

# 1A TOOLS



## ALPHA WHEELS MANUAL

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Firmware Version 0.203-MV2

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# ALPHA WHEELS MANUAL

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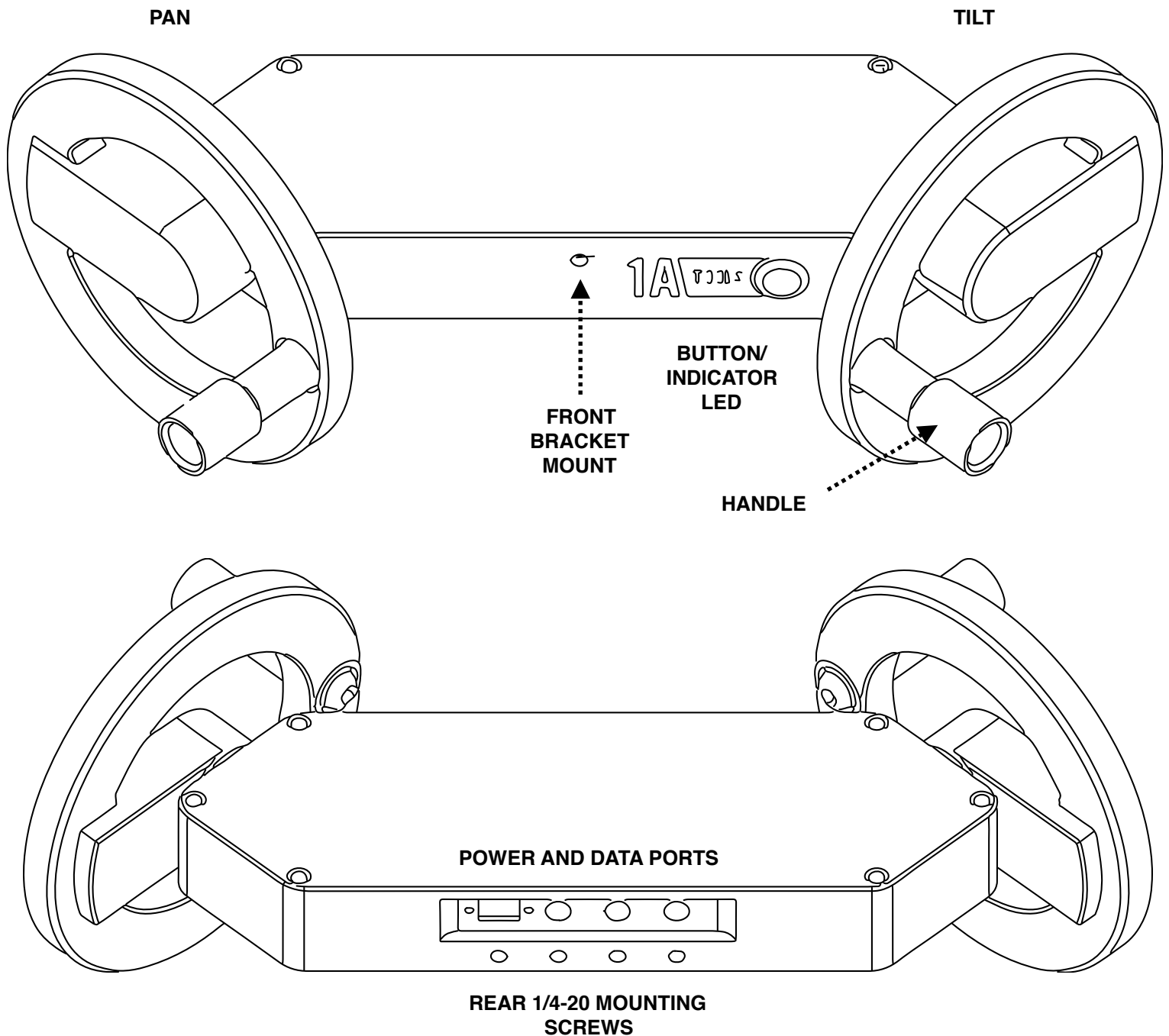
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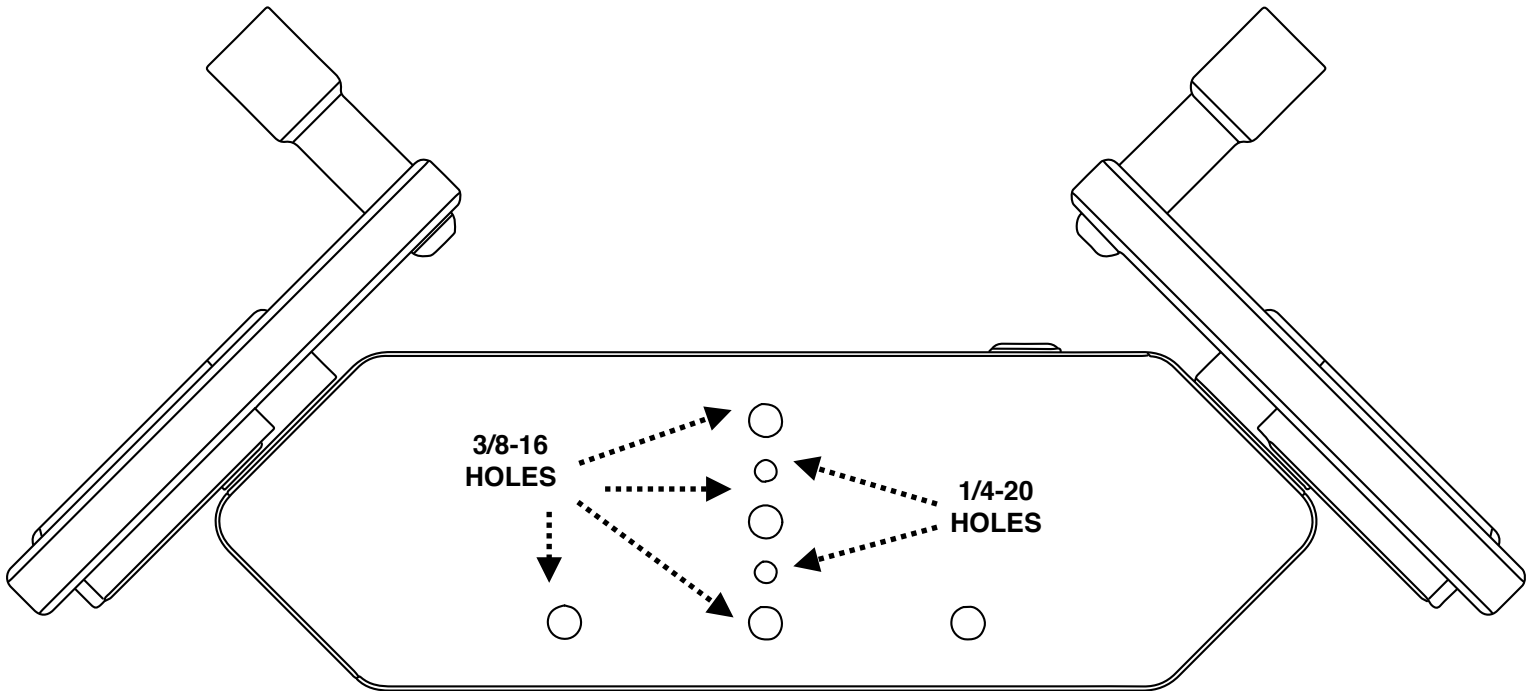
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# ALPHA WHEELS

## DIAGRAMS





# ALPHA WHEELS

## DISCLAIMERS

### A NOTE ABOUT ELECTRONICS

Before connecting the Alpha Wheels to any other electronics, be certain you understand voltage ratings and voltage polarity for all devices. 1A Tools is not responsible and will not cover under warranty any damage from reverse polarity or over voltage. Always test any cable before plugging into the Alpha Wheels.

### LIABILITY DISCLAIMER

Use the 1A Tools Products at your own risk. Always have proper filmmaking insurance. Always understand and abide by the laws that govern where you are filming. Never use any filmmaking equipment, including 1A Tools equipment, outside of its intended purpose. Never deviate from the instructions in this manual.

# ALPHA WHEELS

## OVERVIEW

### INTENDED USE

The Alpha Wheels are a digital, re-programable wheel interface for camera pan tilt control. They are designed to work with various remote heads, gimbals, and software.

### IMPORTANT NOTE ABOUT THE MODE

Since the Alpha Wheels are designed to interface with many different types of film equipment, it has a internal MODE system. There is currently no universal protocol for wheels to communicate with film equipment (we're working on developing it), each needs its own particular type of signal. As a way to simplify this, we have created (and will create more) several top-level modes to put the Alpha Wheels in depending on the type of output necessary.

Before the Alpha Wheels can communicate with any film equipment, it's important that the Alpha Wheels are put into the proper mode.

Some equipment, like the MōVI Controller, recognize the Alpha Wheels and are capable of setting the Alpha Wheel's mode automatically. Others, like a Spektrum controller, are not capable of recognizing the Alpha Wheels and thus the Alpha Wheels will need to be setup by the user before.

As such, each section of this manual will reference how to configure the proper mode.

As another note, the mode is saved to the memory of the wheels and will persist between reboots. So if the mode is set up on a prep-day, it will be ready the following shoot day.

### TURNING ON THE ALPHA WHEELS

The Alpha Wheels do not have a power button. Simply connect the wheels to a proper power source and they will turn on. See the section on Connectors to learn about the various options.



# ALPHA WHEELS

## MōVI CONTROLLER SETUP

### PHILOSOPHY

The Alpha Wheels and the MōVI Controller are both designed to seamlessly communicate with each other to provide quick, effortless setup via a single cable. Regardless of how the Alpha Wheels were last used, it will automatically configure itself when plugged into the MōVI Controller.

### PERFORMANCE

The Alpha Wheels and MōVI Controller use an all-digital communication protocol that allows the MōVI and Wheels to share ABSOLUTE POSITIONING. This means that the position of the wheels directly correlate to the position of the pan and tilt.

### POWERING THE ALPHA WHEELS

The Alpha Wheels are powered directly off the 7-Pin Lemo Cable when plugged into the MōVI Controller. No other power is necessary or recommended.

### MODE

The MōVI Controller will automatically set the Alpha Wheels' MODE. Nothing is necessary for setup beyond the following steps.

### COM CABLE

Plug one end of the 7-Pin Lemo Cable into the I/O port on the Alpha Wheels. Plug the other end into the AUX port on the MōVI Controller.

## CONFIGURING THE MÖVI CONTROLLER

Power on the MöVI Controller. The Indicator LED on the Alpha Wheels should turn on as well.

In the MöVI Controller menu, navigate to TX CONFIG > TX MODE and change it to read "ALPHA WHEELS". After approximately 2 seconds, the Alpha Wheels are configured and have control over a connected MöVI.

## DIGITAL WHEEL BRAKE

Momentarily press the button the Alpha Wheels to enable a digital wheel brake. This will stop the Wheels from outputting their position data. The light will blink to indicate it is on. Momentarily press again to turn off the brake.

## CHANGING SPEED

In the MöVI Controller, below TX CONFIG > TX MODE: ALPHA WHEELS, change TILT GEAR RATIO and PAN GEAR RATIO. These are mathematically accurate gear ratios. The number listed is how many full 360° turns of the hand wheel it will take to complete one full 360° pan or tilt of the MöVI. Simply change these numbers to change the speed.

## CHANGING DIRECTION

To change direction, on the MöVI Controller press in with the SET knob on the TILT GEAR RATIO or PAN GEAR RATIO. You will see an R next to it to indicate it's reversed.

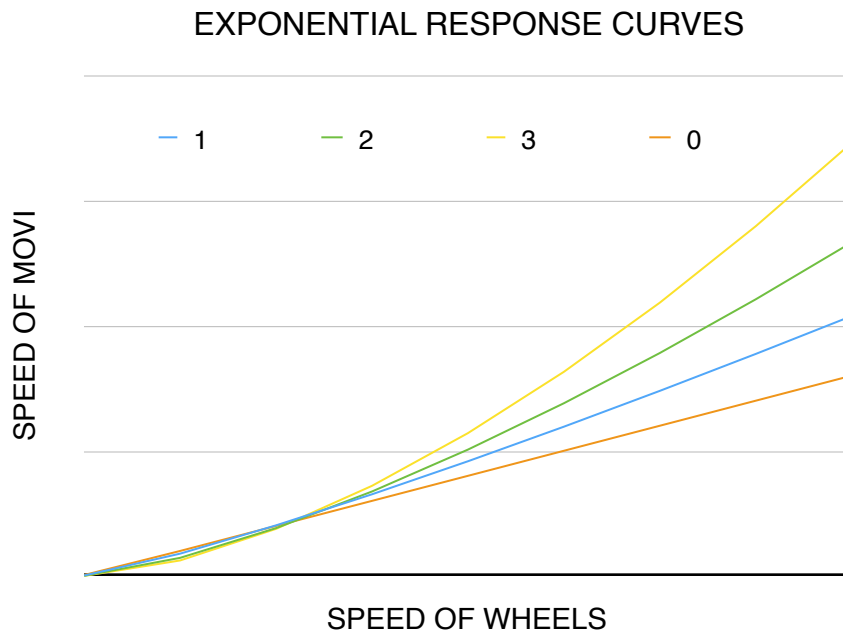
## SMOOTHING

Under some circumstances when operating, the wheels may be too reactionary and precise and some smoothing would assist. Turn up the AW SMOOTHING to add smoothing.

NOTE: Any value greater than 0 will mean that the wheel's position will no longer directly correlate to the MöVI's position. Smoothing adds averaging which loses precision.

## EXPONENTIAL RESPONSE

Under some circumstances when operating, a shot may need both very quick and very slow movement in one shot. Turn up the AW EXPO to increase an exponential repose. This means that as the wheels turn slowly, the gimbal will move extra slowly. When the wheels turn quickly, the gimbal will move extra quickly.



NOTE: Any value greater than 0 will mean that the wheels position will no longer directly correlate to the MōVI's position.

## TIPS FOR GETTING THE BEST PERFORMANCE

The wheels are a very precise and direct method of controlling a gimbal. The limits of the MōVI's performance may appear to be reached much quicker with the Alpha Wheels than under previous joystick/mimic/majestic modes. As such, it is highly recommended to follow these tips.

Always balance the MōVI as well as possible. A well balanced payload means the motors have more power to respond quickly and precisely to wheel movements.

After balancing, autotune.

Adjust the PAN/TILT HOLD strength. The default 8 may be enough for majestic, mimic and joystick. But there may be a delayed/slow response with wheels if it's too low or backlash if it's too strong. Try starting around 22 and work back down.

## TROUBLESHOOTING

With quick movements, there is a lot of backlash.

Adjust the PAN/TILT HOLD strength down.

Rebalance and run autotune.

The camera build may just be too heavy. Wheels can be very demanding of the motors. It possible that the motors cannot stop the gimbal as quickly as the wheels are stopping.

Under TX CONFIG > TX MODE there is no ALPHA WHEELS option.

The firmware may not be up to date on the MōVI Controller. Currently the firmware that supports the Alpha Wheels is under limited release and not public. Contact [info@1a.tools](mailto:info@1a.tools) to get access.

The MōVI is drifting when the wheels are not moving.

If any knobs or inputs are linked to pan or tilt trim, unlink them. And reboot.

Reboot the MōVI and the MōVI Controller and keep both completely static. Slight movements when booting can confuse internal sensors.

Once you achieve a drift-free MōVI, rather than powering down the MōVI when not in use, use the kill switch and keep the sensors calibrated while saving batteries.

Read the Freefly MōVI manual on how to properly use Heading Assist. And use it when conditions are favorable.

# ALPHA WHEELS

## MÖVI SPEKTRUM DX8 (FIRST GEN) SETUP

### NOTE

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The setup of the first generation DX8 controllers is very similar to the Spektrum DX7S, however, it is likely you will have to specifically calibrate the Alpha Wheels for the type of analog input on the older DX8 models. Please email us at [info@1a.tools](mailto:info@1a.tools) to get specifically calibration instructions.

.....

# ALPHA WHEELS

## MÖVI SPEKTRUM DX8 G2 SETUP

### PHILOSOPHY

The Alpha Wheels are capable of outputting a signal into the trainer port of RC controllers. This signal is interpreted by the RC Controller as another controller used for training RC aircraft pilots. In order to give the Alpha Wheels control of the pan and tilt, the user will need to tell the RC Controller just to handle the input signal, and the user will need to tell the Alpha Wheels what type of signal to output.

### PERFORMANCE

The signal that the RC controller requires is an analog signal that only communicates the speed of the wheels and not absolute positioning. As such, the response time will be quick, but the longer the wheels are operated, the position of the wheels may begin to shift relative to the position of the gimbal. This is typical of all wheels that piggyback on RC components.

### POWERING THE ALPHA WHEELS

When used with an RC controller, an external power source is needed. A USB power source via the micro USB cable, or a 7-35v power source via the PWR connector may be used. See the Connectors section for more details.

### MODE

Use TyQT to change the MODE of the Alpha Wheels to *mode,spektrum\_movi*. See the section on Computer Setup to learn more.

### BEFORE SETTING UP THE CONTROLLER

Make sure your Spektrum controller is already configured, connected, and controlling the MöVI as it should be according to the Freefly MöVI Manual.

## COM CABLE

Plug the 7-Pin Lemo end of the 1A Tools Spektrum Com Cable into the I/O port on the Alpha Wheels and the other end into the trainer port located on the rear of the Spektrum Controller.

The RC controller may automatically boot into Slave mode. Flip on the RC controller's power switch to turn on to turn it into Master mode.

## CONFIGURING THE CONTROLLER

With the RC controller off, press and hold the Roller Button down and boot the controller.

Scroll down and select TRAINER.

Selected WIRED TRAINER.

Change SLAVE to PROGRAMMABLE MASTER.

Change all channels, except AIL and ELE to have the black switches down.

AIL and ELE White switches should be up.

Change SWITCH to SWITCH I (Or whatever switch is preferred).

Change MASTER OVER-RIDE: INHIBIT. Done.



IT SHOULD LOOK LIKE THIS

## ACTIVATING THE WHEELS

Switch I, or whichever switch was selected in the TRAINER menu, will toggle the wheels on or off.

## REVERSING PAN/TILT DIRECTION

With the controller is on, access the menu by pressing down the Roller Button and go to SERVO SETUP

Hover over TRAVEL and select it and scroll to REVERSE

To reverse pan, move the black switch up on ALL.

To reverse tilt, move the black switch up on ELE.

ALTERNATIVELY: For advanced users, to change the default direction of the Alpha Wheels output, use TYQT and sent it the command *multi,pan,-5* or *multi,tilt,-5*. 5 is the default value. -5 reverses it. When changed, this is saved to memory. It will be reset by firmware updates.

## CHANGING PAN SPEED

If the controller is properly set up according to Freefly's manual, the large control stick on the left will control pan speed.

ALTERNATIVELY: For advanced users, to change the default speed the Alpha Wheels output, use TYQT and sent it the command *multi,pan,x* with x being an integer between -30 and 30. 5 is the default. Negative numbers reverse the direction. When changed, this is saved to memory. It will be reset by firmware updates.

## CHANGING TILT SPEED

If the controller is properly set up according to Freefly's manual, the knob on the top right of the controller will control tilt speed.

ALTERNATIVELY: For advanced users, to change the default speed the Alpha Wheels output, use TYQT and sent it the command *multi,tilt,x* with x being an integer between



-30 and 30. 5 is the default. Negative numbers reverse the direction. When changed, this is saved to memory. It will be reset by firmware updates.

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## DIGITAL WHEEL BRAKE

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Momentarily press the button the Alpha Wheels to enable a digital wheel brake. This will stop the Wheels from outputting their position data. The light will blink to indicate it is on. Momentarily press again to turn off the brake.

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# ALPHA WHEELS

## MÖVI SPEKTRUM DX7S SETUP

### PHILOSOPHY

The Alpha Wheels are capable of outputting a signal into the trainer port of RC controllers. This signal is interpreted by the RC Controller as another controller used for training RC aircraft pilots. In order to give the Alpha Wheels control of the pan and tilt, the user will need to tell the RC Controller just to handle the input signal.

### PERFORMANCE

The signal that the RC controller requires is an analog signal that only communicates the speed of the wheels and not absolute positioning. As such, the response time will be quick, but the longer the wheels are operated, the position of the wheels may begin to shift relative to the position of the gimbal. This is typical of all wheels that piggyback on RC components.

### POWERING THE ALPHA WHEELS

When used with an RC controller, an external power source is needed. A USB power source via the micro USB cable, or a 7-35v power source via the PWR connector may be used. See the Connectors section for more details.

### MODE

Use TyQT to change the MODE of the Alpha Wheels to *mode,spektrum\_movi*. See the section on Computer Setup to learn more.

### INITIAL SETUP

Make sure your Spektrum controller is already configured, connected, and controlling the MöVi as it should be according to the Freefly MöVi Manual.

## COM CABLE

Plug the 7-Pin Lemo end of the 1A Tools Spektrum Com Cable into the I/O port on the Alpha Wheels and the other end into the trainer port located on the rear of the Spektrum Controller.

The controller may automatically boot into Slave mode. Flip on the controller's power switch to turn on.

## SETTING UP THE CONTROLLER

With the controller off, press and hold the Roller Button down and boot the controller.

Scroll down and select TRAINER.

Change SLAVE to PROGRAMMABLE MASTER.

Change all channels, except AIL and ELE to have the black switches down.

AIL and ELE White switches should be up. Done.



**IT SHOULD LOOK LIKE THIS**

## ACTIVATING THE WHEELS

Press and hold down the TRAINER BUTTON to activate the wheels. A piece of tape can usually keep the button held down.

## REVERSING PAN/TILT DIRECTION

With the controller is on, access the menu by pressing down the Roller Button and go to SERVO SETUP

Hover over TRAVEL and select it and scroll to REVERSE

To reverse pan, move the black switch up on ALL.

To reverse tilt, move the black switch up on ELE.

ALTERNATIVELY: For advanced users, to change the default direction of the Alpha Wheels output, use TYQT and sent it the command *multi,pan,-5* or *multi,tilt,-5*. 5 is the default value. -5 reverses it. When changed, this is saved to memory. It will be reset by firmware updates.

## CHANGING PAN SPEED

If the controller is properly set up according to Freefly's manual, the large control stick on the left will control pan speed.

ALTERNATIVELY: For advanced users, to change the default speed the Alpha Wheels output, use TYQT and sent it the command *multi,pan,x* with x being an integer between -30 and 30. 5 is the default. Negative numbers reverse the direction. When changed, this is saved to memory. It will be reset by firmware updates.

## CHANGING TILT SPEED

If the controller is properly set up according to Freefly's manual, the knob on the top right of the controller will control tilt speed.

ALTERNATIVELY: For advanced users, to change the default speed the Alpha Wheels output, use TYQT and sent it the command *multi,tilt,x* with x being an integer between -30 and 30. 5 is the default. Negative numbers reverse the direction. When changed, this is saved to memory. It will be reset by firmware updates.

## DIGITAL WHEEL BRAKE

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Momentarily press the button the Alpha Wheels to enable a digital wheel brake. This will stop the Wheels from outputting their position data. The light will blink to indicate it is on. Momentarily press again to turn off the brake.

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# ALPHA WHEELS

## CINE DESIGNER SETUP

### PHILOSOPHY

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In Cine Designer, you can build and control virtual sets and cameras. Extremely helpful for pre-visualization and more. The Alpha Wheels extend this to allow you to control camera rigs in real time during playback. The most recent version of Cine Designer has Alpha Wheels functionality built right in.

.....

### PERFORMANCE

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Cine Designer and the Alpha Wheels were designed to work together. They share digital, absolute positioning data. As such, the performance is responsive and precise—perhaps better than real remote heads even.

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### POWERING THE ALPHA WHEELS

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Use the micro USB cable between your computer and the wheels.

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### MODE

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Cine Designer automatically configures the wheels. Users do not need to manually change the mode.

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### COM CABLE

.....

Use the micro USB cable between your computer and the wheels.

.....

### SETUP

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See Cine Designer's manual for setup instructions.

.....

## REVERSING PAN/TILT DIRECTION

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Available in Cine Designer.

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## CHANGING PAN SPEED

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Available in Cine Designer.

---

## CHANGING TILT SPEED

---

Available in Cine Designer.

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## DIGITAL WHEEL BRAKE

---

Momentarily press the button the Alpha Wheels to enable a digital wheel brake. This will stop the Wheels from outputting their position data. The light will blink to indicate it is on. Momentarily press again to turn off the brake.

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# ALPHA WHEELS

## FUTABA 14SG RONIN SETUP

### PHILOSOPHY

The Alpha Wheels are capable of outputting a signal into the trainer port of RC controllers. This signal is interpreted by the RC Controller as another controller used for training RC aircraft pilots. In order to give the Alpha Wheels control of the pan and tilt, the user will need to tell the RC Controller just to handle the input signal.

### PERFORMANCE

Although Futaba has a digital protocol, their controllers trainer ports still feature an analog signal. With this, the Alpha Wheels can only communicate the speed of the wheels and not absolute positioning. As such, the response time will be quick, but the longer the wheels are operated, the position of the wheels may begin to shift relative to the position of the gimbal. This is typical of all wheels that piggyback on RC components.

### POWERING THE ALPHA WHEELS

When used with an RC controller, an external power source is needed. A USB power source via the micro USB cable, or a 7-35v power source via the PWR connector may be used. See the Connectors section for more details.

### MODE

Use TyQT to change the MODE of the Alpha Wheels to *mode,futaba\_ronin*. See the section on Computer Setup to learn more.

### INITIAL SETUP

Make sure the Futaba controller is already configured, connected, and controlling the Ronin as it should be according to the Ronin Manual.



## COM CABLE

Plug the 7-Pin Lemo end of the 1A Tools Futaba Com Cable into the I/O port on the Alpha Wheels and the other end into the trainer port located on the rear of the Futaba Controller.

## LINKING THE WHEELS TO CONTROLLER

Enter the main menu of the controller by pressing and holding the "+" (plus) button.

Move right in the menu several pages and select TRAINER.

Change the MODE to either "OFF" or "ON". Be certain it is not in "INH" mode.

Change "1:AIL" to "FNC"

Change "2:ELE" to "FNC"

Change all others to "OFF"

At this point, make sure the cable is connected, the Alpha Wheels are powered and in the right mode (see above if the mode has not been set yet). If this is done, the controller will display TRAINER (ONLINE).

The D Switch on the top right of the controller will give the Alpha Wheels control. Toggle it to see how it is configured. Pulled up, it will display "MODE>ON".

Press the end button twice to exit to the status screen.

Press and hold the "-" (minus) button to enter the MONITOR.

By moving the wheels on the Alpha Wheels, the values in channels 1 and 2 will move accordingly.

## REVERSING PAN/TILT DIRECTION

Enter the main menu of the controller by pressing and holding the "+" (plus) button.

Select REVERS.

To change pan move the cursor over ALL.

To change tilt move the cursor over ELE.

Move the joystick up or down to toggle the displayed switch up or town.

And confirm your choice by pressing down on the joystick.

ALTERNATIVELY: For advanced users, to change the default direction of the Alpha Wheels output, use TYQT and send the command *multi,pan,-5* or *multi,tilt,-5*. 5 is the default value. -5 reverses it. When changed, this is saved to memory. It will be reset by firmware updates.

## CHANGING PAN SPEED

If the controller is properly set up according to the Ronin Manual. You can adjust the controller speed in the DJI App.

ALTERNATIVELY: For advanced users, to change the default speed the Alpha Wheels output, use TYQT and sent it the command *multi,pan,x* with x being an integer between -30 and 30. 5 is the default. Negative numbers reverse the direction.

## CHANGING TILT SPEED

If the controller is properly set up according to the Ronin Manual. You can adjust the controller speed in the DJI App.

ALTERNATIVELY: For advanced users, to change the default speed the Alpha Wheels output, use TYQT and sent it the command *multi,tilt,x* with x being an integer between -30 and 30. 5 is the default. Negative numbers reverse the direction.

## DIGITAL WHEEL BRAKE

---

Momentarily press the button the Alpha Wheels to enable a digital wheel brake. This will stop the Wheels from outputting their position data. The light will blink to indicate it is on. Momentarily press again to turn off the brake.

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# ALPHA WHEELS

## COMPUTER SYSTEM: TYQT

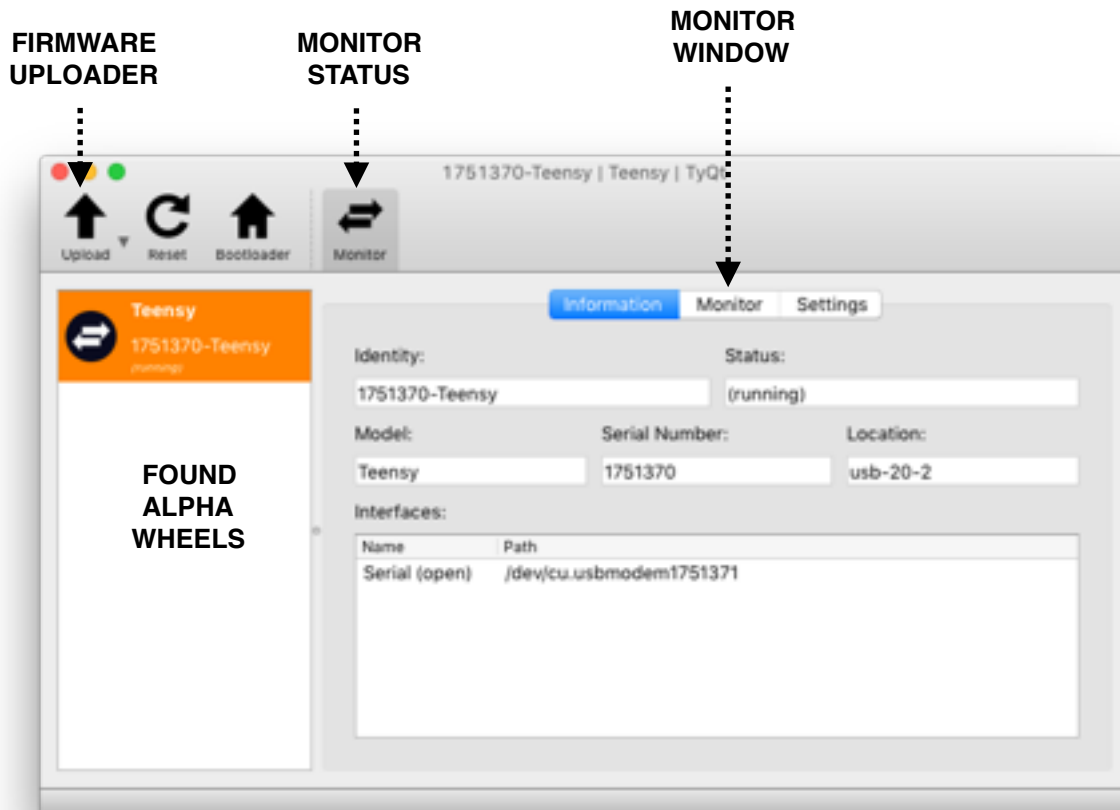
### ABOUT TYQT

TyQt is a desktop software application designed to interface with the reprogrammable board in the Alpha Wheels, which is called a "Teensy". This software allows you to upload new firmware and view and change settings, including the important MODE setting.

Visit <http://1a.tools/downloads> to get the latest version of TyQt.

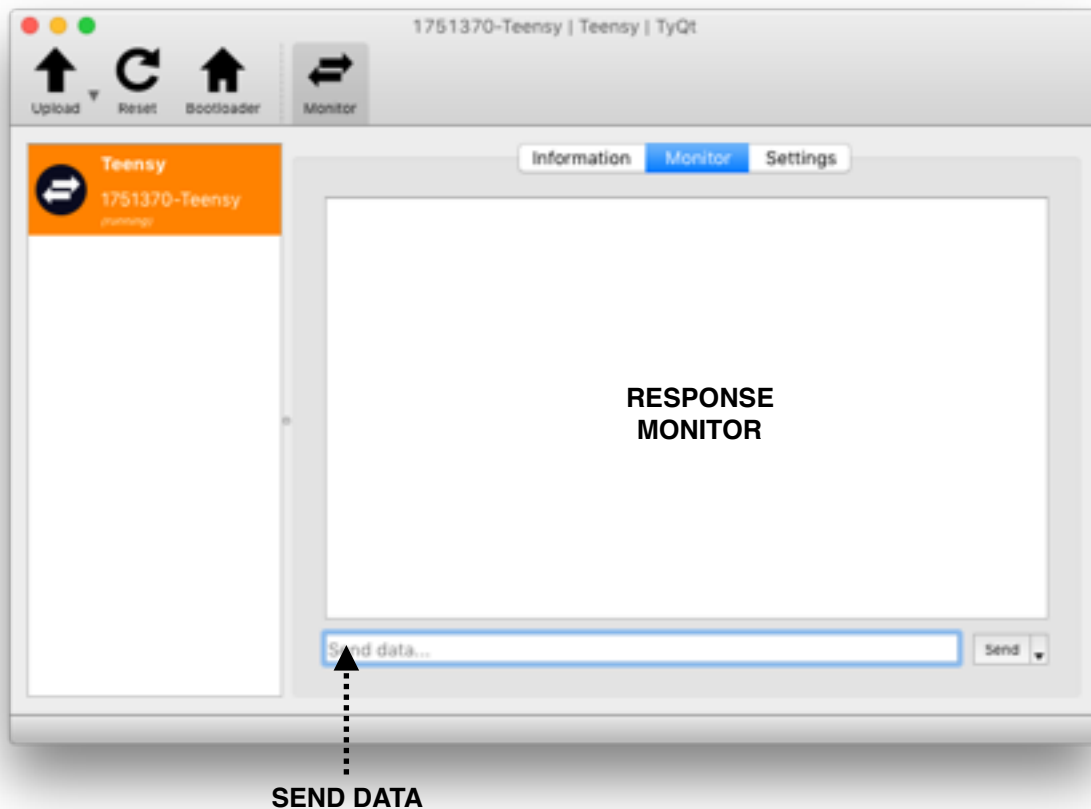
### GETTING STARTED

Start by launching TyQt and plugging in the Alpha Wheels via micro USB to your computer. TyQt will automatically detect your wheels.



## USING THE MONITOR

Start by looking at the Monitor Status icon in the top. If it is shaded darker, it means the monitor is open and ready. Go to monitor window.



## SENDING A COMMAND

To send a command simply type it in Send Data field and press the enter key. For example, send the command *firmware* and it will reply with it's current firmware version.

## SETTING THE MODE

To set a mode, simply type in *mode* followed by a comma and the desired mode. Here are some modes you can use:

*mode,spektrum\_movi*

.....  
*mode,futaba\_ronin*  
.....

For a list of modes send command: *mode,help*  
.....

NOTE: Certain modes are automatically configured when the Alpha Wheels are plugged into the partnering device. Read each section on what you would like to connect to to properly understand when to use the *mode* command.  
.....

## FACTORY RESET

.....

To revert all settings of the Alpha Wheels back to factory default settings send command: *factoryreset*  
.....

And then reboot.  
.....

## OTHER COMMANDS

*multi,pan,[-30 to 30]*

Changes the scale of the pan output for analog modes, i.e. Futaba, Spektrum. Default is 5. Negative numbers reverse direction.

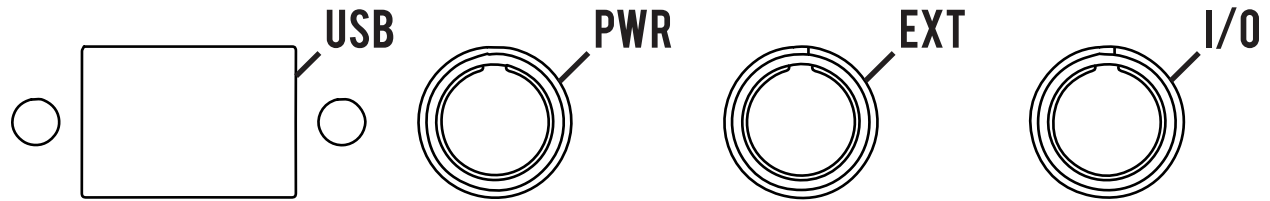
*multi,tilt,[-30 to 30]*

Changes the scale of the tilt output for analog modes, i.e. Futaba, Spektrum. Default is 5. Negative numbers reverse direction.

.....  
There are other commands available via the command menu. However, currently these are still being developed and are undocumented. Please refrain from using them.  
.....

# ALPHA WHEELS

## CONNECTORS



### USB

For firmware updates and communicate with computer applications. The Alpha Wheels can also be powered off of USB. Micro USB Cable.

### PWR

7-35V Power Connector. Pin Polarity is the same as Teradek and Arri. 302.0B Pin Lemo.

### I/O

Main communication port with Serial, CAN, and analog. Can also be powered via this port with regulated 5V power. 307.0B Lemo Connector

### EXT

Additional port for additional capabilities and external communication. Also has 5V low wattage output. 306.0B Lemo Connector.

# ALPHA WHEELS

## CONNECTOR PIN OUT

.....  
All pin numbering is determined according to the Lemo standard.  
.....

### PWR

Pin 1 - Ground

Pin 2 - 7-35V

### I/O

Pin 1 - Ground

Pin 2 - 5V IN (MUST BE REGULATED!!)

Pin 3 - CAN H or ANALOG

Pin 4 - CAN L or ANALOG

Pin 5 - PPM or General I/O

Pin 6 - 3.3v UART RX - 115200 Baud 8N1

Pin 7 - 3.3v UART TX - 115200 Baud 8N1

### EXT

Pin 1 - Ground

Pin 2 - 5V OUT

Pin 3 - General I/O

Pin 4 - General I/O

Pin 6 - 3.3v UART RX - 19200 Baud 8N1

Pin 7 - 3.3v UART TX - 19200 Baud 8N1



# ALPHA WHEELS

## OPEN API

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The Open API is still in development. We will release details as soon as possible.

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If you believe you have an immediate need for access and have a reason to contribute, please email us at [info@1a.tools](mailto:info@1a.tools) to discuss early access.

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# **ALPHA WHEELS**

## HASHTAGS

**#ALPHAWHEELS**

**#1ATOOLS**

**@1ALPHATOOLS**