

Xicoy

Electrónica SL

Electric Landing Gear controller and sequencer LGC 15A

Users Guide.



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Manual contents & design: Gaspar Espiell V0.9

Welcome!

Congratulations on the purchase of your new landing gear controller. Xicoy are dedicated to the design and production of electronic controllers to the highest standards of quality and reliability to bring you the customer the very latest next generation designs.

Features:

- Direct control of 3 motors in bidirectional mode up to 12V/5A. Supports the different motor shut-off control currently available (time, current and encoder)
- Dual control of electric brakes, full proportional, lineal and adjustable pulsed mode.
- Differential brake mode, to steer the model using the brakes.
- Steering servo processor. Gain, sense and center can be adjusted. The steering servo is centered during retraction.
- Internal Gyro. It can be mixed with the steering servo output and to the differential brakes.
- 8 servo outputs for the control of the doors. The endpoints of each servo can be programmed individually. The Servo speed can be programmed independent in the two senses in 0,1s resolution.
- 10 step sequencer. The position of the gears and the position of the 8 doors can be defined independent in each step. Step duration in 0,1s steps.
- Wide choice of RC inputs. Single RC channel, Dual RC channel, Futaba SBUS, UDI Bus, SRXL Bus, JR Mode A Bus, JETI EX Bus.
- Programmable trough integrated color touchscreen.
- uSD card slot to save the settings and upgrade the software

Installation:

Thanks the small size and lightweight of the unit, it can be placed in any place on the model. We recommend a place where the wiring to the gears be the shorter as possible to have a clean installation, but at same time accessible for programming.

Power supply considerations: **PLEASE READ!**

This controller can receive up to 3 different power sources. In order to prevent malfunctions in your system you should know that:

-The voltage of the main battery connected to the green MPX connector should be of the voltage adequate for the motors and brakes on your installation. The controller can work with a battery voltage between 5.0 to 12.0V. But this doesn't mean that you can use 12V in systems designed to work at 8V. Motors will be overloaded and burn, possibly causing damage to the controller. Check the instructions of your LG supplier, and use the recommended voltage.

Please double check the polarity before connecting it. The damage caused by polarity reversal is important and not covered by warranty!!!

The battery connected to the MPX connector powers the motors and the brakes. The controller has an internal switch operated by the *Gear Input* power. It is

not necessary to disconnect this battery between uses, but it is recommended to disconnect it after the flying session. There is a minimal power drawn from this battery when the unit is switched off that can drain a battery in a 2 month period.

In the case you use battery regulators:

-The steering servo is powered by same supply as on the steering input (*Steer In*). So, for example, if the steering input comes from a battery regulator (powerBox, etc) at 6V and the *Gear In* channel comes directly from the receiver powered at 5V, the steering servo will be powered at 6V.

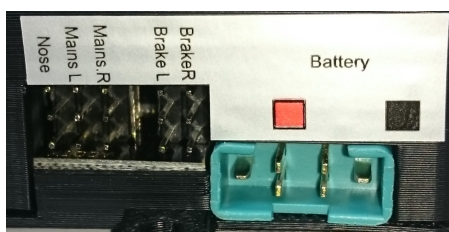
-The outputs to the servos for the doors are powered from the *Gear Input* socket. If you connect directly the gear input to a low power source (for example, directly to the receiver when the receiver is powered by a low power, 5V regulator) the current draw by the servos of the doors could be excessive, causing the receiver to switch off.

-The power input pin of the *Gear* and *Brake* inputs are internally connected together. This could cause a malfunction by connecting different voltages together. For example, if you connect the *Gear Input* directly to the receiver that is powered at 5V and the *brake input* to a battery regulator that supply 6V, then the 6V supply will flow through the unit to the receiver, being no longer powered at 5V by an independent regulator. In this case, it is necessary to cut the central wire (red) on the lead from *Gear In* to the receiver to prevent the voltage present at *Brake In* to reach the receiver. The controller and the door servos will be powered by the power arriving to the *brake input*.

-All negative (ground) connections are connected together inside the unit. Always fully disconnect the batteries (both poles) from the installation before charging, as current can flow through the unit from one battery to the other during charge, damaging the installation.

Please contact to Xicoy Electronica for advice on particular installations.

Electrical connections:



On left side there are the connections for the main battery, brakes and retracts. Connect each item to its socket in order that all commands act as it should. Brake polarity is not important. Motors polarity should be the correct in order that the gear is extended when the screen display "Gear Down". Reverse the connection in the case that the retracts

move inversely as desired.

On the right side there are the RC connections.



Gear In: This is the main input for the RC power and commands.

The power to run the internal processor and display, plus the power for the outputs for the doors is taken from this input. The internal processor accepts up to 9V, but the servos connected to the outputs will receive this voltage, so you must use HV servos for the doors if you plan to run the controller in HV.

The RC commands on this input would depend on the mode used:

-*Normal servo mode, dual channel:* This input will control the deployment of the gear. Brakes will be controlled by the command received on "Brake In" input.

-*Normal servo mode, single channel:* Gear deployment and brakes will be controlled by this input; signal present on "Brake In" input will not be used.

-*BUS Mode:* Connect here the SBUS/XBUS/UDI/SRXL/EXBUS from the RX. The commands for Gear, Brake and steering will be extracted from the appropriate channels on the decoded bus protocol.

Brake In: Input for the brake command when dual channel mode is used.

Out 1 ... 8: Outputs for the 8 servos to operate the doors. The power for these servos will come from the *Gear In* and *Brake In* inputs.

Steer In: Command input for the steering servo when *Normal Servo mode* is used. Signal could come from a dedicated receiver output or through a "Y" lead from rudder channel. Center and sense of movement can be adjusted, to allow adjusting the travel and center of the steering servo without influence on the rudder.

Steer Out: Output for the steering servo. Signal is processed, according to the center, gain and gyro mixes when the gear is deployed, and centered during retraction.

Note: The power for the steering servo comes from the *Steer In* input, to allow using different voltages. In the case of using BUS input, a patch lead should be connected between the Steer In to the *Brake In* connectors to supply power to steering servo

Main screen:

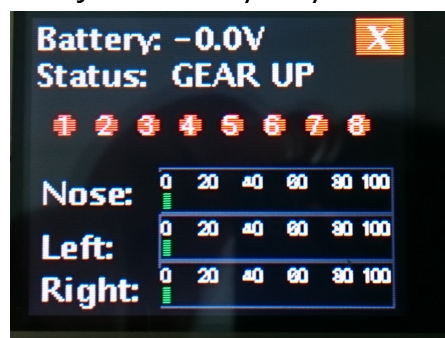
All programming is done through the color touchscreen. The different programming options are separated in dedicated screens, making the adjustment very easy to understand.

Operation is divided in two main areas. At power up the operation status is displayed:

First line: Battery voltage

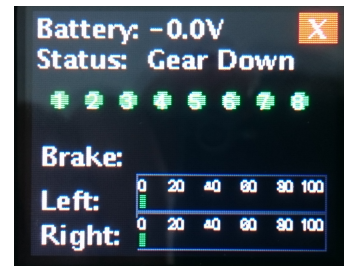
Second line: Status

Third line: Door state. Green means open, red closed.



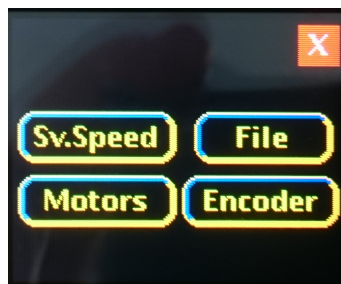
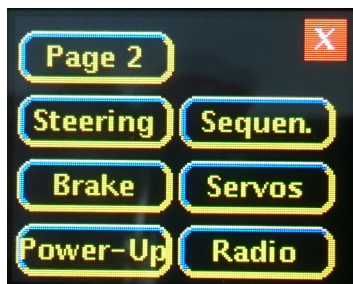
Bar graphs: in all states except in **Gear Down**, the power used by the motors is displayed.

In **Gear Down** state, this indication is replaced by the power applied to the brakes.



Setup:

Touching the *Setup* button, all the available options will be offered, spread in two screens:

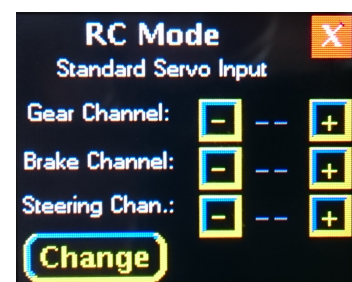


Touching the buttons, the relevant adjustment page will be displayed.

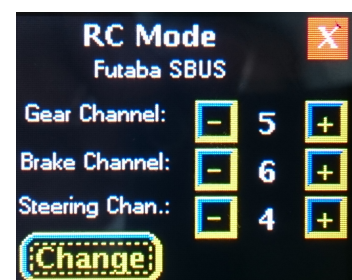
It is recommended to not connecting the main battery nor the servos during the first stages of the setup to avoid uncommand movements.

Radio: There are different options for the radio commands. First you should decide if you will use separated channels or BUS. Bus is convenient when the receiver outputs are reduced but the TX has more channels, for example, a TX of 16 channels being used with a 8ch receiver. You can set the LG15 in BUS mode, and assign three of the channels not available in the RX (say 9, 10 and 11) to control the Gear, Brakes and steering servo, leaving all 8 channels on the RX available for all other functions.

Touch the RCMODE button to select the type of RC you wish to use. The screen will change trough all available modes. *Standard servo, Futaba SBUS, UDI, SRXL, XBUS_A, JetiEX.*

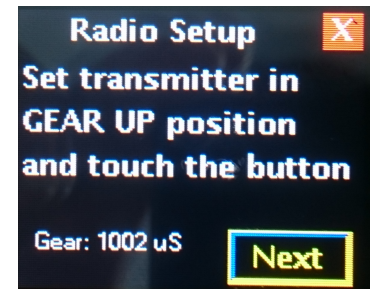


In all modes except *standard servo*, the selection of the desired channel for each function is done through the +/- buttons. In the picture, the Gear will be the CH5, the brake the CH6 and steering the CH4.



Once the RC Mode is selected and the channels assigned, now you should adjust the endpoints for the Gear channel and for the Brake Channel.

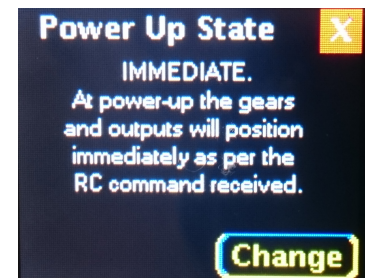
Touch the *RC SET* button. This will drive you through the alignment sequence. Screens are self-explaining, just follow the instructions. If during the radio alignment there isn't a valid RC signal on *Brake IN* input, the system will assume that it should work in single channel mode, and will expect that the defined position for the gear down command be at an intermediate point between *Gear Up* and *Maximum brake*. For example, *Gear Up* 1.000us, *Gear Down* 1200us, *Full brake* 2000us.



Power-Up.

Touching the *Change* button you can scroll through the 3 different power-up options.

Immediate: The servos and gears will be activated immediately as per the RC command received, whatever it be.



Check Switch: The Gears and servos will be powered only if the command received is Gear Down, preventing the gear to collapse if the system is powered with the switch in the retracted position.

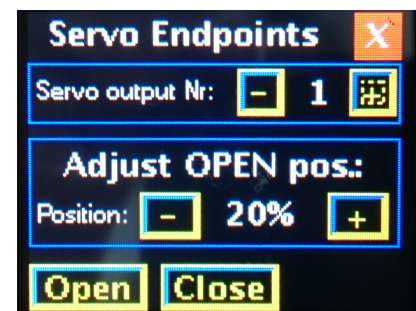
Cycle Switch: The gears and servos will not be powered until a full cycle on the gear switch is done.

Servos:

The opened and closed positions of each of the 8 servo output can be individually adjusted through this screen.

Select the servo output to be adjusted (1 ... 8) using the buttons on upper line.

Touch the *Open* button to adjust the position of the door when in OPEN position. Using the position buttons, adjust the door to the desired position.

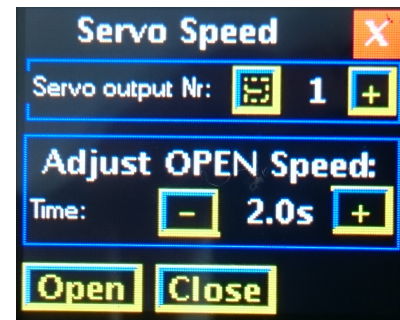


Touch the *Close* button to adjust the position of the door in CLOSED position.

If the readings are below 60%, you may consider changing the mechanical links to have more servo travel and higher torque at the door. Specially check that the servo is not fighting against a hard stop, this would cause the servo to burn quickly. If possible, use an ampermeter to check the power used by the servos to assure that they are not mechanically overloaded.

Servo Speed:

The adjustment procedure is similar to previous section, here you adjust the speed you wish that a particular door opens and close, the speed in each sense is defined separately.



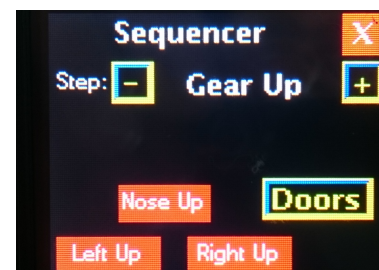
Sequencer:

The sequencer has 10 independent steps. In each of the steps the position of all 11 outputs (3 gears and 8 doors) should be defined.

Using the +/- buttons on top line you can select the step to be modified.

Once the step selected, the positions of the 3 gears and the 8 doors is defined.

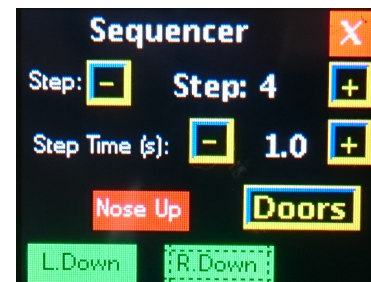
Touching the color buttons in the bottom of the screen, you can toggle the position of this particular gear in the step being adjusted. Red color means that the gear is in UP position, Green color in down position.



On intermediate steps the duration of each step is defined in 0.1 s increments.

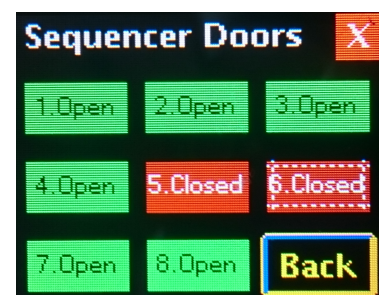
To define the position of the doors in each step, touch the *Doors* button.

Same as with the gear setup, touching on the button of each output will toggle between the closed and opened state on the current step selected.



Notes:

-The step duration is not linked to the speed of the servo defined in the *servo speed* screen. This can cause that a step be executed before the command on previous step be finished. For example, if the speed of a door is defined to open in 4s, but the step time is of 1s, the next step will be executed while the door is still opening.

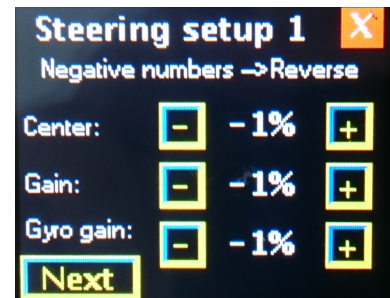


-The last two steps on each sense (Step 2 and Step 7) will not be executed until the gear movement is finished. For example, if the delay of all steps is less than the total time for the gear to extend, the system will wait in Step 7 until the gear is fully deployed; independently if the time set is lower, to prevent a door to close while the gear is still moving.

-If you need less than 10 steps, copy the settings of the steps not used to same as previous step, and give a time of 0,1s.

Steering processor:

These screens allow adjusting the steering servo. It is possible to center, change the sense of the movement, reverse, and to mix the internal gyroscope. These features allow using same RC Channel as the rudder, while retaining the capability of precisely adjusts the steering.



Also, during retraction and while retracted, the servo is kept centered without movement.

On first screen, the adjustment of servo center, gain and gyro gain are displayed. To reverse the action of the servo or the gyro, simply use negative numbers.

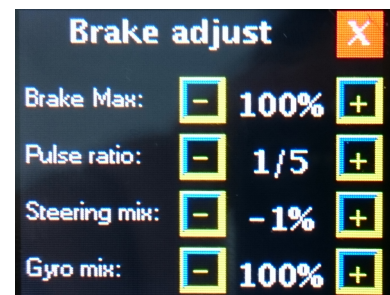
Next screen allow adjusting the center of the servo during retraction.

Brakes:

There are 4 adjustments possible for the brakes.

Brake Max: Allow to reduce the maximum brake force on light planes.

Pulse ratio: Applies a force modulation on the brakes in order to keep the wheel rotating to avoid creating flats on the tires in 5 different levels. A ratio of 1/3 means that the low force pulse is 1/3 of maximum force.



Steering Mix: It is possible to mix the steering channel to the brakes, in order to steer the plane using brakes (usually on warbirds like the P-47). This percentage adjust the influence of the steering channel to the brakes. Same as in the steering processor, use negative numbers if you need an reversed action.

Gyro Mix: Same as the steering mix, this adjustment allows to mix the gyro to the differential brake.

ALWAYS while modifying these settings, begin with modest values and increase as needed after testing with the plane, too high gain could have the brakes acting all the time at the minimum vibration.

Motors:

This adjustment is available only in generic controllers. Those supplied in a kit by a landing gear manufacturer could have these screens locked to avoid damaging the motors or gearboxes if the settings are not correct.

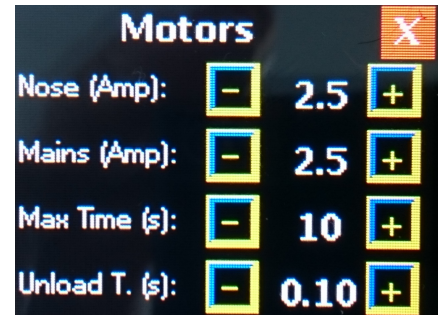
The adjustments are:

Nose Amp: Maximum amperage for the nose gear.

Mains Amp: Maximum amperage for the main gears.

Max Time: Maximum allowed travel time.

Unload Time: Time of the motor run in reverse to unload the gearbox after hitting the end of travel.

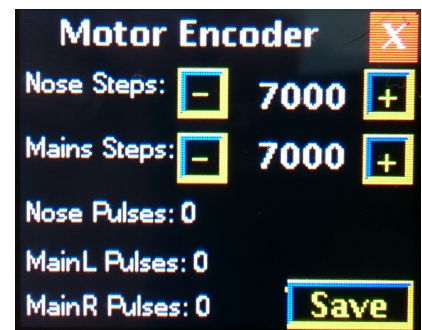


CAUTION: USE THE SETTINGS RECCOMENDED BY YOUR GEAR MANUFACTURER. You can burn the motors or damage the gearbox if the amperage or the battery voltage are higher than the maximum allowed.

Encoder:

If the gears used include an pulse encoder, on this screen is possible to adjust the pulses for each cycle. First line adjusts the steps on nose gear, and second on mains, this allow to use different gears on mains than on nose. Even using the encoder option, the overcurrent threshold and the maximum time protection apply, always you should adjust all 3 settings.

On bottom lines are displayed the current count, to help to adjust the correct value.

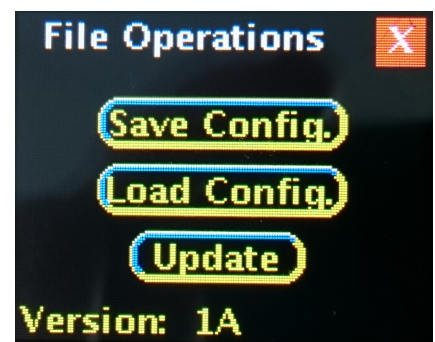


File:

The controller has a socket for a uSd card that is not necessary for normal operation, nor supplied as standard.

The card allows to save all the settings to a file, load these settings and to update the firmware of the controller.

Bottom line displays the current software version.



Disposal

Electrical equipment marked with the cancelled waste bin symbol must not be discarded in the standard household waste; instead it must be taken to a suitable specialist disposal system.

In the countries of the EU (European Union) electrical equipment must not be discarded via the normal domestic refuse system (WEEE - Waste of Electrical and Electronic Equipment,directive 2002/96/EG). You can take unwanted equipment to your nearest local authority waste collection point or recycling centre. There the equipment will be disposed of correctly and at no cost to you.

By returning your unwanted equipment you can make an important contribution to the protection of the environment.