



Date: 14th Sept 2009

Easy and Quick Install Instructions for Rotec TBI unit and regulator.

- Mount TBI unit on your engine, make sure there no air leaks between the TBI flange and the engine inlet manifold. **Use a good quality air filtration system complete with exhaust heated carburettor anti icing system. Dirty air can impede the mechanical action of the slide throttle.**
- The location of the fuel regulator **MUST be at the same HORIZONTAL level as the TBI fuel fitting or slightly above.** The regulator should be located at a distance **no farther than 6"** from the air intake from the TBI unit. Closer would be better. The shorter this distance the less effect gravity will have on the regulator when pulling G's. In some installations it is possible to mount the regulator directly to the TBI fuel fitting using an elbow fitting. This would be ideal.
- Connect the fuel line to TBI unit as per any typical carburettor. The fuel pressure from your normal engine and boost pumps will be suitable to use with the TBI unit. A range of .5-6 psi of fuel PX will be good.
- For convenience the fuel fitting can be swapped from one side to the other.
- Note the TBI unit has a built in finger fuel strainer this is your last chance filter only and should be serviced every 100hrs. Blow out or clear/clean/replace as necessary.
- The airframe **MUST** have its own fuel filters, and not rely solely on the last chance filter on the TBI unit!
- The TBI unit will need to have typical Bowden cables connected to it to control both slide throttle and mixture lever. **WARNING! Do not hang heavy unsupported cables on the mixture lever as this can results in the damage or failure of the mixture lever and or base of the spray bar.**
- The mixture lever can be re positioned on its ratchet base.
- The fuel fitting threads on the TBI regulator are 1/8" NPT. **Warning be careful not to accidentally allow debris to enter the fuel system. Such debris can be introduced accidentally when using sealant compounds and or tapes.... BE VERY CAREFUL!!!!**
- To avoid vapour lock all fuel lines should be shrouded in typical fireproofing hose. AVGAS is the preferred fuel as it is far less prone to suffering from vapour lock. Auto fuels vapour lock easier and extra precautions need to be taken when using this fuel type.

- Keeping all fuel related items COOL such as the TBI regulator, fuel pumps. and fuel lines etc is highly recommended. To avoid any possibility of unwanted vapour lock air blasting (flow through ventilation) of such items can greatly reduce their temperature.
- Set the idle mixture screw for best Idle and pick up. The TBI unit does not have an accelerator pump so rapid use of the throttle slide should be avoided. Setting the idle mixture screw a little on the richer side can aid pick up and its recommended.
- The slide throttle stop should be set for best idle speed. A combination of both the idle mixture screw and the throttle stop will result in best idle performance.
- A full open slide throttle stop should be set on the throttle quadrant so as to avoid pulling on the roll pin that secures the slide lever to the slide throttle tongue.

Rotec Technical Support Team.

Date: 14th Sept 2009

Rotec TBI Explained.

The Rotec TBI is easy to set up and very stable, because unlike the Revmaster and Aero carb, which are both derivatives of the original Posa design and are both **carburetors**, the TBI-40 is actually **mechanical fuel injection** and it's variably metered so fluctuations that affect the Posa style units don't affect the TBI-40 as its consistently adjusting supply.

For priming "step 4" we have added and override button which can be easily depressed via a simple pushrod or lever which is accessed in the cockpit. In reality I've found that the engine once primed will start easily with out priming as the fuel is now held all the way up to the fuel reg.

Marvin, you won't go wrong dealing with Rotec, we are a good size company that has been supplying Radial engines and other associated products to recreational aircraft all around the world for 10 years. It's a family owned business and we run a tight ship. Our communications are prompt and concise, we pride ourselves on this fact. All ready you must be impressed with our fast email responses, that will continue long after you have your item. We are experts in customer service and we know what our clients want!

Regarding ordering and payment can be done electronically with Visa or MasterCard CC item is shipped FedEx express to your door. All relevant documentation supplied via email.

Here's a bit more on the comparisons between the Posa style and Rotec TBI-40 CUT AND PASTE BEGINS:

Hi Tony,

The Revmaster is a non float controlled slide carburetor, it and the Aero carb are both derivatives of the original Posa carb, all of these are not a throttle body injectors. The Rotec TBI-40 is not a carburetor it is in the true sense a single point mechanical fuel injection system that uses a variable on demand metered fuel supply. This is where the big difference is.

With the Revmaster, as soon as you have one slight change in fuel pressure your mixture changes. This makes it very difficult to set up with no two sessions being the same. As your fuel tanks change level or attitude so too will the mixture.

*Now you can try running a fuel regulator but this will now only offer fuel pressure at a **fixed** rate so again as soon as demand increases or decreases you may be left wanting. I.e. you're ether too rich at idled or too rich at full power. So you lean off full power mixture and now mid and low range is not correct. It's a real juggling act. I've been there, its very frustration not to mention potentially dangerous if you happen to go flying with the set up way out.*

With your Revmaster running at full power what would you expect it to do you if you varied the fuel pressure between .5-10psi? The answer would be the mixture on the Revmaster would go all over the place, it would be an impossible situation. This same situation on the Rotec TBI-40 will have no effect at all and the engine will run smoothly at any power setting no matter what you do to the fuel pressure. As long as the fuel flow is sufficient the engine will not be affected.

Another annoyance with "Posa" types is that on shut down you must shut the mixture tap and or fuel taps to off or fuel will continue to pour out (gravity fed) this is because your fixed regulator is always set open. On shut down the Rotec TBI-40 on demand fuel system allows no fuel to flow once the demand at the injector spray bar is zero, so no leaks occur even if you leave the fuel taps on and the mixture set at full rich.

Regards, Paul.

END CUT AND PASTE:

The Rotec TBI-40 is really child's play to set up, I have tested it on both our R2800 and R3600 radials and also the Jabiru engines and had it fitted up in around 15mins this was of course less the extra cable required for the mixture lever. The Jabiru engines use the exact same rubber coupling we use on our Rotec radial engines and also the TBI-40, so you can use the one you already have.

Here are some notes:

- The Rotec TBI-40 will directly replace the Bing on the standard Jabiru coupling.
- A mixture cable will have to be added to the airframe.
- The original Scat hose used on the Bing carb will couple to the inlet side of the TBI-40 and serve the same purpose as it did for the Bing.
- The TBI-40 will use the same fuel fitting as the Bing.
- The TBI-40 will use the same fuel pressure lines and filters as previously used on the Bing.
- Auto gas vapor locks a lot easier than AVGAS!
- For Auto gas the TBI-40 will need an anti vapor lock return fuel line routed back to the fuel tank
- For AVGAS no anti vapor lock return line is needed. But still can be fitted.
- The Rotec Fuel regulator should be mounted at the same level or below the spray bar of the TBI-40. This is to stop the "on demand regulator" from being tricked into thinking it needs to supply fuel via a siphon head on the aft side of the fuel supply regulator.
- Position of the TBI-40 regulator should be at a level equal or slightly above the TBI main fuel fitting and at a length **no greater than 8 inches away**.
- TBI-40 requires a fuel pressure between 0.5 - 6psi. Fuel pressure fluctuations have NO affect on mixture even in flight changes!
- Once the engine is running simply set idle mixture via a single screw and idle stop for smoothest idle and your done.
- The TBI-40 will give you more power for the same manifold pressure! Tested and confirmed.

HOW TO START ENGINE USING TBI-40:

1. Turn boost pumps on.
2. Set mixture to rich
3. Close throttle
4. Press primer button (diaphragm override) for 5 seconds.
5. Mags on
6. Crank engine, if engine does not start press primer button while cranking.
7. Engine starts great!

TAXI TO RAMP:

1. Boost pumps on and set as required
2. Set mixture to full rich and take off.
3. Fly at full rich all the time for local flights and CCTS etc. Any throttle setting from idle to WOT can stay at full rich.
4. Lean off for cross country flight or very high altitudes to gain best economy.
5. Land plane at full rich, TAXI full rich.
6. Park plane and kill engine by leaning off until engine quits, rpms may need to be raised to come off idle cct.
7. Set full lean. Switch off mags.
8. Close air frame fuel tap (optional)

In summary you always fly at full rich and only use the mixture lever to lean off for cross country flight where best economy is of greater importance. Best lean setting is determined by engine manufacturer. Generally slightly "lean of peak" is safest, lowest temperature and best fuel economy for cruise power. Contrary to popular opinion "rich of peak" is actually where the highest engine temperatures occur and should be avoided.

NOTE: If you are having to lean off your Revmaster to smooth out engine operation during flight then you are basically using your mixture lever as an in-flight "tuning" device, this is not correct. Full rich does not mean black smoke and fouled plugs!

Regards, Paul.

FAQ's

1. Q: How does the TBI work it appears to be just like any of the other slide type carburetors?

A: Wrong! The Rotec TBI-40, unlike the others is not a carburetor, it is in fact a mechanical fuel injection system, that self meters fuel supply by use of a cleverly calibrated negative pressure fuel regulator. This in effect continuously compensates for any variations in fuel pressure and or power requirement. The other slide types do not do this!

2. Q. How does the TBI 40 unit allow the pilot to adjust mixture in flight, does it use a flow valve like most others?

A: No, the TBI-40 has the most efficient means of adjusting fuel mixture. Rather than just closing or opening a crude fuel flow tap the TBI-40 works completely different in that it rotates the fuel delivery spray bar through a 90 degrees. The spray bar has around 50 tiny holes along its length. When the holes are rotated to directly face the incoming airstream the engine is at full lean, when the holes are rotated so they are at right angles to the air flow the TBI is at full rich. It is such a smooth and consistent action.

3. Q. Do I have to keep adjusting the mixture as the fuel tanks get low, or if I change power settings?

A. No, unlike many other fuel systems you do not have to keep adjusting the mixture in flight. You would typically fly at full rich for the entire flight and at all throttle settings and only lean the mixture in instances where fuel economy is required, cross country etc. For any given mixture setting the entire range of throttle can be used and this fuel air ratio will be maintained. This ratio is set by the allocation of the 50 tiny holes and where they are located in relationship to the power setting used. More at the top less at the bottom.

4. Q. What sort of fuel pumps do I need to use, can it run on a gravity fed fuel system?

A. The TBI-40 can run at a fuel pressure ranging from .05 – 6psi. This would include gravity fed fuel systems too. In most cases the typical fuel pumps used on most piston aircraft engine will fall within the correct specifications.

5. Q. What sort of fuels can the TBI-40 run on?

A. The TBI-40 can run on both AVGAS and AUTO gas. However it should be noted that vapor lock is far more prevalent with Auto fuels than with Avgas. In both cases and in particular use with auto fuels, great care must be taken to shield the fuel hoses in fireproof sleeve and keep all fuel items such as fuel pumps and the regulator as cool as possible. Air blasting these items is recommended. In the case of using Auto fuel a restricted return fuel line back to the main fuel tank is recommended, this will allow any air bubbles that are formed by vapor lock to bleed off back to the fuel tank.

6. Q. How do you start the engine do you have to use a primer?

A. To start the engine you simply depress the diaphragm override button and this injects fuel into the engine, this can be operated from the cockpit with a simple cable and rocker arm mechanism. After starting the engine subsequent restarts should not require priming. If the aircraft is already fitted with an existing primer system this can be used too.

7. Q. What attitude should I mount the TBI-40 to the engine?

A. The TBI-40 can be mounted at any attitude and at any angle. The system has no float so can fly at any attitude. Even upside down. Making the TBI-40 the perfect aerobatic fuel systems.

8.Q. Where would be the best spot to mount the remote fuel regulator?

A. The remote fuel regulator can suffer from the effects of G forces because these forces will alter the weight of the fuel in the delivery lines. For this reason it is recommended to mount the TBI regulator no further than 6 inches from the fuel fitting on the TBI's main body, closer would be even better. On the Horizontal plain the regulator must be mounted level with the same fuel fitting or even slightly above +2" -00". This is important. Do not position the TBI regulator LOWER than the throttle body.

9. Q. What about fuel filters?

A. The TBI-40 comes standard with a "last chance filter" this is located inside the main fuel fitting. It consists of a very fine gauze mesh that is designed to stop debris from blocking the many fine jets. The airframe is still required to have its own filtration up stream. The TBI-40 in built filter should be inspected and cleaned every 100hrs.

10. Q. Air cleaners?

A. Yes the TBI-40 relies on fine air filtration as unwanted debris and dirt are not only bad for your engine but also can impeded the movement of the slide throttle.

11. Q. What about carb heat I hear that slide throttle bodies don't ever suffer from ice?

A. Nonsense, any carburetor or throttle body that restricts manifold pressure to control power output, will by nature greatly reduce the local temperature at the throttle opening. A traditional exhaust heated carb heat system is mandatory.

12. Q: What if I accidentally lean the engine to the point the engine quits while in flight, to bring the engine back to life do I just go to full rich?

A: NO! If you lean the engine to the point where it has actually stopped firing, to richen the mixture will probably do nothing as the air speed over the injector spray bar has now become too slow to help even if you go full rich. The best way to bring the engine back to life is to promptly pull the throttle back to idle, if the prop is still wind milling this will immediately restart the engine, then apply full rich and increase power to desired levels. The engine will give plenty of warning that it's getting towards an over lean state. It will start to run very rough when too lean. Leaning any further will see the engine starve of fuel and stop firing.

13. Q: In the advent of an emergency can the primer override button be used if I suspect the engine has suffered from vapor lock and or fuel starvation?

A: 100% Yes! If you suspect you have vapor lock and or a failure of the fuel delivery system by all means try introducing fuel by employing diaphragm override button. Tests have shown that at full power most engines will continue to run albeit extremely rich with the diaphragm button employed. Definitely something to understand and keep in mind.