

SWIWIN Brushless Operations Manual





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Introduction

Congratulations on the purchase of your SWIWIN Turbojet Engine. This manual is intended to aid the user in proper setup and running procedures associated with the SWIWIN Turbojet Engine. The user should have the appropriate skills and working knowledge and or experience with RC turbines. If you do not have the appropriate skills and knowledge or experience, we strongly urge you to seek the help of a qualified person to assist in safe handling and installation practices.

Non – Disclaimer

Turbojet engines are inherently dangerous to run. It is NOT a Toy! Please read the instructions completely until you are confident in the safe handling and running procedures. It is strongly advised that for first time users, a seasoned turbine pilot with installation experience be engaged to help with the installation and operation of the engine. This may minimize potential risks and hazards associated with running the engine. Swiwin Turbines and The Lighter Side Of RC will take no responsibility for any damages or injuries to property, animals, people, users, or any bystanders. The Lighter Side Of RC advises all users to test all engines in a secure test stand, outside of any model aircraft prior to the installation into any model aircraft. Test stand operation confirms that the turbine is setup properly and allows the operator to familiarize themselves with the turbojet engine prior to installation. If you are uncertain how to operate the engine or any questions arise DO NOT attempt to run the engine.

Proper PPE

Turbine engines produce a significant amount of DB and can damage hearing. Always wear suitable hearing protection while operating a Turbine engine. It is up to the end user to protect themselves and decide what PPE (Personal Protection Equipment) is suitable for them. Hearing protection, Eye Protection, Gloves are all common items.

FIRE Extinguishers

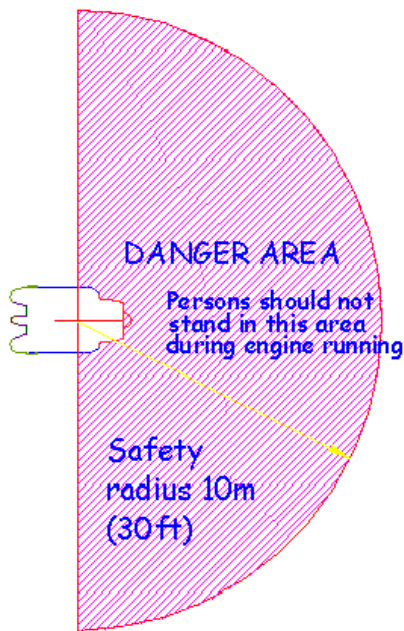
It is advised, Common practice and in some cases mandatory to have a fire extinguisher close at hand during the operation of a Turbojet engine. A CO2 Type extinguisher should be used and not a Dry Chemical type. Dry chemical types will extinguish the flames but WILL Damage the Turbine engine. The use of Dry Chemical Extinguishers will void the warranty of the engine.

SAFETY FIRST

The User or End User should be versed in the model turbojet/turbine operation. The purchaser acknowledges and assumes the risks and dangers involved. Turbines are potentially hazardous to operate and pose a risk to the user and any bystanders.

Warning to Bystanders

- The User accepts full responsibility for all risks including those to any bystanders. User accepts responsibility and bases all risks associated with the operation of SWIWIN Turbine engines.
- Risk of Explosion
- Risk of expelled turbine blades
- Risk of Burns
- Risk of long term effects of inhalation of exhaust from turbine fuel, oil or any additives
- Risk of death or injury due to loss of control of a turbine or turbine propelled model.
- Risk of effects from contact with fuel, oil, electrical components etc.



Warning to Bystanders – The User acknowledges the risk of injury or burns to bystanders during the start-up or while operating a turbine. The user agrees to take all steps necessary to ensure that all persons are situated a safe distance from the operating engine.

Please refer to the figure on the left. Always ensure that any and all bystanders and flammable materials maintain a safe distance from the engine. At least 30ft/10m clear of the area to the side and rear of the engine.

It is rare that turbines catastrophically malfunction or fail but in the rare case that this happens, having the DANGER AREA clear may help to prevent injury.

Fire Extinguishers – As mentioned, it is crucial to always have at least one CO2 Style fire extinguisher on hand. CO2 is the only recommended extinguisher for an engine fire as a dry chemical extinguisher will damage the engine. Warranty is void if a dry chemical extinguisher is used on an engine.

Fail Safe – Please refer to your radio manual for the proper setup of the fail-safe to ensure proper operation in the event of interference or signal loss.

Ear Protection – Turbines produce excessive DB levels of noise. Always use suitable ear protection when the engine is in operation.

Burns – Exhaust gasses can be very hot and reach temperatures up to 1000 degrees C. These excessive temperatures can cause burns to skin or damage to objects within the exhaust path or even close to it. Keep engine exhaust clear of anything that may be damaged by heat.

Turbine Oil Toxicity – Turbine oil may be Poisonous. Always keep it away from the mouth, eyes, lungs and skin. Store oil containers and mixed fuel containers out of reach of Children and Pets.



Exhaust inhalation – Turbine oil may be carcinogenic. Inhalation or repeated exposure to turbine exhaust can be damaging to the health of the operator or bystanders.

Pit/Ground Assistant – It is highly recommended to use a qualified ground assistant during all start up and shutdown procedures. The ground assistant should be familiar with the operation and safety procedures of a Turbo jet Turbine engine. The assistant should fully understand their role prior to the operation of the turbine engine. The assistant's role should be determined between the operator and the assistant.

Fuel & Turbine Oil

SWIWIN Engines operate on Diesel, 1-K Kerosene or Jet A Fuel. Fuel must be clean and filtered prior to use. Fuel **MUST** be mixed with 5% synthetic turbine oil. The use of any non-approved oil such as 2 cycle oil will void the warranty.

SWIWIN Limited Lifetime Warranty

SWIWIN Warrants each turbine to be free from defects in materials and workmanship during normal usage, according to the following terms and conditions.

1. The warranty is transferable to any subsequent user. There is a \$75.00 Admin Fee which will be collected when ownership of the engine is transferred. Please make sure that each user registers the engine with SWIWIN at the time of transfer so that service can be maintained on the engine.
2. Warranty period commences on the date of purchase.
3. First year warranty covers all parts.
4. Lifetime warranty coverage applies after year one (1) and covers the following items:
 - a. Combustion Chamber.
 - b. Shaft
 - c. Shaft Tunnel
 - d. Diffuser
 - e. Injectors
 - f. NGV (nozzle guide vanes)
 - g. Turbine Wheel.
5. Lifetime warranty does NOT cover the following items:
 - a. Damage caused by improper installation
 - b. Damage to can / FOD / including Crashes
 - c. Starter Motor
 - d. Glow plug/igniter
 - e. Diffuser
 - f. GSU
 - g. ECU/DRM
 - h. Fuel Pump
 - i. Solenoids/Valves



Warranty Terms

1. Within the initial 1 year warranty period, SWIWIN will repair or replace, at SWIWIN's discretion, any defective part(s), with new replacement parts if such repair or replacement is required and is due to a malfunction during normal usage.
2. SWIWIN will cover labor charges associated with any warranty repair.
3. SWIWIN warranty coverage is limited to replacement of parts and repair of the unit ONLY and does not apply to any other losses or damages due to a failure.
4. Buyer/Customer is required to register the engine with SWIWIN at the time of purchase. Please retain all receipts and paperwork.
5. Buyer/Customer agrees to cover the cost of shipping the turbine to The Lighter Side of RC or SWIWIN for the repair.

Warranty Exclusions

Warranty and/or extended coverage does NOT apply under the following circumstances:

- a. The ECU or turbine leads altered in any way
- b. The turbine has been stored improperly.
- c. The turbine has sand, water or FOD Damage
- d. The turbine has been modified in any fashion
- e. Any attempt to repair or dismantle
- f. Any crash, regardless of the cause.
- g. The turbine was not cooled properly
- h. Turbine serial number has been modified, altered or removed.
- i. Turbine is found to have been operated with 2 Cycle oil.

If a problem occurs during the warranty period, please contact The Lighter Side Of RC.

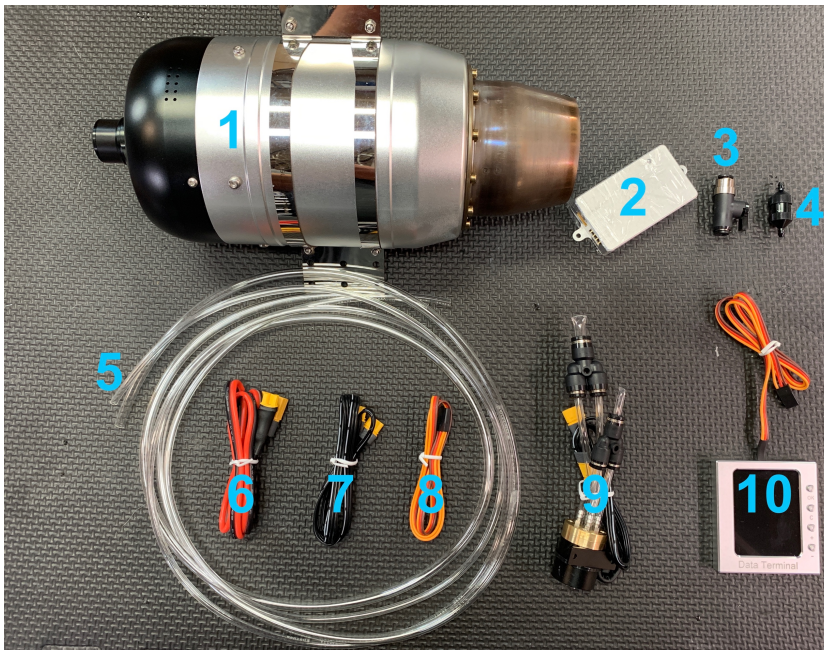
thelightersideofrc@gmail.com

- Please have sufficient information ready to provide to help diagnose the problem. In many cases the problems can be traced back to improper installation and/or parameters that may need to be altered for varying weather or elevation conditions.

If the turbine needs to be sent back to The Lighter Side Of RC

1. Contact The Lighter Side of RC to coordinate shipping of turbine for evaluation and repair.
2. Send turbine in for repair. Please include all accessories. ECU, GSU, PUMP and all Wires. We will also need the owners information including address, daytime phone number, email address, etc. Please also include a photo copy of the original sales receipt.
3. The owner agrees to cover charges for all parts and/or labor charges NOT covered by this warranty.
4. In the event that a turbine is retuned and it is later determined that the engine has failed due to issues that are not covered under the warranty (See Conditions Above) the owner will be provided with a repair estimate. If the estimate is refused the turbine will be returned to the user. The owner agrees to cover all return shipping costs.
5. This document constitutes the entire warranty between SWIWIN/The Lighter Side Of RC and the owner and supersedes all prior agreements and/or understandings.

Operation and Setup - What's Included



INCLUDED is – **1.**Engine **2.**ECU/DRM **3.**Pisco Valve **4.**Fuel Filter **5.**Fuel Tubing (4mm and 6mm depending on engine size). Standard Cable Set (**6.**Power Cable **7.**Data Cable **8.**Throttle lead servo cable). **9.**Fuel Pump (Type will depend on engine size). **10.**Data Terminal (GSU).

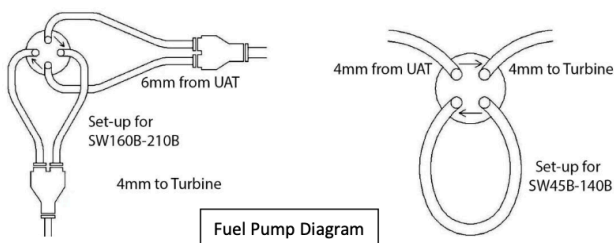
You will need to provide – Receiver and suitable radio setup. 3 Cell LIPO Battery to power the turbine. 2200 Mah Capacity and higher should be suitable. Although the turbine may work with other battery cell counts and chemistry the recommended battery is a 3 Cell LIPO Battery.

Test Stand and Operation.

For first time users and first time use of any engine it is strongly recommended that the engine be installed and run in a test stand. The test stand should be sufficient to easily handle the thrust produced by the engine and the test stand should be suitably mounted to ensure no movement or damage can occur. It is the Users responsibility to ensure the test stand is suitable and sufficient to be used for this purpose. Engines should be not run indoors and all the safety precautions listed in the manual should be adhered to. The use of a test stand allows the user to familiarize themselves with the engine operation outside of a model aircraft.

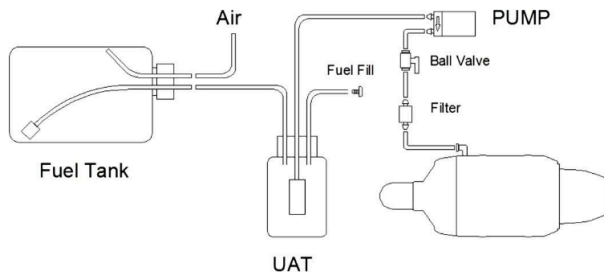
Plumbing and Fuel System Setup

- A properly plumbed fuel system setup is critical to proper running and operation of the turbine engine. Please take note of diagrams below and plumb your fuel systems accordingly. The diagrams are just guidelines, and each installation may be different.



Please note the marked arrow on the fuel pump which notes the direction of flow. On the 160 and up model the input from the UAT is on the 6mm line and the output to turbine is on the 4mm line. It is suggested that the intake line between the UAT and input side of the fuel pump be as short as possible. Excessive tubing length will add restrictions.

Setup Diagram



The UAT (Bubble Trap) is not included in the engine and needs to be provided by the end user. The UAT is the Last line of defense between air and the turbine. It is highly suggested to include one in your model aircraft installation. Please note the location of the physical on/off ball valve between the pump and the engine. Please note the location of the filter after the pump and before the fuel input on the engine. The Fuel filter has a marked line on the casing. This relates to fuel flow direction.



Connections and Wiring

- Please note the polarity and location of the connections prior to making any connections on the Engine, ECU, Battery, Etc.

WARNING Mixing up the engine and Pump connection will produce smoke from the pump and may destroy the ECU if the pump is mistakenly connected to the engine port. Pump output is 3 Phase AC (Brushless Pump) while the engine connection is a DC Power and Signal Cable.



PPM - input is used by a conventional receiver/throttle channel setup. The PPM port receives the signal from the Throttle Channel on the Receiver.

GSU/PC - is the connection for the Data Screen or GSU (Ground Support Unit). The screen may be removed before flight or left in the aircraft.

TELEMETRY – output to telemetry systems.

DBUS – connection point for BUS Systems.

NOTE POLARITY! Signal line (typically orange, yellow or white) to the top face of ECU/DRM.

ENGINE – Connection goes from ECU/DRM to single engine Input.
PUMP – Connection goes to fuel pump.

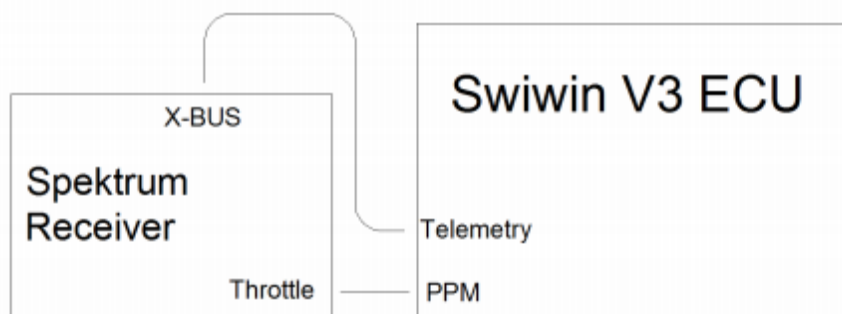
Please note overall connection diagram below showing the connections between the Engine and all the support equipment.



Turbine Setup – PLEASE REFER TO DIAGRAMS ON PREVIOUS PAGE.

1. Connect one end of the R30 (Black data cable with yellow ends) cable provided to the motor connection. Connect the other end of the R30 cable to the ECU/DRM connection labelled “Engine”.
2. Connect the Red and Black power cable to the ECU/DRM port labelled “3S Lipo Batt”. Do not connect a 3 cell lipo battery at this time.
3. Connect the fuel pump wire connection to the ECU/DRM port labelled “PUMP”.
4. Connect one end of the Male/Male Servo connection to the ECU/DRM port labelled “PPM”. Connect the other end of this connection to your receiver throttle channel.
5. Connect the GSU/Data Screen to the ECU/DRM port labelled “GSU/PC”.

Telemetry Connections



GSU Screen & Functions



Initial Screen

RPM – Current Running RPM of Turbine.

Temp – Current engine Temperature.

Curr – Electrical current in use.

Cap – Main Battery mAh used.

PwrVol – Turbine Battery Voltage.

RevVol – Receiver Voltage.

ACC – Response time from Idle to max.

State – Current engine status.

RPM Graph – Running status 0-100%

Temp Graph – Running Temp 0-1000 C

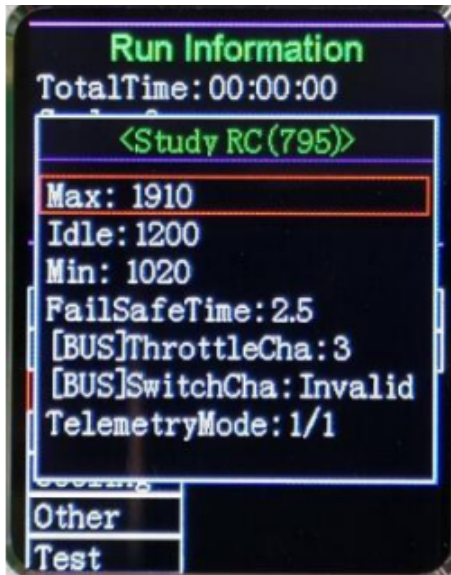
Pump Graph – Pump power – 4500 = 4.5 Volts

RC Graph – Throttle stick position 0 – 100%

OK Button – Invoke change or command. **C Button** – Back or Clear a Screen.

“+” increase value. **“-”** decrease value.

Radio Setup – LEARN RC



1. First power up your transmitter and receiver. Then power up your ECU/DRM with a suitable 3 cell Lipo.
2. The Engine will make an audible noise.
3. Press the “OK” button on the GSU Screen.
4. Use the “+” and “-” button to highlight the “STUDY RC” Menu. Press “OK” to enter the menu.
5. The <Study RC (795)> Shows the current location of throttle stick.
6. With the “Max:” highlighted, press the “OK” button. Move the throttle trim to max and the throttle stick to max and press “OK” to confirm.
7. With the “Idle:” highlighted, press the “OK” button. Move the throttle stick to minimum and keep the trim at max. Press the “OK” button to confirm.
8. With the “Min:” highlighted, press the “OK” button. Move the throttle trim to minimum and press the “OK” button to confirm.

Please note. Your numbers will vary from those shown in the diagram but they should show a similar layout with “Max” showing the highest number. “Min” showing the lowest number and “Idle” showing a number in between. Futaba users may need to reverse the throttle channel. JR Users may have to reduce travel from 150 to 100.



Priming Fuel Pump

Before using the turbine engine for the first time it is necessary to prime the fuel system and remove all air from the lines before attempting to start the engine. Priming of the engine should be completed with the fuel line NOT connected to the engine to ensure engine does not become flooded.

1. With the engine installed in the test stand, all the plumbing completed and electrical connections completed, remove the fuel line plugged into the turbine fuel input.
2. If this line is not long enough to reach a separate container or fuel jug an extension may need to be added. Run line into a suitable fuel jug or container.
3. Turn on Transmitter and receiver. Turbine ECU/DRM will require power for this process.
4. Turn on Fuel valve between the Fuel pump and the Turbine.
5. Press the “OK” button on the GSU and scroll down to the “Test” menu. Press “OK” to enter the test menu.
6. Highlight the “Test Pump” Option.
7. Press the “OK” button to initiate the fuel pump. The “OK” Button will need to remain pressed to run the pump. Once released the pump will stop. Run the pump until all the air bubbles have been expelled from the fuel system.
8. Re-insert the fuel line into the fitting on the turbine.
9. Your fuel system is now primed!

Startup Operation

Prior to Startup of the turbine, ensure all connections are in place, all fuel tubing is installed properly and the test stand is firmly mounted.

1. Ensure fuel tank is adequately filled and batteries are sufficiently charged. **Please Note – When filling the fuel system ensure the fuel mechanical (Pisco/Festo) fuel valve is in the off or closed position. Failure to do so can flood the engine and cause a fire voiding your warranty.**
2. Turn on transmitter and receiver. GSU screen should always be plugged into the GSU port on the ECU/DRM on start-ups.
3. Turn on Fuel Valve
4. Raise throttle channel trim to 100% and observe the status on the GSU Screen change from STOP to READY. If this is not the case you may need to re learn the radio to the turbine.
5. Raise the throttle stick to max and then back down to min. This initiates the start sequence.
6. The glow igniter will take a few moments to warm up and then the turbine will power up the starter motor and continue to spin the turbine.
7. The GSU will switch to IGNITION and you will hear the fuel pump start flowing with the solenoids in the engine clicking to control fuel flow. Then moving to PREHEAT, FUEL RAMP and RUNNING

IGNITION – This is the first phase of Startup. During the ignition phase there is a minimal flow of fuel to the glow ignitor. After a sufficient temperature increase the engine will transition to PREHEAT.

PREHEAT – The engine will increase RPM as fuel flow to the engine increases.

FUEL RAMP – The engine begins to enter the Running stage as RPM and fuel flow increases to reach proper running temperature.

RUNNING – The engine has reached running/idle stage and control is transferred to the user.



Shutdown Procedure

Always observe proper shutdown and cooling of the turbine engine. Failure to observe proper shutdown by not properly cooling the unit may cause damage and void the warranty.

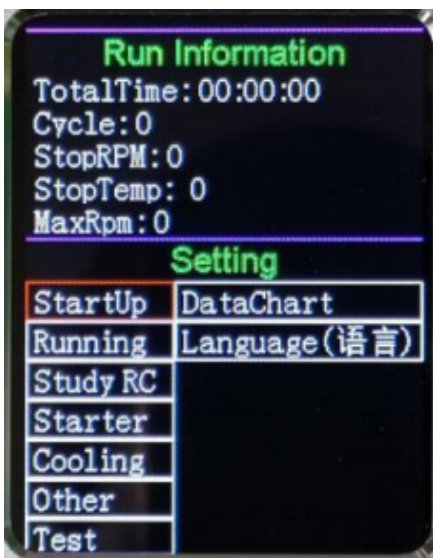
1. Lower the throttle stick to minimum.
2. Lower the throttle trim to minimum.
3. The turbine will initiate shutdown and cooldown sequence. The starter motor will turn continually until the engine has reached a SAFE temperature.
4. Turn fuel on/off valve to the off position.
5. Turn off power to the Receiver and ECU/DRM.
6. Turn off Transmitter.

ECU/DRM – GSU Functions



LARGE PRIMARY SCREEN

- From the main screen readout press the “C” Button to toggle between the Large Readout screen and the standard main screen.



MAIN MENU – INITIAL SETTING SCREEN

STARTUP – Enter Startup settings menu.

RUNNING – Enter Running settings menu.

Study RC – Program/Lean radio to ECU.

STARTER – Sets Starter engagement parameters.

COOLING – Sets Cooling Parameters.

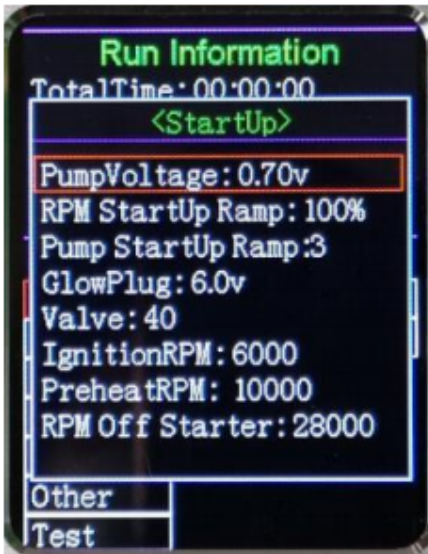
OTHER – Enter the other menu. Clear Battery MAH is located here!

TEST – Enter the Test functions.

DATA CHART – Displays engine information.

LANGUAGE – Select Language Menu.

Please NOTE! - The following explanations are for information purposes only. It is suggested that the end user does not adjust the parameters of the engine.



START UP MENU FUNCTIONS

PumpVoltage – Sets pump voltage and volume when the fuel pump is first started (ignition phase). Flow should be drops not a steady flow.

RPM StartUp Ramp – Most engines set to 100%. Higher Altitudes may require a lower number.

Pump StartUp Ramp – This parameter adjusts the speed of the fuel increase during the “Fuel Ramp” phase. A higher value will speed up the time to go from “Fuel Ramp” to “Idle”. Typical values from 3 – 5.

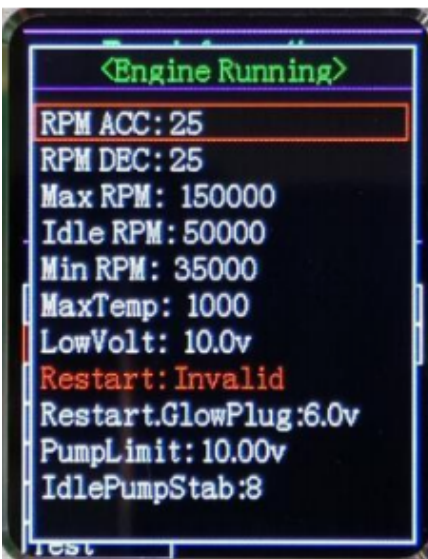
GlowPlug – Sets Glow plug Voltage. Typical Value 5.8V – 6.4V. Value vary from plug to plug. The lowest value to achieve a reliable start should be used.

Valve – This value sets the sets the open time of the startup (gas) solenoid valve at the beginning of the ignition phase.

IgnitionRPM – The RPM of the engine during the ignition phase.

PreheatRPM – The RPM of the engine for the preheat phase to begin.

RPM Off Starter – Sets the RPM where the starter motor will disengage.



ENGINE RUNNING MENU FUNCTIONS

RPM ACC – Sets the Acceleration speed of the engine. The higher the number the faster the Acceleration rate.

RPM DEC – Sets the Deceleration speed of the engine. The higher the number the faster the Deceleration rate.

CAUTION! The fastest setting is not always the best. Should be adjusted according to weather, altitude, temperature, etc. It is best to find a happy medium between response and reliability.

Max RPM – Sets the Max RPM of the engine.

Idle RPM – Sets the Idle RPM of the engine.

Min RPM – Sets the STOP RPM of the engine. If the engine RPM falls below this value, the engine will shutdown.

MaxTemp – Sets the maximum running temperature. If the engine exceeds this value, ECU will automatically limit fuel in order to reduce temp. Under normal conditions, will not shut down the engine.

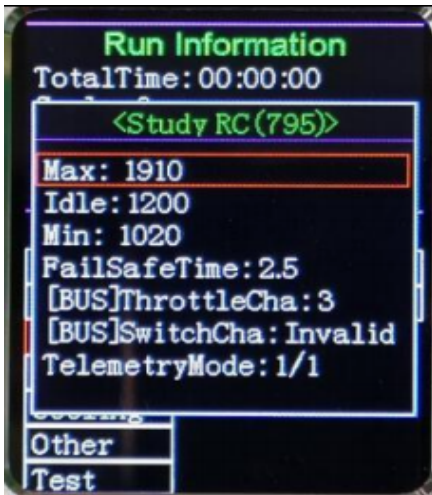
LowVolt – Sets the Low Voltage warning.

Restart – Invalid means restart is disabled. Valid means restart in enabled.

Restart.GlowPlug – sets the glow plug voltage on the restart. Typically this will be higher than the normal glow plug setting. Normal range 6.0V - 6.6V

Pump Limit – This value is used to set the limit to the fuel plump at a reasonable limit and is based on actual running values. It is best to set this value to 20% above actual observed pump power. EG. Pump power at full throttle 5800 = 5.8v. + 20% (1.2). Max pump limit should be set to 7.0v.

IdlePumpStab – Set pump stability delay on idle rpm.



STUDY RC MENU FUNCTIONS

MAX – Throttle UP, Trim UP

IDLE – Throttle DOWN, Trim UP

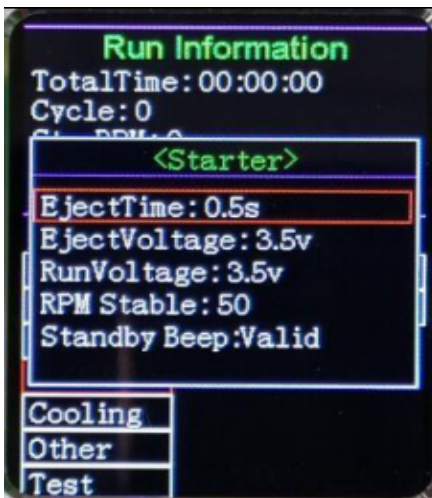
MIN – Throttle DOWN, Trim DOWN

FailSafeTime – Sets failsafe time in seconds.

BUS ThrottleCha – Set up throttle channel if using a BUS Mode Input.

BUS SwitchCha – Set up switch channel if use BUS Mode Input and switch start function. With this function enabled, PPM input on ECU/DRM is disabled, use the BUS mode for input.

TelemetryMode – Set the telemetry mode 1/1 for single engine mode.



STARTER MENU FUNCTIONS

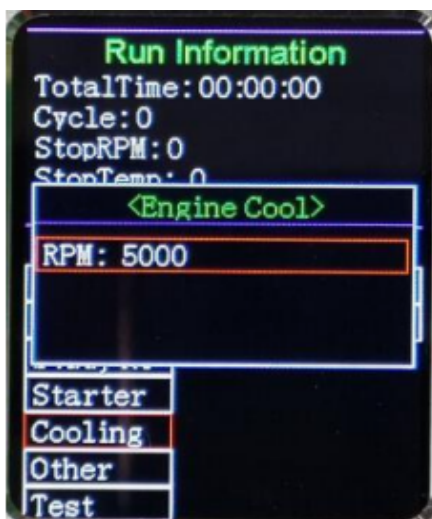
EjectTime – Sets the time for the reverse voltage pulse to disengage the starter motor.

EjectVoltage – Sets the eject voltage to disengage the clutch on the startup.

RunVoltage – Sets the voltage for the starter motor during the startup phase.

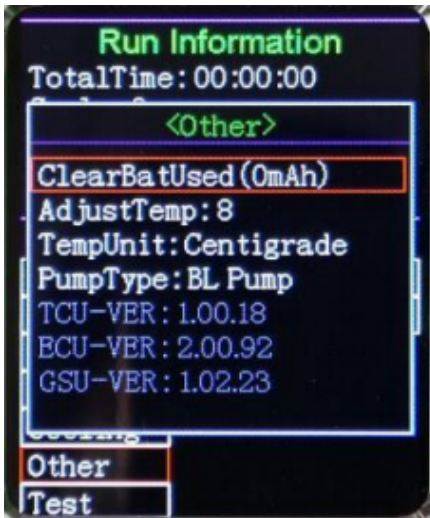
RPM Stable – RPM adjust rate of the starter.

Standby Beep – Valid and the engine will let out an audible beep to notify that engine is ready to start. Invalid and beep will be muted.



ENGINE COOL MENU FUNCTIONS

RPM – Sets the engine RPM during the cool down phase or when the starter motor is run in test menu.



OTHER MENU FUNCTIONS

ClearBatUsed – Resets the mAh of turbine battery that has been used. This figure is displayed on the main home screen.

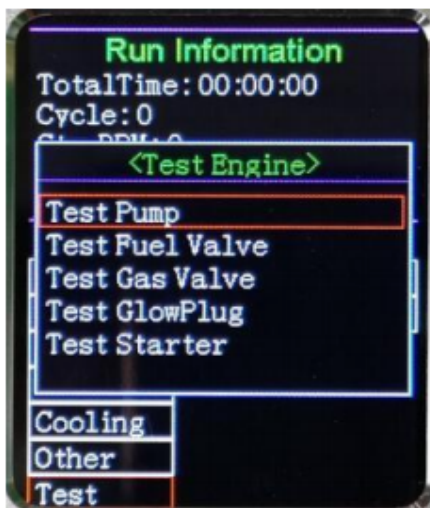
AdjustTemp – Used to Calibrate the Temp probe reading on the engine. Typically adjustments are not needed.

TempUnit – Sets to Fahrenheit or Celsius.

PumpType – Sets DC Pump or Brushless Pump

Displayed Firmware version.

- TCU. Turbine Control Unit
- ECU. Engine Control Unit
- GSU. Ground Screen Unit



TEST ENGINE MENU FUNCTIONS – Press “OK” to engage

Test Pump – Press and Hold the “OK” button to run fuel pump. Test pump engages both solenoids. Be careful to not flood engine.

Test Fuel Valve – Press “OK” to activate fuel solenoid valve. An audible Click, Click, Click will be heard.

Test Gas Valve – Press “OK” to activate gas solenoid valve. This is the valve used during the start phase to control fuel to glow plug. An audible Click, Click, Click will be heard.

Test GlowPlug – Press “OK” to activate glow plug circuit. If quiet, you can hear the glow plug energizing. A glow can also be seen from the rear of the engine.

Test Starter – Press “OK” to activate the starter motor. Engine will spin to RPM set in cooling menu. This can be used to manually cool the engine if needed.



DATA CHART MENU FUNCTIONS

Running data can be recorded for 34 min of run time. 1, 15, 50 are the data point increments.

Red – Temperature

Yellow – Throttle position

Light Blue – Fuel Pump Voltage

Green – Engine RPM

Dark Blue – Power Voltage



GSU Error Messages

NO.	ERROR MESSAGE	DESCRIPTION
0	No Error	
1	Time Out	1. Temp did not increase over 20 sec. during ignition phase 2. Throttle stick cooling over 60 seconds.
2	Low Battery	1. Turbine battery low voltage (setting from GSU) 2. Receiver Battery below 4V.
3	Glow Plug Bad	No current to glow plug.
4	Pump Anomaly	No pump driver detected. Pump, Cable, ECU pump driver bad.
5	Starter Failure	Starter can not increase to ignition RPM
6	RPM Low	1. When ignition RPM drops to 50% of ignition RPM set in ECU. 2. When preheat RPM drops below ignition RPM. 3. When fuel ramp RPM drops below preheat RPM. 4. When running RPM drops below stop RPM.
7	RPM Instability	1. When fuel ramp RPM is up and down. 2. When fuel ramp RPM quickly drops.
8	High Temp	1. When ignition temperature is over high temp setting. 2. When preheat temperature is over high temp setting. 3. When fuel ramp temperature is over high temp setting for more than 4 seconds.
9	Low Temp	1. When preheat temp quickly drops. 2. When fuel ramp temp quickly drops.
10	TempSensorFail	Temp sensor has failed.
11	Gas Valve Bad	Start up solenoid valve has failed.
12	Fuel Valve Bad	Main Fuel solenoid valve has failed.
13	Lost Signal	No PPM signal from receiver.
14	Starter Temp High	High temp of starter motor.
15	Pump Temp High	High temp of fuel pump.
16	Clutch Failure	Starter motor clutch not engaging.
17	Current Overload	ECU Detects a current overload.
18	Engine Offline	ECU Cant connect to turbine. Typically caused by no power to ECU (3 Cell LIPO) or cable between ECU and turbine not connected.

Thank you for thoroughly reading your new engine manual! We hope you enjoy many successful flights with your SWIWIN Turbojet Turbine engine!

Please contact us for any service requests and prior to sending in any engines for service. Postage is the responsibility of the engine owner.

- Email: thelightersideofrc@gmail.com
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