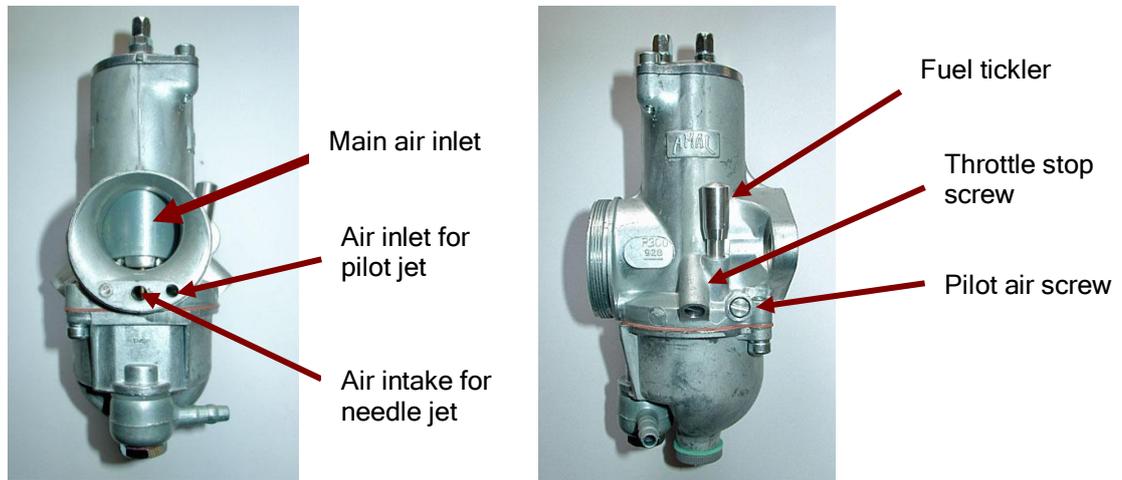


Notes on tuning Amal Concentric Mk 1

The Amal Concentric Mk 1 Jet Systems



When preparing to tune the AMAL Concentric Mk 1 you need to be aware that the carburettor has four jet systems, these control the fuel mixture at different throttle openings. So, for example, if the problem with your engine is an erratic idle the answer won't be to change the main jet. The four jet systems are semi-independent, with a small degree of over-lap as you change from one throttle setting to another.

A petrol engine requires different ratios of fuel and air for different stages of its operation. So for starting in cold conditions a rich mixture, of about 1 part fuel to 7 parts air, is ideal; for tickover about 1 part fuel to 12 parts air; for general use 1 to 15 (known also as the 'stoichiometric'); for full throttle use about 1 part fuel to 14 parts air. The four systems correspond to the following throttle positions:

- **closed to 1/8 open:** idle system: controlled by the pilot jet and fine tuned with the pilot air screw and throttle stop screw
- **1/8 - 1/4:** the cut-away portion of the throttle valve
- **1/4 - 3/4:** the needle and needle jet
- **3/4 to full throttle:** the main jet

idle: when the engine is at tickover, with the throttle rotor closed, the **pilot jet** regulates the fuel, the pilot air screw will regulate the air. The throttle stop screw sets the height of the throttle valve when the throttle rotor is closed. Tickover speed can be regulated by adjusting the pilot air screw and the throttle stop screw.

1/8-1/4: air enters the carburettor through the air intake for the needle valve and via the **cut-away** in the throttle. A small difference in the cut-away may make a significant difference to the running of the engine at this throttle opening. The difference between a number 3 slide and a number 3½ slide is only 1/32 inch.

1/4-3/4: as the twist grip rotor is turned the **throttle valve** is raised in the carburettor body and draws the **throttle needle** up with it. The upper section of the throttle needle has parallel sides and almost fills the drilling through the centre of the needle jet. The lower part of the throttle needle has tapered sides, as the needle is raised in the jet, the taper allows an increasing quantity of petrol through the jet. The throttle valve regulates air entering the carburettor.

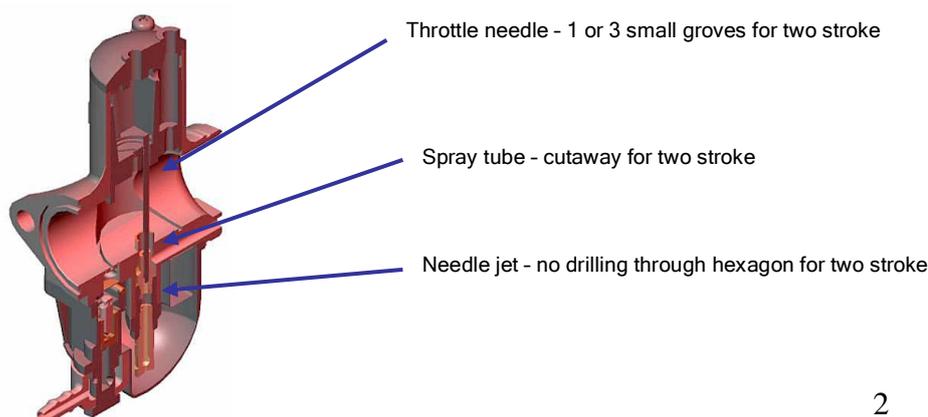
The throttle valve, the throttle needle and the needle jet regulate the amount of air and fuel for any given throttle opening between ¼ and ¾ throttle, together they maintain the correct mixture ratio.

¾-full open: the **main jet** regulates the fuel when the throttle is fully open. In this position the needle is so high that fuel passes unrestricted through the main jet. The size of the main jet regulates the amount of fuel at full throttle.

Two Stroke or Four Stroke?

The Amal Concentric Mk 1 is available for four stroke or two stroke applications: the two stroke set-up has three main differences from the four stroke arrangement:

- 1] throttle needle** (identified for two strokes by either 1 or 3 rings etched on the top of the needle, the four stroke version has 2 identification rings).
- 2] needle jet** (the four stroke jet has a small horizontal drilling through the hexagon, the two stroke does not - to increase pressure at the jet).
- 3] spray tube** (the two stroke version has a cutaway sloping towards the mounting flange, the four stroke has a level top edge).



Fixing the carburettor to the engine

It is very important that the nuts holding the flange of the carburettor are not over-tightening. Any over-tightening may distort the carburettor body and leave it unusable.

The following hints will help avoid this problem:

- the surface to which the carburettors are bolted must be flat and clean - this includes the manifold surface on the cylinder head and any heat insulators or spacers
- use plain nuts and spring washers
- the nuts should be tightened until the spring washers are just flattened and then further tightened no more than a quarter turn - if you choose to use nyloc nuts be very careful not to over-tighten them
- thicker O rings are used on some Concentrics. If using the thicker O ring the nuts should be tightened until the clearance between the carburettor flange and the manifold surface is no less than 0.025 inches
- mount the carburettor to the engine fully assembled with the mixing chamber lid, throttle cable and slide components installed - this ensures maximum rigidity of the assembly while it is being installed
- after tightening ensure that the carb flexes slightly on the flange
- if using a torque wrench the setting should be no more than **4 ft/lbs**

Tuning the Carburettor

1. tune carburettor with engine at normal working temperature

2. check the main jet

Run the bike for some distance at 3/4 - full open

'Cut' the engine with the throttle wide open

Examine the spark plug tip to determine if the carb is correctly set

The colour of the plug firing tip should be between light brown to dark brown, not too sooty or wet and not showing signs of excessive heat bleaching

At full throttle the engine should run evenly with maximum power

> if the engine runs **better with the throttle eased back slightly INCREASE** the main jet size

> **REDUCE** the main jet size if the engine shows signs of being over-rich at full throttle - the signs are a wet plug (test by carrying out a 'plug chop' at full

throttle), black smoke from the exhaust at full throttle and an engine that feels generally lumpy and unresponsive at full throttle

3. adjust the idle

Adjust the **throttle stop screw** so the engine speed is at a fast idle

Adjust the **pilot air screw** to *increase* the engine speed to its fastest possible

Adjust the **throttle stop screw** to achieve your target idle speed

Adjust the **pilot air screw** again to *increase* engine speed to the highest possible

Finally, adjust the **throttle stop screw** to settle the engine at the correct idle speed (repeating the process may help achieve an even better engine idle)

NB - the sequence is

1. **pilot air screw - fast**

2. **throttle stop screw - slow**

4. check the throttle valve cutaway is the correct size

Ride at $\frac{1}{8}$ to $\frac{1}{4}$ throttle, note of how the bike runs and the spark plug colour
If the engine spits or backfires through the exhaust the mixture is too weak - weak fuel mixture burns more slowly and may still be burning when the exhaust or inlet valves are open, burning fuel then escapes into the carb or the exhaust pipe

One cause of weak mixture is air leaks at the carburettor or exhaust pipe
Check for leaks before making any changes to carburetion

If carburettor adjustment is needed fine tune by turning the pilot air screw slightly - inwards will richen the mixture, outwards to weaken it

Where more adjustment is needed the throttle slide may be changed for a slide with a different cutaway: a smaller cutaway for a richer mixture and vice-versa

If the engine is hesitant at $\frac{1}{8}$ to $\frac{1}{4}$ throttle this may indicate that the needle is set too high or the slide cutaway too small, both cause a richer mixture

5. tuning the needle position

Adjust the position of the needle clip - lowering the clip raises the needle and richens the mixture or vice-versa

Start with the needle in the lowest position - i.e. the clip in the top groove

If acceleration is poor or the engine spits back and closing the choke valve improves performance, then richen by lower the needle clip two grooves

If this gives a better result, raise the clip by one groove

If with the clip in the top groove the mixture is still too rich check that the needle or jet are not worn, if they are worn the jet will pass too much fuel and the needle and jet must be replaced. If not worn, fit a smaller needle jet

Finally, check the idle settings is still correct, and adjust if necessary

Concentric Mk 1 Pilot Jets, Starting and Idling

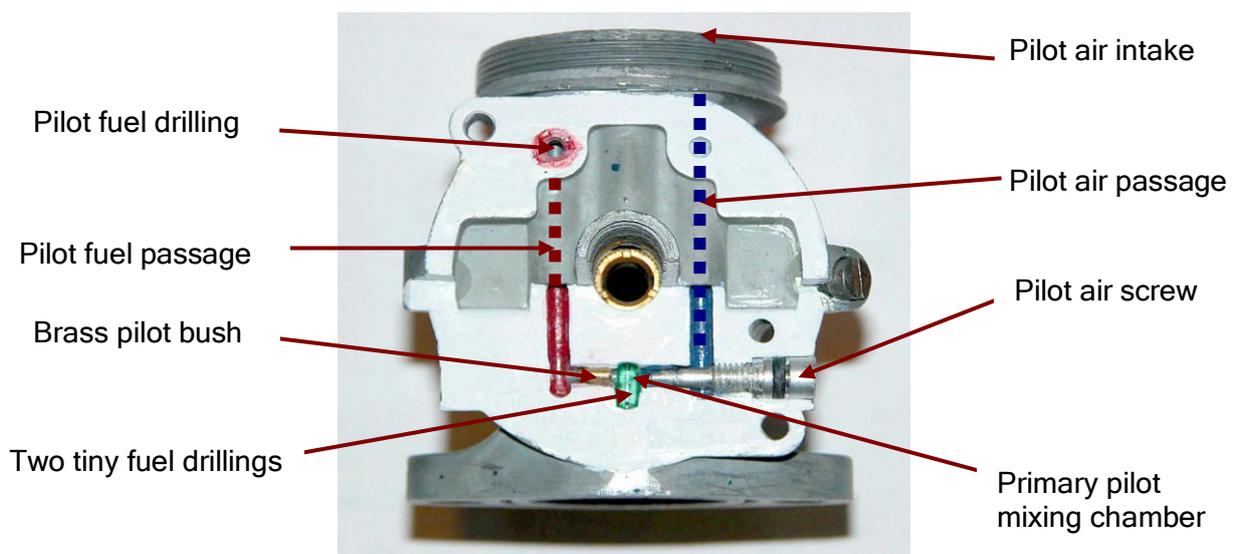
AMAL Mk 1 Concentrics currently are fitted with a brass pilot bush not a removable pilot jet. The fitted bush is size 20.

Burnt exhaust valves are one cause of poor idling that has nothing directly to do with carburetion. This can create similar erratic idling to poorly adjusted carburetion. Here the problem must be dealt with by cylinder head work.

Another cause of poor starting, erratic running and irregular idling is air leaks. These occur if the mounting flange is distorted, usually by over-tightening the flange nuts. Check for air leaks by spraying WD 40 on the manifold with the engine running, air leaks will make the engine revs rise. Check the flange for flatness with a straightedge. Alternatively, place the carb flange down on a flat surface, if the flange is distorted the carb body will rock over its length. Carefully flatten the flange with fine wet and dry paper on a flat surface.

Older or well used carburetors may have excessive wear on the surfaces of the throttle slide and carb body (running without an air filter increases wear). This wear is largely due to both parts being of the same material (zinc alloy). If wear is excessive, air will pass between the two surfaces and weaken the mixture, in this case the carburettor may need to be replaced.

Poor starting, erratic idle and poor low speed running may be caused by a blocked pilot jet. The pilot system has two components: 1) an air way, adjusted with the slow running screw; and 2) an internal fuel way, normally regulated by a fixed brass pilot bush. The brass bush is pressed into a location opposite the air adjusting screw. The fitted jet (size 20) has a very narrow drilling (0.016" dia). Fuel drawn from the float bowl is regulated by the pilot bush before passing through two tiny drillings in the venturi floor. These narrow passages may easily clog with residue or debris and require clearing with an air jet or carb cleaner (avoid using wire probes).

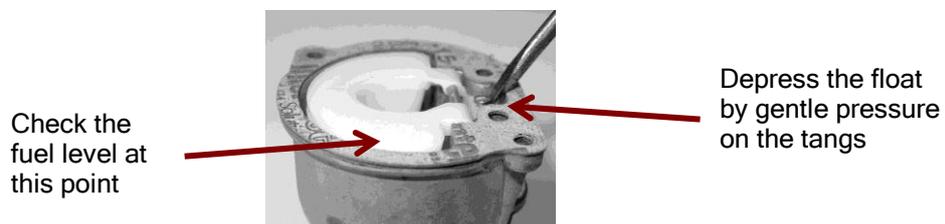


Checking that to determine that the pilot jet fuel ways are clear is easily done. Looking through the carburettor air intake, two tiny holes can be seen on the lower surface of the venturi, just in front of the carb flange. If the passage-ways are clear, carb cleaner squirted into the pilot air inlet will spray up as jets through the two tiny fuel holes (see picture at the top of this article).

Concentric Mk 1 Float Level

The Concentric Mk 1 carburettor was designed to operate reasonably well even if the float level is not absolutely accurate. However, best performance does depend on the float level being set precisely. The designer, Barry Johnson, specified the fuel level to be .170" - .240" below the top edge of the float bowl with gasket fitted. This applied to the original version of the Mk1 Concentric. With the current version of the Mk1 the float height is easily checked, the correct height is when the top surface of the float is parallel with and just above the top face of the float bowl.

To check the float level, remove the float bowl and gently press down on the float tangs until the float needle is fully 'seated'. Do not press on the float needle itself and not to depress the tangs beyond the point where the needle is seated. The top surface of the float should be parallel with the top edge of the float bowl and slightly higher.



An alternative method is to remove the float bowl from the carburettor and, with the float and float needle still in place and the fuel line attached, allow the float bowl to fill under gravity. Again, the top surface of the float should be parallel with the top edge of the float bowl and slightly higher.

If the float height needs adjustment the only effective option is to use the Amal adjustable float, the 'Stay-Up' float (see picture). There are two methods sometimes used to adjust the float height of the standard float but neither method is successful. One is to alter the brass needle-seat. This method is rarely successful as the brass bush is fully seated and is nowadays fixed with a sealant.



The other was to 'tweak' the tangs on the float. However, the plastic has 'position-memory', returning to its original shape. In tests we found that the tangs loose about 50% of their adjusted position over a four day period, while in a couple of weeks they reverted fully to their original shape. For effective adjustment the 'Stay Up' float is recommended.

Difficulty Starting? - The answer may be simple!

Some riders are unsure of the choke operation on the Concentric carb.

- **for cold starting**, the choke valve normally needs to be fully lowered in the carburettor. To achieve this, the handlebar lever must be rotated to the fully 'closed' position - as shown here:



- **when the engine is warm**, the choke valve must be lifted fully clear of the carburettor venturi. To achieve this, the handlebar lever should be moved to the fully 'open' position - as in this picture:

