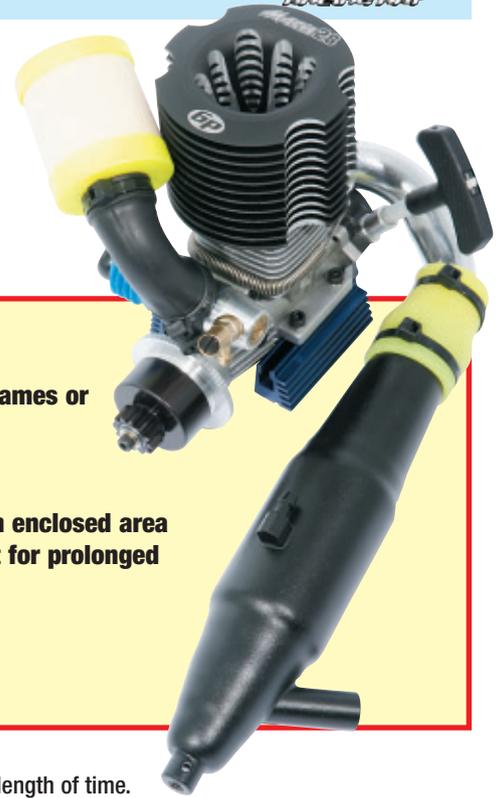


NITRO ENGINE INFORMATION



Mac Star 28

IMPORTANT - READ THIS BEFORE STARTING YOUR ENGINE!



For your safety - Your engine is not a toy!

- You will be working with highly flammable fuel, so keep it away from exposed flames or any thing which might ignite it. Read the safety info on the fuel container.
- Do not use fuels that were not designed for glow plug engines.
- Keep the fuel out of reach of children!
- Deadly carbon monoxide gas will be released, so do not operate the engine in an enclosed area where exposed flames or sparks can ignite it, or where it causes you to inhale it for prolonged periods.
- During operation, the engine may be dangerously hot to the touch.
- Do not use the engine for purposes other than in model cars designed for them.
- Mount the engine securely.

Before Starting Your Engine

Oiling the filter

The air filter is essential for keeping dirt out of the engine. A foam filter must be oiled before running the engine. We recommend using Associated AS7710 foam pre-filter treatment. Dab the treatment all around the filter, put the filter in a plastic bag and knead it until the filter is saturated, but not soaked. NEVER RUN YOUR VEHICLE WITHOUT THE AIR FILTER.

Adjustments

Your engine has come factory set to allow for an easy start and rich running . DO NOT alter any of the settings until the running in period has been completed.

Putting fuel in the fuel tank

Squeeze the fuel bottle, put the bottle's tube into your fuel container, and draw out some fuel. Lift up the lid on the fuel tank, and slowly squeeze the fuel bottle until the tank is full. Be careful here. If you overflow the tank it might get on your radio gear or on your brakes and you may create an unsafe driving situation. Always keep your fuel bottle closed when not in use.

Understanding the engine terms "rich" and "lean"

Your carburettor has screws that regulate how much air and fuel enter the engine together, the air/fuel mixture. An air/fuel mixture that is too "rich" means 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 (one symptom of this, is excessive amounts of smoke from the exhaust). 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/or glow plug is almost certain.

CAUTION:

If, while you are driving, the engine stalls because of an overheating condition, severe damage may have already occurred. Overheating is caused by the following conditions.

- Fuel mixture is set too lean
- Air leak around carb
- Loss of muffler pressure (line falls off)
- Excessive nitro content in the fuel
- Incorrect oil content in the fuel
- No air filter
- Poor quality of fuel
- Contaminated fuel
- Excessive loads on the engine (locked drivetrain)

Your engine will be short-lived if any of the above conditions are

allowed to exist for any length of time. During the first few tanks watch closely for any signs of overheating. These will include:

- Steam or smoke coming from the engine surfaces
- Cleaning out and then lagging during high-speed acceleration, as if it is running out of fuel.
- Popping or clattering sound when slowing down. Idle speed will surge or possibly diminish to the point of stalling.

To Test For Overheating

It's important to check the head temperature during the operation of the engine. The best method for checking the head temperature is to use a head temperature gauge. There are several head temperature gauges available, and the temperature readings between these different brands of gauges vary. Due to this variance , the temperature readings will range between approximately 185 degrees and 225 degrees. About 185 degrees is the normal for the Hyper 21. If you don't have access to a head temperature gauge, you can use water to check the head temperature. Place a drop of water on top of the cylinder head. If it sizzles away immediately, shut down your engine. If it takes approximately 3-5 seconds for the water drop to boil away, then the engine is running within a normal temperature range.

Start Your Engines

Running-In

The modern model car engine requires relatively little running in, due to the use of ABC piston and liner assembly. The engine should be run on a rich setting for approximately 6-8 tanks of fuel, with another 6-8 at a slightly less rich setting. Once this has been completed, the internal engine components should be properly seated and a normal setting can be used. A good idea is to use a running in fuel for this purpose, as it is especially designed for breaking in new engines without damage.

The best methods of checking on the running setting of the engine, is to first check the smoke trail coming out of the exhaust with the car is running. A very rich setting would allow the car to pull away slowly or sluggish with a momentary hesitation and lots of smoke from a standing start. When the car is accelerating at full throttle, the engine will never "Clean Out". When an engine cleans out, the speed and the rpms will increase suddenly and dramatically, as if the engine has switched to second gear. Also, the amount of smoke that comes from the exhaust will decrease. Cleaning Out is a desirable characteristic once the engine is fully broken in.

As the engine reaches normal operating temperature, it will speed up and performance will increase. This occurs because the fuel mixture is becoming leaner with the increased temperature. You will need to richen the fuel mixture so that the engine continues to run as described above.

When the first tank is almost gone, bring the car in and shut off the engine. Allow the engine to cool for 8 to 10 minutes before starting the engine up again. Add more fuel. Start it back up and run the second tank of fuel. Again allow the engine to cool before starting it up again.

The key to breaking in your engine is patience. During the break in period, your engine may appear to malfunction with problems such as stalling, inconsistent performance, and fouling out glow plugs. Don't give up. These are just a few things you may go through during the break in period. Just keep it running, apply the throttle on and off as smoothly as you can. Sudden bursts or quick releases of the throttle can stall your engine. Soon after break in your patience will pay off with a well running engine. The performance level of the

engine will be limited by the "rich" fuel mixture which you will use all during the break-in process. Once the engine is fully broken-in the mixture can be "leaned out," and speed and acceleration will increase. Because of the rich fuel mixture and the wearing of the new parts, deposits will form on the glow plug causing it to fail. Expect to replace the glow plug during the break in period, and definitely when the engine is fully broken in and the fuel mixture is leaned out.

Setting Engine for Normal

Tuning High Speed

As you approach the first 6-8 tanks running you can start to GRADUALLY adjust you engine for normal performance. PLEASE NOTE any adjustments need to be very small at 1/8th turn increments. You can then begin adjusting the fuel mixture to maximize performance for your driving needs. To lean turn the main fuel control needle in a clockwise direction. This will allow the car to pull away faster and more cleanly, without hesitation and increase the top speed. There should however still be a noticeable smoke trail.

If the main needle is screwed in too far thus allowing the engine to run 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. This is because fuel includes lubrication, and that lubrication is inadequate when the setting is too lean. CHECK THE ENGINE TEMPERATURE OFTEN AS YOU LEAN THE MIXTURE. DO NOT LET THE ENGINE OVERHEAT. You should always see smoke coming from the exhaust.

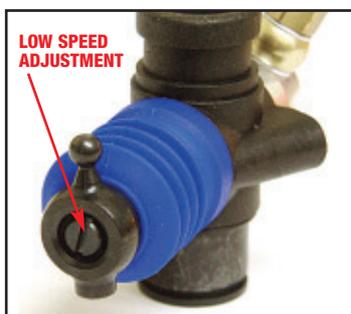
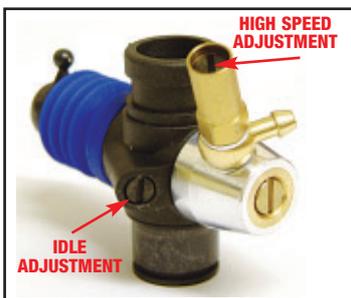
At the optimum setting, the engine will clean out; have a strong-sounding, high-pitched whine at full speed; and there will be a thin trail of whitish smoke coming from the exhaust. It is always better to set the engine a little rich rather than too lean.

If the engine stalls on acceleration, begins to bog or slow down at full throttle, or if there is a reduction in exhaust smoke, then the engine is running too lean. Immediately turn the high speed mixture screw counterclockwise 1/4 of a turn and operate the car at medium speeds for 1 to 2 minutes to allow the engine to cool.

Tuning Low Speed

The low-speed mixture affects how the engine will perform in the low to mid range rpms. Turning the low-speed needle 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 quickly apply throttle and note the performance. If the engine bogs, accelerates erratically, and a large puff of blue smokes emitted, then the low speed mixture is too rich. Turn the low-speed screw clockwise 1/8 of a turn. If the engine speeds up for a moment then bogs, hesitates, or stalls, then the low speed mixture is too lean. Turn the screw counterclockwise 1/8 of a turn. Adjust the mixture screws in 1/8 of a turn increments, wait 15 seconds, and retest after each change. Adjust for the best acceleration without the car stalling.



Care and Maintenance

When you are finished racing for the day, drain the fuel tank. Afterwards, energize the glow plug with your glow plug starter and try to restart the engine in order to burn off any fuel that may remain inside the engine. Repeat this procedure until the engine fails to fire. Try to eject residue while the engine is still warm. Finally, inject some corrosion inhibiting oil, and rotate the engine to distribute the oil to all the working parts. Do not, however, inject the oil into the carburetor, for it may cause the O-rings inside to deteriorate. When cleaning the exterior of the engine, use WD-40. Do not use gasoline or any solvents that might damage the silicone fuel tubing.

Cleaning the air filter. When the air filter starts to get dirty, do the following steps:

Step 1. Clean the foam with fuel. Do this by pouring a little fuel in a small can and kneading the filter in the fuel. When it looks cleaner, then dispose of the fuel.

Step 2. Dry the filter. Squeeze out the fuel with a paper towel until it's dry.

Step 3. Apply Associated's #7710 Foam Pre-Filter Treatment to help keep the dirt out. Dab the treatment all around the filter, put the filter in a plastic sandwich bag, and knead it until the filter is saturated, but not soaked.

Troubleshooting

Glow Plug Problems

The glow plug in your engine is an inexpensive 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 checked if the engine's acceleration and top speed performance suddenly becomes flat. The only sure way to test for a faulty glow plug is simply install a new one to see if the problem goes away. Remove the plug from the cylinder head with a 5/16" nut driver. Make sure there is no dirt or debris on top of the head which could fall into the engine. Do not loose the copper gasket which seals the glow plug. Touch the glow plug to the contacts of the glow plug starter. All of the coils should glow white. Sometimes the first few coils will not glow while the rest are bright, most likely indicating a bad plug. If the glow is dim orange, then the glow starter battery should be replaced or recharged.

At the high rpm that the engines operate only a top quality plug will cut the mustard. Therefore we recommend the use of either McCoy MC9 or RB #6 plugs.

Fuel Mixture

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 the next day, it is probably the result of a change in the air quality and temperature. This should be expected and adjusted for.

Although there are many fuels on the market, very few are designed to perform and protect your engine at the likes of 35,000rpm that some of our engines can attain. It is with this fact in mind, and our own in house testing that we **ONLY RECOMMEND** the following fuels:

Byron RACE Gen2, Byron RACE Gen2 RTR and Model Technics Dynaglow.

Keep between 10 and 20% nitromethane content for running and first use. The single most popular reason for engine failure or unreliability is poor or wrong fuel. These fuels have been tested with our engines and we are confident of their performance.

OTHER FUELS MAY WORK WITH OTHER ENGINES BUT THE FUELS LISTED WORK BEST WITH THESE ENGINES. FAILURE TO KEEP TO THESE FUELS MAY RESULT IN DAMAGE OR REDUCED PERFORMANCE AND VOID ANY WARRANTY CLAIMS.



Pull Starter Hints

The pull starter as fitted to most of the entry level engines is, if treated correctly, the easiest and most cost effective method of starting an engine. As with every silver lining, there is a cloud. The pullstart system is similar to that of a lawnmower to look at, but that is where the similarity ends. The pullstarter is susceptible to breaking if the engine is flooded or not lubricated enough. To ensure this does not happen, a few simple rules should be followed.

1. Before attempting to start the engine from cold, remove the glowplug and then prime the engine with fuel. For cars with a primer button

on the tank, press this until the fuel has travelled along the fuel pipe to the carburettor and then a further 10-20 presses. For cars without a primer on the tank, pull the pullstarter rapidly with your finger over the exhaust pipe outlet until the fuel has travelled to the carb, and then a further 10-20 times to lube the engine.

2. Then turn the car upside down and pull the pullstarter rapidly until all the excess fuel has emptied onto the floor through the glowplug hole. Refit the plug ensuring the copper gasket washer is also refitted. Wind it all the way in and then re-wind 1 to 1.5 turns. This allows gases to escape thus lowering the engines initial compression.

3. Start engine. The engine will run "lumpily" or stop after a few seconds so try and keep it running by blipping the throttle. Tighten the glowplug while the engine is running if possible. If the engine has stalled restart with the plug tightened.

The above procedure should always be followed from cold or if difficulty with starting is being experienced.

Flooding of the Engine

The most common cause of engine and pullstarter damage is from the "flooding" of the engine or a hydro-locked. More accurately this is too much fuel inside the engines crankcase causing the piston to lock. The piston rises to the top of the combustion chamber and instead of compressing a gas i.e. fuel/air mixture it has to try and compress a liquid, fuel only, which isn't possible. This puts massive strain on the piston, conrod and crankshaft as well as the starter. Invariably one component will fail, usually the conrod causing massive damage to the engines internals.

To avoid flooding the engine, always start the engine from cold using the methods mentioned above and if at any time the engine becomes difficult to turn over with the pullstarter, then remove the glowplug and empty all excess fuel out and start again. The pullstarter assembly can only be damaged by a flooded engine, so if you break a pullstarter, this is a warning that you are flooding the engine.

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 it again. Bodies must have holes cut in them to allow for cooling air to circulate over the surface of the cylinder head. On most bodies, it is a good idea to cut part of the wind-shield out and part of the back window to allow for additional cooling.

Troubleshooting Quick Glance

Description	Problem	Solution
Engine will not start	Out of fuel Improper or contaminated fuel Glow starter not charged Glow plug bad Engine flooded Engine overheating Carburetor incorrectly adjusted Exhaust blocked Air cleaner blocked	Fill fuel tank Replace fuel Charge glow starter Replace glow plug, see "Glow Plug Problems" See "flooding" section. Allow engine to cool, richen fuel mixture, check airflow Readjust carburetor Clean exhaust system Clean air filter
Starter will not pull	Engine is flooded Rope is jammed Engine seized	Clear excess fuel, see "flooding" Section. Repair starter. Examine engine for damage.
Engine starts and then stalls	Idle speed set too low Air bubbles in fuel line Glow plug is fouled Engine is overheated Insufficient fuel tank pressure Blockage at exhaust header fitting	Increase idle speed. Check for holes in the fuel line. Replace glow plug, see "Glow Plug Problem" section. Allow engine to cool, richen fuel Mixture, check airflow Replace pressure hose- clear Check flow to and from the tank.
Engine sluggish / poor performance	High-speed fuel mixture is too rich Leaking glow plug Fuel bad or contaminated Carburetor dirty or blocked Engine overheating Engine over geared for application Clutch slipping Bound up drive train	Set high-speed mixture to a leaner setting Check glow plug gasket Replace fuel Clean Carburetor Stop the engine- find the cause Use a lower gear ratio Replace clutch shoes Find the bound item and repair
Engine overheats	High-speed fuel mixture is too lean Cooling air is being blocked Excessive nitro in the fuel Excessive load on the engine Low-speed mixture too lean	Richen high-speed mixture Get air to the head Use fuel with lower nitro Check for bound up drive train Richen low-speed mixture
Engine hesitates or stumbles	High-speed mixture too lean Low-speed mixture too rich Engine overheated Air bubbles in fuel line Glow plug fouled	Richen high-speed mixture. Lean low-speed mixture. Stop the engine and find the cause. Check for holes in fuel line. Test or replace plug
Engine stalls instantly when throttle is fully opened from idle	Glow plug fouled Low-speed mixture too lean High-speed mixture too rich	Replace glow plug. Richen low-speed mixture. Lean high-speed mixture.
Engine stalls while driving around turns	Fuel level is low Idle speed set too low	Add fuel Increase idle speed.

