# Tuning Notes for the Triumph "Bonneville" Family of Motorcycles

**Includes the Bonneville, T100, Thruxton, Scrambler, America and Speedmaster - 2001 onwards**

**Version 5: June 2006**

**Cat No: CTN 01**

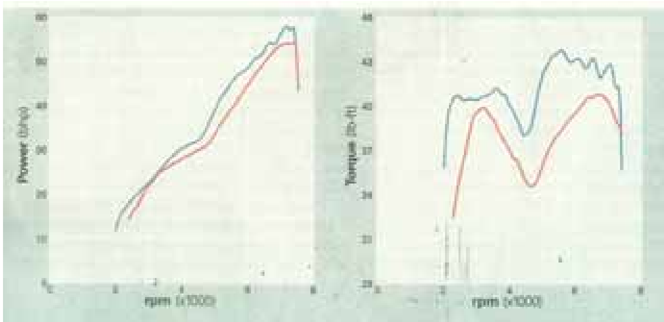
# About Tuning

## Why Tune?

At “Jenks Bolts®” we get regular enquiries about tuning the Bonneville motor and the “best” carburettor setup for a particular exhaust system and riding style.

As with all modern Triumphs, the parallel twins used in the Bonneville family are set up by the factory to ensure the bike meets all the various permits for “Type Approval” around the world. This means that the carburettors are set to run very lean, so that with the secondary air injection system the simple oxidative catalysts in the stock exhausts will work correctly.

The graphs below show the power curves from an early 790cc Bonneville, with (blue) and without (red) Triumph “off road” (TOR) exhausts. The vibration in the blue line at high revs shows that the mixture is very lean. The dip in power and torque curves in the mid range is also very noticeable.




Fuel injected bikes, with the complex “mapping” options available, are much easier to optimise: it is a sign of Triumph’s skill that they have been able to keep carburettors on the Bonneville into the 2006 model year.

To get the “most” from the new Triumph twins it is necessary to fit free flowing exhausts and air filter, re-jet the carburettor and remove the air injection equipment, effectively undoing much of what Triumph did to get the bikes “legal”.

There is considerable scope for improvement: over the last five years we have built up a range of settings that cover most requirements. The aim is a set up that allows the bike to pull strongly in every gear to the red line, from any throttle position. “Snap open” full throttle from 4000 rpm in 3rd or 4th should result in an immediate increase in revs, without any hesitation. There should be no obvious flat spot and a smooth even mid range torque.

Remember, to optimise setup there is NO substitute for an experienced technician with an exhaust gas analyser and a rolling road or Dynamometer. Without proper analysis it is easy to end up with settings that seem OK, but in fact leave the mixture very weak at high revs. We use a local Dynotech facility and encourage you to find one near you—but make sure the technician understands carburettors: many younger operators don't.

## Triumph’s Twins

With the launch of the 2006 model there are, in effect, 6 versions out on the streets. The table on page 10 is based on Triumph’s published data and information developed by Jenks Bolts. It shows the stock setup in green text; validated tuning options in blue; settings reported to us by other riders, but not validated by us, in black and finally provisional information in grey. Take a moment to see where your ride or rides fit into this matrix.

## What this Booklet Does

In this booklet we will:

- Look at how the CVK carburettor works and how the various jets and needle interact,
- Examine the tuning changes that can be made to various parts of the motor, and
- Bring all the information together with a clear explanation of the changes you can make and what to expect.

By following through this booklet you will:

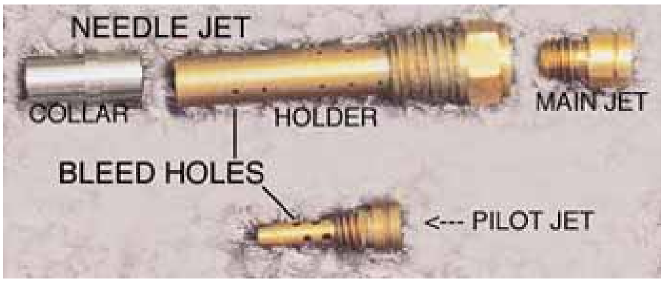
- Gain a clear understanding of the variation in carburettor settings between the stock models
- Understand the options that are available for enhancing performance
- Understand the changes that need to be made to achieve improved performance.

# Understanding Keihin's CVK

## Basics

The CVK carburettor used on the Triumph parallel twins is technically a bleed type carburettor, with a variable venturi that's controlled by a slide that is in turn controlled by the vacuum above the diaphragm. It's also known as Constant Depression or Constant Vacuum carburettor. The 36 in the name represents a 36 mm venturi exit diameter.

Most carburettors have a one piece needle jet. On the CVK36 it consists of 3 parts: a collar, the jet and what Triumph call a holder. Most 4-stroke carburettor jets have pin holes along the length of the jet or holder. These pin holes allow air from the air jet to premix with fuel from the fuel jet to start the mixture emulsification process before it enters the venturi. The photo below shows the main parts of the main jet and the pilot jet.

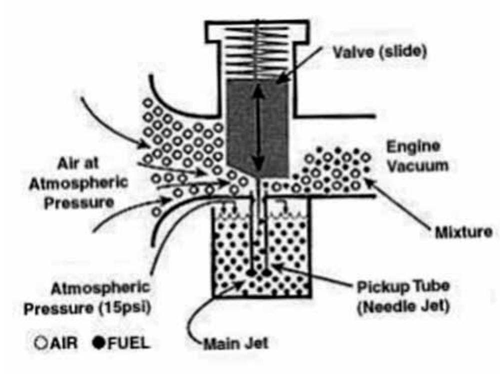



A venturi is a tube with a convex taper, (one end wider than the other). As air enters the wider end it's squeezed into the narrower section of the tube, lowering air pressure.

The area of lowest pressure in the carburettor venturi is just past the narrowest point: Bernoulli's Principle outlines the fluid dynamics involved in this effect. This lowered pressure, known as a "comparative vacuum" is a completely separate effect from the engine vacuum caused by the piston descending.

A variable venturi carburettor is able to vary the effective venturi diameter at the depression point by raising or lowering an obstruction, known as a slide. On a CV carburettor the slide is also known as a piston or diaphragm valve.

The following diagram nicely illustrates the main parts of the carburettor.




Both the CV and conventional slide carburettors, like Amals, are classified as variable venturi carbs. The slide on a conventional carburettor is directly connected to the throttle cable. Twist the throttle grip and the slide is raised in the venturi.

On a CV carburettor the throttle cable is connected to a butterfly valve that varies the volume through the venturi. It's not the throttle, it's the pressure difference from the venturi to the outside atmosphere that moves the slide.

Most carburettor problems boil down to it being either too rich, (too much fuel or too little air), or too lean, (too much air or too little fuel). The mixture is theoretically ideal at around 13 parts of air to one part of gasoline/petrol vapour. The outer limits for safe running are between 12:1 and 14:1.

Too rich and you're wasting fuel, spewing more pollutants, diluting your oil, fouling engine parts, and as a result performance suffers. Too lean and you run the risk of detonation, damage to the valves caused by overheating and performance suffers.

An air-cooled engine needs to run richer (more fuel) to aid in engine cooling, which is a further conflict that the Triumph twins have to do with and why their oil system plays such a big part in cooling.

## The Main Parts

We have already mentioned some of the main parts in the CVK, but it is worth looking in some more detail at the parts of the carburettor that can change the mixture, as understanding what they do and how they work together is the key to optimising your carburettor settings.

### 1. The Float

The float bowl acts as a fuel reservoir to meet engine demand. The float is hinged on a pin in the float boss. It rises and falls with the fuel level in the float bowl. The small metal tang integrated in the plastic float supports the float valve, also known as the float needle.

As the fuel in the float bowl rises, the float valve is pushed into the valve seat, until it's high enough to shut off the fuel flow to the bowl. As fuel is used the level in the bowl drops lowering the float which pulls the float valve from its seat, and fills again. Adjusting the height of the float has a big effect on the mixture as a low or high float level makes it harder or easier for the vacuum to suck fuel into the venturi. Differing float levels cause an imbalance which may be perceived as vibration.

### 2. The Choke

This system is referred to as the choke. But that's a misnomer. When you pull the choke knob, what you're doing is retracting a plunger that opens a tube connected to the starter jet, allowing additional fuel to enter the venturi just below the vacuum hose nipple. It supplements the pilot system at start up.

### 3. The Pilot System

The primary purpose of the pilot system is to supply the mixture at idle. It continues to supply fuel throughout the entire throttle range, but after about 1/8 throttle is reached the main system starts to put out more of the total mixture, up to full throttle.

By adjusting the idle with the big screw on the left side of the carburettors the position of the butterfly is altered, so exposing one or more of the four small holes that are drilled into the venturi, (leading to the pilot jet) just under the butterfly valve, letting more or less air pass the butterfly.

Adjusting the pilot screw that's under the carburettor varies the amount of air premixing with the fuel before it enters the venturi.

### 4. The Main System

Open the throttle and the cable that's connected to the butterfly valve turns it from vertical to horizontal, so letting more air through the venturi. This increases the vacuum effect that is transferred up through the vacuum drilling in the slide to the diaphragm valve that leads to the diaphragm chamber.

The top chamber is separated from the bottom by a rubber diaphragm. The bottom chamber is open to atmospheric pressure from the airbox. When the vacuum in the top chamber rises enough, the constant ambient pressure of the lower chamber helps the diaphragm valve overcome the downward force of the diaphragm spring, so it rises from the venturi.

As the diaphragm is raised the needle is pulled out of the needle jet, exposing a thinner portion of the needle taper which allows more fuel to rise into the venturi to meet the increased engine demand.

The key parts of the main system are shown in the photo below.

The slide is on the left, with the diaphragm above. The drill bit indicates the vacuum drilling that you may wish to consider enlarging. On the right is the spring, with needle “spider” and tapered needle. When assembled, the spring, needle carrier and needle sit inside the slide, with the needle sticking through the centre hole in the bottom of the slide.

### 5. The Overrun EnrichneR

This is the little cover on the left side of the carburettor, visible above the idle adjuster knob.

When the throttle is closed the butterfly valve is swiftly closed so the slide drops. The bike is still rolling with inertia, keeping the engine revs high. It can't get the mixture it's trying to suck in because the butterfly valve is closed, blocking the air flow. To get round this there is an air jet in the lower diaphragm chamber that transfers ambient pressure to one side of the coasting Enrichner’s spring loaded cut off valve.

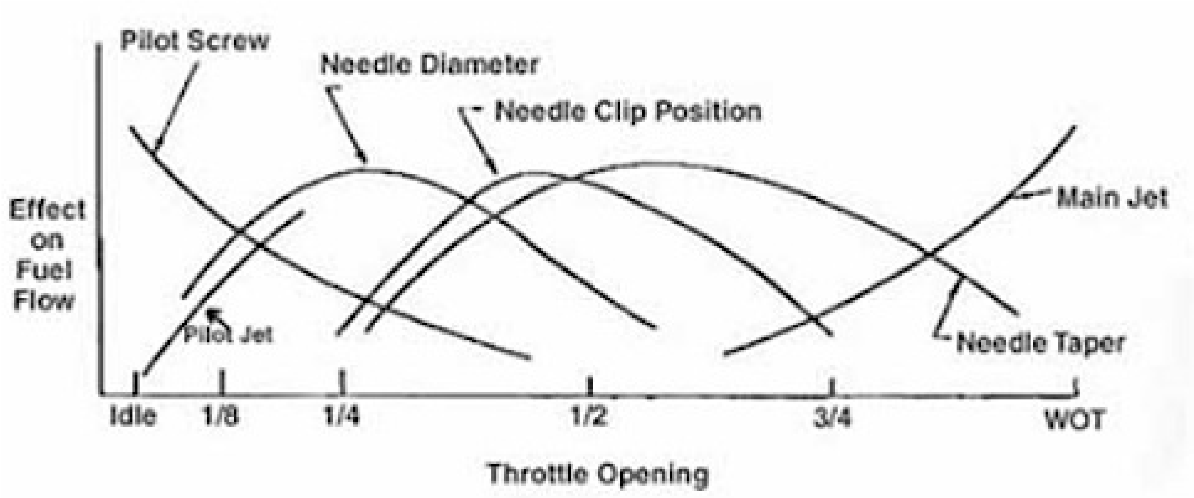
The excess vacuum in front of the butterfly valve is transferred to a drilling that leads to the other side of the cut off valve. This sucks it open, allowing the pilot jet to feed more fuel to the engine preventing an overly lean condition. Changing the size of the drilling will alter the speed with which the slide rises.

### 6. Putting it all Together

The figure below shows how all the various parts already mentioned interrelate as the throttle is opened. The figure also shows how needle height, diameter and taper have a big influence as the revs rise. This means that to get the bike running optimally it is necessary to ensure that:

- ◊ The main jet size,
- ◊ The pilot jet size,
- ◊ The pilot screw,
- ◊ The needle diameter and taper,
- ◊ The needle height and
- ◊ The slide

are all working in harmony to give the correct air fuel ratio from idle to the rev limiter. This is not easy and compromises have to be made!




# The Jenks' Bolts Experience

Until the arrival of the 856cc Thruxton motor, most Bonneville tuning was simple:

- Fit free flow exhausts,
- Improve inlet air flow with a Unifilter, remove the snorkel and possibly take out the internal baffle.
- Adjust the mixture by changing jet sizes and using shims.
- As a final step, some removed the airbox and fitted "pancake" air filters.

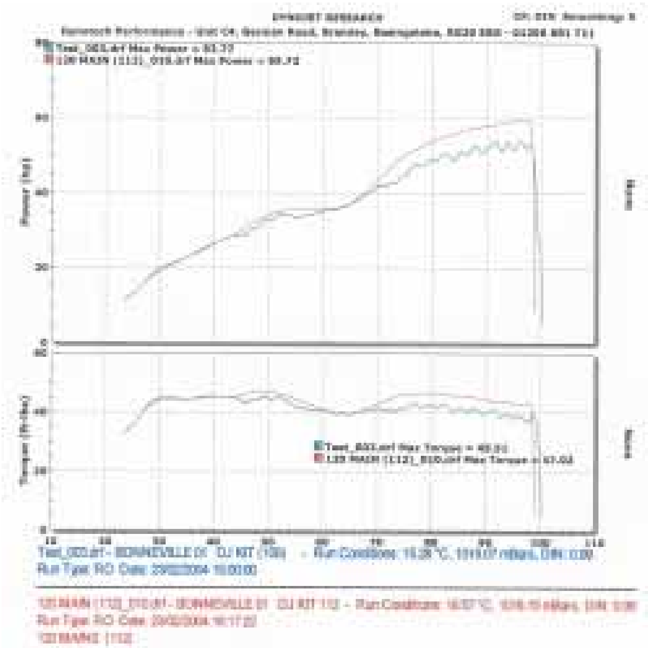
Reported results were mixed: without the airbox some talked of using 150 or 155 main jets with 42 or 45 pilot jets. The felt they had considerable power gains at the top end, but others felt this was at the expense of mid range flexibility. In the end most riders settled with main jets between 125 and 130 and often with 42 pilot jets.

### My Bonneville

I was not convinced that messing about with the airbox was a good idea: it is a complex device and the baffle in the centre is there for a purpose.

As is clear from the graph above, adjusting the shape, taper and height of the needle has the potential to improve fuelling over a wider throttle range than just altering jets, pilot screw settings and shims.

In mid 2003 I fitted a pair of specially developed tapered needles into my 790cc Bonneville. I'd already fitted TOR exhausts and a Unifilter and had removed the rubber inlet snorkel. I took the bike to

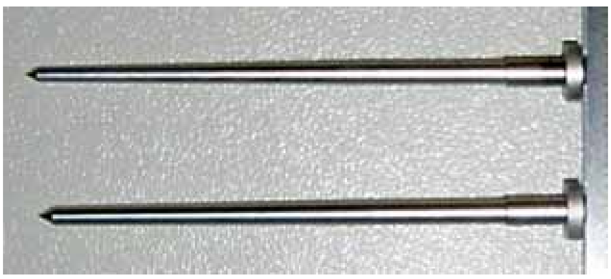


Dynotech in Basingstoke, Hampshire, UK. The results are shown in the figures above, power top and torque below. The lower blue trace is my bike on arrival: it was clear that the 106 main jets were not big enough. We ended up with 120 main jets: they gave a better performance, as the upper red trace shows, with the bike delivering 59bhp and 47 ft lbs torque at the rev limit. But the big dip between 4000 and 6000 rpm was still much in evidence: it was impossible to do anything about this.

At about the same time I received good reports from the USA of results by fitting the Triumph Thunderbird Sport needle (Identification code N3RF) in the America and Speedmaster. The TBS needle is tapered, but not evenly.

Then, in 2004, Triumph released the Thruxton, which was found to have a markedly tapered needle – as shown below. The Bonneville needle is the lower one, the Thruxton above: note that it is not only more tapered, but slightly longer.

In early October 2004 Mike Selman in the USA,



(www.Bellacorse.com) tried Thruxton needles in his Bonneville. The result was very positive, with much improved mid range flexibility, but no apparent loss of top end power.

## My Thruxton

In May 2004 I changed my Bonneville for a Thruxton. It got the same treatment: TOR exhausts, Unifilter, snorkel removed, replaced with a carefully designed "Bell-mouth" or velocity stack, shown in the photo below.

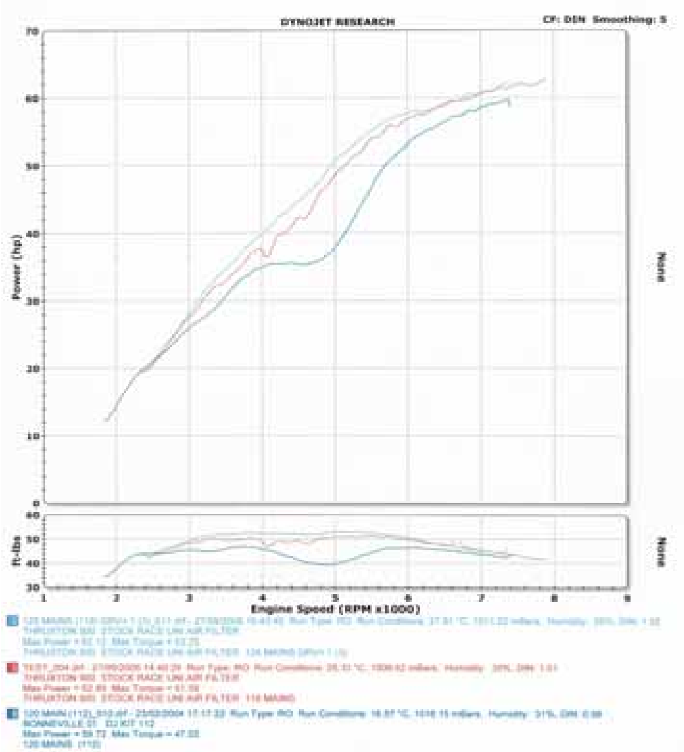
To take advantage of the improved airflow we increased the main jet size from 110 to 118 and put 2 shims under the needle. A visit to the Dynamometer at local racing team (Crescent Suzuki UK) resulting in the technician suggesting that another shim would be a good idea. So with 3 shims I thought it was going well. Wrong! The technician was used to working with fuel maps and doing everything with a computer: the bike still didn't run as I felt it should.

I then talked to the technician at my dealer, 3 Cross Triumph in Dorset, UK, who suggested increasing the size of the hole in the air slide to 3mm – better pick up immediately – and going back to Dynotech. So I did and the result was interesting – as the set of graphs on page 8 clearly show.

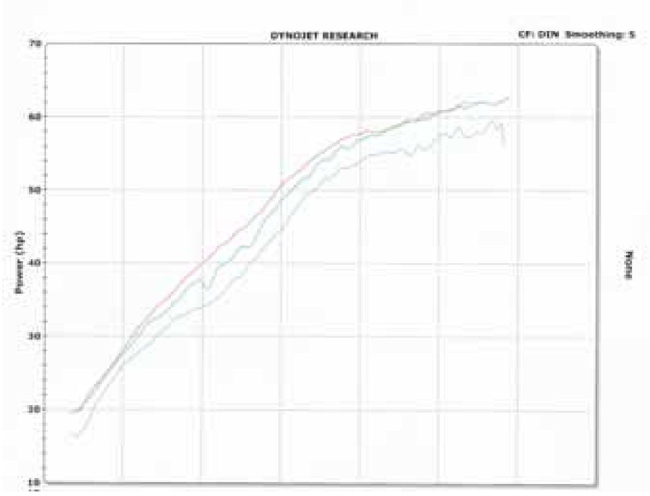
The middle red line is the Thruxton on arrival: much too lean, almost 15:1 in places. Increasing the main jet to 125 and removing 2 of the 3 shims solved the problem, as the upper blue trace shows. The best result was 64bhp and 53 ft lbs torque. Good, but not that much better than the results from my Bonneville, shown in the lower blue trace.

The big difference is in the real world mid range: at 4500 rpm the Bonnie was making 35 bhp and 39 ft lbs torque, whilst the Thruxton was making 45 bhp and 52 ft lbs torque.

Much more importantly, compare the lower blue




line from the Bonneville with the top red line. No mid range hole! The result is that between 50mph and 80mph the Thruxton is a joy to ride. There is always ample power to overtake without chasing the torque peak, it is there, all 53 ft lbs of it, from 3500 to 6000 rpm




### The Unifilter

There has been much discussion about the effectiveness of the Unifilter and removing the snorkel. The Thruxton was re-tested with a stock air filter and inlet. The results are shown below.

Top Red = 125 jets, Unifilter and velocity stack

Bottom Blue = Stock filter and snorkel.

Difference = 7 bhp at 4500 rpm! This experiment seems to show that the stock paper air filter together with the rubber snorkel is restrictive—indeed it was possible to reduce the main jet to 115 without going too lean.

# What Can You Do?

In this section we look in some detail at the non — carburettor areas where modification can be made, and consider some of the costs.

### 1. Air Injection Removal

Removing the air injection equipment does not require ANY change to the carburettors.

BUT any increase in jet size, without removing the air injection equipment, means that your exhaust pipes will go very dark blue very quickly and you will get lots of popping and backfiring on the overrun.

### 2. Air Box Management

The air box has 3 important functions: filtering the air, suppressing inlet noise and providing the carburettors with smooth, un-turbulent air.

There is scope for changing the inlet side to help the bike breath better, so it can burn more fuel and produce more power, but many of the more radical changes have side effects.

**Step 1**:

Fit a free flow air filter, we recommend the Unifilter, available for the Bonneville family and America and Speedmaster.

**Step 2**:

Remove or modify the snorkel. Removing it improves air flow at high revs. It is easy to remove and easy to replace. Noise levels increase, especially with a wide open throttle. Adding a spun shaped velocity stack smoothes airflow into the filter.

**Step 3**:

Take out the restrictor plate inside the air box, easy to do – once you have the air box removed, which is not so easy! Results vary and some riders have report that mid throttle ride-ability is compromised.

Step 4:

Remove the airbox and fit pancake air filters. This step requires expensive additional parts but the results, especially with the 856 Bonneville and Thruxton are stunning– up to 68bhp and 57 ft lbs at the rear wheel—almost 80 bhp at the crank!

### 3. Exhausts

The standard exhausts supplied by Triumph are restrictive: tests on the dynamometer show a 6 bhp loss compared with free flowing exhausts. But they are very quiet so the bike meets noise regulations. From 2006 in most markets the stock exhausts contain single way oxidative catalysts to reduce unburnt hydrocarbons.

Triumph offer so called “off road” exhausts. These are not homologated, so their use is illegal. These exhausts produce a “traditional Triumph” sound, unlikely to attract attention and as mentioned, return 5 to 6 bhp. They are easy to fit and look indistinguishable from the stock exhaust.

Some third party systems have become available: some are very loud. Listen before buying!

### 4, Capacity

The Bonnie has the potential to be bored out to about 1000cc. Triumph, with the Thruxton, Speedmaster and T100, have taken the capacity to 856cc. There are after market alternatives available at 900, 950 and 1000cc.

### 5. Camshafts

The 2006 model year 856cc bikes use a number of camshafts! The Thruxton cams improve mid range torque, but reduced overlap lessens top end power.

The 2005 Speedmaster has been optimised for torque at low revs. Clearly camshaft changes can improve the bikes performance, the problem is to know what to do.

### 6. Rev Limit

The rev limit is programmed into the engine management computer, produced for Triumph by Gill Engineering Ltd.

It is possible to re-program a higher rev limit, but unless the exhausts and inlet restrictions are removed there is little point. The Thruxton already has a higher rev limit.

### 7. Fuel Injection

A number of experimental systems, built around the “Megasquirt” open system design have been developed. The results are good, with one UK owner reporting almost 70bhp at the back wheel with a 790cc Bonneville.

More information? www.megasquirt.info

It is expected that as emission restrictions get stricter in 2008 that Triumph will have to fit fuel injection to their parallel twin cylinder bikes.

### Turbocharging

There is a Turbo option: with a big bore kit, fuel injection and 0.8 bar boost, around 100 bhp at the rear wheel.

Turn up the boot to 1.6 bar and the power goes up to 160 bhp, but the clutch is at its very limit!

More information? www.stabbarps-auto.com

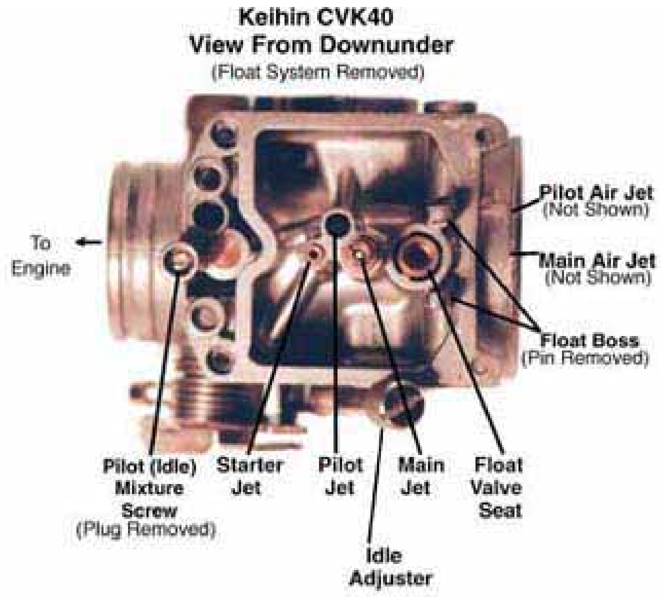
# Tuning the Carburetors

### The Theory

In the previous chapter we looked at some other parts of the bike that can influence performance.

This section looks at the parts of the carburettor that can be altered to improve performance and how they can, in theory, be changed. In the second part of this chapter we go on to look at the application of the theory to the bike!

It is important to be able to recognise the parts mentioned in this chapter. The photograph on the next page shows the underside of the Keihin CVK 40 Carburettor, which is very similar to a CVK 36, including the position of key components that you need to be able to quickly recognize.




## 1. the Best Main Jet

To get the best, most even top end power (full throttle from 4000 to 5000 rpm), select main jets that produce the highest top speed and pull strongly at high revs. The photo on page 3 shows the main jet

If the bike pulls harder at high rpm when cold and .less hard when hot the main jet is too large. In this case fit a 1 step smaller main jet and retest step by step until you find the main jet that pulls the hardest at high rpm when hot .

If the bike doesn't pull well at high rpm when cold and gets only slightly better when fully warmed up, the main jet is too small.

Setting up the main jet must be done first - before moving on to the other operating tuning ranges. It is much easier to do this with a dynamometer and exhaust gas analyser.

At this point do not concern yourself with the low-end mixture. It is important to get the main jets right to produce the best power at high rpm.

## 2. Adjust needle Height

To get the best power from 2500 to 3500 rpm at full throttle adjust the needle height, after you have already selected the best main jet. The photo opn page 4 shows how the needle fits into the carrier.

If the engine pulls better or is smoother in this range during a full throttle roll-on starting at <1500 rpm when cool, but is soft and/or rough when at full operating temperature, it is too rich in the midrange and the needle should be lowered—if you can. With the Triumph "nail head" needle, this is impossible.

If the engine pulls better when hot but is still not great between 5000 and 70000 rpm try raising the needle using 1 or 2 x 0.5mm shims to enrichen the 2500 to 3500 rpm region.

If the engine pulls equally well between 2500 and 3500 rpm when cooler, compared to hot, the needle height is probably about right.

## 3. Float height

To get best low-end power, set float height (fuel level) so that the engine will accept full throttle, without missing or stumbling, in 2nd gear from 1500 to 2000 rpm.

Float heights are measured, with the carburettor inverted and the float chamber removed, from the "gasket surface" of the carburettor body to the highest part of the top of the float - with the float tang touching but not compressing the float valve spring. The stock Triumph setting is 17mm, ± 1mm

If the engine has a "wet" rhythmic, soggy area at full throttle in the 1500 to 2000 region and it gets worse as the engine heats up, lower the fuel level by resetting the float height 1mm greater.

If the engine is "dry" and flat between 1500 and 2000 rpm, raise the fuel level by resetting the float height by 1mm less.

REMEMBER, since the main jet WILL affect low speed operation, the MAIN JET has to be set correctly first before final float setting.

WARNING: If the fuel level is too high as well as poor performance there is a risk of plug fouling.

Finally, if there are still low-end richness problems, even after lowering the fuel level much more than 1.5mm from initial settings, check for needle wear and needle jet (part of the emulsion tube). It is reported that the brass needle jets (in the top of the "emulsion tube") in 36mm CV carburettors can start to wear in as little as 5,000 miles.

## 4. Pilot Screw setting

In some markets there is an aluminium cap over the fuel screws on all but newer Triumphs, which

# Carburetor Settings—2006

| 110Model | Needle | Jets | Stock Bike | Free Flow Air filter Only | Triumph "Off-Road" Exhausts Only | "Off road" exhausts & free flow Airfilter | "Open" exhausts & free flow Air filter | Airbox Baffle removed and [no airbox] |
|---|---|---|---|---|---|---|---|---|
| 790cc Bonneville versions | Stock Needle | Main Jet | 110 | 115 | 120 | 130 | 135 | 140 [145] |
| | | Pilot Jet | 40 | 40 | 40 | 42 | 42 | 42 |
| | | Shims | 0 | 0 | 0 | 1 | 1 | 1 to 2 |
| | | Pilot Screw | 2.5 turns | 2.75 turns | 2.75 turns | 2.5. turns | 3 turns | 3 turns |
| | | Needle Code | NAGB | NAGB | NAGB | NAGB | NAGB | NAGB |
| | | Air Hole | 2.5mm | 2.5mm | 2.5mm | 2.5mm | 2.5mm | 2.5mm |
| 790cc Bonneville versions | Thruxton Needle | Main Jet | | | 115 | 118-122 | 125-130 | 130 [135] |
| | | Pilot Jet | Not Advised | Not Advised | 40 | 40 | 40 | 40 |
| | | Shims | | | 1 | 1 | 1 | 1 |
| | | Pilot Jet | | | 2.75 turns | 3 turns | 3 turns | 3 turns |
| | | Needle Code | | | NBTZ | NBTZ | NBTZ | NBTZ |
| | | Air Hole | | | 3.0 mm | 3.0 mm | 3.0 mm | 3.0 mm |
| 790cc America & Speedmaster | Stock Needle | Main Jet | 110 | 115 | 120 | 125 | 130 | No information |
| | | Pilot Jet | 42 | 42 | 42 | 42 | 42 | |
| | | Shims | 0 | 0 | 0 | 1 | 1 | |
| | | Pilot Screw | 1.5 turns | 1.75 turns | 1.75 turns | 2.0 turns | 2.25 turns | |
| | | Needle Code | NBAD | NBAD | NBAD | NBAD | NBAD | |
| | | Air Hole | 2.5 mm | 2.5 mm | 2.5 mm | 2.5 mm | 2.5 mm | |
| 790cc America & Speedmaster | Thruxton or Speedmaster Needle | Main Jet | | | 122 | 125 | 130 | No information |
| | | Pilot Jet | Not Advised | Not Advised | 40 | 40 | 40 | |
| | | Shims | | | 2 with NBTZ | 2 with NBTZ | 2 with NBTZ | |
| | | Pilot Screw | | | 2 turns | 2.25 turns | 2.5 turns | |
| | | Needle Code | | | NBTZ or NBZY | NBTZ or NBZY | NBTZ or NBZY | |
| | | Air Hole | | | 2.5 mm | 2.5 mm | 2.5 mm | |
| 856cc Bonneville T100 | Stock Thruxton Needle | Main Jet | 110 | 110 | 115 | 120 | 125 | 130 [138] |
| | | Pilot Jet | 40 | 40 | 40 | 40 | 40 | 40 |
| | | Shims | 0 | 1 | 1 | 1 | 1 | 1 |
| | | Pilot Screw | 2.5 turns | 2.75 turns | 2.75 turns | 2.5. turns | 3 turns | 3 turns |
| | | Needle Code | NBZT | NBZT | NBTZ | NBTZ | NBTZ | NBTZ |
| | | Air Hole | 2.5 mm | 2.5 mm | 3.0mm | 3.0 mm | 3.0 mm | 3.0 mm |
| 856cc Speedmaster | Stock Speedmaster Needle | Main Jet | 120 | 122 | 125 | 128 | 130 | No information |
| | | Pilot Jet | 40 | 40 | 40 | 40 | 40 | |
| | | Shims | 0 | 1 | 1 | 2 | 2 | |
| | | Pilot Screw | 1.5 turns | 1.5 Turns | 1.75 turns | 2 turns | 2.25 turns | |
| | | Needle Code | NBZY | NBZY | NBZY | NBZY | NBZY | |
| | | Air Hole | 2.5 mm (?) | 2.5 mm (?) | 2.5 mm (?) | 2.5 mm (?) | 2.5 mm (?) | |
| 856cc Thruxton | Stock Thruxton Needle | Main Jet | 110 | 112 | 118 | 125 | 130 | 135 [140] |
| | | Pilot Jet | 40 | 40 | 40 | 40 | 40 | 40 |
| | | Shims | 0 | 1 | 1 | 1 | 1 | 1 |
| | | Pilot Screw | 2.5 turns | 2.75 turns | 2.75 turns | 2.5. turns | 3 turns | 3 turns |
| | | Needle Code | NBZT | NBZT | NBTZ | NBTZ | NBTZ | NBTZ |
| | | Air Hole | 2.5 mm | 2.5 mm | 3.0 mm | 3.0 mm | 3.0mm | 3.0 mm |
| 856cc Scrambler | New Scrambler Needle | Main Jet | 110 | 110 | 115 | 120 | | |
| | | Pilot Jet | 40 | 40 | 40 | 40 | No information | No information |
| | | Shims | 0 | 1 | 1 | 1 | | |
| | | Pilot Screw | 1.5 turns | 1.5 turns | 1.5 turns | 1.5 turns | | |
| | | Needle Code | N3RL | N3RL | N3RL | N3RL | | |
| | | Air Hole | 2.5 mm (?) | 2.5 mm (?) | 2.5 mm (?) | 2.5 mm (?) | | |

use a “security D screw head” ,there is no cap.

This screw must be set to give a smooth idle and 2nd gear, 2000 rpm, steady state cruise. Initially set mixture screws at the recommended settings shown in the table on page 10.

If lean surging is encountered during steady cruise turn the mixture screws (turn out) in 1/2 turn increments.

Further, if the pilot screws are too lean there will be surging problems when the engine is operated at high rpm at small throttle openings. Opening the mixture screws and/or increasing pilot jet size will usually cure the problem. Start by opening the screws by a quarter turn at a time, but if you need to go more than 2 turns, change the pilot jet for the next size up and go back to the stock airscrew settings.

NOTE: A rich problem gets worse as the engine heats up.

If the throttle is lightly "blipped" at idle and the rpm drops below the set idle speed then rises up to the set idle speed, the low speed mixture screws are probably set too rich: try 1/2 turn in, to lean the idle mixture. But if you need to go more than 2 turns then change the pilot jet for the next size down and go back to the stock airscrew settings.

NOTE: A lean problem gets better as the engine heats up.

If the throttle is lightly "blipped" from idle at 1000 rpm or less and the rpm "hangs up" before dropping to the set idle speed, provided that there are no intake leaks, then the mixture screws are probably too lean: try 1/4 turn out, to enrichen mixture.

## 5. Drilling the Slide

The hole that transfers vacuum from the venturi to above the diaphragm plays an important part in throttle response. Too small and the bike feels sluggish, too large and the air flow increases faster than the main jet can deliver fuel, so there is a sudden loss of power. The photo on page 4 shows the slide, spring and needle.

The stock bike has a 2.5mm diameter hole: with larger main jets you can enlarge the hole to 3mm. BUT reversing the change is expensive as new slides have to be purchased!

## The Practice

Now you understand all the theory, what can—or should—you do?

For the 790cc bikes fitting a Thruxton needle in conjunction with stock 110 main jets and 1 or 2 shims is a good starting point as it gives better results than simply increasing main jet sizes. As changes are made to the exhaust and inlet, the main jet can be increased further.

The table on page 10 shows all the available combinations, including stock settings and suggestions for the 2005 model year, including for the America and Speedmaster. Settings for the 2006 Scrambler, which has its own unique needle, will be developed in due course and this guide revised.

For all the settings a “Thruxton Needle” option is given, but for the more extreme airbox changes experience is limited and these suggestions are provisional.

## 1. Main Jets

### Settings for a Stock Bike with standard exhausts, stock air filter and the Air Injection equipment fitted.

- **Bonneville**: Very early bikes came with 105 main jets, Since mid 2001 bikes were delivered with 110 main jets. Going up to 115 will help: some dealers do this as part of pre-delivery inspection work to get the bike to run well.
- **Thruxton Needle Bonnie**: Not recommended
- **Thruxton / T100**: No change is needed.

### Settings for Bikes with Free Flow Exhausts, stock air filter and with the Air Injection equipment removed.

- **Bonneville**: The stock exhausts restrict power by 12% from open exhausts. The off road exhausts allow more air through, but the airbox and air filters still restrict air flow. Jet choice depends very much on the make and restriction of your pipes. For Triumph “Off Road” pipes, start with 120 main jets. With other makes of exhaust it may be necessary to go up to 135 main jets.
- **Thruxton Needle Bonnie**: 105 main jets.
- **Thruxton/T100** With the Triumph “Off Road” Pipes: fit 115 main jets.

## 2, Modified Air Box

Settings for Bikes with Free Flow Exhausts, the Air Injection equipment removed and a range of changes to the air filter / air box.

**Step 1 change,** (fitting a free flow air filter such as a Unifilter), allows a further increase in jet size provided that "off road" exhausts have already been fitted.

- **Bonneville:** Increase the main jet by 02 to 05 units, e.g. if you have a 120 main jet, go to 122 or 125.
- **Thruxton Needle Bonnie**: 110 or 112 mains
- **Thruxton/T100**: Go to 118 main jets

**Step 2 change:** (Step 1 plus snorkel removed and optional velocity stack fitted) the main jet can be increased in size, provided that both "off road" exhausts and free flow air filter have been fitted.

- **Bonneville**: Increase the main jet by a further 02 to 05 unit, for example, if you have a 122 main jet, go to 125.
- **Thruxton Needle Bonnie**: 115—118 main jet.
- **Thruxton**: Increase the main jet to 125.

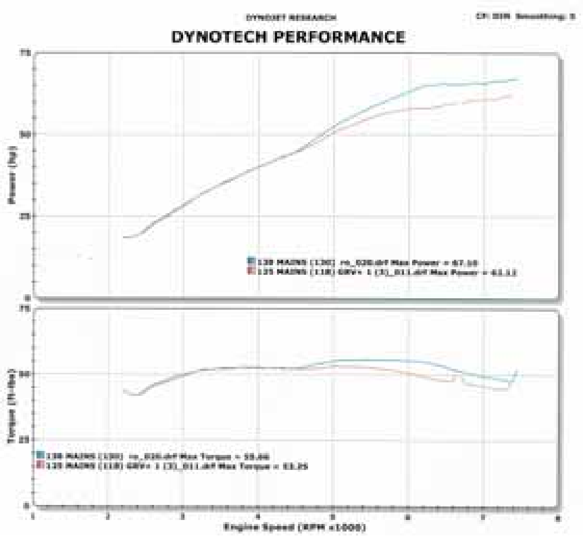
**Step 3 change:** (Step 2 plus air box baffle removed) the main jet can be further increased, provided that both "off road" exhausts and free flow air filter have been fitted.

- **Bonneville**: Increase the main jet by a further 10 units, so with 125 main jets go up to 125.
- **Thruxton Needle Bonnie**: 120 main jet.
- **Thruxton**: Some riders suggest 130 to 135

**Step 4 change,** the final stage is to remove the air box and replace it with the Air box eliminator kit from Bella Corse in the USA. K&N pancake air filters go straight on the carbs. It is assumed that off road pipes have already been fitted.

- **Bonneville**: Start at 145 and work up to 155.
- **Thruxton Needle Bonnie**: 135.
- **Thruxton**: Dynamometer trials show 138 main jets and stock pilots produce 68bhp and 57 ft lbs torque at the back wheel—perfect performance.

The dynamometer graphs that follow show exactly what can be achieved.
The lower red line is the same curve as shown on P7, the upper blue line shows just how much extra power and torque can be released.




## 3. Pilot Screw and Pilot Jets

The role of this jet was discussed on pages 9&10. The stock settings are shown in the table on page 10: The right side jet may need to be about an eighth of a turn less open than the left side.

As is clear from the figure on page 5 and the description of the action of this jet, the main jet must be set first. Then, as the main jet and the needle are adjusted, it will be necessary to re-adjust the Pilot Screw. As a crude rule, the larger the pilot jet, the less the Pilot Screw needs to be open.

- **Bonneville**: Unless you have a problem with cold starting leave the stock pilot jets at (Bonnie 40, America 42). Some people report that going up a size (42/45 respectively) with the pilot screws set at 2.5 to 2.75 turns open improves cold starting. Others disagree!
- **Thruxton**: The stock pilot jets are fine, cold starting does not seem to be a problem.

## 4. Using Shims

Shims allow a subtle adjustment of the needle, and are useful in certain conditions.

- **Solo Bonneville:** Using the stock needle no shims are needed, If you have either free flow exhaust or free flow air filter try a single 0.5mm shim. With both, try a 1mm shim. With the Thruxton needle use 1 shim.
- **Pillion Bonnie:** With the stock needle and both air filter and exhaust modifications, and you ride two up, don't shim.
- **Thruxton**: Dynamometer testing shows 1 shim is fine with a free flow exhausts and air filter.

### 5. the Primary Sprocket

The smaller engined Bonnies have a 17 tooth primary sprocket, the Thruxton and 900cc T100s have an 18 tooth sprocket. With tuned Bonnies an 18 tooth main sprocket, or 19 tooth on the T100 makes riding at typical road speeds more relaxing. For the Thruxton the torque characteristics do not suggest fitting a larger sprocket, but if acceleration is your “thing” try a 17 tooth main sprocket.

### 6. Altitude

The Bonnie is set up to work from sea level to 3000ft / 1000m. All our instructions are based on that assumption. Popular wisdom developed from advice given by Amal Carburettors is that if you ride between 3000ft and 6000ft then it may help to reduce main jet sizes by 5%. For every further 1000ft reduce jet sizes by about 3%.

# Your Notes!

Jenks Bolts® are manufactured in England by:

# The Jenks Partnership Limited

PO Box 1840 Salisbury Wiltshire SP5 3WA

Phone: +44 1722 711 745
Fax:+44 1722 711 383
Email: info@triumph-bonneville.com



## Notice

The name Triumph, the model names: Bonneville, T100, Thruxton, Scrambler, America, Speedmaster, Trophy, Thunderbird, Legend and Adventurer and the photographs on the front cover of this leaflet are either trademarked names of Triumph Designs Ltd or subject to copyright owned by Triumph Designs Ltd. The names and the pictures are used for model reference only.
The Paul Smith signature is a Registered Trade Mark of Paul Smith
The Jenks' Partnership Ltd is not affiliated with Triumph Motorcycles, Ltd. in any way and the parts and accessories offered by the Jenks' Partnership Ltd are not manufactured or endorsed by Triumph Motorcycles Ltd.

## Disclaimer

The suggestions provided on this data sheet are without warranty and each user is responsible for making sure that the settings they chose are suitable for their particular set of conditions. Following these instructions may make the bike suitable, in certain countries, only for use off road or on closed tracks! Users should also inform their insurance company that performance enhancing modifications have been made.