

XICOY®

INNOVATION & TECHNOLOGY

BY GASPAR

Electric Landing Gear controller and
sequencer

LGC-25

Users Guide.



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Manual contents & design: Gaspar Espiell V1.0

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Features:

- Direct control of 3 motors in bidirectional mode. Supports two different motor shut-off control systems (time and amperage)
- Independent control of electric brakes, fully proportional, lineal and pulsed mode.
- Differential brake mode, to steer the model using the brakes.
- Steering servo processor. The travel, sense and center of the steering servo can be adjusted. The steering servo is centered during retraction.
- Internal Gyroscope. 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 each wheel and the position of the 8 doors can be defined independent in each step. Step duration in adjusted in 0,1s steps.
- Single RC channel or dual RC channel.
- Programmable trough integrated color touchscreen.
- USB-C connection to save the settings and upgrade the software

CHARACTERISTICS

| | |
|---------------------------------|--|
| Weight: | 62 gram |
| Dimensions: | 70 x 41 x 16 mm |
| Inputs | Gear control input (PWM servo). Up to 12V. Brake control input. Optional (PWM servo) Steering control input. Optional (PWM servo) Battery. Used to power only the gear motors and brakes. |
| Outputs | 3 x motor output. Short-circuit protected 2 x brake output. Short-circuit protected 8 x door servo 1 x steering servo |
| Battery voltage: | 6V to 26V (6s) XT30 connector |
| Retracts power output (LGC25L) | 6A (8A peak). 150W at 25V each. JR pin connector |
| Retracts power output (LGC25H) | 10A (15A peak). 250W at 25V. XT30 connector |
| Brakes power output (each) | 6A (8A peak). 150W at 25V JR pin connector |
| Voltage output (Motors) | Adjustable from 6V to full battery voltage |
| Voltage output (Brakes) | Variable from 0V to full battery voltage |
| Voltage output (Door servos) | Same as RCIN voltage |
| Voltage output (Steering servo) | Same as Steering In voltage |
| USB C connection | |

MECHANICAL INSTALLATION

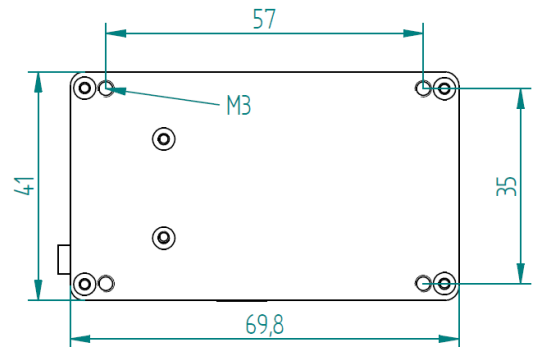
Thanks the small size and lightweight of the unit, it can be placed in any place on the model. We recommend a place where the wiring to the gears be the shorter as possible to have a clean installation, but at same time accessible for programming.

Screen orientation should be facing top to assure proper operation of the gyroscope.

The connections have been rationally thought out, occupying only the sides of the device in order to take up the minimum space in the model, similar to an RC receiver. On the left side there are the high power connections, and on the right side the servo and receiver connections.

The fixing on the model is done with 4 pc of M3 screws, in the threaded holes on the bottom of the device, ensuring minimum space used on the aircraft tray. The maximum length of the screws inside the device must be less than 12mm.

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ELECTRICAL INSTALLATION

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 yellow XT30 connector should be of the voltage adequate for the motors and brakes on your installation. The controller can work with a battery voltage between 6 to 26V. The voltage output to the motors can be adjusted to a lower value than the battery voltage, but for maximum reliability is recommended to use a battery voltage close to motor voltage. Check the instructions from your LG supplier, and use the recommended voltage.

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

The battery connected to the XT30 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 typical battery in a 2 month period.

In the case you use battery regulators in your installation:

-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 and Brake Input* sockets. 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. 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*.

-If you want to use an external voltage regulator or battery to power the servos for the doors, connect it in any of the not used outputs (or using a "Y" servo lead)., and cut the red (central) wires connected to Gear In and Brake In connectors, to prevent the external voltage to flow backwards to the receiver.

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

Please contact to Xicoy Electronica for advice on particular installations.

Electrical connections:

Battery:



Connect the battery to the XT30 yellow connector. Please double check the polarity before connecting.

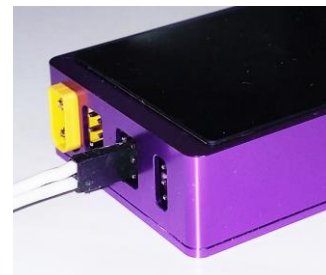
Connection of Motors and brakes:

Connectors close to the battery socket are the brakes (no polarity), central connectors are the main motors and the single connector is the nose gear motor.



This device accepts the 3-pin style connectors used in our older controllers (used by several retract manufacturers), and the 2-pin connectors used by the other manufacturers.

Use the 2 lower pins when using 2 pin connectors as per picture.



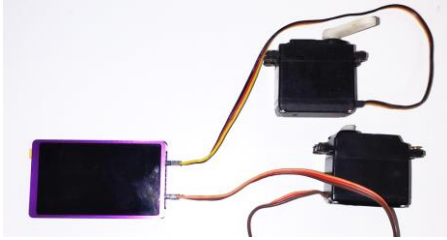
Connection of radio and servos:



On the other side of the device there are the standard servo connections to the receiver and servos. Ground wire is always connected to the bottom pin.

Receiver connections. Top is the rudder/steering input, bottom the brake and gear channel.





Next to the receiver sockets there are the 8 sockets to connect the servos for the doors. In the pictures the servos are connected to output 1 and 8.

Touchscreen:

Programming is done through the high resolution touch screen. The screen used is of high quality capacitive type and can recognize gestures, so navigation through different screen options is done by swiping left/right and up/down, similar to a smartphone.

Navigation through different screens:

There is a group of screens informative that are intended to be used in normal operation, and a group of screens that are used to adjust the controller to your particular operation, only used during installation.

In adjustment mode, swiping in horizontal sense, right to left, it changes the menus over the different sections (motor adjustment, brake adjustment, servo, etc). Swiping in vertical sense change to adjusting screens of the particular section selected.

Informative screens: Main screen.

After power-up, the unit will display the main screen where all the relevant data is displayed.

On this screen is displayed the battery voltage, the battery amperage, the status of the sequencer, the position of the doors and the power of the motors or the brakes.

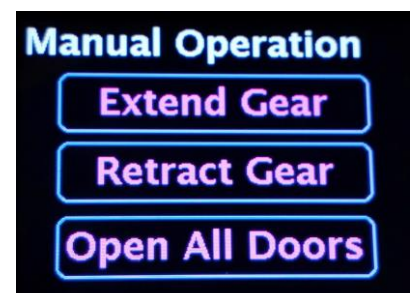


Swiping down the screen will change to the:

Manual operation:

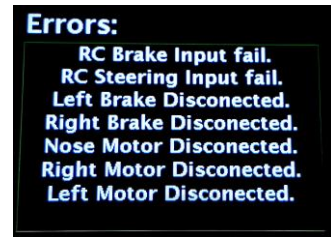
This screen allows operate the gear without the radio, it is a very useful function to be used while assembling the model.

Note: The gear position will return to radio control if this screen is not active.



Diagnostics screen:

Swiping down again the current errors sensed by the unit will be displayed.

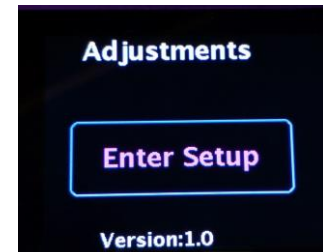


Adjustments screen:

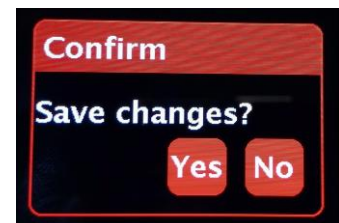
There are two ways to enter in the different adjustment sections.

-By touching the center of any informative screen for over 2 seconds.

-Through the button displayed on last informative screen.



Important: All changes done in the adjustments screens are not automatically saved. To save permanently the changes you must return to main screen by touching continuously in the center of any screen for more than 2 seconds, or by the exit button provided in the last adjustment screen. You should confirm if the changes you have done must be saved in the permanent memory.



STEP BY STEP SETUP:

We strongly recommend to adjust your unit by following the adjustment steps from this guide in the suggested order, especially if is the first time you use it.

STEP1. Radio.

This unit can use one or two RC channels to control the gear retraction and the brakes.

First you should decide if you are going to use one or two channels and setup your transmitter accordingly.

If using 2 separate channels:

-Assign the switch you want to use for retraction control and assign to the channel output in the receiver you want to use for retraction. Adjust the travel of this channel from +100% to -100%. Connect one of the servo patch cables from the selected channel output to the *RC_In* input in the controller.

-Assign the proportional channel (slider, rotating knob, etc) you want to use to control the brakes to a different receiver channel, and adjust the travel to be +100% to - 100%. Connect the selected receiver output to the Brake_In connector in the controller.

If you decide to use only one RC Channel:

-Select the channel you want to use in your transmitter and program a mix between a switch and an proportional control so that:

When switch in the “gear retracted” position, the output on this channel be -100%, independently of the position of the proportional (brake) control.

When the switch in the “gear extended” position and the brake to minimum, the output on the channel is around -50%.

When the switch in the “gear extended” position and the brake to maximum, the output on the channel is around +100%.

Once verified that the transmitter is correctly programmed, connect one of the servo patch cables from the selected channel output to the *RC_In* input in the controller. Leave empty the *Brake_In* socket or use it to connect an extra power input for the servos of the doors.

To program the radio, only is needed to connect the receiver, you can leave all other connections (battery, motors, servos...) disconnected.

Now power-up the receiver.

When main screen is displayed, touch continuously the center of the screen for over 2 seconds, or navigate to the setup button by swiping down through the different informative screens.

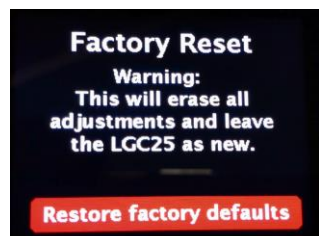
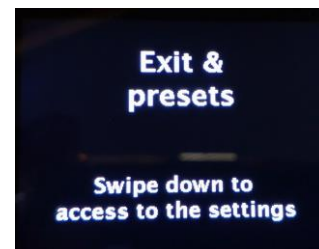
Now you are in the setup menus. All options are grouped to ease the different adjustments.

You can swipe left/right to see the different sections.

To exit the setup and return to main screen, touch in the center of the screen continuously for over 2 seconds.

Before adjusting the radio, maybe you want to start the programming from zero, as new, so first swipe left through different sections until last one:

Swipe down. The RESET option will be offered. Using this function will reset ALL the settings



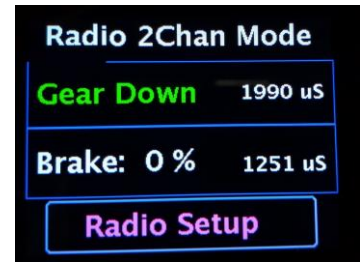
and leave the device as new. So please, be careful and use it only as last option.

Important: All changes done in the setup screens, except the radio, are stored permanently only when returning to the main screen. If power is removed before returning to main screen, all changes will be lost!.

Programming the radio endpoints:

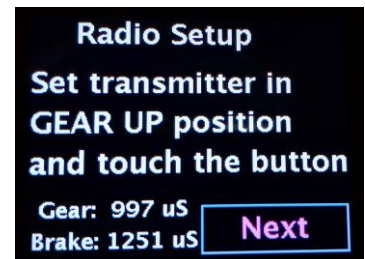
Swipe left until the “radio setup” screen is displayed.

On this screen you can see the readings of the pulse width sent by the transmitter, and the equivalent in the gear position and brake power.



To start the radio adjustment procedure, touch the “radio setup” button.

Verify that the reading on “Gear:” in the screen is around 1,000us. Check that when toggling the retraction switch on the radio, the reading changes to around 2,000us. Exact values are not important as long as the difference is at least 250uS when toggling the switch.

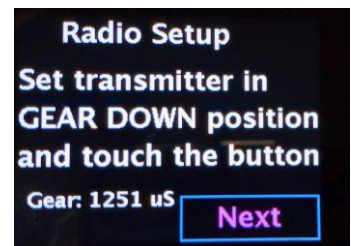


If you are using a single channel control, the “Brake:” reading should display 0uS, otherwise it will display the brake command that should change when moving the brake lever.

Set the retraction switch on the radio to “gear up” position and brake slider to minimum.

Touch the “Next” button.

Now set the switch on the radio to “extended” position. Check that the reading of “Gear:” is at least 250uS different from previous adjustment.



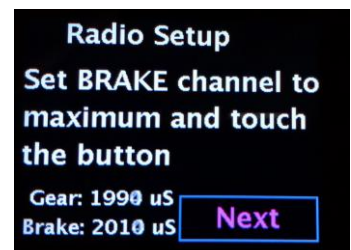
Touch the “Next” button.

Check that the brake control is at minimum on the radio.



Touch the “Next” button to store this setting.

Finally, set the brake control to maximum. Verify that the reading is at least 500uS different from previous step.



Touch the next button. The radio settings will be checked and stored in the memory.

STEP2. Motors setup.

The adjustment of the parameters of the motors is one of the most important adjustments to be done.

It is recommendable to connect only the radio and the main battery, leaving the motors disconnected until all adjustments are done.

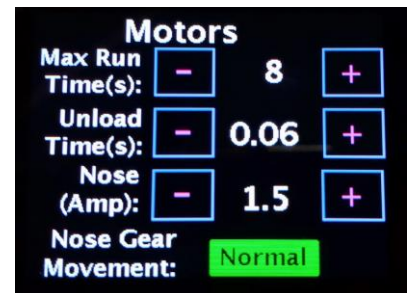
This device detects when motors have reached the end of their travel by checking the amperage used by each motor independently. Once the amperage used by the motor is higher than the programmed threshold, the power is cut off and a short pulse of reverse polarity is applied to the motor to remove the mechanical stress. If the peak of amperage is not detected, then the motors are switched down after a programmable time.

It is important to set the correct parameters, otherwise there is a risk of to damage the motors or of reduced performance. Please ask your supplier of landing gear motors for correct values.

Swipe to the right, up to the “Motor Setup” section.

Swipe down to the first adjustment screen.

First adjustment is the maximum time that the motors will be powered. Measure the time that usually your gear takes to retract, add a bit of extra time. For example, if the gear usually takes 5 seconds to retract, set to 8s.



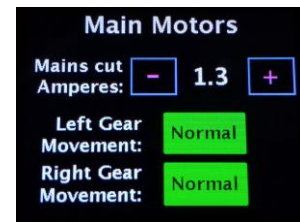
Second adjustment is the time that the motor is powered in reverse direction once it has arrived to the end of travel. This reverse action removes the permanent mechanical tension on the motor gearbox and prevents early failures. Adjust this time so that the slider moves slightly back from endpoint.

Third adjustment is the cut-off amperage of the nose gear. This device allows different motors to be used in the nose/tail retracts than the ones used in main retracts. This is a very important adjustment. Too high value could damage the motor or cause the gear to become stuck. Too low value could cause weak retracts that could stop at midway. Check with the retract manufacturer!!!!

Last adjustment is the sense of the movement of the nose retract, if it is retracted when should be extended, reverse the operation using this button.

Now swipe down for the settings of the main motors.

Same as with the nose/tail retract motor, on this screen you can adjust the cut-off amperage of the main motors and reverse the operation if necessary



Swipe down again and...

On this screen you can adjust the voltage applied to the motors. It is useful if is necessary to slow down the motors, or is necessary to use a battery of higher voltage than the rated voltage of the motors.



To reduce the wear on the motors and heat in the controller it is recommendable to use a battery of similar voltage than the motor voltage, so if your motors are rated to 6V, use a 2S battery. Using a higher voltage is possible, but not recommended.

Please note that if you use this function to slow down the motor speed, the rated power of the motor will be reduced accordingly.

Last adjustment screen in the motors section is some preset values for known retracts.

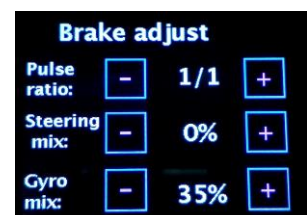
Please note that the preset values have been determined by reverse engineering, measuring the original controllers of the manufacturers retracts. Retract manufacturers have not provided official data, so it is not guaranteed that the preset values are correct for your particular gear. Please contact your gear manufacturer if possible.

STEP3. Brake setup.

Note: You can skip this step if the electromagnetic brakes are not used in your installation.

The two brake outputs are controlled independently allowing differential brake function, helping in the steering control of the model while on the ground.

First adjustment is the “pulse ratio”. This function modulates the brake power in different ratios, similar to the ABS function in the cars, preventing the wheels to become blocked and causing a flat spot on the tires. For heavy models with limited brake power, where the wheel is unlikely to become blocked, set the ratio 1/1, meaning no pulsing. For light models with powerful brakes, then set the ratio to maximum.



Steering mix: This function allow steering the model by the brakes, applying more force to the brake to the side the model must turn. This function is helpful to have steering capability while the nose wheel is in the air or in models with light weight on the nose wheel, or in warbirds with tail wheel without steering. For this function to work, it is necessary to connect the rudder channel in the “steer in” connector. Adjustment of the steering power is done by the buttons, from zero (no steering action) to higher values. Steering effect depends on the brake power and weight of the model, so is recommended to start with low value (10%) and increase as needed. If the correction is reverse as desired, then use negative numbers to reverse the action of the brakes.

Gyro mix: This function use same principle as the steering, but the correction input comes from the internal gyroscope. Start with a 10% and increase if needed. Same as steering, if correction is in the wrong sense, use negative numbers to reverse the correction sense.

Brake limit: In the cases of light planes with powerful brakes could be necessary to limit the brake power. It can be adjusted independently to correct possible differences between the brakes.

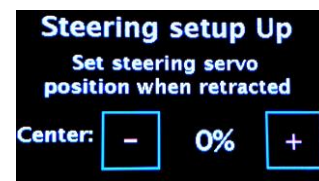


STEP5. Steering setup.

Note: You can skip this step if the steering servo is not connected to the device.

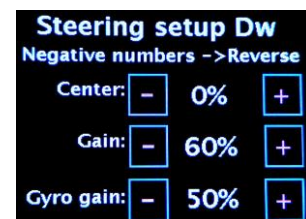
The steering processor allows control the steering servo from the command received from the rudder servo, saving the use of a dedicated channel for the steering servo and programming mixes in the radio, plus adding the capability of using the gyroscope to ease the control of the plane during takeoff and landing.

When the landing gear is in retraction or retracted, the steering servo is locked and don't move by the rudder commands. The position where the servo is locked in “gear up” position is defined on this screen.



When the gear is fully deployed, the steering servo is controlled by the commands from the rudder channel, connected in the “Steer In” socket.

Using this screen is possible to modify the center of the servo, the amount of travel (Gain), and the amount of gyroscope mix. Gyroscope influence is automatically reduced when there is a steering command, to not having the gyro to fight against pilot commands. To



reverse the sense of movement of the servo, use a negative number on the gain, same to reverse the correction by the gyro.

STEP 6. Servo door travel adjustment.

Note: You can skip this step if you don't use doors in your plane

This device allows connecting up to 8 servos to control the landing gear doors.

Warning: Improper setup of the servo travel could cause damage to the door hinges, damage to the servo and doors jamming during operation.

Important: To minimize the possible damages, connect only the servo you are going to adjust, disconnect all others. Initially remove the mechanical link from the servo to be adjusted to the door to prevent the servo moving off limit before the adjustment done.

Swipe left up to the "Servo position setup" screen and then swipe down once to access to the screen that allows the adjustment of the servo connected to the output 1.



Connect the servo to the controller in the output #1. Make sure that the mechanical link to the door is not connected to prevent door or servo damage in the case the servo moves out of limits.

Touch the "Opened" button. The servo will move to the position that it will go when the door should be opened.

Now temporarily connect the mechanical link to the door.

Using the buttons, move the servo until the door is in the position you want when opened. In the case you need to go over +100% or -100%, modify the mechanical link to have the door to the approximate desired position, and do the fine tuning by the buttons.

Now disconnect the mechanical link to the door and touch the "closed" button. The servo will move to the position it should be when the door is closed. Reconnect the door to the servo, and use the buttons to adjust the position you want the servo when door closed.

Double check that the servo is not continuously pushing the door, as it will draw a lot of electrical power and risk to burn.

Once the adjustment finished, secure the mechanical connection of the door to the servo, and by touching the "opened" and "closed" buttons, verify that the door open and close on the desired positions, without jamming.

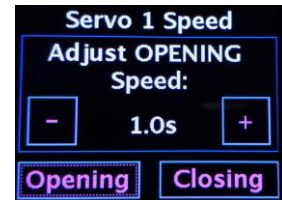
If the readings are below 60%, you may consider changing the mechanical links to have more servo travel and higher torque at the door. Specially check that the servo is not fighting against a hard stop, this would cause the servo to burn quickly. If possible, use an ampere meter to check the power used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

Now, swipe down to enter in the servo 2 adjust, and repeat the procedure again to adjust all other doors.

STEP 7. Servo door speed adjustment.

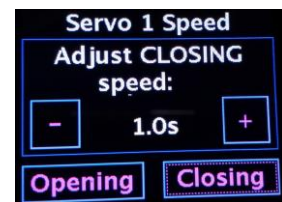
Note: You can skip this step if you don't use doors or you don't need to slow down the door movement.

For greatest scale effect, it is possible to slow down the operation of the servos that control the doors. The procedure is similar to travel setup described in Step 6, but with the advantage that this adjustment can't damage anything.



Touch the "opening" button and adjust the time you want that the servo takes to move from closed position to opened position.

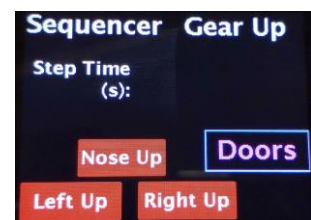
Touch the "closing" button to adjust the time to move from opened position to closed position.



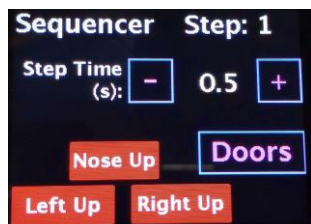
Swipe down to access to the different servos.

STEP 8. Sequencer

The sequencer is organized in 10 steps (or states). The duration of each step is programmable (0,1s resolution), and the state of all 3 motors and 8 doors is defined in each step.

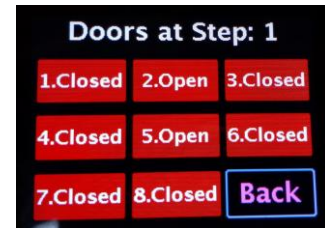


Swiping down all the steps of the sequencer are accessed. Touching the lower buttons the state of the gears is defined on each step.



Step time is defined in 0,1s intervals.

Touching the “Doors” button you can define the state of each door in each step.



Sequencer setup:

Important: To avoid damage to the motors, doors or servos, please complete all previous steps before adjusting the sequencer.

Suggestion: Initially don't connect all servos and motors. Do little by little. First connect only the motors, leave all doors open with the servos disconnected.

First: Motors adjustment.

-Normal case, all 3 motors run at same time:

Set half the sequence steps (From “gear Up” to step 4) so that all 3 motors are in Up (red) state. Set the steps from 5 to “Gear down” in down (green) state.

-If you need that motors start at different time:

Set the sequence steps from “gear Up” to step 3 so that all 3 motors are in Up (red) state.

In Step 4, set the first motor that should deploy in “down” (green) state. Set the other 2 motors in “up” (red) state. Program the “Step time” you need that first motor run alone before second motor start.

In Step 5, set the first motor that should deploy and second motors in “down” (green) state. Set the other motor in “up” (red) state. Program the “Step time” you need to wait until last motor is started.

In next steps (Step 6 to “gear down), set all 3 motors in “down” (green) state.

Once the motors move as needed, you can program the doors.

Doors adjustment:

Connect the servos for the doors one by one, once first one is adjusted and operating, connect the next.

On “gear Up” all doors usually are closed, so all should be selected as closed.

On Step 1, select “open” the doors that should open first before any motor movement. If you need that a door opens later than the first one, then program the time to wait in the “step 1” screen and set the second door to “open” state in step2. You can use steps 3-4 for other door servos that should be operated later.

You should copy the door state in all next steps to keep it open.

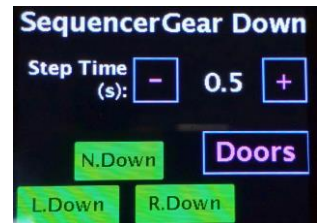
If some doors must close again after the gear is deployed, program the closure in step 8 or “Gear down”.

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.

Important: the sequencer includes a “security” system to prevent the doors to close before the gear has finished the movement. The sequence will be hold in step 2 when retracting and in step 8 when deploying until the motors stop to move, independently of the time programmed. For example, say that the motors take 10 seconds to move. If you program a sequence where the time between that the motor is powered to the door closing is defined at 5 seconds, without the security mechanism the door would close before the wheels fully retracted, damaging the doors or jamming the gear. But as the sequencer will wait while the motors are running, the doors will keep open. This security system applies for door movements programmed in the two first or two last states of the sequencer. This means that if you need to close a door while the motors are powered, this command should be programmed in steps 2 to 7.

In the case you run the system with one of the motors disconnected, the system will wait until the maximum motor time programmed in the motor section has elapsed, adding an extra delay.

This system can't prevent the case of a motor stopping before reaching the final position, as it only looks if the motors are in movement, not its real position.



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.

USB connection:

On the side of the device there is a USB-C connector that is used to save the settings, to copy the settings to the same or another unit (clone), to update the firmware and to change/personalize the image displayed on the initial screen.

Download the Windows software from Xicoy website, connect first the unit to the computer using a standard USB-C cable, and launch the software. Once the connection is established, you have different buttons to accomplish all the tasks.

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.