



TRX NITRO ENGINE MANUAL

Covers:
TRX .12 and TRX Pro .15



HOW IT WORKS

WARNING!
**FAILURE TO FOLLOW THE PROCEDURES
IN THIS MANUAL COULD VOID YOUR
WARRANTY AND CAUSE PERMANENT
DAMAGE TO YOUR ENGINE.**

The TRX engine is a two-stroke, air-cooled design. It features "ABC" (Aluminum, Brass, Chrome) type construction. The chrome sleeve is tapered so that the aluminum piston feels tighter at the top of the stroke than at the bottom. The piston and sleeve are designed to reach perfect running clearance when they reach normal operating temperatures. The piston will feel tighter when cold.

INTRODUCTION

Thank you for purchasing a new Traxxas TRX engine. This manual contains the instructions you will need to operate and maintain your new engine. **Look over the manual and examine the engine carefully before starting it.** If for some reason you think the engine is not what you wanted, then do not continue any further. Your hobby dealer *absolutely* cannot accept an engine for return or exchange after it has been run.

Fuel enters the engine through the carburetor where it is metered and mixed with air. The fuel/air mixture is then drawn into the crankcase. A rotating valve in the crankshaft opens and closes the crankcase. On the piston's down stroke, the crankcase becomes pressurized, and fuel is blown into the combustion chamber through two timed intake ports cut into the sleeve. Swirling action prevents the fresh fuel/air mixture from exiting the exhaust port. On the upstroke, the fuel is compressed and ignited. When the engine is first started, the electrically heated glow plug causes the fuel to ignite. Once the engine is running, the fuel is ignited by a combination of rapid compression (similar to a diesel) and retained heat from the glow plug. Exhaust gasses are evacuated through a third port in the sleeve.

Please read this entire manual before attempting to start your new engine. Even if you are an experienced R/C enthusiast, please continue reading to learn about the special features that make the TRX engine unique. Pay special attention to the break-in instructions outlined in this manual. The engine must be broken in (or "run in") before maximum performance can be achieved. Follow the directions in this manual exactly. Do not be tempted to take a shortcut here and immediately adjust for top speed and acceleration. A comprehensive rebuild section and a troubleshooting guide have also been included.

The contact surfaces of the engine are lubricated by the oil carried in the fuel mixture. The oil also helps to cool the engine. Some of the oil is burned with the fuel mixture, producing the characteristic smoke trail.

If you have any questions about your new engine, then call Traxxas' technical support line at 1-888-TRAXXAS (toll free, U.S.A. residents only- outside U.S.A. call 972-265-8000). Technical support is available Monday through Friday, from 8:30am to 9:00pm Central Standard Time. We hope that you will enjoy your TRX engine for many hours to come.

The ratio of air to fuel (mixture) is critically important. A mixture that is **too "rich" means that there is too much fuel, and a mixture that is too "lean" means that there is not enough fuel** for the given amount of air. When the mixture is too rich, performance will be sluggish and there will be an excessive amount of smoke. There is also a potential to

foul the glow plug when the mixture is too rich. When the mixture is too lean, there is not enough fuel to cool or lubricate the internal engine components, and damage to the engine and a burned out glow plug is almost certain.

REQUIRED EQUIPMENT

To operate the engine, you will need the following equipment, which is available from your hobby shop.

1. Glow starter (must be long enough to reach the glow plug)
2. Model engine fuel (see fuel recommendations)
3. Fuel dispensing bottle (or some way of easily filling the vehicle's tank, ie. fuel bulb or pump.
4. Small phillips head and flat screwdrivers (for making adjustments)
5. "AA" size batteries for your transmitter(8) and receiver(4)
6. After-run oil
7. Spare glow plugs
8. Air-filter lube

GLOW STARTER

The glow starter is a battery-powered device used to heat the glow plug so that the engine can be started. Once the engine is running, the glow starter is removed. The glow starter is used even when the engine is hot.

FUEL

CAUTION:
ALWAYS FOLLOW THE PRECAUTIONS PRINTED ON THE CONTAINER OF FUEL. KEEP IT AWAY FROM FLAMES AND CHILDREN. THE MIXTURE IS FLAMMABLE AND POISONOUS.

Fuel is the most critical component of making your engine perform properly. Improper fuels will cause hard starting, poor performance, and excessive wear on the engine. At the time of this publication, Traxxas has tested and recommends the following fuels:

Blue Thunder
Byron's Originals
Omega
Power Master

Other brands of fuel which are not listed may also be used however, they **must** meet the following requirements completely.

1. The fuel must contain both castor and synthetic oils with a total oil content of 12 to 18%
2. 3-5% castor oil must be present in a synthetic/castor blend fuel.
3. Nitromethane (nitro) content should try to be kept between 10% and 20%.

CAUTION:
Synthetic-only fuels are not designed for ABC engines and can permanently damage your engine. If you have any questions about fuels call us toll-free at 1-888-TRAXXAS.

The best fuels are castor/synthetic blends. The castor provides high-temperature lubrication while the synthetic oils help prevent varnish build up. The best fuels also contain anti-wear agents, anti-foaming agents, lubrication additives, and rust and corrosion inhibitors. Use fuels that are made for use in cars, not airplanes. Car fuel will provide better throttle response, easier tuning, and longer run times.

For more detailed information about fuels, refer to the section on page 11, "More About Fuels."

FUEL BOTTLE

Fuel is usually purchased by the gallon, so a smaller bottle with a dispensing tube is required to fill the fuel tank. Fuel tanks typically have capacities from 75cc (car and truck) to 120cc (marine). The fuel bottle should be capped to prevent the fuel from evaporating and becoming contaminated with debris or moisture. The alcohol and nitro contents of the fuel will evaporate, thus upsetting the fuel balance and spoiling the fuel. Do not use fuel which is old and/or discolored.

CAUTION:
KEEP THE FUEL CONTAINERS CAPPED AT ALL TIMES WHEN NOT IN USE. THE FUEL CAN SPOIL VERY QUICKLY.

Aftermarket inline fuel filters are available from your hobby shop and can be used to insure a clean supply of fuel for your engine. Dirt is a serious threat to your engine.

RADIO SYSTEM OPERATION

Fully-assembled Traxxas models only.

Install the "AA" batteries into the battery holder in your model. Tape the batteries into the holder to prevent them from falling out during rough driving. Wrap a rubber balloon over the battery holder to prevent fuel contamination, and to prevent the battery holder from short-circuiting against the metal chassis. Make sure the battery holder is held securely.

1) Turn on the radio system, and make sure the throttle and steering servos are operating quickly and that none of the linkages are binding. When operating your model, always turn the transmitter on first, followed by the receiver in the model. After driving, turn off the receiver first, and then turn off the transmitter. **NEVER TURN OFF THE RADIO WHILE THE ENGINE IS RUNNING.** (The on/off switch only turns the receiver on and off. It does not turn off a running engine.)

2) It is very important that all of the "AA" radio system batteries are strong or fully charged. **DO NOT ATTEMPT TO OPERATE THE MODEL WITH WEAK BATTERIES. IF THE BATTERIES FAIL WHILE THE MODEL IS IN MOTION, IT CAN CONTINUE TO RUN OUT OF CONTROL.**

3) Always check the routing of the battery pack wires and their condition before each use. A melted wire can cause a short-circuit and lead to a loss of control.

4) Before start-up, have a friend help in range testing the model's radio to insure complete control at the maximum distance from the driver.

STARTING THE ENGINE

STEP 1: FILLING THE FUEL TANK

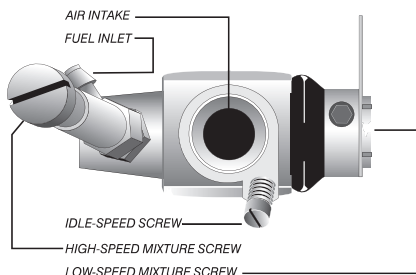
Use a small fuel bottle or bulb to put fuel into the tank. Only fill the tank to the bottom of the fill neck. The model can carefully be refueled while the engine is running.

STEP 2: OILING THE AIR FILTER ELEMENT

The foam air filter element must be oiled before running the engine. For the best filtration, use the special type of oil made for foam air filters. It should be available locally from motorcycle shops and small engine repair shops. Lightweight motor oil or after-run oil may also be substituted. Saturate the filter element with oil and then thoroughly squeeze out the excess. For extremely dusty conditions, special two or three-stage, pre-lubed filters are available from Traxxas (Part #4062, and 4063).

STEP 3: HIGH-SPEED MIXTURE SETTING

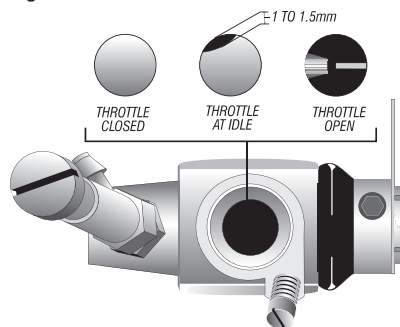
The high-speed mixture screw controls how much fuel enters the engine during mid and high-speed operation. Turn the high-speed mixture screw clockwise, by hand, until it stops (**Do not tighten or the needle may be damaged**). Now, turn the mixture screw counter-clockwise $2\frac{1}{2}$ complete turns.



Note: If you live in higher altitudes (1000 feet or higher above sea level), it may be necessary for you to set your high-speed fuel mixture as much as $\frac{1}{2}$ a turn leaner than outlined here. Call 1-888-TRAXXAS if you have questions about setting your fuel mixture.

STEP 4: SETTING THE IDLE SPEED

The idle screw regulates the throttle opening to control the idle speed. The throttle opening at idle should be set as shown in the drawing. The opening should be 1 to $1\frac{1}{2}$ millimeters at the widest point in the opening. The idle speed may need to be readjusted after the engine is warm.



STEP 5: LOW SPEED MIXTURE SETTING

This screw meters the fuel at low speeds. The low-speed mixture screw is located in the end of the carburetor, inside the throttle arm. This screw controls how much fuel enters the engine at idle and low throttle. This adjustment will smooth the idle and improve acceleration to mid speed. Make this adjustment with the throttle closed, after setting the idle. Gently turn this screw clockwise until it stops. Now turn the low-speed mixture screw counter-clockwise $1\frac{3}{4}$ turns.

STEP 6: PRIMING THE ENGINE

Some models have a button on top of the fuel tank, referred to as the prime button. Pressing it will manually pump fuel into the carburetor. Press the button several times until

the fuel moves through the hose up to the carburetor. Once the fuel has reached the carburetor, press the button a few more times to ensure that there is fuel in the engine. On models which are not equipped with a prime button (such as marine), the engine may be primed by holding your finger over either the carburetor intake or the exhaust outlet(s) and pulling the recoil starter. **ALLOW A HOT ENGINE AND EXHAUST TO COOL FIRST SO THAT YOU DO NOT BURN YOURSELF.** Pull until the fuel reaches the carburetor and then pull one more time to prime.

STEP 7: SHUTTING OFF THE ENGINE

To stop the engine, pinch and hold the carburetor's fuel line while running at idle speed. Do not shut the engine off by placing your finger over the exhaust outlet. On some models, you can stop the engine by placing your shoe against the flywheel where it protrudes through the bottom of the chassis.

STEP 8: STARTING

Before starting your engine, read the safety and mechanical engine precautions.

Turn the radio system on. Now, attach the glow starter to the glow plug. Hold the model **firmly** and pull the handle on the recoil starter with **short, quick pulls** until the engine starts. **Do not extend the starter rope more than 12 inches, or pull it to its limit.** This could damage the starter. To prevent over extending the starter, try resting your elbow against your knee while bending over to start the model. This technique will make it difficult for you to have a long enough stroke to over-pull the starter. Note: Do not relate the starting of the TRX engine to that of a lawnmower or weed trimmer. Those types of engines and starters are completely different.

CAUTION:
IF THE STARTER BECOMES LOCKED OR DIFFICULT TO PULL, DO NOT FORCE IT OR YOU COULD BREAK THE STARTER. A STIFF OR LOCKED STARTER IS USUALLY CAUSED BY ENGINE FLOODING.

If the starter is difficult to pull, try loosening the glow plug $\frac{1}{4}$ turn. This will reduce compression and put less strain on the starter components. Retighten the glow plug once the engine starts.

Once the engine starts, do not let it yank the starter handle from your hand. This could cause the spring or the string to break.

If the engine does not start, then while pulling the starter, open the throttle slightly by either using the transmitter or by manually pulling on the throttle arm adjustment collar.

If, after many tries, the engine still will not start, there could be a problem with the glow plug, glow starter, or the engine could be flooded. Refer to the troubleshooting section for more information. Any starting problems are most likely fuel or glow starter related. Refer to the Troubleshooting Guide for more detailed information.

BREAKING-IN THE ENGINE

CAUTION:
TRX ENGINES MUST BE BROKEN-IN FOR MAXIMUM LIFE AND HIGHEST LEVEL OF PERFORMANCE. THIS PROCESS MUST NOT BE SKIPPED. A SHORTCUT HERE COULD SHORTEN THE ENGINE LIFE

The key to breaking in your engine is patience. During the break in period, your engine may appear to malfunction with symptoms such as stalling, wildly inconsistent performance, and fouled glow plugs. Don't give up on it! These are just "break-in pains" that every new engine has to go through, and which will disappear once you get through the break in period. **Just keep it running, and throttle on and off as smoothly as you can. Sudden bursts or releases of the throttle can stall your engine.** Soon, after about the fourth tank of fuel, your patience will pay off with solid, consistent, performance.

The break in time will take about 1 to 1½ hours. During this time, you should resist the temptation to tune the engine for performance and/or run for extended times at wide open throttle. Completing the break in process as instructed will result in the fastest, best performing engine as compared to those engines which were improperly broken in.

READ THIS BEFORE YOU BEGIN:

During break in, use fuel with the same percentage of nitro which you plan to run every day. **Do not use a lower percentage of nitro during break in and then switch to a higher percentage for normal running.**

THE ENGINE SHOULD BE BROKEN-IN WHILE DRIVING THE MODEL ON A SMOOTH, HARD SURFACE. For marine engines, choose a body of water which is clean and calm.

AVOID BREAKING IN THE THE ENGINE ON VERY HOT, HUMID DAYS. Wait until the morning or evening when it is cooler.

Turn the high-speed mixture screw (needle) clockwise (in) to lean the mixture. This decreases fuel flow for the given amount of air. Turn counter-clockwise (out) to richen the mixture and increase the amount of fuel to be mixed with the air.

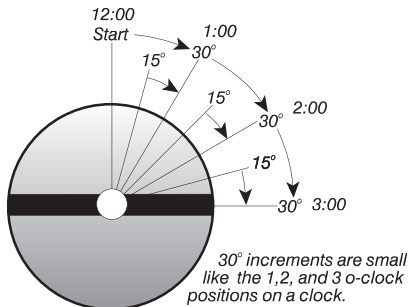
BREAK-IN THE ENGINE WITH THE BODY REMOVED FROM THE MODEL (FOR EXTRA COOLING). You must not allow the engine to overheat by running it with too lean a mixture or blocking the cooling air. Overheating can cause severe engine damage.

DURING BREAK-IN, THE ENGINE CONSUMES A LARGE QUANTITY OF FUEL. Watch the fuel level in the tank. As the fuel level decreases, the engine will run leaner which is undesirable during break in. If the engine is allowed to run out of fuel while it is running at speed, the glow plug could be damaged and require replacement

During the break-in period the performance level of the engine will be limited by the rich fuel mixture which is required. Once the engine is fully broken-in (after about 4-6 tanks of fuel) the mixture can be leaned out, and speed and acceleration will increase.

Because of the rich fuel mixtures and the wearing of the new parts, deposits will form on the glow plug causing it to fail. Expect to replace the glow plug possibly during the break-in period, and definitely after the engine is broken-in and the fuel mixture is leaned. **Glow plugs are consumable items which have a tremendous effect on how your engine performs. Keep a supply of extra glow plugs available.**

THE FIRST TANK OF FUEL



1. Set the high-speed and low-speed mixture screws as described in STEPS 3 and 5. Once the engine is started, drive the model slowly for approximately 30 seconds to warm the engine. **Ease in and out of the throttle slowly.** If the engine keeps stalling when accelerating, then richen the high-speed mixture screw to 2³/₄ turns and/or the low-speed mixture screw to 2 turns out from closed.

2. The idle speed should be set as fast as possible without causing the model to move. If necessary, adjust as shown in Step 4 (page 3).

3. The baseline setting of the high-speed mixture screw will vary slightly with each engine. To know if your engine is set correctly for break in, look for the following performance characteristics (on a warm engine):

* The engine will accelerate sluggishly from a standing start and may even try to stall if the throttle is applied too quickly.

* Blue-white smoke will be emitted from the exhaust.

* When the model is accelerating at full throttle, the engine will never “clean out.” When an engine “cleans out,” the speed and rpms will increase suddenly and dramatically, as if the engine has gone into “second gear.” Also the amount of smoke emitted from the exhaust will decrease. **“Cleaning out” is a desirable characteristic once the engine is broken-in; however, during the first four tanks, try to avoid it.**

4. Alternate driving the model at medium speeds and short (2-second) bursts of full-throttle acceleration.

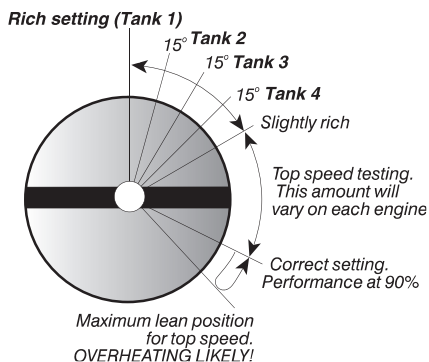
5. As the engine reaches normal operating temperature, it will speed up and performance will improve. This occurs because the fuel mixture is becoming leaner with the increased temperature. You will need to richen the fuel mixture 15° or more, so that the engine continues to run as described above. **Tip: Remember to keep the engine from “cleaning out” during break in by richening the high-speed mixture as necessary.**

6. When the first tank is almost gone, bring the model in, shut off the engine, and allow it to cool for 7-10 minutes before continuing.

7. Form the habit of inspecting the air cleaner each time you refuel. Look inside the carburetor for any signs of dust entering the engine. Remove any dust with a Q-tip and clean and re-oil the filter. When the model is used in extremely dusty conditions, use Traxxas 2-stage (part #4062) or 3-stage (part #4063) foam air filters.

TANKS 2-4

1. Turn the high-speed mixture screw clockwise 15° and run through the second tank of fuel. Repeat this process for the third and fourth tanks of fuel as well. **Important: Do not lean the high speed mixture less than 2 turns out from closed (see illustration). Also, be sure to allow the engine to cool between each run.**



2. During tanks 1-4, Watch closely for any **signs of overheating. These include:**

- Steam or smoke emanating from the engine surfaces
- Cleaning out and then lagging during high-speed acceleration (as if running out of fuel)
- Popping or clattering sound when decelerating (detonation)
- Idle speed will surge or possibly diminish to the point of stalling.

CAUTION:

IF THE ENGINE STALLS WHILE YOU ARE DRIVING, BECAUSE OF AN OVERHEATING CONDITION, SEVERE DAMAGE MAY HAVE ALREADY OCCURRED. OVERHEATING IS CAUSED BY THE FOLLOWING OPERATIONAL ERRORS:

- FUEL MIXTURE IS SET TOO LEAN
- COOLING AIR FOR THE HEAD IS BLOCKED
- EXCESSIVE NITRO CONTENT IN THE FUEL
- INCORRECT OIL CONTENT IN THE FUEL
- POOR QUALITY FUEL
- EXCESSIVE LOADS PLACED UPON THE ENGINE (caused by a bound drivetrain or driving in grass and deep sand)

YOUR ENGINE WILL BE SHORT-LIVED IF ANY OF THE ABOVE CONDITIONS ARE ALLOWED TO EXIST FOR ANY LENGTH OF TIME.

TO TEST FOR OVERHEATING, place a drop of water or spit on the top of the cylinder head. If it sizzles away immediately, shut the engine off at once. If it takes approximately 3-5 seconds for the water drop to boil away, then the engine is running within a normal temperature range. **Tip: On-board digital temperature gauges are available from your hobby shop.**

TUNING FOR POWER

Sometime between the fourth and sixth tank of fuel, the internal engine parts should be broken-in. You can then begin adjusting the fuel mixture to maximize performance for your normal driving needs.

The engine should never be run at more than 90-95% of its maximum performance capacity. As you continue to lean the fuel mixture, the engine will run faster up to a point. When the engine is set too lean, it will seem to run strong at first, but will bog, hesitate, or stall when running at high speed. The engine will also rapidly overheat when the setting is too lean. **CHECK THE ENGINE TEMPERATURE OFTEN AS YOU LEAN THE MIXTURE. DO NOT LET THE ENGINE OVERHEAT.**

At the optimum setting, the engine will clean out; have a strong-sounding, high-pitched whine at full speed; and there will be a thin trail of whitish smoke emitted from the exhaust. **It is always better to set the engine a little rich rather than a little lean.**

Find an area with a long smooth straight-away that will allow the engine to run at full throttle. Run the model two or three passes at full throttle and note the top speed and acceleration. Turn the high-speed mixture screw clockwise 15° and retest the model, again noting the performance. Continue to lean the mixture and retest the model until the highest speed is achieved. At that point, turn the mixture screw counterclockwise 15 to 30°. This is the optimum setting that the engine should be run at.

If the engine stalls on acceleration, begins to bog or slow down at full throttle, or if there is a significant reduction in exhaust smoke, then the engine is running too lean. Immediately turn the high speed mixture screw counterclockwise 45° and operate the model at medium speeds for 1 or 2 minutes to allow the engine to cool. Then, continue testing. At no point should your high-speed mixture needle be adjusted to fewer than 2 turns out from the closed position.

TUNING THE LOW-SPEED MIXTURE FOR PERFORMANCE

The low-speed mixture affects how the engine will perform in the low and mid-rpm ranges. Turning clockwise will lean the mixture. As with the high-speed mixture, leaning the low-speed mixture increases performance. Again, if the mixture here is set too lean, the engine may be starved for lubrication in the low and mid-rpm ranges, thus causing overheating and excessive engine wear.

Perform the following test to determine if the low speed mixture is set correctly. With the engine warm and running, allow it to idle for approximately 15 seconds. Now apply wide-open throttle and note performance. If the engine bogs, accelerates erratically, and a large puff of blue smoke is emitted, then the low speed mixture is too rich. Turn the screw clockwise 15°. If the engine speeds up momentarily and then bogs, hesitates, or stalls, then the low speed mixture is too lean. Turn the screw counterclockwise 15°. Adjust the mixture screw in 15° increments, wait 15 seconds, and retest after each change. Adjust for the best acceleration without stalling.

ADJUSTING THE SLIPPER CLUTCH

Some Traxxas fuel-powered models are equipped with an adjustable slipper clutch which is built into the large spur gear. The purpose of the slipper clutch is to regulate the amount of power sent to the wheels in order to prevent tire spin. When it slips, the slipper clutch makes a high-pitch chirping noise, which you should be able to hear over the engine noise. When running on pavement, set the clutch so that it is tight. When running on dirt, slightly loosen the adjusting nut $\frac{1}{8}$ of a turn out to reduce tire spin.

STORAGE

After running your model, use a good "after-run" oil prior to storage. The methanol used in the fuel attracts moisture and can cause moisture and corrosion to form inside the engine. Drain the fuel tank, attach the glow starter and try to start the engine until all of the remaining fuel is completely used up. Remove the air cleaner and place the recommended number of drops (usually 6 drops) of the after-run oil into the carburetor. Now pull the recoil starter 4 or 5 times to circulate the oil and then replace the air cleaner. Never store your model with unused fuel in it.

TROUBLESHOOTING:

GLOW PLUG PROBLEMS

The glow plug in your engine is a consumable item which must be replaced periodically to maintain peak performance and starting ease. **Most often, any starting problems or erratic performance can be traced back to the glow plug.** The glow plug should also be suspected if the engine's acceleration and high-speed performance suddenly become flat.

A leaking glow plug can cause many problems with engine performance, especially if the engine is not running well at speed. While the engine is running, look for bubbles at the base of the glow plug. Loosen the glow plug and then re-tighten. If the problem persists, remove the glow plug and replace it.

The only sure way to test for a faulty glowplug is simply to install a NEW one to see if the problem goes away. Remove the plug from the cylinder head with a $\frac{5}{16}$ inch nut driver or socket. Make sure there is no dirt or debris on the top of the head which could fall down into the engine. Do not lose the copper gasket which seals the glow plug. Touch the glow plug to the contacts of the glow starter. All of the coils should glow bright orange. **Sometimes the first few coils will not glow while the rest are bright, most likely indicating a bad plug.** Do not perform this test in direct sunlight. If the glow is dim orange, then the glow starter battery should be replaced or recharged.

Tip: Glow plugs can be damaged by running the fuel mixture too lean, applying more than 1.5 volts to the plug, or by running out of fuel while the engine is running at high RPMs.

Replacement glow plugs are available from your hobby shop or Traxxas. From the factory, your engine was equipped with a standard long-reach plug. For the best performance, use the original Traxxas replacement plugs: (part #3230, standard long plug for TRX .12 or part #3231 heavy-duty long for TRX .15). Glow plugs with idle bars should not be used. Always use the new gasket which comes with the glow plug. **Do not use plugs with idle bars.**

Tip: Traxxas heavy-duty glow plugs (part #3231) should also be used in TRX .12s equipped with tuned pipes. Do not use the heavy-duty plug in a TRX .12 with stock exhaust or poor performance may result.

FUEL PROBLEMS

A clean, properly-lubed, air filter is essential for maintaining the performance of the engine. **NEVER RUN YOUR ENGINE WITH A DRY FILTER, OR WITHOUT THE AIR FILTER IN PLACE.** If dirt gets into the engine, all of the internal parts can be severely damaged in a short amount of time. **INSPECT THE AIR FILTER EACH TIME YOU REFUEL.** The air filter could become saturated with fuel when the model is turned upside down, or when the engine is flooded. The air filter should be cleaned at the first sign of deterioration, oil contamination, or blockage.

If you will be running your engine in extremely dusty conditions or where there is fine, powdery dust, then the Traxxas two-stage oil/foam air filter (part #4062) or three stage filter (part #4063) should be used.

Your engine consumes more fuel than you might expect. It will run approximately 8-10 minutes on a tank of fuel. Run time will be even less during break-in because of the rich fuel mixtures. Try not to let the fuel level drop below $\frac{1}{4}$ of a tank. When the fuel level is low, the engine will begin to draw air in with the fuel, as the fuel sloshes away from the fuel pickup point in the bottom of the tank. The air in the line causes erratic performance and radical leaning of the fuel mixture. In this case, the engine may lean out, stall, and the glow plug could be damaged.

The main component of model engine fuel is methanol. Methanol will attract moisture from the air when left uncapped. **If the fuel is left uncapped, for even a few days, it should be disposed of.** Also, fuel left open will get dust in it, which can damage your engine. **Keep the fuel tightly capped at all times and store it away from direct sunlight.**

Poor quality fuels may lead to overheating problems. If the methanol is not pure, or the nitro content is composed of nitromethane and nitropropane instead of nitromethane, you could experience all types of running problems in addition to destructive ash buildup inside the engine. Also, if the fuel does not contain both castor oil and high quality synthetic oil, then the fuel will cause many problems and should not be used. You simply **MUST** use a fuel which meets the standards outlined in the fuel requirements section of this manual. Other types of fuel are unacceptable.

The TRX engine is designed to perform best on nitro contents between 10 and 20%.

When the 20% mark is surpassed, all risk and responsibility for engine performance becomes your own. Engine temperatures will increase when more nitro is used, with only modest gains in performance, and a decrease in engine life. **Use less nitro in warm weather, and more in cool weather.** Perform the following test to determine if you are using enough nitro. Start the engine, allow it to warm up, and disconnect the glow starter. If there is no discernable drop in RPMs, then you are using enough nitro. If the engine doesn't idle smoothly or as fast when the glow starter is removed, then the next higher level of nitro should probably be purchased on your next gallon of fuel. This test assumes that the glow plug is good (a bad glow plug will also cause poor running when the glow starter is removed) and the engine is broken in.

It is possible for the fuel lines to develop cuts and pinhole leaks when the fuel lines are removed from their fittings. These leaks allow air in the line which interrupts the fuel flow. If a leak is suspected, replace the lines with new tubing. **DO NOT BLOW ON THE TUBES WITH YOUR MOUTH. MODEL FUEL IS POISONOUS.**

FLOODING:

Occasionally, you may accidentally flood the engine. Symptoms of a flooded engine include difficulty pulling the starter and muffled sound coming from the exhaust. Remove the glow plug with a $\frac{5}{16}$ inch nut driver and then remove the air cleaner. Turn the engine upside down to drain any excess fuel out of the combustion chamber and carburetor. Pull the recoil starter 4-5 times to clear the engine. Be extremely careful not to let the fuel spray into your face! Turn the model back over, install the glow plug, and re-prime the carburetor. The engine should start and run normally.

CARBURETOR TIPS:

The carburetor, because of its simple design, is very reliable. Its only enemy is dirt. Dirt particles become embedded in the needle seats and prevent consistent mixture settings. The carburetor should be suspected when a sudden and persistent leaning of the fuel mixture is observed (the engine may suddenly speed up). To dislodge the dirt particle, try screwing the high and low-speed mixture screws all the way in and then back out to their original settings. If the engine doesn't return to normal operation, try backing the mixture screws out several more turns and then use the prime button to force fuel through the carburetor. Return the mixture screws to their

original position. The engine will be flooded after this process so follow the steps in the above paragraph to return the engine to normal. If the dirt particles are still not cleared, then remove the carburetor and clean both the high-speed and low-speed needles with denatured alcohol. To prevent this from re-occurring, replace the air filter with a new unit and install a new in-line fuel filter between the carburetor and fuel tank.

FUEL MIXTURE TIPS:

The fuel mixture is the largest variable you have to control while operating your engine. Fuel brand, ambient temperature, and humidity all effect how your mixture should be set. If the engine runs great one day but runs rich or lean on another day, it is most likely the result of a change in the air quality and temperature. This should be expected and adjusted for.

STARTER PROBLEMS

Most starter problems result from pulling the starter too far or after the engine has been flooded and/or is in a "locked" condition. The starter can be removed from the engine by removing the four 3x6mm philips head screws that fasten the housing to the engine. The starter must be removed in order to perform any service on it. Refer to rebuild steps 6-12 on pages 13-14 for starter service.

COOLING PROBLEMS

Engine overheating is most often caused by running the engine too lean or because the cooling air for the cylinder head is blocked. If the mixture is too lean, simply allow the engine to cool, richen the mixture, and try again (both the high-speed and low-speed mixtures have an effect on running temperatures). Truck, buggy, and car bodies must have holes cut in them to allow cooling air to move across the fin surfaces of the cylinder head. On some bodies, the windshield should be cut out so that air can flow to the head. Additional cooling can be achieved by cutting an opening in the back of the body so that air will pass completely through the body.

If the fuel meets all of the requirements, the mixture is set rich, the head is receiving adequate ventilation, and the engine continues to overheat, then the model may have a bound-up drivetrain. Look for dirty wheel bushings which may have tightened or any other moving part which may be causing excess drag on the model. Driving through deep sand and grass will also put excessive loads on the engine.

CHANGING CLUTCH BELLS

The clutch bell gear will wear from use and should be changed periodically. The gear should be replaced when the teeth on the gear are sharp and pointed rather than square-shouldered. Metal particles become embedded in the spur gear and it should be replaced at this time also. Refer to engine rebuild steps and the exploded-view drawing when disassembling the clutch mechanism (the numbers in parenthesis are part identification numbers).

MAINTENANCE

CONNECTING ROD

The connecting rod inside the engine should be inspected for wear about every gallon of fuel. We recommend that the connecting rod be replaced if it shows wear. See engine rebuild steps 1-5. If your engine is being used in an application that requires continuous high-speed operation, or if a lean fuel mixture has been used to gain performance, then the connecting rod should be checked more often. Follow the step-by-step instructions in the rebuild section of this manual to inspect or change the connecting rod. Failure to inspect the connecting rod at the prescribed intervals could result in severe internal engine damage.

AIR CLEANER

The air cleaner is essential for keeping dirt out of the engine. The air cleaner should be inspected carefully every time you refuel. It should be cleaned and re-oiled whenever it is dirty. If you will be running your engine in extremely dusty conditions or where there is fine, powdery dust, then the Traxxas two-stage oil/foam air filter (part #4062) or three stage filter (part #4063) should be used.

CLEANING

The engine should be kept clean of oil and grime for more effective cooling. The more often the engine is cleaned, the easier it will be to clean the engine. **The easiest and most effective cleaning method is to use denatured alcohol applied with a trigger spray bottle.** Denatured alcohol is available from paint and hardware stores and it will not attack the plastics used in the construction of your model. **THE DENATURED ALCOHOL IS FLAMMABLE SO KEEP IT AWAY FROM OPEN SPARKS AND FLAME. FOLLOW ALL OF THE PRECAUTIONS ON THE CONTAINER.** Remove the batteries and radio system from your model before spraying it with the

cleaner. Tilt the model up so that the alcohol will dissolve the grime causing it to run off the back of the model. The alcohol will then evaporate leaving little residue.

STORING YOUR MODEL

Use an after-run product in the engine whenever the model is going to be stored and whenever it has been cleaned with alcohol. Use of the after run oil is described on page 7. The denatured alcohol and the alcohol in the fuel attracts moisture so the oil is needed to prevent rusting and corrosion. Clean the model as thoroughly as possible. Clean and oil the bushings in the front wheels and rear axles. Store unused fuel in a tightly-capped container away from direct sunlight.

PRECAUTIONS

If the precautions are followed and your model is operated sensibly and with care at all times, it poses very little danger to you or your spectators. Failure to operate your model in a safe and responsible manner could result in property damage and injury. You alone must see to it that the instructions are followed and that the precautions are adhered to.

PERSONAL PRECAUTIONS

- * The fuel is dangerous. Follow all of the directions and precautions on the fuel container.
- * The fuel can look like a cool drink to a young child. Keep it out of children's reach.
- * The fuel is flammable. Do not allow sparks, flame, or smoking in the presence of model fuel.
- * The engine emits poisonous carbon monoxide gas just like a real automobile engine. Always run the model in a well-ventilated area. Never attempt to run the engine indoors unless there is adequate ventilation.
- * The engine, head, and exhaust system become extremely hot during use. Be careful not to touch these parts, especially when refueling or reaching for the starter handle.
- * Do not drive the model at night, on public streets, or in large crowds of people.
- * Do not reach underneath a running model to pick it up. You might accidentally come in contact with the spinning flywheel.
- * Fuel-powered models are very fast and can cause injury if allowed to run into people or animals. For this reason, it is very important to maintain the mechanical integrity of the model. The radio system, batteries, connections, and brakes should all be kept in good working order so that they will be reliable.
- * The engine produces a fair amount of noise. Be considerate of your neighbors by not run-

ning your model early in the morning or late in the evening. Try to find a place to run your model where no one will be disturbed by its noise.

MECHANICAL PRECAUTIONS

- * The engine is capable of turning 30,000 or more RPMs at full throttle. **Continuous full-throttle, high-speed operation will rapidly decrease the life span of the internal engine parts. For longer engine life, vary your speed. If the engine will be run at high speeds in a racing situation, expect to replace worn parts more often.**
- * Do not attempt to operate the engine using gasoline, alcohol, naphtha, or any other fuel other than model engine fuel.
- * Do not allow the engine to overheat. Overheating can damage the engine.
- * Never run the engine without the air cleaner. Inspect the air cleaner carefully each time you re-fuel. Replace the air cleaner when even the slightest signs of deterioration are visible.
- * Do not run excessively lean mixtures. A mixture which is too lean will cause engine overheating and damage.
- * If the engine performance suddenly changes, stop at once and find the cause for the change.
- * Do not over-rev the engine. The engine will over-rev if the throttle is fully opened while the rear wheels of the model are off the ground.
- * If the model flips upside down, do not rev the engine.
- * Do not allow the engine to run out of fuel while it is running at high RPMs. This could damage the glow plug.
- * Test the radio system each time before you operate the model. Always use strong batteries in the radio system. Stop running immediately at the first sign of weak batteries.
- * Do not drive your model in thick grass or deep sand. This puts excessive loads on the engine and could cause it to overheat.
- * Do not run your car, truck, or buggy through water. The engine is not waterproof.
- * The fuel used must meet the recommendations outlined in this manual. Failure to use the correct fuel will damage the engine.
- * The starter rope should not be pulled out more than 12 inches. Longer pulls are not necessary and can damage the starter.
- * Using fuels containing more than 20% nitromethane will cause the engine to run hotter and decrease its longevity.

MORE ABOUT FUELS

Do not use fuels blended with 100% synthetic oils, without castor. Synthetic oils have a lower flash point than castor. Thus, when the engine reaches its higher operating temperatures, the synthetic oil may burn off the bearing surfaces and not provide adequate lubrication. This will result in severe damage to your engine. When castor oil is present in fuel, there is an extra margin of safety, providing for some measure of lubrication if the synthetic oils have possibly burned away.

Also, do not use fuels blended with 100% castor oil and no synthetic oil. 100% castor oil will cause varnish to build up inside the engine. The varnish coats the parts and prevents effective heat transfer.

The purpose of the nitromethane in the fuel is to increase the amount of fuel being burned, thus improving power. The TRX-12 engine will run on fuels which contain no nitromethane; However, fuels containing 10-20% nitromethane should be used. Increasing the nitro content beyond 20% may improve power up to a point; however, running temperatures will also increase. A cool-running engine will last longer and perform better.

There are several different types of "nitro": nitromethane, nitromethane, and nitropropane. Only use fuels with nitromethane in model engines. Nitroethane and nitropropane cause the engines to run very hot, but are sometimes used in small percentages to lower the cost of the fuel. Nitropropane is a known carcinogen, and should be avoided.

The color in the fuel is simply for identification purposes only. It has no effect on the performance of the engine.

Do not buy fuel if you are unsure of its contents. Proper fuel is absolutely vital for the life and performance of your engine. Not all fuel is created equal. If there is any doubt about the content of the fuel, the quality of the fuel, or the reputation of the maker or seller, do not buy it. Your best source for fuel is a reputable, well-known hobby dealer who has experience with small model engines. Always read the label, but generally speaking, nationally-recognized, brand-name fuels should have the oil content you need.

During the break-in period, use the percentage of nitro which you plan to run every day. Do not use a lower percentage of nitro during break in and then switch to a higher nitro percentage for normal running.

Engine will not start	Out of fuel Fill fuel tank Improper or contaminated fuel Replace fuel Carburetor not primed Prime carburetor Glow starter not charged Charge glow starter Glow plug bad Replace glow plug- see "Glow Plug Problems" section Engine flooded See "Fuel Problems-Flooding" section Engine overheated Allow engine to cool- find cause for overheating Carburetor incorrectly adjusted Readjust carburetor Exhaust blocked Remove and clean exhaust system Air cleaner blocked Clean air filter
Starter will not retract	No lubrication Turn flywheel by hand to retract starter rope- problem will correct itself after first run Rope is jammed Repair starter- see "Starter Problems" section Spring is unwound or broken Repair starter- see "Starter Problems" section
Starter will not pull	Engine is flooded Clear excess fuel- see "Flooding" section Rope is jammed Repair starter- see "Starter Problems" section Engine seized Disassemble engine to find cause
Engine starts and then stalls	Idle speed set too low Increase idle speed Air bubble in fuel line Use prime button to force bubble through- check for a hole in the fuel lines Glow plug is fouled or weak Replace glow plug- see "Glow Plug Problems" section Engine overheated Allow engine to cool- find cause for overheating Insufficient fuel tank pressure Replace pressure hose- Clear blockage at exhaust header fitting- check flow to and from tank
Engine sluggish/ poor performance	High-speed fuel mixture is too rich Set high-speed mixture to a leaner setting Leaking glow plug Check glow plug gasket/ tighten glow plug Glow plug is fouled or weak Replace glow plug- see "Glow Plug problems" section Fuel bad or contaminated Replace fuel Carburetor dirty or blocked Clean carburetor- see "Fuel Problems" section Engine overheating Stop at once- find cause for overheating Slipper clutch is improperly adjusted Tighten slipper clutch (when equipped) Engine overgeared for application Use a lower gear ratio Centrifugal clutch slipping Replace clutch shoes (return for service) Model has bound up drivetrain Find the bound item and repair Engine excessively worn Return for service
Engine overheats	High-speed mixture too lean Richen high-speed mixture Cooling air is blocked Direct air to the head Excessive nitro in the fuel Use fuel with lower nitro content Incorrect oil content in the fuel Purchase correct fuel Poor quality fuel Purchase correct fuel Excessive load on the engine Check for bound up drivetrain Low-speed mixture too lean Richen low-speed mixture
Engine hesitates or stumbles	High-speed mixture too lean Richen high-speed mixture Low-speed mixture too rich Lean low-speed mixture Engine overheated Stop at once- find cause for overheating Air bubble in fuel line Use prime button to force bubble through- check for a hole in the fuel lines or low fuel level Glow plug fouled Test and/or replace glow plug- see "Glow Plug Problems" section Insufficient fuel tank pressure Replace pressure hose- Clear blockage at exhaust header fitting- check flow to and from tank
Engine stalls instantly when throttle is fully opened from idle	Glow plug fouled or weak Replace glow plug- see "Glow Plug Problems" section Low-speed mixture too lean Richen low-speed mixture High-speed mixture too rich Lean high-speed mixture
Engine stalls while driving around turns	Fuel level is low Refill fuel tank Idle speed set too low Increase idle speed
Engine stalls while running for no apparent reason	Glow plug fouled or weak Replace glow plug- see "Glow Plug Problems" section Engine overheated Stop at once- find cause for overheating Fuel line blocked with trash Replace fuel line- install fuel filter Insufficient fuel tank pressure Replace pressure hose- Clear blockage at exhaust header fitting- check flow to and from tank