



Carburettor Synchronisation

Uneven idling, poor throttle response and more vibration than necessary in multi-cylinder engines can be a sign that the carburettors are not in sync. Imagine a team of horses where one wants to gallop, another is moving at a gentle trot while

two others are more inclined to walk. As a result, the galloper strains at the harness in vain, the walkers begin to stumble, the trotter doesn't know if it's coming or going and the driver has had enough.

Requirements

Before you consider synchronising the carburettors, you must ensure that everything else is in order. In other words, the ignition and the valves must be correctly adjusted, as must the play in the throttle cables. The air filter, the intake manifolds and the spark plugs should be well within the service limit.

Why synchronise?

The engine sucks in the air/fuel mixture from the carburettors at each intake stroke. And where there is suction, there is a vacuum. This vacuum must be the same in all the intake tracts of the cylinders so that the combustion chambers are fed at the same rate. This is one of the requirements for smooth engine running. The feeding speed is regulated by opening the

feed port to varying degrees; or in other words, the position of the throttle valve or slide valve in the individual carburettors.

How is the adjustment done?

In most cases, the carburettors are actuated via a linkage extending from the throttle cable mount. This can be adjusted on the individual carburettors by a spring-loaded screw. Only the "master carburettor" cannot be adjusted, so it serves as the point of reference for all the others. To access the adjustment screws, you generally need an extra-long screwdriver. Or a bit driver and $\frac{1}{4}$ -inch extension, as found in larger socket wrench sets, will do as an alternative. Carburettor systems with a separate cable for each carburettor require much more frequent synchronisation checks than linkage types.

Essential: vacuum gauges

To enable you to set the same air/fuel mixture rate in all intake tracts, you need vacuum gauges, which are essentially the opposite of a pressure gauge for checking the tyre pressure. Since, unlike with tyres, all cylinders are measured at the same time, you need one vacuum gauge per cylinder. They are available in 2- or 4-gauge sets and are called synchronisers. They also contain the tubes and adapters you need. Since in most cases the tank has to be removed but the engine has to be running during adjustment, it is recommended you also get a small fuel bottle to supply the carburettor. It can, for example, be fixed to the rear-view mirror or, better still, a tripod microphone stand, which can be folded away when not in use.

1



Important: First minimise air passage

2



Any variance must be corrected

3



Connection types: cylinder head...

Very important: Synchronisation should be done in the open air or in an open carport; never in even partially enclosed spaces on account of the running engine. If wind conditions are unfavourable the exhaust fumes pose a risk of carbon monoxide poisoning, even in an open garage.

First warm up the motorbike, then switch off the engine for the time being. Park it on the centre stand, if it has one. Now remove the tank and any covers and fairings that may be in the way. When pulling off the fuel hose, do not burn your fingers: the engine is hot! The fuel bottle must be positioned higher than the carburettors, or else the fuel won't flow. If you don't have a fuel bottle, place the tank on a table at an appropriate height right beside the bike, bearing in mind that you will need a longer fuel hose to connect the tank.

Next comes the synchroniser. To prevent irreparable damage, observe the following before connecting it up: For ease of packaging, synchronisers generally come disassembled, but they are very easy to assemble. Before every use, be sure to screw in the knurled screw (regulates the air passage) hand-tight, but without crushing the tube (see Fig. 1). The reason: We are dealing with very low vacuums, so the gauge pointers are highly sensitive. If you connect up a gauge with the damping set too low and start the engine, the pointer will flick violently from one extreme to the other with each stroke of the engine, and the gauge may be wrecked in a matter of seconds.

The next job is to find the connection points. They may be on the cylinder head (see Fig. 3), the carburettors themselves (generally on the top towards the intake manifold) or actually on the intake manifolds (see Fig. 4). Also, not all connection types are identical. The easiest to find and use are the little nozzles welded into the intake manifolds and fitted with rubber plugs. Remove the plug, connect the tube from the vacuum gauge, done. However, on some motorcycles you have to locate small screw plugs, unscrew them and replaced them with screw-in nozzle adapters (the most common adapters are generally included with the synchroniser).

Before connecting the gauges, calibrate them so that they all show the same reading. This will reveal if any gauge is giving inaccurate readings or if any tube connection is leaking. To do this, first connect up all gauges with T- or Y-adapters (generally also included with the synchroniser) so that they all feed into

a single tube (see Fig. 5). Connect the tube to a carburettor or intake manifold, and leave the plugs or screws on the other cylinders. Now start up the engine and adjust the gauges at the knurled nuts so that the pointers still move quite freely, but it is easy enough to read the gauge scale. Pointers that don't move at all mean a blocked gauge, so undo the knurled nut a little. All gauges should now show the same readings. Switch off the engine. If you get any variance, check the placement and condition of the tubes.

Assuming the gauges are completely intact, one gauge is now connected to each cylinder and the gauges placed in a suitable place on the bike and secured to prevent them falling (be careful because the gauges tend to "wander" due to the engine vibrations). Start up the engine, rev gently to 3000 rpm a few times and then let it idle. Check the gauge readings and readjust, if necessary, at the knurled nuts until they are easy enough to read. Most manufacturers tolerate a variance of up to 0.03 bar. Now, locate the non-adjustable carburettor by looking at the linkage, and set all the others, one after another, as accurately as possible to the same value using the adjustment screws on the linkage (see Fig. 6). From time to time rev gently to check whether the engine returns to the correct idle speed; if not, readjust with the idle adjustment screw. If the readings of one or more cylinders absolutely cannot be brought in line with the "master carburettor", it is highly likely that they are taking in air via an intake manifold that is, either porous or leaking at the transitions of carburettor or cylinder head. In this case, the only solution is replacement or resealing. In rare cases, a heavily soiled carburettor may be the cause. You should definitely investigate and remedy these potential faults, or else all further attempts at synchronisation will be pointless.

However, we will assume it has been a success and congratulate you on a considerably smoother-running bike and more spontaneous throttle response, making for an even more enjoyable ride than before. Now you can disconnect the synchroniser and take the pressure off the tubes by undoing the knurled nuts slightly. Put the rubber plugs back in (take the opportunity to check for porosity) or screw the screw plugs back in with care (soft material!). Then refit and connect up the tank and cover/fairings, and pour any fuel left in the fuel bottle into the tank. Job done!

Please note!

These tips for DIY mechanics contain general recommendations that may not apply to all vehicles or all individual components. As local conditions may vary considerably, we are unable to guarantee the correctness of information in these tips for DIY mechanics. Thank you for your understanding.



4

... on the intake manifolds (like here) or on carburettor itself



5

Essential: Calibrate all gauges to one cylinder



6

Adjustment screws on carburettor linkage