the cut-out portion of the throttle valve is flush with the bore, turn the adjusting sleeve (C) counterclockwise as follows: 3-1/2 turns on 340 Liquifire, 4 turns on 340 Cyclone and 440 Liquifire and 5 turns on the 440 Cyclone. This will move the throttle valve "UP" making the backside of the valve flush with the bore. Tighten jam nut (B).

IMPORTANT: After adjustment on the 340 and 440 Cyclone Snowmobiles (Serial No. 50,001-70,000) check for a clearance of 0.100 inch (2.54 mm) between throttle lever and handgrip. Excess clearance could allow the throttle cable retainer to come loose from the throttle lever, increasing idle speed. Back out throttle adjusting sleeve as necessary to prevent retainer from coming loose.

NOTE: When the throttle valve is adjusted correctly, the backside of the valve will be flush with or above the bore. No part of the valve will restrict air flow through the carburetor throat.

4. Turn throttle stop screw (A) counterclockwise until the screw tip is flush with the inside of the bore.
5. Remove rubber band or clamp from the throttle lever and allow the throttle valve to fully seat in the bore.
6. Turn throttle stop screw (A) clockwise until the screw contacts the throttle valve. When the screw contacts the valve, the valve will begin to rise. Turn throttle stop screw two additional turns clockwise. This will give preliminary idle speed.
7. Look into the throat of the carburetor and slowly compress the throttle lever on the handgrip. The throttle valve should begin to rise.

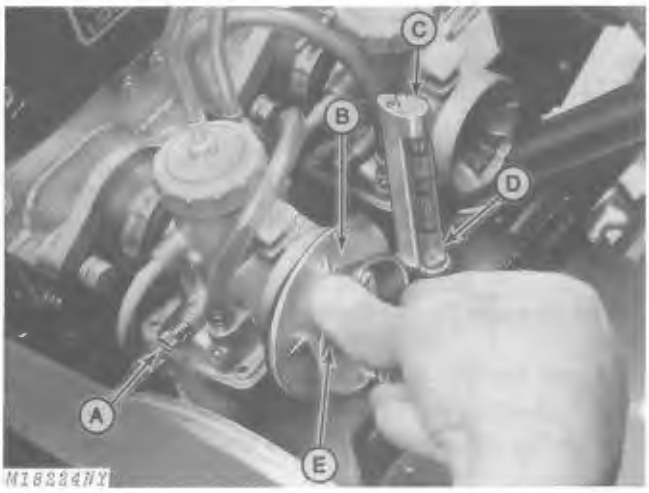
NOTE: On the Liquifire Snowmobiles, both throttle valves should begin to rise at exactly the same time. If throttle valve movement does not occur as specified, repeat Steps 2 through 7.

8. Carefully turn pilot air screw (D) clockwise (in) until a slight seating resistance is felt.
9. Turn pilot air screw (D) counterclockwise (out). See charts on page 30-10-11 and 30-10-12.
10. The idle speed may not be correct for normal operation. To check engine for proper idle, proceed as follows:
    a. Install air intake silencer and run the engine until operating temperature is reached.
    b. If engine will not idle or if increased idle rpm is desired, turn throttle stop screw (A), clockwise until idle speed of 1800 to 2200 rpm is obtained.

NOTE: On 340 and 440 Liquifire Snowmobiles, set both throttle stop screws equally.

IMPORTANT: DO NOT use the pilot air screws (D) at any time to set engine idle. Be sure the pilot air screws are adjusted as explained in Step 9.

Synchronizing Carburetors (340 and 440 Liquifire)



A—Idle Adjusting Screw
B—JDM-64-2 Air Flow Meter
C—Tube in Vertical Position
D—Float
E—Air Flow Control

Fig. 21-Synchronizing Carburetors

1. Raise and support the rear of the snowmobile so track is clear of the ground.
2. Start and run the engine at 4000 rpm. Use a wedge in the throttle lever to maintain engine speed at 4000 rpm.
3. Open air flow control (E, Fig. 21) of the JDM-64-2 Air Flow Meter and place meter over right-hand carburetor throat. Tube on meter must be in vertical position (C).
4. Slowly close air flow control (E) until the float (D) in tube lines up with a graduated mark on tube.
5. Place Air Flow Meter (B) on left-hand carburetor without changing adjustment of air flow control (E). If carburetors are equal, all settings are correct.

NOTE: Air flow meter should be placed on carburetor for only 1 to 5 seconds at a time.

6. If adjustment is necessary, loosen jam nut on carburetor with lowest float level and turn adjusting sleeve counterclockwise until float level matches the other carburetor.

⚠ CAUTION: BE VERY CAREFUL when making slide adjustment. DO NOT allow your arm to contact drive belt. DO NOT wear loose clothing that may be caught in the drive belt.

7. Remove wedge from the throttle lever and allow the engine to idle. Repeat Steps 3, 4 and 5. Adjust throttle stop screws as necessary to give proper idle.

Selecting Main Jets

The main jet meters fuel through the carburetor when operating in the one-half-to-full throttle range. Temperature and altitude affect the density of air. In order to maintain a constant air-fuel ratio, which results in peak performance, the carburetors must be jetted richer or leaner for varying conditions.

1. Operate the snowmobile at wide open throttle for several minutes on a flat, well-packed surface. Failure to achieve maximum rpm or laboring at high rpm indicates the main jet should be changed. Try to determine if operating problems are caused by too rich or too lean a fuel mixture.

2. Continue to operate at wide open throttle and shut off the ignition before releasing the throttle. This will enable you to determine if the fuel mixture is too rich or too lean by examining the exhaust manifold and spark plugs.

3. If the exhaust manifold or spark plug insulator is dark brown or black, the fuel/air mixture is too rich. Decrease the jet size.

NOTE: Do not change jet sizes more than one increment (step) at a time.

4. If the exhaust manifold or spark plug insulator is very light in color, the fuel/air mixture is too lean; increase the jet size.

5. If you cannot determine the color, proceed as though it is too lean and increase the jet size. If operation improves, continue to increase the jet size to obtain peak performance. If operation becomes worse, decrease the jet size to obtain peak performance.

6. After the proper main jet is selected, recheck the jet needle and needle jet.

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SEA LEVEL AND ALTITUDE CHARTS
Cyclone and Liquifire Snowmobiles
(Serial No. 55,001-70,000)

ITEM	340 CYCLONE		440 CYCLONE		340 LIQUIFIRE		440 LIQUIFIRE	
Altitude	Sea Level to 2000 ft. (609.6 m)	8,000 to 12,000 ft. (1138.4 to 3657.6 m)	Sea Level to 2000 ft. (609.6 m)	8,000 to 12,000 ft. (1138.4 to 3657.6 m)	Sea Level to 2000 ft. (609.6 m)	8,000 to 12,000 ft. (1138.4 to 3657.6 m)	Sea Level to 2000 ft. (609.6 m)	8,000 to 12,000 ft. (1138.4 to 3657.6 m)
Main Jet No.	370*	320	410*	320	180*	170	200	160
Jet Needle	6FL14-2**	6FL14-2**	6FL14-2**	6FL14-2**	6DH3-4**	6DH3-4**	6DH3-3**	6DH3-3**
Needle Jet	Q-0	P-8	Q-0	Q-0	0-8	0-8	P-0	P-0
Throttle Valve	2.5	1.5	3.0	2.5	2.0	1.0	2.5	1.0
Pilot Jet No.	20	15	20	20	45	25	40	25
Air Screw (turns)	1 Open	2 Open	1 Open	1 Open	2 Open	1 Open	1-1/2 Open	1-1/2 Open
Idle Speed (rpm)	1800-2400	3000	1800-2400	1800-2400	1800-2400	3000	1800-2400	1800-2400

**Factory Installed.*
***Example 6FL14-2. The last number (2) indicates the E-ring position on the jet needle, that is, the 2nd groove down from the top.*

340 Cyclone Snowmobile (Serial No. 70,001-)

Item	Sea Level to 2000 ft. (609.6 m)	2000 to 4000 ft. (609.6 to 1219.2 m)	4000 to 6000 ft. (1219.2 to 1828.8 m)	6000 to 8000 ft. (1828.8 to 2438.4 m)	8000-10000 ft. (2438.4 to 3048 m)
Main Jet	400	370	320	310	270
Jet Needle	6FL14-3*	6FL14-3*	6FL14-4*	6FL14-3*	6DH7-5*
Needle Jet	Q-0	Q-0	Q-0	Q-0	P-6
Throttle Valve	2.0	2.0	2.0	2.0	1.5
Pilot Jet	20	20	20	20	20
Air Screw (turns)	2.0	2.0	1.5	1.5	1.5
Idle Speed (rpm)	1800-2200	1800-2200	1800-2200	1800-2200	3000

440 Cyclone Snowmobile (Serial No. 70,001-)

Item	Sea Level to 2000 ft. (609.6 m)	2000 to 4000 ft. (609.6 to 1219.2 m)	4000 to 6000 ft. (1219.2 to 1828.8 m)	6000 to 8000 ft. (1828.8 to 2438.4 m)	8000-10000 ft. (2438.4 to 3048 m)
Main Jet	420	400	370	360	350
Jet Needle	6FL14-3*	6FL14-3*	6FL14-4*	6FL14-4*	6FL14-4*
Needle Jet	P-2	P-2	P-2	P-2	P-2
Throttle Valve	2.0	2.0	2.0	2.0	2.0
Pilot Jet	30	30	30	30	30
Air Screw (turns)	2.0	2.0	2.0	2.0	2.5
Idle Speed (rpm)	1800-2200	1800-2200	1800-2200	1800-2200	1800-2200

**Last number indicates position of E-ring on the jet needle.*

340 Liquifire Snowmobile (Serial No. 70,001-)

Item	Sea Level to 2000 ft. (609.6 m)	2000 to 4000 ft. (609.6 to 1219.2 m)	4000 to 6000 ft. (1219.2 to 1828.8 m)	6000 to 8000 ft. (1828.8 to 2438.4 m)	8000-10000 ft. (2438.4 to 3048 m)
Main Jet	210	190	180	170	160
Jet Needle	6DH3-4*	6DH3-4*	6DH3-4*	6DH3-4*	6DP1-4*
Needle Jet	0-6	0-6	0-6	0-6	0-6
Throttle Valve	2.0	2.0	1.5	1.5	1.0
Pilot Jet	40	40	40	40	25
Air Screw (turns)	1	1.5	1	2	2
Idle Speed (rpm)	1800-2200	1800-2200	1800-2200	1800-2200	3000

440 Liquifire Snowmobile (Serial No. 70,001-)

Item	Sea Level to 2000 ft. (609.6 m)	2000 to 4000 ft. (609.6 to 1219.2 m)	4000 to 6000 ft. (1219.2 to 1828.8 m)	6000 to 8000 ft. (1828.8 to 2438.4 m)	8000-10000 ft. (2438.4 to 3048 m)
Main Jet	220	220	210	200	200
Jet Needle	6DH4-4*	6DH4-3*	6DH8-2*	6DH8-2*	6DH7-3*
Needle Jet	P-0	P-0	P-0	P-0	P-2
Throttle Valve	2.0	2.0	2.0	1.5	1.0
Pilot Jet	30	30	30	30	25
Air Screw (turns)	1.5	1.5	1.0	1.0	1.5
Idle Speed (rpm)	1800-2200	1800-2200	1800-2200	1800-2200	1800-2200

**Last number indicates position of E-ring on the jet needle.*

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TUNING COMPONENTS

MAIN JETS

MIKUNI 4/042-	JOHN DEERE NO.
LEAN	
70	M66899
75	M66900
80	M66901
85	M66902
90	M66903
95	M66904
100	M66905
110	M66906
120	M65336
130	M65335
140	M65332
150	M65333
160	M65334
170	M65468
180	M65469
190	M65470
200	M65471
210	M65472
220	M65852
230	M65882
240	M65853
250	M65854
260	M65855
270	M65883
280	M65884
290	M66324
300	M66325
310	M66326
320	M66327
330	M66328
340	M66329
350	M66330
360	M66331
370	M66332
380	M66333
390	M66334
400	M66335
410	M66336
420	M66497
430	M66498
440	M66500
450	M66824
460	M66907
470	M66908
480	M66909
490	M66910
500	M66911
RICH	

JET NEEDLES*

MIKUNI NO.	JOHN DEERE NO.
6DH3	M65354
6DH2	M66656
6FL14	M66422
6DP1	M66926
6DH7	M66927
6DH4	M66928
6DP5	M66941

NEEDLE JETS

MIKUNI VM34/05	JOHN DEERE NO.
LEAN	
0-0	M66890
0-2	M66891
0-4	M66892
0-6	M66893
0-8	M66739
P-0	M65340
P-2	M66845
P-4	M66894
P-6	M66741
P-8	M66895
Q-0	M66740
Q-2	M66896
Q-4	M66897
Q-6	M66898
Q-8	M66916
RICH	

THROTTLE VALVES - 34 MM

MIKUNI VM34/110	JOHN DEERE NO.
RICH	
0.5	M66880
1.0	M66881
1.5	M66882
2.0	M66344
2.5	M66743
3.0	M66744
3.5	M66883
LEAN	

THROTTLE VALVES - 36 MM

MIKUNI VM36/39	JOHN DEERE NO.
RICH	
0.5	M66884
1.0	M66885
1.5	M66886
2.0	M66887
2.5	M66658
3.0	M66888
3.5	M66889
LEAN	

PILOT JETS

MIKUNI VM22/210	JOHN DEERE NO.
LEAN	
#15	M66912
#17.5	M66913
#20	M66745
#25	M66929
#30	M66844
#35	M66914
#40	M65355
#45	M66746
#50	M66663
#55	M66672
#60	M66915
RICH	

AIR JETS

MIKUNI BS30/97	JOHN DEERE NO.
LEAN	
0.5	M66499
0.6	M66917
0.7	M66033
0.8	M66918
0.9	M66919
1.0	M66920
1.2	M66921
1.4	M66922
1.6	M66923
1.8	M66924
2.0	M66925
RICH	

**Lean to Rich information not available at this time.*

TUNING COMPONENTS—Continued

MAIN JET


M22340

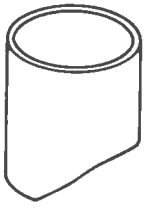
AMBIENT TEMP	ALTITUDE	JET SIZE	FUEL MIXTURE
HOT	HIGH ALT.	75	LEAN
		100	
		150	
		200	
		250	
		300	
		350	
		400	
		450	
COLD	SEA LEVEL	500	RICH

NEEDLE JET


M22343

AMBIENT TEMP	ALTITUDE	JET SIZE	FUEL MIXTURE
HOT	HIGH ALT.	O-2	LEAN
		O-4	
		O-6	
		O-8	
		P-2	
		P-4	
		P-6	
		P-8	
COLD	SEA LEVEL	Q-0	RICH

THROTTLE VALVE


M22341

AMBIENT TEMP	ALTITUDE	THROTTLE VALVE CUTAWAY	FUEL MIXTURE
COLD	HIGH ALT.	.5	RICH
		1.0	
		1.5	
		2.0	
		2.5	
		3.0	
		3.5	
HOT	SEA LEVEL		LEAN

JET NEEDLE


M22344

AMBIENT TEMP	ALTITUDE	NEEDLE CLIP POSITION	FUEL MIXTURE
HOT	HIGH ALT.		LEAN
COLD	SEA LEVEL		RICH


M22345

AIR SCREW


M22342

AMBIENT TEMP.	ALTITUDE	TURNS OPEN	FUEL MIXTURE
HOT	HIGH ALT.	2-1/2	LEAN
		2	
		1-1/2	
		1	
COLD	SEA LEVEL	1/2	RICH

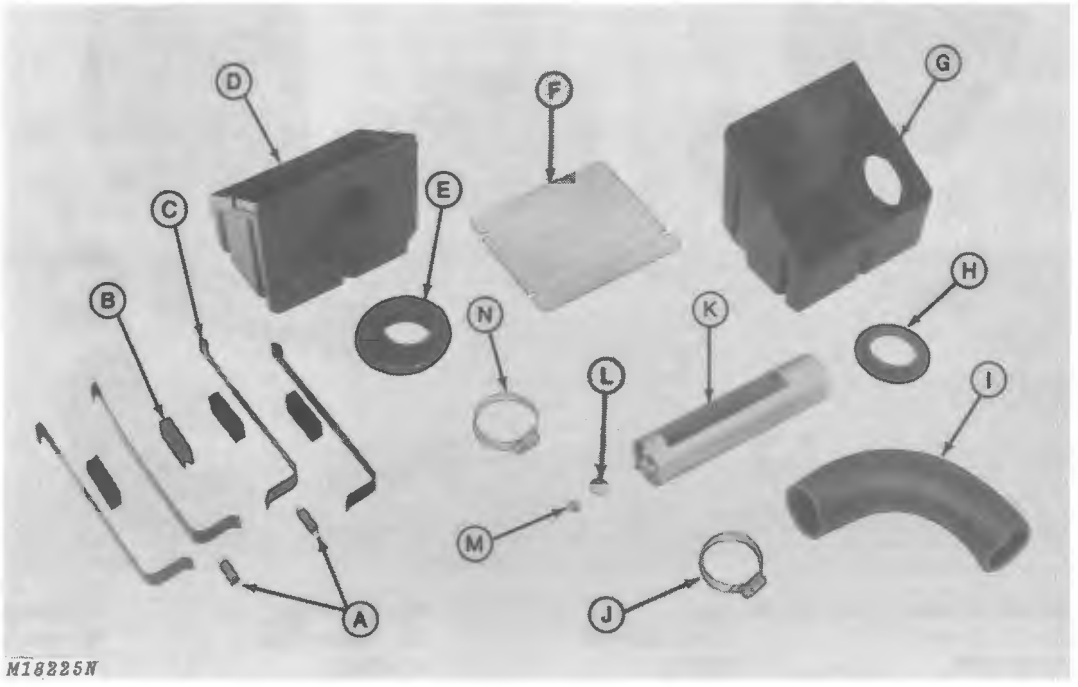
PILOT JET


M22346

AMBIENT TEMP	ALTITUDE	JET SIZE	FUEL MIXTURE
HOT	HIGH ALT.	15	LEAN
		20	
		25	
		30	
		35	
		40	
		45	
		50	
		55	
COLD	SEA LEVEL	60	RICH

Group 15
SILENCERS

340 AND 440 CYCLONE SNOWMOBILE
(Serial No. 55,001-70,000)



A—Spring (2 used)
B—Pads (4 used)
C—Straps (4 used)
D—Lower Half
E—Boot
F—Screen
G—Upper Half
H—Rubber Ring
I —Hose
J —Clamp
K—Tube
L —Washer
M—Nut
N—Clamp

Fig. 1-Cyclone Silencer Components (Serial No. 55,001-70,000)

General Information

The function of the silencer, Fig. 1, is to quiet the sound of rushing air, and to catch fuel that spits back out of the carburetor throat.

The silencer is not intended to filter incoming air because the snowmobile should be operated only on clean, snow-covered areas.

Service

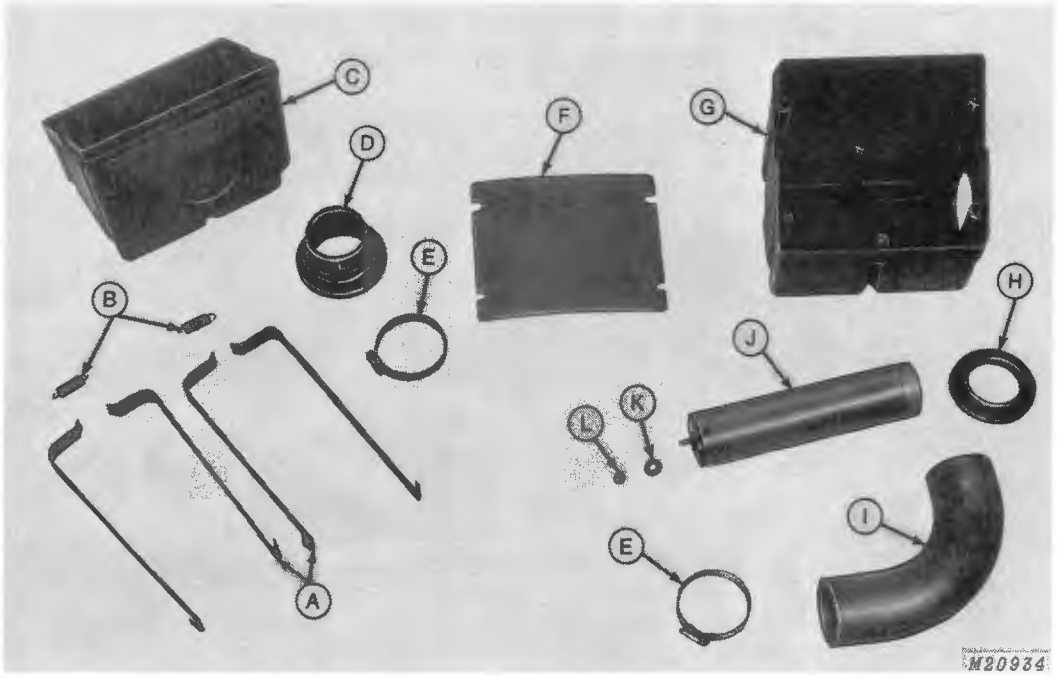
There is no service for the upper (G) and lower (D) half of the silencer. If these two parts are cracked or damaged in any way, they must be replaced.

IMPORTANT: NEVER run the snowmobile with the silencer removed. Lean mixtures, loss of power and engine damage will result if the engine is run without the silencer.

Installing Tube

When installing tube (K) in upper half (G) of silencer, be sure "This Side Up" on tube is toward the top of the upper half. Chamfered part of rubber ring (H) must face inside of box.

340 AND 440 CYCLONE SNOWMOBILE (Serial No. 70,001 and up)



A—Straps (4 used)
B—Spring (2 used)
C—Lower Half
D—Boot
E—Clamp (2 used)
F—Screen
G—Upper Half
H—Rubber Ring
I —Hose
J—Screen
K—Washer
L—Nut

Fig. 2-Cyclone Silencer Components (Serial No. 70,001 and up)

General Information

The function of the silencer, Fig. 2, is to quiet the sound of rushing air, and to catch fuel that spits back out of the carburetor throat.

The silencer is not intended to filter incoming air because the snowmobile should be operated only on clean, snow-covered areas.

Service

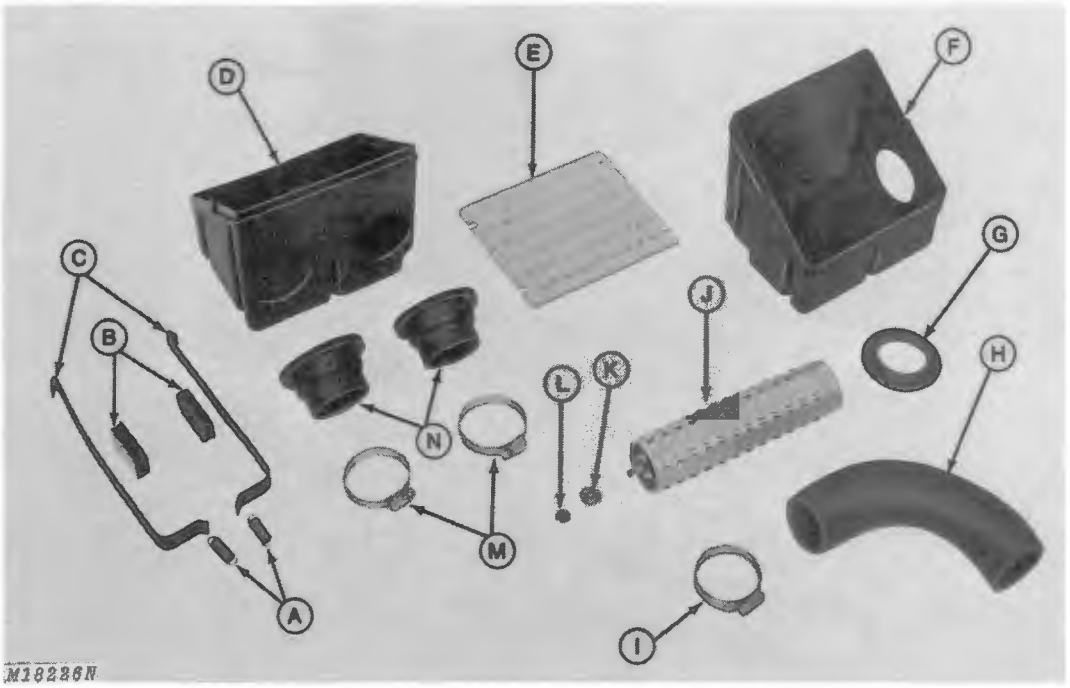
There is no service on the upper and lower half of the silencer. If these two parts are cracked or damaged in any way, they must be replaced.

IMPORTANT: NEVER run the snowmobile with the silencer removed. Lean mixtures, loss of power and engine damage will result if the engine is run without the silencer.

Installing Hose

When installing hose, chamfered part of rubber ring (H) must face inside of box.

340 AND 440 LIQUIFIRE SNOWMOBILE (Serial No. 55,001-70,000)



A—Springs (2 used)
B—Pads (2 used)
C—Straps (2 used)
D—Lower Half
E—Screen
F—Upper Half
G—Rubber Ring
H—Hose
I —Clamp
J —Tube
K—Washer
L —Nut
M—Clamps (2 used)
N—Boots (2 used)

Fig. 3-Liquifire Silencer Components (Serial No. 55,001-70,000)

General Information

The function of the silencer, Fig. 3, is to quiet the sound of rushing air, and to catch fuel that spits back out of the carburetor throat.

The silencer is not intended to filter incoming air because the snowmobile should be operated only on clean, snow-covered areas.

Service

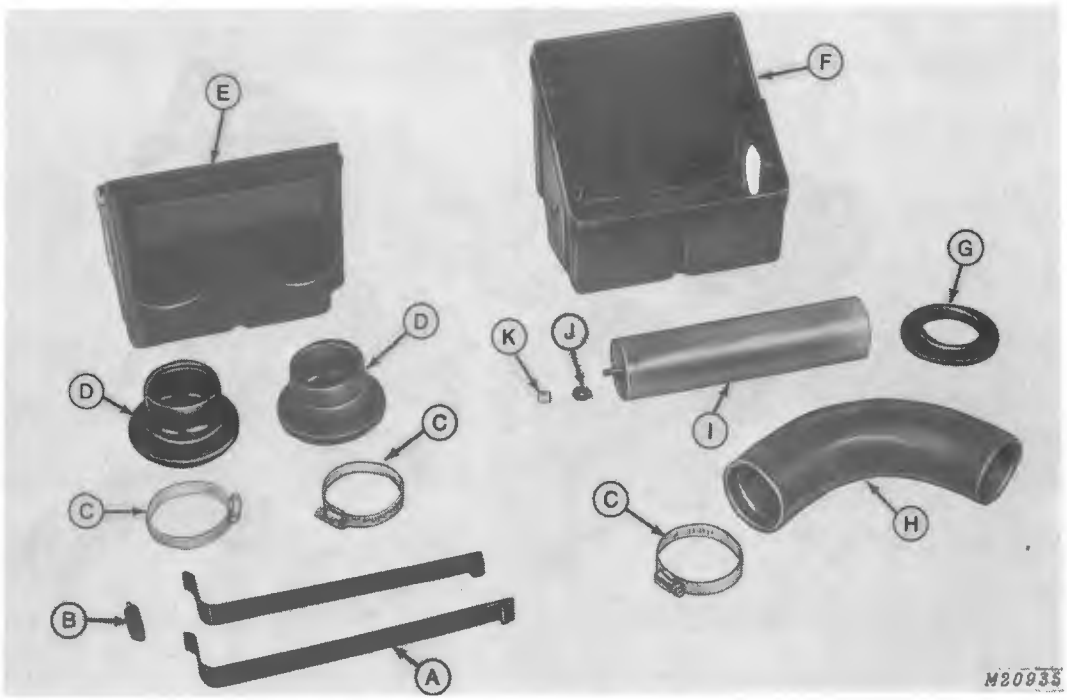
There is no service on the upper (F) and lower (D) half of the silencer. If these two parts are cracked or damaged in any way, they must be replaced.

IMPORTANT: NEVER run the snowmobile with the silencer removed. Lean mixtures, loss of power and engine damage will result if the engine is run without the silencer.

Installing Tube

When installing tube (J) in upper half (F) of silencer, be sure "This Side Up" on tube is toward the top of the upper half. Chamfered part of rubber ring (G) must face inside of box.

340 AND 440 LIQUIFIRE SNOWMOBILE (Serial No. 70,001 and up)



A—Straps (2 used)
B—Spring
C—Clamp (3 used)
D—Boots (2 used)
E—Lower Half
F—Upper Half
G—Rubber Ring
H—Hose
I —Screen
J—Washer
K—Nut

Fig. 4-Liquifire Silencer Components (Serial No. 70,001 and up)

General Information

The function of the silencer, Fig. 4, is to quiet the sound of rushing air, and to catch fuel that spits back out of the carburetor throat.

The silencer is not intended to filter incoming air because the snowmobile should be operated only on clean, snow-covered areas.

Service

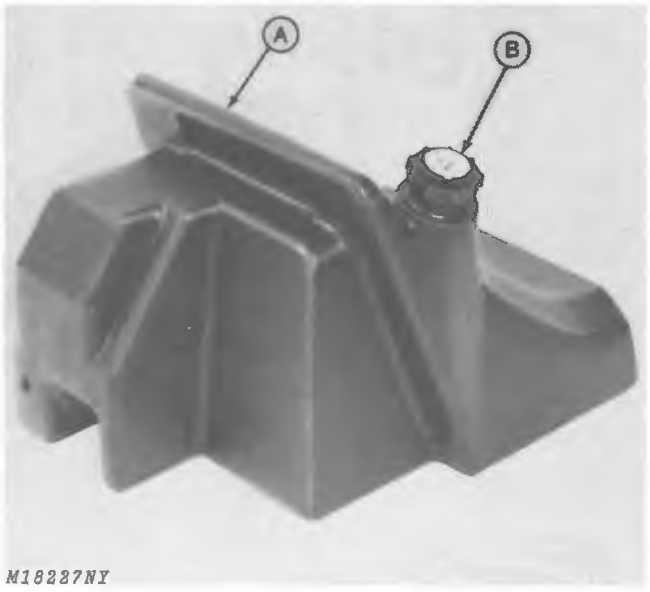
There is no service on the upper and lower half of the silencer. If these two parts are cracked or damaged in any way, they must be replaced.

IMPORTANT: NEVER run the snowmobile with the silencer removed. Lean mixtures, loss of power and engine damage will result if the engine is run without the silencer.

Installing Hose

When installing hose, chamfered part of rubber ring (G) must face inside of box.

Group 20
FUEL PUMP, FUEL TANK, SCREEN AND IN-LINE FUEL FILTER



A—Fuel Tank **B—Fuel Cap and Gauge**

Fig. 1-Fuel Tank Assembly

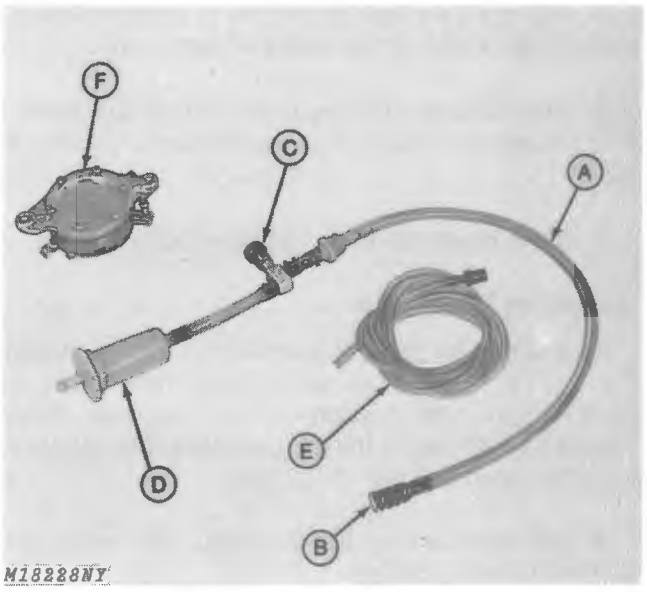
GENERAL INFORMATION

The fuel tank (A, Fig. 1), features a fuel gauge in the cap (B) and a spill ledge. The spill ledge prevents spilled fuel from spilling onto the seat. The tank has a capacity of 8 U.S. gallons (30.3 l). The fuel tank cap is sealed and the tank is vented by the vent line (E, Fig. 2) at the top of the tank.

The fuel pick-up line (A, Fig. 2) in the tank is connected to a screen (B). The fuel shut-off valve (C) (Serial No. -80,000) and in-line fuel filter (D) are located in the fuel line between the fuel tank and fuel pump (F).

The nylon screen in the in-line fuel filter (D) has a self-cleaning action. Pulsation of the screen shakes loose contamination such as dirt, rust and small fibers. Loose contamination collects at the base of the cone.

NOTE: If snowmobile (Serial No. -80,000) has been transported on a trailer and the fuel shut-off valve (C) was not closed, the engine may be "flooded".



A—Fuel Pick-Up Line
B—Screen
C—Shut-Off Valve (-80,000)
D—Fuel Filter
E—Vent Line
F—Fuel Pump

Fig. 2-Fuel Tank Fitting, Lines and Screen

SERVICE

Screen

To remove pickup screen, disconnect fuel lines from fitting, and remove fitting from fuel tank, Fig. 2. Remove pickup screen (B) from end of line, Fig. 2.

Clean screen with gasoline and compressed air. Replace screen if it is damaged. Replace gasket on fuel line fitting, if necessary.

Fuel Tank

Clean fuel tank if dirt deposits have been detected in tank. Remove tank by disconnecting fuel lines and vent lines. Remove the seat and tank hold-down clips. Slide tank rearward to remove.

If tank has major damage, it should be replaced. Minor damage or leaks can be patched, if practical.

In-line Fuel Filter

Change the filter annually or when packed contamination starts to build up at the base of the cone.

Litho in U.S.A.

Fuel Pump

Testing Fuel Pump

1. Disconnect impulse line from fuel pump.

2. Use a short piece of fuel line to connect a pressure gauge to the impulse side of fuel pump.

3. Pressurize to 5 or 6 psi (0.34 or 0.41 bar) (0.35 or 0.42 kg/cm²) and observe gauge. Pressure should not drop.

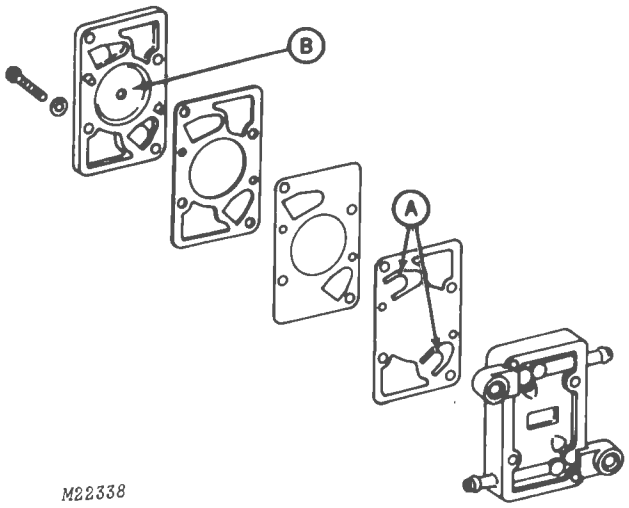
4. If the pressure drops, replace the fuel pump.

Inspecting Fuel Pump

To inspect fuel pump, separate the castings shown, Fig. 3 or Fig. 4. Check valves (A) should not be bent or have foreign matter holding them off their seat. There should be no liquid in the impulse cavity (B). All parts must be clean and not discolored.

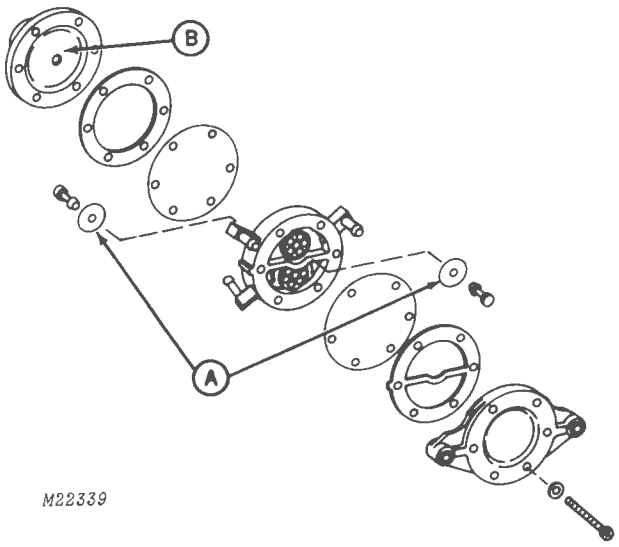
If any components are damaged, the entire fuel pump must be replaced.

IMPORTANT: Do not use carburetor cleaner or strong solvents on fuel pump components.



A—Check Valves **B—Impulse Cavity**

Fig. 3-Inspecting Rectangular Fuel Pump



A—Check Valves **B—Impulse Cavity**

Fig. 4-Inspecting Round Fuel Pump

Section 40
ELECTRICAL SYSTEM
Group 5
GENERAL INFORMATION

CONTENTS

Litho in U.S.A.

PRINCIPLE OF OPERATION

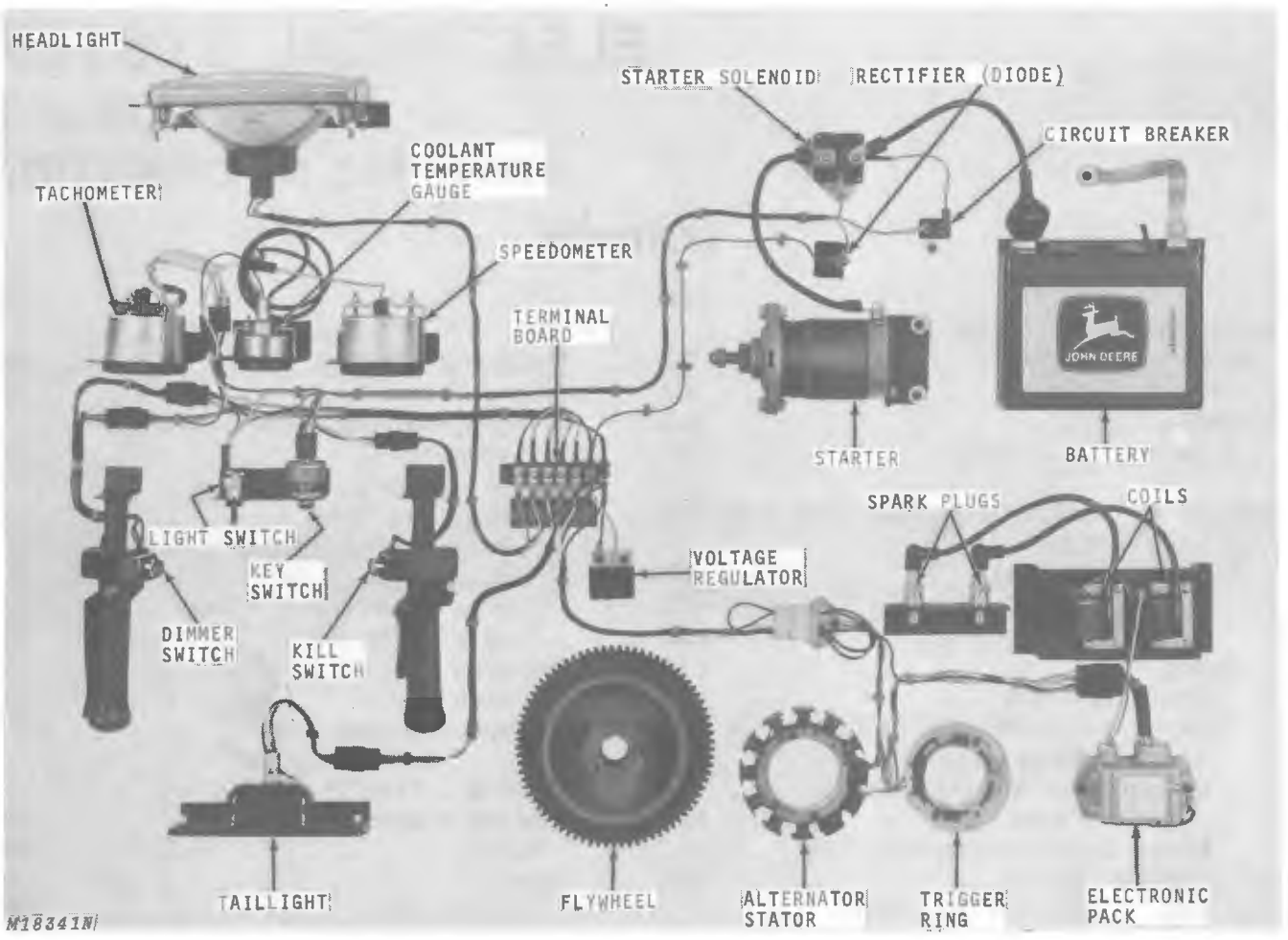


Fig. 1-John Deere Snowmobile Electrical System with Electric Start Option

John Deere 340 and 440 Cyclone and Liquifire Snowmobiles have an alternator which provides power for the lighting system. On models equipped with the electric start option, the alternator also charges the battery through a diode, Fig. 1, which changes the AC current to DC current for charging the battery.

A voltage regulator in the system limits the average AC voltage, allowing only the voltage needed in the system at a given time. A CDI ignition system is used with dual ignition coils and electronic pack. Of the twelve poles on the alternator stator, nine supply power for the lighting system and three supply power for the ignition system.

An "ON-OFF" switch on the instrument panel switches the headlight and taillight "on" and "off". A brake light switch turns the brake light on when the brakes are applied.

The three-position ignition switch has "OFF", "ON" and "START" positions. "OFF" position grounds out the electronic pack. ("ON" position opens the ignition circuit. However, on the electric start equipped snowmobiles, "ON" position also closes a circuit making it possible for the alternator to charge the battery.) "START" position energizes the starter solenoid cranking the engine (electric start).

An emergency stop switch also grounds out the electronic pack when depressed.

The electric start option includes battery box, solenoid, starter motor, circuit breaker and diode. A 12-volt manifold-vented battery is used with the electric start kit.

Refer to "Wiring Diagram" and "Diagnosing Malfunctions" in this group, to aid in understanding the electrical system and diagnosing malfunctions.

Litho in U.S.A.

WIRING DIAGRAM
Cyclones and Liquifire Snowmobiles (Serial No. 55,001-70,000)

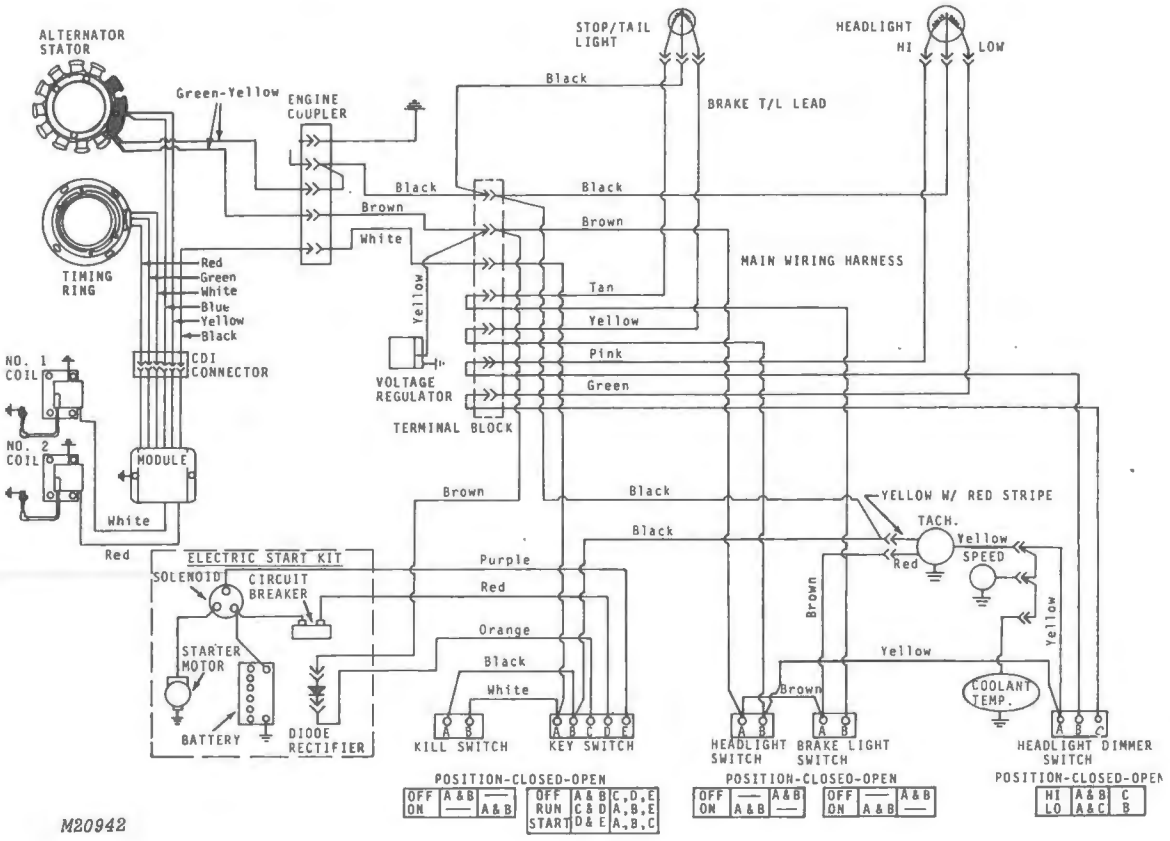


Fig. 2-Wiring Diagram

WIRING DIAGRAM
Cyclones and Liquifire Snowmobiles (Serial No. 70,001-80,000)

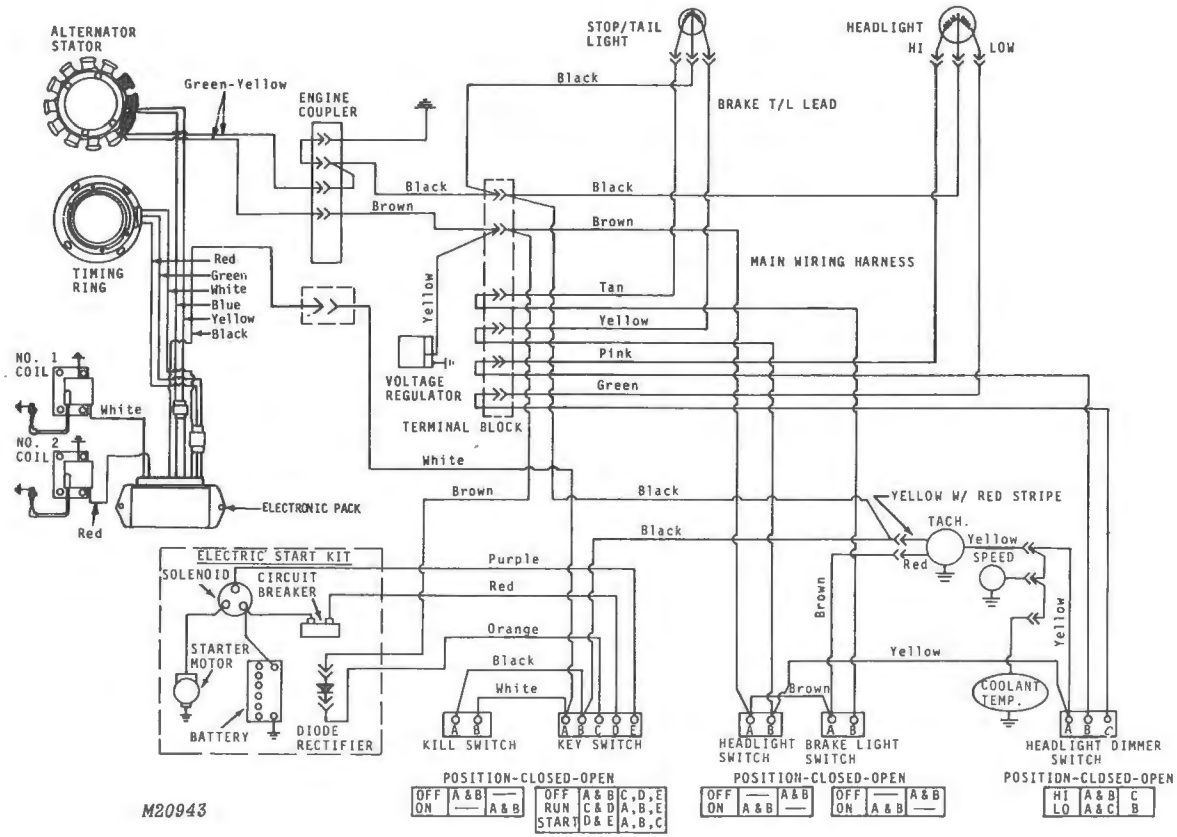


Fig. 3-Wiring Diagram

Litho in U.S.A.

WIRING DIAGRAM
Liquifire Snowmobiles (Serial No. 80,001-)

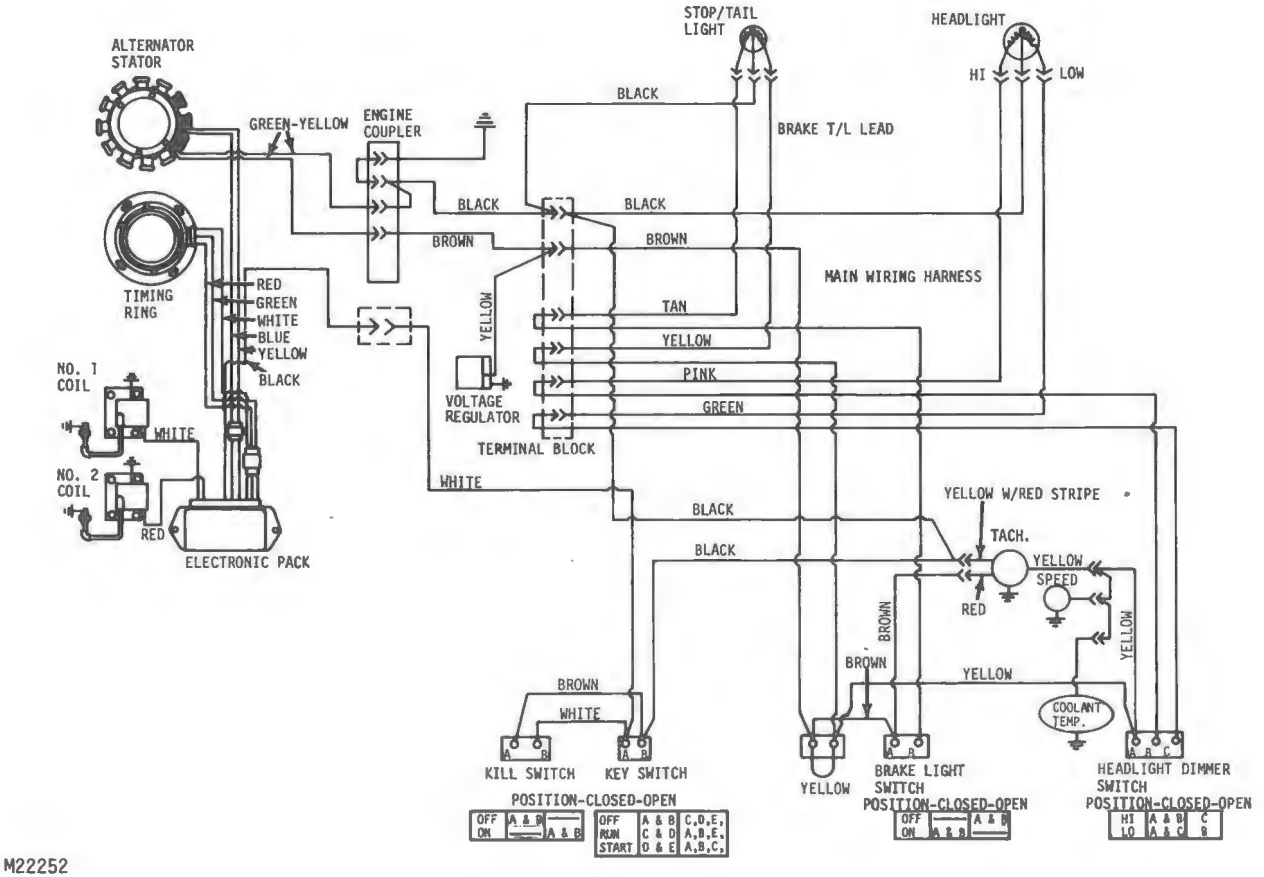


Fig. 4-Wiring Diagram

WIRING DIAGRAM
Cyclone Snowmobiles (Serial No. 80,001-)

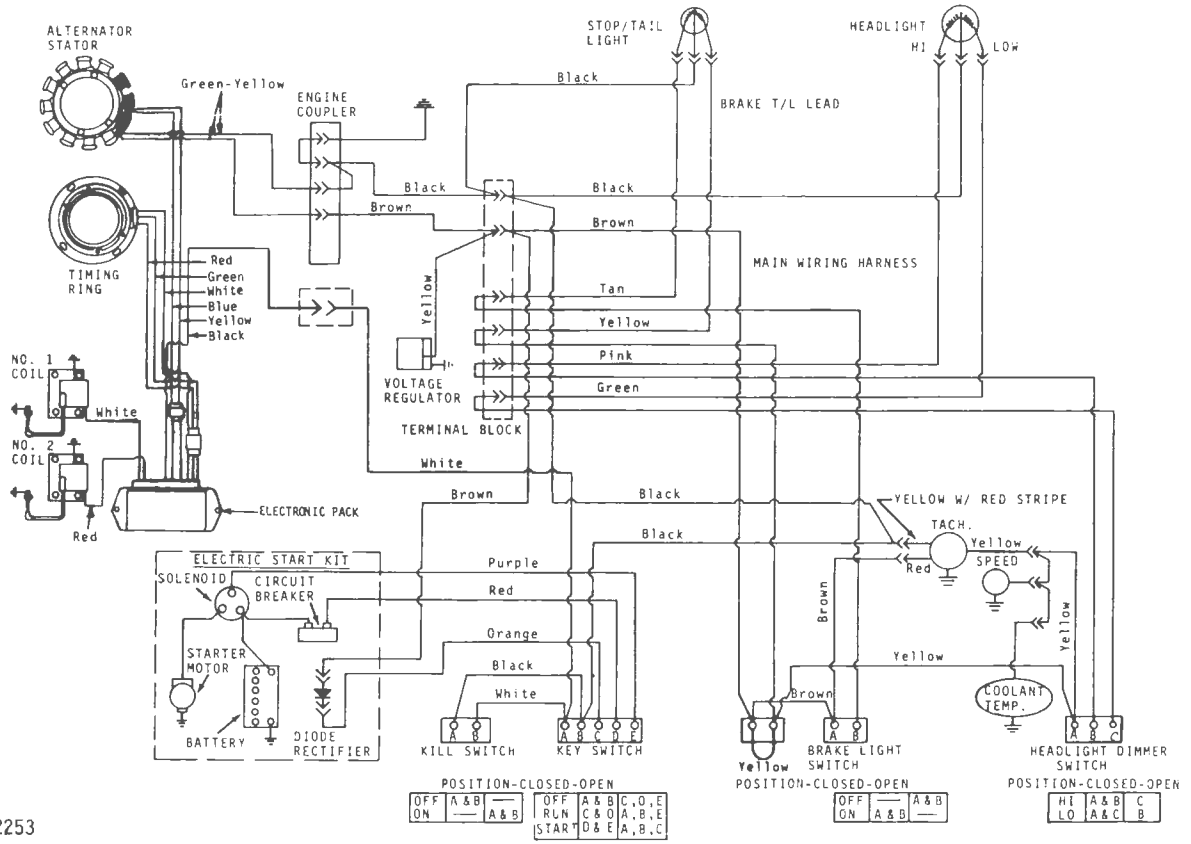


Fig. 5-Wiring Diagram

TESTING

Instructions are provided in each group for testing electrical components. The purpose of the tests is to isolate the cause of trouble in the ignition system, lighting system, or electric start system.

High quality test equipment is a must for accurate diagnosis of electrical malfunctions. Always follow the procedures outlined by the manufacturer of the test equipment to supplement instructions contained in this manual.

NOTE: Because there are many manufacturers of test equipment, each with its own specific operating instructions, it is important to follow the manufacturer's recommendations if the procedures in this manual should contradict those of the manufacturer.

DIAGNOSING MALFUNCTIONS

Ignition System

Engine Hard to Start

Spark plugs fouled, or defective.

Engine not timed properly.

Electrical connections loose or corroded.

High tension lead(s) arcing.

Engine Misfires

Spark plugs fouled, or defective.

Electrical connections loose or corroded.

Engine not timed properly.

High tension lead(s) arcing.

Engine Overheating

Engine not timed properly.

Engine Kicks Back and Backfires

Spark plug wires reversed.
Engine not timed properly.

Lights Will Not Light

Electric connections loose or wires damaged.

Alternator faulty.

Light switch faulty (-80,000).

Bulbs burned out.

Voltage regulator faulty.

Brake Light Will Not Light

Brake light switch faulty.

Electrical connections loose or wires damaged.

Bulb burned out.

Bulbs Burn Out Often

Wrong type bulbs used.

Voltage regulator faulty.

Lights Too Bright or Too Dim

Voltage regulator faulty.

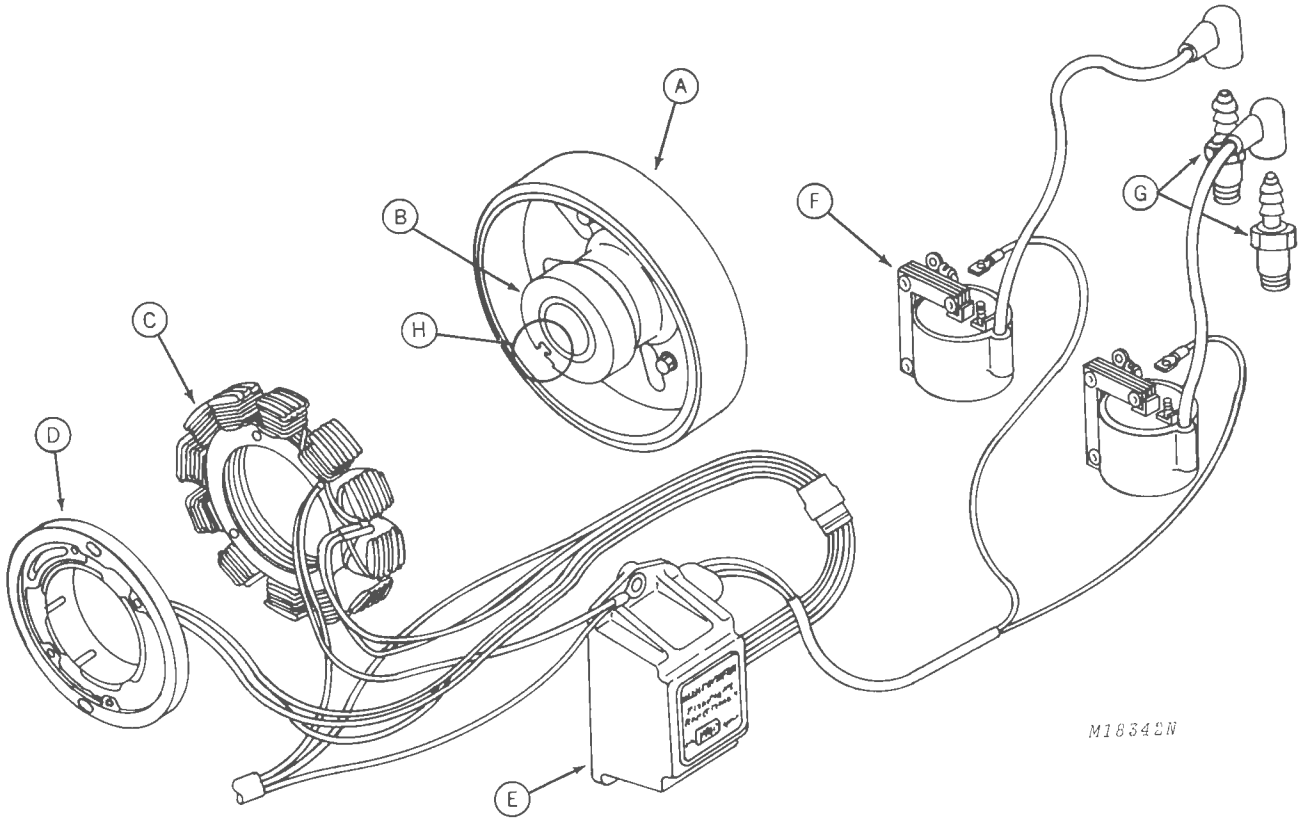
Defective alternator.

Litho in U.S.A.

Litho in U.S.A.

Group 10
CAPACITOR DISCHARGE IGNITION (CDI)

PRINCIPLE OF OPERATION



A—Magnetic Flywheel Rotor
B—Ignition Timing Rotor
C—Alternator Stator
D—Ignition Timing Ring
E—Electronic Pack
F—Ignition Coils
G—Surface Gap Spark Plugs
H—Triggering Slot

Fig. 1-Exploded View of Capacitor Discharge Ignition (CDI)

The Capacitor Discharge Ignition (CDI) System, Fig. 1, consists of a permanent magnet flywheel, alternator and solid-state capacitor. This supplies high voltage for ignition and generates current required for the lighting system.

The flywheel (A, Fig. 1) incorporates a special flexible magnet and is mounted on the engine crankshaft. The flywheel and magnet revolve around the stator assembly (C), which is fixed to the engine. Current is generated in the twelve pole windings of the stator.

Nine poles supply power for the lighting system and three poles supply power for the ignition.

Litho in U.S.A.

Electronic Pack

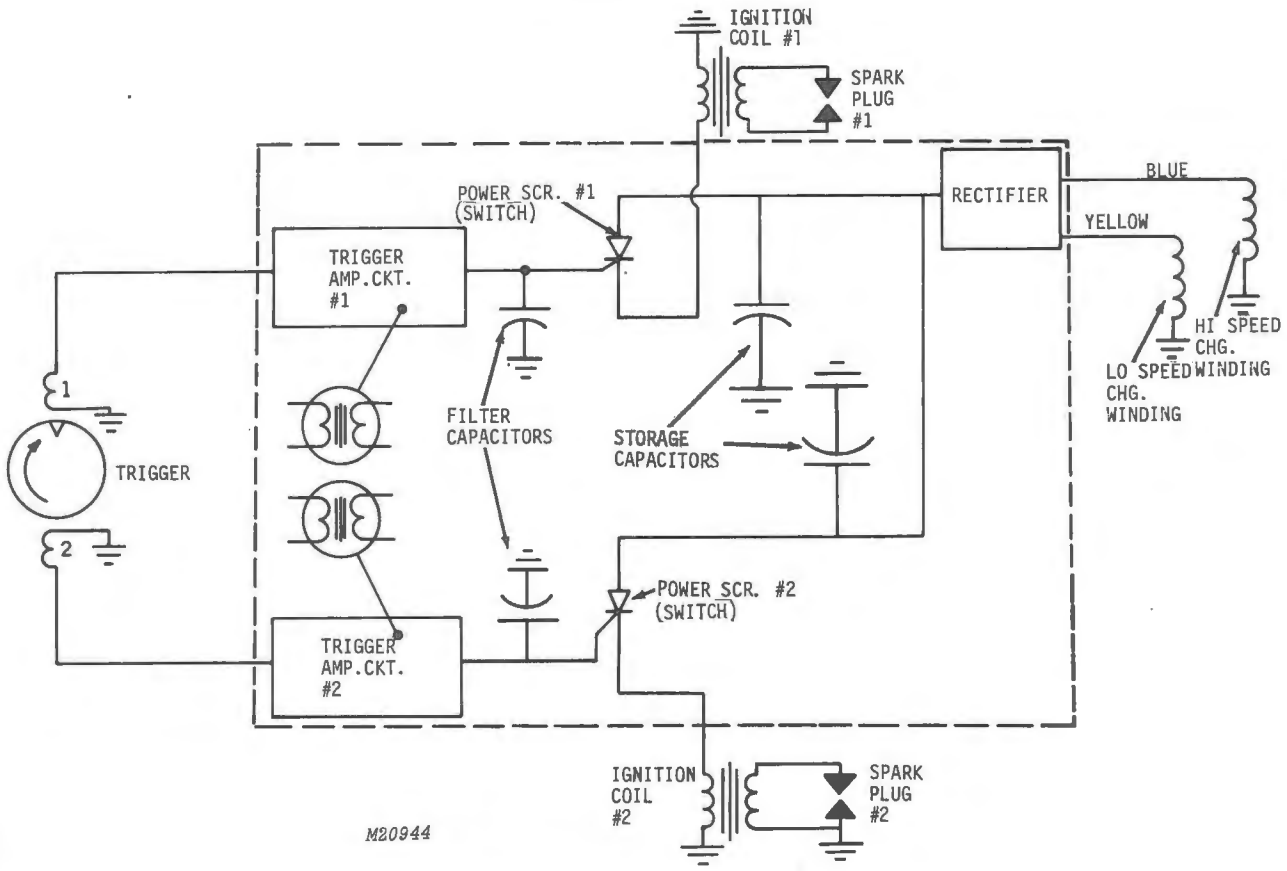


Fig. 2-Electronic Pack Schematic Wiring Diagram

The electronic pack, Fig. 2, incorporates a rectifier, two storage capacitors (condenser), two power SCR (silicon control rectifier) switches, two trigger circuits and two filter capacitors (condensers).

The flywheel and magnets revolve around the stator producing AC current. The AC current is fed to the electronic pack and changed by the rectifier to DC current. This DC current is put into and stored by the two storage capacitors (condensers).

The timing rotor of the flywheel revolving within the timing ring triggers an electrical voltage discharge to one of the trigger circuits of the electronic pack. The trigger circuit amplifies the signal to the power SCR switches. This voltage opens the gate of the power SCR switch allowing the voltage stored in the capacitor to be released to the ignition coils.

The ignition coils, "step-up", the electrical voltage to a level high enough to insure firing of the spark plugs.

Spark Plugs

Use Champion QN-1 spark plugs. No additional plugs or heat ranges are required. Do not regap plugs, replace them when gap reaches 0.060" (1.52 mm).

TESTING

⚠ CAUTION: High energy ignition systems can produce injurious electrical shock. Always stop engine before touching or working on any ignition components. DO NOT hold spark plugs, leads or connectors in hand to check for spark.

Preliminary Check

Be sure all connections are clean and tight and that no leads are broken or grounded out. Check key switch and emergency stop switch.

IMPORTANT: Do not check the CDI system for continuity with a 12-volt test light. To do so will destroy the system. Do not attempt tests unless the system is completely and properly grounded.

Testing Ignition With JDM-74 Tester

Fig. 3-JDM-74 Capacitor Discharge Ignition Tester

The JDM-74 CD Ignition Tester, Fig. 3, is an electrical energy measuring device capable of measuring the peak energy output of capacitor discharge ignition units, trigger, stator and electronic pack.

Capacitor discharge ignition energy output pulses occur at a speed of microsecond duration and cannot be accurately measured by a voltmeter.

The tester is of solid state construction and is capable of measuring energy peaks of less than one microsecond in duration. It performs as a comparator. The correct value of energy output is determined by using specifications from factory-correct ignition systems. The value limits of these specifications are determined and provided to the service technician. These values are then compared with the values taken from the engine being tested.

The ignition energy output is referenced against a 0-100 scale on the tester. The greater the energy output, the greater the value indication on the scale. The indication is in the form of an incandescent lamp that lights when the scale knob is set at the position corresponding to the energy output. After each test where indicator lamp lights, the "RESET" button must be pushed to turn off the lamp in preparation for the next test.

The tester has two input circuits selected by a toggle switch. The "LOW" circuit is sensitive to AC or DC voltages from 0.5 to 27 volts. The "HIGH" circuit is senstitive to AC or DC voltages of approximately 75 to 500 volts.

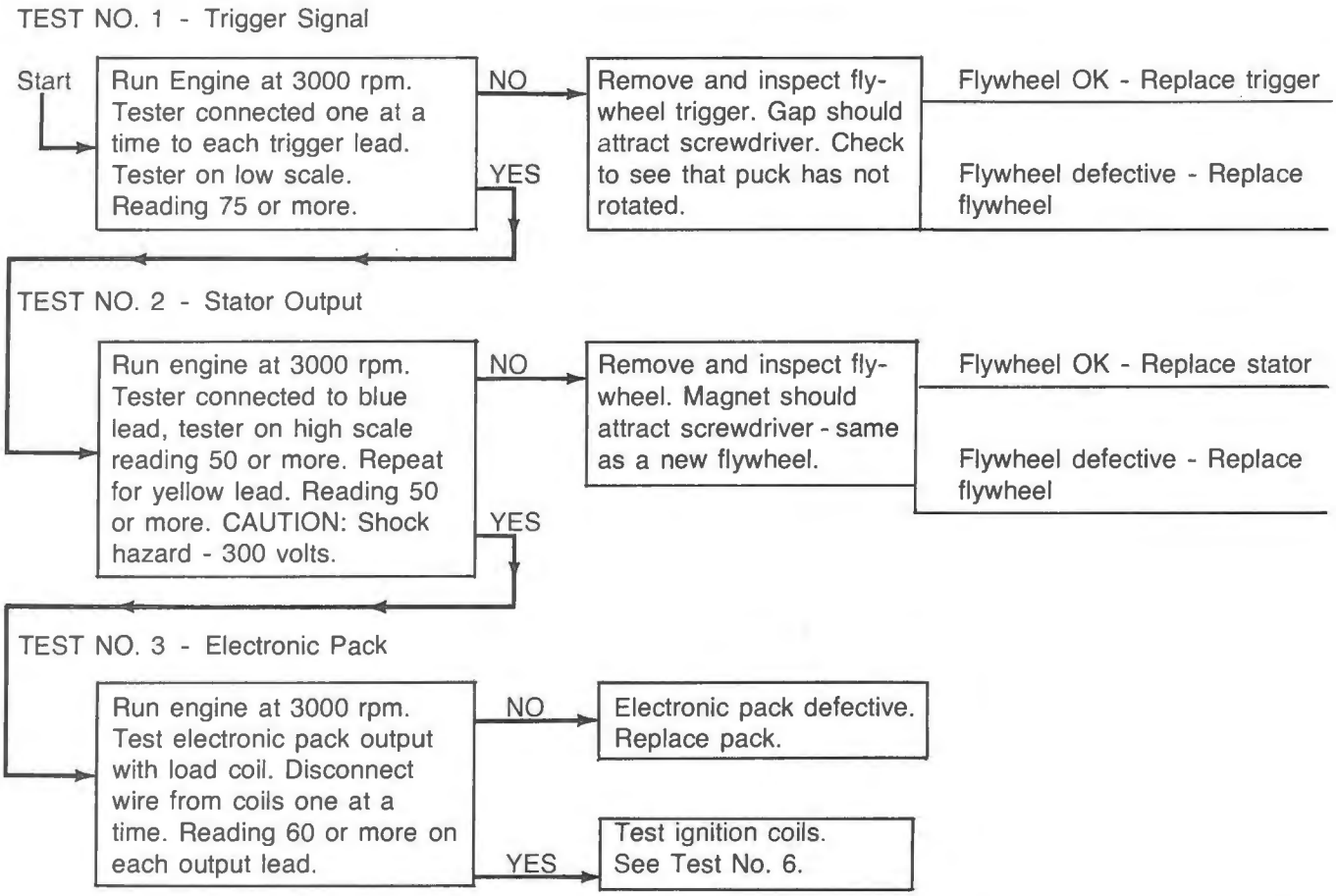
A test simulator is provided with each tester as a means to test the lamp, detector circuits and batteries.

Check the tester as follows:

1. Plug the test simulator into a wall plug outlet (110 - 115 volt AC) for ten seconds.
2. Place toggle switch of tester to "HIGH" circuit.
3. Turn scale knob of tester to 50 on the scale.
4. Hook yellow lead of tester to "N" post of simulator and red lead of tester to "P" post of simulator.
5. Push button on bottom of simulator. The tester light should light. If light does not light, put new batteries in the tester and test again.
6. If tester does not function after installing new batteries, return to:

Electro-Specialties, Inc.
11225 W. Bluemound Rd.
Wauwatosa, Wis. 53226

Trouble Shooting Guide



Problem	Cause	Component to Check First
1. Engine Fails to Start	Any Component of Electrical System	Electronic Pack - Test No. 3
2. Random Firing	Any Component of Electrical System	Trigger Assembly - Test No. 1
3. Loses Fire on One Cylinder	Any Component of Electrical System	Ignition Coil - Test No. 6
4. One Cylinder Fires Many Times Per Revolution	ITT Cannon Connectors or Electronic Pack	Check Connectors and Electronic Pack, Test No. 3
5. Engine Starts Hard and Fouls Plugs	Any Component of Electrical System	Ignition Coil - Test No. 6
6. No Spark on One Cylinder	Any Component of Electrical System	Ignition Coil - Test No. 6
7. Backfires in Exhaust System	Electronic Pack - Crankcase Loaded With Fuel	Electronic Pack - Test No. 3 Crankcase

IMPORTANT: Install new spark plugs and perform the following tests in the sequence listed. If the engine can't be started, use the pull-method, page 40-10-14.

1. Testing Trigger Assembly with JDM-74 Tester

NOTE: The following test is written to accommodate snowmobiles with CD ignition and ITT cannon connectors between the engine and electronic pack. See Test No. 3 for snowmobiles with 6-wire plastic connectors between the engine and electronic pack.

CAUTION: Raise and support the rear of the snowmobile so track is clear of the ground before conducting test.

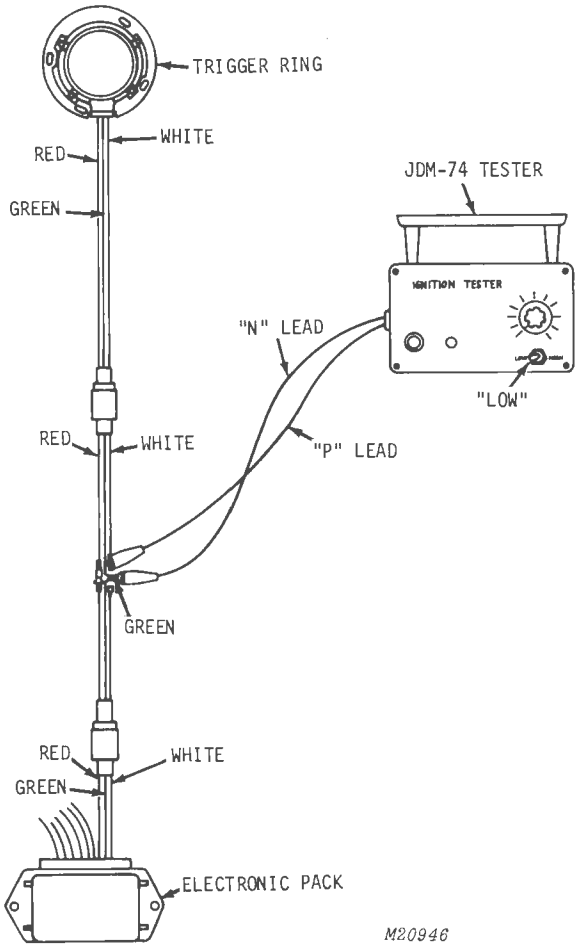


Fig. 4-Testing Trigger Assembly

1. Disconnect the red, white and green wiring harness between the engine and electronic pack.
2. Install JDM-74A-2 Wiring Harness between the engine and electronic pack, Fig. 4.
3. Place toggle switch of JDM-74 Tester on the "LOW" circuit. Turn dial knob of tester clockwise to 100 on scale.
4. Connect red wires of JDM-74A-2 Wiring Harness together. Separate the white wire of JDM-74A-2 Wiring Harness.
5. Connect "P" lead of the tester to male terminal of the white wire.
6. Connect "N" lead of the tester to ring of green wire of the JDM-74A-2 Wiring Harness.
7. Start and run the engine at 3000 rpm. Run on one cylinder, the one not being tested.
8. Turn the dial knob of the tester slowly counterclockwise. Light should light before 75 is reached on the scale.
9. Stop the engine. Disconnect "P" lead of the tester from white wire of JDM-74A-2 Wiring Harness. Leave the "N" lead attached to the green wire.
10. Reconnect the white wire and separate the red wire of JDM-74A-2 Wiring Harness.
11. Connect "P" lead of tester to male terminal of the red wire. Turn dial knob of tester clockwise to 100 on the scale.
12. Start and run the engine at 3000 rpm. Run on one cylinder, the one not being tested.
13. Turn the dial knob of the tester slowly counterclockwise. Light should light before 75 is reached on the scale.

NOTE: In Steps 8 and 13, the light should light before 75 is reached on the scale. If the light lights at a number under 75, the trigger is bad and should be replaced.

14. Stop the engine. Disconnect the tester "P" and "N" leads. Reconnect the red wire of JDM-74A-2 Wiring Harness and remove harness.
15. Reconnect the wiring between the engine and the electronic pack.

IMPORTANT: Engine must be run at 3000 rpm for the trigger test. Engine rpm above or below 3000 rpm will alter the dial reading as recommended.

2. Testing Stator Assembly with JDM-74 Tester

NOTE: The following test is written to accommodate snowmobiles with CD ignition and ITT cannon connectors between the engine and electronic pack. See Test No. 3 for snowmobiles with 6-wire plastic connectors between the engine and electronic pack.

⚠ CAUTION: Raise and support the rear of the snowmobile so track is clear of the ground before conducting test.

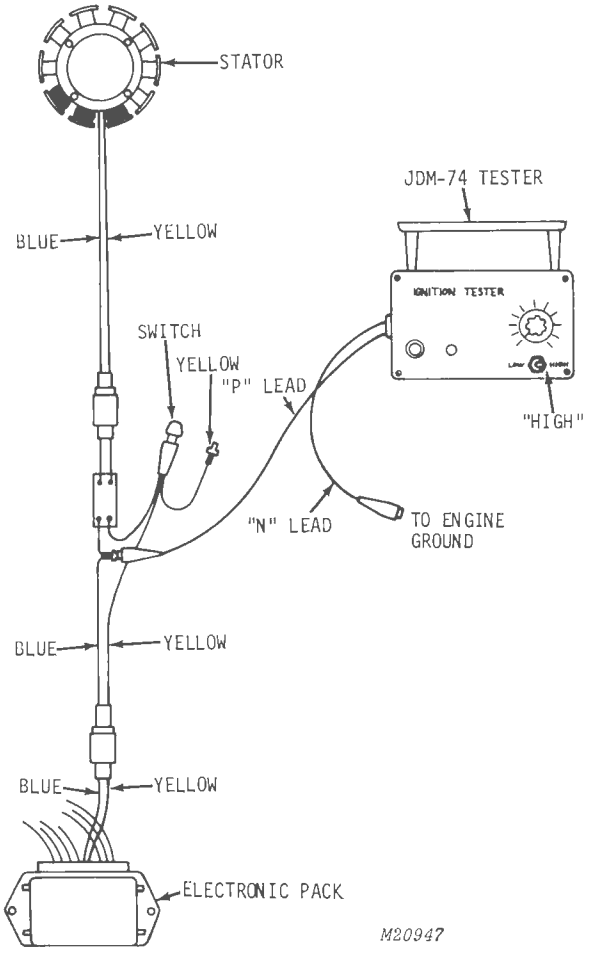


Fig. 5-Testing Stator Assembly

1. Disconnect the yellow and blue wiring harness between the engine and electronic pack.

2. Install JDM-74A-3 Wiring Harness between the engine and electronic pack, Fig. 5.

3. Place toggle switch of JDM-74 Tester on the "HIGH" circuit. Turn dial knob of tester clockwise to 100 on the scale.

4. Connect "P" lead of tester to blue wire of JDM-74A-3 Wiring Harness and "N" lead of tester to engine ground.

5. Start and run the engine at 3000 rpm.

6. Turn the dial knob of the tester slowly counterclockwise. Light should light before 50 is reached on the scale.

7. Stop the engine. Leave the "N" lead of the tester connected to engine ground. Move the "P" lead of the tester from the blue wire to the yellow wire of JDM-74A-3 Wiring Harness.

8. Start and run the engine at 3000 rpm.

NOTE: Use a wedge between the throttle and handgrip to obtain and hold the 3000 rpm.

9. Grasp the switch in the yellow wire with your index and middle finger and push in and hold switch "ON" with your thumb.

NOTE: Switch in yellow wire must not be pushed in when starting engine. If switch is pushed in, the tester will "load" the start system and engine will not start.

⚠ CAUTION: 300 volts is possible at either the yellow or blue leads when engine is running. DO NOT touch leads when engine is running. Make certain lead not being tested does not touch machine metal.

10. Use the other hand to slowly turn the dial knob counterclockwise. Light should light before 50 is reached on the scale.

NOTE: In Steps 6 and 10, the light should light before 50 is reached on the scale. If the light lights at a number less than 50, the stator is defective and should be replaced.

11. Stop the engine. Disconnect "P" and "N" leads of the tester. Remove JDM-74A-3 Wiring Harness.

12. Reconnect the wiring between the engine and the electronic pack.

IMPORTANT: Engine must be run at 3000 rpm for the stator test. Engine rpm above or below 3000 rpm will alter the dial reading as recommended.

3. Testing Trigger and Stator with JDM-74 Tester

NOTE: The following test is written to accommodate snowmobiles equipped with capacitor discharge ignition and 6-wire plastic connectors between the engine and the electronic pack.

⚠ CAUTION: Raise and support the rear of the snowmobile so track is clear of the ground before conducting test.

Testing Trigger

1. Disconnect the wiring harness between the engine and electronic pack.

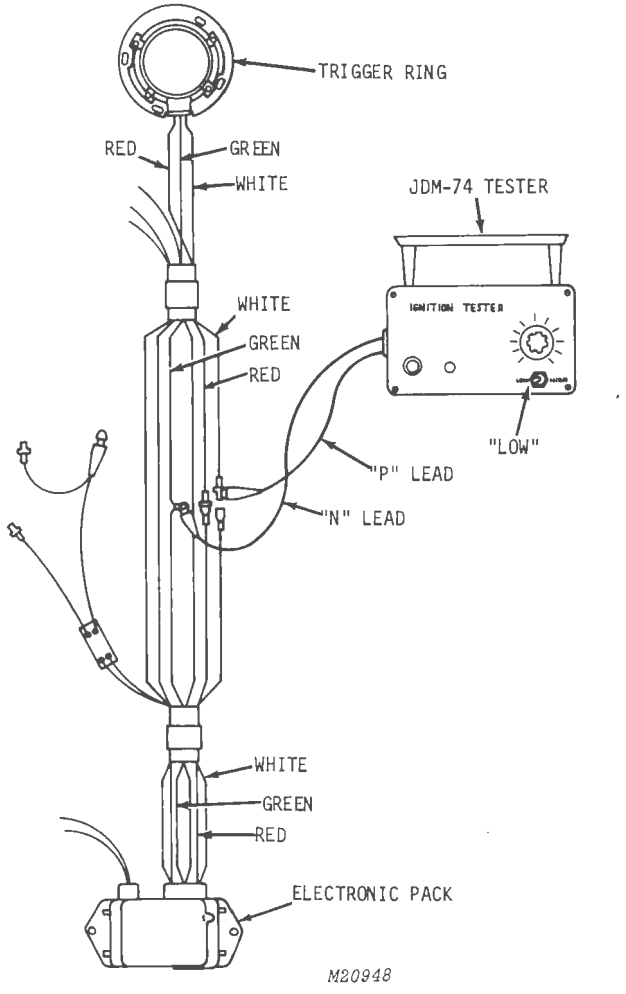


Fig. 6-Testing Trigger Assembly

2. Install JDM-74A-4 Wiring Harness between the engine and electronic pack, Fig. 6.

3. Place toggle switch of JDM-74 Tester on the "LOW" circuit. Turn dial knob of tester clockwise to 100 on the scale.

4. Connect red wires of JDM-74A-4 Wiring Harness together. Separate the white wire of JDM-74A-4 Wiring Harness.

5. Connect "P" lead of the tester to male terminal of the white wire, Fig. 6.

6. Connect "N" lead of the tester to ring of green wire of the JDM-74A-4 Wiring Harness, Fig. 6.

7. Start and run the engine at 3000 rpm. Run on one cylinder, the one not being tested.

8. Turn the dial knob of the tester slowly counterclockwise. Light should light before 75 is reached on the scale.

9. Stop the engine. Disconnect "P" lead of tester from white wire of JDM-74A-4 Wiring Harness. Leave the "N" lead attached to the green wire.

10. Reconnect the white wire and separate the red wire of JDM-74A-4 Wiring Harness.

11. Connect "P" lead of tester to male terminal of the red wire. Turn dial knob of tester clockwise to 100 on the scale.

12. Start and run the engine at 3000 rpm. Run on one cylinder, the one not being tested.

13. Turn the dial knob on the tester slowly counterclockwise. Light should light before 75 is reached on the scale.

NOTE: In Steps 8 and 13, the light should light before 75 is reached on the scale. If light lights at a number less than 75, the trigger is bad and should be replaced.

14. Stop the engine. Disconnect tester "P" and "N" leads.

15. Reconnect the red wire. Leave the JDM-74A-4 Wiring Harness in place and proceed with the stator test.

Testing Stator

16. Place toggle switch of the JDM-74 Tester on the "HIGH" circuit. Turn dial knob of tester clockwise to 100 on the scale.

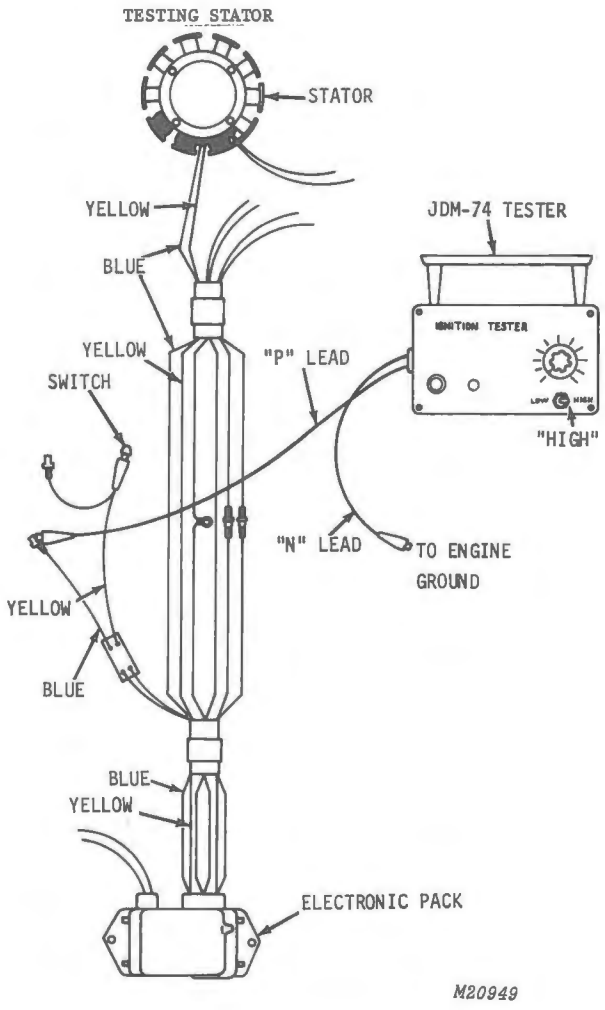


Fig. 7-Testing Stator Assembly

17. Connect "P" lead of the tester to the blue wire of JDM-74A-4 Wiring Harness and "N" lead of the tester to engine ground, Fig. 7.

18. Start and run the engine at 3000 rpm.

19. Turn the dial knob of the tester slowly counterclockwise. Light should light before 50 is reached on the scale.

20. Leave the "N" lead of the tester connected to ground. Move the "P" lead of the tester from the blue wire to the yellow wire of JDM-74A-4 Wiring Harness.

21. Start and run the engine at 3000 rpm.

NOTE: Use a wedge between the throttle and handgrip to obtain and hold the 3000 rpm.

22. Grasp the switch in the yellow wire with your index and middle finger and push in and hold switch "ON" with your thumb.

NOTE: Switch in yellow wire must not be pushed in when starting engine. If switch is pushed in the tester will "load" the start system and engine will not start.

⚠ CAUTION: 300 volts is possible at either the yellow or blue leads when engine is running. DO NOT touch leads when engine is running. Make certain lead not being tested does not touch machine metal.

23. Use the other hand to slowly turn the dial knob counterclockwise. Light should light before 50 is reached on the dial.

NOTE: In Steps 19 and 23, the light should light before 50 is reached on the scale. If the light lights at a number under 50, the stator is defective and should be replaced.

24. Stop the engine. Disconnect the tester "P" and "N" leads and remove the JDM-74A-4 Wiring Harness.

25. Reconnect the wiring between the engine and electronic pack.

IMPORTANT: Engine must be run at 3000 rpm for the trigger and stator tests. Engine rpm above or below 3000 rpm will alter the dial reading as recommended.

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4. Testing the Electronic Pack

IMPORTANT: Before testing the electronic pack, be sure the pack is receiving the correct input signals by performing Tests 1, 2 or 3. A "GOOD" electronic pack will not function correctly with defective inputs from the trigger or stator.

⚠ CAUTION: Raise and support the rear of the snowmobile so track is clear of the ground before conducting test.

1. Place toggle switch of JDM-74 Tester on the "HIGH" circuit. Turn dial knob of tester clockwise to 100 on the scale.

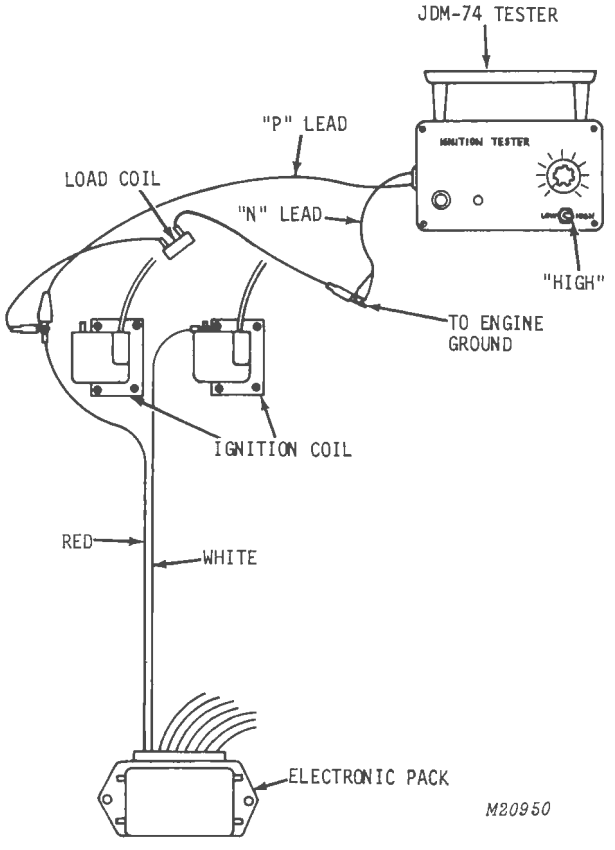

Fig. 8-Testing The Electronic Pack

2. Disconnect the red wire from the left coil.

3. Connect "P" lead of the tester to red wire and "N" lead of tester to engine ground.

4. Connect load coil (comes with JDM-74 Tester) to the red wire and to engine ground, Fig. 8.

NOTE: Load coil now takes the place of the engine coil and loads the electronic pack to a specific resistance.

5. Start and run engine at 3000 rpm. Run on one cylinder, the one not being tested.

6. Turn dial knob of the tester slowly counterclockwise. Light should light before 55 is reached on the dial.

7. Stop the engine. Disconnect "P" lead from tester and the lead from the load coil from the red wire. Leave "N" lead from tester and load coil attached to engine ground.

8. Reconnect red wire to left coil.

9. Disconnect white wire from the right coil.

10. Connect "P" lead from the tester and lead from the load coil to the white wire. Turn dial knob of the tester clockwise to 100 on the scale.

11. Start and run engine at 3000 rpm. Run on one cylinder, the one not being tested.

12. Turn dial knob of the tester slowly counterclockwise. Light should light before 55 is reached on the dial.

NOTE: In Steps 6 and 12, the light should light before 55 is reached on the scale. If the light lights at a number under 55, the electronic pack is defective and should be replaced.

13. Disconnect "P" and "N" leads of the tester and both leads of the load coil.

14. Reconnect white wire to the right coil.

IMPORTANT: Engine must be run at 3000 rpm for the electronic pack test. Engine rpm above or below 3000 rpm will alter the dial reading as recommended.

5. Testing The Alternator

IMPORTANT: DO NOT run the engine for this test. Crank the engine with the start rope.

1. Place toggle switch of the JDM-74 Tester on the "LOW" scale. Turn dial knob of tester to 90 on the scale.

2. Disconnect wiring harness coupler from the engine.

3. Use electrical wiring male terminals and install terminals in yellow/green wire connections of the engine coupler.

Fig. 9-Testing The Alternator

4. Connect "P" lead and "N" lead to the male terminals, Fig. 9.

NOTE: Leads from tester can be connected in any manner as long as they do not contact each other when connected.

5. Crank the engine with the start rope. Light should light. If light lights at a number less than 90, the stator is defective.

6. Disconnect tester leads and remove terminals.

7. Reconnect wiring harness coupler to engine.

6. Testing Ignition Coils with JDM-74A-5 Ignition Tester

NOTE: The JDM-74A-5 Ignition Tester can be used to determine ignition coil output on all John Deere Snowmobiles without removing the coils.

1. Install new spark plugs in the engine.

NOTE: New spark plugs must be installed because if one of the spark plugs is fouled, that plug will go to ground and the ignition tester will still show spark.

Fig. 10-Testing Ignition Coils With JDM-74A-5 Ignition Tester

2. Remove high tension lead from one plug. Clamp ignition tester to this plug and connect high tension lead to the ignition tester, Fig. 10.

3. Start and run the engine at 3000 rpm.

4. The ignition coil should be able to fire the ignition tester and the spark plug under compression in the engine.

5. Low ignition coil output will not fire the ignition tester or the spark plug under compression. Consequently the engine will run on only one cylinder, the one not being tested.

6. Test both coils in the same manner.

IMPORTANT: DO NOT ground the ignition tester to the engine to determine coil output. This does not require the ignition coil to put out maximum voltage. Ignition tester must be clamped to the spark plug under compression in the engine.

7. Check for higher voltage leaks in high tension leads. Look for spark arcing to nearby metal. Replace coil if spark is present.

Testing The Coils With Merc-O-Tronic Analyzer

The Model 98A Merc-O-Tronic Analyzer, Fig. 11, is one of the most precise and versatile testers available for checking capacitor discharge ignition coils.

The following tests are made using the Merc-O-Tronic analyzer. If different equipment is used, the same tests should be made, but follow the test equipment manufacturers recommendations for procedures.

Analyzer Test

Prior to testing the coils, test the operation of the battery power of the analyzer.

A—Negative Post
B—Positive Post
C—Volt Scale Switch

Fig. 11-Testing Merc-O-Tronic Analyzer

1. Turn the adjustment screw on the front of the analyzer meter so that needle aligns with "0" reading on Scale No. 1, Fig. 11.
2. Remove two screws and tip cover to the rear to allow access to the battery.
3. Connect the black test lead of analyzer to the negative post (A) of the battery.
4. Connect the red test lead of analyzer to the positive post (B) of the battery.
5. Turn volt scale switch to the "ON" position.
6. Read red figures on top of Scale No. 1. Reading should show 6 volts. If less, replace analyzer battery.

⚠ CAUTION: Perform tests with analyzer and components on an insulated or wooden table top to prevent any leakage or shock hazard.

Testing Ignition Coil Power

IMPORTANT: Capacitor Discharge Adapter (55-980) must be used with the Model 98 or Model 98A Analyzer when conducting the coil power test.

1. Connect the small red lead of the analyzer to the red post of the adapter.
2. Connect the small black lead of the analyzer to the black post of the adapter.

Fig. 12-Testing Ignition Coil Power

3. Connect large lead from the analyzer to the spark plug wire of the coil, Fig. 12.
4. Connect red lead of the adapter to the primary post of the coil, Fig. 12.
5. Connect black lead of the adapter to black wire and coil laminations, Fig. 12.

NOTE: DO NOT connect the black lead of the adapter to the black wire or coil laminations only. Both must be connected together for the coil power test.

6. Turn the analyzer current control knob to "LO".
7. Place selector switch of analyzer to No. 1 Coil Power Test.
8. Turn current control knob clockwise (slowly). Spark gap indicator on the right side of the analyzer should fire steadily before needle reaches 1.9 on Scale No. 1.
9. If steady spark occurs after 1.9 is reached on Scale No. 1, the coil is defective and must be replaced.

NOTE: When test is completed, disconnect adapter from coil and the analyzer leads from the adapter. Adapter is used only for the coil power tests and SHOULD NOT be used for any of the additional tests.

Testing Ignition Coil Insulation

Fig. 13-Testing Ignition Coil Insulation

1. Connect the small black lead of the analyzer to the black wire and coil laminations, Fig. 13.

NOTE: DO NOT connect the black lead of the analyzer to the black wire or coil laminations ONLY. Both must be connected together for the ignition coil insulation test.

2. Connect small red lead of the analyzer to the primary post of the coil, Fig. 13.

3. Install test probe in the analyzer.

4. Turn analyzer current control knob to "LO".

5. Place selector switch of analyzer to No. 1—"Coil Power test."

6. Pass probe over coil and spark plug wire. Spark discharge will be noted if damage is present.

NOTE: If spark discharge is noted, replace coil.

Testing Primary Resistance

Fig. 14-Testing Primary Resistance

1. Place selector switch of analyzer to No. 2 Distributor Resistance.

2. "Zero" meter on right-hand side of Scale No. 2.

3. Connect small black lead of the analyzer to the black wire of the coil, Fig. 14.

NOTE: Connect only to the black wire, not the coil laminations.

4. Connect small red lead of the analyzer to the primary post of the coil, Fig. 14.

5. Needle should move to the left and be in the "OK" zone of Scale No. 2.

6. If needle is not in the "OK" zone, the primary circuit of the coil is defective and coil must be replaced.

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Testing Secondary Resistance

Fig. 15-Testing Secondary Resistance

1. Place selector switch of analyzer to No. 3—"Coil Continuity."

2. Touch the small red and black leads of the analyzer together and "Zero" meter on right-hand side of Scale No. 3.

3. Connect small black lead of the analyzer to the black wire of the coil, Fig. 15.

NOTE: Connect only to the black wire, not the coil laminations.

4. Connect the small red lead of the analyzer to the spark plug wire of the coil, Fig. 15.

5. Needle should move between 0 and .5 on the right-hand side of Scale No. 3.

6. If needle does not register between 0 and .5, the secondary circuit of the coil is defective and coil must be replaced.

Testing CDI System with JDM-74 Tester (Pull Method)

NOTE: The pull method is recommended ONLY if the engine will not start. ALWAYS use the running method for checking the CDI system when possible.

Trigger

1. Place toggle switch of tester on "LOW" scale.
2. Install wiring harness between engine and electronic pack.
3. Connect red wires of wiring harness together. Separate white wire of harness. Connect "P" lead of tester to male terminal of white wire.
4. Connect "N" lead of tester to green wire of wiring harness.
5. Set tester dial at 20 - crank engine - light should light.
6. Connect white wire. Separate red wire. Connect "P" lead of tester to male terminal of red wire.
7. Connect "N" lead of tester to green wire of wiring harness.
8. Set tester dial at 20 - crank engine - light should light.
9. Remove wiring harness.

Stator

1. Place toggle switch of tester on "LOW" scale.
2. Install wiring harness between engine and electronic pack.
3. Connect "P" lead of tester to blue wire.
4. Connect "N" lead of tester to engine ground.
5. Set tester dial at 90 - crank engine - light should light.
6. Place toggle switch of tester on "HIGH" scale.
7. Connect "N" lead of tester to engine ground.
8. Connect "P" lead of tester to yellow wire.
9. Push in and hold switch in yellow wire.
10. Set tester dial at 10 - crank engine - light should light.

Electronic Pack

1. Place toggle switch of tester on "HIGH" scale.
2. Disconnect red wire from left coil.
3. Connect "N" lead of tester to engine ground.
4. Connect "P" lead of tester to red wire.
5. Connect load coil between red wire and engine ground.
6. Set tester dial at 55 - crank engine - light should light.
7. Reconnect red wire to left coil.
8. Disconnect white wire from right coil.
9. Connect "N" lead of tester to engine ground.
10. Connect "P" lead of tester to white wire.
11. Connect load coil between white wire and engine ground.
12. Set tester dial at 55 - crank engine - light should light.
13. Reconnect white wire to right coil.

Alternator

1. Place toggle switch of tester on "LOW" scale.
2. Connect "P" lead of tester to one of the yellow-green wires of terminal block on the engine.
3. Connect "N" lead of tester to the other yellow-green wire of terminal block on engine.
4. Set tester dial at 90 - crank engine - light should light.

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REPAIR

Removing Flywheel, Stator and Trigger Assemblies

NOTE: Engine has been removed from snowmobile for photographic purposes.

Remove recoil start, flywheel housing and lower fan sheave.

IMPORTANT: Do not strike flywheel with a steel mallet because this can cause permanent damage to the flywheel.

Fig. 16-Removing Flywheel Retaining Nut

Use two of the bolts that secure lower fan sheave to attach JDM-64-1 Flywheel Holding Tool to the flywheel, Fig. 16. Remove retaining nut and remove JDM-64-1 Flywheel Holding Tool.

Fig. 17-Removing Flywheel

Install JDM-9 Puller assembly as shown in Fig. 17. Two of the puller bolts should be installed through JDM-64-1 Flywheel Holding Tool. This provides a method of holding the flywheel while tightening the puller bolt.

Remove stator and trigger assembly.

NOTE: Screws securing stator and trigger assembly are held with Loctite. Use an L-shaped Phillips-head screwdriver to break Loctite loose, making screw removal easier.

Installing Flywheel, Stator and Trigger Assemblies

Install trigger and stator assemblies. Use Loctite on each screw and tighten securely.

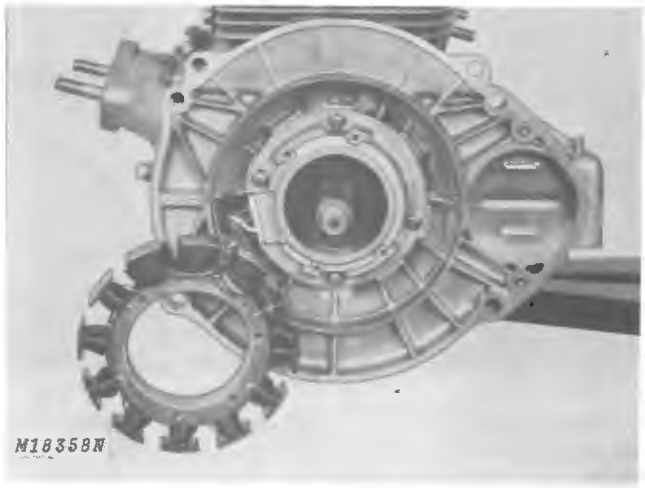

Fig. 18-Installing Trigger Assembly

When installing trigger assembly, Fig. 18, position all four screws in the center of their slots. In most cases this will be the correct timing position for the trigger assembly.

Fig. 19-Installing Flywheel Retaining Nut

Install flywheel and torque retaining nut to 60 ft-lbs (81.34 Nm), Fig. 19.

Remove JDM-64-1 Flywheel Holding Tool and install lower fan sheave, flywheel housing and recoil start.

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Checking Ignition Timing (Without Timing Decal)

NOTE: For a quick check, locate a pointer on an intake manifold bolt and mark recommended timing on fixed face of primary clutch.

A—Dial Indicator
B—Brass Pointer
C—Mark on Flywheel Sheave

Fig. 20-Checking Ignition Timing

1. Remove recoil starter. Bend a loop in a brass rod (B, Fig. 19) and secure it to flywheel housing with screw. Pointer (B) should just miss flywheel sheave.

2. Install dial indicator (A, Fig. 20) in No. 1 spark plug hole.

3. Rotate crankshaft to locate TDC (Top Dead Center), and "zero" dial indicator (A).

4. Rotate crankshaft counterclockwise (opposite normal rotation) until dial indicator reads 0.096-inch BTDC (before top dead center).

5. With flywheel in this position, place a mark (C) (with a felt-tip pen) on sheave rim corresponding with pointer (B).

6. Remove dial indicator (A) and reinstall spark plug.

A—Timing Light
B—Clamp on Pick-up
C—Pointer
D—Mark on Sheave

Fig. 21-Checking Ignition Timing

7. Connect a timing light (A, Fig. 21) to No. 1 spark plug lead and to a 12-volt battery.

8. Start and run engine at approximately 4000 rpm.

9. Aim timing light (A) at pointer (C) and mark (D) on flywheel sheave. Mark on flywheel sheave should align with pointer.

10. If not, remove flywheel housing, flywheel and alternator-stator. Loosen four screws securing timing ring and rotate ring as necessary to advance or retard timing. Rotating ring counterclockwise advances timing - rotating ring clockwise retards timing. Retighten screws securely.

Reassemble and recheck timing.

Checking Ignition Timing (With Timing Decal)

1. Remove drive belt and spark plugs.

Fig. 22-Marking Primary Sheave

2. Install JDM-15 Dial Indicator in No. 1 cylinder spark plug hole, Fig. 22.

3. Form a piece of 0.080-inch (2.032 mm) wire and attach it with an intake manifold nut as shown, Fig. 22.

4. Rotate primary sheave until dial indicator shows the No. 1 piston is at top-dead-center (TDC).

5. Use a fine-point, felt-tip pen to make a mark that is in line with the wire pointer.

6. Rotate primary sheave clockwise until dial indicator shows that the piston is 0.096 inch (2.438 mm) BTDC before-top-dead-center (BTDC).

7. Make a second mark in line with the wire pointer.

Fig. 23-Installing Timing Decal

8. Install JDM-108 Timing Decal on sheave so that the 0 degree line on timing decal is directly over TDC mark on the sheave.

NOTE: Lined edge of decal should be even with the edge of the sheave and the 20 degree advance mark on the decal should be over the 0.096 inch (2.438 mm) BTDC mark.

9. Repeat Steps 2 through 8 for the No. 2 cylinder, using another decal.

10. Install spark plugs.

11. Connect timing light to No. 1 cylinder spark plug lead.

12. Start and run engine at 3000 rpm. Timing light should indicate 20 degrees ± 1 degree BTDC.

⚠ **CAUTION: Do not overspeed engine with drive belt removed.**

13. Repeat Steps 11 and 12 on No. 2 cylinder.

IMPORTANT: Timing variance should not exceed ± 1 degree between cylinders. Recheck dial indicator readings (Steps 4, 5, 6 and 7) if it varies more than 1 degree.

14. If timing is incorrect, remove recoil starter, flywheel housing, flywheel and alternator-stator. Loosen four screws securing timing ring and rotate ring as necessary to advance or retard timing. Rotating ring counterclockwise advances timing, clockwise retards timing. Re-tighten screws securely.

15. Reassemble and recheck timing.

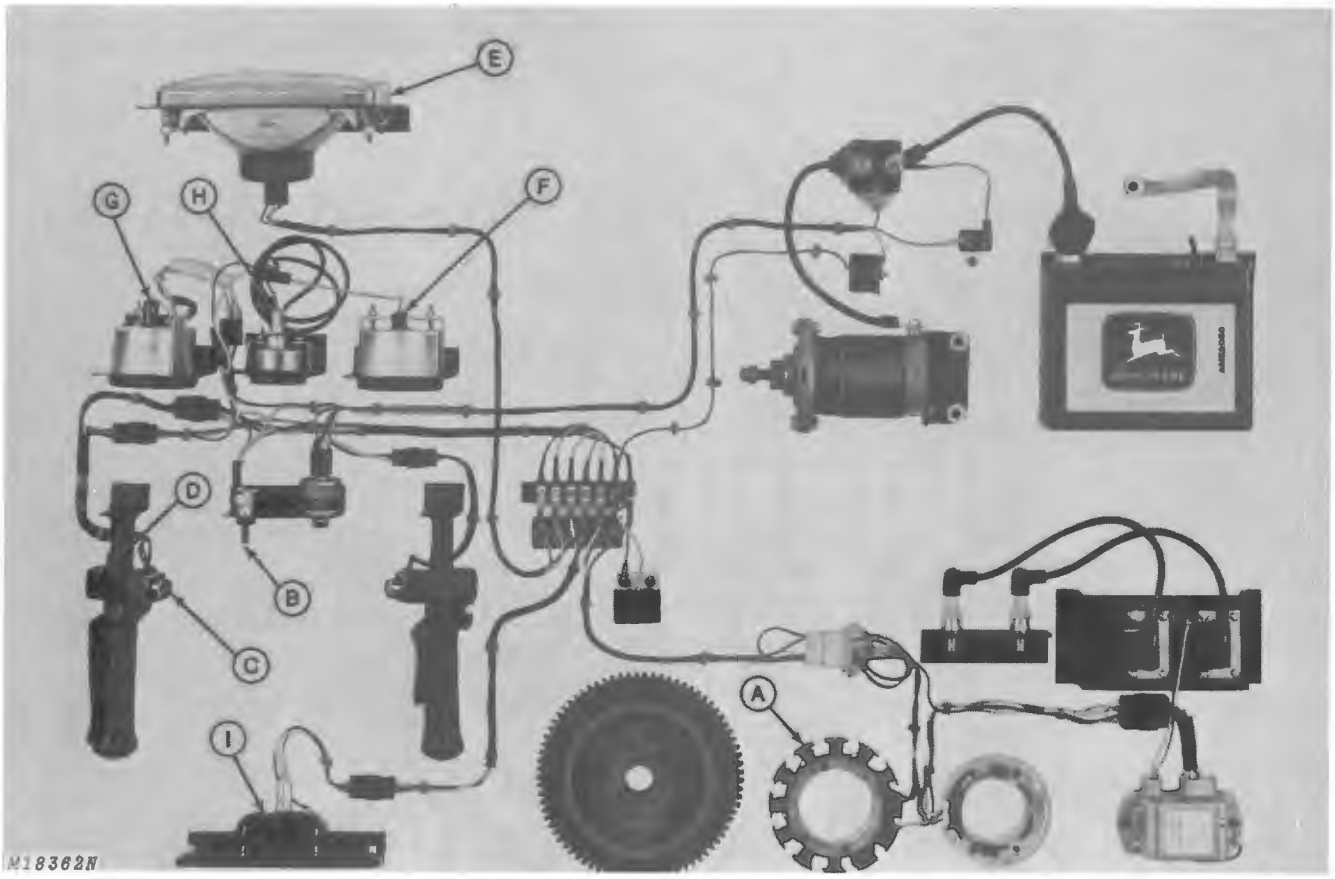
16. Install drive belt.

Checking Ignition Timing (With Timing Decal)—Continued

Fig. 24-Checking Timing

Group 15
LIGHTING SYSTEM

PRINCIPLE OF OPERATION



A—Alternator Stator
B—Light Switch (-80,000)
C—Dimmer Switch
D—Brake Light Switch
E—Headlight
F—Speedometer Light
G—Tachometer Light
H—Coolant Gauge Light
I —Brake and Taillight

Fig. 1-Components of Snowmobile Lighting System

The lighting system on John Deere 340 and 440 Cyclone and Liquifire Snowmobiles consists of an alternator-stator (A, Fig. 1), light switch (B), dimmer switch (C), brake light switch (D), headlight(E), speedometer light (F), tachometer light (G), coolant gauge light (H), (Liquifire only) and a combination brake and taillight (I).

The flywheel contains a special flexible magnet which revolves around the alternator-stator. Current is generated in the twelve poles of the stator plate, nine of which supply power for the lighting system and battery charging and three supply power for the ignition system.

On Snowmobiles equipped with electric start, the AC current generated by the alternator-stator is rectified to DC current by a diode to make battery charging possible.

A light switch mounted on the instrument panel (Serial No. -80,000) switches the lights "on" and "off". A brake light switch switches the brake light "on" when the brake is applied.

See Group 20 of this section for testing and repair of battery charging system.

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TESTING

Testing Alternator With a Voltmeter
All Snowmobiles (Serial No. 55,001-)

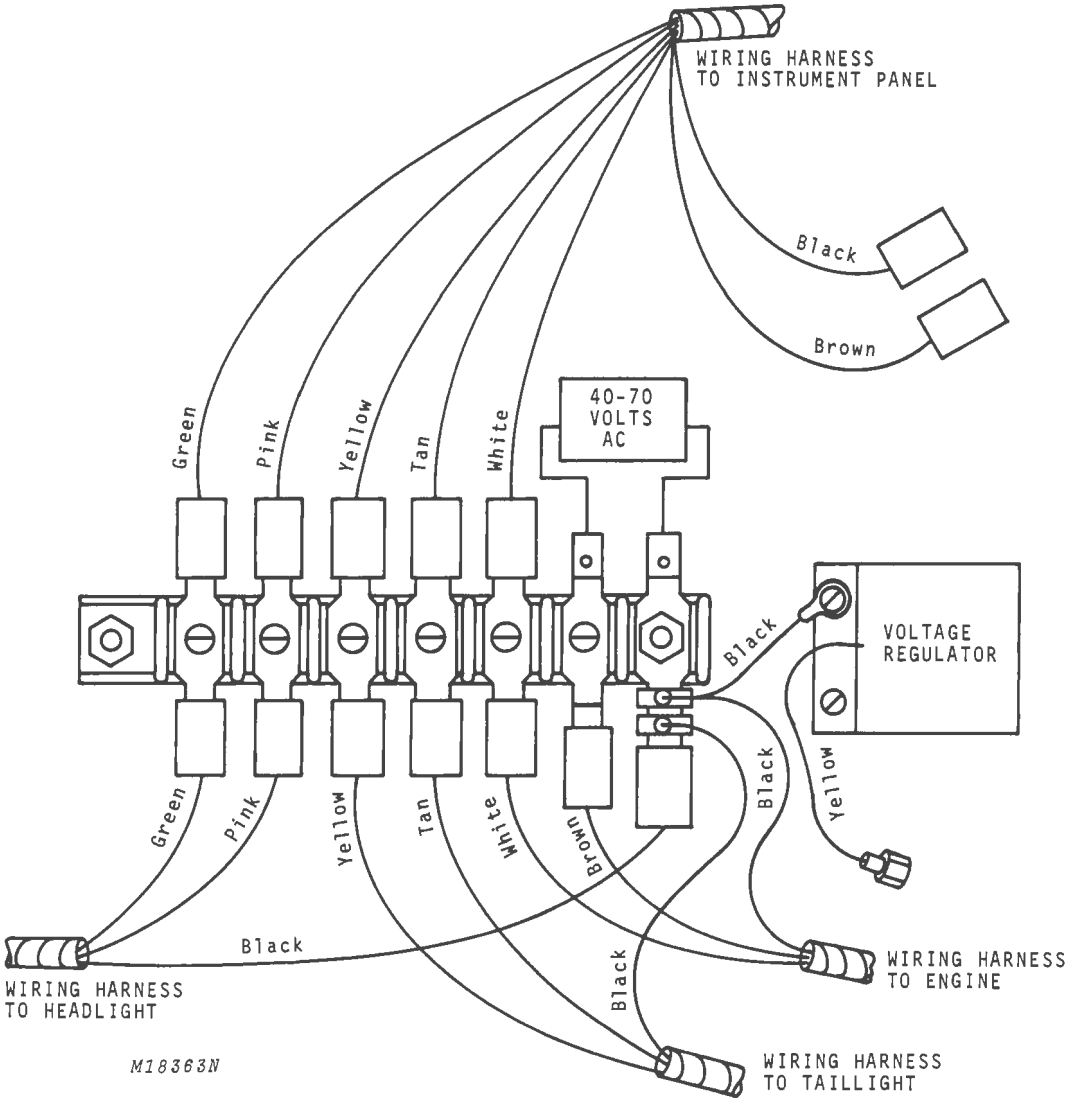

Fig. 2-Testing Alternator With A Voltmeter

The following tests are designed to isolate the cause of trouble in the lighting system. A complete guide for diagnosing malfunctions appears in Group 5 of this section.

Visually inspect all wiring, couplers and terminals prior to testing to be certain they are not at fault. Also, check for burned out light bulbs.

Testing Alternator System With an AC Voltmeter

1. Connect AC voltmeter to the brown and black leads at the terminal block, Fig. 2. Disconnect yellow voltage regulator lead from terminal block.

2. Start and run the engine at approximately 4000 rpm. The AC voltmeter should indicate 40 to 70 volts. If the stator does not produce the voltage indicated, then it must be replaced.

IMPORTANT: The wiring harness coupler must be connected to the engine coupler when testing at the terminal block. The engine will run with the harness plug disconnected but CANNOT BE STOPPED. With the wiring harness coupled to the engine, the engine can be stopped with the key switch or emergency stop switch.

Testing Headlight Dimmer Switch
All Snowmobiles (Serial No. 55,001-)

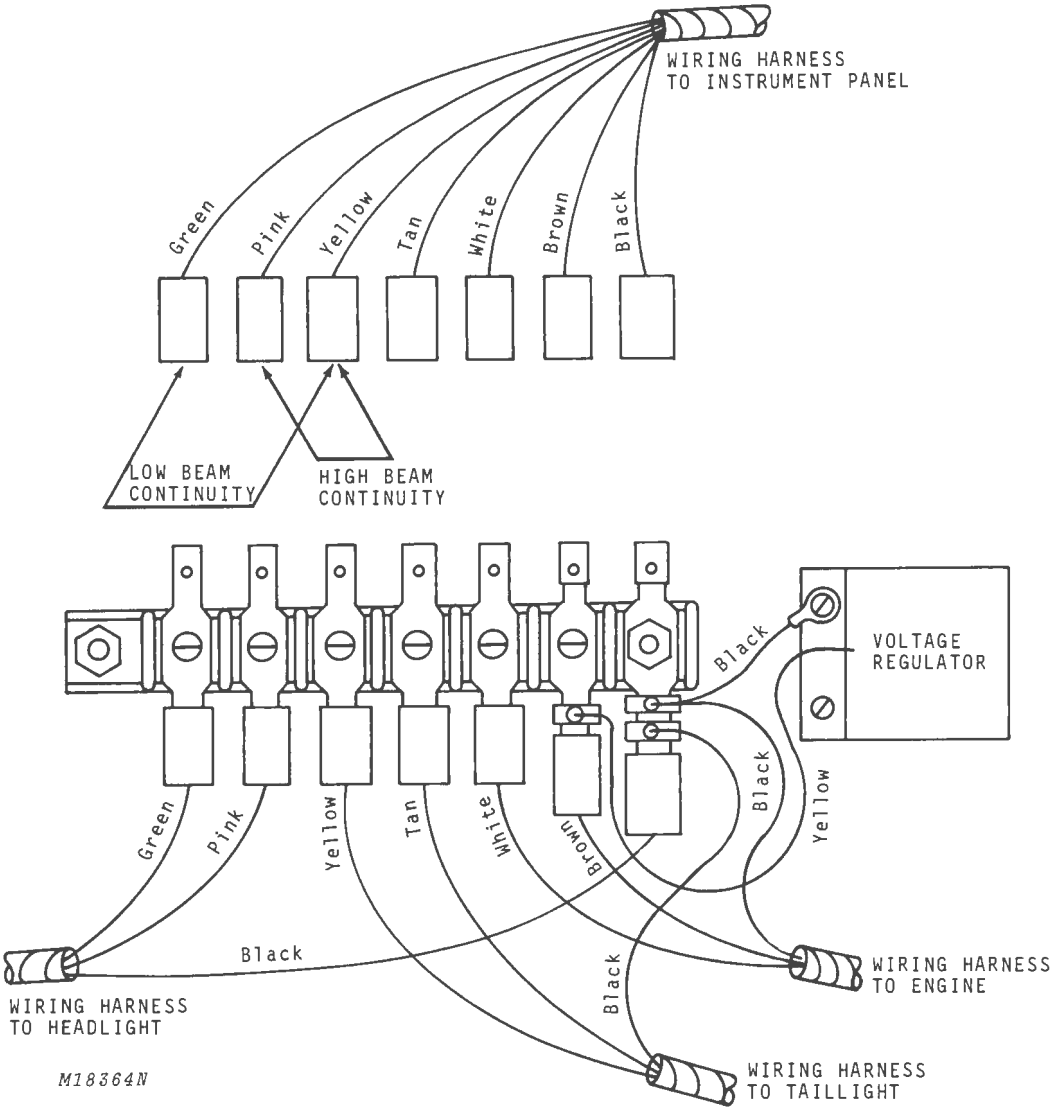

Fig. 3-Testing Headlight Dimmer Switch

Test headlight dimmer switch as follows:

1. Disconnect the green, pink, and yellow lead from the terminal block as shown in Fig. 3.

2. Connect the leads of a continuity test light to the green and yellow wires.

3. With the switch in the low beam position, test light should light.

4. With the lead from the test light still connected to the yellow wire, connect the other lead of the test light to the pink wire.

5. With the switch in the high beam position, continuity light should light.

If switch does not function properly, replace it.

Testing Light Switch
All Snowmobiles (Serial No. 55,001-80,000)

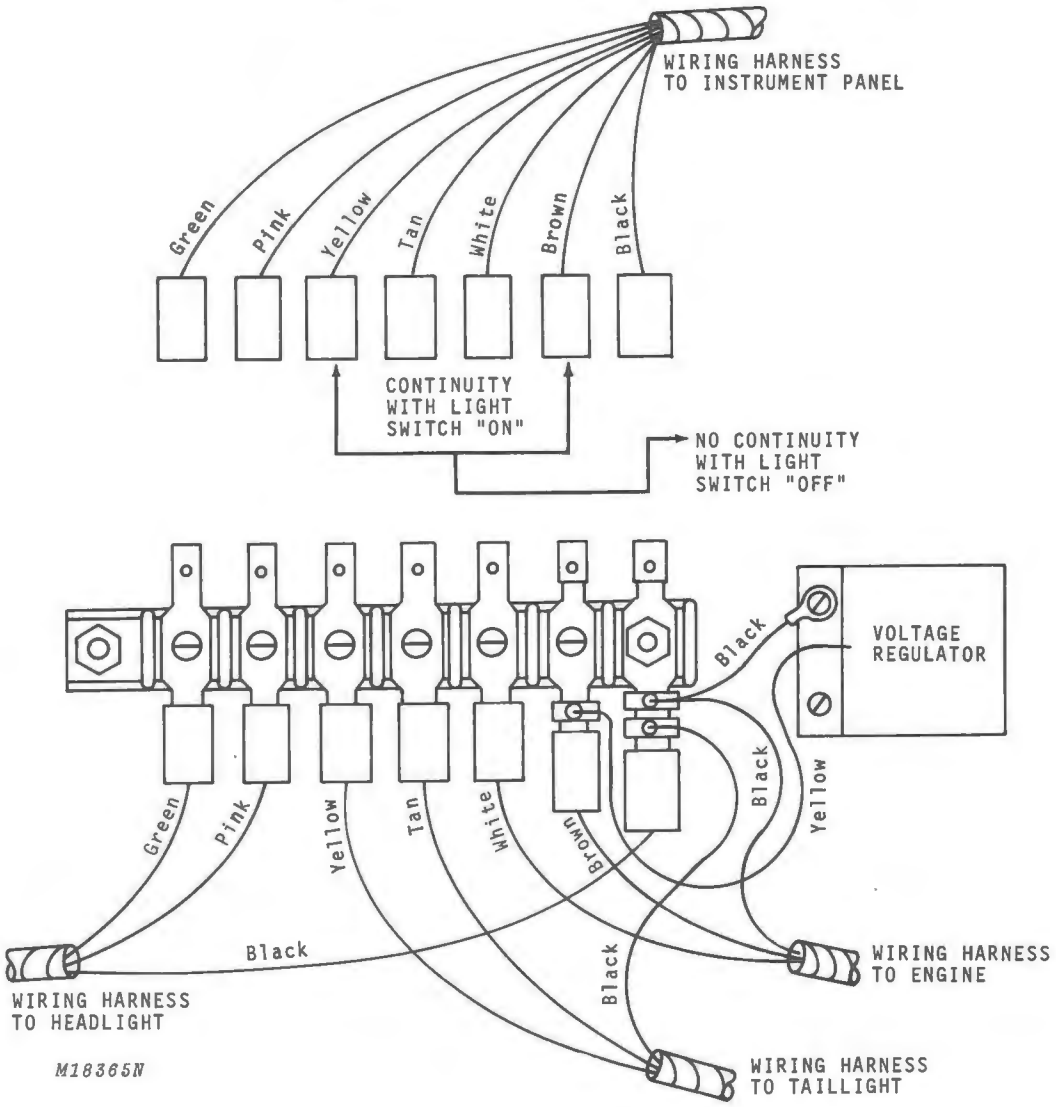

Fig. 4-Testing Light Switch

Test the light switch as follows:

1. Disconnect the yellow and brown wire from the terminal block as shown in Fig. 4.

2. Connect the leads of the continuity test light across the two wires.

3. With light switch in the "ON" position, test light should light. With switch "OFF", test light should not light.

Replace switch if determined faulty.

Testing Brake Light Switch
All Snowmobiles (Serial No. 55,001-)

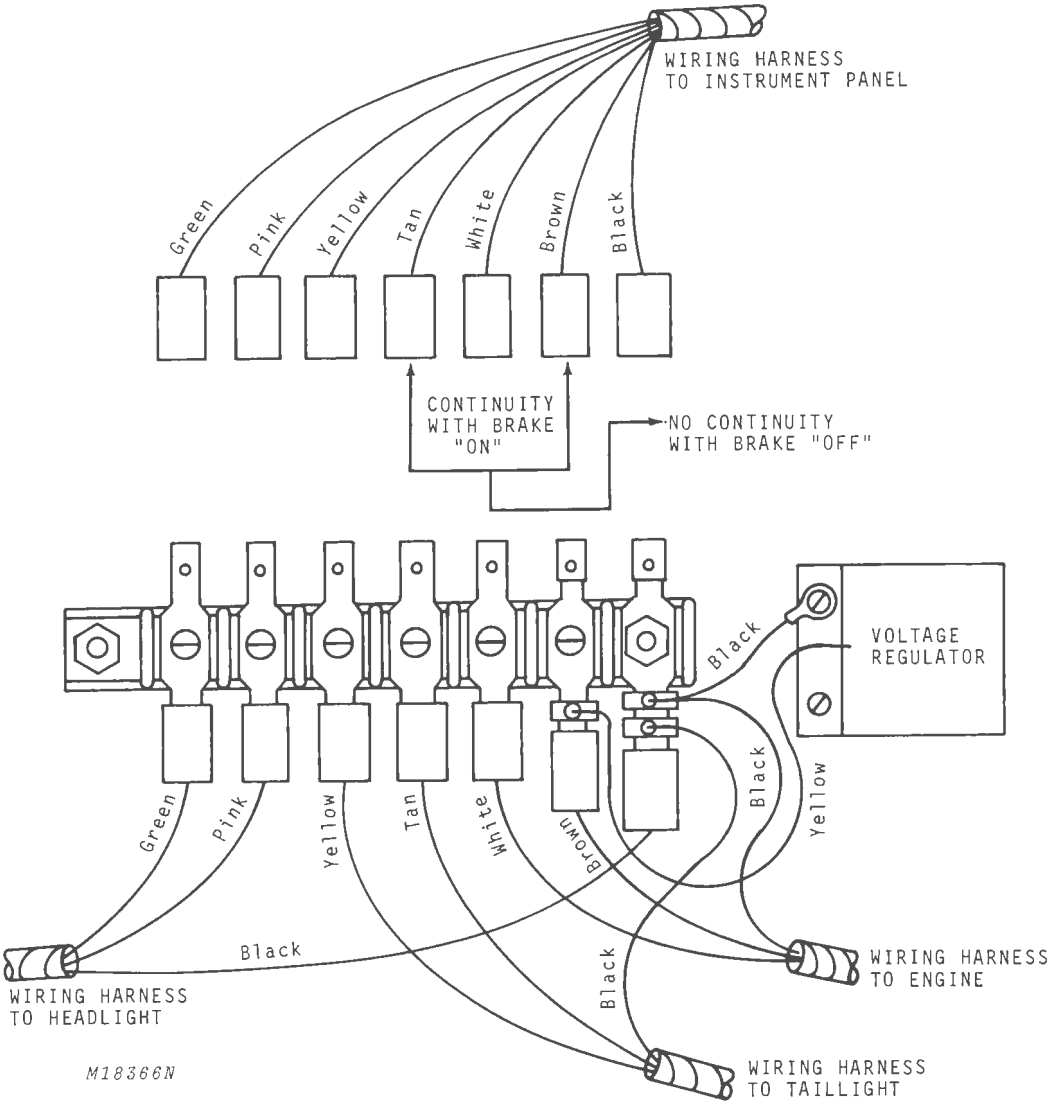

Fig. 5-Testing Brake Light Switch

Test the brake light switch as follows:

1. Disconnect the tan and brown wires from terminal block, Fig. 5.

2. Connect leads of continuity test light to the tan and brown wires.

3. With brake "ON", test light should light. With brake "OFF" test light should not light.

Replace brake switch if it does not function properly.

Testing Engine Kill Switch
1976 Snowmobiles (Serial No. 55,001-70,000)

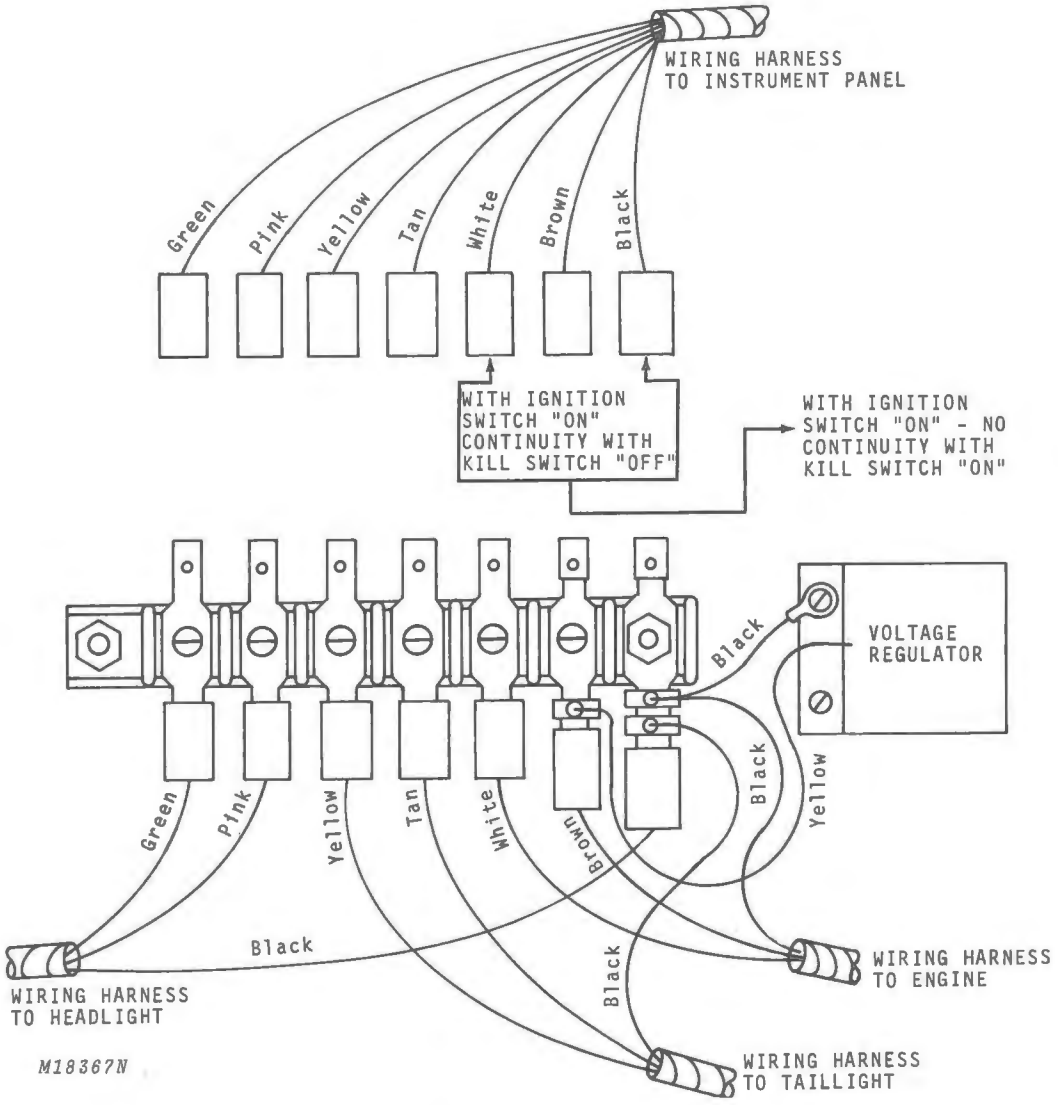

Fig. 6-Testing Engine Kill Switch

1. Disconnect the white and black wires leading to the terminal block, Fig. 6.

2. Connect the test leads of a continuity light to the white and black wires.

NOTE: Both white wires have been removed from the terminal board on 1977 Snowmobiles (Serial No. 70,001-). This is also true on all 1976 Snowmobiles (Serial No. 55,001-70,000) that have been modified under Modification Program 280. See kill switch and ignition switch tests on page 40-15-8.

3. Turn the ignition switch to the "ON" position.

4. With the kill switch in the "OFF" position test light should light. Test light should not light with the kill switch in the "ON" position.

Replace kill switch if defective.

Testing Ignition Switch
1976 Snowmobiles (Serial No. 55,001-70,000)

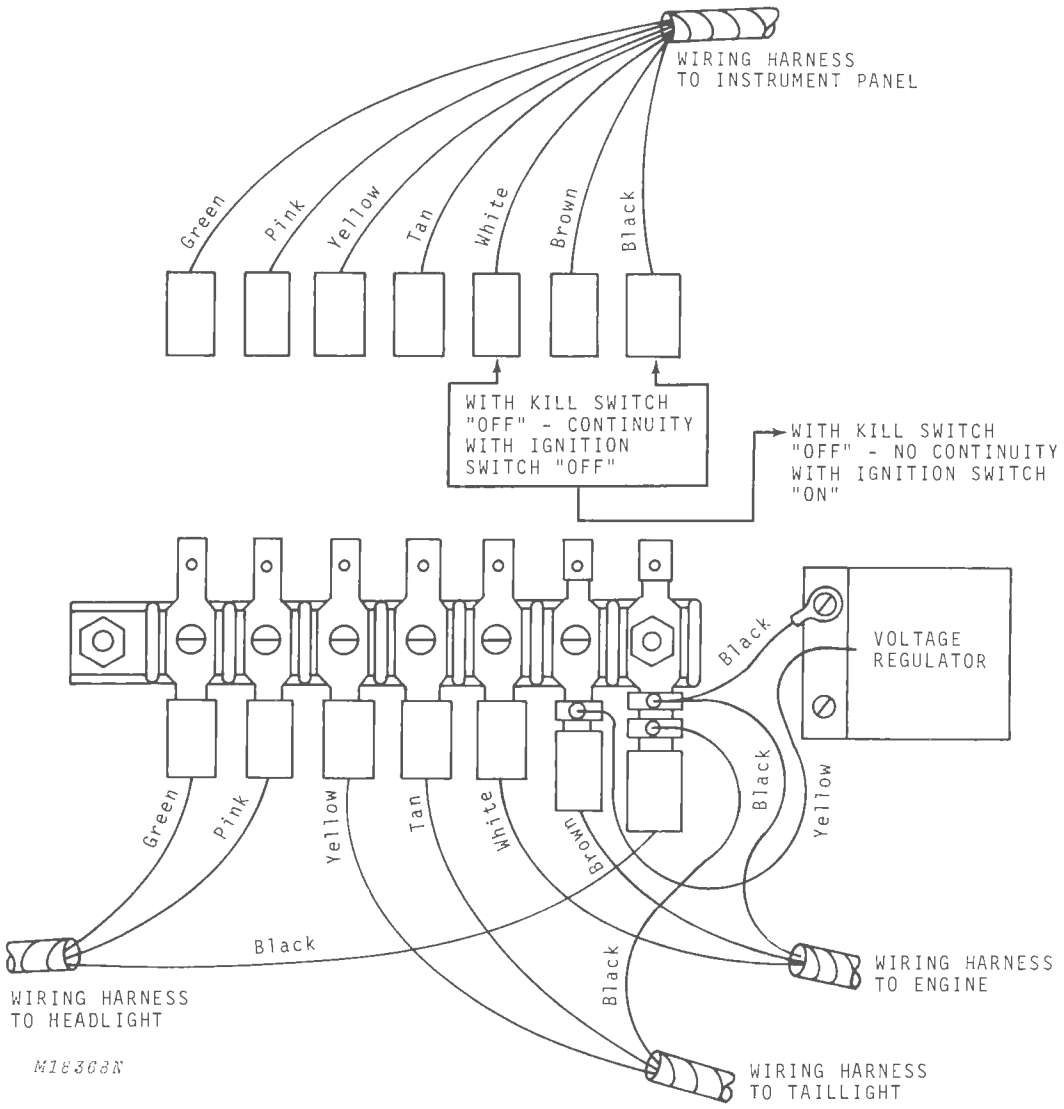

Fig. 7-Testing Ignition Switch

1. Disconnect the white and black wires leading to the terminal block, Fig. 7.

2. Connect the test leads of a continuity light to the white and black wires.

NOTE: Both white wires have been removed from the terminal board on 1977 Snowmobiles (Serial No. 70,001-). This is also true on all 1976 Snowmobiles (Serial No. 55,001-70,000) that have been modified under Modification Program 280. See kill switch and ignition switch tests on page 40-15-8.

3. Place the engine kill switch in the "OFF" position.

4. With the ignition switch in the "OFF" position, test light should light.

Testing Ignition and Kill Switches 1977 Snowmobiles (Serial No. 70,001-)

Fig. 8-Testing Ignition and Kill Switches

1. Disconnect the white and black wires between the electronic pack and the ignition and kill switches. These are the two wires that are taped together.

2. Connect the test leads of a continuity light to the white wire and ground, Fig. 8.

3. Turn the ignition switch to the "ON" position.

4. With the kill switch in the "OFF" position, test light should light. Test light should not light with the kill switch in the "ON" position.

5. Place the kill switch in the "OFF" position.

6. With the ignition switch in the "OFF" position, test light should light.

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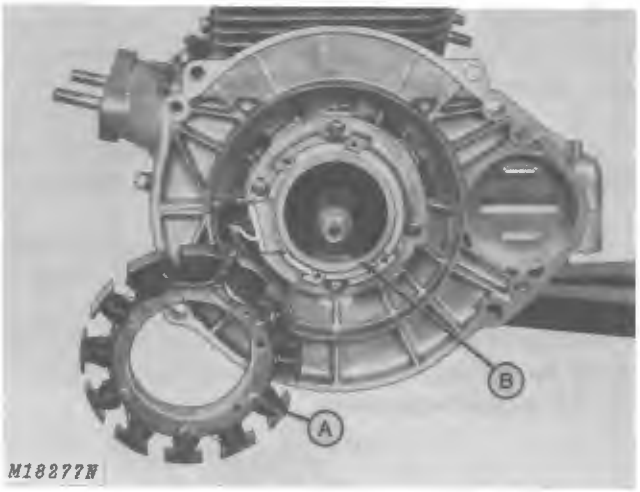
REPLACING ALTERNATOR STATOR



A—Alternator Stator **B—Trigger Assembly**

Fig. 9-Replacing Alternator Stator

Remove flywheel retaining nut, and flywheel using JDM-64-1 Flywheel Holding Tool and JDM-9 Flywheel Puller.

Remove four screws securing alternator stator (A, Fig. 9), to trigger assembly (B).

Disconnect alternator stator leads from engine coupler so that the wires will pass through the rubber grommet located between the crankcase halves.

AIMING HEADLIGHT

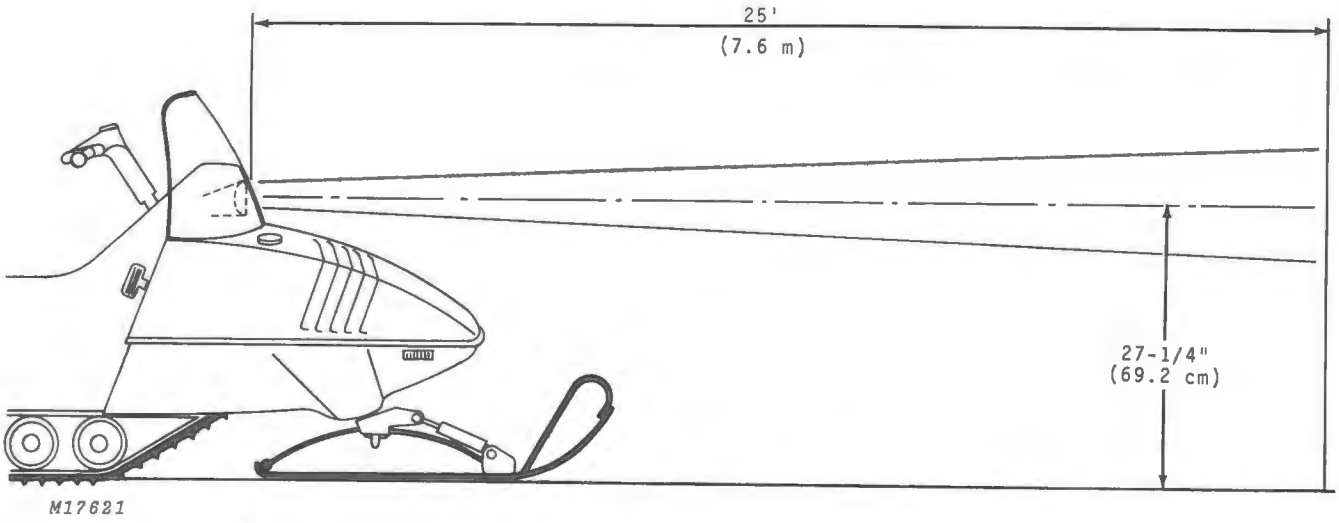


Fig. 10-Aiming Snowmobile Headlight

Position snowmobile on a flat surface with the headlight 25 feet (7.6 m) from a vertical surface. With an operator on the seat and the headlight on high beam, the light beam centerline should be straight ahead of the machine and 27-1/4 inches (69.2 cm) above the ground level, Fig. 10.

ADJUSTING HEADLIGHT

Adjust headlight to the above specifications by turning the screws 1, 2, or 3, Fig. 10, located around the headlight either clockwise or counterclockwise.

Fig. 11-Adjusting Headlight

1. Turning these two screws, Fig. 11, clockwise lowers the light beam and turning them counterclockwise raises the light beam.

2. Turning this screw clockwise moves the light beam to the left (viewed from operator's position).

3. Turning this screw clockwise moves the light beam to the right (viewed from operator's position).

NOTE: When making adjustments in Steps 2 and 3, it will be necessary to adjust the opposite screw by turning it counterclockwise.

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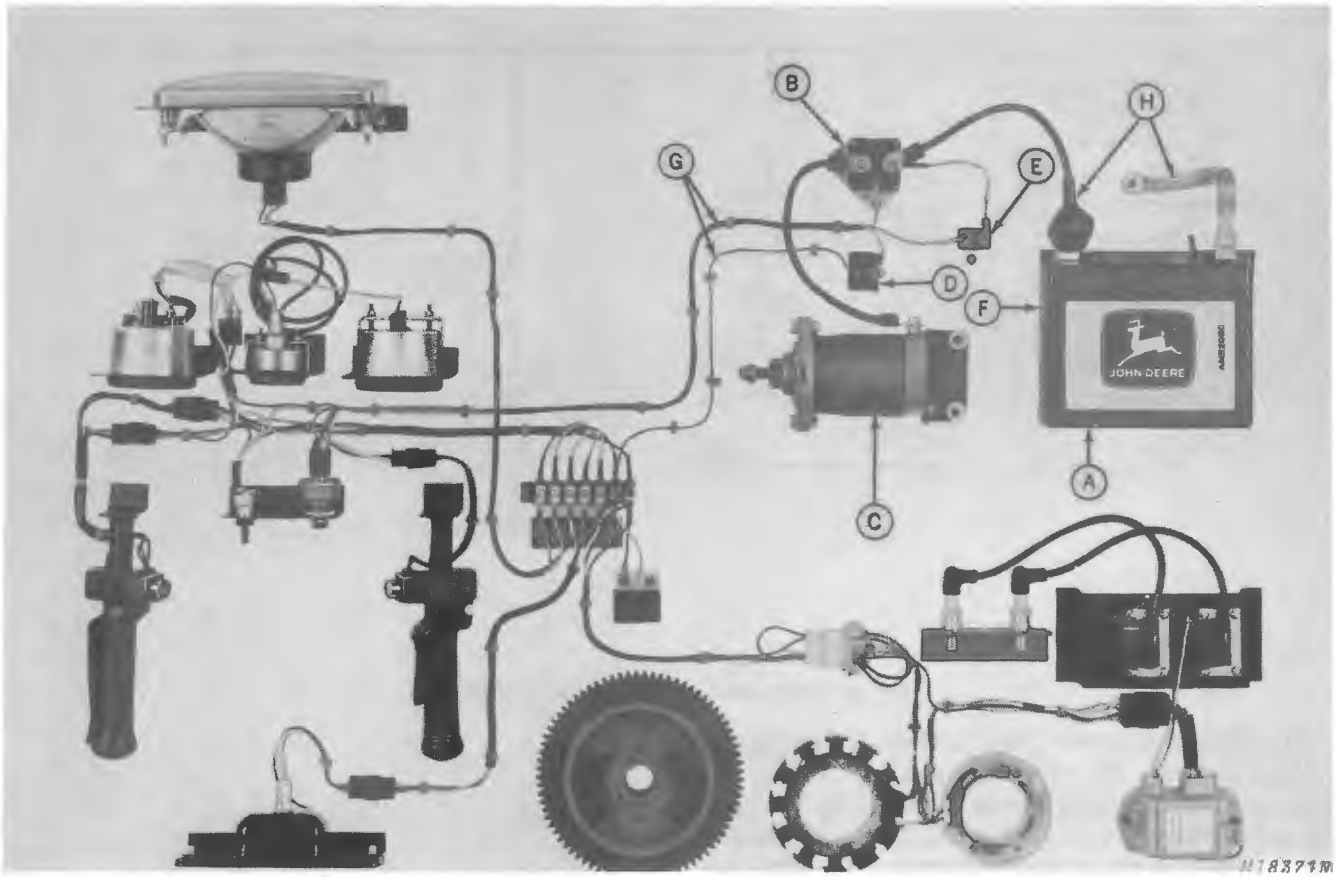
Group 20
ELECTRIC START KIT

PRINCIPLE OF OPERATION



A—Battery
B—Solenoid
C—Starter Motor
D—Diode (Rectifier)
E—Circuit Breaker
F—Battery Box
G—Wiring Harness
H—Battery Cables

Fig. 1-Electric Start Components

The electric start kit, Fig. 1, consists of a 12-volt battery (A), starter solenoid (B), starter motor (C), diode (D) and circuit breaker (E). Battery box (F), wiring harness (G), and battery cables (H) are also included.

When the ignition switch is turned to the "START" position, battery current is directed to the starter solenoid. This activates the solenoid which connects the battery directly to the starter motor.

As the starter motor begins to rotate, the Bendix type drive moves into mesh with the flywheel ring gear and rotates the crankshaft.

Once the engine is started, the alternator-stator within the flywheel generates alternating current. This alternating current is changed to direct current through a diode. The direct current recharges the battery.

A circuit breaker protects the system from short circuits or electrical overloads. The circuit breaker resets automatically after opening.

See "Wiring Diagram" and "Diagnosing Malfunctions" in Group 5 of this section.

PRINCIPLE OF OPERATION—Continued

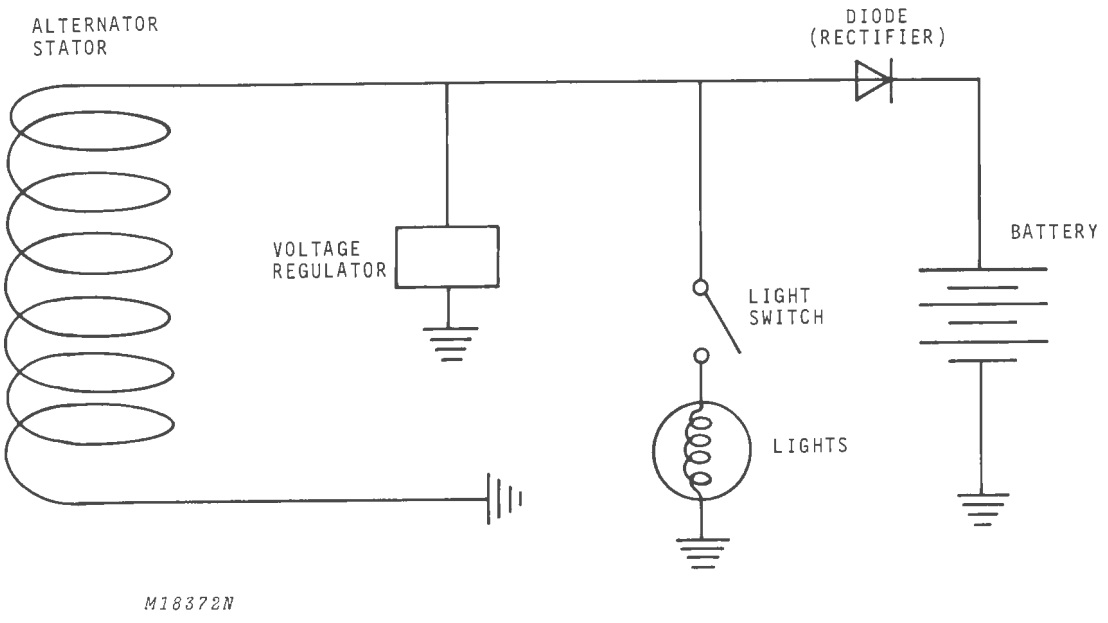


Fig. 2-Snowmobile Lighting and Charging System

The voltage regulator, Fig. 2, limits the amount of voltage available for either charging the battery (on electric start models) or operating the lights. The lighting system operates entirely on AC current supplied by the 9 poles of the alternator stator. The battery is charged with DC current (AC voltage rectified by one diode). On 1975 models the lights could be operated without the engine running. On 1976 and 1977 models the engine must be running for the lights to operate.

Battery

A—Manifold Vent **B—Discharge Tube Connection**

Fig. 3-John Deere Snowmobile Battery

The 12-volt, 32-amp-hr. storage battery, Fig. 3, is of the lead-acid variety. Lead is used in the construction of the cell plates and a sulfuric acid solution serves as the electrolyte.

The 12-volt battery has a hard rubber case with six individual cells. Each cell contains a specific number of sets of negative and positive plates.

All plates of like charge are interconnected so that the accumulative charges are present at the positive and negative battery terminals.

As a battery discharges and the energy is not replenished, the sulfuric acid is withdrawn from the electrolyte and the lead sulfate deposits build up on the plates. This causes the specific gravity of the electrolyte to diminish. Charging the battery reverses the chemical reaction, restoring the electrolyte to its original potential.

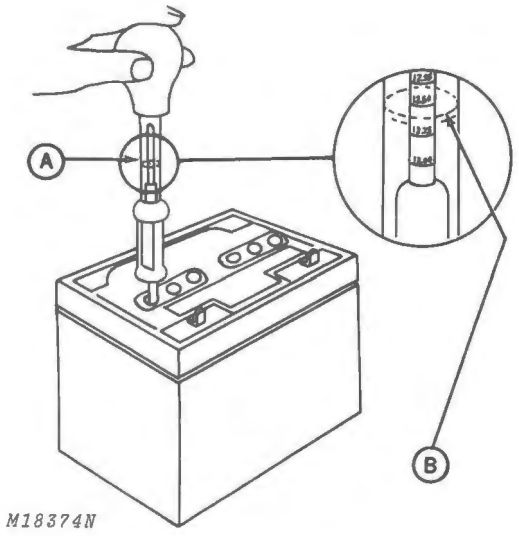
IMPORTANT: A discharged battery will freeze and damage the battery. Always keep battery fully charged when used in sub-zero weather.

John Deere snowmobile batteries feature a manifold vent system, (A, Fig. 3). This system vents all six cells into a discharge tube (B) which extends below the snowmobile pan. The six fill caps are not vented as in a conventional battery.

The battery base also has a tube extending below the pan to discharge water or acid which might accumulate in this area.

TESTING

Testing Battery



A—Float Must Be Free **B—Take a Reading at Eye Level**

Fig. 4-Testing Specific Gravity

Checking Specific Gravity

To determine whether the battery is capable of meeting the requirements of the starter motor, it is necessary to duplicate operating conditions by subjecting the battery to a load test. To obtain a true test, the battery should be at least 75 percent charged. This can be determined by taking a hydrometer reading, Fig. 4.

The following table illustrates typical ranges of specific gravity (amount of unused sulfuric acid remaining in the solution) for a cell in various states of charge, with respect to its ability to crank the engine at 80°F. Initial full-charge specific gravity is either 1.260 or 1.280.

Specific Gravity	Capacity
1.260 to 1.280	100%
1.230 to 1.250	75%
1.200 to 1.220	50%
1.170 to 1.190	25%
1.140 to 1.160	Very little useful capacity
1.110 to 1.130	Discharged

Checking Battery Voltage

With a battery in good condition, each cell contributes approximately 1.95 to 2.08 volts. If battery charge is low and less than 0.05 volt difference is noted between the highest and lowest cells, the battery may be recharged.

If the difference is more than 0.05 volts, this could indicate a cracked plate or other damage which could call for replacement of the battery.

There are two methods of testing battery capacity. Battery electrolyte temperature should be at or near 80°F for these tests.

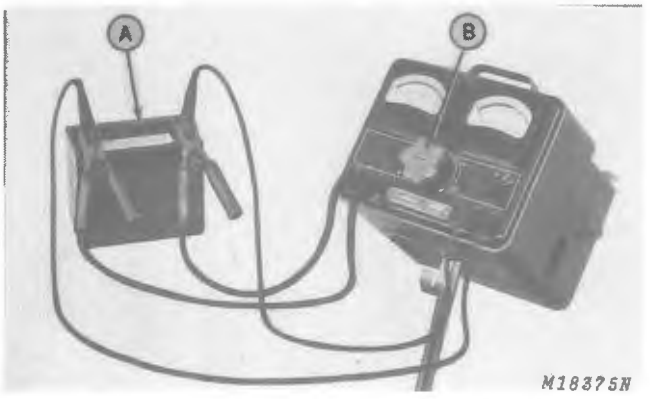
Before making either of the two following tests, first check electrolyte level in battery. Add water if necessary. If water is added, be sure it is thoroughly mixed with the underlying electrolyte by charging. Battery voltage should be 11.5 to 12.6 volts before testing.

Using the first method, crank the engine for 15 seconds with the starter motor and measure the battery voltage. If voltage is less than 9.6 volts at the end of 15 seconds, replace battery.

As a second method, use high-rate discharge test equipment, Fig. 5.

Discharge the battery (A, Fig. 5) by means of a heavy-duty carbon pile (B) at a rate of 3 times the ampere-hour capacity. Follow equipment manufacturer's recommendations for testing.

If after 15 seconds the battery voltage is less than 9.0 volts, the battery fails to meet the load test, indicating loss of capacity or internal short circuits. Any battery that passes the load test is a good battery and can be relied upon to fulfill the requirements of the starter motor under normal conditions.



A—Battery **B—Carbon Pile**

Fig. 5-Testing Battery Capacity

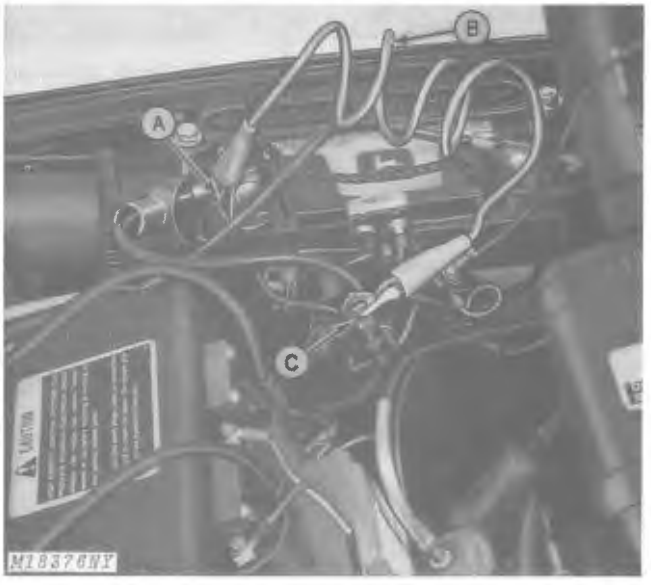
Testing Starter

If starter fails to crank engine or cranks very slowly, make the following checks:

1. Inspect cranking circuit wiring for loose or badly corroded connections or damaged wiring.

2. Check condition of battery to be certain battery is charged and not defective.

3. Crank engine with recoil starter to determine if engine turns freely and is not seized.



A—Positive (+) Battery Terminal **C—Starter Cable**
B—Heavy Jumper

Fig. 6-Testing Starter Operation

CAUTION: Remove spark plug wires prior to making the following test.

If the above checks revealed no defects and the starter still will not crank engine, remove starter cable (C, Fig. 6) from the solenoid and place a heavy jumper lead (B) from the positive (+) battery terminal (A) to the starter cable end.

This eliminates the ignition switch, circuit breaker and starter solenoid from the circuit. If starter cranks engine, then one of these items is defective.

If starter still will not crank engine, starter is defective and must be removed and disassembled for further testing.

Service on the starter motor is limited to three assemblies. These are: the armature; the end cap assembly, which includes the brushes and springs; and the pinion drive assembly, which includes the drive gear, anti-drift spring, spring cup and nut.

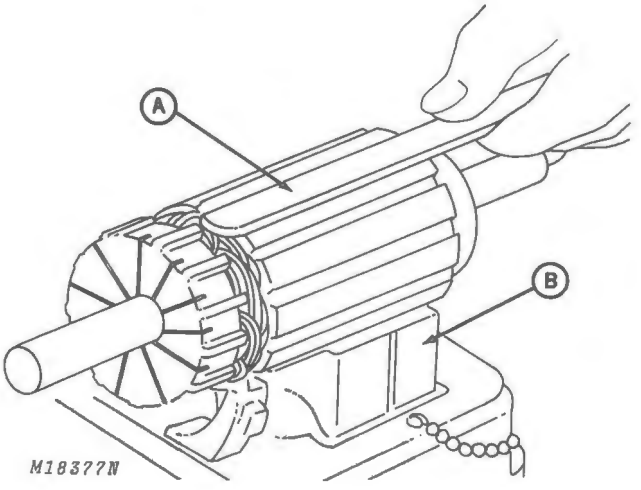
Testing Starter Magnets

Check to make sure the magnets are bonded to the housing.

Check magnets for magnetism.

Testing Armature

If the trouble has not yet been located, test the armature for opens, shorts, and grounds as follows:

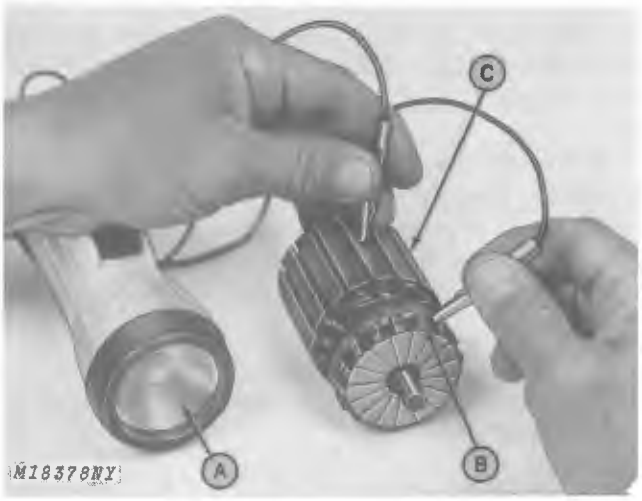


A—Hacksaw Blade **B—Growler**

Fig. 7-Checking Armature for Short Circuits

1. SHORTS—A burned commutator bar indicates a shorted armature. Short circuits are located by rotating the armature in a growler (B) with a steel strip (hacksaw blade) (A) held on the armature, Fig. 7. The steel strip will vibrate on the area of the short circuit.

Shorts between bars are sometimes caused by brush dirt or copper between bars. Inspect for this condition. Undercut commutator insulation 1/32-inch to eliminate these shorts.



A—Flashlight Tester **C—Armature Core**
B—Commutator

Fig. 8-Checking Armature for Grounds

2. GROUNDS—Grounds in the armature can be detected by use of a test light (A) and prods. If the lamp lights when one test prod is placed on the commutator (B) and the other prod on the armature core (C) or shaft, the armature is grounded, Fig. 8.

3. OPENS—Inspect for loose connnections at the points where the conductors are joined to the commutator (B). Poor connections cause arcing and burning of the commutator. If bars are not badly burned, resolder leads in riser bars.

If armature (C) checks good on the above test, but the commutator (B) is worn, dirty, out of round, or has high insulation, turn down the commutator and undercut insulation 1/32-inch.

If armature is defective, replace armature.

Testing Starter Solenoid

The solenoid is a sealed magnet switch and cannot be repaired. If testing reveals a defective unit, it must be replaced.

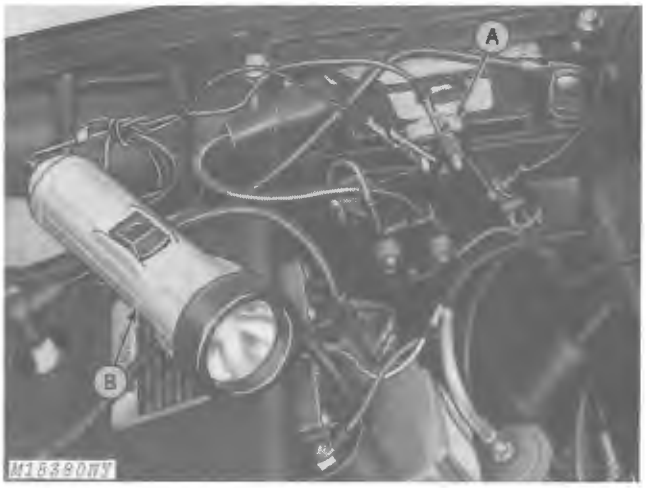
Remove and insulate cable from starter terminal. Connect test light across two large terminals, Fig. 9, of starter solenoid.

With a jumper lead (B), connect positive (+) battery post (A) to small terminal (C) on solenoid, Fig. 9. If in good condition, the solenoid plunger will snap in, light the test lamp, and hold until the jumper is removed.

A—Positive Battery Terminal **C—Small Terminal**
B—Heavy Jumper Lead **D—Large Terminals**

Fig. 9-Testing Starter Solenoid

Testing Circuit Breaker



A—Circuit Breaker **B—Flashlight Tester**

Fig. 10-Testing Circuit Breaker

Test light (B, Fig. 10) must light when connected across circuit breaker (A) terminals. If circuit breaker is found defective, it must be replaced.

The circuit breaker terminals are designated "BAT" and "AUX". Short red lead from starter solenoid must be connected to the "BAT" terminal of circuit breaker.

The circuit breaker should reset automatically after opening due to electrical overload.

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Testing Ignition Switch

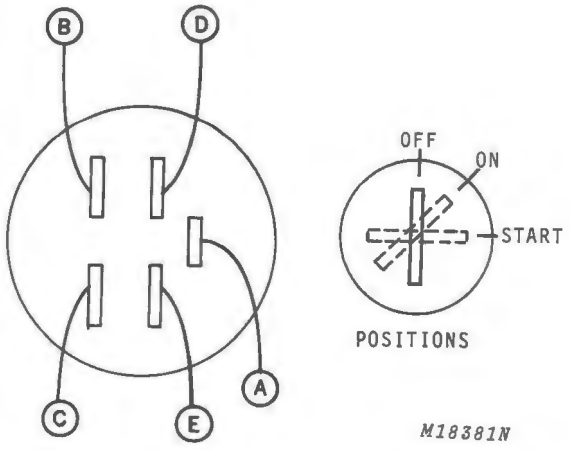


Fig. 11-Testing Ignition Switch

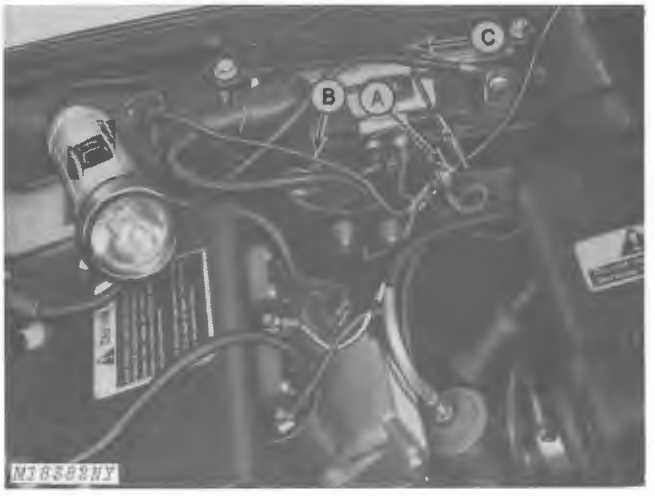
Lift hood and remove coupler from ignition switch. The ignition switch, Fig. 11, can be tested with a test light. Check for continuity between terminals with switch placed in each of three positions.

See Fig. 11 and chart below for correct current flow diagram. If switch is defective it must be replaced.

Position	Closed	Open
OFF	A & B	D,C,E
ON	C & D	A,B,E
START	D & E	A,C,B

Testing Diode (Rectifier)

Connect the black test lead (C, Fig. 12) from the flashlight tester to the brown wire side of the diode (A). Connect the red lead (B) from the flashlight tester to the orange wire side of the diode. Test light should light. With the flashlight leads reversed, test light should not light.



A—Diode **C—Black Lead**
B—Red Lead

Fig. 12-Testing Diode (Rectifier)

Testing Charging System

The alternator, which is used to provide current for the lighting system, is also used to charge the battery when the snowmobile is equipped with electric start.

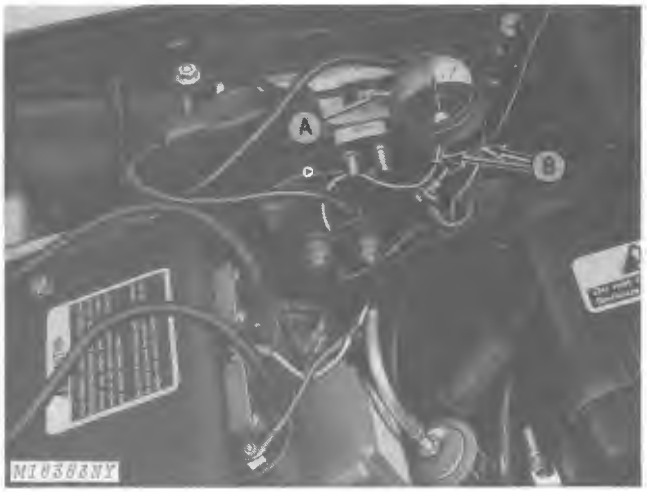
Refer to Group 15 of this section for testing the AC voltage output of the alternator.

If battery is not being charged properly, make the DC amperage test.

⚠ CAUTION: Block up snowmobile track securely so engine can be run at operating speeds without danger.

IMPORTANT: Do not operate engine with drive belt removed. Engine could overspeed and cause engine and drive sheave failure.

IMPORTANT: Start engine using recoil starter. Do not start engine with electric starter when meter is attached or meter will be damaged.



A—Ammeter **B—Leads From Circuit Breaker**

Fig. 13-Testing Charging System

Disconnect the two leads from the circuit breaker and attach them to a 140 Tractor Ammeter (AM32296) as shown in Fig. 13.

Run the engine at 6000 to 7000 rpm. DC output should be 2 to 3 amps with lights "OFF" or "ON." If not, test rectifier, circuit breaker, voltage regulator, and ignition switch. Also check condition of wiring and connections.

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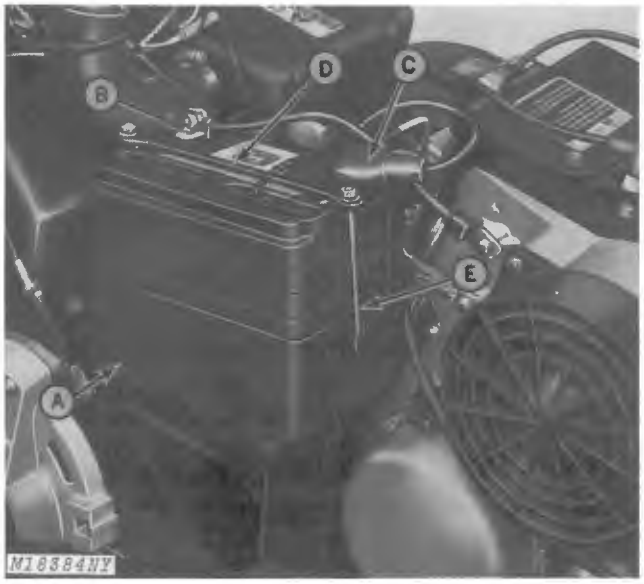
REPAIR

Battery

Removing Battery

To avoid injury from a spark or short circuit, disconnect negative (−) battery cable first (B, Fig. 14). Then remove rubber boot and disconnect positive (+) cable (C).



A—Battery Box
B—Negative Terminal
C—Positive Terminal
D—Hold-Down
E—Hold-Down Bolt

Fig. 14-Removing Battery

Loosen two hold-down bolts (E, Fig. 14), unhook bolts from box and remove hold-down (D). Disconnect vent tube from battery and lift battery from box.

Servicing Battery and Battery Box

Good battery servicing should include the following items:

1. Clean battery and battery box.
2. Inspect cables and ground strap.
3. Clean terminals and ground strap connection.
4. Inspect hold-downs.
5. Inspect battery case for leaks.
6. Make hydrometer test.
7. Add water if necessary. Use caution to protect snowmobile from electrolyte damage.
8. Recharge battery if less than 75% charged.
9. Inspect condition of battery vent tube and battery box drain tube.

Activating New Battery

Activate a new battery before installing it in snowmobile. This will prevent damage to machine in case electrolyte spills.

Add electrolyte until plates are just covered. Leave cell caps off while charging. Charge at 7 amps for 30 minutes. After initial charge, do not charge battery at more than 5 amps.

Charging the battery will increase battery temperature and raise the electrolyte level. If electrolyte is still below the ring in the battery neck, add enough electrolyte to fill to the bottom of the ring.

Advise customers to add water as required. A healthy battery will consume about one teaspoon of water per cell each month.

⚠ CAUTION: While charging battery, hydrogen and oxygen gases are emitted which are very explosive. Therefore, keep open flames and sparks away from battery.

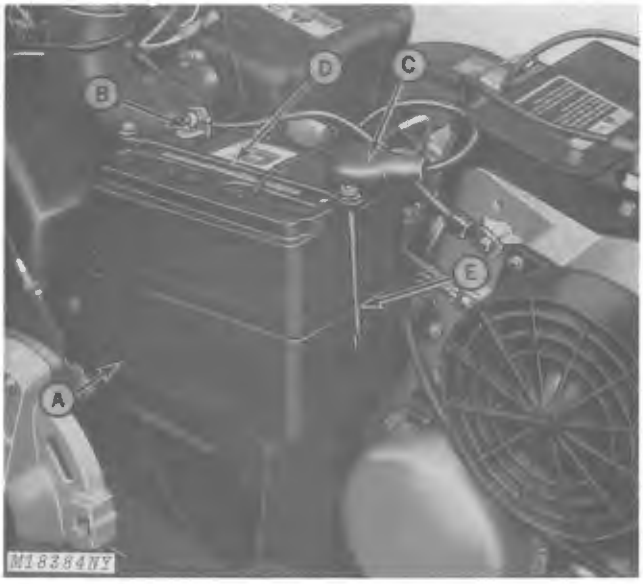
Cleaning Battery

Corrosion around the battery terminals is normal. However, an accumulation of corrosion over a long period can shorten the life of the battery. Therefore, keep battery terminals as clean as possible.

To clean terminals, remove battery from snowmobile. Remove all corrosion using a wire brush. Wash terminals using a solution of one part ordinary baking soda to four parts water. Do not permit cleaning solution to enter battery cells.

Wash entire battery, battery box and hold-down components with clear water. Do not get water in electrical couplers.

Installing Battery



A—Battery Box
B—Negative Terminal
C—Positive Terminal
D—Hold-Down
E—Hold-Down Bolt

Fig. 15-Installing Battery

Clean and dry battery exterior. Check condition of battery box rubber pads and replace if necessary. Place battery in box (A, Fig. 15). Clean and install battery hold-down (D) and bolts (E). Tighten securely, but not so tight rubber pads under battery are completely compressed.

Attach vent tube to battery. Attach positive (+) battery cable (C) first and install rubber boot; then attach negative (−) cable (B).

IMPORTANT: Be careful when attaching battery cables to prevent breaking or loosening battery terminals.

Checking Battery Electrolyte Level

Periodically check the level of the electrolyte in the battery cells. This should be done at least once a week during peak operating periods.

Proper level is to the bottom of the ring (filler neck) so that the tops of the battery plates are covered.

IMPORTANT: Do not overfill.

Add only distilled water to the battery. If not available, be sure to use clean, soft water. Avoid water with a high mineral content.

Never add acid to the battery unless electrolyte is lost by spilling. To add acid to the battery will unbalance the 10 to 1 sulfuric acid-to-water ratio.

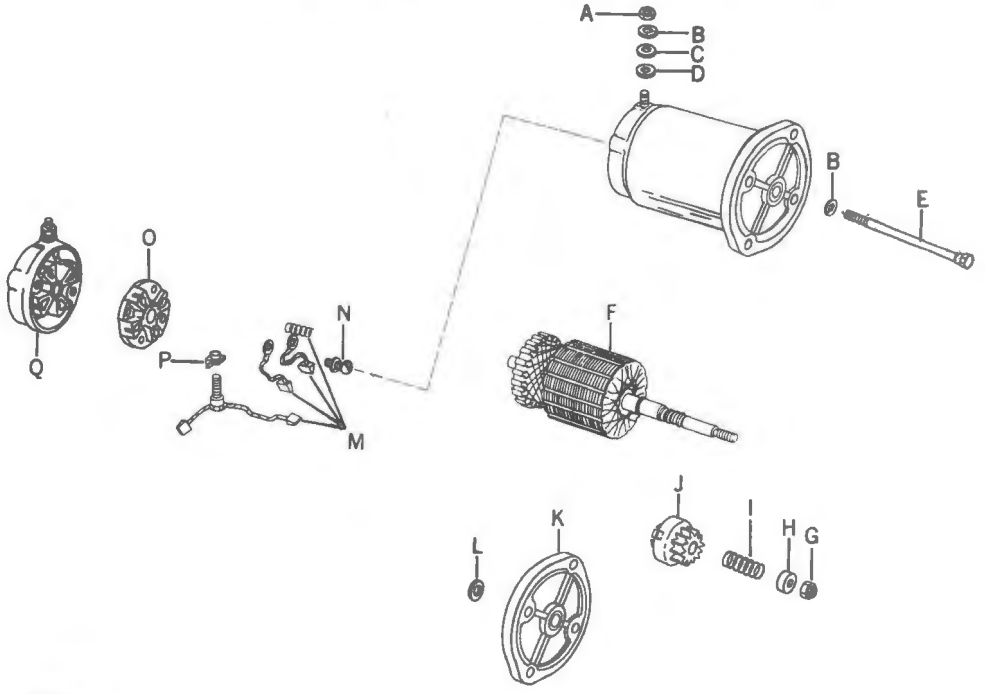
Always wait until after checking specific gravity before adding water to the battery. This will assure a true reading. If level is too low to check specific gravity, add water and operate system for a few minutes to mix water and electrolyte; then check.

In freezing weather, never add water to the battery unless snowmobile will be operated for a period of time to allow mixing of the water and electrolyte.

IMPORTANT: A discharged battery will freeze and break battery case. Always keep battery fully charged.

Litho in U.S.A.

Starter Motor (Permanent Magnet Field)



A—Nut
B—Lock Washer
C—Plain Washer
D—Insulating Washer
E—Thru Bolt
F—Armature
G—Retaining Nut
H—Gear Stop Spacer
I —Anti-Drift Spring
J —Drive Assembly
K—Mounting Bracket
L—Thrust Washer
M—Brush and Spring Set
N—Screw
O—Brush Holder
P—Insulating Bushing
Q—Commutator End Cap Assembly

Fig. 16-Permanent Magnet Starting Motor

Repair to the starter is limited to the brushes (M), end cap (Q), mounting bracket, armature and starter drive assembly (F), Fig. 16. Any of these parts can be replaced if found to be defective. Fields in this starter are permanent magnets and no service is required or possible. Any serious defect in the magnets will require a complete starter replacement.

Removing Starter

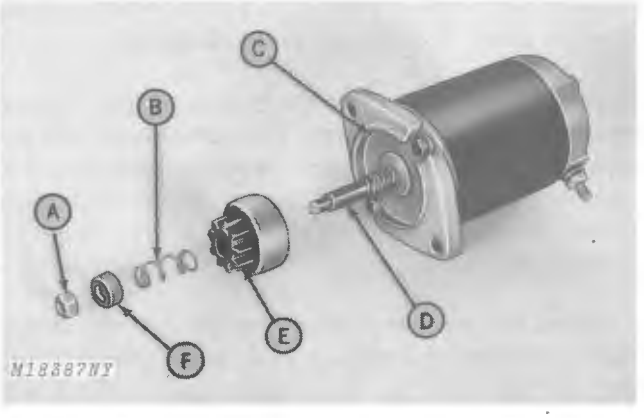
Disconnect ground cable from the battery.

Disconnect solenoid-to-starter cable from starter terminal.

Remove mounting bolts securing starter to engine and mounting bracket to engine, remove starter and mounting bracket.

Remove mounting bracket from starter.

Disassembling Starter Drive

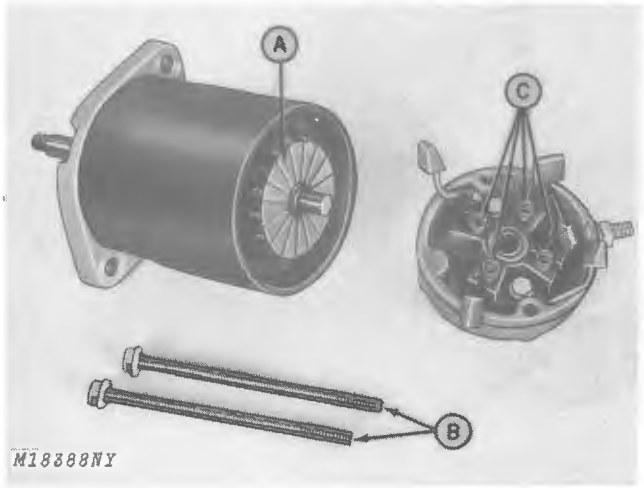


A—Lock Nut
B—Anti-Drift Spring
C—Starter Assembly
D—Armature Shaft
E—Drive Gear
F—Spring Cap

Fig. 17-Starter Drive

Hold drive gear (E) and unscrew lock nut (A), Fig. 17. Remove drive parts (B,C,D,F) from armature shaft.

Disassembling Starter



A—Commutator **C—Brush Springs**
B—Thru Bolts

Fig. 18-Disassembling Starter

Remove the two thru bolts (B, Fig. 18) which hold the end cap and mounting bracket to starter housing. Remove end cap carefully to avoid losing brush springs (C) which will pop out when end cap is removed. Tap mounting bracket lightly with a hammer to free it from the housing.

NOTE: Take care not to lose the thrust washer when removing mounting bracket.

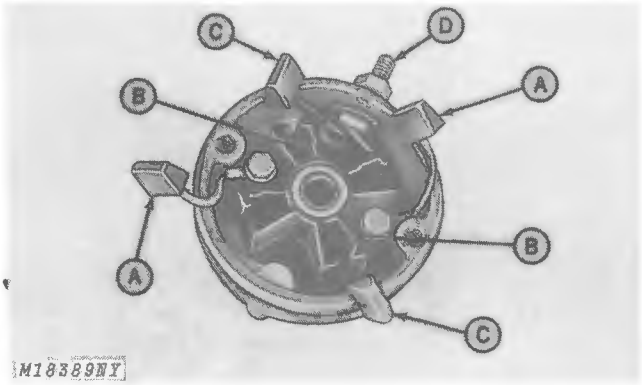
Inspection

Clean and inspect starter drive components for excessive wear. Replace parts as necessary.

Inspect bearings in end cap and mounting bracket. Also inspect armature shaft. If armature shaft has excessive play in bearings, replace end cap and mounting bracket. It may be necessary to replace armature if bearing surfaces are worn badly. Excessive bearing play will allow armature to rub against fields.

Clean and inspect commutator (A, Fig. 18). If surfaces are badly grooved, true up on a lathe and undercut mica. Brushes must make good contact with commutator.

Replacing Brushes



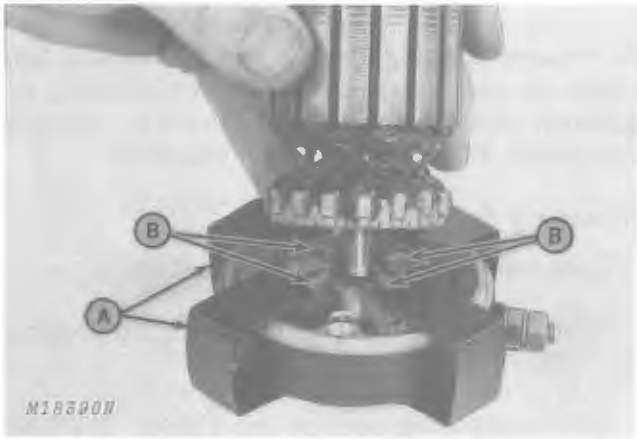
A—Ground Brush **C—Input Brush**
B—Insulating Brush Holder **D—Input Terminal**

Fig. 19-Replacing Brushes

Replace brushes whenever they show any appreciable amount of wear. To replace input brush (C, Fig. 19) assembly, remove nuts and washers from terminal (D) and pull the brushes out through the inside of the cap. When assembling, place the input brush (C) into the insulated brush holders (B).

The leads from the ground brushes (A) are attached to the metal screws which secure the insulated brush holders to the end cap, Fig. 19. Place these brushes in the non-insulated brush holders.

Assembling Starter



A—Retaining Clips **B—Brushes**

Fig. 20-Installing Brushes

The preparation of the starter end cap is the first step in the assembly of the starter.

First, place brush springs into brush holders. Then, in succession, place each brush (B, Fig. 20) in its respective holder with the beveled side up.

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Compress brush spring and place a U-shaped retaining clip (A, Fig. 20) made of banding steel onto each brush.

Wipe commutator clean with a dry cloth and lubricate armature shaft with a small amount of light grease.

Place armature into end cap, Fig. 20, and remove U-shaped brush retaining clips.

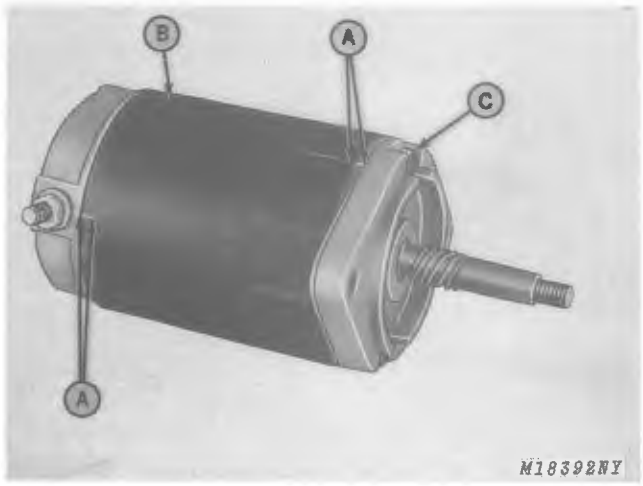
Place starter housing over armature while exerting down pressure on the armature. This prevents brush springs from pushing armature up and away from end cap. If this occurs, reload brushes into end cap and reassemble.

A—Steel Spacer Washer
B—Armature
C—Housing
D—Index Marks
E—End Caps

Fig. 21-Aligning Index Marks

Align housing (C, Fig. 21) with end cap (E) using the index marks (D) on cap and housing.

NOTE: The starter housing has a mark and an indentation on the inside which must fit into the two indentures on the drive end cap.



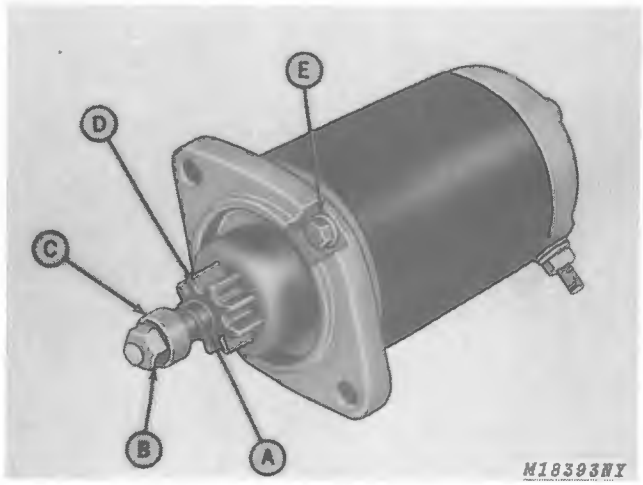
A—Index Marks
B—Housing
C—Mounting Bracket

Fig. 22-Mounting Bracket Index Marks

Place steel spacer washer (A, Fig. 21) onto armature shaft (B) and install mounting bracket (C) over armature shaft.

NOTE: Align marks (A) on mounting bracket (C) with mark on housing (B).

Insert thru bolts and tighten them to 70 in-lbs (7.9 Nm) torque.



A—Anti-Drift Spring
B—Lock Nut
C—Spring Cup
D—Drive Gear
E—Thru Bolt

Fig. 23-Installing Drive Assembly

Install starter drive gear (D, Fig. 23), anti-drift spring (A), spring cup (C), and lock nut on armature shaft. Torque lock nut to 45 to 50 in-lbs (5 to 5.6 Nm).

Install starter in snowmobile, attach solenoid to starter wire, and connect battery ground cable to the battery.

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Group 25
SPECIFICATIONS

SPECIFICATIONS

Item	Specification
Spark Plug*	Champion QN-1**
Ignition	Wico CDI
Timing Dimension	0.096-inch 20° BTDC
Ignition Coils:	
Primary Resistance	0.2 ohms
Secondary Resistance	225 to 275 ohms
Alternator:	
Alternator Resistance	0.1 to 0.3 ohms
Alternator Output	120 Watts
Starter Motor:	
Armature End Play	0.005 to 0.015 inch (0.127 to 0.381 mm)

*Spark plugs are gapped at 0.020" (0.508 mm) at the factory. Do not regap plugs. When plug gap reaches 0.060" (1.52 mm) replace them.

**For sustained high-speed running, use a surface-gap plug QN-19V or N-19V.

TORQUE FOR HARDWARE

Item	Torque
Starter Thru Bolts	70 in-lbs (7.90 Nm)

Litho in U.S.A.

LIGHT BULB CHART

Location	Size	John Deere Part Number
Headlight	12-volt	AM53887
Brake-Taillight	12-volt	AM52619
Speedometer Light	12-volt	AM52847
Tachometer Light	12-volt	AM52847
Coolant Gauge Light	12-volt	AT22970

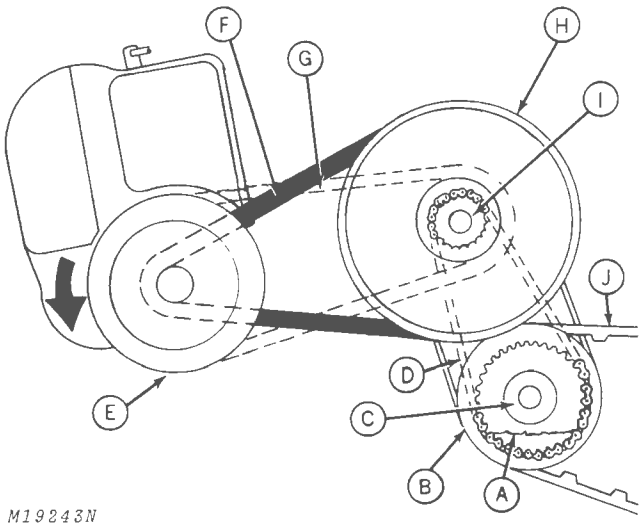
Litho in U.S.A.

Section 50
POWER TRAIN
Group 5
GENERAL INFORMATION

CONTENTS

Litho in U.S.A.

PRINCIPLE OF OPERATION



M19243N

A—Oil Level
B—Chain Case
C—Track Drive Shaft
D—Drive Chain
E—Drive Sheave
F—Drive Belt (Low-Speed Position)
G—Drive Belt (High-Speed Position)
H—Driven Sheave
I —Secondary Shaft
J —Track

Fig. 1-Power Train

The power train for 340 and 440 Cyclone and Liquifire Snowmobiles consists of a drive sheave (E), Fig. 1, drive belt (F), driven sheave (H), disk brake, secondary shaft (I), chain case (B), sprockets, drive chain (D), and drive shaft (C).

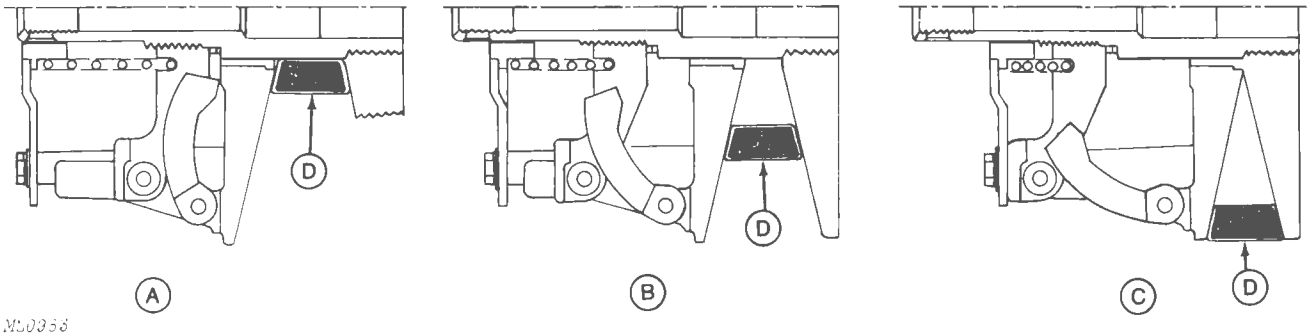
John Deere (Comet) 102C Drive Sheave

The drive sheave is mounted on the engine crankshaft and functions as a centrifugally-operated clutch and variator.

When stopped or at idle speed, the sides of the sheave do not contact the drive belt, thus providing a de-clutched position.

Increasing engine speed causes the centrifugally-actuated arms, Fig. 2, in the movable face to swing out against the rollers of the spider on the fixed face. This action forces the sheave halves together, engaging the drive belt with the sheave and starts the snowmobile moving.

When the engine reaches top rpm, the sheave halves are as close together as possible. The drive belt continues to ride out as engine speed increases and the sheave halves come together. This action provides a smooth transition from slow to fast snowmobile travel speed.

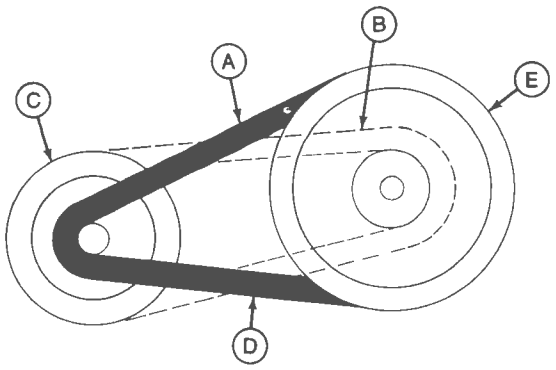


M20358

A—Idle Speed
B—Moderate Speed
C—High Speed
D—Drive Belt

Fig. 2-John Deere (Comet) 102C Drive Sheave Operation

John Deere Driven Sheave



M19245N

A—Low-Speed Position
B—High-Speed Position
C—Drive Sheave
D—Drive Belt
E—Driven Sheave

Fig. 3-Driven Sheave Operation

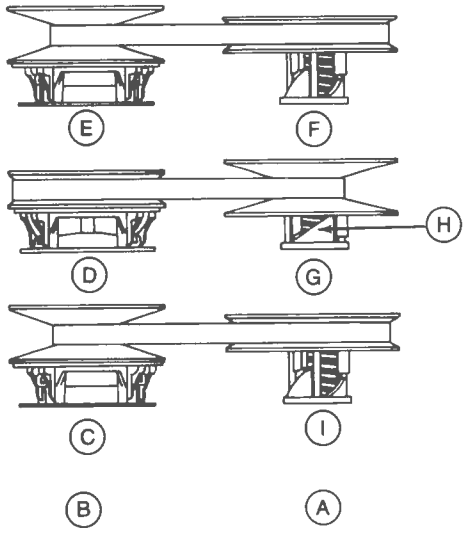
The drive sheave (C, Fig. 3) is spring-loaded in the low-speed position (A). As the speed of the drive sheave (C) increases and the drive belt (D) rides out on the drive sheave (C), the driven sheave (E) opens against spring tension, allowing the drive belt to ride deeper in the driven sheave (E).

The driven sheave works with the drive sheave to provide a smooth transition from a low speed ratio to a high speed ratio as engine speed increases.

The driven sheave (A, Fig. 4) does more than act as a take-up for the action of the drive sheave (B). The driven sheave is also "torque-sensitive". The driven sheave rides on the cam bracket (H) as it opens to obtain high speed position.

Normal rotational force on the cam bracket (H) works to keep the driven sheave (E, Fig. 3) in the low speed position.

If an increased load or high torque requirement occurs (such as climbing a steep hill) after the snowmobile is up to speed, the cam bracket (H, Fig. 4) in the driven sheave (E, Fig. 3) forces the sheave halves together, thus obtaining a slower travel speed while maintaining high engine rpm for increased torque.



M20984

A—Driven Sheave
B—Drive Sheave
C—High Engine RPM
D—High Engine RPM
E—Low Engine RPM
F—Low Output Speed
G—High Output Speed
H—Cam Bracket
I —Medium Output Speed

Fig. 4-Torque Sensitive Driven Sheave

In Fig. 4, the top and bottom drawings have the same drive belt position. However, increased speed of the engine in the lower drawing, causes a difference in the output speed of the driven sheave.

The drive and driven sheaves are matched to the engine and to each other to provide smooth clutching speed and torque-sensitive operation.

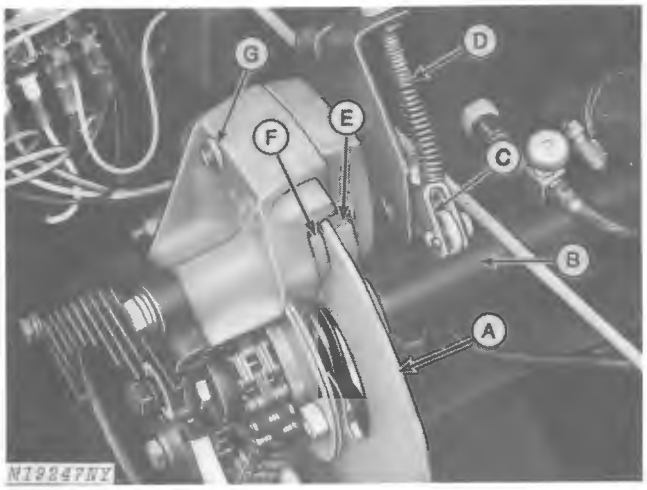
Chain Case and Drive Chain

The fully-enclosed chain case consists of a silent chain, two sprockets and spring-loaded tensioners. The chain and sprockets are oil-bath lubricated.

NOTE: 1976 Snowmobiles (Serial No. 50,001-70,000) have two spring-loaded chain tensioners. 1977 Snowmobiles (Serial No. 70,001 and up) have a single spring-loaded tensioner.

The spring-loaded tensioners maintain proper chain tension when both accelerating and decelerating. No chain tension adjustment is necessary.

Brakes



A—Disk
B—Secondary Shaft
C—Brake Arm
D—Brake Cable
E—Puck
F—Puck
G—Chain Case

Fig. 5-Mechanical Disk Brake

The mechanical disk brake (A, Fig. 5) operates on the secondary shaft (B) and is actuated by the brake cable (D). When the brake is applied the cam on the brake arm (C) moves two pins in against the brake puck (E). The puck moves the brake disk (A) against a second puck (F) in the chain case (G), providing positive braking.

CLUTCHING RECOMMENDATIONS

To obtain and provide proper governed engine speed proceed as follows:

1. Be sure proper gear ratios and clutching is being used for the altitude at which the snowmobile will operate. See charts on page 50-5-5, through 50-5-10.

2. Change carburetor as required. See page 30-10-11.

3. Add shorter spacer between 39-tooth gear and shaft on 440 Cyclone and Liquifire Snowmobiles.

4. For altitudes above 6000 feet (1828.8 m), install 38 degree cam in secondary sheave on 440 Cyclone and Liquifire Snowmobiles (Serial No. 70,001 and up).

5. On 440 Cyclone Snowmobiles (Serial No. 55,001 to 70,000) change the spring in the primary drive sheave from black (M65684) to silver (M66541).

Litho in U.S.A.

Clutching Recommendations - Cyclone and Liquifire Snowmobiles (Serial No. 55,001-70,000)

ALTITUDE - SEA LEVEL TO 6,000 FEET

Snowmobile Model	Clutch Engagement (rpm)	Governed Speed (rpm)	*Gearing Sprockets	Spacers in Primary Clutch	Primary Clutch Spring	Primary Clutch Arm Kit	Spring and Position in Secondary Clutch	Secondary Clutch Cam	**Chain
340 Cyclone	3700-3900	6500-7000	21 tooth 39 tooth	Two	Silver	AM53949	Blue No. 2	38° M66384	66 Pitch
440 Cyclone	3400-3600	6500-7000	24 tooth 40 tooth	Two	Black	AM53949	Blue No. 2	38° M66384	68 Pitch
340 Liquifire	3700-3900	7000-7500	21 tooth 39 tooth	Two	Silver	AM53949	Blue No. 2	38° M66384	66 Pitch
440 Liquifire	3400-3600	7250-7750	24 tooth 40 tooth	Two	Black	AM54279	Blue No. 2	38° M66384	68 Pitch

**21 tooth gear - M66121*
24 tooth gear - M66322
39 tooth gear - M65693
40 tooth gear - M66323

***66 pitch chain - M66122*
68 pitch chain - M66321

Gear Ratios

1.67:1 - With 24/40 gears and 68 pitch chain
1.86:1 - With 21/39 gears and 66 pitch chain

Litho in U.S.A.

Clutching Recommendations - Cyclone and Liquifire Snowmobiles (Serial No. 55,001-70,000)

ALTITUDE 6,000 TO 12,000 FEET

Snowmobile Model	Clutch Engagement (rpm)	Governed Speed (rpm)	*Gearing Sprockets	Spacers in Primary Clutch	Primary Clutch Spring	Primary Clutch Arm Kit	Spring and Position in Secondary Clutch	Secondary Clutch Cam	**Chain
340 Cyclone	4100-4300	6500-7000	17 tooth 42 tooth	One	Silver	AM54287	Blue No. 2	38° M66384	66 Pitch
440 Cyclone	3500-3700	6500-7000	21 tooth 39 tooth	One	Silver	AM54279	Blue No. 2	38° M66384	66 Pitch
340 Liquifire	4100-4300	7000-7500	17 tooth 35 tooth	One	Silver	AM54287	Blue No. 2	38° M66348	62 Pitch
440 Liquifire	4100-4300	7250-7750	21 tooth 39 tooth	None	Black	AM54289	Blue No. 2	38° M66348	66 Pitch

**17 tooth Gear - M66302*
21 tooth Gear - M66121
35 tooth Gear - M65809
39 tooth Gear - M65693
42 tooth Gear - M65810

***62 pitch chain - M66123*
66 pitch chain - M66122

Gear Ratios

1.86:1 - With 21/39 gears and 66 pitch chain
2.06:1 - With 17/35 gears and 62 pitch chain
2.47:1 - With 17/42 gears and 66 pitch chain

NOTE: The 440 Cyclone and Liquifire Snowmobiles (Serial No. 55,001 to 70,000) are equipped with a long spacer (M66346) between the 40-tooth gear (M66323) and shaft as standard equipment. When using the 39-tooth gear (M65693) a shorter spacer (M66133) must be used.

Litho in U.S.A.

Clutching Recommendations—340 Cyclone Snowmobile (Serial No. 70,001-)

Altitude	Clutch Engagement (rpm)	Governed Speed (rpm)	*Gearing Sprockets	Spacers in Primary Clutch	Primary Clutch Spring	Primary Clutch Arm Kit	Spring Position in Secondary Clutch	Secondary Clutch Cam	**Chain
Sea Level	4000-4300	6200-6700	21 Tooth 39 Tooth	One	Silver	AM54279	No. 2	38° M66384	66 Pitch
2000	4000-4300	6200-6700	21 Tooth 39 Tooth	One	Silver	AM54279	No. 2	38° M66384	66 Pitch
4000	3900-4200	6200-6700	17 Tooth 35 Tooth	One	Silver	AM53949	No. 3	44° M66938	62 Pitch
6000	3900-4200	6200-6700	17 Tooth 35 Tooth	One	Silver	AM53949	No. 2	44° M66938	62 Pitch
8000-10000	4300-4600	6200-6700	17 Tooth 42 Tooth	One	Silver	AM54288	No. 2	38° M66384	66 Pitch

* *17 tooth gear - M66302*
21 tooth gear - M66121
35 tooth gear - M65809
39 tooth gear - M65693
42 tooth gear - M65810

** *62 pitch chain - M66123*
66 pitch chain - M66122

Gear Ratios

1.86:1 With 21/39 gears and 66 pitch chain
2.06:1 With 17/35 gears and 62 pitch chain
2.47:1 With 17/42 gears and 66 pitch chain

Litho in U.S.A.

Clutching Recommendations - 440 Cyclone Snowmobile (Serial No. 70,001-)

Altitude	Clutch Engagement (rpm)	Governed Speed (rpm)	*Gearing Sprockets	Spacers in Primary Clutch	Primary Clutch Spring	Primary Clutch Arm Kit	Spring Position in Secondary Clutch	Secondary Clutch Cam	**Chain
Sea Level	3600-3800	6200-6700	24 Tooth 40 Tooth	Two	Silver	AM54279	No. 2	44° M66938	68 Pitch
2000	3600-3800	6200-6700	24 Tooth 40 Tooth	Two	Silver	AM54279	No. 2	44° M66938	68 Pitch
4000	4000-4300	6200-6700	21 Tooth 39 Tooth	One	Silver	AM54279	No. 2	38° M66384	66 Pitch
6000	4000-4300	6200-6700	21 Tooth 39 Tooth	One	Silver	AM54279	No. 2	38° M66384	66 Pitch
8000-10000	3900-4200	6200-6700	17 Tooth 35 Tooth	One	Silver	AM53949	No. 2	38° M66384	62 Pitch

* *17 tooth gear - M66302*
21 tooth gear - M66121
24 tooth gear - M66322
35 tooth gear - M65809
39 tooth gear - M65693
40 tooth gear - M66323

** *62 pitch chain - M66123*
66 pitch chain - M66122
68 pitch chain - M66321

Gear Ratios

1.67:1 With 24/40 gears and 68 pitch chain
1.86:1 With 21/39 gears and 66 pitch chain
2.06:1 With 17/35 gears and 62 pitch chain

Litho in U.S.A.

Clutching Recommendations - 340 Liquifire Snowmobile (Serial No. 70,001-)

Altitude	Clutch Engagement (rpm)	Governed Speed (rpm)	*Gearing Sprockets	Spacers in Primary Clutch	Primary Clutch Spring	Primary Clutch Arm Kit	Spring Position in Secondary Clutch	Secondary Clutch Cam	**Chain
Sea Level	4000-4300	6800-7300	21 Tooth 39 Tooth	One	Silver	AM54279	No. 2	38° M66384	66 Pitch
2000	4000-4300	6800-7300	21 Tooth 39 Tooth	One	Silver	AM54279	No. 2	38° M66384	66 Pitch
4000	4000-4300	6800-7300	21 Tooth 39 Tooth	One	Silver	AM54279	No. 2	38° M66384	66 Pitch
6000	4000-4300	6800-7300	21 Tooth 39 Tooth	One	Silver	AM53949	No. 2	38° M66384	66 Pitch
8000-10000	4300-4600	6800-7300	17 Tooth 35 Tooth	One	Silver	AM54288	No. 3	38° M66384	62 Pitch

* *17 tooth gear - M66302*
21 tooth gear - M66121
35 tooth gear - M65809
39 tooth gear - M65693

** *62 pitch chain - M66123*
66 pitch chain - M66122

Gear Ratios

1.86:1 With 21/39 gears and 66 pitch chain
2.06:1 With 17/35 gears and 62 pitch chain

Clutching Recommendations - 440 Liquifire Snowmobile (Serial No. 70,001-)

Altitude	Clutch Engagement (rpm)	Governed Speed (rpm)	*Gearing Sprockets	Spacers in Primary Clutch	Primary Clutch Spring	Primary Clutch Arm Kit	Spring Position in Secondary Clutch	Secondary Clutch Cam	**Chain
Sea Level	3200-3400	6800-7300	24 Tooth 40 Tooth	Two	Black	AM54279	No. 2	44° M66938	68 Pitch
2000	3200-3400	6800-7300	24 Tooth 40 Tooth	Two	Black	AM54279	No. 2	44° M66938	68 Pitch
4000	3600-3800	6800-7300	24 Tooth 40 Tooth	Two	Silver	AM54279	No. 2	38° M66384	68 Pitch
6000	3600-3800	6800-7300	24 Tooth 40 Tooth	Two	Silver	AM53949	No. 2	38° M66384	68 Pitch
8000-10000	3800-4000	6800-7300	17 Tooth 35 Tooth	One	Black	AM54288	No. 2	38° M66384	62 Pitch

* *17 tooth gear - M66302*
24 tooth gear - M66322
35 tooth gear - M65809
40 tooth gear - M66323

** *62 pitch chain - M66123*
68 pitch chain - M66321

Gear Ratios

1.67:1 With 24/40 gears and 68 pitch chain
2.06:1 With 17/35 gears and 62 pitch chain

Litho in U.S.A.

DIAGNOSING MALFUNCTIONS

John Deere (Comet) 102C Drive Sheave

Sheave Clutching at Too Low rpm

Spring weak or broken.

Incorrect roller arm (weights) being used.

Sheave Clutching at Too High rpm

Wrong spring.

Drive sheave dirty internally.

Worn spider buttons.

Clutch Sticking

Mold release from belt builds up on center post and movable face can not slide properly.

Erratic Shifting

Oil or grease on drive or driven sheaves.

Drive Belt Not Operating Smoothly in Drive Sheave

Sheave faces rough, grooved, pitted or scored.

Drive belt defective.

John Deere Driven Sheave

Driven Sheave Not Opening Properly

Nylon ramp buttons worn.

Ramp on movable face damaged.

Moveable sheave half binding on fixed half.

Incorrect spring installed.

Spring pretensioned improperly.

Driven Sheave Opening Too Easily

Spring weak or broken.

Spring pretensioned improperly.

Drive Belt

Uneven Belt Wear

Sheaves misaligned.

Engine mounts loose.

Drive Belt Glazed

Excessive slippage.

Oil on sheave surfaces.

Belt Worn Narrow in One Section

Excessive slippage caused by stuck track.

Belt Too Tight at Idle Speed

Engine idle set too fast.

Incorrect distance between sheaves.

Incorrect belt length.

Belt Edge Cord Breakage

Sheaves misaligned.

Brake

Brake Not Holding Properly

Brake cable out of adjustment.

Brake pucks worn.

Brake pucks oil-saturated.

Key sheared on brake disk.

Brake Not Releasing Properly

Return spring weak or broken.

Brake lever bent or damaged causing binding.

Chain Case Assembly

Chain Case Leaking

Gaskets on drive shaft bearing flangettes or secondary shaft bearing flangettes damaged.

O-ring on drive shaft or secondary shaft bearings damaged.

Chain case cracked or broken.

Rapid Chain and Sprocket Wear

Insufficient oil in chain case.

Sprockets out of alignment due to improper assembly.

Chain tension block spring broken.

Litho in U.S.A.

Litho in U.S.A.

Group 10
JOHN DEERE (COMET) DRIVE SHEAVE

GENERAL INFORMATION

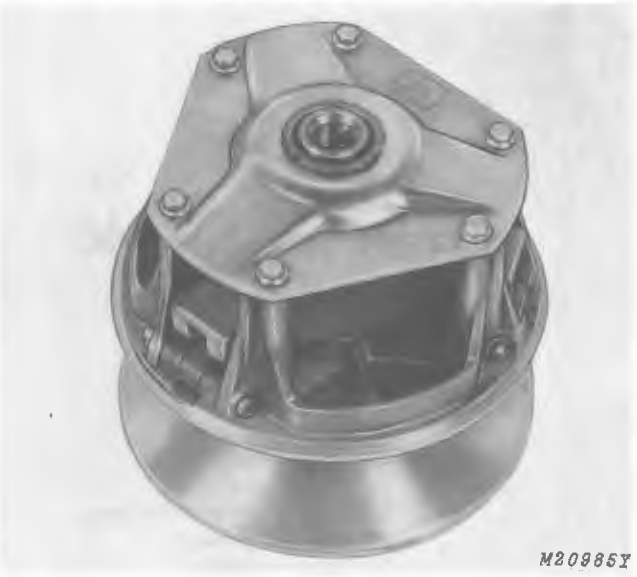


Fig. 1-John Deere (Comet) 102C Drive Sheave

The centrifugally-operated drive sheave, Fig. 1, is both a clutch and variator. See Group 5 of this section for "Principle of Operation".

The drive sheave is "matched" to the driven sheave and to the engine to provide smooth operation. It is important to use the proper components for repair.

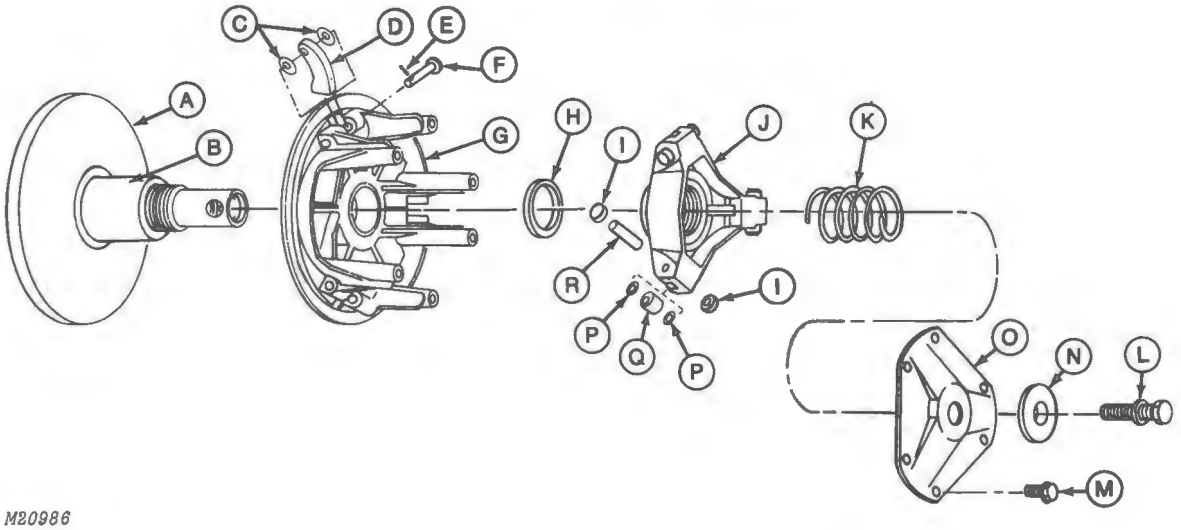
The drive sheave provides belt engagement as shown in the charts on pages 50-5-5 through 50-5-10 at altitudes from sea level to 12,000 feet (3657.6 m).

IMPORTANT: Never operate the engine with the drive belt removed. The engine could overspeed and cause possible engine and drive sheave failure.

CAUTION: To check drive sheave operation, use a dynamometer or block up the snowmobile securely, so the track can be run at operating speeds without danger.

Group 5 of this section contains "Diagnosing Malfunctions" to help correct problems associated with the drive sheave.

DISASSEMBLY AND REPAIR



A—Fixed Face Sheave
B—Bronze Bushing
C—Washers (6 used)
D—Roller Arm (3 used)
E—Spring Pin (3 used)
F—Pivot Pin (3 used)
G—Movable Face Sheave
H—Spacing Washer
I —Button (6 used)
J —Spider
K—Spring
L—Retaining Cap Screw with Lock Washer
M—Cap Screw (6 used)
N—Pilot Washer
O—Cover Plate with Bushing
P—Washers (6 used)
Q—Roller (3 used)
R—Pin (3 used)

Fig. 2-Exploded View of John Deere (Comet) 102C Drive Sheave

Removing Drive Sheave

Raise hood and drive belt guard. Remove drive belt and knock-out plug from side of pan.

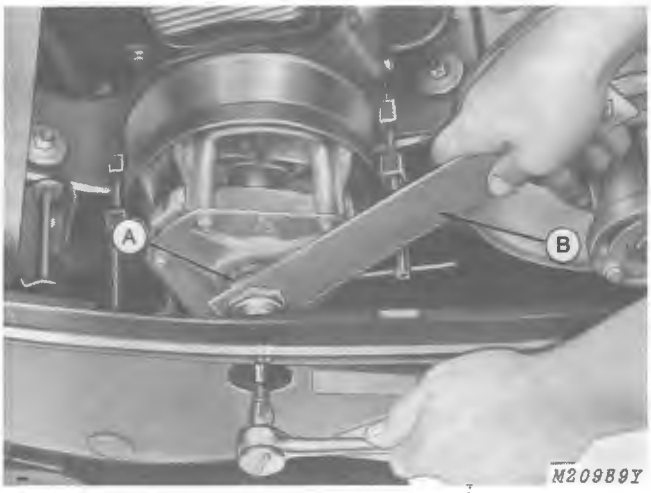
A—Cross Hole **B—JDM-41-2**

Fig. 3-JDM-41-2 Compressor Ring Installed

Use JDM-41-2 Compressor ring (B, Fig. 3) to compress movable face to expose cross hole (A) in hub.

Fig. 4-JDM-41-4 Two-Piece Nut Installed on Hub

Install JDM-41-4 Two-Piece Nut, Fig. 4, around hub. Engage pins on nut in hub cross hole.



A—JDM-41-4 Nut **B—JDM-12-2 Nut Wrench**

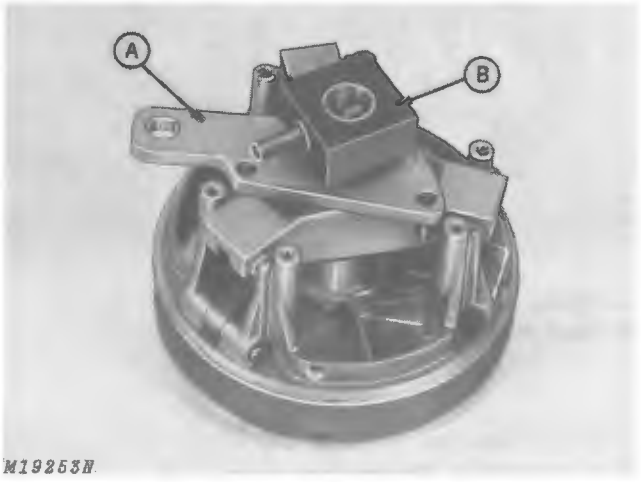
Fig. 5-Removing Drive Sheave

Hold nut JDM-41-4(A) with JDM-12-2 Nut Wrench (B, Fig. 5) and remove retaining cap screw, lock washer and pilot washer. Turn JDM-41-1 Puller into hub, until drive sheave comes loose from the crankshaft.

Disassembling Drive Sheave

Remove JDM-41-1 Puller from hub.

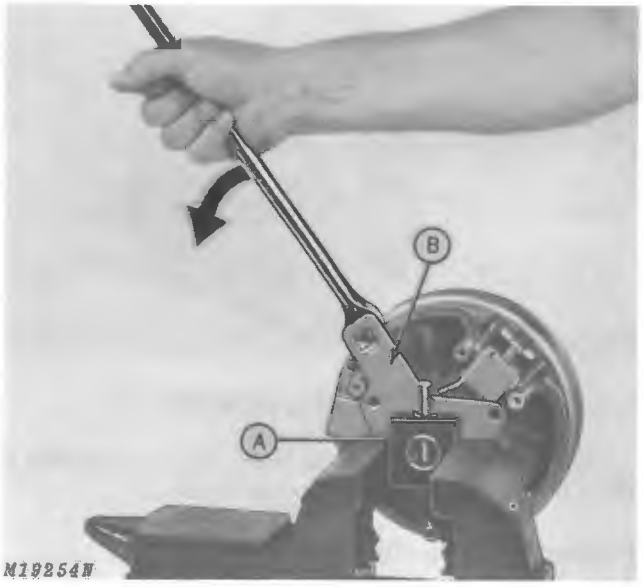
Remove every other screw securing drive sheave cover plate to movable face. Remove the three remaining cap screws equally, a few turns at a time. This allows the cover plate to come off slowly and equally. Remove cover plate and spring.



A—JDM-41-3 Spider Tool **B—JDM-41-5 Hub Lock**

Fig. 6-Spider Tool and Hub Lock Tool Installed

Place JDM-41-3 Spider Tool (A, Fig. 6) over hub with spring pins on tool engaging spider. Install JDM-41-5 Hub Lock tool (B) over hub with pin of tool through cross hole in hub.



A—JDM-41-5 Hub Lock **B—JDM-41-3 Spider Tool**

Fig. 7-Removing Spider From The Hub

Clamp assembly very securely into vise and install a 1/2-inch drive long handle into JDM-41-3 Spider Tool (B, Fig. 7) and turn counterclockwise to loosen spider from the hub.

Remove JDM-41-3 Spider Tool (B) and JDM-41-5 Hub Lock (A). Turn spider off the hub by hand.

IMPORTANT: Remove spacer rings and movable face. Take note of the number of spacers for installation later on.

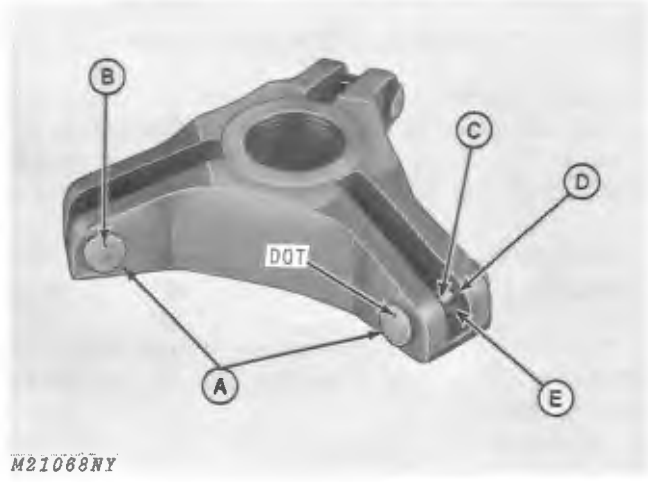
INSPECTION

Inspecting Bushings

Fig. 8-Cover Plate and Bushing

Inspect bushing and cover plate, Fig. 8. If bushing is worn or damaged, replace cover plate.

Inspecting Guide Buttons and Rollers



A—Guide Button
B—Dot
C—Steel Washers
D—Fiber Washer
E—Roller

Fig. 9-Installing Guide Buttons

Inspect guide buttons (A, Fig. 9) and rollers (E) in spider. Replace if necessary. Use pliers to remove guide buttons (A). Then remove pin, roller and two washers. Place roller in spider with a steel washer (C) on each side of the roller. Install pin and guide buttons (A). Tap buttons gently until they are seated.

NOTE: 1977 Model 440 Snowmobiles have a fiber washer (D, Fig. 9) on the thrust side of the spider.

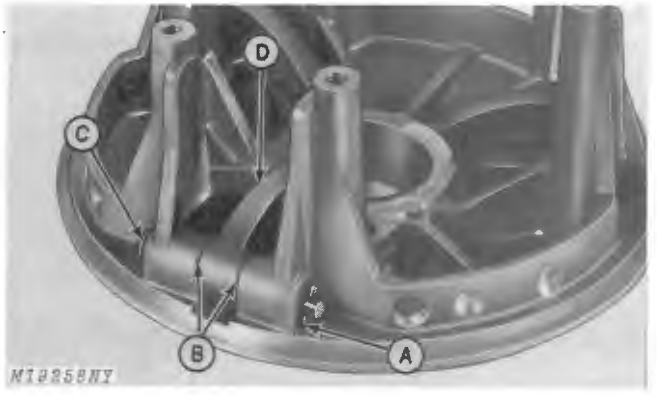
NOTE: Small dot (B) on guide buttons (A) must be positioned straight up or straight down, Fig. 9. This allows bearing surface of guide button to match bearing surface in movable face.

Inspecting Roller Arms

A—Spring Pin
B—Pivot Pin

Fig. 10-Removing Spring Pin From Pivot Pin

Inspect roller arms for wear and replace as necessary. Use screwdriver to pry spring pin out as far as possible and then use side cutters to remove spring pin (A, Fig. 10), from the end of the pivot pin (B). Remove pivot pin, roller and three steel washers.



A—Spring Pin
B—Steel Washers
C—Pivot Pin
D—Roller Arm

Fig. 11-Installing Pivot Pin

Install roller arm (D, Fig. 11) in movable face with a steel washer (B) on each side of the arm. Install pivot pin (C) from left to right. Install steel washer and NEW spring pin (A) through pivot pin (C).

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Inspecting Fixed and Movable Faces

Check sheave faces for pitting or wear and replace as necessary.

Inspect bushing of movable face and hub of fixed face for damage or excessive wear. Measure outside diameter of fixed face hub and inside diameter of movable face bushing. Maximum allowable clearance is 0.030 inch (0.762 mm). If clearance is greater than 0.030 inch (0.762 mm), replace movable face bushing.

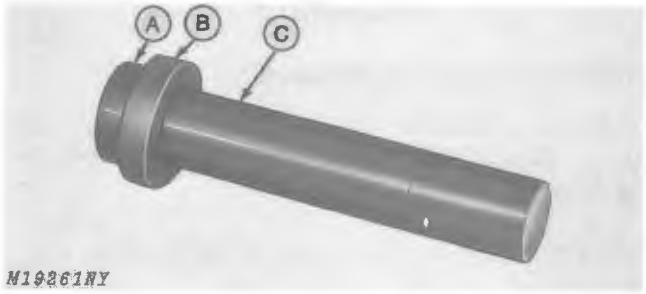
Fig. 12-Cuts in Movable Face Bushing

Use a hacksaw blade and carefully cut through the movable face bushing in several places, Fig. 12.

IMPORTANT: DO NOT saw into the metal of the movable face. This could weaken and damage the movable face. Remove bushing with a small cold chisel and hammer.

Fig. 13-Snap Ring Position of Movable Face Bushing

Install new bushing in movable face with snap ring of bushing up as shown in Fig. 13.



A—27509 Disk **B—27516 Disk** **C—27488 Handle**

Fig. 14-Tool For Installing Movable Face Bushing

To complete installation of bushing, use Owatonna Tool Company, Bushing, Bearing and Seal Driver Sets. Install 27516 Disk and 27509 Disk to 27488 Handle as shown in Fig. 14. This combination will install movable face bushing.

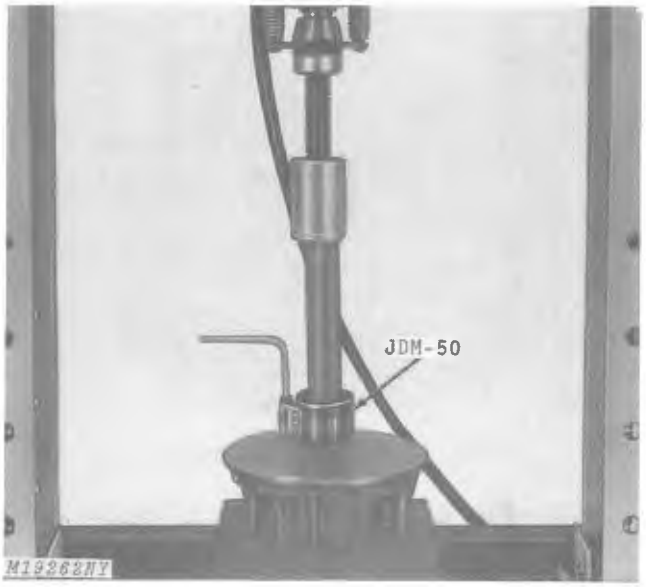


Fig. 15-Installing Movable Face Bushing

Use a press and ring compressor (Fig. 15) to install bushing flush with movable face.

NOTE: Use JDM-50 Ring Compressor for tractor engines to compress snap ring when installing movable face bushing.

ASSEMBLY

Lubricating Drive Sheave

Lubricate the drive sheave before assembly. Use Never-Seez Lubricant (PT569) or its equivalent on the following:

1. Roller arms and roller pins in the movable face.

2. Guide buttons in the spider and on mating surface of movable face.

NOTE: Use Loctite (grade AV, red) (ATL 4927) on the spider-to-hub threads. This will prevent spider from loosening while in use.

Assembling Drive Sheave

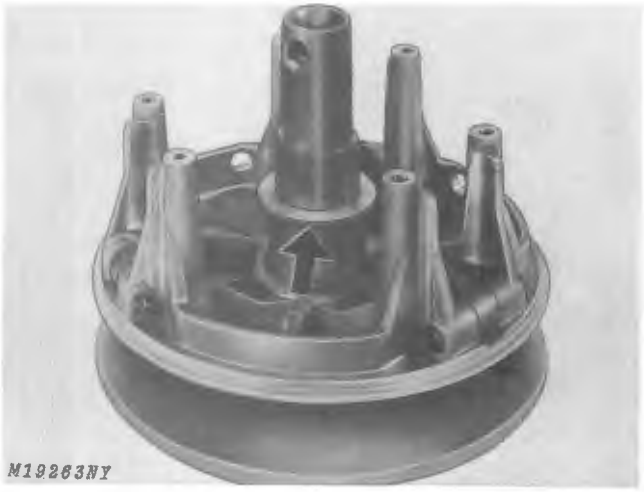


Fig. 16-Installing Spacer Rings

Install movable face over fixed face hub and place required number of spacer rings, Fig. 16, on hub.

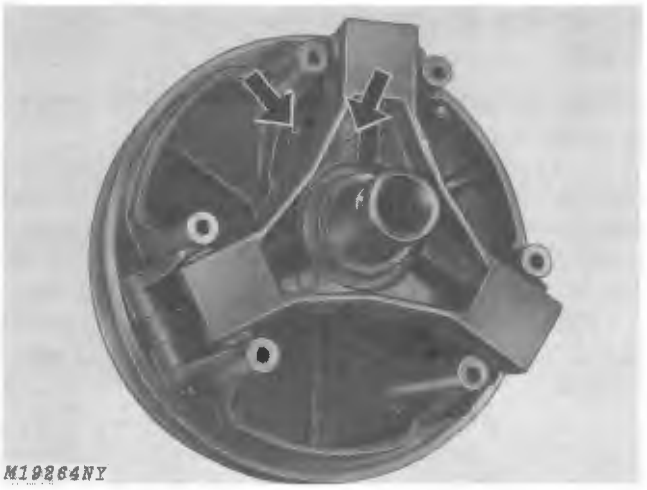
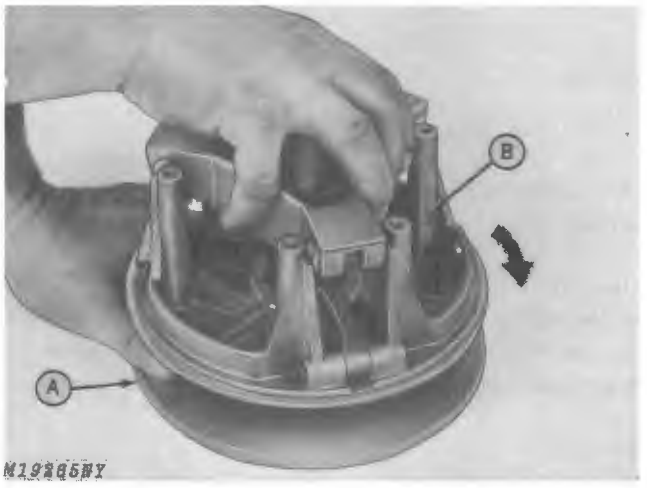


Fig. 17-Identification Marks on Spider and Movable Face

Install spider on movable face. Align identification marks on spider with identification marks on movable face, Fig. 17. Proper alignment of these marks is necessary for proper balance of the drive sheave.



A—Fixed Sheave **B—Movable Sheave**

Fig. 18-Installing Spider and Movable Face

With one hand, grasp the spider assembly and movable sheave (B, Fig. 18). Hold the fixed sheave (A) and with the other hand turn the spider and movable sheave clockwise to start the threads of the spider onto the hub post. Continue to tighten the assembly as far as possible by hand.

A—JDM-41-5 Hub Lock **B—JDM-41-3 Spider Tool**

Fig. 19-Tightening Spider to the Hub

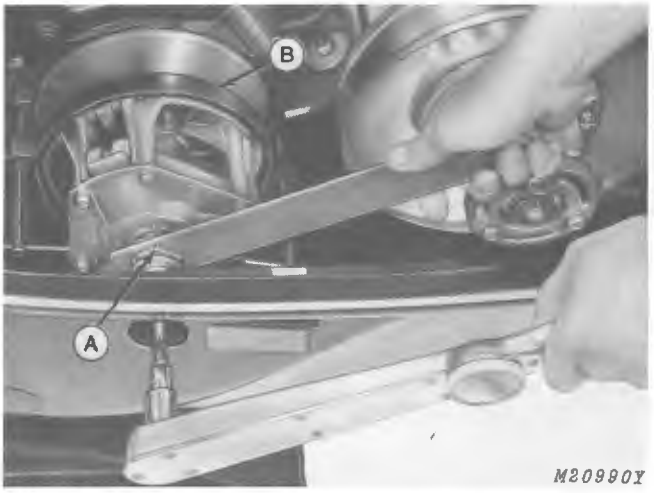
Place JDM-41-3 Spider Tool (B, Fig. 19) over hub with spring pins on tool engaging spider. Install JDM-41-5 Hub Lock (A) over hub. Clamp assembly very securely into vise. Install a 1/2-inch drive long handle in JDM-41-3 Spider Tool and turn clockwise to tighten spider to hub.

Remove JDM-41-3 Spider Tool (B) and JDM-41-5 Hub Lock (A).

Install spring and cover plate. Tighten the six screws evenly and securely.

Installing Drive Sheave

Clean crankshaft tapered surface and place drive sheave on crankshaft.



A—JDM-41-4 Two-Piece Nut **C—JDM-12-2 Nut Wrench**
B—JDM-41-2 Compressor Ring

Fig. 20-Installing Drive Sheave

Use JDM-41-2 Compressor Ring (B, Fig. 20) and compress movable face to expose cross hole in hub.

Install JDM-41-4 Two-Piece Nut (A) and hold with JDM-12-2 Nut Wrench (C).

Install lock washer and pilot washer onto retaining cap screw. Install and tighten retaining cap screw to 50 ft-lbs (67.79 Nm) torque, Fig. 20.

IMPORTANT: Do not torque the retaining cap screw more than 50 ft-lbs (67.79 Nm) because it will "swell" the hub end causing the drive sheave to "stick."

Install drive belt, belt guard and secure hood.

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Group 15
JOHN DEERE DRIVEN SHEAVE

GENERAL INFORMATION

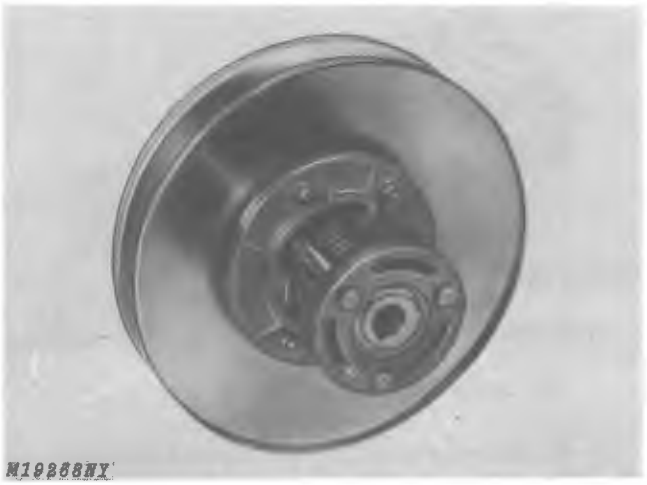


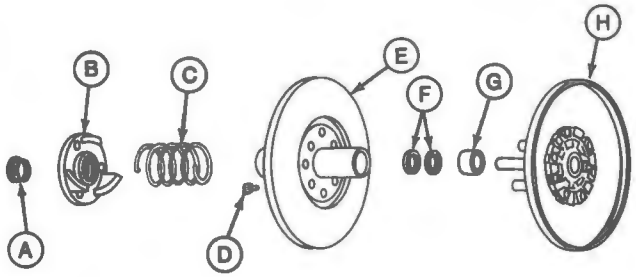
Fig. 1-John Deere Driven Sheave

The John Deere Driven Sheave, Fig. 1, is used on the 340 and 440 Cyclone and Liquifire Snowmobiles.

The driven sheave acts as a take-up for the action of the drive sheave. The driven sheave is also "torque-sensitive". See "Principle of Operation" in Group 5 of this section.

Group 5 also contains "Diagnosing Malfunctions" to help correct problems associated with the driven sheave.

DISASSEMBLY AND REPAIR



M19269N

A—Bushing
B—Cam Bracket
C—Spring
D—Button
E—Sheave and Post
F—Shims
G—Bushing
H—Movable Sheave

Fig. 2-Exploded View of Driven Sheave

Removing Driven Sheave

Raise the hood and drive belt guard. Remove drive belt.

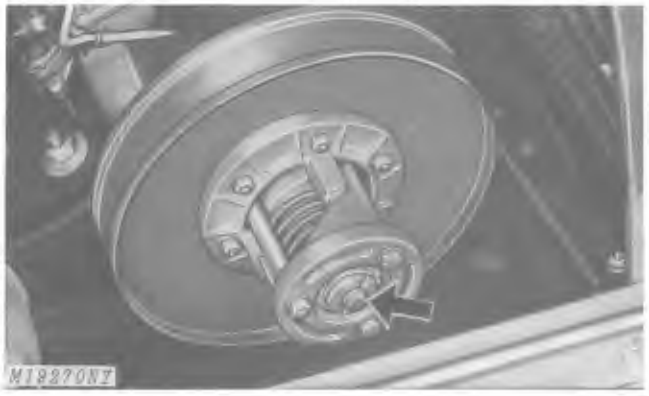
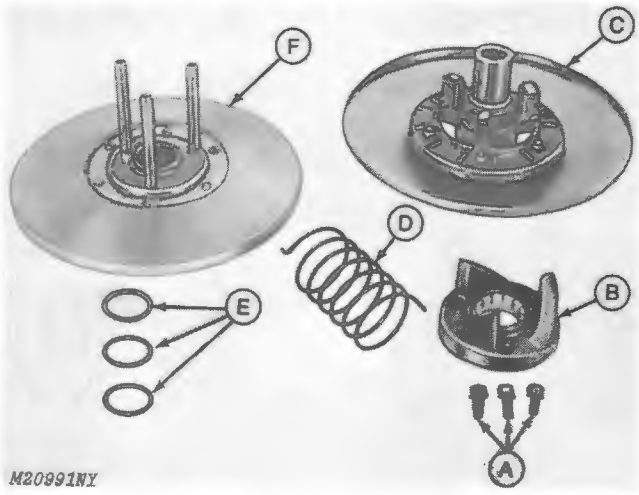


Fig. 3-Removing Driven Sheave

Remove cap screw and washer and slide driven sheave with key off the shaft, Fig. 3.

Disassembling Driven Sheave



A—Cap Screws **D—Spring**
B—Cam **E—Spacers**
C—Fixed Face **F—Movable Face**

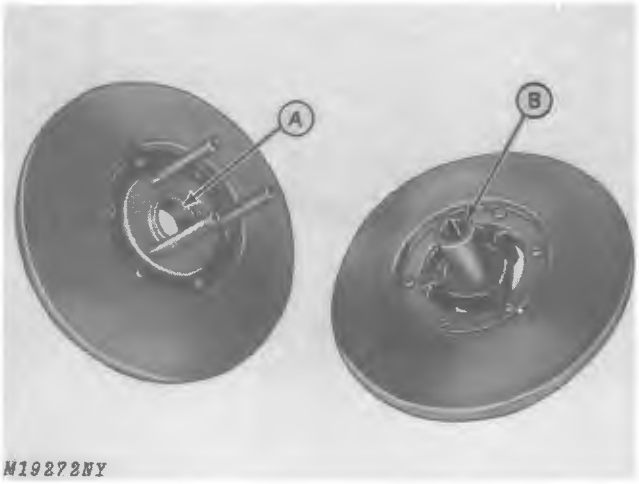
Fig. 4-Disassembling Driven Sheave

Remove three cap screws (A, Fig. 4) securing cam (B) to movable face (F).

Remove cam (B), spring (D) and fixed face (C) with insert buttons from movable face (F). Do not lose spacers (E) between movable face (F) and fixed face (C).

INSPECTION AND REPAIR

Thoroughly clean all components in solvent.

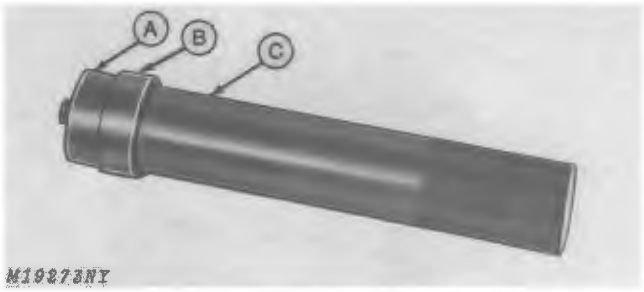


A—Movable Face Bushing **B—Fixed Face Hub**

Fig. 5-Movable Face Bushing and Fixed Face Hub

Inspect movable face bushing (A, Fig. 5) and fixed face hub (B) for wear. Replace parts as necessary. Excessive looseness could cause binding.

Replace movable face bushing as follows:



A—27505 Disk **B—27507 Disk** **C—27488 Handle**

Fig. 6-Tool For Removing Movable Face Bushing

1. To remove and install bushing use Owatonna Tool Company, Bushing, Bearing and Seal Driver Sets. Install 27507 Disk (B) and 27505 Disk (A) to 27488 Handle (C) as shown in Fig. 6. This combination will remove and install movable face bushing.

Fig. 7-Removing Movable Face Bushing

2. Use a press and remove old bushing, Fig. 7.

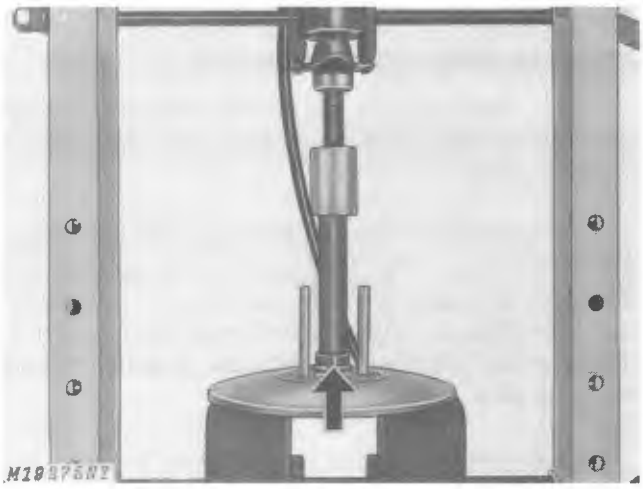
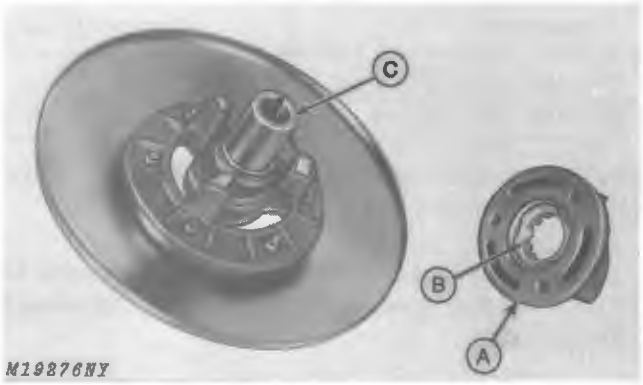


Fig. 8-Installing Movable Face Bushing

3. Use a press and install new bushing flush with the hub of movable face, Fig. 8.

Inspect spring for cracks or pits. Replace as necessary.

Check sheave faces with a straight-edge. Replace if badly worn, grooved, scored or pitted.



A—Cam **B—Bushing** **C—Fixed Face Hub**

Fig. 9-Cam Bushing and Fixed Face Hub

Inspect bushing (B, Fig. 9) in cam (H) and fixed face hub (C) for wear. Replace parts as necessary.

Replace bushing in cam as follows:

Fig. 10-Removing Cam Bushing

1. Place cam on two wooden blocks and use a cold chisel to remove bushing, Fig. 10.

Fig. 11-Installing Cam Bushing

2. Install new bushing by pushing in place with your thumbs, Fig. 11. Be sure bushing is aligned properly when installing.

INSPECTION AND REPAIR—Continued

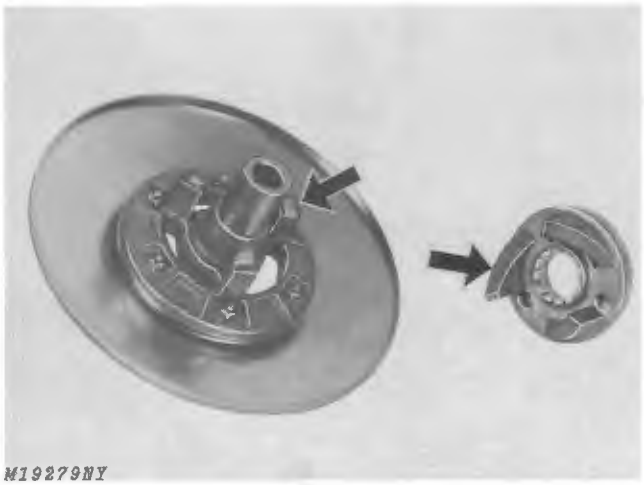


Fig. 12-Inspecting Insert Buttons

Inspect insert buttons for wear, Fig. 12. Buttons and mating surfaces on cam must be smooth. Replace insert buttons as a set if worn. If not replaced as a set, binding and improper sheave operation could result.

Replace insert buttons as follows:

1. Use pliers and break off insert button ramp.

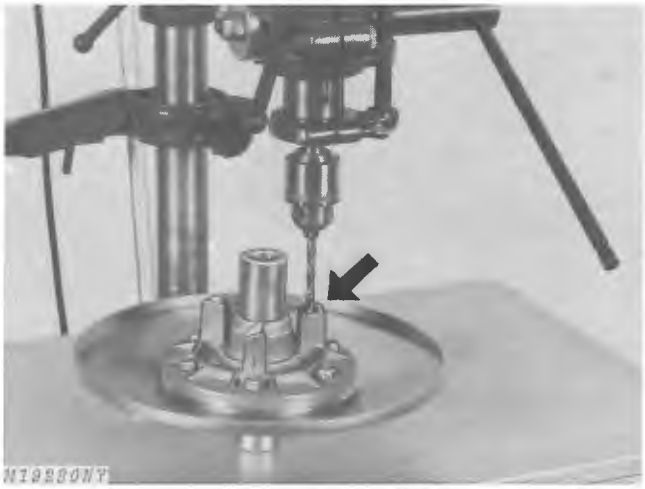


Fig. 13-Drilling Out Insert Button Shank

2. Use a 15/64-inch drill and very CAREFULLY drill out the shank of the insert button, Fig. 13. DO NOT enlarge the hole or the new insert button will not fit snug.

3. Use two part epoxy glue on the shank of the new insert button and tap it in place very LIGHTLY with a plastic hammer. Be careful not to break the insert button.

ASSEMBLY

Pretensioning Driven Sheave

NOTE: The spring in the driven sheave must be pretensioned differently as altitude and temperature changes occur.

As temperature or altitude increases, engine horsepower decreases. The drive system now upshifts too rapidly for an engine with less horsepower. In order to counteract this, the drive system must be modified to obtain proper governed speed. Low governed speed results in poor performance.

Engine governed speed should be as follows:

1976 SNOWMOBILES
(Serial No. 50,001-70,000)

Snowmobile	Governed Speed
340 Cyclone	6500-7000 rpm
440 Cyclone	6500-7000 rpm
340 Liquifire	7000-7500 rpm
440 Liquifire	7250-7750 rpm

1977 SNOWMOBILES
(Serial No. 70,001- and up)

Snowmobile	Governed Speed
340 and 440 Cyclone	6200-6700 rpm
340 and 440 Liquifire	6800-7300 rpm

See charts on pages 50-5-5, through 50-5-10 for clutch engagement speeds.

IMPORTANT: Do not adjust the driven sheave to provide engine speeds in excess of the governed speeds listed.

NOTE: The carburetor must be changed for increases in altitude as well as spring tension on the driven sheave. See Section 30, page 30-10-11 for proper carburetor changes.

Additional driven sheave pretension increases engine speed; less pretension decreases speed.

The John Deere driven sheave can be pretensioned as shown in the chart on page 50-15-5.

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PRETENSIONING CHART FOR DRIVEN SHEAVE SPRING

Insert spring tang in cam hole number.	Place cam and spring over fixed face hub with tang on spring in hole of fixed face. Rotate cam clockwise past the ramp indicated.	Degrees of pretension.	Pounds of spring tension when measured at sheave rim.
1	1 ramp	50°	5 lbs.
2*	1 ramp	80°	6 lbs.
3	1 ramp	110°	8 lbs.
4	2 ramps	140°	10 lbs.

**This is the factory setting for 340 and 440 Cyclone and Liquifire Snowmobiles.*

Assembling Driven Sheave

Fig. 14-Installing Spacer

1. Lay movable sheave flat with posts up. Place spacers on hub of movable sheave, Fig. 14.

2. Install fixed sheave hub through movable sheave.

Fig. 15-Spring Installed in Cam

3. Install spring in proper hole in cam, Fig. 15, as indicated in the chart above. The proper hole for most applications is No. 2.

NOTE: Refer to pages 50-5-5 through 50-5-10 for the correct cam to be used. Use the 38 degree cam in all the snowmobiles for high altitude applications.

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Fig. 16-Installing Cam With Spring on Fixed Face Post

4. Install cam with spring over post of fixed face with tang of spring in hole in fixed face, Fig. 16.

5. Rotate cam past the proper ramp as indicated in the chart on page 50-15-5. Push down on cam making sure posts of movable face fit in recesses in cam.

6. Install and tighten cap screws securely.

Installing Driven Sheave

1. Lubricate shaft and inside of driven sheave hub with Never-Seez Lubricant (PT569).

2. Be sure spacers are on shaft.

Fig. 17-Installing Driven Sheave on Shaft

3. Place key in driven sheave. Place sheave inline with shaft and back key out of sheave slightly, Fig. 17. This will help line-up sheave with keyway in shaft.

4. Slide sheave in place and push key in to lock sheave to shaft.

5. Install washer and retaining cap screw. Tighten cap screw to 20 ft-lbs (27 Nm) torque.

NOTE: To be sure sheave is installed correctly, recheck alignment. See page 50-20-2.

Group 20
DRIVE BELT

GENERAL INFORMATION

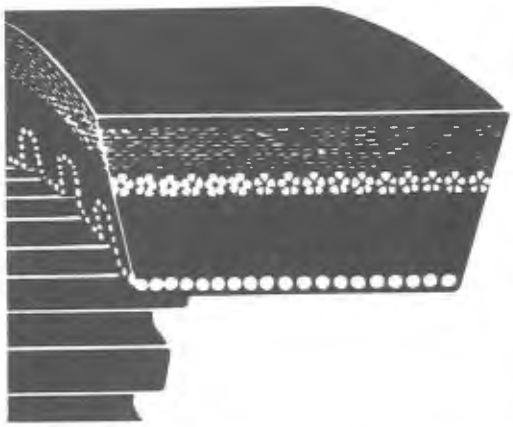

Fig. 1-Cutaway View of Drive Belt

The function of the drive belt is to transmit power from the drive sheave to the driven sheave.

The snowmobile drive belt contains layers of cords, Fig. 1, close to the outer surface.

The drive belts are not interchangeable between snowmobiles even though the width may be the same.

The drive belt should be replaced when its width is reduced by 1/8 inch (3.175 mm) or more because snowmobile performance will be affected.

REMOVING AND INSTALLING DRIVE BELT

IMPORTANT: Mark the direction of rotation before removing the drive belt so it can be reinstalled in the same direction.

1. Raise the hood.

2. Pull spring lock and tip belt guard forward to provide access to drive belt.

Fig. 2-Removing Drive Belt

3. Push in on center of driven sheave as shown in Fig. 2 and lift belt up and over sheave half to remove.

4. Remove belt from drive sheave last.

IMPORTANT: Never pry belt over sheaves. If driven sheave is opened properly, no prying is necessary.

⚠ CAUTION: Keep fingers out of area between center of driven sheave halves when sheave is opened. If driven sheave sticks closed, use care in opening it to prevent fingers from being pinched.

5. Install belt in opposite sequence from which it was removed making sure it operates in the same direction as it did before being removed. This provides longer belt life by not disturbing the wear pattern.

6. Tip belt guard back into position and secure with spring lock. Secure hood.

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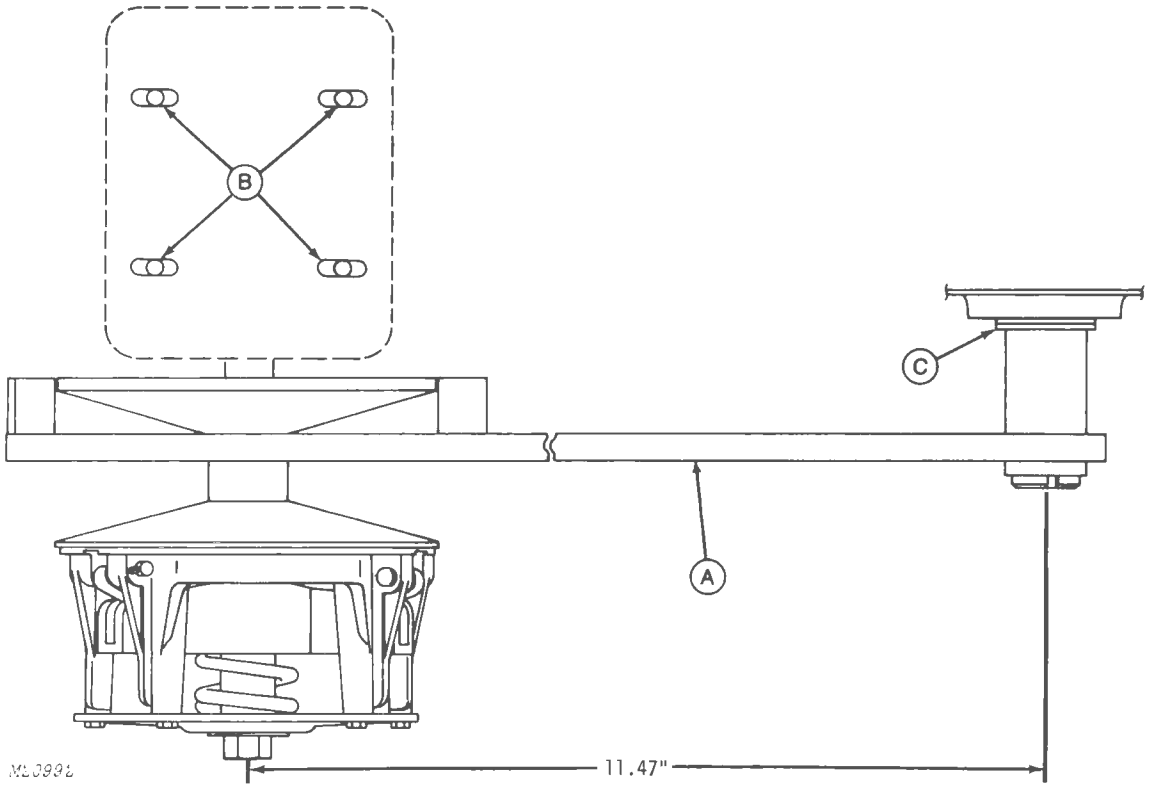
ALIGNING DRIVE BELT



A—JDM-81 Clutch Aligning Tool **B—Engine Mounting Bolts** **C—Shims (0.018 or 0.060-Inch)**

Fig. 3-Aligning Drive Belt

Proper belt alignment is important because it affects belt life. A misaligned belt can be ruined in a few hours of operation. Check drive belt alignment whenever the engine is installed or whenever rapid belt failure occurs.

The distance between the sheave shaft centers is adjustable by loosening the engine mounting bolts and moving the engine forward or rearward. Side-to-side adjustment is obtained by adding or deducting shims between the driven sheave and bearing.

Adjust as follows:

1. Remove drive belt.

2. Remove driven sheave and shims from between the driven sheave and secondary shaft bearing.

3. Install JDM-81 Clutch Aligning Tool on secondary shaft and drive shaft, Fig. 3.

4. For side-to-side adjustment, remove JDM-81 Clutch Aligning Tool and add shims (C) between the tool and secondary shaft bearing to give proper dimension, Fig. 3. Shims are available in 0.018 or 0.060 inch thicknesses.

5. For forward or rearward adjustment, loosen engine mounting bolts and move engine as required to properly align with JDM-81 Clutch Aligning Tool, Fig. 3,

ANALYSIS

Refer to "Diagnosing Malfunctions" in Group 5 of this section for additional information.

Fig. 4-Drive Belt With Frayed Edge

If drive belt wears rapidly exposing frayed edge cord, Fig. 4, belt is misaligned. Engine mounting bolts could also be loose allowing engine to twist and misalign belt.

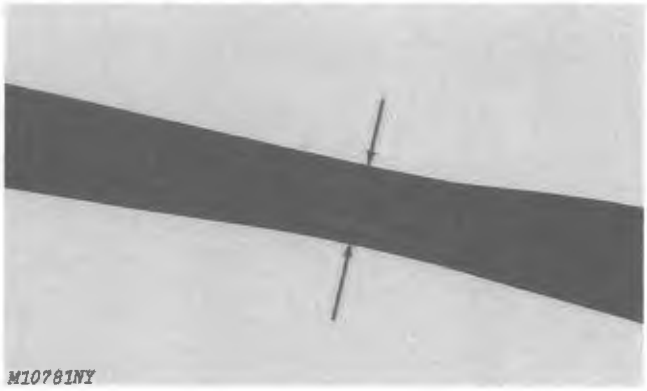


Fig. 5-Belt Worn Narrow In One Section

If drive belt is worn narrow in one section, Fig. 5, excessive slippage is indicated due to a stuck or frozen track. Too high an engine idle speed could also be indicated if several narrow sections are evident.

Fig. 6-Drive Belt Disintegration

Drive belt disintegration, Fig. 6, could be caused by a misaligned belt, using an incorrect drive belt, or oil on sheave surfaces. If badly misaligned, drive belt will roll over at high speed causing belt disintegration.

Never use grease or oil on sheave components except for storage. When snowmobile is removed from storage, sheaves should be thoroughly cleaned to remove lubricants.

Fig. 7-Drive Belt With Sheared Cogs

A drive belt having sheared cogs, Fig. 7, could indicate violent engagement of drive sheave caused by binding or improperly installed drive sheave components.

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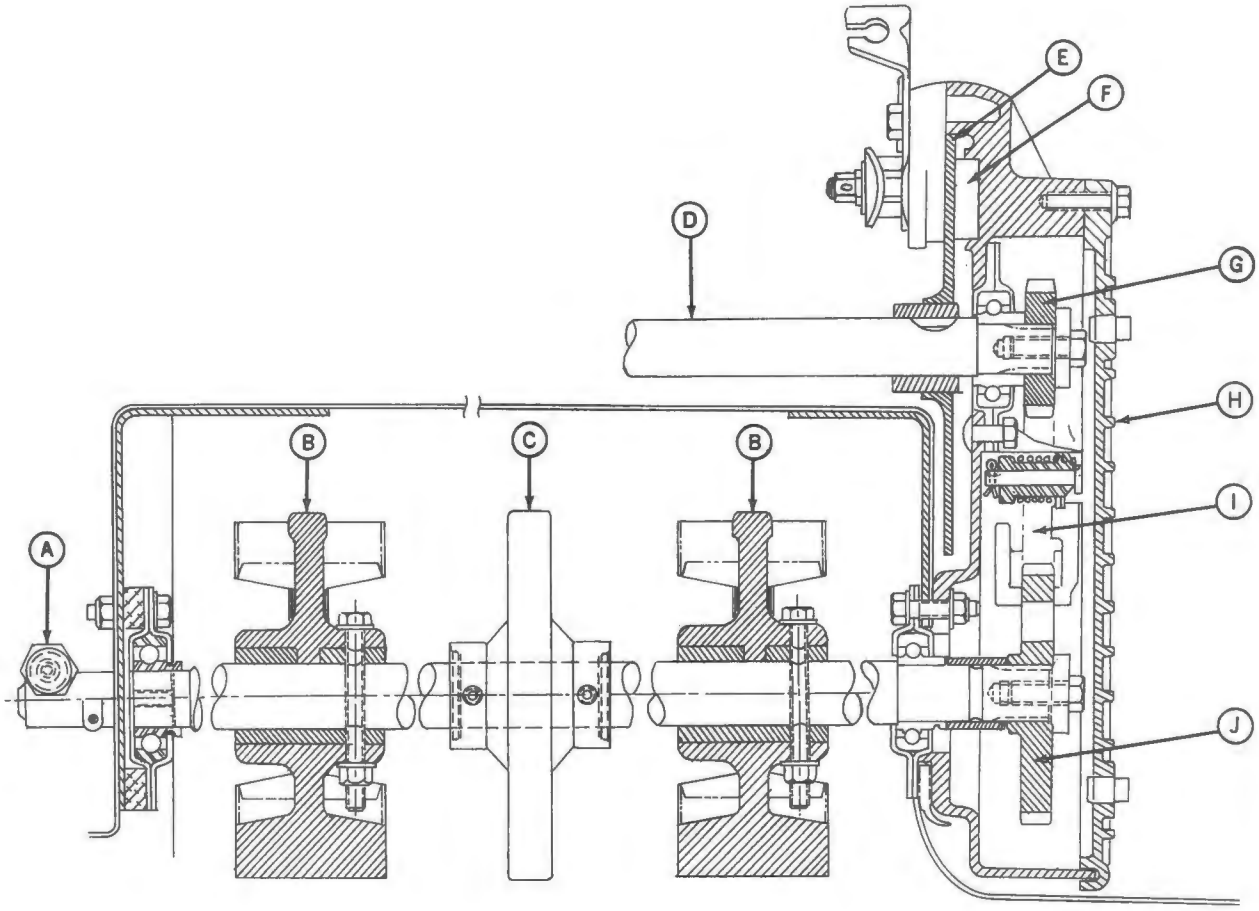
Group 25
CHAIN CASE, SECONDARY SHAFT AND DRIVE SHAFT

GENERAL INFORMATION



M19287N

A—Speedometer Drive	C—Idler Wheel (-80,000)	E—Brake Disk	G—Upper Sprocket	I—Chain Tensioner
B—Drive Wheels	D—Secondary Shaft	F—Brake Puck	H—Chain Case Cover	J—Lower Sprocket

Fig. 1-Cutaway View of Chain Case (1976 Snowmobiles)

The chain case, Fig. 1, is a sealed unit containing an upper sprocket (G), lower sprocket (J), endless silent chain and self-adjusting chain tensioner (I).

NOTE: A single chain tensioner is used on Snowmobiles Serial No. 70,001 and up.

The endless chain cannot be serviced. If worn or broken, it must be replaced.

Polyurethane drive wheels on the drive shaft engage with the lugs on the inside surface of the track to drive the track.

NOTE: The idler wheel (C) is used on snowmobiles (Serial No. -80,000).

The brake disk (E) is mounted on the secondary shaft (D). Two brake pucks (F), one on each side of the brake disk, provide the braking action. See Group 30 of this section for brake maintenance and adjustments.

Sealed ball bearings support both the secondary shaft and the drive shaft.

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FINAL DRIVE RATIOS

The following chart lists the final drive ratios possible for most snowmobiling conditions.

Snowmobile	Upper Sprocket (No. of Teeth)	Lower Sprocket (No. of Teeth)	Chain Length (No. of Pitches)	Ratio
340 Cyclone and Liquifire	21	39	66	1.86:1*
440 Cyclone and Liquifire	24	40	68	1.67:1**
All Machines	17	35	62	2.06:1
All Machines	17	42	66	2.47:1

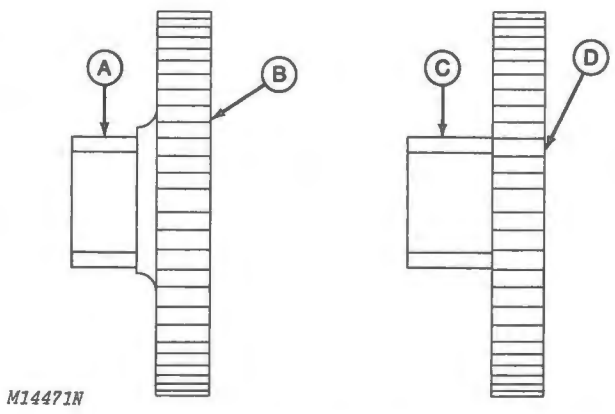
**The 340 Cyclone and Liquifire Snowmobile final drive standard ratio is 1.86:1 with the 2.06:1 as the first optional ratio.*
The other ratios may be used as required.

**The 440 Cyclone and Liquifire Snowmobile final drive standard ratio is 1.67:1 with the 1.86:1 as the first optional ratio.*
The other ratios may be used as required.

The long spacer (C, Fig. 2), is required with the 40-tooth sprocket on 1976 440 Cyclone and Liquifire Snowmobiles (Serial No. 50,001-70,000) because this sprocket is minus the shoulder present on the other sprockets.

NOTE: 1977 440 Cyclone and Liquifire Snowmobiles (Serial No. 70,001 and up), use the short spacer (A, Fig. 2), because the 40-tooth sprocket has a shoulder cast as an integral part of the gear.

IMPORTANT: 440 Cyclone Snowmobiles (Serial No. 70,001 to 71,001) use the long spacer and 40 tooth sprocket without the shoulder.



A—M66133 Short Spacer
B—35, 39 and 42-Tooth Sprocket
C—M66346 Long Spacer
D—40-Tooth Sprocket

Fig. 2-Lower Sprockets and Spacers

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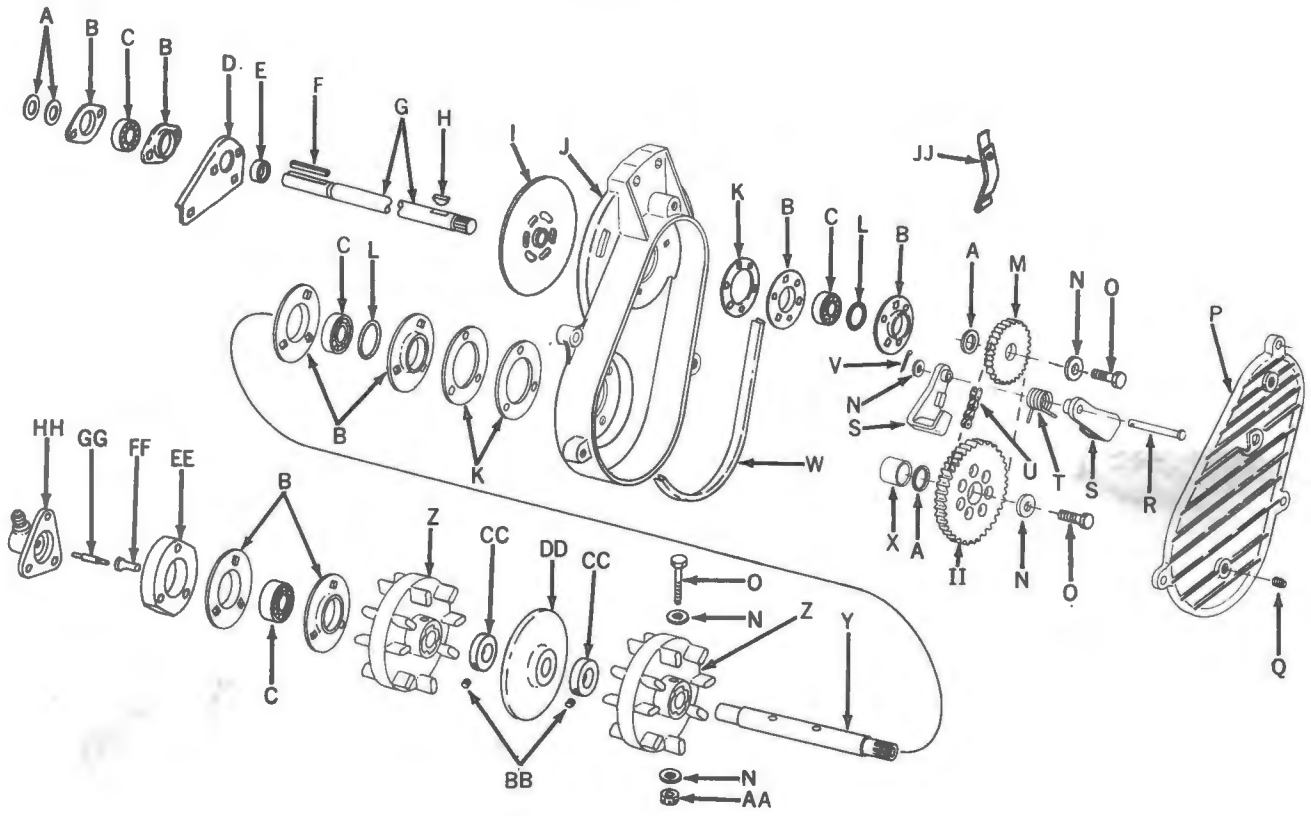
DISASSEMBLY



M20993N

A—Shims
B—Bearing Flangette
C—Bearing
D—Bearing Mount
E—Bearing Spacer
F—Key
G—Secondary Shaft
H—Woodruff Key
I —Brake Disk
J —Chain Case
K—Gasket
L —O-Ring
M—Upper Sprocket
N—Washer
O—Cap Screw
P—Chain Case Cover
Q—Plug
R—Pin
S —Chain Tensioner
T —Spring
U —Silent Chain
V —Cotter Pin
W—Rubber Gasket
X —Spacer
Y —Drive Shaft
Z —Drive Wheel
AA—Lock Nut
BB—Set Screw*
CC—Locking Collar*
DD—Idler Wheel*
EE—Spacer
FF —Speedometer Bushing
GG—Speedometer Core
HH—Speedometer Drive
II —Lower Sprocket
JJ —Single Chain Tensioner**

Fig. 3-Exploded View of Chain Case, Secondary Shaft and Drive Shaft

*Used on snowmobiles (Serial No. -80,000).

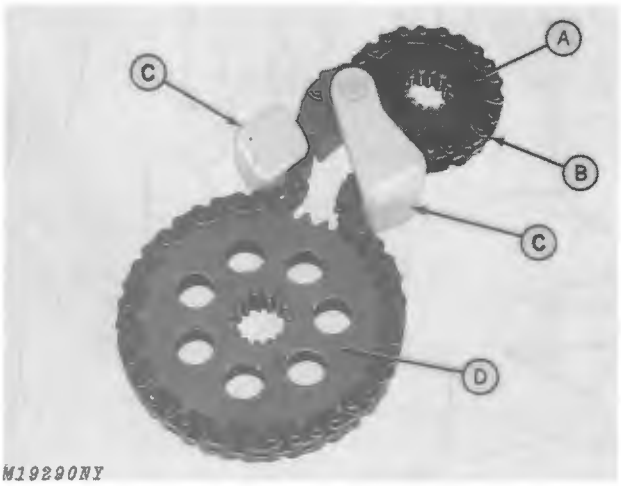
**Used on snowmobiles (Serial No. 70,001-).

Removing Drive Chain and Sprockets

1976 Snowmobiles (Serial No. 55,001-70,000)

Loosen chain case cover screws and allow the oil to drain out.

Remove chain case cover. Remove cap screws securing upper and lower sprockets.



A—Upper Sprocket **C—Chain Tensioners**
B—Drive Chain **D—Lower Sprocket**

Fig. 4-Sprockets, Drive Chain and Chain Tensioners

Remove sprockets, drive chain and chain tensioners as an assembly, Fig. 4.

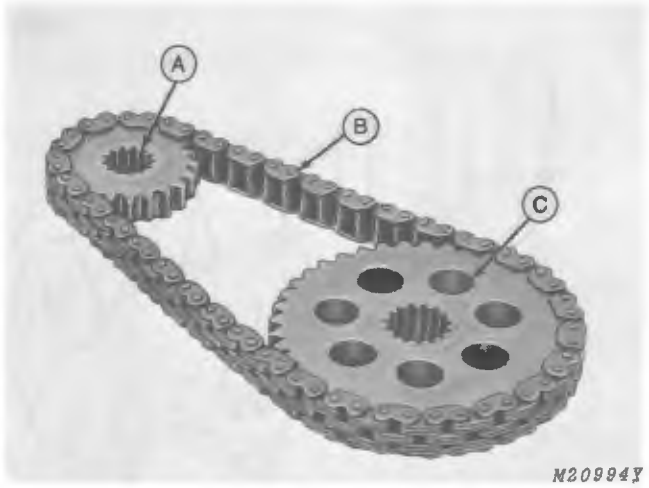
IMPORTANT: Record the number of shims between sprockets and shafts. This will help determine the correct shims for reassembly.

1977 Snowmobiles (Serial No. 70,001 and up)

Loosen chain case cover screws and allow the oil to drain out.

Remove chain case cover. Remove cap screws securing upper and lower sprockets.

Remove chain tensioner.



A—Upper Sprocket **B—Drive Chain** **C—Lower Sprocket**

Fig. 5-Drive Chain and Sprockets

Remove sprockets and drive chain as an assembly, Fig. 5.

IMPORTANT: Record the number of shims between sprockets and shafts. This will help determine the correct shims for reassembly.

Removing Secondary Shaft and Brake Disk

Remove drive belt and driven sheave. Record the number of shims behind the driven sheave for reassembly. These shims correctly align driven sheave and drive sheave.

Remove sprockets and drive chain from chain case.

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Fig. 6-Bearing and Bearing Flangettes

Remove flangettes and bearing from left side of tunnel, Fig. 6. Slide secondary shaft out of chain case bearing and out of brake disk. Remove chain case bearing flangettes, bearing and O-ring if replacement is necessary.

Remove brake puck body, brake puck, and backing plate. Remove brake disk.

Remove brake puck from chain case.

Removing Drive Shaft

Siphon all fuel from the fuel tank and drain oil from the chain case by loosening chain case cover screws. Close fuel shut-off valve.

Remove battery if snowmobile is so equipped.

NOTE: If the JDST-24 Lift and Repair Stand is not available, turn the snowmobile on its side to remove the suspension.

Remove drive belt and secondary sheave. Disconnect speedometer cable from speedometer drive.

Remove chain case cover. Remove upper and lower sprockets, chain and chain tensioners.

Turn snowmobile upside-down with the JDST-24 Lift and Repair Stand. Remove slide suspension. See page 60-10-3.

Fig. 7-Drive Wheels Positioned in the Center

Remove bolts securing drive wheels to drive shaft and slide drive wheels toward the center, Fig. 7. This allows access to bearing flangette cap screws.

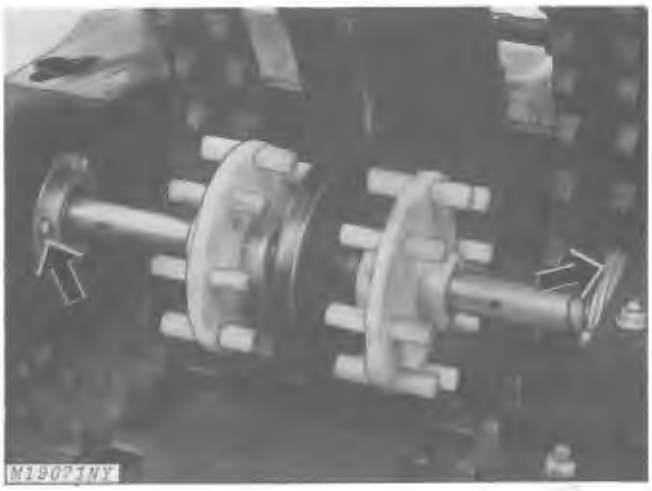

Fig. 8-Removing Drive Shaft

Remove cap screws securing drive shaft flangettes to tunnel, Fig. 8. Slide drive shaft toward the chain case side. Lift the opposite end with spacer up far enough to clear tunnel and remove drive shaft.

Removing Chain Case

Relieve tension on the track.

Loosen chain case cover screws and allow the oil to drain out.

Remove chain case cover. Remove cap screws securing upper and lower sprockets.

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Remove sprockets, chain and chain tensioners as an assembly. Remove secondary shaft and brake disk.

Remove upper and lower bearing flangette nuts.

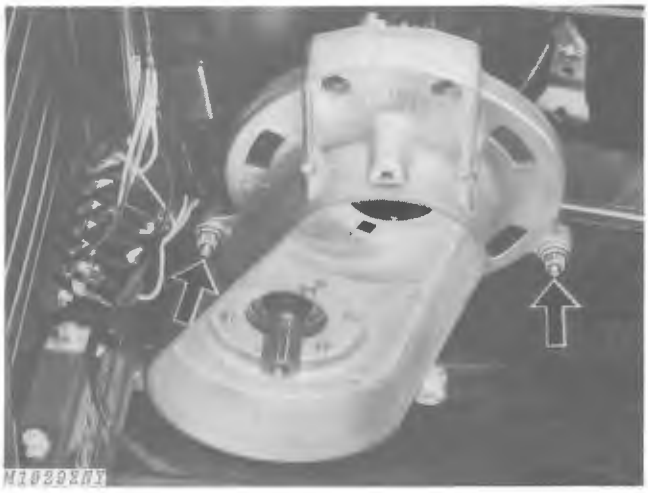

Fig. 9-Removing Chain Case

Remove two nuts securing chain case to tunnel and remove chain case, Fig. 9.

INSPECTION

Thoroughly clean all components prior to inspection.

Inspecting Secondary Shaft

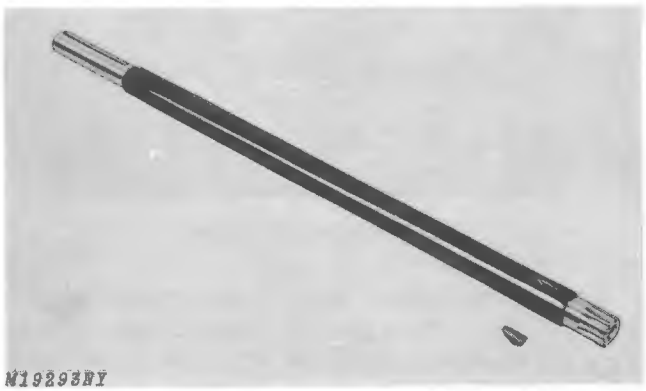

Fig. 10-Secondary Shaft

NOTE: To remove secondary shaft, remove exhaust silencer and slide shaft past the chain case and out the right-hand side.

Inspect secondary shaft bearing surfaces, Fig. 10, for evidence of bearings turning on shaft. Also inspect condition of splined-end threads. Replace shaft if it is defective.

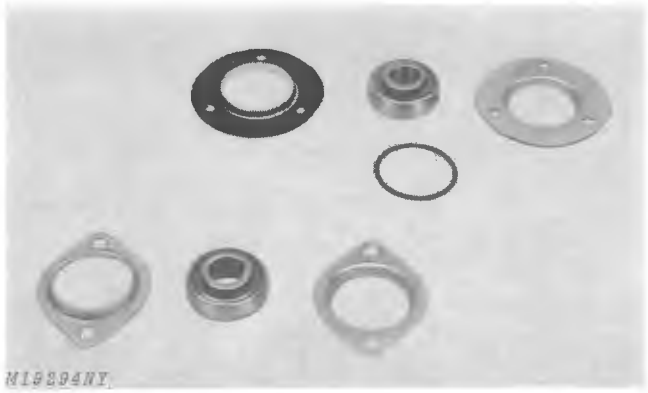

Fig. 11-Secondary Shaft Bearings and O-Ring

Inspect secondary shaft bearings, Fig. 11, and replace them if they are binding, worn, or noisy. Install a new O-ring on bearing in chain case.

Inspecting Drive Chain, Sprockets and Chain Tensioners

Fig. 12-Drive Chain, Sprockets and Tensioners

Inspect drive chain, Fig. 12, for excessive wear. Replace it if it is badly worn or broken. The drive chain is an endless chain and cannot be repaired.

Inspect sprocket teeth, Fig. 12, for wear. If a new drive chain is installed, replace sprockets also, because a new chain will not properly match worn sprockets.

Rapid chain and sprocket wear could be caused by sprocket misalignment from improper assembly or from lack of lubrication.

Replace chain tensioners, Fig. 12, if contact surfaces are worn deeply. Replace tension spring if it is cracked, broken, or pitted.

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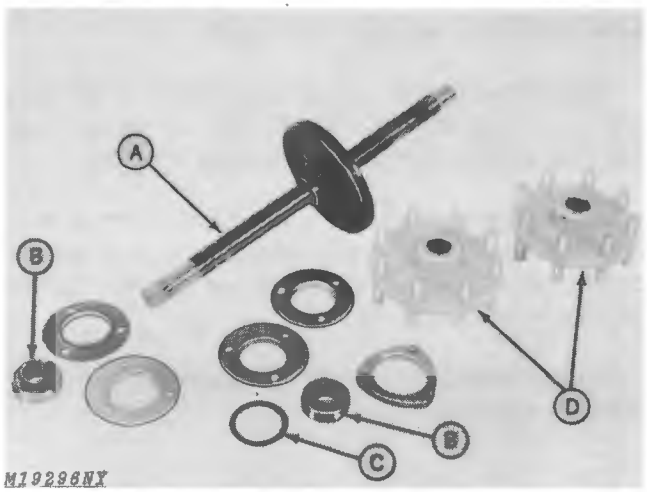
Inspecting Drive Shaft Assembly



A—Drive Shaft
B—Bearings
C—O-Ring
D—Drive Wheels

Fig. 13-Drive Shaft Assembly

Inspect drive shaft bearing surfaces, Fig. 13, for evidence of bearings turning on shaft. Also inspect speedometer drive core and bushing for tightness.

Inspect drive shaft bearings, Fig. 13, and replace them if they are binding, worn, or noisy. Use a new O-ring on lower chain case bearing.

Inspect drive wheels and replace them if lugs are worn down to metal center. Rapid wear of this type on the leading edge of the drive lugs indicates snowmobile was run without snow lubrication.

Wear on the trailing edge of the drive lugs is normal after many hours of regular operation.

Inspecting Chain Case

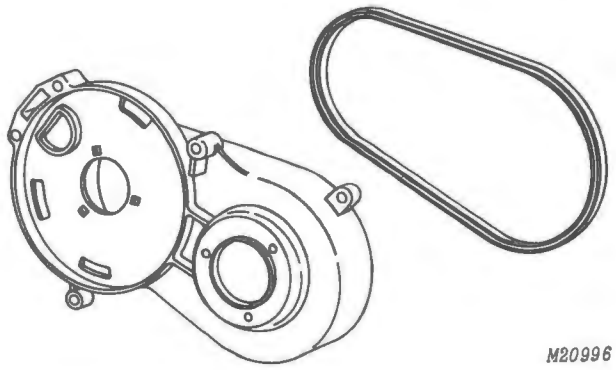


Fig. 14-Chain Case

Inspect chain case, Fig. 14, for cracks or other damage that could cause chain and sprocket misalignment or oil leakage.

Install new rubber gasket when installing chain case cover.

ASSEMBLY

Installing Chain Case

Install upper bearing and flangettes to chain case. Do not tighten nuts at this time.

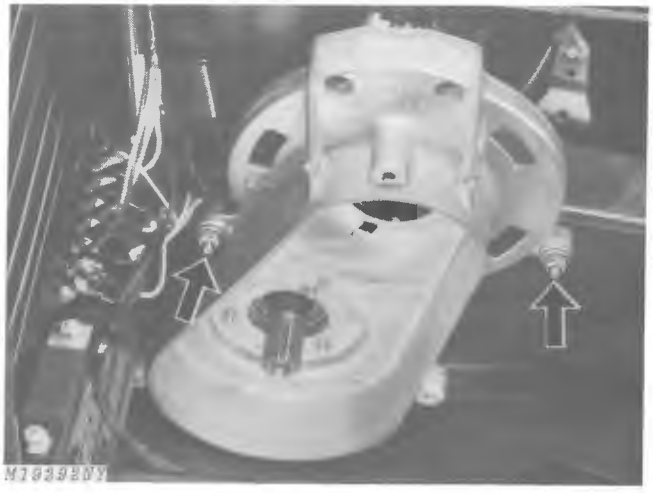
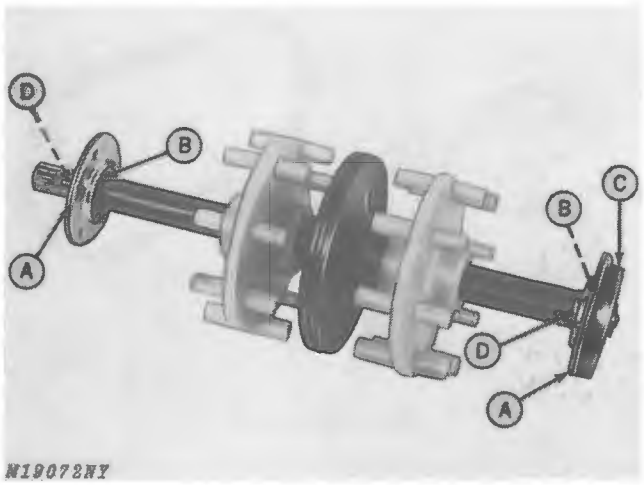


Fig. 15-Installing Chain Case

Install chain case and secure with two nuts, Fig. 15.

Installing Drive Shaft



A—Bearing Flangettes **C—Spacer**
B—Bearings **D—Locking Flanges**

Fig. 16-Drive Shaft Assembled

Assemble bearing flangettes (A), bearings (B) and spacer (C) on drive shaft as shown in Fig. 16. Lubricate and install O-ring on chain case bearing.

IMPORTANT: Locking flanges (D) on bearings must face splined end of drive shaft as shown in Fig. 16.

Install new gasket on flangette side facing the chain case. Gasket sticks to flangette and is between flangette and chain case.

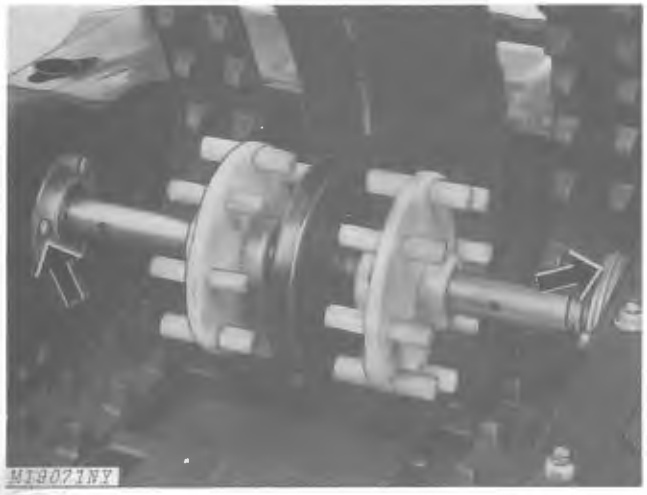


Fig. 17-Installing Drive Shaft

Position drive shaft assembly in tunnel by placing splined end of drive shaft into position, Fig. 17.

IMPORTANT: Be certain O-ring on bearing between flangettes on chain case side is in correct position, or oil leakage will result.

Secure chain case bearing flangettes to chain case with three cap screws, Fig. 17. Do not tighten until opposite bearing flangette is secured to tunnel.

Insert speedometer core into left-hand end of drive shaft. Attach bearing flangettes, spacer and speedometer drive to tunnel with three cap screws. Tighten all cap screws securely.

Move drive wheels into position and secure with bolt, washers and lock nut.

Install slide suspension. See page 60-10-6.

Turn the snowmobile right-side-up. Install sprockets, chain and chain tensioner in chain case.

NOTE: Upper and lower sprocket must be aligned within 0.010 inch (0.254 mm). Align sprockets as instructed on pages 50-25-8 and 50-25-9.

Install speedometer cable to speedometer drive.

Install secondary sheave and drive belt.

Fill chain case with SAE 90 oil. Install battery if snowmobile is so equipped.

Fill fuel tank and open fuel shut-off valve.

Adjust track tension. See page 60-10-6.

Aligning Drive Chain and Sprockets

Install four 0.010 inch (0.254 mm) shims and spacer on lower shaft and install lower sprocket. Install two 0.018 inch (0.457 mm) shims and upper sprocket. Install washers and cap screws and tighten securely.

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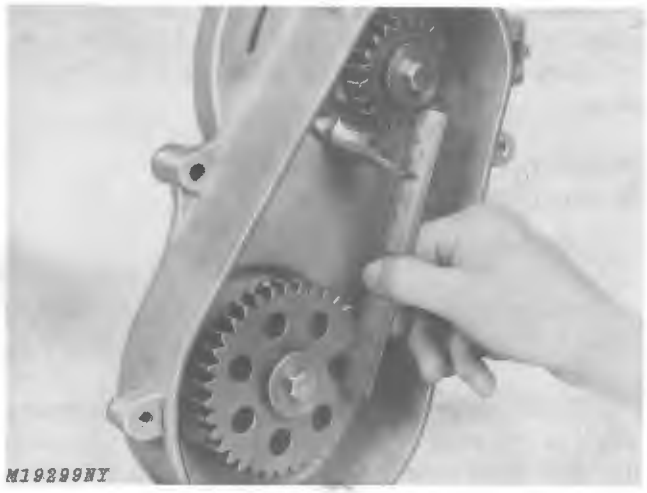


Fig. 18-Checking Sprocket Alignment

Place straight-edge on flat surface of lower sprocket, Fig. 18, and slide up toward upper sprocket to check alignment. If sprockets do not align, add or deduct shims as necessary.

IMPORTANT: Use a maximum of three 0.018-inch (0.457 mm) shims behind the upper sprocket and ten 0.010-inch (0.254 mm) shims behind the lower sprocket. Shims on lower sprocket should be between spacer and bearing. When sprockets are shimmed correctly the shafts should be recessed into the sprockets. DO NOT allow the shafts to protrude beyond the sprockets.

Remove the sprockets and leave spacer and shims in place.

1976 Snowmobiles (Serial No. 50,001-70,000)

Place drive chain around both sprockets and install chain tensioners on chain between sprockets. Head of chain tensioner bolt should be to the outside. Install the spring in the grooves of the chain tensioners.

Position JDM-82 Chain Tensioner Tool over the chain tensioners, Fig. 19.

Install the sprockets, chain and chain tensioners in the chain case as an assembly. Remove JDM-82 Chain Tensioner Tool.

Apply Loctite (grade AV, red) (ATL 4927) to the cap screw threads and secure sprockets with washers and cap screws.

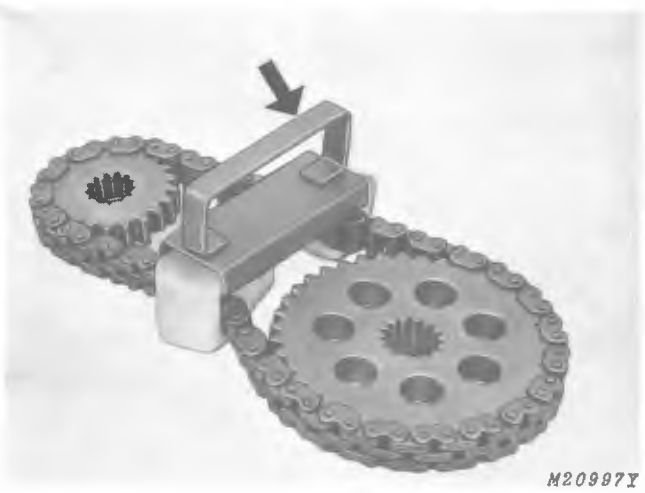


Fig. 19-Positioning JDM-82 Chain Tensioner Tool

1977 Snowmobiles (Serial No. 70,001 and up)

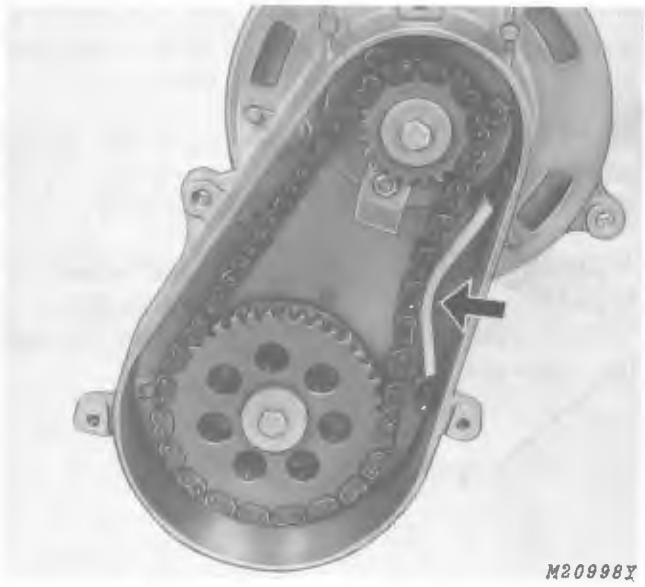


Fig. 20-Installing Drive Chain Tensioner

Place drive chain around both sprockets and install sprockets and chain in the chain case as an assembly. Install chain tensioner on pin in the chain case, Fig. 20. Be sure the hyfax of the chain tensioner is aligned properly with the chain.

Apply Loctite (grade AV, red) (ATL 4927) to the cap screw threads and secure sprockets with washers and cap screws.

Fig. 21-Chain Case Gasket Installed

Install rubber gasket on chain case with gap in gasket at the eleven o'clock position, Fig. 21. The gap in the gasket should be 1/16 to 3/16 inch (1.588 to 4.762 mm). This serves as the vent for the chain case and prevents pressure build-up in the case.

NOTE: On 1977 Snowmobiles (Serial No. 70,001 and up) the gasket is one piece and the seam in the gasket must be at the eleven o'clock position.

IMPORTANT: If the one piece gasket is used on 1976 Snowmobiles (Serial No. 50,001-70,000) a 1/16-inch hole must be drilled lengthwise through the upper plug.

Install chain case cover. Remove upper and lower plugs. Install a good grade of SAE 90 oil in the upper hole until it starts to run out the lower hole. Replace plugs.

Installing Secondary Shaft and Brake Disk

Install brake puck in chain case.

Position brake disk and slide secondary shaft through disk and chain case bearing.

IMPORTANT: Use Never-Seez on the secondary shaft in the area of the brake disk. This will keep the disk from binding or sticking. DO NOT allow Never-Seez to get on the face of the brake disk.

Install flangettes and bearing over shaft and secure to the left side of the tunnel.

Install sprockets and drive chain in chain case.

Place secondary shims over shaft (these were removed during disassembly) and install driven sheave. Recheck sheave alignment.

Install drive belt.

Install brake puck body with backing plate and brake puck. See Group 30 of this section for brake adjustment.

Group 30
MECHANICAL DISK BRAKE

GENERAL INFORMATION

The mechanical brake disk is keyed to and rotates with the secondary shaft. Squeezing the brake lever causes a cam to push two pins against the backing plate and puck in the brake puck body. The puck in the body contacts the brake disk.

Further pressure on the brake lever causes the puck in the brake puck body to slide the brake disk on the secondary shaft. The disk contacts the puck in the chain case and the action of the pucks against the disk slows or stops the snowmobile.

The brake can be adjusted easily, but the secondary shaft and brake puck body must be removed to replace the disk or pucks.

DISASSEMBLY AND REPAIR

Removing Brake Disk

Remove air silencer.

Remove drive belt and driven sheave. Record the number of the shims between driven sheave and bearing for reassembly.

Remove chain case cover, sprockets, drive chain and chain tensioner. Record the number of shims between the upper sprocket and bearing for reassembly.

Do not remove spacer and shims from the lower drive shaft.

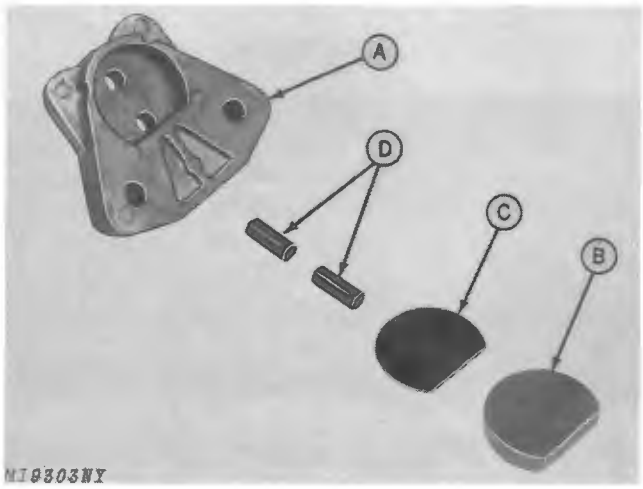
Remove the bearing flangettes and bearing from the secondary shaft on the left side of the tunnel.

Slide secondary shaft out to free shaft from the brake disk.

A—Cotter Pin **B—Adjusting Nut**

Fig. 1-Removing Cotter Pin and Adjusting Nut

Remove cotter pin (A, Fig. 1) and adjusting nut (B) from stud of brake puck body. Loosen jam nuts securing brake cable to bracket. Remove cam and spring with brake cable and bracket from the stud of brake puck body.



A—Brake Puck Body **C—Backing Plate**
B—Brake Puck **D—Pins**

Fig. 2-Removing Brake Puck Body

Remove brake puck body (A, Fig. 2), brake puck (B), backing plate (C) and pins (D).

NOTE: When removing pucks on 1977 Snowmobiles it may be necessary to heat the puck with a hand torch before removing it. The pucks are installed with Loctite and heat (400 degrees) is required to loosen the puck.

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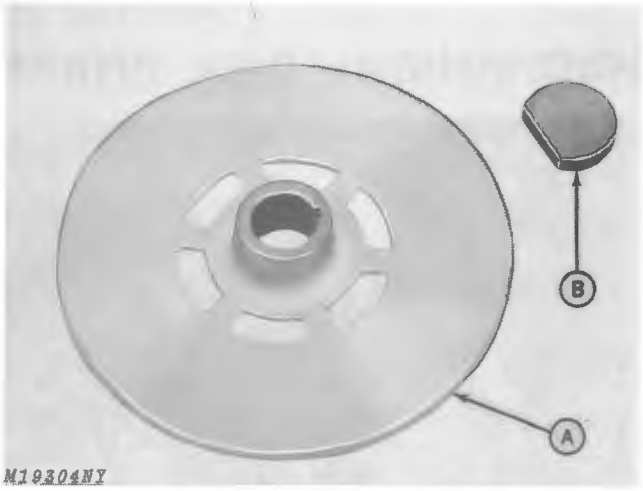


A—Brake Disk **B—Brake Puck**

Fig. 3-Brake Disk Removed

Remove brake disk (A, Fig. 3). Remove brake puck (B) from chain case.

INSPECTION

Replace brake pucks if they are oil contaminated or if no more adjustment is left to tension brake properly.

Inspect brake disk, cam, pins and brake cable. Replace worn or damaged parts, because brake adjustment and safe operation could be affected.

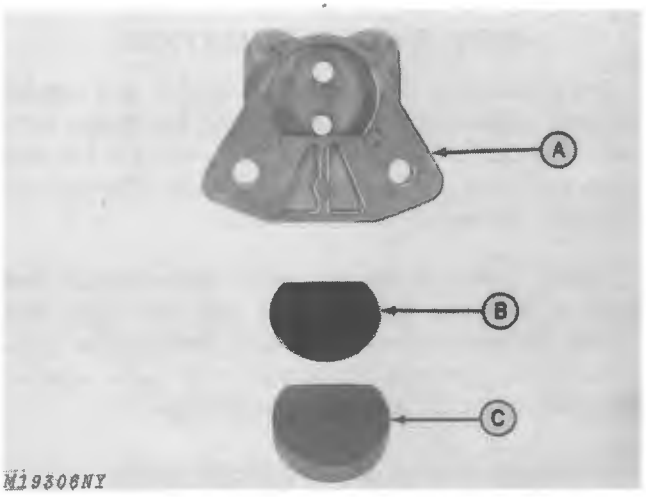
ASSEMBLY

Fig. 4-Installing Brake Puck and Brake Disk

Place brake puck and brake disk in chain case Fig. 4.

NOTE: Before installing puck, spray it with Lockwick Primer, Grade T, then wipe off. Apply Loctite 306 to the puck and install puck on chaincase side only.

NOTE: If the brake disk is warped or pucks are cracking, install heavy-duty brake kit.



A—Brake Puck Body **C—Brake Puck**
B—Backing Plate

Fig. 5-Installing Backing Plate and Brake Puck in Brake Puck Body

Install backing plate (B) and brake puck (C) in brake puck body (A, Fig. 5). Install body and brake cable bracket to chain case. Install key in keyway of secondary shaft and install shaft through brake disk and bearing in chain case. Install bearing flangettes and bearing on secondary shaft on the left side of tunnel.

IMPORTANT: Use Never-Seez on secondary shaft in the area of the brake disk. This prevents disk from seizing or sticking on shaft.

Fig. 6-Installing Shims on Secondary Shaft

Place shims on secondary shaft, Fig. 6, and install driven sheave and drive belt.

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Install drive chain, sprockets and chain tensioners in chain case. Check sprocket alignment as explained on page 50-25-9. Install chain case cover and add oil.

Fig. 7-Installing Cam

Install pins in brakepuck body. Install spring and cam on stud of brakepuck body, Fig. 7. Install washer and adjusting nut. Do not tighten nut at this time.

ADJUSTMENT

Fig. 8-Adjusting Cam

Loosen or tighten jam nuts on brake cable until the cam is parallel with the ground (level) and pointing straight ahead, Fig. 8.

Fig. 9-Adjusting Brake

Tighten the adjusting nut on the brake body post until 1 to 1-1/2 inches (25 to 38 mm) clearance exists between the brake lever and handgrip, Fig. 9. Install cotter pin through adjusting nut.

After adjusting brake, check operation of stoplight switch. Check for a "frozen" switch if stoplight does not work.

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Group 35
SPECIFICATIONS

SPECIFICATIONS

Drive Belt Total Width:
All Snowmobiles ..... 1-1/4 in. (31.75 mm)

Drive Belt Effective Length:
All Snowmobiles ..... 46.30 ± 0.25 in.
(1175.62 ± 6.35 mm)

Drive Sheave Alignment
All Snowmobiles ..... See Page 50-20-2

TORQUE FOR HARDWARE

Location	Torque
Drive Sheave Retaining Cap Screw	50 ft-lbs (68 Nm)
Driven Sheave Retaining Cap Screw	20 ft-lbs (27 Nm)

Litho in U.S.A.

Litho in U.S.A.

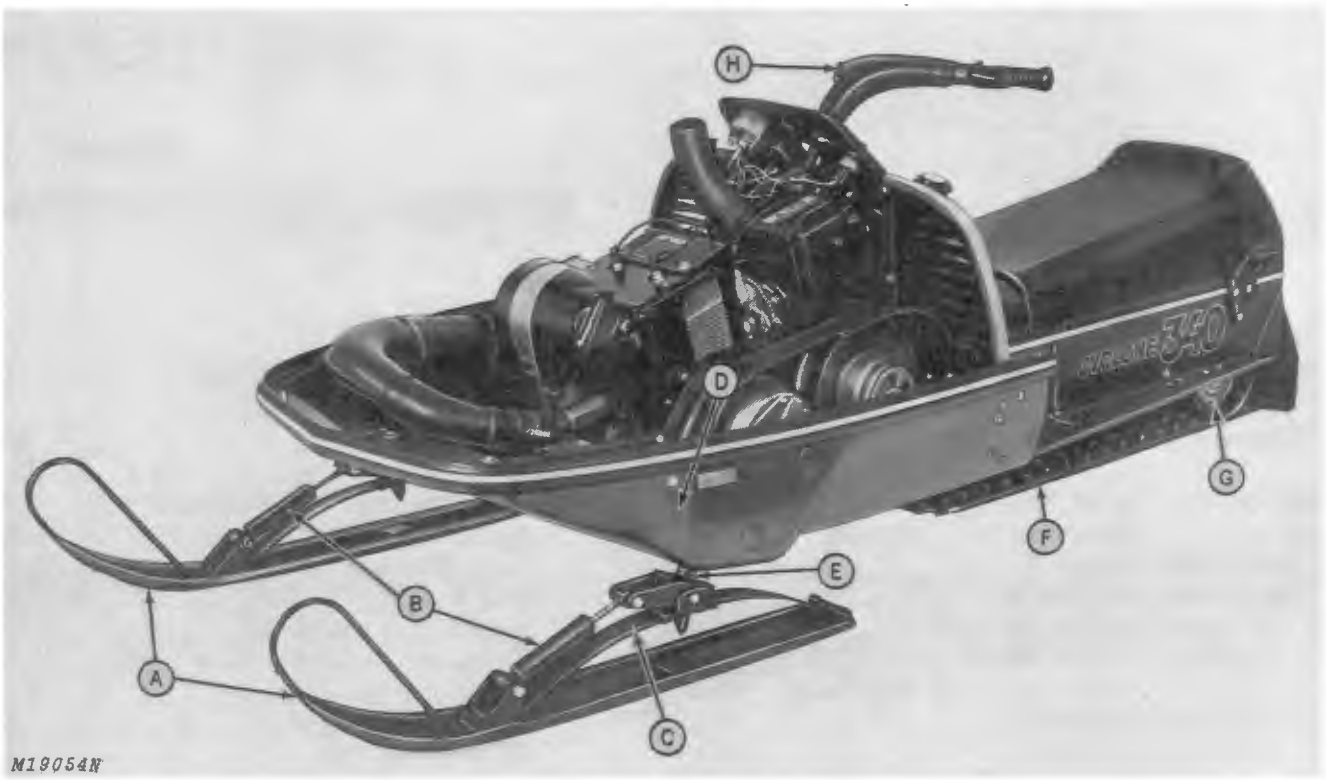
Section 60
SUSPENSION

Group 5
GENERAL INFORMATION

CONTENTS

Litho in U.S.A.

DESCRIPTION



A—Skis
B—Shock Absorbers
C—Ski Spring
D—Steering Arm
E—Ski Spindle
F—Slide Suspension
G—Rear Idler Assembly
H—Steering Column

Fig. 1-Slide Suspension Components

The slide suspension system, Fig. 1, consists of the skis and steering mechanism, the track and slide suspension and the rear idler assembly. The system also incorporates a weight transfer adjustment, replaceable wear bars, adjustable suspension springs and hydraulic shock absorber. The combination of these features and adjustments will give excellent ride and performance.

The rear idler shaft turns in double lip, sealed ball bearings. The idler assembly is easily adjusted to properly tension the track.

The rubber track has lugs on the inside surface of the track which engage with the drive wheels on the drive shaft for maximum efficiency.

The skis have replaceable wear rods. Ski springs are replaceable only as a complete set. Ski spindles and tie rods are designed to bend rather than break when subjected to severe shock loads, providing additional operator safety.

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DIAGNOSING MALFUNCTIONS

Track Assembly

Track Edge Frayed

Track out of alignment.

Track Grooved On Inner Surface

Track run excessively tight.

Rear idler shaft bearings frozen.

Track Drive Ratcheting

Track too loose.

Rear Idlers Turning on Shaft

Rear idler shaft bearings frozen.

Skis and Steering

Loose Steering

Tie rod ends loose.

Spindle bushings worn.

Spindle splines stripped.

Skis Not Turning Equally In Both Directions

Tie rod adjusted improperly.

Steering arms installed improperly.

Rapid Ski Wear

Skis out of alignment.

Wear rods worn out.

Spring wear plate worn out.

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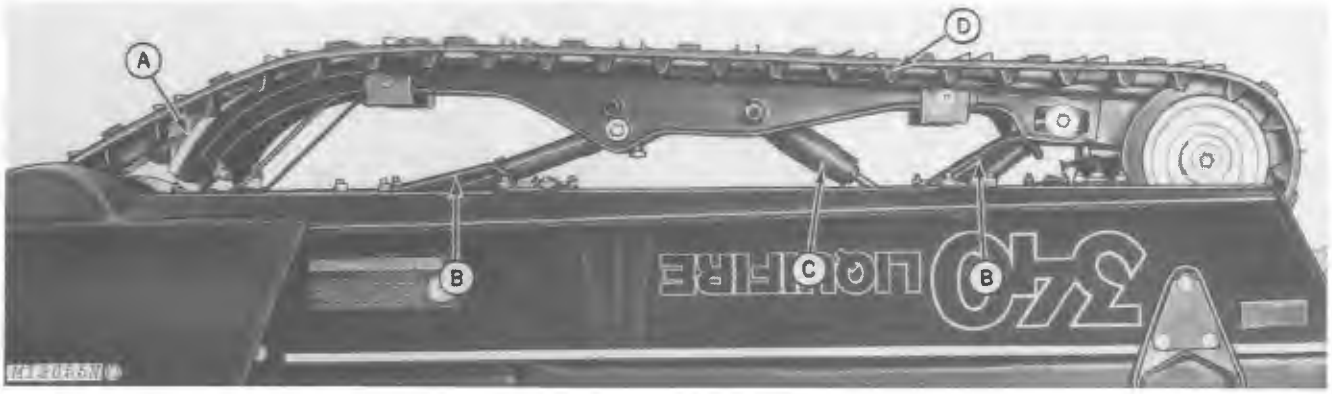
Litho in U.S.A.

Group 10
SLIDE SUSPENSION (Serial No. -80,000)

GENERAL INFORMATION



A—Replaceable Wear Bars
B—Suspension Springs
C—Shock Absorber
D—Grouser Bar Track

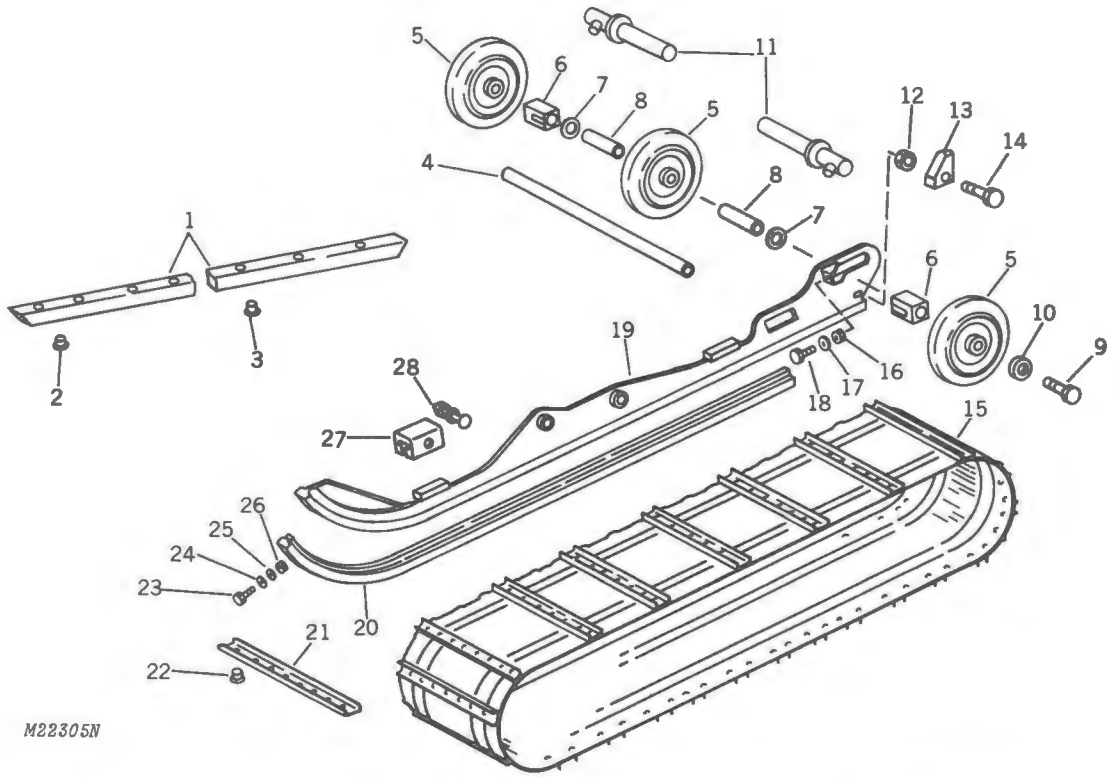
Fig. 1-Slide Suspension System

The slide suspension system consists of replaceable wear bars (A, Fig. 1), shock absorber (C), adjustable suspension springs (B), and a grouser bar track (D).

Replaceable polyethylene wear bars provide low friction between grouser bars and slide rail. The shock absorber dampens the suspension and the adjustable springs permit varying the degree of ride from soft to firm.

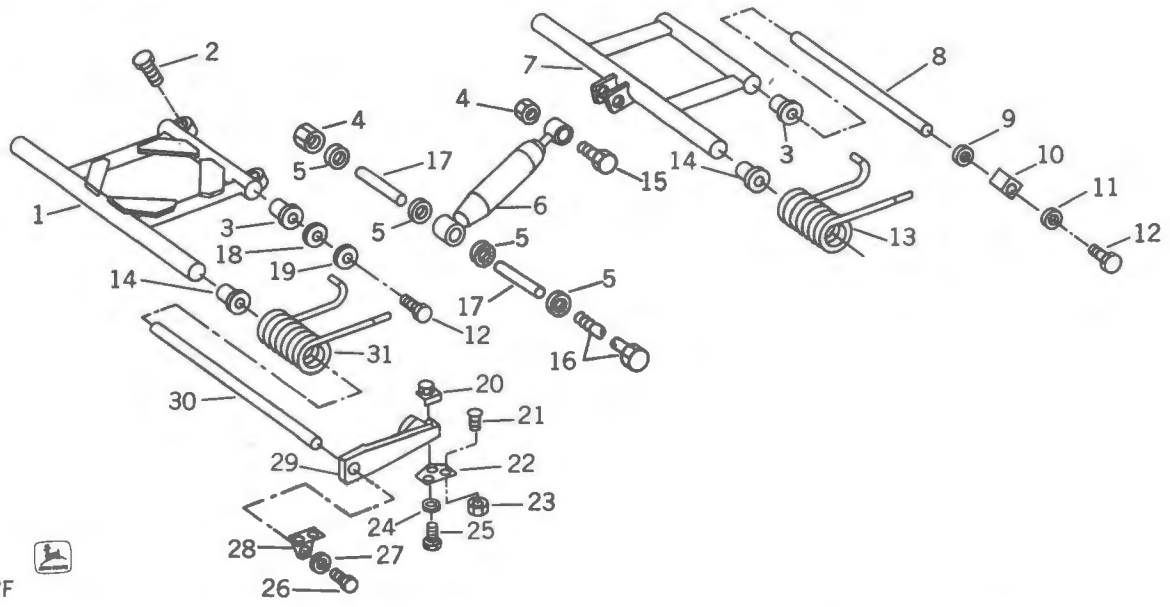
The molded rubber bars and lugs in the track give good traction on ice and during cornering. The molded-in-steel or riveted grouser bars provide good traction for acceleration. The steel grouser bars are also replaceable.

DISASSEMBLY AND REPAIR



1—Tunnel Wear Strip
2—Pop Rivet
3—Semi-Tubulor Rivet
4—Rear Idler Axle
5—Rear Wheel
6—Spacer
7—Washer
8—Spacer
9—Cap Screw
10—Washer
11—Spacer
12—Lock Nut
13—Wear Bar Stop
14—Cup Screw
15—Track
16—Lock Washer
17—Nut
18—Cap Screw
19—Slide Rail
20—Slide Wear Bar
21—Grouser Bar
22—Steel Pop Rivet
23—Cap Screw
24—Washer
25—Washer
26—Lock Nut
27—Rubber Bumper
28—No. 10 Machine Screw, Lock Washer and Nut

Fig. 2-Exploded View of Rear Idler, Track and Slide Rails



1—Front Pivot
2—Locking Bolt
3—Bearing
4—Lock Nut
5—Washer
6—Shock Absorber
7—Rear Pivot
8—Pivot Shaft
9—Washer
10—Rear Slip Bearing
11—Washer
12—Cap Screw
13—Pivot Spring
14—Bearing
15—Cap Screw
16—Shock Absorber Shaft
17—Spacer
18—Washer
19—Washer
20—Adjusting Arm Clip
21—Round Head Bolt
22—Adjusting Plate
23—Lock Nut
24—Washer
25—Cap Screw
26—Locking Bolt
27—Washer
28—Front Reinforcement Bracket
29—Adjusting Arm
30—Pivot Shaft
31—Pivot Spring

Fig. 3-Exploded View of Slide Rail Pivots and Springs

Removing Slide Suspension

IMPORTANT: Siphon all fuel from the fuel tank and use a syringe to remove all oil from the chain case.

Use convenience tool JDST-24, Snowmobile Lift and Repair Stand. Raise and rotate the machine to provide easy access to the slide suspension.

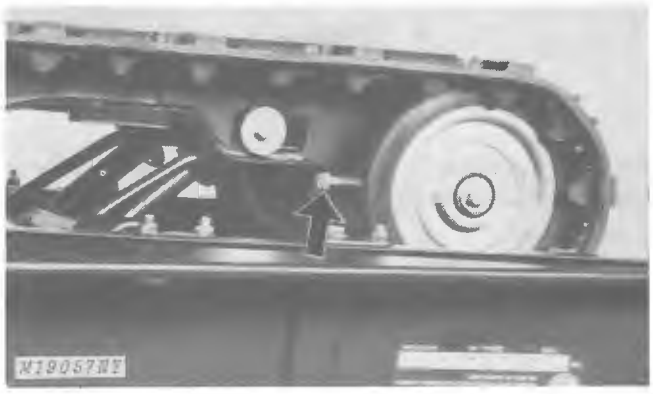


Fig. 4-Track Adjusting Screws

Back out adjusting screws, Fig. 4, to relieve track tension.

Fig. 5-Removing Spring Adjusting Screws

Use a large 1-1/4-inch wrench to relieve spring tension, Fig. 5, and remove four adjustment screws, (two on each side).

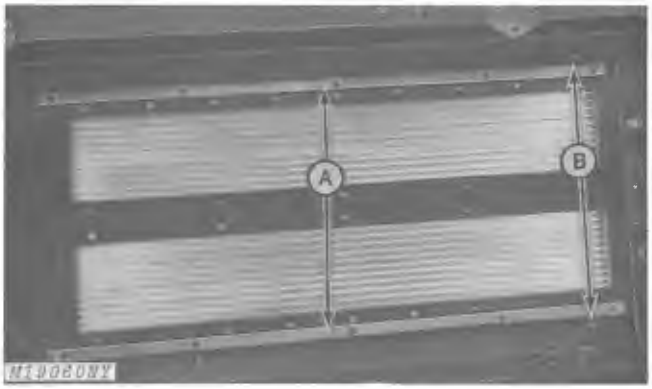
Fig. 6-Cap Screws Securing Suspension to Tunnel

Release track tension. Remove four cap screws securing suspension to tunnel, Fig. 6, and remove suspension.

Replacing Tunnel Wear Bars

The polyethylene tunnel wear bars prevent the steel grouser bars from damaging the tunnel.

Remove the suspension. Lay the track over the front of the machine to expose the tunnel wear bars (A, Fig. 7). Remove two cap screws (B) securing seat and remove seat.



A—Tunnel Wear Bars **B—Seat Screws**

Fig. 7-Tunnel Wear Bars

Chisel off the old rivets from the top or seat side.

Install new wear bars using semi-tubular rivets.

NOTE: Install all rivets from the wear bar side.

Install suspension and seat.

Replacing Slide Suspension Wear Bars

Turn the snowmobile on its side.

Remove retaining nut and bolt securing front of wear bar to suspension.

Remove wear bar stop from rear of suspension on 1977 Snowmobiles (Serial No. 70,001-).

Fig. 8-Removing Slide Rail Wear Bar

Use a chisel and hammer, as shown in Fig. 8, drive the wear bar to the rear to remove it.

NOTE: Suspension was removed for photographic purposes.

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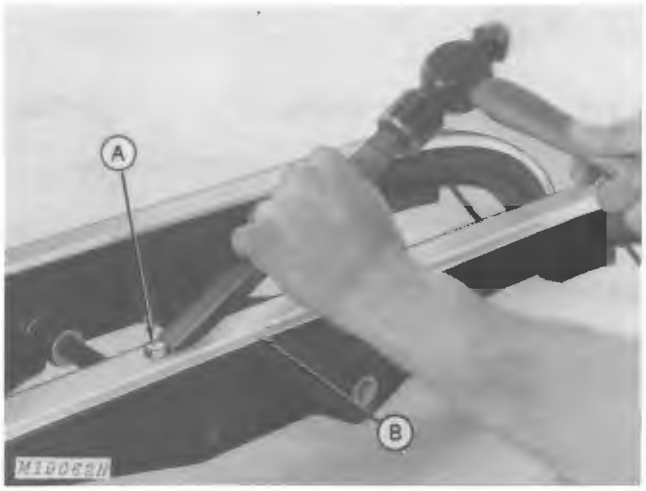
NOTE: In some cases the wear bars are difficult to remove because the opening in the rail is too narrow.

Use the following method:

1. Drill a 3/8-inch diameter hole in the center of the wear bar, 18 inches (45.7 cm) from the rear of the bar.

NOTE: Drill carefully so that drill bit does not contact the metal rail.



A—3/8 x 3/4-Inch Cap Screw **B—Wear Bar**

Fig. 9-Removing Slide Rail Wear Bar

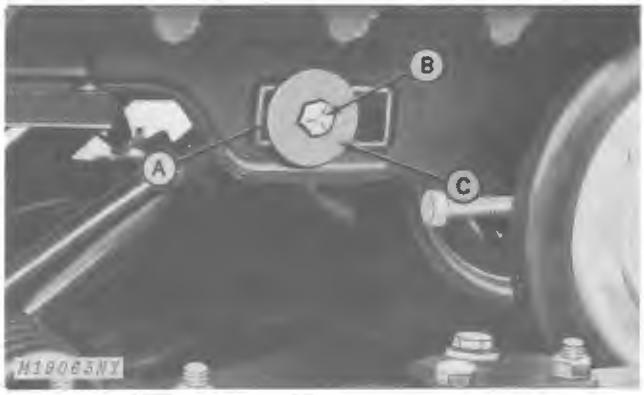
2. Install a 3/8 x 3/4-inch cap screw (A, Fig. 9) and use a chisel or steel bar to drive wear bar (B) out the rear.

3. Check the width of the opening in the rail. It should be 0.44 to 0.50-inch (11.1 to 12.7 mm) in width. If the measurement is less, carefully pry open the rail to the correct measurement before installing a new wear bar.

Lubricate rail with grease. Install new wear bar from the rear, and use a soft mallet to drive it into place. Do not use a chisel for installation. Install front retaining bolt and nut. Install rear wear bar stop on 1977 Snowmobiles (Serial No. 70,001-).

Replacing Wear Blocks

NOTE: The suspension need not be removed to replace wear blocks.



A—Wear Block **B—Cap Screw** **C—Washer**

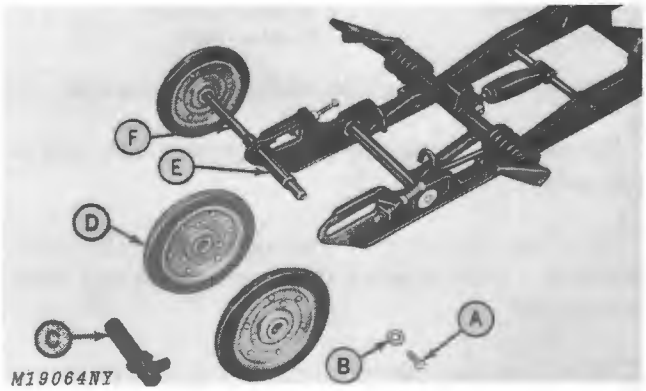
Fig. 10-Replacing Rear Wear Blocks

Remove cap screw (B, Fig. 10), washer (C) and wear block (A) from each end of lower pivot shaft.

Install new wear block. Install cap screw and washer. Tighten cap screw securely.

Replacing Idler Wheels

1976 Snowmobiles (Serial No. -70,000)



A—Cap Screw
B—Washer
C—Wheel Spacer
D—Idler Wheel
E—Wheel Spacer
F—Idler Axle

Fig. 11-Removing Rear Idler Axle, Wheels and Spacers

Remove suspension.

Remove cap screw (A) and washer (B) from one side of idler axle (F, Fig. 11).

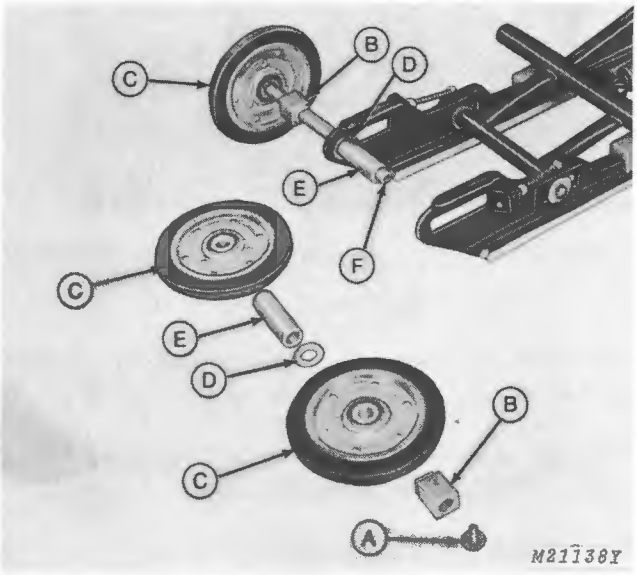
Drive axle (F) out the other side and remove idler wheels (D) and wheel spacers (C and E).

To reassemble; install axle through one rear idler wheel and one spacer, center idler wheel, spacer and third idler wheel. Use washer and tighten cap screw to secure axle. Use Loctite on cap screw.

Replacing Idler Wheels—Continued

1977 Snowmobiles (Serial No. 70,001-)

Remove suspension.



A—Cap Screw and Washer
B—Outer Spacer
C—Idler Wheel
D—Washer
E—Inner Spacer
F—Idler Axle

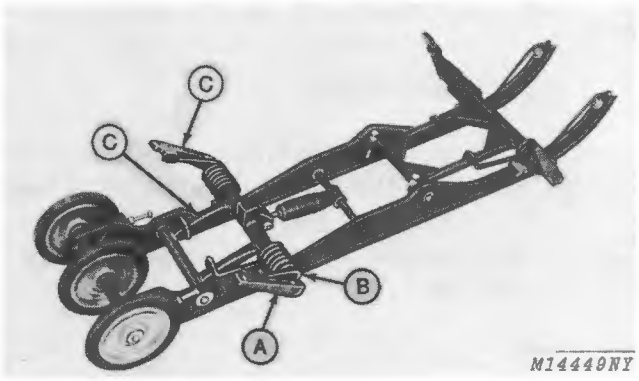
Fig. 12-Removing Rear Idler Axle, Wheels and Spacers

Remove cap screw and washer (A) from one side of idler axle (F, Fig. 12).

Drive axle (F) out the other side and remove idler wheels (C), inner spacers (E), washers (D) and outer spacers (B).

To reassemble: Place cap screw with washer in one end of the axle and install idler wheel and outer spacer. Place this assembly through the suspension, and install washer, inner spacer, idler wheel, inner spacer and washer. Push the shaft completely through suspension and install outer spacer, idler wheel, washer and cap screw. Use Loctite on cap screws.

Installing Slide Suspension



A—Arm **B—Spring** **C—Tape**

Fig. 13-Arms and Springs Installed on Slide Suspension

Assemble springs (B) and arms (A) to the slide suspension as shown in Fig. 13. Use tape (C) to hold springs in place and to hold arms to springs.

Install suspension with arms and springs inside track into place in tunnel. Install front two cap screws and then rear two cap screws, Fig. 6. Tighten all four cap screws securely.

NOTE: It is important to keep these four screws tight. Advise customer to check them periodically and tighten if necessary.

Use a large 1-1/4-inch wrench over the end of the spring arm, Fig. 5. Press down on wrench to pivot spring arm to allow installation of spring adjustment screw and special nut. Turn adjustment screw through nut until screw is through nut by two threads. Repeat procedure on remaining three adjustment screws.

NOTE: Adjust these four screws to give a firm or soft ride after the track has been adjusted, page 10-7.

Turn both track adjusting screws (see Fig. 4) in until the track is fairly tight. Do not tighten the jam nuts on the adjusting screws.

Remove snowmobile from convenience tool JDST-24, Snowmobile Lift and Repair Stand.

Install SAE-90 oil in chain case and refill fuel tank with proper fuel-oil mixture.

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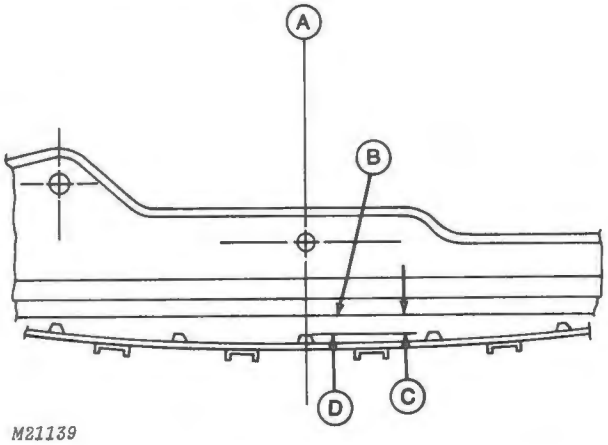
ADJUSTING TRACK TENSION

A track that is too loose or too tight requires additional power to operate. A loose track causes excessive slap which can damage the track, tunnel or slide assembly.

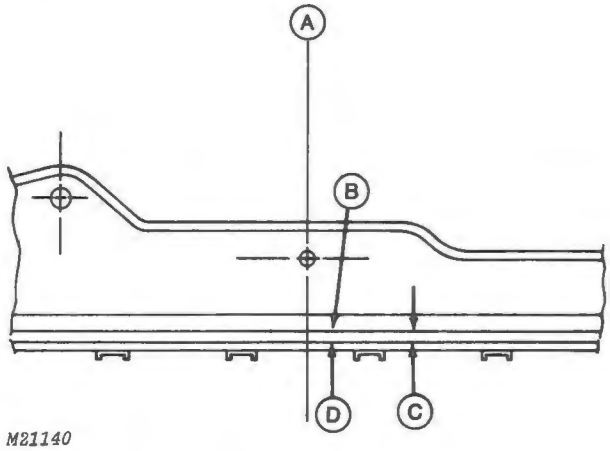
1. Suspend and support the rear of the snowmobile until track is clear of the ground.



A—Lower Shock Absorber Mount
B—Bottom of Slide Wear Bar
C—0.00 to 0.38 Inch (0.00 to 9.652 mm)
D—Top of Drive Lug

Fig. 14-Adjusting Molded Grouser Bar Track

2. To adjust the molded grouser bar track, Fig. 14, tension the track until the dimension between the bottom of the slide wear bar and the top of the drive lug is 0.00 to 0.38 inch (0.00 to 9.652 mm). Measure the dimension below the lower shock absorber mount.



A—Lower Shock Absorber Mount
B—Bottom of Slide Wear Bar
C—0.00 to 0.25 Inch (0.00 to 6.350 mm)
D—Inside of Track Band

Fig. 15-Adjusting Riveted Grouser Bar Track

3. To adjust the riveted grouser bar track, tension the track until the dimension between the bottom of the slide wear bar and the top of the track is 0.00 to 0.25-inch (0.00 to 6.350 mm). Measure the dimension below the lower shock absorber mount. Both sides must be equal.

4. Tighten the jam nuts.

5. Start the engine and idle the track slowly so that it rotates several times. Shut off the engine and allow the track to coast to a stop. DO NOT apply the brake.

6. Check alignment by observing where the rear idler wheels run with respect to the drive lugs. The rear idler wheels should run in the center of the drive lugs.

7. Look under the track to determine if the slide rail wear bar is directly in the middle of both slide rail openings on the track.

8. If Step 6 or 7 indicates a need for adjustment, repeat the tension procedure.

NOTE: A track will always run to the loose side. For proper tensioning, the adjusting screw on the loose side should be tightened. For example, if the track is too far to the left side, tighten that side to move the track over.

ADJUSTING SUSPENSION SPRINGS

Turning adjusting screws in (clockwise) gives a firm ride; turning adjusting screws out (counterclockwise) gives a soft ride. Adjust screws equally, side-to-side.

Fig. 16-Suspension Spring Adjusting Screws

IMPORTANT: Never turn adjusting screws, Fig. 16, all the way out. At least two threads on each screw must protrude through its respective adjusting nut.

NOTE: For the smoothest ride, leave the front adjusting screws loose with two threads protruding through the nuts. Tighten rear screws sufficiently to prevent suspension from "bottoming" on all but the severest bumps.

A firm setting should be used if a passenger is riding with the operator.

ADJUSTING STEERING RESPONSE

The Cyclone and Liquifire Snowmobiles are adjusted for maximum steering response and minimum lift on the skis at the factory.

The steering response can be decreased for trail or mountain riding in deep snow conditions by adjusting the steering response screws or repositioning the front pivot arm or both. The front pivot arm can only be repositioned on the 1976 Liquifire Snowmobiles (Serial No. -70,000). By adjusting the steering response screws or repositioning the front pivot arm, weight transfer to the track is increased. This weight transfer allows the front end weight of the snowmobile to shift to the rear of the snowmobile.

Ski Lift (Cyclone and Liquifire Snowmobiles)

Fig. 17-Steering Response Adjusting Screws

Adjust as follows:

1. Turning the screws, Fig. 17, out decreases steering response and gives lift to the skis.

2. Turning the screws in increases steering response and decreases lift on the skis.

3. Adjust screws equally.

IMPORTANT: On 340 and 440 Cyclone Snowmobiles, never back the adjusting screws out any further than "flush" with the weld nut. On 1976 340 and 440 Liquifire Snowmobiles (Serial No. 70,000), never back adjusting screws out more than 0.37 inch (9.39 mm) when front pivot arm is in the upper hole. Dimension is from the underside of adjusting screw to the top of the locking nut.

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Additional Ski Lift (1976 Liquifire Snowmobiles Only) (Serial No. 50,001-70,000)

This adjustment is to be used for extremely deep snow conditions when additional ski lift is needed beyond that which can be accomplished with the steering response screws.

1. Lift and support the rear of the snowmobile so track is clear of the ground. Back out the track adjusting screws to relieve track tension.

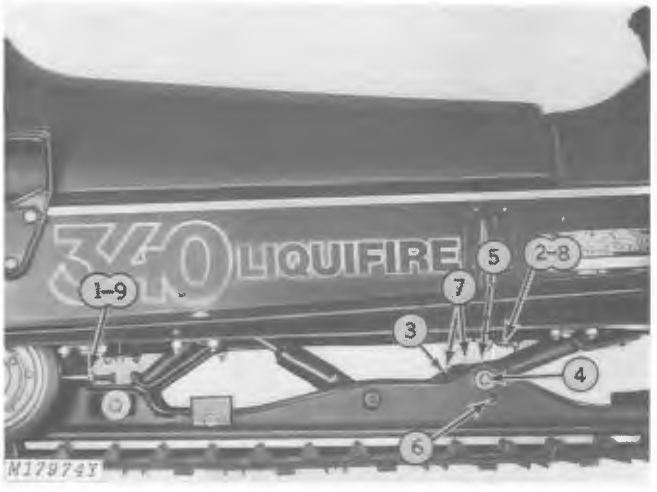

Fig. 18-Maximum Ski Lift Adjustments

2. Back out the front and rear suspension spring adjusting screws, Fig. 18, to relieve tension on the springs.

3. Back out steering response adjusting screws.

4. Remove cap screw securing front pivot arm shaft to right-hand slide rail.

5. Pull front pivot arm shaft with cap screw out the left-hand side of the snowmobile.

6. Move front pivot arm to the lower holes. Install shaft from left-hand side. Secure shaft to the right-hand slide rail with cap screw.

7. Turn in steering response adjusting screws. When front pivot arm is in the lower hole, turn screws in so that end of screw is flush with bottom of bushing. Continuing to turn the screws in will decrease ski lift.

CAUTION: When front pivot arm is in the lower holes and steering response screws are backed out the maximum allowable distance, sudden starts will lift the skis completely off the snow. Avoid this type of start because of lack of steering and the possibility of injury to the operator, passenger or both.

8. Install suspension spring adjusting screws. Adjust screws equally for desired ride.

9. Readjust track tension.

IMPORTANT: When front pivot arm is in the lower holes, track should be adjusted to 1-1/2 to 2 inches (38 to 50 mm) clearance between grouser bars and slide rail. DO NOT adjust track for less than this clearance.

10. Remove support from rear of snowmobile.

Ski Steering Control

For optimum steering control on cross country high speed running, skis should be installed to spindles by the front holes of the ski saddles. With skis in the front holes "castor" increases and ski "darting" is held to a minimum. For slow trail riding move skis to rear holes to reduce steering effort.

NOTE: For optimum ride and steering control (cross country high speed running) place the slide suspension front pivot arm in the upper holes. Install skis to spindles by front holes of ski saddles. For slow trail riding, place front pivot arm in upper holes and install skis to spindles by rear holes in ski saddles.

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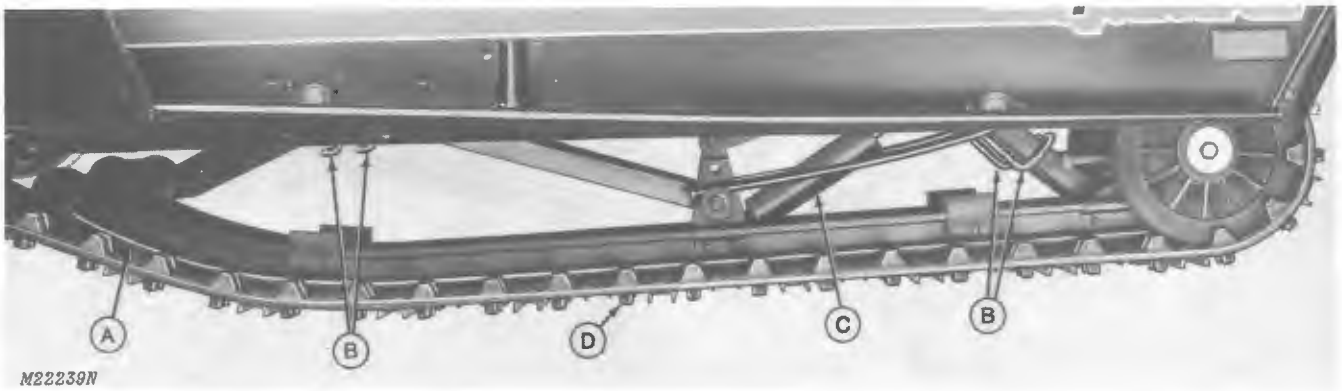
Litho in U.S.A.

Group 12
SLIDE SUSPENSION (Serial No. 80,001-)

GENERAL INFORMATION



A—Replaceable Wear Bars **B—Suspension Springs** **C—Shock Absorber** **D—Grouser Bar Track**

Fig. 1-Slide Suspension System

The slide suspension system consists of replaceable wear bars (A, Fig. 1), shock absorber (C), adjustable suspension springs (B) and a grouser bar track (D).

Replaceable polyethylene wear bars provide low friction between grouser bars and slide rail. The shock absorber dampens the suspension and the adjustable springs permit varying the degree of ride from soft to firm.

The molded rubber bars and lugs in the track give good traction on ice and during cornering. The molded-in-steel or riveted grouser bars provide good traction for acceleration. The steel grouser bars are also replaceable.

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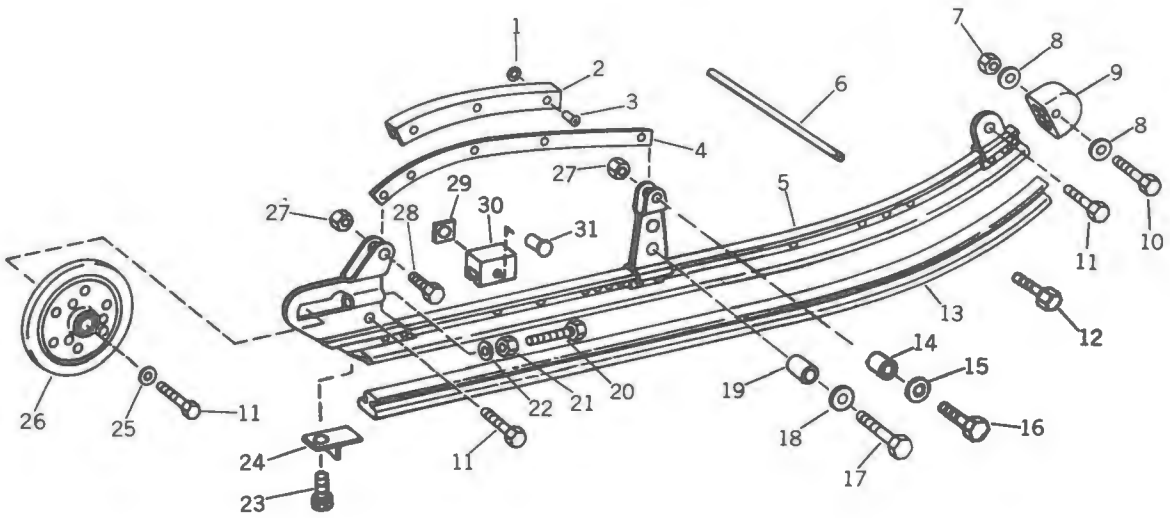
REPAIR



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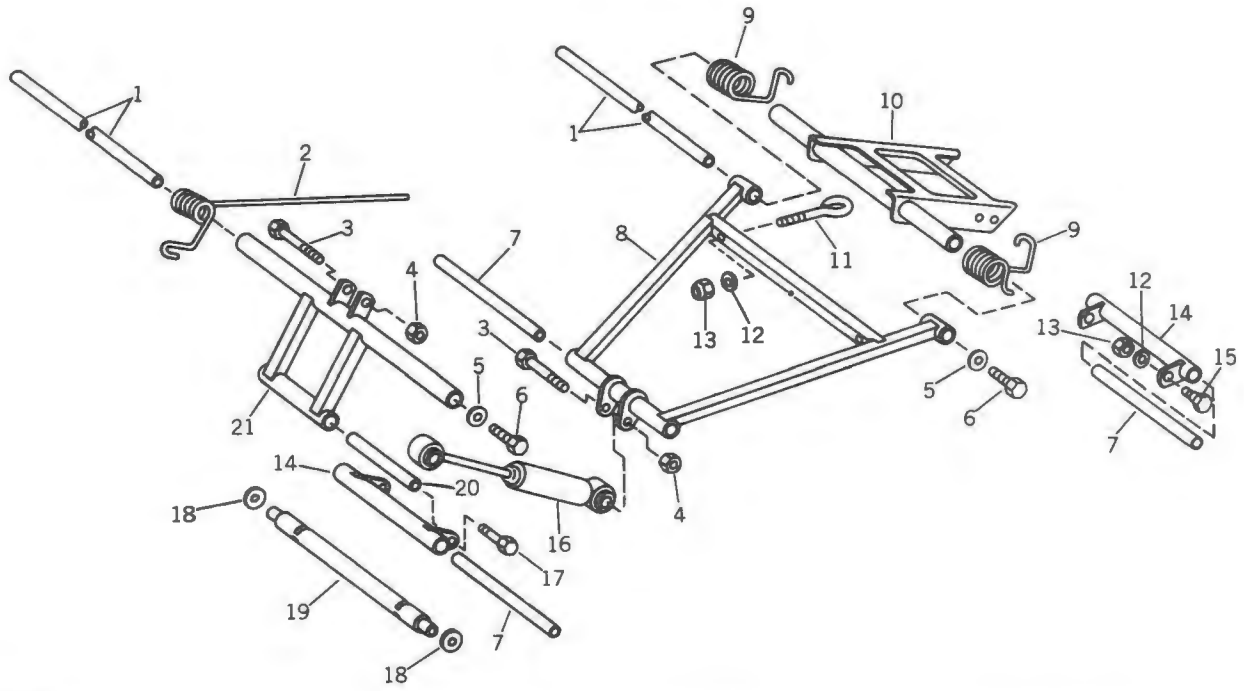
1—Flat Washer
2—Wear Strip
3—Pop Rivet
4—Track Guide
5—Slide Rail
6—Shock Absorber Shaft
7—Lock Nut
8—Flat Washer
9—Slide Rail Cap
10—Cap Screw
11—Cap Screw
12—Self-Tapping Bolt
13—Wear Bar
14—Spacer
15—Flat Washer
16—Cap Screw
17—Cap Screw
18—Flat Washer
19—Spacer
20—Cap Screw
21—Nut
22—Flat Washer
23—Cap Screw
24—Wear Bar Stop
25—Flat Washer
26—Rear Idler Wheel
27—Lock Nut
28—Cap Screw
29—Push Nut
30—Bumper
31—Rivet

Fig. 2-Exploded View of Rear Idler and Slide Rails



1—Pivot Shaft
2—Pivot Spring
3—Cap Screw
4—Lock Nut
5—Flat Washer
6—Bolt
7—Pivot Shaft
8—Front Swing Arm
9—Spring
10—Hinge
11—Eye Bolt
12—Flat Washer
13—Lock Nut
14—Pivot Tube
15—Hinge Bolt
16—Shock Absorber
17—Cap Screw
18—Flat Washer
19—Axle
20—Shaft
21—Swing Arm

Fig. 3-Exploded View of Pivots and Springs

Removing Slide Suspension

Remove suspension bolts, Fig. 4.

Lift up rear of snowmobile to remove suspension.

Fig. 4-Removing Suspension

Replacing Tunnel Wear Bars

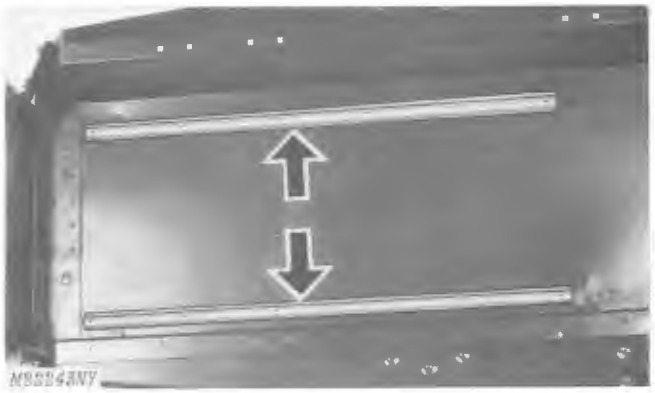


Fig. 5-Replacing Tunnel Wear Bars

Remove seat and suspension.

Chisel off rivets holding tunnel wear bars, Fig. 5, from seat side and remove wear bars.

Install new wear bars by installing rivets from wear bar side.

Replacing Slide Suspension Wear Bars

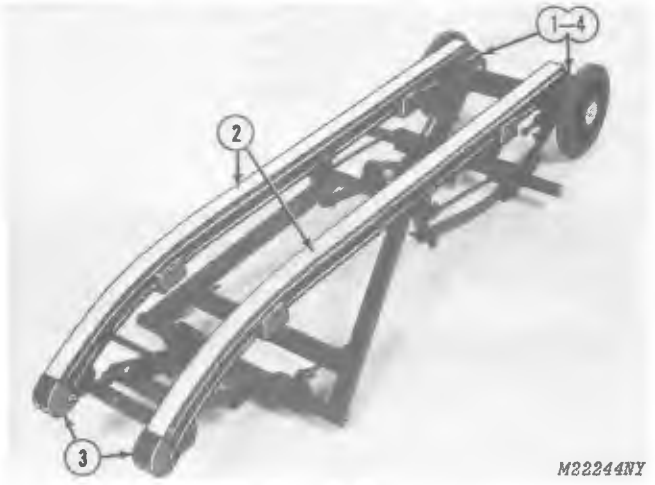
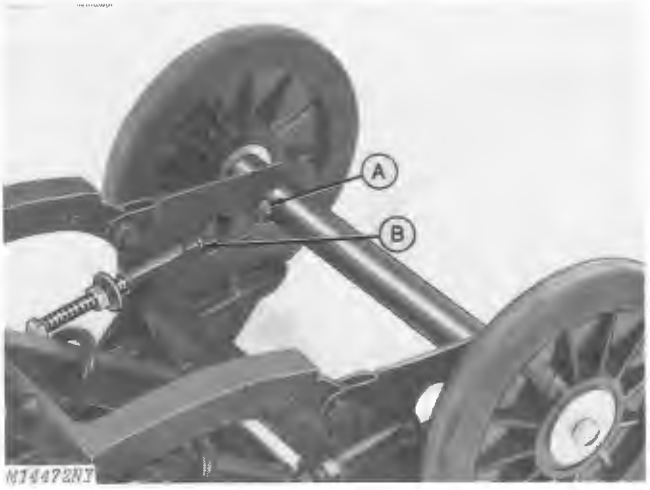


Fig. 6-Removing Wear Bar

NOTE: It is not necessary to remove the slide suspension to replace wear bars.

1. Remove rear stops.
2. Drive wear bar off slide rail with a hammer and chisel.
3. Drive wear bar onto slide rail with a soft mallet until it is flush with slide rail cap.
4. Install rear stops.

Replacing Idler Wheel Axle



A—Flat Surface **B—Adjusting Bolt**

Fig. 7-Replacing Axle

Whenever the idle wheel axle is being replaced, make sure the flat surface, (A, Fig. 7) faces the adjusting bolt (B).

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Replacing Slide Suspension Components

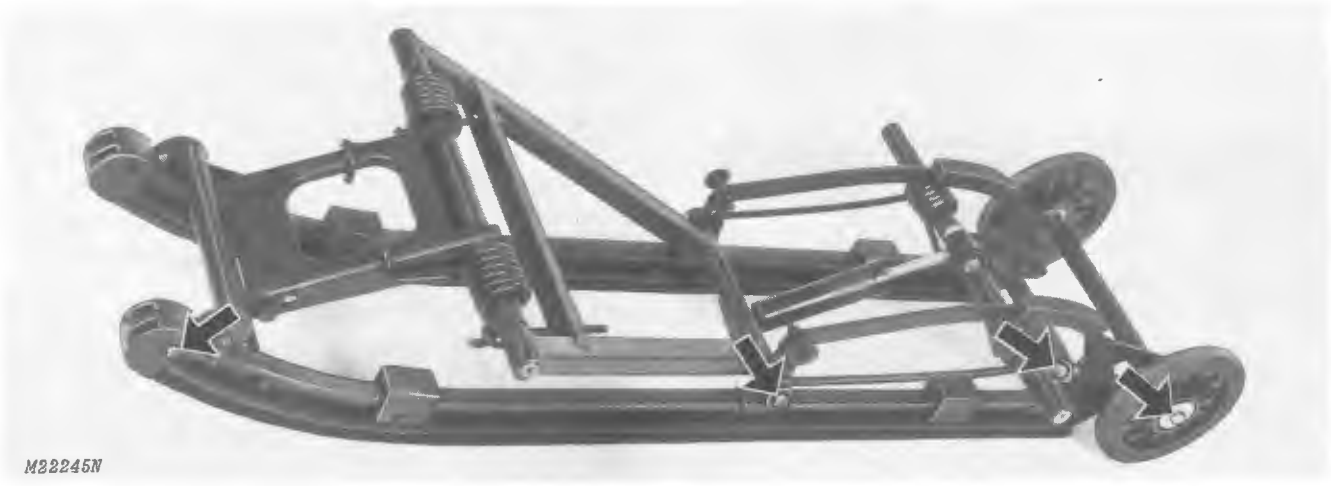


Fig. 8-Replacing Slide Suspension Components

Any components that must be replaced on the suspension should be reinstalled as shown in Fig. 8. Replace hardware indicated by the arrows and apply Loctite.

Installing Slide Suspension

Support snowmobile on it's side.

Place suspension inside track.

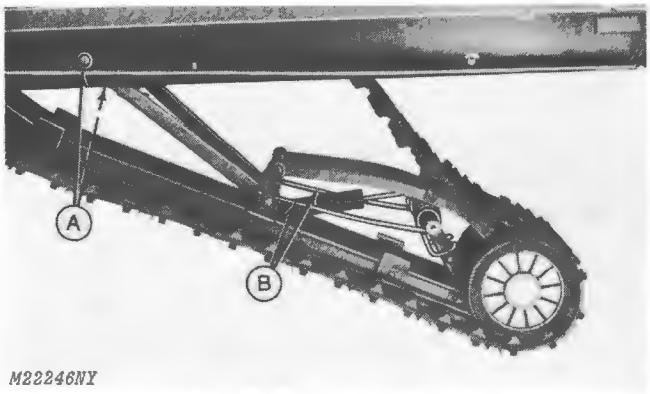
Install front suspension bolts (A), Fig. 9.

Disconnect the long end of rear pivot springs (B) from their anchor bolts to relieve tension.

Install rear suspension bolts (A), Fig. 10.

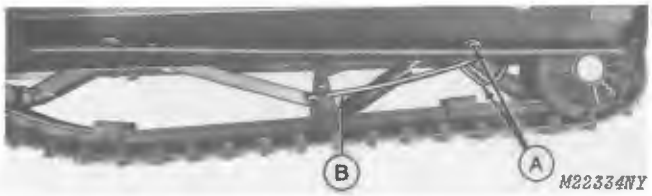
Retension rear pivot springs (B).

If necessary, tension track as instructed on page 60-12-6.



A—Front Suspension Bolts **B—Rear Pivot Springs**

Fig. 9-Installing Slide Suspension



A—Rear Suspension Bolts **B—Rear Pivot Springs**

Fig. 10-Installing Slide Suspension

ADJUSTMENTS

Adjusting Track Tension

Support rear of snowmobile so that track is clear of ground.

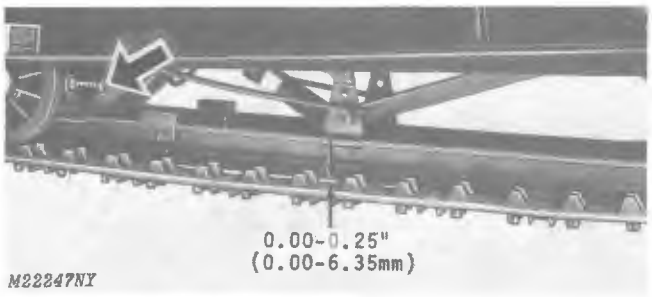


Fig. 11-Adjusting Track Tension

Tension the track to have 0.00 to 0.25 inch (0.00 to 6.35 mm) between the inside of track and bottom of the wear bar, Fig. 11. Measure below the shock absorber mount and make sure both sides are equal. Tighten jam nuts.

Start engine and idle track slowly until it rotates several times. Shut off engine and allow track to coast until stopped. DO NOT apply brake.

Check alignment as follows:

1. Rear idler wheels should run in center of drive lugs.

2. Slide rail wear bar should run in center of slide rail opening on each side of track.

If not, retension track.

NOTE: Tracks run to the loose side. For example, if the track is too far to the left side, tighten the left side to move track over.

Run track again to recheck.

Adjusting Slide Suspension Springs

Condition	Spring	Tension
Heavy or Two Riders Light Rider or Normal Riding	Rear	Increase Reduce
Deep Snow (for More Lift) Light Snow (for More Steering Control)	Front	Increase Reduce

Fig. 12-Tensioning Front Spring

Turn adjusting nuts counterclockwise to reduce tension or clockwise to increase tension, Fig. 12.

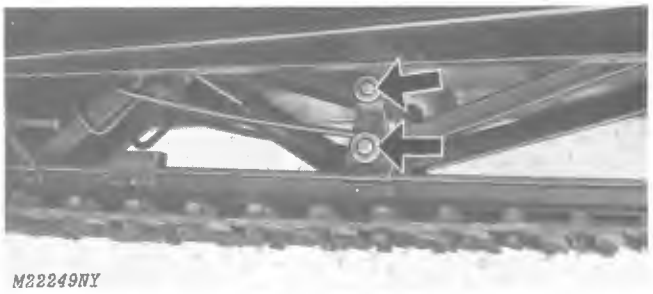


Fig. 13-Tensioning Rear Spring

Place long end of spring over bottom bolt to reduce tension or top bolt to increase tension, Fig. 13.

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Group 15
JOHN DEERE AND GOODYEAR TRACKS

GENERAL INFORMATION

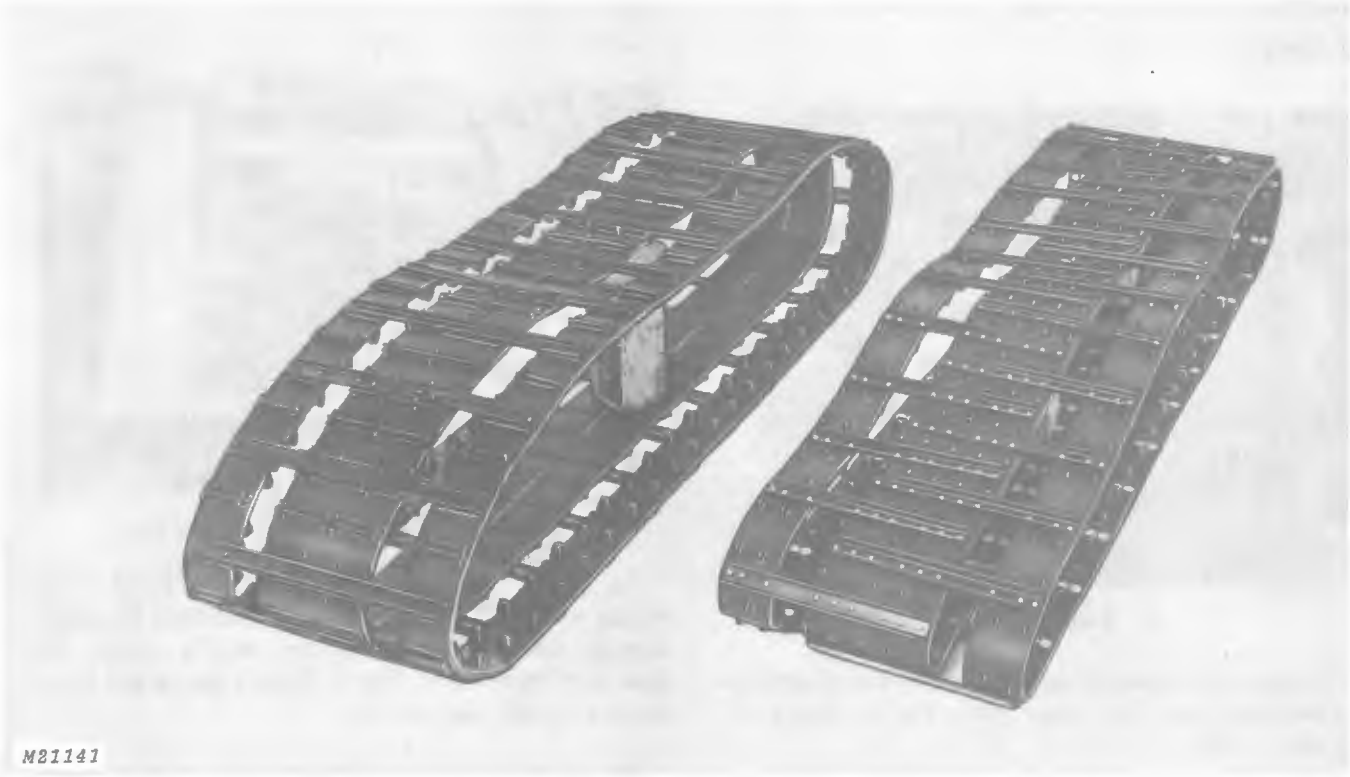

Fig. 1-John Deere and Goodyear Grouser Bar Tracks

The Goodyear grouser bar track, Fig. 1, is a molded rubber track with nylon fabric and fiberglass cord. The steel grouser bars are molded into the rubber and are replaceable.

The John Deere grouser bar track, Fig. 1, is of a similar material but the grouser bars are riveted in place rather than molded into the rubber. These bars are also replaceable.

The tracks are equipped with lugs on the inside of the track which engage with lugs on the drive wheels to provide smooth, efficient transfer of power.

Each grouser bar track is date coded as shown in Fig. 1. The date code is located in two places on the track, 180 degrees apart. The code indicates the month and year of manufacture and should be included on any warranty claim.

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GROUSER BAR TRACK ANALYSIS

NOTE: The grouser bar tracks are rugged and long-lasting, providing proper tension and alignment are maintained. The majority of track failures are caused by operator abuse.

Failures Covered Under Warranty

Ply Separation

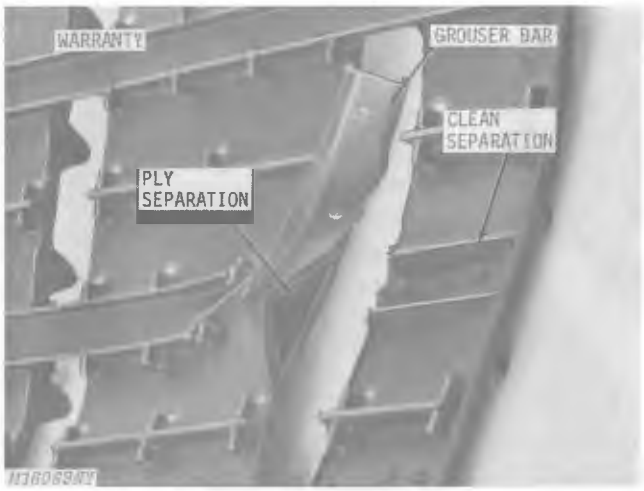

Fig. 2-Ply Separation

Ply separation can be identified by obvious parting of the rubber from the tensile cords, Fig. 2, on any of the three belts.

Track Stretch

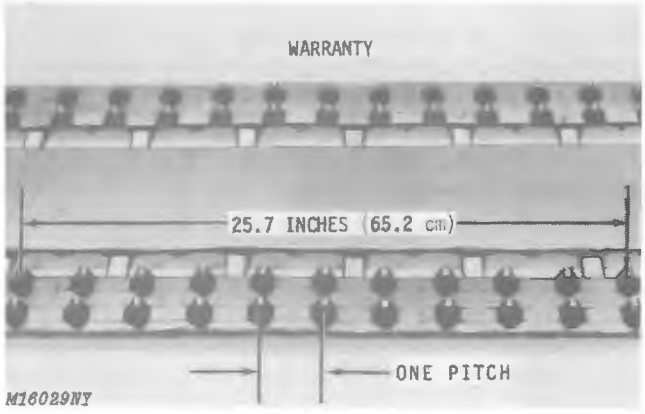

Fig. 3-Measuring Track for Stretch

Track stretch occurs only on a used track. The first indication of track stretch is running out of adjustment on the track-adjusting screws, making it impossible to adjust the track. Remove the used track and lay it flat. Measure ten pitches on the track. This distance should not exceed 25.7 inches (65.2 cm), Fig. 3.

NOTE: A pitch is the distance (center-to-center) from one drive lug to the other.

Poor Bond (Goodyear Tracks Only)

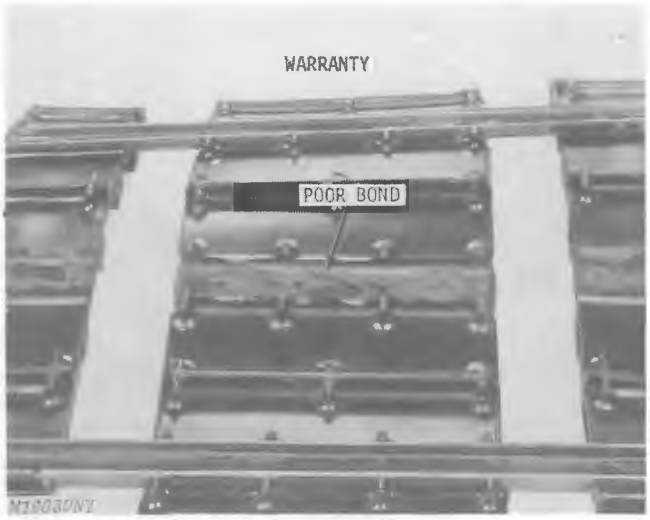

Fig. 4-Poor Bond of Rubber to Grouser Bar

If a grouser bar dislodges due to poor bond of the rubber to the metal bar, it can be identified by clean, straight, untorn lines of rubber, usually across the face of all three belts, Fig. 4. Such a failure will occur EARLY in the use period.

The metal grouser bar if found, will not have much, if any, rubber adhering to it.

Tensile Cord Mislocated

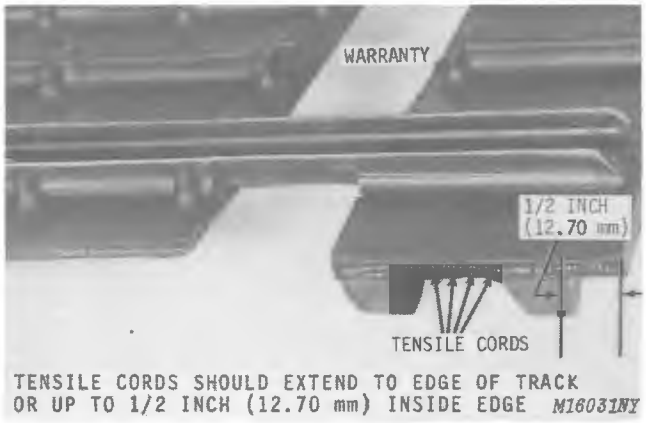

Fig. 5-Tensile Cord

The heavy tensile cords, Fig. 5, which are wound radially, should extend to the edge of the track or not more than 1/2 inch (12.70 mm) inside the edge.

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Variation in Track Thickness

Fig. 6-Variation in Track Thickness

A great variation in thickness, Fig. 6, could cause the track to vibrate and thump. A 0.060-inch (1.52 mm) variance in track thickness is the maximum allowed. Use a caliper and inside micrometer for measurements. Measurements should be taken on each belt of the track in four or five different places around the track.

Non-Warranty Failures

Obstruction Damage

Apparent cuts, slashes or gouges in the surface of the track are caused by obstructions such as broken glass, sharp rocks or buried steel. The track is highly resistant to obstructions but, invariably, damage will occur during rapid acceleration or side-skidding over foreign objects.

If the grouser bar is bent, broken, cracked or torn from the track due to buried objects, obstructions or road hazards, neither repair nor replacement will be considered for warranty.

Fig. 7-Grouser Bar Torn from the Track

When the grouser bar is torn from the track, rubber will be torn away from the bonding area, Fig. 7. The metal grouser bar will be bent, broken or damaged and will have rubber adhering to the bar.

Worn Grouser Bars

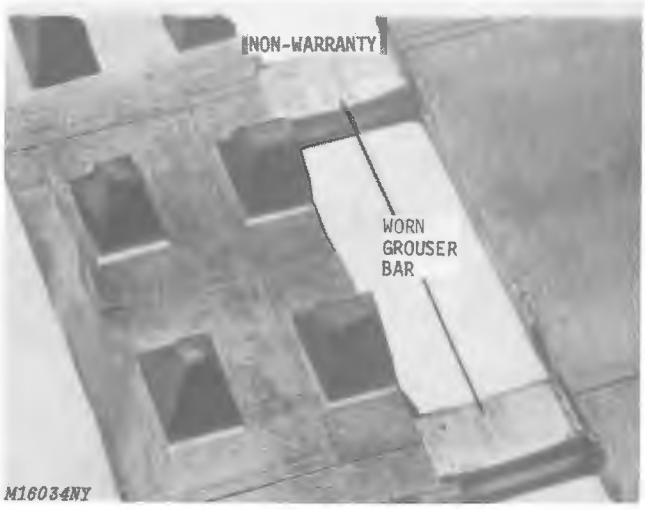

Fig. 8-Worn Grouser Bars

Excessively worn grouser bars, Fig. 8, are related to operating on rough and dry terrain such as non-snow covered fields, railroad and highway roadsides, gravel roads and other non-approved snowmobile field conditions.

The polyethylene suspension wear bar becomes hot and sand, dirt and grit imbed in the wear bar causing wear on the grouser bars. The suspension wear bars must be replaced.

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Lug Damage

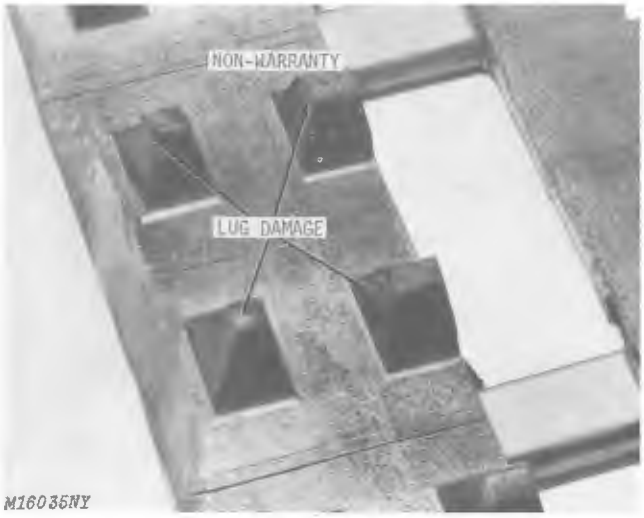

Fig. 9-Lug Damage

Lug damage, Fig. 9, to the sides or rear edges of the lug is usually caused by lack of snow lubrication. Excessive track tension, dirt or soil, (summer operating conditions) entering the drive mechanism is also a frequent cause.

Racheting Damage

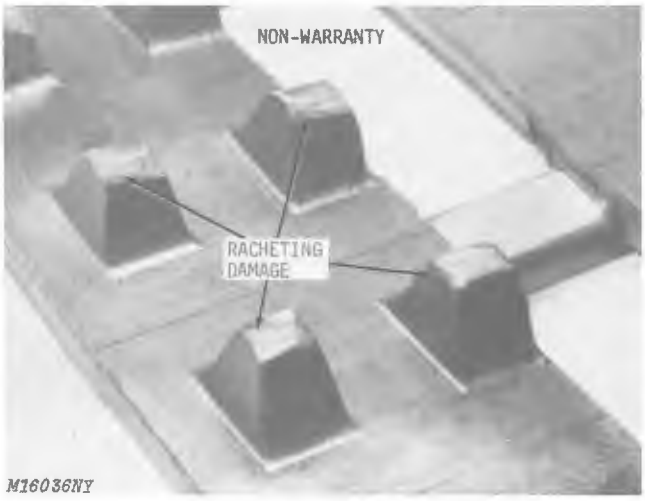

Fig. 10-Racheting Damage

Racheting damage, Fig. 10, to the top of the lugs is caused by insufficient track tension, pulling too great a load, or frequent prolonged periods of rapid acceleration. Constant "jack-rabbit" starts are not necessary with a snowmobile.

Over-Tension Damage

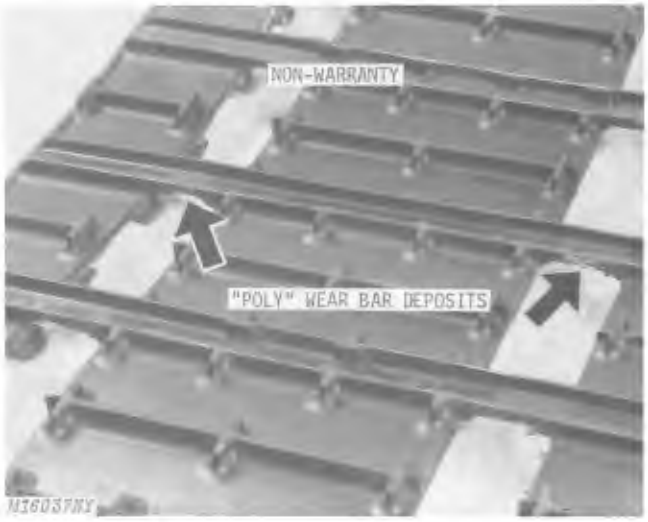

Fig. 11-Over-Tension Damge

Tightening the track too much causes excessive friction between the polyethylene wear bars and the grouser bars. The wear bars will melt and adhere to the grouser bars, Fig. 11.

The first indication of this condition is that the track may "stick" or have a tendency to "lock-up", causing loss of engine horsepower.

Loose Track Damage

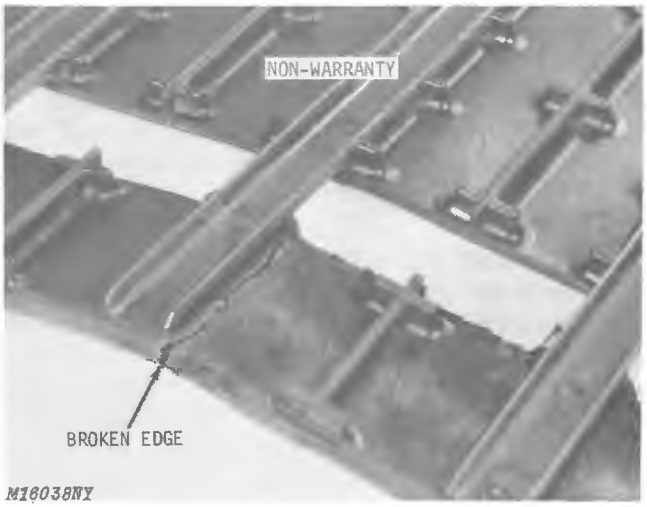

Fig. 12-Loose Track Damage

Operating a track loose causes the outer edge to flex too much, resulting in damage as shown in Fig. 12. Some wear on the driving lugs may also be visible. Riding double (excessive weight) can also cause the track to flex and break the edge.

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Impact Damage

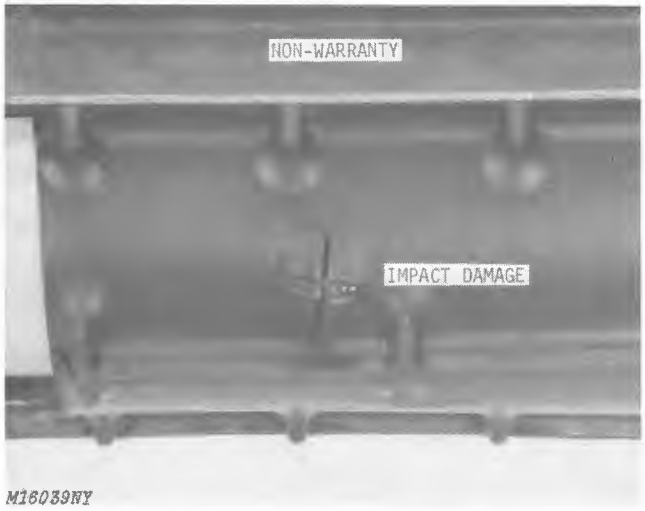


Fig. 13-Impact Damage

Impact damage, Fig. 13, will cause the rubber on the tread side to open up allowing the cords to become visible. This will happen in more than one place.

Edge Damage

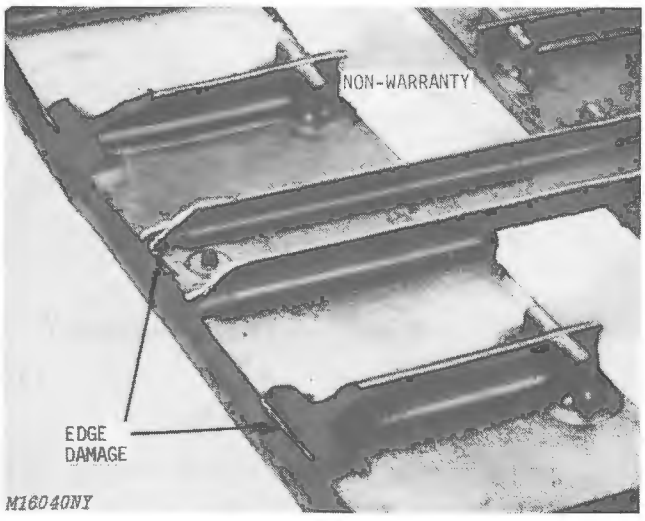


Fig. 14-Edge Damage

Edge damage of the type illustrated in Fig. 14, or similar damage, is the fault of the operator. The most frequent cause is tipping the snowmobile on its side to clear the track, allowing the track to come in contact with an abrasive surface.

Broken Grouser Bar

Grouser bar breakage is normal and expected in the center belt area of the track.

Grouser bars are notched and installed in a staggered pattern. This predetermines the fatigue area for grouser bar breakage, preventing breaks in unwanted areas. If the grouser bar breaks but still remains securely bonded to the center of the track, it is not necessary to replace the grouser bar.

DISASSEMBLY AND REPAIR

Replacing Grouser Bars

Goodyear Tracks

NOTE: Bent or broken grouser bars can be replaced individually. If the grouser bar is broken in the center but still securely attached to the belts it need not be replaced.

NOTE: If the JDST-24 Lift and Repair Stand is not available, turn the snowmobile on its side.

Fig. 15-Removing Grouser Bar
(Track Removed for Illustration Purposes)

⚠ CAUTION: Be sure fuel tank has been drained and capped. Keep propane torch away from fuel tank area.

Use a propane torch and apply heat to the grouser bar, Fig. 15.

Clamp a "Vise-Grip" pliers to the grouser bar and twist the bar loose from the belt.

NOTE: Use minimum heat required and break grouser bar loose from one belt at a time.

Position new grouser bar in place. Drill eight 3/16-inch (4.762 mm) holes in belts using the new grouser bar as a template.

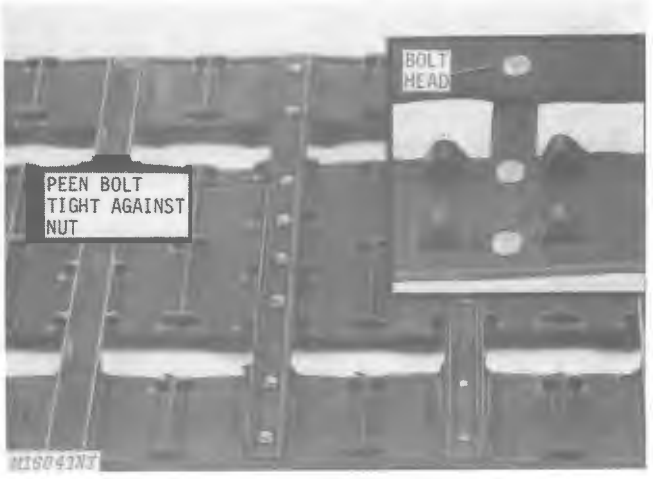


Fig. 16-Installing Grouser Bar

Use eight bolts and nuts (AM53418), Fig. 16, to secure grouser bar to track. Install bolt from the inside or drive lug side of the track, with nut to the outside. Tighten nut securely and then peen the bolt tight against the nut using two hammers; one for backing and the other for peening.

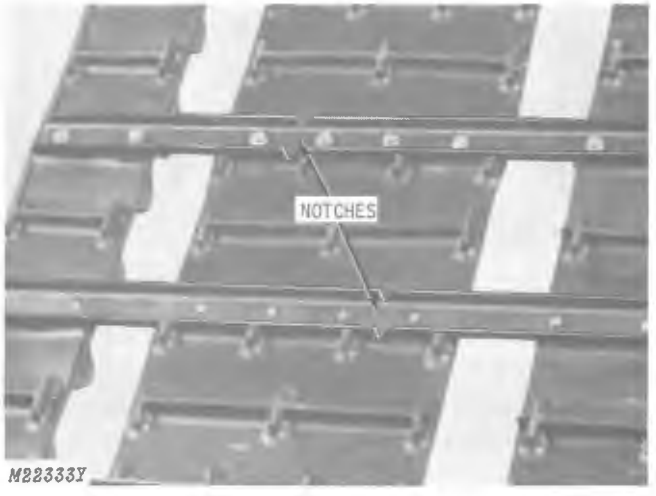


Fig. 17-Grouser Bars Installed in a Staggered Pattern

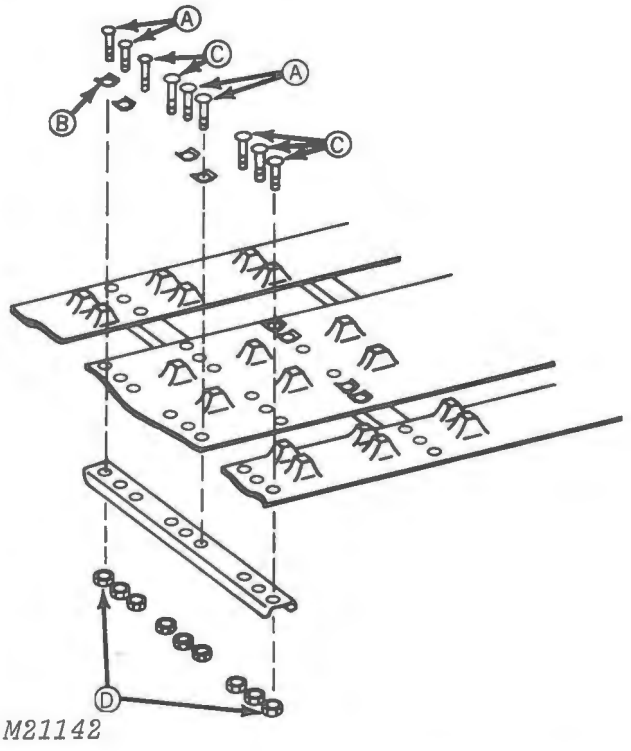
NOTE: When installing new grouser bars, notches in bars should be installed in a staggered pattern as shown in Fig. 17. This predetermines the fatigue area for grouser bar breakage, preventing breaks in unwanted areas.

John Deere Tracks

NOTE: Bent or broken grouser bars can be replaced individually. If the JDST-24 Lift and Repair Stand is not available, turn the snowmobile on its side.

CAUTION: Be sure fuel tank has been drained and capped.

Use a hammer and cold chisel to remove rivets securing grouser bar to track.



A—Small Head Stud Bolt
B—Backing Plate
C—Large Head Stud Bolt
D—Hex. Nuts

Fig. 18-Installing Grouser Bar

Install new grouser bar with four small head stud bolts (A), four backing plates (B), five large head stud bolts (C) and nine hex. nuts (D) as shown in Fig. 18.

NOTE: Be sure to assemble a backing plate (B) under the head of each small head stud bolt (A). Small head stud bolts and backing plates must be installed as indicated in Fig. 18, so they do not interfere with the idler wheels.

IMPORTANT: Use a hammer and chisel to peen the end of each stud bolt after tightening hex. nuts.

Removing Track and Drive Shaft

Siphon all fuel from the fuel tank and use a syringe to remove oil from the chain case. Close fuel shut-off valve.

Remove battery, if snowmobile is so equipped.

NOTE: If the JDST-24 Lift and Repair Stand is not available, turn the snowmobile on its side and remove the suspension.

Remove drive belt and secondary sheave. Disconnect speedometer cable from speedometer drive.

Remove chain case cover. Remove upper and lower sprockets, chain and chain tensioner.

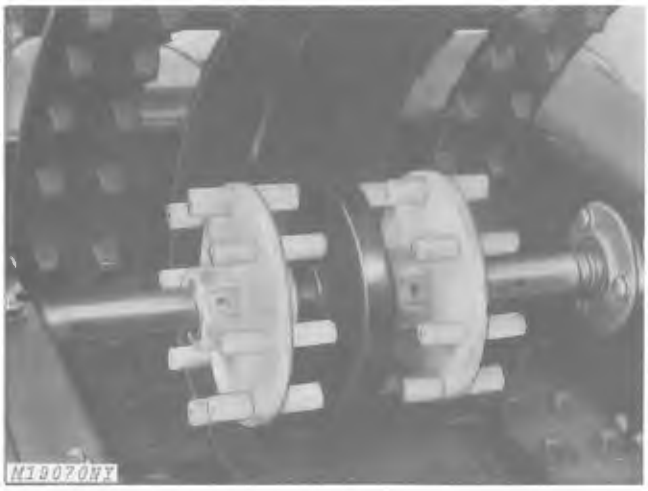


Fig. 19-Drive Wheels Positioned In The Center Snowmobile (Serial No. -80,000) Illustrated

Remove bolts securing drive wheels to drive shaft and slide drive wheels toward the center, Fig. 19. This allows access to bearing flangette cap screws.

Fig. 20-Removing Drive Shaft- Snowmobile (Serial No. -80,000) Illustrated

Remove cap screws securing drive shaft flangettes to tunnel, Fig. 20. Slide drive shaft toward the chain case side. Lift opposite end (with spacer) up far enough to clear tunnel and remove drive shaft.

Remove track from snowmobile.

Installing Track and Drive Shaft

Install new track in snowmobile tunnel.

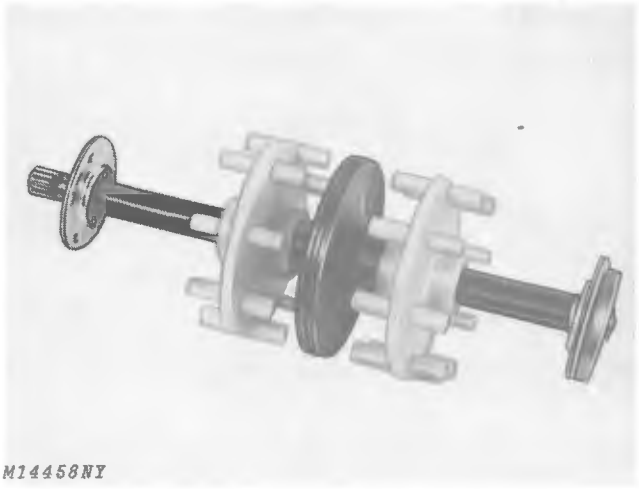


Fig. 21-Assembling Drive Shaft- Snowmobile (Serial No. -80,000) Illustrated

Assemble bearing flangettes, bearings, and spacer on drive shaft as shown in Fig. 21. Lubricate and install O-ring on chain case bearing.

IMPORTANT: Locking flanges on bearings must face splined end of drive shaft as shown in Fig. 21.

Install new gasket on side of flangette facing the chain case. Gasket sticks to flangette and is between flangette and chain case.

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Fig. 22-Installing Drive Shaft - Snowmobile (Serial No. -80,000) Illustrated

Position drive shaft assembly in tunnel, splined end first, Fig. 22.

IMPORTANT: Be certain O-ring on bearing between flangettes on chain case side is in correct position, or oil leakage will result.

Secure chain case bearing flangettes to chain case with three cap screws, Fig. 22. Do not tighten cap screws until opposite bearing flangette is secured to tunnel.

Insert speedometer core into left-hand end of drive shaft. Attach bearing flangettes, spacer and speedometer drive to tunnel with three cap screws. Tighten all cap screws securely.

Move drive wheels into position and secure with bolt and lock nut.

Install slide suspension. See page 60-10-6.

Turn the snowmobile right side up. Install sprockets, chain and chain tensioner in chain case.

NOTE: Upper and lower sprocket must be aligned within 0.010 inch (0.254 mm). Refer to page 50-25-8 for correct method of aligning sprockets.

Install speedometer cable to speedometer drive.

Install secondary sheave and drive belt.

Fill chain case with SAE 90 oil. Install battery if snowmobile is so equipped.

Fill fuel tank and open fuel shut-off valve.

Adjusting Track Tension

Refer to page 60-10-7.

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Group 20
SKIS AND STEERING

GENERAL INFORMATION

A—Spindle Housing
B—Ski Spring
C—Skis
D—Steering Arm
E—Tie Rod
F—Steering Post

Fig. 1-Skis and Steering

The skis, Fig. 1, have replaceable wear rods, wear plates, mono-leaf springs, 3 or 4-leaf springs and shock absorbers. The 3 and 4-leaf springs are replaceable as a complete unit only. Because spring leaves wear out simultaneously, replacing only the broken leaf would result in early failure of another leaf.

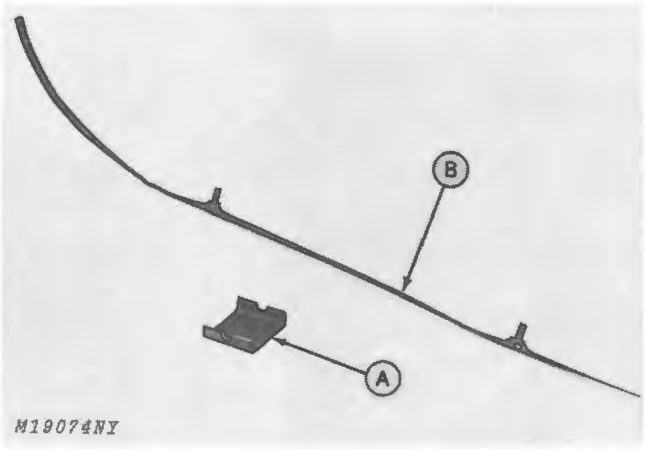
The ski spindles are mounted in replaceable bearings and the bearings are pressed into the spindle housings.

The tie rod and drag link ends are color-coded for convenience; silver color indicates right-hand threads, gold color indicates left-hand threads. The tie rod, drag link and spindles are designed to bend rather than break when subjected to severe shock loads.

The one-piece handlebar steering column is mounted in rubber at the top and a replaceable nylon bushing at the bottom.

ANALYSIS

⚠ CAUTION: Worn, bent, or damaged ski and steering components are unsafe. Remember, a snowmobile travels at near-highway speeds.

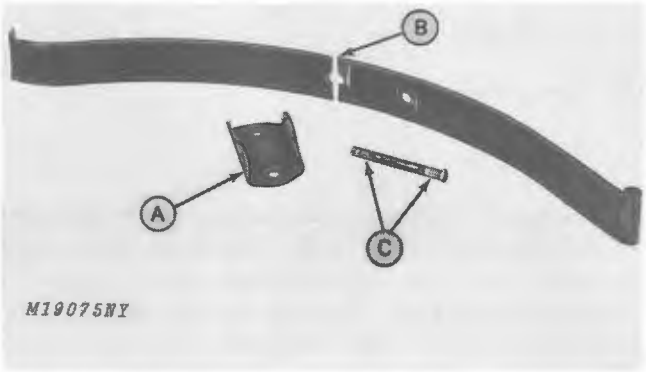


A—Wear Plate **B—Worn Wear Rod**

Fig. 2-Wear Plate and Wear Rod

Replace the wear rods (B) on the skis if worn as shown in Fig. 2. Rapid wear of this type indicates operation without snow lubrication. Worn wear rods are unsafe because they cause a loss of snowmobile maneuverability.

Replace the ski wear plates (A, Fig. 2) if badly worn or damaged. If a worn out wear plate is not replaced, the ski spring will wear through the ski, making ski replacement necessary.



A—Bent Ski Saddle **C—Pin Wear**
B—Broken Ski Spring

Fig. 3-Ski Spring, Saddle and Pin

Replace ski springs (B) if found broken, Fig. 3, or damaged.

Inspect ski saddles (A, Fig. 3) and replace if bent or damaged. A bent saddle indicates ski was subjected to severe forces, such as hitting an obstruction at high speed, or landing on one ski after jumping.

Replace ski attaching pins (C, Fig. 3) if worn.

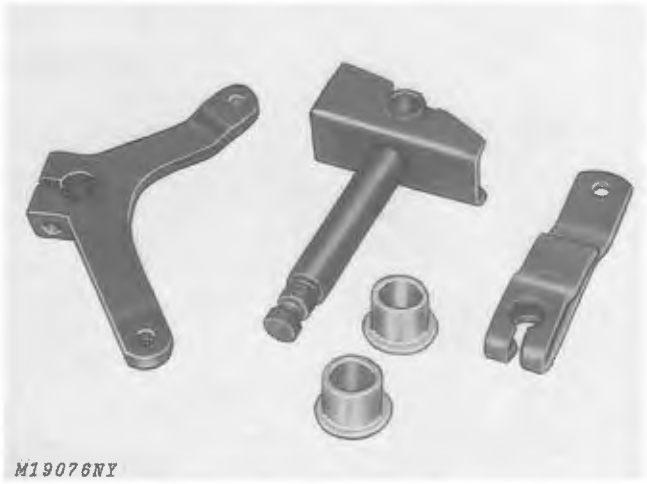


Fig. 4-Steering Arms Spindle and Bushings

Stripped spindle and steering arm splines, Fig. 4, indicate operation without steering arm attaching cap screws tight or improper installation of steering arm. Never force steering arms into place.

A bent spindle, Fig. 4, indicates ski was subjected to severe forces such as hitting an obstruction at high speed or landing on one ski after jumping. Whenever damage of this type is found, closely examine the rest of the ski and steering mechanism for bends, damage or cracks.

Replace ski spindle bushings, Fig. 4, if worn, cracked or damaged.

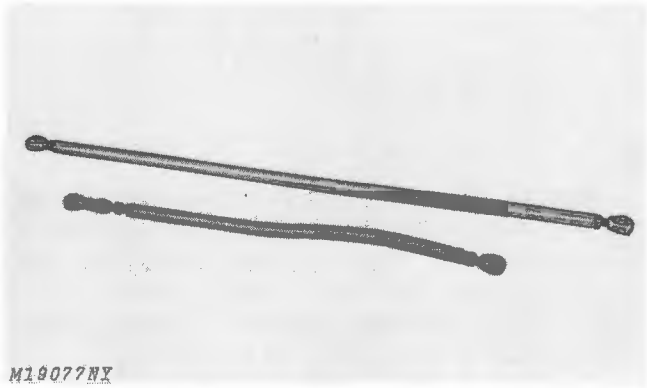
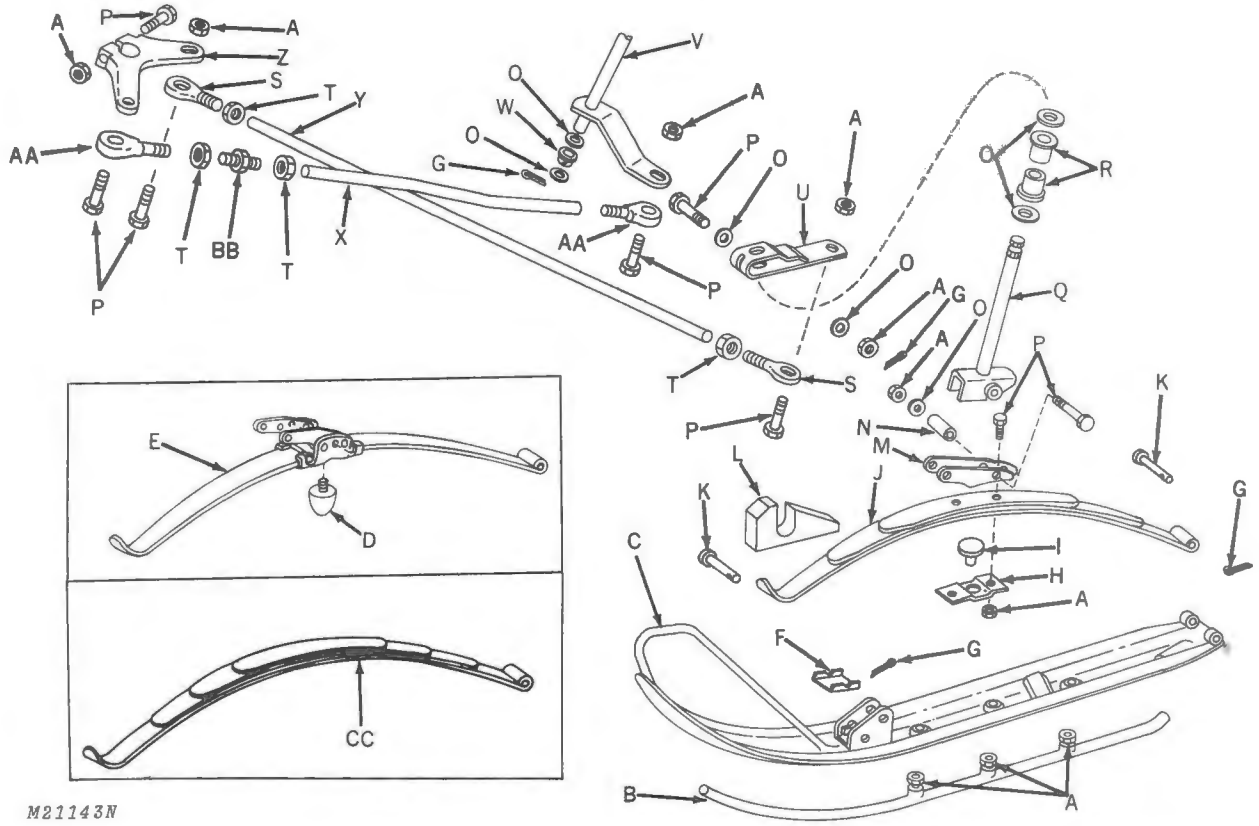


Fig. 5-Tie Rod and Drag Link

A bent tie rod or drag link, Fig. 5, indicates ski was subjected to severe forces. Replace the tie rod or drag link and closely inspect the rest of the steering mechanism for damage.

Replace tie rod and drag link ends, Fig. 6, if excessively loose. A loose end can cause sloppy steering and could be a safety hazard.

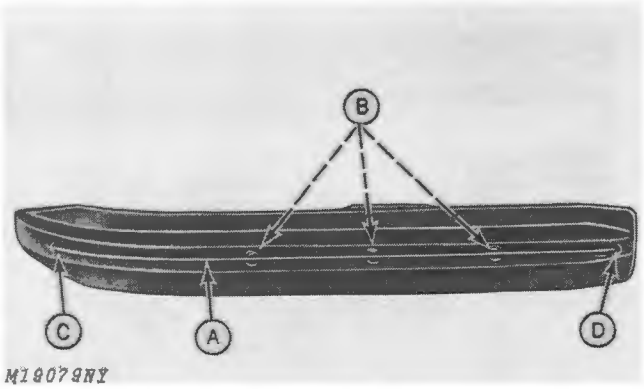
REPAIR



A—Lock Nut
B—Wear Rod
C—Ski
D—Ski Bumper
E—Mono-leaf Ski Spring
F—Wear Plate
G—Cotter Pin
H—Bumper Retainer (Liquifire)
I —Ski Bumper
J—3-leaf Ski Spring
K—Drilled Pin
L—Ski Spring Stop
M—Ski Saddle
N—Spacer
O—Washer
P—Cap Screw
Q—Spindle
R—Bushing
S —Tie Rod End
T —Jam Nut
U—Steering Arm (Left-Hand Side)
V —Steering Post
W—Steering Post Bushing
X—Drag Link
Y—Tie Rod
Z—Steering Arm (Right-Hand Side)
AA—Drag Link End
BB—Adjusting Screw
CC—4-Leaf Spring

Fig. 6-Exploded View of Skis and Steering Mechanism

Replacing Ski Wear Rods



A—Wear Rod
B—Lock Nuts
C—Front Hole
D—Rear Hole

Fig. 7-Replacing Wear Rod

Remove the lock nuts (B, Fig. 7) securing the wear rod (A) to the ski. Pry wear rod down to get studs out of holes; then slide rod forward to remove back of rod from rear hole (D) in ski, and remove.

Place forward end of new wear rod in position and slide it rearward, positioning back end of rod and studs into holes in ski. Install lock nuts and tighten securely.

Replacing Wear Plates

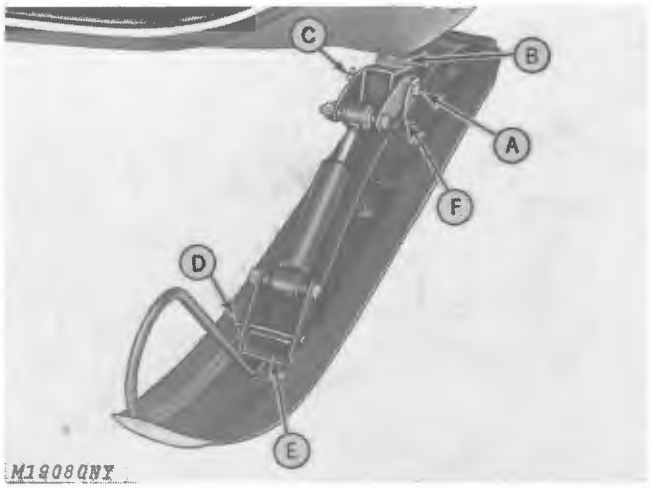
NOTE: Ski spring does not have to be removed to replace wear plate.

Remove pin securing forward end of ski spring. Lift spring up slightly and slide out old wear plate.

Slide new wear plate into position, drop forward end of spring and secure with pin and cotter pin.

Replacing Ski Springs

The three- and four-leaf ski spring is available only as an assembly including the saddle, bumper retainer and bumper. The mono-leaf spring, saddle and bumper are also replaced as an assembly. The bumpers are replaceable individually on both springs. The saddle is replaceable on the three- and four-leaf springs.



A—Cap Screw
B—Ski Spindle
C—Cotter Pin
D—Drilled Pin
E—Wear Plate
F—Ski Spring Stop

Fig. 8-Replacing Ski Springs

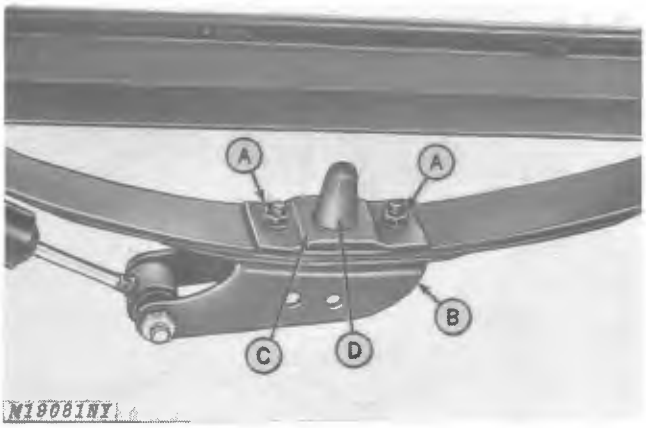
Remove cap screw (A, Fig. 8) securing the ski to the ski spindle (B). Remove ski spring stop (F) from spindle (B).

Remove cotter pins (C) and drilled pins (D, Fig. 8) securing the spring assembly to the ski.

Install new wear plate (E) if necessary. Install new spring assembly to ski with drilled pins and cotter pins. Install spacer in ski spindle and place ski spring stop over spindle. Attach ski assembly to spindle with cap screw, washer, and lock nut. Torque nut to 39 ft-lbs (53 Nm).

Replacing Ski Bumpers and Saddles

Three- and Four-Leaf Springs



A—Lock Nuts
B—Saddle
C—Bumper Retainer
D—Bumper

Fig. 9-Three-Leaf Spring

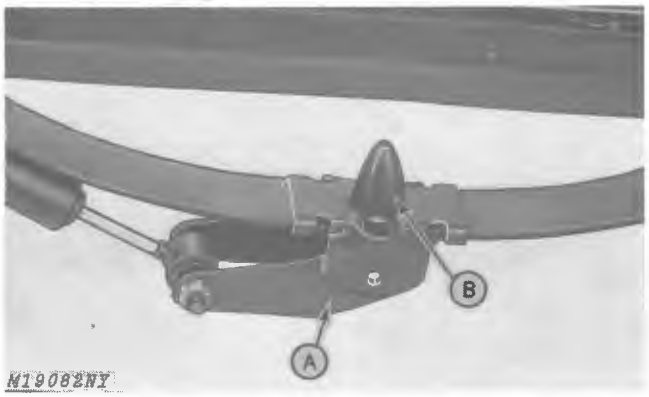
Remove the two lock nuts (A) securing the saddle (B) and bumper retainer to the ski springs, Fig. 9.

Remove the bumper retainer (C). Install a new bumper (D) and secure with bumper retainer and lock nuts. Tighten nuts to 35-43 ft-lbs (47 to 58 Nm).

IMPORTANT: Check condition of two cap screws securing saddle and bumper retainer to ski springs. Replace cap screws if worn. Replace saddle if necessary.

Mono-Leaf Spring

The mono-leaf spring and saddle (A, Fig. 10) must be replaced as an assembly. The bumper (B) screws into the bottom of the saddle, and is replaceable.



A—Saddle
B—Bumper

Fig. 10-Mono-Leaf Spring

Replacing Ski Spindles and Bushings

Remove ski and spring assembly and ski spring stop from the spindle. Remove spacer from the spindle.

Remove the cap screw, washers and lock nut securing the steering arm to the spindle and drive the spindle down and out of the front frame. Replace bushings if worn, damaged, or cracked.

Replace bushings as follows:

Fig. 11-Removing Steering Spindle Bushings

1. Use a drift punch to remove bushings as shown in Fig. 11. Drive lower bushing out from the top. Reverse procedure to remove the upper bushing.

2. Install new bushing until bushing bottoms on front frame. Use care not to crack or distort bushing during installation.

Slide ski spindle up into place from the bottom.

Install spacer in spindle. Place ski spring stop over the spindle and install ski and spring assembly.

Secure with cap screw, washer, and lock nut. Tighten nut to 39 ft-lbs (53 Nm) torque.

Replacing Steering Arms

Position handlebars and skis to point straight ahead.

Remove exhaust silencer.

Disconnect tie rod from left- and right-hand steering arms. Disconnect drag link from right-hand steering arm. Remove steering arm retaining cap screws and lift arms off steering spindles.

Fig. 12-Replacing Steering Arms

With skis and handlebars pointing straight ahead, place steering arm over spindle. To be sure steering arm is correctly installed, measure from the center of the tie rod hole in the arm to the snowmobile frame. The approximate distance should be 5.9 inches (14.9 cm) as shown in Fig. 12. This distance may vary by 1/8-inch (3.175 mm) due to spline alignment of arm and spindle. When steering arm is positioned correctly on spindle, secure steering arm with cap screw, washers and lock nut.

IMPORTANT: The approximate 5.9 inch (14.9 cm) distance from steering arm to snowmobile frame is very important. This places the steering arms at the proper angle to prevent any interference in steering effort.

Connect tie rod and drag link to steering arms and align skis. See page 20-7.

Install exhaust silencer.

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Replacing Tie Rod and Drag Link

Remove cap screws securing tie rod and drag link. Remove tie rod through knock-out hole on left-hand side of pan.

Install new tie rod. Attach gold-colored end to left-hand steering arm and silver-colored end to right-hand steering arm. Silver color indicates right-hand threads. Gold color indicates left-hand threads.

Install new drag link to steering post and right-hand steering arm. Adjusting screw end of drag link must be attached to steering arm.

Align skis. Adjust drag link and tie rod. See page 20-7.

Replacing Steering Post Assembly

Remove seat and air intake silencer.

Close fuel shut-off valve and disconnect fuel line from in-line fuel filter. Remove fuel tank. Disconnect drag link from steering post. Remove cotter pin and washer from bottom of steering post.

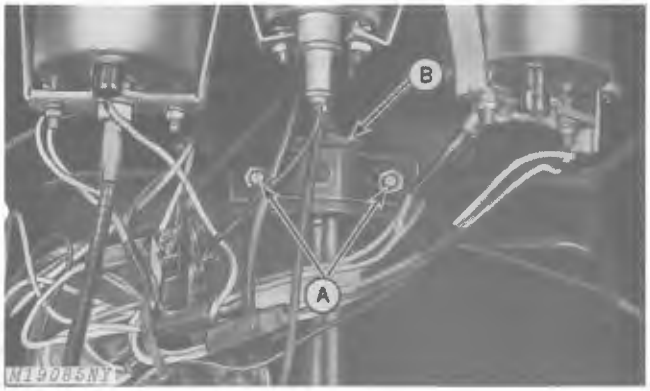
Remove upper rubber bushing from bushing bracket. Remove bracket from dash.

Remove brake and throttle grips from handlebar. Pull up and twist and turn steering post to remove it.

Reinstall in the opposite sequence.

Replacing Steering Post Bushings

Upper Bushing

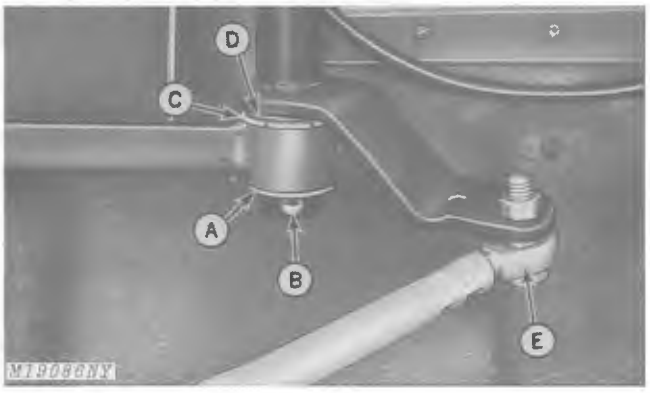


A—Lock Nuts **B—Bushing**

Fig. 13-Replacing Upper Bushing

Remove two lock nuts (A, Fig. 13) and clamp securing bushing (B). Open bushing and remove from steering post. Install in opposite order.

Lower Bushing



A—Washer
B—Cotter Pin
C—Bushing
D—Washers
E—Drag Link

Fig. 14-Replacing Lower Bushing

Disconnect drag link (E, Fig. 14) from steering post.

Remove cotter pin (B) and washer (A) from end of steering post. Slide steering post up sufficiently to remove two washers (D) and bushing (C).

Install new bushing, place two washers over steering post and slide it back in place. Secure with washer and cotter pin.

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ADJUSTMENT

Aligning Skis

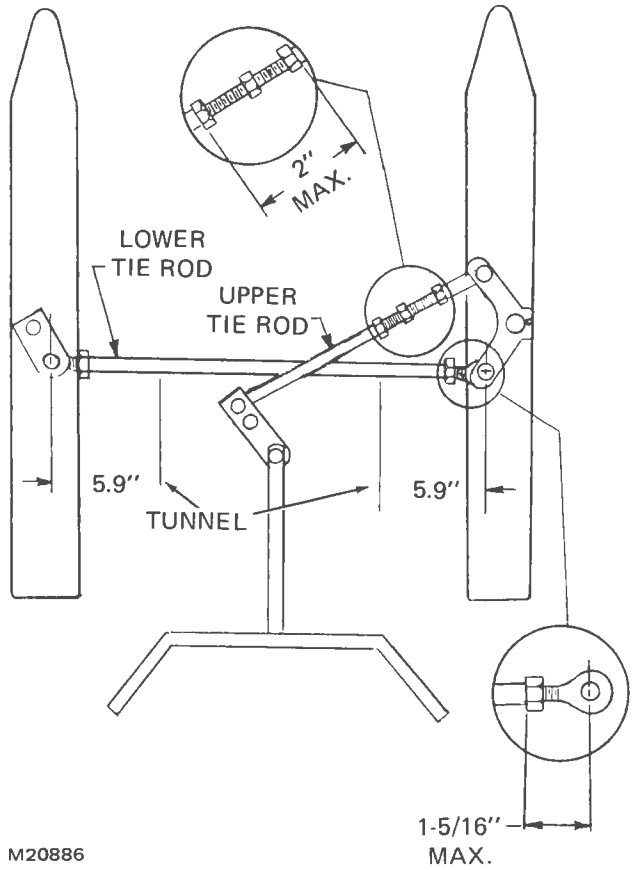

Fig. 15-Aligning Skis

Fig. 15 shows the proper positioning of the skis in relationship to the steering arms, tie rods and steering column.

To align skis:

1. Raise the front of the snowmobile slightly to remove weight from the skis.

2. Position the handlebars straight ahead.

3. Measure the distance over the front and rear wear rod nuts. The two dimensions should be the same.

4. If the adjustment is necessary, remove the exhaust silencer for access to the tie rods.

5. Loosen the jam nuts on each end of the lower tie rod. Rotate the tie rod until the skis are parallel and tighten the jam nuts.

NOTE: Turn the tie rod toward the front of the snowmobile to spread the skis apart. Turn tie rod toward the rear of the snowmobile to bring the skis together.

6. To realign the handlebars, loosen jam nuts on both sides of the adjusting screw on the upper tie rod. Rotate the adjusting screw until the handlebars are aligned. Tighten the jam nuts.

IMPORTANT: DO NOT exceed 1-5/16 inches (33.34 mm) between tie rod and center of tie rod end when adjusting the tie rod. DO NOT exceed two inches (50.58 mm) between the drag link and drag link end when adjusting drag link.

7. After aligning the skis, make sure all the jam nuts are tight. Install the exhaust silencer.

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Eliminating Loose Steering

Fig. 16-Correcting Loose Steering

The two major causes of loose steering are as follows:

1. Excessively worn tie rod ends, Fig. 16.
2. Excessively worn spindle bushings, Fig. 16.

Tighten and replace parts as necessary.

⚠ CAUTION: Make it a habit to frequently check steering components and hardware for condition and tightness.

Group 25
SPECIFICATIONS

TORQUE FOR HARDWARE

Location	Torque
Lower Chain Case Sprocket Retaining Cap Screw	30 to 38 ft-lbs (40 to 52 Nm)
Driven Sheave Retaining Cap Screw	20 ft-lbs (27 Nm)
Ski Mounting Cap Screw	39 ft-lbs (52 Nm)
Ski Saddle to Ski Spring	35 to 43 ft-lbs (47 to 58 Nm)

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Section 70
SERVICE TOOLS
Group 5
ESSENTIAL SERVICE TOOLS

CONTENTS

The essential tools listed in this group will service all John Deere Snowmobiles. These essential tools are required for all snowmobile dealers. They can be ordered from:

Service Tool Division
Owatonna Tool Co.
P.O. Box 314
Owatonna, Minn. 55060

ENGINE TOOLS

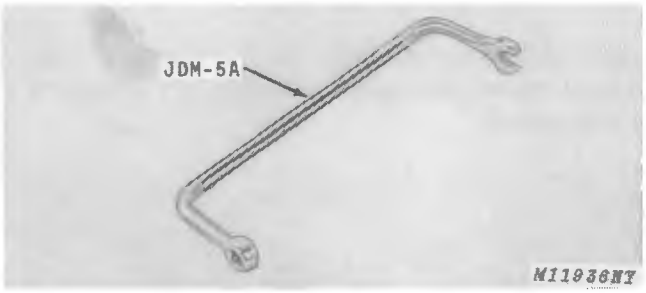

Fig. 1-Cylinder Nut Wrench

JDM-5A Cylinder Nut Wrench, Fig. 1, provides a means of removing and retorquing the cylinder-to-crankcase nuts.

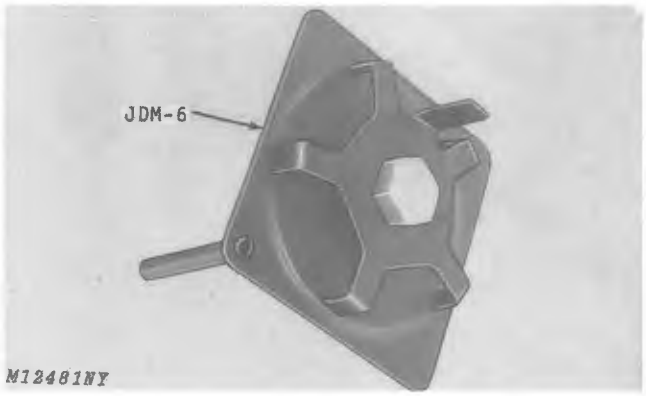

Fig. 2-Starter Spring Winding Tool

JDM-6 Starter Spring Winding Tool, Fig. 2, enables recoil starter springs to be rewound in a fast, safe and easy operation.

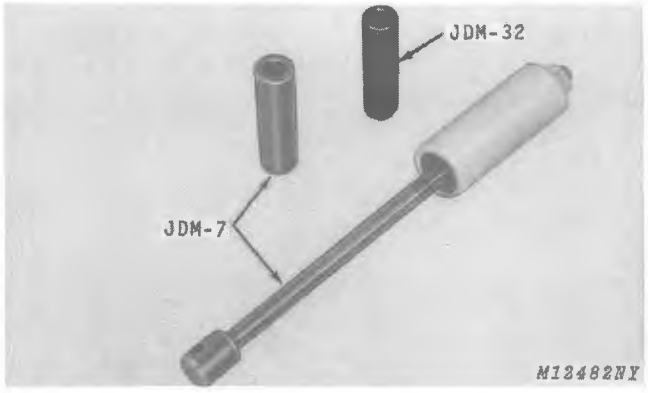

Fig. 3-Piston Pin Service Tools

JDM-7 Piston Pin Service Set, Fig. 3, is used to remove and install piston pins without damage to piston or rod bearings.

ENGINE TOOLS—Continued

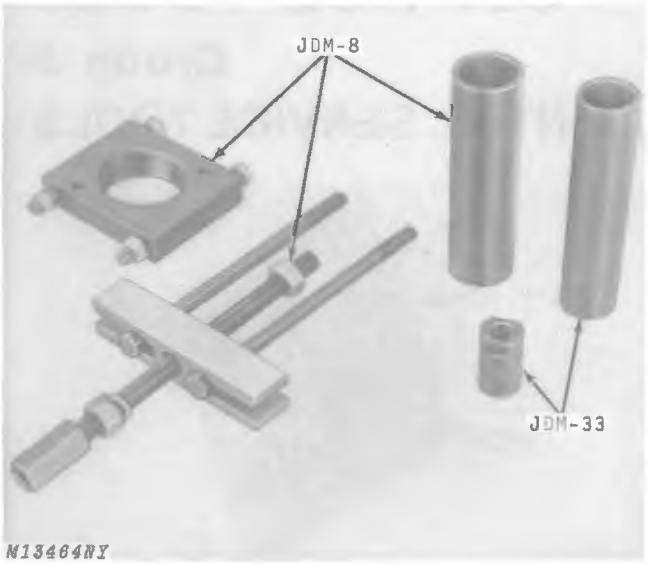

Fig. 4-Crankshaft Bearing Service Set and Bearing Tool Adapter Kit

JDM-8 Crankshaft Bearing Service Set and JDM-33 Bearing Tool Adapter Kit, Fig. 4, are used to remove and install the crankshaft bearings.

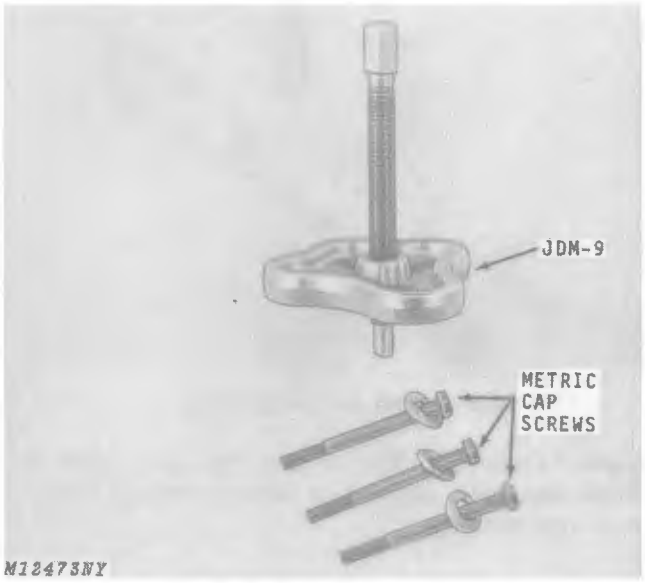

Fig. 5-Flywheel Puller Assembly

JDM-9 Flywheel Puller Assembly, Fig. 5 is a versatile puller that includes metric cap screws and washers to remove the flywheel.

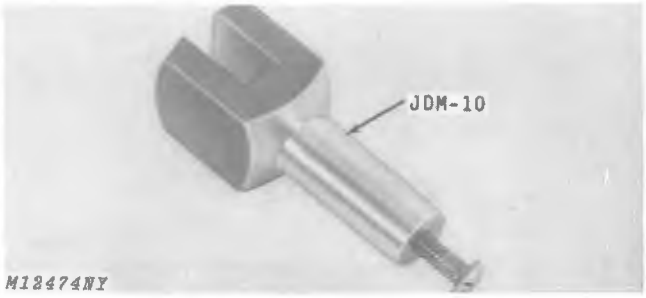

Fig. 6-Dial Indicator Mounting Bracket

JDM-10 Dial Indicator Mounting Bracket, Fig. 6, is used with JDM-15 or an equivalent dial indicator to measure the crankshaft runout.

Fig. 7-Spanner Wrench

JDM-30 Spanner Wrench, Fig. 7, is used to hold the axial cooling fan during assembly and disassembly procedures.

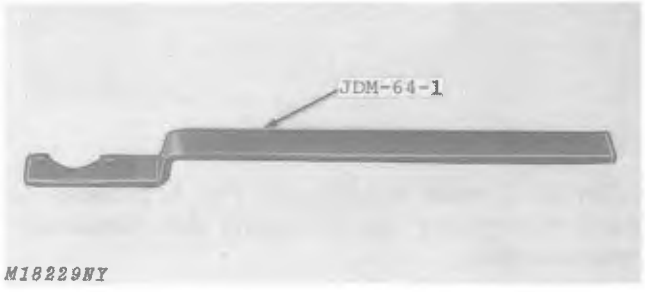

Fig. 8-Flywheel Holding Tool

JDM-64-1 Flywheel Holding Tool, Fig. 8, prevents the flywheel from rotating while removing and installing the retaining nut.

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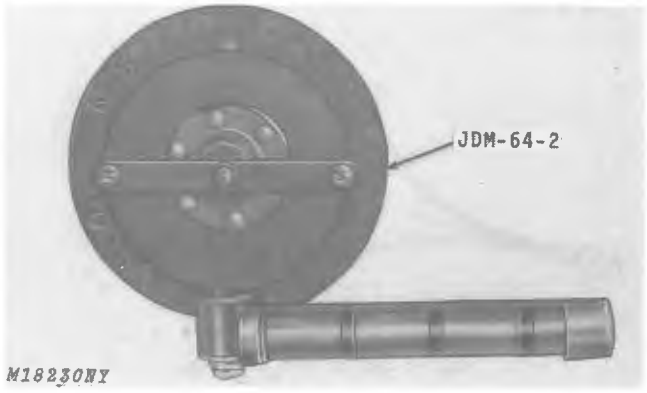

Fig. 9-Air Flow Meter

JDM-64-2 Air Flow Meter is used to fine tune the Mikuni carburetors.

CLUTCH TOOLS

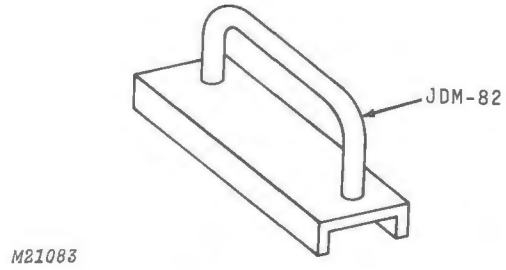

Fig. 10-Chain Tensioner Tool

JDM-82 Chain Tensioner Tool holds the chain tensioner "OPEN" during the installation of the drive chain and sprockets on 1976 Cyclone and Liquifire Snowmobiles.

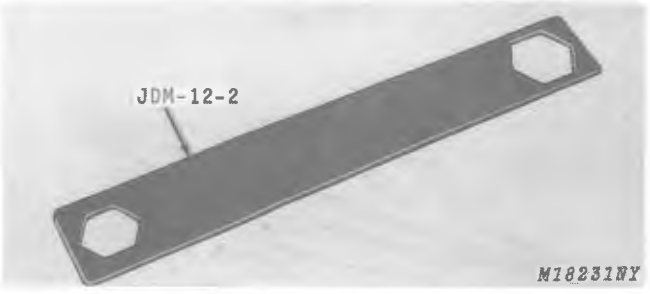

Fig. 11-Ramp Plate Nut Wrench

JDM-12-2 Ramp Plate Nut Wrench, Fig. 11, is used in conjunction with JDM-41-4 to hold the Comet Clutch when removing retaining cap screw.

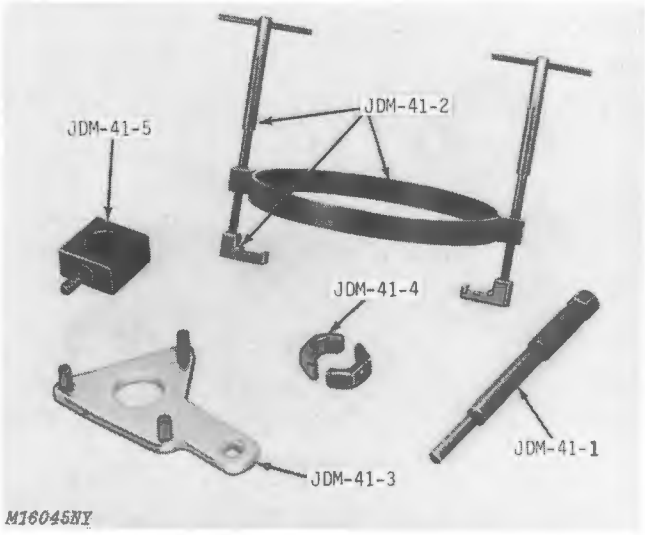

Fig. 12-John Deere (Comet) Drive Sheave Set

JDM-41-A John Deere (Comet) Drive Sheave Set, Fig. 12, is used to remove, disassemble and assemble the drive sheave. The set consists of JDM-41-1 Puller, JDM-41-2 Screw Assembly with Swivel and Ring, JDM-41-3 Spider Tool and JDM-41-4 Two-Piece Nut and JDM-41-5 Hub Lock.

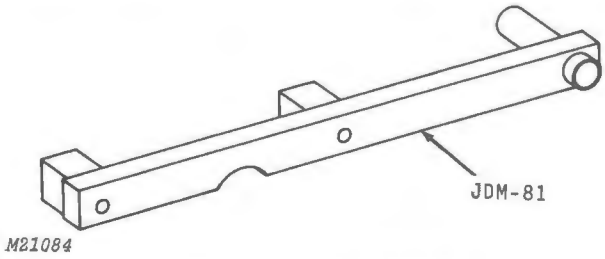

Fig. 13-Engine and Clutch Aligning Tool

JDM-81 Aligning Tool is used to accurately align the engine and secondary clutch. This tool checks both center distance and offset simultaneously on 1976 1977 and 1978 Cyclone and Liquifire Snowmobiles.

ELECTRICAL TOOLS

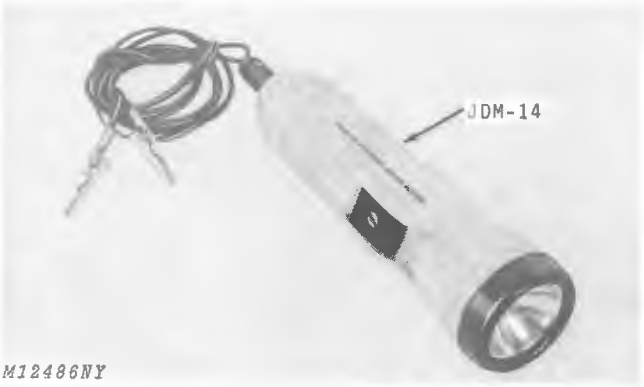

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Fig. 14-Continuity Tester

JDM-14 Continuity Tester, Fig. 14, is used in conjunction with JDM-15 Timing Indicator to quickly and accurately establish engine timing. It may also be used to locate open or closed electrical circuits.

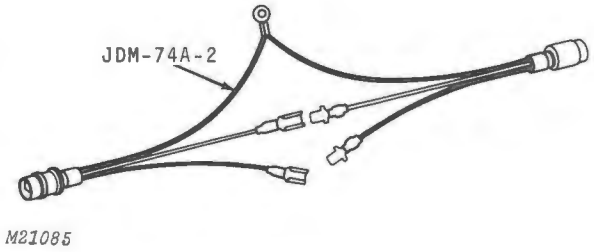
M18233NY

A—Tester
B—Test Simulator
C—Test Adapter
D—Load Coil

Fig. 15-Capacitor Discharge Ignition (CDI) Tester

JDM-74 Capacitor Discharge Ignition (CDI) Tester, Fig. 15, consists of the tester (A), test simulator (B), test adapter (C) and load coil (D). The tester measures peak energy output of CDI units, magneto charge and trigger coils.

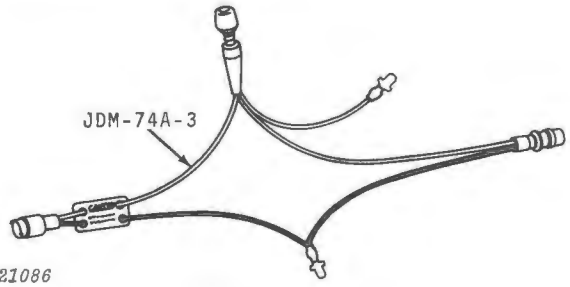
The ignition energy output is referenced against a 0-100 scale on the tester. The tester has two input ranges selected by a toggle switch. The "LOW" range senses AC or DC voltage from 0.5 to 27 volts. The "HIGH" range senses AC or DC voltage from approximately 75 to 500 volts.



M21085

Fig. 16-Special Wiring Harness

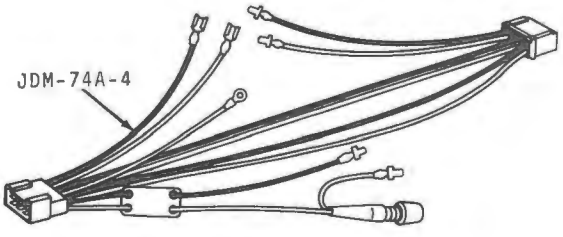
JDM-74A-2 Special Wiring Harness is used with the JDM-74 CD Tester to check trigger output of the CDI system on 1977 340 and 440 Liquifire Snowmobiles, 440 Cyclone Snowmobiles and 340 Cyclone Snowmobiles (Serial No. 70,401 and up).



M21086

Fig. 17-Special Wiring Harness

JDM-74A-3 Special Wiring Harness is used with JDM-74 CD Tester to check stator output of the CDI system on 1977 340 and 440 Liquifire Snowmobiles, 440 Cyclone Snowmobiles and 340 Cyclone Snowmobiles (Serial No. 70,401-up).



M21087

Fig. 18-Special Wiring Harness

JDM-74A-4 Special Wiring Harness is used with JDM-74 CD Tester to check trigger and stator output on 1975 JDX8 and 800 Snowmobiles with CD ignition, 1976 400, 340 and 440 Cyclone and 340 and 440 Liquifire Snowmobiles and 1977 340 Cyclone Snowmobiles (Serial No. 70,001-70,400).

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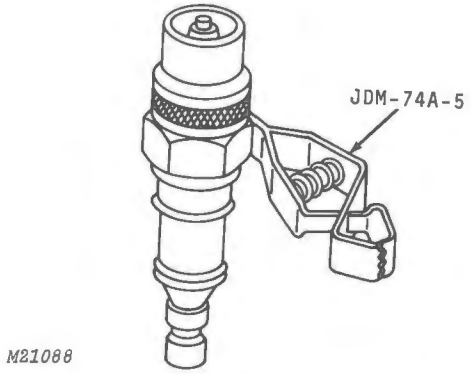

Fig. 19-Ignition Test Plug

JDM-74A-5 Ignition Test Plug is used to check snowmobile ignition coil output. Allows serviceman to check ignition coils without removing coils from the engine.

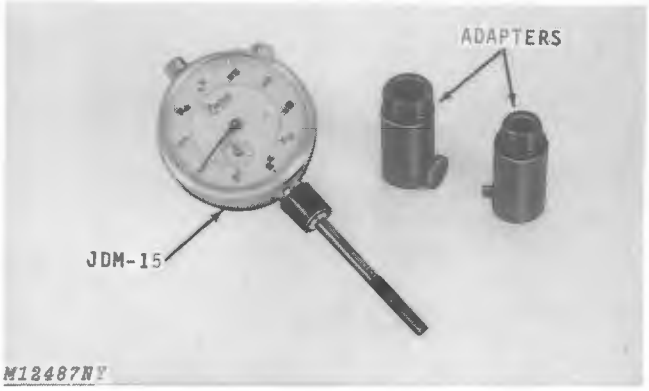

Fig. 20-Snowmobile Timing Indicator

JDM-15 Snowmobile Timing Indicator, Fig. 20, is a dial indicator graduated in 0.001-inch increments with a 1-inch range and collar for fastening into the 14 mm and 18 mm spark plug hole. The adapters are also included. Use the indicator with the JDM-14 Continuity Tester to establish engine timing. The dial indicator can also be used with the JDM-10 Mounting Bracket to measure crankshaft runout. In addition, this tool is required to check crankshaft twist.

HAND TOOLS

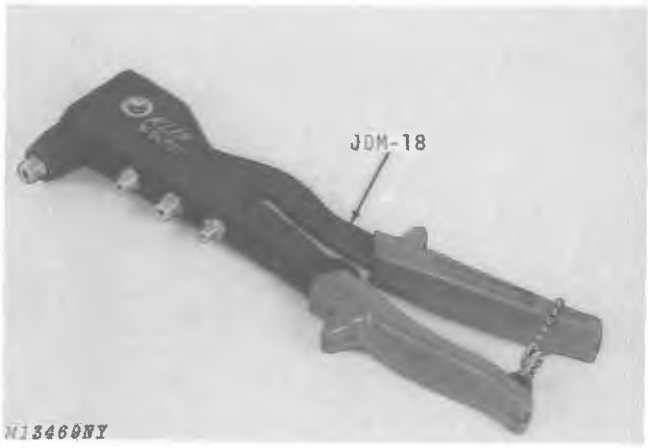

Fig. 21-Pop Rivet Tool

JDM-18 Pop Rivet Tool, Fig. 21, is a heavy-duty hand-operated tool which can be used with up to 3/16-inch diameter steel core rivets. This tool can be used to replace the rivets of the grouser bars on the cleated tracks and for general application of pop rivets on the snowmobile chassis.

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Group 10
CONVENIENCE SERVICE TOOLS

These tools are strictly for the convenience of the mechanic. They are not required but they will make any job quicker and easier.

SNOWMOBILE SUPPORT TOOLS

Fig. 1-Snowmobile Dolly

JDM-17A Snowmobile Dolly, Fig. 1, is excellent for moving snowmobiles in or out of the service shop or display area. Large 400 x 8 pneumatic tires make for easy operation. One model fits all snowmobiles.

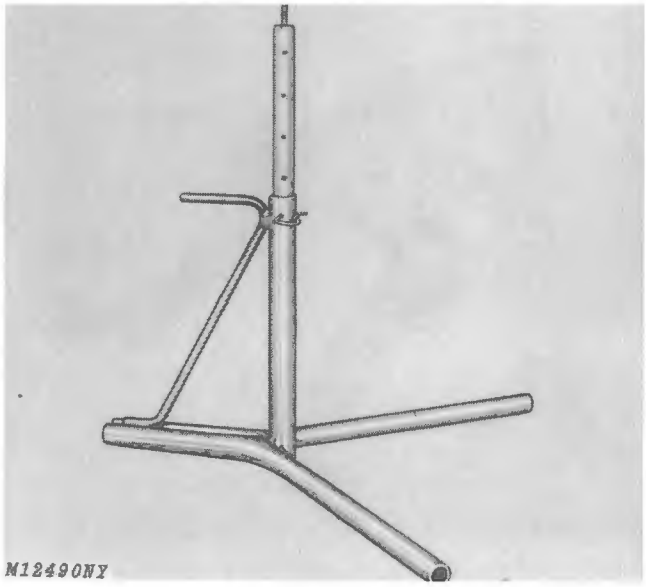

Fig. 2-Rear Stand

JDM-27 Rear Stand, Fig. 2, is designed to hold the snowmobile track off the floor when the machine is being serviced or stored.

JDST-24 Snowmobile Lift and Repair Stand, (Not Illustrated), is designed for most makes and models of snowmobiles. Raises and rotates machines for preventive maintenance work. Allows serviceman to position the unit at a convenient working height to service or repair difficult-to-reach components. Can also be used in the sales showroom to show customers all the snowmobile features, including the undercarriage.

JDM-26 Fold-A-Ramp Loading Platform, (Not Illustrated), is a 41-inch wide, 1000 pound capacity ramp that attaches to a pickup tail gate. Folded the ramp is 36 inches high. When ramp is lowered it extends 7 feet to the ground, making it easy to load or unload snowmobiles.

41332 Tool Storage Panel (Not Illustrated) is a standard 24 x 28-1/2-inch pegboard panel for storage of tools not assigned to a specific tool board. Uses standard pegboard hangers on 1 inch centers. Organizes and stores tools for ready accessibility. Complete with large "SERVICE TOOLS FOR JOHN DEERE" decals.

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ENGINE TOOLS

Fig. 3-Bench Mounted Service Fixture

JDM-16 Bench Mounted Service Fixture, Fig. 3, will become an indispensable item in your shop. The universal design enables you to mount all consumer product engines, as well as hydrostatic units, selective control valves, hydraulic pumps and many more components. When mounted, any component weighing 350 pounds or less may safely be rotated 360 degrees with positive stops at 90 degree increments.

Fig. 4-Ring Compressor

JDM-35 Ring Compressor, Fig. 4 is a band-type ring compressor with two adapters, capable of use with piston diameters of 2-1/8 inch to 2-5/8 inch. Holds rings in compressed position when installing piston in all John Deere snowmobile engines.

Fig. 5-Piston Lock Ring Plier

JDM-36 Piston Lock Ring Plier, Fig. 5 provides an easy way to install all sizes of piston pin lock rings safely and easily without destroying the rings.

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Fig. 6-Pressure Testing Tool

JDM-44 Pressure Testing Tool, Fig. 6, consists of a control valve, pressure gauge, rubber sheet, hoses and clamps. These items are used to seal the intake and exhaust system to pressure test the engine crankcase.

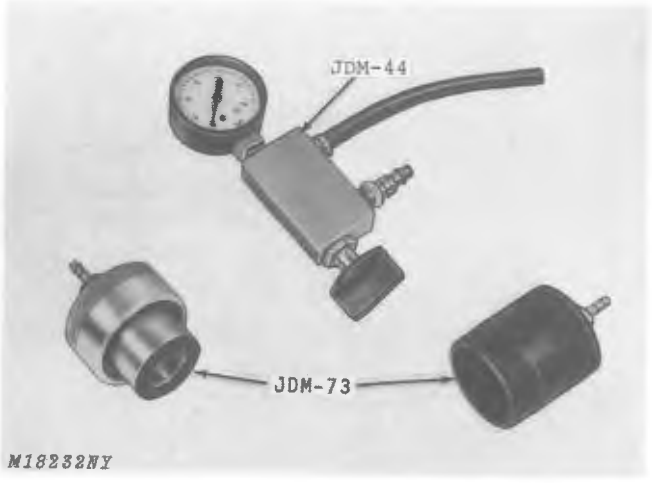

Fig. 7-Cooling System Tester

JDM-73 Cooling System Tester, Fig. 7, is used to test the system pressure and pressure cap of Liquid Cooled Snowmobiles. It is used in conjunction with JDM-44 Pressure Gauge.

IMPORTANT: JDM-73-3 Adapter is required when pressure testing caps on snowmobiles (Serial No. 70,001-).

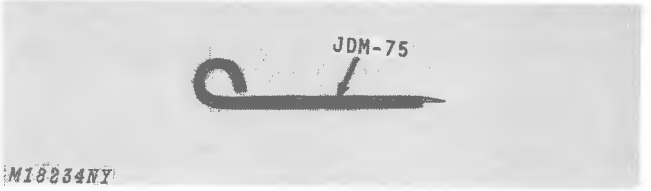

Fig. 8-Carburetor Choke Gauge

JDM-75 Carburetor Choke Gauge, Fig. 8, is used to correctly set the choke plunger on Mikuni Carburetors.

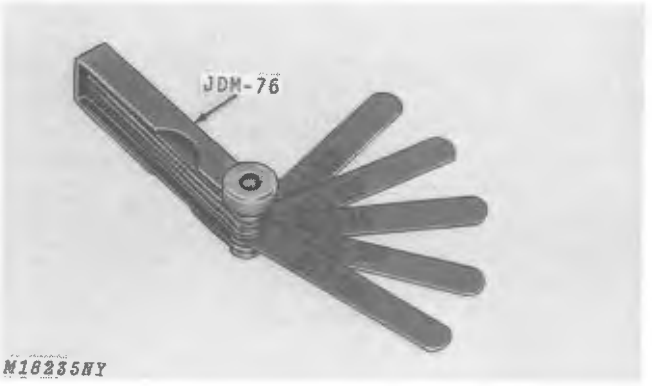

Fig. 9-Non-Magnetic Feeler Gauge Set

JDM-76 Non-Magnetic Feeler Gauge Set, Fig. 9, is used to set the points on snowmobile engines.

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Group 15
DYNAMOMETER TEST PROCEDURE

GENERAL INFORMATION

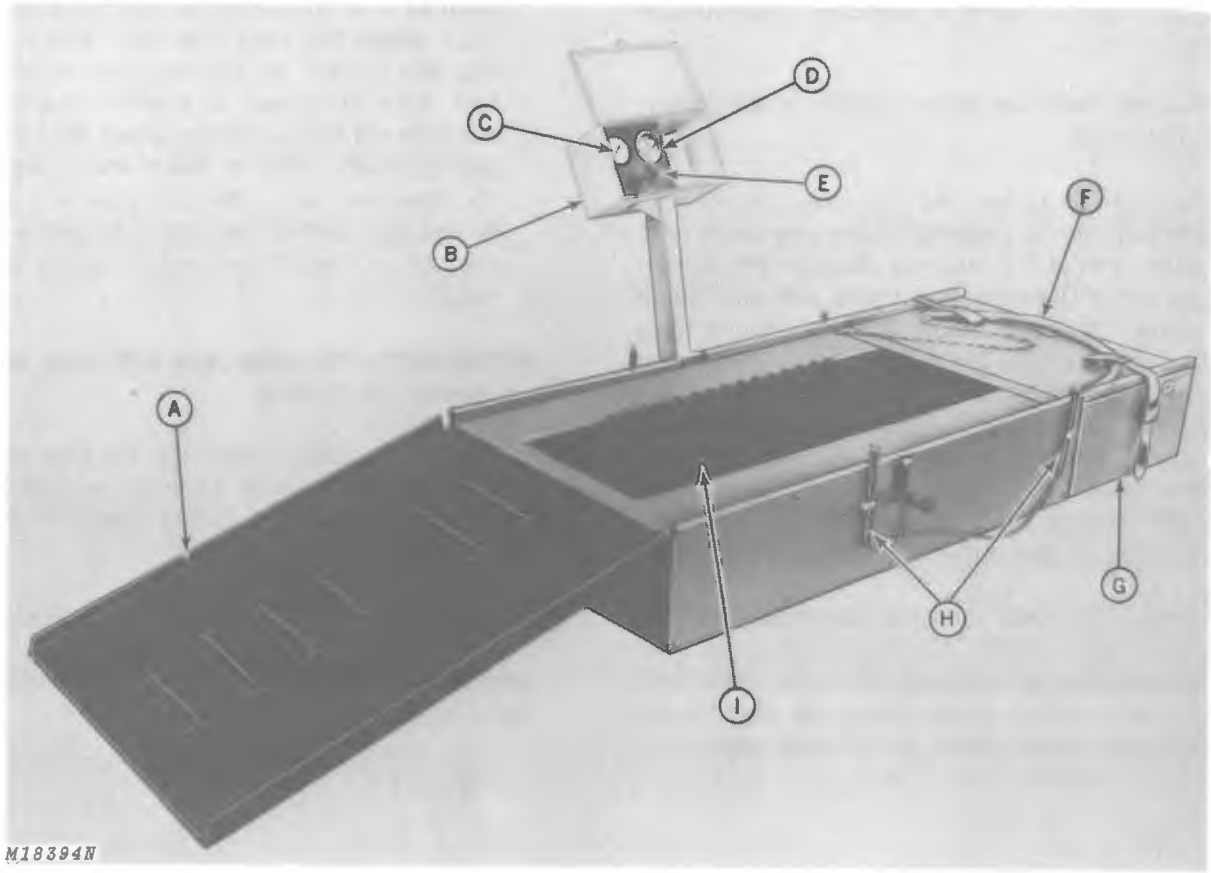
The JDM-45 Dynamometer is designed to do the following:

1. Check total engine performance.
2. Check operation of drive and driven sheaves.
3. Check out overall snowmobile performance.
4. Check track alignment and suspension operation.
5. Perform pre-delivery checks on new snowmobiles.
6. Evaluate condition of snowmobiles for trade-in value.

To order the JDM-45 Dynamometer contact:

Service Tool Division
Owatonna Tool Company
P.O. Box 314
Owatonna, Minnesota 55060

SET-UP INSTRUCTIONS



A—Drive-On Ramp and Deflector Shield
B—Control Console
C—Pressure Gauge
D—Speedometer
E—System Load Valve
F—Front Safety Ties
G—Reservoir and Support Platform
H—Slide Rail Lubricators
I —Drive Track

Fig. 1-JDM-45 Dynamometer

Perform the following steps when preparing the unit for use.

1. Remove four cap screws and left-hand front side panel from unit.

2. Attach the instrument package and console post with four cap screws, washers, and grommets. Remove hydraulic hoses and wiring harness from inside tunnel and install.

3. Plug the wiring harness into the connection in the side tunnel. Attach short hydraulic hose to relief valve and long hose to reservoir. Make certain all connections are tight. Replace left-hand front side panel with four screws.

4. Remove the reservoir filler cap and add approximately 30 gallons of Hy-Gard Transmission and Hydraulic Oil or Dexron automatic transmission fluid or Type A, Suffix A automatic transmission fluid.

5. Set-up the track lubrication system in the following sequence.

   a. Remove spray bar cap and spray bar assembly through the openings in the side cover from either end of the machine. Secure the assembly to the Dynamometer frame with one thumb screw. Thread it through the mounting bracket and into the side cover bolt hole directly above the water-valve. On the opposite side of the Dynamometer, place the aluminum O-ring spray bar cap over the turned-down portion of the spray bar and push in until the roll pins hook behind the side panel. Rotate fitting 90 degrees so the outlet connection points down.

   b. Locate the water spraying assemblies, one on each side of the Dynamometer, with four spring bracket assemblies. Attach the four spring mounted spray heads by slipping the springs through them two to each side.

   c. Attach a garden hose between the valve and a convenient water faucet. By opening the water-valve, water will now be directed to the inside of the dynamometer track. This provides coolant for the drive sprockets and should always be used when operating the machine at temperatues above freezing. Below 32°F (0°C) snow or liquid detergent should be applied to the inside of the track. Since the spray bar and spray heads cannot be drained, they should be removed and stored inside when freezing temperatures are expected.

   d. By attaching the quick couplers on the water spray assembly to the spray bar assembly, water will be directed to the heads both at the front and center of the machine on either side. The front spray jets should be directed at a point where the dynamometer and snowmobile tracks come together. On slide rail machines, each jet is to be directed at the openings in the track where the slide rails ride. This will provide the coolant for the front half of the slide rails. Side jets should be directed at a point on the slide rail frame midway along the track and just above the rails. In this manner, water will run down and along the rails providing coolant for the back half of the slide rails. Below freezing, snow should be used to cool the slide rails.

IMPORTANT: The slide rails will seize without some means of cooling.

6. Fasten safety chain to right side rail tube with cap screw, washer, and nut. Slide tubing over chain. Thread strap assembly through buckles on each side of reservoir.

7. Place hitch post assembly in its position at rear of Dynamometer. Position back ramp over hooks provided on the rear of the Dynamometer. The ramp is equipped with a safety shield.

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OPERATION

Perform the following steps in testing a snowmobile on the Dynamometer. Be certain to observe all CAUTIONS and IMPORTANTS during testing.

Prior to operation, and before starting the vehicle, read through the instructions to obtain a knowledge of the equipment and its function. Proceed as follows:

1. Drive the snowmobile onto the Dynamometer. Position the snowmobile so that the rear idler is over the last idler shaft on the Dynamometer.

NOTE: Adjust snowmobile carburetor to specification or to a slightly rich condition prior to running initial test.

2. Open the trap door on the rear ramp and insert the hitch post into the hitch socket. Secure the snowmobile and Dynamometer hitches together using clevis pin on hitch post. If the snowmobile is not equipped with a hitch, chain the unit to the hitch post.

⚠ CAUTION: Do not allow anyone to stand in the area behind the snowmobile while it is running. There is danger of flying debris from the track.

IMPORTANT: The hitch post is so designed and located to hold the ramp safety shield open. This forms a safety guard behind the snowmobile that stops and deflects downward debris that could be projected back by the tracks. Do not attempt to defeat this purpose.

3. Position the safety chain around the front of the snowmobile ski pivot spindles and hook to the stud welded on Dynamometer reservoir.

4. Hook safety straps to inside edges of skis. Best results will be obtained if the rear hitch takes the strain of the snowmobile pulling forward, and the front safety chain and centering straps are somewhat slack. Best traction, with no slipping between the snowmobile track and the Dynamometer track results when the connection bar to the snowmobile rear hitch angles up a bit, therefore pulling the rear of the snowmobile down as the machine strains forward.

NOTE: Too much down pull will increase track wear.

⚠ CAUTION: Do not operate snowmobile in a confined and poorly ventilated working area. Attach necessary exhaust hose and or blowers. Carbon monoxide is a deadly gas.

IMPORTANT: The operator should be certain to wear a hearing protector that complies with OSHA standards as the noise level of a snowmobile on a dynamometer in an enclosed area is extremely high.

5. When starting a test sequence, the dynamometer pump should be set for zero pressure. This is done by turning the pressure control valve fully counterclockwise.

6. Hook up the remote engine tachometer to the snowmobile engine.

7. Turn on the water for cooling during the test.

8. Start the snowmobile and run at part throttle no load, until snowmobile and dynamometer have reached normal operating temperatures. Now operate snowmobile at full throttle, no load, and record the zero pressure engine and track speed on the recording pads located in the control console.

9. Increase the track load from zero to 500 psi by turning the pressure control valve clockwise while still maintaining full throttle. Record the engine and track speed.

10. Continue to increase the track load and record the track and engine speeds in increments of 250 psi until the driven sheave is fully back shifted.

⚠ CAUTION: Do not continue to increase the load after the driven sheave is fully back shifted or damage to the snowmobile may occur.

IMPORTANT: The snowmobile should be run on the dynamometer only long enough to get the necessary information and/or checks. The snowmobile running on the dynamometer is not moving and engine cooling, in warm weather, is limited. Judgement is required to avoid overheating engines. A fan blowing air across the cylinder cooling fins will help.

OPERATION—Continued

11. Adjustments to the snowmobile may now be made. A second run should be made from zero pressure at full throttle through a full clutch shift and the engine and track speeds, recorded for comparison to those prior to the tune-up.

12. Approximate track horsepower may be obtained from the graph on page 70-15-5. Join the point on the pressure curve directly above the appropriate track speed with the track horsepower, read directly to the left of this point.

IMPORTANT: When running the dynamometer for long periods at high loads, the reservoir oil will become hot. If you cannot hold your knuckle against the side of the reservoir without discomfort, allow oil to cool.

MAINTENANCE

Perform the following maintenance on the Snowmobile Dynamometer if it is necessary. Under normal usage and with proper care, the unit needs only periodic tightening and inspection.

Replacing Track

In the event the Dynamometer track should require replacement, proceed as follows:

1. Disconnect the spray head quick couplers from the spray bar.

2. Remove spray bar cap.

3. Remove the spray bar.

4. Remove side panels from both sides.

5. Loosen the track adjustment screws and swing them out of the way (one on each side).

6. Loosen the two rear idler frame mounting bolts at the rear of each tunnel and slide the frame fully forward.

7. Disconnect wires from speedometer sender unit.

8. Remove all nuts and bolts from inside the right-hand tunnel.

9. Remove the right-hand tunnel.

10. Replace the track.

11. Replace the right-hand tunnel and all attaching nuts and bolts.

12. Slide the rear idler frame back until the track adjustment screws can be swung into place.

13. Tighten the track by drawing up the adjusting screws alternately until there is approximately 8-3/4 to 9 inches measured inside between the top and bottom of the track. This adjustment is important since it insures the proper engagement between the track pitchline and the sprockets.

14. Tighten rear idler frame cap screws.

15. Reconnect speedometer sending unit wires.

16. Replace side panels and hardware.

17. Replace spray bar, spray bar cap and make quick connections.

Changing Oil

Under normal conditions the only time an oil change is necessary is:

1. If water gets in the oil.

2. Unit has been allowed to run too hot and oil appears and smells burned.

Litho in U.S.A.

DYNAMOMETER TEST WORKSHEET

DATE: _____

OWNER: _____ **SNOWMOBILE:** _____

ADDRESS: _____

Check These Performance Variables:

___ Carburetor high speed jet setting
____Spark plug condition
____Drive belt condition
____Ignition timing
____Clutch alignment
____Clutch general condition
____Clutch weight arm kit
____Secondary general condition
___ Secondary cam/spring position
____Sprocket ratio

TEST DATA

Run All Tests AT Full Throttle

Dyno Load (psi)	Test 1		Test 2		Test 3	
	MPH	Engine RPM	MPH	Engine RPM	MPH	Engine RPM
500						
750						
1000						
1250						
1500						
1750						
2000						
2250						
2500						
2750						
3000						

(Note below your comments and any performance adjustments made.)

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