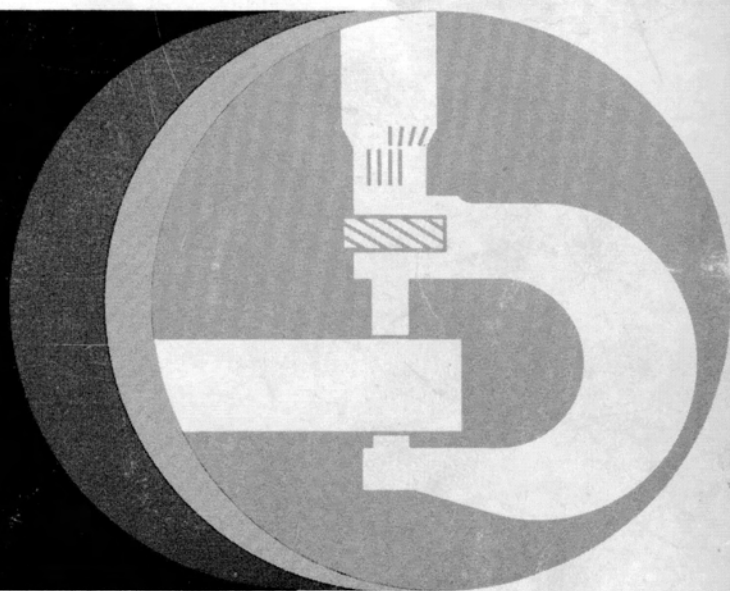


How To Fine Tune
Your 1982

TRAILFIRE[®], LIQUIFIRE[®],
and SPORTFIRE[®]
Snowmobiles



and SPORTFIRE[®]
Snowmobiles





Introduction

This manual is written for John Deere dealers and customers who are experienced snowmobilers.

NOTE: This manual is not intended to provide detailed racing information; it is intended to provide the information necessary to fine tune a snowmobile for various altitudes and riding conditions. The information is presented in a cause and effect relationship to help you understand the effects of tuning on the performance of your snowmobile. The procedures 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 system.

Tuning is often a process of trial and error at the dealer/customer level due to a lack of sophisticated equipment. Improved performance in one area may be 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 4000 feet (1219 m). 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 any procedures in this manual, be sure you have read and understand the information in your Operator's Manual. This manual does not contain assembly and disassembly instructions. If you need this information, get the appropriate Technical Manual through your John Deere dealer.

NOTE: Some of the procedures require special tools. These tools are described in the Technical Manual.

IMPORTANT: All obligations of John Deere warranty shall be terminated if products

JOHN DEERE

INTRODUCTION

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NOTE: This manual is not intended to provide detailed racing information; it is intended to provide the



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Carburetion

PRINCIPLES OF OPERATION

CARBURETORS

Snowmobile	John Deere Part No.	Mikuni Part No.
TRAILFIRE	AM55053	VM34/192
TRAILFIRE LX	AM55054	VM34/232
SPORTFIRE	AM55055	VM34/231
LIQUIFIRE		
PTO Side	AM55436	VM36/122
Mag Side	AM55435	VM36/121

The TRAILFIRE snowmobiles use a standard Mikuni Slide Valve carburetor. The LIQUIFIRE and SPORTFIRE snowmobiles use a Mikuni Power Jet carburetor. See pages 22 and 23 to familiarize yourself with the components of each carburetor.

The Mikuni carburetors use several fuel metering systems.

Standard Slide Valve

- Starting System
- Float System
- Pilot/Air System
- Needle Jet and Jet Needle System
- Throttle Valve
- Main Jet System

Power Jet Slide Valve

- Starting System
- Float System
- Pilot/Air System
- Needle Jet and Jet Needle System
- Throttle Valve
- Main Jet System
- Power Jet System

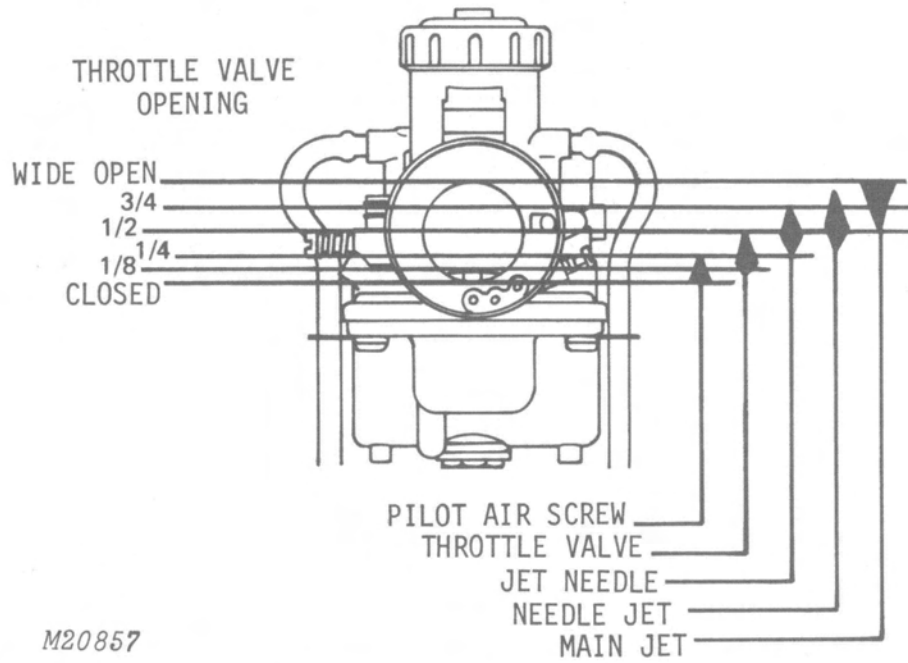
By carefully matching these fuel metering systems, the carburetor can be tuned for maximum performance and efficiency to suit operating conditions.

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 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 diagrams on pages 3 and 4.

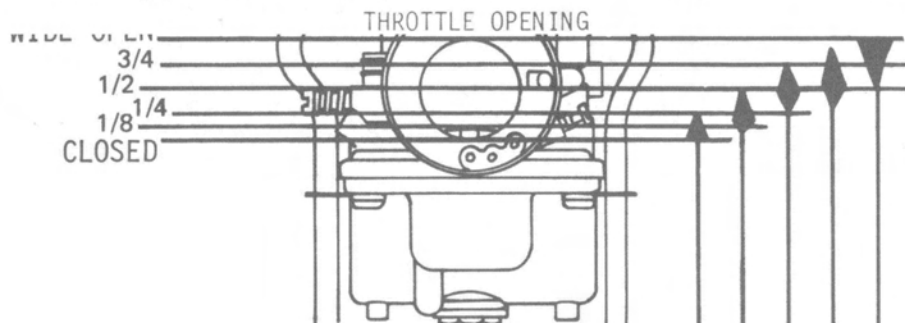
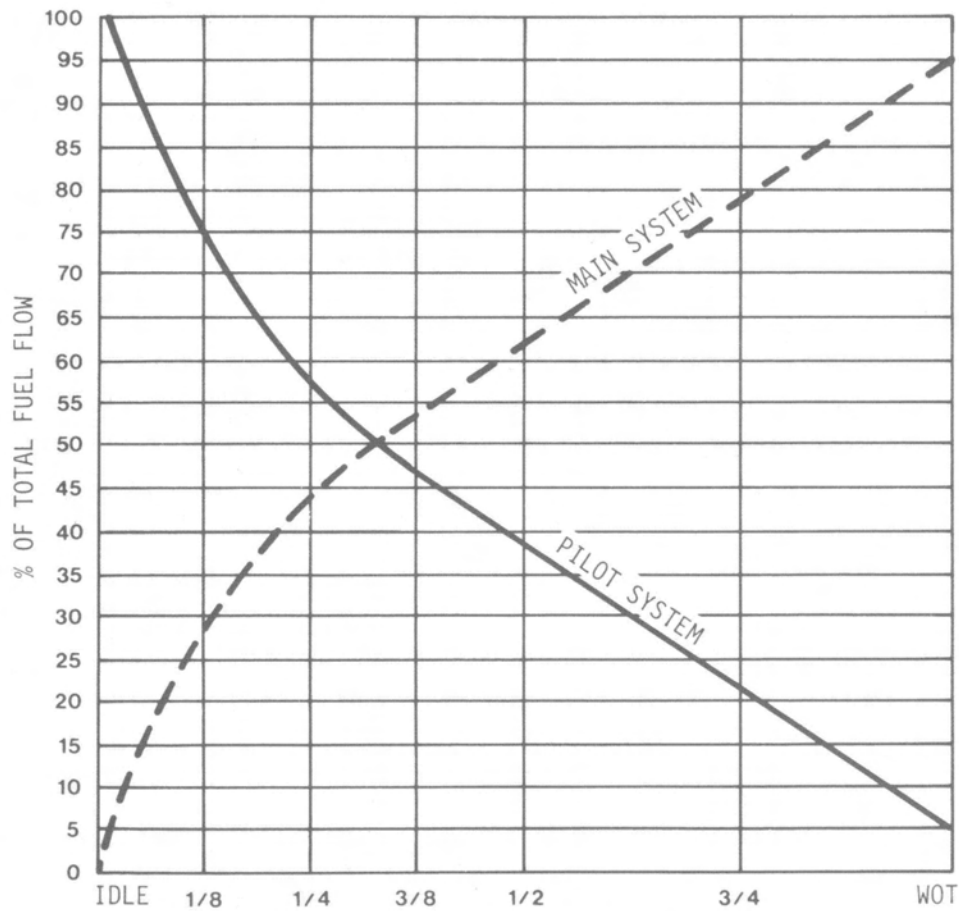
PRINCIPLES OF OPERATION

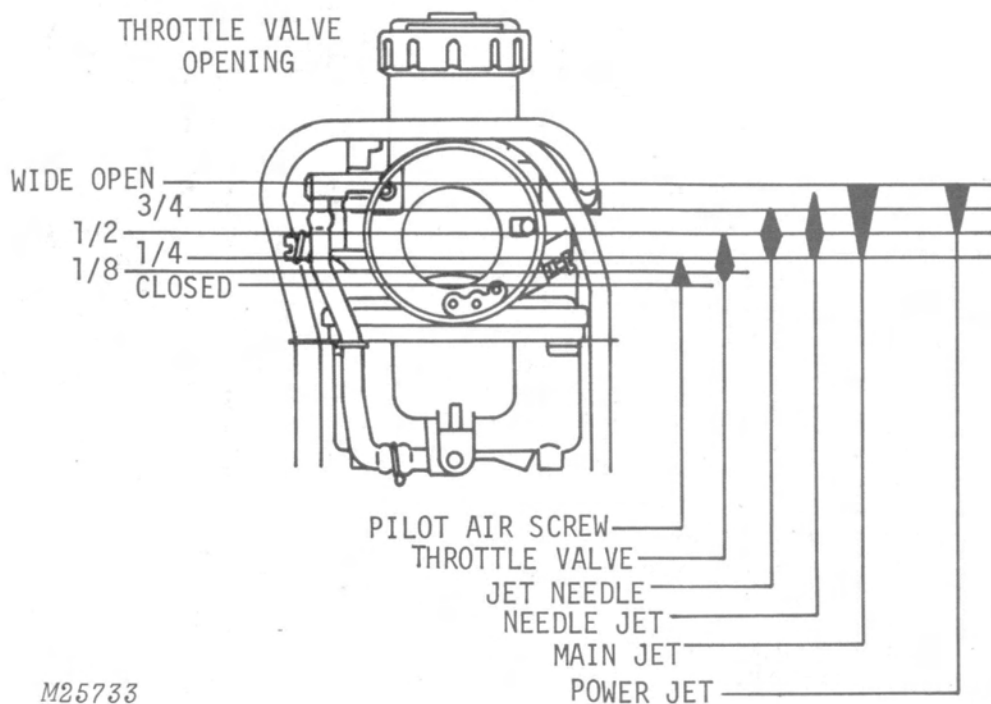
CARBURETORS



Standard Slide Valve Carburetor

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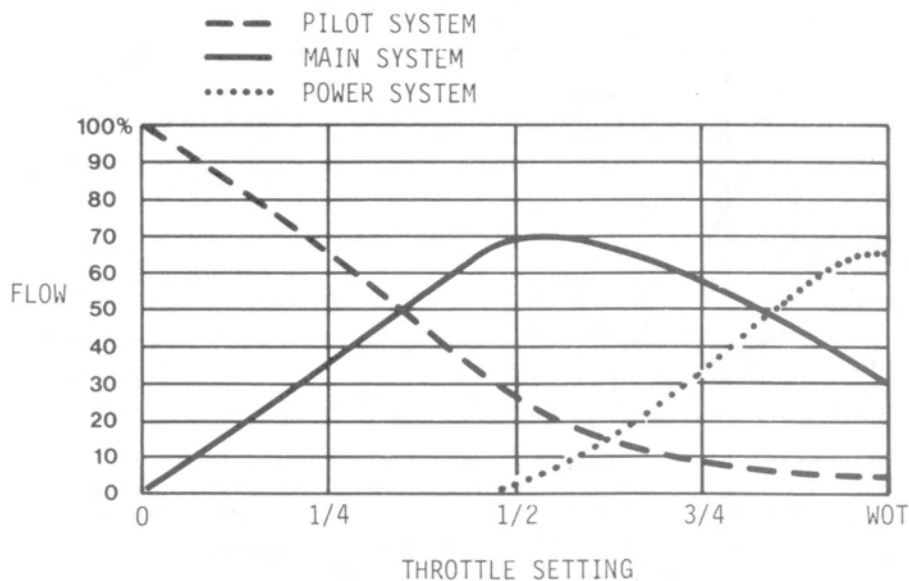




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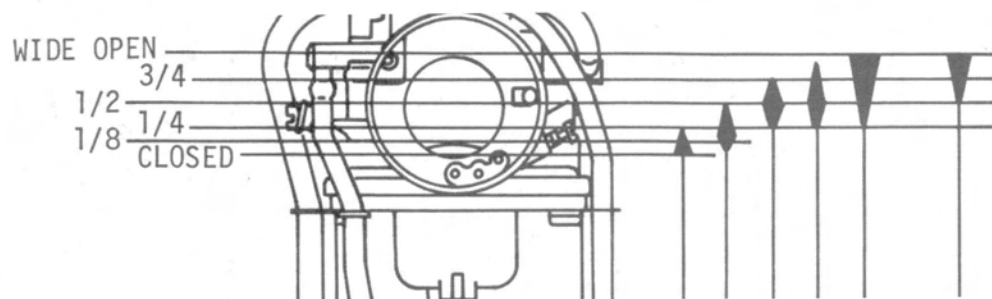
Power Jet Carburetor

M25733



Power Jet Carburetor

M29253



1. The fuel level in the bowl of the float system is the base line.
2. The pilot/air system functions from the time the throttle is in the 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 (from approximately 1/4 to near wide open throttle).
5. The main jet system on the standard carburetor determines the mixture at wide open throttle. This system supplies fuel to all but the pilot/air system through the main jet.
6. The main jet system on the power jet carburetor determines the mixture supplied to the engine from 1/4 to wide open throttle.
7. The power jet system provides the additional fuel required from approximately 3/4 to wide open throttle.

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 (from approximately 1/4 to near wide open throttle).
5. The main jet system on the standard carburetor determines the mixture at wide open throttle. This system supplies fuel to all but the pilot/air system through the main jet.

GENERAL TUNING PROCEDURE

The best way to evaluate the tuning of a carburetor is by operating the snowmobile.

IMPORTANT: Operating an engine with too lean a fuel mixture may cause engine damage.

Bogging, popping, or spitback during acceleration indicates a lean 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.

Excessive smoking or rough engine operation indicates a rich fuel/air mixture.

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 18 and 19.

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

by operating the snowmobile.

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Bogging, popping, or spitback during acceleration indicates a lean 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

Tuning the Carburetor

1. Check the position of starter plunger (see below).
2. Make sure floats are properly adjusted (page 9).
3. Operate snowmobile at wide open throttle and check operation of main jet system (page 15) and power jet system (page 17). If main jet or power jet is changed by several sizes, recheck jet needle and needle jet.
4. Operate engine between idle and 1/4 throttle and check engine operation. Flip choke lever momentarily to provide excess fuel. If engine operation improves, more fuel is needed. If engine operation becomes worse, less fuel is needed. When carburetor is properly tuned there will be very little effect. If adjustment is necessary, perform Step 5 (also see page 10).
5. Check and adjust air screw setting (page 10). If required, change pilot jet (page 10) and readjust air screw.
6. Use air screw adjustment to check for proper throttle valve selection (page 11).

IMPORTANT: Except for extreme running conditions, the needle jet should not be changed.

7. Operate snowmobile at mid-throttle settings and check operation of jet needle (page 12) and needle jet (page 14).
8. Operate snowmobile through all throttle settings. Check for smooth operation.

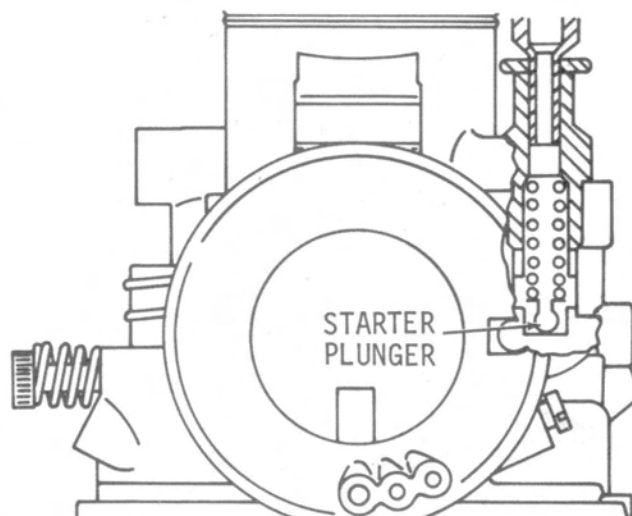
STARTING SYSTEM

Principles of Operation

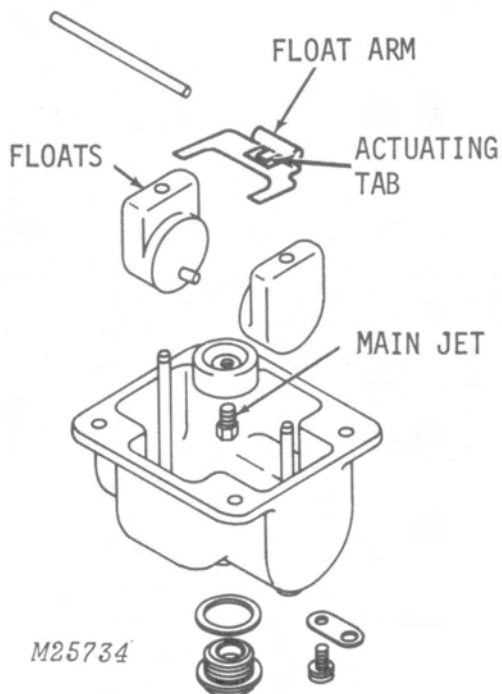
When raised, the starter plunger allows fuel to be metered through starter jet and mixed with air. This fuel/air mixture flows into plunger area, mixes with more air from air intake port used for starting, and is then drawn into engine. The throttle must be closed for this starting system to operate.

Adjusting Starter Plunger

1. Inspect starter plunger to make sure it is seated when choke lever (on dash) is in the off (or down) position. Choke cable should have a 0.060 to 0.080-inch (1.524 to 2.032 mm) end play.
2. Adjust starter plunger so it rises approximately 1/2 of bore diameter when choke lever is lifted to the power jet system (page 17). If main jet or power jet is changed by several sizes, recheck jet needle and needle jet.
4. Operate engine between idle and 1/4 throttle and check engine operation. Flip choke lever momentarily to provide excess fuel. If engine operation improves, more fuel is needed. If engine operation becomes worse, less fuel is needed. When carburetor is properly tuned there will be very little effect.



FLOAT SYSTEM

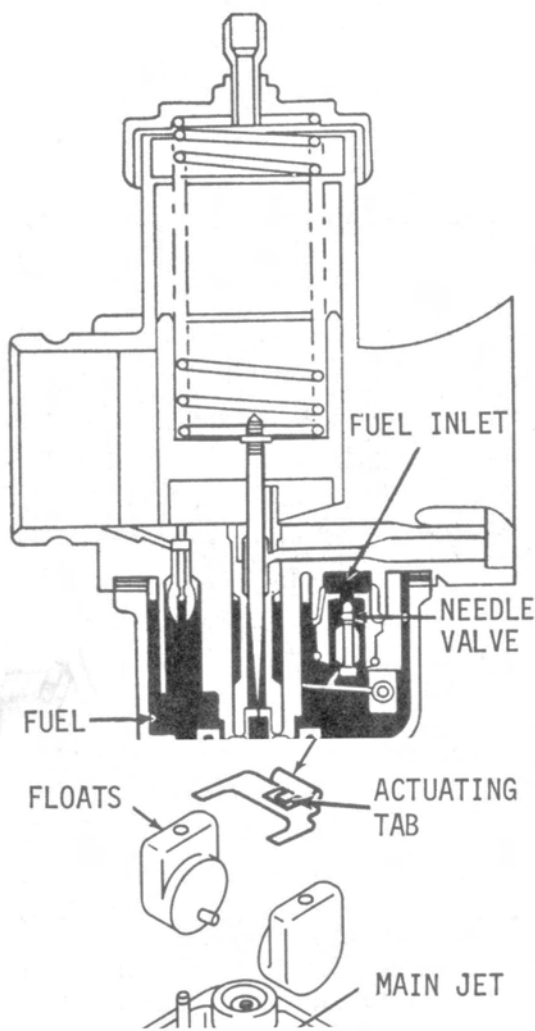


Principles of Operation

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 bowl, the floats and float arm with actuating tab also drop, opening the needle valve. The fuel pump forces fuel from the fuel tank past the needle valve into the float bowl. As the fuel in the float bowl approaches the correct level, the floats rise, causing the needle valve to seat, shutting off the fuel flow.

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



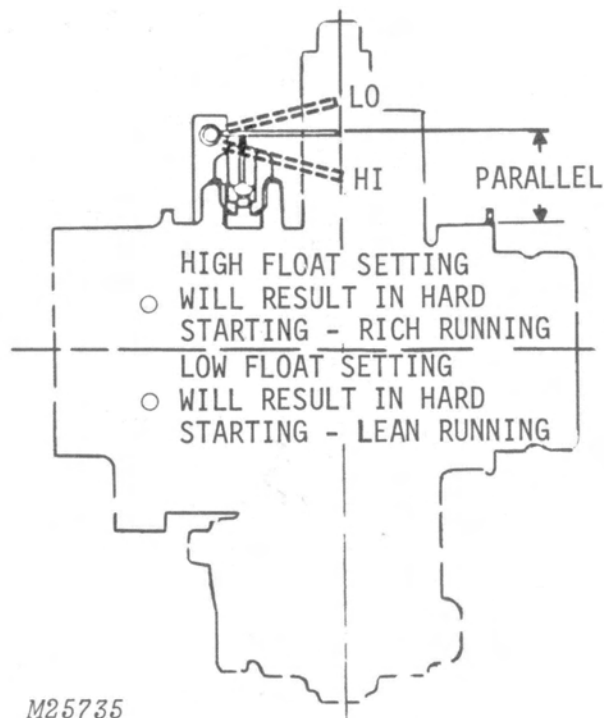
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Checking and Adjusting Float System

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

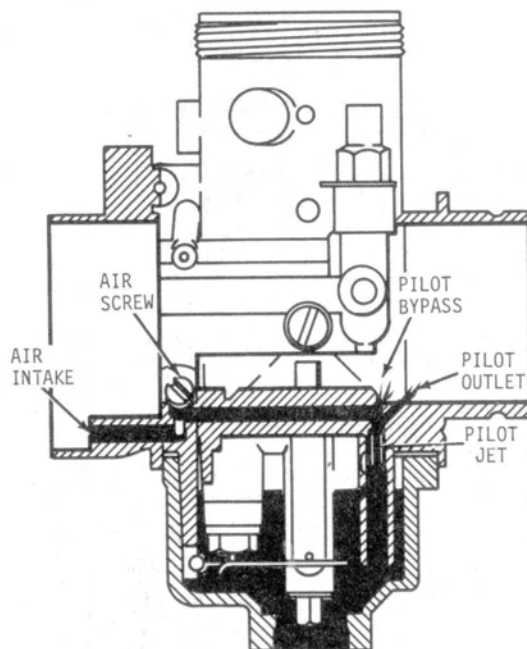
NOTE: *Incorrect float adjustment can prevent proper tuning of a carburetor. Always make sure the float is properly adjusted before attempting adjustment of the other fuel metering systems.*



PILOT/AIR SYSTEM

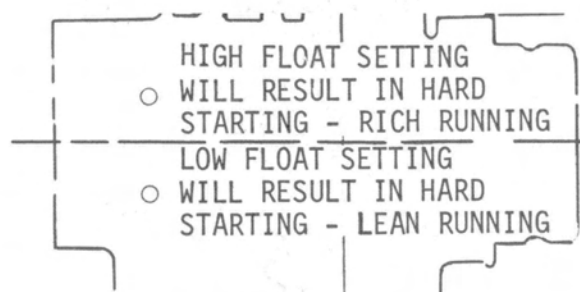
Principles of Operation

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 (page 10).

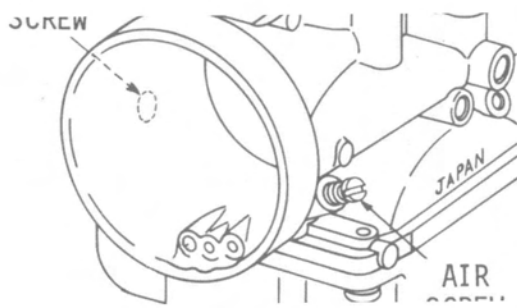
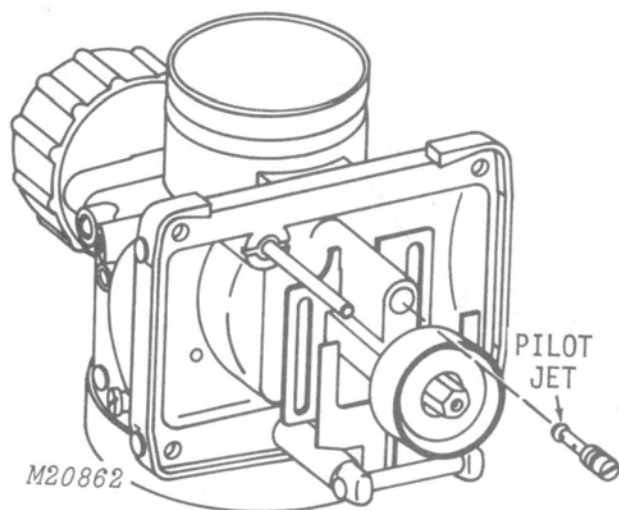
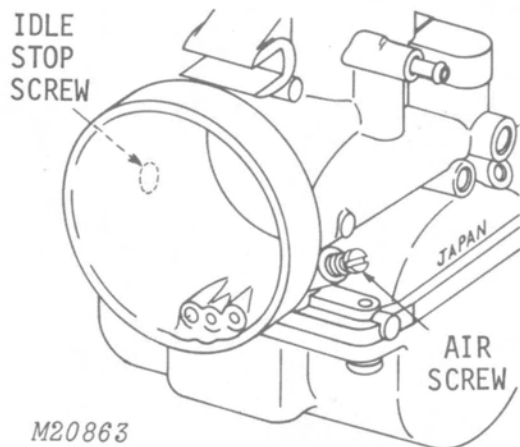


arm parallel to the base. Be careful not to bend the float arm.

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.*



PILOT/AIR SYSTEM—Continued



Adjusting Air Screw

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

1. Turn idle stop screw in until screw contacts throttle valve. Then turn idle stop screw in 2 additional turns.
2. Start and warm up engine. Adjust idle stop screw to 500 rpm above normal idle speed. See pages 18 and 19.

NOTE: Set idle speed at 3500 rpm on LIQUIFIRES with speed limiter systems.

3. Turn air screw in or out using 1/4-turn increments until engine rpm peaks or reaches its maximum rpm.
4. Readjust idle stop screw to return engine to normal idle speed. See pages 18 and 19.
5. Repeat Steps 3 and 4 until engine operates at normal idle speed and air screw is peaked.
6. When air screw is adjusted stop engine. Note the setting of air screw and turn it all the way in. If it takes less than 1 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 air screw, the pilot jet is too large and must be replaced by a smaller one.

Replacing Pilot Jet

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

After changing the pilot jet, check and adjust 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.

and dual carburetors. On dual carburetors, both air screws must be adjusted exactly the same. Never adjust the screws more than 1/4 turn at a time.

1. Turn idle stop screw in until screw contacts throttle valve. Then turn idle stop screw in 2 additional turns.
2. Start and warm up engine. Adjust idle stop screw to

THROTTLE VALVE

Principles of Operation

The throttle valve is cut away on the air 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 in 0.5 increments based on the size of the cutaway. 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.

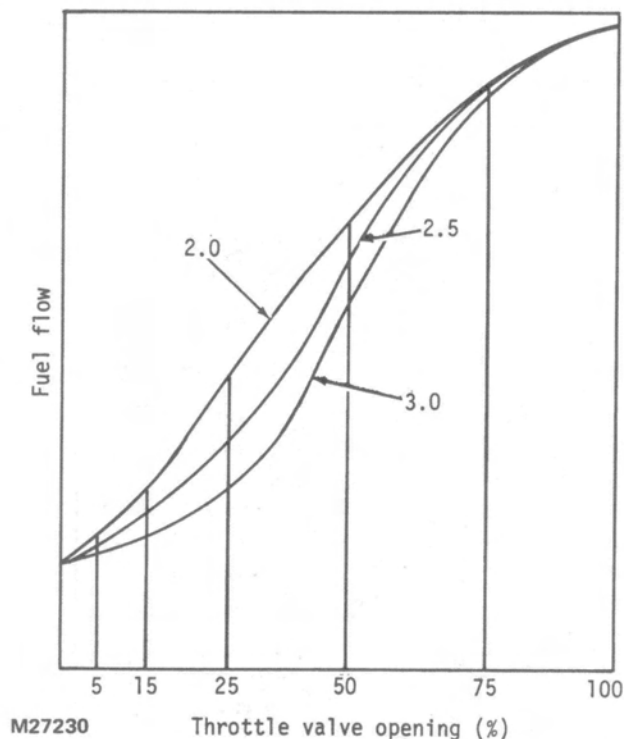
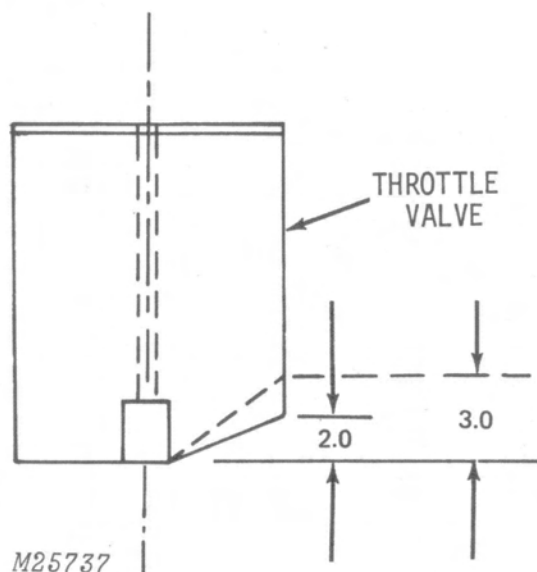
The throttle valve functions in about the same range as the pilot/air system. After the air screw is adjusted, it can be used to check the throttle valve selection.

Checking and Selecting Throttle Valve

1. Operate engine at low throttle settings, accelerating from idle to 1/4 throttle.
2. If engine bogs during acceleration, there is probably insufficient fuel. Turn in air screw about 1/4 turn at a time. If engine acceleration is improved, after adjusting air screw, the throttle valve cutaway needs to be decreased.
3. If engine runs rough or smokes excessively during acceleration, there is probably too much fuel. Turn out air screw 1/4 turn at a time. If engine operation is improved, the throttle valve cutaway needs to be increased.

NOTE: Illustration at right indicates fuel flow by throttle valve size and the amount throttle valve is opened.

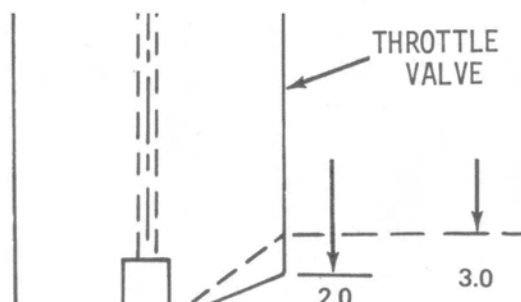
4. Increase or decrease throttle valve cutaway size in 0.5 steps.
5. Return air screw to its original setting and operate engine at low throttle settings. Accelerate engine from idle to 1/4 throttle; engine should accelerate smoothly.
6. As a final check, change the position of the air screw. If this does not significantly affect engine performance (as in Steps 2 and 3), the throttle valve is correct.



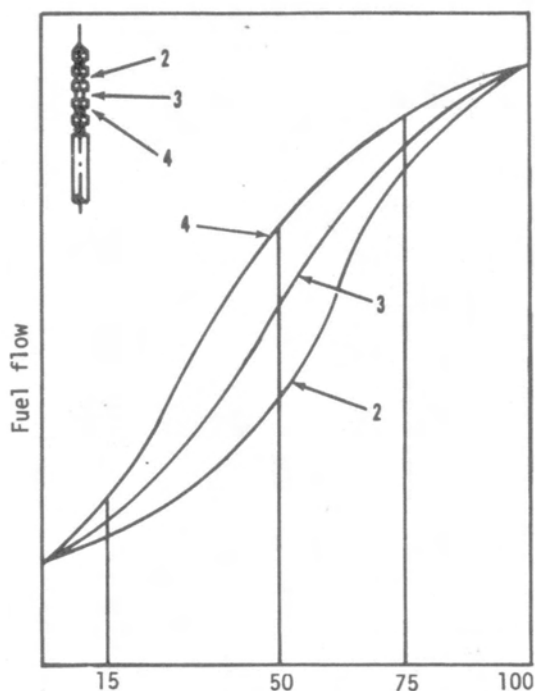
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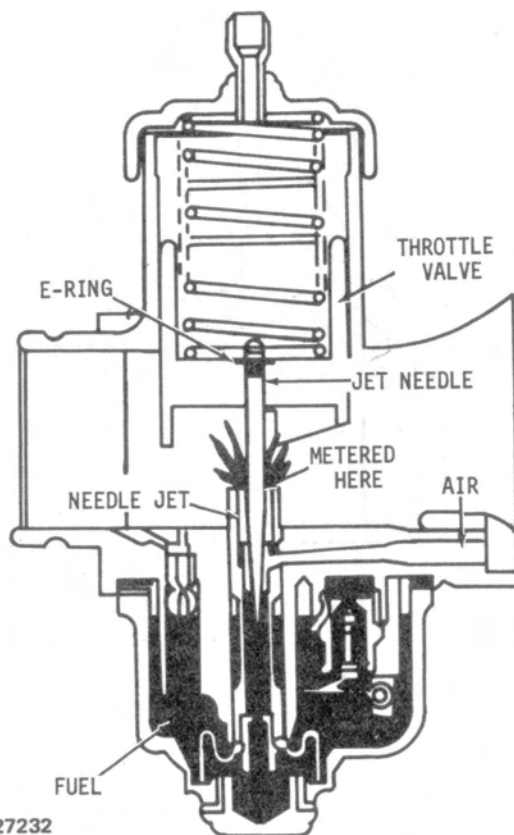


JET NEEDLE

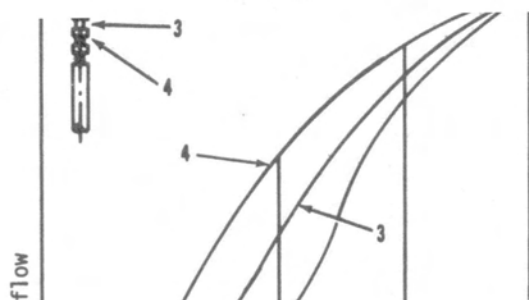


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Throttle valve opening (%)



M27232



Principles of Operation

The jet needle works with the needle jet to increase the amount of fuel as the throttle valve is raised.

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 jet system operation (page 15).

The jet needle raises and lowers with the throttle valve which changes jet needle position in the needle jet. Because the jet needle is tapered from top to bottom, an increasing amount of fuel is delivered through the needle jet whenever the throttle valve is raised. Increased or decreased air flow, by the throttle valve position, regulates the amount of fuel through the needle jet and around the jet needle.

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.

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Example: 6DH7

- 6 - Basic length of needle.
- DH - A single letter would indicate a single taper of the needle, double letter a double taper.
- D - Amount of taper at top of needle.
- H - Amount of taper at bottom of needle.
- 7 - Material, type of coating and start of second taper on needle.

NOTE: Letter designation of the jet needle indicates the angle of taper. Each letter (starting with A) is 0.25° greater than preceding letter. Example: D = 1° , E = $1-1/4^\circ$, F = $1-1/2^\circ$, G = $1-3/4^\circ$, and H = 2° . This applies to both single and double taper needles.

At the top of the jet needle are five grooves numbered 1 through 5 from top to bottom—the number 3 or middle groove being the starting point for the E-ring. The E-ring position on any jet needle determines the rich or lean part throttle or mid-range carburetor operation.

Moving E-ring to position 1 or 2 lowers jet needle into needle jet and leans out the fuel/air mixture. Similarly, moving E-ring to position 4 or 5 raises jet needle in needle jet and enriches the fuel/air mixture.

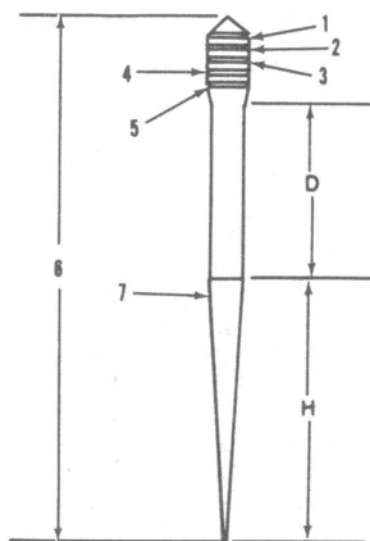
Positioning E-Ring

1. Check for a rich or lean setting by examining the muffler ball joint (page 15). 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 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, operation may be improved by changing the jet needle taper. Do not, however, change the jet needle until 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. This may be done only after thoroughly checking the main jet, jet needle, and E-ring positions.

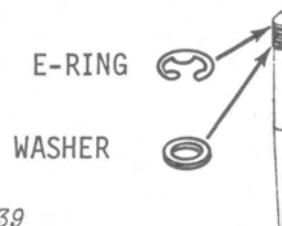
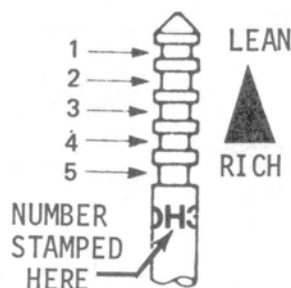
NOTE: Make sure washer is installed under E-ring.

- H - Amount of taper at bottom of needle.
- 7 - Material, type of coating and start of second taper on needle.

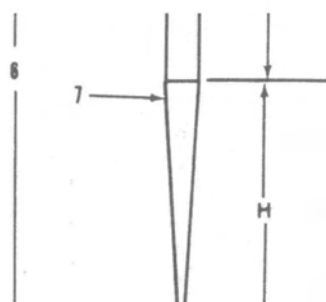
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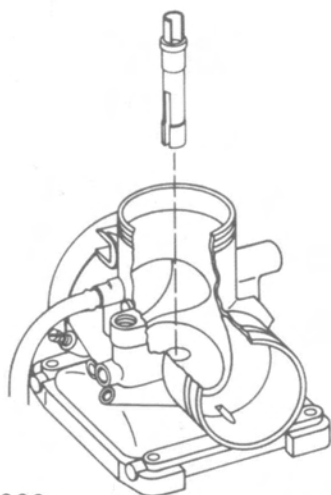
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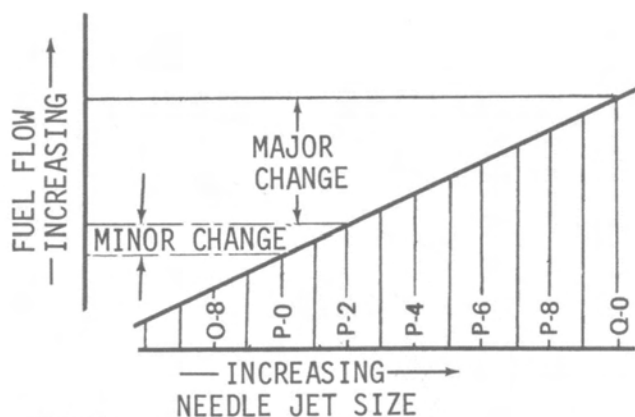
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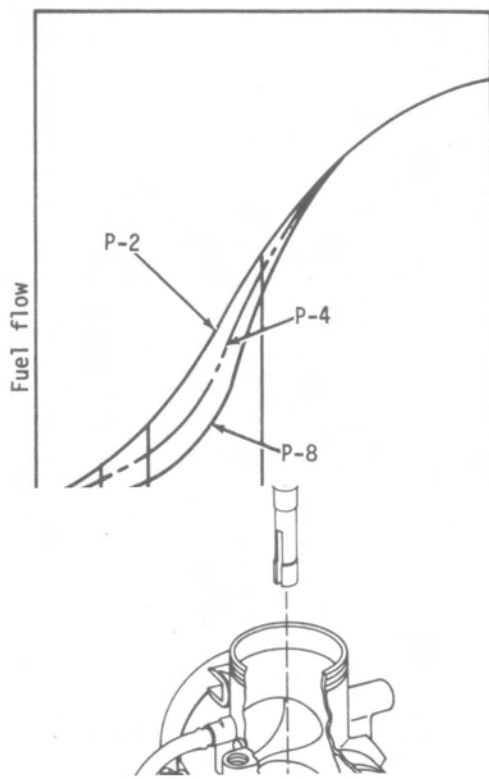
NEEDLE JET



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Principles of Operation

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

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 requires much care and experience. Decreasing the needle jet size can prevent the main jet from metering the proper amount of fuel at wide open throttle.

Needle jets are stamped with an alphanumeric code. The letter indicates a major change in fuel flow. P-2, for example, indicates low flow; P-4, greater flow, and so on. The number indicates minor adjustments in fuel flow. The diagram at left shows the relationship between the alphanumeric needle jet size number and fuel flow.

NOTE: Needle jets carry the numbers 166, 159 or 169 in addition to the P-2 or P-4 and are not interchangeable. Be sure correct needles are used as specified per snowmobile.

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MAIN JET SYSTEM

Principles of Operation

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 500. The size number corresponds to flow and not necessarily to hole size.

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

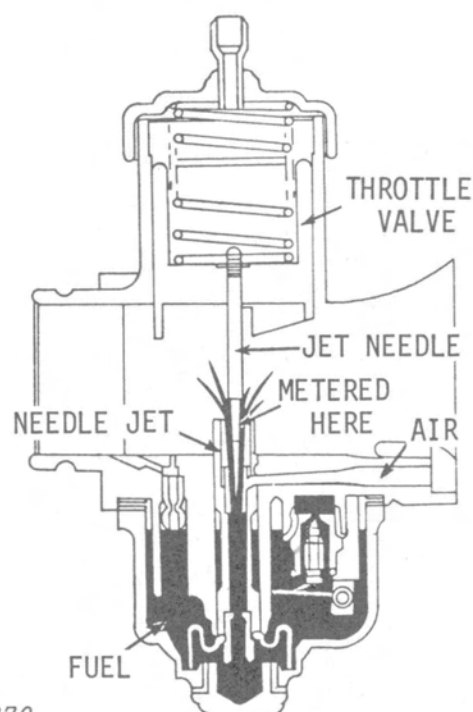
Tuning Main Jet System

Before operating the snowmobile, make sure all parts, including clutch and drive belt, are in good operating condition.

1. Operate snowmobile at wide open throttle for several minutes on a flat, well-packed surface. Change main jet if snowmobile fails to achieve maximum rpm or labors at high rpm.
2. Continue to operate at wide open throttle and shut off ignition before releasing throttle. Remove muffler and inspect inside of ball joint area for correct color (tan) which indicates correct mixture.

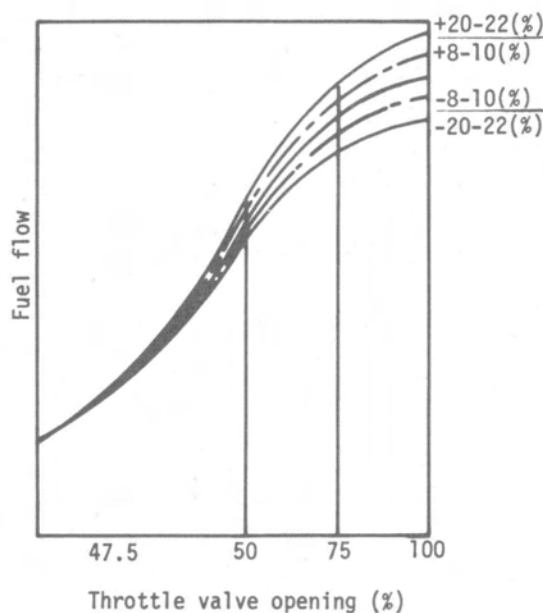
NOTE: Do not change jet sizes by more than one increment (step) at a time.

3. If ball joint is dark brown or black, the fuel/air mixture is too rich. Decrease jet size.
4. If the ball joint is very light in color, the fuel/air mixture is too lean. Increase jet size.



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Standard Carburetor

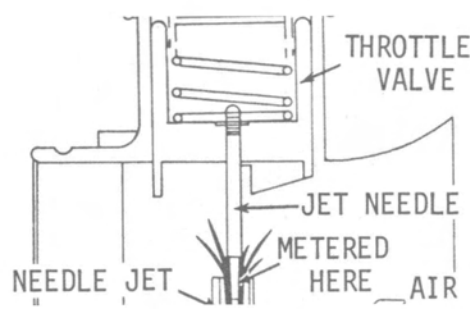


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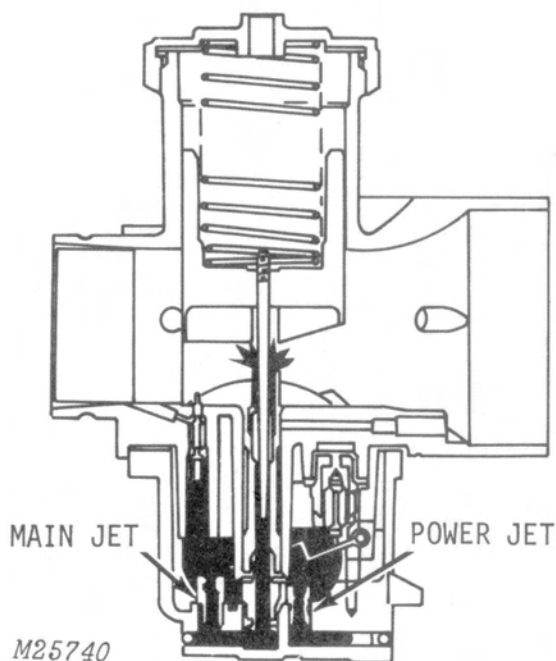
plied by the main jet and regulated by the needle jet/jet needle combination. The main jet meters the fuel when the throttle is in the wide open position.

The main jets are available in sizes from number 50 to number 500. The size number corresponds to flow and not necessarily to hole size.

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

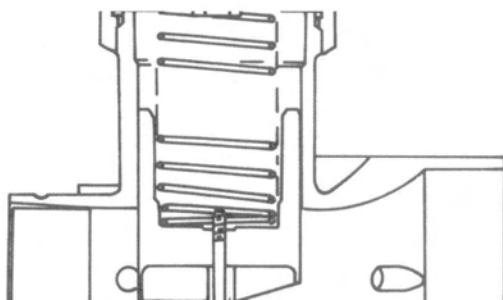


MAIN JET SYSTEM—Continued



Power Jet Carburetor

5. If you cannot determine the color, proceed as if fuel/air mixture is too lean and increase jet size. If operation improves, continue to increase jet size to obtain peak performance. If operation becomes worse, decrease jet size to obtain peak performance.
6. After proper main jet is selected, recheck jet needle and needle jet.



fuel/air mixture is too lean and increase jet size. If operation improves, continue to increase jet size to obtain peak performance. If operation becomes worse, decrease jet size to obtain peak performance.

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

POWER JET SYSTEM

Principles of Operation

The power jet system is similar to and works in conjunction with the main system.

The power jet system starts to function at engine speeds of approximately 5000 rpm and above. High velocity air moving through the venturi, past the power jet outlet, creates a vacuum to pull fuel through the power jet and out the outlet. At the same time air is drawn through the power air jet to mix with and help atomize fuel from the power jet.

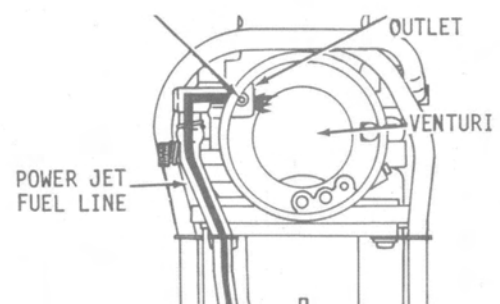
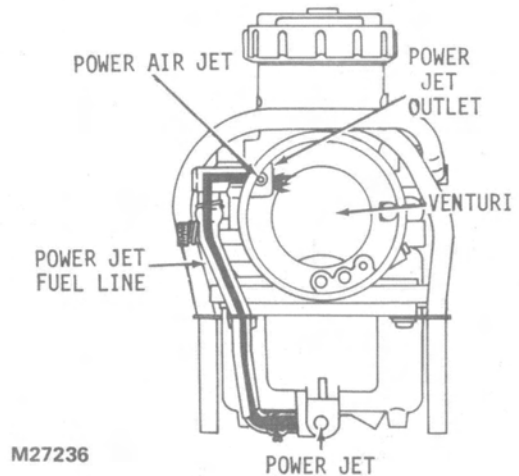
When the power jet system is functioning, it supplies approximately 40 per cent of the fuel requirement while the main jet supplies 60 per cent.

Power jets are available in sizes from number 60 to number 200. The size number corresponds to flow and not necessarily to hole size.

NOTE: *Never change the power jet by more than one size at a time.*

Make minor changes to both the power jet and main jet at the same time. Follow the main jet system tuning procedure for the power jet system.

When experiencing erratic operation or overheating, check the power jet and power jet outlet for dirt and the external fuel line for leakage.



The power jet system starts to function at engine speeds of approximately 5000 rpm and above. High velocity air moving through the venturi, past the power jet outlet, creates a vacuum to pull fuel through the power jet and out the outlet. At the same time air is drawn through the power air jet to mix with and help atomize fuel from the power jet.

When the power jet system is functioning, it supplies

COMPENSATION FOR ALTITUDE AND TEMPERATURE

An engine loses about 3-1/2 per cent of its power for each 1000-foot (304.8 m) increase in elevation. Although this power loss cannot be regained, tuning the carburetor will insure peak performance at 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 throughout most of the throttle range. The following tables provide guidelines for tuning the carburetor for high altitude. Refer to pages 24 and 25 for related part numbers.

TRAILFIRE CARBURETION RECOMMENDATIONS*

Temperature	Component	Sea Level to 4000 ft. (1 219 m) (Factory Installed)	4000 ft. (1 219 m) to 6000 ft. (1 829 m)	6000 ft. (1 829 m) and above
Below 0°F (-18°C)	Main Jet	200	190	170
Above 0°F (-18°C)	Main Jet	190	180	160
All Temperatures	Jet Needle	6F27-3	6F27-3	6F27-3
	Needle Jet	166-06	166-06	166-06
	Throttle Valve	3.0	3.0	3.0
	Pilot Jet	30	30	30
	Air Screw	1-1/2 Turns Open	1-1/2 Turns Open	1-1/2 Turns Open
	Idle Speed	1800-2300 rpm	2000-2500 rpm	2000-2500 rpm

TRAILFIRE LX CARBURETION RECOMMENDATIONS*

Temperature	Component	Sea Level to 4000 ft. (1 219 m) (Factory Installed)	4000 ft. (1 219 m) to 6000 ft. (1 829 m)	6000 ft. (1 829 m) and above
Below 0°F (-18°C)	Main Jet	240	230	210
Above 0°F (-18°C)	Main Jet	230	220	200
All Temperatures	Jet Needle	6F27-3	6F27-3	6F27-3
	Needle Jet	166-Q0	166-Q0	166-Q0
	Throttle Valve	3.5	3.5	3.5
	Pilot Jet	25	25	25
	Air Screw	1 Turn Open	1 Turn Open	1 Turn Open
	Idle Speed	1800-2300 rpm	2700-3200 rpm	2700-3200 rpm

*These are suggested carburetor component changes from stock to altitude and temperature requirements. See pages 2 through 18 and 24 and 25 for explanations and details of optional fine tune components.

each 1000-foot (304.8 m) increase in elevation. Although this power loss cannot be regained, tuning the carburetor will insure peak performance at 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 throughout most of the throttle range. The following tables provide guidelines for tuning the carburetor for high altitude. Refer to

SPORTFIRE CARBURETION RECOMMENDATIONS*

Temperature	Component	Sea Level to 4000 ft. (1 219 m) (Factory Installed)	4000 ft. (1 219 m) to 6000 ft. (1 829 m)	6000 ft. (1 829 m) and above
Below 0°F (-18°C)	Main Jet	210	200	180
Above 0°F (-18°C)	Main Jet	200	190	170
All Temperatures	Power Jet	170	170	170
	Jet Needle	6F27-3	6F27-3	6F27-3
	Needle Jet	159-Q0	159-Q0	159-Q0
	Throttle Valve	3.0	3.0	3.0
	Pilot Jet	25	25	25
	Air Screw	1-1/2 Turns Open	1-1/2 Turns Open	1-1/2 Turns Open
	Idle Speed	2400-2700 rpm	2600-3000 rpm	2600-3000 rpm

*These are suggested carburetor component changes from stock to altitude and temperature requirements. See pages 2 through 18 and 24 and 25 for explanations and details of optional fine tune components.

LIQUIFIRE CARBURETION RECOMMENDATIONS

TEMPERATURES ABOVE 0°F (-18°C)

Carburetor	Sea Level to 4000 ft. (1 219 m)	4000 to 8000 ft. (1 219 to 2 438 m)	8000 ft. and up (2 438 m)
Main Jet	150	130	100
Power Jet			
PTO Carb.	110	90	85
Mag. Carb.	105	85	80
Jet Needle	6DH22-3	6DH22-3	6DH22-3
Needle Jet	159 (P4)	159 (P4)	159 (P4)
Throttle Valve	3.5	3.5	3.5
Pilot Jet	40	40	40
Air Screw (Turns Open)	1-1/2	1-1/2	1-1/2
Idle Speed (RPM'S)	2000 - 2500	2000 - 2500	2000 - 2500

TEMPERATURES BELOW 0°F (-18°C)

Carburetor	Sea Level to 4000 ft. (1 219 m)	4000 to 8000 ft. (1 219 to 2 438 m)	8000 ft. and up (2 438 m)
Main Jet	160	140	110
Power Jet			
PTO Carb.	115	90	85
Mag. Carb.	110	85	80
Jet Needle	6DH22-3	6DH22-3	6DH22-3
Needle Jet	159 (P4)	159 (P4)	159 (P4)
Throttle Valve	3.5	3.5	3.5
Pilot Jet	40	40	40
Air Screw (Turns Open)	1-1/2	1-1/2	1-1/2
Idle Speed (RPM'S)	2000 - 2500	2000 - 2500	2000 - 2500

IMPORTANT: The carburetion recommendations shown in the LIQUIFIRE charts are based on general conditions and will not necessarily provide optimum performance in all operating

tion on page 20 and use the graph provided to further fine tune your carburetor.

Above 0°F (-18°C)	Main Jet	210	200	180
All Temperatures	Main Jet	200	190	170
	Power Jet	170	170	170
	Jet Needle	6F27-3	6F27-3	6F27-3
	Needle Jet	159-Q0	159-Q0	159-Q0
	Throttle Valve	3.0	3.0	3.0
	Pilot Jet	25	25	25
	Air Screw	1-1/2 Turns Open	1-1/2 Turns Open	1-1/2 Turns Open
	Idle Speed	2400-2700 rpm	2600-3000 rpm	2600-3000 rpm

Carburetion Explanation

Temperature, altitude and even humidity affect the amount of oxygen supplied to the engine combustion chamber.

Basically, as temperature, altitude and humidity increase, the amount of oxygen in the atmosphere decreases. As oxygen decreases, the amount of fuel delivered to the engine combustion chamber must be decreased or a loss of performance will result.

For example, if you consistently operate the snowmobile at the upper end of the 4000 to 8000-foot (1 219 to 2 438 m) range, say 7000 feet (2 134 m) (at temperatures of 0°F [-18°C]), you may wish to install a 120 main jet and leave the 90 and 85 power jets alone.

IMPORTANT: Avoid installing jet sizes that are too lean (small) as piston seizure may result.

Normally the number 40 pilot jet will provide good starting characteristics at the 4000 to 8000-foot (1 219 to 2 438 m) range. In some instances it may be necessary to richen the pilot system to make up for fuel that is lost by leaning (reducing main jet size) in the main carburetor system.

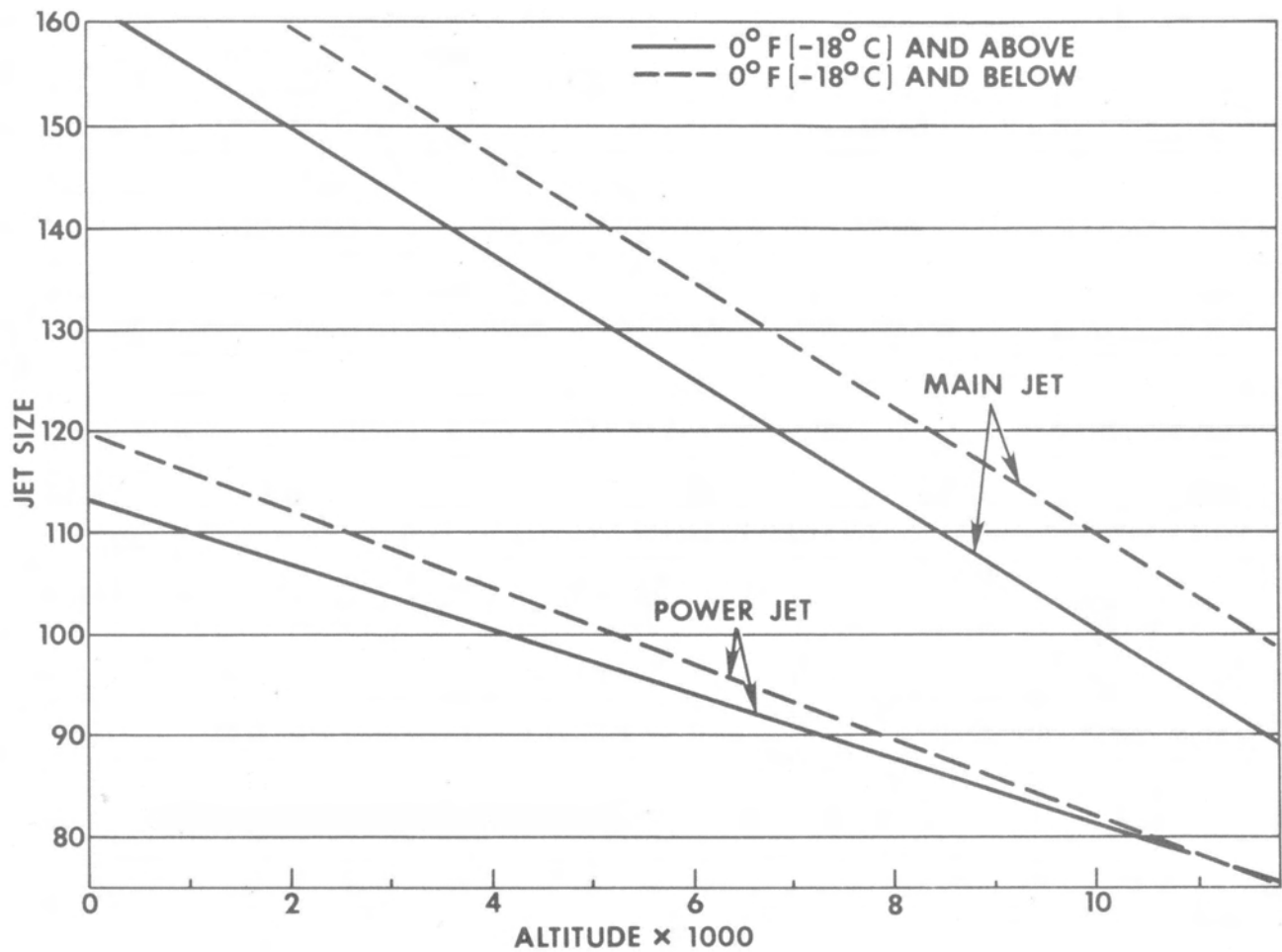
The graph gives an indication of specific jet sizes to be used at given altitudes and temperature. However, keep in mind that temperature and humidity levels will also affect engine output, especially when temperatures are at one extreme or the other.

Many different factors affect snowmobile performance. To receive ultimate performance from your snowmobile all factors must be considered. Using the base line jet sizes listed in the chart and the graph, you should have a good performance level from which to fine tune your snowmobile.

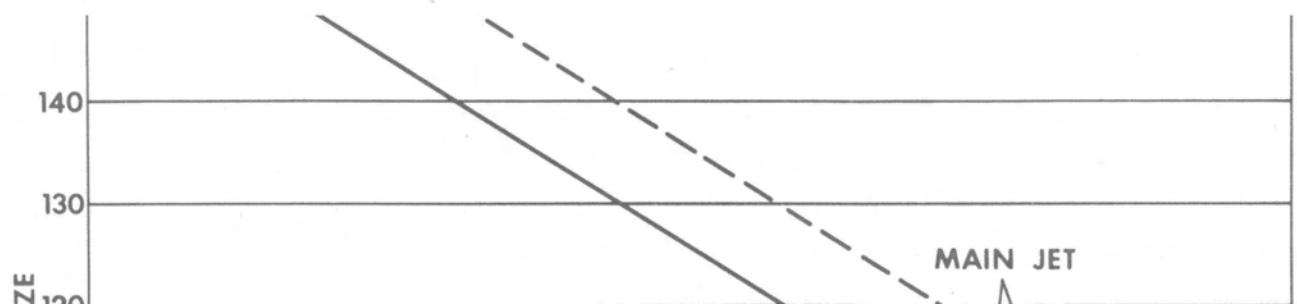
Basically, as temperature, altitude and humidity increase, the amount of oxygen in the atmosphere decreases. As oxygen decreases, the amount of fuel delivered to the engine combustion chamber must be decreased or a loss of performance will result.

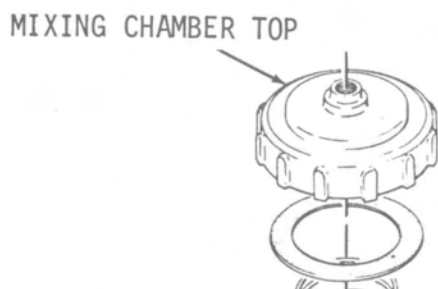
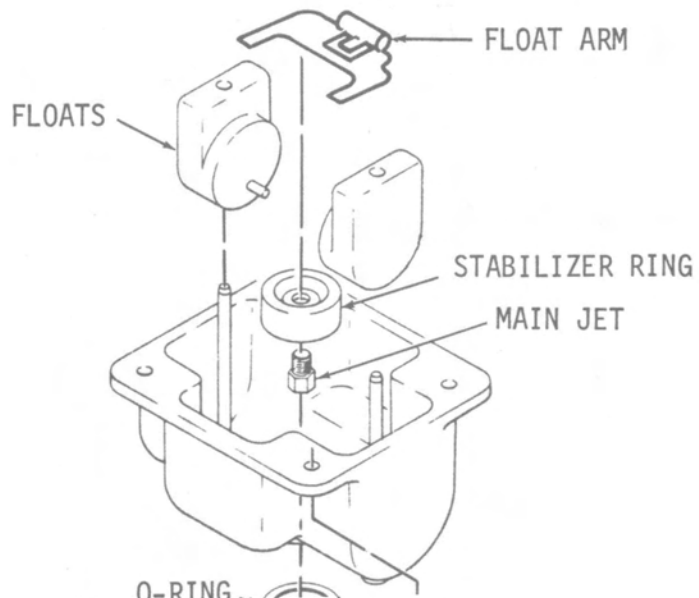
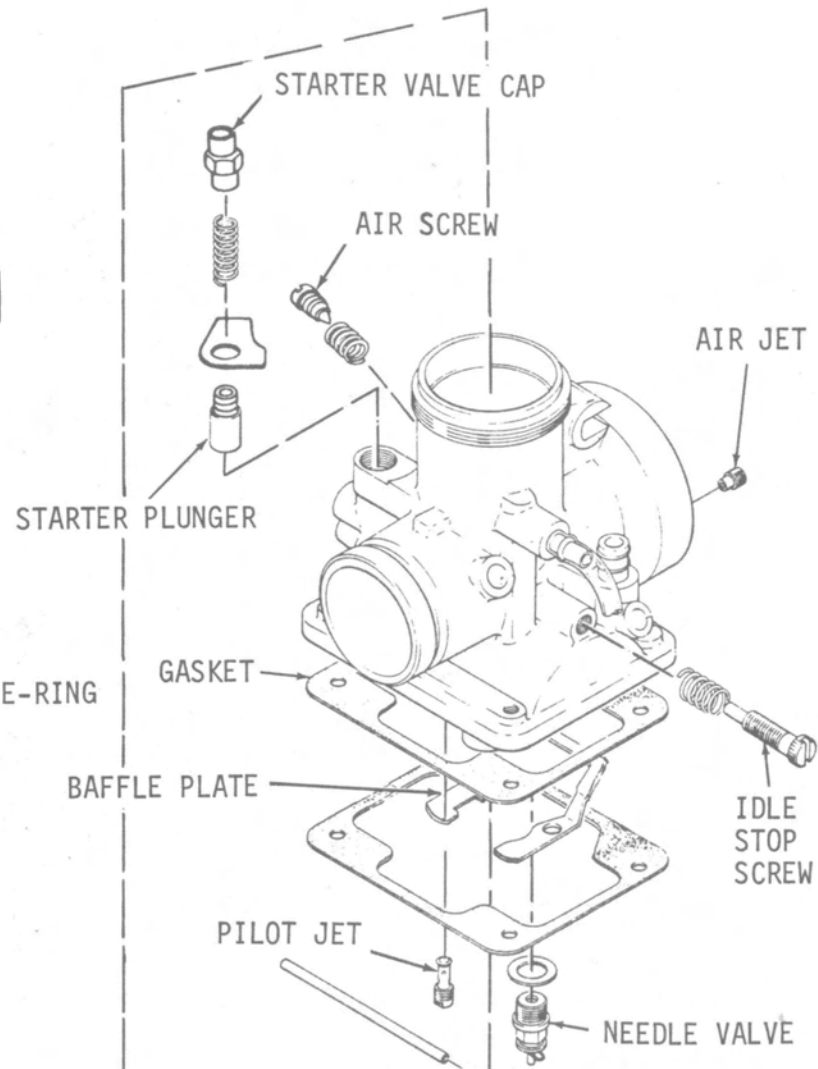
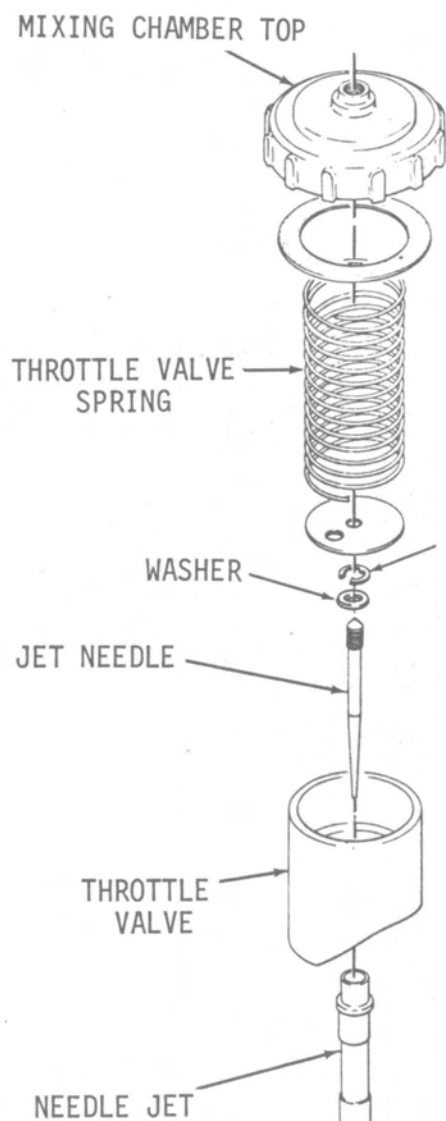
For example, if you consistently operate the snowmobile at the upper end of the 4000 to 8000-foot (1 219 to 2 438 m) range, say 7000 feet (2 134 m) (at tempera-

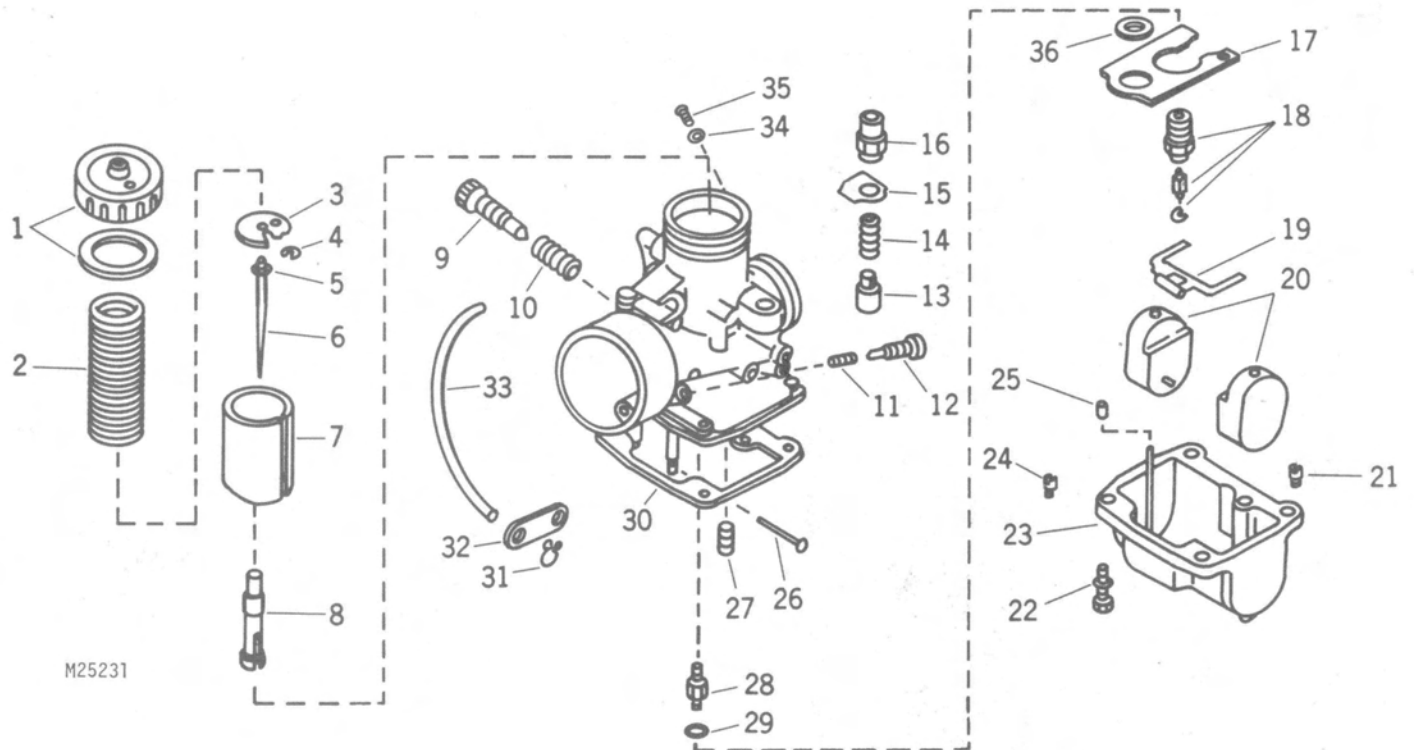
CARBURETION GRAPH



M29254





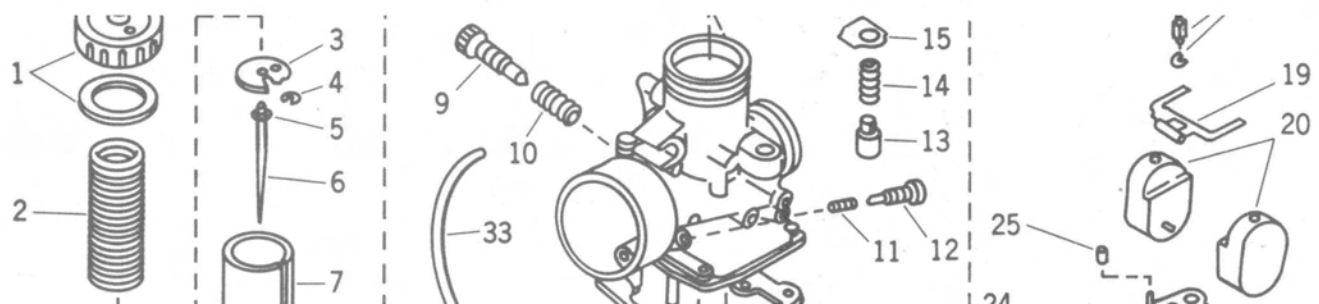


M25231

- 1—Top
- 2—Spring
- 3—Plate
- 4—E-Ring
- 5—Washer
- 6—Jet Needle
- 7—Throttle Valve
- 8—Needle Jet
- 9—Screw
- 10—Spring
- 11—Spring
- 12—Screw
- 13—Starter Valve
- 14—Spring
- 15—Washer
- 16—Cap
- 17—Baffle Plate
- 18—Needle Valve

- 19—Float Arm
- 20—Floats
- 21—Main Jet
- 22—Machine Screw
- 23—Float Bowl
- 24—Power Jet
- 25—Cap
- 26—Pin
- 27—Pilot Jet
- 28—Needle Jet Holder
- 29—O-Ring
- 30—Gasket
- 31—Clip
- 32—Plate
- 33—Tube
- 34—Washer
- 35—Machine Screw
- 36—Washer

Exploded View of Power Jet Carburetor



M25744 **MAIN JETS**

Temp.	Altitude	Mikuni No.	John Deere No.	Fuel Mixture
HOT	HIGH	70	M66899	LEAN
		75	M66900	
		80	M66901	
		85	M66902	
		90	M66903	
		95	M66904	
		100	M66905	
		105	M68789	
		110	M66906	
		115	M68790	
		120	M65336	
		125	M68791	
		130	M65335	
		135	M68792	
		140	M65332	
		145	M68793	
		150	M65333	
		155	M68013	
		160	M65334	
		165	M68794	
		170	M65468	
		175	M68277	
		180	M65469	
		185	M68795	
		190	M65470	
		195	M68276	
		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	

Temp.	Altitude	Mikuni No.	Deere No.	Fuel Mixture
HOT	HIGH	70	M66899	LEAN
		75	M66900	
		80	M66901	
		85	M66902	
		90	M66903	
		95	M66904	
		100	M66905	
		105	M68789	

POWER JETS

Temp.	Altitude	Mikuni No.	John Deere No.	Fuel Mixture
HOT	HIGH	60	M68765	LEAN
		65	M68766	
		70	M68767	
		75	M68768	
		80	M68769	
		85	M68770	
		95	M68771	
		100	M68772	
		105	M68773	
		110	M68774	
		120	M68775	
		140	M68776	
		145	M68777	
		150	M68778	
		155	M68779	
		160	M68780	
		165	M68781	
		170	M68782	
		175	M68783	
		180	M68784	
		185	M68785	
		190	M68786	
		195	M68787	
		200	M68788	RICH

PILOT JETS

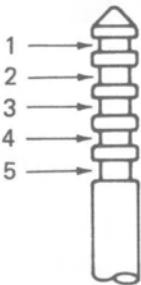
Temp.	Altitude	Mikuni No.	John Deere No.	Fuel Mixture
HOT	HIGH	15	M66912	LEAN
		17.5	M66913	
		20	M66745	
		22.5	M68796	
		25	M66929	
		27.5	M68797	
		30	M66844	
		~~35~~	M66914	
		~~40~~	M65355	
		45	M66746	
		50	M66663	
		55	M66672	
		60	M66915	RICH

Temp.	Altitude	Mikuni No.	Deere No.	Fuel Mixture
HOT	HIGH	60	M68765	LEAN
		65	M68766	
		70	M68767	
		75	M68768	
		80	M68769	
		85	M68770	
		95	M68771	
		100	M68772	
		105	M68773	
		110	M68774	
		120	M68775	
		140	M68776	

THROTTLE VALVES			
 M22341	Mikuni No.	John Deere Snowmobile and Part No.	Fuel Mix.
		Trailfire	RICH
	3.0	M68278	▼ LEAN
	3.5	M68279	
		Sportfire	RICH ▼ LEAN
	0.5	M66880	
	1.0	M66881	
	1.5	M66882	
	2.0	M66344	
	2.5	M66743	
	3.0	M66744	
	3.5	M66883	
		Liquifire	RICH ▼ LEAN
	1.5	M68798	
	2.0	M68799	
	2.5	M68667	
	3.0	M68800	
	3.5	M68801	

NOTE: Throttle valves are not interchangeable between snowmobiles.

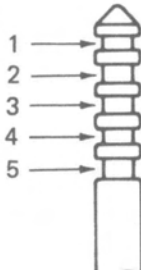
NEEDLE JETS					
 M22343	Temp.	Altitude	Mikuni	John Deere No.	Fuel Mixture
			(159)		
	HOT ▲	HIGH ▲	P-4	M66894	LEAN ▲
			P-6	M66741	
			P-8	M66895	RICH ▲
			Q-0	M66740	
			Q-2	M66896	
	COLD ▲	SEA LEVEL ▲	Q-4	M66897	
			(166)		
	HOT ▲	HIGH ▲	O-6	M68699	LEAN ▲
			P-0	M68273	
			Q-0	M68698	RICH ▲
			Q-2	M68308	
	COLD ▲	SEA LEVEL ▲			

JET NEEDLES				
 M22344	Temp.	Altitude	E-Ring Position	Fuel Mixture
	HOT ▲	HIGH ▲	 M22345	LEAN ▲
	COLD ▲	SEA LEVEL ▲		RICH ▲

JET NEEDLE PART NO.	
Mikuni No.	John Deere Part No.
6DH3	M65354
6DH2	M66656
6FL14	M66422
6DP1	M66926
6DH7	M66927
6DP5	M66941
6DH8	M67634
6F27	M68280
6DH22	M69074

AIR SCREWS				
 M22342	Temp.	Altitude	Turns Open	Fuel Mixture
	HOT ▲	HIGH ▲	2-1/2	LEAN ▲
			2	
			1-1/2	
			1	
	COLD ▲	SEA LEVEL ▲	1/2	RICH ▲

 M22341	3.0	M68278	▼ LEAN
	3.5	M68279	
		Sportfire	RICH ▼ LEAN
	0.5	M66880	
	1.0	M66881	
	1.5	M66882	
	2.0	M66344	
	2.5	M66743	
	3.0	M66744	
	3.5	M66883	
		Liquifire	RICH ▼ LEAN
	1.5	M68798	
	2.0	M68799	
	2.5	M68667	
	3.0	M68800	
	3.5	M68801	

 M22344	Temp.	Altitude	E-Ring Position	Fuel Mixture
	HOT ▲	HIGH ▲	 M22345	LEAN ▲
	COLD ▲	SEA LEVEL ▲		RICH ▲



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, drive belt, and, on the LIQUIFIRE, the chain tensioner.

IMPORTANT: Use the parts recommended in the carburetion and clutching charts for good overall snowmobile performance.

If sharp acceleration is desired a stronger primary clutch spring may be used to increase clutch engagement rpm's. However, harsh engagement may result and belt life may be shortened. On some snowmobiles, top-end performance may be increased by installing higher gear ratios in the chain case, but, low-end acceleration may be reduced.

At higher elevations, the decrease in air density reduces the horsepower output of naturally aspirated engines. Higher elevation also involves deep snow operation and additional hill climbing.

Because the engine develops less horsepower, the drive train components and carburetion must be changed to achieve optimum performance. For example; the clutch weights in the TR800 primary clutch (LIQUIFIRE) and clutch arms in the 102C primary clutch (TRAILFIRE and SPORTFIRE) must be of lighter weight to maintain governed engine rpm's. A stronger spring in the primary clutch may be used to increase clutch engagement rpm's and help maintain governed engine rpm's.

Carburetor parts must also be changed. Because the engine receives less oxygen at higher elevations, the fuel flow must be reduced to maintain the proper

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

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 snowmobile only after the sprocket ratio is determined. The 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 (pages 38 and 39). For example, when changing from a 24/40 to 21/39 gear ratio, change the driven sheave spring from hole No. 2 to hole No. 1 and see if performance is improved. In some cases, performance may improve at high altitudes.

AVAILABLE DRIVE SPROCKET RATIOS

Ratio	Sprockets Upper/Lower	SPORTFIRE and TRAILFIRE		LIQUIFIRE	Upper Sprocket	Lower Sprocket	TRAILFIRE and SPORTFIRE Chain	LIQUIFIRE Chain
		mph at 6500 rpm (Ideal)	mph at 7000 rpm (Ideal)	mph at 8000 rpm (Ideal)				
1.56:1	25/39	79	86	105	25 (M67970)	39 (M65693)	68 (M66321)	70 (M68634)
1.59:1	22/35	NA	NA	103	22 (M68551)	35 (M65809)	NA	66 (M66122)
1.67:1	24/40	74	80	99	24 (M67727)	40 (M66804)	68 (M66321)	70 (M68634)
1.72:1	22/38	71	77	96	22 (M68551)	38 (M67898)	66 (M66122)	68 (M66321)
1.77:1	22/39	NA	NA	92	22 (M68551)	39 (M65693)	NA	68 (M66321)
1.86:1	21/39	67	72	88	21 (M66121)	39 (M65693)	66 (M66122)	68 (M66321)
1.91:1	22/42	NA	NA	86	22 (M68551)	42 (M65810)	NA	70 (M68634)
1.95:1	20/39	NA	NA	84	20 (M69404)	39 (M65693)	NA	66 (M66122)
2.05:1	19/39	NA	NA	80	19 (M69403)	39 (M65693)	NA	66 (M66122)
2.06:1	17/35	60	65	79	17 (M66302)	35 (M65809)	62 (M66123)	64 (M69026)
2.19:1	16/35	55	60	75	16 (M65811)	35 (M65809)	62 (M66123)	62 (M66123)

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 snowmobile only after the sprocket ratio is determined. The 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

102C DRIVE SHEAVE

Principle of Operation

The 102C 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 snowmobile in motion.

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. There are three drive sheave components which may be changed to modify drive sheave performance: drive sheave spring, centrifugal weights, and spacer washers.

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

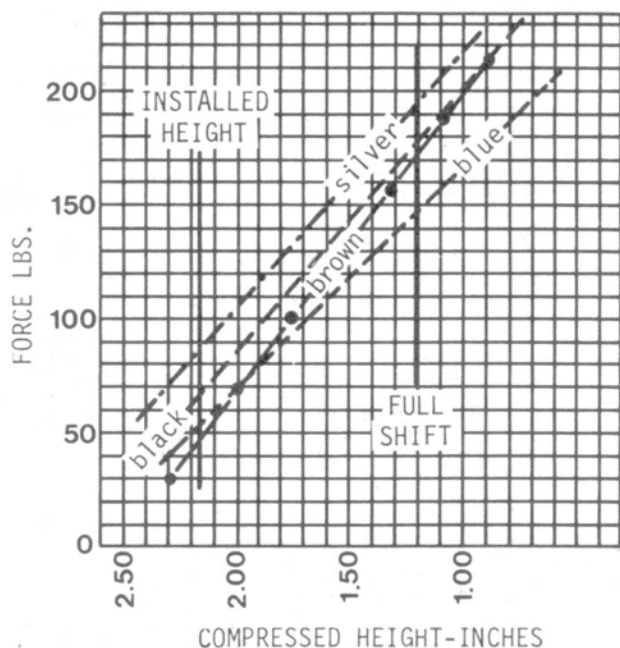
The following table lists the available springs and their free lengths. The chart shows the required compressing force for each of these springs.

AVAILABLE DRIVE SHEAVE SPRINGS AND FREE LENGTHS

	Color	Part Number	Free Length
Light ↓ Heavy	Blue	M66024	3.000" ± 0.06" (76.2 mm ± 1.5 mm)
	Brown	M66692	2.875" ± 0.06" (73.0 mm ± 1.5 mm)
	Black	M65684	3.030" ± 0.06" (77.0 mm ± 1.5 mm)
	Silver	M66541	3.475" ± 0.06" (88.3 mm ± 0.5 mm)

The 102C 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

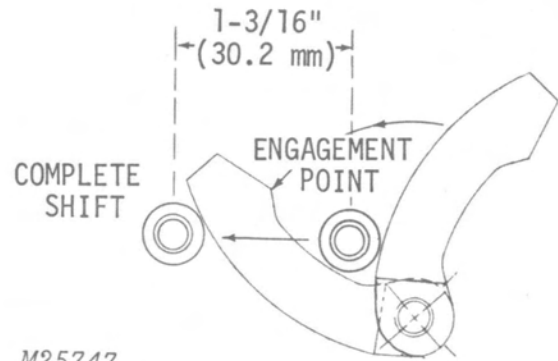


M29255

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 inches (30.2 mm).



M25747

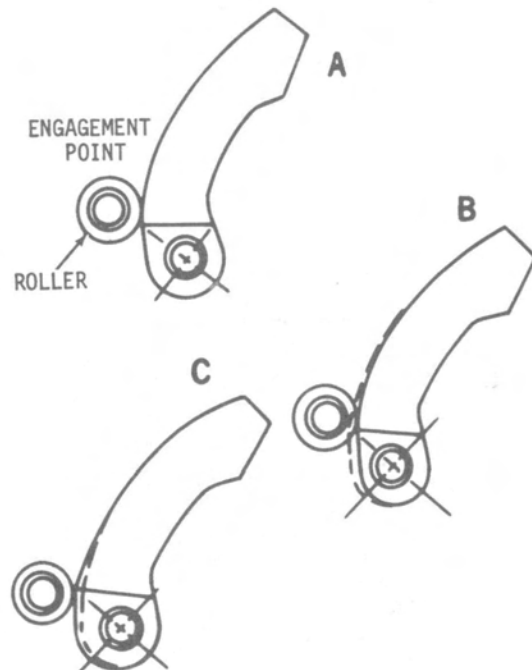
M25747

By varying the profile (shape) of the weight, the governed engine rpm and engagement speed can be increased or decreased. The illustration at right shows how the weight profile affects engagement speed.

Assume, for example, that the ramp of weight (A) allows the clutch to engage at 3500 rpm. Notice the point where the movable 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.

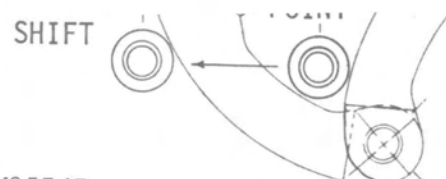
On weight (C), the angle of incline at engagement is less than that of weight (A). Because it is easier for centrifugal force to cause the movable face to move up ramp of weight (C), the clutch will engage at less than 3500 rpm.



M27238

M27238

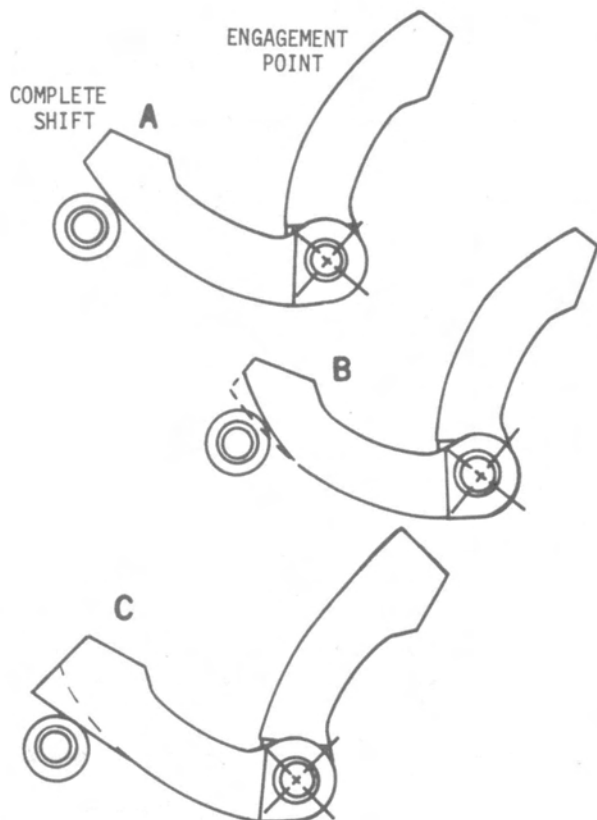
The effects of shape are more difficult to understand. For the standard weight, the total distance that the weight contacts the rollers during the shift pattern is about 1-3/16 inches (30.2 mm).



M25747

M25747

102C DRIVE SHEAVE—Continued



M27239

M27239

The illustration at left 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. The profile of weight (B) is cut back, providing a smaller angle of incline toward the top. It is therefore easier for centrifugal force to move the movable face, and engine speed is less than 6500 rpm.

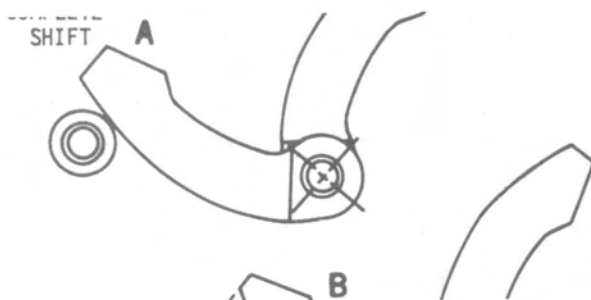
Weight (C) is not cut back as far as weight (A), and engine speed will therefore be greater than 6500 rpm for the weight to complete the shift pattern.

The weight kits available are identified in the table below and illustrated in the drawings on pages 31 through 33.

DRIVE CLUTCH WEIGHTS

	KIT NO.
Light	AM54284*
	AM55325
	AM54285
	AM54286
	AM53003
	AM54290*
	AM54283
	AM54282*
	AM54287*
	AM54288
	AM54280
	AM53949
	AM54920*
	AM55159
	AM54289
	AM54279
Heavy	AM54281

**These arms have increased engagement speeds because of 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.*

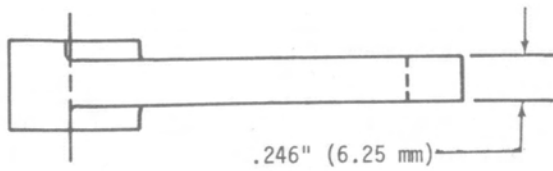


proved no shift pattern.

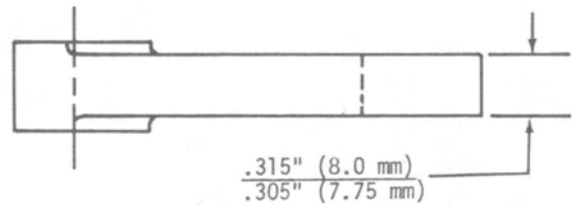
Again note the angles of incline. Assume that the engine with weight (A) is running at 6500 rpm and is fully upshifted. The profile of weight (B) is cut back, providing a smaller angle of incline toward the top. It is therefore easier for centrifugal force to move the movable face, and engine speed is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

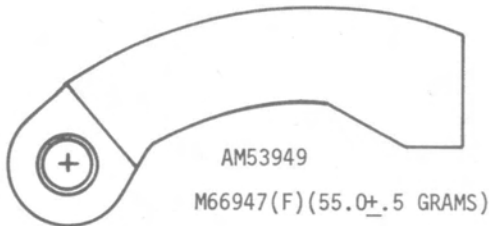
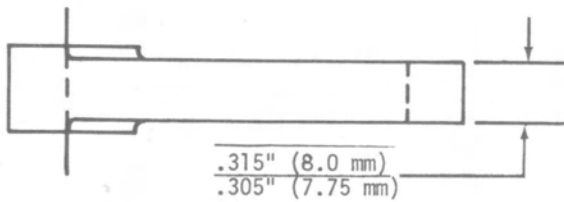
WEIGHT KITS



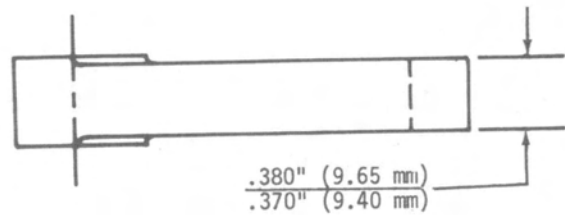
M27268



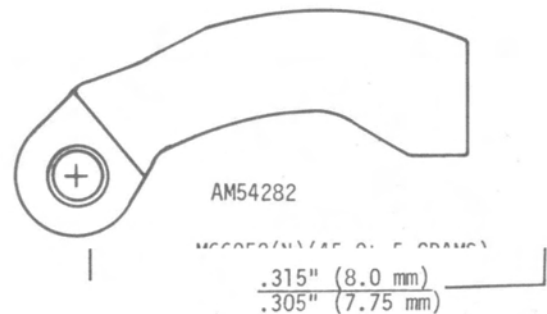
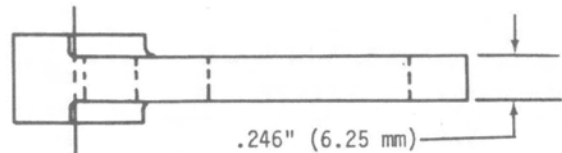
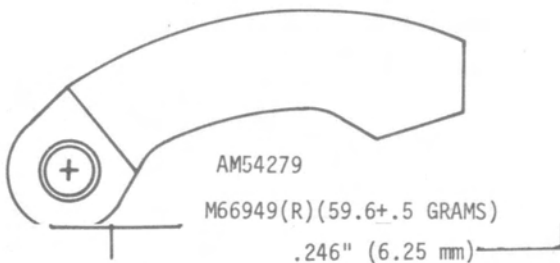
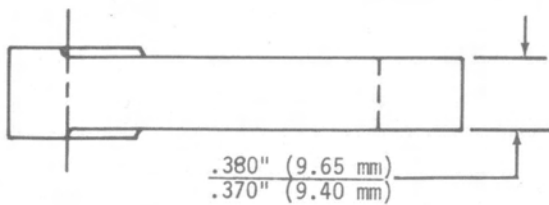
M27271



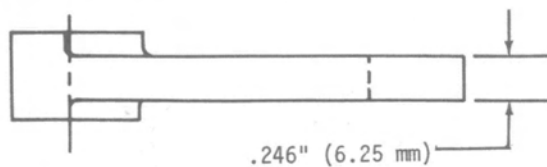
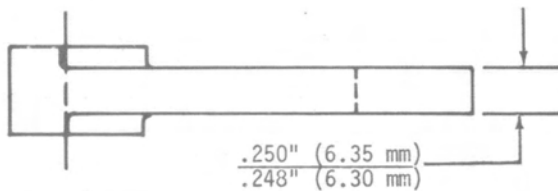
M27269



M27272



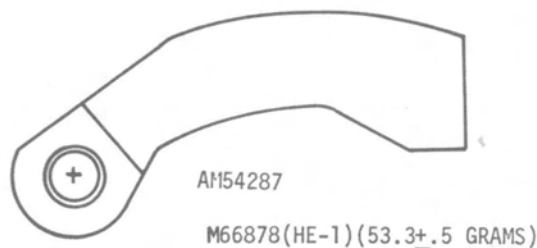
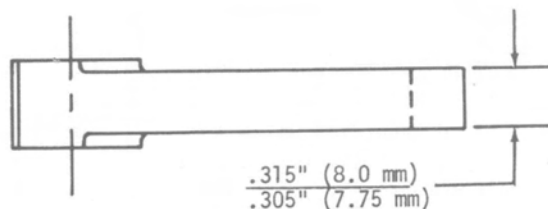
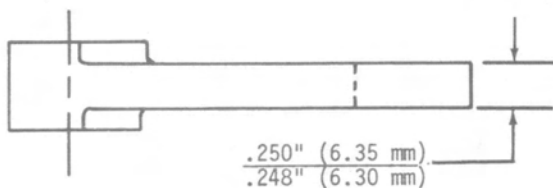
WEIGHT KITS



M27274

M66953(B) (44.0±.5 GRAMS)

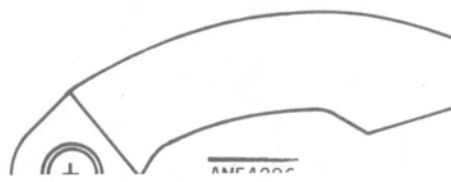
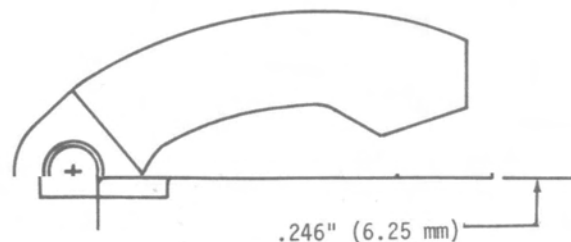
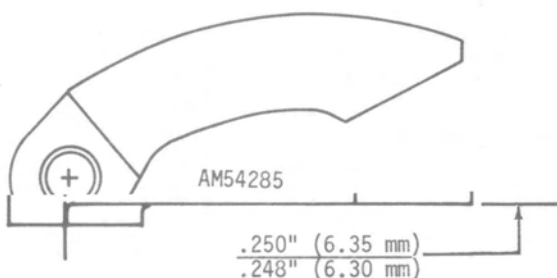
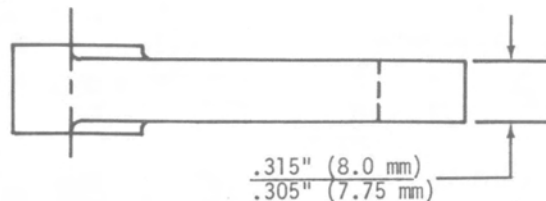
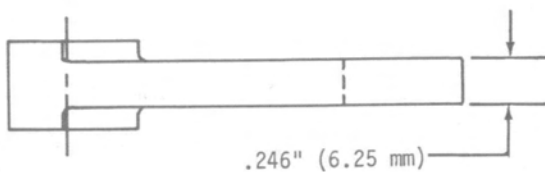
M27277



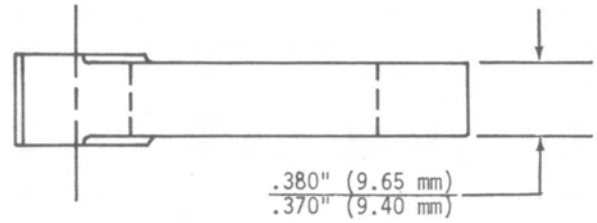
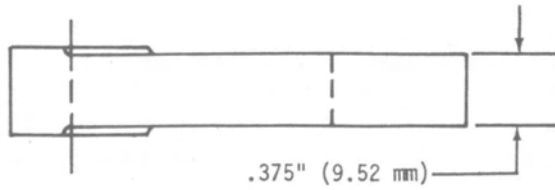
M27275

M66954(L) (38.6±.5 GRAMS)

M27278



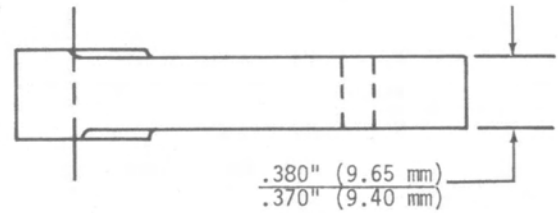
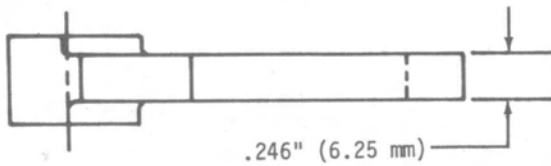
WEIGHT KITS



M27280

M27282

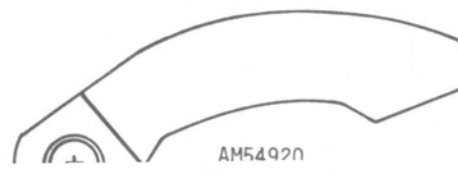
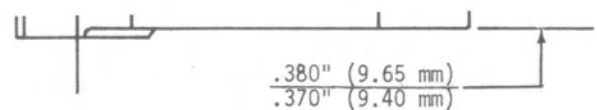
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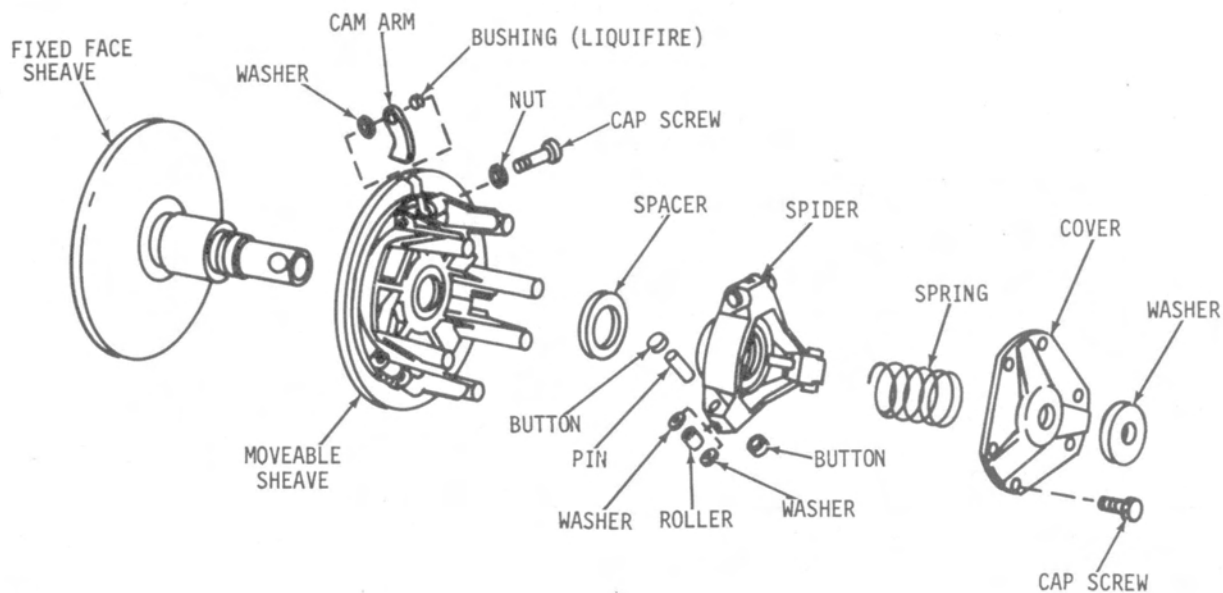


M27281

M27284

M27284

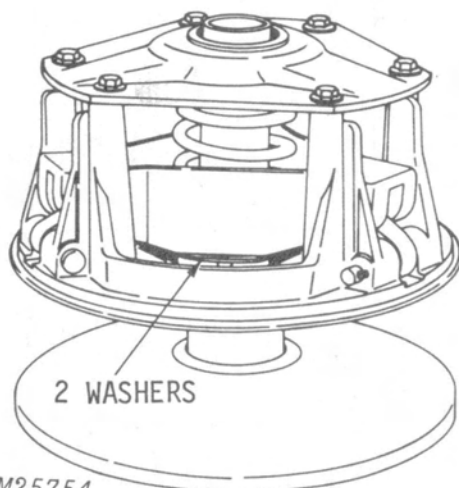




M27289

M27289

Exploded View of 102C Drive Sheave



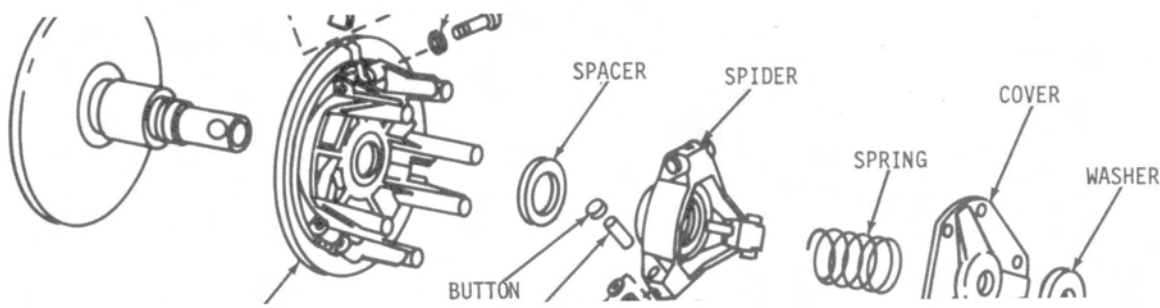
M25754

M25754

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.



TR800 DRIVE SHEAVE

Principle of Operation

The TR800 drive sheave, mounted on the PTO side of the engine, is a centrifugally-operated clutch.

The drive sheave contains six centrifugal weights attached by pins to the roller arms of 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 primary spring which holds the movable face in position. As the movable face approaches the fixed face, the tension on the drive belt increases and starts the snowmobile in motion.

Tuning

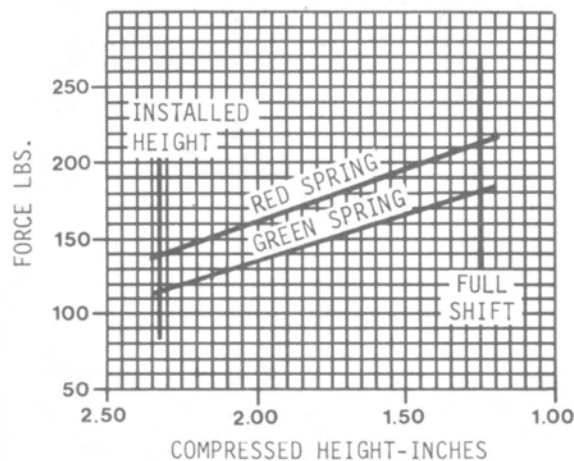
When properly tuned, clutch engagement and shift pattern will be matched with the engine rpm at which maximum horsepower is delivered at wide open throttle. This will result in maximum performance. There are three drive sheave components which may be changed to modify drive sheave performance: drive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

Drive Sheave Spring

The drive sheave spring (green) controls engagement speed. If a heavier spring (red) is installed, a higher speed will be required to overcome the spring force for engagement.

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

	COLOR	PART NUMBER	FREE LENGTH
STD.	Green	M69314	4.125" $\pm$ 0.020" (104.8 mm $\pm$ 0.508 mm)
HVY.	Red	M69331	4.000" $\pm$ 0.020" (101.6 mm $\pm$ 0.508 mm)

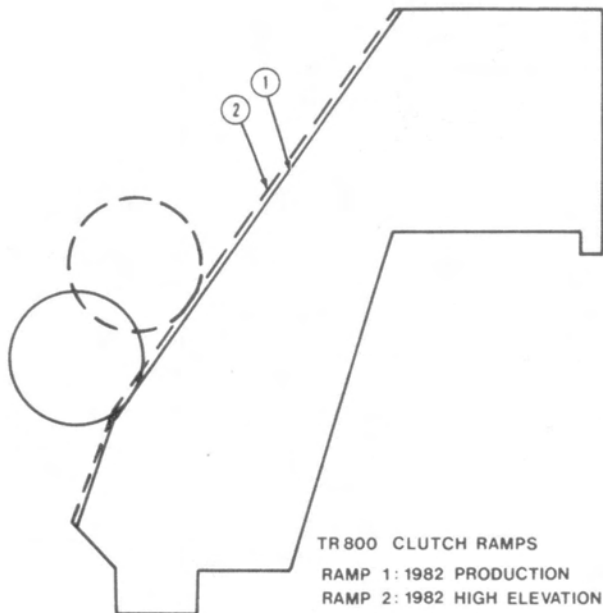


M29256

the engine, is a centrifugally-operated clutch.

The drive sheave contains six centrifugal weights attached by pins to the roller arms of 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 primary spring which holds the movable face in position. As the movable face approaches the fixed face, the tension on the drive belt increases and starts

TR800 DRIVE SHEAVE—Continued



M29257

Centrifugal Weights and Ramps

When lighter weights and heavier clutch spring (red) are installed, the centrifugal force is less and the clutch takes longer to upshift. This causes shifting at a higher engine rpm.

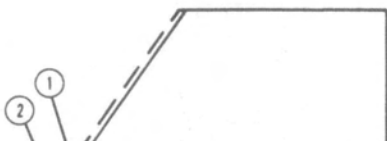
For the standard weights, clutch spring (green) and No. 1 ramp, the total angle that the roller arm swings when the roller travels up the ramp during the shift pattern is from about 15 to 45 degrees. By varying the weights, clutch spring and angle of the ramp the governed engine rpm and engagement speed can be increased. The shift pattern remains about 15 to 45 degrees. The illustrations show how centrifugal weights, spring and ramp angle affects engagement speed.

Assume, for example, that the standard weights, spring (green) and No. 1 ramp allow the roller to engage at approximately 4400 rpm. Notice the point where the roller contacts the initial angle of the No. 1 ramp.

With lighter weights, heavier spring (red) and No. 2 ramp the engine must develop higher rpm before engagement takes place. Lighter weights, heavier spring and No. 2 ramp would provide an engagement speed of approximately 5100 rpm.

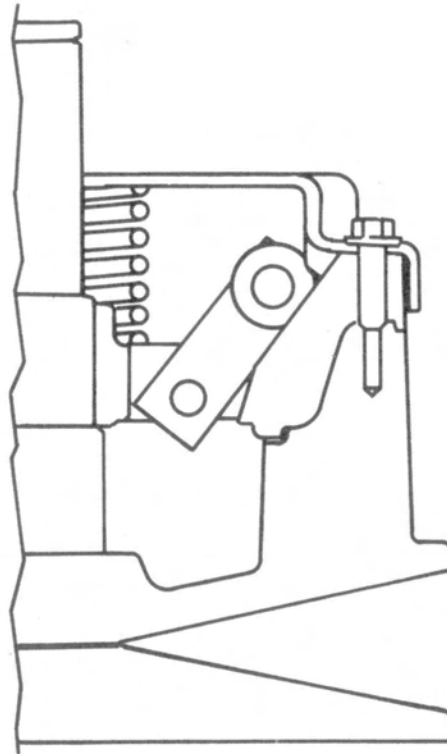
When lighter weights and heavier clutch spring (red) are installed, the centrifugal force is less and the clutch takes longer to upshift. This causes shifting at a higher engine rpm.

For the standard weights, clutch spring (green) and No. 1 ramp, the total angle that the roller arm swings when the roller travels up the ramp during the shift pattern is from about 15 to 45 degrees. By varying the weights,



The illustration shows the position of the roller on the ramp when the clutch has completed the shift pattern.

IMPORTANT: The angle on the ramps is very critical. DO NOT under any circumstances attempt to alter the angle of the ramps.



M29258

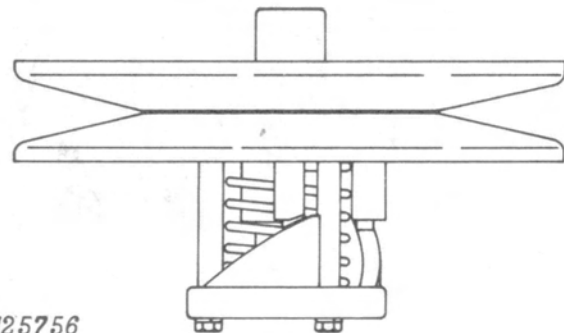
DRIVEN SHEAVE

Principles of Operation

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

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

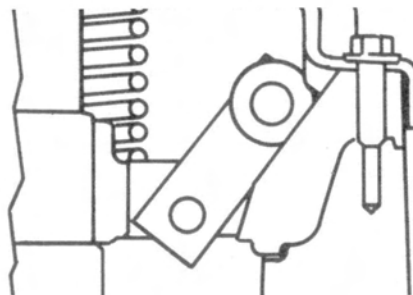
Because the driven sheave can sense load and shift into the proper ratio, engine rpm remains at peak output at wide open throttle. If the driven sheave did not downshift, the engine would run below its maximum power rpm.



M25756

M25756

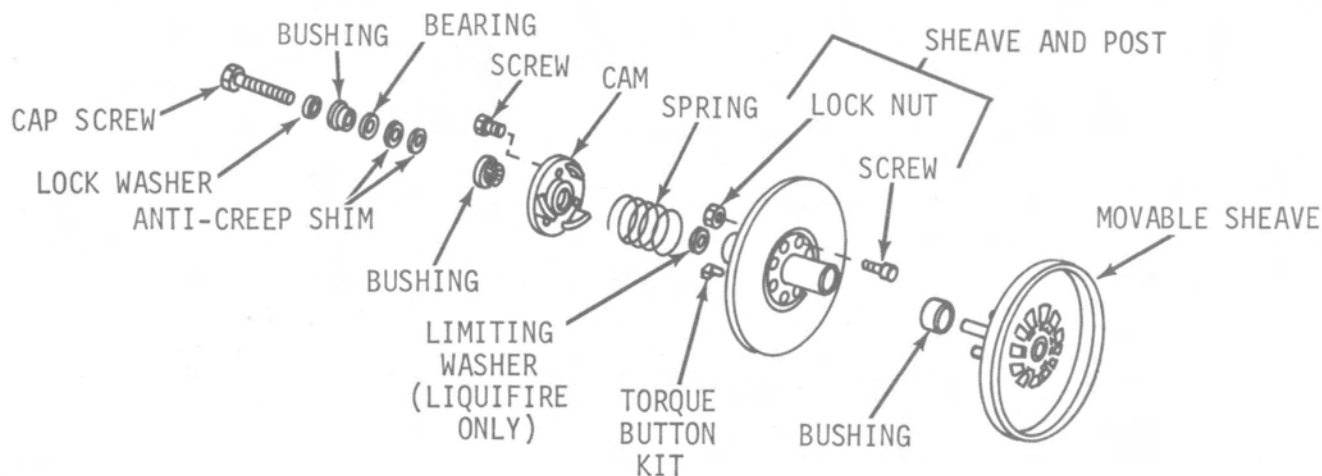
the ramps.



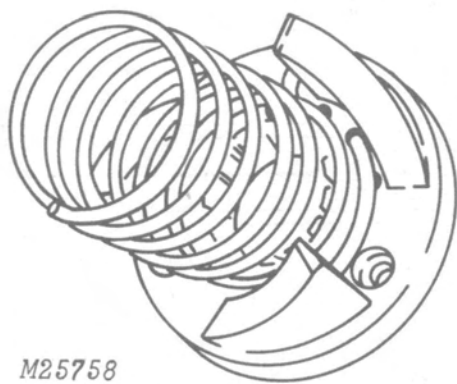
DRIVEN SHEAVE—Continued

Tuning

If there is a loss of snowmobile performance or if the drive belt appears too loose, remove "anti-creep" shims from the driven sheave until snowmobile just starts to "creep" at engine idle speed. Then add one shim to tighten the drive belt. This holds the belt tighter in the drive sheave and allows clutch engagement at the lowest drive ratio.



M25757



M25758

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.



CAUTION: When changing spring tension, be sure governed speed is not exceeded (pages 43 and 44).

Decreasing spring tension allows the driven sheave to shift into a higher ratio under the same load and thus decreases engine speed.

Decrease spring tension:

- If the engine is operating at speeds above the peak power curve.
- Under light load conditions, such as a lightly snow-covered lake.

Increasing spring tension prevents the driven sheave from shifting up and thus increases engine speed.

Increase spring tension:

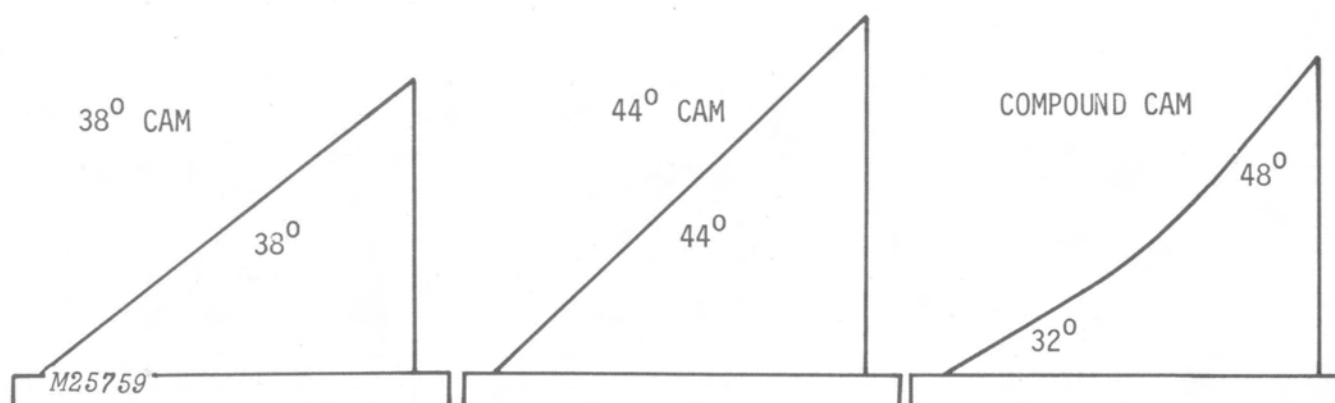
- If the driven sheave is shifting into a higher ratio than drive belt appears too loose, remove "anti-creep" shims from the driven sheave until snowmobile just starts to "creep" at engine idle speed. Then add one shim to tighten the drive belt. This holds the belt tighter in the drive sheave and allows clutch engagement at the lowest drive ratio.

BUSHING BEARING

SHEAVE AND POST

Cam Angle

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



PRETENSION CHART

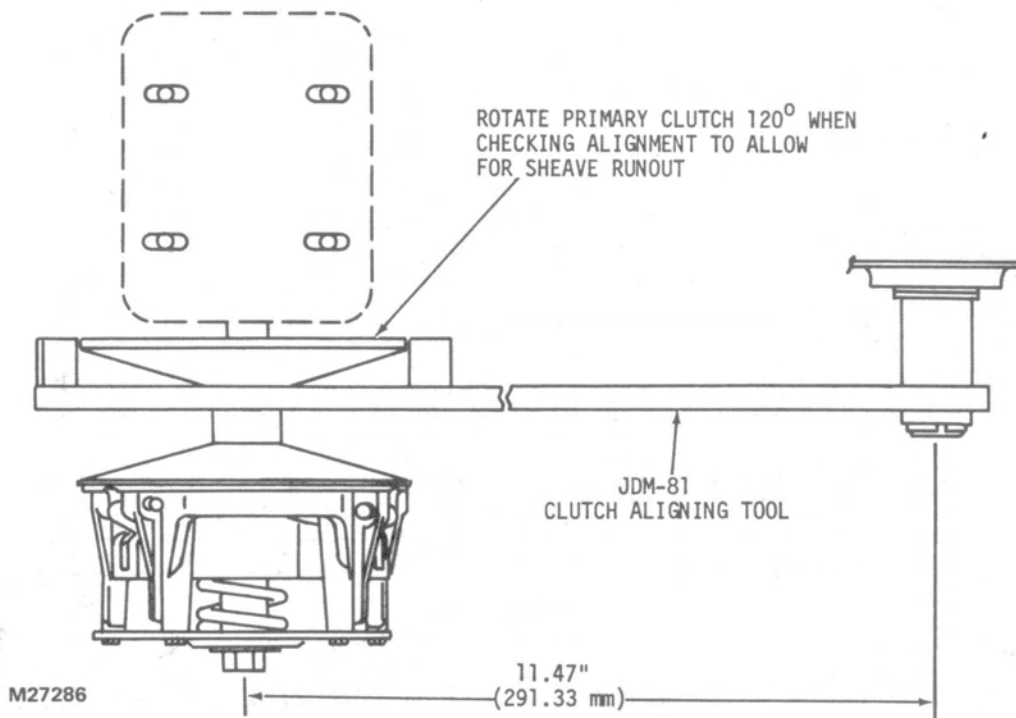
Insert spring tang into cam hole number-	Place cam and spring over fixed-face hub with spring tang in hole of fixed face. Rotate cam clockwise past ramp indicated.	Degrees of Rotation to Pass Ramp	Pounds of Spring Tension Measured at Sheave Rim
1	1 ramp	50°	5 lb. (22.2 N)
2 (std.)	1 ramp	80°	6 lb. (26.7 N)
3	1 ramp	110°	8 lb. (35.6 N)
4	2 ramps	140°	10 lb. (44.5 N)

is decreased, engine rpm will increase. For example, a 38° cam angle will provide more engine rpm and shift up slower than a 44° cam angle.

DRIVE SHEAVE AND DRIVEN SHEAVE ALIGNMENT

The drive and driven sheaves must be aligned for peak performance and maximum belt life.

TRAILFIRE and SPORTFIRE



NOTE: Remove drive belt and driven sheave. Use JDM-81 Clutch Aligning Tool to make the following adjustments.

Center Distance Alignment

Hub of drive sheave should fit fully into notch in JDM-81 Clutch Aligning Tool. If not, loosen engine mounting bolts and move engine as required.

Driven Sheave Offset Alignment

Rotate drive sheave and check for offset alignment every 120 degrees (three places). Ears on JDM-81 Clutch Aligning Tool should align with inside of stationary face on drive sheave. If not, add or remove shims on driven sheave shaft.

Drive Sheave Alignment

Rotate and check drive sheave for alignment every 120 degrees.

TRAILFIRE and SPORTFIRE

LIQUIFIRE Driven Sheave Offset Alignment

NOTE: On the LIQUIFIRE, center distance and drive sheave alignment cannot be adjusted. Secondary sheave offset is adjustable.

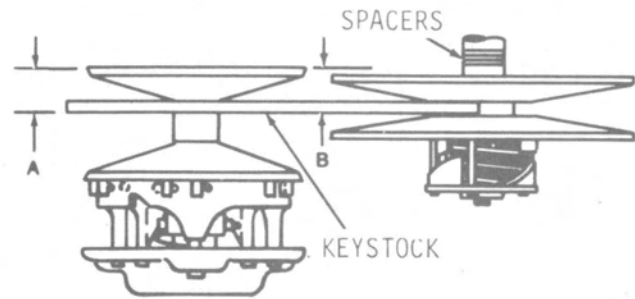
1. Remove belt.
2. Separate driven sheave and insert 3/8-inch (9.5 mm) keystick. Measure distances A and B every 120 degrees (three places) on the clutch.

IMPORTANT: Do not allow the bar stock to contact the rivet heads securing the driven sheave to the hub.

3. Use the following formula to calculate offset.

$$\frac{A+B}{2} = \text{OFFSET}$$

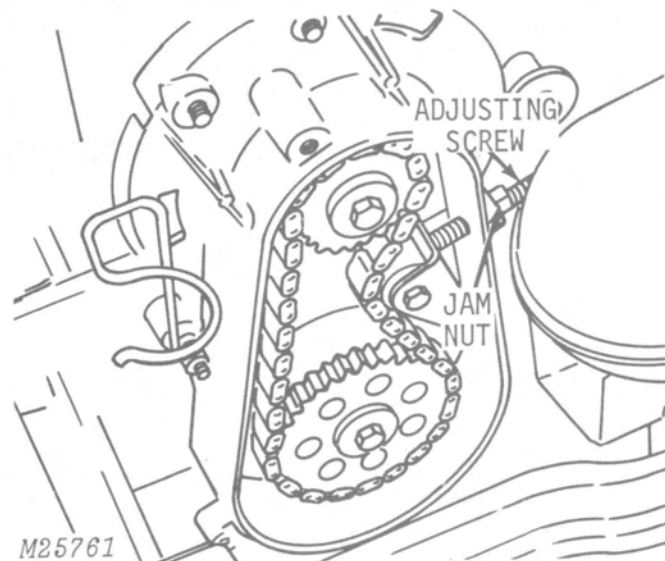
4. If offset is not between 1.44 inches (37 mm) to 1.48 inches (38 mm), add or remove spacers from driven sheave as necessary.



M29259

LIQUIFIRE CHAIN TENSIONER ADJUSTMENT

1. Loosen jam nut, and turn adjusting screw in finger-tight.
2. Turn the driven sheave 1/2 turn forward, check adjusting screw again. Turn driven sheave another 1/2 turn and check adjusting screw a second time.
3. Back off adjusting screw 1/4 turn, and tighten jam nut.



M25761

1. Remove belt.
2. Separate driven sheave and insert 3/8-inch (9.5 mm) keystick. Measure distances A and B every 120 degrees (three places) on the clutch.

IMPORTANT: Do not allow the bar stock to contact the rivet heads securing the driven sheave to the hub.

3. Use the following formula to calculate offset



M29259

DRIVE BELT DIMENSIONS

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.

A drive belt that is worn affects performance similar to a long belt. A drive belt worn to less than 1-1/8 inches (28.6 mm) wide should be replaced.

Snowmobile	Belt No.	Outside Circumference	Width
TRAILFIRE	M66345	46.3" (1 176 mm) ±0.12" (3.0 mm)	1-1/4" (32 mm)
SPORT-FIRE	M66345	46.3" (1 176 mm) ±0.12" (3.0 mm)	1-1/4" (32 mm)
LIQUIFIRE	M69170	46.8" (1 190 mm) ±0.25" (6.4 mm)	1-3/8" (35 mm)

HIGH ALTITUDE APPLICATION

At higher altitudes, the carburetor must be tuned to provide peak performance. 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 tables on pages 43 and 44 provide guidelines for tuning the power train for high altitude operation.

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.

Clutch Recommendations - TRAILFIRE - 102C Clutch*

Altitude	Clutch Engagement (rpm)	Governed Speed (rpm)	Primary Clutch			Secondary Clutch		Chain Case	
			Spacers in Clutch	Clutch Spring	Arm Kit	Spring Position	Cam	Gearing Sprockets	Chain (Pitch)
Sea Level to 4000 Ft. (0 to 1 219 m)	3600 to 3800	6200 to 6700	2	Silver	AM55159	No. 2	38°	17 Tooth 35 Tooth	62
4000 Ft. (1 219 m) and up	4300 to 4500	6200 to 6700	2	Silver	AM54287	No. 2	Compound AM55127	17 Tooth 35 Tooth	62

Clutching Recommendations - TRAILFIRE LX - 102C Clutch*

Altitude	Clutch Engagement (rpm)	Governed Speed (rpm)	Primary Clutch			Secondary Clutch		Chain Case	
			Spacers in Clutch	Clutch Spring	Arm Kit	Spring Position	Cam	Gearing Sprockets	Chain (Pitch)
Sea Level to 4000 Ft. (0 to 1 219 m)	3600 to 3800	6200 to 6700	2	Silver	AM54281	No. 2	44°	21 Tooth 39 Tooth	66
4000 Ft. (1 219 m) and up	3700 to 3900	6200 to 6700	2	Silver	AM54920	No. 2	44°	21 Tooth 39 Tooth	66

*These are suggested clutch component changes from stock to altitude requirements. See pages 26 through 42 for explanations and details of optional fine tune components.

Altitude	Clutch Engagement (rpm)	Governed Speed (rpm)	Primary Clutch			Secondary Clutch		Chain Case	
			Spacers in Clutch	Clutch Spring	Arm Kit	Spring Position	Cam	Gearing Sprockets	Chain (Pitch)
Sea Level to 4000 Ft. (0 to 1 219 m)	3600 to 3800	6200 to 6700	2	Silver	AM55159	No. 2	38°	17 Tooth 35 Tooth	62
4000 Ft. (1 219 m) and up	4300 to 4500	6200 to 6700	2	Silver	AM54287	No. 2	Compound AM55127	17 Tooth 35 Tooth	62

HIGH ALTITUDE APPLICATION—Continued

Clutching Recommendations - SPORTFIRE - 102C Clutch*

Altitude	Clutch Engagement (rpm)	Governed Speed (rpm)	Primary Clutch			Secondary Clutch		Chain Case	
			Spacers in Clutch	Clutch Spring	Arm Kit	Spring Position	Cam	Gearing Sprockets	Chain (Pitch)
Sea Level to 4000 Ft. (0 to 1 219 m)	3800 to 4000	6700 to 7200	2	Silver	AM55195	No. 2	Compound AM55127	21 Tooth 39 Tooth	66
4000 Ft. (1 219 m) and up	4300 to 4500	6700 to 7200	2	Silver	AM54287	No. 1	Compound AM55127	21 Tooth 39 Tooth	66

Clutching Recommendations - LIQUIFIRE - TR800 Clutch*

Altitude	Clutch Engagement (rpm)	Governed Speed (rpm)	Primary Clutch				Secondary Clutch		Chain Case	
			Spacers In Clutch	Clutch Spring	Weight Kit	Ramp Kit	Spring Position	Cam	Gearing Sprockets	Chain (Pitch)
Sea Level to 4000 Ft. (0 to 1 219 m)	4400 to 4600	8000 to 8200	2	Green M69314	6-AM55476	No. 1 AM55477	No. 2	44	21 Tooth 39 Tooth	68
4000 to 8000 Ft. (1 219 to 2 438 m)	5100 to 5300	8000 to 8200	2	Red M69331	3-AM55476 3-AM55478	No. 2 AM55479	No. 2	44	20 Tooth 39 Tooth	66
8000 Ft. (2 438 m) and up	5100 to 5300	8000 to 8200	2	Red M69331	3-AM55476 3-AM55478	No. 2 AM55479	No. 2	44	19 Tooth 39 Tooth	66

*These are suggested clutch component changes from stock to altitude requirements. See pages 26 through 42 for explanations and details of optional fine tune components.

NOTE: In many cases, at altitudes of 4000 to 6000 feet (1 219 to 1 829 m), satisfactory performance can be obtained on the TR800 clutch by using a green spring (M69314), 20/39 gearing, 66 pitch chain, No. 2 ramps, 3- (AM55476) and 3-(AM55478) weights.

Altitude	Clutch Engagement (rpm)	Governed Speed (rpm)							
			Spacers in Clutch	Clutch Spring	Arm Kit	Spring Position	Cam	Gearing Sprockets	Chain (Pitch)
Sea Level to 4000 Ft. (0 to 1 219 m)	3800 to 4000	6700 to 7200	2	Silver	AM55195	No. 2	Compound AM55127	21 Tooth 39 Tooth	66
4000 Ft.	4300	6700							



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
- Ski alignment
- Ski steering control
- Track tension

TORSION SPRING ADJUSTMENT

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

Front and rear torsion spring tension can be adjusted to suit the weight and riding style of the operator.

Front Torsion Springs

NOTE: In deep snow at high speeds, increased tightening of front torsion springs will help provide additional ski lift. A deep snow suspension kit for the LIQUIFIRE is available from your John Deere dealer.

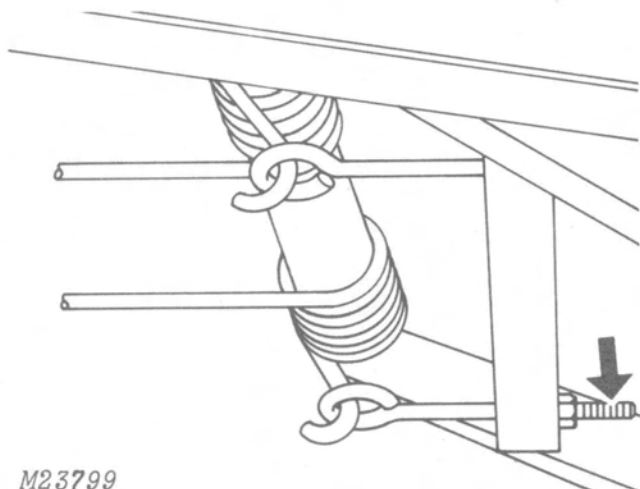
If the front torsion springs are tightened too much, the ride will be stiff and the front of the snowmobile will seem light and lift up when power is applied. Added lift is fine for deep snow but makes the ride choppy on rough surfaces. The front torsion spring is not the only adjustment for ski lift,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

To reduce the spring tension, turn adjusting nuts counterclockwise. Be sure that at least 1/2 inch (12.7 mm) of the adjusting screws protrudes through the nuts.

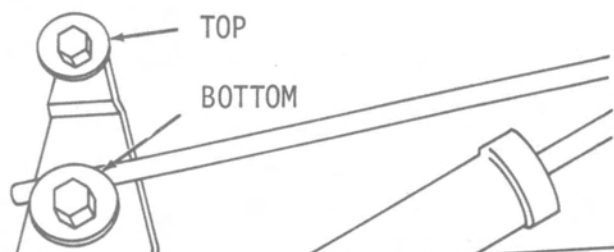
Rear Torsion Springs

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

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



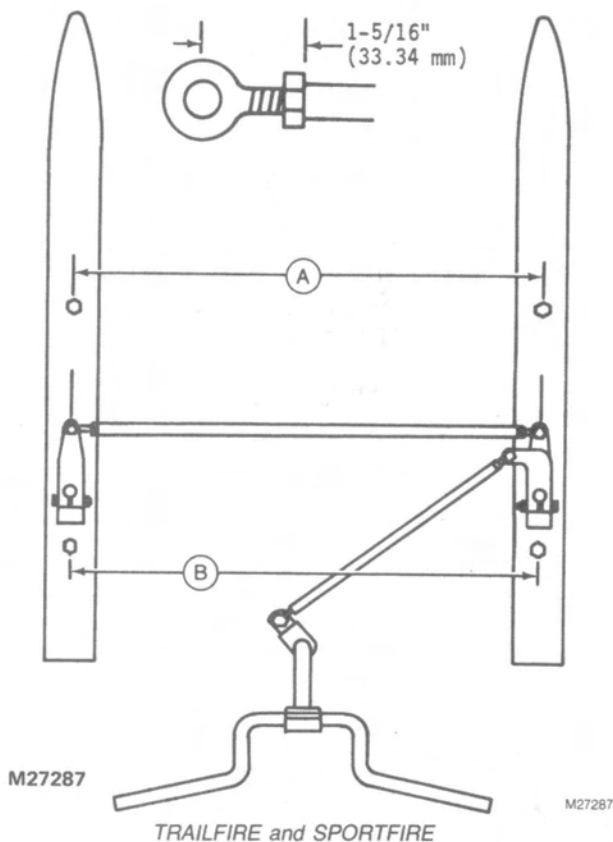
M23799



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
- Ski alignment
- Ski steering control

SKI ALIGNMENT

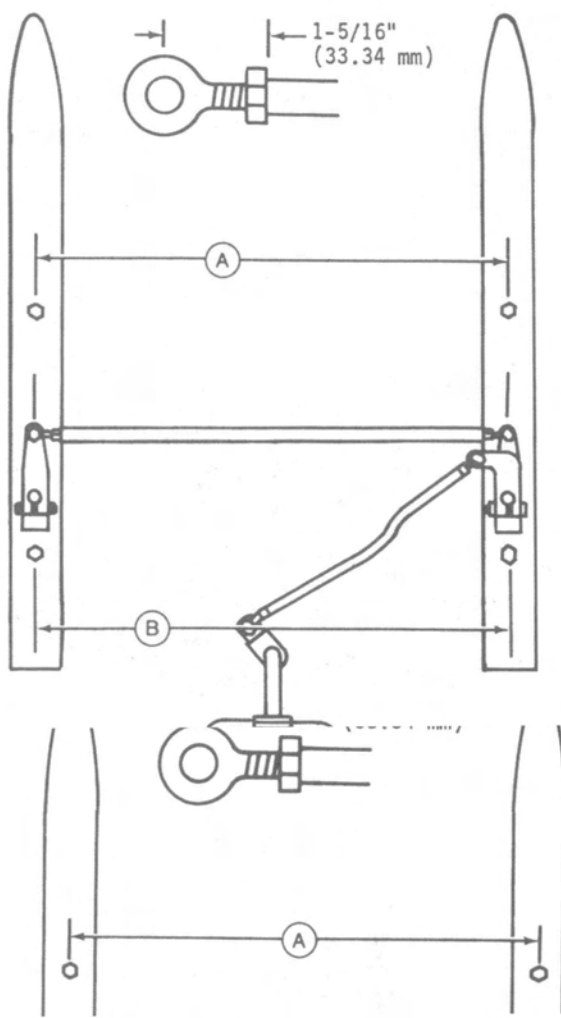


The illustrations at left show the proper positioning of the skis in relationship to the steering arms, tie rods, and steering column. To align the skis:

1. Raise the front of sled slightly to remove weight from skis.
2. Position handlebars straight ahead.
3. Measure distances (A and B) between front and rear wear rod nuts. The two dimensions should be equal.
4. If adjustment is necessary, remove exhaust silencer for access to tie rods.
5. Loosen jam nut on end of tie rod. Rotate tie rod until skis are parallel, and tighten jam nuts.

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

6. To realign handlebars, loosen jam nuts on both sides of adjuster on drag link. Rotate adjuster until handlebars are aligned. Tighten jam nuts.
7. After aligning the skis, be sure all jam nuts are tight, and install exhaust silencer.



the skis in relationship to the steering arms, tie rods, and steering column. To align the skis:

1. Raise the front of sled slightly to remove weight from skis.
2. Position handlebars straight ahead.
3. Measure distances (A and B) between front and rear wear rod nuts. The two dimensions should be equal.

SKI STEERING CONTROL

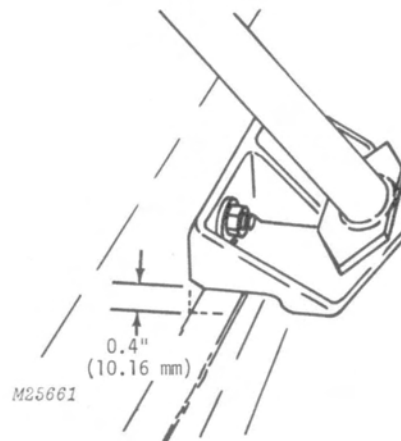
Adjusting Steering Column (TRAILFIRE and SPORTFIRE)

1. Remove engine with base.
2. Loosen bracket hardware. Position bracket 0.4 inch (10.16 mm) above ledge in pan. Tighten hardware.
3. Install engine with base. Tighten hardware.
4. Move steering handlebars full left and full right. Check steering for smooth operation.

NOTE: Clearance must exist between drag link bolt head and pan when steering is in a full left turn. If bolt head hits pan, move bracket up.

Clearance must exist between drag link slotted nut and engine when steering is in a full right turn. If slotted nut hits engine, move bracket down.

Both clearances should be approximately equal. Readjust if clearances are obviously unequal.



M25661

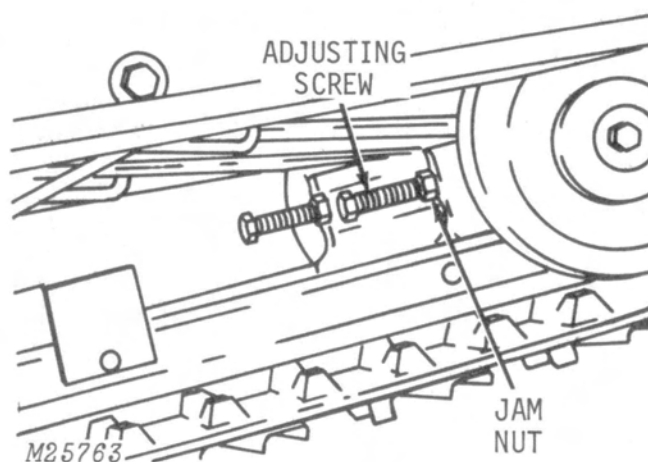
TRACK ADJUSTMENTS

Snowmobile	Track	Tension
TRAILFIRE	Molded rubber with 29 low profile cleats	3/8" (9.5 mm) slack max.
SPORTFIRE	Molded rubber with 29 low profile cleats	3/8" (9.5 mm) slack max.
LIQUIFIRE	Molded rubber with replaceable wear clips	1/2" (12.7 mm) slack max.

Check track tension and alignment frequently. A track that is too loose causes 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.

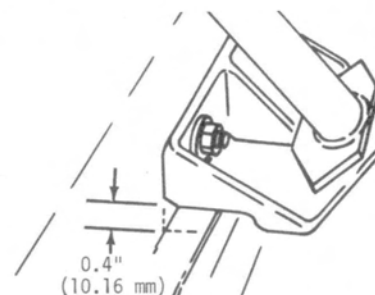
Adjusting Track

1. Suspend rear of sled.
2. Loosen jam nuts on two track adjusting screws.
3. Tension the track so the dimension between the bottom of the slide wear bar and inside of track band is as shown in chart above. Measure this dimension below lower shock absorber mount.
4. Tighten jam nuts.



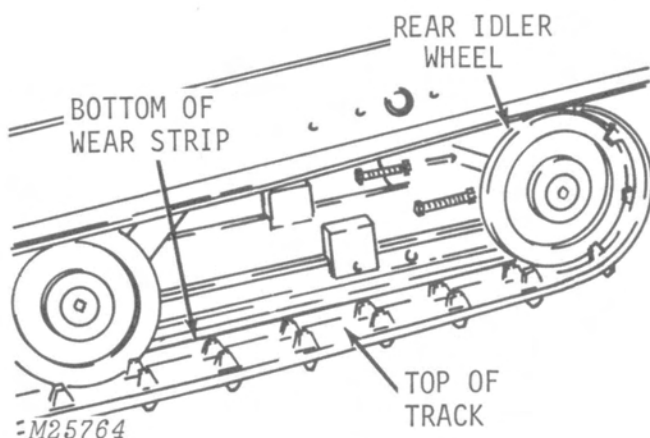
M25763

JAM NUT



0.4" (10.16 mm)

TRACK ADJUSTMENTS—Continued



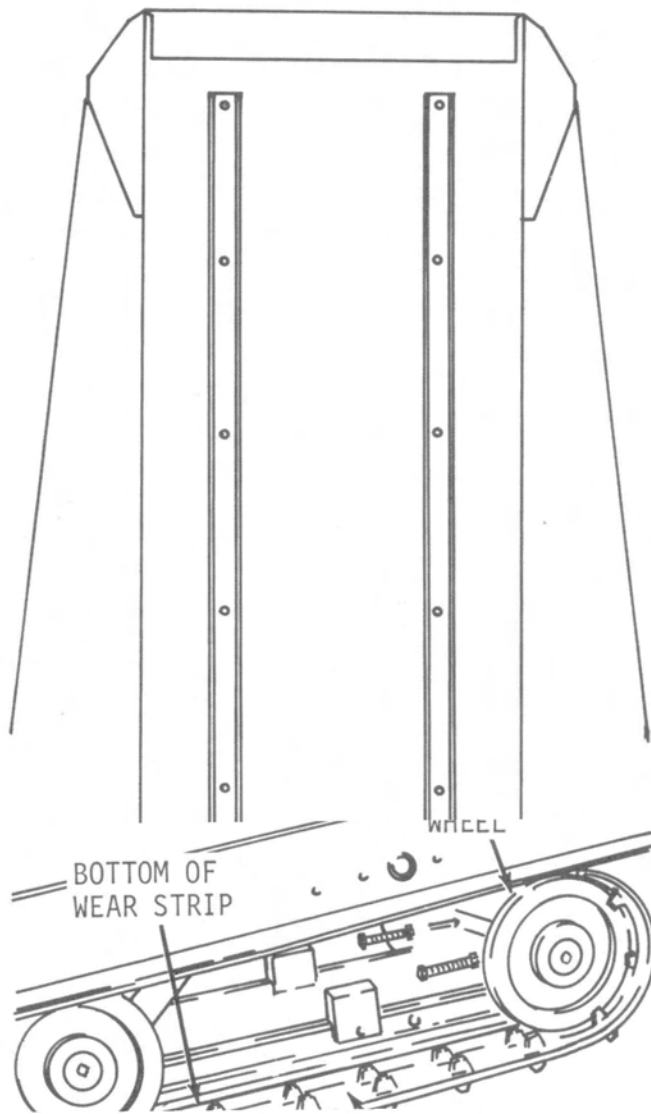
M25764

After Adjustment

1. Start engine and idle track slowly so it rotates several times. Turn off engine and allow track to coast to a stop. Do not brake.
2. Check alignment by seeing where rear idler wheels run with respect to drive lugs. The rear idler wheels should run in center of drive lugs.
3. Look under track and see if slide rail wear strip is directly in the middle of each slide rail opening on track.
4. Repeat tensioning procedure if necessary.

NOTE: A track always runs to the loose side. For proper tensioning, tighten adjusting screw on loose side. For example, if track is too far to the left, tighten screw on left side to move track to the right.

TRACK STUDS



Installing Wear Strips

Performance can often be improved by adding studs to the tracks.

NOTE: Wear strips must be added to TRAILFIRE, SPORTFIRE, and LIQUIFIRE snowmobiles when studs are added to the track.

Use only the kit indicated for each snowmobile. Do not substitute.

AM55180 - TRAILFIRE and SPORTFIRE Wear Strip Kit

AM55182 - LIQUIFIRE Wear Strip Kit

1. Remove seat and fuel tank.



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

2. Remove slide suspension.
3. Install wear strips (see illustration at left).

NOTE: Drilling holes for wear strips is necessary for 1982 snowmobiles. Install rivets from the top side of tunnel.

1. Start engine and idle track slowly so it rotates several times. Turn off engine and allow track to coast to a stop. Do not brake.
2. Check alignment by seeing where rear idler wheels run with respect to drive lugs. The rear idler wheels should run in center of drive lugs.
3. Look under track and see if slide rail wear strip is directly in the middle of each slide rail opening on

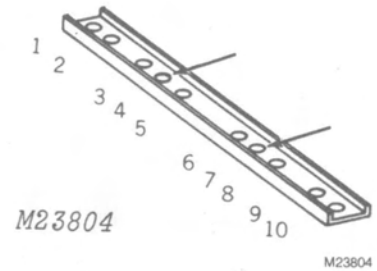
Installing Studs on TRAILFIRE and SPORTFIRE Snowmobiles

Trail Riding and Normal Snowmobiling

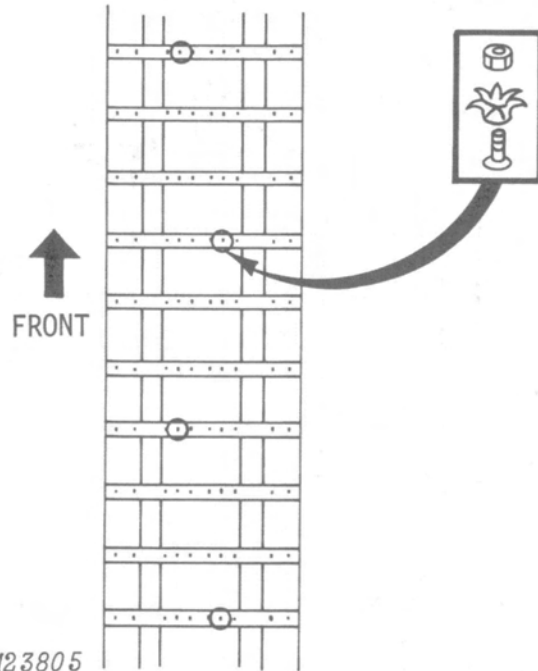
The stud kit should be installed in a staggered pattern, using the number 4 and number 7 holes in the grouser bar as shown at right.

NOTE: All studs are mounted in the center band only.

1. Turn snowmobile on its side.
2. Use a cold chisel to remove the number 4 and number 7 rivets from the grouser bars, using the pattern at right as a guide.
3. Install stud through rivet hole.
4. Apply a small amount of John Deere Loctite to stud threads.
5. Place "star" claw over stud, and tighten lock nut securely.



M23804



M23805

bar as shown at right.

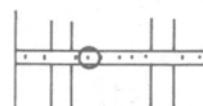
NOTE: All studs are mounted in the center band only.

M23804

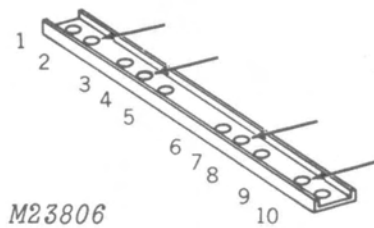


M23804

1. Turn snowmobile on its side.
2. Use a cold chisel to remove the number 4 and number 7 rivets from the grouser bars, using the



TRACK STUDS—Continued



M23806

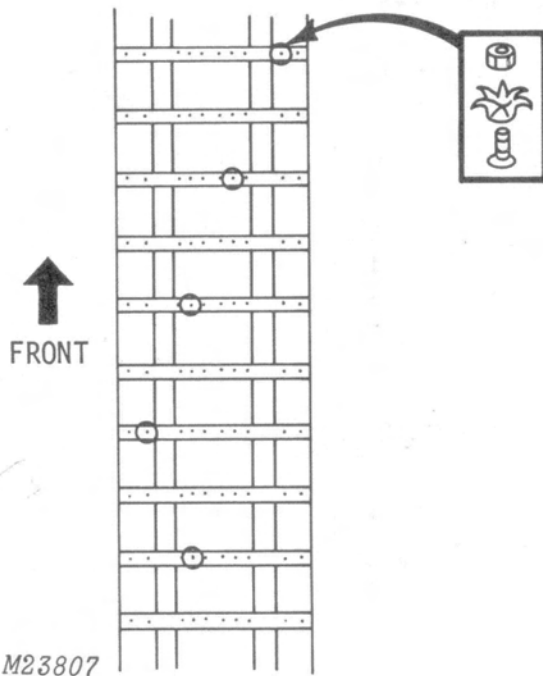
M23806

Lake or Hardpack Running

NOTE: Do not use this pattern for trail riding. Carbide ski wear rods should be used with this pattern.

The stud kit should be installed in a staggered pattern, using the number 9, 7, 4, and 2 holes in the grouser bar as shown at left.

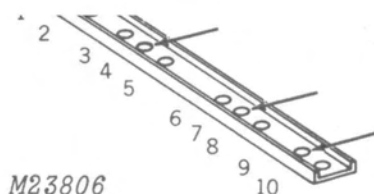
NOTE: The studs are mounted on each outer band and the center band.



M23807

M23807

1. Turn snowmobile on its side.
2. Use a cold chisel to remove the number 9, 7, 4, and 2 rivets from the grouser bars, using the pattern at left as a guide.
3. Install stud through rivet hole.
4. Apply a small amount of John Deere Loctite to stud threads.
5. Place "star" claw over stud, and tighten lock nut securely.



M23806

M23806

NOTE: Do not use this pattern for trail riding. Carbide ski wear rods should be used with this pattern.

The stud kit should be installed in a staggered pattern, using the number 9, 7, 4, and 2 holes in the grouser bar as shown at left.

NOTE: The studs are mounted on each outer band and the center band.

Stud Kits for LIQUIFIRE Snowmobiles

Two 18-stud kits and two track patterns are available.

The stud kits are:

AM55177 - Steel Stud Kit

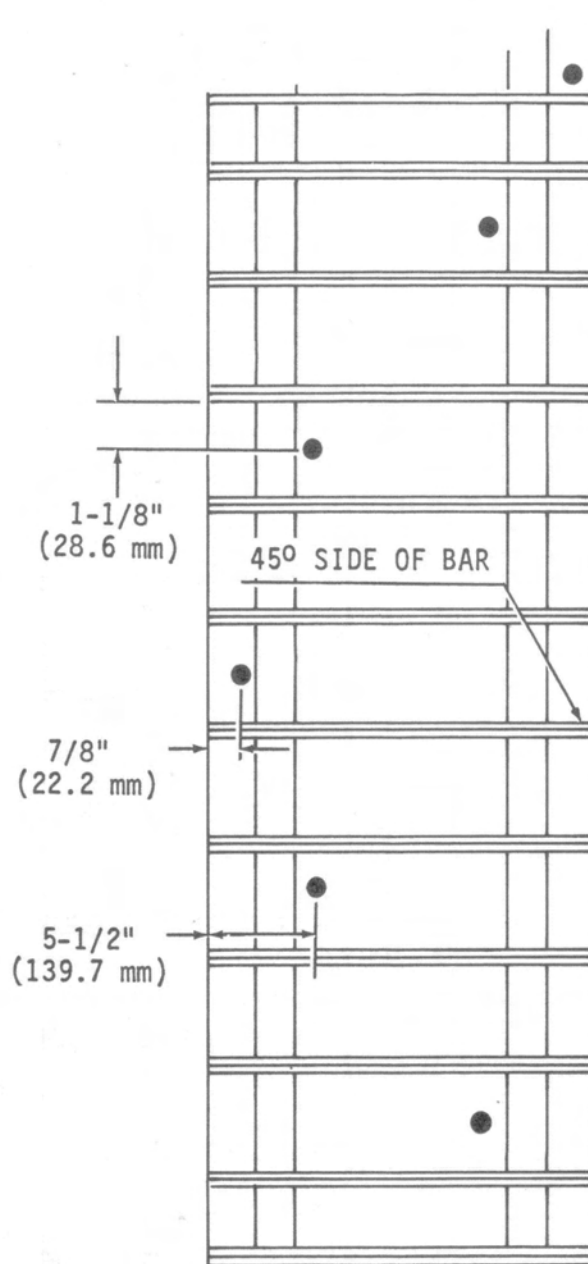
AM55178 - Carbide Stud Kit

One stud pattern consists of 18 studs and is used for normal snowmobiling and trail riding.

The other pattern consists of 36 studs and is used for hardpack and lake running. Use two like kits for the 36-stud pattern. DO NOT use steel and carbide studs together.

NOTE: Carbide wear rods must be used on the skis when using the 36-stud pattern.

IMPORTANT: Upper tunnel wear strips must be installed whenever the track is studded.



M25766

18-Stud Pattern

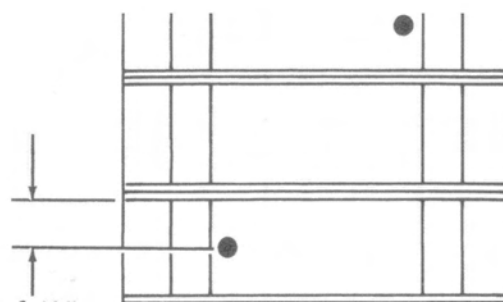
M25766

AM55178 - Carbide Stud Kit

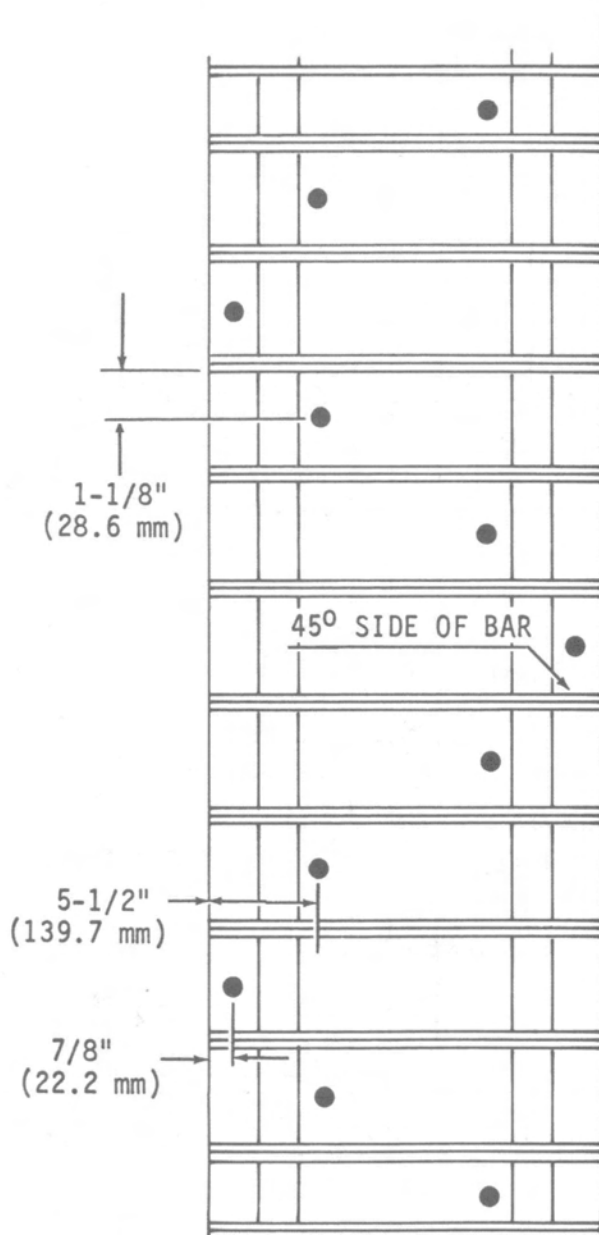
One stud pattern consists of 18 studs and is used for normal snowmobiling and trail riding.

The other pattern consists of 36 studs and is used for hardpack and lake running. Use two like kits for the 36-stud pattern. DO NOT use steel and carbide studs together.

NOTE: Carbide wear rods must be used on the skis



TRACK STUDS—Continued



M25767

36-Stud Pattern

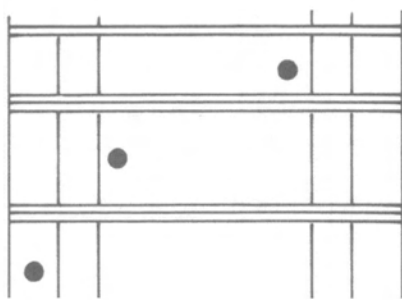
M25767

Installing Studs on LIQUIFIRE Snowmobile

1. Remove suspension bolts.
2. Turn snowmobile on its side, and swing track and suspension out.
3. Drill 5/16-inch (7.9 mm) holes in rubber track, using appropriate pattern as a guide. Holes for studs should be centered between fiberglass rods of track.

NOTE: Holes can be made in track by heating a 5/16-inch (7.9 mm) rod or awl and pushing it through the track.

4. Place T-nut on inside of track and washer on outside of track.
5. Install stud through washer, and tighten T-nut to lock stud in place. Do not squash or flatten rubber track when tightening T-nut. Stud should be at least flush with T-nut.
6. Put track and suspension back in place, and install suspension bolts.



DIE

1. Remove suspension bolts.
2. Turn snowmobile on its side, and swing track and suspension out.
3. Drill 5/16-inch (7.9 mm) holes in rubber track, using appropriate pattern as a guide. Holes for studs should be centered between fiberglass rods of track.