MECHA

C2 USER'S GUIDE

January 12, 2022

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MECHA C2 User's Guide

For firmware version **12315** or newer.
NOTE. Images shown in this guide may not be an exact representation of the current firmware version.

Download the latest version of this guide from
https://www.nodalninja.com/Manuals/c2-guide.pdf

Web: **www.nodalninja.com**, **www.fanotec.com**

Support email address: **mecha@nodalninja.com**

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How to use this User's Guide

Welcome to the MECHA C2 User's Guide!

C2 is our second generation of controllers, with OLED display, external battery, and support for two MECHA rotators.

Before you start reading page-by-page, go section-by-section, looking at titles, tables, highlighted paragraphs, images, etc. Although there is a lot of information you have not read yet, this will clue you into what you are about to read.

After that, go back to the beginning and read the **Introduction** and **Before First Use** chapters. Please move on only after you become familiar with the basic operations we present here, and leave aside the more complex chapters and deepen the part that interests you more.

Even if you are an experienced user, please pay attention to the warnings.

If you find the firmware update and other operations difficult, you can receive support and guidance at **mecha@nodalninja.com**

Let's get started!

WARNINGS

WARNINGS to Dual Axis MECHA Users

- Test MECHA WITHOUT a camera mounted first!
- Please test for camera clearance before running any program.
- Test any preset supplied or adjusted WITHOUT a camera mounted FIRST, especially when the clearance is not enough.
- CHECK for clearance with shutter cable attached!
- Use short cable with extreme caution.
- The power button, ⏻, can always be used as an emergency stop, except for the speed calibration procedure.
- If the movement is not as expected, or there is any danger for the moving parts to hit something, please press ⏻, the power button of MECHA, to stop the movement immediately.

> ⚠ In this user guide, we assume that some settings on the *Configuration* page – such as the rotation intervals for the ◀ ▶ ▲ ▼ buttons – have their default values.
>
> So when we say „*Press ▲ then quickly press ✚ for a rotation of 90°…*", this statement is valid if *Arrow buttons Interval 2* is indeed 90°.

Simple Mode

Before practicing what you read in this section, please make sure that C2 works in *Simple Mode*.

Power on MECHA by pressing the button for 3 to 5 seconds (long press). It may take about 35-45 seconds to start, then MECHA reaches the **idle status** and the display will show

1. either the *Preset (P) Menu*
2. or the rotators in use and the dynamic IP address.

Case 1. The display shows the *Preset (P) Menu*:

- Press the button to switch to *Config (C) Menu*.
- If the first option in this menu is *SIMPLE MODE*, just leave it unchanged. Otherwise, press the button to change it to *SIMPLE MODE*.

Case 2. The display shows the rotators in use and the IP address:

- Long press the button to enter *Menu Mode*.
- Press the button to switch to *Config (C) Menu*.
- Press the button to change the first option to *SIMPLE MODE*.

https://youtu.be/gBGxE5Q11xI

Introducing Simple / Advanced Mode – MECHA C2

Introduction

You may already know, from the documentation available at this time, that MECHA consists of a rotator (E1, E2, or P1) and a controller (C1), and is generally used to automate the movement of various devices, such as a panoramic head mounted on a tripod or a turn table holding an object for filming or photography.

Two such paired MECHA units – MECHA Dual Axis Combo (DAC) – can be used for dual axis applications, for example, in panoramic photography.

The controller is the part of MECHA where the buttons are located and that allows you to send various commands to the rotators, or to update the firmware, for example, when you do not want to use the User Interface (UI) for these purposes.

The new controller – C2 – which we present in this user guide, is a dedicated dual-axis controller with an OLED display and external battery.

It is similar to C1 and can control the same rotators – E1, E2, and P1 – so now you can choose from the two controllers the one that best suits your needs and preferences.

Please see C2 – C1 Differences and Similarities for more details.

The OLED display can guide you through all the major operations and settings, making C2 much more intuitive than the single-axis C1 controller with LED indicators only.

The use of an external battery means you can carry spare batteries and quickly refuel MECHA before or during a shooting session.

A power cable splitter (optional) is available for using 2 sets of batteries at the same time for extended operation and/or changing batteries without a pause.

MECHA Controller C2 Features

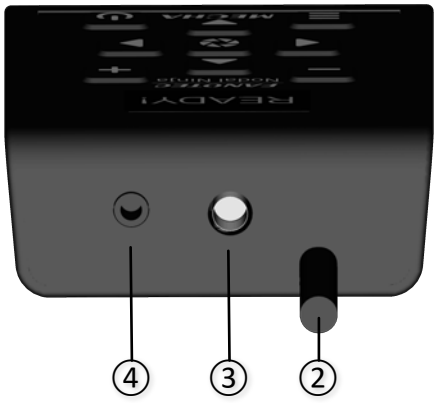
- Controlling two MECHA rotators.
- Compact with an OLED display.
- 9 buttons for controls and inputs, including a button to trigger camera shutter release.
- Shortcut keys to run presets stored in the memory, which can be configured via the OLED display and web page interface.
- Wi-Fi remote control from smartphones, tablets, PCs by using simple web page interface.
- Connection via a Wi-Fi access point and remote control over the internet.
- Over-the-air firmware update.
- Linking and controlling multiple controllers via Wi-Fi (future firmware development).
- External power input (DC 9-19V, 2A rated, plug 1.7x4.0x9.5mm) for use with different battery packs, or regulated power supplies for continuous operation.
- CAM port to trigger camera focus and shutter release.
- Support any camera with a wired remote release port.
- Multipurpose AUX port for
    - Commanding MECHA Start/Stop and other functions with a wired or wireless RF remote.
    - Commanding MECHA various functions with NN IR remote.
    - Triggering a camera with an IR remote emitter.
    - Camera shutter release confirmation.

Before First Use

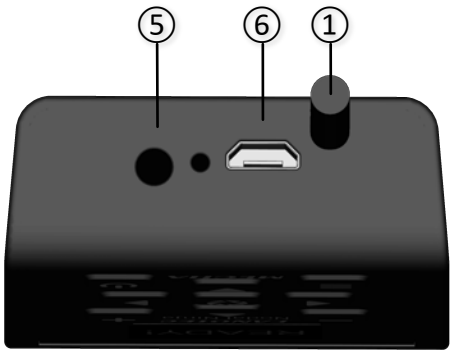
Get your equipment ready

Note the numbers 1 and 2 printed on the back of the controller, and then connect the controller to the rotators as follows:

- the end of the cable 1 to the lower rotator
- the end of the cable 2 to the upper rotator

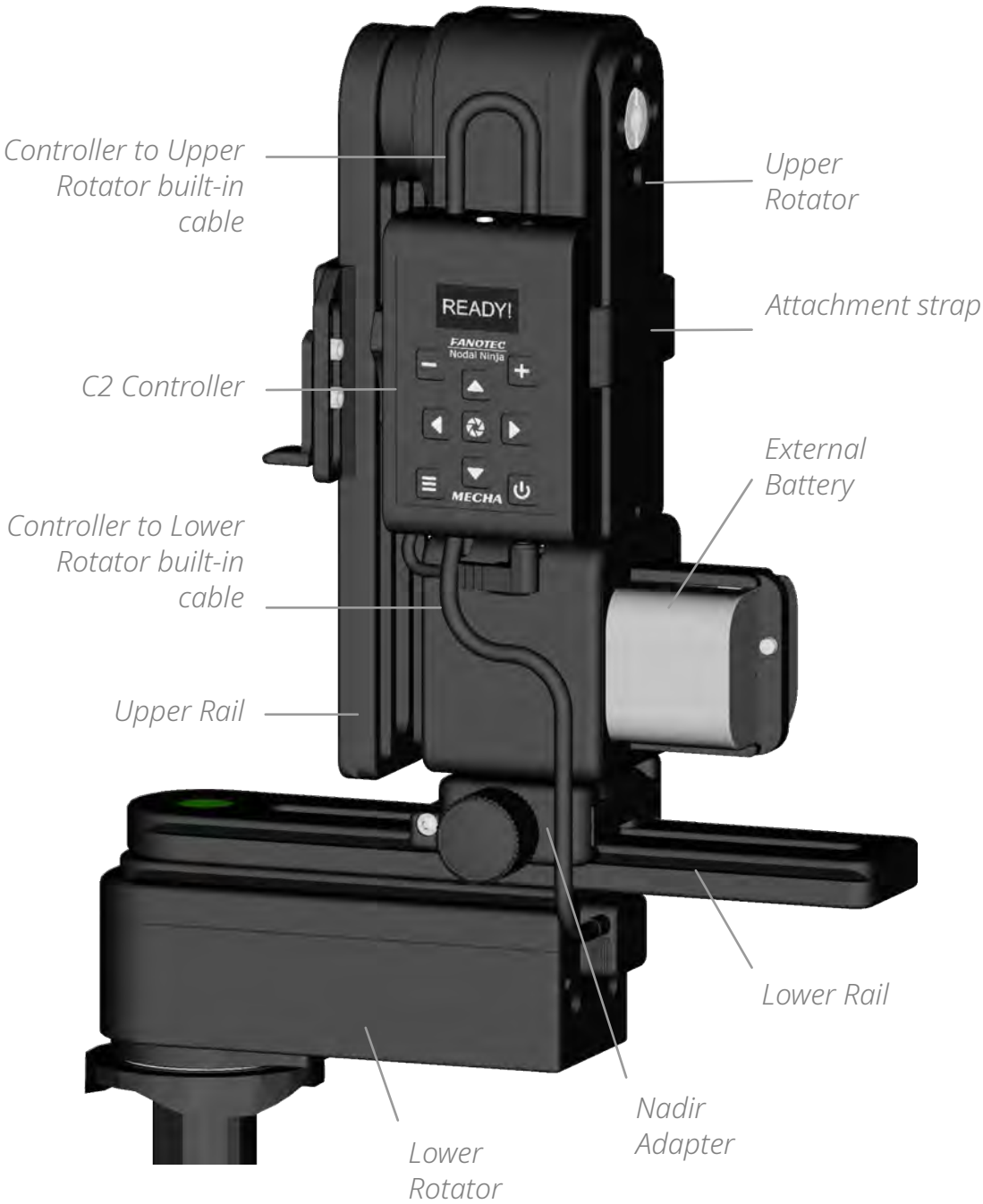


1. Controller to lower rotator built-in cable
2. Controller to upper rotator built-in cable
3. Aux Port
4. Camera Trigger Port
5. DC Power Input port
6. USB Port (mainly for programming and troubleshooting)



The lower rotator is the rotator mounted under the lower rail of the device, and the upper rotator is the vertical rotator, mounted on the upper rail.

Although the controller can be mounted in several ways, we recommend that you mount it on the upper rotator, using its attachment strap, as shown in the image below.



Related Videos

https://youtu.be/mY-aPgb-1ic

Installation Instruction for Dual-Axis MECHA C2-P1-E2 With NN6 (F9923)

https://youtu.be/X3AZjPZ-re4

Installation Instruction for Dual-Axis MECHA C2-E2 With NN6 (F9922)

https://youtu.be/iEyR3Jq9j34

Installation Instruction for Dual Axis Mecha C2-E1 With NN3 MK2 (F9920) First Batch

https://youtu.be/VKEyS24MNgY

Installation Instruction for Dual Axis MECHA C2-E1 With NN3 MK3 (F9921) First Batch

https://youtu.be/foEr50L0dZU

Power On and Test – MECHA C2

C2's Buttons

Here are some of the functions of the buttons, to give you a quick overview, and we will provide more details later when we use the buttons.

Minus button — use it to adjust values in edit mode and delete editable presets; hold it down to speed up the adjustment. It is also needed for simple rotations.

Plus button — use it to adjust values in edit mode, create presets and enter edit mode; hold it down to speed up the adjustment. It is also needed for simple rotations.

Menu button — use it to switch from a menu to another and to show information about parameters in edit mode.

Left and right buttons — menu navigation buttons. In edit mode, they increase/decrease 10 times the current value of some parameters in *Config Menu*. Use them to rotate the system manually to the left and to the right, respectively, and also to specify the direction when launching a preset.

Up and down buttons — menu navigation buttons, control the up and down movement of the upper rotator.

Center button — has a camera trigger function, confirms the execution of a preset selected from the *Preset Menu* or confirms the adjustment of values in edit mode. It can also be used to switch between pair options (ON/OFF) and show details about the current option.

Power button — use it to power on/off MECHA (long press), to confirm or cancel some operations and show the battery percentage.

NOTE. The long press of the power button is only necessary at power on/off. In all other cases, use a normal press.

Power On and Test

Position the upper rail as shown in the image on the right (**parked** position), then power on MECHA and perform the test below **without mounting a camera**.

Power on MECHA by pressing the ⏻ button for 3 to 5 seconds (long press). It may take about 35-45 seconds to start, then MECHA reaches the **idle status** and the display will show the *Preset (P) Menu*:

TEST Without Camera Mounted

Use the ▼▲ buttons to find the *PANORAMA TEST PARKED* option, which tells the MECHA C2 to execute a panorama to the right, as follows: 12 shots around, 3 rows – at 0° and +/- 45° – plus zenith and nadir, starting from **parked** position.

- Press the 📷 button to launch the test and wait until the test is performed and *PANORAMA TEST PARKED* is shown on the display again.

NOTE. The ⏻ button can always be used as an emergency stop.

Power off MECHA by pressing the power button for 3 to 5 seconds.

⚠ If the above test is not successful and you need assistance, please contact us at **mecha@nodalninja.com**

Check the Battery Level

Power on MECHA as shown above.

After that, press the button and notice the battery percentage shown on the display. The battery symbol is shown in the upper left corner of the display, alternating with the rotators in use. The dynamic IP address is shown at the bottom of the display as well.

If necessary, replace the battery. Always use a 9-19V battery, according to the technical specifications.

> If the display is not showing anything, the battery may be completely discharged and needs to be replaced.

NOTE. When the *BATTERY* warning is shown on C2's display, it can be canceled with the button.

> https://youtu.be/7X6QS__4KYk
>
> **Check the Battery Level and Set Low Battery Warnings – MECHA C2**

Simple Rotations

Power on MECHA as shown above.

In the *Preset (P) Menu*, select – or navigate to – the first option, which is *SIMPLE ROTATIONS*, then press the button to confirm. The display will show: *Set POSITION*, as in the image above.

1. **For the lower rotator**

- For 45° rotations:
  - Press ◀ then quickly press −.
  - Press ▶ then quickly press −, for the opposite direction.
- For 90° rotations:
  - Press ◀ then quickly press +.
  - Press ▶ then quickly press +, for the opposite direction.
- For 180° rotations:
  - Press ◀ then quickly press ≡.
  - Press ▶ then quickly press ≡, for the opposite direction.

2. **For the upper rotator** do the same, but use the up and down buttons instead of the left and right buttons:

- For 45° rotations:
  - Press ▼ then quickly press −.
  - Press ▲ then quickly press −, for the opposite direction.
- For 90° rotations:
  - Press ▼ then quickly press +.
  - Press ▲ then quickly press +, for the opposite direction.
- For 180° rotations:
  - Press ▼ then quickly press ≡.
  - Press ▲ then quickly press ≡, for the opposite direction.

> Note that the rotation angle for the above button combinations can be set in the *Config Menu* or on the *Configuration* page.

3. **For continuous rotation** press and hold the arrow buttons, one at a time. For example, for continuous left rotation, press and hold ◀.

When you press the ⏻ button and the battery percentage is shown on the display, you can also perform simple rotations.

Use the ⏻ button to exit.

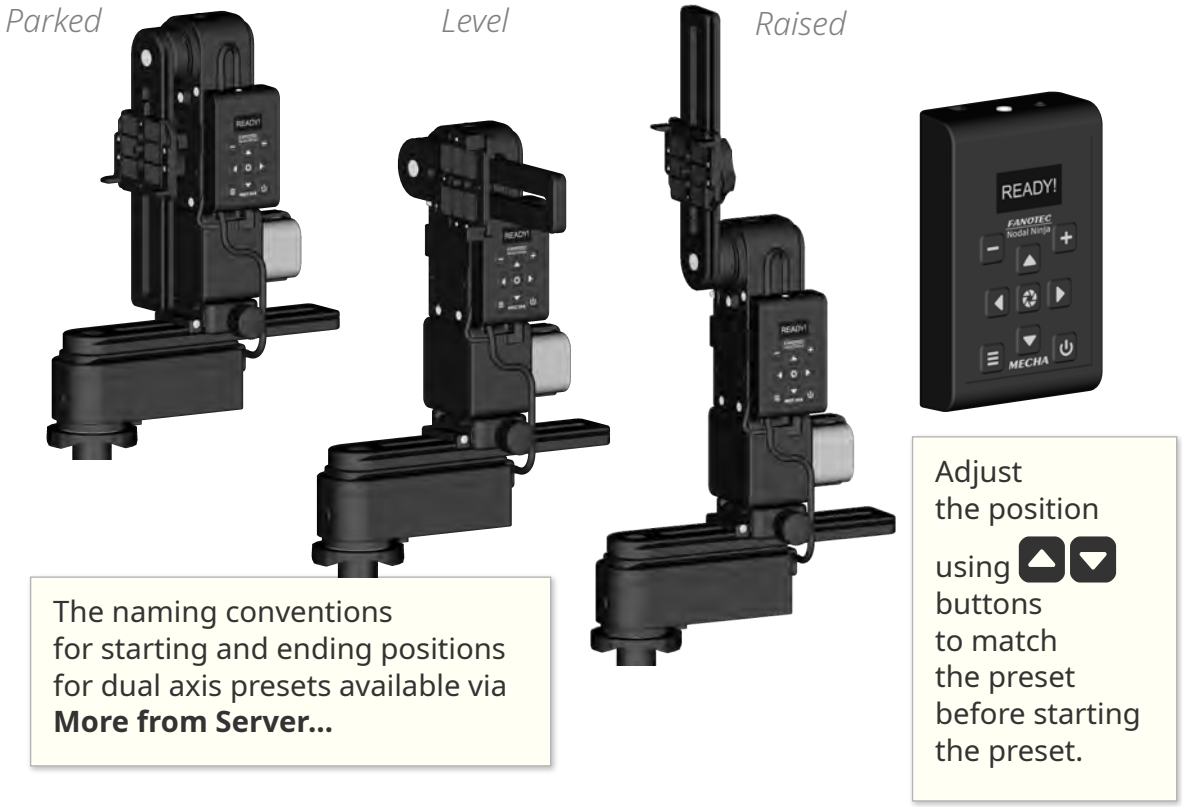
https://youtu.be/0YVjtnbwnFM

Simple Rotations – MECHA C2

⚠ If the above simple rotations do not work as expected, the rotators in use may not be set correctly (see Setting the Rotators Using C2's Menu), or the intervals 1 −, 2 +, and 3 ≡ are not the default ones in the *Config Menu* or on the *Configuration* page.

Parked, Level and Raised Positions

The Simple Rotations mentioned above are very helpful when the upper rail needs to be in a certain position. The basic positions required for presets are shown in the image below, and they are:



1. **Parked** — the most compact position, the upper rail is oriented vertically down.
2. **Level** — the upper rail is in the horizontal position.
3. **Raised** — the opposite of parked, the upper rail is oriented vertically upwards.

For example, if the current position is **parked** and the preset requires **raised**, you can do this with **one of the following** Simple Rotations:

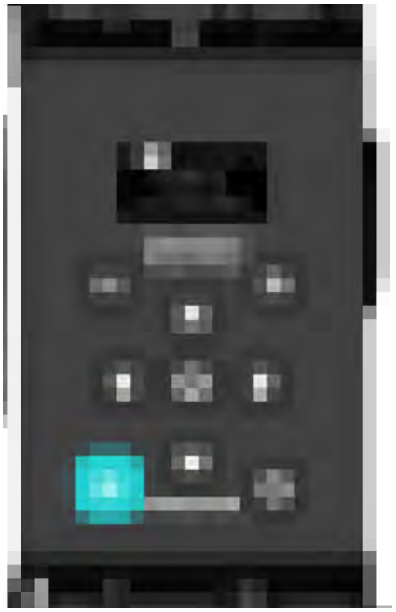
- Press ▲ then quickly press ＋, and do this twice (90°x2=180°).
- Press ▲ then quickly press ≡.
- Press and hold ▲ until the upper rail reaches the desired position.

Firmware Update Using a Hot-spot

MECHA's firmware act as the device's complete operating system, performing all control, monitoring and data manipulation functions, and it is important to have the latest version installed to benefit from all the features implemented in MECHA.

However, if you prefer not to update it at this time, or you are not comfortable with the firmware update procedure, you can skip it for now and read the next section.

Use this update method for version *(1)2201* or newer.



For this simple method of updating the firmware, we assume that you know how to set up a hot-spot on your 3G, 4G, or 5G smartphone, a smartphone with mobile data enabled and Internet available to it; in other words, you can navigate the Internet using that smartphone alone, without the smartphone being connected to a Wi-Fi.

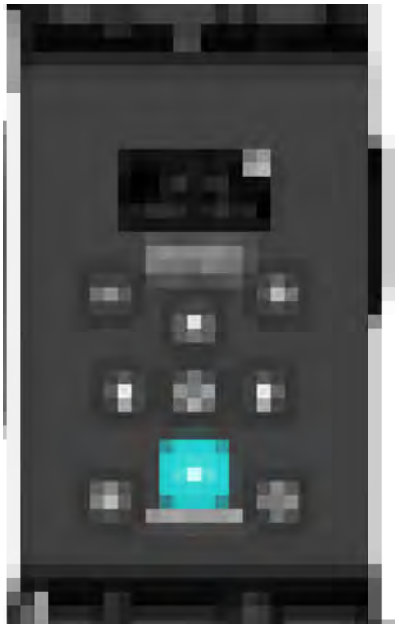
- First, set up a hot-spot with the name **MECHA-UPDATE** and (default) password **87654321**, in 2.4 GHz band.
- Press the button for about 3 to 5 seconds to power on MECHA, and wait until MECHA reaches the idle status (and the *Preset (P) Menu* is shown on C2's display).
- If MECHA doesn't reach this status, then please power it off, by pressing the button 3 seconds, and contact us at **mecha@nodalninja.com**.
- Press the button to switch to *Config (C) Menu*.
- Press the button to select page 8.
- Press the button several times, until ***UPDATE USING H-SPOT*** appears on the display, as shown in the image below.
- Press the button to launch the update. Now MECHA starts scanning the existing networks, and when it connects to the previously created hot-spot, two beeps are heard. The *UPDATE USING H-SPOT* option will update the firmware using the MECHA-UPDATE hot-spot you set.
- Now, deactivate the hot-spot, power MECHA off, then power it on.

The response shown on the display will be: **"*No update found!*"**, if Internet is not available for MECHA.

> If you use the above option without creating the hot-spot, the firmware will be updated later, when the internet will be available.

The update may take up to 5 minutes, but it could take longer in case of slow Internet connection.

> For more details on using C2's menus, please read C2's Menu Mode.



Please do not turn off MECHA while updating the firmware!

https://youtu.be/rZu4EI5AbIw

Firmware Update Using a Hot-spot – MECHA C2

C2's Menu Mode

Using C2's Menus

C2's current menus are *Preset (P) Menu* and *Config (C) Menu*.

A **preset** is a set of instructions and configuration settings, that can be saved and used when needed, to perform specific operations much faster. For example, some presets contain all the information that MECHA needs to execute a whole panorama.

1. ***Preset (P) Menu*** contains:
   - Default presets – displayed on page 1:
     - → **Test presets**: *PANORAMA TEST SINGLE 6, PANORAMA TEST PARKED, PANORAMA TEST LEVEL, PANORAMA TEST RAISED*.
     - → **Factory presets**: *KIT LENS 18(29) LEVEL, FE 12mm NZ Level, FE 16mm NZ Level, FE 20mm NZ Level, FE 24mm NZ Level*.

> One of the differences between a Test and Factory preset is that the Test preset does not require position confirmations when executing it.

   - *EMPTY* options where you can display or create your own presets, on pages 2-8.
   - Other options
     - → *SIMPLE ROTATIONS*
2. ***Config (C) Menu*** consists of various options, such as *SIMPLE/ADVANCED MODE*, *MECHA ID, MAC ADDRESS, IP ADDRESS, BATTERY PERCENTAGE, BATT. WARNING, STEP by STEP ..., IR REMOTE TEST, FIRMWARE VERSION, ROTATOR 1, ROTATOR 2*, and *UPDATE USING H-SPOT* that can be used to update the firmware, as shown in Firmware Update Using a Hot-spot.

> After powering on MECHA, the *Preset (P) Menu* is shown on the display.

Each menu consists of 8 pages, and a page can contain 10 presets or other options.

Press the button to display the next option. Press the button to display the previous option.

Press the button to go to the next page, and the button to go to the previous page. Blank page numbers will be displayed in smaller fonts.

Press the center button of C2 to confirm, execute or show details about the current option.

Use these buttons to adjust values in edit mode.

Press the button to delete an editable preset, and button to enter edit mode.

Press the button to switch to another menu. *SIMPLE MODE* is the first option in the *Config (C) Menu***.**

Press the button when you need to change it (switch) to *ADVANCED MODE*.

To execute a preset, press the button when the preset name is shown on the display, then press either the or button to specify the direction of rotation, or provide the information required by the preset.

As we will see in the next section, if the preset name contains the direction information, there is no need to press the left or right buttons, the preset is executed automatically when you press the button.

> After 10 seconds of inactivity, in some cases, the display shows contextual information that will help you use MECHA even without knowing too much about it. The *SHOW HINTS...* option in the *Config Menu* allows you to enable / disable contextual information using the button.

Creating a Preset in C2's Menu Mode

Creating a preset in C2's *Menu Mode* is very simple, fast and preferable when you do not want to access the User Interface for various reasons. The preset can be used immediately to shoot a panorama and it can also be edited later or deleted if no longer needed.

- In the *Preset (P) Menu*, use the button to find an empty option, for example *024 EMPTY*.
- Press the button to enter edit mode and adjust the preset parameters, which are:

  - ***Focal length*** (*50mm* – in the first image above) alternates with ***Number of shots*** (*12sh* – in the second image above) and ***AUTO***; press the button to toggle between the three parameters.

> Press the button to find out information about a flashing parameter – *explained show* (the third image above) – and press it again to return to the *concise show*.
>
> Use the buttons to adjust the current value.
>
> Use the button to go to the next parameter.

  - ***Number of camera triggerings in each position***. *T1* means one camera triggering. For example, if you increase the value to 3 (*T3*) using the button, there will be 3 triggerings in each position.
  - ***Exposure*** (in seconds). *E1/2* means an exposure of half a second. If you try to decrease the value below zero, notice that shutter/button confirmations options are displayd instead – *E: SHT C., E: SHT C1, E: BTN > C, E: BTN > C1* – which are explained in the User Interface chapter.

> ***Image overlap*** and ***coverage area*** can be set only when ***AUTO*** or ***focal length*** is specified (the first image above).

- ***Image overlap*** (percent). Values in the range 5-80% are allowed, or go to the next parameter if you do not want to change the current value.
- ***Coverage area***:
  - → 360 180 for a full panorama
  - → or less for a partial panorama vertically centered

> Up to three ***rows*** and the corresponding ***tilts*** can be set only when the ***number of shots*** is specified (the second image above).

- ***Rows and tilts*** examples:
  - → 12sh 0° 0° 0° — one row of 12 shots at a tilt of 0°
  - → 6sh 7.5° 0° 0° — one row of 6 shots at a tilt of 7.5°
  - → 8sh 30° -30° 0° — two rows of 8 shots: one at a tilt of 30° and the other at -30°
  - → 12sh 0° 45° -45° — three rows of 12 shots, one at a tilt of 0°, one at 45°, and the other at -45°.
- ***Position of the upper rail*** (when running this preset, the upper rail must be in this position):
  - → parked (P)
  - → level (L)
  - → or raised (R)
- ***Direction of rotation***:
  - → right
  - → left
  - → or unspecified (?), in which case the direction of rotation must be provided when the preset is executed.

The following parameters are displayed on the second and third OLED screens and explained in the User Interface chapter. For now, you can simply leave them as they are in the template.

- ***Modifier of exposure*** (M) — Modifier of the duration of shutter button signal.
- ***Auto-Focus*** (AF) — Duration of AF signal time.

- ***Wake*** (W) — Pause for camera wake-up.
- ***Before*** (B) — Pause before each triggering sequence.
- ***After*** (A) — Delay after each triggering sequence or individual triggering.
- ***Row order***. Possible values for row order are: *MDU*, *MUD*, *UMD*, *UDM*, *DMU*, *DUM*, *MD*, *MU*, *UM*, *UD*, *DM*, *DU*, *M*, *D*, *U*, where ***M*** means middle row, ***D*** - down, ***U*** - up. Let's look at some examples:
  - → *MDU* — The middle row will be photographed first, then the down row(s), then the up row(s).
  - → *MD* — The middle row first, then the down row(s). The preset will not contain the up row(s).
  - → *UD* and *DU* are special values — Although the preset will not contain the middle row, the area correspondig to it will not be missing from the panorama, as there will be an overlap in the middle, meaning that the top row closest to the middle and the bottom row closest to the middle will overlap. *UD* means the up row(s) first, then the down row(s), while *DU* is the reverse.
  - → *M* — The preset will only contain the middle row.
  - → *D* — The preset will only contain the down row(s).
  - → *U* — The preset will only contain the up row(s).
- ***Zenith and Nadir shots***:
  - → --- — no shots
  - → *Z* — one zenith shot
  - → *N* — one nadir shot
  - → *Z,N* — one zenith + one nadir shot
  - → *N,Z* — one nadir + one zenith shot
  - → *ZZ* — two zenith shots 90° apart
  - → *NN* — two nadir shots 90° apart
  - → *ZZ,N* — two zenith shots 90° apart + one nadir shot
  - → *NN,Z* — two nadir shots 90° apart + one zenith shot
  - → *Z,NN* — one zenith shot + two nadir shots 90° apart
  - → *N,ZZ* — one nadir shot + two zenith shots 90° apart
  - → *ZZ,NN* — two zenith + two nadir shots 90° apart
  - → *NN,ZZ* — two nadir + two zenith shots 90° apart
  - → *Zx2* — two zenith shots 180° apart

→ *Nx2* — two nadir shots 180° apart

→ *Zx2,N* — two zenith shots 180° apart + one nadir shot

→ *Nx2,Z* — two nadir shots 180° apart + one zenith shot

→ *Zx2,Nx2* — two zenith + two nadir shots 180° apart

→ *Nx2,Zx2* — two nadir + two zenith shots 180° apart

→ *N,PN* — one nadir shot + a pause for preparations* for the extra nadir shot

→ *Z,N,PN* — one zenith + one nadir shot + a pause for preparations* for the extra nadir shot

→ *ZZ,N,PN* — two zenith shots + one nadir shot + a pause for preparations* for the extra nadir shot

→ *ZZNN,PN* — two zenith + two nadir shots + a pause for preparations* the extra nadir shot

* For example, rotating the nadir adapter and moving the tripod.

- ***Normal*** / ***Zigzag*** — Horizontally, how to take photos in rows, row by row:
  - → *Normal*: after the last position of the first row, the first position of the second row, an so on.
  - → *Zigzag*: after the last position of the first row, the last position of the second row, then the first position of the third row, and so on.
- ***Sphere*** / ***Grid*** — Mapping type. The number of positions will be the same on every row when *Grid* is specified. *Grid* mapping is sometimes required when stitching photos for high-resolution or multi-resolution panoramas.
- ***Portrait*** / ***Landscape*** — Camera orientation when taking photos.
- ***Overlap W*** (percent) — Custom overlap on width. Values in the range 5-80% are allowed. When the main overlap (*Image overlap*) is adjusted, the *Overlap W* will also be set to the same value, so edit the main overlap first, then edit *Overlap W*, if needed.
- ***Load profile*** — *Light*, *Medium*, and *Heavy*.
- ***Speed*** in revolutions per minute.
- ***Micro-stepping*** value, simple or combined.
- ***Wait / Rewind*** — These options tell MECHA to wait after the last shot, or to rewind to the initial position.

Press the button to cancel and exit edit mode, if necessary.

- A flashing parameter means the value can be adjusted using the and buttons (hold down the desired button to speed up the adjustment).
- Use any of the buttons so you can quickly navigate to other parameter.
- The preset is automatically saved when you confirm the adjustments by pressing the button.

As soon as a preset is saved, you can start shooting or use it anytime later. Press the button to execute the preset.

- After launching the preset, the display will show *Set POSITION*, meaning you can set the initial view and position the upper rail before continuing, as shown in Simple Rotations. Press the button to skip this step if no change is needed.
- Note the + (plus) sign at the beginning of the preset name. This preset is editable and it can be
  - deleted with the button,
  - edited with the button.

The most recently selected preset serves as a template for the next one. Thus, if it is deleted by mistake, you only need to create a new preset to have the deleted one back.

What happens if the direction of rotation is not specified?

If the direction of rotation is not specified when a preset is created, then when launching the preset from the *Preset (P) Menu* it will ask for direction (*ROT. SENSE*), as shown in the second image below.

- First, optional, use the ◀ ▶ ▲ ▼ buttons to set the initial view and level the upper rail, if necessary, as shown in Simple Rotations, then press the button to confirm. Use the button to skip this step if the position of the upper rail is correct (**level** in our example) and no other adjustments are needed.

- Use the ◀ or ▶ button to execute the preset to the left or right.

- When launched by mistake, use the button to cancel.

Panorama with Automatic Shooting Pattern Using C2's Menu

This method requires the firmware version *(1)2272* or newer, and works for any lens from 4 to 1000mm, including fisheye lenses.

MECHA will compute a preset for your lens based on the data it receives when performing the following procedure:

- Power on MECHA as usual.
- Make sure the upper rail is in the **level** position.
- Place a small object in front of MECHA so that it is right in the center of the frame. The distance to the target object is not important.
- The camera and lens must be set the same as for shooting the actual panorama.

> The above three settings can be made either now or later when the display shows ***Set POSITION***.

- Now, in the *Preset (P) Menu*, use the button to find an empty option or editable preset.
- Press the button to enter edit mode.
- The first parameter is already selected and flashes, which means you can adjust it. Use the button to find the ***AUTO*** value. You can adjust the other parameters, if necessary. We assume that you have read the chapter on editing the preset and therefore know how to work with parameters.
- Press the button to confirm.
- Press the button again to launch the preset.
- When the preset asks you to *Set POSITION*, you just have to press the button to confirm, assuming that the upper rail is in the **level** position and the target object is already in the center of the frame.

- The following message appears on the display to remind you what to do next, and you have 10 seconds to read it:

- After 10 seconds, MECHA starts to rotate slowly to the right, and you have to press the button when the target object is out of the camera's view, as stated in the message.
- Then MECHA goes back to the initial position and starts to slowly tilt down, and you have to press again the button when the target object is out of the camera's view.
- Then MECHA goes back to the initial position and the computed presset can be used. So press the button to launch it, or use it later as you use any other preset.

https://youtu.be/zYqLbYMZjJs

Creating a Panorama Preset Without UI – MECHA C2

Panorama Using C2's Menu

Power on MECHA and wait until it reaches the idle status.

Setting the Rotators Using C2's Menu

The following options available in the *Config (C) Menu* can be used to tell MECHA what type of rotators are connected to it, if you purchased them separatelly, or changed the rotator type, or if you want to be sure MECHA has the correct one set.

- *ROTATOR 1 is ...* – use it to set the lower rotator.
- *ROTATOR 2 is ...* – use it to set the upper rotator.

First, find the option you need and enter edit mode using the ⊞ button. Then use the ⊟ and ⊞ buttons to find the right type of rotator and confirm pressing the 📷 button.

https://youtu.be/R0OIwuGq9lE

Setting the Rotators Using C2's Menu

Test Panoramas

Now let's continue with some tests **without mounting the camera**.

1. Position the upper rail in the **parked**, **level**, or **raised** position, as required for each of the following tests, as shown in Simple Rotations section. If the upper rail of your device is already in one of the three positions mentioned above, you can only perform the corresponding test.
2. In the *Preset (P) Menu* page 1, use the buttons to find the option specified in each test below.
3. Confirm pressing the button.

Test without Camera – Parked Position

With the upper rail in the **parked** position, as shown in the image on the right, select the *PANORAMA TEST PARKED* option:

Press the button to confirm.

This option tells the MECHA C2 to execute a panorama to the left or right, as follows: 12 shots around, 3 rows – at 0° and +/- 45° – plus zenith and nadir, starting from **parked** position.

Test without Camera – Level Position

With the upper rail in the **level** position, as shown in the image on the right, select the *PANORAMA TEST LEVEL* option:

Press the button to confirm.

This option tells the MECHA C2 to execute a panorama to the left or right, as follows: 12 shots

around, 3 rows – at 0° and +/- 45° – plus zenith and nadir, starting from **level** position.

Test without Camera – Raised Position

With the upper rail in the **raised** position, as shown in the image on the right, select the *PANORAMA TEST RAISED* option:

Press the button to confirm.

This option tells the MECHA C2 to execute a panorama to the left or right, as follows: 12 shots around, 3 rows – at 0° and +/- 45° – plus zenith and nadir, starting from **raised** position.

Panorama with Camera Mounted

If the above tests are successful, repeat at least one of them with a camera mounted.

Mount the camera on the upper rail, using the camera mounting knob shown in the image on the right.

Plug the right shutter cable for the camera in use into the Camera Port (CAM). This allows the triggering of the shutter automatically.

Use the test panoramas mentioned above whenever you want to quickly shoot this type of panorama without using the User Interface.

As we have already mentioned, a test preset does not require position confirmation when executing it, so make sure the initial view and the position of the upper rail are correct, then select the preset you need and press the button to confirm, just like in the case of tests without camera.

Basic Information About Shooting

- If none of the available presets are suitable for the type of panorama you want to shoot, select any *EMPTY* option in the *Preset (P) Menu* and create a new preset as we have already shown in Creating a preset in C2's Menu Mode section.
- Before executing any test preset with camera mounted, make sure the initial view and the position of the upper rail are correctly set, as test presets are executed without asking about positions.
- Use the buttons to find the preset you want to use and press the button to confirm.
- All presets, except test presets, request you to set some positions – *Set POSITION* – meaning you can set the initial view and position the upper rail before continuing, as shown in Simple Rotations. You can also set two corners to define a partial panorama, if needed. Press the button to confirm or skip this step.
- You may also need to set the sense of rotation – *ROT. SENSE* – which can only be left or right, so press either the or button to start shooting.
- Press the button to cancel shooting.

Shooting in Step-by-Step Mode

- In *Config (C) Menu*, find the *STEP by STEP is OFF* option and activate it by pressing the button.

- In *Preset (P) Menu*, find the preset you want to use and, depending on the preset type, launch it as shown above.
- *STEP by STEP* being *ON*, MECHA pauses before each position and waits for you to press the button to take the photo and go to the next position, resulting in step-by-step movement.
- Press the button to exit step-by-step mode and continue automatically.
- There is no need to change *STEP by STEP* from *ON* to *OFF*, as this change is done automatically.

Custom Partial Panorama Using Two Corners

When creating a preset using the C2's *Preset Menu*, one can set a *Coverage area* less than 360°x180° if a partial panorama is needed. But this partial panorama is vertically centered. To be able to shoot a custom partial panorama, MECHA needs to know the **upper left** corner and **down right** corner of the area to be photographed. Let's see how this can be done.

- Launch any preset created using C2's *Preset Menu* by pressing the button when the preset name is shown on the display (remember that this type of preset has the plus sign at the beginning of its name). The display will show *Set POSITION*, as in the image below.

- If necessary, position the upper rail as required in the preset by using the arrow buttons. In our example, notice that the position is level.
- Press the button and note that the display shows ***Up Left***, as in the image below, which means that now the upper left corner should be set.

- Use the arrow buttons to rotate the panoramic head to point to the upper left corner of the desired area, then press the button to confirm.

- Now the display shows ***Down Right***, as in the image below, and you should set the down right corner.

- Use the arrow buttons to rotate the panoramic head to point to the down right corner of the desired area, then press the button to confirm (*Set POSITION* is shown again on the display).

- By pressing the button again, MECHA walks through the two corners, which can be further adjusted. This step is not required, but allows you to make sure the corners are correctly set.

> The rotational speed when a button is held down can be adjusted using the *ARROWS speed … RPM* option in *Config Menu*.

- If necessary, after you finish setting the corners and *Set POSITION* is shown again on the display, you can set the initial view by using the arrow buttons.

- Then press the button to execute the preset.

> https://youtu.be/bleU7YEFZSc
>
> **Partial Panorama Using Two Corners – MECHA C2**

C2's Menu Options

This chapter briefly describes C2's menu options to give you an idea about what you can do using the menu.

First, to be able to use a certain option, find or navigate to that option using the navigational buttons – – then follow the instructions below and access the links provided for more details.

Usually, you can use the button to confirm or switch between ON/OFF options and the button to exit or cancel.

Preset (P) Menu

- *SIMPLE ROTATIONS* — Press the button to confirm you want to perform Simple Rotations.
  - Use a button in the set in combination with one in the set for a rotation with the angle specified in *Interval 1, 2 or 3,*
  - or press and hold a button in the first set if you need a continuous rotation.

- *PANORAMA TEST SINGLE 6* — A **test** preset for a single-row panorama: 6 shots around. For dual axis applications, make sure the upper rail is in the **level** position, then press the button to launch the preset.
- *PANORAMA TEST PARKED* — A **test** preset for a multi-row panorama: 12 shots around, 3 rows – at 0° and +/-45° – plus zenith and nadir. Make sure the upper rail is in the **parked** position, then press the button to launch the preset.
- *PANORAMA TEST LEVEL* — A **test** preset for a multi-row panorama: 12 shots around, 3 rows – at 0° and +/-45° – plus zenith and nadir. Make sure the upper rail is in the **level** position, then press the button to launch the preset.

- *PANORAMA TEST RAISED* — A **test** preset for a multi-row panorama: 12 shots around, 3 rows – at 0° and +/-45° – plus zenith and nadir. Make sure the upper rail is in the **raised** position, then press the button to launch the preset.

- *KIT LENS 18(29) LEVEL* — A preset for a multi-row panorama: 12 shots around, 3 rows – at 0° and +/-45° – plus zenith and nadir.
- *FE 12mm NZ Level* — A preset for 12mm fisheye lenses, 4 shots around, plus nadir and zenith.
- *FE 16mm NZ Level* — A preset for 16mm fisheye lenses, 6 shots around, plus nadir and zenith.
- *FE 24mm NZ Level* — A preset for 24mm fisheye lenses, 8 shots around, 2 rows – at -30° and +30° – plus zenith and nadir.

After pressing the button to launch the preset, the four presets above will require confirmation of position and direction of rotation:

  - *Set POSITION*: position the upper rail in the **level** position as shown in Simple Rotations. Press the button to confirm.
  - *ROT. SENSE*: press either the or button to start shooting.

Config (C) Menu

- *SIMPLE / ADVANCED MODE is ON* — Press the button to switch between the two options. The main difference between the two modes is that in *SIMPLE MODE* you are always in one of C2's menus and some operations are therefore easier to perform.
- *USER'S GUIDE QR CODE* — Press the button to show the QR code.
  - By pressing the button, the QR code will be displayed on a white background. With a second button press, the display will show the web address to which the code points. Press the button again to exit immediately.

- *MECHA ID* — Press the button to show the MECHA's ID, which is an identifier comprised of letters and numbers and is part of the *MAC ADDRESS*.
- *MAC ADDRESS* — Press the button to show the entire MAC address (media access control address), which uniquely identifies your MECHA.
- *IP ADDRESS* — Press the button to show the full (dynamic) IP address; you will need it to access the MECHA's User Interface on your computer.
- *BATTERY PERCENTAGE* — Press the button to show the battery percentage. You can also use the button whenever you want to show the battery percentage, but not in edit mode or when a preset is executed, because in these cases the button has a cancel/exit function.
- *BATT. WARNING AT ...* — Press either or button to enter edit mode and set the *Battery min*. For a voltage close to *Battery min*, you will see the *BATTERY* warning shown on the display (see Check the Battery Level).
- *ALWAYS ON NO POWER OFF* — Press either or button to enter edit mode and set MECHA to shut down automatically after a certain number of minutes of inactivity, or vice versa, to keep it always on.
- *+ASSISTANT* — This option allows you to specify the IP address of a second MECHA, such as a C1 mounted on a hot-shoe, which can be used for triggering purposes, without any cable between the moving parts of the gear. This particular MECHA *+ASSISTANT* can be either C1 or C2 as long as it is in STA mode and is connected to the AP of the main C2 unit. You can set a fixed IP address for the *+ASSISTANT* unit, in its *Configuration* page, like IP:192.168.8.110 SN:255.255.255.0 GW&DNS:192.168.8.1.

  A C2 using a *+ASSISTANT* will be referred to as C2+ in supporting materials. C2+ will trigger C2 and the *+unit* at the same time.

  Press the button to enter edit mode, then use the and buttons to change the last part of the IP address, which is 192.168.8.**XXX**, or choose *OFF* to disable the assistant unit. Confirm using the button, as usual.

- *DEGREES / REAL MOVE is ON* — Press the button to switch between the two options. **Note that this is only possible if the** *Allow DEGREES - REAL MOVE Switching* **is enabled on the *Configuration* page**.

  The *REAL MOVE* option allows the use of MECHA C2 to control real world devices, such as linear rails – including macro, focus and so on – but also

rotational devices, say a MECHA P1 rotator is driving a large turntable using a gearbox with ratio unknown or using belt.

To use *REAL MOVE* option:

- Mark a reference point for a REAL device driven by Rotator 1 (or lower rotator), say, on a rail.
- Switch to *DEGREES MOVE* if it is not already *ON*.
- Set *1.0 TUR* (1 turn or 360°) for *INTERVAL 3*. You can use other values if *1 TUR* is not appropriate for the device used, for example it is too small or too large.
- Press either ▶ or ◀ then ☰ for one full rotation (or according with your setting), and wait until the movement is complete. Now measure or calculate the distance the REAL device has moved from the reference point.
- Press the ⏻ button to exit, then navigate to *i3 REAL MOVE 1* option and enter the value calculated or measured before. Say 100.0 for 100.0 mm.
- Switch to *REAL MOVE*. Now MECHA creates a conversion factor and will interpret all the numeric values as real values. 100.0 will be 100 mm on the REAL device wherever these numeric values are used, in button intervals, presets, or scripts.

To go back to values interpreted as degrees, switch to *DEGREES MOVE ON*.

Do the same for the Rotator 2 (or upper rotator), if needed, with *i3 REAL MOVE 2* as final adjustment.

There is no need to repeat this process unless you have changed the REAL device type used. When *DEGREES MOVE* is *ON*, you can set the desired value for *Interval 3*, and the conversion factor already created will not change.

- *STEP by STEP is ON / OFF* — Press the button to switch between the two options (see Shooting in Step-by-Step Mode).
- *MOTOR 1 is ENABLED / DISABLED* — Press the button to switch between the two options. The **lower** motor will be enabled/disabled.
- *MOTOR 2 is ENABLED / DISABLED* — Press the button to switch between the two options. The **upper** motor will be enabled/disabled.
- *DISABLE / ENABLE MOTOR 1 & 2* — Press the button to switch between the two options. **Both** the lower and upper motors will be enabled/disabled.

- *CHANGE SENSE LEFT-RIGHT* — Press the button to change the sense of left/right rotation when it is done manually using the and buttons.
- *CHANGE SENSE UP-DOWN* — Press the button to change the sense of up/down rotation when it is done manually using the and buttons.
- *ARROWS speed ... RPM* — Press either or button to enter edit mode and adjust the rotational speed when a button is held down (see Arrow Buttons).
- *INTERVAL 1/2/3* and *Interval 1/2/3 speed* are the angles of rotation and corresponding speeds for Simple Rotations. Press either or button to enter edit mode and adjust their value.
- *LEVEL AMOUNT* — The angle at which the upper rail is rotated after powering on if you press the button when the display shows **-+=**.

  The upper rail should be in the **parked** position at powering ON.

  Enter edit mode using the button and adjust the *LEVEL AMOUNT*, or adjust it right after the rotation, when there is the possibility to omit the confirmation of the change, meaning that you can press the button instead of pressing the button as usual. This means that the new value is only available during the current work session, until MECHA is powered off.

  If the upper rotator has a position sensor, MECHA will use it as reference and the rotation will be more accurate. When adjusting the *LEVEl AMOUNT*:

  - **X** – will be shown if you are in the area of the positioning sensor
  - **!** – will be shown if the sensor is not detected at leveling, which is normal for E1, and may be necessary to disassemble and assemble the upper rail rotated 180° in the case of E2 or P1 .

- *SHOW HINTS is ON / OFF* — Press the button to switch between the two options. If enabled, the display will show contextual information to help you use C2's Menus.
- *Default Wi-Fi is AP / STA / AP+STA / OFF* — Press either or button to enter edit mode and select the desired option.

- *CONNECT TO Wi-Fi* — By pressing the button when this option is displayed, MECHA will try to connect to the last known Wi-Fi network.
- *KEEP PAGE is ON / OFF* — Press the button to switch between the two options. If enabled, the and buttons will not change the page, thus will not go through all the options from all pages.
- *USE NN IR is ON / OFF* — Press the button to switch between the two options. Choose the *ON* option to be able to use Nodal Ninja IR Remote.
- *IR REMOTE TEST* — This option allows you to test the IR Remote. Press the button to start the test. During the test MECHA will not execute the commands received from the IR Commander's buttons. Instead, it will only beep and show on its display the code of the button pressed (after the button is released).
- *at SHOOT, OLED is ON / OFF* — Press the button to switch between the two options. *ON* means that the display will be ON during the exposure time, while *OFF* is the reverse.
- *OLED TEST* — This option allows you to check if the OLED works.
- *Shutter CONF. TEST* — Before launching the test, connect a camera to the MECHA's *CAM* port using a PC sync cable, then do the following:
    - Find the *Shutter CONF. TEST* option on page 6 of the *Config Menu* and press the button to launch the test.

    - Trigger the camera a few times, manually, by pressing the camera's trigger button or using a camera remote. Note that if no action is detected, the test ends automatically after 10 seconds.
    - Now MECHA will count the shutter detections from camera via the AUX port and show on C2's display the number of detections after 10 seconds of idling. For example, if you trigger the camera 4 times, the display should show ***4*** if the test is successful.

> *Use New Shutter Confirmation* checkbox is enabled by default on *Configuration* page. If the above *Shutter CONF. TEST* fails, please perform the test again with the ***Use New Shutter Confirmation*** disabled.

- *ROTATOR 1 is ...* — Press either or button to enter edit mode and set the desired rotator as lower rotator.
- *ROTATOR 2 is ...* — Press either or button to enter edit mode and set the desired rotator as **upper** rotator.
- *ROT. 2 SENSOR is ENABLED / DISABLED* — Press the button to switch between the two options. If E2 or P1 have no sensor (like some prototypes), or you do not want it to be used, then it can be disabled with this option. Therefore, the leveling at powering on will be done without sensor, assuming the upper rail is in the **parked** position.
  - If E2 or P1 is used as upper rotator with *ROT.2 SENSOR ENABLED*, at ***Set POSITION*** in Simple Mode (or out of Menu in Advanced Mode), by pressing then quickly , MECHA will level the upper rail if the camera is above and near the **level** position, or below the **level** position, down to **parked**.
  - If Rotator 2 sensor *is DISABLED* (or not supported), by pressing then quickly , MECHA will perform a 90º rotation up, and by pressing then quickly , it will perform a 90º rotation down.

  So now you can set button intervals freely, as there is and and for 90º rotations.

Backlash compensation options

- *BACKLASH 1 COMPENSATION* — Compensation of backlash for the **lower** rotator.
- *BACKLASH 2 COMPENSATION* — Compensation of backlash for the **upper** rotator.

The purpose of backlash compensation is to improve the precision of left-right and up-down movements, and it can be performed after a long period of use.

Press the button to start the backlash compensation procedure and wait until the power button symbol start flashing on the display, then press the button when you notice that MECHA starts moving very slightly to the left.

- *i3 REAL MOVE 1 / 2* — This is the length of a path traveled by a REAL device controlled by the Rotator 1/2 for a certain amount of rotation performed by MECHA. See the *REAL MOVE* option for more details. Press either or button to enter edit mode and adjust its value.
- *ZENITH / NADIR POS.* — Press either or button to enter edit mode if you need to change the default values, which are 90° and -90°. Other values may be useful for backlash reasons or to have a certain overlap. MECHA will use these values in scripts that contain Z and N.
- *UPDATE* — Press the button to re-update the current firmware. MECHA will use the latest data connection available to connect to the internet.
- *REBOOT* — Press the button to reboot MECHA without power cycling it.
- *FIRMWARE VERSION* — Press the button to show the current firmware version for all MCUs (microcontroller units) and connected rotators. The first (MECHA's firmware) is the one you update over the internet using the *UPDATE* options. The others cannot be updated in the same way, but it is good to know where to find them in case you need assistance.
- *UPDATE USING H-SPOT* — Press the button to update the firmware using a hot-spot with the name **MECHA-UPDATE** and (default) password **87654321**, which needs to be created and active before using this option (see Firmware Update Using a Hot-spot).

Reset options

- *RESET CONFIG. TO DEFAULT !* — Resets the configuration settings to their default values, for example: SSID password → 12345678, Password for Configuration page → Mecha, Hot-Spot password for firmware update → 87654321, Default Mode → AP.
- *FACTORY RESET !* — Will restore your MECHA to its original factory settings.

Press the button to start the reset procedure and follow the intructions on the display:

  - After a few seconds, you are asked to repeat the step above, so press again the button when the reset option appears on the display.

- Then the power button symbol start flashing on the display, which means you have to press the button, and wait until the reset procedure is completed.

- *QUIET − LOUD BEEP* — Press the button to switch between the two options.

How to Access the UI

About the User Interface

To access the MECHA's User Interface, a device with an Internet browser needs to be used. It can be a smartphone, or a tablet, or even your own computer.

MECHA uses wireless connection, abbreviated Wi-Fi.

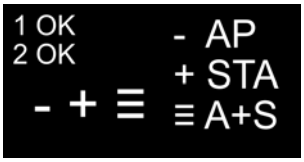
It can be set as AP (Access Point), or STA (Station), or even both: AP+STA, as well as no Wi-Fi, in which case the control is possible only by buttons.

The desired mode can be set as default in MECHA's *Configuration* page, or by a short press of a button when MECHA expects this, and this is when - + ≡ is shown on the display, during the starting sequence, as in the image on the right.

Set MECHA in AP, STA, or AP+STA Mode at - + ≡ on Display

First, power on MECHA pressing the button for 3 to 5 seconds.

When - + ≡ is shown on C2's display:



- pressing will set MECHA in AP mode
- pressing will set MECHA in STA mode
- pressing will set MECHA in AP+STA mode

> If you missed the setting time, power MECHA off and on again, and this time make sure you act faster. Also, if the desired option is already selected, then you don't have to select it again.

When MECHA is in AP or AP+STA mode, it broadcasts a SSID with a specific name – the default name contains the word "MECHA" in it – to which the smartphone can be connected using a password, which is 12345678 by default.

Once the smartphone is connected to the MECHA's SSID, the MECHA's User Interface can be accessed in browser at **192.168.8.1**

When MECHA is in STA or AP+STA, it can also connect to the SSID of a particular network, other than MECHA's own SSID, and as a result the User Interface of MECHA can also be accessed at the address given in that particular network, like this: 192.168.1.100

The particular network can be managed by the smartphone itself, if on smartphone a hot-spot is enabled and MECHA can connect to it.

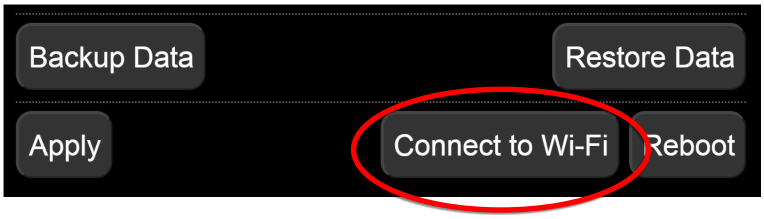
Access the User Interface (UI) with a Smartphone

- Press the power button, ⏻, for about 3 to 5 seconds to power on MECHA, and wait until **- + ≡** is shown on the display.
- To be able to connect your smartphone to MECHA's network, MECHA must be in AP mode. So press either −, to set MECHA in AP mode, or ≡, to set MECHA in AP+STA mode.
- Tap *Settings* icon on your device. Under *Wireless and Networks*, make sure *Wi-Fi* is turned on, then tap *Wi-Fi*. Tap the nettwork name that contains **MECHA** in its name, to connect the smartphone to MECHA. The default password for MECHA's network is **12345678**.
- Now MECHA's User Interface (UI) can be accessed on the smartphone's browser at: **192.168.8.1** (which is a static IP address).

MECHA ACCESS POINT IP
http://192.168.8.1/

Access the User Interface (UI) on Your Computer Connected to a Wireless Network

- The first step is to access the User Interface (UI) with your smartphone, as shown above, and preferably **set the AP+STA mode**. After that:



  - Press the *[Connect to Wi-Fi]* button on the *Configuration* page (there is a similar button on the *Row* page).
  - Select the name of the Wi-Fi network you want to connect to and enter the password. Please see User Interface – Connect to Wi-Fi for more details.

> In this way, MECHA has the connection data to a Wi-Fi network and is able to connect to this network when needed. The above step is required only once for a certain network. If the network changes or you have deleted the connection data, then you need to repeat this step, because MECHA saves only the last accessed network.

- To be able to see MECHA's UI on your PC, MECHA must be in **STA**, or **AP+STA**, mode.
  - If you set the AP + STA mode, as requested in the previous step, you can proceed to the last step.
  - If, for some reasons, the set mode is AP, power off MECHA, then power it on, pressing the ⏻ button for about 3 to 5 seconds, and wait until - + ≡ is shown on the display. Now press either +, to set MECHA in STA mode, or ≡, to set MECHA in AP+STA mode. (You can also make this setting on the *Configuration* page.)
- Now you can access the MECHA's UI on your computer's browser by entering the IP address shown on the controller display, like 192.168.2.104, in the browser address bar, at the top of the window.

Test Using the UI

Some tests performed before – using the C2's *Menu* – now, in this chapter, we want to perform them using the User Interface, so please access the User Interface with your smartphone, for example, then access the *Row* page.

Tap the *[info]* button at the top of the *Row* page whenever you want to find out more details about the functions of the controls available on the User Interface.

At the same time, at the top of the page are displayed three links to some useful pages: a quick *help* page, the *configuration* page and the *new* page:

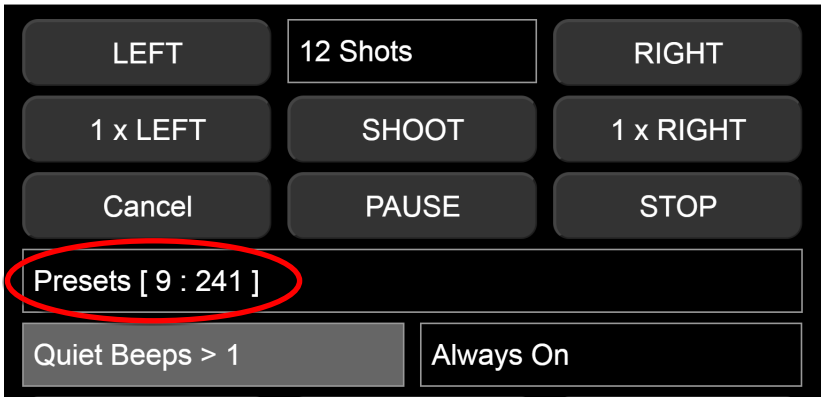
When using the User Interface, you can display all or only some of the controls. To see them all, select *A3* from the select list next to the *[info]* button, which is the highest level of complexity for the interface. The other options are: *S1*, *S2*, *S3*, *A1*, and *A2*, where ***S*** means **Simple**, and ***A*** – **Advanced**.

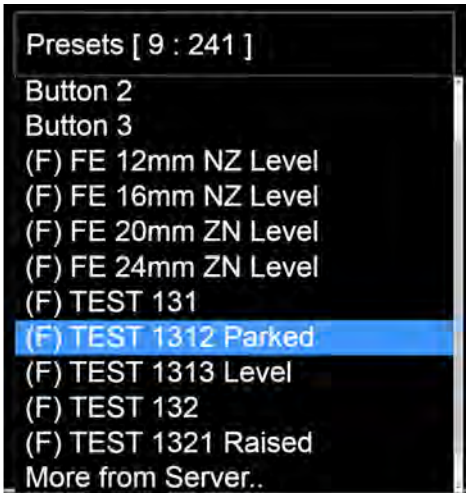
Although C2 is designed to work for dual axis applications, you may use it for single axis applications as well, so with C2 you can use both dual axis (DAC) and single axis presets.

UI Test – Parked, Level, Raised

To perform the same tests that you did before using the C2's *Preset (P) Menu*, proceed as follows using the UI buttons:

- On the *Row* page, tap *Presets* and select *TEST 1312 Parked* from the *Presets* list, which is the panorama executed before, on the chapter Panorama Using C2's Menu (12 shots around, 3 rows – at 0° and +/- 45° – plus zenith and nadir). If necessary, use the left/right buttons to position the upper rail in the **parked** position.





To load the preset, tap the *[Load]* button, if visible, under *Presets* list. Otherwise, it means the UI complexity is *S* (Simple) and some buttons and options are not visible, and the selected preset is already loaded. That means you can go to the next step.

- Tap the *[LEFT]* button to execute the preset to the left, or *[RIGHT]* button to execute the preset to the right.

Do the same with the presets *TEST 1313 Level* and *TEST 1321 Raised*. Use the ▲▼ buttons to position the upper rail in the **level** or **raised** position.

Advanced Mode

User Interface (UI)

UI Controls

In this chapter, we will explain the functions of the buttons and the options available on the *Row* page. *Ring* and *Turn* pages are quite similar to *Row*.

Access the User Interface as shown in the chapter How to Access the UI, and tap/click the *[Row]* button to access the *Row* page.

- Tap/click the *[info]* button, at the top of the *Row* page, to show the descriptions for all the controls. At the same time, three more buttons are displayed at the top of the page – *[HELP]*, *[Config]*, and *[NEW]* – for accessing the following pages:
  - *Help* — Useful information and codes. See the Current Codes List at the end of the guide.
  - *Configuration page* — User: **admin**, and default password: **Mecha**.
  - *What's new?* — The page where you can find information about the current firmware version and the versions published so far.
- *Level of complexity* — Next to the *[info]* button there is a list of options to set the level of complexity for the User Interface, from the simplest (*S1*) to the most complex (*A3*). Select *A3* to show all the controls.
- *Firmware version* — Under the *Row* label, note the current firmware version, *(1)2250* in our example (images shown in this guide may not be an exact representation of the current firmware version). Click this tag to access the *What's new?* page.
- *Battery voltage* — At the right side of the page, see the battery voltage. Set the minimum and maximum voltage values in the *Configuration* page to display percentages instead of voltage.
- *Hand symbol* — Toggles gesture mode. Tap the screen and drag to see how it works. Always make sure there are no objects near the robot, especially in gesture mode.

- *Status Feedback* — In the next area, the *MECHA's ID*, the *Refresh rate of the motor/controller status* and the *Current lower rotator* are displayed, followed by the *Current angle position* for both rotators, and the *Current status* (shots remaining, position, repeat set). The *Status Feedback* (SF) also reflects the tilt angle for the 2nd axis. When scripting is used, yaw is shown on *Status Feedback* as well.

- At the right side of this area, note the *Current time*, *Current date or time remaining*, *Current rotation degree interval*, *Seconds remaining in current delay*.

- *Horizontal slider* — Allows manual rotation in degrees, relative to the current position. Click/tap the screen and drag to the left or right.

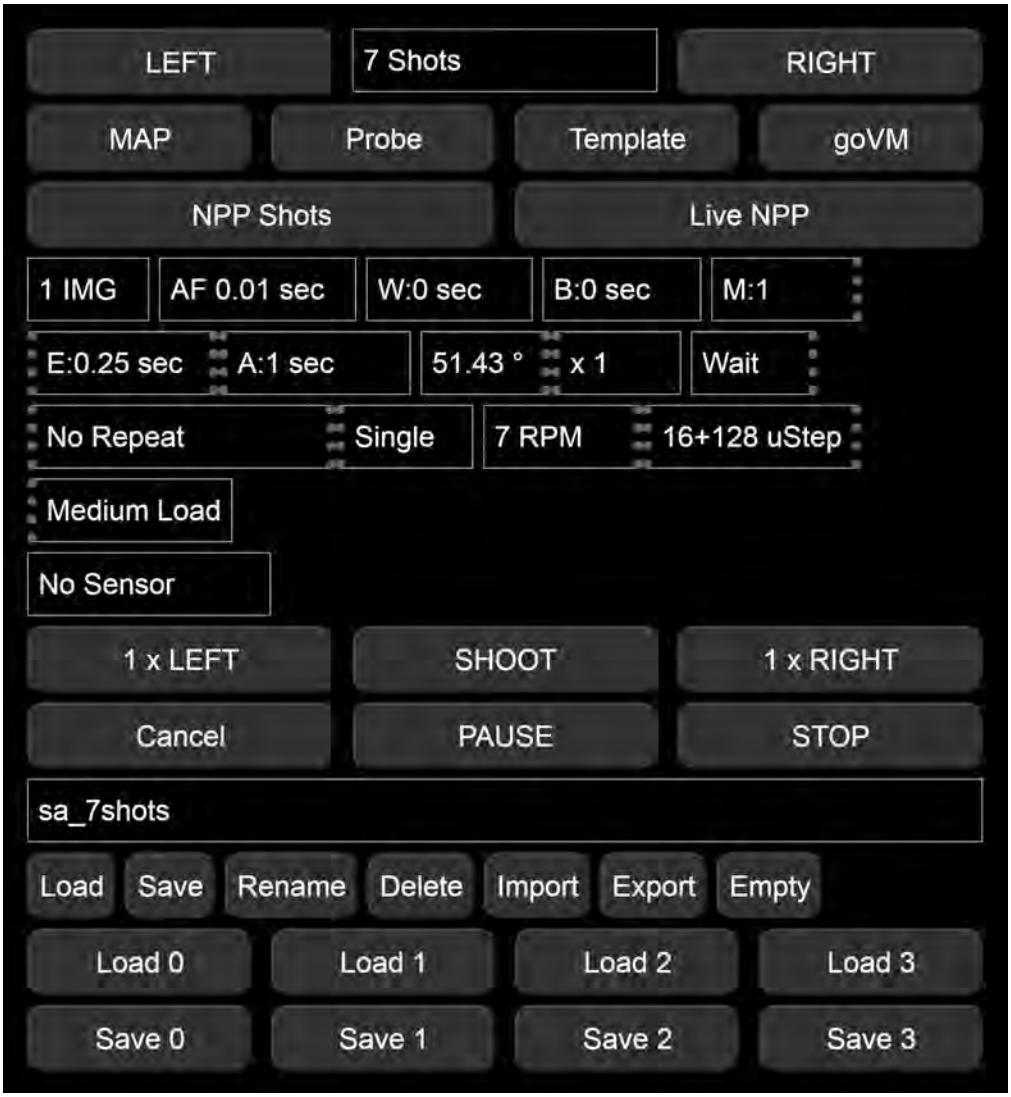
The controls shown in the image below, are directly related to the current preset and settings. The values displayed in the fields are the current preset (*sa_7shots*, in our example).

- *[LEFT]* button — Shoots a 360° panorama counter-clockwise. In our example, the panorama consists of 7 photos, and the first photo is taken in the current position, followed by the second 51.43° apart, and so on.
- *Shots* — Number of shots around for a 360° row. Select the number of shots from the list, or select *Custom* and enter the desired number of shots, or the focal length of the lens used followed by *mm*. The *mm2* notation is also accepted. For example, *28 mm2* will compute the full spherical panorama for a 28 mm lens, using *Repeat*. If the number of shots is 1, using the *[LEFT]* button, only one photo is taken followed by a rotation of 360° (return to the initial position), if the *Wait* option is selected. Useful when shooting (filming) 360°. If the *Rewind* option is selected, the rotation is 0° (no rotation).
- *[RIGHT]* button — Shoots a 360° panorama clockwise. It is similar to *[LEFT]* button, but the rotation is to the right.
- *[MAP]* button — Downloads a PTGui file with the current preset. Use this button after all the settings are set as you want.

MECHA will also offer to download a *map.zip* file containing three small .png images. The images are the same for any map.

A high resolution set is also available here, with **Mecha** as zip password:

https://www.nodalninja.com/MECHA-MAP/map-png.zip



- *[Template]* button — Downloads a PTGui file that can be applied to a real set of images. This template also contains the focal length.
- *[Probe]* button — Downloads a probe (a PTGui file) from shooting pattern to study/refine the overlap.
- *[goVM]* button — Downloads a script (a *goVM.py* file) for the upcoming Virtual MECHA. Until Virtual MECHA will be available, this file can be also used for support and demo purposes.
- *[NPP Shots]* button — Takes two shots for NPP (No-Parallax Point) check.

- *[Live NPP]* button — Displays the instructions for determining the NPP along lens axis using camera live view, as follows:
  - Use two vertical reference points with one far behind the other. Turn on live view mode. Position tripod to line them up at image center. Use grid and magnified view for greater accuracy.
  - Scroll left to see the reference points. Slide the lens back or forth to line them up, **being careful not to move the tripod**!
  - Scroll right to see the reference points. Carefully slide the lens back or forth to line them up, if needed.
  - Check if the reference points are still perfectly lined up at image center. Nudge tripod to line them up, if needed.
  - Check if the reference points are lined up to the same extent as in the last step. Carefully adjust to achieve similar alignment.
  - End of Live NPP procedure. Repeat the process to confirm alignment, if needed.

- *TRG* — Number of camera triggerings for each position. Select zero if no triggering is needed. When using automatic exposure bracketing in continuous shooting or self-timer mode, MECHA treats it as 1 triggering. In our example: 1 triggering.
- *AF (Auto-Focus)* — Duration of AF signal time, for example, 0.05. If the value is negative, the AF signal will be ON during the entire image sequence. In order to trigger the camera, for some Sony cameras, you have to set an AF value greater than zero, even if the camera focus is set to manual.
- *W (Wake)* — Duration of the signal for camera wake-up. If the value is negative, the pause will be forced even when the camera is ON, before each sequence begins. Also, it will force a *B (Before)* delay in case of *B: not zero*. A small negative value, under 1 second – for example, *W:-0.9* s, or *W:-0.1* s – will trigger the *Wake* signal, which is a focus signal, before every position instead of only at the beginning of a session. Useful for moving out of the camera's view.

- When *W* delay is negative, B delay is referenced to MCU's clock rather than added delay. For example, in time lapse sessions, for *W:-0.001 sec* and *B:5 sec*, the result will be a shot at every 5 seconds. If movements are executed, the value of B needs to be large enough to cover the time taken by the move.
- Also, when *W* delay is negative, a log file – */intervals.txt* – will be produced, with all the intervals, in ms, between the triggerings of the shutter done by MECHA.

- *B (Before)* — The pause before each triggering sequence. If the value is negative, up to 2 seconds will be used for Mirror Lock Up.
- *M (M*odifier of Exposure) — Modifier of the duration of shutter button signal, a list of multipliers, like 1,0.5,2 for normal, half and double exposure time, respectively, in case of 3 *TRG*, or it can be entered as -0.7EV (for under, normal, over), or 0.7EV (for normal, under, over), in which case it will automatically extend to the number of *TRG*. If the modifier starts with B, like B-2EV, or B1, or 1,0.5,2, the "Bulb" mode will be assumed.
- *E (E*xposure) — Duration of shutter button signal, for example, 3 or 0.5*3 for progressive half Exposure, or 2*3 for progressive double Exposure in a set. These can be entered as custom values. The values can be entered as 1/100.

- *E: SHT C., E: SHT C1* — Fast Shutter Confirmation is automatically used if *E:SHT C.* or *E:SHT C1* is set in preset. Both options work as a variable pause. In the case of the *E: SHT C1* option, MECHA sends only One Signal to the camera and waits for *TRG* confirmations (the *[STOP]* and *[Cancel]* buttons in the User Interface can also be used to cancel the wait). This is useful when you have your camera set for bracketing, to press the button one time and the camera to take automatically the whole bracketing set.

> Use *E:SHT C1* or *E:SHT C.* only if the OLED test is successful (see the *Shutter CONF. TEST* option in the *Config Menu*), otherwise use the Button Confirmation instead: *E:BTN* > *C*. or *E:BTN* > *CT*.

To be able to use the Shutter Confirmation feature, connect the ***Mecha 3.5mm to Male PC Sync Cable*** (cable for shutter release confirmation, F9981) to the Aux Port of the MECHA C1 or C2 Controller used and to the PC Sync Port of your camera.

If your camera does not have a PC Sync Port, then you need a ***Flash Shoe to PC Sync Adapter*** (such as F9982, F9983 or F9984).

Shutter release confirmation and IR remote control is possible with a receiver like the one in the image below. In this case, connect the receiver to the Aux Port of the C1 or C2 Controller used and connect the cable for shutter release confirmation (F9981) to the female jack of the receiver.

- *E: BTN > C, E: BTN > C1* — Button confirmation options.
  - → *E: BTN > C.* — MECHA will wait, after any triggering, for confirmation with the ▶ button on the controller or NN IR Remote to continue.
  - → *E: BTN > CT* — MECHA will only wait for *TRG* confirmations with the ▶ button on the controller or NN IR Remote, then it will use the learned delay(s) to finish the preset.

- *A (A*fter) — The delay after each triggering sequence or individual triggering. If the value is negative, there will be a delay after each shutter actuation.
- *Degrees of rotation* — The rotation angle between two consecutive positions in a sequence, specified for *[N x LEFT]* or *[N x RIGHT]* buttons. The rotation angle is updated automatically, simultaneously with the number of *Shots*. However, if the rotation angle is changed, the number of *Shots* does not change. Use this feature when you want to take a certain number of shots, not an entire panorama. Specify this number in the next field (*x N*), and execute the sequence with the *[N x LEFT]* or *[N x RIGHT]* buttons.
- *x N* — The number of moves (N) for *[N x LEFT]* or *[N x RIGHT]* buttons.
- *Wait/Rewind* — these options tell MECHA to *wait* after the last shot, or to rewind to the initial position. *Rewind* is useful if there are cables attached, or for partial panorama and time-lapse.
- *Repeat* — Delay in seconds until the shooting sequence will be repeated automatically, for example, 300 for 5 minutes, or 4*300 to repeat 4 times 5 minutes apart, or 0, or *no repeat*, for no repeat.
- *Single / Dual / Scripted* — Select *Single* for single axis applications. However, you can select *Dual* even if there are no instructions for the second axis. *Scripted* is valid for both types of applications. See MECHA's Simple Scripting (MSS) for details about *Scripted* option.
- *Speed* — Speed denoted by Revolutions Per Minute. Select an option from the list, or enter a value via *Custom*.

> If the *Speed* value is too high, the device may stop or move too fast, in which case be prepared to stop it by clicking/tapping the *[Stop]* button.

- *uStep* — Micro-stepping value, simple or combined; for example, different values for acceleration + constant speed region.

- *Load* — The options for *Load* are: *Custom*, *Light*, *Medium*, *Heavy*, and *Ring*. These are optimized motion profiles for a rated load. We encourage you to try them all, to see which one is best for the camera and lens you are using, or for what you want to do. You may prefer the *Heavy* option, even if you use a light camera.

- *[N x LEFT]* button — Shoots & rotates counterclockwise for N positions with the degrees interval specified above, regardless of the number of shots specified in the *Shots* field.

  For example, if you want to take 3 shots 45° apart to the left, set the degrees of rotation to 45°, and the number of positions to 3, as in the image below, and click the *[3 x LEFT]* button.

- *[Shoot]* button — Shoots the number of photos in a set for a single position. In our example, 1 photo (*1 TRG*) is taken. Use this feature when you want to take some photos in a certain position, without any rotation.
- *[N x RIGHT]* button — The same as *[N x LEFT]*, but the shooting and rotation are done clockwise.

- *[Cancel]* button — Executes a smooth stop and a rewind to the initial position, where the preset has started.
- *[PAUSE] button* — Pauses the current running preset. Click/tap again this button to continue.
  - The **21<** code switches MECHA to or off pause mode, the same as clicking the *[Pause]* button on UI, or on IR Remote.
  - While MECHA is in pause mode, the text „PAUSE" is shown on C2's display.

- If MECHA is in pause mode and a preset is started, MECHA will pause before every position, resulting in step-by-step movement, and the text „STEP BY STEP" is shown on C2's display.
- When MECHA runs a preset and is paused, you can press , or on IR Remote, or *[PAUSE/NEXT]* on UI, to continue to the next position.
- If, instead, is pressed on C2 or on IR Remote, MECHA will continue to the next position and switches on/off the step-by-step mode.

The above allows both:

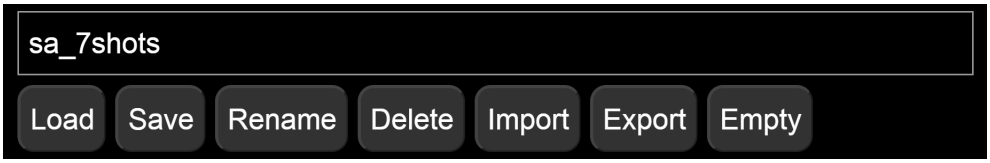
1. Starting a preset in step by step, then switch off step by step when it is not needed, thus the preset will continue automatically.
2. If a preset is paused by remote/UI/script, then pressing will advance and switch on/off the step by step.

   A possible application is a spherical panorama with certain areas needing to be done step by step, and which areas depends on the events on the field.

   During the pause, pressing on IR Remote, or *[SHOOT]* on UI, MECHA will trigger the number of shots specified by *[TRG]* in presets.

   This can be used for extra shots for a particular position.

- *[STOP]* — Emergency stop.



- *Presets list* — This list contains all the presets, both those created and those downloaded from the server.
  - The names of the presets downloaded from the server start with (s), which means they are not saved yet. You can load and save the presets you want to keep.
  - The option *More from Server...* allows you to download presets from the server.
- *[Load]* button — Loads the preset selected from the *Presets* list. In our example, the current preset is *sa_7shots*.
- *[Save]* button — Allows you to save the current preset with the same name (overwrite), or with a different name.
- *[Rename]* button — Allows you to rename the selected preset.

- *[Delete]* button — Deletes the selected preset.
- *[Import]* button — Imports a preset and displays it in the *Presets* list, or multiple presets at once, if *all_presets(..).mps* file is given when importing.
- *[Export]* button — Exports the selected preset, or exports all the presets, if *Presets* is selected.
- *[Empty]* button — Empties the *Presets LIST* without deleting the presets.

- *[Load 0]* button — Loads the default preset, the preset saved using the *[Save 0]* button.
- *[Load 1]* button — Loads the preset assigned to the button using the *[Save 1]* button.
- *[Load 2]* button — Loads the preset assigned to the button using the *[Save 2]* button.
- *[Load 3]* button — Loads the preset assigned to the button using the *[Save 3]* button.
- *[Save 0]* button — Saves the current preset as default preset that can be loaded with the *[Load 0]* button.
- *[Save 1]* button — Saves the current preset and assigns it to the button, and can also be loaded with the *[Load 1]* button on the User Interface.
- *[Save 2]* button — Saves the current preset and assigns it to the button, and can also be loaded with the *[Load 2]* button on the User Interface.
- *[Save 3]* button — Saves the current preset and assigns it to the button, and can also be loaded with the *[Load 3]* button on the User Interface.

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- *[Reboot]* button — Restarts MECHA, similar to restarting a computer.
- Default page at start — MECHA's home page, or start page, can be one of the following pages: *Row*, *Ring*, or *New* (like in our example). Select the desired option from the list.
- *Volume of Beeps* — A value from 0 to 250, and can be entered via *Custom*, or select another option from the list.
- *Power Saving Mode* — A list of options to set MECHA to shut down automatically after a certain number of minutes of inactivity, or vice versa, to keep it always on. The setting for this field can be done on the *Configuration* page, in which case it has priority over other options, and is displayed on a gray background.
- *[Go to Ring]* button — Accesses the *Ring* page, and alternates with *[Go to Row]*.
- *[Shut Down]* button — Shuts down MECHA in 20 seconds. Press *[Cancel]* or *[Stop]* to cancel.
-

  [Connect to Wi-Fi] button — Initiates the process of connecting to a Wi-Fi network to use MECHA in STA (Station) mode or for firmware update. Available networks are displayed as in the image shown on the right. If you have successfully connected to one of the networks in the list, it is displayed on a gray background and you can connect to it using the stored password instead of typing it.

  MECHA will show the connection status on the display when trying to connect to Wi-Fi in STA or AP+STA mode. The process can be stopped by pressing the ⏻ button if you know that the targeted Wi-Fi is not in range.
- *[Wi-Fi Off]* button — Turns Wi-Fi OFF. It needs power cycling to have it ON again.
- *[More or Less...]* button — Shows more or less settings.

Configuration Page

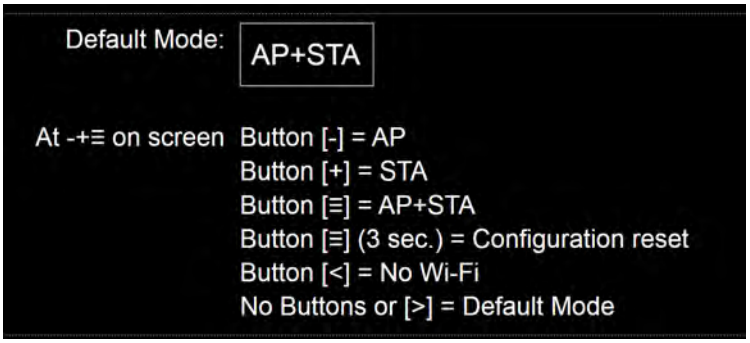
The Configuration page can be accessed at *192.168.8.1/config*, using the following username and password:

User:	**admin**
Password:	**Mecha**

At the top of the *Configuration* page, there are links to access *Ring* page (for single axis applications), *Row* page (for dual axis applications), and *Turn* page (for turn table applications – work in progress, at the moment). These pages are quite similar and, as a result, are not presented separately in this user guide. And for single axis applications, you can access either the *Ring* or *Row* page.

Default Mode

Default Mode — The possible values for *Default Mode* are: AP, STA, AP+STA, No Wi-Fi. The *Default Mode* set here will be the current mode for MECHA after powering on. However, the *Default Mode* can be changed by pressing one of the MECHA's buttons at the begining of the starting sequence, when - + ≡ is shown on the display, as follows:



Press the menu button, ≡, for 3 seconds at - + ≡ on the display to reset the configuration settings to their default values, for example:

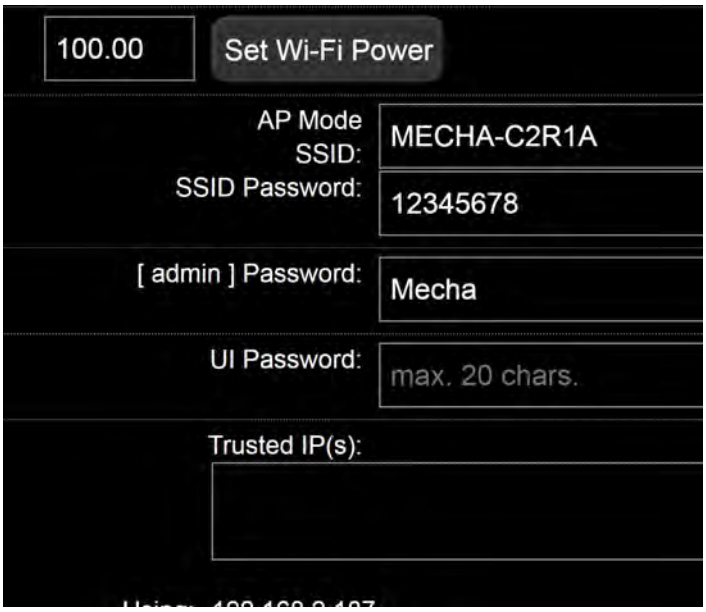
- Fixed Settings → no settings
- AP Mode SSID → MECHA-ID
- SSID password → 12345678

- Password for Configuration page → Mecha
- Hot-Spot password for firmware update → 87654321
- Default Mode → AP
- STA Mode → no settings

Very useful if you have forgotten the set passwords and cannot access, for example, the *Configuration* page or the User Interface.

Also, if a hot-spot with the name M-XXXXXX (where XXXXXX is the MECHA ID) and the password 12345678 is found, the firmware will be updated using that hot-spot.

[Set Wi-Fi Power] button — Sets the value for Wi-Fi power. The maximum value for Wi-Fi power is 100. In our example (see the image below), it is 100.



AP Mode SSID — The name of MECHA's nettwork. This is how it is displayed in the list of available networks on your device.

SSID password — The default SSID password is **12345678**.

MECHA-UPDATE Hot-Spot Password — By default, it is **87654321**.

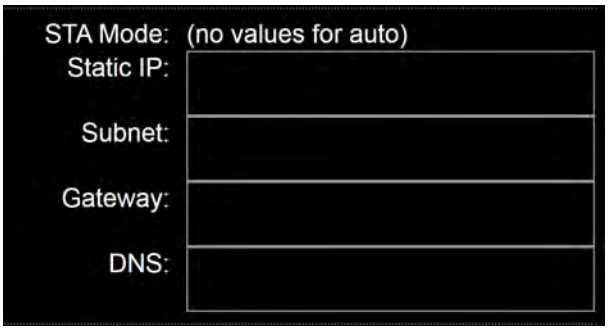
[admin] Password — The default password for *Configuration* page is **Mecha**.

UI Password — Allows you to prevent someone from changing the settings on the *Configuration* page. You may want to allow someone to access your interface, but may not want the settings to be changed.

Trusted IP(s) — The IPs added to this field will not be restricted in any way when accessing MECHA. Add the IPs of your personal devices that you use to connect to MECHA.

Using — This is the IP of the current device connected to MECHA. In our example, 192.168.2.187.

STA Mode

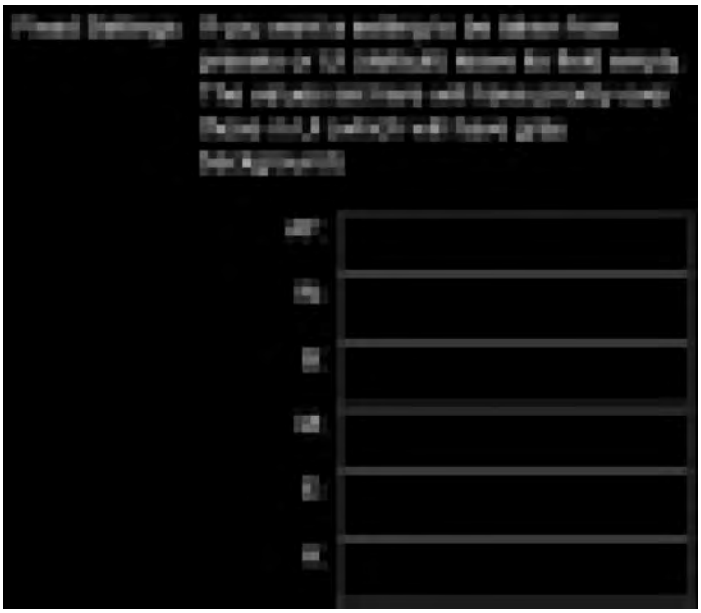


Static IP — Remember that the IP address to access the MECHA's User Interface on your computer is dynamic. Therefore, it changes from time to time. Enter a dynamic, available IP address in the *Static IP* field to make it static.

You can ignore the *Subnet*, *Gateway* and *DNS* fields if you do not know what information to provide.

Fixed Settings

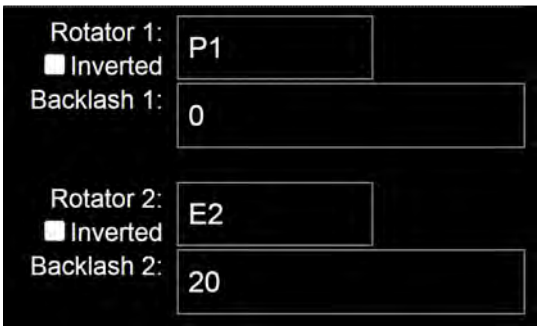
Fixed Settings — Settings that overwrite the corresponding settings on the *Row*/*Ring*/*Turn* page. For example, if the *fixed Motor Speed* is *7*, the one provided via the preset will be ignored, and MECHA will use *7 RPM* as speed.



Power OFF after — If this field is not empty, then the value specified here tells MECHA to power off if there is no activity a number of seconds equal to this value.

The second *Power OFF after* field — The same as the first field, but it refers to the period of time immediately after powering on MECHA, when no presets are executed. Value 1 means *No Power OFF.*

Rotator Settings



If you use only one rotator, fill in the fields for rotator 2 with the data for rotator 1.

Rotator 1 — Set the **lower** rotator in use by selecting an option from the list, or using the following codes: **13131<** for E1, **13132<** for E2, and **13121<** for P1. The *AUTO* option enables the automatic detection of the rotator type for the lower rotator.

Inverted — Check this checkbox if, for a particular reason, the rotator needs to have all its movements in the opposite sense of rotation, for example when mounted under a turn table.

Backlash 1 — If the value needs to be entered manually instead of using the automatic procedure, for E1 and E2 rotators it is around 21, and for P1 rotator the value is 0 (zero). It is recommended to use the automatic procedure for a better

result, if the conditions to detect the small movements are met. Please see the code 12321< (Backlash compensation calibration) for more details.

Rotator 2 — Set the **upper** rotator in use by selecting an option from the list, or using the following codes: **23131<** for E1, **23132<** for E2, and **23121<** for P1. The *AUTO* option enables the automatic detection of the rotator type for the upper rotator.

Inverted for **upper** rotator — The same as *Inverted* for **lower** rotator.

Backlash 2, for **upper** rotator — The same as *Backlash* for **lower** rotator. The backlash compensation calibration code is **123212<**.

Buzzer PWM and Start Page

Buzzer PWM values — Range from 1 to 255, and do not necessarily refer to the sound loudness. We recommend that you try a few values to find your preferred value.

Start Page — Can be *New*, *Row*, or *Ring*, and can also be set on these pages.

IR Settings and more

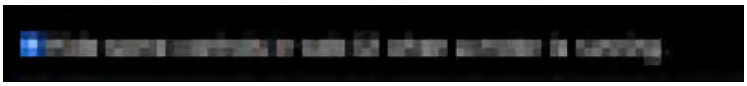
Enable i2c on Aux Port — Upcoming feature.

Use New Shutter Confirmation — It will be used in both shutter confirmation and test of shutter confirmation (see the *Shutter CONF. TEST* option in the *Config Menu*). If the test fails, please perform the test again with this option disabled.

Shutter Confirmation Time Out (sec) — The maximum time MECHA waits for the shutter confirmation to occur.

Shutter Confirmation via other MECHA — If enabled, the shutter confirmation will work via other MECHA for C2+ as well if camera and PC-Sync cable are connected to another C1/C2 mounted on hot shoe.

Enable Fast Mode — Leave this checkbox checked.



Hide some controls in web UI when a motor is running — You will notice that some controls are automatically hidden so you can more easily find the important ones – such as *[STOP]*, *[PAUSE]* – while the motor is running. Enabled by default.

Use Nodal Ninja IR Remote — Check this checkbox if you use an NN IR remote control, and connect the receiver to the AUX port.

Double press the Nodal Ninja IR Remote Power button for power OFF — Check this checkbox to be able to power off MECHA by pressing the power button on the remote control twice.

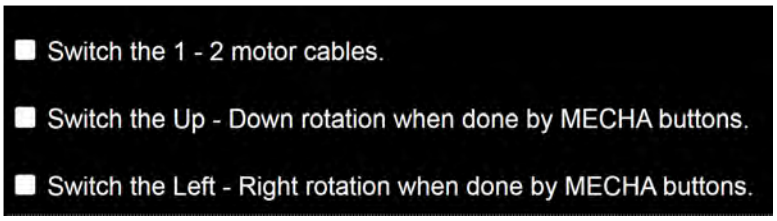
Use Aux Pulse, if exists — Check this checkbox if you use MECHA in applications requiring the Aux Pulse file. Default is clear and can be ignored.

Custom Protocol on AUX Port — Allows the use of the auxiliary port for equipment that uses a specific protocol. With common remotes, a half-press is detected as 1A, a full press is detected as 1A1S. These are the possibilities for a half-press:

- **045=1A** executes a preset whose name starts with 045 + blank.
- **-045=1A** executes a preset whose name starts with 045 + blank, but in the opposite sense of rotation.
- **HS=1A** – Home Set. A Home Set can also be done by pressing the power button.
- The following uses the inverted rotation for buttons, if it is set:
  - **45.0=1A** rotates MECHA 45.0° from Home position, absolute.

  - **-45.0=1A** rotates MECHA -45.0° from Home position, absolute.
  - **^45.0=1A** rotates MECHA 45.0° from previous position, incremental.
  - **^-45.0=1A** rotates MECHA -45.0° from previous position, incremental.
- **H=1A** returns MECHA to Home position set by HS or by the power button.

Reverse Direction of Rotations

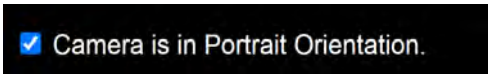


Switch the 1 - 2 motor cables — Check this checkbox if, for some reasons, you want to connect the top cable of the controller to the lower rotator, and the bottom cable of the controller to the upper rotator.

Switch *the Up - Down rotation when done by MECHA's buttons* — Check this checkbox if you want to change the sense of up/down rotation when it is done manually using the ▼, ▲ buttons. The equivalent of **2323<** code.

Switch *the Left - Right rotation when done by MECHA's buttons* — Check this checkbox if you want to change the sense of left/right rotation when it is done manually using the ◀, ▶ buttons. The equivalent of **2313<** code.

Camera Settings



Camera is in Portrait Orientation — This checkbox is checked by default. You can uncheck it if you want to specify that the camera is in landscape orientation. For example, if the number of shots around is *35mm* or *35mm2*, via custom, the shooting pattern will be computed considering the camera orientation.

Preferred MSS pattern — This is how you want the MSS scripts to be produced automatically. By default it is **SL,MDU,ZZ,NN**.

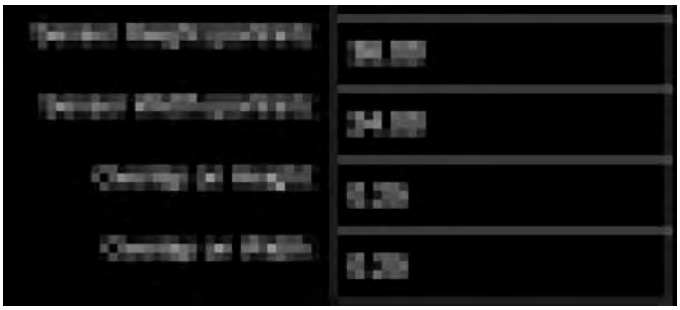
Any MSS script consists of three parts, the first part refers to the starting position (**SL** – Start Level, in our case), and the third, to the number of images for zenith

and nadir (**ZZ, NN** – 2 zeniths, 2 nadirs). MECHA will replace the middle part (**MDU**) with the computed script.

For example, if you want Start Parked instead of Start Level, and a single Zenith photo instead of two, and a pause before the first row, the *Preferred MSS Pattern* should be: **SP,PMDU,Z,NN**

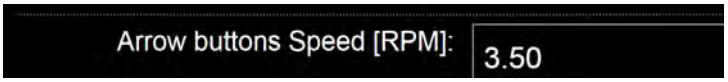
Usually, the following settings do not need to be changed. If these values are changed, the script on the *Row* page must be generated again by entering the focal length in the *Shots* field, via custom, for example: *56mm*.

- *Default Focal Length* — **50.00** (used unless otherwise specified). MECHA supports a focal length from 10 to 1500mm (FF equiv.), with camera in Portrait or Landscape orientation.
- *Fisheye FOV* — **0.00**
- *Fisheye MAX Width* — **0**
- *Fisheye Crop L, R, T, B* —
- *Fisheye Parameters a, b, c* —



- *Sensor Height (portrait)* — **36.00**
- *Sensor Width (portrait)* — **24.00**
- *Overlap on Height* — **0.25**
- *Overlap on Width* — **0.25**

Arrow Buttons



Arrow buttons Speed [RPM] — Rotational speed when a button is held down. If the *RPM* is zero, pressing MECHA's directional buttons, the rotator will start slowly and accelerates afterwards, if the button is kept pressed. Useful for precise alignment done with the buttons of the controller or IR remote.

Arrow buttons Interval 1 [deg] — Rotation angle for

.

Arrow buttons Interval 1 Speed [RPM] — Rotational speed corresponding to *Interval 1*.

Arrow buttons Interval 2 [deg] — Rotation angle for

.

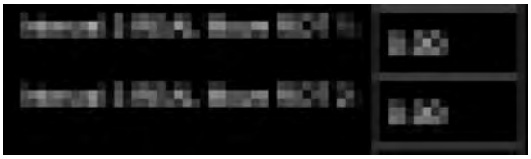
Arrow buttons Interval 2 Speed [RPM] — Rotational speed corresponding to *Interval 2*.

Arrow buttons Interval 3 [deg] — Rotation angle for

.

Arrow buttons Interval 3 Speed [RPM] — Rotational speed corresponding to *Interval 3*.

> Please see the Simple Rotations section for more details.



Interval 3 REAL Move ROT 1 — The equivalent of *i3 REAL MOVE 1* option in the *Config Menu*.

Interval 3 REAL Move ROT 2 — The equivalent of *i3 REAL MOVE 2* option in the *Config Menu*.

Leveling Amount [deg] — The angle at which the upper rail is rotated after powering on, if you press the ▲ button when the display shows **-+=**. Right after the rotation, this angle can be edited in the C2's menu, with the possibility to omit the confirmation of the change, meaning that you can press the ⏻ button instead of pressing the button as usual. This means that the new value is only available during the current work session, until MECHA is powered off.

Zenith / Nadir Position [deg] — The default values are 90° and -90°. Other values may be useful for backlash reasons or to have a certain overlap. MECHA will use these values in scripts that contain Z and N.

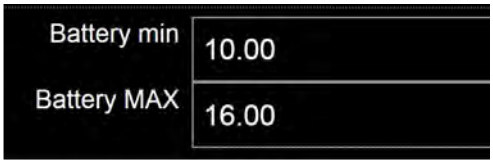
Favorite Codes

The above settings allow you to assign two of your favorite codes to the ⊖ and ⊕ buttons, respectively, as follow:

- *FavCode 1* to the ⊖ button
- *FavCode 2* to the ⊕ button

These are shortcuts that allow a quick use of codes by long pressing the corresponding button. See the Current Codes List at the end of the guide.

Battery Voltage



Battery min and *Battery MAX* — The minimum and maximum values for the battery voltage according to the technical specifications for the batteries you use.

For voltage values greater than zero, the battery level will be expressed as percentage on the User Interface.

For voltage values lower than *Battery min*, you will see "**BATTERY**" shown on the controller display, **then MECHA will enter the *Pause* mode**, if it's running a preset.

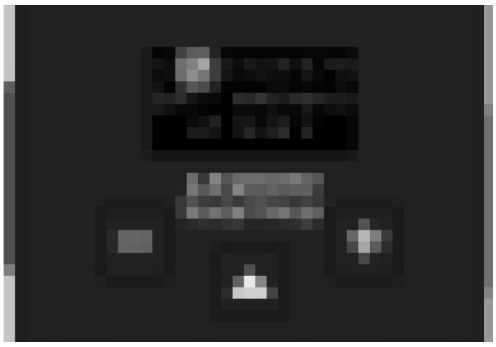
> In *Pause* mode, you can use the ▼ button to go to the **parked** position, and ▲ button to go back to the previous position.

> ⚠ In C2 configurations, you cannot power the rotators via a power bank. If C2's batteries need to be changed during a shooting session, use ▼ to go to the **parked** position, then use a power bank to power the controller. Change the batteries, then remove the power bank. To continue shooting where you left off, use the ▲ button, if necessary.

Set *Battery min* in *C Menu*

Battery min can be set in C2's *C (Config) Menu* as well. In this case, it is recommended to **fully charge the battery** before powering on MECHA, then

access this menu and adjust the value using the ⊖ and ⊕ buttons. Hold down the desired button to speed up the adjustment.



> Why fully charge the battery before this adjustment?
> This is because when you set the *Battery min* as shown above, MECHA detects the current battery voltage and automatically sets it as *Battery MAX*, to be able to compute the percentage.

Battery Voltage–Capacity Points: optional, 10 voltage values for 5%, 10%, 20%, 30%...90% (empty by default) — Can be used to fine-tune the capacity of battery shown as percentage. If left empty, the percentage will show how the voltage is related to *Battery min* and *Battery MAX* values.

Loud Beep at Warning (checked by default) — If you check this checkbox, MECHA will beep loudly when the battery percentage drops below the value you provide in this field: *Battery Extra Warning if Under Percent*.

> ⚠ The warning beep will be loud regardless of other beep settings.

When the *BATTERY* warning is shown on C2's display, the warning can be canceled with the ⊖ button. Another warning will be shown when the battery reaches 0%.

If the **0%** battery warning is canceled with the ⊖ button, there will be no more warnings and the battery level will be shown as **voltage**.

⚠ If you continue to use MECHA despite these warnings, be aware that the battery will turn off by itself when it reaches a certain voltage.

[*4-Cell Li-ion > 2500 mAh*], [*4-Cell Li-ion ~ 2000 mAh*] — Depending on the batteries used, click one of these buttons for common battery profile to automatically fill in the fields mentioned above. Then you can edit the entered values, if necessary. Click the *[Apply]* button to save the new settings.

How to test the *BATTERY* warning?

First check the battery level on C2's display, or find and select the BATTERY PERCENTAGE option in *C* (*Config*) *Menu*, page 1:

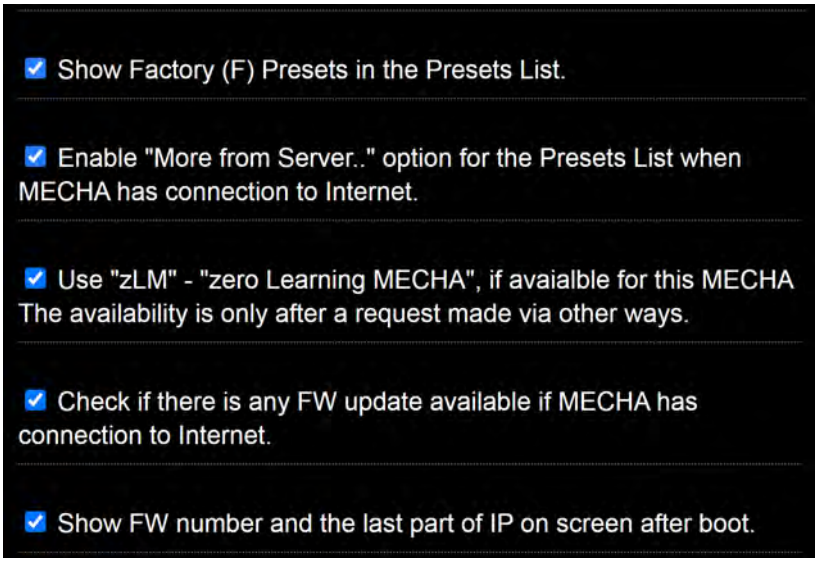
Then enter any value greater then this in the field below:

Scroll to the bottom of the *Configuration* page and click the *[Apply]* button to save the new settings.

Now the warning should be shown on C2's display:

Note that the warning will be displayed again when you click the *[Apply]* button, as long as the above conditions are true.

More from Server, zLM, Firmware, OLED



The settings above have fairly self-explanatory descriptions, and we just add that the third – Use "zLM" – refers to a custom preset, specially created according to the specifications provided by you.

Start with the Latest Preset Used selected on OLED Menu (checked by default) — If enabled, MECHA C2 will start quickly and show the latest preset used, selected and ready to be executed. Another preset can be selected instead by pressing the arrow buttons on C2 controller. Or one can exit from C2's *P Menu* with the button or switch to *C Menu* with the button.

If not enabled, it is possible to go directly to the latest preset used by pressing the button at - + on display.

Likewise, pressing one of the buttons , or will go to the regular start instead of the quicker to the latest preset used.

See Show your own presets in C2's Preset Menu for how to add the wanted presets on C2's Preset Menu.

Keep the same menu page on OLED at up-down buttons (OFF by default) — If enabled, the and buttons will not change the page, thus will not go through all the options from all pages.

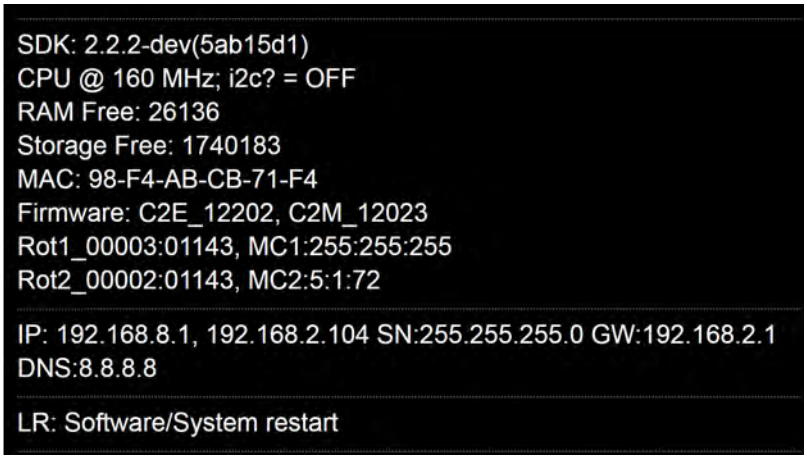
Allow DEGREES – REAL MOVE Switching — If enabled, switching from *DEGREE MOVE to REAL MOVE* is allowed via the *Config Menu*.

REAL MOVE — The equivalent of the *REAL MOVE is ON* option in the *Config Menu*. If enabled, *REAL MOVE* will be *ON*.

Simple Mode — Leave this option checked to benefit from the facilities of the simplified mode in working with the C2 Controller.

Show Hints on OLED — If enabled, the display will show contextual information to help you use C2's Menus, as in the second image above.

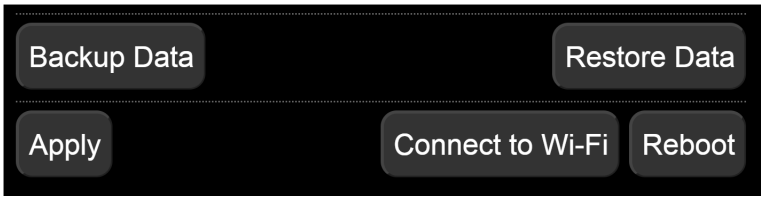
Technical Details – IP Addresses, FW



Finally, several technical details are displayed, including the firmware version and the IP addresses at which the User Interface can be accessed:

- the first is the static address for access from smartphones: **192.168.8.1**
- and the second, which is displayed only when MECHA is in STA mode, is the dynamic IP for accessing the User Interface on your computer.

Backup and Restore Data



[Backup Data] button — Creates a download archive that contains all of MECHA's settings and files except the firmware.

[Restore Data] button — Uploads the archive downloaded with the *[Backup Data]* button.

[Connect to Wi-Fi] button — Initiates the process of connecting to a Wi-Fi network to use MECHA in STA (Station) mode or for firmware update. Please see User Interface – Connect to Wi-Fi for more details.

[Reboot] button — Restarts MECHA, similar to restarting a computer.

[Apply] button — Applies / saves the current settings.

Other Updating Methods

If MECHA is not connected to a Wi-Fi with Internet access, it will ask for a SSID name and password, as a guest asks if Wi-Fi is available in your home, to be able to check something on the Internet, a Wi-Fi the guest will connect the phone to. The same way, MECHA will use that Wi-Fi in order to download the new firmware and perform the update.

Firmware Update Using a Smartphone: Method 2

- Press the power button, ⏻, for about 3 to 5 seconds to power on MECHA, and wait until - + ≡ is shown on the display.
- Then press the − button to set MECHA in AP mode.
- Tap *Settings* icon on your device. Under *Wireless and Networks*, make sure *Wi-Fi* is turned on, then tap *Wi-Fi*. Tap the nettwork name that contains **MECHA** in its name, to connect the smartphone to MECHA. The default password for MECHA's network is **12345678**.
- Now MECHA's User Interface (UI) can be accessed on the smartphone's browser at: **192.168.8.1** (which is a static IP address).
- This is the *New* page. At the top of the page, the current firmware version is displayed. Tap the *[Update]* button and follow the instructions to update the firmware:
    - Connect to Wi-Fi for Internet acces. Enter the Wi-Fi network name that you want to connect to. It can be your home or work Wi-Fi. The name and the password are case sensitive, like **MyWiFi** and **myPassword**! It's not about MECHA's passwords here, but the Wi-Fi name and password MECHA needs to connect to Wi-Fi.

MECHA ACCESS POINT IP
http://192.168.8.1/

- When the update is complete, a few beeps are heard, and the new firmware version is displayed at the top of the page. If it is not displayed in 1-2 minutes, refresh the page or reconnect the smartphone to MECHA, if necessary.

⚠ Please do not turn off MECHA while updating the firmware!

Working with Presets

Programming a Preset Using Parameters

A programming method available starting with firmware version *(1)2134*.

> This method of programming, or creating, a preset consists in connecting to the User Interface (see How to Access the UI) and passing some parameters in the url. This preset is assigned to one of MECHA's buttons, so it can be executed by pressing that button, and the ◀ or ▶ buttons.

> ⚠ Creating a preset using parameters always overwrites one of the following presets: *Button 1*, *Button 2*, or *Button 3*, depending on the value passed through the **b** parameter.

Being connected with your smartphone, or computer, to the MECHA's SSID (MECHA's Wi-Fi), enter **one** of the following urls in the browser address bar and tap *Access*, or press the *Enter* key (this will overwrite the preset already assigned to the ⊖ button):

```
192.168.8.1/preset?b=1&s=12&p=2

192.168.8.1/preset?b=1&f=30&p=2
```

The page will ask for credentials, which are: **admin**, **Mecha** (by default).

Now check that the position for the upper rail is **level**, or as specified on the *Configuration* page.

If you press the ⊖▶ or ⊖◀ buttons:

- MECHA will take 12 shots around (**s=12**) if you enter

  192.168.8.1/preset?b=1&s=12&f=30&p=2
- or it will start to shoot a full 360° panorama for a 30 mm lens (FF equiv.) (**f=30**) if you enter **192.168.8.1/preset?b=1&f=30&p=2**

In both cases will be a pause of 2 seconds after each shot (**p=2**).

Let's now explain the above examples and see how you can modify them to create your own preset.

The **parameters passed in the url** are as follows:

- The first parameter is **b** and refers to the button to which the preset will be assigned. Possible values are 1, 2, and 3, because MECHA has three numerical buttons, ⊖, ⊕, and ☰. There are no numbers displayed on these buttons of C2 controller, but you may remember that they are also used to enter the numbers 1, 2 and 3, respectively. This parameter is required.
- The second parameter – **s** – is the number of shots around; the third parameter can be used instead.
- The third parameter is the focal length – **f** – and it is optional. If you provide this parameter, the panorama will be spherical, otherwise it will be cylindrical.
- The fourth parameter – **p** – is the pause after each shot, and it is optional. The default value is 1 second.
- Starting with firmware version *(1)2134*, you can use **h** and **v** parameters to specify, in degrees, the area of a partial panorama. For example:

```
192.168.8.1/preset?b=1&f=80&h=100&v=75
```

  Above is the url for a partial panorama for **80** mm lens, **100**° wide and **75**° tall.

For example, a **url with two parameters** looks like this:

```
192.168.8.1/preset?b=1&s=12
```

Now, all you have to do is replace the values in this example with the desired values. For example, for **6 shots around**:

```
192.168.8.1/preset?b=1&s=6
```

and for a **full spherical panorama** for a **50** mm lens (FF equiv.):

```
192.168.8.1/preset?b=1&f=50
```

How to Create Your Own Presets Using the UI

Besides the very simple method with buttons only (see Panorama with Automatic Shooting Pattern), and the url with parameters method (see Programming a Preset Using Parameters), the following is the method using the UI.

Access the User Interface (UI) using a device or computer (see How to Access the UI) and tap/click the *[Row]* button to access the *Row* page.

> An easy way to create a preset is to load one from the *Presets* list, and modify it as needed, then save it with a different name.

First, let's analyze some default presets.

Default Presets

Factory (F) presets − cannot be overwritten

- *FE 12mm NZ Level* — for 12mm fisheye lenses, 4 shots around, plus nadir and zenith, starting from **level** position.
- *FE 16mm NZ Level* — for 16mm fisheye lenses, 6 shots around, plus nadir and zenith, starting from **level** position.
- *FE 20mm ZN Level* — for 20mm fisheye lenses, 6 shots around, 2 rows − at -30° and +30° − plus zenith and nadir, starting from **level** position.
- *FE 24mm ZN Level* — for 24mm fisheye lenses, 8 shots around, 2 rows − at -30° and +30° − plus zenith and nadir, starting from **level** position.
- *TEST 1312 Parked* — 12 shots around, 3 rows − at 0° and +/-45° − plus zenith and nadir, starting from **parked** position.
- *TEST 1313 Level* — 12 shots around, 3 rows − at 0° and +/-45° − plus zenith and nadir, starting from **level** position.
- *TEST 1321 Raised* — 12 shots around, 3 rows − at 0° and +/-45° − plus zenith and nadir, starting from **raised** position.
- *TEST 131* — 6 shots around (for single axis applications).
- *TEST 132* — 12 shots around (for single axis applications).

If the fisheye presets are not available in the *Presets* list, you may have a firmware version older than *(1)2208* installed.

To hide all factory presets, uncheck the ***Show Factory (F) Presets in the Presets List*** option on the *Configuration* page.

Presets assigned to buttons

- *Button 1*, *Button 2*, and *Button 3* are default presets consisting of 4, 6, and 8 shots, respectively (for single axis applications). These presets can also be executed with the following button combinations:
  - ⊖▶, ⊕▶, ≡▶ to the right.
  - ⊖◀, ⊕◀, ≡◀ to the left.

More from Server

More from Server — This option allows you to get more presets from server. See chapter Download More Presets from Server.

> Note that MECHA accessed at *192.168.8.1* is in AP mode, and *[More from Server..]* is not available.
> MECHA controllers work in two network modes: Access Point (AP) and Station (STA). AP mode allows the controller to create its own network and have up to 5 devices to connect to it. STA mode allows it to connect to a Wi-Fi network (for example, one created by your wireless router), acting as a client. Out of the box, MECHA works in AP mode. Since it does not have a wireless modem, it does not have Internet access. A device connected to it may also lose Internet access. Please refer to MECHA Controller C1 Manual on STA mode for more details.

Now we will take a look at preset descriptions above and load the preset most similar to what we want to get.

Loading a Preset

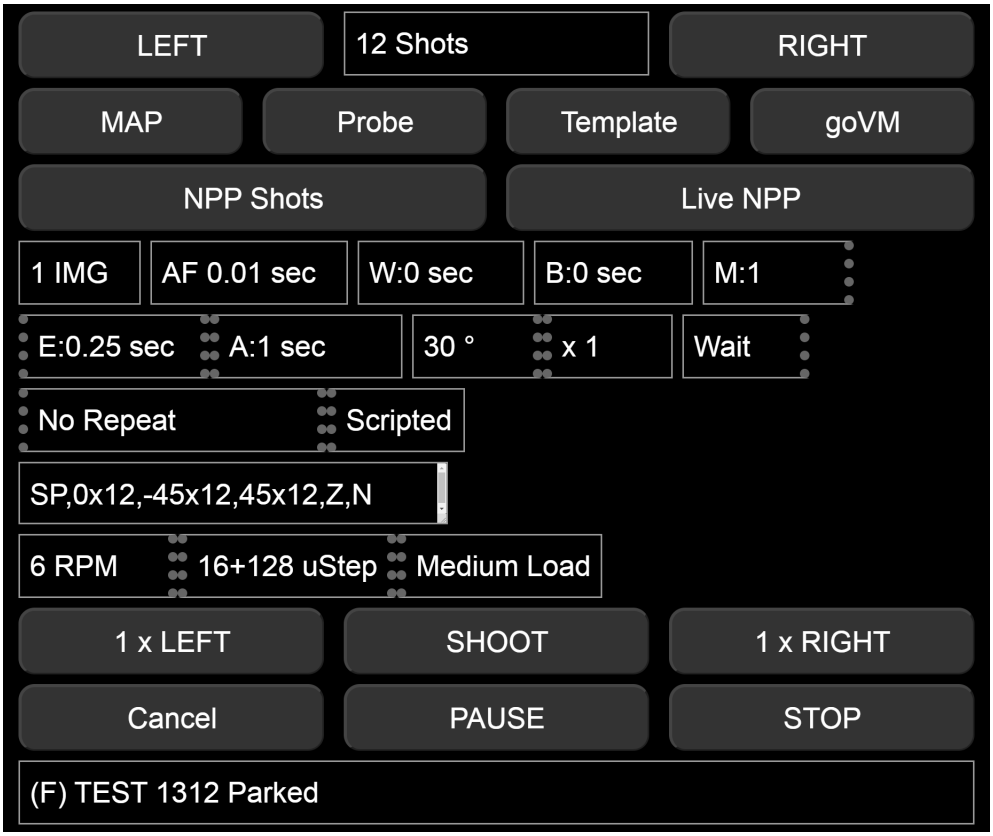
Suppose we want **6 shots around, 1 horizontal row, plus zenith and nadir, starting from parked position**. The most appropriate preset seems to be *TEST 1312 Parked*, so we select this preset and load it using the *[Load]* button.

To find out more about a preset, you can choose a higher **level** of complexity for the UI from the drop down list next to *[info]* button, at the top of the page. Select *A3*, which is the most advanced **level**.

Now we have the full description of the selected preset and, in addition, clicking/tapping the *[info]* button will toggle descriptions for all the controls:

- *12 Shots* — 12 shots around for a full 360° panorama. Notice how the rotation angle changes according to the number of photos, so that if we multiply them, the result is 360°. On the other hand, if we change the rotation angle, the number of images does not change.

  We will get a similar result for *33mm* focal length entered via *Custom* instead of *12 Shots*.



- *1 TRG* — 1 triggering. This is the number of camera triggerings for each position. Select zero if no triggering is needed. When using automatic exposure bracketing in continuous shooting or self-timer mode, MECHA treats it as 1 triggering.
- *AF 0.01 sec* — Auto-focus 0.01 sec. If the value is negative, the AF signal will be ON during the entire image sequence. In order to trigger the camera, for some Sony cameras, you have to set an AF value greater than zero, even if the camera focus is set to manual.
- *W:0 sec* — No pause for camera wake up. If the value is negative, the pause will be forced even when the camera is ON, before each sequence begins. Useful for moving out of the camera's view.
- *B:0 sec* — No pause before a set of images. If the pause before each bracketing sequence or set of images is negative, up to 2 seconds will be used for Mirror Lock Up.
- *M:1* — Normal modifier of exposure. Modifier of Exposure is the Modifier of the Duration of shutter button signal, a list of multipliers, like 1,0.5,2 for normal, half and double exposure time in case of *3 TRG*, or it can be entered as -0.7EV (for under, normal, over) or 0.7EV (for normal, under, over), in which case it will automatically extend to the number of *TRG*.

  If the modifier starts with B, like B-2EV, or B1, or 1,0.5,2, the "Bulb" mode will be assumed.
- *E:0.25 sec* — Exposure 0.25 sec. Duration of shutter button signal, for example, 3 or 0.5*3 for progressive half Exposure, or 2*3 for progressive double Exposure in a set. These can be entered as custom values. The values can be entered as 1/100.
- *A:1* — 1 sec. delay after each bracketing sequence or individual image. If the value is negative, there will be a delay after each shutter actuation.
- *30°* — The rotation angle between two consecutive positions in a sequence specified for *[N x LEFT]* or *[N x RIGHT]* buttons.
- *x1* — 1 move. The number of moves (N) for *[N x LEFT]* or *[N x RIGHT]* buttons.
- *Wait* — Wait after the last shot. The other option is *Rewind*, which means rewind to the initial position. Useful if there are cables attached, or for a partial panorama and time-lapse.
- *No Repeat* — This is the delay in seconds until the shooting sequence will be repeated automatically. Set zero (0) or *No Repeat* for no repeat.
- *SP,0x12,-45x12,45x12,Z,N* — The MSS script that describes our preset: start position is **parked**, 3 rows of 12 positions, one Zenith and one Nadir (see MECHA's Simple Scripting (MSS) for more details).
- *6 RPM* — Speed denoted by Revolutions Per Minute.

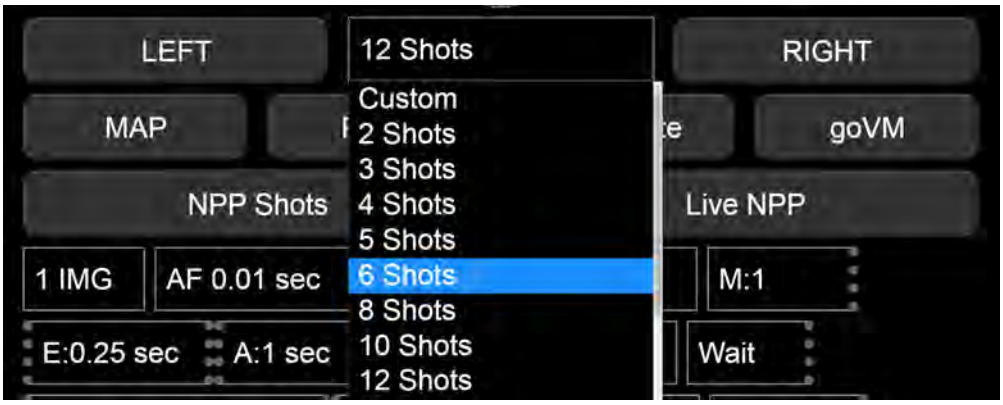
- *16+128 uStep* — Micro-stepping value, simple or combined; for example, different values for acceleration + constant speed region.
- *Medium Load* — Means a profile for an average load. The other options are *Light*, *Heavy*, and *Ring*.

> ⚠ Most input lists, in both *Ring* and *Row* pages, can receive custom values. There is no error check, nor range check for the custom values at the moment, so please use this feature with caution.

Modifying a Preset

To get a preset with *6 Shots* and just *1 horizontal row*:

1. Instead of *12 Shots* select *6 Shots*:



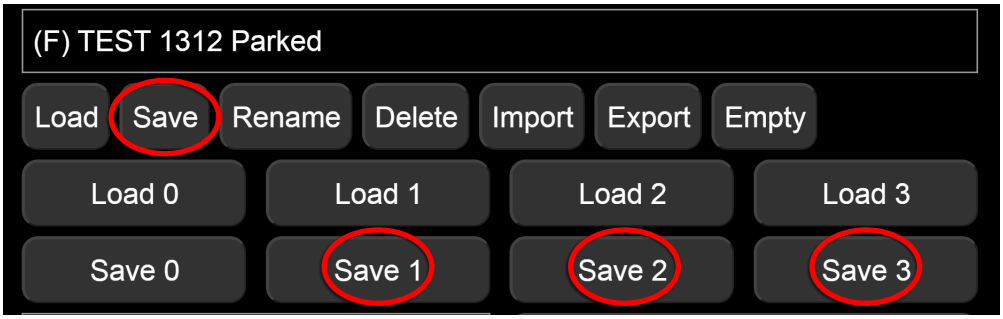
2. Remove the second row (-45x12,) and third row (45x12,) from the MSS script as follows:

```
SP,0x12,Z,N
```

3. Follow the instructions below to save the preset.

Saving a Preset

To save a preset, do one of the following:



1. **Tap/click the *[Save]*** button to save the preset with a different name, or with the same name if it is a presets that can be overwritten.

   The preset name can be preceded by a power code of maximum 7 digits. This feature also allows you to execute the preset using MECHA's buttons. For example, if the preset name is ***01*** *C2 6 shots*:

   - use ⏻ − ▶ to execute the preset to the right,
   - use ⏻ − ◀ to execute the preset to the left.

Preset Power Code

Create a **preset power code** as follows:

- the first digit must be **0** (zero) (remember that every power code starts with zero)
- the next sequence of maximum six digits must be a combination of the digits **1**, **2**, or **3**, so that two identical digits are not in consecutive positions.

Example: 01, 023, 0123, 02123, 0123123 etc.

2. **Tap/click the *[Save 1]*** button to overwrite the preset with the name *Button 1*, assigned to the − button.
3. **Tap/click the *[Save 2]*** button to overwrite the preset with the name *Button 2*, assigned to the + button.
4. **Tap/click the *[Save 3]*** button to overwrite the preset with the name *Button 3*, assigned to the ≡ button.

Now the new preset is saved and displayed in the *Presets* list and ready to be used in the future.

https://youtu.be/t3AkkXDxmI0

MECHA User Interface Basics – Presets

Show your own presets in C2's Preset Menu

In this section, we are going to show you how to make a preset you created in the User Interface appear in the *Preset (P) Menu*.

Long press the button to enter *Menu Mode*. Press the button to exit *Menu Mode*.

By default, on the first page of C2's *Preset Menu* are shown some default presets, while pages 2-8 are blank and can be used in two ways:

- either to create presets directly in the *Preset Menu*, as shown in Creating a Preset in C2's Menu Mode
- or to display some presets you have already created in the User Interface, as we will se in this section.

For example, the first option on page 2 might look like this:

The next options on this page might be: *021 EMPTY*, *022 EMPTY*, ..., *029 EMPTY* (10 in total).

To be able to see a preset in exactly the above position – *020* – you have to rename that preset adding the code *020* to the beginning of the preset name. So access the User Interface using your smartphone or computer, select the preset from the *Presets* list and click the *[Rename]* button.

In our example, the preset is *kit-lens-pano*:

In the popup window that appears, add ***020*** and a **space** at the beginning of the preset name, then click the *[Ok]* button. And the result should be:

Now the first option on page 2 of C2's *Preset Menu* is our preset:

Similarly for pages 3-8. For example, if the name of a preset is preceded by a code found in the range 030-039, then this preset is automatically listed on page 3, and so on.

> **In short**, to be able to see in C2's *Preset Menu* a preset created in the User Interface, access the User Interface and rename the preset adding a code from the range 020-089 and a space to the beginning of the preset name.

To execute the above preset, press the button when the preset name is shown on the display, then press either the or button to specify the direction of rotation.

The code used in the preset name is a *preset power code* explained in the section Preset Power Code.

Although the power code used in the name of the presets shown in C2's *Preset (P) Menu* consists of only 3 digits, longer codes can be used in a preset name. These presets cannot be displayed in the menu, but can be executed using the menu, as we will see below.

Using a preset name as a base name

> When the name of a preset begins with a code in the range 020-089, then it can be used as a **base name**.

- Suppose we have a preset to shoot a common spherical panorama and its name is ***020 kit-lens-pano***. Since 020 is in the range 020-089, we can use

020 kit-lens-pano as a base name. We also know how to execute this type of preset, as we have shown this before.

- If we create another preset and give it a similar name adding a number in the range 1-3 after the code 020:

  0203 kit-lens-pano, this preset can be executed as follows:

  - Press the button to select the preset *020 kit-lens-pano* (the power code is shown on the display).
  - Press the button to enter the number **3** (or , for 1 and 2).
  - Press either the or button to specify the direction of rotation.

As you can see, the preset is executed as usual, only we have to **specify what is different** from the base name – the number **3** in our case.

The second preset can be, for example, a preset to shoot 3 images in each position (*3 TRG*) or whatever you find useful for you.

Of course, instead of the number **3** used in our example, you can use a combination of digits, as shown in the chapter on presets (see Preset Power Code).

Directional preset name

If a preset name ends with one of the > or < signs, then the preset will be executed automatically when you press the button, as the direction of rotation is specified in the preset name and there is no need to use the or buttons to do that.

For example, the *020 kit-lens-pano>* preset will be executed to the right when the button is pressed.

Although the directional preset names may be preferrable in some situations, please note that:

- Directional names cannot be used as a base name.
- The execution of the preset can be performed in one direction only, the one specified in the preset name.

MSS scripts are row and column oriented and help you photograph a panorama with few clicks or button presses, without the need to understand the script. You only provide the focal length, and MECHA generates the script.

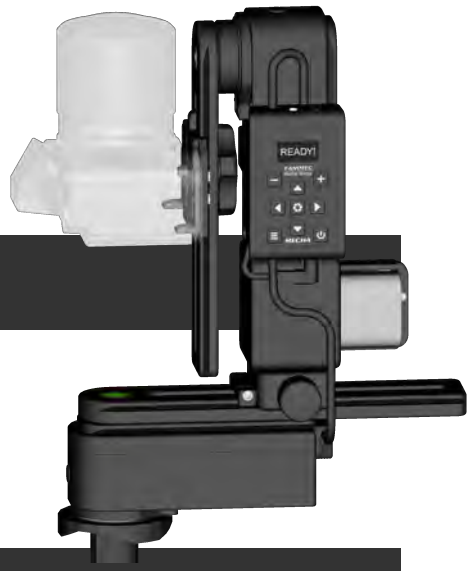
MECHA's Simple Scripting (MSS)

Starting with firmware version *(1)2116*, **MECHA's Simple Scripting (MSS)** reached a level of flexibility that allows easy scripting for common shooting patterns, for both single and dual axis applications.

A MSS script looks like the following. No need to fully understand it now, as MECHA will generate it for you in most cases.

Three Row Panorama + Nadir + Zenith (MSS)

Suppose we want to script a panorama starting from **parked** position, made of 12 shots around, zenith, nadir, one row at 0°, one row at +45° and, finally, one at -45°. The MSS script, in this case, can be:




```
SP,Z,N,0x12,45x12,-45x12
```

In the **parked** position, the camera – mounted on the upper rail – is facing up.

If we want the starting and ending positions to be **level**, the script will be:

```
SL,Z,N,0x12,45x12,-45x12
```

And if we want the starting and ending positions to be **raised**, the script will be:

```
SR,Z,N,0x12,45x12,-45x12
```

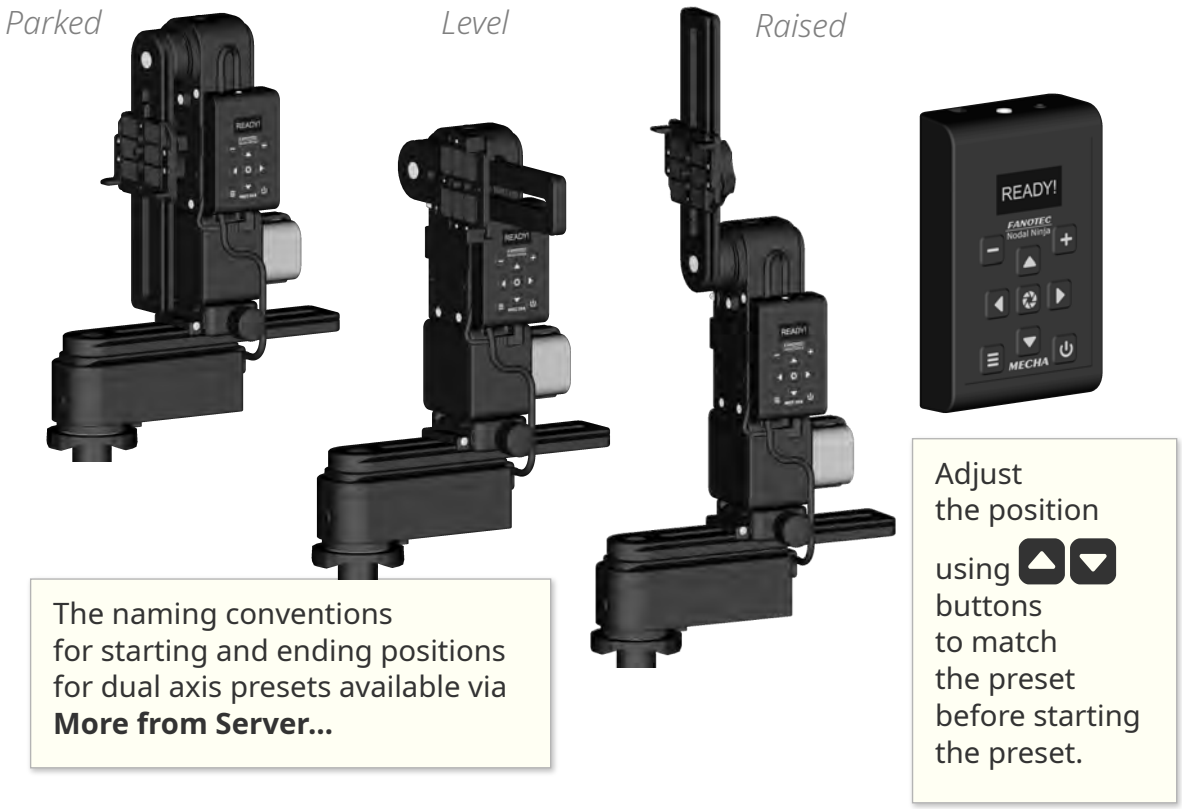
If we want a pause before a row, we can add **P** in script, before that row. For example, this will set a pause just before the row at 0°:

```
SP,Z,N,P0x12,45x12,-45x12
```

In the example above, the pause is infinite, and to continue you need to press ▶, the right button of MECHA, or the equivalent UI button, *[RIGHT]*.

Now let's have a closer look at scripting using the MSS Language.

For dual axis applications**,** MECHA needs to know its starting position. This can be **parked**, **level**, or **raised**. These conventions are also used in naming the presets available from Server.



Shooting Panorama Made Easy for Dual Axis

Shooting a panorama is made easy by following the steps below.

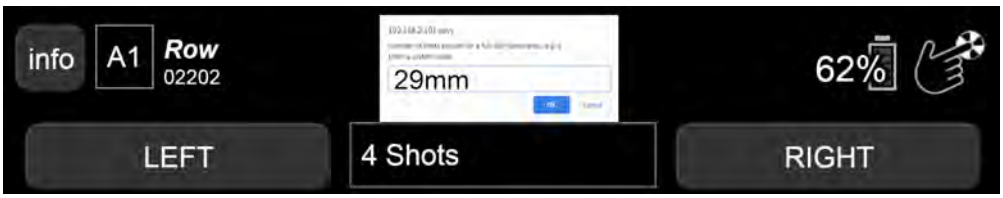
1. Use the ▲ and ▼ buttons to position the upper rail in **level** position (see the section Parked, Level, Raised Positions).

> Why **level**? Because this is the default position in *Preferred MSS pattern* on the *Configuration* page. If you have changed this setting, then you need to position the upper rail according to your setting.

2. Connect to the MECHA's User Interface (see the chapter How to Access the UI).
3. On the *Row* page, select the *A1* (or *A2, A3*) level of complexity for the User Interface. In *A1-A3* (*Advanced*) modes, you will see more controls than in *S1-S3* (*Simple*) modes.

4. We recommend that you load any simple preset, for example the default *Button 2* preset. To load this preset, use the *[Load 2]* button. Now, the current settings are the loaded preset settings.

5. Click/Tap the *Shots* field, choose the *Custom* option and enter the desired focal length, for example ***29mm***. Confirm by clicking/tapping the *OK* button.



When you click/tap the OK button, MECHA creates a script for you to shoot a full panorama, according to the focal length provided:

```
SL,0x11,-43.27x10, 43.27x10,ZZ,NN
```

The settings provided by the script have priority over the other settings.

6. To start shooting, press either the *[LEFT]* or *[RIGHT]* button.

7. To further simplify this process, we recommend that you save the current settings as a preset. For example, click / tap the *[Save 2]* button to overwrite the default *Button 2* preset, which is assigned to the button by default (see Saving a Preset for more details).

Next time you need to shoot this type of panorama:

- either load the preset using the *[Load 2]* button, and execute it with the *[LEFT]* or *[RIGHT]* button
- or execute the preset directly using the or button combinations.

Next, we present an example of a MSS script similar to the one above, but with a larger image overlap, resulting in 12 photos per row.

MSS Script Explained

Considering the quite popular shooting pattern made with kit lenses around 29mm (FF equiv), that consists in:

1. one row of 12 positions at a tilt of 0° (horizontally)
2. another row of 12 positions at a tilt of +45°
3. another row of 12 positions at a tilt of -45°

4. a single position at a tilt of -90°, known as Nadir
5. a single position at a tilt of 90°, known as Zenith

and assuming the **Start Level** position, as in the image above, this pattern can be programmed with the following **MSS**:

```
SL,0x12,45x12,-45x12,N,Z
```

Breaked down, you'll recognize the description above:

- **SL**: **S**tart Level
- **0x12**: at a tilt of **0**°, one row of **12** positions
- **45x12**: at a tilt of **45**°, one row of **12** positions
- **-45x12**: at a tilt of **-45**°, one row of **12** positions
- **N**: the **N**adir position
- **Z**: the **Z**enith position

Assuming that the angles of rotation are 45°, 90°, and 180°:

- To go from **parked** to **level** and back, you can use ▶ ➕, then ◀ ➕.
- And to go from **level** to **raised** in one go, use ▶ ☰, then use ◀ ☰ to go back to **level** position.

NOTE. On the *Configuration* page, there is also a checkbox that establishes if the left is left, or the left is right, regarding the movements when the buttons are pressed. You might want to change its status if you prefer a particular behavior over the other.

There are also two codes – **2313<** and **2323<** – for changing the direction of rotation if it is done using the left/right/up/down buttons, without the need to access the *Configuration* page.

If you notice that instead of a 90° rotation, MECHA seems to rotate more or less, the cause could be a wrong setting regarding the type of the rotators you use. The rotators can be set either on the *Configuration* page or using special codes.

Considering the script:

```
SL,0x12,45x12,-45x12,N,Z
```

let's see how it can be modified in different situations.

What Needs to be Changed, sometimes, in Real Situations

Instead of a single Zenith, more Zeniths may be needed, say, for flare reasons, in which case Z can be replaced with Zx2, for example, which will produce 2 Zeniths 180° apart (360°/2):

```
SL,0x12,45x12,-45x12,N,Zx2
```

For 2 Zeniths 90° apart, the ZZ convention can be used, or ^90, which tells to use 90° interval between Zeniths instead of the computed 360°/2.

```
SL,0x12,45x12,-45x12,N,ZZ
SL,0x12,45x12,-45x12,N,Zx2^90
```

The same way, for 2 Zeniths **120°** apart:

```
SL,0x12,45x12,-45x12,N,Zx2^120
```

Now, for Zeniths at a tilt of 80° instead of 90°, which might help in automatic control points, because the Zenith is just like any row, but at a tilt of **90°**, **90x1** will do the same as **Z**, thus **80x1** is what you need for a Zenith at a tilt of **80°** instead.

For 2 Zeniths at a tilt of 80° and 180° apart, 80x2, and for 2 Zeniths 90° apart, we can use **80x2^90**, thus we will end with this script:

```
SL,0x12,45x12,-45x12,N,80x2^90
```

Suppose that the rows at a tilt of +45° and -45° must have 10 positions instead of 12, then the script can be changed as follows:

```
SL,0x12,45x10,-45x10,N,80x2^90
```

The above apply for Nadirs as well, in which case the **N, NN, -90x1, -80x1, -80x2^90** can be used.

The Nadir is like a row at a tilt of **-90°**.

Using Pause in MSS Script

Let's take a pause. Sometimes, to the above, we need a pause, say, before the horizontal row, or before Nadir, to be sure we are out of view.

The pause can be added using **P**, so

0x12 will mean: at a tilt of 0°, a row of 12 positions, while

P0x12 will mean the same, but with a pause before, and MECHA will wait for the button to be pressed, or for the UI *[PAUSE]* button to be pressed, or for the (pause) button of the NN IR Remote to be pressed, to continue.

NN IR Remote

That pause can be used to adjust some camera settings, like exposure, aperture, WB, focus, and more.

```
SL,P0x12,45x10,-45x10,N,ZZ
```

If you want a pause before each row, for focus, for example, then:

```
SL,P0x12,P45x10,P-45x10,N,ZZ
```

or even before Nadir and Zenith:

```
SL,P0x12,P45x10,P-45x10,PN,PZZ
```

To customize it even more, let's say we want an extra image at the beginning, a kind of clapboard you may want to use, for WB or even for focus; it will be a kind of image you need to take again, without the extra elements in it, and the second one to be used in panorama.

As the horizontal row is scripted by 0x12, for the extra shot we can add another horizontal row, but made from only one position, like 0x1 with pause or not. For example, if starting from **level**, we may not need a pause, as we can launch the preset after the clapboard preparations are done, and we will have the pause only before the actual row of 12 to start, time to remove, say, the gray card.

```
SL,0x1,P0x12,45x10,-45x10,N,ZZ
```

If MECHA is in **parked** position, we need a pause to adjust the camera settings right after MECHA arrives in horizontal orientation for the first horizontal row.

```
SP,P0x1,P0x12,45x10,-45x10,N,ZZ
```

Let's Take a more Dense Approach with more Photos toward Gigapixel Imagery

Suppose we want a shooting sequence made out of rows at a tilt of 15° – instead of 45°, as we had before:

```
SL,0x36,15x32,30x28,45x24,60x20,-15x32,-30x28,
-45x24,-60x20
```

- **SL**: Start Level
- **0x36**: first row at a tilt of 0° (horizontally) made out of 36 positions
- **15x32**: one row at a tilt of 15° of 32 positions
- **30x28**: one row at a tilt of 30° of 28 positions
- **45x24**: one row at a tilt of 45° of 24 positions
- **60x20**: one row at a tilt of 60° of 20 positions

The same for the negative tilts:

- **-15x32**: one row at a tilt of -15° of 32 positions
- **-30x28**: one row at a tilt of -30° of 28 positions
- **-45x24**: one row at a tilt of -45° of 24 positions
- **-60x20**: one row at a tilt of -60° of 20 positions

Because there are many shots to be taken, it will take a while.

Now, suppose we want only a vertical slice of it, of **45 degrees**, a kind of preview, also to test overlap and to see if the full 360° around can be used in production, or just simply as a partial panorama 45° degrees wide, instead of 360°, with the same camera-lens combo.

To achieve this, we need to add **(45)**, which tells MECHA that only a bit over 45 degrees should be taken.

The resulting MSS script will be:

```
SL,0x36,15x32,30x28,45x24,60x20,-15x32,-30x28,
-45x24,-60x20(45)
```

As in the examples above, it can have pause(s) before row(s), or extra 1 position row for clapboard, so on.

We can also add 1 Nadir and 1 Zenith with pause, and even use that pause to replace the lens with a fish eye, or change the focal lens to the shortest (widest angle) extent.

```
SL,0x36,15x32,30x28,45x24,60x20,-15x32,-30x28,
-45x24,-60x20,PN,Z(45)
```

If the preview slice looks good, we can remove the (45), and make some changes regarding the number of shots per positions (HDR), ending up with the full 360° around and 150° tall panorama:

```
SL,0x36,15x32,30x28,45x24,60x20,-15x32,-30x28,
-45x24,-60x20,PN,Z
```

Rewind after each ROW

The *RW* term in the MSS script indicates rewind after each ROW, useful in gigapixel sessions when cables to a power bank are used.

For example, for 50mm (FF equiv.):

```
SL,0x18,-28.30x17,-56.60x12,28.30x17,56.60x12,
ZZ,NN,RW
```

Shooting in Horizontal Zigzag Pattern

The HZ term in MSS script indicates shooting in Horizontal Zigzag pattern.

MECHA will change the sense of rotation after each row.

For example, for 50mm (FF equiv.):

```
SL,0x18,-28.03x18,-56.06x14,28.03x18,56.06x14,
ZZ,NN,HZ
```

Example of partial panorama with explicit intervals for lower rotator (24°) and upper rotator (36°) in Horizontal Zigzag, 4 rows, 8 columns:

```
SL,54x8^24,18x8^24,-18x8^24,-54x8^24,HZ
```

Script for 2 Focal Lengths - MECHA Dual Axis

Script for shooting a spherical panorama using 50 mm and 24 mm lenses or focal lengths:

```
SL,12x19,-12x19,P-50x10,50x10,ZZ,NN
```

Select the *Scripted* option from the *Mode* list on the *Row* page and enter the above script in the displayed text box.

For example, use *[Save 1]* button to assign the preset to the button.

Since the preset is assigned to the button, you can start shooting using the buttons.

During Pause (P), change the lens or focal length, then press the button to continue.

Please watch the video below for more details.

https://youtu.be/fKb7Ma3Rddg

Script for 2 Focal Lengths - MECHA Dual Axis

Download more Presets from Server

In short, to download presets from server, make sure MECHA is connected to the Internet, then select the option *More from server* from the *Presets* list on the *Row* page. If the option *More from server* is not displayed in the list, it means that MECHA is not connected to the Internet. In this case, tap/click the *[Connect to Wi-Fi]* button at the bottom of the page, and after connecting, refresh the page. Please see User Interface – Connect to Wi-Fi for more details.

Step by step:

- On *Row* page, select the option *More from server* from the *Presets* list.
- Provide a keyword if you want to get only certain presets, and click/tap the *[OK]* button. The names of the presets found on the server are added to the *Presets* list.
- The preset name describes what the preset does, and over time you will know which keywords to use. For example, the sequence *_P_* in a preset name means that the preset includes a pause.
- *(S)* in a preset name means that the preset is not saved yet on MECHA.
- Save the presets you find useful, as showed in How to Create Your Own Presets using the UI section:
    - Select a preset from the *Presets* list.
    - Tap/click the *[Load]* button to load it (if the button is visible).
    - Modify the preset if necessary.
    - Save the preset with the same name, or with a different name.

Launch a Preset by Scanning a QR Code

A complete list of preset qr codes can be found on this web page:

MECHA QR Codes
https://www.fanotec.com/mecha-qr-codes

- To be able to launch a preset by scanning a qr code, your phone needs to be connected to the MECHA's SSID first (see Access the User Interface (UI) with a Smartphone).
- Click to enlarge, then scan the preset qr code you want to launch.

For example, to launch the preset **20**, which is an option in C2's *Preset (P) Menu*, scan the qr code corresponding to **020**:

How to Set Both MECHA and Smartphone to Have Internet Access

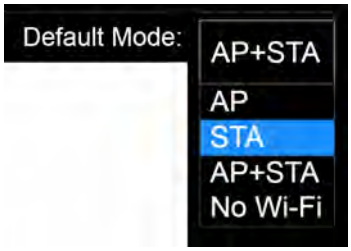
In this chapter, we will explain how to set both MECHA and smartphone to have Internet access, and also how to enable the update and use your device for usual Internet browsing at the same time.

First, set up a hot-spot on your device, in 2.4 GHz band, and name it **MECHA-PHONE**. Please refer to your device documentation about how to set up a hot-spot.

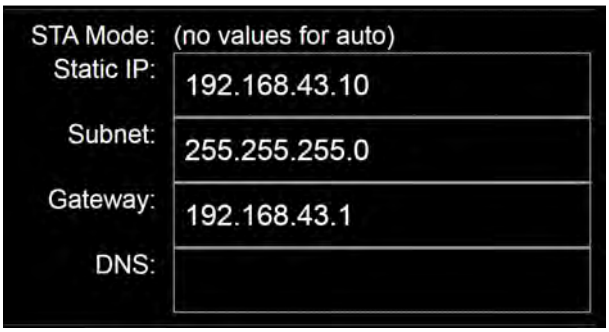
Suppose the hot-spot is disabled for the moment.

That hot-spot gives 192.168.43.xxx address to its clients.

1. Power on MECHA.
2. Connect to MECHA */config* with your device, then set it in STA mode, choosing the STA option from the Default Mode select list.



Scroll to the STA Mode and enter the following values:



- Static IP: 192.168.43.101
- Subnet: 255.255.255.0
- Gateway: 192.168.43.1

- DNS: 8.8.8.8 (or leave the field blank)

3. Scroll to the bottom of the page and tap the *[Apply]* button.
4. Tap the *[Connect to Wi-Fi]* button at the bottom of the page, then enter (or select) **MECHA-PHONE** and the required password. Please see User Interface – Connect to Wi-Fi for more details.
5. Start MECHA-PHONE hot-spot.

MECHA should connect to **MECHA-PHONE** after a little while.

As a result:

- We have MECHA connected to a SSID with Internet access, provided 3G, 4G, so on, is available.
- This enables downloads of presets from server, updates and the use of your phone for Internet browsing as usual.
- MECHA will be accessible always at 192.168.43.101

All you have to do is turn **MECHA-PHONE** hot-spot on when powering on MECHA, and to maintain it on while using MECHA, for example disable any automatic turn-OFF of hot-spot on phone/device.

Now your device is connected to the Internet and to MECHA, and you can download presets from server.

Panorama Using MECHA's Buttons

Panorama with Automatic Shooting Pattern Using only the MECHA's Buttons

This method requires the firmware version *(1)2118* or newer, and works for rectilinear lens from 10 to 200 mm (FF equiv).

The shooting pattern will be computed by MECHA based on only few presses of a button, without using the User Interface, as follows:

- First, position the upper rail in the **level** position using the left/right buttons.
- Place **a sheet of paper in front of MECHA** in such way to fill the frame. The frame can be viewed through viewfinder or through the live view. Instead of the sheet of paper, any well defined feature or image on a screen, or other means, can be used. A gray sheet of paper will work best for exposure purposes as well.
- The camera and lens must be set the same as for shooting the actual panorama.
- Enter the **31<** code. After entering the code, MECHA waits for two quick presses of the power button, ⏻, as follows:
  - the **first** – in order to trigger the camera
  - and the **second** – after the camera was triggered.
- After that, MECHA will rotate slowly to the right and wait for another **press of the power button**, ⏻, right after the sheet of paper is out of the camera's frame.

- Then MECHA will go back to the initial position and start to slowly tilt down and, again, wait for **another press of the power button**, ⏻, when the sheet of paper is out of the camera's view.
- Then MECHA will go back to the initial position, and
- the characters **- + ≡** are shown on the display, and MECHA waits (15 seconds) for one of the −, +, or ≡ buttons to be pressed, to assign the computed preset to that particular button. To cancel the assignment, the power button, ⏻, can be pressed instead.

If MECHA is unable to compute a pattern using the feedback received from pressing the power button (mostly caused by too small intervals), on the display will be shown ***"!!!"***, which indicates that nothing has changed.

To execute the panorama computed by MECHA, make sure the upper rail is in the **level** position, and press the button to which you have assigned the panorama, then press either the left or right button.

MECHA's Current Codes

The controller buttons allow you to quickly perform some operations, and they can be an alternative to the User Interface, in most cases.

See below the equivalence of buttons and characters:

1	2	3	<	>	0

For example, to enter the code **1<**, use the buttons. This code executes the *Button 1* preset to the left.

> To be able to enter codes, make sure the C2 works in *Advanced Mode* (see Config (C) Menu, *SIMPLE / ADVANCED MODE* option).

All codes end with either the **>** or **<** sign, which usually tells MECHA to execute the preset to the right or to the left.

See all standard current codes below.

> Please note that the power button, , can always be used as an emergency stop, if necessary, except for the speed calibration procedure.

Current Codes List

> 1< or 1>
> Executes the *Button 1* preset to the left or to the right.
> By default, the *Button 1* preset consists of 4 shots around, or it is the preset saved with the *[Save1]* UI button.

2< or 2>
Executes the *Preset 2* to the left or to the right.
By default, the *Preset 2* consists of 6 shots around, or it is the preset saved with the *[Save2]* UI button.

3< or 3>
Executes the *Preset 3* to the left or to the right.
By default, the *Preset 3* consists of 8 shots around, or it is the preset saved with the *[Save3]* UI button.

131< or 131>
Executes a panorama of 6 shots around to the left or to the right.

132< or 132>
Executes a panorama of 12 shots around to the left or to the right.

1312< or 1312>
Executes a panorama of 12 shots around, 3 rows – at 0° and at +/-45° – plus zenith and nadir, to the left or to the right. The lower rotator must be **parked**, i.e. oriented upward, as for the zenith photo.

1313< or 1313>
The same as 1312, but with the upper rotator in the **level** position. First time, please test the codes without camera mounted on the panohead.

1321< or 1321>
The same as 1312, but with the upper rotator in the **raised** position. First time, please test the codes without camera mounted on the panohead.

121< → MECHA ID
Shows the MECHA's ID, like "*123ABC*".

123< → MAC ADDRESS
Shows the **entire** MAC address, like "*123ABC123ABC*".

323< → IP ADDRESS
Shows the **full** IP address, like "*192.168.0.100*".

321<

Shows the **last** part of the IP address, starting with a dot, like "*.100*".
If "***AAA***" is shown, MECHA is in AP mode, and the IP address is 192.168.8.1
If ***"!!!"*** is shown, Wi-Fi is OFF.
If either "***.0***" or "***0.0.0.0***" is shown, MECHA is not in AP mode, nor does it have an IP assigned. In this case, a restart, then pressing the ⊖ button 3 seconds when **- + ≡** is shown on the display will enable the AP mode and allow access to the web interface at 192.168.8.1

13< → BATERY PERCENTAGE

Shows the Battery voltage.

131313< → REBOOT

Reboots MECHA without power cycling it.
This is useful when you want MECHA to reboot (say, to enable Wi-Fi, or change the AP-STA mode), without disengaging the motors. Thus, the camera will not move due to gravity or other causes.

21< → TOGGLE PAUSE MODE

Switches MECHA **to** or **off** pause mode, the same as clicking the *[PAUSE]* button on UI, or ⏯ on IR Remote.

23< → DISable-Enable MOTOR 1

Disables/Enables the motor 1.

2313< → DISable-Enable MOTOR 2

Disables/Enables the motor 2.

2312< → DISable-Enable MOTOR 1&2

Disables/Enables both motors.

UI *[Reboot]* command will be ignored if the motors are disabled.
While the motors are disabled, the power icon blinks in UI, and C2's display shows **1 DS**, **2 DS** instead of 1 R, 2 R (where R are the rotators used).
Also, while one motor is disabled, if you press the directional buttons corresponding to the second motor, the second will also be disabled.
When enabling the motors, regardless of which motor you enable, both will be enabled.
Disabling the motors is useful to prevent MECHA from turning on by accident in some cases, for kids protection, or to simulate the functioning of MECHA

for learning purposes, and when you want to be able to rotate the rotators by hand. There are other applications not listed here.

⚠ Before disabling the upper motor (MOTOR 2), we recommend that you position MECHA in the **parked** position, using the button, for example, to avoid a sudden change of position in the case of heavy cameras. Please see the Simple Rotations and Parked, Level and Raised Positions at the beginning of the guide.

31<

Code for automatic shooting pattern computed by MECHA, without using the UI. After entering the **31<** code, MECHA waits for two quick presses of the button, first is in order to trigger the camera, and the second is after the camera was triggered.
Please see Panorama with Automatic Shooting Pattern... for details.
After that, MECHA will rotate slowly to the right and wait for another press of the button, right after the sheet of paper is out of the camera's frame.

Then MECHA will go back in the initial position and wait for one of the , , or buttons to be pressed, to assign the computed preset to that particular button.

To cancel the assignment, the button can be pressed instead.
For single axis applications, after the first row, MECHA will enter the pause mode and the vertical axis should be tilted manually to continue to a full spherical panorama. If only a cylindrical is needed, or no manual tilt is possible, press the button.

32<

Similar with **31<** code, but fish-eye lenses can be used as well.
Also, **32<** uses for refference a small feature centered in the frame, say, below the central focus point.

12321< → BACKLASH COMPENSATION

Backlash compensation calibration for the lower rotator.
After the code is entered, MECHA will turn slowly to the right.

After that, you have to press the ⏻ button when you see/feel that MECHA starts moving very slightly to the left.
You can use the viewfinder, LIVE view with zoom, or other devices attached, like a laser pointer, and so on, or simply feel by hand when that small movement begins.
At the end, on the display will be shown, say, ":*24*", where 24 is the new calibration factor (it should be around this value).
You can enter the code again if you want a better result or you have more precise ways to determine the small movement.
You can cancel the procedure with any other button when the power symbol, ⏻, flashes on the display, or press the ⏻ button right after it starts to flash to have no compensation at all, or it will time-out in 5 minutes if no buttons are pressed.

123212<

Backlash compensation calibration for the upper rotator, similar to the code above.

TIP: If you have an R1 with camera in portrait mode, with the grip up and no Live view, and you have to look through viewfinder to see when the small movement begins, you can look with your left eye, and there is no need to close the right eye.

If the grip is mounted to the bottom of the camera, you can look with your right eye, and there is no need to close the left one.

This will make the process more bearable.

123123<

Speed calibration for the lower rotator.
The procedure takes **1 hour** and is silent, the motor is not moving.
Please wait until MECHA turns OFF automatically, and don't use the web interface during this time.
This is a one-time procedure, which you can omit if you wish, as default factory calibration is good.
It cannot be canceled once started.

1231232<

Speed calibration for the upper rotator, similar to the code above.

Both **backlash compensation** and **speed calibration** codes can be used only if they are absolutely necessary for your application. Both procedures save the results automatically.

The **speed calibration** makes the RPM value set in the interface as close as possible to the same calculated RPM value.

Backlash compensation is to compensate the backlash of the gear assembly, to have a better precision for left-right movements, like rewind to the initial position for cable protection (in case of C1), or in case of partial panoramas and time-lapse.

The procedure can be repeated after a longer period of time, after gear wears.

If you hear or see a slight right-left movement when starting the unit, a compensation is set. Otherwise, the compensation is 0, or is not set.

3212< → FIRMWARE VERSION

Shows the firmware version on the display, then **32123<** code can be used to update the firmware, provided MECHA has Internet access, or the Wi-Fi with Internet that MECHA was connected to before is on.

32123<

Updates the firmware, if possible. To update the firmware using the **32123<** code, MECHA must be in *STA* or *AP+STA* mode and connected to a Wi-Fi with Internet access, before entering the code. Depending on *Default Mode*, it may be necessary to enable temporarily *STA* or *AP+STA* at start via buttons, then enter the **32123<** code. MECHA will show on the display *"No update found"* if no update was found, or "***!!!***" if there is no Internet connection.

312123< → UPDATE USING H-SPOT

Update the firmware using a hot-spot with the name **MECHA-UPDATE** and (default) password **87654321**, which needs to be created and active before entering the code.

312< → UPDATE

Re-updates the current firmware.

3231<

Code for testing the IR Remote. After the code is entered, MECHA will not execute the commands received from the IR Commander's buttons. Instead, it will only beep and show on its display the code of the button pressed (after the button is released), and over the battery symbol in UI. To end the test, press the power button, ⏻.

3123<

This code will temporarily switch from ***AP*** to ***STA*** mode and connect MECHA to the last Wi-Fi, if the last Wi-Fi is detected by MECHA.

2313< → CHANGE SENSE LEFT-RIGHT

Changes the sense of left/right rotation when it is done manually using the ◀, ▶ buttons.

2323< → CHANGE SENSE UP-DOWN

Changes the sense of up/down rotation when it is done manually using the ▼, ▲ buttons.

The following codes should match with the current rotators connected to the controller.

13131< → SET E1 AS ROTATOR 1
Sets E1 as lower rotator.

13132< → SET E2 AS ROTATOR 1
Sets E2 as lower rotator.

13121< → SET P1 AS ROTATOR 1
Sets P1 as lower rotator.

23131< → SET E1 AS ROTATOR 2
Sets E1 as upper rotator.

23132< → SET E2 AS ROTATOR 2
Sets E2 as upper rotator.

23121< → SET P1 AS ROTATOR 2
Sets P1 as upper rotator.

231231< → RESET CONFIG. TO DEFAULT !
Resets the configuration settings to their default values, for example: SSID password → **12345678**, Password for Configuration page → **Mecha**, Hot-Spot password for firmware update → **87654321**, Default Mode → **AP**. This code needs to be entered twice, as follows:
1) enter **231231<** and wait until the display shows "*please execute again, then press power*", then
2) enter **231231<** again.

When the power symbol starts flashing on the display, press the ⏻ button (short press).

231231231< →FACTORY RESET !
This code will restore your MECHA to its original factory settings and needs to be entered twice, as follows:
1) enter **231231231<** and wait until the display shows "*please execute again, then press power*", then
2) enter **231231231<** again.

When the power symbol starts flashing on the display, press the ⏻ button (short press).
If a few exclamation marks are shown on the display – "***!!!***"– it means that the factory file is not found, and nothing is done.

Appendix

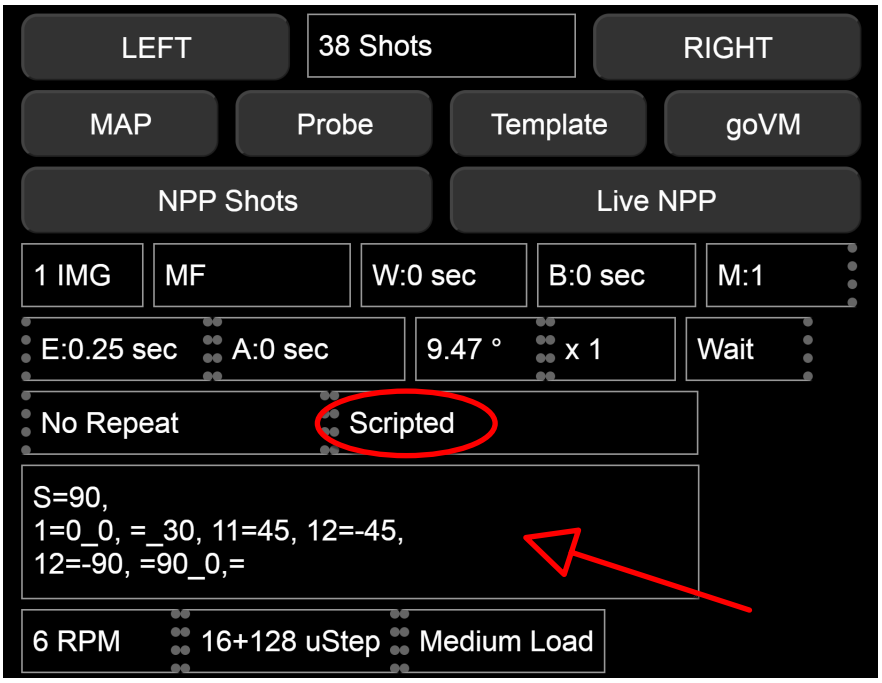
MECHA's S (Shots) Language

The S Language requires the firmware *(1)2054* or newer.

In this chapter we will explain how to make a script for your desired pattern of shooting.

The S language is Shots oriented, and it can be used for both single axis and dual axis applications.

Access the *Row* page using the User Interface, and select *Scripted*. As a result, a blank text area is displayed in which you will write the script.



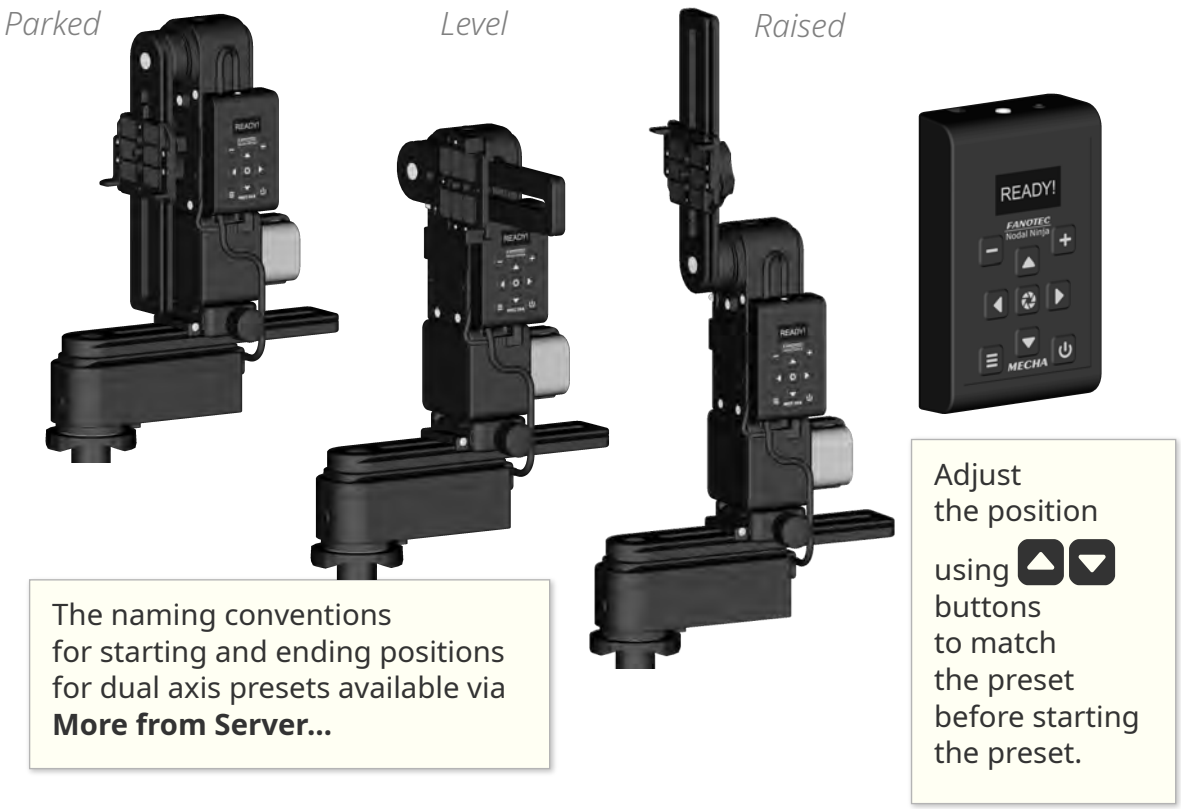
The script starts with the initial position of MECHA, as follows:

> S={position in degrees}

> Please note that usually MECHA's position refers to the position/ orientation of the rail/device controlled by MECHA.

For dual axis applications, we commonly have 3 possible start positions: **level**, **parked**, and **raised**. To go from a position to another, please see the Simple Rotations and Parked, Level and Raised Positions sections at the beginning of this guide.

For example, use the ▼ ☰ or ▲ ☰ buttons to go from **raised** to **parked** and back.



There are a couple of conventions in S language, and the most important are the following:

_	*Underscore* refers to the lower rotator.
=	*Equal sign* refers to the upper rotator.
::	*Double colon* is the equivalent of the *equal sign*.
( )	*Round brackets* indicate a loop.
^	*Caret* means „relative to the previous position", and can be used for the upper rotator, as the positions for the lower rotator are always relative to the previous position.

Three Row Panorama + Nadir + Zenith – EXAMPLE 1 (SL)

The MSS example Three Row Panorama + Nadir + Zenith (MSS) can be translated in S-Language as follows:

```
S=90, 1=0_0, =_30, 11=45, 12=-45, 12=-90,
=90_0, =
```

The S-Language also accepts precise values for the pause, of integer and float type. For example, **2.5:** means 2.5 seconds. To cancel a pause, you need to set another pause, of zero seconds: **0:**

```
S=90, 1=2.5:0_0, =0:_30, 11=45, 12=-45, 12=-90,
=90_0, =
```

Three Row Panorama + Nadir + Zenith – EXAMPLE 2 (SL)

> In the *Script* text area, **::** will be automatically replaced with **=** (equal sign), to allow more easy input from phones.

This is an example similar to the previous one. Suppose we want to script a panorama starting, again, from **parked** position, made of 12 photos around, 3 rows in total, at 0° and at +/- 45°, + zenith and nadir. In this case, we want **zenith and nadir to be taken at the end**.

This way of scripting is more complex, but allows more flexibility for a particular shooting pattern.

In the **parked** position, the camera – mounted on the upper rail – is facing up, as in the image on the right, and MECHA has to rotate the upper rail 90° to photograph the first row, as required in our example. So we specify the **parked start position** for the upper rotator as follows: **S=90**.

If the start position is **raised**, **S=-90**. For the **level** position, **S=0**, or **S=** (**S=0** is equivalent to **S=**).

Level	Parked	Raised	Other
S=0	**S=90**	**S=-90**	**S=45**

After the start position, we have to specify the details for the **first position**, as follows:

> {Number of position until the changes occur}
> ={upper rotator position}_{lower rotator position}

1=0_0

1	Next 1st position for the change to occur
=0	Upper rotator at a tilt or pitch of 0° (thus it does not move)
_0	Lower rotator at a yaw of 0° relative to the previous (thus it does not move)

Assuming **parked** position, our script becomes:

```
S=90, 1=0_0,
```

Then we have to think about how we want the rotators to move so that we have 12 photos around, 30° apart.

For the next position, the lower rotator rotation will be 30°, while for the upper rotator the position does not change.

We can write that as **1=0_30**, but S language also allows this compact form instead: **=_30**, by omitting the number 1, and writing the equal sign followed by nothing, meaning no changes for the upper rotator.

So, the script becomes:

```
S=90, 1=0_0, =_30,
```

The movement for the next 10 positions or photos (as we have only one photo at every position) will continue by changing only the rotation of the lower rotator, then at 11th photo something changes, the upper rotator should rotate the upper rail up 45°, so we have to add **11=45,** to our script:

```
S=90, 1=0_0, =_30, 11=45,
```

Then 11 positions will continue in the same manner, and at the 12th photo the upper rotator should rotate down 45 (-45)°. So we have to add **12=-45,** to our script, and it becomes:

```
S=90, 1=0_0, =_30, 11=45, 12=-45,
```

As for the previous row, things goes the same for another 11 photos, and at the 12th photo the upper rotator has to rotate at -90°, which is the position for nadir, so we have to add **12=-90,** and the script becomes:

```
S=90, 1=0_0, =_30, 11=45, 12=-45, 12=-90,
```

Finally, we only need a position for the zenith photo, at 0° from the nadir, for the lower rotator. So we have to add **=90_0, _0** is to tell that the previous position and the next position are 0° apart.

Now the script is:

```
S=90, 1=0_0, =_30, 11=45, 12=-45, 12=-90,
=90_0,
```

To complete the script, now we can add an equal sign **=**, which in other cases can be omitted. And our final script is:

```
S=90, 1=0_0, =_30, 11=45, 12=-45, 12=-90,
=90_0, =
```

which you can see in the above image as well.

Just a side note. The script allows to have some pieces of the code in a loop, and much less code to enter, especially in the case of gigapixel panoramas. This feature will be exemplified later.

Before launching the panorama, enter 38 in the *number of shots* field, via *Custom* option, then click/tap either the *[RIGHT]* or *[LEFT]* button.

We will explain in another example how to tell MECHA to wait or take extra shots in a particular orientation, so on.

Panorama Using Loop in Script – EXAMPLE 3 (SL)

```
S=90, 1=0_0, =10(^3_30, =^3), =10(^-3_30, =^-3),
```

S=90, — Start from **parked** position.

1=0_0, — The first position is at **=0_0**

=10(^3_30, — From the next position, we will start a loop (round brackets) **10** times that sets horizontal rotations of **30°** from the previous position,

=^3), — and the upper rotator tilts **3**° from the previous position (specified by the **^** sign).

In the loop, we have only the tilting of **3°** for the upper rotator, and no changes for the horizontal interval.

The above loop repeats with **-3**° instead of 3° for the upper rotator:

=10(^-3_30, =^-3),

Panorama with Extra Shots and Pause – EXAMPLE 4 (SL)

A script for 28mm on a full frame camera:

- 2 images 90° apart for both zenith and nadir.
- 2 rows of 10 shots at 45° above & below horizontal,
- and 12 shots around for the horizontal. 36 shots in total.
- Start in **parked** position (zenith), and end in **raised** position (nadir).

```
S=90, 1=0_0, =_30, 11=-45, =_36, 9=45, 10=90,
=_90, =-90_0, =_-90, =
```

S=90, — The start position is **parked**.

1=0_0, — The first shot is at **0,0** (no rotation).

=_30, — The next shot is at the same tilt, but 36° apart, and will keep going so.

11=-45, — Then, at the **11th** shot from the previous change, the tilt becomes **-45** and

=_36, — the next shot is at the same tilt, but **36**° apart, and will keep going so.

9=45, — Then, at the **9th** shot from the previous change, the tilt becomes **45**°, and

-10=90, — then, at the **10th** shot from the previous change, the tilt becomes **90** for zenith, and

=_90, — the next shot is at the same tilt, but **90**° apart (the second zenith shot).

=-90_0, — Then, at the next shot, the tilt becomes **90**° for nadir, and

=_-90, — the next shot is at the same tilt, but **90**° apart (the second nadir shot).

= — End.

To end in the **parked** position, as it started, in order to repeat it again and again:

```
S=90, 1=0_0, =_30, 11=-45, =_36, 9=45, 10=90,
=_90, =-90_0, =_-90, =90
```

When the camera is facing up, and its buttons and display are not accessible, you can add P to the first shot:

1=P0_0,

MECHA will pause before the first shot, and will continue only after you click the *[PAUSE]* button on UI or press the button on controller.

C2 – C1 Differences and Similarities

- C2 can be connected to two rotators, so it can control two rotators simultaneously.
  - C1 can control only one rotator at a time.

> For dual axis applications, you need either one C2 controller and two rotators or two C1 controllers and two rotators.

- The C2 controller connects to the rotators with its built-in cable.
  - The C1 controller connects wirelessly to another C1, thus two C1 can be assembled in DAC and control two axes.
- The C2's battery is external and you can quickly replace it when needed.
  - C1 has a built-in battery which lasts for one day after a full charge and can be charged from a power bank or outlet adapter even while it is in use.

> Both systems allow MECHA to operate non-stop.

- READY! C2 has a 0.96 inch OLED display on which various data are shown, including presets for shooting panoramas, code names, warnings.

> **Codes** are special, predefined numerical combinations that you can use to get information from MECHA or to ask MECHA to perform various operations.

  - C1 has no display, but it has five LEDs with a similar function.
- C2 has nine buttons, C1 has six.
  - − The minus button of C2 is the equivalent of the 1 button of C1. It comes pre-programmed with 4 shots around. It can also be used to enter the number 1, or long press it to execute the *favorite code 1*. Other special functions: adjusting values in preset editing mode, deleting presets created in C2's menu.
  - + The plus button of C2 is the equivalent of the 2 button of C1. It comes pre-programmed with 6 shots around. It can also be used to enter the number 2, or long press it to execute the *favorite code 2*. Other special

functions: adjusting values in preset editing mode, creating presets, accessing edit mode.

- The menu button of C2 is the equivalent of the 3 button of C1. It comes pre-programmed with 8 shots around. It can also be used to enter the number 3. Other special functions: long press it to show the C2's menus, switching from one menu to another.

> **NOTE.** When we say the MECHA's buttons, or the buttons, we are actually referring to the controller buttons.

Equivalence numbers – buttons			
numbers	**1**	**2**	**3**
C2 buttons	−	+	≡
C1 buttons	1	2	3

- ◀ ▶ On both C1 and C2, the left and right buttons are used to rotate the system manually to the left and to the right, respectively, and also to specify the direction when launching a preset using the controller buttons, as terminator for codes (similar to the Enter key). They are navigation buttons as well.

- ▲ ▼ The up and down buttons of C2 control the up and down movement of the upper rotator, when two rotators are used. They are navigation buttons as well.

  → On Dual Axis Combo, the left and right buttons of the upper C1, ◀ ▶, act as up and down buttons and control the upper rotator.

- The center button of C2 has a camera trigger function and confirms the execution of a code or preset selected from the menu or confirms the adjustment of values when editing a preset.

> A code can be entered using the C2's buttons and can also be selected from the C2's Config (C) menu.

  → There is no C1 equivalent of the above button.

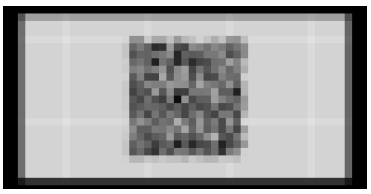
- ⏻ On both C1 and C2, the power button is used to power on/off MECHA, to confirm or cancel some operations, and it is also the equivalent of the number 0 (zero) when power codes are entered.

Power codes are codes that start with zero.

- Both C1 and C2 have support for IR or wired remote control.
- Both C1 and C2 can be controlled using the User Interface and also using their own buttons.
- C2 uses Wi-Fi for connection, as does C1, so both can be accessed directly by phone or via a Wi-Fi network, or even via the Internet, with a device connected to the Internet.
- On both C1 and C2, for complex tasks, or to assign complex tasks to a single button, the User Interface can be used.

MECHA C2 OLED Images

Config Menu



Interval 1 speed
3.5 RPM
INTERVAL 2 [+]
90.0 deg.
Interval 2 speed
3.5 RPM
INTERVAL 3 [=]
180.0 deg.
Interval 3 speed
3.5 RPM
LEVEL AMOUNT
90.0 deg.
SHOW HINTS
is OFF
Default Wi-Fi is
AP + STA
CONNECT TO
Wi-Fi
KEEP PAGE
is OFF
USE NN IR
is ON
IR REMOTE
TEST
SHOOT , OLED
is ON
OLED
TEST
Shutter CONF.
TEST
ROTATOR 1 is
AUTO
ROTATOR 2 is
AUTO
BACKLASH 1
COMPENSATION
BACKLASH 2
COMPENSATION
is REAL MOVE 1
0.0
is REAL MOVE 2
0.0

C1234567 8
ZENITH POS.
90.0 deg.

C1234567 8
NADIR POS.
-90.0 deg.

C1234567 8
ROT. 2 SENSOR
is ENABLED

C1234567 8
UPDATE

C1234567 8
REBOOT

C1234567 8
FIRMWARE
VERSION

C1234567 8
UPDATE
USING H-SPOT

C1234567 8
RESET CONFIG.
TO DEFAULT !

C1234567 8
FACTORY
RESET !

C1234567 8
QUIET - LOUD
BEEP

Preset Menu

P 1 2345678
SIMPLE
ROTATIONS

P 1 2345678
PANORAMA
TEST SINGLE 0

P 1 2345678
PANORAMA
TEST PARKED

P 1 2345678
PANORAMA
TEST LEVEL

P 1 2345678
PANORAMA
TEST RAISED

P 1 2345678
KIT LENS (0/28)
LEVEL

P 1. 2345678
+ FE 12mm NZ
Level

What is New

- **Version 02.8.6 – 2022.01.12**:
  - Added: *Launch a Preset by Scanning a QR Code.*
- **Version 02.8.5 – 2021.12.27**:
  - New option, C-11: *USER'S GUIDE QR CODE*. C-11 – C-17 images updated.
  - Added: a link to a youtube video about UI presets (pg.91), a note about using codes in *Advanced Mode* (pg.109).
- **Version 02.8.4 – 2021.12.08**:
  - More details about the shutter confirmation feature added in the *User Interface* chapter.
- **Version 02.8.3 – 2021.10.26**:
  - MECHA C2 OLED Images.
  - Added in the *Configuration* page:
    - → *Hide some controls in web UI when a motor is running.* Enabled by default.
    - → *Shutter Confirmation Time Out (sec.).*
  - Added in the OLED *Config Menu*, C-42 option: *CONNECT TO Wi-Fi*.
  - *FIRMWARE VERSION* option shows the current firmware version for all MCUs (microcontroller units) and connected rotators.

Useful links

https://www.nodalninja.com/Manuals/mecha-card.pdf

MECHA Quick Reference Card

https://www.nodalninja.com/manual

Quick reference guides and complete manuals.

https://www.youtube.com/user/Fanotec

Fanotec Youtube Channel

https://www.youtube.com/user/NodalNinja

Nodal Ninja Youtube Channel

https://forum.nodalninja.com/

Nodal Ninja's Panoramic Photography Forum

https://www.fanotec.com/

Fanotec International Limited official website

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FCC Warning

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any inte rference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interferenceto radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-Reorient or relocate the receiving antenna.

•Increase the separation between the equipment and receiver.

•Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

•Consult the dealer or an experienced radio/TV technician for help.

Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.