## LIQUIFIRE TECHNICAL MANUAL TM-1217 (Nov-81)

### CONTENTS

SECTION 10 - GENERAL Group 05 - Snowmobile Identification Group 10 - Specifications Group 15 - Tune-Up and Adjustments Group 20 - Break-In, Fuel and Lubricants SECTION 20 - ENGINE Group 05 - General Information Group 10 - Basic Engine Group 15 - Cooling System Group 20 - Recoil Starter Group 25 - Specifications SECTION 30 - FUEL SYSTEM Group 05 - General Information Group 10 - Mikuni Carburetor Group 15 - Oil Injection System Group 20 - Fuel Pump, Fuel Tank, Screen and In-Line Fuel Filter SECTION 40 - ELECTRICAL SYSTEM Group 05 - General Information Group 10 - Capacitor Discharge Ignition (Serial No. 120,001-190,000) Group 12 - Capacitor Discharge Ignition (Serial No. 190,000-) Group 15 - Lighting System and Switches Group 20 - Specifications

SECTION 50 - POWER TRAIN
Group 05 - General Information
Group 10 - 102C Drive Sheave
Group 12 - John Deere (TR800) Drive Sheave
Group 15 - John Deere Driven Sheave
Group 20 - Drive Belt
Group 25 - Chain Case, Secondary Shaft and
Drive Shaft
Group 30 - Mechanical Disk Brake
Group 35 - Specifications
SECTION 60 - SUSPENSION
Group 05 - General Information
Group 10 - Slide Suspension
Group 15 - John Deere Track
Group 20 - Skies and Steering
Group 25 - Specifications
SECTION 70 - SERVICE TOOLS
Group 05 - Essential Service Tools
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Page

### CONTENTS

#### Page

GROUP 05 - GENERAL INFORMATION	
Snowmobile Serial Number	10-05-01
Engine Serial Number	10-05-01
Vintage Information	10-05-01

# GROUP 10 - SPECIFICATIONS

Snowmobile Specifications	•						10-10-01
Engine Specifications	•	•	• •	• •	•	•	10-10-02

GROUP 15 - TUNE-UP AND ADJUSTMEN Tune-Up and Adjustments	ITS 10-15-01 10-15-01
GROUP 20 - BREAK-IN, FUEL AND LUBR	ICANTS
Break-In Period	10-20-01

ROUP 20 - BREAK-IN, FUEL AND LUBF	RICANTS
Break-In Period	10-20-01
Fuel and Oil	10-20-01
Lubricants	10-20-01
Capacities and Service Intervals	10-20-02

2A8; M22;1005A A 280981

#### Contents

### SNOWMOBILE SERIAL NUMBER

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



### ENGINE SERIAL NUMBER

The engine serial number is stamped into the upper crankcase half.



### VINTAGE INFORMATION

### 1980 Model Year

1982 Model Year

Snowmobile

Serial Number Code No. (Type) Engine Manufacturer Engine Model No. J44LJ 120001M J44LJ John Deere Fireburst\* TC440-A Piston Ported

### 1981 Model Year

Liquifire

Serial Number Code No. (type) J44LK Engine Manufacturer Engine Model No.

Snowmobile

J44LK 155001M

John Deere Fireburst\* TC440A Piston Ported

Snowmobile

Liquifire

Liquifire

Serial NumberJ44LL 190001MCode No. (type)J44LLEngine ManufacturerJohn Deere Fireburst\*Engine Model No.TC440A Piston Ported

\*Manufactured for John Deere by Kawasaki Heavy Industries, Japan



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General Information

### SNOWMOBILE SPECIFICATIONS

FUEL SYSTEM	
Fuel Tank Capacity	(28.4 L)
	7.5 U.S. gals
Mixing Ratio	
Oil Tank Capacity	(1.7 L) 3-1/2 pints
Filters	Two located in pick-up line
Fuel Pump:	· · · · · · · · · · · · · · · · · · ·
Mikuni	Impulse-type located
	in the inlet line
Oil Pump	
Mikuni	Reciprocating-plunger
	driven by the engine
Carburetor	Mikuni
	A
Capacity	(281)3 ate
	Proceutized eveter with
туре	contrifugal pump
Engine Temperature Cor	otrol One thermostat
Pump Output	$(74 \downarrow)$ 19.5 app at
	7000 opging rpm
Coolont Filler Con	
Coolant Filler Cap	(02.7 10 09.0 KPa)
	12 to 13 psi
Charge Queter	
	Flywneel Alternator
	Capacitor Discharge
	Align Mark on Stator
	with mark on crankcase.
	(0.635 mm) 0.025 in.
Spark Plug	N-2 or QN-2

POWER	TRA	IN
-------	-----	----

Transmission Two-sheave variable
Drive Sheave John Deere (Comet) 102C** or
John Deere (TR800)
Secondary Sheave John Deere
Final Drive Enclosed Chain
Standard Ratio:1.59:1 or
1.86:1
Brake Mechanical Disk
Stop Light Standard

#### SUSPENSION

Suspension	Slide Rail
Drive Sprockets	Compression-Molded
	Polyethelene
Track	Yokohama
Track Material	Rubber
Track Width	(38.1 cm) 15 in.
Track Drive	Involute

#### CHASSIS AND BODY

Tunnel	Aluminum
Pan	Steel and TPR
Hood	Sheet Molding Compound
Windshield	Polycarbonate
Overall length	(259.1 cm) 102 in.
Overall Width	(99.1 cm) 39 in.)
Overall Height	(88.9 cm) 35 in.
Weight (Approx.)	(182.3 kg) 404 lbs.

\* First tank of fuel and operation below  $-20^{\circ}$ F ( $-29^{\circ}$ C).

\*\*Manufactured for John Deere by Comet Industries, Richmond, Indiana

### ENGINE SPECIFICATIONS

ITEM

440 LIQUIFIRE

Engine ModelTC4Engine ManufacturerJohnType of EngineTwoNumber of CylindersTwoCylinder SleeveChroBore (mm)68Stroke (mm)60Displacement (cc)436Compression Ratio6.9:Ignition TypeCapIgnition ManufacturerKokLighting Coil Output120Carburetor ManufacturerMikuCarburetor ModelVM3

TC440A Piston Ported John Deere Fireburst\* Two-Stroke, Liquid-Cooled Two Chrome 68 60 436 6.9:1 Capacitor Discharge Kokusan 120 Watt Mikuni VM36/85/, VM36/108, VM36/121, VM36/122 Recoil Start

Starting System

\*Manufactured for John Deere by Kawasaki Heavy Industries, Japan.

2A8; M22;1010A B 280981

Section 60, Group 15

Section 60, Group 20

### TUNE-UP AND ADJUSTMENT

Operation	Specifications	Reference		
Replace spark plugs	Test for spark Champion QN-2 or N-2 DO NOT regap - replace	Section 40, Group 10		
Time ignition system	Align mark on stator with mark on crankcase	Section 40, Group 10		
Adjust carburetor	Select main jet Select power jet Adjust choke plunger Adjust throttle slide Adjust float height Adjust idle screw Adjust air jet	Section 30, Group 10		
Recondition carburetor	Clean carburetor and install necessary parts.	Section 30, Group 10		
ADJUSTMENTS				
<b>Adjustment</b> Brake Sheave alignment	Specification	<b>Reference</b> Section 50, Group 30 Section 50, Group 20		

### SPARK PLUG RECOMMENDATION

Use a Champion N-2 (AM52640) in the United States and a Champion QN-2 (AM55044) in Canada. These plugs are the only ones required for the 440 Liquifire engine.

2A8; M22;1015A A 280981

Track

Skis

Tune-Up and Adjustment

### BREAK-IN PERIOD

Do not exceed 50 mph (80 km/h) for the first 100 miles (160 km) or force the machine at full throttle in deep snow. An occasional burst of power on hardpacked snow will not be harmful.

For the first tank of fuel, pre-mix gasoline and oil in a 50:1 ratio and fill fuel tank. Fill the oil tank with John Deere 2-cycle oil. After break-in, use only gasoline in the fuel tank and 2-cycle oil in the oil tank.

2A8; M22;1020A A 280981

### FUEL AND OIL

IMPORTANT: Use regular (leaded or non-leaded) gasoline with an anti-knock index of 88 or higher. Regular (leaded) gasoline is preferred but non-leaded gasoline is acceptable.

NEVER ALLOW OIL TANK TO BECOME EMPTY. Use John Deere 2-cycle oil.

IMPORTANT: If other than John Deere 2-cycle oil is used, it must meet BIA (Boating Industry Association) test qualification TCW.

IMPORTANT: When operating snowmobile at temperatures of  $-20^{\circ}$ F ( $-29^{\circ}$ C), use a 50:1 gasoline and oil premix in the fuel tank an fill the oil tank with 2-cycle oil. DO NOT run straight gasoline in the fuel tank. The oil injection system may not function efficiently at  $-20^{\circ}$ F ( $-29^{\circ}$ C) and this could cause engine failure.

2A8; M22;1020A 8 280981

### LUBRICANTS

- 1. Park snowmobile on a level surface.
- 2. Remove lower plug. If oil flows from this hole, oil level is satisfactory.
- 3. To add oil, remove upper plug and add API-GL5 gear oil (SAE 90) until it flows from the lower hole.
- 4. Replace plugs.



## CAPACITIES AND SERVICE INTERVALS

Fuel Tank	(28.4 L) 7.5 U.S. gal.
Oil Tank	(1.7 L) 3-1/2 U.S. pt.
Gear Case	(40 cc) 1.35 oz.
Chain Case (Oil Change)	200 hours, 2 years
	or (1609 kms) 1000 miles
Gear Case (Oil Change)	Annually

2A8; M22;1020A D 290981

Page

### CONTENTS

#### Page

GROUP 05 - GENERAL INFORMATION	
Power Stroke	20-05-01
Exhaust Stroke	20-05-01
Fuel Transfer Stroke	20-05-01
Compression and Intake Stroke	20-05-01
Diagnose Malfunctions	20-05-02
Engine Spark Test	20-05-03
Engine Compression Test	20-05-03
GROUP 10 - BASIC ENGINE	
Remove Engine	20-10-01
Disassemble Engine	20-10-03
Inspect Cylinder Heads	20-10-06
Inspect Cylinders	20-10-07
Inspect Pistons and Rings	20-10-08
Inspect Crankshaft	20-10-09
Replace Outer Crankshaft Bearings	20-10-09
Inspect Crankcase	20-10-10
Install Crankshaft	20-10-10
Measure Crankshaft End Play	20-10-11
Install Lower Crankcase Half	20-10-11
Install Pistons	20-10-11
Install Cylinders and Heads	20-10-12
Check Crankshaft Runout	20-10-12
Install Oil Injection Pump	20-10-12
Install Stator	20-10-15
install Flywheel	20-10-15
Install Flywheel Housing	20-10-16
Install Exterior Components	20-10-16
Pressure Test Engine	20- <b>10-</b> 17
Install Engine	20-10-17

.

GROUP 15 - COOLING SYSTEM	
General Information	20-15-01
Test System	20-15-02
Test Filler Cap	20-15-03
Drain Cooling System	20-15-03
Fill Cooling System	20-15-04
Check or Replace Thermostat	20-15-04
Repair Radiator	20-15-05
Replace Heat Exchanger	20-15-05
GROUP 20 - RECOIL STARTER	
Remove Starter	20-20 <b>-</b> 01
Disassemble Starter	20-20-01
Assemble Starter	20-20-02
Install Starter	20-20-05
GROUP 25 - SPECIFICATIONS	
Engine Specifications	20-25-01
Spark Plug Specifications	20.25.01
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2AB; M22;2000A A 290981 TM-1217 (Nov-81)

# Group 05 GENERAL INFORMATION

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### **POWER STROKE**

NOTE: Power, exhaust and fuel transfer all occur on the downstroke and compression and intake occur on the upstroke.

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

As the piston, moves down it exposes the exhaust (B) and tranfer ports (C). The intake port (A) remains closed.

### **EXHAUST STROKE**

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

> A—Intake Port B—Exhaust Port C—Transfer Port

> > 20-05-01

### FUEL TRANSFER STROKE

After uncovering the exhaust port, the piston moves down, exposing the transfer port. 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.

A---Intake Port

B-Exhaust Port C-Transfer Port

### **COMPRESSION AND INTAKE STROKE**

As the piston moves up it closes off the transfer (C) and exhaust port (B) and opens the intake port (A). This also creates a partial vacuum in the crankcase. Atmospheric pressure forces a new charge of fuel and air from carburetor through 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.



2A8;M28437 M22;2005 G 220581





2A8;M28435 M22;2005 E 220581

### **DIAGNOSE MALFUNCTIONS**

#### ENGINE WILL NOT START

Carburetor and/or fuel pump faulty. Spark plugs faulty. Fuel lines obstructed. Head gasket leaking. Electrical connections loose.

#### ENGINE STARTS WITH DIFFICULTY

Carburetor out of adjustment. Choke not functioning properly. Spark plugs fouled. Ignition coil weak. Fuel mixture incorrect. Ignition out of time. Water in fuel system.

#### **ENGINE WON'T CRANK**

Piston seized. Crankcase seized to bearings. Connecting rod broken. Faulty recoil starter.

#### ENGINE WILL NOT IDLE PROPERLY

Carburetor idle adjustments incorrect. Air screw on carburetor not adjusted. Head gasket leaking. Fuel mixture incorrect. Crankshaft seal leaking. Impluse tube to fuel pump obstructed or leaking.

#### ENGINE MISSES AT HIGH SPEEDS

Ignition out of time. Fuel pump faulty. Head gasket leaking. Ignition coil weak. Incorrect main jet in carburetor. Impulse tube to fuel pump obstructed or leaking.

#### ENGINE OVERHEATED

Wrong main jet in carburetor. Ignition out of time. Air leak in intake system or crankcase. Coolant pump damaged. Coolant leak in cooling system.

#### **ENGINE RUNS ROUGH AND SMOKES**

Improper fuel mixture. Choke plunger not seated. Muffler obstructed. Water in fuel.

#### **ENGINE KICKS BACK AND BACKFIRES**

Ignition out of time.

#### ENGINE LOSES POWER OR ACCELERATION

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

# RECOIL STARTER PAWLS NOT EXTENDING WHEN ROPE IS PULLED

Friction spring broken. Retaining nut loose.

# RECOIL STARTER PAWLS NOT RETURNING WHEN ROPE IS RELEASED

Return spring broken. Retun spring not assembled properly.

#### **RECOIL STARTER ROPE NOT RETURNING**

Main spring broken or unhooked. No lubrication between friction plate and washer.

### ENGINE SPARK TEST

- 1. Ground JDM-74A-5 Tester Plug to the engine spark plug.
- 2. Connect high tension lead to the tester plug.
- 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.

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.



2A8;M25316 M22;2005A F 290981

### **ENGINE COMPRESSION TEST**

1. Remove spark plugs.

2. Install compression gauge in one of the spark plug holes.

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

4. Pull recoil start rope and crank engine vigorously. Test both cylinders for compression.

5. Compression pressure should be (827.4 to 965.3 kPa) 120 to 140 psi. Pressure should not vary more than (69 kPa) 10 psi between cylinders. Minimum pressure for a used engine is (689.5 kPa) 100 psi.

6. If compression pressure is low, check for head gasket leakage, worn or stuck piston rings, damaged pistons or damaged cylinder walls.



2A8;M25317 M22;2005A G 290981

### General Information

## Group 10 BASIC ENGINE

### **REMOVE ENGINE**

1. Remove hood. Drain cooling system. Remove muffler.

2. Remove oil tank and raise belt guard. Remove air intake silencer.

IMPORTANT: Remove hose from intake silencer before removing silencer. Hose can contact elbow of brake cable causing elbow to loosen and affect the brake adjustment.



2A8;M25377 M22;2010A A 290981

3. Remove carburetors. Remove choke lever from instrument panel.





2A8;M25379 M22;2010A C 290981

5. Disconnect heat exchanger hose from pump.

4. Remove impluse line from fuel pump.

6. Remove drive belt and drive sheave. Use JDM-41-1 Clutch Puller and impact wrench to remove drive sheave.



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20-10-01

7. Remove oil injection pump control cable from control lever and disconnect inlet oil line. Plug line to prevent leakage.



248;M25381 M22;2010A E 290981

8. Remove hoses from radiator and thermostat housing. Remove coolant temperature sender from thermostat housing.



2A8;M25382 M22;2010A F 290981

9. Disconnect electrical wiring harness.

10. Disconnect speedometer cable from speedometer.

11. Remove radiator support mounting bolts and move radiator and instrument panel out of the way.

12. Knot recoil starter rope to prevent rope rewinding into starter and remove handle.

13. Remove engine mounting bolts.



2A8;M28453 M22;2010A G 290981

### DISASSEMBLE ENGINE

1. Remove exhaust manifold and carburetor rubber mounts.

2. Remove bypass hose, thermostat housing and impluse line.

- 3. Remove recoil starter.
- 4. Remove starter cup and inertia disk.

NOTE: Inertia disk is not used on 1982 Model Liquifire Snowmobiles.



2AB;M25384 M22;2010A H 290981

5. Disconnect red and white ignition wires. Remove two yellow and one brown wire from engine plug.

NOTE: 1982 Models have one yellow wire and one green/white wire from the alternator instead of two yellow wires.

6. Remove flywheel housing with CDI unit and coil and engine mount.

A - Ignition Wires B - Yellow Wires C - Brown Wire



2A8;M25385 M22;2010A 1 290981

7. Open locking tabs and remove flywheel nut.



2A8;M25386 M22;2010A J 290981

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#### Basic Engine





- 9. Remove stator. Remove grommet with the wiring.
- 10. Remove water manifold.

- 11. Drain oil from gear case.

12. Remove coolant pump and coupling.

A - Vent Hole B - Sight Glass C - Drain Plug



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20-10-05

19. Remvoe retainers, piston pins and pistons.

NOTE: Mark pistons and cylinders for proper reassembly.

20. Remove connecting rod needle bearings.



21. Set crankcase on a bench.

22. Separate crankcase halves. Do not pry apart. Tap with a plastic hammer to separate.

23. Remove crankshaft.



### **INSPECT CYLINDER HEADS**

1. Scrape carbon deposits from cylinder head with a soft metal (non-ferrous) scraper.

2. Clean spark plug threads with a 14 mm tap.

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



### INSPECT CYLINDERS

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

2. Check coolant passages and remove any obstructions.

3. Check cylinder wall for scoring.

4. Check cylinder bore at C and D in position A of cylinder. Measure cylinder bore at C and D in position B of cylinder.

5. If any dimension exceeds the wear tolerance the cylinder must be replaced.

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

A - Top of Ring Travel Zone B - Bottom of Ring Travel Zone C - Parallel to Crankshaft D - Right Angle to Crankshaft Zone

2A8;M23493 M22;2010A V 290981

### **INSPECT PISTONS AND RINGS**

1. Measure piston pin in the two locations. If dimension is

less than (15.96 mm) 0.6283-in. replace it.

2. Measure piston pin bore dimension on both sides of piston. If either dimension exceeds (16.08 mm) 0.6331-in. replace the piston.

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

4. Check piston for pitting, scoring or corrosion. Replace if necessary. Clean carbon from top of piston.

5. Measure piston diameter at a right angle to the piston pin bore. If dimension is less than (67.82 mm) 2.6701 in. replace the piston.

6. Use a piston to push the ring into a cylinder that has been inspected and proven correct. Push ring into bore (25.4 mm)1 in. below top of bore.

7. Measure ring end gap. End gap should be (0.203 to 0.406 mm) 0.008 to 0.016-in. If end gap is incorrect, the ring is worn. Replace it.



8. Install ring in bottom groove. Check ring groove clearance with a flat feeler gauge. If clearance exceeds (0.19 mm) 0.0075-in. replace piston and rings.

9. Install half keystone L-ring in top groove (bevel up).

10. Be sure both rings are located with ring gap around pins of the piston and widest part of ring gap is up.



### **INSPECT CRANKSHAFT**

1. Check crankshaft seals and retainers. Seals must be replaced if they are damaged.

2. Measure inside diameter of connecting rods. If measurement exceeds (20.05 mm) 0.7894-in. replace the crankshaft assembly.

3. Move the connecting rod to one side and measure the clearance on opposite side. If clearance exceeds (0.70 mm) 0.0276-in. replace the crankshaft.

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



2A8;M25398 M22;2010A Z 290981

### **REPLACE OUTER CRANKSHAFT BEARINGS**

- NOTE: Bearing, seal and gear on PTO end of crankshaft must be removed as a unit. DO NOT remove one at a time.
- 1. Remove bearing, seal and gear.



2. Remove bearings from flywheel end.

3. To install NEW bearings and gear, heat them in oil or use a bearing heater. Bearings will then slide on crankshaft. No tool is required.



### INSPECT CRANKCASE

1. Clean sealer off crankcase sealing surface. Inspect surface for 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.

3. Crankcase halves are available only as a matched set.

1. Check the gears, bearing and seals for wear or damage, replace if necessary.

NOTE: Bearing in the gear case must be pressed out and in. Bearing should be flush with boss in cover.

2. Check gear case vent hole directly above sight glass. This hole must be open and not obstructed to insure proper seal operation. If this hole is plugged, oil from the gear case could be sucked into the crankcase through the seal between crankcase and gear case. This would result in gear and bearing failure.

A - Vent Hole B - Sight Glass C - Drain Plug



### INSTALL CRANKSHAFT

1. Place retainers and oil seals (lip inward) on crankshaft. Lubricate seals and bearings.

2. Install crankshaft.

NOTE: The locating pin on labyrinth seal must be properly located in the notch of the upper crankcase half.



2A8; M22;2010A AC 290981

2A8;M25401 M22;2010A AD 29098

### MEASURE CRANKSHAFT END PLAY

1. Install dial indicator against one end of crankshaft.

2. Move crankshaft to one end of crankcase and then back to opposite end. The difference in the two readings is end play. Maximum end play is (0.38 mm) 0.015-in.

3. Install shim as necessary between thrust washer and crankshaft center bearing on the flywheel end.



### INSTALL 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.

1. Install lower crankcase half and tighten cap screws 1 through 8 to (22 N·m) 16 ft-lbs torque in the sequence shown. Tighten cap screws 9 and 10 to (6 to 8 N·m) 5 to 6 ft-lbs torque.



2A8;M28455 M22;2010A AH 290981

### **INSTALL PISTONS**

- 1. Place needle bearings in connecting rods.
- 2. Install piston over connecting rod with arrow pointing toward exhaust side.
- NOTE: Be sure pistons are installed on the same side as marked during disassembly.
- 3. Install piston pin and new retainers.
- 4. Correctly install new cylinder gaskets on crankcase.



### INSTALL CYLINDERS AND HEADS

1. Center piston ring end gaps over pin of piston. Compress rings with your fingers as you install cylinder.

NOTE: Be sure cylinders are installed on the same side as marked during disassembly.

2. Install new cylinder head gaskets and install heads. DO NOT tighten hardware.

3. Install water manifold with new gaskets. Tighten hardware to (8 to 10  $N{\cdot}m)$  6 to 8 ft-lbs. torque. This aligns the cylinders.

4. Tighten cylinder head hardware in a crisscross pattern to (22 N·m) 16 ft-lbs.



### CHECK CRANKSHAFT RUNOUT

IMPORTANT: Whenever engine is disassembled and new bearings on either end have been replaced or a new oil pump drive gear has been installed on the crankshaft, the crankshaft must be checked for alignment.

1. Install a dial indicator. Maximum permissible runout is (0.05 mm) 0.002-in. If runout exceeds this dimension, replace the crankshaft.



#### 2A8;M25405 M22;2010A AK 290981

#### INSTALL OIL INJECTION PUMP

1. Install oil injection pump and oil lines.





#### Basic Engine



4. Measure from the gasket surface of the gear case cover to the inner race of the bearing. Also measure from the gasket face of the crankcase to the face of the drive gear on the end of the crankshaft. Subtract dimension C from dimension E and the result will be the clearance.

**E** - Dimension

F - Drive Gear

#### Clearance = Dimension C-E

A - Gear Case Cover

**B** - Gear Case Bearing

(в

(0.135 to 0.39 mm) 0.0051 to 0.0156 in. (0.4 to 0.59 mm) 0.0157 to 0.0232 in. (0.06 to 0.079 mm) 0.236 to 0.0312 in. (0.8 to 0.099 mm) 0.0315 to 0.0390 in. (1.0 to 1.19 mm) 0.0394 to 0.0469 in. (1.2 to 1.39 mm) 0.0472 to 0.0527 in. (1.4 to 1.59 mm) 0.0551 to 0.0626 in. (1.6 to 1.79 mm) 0.0629 to 0.0705 in. (1.8 to 1.99 mm) 0.0709 to 0.0783 in. (2.0 to 2.19 mm) 0.0787 to 0.0862 in. (2.2 to 2.39 mm) 0.0866 to 0.0931 in. (2.4 to 2.39 mm) 0.0945 to 0.1020 in. (2.6 o 2.735 mm) 0.1024 to 0.1076 in. None (1) (1)+(1)

Shim No. Requried

**E** - Dimension

F - Crankcase

selection.

(1)+(1)(1)+(1)+(1)(1)+(1)+(1)(2)(2)+(1)(2)+(1)+(1)(2)+(1)+(1)+(1)(2)+(1)+(1)+(1)+(1)(2)+(2)(2)+(2)+(1)(2)+(2)+(1)+(1)

#### Total Shim Thickness

5. The axial clearance should be (0.15 to 0.39 mm)

0.004 to 0.016-in. See table for proper shim

Shim No. 1 (M68127) is (0.2 mm) 0.0078-in. and

Shim No. 2 is (1.0 mm) 0.0397-in. thick.

G - Crankshaft

(0.1999 mm) 0.0079 in. (0.3998 mm) 0.0157 in. (0.5997 mm) 0.0236 in. (0.7996 mm) 0.0315 in. (1.0 mm) 0.0394 (1.1999 mm) 0.0472 in. (1.3998 mm) 0.0551 in. (1.5997 mm,) 0.0630 in. (1.7996 mm) 0.0708 in. (2.0 mm) 0.0787 in. (2.1999 mm) 0.0866 in. (2.3977 mm) 0.0944 in.

#### 2A8,M25408 M22;2010A A0 290981

6. Install gear case cover. Use a light coating of M64850 silicon Rubber Adhesive over the gear case cover O-ring.

7. Add (40 cc) 1.35 ounces of 10W-40 (Series SE) oil to the gear case. Oil level should be approximately half way up on the sight gauge.

A---Vent Hole B---Sight Gauge C---Drain Plug



1. Install coupler on oil injection pump shaft. Use molybdenum grease on the coupler.

2. Install coolant pump, bypass hose and thermostat housing. Use a light coating of M64850 (Silicon Rubber Adhesive) over the coolant pump O-ring.

### **INSTALL STATOR**

1. Guide stator leads through grommet and place stator against crankcase.

- 2. Align mark on stator with ridge of crankcase.
- 3. Tighten stator screws.



#### 2A8;M25410 M22;2010A AR 300981

2A8;M25409 M22;2010A AQ 300981

### **INSTALL FLYWHEEL**

- 1. Install flywheel key in crankcase keyway.
- 2. Install flywheel, lock washer and nut.

3. Hold flywheel with JDM-64-1 Flywheel Holding Tool and tighten nut to (81 N·m) 60 ft-lbs torque. Bend tabs on lock washer.

4. Install inertia disk and starter cup. Tighten cap screws to (11 to 12 N·m) 8 to 9 ft-lbs. torque.

NOTE: Inertia disk not used on 1982 Models.



A - Inertia Disk B - Starter Cup

ZA8;M25411 M22;2010A AS 300981 TM-1217 (Nov-81)

### INSTALL FLYWHEEL HOUSING

1. Install engine mount and flywheel housing with CDI unit and coil.

2. Connect red and white ignition leads.

3. Run two yellow (aternator wires) and one brown wire through grommet of engine mount. Install wires in plug.

NOTE: One yellow wire and one green/white wire for alternator on 1982 Models.



A - Ignition Wire B - Yellow Wires C - Brown Wire

2A8;M25385 M22;2010A AT 300981

### **INSTALL EXTERIOR COMPONENTS**

1. Install exhaust manifold, carburetor rubber mounts, impulse line and recoil starter.

2A8: M22:2010A AU 300981

### PRESSURE TEST ENGINE

1. Place a rubber sheet between exhaust manifold and cylinders. Torque nuts to (13 to 16 N·m) 10 to 12 ft-lbs.

 Place a rubber sheet between each carburetor rubber mount and intake manifold. Torque bolts to (5.8 to 7.8 N·m)
4.3 to 5.8 ft-lbs.

3. Connect JDM-44 Pressure Regulator to impulse fitting.

4. Close regulator valve.

5. Connect shop air to pressure regulator.

6. Open regulator valve until gauge reads (48.3 kPa) 7 psi. Then, close valve.

7. Gauge needle should not drop below (34.5 kPa) 5 psi for at least 10 seconds.

8. If needle drops before 10 seconds, open valve to maintain (48.3 kPa) 7 psi. Apply a liquid soap solution to seals and seams to locate leaks.

### INSTALL ENGINE

1. Place engine in snowmobile. Install mounting bolts. Tighten four socket screws to (16.3 N·m) 12 ft-lbs. torque.



2A8;M25412 M22;2010A AW 300981

2A8; M22;2010A AV 300981

2. Tighten two rubber mount cap screws to  $(42 \text{ N} \cdot \text{m}) 31 \text{ ft-lbs}$  torque.



2A8;M25413 M22;2010A AX 300981

- 3. Connect hose to coolant pump.
- 4. Connect impulse line to fuel pump.
- 5. Connect oil line to oil injection pump. Adjust cable.
- 6. Install carburetors.
- NOTE: Carburetor with red dot should be installed on magneto side on 1982 Model Snowmobiles.



2A8;M25414 M22;2010A AY 300981
- 7. Install radiator support with instrument panel.
- 8. Connect all electrical wiring.
- 9. Connect speedometer cable to speedometer.
- 10. Install choke lever in dash.
- 11. Install radiator hoses and coolant temperature sender.

12. Install drive sheave. Tighten retaining cap screw to (69 N·m) 50 ft-lbs. torque. Check sheave alignment. Install drive belt.

- 13. Install air intake silencer.
- 14. Install belt guard and oil tank.
- 15. Install recoil start handle and release knot in rope.
- 16. Install muffler.
- 17. Fill cooling system.
- 18. Bleed the oil injection pump.
- 19. Install hood.



## Group 15 COOLING SYSTEM





The pressurized, thermostatically controlled liquidcooling system has a centrifugal pump (E), one thermostat (G), a radiator (C) and tunnel mounted heat exchanger (D).

Systm capacity is approximately (2.8 L) 3 quarts.

The coolant filler cap (B) has a pressure relief valve that releases when cooling system pressure reaches (82.7 to 89.6 kPa) 12 to 13 psi.

The pump is attached to the engine and driven by a coupling connected to the oil injection pump drive shaft. Pump output is (74 L) 19.5 gallons-per-minute at 7000 engine rpm.

2A8;M25318 M22;2015A A 300981

During warm-up period, the thermostat (A) is closed and coolant is diverted through by-pass hose (G) and recirculated in engine.

At operating temperature (42°C) 108°F, the thermostat opens shutting off the by-pass. Coolant now flows through the radiator and heat exchanger.

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

If the engine overheats slighty, coolant will overflow into the recovery tank. As the engine cools, the coolant is drawn from the tank back to the engine.

The coolant is a 50-50 mixture of e t hylene glycol antifreeze and water. This mixture should give approximately a  $(-40^{\circ}\text{C}) - 40^{\circ}\text{F}$  protection for thu system. Do not exceed the 50-50 mixture.

Check the coolant with a hydrometer, when the engine is completely warmed up. Do not add antifreeze before checking the coolant.

IMPORTANT: Do not use antifreeze containing a radiator stop leak or add stop leak to the system.



2A8;M25319 M22;2015A 8 300981

## TEST SYSTEM



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

Pump system pressure to approximately (138 kPa) 20 psi on the gauge. Pressure should hold steady. If pressure falls, there is a leak in the system.



## **TEST FILLER CAP**

Cap should release at (82.7 to 89.6 kPa) 12 to 13 psi.



## DRAIN COOLING SYSTEM

- NOTE: Normally the system needs to be drained and refilled only every two years.
- 1. Remove drain screw.
- 2. Remove filler cap.
- 3. Disconnect bottom hose from heat exchanger.

4. Raise rear of snowmobile to drain system. Reinstall drain screw.



2A8;M25322 M22;2015A E 300981

## FILL COOLING SYSTEM

- 1. Level snowmobile.
- 2. Connect hose to heat exchanger.
- 3. Remove vent screw.

# IMPORTANT: Use a 50-50 solution of ethylene glycol antifreeze and water.

4. Add coolant until it flows from vent hole. Then, install vent screw.

5. Continue to add coolant until system is full to bottom of radiator filler neck and approximately (25.4 mm) 1 in. of coolant is in coolant recovery container.

- 6. Check cooling system for leaks.
- 7. Install filler cap.
- 8. Start and idle engine until outlet hose is warm. Do not idle for more than 5 minutes. Recheck coolant level.

2A8; M22;2015A F 300981

## CHECK OR REPLACE THERMOSTAT

- 1. Drain coolant until thermostat housing is empty.
- 2. Remove housing and thermostat.

3. Suspend thermostat in pan of water. Heat water. Thermostat should open at (42°C) 108°F.

4. Install thermostat and thermostat housing. Refill cooling system.



## **REPAIR RADIATOR**

- *NOTE: Repairs should be made only by an experienced radiator repair person.*
- 1. Drain system.
- 2. Disconnect hoses from radiator.

3. Disconnect coolant recovery container hose from radiator.

- 4. Remove instrument panel from radiator support rod.
- 5. Remove support rod and radiator.
- 6. Install support rod and radiator.
- 7. Install instrument panel to support rod.
- 8. Install hoses to radiator.
- 9. Fiil the cooling system.



2A8;M25324 M22;2015A H 300981

## **REPLACE HEAT EXCHANGER**

- 1. Drain cooling system. Remove hoses from exchanger.
- 2. Remove suspension.
- 3. Remove track.
- 4. Remove and replace heat exchanger.



2A8;M28457 M22;2015A 1 300981

- 5. Connect hoses.
- 6. Replace track and suspension.
- 7. Fill cooling system.



2A8;M25526 #22,2015A 3 500781

TM-1217 (Nov-81)

## **REMOVE STARTER**

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



#### DISASSEMBLE STARTER

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

1. Press down on spring cover and remove nut, lock washer and large washer.

2. Slowly lift off spring cover.



- 3. Remove pawls and pawl springs.
- 4. Remove return spring, center spring and washer.
- 5. Untie knot in rope and release it.

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

6. Rotate recoil reel back and forth to release spring and slowly remove reel from housing.





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TM-1217 (Nov-81)



8. Use a long screwdriver to pry up on center of spring until it is free out of housing.

## ASSEMBLE STARTER

1. Set recoil spring on JDM-113 Starter Spring Winding Tool with the inner bend hooked on pin.



2A8;M23536 M22;2020A E 300981

2. Set retainer over spring and install washer and nut.

3. Start rotating retainer clockwise.



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.



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

Recoil Starter

8. Hold spring down and remove retainer.



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

10. Wind rope counterclockwise around recoil reel.







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





20-20-03

TM-1217 (Nov-81)

- 13. Place starter pawls on reel and install pawl springs.
- 14. Install washer over center post.



15. Set center spring over post.

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



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.



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), lock washer and nut. Tighten nut.



## **INSTALL STARTER**

1. Install recoil starter.

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



2A8;M24327 M22;2020A Q 300981

## ENGINE SPECIFICATIONS

#### ltem

Cylinder Bore

Connecting Rod Small End

Connecting Rod Side Clearance

Crankshaft Runout

Crankshaft End Play

Ring End Gap

Piston at Skirt

Piston Pin Bore

Piston Pin

Ring Groove Clearance (Bottom)

Crankshaft O.D. PTO End

#### New Part Dimension

(68.005 to 68.025 mm) 2.6774 to 2.6781 in.

(20.003 to 20.014 mm) 0.7875 to 0.7880 in.

(0.4 to 0.5 mm) 0.0157 to 0.0197 in.

(0.05 mm) TIR 0.0020 in. TIR

(0.38 mm) 0.0150 in.

(0.2 to 0.4 mm) 0.008 to 0.016 in.

(67.91 to 67.93 mm) 2.6736 to 2.6744 in.

(16.001 to 16.005 mm) 0.6299 to 0.6301 in.

(15.994 to 16.000 mm) 0.6297 to 0.6299 in.

(0.05 to 0.09 mm) 0.0020 to 0.0035 in.

30 mm

#### Wear Tolerance

(68.10 mm) 2.6811 in.

(20.05 mm) 0.7894 in.

(0.70 mm) 0.0276 in.

(0.08 mm) TIR 0.0032 in. TIR

Maximum

(67.82 mm) 2.6701 in.

(16.08 mm) 0.6331 in.

(15.96 mm) 0.6283 in.

(0.19 mm) 0.0075 in.

2A8; M22;2025A A 300981

## SPARK PLUG SPECIFICATIONS

Champion QN-2 (John Deere Part No. AM55044) (Canada)

Champion N-2 (John Deere Part No. AM52640) (U.S.A.)

Spark Plug Gap (0.635 mm) (0.025 in.)

When plug gap opens up to (1.143 mm) 0.045 in. replace plug. Do not regap.

TORQUE SPECIFICATI Location Crankcase Cap Screws	ONS Torque (22 Nm) 16 ft-lbs	
Cylinder-to-Crankcase Nuts	(22 Nm) 16 ft-lbs	
Cylinder Head Nuts	(21 to 24 Nm) 16 to 18 ft-lbs	
Flywheel-to-Crankshaft Nut	(81.4 N) 60 ft-lbs	
Intake Manifold Nuts	(5.8 to 7.8 Nm) 4.3 to 5.8 ft-lbs	
Exhaust Manifold Nuts	(13 to 16 Nm) 10 to 12 ft-lbs	
Spark Plug	(27 Nm) 20 ft-lbs	
Carburetor Rubber Flange	(4.7 Nm) 3.5 ft-lbs	
	(10.8 Nm) 8 ft-lbs	
Engine Mounting Bracket Left-Hand (Cap Screws)	(16.3 Nm) 12 ft-lbs	
Engine Mounting Bracket Right-Hand (Nuts)	(16.3 Nm) 12 ft-lbs	
Rubber Engine Mount Right-Hand (Bolt and Nut)	(42 Nm) 31 ft-lbs	2A8: M22

## CONTENTS

Page

#### **GROUP 05 - GENERAL INFORMATION**

Choke System	30-05-01
Float System	30-05-02
Pilot System (Idle and Slow Speed)	30-05-03
Main System	30-05-04
Power Jet System	30-05-05
Oil Injection Pump	30-05-06
Fuel Pump	30-05-07
Diagnose Malfunctions	30-05-08

#### **GROUP 10 - MIKUNI CARBURETOR**

Remove Carburetor	30-10-01
Disassemble Carburetor	30-10-01
Clean Carburetor	30-10-03
Inspect Carburetor	30-10-03
Install Pilot Jet	30-10-04
Instali Needle Jet	30-10-04
Install Needle Valve and Float Arm	30-10-04
Float Level Adjustment	30-10-05
Install Floats	30-10-05
Install Main Jet and Power Jet	30-10-06
Install Air Screw and	
Throttle Stop Screw	30-10-06
Install Float Bowl and Vent Lines	30-10-06
Install Carburetor	30-10-06
Install Throttie Valve	30-10-07

	Page
Install Choke Plunger	30-10-07
Adjust Choke Plunger	30-10-07
Adjust Throttle Cables	30-10-08
Set Engine Idle Speed	30-10-09
Check Choke Adjustment	30-10-09
Carburetor Recommendations for Altitude	1
and Temperature	30-10-10

#### **GROUP 15 - OIL INJECTION SYSTEM**

Test Oil Injection Pump	30-15 <b>-</b> 01
Remove Oil Injection Pump	30-15-02
Inspect Gear Case	30-15-02
Remove Bearing	30-15-03
Install Bearing	30-15-03
Install Oil Seal	30-15-03
Install Oil Injection Pump	30-15-03
Adjust Control Cable	30-15-05
Bleed Pump and Lines	30-15-06

# GROUP 20-FUEL PUMP, TANK, SCREEN AND IN-LINE FILTER

Fuel Pump and In-Line Filter	30-20-01
Screen	30-20-01
Fuel Tank	30-20-01

2A8; M22;3000A A 300981

# Group 05 GENERAL INFORMATION

## CHOKE SYSTEM

The choke system consists of a non-replaceable starter jet (E) and choke plunger (A). This system eliminates the need for a choke plate in the carburetor bore.

NOTE: The throttle valve must be closed for starting; otherwise, the fuel-air mixture will be too lean and will result in hard starting.

The system is opened and closed by the choke plunger (A). Moving the choke lever up lifts the choke plunger and opens the choke system.

Fuel is metered through the starter jet (E) and mixed with air in the emulsion tube. The air flow through the starter air intake creates a suction on the emulsion tube and draws the fuel-air mixture from the bowl into the chamber below the plunger. Here it is mixed with the air from the air intake and is then drawn into the engine.

> A---Choke Plunger B---Air C---Fuel-Air Mixture

D—Atmospheric Air E—Starter Jet



## FLOAT SYSTEM

The float system 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 (B) and into the float chamber.

As fuel in the fuel chamber approaches the correct level, the floats raise, contacting the float arm. The float arm moves the needle valve against the valve seat stopping the 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 float bowl is equal to the outward flow of fuel to the engine.



2A8;M25331 M22;3005A B 310981

## PILOT SYSTEM (IDLE AND SLOW SPEED)

The pilot system consists of the pilot jet (C), air screw, pilot outlet (B), and pilot bypass (A). 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 across the needle jet (F) is low. This low pressure is not enough to draw fuel from the main system.

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

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



2A8;M25332 M22;3005A C 300981

## MAIN SYSTEM

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

From 1/4 to 3/4 open throttle, the fuel enters the carburetor bore through the main jet (C) and is metered in the clearance between the needle jet (D) and jet needle (B). The fuel is atomized by the air of the air intake (E) and this mixture then mixes with the air coming through the venturi (F) before entering the engine.

During this operation, the cutaway (slant) of the throttle valve (A) controls the air flow across the needle jet (D), thereby regulating the amount of fuel that is drawn through the main jet.

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



## POWER JET SYSTEM

The power jet system is similar to and works in conjuction with the main system. The power jet (B) system only flows fuel when there is enough air flow through the venturi to draw fuel from the system.

The power jet system starts to function at engine speeds of 5000 rpm and above. This gives better engine performance at high engine speeds and better fuel economy at lower engine speeds. When the power jet system is functioning, it supplies approximately 40 per cent of the fuel requirement while the main jet supplies 60 per cent.

The power jet stops feeding fuel at 1/2 throttle or 5000 rpm due to reduced air flow through the venturi.



A---Outlet

B-Power Jet

2A8;M25334 M22;3005A E 300981

### OIL INJECTION PUMP



A--Control Shaft B--Spring C—Piunger

D-Differential Plunger

E-Drive Shaft

Fig. 8 - Oil Injection Pump

The oil injection pump consists of a drive shaft (E), a plunger (C), a differential plunger (D), a spring (B) and a control shaft with lever (A).

The pump drive shaft is driven by a gear that meshes with a gear on the engine crankshaft. Engine crankshaft rotation is transmitted directly to the oil pump drive shaft, which controls oil pump output, in direct proportion to engine rpm.

The other end of the drive shaft has a worm gear that meshes with a worm gear on the plunger. As the drive shaft turns, the plunger also turns, producing a pumping action (or strokes) simultaneously with rotation. The number of plunger strokes is determined by the drive shaft rotation speed.

The other factor that controls oil pump output is the length of the plunger stroke. The plunger stroke is controlled by the control shaft that contacts the end of the plunger cam. The plunger is in constant contact with the control shaft because of spring pressure against the plunger from the opposite end. When the throttle lever is pressed, the cable connected to the control shaft lever, moves the control shaft increasing plunger stroke.

When the control shaft is turned from the minimum flow position (engine idle) to the maximum flow position (WOT), the plunger is allowed more travel, thereby pumping more oil. The plunger cam has two high points which allow two pumping cycles for each revolution of the plunger.

The plunger has a notch which connects alternately to the inlet port and the three discharge ports. When the notch aligns with the inlet port, oil is drawn into the pump. When the notch aligns with the discharge ports, the oil is discharged. Two of the discharge ports are connected to the intake manifold and the third port is connected to the engine crankcase for oiling the crankshaft center main bearing.

The pumping action that takes place in the annular area of the pump body is due to different diameters of the plunger and differential plunger.

The oil pump output is controlled to regulate the amount of oil to the carburetor fuel/air mixture so that proper lubrication is possible at all engine speeds and loads.

2A8;M25335 M22;3005A F 300981

#### FUEL PUMP

The fuel pump functions due to negative and positive pressure from the engine crankcase. The pump senses this pressure through the impulse line (H).

Negative pressure from the engine crankcase causes the following to occur in the fuel pump.

1. Flapper valve (G) is sucked open.

2. Vacuum on the upper diaphragm (N), with springloaded shut-off valve, raises the diaphragm, causing the shut-off valve (M) to lift off its seat, opening the passage (L) to the fuel outlet lines (K).

3. Lower diaphragm (F) is sucked down, opening the inlet check valve (E) and closing the outlet check valve (J).

These three functions draw fuel through the filter (C), into chamber (A), and out opening (B) and through the inlet check valve (E) to the top of the lower diaphragm (F).

Positive pressure from the engine crankcase causes the following to occur in the fuel pump:

1. Flapper valve (G) is forced shut.

2. Lower diaphragm (F) is pushed up, closing the inlet check valve (E), opening the outlet check valve (J) and moves the fuel on top of the lower diaphragm past the spring-loaded shut-off valve (M) and out the lines (K) to the carburetor.

The upper diaphragm (N), with spring-loaded shut-off valve (M), remains in a raised position, keeping the valve off its seat and the passage to the outlet lines open, whenever the engine is running. This is due to the opening (negative pressure) and closing (positive pressure) of the flapper valve (G).

When the engine is stopped, a small bleed hole (I) in the flapper valve (G) allows air from the engine crankcase to bleed to the upper diaphragm (N) dispelling the vacuum. This allows the spring (O) to force the diaphragm (N) and shut-off valve (M) to close down, closing the passage (L) to the outlet lines (K).

When the shut-off valve is closed, fuel cannot drain back from the carburetor lines (K) or flow from the fuel tank past the shut-off valve (M). This keeps the engine from "flooding" when transporting the snowmobile.



## **DIAGNOSE MALFUNCTIONS**

#### CARBURETOR TOO RICH

Float level incorrect. Dirt under inlet needle valve. Silencer restricted. Wrong main jet. Choke system adjusted incorrectly. Jet needle clip positioned incorrectly. Air jet restricted.

#### CARBURETOR TOO LEAN

In-line fuel filter plugged or restricted.

Dirty fuel pick-up strainer in fuel tank.

Fuel pump impulse line plugged.

Hole in fuel pump impulse line.

Jet needle clip positioned incorrectly.

Wrong main jet.

Faulty fuel pump.

Pinched fuel lines.

Hole in intake silencer boot.

Head gasket leaking.

Operating with air intake silencer removed.

Air leakage at intake manifold gaskets.

Air leakage at crankshaft seals or crankcase mating surfaces.

Inlet needle valve restricted.

2A8; M22;3005A H 011081

# Group 10 MIKUNI CARBURETOR

## **REMOVE CARBURETOR**

1. Remove air silencer.

IMPORTANT: Remove hose from intake silencer before removing silencer. Hose can contact elbows of brake cable causing elbow to loosen and affect the brake adjustment.

- 2. Disconnect fuel line from carburetor.
- 3. Remove choke plunger assembly.
- 4. Remove throttle valve assembly.
- 5. Remove carburetor.





2A8;M25338 M22;3010A B 011081

## **DISASSEMBLE CARBURETOR**

1. Remove vent lines and power jet line.

2. Remove idle screw and air screw.

3. Loosen screws on float bowl and drain fuel from float chamber.



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

4. Remove float chamber.

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TM-1217 (Nov-81)

2A8; M22;3010A C 011081



#### **CLEAN CARBURETOR**

# IMPORTANT: Never clean jets or passages with small drills or wires.

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 towels 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.

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

5. Check seating surface on inlet valve and seat for damage. Retainer should not bind movement of the inlet valve.

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

7. Install floats in float chamber. Be sure floats are not binding on guides.

8. Be sure float arm and float pin are not binding.

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.

2A8; M22;3010A I 0110

## **INSTALL PILOT JET**

1. Install and tighten pilot jet.



## INSTALL NEEDLE JET

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



2A8;M25345 M22;3010A L 011081

2. Secure needle jet with washer and needle jet holder. Use a NEW O-ring on the holder.



# INSTALL NEEDLE VALVE AND FLOAT ARM

1. Install baffle plate and needle valve seat. There should be a gasket under and over the baffle plate. Tighten seat securely.



2. Install needle valve and spring retainer.



3. Install float arm and float arm pin. Legs on float arm should be as shown. Pin is installed from left to right.



#### 2A8;M25349 M22;3010A P 011081

## FLOAT LEVEL ADJUSTMENT

1. With carburetor inverted, the edge of the body should be parallel with the float arm.

2. If adjustment is necessary, bend only the actuating tab, not the float arm.



#### 2A8;M28458 M22;3010A Q 011081

## **INSTALL FLOATS**

1. Install floats with pins on floats down and to the inside of the float chamber. Install plastic retainers on float pins.



TM-1217 (Nov-81)

## INSTALL MAIN JET AND POWER JET

2. Install main jet (A) and power jet (B) in float chamber.



# INSTALL AIR SCREW AND THROTTLE STOP SCREW

1. Install air screw with spring. Turn screw in until it just seats. Do not force it.

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

3. Install throttle stop screw with spring. Turn screw in until it is flush with inside of bore.

## **INSTALL FLOAT BOWL AND VENT LINES**

1. Connect vent lines to carburetor.

2. Install gasket and float bowl on mixing chamber. Position clips and lines as shown.

3. Connect power jet line to carburetor.



## **INSTALL CARBURETOR**

1. Position carburetor in rubber mount and secure with clamp.

NOTE: Be sure carburetor with red dot on 1982 Models is installed on magneto side of engine.

2. Connect fuel line to carburetor.

30-10-06

248; M22;30104 V 011081 TM-1217 (Nov-81)

2A6; M22;3010A T 011081

## INSTALL THROTTLE VALVE

1. Install E-ring and plastic washer in correct groove of jet needle. Plastic washer goes between E-ring and throttle valve.

2. Guide throttle cable through cap, spring and slot in throttle valve.

3. Install plate between spring and throttle valve with tab on plate in slot of throttle valve.

4. Install cap on mixing chamber body.



2A8;M25353 M22;3010A W 011081

## INSTALL CHOKE PLUNGER

1. Be sure choke lever is down (no choke position).

2. Guide choke cable through cap and spring. Hook end button in choke plunger and install assembly.

NOTE: Adjust the choke before installing the choke assembly.



2A8;M25354 M22;3010A X 011081

## ADJUST CHOKE PLUNGER

1. Leave choke lever down (no choke position).

2. Loosen jam nut securing adjusting sleeve to brass choke adapter.

3. Turn adjusting sleeve (in or out) to obtain a dimension of 32 to 33 mm (1.25 to 1.30 in.) on the right choke and 31 to 33 mm (1.20 to 1.25 in.) on the left choke, from the bottom of choke plunger to bottom of brass choke adapter. Tighten jam nut against adapter.

4. Install washer and choke assembly in carburetor.



5. Place the choke lever on instrument panel in the down position. Use a 0.762 mm (0.030-in.) feeler gauge to check clearance between choke lever and instrument panel. This is the minimum required clearance between the choke lever and instrument panel.



2A8;M24939 M22;3010A Z 011081

## ADJUST THROTTLE CABLES

# IMPORTANT: Oil injection pump must be synchronized with the carburetor throttle valves.

1. Lock throttle lever against handgrip with a strong rubber band or clamp.

2. Place your finger in the throat of each carburetor. Loosen jam nut and turn adjusting sleeve until the backside of throttle valve is flush with the bore. Tighten jam nut.

NOTE: No part of the throttle valve should restrict air flow through the carburetor throat when the throttle valve is in the wide open position.

3. Remove rubber band or clamp from throttle lever. This allows throttle valve to fully seat in bore.



2A8;M24940 M22;3010A AA D11081

4. Turn both idle adjusting screws in (clockwise) until the screws contact throttle valves. Turn screws clockwise three additional turns. This gives preliminary idle speed.

5. Look into the throat of both carburetors and slowly compress the throttle lever on the handgrips. Both throttle valves should begin to rise at exactly the same time; if not, repeat Steps 1 through 5.

IMPORTANT: There must be slight freeplay between the front of throttle lever and safety switch housing.



6. Turn both air screws clockwise (in) until a slight seating resistance is felt.

7. Back air screws out (counterclockwise) 1-1/2 turns.

IMPORTANT: Lubricate throttle cable once each season with LPS or WD-40. Hold the throttle lever against handgrip and allow lubricant to run down cable. DO NOT use engine oil or silicon spray. These lubricants may destroy the throttle cable or cause cable to stick in cold temperatures.

## SET ENGINE IDLE SPEED

1. Install air intake silencer and run engine until operating temperature is obtained. DO NOT run engine for more than 5 minutes at idle speed.

IMPORTANT: DO NOT use the air screws at any time to set engine idle speed. Air screws should be adjusted as explained in Steps 6 and 7.

## CHECK CHOKE ADJUSTMENT

1. After engine is warmed up and idle speed is correct, check choke adjustment.

2. Flip choke lever up to the first position and the engine should stop. This indicates that the choke is operating properly.

3. Repeat choke adjustment if necessary.



2A8; M22;3010A AD 011081

2A8; M22;3010A AE 011081

## CARBURETOR RECOMMENDATIONS FOR ALTITUDE AND TEMPERATURE

#### TEMPERATURES ABOVE 0°F (-18°C)

CARBURETOR	SEA LEVEL TO 4000 FT. (1219m)	4000 to 8000 FT. (1219 to 2438 m)	8000 FT. and UP (2438 m)
Main Jet	150	130	100
Power Jet			
PTO Carb.	110	90	85
Mag. Carb.	105	85	80
Jet Needle	6DH22-3	6DH22-3	6DH22-3
Needle Jet	159 (P4)	159 (P4)	159 (P4)
Throttle Valve	3.5	3.5	3.5
Pilot Jet	40	40	40
Air Screw (Turns Open)	1-1/2	1-1/2	1-1/2
Idle Speed (RPM's)	2000 - 2500	2000 - 2500	2000 - 2500

2A8; M22;3010A AF 011081

TEMPERATURES BELOW 0°F (-18°C)

CARBURETOR	SEA LEVEL TO 4000 FT. (1219 m)	4000 to 8000 FT. (1219 to 2438 m)	8000 FT. and UP (2438 m)
Main Jet	160	140	110
Power Jet			
PTO Carb.	115	90	85
Mag. Carb.	110	85	80
Jet Needle	6DH22-3	6DH22-3	6DH22-3
Needle Jet	159 (P4)	159 (P4)	159 (P4)
Throttle Valve	3.5	3.5	3.5
Pilot Jet	40	40	40
Air Screw (Turns Open)	1-1/2	1-1/2	1-1/2
Idle Speed (RPM's)	2000 - 2500	2000 - 2500	2000 - 2500

2A8; M22;3010A AG 011081
## Group 15 **OIL INJECTION SYSTEM**

## TEST OIL INJECTION PUMP

1. Remove air intake silencer.

**IMPORTANT:** Remove hose from intake silencer before removing silencer. Hose can contact elbow of brake cable causing elbow to loosen and affect the brake adjustment.

2. Disconnect the in-line fuel filter from the fuel tank line. Plug fuel tank line.



CAUTION: Use care when disconnecting in-line filter. Avoid fires due to smoking or careless maintenance practices.

3. Connect auxillary fuel tank (with 50:1 pre-mix fuel) to the in-line filter.

NOTE: Remove air intake silencer and left carburetor to remove oil injection pump lines. Reinstall carburetor before starting the engine in Step 6.



2A8;M25355 M22;3015A A 011081

4. Disconnect oil pump output lines at pump.

5. Install separate oil lines to each outlet and place end of each in a separate container.

6. Start and run engine at 3000 rpm.

7. Hold the pump lever in the rear WIDE OPEN POSITION. Measure the output of each port in a calibrated glass tube. Correct output from the port to crankcase should be 3.35 to 4.06 cc per minute. The output from each port to the cylinder fittings should be 1.68 to 2.03 cc per minute. Replace pump if output is below these specifications.

- 8. Shut-off engine.
- 9. Connect lines to pump discharge ports.
- 10. Remove auxillary tank and connect in-line filter.
- 11. Install air intake silencer.



2A8;M25356 M22;3015A B 011081

## **REMOVE OIL INJECTION PUMP**

- 1. Remove engine.
- 2. Drain gear case oil.
- 3. Remove gear case cover. Check to see if spacer used on idler gear came off with cover. Do not lose spacer.



2A8;M25357 M22;3015A C 011081

- 4. Remove idler gear, spacer behind the gear and shaft.
- 5. Remove coolant pump and coupling. Coupling is between oil injection pump drive shaft and coolant pump shaft.



6. Remove retaining nut and gear.

7. Remove oil lines from pump and remove oil injection pump.



2A8;M25359 M22;3015A E 011081

## **INSPECT GEAR CASE**

1. Check gear case vent hole. Hole must be open. If hole is plugged, the gear case oil could be sucked past the seal and into the crankcase. Loss of oil would result in gear and bearing failure.

2. Check the gears, bearings and seals for wear or damage and replace if necessary.

3. Pry out seal with a screwdriver.



## **REMOVE BEARING**

4. Press bearing out of housing.



### **INSTALL BEARING**

5. Press new bearing in flush with machined boss on inside of cover.



2A8;M25362 M22;3015A H 011081

## INSTALL OIL SEAL

6. Press seal in flush with cover.



2A8;M25363 M22;3015A [ 011081

## INSTALL OIL INJECTION PUMP

1. Install a new O-ring in pump flange. Apply a thin coat of M64850 Silicon Rubber Adhesive over the O-ring. Install pump to engine.

NOTE: Use new sealing washers on the mounting bolts to prevent gear case oil leakage.

2. Install oil pump drive gear. Tighten nut to (22 N·m) 16 ft-lbs. Install idler gear wth one spacer on each side of gear.



3. Lay a rule across the gear case and measure from rule to inner race of bearing.



4. Lay a rule across face of crankshaft gear and measure between rule and gasket surface.

5. Subtract the dimension in Step 5 from the dimension in Step 4. This gives a clearance to start from for adding the proper shims between gear and bearing.

6. With correct shims, there should be an axial clearance of (0.15 to 0.39 mm) 0.004 to 0.016-in.

7. Install a new O-ring in gear case cover and coat O-ring slightly with M64850 Silicon Rubber Adhesive. Fill outer cover seal with grease (between seal lips).

8. Install gear case cover.

9. Install lines to injection pump and engine.

10. Coat injection pump and water pump coupling and shafts with molybdenum grease.

11. Install water pump.

12. Add (40 cc) 1.35 ounces of 10W-40 (Series SE) oil to the gear case.

13. Bleed oil injection pump and lines.



## ADJUST CONTROL CABLE

IMPORTANT: The oil injection pump control lever must be adjusted to move off the peg at exactly the same time that the carburetor throttle valves start to rise.

- 1. Remove the air intake silencer.
- 2. Remove left-hand carburetor.

3. Loosen the two jam nuts securing control cable adjusting sleeve.

4. Back sleeve out to tighten or turn in to loosen cable. Cable should have slight freeplay; it should not be stretched tight. Control lever should be tight against stop pin.

5. Press throttle lever on handgrip. The throttle valves and lever should all start to move at exactly the same time.

6. When adjustment is correct, tighten jam nuts.

7. Install left-hand carburetor and air intake silencer.



#### Oil Injection System

## BLEED PUMP AND LINES

## IMPORTANT: Fill oil tank with BIA approved 2-cycle oil before bleeding pump.

- 1. Remove air intake silencer.
- 2. Remove bleed screw.

3. Hold control lever in the full open position until all air is deleted from the oil line feeding the pump. Install bleed screw.

4. Connect an auxiliary fuel tank (with 50:1 pre-mix fuel) to the in-line fuel filter.

5. Start and run engine at idle speed.

6. Hold the oil pump control lever in the full open position for 1 minute. This generates maximum oil injection pump flow and should purge the discharge oil lines of air.

- 7. Stop engine and install air intake silencer.
- 8. Remove auxillary fuel tank. Refill oil tank.



2A8;M25368 M22;3015A N 011081

#### FUEL PUMP AND IN-LINE FILTER

1. The fuel pump is non-serviceable.

2. Change the filter annually or when contamination builds up at the base of the cone.

SCREEM	V
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1. Disconnect fuel line from tank fitting. Remove fitting with pickup line from tank.

2. Remove screen from end of line.

3. Clean screen with solvent and compressed air. Replace screen if it is damaged.

4. Replace gasket on fuel tank fitting.



248: M22:3020A A 011081

#### FUEL TANK

1. Disconnect fuel line. Drain tank.



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

2. Remove seat and tank hold-down clips. Slide tank rearward to remove.

3. Tank can be cleaned with solvent and compressed air.

2A8; M22;3020A C 011081

Page

## CONTENTS

#### Page

#### **GROUP 05 - GENERAL INFORMATION** Electrical System Wiring Diagram ..... 40-05-01 Ignition System Wiring Diagram ..... 40-05-02 Diagnose Malfunctions ..... 40-05-03 **GROUP 10 - CAPACITOR DISCHARGE IGNITION** (SERIAL NO. 120,001-190,000) Test with JDM-74 Tester ..... 40-10-01 Test No. 1 - Coil Output ..... 40-10-01 Test No. 2 - CDI Unit Output ..... 40-10-02 Test No. 3 - Exciter Coil Ouput ..... 40-10-03 Test No. 4 - Pulser Coil Output ..... 40-10-04 Remove Flywheel and Stator ..... 40-10-05 Install Stator and Flywheel (Time Ignition) ..... 40-10-06 Replace Pulser and Exciter Coils ..... 40-10-07 **GROUP 12 - CAPACITOR DISCHARGE IGNITION** (SERIAL NO. 190,001-) Test Ignition with JDM-74 Tester ..... 40-12-01 Test No. 1 - CDI and Coil Output ..... 40-12-01 Test No. 2 - Exciter Coil Output ..... 40-12-02 Test No. 3 - Pulser Coil ..... 40-12-03 Remove Flywheel and Stator ..... 40-12-05 Install Stator and Flywheel (Time Ignition) ..... 40-12-06 Replace Pulser and Exciter Coils ..... 40-12-07

GROUP 15 - LIGHTING SYSTEM AND SW	VITCHES
Lights Dim	40-15-01
Test Alternator	40-15-01
Test Voltage Regulator and	
Lighting Coil	40-15-02
Test Headlight Dimmer Switch	40-15-02
Test Brake Light Switch	40-15-02
Test Engine Kill Switch	40-15-03
Test Ignition Switch	40-15-03
Test Speed Limiter Switch	40 <del>-</del> 15-03
Speed Limiter System	40-15-04
Adjust Headlight	40-15-05
GROUP 20 - SPECIFICATIONS	

Electrical System Specifications	40-20-01
Torque Specifications	40-20-01
Light Bulb Chart	40-20-01

## Group 05 GENERAL INFORMATION





#### DIAGNOSE MALFUNCTIONS

#### LIGHTS WILL NOT LIGHT

Electrical 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.

#### **ENGINE HARD TO START**

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

#### ENGINE MISFIRES

Speed limiter system malfunctioning. Spark plugs fouled or defective. Electrical connections loose or corroded. Engine not timed properly.

#### ENGINE BACKFIRES AND RUNS UNEVENLY

Engine not timed properly Speed limiter system malfunctioning.

2A8; M22;4005A D 300981

#### TEST 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 or the CDI ignition system will be destroyed.

- 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 - COIL OUTPUT

1. Connect test adapter (red end) to either spark plug cable (close to plug).

2. Connect JDM-74 Tester yellow lead to Test Adapter (black end).

3. Connect JDM-74 Tester red lead to ground.



248; M22;4010A A 300981

4. Set test for "LOW" range.

5. Turn test dial to "25."

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 7 twice.

9. Repeat procedure on the other spark plug wire.

#### TEST RESULTS

Indicator lights on both spark plugs. Ignition system OK.

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



## TEST NO. 2 - CDI UNIT OUTPUT

1. Separate three-wire connector between CDI unit (A) and coil (B).



2A8;M28461 M22;4010A D 300981

2. Connect either load coil lead to male terminal (brown lead) on CDI end of three-wire connector.

3. Connect remaining load coil lead to both female terminals (blue leads). Make sure contact is good on both terminals.

4. Connect JDM-74 Tester red lead to load coil lead on male terminal (brown lead).

5. Connect JDM-74 Tester yellow lead to load coil lead on female terminal (blue lead).



6. Set tester for "HIGH" range.

7. Turn dial to "55."

8. Turn key switch "ON" and place emergency stop switch in center position.

9. Crank engine with starter rope and observe indicator light.

10. Push reset button and repeat Step 9 twice.

#### **TEST RESULTS**

Indicator lights:

Remove tester and replace coil.

Indicator does not light:

Remove tester, reconnect three-wire connector and proceed to Test No. 3.



## **TEST NO. 3 - EXCITER COIL OUTPUT**

1. Disconnect white CDI lead from engine harness.

2. Disconnect red CDI lead from engine harness.



3. Connect JDM-74A-6 Test Harness red lead to engine harness red lead.

- 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.



TM-1217 (Nov-81)

- 7. Set tester for "HIGH" range.
- 8. Turn dial to "55."
- 9. Crank engine with starter rope and observe indicator light.

10. Push reset button and repeat Step 9 twice.

#### TEST RESULTS

Indicator lights:

Proceed to Test No. 4

Indicator does not light:

Remove tester and replace exciter coil.



2A8;M23706 M22;4010A I 300981

## TEST NO. 4 - PULSER COIL OUTPUT

1. Change the connections from Test No. 3 as follows:

2. Disconnect JDM-74 Tester red lead from JDM-74A-6 Test Harness red lead.

3. Connect JDM-74 Tester red lead to JDM-74A-6 Test Harness yellow lead.



- 4. Set tester for "HIGH" range.
- 5. Turn dial to "55."
- 6. Crank engine with starter rope and observe indicator light.
- 7. Push reset button and repeat Step 6 twice.

#### TEST RESULTS

Indicator lights:

Remove tester and replace CDI unit.

Indicator does not light:

Remove tester and replace pulser coil.



248;M23706 M22;40104 K 300981

## REMOVE FLYWHEEL AND STATOR

1. Remove engine.

2. Remove recoil starter, starter cup and inertia disk.

NOTE: Inertia disk not used on 1982 Models.

3. Remove flywheel nut and washer.



4. Use an air or electric impact wrench to remove flywheel.



2A8;M25527 M22;4010A M 300981

5. Remove two yellow leads (A) and one brown lead (B) from connector. Mark their location in connector for reassembly.

NOTE: One yellow wire and one green/white wire used on 1982 Models.

6. Disconnect red lead and white lead.

7. Scribe a mark on the stator plate and the crankcase boss for proper indexing during reassembly.

8. Remove stator screws and pull leads through grommet as you remove stator.



2A8;M25528 M22;4010A N 300981

# INSTALL STATOR AND FLYWHEEL (TIME IGNITION)

1. Guide stator leads through grommet.

2. Install stator so that mark on stator plate aligns with mark on crankcase boss. Tighten stator screws to (1.4 N·m) 5 ft-lbs.



- 3. Connect red lead and white lead.
- 4. Install two yellow leads and one brown lead in connector.
- NOTE: Install one yellow lead and one green/white lead on 1982 models.



A8;M25530 M22;4010A P 300981

5. Place flywheel key in crankshaft.

6. Install flywheel, lock washer and nut.

7. Hold flywheel with JDM-64-1 Flywheel Holding Tool and tighten nut to (81.4 N·m) 60 ft-lbs.

8. Bend tabs on washer. Install inertia disk and starter cup.

NOTE: Inertia disk not used on 1982 models.

9. Install recoil starter.

10. Install engine.



2A8;M25531 M22;4010A Q 300981

## **REPLACE PULSER AND EXCITER COILS**

- 1. Remove flywheel and stator.
- 2. Remove screws.



3. Chip epoxy seal from connections on coil being replaced.

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. Be sure curvature of coils align with curve of stator plate, then tighten screws.



2A8;M25533 M22;4010A S 300981

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#### TEST 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**

1. Connect test adaptor (red end) to either spark plug cable (close to plug).

2. Connect JDM-74 Tester yellow lead to test adaptor (black end).

3. Connect JDM-74 Tester red lead to ground.



2AB; M22;4012A A 100181

- 4. Set tester for "HIGH" range.
- 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.
- 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**

- 1. Disconnect white CDI lead from engine harness.
- 2. Disconnect red CDI lead from engine harness.



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TO SPARK PLUGS



harness red lead.

harness white lead.

Harness red lead.

TM-1217 (Nov-81)

7. Set tester for "HIGH" range. Turn dial to "55." 8. Crank engine with starter rope and observe indicator. 60 30 9. Push reset button and repeat Step 8 twice. RESET INDICATOR 20 **TEST RESULTS** Ο ٢ 100 Indicator lights: Proceed to Test No. 3. LOW ( HIGH Indicator does not light: Replace exciter coil. 2A8;M23706 M22;4012A F 100181 **TEST NO. 3 - PULSER COIL** RE 1. Disconnect JDM-74 Tester red lead from JDM-74A-6 test harness red lead. RED YELLOW RED 2. Connect JDM-74 Tester red lead to JDM-74A-6 test harness yellow lead. YELLO WHITE M25595 2A8;M25595 M22;4012A G 100181 3. Set tester for "HIGH" range. Turn dial to "55." 4. Crank engine with starter rope and observe indicator. 50 60 30 5. Push reset button and repeat Step 5 twice. RESET INDICATOR 20 **TEST RESULTS** Ο 10 100 Indicator lights: Pulser coil OK. LOW HIGH Indicator does not light: Replace pulser coil. 2A8;M23706 M22;4012A H 10038

- 7. Set tester for "HIGH" range.
- 8. Turn dial to "55."
- 9. Crank engine with starter rope and observe indicator light.

10. Push reset button and repeat Step 9 twice.

#### TEST RESULTS

Indicator lights:

Proceed to Test No. 4

Indicator does not light:

Remove tester and replace exciter coil.



## TEST NO. 4 - PULSER COIL OUTPUT

1. Change the connections from Test No. 3 as follows:

2. Disconnect JDM-74 Tester red lead from JDM-74A-6 Test Harness red lead.

3. Connect JDM-74 Tester red lead to JDM-74A-6 Test Harness yellow lead.



- 4. Set tester for "HIGH" range.
- 5. Turn dial to "55."
- 6. Crank engine with starter rope and observe indicator light.
- 7. Push reset button and repeat Step 6 twice.

#### TEST RESULTS

Indicator lights:

Remove tester and replace CDI unit.

Indicator does not light:

Remove tester and replace pulser coil.



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ZA8;M23705 M22;4010A K 300981

### **REMOVE FLYWHEEL AND STATOR**

1. Remove engine.

2. Remove recoil starter, starter cup and inertia disk.

NOTE: Inertia disk not used on 1982 Models.

3. Remove flywheel nut and washer.



4. Use an air or electric impact wrench to remove flywheel.



248;M25527 M22,40104 M 500981

TM-1217 (Nov-81)

5. Remove two yellow leads (A) and one brown lead (B) from connector. Mark their location in connector for reassembly.

NOTE: One yellow wire and one green/white wire used on 1982 Models.

6. Disconnect red lead and white lead.

7. Scribe a mark on the stator plate and the crankcase boss for proper indexing during reassembly.

8. Remove stator screws and pull leads through grommet as you remove stator.



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2A8;M25528 M22;4010A N 300981

# INSTALL STATOR AND FLYWHEEL (TIME IGNITION)

1. Guide stator leads through grommet.

2. Install stator so that mark on stator plate aligns with mark on crankcase boss. Tighten stator screws to (1.4 N·m) 5 ft-lbs.



ZA8;M25529 M22;4010A 0 300981

- 3. Connect red lead and white lead.
- 4. Install two yellow leads and one brown lead in connector.

NOTE: Install one yellow lead and one green/white lead on 1982 models.



TM-1217 (Nov-81)

5. Place flywheel key in crankshaft.

6. Install flywheel, lock washer and nut.

7. Hold flywheel with JDM-64-1 Flywheel Holding Tool and tighten nut to (81.4 N·m) 60 ft-lbs.

8. Bend tabs on washer. Install inertia disk and starter cup.

NOTE: Inertia disk not used on 1982 models.

9. Install recoil starter.

10. Install engine.



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2A8;M25531 M22;4010A Q 300981

## REPLACE PULSER AND EXCITER COILS

1. Remove flywheel and stator.

2. Remove screws.



- 3. Chip epoxy seal from connections on coil being replaced.
- 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. Be sure curvature of coils align with curve of stator plate, then tighten screws.



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2A8;M25533 M22;4010A S 300981

#### LIGHTS DIM

IMPORTANT: Check the speed limiter system before checking the voltage regulator or alternator. The speed limiter is voltage regulated. A short in the limiter can affect the lights, due to interplay between the limiter and voltage regulator.

1. Disconnect speed limiter from system.

2. Run engine at idle speed.

3. If lights remain normal, speed limiter is faulty.

4. Replace limiter.

5. If lights remain dim, check voltage regulator and alternator.

NOTE: Check all wiring and harness connectors before conducting tests on alternator, voltage regulator and switches.

## TEST ALTERNATOR

1. Disconnect five-wire coupler.

2. Connect JDM-74 Tester between the two yellow leads from the engine.

NOTE: Use one yellow lead and one green/white lead on 1982 Models.

3. Set tester dial to "80" on the "LOW" circuit.

4. Crank engine with starter rope and observe indicator light.

5. Push reset button and repeat step 4 twice.

#### TEST RESULTS

Indicator lights:

Alternator is O.K.

Indicator does not light:

Alternator is defective.



248;M23726 M22;4015A B 100181

2A8; M22;4015A A 100181

# TEST VOLTAGE REGULATOR AND LIGHT-ING COIL

1. Disconnect the yellow lead from the voltage regulator. Start and idle engine.

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

Lights light: Replace voltage regulator.

Lights do not light: Test alternator. Alternator tests OK, replace voltage regulator.



### TEST HEADLIGHT DIMMER SWITCH

1. Disconnect headlight coupler from wiring harness.

2. Connect flashlight tester between pink and yellow leads. 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 dimmer switch is defective.



2A8;M23726 M22;4015A 0 100181

#### **TEST BRAKE LIGHT SWITCH**

1. Disconnect brake light coupler. Connect flashlight tester between orange and tan leads.

2. 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 brake light switch is defective.



## TEST ENGINE KILL SWITCH

1. Disconnect engine kill switch coupler. Connect flashlight tester between black and white leads.

2. Tester should light when kill switch is turned right or left and go out when switch is in the center position.

#### TEST RESULTS

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



### **TEST IGNITION SWITCH**

1. Remove wiring harness from switch. Connect a flashlight tester between switch terminals.

2. Test light should light with key switch in "ON" position and go out in the "OFF" position.

#### TEST RESULTS

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



2A8;M28476 M22;4015A F 100181

2A8:M23731 M22:4015A G 100181

## TEST SPEED LIMITER SWITCH

1. Disconnect speed limiter coupler.

2. Connect flahslight tester between orange and tan leads. Test light should light when throttle lever is pressed and go off when throttle is released.

#### TEST RESULTS

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



## SPEED LIMITER SYSTEM

The speed limiter system provides two types of protection; it limits engine speed to 3500 to 3700 rpm if the throttle lever is released and the carburator slides stick open and it also limits maximum engine speed to 9000 rpm in the event of a broken drive belt at wide open throttle.

The function of the speed limiter system can be checked by holding the throttle lever pin rearward and pressing the throttle lever slowly. If the system is functioning correctly, the engine will "miss" or "cutout" at 3500 to 3700 rpm.

The "miss" or "cutout" will also occur at high speed running if engine speed exceeds 9000 rpm.

2A8; M22;4015A ! 100181

#### Lighting System and Switches



1. Postion snowmobile on a flat surface with the headlight (7.6 m) 25 ft. from a vertical surface.

2. With operator on seat and headlight on "HIGH" beam, light beam center line should be straight ahead and (41.2 cm) 16-1/4 ins. 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 left or right.


### **ELECTRICAL SYSTEM SPECIFICATIONS**

ltem

#### Specification

Spark Plug Spark Plug Gap\* Ignition Timing N-2 (AM52640) QN-2 (AM55044) (0.635 mm) 0.025 in. Kokusan (CDI) Align mark on stator with mark on crankcase.

\*Spark plugs are gapped at 0.025 in. (0.635 mm) at the factory. Do not regap lugs. When plug gap widens to 0.045 in. (1.143 mm), replace the plugs.

#### 2A8; M22;4020A A 100181

2A8; M22;4020A 8 100181

### TORQUE SPECIFICATIONS

ltem

Torque

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

### LIGHT BULB CHART

Location

#### John Deere Part No.

Headlight Brake - Taillight Speedometer Tachometer Coolant Gauge AM51959 or AM53888 AM52619 AM52847 AM52847 AT22970

Litho in U.S.A.

# CONTENTS

	Page
GROUP 05 - GENERAL INFORMATION 102C Drive Sheave (John Deere Comet) John Deere Driven Sheave Chain Case and Drive Chain Brakes Diagnose Malfunctions Clutching Recommendations (Serial No. 120,001-190,000) Clutching Recommendations (Serial No. 190,001- )	50-05-01 50-05-01 50-05-02 50-05-02 50-05-03 50-05-04 50-05-05
GROUP 10 - 102C DRIVE SHEAVE Remove Drive Sheave Disassemble Sheave Inspect Bushing Inspect Guide Buttons and Rollers Inspect Arms Inspect Fixed and Movable Faces Lubricate Drive Sheave Assemble Drive Sheave Install Drive Sheave	50-10-01 50-10-02 50-10-03 50-10-03 50-10-03 50-10-04 50-10-05 50-10-05 50-10-06
GROUP 12 - JOHN DEERE (TR800) DRIVE Remove Drive Sheave	SHEAVE 50-12-01 50-12-03 50-12-04 50-12-04 50-12-04 50-12-05 50-12-05 50-12-06 50-12-07
GROUP 15 - JOHN DEERE DRIVEN SHEA Remove Driven Sheave Disassemble Driven Sheave Inspect and Repair Driven Sheave Assemble Driven Sheave Install Driven Sheave	VE 50-15-01 50-15-01 50-15-01 50-15-04 50-15-05

	Page
GROUP 20 - DRIVE BELT	
Remove and Install Drive Belt	50-20-01
Check Drive Belt Tension	50-20-01
Align Drive Belt	
(Serial No. 120,001-190,000)	50-20-02
Align Drive Belt	
(Serial No. 190,001- )	50-20-03
Diagnose Malfunctions	50-20-04
Diagnose Malfunctions GROUP 25 - CHAIN CASE, SECONDAR' AND DRIVE SHAFT Final Drive Ratio's Remove Chain and Sprockets Inspect Chain and Sprockets Install Secondary Shaft Install Secondary Shaft Install Secondary Shaft Inspect Drive Shaft Inspect Drive Shaft Install Drive Shaft Inspect Chain Case Install Chain Case	50-20-04 Y SHAFT 50-25-01 50-25-02 50-25-02 50-25-02 50-25-03 50-25-03 50-25-04 50-25-04 50-25-06 50-25-06 50-25-07 50-25-08 50-25-09 50-30-01
Inspect Brake Parts	50-30-02
Install Disk Brake	50-30-02
Remove and Install Brake Pucks	50-30-02
Adjust Brake	50-30-03
GROUP 35 - SPECIFICATIONS Specifications Torque for Hardware	50-35-01 50-35-01

# 102C DRIVE SHEAVE (JOHN DEERE, COMET)

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

When stopped or at idle speed, the sides of the sheave do not contact the drive belt, thus providing a de-clutched position.

Increasing engine speed causes the centrifugally-actuated arms (B) in the movable face (A) to swing out against the spider rollers (C) on the fixed face (D). This action forces the sheave halves together, engaging the drive belt with the sheave and starts snowmobile movement.



2A8;M23572 M22;5005A B 011081

### JOHN DEERE DRIVEN SHEAVE

The drive sheave (C) 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).

- A Low-Speed Position
- **B** High-Speed Position
- C Drive Sheave
- D Drive Beit
- E Driven Sheave



The driven sheave (A) 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 toque requirement occurs (such as climbing a steep hill) after the snowmobile is up to speed, the cam bracket (H) in the driven sheave forces the sheave halves together, obtaining a slower travel speed (I) while maintaining high engine rpm (C) for increased torque.

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.



# CHAIN CASE AND DRIVE CHAIN

The fully-enclosed chain case consists of a silent chain, two sprockets, and adjustable tensioner. The chain and sprockets are oil-bath lubricated.

The adjustable tensioner maintains proper chain tension when both accelerating and decelerating. Chain tension adjustment is necessary.

2A8; M22;5005A E 011081

# BRAKES

The mechanical disk brake (A) 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 for braking.

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



TM-1217 (Nov-81)

General Information

#### **DIAGNOSE MALFUNCTIONS**

#### DRIVE SHEAVE OPERATING AT TOO LOW RPM

Spring weak or broken. Inspect roller arm weights.

#### DRIVE SHEAVE OPERATING AT TOO HIGH RPM

Wrong spring Drive sheave dirty internally. Worn spider buttons.

#### **Drive Sheave Sticking**

Belt mold builds up on center post and movable face cannot slide properly.

#### DRIVE SHEAVE SHIFTING ERRATIC

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.

#### DRIVEN SHEAVE NOT OPENING PROPERLY

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

#### DRIVEN SHEAVE OPENING TOO EASILY

Spring weak or broken. Spring pretensioned improperly. Wrong cam

#### UNEVEN DRIVE BELT WEAR

Sheaves misaligned. Engine mounts loose.

#### DRIVE BELT GLAZED

Excessive slippage. Oil on sheave surfaces.

#### DRIVE BELT WORN NARROW IN ONE SECTION

Excessive slippage caused by stuck track.

#### DRIVE BELT TOO TIGHT AT IDLE SPEED

Engine idle set too fast. Incorrect distance between sheaves. Incorrect belt length

#### DRIVE BELT EDGE CORD BREAKAGE

Sheaves misaligned.

#### BRAKE NOT HOLDING PROPERLY

Brake cable out of adjustment. Brake pucks worn. Brake pucks oil-saturated. Key sheared on brake disk.

#### BRAKE NOT RELEASING PROPERLY

Return spring weak or broken. Brake lever bent or damaged causing binding.

#### CHAIN CASE LEAKING

Gaskets on drive shaft bearing flangettes or secondary shaft bearing flangettes damaged.

O-ring on drive shaft or secondary shaft bearings damaged.

Chain case cracked or broken.

#### RAPID CHAIN AND SPROCKET WEAR

Insufficent oil in chain case. Sprockets out of alignment due to improper assembly.

Altitude	Clutch	Governed Speed (rpm)	102	Secondary Clutch		Chain Case			
	Engagement (rpm)		Spacers In Clutch	Clutch Spring	Arm Kit	Spring Position	Cam	Gearing Sprockets	Chain (Pitch)
Sea Level to 4000 Ft. (0 to 1219 m)	4400 to 4600	8000 to 8200	2	Purple*	AM55172	No. 2	44	22 Tooth* 35 Tooth*	66
4000 to 8000 Ft. (1219 to 2438 m)	5000 to 5200	to	2	Green	AM55112	No. 2	44	22 Tooth 42 Tooth	70
8000 Ft. and Above (2438 m)	5200 to 5400	8200 to 8400	2	Gold	AM55112	No. 2	44	22 Tooth 42 Tooth	70

# CLUTCHING RECOMMENDATIONS (SERIAL NO. 120,001-190,000)

\*Factory Installed

- NOTE: At altitudes of 4000 to 6000 feet (1219 to 1829 m), in many cases, satisfactory performance can be obtained by using 22/39 gearing, 68 pitch chain, AM55172 arms and a green primary clutch srping.
- IMPORTANT: If clutch engagement is "harsh" when using either the green or gold primary clutch spring and AM55112 primary arm kit, install special engagement spacer (M69492) between the spider and movable face. Remove one of the present spacers and install special engagement spacer.

2A8;M29993 M22;5005A H 01106

)

Altitude	Clutch G Engagement (rpm)	Governed Speed (rpm)	TR800 Primary Clutch				Secondary Clutch		Chain Case	
			Spacers In Clutch	Clutch Spring	Weight Kit	Ramp Kit	Spring Position	Cam	. Gearing Sprockets	Chain (Pitch)
Sea Level to 4000 Ft. (0 to 1219 m)	4400 to 4600	8000 to 8200	2	Green*	6-AM5 <u>5</u> 476	No. 1 AM55477	No. 2	44	21 Tooth* 39 Tooth*	68
4000 to 8000 Ft. (1219 to 2438 m)	5100 to 5300	8000 to 8200	2	Red	3-AM55476 3-AM55478	No. 2 AM55479	No. 2	44	20 Tooth 39 Tooth	66
8000 Ft. and Above (2438 m)	5100 to 5300	8000 to 8200	2	Red	3-AM55476 3-AM55478	No. 2 AM55479	No. 2	44	19 Tooth 39 Tooth	66

# CLUTCHING RECOMMENDATIONS (SERIAL NO. 190,001-

\*Factory Installed

NOTE: At altitudes of 4000 to 6000 feet (1219 to 1829 m), in many cases, satisfactory performance can be obtained by using 20/39 gearing, 66 pitch chain, No. 2 ramps, green primary spring, with 3-AM55476 and 3-AM55478 primary clutch weights.

2A8;M29992 M22;5005A [ 011081

#### General Information

# Group 10 102C DRIVE SHEAVE

### **REMOVE DRIVE SHEAVE**

- 1. Remove drive belt and knock-out plug from side of pan.
- 2. Remove retaining screw and washer.



3. Screw JDM-41-1 Puller into sheave hub until sheave comes loose from the crankshaft.

NOTE: Use an impact wrench or 1/2-in. socket wrench with long handle to remove retaining screw and to install JDM-41-1 Puller.



### DISASSEMBLE SHEAVE

- 1. Remove every other screw from cover plate.
- 2. Remove three remaining cap screws equally.
- 3. Remove cover plate and spring.
- 4. Install JDM-41-3 Spider Tool (A) over hub.

5. Install JDM-41-5 Hub Lock Tool (B) over hub with pin of tool through cross hole in hub.



6. Clamp assembly securely in vise. Install 1/2-in. socket wrench with long handle in Spider Tool (B). Turn counterclockwise to loosen spider from hub.

IMPORTANT: Do not tighten vise too tight. Excess pressue on JDM-41-5 Hub Lock Tool can distort fixed face hub.

7. Remove Hub Lock (A) and Spider tools. Turn spider off hub.

NOTE: Remove spacer rings and movable face. Note spacers for reassembly.



### **INSPECT BUSHING**

1. If bushing in cover plate is worn or damaged, replace cover plate. Bushing is not serviceable.



2A8;M19254 M22;5010A D 021081

# INSPECT GUIDE BUTTONS AND ROLLERS

1. Inspect guide buttons (A) and rollers (E) in spider. Replace if necessary.

- 2. Use pliers to remove guide buttons.
- 3. Remove pin, roller and three washers.

4. Install roller in spider with a fiber washer (C) on each side of roller. Fiber washer (D) should be installed with fiber side facing roller.

IMPORTANT: Position small dot (B) on guide buttons (A) straight up or straight down. This matches bearing surface of guide button to bearing surface of movable face.



A---Guide Button B---Dot C—Fiber Washer D—Roller

2A8;M29193 M22;5010A F 021081

# INSPECT ARMS

1. Inspect arms for wear and replace as necessary.

NOTE: Duralon bushng in the arm is replaceable. If arm is too loose on the pivot bolt, press out the bushing and press in a new one.

2. Remove lock nut (A), pivot bolt (C), two steel washers (B) and arm (D).



2A8;M25543 M22;5010A G 021081

3. Install arm (D) in movable face with a steel washer (B) on each side of arm.

4. Install pivot bolt (C) from right to left. Install a NEW lock nut (A). DO NOT tighten nut.

NOTE: Pivot bolt nut is tightened during assembly.



# INSPECT FIXED AND MOVABLE FACES

1. Check sheave faces for pitting or wear. Replace as necessary.

2. Inspect bushing of movable face and hub of fixed face for damage or wear.

3. Measure outside diameter of fixed face hub and inside diameter of movable face bushing. Allowable clearance should not exceed (0.762 mm) 0.030-in. If clearance is greater, replace movable face bushing.

4. Use a hacksaw blade to carefully cut through the movable face bushing in several places.

IMPORTANT: DO NOT saw into metal of movable face.

Remove bushing with a small cold chisel and hammer.



2A8;M19259 M22;5010A J 021081

2A8; M22;5010A I 021081

5. Install new bushing with snap ring up.



# LUBRICATE DRIVE SHEAVE

Use Never-Seez Lubricant (PT569) or its equivalent on the following:

1. Arms and bolts in movable face.

2. Guide buttons in spider and mating surface of movable face.

NOTE: Use Loctite (T43512) on spider-to-hub threads.

# ASSEMBLE DRIVE SHEAVE

1. Install movable face over fixed face hub with required number of spacer rings.



2A8;M25545 M22;5010A 0 021081

248; M22;5010A N 021081

2. Install spider on movable face. Align identification marks on spider with identification marks on movable face. This is necessary for proper balance of drive sheave.



3. Hold fixed sheave (A) and turn the spider and movable sheave (B) clockwise. Tighten the assembly as far as possible by hand.



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TM-1217 (Nov-81)

4. Install JDM-41-3 Spider Tool (B) and JDM-41-5 Hub Lock Tool (A) over fixed face hub.

5. Clamp assembly securely in vise.

IMPORTANT: Do not tighten vise too tight. Excess pressure on JDM-41-5 Hub Lock Tool can distort fixed face hub.

6. Instil a 1/2-in. socket wrench long handle in Spider Tool; turn clockwise to tighten spider.

7. Remove Hub Lock and Spider Tools.

8. Install cover plate. Torque screws to (13 to 16 N·m) 10 to 12 ft-lbs.

9. Apply Loctite to the pivot bolt threads.

10. Tighten lock nuts on pivot bolts until they are snug. Movable face and arms should move freely and not bind after the nuts are tightened.

11. Remove cover plate and install spring. Reinstall cover plate and torque screws to (27 N·m) 20 ft-lbs.





2A8;M25548 M22;5010A S 021081

### **INTSTALL DRIVE SHEAVE**

1. Install drive sheave on crankshaft.

2. Install retaining cap screw and washer. Torque retaining cap screw to (68 N·m) 50 ft-lbs.

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

3. Install drive belt and knock-out plug. Install belt so number can be read from left side.

# REMOVE DRIVE SHEAVE

- 1. Remove drive belt and knockout plug from side of pan.
- 2. Remove retaining screw and washer.
- 3. Use JDM-41-1 Puller to remove drive sheave.
- NOTE: Use an impact wrench or 1/2-in. socket wrench long handle to remove retaining screw and to install JDM-41-1 Puller.

# DISASSEMBLE SHEAVE

- 1. Press down on cover and install screwdriver through hole.
- 2. Remove cover screws.
- 3. Press down on cover and carefully remove screwdriver so spring and cover do not fly off.
- NOTE: Ramps are loose on ramp towers and may drop into movable face when cover is removed.
- 4. Remove ramps (A).





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2A8; M22;5012A A 021081

5. Remove lock nut (A) and bolt (B) to remove weights (C) from arms.



TM 1017 (Nov 91)

6. Remove rollers and washers from arms by tipping arms in and prying up with a screwdriver.



7. Photo shows the roller and washer arrangement.



8. Install JDM-41-3 Spider Tool in the pockets of spider. Be sure spider tool engages pockets of the spider and not the roller arms.

9. Install JDM-41-5 Hub Lock Tool over hub with pin of tool through cross hole in hub.



2A8;M28647 M22;5012A G 021081

10. Clamp assembly in vise. Do not tighten vise too tight. Excess pressure on JDM-41-5 Hub Lock Tool can distort fixed face hub.

11. Use 1/2-in. socket wrench long handle in Spider tool and turn counterclockwise to loosen spider from hub. Remove tools.



248;M28648 M22;50124 H 021081

12. Turn spider over and remove cap screws (A) securing arm pivot shafts to spider. Remove arms and washers.

13. Remove the two spacers from post of fixed face.



#### **INSPECT COVER BUSHING**

1. If bushing (A) in cover is worn or damaged, replace cover. Bushing is not serviceable.



TM-1217 (Nov-8物)

# INSPECT GUIDE BUTTONS

- 1. Inspect guide buttons (A) and replace if necessary.
- 2. Use pliers to remove guide buttons.
- 3. Install new guide buttons, with small dot on guide button straight up or down. Tap buttons gently until seated.



248;M28651 M22;50124 K 021081

### **INSPECT ARMS AND ROLLERS**

1. Inspect rollers (B) in arms (A). Replace roller if sticking or worn. Inspect sleeve (C) on which roller asembly rotates. Replace if worn.

2. Duralon bushing (D) in arm is replaceable. If arm is loose on pivot bolt, press out the bushing and press in a new one.

A - Arm B -Rolier C - Sleeve D - Bushing

# INSPECT FIXED AND MOVABLE SHEAVES

1. Check sheave faces for pitting or wear. Replace as necessary.

2. Inspect bushing (A) of movable face and hub (B) of fixed face for damage or wear.

3. Measure O.D. of fiexed face hub and I.D. of movable face bushing. Clearance should not exceed (0.762 mm) 0.030 in. Replace bushing if clearance is greater.





### REMOVE BUSHING

1. Use a hacksaw blade to carefully cut through movable face bushing in several places. Remove bushing with cold chisel and hammer.

#### IMPORTANT: Do not saw into metal of movable face and do not remove snap ring.

2. Carefully file down stake marks of movable face, do not file bore, to allow for installing new bushing.



#### 2A8;M28654 M22;5012A N 021081

### INSTALL BUSHING

1. Use Owatonna Tool Company Bearing Set, 27512 disk, 27509 disk and 27488 handle to install new bushing.

2. Press bushing in until it contacts snap ring. use 1/8-in. drift punch to restake bushing in place.

IMPORTANT: Use T43513 locktite on O.D. of bushing before pressing in place.



# ASSEMBLE DRIVE SHEAVE

# IMPORTANT: Do not use any type of lubricant when assembling drive sheave.

1. Install thrust washer, steel washers and arm and pivot shaft in spider with ridge (A) on arm aligned with square (B) on spider. Felt side of thrust washer must face in against the arm. Torque cap screws to  $(16 \text{ N} \cdot \text{m})$  12 ft-lbs.

NOTE: Notch and square must be aligned. Arm can be installed incorrectly causing it to malfunction.

2. Install movable face over fixed face hub. Install 2 washers over hub.

3. Apply loctite (Part No. T43512) to threads of fixed face hub.



2A8;M28656 M22;5012A P 021081

4. Install spider on movable sheave. Align arrow (A) on spider with arrow (B) on movable sheave. This properly balances drive sheave.

5. Hold fixed sheave and turn spider and movable sheave clockwise. Tighten as far as possible by hand.

6. Install JDM-41-3 Spider Tool in spider and JDM-41-5 Hub Lock Tool over fixed face hub. Be sure spider tool engages pockets of spider and not the roller arms.

7. Clamp assembly in vise. Do not tighten vise too tight. Excessive pressure on JDM-41-5 Hub Lock Tool can distort fixed face hub.



ZAB;M28657 M22;501ZA Q 021081 TM-1217 (Nov-81)

John Deere (TR800) Drive Sheave 8. Install a 1/2-in. socket wrench long handle in spider tool and turn clockwise to tighten spider to hub. 2A8;M28658 M22;5012A R 031081 9. Assemble steel washer, with felt facing (B), on roller bushing (C) (felt face out). Install large steel washer (C) and hold assembly together. 2A8;M28659 M22;5012A S 031081 10. Use a screwdriver to spring arm apart only far enough to install roller assembly.



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11. Push roller into place with your fingers. Be sure roller turns freely.



2A8;M28661 M22;5012A U 031081

12. Install weight (B) on bolt (C) and install bolt from right to left. Install second weight (B) and locknut (A). Torque nut to (8 N·m) 72 in-lbs.



ZA8;M28662 M22;5012A V 031081

13. Install spring (A) and ramps (B).
13. Install spring (A) and ramps (B).
14. Install cover with identification mark on cover (A) inline with identification mark on movable face (B).

15. Press down on cover and install screwdriver through hole. Be sure ramps are positioned correctly and install long cover bolts (C) first to align ramps. Do not tighten bolts.



2A8;M28664 M22;5012A X 031081

TM-1217 (Nov-81)

16. Install 6 short cover bolts (A). Torque all 9 cover bolts to (16 N·m) 12 ft-lbs.



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2A8; M22;5012A Z 031081

#### INSTALL DRIVE SHEAVE

1. Install drive sheave on crankshaft.

2. Install retaining cap screw and washer. Torque cap screw to (68 N·m) 50 ft-lbs.

3. Install drive belt and knockout plug.

NOTE: Install drive belt so number can be read when viewed from left side.

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### REMOVE DRIVEN SHEAVE

1. Remove oil tank, belt guard and drive belt.

2. Remove cap screw, washer and spacers. Remove driven sheave and key.



# DISASSEMBLE DRIVEN SHEAVE

- 1. Remove cam (B) from movable face (F).
- 2. Remove spring (D) and fixed face (C) with insert buttons.



2A8;M26925 M22;5015A B 031081

# INSPECT AND REPAIR DRIVEN SHEAVE

1. Clean all components in solvent.

2. Check movable face bushing (A) and fixed face hub (B) for wear. Replace parts as necessary. Excessive looseness could cause binding.



2A8;M19272 M22;5015A C 031081

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TM-1217 (Nov-81)



TM-1217 (Nov-81)

John Deere Driven Sheave 9. Use a press and the tool in Step 3 to remove cam bushing. 2A8;M26927 M22;5015A H 031081 10. Use the tool from Step 9 to install new bushing flush with top of cam. 2A8;M26928 M22;5015A I 031081 11. Inspect insert buttons for wear. Buttons and mating surface on cam must be smooth. Replace insert buttons as a set. NOTE: To remove worn buttons, heat tower slightly with a hand torch. Grasp button with a vice grip and pull button out.

2A8;M26929 M22;5015A J 031081

12. Replace broken insert buttons as follows: clamp a pop rivet steel shank (do not use aluminum shank) securely with vice grips and heat end red hot with a hand torch. Push steel shank into center of broken insert button shank. Allow to cool slightly and remove insert button shank.

NOTE: Repeat process until insert button shank is completely removed from bore.

13. Clean all glue out of bore.

14. Use a plastic or wood mallet to gently tap button into bore until it is seated flush. DO NOT tap too hard, buttons are easily broken if hit too hard.



248;M28535 M22;50154 K 031081

# ASSEMBLE DRIVEN SHEAVE

1. Lay movable sheave flat.

2. Install fixed sheave with spring hole (A) in fixed sheave aligned with arrow (B) on movable sheave.

2A8;M28538 M22;5015A L 031081

3. Install spring in No. 2 hole (A) in cam.



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

5. Rotate cam past one ramp. Push down on cam making sure posts of movable face fit in recess in cam.

NOTE: Arrow (A) on cam should be in line with arrow (B) next to post of fixed face sheave.



- 6. Install and torque cap screws (A) to (32 to 38 N·m) 24 to 28 ft-lbs.
- NOTE: When clutch is properly assembled the arrow mark on cam should be in line with arrow on bottom of movable sheave.



2A8;M28541 M22;5015A 0 031081

### INSTALL DRIVEN SHEAVE

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

2. Install spacers and shims on shaft.

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

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

5. Install spacers, washer and cap screw. Torque cap screw to (27 N·m) 20 ft-lbs. Recheck alignment.

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

7. Install belt guard and oil tank.



John Deere Driven Sheave

# Group 20 DRIVE BELT

### **REMOVE AND INSTALL DRIVE BELT**

IMPORTANT: A drive belt that is too loose or too tight will cause slow acceleration and affect performance. As belt wear increases, remove spacer washer (A) from behind retaining washer (B). When new belt is installed, replace washer. Torque cap screw to (27 N·m) 20 ft-lbs. If snowmobile has a tendency to creep at idle speed after installing a new belt, add a washer (A).

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



A-Spacer Washer

B-Retaining Washer

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 (3.175 mm) 1/8-in. Correct drive belt width is (34.93 mm) 1-3/8 in. on 1982 Liquifires: (31.75 mm) 1-1/4 in. on all other models.

2A8;M24951 M22;5020A A 031081

#### CHECK DRIVE BELT TENSION

1. Pull down on the belt with your hand and measure between the straightedge and belt.

2. If belt deflection is less than 1 inch, add a washer. If belt deflection is more than 1-1/2 inches, remove a washer.



TM-1217 (Nov-81)



2A8;M25552 M22;5020A C 031081





2A8;M28542 M22;5020A D 031081

# DIAGNOSE MALFUNCTIONS

PROBLEM	CAUSE	SOLUTION
Uneven belt wear on the side only.	Sheave misalignment. Loose engine base.	Align sheaves. Replace or tighten base.
Belt glazed or has a baked appearance.	Insufficient pressure on belt sides. Excessive horsepower for belt and clutch. Oil on sheave surfaces.	Check drive sheave for worn flyweights or clutch arms. Be sure correct clutch is being used. Clean sheave surfaces.
Belt worn excessively in top width.	Excessive slippage. Rough or scratched sheave surfaces. Improper belt angle.	Check drive sheave for smooth operation. Replace or repair sheaves. Check alignment.
Belt worn narrow in one section.	Excess slippage due to frozen track or clutch not functioning properly.	Rotate track by hand until free. Repair or replace clutch.
Belt too tight at engine idle.	Idle speed too high. Incorrect belt length. Incorrect shims in secondary.	Reduce speed. Check belt. Add a shim.
Belt disintegration.	Excessive belt speed.	Check engine speed at wide open throttle.
Belt worn concave on sides.	Excessive ride out on drive sheave.	Repair or replace sheave. Belt too long.
Belt "Flip-Over" at high speed.	Sheave misalignment. Excessive belt speed. Excessive ride out on drive sheave.	Align sheaves. Reduce engine rpm. Belt too long.
Belt edge cord breakage.	Sheave misalignment. Improper belt.	Align sheaves. Check drive belt.
Flex cracks between cogs.	Belt worn out.	Replace belt.
Sheared cogs, compression section fractured or torn.	Improper belt. Belt rubbing stationary object.	Check belt. Check drive sheave.

248; M22;5020A E 031041
# Group 25 CHAIN CASE, SECONDARY SHAFT AND DRIVE SHAFT

#### FINAL DRIVE RATIOS

Upper Sprocket	Lower Sprocket	Chain Length	
(No. of Teeth)	(No. of Teeth)	(No. of Pitches)	Ratio
21**	39**	68**	1.86:1
22*	35*	66*	1.59:1
22	39	68	1.77:1
24	40	70	1.67:1
25	39	70	1.56:1
22	42	70	1.91:1
20	39	66	1.96:1
19	39	66	2.05:1

\* 22/35 Factory installed (Serial No. 120,001 - 190,000)

\*\* 21/39 Factory installed (Serial No. 190,001 - )

#### **REMOVE CHAIN AND SPROCKETS**

1. Remove muffler. Loosen chain case cover to drain oil. Remove cover.

2. Remove chain tensioner.

3. Remove sprockets and drive chain.

IMPORTANT: Record the number of shims between sprockets and bearings for reassembly.



2A8;M25553 M22;5025A B 031081

2A8; M22;5025A A 0310

## INSPECT CHAIN AND SPROCKETS

1. Replace chain if worn or broken. Chain is an endless chain and cannot be repaired.

2. If new chain is installed, replace sprockets. New chain will not properly match worn sprockets.

NOTE: Rapid chain and sprocket wear is caused by misalignment or lack of lubrication.

3. Replace chain tensioner if roller is worn.



2A8;M25554 M22;5025A C 031081

#### ALIGN SPROCKETS

1. Install spacer and four (0.254 mm) 0.010-in. shims and sprocket on lower shaft. Tighten cap screw.

2. Install two (0.457 mm) 0.018-in. shims and upper sprocket. Tighten cap screw.

3. Place straightedge on flat surface of lower sprocket and slide toward upper sprocket to check alignment. If sprockets do not align, add or deduct shims as necessary.

IMPORTANT: Use a maximum of three (0.457 mm) 0.018-in. shims behind upper sprocket and ten (0.254 mm) 0.010-in. shims behind lower sprocket. When sprockets are shimmed correctly, the shafts should be recessed into the sprockets.

NOTE: Upper and lower sprockets must be aligned within (0.254 mm) 0.010-in. of each other.

4. Remove sprockets and leave spacer and shims in place.



Litho in U.S.A.

#### INSTALL CHAIN AND SPROCKETS

1. Install sprockets and chain.

2. Apply Loctite (T43512) to cap screws and tighten securely.



3. Install chain tensioner.

4. Loosen jam nut, and turn adjusting screw in finger-tight.

5. Turn the driven sheave 1/2 turn forward, check adjusting screw again. Turn driven sheave another 1/2 turn and check adjusting screw a second time.

6. Back off adjusting screw 1/4 turn, and tighten jam nut.

2A8;M25553 M22;5025A F 031081

7. Remove upper and lower plugs. Add API-GL5 gear oil (SAE 90) in the upper hole until it starts to run out lower hole. Replace plugs.



2A8;M25557 M22;5025A G 031081

#### **REMOVE SECONDARY SHAFT**

1. Remove drive belt and driven sheave. Record shims between retaining washer and driven sheave and driven sheave and bearing.

2. Remove air intake silencer hose. Remove air intake silencer.

- 3. Remove locking collar set screw.
- 4. Loosen collar by driving it clockwise.



TM-1217 (Nov-81)

5. Remove left-hand bearing.

6. Remove chain case cover, sprockets and chain. Record shims between sprockets and bearings for reassembly.

7. Loosen right-hand bearing. Slide secondary shaft to the left, to remove.

NOTE: Do not lose spring inside hub of brake disk.

# INSPECT SECONDARY SHAFT

1. Check shaft bearing surfaces for evidence of bearings turning on shaft.

- 2. Inspect splined end.
- 3. Replace shaft if defective.
- 4. Check bearing and flangettes.

#### **INSTALL SECONDARY SHAFT**

1. Install flat spring in brake disk.

2. Position brake disk and install secondary shaft through brake disk and chain case bearing.

IMPORTANT: Use Never-Seez on secondary shaft in area of brake disk. DO NOT allow Never-Seez to get on face of brake disk.



2A8;M25560 M22:5025A J 031081

2A8;M25559 M22;5025A | 031081





NOTE: Bearing collars should face toward chain case.

4. Install spacer, shims, sprockets, and drive chain. Add chain case oil.



2A8;M25559 M22;5025A L 031081

TM-1217 (Nov-81)

- 5. Install spacer, shims, and driven sheave.
- 6. Install air intake silencer.
- 7. Recheck belt alignment.
- 8. Install drive belt.



2A8;M25561 M22;5025A M 031081

#### **REMOVE DRIVE SHAFT**

- 1. Siphon fuel from tank and drain chain case oil.
- 2. Remove drive belt, driven sheave and shims.
- 3. Remove chain case cover, tensioner, sprockets and drive chain.

NOTE: Use JDST-24 Lift and Repair Stand. If stand is not available, turn snowmobile on its side.

4. Remove slide suspension.

2A8; M22;5025A N 031081

5. Remove cap screws securing bearing flangettes to tunnel.



2A8;M25562 M22;5025A 0 031081

6. Move drive shaft toward chain case side. Lift end with spacer to remove shaft.



2A8;M25563 M22;5025A P 031081

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TM-1217 (Nov-81)

# INSPECT DRIVE SHAFT

1. Check shaft bearing surfaces for evidence of bearings turning on shaft.

2. Inspect drive shaft bearings. Replace them if they are binding, worn or noisy. Use a NEW O-ring on chain case bearing.

3. Inspect drive wheels and replace them if lugs are worn down to metal center.

- IMPORTANT: Drive wheels are pressed on drive shafts (Serial No. 155,001 - ). Any damage to wheels or to the shaft requires replacement of the complete assembly.
- NOTE: Rapid wear on leading edge of drive lugs indictes snowmobile was run without proper snow lubrication. Wear on trailing edge is normal after many hours of operation.



#### **INSTALL DRIVE SHAFT**

- 1. Assemble bearing flangettes (A), bearings (B) and spacer (C) on drive shaft.
- NOTE: Install new gasket on flangette side facing chain case. Gasket sticks to flangette and is between flangette and chain case.
- IMPORTANT: Bearing locking flanges must face splined end of drive shaft.



2. Position splined end of drive shaft through the tunnel.

IMPORTANT: Be sure chain case bearing O-ring is in correct position, or oil leakage will occur.

3. Position drive shaft and spacer. Install and tighten cap screws and nuts securing bearing flangettes.

- 4. Install slide suspension.
- 5. Install sprockets, chain and tensioner in chain case.
- 6. Install driven sheave and drive belt.
- 7. Add API-GL5 gear oil (SAE 90) to chain case.
- 8. Adjust track tension.
- 9. Fill fuel tank.



2A8;M25563 M22;5025A \$ 031081

#### **REMOVE CHAIN CASE**

- 1. Relieve track tension.
- 2. Remove engine muffler and bracket.
- 3. Loosen chain case cover screws to drain oil.

4. Remove chain case cover, tensioner, sprockets and drive chain.

- 5. Remove upper and lower flangette nuts.
- 6. Remove air intake silencer.

IMPORTANT: Remove hose from intake silencer before removing silencer. Hose can contact elbow of brake cable causing elbow to loosen and affect the brake adjustment.

- 7. Remove drive belt, drive sheave and secondary shaft.
- 8. Remove brake cable from brake arm and bracket.



9. Remove chain case with brake assembly.

10. Remove brake disk, body, retainer, pucks and brake cable bracket from chain case.



# INSPECT CHAIN CASE

1. Inspect chain case for cracks or other damage that could cause chain and sprocket misalignment, or oil leakage.

2. Install new rubber gasket when installing chain case cover.



2A8;M23606 M22;5025A U 031081

#### INSTALL CHAIN CASE

1. Attach chain case and muffler bracket to the tunnel.

2. Install upper bearing and flangettes.

3. Place brake disk in chain case. Install flat spring in brake disk hub.

4. Install secondary shaft through brake disk and upper bearing.

5. Install secondary shaft left-hand bearing.

6. Install sprockets, drive chain, tensioner and cover. Use new gasket. Add API-GL5 gear oil (SAE 90) to chain case.

7. Install brake puck body and puck, retainer and brake cable. Adjust brakes.

8. Install engine muffler and air intake silencer.

9. Install driven sheave and drive belt. Adjust track tension.

2A8; M22;5025A W 031081

# Group 30 MECHANICAL DISK BRAKE

#### **REMOVE DISK BRAKE**

- 1. Remove drive belt and driven sheave.
- 2. Remove air intake silencer.

IMPORTANT: Remove hose from intake silencer before removing silencer. Hose can contact elbow of brake cable causing elbow to loosen and affect the brake adjustment.

3. Remove secondary shaft left-hand bearing.

4. Remove chain case cover, chain tensioner, drive chain and sprockets.

5. Loosen secondary shaft bearing assembly in the chain case.

6. Slide secondary shaft to the left to free it from the brake disk.



2A8;M25567 M22;5030A A 031081

7. Remove brake puck body (A), brake cable, and brake puck retainer.



8. Remove brake disk.



248:M25569 M22;5030A C 031081 TM-1217 (Nov-81)

# INSPECT BRAKE PARTS

1. Replace brake pucks if contaminated or worn enough to prevent proper adjustment.

2. Replace brake disk or cable if worn or damaged.

#### **INSTALL DISK BRAKE**

1. Install brake disk (A), brake puck retainer (C) and brake puck body (B).

NOTE: Whenever a new disk is installed, always install new brake pucks.

2. Install secondary shaft.

IMPORTANT: Use Never-Seez on secondary shaft in area of brake disk to prevent disk from seizing or sticking.

- 3. Tighten chain case bearing assembly.
- 4. Install and tighten secondary shaft left-hand bearing.
- 5. Install air intake silencer.
- 6. Install driven sheave and drive belt.

7. Install drive chain and sprockets, chain tensioner and chain case cover. Add API-GL5 gear oil (SAE 90) to chain case. Adjust brake.

#### REMOVE AND INSTALL BRAKE PUCKS

1. Remove brake puck body with cable and brake puck retainer.

2. Loosen jam nut and back out the adjusting screw.

3. Install brake puck retainer and brake puck body with cable.



2AB: M22:5030A D 031081

2A8;M23611 M22;5030A E 031081

# ADJUST BRAKE

1. Loosen or tighten jam nuts on brake cable until arm is parallel with tunnel.



2A8;M25570 M22;5030A G 031081

- 2. Turn adjusting screw in until (25 to 38 mm) 1 to 1-1/2 in. clearance exists between the brake lever and the handgrip.
- 3. Tighten jam nut securely.
- 4. After brake adjustment, check stop light operation.



2AB;M24952 M22;5030A H 031081

#### SPECIFICATIONS

Serial No. (120,001 - 190,000)	
Drive Belt Total Width	(31.75 mm) 1-1/4 in.
Drive Belt Effective Length	(1193.80+6.35 mm) 47.0 + .25 in.
Drive Belt Alignment	offset-(32 to 33 mm) 1.26 to 1.30 in.
Serial No. (190,001 - )	
Drive Belt Total Width	(34.93 mm) 1-3/8 in.
Drive Belt Effective Length	(1189.5+6.35 mm) 46.83+0.25 in.
Drive Belt Alignment	offset (37 to 38 mm) 1.44 to 1.48 in.

2A8; M22;5035A A 031081

2A8; M22;5035A B 031081

# TORQUE FOR HARDWARE

Drive Sheave Retaining Cap Screw	(68 N·m) 50 ft-lbs.
Driven Sheave Retaining Cap Screw	(27 N·m) 20 ft-lbs.

Page

# CONTENTS

#### Page

#### **GROUP 05 - GENERAL INFORMATION**

Diagnose Malfunctions	•	•	•	•	•	•	•	•	•	·	60-05-01
Diagnose Malfunctions	•	•	•	•	•	•	•	•	•	•	60-05-0

#### **GROUP 10 - SLIDE SUSPENSION**

60 <b>-</b> 10-01
60-10-01
60-10-02
60-10-02
60-10-03
60-10-04

#### **GROUP 15 - JOHN DEERE TRACK**

Warranty Failures	60-15-01
Ply Separation	60-15-01
Track Stretch	60-15-01
Non-Warranty Failures	60-15-01
Obstruction Damage	60 <b>-</b> 15-01
Wear Clips	60-15-01
Lug Damage	60-15-01
Racheting Damage	60-15-01
Over-Tension Damage	60-15-01
Loose Track Damage	60-15-01
Impact Damage	60-15-01
Edge Damage	60-15-01
Remove Track	60-15-02
Repair Track	60-15-02
Replace Wear Clip	60-15-02
Install Track	60-15-03
Track Stud Pattern	60-15-04

#### **GROUP 20 - SKIS AND STEERING** Ski Renair

Ski Repair	60-20-01
Replace Ski Wear Rods	60-20-02
Replace Ski Wear Plates	60-20-02
Replace Ski Spring	60-20-02
Replace Ski Spindles and Bushings	60-20-03
Replace Steering Arms	60-20-03
Replace Tie Rod and Drag Link	60-20-03
Replace Steering Post	60-20-04
Align Skis	60-20-05

#### **GROUP 25 - SPECIFICATIONS**

Specifications											60-25-01
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2A8; M22;6000A A 021081

Suspension

# DIAGNOSE MALFUNCTIONS

#### TRACK EDGE FRAYED

Track out of alignment.

#### TRACK GROOVED ON INNER SURFACE

Track run too tight. Rear idler shaft bearings frozen.

#### TRACK DRIVE RACHETING

Track too loose.

#### REAR IDLERS TURNING ON SHAFT

Rear idler shaft bearings frozen.

#### LOOSE STEEERING

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.

2A8; M22;6005A B 021081

#### General Information

#### **REMOVE SUSPENSION**

1. Remove suspension retaining bolts from each side of tunnel. Remove rear bolts first.

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

IMPORTANT: Siphon all fuel from the tank.



CAUTION: Gasoline is dangerous. Avoid fire due to smoking or careless maintenance practices.

2A8; M22;6010A A 021081





#### **REPLACE SLIDE SUSPENSION WEAR BARS**

1. Remove stops from rear of each slide rail.

2. Use a cold chisel and hammer to remove wear bar.

3. Lubricate slide rail and new wear bar with liquid soap solution.

4. Install new wear bar. Install stops on end of each slide rail.

#### REPLACE REAR IDLER WHEELS AND AXLE

1. Remove suspension.

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

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



248:M25577 M22;60104 E 021081

2AB; M22;6010A D 021081

Slide Suspension

4. Place rear axle through slide rail. Be sure grooves in axle fit slide rail correctly.

5. Partially tighten both adjusting screws.

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

NOTE: Use Loctite on each cap screw.

7. Install suspension.

#### ADJUST TRACK TENSION

1. Support rear of snowmobile so that track is clear of ground.

2. Tension the track to give (12.7 mm) 1/2-in. clearance between the inside of track and bottom of the wear bar. Measure below shock absorber mount. Track should be suspended as shown.

3. Adjust both sides equally. Tighten jam nuts.

4. Start engine and idle track slowly until it rotates several times.

5. Shut off engine and allow track to coast to a stop. DO NOT APPLY BRAKE.

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





A-Jam Nuts

B-Adjusting Screws

2A8;M25579 M22;6010A G 021081

# ADJUST FRONT SUSPENSION SPRINGS

1. Turn adjusting nuts counterclockwise to reduce tension or clockwise to increase tension.

2. In deep snow (for more lift) increase tension. In light snow (for more steering control) reduce tension.

IMPORTANT: Never turn adjusting nuts all the way out. At least two threads on each screw must protrude through its respective adjusting nut.



# ADJUST REAR SUSPENSION SPRINGS

1. If suspension bottoms frequently, increase rear spring preload.

2. Move springs from bottom position (A) to top position (B) to increase spring preload.

# 

#### WARRANTY FAILURES

#### **Ply Separation**

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

#### Track Stretch

Track stretch occurs on a used track. Track stretch is first noticed by lack of adjustment on the trackadjusting screws. Remove the track and lay it flat. Measure ten pitches on the track. This distance should not exceed (83.6 cm) 32.9 inches.

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 broken glass, sharp rocks or buried steel. Damage occurs during rapid acceleration or side-skidding over foreign objects.

If the fiber glass rod is torn from the track due to buried objects, obstructions or road hazards, neither repair nor replacement will be considered for warranty.

#### Lug Damage

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

#### Over-Tension Damage

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

The first indication of this condition is that the track may "stick" or "lock up", causing loss of engine horsepower.

#### Impact Damage

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

#### Wear Clips

Wear clips wear from operating on rough, dry terrain, railroads and highway roadsides, gravel roads and other non-approved snowmobile field conditions.

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

#### 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.

#### 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.

#### Edge Damage

Edge damage is the operator's fault. 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.

2A8; M22;6015A B 021081

# **REMOVE TRACK**

1. Siphon fuel from tank.

2. Remove chain case cover, chain tensioner, sprockets and drive chain.

3. Remove suspension.

4. Remove cap screws securing bearing flangettes to tunnel.

5. Move drive shaft toward chain case side. Lift end with spacer to remove shaft.

6. Remove track.



2A8;M25563 M22;6015A C 021081

2A8; M22;5015A D 021081

# **REPAIR TRACK**

IMPORTANT: Any of the following conditions require wear clip or track replacement.

- 1. Wear clip missing (replace clip).
- 2. Excessively worn wear clips (replace clips).

3. Wear clip guides missing on more than three successive wear clips (replace clips).

4. Fiber glass rod broken (replace track).

#### REPLACE TRACK WEAR CLIP

1. Break clip off with pliers or saw with hacksaw.

IMPORTANT: Use care when using hacksaw so as not to damage rubber or fiber glass rod.

2. Use Track Wear Clip Installing Tool JDG-46, to install new wear clip.



# **INSTALL TRACK**

1. Place track in tunnel.

2. Install drive shaft, chain case sprocket, drive chain and chain tensioner.

- 3. Adjust track tension.
- 4. Fill chain case with API-GL-5 gear oil (SAE 90).
- 5. Fill fuel tank.

2A8; M22;6015A F 021081

# TRACK STUD PATTERNS



Two stud kits are available: AM55177 (Steel Stud Kit) and AM55178 (Carbide Stud Kit). Each stud kit contains 18 studs. Use two like stud kits for the 36 stud position.

# IMPORTANT: Upper tunnel wear strips must be installed when track is studded.

NOTE: Use carbide wear rods on the skis when using the 36 stud pattern.



2A8;M28563 M22;6015A G 02108

# Group 20 SKIS AND STEERING





A---Cap Screw B---R.H. Rod End C---Spindle Arm D---Jam Nut E---Tie Rod F---R.H. Rod End G---L.H. Rod End H—Lock Nut I—Flat Washer J—Spindle Arm K—Washer L—Spindle Bushing M—Spindle N—Lock Nut O—Flat Washer P—Pivot Bushing Q—Drilled Pin R—Cotter Pin S—Spring Assembly T—Ski Pivot Bolt U—Bumper V--Flanged Lock Nut W--Ski X--Wear Rod Y--Wear Block Z--Lock Nut AA--Shock Absorber BB--Cap Screw

TM-1217 (Nov-81)

2A8;M23629 M22;6020A A 021081

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# REPLACE SKI WEAR RODS

1. Remove lock nuts (C). Pry wear rod (B) down to free studs from holes.

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).



2A8;M23630 M22;6020A B 021081

# REPLACE SKI WEAR PLATES

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

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

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



#### REPLACE 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.

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

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



#### **REPLACE SKI SPINDLES AND BUSHINGS**

1. Remove ski and spring assembly.

2. Remove hardware securing the steering arm to the spindle.

3. Remove the spindle.

4. Use a drift punch to remove bushings. 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 rut to (53 N·m) 39 ft-lbs.



2A8;M25584 M22;6020A E 021081

#### **REPLACE STEERING ARMS**

1. Position handlebars and skis straight ahead.

2. Disconnect tie rod from steering arm. Remove steering arm from spindle.

3. Install new steering arm parallel. Torque nut to (47 N·m) 35 ft-lbs.

4. Connect tie rod and align skis.



#### **REPLACE TIE ROD AND DRAG LINK**

1. Remove tie rod from steering arms. Remove drag link from right-hand steering arm and steering post.

2. Install new tie rod and drag link. Align skis.

3. Adjust drag link so handlebars are pointing straight ahead.

# **REPLACE STEERING POST**

1. Remove seat and fuel tank.



- 2. Remove air intake silencer.
- 3. Remove engine.
- 4. Remove handlebar from steering post.
- 5. Disconnect drag link from steering post.
- 6. Disconnect steering post bracket from tunnel. Remove steering post and spacer.
- 7. Install in opposite sequence.



2A8;M25606 M22;6020A [ 021081

2A8; M22;6020A H 021081

- NOTE: When reinstalling steering post and spacer, the ridge on spacer should be down and toward the tunnel.
- 8. Align skis.



# ALIGN SKIS

1. Raise the front of sled slightly to remove weight from skis.

2. Position handlebars straight ahead.

3. Measure distances (A and B) between front and rear wear rod nuts. The two dimensions should be equal.

4. If adjustment is necessary, remove exhaust silencer for access to tie rods.

5. Losen jam nuts on ends of tie rod. Rotate tie rod until skis are parallel, and tighten jam nuts.

# IMPORTANT: DO NOT exceed (33.34 mm) 1-5/16 in. between tie rod and center of tie rod end.

6. To realign handlebars, loosen jam nuts on both sides of adjuster on drag link. Rotate adjuster until handlebars are aligned. Tighten jam nuts.

7. After aligning the skis, be sure all jam nuts are tight, and install exhaust silencer.



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# Group 25 SPECIFICATIONS

# SPECIFICATIONS

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Drag Link-to-Steering Post	(43 to 51 N·m) 32 to 38 ft-lbs
Drag Link-to-Steering Arm	(43 to 51 N·m) 32 to 38 ft-lbs
Steering Arm-to-Spindle Bolt	(30 to 38 N·m) 22 to 28 ft-lbs
Ski Mounting Cap Screw	(52 N·m) 39 ft-lbs
Tie Rod Jam Nut	(11 to 16 N·m) 8 to 12 ft-lbs
	2A8; M22;6025A A 021
## CONTENTS

Engine loois	70-05-01
Clutch Tools	70-05-03
Electrical Tools	70-05-03
Track Tools	70-05-04

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Snowmobile Support Tools	70-10-01
Engine Tools	70-10-01
Carburetor Tools	70-10-02

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## Group 05 ESSENTIAL SERVICE TOOLS

## **ENGINE TOOLS**

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



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



2A8;M28446 M22;7005A C 021081

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





## **CLUTCH TOOLS**

JDM-41-1 Clutch Puller, is used to remove the 102C and TR800 drive sheave.

## **ELECTRICAL TOOLS**

JDM-74A-5 Ignition Test Plug is used to check snowmobile ignition coil output. Allows service technician to check ignition coils without removing coils from the engine.

JDM-74 Capacitor Discharge Ignition (CDI) Tester consists of the tester (A), test simulator (B), test adapter (C) and load coil (D). The tester measures peak energy output of CDI units, exciter coil and pulser coil.

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 aproximately 70 to 500 volts.



2A8;M23674 M22;7005A [ 021081

JDM-41-1





TM-1217 (Nov-81)

M22;7005A K 021081

output.

## TRACK TOOLS

JDG-46 Wear Clip Installing Tool is used to install the wear clip on John Deere tracks.



## Group 10 CONVENIENCE SERVICE TOOLS

#### SUPPORT TOOLS

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

#### 2A8; M22;7010A A 021081

#### **ENGINE TOOLS**

JDM-16 Bench Mounted Service Fixture 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.

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





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



JDM-44 Pressure Testing Tool 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.

JDG-56 Cooling System Tester is used to test coolant system and pressure cap. It is used in conjunction with JDM-44 Pressure Gauge.

## CARBURETOR TOOLS

JDM-109-A Mikuni Carburetor Tool Kit is used for making adjustments on the Mikuni Carburetor.

2A8;M25502 M22;7010A F 021081





