Amal Concentric Technical Manual

IF YOU TOOK the time to read the last section on the retired Monobloc carb, then you know that the newer Concentric (though basically a superior design) had its share of problems. Designed in bugs, as it were. Most of the hassle was caused by a lack of available information from abroad. The few tuners who knew what they were doing sure didn’t go out of their way to let anyone else know.

The Concentric was a lighter, slimmer carb than the Monobloc and featured a float bowl directly under the main jet. This feature allowed the bike to be leaned at severe angles without affecting the flow of fuel to the main jet. However, the Concentric dealt the four stroke riders a serious jolt by removing the normal pilot jet that the Monobloc had. In its place was an insidious little pressurized bushing that defied tuning. Two stroke riders didn’t have this problem, as all the two-stroke carbs came with a removable pilot jet. However, they had their own problems with frothing and slide breakage. Later models of the Concentric cured many of these problems, but the four stroke carbs are still coming through as of this writing with a non-adjustable pilot circuit.

New magnesium Amal Concentric carb is now on the market. It looks just like the old one, but only weighs 15 ounces—about half the weight of the standard model. The velocity stack adds to performance, bringing the effective venturi size up a few steps higher than indicated.

The Mark II promises to change all that.

One advantage that the Concentric did offer, though, was that it could pull more horsepower on the top end out of a given motor than other comparative carbs. Dyno tests have repeatedly backed this up. The bore of the Concentric is less interrupted than any other carb on the market as of this writing. Simply put, a 36mm Amal will flow more than a 36mm anything else. What it does to the low end response of the bike, is still open to hot debate, however.

Concentric carbs come in three series:
The 600 Series goes 22mm, 24mm and 26mm. The 900 Series has 28mm, 30mm and 32mm and is probably the most common Amal in use today. The 1000 Series is generally found on racing machines and comes in 34mm, 36mm and 38mm.

A wide range of jets is available:
Pilot jets ... 15 to 70 in steps of 5.
Needle jets ... 105 to 110 in one point jumps; special jets go to 125 in 5 point jumps.
Main jets ... 60 thru 500 in 5 point jumps and 500 thru 1000 in 40 point jumps. Alcohol jets go from 1000 to 1900 in 100 point jumps.

Like other Amals, all the jets are interchangeable from carb to carb. Even the new Mark II can use the same jets that were good decades ago.

The only big changes in jetting is in the four stroke to two stroke. Pilot jets and main jets are identical in both, but needle jets and spray tubes vary. And the jet holders are different. Here is where most tuners make their mistakes. Needle jets part number for four strokes is 622/122, while the two stroke number is 622/079. A four stroke spray tube is called by its proper Christian part number of 622/074 and the two stroker is 622/075. Look at the photos for a comparison. The four stroke needle jet has a hole drilled through it and meters...
If this sounds like a plug, it is. But a highly recommended Jerry sells all Amal parts and will handle most problems. Give him a call if you have any question regarding Amals. But don’t collect, OK.

One of Jerry’s favorite tuning tricks is to use the two-stroke carb (with the adjustable idle circuit) and convert it to four-stroke parts and surprise people with the resultant performance gains.

He claims that most of the hassle that has been experienced with Concentric is because people have never known how to tune them and set them up properly in the first place. Additionally, he recommends a VITON tipped foot needle be installed in any Amal and most of the loading up problems will go away. Apparently, the standard foot needle allows gas to dribble in the motor at the oddest times. He sells this foot for a buck and a half and it fits
all Amals, from the oldest to the newest. And it will be standard equipment on the new Mark II carb.

Burak used to do all the tuning for J. N. Roberts. You may have heard of him. One of the tricks he uses to do on J. N.'s Husky, was to use the smallest capacity float (there are two available) and the biggest banjo fitting available. The 5½” I.D. fitting flows like a ruined kidney. This gave less area in the float chamber and made J. N.'s bike far less susceptible to changes in altitude. But don't try this unless you get a lot of gas flowing in the float chamber.

Slides in Concentric Series carbs are few, but apparently sufficient for tuning. Needle selection is limited. The 600 Series goes from 2.0 cutaway to 4.0 in .5 jumps. The 900 Series from 2.0 to 5.0 in the same jumps, and the 1000 Series from 2.0 to 3.5 likewise. The newer Mark II will go from 2.0 to 4.0.

Jerry feels that whatever shortcomings the Concentric may have, the performance gains are worth it. But, the new Mark II is supposed to have all the benefits and none of the hassles.

Series 600 and 900 Carburetors

GENERAL INFORMATION

These carburetors are supplied right hand as standard with the tickler, throttle stop and pilot air adjustment positioned on the right hand side as viewed from the air intake end. Left hand instruments are available with tickler,

<table>
<thead>
<tr>
<th>Series</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
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<tr>
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<td>0.34</td>
<td>0.18</td>
<td>0.76</td>
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</table>

* This dimension only applies to carburetors fitted with drain plug (depended mate).
** Flange radius.
*** Hole diameter.
throttle stop and pilot air adjustment on the opposite side.

Carburetors are normally supplied with an air valve which is cable operated from the handlebar position, if requested this valve can be omitted and the mixing chamber top sealed with a plug screw.

The standard range of float chamber connections available are as follows:

Banjo part No. 375/068 Single feed for 3/16" bore pipe.

Banjo Part No. 376/090 Single feed screwed 1/4" BSP complete with nut and nipple for copper pipe.

Banjo part No. 376/097 Single feed for 1/4" bore flexible pipe.

Banjo part No. 376/098 Double feed for 1/4" bore flexible pipe.

Banjo part No. 376/108 Double feed screwed 1/4" BSP complete with nuts and nipples for copper pipes.

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**Important**

When incorporating the latest metering system the following three items must be fitted as a set: Throttle Needle 622/124, Needle Jet 622/122 and Jet Holder 622/128.

It is permissible to fit the latest Jet Holder 622/128 with the original Throttle Needle and Needle Jet, but not possible to fit the new Needle and Needle Jet with the original Jet Holder, obviously the Needle and Needle Jet must be paired.

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*Pilot Jet is replaced by a Pilot Bush positioned here on certain models*
### Carburetor Settings List 1969, 1970

<table>
<thead>
<tr>
<th>AIRCRAFT</th>
<th>1969</th>
<th>1970</th>
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### HOW THE CARBURETTER WORKS

The carburettor proportions and stoichiometry require the absorption of fuel at the intake manifold, and therefore the power, and at all of the positions of the throttle the mixture is automatically controlled. The throttle control has five settings: fast idle, slow idle, take-off, high and low. The fast idle setting is for starting the engine, the slow idle setting is for idling, the take-off setting is for taking off, the high setting is for cruising at high speeds, and the low setting is for cruising at low speeds. The carburettor maintains a constant level of fuel at the jets and cuts off the supply when the engine stops.

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### HINTS AND TIPS

**STARTING** from cold. Turn on fuel supply, set ignition (if manually operated) for best slow running, depress kickstand to floor, close throttle, open close air valve, open throttle slightly and start engine. When engine starts open air valve and close throttle; if engine begins to idle, partially close the air valve until engine is warm, then set in fully open position.

**STARTING**, engine hot. Open throttle slightly and start engine. It should not normally be necessary to flood the float chamber or close the air valve when starting a warm engine.

**STARTING**, general. Experience will show when it is necessary to flood the carburettor or use the air valve and also the best setting of the throttle valve. If the carburettor has been over-flushed or strangled, which would result in a wet engine and over-rich starting mixture—fully open the throttle valve and air valve, give the engine several turns to clear it Ron, then start again with the air valve fully open and the throttle valve slightly open.

**STARTING, SINGLE LEVER CARBURETTORS. OPEN THE THROTTLE VERY SLIGHTLY FROM THE IDLING POSITION AND FLOOD THE CARBURETTER MORE OR LESS ACCORDING TO THE ENGINE BEING COLD OR HOT RESPECTIVELY.**

**CABLE CONTROLS.** See that there is a minimum of backlash when the controls are set back and that any movement of the handlebar does not cause the throttle to open; this is done by the adjusters on top of the carburettor after releasing the adjuster locknuts. See that the throttle valve shuts down freely, then resets locknuts.

**PETROL FEED.** A filter gauge is fitted at the inlet to the float chamber, to remove this gauge unscrew the banjo bolt (9) and the banjo and filter gauge can then be removed. Before replacement ensure that the filter gauge is both clean and undamaged and check fuel supply by momentarily turning on fuel tap. Vertical leaks in petro pipes must be avoided to prevent air locks. Float chamber flooding may be due to a worn float needle but nearly all flooding and blockages may be a filter gauge with the wrong size or impurities from the tank. Periodically clean out filter gauge and float chamber, until the trouble ceases or alternatively the tank may be drained and swilled out, etc.

**FIXING CARBURETTOR AND AIR LEAKS.** Erratic slow running is often caused by air leaks, so verify there are none at the point of attachment to the carburettor and fix them. Also in old machines look out for air leaks caused by a worn throttle or worn inlet valve guide.

**BANGING IN EXHAUST** may be caused by too weak a pilot mixture when the carburettor is closed or nearly closed, also may be caused by too rich a pilot mixture and an air leak in the exhaust system. The reason in either case is that the mixture has not been set in the cylinder and has been left in the hot silencer. If the banging happens when the cylinder is wide open the trouble will be ignition—not carburation.

**BAD PETROL CONSUMPTION** of a new machine may be due to flooding, caused by improperly fitting the petrol tank, or any other fault. The fuel must pass from the float needle seat and so prevent its valve from closing. flooding may be caused by a worn float needle valve. Also bad petrol consumption will be apparent if the needle jet (24) has worn; it may be remedied or improved by lowering the needle in the carburettor, but if it cannot be fixed—then the only remedy is to get a new jet and needle.

**AIR FILTERS.** These may affect the jet setting, so if one is fitted afterwards to the carburettor the main jet may have to be smaller. If a carburettor is fitted with an air filter and the engine is run without it, take care not to overheat the engine due to too weak a mixture. Testing with the air valve (5), will indicate if a larger main jet and higher needle position are required.

**EFFECT OF ALTITUDE ON CARBURETTER.** Increased altitude tends to produce a rich mixture. The greater the altitude, the smaller the main jet required. Carburettors are set for altitudes up to 3,000 feet approximately. Carburettors used at altitudes above 3,000 feet should have a reduction in main jet size of 5 per cent, and thereafter for every 1,000 feet in excess of 3,000 feet altitude further reductions of 4 per cent should be made.

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<thead>
<tr>
<th>AIRCRAFT</th>
<th>1971</th>
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**RE-ASSEMBLING**

When replacing the valve assembly see that the jet needle goes into the holes in the choke tube, needle jet, and main jet and that both the throttle and air valve spring locates correctly in the mixing chamber too.

When refitting the float, engage the float needle recess in the horse shoe section of the float and fit in float chamber. Check that the needle jet (24) jet holder (28) and main jet (24) are fully tightened together before screwing assembly into the body.

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**HOW TO TRACE FAULTS**

There are only two possible faults in carburation, either richness or weakness of mixture.

**INDICATIONS OF:**

**RICHNESS.**
- Black smoke in exhaust
- Petrol spraying out of carburettor
- Four strokes, rattle-stroking
- Heavy, lumpy running
- Sparking plug sooty

**WEAKNESS.**
- Splicing back in carburettor
- Erratic slow running
- Overheating
- Acceleration poor
- Engine goes better if:
  - Throttle is not wide open or
  - Air Valve is partially closed.

If richness or weakness is present, check if caused by:

1. **Petrol feed.**
   - Check that jets and passages are clear, the filter gauze in float chamber bans connection is not choked with foreign matter, and that there is ample flow of fuel.
   - Check there is no flooding.

2. **Air leaks.**
   - At the connection to the engine or due to leaky inlet valve stems.

3. **Defective or worn parts.**
   - As a loose fitting throttle valve, worn needle jet, loose jets.

4. **Air cleaner being choked up.**

5. **Air cleaner having been removed.**
   - Removing the silencer or running with a straight through pipe requires a richer setting.

Having verified the correctness of fuel feed and that there are no air leaks, check over ignition, valve operation and timing. 

AT THROTTLE POSITION shown on page 7, Fig. 3, to test if mixtures are rich or weak. This is done by partially closing the air valve, and if engine rate better weakness is indicated, but if engine runs worse richness is indicated.

To remedy, proceed as follows:

**To cure richness.**
- Position 1: Fit smaller main jet.
- Position 2: Screw out pilot air adjusting screw.
- Position 3: Fit a throttle with larger cutaway (page 6).
- Position 4: Lower needle one or two grooves (page 6).

**To cure weakness.**
- Fit larger main jet.
- Screw pilot air adjusting screw in.
- Fit a throttle with smaller cutaway (page 6).
- Raise needle one or two grooves (page 6).

**NOTE.** It is not correct to cure a rich mixture at half throttle by fitting a smaller main jet because the main jet may be too large for power as full throttle: the proper thing to do is to lower the needle.

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**PARTS TO TUNE UP WITH**

**THROTTLE ADJUSTING SCREW (26).** Set this screw to hold the throttle open sufficiently to keep the engine running when the twist grip is off. An "O" ring is fitted to the screw to hold this adjustment by friction.

**MAIN JET (29).** The main jet controls the petrol supply when the throttle is more than three-quarters open, but at smaller throttle openings although the supply of fuel goes through the main jet, the amount is diminished by the metering effect of the needle in the needle jet. Each jet is calibrated and numbered so that its exact discharge is known and two jets of the same number are alike. NEVER REAMER A JET OUT, GET ANOTHER OF THE RIGHT SIZE. The bigger the number the bigger the jet.

To remove the main jet, remove the float chamber, the exposed main jet can then be unscrewed from the jet holder (28).
Carburetor Settings List

EXPLANATION OF CARBURETTER
THROTTLE OPENINGS

NEEDLE AND NEEDLE JET (22 and 24). The needle being taper
either allows more or less petrol to pass through the needle jet as the
throttle is opened or closed throughout the range except when idling or
neatly full throttle. The positions of the needle jet slot, the relation to the
throttle valve can be set according to the mixture required by repositioning the
jet needle clip in any of three positions thus raising or lowering it. Raising
the needle richer the mixture and lowering it weakens the mixture at
throttle openings from one-quarter to three-quarters open (see fig. 5.
page 7). The throttle needles are marked with a single groove around the
top diameter for use on the 600 series carburettor, the 500 series car-
burretted needles are identified by two grooves around the top of the needle.
throttle needles indelible by two grooves are used on certain models for
both series 600 and 500 carburetters.

THROTTLE VALVE CUT-AWAY. The atmospheric side of the
throttle is cut away to influence the depression on the main fuel supply
and thus gives a mass of tuning between the pilot and needle jet range
of throttle opening. The amount of cut-away is recorded by a number
marked on the throttle valve, viz.: 632/3 means throttle valve type 632
with No. 3 cut-away; larger cut-aways, say 4 and 5, give weaker mixtures
and 2 a richer mixture.

AIR VALVE (3) is used only for starting and running when cold, and
for experimenting with, otherwise run with it wide open.

TICKLER (25), a small plunger spring loaded, fixed in the carburter
body. When pressed down on the float, the needle valve is allowed to
move to the top of the carburettor, this enriches the mixture until the level of the petrol
subsidises to normal.

ALCOHOL FUELS. When using alcohol fuels the following new
components are necessary. A metallic tube preferably double feed if not
already fitted, float chamber 632/061, banjo bolt washer 13/163, needle jet
632/1000, jet needle 632/099 or "B/99" according to type of carburettor,
filter gauze 376/0938 and banjo w.s. 1/14/075.
The main jet must be increased for straight alcohol by approximately 150%.
The final setting must be a question of trial and error according to the
nature of fuel used.

When using alcohol fuels it is advisable to err on the rich side to avoid
engine overheating.

HOW TO TUNE UP

PHASES OF AMAL NEEDLE JET CARBURETTER
THROTTLE OPENINGS

Up to 1/2 open from 1/2 open 1/2 open 2/3 to full open
PILOT JET THROTTLE NEEDLE- MAIN JET
CUT-AWAY POSITION SIZE

SEQUENCE OF TUNING

FIG. 5

TUNE UP IN THE FOLLOWING ORDER:

NOTE. The carburetted is automatic throughout the throttle range—
the air valve should always be wide open except when used for starting or
until the engine has warmed up. We assume normal petrol is used.

READ REMARKS ON PAGES 6 AND 7 for each tuning device and
get the meter going perfectly on a quiet road with a slight up gradient
so that on test the engine is pulling.

1st, MAIN JET with throttle in position 1 (fig. 5).
If at full throttle the engine runs "heavily" the main jet is too large.
If at full throttle by slightly closing the throttle or air valve the engine
seems to have better power, the main jet is too small.

TWO STROKE SETTINGS

FOUR STROKE SETTINGS

SETTINGS SUGGESTED AS A BASIS FOR TUNING: WHEN NO SETTING IS LISTED ABOVE
Carburetor Settings
1973

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<td>27</td>
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**SPECIAL NOTES:**
- Always use the correct jet size for your carburetor type.
- Check the choke size to ensure proper airflow.

**TUNING TWIN ENGINES WITH TWIN CARBURATORS**

Where each cylinder has its own Carbureter.

First of all, slacken the Throttle stop screws and put the Twist Grip into the shut off position to allow the Throttles to shut off, there should be a slight backlash in the cables which backlash can be obtained, if necessary, by screwing in the cable adjusting screws on the top of the Carbureter after releasing lock nuts. Then, with the Handlebars in the normal position, and with the Throttles closed, adjust the cable adjusting screws so that on the slightest opening of the Twist Grip, both Throttles begin to open simultaneously, then reset lock nuts.

To set the Carburaters, follow the procedure as given on page 7, and bear in mind these "Hints," which may be useful:

- Main Jet size are of course selected by checking the effect of the Mixture on the Sparking Plug after taking a run at full throttle over a straight piece of road: the smallest pair of jets that give the best maximum speed are usually correct provided the plugs do not show any signs of excessive heat. It might be that for really critical tuning, one Carbureter might require a slightly different jet size than the other.

For slow running, set the Twist Grip to make the Engine run slowly but not too fast, then gently screw in the Throttle stop to just hold the Throttles in that position, and return the Twist Grip into the shut off position, leaving the Engine running on the Throttle Stops.

The next thing to do is to set each Carbureter according to paragraph 2, on page 7, to prevent the idling by screwing down the Throttle Stop Screws and adjusting the Pilot Air Screws accordingly.

Regarding the setting of the Pilot, a fairly satisfactory method is to detach one Sparking Plug lead, and set the Pilot Air Adjusting Screw on the other Cylinder as a single unit, and then reverse the process in the other Cylinder. It may be found that when both leads are connected to the Sparking Plugs, the Engine runs slightly quicker than desirable, in which case, a slight readjustment of the Throttle Stop Screws will put this right. It is essential that the speed of idling on both Cylinders is approximately the same, as this will either make or mar the smoothness of the go-away on the initial opening of the Throttle.

It is essential with Twin Carburaters that the Throttle Slides are a good fit in the bores, and also that there is no suspicion of air leaks at either of the flange attachments to the Cylinder.

Regarding the lower end of the Throttle range, which is always the more difficult to set, one can only take excessive pains to make sure that the Control Cables are perfectly adjusted, without any excessive backlash difference in the amount of both lash between one Carburater and another: otherwise one throttle slide will be out of phase with the other, and so resulting in lumpy running.

To check the opening of the Throttle simultaneously, shut the Twist Grip back so that the Throttles are resting on the Throttle Stop Screws in their final position of adjustment: then insert the fingers into the air intakes and press them on the Throttles and with the other hand, gently open by the Twist Grip and feel that the Throttles lift off their stops at the same time.
EVEN THOUGH THE Mark II is a breakthrough, it still has to be tuned the same way as the Concentric, or even the stately Monobloc. Refer to these sections for tuning procedures and jetting specifications. The same jets are used throughout, so you don't have to throw away your box of old jets. The only new jets you'll need, will be the new high speed air bleeds, and there are only three of these.

Series numbers in the new Mark II will be similar to the Concentric numbering system. All they've done is add a "2" in front of the basic numbers. The 2600 Series Mark II will come in 22, 24 and 26mm bore. The 2900 Series in 28, 30, 32 and 34mm, while the 2000 Series will be 36, 38 and 40 millimeters across the throat. This 40 should be a highly sought after number.

Probably the single biggest change to the Mark II (other than spiffy looks) is the first ever "two pilot" system. Now the tuner has a choice of not only what pilot jet to use, but where he can put it. It can be located near the front or the back of the carb, depending on the need of the motor. Two stroke motors (with poor pressure drops at very low rpm) will benefit from a location closest to the venturi. The pilot hole that isn't being used is simply blocked off. Naturally, standard pilot jets are used.

Other features of the Mark II include the following, in no particular order:
1. Plastic cap, so you don't have to fart around with screws.
2. 5 position needle, for finer tuning without changing the needle.
3. Thicker slide. That should eliminate the breakupage problem of the past.
4. Cold start jet for choke. Uses a standard pilot jet. (larger)
5. A high flow ball that increases flow.
6. Removable high speed air bleed jets for finer tuning.
7. Choice of floats. (But, you've had this all along and didn't know it)
9. Two float tubes vented high up for cleaner carbs. If there is any leakage, it won't dribble all over the motor like in days of old.
10. Lighter weight. The new carb is aluminum and weighs 1¾ pounds, while the Concentric weighed 2¾ pounds.

Other than the above reasons, the whole carb looks like it was made much more carefully than Amals of old. We're going to be trying some of them soon and checking results on the dyno and on the track. We'll keep you posted. Oh yes, they'll be coming as standard equipment on several bikes, including Bultaco and Montesa.
All Mark II carbs will be rubber mounted for protection against frothing from vibration.

### Dimensions

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<th></th>
<th>A</th>
<th>B</th>
<th>C*</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
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<td>4</td>
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<td>43</td>
<td>35, 38 or 40</td>
</tr>
</tbody>
</table>

* Diameter

† Tapped holes: M5-6H (Series 2800: M5-8H)

‡ Bore diameter

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* modern cycle 53
Needle, clip and slide from 36mm carb.

Two floats are available. Small volume one is on right.

New cap and spring/clip combo look very Mikuni-ish.

Needle jet, jet holder, main jet and screen—in order.

Different size flow fittings will be available for Mark II.
New bell holds the high speed air bleeds in place.

Removable high speed air bleeds.

Burak-Bye offers this racing bell as an accessory for the Mark II as well as the Concentric.
High speed air bleeds. Richest on the left, leanest on the right.

Old style small flow banjo fittings are on the left. High flow one is at right.

Two stroke main jet holder on left; four stroke on right.

New line of jets is bench flowed for markings.

### Service Parts for Mark 2 Amal Concentric Carburetors

<table>
<thead>
<tr>
<th>Key to illustration</th>
<th>Component</th>
<th>Carburetor Series 2000</th>
<th>Carburetor Series 2900</th>
<th>Carburetor Series 2900</th>
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<tr>
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<td>Cable adjuster</td>
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<tr>
<td>2</td>
<td>Cable-adjuster locknut</td>
<td>5/077</td>
<td>6/077</td>
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<td>mixing-chamber top (standard)</td>
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<td>2622/064</td>
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<tr>
<td>4</td>
<td>Throttle slide spring</td>
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<td>Needle retaining disc</td>
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<td>Needle clip</td>
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<tr>
<td>7</td>
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<td>Throttle needle (paired with 4-cycle jet below)</td>
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<tr>
<td>9</td>
<td>Throttle needle (for alcohol only)</td>
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<td>10</td>
<td>Carburetor body assembly</td>
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<td>Cold start plunger assembly (lever operated)</td>
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<tr>
<td>12</td>
<td>Cold start lever and bracket assembly</td>
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<td>Air intake adaptor</td>
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<tr>
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<td>Air intake adapter securing screws</td>
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<td>Filter</td>
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Two stroke needle jet on left; four stroke on right.

56 modern cycle
### Needle Markings Chart

Needles are marked with grooves.

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Four stroke spray tube on left, part no. 622/074. Two stroker on right, part no. 622/075.