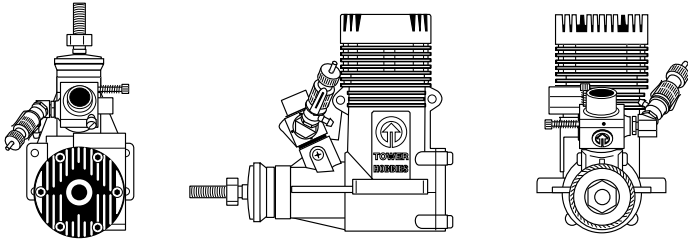


INSTRUCTIONS FOR



.40 ENGINE

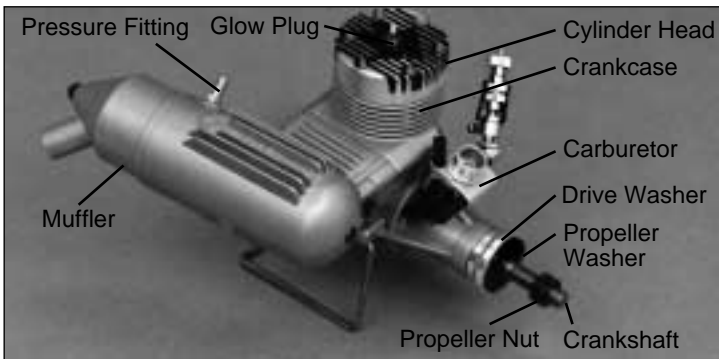


Important:

Please read and follow this instruction manual before operating your engine.

Thank you for purchasing this high quality Tower .40 engine. Your engine was produced to exacting tolerances with state-of-the-art computerized machine equipment using the finest materials and should provide consistent, reliable service for many years. The new safety needle valve design feature of this engine is a step forward in engine technology, offering safer operation than conventional needle valve locations. The ABC construction and schuerle porting will provide you with performance to meet your sport flying needs, along with easy starting and reliability. Like all model airplane engines, care must be taken in operation as severe injury can result from improper or careless use. Please read and understand the safety precautions and warnings in this manual before operating this engine.

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Parts of the Engine:

Crankshaft: The crankshaft transforms the reciprocating motion of the piston into rotational motion. The propeller is mounted on the portion of the crankshaft protruding from the crankcase.

Propeller Nut: The propeller nut secures the propeller to the crankshaft.

Propeller Washer: The propeller washer provides a larger, stronger surface area to apply pressure to the propeller.

Drive Washer: The drive washer is keyed to the crankshaft and is knurled on one face to provide a good contact surface for the propeller.

Carburetor: The carburetor meters the amount of fuel and air that enters the engine.

Crankcase: The crankcase houses the internal parts.

Cylinder Head: The cylinder head is mounted on top of the crankcase. It provides a seal at the top of the cylinder. The fins on the cylinder head provide a cooling surface. The cylinder head also holds the glow plug.

Glow Plug: The glow plug provides the heat needed to ignite the fuel in the cylinder.

Muffler: The muffler quiets the exhaust exiting the cylinder.

Pressure Fitting: A tube is connected from the pressure fitting to the fuel tank. When the engine is running, pressure from the muffler is used to pressurize the fuel tank.

Parts of the Carburetor:

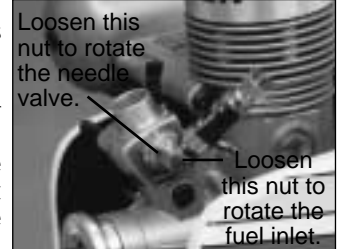
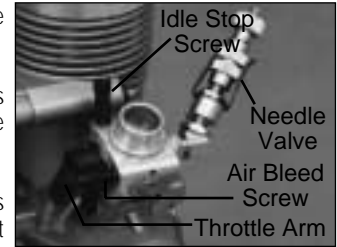
Needle Valve: The needle valve controls the fuel/air mixture entering the carburetor.

Air Bleed Screw: The air bleed screw controls the amount of fuel/air mixture entering the carburetor while the engine is idling.

Idle Stop Screw: The idle stop screw controls how far the throttle closes. We suggest that it be set to allow the throttle to close completely to stop the engine using the throttle trim on the transmitter.

Throttle Arm: The throttle arm is connected to the carburetor barrel and is operated by the throttle servo. By moving the throttle arm, the barrel can be opened and closed. This adjusts the speed of the engine.

By loosening the nut next to the carburetor body, the safety needle valve can be rotated. By loosening the nut below the fuel inlet, the inlet can be rotated. An optional straight needle valve adapter (TOWG5260) is available if the engine will be enclosed in a cowl.

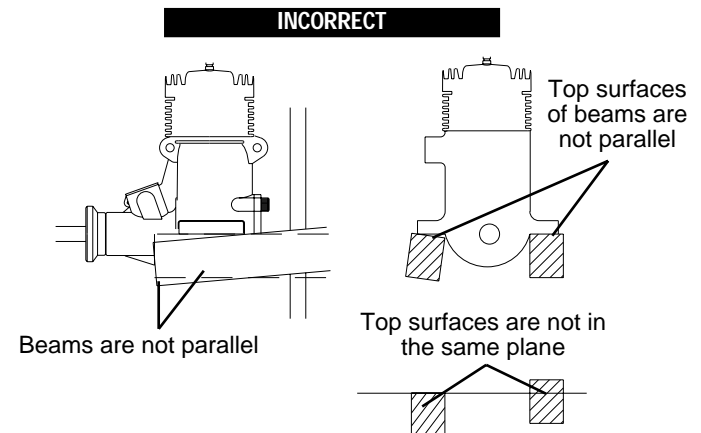
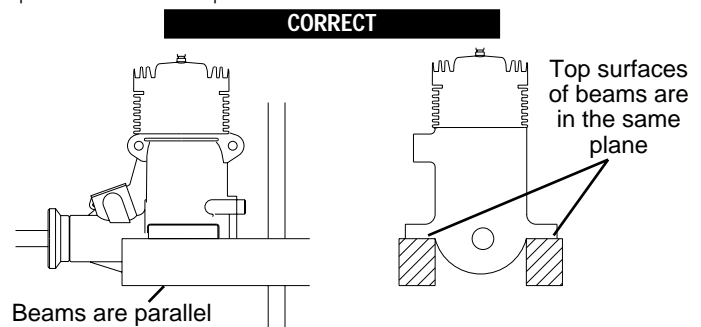


How the Tower .40 Engine Operates:

The aluminum piston and chrome-plated brass cylinder are designed to have the proper fit at normal operating temperature. As the engine warms up, each part expands, producing the proper fit. If the fuel mixture entering the engine is wrong, the parts do not expand properly. The engine will not run correctly and in some cases can be damaged. The reason the fuel mixture is so important is that the fuel is a blend of oil (synthetic oil and/or castor oil), nitromethane and alcohol; plus anti-wear and anti-foaming agents and corrosion inhibitors. The Tower .40 engine will run best on fuel with a 5% to 15% nitromethane content and a mixture containing castor oil or a castor-synthetic blend. The nitromethane helps the alcohol burn better. The oil lubricates and cools the engine. So, if the fuel mixture is not correct, the engine can overheat or will not get hot enough for the cylinder to expand properly and provide maximum power.

Installation:

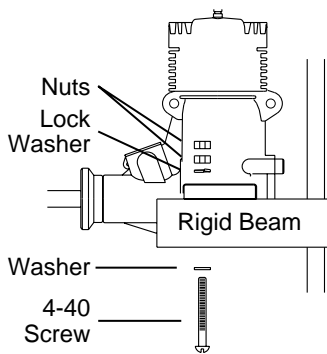
The beams the engine is to be mounted on must be rigid, parallel with each other and the top surfaces in the same plane.



Set the engine on the beams at the correct angle to the center line of the fuselage, according to the instructions provided by the airplane manufacturer. Mark on the beam the locations of the four mounting holes. If mounting the engine on wooden beams, drill four 7/64" holes through the beams perpendicular to the top surface of the beams. Secure the engine to the beams with 4-40 screws, flat washers, lock washers and 4-40 nuts.

If mounting the engine on a metal or fiberglass engine mount, follow the manufacturer's mounting instructions. If they did not provide instructions, drill and tap the engine mount to accept 4-40 screws and lock washers installed through the engine mounting flanges and into the engine mount.

Note: Some airplane kits require a slight amount of right thrust. This is done by angling the engine to the right to counteract the torque factor of the propeller while making thrust. Follow the kit manufacturer's instructions to incorporate the correct amount of right thrust if required.

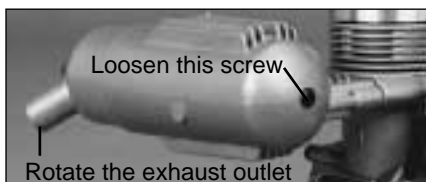
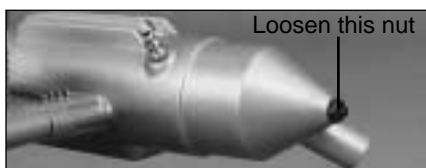


Muffler Installation:

Install the muffler on the engine after the engine has been installed in the airplane. Insert the two muffler screws through the crankcase and thread them into the muffler. Tighten the muffler screws, being careful not to strip the threads in the muffler.



To adjust the exhaust outlet, loosen the lock nut at the rear of the muffler, then loosen the screw at the front of the muffler. Rotate the exhaust outlet away from the airplane. Re-tighten the screw at the front of the muffler just tight enough to prevent the exhaust outlet from rotating. Then tighten the lock nut at the rear of the muffler. If the screw is over-tightened the screw will break as the muffler heats up and expands.



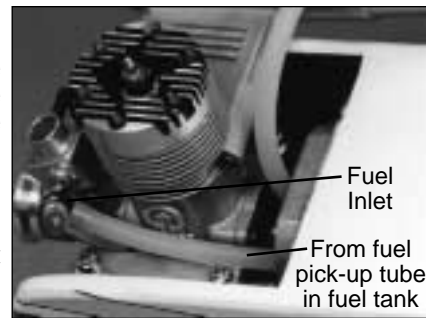
Pressure Line:

For the engine to operate properly at any angle, the carburetor requires constant fuel pressure. When the engine is running, pressure is created in the muffler by the exhaust. Some of this pressure is used to pressurize the fuel tank. This pressure is provided by a tube from the pressure fitting on the muffler to the vent tube in the fuel tank. Although not absolutely necessary, pressurizing the fuel tank with muffler pressure will provide more consistent running, and will help to maintain more consistent fuel flow during maneuvers. We recommend the use of muffler pressure.



Fuel Line:

Connect a medium size silicone fuel line from the fuel inlet on the carburetor to the fuel pick-up tube that is connected to the clunk in the fuel tank. We suggest that a fuel filter be installed in the fuel line between the carburetor and the fuel tank. The filter will prevent any contaminants in the fuel from clogging the carburetor.



Equipment Required to Operate the Tower 40 Engine

High Quality Fuel: We recommend two-stroke fuel with 5% to 15% nitromethane and a mixture containing castor oil or a castor-synthetic blend. Tower's own Tower Power brand fuel is recommended.



Propeller: For "break-in" and most trainer and sport airplanes, we suggest a Top Flite 10x6 Propeller (TOPQ5085). A 10x5 (TOPQ5080) or an 11x4 Propeller (TOPQ5095) may also be used.



Glow Plug Battery: For ease of operation and safety we recommend a Hobbico Glow Plug Clip (HCAP2505) with the self contained battery. If using a Tower Hobbies Glow Plug Clip (TOWP1200) connected to a power panel on a field box, make sure the wire lead is behind the propeller when starting the engine.



Fuel Pump: If you will be using a field box, we recommend a Hobbico Electric Fuel Pump (HCAP3100) that can be mounted on the field box. If you will not be using a field box, we recommend a Tower Hobbies hand Crank Fuel Pump (TOWP1210).

Chicken Stick or Electric Starter: Again, if a field box is used, we recommend a Tower Hobbies Electric Starter (TOWP0500). If you do not have a field box with a 12 volt battery, a chicken stick can be used to flip the propeller to start the engine.



Caution: never use your finger to flip the propeller. If the engine should backfire, the propeller could injure your finger.

Glow Plug Wrench:

The glow plug will eventually fail to retain heat or it will need to be removed to clear a flooded engine. We recommend a Hobbico 4-Way Wrench (HCAP2550) that can be used to remove the glow plug and the propeller nut.



Glow Plugs: For best performance and sure-fire starts, we recommend using Tower Hobbies R/C Long Glow Plugs (TOWG1001).

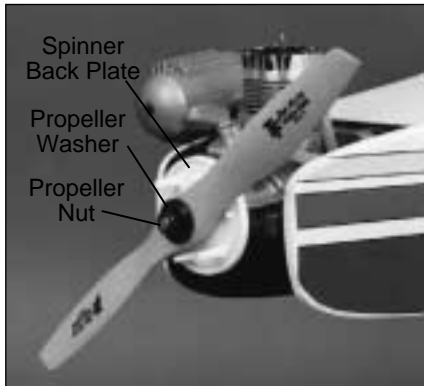


Starting the Engine

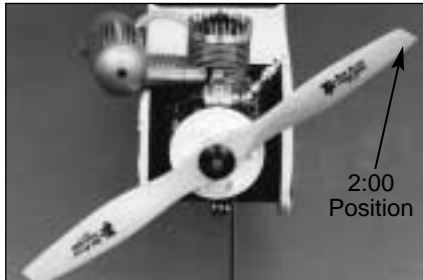
Before installing, check your glow plug by briefly attaching the glow plug battery to the plug. The plug must glow brightly.

1. To install the glow plug in the engine first slide the compression washer on the glow plug. Carefully install the glow plug in the top of the cylinder head with your fingers. Tighten the glow plug finger tight then use a glow plug wrench to tighten the glow plug securely. Do not overtighten the glow plug or the threads in the cylinder head may strip.

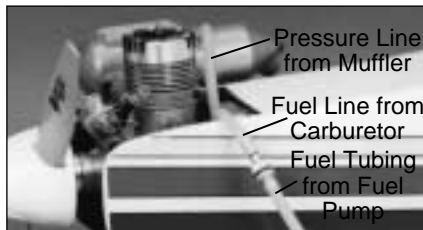
2. First balance your propeller using a prop balancer such as the Top Flite Precision Magnetic Balancer (TOPQ5700). To install the propeller on the engine, remove the propeller nut and propeller washer. If installing a spinner, install the spinner back plate first, following the manufacturer's instructions. Next, install the propeller with the rounded surface of the propeller blade facing forward. Install the flat side of the propeller washer against the propeller. Thread the propeller nut against the propeller washer, but do not tighten it. Rotate the crankshaft of the engine counterclockwise to the compression stroke (the crankshaft will become difficult to turn).



Continue rotating the propeller until it's at the 2:00 o'clock position, then tighten the propeller nut securely against the propeller washer. Some people use a 4-way wrench for this purpose, but it is difficult to get the nut tight enough with that type of wrench. Many modelers use a 6-inch adjustable wrench for tightening prop nuts.



3. Fill the fuel tank by removing the fuel line from the fuel inlet, on the carburetor, and connecting it to the fuel tubing from the fuel pump. Remove the pressure line from the pressure fitting on the muffler and aim it at the ground where you want the overflow fuel to spray. Environmentally conscious modelers direct this fuel into an "overflow bottle." Start filling the fuel tank. When the tank is full, fuel will overflow out the pressure line. Disconnect the fuel line from the fuel pump and reconnect it to the carburetor. Reconnect the pressure line to the muffler.



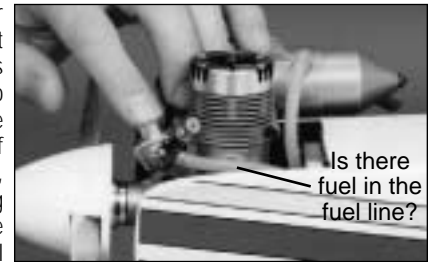
4. The first time you run your new engine, gently screw in the high speed needle, turning it clockwise until you feel resistance. This should be done with a light touch, to avoid screwing the needle in too far and damaging it. Now unscrew the needle exactly 3 turns. Every engine is slightly different, but the engine should be able to start and run rich* at this setting. **Note: You will make this adjustment only once, when you prepare to start the engine for the very first time.**



*"Rich" means that there is a lot of fuel in the fuel/air mixture. An engine that is "running rich" is probably running rough and spitting excess fuel out of the carburetor, and the cylinder head is only warm.

*"Lean" means that there is not enough fuel in the fuel/air mixture. An engine that is "running lean" is probably running fast and smooth, but the cylinder head is very hot. **Running the engine "lean" can damage your engine and void your warranty.**

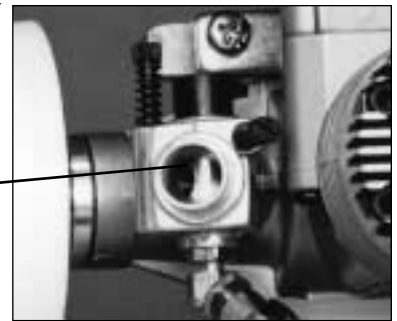
5. Turn the transmitter and receiver on. Set the throttle at high. Do not attach the glow plug clip at this time. Look at the fuel line going to the carburetor, you should be able to see if there is fuel in the line. If the line is empty or has bubbles, place your finger over the opening in the carburetor while rotating the propeller counterclockwise until fuel reaches the carburetor. Rotate the propeller one to two more times. Remove your finger from the carburetor and flip the propeller counterclockwise three or four more times to distribute the fuel in the engine.



The engine is now ready to be started. If the above five steps sound like a lot of work in preparation for starting an engine, it's not. In actual practice, you will only need to perform steps 3 and 5 after the engine has been started for the first time.

6. Have an assistant hold the airplane securely from behind the wing to prevent the airplane from moving forward. You will see some modelers starting their engine with one hand while holding their airplane with the other. This is an unsafe practice that greatly increases the chances of having an accident.

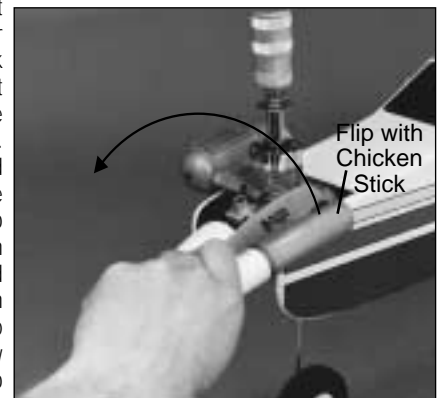
7. Set the throttle so that the carburetor is about 1/8 to 1/4 open.

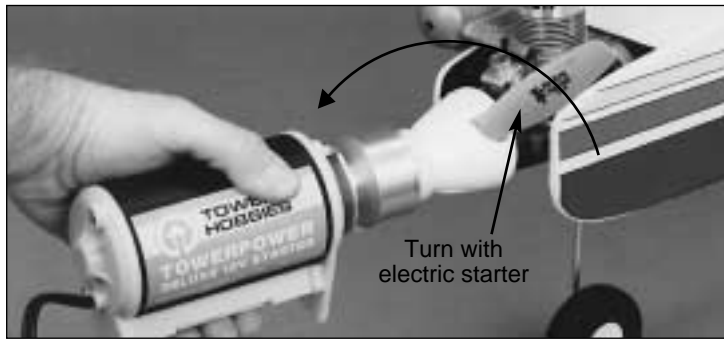


8. Securely attach the glow plug clip to the glow plug. If using a glow plug clip connected to the power panel of a field box, make sure the wire cannot become entangled in the prop.



9. If using a chicken stick to start the engine, flip the propeller counterclockwise using quick flips. If the engine fails to start after 10 flips, it may not have enough fuel in the engine. Remove the glow plug clip and repeat the priming process. If the propeller becomes difficult to rotate, the engine is flooded with fuel. Remove the glow plug and turn the airplane upside down (pointing away from you), and flip the propeller backwards a few times, allowing the excess fuel to drain out. Reinstall the glow plug, attach the glow plug clip and try starting the engine again. **Do not under any circumstances attempt to start engine using only your finger.**





If using an electric starter to start the engine, make sure the starter is turning counterclockwise. If your engine has a spinner on it, place the large opening of the rubber adapter on your starter against the spinner. Turn the starter on and hold it against the spinner until the engine starts. Because the engine is new, it may be tight. You may need to turn the starter on first and bump the spinner with the rubber adapter to get it started the first few times. If only a propeller nut is on the front of the propeller, turn the rubber adapter on the starter around and center the small hole of the rubber adapter over the nut. Turn the starter on and hold it against the propeller until the engine starts. If the starter has difficulties turning the engine, the engine may be flooded with fuel. Clear the engine of fuel as described above. **Do not** continue to try to start a flooded engine. The connecting rod in the engine could be damaged.

10. After the engine starts allow it to warm up for 15-30 seconds before removing the glow plug clip. Do not reach around the spinning propeller to remove it, as this is how many accidents happen. Instead, reposition yourself behind the propeller before removing the glow plug clip or adjusting the needle valve.

Engine "Break-in"

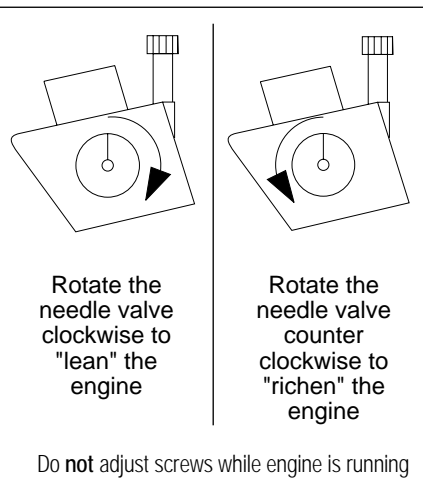
Have an assistant hold the airplane securely. Start engine and advance to full throttle. Slowly, by turning "clockwise," lean the needle valve. As you do this, you will hear the engine pick up speed, with the exhaust sound becoming higher in pitch. At the same time, you will also hear that the engine will start running smoother. At some point, the sound of the exhaust will start trying to change from a low pitch to a higher pitch sound. It will alternate back and forth as you adjust the needle. Continue to slowly lean the needle valve.

Eventually, the engine will be running mainly at the higher-pitch sound with an occasional misfire or momentary change to the lower-pitch sound. "Richen" the needle 5-6 clicks from this point, and allow the engine to run at this setting for at least five minutes.

If, at some time during the break-in process, the engine runs the tank out of fuel, don't change the needle valve setting. Just refill the fuel tank, set the throttle at 1/4 open, connect the glow plug clip, and start the engine. Since it's been running, it should start easily. If it doesn't start right away, remove the glow plug clip, and prime the engine as described above. Once you've restarted the engine, advance the throttle to full and continue the process.

After five minutes, give the fuel line a quick pinch. You should hear the engine increase speed then return to normal. If, when you pinch the fuel line, the engine does not change speed, or if it slows down, immediately richen the needle valve at least 1/4 turn. Try pinching the fuel line again. The engine **MUST** increase speed when the fuel line is pinched.

If, when you pinch the fuel line, you do get an increase in engine speed, repeat the pinch five times at 30-second intervals, but do not adjust the needle valve between pinches.



Now lean the needle valve about 1/8 turn (clockwise). The engine should increase speed slightly. Allow the engine to run at this setting for a minute or two and then repeat the pinching process like before (five pinches at 30-second intervals). Did the engine jump in speed? If so, then lean the needle another 1/8 turn (clockwise). Continue this process until a quick pinch will result in no change in engine speed.

If, at any point, the engine starts to slow down while you are leaning the needle valve, or when you pinch the fuel line, immediately stop and turn the needle valve back at least 1/4 turn (counterclockwise). This means that you have turned the needle valve too far. If this happens when you first start adjusting the needle valve, run the engine longer at the first setting, it hasn't run long enough to accept the new setting.

Eventually, you will get to the point where a quick pinch will not cause the engine to speed up. You will either hear no change, or the engine will slow down a bit. Richen the needle valve so that you can hear the engine speed up when you give the fuel line a pinch. Allow the engine to run at this setting for a full tank of fuel.

While the engine is running at this setting, pinch the fuel line occasionally to make sure you get a speed increase. As the fuel level in the tank lowers, most engines will tend to lean a bit, so make sure the needle valve setting allows for this. If the engine will run at this setting for an entire tank of fuel, it's time to set the idle speed and mixture.

Adjusting the Idle

Slowly close the throttle. The engine will begin to slow down. You will also hear it start to misfire and run a bit rough. This is normal. The carburetor opening should be about 1/16" open when the engine is idling.

If the engine will not idle smoothly, or tries to stop, the air-bleed screw will need to be adjusted. With the engine running, close the throttle to a point just short of where the engine stops. Pinch the fuel line. If the engine speeds up a bit, the mixture is rich. Stop the engine and turn the air-bleed screw counterclockwise 1/4 turn. Restart the engine and repeat the process until no change occurs. Note that the airbleed screw is adjusted exactly in reverse of the needle valve (for the airbleed screw, "in" (turning clockwise) is rich, and "out" (turning counterclockwise) is lean).

If the engine slows down when you pinch the fuel line, the mixture is lean. Richen the airbleed screw 1/4 turn clockwise. Repeat the process until you get no change in engine speed when you pinch the fuel line.

Since the engine is running slowly, a very quick pinch may not have much effect. You may have to pinch the fuel line for a few seconds. Don't pinch off the fuel line long enough to stop the engine.

Another way to check your idle setting is to throttle down the engine and then let it idle. If it gradually slows down and then quits, lean the airbleed screw. If it speeds up just before it quits, richen the airbleed screw.

Once you have the air bleed screw adjusted and the engine idles smoothly, move the throttle from idle to full speed. There may be a slight hesitation as the throttle is advanced, but this is normal. The engine should not be sluggish going from idle to full speed. There should also be a smooth transition when the throttle is reduced from full speed to idle. The engine should be idling the same as in the beginning of this step.

Your engine is now ready to fly.

Stopping and Restarting the Engine:

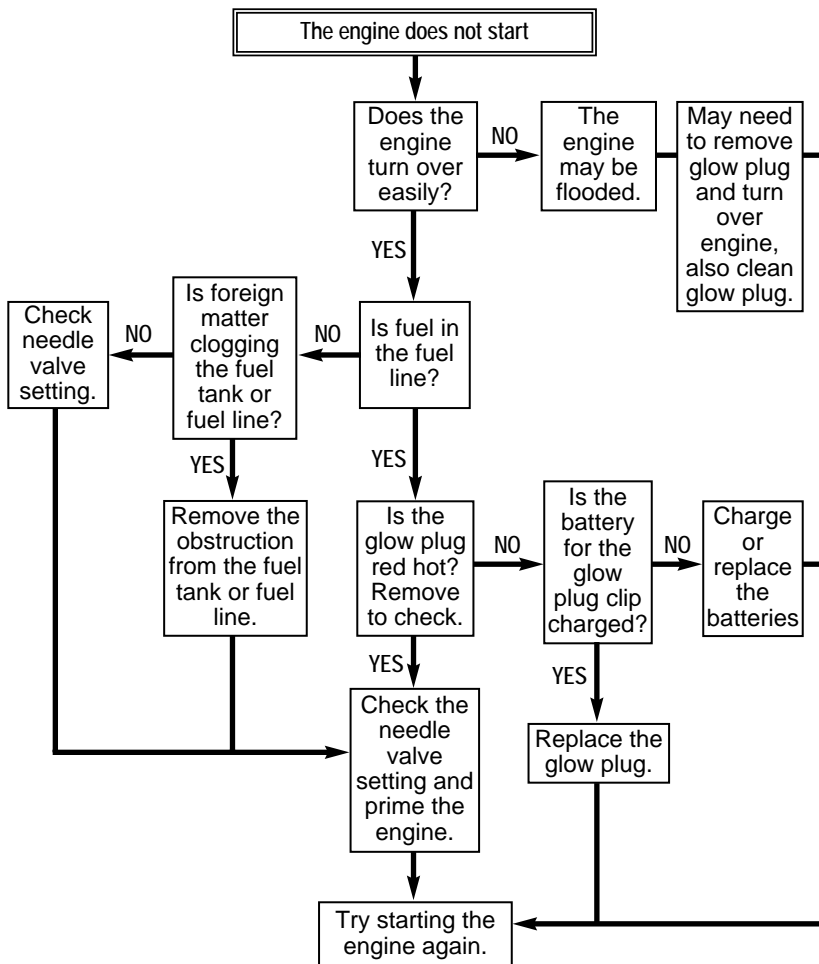
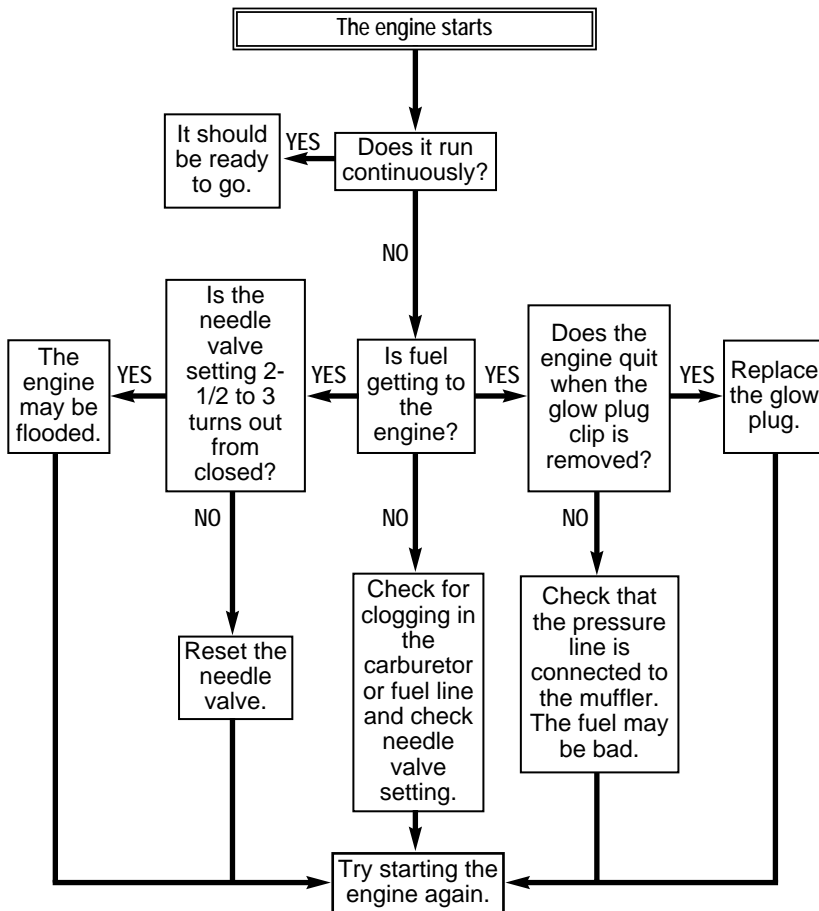
To stop the engine before it runs out of fuel, we suggest that the radio be set up so that when the throttle and throttle trim are moved to the low-speed position, the carburetor can be completely closed. If your throttle was not set up this way, pinch the fuel line from the fuel tank to the carburetor to stop the engine.

Restarting the Engine:

If the engine is still warm, try to start the engine without priming it first. If the engine has cooled down it may need to be primed.

If the engine does not start after priming, the engine may be flooded. Clear the excess fuel from the engine as described before. Attach the glow plug clip to the glow plug and check that it glows bright orange. If it does, re-install it in the engine. If it does not, replace the glow plug with a new one. Try to restart the engine without priming it.

Trouble Shooting:

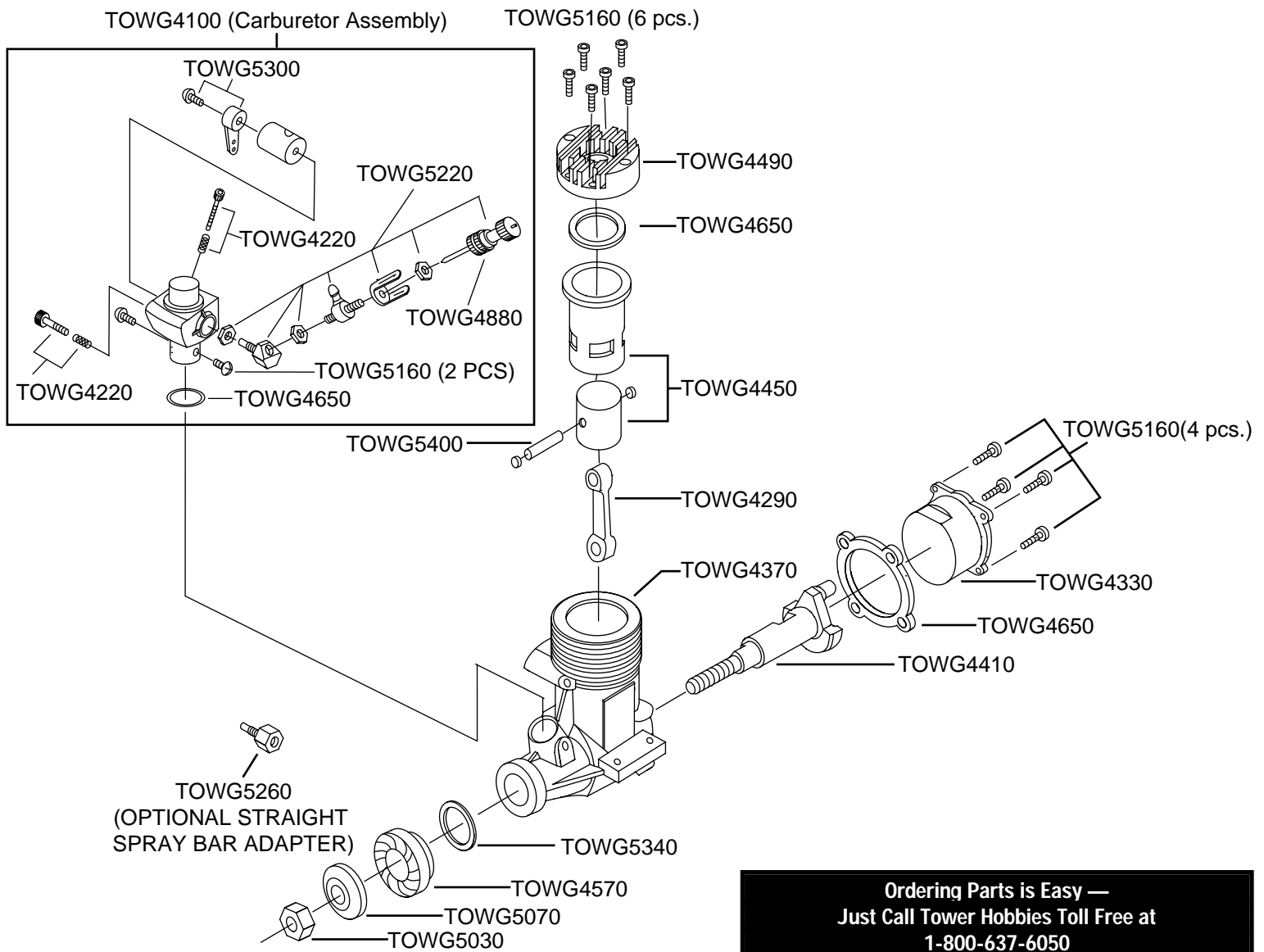


Care and Maintenance:

- We suggest that a fuel filter be installed between the carburetor and the fuel tank to prevent dirt from entering the carburetor.
- At the end of a day of flying, remove all the fuel from the fuel tank. Start the engine and allow it to run at idle until it stops. This will remove any fuel left inside of the crankcase.
- Put a few drops of a quality "after-run oil" in the carburetor. Flip the propeller a few times to distribute the oil throughout the engine. This will prevent rust and corrosion from damaging the engine.
- Wipe off the outside of the engine with denatured alcohol to remove any fuel residue and dirt. If the residue is left on the engine, the heat from the engine will bake it on the next time it is run. Baked on residue reduces the cooling of the engine.
- Do not disassemble the engine unless you are a qualified to do so.
- Avoid running the engine in dusty conditions. If the area you fly in is dusty, such as a dirt runway, we suggest installing an air filter made for airplane engines.
- After flying, check all engine mounting bolts, muffler screws, propeller nut and spinner to make sure they have not loosened up.

Safety Precautions and Warnings

1. Keep all spectators at least 20 feet away when operating engine.
2. Keep yourself out of the path of the prop. Do not lean over the propeller when starting or adjusting the engine.
3. We recommend wood propellers only. All plastic or fiberglass props require special handling. Follow instructions of the propeller manufacturers.
4. Always balance the propeller before installing it on the engine. Never use a propeller that is damaged, no matter how slight.
5. Make sure the edges of the spinner do not touch the propeller blades. The sharp edges may cut into the propeller blades and cause them to break.
6. Be sure your glow plug cord will not interfere with the propeller when running.
7. Never use your fingers to start the engine. Always use a chicken stick or electric starter.
8. Make all engine adjustments from behind the propeller. Always stop the engine before adjusting idle stop screw or air bleed screw.
9. Do not operate the engine in an area with loose gravel or sand.
10. Wear safety glasses when starting and running the engine.
11. Keep all loose clothing such as neck ties and shirt sleeves away from the propeller. Remove any objects from your shirt pockets to prevent them from falling into the propeller.
12. Keep all engine fuel away from children, sparks and excessive heat. Do not smoke while handling model fuel. Model fuel is highly flammable and must be handled with caution.
13. Never operate the model engine in an enclosed area. The engine produces deadly carbon monoxide and must be run in a well ventilated area.
14. Model engines get very hot when running. Do not touch any part of the engine until it cools.



Ordering Parts is Easy —
Just Call Tower Hobbies Toll Free at
1-800-637-6050

STOCK #	DESCRIPTION
TOWG4100.....	CARBURETOR ASSEMBLY
TOWG4220.....	CARBURETOR SCREWS IDLE AND STOP
TOWG4290.....	CONNECTING ROD
TOWG4330.....	COVER PLATE
TOWG4370.....	CRANKCASE
TOWG4410.....	CRANKSHAFT
TOWG4450.....	CYLINDER LINER AND PISTON
TOWG4490.....	CYLINDER HEAD
TOWG4570.....	DRIVE WASHER
TOWG4650.....	GASKET SET (3)
TOWG4720.....	MUFFLER ASSEMBLY
TOWG4760.....	MUFFLER ASSEMBLY SCREW
TOWG4840.....	MUFFLER MOUNTING SCREWS
TOWG4880.....	NEEDLE VALVE
TOWG4990.....	PRESSURE TAP
TOWG5030.....	PROPELLER NUT
TOWG5070.....	PROPELLER WASHER
TOWG5160.....	SCREW SET (12)
TOWG5220.....	SPRAYBAR ASSEMBLY-ANGLED
TOWG5260.....	SPRAYBAR ADAPTER-STRAIGHT
TOWG5300.....	THROTTLE ARM AND SCREW
TOWG5340.....	THRUST WASHER
TOWG5400.....	WRIST PIN WITH RETAINERS

Limited Warranty:

Your engine is warrantied to be free of defects in parts and workmanship for a period of 2 years from the date of purchase when returned for service accompanied by your proof of purchase. Crash damage and problems caused by neglect, abuse or over-leaning will not be covered under warranty. Damage caused by customer disassembly, tampering, use of substandard fuel, use of incorrect accessories (glow plug, propeller, etc.), or any use of the engine for which it is not specifically intended will automatically void the warranty of the engine. Should your engine require warranty or non-warranty service, please return it via an insured shipper to our national servicing facility.

Hobby Services
P.O. Box 9021
1610 Interstate Dr.
Champaign, IL 61821
Ph. (217) 398-0007

9:00 A.M. to 5:00 P.M. Central time. Monday through Friday

Along with your engine and proof of purchase date, please enclose a complete written explanation detailing the problems. State your name and address clearly. For repairs not covered under warranty, you must specify whether you wish the charges to be billed C.O.D. or if you wish to be notified of the charges so you can send a check. VISA and MasterCard are also accepted