



SW Brushless Series



Kero Start
Full Auto Start with Restart
Operations Manual

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Ver. 220207

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Introduction

This manual is intended to aid the user in setup and running practices associated with the SWIWIN SW and CRX series micro turbines. This manual is not intended to take the place of a primer on micro-turbines. It is assumed that the user has working knowledge and experience with turbines and that each user is familiar with best practices before attempting to run a turbine.

Non- Disclaimer - Turbines are inherently dangerous to run. Please read these instructions completely over and over then read them over and over AGAIN. You must be entirely familiar with the operation of this turbine before attempting to run this unit. It is strongly advised that if this is a first time turbine that the user engage the help of a seasoned pilot or turbine mechanic in order to help to familiarize the user with the operation and to minimize potential risks involved. This entails risk to the engine and risk to yourself and any bystanders.

SWIWIN USA/CRX will not assume any responsibility for any damages or injury to the user(s), bystander(s) or for damages directly or indirectly resulting from the use of our engines. The applications for microturbines is evolving. CRX will not assume any liability for damages to user aircraft, i.e., real scale or model, cars, i.e., real scale or model or any apparatus, i.e., flying as in drone or fixed wing or helicopter, etc. Our responsibility is explicitly limited to the motor and ancillary supplies offered with the turbine.

SWIWIN USA/CRX advises ALL users (novice or pro) to test their motors in a test stand before mounting them in a plane. The reason for this is to familiarize yourself with SWIWIN motor operation and to ensure reliable operation before mounting the engine in the plane.

If you have any questions, do not run the turbine. If you are unsure about how to operate the unit, do not run the turbine.

Safety First

Users need to be versed in model jet turbine operation. Purchaser acknowledges the risks and dangers involved. Turbines are potentially hazardous to operate and pose a risk to the user and any bystanders.

- Risk of expelled compressor blades (front)
- Risk of expelled turbine blades (rear)
- Risk of Burns
- Risk of long range effect of inhalation of smoke from turbine oil additives
- Risk of death or injury due to loss of control of a turbine or turbine model

User accepts full responsibility for all risks including those to any bystanders.

User accepts responsibility and bares all risks associated with operation of SWIWIN/CRX turbine engines.

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

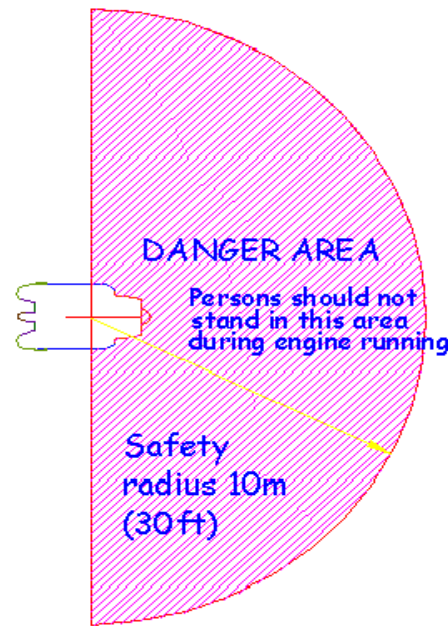


Figure 1 Minimum Safe Distance

Please refer to figure 1. Always ensure, that all bystanders maintain a safe distance from the engine. At least 10m (30ft) clear of the area to the side and rear of the engine, Turbines rarely catastrophically malfunction but in the rare event of an issue, it is best to maintain a safe distance.

Fire extinguishers – It is absolutely crucial to have at least one CO2 extinguisher and a Class ABC extinguisher on hand at all times. CO2 is the only recommended application for a motor fire. A dry chemical extinguisher will work to extinguish a motor fire but the residue left behind from dry chemical



extinguishers does heavy damage to a running turbine. If a chemical extinguisher is used to extinguish a running engine fire, the motor will need to be completely disassembled and cleaned. The warranty is void if dry chemical extinguisher is ever used to extinguish a turbine fire.

Important Note: Please be sure to inspect all extinguishers each day that a turbine is being used. There is nothing more disheartening than watching a plane burn because a fire extinguisher was not operational when needed.

Failsafe - Failsafe. Please read carefully on the notes on setting the failsafe on your radio to ensure safe operation in event of interference or loss of signal.

Ear Protection – Turbines produce excessive Db levels of noise. Always use ear protection when running the engine.

Burns - Exhaust gases are very hot (up to 1000°C/1800°F) and can cause burns to skin or damage to objects close to it – keep exhausts clear of anything which is affected by such heat. The exhaust from a turbine can and will burn grass and ignite dry brush.

Turbine Oil Toxicity - Turbine oil is poisonous. Keep it away from the mouth and eyes and from contact with skin. Always store it in a marked container and out of reach to children.

Inhalation of Smoke from Turbine Exhaust – Smoke generated from burning turbine oil is a known carcinogen. Prolonged and repeated exposure to turbine exhaust (¹when using turbine oil) can pose a health hazard.

Ground Assistants - Use a qualified ground assistant during all Start-Up procedures. Purchaser agrees to use an assistant who is familiar with the operations of a micro turbine.

Keep assistants close and be sure that they understand their role before starting the engine. One assistant should carry out the role of fireman. Ensure that they are aware of what to do in event of emergency and where to position the extinguishers.

¹ Turbine oil or Mobil DTE may be used for lubrication purposes.



Turbine Oil – Turbine oil is required for operation of your turbine. Use of any non-approved oil such as 2 cycle oil voids the warranty.

SWIWIN 1 Year 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. Warranty period commences on the date of purchase.
2. First year warranty covers all parts except for batteries.
3. Warranty coverage applies after year one and covers the following items:
 - a. Combustion chamber
 - b. Shaft
 - c. Shaft tunnel
 - d. Diffuser
 - e. Injectors
 - f. NGV
 - g. Turbine wheel
4. Warranty does not cover the following items:
 - a. Crash Damage
 - b. Damage to Can
 - c. Damage resulting from misuse
 - d. Any FOD damage including and not limited to:
 - i. Broken compressor blades
 - ii. Scored intake cover

Terms

1. Within the initial 1 year warranty period, CRX/SWIWIN will repair or replace, at SWIWIN's discretion, any defective part(s), with new or factory rebuilt replacement items if such repair or replacement is required and is due to a malfunction during normal usage.
2. CRX will cover labor charges associated with any warranty repair.
3. CRX warranty coverage is limited to replacement of parts and repair of the unit and does not apply to any other losses or damages, consequential or inconsequential to the failure.
4. Buyer does not need to register the motor with SWIWIN at the time of purchase. CRX maintains a customer database by serial number.
5. Buyer agrees to cover the cost of shipping the turbine to CRX for repair. CRX may at their discretion, pay postages to return the engine for service.



Exclusions

1. Warranty and/or extended coverage does not apply under the following circumstances:
 - a. The turbine is used for commercial or institutional (school) use
 - b. The turbine has been stored improperly
 - c. The turbine was submerged in water
 - d. The turbine has been modified in any fashion
 - e. Any attempt to repair
 - f. Any dismantling of the turbine
 - g. Any crash regardless of cause
 - h. The turbine was not cooled properly
 - i. Improper electrical connections
 - j. Turbine serial number has been removed or altered.
 - k. Turbine is found to have been operated with 2 cycle oil
2. If a problem occurs during the warranty period, please contact our service department and take the following steps:
 - a. Contact CRX in order to coordinate shipping of the turbine to the service center for evaluation and repair.
 - b. A service order form is located on our site. Please include a copy with the engine. The form can be emailed to service@crxturbines.com
 - c. Send the turbine to our repair center.
3. 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 returned and it is later determined that the engine has failed due to issues that are not covered under the warranty (see above conditions) the owner will be provided with a repair estimate.
 - a. If the estimate is refused, the turbine will be returned to the user. Owner agrees to cover all return shipping costs.
5. This document constitutes the entire warranty between SWIWIN/CRX and the owner and supersedes all prior agreements and/or understandings.

Operation and Setup

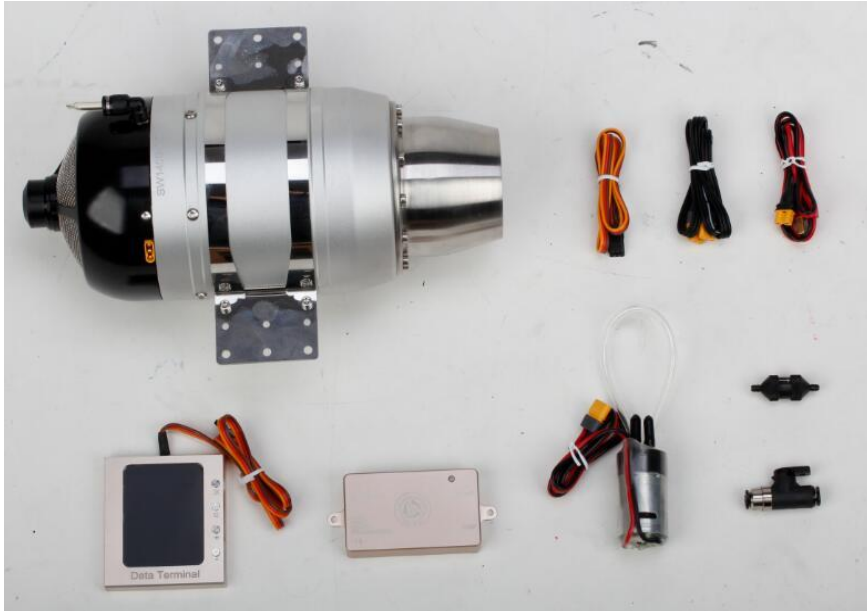


Figure 2 Items Included in Motor Kit

Important Note About Motor Training

Swiwin is a centrifugal flow turbine (as opposed to axial). There are many similarities between other microturbines on the market and Swiwin. One major thing that sets Swiwin apart from others is the ECU. Other manufacturers are mostly based on Xicoy Ecus. This includes King Tech, Jet Central, Jet Italia, ATJ but does not include Jetcat, Behotec or AMT.

Swiwin utilizes an intelligent trending algorithm for turbine response meaning the unit learns to achieve maximum response over time.

Response time is controlled by programmable delays for acceleration and deceleration and both are affected by these key factors:

- ASL – altitude above Sea Level
- Humidity
- Ambient Temperature



Each user will need to tailor his/her engine to their liking and based on their surroundings. There is no one size fits all.

Engine Training – Swiwin engines are designed to “learn” to reach optimal response over time. Because the ECU and pump can be interchanged between engines, this process is imperative to insure user safety and for bystanders. The motor needs to run to max thrust to achieve optimum response. The short response times that can be seen in some videos are attained over a period of time. It is highly recommended that the user manually exercise the engine to ascertain the best possible response for their surroundings. It is also highly recommended that the engine be placed in a test stand to conduct this exercise. Motors can easily flame excessively if delay times are set low. Please don't risk your plane by running initial tests on a new motor in your new plane.

IMPORTANT NOTE: If you elect to switch your engine between planes, please allow the engine to retrain each time.

Fuels and Lubrication

Preparation of Fuel

In a clean fuel container mix fuel using the following ratio:

- 3% oil diesel
- 5% oil Kerosene or JetA

General rule of thumb is to mix 5 gallons of fuel.

For smaller or larger amounts the following formula can be used:

- Gallons fuel X 128 X .03 or .05 = ounces of oil

Fuels

Swiwin supports use of JetA, Kerosene and Diesel. This means the engines run on all 3. This does not mean the fuels are all the same.

JetA - JETA is in its purest form and is the best fuel to burn in any

turbine. The reason is that this fuel is blended with a turbine in mind. It has properties that far exceed the needs of any turbine being run on the ground. JETA is formulated to perform in adverse conditions where the motor sees very low temps and at high altitudes. Availability of JETA makes it an excellent option but accessibility outside an airport might be problematic.

Kerosene - This is clean fuel with simple formulation. This is a first runner up to JETA where it comes to fuels. Pricing in warmer states might be problematic. Department stores sell gallons for absurd costs. In northern states where homeowners may use kerosene heaters, gas stations tend to offer kero more often but please run a good cartridge filter on your filling canister. This is not the filter in line with your engine. This is a cartridge filter that is made to catch everything and will impede flow for running an engine.

Diesel - Diesel is by far the easiest fuel to obtain and accessible everywhere. Diesel runs well in Swiwin engines and has been a proven performer in every jet community. Diesel is said to be a "dirtier" fuel and should also be filtered on your filling container.

There are a couple of points to consider when using diesel.

1. Smell - Diesel tends to produce more smoke.
2. Additives - Diesel is formulated for trucks and buses. In northern states where winter temperatures are extreme, there is a higher concentration of additives. This has no bearing on turbine running but it might affect the amount of lubrication needed.
3. Impulse Energy - Diesel has been reported to be more energetic in turbines than other fuels. The impulse energy is essentially the energy that is given off from burning the fuel and can produce more heat than other fuels. Some pilots report a higher thrust output on Diesel.



Amount of Oil to Fuel

- 3% for Diesel
- 5% for Kero

How to calculate:

1. Convert gallons to ounces then multiply by .03 (3%) or .05 (5%).
Answer is ounces of oil needed.

Example: How much oil for 3.5 gallons of fuel

Answer:

$$3.5 \times 128 = 448 \text{ oz}$$

$$448 \text{ oz} \times .03 (3\%) = \mathbf{13.44 \text{ oz oil for diesel}}$$

or

$$448 \text{ oz} \times .05 (5\%) = \mathbf{22.4 \text{ oz oil for JetA or Kero}}$$

SWIWIN's Recommendation for lubrication - Swiwin advises the use of any turbine oil and currently prohibit the use of 2 cycle oil. They have left it up to their dealers to manage this.

CRX Recommendations - CRX recommends Mobil DTE light - Hydraulic

oil or any turbine oil.

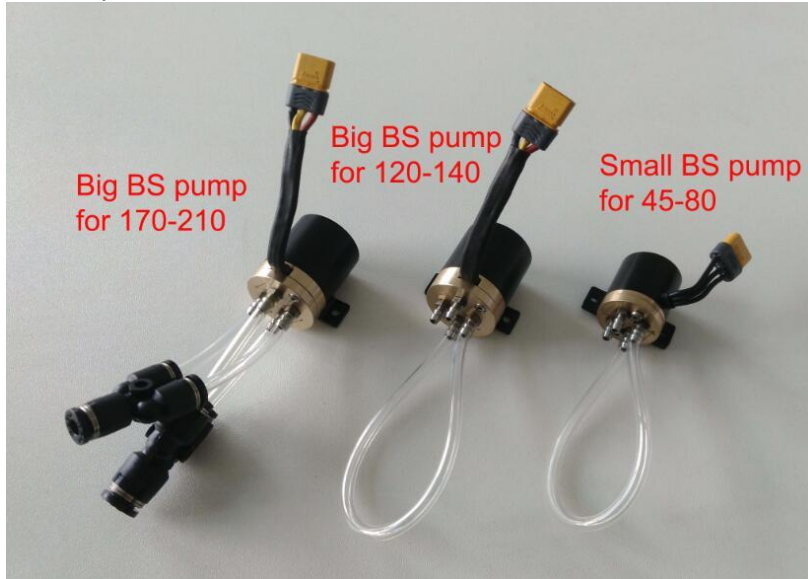


Figure 3 Brushless Pumps

1. Connect one end of the MR30 black cable to the ECU receptacle labeled “motor”. Connect the other end of to the yellow MR30 engine port.
2. Connect the yellow XT30 power cable (Male) to the ECU port labeled “Power Cable”.



Figure 4 ECU Connections and Power Connection

3. Connect the other end of the power cable (XT60) to 3S Lipo.
4. Connect one end of the servo cable between the ECU port labeled “PPM” and the other end to your receiver throttle output.
5. Connect the pump to the pump cable and the other end to the ECU port labeled “pump”.

Warning: Mixing up the engine and pump connection will produce white 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 while the engine connection is a composite DC power and signal cable.

6. Connect the GSU to the ECU port labeled GSU. Orange/white signal toward top of ECU. Please observe correct polarity or the terminal will not operate properly.
7. Follow diagrams below to connect Telemetry. Refer to Transmitter instructions for further details

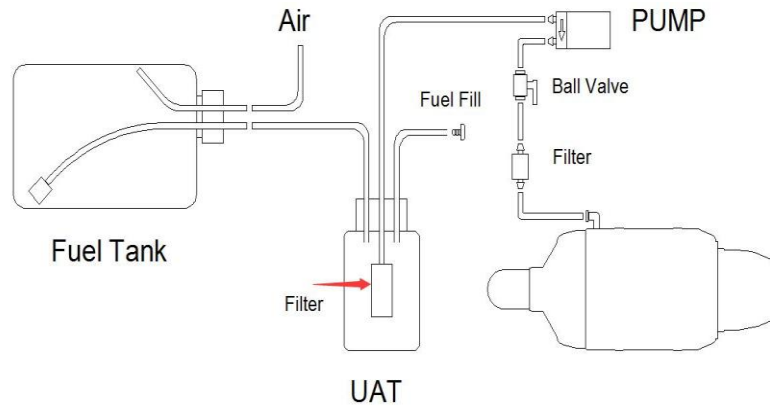


Figure 5 Motor Setup

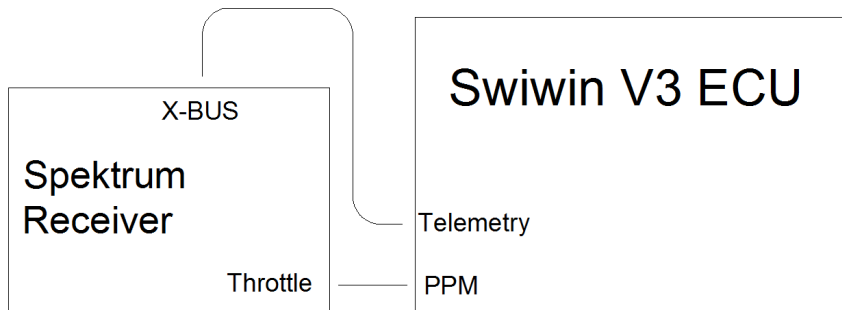


Figure 6 Telemetry Spectrum Diagram

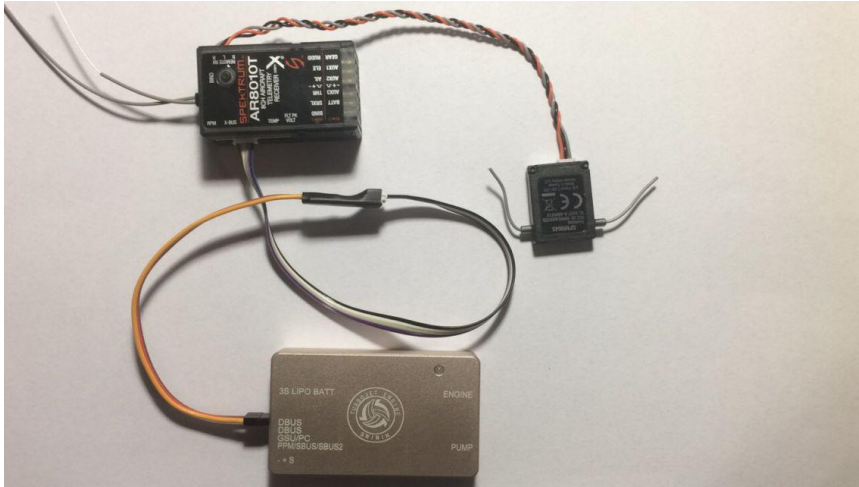


Figure 7 Telemetry Cabling



Figure 8 Spectrum Cable

Motor Setup

Introduction – For first time users and for first time use of any engine, it is strongly recommended that the motor be placed into a test stand for the first time. **We receive many calls from customers that have worked tirelessly to install a motor in their plane only to realize it had to come out and/or they experienced an issue on startup and caused damage to their plane from an improper start. Please don't disregard the initial test process. Failure to**

following this simple step can result in serious damage to your plane.

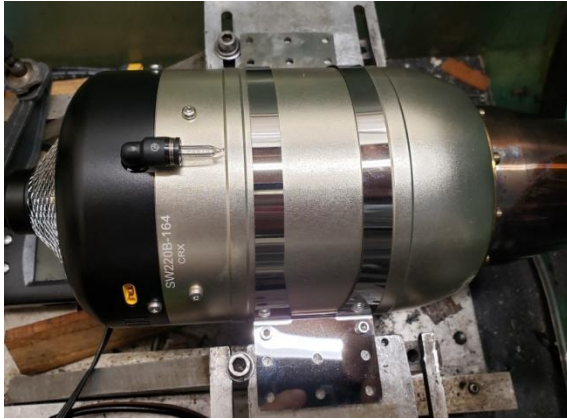


Figure 9 Motor Orientation

Procedure: Mount the engine in a test stand that will minimally handle the full thrust of the engine. Position the engine with the filler toward 12 o'clock or as close to this position as possible. Weight the table if needed. Do not do this indoors. Do route the exhaust outdoors if in a garage or into a pipe that goes

outdoors. Mount the ancillaries neatly where you can see them. Do not skimp on this step. Note the orientation of the parts and the plumbing. Make sure the valve is off. Then work on the electrical. It is difficult to mix up polarity with all of the enhancements to the wiring we provide now but depending on how you are supplying main current, please observe correct polarity when connecting to the ECU. If you mix up polarity on the main supply, the ecu will instantly be destroyed. There is no warranty on a burnt ecu.

IMPORTANT NOTE: The case of the ECU is negative grounded. DO NOT CROSS THE CASE OF THE ECU WITH THE POSITIVE MAIN ECU POWER OTHERWISE COMPLETE DESTRUCTION OF THE ECU CAN OCCUR.

1. Please refer Motor Setup above. Connect the motor festo fitting to a section of 4mm tubing (included). Route the tubing to the filter then to the shut off as shown.
2. Connect the other end of the shutoff with 4mm tubing to the output of the pump.
3. Plumb the UAT as shown and per the UAT instructions (UAT is not included)
4. Plumb the Fuel tank per the manufacturer instructions noting orientation above.
5. Connect Input of fuel pump to UAT fuel out fitting

6. Double check your fittings
7. Use 20 gauge stainless wire to secure tubing to non-festo connections.

Pump Setup

Refer to plumbing for pumps below. Depending on the engine, you received a small pump (60) or a large pump for 80 and up.

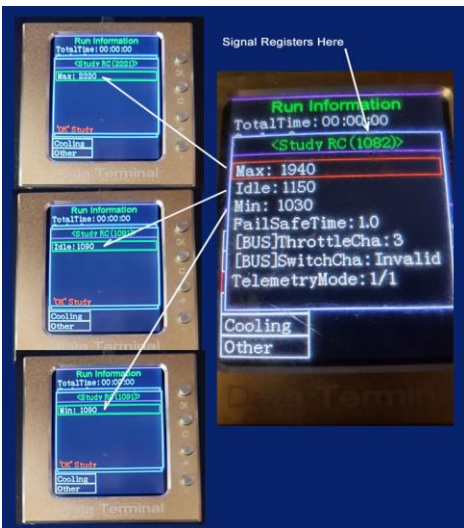
For 160, 170, 190 and above, fuel inlet to the pump is 6mm nylon tubing and 4mm from the pump the engine. All motors are 4mm inlet.



Figure 10 Plumbing for pumps

Radio Setup and Radio Training – Study RC

Refer to Study RC below. It may take some getting used to the functions of the GSU. Note the signal level changes as you raise stick and trim.



1. Highlight maximum on the GSU, raise the radio stick and trim to max. Depress OK to lock in the new max value.
2. Highlight idle on the GSU and lower stick to min and trim to anything above minimum. Depress Ok to lock in the idle value.
3. Highlight Minimum on GSU and lower the trim to any value you wish to use as stop.

Note: when set properly, the turbine will go to cool down when the signal value reaches the value

you set as stop.

Telemetry setup – Vspeak

Vspeak is a popular choice for pilots wishing to collect telemetry data from their engine and to display select parameters on the screen. While the stock ECU does collect motor information, the Vspeak module offers simplicity and in addition offers the ability to display fuel consumption.

Please refer to the following link in order to download information regarding Vspeak for Swiwin.

<https://www.vspeak-modell.de/en/ecu-converter/swiwin>

Download the manual from here:

https://drive.google.com/file/d/1p0_AabUZ_LAK-ZDITETbqpFUGdEeaPQD/view

Once you have connected the Vspeak module according to your radio type you can utilize the following fuel consumption rates for input for the Vspeak module.

High Flow Pump Config (2 line pump)

Applied

| Voltage | ml/sec | oz/sec |
|----------------|---------------|---------------|
| 1 | 5ml/sec | .169 oz/sec |
| 2.5 | 5.5ml/sec | .185 oz/sec |
| 4 | 6.25ml/sec | .211 oz/sec |

Standard Flow Pump Config (1 line pump)

Applied

| Voltage | ml/sec | oz/sec |
|----------------|---------------|---------------|
| 1 | 3.25ml/sec | .11oz/sec |
| 2.5 | 3.67ml/sec | .124oz/sec |
| 4 | 3.875ml/sec | .131oz/sec |



Startup Operation

Prior to running the turbine walk around the aircraft or motor stand and make sure that all power and data connections are placed properly.

Note: First time motor use. Please be sure to prime the pump and remove all air from the lines before attempting to start the engine.

1. Turn the fuel valve to the on position
2. Turn on power to the transmitter and receiver and observe GSU startup. The motor and GSU will sync up with an audible signal.
3. If this is the first startup, use the test menu and locate "test pump" function.
4. Prime the lines with fuel using the test pump function. The fuel line to the motor can be placed into a tank to circulate fuel then connected to the motor when primed. Failure to conduct this exercise will cause the motor not to run.

Note: Some users report running the pump for a few minutes with fuel circulating to "break in" the pump before running the engine for the first time.

5. With the throttle at minimum, raise the trim to idle and observe ECU status switches from "stop" to "ready". If the ECU does not transition to ready state, recheck the ECU to radio connection and retrain if needed.
6. Raise the throttle stick to full then to min. This will initiate a start sequence.
7. The starter motor will begin to spin. The ECU will switch to ignition, then to preheat, then to ramp.

Ignition - This the first start phase. There is a minimal flow of fuel (based on pump voltage you select) to the plug. After a few seconds, observe pump energy on the GSU. You should hear the burning of fuel. A sizzling can be heard. As heat increases, the engine will then transition to preheat. View the transition on the screen. Temperature should be on a continuous rise.



Preheat – the motor increases rpm to the value set in startup – “preheat RPM”. This is accompanied by a transition of fuel to the main jets. The amount of fuel to the plug and mains is controlled by the gas value.

Fuelramp – After the engine EGT reaches 120 degrees (C), the engine enters the fuelramp stage. As the motor begins to ramp, the pump begins to pump more and more aggressively. The rate at which the engine increases speed is based on the value set for percentage fuel ramp and ramp start values. Adjust pump start, ramp start and % ramp to fine tune the startup. Please note that these values have no effect on the running state of the engine.

First time use

For first time only use, the ECU may indicate “raise stick to high”. Raise the stick to full and allow the motor time to reach full output. This can take up to 30 seconds or longer. Next, the ecu will indicate “lower stick”. Respond by lowering the stick (not the trim) to minimum. After the motor reaches idle speed, the ECU will transfer control to the user and switch to “running” status.

NOTE: When the engine is first run or after changes to startup are made, the ECU may enter learn mode. Allow the engine to reach full output. The motor stores the electrical current values needed to reach max thrust and to return to idle. After the motor has sufficient time, the engine will become more and more responsive. Refer to ACC and DEC delays for more information on throttle response.

Shutdown Procedure

Always observe proper shutdown and cooling of the turbine. Failure to observe proper shutdown by not properly cooling the unit will render damage and will void the warranty.

Shut down the turbine

1. Lower the stick to minimum
2. Lower trim to stop (this is the level defined in learn RC procedure).
When the stick is at minimum and as the trim is lowered to the threshold initially set, the motor will shut down and initiate a cool



down sequence by turning on the starter motor to the RPM setting found in the "cooling" menu. Brushless starters turn continuous until 78 degrees is reached. For brushed motors the cooling is intermittent. Turn off the fuel.

3. Turn off power to the ECU and plane
4. Turn off power to your radio

EXPERT TIP: *At any interval whether after shutdown or prior to startup, whenever the stick is raised to max, the motor enters cool down mode and continues spinning at a rate defined in the "cooling menu" until the stick is lowered back down. This provides a handy means to initiate the starter without going to test mode. **This feature works regardless of engine temperature.***



Figure 11 Version 2 Brushless ECU



Figure 12 V3 ECU



Figure 13 Power and Control Connections



Figure 14 Throttle Cable



Figure 15 Engine and Pump Connections



Figure 16 GSU



Figure 17 Optional Temp/RPM Monitor



Engine Cable - Female to Female (MR30)

Figure 18 Engine Cable (Female to Female Mr30)



Pump Cable - Male to Female (MR30)

Figure 19 Pump Cable (Male to Female MR30)



Figure 20 Power Cable

ECU

The SWIWIN ECU was designed from the ground up and is based on 32 bit microprocessor functionality and designed specifically for Swiwin Turbines.

SWIWIN ECUs offers the following benefits:

- ✚ Data Logging
- ✚ Auto start
- ✚ Automatic Restart
- ✚ Color Screen visible in direct sunlight
- ✚ Configurable thrust curve with very fast throttle response
- ✚ User upgradeable off Swiwin servers (via internet)

ECU/Motor Electrical Connections

PLEASE READ - Do not exceed maximum voltages!

Manufacturer Recommended Battery for Main Turbine Power – **3S LIPO**

Recommended Logic voltage – connect to Rx throttle (**5v nominal**)



Maximum Voltage for Main Power

²7.4V (2S) – 18.5 (5S) (XT60)










Receiver voltage

Nominal 5V – Please follow manufacturer recommendations. The ECU will begin to exhibit erratic operation as voltage to the ECU goes below 5 volts. Screen will fade as voltage approaches 4 volts.

Main power voltage : *Programmable Minimum - 14.5 volts

*Please refer to figure 2 to adjust minimum main voltage. Minimum voltage is programmable and should be based on the source voltage.

High Altitudes – Altitude affects the startup of any jet engine. Since air is thinner at higher altitudes, the engine that you receive might need to be tweaked to work in your area. CRX is at 982 FT ASL. For areas at sea level there is no concern but for others where ASL might be at 4 or 5000 such as areas in mountains, there are parameters that will need to be adjusted. The functions in this guide have a (A) following the titles and are:

-  Glow voltage
-  Pump Start Voltage
-  Pump Startup Ramp
-  Percent Ramp
-  Gas Valve
-  Ignition RPM
-  Preheat RPM
-  RPM Starter off
-  Acceleration/Deceleration

² Swiwin V3 ECU will operate with input voltages from 2S – 5S LIPO, however Swiwin maintains, at this time, that they only support connection to a 3S LIPO.

ECU/GSU Operation



Figure 21 GSU Screen

GSU Screen Button

Function

- "OK" Invoke a change or command
- "C" Clear a screen
- "+" Increment a value
- "-" Decrement a value



Figure 22 GSU Status Screen

Initial Screen

- RPM** – Current running status of the turbine
- Temp** – Current temperature of engine
- Curr** – Electrical current in use
- Cap** – Main Battery that has been used
- ACC** – Response time from idle to max. in seconds.

Screen Bottom – Running Status

- RPM** - 0 – 100%
- Temp** - 0 – 1000 Celsius
- Pump** – output measured in volts – ex.
 $4300/1000 = 4.3$ volts
- RC** – throttle position from 0 – 100%



Figure 23 Large Data Screen

Large font Running Screen

Press "C" to toggle between large screen and normal



Figure 24 Running Information

Main menu – initial screen

From the initial screen, press "OK" key, click "C" to toggle back to boot screen

StartUp – enter startup menu

Running – enter Running menu

StudyRC – train Radio to ECU

Starter – sets starter engagement

Cooling – set cooling rpm

Other – enter other parameters menu

Test – enter Test menu

DataChart – displays engine information

Language - switchable Chinese or English



Figure 25 Startup Menu

Pump Voltage, ramp, start ramp, etc. – These values have zero effect on the engine after the engine is running.

IMPORTANT POINT – GLOW

VOLTAGE - Limiting the Glow voltage to the lowest voltage needed to produce consistent good starts is the key. **Plug voltages vary from plug to plug. Adjust this for your particular motor.**

Start Up Screen

PumpVoltage (A) - Set pump voltage based on the engine parameters. This sets the initial pump volume when the motor is first started (ignition phase). The flow should be a drip, drip, drip, not a heavy flow at all. Test over a piece of rag or a canister. Each pump is different even for the same brand of pump. .2 - .8 is a huge change. Make adjustments .02 - .04 increments at a time.

RPM StartUp Ramp % (A) – Set ramp profile – On new engines this is usually set to 100%. For higher altitudes, this value may need to be lowered.

PumpStartUp Ramp (A) - This parameter adjusts the initial fuel rate during the “Fuel ramp” phase. Higher values mean a faster fuel flow at start of the ramp phase. Increase this value if the engine is taking too long begin to heat up and decrease it if the start is too aggressive. Initial value is 3. Typical values from 0 – 5.

For higher altitude, numbers should be lowered until a working value is found.

GlowPlug (A) – Set Glow Plug Voltage. Typical value from 5.5 to 6.8. Set this to the lowest value to achieve a reliable start.

GasValve (A) - This controls the energy to the gas (plug) solenoid (PWM). Higher values yield longer duty cycle; lower values yield lower duty cycle. This value controls the heat during preheat.

Ignition RPM (A) – Set the RPM where ignition phase commences. Please refer to engine default values where needed.

Preheat RPM (A)– Set the RPM value for preheat phase to begin. Please refer to engine default values where needed.

RPM Starter Off (A) – Set the RPM where the starter motor will disengage. Set this to the lowest value needed for the engine to self sustain.



Figure 26 Study RC Menu

Study RC –train the transmitter to the ECU

Max – Throttle up, trim up

Idle – Throttle down, trim up

Min – Throttle down, trim down

FailSafeTime – set fail safe time in seconds

[BUS] Throttle cha – setup throttle channel if use BUS Mode input

[BUS] Switchcha – setup switch channel if use BUS Mode input and switch startup function, with this function enabled, ppm input is disabled, use BUS mode for input

TelemetryMode – set telemetry mode 1/1 for single engine mode

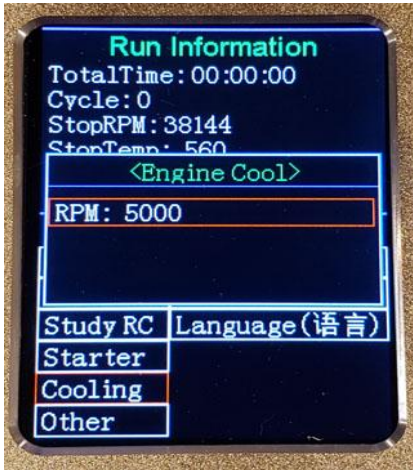


Figure 27 Cooling Menu

Cooling Menu

Set engine cooling RPM according to engine specs.

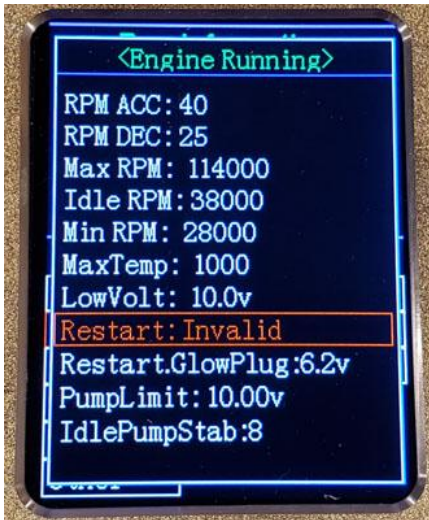


Figure 28 Running Menu

Running Screen

Acceleration/Deceleration (A)

Sets Response time for the engine
Contrary to Xicoy and others, higher numbers yield shorter delay times.
Adjust according to weather, altitude (ASL) or other conditions which require adjustments to delay time. It is best to play with this setting until you reach a happy medium between a motor that is responsive but not unstable. Motor default from CRX is 30.

Max RPM – Set maximum RPM

Idle RPM – set idle RPM

Min RPM – set stop RPM, if motor RPM falls below this setting, motor will shutdown.

MaxTemp (EGT) - Set maximum running temp. If motor exceeds this value, ECU will automatically limit fuel

Note: Max RPM limit is set in firmware such that you cannot exceed the manufacturer maximum for the motor.

Any motor can be tuned down so a larger engine can be used in a smaller airframe.

Restart voltage typically needs to be higher than regular start. This is similar to a gas grill. It is harder to start a hot grill than a cool one. Set restart glow voltage .2 higher than normal start.

Pump Limit is not a measure of an applied voltage. This is a maximum, not to exceed voltage which limits the voltage output of the ECU to the pump at any given point. It is a safeguard to prevent a burst fuel line in the event of a restriction in the fuel system.

in order to reduce the temp but under normal conditions will not shut down the engine.

LowVolt – set low volt warning

Restart - Can be set “valid” for enable or “invalid” disabled, flame out automatically restart or not.

Restart Glow Plug – set glow plug voltage on restart. Normal range from 6.0v – 6.6 Volt

PumpLimit – This value is used to set the limit to the pump to a reasonable limit and is based on observation of actual running values. Set this value to 20% higher than maximum value at max thrust. This prevents excess pump pressure.

IdlePumpStab – set pump stable delay on idle rpm, normally SW60B turbine set 5-8, SW120-210 set 3-5

Starter

Eject Time – sets the time for a reverse voltage pulse to disengage the starter.

Eject Voltage – sets the eject voltage in order engage the clutch on startup

Run Voltage – Sets the voltage for the starter during startup

RPM Stable – rpm adjust rate of starter



Figure 29 Starter Menu

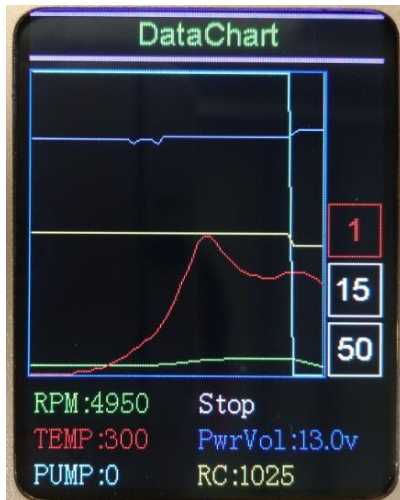


Figure 30 Data Chart

Data chart

Record running data use the increment and decrement key to step through events in the data chart.

The color corresponding to each parameter as follows

Red – Temp
Yellow – Throttle position
light blue – Pump
Green – RPM
Dark Blue – Power



Figure 31 Test Menu

Test function menu

Press "OK" to access test functions

Test Pump – depress OK and hold down in order to run the pump. Pressing once runs the pump for 1 second. Holding the Ok button causes the pump to increase pump speed to a programmed max. (not full power) Test pump can be run with or without the engine attached. If initiated with the engine attached, the solenoids (gas and fuel) are both energized. Be careful not to flood the engine.

Test Fuel Valve – press "OK" to activate fuel valve. You will hear click, click,

click

Test Gas Valve – press “OK” to activate Gas Valve – this controls fuel to the glow plug. You will hear click, click, click

Test Glow Plug – press “OK” to activate Glow Plug circuit. A glow can be seen from the rear of the motor.

Test Starter – Press “OK” to activate starter. Use this function to manually cool the motor if needed. RPM speed of starter is set in the cooling menu

Other

Clear Battery used – reset the value to zero. This allows the pilot to determine how much battery life is remaining.

Adjust Temp – Used to calibrate the temperature reading on the engine. Unless there is an issue adjustments are not normally needed.

Temp Unit – set to Fahrenheit or Centigrade

Pump Unit – set DC pump or BL pump

Firmware Version – Displays the current version firmware for the following engine controls:
TCU – Turbine control Unit
ECU – Engine Control Unit
GSU – Ground Screen Unit

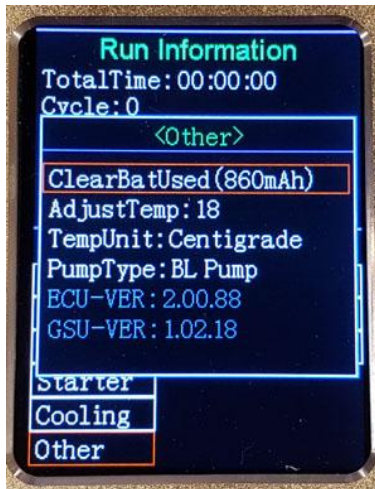


Figure 32 Other Menu

USB Adapter

A USB Adapter and cable set is available from CRX.

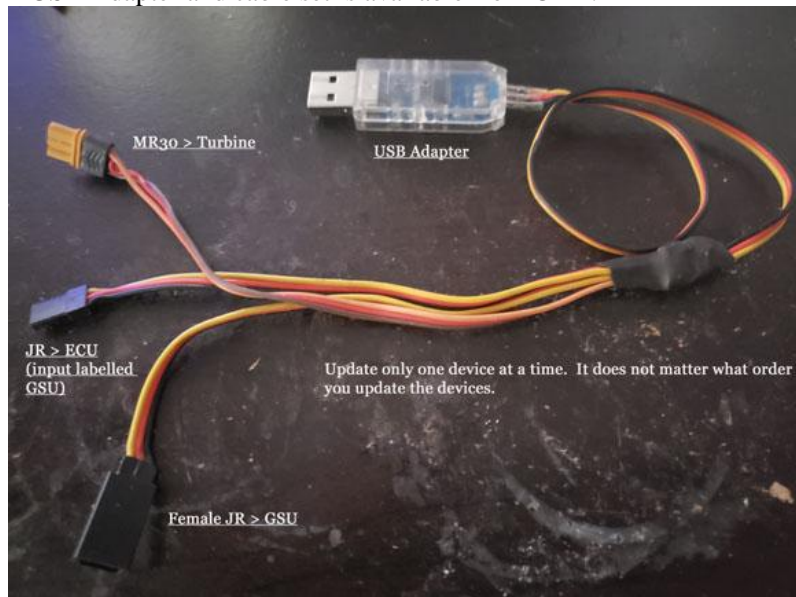


Figure 33 USB and Cable

Software Updates

Swiwin continuously updates software for the turbines. There are 3 updates:

- (TCU) turbine control unit (MR30)
- (ECU) connection labeled GSU (JR)
- (GSU) female JR connection
- Use the optional USB Dongle to connect each device. The provided cable has all 3 connections but connect each one separately.

Note: An active internet connection is required to run this software as the most recent software is pulled down from Swiwin servers

To obtain the upgrade software go to the following link:

<http://www.crxturbines.com/manuals-and-upgrade-tool.html>

Click on the third link for upgrade. The following window appears:

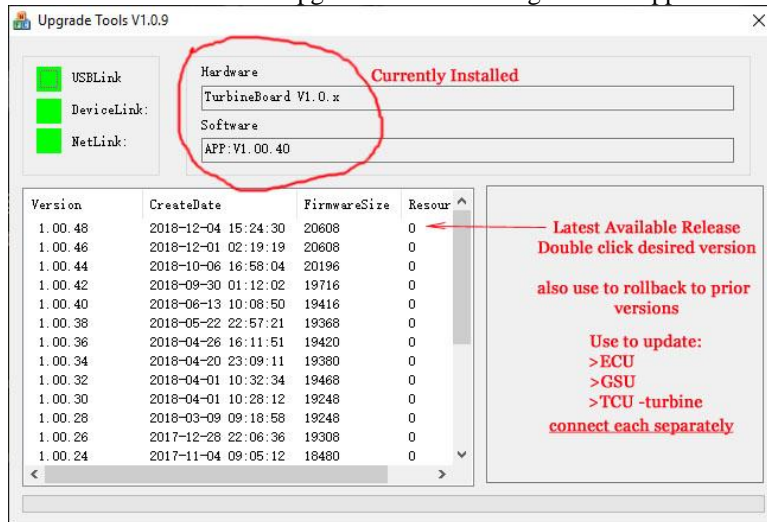
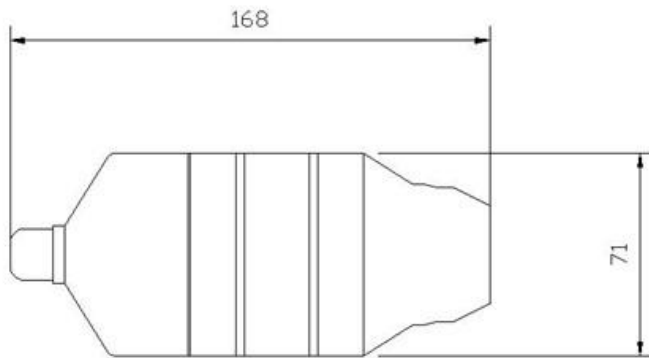


Figure 34 Software Update Application

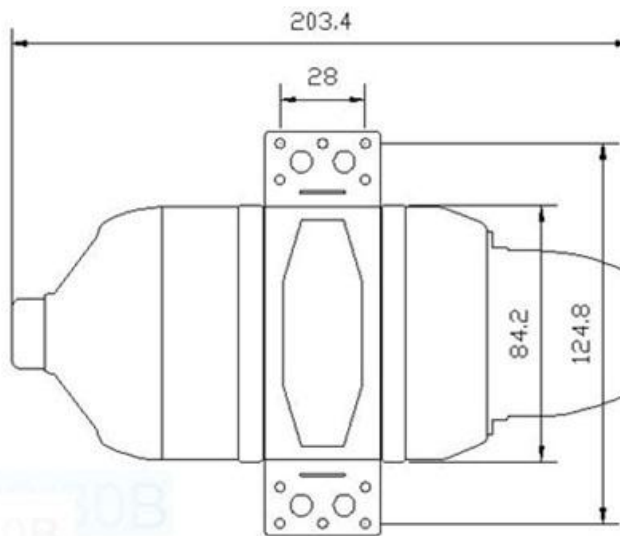
1. The top window indicates the currently installed version of software
2. The bottom window indicates available releases.
3. Double click the desired release.
4. Enter confirm upgrade when prompted.
5. Disconnect the device when the download is complete

Engine Diagrams



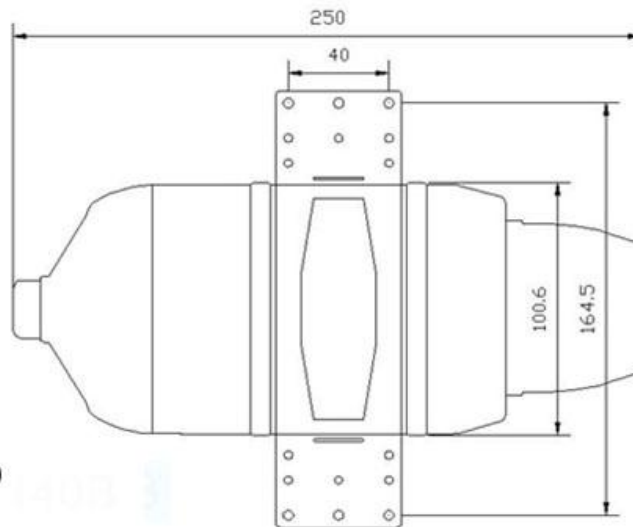
SW45B

Figure 35 SW45B Diagram



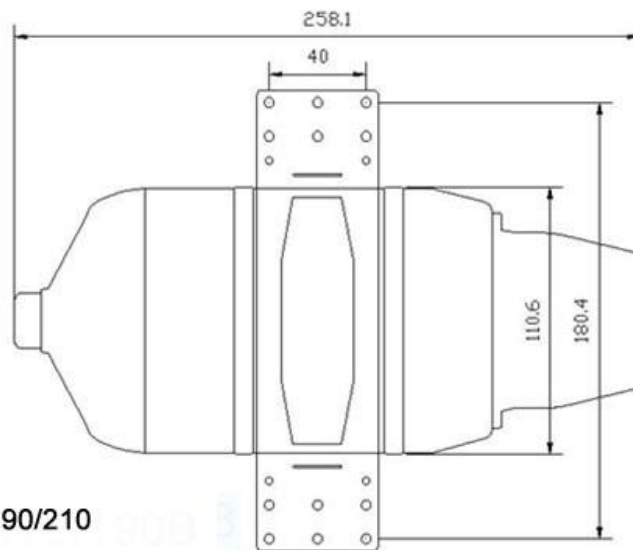
SW60/80
Ace, ACEx, CRX

Figure 36 SW 60 and 80B



SW120/140
Ace, ACEx, CRX

Figure 37 SW 120 and 140B



SW160/170/190/210
Ace, ACEx, CRX

Figure 38 SW 160, 170, 190 and 210B

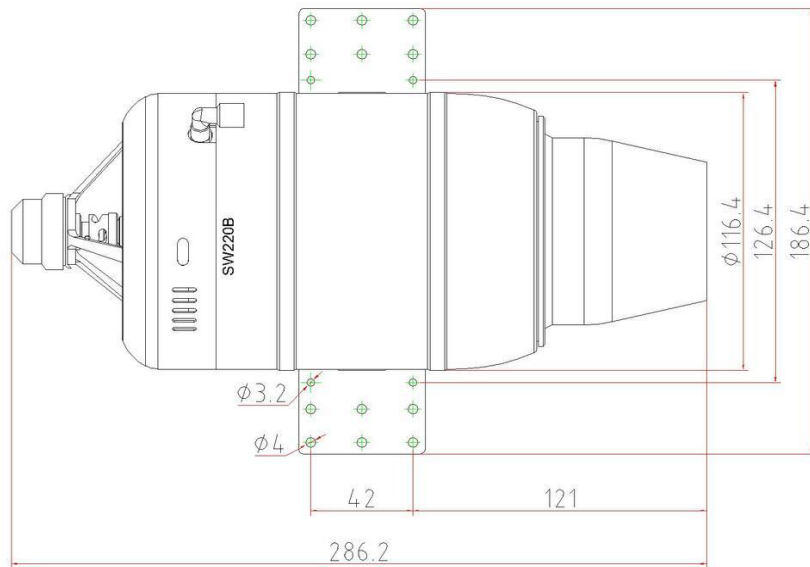


Figure 39 SW220/240B

Specifications

| | SW60B | SW80B | SW120B | SW140B | SW170B | SW190B | SW220B | SW300B | SW400B |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Diameter | 84mm | 83mm | 99mm | 99mm | 109mm | 109mm | 116mm | 133mm | 146mm |
| Length | 203mm | 203mm | 250mm | 250mm | 258mm | 258mm | 275mm | 342mm | 335mm |
| Weight | 780g | 780g | 1250g | 1250g | 1450g | 1450g | 1700g | 2500g | 3000g |
| RPM range | 50,000- 150,000 | 50,000- 155,000 | 38,000- 125,000 | 38,000- 130,000 | 36,000- 113,000 | 36,000- 116,000 | 38,000- 115,000 | 38,000- 98,000 | 33,000- 95,000 |
| Thrust | 60N | 80N | 120N | 140N | 170N | 190N | 220N | 300N | 400N |
| EGT | 700°C | 700°C | 700°C | 700°C | 700°C | 700°C | 700°C | 700°C | 700°C |
| Consumption | 200g/min | 270g/min | 350g/min | 380g/min | 480g/min | 550g/min | 660g/min | 820g/min | 1000g/min |
| Fuel | kero or diesel | kero or diesel | kero or diesel | kero or diesel | kero or diesel | kero or diesel | kero or diesel | kero or diesel | kero or diesel |
| Lubrication | 5% kero 3% diesel | 5% kero 3% diesel | 5% kero 3% diesel | 5% kero 3% diesel | 5% kero 3% diesel | 5% kero 3% diesel | 5% kero 3% diesel | 5% kero 3% diesel | 5% kero 3% diesel |
| Maintenance Interval | 25Hours | 25Hours | 25Hours | 25Hours | 25Hours | 25Hours | 25Hours | 25Hours | 25Hours |

Table 1 Motor Specifications

ECU Parameters

Auto Restart ECU Parameters – default values. Use this table as a reference only. The actual values you use may vary.

| Startup | 60B | 80B | 120B | 140B | 160B | 170B | 190B | 220B | 240B | 300B |
|--------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Pump Voltage | .6 - .8 | .6 - .8 | .6 - .8 | .6 - .8 | .6 - .8 | .6 - .8 | .6 - .8 | .6 - .8 | .6 - .8 | .6 - .8 |
| RPM Start Ramp (%) | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Pump Startup Ramp | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Glow Plug | 5.8 - 6.6 | 5.8 - 6.6 | 5.8 - 6.6 | 5.8 - 6.6 | 5.8 - 6.6 | 5.8 - 6.6 | 5.8 - 6.6 | 5.8 - 6.6 | 5.8 - 6.6 | 5.8 - 6.6 |
| Gas Valve | 25-40 | 25-40 | 25-40 | 25-40 | 25-40 | 25-40 | 25-40 | 25-40 | 25-40 | 25-40 |
| Ignition RPM | 6K | 6K | 4K | 4K | 3K | 3K | 3K | 3K | 3K | 3K |
| Preheat RPM | 10K | 10K | 6K | 6K | 5K | 5K | 5K | 5K | 5K | 4K |
| RPM Off Starter | 28K | 28K | 25K | 25K | 22K | 22K | 22K | 20K | 20K | 16K |
| Running | | | | | | | | | | |
| RPM ACC | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| RPM DEC | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Max RPM | 150K | 155K | 125K | 130K | 110K | 113K | 118K | 115K | 118K | 98K |
| Min RPM | 35K | 35K | 33K | 33K | 28K | 28K | 28K | 28K | 28K | 33K |
| Max Temp | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |
| Low Voltage | 10v | 10v | 10v | 10v | 10v | 10v | 10v | 10v | 10v | 10v |
| Restart | Invalid | Invalid | Invalid | Invalid | Invalid | Invalid | Invalid | Invalid | Invalid | Invalid |
| Restart Glow Volt. | 6.2 - 6.8 | 6.2 - 6.8 | 6.2 - 6.8 | 6.2 - 6.8 | 6.2 - 6.8 | 6.2 - 6.8 | 6.2 - 6.8 | 6.2 - 6.8 | 6.2 - 6.8 | 6.2 - 6.8 |
| Pump Limit | 20% + full | 20% + full | 20% + full | 20% + full | 20% + full | 20% + full | 20% + full | 20% + full | 20% + full | 20% + full |
| Idle Stab | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Starter | | | | | | | | | | |
| Eject Time | 0.5s | 0.5s | 0.5s | 0.5s | 0.5s | 0.5s | 0.5s | 0.5s | 0.5s | 0.5s |
| Eject Voltage | 3.5v | 3.5v | 3.5v | 3.5v | 4v | 4v | 4v | 4v | 4v | 4v |
| Run Voltage | 3.5v | 3.5v | 4v | 4v | 4v | 4v | 4v | 4v | 4v | 5v |
| RPM Stable | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Cooling | | | | | | | | | | |
| RPM | 6K | 6K | 5K | 5K | 5K | 5K | 5K | 5K | 5K | 4K |
| Other | | | | | | | | | | |
| TempUnit | Cent. | Cent. | Cent. | Cent. | Cent. | Cent. | Cent. | Cent. | Cent. | Cent. |
| PumpType | BS Pump | BS Pump | BS Pump | BS Pump | BS Pump | BS Pump | BS Pump | BS Pump | BS Pump | BS Pump |

Table 2 ECU Parameters



CRX Turbines is located outside of Buffalo New York. Our mailing address for all motor related matters is:

For US Mail, Fedex, DHL, UPS

CRX Turbines
408 Quaker Road
Unit 491
East Aurora, New York 14052

Service Request Form

Please refer to the following link for a copy of our service request form.

<http://www.crxturbines.com/service-request-form.html>

If you are sending a motor back to us for service (regardless of brand), please include a copy of the completed form with your motor and email us a copy to info@crxturbines.com. We will respond promptly.

Typical turnaround time for repairs is based on the extent of work required.

Postage is the responsibility of the user unless prior arrangements are made.

Warranty Coverage – Please contact CRX prior to sending an engine.