Charging the Battery - Do not charge the battery, with a charger using negative discharge pulses, when connected to the ECU. This will destroy the electronics of the ECU. The only method is to disconnect the battery from the ECU and charge it directly.

Also make it a routine to reset battery used, to zero, under Info menu by pressing the “+” button after each completed charge. This will cumulatively monitor mAh used, again, make sure you stop flying and starting charging if it becomes near 80% of the capacity.

**Glow Plug for E Series Only**

A modified, (non-idle bar) glow plug OS no8, Rossi 9, McCoy 9, any of the colder plug is appropriate. Hotter plugs maybe used, but adjustment from glow setting must be made to achieve maximum longevity. The glow plug is installed on the turbine with the washer. Do not over-tighten or you may damage the threaded bushing. Light torque is fine; there is no vibration to loosen it. The glow plug is modified, so that at least two turns of the element extend beyond the bottom of the plug. With a pin, pull out two turns of the heating element. Make sure the plug glows brightly red before installing in to the turbine. The limits menu features an adjustment for glow plug voltage. If higher voltage plugs are used a value of 2.6-2.7 V will be required. This adjustment is described later.

**Description of the ECU**

The ECU is a system for the control of a model gas turbine engine. Its main function is to control and regulate the fuel pump, providing to the turbine engine the necessary amount of fuel for safe and controlled operation, and to operate the
ancillary devices for starting. The ECU measures the exhaust gas temperature, the relative position of the throttle stick and the rotor speed. It monitors all of the controls necessary to make sure that the engine stays between the user defined parameters of operations, also providing failsafe shutdown of the engine when it has detected any important anomaly. In order to make this assessment, the ECU has a rpm sensor, a thermocouple input, a throttle servo input, power connections for the fuel pump, starter, glow plug, fuel and gas valves and the battery and a data port to program and read the data in real-time from the GSU or a PC. The measurements made by the ECU are:

- Temperature of the exhaust gas
- Battery voltage
- Battery current
- Width of the throttle pulses from the radio transmitter
- Engine rotor RPM
- Engine run time.
- External analog signal (airspeed sensor)

**Features:**

- RPM input: Magnetic sensor up to 250,000 R.P.M.
- Temperature range up to 1000ºC using a "K" type thermocouple
- PWM control of 8192 levels for pump, glow plug and starter motor.
- Adjustable power for the starter motor
- Build-in electronic brake for the starter motor to help the clutch to disengage.
- Blown glow-plug detector
- Adjustable glow-plug power
- Glow-plug temperature independent of the battery voltage
- Elapsed engine run timers
- RS232 or USB interface to PC, cable must be purchased separately.
- Black box function. Record the engine measures each 0.5sec up to 52 minutes.
- Radio link error counter
• Battery usage counter in mA/h, (reset this value on a freshly charged pack)
• Test functions for all connected devices.

**Setting up the ECU**

All the programming and measures are done through the GSU, Ground Support Unit. Once the ECU is programmed, it is no longer necessary and do not leave inside the airplane. The GSU has a 16 character LCD screen and 4 buttons. The first two buttons on the left side allow moving through the menus, and the two buttons on the right side (+, -) allow changing the data. Main screen, as shown in the picture, give to the user that main readings from the engine. These are the ECU status, the EGT (temperature), RPM and Fuel Pump pulse width (Pw)

![Data Terminal](image)

In the case of an error, this screen changes to the error screen every 2 seconds.

![Error Screen](image)

Pressing the second button from the left (Menu Up) the second information screen is shown. In the first line you have the measure of the pulse width received from your RC system, and the relative stick position. Second line shows the voltage of the battery and the software version.
Next menu lets you to choose in four submenus, selected by pressing the button under of each Heading.

Start: To the parameters used on startup

Info: Information and test menus

Radio: Programming the transmitter throttle and trim throws, and setting of throttle curve.

Run: Set the parameters used during engine run.

It is recommended to program the learn RC first.
Learn R/C. Teach the ECU to Your Radio System

Learn RC (throttle stick and trim travel) on Xicoy ECU just doesn’t get easier. First, please set stick low and trim low on transmitter and power on transmitter, and receiver. Power on ECU plug in GSU, scroll and select “Radio” then just follow directions on the screen, make sure you press the #2 button to “save” and exit.

Once you have done all steps correctly the green LED located directly above the GSU socket will light up in the ECU when the “Idle” command, (trim and throttle stick set to idle positions on the transmitter). Lower your throttle trim and the green LED will go out indicating correct reading of the transmitter engine shut off signal by the ECU. On rare occasions, usually when using a Futaba transmitter, it has been found that the throttle channel sense of movement may require reversing (Servo reverse) and repeat the transmitter alignment, where JR 12X requires to be at Normal.

Correct reading of throttle % by the ECU can be verified on the second screen, percentage of the throttle position is shown on, 0% in the position of engine stop (trim and stick down), 100% with stick/trim full up and between 10% and 30% at idle, (stick up trim down).

This now completes your radio setup and should only need doing again if the radio settings in the TX are changed or a different Radio is being used. **Or, you are experiencing high idle due to a broken-in pump motor, typically about 1 to 2 hours from brand new.**

**On your first start after RC learned:** Be patient until ECU stabilizes idling RPM, this may take up to 1 minute or so, subsequently hold on tight to your airplane and apply full throttle, and again let the ECU to stabilize its peak RPM, then back down to idle to verify, do this a couple more times and you are ready to go.
Throttle Curves

Jet engines develop the thrust exponentially, thus half RPM means approximately ¼ of thrust. On small engines with a high idle to full power rpm ratio, or in a high drag/low power planes, often only the last 1/3 of the throttle stick produce significant thrust, with the low half stick travel being not used. Although that with current digital TX the pilot can modify the throttle curve to suit his needs, from Xicoy ECU version 5.48 three throttle curves have been added to simplify the setup for most of the installations:

**FULL EXPO**: Mean linear RPM, it is the default setting and the mode used for all previous software versions. Thrust develops exponentially, and it is the recommended curve for big engines or/and high thrust/weight ratio planes, as it ease the control in low power used during taxi.

**LINEAR**: Mean that the thrust develop linearly with the throttle setting, has more resolution at lower half of the throttle stick.

**HALF EXPO**: An intermediate setting between the previous two modes. This is the KingTech factory setting and we are sure you will find this setting to be the most suitable.

<table>
<thead>
<tr>
<th>MODE</th>
<th>0% (Idle)</th>
<th>25%</th>
<th>50%</th>
<th>75%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>FULL EXPO</td>
<td>Idle thrust</td>
<td>6%</td>
<td>25%</td>
<td>56%</td>
<td>100%</td>
</tr>
<tr>
<td>HALF EXPO</td>
<td>Idle thrust</td>
<td>16%</td>
<td>38%</td>
<td>66%</td>
<td>100%</td>
</tr>
<tr>
<td>LINEAR</td>
<td>Idle thrust</td>
<td>25%</td>
<td>50%</td>
<td>75%</td>
<td>100%</td>
</tr>
</tbody>
</table>

% of total thrust
Test Functions

The ECU provides testing functions to the starter motor, glow or burner plug, pump and both solenoid valves. These test screens are only available when the ECU is on “Trim Low” status, that is to say, recently powered up and receiving a STOP signal from the TX. Pressing the (-) button (under the “ON” reading on the screen) will energize the selected device and pressing (+) will shut down. Special care should be taken when testing the pump, as it is possible that fuel can be pumped into the engine, flooding it, and causing a hot start on next startup.

*Some LiFe chargers is capable to peak a 3S pack over 10.7V, the ECU might display “Over Voltage” and will not engage engine start mode. Please use “Test Glow-Plug” for say 30 seconds, this will 1) Preheat the chamber 2) drop the voltage of your ECU pack to nominal for subsequent normal operations.*