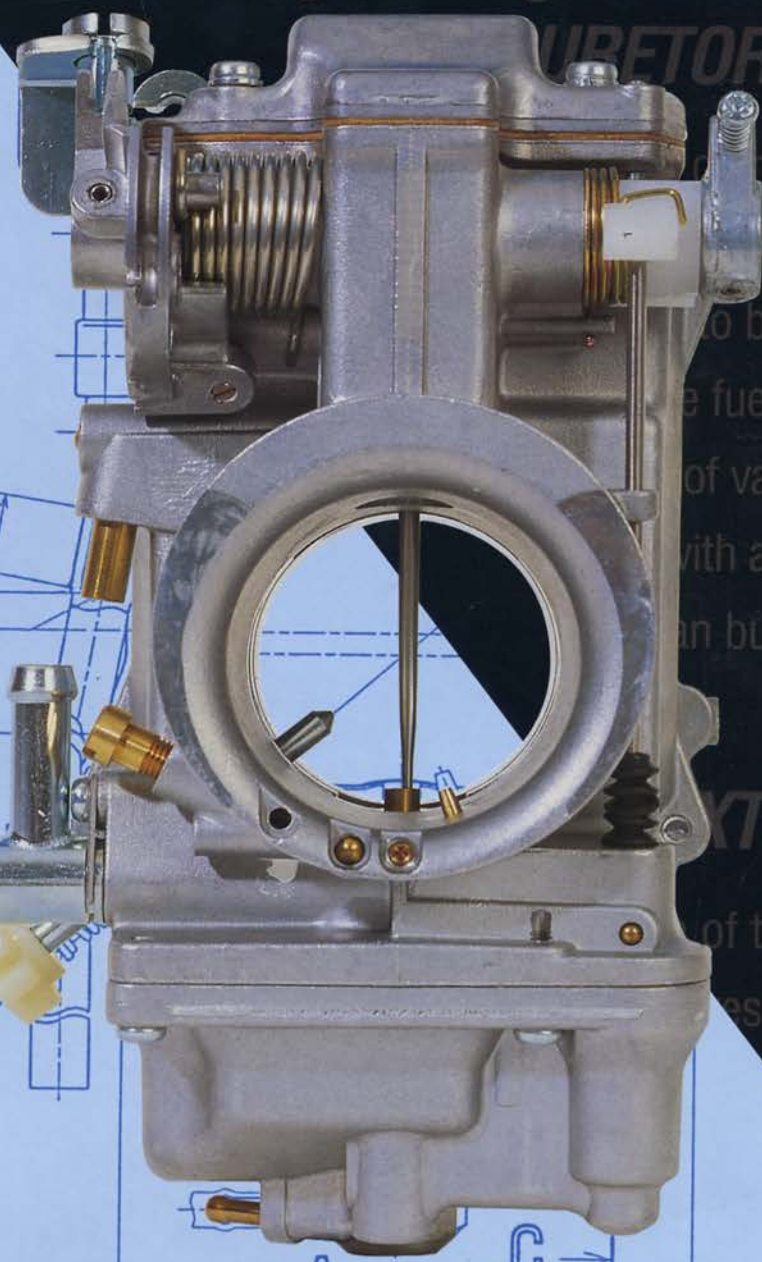
Sudco

MIKUNI



TUNING MANUAL

Venturi Operation

Operation of a Simple Venturi

The Mikuni slide type carburetors described in this manual are also known as "variable venturi" type carburetors. A venturi is a restriction within the carburetor designed to speed up the air flowing through the carb. It is at the point of the smallest cross section that the incoming air flow will have the greatest velocity. As air flow speeds up to pass through the venturi, it loses pressure. It is at this point that the pressure within the carb throat will be at its lowest; this is called "depression". At this point of maximum depression, the fuel will be introduced to the air stream. In order to transfer fuel from the fuel chamber into the carburetor venturi, a small tube is placed into the venturi which connects the fuel load in the chamber to the venturi. The fuel chamber is open to atmospheric pressure (15 psi approx.) and the pick up tube is exposed to the depression within the venturi. The difference in pressure will attempt to equalize through the pick up tube, pushing fuel from the fuel chamber into the venturi. The fuel is mixed with the incoming air and delivered to the engine down stream. This is the basic principle by which all carburetors operate.

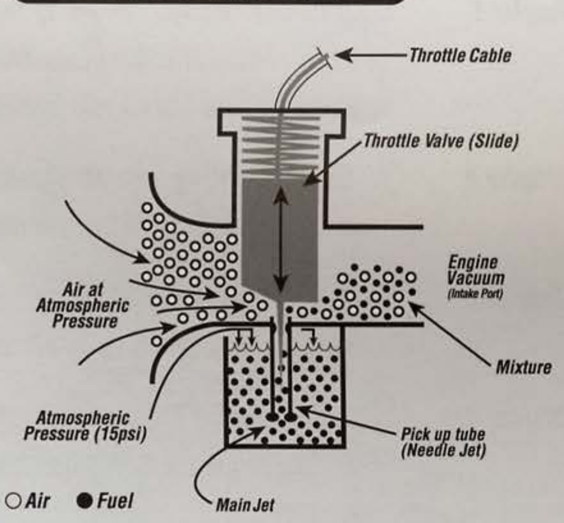
It is important to remember that it is the pressure difference between the fuel chamber and the venturi which pushes the fuel into the intake air stream. The presence of engine vacuum alone is not enough to draw fuel into the intake port. Without the atmospheric pressure in the fuel chamber, the fuel could not be delivered into the intake port.

The above model will serve a single speed engine very well with the venturi becoming the throttle. The engine will run at one speed only, depending upon the size of the venturi. Because motorcycles are operated at various engine speeds, there needs to be a way to control the speed of the engine.

In order to throttle down this wide open carburetor design, Mikuni has inserted a slide which crosses the carburetor throat to control air flow to the engine, limiting engine speed according to slide lift. This slide lift varies the cross section of the carburetor bore at the venturi point. This is how slide carburetors become known as "variable venturi". These variable venturi type carburetors are very good at maintaining high air speeds within the carburetor throat and generally offer better overall performance than most other carburetor designs.

From this simple fuel delivery circuit, carburetor designers will add and divide this circuitry in order to tailor the mixture available to the engine, enabling it to run accurately at a wide variety of speeds and loads.

Variable Venturi Design

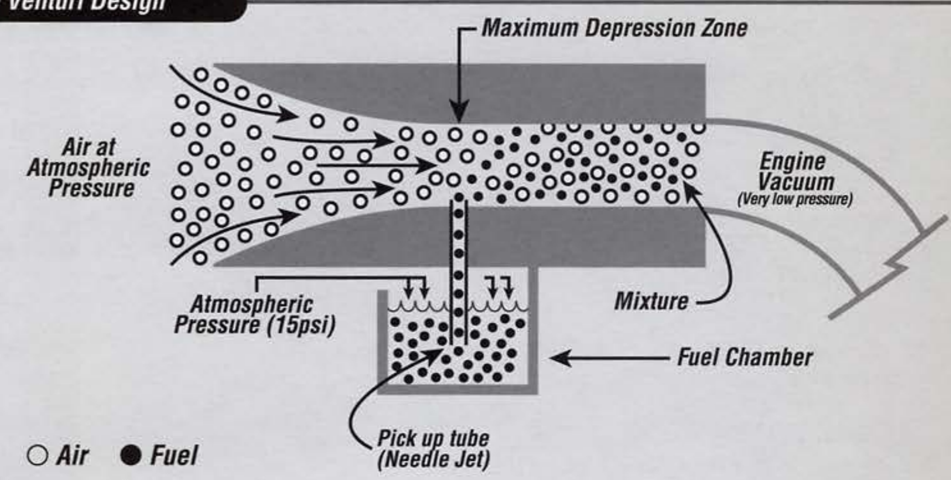


Operation of a Variable Venturi

All Mikuni motorcycle carburetors described in this manual are of the variable venturi type. With this type of carburetor, the maximum depression zone is beneath the throttle valve (slide) which is raised and lowered by the throttle cable, controlling the speed of the engine. As shown in the drawing, the bottom of the slide features a tapered needle which fits into the fuel pick up tube (needle jet) to meter the fuel delivery of the tube from about a 1/4 throttle to 3/4 throttle. From 3/4 to full throttle, the needle will be too narrow to affect the fuel flow of the tube. From this point on, the fuel flow of the tube is metered by the main jet which is positioned at the bottom of the tube.

The above description is a simple model of the main circuit common to most Mikuni slide type carburetors. The following chapter contains a more complete description of Mikuni motorcycle carburetor design and fuel delivery circuits.

Simple Venturi Design



General Mikuni Slide Carb Circuitry

This manual is intended as a guide for users of Mikuni carburetors who want to learn the basic methods of tuning and adjusting to obtain top performance and fuel economy. The arrows that appear in the drawings in this text show direction in which air, fuel, and air-fuel mixture flows.

Information herewith obtained from Mikuni engineering data and manuals.

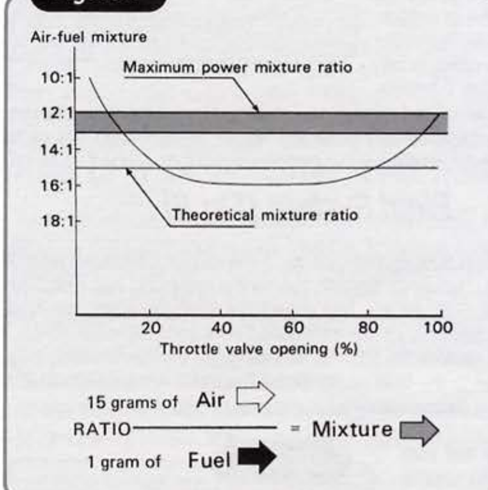
1. CARBURETOR FUNCTION

The function of a carburetor is to deliver a combustible air-fuel mixture to the engine. However, in order to be effective, it must first break the fuel into tiny particles (in the form of vapor) and then mix the fuel with air in a proper ratio so it can burn without leaving excess fuel or air.

2. AIR-FUEL MIXTURE (Fig.1)

The mixture of the air-fuel ratio is generally expressed by its relative weight proportion. For example, the amount of air required for complete combustion of 1 gram of fuel under normal conditions is:

Figure 1



Varying mixture ratios are required for the engine depending on operating conditions. Although the required mixture ratio varies more or less with the type of engine, its cooling efficiency, etc., the mixture ratio shown in fig. 1 is required for ordinary engines. In the high speed range the ratio of about 12 to 13 grams of air for 1 gram of fuel produces the maximum output. However, in the case of an engine with low cooling efficiency, a somewhat richer mixture (10 to 12 grams of air against 1 gram of fuel) may be required to prevent seizure of the engine.

3. FUNCTIONS AND CONSTRUCTION MIKUNI SLIDE TYPE CARBURETORS

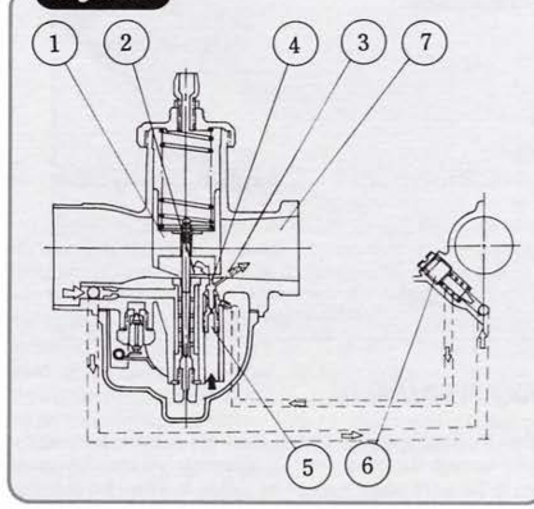
Motorcycle engines are operated under a wide range of conditions, from idling with the throttle valve (Fig.2(1)) remaining almost closed, to the full load (the maximum output) with the throttle valve fully opened. In order to meet the requirements for the proper mixture ratio under these varying conditions, a low-speed fuel system (the pilot system) and a main fuel system (the main system) are provided in Mikuni Slide-type carburetors, except Mikuni TMS.

A. - The Pilot System

Low-speed fuel system (Fig.2 and Fig.3)

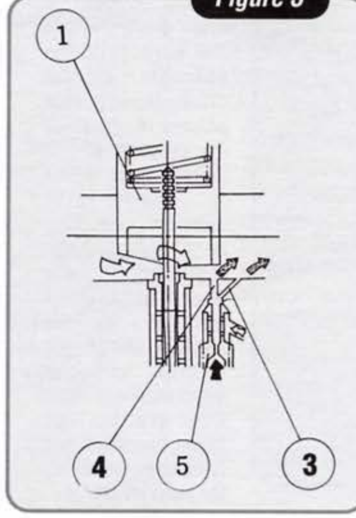
Since the engine is operated with the throttle valve almost closed at idling or in the low speed range, the velocity of air flowing through the needle jet (2) is slow. Consequently, a vacuum strong enough to draw fuel from the needle jet in main fuel system is not created. The fuel supply during this low speed operation is controlled by means of the pilot outlet (3) and the bypass (4) that are situated nearest to the engine. At idle, when the throttle valve is slightly opened, fuel metered by the pilot jet (5) is mixed with air adjusted in a proper amount by the air screw (6) and is broken into fine vapor particles.

Figure 2



The mixture is again mixed with air coming from the bypass and is drawn into the pilot outlet to mix with air flowing through the main bore (7). The fuel mixed with air at this stage then goes to into the engine. When the throttle valve is opened slightly during low speed operation, the pilot outlet alone cannot supply the required fuel and the shortage has to be made up with fuel injected from the from the bypass. The adjustment of the mixture ratio during this stage is made by the pilot jet and the air screw, as in the case of a two-hole type fuel system (Fig.3). While at low speed operation, if full throttle is initiated a similar shortage of fuel again has to be injected from the bypass until enough (vacuum) can be created to draw fuel from the main fuel system. There is also a one-hole type low speed fuel system mainly used for carburetors having a small main bore. The process of producing the air fuel mixture and of adjusting the mixture ratio are the same as in a two-hole type low speed system.

Figure 3



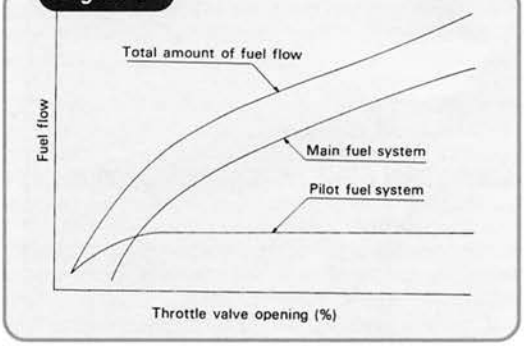
General Mikuni Slide Carb Circuitry

B. - Main Fuel System

On Mikuni VM-type carburetors, the pilot system and the main system are of independent construction. The fuel flow in these two systems is shown in Fig.5. There are two types of main fuel system; one is a primary type used widely for 2-cycle engines and the other is a bleed type which is normally used for 4-cycle engines as well as for rotary valve 2-cycle engines.

Sudco uses primary type needle jets in most 4-cycle VM applications. It is important to note (Fig.5) that the main system mixture delivery is in addition to the mixture delivered by the pilot system. Therefore, adjustments to the pilot system should be made first, as they will affect the adjustment of the main system to a diminishing extent as the throttle is opened from 1/4 to full throttle.

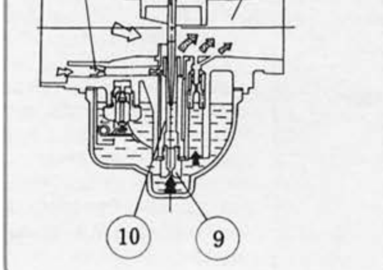
Figure 5



Primary Type (Fig.6)

When the throttle valve is opened about 1/4 or more, the velocity of air flowing through the needle jet (10) increases and also the vacuum increases to the point where fuel can be sucked in. When the opening of throttle valve (1) is between a quarter and three quarters, fuel passes through the main jet (9) and, after being metered in the clearance between the needle jet (10) and the needle (11), it is mixed with air that is metered by the air jet (12) and atomization of the fuel is accelerated.

Figure 6

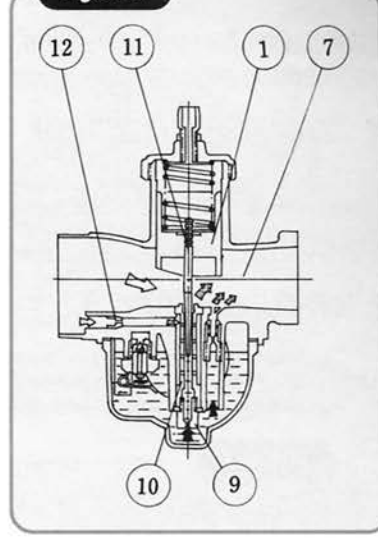


The mixture is then injected, after mixing with air flowing through the main bore (7), to the engine in the optimum air-fuel ratio. During this process of operation, the cutaway of the throttle valve serves to control the vacuum on the needle jet, thereby regulating the amount of fuel that is injected to the engine. When the throttle valve is opened more than three quarters high speed operation, fuel is metered chiefly by the main jet (9).

Bleed Type (Fig.7)

The construction of the bleed-type (10) main fuel system is the same as that of the primary type, except for the bleed holes that are provided in the needle jets.

Figure 7

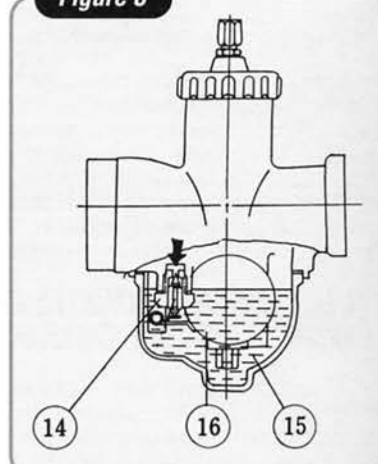


In the case of the primary type, air which comes from the main air jet is mixed with the raw fuel after it has been metered by needle jet and needle. This atomization takes place behind the nozzle screen or shroud above the needle jet outlet. The bleed type on the other hand is designed to bleed the air coming from the main air jet into the body section of the needle jet where it is emulsified with the fuel coming up from the bottom. The needle jet and needle then meter a blend of air/fuel, resulting in a finer atomization and generally leaner mixture than the same size primary type needle jet.

C. - Float System (Fig.8)

The float system serves to maintain a constant level of fuel in the bowl. Fuel flows through the needle valve (14) and enters the float chamber (15). As the fuel enters the float chamber, the float (16) moves upward to its pre-determined level because of buoyancy. When the fuel reaches the pre-determined level, the needle valve begins to close due to the lever action of the float arm rising as the float attains buoyancy, thus shutting off the supply of fuel.

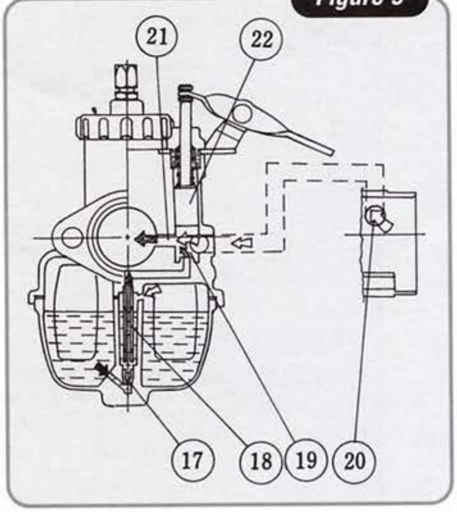
Figure 8



The fuel level in the bowl controls the amount of fuel which is metered to make the optimum fuel mixture. For example, too high a level allows more fuel than necessary to leave the needle jet, enriching the mixture. Too low a level results in a leaner mixture, as not enough fuel leaves the needle jet. Therefore, the pre-determined fuel level should not be changed arbitrarily.

D. - Starter System (Fig.9)

Figure 9



Rather than a choke, the enrichener type starter system is employed for Mikuni carburetors. The enrichener starter type, fuel and air, for starting the engine are metered by entirely independent jets. The fuel metered by the starter jet (17) is mixed with air and is broken into tiny particles in the emulsion tube (18). The mixture then flows into the plunger area (19), mixes again with air coming from the the air intake port for starting and is delivered to the engine in the optimum air-fuel ratio through the fuel discharge passage (21). The enrichener is opened and closed by means of the starter plunger (22). Since the enrichener is constructed so as to utilize the vacuum of the inlet passage (20), it is important that the throttle valve is closed when starting the engine.

4. TUNE UP & CARBURETOR SELECTION

Tuning up normally means a process of accurate and careful adjustment to obtain maximum engine performance. Although, it means in a broad sense, an economical improvement in fuel consumption. Improvement of power output of the engine depends on the amount of air drawn into the cylinder per unit time. A practice generally followed for engine tune-up includes:

1) ***To improve suction efficiency and exhaust efficiency by remodeling the intake and exhaust system***
2) ***To improve combustion efficiency by raising the compression ratio***
3) ***To increase the number of revolutions by adjusting the ignition timing***

Air/Fuel Mixture

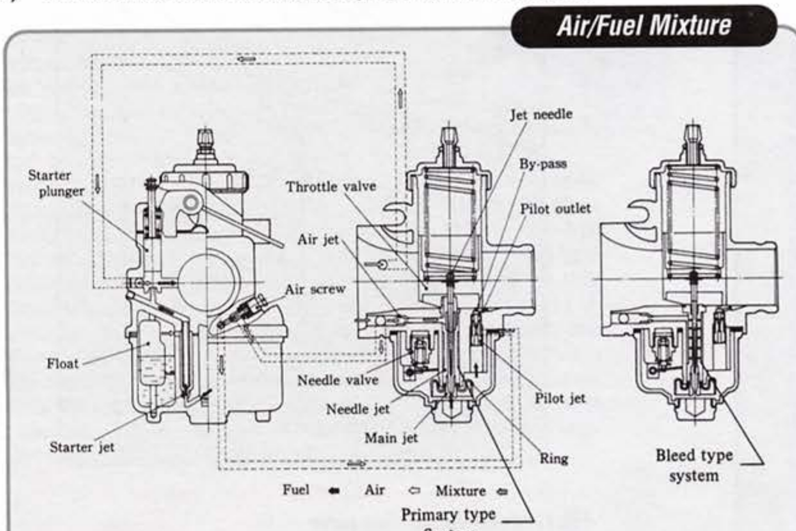
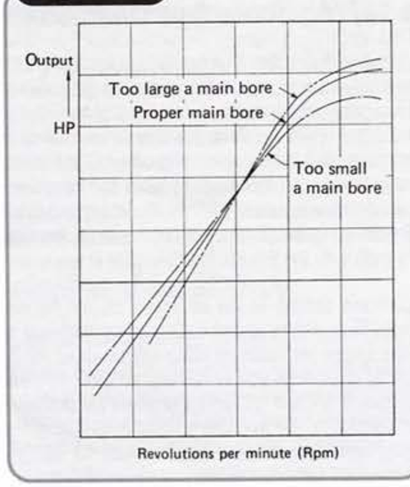


Figure 10



A. - Carburetor Main Bore Size Selection

One of the prerequisites for improving the output is to use a carburetor with as large a main bore as possible. However, a large main bore alone does not necessarily improve the output. As shown in Fig.10, it is true that a large main bore improves the power output in the high speed range. However, in the slow speed range, the output may drop. The main bore size selection should be determined by various factors such as: (1) whether the vehicle is intended for racing, (2) the design of the engine, (3) riding technique of the rider, (4) the rider's preference, etc. In addition, the maximum output, the maximum torque, and the minimum number of revolutions for stable engine operation must also be taken into account. Fig.10 shows the values which we have obtained throughout experience over the years.

Since the engine comes in a wide variety of types, the values given in Fig.10 should be taken only as reference values.

5. CARBURETOR SETTING

Once the main bore size of the carburetor is determined, a test (normally referred to as setting or matching) to select the proper jet or setting part should be made. The size of the jet is determined by measuring the output in a bench or in a chassis dyno test. For racing, it is best to determine the proper size of the jet on the racing course. The following points must be taken into account:

1) ***The altitude (atmospheric pressure), temperature and humidity of the racing course.***
2) ***The operation of the engine based on the topography of the racing course.***
3) ***Generally, carburetor tuning is done in four stages: idle, low speed, mid-range, and high speed in that order. With the Mikuni, each stage is controlled by a separate component simplifying the tuning process.***

The engine cylinders need to take sufficient air and fuel mixed in proper amounts. The function of a carburetor is to prepare and supply a mixture of fuel vapor and air to the engine cylinders in the proper ratio for efficient combustion.

General Mikuni Slide Carb Circuitry

A. - Pilot Jet and the Low Speed Fuel System (Fig.15 & 16) (Air Screw type carburetors only)

In the low speed fuel system of the carburetor, the pilot outlet and the bypass have holes whose size is in relation to the main bore of the carburetor. Hence, the adjustment and selection of the pilot jet and the air screw is important. Turn the throttle a little at no-load operation and see if the engine revolution increases smoothly. If the pilot jet is too small, increase in the engine speed will be slow and irregular. Too big a pilot jet, on the other hand, would give rise to heavy exhaust smoke as well as a dull exhaust noise. If you cannot maintain the speed in the range of 12-25 mph with the throttle held,the pilot is too small.

Selection and setting of the air screw should be made in the following manner. First, warm up the engine adequately and set the idle screw so that the engine revolution at idling will be about 10-20% higher than the number of revolutions you are aiming at. Then, turn the air screw left and right (between 1/4 and 1/2 turn) and select the position where the engine revolution reaches the maximum. Adjust the idle screw to bring down the engine revolution to your target speed for idling. After this adjustment of the idle screw is made, select once more the position where the engine revolution reaches the maximum, by turning the air screw left and right (between 1/4 and 1/2 alternately). At this point, attention should be paid to the following points.

1) ***If there is a certain range in the opening of the air screw where fast engine revolution can be obtained, (for instance, the number of revolutions does not change in the range of 1-1/2 to 2.0 turn), for better performance you should select approximately 1-1/2 turns.***

2) ***To determine the "fully closed" position of the air screw, turn the air screw slightly. Excessive tightening of the air screw would damage the seat. The position where the air screw comes to a stop should be considered the "fully closed" position. The maximum number of turns in the opening of the air screw must be limited to 3.0. If the air screw is opened over 3.0 turns, the spring will not work and the air screw can come off during operation of the vehicle. Fig. 16 shows the fuel flow curve in relation to the opening of the air screw.***

Figure 15

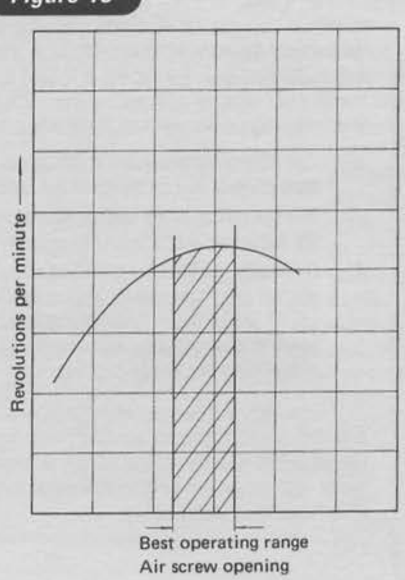
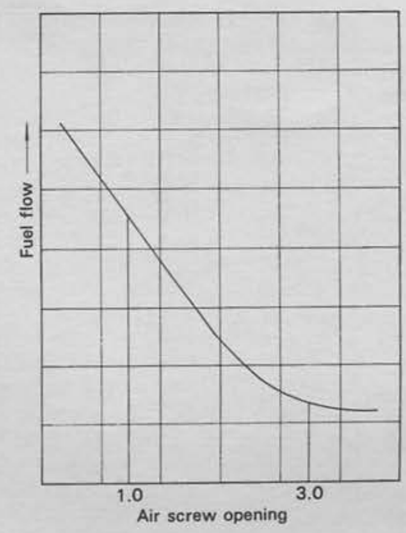


Figure 16



B. - The Cutaway Size of the Throttle Valve (Fig.17)

The size of the cutaway of the throttle valve affects the air-fuel mixture ratio when the degree of the throttle valve opening is between 1/8 and 1/2, especially in the range of 1/8 and 1/4 opening. As the cutaway gets larger in size, with the throttle valve opening kept unchanged, air inflow resistance is reduced and causes the amount of air intake to increase, resulting in a lean mixture. On the other hand, the smaller the size of the cutaway, the richer the air-fuel mixture will become. Interchange of the cutaway is made, when the low speed fuel system is out of balance with the main fuel system.

Figure 17

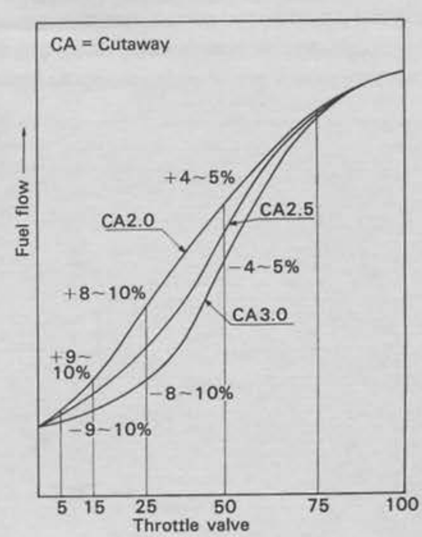
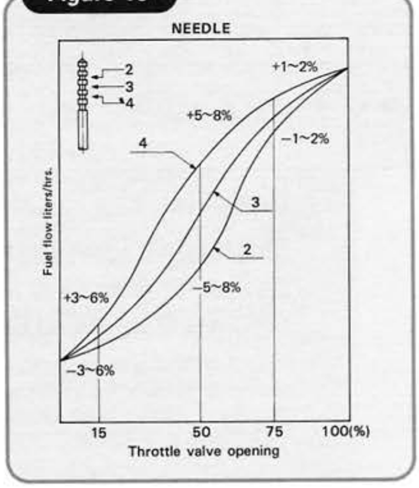


Fig.17 shows the fuel flow curve in relation to the size of the cutaway.

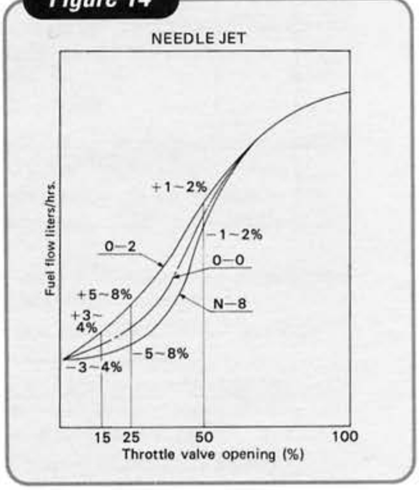
C. - Selection of NEEDLE JET and NEEDLE (Fig.13 & 14)

Figure 13



A carburetor with a piston-type throttle valve is also called a variable venturi-type carburetor. In this type of carburetor, the needle jet and the needle serve to control a proper air-fuel mixture ratio during the so-called medium throttle valve opening (between 1/4 and 3/4 opening). The right combination of needle jet and needle will have a major bearing on the engine performance at partial load. The jet needle tapers off at one end and the clearance between the needle and the needle jet increases as the throttle valve opening gets wider. The air-fuel mixture is controlled by the height of the needle positioning clip that is inserted into one of the five slots provided in the head of the needle. The variation of fuel flow based on the height of the clip is shown in Fig. 13.

Figure 14



Generally, it is easier to evaluate and select a needle jet than it is to select a jet needle. The reason is that the needle jet sizes are arranged on a linear scale, with each size increasing in increments. (For a thorough explanation of needle jet sizes please refer to Chapter 5.) Jet needles are not cataloged according to a linear size pattern or a rich to lean scale. The most effective way to determine the needle jet / jet needle relationship is to visualize the jet needle as a tool for setting the fuel delivery curve, or the shape of the fuel delivery according to throttle opening. The needle jet controls the fuel delivery rate, either increasing or decreasing the fuel delivery according to the profile of the needle being used. Sudco suggests that initially, experiments should be limited to changes in needle jet size. Once a satisfactory size has been identified, experiment with needle clip position to obtain the best driveability and roll-on performance. If one is working with an O.E.M. Mikuni carburetor, it is safe to assume that the manufacturer has already selected the proper needle or "fuel curve" for that motorcycle and changing the needle profile will complicate the tuning process. Once the correct needle jet size has been identified and it becomes apparent that a change in needle profile is necessary, then refer to the needle dimension charts in Chapter 5.

To evaluate the performance of the needle jet, run the motorcycle in third gear at 1/4 throttle, taking notes on how the engine accelerates from 1/4 to 1/2 throttle only. The engine should respond cleanly and crisply without sputtering or bogging. It may be useful to try experimenting with clip positions to decide if a problem is a rich or lean condition. If the engine response is better at a lean clip position, it may be necessary to change to a leaner needle jet. Sudco suggests that it is best to use as lean a needle jet as possible, as this component will have the greatest effect on fuel economy, emissions, and general driveability. If a leaner needle jet is installed and there is no negative impact on performance, and no positive effect, continue working in the direction of "lean" until there are negative results and go back up one size.

D. - Selection of the Main Jet

First, do the following on a flat road.

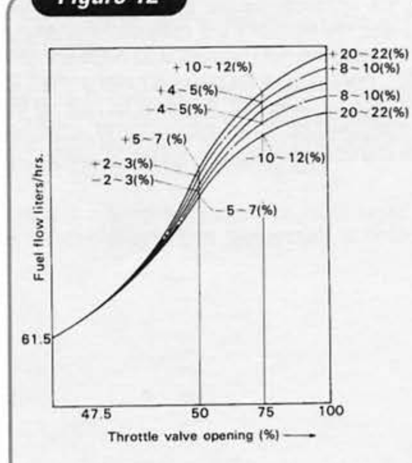
1) ***Select the largest main jet (the limit of a rich mixture) which can give you the maximum revolutions per minute (the maximum speed). In this case, select the engine speed according to the dimensions of the test course.***
2) ***Compare the gain in speed that you can obtain by quick acceleration from a constant speed of 25-30 MPH to maximum desired speed, by using different sizes of main jets.***
3) ***Check the exhaust fumes and read the spark plug (selection of the spark plug should be made based on the thermal value that would best suit power output of the engine).***

Next, compare on the racing course, the test results you obtained from above. The points to be checked, among others, are:

1) ***Smooth and steady operation of the engine at as high a speed as possible under varying operating conditions such as shifting of the gears, changes in road conditions, ascending and descending slopes, etc.***
2) ***Sustained operation at low speeds and at heavy engine load.***
3) ***Sustained operation at high speeds (without knocking or seizure).***

CAUTION: Selection of too lean a main jet may cause severe engine overheating, and subsequent piston seizure. Fig.12 shows comparison of fuel flow curves. The straight line is for Model C main jet and the dotted line for Model A and B main jets. In each model of main jet, different sizes within the range of +10% were tried.

Figure 12



General Mikuni Slide Carb Circuitry (Cont.)

6. MAINTENANCE

A carburetor consists of various precision-machined parts such as jets, needles, valves, etc. Therefore, care should be exercised, when removing jets or disassembling the carburetor for cleaning.

1) ***Proper tools should be used for disassembling and reassembling of jets. Handle each part carefully to avoid scratches, bending, etc.***
2) ***Wash the jets and the carburetor properly in solvent and blow them out with compressed air.***
3) ***For carburetors whose main jet can be replaced from the outside, an "O" ring is used to prevent leakage of fuel. When you fit the "O" ring, apply a little lubricant or fuel.***
4) ***It is important to maintain the fuel level in the carburetor. Do not touch the float arm, when disassembling the carburetor. If the float arm is bent accidentally, adjust the height of rib to the specific measurement (refer to Fig.18).***

Figure 18

Model	VM26 −74	VM28 −49	VM30 −44	VM32 −33	VM34 −20	VM36 −4	VM38 −3	VM40 −1	VM44 −1
H (Inch) (mm)	.59~.66 15~17	.59~.66 15~17	.86~.94 22~24	.86~.94 22~24	.86~.94 22~24	.66~.74 17~19	.66~.74 17~19	.66~.74 17~19	.66~.74 17~19

Float Height information for other carburetor designs is listed within the section pertaining to that carburetor.

7. TUNING THE CARBURETOR FOR RACING

The maximum output of the engine depends on:

1) ***The amount of air drawn into the cylinders***
2) ***Whether an air-fuel mixture is delivered to the cylinders in a proper ratio***

Since the amount of air that is drawn into the the carburetor varies with the temperature, the atmospheric pressure, humidity, etc., the mixture ratio is also changed. It is important, therefore, that the fuel flow be adjusted in accordance with the altitude of the racing course and meteorological conditions prevailing.

A. - Incoming Air in Relation to Meteorological Conditions

The amount of air drawn into the cylinders is influenced by such factors as the altitude, the temperature, the humidity, etc. Suppose that the amount of air sucked into the cylinders at an elevation of zero is taken as 100 (the temperature and humidity in this case are considered constant). The amount of air in question decreases in proportion to a rise in elevation as shown in Fig.19. Reduction in the amount of air drawn into the cylinders changes the air-fuel mixture ratio, with the result that the power output drops markedly. Fig.20 shows the relation between a rise in temperature and the amount of air drawn into the cylinders (in this case, the atmospheric pressure (elevation) and the humidity are considered unchanged and the amount of air going into the cylinders at 32 degrees F (0 degrees C) is taken as 100). In the case of the engine for racing where the maximum output is constantly called for, it is best to tune up the engine by making a matching test of the carburetor in accordance with the temperature and other conditions on the racing course.

Figure 19

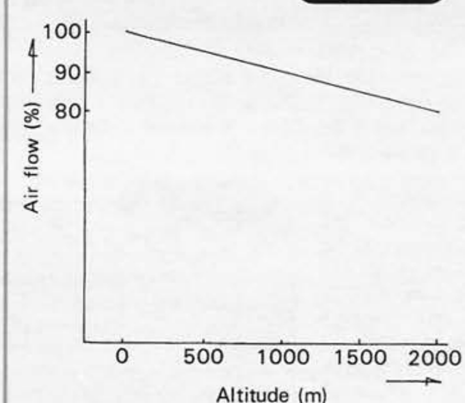
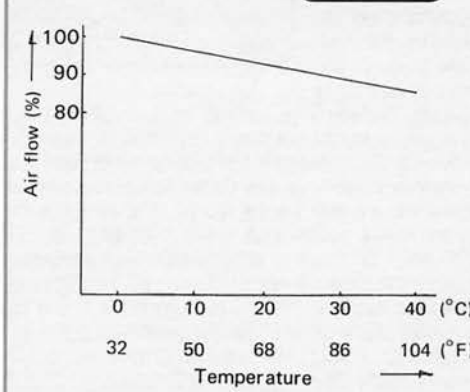


Figure 20



Troubleshooting & General Procedures

When tuning motorcycle carburetors, there are several procedures and preliminary checks that will make the tuning and troubleshooting process go smoothly and quickly.

1. In order for carburetors to work properly, the engine must be in good mechanical condition. All of the following parameters should be checked in order to proceed with the carburetor tuning.

A. ***Compression - all cylinders should be within 10% of each other according to cranking compression.***

B. ***Valve Adjustment / Cam Timing - check valve clearance according to the factory service manual, consult a qualified technician if there is any question about the cam timing.***

C. ***Ignition Quality - adjust point gap and ignition timing according to the factory service manual. Double check the gap and install new spark plug prior to any carburetor tuning.***

D. ***Air Filter Quality - Check to see that the air filter is clean and that all baffles and snorkels are in place, or have been removed as necessary for increased airflow. In any case, the air box / air filter dimensions should be finalized.***

E. ***Exhaust System - Install all mufflers and baffles. Double check all silencer packing and baffle installations. Finalize all exhaust system specifications before moving on to the carburetors. Jetting can vary dramatically according to muffler / baffle selection.***

2. All fuel delivery circuits operate according to throttle position. In order to determine which circuit to tune, one must know the throttle opening at which there is a problem. Do not use R.P.M. to determine which circuit to tune. Sudco suggests the use of a throttle index on the twist grip to track the exact throttle opening of the carburetor.

Throttle Index

A. ***Place a piece of masking tape across the throttle housing adjacent to the twist grip so that it is visible from the riding position.***

B. ***Install a colored push pin or sewing pin into the throttle grip flange adjacent to the masking tape. Adjust the throttle cable free play to near zero.***

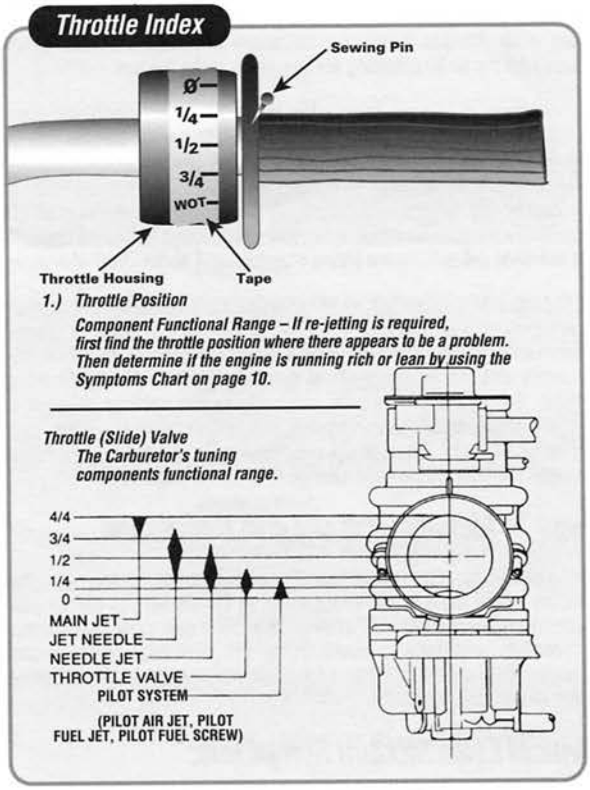
C. ***With the throttle closed, make a "0" mark on the masking tape adjacent to the pin head on the throttle flange.***

D. ***Open the throttle all the way and make a "W.O.T" mark on the masking tape adjacent to the pin head.***

E. ***Using a tape measure, divide the distance between the two marks on the tape into quarters and make marks for each throttle opening on the tape. (0, 1/4, 1/2, 3/4, W.O.T.)***

F. ***Ride the motorcycle and make mental notes regarding the carburetion according to the throttle index. If a problem is truly carburetor related, the symptoms will come and go according to the throttle position.***

3. Work in progression from 0 throttle through full throttle. Motorcycle carburetor fuel circuits are additive. This means the main circuit delivery is an addition to the pilot circuit delivery. The pilot system delivers fuel at all throttle settings, therefore, the tuning of the pilot circuit will have some influence on the decisions to be made regarding the main circuit. If there is any question about the jetting of the pilot circuit it should be addressed first. After the pilot circuit has been optimized it is then possible to accurately evaluate the main circuit and it's related components.



4. Altitude and Temperature

The purpose of the carburetor is to mix air and fuel in a specific ratio, by mass, in order to present a combustible mixture to the engine. Carburetors are generally flexible instruments when used to mix air and fuel in the proper ratio and will compensate for small changes in air density. It is when the altitude or temperature becomes extreme that it will be necessary to re-jet according to atmospheric conditions.

Altitude and temperature are important factors to consider when tuning carburetors for peak performance, as they directly affect air density. Notes should be taken regarding altitude and temperature changes as they occur in order to determine which way to go with carburetor adjustments.

Because air is a gas, its density is directly affected by altitude, barometric pressure, temperature and humidity. These factors will increase or decrease air density depending upon where you travel or how weather patterns develop in your riding area.

Gasoline is a liquid and cannot be compressed. Therefore, its density is not affected by altitude, temperature, or humidity.

Because air density changes according to atmospheric conditions and fuel density does not, it becomes necessary to re-jet the carburetor according to changing altitude and weather conditions. As the density or mass of air changes, it becomes necessary to change the mass of fuel mixed with the air by changing the jets which meter the fuel.

Altitude affects air density the most. All other conditions being equal, as the elevation nears zero (sea-level), the air density will be greatest and the engine will require the richest carburetor settings that it will ever use. As elevation increases, the air density becomes less and the engine will require leaner carburetor settings in order to maintain peak performance. Generally, an engine which has been tuned correctly for sea-level will not require jetting changes until about 2500' elevation.

Temperature also has an affect on air density. As air temperature nears freezing (32 degrees F), the density of air will become greater. Conversely, as temperature rises toward100 degrees F, air density becomes less. As air temperature decreases and air density becomes greater, the engine will require richer carburetor settings in order to maintain peak performance. Generally, an engine which has been tuned correctly for room temperature (72 degrees F) will not require jetting changes until the temperature change is about 20 degrees F.

How To Identify Rich or Lean Conditions

Lean Condition - A lean condition is an out of balance air / fuel mixture where there is not enough fuel in the mixture to deliver peak performance. The results of lean mixtures can vary from minor driveability problems to overheating and possible severe engine damage. Care should be taken to identify lean mixtures and correct them as soon as possible.

Typical Lean Mixture Symptoms:

1. ***Engine acceleration is flat or slow to pick up.***
2. ***It becomes difficult to apply the throttle quickly or the engine picks up speed when the throttle is rolled off.***
3. ***The engine knocks, pings, or overheats.***
4. ***The engine surges or hunts for a stable R.P.M. while cruising at part throttle.***
5. ***When the pilot circuit is too lean there will be popping or spitting in the carburetors as the throttle is opened. Sometimes there will be popping or backfires in the exhaust system on engine deceleration after the throttle has been closed.***
6. ***Engine performance improves in warmer weather conditions, or engine runs poorly in cold weather.***
7. ***Engine performance worsens when the air filter is removed.***

Rich Condition - A rich condition is an out of balance air / fuel mixture where there is too much fuel in the mixture to deliver peak performance. A rich condition will result in excess carbon deposits within the combustion chamber and exhaust system, decreasing the life of the engine and related components. In addition to poor fuel economy, a rich running motorcycle will pollute excessively and contribute to environmental problems.

Typical Rich Mixture Symptoms:

1. ***Engine acceleration if flat, uneven, not crisp.***
2. ***Two stroke engines will sputter or "4 stroke" and skip combustion cycles.***
3. ***The throttle needs to be opened continuously to maintain consistent acceleration.***
4. ***The engine performs poorly when the weather conditions get warmer, or the engine works better in cold conditions.***
5. ***Excessive smoke from the tail pipe, black smoke from the tail pipe of four strokes.***
6. ***Poor fuel economy.***
7. ***Engine performance improves when air cleaner is removed.***
8. ***When the pilot circuit is rich, the engine will idle roughly or not return to idle without blipping the throttle. The exhaust will smell of excessive fuel and burn the eyes.***
9. ***Black, sooty or fouled spark plugs. Black and sooty exhaust tail pipes on four-strokes. Greasy and drippy tail pipes on two-strokes.***

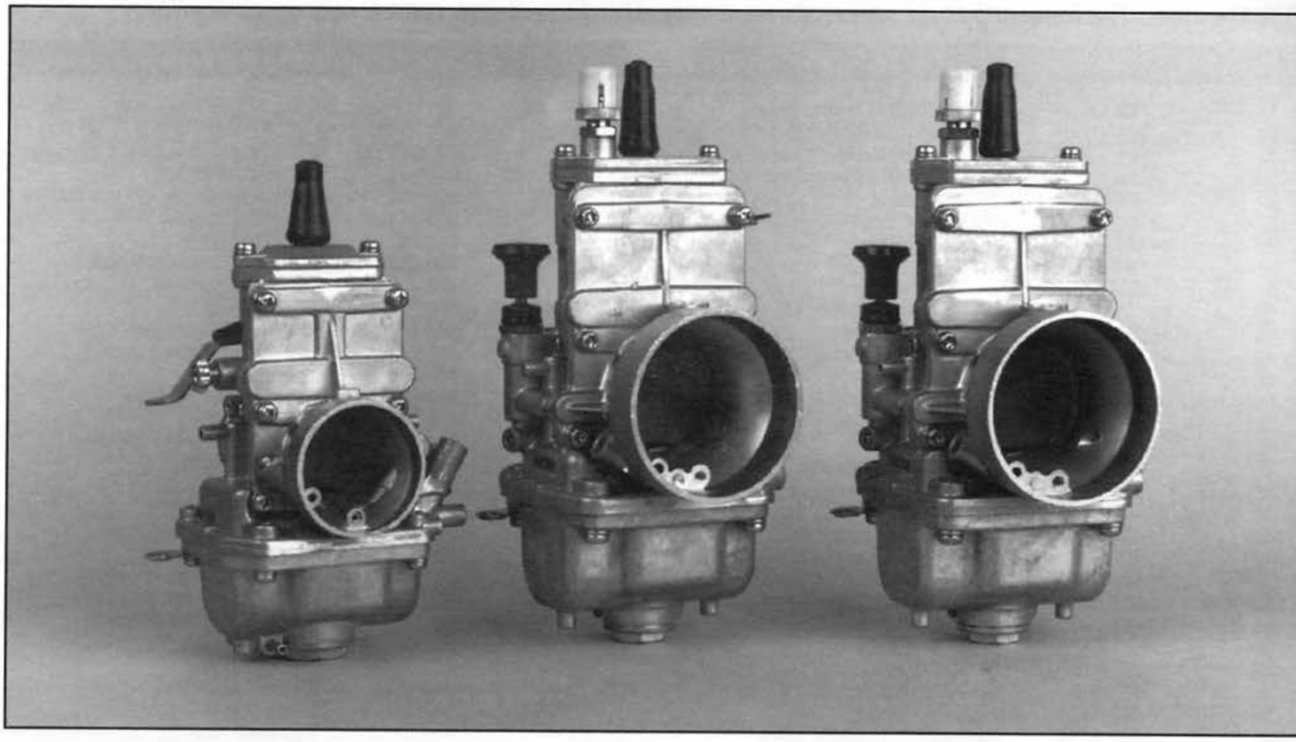
Carburetor Troublshooting Guide

PROBLEM	Possible Causes	CORRECTION
HARD STARTING.	Incorrect use of choke.	Correct use of choke.
	Incorrect air-fuel mixture adjustment.	Set mixture adjustment screw in accordance with owneris manual or shop manual instructions.
	Clogged fuel filter.	Clean filter.
	Clogged low speed fuel jets.	Disassemble carburetor and chemically clean.
	Clogged vent in fuel tank cap.	Unclog vent or replace cap.
	Float stuck.	Remove float bowl, check float operation, and correct or replace.
	Float damaged or leaking.	Replace float.
	Incorrect float level.	Set float height in accordance with shop manual specifications.
	Intake air leak.	Check carburetor mounting flanges for air leaks.
	Ignition problem.	Repair, replace, or adjust as necessary.
	Low cylinder compression.	Repair, replace, or adjust as necessary.
POOR IDLE OR STALLING.	Idle speed adjustment(s) set too low.	Adjust idle RPM in accordance with specifications in owner's manual or shop manual.
	Idle speed adjustments are unequal (twin and multi-carburetor models using individual throttle stop adjustments.)	Equalize throttle stop settings.
	Clogged idle & low speed air bleed.	Disassemble carburetor and chemically clean.
	All causes listed under "HARD STARTING."	
IDLE MIXTURE ADJUSTMENT IS INEFFECTIVE. CARBURETOR DOES NOT RESPOND TO MOVEMENT OF THE IDLE MIXTURE SCREW.	Idle speed set too high.	Adjust idle speed in accordance with specifications in owner's manual or shop manual.
	Clogged low speed air-bleeds.	Disassemble carburetor and chemically clean.
	Damaged mixture adjustment needle.	Replace mixture adjustment needle.
	Mixture adjustment needle "O" ring is not sealing (models using "O" ring).	Replace "O" ring.
	Damaged mixture adjustment needle seat.	Replace carburetor.
	All carburetor problems listed under "HARD STARTING."	

Carburetor Troublshooting Guide

PROBLEM	POSSIBLE CAUSE	CORRECTION
SLOW RETURN TO IDLE.	Idle speed set too high.	Adjust idle speed in accordance with specifications in owner's manual or shop manual.
	Idle speed adjustments are unequal (twin and multi-carburetor models using individual throttle stop adjustments).	Equalize throttle stop settings.
	Throttle valve sticking.	Clean and inspect throttle valve and return spring. Replace as necessary.
	Throttle linkage sticking	Clean and inspect throttle linkage and return spring. Lubricate, repair, or replace as necessary.
	Throttle cable binding.	Correct routing or replace cable as necessary.
ENGINE SURGES WHEN AT A CONSTANT SPEED.	Incorrect air-fuel mixture adjustment.	Low speed - Low speed jet size change. Intermediate-Jet needle height adjustment.
	Vacuum piston sticking.	Clean and inspect vacuum piston and return spring. Replace if necessary.
ENGINE DOES NOT DEVELOP FULL POWER, OR MISSES ON ACCELERATION.	Incorrect use of choke.	Correct use of choke.
	Clogged air cleaner.	Clean or replace.
	Incorrect air-fuel mixture adjustment.	Low speed - Low speed jet size change. Intermediate - Jet needle height adj. High Speed - Main jet size change.
	Throttle valves not synchronized (models with two or more carburetors)	Adjust throttle valve synchronization.
	Clogged fuel filter.	Clean filter.
	Clogged fuel jets.	Disassemble carburetor and chemically clean.
	Clogged air bleeds.	Disassemble carburetor and chemically clean.
	Fuel jets loose.	Tighten fuel jets.
	Fuel jet "O" rings leaking (models using "O" rings).	Replace "O" rings.
	Float stuck	Remove float bowl, check float operation, and correct or replace.
	Float damaged or leaking.	Replace float.
	Incorrect float level.	Set float height in accordance with shop manual specifications.
	Vacuum piston sticking.	Clean and inspect vacuum piston and return spring. Replace if necessary.
	Vacuum piston diaphragm ruptured.	Replace vacuum piston assembly.
	Ignition problem.	Repair, replace, or adjust as necessary.
	Low cylinder compression.	Repair, replace, or adjust as necessary.

Mikuni TM Flat Slide Carburetor



TM Series Flat Valve Carburetor

Mikuni's original flat valve (flat slide) carburetor, the TM Series Carburetors provide significant performance improvements over older design round slide carburetors. Air flows faster and smoother through the TM Series venturi due to the flat slide configuration and the jet blocks which help create a smoothbore effect. The high velocity of the air flow means a stronger vacuum at the needle jet, providing more precise metering and better throttle response.

Order No.	Carburetor Description	Main Jet	Pilot Jet	Needle Jet	Jet Needle	Throttle Valve	Air Jet
001-017	TM24-1	4/042 130	VM22/210 15	454 Q-0	5N13	832-30006 3.0	
001-023	VM28-418	4/042 180	VM22/210 15	175 P-8	5DP39	832-33001 2.5	None
001-026	TM32-1	4/042 250	VM22/210 45	389 Q-2	5FP17	832-39012 4.0	None
001-033	TM34-2	4/042 280	VM22/210 50	389 Q-2	5FP17	832-39012 4.0	None
001-038	TM36-2	4/042 280	VM22/210 50	389 Q-6	6FJ40	832-43002a 4.0	None
001-060	TM38-85/47mm*	4/042 230	VM22/210 22.5	389 Q-2	6FJ41	832-43010 4.0	None
001-061	TM38-86/44mm*	4/042 230	VM22/210 22.5	389 Q-2	6FJ41	832-43010 4.0	None
001-032	TM33-8012	N100.604 127.5	VM28/486 37.5	640 P-8	5PF96	Pilot Air Jet 1.1	None

*Spigot O.D.

Power Jet Kits

The TM Series bodies are designed to accept Power Jet Kits. Power Jet Kits are usually used on carburetors in 2 stroke engine applications to prevent leaning out during extended full-throttle running.

002-041 ***Power Jet Kit 36-44mm***

Special set TM Series Flat-Valve Carbs

Use the following part numbers when ordering a special jetting or request.

Order No.		Description of Carb	
001-170	TM24	Flat-Slide Special Set	
001-172	TM28	" "	
001-176	TM32	" "	
001-178	TM34	" "	
001-180	TM36	" "	
001-181	TM36	" "	with Throttle Valve Change
001-152	TM38 44mm*	" "	
001-153	TM38 44mm*	" "	with Throttle Valve Change
001-154	TM38 47mm*	" "	
001-155	TM38 47mm*	" "	with Throttle Valve Change

*Spigot O.D.

Mikuni Needle Jets

Needle Jets

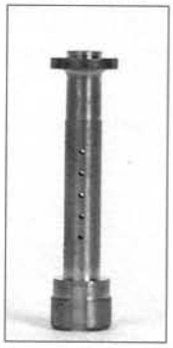
The needle jet is the main fuel passage to the main bore (venturi) of the Mikuni carburetor. Depending on the inside diameter of a specific needle jet, this will also affect the function of the needle. Therefore, needle jets and needles act together as the main system in controlling the amount and mixture of the fuel which is drawn in mid-range (1/4 - 3/4) throttle operation.

Two Basic Types of Needle Jets

PRIMARY TYPE

"P"
Primary Choke Type

BLEED TYPE



"B"
Bleed Type

Using the application chart located on page 71, it is noted that certain needle jets require a specific type of main jet because there are two types of main jets (4/042 & N100/604) that have different fuel flow rate characteristics. Also, needle jets are available not only in types, but series and sizes. Use Mikuni series numbers for style of the needle jet. Their sizes (inside diameter size) within each series are listed according to a letter-number combination. The letter shows the inside diameter size in increments of .50mm.

For example, the difference between P-2 and Q-2 is that the inside diameter of needle jet size Q-2 is .050mm greater than P-2.

The number shows the inside diameter size in increments of.010mm.

For example, the difference between P-2 and P-4 is that the inside diameter of needle jet size P-4 is .010mm greater than P-2.

Exception: (-5) is measured as an increment increase of .005mm. For example, the difference between P-4 and P-5 is that the inside diameter of needle jet size P-5 is .005mm greater than P-4.

LEAN N-0
N-2
N-4
N-6
N-8
O-0
O-2
O-4
O-6
O-8
P-0
P-2
P-4
P-5
P-6
P-8
Q-0
Q-2
Q-4
Q-6
Q-8
R-0
R-2
R-4
R-6
RICH R-8

For Mikuni Series #224

LEAN Z-0
Z-5
AA-0
AA-5
BB-0
BB-5
CC-0
RICH CC-5

Note: Letters Z, AA, BB, and CC are sizes in increments of .050mm.

Numbers 0 & 5 are sizes in increments of .025mm.

Series	Size	Type	Carb Application
159	O-0 thru R-8	P	30 - 36mm Spigot
166	O-0 thru R-8	P	38mm Spigot
169	N-0 thru Q-8	P	28, 30mm Small Body
171	O-0 thru Q-8	P	30mm Flange
172	O-0 thru Q-8	P	28mm Flange
175	N-0 thru Q-8	B	28mm Spigot
176	N-0 thru Q-8	B	30 - 36mm Spigot
182	N-0 thru Q-8	P	26mm Spigot
188	O-0 thru Q-8	P	32mm Flange, Kawasaki
192	N-0 thru O-8	P	26mm Flange
193	N-0 thru O-8	P	24mm Flange
205	O-0 thru Q-8	P	34mm Flange
211	N-0 thru Q-8	P	Kaw KR250/350/750
224	Figure "B"	P	40-44mm Spigot
235	O-0 thru Q-8	P	30mm Flange
247	P & Q only	P	Yamaha 250, YZ400, IT400
258	O & P only	B	Yamaha TT, SR, XT500 Suzuki DR, SP, GS550 GS750/850, Kaw KZ650,/1000
261	N-8 thru Q-8	B	VM29 and VM33 Smoothbores
389	O-0 thru R-8	P	TM32, 34, 36, 38, 41 Pro-Series and Flat-Slide
499	P-2 thru Q-4	B	TM33 Flat Slide Smoothbore
568	O-6 thru P-8	P	RS34, 36 Radial FS Smoothbore
568	Y-0 thru Z-6	P	RS38, 40 Radial FS Smoothbore

Mikuni Needle Jet Orifice Diameters

	-0	-1	-2	-3	-4	-5	-6	-7	-8	-9
N	2.550	2.555	2.560	2.565	2.570	2.575	2.580	2.585	2.590	2.595
O	2.600	2.605	2.610	2.616	2.620	2.625	2.630	2.635	2.640	2.645
P	2.650	2.655	2.660	2.665	2.670	2.675	2.680	2.686	2.690	2.695
Q	2.700	2.705	2.710	2.715	2.720	2.725	2.730	2.735	2.740	2.745

Mikuni Needle Jets

Needle Jets

Sizes	Series →	159	166	169	171	172	175	176
Lean	N-0			003-249	003-271			003-324
	N-2			003-250	003-272			003-325
	N-4	003-200		003-251	003-273			003-326
	N-6	003-201		003-252	003-274			003-327
	N-8	003-202		003-253	003-275			003-328
	O-0	003-203	003-227	003-254	003-276			003-329
	O-2	003-204	003-228	003-255	002-277		003-305	003-330
	O-4	003-205	003-229	003-256	002-078	003-294		003-331
	O-5	003-543	003-545	003-257				
	O-6	003-206	003-230	003-258	003-279	003-295	003-307	003-333
	O-8	003-207	003-231	003-259	003-280	003-296	003-308	003-334
	P-0	003-208	003-232	003-260	003-281		003-309	003-335
	P-2	003-209	003-233	003-261	003-282	003-298	003-310	003-336
	P-4	003-210	003-234	003-262	003-283		003-311	003-337
	P-5	003-211	003-235	003-263			003-312	003-338
	P-6	003-212	003-236	003-264	003-284		003-313	003-339
	P-8	003-213	003-237	003-265	003-285		003-314	003-340
	Q-0	003-214	003-238	003-266	003-286		003-315	
	Q-2	003-215	003-239	003-267	003-287			003-342
	Q-4	003-216	003-240	003-268	003-288			003-343
	Q-5	003-217	003-546					
	Q-6	003-218	003-241	003-269	003-289			003-344
	Q-8	003-219	003-242	003-270	003-290			003-345
	R-0	003-220	003-243		003-291			
	R-2	003-221	003-244					
	R-3							
	R-4	003-223	003-245					
	R-5	003-224	003-246					003-349
	R-6	003-225	003-247					
Rich	R-8	003-226	003-248					

Sizes	Series →	182	183	188	192	193	196	235
Lean	N-0	003-352	003-372			003-424		
	N-2	003-353	003-373			003-425		
	N-4	003-354	003-374					
	N-6	003-355	003-375					
	N-8	003-356	003-376		003-411			
	O-0	003-357	003-377				003-439	
	O-2	003-358	003-378	003-394	003-413		003-440	
	O-3							
	O-4		003-379	003-395			003-441	
	O-5						003-442	
	O-6	003-360	003-381		003-417	003-432	003-443	
	O-8	003-361	003-382	003-398		003-433	003-444	
	P-0	003-362	003-383	003-399	003-419	003-434		
	P-2	003-363	003-384		003-420	003-435		
	P-4		003-385		003-421	003-436		
	P-6	003-365	003-386		003-422	003-437		003-503
	P-8	003-366	003-387	003-404	003-423	003-438	003-450	
	Q-0	003-367	003-388				003-451	
	Q-2	003-368	003-389				003-452	
	Q-4	003-369	003-390				003-453	
	Q-6	003-370	003-391					
Rich	Q-8	003-371	003-392					

Mikuni Needle Jets

Needle Jets

Sizes	Series →	247	258	389	261	499
Lean	0-0		003-522	003-570	003-532	
	0-2		003-523	003-571	003-533	
	0-4		003-324	003-572	003-534	
	0-5					
	0-6			003-573	003-535	
	0-8		003-526	003-574	003-536	
	P-0	003-510	003-527	003-575	003-537	
	P-2	003-511	003-528	003-576	003-538	003-606
	P-4	003-512	003-529	003-577	003-539	
	P-5	003-513				
	P-6	003-514	003-530	003-578		
	P-8	003-515	003-531	003-579	003-549	003-609
	Q-0	003-516		003-580		003-610
	Q-2	003-517		003-581		003-611
	Q-4	003-518		003-582		003-612
	Q-6	003-520		003-583		
	Q-8	003-521		003-584		
	R-0	003-553		003-585		
	R-2	003-554		003-586		
	R-4	003-555		003-587		
	R-6	003-556		003-588		
Rich	R-8	003-557	005-589	003-589		

Needle Jets (continued)

Sizes	Series →	568 (RS38-40)	Series →	568 (RS34-36)	Series →	224
Lean	Y-0	003-663	0-6	003-650	Q-5	003-560
	Y-2	003-664	0-8	003-651	Z-0	003-495
	Y-4	003-665	P-0	003-652	Z-5	003-496
	Y-6	003-666	P-2	003-653	AA-0	003-497
	Y-8	003-667	P-4	003-654	AA-5	003-498
	Z-0	003-668	P-6	003-655	BB-0	003-499
	Z-2	003-669	P-8	003-656	BB-5	003-500
	Z-4	003-670			CC-0	003-501
Rich	Z-6	003-671			CC-5	003-502

Throttle Valve (For Mikuni aftermarket carbs only. No O.E. carb fitment. See specific carb model section for Sudco part number)

Part Number	Carb Application	Slide Material	Idle Screw Location	Guide Pin Groove Width	Cut-away Sizes Available
VM28/56	26-28 Spigot	Brass	Left	2.05mm	1.5, 2.0
VM30/176	30 Small Body	Brass	Left	2.05	1.0 thru 3.5
VM32/65	30, 32, 34 Spigot	Brass	Right	2.60	1.5 thru 3.5
VM34/110	30, 32, 34 Spigot	Brass	Left	2.60	1.0 thru 3.5
VM36/36	36 Spigot	Brass	Left	3.05	1.5 thru 3.5
VM36/39	36 Spigot	Brass	Right	3.05	3.0, 3.5
VM38/24	38 Spigot	Brass	Right	3.05	1.0 thru 3.5
VM38/52	38 Spigot	Brass	Left	3.05	1.5 thru 3.0
VM40/02	40, 44 Spigot	Alum.	Left	3.05	0.5 thru 4.0
VM44/23	40, 44 Spigot	Brass	Left	3.05	1.5 thru 4.0
832-39012	TM32-34	Alum.	Left		4.0
832-43002	TM36, 38	Alum.	Left		1.5 thru 5.0
832-43011	TM38-85, 86	Alum.	Left		2.5 thru 4.5
999-832-014	TMX35, 38	Alum.	Left		2.5 thru 6.0
999-832-017-IG	TMS38, 125	Alum.	Left		None
999-832-017-IH	TMS38, 250	Alum	Left		None

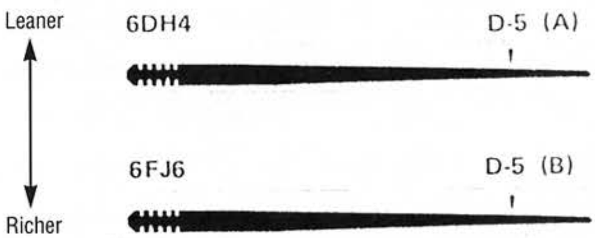
NOTE: Brass slides are chrome plated. Aluminum slides are anodized, Xylan or Nickel-plated.

Mikuni Jet Needles

Quick Reference Chart for Needle Selection
(average Performance Chart)

Note: The following listing of needles are simply the *average* performance of a needle between 1/4 and 3/4 throttle opening. Needles are constructed such that a given point on a needle, (for example, at 3/4 throttle opening), the needle *may* be fount to perform *richer* at this given point when compared to the same given point on another needle, but according the the *average* performance chart, the needle should perform *leaner.*

For example:
average Performance chart



At D-5 (A), the taper diameter is **1.915**, at **D-5 (b)**, the taper is **2.040**; the taper diameter at **D-5 (A)** is *smaller* than **D-5 (B)**. At this *given point* of throttle opening **(3/4)**, needle **6DH4** will run slightly *richer* than **6FJ6**, but the *average* performance will still be that **6DH4** will be a *leaner* needle because it will perform *leaner* at *more* given points than a **6FJ6**. Consequently, if you are concentrating on a *specific* throttle opening for *competition use,* be certain to check the *taper diameter* at that *point* of throttle opening.

For a more detailed and comprehensive explanation of the various needles as to their taper diameters at given points, see ***NEEDLE TAPER DIAMETER DIMENSION CHARTS.***

THE QUICK REFERENCE CHART FOR NEEDLE SELECTION was prepared by measuring the needles as to their diameter at given points. Given points are 10mm apart from each other.

By computing the different measurements and arranging them in order of taper thickness or thinness, three categories for application of needles were determined.

Category I - Competition.
For example, motocross racing and desert racing where mid-range throttle operation is vital.

Category II - Racing.
For example, Road racing, where 3/4 to full throttle operation is vital.

Category III - Overall. For example, Street riding, where the full range of throttle operation is required.

NEEDLES #4 SERIES

		COMPETITION	RACING	OVERALL
LEANER	1	4D8	4P3	4P3
↑	2	4DH7	4D8	4D8
	3	4DG6	4D3	4D3
	4	4P3	4F10	4DG6
	5	4D3	4DG6	4DH7
	6	4F6	4F6	4F10
	7	4F10	4DH7	4F6
	8	4F15	4F15	4F15
	9	4E14	E1	4E1
	10	4J13	4L13	4L13
	11	4L6	4J11	4J13
↓	12	4L13	4J13	4J11
RICHER	13	4J11	4L6	4L6

NEEDLES #5 SERIES

		COMPETITION	RACING	OVERALL
LEANER	1	5D6	5C4	5C4
↑	2	5D120	5D6	5D6
	3	5C4	5D5	5D5
	4	5EJ13	5D120	5D120
	5	5J9	5D1	5F18
	6	5F18	5F18	5D1
	7	5DP7	5F16	5EJ13
	8	5FL14	5FJ9	5F3
	9	5F3	5F3	5EH7
	10	5EH7	5EJ13	5FJ9
	11	5FL7	5EH7	5DP
	12	5D5	5DH21	5FL14
	13	5E13	5FL14	5FL7
	14	5L1	5FL7	5E13
	15	5J6	5E13	5F16
	16	5D1	5DP7	5DH21
	17	5FJ9	5J9	5J9
	18	5F16	5J6	5J6
↓	19	5DH21	5L1	5L1
RICHER	20	5F12	5F12	5F12

Please Note: Many of the needles listed in the charts above are no longer in production. We have listed them for reference only.

Mikuni Jet Needles

NEEDLES #6 SERIES

	COMPETITION	RACING	OVERALL
LEANER 1	5F54	6F3	6F3
2	6L1	5F54	5F54
3	6DH4	6FJ6	6FJ6
4	6FJ6	6DH7	6DH7
5	6F3	6F5	6DH4
6	6DH7	6F8	6F9
7	6F9	6DH4	6F8
8	6DP5	6F9	6L1
9	6F8	6F16	6F16
10	6JI	6CF1	6CF1
11	6DP1	6DH2	6F5
12	6DH2	6FJ11	6DH2
13	6F16	6F4	6FJ11
14	6CF1	6L1	6F4
15	6J3	6J1	6J1
16	6F4	6J3	6J3
17	6N1	6DH3	6DP5
18	6FJ11	6DP5	6DH3
19	6F5	6DP1	6DP1
RICHER 20	6DH3	6N1	6N1

NEEDLES #7 SERIES

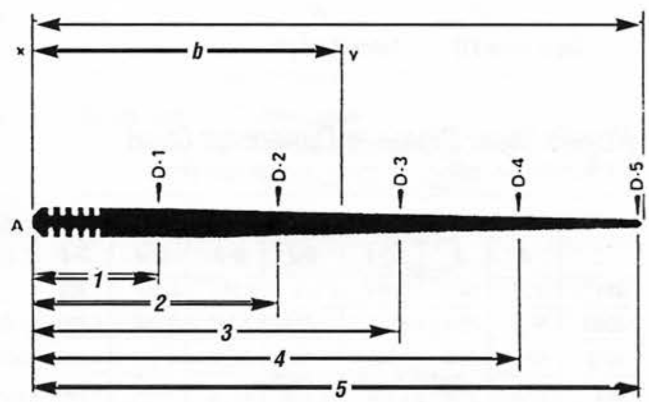
	COMPETITION	RACING	OVERALL
LEANER 1	7F06	7F06	7F06
2	7H2	7F2	7H2
3	7J2	7H2	7J2
RICHER 4	7F2	7J2	7F2

NEEDLE TAPER DIAMETER DIMENSION CHART (A)

(a)=Needle Length (mm)
(b)=Length between points (x) and the taper point (Y)

1=10mm
2=20mm
3=30mm
4=40mm
5=50mm

D-1, -2, -3, -4, -6 are the actual taper diameters at those given points in millimeters

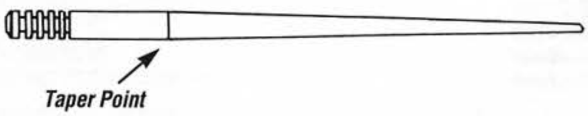


Mikuni Jet Needles

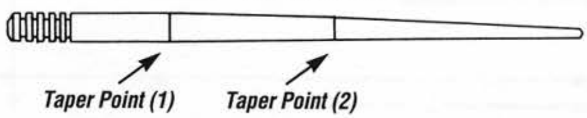
Jet Needles

The Jet Needle controls the fuel mixture in the mid-range (1/4-3/4) throttle position. The taper of the needle determines the amount of fuel. For example: the thinner the diameter of the needle, the more fuel will be drawn. The thicker the diameter of the needle, the less fuel can be drawn.

Two Types of Needles:



Double Taper Type



Needle Taper Diameter Dimension Chart

D-1 through D-5 indicates diameter (mm) at each point.

	A	B	D-1	D-2	D-3	D-4	D-5
4E1	50.3	28.0	2.515	2.515	2.345	2.127	1.924
4DH7	50.3	23.0	2.518	2.518	2.386	2.098	1.790
4J13	50.2	24.0	2.513	2.513	2.230	1.800	1.400
4L6	50.3	24.5	2.515	2.515	2.178	1.660	1.190
4J11	41.5	21.3	2.512	2.506	2.188	1.776	

D-1 through D-6 indicates diameter (mm) at each point.

	A	B	D-1	D-2	D-3	D-4	D-5	D-6
5F3	58.0	27.4	2.519	2.519	2.419	2.135	1.863	
5EJ11	60.3	28.5	2.515	2.515	2.515	2.241	1.839	1.420
5FL11	60.3	28.2	2.518	2.518	2.438	2.175	1.740	1.256
5FL14	58.0	28.0	2.520	1.520	2.440	2.170	1.735	
5FL7	58.0	28.0	2.518	2.518	2.440	2.170	2.170	1.735
5DP7	57.6	26.4	2.512	2.512	2.440	2.259	1.580	
5J6	58.0	27.5	2.518	2.518	2.340	1.890	1.450	
5L1	58.0	27.0	2.518	2.518	2.330	1.811	1.297	
5J9	58.0	27.0	2.522	2.520	1.432	1.996	1.505	

D-1 through D-6 indicates diameter (mm) at each point.

	A	B	C	D-1	D-2	D-3	D-4	D-5	D-6
6F5	62.3	38.1	19.0	2.515	2.456	2.454	2.364	2.098	1.840
6F4	62.3	32.0	19.4	2.515	2.442	2.436	2.206	1.939	1.678
6F8	62.3	34.0	21.5	2.512	2.512	2.386	2.214	1.945	1.688
6F16	64.6	31.2	18.4	2.520	2.404	2.400	2.201	1.941	1.679

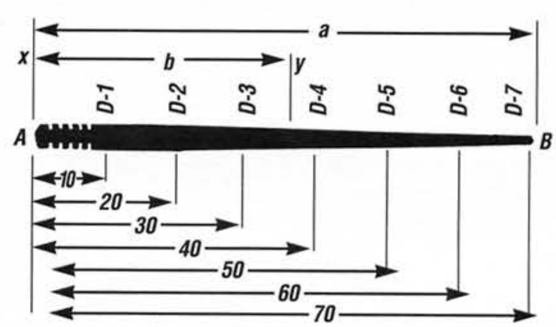
Series Type	Application
#4	All 18mm Carburetors 22mm and 24mm Flange
#5	26mm-32mm Spigot 28mm-34mm Flange
#6	30mm-38mm Spigot
#7	40mm and 44mm Spigot
#9	RS and HS Carbs

D-1 through D-6 indicates diameter (mm) at each point.

	A	B	D-1	D-2	D-3	D-4	D-5	D-6
6DH2	62.3	28.0	2.511	2.511	2.466	2.295	2.000	1.660
6F9	62.3	28.9	2.516	2.516	2.475	2.210	1.949	1.678
6CF1	61.5	29.5	2.512	2.512	2.429	2.240	1.974	1.710
6FJ6	62.3	35.2	2.505	2.505	2.505	2.376	2.040	1.606
6DH3	62.3	22.0	2.512	2.512	2.458	2.286	1.948	1.607
6L1	62.3	37.0	2.512	2.512	2.512	2.335	1.826	1.313
6DP17	62.3	32.1	2.518	2.518	2.518	2.372	1.834	1.141
6N1	62.3	37.0	2.514	2.514	2.514	2.278	1.672	1.058
6DP1	62.3	28.9	2.511	2.511	2.476	2.312	1.748	1.075
6DH4	62.3	25.5	2.520	2.520	2.440	2.258	1.915	1.575
6DH7	62.2	28.5	2.516	2.516	2.505	2.316	2.009	1.688
6DH8	62.2	20.3	2.538	2.538	2.436	2.208	1.827	1.497
6FL14	62.1	26.7	2.538	2.538	2.538	2.233	1.649	1.218
6F15	62.2	19.8	2.535	2.538	2.461	2.208	1.979	1.649
6DP10	62.4	26.5	2.51	2.51	2.44	2.26	1.56	.89
6F13	64.2	32.8	2.50	2.46	2.46	2.24	1.97	1.70
6DJ30	64.7	26.3	2.51	2.51	2.45	2.09	1.66	1.24

Needle Taper Diameter Dimension Chart

	A	B	D-1	D-2	D-3	D-4	D-5	D-6	D-7
7DH5	72.2	27.4	2.98	2.98	2.94	2.78	2.44	2.08	1.72
7F7	72.3	33.1	2.99	2.99	2.99	2.80	2.54	2.28	2.02
7F6	72.3	29.0	3.00	3.00	2.95	2.68	2.41	2.14	1.87
7DH3	72.5	28.1	2.98	2.98	2.96	2.80	2.47	2.11	1.76
7DH2	75.3	31.6	2.99	2.99	2.99	2.84	2.66	2.27	1.92



Mikuni Jet Needles *(Flatslide Carbs)*

Jet Needle No.		*Applications*	*Needle Diameter–Before Taper (mm)*	*Air Fuel Ration*
6FJ41	**002-713**	TM38 FLATSLIDE	2.51	LEANER
6FM46	**002-349**	↓	2.51	↕
6FJ40	**002-712**		2.50	
6DP4	**002-341**			RICHER
6EJ12- 60	**007-077**	TMX38 FLATSLIDE	2.60	LEANER
59	**007-076**	↓	2.59	↕
58	**007-075**		2.58	
57	**007-074**		2.57	
56	**007-073**		2.56	
55	**007-072**		2.55	
54	**007-071**		2.54	
53	**007-070**		2.53	RICHER
6EN11- 58	**007-056**	TMX35 FLATSLIDE	2.58	LEANER
57	**007-055**	↓	2.57	↕
56	**007-054**		2.56	
55	**007-053**		2.55	
54	**007-052**		2.54	
53	**007-051**		2.53	
52	**007-050**		2.52	
51	**007-049**		2.51	RICHER
6GDY12- 60	**007-089**	TMS38-77, 78	2.60	LEANER
59	**007-088**	125cc	2.59	↕
58	**007-087**	↓	2.58	
57	**007-086**		2.57	
56	**007-085**		2.56	RICHER
6DGY04-60	**007-048**	TMS38-77, 78	2.60	LEANER
59	**007-047**	250 cc	2.59	↕
58	**007-046**	↓	2.58	
57	**007-045**		2.57	
56	**007-044**		2.56	
55	**007-043**		2.55	
54	**007-042**		2.54	RICHER
9DZH01 STD	**007-035**	RS34-36	2.50	LEANER
9DZH03	**007-037**	SMOOTHBORE	2.49	↓
9DZH04	**007-038**		2.48	RICHER
9CHY03 STD	**007-020**	RS38-40	2.98	LEANER
9CHY05	**007-022**	SMOOTHBORE	2.98	
9CHY06	**007-023**		2.97	RICHER
9CHY10-99 (9CHY03) STD		RS38-40	2.99	LEANER
96		↓	2.96	↕
95			2.95	
94			2.94	
93			2.93	RICHER
9DJY01 STD	**007-015**	HS40	2.97	LEANER
9DJY03	**007-017**	SMOOTHBORE	2.96	↓
9DJY02	**007-016**		2.95	RICHER
8DDY01-98	**007-083**	HSR 42		LEANER
8DDY01-97	**007-082**	NEEDLES		↕
8DDY01-96 STD	**007-081**			
8DDY01-95	**007-080**			RICHER

Pro Option-TMS38 Needles **(for 125 & 250 cc Engines without Main Jets thru 1992 Each kit contains a selection of 5 different needles)**

KIT NO.	NEEDLE DIAMETER	AIR/FUEL	MAIN JET EQUIVALENT	SUDCO PART
125 CC				
TMS-JN125/56	2.56 mm	richer	400, 390, 380, 370, 360	007-091
TMS-JN125/57	2.57 mm	↓	400, 390, 380, 370, 360	007-092
TMS-JN125/58	2.8 mm	leaner	400, 390, 380, 370, 360	007-093
250 CC				
TMS-JN250/57	2.57 mm	richer	380, 370, 360, 350, 340	007-095
TMS-JN250/58	2.58 mm	↓	380, 370, 360, 350, 340	007-096
TMS-JN250/59	2.59 mm	leaner	380, 370, 360, 350, 340	007-097

NEEDLE PART NUMBERS

125 cc = J8-6EL 11-15 — (400) 11 or (390) 12, (380) 13, (370) 14, (360) 15 (400-360)

250 cc = J8-6 CEM01-05 — (380) 01 or (370) 02, (360) 03, (350) 04, (340) 05 (380-340)

Important Note: If your current correct jetting using a TMS Carb falls within this guideline table, you may achieve improved performance with the pro-option kit.
Example: TMS 38 with 6DGY04-57 and 360 main jet, choose TMS-JN250/57.

Mikuni Main Jets

Main Jets

The main jet meters the amount of fuel entering the needle jet. Main jets control the fuel flow at the full throttle opening. The size numbers of the main jets run from smaller (leaner) to larger (richer). For example, if a 4/042 #150 main jet is being used, and a leaner main jet is required, one would use a #145 or lower.

Mikuni No.	Type	Sizes
4/042 	**Large Hex** -fits needle jets 159, 166, 176 183, 188, 192, 193, 205, 211, 224	#50-#200 in increments of 5. (#200 - #500 in increments of 10
N100/604 	**Large Round** -fits needle jet 171, 188, 196	#50-#210 in increments of 2.5 (e.g. 50, 52.5, 55, 57.5, etc.)
M10/14 	**Small Hex**	#50-#200 in increments of 5.
N102/221 	**Small Round** -fits needle jets Same as large round type	#30-#190 in increments of 2.5 #190-#220 in increments of 5.0
N208.099	**Press In** late model Ducati CV Yamaha CV	(See Mikuni Catalog)

Large Hex

4/042		4/042		4/042	
004-070	50	004-095	175	004-125	400
004-071	55	004-100	180	004-126	410
004-072	60	004-101	185	004-127	420
004-073	65	004-102	190	004-128	430
004-074	70	004-103	195	004-129	440
004-075	75	004-104	200	004-130	450
004-076	80	004-105	210	004-131	460
004-077	85	004-106	220	004-132	470
004-078	90	004-107	230	004-133	480
004-079	95	004-108	240	004-134	490
004-080	100	004-109	250	004-135	500
004-081	105	004-110	260	004-137	520
004-082	110	004-111	270	004-139	540
004-083	115	004-112	280	004-141	560
004-084	120	004-113	290	004-143	580
004-085	125	004-115	300	004-145	600
004-086	130	004-116	310	004-146	620
004-087	135	004-117	320	004-147	640
004-088	140	004-118	330	004-148	650
004-089	145	004-119	340	004-149	660
004-090	150	004-120	350	004-150	680
004-091	155	004-121	360	004-151	700
004-092	160	004-122	370	004-152	710
004-093	165	004-123	380	004-153	720
004-094	170	004-124	390		

Small Hex

M10/14	
004-224	50
004-225	55
004-226	60
004-227	65
004-228	70
004-229	75
004-230	80
004-231	85
004-232	90
004-233	95
004-234	100
004-235	105
004-236	110
004-237	115
004-238	120
004-239	125
004-240	130
004-241	135
004-242	140
004-243	145
004-244	150
004-245	155
004-246	160
004-247	165
004-248	170
004-249	175
004-250	180
004-251	185
004-252	190
004-253	195
004-254	200

Small Round

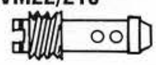
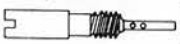
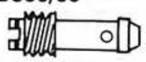
N102/221	
004-255	50
004-256	52.5
004-267	55
004-268	57.5
004-269	60
004-270	62.5
004-271	65
004-272	67.5
004-273	70
004-274	72.5
004-275	75
004-276	77.5
004-277	80
004-278	82.5
004-279	85
004-280	87.5
004-281	90
004-282	92.5
004-283	95
004-284	97.5
004-285	100
004-286	102.5
004-287	105
004-288	107.5
004-289	110
004-290	112.5
004-291	115
004-292	117.5
004-293	120
004-294	122.5
004-295	125
004-296	127.5
004-297	130
004-298	132.5
004-299	135
004-300	137.5
004-301	140
004-302	142.5
004-303	145
004-304	147.5
004-305	150
004-306	152.5
004-307	155
004-308	157.5
004-309	160
004-310	162.5
004-311	165
004-312	167.5
004-313	170
004-314	172.5
004-315	175
004-316	177.5
004-317	180
004-318	182.5
004-319	185
004-320	187.5
004-321	190
004-322	192.5
004-323	195
004-324	197.5
004-325	200

Large Round

N100/604	
004-160	50
004-161	52.5
004-162	55
004-163	57.5
004-164	60
004-165	62.5
004-166	65
004-167	67.5
004-168	70
004-169	72.5
004-170	75
004-171	77.5
004-172	80
004-173	82.5
004-174	85
004-175	87.5
004-176	90
004-177	92.5
004-178	95
004-179	97.5
004-180	100
004-181	102.5
004-182	105
004-183	107.5
004-184	110
004-185	112.5
004-186	115
004-187	117.5
004-188	120
004-189	122.5
004-190	125
004-191	127.5
004-192	130
004-193	132.5
004-194	135
004-195	137.5
004-196	140
004-197	142.5
004-198	145
004-199	147.5
004-200	150
004-201	152.5
004-202	155
004-203	157.5
004-204	160
004-205	162.5
004-206	165
004-207	167.5
004-208	170
004-209	172.5
004-210	175
004-211	177.5
004-212	180
004-213	182.5
004-214	185
004-215	187.5
004-216	190
004-217	192.5
004-218	195
004-219	197.5
004-220	200
004-221	202.5
004-222	205
004-223	210

Mikuni Pilot Jets

Pilot Jets

Mikuni No.	Sizes	Application
VM22/210 	#10-#95 increments of 2.5, to #30 by "5" from #30 to #95	Most Mikuni Carbs
VM28/213 not shown	#15-#40 in increments of 2.5 (6 holes)	Z-1 1972 Mikuni carb
VM28/486 	#12.5 - #65 in increments of 2.5 (8 holes)	1973-78 Z-1, GS750, RS36m, RS38mm
VM28/1001 not shown	#15-#65 in increments of 2.5	22 Flange (1000cc, 2 cycle,Banshee, RZ,Blaster ,Yam)
BS30/96 	#30-#60 increments of 2.5	OEM CV Carb

VM22/210

Order No.	Size
004-000	#10
004-001	#12.5
004-002	#15
004-003	#17.5
004-004	#20
004-005	#22.5
004-006	#25
004-007	#27.5
004-008	#30
004-009	#35
004-010	#40
004-011	#45
004-012	#50
004-013	#55
004-014	#60
004-015	#65
004-016	#70
004-017	#75
004-018	#80
004-067	#85
004-068	#90
004-069	#95

VM28/213

Order No.	Size
004-019	#15
004-020	#17.5
004-021	#20
004-022	#22.5
004-023	#25
004-024	#30
004-025	#35
004-026	#40

VM28/1001

Order No.	Size
004-039	#15
004-050	#17.5
004-040	#20
004-051	#22.5
004-041	#25
004-042	#30
004-043	#35

VM28/1001 *(continued)*

Order No.	Size
004-044	#40
004-045	#45
004-046	#50
004-047	#55
004-048	#60
004-049	#65

VM28/486

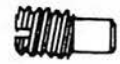
Order No.	Size
004-027	#12
004-028	#15
004-029	#17.5
004-030	#20
004-031	#22.5
004-032	#25
004-033	#27.5
004-034	#30
004-035	#35
004-036	#40
004-037	#45
004-038	#50
004-560	#55
004-561	#60
004-562	#65

BS30/96

Order No.	Size
004-054	#30
004-055	#32.5
004-056	#35
004-057	#37.5
004-058	#40
004-059	#42.5
004-060	#45
004-061	#47.5
004-062	#50
004-063	#52.5
004-064	#55
004-065	#57.5
004-066	#60

Air Jets

Meters the air flow through the passage to and into the needle jet. It acts as a fine tuning component in regulating the fuel-air mixture. This is especially important when a bleed type needle jet is used.



Mikuni No.	Application
BS30/907	26 thru 44mm Spigot
B42/55	OEM CV

BS30/97

002-150	0.5
002-151	0.6
002-152	0.7
002-153	0.8
002-154	0.9
002-155	1.0
002-156	1.1
002-157	1.2
002-158	1.3
002-159	1.4
002-160	1.5
002-161	1.6
002-162	1.7
002-163	1.8
002-164	1.9
002-165	2.0

B42/55

002-166	#160
002-167	#165
002-168	#170
002-169	#175
002-170	#200
002-171	#210

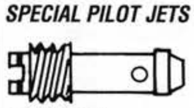
Starter Jet

(Fits TM32 thru 38)

VM17/1002

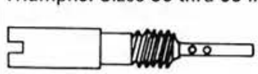
004-400	#15
004-410	#60
004-402	#20
004-414	#80
004-406	#40
004-418	#100

SPECIAL PILOT JETS



N151.067

Used in original equipment OEM carburetors including late model Triumphs. Sizes 30 thru 55 in increments of 2.5



N224.103

OEM for Yamaha YZ motorcycles, original equipment in Mikuni TMX carburetors. Sizes 30 thru 65 in increments of 2.5