

Jakadofsky STARWOOD / PRO EDITION / PRO 5000 turbo shaft engine
controlled by ***PRO ECU***

Dear RC-Model-Enthusiast !

Thank you for having purchased a ***Jakadofsky*** turbo shaft engine!
We congratulate you for this decision, as this engine is the ultimate source of power for your model aircraft.

Please, be aware that gas turbines behave significantly different compared to piston equipped IC engines. Usable power is available at rather high rotational speed, but in abundance. That means that the starter must assist the turbine until app. 28.000 rpm, since only from that speed onwards self sustained acceleration is possible. Idle speed will be reached at app. 30.000 rpm.

Advancing your transmitters throttle slider (or 3 position switch) will result in a slow increase of turbine speed, at app. 40.000 the rotor will cut in and the turbine will slowly rev up to its nominal speed of 89.000 rpm (STARWOOD), 93.000 rpm (PRO EDITION) or 98.000 rpm (PRO 5000) where massive power is available. You can now increase pitch and you are cleared for take-off!

Despite the difference between gas turbines and piston engines, safe operation and flying with gas turbines is achieved with ease, if some basic rules are obeyed. To that purpose, the Gas Turbine Builders Association, GTBA, has established a Code of Practice. Translations into various languages are available and can be downloaded from the GTBA's website free of charge. Reading this Code of Practice before installing the turbo shaft engine into any airframe and strict adherence to Codes of Practice rules and regulations during installation and operation is compulsory.

Although we assume that you are already an expert in all aspects of handling RC controlled vehicles and aircraft, in order to provide you optimal benefit and satisfaction with our product and guarantee maximum safety for you and your environment we suggest to read mind the following:

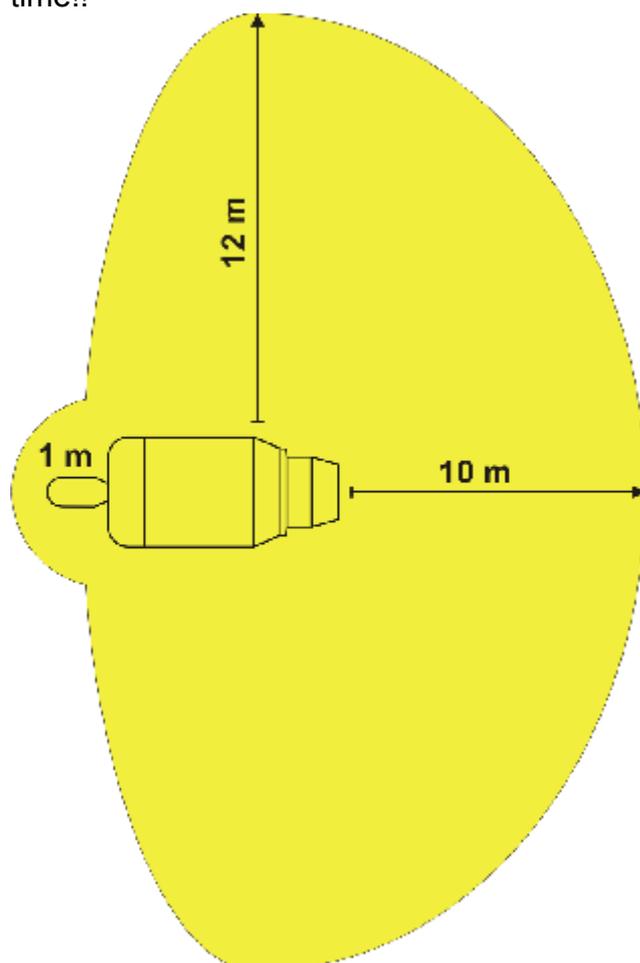
Warnings and Safety Considerations

Operation of any gas turbine, including the STARWOOD, PRO EDITION or PRO 5000 is inherently potentially hazardous. During operation the exhaust part of the turbine may reach high temperature and exhaust gases can have 700 degree Celsius or more during short operation phases. The turbine wheel itself is exposed to extreme temperatures and -due to the high speed- to extreme centrifugal forces. Despite an actual rupture of the turbine wheel is unlikely, it should be considered as possible that turbine blades or other parts pierce the casing and cause fatal damage to objects or persons nearby. It is recommended to seriously consider all potential dangers and hazards before attempting any operation of the device. If you lack sufficient experience with gas turbines get advice and instruction from a knowledgeable person and organize for support for the first starting attempts. Errors and insufficiencies during installation or operation may lead to damage to objects and persons including death.

Follow all national regulations governing the operation of aircraft, the operation of gas turbines and the handling with hazardous and flammable liquids and gases. It is your responsibility to procure sufficient insurance protection for the operation of your aircraft. It is also within your personal responsibility to protect others from damage or injury.

If the turbine is running the following minimum distances must be adhered to by any animal or human being: In front of turbine 1m Behind the turbine 10m

The space in rotation plane of the turbine wheel must be kept absolutely clear at any time!!



- Make sure the turbine is securely bolted to a rigid structure before any start up attempt.
- Have a fully functional CO₂ fire extinguisher with at least 2 kg (4.4 lb) of filling weight at hand always.
- Test the engine at suitable places outdoor only and observe the applicable laws and regulations.
- Before operating the engine, remove all loose objects near the engine intake, such as cleaning cloths, screws, nuts, cables or other material.
- Make sure that about 5 % of turbine oil is added to the fuel. Only use approved aircraft turbine oil.

The turbine operator and its assistants shall stay in suitable physical and spiritual condition and concentrate on the surveillance of the turbine operation. The power unit is strictly reserved for propelling RC (unmanned) models. All instructions given in this document must be strictly adhered to.

Exclusion of liability and damage

Jakadofsky GmbH can not supervise and enforce the instructions given for the installation and operation of the turbine. Hence **Jakadofsky** GmbH rejects any liability whatsoever for damage, losses or costs originating from use or operation of the turbine. If not stated as compulsory by legislation, **Jakadofsky** GmbH obligation for damages is excluded regardless of the cause for the loss. This waiver includes but is not restricted to personal injury, death, loss or damage of property, loss of turnover or

business, interruption of business operation or any other sequential damage, direct or indirect. Under no circumstance shall the total liability exceed the sum for the purchase of the turbine.

Jakadofsky GmbH does not make any promises, commitments, contracts or any other agreements concerning the functionality and operability of the turbine or any RC-aircraft.

Initial and continued operation of the turbine and the model happens on the risk of the operator exclusively.

In case of cession or resale, the current commits himself to hand over to the purchaser/operator all warnings and safety terms and conditions completely and in good order. The purchaser/operator must explicitly agree to this regulations and terms. The turbine and the relevant operation instructions must be handed over at the very same time.

Warranty

Warranty consists of free of charge repair or exchange of parts, which are afflicted with proven deficiencies in material or workmanship during 12 months after purchase or the first ten hours operation, whatever condition occurs first.

The initial purchaser/owner is covered by an unlimited integral gearbox warranty expressed in lifetime and operation time, provided the required maintenance is carried out in accordance with the statutory maintenance schedule.

Any additional claims are excluded. Packaging, transport and travel expenses are charged to the purchaser. Any liability for damage or loss during transportation is rejected. The customer has to contact the appropriate **Jakadofsky** outlet before any mailing. The relevant problem description and dated purchase receipts must be included. Parts damaged by accidents, inappropriate handling or incorrect usage are excluded from charge free repair or replacement. This restriction also pertains to the installation of the power unit in non suitable mechanics or any unsuitable fixing in any mechanics leading to instable meshing of the clutch pinion.

Unauthorized opening, dismantling or removal of the casings locking results in complete voidance of any warranty.

Court of competent Jurisdiction

The Customer/user declares his/her consent for all claims arising from or in connection with usage of our product the court of competent jurisdiction for Vienna, inner city, Austria shall have exclusive jurisdiction.

Austrian Law shall be applicable and binding for all legal disputes connected therewith.

Fuel, Parameters, Technical Data:

Fuel:	Jet A-1 with 5% PJ-W Oil thoroughly mixed (app. ratio 20:1)
Gas:	Propane/Butane mix (app. 30% Propane: 70% Butane) in refillable or exchangeable suitable cartridges
Glow Plug:	Rossi 8 extra cold or OS 8 (2 loops of the filament pulled out 3mm)
RPM:	Idle 30.000rpm, full power 89.000rpm (STARWOOD), 93.000rpm (PRO EDITION), 98.000rpm (PRO 5000)
Power:	Continuous extraction up to 600°C EGT (Exhaust Gas Temperature) Short time extraction up to 700°C EGT (Taking off a high power level results in high EGT)
Power Pack:	6 cell NICAD or KONION LI ION 2 S 1600mAh (good for 2 flights)
Fuel Pump:	FP30725F
Tubing:	Propane Gas System 3mm outside dia. PU Fuel Pressure System 4mm outside dia. PU Fuel Suction and tank system yellow tygon 3,2mm inside dia. Fuel tank fittings 3mm inside dia.
Fuel clunk:	Special anti-air bubble type(or felt clunk)
Consumption:	140ml/min average (up to 170ml/min at high power levels)

The fuel tank system shall consist of two main tanks in parallel (1 quart each) with standard drilled clunks interconnected with a T-fitting. Tygon tubing from the T-fitting to the top position of a hopper tank. This hopper tank is fitted with the special anti-air bubble clunk supplying fuel to the fuel pump. The hopper tank is equipped with an extra fitting for fueling that must be securely closed after fueling is completed. The whole system has to be capable of delivering very high fuel flow without any air bubbles during the entire flight. All tubing, fittings and standard clunks must have an inside dia. of at least 2,5mm (better 3mm).

Always handle flammable liquids and gases with great care.
Adhere to national laws and pay attention to safety recommendations stated by companies selling flammable liquids and gases.

Installation of the Power Unit

Installation of *Jakadofsky Jet Engines* products signifies that you have read this document completely and that you agree to the terms stated within.

The power unit should be preferentially installed into mechanics custom built by serious manufacturers. This mechanics are available in various versions, have been developed in parallel with the power unit and feature outstanding endurance over a long time.

However, the following should be kept in mind unconditionally:

Positioning of the turbine is horizontal with the exhaust duct facing to rear. The power unit is connected to the mechanics by the connector flange. The clutch pinion actuates a plastic (Delrin) gearwheel. **The slack between the clutch pinion and the plastic gearwheel must at any time, under any operation condition and under any load variation be 0,3mm(0,012 inches). This means holding the clutchbell firmly, the Delrin gear can rock 0,3mm back and forth. This liberal slack is necessary as the Delrin gears expand with heat. This liberal lack is especially important installing the STARWOOD / PRO EDITION / PRO 5000 to avoid noisy resonances generated by the internal metal gearbox.** Therefore the turbine casing must be supported with a 0,8-1mm thick stainless bracket, bolted to the turbine`s exhaust pipe with two of the ten 2,5mm screws to the helicopter/turboprop mechanics. The whole construction of the power train must be stable, run smoothly and all slackness in gear meshing must be exact and regulated to a correct value. Any deviation from these recommendations will dramatically decrease the lifetime of the power unit.

The exhaust gas duct should be made from stainless steel sheets (0,2-0,3mm), have light diameter of app. 75 –80 mm and overlap the engines exhaust tube or overlap an extension of several inches length, that is fitted tightly to the engines exhaust tube. A small ring shaped gap should be kept on this position to provide additional cooling of the model and the exhaust tube by fresh air sucked by the injector function of the gap. The exhaust duct must not be bolted or welded to the exhaust tube, it should be positioned with overlap over the exhaust tube and fixed to the mechanics by metal plates. Only a very short and light system may be bolted directly to the turbine. Exhaust ducting in a model with closed fuselage requires your initiative. Generous cross sections and smooth curves are essential. Thermal isolation with isolation mattresses on the fuselages inner side in the area of exhaust ducting is recommended. Technical hints and support can be obtained from a **Jakadofsky** outlet or any other local company dealing with ducting systems. Also suitable openings must be provided in the fuselage in the area of the turbines air intake.

Mount the PRO ECU, battery, ON/OFF switch, propane- and fuel valve on a suitable position in your model protected from heat and potential leak fuel. The propane tank must be mounted vertical +/- 45 degrees in an easily accessible position (for manually opening and closing the bottle valve).

The fuel pump should be on a level as low as possible, preferably same level or lower than the tanks to facilitate suction of fuel. BUT, fuel shall never be allowed to enter accidentally the electric motor soaking the brushes!

All tubes should be installed as outlined by the drawings. All fuel pressure tubes are 4mm PU tubes. Use 3 mm inside/6mm outside diameter diesel/petrol/kerosene resistant Tygon tubes for all tank and suction lines. All fittings and fuel intakes must have a minimum inside diameter of 2.4 (better 3) mm. All connections must be secured. For building the tank system see the description on page 4 as well as the enclosed drawing. The fuel system must always be leak proof and clean.

Wire the system in accordance with the enclosed drawing:

Solder the red glow plug wire to the positive terminal of one supplied green high current connector(use a suitable wire extension if required).

Solder the black strand from the turbine casing to the negative terminal of the same green high current connector(connects to the ECU GLOW port).

Solder the starter strand to the positive terminal of another supplied green high current connector(connects to the ECU STARTER port).

There is no wire needed to the negative ECU terminal STARTER as the negative strand of the starter is connected to the turbine casing from the factory already. The negative terminals BATT, GLOW and STARTER are internally interconnected inside the ECU(common ground).

Connect rev sensor and the temperature probe sensor to the designated ECU ports.

The PRO ECU needs 1 channel from your receiver for proper operation:

R/C 1: needs to be connected to the receiver and corresponds to a 3 position turbine switch on the transmitter: OFF - IDLE - 100%

R/C 2: not used

R/C 3: not used

R/C 4: not used

All other plugs are to be connected to their designated positions as well:

EDT: Port for the EDT: The Engine Data Terminal is reserved for programming and monitoring the start up procedure as well as for readout after shutdown, it needs not to be left connected during the flight (unnecessary weight increase).

AUX LED: Red AUX LED(info light that goes off indicating take off rpm reached)

START-VALVE: Propane Shut Off Valve

FUEL-VALVE: Fuel Shut Off Valve

Xtra-VALVE: Not used

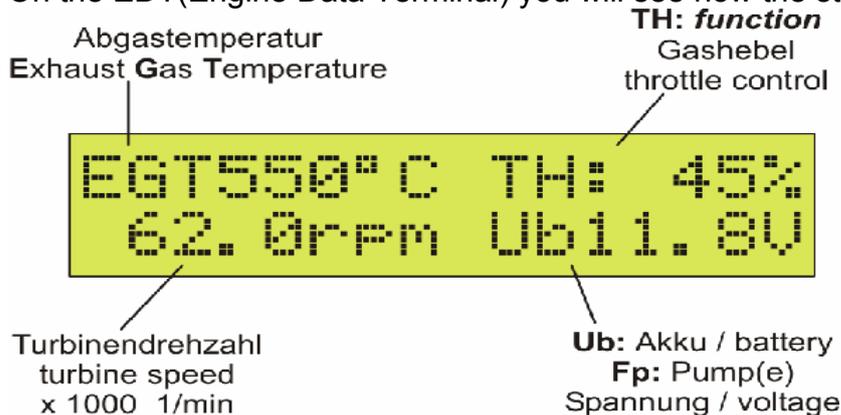
PUMP: Fuel pump FP30725F

BATT: Power supply (7,2 Volts, 6 cell NICAD or 2 S KONION, 1600mAh)

Setup before first STARTUP

- R/C transmitter: ON
- R/C receiver: ON
- PRO ECU: ON
- 4mm Fuel Tubing: DISCONNECTED from turbine (routed overboard)
- Propane bottle valve: CLOSED(to avoid accidentally starting)

On the EDT(Engine Data Terminal) you will see now the start up page.



Push SET and you enter the main menu. Using the UP and DOWN buttons you can scroll through the following main menu:

INFO – STATISTICS – LIMITS – AUTOSTART - R/C SETTINGS - TESTDEVICES

The remote control signal RC1 must have a **positive** servo travel way, i.e. short pulses (~ 1,1 ms) for OFF, neutral (~1,5ms) for IDLE and long pulses (~1,9ms) for 100 % / full rpm. This complies with the **JR/Graupner** standard setting. For **Futaba** or Multiplex transmitters, you may have to **reverse** the servo throw before proceeding.

- 1) Scroll to "RC SETTINGS"
- 2) Push SET(opening the section "RCSETTINGS")
- 3) Scroll to "RC1 TRIM.OFF"
- 4) Check the 3 position turbine switch on your transmitter in OFF position
- 5) Push SET(the ECU is reading in your actual transmitter value 1-1,2ms)
- 6) Push SET again(the ECU is storing now your actual transmitter value)
- 7) Scroll to "RC1 IDLE"
- 8) Place the 3 position turbine switch on your transmitter to IDLE(mid) position
- 9) Push SET(the ECU is reading in your actual transmitter value 1,4-1,6ms)
- 10) Push SET again(the ECU is storing now your actual transmitter value)
- 11) Scroll to "RC1 100%"
- 12) Place the 3 position turbine switch on your transmitter to 100% position
- 13) Push SET(the ECU is reading in your actual transmitter value 1,8-2ms)
- 14) Push SET again(the ECU is storing now your actual transmitter value)

Push SET two seconds to get back to the main menu and again for the startup page. The SETUP is completed now!

Set the turbine switch on your transmitter to OFF position again, to avoid starting of the turbine!!

DO NOT CHANGE ANY OTHER VALUES!!

ALL OTHER VALUES ARE FACTORY PRESET FOR OPTIMUM PERFORMANCE!

TEST DEVICES – Flushing Fuel System before first Startup

- R/C transmitter: ON (3 position turbine switch OFF position)
- R/C receiver: ON
- PRO ECU: ON
- Fuel Tanks: About half filled up(for flushing the fuel lines)
- 4mm Fuel Tubing: DISCONNECTED from turbine (routed overboard)
- Propane bottle valve: CLOSED(to avoid accidentally starting)

- 1) Using the EDT up and down buttons scroll to “TEST DEVICES”
- 2) Push SET(opening the section “TEST DEVICES”)

Now you can scroll through all devices connected to the ECU and test them electromechanically.

For example test the fuel valve:

- a) Scroll to “Fuel Valve”
- b) Push the SET button(? this arms the testing procedure)
- c) Activate the fuel valve pushing the UP button(you here the “Click”)
- d) Push the SET button again(this disarms the testing procedure)

Now you can test for example the fuel pump and flush the fuel system:

- a) Scroll to “Fuel pump”
- b) Push the SET button(? this arms the testing procedure)
- c) Activate the fuel pump one second by pushing the UP button(you here the pump pulsing/running and a “Click” from the fuel valve opening)

We recommend now flushing the fuel system for cleanness and purging air bubbles:

d) Now activate the fuel pump for several seconds, until fuel is flowing out from the **disconnected** 4mm PU fuel tubing. Now stop activating the fuel pump.

(DO not flood the turbine!! Make sure the fuel tubing is disconnected!!)

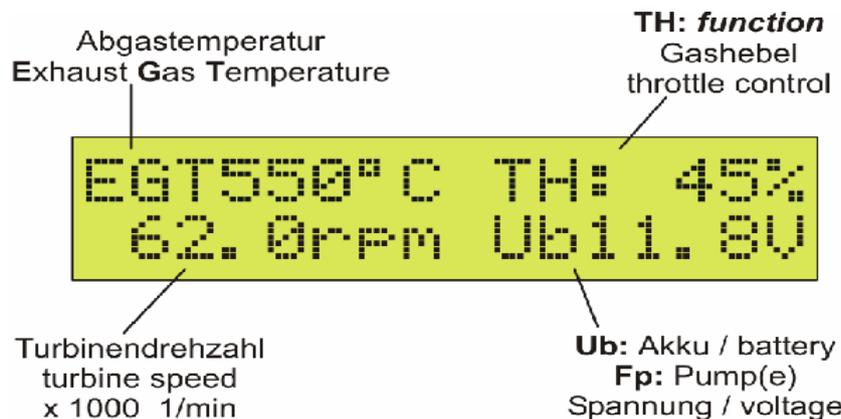
- e) Push the SET button(disarms the testing procedure)
- f) **Reconnect the 4mm PU fuel tubing to the turbine.**

Push SET two seconds to get back to the main menu and again for the startup page.

Flushing the fuel system is completed!

Starting the Turbine (Autostart)

- R/C transmitter: ON(3 position turbine switch OFF position)
- R/C receiver: ON
- PRO ECU: ON
- Propane Bottle: FULL and OPEN
- Fuel tanks: FULL (Jet A + 5% Turbine Oil)
- 4mm fuel tubing on the turbine: CONNECTED
- Fire extinguisher (CO₂ Gas only, no powder, no corrosive Halon) nearby
- Clear the turbine of internal fuel by tilting the aircraft into vertical position with the electric starter pointing to the ground (fuel leaves the turbine via inlet screen only)
- Put the aircraft on the ground in headwind direction
- Check the RC equipment (distance and function)
- Check safety distance to the turbine (other pilots and spectators)
- Check exhaust area clear, no fire danger
- Set rotor pitch=0



Just for info: Using the up- and down-key on the EDT toggles the display between Ub=BATTERY or FP=Fuel pump Voltage.

Set the transmitter turbine switch from OFF to IDLE

EDT: Changes from STOP to RUN

AUX-LED: STEADY ON

Set the transmitter turbine switch from IDLE to 100% and back to IDLE

EDT: TH rel-	System release for start up
TH spin	Starter spins the turbine rotor
TH fire	Glow plug and gas valve is energized, waiting for light up!
TH heat	Short combustion chamber heat up period
TH acce	Fuel valve is energized, turbine engine accelerates
TH idle	Turbine in idle operation

AUX-LED: STEADY ON

Actual Fuel Pump voltage should read now ~1,2 Volt!

Secure the model to the ground safely, not being able to move forward or back!

Set the turbine switch on the R/C transmitter to 100% (Keep Pitch neutral!)

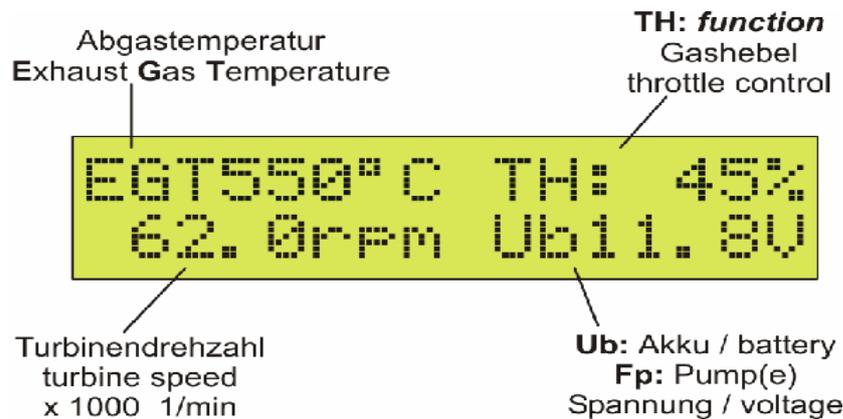
EDT: Idle-100% Slowly accelerating
100% Take off RPM

AUX-LED: STILL ON

AUX-LED: GOES OFF

Actual FP voltage should read now ~2,8 Volts(@neutral pitch)!

Shutdown of the Turbine (followed by Auto-Cooling)



Shutdown the turbine with the 3 position turbine switch on the R/C transmitter(possible from any RPM, normally done from IDLE RPM).

EDT: TH off Fuel valve is closing.
TH cool Turbine is electrically cycled down to below 80°C

HINTS:

Setup is necessary just once and will stay in the memory.

If one parameter needs to be changed, just change one parameter. You need not to do the complete setup again.

If there is the slightest suspect that there are fuel residues inside the turbine:

Turn the turbine(aircraft) exact vertical with the starter pointing to the ground for 10 seconds before the next starting attempt. Excessive fuel can leave the turbine only via the inlet screen! Otherwise a hot start is likely!

If a hot start occurs(tailpipe fire) continue starting, this condition lasts usually just for a few seconds.

No start attempt shall be made without a suitable fire extinguisher (CO2-Gas is recommended, Halon is effective but corrosive).

Shutdown of the turbine shall be done only by the 3 position turbine switch on the transmitter. The ECU power pack has to stay on for cooling and for reading out the EDT later on.

Do not completely empty the fuel tank. Air bubbles trapped in the pump can create a starting problem. Refer to "Flushing fuel system" on page 9.

Before each new starting attempt the EGT has to be below 80°C.

Recharge the 1600 mAh Power pack after performing 2 Flights!

After Flight Checks

The PRO ECU stores several information which can be read out by the user with the EDT after the engine is off(PRO ECU still on):

Scroll to INFO:

Read out the last run EGT-PEAK (Menu "INFO"): This value should not be higher than 700°C. Higher Temps require loading the turbine in a more conservative manner to assist the ECU in their limiting function.

In the worst case the turbine will automatically shut off at more than 800°C!!

Read out the last run FUELPUMP-PEAK Voltage: This value should always stay below 4,2 Volts. A readout of 4,2 Volts or higher indicates fuel flow problems in the tank system, air bubbles or too much power requested. Check the clunks, fittings, tubing and the pump for dirt or looseness. Check the fuel tank vent. Fuel flow problems are also generating possible rpm decrease followed by high EGT during flying.

Write the EGT-PEAK and FUELPUMP-PEAK after each flight into a Log book!

There is a lot more info available from the menu INFO and STATISTICS:

EGT-AVERAGE

RPM-PEAK

RUNS-TOTAL

RUNS-ABORT

HOURL-METER

LAST-OFF(see next page for info/last shut down reason)

APPENDIX and ERRORCODES

- off** Regular switch off of the engine via the R/C transmitter/operator
- R/C!** Same as **-off** regular switch off, but with a hint as to counted radio fail safes. See 10:R/C-FAILS, failures of the remote control connection.
Solution: Check the remote control system and do a transmission range test!
- badG** The glow igniter inside the turbine is defective or too cold. This error can also be caused by a weak or nearly empty turbine battery.
Solution: Charge the turbine battery and/or check the cables and plugs.
- main** Internal hardware error, overheating or bad contacts
Solution: Let the ECU unit cool down and/or check the cables and plugs.
- strR** The starter motor does not deliver sufficient power to continue the starting procedure or the rpm measuring equipment(infrared diodes) is defective.
Solution: Charge the battery, check the connectors, turn centrifugal clutch by hand to see the turbine is mechanically turning easy and check the EDT for rpm indication
- minR** The revolution speed falls below the required value during the start up procedure. This is usually caused by air bubbles in the fuel supply system leading to a flameout in the combustion chamber.
Solution: Make sure that the fuel supply is sufficient and uninterrupted.
- time** The time limit for the start up procedure is exceeded(usually due to poor fuel flow)
Solution: Check the fuel supply, the fuel tubing and the fuel tank.
- minT** The exhaust gas temperature falls below the value specified under LIMITS 34:EGT-MIN. This is usually caused by air bubbles in the fuel supply system leading to a flameout in the combustion chamber. Accompanied by considerable smoke.
Solution: Use a better fuel tank system with a felt clunk in the tank before the pump.
- maxT**
toIF The exhaust gas temperature exceeds the value specified under LIMITS 36:EGT-OFF
Massive over temperature! (Or the temperature probe is disconnected or delivers invalid measurement signals.) This means that the engine can no longer be controlled and must be shut down (safety shutoff).
Reasons may be:
- A fuel puddle inside the turbine(upon start up).
Solution: Hold a cloth against the engine intake and tilt the engine or the aircraft model upright with the intake facing down, so the fuel flows out of the engine.
 - Starter system failure(upon start up).
Solution: Recharge the battery, see page 8 TEST DEVICES (check STARTER)
 - Overloading of the engine (during clutch engagement or during full rpm operation).
Solution: Search for the cause of the high EGT to protect your engine!
- ovrR** Turbine rpm exceeds the value LIMITS 31:ENGINE-100% +extra10% overrun margin. This is usually caused by sudden unloading of the engine or power train breakage.
- runR** The rpm falls below the value specified under LIMITS 33:ENGINE-MIN. This is usually caused by running out of fuel or air bubbles in the fuel supply system leading to a flameout in the combustion chamber. Accompanied by considerable smoke.
Solution: Use a better fuel tank system with a felt fuel clunk.
- lowB** The minimum voltage of the turbine battery has been reached. If the minimum system voltage is reached, a safety shutoff takes place (lowB, lowB).
Solution: Charge the turbine battery and/or check the cables and plugs.
- higB** An overvoltage of the turbine battery has been detected.
Solution: Check the turbine battery, connect the right battery type and/or check the AUTOSTART 46:BATTERY battery type settings.
- R/C?** The RC1 remote control signal was not detected for a longer time than specified under R/C-SETTINGS 57:FAILS-TIME
Solution: Check the remote control system and do a transmission range test!

The transmitter 3 position switch set to STOP removes an actual error code and enables the turbo shaft engine again. **Do not just remove the error code ! Investigate first !**

Performing Flights

Check:

Power packs fully charged

Fuel tanks full, fuel filler hose plugged, vents open

Fire extinguisher (CO₂ Gas only, no powder, no corrosive Halon) nearby

Clear the turbine of any fuel residues by tilting the aircraft into vertical position with the electric starter pointing to the ground (fuel leaves the turbine via inlet screen only)

Put the aircraft on the ground in headwind direction

Turn RC transmitter, receiver, ECU on

Check the RC equipment (distance and function)

Check safety distance to the turbine (other pilots and spectators)

Open the valve on the gas bottle

Check pitch=0

Check exhaust area clear, no fire danger

Perform start up according instructions (use the EDT for the first starts to get familiar with operation sequence) at least until the engine is idling

Disconnect the EDT carefully (rotor may turn slowly already)

Turn the turbine switch on the transmitter to high rpm

After the red status LED goes off (~40 seconds from idle) take off is possible.

First flights

Perform the first flights with moderate max pitch values and don't fly any longer than 3-4 minutes. Fuel consumption is depending on aircraft and flight style.

After landing reduce RPM and turn off the engine with the turbine switch on the transmitter. Wait until the automatic cycled cooling is completed.

Connect the EDT to the ECU and proceed according AFTER FLIGHT CHECKS.

Write the max Temp and max Pump voltage after each flight into a Log book!

Recharge the power pack after 2 flights!

The ECU incorporates a RPM-GOVERNOR regulating turbine and rotor rpm to a constant value. The gain is set to "MEDIUM" from the factory. This setting is supposed to be comfortable for nearly all models. If you realize a rhythmic rpm fluctuation or tail swing, set the RPM-GOVERNOR to "SOFT"(Menu RC-SETTINGS, 59: RPM-GOVERNOR).

Necessary equipment for flying:

- CO₂-Gas fire extinguisher
- Jet A/Oil mix and fuelling pump
- Propane/Butane mix for refill or full spare tank
- Spare glow plug and suitable tooling
- EDT (display)
- Electric charger

Maintenance

The Turbine unit is nearly maintenancefree. The gears in the mechanics are normally a combination of Delrin/steel and shall not be lubricated.

At damage our ground contact of the revving rotor, operation must be stopped immediately.

Fuel, fuel system and gas system has to stay very clean

Clean the inlet screen

Check the engine for damage and lose bolts

Regularly check the internal transmission and bearings: With two fingers turn the nut securing the flyweight of the clutch lightly back and forth. Check for little play, no running noise and the engine running free and easy.

If you have to remove the temp. sensor: After installation check that the temp. sensitive tip stays securely 5-6mm inside the exhaust (**middle of the turbine wheel blade seen from rear**) and don't forget Loctite on the little M3 worm screw.

Any other maintenance action has to be performed at a certified maintenance center. Please do not change the clutch bell by yourself. Special care and play tolerances are here important. Please contact a certified maintenance center if a clutch bell change is really necessary.

If there is any doubt on proper condition or function, or after 25 operating hours (can be read out on the EDT and is standard maintenance cycle) contact us and send the turbine + PRO ECU to:

***EAST COAST SCALE HELICOPTERS
79 GROVE STREET
UNIT B
FRANKLIN, MA 02038***