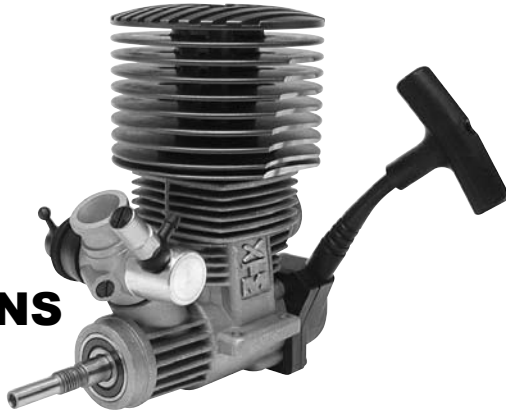


XTM RACING .21 REAR EXHAUST BUGGY ENGINE



OPERATING INSTRUCTIONS

P/N 146026

.21 REAR EXHAUST BUGGY ENGINE SPECIFICATIONS AND FEATURES

Displacement	3.48cc
Bore	16.4mm
Stroke	16.4mm
Maximum RPM	28,000rpm
Power.....	2.1hp@28,000rpm
Weight.....	410gr

- ABC Piston and Sleeve (Liner)
- Dual Ball Bearing-Supported SG-Style Crankshaft
- Dual Bushing-Supported Connecting Rod
- Two-Needle Slide Carburettor and Heat-Dissipating Cylinder Head
- Pull-Start Assembly

INTRODUCTION

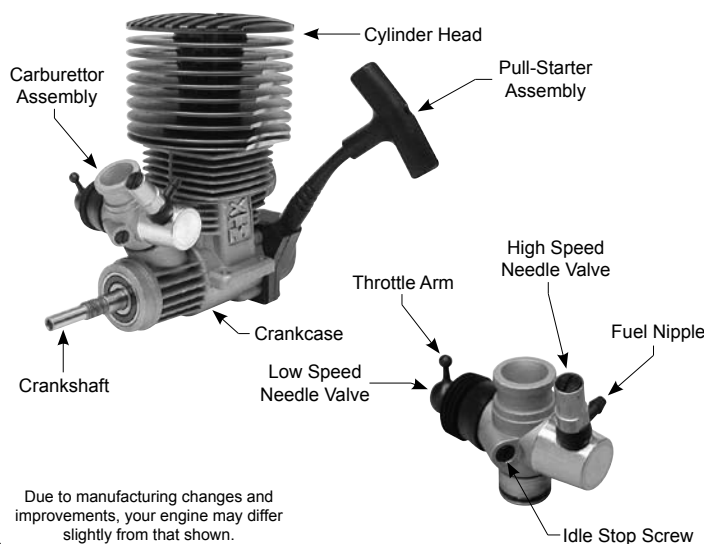
Thank you for choosing the XTM Racing .21 Rear Exhaust Buggy engine. All XTM Racing engines are designed for high power output and easy handling. The XTM Racing .21 Rear Exhaust Buggy engine features a dual ball bearing-supported SG-style crankshaft, ABC piston and sleeve (liner), two-needle slide carburettor, heat-dissipating cylinder head, pull-start assembly and superb attention to detail and quality. All XTM Racing engines are manufactured using CNC manufacturing equipment to ensure every engine is produced to the exacting quality that you would expect from an engine of this caliber. XTM Racing engines offer the best in reliability, power and cost.

BECOMING FAMILIAR WITH YOUR ENGINE

Please read through these operating instructions in their entirety to familiarize yourself with the features and operation of your new XTM Racing .21 Rear Exhaust Buggy engine.

Should you encounter any problems with your engine, we have included a separate Troubleshooting Guide with these Operating Instructions to help you solve them.

Please use the photos below to familiarise yourself with the components of your new XTM Racing engine.



CAUTION - PLEASE READ!

XTM Racing engines will consistently give you dependable performance and reliability and will be a source of satisfaction and pleasure if you follow these instructions as to the engine's proper and safe use. You alone are responsible for the safe operation of your engine, so act sensibly and with care at all times. This engine is not a toy. It is a precision-built machine whose power is capable of causing serious injury to yourself and others if abused, misused or if you fail to observe proper safety precautions while using it.

- Never use any fuel in your engine other than glow fuels specifically designed for use in model car/buggy engines. Use of any other types of fuel can cause severe damage to the engine and/or personal injury.

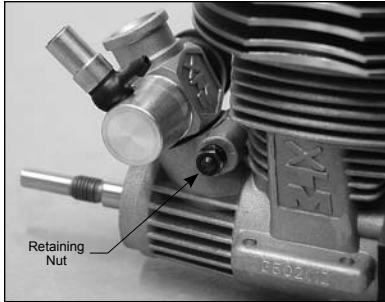
NEVER USE GASOLINE/PETROL OR DIESEL FUEL!

- Never operate your model on any public streets. This could cause traffic accidents, personal injury or property damage.
- Before starting the engine, make sure that the throttle trim is set to the idle position. Starting the engine at any setting above idle can cause the model to lurch out of your hands.
- When the engine is running, there are certain parts that rotate at high speeds. Be careful not to touch the drive shafts, gears, clutch assembly or other moving parts. Serious injury could result.
- It is normal for the engine to get very hot during operation, especially the cylinder head and exhaust system. Never touch the engine or exhaust system while they are hot.
- Model car engines produce vibration when they are running. It is important to periodically check the engine mounting screws, exhaust mounting screws and other assemblies to ensure they are tight. Running the engine with the engine mounting screws loose can lead to severe engine and/or chassis damage.
- Glow fuel engines emit exhaust vapors that are poisonous and can be dangerous to your health. It is important that you operate your engine in a very well-ventilated area, preferably outdoors.
- Glow fuels like those used in your model engine are poisonous. Follow all the precautions that are printed on the fuel manufacturer's container.
- Keep glow fuel out of the reach of children.
- Glow fuel is extremely flammable. Keep away from high heat, sparks and flame.

CARBURETTOR INSTALLATION

IMPORTANT The carburettor on your engine comes preinstalled from the factory; however, we suggest reading this section to familiarise yourself with the steps to install the carburettor properly should you need to remove it later for cleaning or maintenance.

The carburettor is held in place using the pinch bolt and retaining nut installed in the crankcase. Slide the base of the carburettor into the crankcase, being careful to keep the carburettor perpendicular to the front of the engine. With your thumb, push down on the carburettor firmly so the base of the carburettor fits completely into the crankcase and the carburettor O-rings seals the gap between the two parts. While holding the carburettor in place, GENTLY tighten the retaining nut to draw the pinch bolt into place.

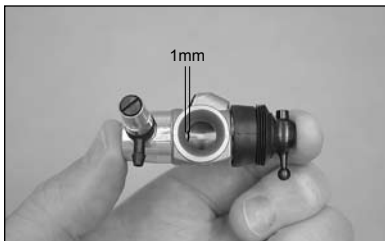


WARNING Do not overtighten the retaining nut. The retaining nut only needs to be tightened enough to keep the carburettor from turning in the crankcase. Overtightening the retaining nut can cause severe damage to the base of the carburettor.

IDLE STOP SCREW

Please first familiarise yourself with the location of the idle stop screw using the photo of the carburettor on page 1.

The idle stop screw adjusts the closure of the carburettor barrel. The idle stop screw should be adjusted so that the carburettor barrel stays open about 1/16" (1mm). Turning the idle stop screw clockwise will cause the carburettor barrel to stay open more. Turning the idle stop screw counterclockwise will allow the carburettor barrel to close more. If the carburettor barrel stays open too far, the engine will idle very high and your buggy's clutch will never disengage. If the idle stop screw is closed too far, the engine may die during idle or when you engage your buggy's brakes. Ideally, the engine should idle smoothly, yet slow enough so that the clutch stays disengaged.



EXHAUST SYSTEM

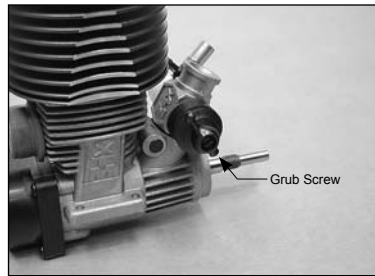


The engine does not include an exhaust system. The exhaust system is typically designed for the particular car, truck or buggy that you have and is generally included with your kit. The engine uses a standard 1/8th-scale

slip-on header (held in place with a spring around the cylinder head).

IMPORTANT The engine is designed to be used with a tuned pipe. To extract optimal power and performance from your engine, we strongly suggest the use of a large-chamber 1/8th scale tuned pipe.

THROTTLE ARM POSITION



The throttle arm angle can be adjusted to better suit your particular application. Loosen the grub screw in the base of the throttle arm, using a 1.5mm hex wrench, then adjust the angle of the throttle arm either forward or backward and firmly tighten the grub screw.

FUEL AND GLOW PLUG RECOMMENDATIONS

Fuel Recommendation

For the break-in period you should use a fuel specifically designed for R/C car engines that contains no more than 20% nitromethane and 10%~14% oil content. Once the engine has been adequately broken in (about 45 minutes of run-time) you can switch to an R/C car fuel containing up to, but no more than, 30% nitromethane and 10%~14% oil content. We recommend using XTM Racing or Trinity Monster Horsepower fuel.

WARNING We do not recommend using fuels designed for R/C airplane engine use. These fuels do not contain the proper amount of lubricants; therefore, they will cause the engine to overheat or run erratically and severe damage to the engine can result.

Glow Plug Recommendation

The glow plug can make a big difference in how your engine performs. During the break-in period we recommend using a "hot" or "medium" heat-range glow plug intended specifically for performance engines like the XTM Racing # 3 or the XTM Racing # 4. After the break-in period you may want to use a different heat-range glow plug.

WARNING Do not use glow plugs intended for four stroke airplane engines or glow plugs with an "idle bar". Using the wrong type of glow plug will cause the engine to run erratically and make it difficult to tune properly. The wrong type of glow plug could also damage the engine.

WARNING ABOUT HYDRO-LOCKING

If at any time the pull-start becomes very tight or difficult to pull - STOP! The engine has become flooded (hydro-locked) and the excess fuel must be removed or damage to the pull-start and/or engine could occur. To remove the excess fuel from the engine follow the steps listed below:

- Completely close the high speed needle valve (turn clockwise) until it bottoms out. **Do this gently. Don't force it!**
- Remove the glow plug from the cylinder head.
- With a rag over the top of the engine, pull the pull-starter cord several times to expel the excess fuel from the engine.
- Make sure that the glow plug has not been fouled, then reinstall it.
- Reset the high speed needle valve (turn counterclockwise) 3.5 full turns out from bottom (fully closed).

IMPORTANT Do not pull the pull-starter cord all the way out or damage to the pull-starter will occur. Use a couple of short pulls - about 7 or 8 inches (18~20cm) long. Do not attempt to start the engine if it is hydro-locked. Doing so can result in breaking the pull-starter cord.

HIGH AND LOW SPEED NEEDLE VALVES

High Speed Needle Valve

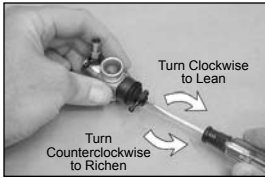
The high speed needle valve is preset from the factory for the initial starting procedure. **Do not make adjustments to it at this time.** The high speed needle valve is used to meter the air/fuel mixture at full throttle. Turn the needle valve clockwise to lean the mixture or turn the needle valve counterclockwise to richen the mixture.



Check to ensure that the high speed needle valve is set at 3.5 full turns out from the closed position for the break-in process.

Low Speed Needle Valve

The low speed needle valve is preset from the factory for the initial starting procedure. **Do not make adjustments to it at this time.** The low speed needle valve meters the air/fuel mixture at idle and during transition from idle to full throttle. Turn the needle valve clockwise to lean the mixture. Turn the needle valve counterclockwise to richen the mixture. The low speed needle valve is preset from the factory, but minor adjustments may need to be made to suit your application: fuel used, glow plug and environment all contribute to the setting. **DO NOT ADJUST THE LOW SPEED NEEDLE VALVE UNTIL AFTER THE ENGINE HAS BEEN BROKEN IN.**



RESETTING THE NEEDLE VALVES TO THE FACTORY SETTINGS

There may come a time when you get the needle valve settings out of spec, resulting in poor engine performance or not even being able to start the engine at all. If this occurs, reset both the high and low speed needle valves to their factory settings as described below:

Resetting the High Speed Needle Valve

- Gently turn the high speed needle valve clockwise until it bottoms out (fully closed). **Do not force it or you may damage the carburettor.**
- Turn the high speed needle valve counterclockwise (open) **3.5 full turns.**

Resetting the Low Speed Needle Valve

- Open the carburettor barrel completely.
- While holding the carburettor barrel open with your fingers, use a flat blade screwdriver to gently turn the low speed needle valve clockwise until it bottoms out (fully closed). **Do not force it or you may damage the carburettor.** From this point, turn the low speed needle valve counterclockwise **3 full turns.**

STARTING PROCEDURE

Prime the engine by first opening the throttle completely and covering the tuned pipe exhaust tip with your finger, then pull the pull-starter cord several times until you see fuel just start to enter the carburettor through the fuel line.

IMPORTANT Do not pull the pull-starter cord all the way out or damage to the pull-starter will occur. Use a couple of short pulls - about 7 or 8 inches (18~20cm) long.

Remove your finger from the exhaust opening and close the throttle down to the idle position.

- Connect a fully charged glow starter to the top of the glow plug, making sure that the glow starter is locked firmly onto the top of the glow plug.
- With the throttle in the idle position carefully pull on the pull-starter cord, using short, quick pulls, until the engine starts.
- After the engine starts, release the pull-starter cord, allow the engine to run for about 10 seconds, then remove the glow starter from the glow plug.

PRO TIP When the engine is new, it can sometimes be difficult to turn over using the pull-starter. You may find you need to pull the pull-starter harder than you expect. A trick to help this is to loosen the glow plug slightly, start the engine, then remove the glow starter and retighten the glow plug. This effectively lessens the engine's compression, making it easier to turn over with the pull-starter.

BREAK-IN PROCEDURE

The XTM Racing .21 Rear Exhaust Buggy engine is an ABC engine. The cylinder sleeve (liner) is tapered at the top, causing resistance when the piston moves through the top of the stroke. This is normal. When the engine heats up to operating temperature, this resistance will decrease and the proper clearance will be achieved. The break-in procedure will guide you through the steps necessary to properly break in your new engine. Please follow the steps closely. **DO NOT OMIT THIS PROCEDURE.**

The break-in process allows the engine parts to perfectly fit to each other and properly protect each part from premature wear. **The engine should be broken in using a good quality R/C car fuel that contains no more than 20% nitromethane and 10%~14% oil content.**



To make sure that you're not leaning out the engine too much and overheating it during break-in and under normal use, we suggest using a temp gun to monitor the engine's temperature.

During break-in, engine temperature should not exceed 270°F (132°C). The optimum engine operating temperature is 210°~230°F (99°~110°C). The minimum engine operating temperature is 180°F (82°C).

- Follow the Starting Procedure to start the engine.
- Once the engine starts, keep the glow starter attached to the glow plug and let the engine run for about 10 seconds without giving it throttle. This will allow the engine to warm up. At this point the engine should be running very "rich" and the engine will also sound like it's running rough.
- After the engine has been running for about 10 seconds, remove the glow starter from the glow plug. Advance the throttle in short, quick bursts and drive your buggy for about 2~3 minutes. If the engine is running rich enough, you should notice smoke coming from the tuned pipe and the engine should sound like it's running very rough. Also, your buggy will barely be moving because the engine is running so rich that it won't produce much power. This is what you want for now. If there is not smoke coming from the tuned pipe, richen the high speed needle valve 1/4 turn (turn counterclockwise). After 2~3 minutes stop the engine by pinching the fuel line to the carburettor.
- Let the engine cool for approximately 10 minutes, then restart it. Set the high speed needle valve mixture to a slightly leaner setting, about 1/8 turn more in (turn clockwise). Repeat the procedure above, advancing the throttle in short, quick bursts and driving your buggy for about 2~3 minutes, then stop the engine again and let it cool for approximately 10 minutes.



- ❑ Repeat the procedure above, leaning the high speed needle valve about 1/8 turn more each time. In all, you should run the engine a total of about 45 minutes. After 45 minutes of run-time the engine will be broken in. Run the engine with the high speed needle valve set slightly rich, but lean enough to power your buggy adequately. At this point the engine should hold a good setting on the high speed needle valve and you can begin to fine tune the needle valve settings to increase performance.

IMPORTANT It is of the utmost importance that the engine never be leaned out too much. When running the engine, you should always be able to see a slight trail of smoke coming from the tuned pipe. If you can't, stop the engine immediately and richen the high speed needle valve (turn counterclockwise). You should also make sure there is plenty of air flowing over the cylinder head to keep the engine from overheating.

FINE-TUNING THE ENGINE

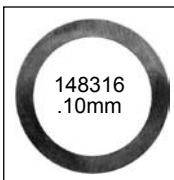
After your engine has been broken in, you can set the high and low speed needle valves for optimum engine performance.

WARNING Be careful to never lean out the engine too much. Remember that the lubricants for your engine are suspended in the fuel. If you lean out the fuel mixture too much you will also be lowering the amount of lubricant entering your engine. Less lubricant means more chance of your engine overheating and possible engine failure.

Setting the High Speed Needle Valve

- ❑ Start the engine and remove the glow starter from the glow plug, then allow the engine to warm up for about 10 seconds.
- ❑ After the engine has warmed up, drive your buggy as you normally would. If the engine seems to be running rich (i.e., not reaching maximum power), lean the high speed needle valve about 1/16 of a turn (turn clockwise) at a time until the desired setting is achieved. Always make sure that you run the engine slightly rich - you want to be able to see a faint exhaust trail at all times.

To get more power from your engine you can use fuel containing up to 30% nitromethane. We must caution you though, that once you run the engine with increased nitro you may not get satisfactory results if you decide to go back to a lower nitro content. Also, if you use fuels containing 30% nitro, we suggest adding a .10mm head gasket to lower the compression ratio. If you don't lower the compression ratio, overheating and erratic running will likely occur.



Setting the Low Speed Needle Valve

- ❑ Start the engine and adjust the high speed needle valve as per the procedures above. Close the throttle until the engine slows down enough so that your buggy's clutch is disengaged and the wheels don't turn when your buggy is lifted from the ground. Allow the engine to idle for about 10~15 seconds.
- ❑ While holding your buggy off the ground (making sure to keep your fingers away from the moving parts), quickly open the throttle in a short burst. If the engine just stops running as soon as the throttle is advanced, the low speed needle valve is too lean and the engine is not getting enough fuel. With the engine stopped, richen the low speed needle valve about 1/16 of a turn (turn counterclockwise).
- ❑ Restart the engine and repeat the procedure above until the engine will transition smoothly and quickly. Very slight hesitation in the transition is normal.

- ❑ If you quickly advance the throttle and the engine seems to be very rich during transition (i.e., lots of smoke coming from the tuned pipe and very rough sounding), the low speed needle valve is too rich and the engine is getting too much fuel. With the engine stopped, lean the low speed needle valve about 1/16 of a turn (turn clockwise).

- ❑ Restart the engine and repeat the procedure above until the engine will transition smoothly and quickly. Very slight hesitation in the transition is normal.

- ❑ Now drive your buggy as you normally would for a while to get a feel for how the engine reacts to throttle. Now that you know the proper way to tune the engine, you can make slight adjustments to the carburettor until you are satisfied with the performance.

IMPORTANT We suggest using a temp gun to frequently check the operating temperature of your engine during use. The optimal operating temperature is between 210° and 230°F (99°~110°C). Do not let the engine exceed 270°F (132°C). If the engine exceeds 270°F (132°C), stop the engine immediately and re-tune the carburettor to a richer setting.

ENGINE MAINTENANCE

- After you are finished running the engine for the day, pinch the fuel line to stop the engine. This will allow the engine to burn any excess fuel out of the crankcase.
- Remove the air filter element and wash it thoroughly in warm water and a small amount of liquid detergent. After it's clean, allow it to dry, then re-oil it and install it back into the air filter housing.
- Remove the glow plug from the engine and squirt several drops of after-run oil into the glow plug hole and the carburettor opening. Pull the pull-starter cord several times to distribute the oil throughout the engine, then reinstall the glow plug and copper washer. The after-run oil will prevent the inside of the engine (especially the crankshaft bearings) from rusting.
- Clean the outside of the engine using a stiff brush and nitro car cleaner, then dry the engine, using a rag or compressed air.
- Check the engine's cylinder head bolts and backplate screws after each day of use to ensure that they're tight. This will prevent air leaks from causing erratic engine performance.

A Replacement Parts List, Troubleshooting Guide and Warranty Return Information can all be found on the separate sheet packaged with your engine.

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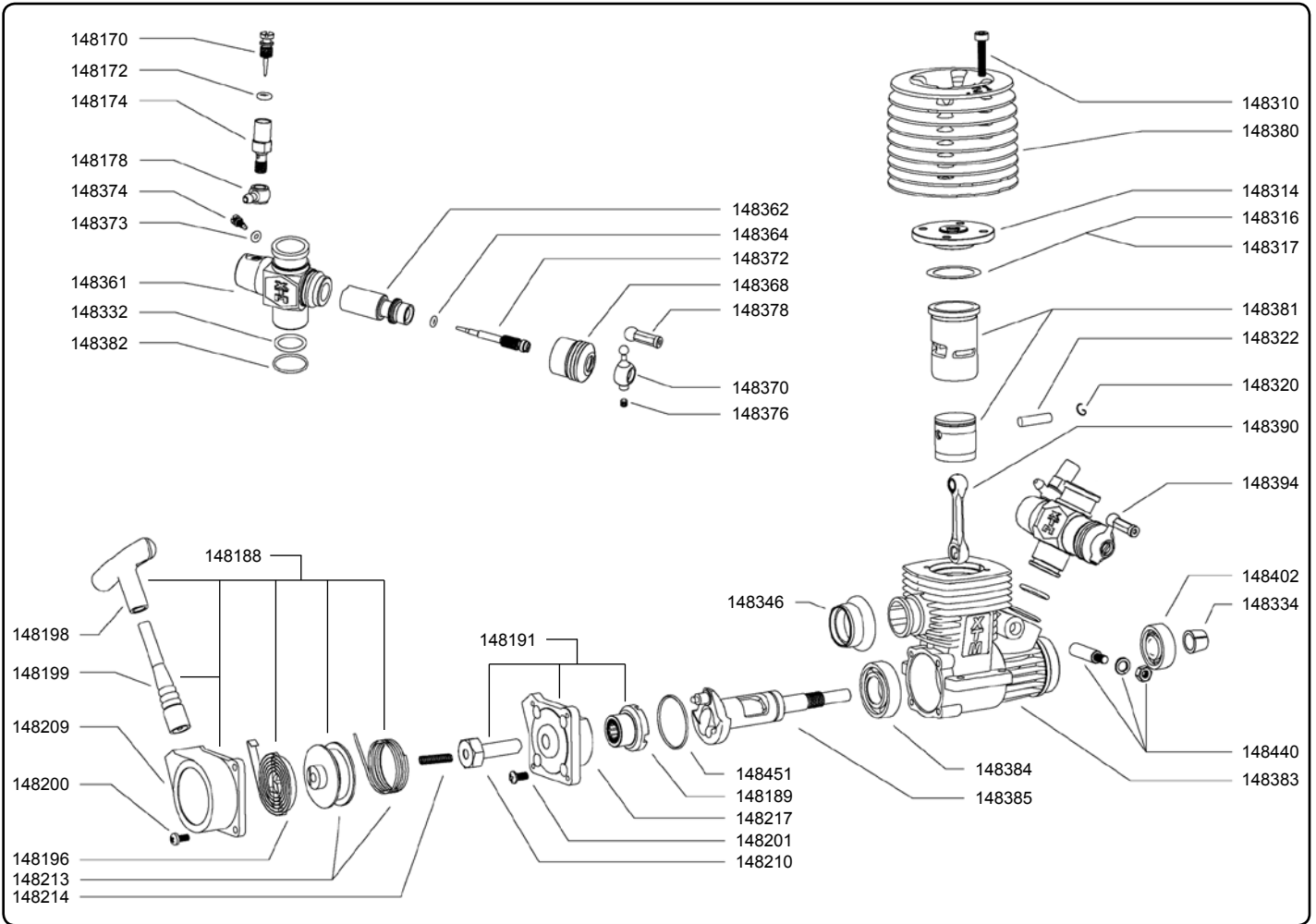


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.21 REAR EXHAUST BUGGY ENGINE EXPLODED PARTS VIEW



ORDER #	REFERENCE #	DESCRIPTION
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148170		High Speed Needle Valve
148172		High Speed Needle Valve O-Ring
148174		High Speed Needle Valve Mounting Seat
148178		Fuel Nipple
148188		Pull-Start Assembly Front Parts
148189		One-Way Bearing
148191		Pull-Start Assembly Rear Parts
148196		Pull-Start Recoil Spring
148198		Pull-Start Handle Only
148199		Pull-Start String Guide Tube
148200		Pull-Start Cover Screw Set (3)
148201		Backplate Screw Set (4)
148209		Pull-Start Cover
148210		Pull-Start Hex Shaft
148213		Pull-Start String and Spool Assembly
148214		Pull-Start Cushion Spring
148217		Backplate
148310		Cylinder Head Screw Set (4)
148314		Head Button
148316		Head Gasket - 0.10mm
148317		Head Gasket - 0.20mm
148320		Wrist Pin Clips (2)
148322		Wrist Pin
148332		Carburettor Base O-Ring (Upper)

ORDER #	DESCRIPTION
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148334	Collet for Flywheel
148346	Exhaust Gasket
148361	Carburettor Body
148362	Carburettor Barrel
148364	Low Speed Needle Valve O-Ring
148368	Carburettor Barrel Dust Cover
148370	Throttle Arm
148372	Low Speed Needle Valve
148373	Idle Stop Screw O-Ring
148374	Idle Stop Screw
148376	Throttle Arm Grub Screw
148378	Throttle Arm Ball End
148380	Cylinder Head - Black (Cast)
148381	Piston and Sleeve (Liner) Set
148382	Carburettor Base O-Ring (Lower)
148383	Crankcase
148384	Rear Ball Bearing
148385	Crankshaft - SG for Pull-Start
148390	Connecting Rod
148394	Carburettor Assembly
148402	Front Ball Bearing
148440	Carburettor Retaining Bolt Assembly
148451	Backplate O-Ring

TROUBLESHOOTING GUIDE

This troubleshooting guide has been provided to help you diagnose and solve most problems that you may encounter with your XTM Racing engine. Most problems encountered can be solved by carefully following the problem-cause-solution sections below. If you cannot solve the problem using this troubleshooting guide, please feel free to contact us using the information below.

<u>PROBLEM</u>	<u>CAUSE</u>	<u>SOLUTION</u>
1) Engine does not start	A) Failed glow plug B) Glow Starter not charged and/or faulty C) Idle mixture screw set too lean D) Old or contaminated fuel E) Engine flooded with too much fuel F) Air leak in fuel system and/or engine	A) Replace glow plug with new one B) Fully charge glow starter and/or replace C) Reset idle mixture to factory setting (Pg 3) D) Replace with new fuel E) Remove glow plug and expel fuel from cylinder (Pg 2) F) Replace fuel lines and/or tighten all engine bolts
2) Engine does not draw fuel	A) Air leak in fuel system and/or engine B) High speed needle valve fully closed C) Idle mixture screw set too lean D) Fuel lines kinked E) Defective fuel tank	A) Replace fuel lines and/or tighten all engine bolts B) Reset high speed needle valve to factory setting (Pg 3) C) Reset idle mixture to factory setting (Pg 3) D) Check and straighten fuel lines E) Replace fuel tank
3) Engine does not transition	A) Failed and/or wrong type glow plug B) Old and/or wrong type fuel C) High speed needle valve set too rich D) Idle mixture set too lean E) Idle mixture set too rich F) Air leak in fuel system and/or engine	A) Replace with new recommended glow plug (Pg 2) B) Replace with new recommended fuel C) Reset high speed needle valve to leaner setting D) Set idle mixture richer E) Set idle mixture leaner F) Replace fuel lines and/or tighten all engine bolts
4) Engine overheats	A) Engine running too lean B) Body shell too restrictive C) Wrong type of fuel used D) Engine not fully broken in	A) Richen high speed needle valve B) Open larger vents in body to allow air to enter and exit C) Use fuel recommended only for R/C cars D) Allow engine further break-in time
5) Engine vibrates excessively	A) Engine and/or engine mounts loose	A) Tighten all engine and engine mounting bolts
6) Engine does not idle down	A) Idle stop screw out of adjustment B) Engine has developed an air leak C) One or more carburettor O-ring damaged	A) Adjust idle stop screw to factory setting (Pg 2) B) Check and tighten all engine screws C) Replace carburettor O-ring(s)
7) Pull-Start Assembly Slips	A) One-way bearing coated with oil	A) Clean one-way bearing using rubbing alcohol

WARRANTY SERVICE INFORMATION

All XTM Racing engines returned for warranty service must be within the warranty terms as stated on the warranty card provided with your engine. Do not return your engine to the place of purchase. They are not authorised or equipped to perform warranty work on XTM Racing products. When requesting warranty service, please observe the following guidelines:

- Always send the complete engine, including the carburettor. The engine must be removed from the model first.
- Include a note detailing the problem or service you are requesting. Service cannot be provided without this information. Include your daytime phone number, shipping address and/or email address in the event we need more details pertaining to the service requested.
- If your engine is out of the warranty period you may request an estimate of services at the time you return your engine for service. An omission of this request implies permission for Global Services / Ripmax Ltd. to service your engine at our discretion.
- Include a method of payment for any service charges.
- Send the engine to us by United Parcel Service, Federal Express or by Insured Mail. Postage is nonrefundable.
- Send your package to the appropriate address at right.

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