

Swiwin Turbine *Brushless Series*



Kero Start
Full Autostart with Auto-Restart
Operations Manual

Introduction

This manual is intended to aid the user in setup and running practices associated with the SWIWIN SW 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.

Sw-jet will not take any responsibility for any damages or injury to the user or bystanders. Our responsibility is explicitly limited to the motor and to the internal workings and ancillary supplies offered with the turbine.

Sw-jet 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. please mail to sw-jet@qq.com ,and **sw-jet.com only service who buy from sw-jet.com**

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 Explosion
- 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 propelled 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 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.

Please refer to figure 1. Always ensure, that all bystanders maintain a safe distance from the engine. Clear of the area to the 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 fire but the residue left behind from dry chemical extinguishers does heavy damage to a running turbine. If a chemical extinguisher is used to douse a running engine fire, the motor will need to be completely disassembled and cleaned.

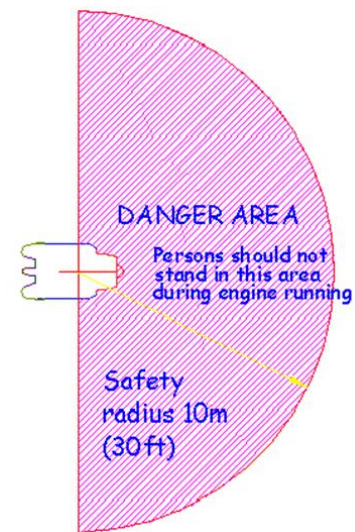


figure 1

Important Note: Please be sure to inspect all extinguishers each day that a turbine is being used. There are countless recounts by pilots and assistants where they reached for a fire extinguisher and it was not where it needed to be and/or the extinguisher was not operational.

Failsafe. Please read carefully the notes on setting the failsafe on your radio to of interference or loss of signal.

Ear Protection – Turbines produce excessive dB levels of noise. when running the engine.

Burns - Exhaust gases are very hot (up to 1000°C) and can cause burns to skin or damage to objects close to it – keep exhausts clear of anything which is affected by such heat.

Turbine Oil Toxicity - Turbine oil is poisonous. Keep it away from the mouth and eyes and from contact with skin. Always store it in out the role of fireman. Ensure that they are aware of what to do in event of emergency and where to position the extinguishers.

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.

Limited Warranty

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. we provide natural damage one year or 25 Hours running time free service.

2. First year warranty covers all parts except for batteries.
3. Warranty not coverage applies after one year or 25 hours of running time , 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. Damage to Can
 - b. Crash Damage
 - c. Any FOD damage including and not limited to:
 - i. Broken compressor blades
 - ii. Scored intake cover

Terms

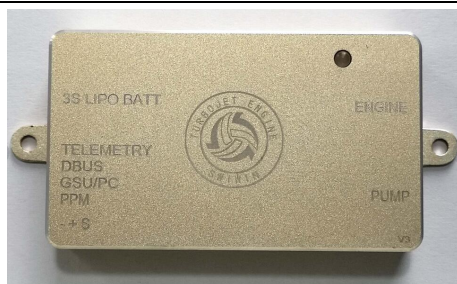
1. Within the initial 1 year (or 25hrs running time) warranty period, sw-jet will repair or replace, at sw-jet discretion, any defective part(s), with new or factory rebuilt replacement items if such repair or replacement is required and is due to a malfunction during normal usage.
2. sw-jet will cover labor charges associated with any warranty repair.
3. sw-jet 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 agrees to cover the cost of shipping the turbine to sw-jet for repair exclusions.
5. 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
7. If a problem occurs during the warranty period, please contact our service department and take the following steps:
 - a. Contact sw-jet@qq.com in order to coordinate shipping of the turbine to the service center for evaluation and repair.

- b. Send the turbine to our repair center. Please include all user information including address and daytime phone number, email address, etc. Please also include a photo copy of the original sales receipt.
8. Owner agrees to cover charges for all parts and/or labor charges not covered by this warranty.
9. 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. If the estimate is refused, the turbine will be returned to the user. Owner agrees to cover all return shipping costs.
10. This document constitutes the entire warranty between sw-jet and the owner and supersedes all prior agreements and/or understandings.

Operation and Setup



Figure 2, Items Included in Motor Kit



V3 ECU

1. Connect one end of the servo cable (provided) between the ECU port labeled "ppm" and the other end to your receiver, if use telemetry function, use telemetry port.
2. Connect the Battery cable to ECU port labeled "3S LIPO BATT"
3. Connect the PUMP cable to ECU port labeled "PUMP"
4. Connect the GSU to the ECU port labeled "GSU/PC".
5. Connect the engine cable to the ECU port labeled "ENGINE".



Engine cable



Brushless Pump



Throttle cable

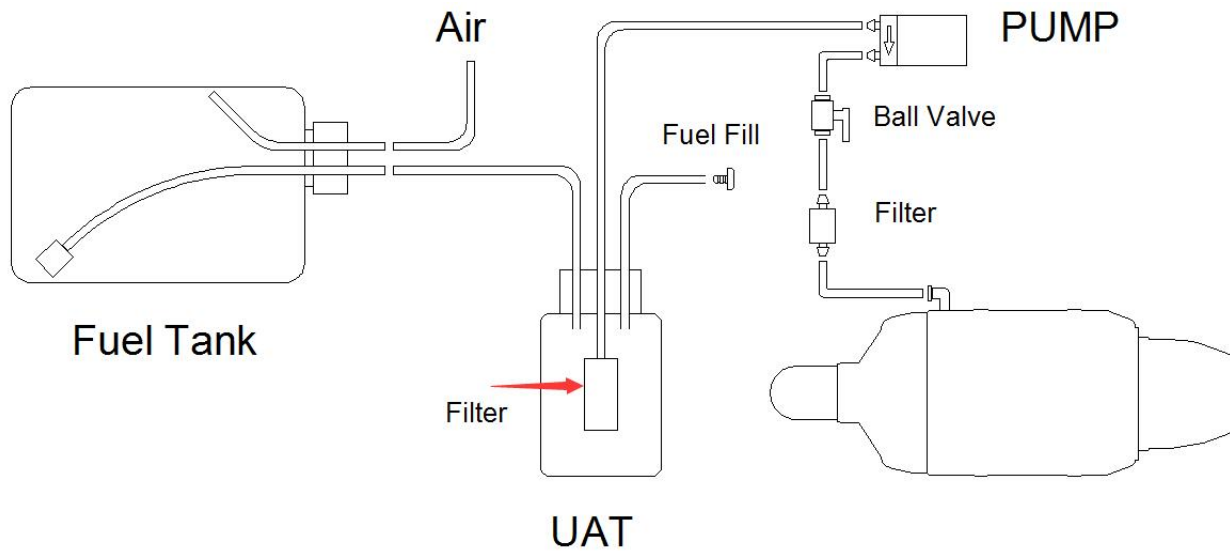


Battery cable

Brushless pump



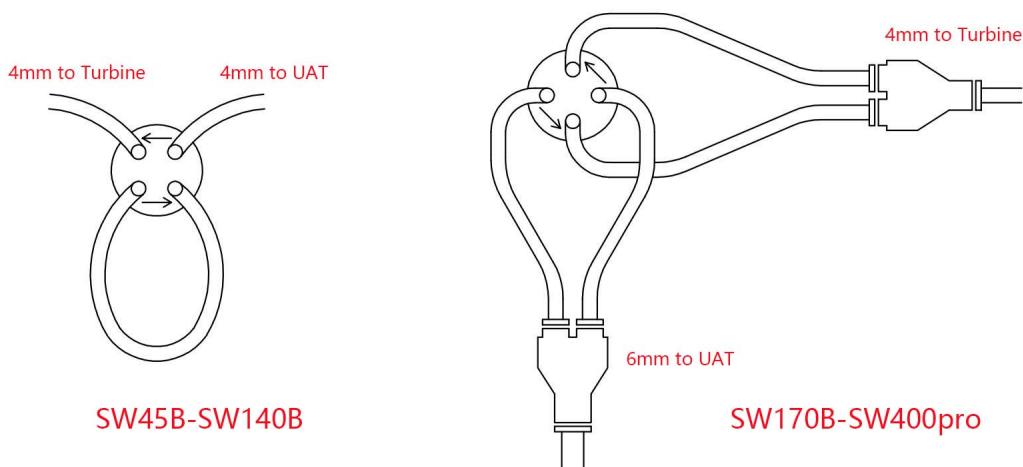
Motor Setup



Please refer to Figure 3 - Motor Setup above

1. Connect the motor festo fitting to a section of 4mm tubing (included).
2. Route the tubing to the filter then to the shut off as shown.
3. Connect the other end of the shutoff with 4mm tubing to the output of the pump.
4. Plumb the UAT as shown and per the UAT instructions (UAT is not included)
5. Plumb the Fuel tank per the manufacturer instructions noting orientation above.
6. Connect Input of fuel pump to UAT fuel out fitting
7. Double check your fittings
8. Use 20 gauge stainless wire to secure tubing to non-festo connections

Pump tube connection



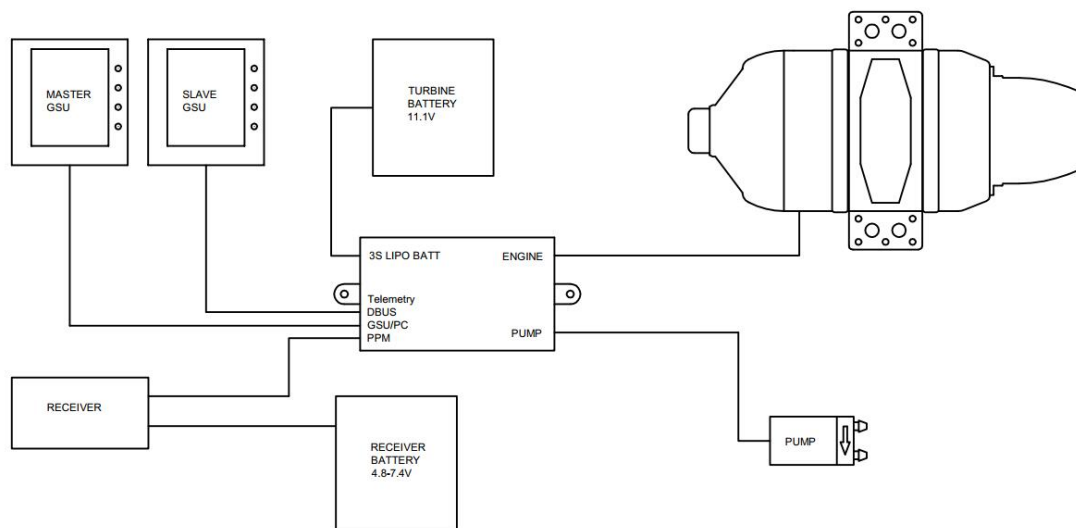
Startup Operation

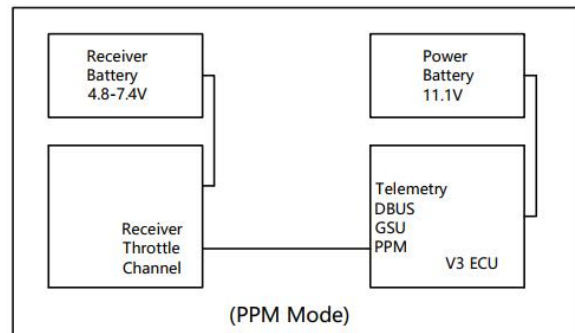
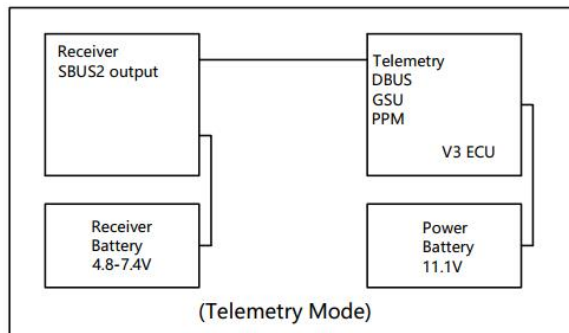
Prior to running the turbine walk around the aircraft or motor stand and make sure that all power and data connections are placed properly.

1. Turn the ball valve to the on position
2. Turn on power to the 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.

5. Turn on power to the Radio Controller. Note an audible sync signal when the radio is powered up. This lets the user know that the motor is online with connection to the radio.
6. Raise the trim to 100% and observe ECU status “ready”
7. Raise the throttle stick to full then to min. This will initiate a start sequence.
8. The starter motor will begin to spin. The ECU will switch to ignition, then to preheat, then to ramp. As the motor begins to ramp the pump begins to pump more and more aggressively. When the motor reaches idle speed the ECU will train to the motor. For first time users, the ECU will switch first to “learn RC”. Raise the throttle to full and allow the motor and ECU to train to full RPM. Please be sure to brace the aircraft from moving now.
9. Return the stick to low position. The motor will now switch to “running” and motor function is transferred to the user.





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.

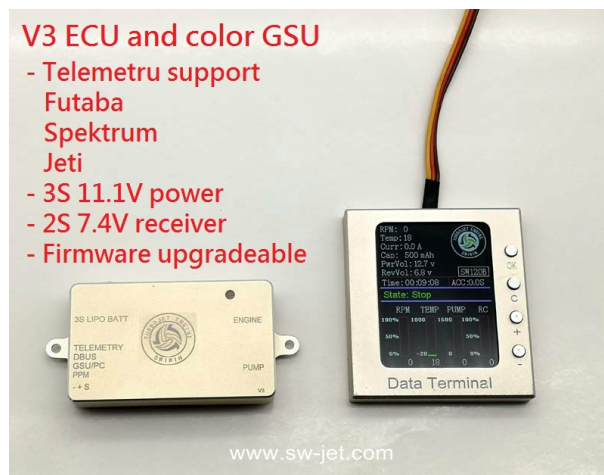
To shut down the turbine

1. Lower the stick to minimum
2. Lower trim to minimum
3. The motor will shut down and initiate a cooldown sequence by turning on the starter motor to an RPM defined in motor parameters. This cool down speed is determined in cooling menu of ECU setup. The motor turns continuously until a safe temperature is reached. Please note that it is normal with new ECU releases for the starter to spin continuously until the motor is cooled. Previous firmware releases spun the motor intermittently to save the life of the motor.
4. Turn off the ball valve
5. Turn off power to the controller
6. Turn off power to your radio

ECU

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

The ECU offers the following benefits:



- Data Logging Auto start Automatic Restart
- Color Screen
- Configurable thrust curve with very fast throttle response
- Telemetry function
- BUS input

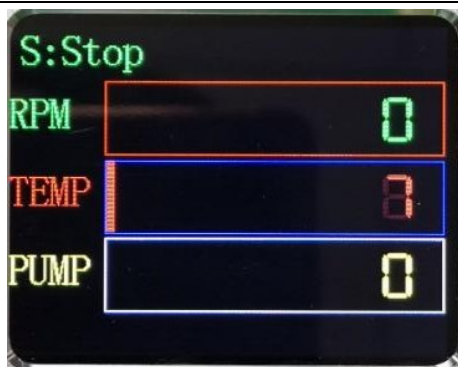
ECU/Motor Digital Connections

Do not exceed these voltages!

Receiver voltage: 6 - 7.4V(2S Life or 2S Lipo)

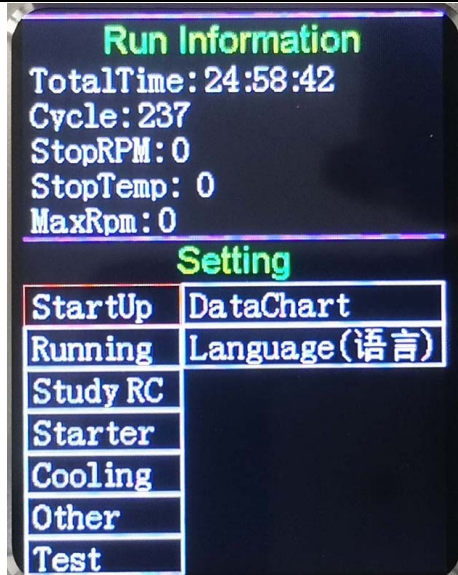
Power voltage: 11.1V (3S Lipo)

	<p>GSU Screen Button Function</p> <p>“OK” Invoke a change or command “C” Clear a screen “+” Increment a value “-” Decrement a value</p> <p>Initial Screen</p> <p>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.4500/1000 = 4.5 volts RC – throttle position from 0 – 100%</p>
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Large font Running Screen

Press "C" to toggle between large screen and normal
Or plug GSU at ECU "DBUS" port



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

Study RC – Train Radio to ECU

Starter – set starter power

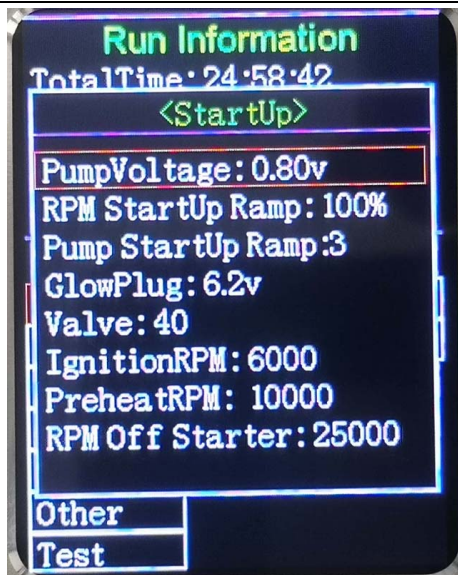
Cooling – set cooling rpm

Other – enter other parameters menu

Test – enter Test menu

DataChart – running data records

Language - switchable languages



Start Up

PumpVoltage - Set ignition pump voltage

RPM StartUp Ramp – Set ramp profile starter , This parameter adjusts the speed of the starter increase during the "Preheat to RPM Off Starter" phase. Higher values mean a faster rpm increase. Increase this value if the engine too hot during preheat to rpm off starter , and decrease it if flame out during preheat to rpm of starter.

Pump StartUp Ramp - This parameter adjusts the speed of the fuel increase during the "Fuel ramp" phase. Higher values mean a faster fuel flow increase. Increase this value if the engine takes too long to arrive to idle, and decrease it if the starts are too hot, with the engine overshooting the idle speed.

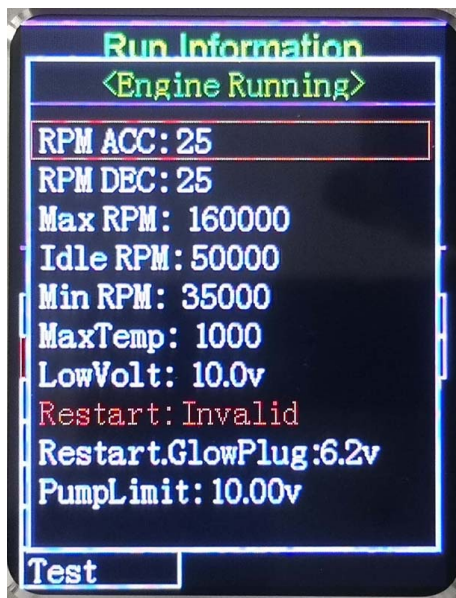
GlowPlug – Set Glow Plug Voltage.

Valve – Set GAS values of time of the gas fuel valve is open at beginning of the ignition phase.

Ignition RPM – Set the RPM where ignition phase commences

Preheat RPM – Set the RPM value for preheat phase to begin.

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



Running

RPM ACC/DEC Curve/Delay time

Higher values mean a faster rpm increase/decrease rate.

Adjust according to weather, Altitude (ASL) or other conditions which require adjustments to delay time. It is best to select a value that is lower than a setting that yields the fastest possible response time in order to avoid a flame out.

Raise value to decrease response time, Lower value to increase response time

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 - Set maximum running temp.If motor exceeds this value, ECU will automatically limit fuel in order to reduce the temp.

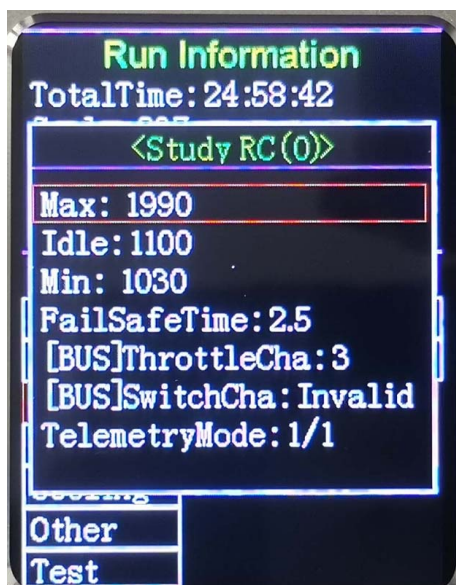
LowVolt – set low volt warning

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

Restart.GlowPlug – set Glowplug voltage on restart.

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 what is observed on the main screen. This prevents excess pump pressure.

IdlePumpStab – set pump stable delay on idle rpm



Study RC

This menu is to train the transmitter to the ECU.

Max – Throttle up, trim up

Idle – Throttle down, trim up

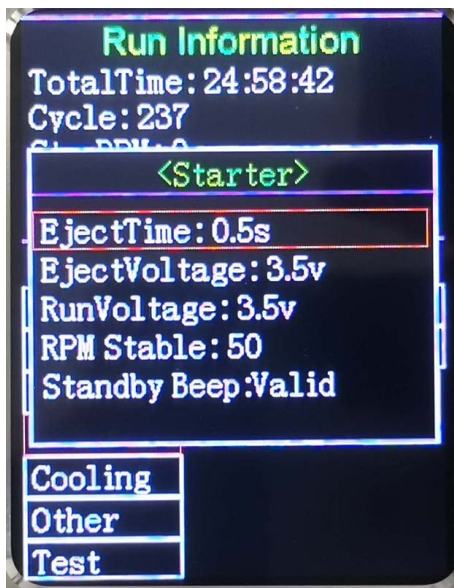
Min – Throttle down, trim down

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,if turn on this function ,ppm input will invalid, need use BUS mode for input

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



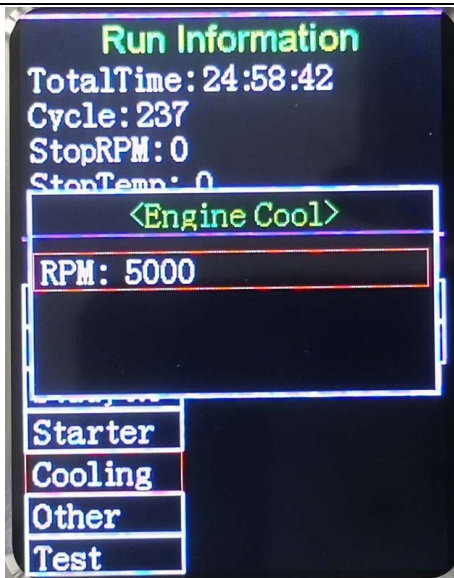
Starter

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

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

Run Voltage – Sets the voltage for the starter during startup

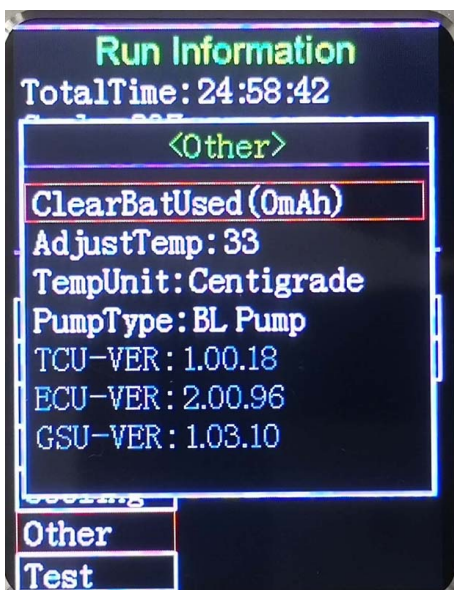
RPM Stable – rpm adjust rate of starter



Engine Cooling

Sets the cooling rpm after shut down or when starter is manually run using test functions.

*Please note that following a failsafe failure or flameout that the motor will not automatically enter a cool down sequence. This is because the ECU has no way of knowing the status of the motor whether flame out, crash or other.



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

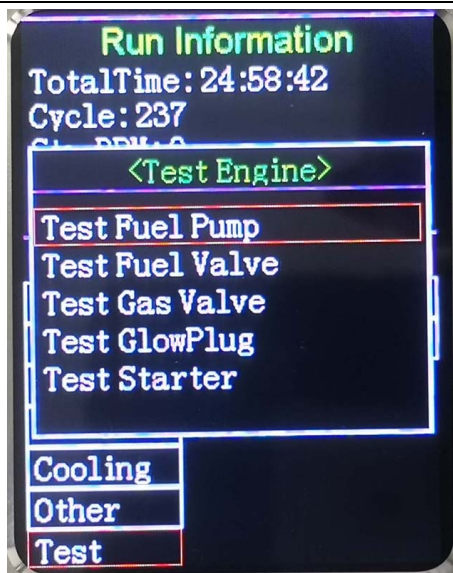
Pump Type – set DC pump or BL pump

Firmware Version – Displays the current version firmware for the following engine controls:

TCU – Turbine control Unit

ECU – Engine Control Unit

GSU – Ground Screen Unit



Test function menu

Press "OK" to access test functions

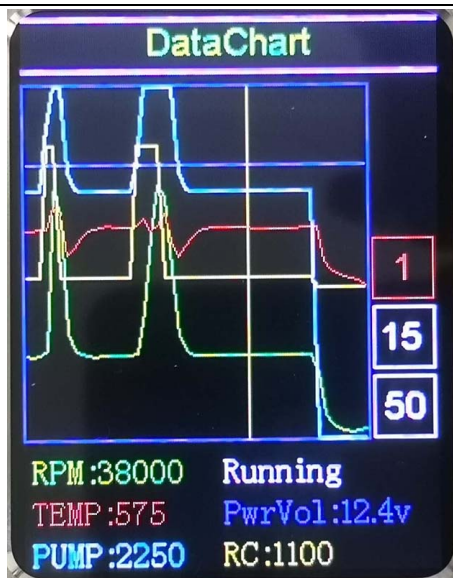
Test Pump – depress OK and hold OK to increase pump speed. Pump increases gradually. Test pump initiates fuel solenoids simultaneously. Be careful not to flood the engine.

Test Fuel Valve – press "OK" to activate fuel valve.

Test Gas Valve – press "OK" to activate Gas Valve – this controls fuel to the glow plug.

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. RPM speed of starter is set in the startup menu



Data chart

Record running data use the increment and decrement key to step through events in the data chart. ECU can record 34 minutes of running data.

The color corresponding to each parameter as follows

Red – Temp

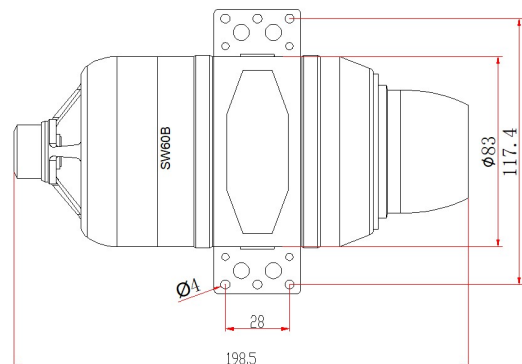
Yellow – Throttle position

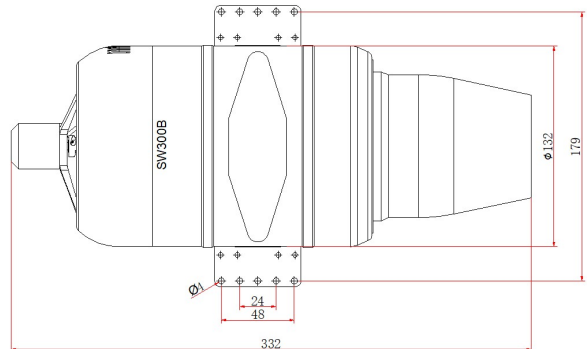
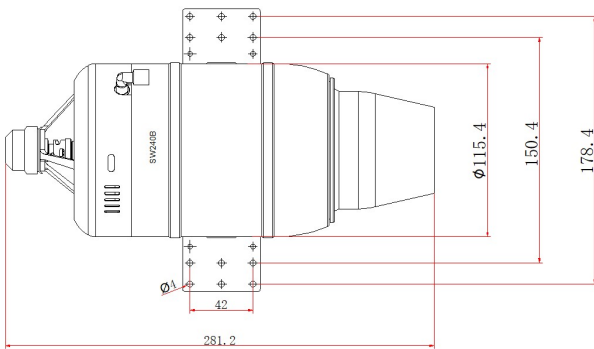
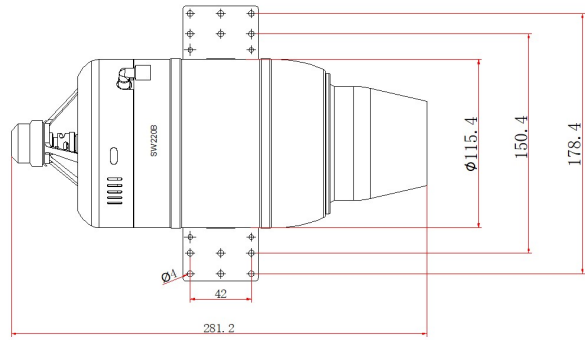
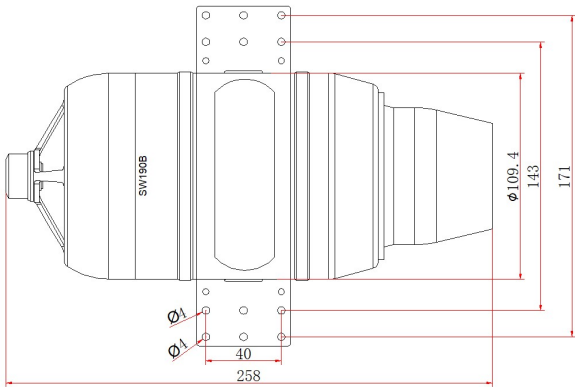
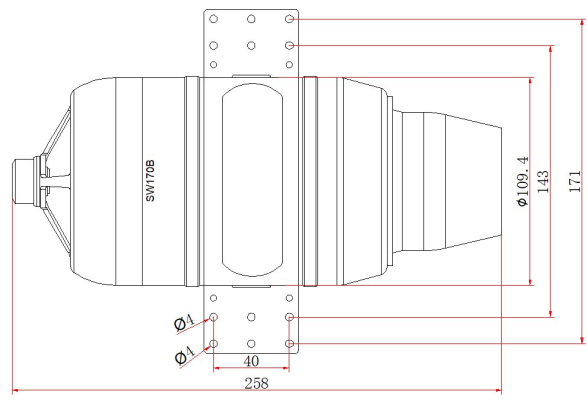
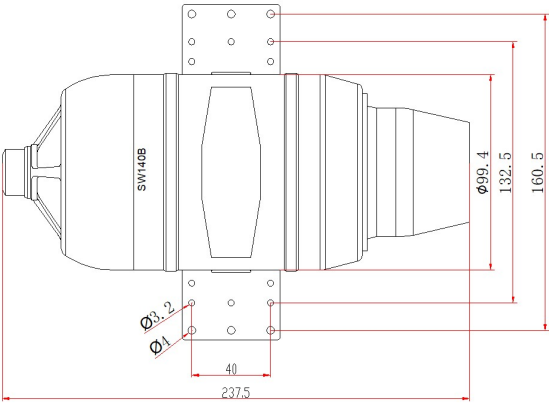
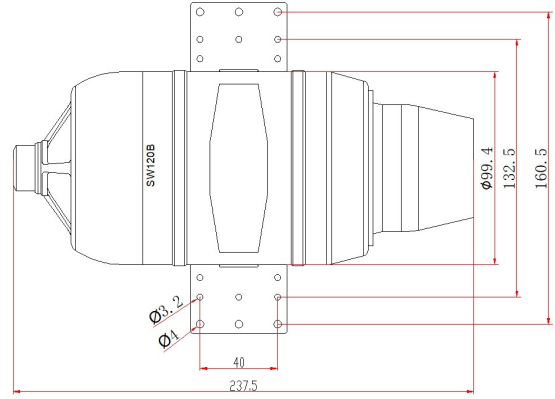
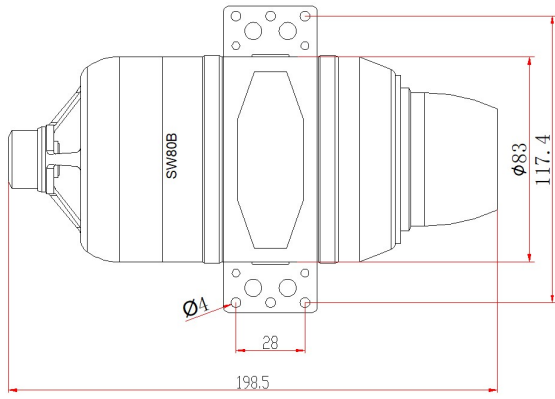
light blue – Pump

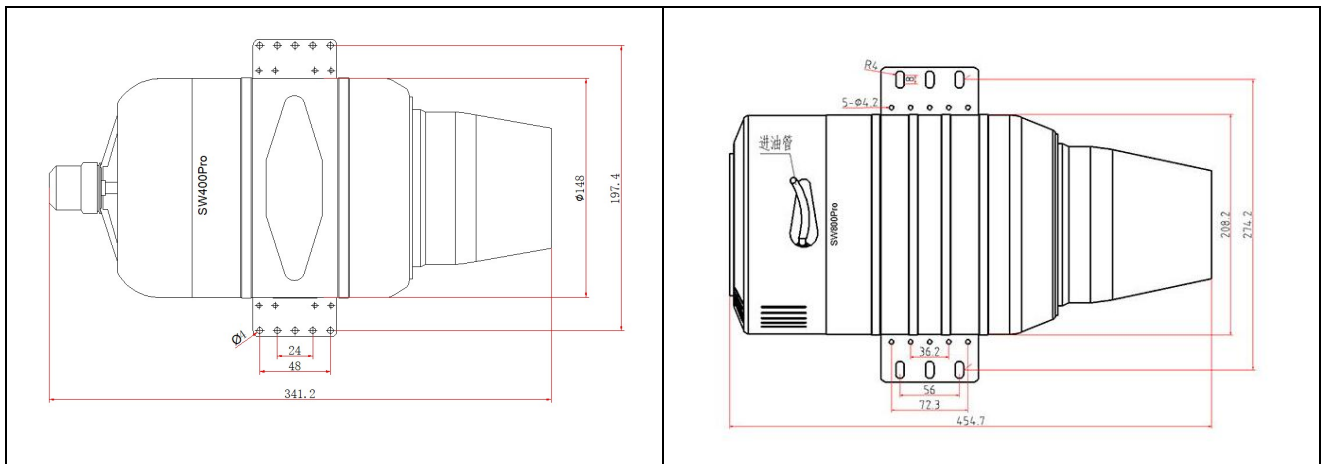
Green – RPM

Dark Blue – Power voltage

Dimension





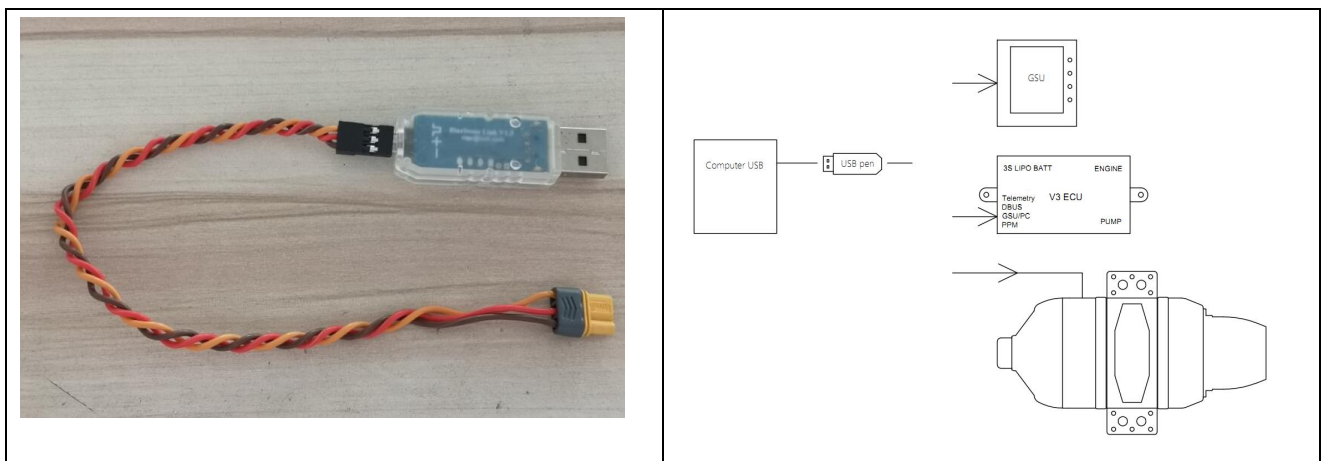


SWIWIN TURBINE SPEC

	SW60B	SW80B	SW120B	SW140B	SW170B	SW190B	SW220B	SW240B	SW300B	SW400pro	SW800pro
Diameter	83mm	83mm	99mm	99mm	109mm	109mm	116mm	116mm	133mm	146mm	208mm
Length	198mm	198mm	250mm	250mm	258mm	258mm	275mm	275mm	332mm	342mm	454mm
Weight	765g	765g	1250g	1250g	1450g	1450g	1700g	1700g	2500g	3000g	8500g
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	38,000-118,000	38,000-98,000	33,000-95,000	20,000-65,000
Thrust	60N	80N	120N	140N	170N	190N	220N	240N	300N	400N	800N
EGT	700℃	700℃	700℃	700℃	700℃	700℃	700℃	700℃	700℃	700℃	700℃
Consumption	200g/min	270g/min	350g/min	380g/min	480g/min	550g/min	660g/min	685g/min	820g/min	1000g/min	1850g/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	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	5% kero 3% diesel	5% kero 3% diesel
Maintenance Interval	25Hours	25Hours	25Hours	25Hours	25Hours	25Hours	25Hours	25Hours	25Hours	25Hours	25Hours

Upgrade firmware:

Use a USB pen (option) ,connect to computer upgrade firmware for your ECU/GSU/TCU



Parameters

SWIWIN TURBINE Parameters

引擎启动	Startup	SW60B	SW80B	SW120B	SW140B	SW170B	SW190B	SW220B	SW240B	SW300B	SW400pro	SW800pro
油泵电压	Pump voltage	0.7-0.9	0.7-0.9	0.7-0.9	0.7-0.9	0.7-0.9	0.7-0.9	0.7-0.9	0.7-0.9	0.7-0.9	0.7-0.9	1.6
转速斜率	RpmStartup ramp	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
油泵斜率	Pump startup ramp	3	3	3	3	3	3	3	3	3	3	1
热火头电压	Glow plug	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.3	6.2	6.2	6.2
点火油阀	Gas valve	40	40	20	20	40	40	40	40	40	40	40
点火转速	Ignition rpm	6000	6000	4000	4000	3000	3000	3000	3000	3000	3000	400
预热转速	Preheat rpm	10000	10000	6000	6000	5000	5000	5000	5000	4000	4000	800
分离转速	Rpm off starter	28000	28000	25000	25000	22000	22000	20000	20000	16000	14000	13000
引擎运行	Running											
加速曲线	RPM ACC	25	25	25	25	25	25	25	25	25	25	10
减速曲线	RPM DEC	25	25	25	25	25	25	25	25	25	25	10
最高转速	Max rpm	150000	155000	125000	130000	114000	118000	115000	118000	98000	97000	65000
怠速转速	Idle rpm	50000	50000	38000	38000	38000	38000	38000	38000	33000	35000	20000
最低转速	Min rpm	35000	35000	33000	33000	28000	28000	28000	28000	20000	20000	15000
最高温度	Max temp	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
最低电压	Low volt	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
熄火重启	Restart	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
重启火头电压	Restartglowplugvoltage	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
油泵限制	Pump limit	7.5v	7.5v	7.5v	7.5v	8.5v	8.5v	8.5v	8.5v	8.5v	12v	14v
怠速稳定	Idle stable	8	8	8	8	8	8	8	8	8	8	8
启动电机	Starter											
弹出时间	Eject time	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
弹出电压	Eject voltage	3.5	3.5	3.5	3.5	4.0	4.0	4.0	4.0	4.0	4.0	5.0
运行电压	Run voltage	3.5	3.5	4.0	4.0	4.0	4.0	4.0	4.0	5.0	5.0	4.5
转速稳定	Rpm stable	50	50	50	50	50	50	50	50	50	50	50
引擎冷却	cooling											
冷却	RPM	6000	6000	5000	5000	5000	5000	5000	5000	4000	4000	3000

GSU error message:

No.	Error message	Description
0	No Error	
1	Time out	1.Temp not increase over 20 sec duing ignition 2.Throttle stick coolong over 60 sec
2	Low Battery	1.Turbine bettery low voltage(setting from GSU) 2.Receiver bettery below 4V
3	GlowPlug Bad	1.no current of glow plug
4	Pump Anomaly	1.Don't detect pump driver(pump,cable,ECU pump driver bad)
5	Starter failure	1.Starter can't increase to ignition rpm
6	RPM Low	1.When ignition:rpm drop down to 50% of ignition rpm 2.When preheat:rpm drop down below ignition rpm 3.When fuel ramp:rpm drop down below preheat rpm 4.When running:rpm drop down below stop rpm
7	RPM Instability	1.when fuel ramp:rpm jumping up and down 2.when fuel ramp:rpm quickly drop down
8	High Temp	1.When ignition:temp over high temp setting 2.When preheat: temp over high temp setting 3.When fuel ramp: temp over high temp setting > 4sec
9	LowTemp	1.When preheat:temp quickly drop down 2.When fuel ramp: temp quickly drop down
10	TempSensorFail	X
11	Gas Valve Bad	X
12	Fuel Valve Bad	X
13	Lost Signal	Lost PPM signal from receiver
14	Starter Temp High	High temp of starter driver
15	Pump Temp High	High temp of pump driver
16	Clutch Failure	X
17	Current overload	ECU detect current overload
18	Engine Offline	ECU can't connect to turbine

Service

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