

**How To Fine Tune Your
'76-'77-'78
Cyclone and Liquifire
Snowmobiles**

SP-282 I7





Introduction

This John Deere Snowmobile Fine Tuning Manual is written for John Deere dealers and customers who are experienced snowmobilers.

NOTE: It is not intended to provide detailed racing information. It is intended to provide the user with the information necessary to tune a snowmobile for various altitudes and riding conditions. The information in this manual is presented in a cause and effect relationship to help you understand the effects of tuning on the performance of your snowmobile. The procedures contained in this manual are not recommendations unless specifically stated as such.

This manual contains instructions for fine tuning the carburetor, power train and suspension system. Adjust the carburetor first, then the power train, and finally the suspension.

Tuning is often a process of trial and error at the dealer/customer level due to lack of sophisticated equipment. At times improved performance in one area is accompanied by degraded performance in another. The object of fine tuning is to obtain the best overall performance throughout the operating range.

NOTE: The John Deere snowmobile is carefully tuned at the factory to provide peak performance for average operating conditions at altitudes of sea level to 2000 feet. Fine tuning can improve performance to suit specific operating conditions and can also help compensate for the machine's power loss at higher altitudes.

Before performing the procedures contained in this manual, be sure you have read and understood the information in your Operator's Manual. This tuning manual does not contain assembly and disassembly instructions. If you require such information about your snowmobile you can obtain the Service Manual (SM-2108) through your John Deere dealer.

NOTE: Some of the procedures contained in this manual require special tools. These tools are described in the Service Manual.

CAUTION

All obligations of John Deere warranty shall be terminated if products are altered or modified in ways not approved by John Deere.



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GENERAL TUNING PROCEDURE

The best way to evaluate the tuning of a carburetor is by operating the snowmobile. In general, symptoms of bogging, popping or spitback during acceleration indicate a lean fuel/air mixture. Symptoms of excessive smoking or rough engine operation indicate a rich fuel/air mixture. Because the internal cooling of the engine depends on the fuel to some extent, a fuel/air mixture which is too lean can cause engine overheating. If you cannot determine if the fuel/air mixture is too rich or too lean, assume a too lean condition and tune accordingly.

When changing parts in a carburetor, keep dirt out of the system. Dirt can clog jets and destroy the performance of a well-tuned carburetor.

Tune the carburetor by performing the following steps in the sequence given. Because a change in one system can affect the performance of other systems, checks of related fuel metering systems must be made frequently throughout the tuning procedure. For high altitude applications, refer to the charts on pages 9 and 10.

CAUTION: All tuning on stock sleds must be performed with the air intake silencer in place. If not, false readings will result which may cause serious engine damage.

1. Check the position of the starting system plunger (page 3, below).
2. Make sure the float arm is properly adjusted (page 4).

3. Operate the snowmobile at wide open throttle and check the operation of the main jet system (page 8). If the main jet is changed, recheck the jet needle and needle jet.

4. Operate the engine between idle and 1/4 throttle and check engine operation. Flip the enrichening or choke lever momentarily to provide excess fuel. If engine operation improves, more fuel needs to be provided in this range. If engine operation becomes worse, less fuel needs to be provided. If this check indicates a need for adjustment perform step 5 below. (Also see page 5.)

5. Check and adjust the setting of the air screw. (See page 5.) If necessary, change the pilot jet (page 5) and readjust the air screw.

6. Use the air screw adjustment to check for proper throttle valve selection as described on page 6.

IMPORTANT: Except for high altitude operation, the needle jet should not be changed.

7. Operate the snowmobile at mid throttle settings and check the operation of the jet needle (page 6) and needle jet (page 7).

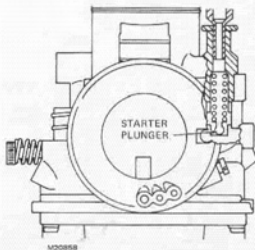
8. Operate the snowmobile through all throttle settings. Check for smooth operation.

THE STARTING SYSTEM

When raised, the starter plunger allows fuel to be metered through the starter jet and mixed with air. This fuel/air mixture flows into the plunger area, mixes with more air from the air intake port used for starting, and is then drawn into the engine. The throttle must be closed for this starting system to operate.

Adjust the starter plunger as follows:

1. Inspect the starter plunger to make sure the plunger is seated when the choke lever (on the dash) is in the off (or down) position.
2. Adjust the starter plunger so the plunger rises approximately 1/2 of the bore diameter when the choke lever is lifted to the on position.





Carburetion

To familiarize yourself with the carburetor see exploded view page 11.

PRINCIPLES OF OPERATION

The Cyclone and Liquifire engines are equipped with Mikuni carburetors for consistent performance and efficient engine operation. The Mikuni carburetor utilizes several fuel metering systems:

- Starting system
- Float system
- Pilot/air system
- Needle jet and jet needle system
- Throttle valve
- Main jet system

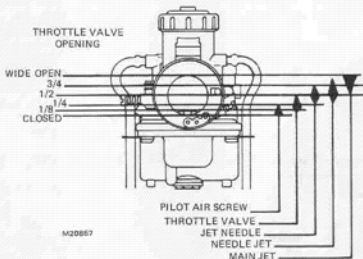
CAUTION

Engine damage is possible if operated with too lean a fuel mixture.

By carefully matching these fuel metering systems, the carburetor can be tuned for maximum performance and efficiency to suit operating conditions.

These systems overlap to provide smooth transition as the throttle moves through its full range of positions. A change in one system can affect the performance of other systems. Any change to the carburetor must therefore be evaluated to determine its effect on other fuel metering systems.

The different fuel metering systems provide fuel at various throttle openings as shown in the following diagram.



1. The fuel level in the bowl or the float system is the base line.

2. The pilot/air system functions from the time the throttle is in closed position until it is about 1/4 open.

3. The throttle valve functions from low throttle openings to near wide open throttle.

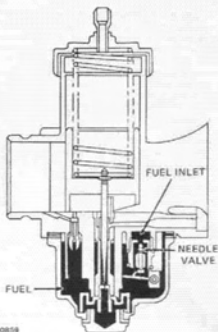
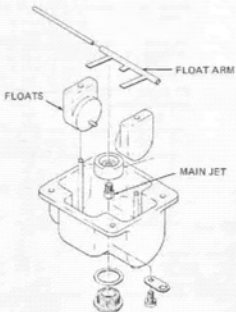
4. The jet needle and needle jet work together to control the midrange mixture or from approximately 1/4 open to near wide open.

5. The main jet system determines the mixture at wide open throttle. This system supplies fuel to all but the pilot/air system through the main jet.

THE FLOAT SYSTEM

The float system maintains the correct fuel level in the float bowl under all engine operating conditions.

The float system uses two floats to counteract side-to-side movement and high and low operating angles of the snowmobile. When the fuel level drops in the float chamber, the floats and float arms with actuating tab also drop, opening needle valve. The fuel pump forces fuel from the fuel tank past the needle valve into the float chamber. As the fuel in the float chamber approaches the correct level, the floats rise, causing the needle valve to seat, shutting off the fuel flow.



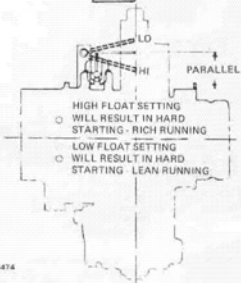
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Check the adjustment of the float system as follows:

1. Invert the carburetor and check the alignment between the float arms and the base of the carburetor. The float arms should be parallel to the base.
2. Bend the actuating tab as required to make the float arms parallel to the base. Be careful not to bend the float arms.

NOTE: Incorrect float adjustment can prevent proper tuning of a carburetor. Always make sure the float is properly adjusted before attempting adjustment of the other fuel metering systems.



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THE PILOT/AIR SYSTEM

The pilot/air system controls the fuel mixture between idle and approximately the 1/4 throttle position. As the throttle is opened wider for low speed operation, the pilot outlet cannot supply adequate fuel, and the fuel then enters the carburetor bore from the bypass as well as the pilot outlet. The pilot/air system is tuned by first adjusting the air screw then, if necessary, by replacing the pilot jet.

Air Screw Adjustment

NOTE: This procedure may be performed for single and dual carburetors. On dual carburetors both air screws must be adjusted exactly the same amount. Never adjust the screws more than 1/4 turn at a time.

1. Turn in the idle stop screw until the screw contacts the throttle valve. Then turn in the idle stop screw two additional turns.

2. Start the engine and adjust the idle stop screw to 2800 rpm.

3. Turn the air screw in or out using 1/4 turn increments until engine rpm peaks or reaches its maximum rpm.

4. Turn the idle stop screw out to return the engine to normal idle speed (2300 rpm).

5. Repeat steps 3 and 4 until the engine operates at normal idle speed and the air screw is peaked.

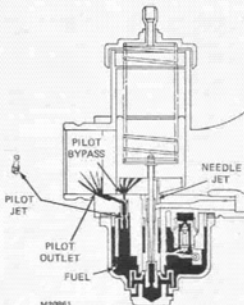
6. When the air screw is adjusted, shut down the engine. Note the setting of the air screw and turn it all the way in. If it takes less than one turn, the pilot jet is too small and a larger one must be installed. If it takes more than 2-1/2 turns to seat the air screw, the pilot jet is too large and must be replaced by a smaller one.

Pilot Jet Replacement

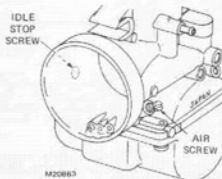
Pilot jets are numbered from No. 15 (the smallest) to No. 80 (the largest). The number is an indication of fuel flow and is not necessarily related to drill size or through hole diameter.

After changing the pilot jet, check and adjust the air screw as described above.

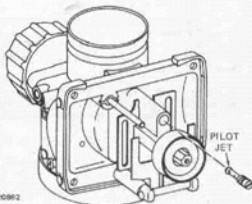
NOTE: Since the pilot/air system provides some fuel up to wide open throttle, changes in this system will affect the throttle valve, jet needle/needle jet and main jet metering systems.



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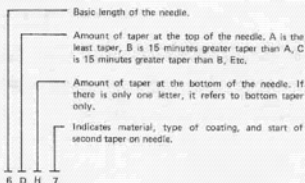


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The jet needle works on a combination of length, taper and E-ring position. Each jet needle has a number and letter series stamped on the body:

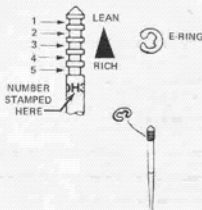


At the top of the jet needle are five grooves. The grooves are numbered 1 through 5 from top to bottom on the needle. Moving the E-ring to a higher position on the needle allows the jet needle to lower into the needle jet and leans out the fuel/air mixture. Similarly, moving the E-ring to a lower position enriches the fuel/air mixture. See diagram at right.

1. Check for a rich or lean setting by examining the exhaust manifold as described under "Main Jet System" on page 8. A very light brown or white color indicates a lean mixture. A very dark brown or black color indicates a rich mixture. The proper color is tan.

2. Move the E-ring one groove at a time to correct the fuel/air mixture.

3. If proper operation is obtained at all but the 3/4 throttle setting after the main jet has been tuned, an improved operation may be obtained by changing the jet needle taper. Do not however, change the jet needle until the main jet and E-ring position have been thoroughly checked.



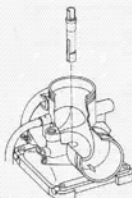
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4. If the E-ring is in the number 5 position and operation is still lean, a needle jet with a larger orifice may be installed. Again, this may be done only after thoroughly checking the main jet, jet needle, and E-ring position.

NEEDLE JET

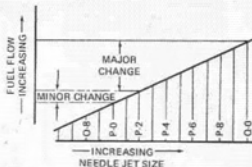
The needle jet works in combination with the jet needle to meter the fuel flow in the mid range.

Changes to the needle jet should be made only if the results of changing the jet needle position are unsatisfactory. (Refer to Paragraph No. 1 of Jet Needle Section.) In stock applications, except for specific calibration changes necessary at high altitudes, the needle jet should not be changed. Selection of the proper needle jet is a very difficult job requiring considerable care and expertise. It should be noted that decreasing the needle jet size can prevent the main jet from metering proper amount of fuel at wide open throttle.



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Needle jets are stamped with an alpha-numeric code. The letter indicates a major change in fuel flow. A, for example, indicates lowest flow, B, greater flow, and so on. The number indicates minor adjustments in fuel flow. Zero indicates lowest flow and 9 indicates highest flow. The diagram at right shows the relationship between the alpha-numeric needle jet size number and fuel flow.



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MAIN JET SYSTEM

The main jet system starts to function when the throttle is approximately 1/4 open. The midrange fuel is supplied by the main jet and regulated by the needle jet/needle combination. The main jet meters the fuel when the throttle is in the wide open position.

The main jets are available in sizes from number 50 to number 100 (in increments of 5) and from number 100 to number 500 (in increments of 10). The size number corresponds to flow and not necessarily to hole size. Never change the main jet by more than one size at a time.

When experiencing erratic operation or overheating, check the main jet for dirt which can plug the orifice.

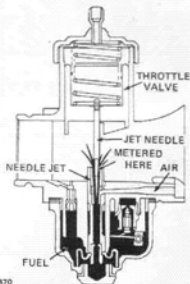
Tuning this system requires that the sled be operated at wide open throttle. Before operating the snowmobile, make sure that all parts, including the clutch and drive belt, are in good operating condition.

1. Operate the snowmobile at wide open throttle for several minutes on a flat, well-packed surface. Failure to achieve maximum rpm (refer to Clutch Chart [Governed Speed RPM] pages 25 & 26) or laboring at high rpm indicates the main jet should be changed. Try to determine if operating problems are caused by too rich or too lean a fuel mixture.

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

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

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



M20870

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

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

6. After the proper main jet is selected, recheck the jet needle and needle jet (page 6 and 7).

COMPENSATION FOR ALTITUDE AND TEMPERATURE

An engine loses about 3-1/2 percent of its power for each 1000 feet increase in elevation. Although this power loss cannot be regained, tuning the carburetor will insure peak performance at the operating altitude. Adjustments to the drive train will also help improve operation.

At high altitudes or high temperatures the carburetor must be tuned for less fuel and less air throughout the throttle range. The following tables provide guidelines for tuning the carburetor for high altitude.

The following tables list factory or dealer carburetor settings for snowmobile delivery. Refer to page 13 for related part numbers.

1976 SNOWMOBILES — HIGH ALTITUDE RECOMMENDATIONS

0° to 40°F -18° to 5°C	340 Cyclone		440 Cyclone		340 Liquefire		440 Liquefire	
	0-2,000 Feet	8,000-10,000 Feet	0-2,000 Feet	8,000-10,000 Feet	0-2,000 Feet	8,000-10,000 Feet	0-2,000 Feet	8,000-10,000 Feet
Main Jet	No. 370	No. 320	No. 410	No. 320	No. 180	No. 170	No. 180	No. 160
Jet Needle	6FL14-2*	6FL14-2*	6FL14-2*	6FL14-4*	6DH3-4*	6DH3-2*	6DH3-3*	6DH3-2*
Needle Jet	Q-0	P-8	Q-0	Q-0	Q-8	Q-8	P-0	P-0
Throttle Valve	2.5	1.5	3.0	2.5	2.0	1.0	2.5	1.0
Pilot Jet	No. 20	No. 15	No. 20	No. 20	No. 45	No. 25	No. 40	No. 25
Air Screw	1-Open	2-Open	2-Open	1-Open	2-Open	1-Open	1.5-Open	1.5-Open
Idle Speed	1800-2400 rpm	3000 rpm	1800-2400 rpm	1800-2400 rpm	1800-2400 rpm	3000 rpm	1800-2400 rpm	1800-2400 rpm

1977-78 MODEL 340 CYCLONE — HIGH ALTITUDE RECOMMENDATIONS

0° to 40°F -18° to 5°C	Sea Level	2,000 Feet	4,000 Feet	6,000 Feet	8,000-10,000 Feet
Main Jet	No. 400	No. 370	No. 320	No. 310	No. 270
Jet Needle	6FL14-3*	6FL14-3*	6FL14-4*	6FL14-3*	6DH7.5*
Needle Jet	Q-0	Q-0	Q-0	Q-0	P-6
Throttle Valve	2.0	2.0	2.0	2.0	1.5
Pilot Jet	No. 20	No. 20	No. 20	No. 20	No. 20
Air Screw	2-Open	2-Open	1.5-Open	1.5-Open	1.5-Open
Idle Speed	1800-2400 rpm	1800-2400 rpm	1800-2400 rpm	1800-2400 rpm	300 rpm

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

1977-78 MODEL 440 CYCLONE -- HIGH ALTITUDE RECOMMENDATIONS

0° to 40°F -18° to 5°C	Sea Level	2,000 Feet	4,000 Feet	6,000 Feet	8,000-10,000 Feet
Main Jet	No. 420	No. 400	No. 370	No. 380	No. 350
Jet Needle	6FL14-3*	6FL14-3*	6FL14-4*	6FL14-4*	6FL14-4*
Needle Jet	P-2	P-2	P-2	P-2	P-2
Throttle Valve	2.0	2.0	2.0	2.0	2.0
Pilot Jet	No. 30	No. 30	No. 30	No. 30	No. 30
Air Screw	2-Open	2-Open	2-Open	2-Open	2.5-Open
Idle Speed	1800-2400 rpm	1800-2400 rpm	1800-2400 rpm	1800-2400 rpm	1800-2400 rpm

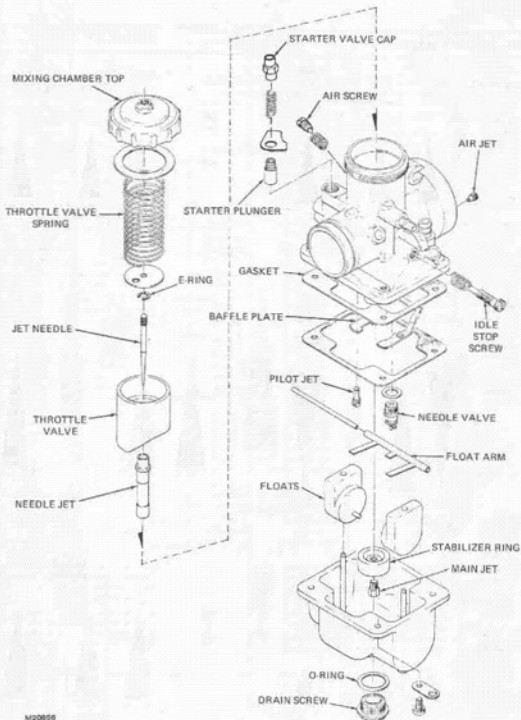
1977-78 MODEL 340 LIQUIFIRE -- HIGH ALTITUDE RECOMMENDATIONS

0° to 40°F -18° to 5°C	Sea Level	2,000 Feet	4,000 Feet	6,000 Feet	8,000-10,000 Feet
Main Jet	No. 210	No. 190	No. 180	No. 170	No. 160
Jet Needle	6DH3-4*	6DH3-4*	6DH3-4*	6DH3-4*	6DP1-4*
Needle Jet	O-6	O-6	O-6	O-6	O-6
Throttle Valve	2.0	2.0	1.5	1.5	1.0
Pilot Jet	No. 40	No. 40	No. 40	No. 40	No. 25
Air Screw	1-Open	1.5-Open	1-Open	2-Open	2-Open
Idle Speed	1800-2400 rpm	1800-2400 rpm	1800-2400 rpm	1800-2400 rpm	3000 rpm

1977-78 MODEL 440 LIQUIFIRE -- HIGH ALTITUDE RECOMMENDATIONS

0° to 40°F -18° to 5°C	Sea Level	2,000 Feet	4,000 Feet	6,000 Feet	8,000-10,000 Feet
Main Jet	No. 220	No. 220	No. 210	No. 200	No. 200
Jet Needle	6DH4-4*	6DH4-3*	6DH8-2*	6DH8-2*	6DH7-3*
Needle Jet	P-0	P-0	P-0	P-0	P-2
Throttle Valve	2.0	2.0	2.0	1.5	1.0
Pilot Jet	No. 30	No. 30	No. 30	No. 30	No. 25
Air Screw	1.5-Open	1.5-Open	1.0-Open	1.0-Open	1.5-Open
Idle Speed	1800-2400 rpm	1800-2400 rpm	1800-2400 rpm	1800-2400 rpm	1800-2400 rpm

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



MAIN JET				
	AMBIENT TEMP.	ALTI-TUDE	JET SIZE	FUEL MIX-TURE
	HOT 	HIGH ALT. 	75 100 150 200 250 300 350 400 450	LEAN 
	COLD	SEA LEVEL	500	RICH

M22340

NEEDLE JET				
	AMBIENT TEMP.	ALTI-TUDE	JET SIZE	FUEL MIX-TURE
	HOT 	HIGH ALT. 	O-2 O-4 O-6 O-8 P-2 P-4 P-6 P-8 O-0	LEAN 
	COLD	SEA LEVEL	O-0	RICH

M22343

THROTTLE VALVE				
	AMBI-ENT TEMP.	ALTI-TUDE	THROTTLE SLIDE CUTAWAY	FUEL MIX-TURE
	COLD 	HIGH 	.5 1.0 1.5 2.0 2.5 3.0 3.5	RICH 
	HOT	SEA LEVEL		LEAN

M22341

JET NEEDLE				
	AMBIENT TEMP.	ALTI-TUDE	NEEDLE CLIP POSITION	FUEL MIX-TURE
	HOT 	HIGH ALT. 		LEAN 
	COLD	SEA LEVEL		RICH

M22344 M22345

AIR SCREW				
	AMBIENT TEMP.	ALTI-TUDE	TURNS OPEN	FUEL MIX-TURE
	HOT 	HIGH ALT. 	2-1/2 2 1-1/2 1 1/2	LEAN 
	COLD	SEA LEVEL		RICH

M22342

PILOT JET				
	AMBIENT TEMP.	ALTI-TUDE	JET SIZE	FUEL MIX-TURE
	HOT 	HIGH 	15 17.5 20 25 30 35 40 45 50 55 60	LEAN 
	COLD	SEA LEVEL		RICH

M22346

MAIN JETS

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

JET NEEDLES

MIKUNI NO.	JOHN DEERE NO.
6DH3	† M65354
6DH2	† M66856
6FL14	† M66422
6DP1	† M66926
6DH7	† M66927
6DH4	† M66928
6DP5	† M66941

NEEDLE JETS

MIKUNI VM34/05	JOHN DEERE NO.
0-0	LEAN M66890
0-2	M66891
0-4	M66892
0-6	M66893
0-8	M66739
P-0	M65340
P-2	M66845
P-4	M66894
P-6	M65741
P-8	M66895
Q-0	M66740
Q-2	M66896
Q-4	M66897
Q-6	M66898
Q-8	RICH M66916

THROTTLE VALVES - 34 MM

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

THROTTLE VALVES - 36 MM

MIKUNI VM36/39	JOHN DEERE NO.
0.5	RICH M66884
1.0	M66885
1.5	M66886
2.0	M66887
2.5	M66888
3.0	M66889
3.5	LEAN M66890

PILOT JETS

MIKUNI VM22/210	JOHN DEERE NO.
# 15	LEAN M66912
# 17.5	M66913
# 20	M66745
# 25	M66929
# 30	M66844
# 35	M66914
# 40	M65355
# 45	M66746
# 50	M66863
# 55	M66872
# 60	RICH M66915

AIR JETS

MIKUNI BS30/97	JOHN DEERE NO.
0.5	LEAN M66499
0.6	M66917
0.7	M66933
0.8	M66918
0.9	M66919
1.0	M66920
1.2	M66921
1.4	M66922
1.6	M66923
1.8	M66924
2.0	RICH M66925

† Not related to lean or rich condition (see Pages 6 & 7 concerning Jet Needles).



Power Train

The drive train must govern the engine rpm at its peak power point for maximum performance.

The drive train components are carefully matched at the factory. In stock applications, except for specific calibration changes necessary at high altitudes, John Deere recommends you do not change the power train components.

DRIVE SPROCKET RATIO

The sprocket ratios are carefully selected after all operational data is known. Operating rpm, horsepower curve, clutch ratio and weight are used to calculate the sprocket ratio that will produce the best overall performance. Extensive field testing in various snow conditions is conducted before a final selection is made. The drive and driven sheaves can be matched to the sled only after the sprocket ratio is determined. The following chart lists available drive sprocket ratios.

Tuning instructions in this section enable you to adjust the power train shift pattern to agree with the rpm at which maximum horsepower is delivered. Power train components which can be tuned are the drive and driven sheaves, drive sprocket, and drive belt.

NOTE: In some cases where the sprocket ratio is increased (geared down), peak performance is obtained by decreasing the spring tension on the driven sheave. For example, when changing from a 24/40 to 21/39 gear ratio, change the driven sheave spring setting from hole No. 2 to hole No. 1 and see if performance is improved. In some cases improved performance will result, usually at high altitudes. Refer to page 23 for a discussion of driven sheave spring tension.

RATIO	SPROCKETS UPPER/LOWER	MPH AT 6500 RPM (IDEAL)	MPH AT 7000 RPM (IDEAL)	UPPER SPROCKETS — PART NO.	LOWER SPROCKETS — PART NO.	CHAIN PITCH — PART NO.
1.67:1	24/40*	74	80	24-M66322	40-M66323	68-M66321
1.86:1	21/39†	67	72	21-M66303	39-M65693	66-M66122
2.06:1	17/35††	60	65	17-M66302	35-M65809	62-M66123
2.19:1	16/35††	56	60	16-M65811	35-M65809	62-M66123
2.47:1	17/42††	50	54	17-M66302	42-M65810	66-M66122
1.72:1	22/38††	71	77	22-M67695	38-M67898	66-M66122

*Standard

†High altitude dealer installed

††Optional

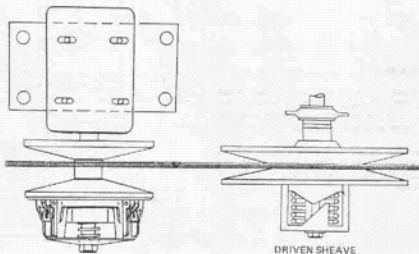
DRIVE SHEAVE

Principles of Operation

The drive sheave, mounted on the PTO side of the engine, is a centrifugally-operated clutch.

The drive sheave contains three centrifugal weights attached by pins to the movable face. As the drive sheave rotates, these weights provide an outward centrifugal

force. For the clutch to engage, this centrifugal force must overcome the force of the drive sheave spring which holds the movable face in position. As the movable face approaches the fixed face, the tension on the drive belt increases, which starts the sled in motion.



M14476

DRIVE SHEAVE (CLUTCH)

DRIVEN SHEAVE

Tuning

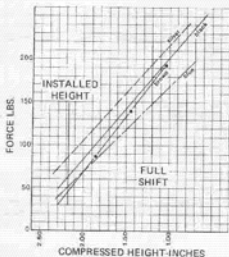
When properly tuned, the clutch engagement and shift pattern will be matched with the engine rpm at which maximum horsepower is delivered at wide open throttle. This will result in maximum performance of the sled. There are three drive sheave components which may be changed to modify drive sheave performance: drive sheave spring, centrifugal weights, and spacer washers.

1. Drive Sheave Spring.

The drive sheave spring controls engagement speed. If a heavier spring is installed, a higher speed will be required to overcome the spring force for engagement. Similarly, if a lighter spring is installed, a lower speed will be required for engagement.

NOTE: Using standard weights, heavier springs tend to cause rough, jack-rabbit starts. Lighter springs cause smoother starts.

The following table lists the available springs and lists their free lengths. The chart shows the required compressing force for each of these springs.



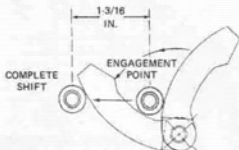
M20876

	COLOR	PART NUMBER	FREE LENGTH
Light	Blue	M66024	3.00" ± 0.06
	Brown	M66692	2.875" ± 0.06
	Black	M66684	3.03" ± 0.06
Heavy	Silver	M66641	3.475" ± 0.06

2. Centrifugal Weights,

The centrifugal weights are available in various shapes and weights. When a lighter weight is installed, the centrifugal force is less and the clutch takes longer to upshift. This causes shifting at a higher engine rpm.

The effects of shape are more difficult to understand. For the standard weight, the total distance that the weight contacts the rollers during the shift pattern is about 1-3/16-inch



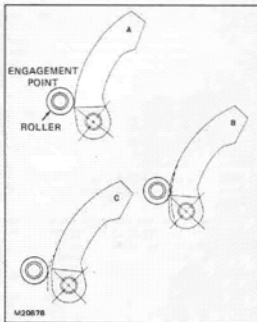
M20877

By varying the profile (shape) of the weight, we can increase or decrease governed engine rpm and engagement speed. The illustration (opposite) shows how the weight profile affects engagement speed.

Assume, for example, that ramp "A" allows the clutch to engage at 3500 rpm. Notice the point where the moveable face roller contacts the steep incline of the weight.

On weight "B", the angle of incline is much steeper, making it necessary for the engine to develop higher rpm before engagement takes place. Weight "B" would therefore provide an engagement speed of more than 3500 rpm.

On weight "C", the angle of incline at engagement is less than weight "A". Because it is easier for centrifugal force to cause the moveable face to move up ramp "C", the clutch will engage at less than 3500 rpm.



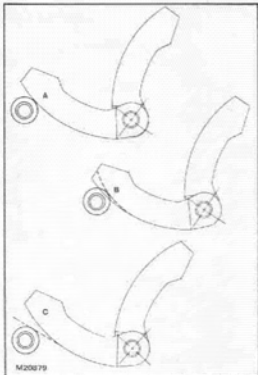
M20878

The next illustration shows the profiles and positions of the same three weights when the clutch has completed its shift pattern.

Again note the angles of incline. Assume that the engine with weight "A" is running at 6500 rpm and is fully upshifted. Weight "B" profile is cut back, providing a smaller angle of incline toward the top. It is therefore easier for centrifugal force to move the moveable face, and engine speed is less than 6500 rpm.

Weight "C" is not cut back as far as weight "A", and engine speed will therefore be greater than 6500 rpm for the weight to complete the shift pattern.

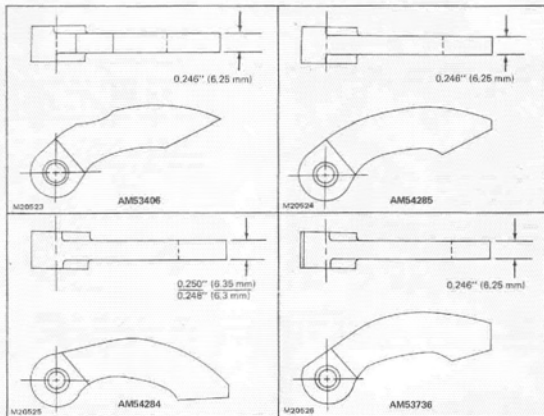
The weight kits available for the 340 and 440 Cyclone and Liquifire snowmobiles are identified in the table below and illustrated in the following drawings.



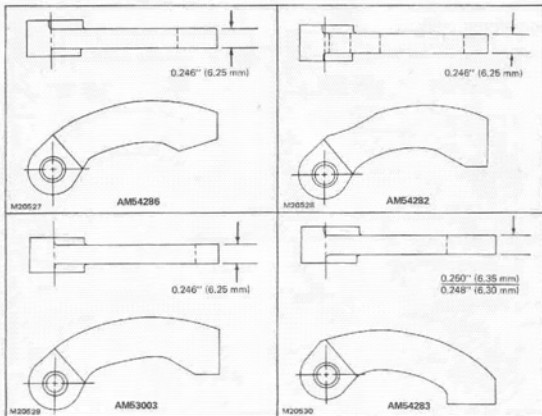
DRIVE CLUTCH WEIGHTS

	KIT NO.
Light ↓ Heavy	AM53406*
	AM54285
	AM54284*
	AM53736*
	AM54286
	AM54282*
	AM53003
	AM54283
	AM54168*
	AM54288
	AM54287*
	AM54290*
	AM53949
	AM54280
	AM54289
	AM54279
	AM54281

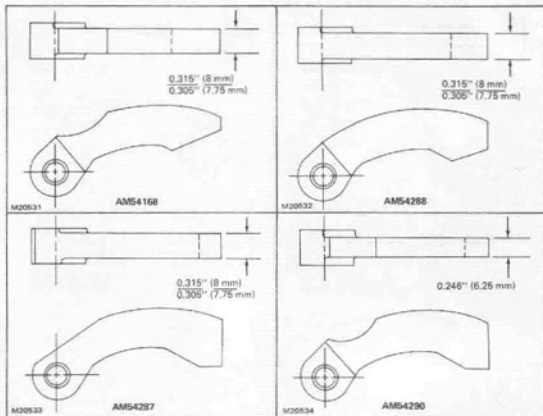
*These arms have increased engagement speeds because of either flats or notches. They tend to increase slip or allow the engine to accelerate through a bog area. These arms will also cause increased belt wear because of additional slip.



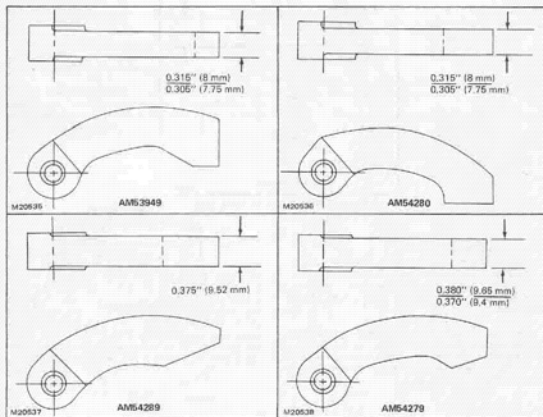
WEIGHTS SHOWN ARE ACTUAL SIZE



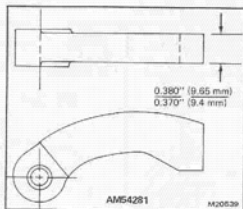
WEIGHTS SHOWN ARE ACTUAL SIZE



WEIGHTS SHOWN ARE ACTUAL SIZE



WEIGHTS SHOWN ARE ACTUAL SIZE

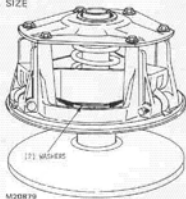


WEIGHTS SHOWN ARE ACTUAL SIZE

3. Spacer Washers,

Spacer washers between the shoulder of the fixed face post and the spider assembly change the position of the weight's center of gravity. This affects the engagement speed and also has some influence on the effective force of the weights.

Removing spacers increases engagement and slightly increases governed rpm. If using less than two spacers, check for proper disengagement. Make sure the movable face contacts the spider assembly in the hub area with the weights installed.



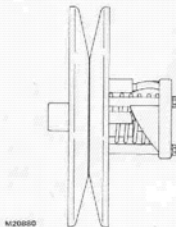
DRIVEN SHEAVE

Principles of Operation

The driven sheave works with the drive sheave to provide a smooth transition from low speed ratio to high speed ratio.

The driven sheave is torque sensitive. If an increased load or high torque requirement occurs after the snowmobile is up to speed, the cam bracket in the driven sheave forces the sheave halves together. This causes the snowmobile to travel at a slower speed while maintaining high engine rpm.

Because the driven sheave can sense load and shift into the proper ratio, the engine rpm remains at peak output at wide open throttle. If the driven sheave did not downshift, the engine would run below its maximum power rpm.



Tuning

1. Driven Sheave Spring

The spring tension determines engine speed during the shift pattern. Spring tension is adjusted by selecting one of four numbered holes in the cam.

- If the engine is operating at speeds above the peak power curve, decrease spring tension. This will allow the driven sheave to shift into a higher ratio under the same load and thus decrease engine speed.

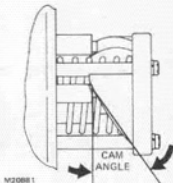
- If the driven sheave is shifting into a higher ratio than the engine can pull, increase spring tension. This will prevent the driven sheave from shifting up and thus increase engine speed.

- Under light load conditions such as a lightly snow-covered lake, decrease spring tension.

- Under heavy snow conditions or when pulling heavy loads, increase spring tension.

2. Cam Angle

The cam angle works with the spring tension to determine how easily the driven sheave will shift up. If the spring tension remains the same and cam angle is increased, the driven sheave will shift to a higher ratio under the same load and will lower the rpm of the engine. If the cam angle is decreased, the rpm of the engine will increase. For example, a 38° cam angle will provide more engine rpm and shift up slower than a 44° angle.



The following chart lists spring pretension with either the 38° or 44° cam.

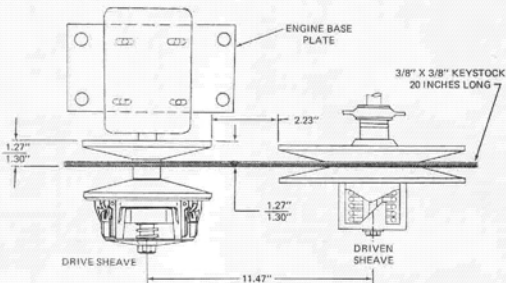
PRETENSION CHART

Insert spring tang into cam hole number.	Place cam and spring over fixed face hub with spring tang in hole of fixed face. Rotate cam clockwise past the ramp indicated.	Degrees of rotation to pass ramp.	Pounds of spring tension measured at sheave rim.
1	1 ramp	50°	5 Lb.
2 (std.)	1 ramp	50°	6 Lb.
3	1 ramp	110°	8 Lb.
4	2 ramps	140°	10 Lb.

DRIVE SHEAVE AND DRIVEN SHEAVE ALIGNMENT

The drive and driven sheaves must be aligned for peak performance and maximum belt life. To align the sheaves,

use the special service alignment tool available from your dealer or use the following diagram,



M14477

DRIVE BELT DIMENSION

The drive belt dimensions are carefully calibrated when the drive system is matched to the machine at the factory. Dimensions critical to the performance of the machine are the outside circumference of the belt and the

width of the belt. Circumference and width both affect the shifting characteristics of the clutch.

A drive belt that is not to specification will not perform well. A drive belt that is too long will decrease top speed and raise engagement speed, and one that is too short will increase top speed but reduce engagement speed.

Belt No.	Outside Circumference	Width
M64550	44.8" (1133.3 mm) $\pm .12$	1-1/4"
M65703	47.5" (1205.2 mm) $\pm .12$	1-1/4"
M66345	46.3" (1176 mm) $\pm .12$	1-1/4"

A drive belt that is worn affects performance similar to a long belt. A drive belt worn to less than 1-1/16-inches wide should be replaced.

HIGH ALTITUDE APPLICATION

At higher altitudes, the carburetor must be tuned to provide peak performance. As you know, the drive train must govern the engine rpm at its peak power point for maximum performance. This means that after the carburetor is tuned, the drive train should also be tuned to agree

with the new carburetor performance.

The following tables provide guidelines for tuning the drive train for high altitude operation.

LOW ALTITUDE CLUTCHING FOR 1976 SNOWMOBILES (SERIAL NO. 55,001-70,000)
ALTITUDE - SEA LEVEL TO 6,000 FEET

SNOWMOBILE MODEL	CLUTCH ENGAGEMENT (RPM)	GOVERNED SPEED (RPM)	GEARING SPROCKETS	SPACERS IN PRIMARY CLUTCH	PRIMARY CLUTCH SPRING	PRIMARY CLUTCH ARM KIT	SPRING POSITION IN SECONDARY CLUTCH	SECONDARY CLUTCH CAM	CHAIN PITCH
340 Cyclone	3700-3900	6500-7000	21 tooth 39 tooth	Two	Silver	AM53940	No. 2	38° M66384	66
440 Cyclone	3400-3600	6500-7000	24 tooth 40 tooth	Two	Black	AM53949	No. 2	38° M66384	68
340 Liquifire	3700-3900	7000-7500	21 tooth 39 tooth	Two	Silver	AM53949	No. 2	38° M66384	66
440 Liquifire	3400-3600	7250-7750	24 tooth 40 tooth	Two	Black	AM54270	No. 2	38° M66384	68

HIGH ALTITUDE CLUTCHING FOR 1976 SNOWMOBILES (SERIAL NO. 55,001-70,000)
ALTITUDE - 6,000 TO 12,000 FEET

SNOWMOBILE MODEL	CLUTCH ENGAGEMENT (RPM)	GOVERNED SPEED (RPM)	GEARING SPROCKETS	SPACERS IN PRIMARY CLUTCH	PRIMARY CLUTCH SPRING	PRIMARY CLUTCH ARM KIT	SPRING POSITION IN SECONDARY CLUTCH	SECONDARY CLUTCH CAM	CHAIN PITCH
340 Cyclone	4100-4300	6500-7000	17 tooth 42 tooth	One	Silver	AM54287	No. 2	38° M66384	66
440 Cyclone	3500-3700	6500-7000	21 tooth 39 tooth	One	Silver	AM54278	No. 2	38° M66384	66
340 Liquifire	4100-4300	7000-7500	17 tooth 35 tooth	One	Silver	AM54287	No. 2	38° M66384	62
440 Liquifire	4100-4300	7250-7750	21 tooth 39 tooth	None	Black	AM54289	No. 2	38° M66384	66

1977-78 340 CYCLONE - CLUTCHING RECOMMENDATIONS

ALTITUDE (FEET)	CLUTCH ENGAGEMENT (RPM)	GOVERNED SPEED (RPM)	GEARING SPROCKETS	SPACERS IN PRIMARY CLUTCH	PRIMARY CLUTCH SPRING	PRIMARY CLUTCH ARM KIT	SPRING POSITION IN SECONDARY CLUTCH	SECONDARY CLUTCH CAM	CHAIN PITCH
Sea Level	4000-4300	6200-6700	21 Tooth 39 Tooth	One	Silver	AM54278	No. 2	38° M66384	66
2000	4000-4300	6200-6700	21 Tooth 39 Tooth	One	Silver	AM54279	No. 2	38° M66384	66
4000	3900-4200	6200-6700	17 Tooth 35 Tooth	One	Silver	AM53949	No. 3	44° M66038	62
6000	3900-4200	6200-6700	17 Tooth 35 Tooth	One	Silver	AM53949	No. 2	44° M66938	62
8000-10000	4300-4600	6200-6700	17 Tooth 42 Tooth	One	Silver	AM54288	No. 2	38° M66384	66

1977-78 440 CYCLONE - CLUTCHING RECOMMENDATIONS

ALTITUDE (FEET)	CLUTCH ENGAGEMENT (RPM)	GOVERNED SPEED (RPM)	GEARING SPROCKETS	SPACERS IN PRIMARY CLUTCH	PRIMARY CLUTCH SPRING	PRIMARY CLUTCH ARM KIT	SPRING POSITION IN SECONDARY CLUTCH	SECONDARY CLUTCH CAM	CHAIN PITCH
Sea Level	3600-3800	6200-6700	24 Tooth 40 Tooth	Two	Silver	AM54279	No. 2	44° M66938	68
2000	3600-3800	6200-6700	24 Tooth 40 Tooth	Two	Silver	AM54279	No. 2	44° M66938	68
4000	4000-4300	6200-6700	21 Tooth 39 Tooth	One	Silver	AM54279	No. 2	38° M66384	66
6000	4000-4300	6200-6700	21 Tooth 39 Tooth	One	Silver	AM54279	No. 2	38° M66384	66
8000-10000	3900-4200	6200-6700	17 Tooth 35 Tooth	One	Silver	AM53949	No. 2	38° M66384	62

1977-78 340 LIQUIFIRE - CLUTCHING RECOMMENDATIONS

ALTITUDE (FEET)	CLUTCH ENGAGEMENT (RPM)	GOVERNED SPEED (RPM)	GEARING SPROCKETS	SPACERS IN PRIMARY CLUTCH	PRIMARY CLUTCH SPRING	PRIMARY CLUTCH ARM KIT	SPRING POSITION IN SECONDARY CLUTCH	SECONDARY CLUTCH CAM	CHAIN PITCH
Sea Level	4000-4300	6800-7300	21 Tooth 39 Tooth	One	Silver	AM54279	No. 2	38° M66384	66
2000	4000-4300	6800-7300	21 Tooth 39 Tooth	One	Silver	AM54279	No. 2	38° M66384	66
4000	4000-4300	6800-7300	21 Tooth 39 Tooth	One	Silver	AM54279	No. 2	38° M66384	66
6000	4000-4300	6800-7300	21 Tooth 39 Tooth	One	Silver	AM53949	No. 2	38° M66384	66
8000-10000	4300-4600	6800-7300	17 Tooth 35 Tooth	One	Silver	AM54288	No. 3	38° M66384	62

1977-78 440 LIQUIFIRE - CLUTCHING RECOMMENDATIONS

ALTITUDE (FEET)	CLUTCH ENGAGEMENT (RPM)	GOVERNED SPEED (RPM)	GEARING SPROCKETS	SPACERS IN PRIMARY CLUTCH	PRIMARY CLUTCH SPRING	PRIMARY CLUTCH ARM KIT	SPRING POSITION IN SECONDARY CLUTCH	SECONDARY CLUTCH CAM	CHAIN PITCH
Sea Level	3200-3400	6800-7300	24 Tooth 40 Tooth	Two	Black	AM54279	No. 2	44° M66938	68
2000	3200-3400	6800-7300	24 Tooth 40 Tooth	Two	Black	AM54279	No. 2	44° M66938	68
4000	3600-3800	6800-7300	24 Tooth 40 Tooth	Two	Silver	AM54279	No. 2	38° M66384	68
6000	3600-3800	6800-7300	24 Tooth 40 Tooth	Two	Silver	AM53949	No. 2	38° M66384	68
8000-10000	3800-4000	6800-7300	17 Tooth 35 Tooth	One	Black	AM54288	No. 2	38° M66384	62



Suspension

The slide rail suspension system allows the weight to transfer to the rear during acceleration for better traction and ski lift.

The following adjustments are provided to tune the suspension to the rider:

- Front and rear torsion spring preload
- Weight transfer
- Ski lift
- Ski alignment
- Ski steering control
- Track tension

TORSION SPRING ADJUSTMENT

ADJUSTING SLIDE SUSPENSION SPRINGS

Before adjusting the front and rear torsion springs, ride the snowmobile to determine adjustment requirements.

Spring tension (tightening or loosening) of the front and rear torsion springs can be adjusted to suit the weight and riding style of the operator. For high speed operation, adjust the front torsion spring for minimum spring tension. Be sure at least two threads of the adjusting screws protrude through the nuts. Adjust the rear torsion spring for the riders weight.

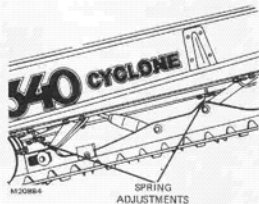
NOTE: In deep snow at high speeds, increased tightening of the front torsion springs will help provide additional ski lift.

Rear Torsion Spring 1976-77 Models

If the suspension bottoms frequently, increase the spring tension. If the ride is stiff, decrease the spring tension.

To increase the spring tension, turn the two adjusting screws clockwise. To decrease the spring tension, turn the two adjusting screws counterclockwise.

When decreasing the spring tension, always make sure that at least two threads of the adjusting screws protrude through the nuts.



Front Torsion Spring 1976-77 Models

If the front torsion springs have excess spring tension, the ride will be stiff and the front of the sled will seem light and lift too easily. Added lift is fine for deep snow but makes the ride choppy on rough surfaces. Although the front torsion spring is not the only adjustment for ski lift, it does contribute.

To reduce the spring tension, turn the adjusting screws counterclockwise. Always make sure that at least two threads of the adjusting screws protrude through the nuts.

WEIGHT TRANSFER/SKI LIFT ADJUSTMENT

1976-77 MODELS

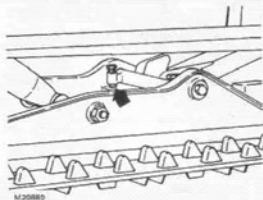
Two steering response screws on the lower portion of the front pivot arm provide adjustment for ski lift or weight transfer. Weight transfer occurs when the front skis are slightly lifted off the ground.

1. Ride the snowmobile and determine the amount of adjustment that is necessary.

2. The screws are factory adjusted for minimum ski lift with the adjusting screw head flush with the top of its bushing. To increase ski lift, turn the screw so that less threads are exposed under the bushing.

3. Set ski lift for maximum in deep snow conditions. Reduce ski lift to a minimum for fast operation on packed surfaces.

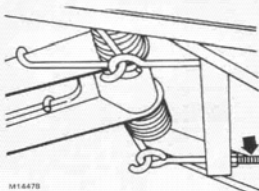
NOTE: Reducing ski lift reduces the amount of weight transfer and improves steering control.



Front Torsion Springs - 1978 Models

If the front torsion springs are tightened too much, the ride will be stiff and the front of the snowmobile will seem light and lift up when power is applied. Added lift is fine for deep snow but makes the ride choppy on rough surfaces. The front torsion spring is not the only adjustment for ski lift, but it does contribute.

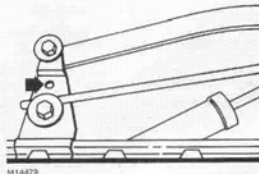
To reduce the spring tension, turn adjusting nuts counterclockwise. Be sure that at least two threads of the adjusting screws protrude through the nuts.



Rear Torsion Springs - 1978 Models

If the suspension bottoms frequently, increase the spring tension. If the ride is stiff, decrease the spring tension.

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



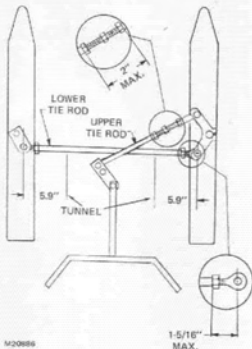
SKI ALIGNMENT ALL MODELS

The illustration at right shows the proper positioning of the skis in relationship to the steering arms, tie rods and steering column. To align the skis:

1. Raise the front end of the sled slightly to remove weight from the skis.
2. Position the handlebars straight ahead.
3. Measure the distance over the front and rear wear rod nuts. The two dimensions should be the same.
4. If adjustment is necessary, remove the exhaust silencer for access to the tie rods.
5. Loosen the jam nuts on each end of the lower tie rod. Rotate the tie rod until the skis are parallel and tighten the jam nuts. Turn the rod toward the front of the sled to spread the front of the skis apart.
6. To realign the handlebars, loosen the jam nuts on both sides of the adjuster on the upper tie rod. Rotate the adjuster until the handlebars are aligned. Tighten the jam nuts.

NOTE: Do not exceed 1-5/16 inches between the tie rod and the center of the tie rod bearing when aligning. Do not exceed 2 inches between the upper tie rod and the center of the tie rod end bearing.

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



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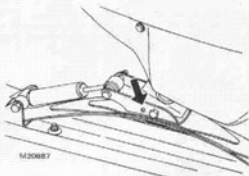
1-5/16\"/>

SKI STEERING CONTROL ALL MODELS

There are two ski mounting holes in the ski spring saddle for adjusting steering control for the various snow conditions.

With the skis in the front holes, caster increases and ski darting is held to a minimum. Use this position for high speed, cross country running where steering effort is not a major consideration but ski darting is.

Use the rear holes for slow trail riding. Steering effort will be reduced to a minimum and darting will not be a problem because of slower speeds.

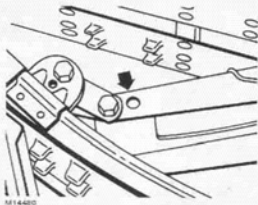


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**ADDITIONAL SKI STEERING CONTROL
FOR 1978 MODELS**

The front portion of the slide rail suspension can be mounted on either of two holes in the front hinge plate to vary the amount of weight on the skis and achieve optimum steering control.

To increase the weight on the skis for more steering control, connect slide rail arms to the upper rear holes of the hinge plate. This would be the position for slow trail riding where more down pressure and steering control is required.

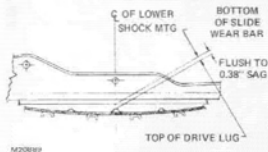
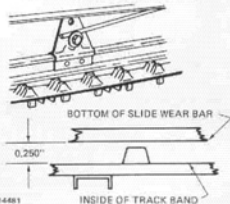
**TRACK ADJUSTMENTS
ALL MODELS**

Track tension and alignment must be checked frequently. A track that is too loose will cause excessive slap which can damage the track, tunnel or slide assembly. A track that is too loose or too tight requires additional power to operate.

The Cyclone models and 1976 Liquifire use a molded grouser bar track with 24 grouser bars. The 1977-1978 Liquifire models use a 2/3 riveted track with 48 bars. Adjustment procedures are similar.

To Tension the Track:

1. Suspend the rear of the sled slightly above the ground.
2. Loosen the jam nuts on the two track adjusting screws.
3. To adjust the molded grouser bar track, tension the track so that the dimension between the bottom of the slide wear bar and the top of the drive lug is 0.00 to 0.38-inch. Measure this dimension below the lower shock mount.
4. To adjust the 2/3 grouser bar track, tension the track so that the dimension between the bottom of the slide wear bar and the top of the track is 0.00 to 0.25-inch. Measure this dimension below the lower shock absorber mount.
5. Tighten the jam nuts.

MOLDED GROUSER BAR TRACK**2/3 RIVETED GROUSER BAR TRACK**

After Adjustment - All Models:

1. Start the engine and idle the track slowly so that it rotates several times. Turn off the engine and allow the track to coast to a stop.
2. Check alignment by observing where the rear idler wheels run with respect to the drive lugs. The rear idler wheels should run in the center of the drive lugs.
3. Look under the track and determine if the slide rail wear strip is directly in the middle of each slide rail opening on the track.

4. If either step 2 or step 3 indicates a need for adjustment, repeat the tensioning procedure.

NOTE: A track will always run to the loose side. For proper tensioning, the adjusting screw on the loose side should be tightened. For example, if the track is too far to the left side, tighten that side to move the track to the right.

TRACK STUDS OR CLAW

Performance can often be improved by adding studs or cleats to the tracks. A claw kit, part number AM54311, is best suited for general, all-around snowmobiling where snow is hard packed or deep. A carbide stud kit, part number AM54373, is suited for operation on marginal snow or ice conditions, such as hard frozen lakes and rivers where there is little or no snow cover. These kits can be installed on both the molded grouser bar track and the 2/3 riveted grouser bar track.

Install the Wear Strip

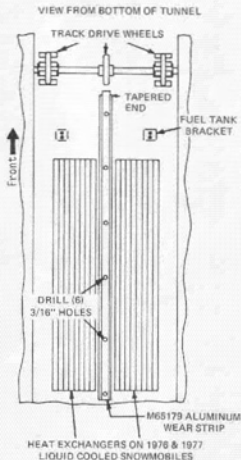
Before installing studs or claws, install the aluminum wear strip, part number M65179, in the tunnel. This wear strip is necessary to protect the heat exchanger and tunnel. Install as follows on all models:

1. Remove the suspension, seat and foam strip between the heat exchangers.
2. Drill out four pop rivets which secure the fuel tank brackets, and remove the fuel tank.
3. Place the wear strip equally fore and aft in the center of the tunnel so that the tapered end of the wear strip points to the front of the snowmobile.
4. Using the wear strip as a template, drill six 3/16-inch holes through the tunnel.

IMPORTANT: Be careful not to drill through electrical wiring or heat exchangers on liquid cooled snowmobiles.

5. Pop-rievet the wear strip to the tunnel using rivets supplied with the stud or claw kit.

6. Reinstall the fuel tank, foam strip and seat. Install the studs or claw before reinstalling the suspension.



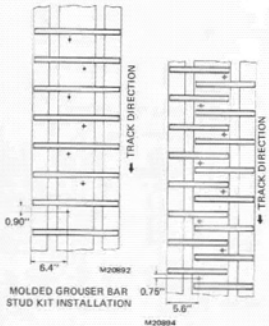
Install the Studs or Claw

The number of studs or claws is not as important as their condition and location. Too many studs can be worse than no studs at all. A stud's effectiveness depends on the amount of weight it supports. Too many studs reduce the effectiveness of the studs and can cause turning and loss of traction.

Claws should be as sharp as possible and should be

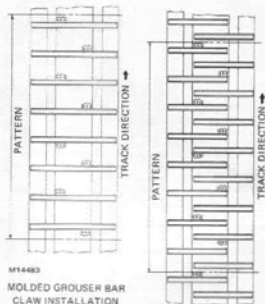
replaced when the sharp points are worn down.

Installation instructions are provided with the stud and claw kit. The following illustrations give recommended installation patterns for claw and stud kits for the two types of tracks.



MOLDED GROUSER BAR
STUD KIT INSTALLATION

2/3 RIVETED TRACK
STUD KIT INSTALLATION



MOLDED GROUSER BAR
CLAW INSTALLATION

2/3 RIVETED TRACK
STUD KIT INSTALLATION

After Installation:

Check the track tension more frequently than usual. Severe track and tunnel damage can occur if the track is operated too loosely.

IMPORTANT: Any damage caused to the track or the snowmobile because of the studs or claws is not warranted by John Deere.



John Deere is at your service when you need it

It is John Deere's objective to train all of their authorized dealer service personnel effectively so they can handle your service needs. Your dealer therefore has service technicians who are trained to give your machine the best of care. We would encourage you to use the service provided by your dealer whenever possible.

If for some reason you are unable to locate a dealer in your area, our sales branches are available to provide you with such information. The location and listing of such sales branches are listed below. Check the listing for the location nearest you.

Sales Branch

- | | | |
|---|--|---|
| 1. JOHN DEERE COMPANY
5147 Peachtree Ind. Blvd. NE
Atlanta, Georgia 30341 | 5. JOHN DEERE LIMITED
S. Service Road
P.O. Box 1000
Grimsby, Ontario, Canada L3M 4H5 | 8. JOHN DEERE COMPANY
Box 855
2001 West 94th Street
Minneapolis, Minnesota 55440 |
| 2. JOHN DEERE COMPANY
701 Georgesville Road
Columbus, Ohio 43228 | 6. JOHN DEERE COMPANY
3210 East 85th Street
Southeast Station
Kansas City, Missouri 64132 | 9. JOHN DEERE COMPANY
P.O. Box 20098
2100 N.E. 181st Avenue
Portland, Oregon 97220 |
| 3. JOHN DEERE COMPANY
P.O. Box 20598
Dallas, Texas 75220 | 7. JOHN DEERE COMPANY
P.O. Box 47
2105 Latham Street
Memphis, Tennessee 38101 | 10. JOHN DEERE COMPANY
P.O. Box 585
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Syracuse, New York 13201 |
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