

JOHN DEERE SPITFIRE™ SNOWMOBILE

Technical Manual
TM-1191 (Jul-79)

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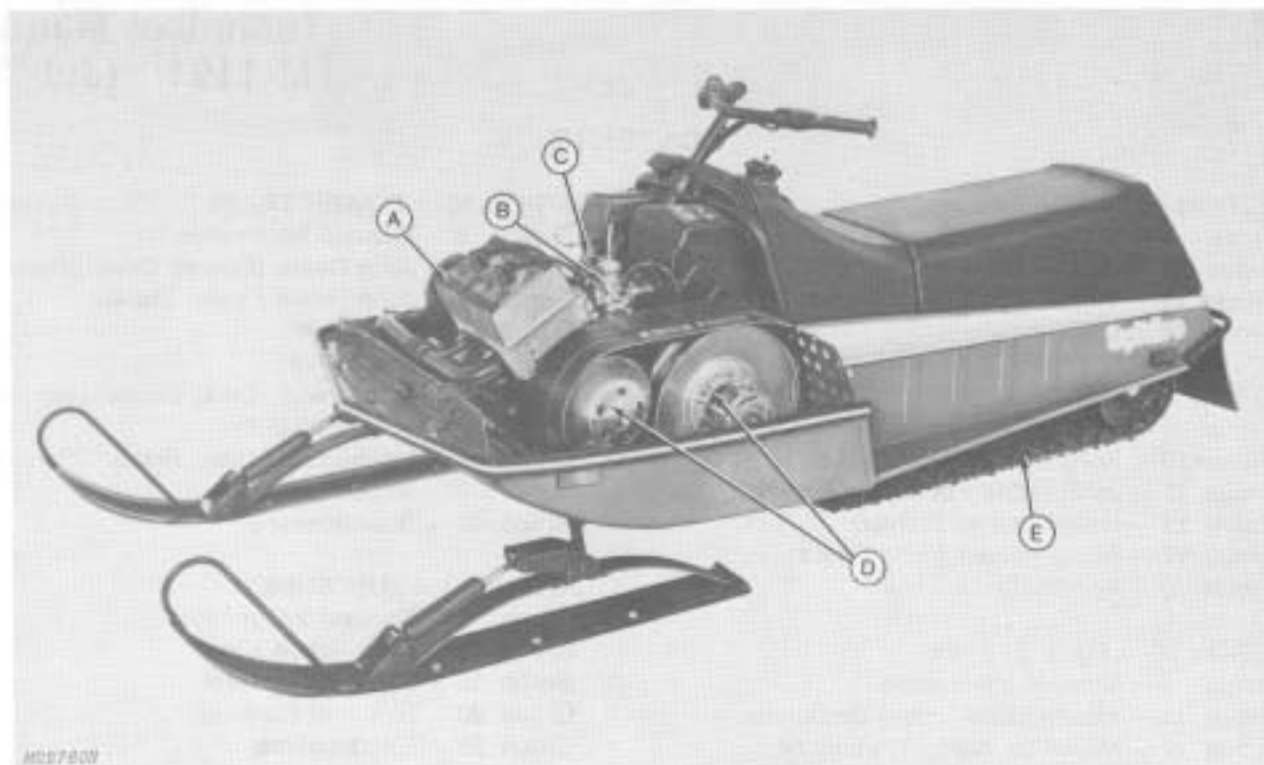
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(All information, illustrations and specifications contained in this technical manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.)

INTRODUCTION



A—Section 20 - Engine
 B—Section 30 - Fuel System
 C—Section 40 - Electrical System

D—Section 50 - Power Train
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Fig. 1-Components Covered in This Technical Manual

This technical manual contains service and maintenance information for the John Deere SPITFIRE Snowmobile.

The manual is divided into sections and groups, pertaining to a component or operational system.

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

Specifications are in the last group of each section. Section 70 covers the special tools.

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

⚠ This safety alert symbol identifies important safety messages. 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 technical manual.

Section 10 GENERAL

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SERIAL NUMBERS

Machine Serial Number



Fig. 1-Machine Serial Number

The machine serial number is stamped into the right-hand side of the tunnel, Fig. 1.

Engine Serial Number



Fig. 2-Kohler Engine Serial Number

The Kohler engine serial number plate is located on the front of the flywheel housing, Fig. 2.

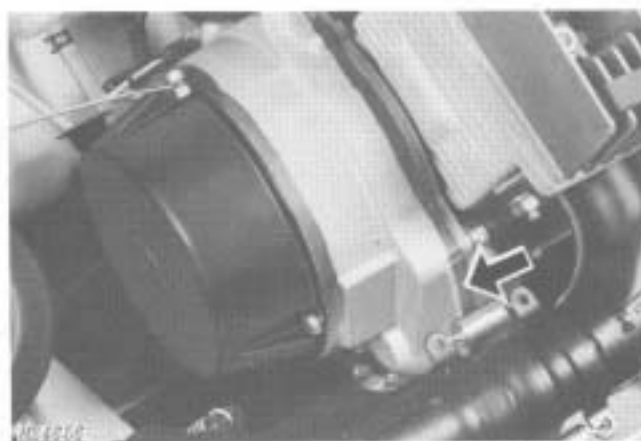


Fig. 3-John Deere Engine Serial Number

The John Deere engine serial number is located on the right front of the flywheel housing, Fig. 3.

VINTAGE INFORMATION

1978 MODEL YEAR

Snowmobile	Spitfire
Serial Number	J34AG 080001M
Code No. (Type)	J34AG
Engine Manufacturer	Kohler
Engine Model No.	K340-2FA Piston-Ported

1979 MODEL YEAR

Snowmobile	Spitfire
Serial Number	JD34AH 095001M
Code No. (Type)	J34AH
Engine Manufacturer	Kohler
Engine Model No.	K340-2FA Piston-Ported

1980 MODEL YEAR

Snowmobile	Spitfire
Serial Number	J34AJ 120001M
Code No. (Type)	J34AJ
Engine Manufacturer	John Deere Fireburst™*
Engine Model No.	TB340A Piston-Ported

*Manufactured for John Deere by Kawasaki Heavy Industries, Japan

Group 10 SPECIFICATIONS

MACHINE SPECIFICATIONS

FUEL SYSTEM

Capacity (U.S. Gallons)	5-3/4 gals. (21.7 L)
Mixing Ratio	50:1
Filters	Two located in pickup line
Fuel Pump:	
Mikuni	Impulse-type located in the inlet line
Carburetor	Mikuni

ELECTRICAL SYSTEM

Charge System	Flywheel Alternator
Capacity	120 Watts
Ignition System	Capacitor Discharge
Ignition Timing (Kohler Engine)	0.085 in. BTDC
Ignition Timing (John Deere Engine)	22° BTDC @ 6,500 rpm
Plug Gap	0.025 in. (0.635 mm)

POWER TRAIN

Transmission	Two-sheave variable
Primary	
Sheave	John Deere (Comet) Model 94C
Secondary Sheave	John Deere
Final Drive	Direct
Standard Ratio:	Low 4.5:1
	High 1.23:1
Brake	Mechanical Disk
Stop Light	Standard

SUSPENSION

Suspension	Slide Rail
Drive Sprockets	Forged Polyethylene
Track Material	Rubber
Track Width	15 in.
Track Drive	Direct

CHASSIS AND BODY

Tunnel and Pan	Aluminum
Hood	(Sheet Molded Compound) Fiberglass
Windshield	Polycarbonate
Overall Length	98 in. (2.48 m)
Overall Width	33.25 in. (84.4 cm)
Overall Height	38.0 in. (96.5 cm)

KOHLER ENGINE SPECIFICATIONS

Item	Specification
Engine Model No.	K340-2FA
Manufacturer	Kohler
Type of Engine	Two-Stroke, Air-Cooled
Number of Cylinders	Two
Cylinder Sleeve	Chrome Plated Aluminum
Bore (mm)	62
Stroke (mm)	56
Displacement (cc)	338
Compression Ratio	6.9:1
Ignition Type	Capacitor Discharge
Ignition Manufacturer	Nippondenso
Lighting Coil Output	12-Volt, 120 Watt
Carburetor Manufacturer	Mikuni
Carburetor Model No.	VM-28 or B34/32-2
Starting System	Recoil Start

JOHN DEERE ENGINE SPECIFICATIONS

Item	Specification
Engine Model No.	TB340A
Manufacturer	John Deere
Type of Engine	Fireburst™**
	Two-Stroke, Air-Cooled
Number of Cylinders	Two
Cylinder Sleeve	Chrome
Bore (mm)	60
Stroke (mm)	60
Displacement (cc)	338
Compression Ratio	6.9:1
Ignition Type	Capacitor Discharge
Ignition Manufacturer	Kukusan
Lighting Coil Output	12-Volt, 120 Watt
Carburetor Manufacturer	Mikuni
Carburetor Model No.	B34/32-2
Starting System	Recoil Start

*Manufactured for John Deere by Kawasaki Heavy Industries, Japan

Group 15

TUNE-UP AND ADJUSTMENT

TUNE-UP GUIDE

Operation	Specification	Reference
Replace Spark Plugs*	Test for spark Spark Gap 0.025 in. (0.635 mm) DO NOT regap - replace	Sec. 40, Group 10
Time ignition system Kohler Engine John Deere Engine	0.085 in. BTDC 22° BTDC at 6500 rpm	Sec. 40, Group 10 Sec. 40, Group 12
Adjust carburetor (Slide Valve)	Select main jet Adjust choke plunger Adjust throttle slide Adjust float height Adjust idle screw Adjust air jet	Sec. 30, Group 10
Adjust carburetor (Butterfly)	Select main jet Adjust float height Adjust choke plunger Adjust throttle cable Adjust idle mixture screw Adjust idle screw	Sec. 30, Group 12
Recondition Carburetor	Clean carburetor and install carburetor kit	Sec. 30, Group 10 and Group 12

ADJUSTMENTS

Adjustment	Specification	Reference
Brake		Sec. 50, Group 30
Sheave Alignment		Sec. 50, Group 20
Track		Sec. 60, Group 15
Skis		Sec. 60, Group 20

SPARK PLUG RECOMMENDATION

*The only spark plug recommended for the Spitfire Snowmobile with Kohler engine is a Champion QN-3 (AM53941).

The only spark plug recommended for the Spitfire Snowmobile with John Deere "Fireburst" engine is Champion ON-3 (Canada) (AM55045) or Champion N3 (United States) (AM52432).

Group 20 FUEL

BREAK-IN PERIOD

1. Do not exceed 30 mph for the first 25 miles.
2. Do not force the machine at full throttle in deep snow.
3. An occasional burst of power on hard-packed snow will not be harmful.
4. Mix gasoline and oil in a 40:1 mix for the first tank of fuel.

NOTE: After the first tank of fuel, mix gasoline and oil in a 50:1 ratio.

FUEL

Mix gasoline with John Deere 2-cycle oil, which is an ashless oil without metallic additives or an oil that meets BIA test qualification. Mixing is improved if oil is at room temperature.

It is important that quality gasoline and oil are mixed thoroughly in the proper ratio. Too little oil results in engine damage; too much oil may cause spark plug fouling.

IMPORTANT: Gasoline must be of regular or premium grade with an anti-knock index of 88 or higher. **DO NOT** use un-leaded gasoline.

Mix fuel as follows:

1. Pour half the gasoline into container.
2. Pour in all the oil.
3. Shake mixture thoroughly.
4. Pour in remaining gasoline.
5. Shake mixture vigorously.

NOTE: Mix gasoline and oil in a separate container. Never mix gasoline and oil in the snowmobile fuel tank. Gasoline and oil mixture that has been stored should be agitated thoroughly before using.

CAPACITY

Fuel Tank 5.75 U.S. Gals.
(21.7 L)

Section 20 ENGINE

Group 5

GENERAL INFORMATION

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DESCRIPTION



Fig. 1-Kohler Engine

The Kohler, free-air, piston-ported engine, Fig. 1, has four ball bearings; two between crank-throws, one on the flywheel end, and one on the PTO end of the crankshaft. Needle bearings are used at both crankpin and piston pin locations.



Fig. 2-John Deere "Fireburst" Engine

The John Deere "Fireburst", free-air, piston-ported engine, Fig. 2, has 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. The outer seals and bearings may be replaced. The crankcase upper and lower halves are available only as a matched set.

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.

NOTE: Oversize pistons and rings are NOT available.

PRINCIPLE OF OPERATION

Stroke 1 - Power, Exhaust, Fuel Transfer

Power

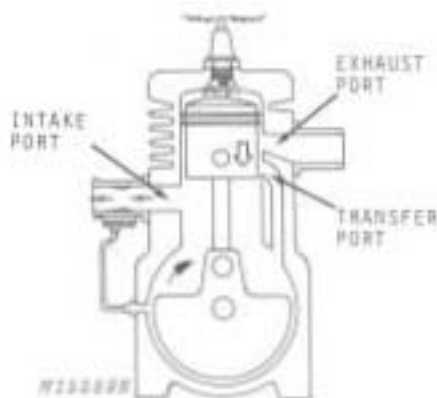


Fig. 3-Power Stroke

Slightly before top-dead-center (TDC) ignition occurs, Fig. 3. Pressure of the burning gases pushes the piston downward, providing power to turn the crankshaft.

Before the piston reaches the end of its downward movement, it exposes the exhaust port and the transfer port. The "intake port" remains closed. The intake and exhaust ports are located on opposite sides of the cylinder.

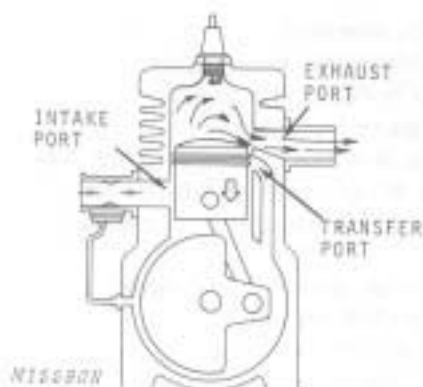
Exhaust

Fig. 4-Power Stroke and Exhaust

The exhaust port, Fig. 4, is uncovered first. Hot gases, under pressure from combustion, escape through the open exhaust port.

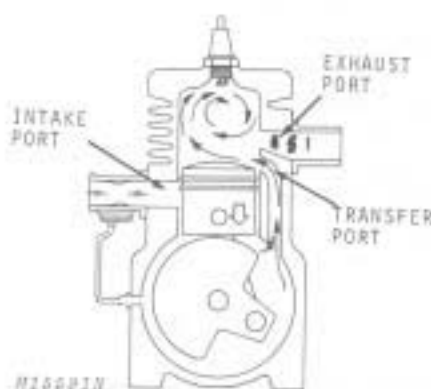
Fuel Transfer

Fig. 5-Power Stroke and Fuel Transfer

After uncovering the exhaust port, the piston moves down, exposing the transfer port, Fig. 5. The intake port is still closed.

The downward movement of the piston pressurizes the crankcase and forces the fuel-air mixture in the crankcase up and out the transfer port into the combustion chamber. This new charge of fuel and air helps drive out any remaining exhaust gases.

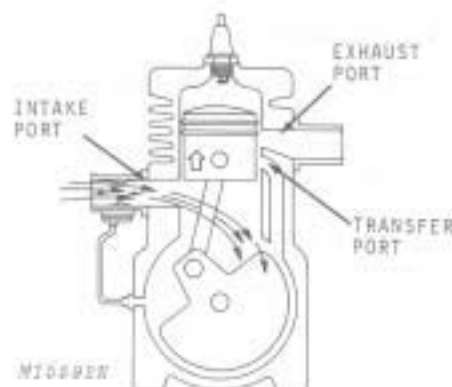
Stroke 2, Compression, Intake**Compression and Intake**

Fig. 6-Compression Stroke and Intake

As the piston moves up, it closes off the transfer and exhaust ports and opens the intake port, Fig. 6. The piston moving up creates a partial vacuum (low pressure) in the crankcase. Atmospheric pressure forces a new charge of fuel and air from the carburetor through the intake port to the crankcase.

The piston moving up also compresses the fuel-air mixture in the combustion chamber. 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.

DIAGNOSING MALFUNCTIONS**Engine****Engine Will Not Start**

- Carburetor and/or fuel pump faulty.
- Spark plugs fouled or faulty.
- Coil weak or faulty.
- Fuel line obstructed.
- Head gasket leaking.
- Electrical connections loose.
- No engine compression.

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.
- Drive belt too tight.

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.
- Spark plugs fouled.
- Head gasket leaking.
- Fuel mixture incorrect.
- Crankshaft seal leaking.
- Impulse tube to fuel pump obstructed or leaking.
- Drive belt too tight.

Engine Misses at High Speed

- Spark plugs fouled.
- 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.
- Spark plugs incorrect.
- Air leak in intake system or crankcase.
- Engine idling for long period of time.
- Cooling fins obstructed or damaged.

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.
- Flywheel key sheared.
- Lean fuel mixture.

Engines Loses Power or Acceleration

- Carburetor out of adjustment.
- Engine overheating.
- Ignition out of time.
- Ignition coil weak.
- Fuel mixture incorrect.
- Muffler obstructed.
- Running on one cylinder.
- Restricted in-line fuel filter.
- Belt too loose.

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.
- Too much lubrication between friction plate and washer.

ENGINE ANALYSIS

Spark Test

Use JDM-74A-5 Ignition Tester Plug to check for spark.

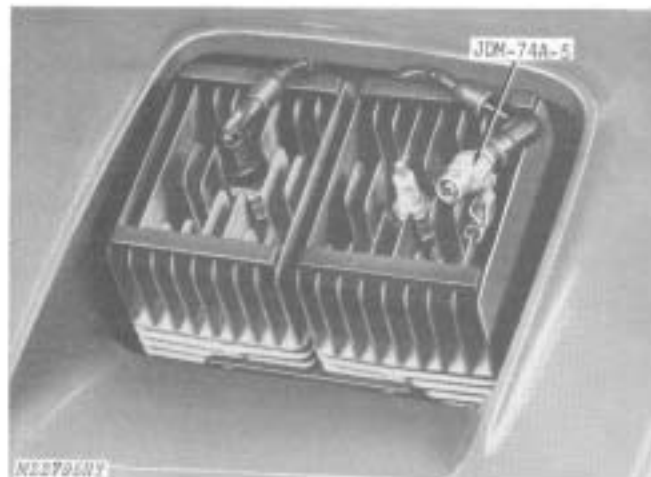


Fig. 7-Checking For Spark

1. Ground JDM-74A-5 Tester Plug to the engine, Fig. 7.
2. Connect high tension lead to the tester plug, Fig. 7.
3. Turn the key switch to the "ON" position.
4. Pull the recoil start rope and check tester plug for spark.
5. Check both cylinders.
6. If CDI system cannot fire the tester plug, ignition system difficulties exist. See Section 40.

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.

7. If spark is good and engine does not start, make compression test and check fuel supply.

Compression Test

1. Remove spark plugs.

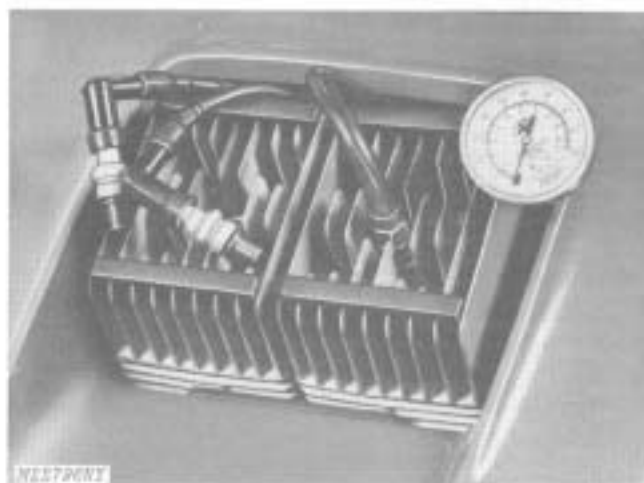


Fig. 8-Testing Engine Compression

2. Install compression gauge in one of the spark plug holes, Fig. 8.
3. With choke "OFF", hold throttle in open position.
4. Pull recoil start and crank engine vigorously. Test both cylinders for compression.
5. Kohler engine compression pressure should be 90 to 110 psi (621 to 758 kPa) (6.2 to 7.5 bar) and should not vary by more than 15 psi (103 kPa) (1.03 bar) between cylinders.
6. John Deere "Fireburst" engine compression pressure should be 110 to 130 psi (758 to 890 kPa) (7.5 to 8.9 bar) and should not vary by more than 10 psi (69 kPa) (0.7 bar) between cylinders.
7. If compression pressure is low, check for head gasket leakage, worn or stuck piston rings, damaged pistons or damaged cylinder walls.

Group 10 KOHLEK ENGINE

REMOVE ENGINE

1. Remove hood.
2. Remove air silencer.

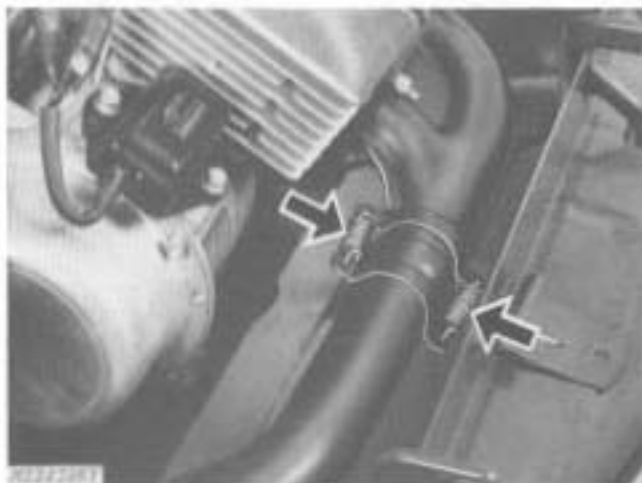


Fig. 1-Muffler-to-Exhaust Manifold Springs

3. Remove springs securing muffler to exhaust manifold, Fig. 1.

4. (Not illustrated.) Remove starter handle. Tie a slip knot in starter rope to prevent rope from winding into starter housing.



Fig. 2-Removing Carburetor

5. Disconnect carburetor from engine at location shown, Fig. 2.

6. (Not illustrated.) Disconnect fuel pump impulse line from engine.



Fig. 3-Engine Wiring and Junction Block

7. Disconnect engine electrical wiring from junction block, Fig. 3.

8. Remove drive belt.
9. Remove engine and base.

DISASSEMBLY

Remove Exterior Components

1. Remove primary clutch.
2. Remove engine base.
3. Remove intake and exhaust manifolds.
4. Remove recoil starter.

Remove Flywheel

1. Remove starter cup.

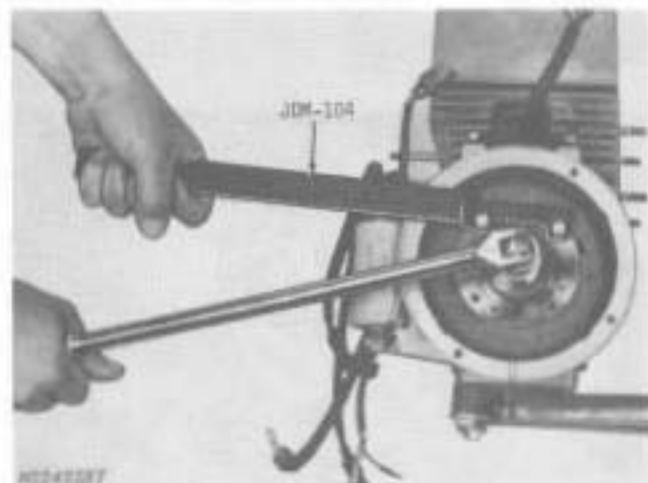


Fig. 4-JDM-104 Flywheel Holding Tool

2. Use JDM-104 Flywheel Holding Tool to hold flywheel, Fig. 4. Remove retaining nut and locking plate.

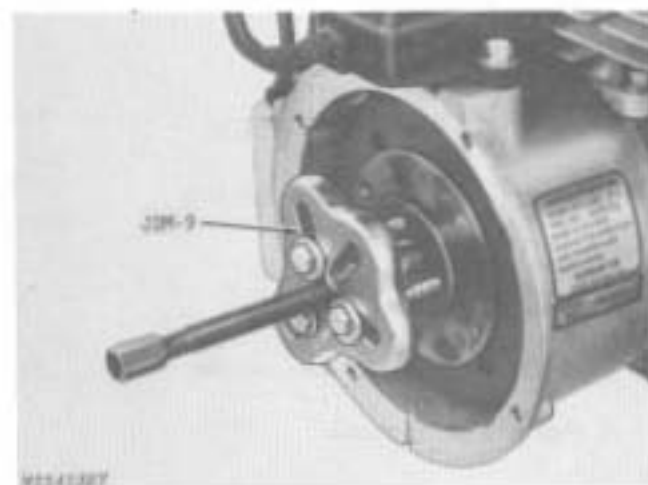


Fig. 5-Removing Flywheel

3. Use JDM-9 Puller positioned as illustrated to remove flywheel, Fig. 5.

NOTE: DO NOT strike puller bolt with hammer. Strike flywheel with plastic or wood mallet in line with flywheel keyway.



Fig. 6-Flywheel Housing

4. Remove flywheel housing, Fig. 6, with coil and CDI unit.

5. Remove stator.

Check Crankshaft Runout

1. Remove spark plugs.

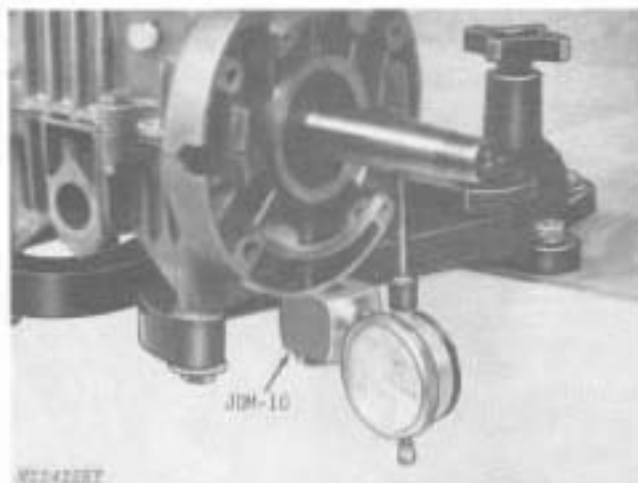


Fig. 7-Checking Crankshaft Runout

2. Use a JDM-10 Mounting Bracket to install a dial indicator at the junction of the crankshaft tapered and parallel sections, Fig. 7.

3. Rotate crankshaft to check runout. Maximum permissible runout is 0.002 inch (0.0508 mm).

4. Replace crankshaft assembly if not within limits.

Remove Cylinder Heads and Cylinders

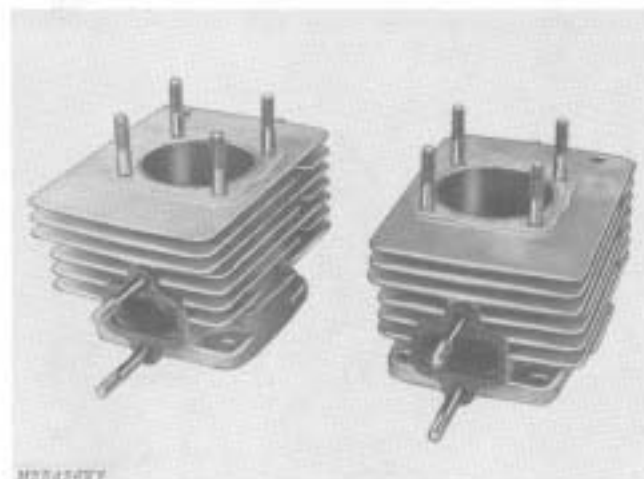


Fig. 8-Cylinders with Heads Removed

1. Remove both cylinder heads. Discard gaskets.
2. Remove cylinders, Fig. 8. Discard gaskets.

Remove Pistons



Fig. 9-Removing Circlip

1. Rotate end of circlip slightly past indentation. Remove circlip with an awl, Fig. 9.

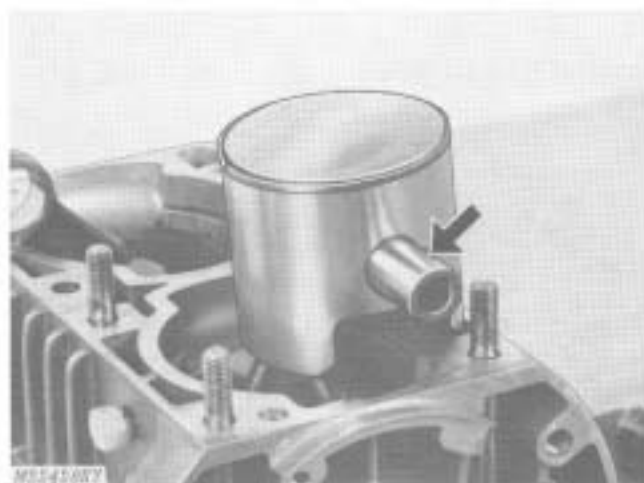


Fig. 10-Removing Piston Pins

2. Use JDM-7 Tool Set with JDM-32 Piston Pin Guide to remove piston pins.

NOTE: In most cases, the piston pin can be pushed out with hand pressure. Warm piston with hands and push pin out, Fig. 10.

Remove Crankshaft

1. Remove crankcase retaining cap screws.

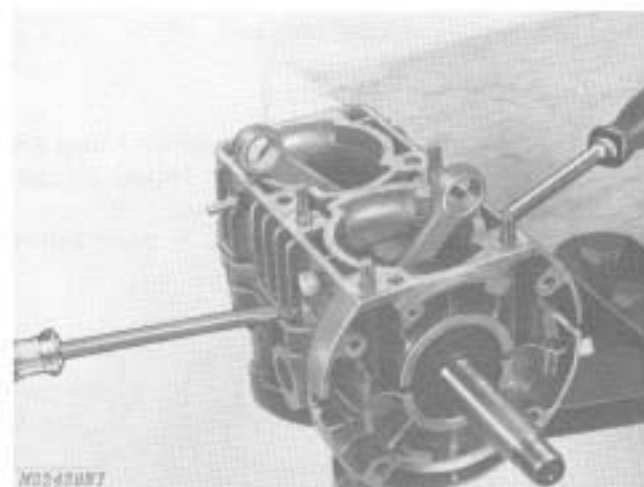


Fig. 11-Separating Crankcase Halves

2. Pry crankcase halves apart with two large screwdrivers as shown in Fig. 11.

IMPORTANT: Pry only in the two slots provided. Prying in any other place will damage crankcase half sealing surfaces.

3. Remove crankshaft assembly.

INSPECTION AND REPAIR

Inspect Crankcase

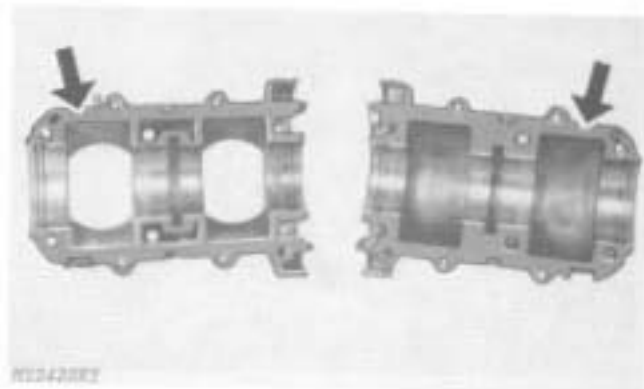


Fig. 12-Check Crankcase Sealing Surfaces

1. Check sealing surfaces, Fig. 12, for deep scratches, pitting, or scoring.

2. Check bearing and oil seal retaining inserts for wear, or conditions that could cause leaks.

NOTE: Minor indication of crankshaft bearing outer race "rotation" is normal.

3. Replace crankcase halves if damaged. Crankcase halves are available only as a set.

Inspect Cylinder Heads

1. Carefully scrape carbon from cylinder heads and exhaust ports. Use a soft metal (non-ferrous) scraper.

2. Use a spark plug tap (14 mm) to clean carbon from spark plug threads.



Fig. 13-Checking Cylinder Head For Flatness

3. Check cylinder head for flatness on a surface plate, Fig. 13. Measure at various points around head.

Inspect Cylinder

1. Install serviceable cylinder head on cylinder without gasket or hold-down nuts.



Fig. 14-Checking Cylinder For Distortion

2. Measure for distortion between studs with a feeler gauge, Fig. 14. Maximum allowable distortion is 0.002 inch (0.0508 mm).

3. Measure cylinder bore with an inside micrometer. Measure parallel with crankshaft and at right angles to crankshaft at both top and bottom of ring travel. See specification on page 20-20-1. **DO NOT** hone or re-bore cylinder. It is chrome-plated and **MUST BE** replaced if not within specification.

Inspect Piston and Piston Pin

1. Clean piston ring grooves.

2. Check piston for scoring, pitting or corrosion.

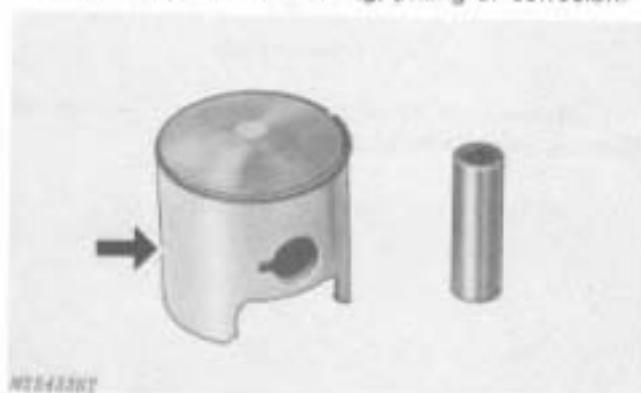


Fig. 15-Checking Piston

3. Measure piston at right angles to piston pin at skirt for wear, Fig. 15. See specification on page 20-20-1.

4. Measure piston pin bore with an inside micrometer. See specifications on page 20-20-1.
5. Measure piston pin. See specification on page 20-20-1.

Inspect Crankshaft and Connecting Rod

1. Inspect threads on each end of crankshaft.
2. Inspect keyway and taper on each end of crankshaft for scoring or wear.
3. Inspect ball bearings for wear and free movement. The outer bearings are replaceable. If the inner bearings are worn, the crankshaft assembly must be replaced.
4. Inspect seals for wear or damage. Outer seals are replaceable. Inner seals are available only with a complete crankshaft assembly.



Fig. 16-Checking Connecting Rod Side Clearance

5. Check connecting rod side clearance, Fig. 16. See specifications on page 20-20-1.
6. Inspect crankpin and piston pin bearings. Piston pin bearings are serviceable, but crankpin bearings are available with a complete crankshaft only.
7. Measure connecting rod small end diameter. If scored or not within tolerance, page 20-20-1, replace crankshaft assembly.

ASSEMBLY

Replace Crankshaft Outer Bearings

1. Remove Woodruff key and slide seals off.

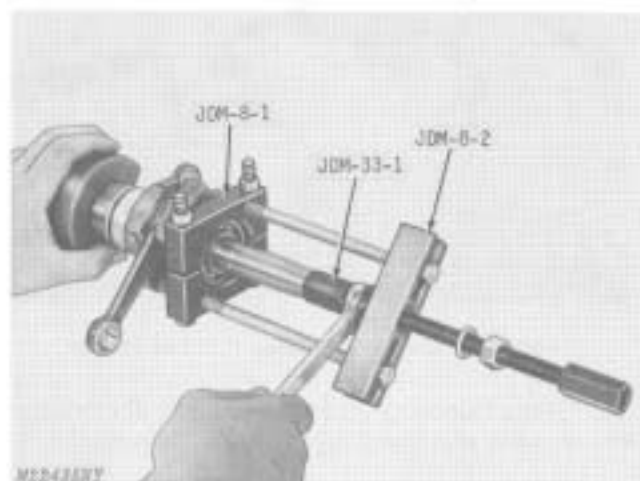


Fig. 17-Removing Outer Bearings

2. Use JDM-8-2 Puller to remove outer bearings as shown, Fig. 17. Thread other end of puller into PTO end to remove PTO end bearing.
3. Apply a light film of 2-cycle engine oil to crankshaft and inner race of bearing.

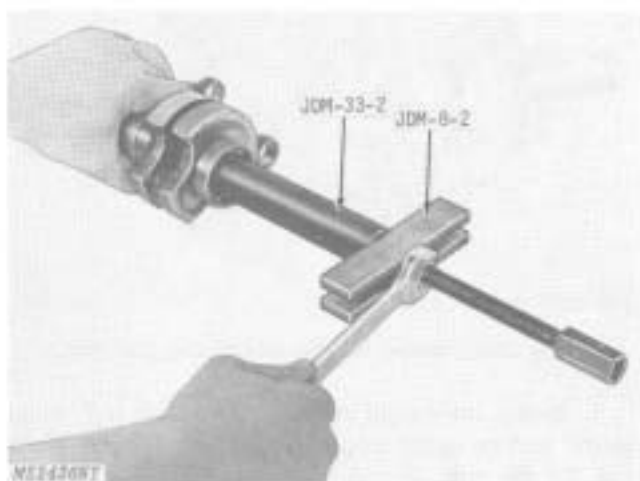


Fig. 18-Installing Crankshaft Bearing

4. Assemble JDM-8-2 and JDM-33-2 from JDM-8 Crankshaft Bearing Service Set as shown in Fig. 18. Install bearing until firmly seated against counterweight.

NOTE: Be sure bearing is started true and not cocked on shaft.

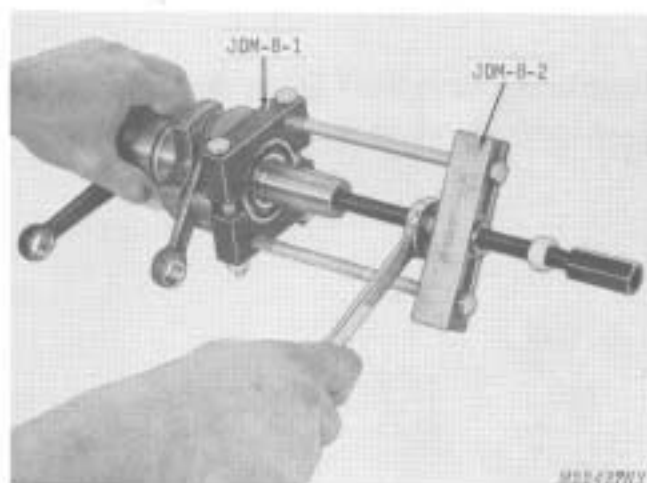


Fig. 19-Removing and Installing PTO End Bearing

5. Thread Bearing Tool into PTO end of crankshaft for removing and installing PTO end bearing, Fig. 19.

6. Install Woodruff key.

Adjust Crankshaft End Play



Fig. 20-Crankshaft Installed for Checking End Play

1. Install crankshaft in lower crankcase half, minus shims and oil seals, but with retaining rings in place, Fig. 20. Be sure O-ring is around PTO end bearing.

2. Tap crankshaft lightly with plastic hammer toward flywheel end.

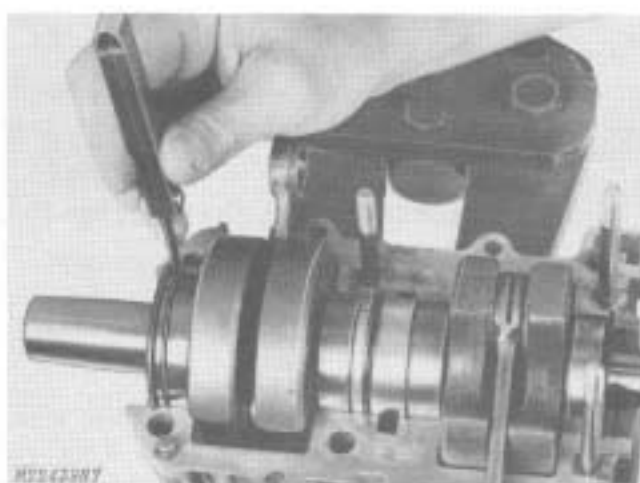


Fig. 21-Checking Crankshaft End Play

3. Measure between PTO end bearing and retaining ring with a feeler gauge, Fig. 21.

NOTE: Measure at flat surface of lower housing and retaining ring. **DO NOT** measure at top of bearing and retaining ring.

4. Correct end play is 0.006 to 0.012 inch (0.15 to 0.30 mm). Install equal shims at each end of crankshaft between bearings and retaining rings to obtain correct end play.

Install Crankshaft

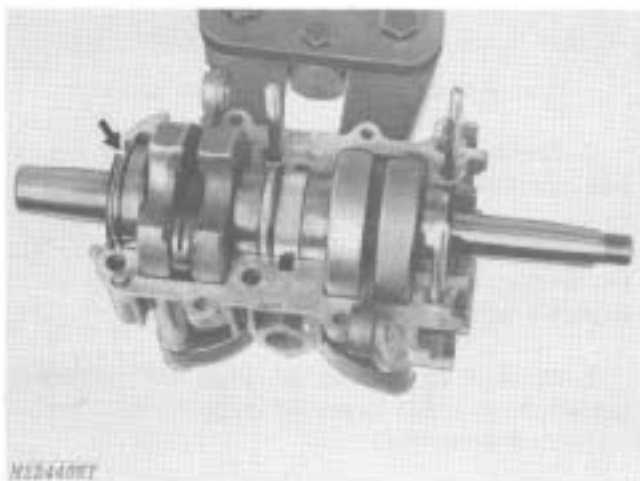


Fig. 22-Crankshaft and Shims Installed

1. Place crankshaft in lower crankcase half with retaining rings firmly in place, Fig. 22.

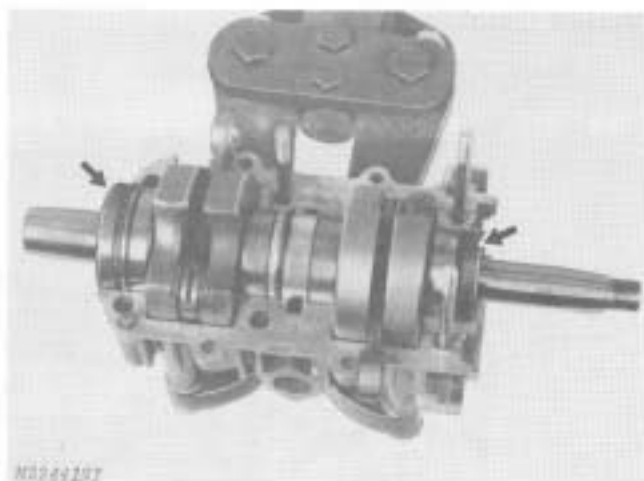


Fig. 23-Installing Crankshaft Oil Seals

2. Lubricate and install seals, lip inward, over each end of crankshaft. Seat seals firmly in lower crankcase half, Fig. 23.

3. Apply a light film of 2-cycle oil to crankshaft bearings.

4. Apply M64850 Silicone Rubber Adhesive evenly to mating surfaces of both crankcase halves.

5. Install upper crankcase half and torque the four cap screws to 8 to 9 ft-lbs (11 to 12 Nm).

Install Pistons

1. Install needle bearings in connecting rods. Lubricate bearings with 2-cycle oil.

2. Place piston over connecting rod with arrow toward exhaust side.



Fig. 24-Installing Piston Pin

3. Push piston pin through piston and connecting rod. Use hand pressure to install piston pin, Fig. 24.

4. Install new piston pin retaining clips. Be sure clips are in grooves so they do not come out when engine is operating.

Install Piston Rings

1. Remove old piston rings.

NOTE: Leaving old rings on piston until this step protects ring grooves.

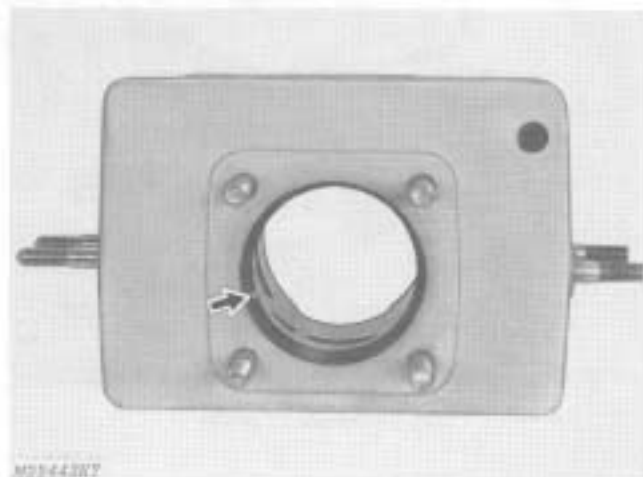


Fig. 25-Checking Ring End Gap

2. Check new ring end gap before installing on piston. Place ring in cylinder 1 inch (25.4 mm) down from top and measure for 0.010 to 0.015 inch (0.254 to 0.381 mm) gap, Fig. 25. If necessary, file each end of ring with ignition file to obtain correct gap.

3. Gently spread new rings with hands and slide ring on piston. Be sure ring gap is positioned over locating pin of piston.

Install Cylinders



Fig. 26-Installing Cylinder Gaskets

1. Install new gaskets with tab on gasket toward exhaust port side, Fig. 26.

NOTE: Gaskets must be installed correctly to avoid partially covering the transfer port.

2. Lubricate piston and cylinder bore with 2-cycle oil.

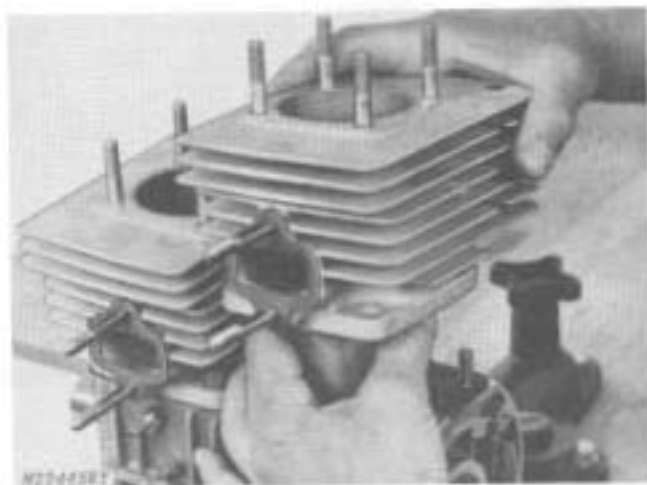


Fig. 27-Installing Cylinder

3. Use one hand to compress ring while sliding cylinder over piston, Fig. 27.

4. Install cylinder-to-crankcase bolts and nuts but do not tighten.

5. Install intake manifold to cylinders using NEW gaskets. Torque intake manifold nuts to 15 to 18 ft-lbs (20 to 24 Nm). This procedure aligns cylinders.



Fig. 28-Torquing Cylinder-to-Crankcase Nuts

6. Torque cylinder-to-crankcase nuts to 15 to 18 ft-lbs (20 to 24 Nm). Use JDM-105 Cylinder Nut Wrench, Fig. 28.

NOTE: Remove intake manifold after torquing cylinder-to-crankcase nuts and torque two nuts behind the intake manifold. Reinstall intake manifold.

Install Cylinder Heads

1. Install NEW cylinder head gaskets.

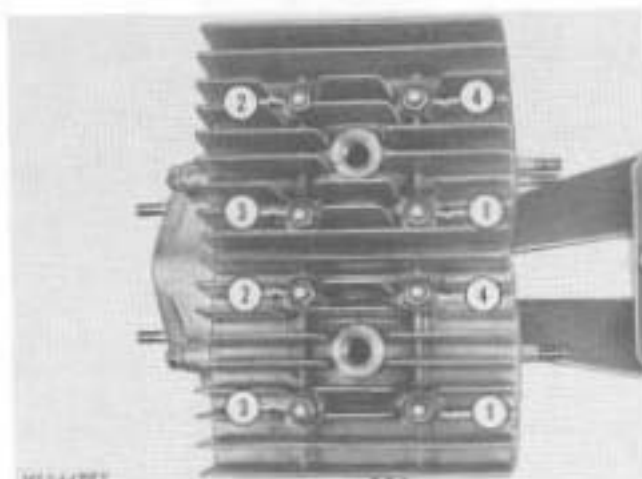
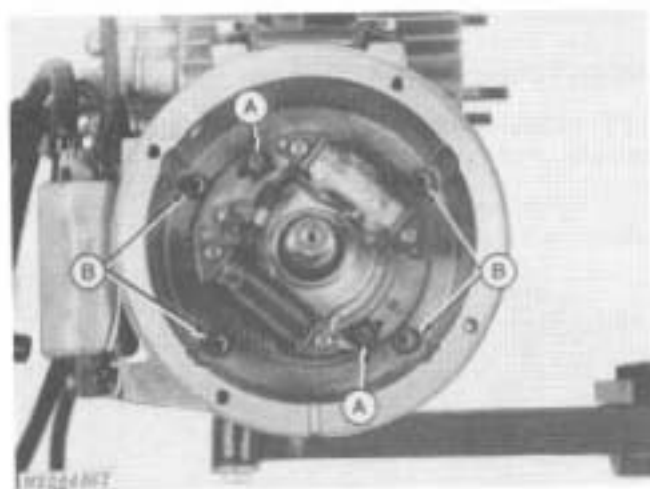


Fig. 29-Installing Cylinder Heads

2. Install cylinder heads and torque nuts in sequence shown in Fig. 29 to 15 to 18 ft-lbs (20 to 24 Nm).

Install Stator and Flywheel Housing



A—Stator Screws

B—Flywheel Housing Screws

Fig. 30-Installing Stator and Flywheel Housing

1. Install stator. Use Loctite on stator screws. Refer to page 40-10-6 for proper method of timing engine.

2. Install flywheel housing. Use Loctite on socket-head screws, Fig. 30. Be sure grommet is in place between housing and crankcase.

3. See page 40-10-6 for engine timing.

Install Flywheel

1. Install flywheel on crankshaft with keyway aligned with key in crankshaft.
2. Install locking plate.

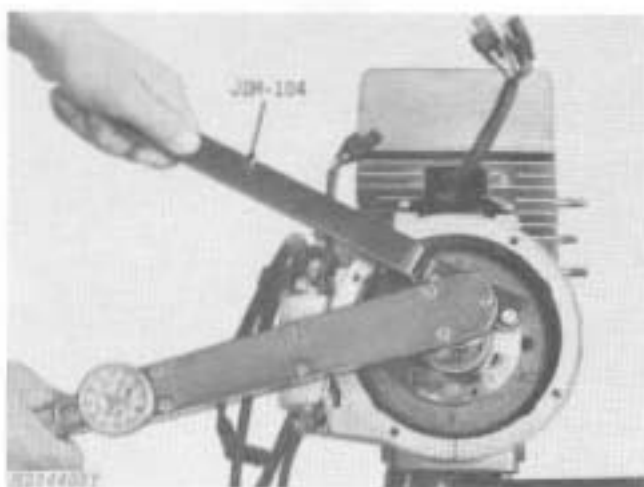


Fig. 31-Installing Flywheel

3. Use JDM-104 Flywheel Holding Tool to restrain flywheel. Torque retaining nut to 85 to 90 ft-lbs (115 to 122 Nm), Fig. 31. Bend locking plate.

IMPORTANT: DO NOT use impact wrench to tighten flywheel retaining nut. This could damage flywheel or engine.

4. Install starter cup and recoil starter.

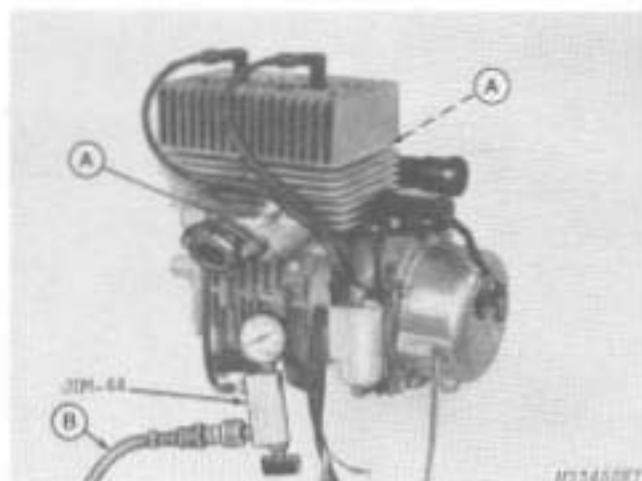
Install Exterior Components

1. Install exhaust manifold. Tighten nuts to 15 to 18 ft-lbs (20 to 24 Nm).
2. Install electronic pack and coil.
3. Install engine base.
4. Install primary clutch.

Pressure Test the Engine

Convenience Tool JDM-44 contains the necessary items to pressure test the engine.

1. Place rubber sheet (A) between exhaust manifold and cylinders.
2. Place rubber sheet (A) between intake manifold and cylinders.
3. Install and torque spark plugs to 14 ft-lbs (19 Nm).
4. Connect pressure regulator to impulse fitting. Close valve on regulator.



A—Rubber Sheets

B—Shop Air

Fig. 32-Pressure Testing Engine

5. Connect shop air (B) to pressure regulator. Open valve until gauge reads 7 psi (0.5 bar) (0.5 kg/cm²), Fig. 32. Close valve.

6. Gauge needle should not drop below 5 psi (0.3 bar) (0.4 kg/cm²) for at least 10 seconds.

7. If needle drops too rapidly, open valve to maintain 7 psi (0.5 bar) (0.5 kg/cm²). Apply a liquid soap solution to seals and seams to help locate leaks.

INSTALL ENGINE

1. Install engine with base. Torque base nuts to 35 to 40 ft-lbs (47 to 54 Nm).
2. Remove secondary sheave and install JDM-107 Clutch Aligning Tool. Align engine and tighten engine mounting bolts.
3. Install drive belt, starter handle, muffler and carburetor.
4. Install air silencer.

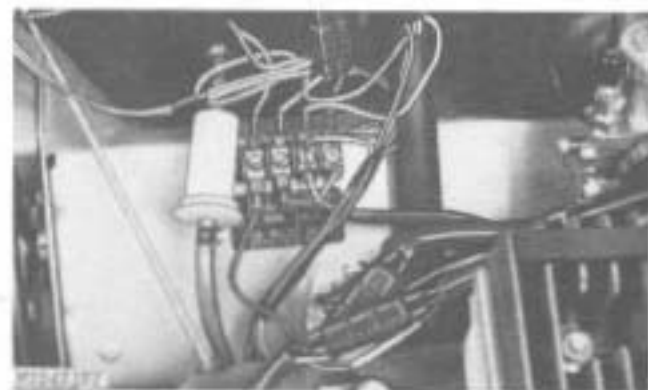


Fig. 33-Electrical Wiring Junction Block

5. Connect engine wiring to junction block, Fig. 33.
6. Connect impulse line from fuel pump to the engine.

Group 12

JOHN DEERE "FIREBURST" ENGINE

REMOVE ENGINE

1. Remove hood.

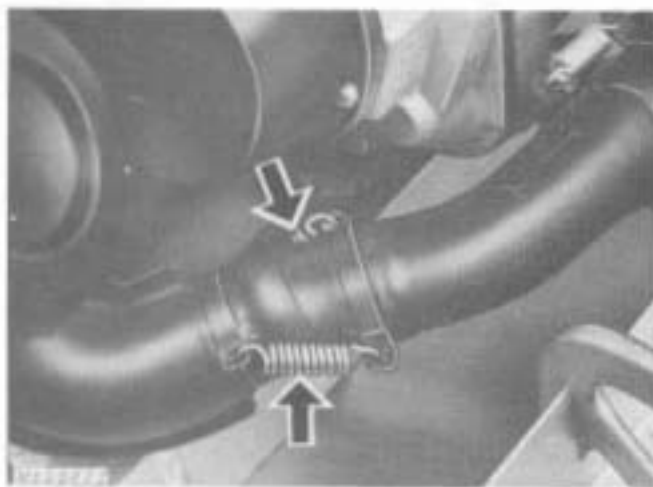


Fig. 1-Removing Muffler Springs

2. Remove springs securing muffler to exhaust manifold, Fig. 1.

3. Remove drive sheave. See Section 50.



Fig. 2-Fuel Pump Impulse Line

4. Disconnect fuel pump impulse line, Fig. 2.
5. Tie a knot in recoil start rope to hold it and remove handle.

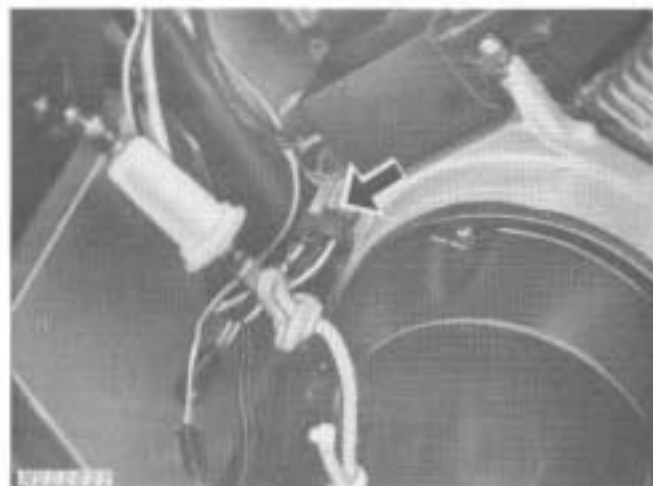


Fig. 3-Harness Connector

6. Disconnect wiring harness connector, Fig. 3.
7. Loosen carburetor clamp.
8. Remove muffler.

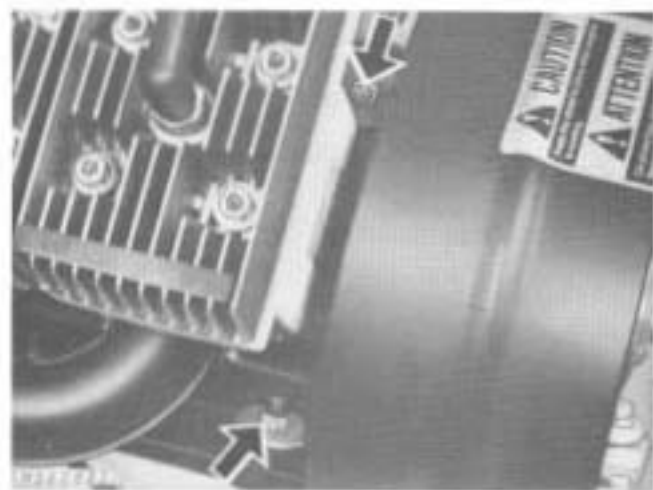


Fig. 4-Removing Engine Mounting Nuts

9. Remove engine mount nuts and lift engine out, Fig. 4.

DISASSEMBLY

Remove Exterior Components

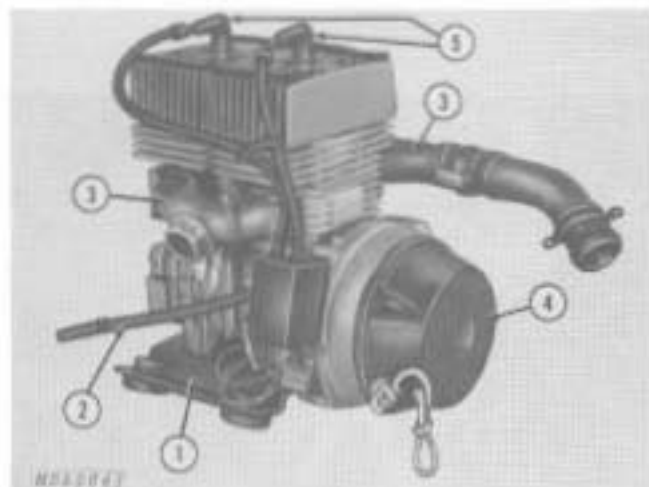
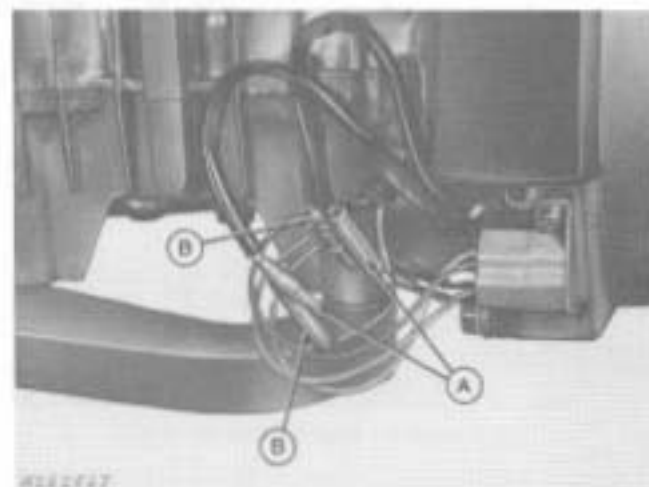


Fig. 5-Removing Exterior Components

1. Remove engine base, Fig. 5.
2. Remove fuel pump impulse line from engine.
3. Remove intake and exhaust manifolds.
4. Remove recoil starter.
5. Disconnect spark plug leads.

Disconnect Wiring

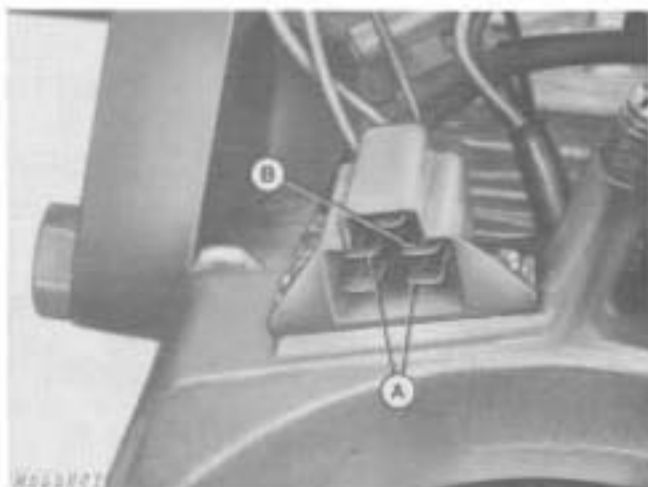


A—White

B—Red

Fig. 6-Disconnecting Wiring

1. Disconnect red and white leads, Fig. 6.



A—Yellow

B—Brown

Fig. 7-Removing Wiring

2. Disconnect one brown and two yellow leads from connector, Fig. 7. Mark their location for reassembly.

Remove Flywheel Housing

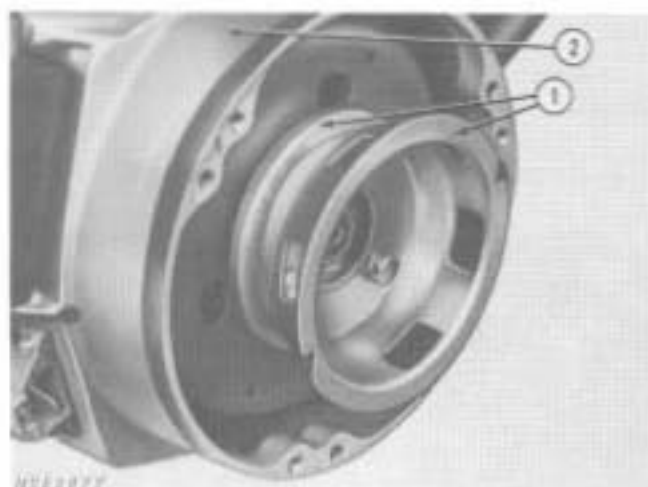
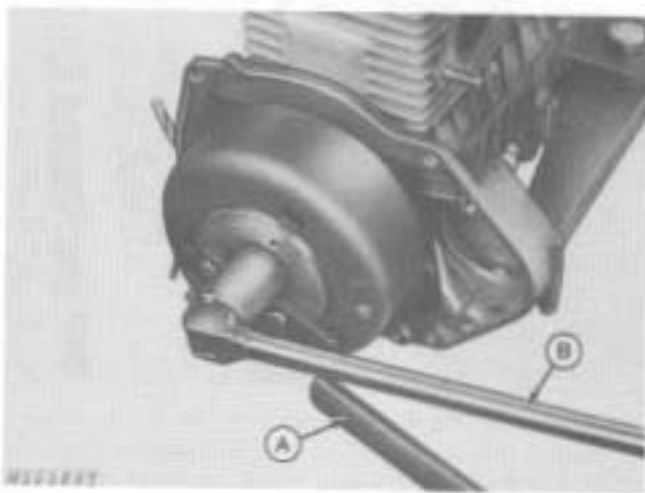


Fig. 8-Removing Flywheel Housing

1. Remove starter pulley and spacer, Fig. 8.
2. Remove flywheel housing.

Remove Flywheel

1. Bend up tangs on locking plate.



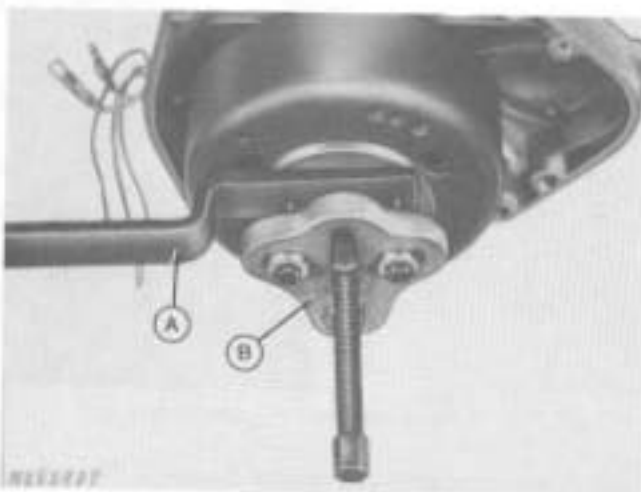
A—JDM-64-1 Flywheel Holding Tool

B—Breaker Bar

Fig. 9-Flywheel Holding Tool

2. Use JDM-64-1 Flywheel Holding Tool. Remove flywheel nut and locking plate, Fig. 9.

NOTE: Modify JDM-64-1 Flywheel Holding Tool by drilling out holes to 3/8 inch (9.5 mm). Elongate holes to fit flywheel.



A—JDM-64-1 Flywheel Holding Tool

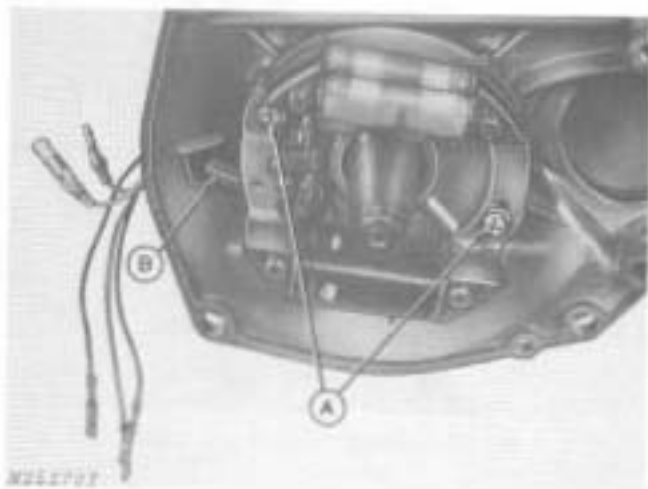
B—JDM-9 Puller

Fig. 10-Removing Flywheel

3. Use JDM-9 Puller and JDM-64-1 Flywheel Holding Tool positioned as illustrated to remove flywheel, Fig. 10.

NOTE: Do not strike flywheel with a hammer. Strike puller bolt with a plastic or wood mallet.

Remove Stator



A—Stator Screws

B—Grommet

Fig. 11-Removing Stator

1. Remove stator, Fig. 11. Pull leads and grommet through crankcase.

Check Crankshaft Runout

1. Remove spark plugs.

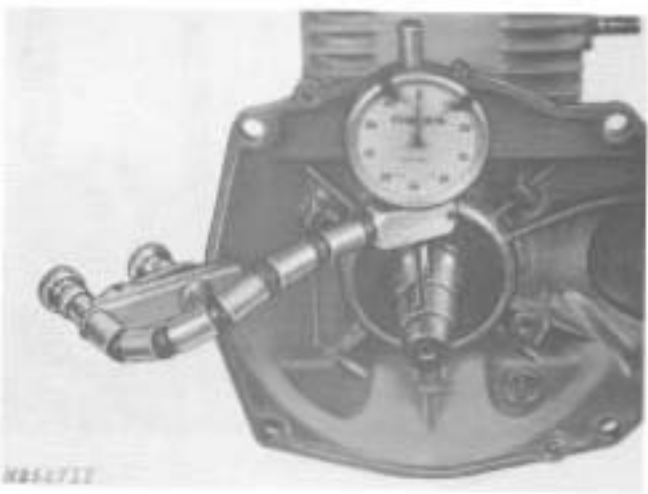


Fig. 12-Checking Crankshaft Runout

2. Install a dial indicator at the junction of the crankshaft tapered and parallel sections, Fig. 12.
3. Rotate crankshaft to check runout. Maximum permissible runout is 0.002 inch (0.0508 mm).
4. Replace crankshaft assembly if not within limits.

Remove Cylinders and Heads



Fig. 13-Removing Cylinders and Heads

1. Mark cylinders and heads, Fig. 13. Use "F" for flywheel and "P" for PTO end.
2. Remove cylinder heads and gaskets.
3. Remove cylinders and gaskets.

Remove Pistons

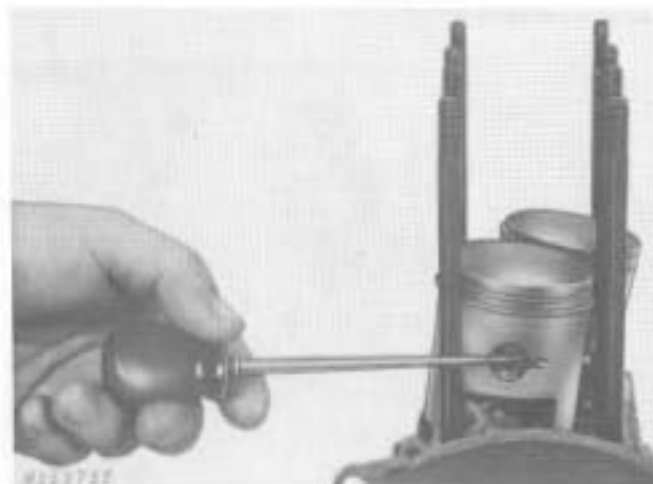


Fig. 14-Removing Piston Pin Retainer

1. Remove piston pin retainer with an awl, Fig. 14. Discard retainers. Use NEW retainers for assembly.



Fig. 15-Removing Piston Pin

2. Warm piston with your hands and push piston pin out, Fig. 15.

NOTE: If pin can't be pushed out by hand, use JDM-7 Tool Set with JDM-32 Guide.

3. Remove piston.



Fig. 16-Removing Piston Pin Needle Bearing

4. Remove piston pin needle bearings, Fig. 16.

Remove Crankshaft

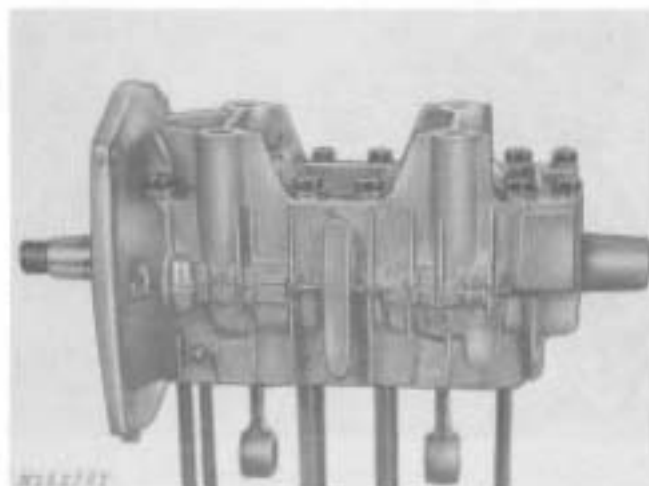


Fig. 17-Separating Crankcase

1. Set crankcase on a bench as shown, Fig. 17.
2. Remove crankcase bolts.
3. Separate crankcase halves using a plastic or wood mallet. DO NOT pry apart with a screwdriver.
4. Lift crankshaft out of upper crankcase half.

INSPECTION AND REPAIR

Crankcase

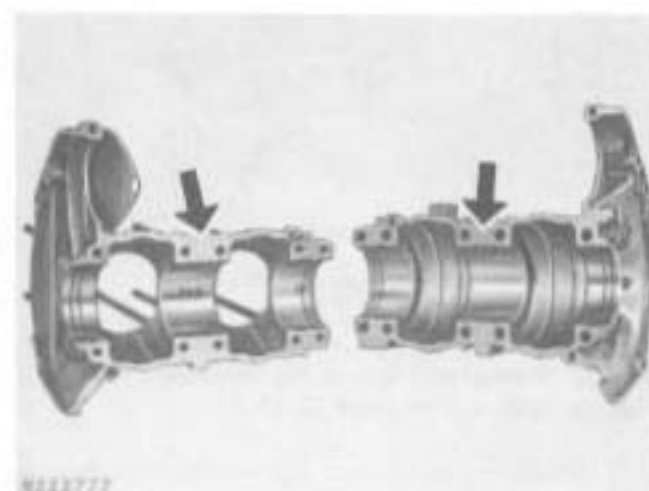


Fig. 18-Inspecting Crankcase

1. Clean sealer off crankcase sealing surface, Fig. 18. Inspect this surface for deep scratches, pitting or scoring.

2. Check bearing surfaces and retainer slots for wear or conditions that could cause leaks.

NOTE: Minor indication of bearing outer race rotation is normal.

Crankcase halves are available only as a matched set.

Cylinder Heads

1. Carefully scrape carbon from cylinder head with a soft metal (non-ferrous) scraper.
2. Use a spark plug tap (14 mm) to clean carbon from spark plug threads.

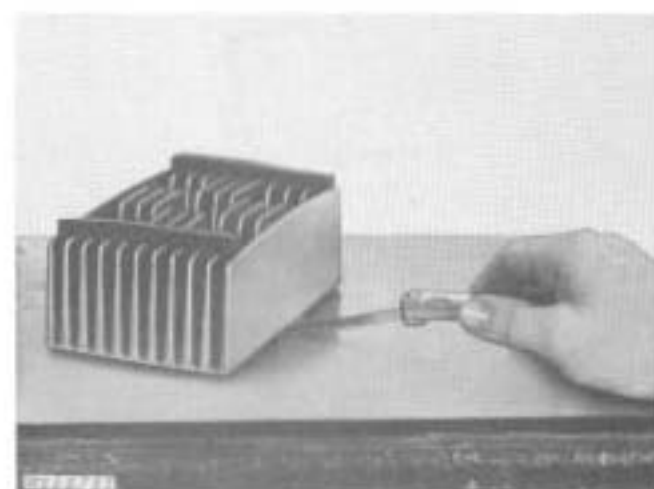
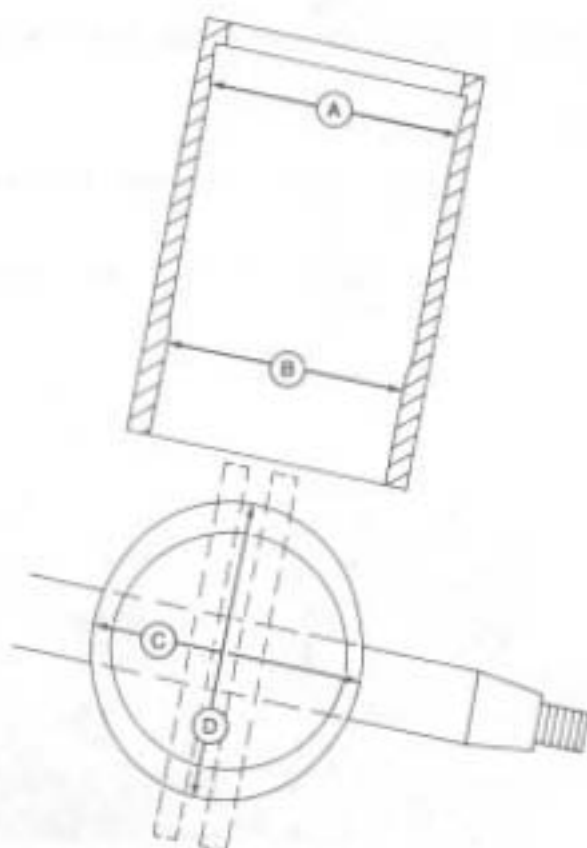


Fig. 19-Inspecting Cylinder Head

3. Check cylinder head for flatness on a surface plate, Fig. 19. Check at various points around head with a 0.001-inch (0.0254 mm) feeler gauge. If there is any distortion, replace the head.

Cylinders

1. Clean gasket material from cylinder surface and carbon from exhaust port with a soft metal (non-ferrous) scraper.



H23393

A—Top of Ring Travel Zone
B—Bottom of Ring Travel Zone

C—Parallel to Crankshaft
D—Right Angle to Crankshaft

Fig. 20—Measuring Cylinder Bore

2. Measure cylinder bore at C and D in position A of cylinder. Measure cylinder bore at C and D in position B of cylinder, Fig. 20. If any dimension exceeds wear tolerances, the cylinder must be replaced. See specifications on page 20-20-2.

IMPORTANT: Do not hone or rebore cylinder. It is chrome-plated and must be replaced if out of specification.

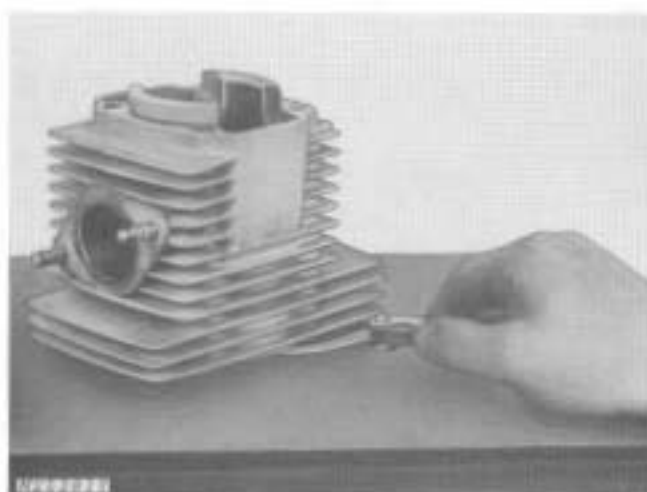
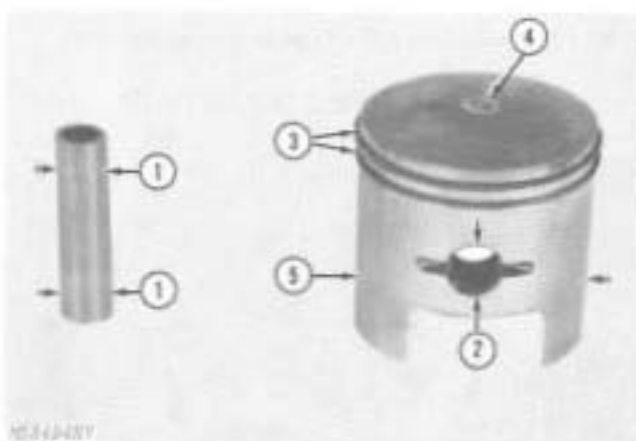


Fig. 21—Inspecting Cylinder

3. Set cylinder on a surface plate and check at various points around cylinder with a 0.001-inch (0.0254 mm) feeler gauge, Fig. 21. If there is any distortion, replace the cylinder.

Piston and Rings



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Fig. 22—Inspecting Piston

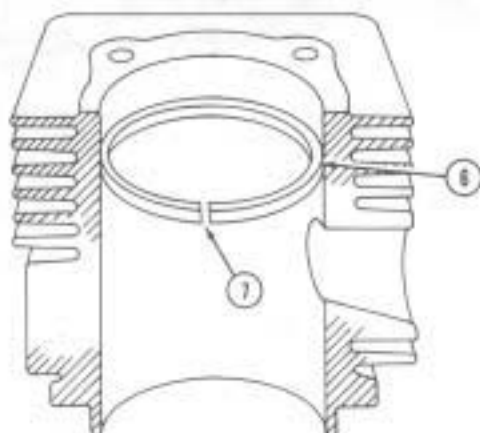
1. Measure piston pin in the two locations shown, Fig. 22. If dimension is less than specified, replace it. See specification on page 20-20-2.

2. Measure piston pin bore dimension on both sides of piston. If either dimension exceeds specification, replace the piston. See specification on page 20-20-2.

3. Remove the piston rings with a ring expander and clean ring grooves with a ring groove cleaning tool.

4. Check piston for being pitted, scored or corroded. Replace it if necessary. Clean any carbon deposit from top of piston.

5. Measure the piston diameter at a right angle to the piston pin bore. If dimension is less than specified, replace the piston. See specification on page 20-20-2.

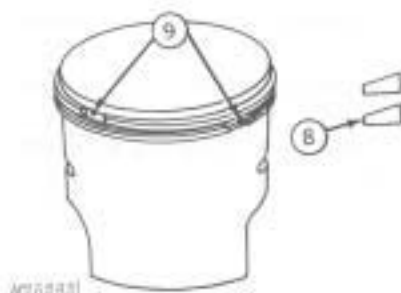


N22485

Fig. 23-Checking Ring End Gap

6. Use a piston to push the ring into a cylinder that has been inspected and proven correct. Push it into bore one inch (25.4 mm) below top of bore, Fig. 23.

7. Measure the ring end gap. End gap should be 0.011 to 0.019 inch (0.28 to 0.40 mm). If end gap is incorrect, the ring is incorrect or worn. Replace it.



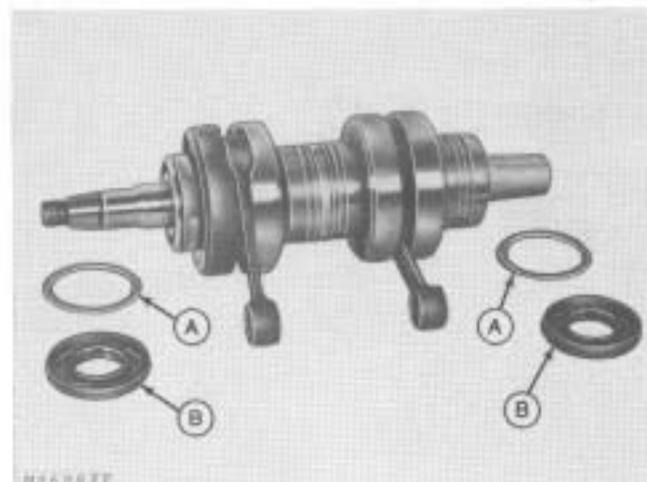
N22533

Fig. 24-Installing Piston Rings

8. Install rings on piston, Fig. 24.

9. Make sure both rings are located so that pins are in the end gap and widest part of ring gap is up.

Crankshaft



N22587

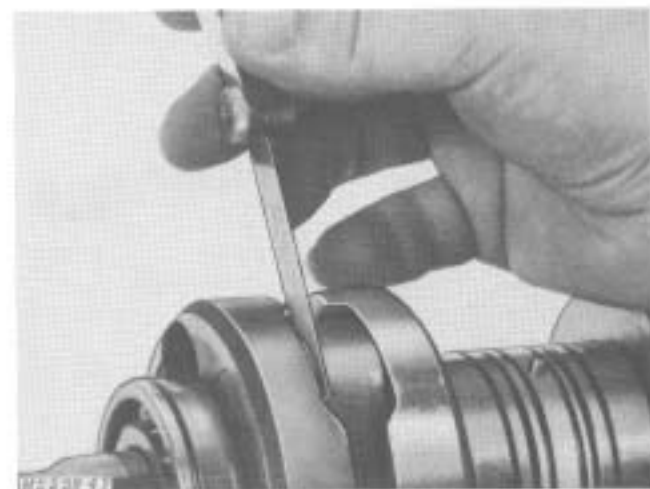
A—Retainers

B—Seals

Fig. 25-Removing Crankshaft Seals and Retainers

1. Remove crankshaft seals and retainers. Replace the seals if they are damaged, Fig. 25.

2. Measure the connecting rod inside diameter. If diameter exceeds specification, replace the crankshaft assembly. See specification on page 20-20-2.



N22588

Fig. 26-Checking Connecting Rod Side Clearance

3. Move the connecting rod to one side and measure the clearance on opposite side with a feeler gauge, Fig. 26. If clearance exceeds specification, replace the crankshaft. See specification on page 20-20-2.

4. Rotate the five crankshaft bearings. If any rotate roughly or are frozen, they are damaged. The outside bearings can be replaced but the inner bearings can be replaced only with a crankshaft assembly.

Replacing Outer Crankshaft Bearings

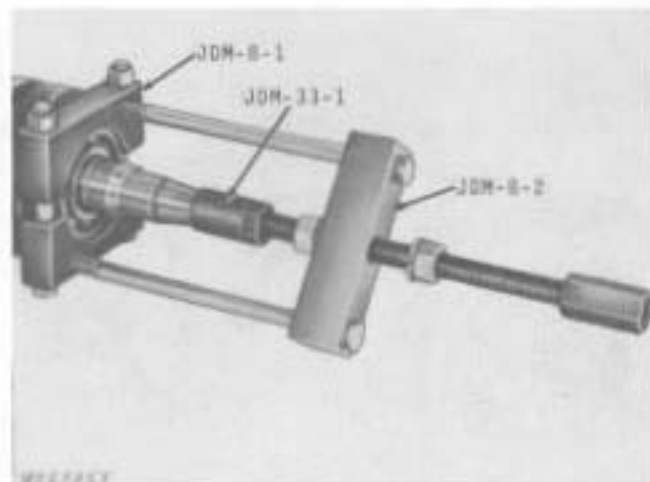


Fig. 27-Remove Outer Bearing from Flywheel End

1. Install JDM-33-1 Adapter on crankshaft.
2. Use JDM-8-1 and JDM-8-2 to remove bearing from crankshaft, Fig. 27.

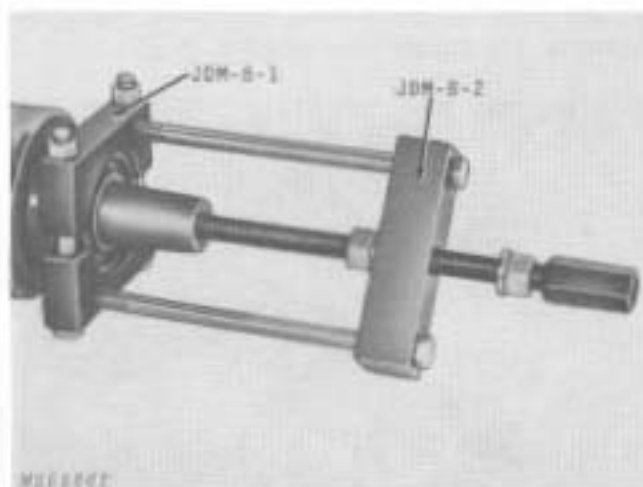


Fig. 28-Removing Outer Bearings from PTO End

3. Use JDM-8-1 and JDM-8-2 to remove bearings from crankshaft, Fig. 28.

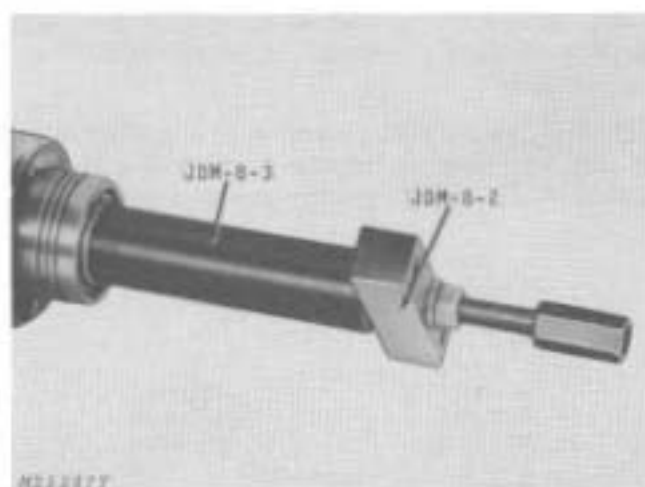


Fig. 29-Installing Outer Bearings on PTO End

4. Use JDM-8-3 and JDM-8-2 to install bearings on crankshaft, Fig. 29.

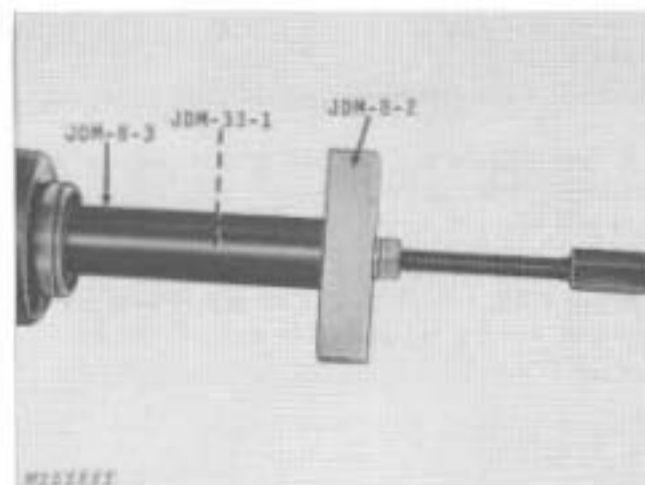


Fig. 30-Installing Outer Bearing on Flywheel End

5. Install JDM-33-1 Adapter on crankshaft, Fig. 30.
6. Use JDM-8-3 and JDM-8-2 to install bearing on crankshaft, Fig. 30.

ASSEMBLY

Installing Crankshaft Seals

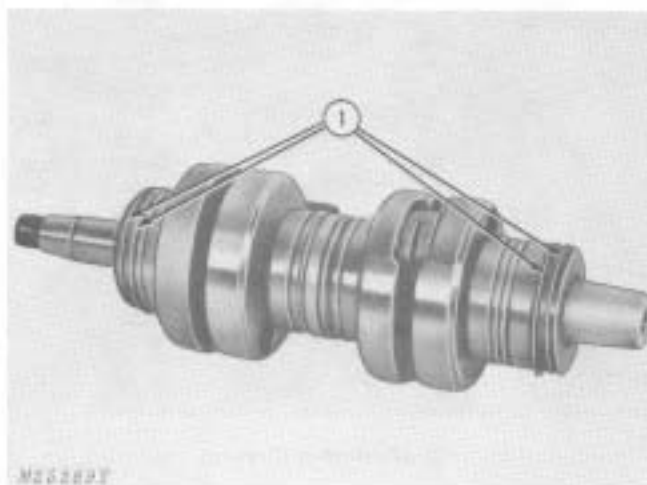


Fig. 31-Installing Crankshaft Oil Seals

1. Place retainers and oil seals (lip inward) on crankshaft, Fig. 31. Lubricate seals.

Installing Crankshaft

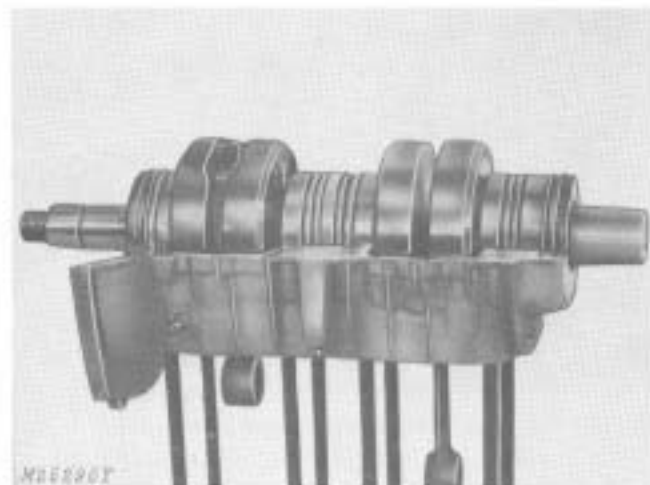


Fig. 32-Installing Crankshaft

1. Place upper crankcase half on work bench as shown and install crankshaft, Fig. 32.

IMPORTANT: The locating pin on the center crankshaft spacer must fit into the hole in the upper crankcase.



Fig. 33-Checking Crankshaft End Play

2. Tap crankshaft toward flywheel end of crankcase with a plastic mallet.
3. Check clearance between outer PTO bearing and retainer, Fig. 33, with a feeler gauge.
4. If end play exceeds 0.030 inch (0.77 mm), shims must be added between the two outer bearings on the PTO end of crankshaft. Shims are available in 0.004-inch (0.1 mm) and 0.010-inch (0.3 mm) thickness.

Installing Lower Crankcase Half

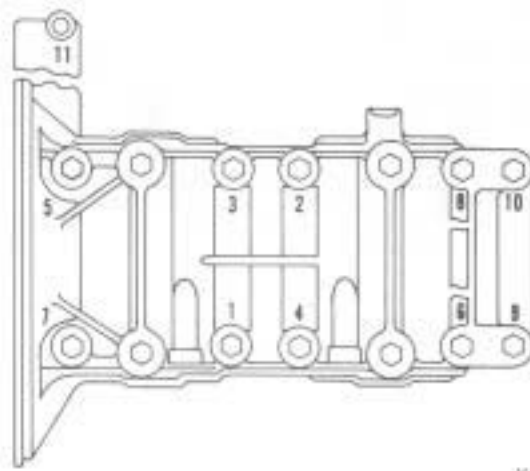


Fig. 34-Installing Lower Crankcase Half

IMPORTANT: Apply an even coat of M64850 Silicon Rubber Adhesive to sealing surfaces of both crankcase halves. Do not permit sealer to enter interior of crankcase halves.

Install lower crankcase half and torque nuts to 16 ft-lbs (22 Nm) in the sequence shown in Fig. 34.

Installing Pistons



Fig. 35-Installing Piston Pin Needle Bearings

1. Place needle bearings in connecting rod, Fig. 35.

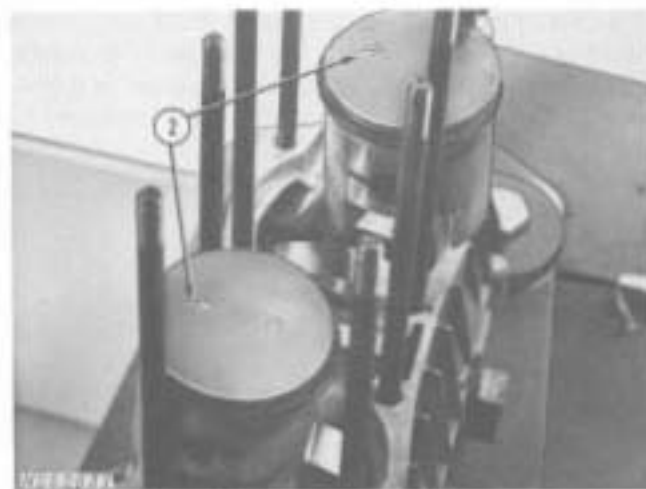


Fig. 36-Installing Pistons

2. Set piston over connecting rod with arrow pointing toward exhaust side, Fig. 36.
3. Push piston pin into piston and connecting rod and install new retainers.
4. Place new cylinder gaskets on crankcase. Make sure they are correctly installed.

Installing Cylinders and Heads



Fig. 37-Installing Cylinders

1. Make sure piston rings end gaps are centered over pin. Compress the rings with your fingers as you install the cylinder, Fig. 37.



Fig. 38-Installing Cylinder Heads

2. Install cylinder heads and gaskets, Fig. 38. DO NOT tighten hardware.
3. Install exhaust manifolds and gaskets. Tighten hardware to 10 to 12 ft-lbs (14 to 16 Nm).
4. Install intake manifold and gaskets. Tighten hardware to 4.3 to 5.8 ft-lbs (5.8 to 7.8 Nm) torque.
5. Tighten cylinder head hardware to 16 ft-lbs (22 Nm) torque.

NOTE: Use a cross pattern when tightening all hardware.

Installing Stator

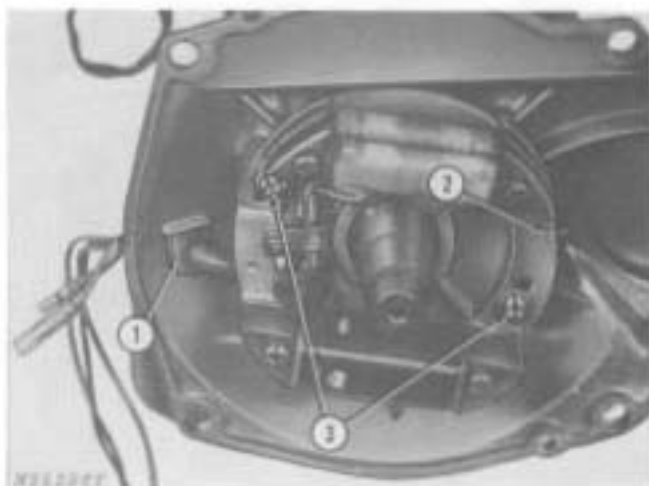
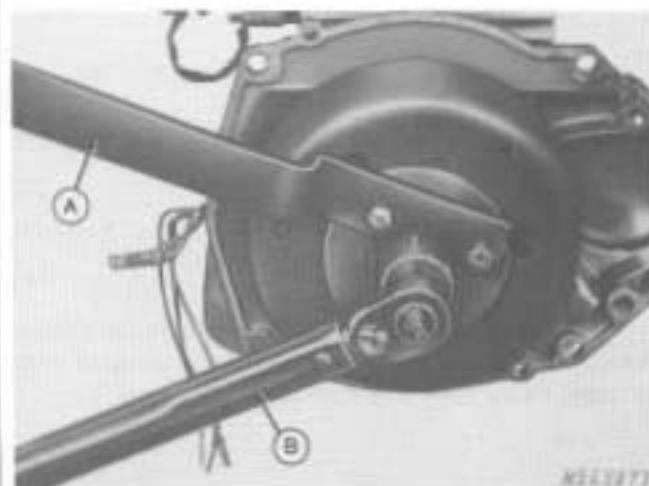


Fig. 39-Installing Stator

1. Guide stator leads through grommet and set stator against crankcase.
2. Align longest mark on stator with top of ridge on crankcase, Fig. 39.
3. Tighten stator screws.

Installing Flywheel



A—JDM-64-1 Flywheel Holding Tool B—Torque Wrench

Fig. 40-Installing Flywheel

1. Install flywheel key in keyway on crankshaft.
2. Install flywheel, lock washer and nut.

NOTE: Lock washer has a tang to engage keyway.

3. Hold flywheel with JDM-64-1 Flywheel Holding Tool and tighten flywheel nut to 60 ft-lbs (81 Nm) torque, Fig. 40.

4. Bend tabs on lock washer to secure nut.

Installing Flywheel Housing

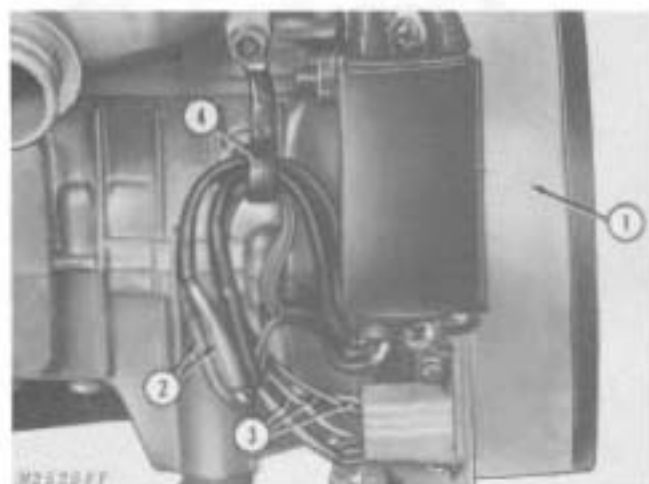


Fig. 41-Installing Flywheel Housing

1. Install flywheel housing, Fig. 41. Install wire harness clamp.
2. Connect red lead and white lead.
3. Install two yellow and one brown lead in connector as marked when removed.
4. Secure wiring harness with clamp.



Fig. 42-Installing Starter Pulley

5. Install flywheel spacer (lip edge inward) and starter cup, Fig. 42.

Installing Exterior Components

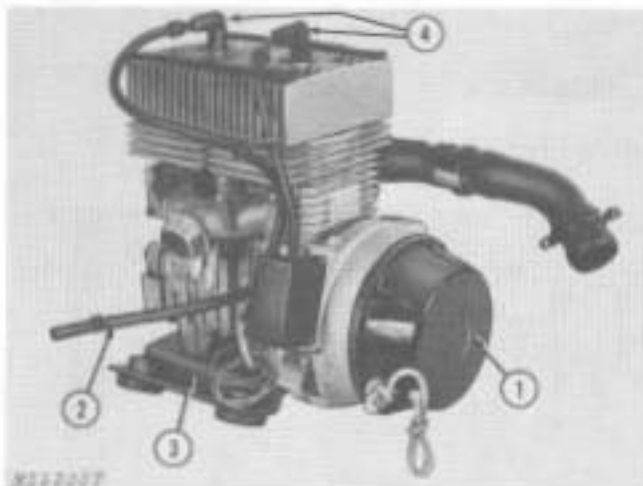
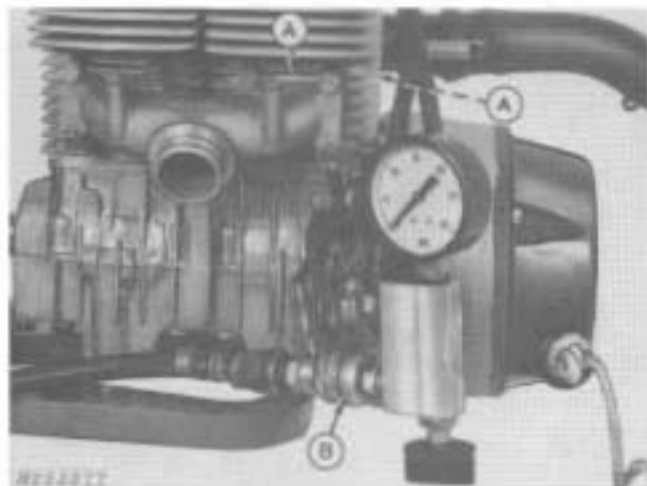


Fig. 43-Installing Exterior Components

1. Install recoil starter, Fig. 43.
2. Install fuel pump impulse line.
3. Install engine base. DO NOT tighten bolts.
4. Install spark plugs. Tighten spark plugs to 20 ft-lbs (27 Nm) torque. Connect spark plug leads.

PRESSURE TESTING ENGINE



A—Rubber Sheet

B—Shop Air

Fig. 44-Pressure Testing Engine

1. Place rubber sheet (A) between exhaust manifold and cylinder, Fig. 44.
2. Place rubber sheet (A) between intake manifold and cylinders. Torque bolts to 4.3 ft-lbs (5.8 Nm).
3. Connect pressure regulator to impulse fitting.
4. Close regulator valve.
5. Connect shop air (B) to regulator, Fig. 44.
6. Open valve until gauge reads 7 psi (48 kPa) (0.5 bar). Then, close valve.
7. Gauge needle should not drop below 5 psi (35 kPa) (0.3 bar) for at least 10 seconds.
8. If needle drops before 10 seconds, open valve to maintain 7 psi (48 kPa) (0.5 bar). Apply a liquid soap solution to seals and seams to locate leaks.

INSTALLING ENGINE

1. Place engine in snowmobile.

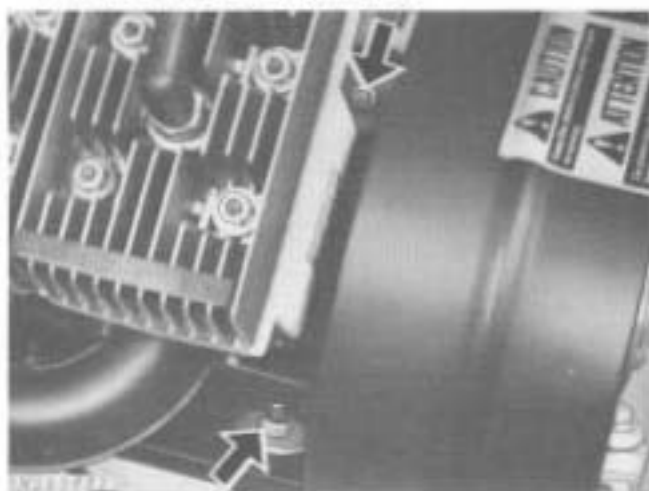


Fig. 45-Installing Engine Mounting Hardware

2. Install engine mounting bolts, Fig. 45. Tighten rear bolts to 45 to 55 ft-lbs (61 to 75 Nm) torque. Tighten front bolts to 35 ft-lbs (47 Nm) torque.

3. Install drive sheave. See Section 50.
4. Check clutch alignment. See page 50-20-2.
5. Connect carburetor to intake manifold.



Fig. 46-Harness Connector

6. Connect wiring harness connector, Fig. 46.
7. Install handle and release knot in recoil start rope.

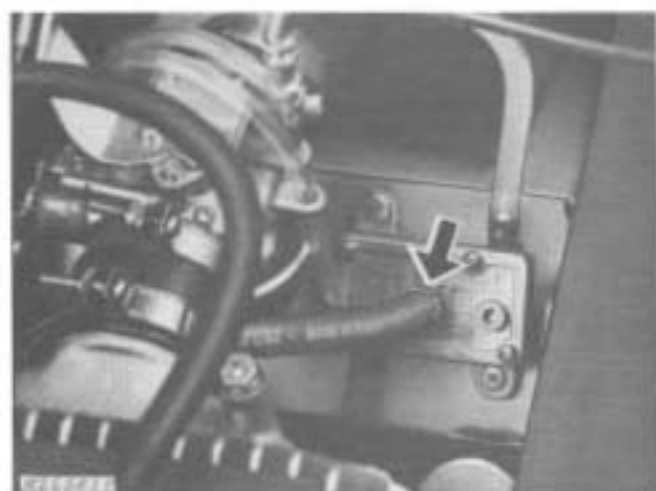


Fig. 47-Fuel Impulse Line

8. Connect fuel impulse line to fuel pump, Fig. 47.

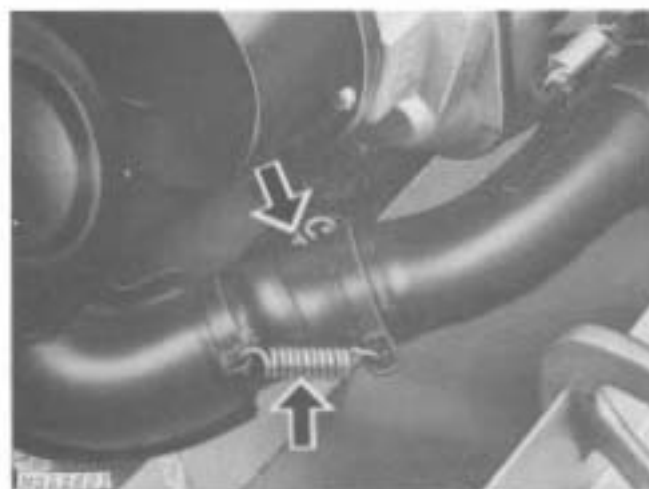


Fig. 48-Installing Muffler Springs

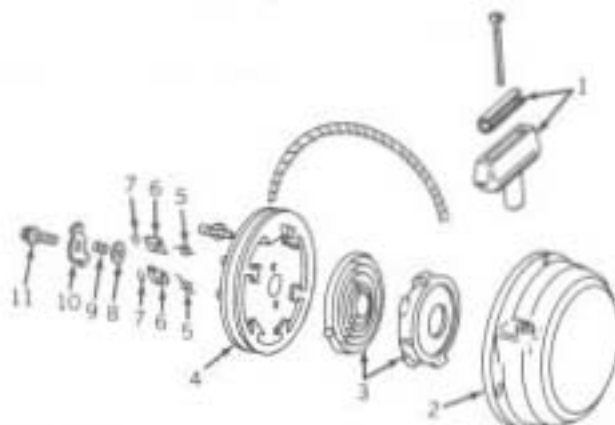
9. Install muffler.
10. Install muffler springs, Fig. 48.
11. Install hood.

Group 15 RECOIL STARTER (KOHLER)

REMOVAL

1. Remove handle and allow rope to wind into housing.
2. Remove recoil starter.

DISASSEMBLY



N122212

- | | |
|---------------------|-------------------|
| 1—Handle | 6—Pawl |
| 2—Housing | 7—Retaining Rings |
| 3—Spring and Keeper | 8—Brake Washer |
| 4—Pulley | 9—Brake Spring |
| 5—Pawl Spring | 10—Pawl Cam |
| | 11—Center Screw |

Fig. 1—Recoil Starter Assembly

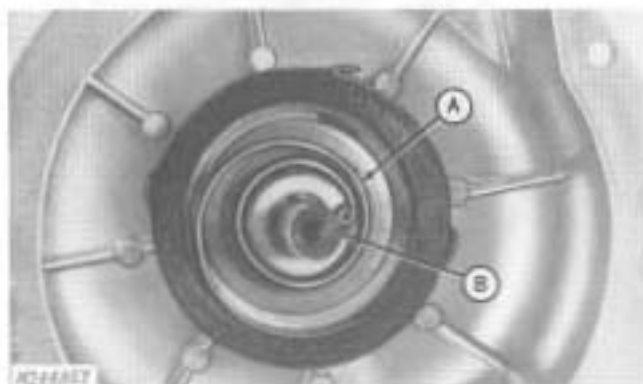
1. Remove center screw, pawl cam, brake spring and brake washer, Fig. 1.
2. Remove retaining rings, pawls and pawl springs.
3. Remove pulley, spring and keeper assembly.

NOTE: Recoil spring is serviced in a steel case. Spring alone is non-serviceable.

INSPECTION

1. Replace rope if frayed or broken.
2. Check pawls and starter cup engagement surfaces for wear.
3. Check pawl return springs for adequate tension.

ASSEMBLY

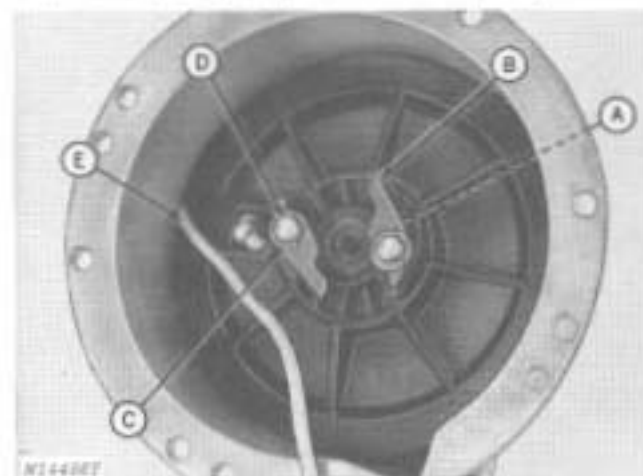


A—Spring Assembly

B—Notch

Fig. 2—Installing Recoil Spring

1. Install spring assembly (A) with loop on end of spring in notch (B) as shown in Fig. 2.
2. Lubricate pawl pivot shafts on pulley with oil.



A—Pawl Springs

B—Pawls

C—Retaining Rings

D—Pivot Shafts

E—Notch

Fig. 3—Installing Pulley

3. Install pawl springs (A), pawls (B) and retaining rings (C) on pivot shafts (D), Fig. 3.
4. If a new rope is to be installed, fuse both ends of the rope with a match.
5. File a small notch (E) in pulley rim as shown in Fig. 3. This provides a place for the rope when pretensioning spring after the pulley is installed.
6. Insert rope through hole in pulley and tie a knot in the end of rope. Wrap rope around pulley in a counterclockwise direction.

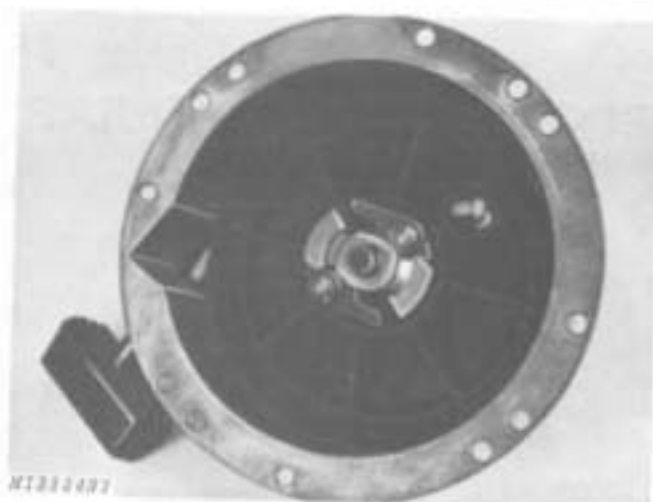


Fig. 4-Recoil Starter Assembled

7. Hold rope in notch and install pulley. Rotate pulley until it drops into place, Fig. 4.

8. Install brake washer, brake spring and pawl cam. Coat center screw bearing surfaces with light grease and torque center screw to 5 ft-lbs (7 Nm).

9. Hold rope in notch and wind pulley counter-clockwise two turns. Insert rope through hole in housing and tie slip knot in rope to prevent it retracting.

NOTE: Do not install handle.

INSTALLATION

1. Install recoil starter.
2. Place rope through console panel and install handle.

Group 17 RECOIL STARTER (JOHN DEERE)

REMOVAL



Fig. 1-Removing Recoil Starter

1. Pull on rope, tie a knot in rope and remove handle, Fig. 1.
2. Remove recoil starter.

DISASSEMBLY

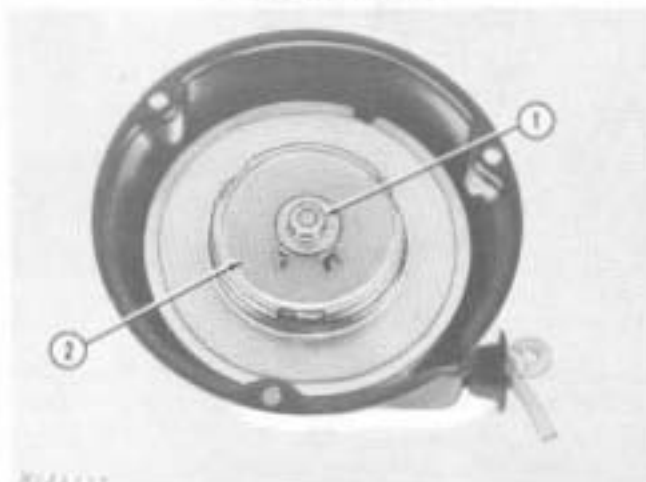


Fig. 2-Removing Spring Cover

CAUTION: Recoil starter parts are under spring pressure. Wear safety glasses and use care during disassembly and assembly.

1. Press down on retainer cover and remove nut, lockwasher and large washer.

2. Slowly lift off retainer cover.

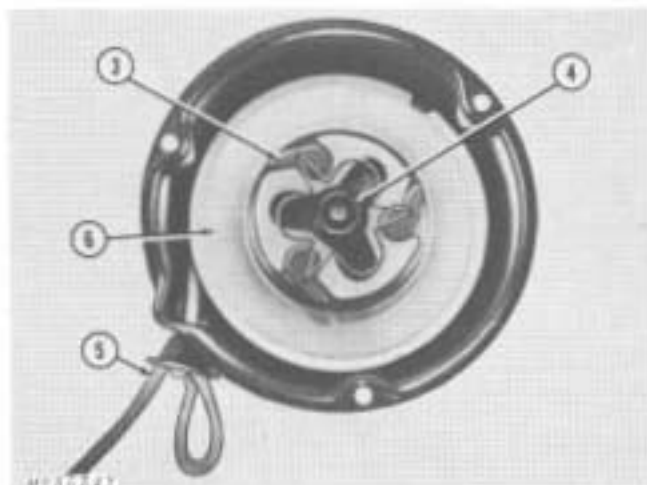


Fig. 3-Removing Spring and Pawls

3. Remove pawls and pawl springs.
4. Remove return spring, center spring and washer.
5. Untie knot in rope and release it.
6. Rotate recoil reel back and forth to release spring and slowly remove reel from housing.

DISASSEMBLY—Continued

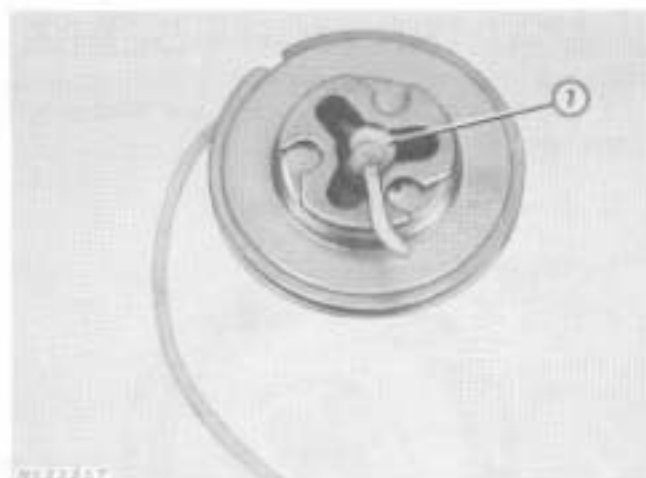


Fig. 4-Removing Rope

7. Pull on knotted end of rope to remove it.

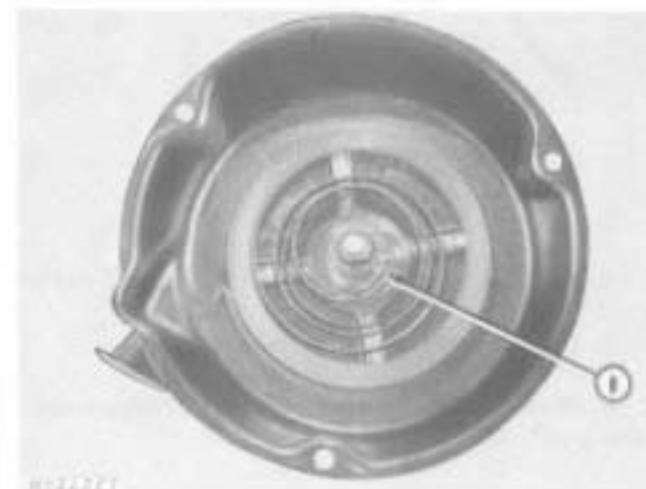


Fig. 5-Removing Recoil Spring

IMPORTANT: Inspect the recoil spring, Fig. 5, for damage. Do not remove it unless it must be replaced. Spring will unwind during removal.

8. Use a long object to pry up on center of spring until it springs out of housing.

ASSEMBLY

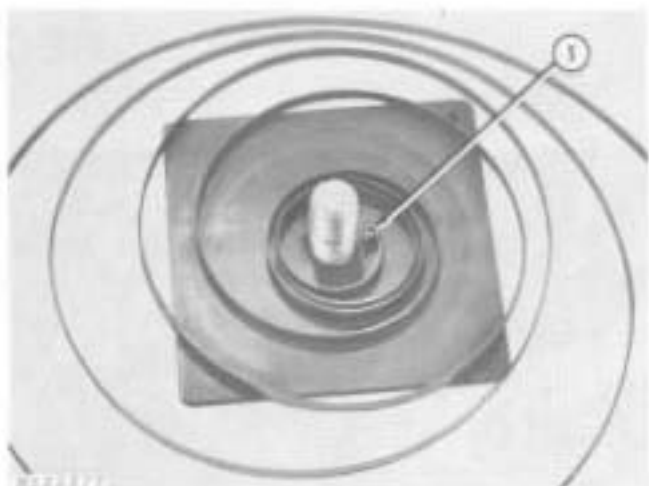


Fig. 6-Installing Spring in Winding Tool

1. Set recoil spring on JDM-113 Starter spring winding tool with the inner bend hooked on pin, Fig. 6.



Fig. 7-Assembling Tool

2. Set retainer over spring as shown, Fig. 7, and install washer and nut.

3. Start rotating retainer clockwise.

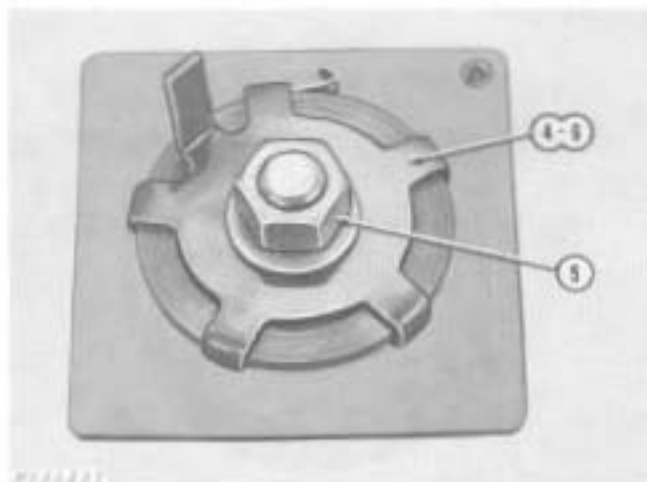


Fig. 8-Winding Recoil Spring

4. Continue winding spring until it is completely gathered in the retainer. Then, release retainer and allow it to spin freely.

5. Remove nut and washer.

6. Carefully lift retainer (with spring encased) from Winding Tool Plate.

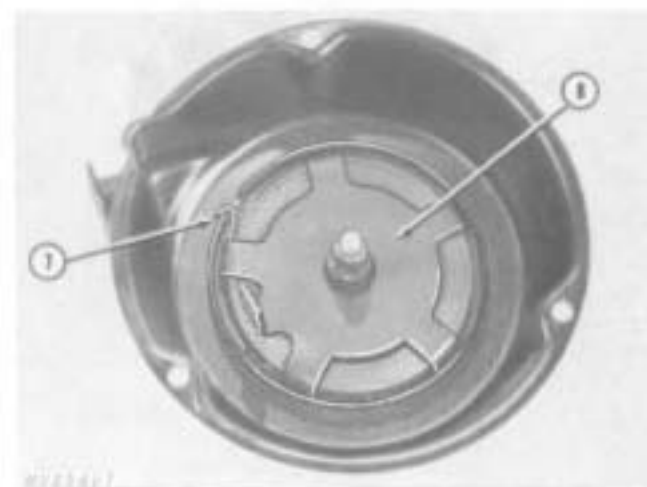


Fig. 9-Installing Recoil Spring

7. Set recoil spring in housing and connect bent end to notch, Fig. 9.

8. Hold spring down and remove retainer.

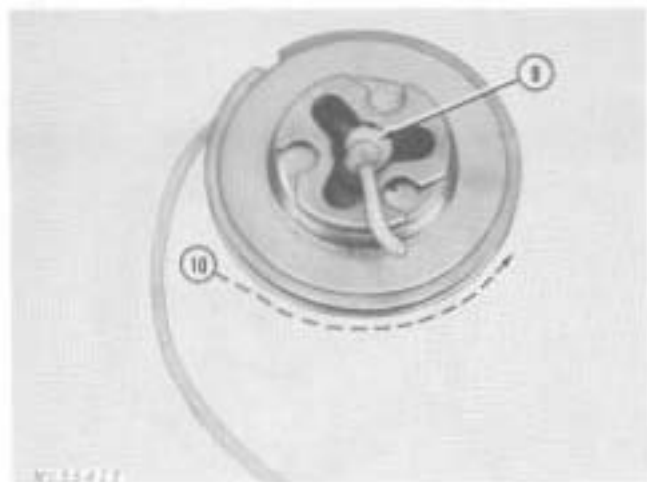


Fig. 10-Installing Rope

9. Tie a knot in one end of rope and guide the other end through hole in recoil reel until knot is seated, Fig. 10.

10. Wind rope counterclockwise around recoil reel.

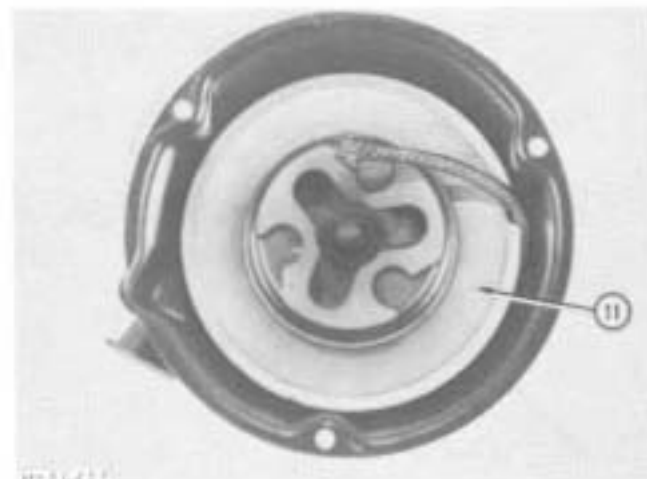


Fig. 11-Installing Recoil Reel

11. Hold end of rope in notch and install recoil reel, Fig. 11. Rotate reel back and forth until you feel it catch in recoil spring and fall into position.

ASSEMBLY—Continued



Fig. 12-Pretensioning Recoil Spring

12. Rotate recoil at least one full turn counterclockwise. Then, guide rope through hole and tie a knot to hold rope in place.

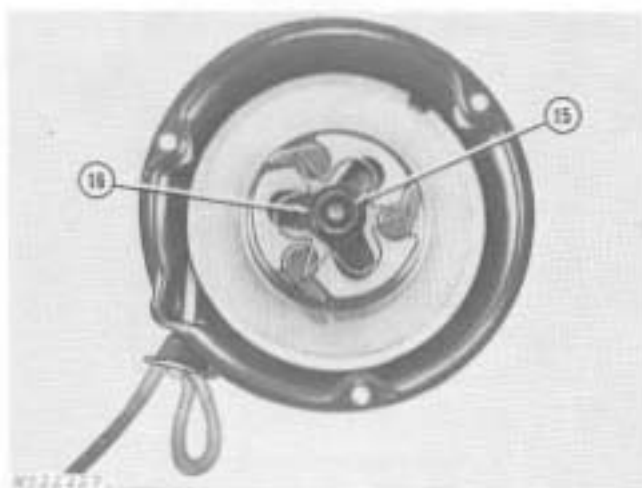


Fig. 14-Installing Center Springs

15. Set center spring over post, Fig. 14.

16. Set return spring over center spring and connect the straight end to a hole in the reel.

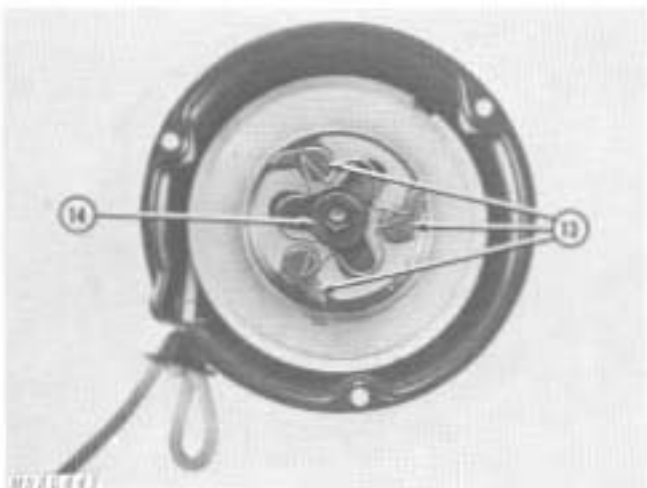


Fig. 13-Installing Starter Pawls

13. Place starter pawls on reel and install pawl springs, Fig. 13.

14. Install washer over center post.

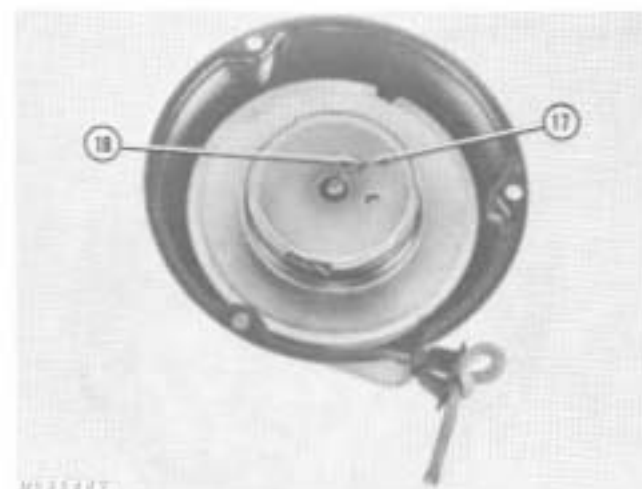


Fig. 15-Installing Spring Cover

17. Set spring cover in a position so that the notch shown aligns with the curved end of return spring.

18. Use a wire or small screwdriver to connect the curved end of return spring in the notch.

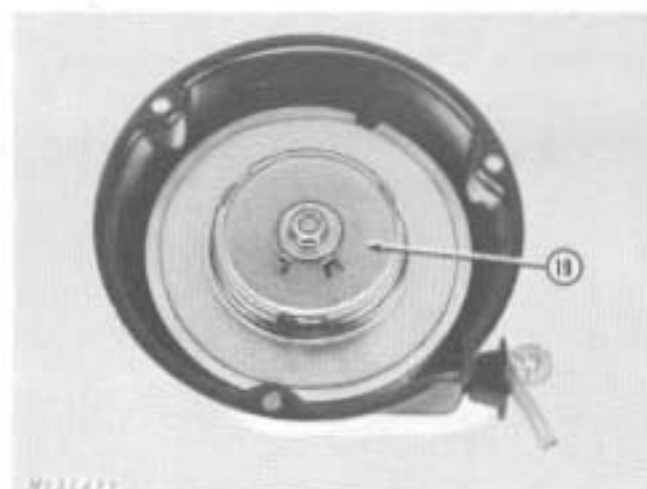


Fig. 16-Sealing Spring Cover

19. Do not press down. Carefully rotate the spring cover counterclockwise until notches align with starter pawls. Then, press down and install flat washer (dimpled side down) lockwasher and nut. Tighten nut.

INSTALLATION



Fig. 17-Installing Recoil Starter

1. Install recoil starter.
2. Guide end of rope through rope guides and install handle. Remove knot in rope to tension rope.

Group 20 SPECIFICATIONS

KOHLER ENGINE SPECIFICATIONS

Item	New Part Dimension	Wear Tolerance
Cylinder Bore	2.4400 to 2.4418 in. (61.978 to 62.023 mm)	0.002 in. (0.05 mm)
Connecting Rod Small End Dia.	0.7842 to 0.7846 in. (19.995 to 20.005 mm)	+ 0.0005 in. + (0.0127 mm)
Connecting Rod Side Clearance	0.006 to 0.016 in. (0.15 to 0.40 mm)	+ 0.005 in. + (0.127 mm)
Crankshaft Runout	0.002 in. (0.05 mm)	—
Piston at Skirt	2.4364 to 2.4370 in. (61.885 to 61.900 mm)	0.005 in. (0.127 mm)
Piston Pin Bore	0.6298 to 0.6302 in. (15.998 to 16.006 mm)	—
Piston Pin	0.6297 to 0.6301 in. (15.996 to 16.004 mm)	—
Ring End Gap	0.010 to 0.015 in. (0.254 to 0.381 mm)	—
Crankshaft O.D. PTO End	30 mm	—
Crankshaft End Play	0.006 to 0.012 in. (0.15 to 0.30 mm)	—
Compression Pressure	90-110 psi (6.2-7.5 bar) (6.3-7.7 kg/cm ²) 15 psi (10.3 bar) (10.5 kg/cm ²) between cylinders	90 psi minimum (6.2 bar) (6.3 kg/cm ²)

JOHN DEERE "FIREBURST" ENGINE SPECIFICATIONS

Item	New Part Dimension	Wear Tolerance
Cylinder Bore	2.3637 to 2.3645 in. (60.04 to 60.059 mm)	2.3675 in. (60.134 mm)
Connecting Rod Small End Dia.	0.7875 to 0.7880 in. (20.003 to 20.014 mm)	0.7894 in. (20.05 mm)
Connecting Rod Side Clearance	0.0157 to 0.0197 in. (0.4 to 0.5 mm)	0.0276 in. (0.70 mm)
Crankshaft Runout	0.0020 in. (0.05 mm)	0.0032 in. (0.08 mm)
Piston at Skirt	2.3607 to 2.3614 in. (59.961 to 59.980 mm)	2.3551 in. (59.82 mm)
Piston Pin Bore	0.6299 to 0.6301 in. (15.999 to 16.005 mm)	0.6331 in. (16.08 mm)
Piston Pin	0.6297 to 0.6299 in. (15.994 to 16.000 mm)	0.6283 in. (15.96 mm)
Ring End Gap	0.011 to 0.019 in. (0.28 to 0.48 mm)	—
Crankshaft O.D. PTO End	1.1811 in. (30 mm)	—
Crankshaft End Play	Max. 0.0303 in. (Max. 0.770 mm)	—
Compression Pressure	110-130 psi (758 to 890 kPa) (7.5 to 8.9 bar) 10 psi (69 kPa) (0.7 bar) between cylinders	90 psi minimum (621 kPa) (6.2 bar)

SPARK PLUG SPECIFICATION

Kohler engine spark plugs are Champion QN-3 (AM53941)

John Deere "Fireburst" engine spark plugs are Champion QN-3 (Canada) (AM55045) or Champion N3 (United States) (AM52432)

TORQUE FOR HARDWARE

Location	Torque (Kohler)	Torque (John Deere)
Crankcase Halves	8 to 9 ft-lbs (11 to 12 Nm)	16 ft-lbs (22 Nm)
Cylinder-to-Crankcase	15 to 18 ft-lbs (20 to 24 Nm)	16 ft-lbs (22 Nm)
Cylinder Head	15 to 18 ft-lbs (20 to 24 Nm)	16 to 18 ft-lbs (22 to 24 Nm)
Intake Manifold	15 to 18 ft-lbs (20 to 24 Nm)	4.3 to 5.8 ft-lbs (5.8 to 7.9 Nm)
Exhaust Manifold	15 to 18 ft-lbs (20 to 24 Nm)	10 to 12 ft-lbs (14 to 16 Nm)
Flywheel to Crankshaft	85 to 90 ft-lbs (115 to 122 Nm)	60 ft-lbs (81 Nm)
Spark Plug	14 ft-lbs (19 Nm)	20 ft-lbs (27 Nm)
Engine Base Nuts-Rear	35 to 40 ft-lbs (47 to 54 Nm)	45 to 55 ft-lbs (61 to 75 Nm)
Engine Base Nuts-Front	35 to 40 ft-lbs (47 to 54 Nm)	35 ft-lbs (47 Nm)

Section 30 FUEL SYSTEM

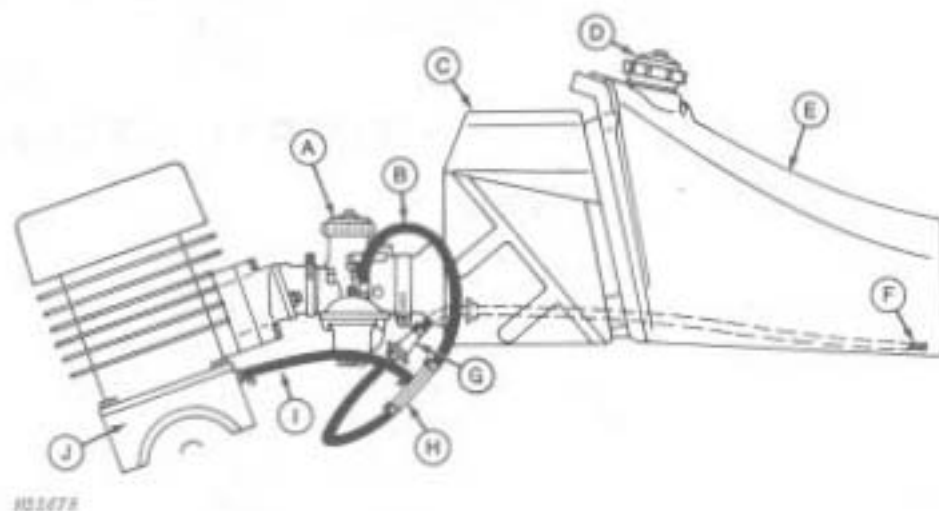
Group 5 GENERAL INFORMATION

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PRINCIPLE OF OPERATION

Fuel System



A—Carburetor
 B—Fuel Pump-To-Carburetor Line
 C—Intake Silencer
 D—Fuel Cap
 E—Fuel Tank

F—Screen
 G—In-Line Fuel Filter
 H—Fuel Pump
 I—Impulse Line
 J—Engine Crankcase

Fig. 1-Fuel System

The fuel system, Fig. 1, consists of the fuel tank (E), impulse line (I), in-line fuel filter (G), fuel pump (H) and carburetor (A). The fuel tank has a capacity of 5-3/4 U.S. gallons (21.7 L). The fuel pickup line in the tank has a self-cleaning screen (F) with a ball-type check valve.

The nylon screen in the in-line fuel filter (G) has a self-cleaning action. Pulsation of the screen

shakes loose contamination which collects at the base of the cone.

Gasoline with an anti-knock index of 88 or higher must be mixed with 2-cycle oil. The oil must be BIA certified oil. Gasoline and oil mixing is improved if the oil is at room temperature. The correct fuel-oil mixture is 50:1 ratio.

Slide Valve Carburetor

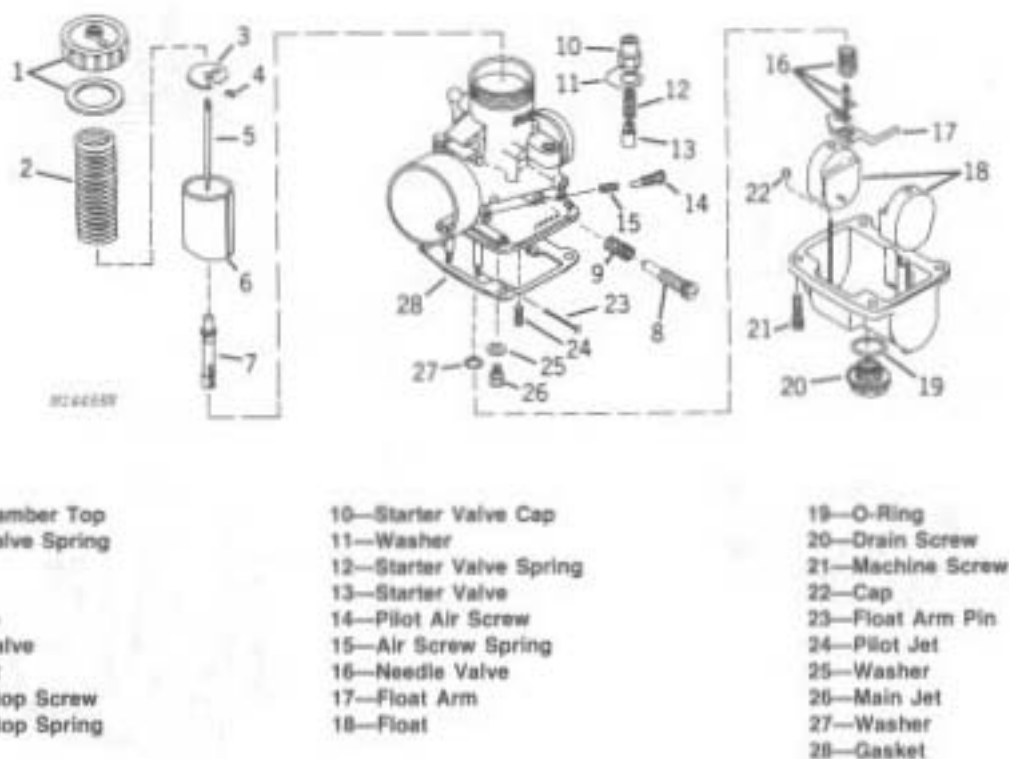


Fig. 2—Exploded View of Mikuni (Slide Valve) Carburetor

The Mikuni Carburetor, Fig. 2, is a twin-float, fixed-jet, throttle-valve carburetor. It consists of four systems; the choke, float, pilot and main systems.

Choke System (Slide Valve)

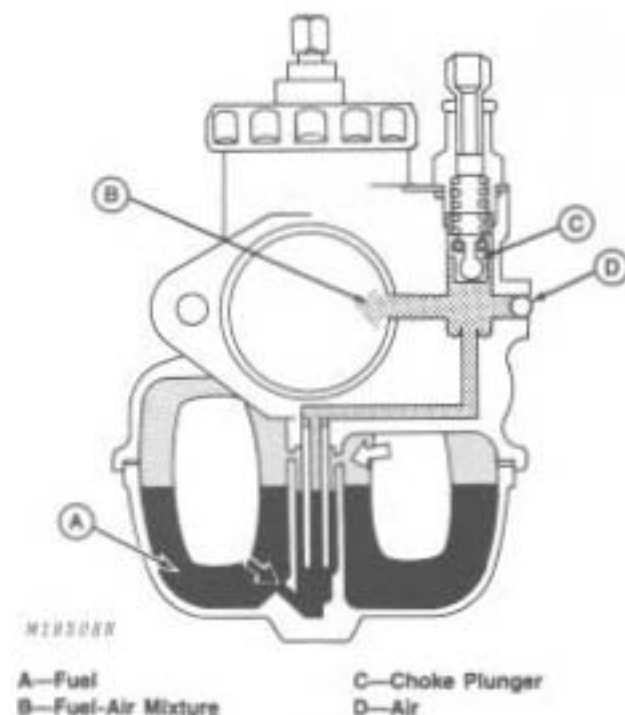


Fig. 3-Choke System

The choke system, Fig. 3, consists of the starter jet and choke plunger (C). This system eliminates the need for a choke in the carburetor bore, thereby increasing efficiency and providing easier starting.

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

The system is opened and closed by the choke plunger (C). Moving the choke lever on the right-hand panel up lifts the choke plunger and opens the choke system.

Fuel (A) is metered through the starter jet and mixed with air (D) 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 (Slide Valve)

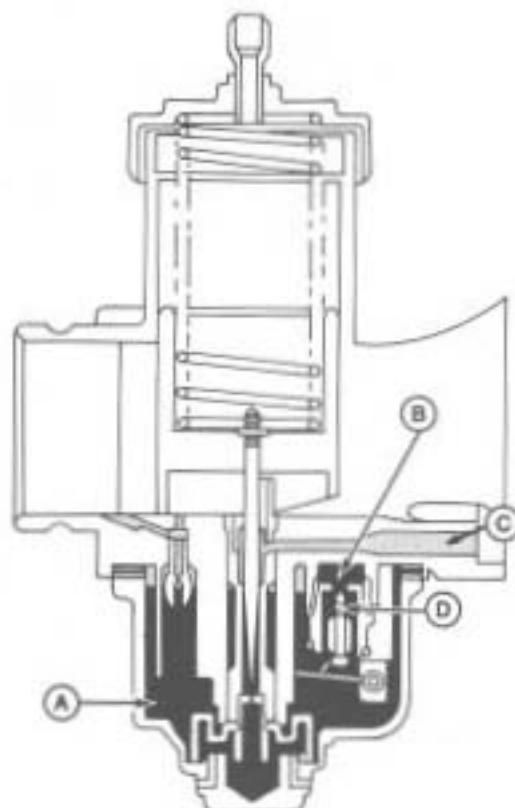


Fig. 4-Float System

The float system, Fig. 4, consists of two independent floats and a needle valve. The system maintains fuel at a constant level in the float chamber.

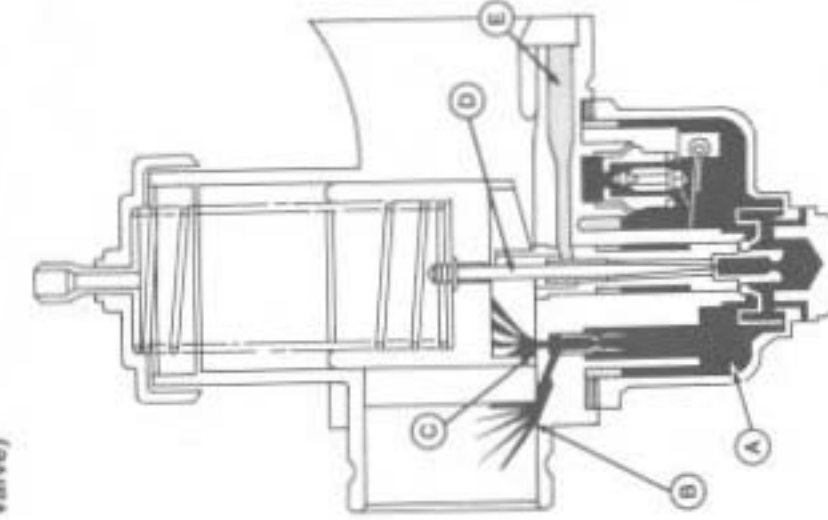
A fuel level drop in the float chamber causes the floats and float arm to drop. Fuel under pressure from the fuel pump is forced around the needle valve (D) and into the float chamber.

As fuel in the float chamber approaches the correct level, the floats raise contacting the float arm. The float arm moves the needle valve against the valve seat, stopping fuel flow into the float chamber.

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

Pilot System (Idle and Slow Speed)
(Slide Valve)

Main System (Slide Valve)



M1112118

A—Fuel
B—Pilot Bypass
C—Pilot Outlet

D—Jet Needle
E—Air

Fig. 5—Pilot System (Idle and Slow Speed)

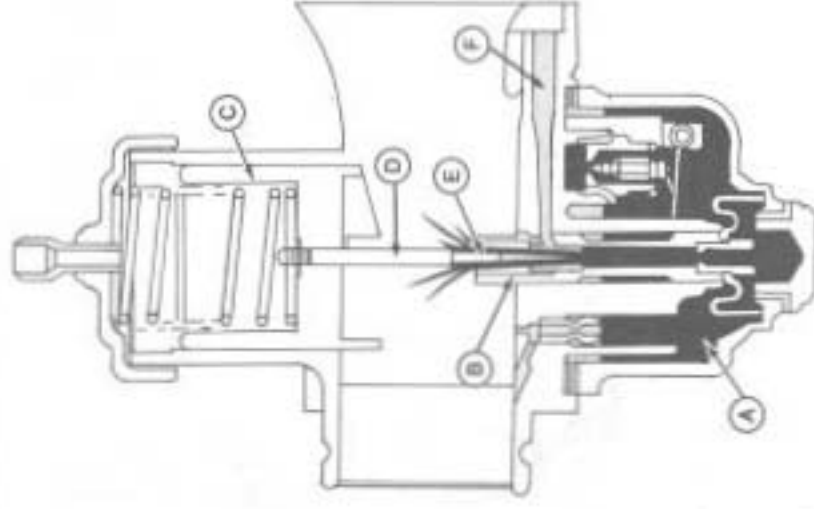
The pilot system, Fig. 5, consists of the pilot jet, air screw, pilot outlet and bypass. The ratio of fuel-air mixture for idling and slow speed is controlled by the pilot jet and air screw.

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

At idle speed the throttle valve is closed and the air velocity through the needle jet is low. This low pressure is not 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 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).



M1112119

A—Fuel
B—Needle Jet
C—Throttle Valve

D—Jet Needle
E—Metered Here
F—Air

Fig. 6—Main Metering System

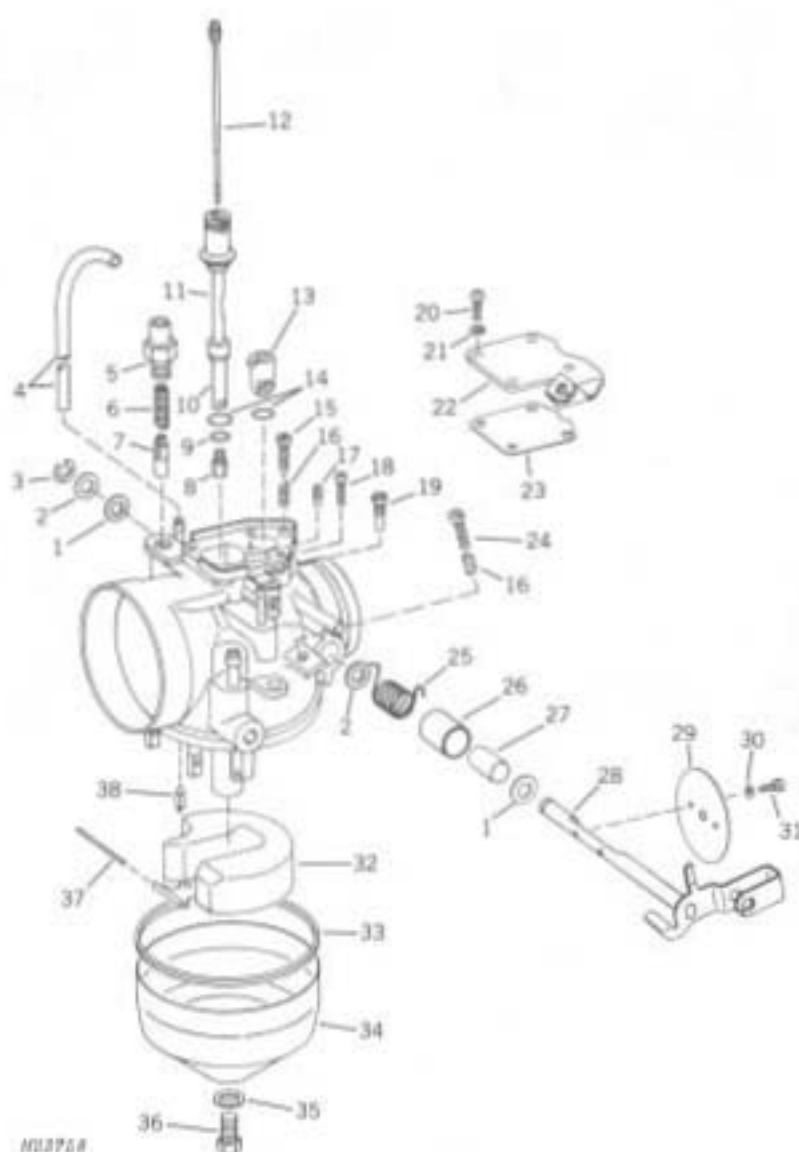
The main system, Fig. 6, starts to function when the throttle valve (C) is opened about 1/4 of the way. Opening the throttle valve causes the jet needle (D) to move up. This increases air flow through the needle jet (B), thereby increasing negative pressure which causes a sucking action to take place.

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 (E) through the air intake, 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.

Butterfly Carburetor



- 1—Seal (2 used)
- 2—Gasket (2 used)
- 3—E-Ring
- 4—Fuel Line (2 used)
- 5—Cap
- 6—Spring
- 7—Starter Valve
- 8—Main Jet
- 9—O-Ring

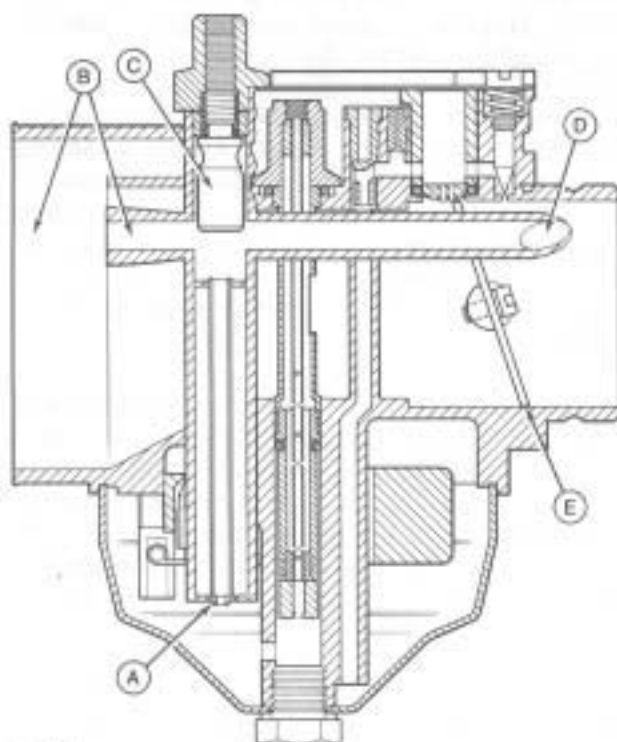
- 10—Holder
- 11—Nozzle
- 12—Main Air Jet
- 13—Pilot Bypass
- 14—O-Ring (2 used)
- 15—Idle Mixture Screw
- 16—Spring (2 used)
- 17—Air Jet
- 18—Machine Screw

- 19—Pilot Jet
- 20—Machine Screw (4 used)
- 21—Lock Washer (4 used)
- 22—Bracket
- 23—Gasket
- 24—Idle Screw
- 25—Spring
- 26—Hose
- 27—Ring
- 28—Throttle Shaft

- 29—Butterfly (Valve)
- 30—Lock Washer (2 used)
- 31—Machine Screw (2 used)
- 32—Float
- 33—Gasket
- 34—Float Bowl
- 35—Washer
- 36—Bolt
- 37—Float Pin
- 38—Inlet Needle Valve

Fig. 7-Exploded View of Mikuni (Butterfly) Carburetor

Choke System (Butterfly)



H2375-9

A—Starter Jet
B—Air Inlet

C—Choke Plunger
D—Starter Outlet
E—Butterfly

Fig. 8-Choke System

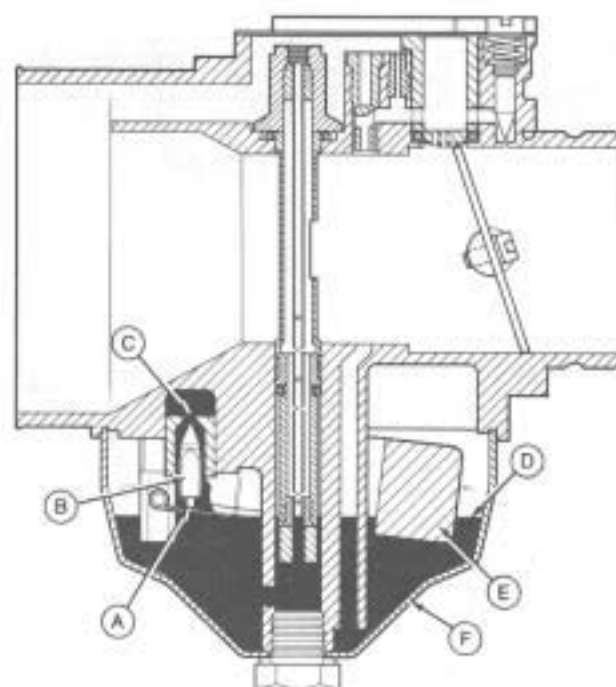
The choke system, Fig. 8, consists of the starter jet (A), choke plunger (C), air inlet (B) and starter outlet (D). This system eliminates the need for a choke plate in the carburetor bore and provides for easier starting.

The butterfly (E) (throttle plate) must be closed for starting. The choke system requires negative pressure in the inlet pipe in order to function.

The system is opened and closed by the choke plunger (C). Pulling out on the choke knob lifts the choke plunger (C) and opens the choke system.

Fuel is metered through the starter jet (A). The fuel from the jet flows into the plunger area, mixes with air from the air inlet (B) and is then drawn into the engine from the starter outlet (D).

Float System (Butterfly)



H2376-0

A—Plunger
B—Inlet Needle Valve
C—Valve Seat

D—Fuel Level
E—Float and Arm
F—Float Bowl

Fig. 9-Float System

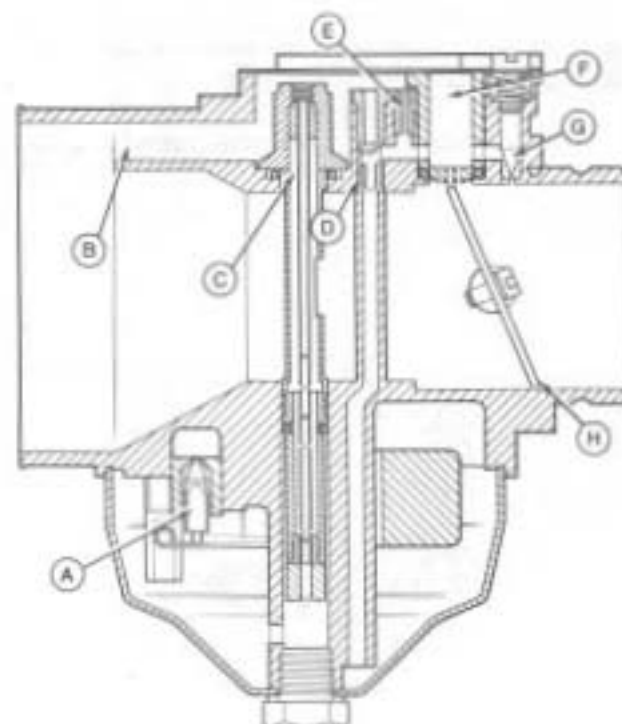
The float system, Fig. 9, consists of a single float (E) and inlet needle valve (B). The needle valve (B) is equipped with a spring-loaded plunger (A) to eliminate the needle opening due to engine vibration and helps prevent undue wear on the needle valve (B) and seat (C).

A fuel level (D) drop in the float bowl (F) causes the float and float arm (E) to drop. Fuel under pressure from the fuel pump is forced around the needle valve (B) and into the float bowl (F).

As fuel in the float bowl approaches the correct level, the float and float arm (E) raise, moving the needle valve (B) against the valve seat (C), stopping fuel flow into the float bowl (F).

Under operating conditions, the fuel level (D) and float (E) position themselves so that inward flow of fuel to the carburetor is equal to the outward flow of fuel to the engine.

Pilot System (Idle and Slow Speed) (Butterfly)



H12701

- | | |
|----------------------|----------------------|
| A—Inlet Needle Valve | E—Pilot Air Jet |
| B—Pilot Air System | F—Pilot Bypass |
| C—Main Air Jet | G—Idle Mixture Screw |
| D—Pilot Jet | H—Butterfly |

Fig. 10-Pilot System

The pilot system, Fig. 10, consists of the pilot jet (D), pilot air jet (E), pilot bypass (F) and idle mixture screw (G). The ratio of fuel-air mixture for idling and slow speed is controlled by the pilot bypass (F) and idle mixture screw (G).

The pilot system controls the fuel-air mixture from idle or closed throttle position, until the butterfly (H) (throttle plate) is opened sufficiently to allow the main system to function.

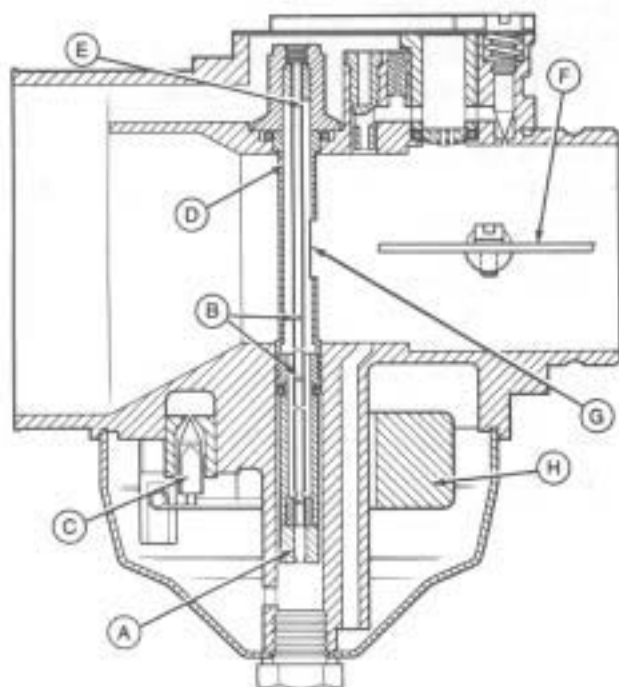
At idle speed the butterfly (H) is closed and the air velocity across the main nozzle and the pilot bypass (F) is low. This low pressure is not enough to cause the main system to function.

Fuel mix during idle is supplied by the pilot jet (D), pilot air jet (E) and pilot bypass (F). Air flow across the pilot bypass (F), plus atmospheric pressure on the fuel in the bowl and engine manifold vacuum, lifts fuel from the bowl through the pilot jet (D). This fuel mixes with the air from the pilot air jet (E) and is metered through the pilot bypass (F) and idle mixture screw (G) before entering the carburetor bore.

If the butterfly (H) is opened only enough to expose the first hole in the pilot bypass (F), the fuel-air mixture would discharge from this hole and the hole from the idle mixture screw (G). Air coming through the venturi would enter the two rear holes of the pilot bypass (F) and also mix with the fuel-air mixture discharging from the front hole of the pilot bypass (F) and idle mixture screw (G) hole.

If the butterfly (H) is opened to expose the first two holes, the fuel-air mixture would discharge from these holes and the hole from the idle mixture screw (G). Air through the venturi would enter the rear hole of the pilot bypass (F) and mix with the fuel-air mixture discharging from the front two holes of the pilot bypass (F) and idle mixture screw (G) hole.

Main System (Butterfly)



M12702

- | | |
|----------------------|-----------------|
| A—Main Jet | E—Main Air Jet |
| B—Air Bleed Holes | F—Butterfly |
| C—Inlet Needle Valve | G—Slot |
| D—Main Nozzle | H—Float and Arm |

Fig. 11—Main System

The main system, Fig. 11, starts to function when the butterfly (F) (throttle plate) is opened about 1/4 of the way. Opening the butterfly (F) allows the engine to pull more air through the venturi and main air jet (E) in the center of the main nozzle (D).

Increased air flow through the venturi and across the slot (G) in the main nozzle (D) creates a partial vacuum inside the nozzle. Air is pulled down the main air jet (E) and fuel is lifted from the fuel bowl through the main jet (A).

The fuel and air mix in the lower half of the main nozzle (D) and the fuel-air mixture is discharged through the slot (G) in the main nozzle (D) as a fine spray to the carburetor bore. The pilot bypass system still continues to function, also discharging a fuel-air mixture into the carburetor bore.

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 (slide valve).
Air jet restricted.

Carburetor Too Lean

In-line fuel filter plugged or restricted.
Dirty fuel pickup strainer in fuel tank.
Fuel pump impulse line plugged.
Hole in fuel impulse line.
Jet needle clip positioned incorrectly (slide valve).
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 intake manifold gaskets.
Air leakage at crankshaft seals or crankcase mating surfaces.
Inlet needle valve restricted.

Group 10

MIKUNI (SLIDE VALVE) CARBURETOR

REMOVAL

1. Remove air silencer.
2. Disconnect fuel line from carburetor.



Fig. 1-Removing Choke Plunger

3. Remove choke plunger assembly, Fig. 1.



Fig. 2-Removing Throttle Valve Assembly

4. Remove throttle valve assembly, Fig. 2.
5. Remove carburetor.

DISASSEMBLY

1. Drain fuel from the float chamber.

CAUTION: Use care when draining fuel. Avoid fires due to smoking or careless maintenance practices.

2. Remove throttle stop screw and air screw.

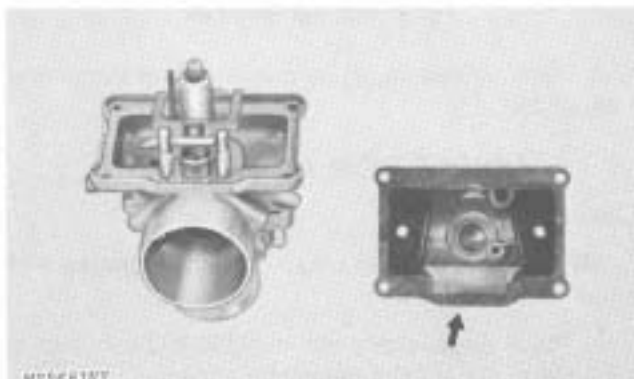
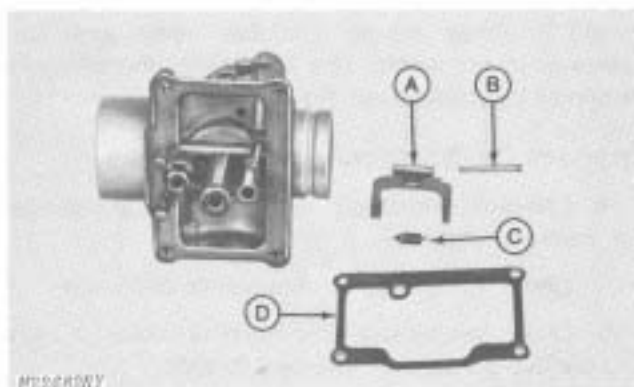


Fig. 3-Float Chamber and Floats

3. Remove float chamber with floats, Fig. 3.
4. Use a 6 mm socket to remove main jet.



A—Float Arm
B—Float Arm Pin
C—Inlet Needle Valve
D—Gasket

Fig. 4-Removing Float Arm Assembly

5. Remove float arm pin (B, Fig. 4) float arm (A), and inlet needle valve (C).

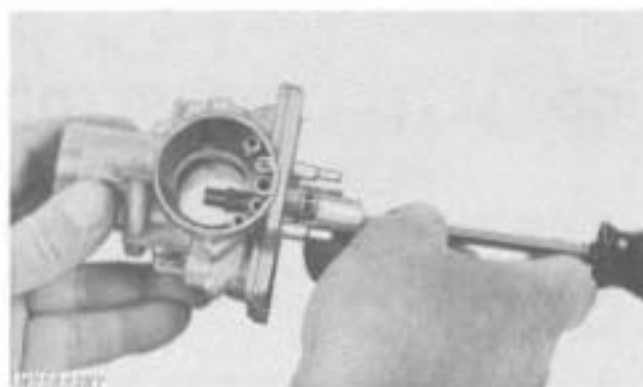


Fig. 5-Removing Needle Jet

6. Remove needle jet by pushing from the bottom with an awl, Fig. 5.

INSPECTION AND REPAIR

Clean Carburetor

IMPORTANT: Never clean jets or passages with small drills or wire.

1. Place carburetor parts in PT503 Cleaner or its equivalent. Do not put gaskets in cleaner.
2. Parts should remain in cleaner for 1 to 2 hours. Remove and rinse with solvent.
3. Dry parts with compressed air. Be sure all holes are open. **DO NOT** use rags or paper to dry parts. Lint may plug jets or passages.

NOTE: Rinse mixing chamber body and float chamber in hot water. This neutralizes the corrosive action of the cleaner on the aluminum.

Inspect Carburetor

1. Check mixing chamber body and float chamber for cracks or damage.
2. Check all springs for damage or distortion.
3. Check throttle stop screw and air screw for seating surface damage or stripped threads.
4. Check 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.

5. Remove retainer and inlet valve. Check seating surface on inlet valve and seat for damage. Retainer should not bind or hinder movement of inlet valve.

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

NOTE: E-ring on the jet needle should be installed in the middle groove.

7. Install floats in float chamber. Move floats up and down to be sure they are not binding on guides.

8. Check float arm and float pin to be sure arm doesn't bind on pin.

9. Check choke plunger for free movement in passage.

10. Place throttle valve in mixing chamber body. Move valve 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 engine operation.

ASSEMBLY

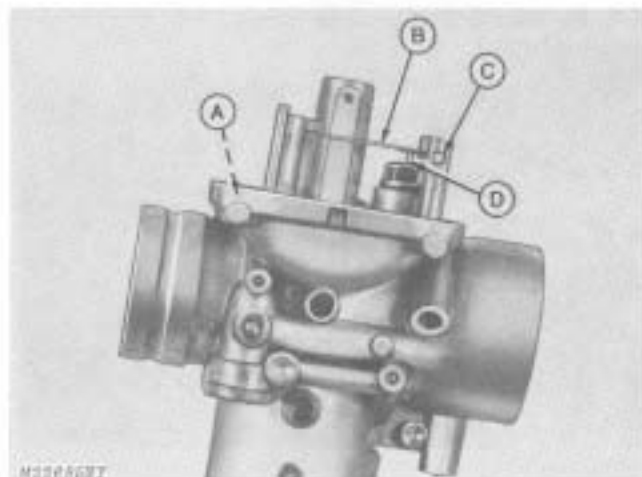
Install Pilot Jet



Fig. 6-Installing Pilot Jet

1. Install and tighten pilot jet, Fig. 6.

Install Needle Valve and Float Arm



A—Gasket
B—Float Arm
C—Float Arm Pin
D—Inlet Needle Valve

Fig. 7-Installing Needle Valve and Float Arm

1. Install gasket (A, Fig. 7)
2. Install new washer on valve seat and install seat. Install inlet needle valve (D) with point down, Fig. 7.
3. Install float arm (B) and secure with float arm pin (C).

Float Level Adjustment

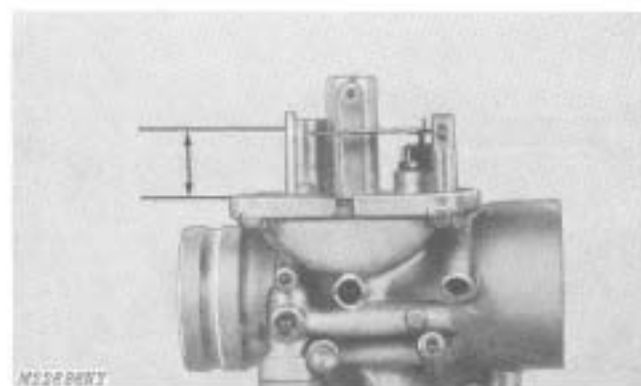
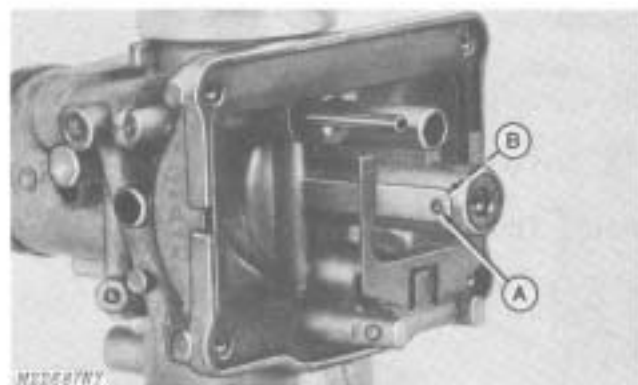


Fig. 8-Float Level Adjustment

1. With carburetor inverted, the edge of the body should be parallel with the float arm, Fig. 8.
2. If adjustment is necessary, bend only the actuating tab, not the float arm.

Install Needle Jet



A—Pin in Bore
B—Notch in Needle Jet

Fig. 9-Installing Needle Jet

1. Install needle jet with notch of needle jet (B) aligned with pin in bore (A), Fig. 9.
2. Install main jet.

Install Floats

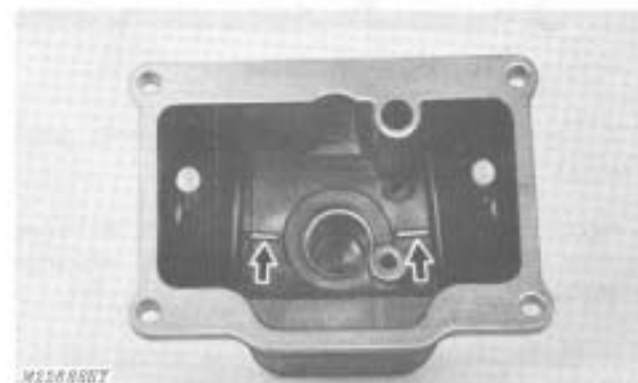


Fig. 10-Installing Floats

1. Install floats with pins on floats down and to the inside of the float chamber, Fig. 10.
2. Install float chamber on mixing chamber body.

Install Air Screw and Throttle Stop Screw

1. Install air screw spring and air screw.
2. Turn air screw in until it just seats. DO NOT force it.
3. Back air screw out 2-1/2 turns.
4. Install throttle stop screw spring and stop screw.
5. Turn throttle stop screw in until it is just flush with inside of the bore.

INSTALLATION

Install Carburetor

1. Position carburetor in rubber mount and secure with clamp.
2. Connect fuel line to carburetor.

Install Throttle Valve



Fig. 11-Installing Throttle Valve

1. Install E-ring in middle groove of jet needle, (inset Fig. 11).

NOTE: Groove No. 1 provides lean midrange operation; groove No. 5 provides rich midrange operation.

2. Guide throttle cable through cap, spring and slot in throttle valve. Slide cable end into narrow part of slot in throttle valve.
3. Install plate between spring and throttle valve with tab on plate in slot of throttle valve. This locks cable to the throttle valve.
4. Compress throttle valve spring and tighten cap to body.

Install Choke Plunger

1. Be sure choke lever is down.



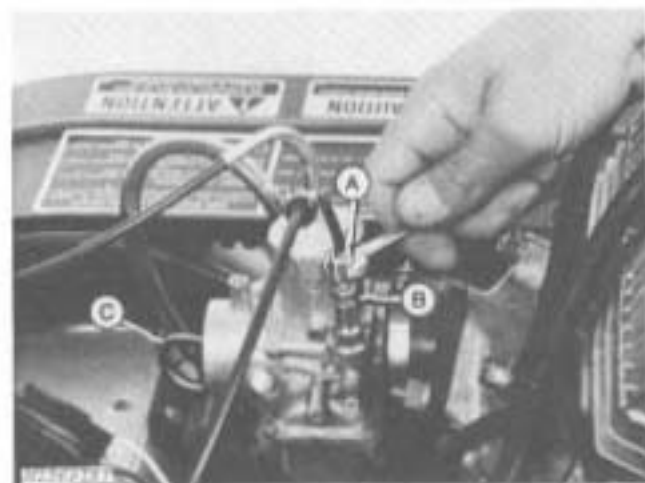
Fig. 12-Installing Choke Plunger

2. Guide choke cable through cap and spring. Hook end button in choke plunger, Fig. 12.
3. Place washer on carburetor body. Install the assembly and tighten cap.

ADJUSTMENTS

Adjust Choke

1. Move choke lever to the first "UP" position.
2. Loosen jam nut and turn adjusting sleeve clockwise to seat choke plunger.



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

Fig. 13-Adjusting Choke Plunger

3. Install JDM-75 Choke Gauge (C, Fig. 13) with flat "UP" into the plunger air hole.

4. Turn adjusting sleeve (A) counterclockwise to bring the choke plunger "up". Continue turning sleeve until choke gauge (C) slides further into air hole, indicating that the choke plunger has raised approximately 1/2 the diameter of the plunger air hole.

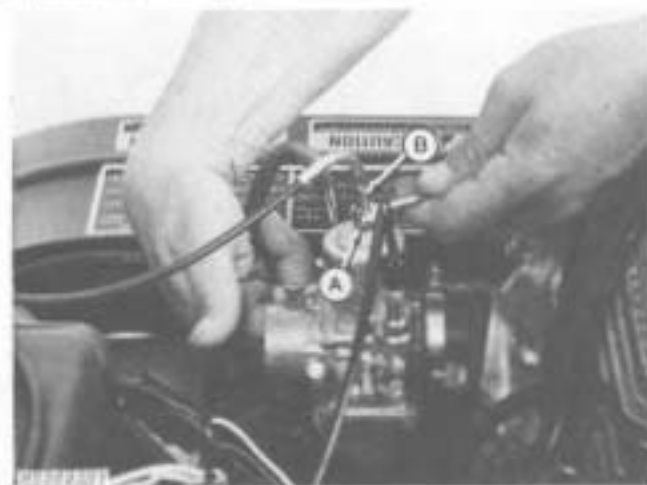
5. Tighten jam nut, (B).

NOTE: When choke lever is down, the choke plunger should be all the way down in the bore. The choke lever should still have slight freeplay.

IMPORTANT: If the choke plunger is not down tight in the bore, the carburetor will run "RICH". This will cause a problem when finding the correct main jet for top engine performance.

Adjust Throttle Cable

1. Remove air silencer. Lock the throttle lever tightly against the handgrip.



A—Jam Nut

B—Adjusting Sleeve

Fig. 14—Adjusting Throttle Cable

2. Place finger in throat of carburetor, Fig. 14. Loosen jam nut (A) and turn adjusting sleeve (B) until the backside of the throttle valve is flush with inside of bore. Tighten jam nut.

NOTE: When the throttle valve is adjusted correctly, no part of the valve will restrict air flow through the carburetor throat.

3. Turn throttle stop screw (B, Fig. 15) until tip is flush with inside of the bore.

4. Release throttle lever and allow throttle valve to fully seat in the bore.

5. Turn throttle stop screw in until screw contacts throttle valve. Turn screw in two additional turns for preliminary idle speed adjustment.



A—Pilot Air Screw

B—Throttle Stop Screw

Fig. 15—Adjusting Carburetor

6. Look into the throat of the carburetor and slowly compress the throttle lever. The throttle valve should begin to rise.

NOTE: If throttle movement does not occur, repeat Steps 1 through 6.

7. Turn pilot air screw (A, Fig. 15) in until a slight seating resistance is felt.

8. Back pilot air screw out 2-1/2 turns.

9. Check engine idle speed as follows:

- Install air intake silencer and run engine to warm it up.
- Turn throttle stop screw to obtain idle speed of 1500 to 2000 rpm.

IMPORTANT: DO NOT use the pilot air screw to set engine idle. Be sure pilot air screw is adjusted as explained in Steps 7 and 8.

ALTITUDE CHART

Altitude	Sea Level to 2000 Ft. (0 to 609 m)	2000 to 4000 Ft. (609 to 1 219 m)	4000 to 6000 Ft. (1 219 to 2 438 m)	6000 to 10,000 Ft. (2 438 to 3 048 m)
Main Jet No.	210	190	170	155
Jet Needle No.	5EJ13-3	5EJ13-3	5EJ13-1	5EJ13-5
Needle Jet No.	0-6	0-6	0-6	0-8
Throttle Valve No.	2.5	2.5	2.5	3.0
Pilot Jet No.	30	30	25	40
Air Screw (turns open)	2-1/2	2-1/2	1-1/2	2
Idle Speed (RPM)	1500-2000	1500-2000	1500-2000	1500-2000

Group 12

MIKUNI (BUTTERFLY) CARBURETOR

REMOVAL

1. Remove air intake silencer.
2. Disconnect fuel line from carburetor.

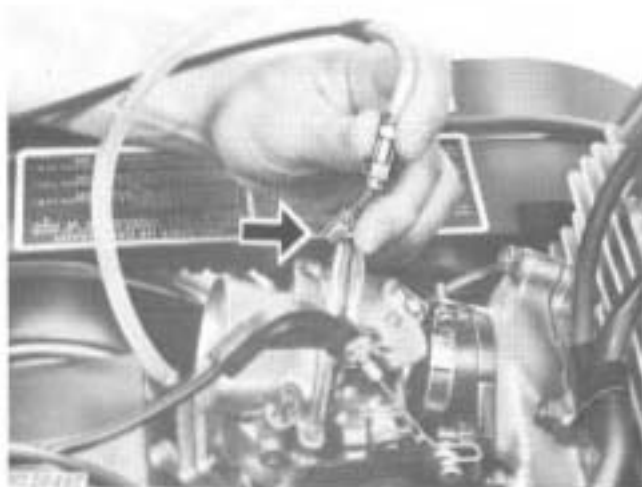


Fig. 1-Removing Choke Plunger Assembly

3. Remove choke plunger assembly, Fig. 1.



Fig. 2-Removing Throttle Cable

4. Disconnect throttle cable from throttle lever. Unscrew the cable from the bracket, Fig. 2.
5. Remove carburetor.

DISASSEMBLY

1. Loosen float bowl bolt to drain fuel from the bowl.

CAUTION: Use care when draining fuel. Avoid fires due to smoking or careless maintenance practices.

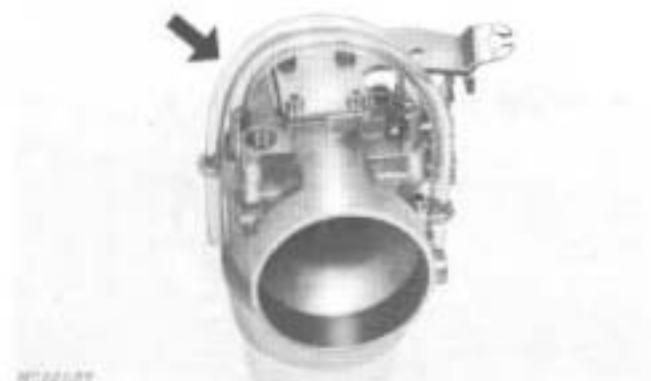
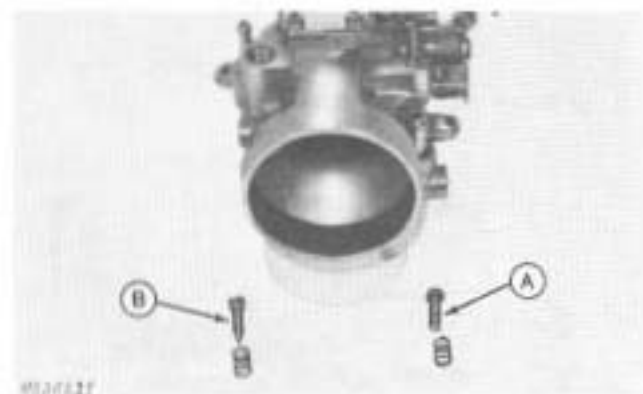


Fig. 3-Removing Hoses From Carburetor

2. Remove hoses from carburetor, Fig. 3.



A—Idle Adjusting Screw B—Idle Mixture Screw

Fig. 4-Removing Idle Adjusting and Idle Mixture Screws

3. Remove idle adjusting screw (A, Fig. 4) and idle mixture screw (B).

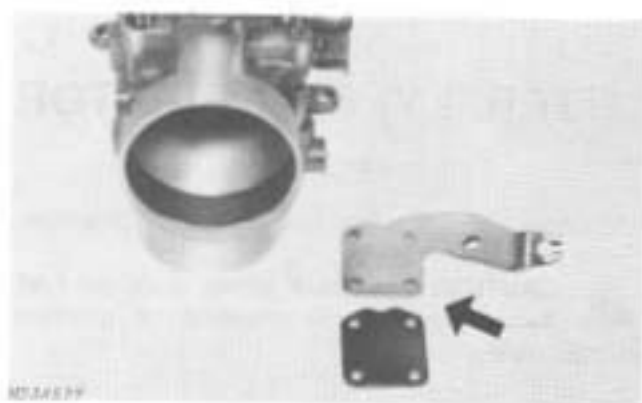


Fig. 5-Removing Bracket and Gasket

4. Remove bracket and gasket, Fig. 5.

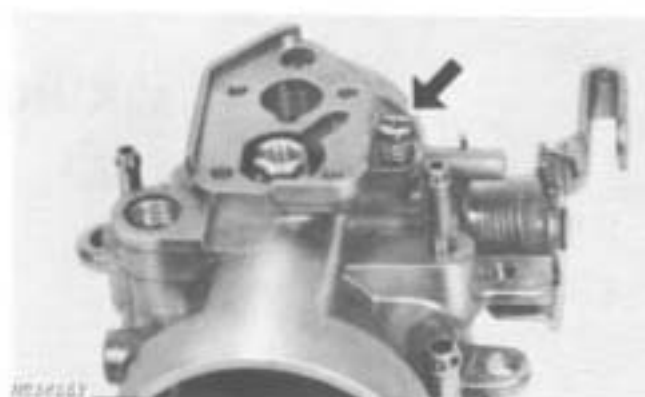


Fig. 8-Pilot Jet

7. Remove pilot jet, Fig. 8.

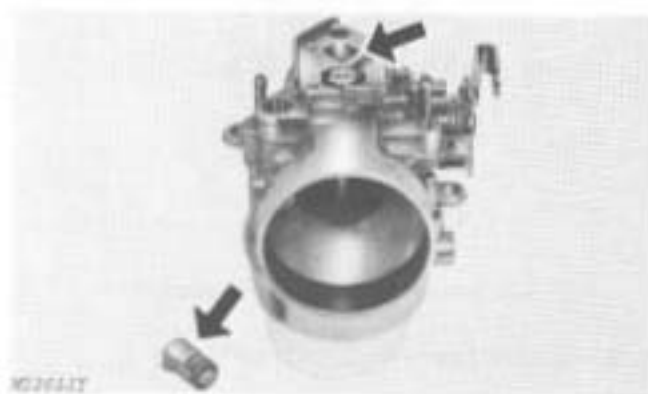


Fig. 6-Pilot Bypass

5. Remove pilot bypass, Fig. 6.

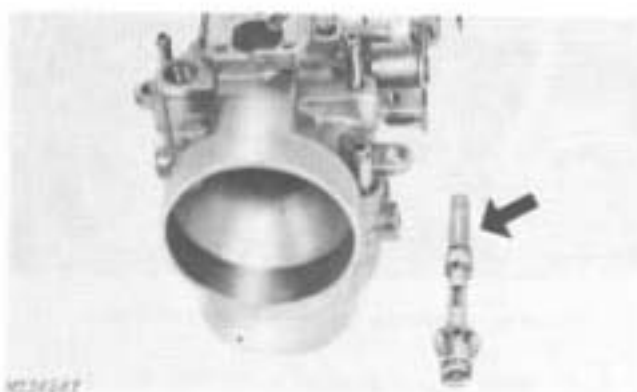


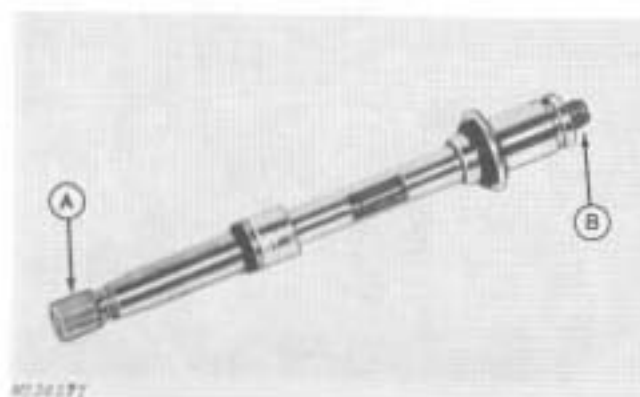
Fig. 9-Main Nozzle

8. Remove main nozzle, Fig. 9.



Fig. 7-Pilot Air Jet

6. Remove pilot air jet, Fig. 7.



A—Main Jet

B—Main Air Jet

Fig. 10-Main Jet and Main Air Jet

9. Remove main jet (A, Fig. 10) and main air jet (B).

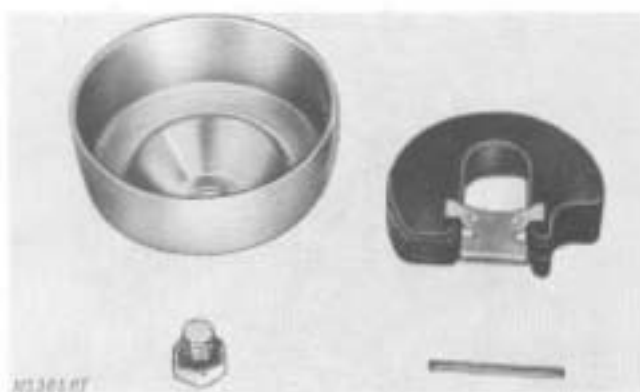
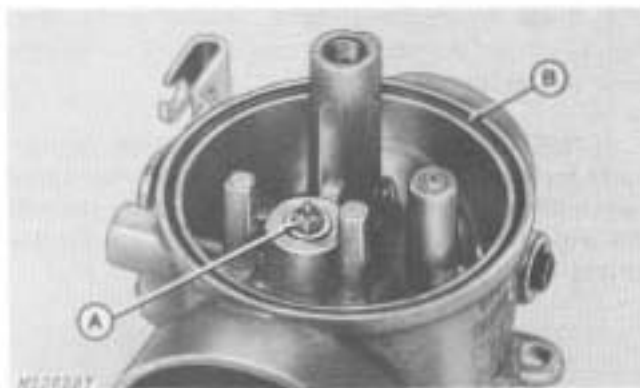


Fig. 11-Float Bowl, Float Pin and Float

10. Remove float bowl, float pin and float, Fig. 11.



A—Inlet Needle Valve

B—Packing

Fig. 12-Inlet Needle Valve and Packing

11. Remove inlet needle valve (A, Fig. 12) and packing (B).

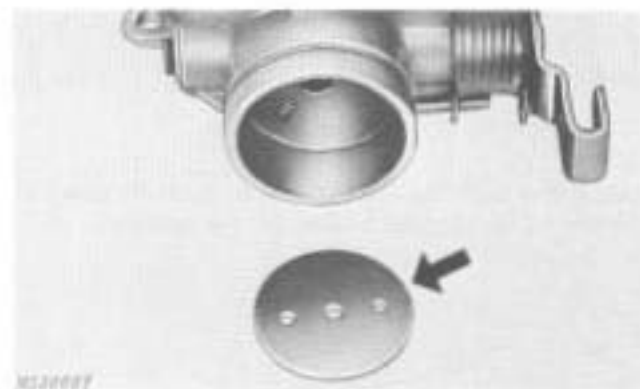


Fig. 13-Butterfly

12. Remove butterfly (throttle plate), Fig. 13.

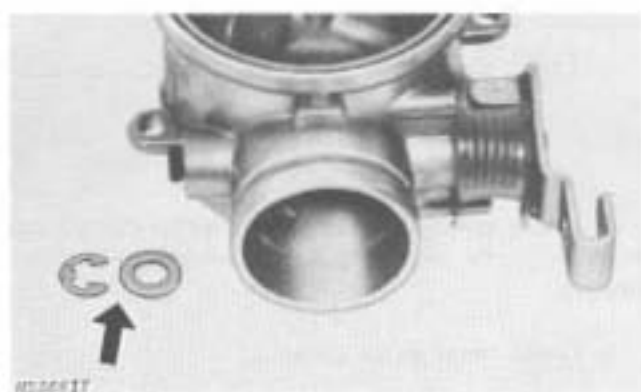


Fig. 14-E-Ring and Washer

13. Remove E-ring and washer, Fig. 14.

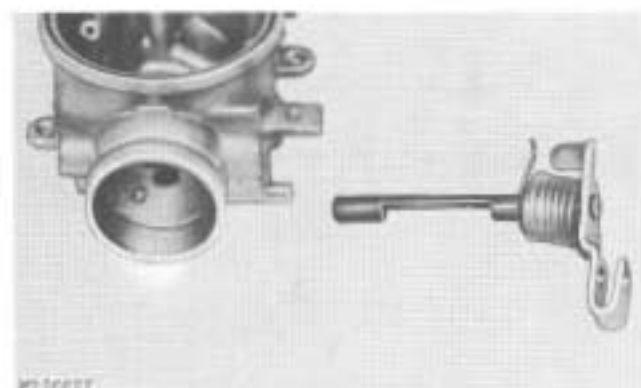


Fig. 15-Throttle Lever and Spring

14. Remove throttle lever and spring, Fig. 15.

INSPECTION AND REPAIR

Clean Carburetor

IMPORTANT: Never clean jets or passages with small drills or wire.

1. Place carburetor parts in PT503 Cleaner or its equivalent. Do not put gaskets in cleaner.
2. Parts should remain in cleaner for 1 to 2 hours. Remove and rinse with solvent.
3. Dry parts with compressed air. Be sure all holes are open. DO NOT use rags or paper to dry parts. Lint may plug jets or passages.

NOTE: Rinse mixing chamber body in hot water. This neutralizes the corrosive action of the cleaner on the aluminum.

Inspect Carburetor

1. Check mixing chamber body for cracks or damage.
2. Check all springs for damage or distortion.
3. Check idle mixture screw, pilot air jet, pilot jet and main air jet for seating surface damage or stripped threads.
4. Check main jet for damage.

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

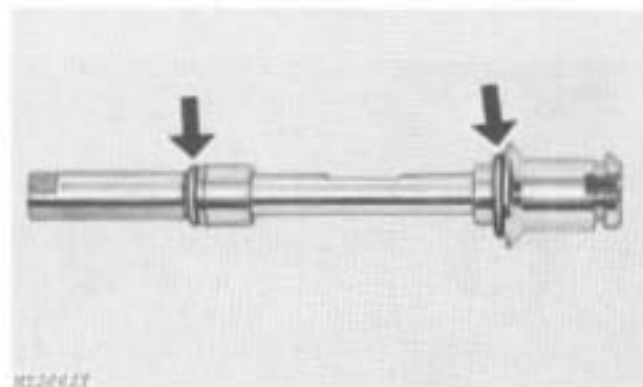


Fig. 16—Main Nozzle O-Rings

5. Replace O-rings on main nozzle, Fig. 16.
6. Check seating surface on inlet valve and seat for damage.
7. Check float and float pin to be sure arm doesn't bind on pin.
8. Check choke plunger for free movement in passage.
9. Install new float bowl packing in mixing chamber body.

ASSEMBLY



Fig. 17—Installing Throttle Lever and Spring

1. Install throttle lever, spring, washer and E-ring. Fig. 17 shows the correct spring position on throttle lever and projection on housing.

IMPORTANT: When replacing original equipment for the first time, install a new throttle lever assembly. The screws securing the throttle plate to the lever are peened over and removing them destroys the threads in the lever.

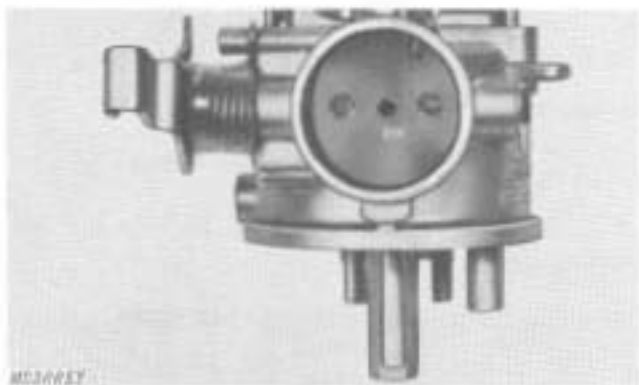
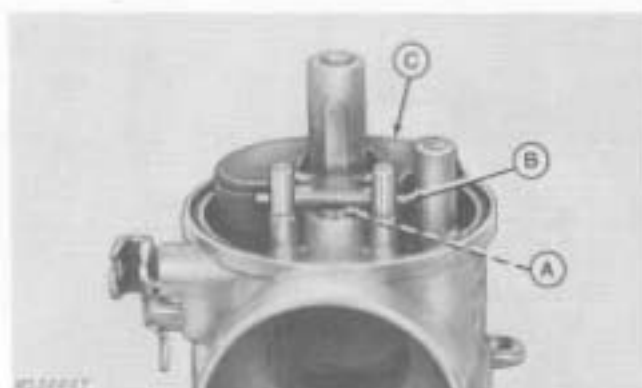


Fig. 18—Installing Butterfly

2. Install butterfly with number on butterfly down as shown in Fig. 18. Use Loctite on the screws.

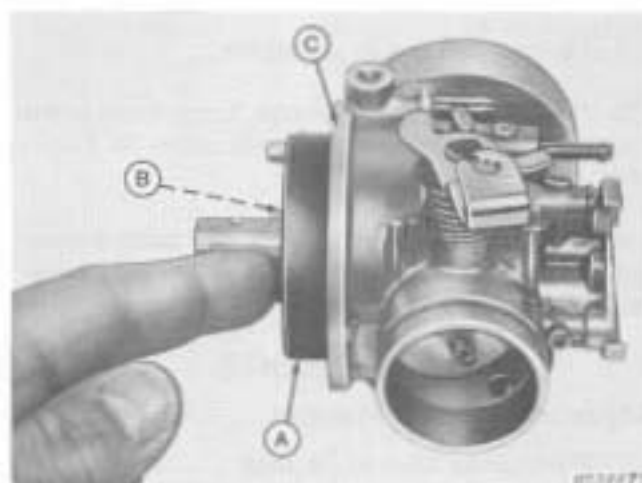


A—Inlet Needle Valve B—Float Pin C—Float

Fig. 19-Installing Inlet Needle Valve and Float

3. Install inlet needle valve (A, Fig. 19) and float (C).

Adjusting Float



A—Float B—Inlet Needle Valve C—Float Chamber

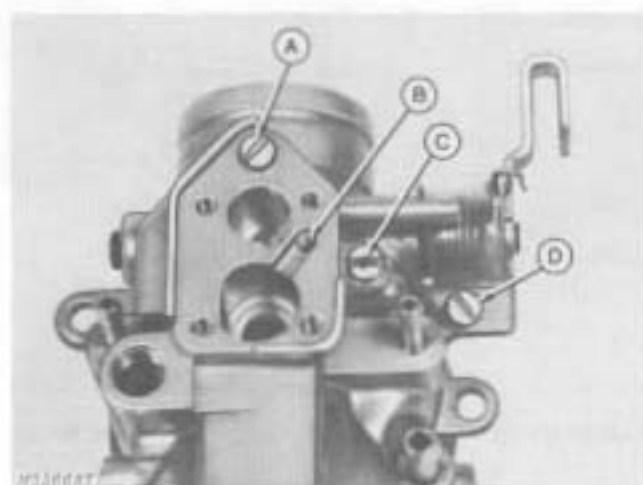
Fig. 20-Adjusting Float

4. Adjust float as follows:

Turn carburetor on its side. Touch float (A, Fig. 20) lightly with finger until float arm just contacts needle valve (B). Float should be parallel with edge of float chamber (C).

If adjustment is necessary, bend the float arm. After adjustment, tap the float lightly. If it is adjusted correctly, it will bounce from spring resistance of the needle valve.

Install float bowl and tighten bolt.

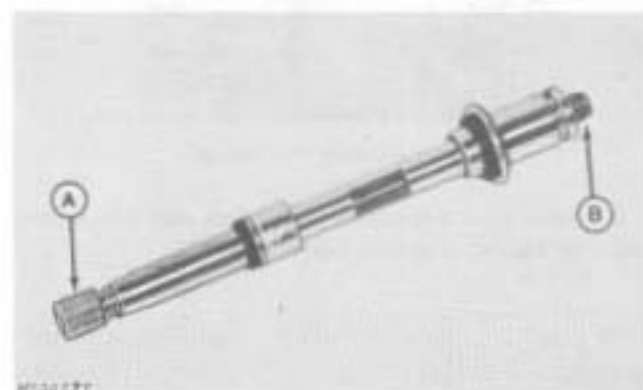


A—Idle Mixture Screw C—Pilot Jet
B—Pilot Air Jet D—Idle Adjusting Screw

Fig. 21-Installing Jets and Adjusting Screws

5. Install idle mixture screw (A, Fig. 21), pilot air jet (B), pilot jet (C) and idle adjusting screw (D).

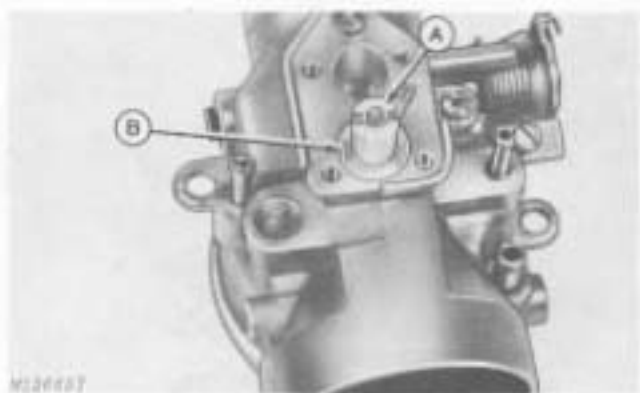
NOTE: Turn idle mixture screw (A) in until it just seats, and back out one full turn. This is preliminary adjustment. Turn idle adjusting screw (D) in until it just contacts throttle lever.



A—Main Jet B—Main Air Jet

Fig. 22-Installing Main Jet and Main Air Jet

6. Install main jet (A, Fig. 22) and main air jet (B) in main nozzle.



A—Main Nozzle

B—Flat On Nozzle

Fig. 23-Installing Main Nozzle

7. Install main nozzle (A, Fig. 23) in mixing chamber body. Flat (B) on nozzle must line up with flat in body.

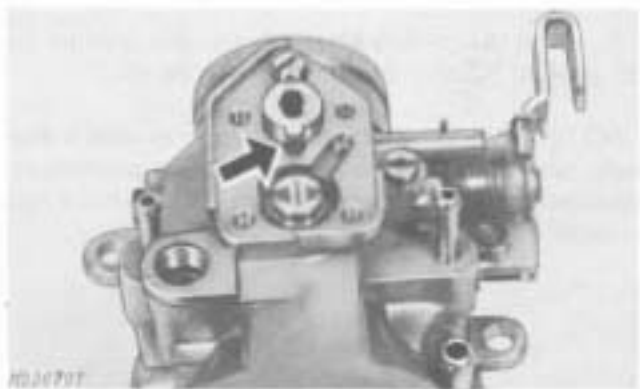


Fig. 24-Installing Pilot Bypass

8. Install pilot bypass with lip inline with the indentation in mixing chamber body, Fig. 24.

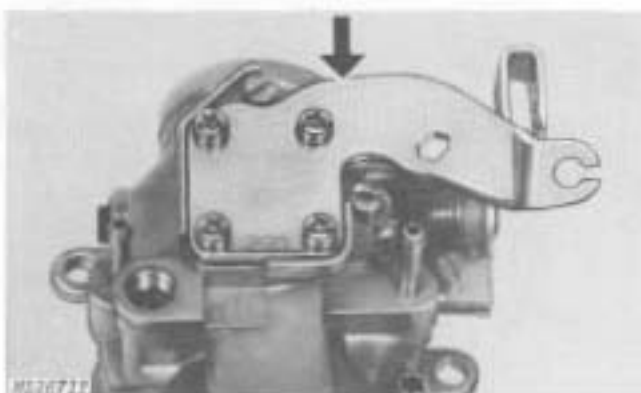


Fig. 25-Installing Bracket and Gasket

9. Install gasket and bracket, Fig. 25. Install hoses.

INSTALLATION

1. Install carburetor in rubber mount and secure with clamp.
2. Connect fuel line to carburetor.
3. Place throttle cable through bracket and screw throttle cable to bracket. Connect cable to throttle lever.
4. Push choke knob in. Guide choke cable through cap and spring. Hook end button in choke plunger. Install assembly and tighten.

ADJUSTMENTS

Adjusting Choke Plunger

1. Push choke knob in (closed).
2. Look in the choke plunger hole in the carburetor throat. Plunger should be all the way down in the bore.



A—Jam Nut

B—Adjusting Sleeve

Fig. 26—Adjusting Choke Plunger

3. To adjust plunger, loosen jam nut (A, Fig. 26) and turn adjusting sleeve (B) clockwise. Tighten jam nut.

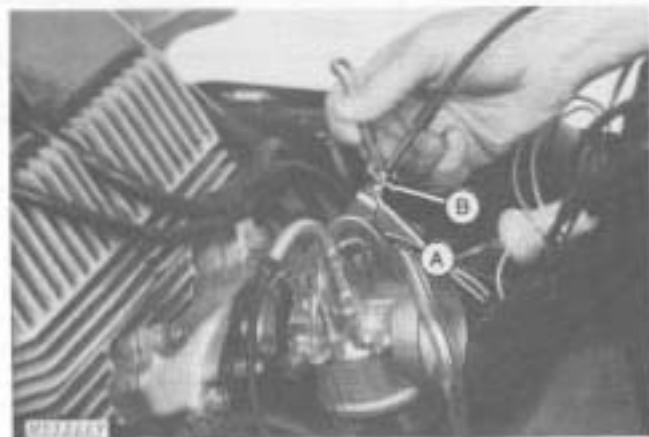
IMPORTANT: Plunger must be down tight in the bore or carburetor will run "rich". This will effect engine performance.

4. Pull out on choke knob and look in choke plunger hole. Plunger should raise and be all the way up in the bore.

Adjusting Throttle Cable

1. Back idle speed adjusting screw out until it no longer contacts the throttle lever.

2. Look in carburetor throat to make sure butterfly is completely closed.



A—Jam Nut

B—Adjusting Sleeve

Fig. 27—Adjusting Throttle Cable

3. Loosen jam nut (A, Fig. 27) on throttle cable. Turn adjusting sleeve (B) until cable is just snug and the butterfly is closed. Tighten jam nut. Use Never-Seez on throttle cable end in handlebar throttle lever.

4. Look in carburetor throat and compress the handgrip throttle lever until it contacts handgrip. Butterfly should be in full open position and parallel with carburetor bore. Repeat Steps 1 through 4 if necessary.

5. Turn idle speed adjusting screw in until it contacts throttle lever. Turn in one additional turn for preliminary idle speed adjustment.

6. Install air intake silencer and warm up engine.

7. Turn idle mixture screw in (lean) or out (rich) to obtain an even engine idle.

8. Readjust idle speed adjusting screw to obtain an engine idle speed of 1500 to 2000 rpm.

ALTITUDE CHART (0°F To 30°F [-18°C To -1°C])
(Serial No. -120,000)

Altitude	Sea Level To 3000 Ft. (0 to 914 m)	3000 Ft. To 6000 Ft. (914 to 1828 m)	6000 Ft. To 9000 Ft. (1828 to 2743 m)	Above 9000 Ft. (2743 m)
Main Jet	190*	175	160	150
Main Air Jet	1.0	1.0	1.0	1.0
Air Bleed	.8 x 2 x 4	.8 x 2 x 4	.8 x 2 x 4	.8 x 2 x 4
Pilot Jet	80	80	80	80
Throttle Valve	210	210	210	210
Bypass	1.0-1.1-1.2	1.0-1.1-1.2	1.0-1.1-1.2	1.0-1.1-1.2
Pilot Screw	1.0	1.0	1.0	1.0
Main Nozzle	4.2	4.2	4.2	4.2
Idle Speed (rpm)	2000-2200	2000-2200	2300-2500	2300-2500

*Factory Installed

ALTITUDE CHART (Below 0°F [-18°C])
(Serial No. -120,000)

Altitude	Sea Level To 3000 Ft. (0 to 914 m)	3000 Ft. To 6000 Ft. (914 to 1828 m)	6000 Ft. To 9000 Ft. (1828 to 2743 m)	Above 9000 Ft. (2743 m)
Main Jet	200	190	180	160
Main Air Jet	1.0	1.0	1.0	1.0
Air Bleed	.8 x 2 x 4	.8 x 2 x 4	.8 x 2 x 4	.8 x 2 x 4
Pilot Jet	80	80	80	80
Throttle Valve	210	210	210	210
Bypass	1.0-1.1-1.2	1.0-1.1-1.2	1.0-1.1-1.2	1.0-1.1-1.2
Pilot Screw	1.0	1.0	1.0	1.0
Main Nozzle	4.2	4.2	4.2	4.2
Idle Speed (rpm)	2000-2200	2000-2200	2300-2500	2300-2500

ALTITUDE CHART (+30°F To 60°F [-1°C To +16°C])
(Serial No. -120,000)

Altitude	Sea Level To 3000 Ft. (0 to 914 m)	3000 Ft. To 6000 Ft. (914 to 1828 m)	6000 Ft. To 9000 Ft. (1828 to 2743 m)	Above 9000 Ft. (2743 m)
Main Jet	175	160	150	140
Main Air Jet	1.0	1.0	1.0	1.0
Air Bleed	.8 x 2 x 4	.8 x 2 x 4	.8 x 2 x 4	.8 x 2 x 4
Pilot Jet	80	80	80	80
Throttle Valve	210	210	210	210
Bypass	1.0-1.1-1.2	1.0-1.1-1.2	1.0-1.1-1.2	1.0-1.1-1.2
Pilot Screw	1.0	1.0	1.0	1.0
Main Nozzle	4.2	4.2	4.2	4.2
Idle Speed (rpm)	2000-2200	2000-2200	2300-2500	2300-2500

ALTITUDE CHART (Above +60°F [+16°C])
(Serial No. -120,000)

Altitude	Sea Level To 3000 Ft. (0 to 914 m)	3000 Ft. To 6000 Ft. (914 to 1828 m)	6000 Ft. To 9000 Ft. (1828 to 2743 m)	Above 9000 Ft. (2743 m)
Main Jet	160	150	140	130
Main Air Jet	1.0	1.0	1.0	1.0
Air Bleed	.8 x 2 x 4	.8 x 2 x 4	.8 x 2 x 4	.8 x 2 x 4
Pilot Jet	80	80	80	80
Throttle Valve	210	210	210	210
Bypass	1.0-1.1-1.2	1.0-1.1-1.2	1.0-1.1-1.2	1.0-1.1-1.2
Pilot Screw	1.0	1.0	1.0	1.0
Main Nozzle	4.2	4.2	4.2	4.2
Idle Speed (rpm)	2000-2200	2000-2200	2300-2500	2300-2500

ALTITUDE CHART (Below -30°F [-34°C])
(Serial No. 120,001-)

Altitude	Sea Level To 3000 Ft. (0 to 914 m)	3000 Ft. To 6000 Ft. (914 to 1828 m)	6000 Ft. To 9000 Ft. (1828 to 2743 m)	Above 9000 Ft. (2743 m)
Main Jet	195	180*	165	150
Main Air Jet	1.0	1.0	1.0	1.0
Air Bleed	.8 x 2 x 4	.8 x 2 x 4	.8 x 2 x 4	.8 x 2 x 4
Pilot Jet	80	80	80	80
Throttle Valve	210	210	210	210
Bypass	1.0-1.1-1.2	1.0-1.1-1.2	1.0-1.1-1.2	1.0-1.1-1.2
Pilot Screw	3/4	3/4	3/4	3/4
Main Nozzle	4.0	4.0	4.0	4.0
Idle Speed (rpm)	2200-2400	2200-2400	2400-2700	2400-2700

*Factory Installed

ALTITUDE CHART (-30°F To +30°F [-34°C To -1°C])
(Serial No. 120,001-)

Altitude	Sea Level To 3000 Ft. (0 to 914 m)	3000 Ft. To 6000 Ft. (914 to 1828 m)	6000 Ft. To 9000 Ft. (1828 to 2743 m)	Above 9000 Ft. (2743 m)
Main Jet	180*	165	150	140
Main Air Jet	1.0	1.0	1.0	1.0
Air Bleed	.8 x 2 x 4	.8 x 2 x 4	.8 x 2 x 4	.8 x 2 x 4
Pilot Jet	80	80	80	80
Throttle Valve	210	210	210	210
Bypass	1.0-1.1-1.2	1.0-1.1-1.2	1.0-1.1-1.2	1.0-1.1-1.2
Pilot Screw	3/4	3/4	3/4	3/4
Main Nozzle	4.0	4.0	4.0	4.0
Idle Speed (rpm)	2200-2400	2200-2400	2400-2700	2400-2700

*Factory Installed

ALTITUDE CHART (+30°F To +60°F [-1°C To +16°C])
(Serial No. 120,001-)

Altitude	Sea Level To 3000 Ft. (0 to 914 m)	3000 Ft. To 6000 Ft. (914 to 1828 m)	6000 Ft. To 9000 Ft. (1828 to 2743 m)	Above 9000 Ft. (2743 m)
Main Jet	170	155	140	130
Main Air Jet	1.0	1.0	1.0	1.0
Air Bleed	.8 x 2 x 4	.8 x 2 x 4	.8 x 2 x 4	.8 x 2 x 4
Pilot Jet	80	80	80	80
Throttle Valve	210	210	210	210
Bypass	1.0-1.1-1.2	1.0-1.1-1.2	1.0-1.1-1.2	1.0-1.1-1.2
Pilot Screw	3/4	3/4	3/4	3/4
Main Nozzle	4.0	4.0	4.0	4.0
Idle Speed (rpm)	2200-2400	2200-2400	2400-2700	2400-2700

ALTITUDE CHART (Above +60°F [+16°C])
(Serial No. 120,001-)

Altitude	Sea Level To 3000 Ft. (0 to 914 m)	3000 Ft. To 6000 Ft. (914 to 1828 m)	6000 Ft. To 9000 Ft. (1828 to 2743 m)	Above 9000 Ft. (2743 m)
Main Jet	155	140	130	120
Main Air Jet	1.0	1.0	1.0	1.0
Air Bleed	.8 x 2 x 4	.8 x 2 x 4	.8 x 2 x 4	.8 x 2 x 4
Pilot Jet	80	80	80	80
Throttle Valve	210	210	210	210
Bypass	1.0-1.1-1.2	1.0-1.1-1.2	1.0-1.1-1.2	1.0-1.1-1.2
Pilot Screw	3/4	3/4	3/4	3/4
Main Nozzle	4.0	4.0	4.0	4.0
Idle Speed (rpm)	2400-2700	2400-2700	2400-2700	2400-2700

Group 15

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

GENERAL INFORMATION



Fig. 1-Fuel Tank

The fuel tank, Fig. 1, has a capacity of 5-3/4 U.S. gallons (21.7 L). The tank is vented by a hole in the cap.

The fuel pickup line in the tank is connected to a screen. The in-line fuel filter is located in the fuel line between the tank and fuel pump.

The in-line fuel filter contains a nylon screen with a self-cleaning action. Pulsation of the screen shakes loose contamination which settles at the base of the filter cone.

NOTE: If the green fuel line (M63270) is leaking at the fittings, install the yellow-colored fuel line (M68254).

SERVICE

Screen



Fig. 2-Fuel Line Pick-up Screen

1. Disconnect fuel line to fuel pump from fitting and remove fitting with pickup line from tank, Fig. 2.
2. Remove pickup screen from end of line.
3. Clean screen with solvent and compressed air. Replace screen if it is damaged.
4. Replace gasket on fuel line fitting.

Fuel Tank

1. Disconnect fuel line. Remove seat and tank hold-down clips. Slide tank rearward to remove.
2. If tank is damaged, replace it.
3. Tank can be cleaned with solvent and compressed air.

In-Line Filter

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

Fuel Pump

1. The fuel pump is non-serviceable.
2. To check fuel pump, remove fuel line from pump to carburetor at the carburetor.
3. With ignition off, pull recoil start handle and check for fuel flow from the line.

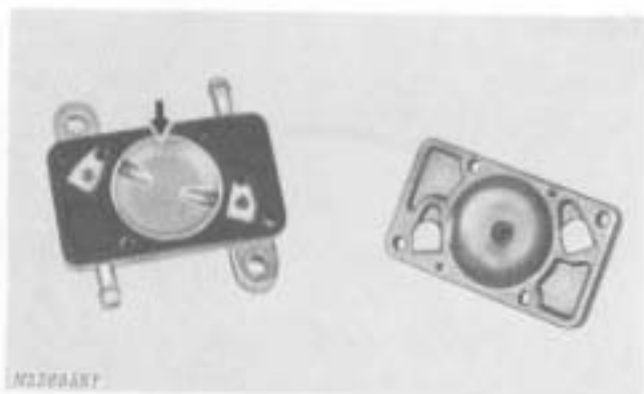


Fig. 3-Fuel Pump

4. If fuel flows from line, pump is satisfactory; if not, disassemble pump and check diaphragm, Fig. 3. Clean the pump and be sure diaphragm is not cracked or wrinkled. If pump does not function after cleaning, replace it.

Section 40 ELECTRICAL SYSTEM

Group 5 GENERAL INFORMATION

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PRINCIPLE OF OPERATION

Electrical System

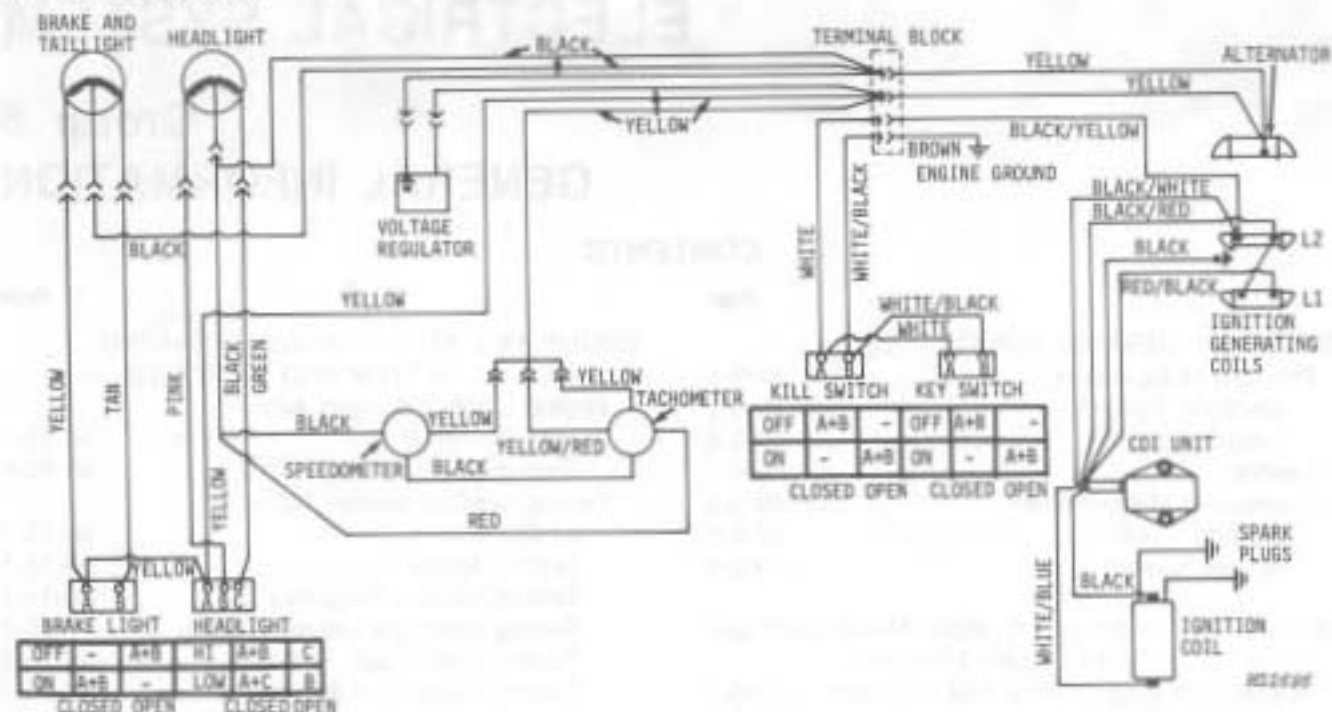


Fig. 1-Electrical System (Serial No. -120,000)

The John Deere SPITFIRE Snowmobile (Serial No. -120,001) electrical system, Fig. 1, consists of two systems: ignition and lighting.

The snowmobiles are equipped with a flywheel alternator to provide power for the lighting system. A voltage regulator in the system limits the average AC voltage, allowing only the voltage needed in the system at a given time.

The lights are automatically "ON" whenever the engine is running. A brake light switch turns the brake light "ON" when the brakes are applied.

Refer to the wiring diagram above (Serial No. -120,000) and "Diagnosing Malfunctions", page 40-5-5, to understand the electrical system and diagnose malfunctions.

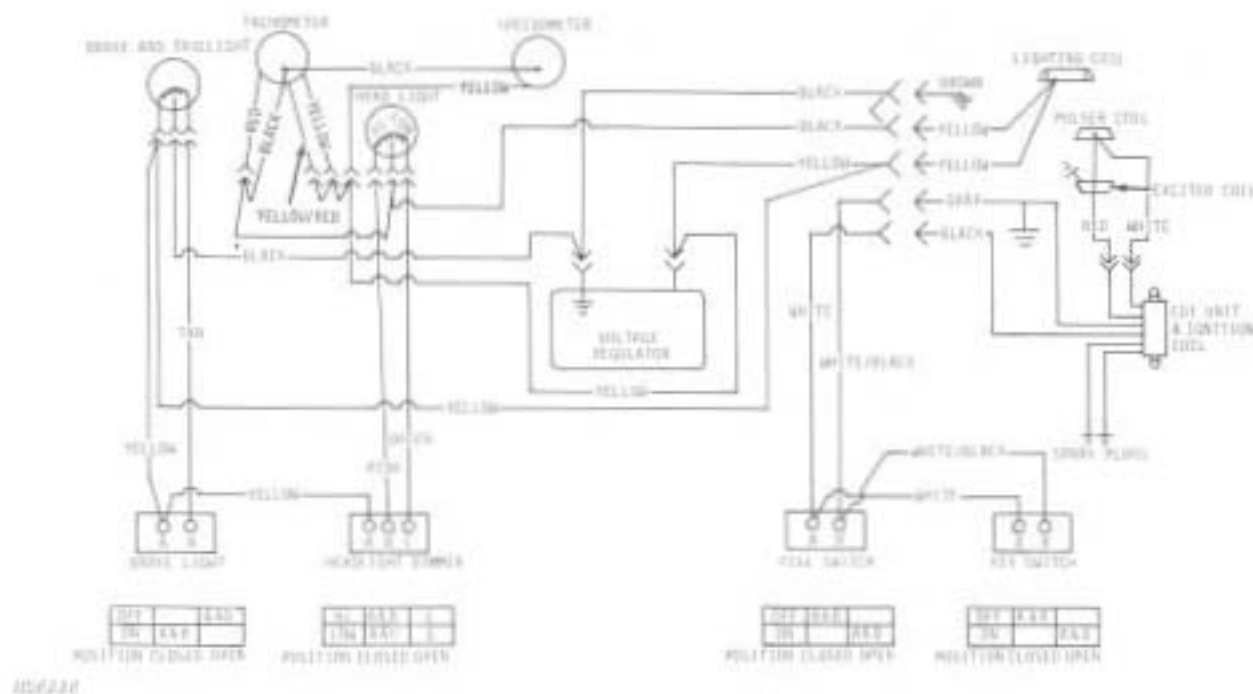


Fig. 2-Electrical System (Serial No. 120,001-)

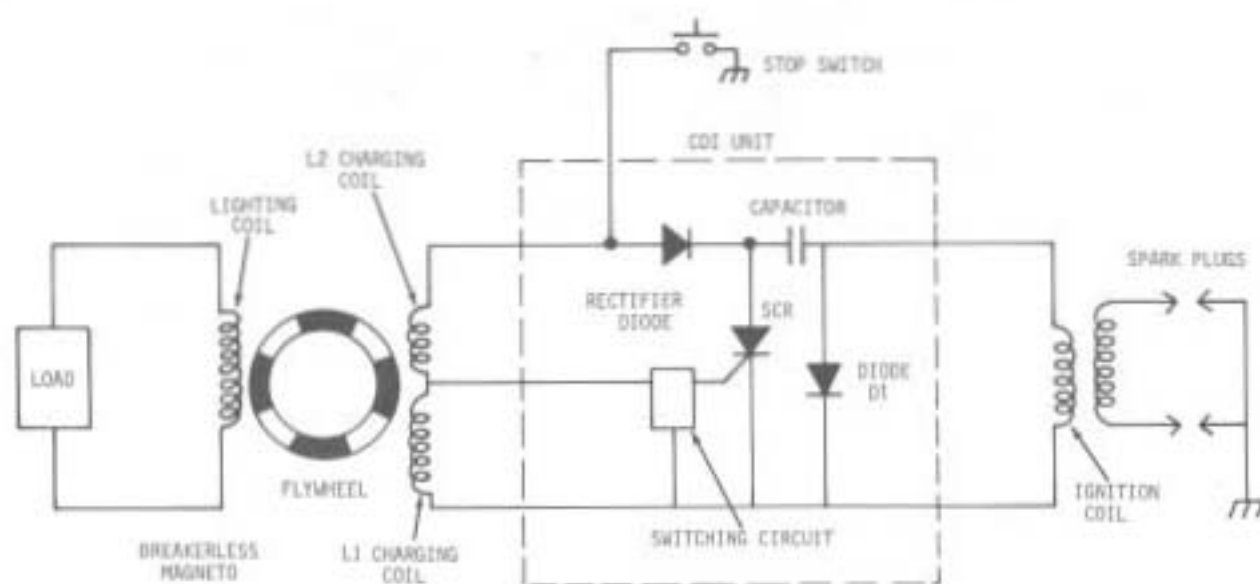
The John Deere SPITFIRE Snowmobile (Serial No. 120,001-) electrical system, Fig. 2, consists of two systems: ignition and lighting.

The snowmobiles are equipped with a flywheel alternator to provide power for the lighting system. A voltage regulator in the system limits the average AC voltage, allowing only the voltage needed in the system at a given time.

The lights are automatically "ON" whenever the engine is running. A brake light switch turns the brake light "ON" when the brakes are applied.

Refer to the wiring diagram above (Serial No. 120,001-) and "Diagnosing Malfunctions", page 40-5-5, to understand the electrical system and diagnose malfunctions.

Ignition System



HD1647

Fig. 3-Capacitor Discharge Ignition

The Capacitor Discharge Ignition (CDI), Fig 3, features a breakerless magneto, two capacitor charging coils, a CDI unit and one ignition coil.

As the four-pole-magnet-flywheel rotates, the magnets within the flywheel rotate past the capacitor charging coils, generating AC current within the coils. The charging coils also supply two ignition signals per revolution to the switching circuit in the CDI unit.

The alternating current from the charging coils passes through a diode in the CDI unit which acts as a 1/2 wave rectifier to change the AC current to DC current to charge the capacitor.

When the capacitor is fully charged, a signal from the charging coils to the switching circuit triggers the gate in the SCR (Silicon Controlled Rectifier) allowing the energy stored in the capacitor to be released to the ignition coil.

The ignition coil "steps-up" the electrical energy to a level high enough to fire the spark plugs.

The DI diode in the CDI unit is connected in parallel with the primary winding of the ignition coil to prolong arc duration time as the spark plugs fire.

Both spark plugs fire simultaneously.

TESTING

Instructions are provided in each group for testing the components. The tests isolate the problem in the lighting or ignition systems.

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

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

DIAGNOSING MALFUNCTIONS

Lighting System

Lights Will Not Light

- Electric connections loose or wires damaged.
- Alternator faulty.
- 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.

Ignition System

Engine Hard To Start

- Spark plugs fouled or defective.
- Engine not timed properly.
- Electrical connections loose or corroded.

Engine Misfires

- Spark plugs fouled or defective.
- Electrical connections loose or corroded.
- Engine not timed properly.

Engine Overheating

- Engine not timed properly.

Engine Kicks Back and Backfires

- Engine not timed properly.

Group 10

CAPACITOR DISCHARGE IGNITION (CDI) KOHLER ENGINE

CAUTION: Capacitor discharge 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.

TESTING CDI IGNITION WITH JDM-74 TESTER

1. Be sure connections are clean.
2. Check wiring harness for damage or a short circuit.
3. Be sure kill switch grounds only in the "OFF" position.

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 properly grounded.

Test No. 1 - Magneto Output (Capacitor Charging Coils)

1. Disconnect the 3-wire connector between the engine and CDI unit and the single red/black wire.
2. Install JDM-74A-6 Wiring Harness to the black/red wire of the connector from the engine, Fig. 1, and to the single red/black wire. Connect yellow wire of JDM-74A-6 Harness to single red/black wire. Connect red wire of harness to black/red wire.
3. Connect "P" lead (red wire) of the tester to the black/red wire, Fig. 1.
4. Connect "N" lead (yellow wire) of the tester to the single red/black wire, Fig. 1.
5. Move tester switch to "HIGH" circuit. Set dial at 50.
6. Crank engine with start rope. Tester light should light. Repeat test at least 3 times to verify reading and check for consistent output. Reading should repeat within 2 points.

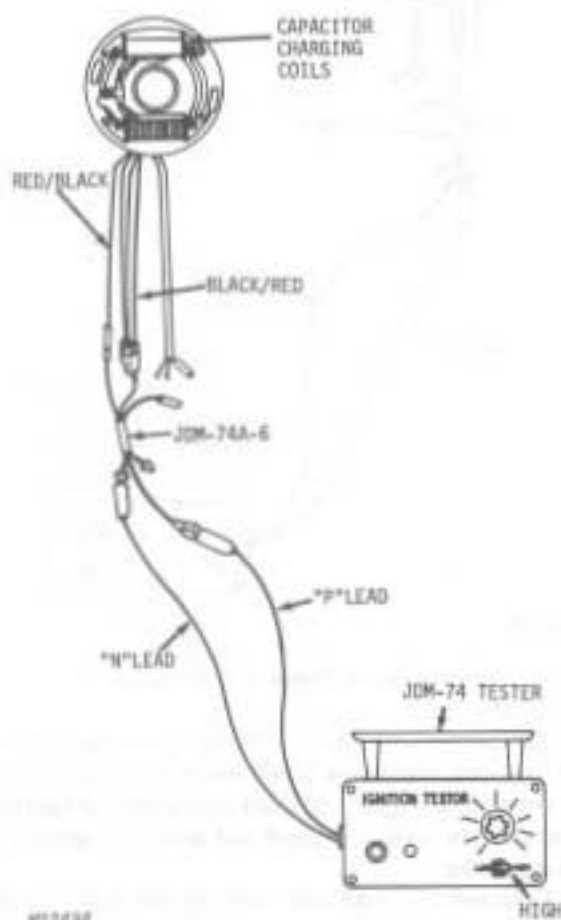


Fig. 1-Testing Magneto Output
(Capacitor Charging Coils)

7. If tester light does not light or dial must be turned downscale to light tester light, magneto capacitor charging coils are defective. Replace stator.

Test No. 2 - Trigger Impulse Output

1. Disconnect the 3-wire connector between the engine and CDI unit.

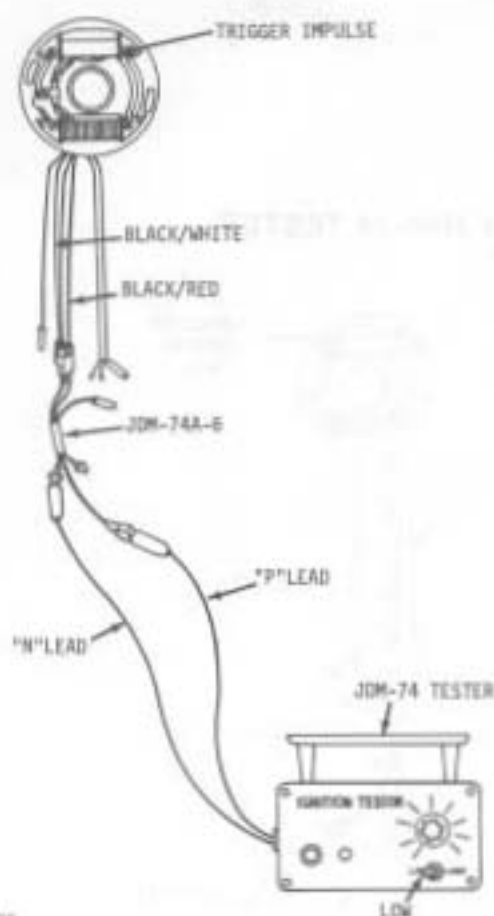


Fig. 2-Testing Trigger Impulse Output

2. Connect JDM-74A-6 Wiring Harness to the black/red wire and black/white wires to the connector from the engine, Fig. 2. Connect yellow wire of harness to black/red wire. Connect red wire of harness to black/white wire.

3. Connect "P" lead (red wire) of the tester to the black/red wire, Fig. 2.

4. Connect "N" lead (yellow wire) of the tester to the black/white wire, Fig. 2.

5. Move tester switch to "LOW" circuit. Set dial at 80.

6. Crank engine with start rope. Tester light should light. Repeat test at least 3 times to verify reading and check for consistent output. Reading should repeat within 2 points.

7. If tester light does not light or dial must be turned downscale to light tester light, magneto capacitor charging coils are defective. Replace stator.

Test No. 3 - CDI Unit Output

IMPORTANT: DO NOT crank engine unless the coil or tester is connected to the CDI unit.

1. Disconnect the 2-wire connector between the CDI Unit and the ignition coil. Reconnect 3-wire connector and single red/black wire.

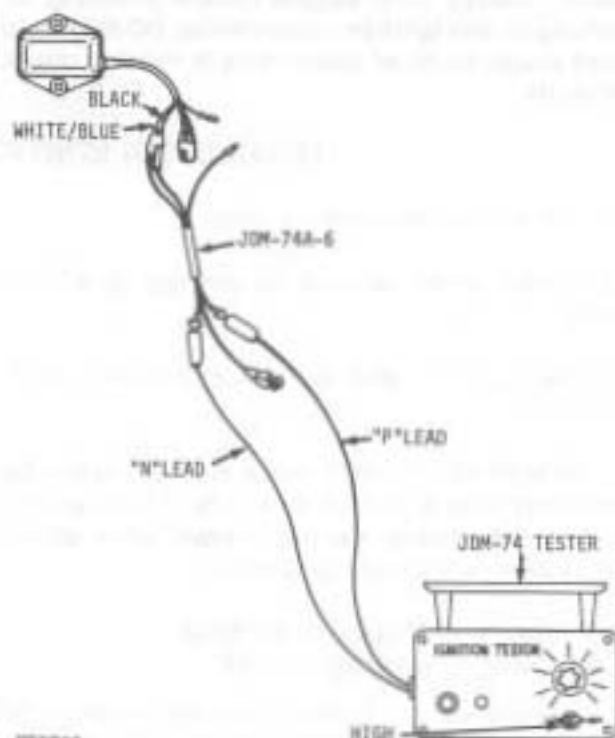


Fig. 3-Testing CDI Unit Output

2. Install JDM-74A-6 Wiring Harness to the 2-wire connector from the CDI unit, Fig. 3. Connect red wire of harness to black wire. Connect yellow wire of harness to white/blue wire.

3. Connect "P" lead (red wire) of the tester to the black wire from the CDI unit, Fig. 3.

4. Connect "N" lead (yellow wire) of the tester to the white/blue wire from the CDI unit, Fig. 3.

5. Move tester switch to "HIGH" circuit. Set dial at 70.

6. Crank engine with start rope. Tester light should light. Repeat test at least 3 times to verify reading and check for consistent output. Reading should repeat within 2 points.

7. If tester light does not light or dial must be turned downscale to light tester light, CDI unit is defective. Replace CDI unit.

NOTE: If Tests 1, 2 and 3 are good and an ignition problem still exists, the ignition coil or spark plugs are defective.

TESTING CDI IGNITION WITH AN OHMMETER

NOTE: Use an ohmmeter to conduct the following tests. Be sure the ohmmeter is accurate and the batteries are fresh. Periodically zero the meter during the tests.

1. Be sure connections are clean.
2. Check wiring harness for damage or a short circuit.
3. Be sure kill switch grounds only in the "OFF" position.

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 properly grounded.

Test No. 1 - Magneto (Capacitor Charging Coils)

Disconnect the 3-wire connector between the engine and CDI unit and the single red/black wire, Fig. 4.

Perform the following tests on the wiring from the engine.

If charging coils do not check out as indicated, replace the stator.



Fig. 4-Testing Magneto (Capacitor Charging Coils)

Item	Position of Ohmmeter Probes	Ohmmeter Reading
L1 Charging Coil	Black/Red-Red/Black	160 to 200 ohms
L2 Charging Coil	Black/White-Black/Red	1.5 to 2.3 ohms
Charging Coils and Ground	Red/Black - Black	00
Ground and Engine Block	Black-Engine Block	0 to 1 ohm

Test No. 2 - CDI Unit

Disconnect the 2-wire and 3-wire connectors from the CDI unit and the single red/black wire, Fig. 5.

Perform the following tests on the wiring from the CDI unit.

NOTE: (-) and (+) in the following chart indicate the probes from the ohmmeter and the respective wires they should contact.

If the CDI unit does not check out as indicated, replace the CDI unit.



Fig. 5-Testing CDI Unit

Position of Probes	Connector	Ohmmeter Reading
Black/White (-) - Black (+)	3-Wire	No or temporary continuity
Black (-) - Black/White (+)	3-Wire	No continuity
Black/Red (-) - Red/Black (+)	3-Wire and Single	Continuity
Red/Black (-) - Black/Red (+)	3-Wire and Single	No continuity
Red/Black (-) - Black (+)	3-Wire and Single	Continuity
Black (-) - Red/Black (+)	3-Wire and Single	No continuity
White/Blue (-) - Black (+)	2-Wire	No continuity
Black (-) - White/Blue (+)	2-Wire	Continuity

Test No. 3 - Ignition Coil



Fig. 6-Testing Ignition Coil

Disconnect the ignition coil 2-wire connector from the CDI unit, Fig. 6.

Perform the following tests on the wiring from the ignition coil.

Item	Position of Ohmmeter Probes	Ohmmeter Reading
Primary Winding	White/Blue-Black	0.2 to 0.3 ohms
Secondary Winding	Both Spark Plug Cables	1100 to 1700 ohms
Between Primary Winding and Core	White/Blue-Core	00
Between Secondary Winding and Core	Each Spark Plug Cable and Core	00

If the ignition coil does not check out as indicated, replace the coil.

REPAIR

Removing Flywheel and Stator

1. Remove recoil starter and ground wire.
2. Remove starter cup.

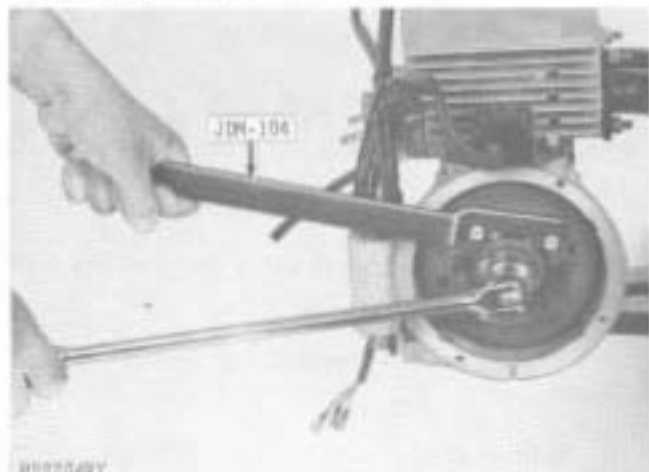


Fig. 7-Removing Flywheel Nut

3. Straighten locking tab. Use JDM-104 Flywheel Holding Tool to hold flywheel and remove flywheel nut, Fig. 7.



Fig. 8-Removing Flywheel

4. Remove flywheel with JDM-9 Puller, Fig. 8.
5. Disconnect wiring between engine CDI unit, and coil.



Fig. 9-Spark Plug Cable Clip

6. Disconnect spark plug wires. Remove clip from intake manifold, Fig. 9.

7. Remove flywheel housing with ignition coil and CDI unit.

8. Remove stator.

Installing Flywheel and Stator (Timing Engine)

1. Remove spark plugs.

2. Install dial indicator in No. 1 cylinder. No. 1 cylinder is on PTO side of engine.

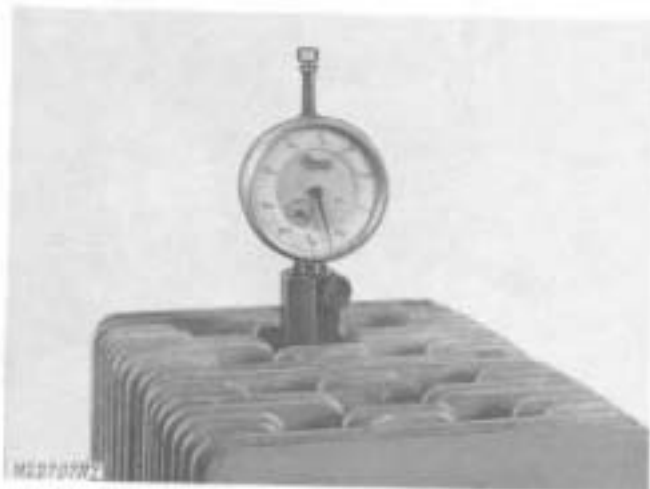


Fig. 10-Dial Indicator Installed

3. Locate top-dead-center (TDC) for No. 1 piston. "Zero" dial indicator. Turn crankshaft counterclockwise until dial indicator reads 0.085-inch, Fig. 10.

4. Install stator. Use Loctite on screws. DO NOT tighten at this time.

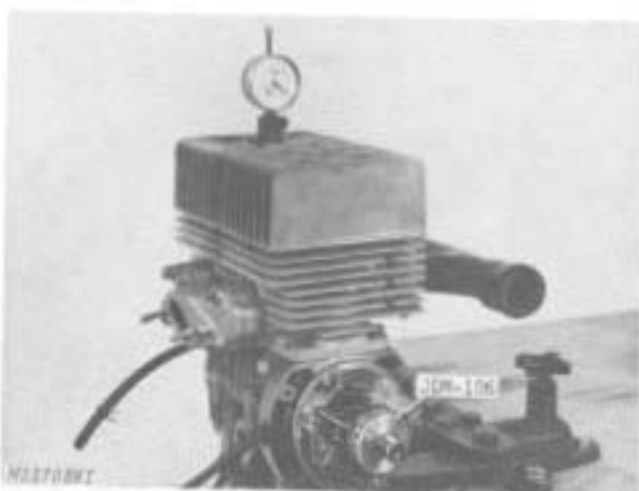


Fig. 11-JDM-106 Timing Tool Installed

5. Install JDM-106 Timing Tool on crankshaft, Fig. 11.

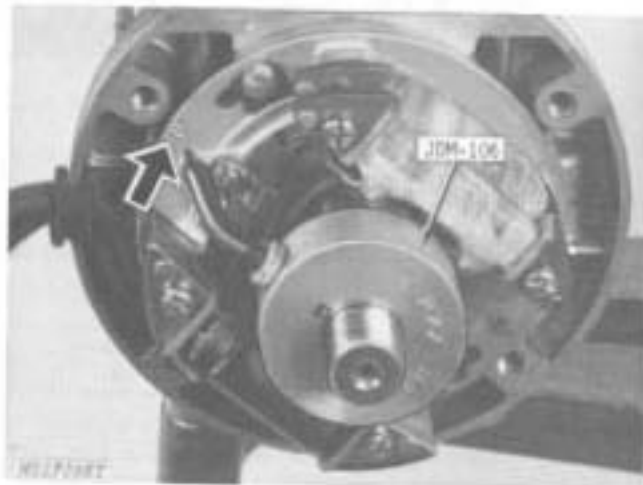


Fig. 12-Timing Mark on Stator

6. Rotate stator until long center mark on stator aligns with pointer on timing tool, Fig. 12. Tighten stator retaining screws.

7. Recheck timing. Remove timing tool and dial indicator.

8. Install flywheel housing. Use Loctite on retaining screws.

9. Connect spark plug wires. Install plug wire clip to intake manifold.

10. Connect wiring between engine and CDI unit.

11. Install flywheel, locking tab and flywheel nut. Hold flywheel with JDM-104 Flywheel Holding Tool and torque nut to 85 to 90 ft-lbs (115 to 122 Nm) (11 to 12 kgm). Bend locking tab.

12. Install starter cup, recoil starter and ground wire.

Checking Ignition Timing



Fig. 13-Checking Ignition Timing

1. Remove drive belt.
2. Connect a timing light to No. 1 spark plug lead, Fig. 13, and to a 12-volt battery.
3. Connect a tachometer to the No. 2 spark plug lead or to the wiring harness.
4. Start and run the engine at 6000 rpm.

IMPORTANT: DO NOT overspeed the engine with drive belt removed. Engine must be run at 6000 rpm (no load) to properly check ignition timing.

5. Aim timing light at hole in flywheel housing. Mark on flywheel should align with external mark on flywheel housing.
6. If timing must be adjusted, refer to page 40-10-6 for the proper procedure.
7. Reinstall drive belt.

Group 12

CAPACITOR DISCHARGE IGNITION (CDI) - JOHN DEERE ENGINE

TESTING CAPACITOR DISCHARGE IGNITION WITH JDM-74 TESTER

CAUTION: Capacitor discharge 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 your hand to check for spark.

IMPORTANT: Never use a 12-volt test light on CDI ignition systems or the system will be destroyed.

Before testing:

1. Make sure all connections are clean and tight.
2. Check all wiring for damage.
3. Install new spark plugs.
4. Read and understand all test procedures.
5. Perform all tests in sequence.
6. Test ignition and kill switches before performing tests on ignition. They must be functioning properly.

Test No. 1 (CDI and Coil Output)

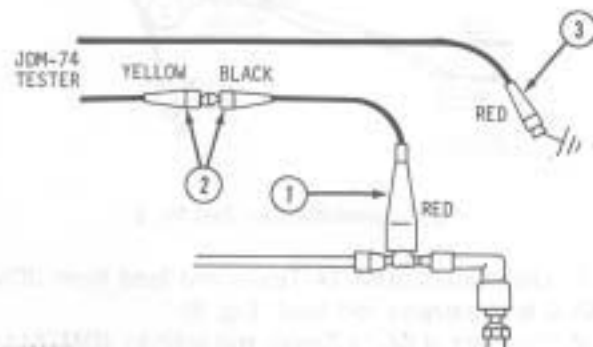
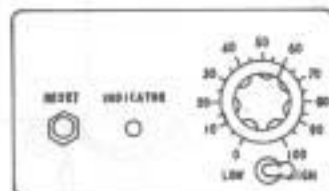


Fig. 1-Connections for Test No. 1

1. Connect test adaptor (red end) to either spark plug cable (close to plug) as shown, Fig. 1.
2. Connect JDM-74 Tester yellow lead to test adaptor (black end).
3. Connect JDM-74 Tester red lead to ground.



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Fig. 2-Procedure for Test No. 1

4. Set tester for "HIGH" range, Fig. 2.
 5. Turn tester dial to "60."
 6. Turn key switch "ON" and place emergency stop switch in center position.
 7. Crank engine with starter rope and observe tester indicator light.
- NOTE: If engine starts, allow it to idle while observing indicator. Then, shut engine off.*
8. Push reset button and repeat Step 6 twice.
 9. Repeat procedure on remaining spark plug.

Test Results

Indicator lights on both spark plugs:

Ignition system is OK. Remove test leads and check for other causes.

Indicator does not light on one or both spark plugs:
Remove test leads and proceed to Test No. 2.

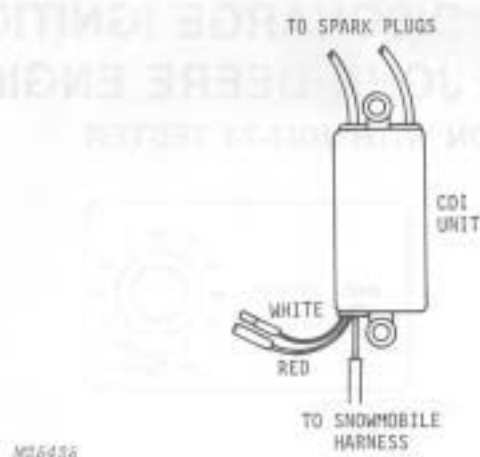
Test No. 2 (Exciter Coil Output)

Fig. 3-Preparation for Test No. 2

1. Disconnect white CDI lead from engine harness, Fig. 3.
2. Disconnect red CDI lead from engine harness.

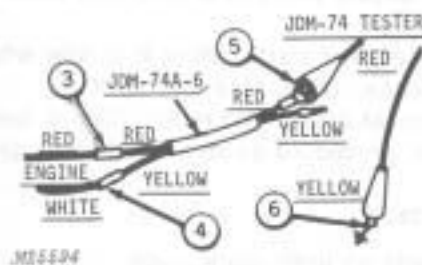


Fig. 4-Connections for Test No. 2

3. Connect JDM-74A-6 Test Harness red lead to engine harness red lead, Fig. 4.
4. Connect JDM-74A-6 Test Harness yellow lead to engine harness white lead.
5. Connect JDM-74 Tester red lead to JDM-74A-6 Test Harness red lead.
6. Connect JDM-74 Tester yellow lead to engine ground.

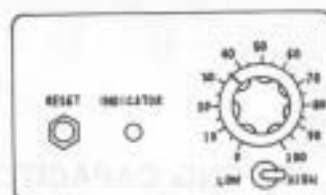


Fig. 5-Procedure for Test No. 2

7. Set tester for "HIGH" range, Fig. 5.
8. Turn dial to "35."
9. Crank engine with starter rope and observe indicator.
10. Push reset button and repeat Step 9 twice.

Test Results

Indicator lights:

Proceed to Test No. 3.

Indicator does not light:

Remove test leads and replace exciter coil.

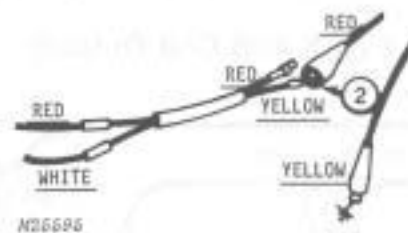
Test No. 3 (Pulser Coil)

Fig. 6-Connections for Test No. 3

1. Disconnect JDM-74 Tester red lead from JDM-74A-6 test harness red lead, Fig. 6.
2. Connect JDM-74 Tester red lead to JDM-74A-6 test harness yellow lead.

3. Set tester for "HIGH" range, Fig. 7.
4. Turn dial to "35."
5. Crank engine with starter rope and observe indicator.
6. Push reset button and repeat Step 5 twice.

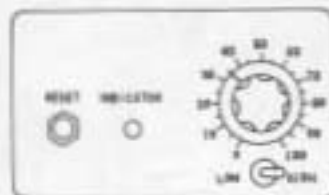
Test Results

Indicator lights:

Remove test leads and replace CDI unit.

Indicator does not light:

Remove test leads and replace pulser coil.



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Fig. 7-Procedure for Test No. 3

REMOVING FLYWHEEL AND STATOR

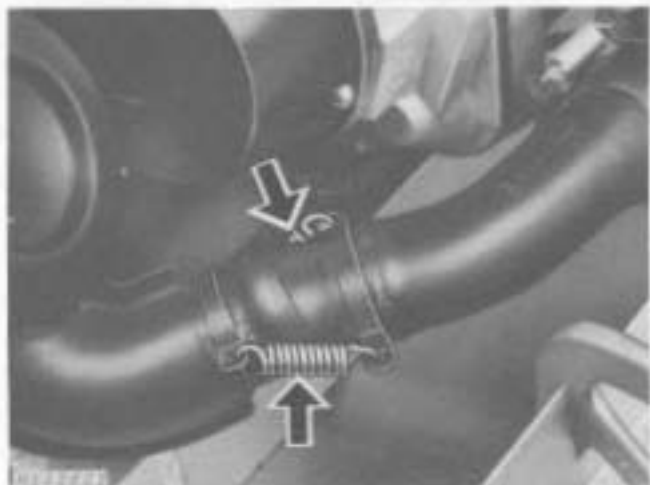


Fig. 8-Removing Muffler Springs

1. Remove springs securing muffler to exhaust manifold, Fig. 8.
2. Remove muffler.
3. Tie a knot in recoil start rope to hold it and remove handle.

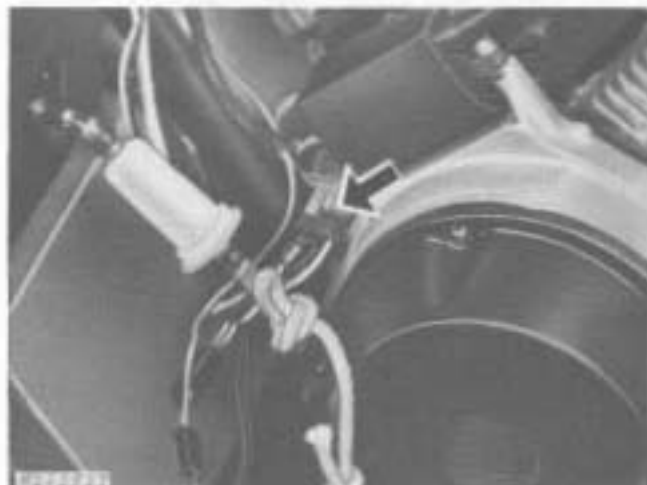
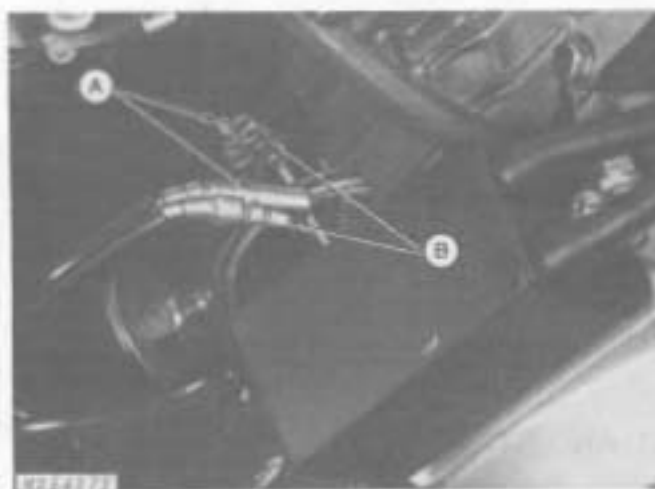


Fig. 9-Harness Connector

4. Disconnect wiring harness connector, Fig. 9.
5. Disconnect spark plug leads.
6. Remove recoil starter.



A—Red Lead

B—White Lead

Fig. 10-Disconnecting Wiring

7. Disconnect red lead and white lead, Fig. 10.

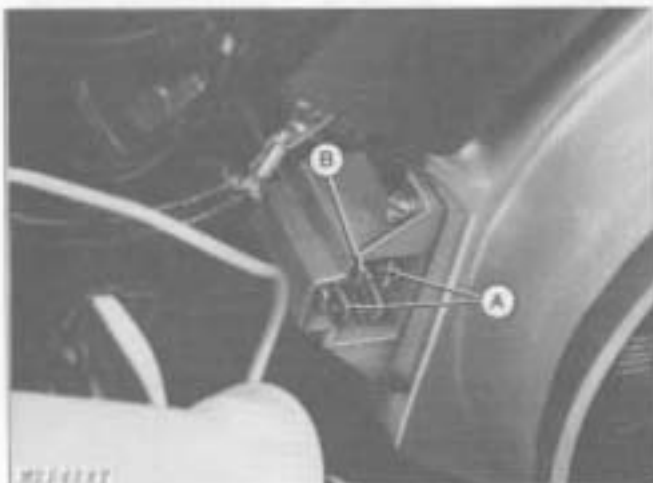


Fig. 12-Removing Flywheel Housing

9. Remove starter pulley and spacer, Fig. 12.

10. Remove flywheel housing.

11. Bend up tangs on locking plate.

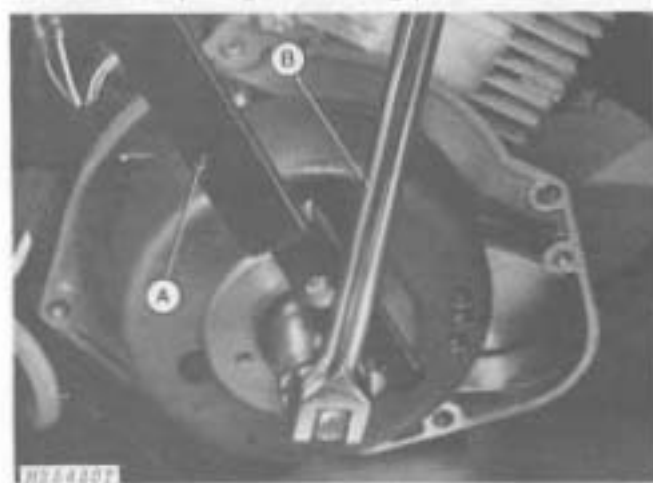


A—Yellow Leads

B—Brown Lead

Fig. 11-Removing Wiring

8. Disconnect one brown and two yellow leads from connector, Fig. 11. Mark their location for reassembly.



A—JDM-64-1 Flywheel Holding Tool

B—Breaker Bar

Fig. 13-Flywheel Holding Tool

12. Use JDM-64-1 Flywheel Holding Tool. Remove flywheel nut and locking plate, Fig. 13.

NOTE: Modify JDM-64-1 Flywheel Holding Tool by drilling out holes to 3/8 inch (9.5 mm). Elongate holes to fit flywheel.



Fig. 14-Removing Flywheel

13. Use JDM-9 Puller and JDM-64-1 Flywheel Holding Tool positioned as illustrated to remove flywheel, Fig. 14.

NOTE: DO NOT strike flywheel with a hammer. Strike puller bolt with a plastic or wood mallet.



A—Grommet

B—Stator Screws

Fig. 15-Removing Stator

14. Remove stator, Fig. 15. Pull leads and grommet through crankcase.

INSTALLING STATOR AND FLYWHEEL

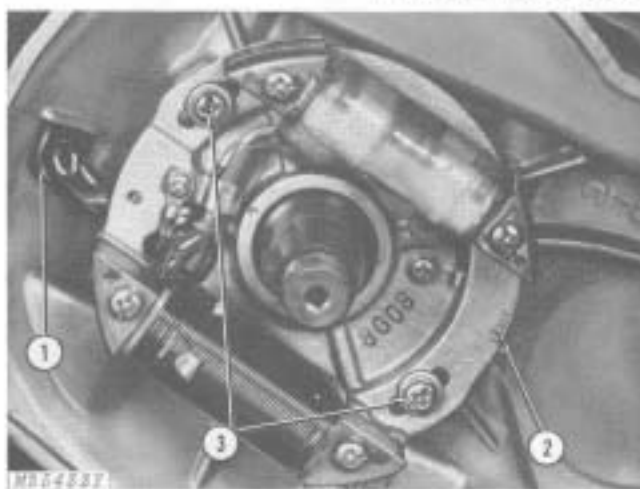


Fig. 16-Installing Stator

1. Guide stator leads through grommet and set against crankcase, Fig. 16.

2. Align longest mark on stator with top of ridge on crankcase.

3. Tighten stator screws.

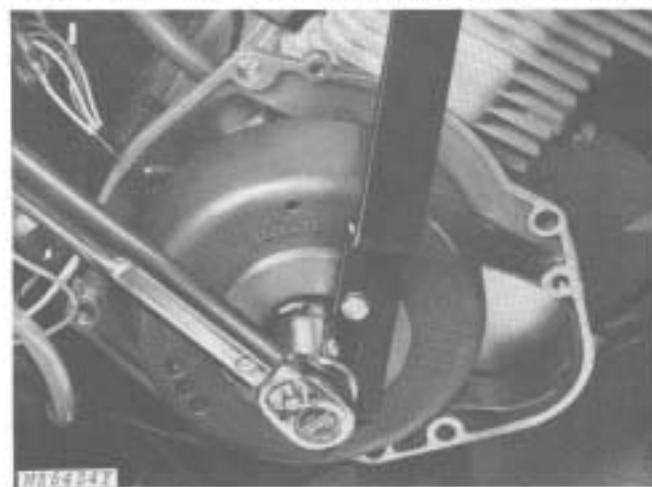


Fig. 17-Installing Flywheel

6. Hold flywheel with JDM-64-1 Flywheel Holding Tool and tighten flywheel nut to 60 ft-lbs (81 Nm) torque, Fig. 17.

7. Bend tabs on lock washer to secure nut.
8. Install flywheel housing.
9. Connect red lead and white lead.
10. Install two yellow and one brown lead in connector as marked when removed.
11. Secure wire harness with clamp.

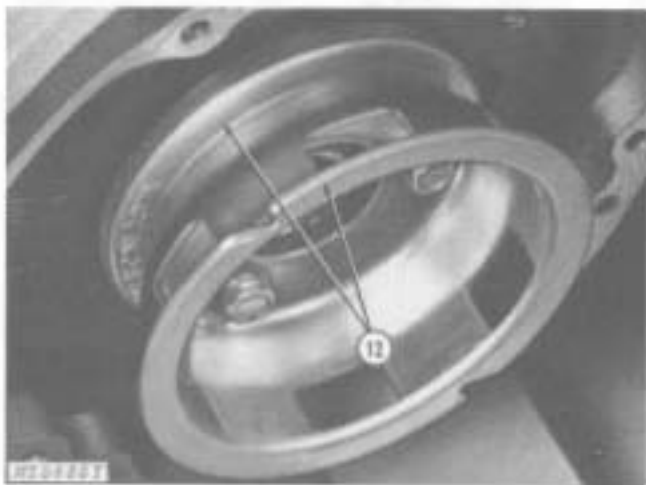


Fig. 18-Installing Starter Pulley

12. Install flywheel spacer (lip edge inward) and starter cup, Fig. 18.
13. Install recoil starter.
14. Connect spark plug leads.

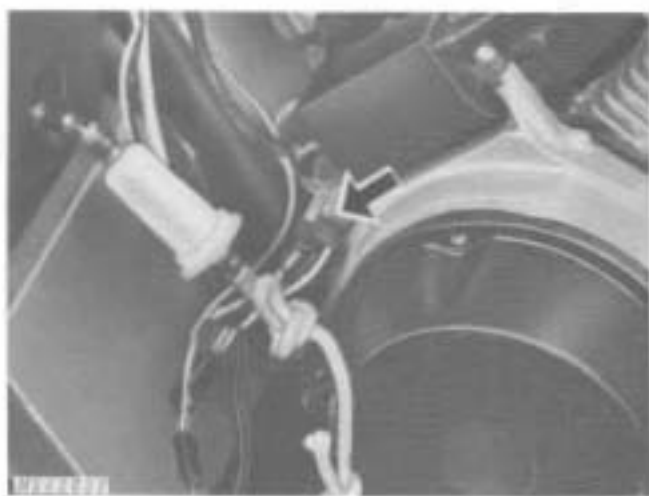


Fig. 19-Harness Connector

15. Connect wire harness connector, Fig. 19.
16. Install handle and release knot in recoil start rope.
17. Install muffler.

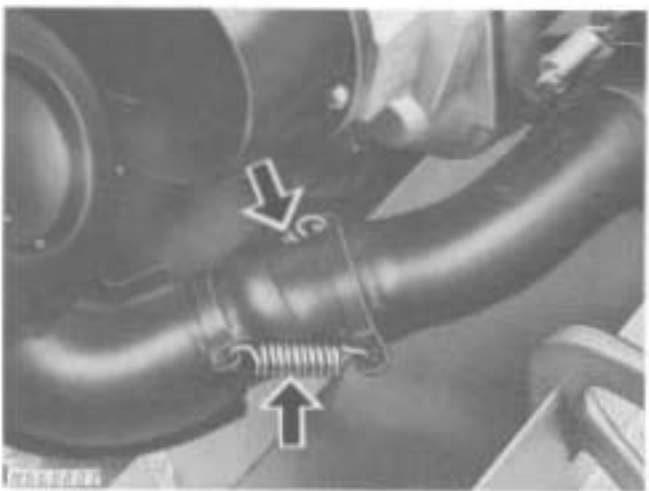


Fig. 20-Installing Muffler Springs

18. Install muffler springs, Fig. 20.

REPLACING PULSER AND EXCITER COILS

1. Remove flywheel. See page 40-12-3.

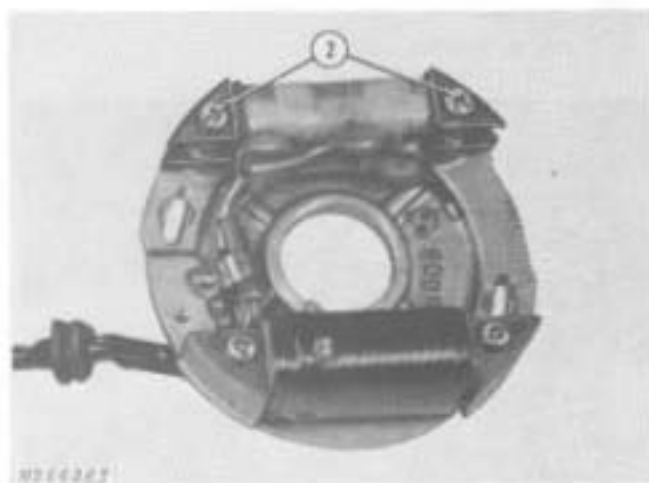


Fig. 21-Removing Coil Screws

2. Remove screws, Fig. 21.

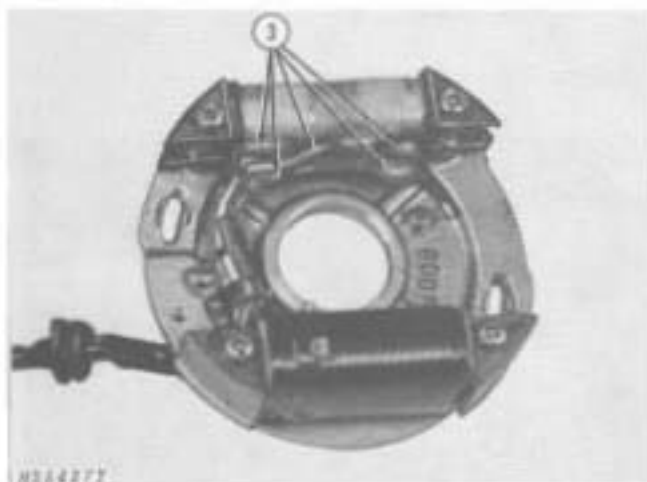


Fig. 22-Removing Coils

3. Chip epoxy seal from connections on coil being replaced, Fig. 22.

4. Unsolder connections and remove coil.

5. Solder leads to new coil with rosin core (high temperature) solder.

6. Seal connections with a two part epoxy.

IMPORTANT: Make sure all exposed metal is covered thoroughly.

7. Mount exciter coil and pulser coil (in that order) on stator plate.

8. Make sure curvature of coils aligns with curve of stator plate; then, tighten screws.

IGNITION TIMING

1. Remove recoil starter.
2. Use a rope to start engine.



Fig. 23-Checking Timing

3. Use a timing light. The "F" mark on the flywheel should align with the fixed mark on flywheel housing with engine running at 6500 rpm, Fig. 23.

IMPORTANT: Run the engine for 5 minutes before checking timing. A cold engine will show a 2 to 4 degree advance. NEVER time the engine unless it is at operating temperature. DO NOT disconnect the lights from the system because this could also cause a variation in engine timing.

4. If marks do not align, proceed to Steps 5 through 8.
5. Remove starter cup.
6. If marks align, reinstall recoil starter.



Fig. 24-Adjusting Stator Plate

6. Use any of the three holes in the flywheel, Fig. 24, to loosen the stator mounting screws. Loosen the two screws slightly.

7. Use a screwdriver to rotate the stator. Rotating stator clockwise retards timing; counterclockwise advances timing.

8. Tighten stator screws and recheck timing.

Group 15

KOHLER ENGINE LIGHTING SYSTEM AND SWITCHES

TESTING LIGHTING SYSTEM WITH JDM-74 TESTER

Testing Alternator



Fig. 1-Testing Alternator Output

1. Disconnect both yellow alternator leads from the junction block, Fig. 1.
2. Move tester switch to "LOW" circuit. Set dial at 80.
3. Connect "P" lead (red wire) of tester to one of the yellow wires from the engine, Fig. 1.
4. Connect "N" lead (yellow wire) to the other yellow wire from the engine, Fig. 1.
5. Crank engine with start rope. Tester light should light. Repeat test at least 3 times to verify reading and check for consistent output.
6. If tester light does not light or dial must be turned downscale to light tester light, alternator charging coil is defective. Replace stator, page 40-10-5.

TESTING LIGHTING SYSTEM WITH AN OHMMETER

Testing Alternator

1. Disconnect both yellow alternator leads from the junction block.



Fig. 2-Testing Alternator With Ohmmeter

2. Connect ohmmeter to these two leads, Fig. 2.
3. Check for continuity and resistance (0.13 to 0.2 ohms).
4. If resistance is higher or lower, replace stator.

Testing Voltage Regulator

The voltage regulator will malfunction in only two ways:

1. An "OPEN" condition will cause all the lights in the system to burn out (at engine speeds over idling).
2. A "SHORTED" condition will prevent any of the lights from lighting.

NOTE: To check for a shorted condition, disconnect the voltage regulator from the system. Start and run the engine at IDLE SPEED ONLY. If lights light, voltage regulator is faulty. Replace voltage regulator.

IMPORTANT: A defective alternator coil will also prevent the lights from lighting.

Testing Headlight Dimmer Switch

1. Disconnect wiring coupler from headlight.



Fig. 3-Testing Headlight Dimmer Switch

2. Connect ohmmeter between pink and black wires (high beam), Fig. 3. Actuate dimmer switch. Ohmmeter should show continuity.

3. Connect ohmmeter between green and black wires (low beam), Fig. 3. Actuate dimmer switch. Ohmmeter should show continuity.

4. If switch does not function correctly, replace it.

Testing Brake Light Switch



Fig. 4-Testing Brake Light Switch

1. Disconnect the brake light switch coupler from the wiring harness, Fig. 4.

2. Connect an ohmmeter between the wires in the coupler, Fig. 4.

3. Apply the brake. Ohmmeter should show continuity. If not, replace switch.

Testing Engine Kill Switch



Fig. 5-Testing Engine Kill Switch

1. Disconnect the kill switch coupler from the wiring harness, Fig. 5.

2. Connect an ohmmeter between the wires in the coupler, Fig. 5.

3. Actuate the kill switch. Ohmmeter should show continuity. If not, replace switch.

Testing Ignition Switch

1. Disconnect the wiring from the ignition switch.
2. Connect an ohmmeter across the ignition switch terminals, Fig. 6.
3. With ignition switch in "OFF" position, ohmmeter should show continuity.
4. Turn switch to "ON" position. Ohmmeter should show no continuity.
5. If ohmmeter does not show continuity, replace switch.



Fig. 6-Testing Ignition Switch

REPLACING LIGHTING COIL

NOTE: If the lighting coil is defective, the stator must be replaced, refer to page 40-10-5, for removing and installing stator.

ADJUSTING HEADLIGHT

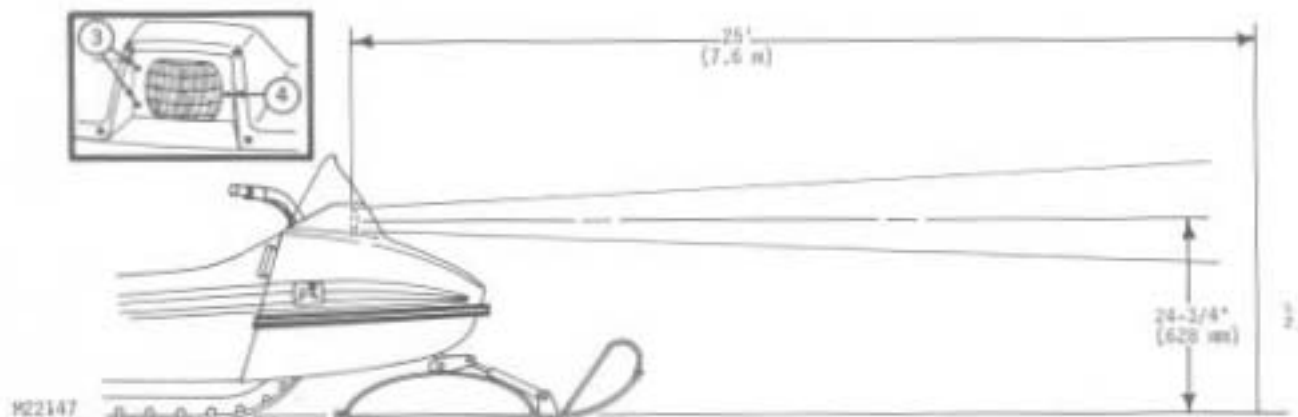


Fig. 7-Adjusting Headlight

1. Position snowmobile on a flat surface with the headlight 25 feet (7.6 m) from a vertical surface, Fig. 7.
2. With operator on seat and headlight on HIGH beam, light beam centerline should be straight ahead and 24-3/4 inches (628 mm) above ground level.
3. Loosen or tighten the two adjusting screws to raise or lower the light beam.
4. Loosen or tighten the adjusting screw to move the light beam right or left.

Group 17

JOHN DEERE ENGINE LIGHTING SYSTEM AND SWITCHES

TESTING ALTERNATOR

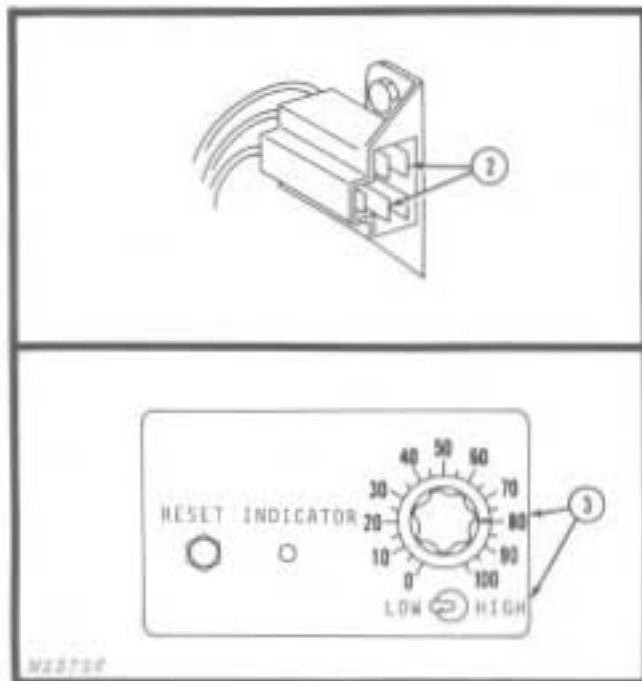


Fig. 1-Testing Alternator Output

1. Disconnect five-wire coupler, Fig. 1.
2. Connect JDM-74 Tester between the two yellow leads.
3. Set tester dial at "80" on the "LOW" circuit.
4. Crank engine with starter rope and observe tester indicator light.
5. Push reset button and repeat Step 4 twice.

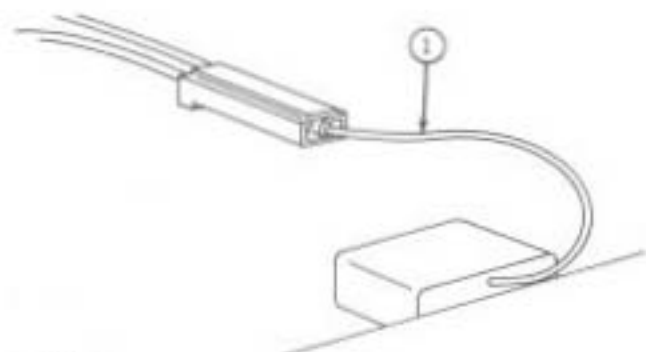
Test Results

- * Indicator lights.
Alternator is OK.
- * Indicator does not light.
Alternator is defective.

TESTING VOLTAGE REGULATOR AND LIGHTING COIL

If all the lights burn out at engine speeds above idle, the voltage regulator is defective. Replace voltage regulator.

If lights will not light at any engine speed, check the voltage regulator and lighting coil as follows:



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Fig. 2-Testing Voltage Regulator

1. Disconnect the yellow lead from the voltage regulator, Fig. 2.

2. Start the engine and allow it to idle.

IMPORTANT: Do not run engine above idle speed or all light bulbs will burn out.

Lights Light: Replace the voltage regulator.

Lights Do Not Light: Test the alternator as shown in Fig. 1. If alternator tests OK, replace voltage regulator.

TESTING HEADLIGHT DIMMER SWITCH

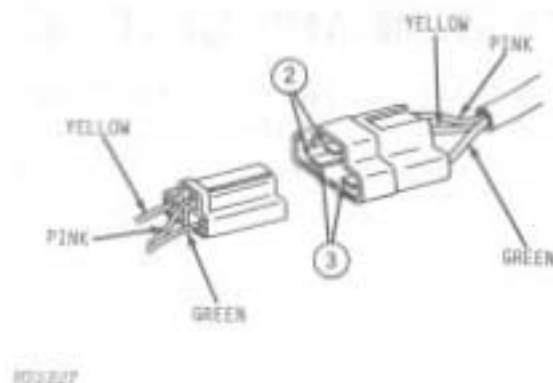


Fig. 3-Testing Headlight Dimmer Switch

1. Disconnect headlight coupler from wiring harness.

2. Connect flashlight tester between pink and yellow leads, Fig. 3. Actuate dimmer switch to high beam. Test light should light.

3. Connect flashlight tester between green and yellow leads. Actuate dimmer switch to low beam. Test light should light.

Test Results

If test light does not react as stated in Steps 2 and 3, the wiring or the dimmer switch is defective.

TESTING BRAKE LIGHT SWITCH

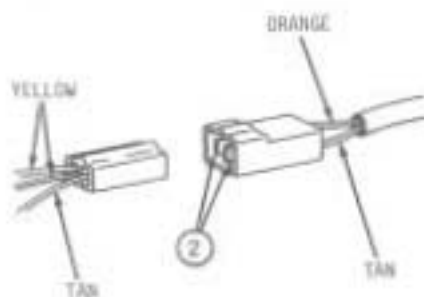


Fig. 4-Testing Brake Light Switch

1. Disconnect brake light coupler from wiring harness.

2. Connect a flashlight tester between the orange and tan leads, Fig. 4. Test light should light when brake is applied and go off when brake is released.

Test Results

If test light does not react as stated in Step 2, the wiring or the brake light switch is defective.

TESTING ENGINE KILL SWITCH

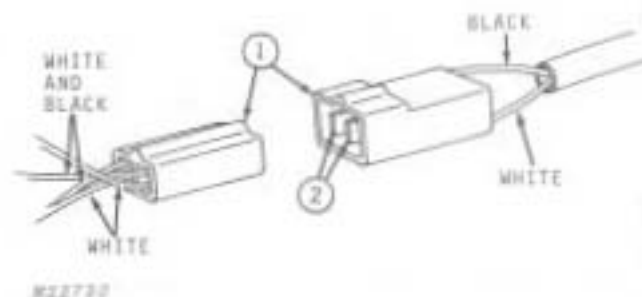


Fig. 5-Testing Engine Kill Switch

1. Disconnect engine kill switch coupler from wiring harness.

2. Connect a flashlight tester between black lead and white lead, Fig. 5. Tester should light when kill switch is actuated and go out when kill switch is released.

Test Results

If test light does not react as stated in Step 2, the wiring or the engine kill switch is defective.

TESTING TWO-TERMINAL IGNITION SWITCH**ADJUSTING HEADLIGHT**

See "Adjusting Headlight," page 40-15-3.



W22721

Fig. 6-Testing Two-Terminal Ignition Switch

1. Remove coupler from ignition switch.
2. Connect a flashlight tester between the switch terminals, Fig. 6. Test light should light with the key switch in the "ON" position and light should go out with key switch in the "OFF" position.

Test Results

If test light does not react as stated in Step 2, replace the ignition switch.

Group 20 SPECIFICATIONS

SPECIFICATIONS

Item	Kohler Specification	Item	John Deere Specification
Spark Plug	Champion QN-3	Spark Plug	Champion ON-3 or N3
Spark Plug Gap	0.025 inch (0.635 mm) (DO NOT REGAP)	Spark Plug Gap	0.025 inch (0.635 mm) (DO NOT REGAP)
Ignition (CDI)	Nippondenso	Ignition (CDI)	Kokusan
Timing Dimension	0.085-inch BTDC	Timing Dimension	22° BTDC @ 6500 rpm
Ignition Coil		Alternator Output	120 Watt
Primary Resistance	0.2 to 0.3 ohms	Ignition Coil	
Secondary Resistance	1100 to 1700 ohms	Resistance	5700 ohms $\pm$ 15%
Alternator		Exciter Coil	
Resistance	0.13 to 0.2 ohms	Resistance	160 ohms $\pm$ 20%
Alternator Output	120 Watt	Pulser Coil	
Capacitor Charging Coils		Resistance	17 ohms $\pm$ 20%
L1 Coil	160 to 200 ohms	Lighting Coil	
L2 Coil	1.5 to 2.3 ohms	Resistance	0.18 ohms $\pm$ 20%

LIGHT BULB CHART

Location	Size	John Deere Part No.
Headlight	12-Volt	AM52959
Brake-Tailight	12-Volt	AM52619
Speedometer Light	12-Volt	AM52847
Tachometer Light	12-Volt	AM52847

TORQUE SPECIFICATIONS

Item	Torque
Stator Screws	5 ft-lbs (1.4 Nm)
Flywheel Nut	60 ft-lbs (81.4 Nm)

Section 50 POWER TRAIN

Group 5 GENERAL INFORMATION

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PRINCIPLE OF OPERATION

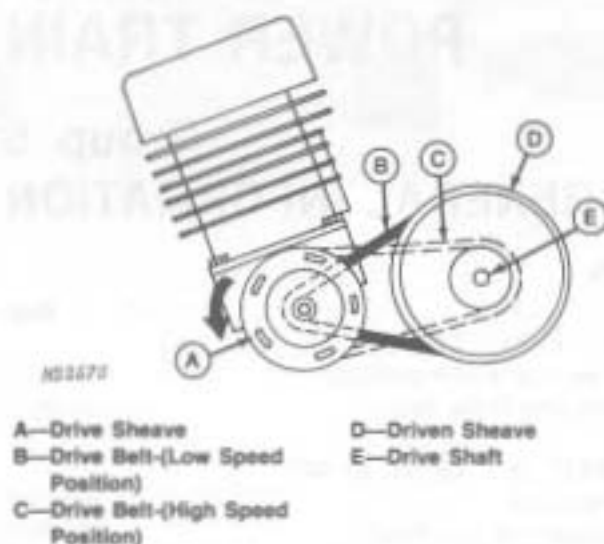


Fig. 1—Power Train

The power train for the SPITFIRE Snowmobile consists of a drive sheave (A), drive belt (B), driven sheave (D), disk brake, drive shaft (E) and drive sprockets, Fig. 1.

John Deere (Comet) 94C Drive Sheave

The drive sheave is mounted on the engine crankshaft and functions as a centrifugally-operated clutch and variator.

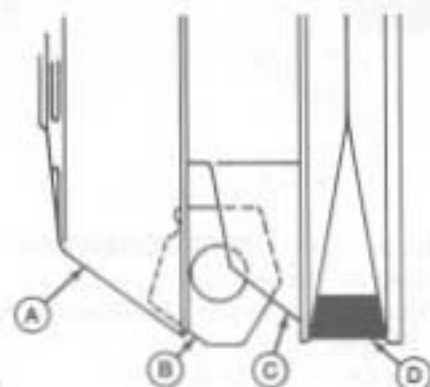
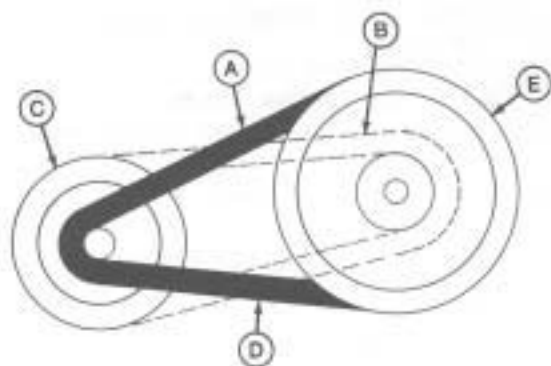


Fig. 2—94C Drive Sheave

Increasing engine speed causes the centrifugally-actuated wedges (B, Fig. 2) in the movable face (C) to move out against the cover (A). This action forces the sheave halves together, engaging the drive belt (D) with the sheave.

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.

John Deere Driven Sheave



M125453

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). Increased speed causes the drive belt (D) to ride 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).



M12573

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

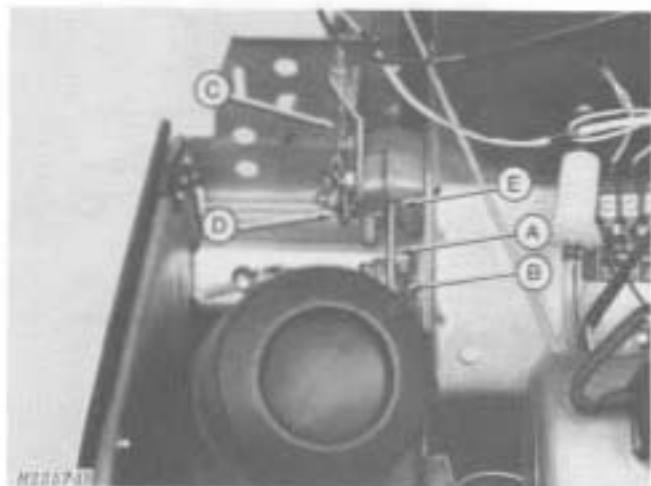
The driven sheave (A, Fig. 4) does more than act as a take-up for the action of the drive sheave. The driven sheave is also "torque-sensitive". The driven sheave rides on the cam bracket (H) as it opens to obtain high-speed position.

Normal rotational force on the cam bracket (H) works to keep the driven sheave in the low speed position (F).

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 forces the sheave halves together, obtaining a slower travel speed (I) while maintaining high engine rpm (C) for increased torque.

In Fig. 4, the top and bottom drawings have the same drive belt position. Increased speed of the engine in the lower drawing, causes a difference in the output speed of the driven sheave.

Brakes



A—Disk Brake
B—Drive Shaft
C—Brake Cable
D—Brake Arm
E—Brake Puck

Fig. 5—Mechanical Disk Brake

The mechanical disk brake (A, Fig. 5) operates on the drive shaft (B) and is actuated by the brake cable (C). When the brake is applied, the cam on the brake arm (D) moves two pins in against the brake puck (E). The puck moves the brake disk (A) against a second puck providing positive braking.

DIAGNOSING MALFUNCTIONS

John Deere (Comet) 94C Drive Sheave

Sheave Clutching at Too Low rpm

Spring weak or broken.
Inspect clutch wedges being used.

Sheave Clutching at Too High rpm

Wrong spring.
Drive sheave dirty internally.

Clutch Sticking

Belt mold builds up on center post and movable face cannot 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

Ramp buttons worn.
Ramp on movable face damaged.
Movable sheave half binding on fixed half.
Incorrect spring.
Spring tensioned 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.

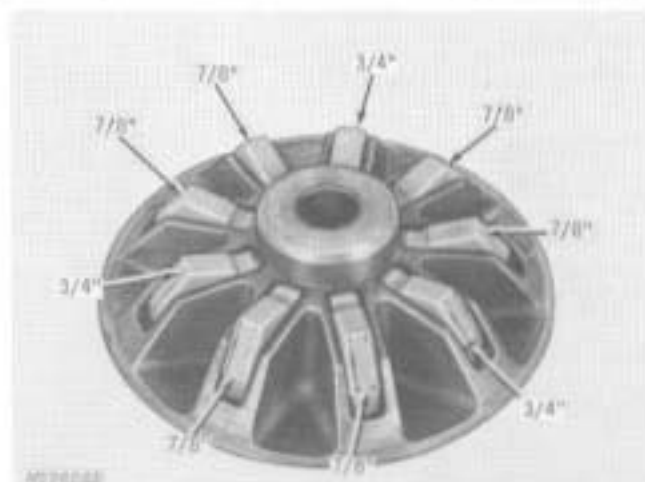
LOW AND HIGH ELEVATION APPLICATIONS

To obtain and provide proper governed engine speed proceed as follows:

1. Be sure correct clutching is used for the altitude at which the snowmobile will operate.
2. Change carburetor jets and settings as required. See Section 30, Groups 10 and 12.

CLUTCHING REQUIREMENTS (Serial No. -120,000)

ALTITUDE	PRIMARY CLUTCH			SECONDARY CLUTCH	
	Number of Weights	Hole Size	Spring	Cam	Spring Preload
Sea Level to 3000 ft. (0 to 914 m)	9	3/4"	White	44°	#2 Hole
3000 ft. to 6000 ft. (914 to 1828 m)	9	3/4"	White	44°	#2 Hole
6000 ft. to 9000 ft. (1828 to 2743 m)	3	3/4"	White	44°	#2 Hole
	6	7/8"			
Above 9000 ft. (2743 m)	9	1"	White	44°	#2 Hole



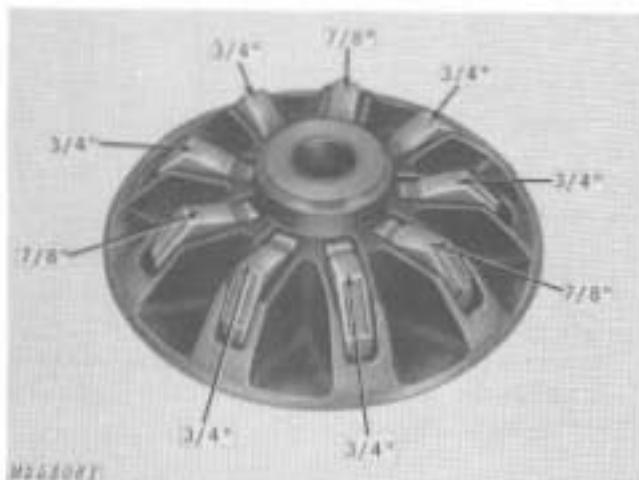
Be sure wedges are installed as illustrated in Fig. 6. This distributes the wedges evenly and keeps the clutch in proper balance.

NOTE: The standard clutch is equipped with 9 wedges with 3/4-inch holes.

Fig. 6-Correct Clutch Wedge Installation for 6,000 to 9,000 Feet (1828 to 2743 m) Altitude - (Serial No. -120,000)

CLUTCHING REQUIREMENTS (Serial No. 120,001-)

ALTITUDE	PRIMARY CLUTCH			SECONDARY CLUTCH	
	Number of Weights	Hole Size	Spring	Cam	Spring Preload
Sea Level to 3000 ft. (0 to 914 m)	9	3/4"	White	44°	#2 Hole
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	3	7/8"			
6000 ft. to 9000 ft. (1828 to 2743 m)	9	7/8"	White	44°	#2 Hole
Above 9000 ft. (2743 m)	9	1"	White	44°	#2 Hole



Be sure wedges are installed as illustrated in Fig. 7. This distributes the wedges evenly and keeps the clutch in proper balance.

NOTE: The standard clutch is equipped with 9 wedges with 3/4-inch holes.

Fig. 7-Correct Clutch Wedge Installation for 3,000 to 6,000 Feet (914 to 1828 m) Altitude - (Serial No. 120,001-)

Group 10 JOHN DEERE (COMET) DRIVE SHEAVE

REMOVAL

1. Remove drive belt.



Fig. 1-Drive Sheave Retaining Screw

2. Remove retaining screw and washer, Fig. 1.



Fig. 2-Removing Drive Sheave

3. Screw JDM-103 Puller into sheave hub until sheave comes loose from the crankshaft, Fig. 2.

NOTE: Use an impact wrench or 1/2-inch socket wrench with long handle to remove retaining screw and to install JDM-103 Puller.

DISASSEMBLY

1. Leave JDM-103 Puller in drive sheave.



Fig. 3-Disassembling Drive Sheave

2. Hold the sheave as shown in Fig. 3 and strike puller with a hammer.

3. Remove JDM-103 Puller.

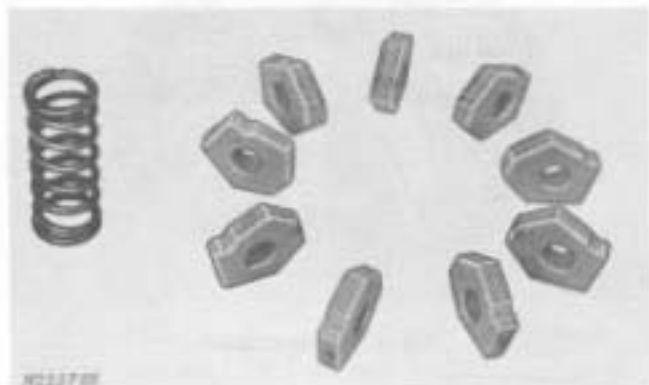


Fig. 4-Spring and Wedges

4. Remove spring and 9 wedges, Fig. 4.

INSPECTION AND REPAIR

1. If bushings in movable face are worn or damaged, replace movable face. Bushings are not serviceable.
2. Check sheave faces for pitting or wear and replace as necessary.
3. Check spring and wedges for wear and replace as necessary.

ASSEMBLY



Fig. 5-Spring Installed

1. Install spring over hub of fixed face, Fig. 5.



Fig. 6-Wedges Installed

2. Install wedges in movable face with notch on wedge up and toward the center, Fig. 6.

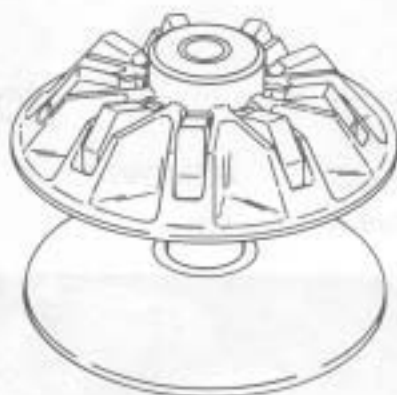


Fig. 7-Installing Movable Face

3. Place movable face over fixed face hub and spring, Fig. 7.



Fig. 8-Installing Cover

4. Place cover over movable face. Line up flats of the cover with flats of the post, Fig. 8. Use your hands and press down on cover until it is retained on the post.

NOTE: Cover will be forced into place by the retaining bolt when clutch is installed on crankshaft.

INSTALLATION

1. Install drive sheave on crankshaft.
2. Install retaining cap screw and washer. Torque retaining cap screw to 50 ft-lbs (68 Nm) (6.8 kgm).

NOTE: Pull on recoil start rope until dogs engage. Hold rope firmly while torquing retaining cap screw.

3. Install drive belt.

NOTE: Always install drive belt so number on belt can be read when viewed from the left side.

Group 15 JOHN DEERE DRIVEN SHEAVE

REMOVAL

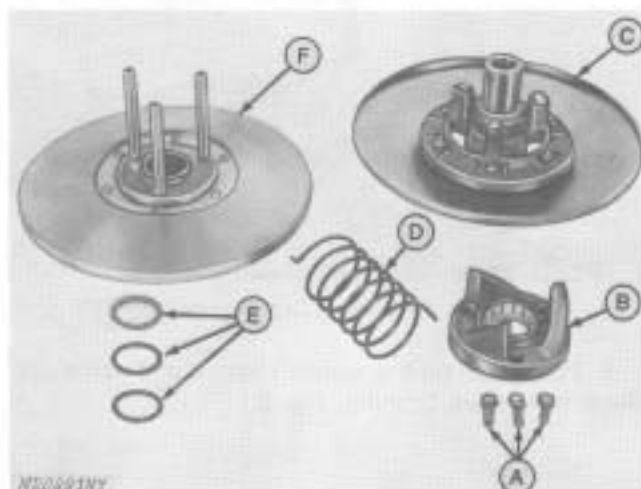
1. Remove belt guard and drive belt.



Fig. 1-Removing Driven Sheave

2. Remove cap screw and washer, Fig. 1, and slide driven sheave with key off the shaft.

DISASSEMBLY



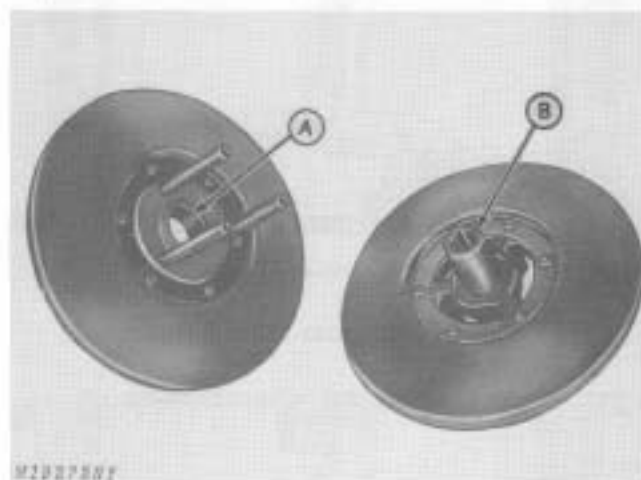
- | | |
|--------------|----------------|
| A—Cap Screws | D—Spring |
| B—Cam | E—Spacers |
| C—Fixed Face | F—Movable Face |

Fig. 2-Disassembling Driven Sheave

1. Remove cam (B) from movable face (F), Fig. 2.
2. Remove spring (D) and fixed face (C) with insert buttons.
3. Take note of spacers (E) between movable face and fixed face.

INSPECTION AND REPAIR

1. Clean all components in solvent.

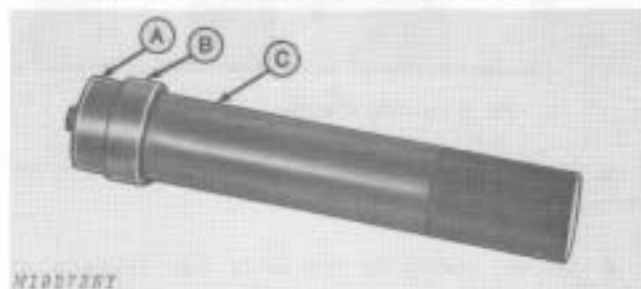


- A—Movable Face Bushing B—Fixed Face Hub

Fig. 3-Movable Face Bushing and Fixed Face Hub

2. Check movable face bushing (A, Fig. 3) 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. 4-Tool For Removing Movable Face Bushing

3. Use Owatonna Tool Company Bushing, Bearing and Seal Driver Sets. Install 27507 Disk (B, Fig. 4) and 27505 Disk (A) on 27488 Handle (C).



Fig. 5-Removing Movable Face Bushing

4. Use a press to remove old bushing, Fig. 5.

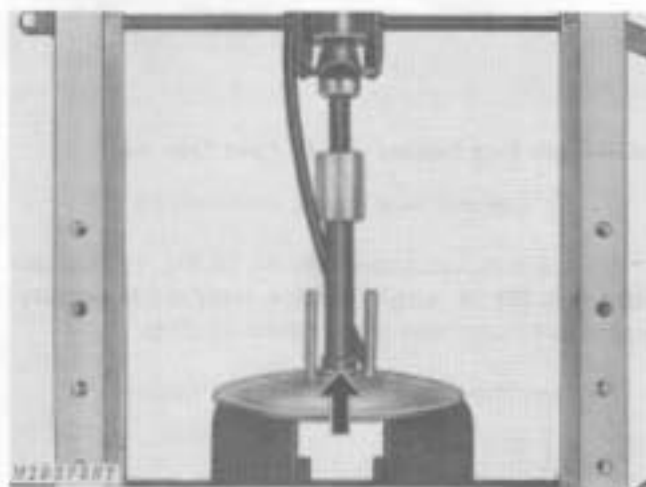
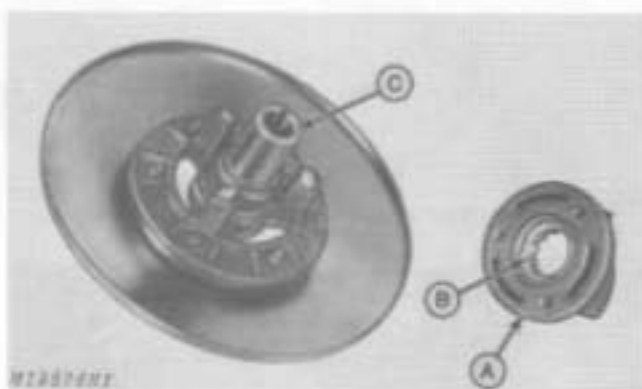


Fig. 6-Installing Movable Face Bushing

5. Use a press to install new bushing flush with the hub, Fig. 6.

6. Inspect spring for cracks or pits. Replace as necessary.

7. Check sheave faces with a straight-edge. Replace if worn, grooved, scored or pitted.



A—Cam

B—Bushing

C—Fixed Face Hub

Fig. 7-Cam Bushing and Fixed Face Hub

8. Check bushing (B, Fig. 7) in cam (A) and fixed face hub (C) for wear. Replace as necessary.

Replace bushing in cam as follows:



Fig. 8-Removing Cam Bushing

9. Place cam on two wooden blocks and use a cold chisel to remove bushing, Fig. 8.



Fig. 9-Installing Cam Bushing

10. Install new bushing by pushing it in place with your thumbs, Fig. 9. Be sure bushing is aligned properly when installing.

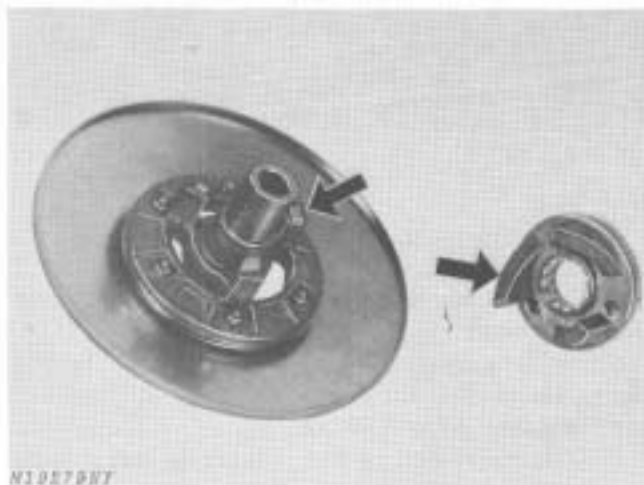


Fig. 10-Inspecting Insert Buttons

11. Inspect insert buttons for wear, Fig. 10. Buttons and mating surface on cam must be smooth. Replace insert buttons as a set.

Replace insert buttons as follows:

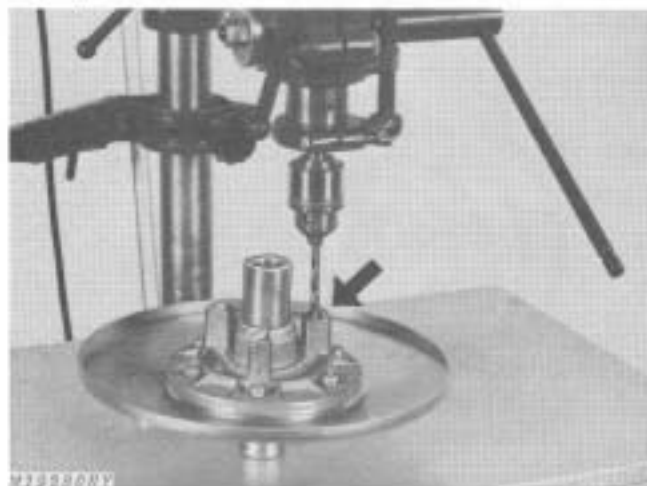


Fig. 11-Drilling Out Insert Button Shank

12. Use pliers and break off insert button ramp.
13. Use a 15/64-inch drill and CAREFULLY drill out the shank of the insert button, Fig. 11. DO NOT enlarge the hole.

14. Use two part epoxy glue on the shank of the new insert button and install it in fixed face.

ASSEMBLY

Pretensioning Driven Sheave

NOTE: The spring must always be pretensioned in the No. 2 hole.

As temperature or altitude increases, the drive sheave and carburetor must be modified to obtain proper governed speed. Do not modify the driven sheave.

Governed engine speed is 5500 to 6000 rpm.



Fig. 12-Installing Spacer

1. Lay movable sheave flat. Place spacers on hub, Fig. 12.

2. Install fixed sheave hub through movable sheave.



Fig. 13-Spring Installed in Cam

3. Install spring in No. 2 hole in cam, Fig. 13.



Fig. 14-Installing Cam With Spring

4. Install cam with spring over post of fixed face with tang of spring in hole in fixed face, Fig. 14.

5. Rotate cam past the proper ramp. Push down on cam making sure posts of movable face fit in recesses in cam.

6. Install and tighten cap screws.

INSTALLATION

1. Lubricate drive shaft and inside of hub with Never-Seez Lubricant (PT569).

2. Install spacers on shaft.



Fig. 15-Installing Driven Sheave

3. Place sheave in line with shaft and back key out of sheave Fig. 15.

4. Slide sheave on shaft and push key in to secure sheave to shaft.

5. Install washer and retaining cap screw. Torque cap screw to 20 ft-lbs (27 Nm) (2.7 kgm). Recheck alignment, see page 50-20-2.

6. Install drive belt so that number on belt can be read when viewed from left side of snowmobile.

7. Install belt guard.

Group 20 DRIVE BELT

REMOVAL AND INSTALLATION

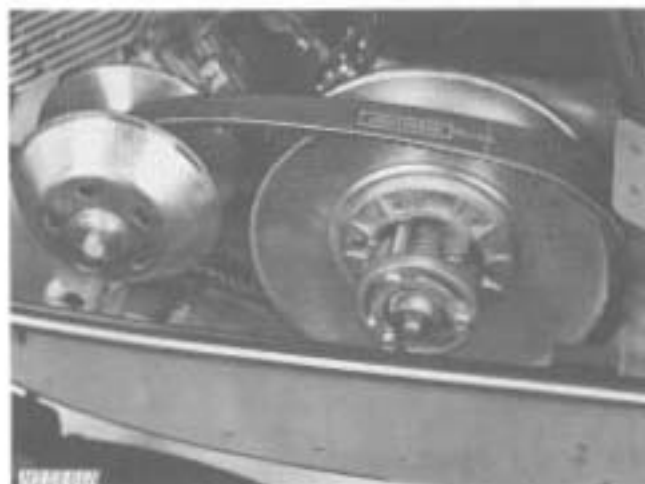


Fig. 1-Removing Drive Belt (Guard Removed to Show Belt)

IMPORTANT: If there is a loss of snowmobile performance or if the belt appears too loose, remove shims (anti-creep) from the outside of the driven sheave. Remove shims until the snowmobile just starts to "creep" at idle speed and then add back one shim. After this adjustment, if snowmobile performance is not satisfactory, realign drive and driven sheaves and install a new drive belt.

If snowmobile has a tendency to "creep" at idle speed after installing a new belt, add "anti-creep" washers to the outside of the driven sheave, as necessary, to stop "creep" at idle speed.

1. Push in on center of driven sheave and lift belt over sheave half, Fig. 1.

2. Remove belt from drive sheave.

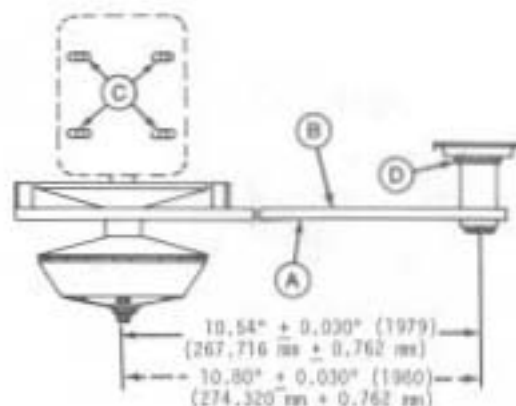
IMPORTANT: Never pry belt over sheaves. No prying is necessary if driven sheave is opened correctly.

CAUTION: Keep fingers out of area between center of driven sheave halves when sheave is opened.

3. Install belt in opposite sequence. Install belt so number on belt can be read when viewed from the left side.

NOTE: The drive belt should be replaced when its width is reduced by 1/8 inch (3.175 mm). Correct drive belt width is 1-1/4 inches (31.75 mm).

ALIGNING DRIVE BELT



A—JDM-107 Clutch Aligning Tool
(Serial No. -120,000)

B—JDG-47 Clutch Aligning Tool
(Serial No. 120,001-)

C—Engine Mounting Bolts

D—Shims (0.018 or 0.060-inch)

Fig. 2—Aligning Drive Belt

Proper belt alignment is important to belt life. A misaligned belt will 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 (C, Fig. 2) 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 on the drive shaft.
3. Install Clutch Aligning Tool (A, or B, Fig. 2), on drive shaft and drive sheave.
4. For side-to-side adjustment, remove Clutch Aligning Tool and add shims (D) between the tool and drive shaft bearing to give proper dimension, Fig. 2. Shims are available in 0.018 or 0.060-inch thicknesses.
5. For forward or rearward adjustment, loosen engine mounting bolts and move engine to properly align with Clutch Aligning Tool, Fig. 2.

IMPORTANT: Always rotate the drive sheave 120 degrees and recheck alignment.

6. Install drive belt so number on belt can be read when viewed from the left side.

Group 25 DRIVE SHAFT

REMOVAL

1. Remove muffler.



Fig. 1-Removing Brake Cam Body and Puck

2. Remove brake cam body and puck, Fig. 1.
3. Slide brake disk off shaft. Remove key from shaft.
4. Remove secondary sheave and shims.

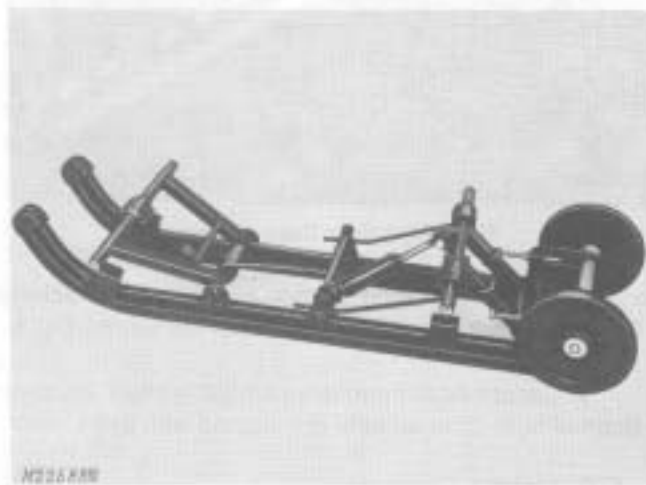


Fig. 2-Suspension Removed

5. Remove suspension, Fig. 2.



Fig. 3-Removing Drive Shaft

6. Remove bolt securing right-hand drive wheel to shaft and slide drive wheel to the left side of tunnel, Fig. 3.
7. Remove the right-hand bearing from the tunnel.
8. Slide drive shaft assembly to the right side of tunnel to remove.
9. Remove left-hand bearing assembly.

INSPECTION AND REPAIR

1. Remove drive wheels from shaft.

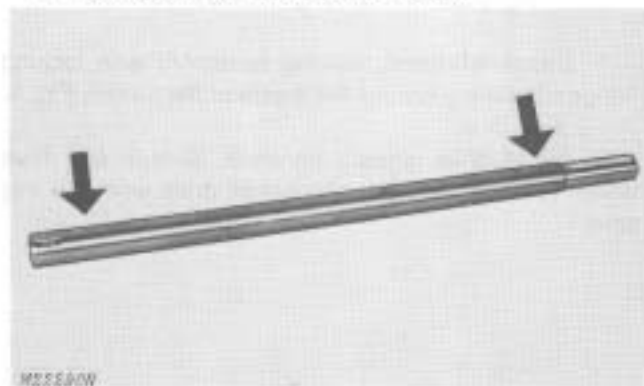


Fig. 4-Inspect Drive Shaft Bearing Surfaces

2. Check drive shaft bearing surfaces, Fig. 4, for evidence of bearings turning on shaft. Replace shaft if it is defective.
3. Check drive wheels for wear. Replace as necessary.

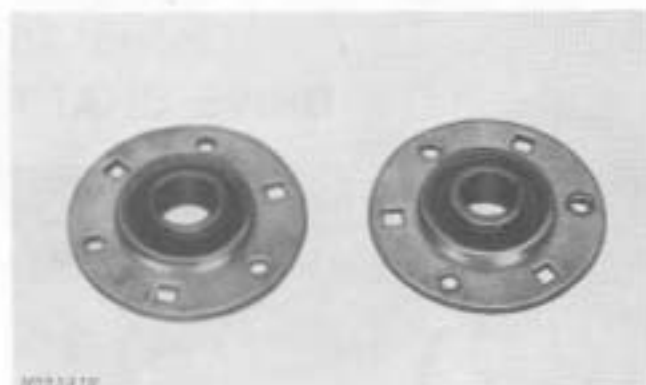


Fig. 5-Drive Shaft Bearings

4. Check drive shaft bearings, Fig. 5, and replace them if they are binding or worn.

ASSEMBLY AND INSTALLATION



Fig. 6-Left-Hand Bearing Assembly Installed

1. Install left-hand bearing assembly with locking flange of bearing toward the inside of the tunnel, Fig. 6.

2. Install drive wheels on shaft. Secure left drive wheel to shaft. Do not secure right drive wheel at this time.



Fig. 7-Drive Shaft Installed in Left-Hand Bearing

3. Install drive shaft in left-hand bearing, Fig. 7.



Fig. 8-Right-Hand Bearing Assembly

4. Install right-hand bearing assembly with locking flange of bearing toward the inside of the tunnel, Fig. 8.

5. Secure right-hand drive wheel to shaft. Be sure teeth of both drive wheels are aligned with each other.

6. Install suspension.

7. Replace key in drive shaft and install brake disk.

8. Install brake puck body with backing plate and puck.

9. Install muffler.

10. Install shims and secondary sheave. Recheck belt alignment.

11. Tension track. See page 60-10-5.

REMOVAL



Fig. 1-Brake Cam Body, Puck and Backing Plate

1. Remove brake cam body, puck and backing plate, Fig. 1.
2. Slide brake disk off shaft.



Fig. 2-Brake Puck Body and Puck

3. Remove brake puck body with puck, Fig. 2.

NOTE: When removing puck from brake puck body it may be necessary to heat the puck with a hand torch to remove it.

Group 30 MECHANICAL DISK BRAKE (Serial No. 80,001-95,000)

INSPECTION

1. Replace brake pucks if they are contaminated or worn enough to prevent proper brake adjustment.
2. Inspect brake disk, cam, pins and brake cable. Replace worn or damaged parts.

ASSEMBLY



Fig. 3-Installing "Thin" Puck

1. Use two-part epoxy glue to secure "thin" puck in the brake puck body, Fig. 3.

NOTE: DO NOT glue the "thick" puck and backing plate in the brake cam body.



Fig. 4-Installing Brake Puck Body

2. Install brake puck body over bolts in tunnel, Fig. 4.

3. Use Never-Seez on drive shaft and install key and brake disk.



Fig. 5-Installing Brake Cam Body

4. Place backing plate and "thick" puck in brake cam body, Fig. 5. Install this assembly and secure with nuts.

ADJUSTMENT



Fig. 6-Adjusting Brake Cable and Cam

1. Loosen or tighten jam nuts on brake cable until the cam is parallel with the ground (level) and pointing straight ahead, Fig. 6.



Fig. 7-Brake Lever Adjustment

2. Remove cotter pin and loosen or tighten the adjusting nut on the brake post until 1 to 1-1/2 inches (25 to 38 mm) clearance exists between the brake lever and handgrip, Fig. 7. Install cotter pin.

3. After adjusting brake, check operation of stop light switch.

Group 35 MECHANICAL DISK BRAKE (Serial No. 95,001-)

REMOVAL

1. Disconnect brake cable from arm.



A—Jam Nut

B—Brake Cable

Fig. 1-Removing Brake Cable

2. Screw bottom jam nut (A, Fig. 1) off brake cable (B).
3. Remove arm from brake puck body.
4. Remove muffler.



A—Bracket

B—Brake Puck Body

C—Puck

Fig. 2-Removing Bracket, Body and Puck

5. Remove bracket (A, Fig. 2), brake puck body (B) and puck (C).

6. Remove brake disk and flat spring.



Fig. 3-Removing Retainer With Puck

7. Remove retainer with puck, Fig. 3.

INSPECTION

1. Replace brake pucks if they are contaminated.

IMPORTANT: New pucks are 3/8-inch thick. If either puck is worn to only 3/16 inch in thickness, replace both pucks.

2. Inspect brake disk, arm, adjusting screw and brake cable. Replace worn or damaged parts.

ASSEMBLY

1. Install retainer with puck over bolts in tunnel.



A—Brake Disk

B—Flat Spring

Fig. 4—Installing Brake Disk

2. Use Never-Seez on drive shaft and install brake disk (A, Fig. 4) and flat spring (B).



A—Arm With Adjusting Screw

B—Brake Puck Body
C—Brake Puck

Fig. 5—Installing Arm and Brake Puck in Brake Puck Body

3. Install arm with adjusting screw (A, Fig. 5) and brake puck (C) in brake puck body (B).

IMPORTANT: Be sure metal part of brake puck faces the screw and not the brake disk.



Fig. 6—Installing Body, Arm, Puck and Bracket

4. Install brake puck body, arm, brake puck and bracket, Fig. 6.



A—Brake Cable

B—Bracket

C—Jam Nuts

Fig. 7—Installing Brake Cable

5. Install brake cable (A, Fig. 7) through bracket (B) and tighten upper and lower jam nuts (C).

NOTE: Threads on brake cable should be approximately at the midpoint of the threads when tightened to the bracket.

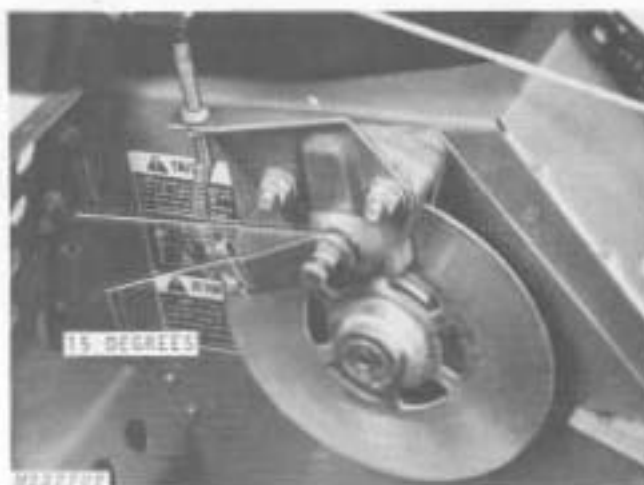


Fig. 8-Installing Brake Cable to Arm

6. Connect brake cable to arm, Fig. 8.

NOTE: Arm should be pointing down approximately 15 degrees from parallel before connecting the brake cable. Loosen or tighten jam nuts on brake cable until arm is in correct position.

7. Install muffler.

ADJUSTMENT



Fig. 9-Brake Adjustment

1. Apply the brake control lever and measure the distance from the lever to the handgrip. It should be 1 to 1-1/2 inches (25 to 38 mm), Fig. 9.



A—Jam Nut

B—Adjusting Screw

Fig. 10-Brake Adjustment

2. Adjust brake by loosening jam nut (A, Fig. 10) and tightening adjusting screw (B). Tighten jam nut.

3. Check brake tension and readjust if necessary.

NOTE: Be certain dowel on end of brake cable is seated properly in recess of brake control lever.

4. After adjustment, check operation of stoplight switch.

Group 40 SPECIFICATIONS

SPECIFICATIONS

Drive Belt Width	1-1/4 in. (31.75 mm)
Drive Belt Length	
(Serial No. -120,000)	46.30 $\pm$ 0.25 in.
	(1175 $\pm$ 6.35 mm)
Drive Belt Length	
(Serial No. 120,001-)	46.82 $\pm$ 0.25 in.
	(1189 $\pm$ 6.35 mm)
Drive Sheave Alignment.....	See page 50-20-2

TORQUE FOR HARDWARE

Drive Sheave Retaining Cap	
Screw	50 ft-lbs (68 Nm)
	(6.8 Kgm)
Driven Sheave Retaining Cap	
Screw	20 ft-lbs (27 Nm)
	(2.7 Kgm)

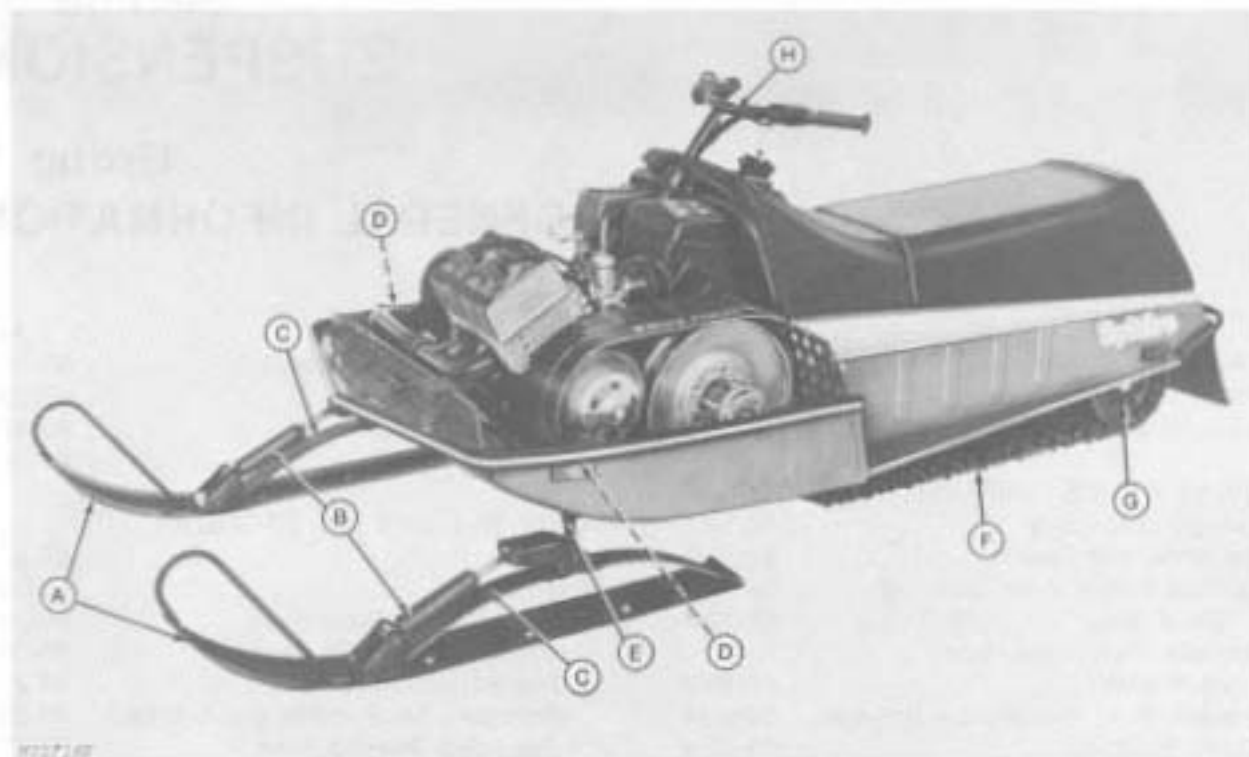
Section 60 SUSPENSION

Group 5 GENERAL INFORMATION

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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, slide suspension and rear idler assembly. The system also incorporates replaceable wear bars, adjustable suspension springs and hydraulic shock absorber.

The rear idler shaft turns in double-lip, sealed ball bearings and is adjustable to properly tension the track.

The rubber track has lugs on the inside surface which engage the drive wheels on the drive shaft. The riveted steel grouser bars are replaceable.

The skis have replaceable wear rods and wear plates. The ski spindles are mounted in replaceable bearings. The tie rod ends are color-coded; silver color indicates right-hand threads, gold color indicates left-hand threads.

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.
Running in marginal snow cover.

Group 10 SLIDE SUSPENSION

REMOVING SUSPENSION

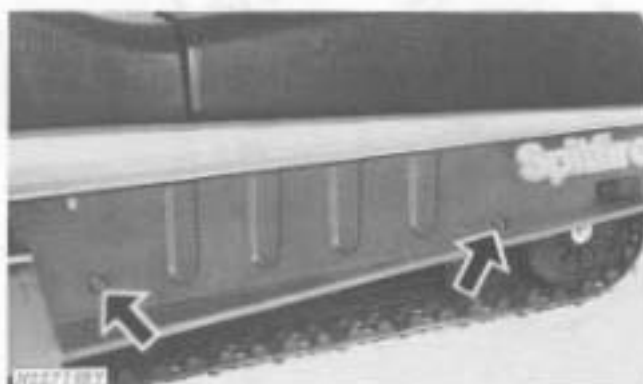


Fig. 1-Suspension Retaining Bolts

1. Remove two suspension retaining bolts, Fig. 1, from each side of the tunnel. Remove both rear bolts first.



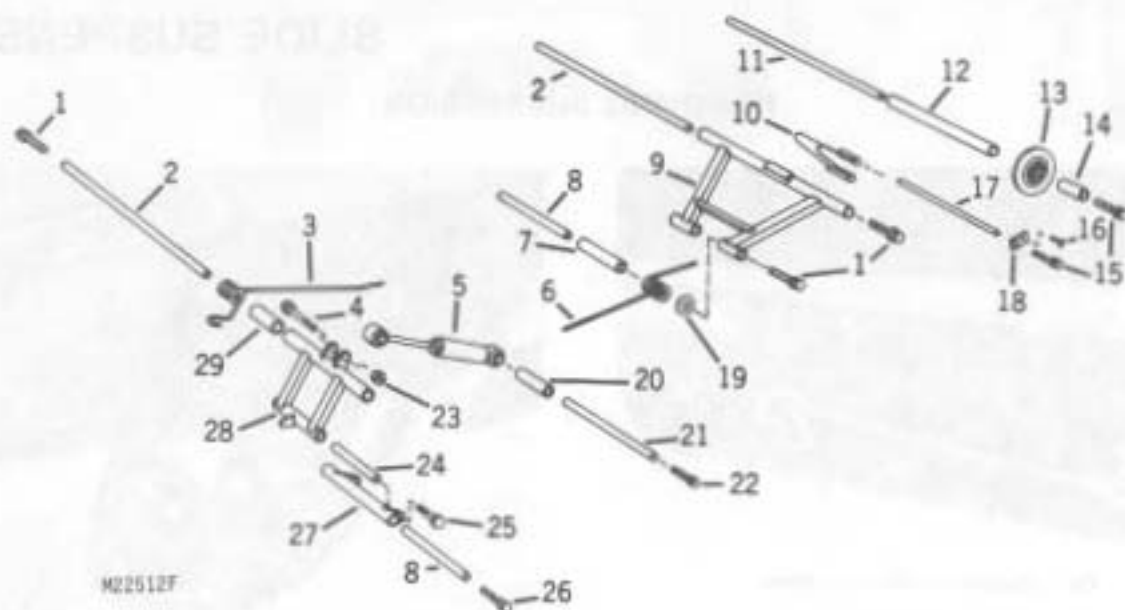
Fig. 2-Removing Slide Suspension

2. Turn the snowmobile on its right side and remove the suspension, Fig. 2.

IMPORTANT: Siphon enough fuel from the tank to prevent spillage when snowmobile is turned on its right side.

CAUTION: Gasoline is dangerous, even when mixed with oil. Avoid fire due to smoking or careless maintenance practices.

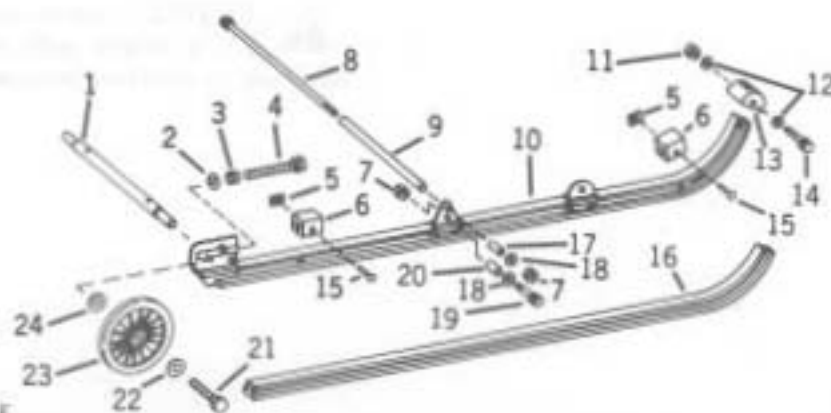
DISASSEMBLY AND REPAIR



M22512F

- | | | | |
|--------------------------|------------------------------|--------------------------------|--------------------------|
| 1—Screw (6 used) | 8—Lower Pivot Shaft (2 used) | 15—Self-Tapping Screw (4 used) | 22—Flanged Screw |
| 2—Pivot Shaft (2 used) | 9—Front Pivot Arm | 16—Pop Rivet (2 used) | 23—Lock Nut |
| 3—Spring (R.H. and L.H.) | 10—Strap | 17—Shock Absorber Shaft | 24—Lower Swing Arm Shaft |
| 4—Cap Screw | 11—Axle | 18—Rail Pad (2 used) | 25—Cap Screw (2 used) |
| 5—Shock Absorber | 12—Spacer | 19—Washer (2 used) | 26—Cap Screw (2 used) |
| 6—Spring (R.H. and L.H.) | 13—Bogie Wheel (2 used) | 20—Spacer (2 used) | 27—Pivot Tube |
| 7—Spring Spacer | 14—Spacer (2 used) | 21—Rail Shaft | 28—Rear Pivot Arm |
| | | | 29—Spacer (2 used) |

Fig. 3—Exploded View of Slide Suspension



M22511F

- | | | | |
|---------------------|------------------------|-------------------------|------------------------------|
| 1—Rear Axle | 7—Lock Nut (3 used) | 13—Cap (2 used) | 19—Cap Screw (2 used) |
| 2—Washer (2 used) | 8—Bolt | 14—Cap Screw (2 used) | 20—Spacer (2 used) |
| 3—Nut (2 used) | 9—Spacer | 15—Truss Rivet (4 used) | 21—Cap Screw |
| 4—Cap Screw | 10—Slide Rail (2 used) | 16—Wear Bar (2 used) | 22—Washer (2 used) |
| 5—Push Nut (4 used) | 11—Lock Nut (2 used) | 17—Spacer (2 used) | 23—Rear Idler Wheel (2 used) |
| 6—Bumper (4 used) | 12—Washer (4 used) | 18—Washer (4 used) | 24—Washer (2 used) |

Fig. 4—Exploded View of Slide Suspension

Replace Tunnel Wear Bars (Serial No. -120,000)

1. Remove the seat.
2. Remove slide suspension.



Fig. 5-Replacing Tunnel Wear Bars

3. Lay track over front of machine to expose tunnel wear bars, Fig. 5.

4. Drill and chisel off old rivets from the top side.
5. Cut new wear bars to length and install.

NOTE: Install all rivets from the top side.

6. Install suspension and seat.

Replace Slide Suspension Wear Bars

1. Remove suspension.
2. Remove cap (inset, Fig. 6) from the front of suspension.

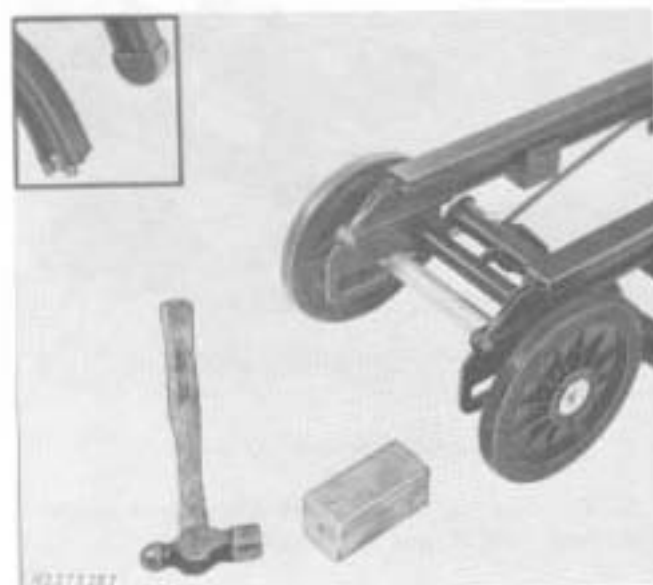


Fig. 6-Removing Slide Wear Bar

3. Use a wood block and hammer to remove the wear bar, Fig. 6.

4. Lubricate slide rail and wear bar with a liquid soap solution.

5. Install new wear bar (cut to length) from the front and drive it in place with a soft mallet.

6. Install cap.

7. Install suspension in snowmobile.

Replace Rear Idler Wheels and Axle

1. Remove suspension.

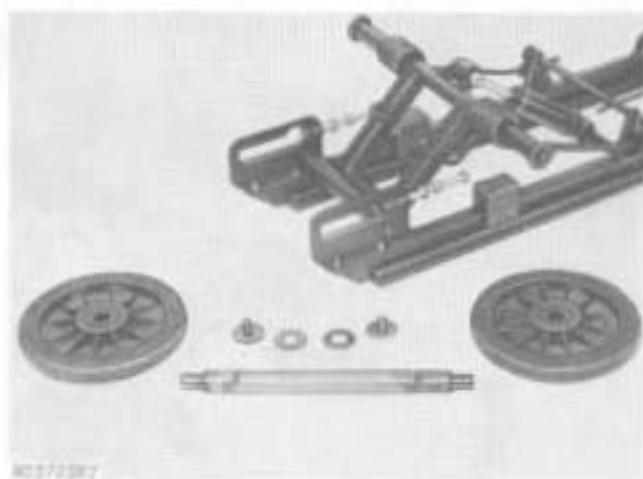


Fig. 7-Rear Axle Shaft and Wheels

2. Remove cap screws, idler wheels and washers from each end of rear axle shaft, Fig. 7.

3. Loosen both adjusting screws and slide rear axle forward. Remove axle through round hole in slide rail.

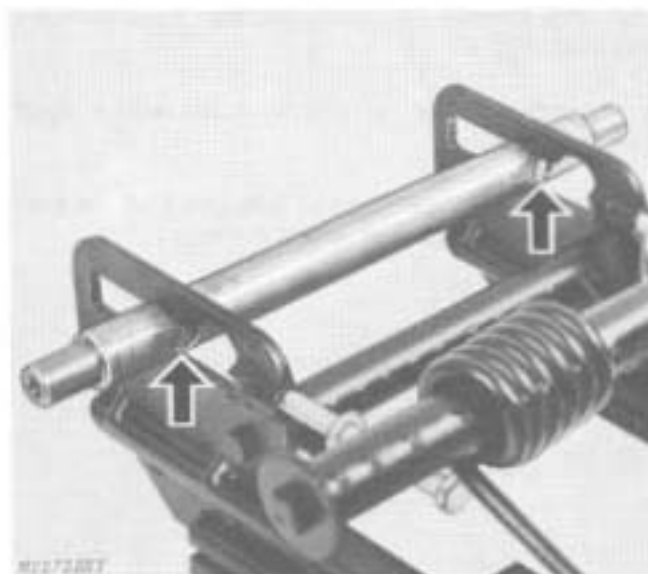


Fig. 8-Installing Rear Axle

4. To reassemble: Place rear axle through hole with holes in axle facing forward. Be sure grooves in axle fit slide rail correctly, Fig. 8.

5. Partially tighten both adjusting screws.

6. Install washer, idler wheel, washer and cap screw on each end of axle.

NOTE: Use Loctite on each cap screw.

7. Install suspension.

INSTALLING SUSPENSION

1. Position suspension in tunnel.

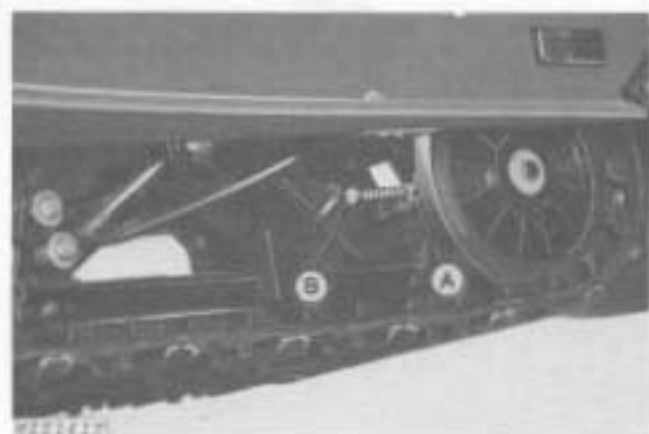
2. Install front two cap screws and then rear two cap screws. Tighten all four cap screws securely.

NOTE: It is important to keep these four screws tight. Advise customer to check and tighten them periodically.

3. Check track tension. Track tension should be all right unless adjusting screws were moved.

ADJUSTING TRACK TENSION

1. Suspend or support snowmobile so track is clear of ground.
2. Turn adjusting screws (B) in to tension track.



A—Jam Nuts

B—Adjusting Screws

Fig. 9-Adjusting Track Tension

3. Measure below the lower shock absorber mount for clearance of flush to 1/4-inch (6.350 mm) between the track and slide wear bar, Fig. 9.

4. Adjust both sides equally. Tighten jam nuts (A).

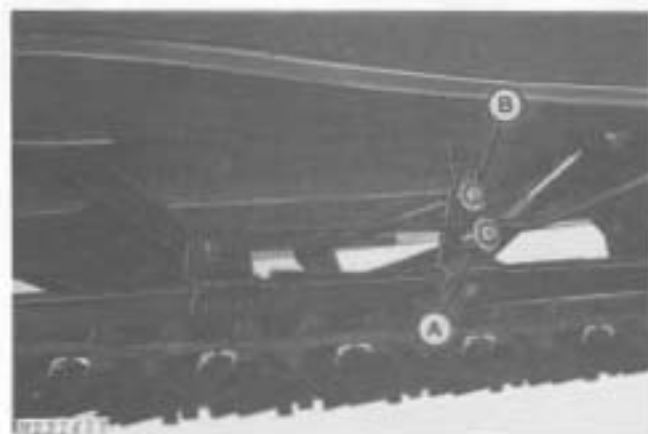
After Adjustment

1. Start engine and allow the track to rotate slowly several times. Turn off the engine and allow track to coast to a stop. **DO NOT APPLY BRAKE TO STOP TRACK.**
2. Check alignment. Rear idler wheels should run in center of drive lugs.
3. Slide rail wear bar should be in the middle of each slide rail opening in track.
4. If either Step 2 or 3 indicates a need for adjustment, repeat the procedure.

NOTE: A track will run to the loose side. For example, if the track is too far to the left, tighten the left adjusting screw to move the track to the right.

ADJUSTING SUSPENSION SPRINGS

1. Ride the snowmobile to determine ride adjustment requirements. If the suspension bottoms frequently, increase the rear spring preload.



A—Bottom Position

B—Top Position

Fig. 10-Adjusting Suspension Springs

2. To increase the preload, move the springs from the bottom position to the top position, Fig. 10.

Group 15 JOHN DEERE TRACK

ANALYSIS

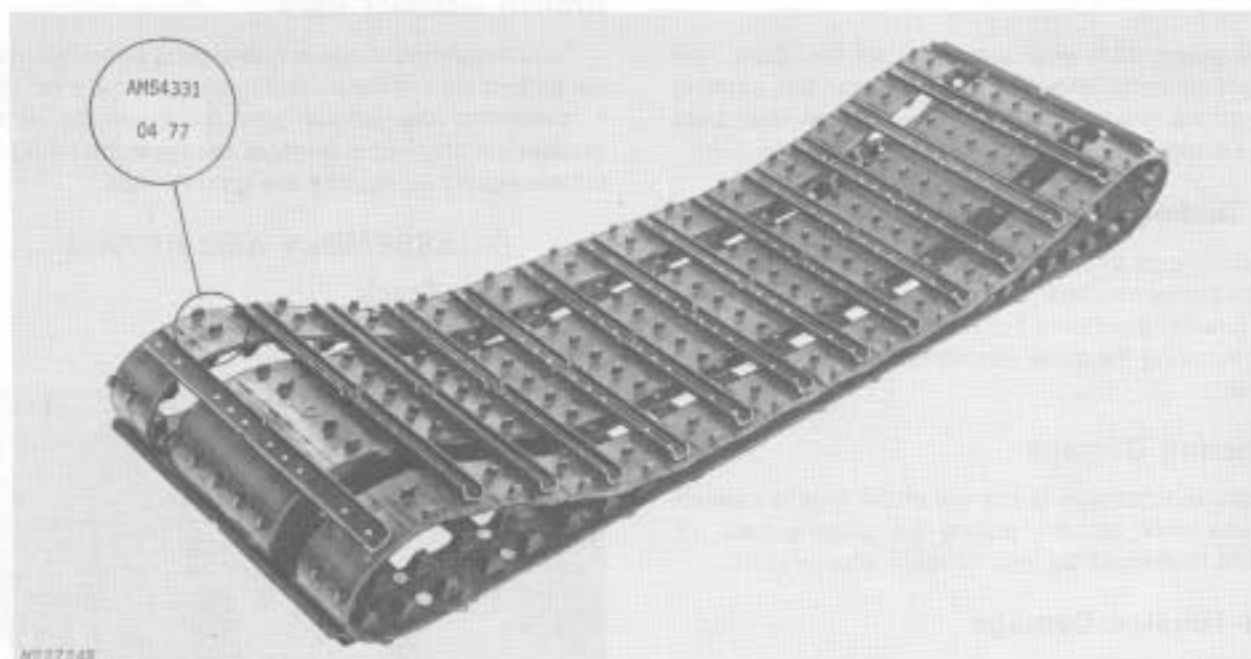


Fig. 1-John Deere Track

FAILURES COVERED UNDER WARRANTY

Ply Separation

Ply separation is identified by parting of the rubber from the tensile cords on any of the three belts.

Track Stretch

Track stretch occurs only on a used track. The first indication of track stretch is lack of adjustment on the track-adjusting screws. Remove the track and lay it flat. Measure ten pitches on the track. This distance should not exceed 22.15 inches (56.12 cm).

NOTE: A pitch is the distance (center-to-center) from one drive lug to the other.

NON-WARRANTY FAILURES

Obstruction Damage

Cuts, slashes or gouges in the track are caused by obstructions such as broken glass, sharp rocks or buried steel. 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.

When the grouser bar is torn from the track, rubber will be torn away and adhere to the bar.

NON-WARRANTY FAILURES—Continued

Worn Grouser Bars

Grouser bars wear from operating on rough and dry terrain such as non-covered fields, railroads and highway roadsides, gravel roads and other non-approved snowmobile field conditions.

The suspension wear bar becomes hot. Sand, dirt and grit become imbedded in the wear bar causing wear on the grouser bars. The suspension wear bars must be replaced when this condition occurs.

Lug Damage

Lug damage to the sides or rear edges of the lug is usually caused by lack of snow lubrication. Excessive track tension and dirt or soil (summer operating conditions) entering the drive mechanism are also frequent causes.

Racheting Damage

Racheting damage to the top of the lugs is caused by loose track tension, pulling too great a load, or frequent prolonged periods of rapid acceleration.

Over-Tension Damage

Too much track tension causes excessive friction between the suspension wear bars and the grouser bars. The wear bars will melt and adhere to the grouser bars.

The first indication of this condition is the track may "stick" or have a tendency to "lock-up", causing loss of engine horsepower.

Loose Track Damage

Operating a track too loose causes the outer edge to flex too much resulting in cracks in the outer belts. Some wear on the driving lugs will also occur. Riding double (excessive weight) can also cause the track to flex and break the edge.

Impact Damage

Impact damage will cause the rubber on the tread side to open up allowing the cords to become visible. This may happen in more than one place.

Edge Damage

Edge 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 Bars

Grouser bar breakage is normal and expected in the center belt area of the track. Grouser bars are notched to determine the fatigue area for breakage. If the grouser bar breaks but remains secure to the track, it is not necessary to replace the grouser bar.

DISASSEMBLY AND REPAIR

Removing Track

1. Remove muffler.



Fig. 2-Brake Cam Body and Puck

2. Remove brake cam body and puck, Fig. 2.
3. Slide brake disk off shaft. Remove key from shaft.
4. Remove secondary sheave and shims.

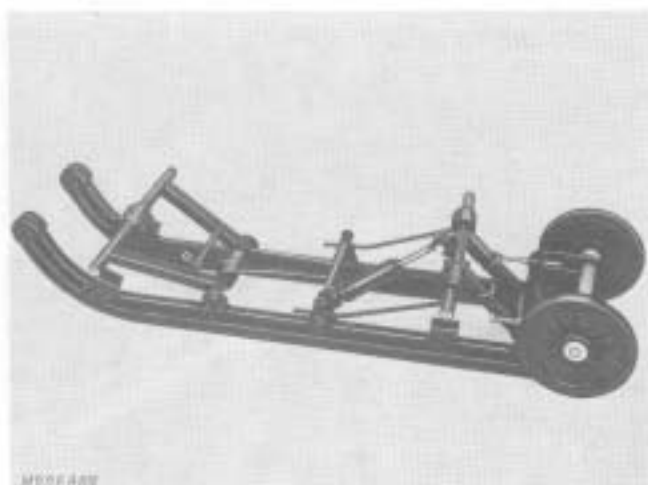


Fig. 3-Suspension Removed

5. Remove suspension, Fig. 3.
6. Remove upper tunnel idler wheels.

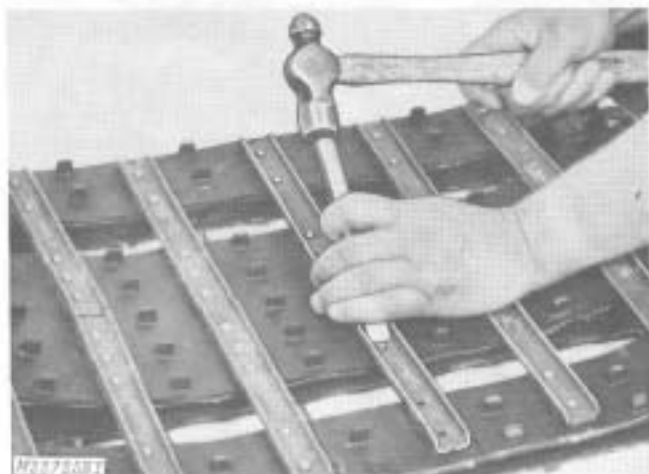


Fig. 4-Removing Drive Shaft

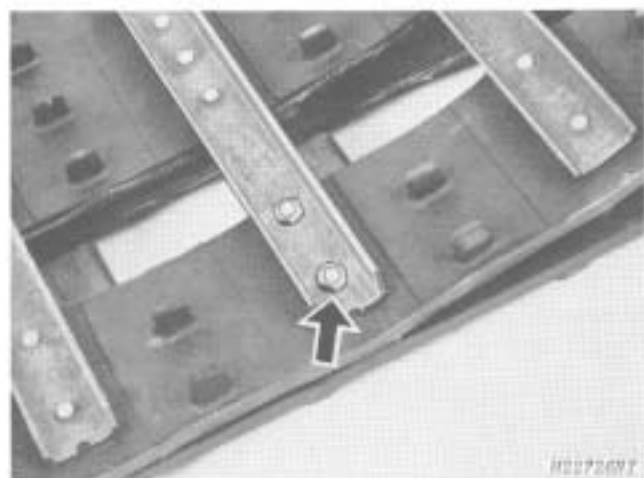
7. Remove bolt securing right-hand drive wheel to shaft and slide drive wheel to the left, Fig. 4.
8. Remove right-hand bearing from the tunnel.
9. Slide drive shaft assembly to the right to remove.
10. Remove track.

Repairing Track

NOTE: Bent or broken grouser bars can be replaced individually. If a grouser bar is broken in the center, but is still securely attached to the belts, it need not be replaced.

Fig. 5-Removing Grouser Bar Rivets
(Track Removed for Photo Purposes)

1. Use a hammer and cold chisel to remove grouser bar rivets, Fig. 5.
2. Position new grouser bar.

Fig. 6-Installing Grouser Bar
(Track Removed for Photo Purposes)

3. Install bolts from the inside (drive lug side of the track) with nut to the outside, Fig. 6.
4. Tighten nuts securely and then peen the bolt tight against the nut.

INSTALLATION

1. Place track in tunnel.



Fig. 7-Drive Shaft Installed in Left-Hand Bearing

2. Install drive shaft in left-hand bearing, Fig. 7.



Fig. 8-Right-Hand Bearing Assembly

3. Install right-hand bearing assembly with bearing locking flange toward the inside of the tunnel, Fig. 8.
4. Replace key in shaft and install brake disk.
5. Install brake cam body with backing plate and puck.
6. Install muffler.
7. Install shims and secondary sheave. Recheck belt alignment.
8. Install upper tunnel idler wheels.
9. Install suspension and tension track. See page 60-10-5.

Group 20 SKIS AND STEERING

ANALYSIS



CAUTION: Worn, bent or damaged ski and steering components are unsafe.

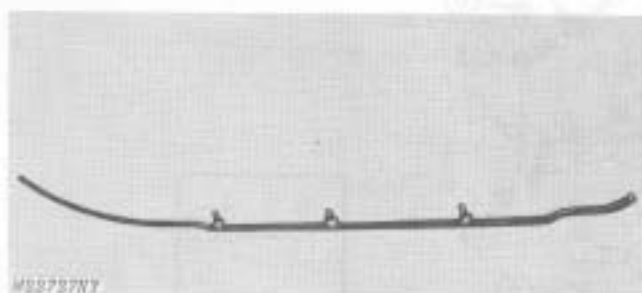


Fig. 1-Wear Rods

Replace wear rods, Fig. 1, if worn. Worn wear rods are unsafe because they cause a loss of snowmobile maneuverability.

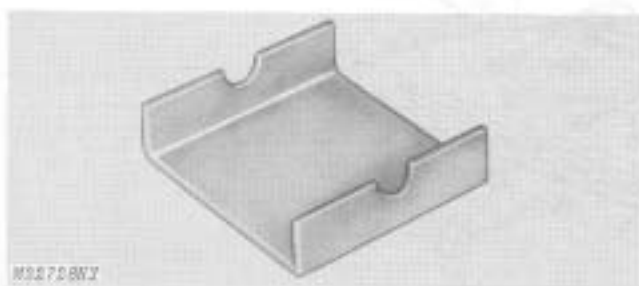


Fig. 2-Ski Wear Plates

Replace ski wear plates, Fig. 2, if worn or damaged. If a worn wear plate is not replaced, the ski spring will wear through the ski.



Fig. 3-Ski Springs



Fig. 4-Spindle, Bushings and Steering Arms

Stripped spindle and steering arm splines, Fig. 4, indicate operation without steering arm attaching cap screws tight or improper installation of steering arm.

Replace ski spindle bushings, Fig. 4, if worn, cracked or damaged.



Fig. 5-Tie Rod

A bent tie rod indicates ski was subjected to severe forces. Replace tie rod and inspect all of the steering mechanism for damage.

Replace tie rod ends, Fig. 5, if loose. A loose tie rod end can cause erratic steering and could be a safety hazard.

REPAIR

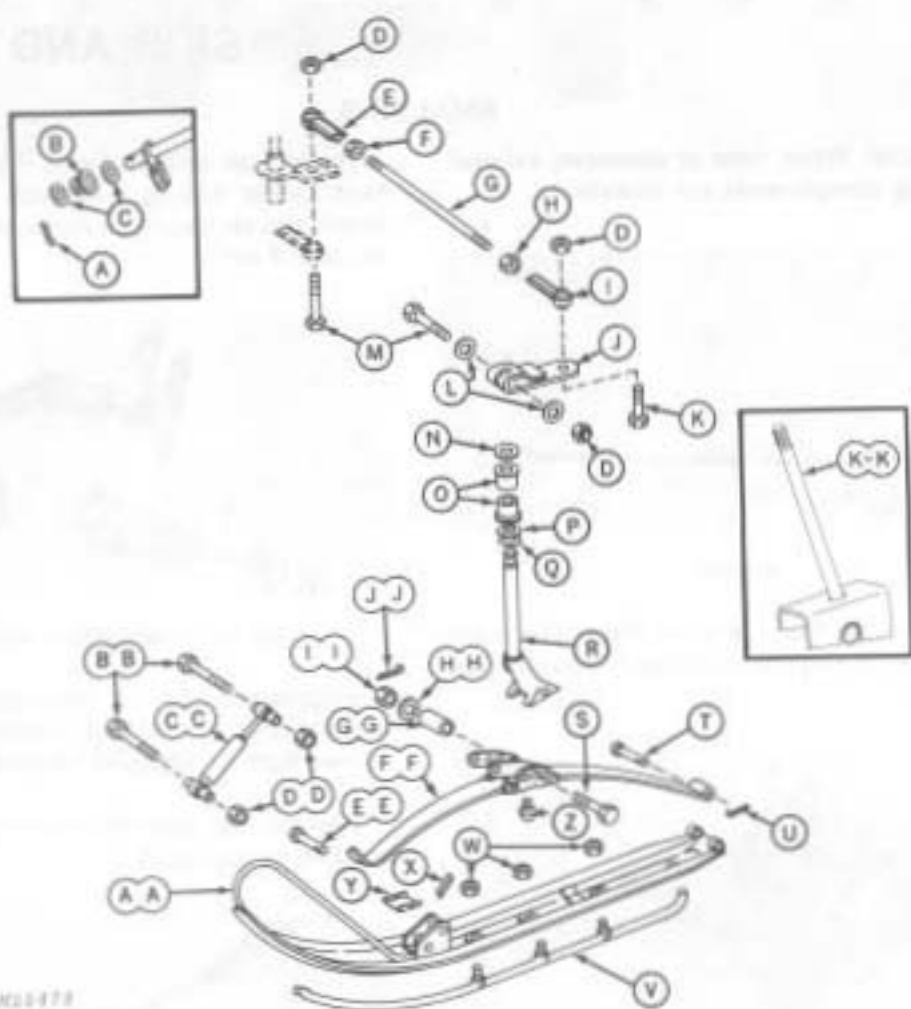
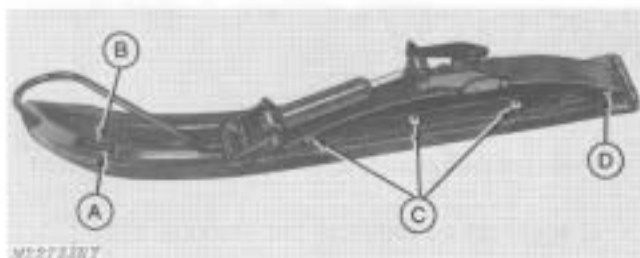


Fig. 6-Exploded View of Skis and Steering

NOTE: Spindle (KK) for Serial No. 120,001- and above is not adaptable to snowmobiles prior to Serial No. 120,001.

Replacing Ski Wear Rods



A—Front Hole
B—Wear Rod

C—Lock Nuts
D—Rear Hole

Fig. 7-Removing Wear Rod

1. Remove lock nuts (C, Fig. 7). Pry wear rod (B) down to free studs from holes. 1980 Snowmobiles have only 2 studs.

2. Slide rod forward to free rod from rear hole (D).

3. Place front of new wear rod in position through front hole (A). Slide wear rod to rear to position studs and rear of rod.

4. Install and tighten lock nuts (C).

Replacing Wear Plates

NOTE: Ski spring does not have to be removed to replace wear plate.

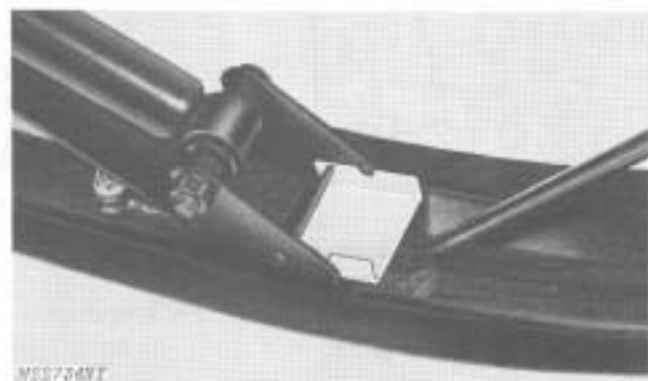


Fig. 8-Replacing Wear Plate

1. Remove cotter pin and drilled pin securing end of ski spring. Lift spring up and remove wear plate, Fig. 8.

2. Install new wear plate. Position spring and install drilled pin and cotter pin.

Replacing Ski Spring

NOTE: The mono-leaf spring, saddle and bumper are replaced as an assembly. The bumpers can be replaced individually.

1. Remove ski from ski spindle.



Fig. 9-Replacing Ski Spring

2. Remove cotter pins and drilled pins securing spring assembly to the ski, Fig. 9.

3. Install new wear plate if necessary. Install new spring assembly to ski.

4. Attach ski assembly to spindle with cap screw, washer and lock nut. Torque nut to 39 ft-lbs (53 Nm).

Replacing Ski Spindles and Bushings

1. Remove ski and spring assembly.
2. Remove hardware securing the steering arm to the spindle.
3. Remove the spindle.

Replace bushings as follows:



Fig. 10-Removing Ski Spindle Bushings

4. Use a drift punch to remove bushings, Fig. 10. Drive lower bushing out from the top. Reverse procedure to remove the upper bushing.

5. Install new bushing until it bottoms on frame. Do not crack or distort bushing during installation.

6. Install washer on spindle and install spindle from the bottom.

7. Install steering arm and upper washers if needed and secure with hardware.

8. Install ski and spring assembly. Torque nut to 39 ft-lbs (53 Nm).

Replacing Steering Arms

1. Position handlebars and skis to point straight ahead.
2. Remove muffler.
3. Remove belt guard, drive belt and drive sheave.
4. Disconnect tie rod from the steering arm.
5. Remove hardware securing steering arm to spindle and remove arm.

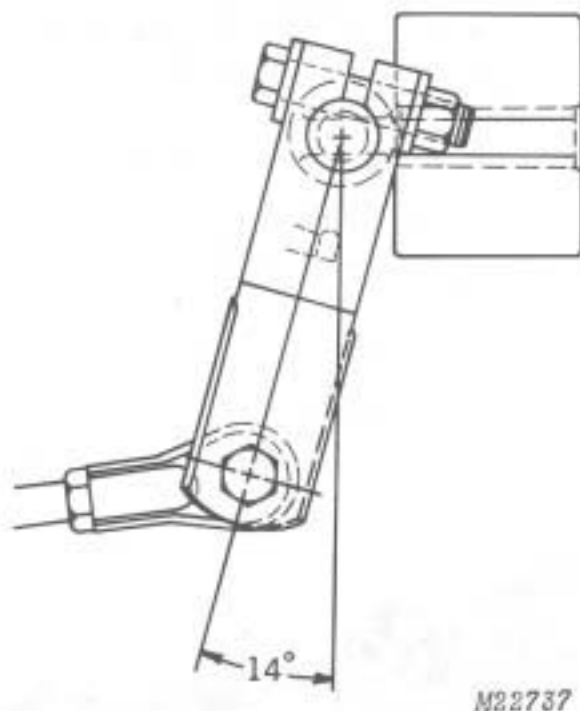


Fig. 11-Installing Steering Arm

6. Install new steering arm with rear of arm angled in 14° as shown in, Fig. 11.

7. Secure steering arm to spindle.

8. Connect tie rod and align skis. See page 60-20-6.

9. Install muffler, drive sheave, drive belt and belt guard.

Replacing Tie Rod

1. Remove tie rod from the steering arm and steering post.
2. Install new tie rod. Connect 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.
3. Align skis. See page 60-20-6.

Replacing Steering Post and Bushings

1. Loosen set screws and slide throttle and brake control handgrips off handlebars.
2. Remove muffler, muffler bracket, recoil starter, flywheel and flywheel housing.
3. Disconnect tie rods from steering post.



Fig. 12-Steering Post Lower Bushing

4. Remove cotter pin and washer from bottom of steering post, Fig. 12.

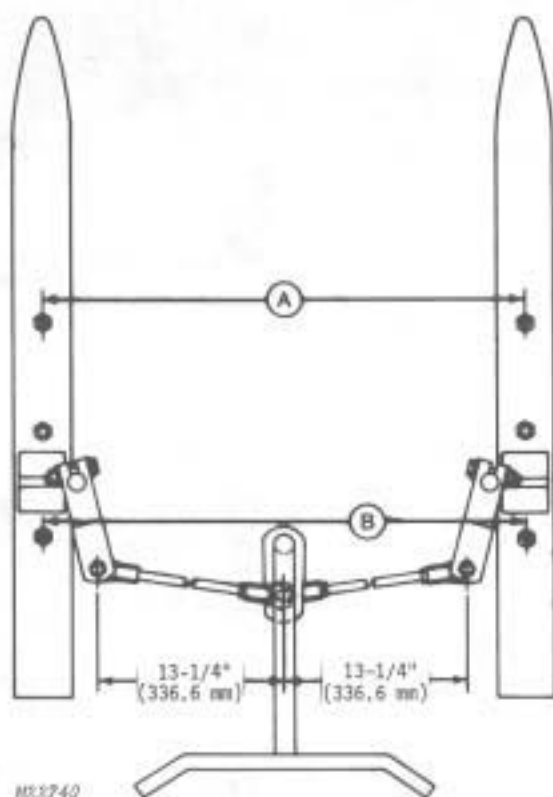


Fig. 13-Steering Post Upper Bushing

5. Remove upper bushing, Fig. 13.
6. Pull up to remove steering post.
7. Install in opposite sequence.

NOTE: Replace worn or damaged bushings.

ALIGNING SKIS



A—Front Wear Rod Nut

B—Rear Wear Rod Nut

Fig. 14-Aligning Skis

Fig. 14 shows the proper position of the skis in relationship to the steering arms, tie rods and steering post.

To align skis:

1. Raise the front of the snowmobile to remove weight from the skis.
2. Position the handlebars straight ahead.
3. Measure the dimension over the front and rear wear rod nuts (A and B). Dimension should be equal.
4. If adjustment is necessary, remove the muffler, belt guard, drive belt and drive sheave for easier access to the tie rods.
5. Loosen jam nuts on each end of both tie rods. Rotate the tie rods to align the skis.

IMPORTANT: DO NOT exceed 13-1/4 inches (336.6 mm) between the centers of the tie rod ends, Fig. 14.

NOTE: It may be necessary to reposition steering arm, so that 13-1/4 inches (336.6 mm) is not exceeded.

6. After aligning skis, tighten jam nuts on tie rods.

IMPORTANT: Be sure tie rod ends are still free to swivel after jam nuts are tight.

ELIMINATING LOOSE STEERING

Two major causes of loose steering are:

1. Worn tie rod ends.
2. Worn spindle bushings.

CAUTION: Check steering components and hardware frequently for condition and tightness.

Replace worn parts.

Group 25 SPECIFICATIONS

SPECIFICATIONS

Tie Rod Bolt-to-Steering Post	32 to 38 ft-lbs (43 to 51 Nm)
Steering Arm-to-Spindle Bolt	22 to 28 ft-lbs (30 to 38 Nm)
Tie Rod Jam Nuts	8 to 12 ft-lbs (11 to 16 Nm)
Tie Rod End Bearing Center Distance	13-1/4 inches (336.6 mm)
Ski Mounting Cap Screw	39 ft-lbs (52 Nm)

Section 70

SERVICE TOOLS

Group 5

ESSENTIAL SERVICE TOOLS

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Carburetor Tools	70-10-2

The essential tools listed in this group will service the John Deere Spitfire Snowmobile. 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

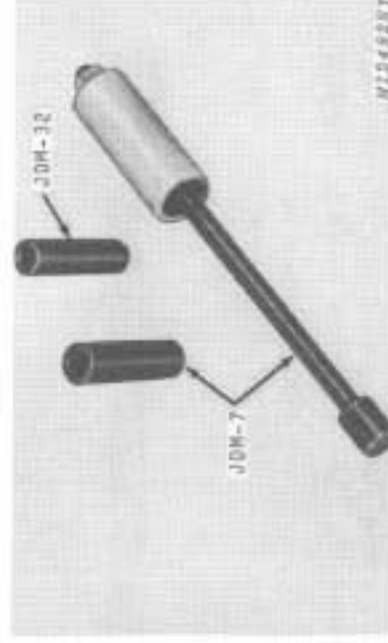


Fig. 1-Piston Pin Service Tools

JDM-7 Piston Pin Service Set, Fig. 1, is used to remove and install piston pins.

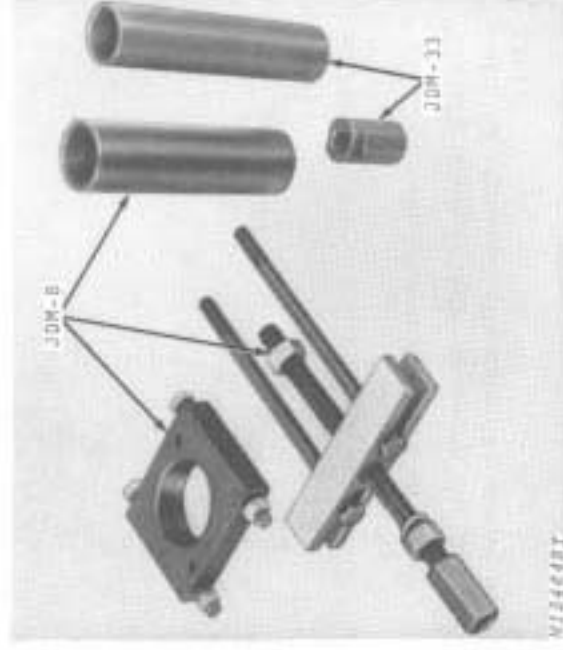


Fig. 2-Crankshaft Bearing Service Set and Bearing Tool Adapter Kit

JDM-8 Crankshaft Bearing Service Set and JDM-33 Bearing Tool Adapter Kit, Fig. 2, are used to remove and install the crankshaft bearings.

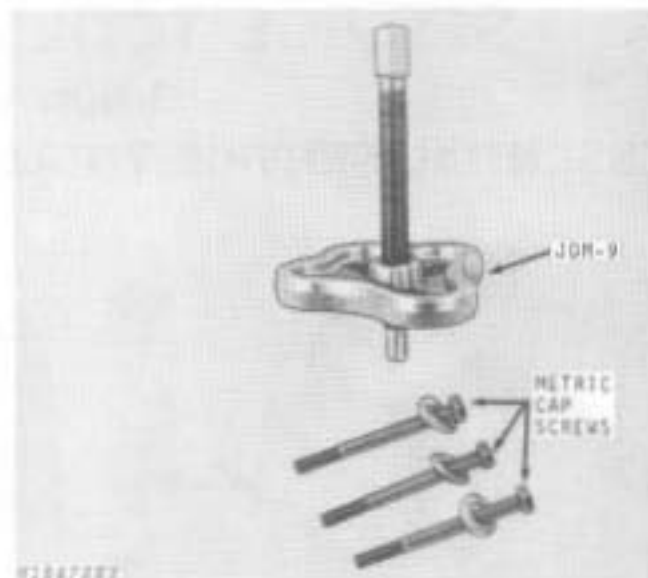


Fig. 3-Flywheel Puller Assembly

JDM-9 Flywheel Puller Assembly, Fig. 3, includes metric cap screws and washers to remove the flywheel.



Fig. 4-Dial Indicator Mounting Bracket

JDM-10 Dial Indicator Mounting Bracket, Fig. 4, is used with JDM-15 Dial Indicator or equivalent to measure crankshaft runout on a Kohler engine.

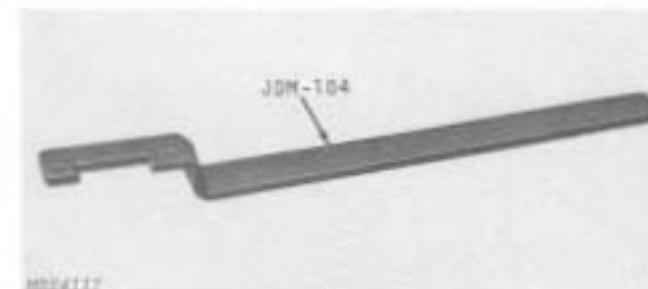


Fig. 5-Flywheel Holding Tool

JDM-104 Flywheel Holding Tool, Fig. 5, prevents the flywheel on a Kohler engine from rotating while removing and installing the retaining nut.

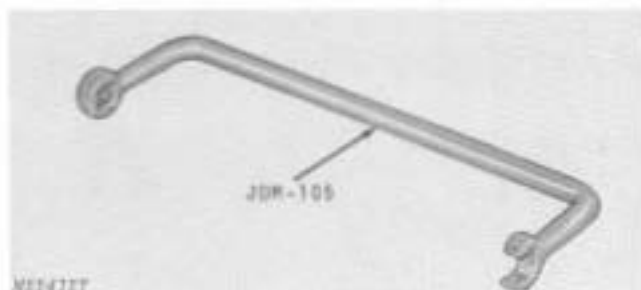


Fig. 6-Cylinder Nut Wrench

JDM-105 Cylinder Nut Wrench, Fig. 6, is used to remove and retorquer the cylinder-to-crankcase nuts on a Kohler engine.

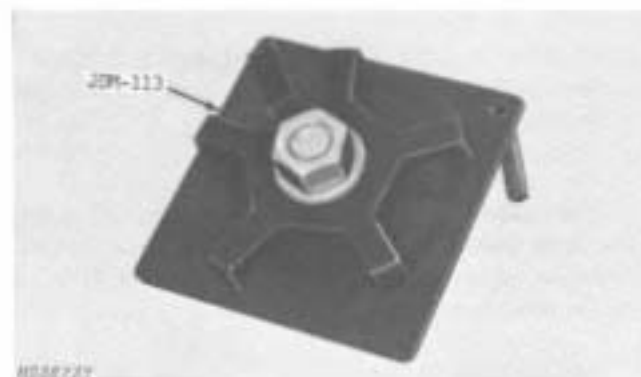


Fig. 7-JDM-113 Starter Spring Winding Tool

JDM-113 Starter Spring Winding Tool, Fig. 7, is used to rewind the starter spring on a John Deere "Fireburst" engine.

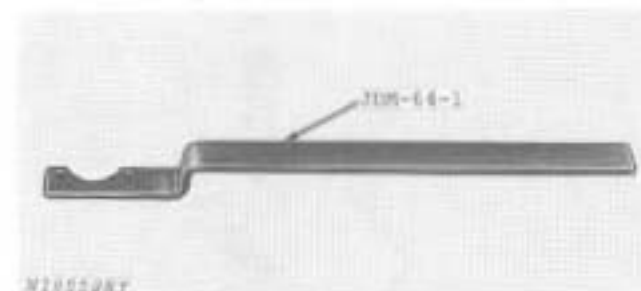


Fig. 8-Flywheel Holding Tool

JDM-64-1 Flywheel Holding Tool, Fig. 8, prevents the flywheel on a John Deere "Fireburst" engine from rotating while removing and installing the retaining nut.

CLUTCH TOOLS

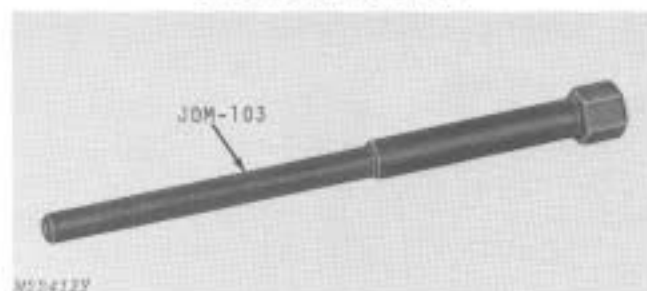


Fig. 9-Clutch Puller

JDM-103 Clutch Puller, Fig. 9, is used to remove and disassemble the primary clutch.

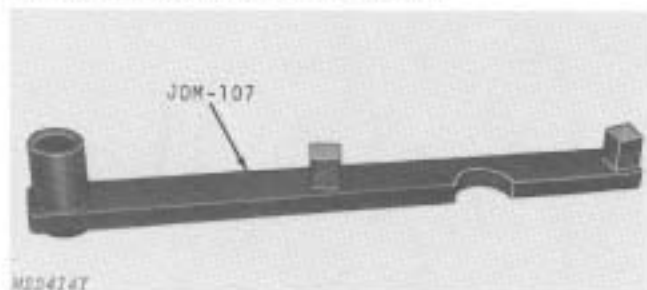


Fig. 10-Clutch Aligning Tool

JDM-107 Clutch Aligning Tool, Fig. 10, is used to accurately align the primary and secondary clutches on a Kohler engine. This tool checks both center distance and offset simultaneously.

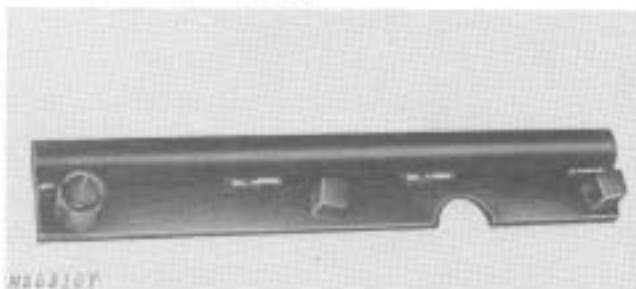


Fig. 11-Clutch Aligning Tool

JDG-47 Clutch Aligning Tool, Fig. 11 is used to accurately align the primary and secondary clutches on a John Deere "Fireburst" engine. This tool checks both center distance and offset simultaneously.

ELECTRICAL TOOLS



Fig. 12-Timing Indicator

JDM-15 Snowmobile Timing Indicator, Fig. 12, 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 included. The indicator also can be used with the JDM-10 Mounting Bracket to measure crankshaft runout.

A—Tester
B—Test SimulatorC—Test Adapter
D—Load Coil

Fig. 13-Capacitor Discharge Ignition Tester

JDM-74 Capacitor Discharge Ignition (CDI) Tester, Fig. 13, 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 impulses.

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 70 to 500 volts.

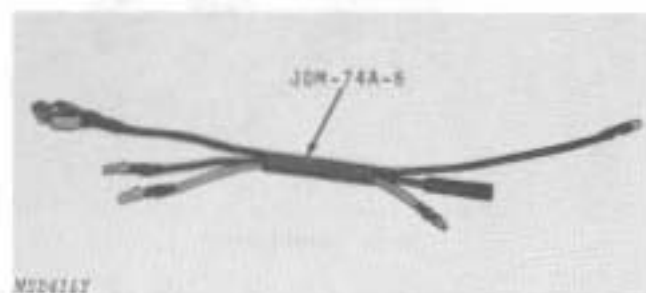


Fig. 14-Special Wiring Harness

JDM-74A-6 Special Wiring Harness, Fig. 14, is used with the JDM-74 CD Tester to check magneto output, trigger impulse and CD unit output.

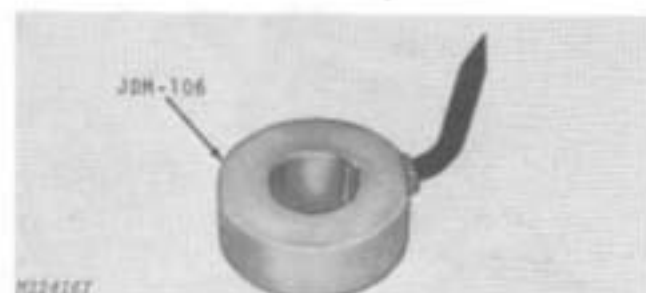


Fig. 15-Ignition Timing Tool

JDM-106 Ignition Timing Tool, Fig. 15, is used to manually set ignition timing on a Kohler engine.

Group 10 CONVENIENCE SERVICE TOOLS

SNOWMOBILE SUPPORT TOOLS

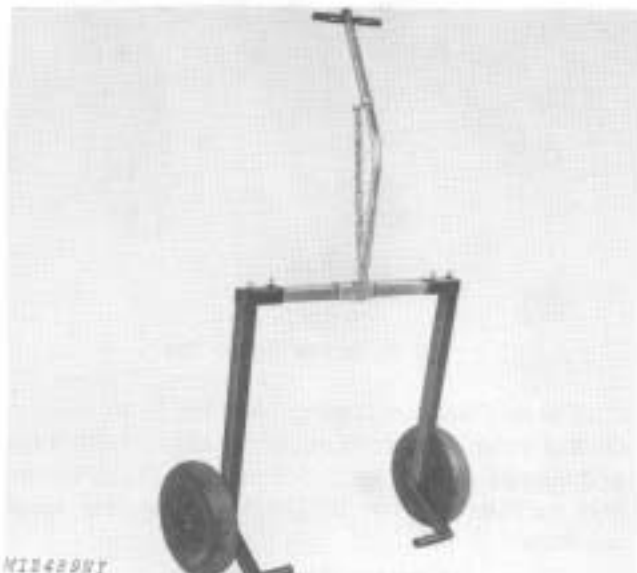


Fig. 1-Snowmobile Dolly

D-05024ST Snowmobile Dolly, Fig. 1, is used for moving snowmobiles in or out of the service shop or display area.

ENGINE TOOLS



Fig. 2-Bench Mounted Fixture

JDM-16 Bench Mounted Service Fixture, Fig. 2, is used to mount all consumer product engines as well as hydrostatic units and many other components. Any component weighing 350 pounds or less may safely be rotated 360 degrees with positive stops at 90 degree increments.



Fig. 3-Ring Compressor

JDM-35 Ring Compressor, Fig. 3, is a band-type ring compressor with two adapters, usable with piston diameters of 2-1/8 inch to 2-5/8 inch.



Fig. 4-Piston Lock Ring Plier

JDM-36 Piston Lock Ring Plier, Fig. 4, is used to install piston pin lock rings.

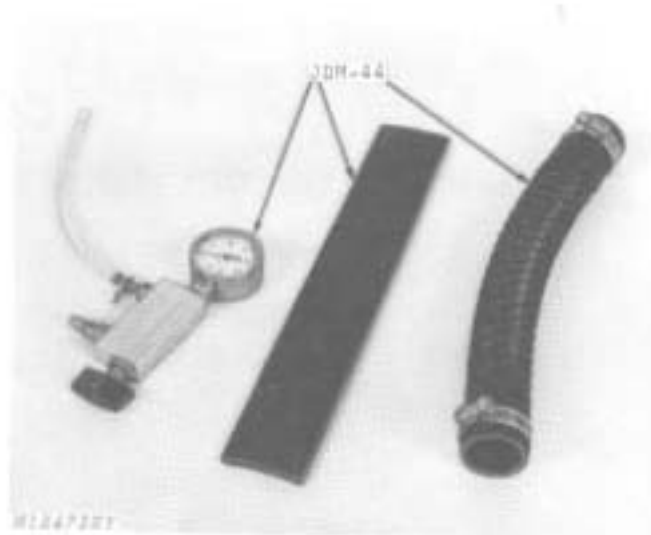


Fig. 5-Pressure Testing Tool

JDM-44 Pressure Testing Tool, Fig. 5, 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.

CARBURETOR TOOLS

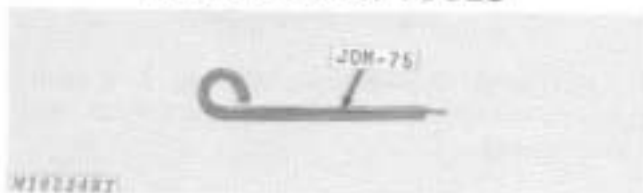


Fig. 6-Carburetor Choke Gauge

JDM-75 Carburetor Choke Gauge, Fig. 6, is used to correctly set the choke plunger on Mikuni Carburetors.

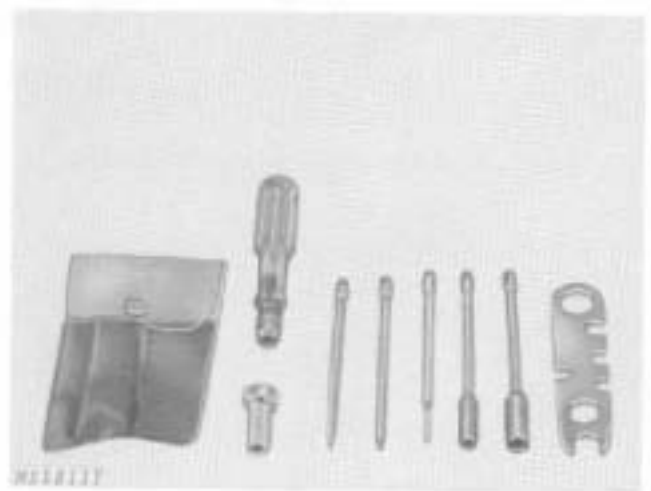


Fig. 7-Mikuni Carburetor Tool Kit

JDM-109A Mikuni Carburetor Tool Kit, Fig. 7, is used for making adjustments on the Mikuni Carburetor.