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

SP-282 I6

JOHN DEERE

Price 1.00

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.

Introduction

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Contents

Carburetion

PRINCIPLES OF OPERATION

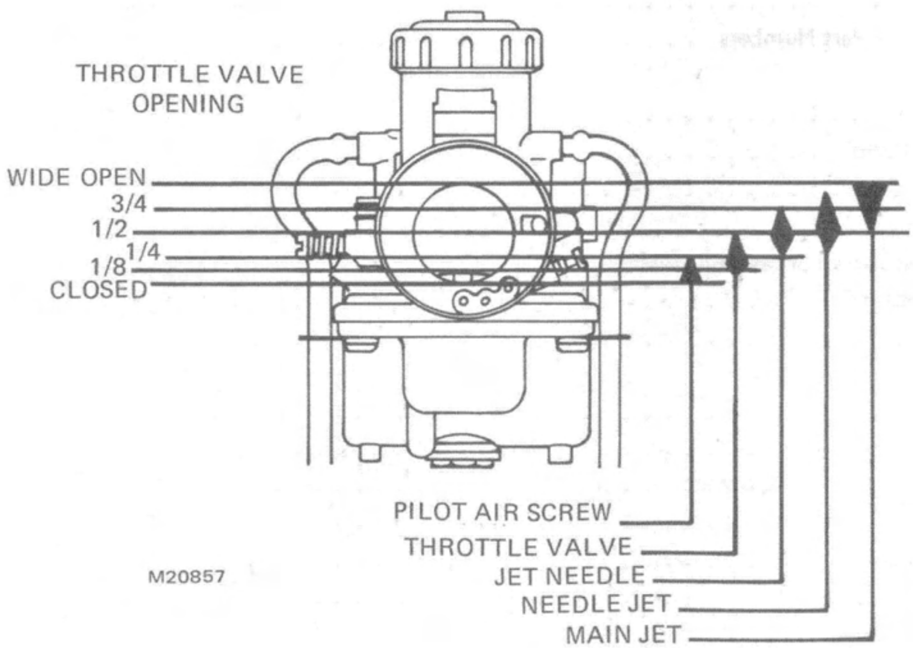
The Cyclone and Liquifire engines are equipped with Mikuni carburetors for consistent performance and efficient engine operation. The Mikuni carburetor utilizes several fuel metering systems:

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

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.



Carburetion

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GENERAL TUNING PROCEDURE

The best way to evaluate the tuning of a carburetor is by operating the snowmobile. In general, symptons 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 page 9.

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 arms are 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 4, 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.

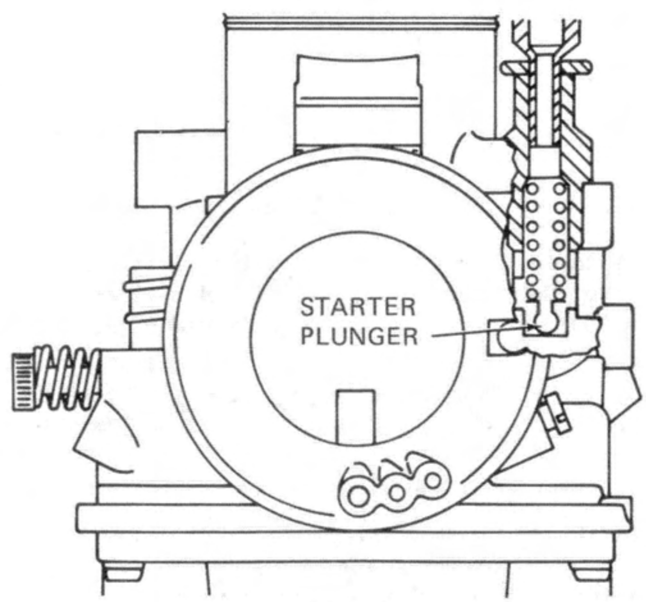
THE STARTING SYSTEM

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.



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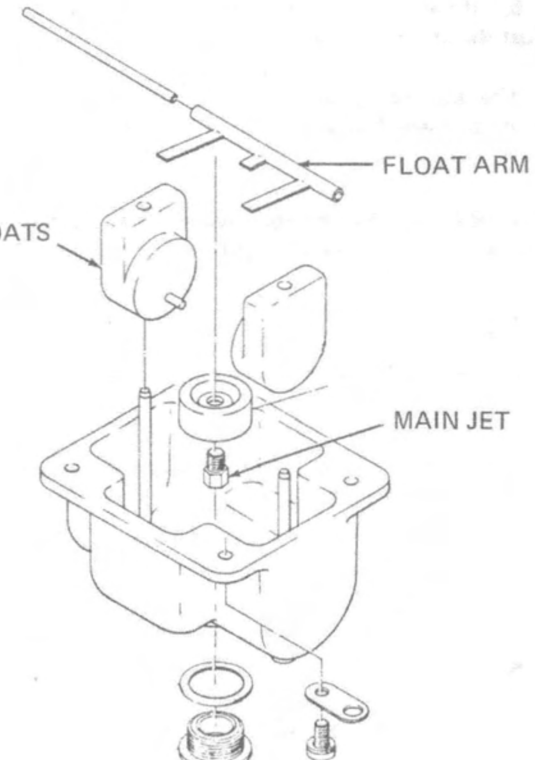
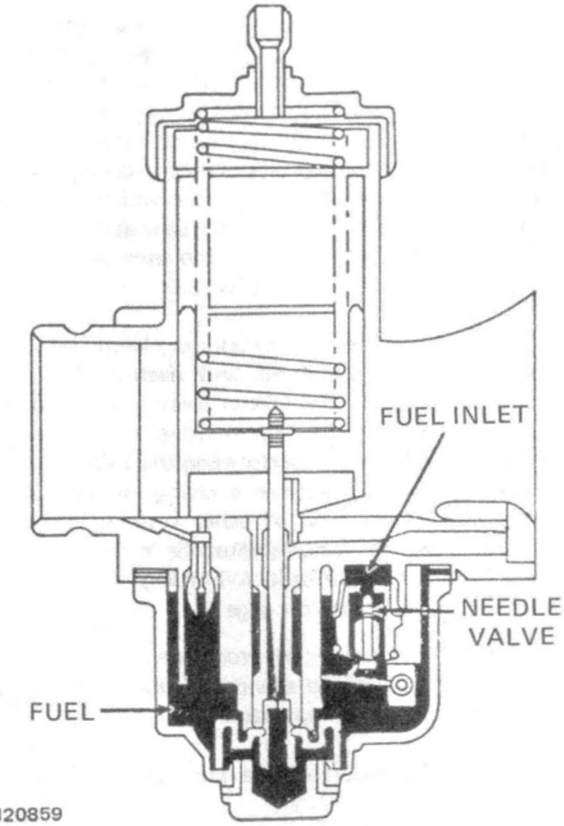
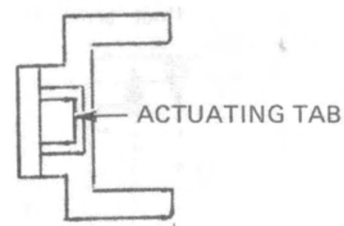
THE FLOAT SYSTEM

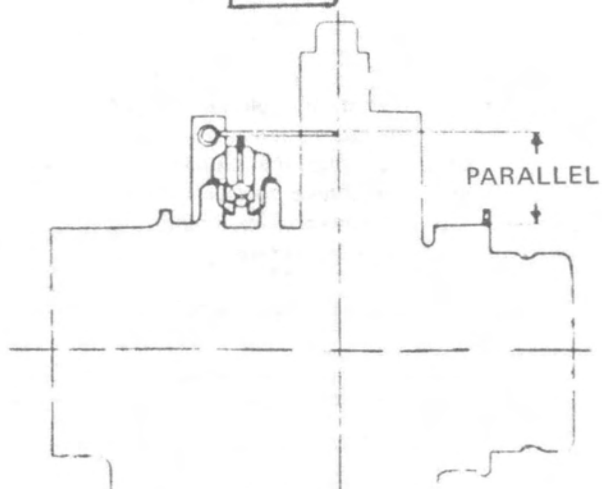
The float system maintains the correct fuel level in the float bowl under all engine operating conditions.

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 tabs also drop. 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.









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

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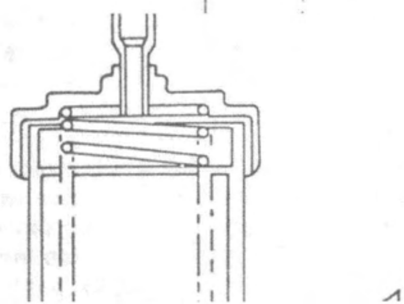
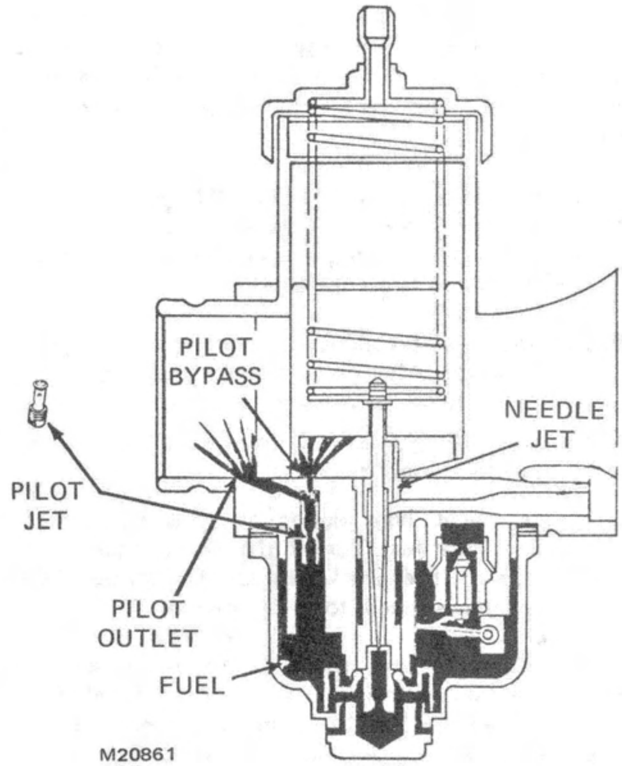


THE PILOT/AIR SYSTEM

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.



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Air Screw Adjustment

NOTE: This procedure maybe 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.

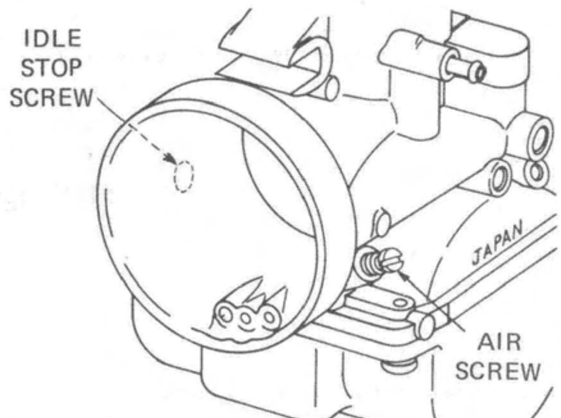
2. Start the engine and adjust the idle stop screw to 2800 rpm.

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.



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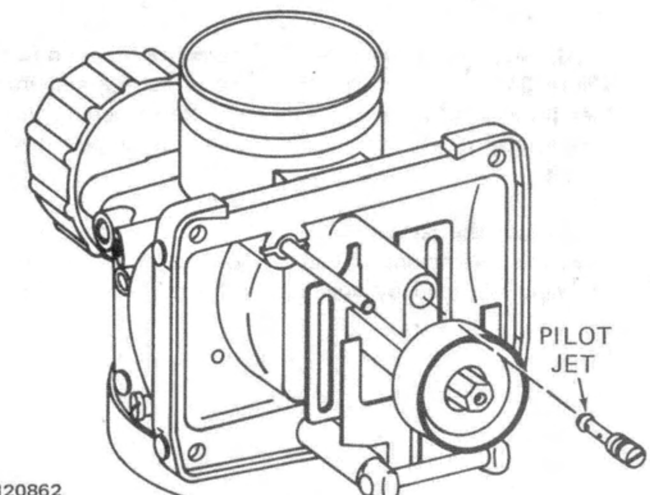
Pilot Jet Replacement

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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THROTTLE VALVE

The throttle valve is cut away on the inlet side to help control the fuel/air mixture at low and intermediate throttle settings. The size of the cutaway also affects acceleration.

Throttle valves are numbered from 0.5 to 4.5 cutaway in 0.5 increments. The most commonly used configurations are 1.5 to 3.5. The higher the number, the greater the cutaway, and the larger the air flow.

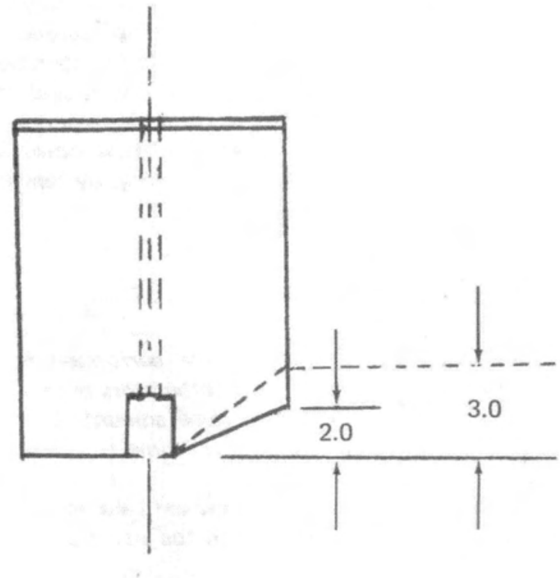
The throttle valve functions in about the same range as the pilot/air system. After the air screw is adjusted, it can be used to check the throttle valve selection:

1. Operate the engine at low throttle settings. (Accelerate from idle to 1/4 throttle.)

2. If the engine bogs during acceleration, there is probably insufficient fuel. Turn in the air screw about 1/4 turn at a time. If engine operation is improved the throttle valve cutaway needs to be decreased.

3. If the engine runs rough or smokes excessively during acceleration, there is probably too much fuel. Turn out the air screw 1/4 turn at a time. If engine operation is improved, the throttle valve cutaway needs to be increased.

4. Increase or decrease the throttle valve cutaway size in 0.5 steps.



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5. Return the air screw to its original setting and repeat the operational test to step 1. Look for smooth acceleration.

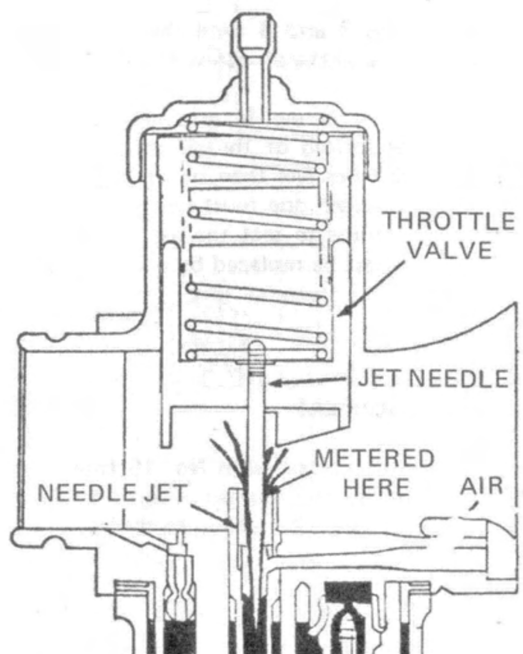
6. As a final check, change the position of the air screw. If this does not significantly affect engine performance (as in steps 2 and 3), the throttle valve is correct.

JET NEEDLE

The jet needle works with the needle jet to increase the amount of fuel as the throttle valve is raised, allowing more air to flow through the carburetor.

Although the jet needle and needle jet function in the 1/4 to 3/4 throttle range, they also affect the amount of fuel present at wide open throttle. When tuning the jet needle, also check main system operation as described on page 8.

Because the jet needle is tapered from top to bottom, an increasing amount of fuel is delivered as the amount of air being provided by opening the throttle valve increases.



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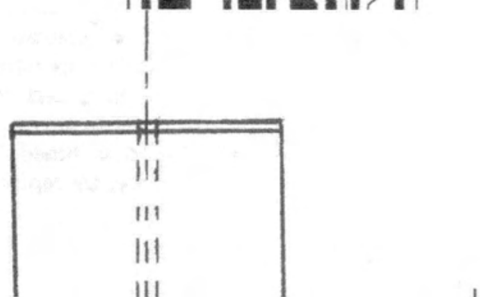
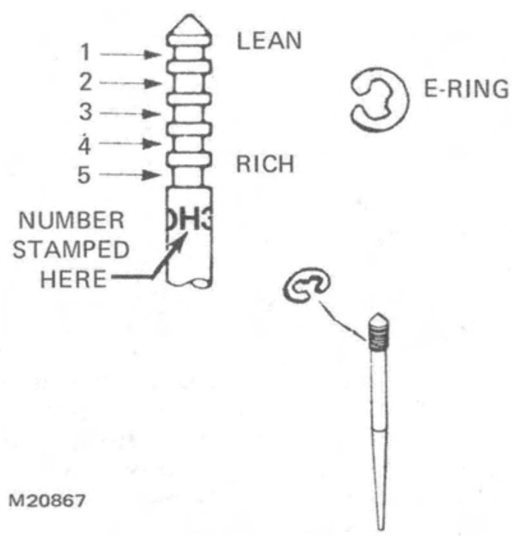


The jet needle works on a combination of length, taper and E-ring position. Each jet needle has a number and letter series stamped on the body:

- **6** — Basic length of the needle.
- **D** — Amount of taper at the top of the needle. A is the least taper, B is 15 minutes greater taper than A, C is 15 minutes greater taper than B, Etc.
- **H** — Amount of taper at the bottom of the needle. If there is only one letter, it refers to bottom taper only.
- **7** — Manufacturer's lot number.

6 D H 7

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 enrichens the fuel/air mixture. See diagram at right.



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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.

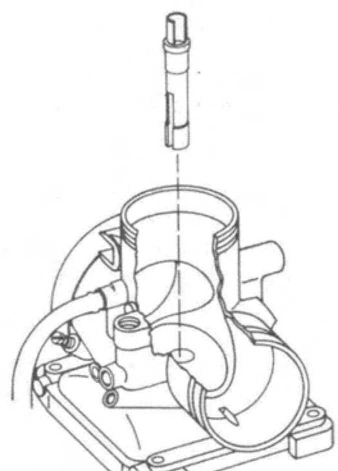
3. If proper operation is obtained at all but the 3/4 throttle setting after the main jet has been tuned, an improved operation may be obtained by changing the jet needle taper. Do not however, change the jet needle until the main jet and E-ring position have been thoroughly checked.

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. 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 fuel at wide open throttle.



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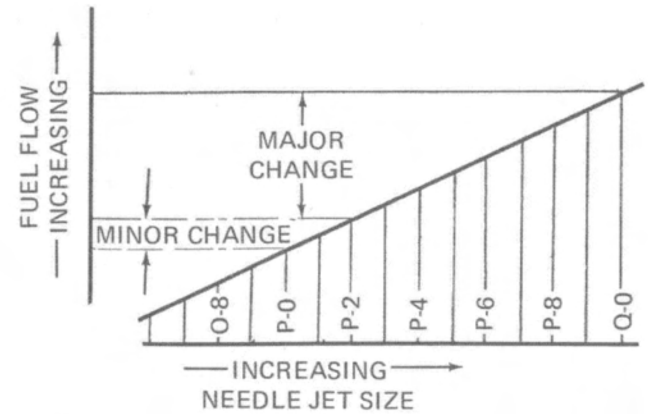
Needle jets are stamped with an alpha-numeric code. The letter indicates a major change in fuel flow. A, for example, indicates lowest flow, B, greater flow, and so on. The number indicates minor adjustments in fuel flow. Zero indicates lowest flow and 9 indicates highest flow. The diagram at right shows 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/jet needle combination. The main jet meters the fuel when the throttle is in the wide open position.

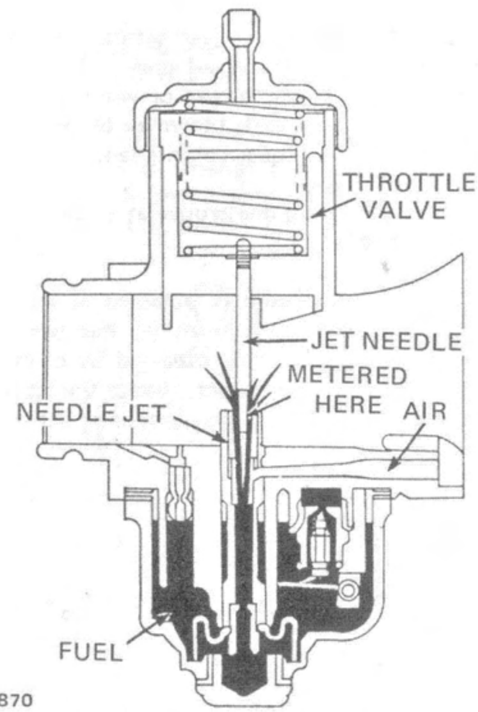
The main jets are available in sizes from number 50 to number 100 (in increments of 5) and from number 100 to number 500 (in increments of 10). The size number corresponds to flow and not necessarily to hole size. Never change the main jet by more than one size at a time.

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 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.



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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

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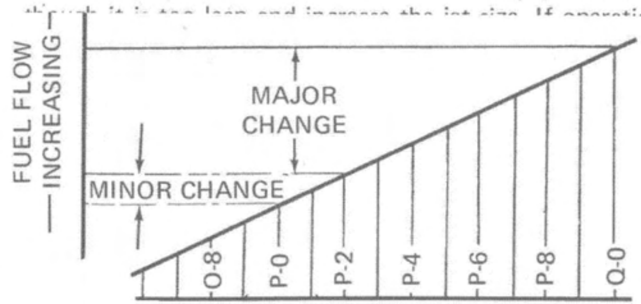


COMPENSATION FOR ALTITUDE AND TEMPERATURE

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.

1976 SNOWMOBILES – HIGH ALTITUDE RECOMMENDATIONS*

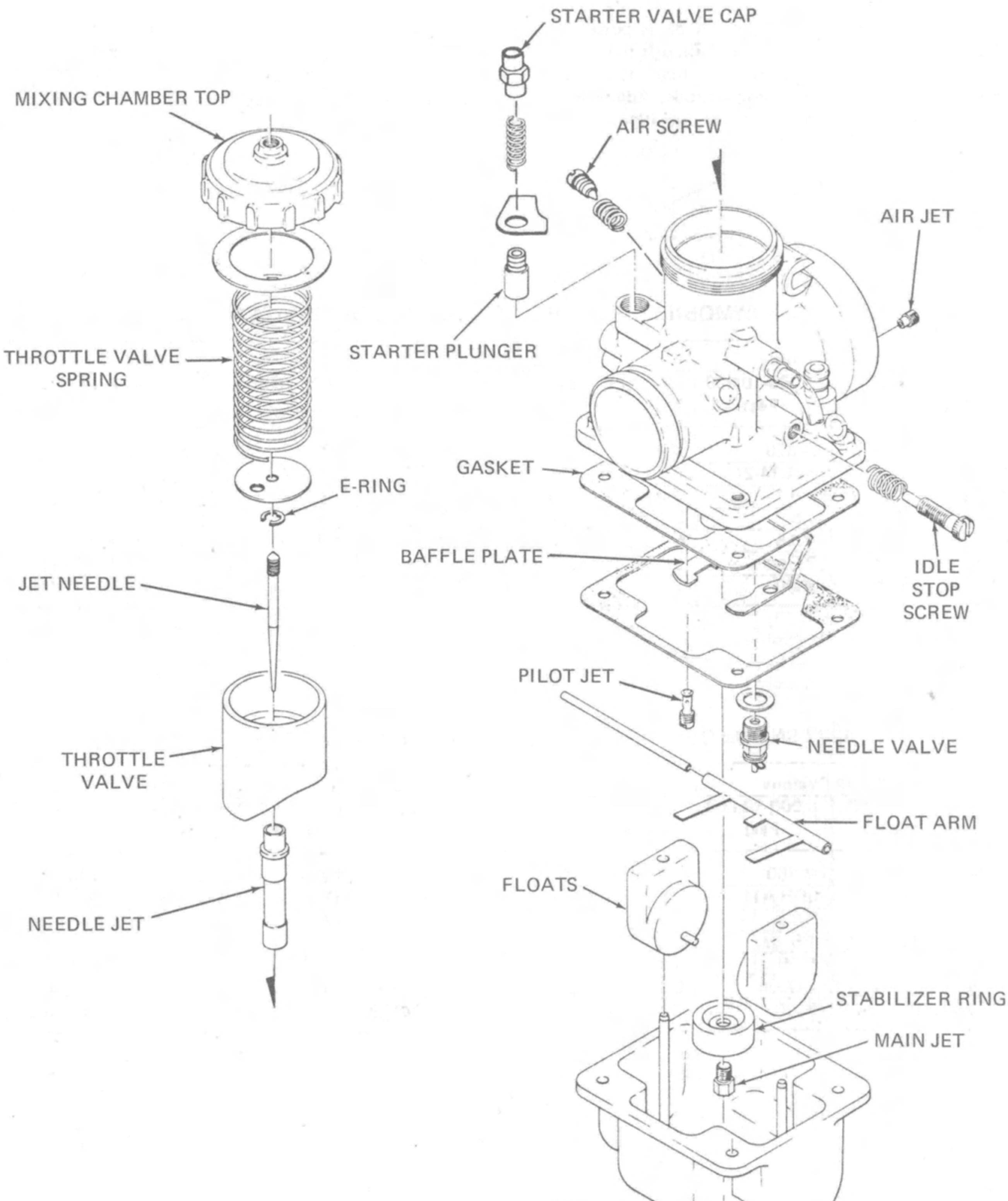
	340 Cyclone		440 Cyclone		340 Liquifire		440 Liquifire	
	0-2,000 Feet	8,000-10,000 Feet	0-2,000 Feet	8,000-10,000 Feet	0-2,000 Feet	8,000-10,000 Feet	0-2,000 Feet	8,000-10,000 Feet
Main Jet	#370	#320	#410	#320	#180	#170	#180	#160
Jet Needle	6FL14-2†	6FL14-2†	6FL14-2†	6FL14-4†	6DH3-4†	6DH3-2†	6DH3-3†	6DH3-2†
Needle Jet	Q-0	P-8	Q-0	Q-0	0-8	0-8	P-0	P-0
Carb. Slide	2.5	1.5	3.0	2.5	2.0	1.0	2.5	1.0
Pilot Jet	#20	#15	#20	#20	#45	#25	#40	#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	3000	1800-2400	1800-2400	1800-2400	3000	1800-2400	1800-2400

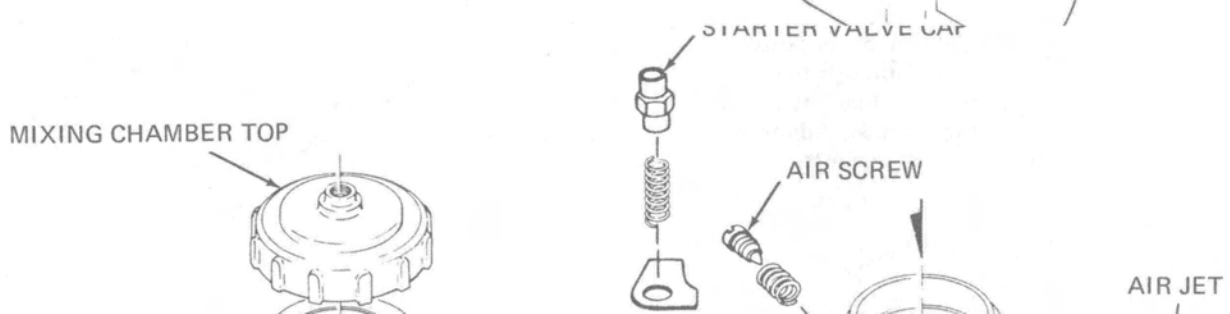
1977 SNOWMOBILES – HIGH ALTITUDE RECOMMENDATIONS*

	340 Cyclone		440 Cyclone		340 Liquifire		440 Liquifire	
	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	#400	#360	#420	#400	#210	#200	#220	#190
Jet Needle	6FL14-3†	6DH7-1†	6FL14-3†	6FL14-3†	6DH3-4†	6DP1-2†	6DH4-4†	6DH7-1†
Needle Jet	Q-0	P-6	P-2	P-2	O-6	O-6	P-0	P-0
Carb. Slide	2.0	1.5	2.0	2.0	2.0	1.0	2.0	1.0
Pilot Jet	#20	#20	#30	#30	#40	#25	#30	#25
Air Screw	2-Open	2-Open	2-Open	1.5 Open	1.0-Open	0.5-Open	1.5-Open	1.5-Open
Idle Speed	1800-2400	3000	1800-2400	1800-2400	1800-2400	3000	1800-2400	1800-2400

*2,000-8,000 feet recommendations will be furnished to your dealer at a later date.

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


STARTER VALVE CAP
MIXING CHAMBER TOP
AIR SCREW
AIR JET
THROTTLE VALVE SPRING
STARTER PLUNGER
GASKET
E-RING
BAFFLE PLATE
IDLE STOP SCREW
JET NEEDLE
PILOT JET
NEEDLE VALVE
THROTTLE VALVE
FLOAT ARM
FLOATS
NEEDLE JET
STABILIZER RING
MAIN JET


MIXING CHAMBER TOP
AIR SCREW
AIR JET

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

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

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

THROTTLE VALVES - 34 MM	
MIKUNI VM34/110	JOHN DEERE NO.
0.5	M66880
1.0	M66881
1.5	M66882
2.0	M66344
2.5	M66743
3.0	M66744
3.5	M66883

THROTTLE VALVES -36 MM	
MIKUNI VM36/39	JOHN DEERE NO.
0.5	M66884
1.0	M66885
1.5	M66886
2.0	M66887
2.5	M66658
3.0	M66888
3.5	M66889

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

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

280 M65884 P-6 M66741 # 55 M66672

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.

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.

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.

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 20 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†	55	60	16-M65811	35-M65809	62-M66123
2.47:1	17/42†	50	54	17-M66302	42-M65810	66-M66122

*Standard
†Optional

DRIVE SHEAVE

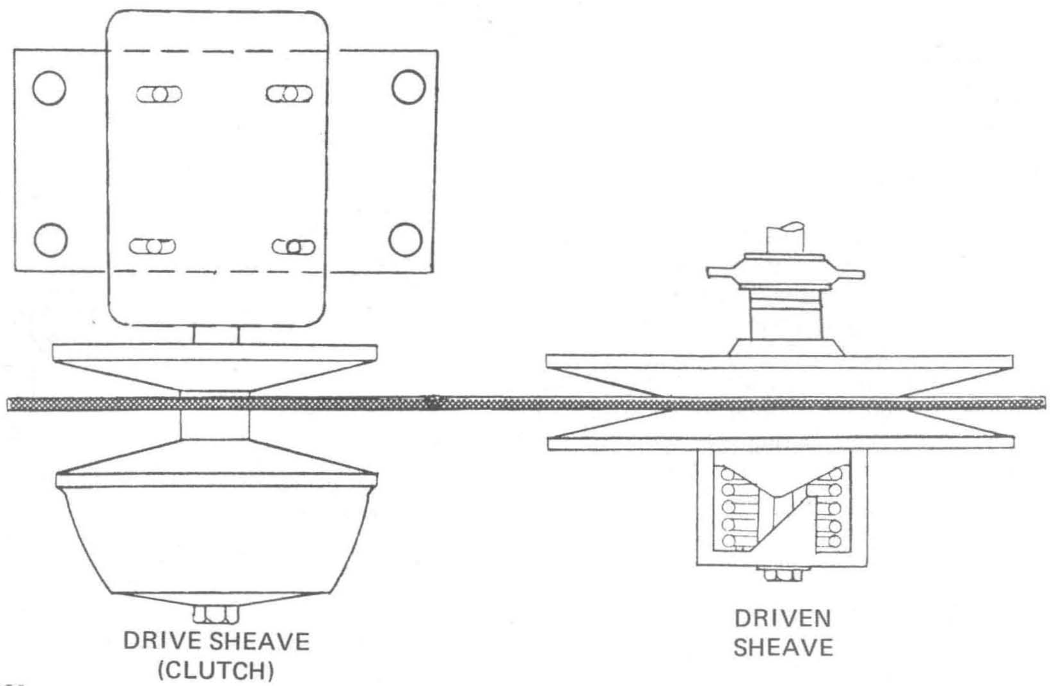
Principles of Operation

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 calibra-

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.



M20882

Tuning

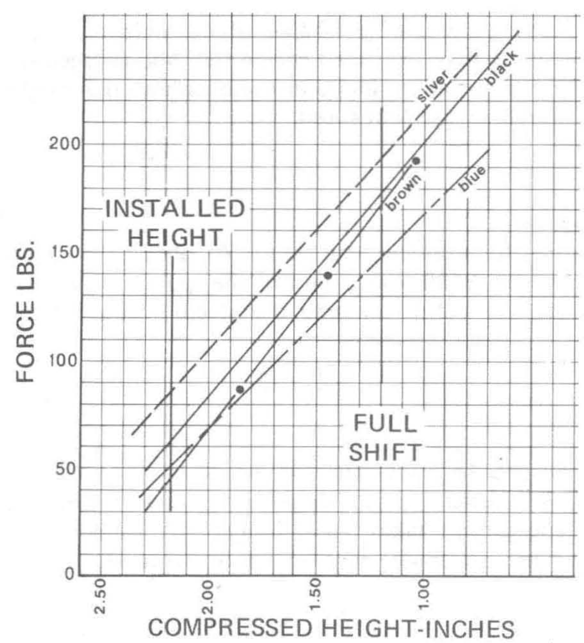
When properly tuned, the clutch engagement and shift pattern will be matched with the engine rpm at which maximum horsepower is delivered at wide open throttle. There are three drive sheave components which may be changed to modify drive sheave performance: drive sheave spring, centrifugal weights, and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

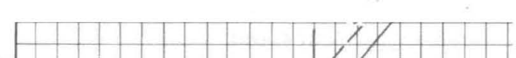
The following table lists the available springs and lists their free lenths. The chart shows the required compressing force for each of these springs.



M20876

	COLOR	PART NUMBER	FREE LENGTH
Light	Blue	M66024	3.00″ ± 0.06
↓	Brown	M66692	2.875″ ± 0.06
	Black	M65684	3.03″ ± 0.06
Heavy	Silver	M66541	3.475″ ±0.06

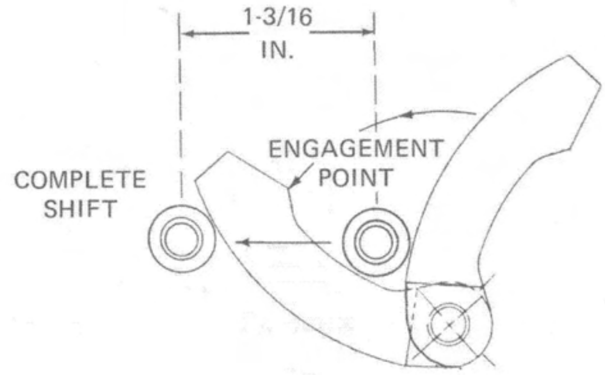
There are three drive sheave components which may be



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



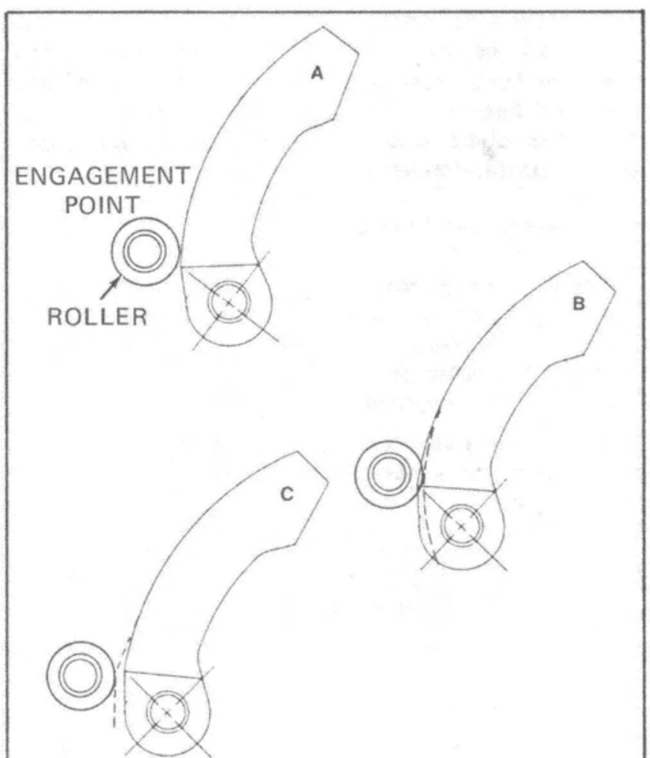
M20877

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.

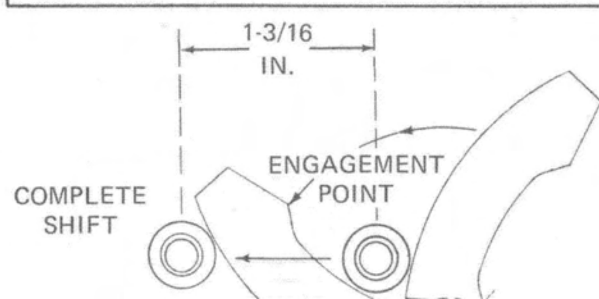
On weight "C", the angle of incline at engagement is less than weight "A". Because it is easier for centrifugal force to cause the moveable face to move up ramp "C", the clutch will engage at less than 3500 rpm.



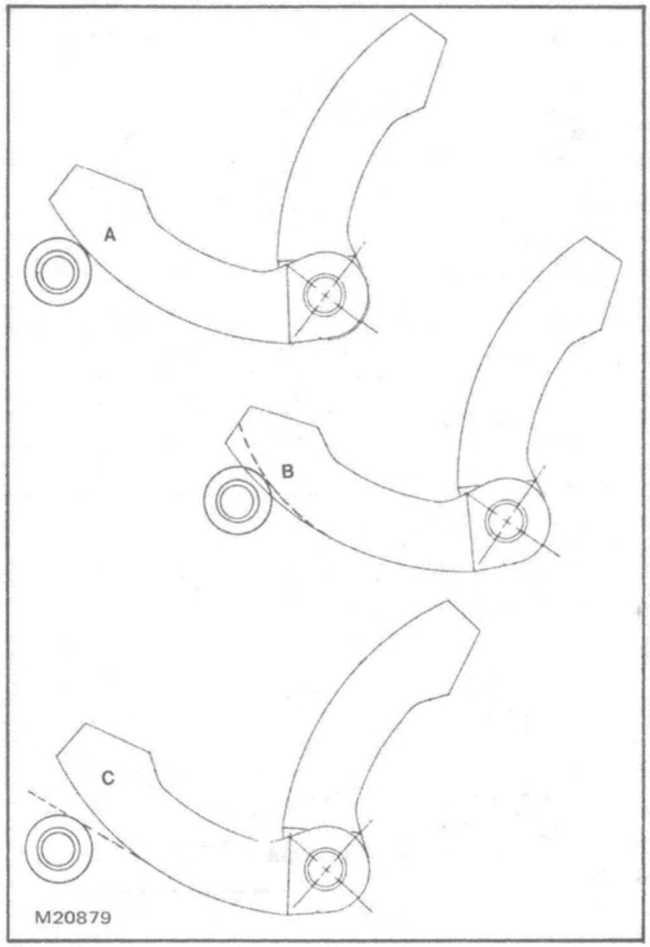
M20878

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 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.

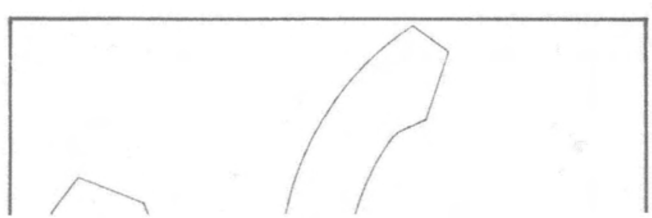
Weight "C" is not cut back as far as weight "A", and engine speed will therefore be greater than 6500 rpm for the weight to complete the shift pattern.

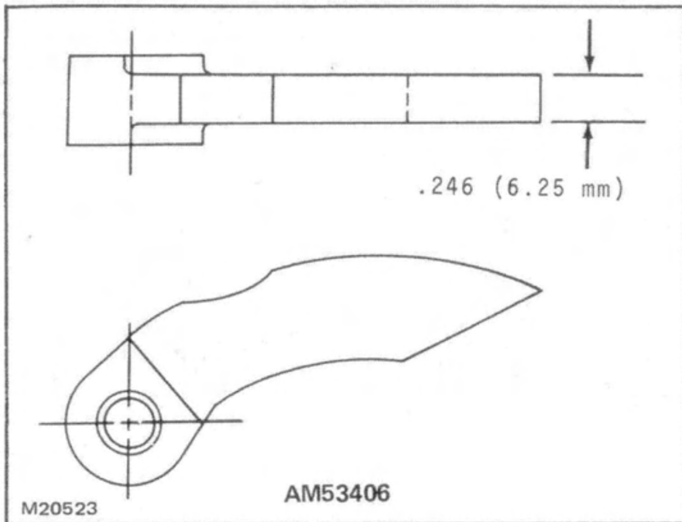
The weight kits available for the 340 and 440 Cyclone and Liquifire snowmobiles are identified in the table below and illustrated in the following drawings.

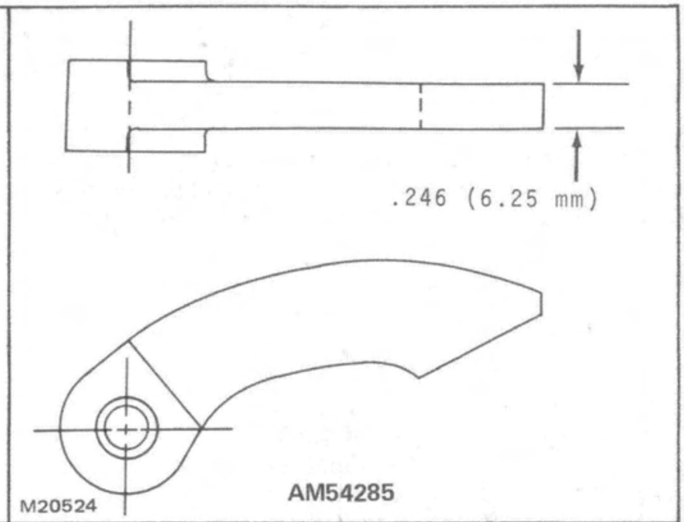
DRIVE CLUTCH WEIGHTS

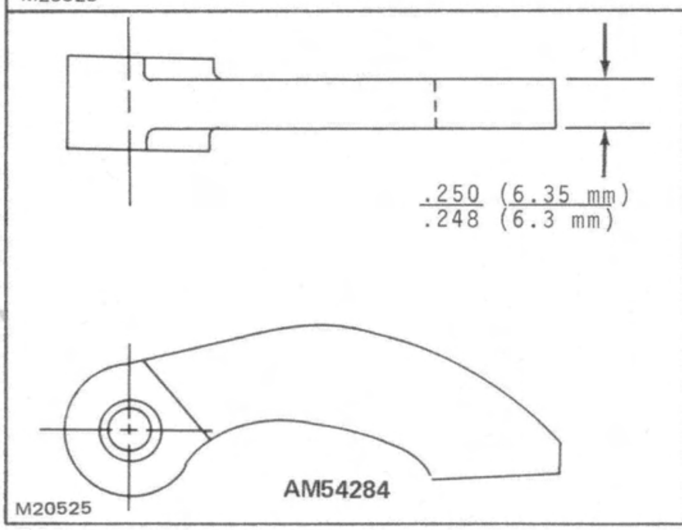
	KIT NO.
Light	AM53406*
	AM54285
	AM54284*
	AM53736*
	AM54286
	AM54282*
	AM53003
	AM54283
	AM54168*
	AM54288
	AM54287*
	AM54290*

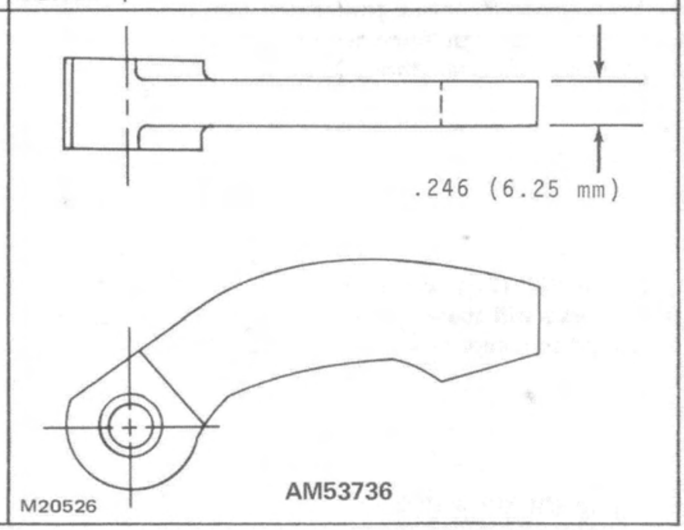
The next illustration shows the profiles and positions of the same three weights when the clutch has completed its shift pattern.

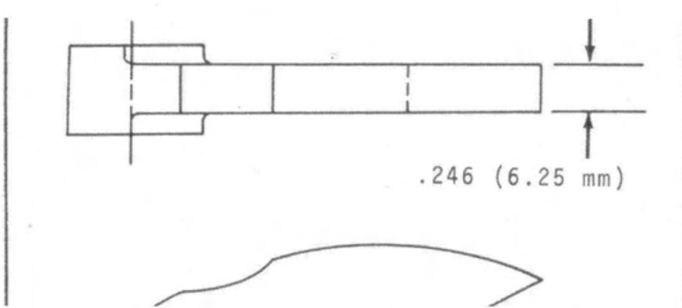


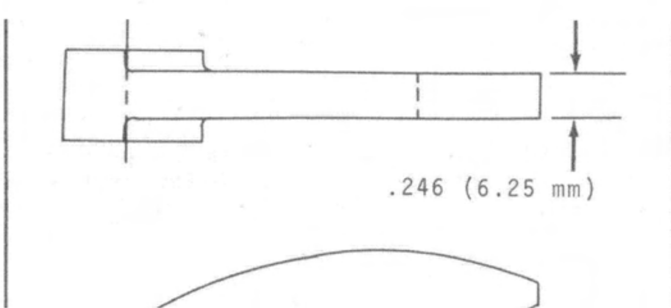

.246 (6.25 mm)
M20523
AM53406

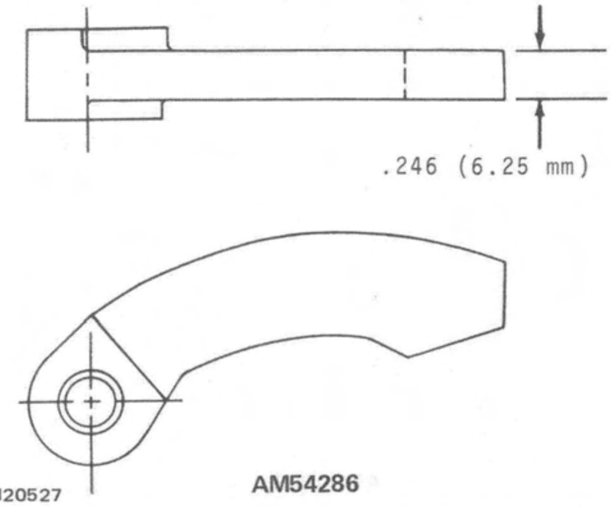

.246 (6.25 mm)
M20524
AM54285


.250 (6.35 mm)
.248 (6.3 mm)
M20525
AM54284

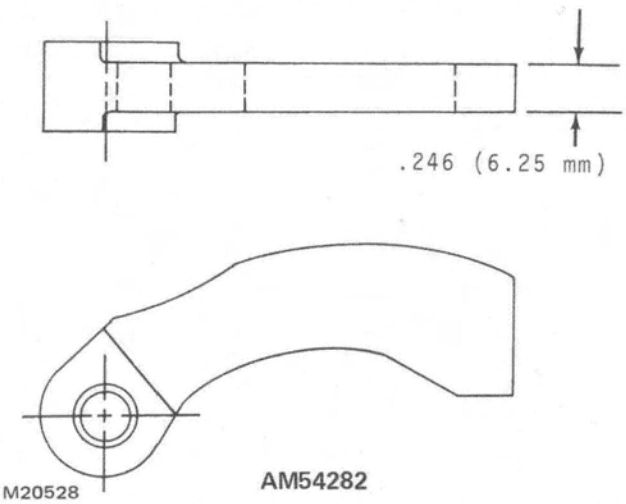

.246 (6.25 mm)
M20526
AM53736


.246 (6.25 mm)

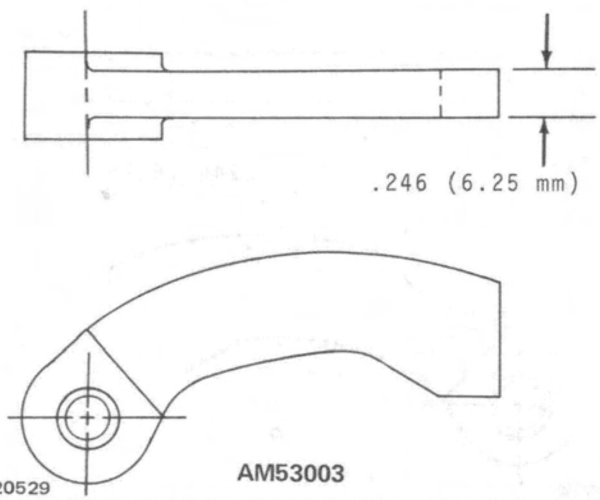

.246 (6.25 mm)



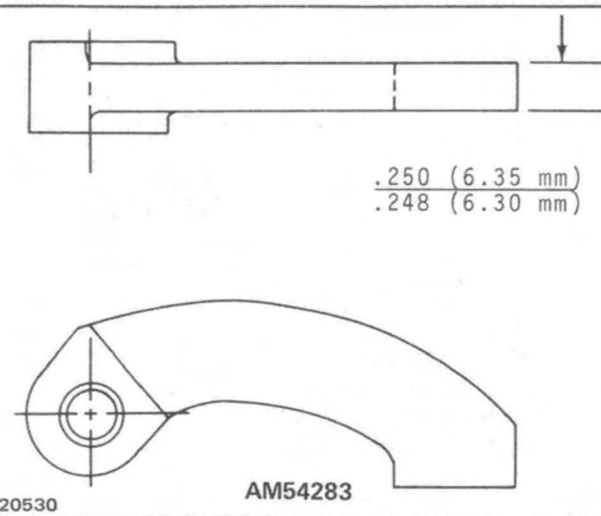
M20527 **AM54286**



M20528 **AM54282**

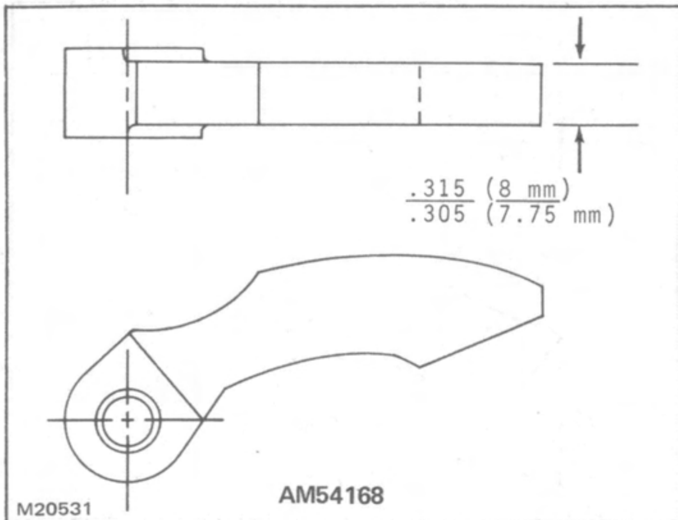


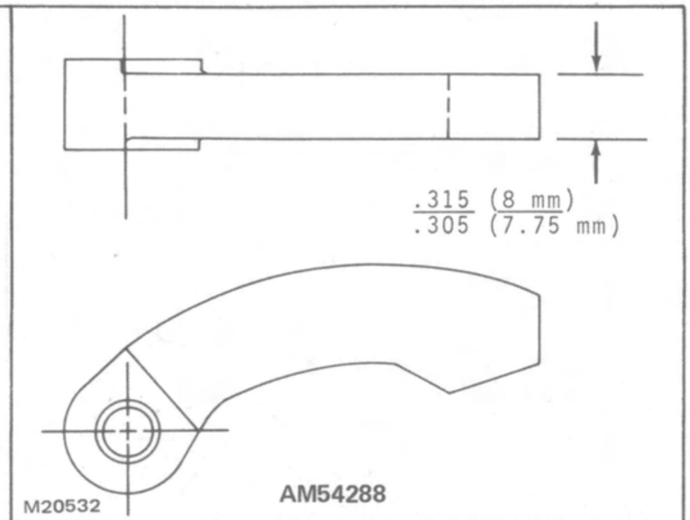
M20529 **AM53003**

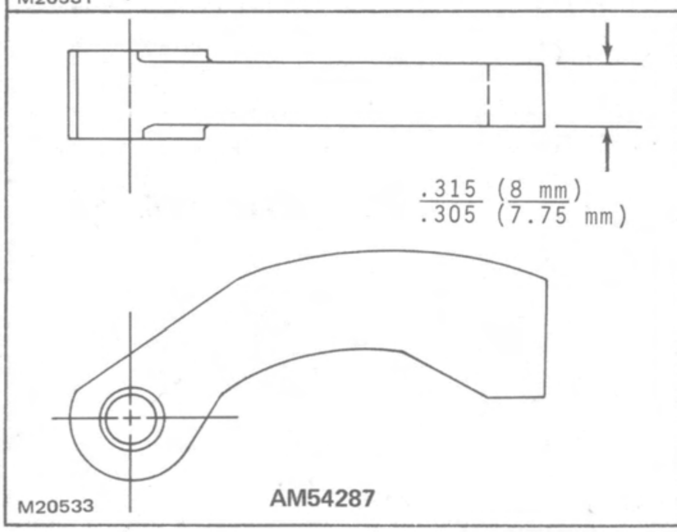


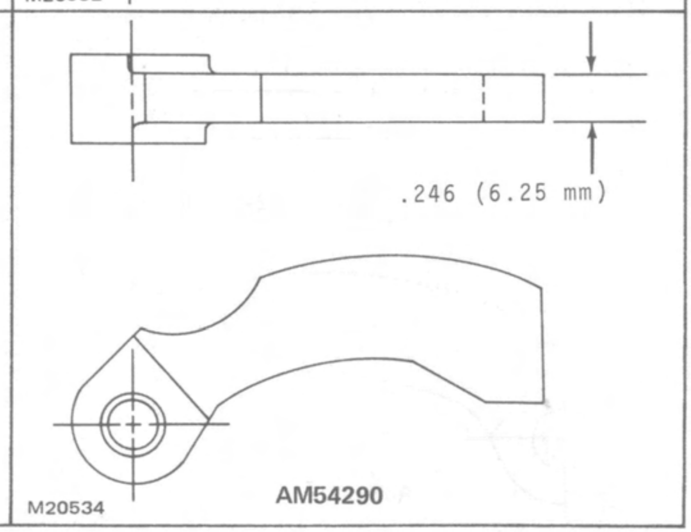
M20530 **AM54283**

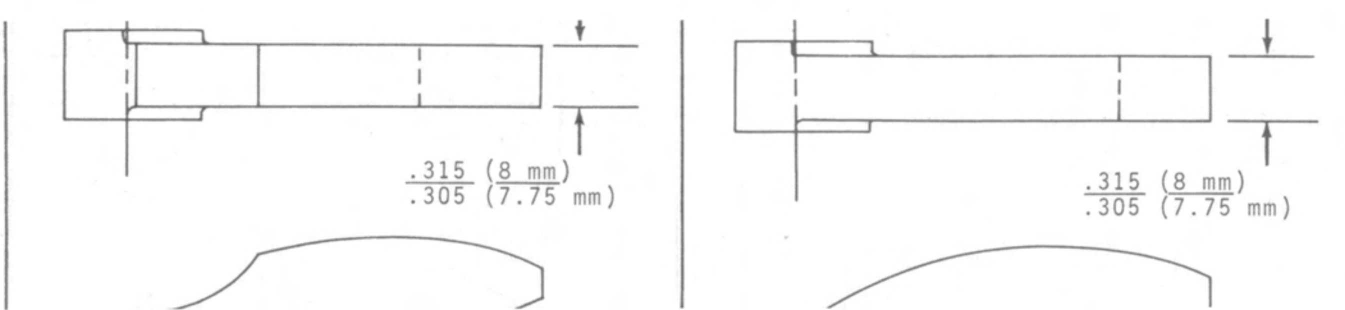
WEIGHTS SHOWN ARE ACTUAL SIZE

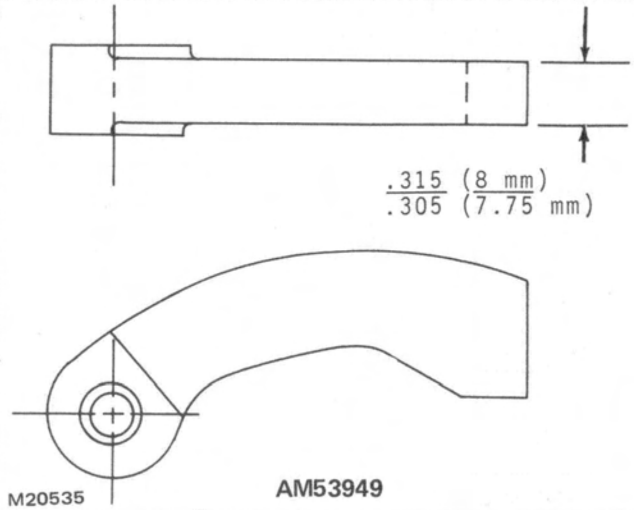

.315 (8 mm)
.305 (7.75 mm)
M20531
AM54168


.315 (8 mm)
.305 (7.75 mm)
M20532
AM54288

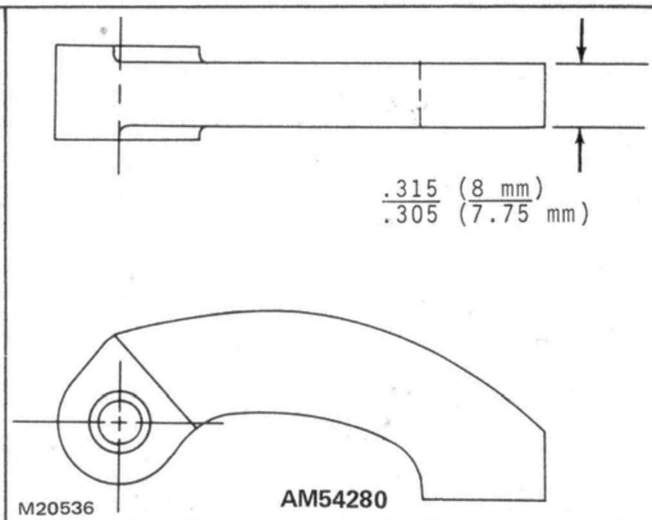

.315 (8 mm)
.305 (7.75 mm)
M20533
AM54287


.246 (6.25 mm)
M20534
AM54290

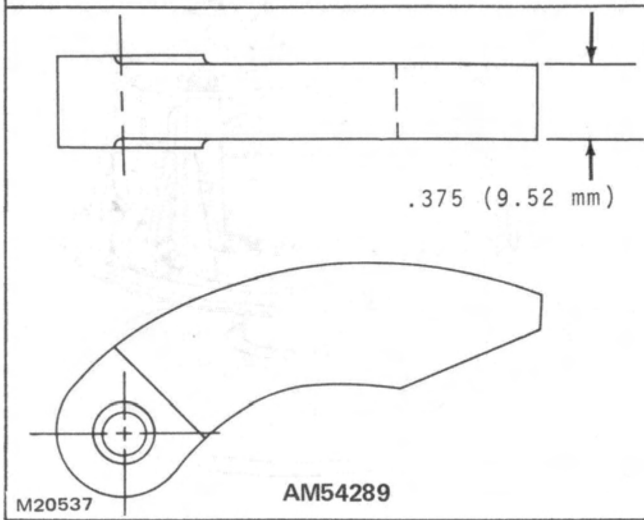

.315 (8 mm)
.305 (7.75 mm)
.315 (8 mm)
.305 (7.75 mm)



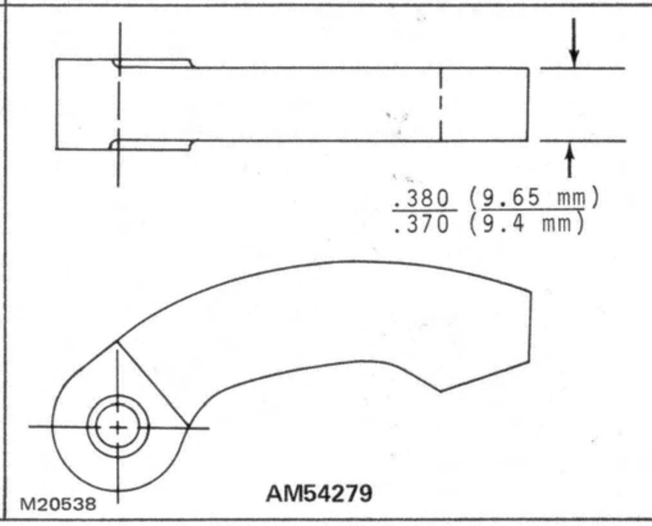
M20535 **AM53949**



M20536 **AM54280**

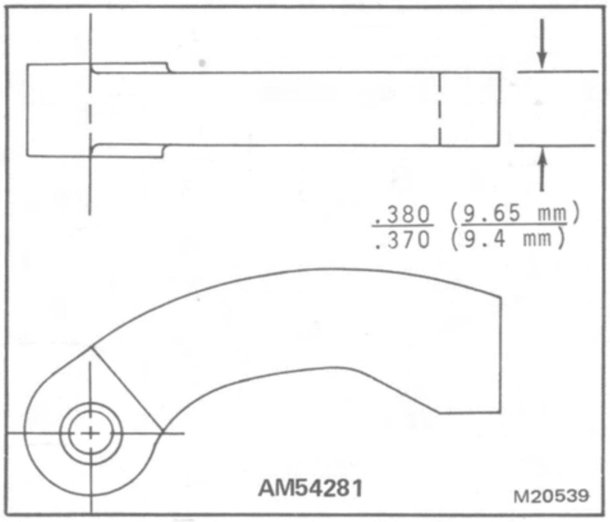


M20537 **AM54289**

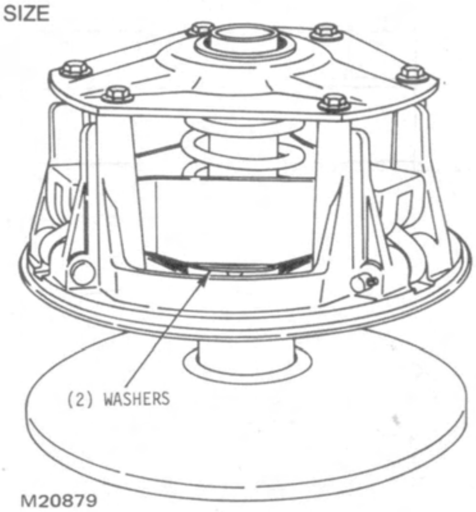


M20538 **AM54279**

WEIGHTS SHOWN ARE ACTUAL SIZE



WEIGHTS SHOWN ARE ACTUAL SIZE



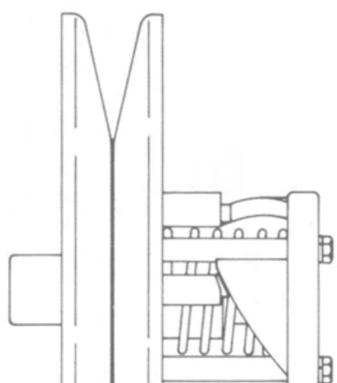
3. Spacer Washers.

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 moveable face contacts the spider assembly in the hub area with the weights installed.

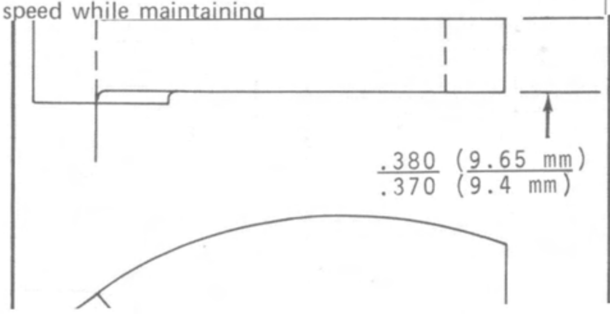
DRIVEN SHEAVE

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



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.

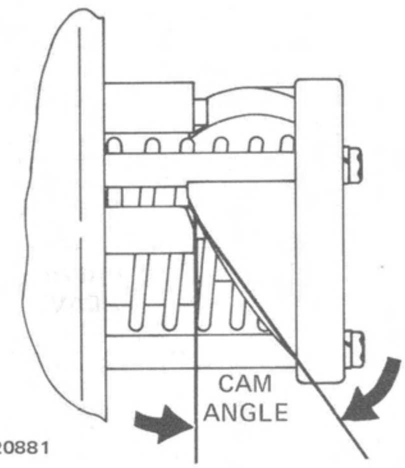
- If the driven sheave is shifting into a higher ratio than the engine can pull, increase spring tension. This will prevent the driven sheave from shifting up and thus increase engine speed.

- 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.



M20881

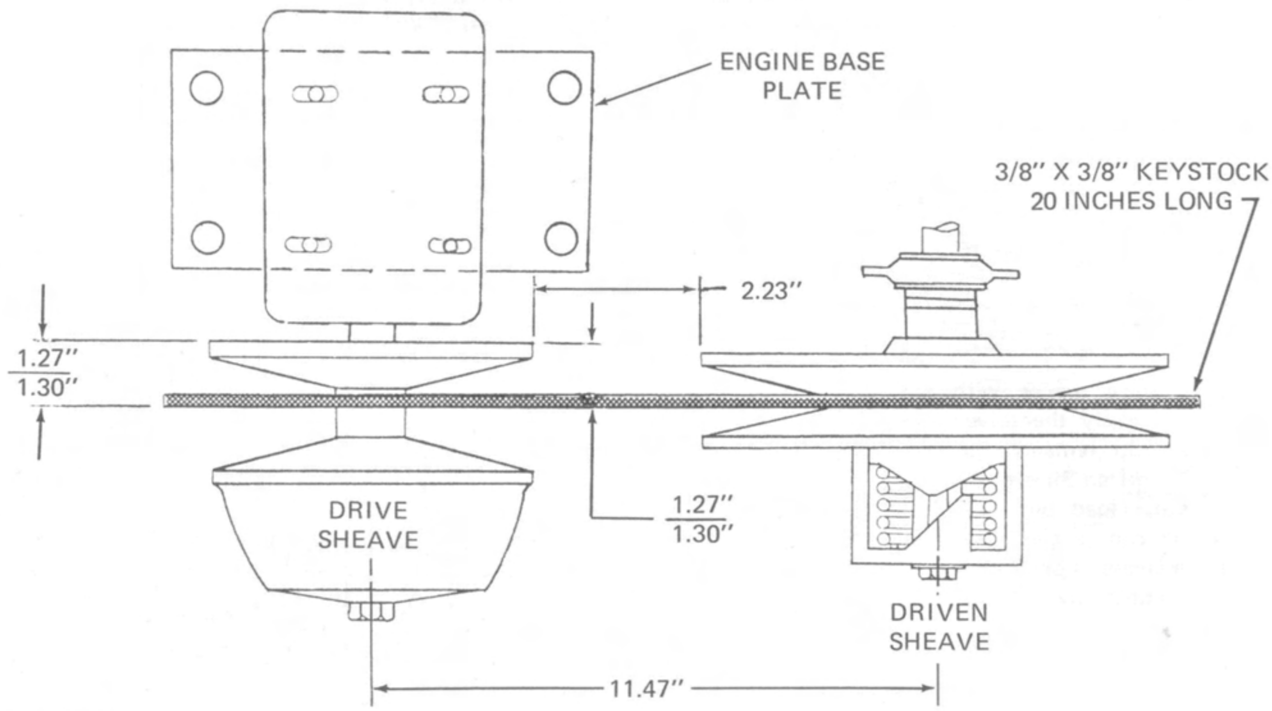
The following chart lists spring pretension with either the 38° or 44° cam.

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.



M20882

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.

Belt No.	Outside Circumference	Width
M64550	44.6" (1133.3 mm) ± .12	1-1/4
M65703	47.5" (1205.2 mm) ± .12	1-1/4
M66345	46.3" (1176 mm) ± .12	1-1/4

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.

A drive belt that is worn affects performance similar to a long belt. A drive belt worn to less than 1-1/16-

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.

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
340 Cyclone	3700-3900	6500-7000	21 tooth 39 tooth	Two	Silver	AM53949	No. 2	38^o M66384	66 Pitch
440 Cyclone	3400-3600	6500-7000	24 tooth 40 tooth	Two	Black	AM53949	No. 2	38^o M66384	68 Pitch
340 Liquifire	3700-3900	7000-7500	21 tooth 39 tooth	Two	Silver	AM53949	No. 2	38^o M66384	66 Pitch
440 Liquifire	3400-3600	7250-7750	24 tooth 40 tooth	Two	Black	AM54279	No. 2	38^o M66384	68 Pitch

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
340 Cyclone	4100-4300	6500-7000	17 tooth 42 tooth	One	Silver	AM54287	No. 2	38^o M66384	66 Pitch
440 Cyclone	3500-3700	6500-7000	21 tooth 39 tooth	One	Silver	AM54279	No. 2	38^o M66384	66 Pitch
340 Liquifire	4100-4300	7000-7500	17 tooth 35 tooth	One	Silver	AM54287	No. 2	38^o M66384	62 Pitch
440 Liquifire	4100-4300	7250-7750	21 tooth 39 tooth	None	Black	AM54289	No. 2	38^o M66384	66 Pitch

LOW ALTITUDE CLUTCHING FOR 1977 SNOWMOBILES (SERIAL NO. 70,001 AND UP)
ALTITUDE – SEA LEVEL TO 6,000 FEET

SNOWMOBILE MODEL	CLUTCH ENGAGEMENT (RPM)	GOVERNED SPEED (RPM)	UPPER LOWER SPROCKETS	SPACERS IN PRIMARY CLUTCH	PRIMARY CLUTCH SPRING	PRIMARY CLUTCH ARM KIT	POSITION IN SECONDARY CLUTCH	SECONDARY CLUTCH CAM	CHAIN
340 Cyclone	3500-3700	6200-6700	21 tooth 39 tooth	One	Silver	AM54279	No. 2	38^o M66384	66 Pitch
440 Cyclone	3500-3700	6200-6700	24 tooth 40 tooth	Two	Silver	AM54279	No. 2	44^o M66938	68 Pitch
340 Liquifire	3500-3700	6800-7300	21 tooth 39 tooth	One	Silver	AM54279	No. 2	38^o M66384	66 Pitch
440 Liquifire	3400-3600	6800-7300	24 tooth 40 tooth	Two	Black	AM54279	No. 2	44^o M66938	68 Pitch

HIGH ALTITUDE CLUTCHING FOR 1977 SNOWMOBILES (SERIAL NO. 70,001 AND UP)
ALTITUDE 6,000 TO 12,000 FEET

SNOWMOBILE MODEL	CLUTCH ENGAGEMENT (RPM)	GOVERNED SPEED (RPM)	UPPER LOWER SPROCKETS	SPACERS IN PRIMARY CLUTCH	PRIMARY CLUTCH SPRING	PRIMARY CLUTCH ARM KIT	POSITION IN SECONDARY CLUTCH	SECONDARY CLUTCH CAM	CHAIN
340 Cyclone	3500-3700	6200-6700	17 tooth 42 tooth	One	Silver	AM54288	No. 2	38^o M66384	66 Pitch
440 Cyclone	3400-3600	6200-6700	21 tooth 39 tooth	One	Silver	AM53949	No. 2	38^o M66384	66 Pitch
340 Liquifire	3700-3900	6800-7300	17 tooth 35 tooth	One	Silver	AM54287	No. 2	38^o M66384	62 Pitch
440 Liquifire	4200-4400	6800-7300	21 tooth 39 tooth	None	Black	AM54289	No. 2	38^o M66384	66 Pitch

Suspension

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

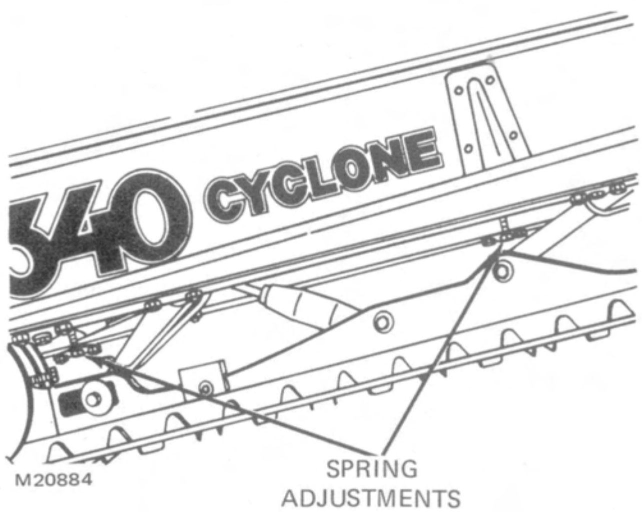
The following adjustments are provided to tune the suspension to the rider:

- Front and rear torsion springs preload
- Weight transfer
- Ski lift
- Ski alignment
- Ski steering control
- Track tensioning

TORSION SPRING ADJUSTMENT

Preload of the front and rear torsion springs can be adjusted to suit the weight and riding style of the operator. In general for high speed operation, adjust the front torsion springs for minimum preload and the rear torsion springs for the rider's weight. In deep snow at high speeds, increase the preload on the front torsion springs to provide additional ski lift.

Before adjusting the torsion springs, ride the sled to identify adjustment requirements.



Rear Torsion Spring

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

To increase the preload, turn the two adjusting screws

Front Torsion Spring

If the front torsion springs are preloaded too much, 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

Suspension

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

WEIGHT TRANSFER/SKI LIFT ADJUSTMENT

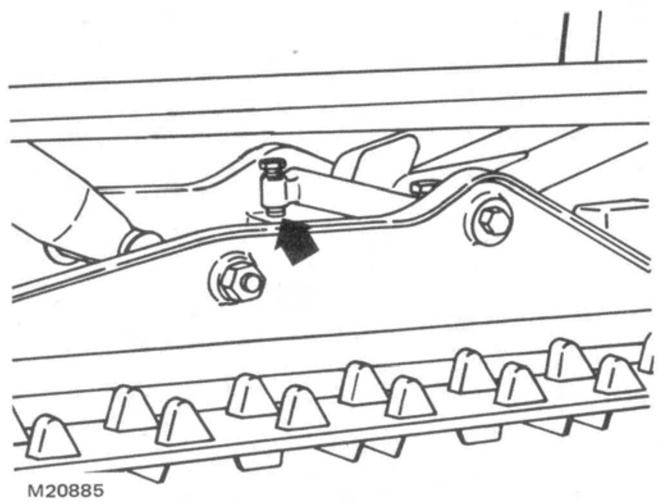
Two steering response screws on the lower portion of the front pivot arm provide adjustment for ski lift or weight transfer. Weight transfer occurs when the front skis are slightly lifted off the ground.

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.



M20885

SKI ALIGNMENT

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.

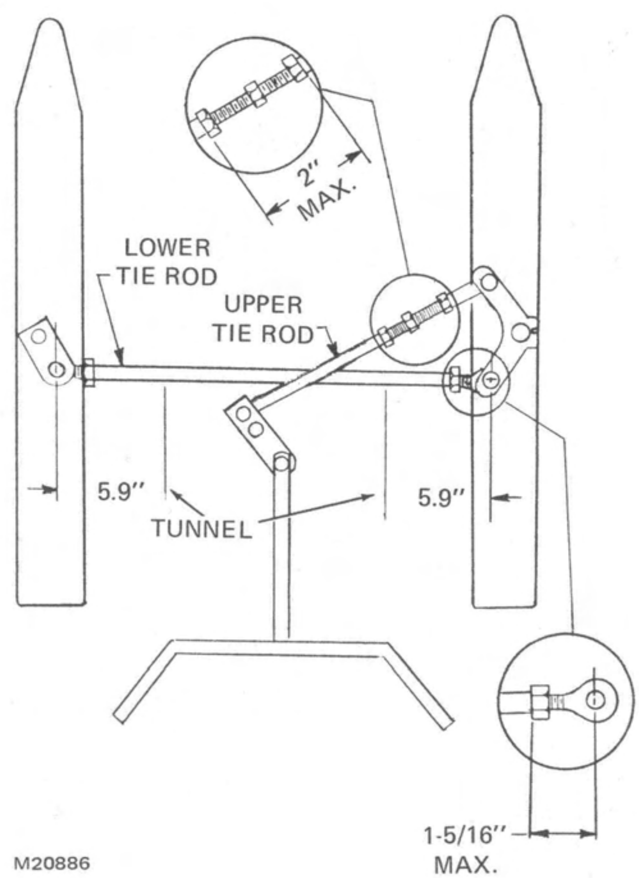
4. If adjustment is necessary, remove the exhaust silencer for access to the tie rods.

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 two 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.



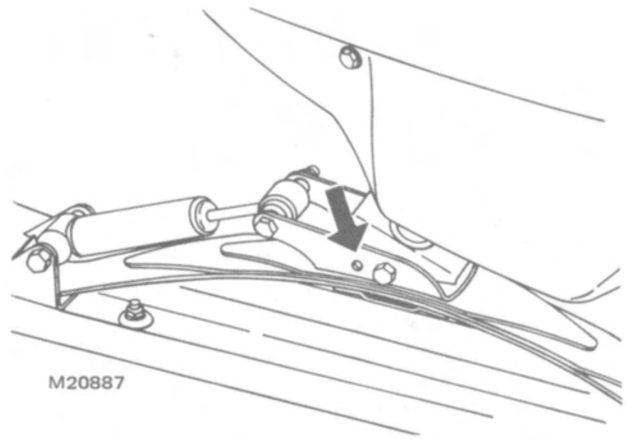
M20886

SKI STEERING CONTROL

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.



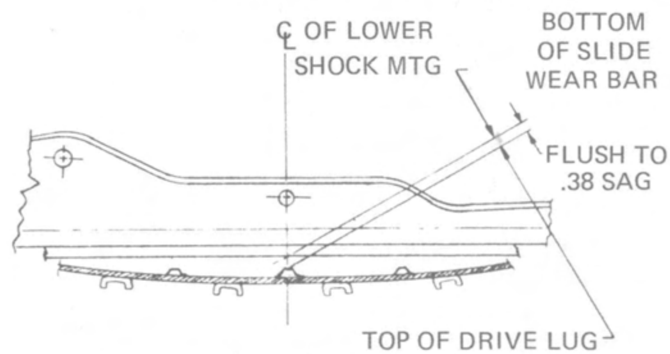
M20887

TRACK ADJUSTMENTS

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 Liquifire models use a 2/3 riveted track with 48 bars. Adjustment procedures are similar.

MOLDED GROUSER BAR TRACK



M20889

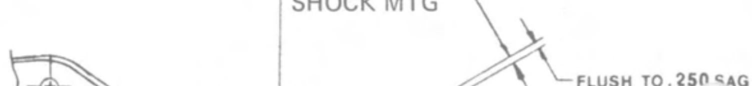
To Tension the Track:

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.

2/3 RIVETED GROUSER BAR TRACK

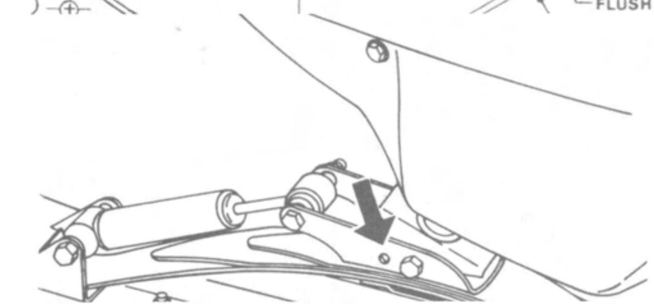


4. To adjust the 2/3 grouser bar track, tension the track so that the dimension between the bottom of the

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



After Adjustment:

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 wheel runs 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 over.

TRACK STUDDING

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 cleats, 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:

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.

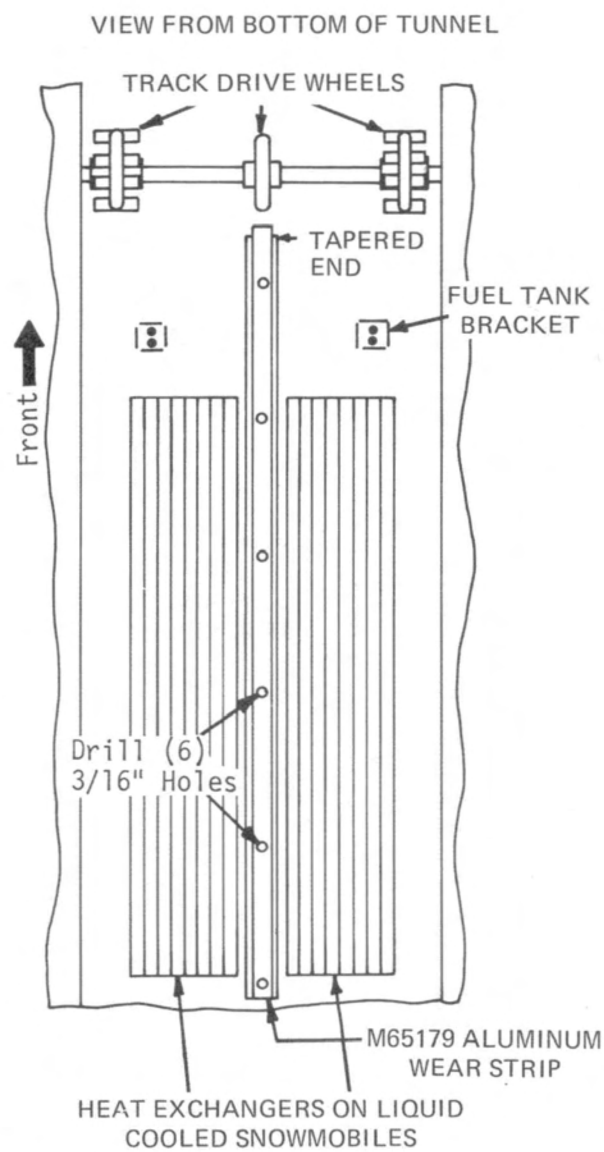
3. Place the wear strip equally fore and aft in the center of the tunnel so that the tapered end of the wear strip points to the front of the snowmobile.

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-rivet 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 claws before reinstalling the suspension.



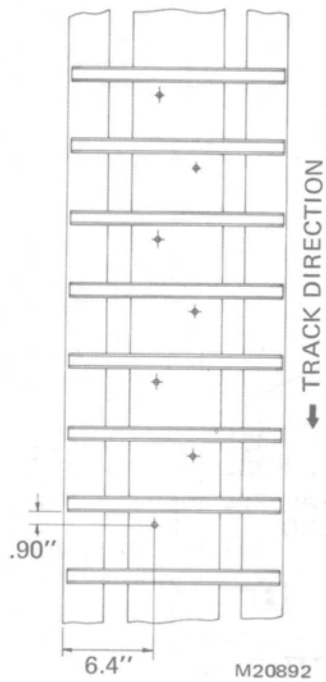
M20895

Install the Studs or Claws

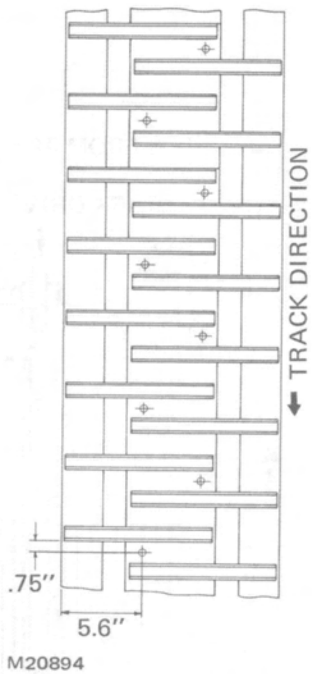
The number of studs or claws is not as important as their condition and location. Too many studs can be worse than no studs at all. A stud's effectiveness depends on the amount of weight it supports. Too many studs reduce the effectiveness of the studs and can cause turning and loss of traction.

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 kits. The following illustrations give recommended installation patterns for claw and stud kits for the two types of tracks.

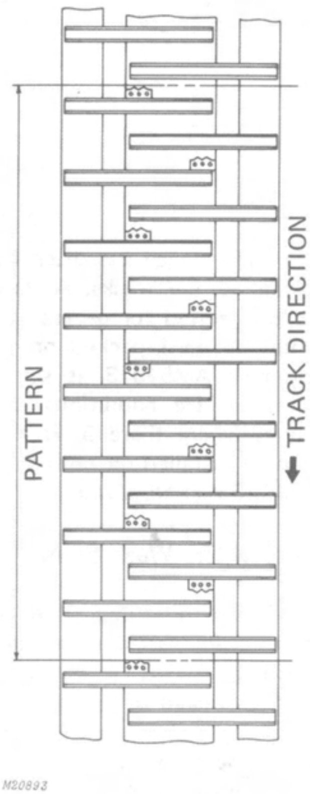


MOLDED GROUSER BAR
STUD KIT INSTALLATION



2/3 RIVETED TRACK
STUD KIT INSTALLATION

MOLDED GROUSER BAR
CLAW KIT INSTALLATION



2/3 RIVETED TRACK
STUD KIT INSTALLATION

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