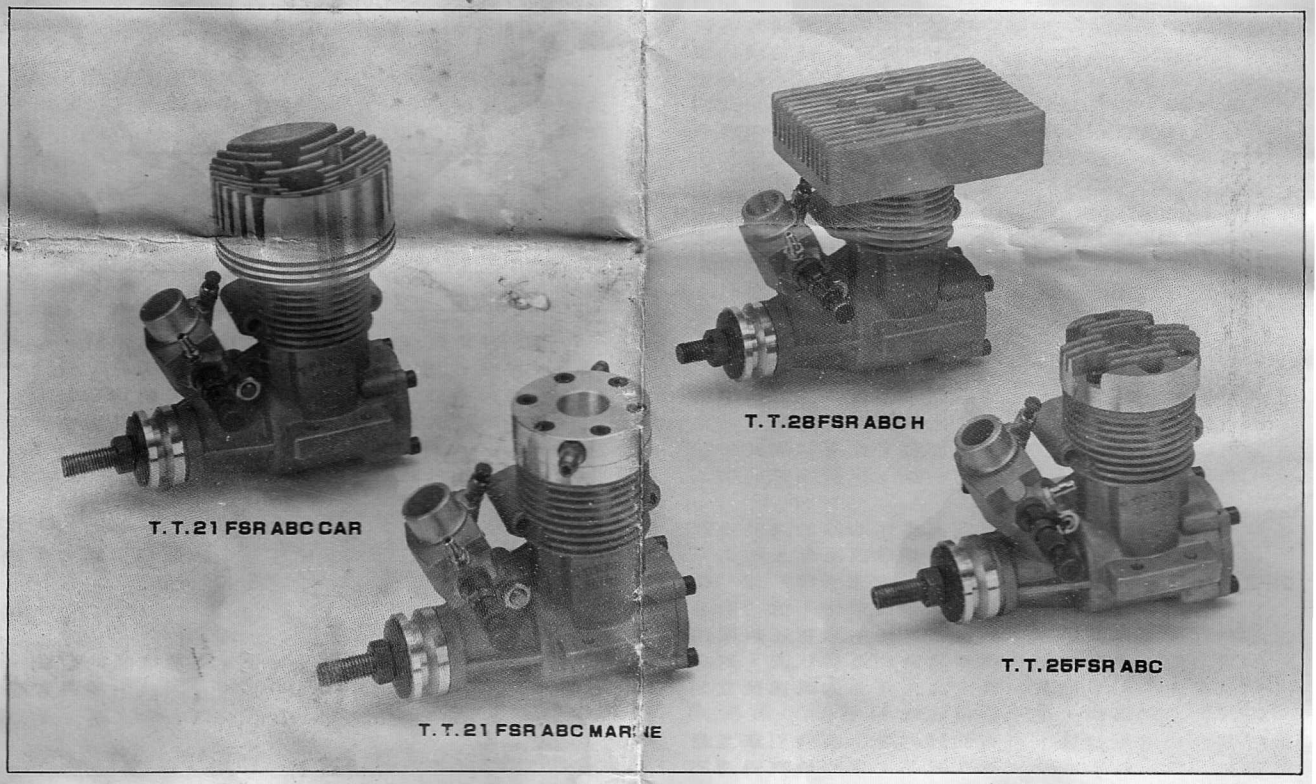
Thunder tiger

INSTRUCTIONS FOR THUNDER TIGER 21. 25 & 28 FSR ABC SERIES ENGINE



SPECIFICATIONS

	21 FSR ABC CAR	21 FSR ABC MARINE	25 FSR ABC	25 FSR F	25 FSR ABC MARINE	28 FSR ABC HELICOPTER
DISPLACEMENT	3.46c.c./0.211cuin	3.46c.c./0.211cuin	4.07c.c./0.248cuin	4.07c.c./0.248cuin	4.07c.c./0.248cuin	4.57c.c./0.278cuin
BORE	16.6mm.	16.6mm.	18mm.	18mm.	18mm.	18.5mm.
STROKE	16mm.	16mm.	16mm.	16mm.	16mm.	17mm
PRACTICAL R.P.M.	2,500~28,000	2,500~28,000	2,500~19,000	2,500~19,000	2,500~19,000	2,500~19,000
CARBURETTOR	TT-133C	TT-133C	TT-133A	TT-133A	TT-133C	TT-133A
WEIGHT	340g	240g	240g	240g	240g	280g

The T.T. 21 FSR ABC and T.T. 25 FSR ABC series are new high-performance engines They incorporate Schnuerle scavenging ABC cylinder piston, twin ball-bearings and the T.T. Type carburettor with automatic mixture control. They are intended for all types of radio-controlled models where performance and durability are of paramount importance.

Like all T.T. engines, the T.T. 21 FSR ABC and T.T. 25 FSR ABC are manufactured to standards of skilled craftmanship.

Modern precision machinery and carefully selected top quality materials are employed to ensure consistant performance and long life.

■ RUNNING-IN ("Breaking-in")

For long life and high-performance. every engine needs to be properly "run-in", or "broken-in", before being put to full use. The procedure is as follows:

(Note for Beginners: Before installing the engine in a model, beginners are recommended to follow the test-bench running-in procedure as explained later.

1. Install the engine in your model and fit a suitable propeller (for example: a 9 x 5 or 10 x 4 depending on the type of model.) Use mild fuel (e.g. not more than 5% nitromethane) containing not less than 20% castor-oil).
2. Open the needle-Valve between 3 and 4 turns from the fully closed position and prime and start in the usual way. For the first few minutes, leave the needle-valve a very rich setting so that, with the throttle full open, the engine is "four-cycling" Then gradually screw in the needle-valve until the

engine just breaks into rich two-cycle operation. Leave the needle-valve at this point and let the engine run until the tank is empty. (Do not run the engine in dusty or gritty surroundings. Such foreign matter sucked into the engine can ruin it in a few seconds.)

3. Now, with the same needle-valve setting, make two or three flights. Although the engine will still be running rich and not delivering its full power, revolutions should be quite sufficient unless the model itself is too large or too heavy or an attempt is made to fly in weather that is too windy.
4. It sometimes happens that, due to the tank position in the model, the mixture becomes leaner in flight. If this should happen, close the throttle, land the model and open the needle-valve slighty before taking off again.
5. For the next three or four flights, the needle-valve can be gradually closed to give more power, but always keep the setting richer than the full-power setting. During these early flights, avoid manoeuvres such as the "stall turn" or "top hat" which require the model to fly vertically upwards. Loops, however, are helpful to running-in as they allow the engine to briefly speed up and then run rich again. In running-in an engine, it is important that the mixture should become rich again immediately after running lean.
6. After six to ten flights, it should be possible to run the engine continuously on its optimum needle-valve setting. This setting is with the needle valve adjustment ¼ to ½ turn on the rich side of the position at which the engine reaches its very highest speed. Your engine can be said to have completed its running-in period when it holds a steady speed at this optimum setting. Never attempt to gain a few more r.p.m. by running the engine on a lean setting: it will run hotter and may eventually become damaged by over-heating.

■ Test Bench Running-in

1. Install the engine in a suitable bench mount. Use a 9 x 5 or 10 x 4 propeller and run the engine for approximately 10 minutes with the throttle fully open but with the needle-valve adjusted for rich, "four-cycle" operation.
2. Now close the needle-valve until the engine speeds up to "two-cycle" operation. Allow it to run like this for about 30 seconds only, then re-open the needle-valve to bring the engine back to four-cycle operation and run it for a further two minutes.
3. Repeat this procedure, alternately running the engine fast and slow by means of the needle-valve. but gradually extending the short periods of high-speed running until a total of at least 30 minutes running time has been accumulated. At a two-cycle setting, an engine runs hot, whereas, at a four-cycle setting, it runs cool. It is very helpful to induce such changes of temperature within the engine during the running-in period.
4. Now gradually close the needle-valve until the engine reaches its maximum r.p.m., then re-open the needle-valve very slightly as a safety margin. If, at this stage, the engine holds a steady speed; the initial running-in is complete. If it does not extend the running-in period as necessary.
5. After running-in, and before installing the engine in your model, it is advisable to check carburettor adjustment. Refer to the separate Carburettor Instructions sheet.

Warning: It has been observed that a modeller will sometimes attempt to run-in his engine by simply running it for a lengthy period on a bench mount with a rich needle setting and then install it in a model and fly it at the maximum r.p.m. setting immediately. This is incorrect and will often result in a lean run that may ruin the piston and cylinder assembly. Always follow the running-in procedures outlined above and in the case of fixed wing aircraft, make the early flights on a rich setting.

If used in helicopters, however, it is inadvisable to fly on an over-rich setting because this may cause the mixture to become too rich to support combustion at reduced throttle openings. When an engine is used in a helicopter, therefore, the engine should be adequately run-in on the bench so that the needle-valve can be safely adjusted to the optimum setting before any flights are undertaken.

■ INSTALLATION

Mount the engine securely on rigid hardwood mounts with steel screws and locknuts and suitable washers. Make sure that the mounting beams are parallel and that their top surfaces are in the same plane. Poor installation may cause vibration, erratic running and loss of performance. Make sure that the mounting holes are accurately aligned with those in the engine mounting lugs. Forcing screw through badly aligned holes may deform the engine housing.

■ FUEL

Use a good quality commercial fuel or one of the blends shown in the table. Fuel "A" is for ordinary use. Fuel "B" is for use where higher output is required. Use only castor-oil and methanol of the highest available purity and chemical neuterness.

	A	B
Methanol	72-75%	62%
Castor oil	23%	23%
Nitro methane	2-5%	15%

Synthetic lubricants are less tolerant of a "lean rub" than castor oil. If, therefore, a synthetic is employed in the fuel, the needle-valve should be re-adjusted to a richer setting, as an additional safety measure, in case the mixture runs too lean in the air.
In helicopter installations, it may be helpful to experiment with different fuels and glowplugs to obtain optimum mid-range performance.
Whatever fuel is used, the engine should be checked out to make sure that it is sufficiently run-in to operate satisfactorily on that particular fuel. Do not use fuels containing less than a 20% lubricant content.

■ GLOW PLUGS

Select a plug that will give the most satisfactory results after tests of available R/C plugs. Prefer cold glow plugs.

■ PROPELLER

Use well balanced propellers only. As the ideal prop diameter, pitch and blade area vary according to the size, weight and type of model, final prop selection can be made after practical experiment.

Warning: There is always a danger, especially with nylon props and depending on engine speed and weather conditions, of the propeller fracturing and a blade flying off and, obviously, this can cause injury. Therefore, never crouch over the engine when it is running and keep all onlookers well back—preferably behind the model. If a spinner is used, make sure that the spinner notches are large enough to clear the prop blades and so do not cut into and weaken the blade roots.

	Dia×Pitch	
	21	25 / 28
R/C STUNT	9x5,9x6	9x6,9½x5
SCALE	9x6,10x4	10x4,10x5
R/C SPORT	9x4,9x5	9x6,10x4

■ MAINTENANCE

1. Avoid unnessary dismantling of your engine.
2. Always keep your engine clean and do not let dirt or dust enter through the intake or exhaust. Fuel should be filtered. Use a fuel filter on your fuel container and another fliter in the fuel line to the carburettor.
3. If the engine is to be fitted with flywheel instead of an aircraft propeller, do not allow it to run at peak revolutions without adequate provision for cooling.

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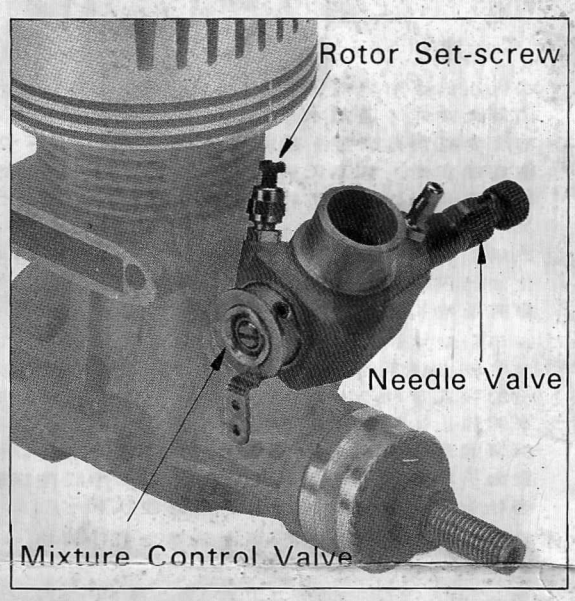
INSTRUCTIONS FOR T.T.-133C & T.T.-133A AUTOMATIC CARBURETTOR

This new carburettor incorporates an automatic mixture control device which ensures that the engine receives a correctly balanced mixture of fuel and air at all throttle settings. The device progressively reduces the effective size of the fuel jet orifice as the throttle is closed, thereby preventing the engine from running too rich at low speeds This also means that an airbleed is no longer required and, with its elimination, maximum suction is maintained at the fuel jet at all times. This is a most important factor where manoeuvres have to be executed at low engine speeds and through wide variations of fuel level within the fuel tank.

Under average operating conditions, the carburettor will normally function satisfactorily as factory set. Simply start the engine in the normal way and adjust the Main needle-valve maximum r.p.m. On closing the throttle, the engine should idle at between 2,000 and 2,500 r.p.m. and also run steadily at all intermediate speeds. However, different fuels and/or climatic conditions, may require minor readjustments of idle screw for optimum results.



■ ADJUSTING THE CARBURETTOR

Three adjustable controls are provided on this carburettor:

(1) The Main Needle-Valve (located on left-hand side of carburettor).

(2) The Mixture Control Screw (recessed idle screw on right-hand side).

(3) The Throttle Rotor Set-Screw (angled at rear of body).

I. The Main Needle-Valve is used in the same way as on all model engines, i.e., for adjusting the high-speed mixture strength. Start the engine and, with the throttle fully open, gradually close the Needle-Valve until it is running at its maximum speed. Caution: Do not close Main Needle-Valve to too "lean" a setting as this will cause the engine to over-heat and slow up. Set the Main Needle-Valve very slightly to the "rich" side of the peak r.p.m. setting. Make sure that the engine is fully "broken-in" (about 1 hour of total running time in short runs) before operating it continuously at full throttle. After setting of Main-Needle valve for max R.P.M. only adjustment of idle setting screw is required for idle setting. Don't try to adjust idle mixture with the main needle valve.

II. The Mixture Control Screw is for adjusting fuel mixture Main Needle-Valve as detailed above, close the throttle. The engine should idle continuously and steadily without further adjustment.

(a) If, however, the engine begins to idle unevenly, open the throttle. If the engine then hesitates before picking up to full speed, it is probable that the idling mixture is too rich. Check this by closing the throttle again and letting the engine idle for a little longer before again opening up. If the engine now puffs-out a good deal of smoke and hesitates or even stops, it will be necessary to close fhe Mixture Control Screw. Do this by inserting a small screwdriver into the recessed screw on the right-hand side and turning it **clockwise.** About one-half turn should be sufficient.

(b) If instead of being set too rich, the Mixture Control Screw is set too lean, the engine will stop when the throttle is closed, or will lose speed while idling and then cut-out abruptly (without smoking) when the throttle is opened again, In this case, turn the Mixture Control Screw about one-half turn **counter-clockwise.**

Mixture Control Screw adjustment is not critical and by remembering the symptoms of rich and lean running quoted above, it is a very simple matter to establish the best setting.

III. The Throttle Rotor Set-Screw is for establishing the minimum idling speed. If the engine runs too fast with the throttle closed. the Rotor Set-Screw should be turned counter-clock wise to allow the throttle opening to be reduced.

■ SUBSEQUENT OPERATION AND CARE

Once the required settings, have been established it should be unnecessary to alter them. Such slight needle-valve alterations as may be necessary to cope with differences in atmospheric conditions or fuels, do not affect the other two adjustments. The engine should start readily with the throttle in the idle position.

It is important that the carburettor operates under clean conditions. Make sure that fuel is properly filtered before use. We advise fitting a filter to your fuel can and another filter in the delivery tube between tank and engine, to reduce the risk of the carburettor jet becoming partially clogged and upsetting running adjustments.

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