

PINE Motion Controller

User Manual



Valid for: PINE, PINE LITE, PINE R

Firmware Version: 3.0

Release Date: 21. January 2020

Revision:



Dear customer,

Thank you for purchasing the PINE Motion Controller from Black Forest Motion. As our customer, you receive our highest attention and we are always there for you, if you have questions or suggestions to our products.

In order to make it as easy as possible for you to start using our product, please read this user manual carefully and familiarize yourself with its safe and efficient operation.

Keep this user manual in a safe place so that it can be accessed at any time if necessary.

The current user manual is also always available for download from our website:

https://www.blackforestmotion.com/support

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Content

1.		Usage of this Manual5				
2.		Pre	eface	. 6		
3.		Rev	vision History	. 7		
4.		Intr	oduction	. 8		
5.		Saf	fety Instructions	. 9		
6.		Tec	chnical Specifications	11		
7.		Со	nnections	12		
	7.	۱.	Difference between the PINE Models	12		
	7.2	2.	Motors	12		
		7.2.	.1. Compatible 3 rd Party Manufacturers	12		
		7.2.	.2. Motor Connector Pinout	13		
	7.3	3.	Cameras	13		
		7.3.	.1. Technical Details of the Camera Ports	15		
	7.4	4.	AUX Input	15		
		7.4.	.1. Technical Details of the AUX Input	16		
	7.5	5.	Power Supply of the Controller	17		
	7.	3.	Mounting Options	17		
8.		Ор	peration of the Controller	18		
	8.	۱.	Boot-Up Process	18		
9.		PIN	IE Motion App	19		
	9.	۱.	Connection with a PINE Controller	19		
	9.2	2.	Motor Profiles / Motor Quick Setup	21		
	9.3	3.	Motor Setup Assistant	23		
	9.4	4.	Status Bar	25		
	9.5	5.	Homescreen	25		
	9.0	5.	Motor Settings	26		
	9.7	7.	Connections	30		
	9.8	3.	Community & Help	32		
	9.9	7.	Dragonframe Mode	33		



9.10.	Ap	plication Modes	34
9.10	.1.	Freerun	34
9.10	.2.	General Screen Layout	36
9.10	.3.	Time-Lapse	38
9.10	.4.	Video	51
9.10	.5.	Giga-Pixel	56
9.10	.6.	3D-Scan	68
9.10	.7.	360-Degree	79
9.10	.8.	Live	93
9.10	.9.	Macro	97
9.10	.10.	Turntable	105
9.10	.11.	Astro	106
9.10	.11.1	. Tracking	107
9.10	.11.2	. Astro Intervalometer	109
9.10	.12.	Intervalometer	110
9.11.	Μu	ltitasking	113
		re Updates	
10.1.	Ac	tivating the Firmware Update Mode on PINE	114
10.2.	Upo	dating on Windows	116
10.3.	Upo	dating on Mac OS X	118
11 T	- لماني	ala a a kina ay aya al EA Oa	101
		eshooting and FAQs	
12. Inc	dex		126



1. Usage of this Manual

This manual serves as a help and reference document for the end user of the Black Forest Motion PINE Controller. Read this manual thoroughly to familiarize yourself with the function of the device.

In this manual different info fields are used to clarify important points for the reader. These are listed below.

Important Note



This is an important hint. Please observe it to avoid unexpected behavior of the device.

Tip



This is a useful tip that will be helpful when using the device.



2. Preface

This work is protected by copyright. The rights based thereby, in particular those of the translation, the reprint, the lecture, the removal of illustrations or tables, the radio transmission, the microfilming or the duplication on other ways and the storage in data processing plants, remain reserved, also with only partial utilization.

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3. Revision History

The following things have changed in the revisions of these manuals.

Revision 2

- Screenshots of the Homescreen adjusted in chapter 9.5.
- Added global motor settings in chapter 9.6.
- Description for changing the controller Bluetooth name added in chapter 9.7.
- Description of the "Community & Help" area added in chapter 9.8.
- Added description of Dragonframe mode in chapter 9.9.
- Added description of "Complex Movements" in time-lapse mode in chapter 9.10.3.5.
- Description of the "Movement Test" in time-lapse mode adapted in chapter 9.10.3.11.
- Added "Complex Movements" in Video Mode in chapter 9.10.4.5.
- Updated the screenshots for the XML generation in Gigapixel Mode in Chapter 9.10.5.10.
- Description of the "Sphere Calculator" in 360 degree mode adapted in chapter 9.10.7.5.
- Updated the screenshots for the XML generation in 360 degree mode in Chapter 9.10.7.10.
- Added chapter 9.10.7.7 "Profiles (shooting patterns)" in 360 degree mode.
- Macro mode (chapter 9.10.9) added.
- Astro mode adapted in chapter 9.10.11.



4. Introduction

PINE, PINE LITE and PINE R are the most universal and flexible motion controllers on the market.

PINE is a universal and smartphone-controlled device for motion-controlled photography and video applications. With PINE you can create automated camera movements, panoramic Giga-pixel and 360° photos, motion-controlled time-lapse, automated 3D photogrammetry scans and more.

Universal and flexible

PINE is widely compatible with existing 3rd party hardware such as sliders, pan/tilt heads and focusing units. Control up to 4 axes and 2 cameras simultaneously with one controller. Corresponding adapter cables to third-party systems are available from Black Forest Motion.

Smartphone-Control

The most convenient way to control your system. Simply use your smartphone or tablet and the PINE Motion App gives you access to the extensive functions of the PINE Controller.

Once you've set everything up, the PINE Controller ends its task even if the connection to the app is disconnected or your phone's battery dies. The PINE Motion App is available for Android and iOS devices.

Wide Application Range

With its enormous range of supported applications, PINE can be used in almost any situation you can imagine. We integrated functionality for applications like: Time-Lapse, Real-time Video recordings, Live recordings, Giga-Pixel Panoramas, 360-Degree Photography, Astro Tracking, Macro-Stacking Photography, and 3D Scanning.

Dragonframe Compatible

PINE is compatible with the famous stop-motion software Dragonframe for time-lapse and stop-motion animations.

High-quality Connectors & Cables

PINE uses high quality, lockable Hirose connectors for a secure connection to the motors. The camera and power connections are equipped with industry standard connectors.



5. Safety Instructions

- a) Before operating the device, make sure that you only use cables and accessories manufactured or recommended by us.
- b) Never connect or disconnect a motor connection to the controller while it is in operation. Disconnect the power supply to the PINE Controller before connecting or disconnecting motors. Otherwise the motors or the controller as well as all connected devices may be damaged!
- c) Never use the controller in humid or wet environments such as rain. Water and moisture entering the controller may destroy it, cause unexpected behavior, or cause personal injury from electric shock.
- d) With the PINE Controller you can control stepper motors. These stepper motors can generate a very high force, especially if they are geared. It is your responsibility as a user to ensure that no persons are injured, or other damage is caused during operation.
- e) Before the motors are connected to the PINE Controller, all motors should be mechanically brought into a position where they can move freely.
- f) PINE has no sensors to detect the current position of the motors. It may happen that a motor is mechanically blocked (e.g. if it is overloaded or blocked) and does not continue to rotate. In this case, the stored positions no longer correspond to the current positions of the Motion Control. If a stored sequence is then played back, the movement can be completely different from the movement programmed by the user. In the worst case, this can lead to defects in the attached accessories, cables or even injuries.
- g) If the device and the connected motors behave differently than expected, please disconnect the power supply at the PINE Controller immediately to stop the movement.
- h) Do not reset the PINE controller into firmware update mode without intending to install a new firmware. The controller cannot be used in update mode until a new firmware has been installed.





The symbol of a crossed-out wheeled bin indicates that our device complies with the Directive 2012/19/EU of the European Parliament and European Council of 27.01.2003 on the separate collection of electrical and electronic equipment.



By affixing the CE mark, we declare that our device, in accordance with EU Regulation 765/2008, meets the applicable requirements laid down in the Community harmonization legislation on its affixing.



6. Technical Specifications



		PINE	PINE LITE	PINE R	
Operating Temperature	-20° to +45°		•		
Storage Temperature	-30° to +60°				
Humidity	10%-90% not condensing				
	Power: DC-Barrel 2.1x5.5mm Center	er Positiv	9		
	USB: Micro USB B			_	
	Motors: Hirose HR10A-7R-6S(73)	4x	2x	4x	
Connectors	(6-pin Female)				
	Cameras: 2.5mm TRS 3-pin	2x	1x	1x	
	AUX: 2.5mm TRS 3-pin	1x	1x	1x	
	Expansion RJ11 6-pin	2x	-	-	
Limitswitch	Mechanical (NC) Switch for each	Motor (F	Pin 5 and Pi	n 6 on the	
	HR10 Connectors)				
Motor Type	Bipolar Stepper motors (max. 1.2A per Chanel)				
Motor Ports	Not limited with Expansion	4x	2x	4x	
Expansion	Daisy Chain over Bluetooth or	Yes	No	No	
	RJ11				
Input-voltage	10-24V				
Dimensions	L/W/H: 99 x 77 x 30mm				
Weight	Approx. 150g				
App Compatibility	Android 4.3 or newer / iPhone 5 and iOS 10.3 or newer				
Wireless Range	30-100m under ideal conditions and line of sight				
Wireless Technology	Bluetooth Low Energy 4.1 (2.4-2.48 GHz)				
CPU	ARM Cortex				
Firmware Update	Over Micro USB (With PINE Firmwar	e Updat	er Utility)		

All PINE controllers were subjected to the following test specifications, which were successfully passed:

•	Radio interference voltage mains	
	connection	EN 61000-6-3:2007+A1:2011
•	Radio interference field strength	EN 61000-6-3:2007+A1:2011
•	ESD-Test	EN 61000-4-2:2009
•	Testing against electromagnetic fields	EN 61000-4-3:2006+A1:2008+A2:2010
•	Burst-Test	EN 61000-4-4:2012
•	Surge-Test	EN 61000-4-5:2014
•	Testing against conducted radio	
	interference	EN 61000-4-6:2014
•	Testing against magnetic fields with	
	energy frequencies	EN 61000-4-11:2004



7. Connections

The PINE models have different connectors configurations. They differ in the number of motor and camera connections as well as the serial RJ11 sockets.

7.1. Difference between the PINE Models

	PINE	PINE LITE	PINE R
Number of Motor Ports	4	2	4
Number of Camera Ports	2	1	1
Number of AUX Ports	1	1	1
Wireless expandable	Yes	Only with PINE	Only with PINE
Wired expandable	Yes	No	No

7.2. Motors

Only stepper motors may be connected to the motor sockets. The connection is made via a lockable high-quality Hirose HR10 socket.

The motors available via Black Forest Motion offer the same high-quality connectors and can be connected with the standard Black Forest Motion 4pin Hirose cables.

In addition, the PINE controllers support various third-party motor units. These are listed in the following chapter. Black Forest Motion offers adapter cables for most of these systems which allows for a plug & play integration.

7.2.1. Compatible 3rd Party Manufacturers

Any motorized slider, pan/tilt head, turntable, focus/zoom unit that has a stepper motor can be connected to PINE. Here are some examples of working systems:

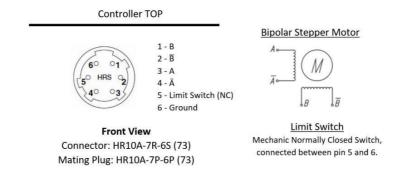
- Dynamic Perception Stage Zero Slider
- Dynamic Perception Stage One Slider
- Dynamic Perception Sapphire Pro Pan + Tilt Head
- Dynamic Perception Stage R Rotary System
- MDK V5 Pan & Tilt Head
- MDK V6 Pan & Tilt Head
- Rhino Motion Slider
- PocketSlider PT PRO
- PT Pan Tilt Head (PocketSlider)
- Cognisys Rotary Table
- Nic-O-Slider



- Nic-O-Tilt Head
- eMotimo Turntable
- PureMoCo Focus/Zoom Unit
- GVM Slider
- Many more

7.2.2. Motor Connector Pinout

The following connection diagram is given for the proper use of your own stepper motors.



Connections 5 and 6 can be used for mechanical limit switches (normally closed). If the contacts are opened, the PINE controller can detect the start positions of the motors (if activated in the app).



Never disconnect motors from the PINE Controller while it is powered on. Never plug motors into the controller while it is active. This can lead to defects of the internal motor drivers. Always disconnect the power supply before connecting and disconnecting motors.

7.3. Cameras

All cameras that can be triggered with a so-called "trigger cable" can be connected. Cables from other manufacturers can also be used. On the controller side, these cables must have a 2.5mm 3-pin TRS plug.

The following cables, which are compatible with the specified cameras, are available as accessories (see following page):



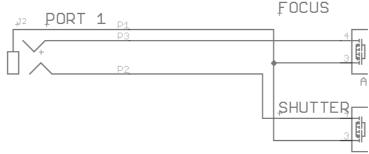
Туре	Camera
E3	For Canon:
	G10/G11/G12/G15/G1X/G1X
	II/T1i/T2i/T3i/T3/T4i/T5i/450D/500D/550D/600D/650D/700D/70D/750D
	/760D/800D/80D/100D/60D/77D/M6/M5/400D/350D/300D/1300D/1
	200D/1100D/1000D/SX50/SX60
N3	For Canon:
	7D/7DII/6D/50D/5DII/5DIII/5D/5D4/5DS/40D/30D/20D/10D/1D/1DS/ 1DX/
	1Ds Mark II/1Ds Mark III/1Ds Mark IV/EOS-1V/EOS-3
DC0	For Nikon :
	D1/D1H/D1X/D2/D2H/D2X/D3/D3s/D3x/D4/D5/D100/D200/D300/D
	300s/D500/D700/
	D800 /D800e/D810/F100/F90/F90X/N90s/F6/F5
	For Fujifilm : S3 Pro/S5 Pro
DC0	For Kodak : DCS-14N
DC2	For Nikon : D7500/D750/D7200/D7100/D7000/D610/D600/D5600/D5500/D5300/
	D5200/D5100/
	D5000/D3300/D3200/D3100/D90/DF/P7700/P7800/coolpix A
<u>S1</u>	For Sony :
	a900/a850/a800/a700/a580/a560/a550/a500/a450/a400/a350/a3
	00/a200/a100/
	a99/ a77/a65/ a57/a55/a35/a33/a77M2/a99M2
	For Konica Minolta : DIMAGE a2/a1/9/7Hi/7i/7/5/4/3/DYNAX 7D/5D
S2	For Sony:
	a9/a7/a7R/a7S/a7SII/a7R
	HX60/RX100 II/RX100 III/RX100M4/RX100M5/a58/NEX-3N For Panasonic DMC:
LI	FZ50/FZ50K/FZ50S/FZ30/FZ30K/FZ20/FZ20K/FZ20S/FZ300/FZ200/FZ150/
	FZ100/FZ1000/FZ2000/FZ2500/G85H/G85/G10/G7/G6/G5/G3/G2/G
	1/GH4A/GH4/GX8/GX7/GX1/GH3/GH2/GH1/GF1/LC-1/L1/L10/DC-
	GH5
	For Leica : DIGILUX2/DIGILUX3
UC1	For Olympus :
	E-620/E-600/E-550/E-520/E-510/E-450/E-420/E-410/E-100/E-30/E-
	M10/E-M10II/E-M5/E-M5II/E-M1/E-PM1/E-PM2/PEN-F/E-PL8/E-PL7/E-
	PL6/E-PL5/E-PL3/E-PL2/E-P5/E-P3/E-P2/E-P1
	SP: SP-590UZ/570UZ/565UZ/560UZ/550UZ/510UZ/810UZ/SZ-300MR/SZ-
E2	20/SZ-11/XZ-1 For Fujifilm :
LZ	FOF FOILING. X-M1/X100T/X100F/X-T20/X-T2/X-T1/X-T10/X-E2/X-A1/X-A2/X-A3/
	X-A10/X70/X30/GFX50S/XQ1/XQ2/FinePix S1/X-PRO2
	1 5/



7.3.1. Technical Details of the Camera Ports

The PINE Controller has two potential-free, galvanically isolated open collector/drain outputs (Solid State Relay) per camera socket. One output controls the focus and the other the shutter release of the camera. Both outputs are connected to the ground connector of the camera by the PINE controller.

In the following, a symbolic representation of the internal wiring is shown:



7.4. AUX Input

In addition to the camera connections, the PINE Motion Controllers also have a connection for an AUX input. This input can be used, for example, to control a time-lapse motion with an external interval generator. The connector can be connected to the flash sync connector of a camera or directly to the corresponding interval generator.

A typical application is the use of the PINE motion controller with the stop trick animation software Dragonframe.

The camera is controlled directly by Dragonframe via USB. The PINE can then be operated in Slave Mode (in Time-Lapse Mode). For this purpose, the camera is connected to the AUX port of the PINE controller via a special connection cable at the flash synchronization connection.

In Time-Lapse mode, the interval setting must now be changed to SLAVE MODE. With a corresponding delay time, the PINE moves the camera to the next desired position after each image.

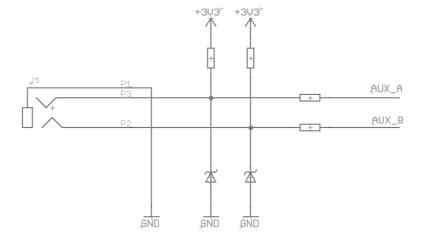
A similar application is the operation of the PINE Controller by an external interval generator such as the **VIEW by Timelapse+** or the **LRT Pro Timer** by Gunther Wegner. This takes over the interval and can then also carry out a so-called interval ramping.



7.4.1. Technical Details of the AUX Input

The AUX input of the PINE Controller has two inputs which are internally connected to 3.3V via pull-up resistors.

The following schematic shows the internal wiring of the AUX socket.



If the AUX input is used, the inputs must be connected to the ground line via potential-free open collector/drain circuits.



Do not connect any external voltages to the inputs of the AUX socket! This can destroy the internal components. Only use potential-free, open collector/drain circuits (optocouplers or solid-state relay outputs) to connect the input lines to the ground line.

So far, only the AUX_B input (front center pin of the TRS connector) is used. The AUX_A input is reserved for later developments.



7.5. Power Supply of the Controller

Universal, rechargeable batteries and power supply units can be used for the voltage supply. They should output a DC voltage in the range between 10 and 24V. We recommend a voltage of 12V.

Connected batteries and power supplies should be able to deliver at least 15W or 1.5A.

It is essential to use a suitable DC cable with a 2.1x5.5mm plug. The middle "Center" connector must be positive. Using other DC connectors (e.g. 2.5x5.5mm) can cause sudden restarts or voltage losses. This might also result in connection problems with the App.



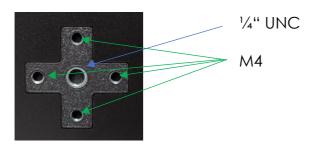
Only one power supply for the PINE is required for the entire system. All connected motors are then supplied via the PINE and do not require any further power supply.



The PINE Controller can only be operated via the DC socket. The USB socket is used for pure data transfer and firmware updates and cannot be used for connecting power supplies to the controller.

7.6. Mounting Options

To attach the PINE Controller to the Motion Control (Slider, Pan & Tilt, etc.) different threads are attached to the bottom of the controller. The middle thread is a 1/4" UNC photo thread. This allows to attach the Controller to any photo tripod or photo accessory. In addition, the PINE controller offers four metric M4 threads that are specially arranged. Here, the mounting plate can be mounted in two directions - horizontally and vertically. This plate can be slid onto the Arca-Swiss profiles of the Nic-O-Tilt or slider and is held in place by magnets.





8. Operation of the Controller

Please observe all above mentioned safety instructions before putting the PINE Controller into operation! First connect all motors to the controller before connecting the power supply. Make sure that all motors can move freely.

If you have connected the PINE controller to the motors, you can plug in the power supply via the DC socket. The controller now starts its boot process. Various tests of the internal components are carried out. All LEDs light up at least once during the boot up process.

8.1. Boot-Up Process

After connecting the power supply, the boot process starts. The status LED lights up red and flashes green at the same time. After a successful boot process, the red status LED goes out and then remains flashing green. The controller is then ready for operation and ready to establish a Bluetooth connection with a smartphone.

If the status LED remains red even after several seconds, the boot process has failed and the power supply must be disconnected and reconnected.

During the boot process, the blue Bluetooth connection LEDs also light up. In these moments the wireless modules of the controller are checked and initialized.

If the LEDs under the motor sockets light up red, the controller checks whether motors are connected to the corresponding sockets. If a motor is connected, it should make a short buzzing noise. If the motor has been successfully detected, the motor LED changes to green. Otherwise, if no motor is detected, the LED will turn off. If not all connected motors have been detected, check the connectors and restart the controller.



If all LEDs of the controller flash red after connecting the power supply, this indicates that the voltage is outside the allowed specifications. Check that the voltage is between 10V and 24V.



9. PINE Motion App

With the PINE Motion App, the PINE Controller can be controlled remotely. The app is available for Android devices (version 4.3 or newer) and iOS devices (iPhone 5 and newer / iOS 10.3 or newer). It can be downloaded from the Google Play Store or App Store. More information can also be found on our website.

Both versions of the app (Android and iOS) are almost identical. In some views, however, the apps differ. In this chapter you will therefore find screenshot views from both apps.

At the first start of the Apps, the permissions for different services have to be granted. If the user does not grant them all, the app may not start. In this case, uninstall the app and reinstall it. Enter all requested permissions.

9.1. Connection with a PINE Controller

After a successful boot process (status LED flashes green), the controller can be connected to a smartphone and the PINE Motion App via Bluetooth.

First make sure that the PINE Motion App is installed on your smartphone.



Do not try to pair your smartphone with the PINE Controller using the phone's Bluetooth settings. A Bluetooth connection is handled exclusively via the PINE Motion App and no Bluetooth settings need to be adjusted.

Before starting the PINE Motion App, activate the Bluetooth function of your smartphone. Some mobile phones also require an active GPS/location function to establish a successful connection with the controller. The PINE Motion app only uses GPS data to store your location in user-created XML files in Giga-Pixel and 360-degree mode. Otherwise your GPS data will not be used or stored.



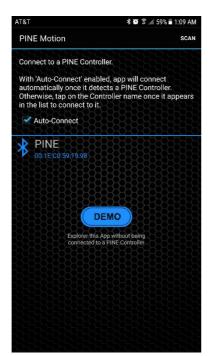
After starting the PINE Motion App, it starts the Bluetooth scan process after about 3 seconds and searches for a PINE Controller. If the "Auto-Connect" option is activated, the app connects automatically as soon as a controller is found. The controller indicates a successful and active Bluetooth connection via a blue connection LED.

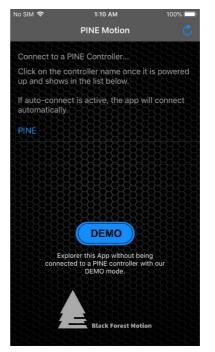
If the app does not find a controller after approx. 60 seconds, it stops the search process to reduce the battery consumption. A new search process can be started via the "Scan" or c field.

If the "Auto-Connect" option is deactivated, you must tap on the "PINE" entry as soon as the controller is within range and has been found. The "Auto Connect" option can be activated and deactivated directly on the connections screen in Android and can be changed under "Connections" in iOS.

The demo mode of the app can be accessed via the "DEMO" field. Use this mode to familiarize yourself with the app if you have not yet purchased a PINE Controller.

Android





iOS



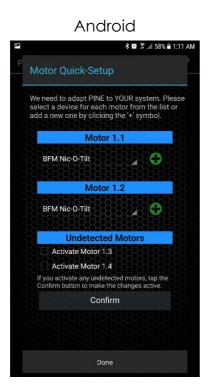
It is recommended to close the app completely and start it new with every new use. Do the same if you have problems establishing a connection. In this case, restarting the controller itself can also help.



9.2. Motor Profiles / Motor Quick Setup

After successful Bluetooth connection, the Motor Quick Setup will appear (if motors are connected). This selection can be used to set different motor profiles for the motors. These motor profiles define settings such as motor gear ratio and output current. For a correct function of the motors, all profiles should be set correctly. Only in this case is it ensured that the motors move as specified by the app. The appropriate profiles are already stored for the motors, sliders and pan & tilt heads distributed via Black Forest Motion.

In the Android app, the selection of a suitable profile is made from a drop-down menu. Within the iOS app, you make the selection via a scrollable list. You do <u>not</u> need to click the icon when making your selection. This field is only needed if you want to create a completely new profile yourself.





Once all profiles are selected, tap the "Done" button to exit the Quick Setup. All settings will now be transferred to the PINE Controller.





Take enough time to understand the need for motor profiles. If the motors behave strangely, become very hot, or make noises, there is a high probability that incorrect profiles have been selected.

The "Default" profile within the app defines a motor current of 0.4A. This is too low for many standard motors to provide a proper function. Therefore, set the appropriate profiles correctly.

If motors were not detected during the boot process, they can also be activated manually under the "Undetected Motors" section of the Motor Quick Setup. Activate the motors and confirm the selection with "Confirm".



The profiles for the motors are stored according to the motor ports. If you for example always connect your slider to motor port 1 and the Pan & Tilt units to 2 & 3, the entered profiles will be loaded again the next time you start the app. All you need to do now is confirm the selection.

The Motor Quick Setup can be accessed at any time via the Homescreen and the icon in the status bar.



9.3. Motor Setup Assistant

If no predefined motor profile is available for your system, you can create your own profile in just a few steps. To do this, tap on the symbol to the right of the profiles for the corresponding motor. An intuitive Motor Setup Wizard will then open and guide you step by step through the process.

- 1. First select whether the connected unit is a slider (linear unit) or a pan/tilt (rotation unit).
- 2. In the second step, specify a distance or angle by which you want to move the motor. As an example, for a pan/tilt motor we set an angle of 90 degrees. Now you have to turn the motor exactly 90 degrees. Use the arrow keys for forward / backward. You can use the slide bar to adjust the speed to move larger angles faster and smaller angles more accurate and slower. If you have rotated the motor by exactly the same angle as indicated above, you can jump to the next step. Based on the distance travelled, the PINE Controller can now automatically determine the gear ratio of your motors.
- 3. On the last page of the Motor Setup Wizard you can now enter a name for your profile and save the profile. You can then use this profile at any time to define exactly this motor.



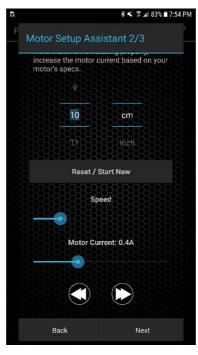
If the motor does not rotate properly at step 2, the set output current is probably too low. The current is 0.4A after controller restart. In this case, change the motor current via the corresponding slide bar.

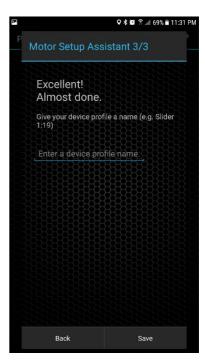
When you have defined and set the profiles for all motors, confirm the Quick Motor Setup. The app now transmits all data to the controller. This may take a few seconds. You will then be taken to the Home screen.



Android







iOS









9.4. Status Bar

In the status bar you will find a motor icon. The motor icon is used within the Homescreen to access the motor quick setup and within some other applications as a motor selection menu (see the description of the different applications below for more details).

You can also use the question mark to display explanations of the different modes. If you have any questions, you will find a quick answer to the mode you are currently using.

The iOS App also has a blue Bluetooth icon on the left that indicates the status of the Bluetooth connection. The symbol is blue when the connection is active, otherwise it is grey. If you tap on the field, you will get additional options to disconnect manually and reconnect if the connection is lost.



9.5. Homescreen

On the Homescreen, you will find information about the current App and Controller firmware version and access to the main areas of the PINE Motion App. Each mode or button is explained below.







9.6. Motor Settings

In the Motor Settings, important properties of the connected motors can be adapted. Take enough time to understand all possible settings. This is important and necessary for the proper functioning of the motors.

In the upper part of the view, the connected motors can be selected. Tap on the symbols to do this. A selected motor appears with a colored motor icon, while the inactive motors have grayed-out icons. Settings are made separately for each motor.





The **motor profiles** can also be set under the motor settings (similar to the Motor Quick Setup). Further profiles can also be added via the Motor Setup Wizard. To do this, click on the green **a** symbol.

Within the iOS App, motor profiles can also be copied using the \P icon.

User-created profiles can be deleted via the red 🕱 icon.

In addition to the profiles, you can also assign **names** to the individual motors. These names are then displayed in the other modes and are useful for quick identification of the individual axes.



A **maximum speed** per motor can also be set. This is global for the motor. All speed settings within the different modes are to be understood proportional to this total speed.

Under the **Advanced tab**, advanced settings can be made. For predefined motor profiles (except the default profile) the settings for Ratio/Revolution and Current are blocked.

The following settings can be adjusted:

Ratio and Revolution

This is an important setting if you want exact position values to be displayed within the app. For application modes such as Time Lapse or Video, this setting may be irrelevant for the function of the motors if they do not require exact position values. However, if you use the Giga-Pixel, 3D scan, or 360-degree mode, a correct setting of the gear ratio is absolutely necessary.

A rotation unit (e.g. Pan/Tilt) requires a setting of the gear ratio. Specify the ratio between the stepper motor shaft and the (externally accessible) pan or tilt axis shaft.

Example NT Head: The unit contains a worm gear with a ratio of

1:32. Specify exactly this ratio in the app.

A linear unit (e.g. slider) requires a setting of the moved distance per stepper motor revolution.

Example BFM Slider:

Our BFM Slider has a gear diameter of 25mm (which adapts to the toothed belt). With a stepper motor without gearbox (1:1), the slider moves by L= $25x\pi$ =78,5mm per motor shaft revolution. Enter a rotation of 78.5mm in the app. For a stepper motor with gearbox (e.g. 14:1) the moved slider distance per revolution is reduced to L= $25x\pi/14$ =5,6mm. Enter a rotation of 5.6mm in the app.



Current

Defines the maximum current for the motor in amperes. It can be set up to 1.2A. If a motor is too warm, the current should be reduced. If a motor does not appear to be moving or has too little power, increase the current.

The end user is responsible for setting an output current within the range permitted for the motor. If a motor is overloaded and defects in the motor occur, the end user is responsible.



If you use a **lens unit** from Black Forest Motion, do not exceed an output current of 0.4A! All other motor units available from Black Forest Motion can be operated up to 1.5A.

Energy Saving

This limits the current for the motor during standstill. This can be used on motors with gearbox or worm gears.

A setting of 0% does not save any energy during standstill and the motor is continuously operated at full output current. This setting provides the best motor performance and response.

A setting of 100% completely reduces the output current during standstill to 0A.

Zero Position

This allows the position of the motor to be reset to zero. This setting is only relevant if you want to work with absolute position values. When using a slider, you can, for example, set the zero position at the end stop of the slider. Then you can enter exact absolute positions for keyframes to move the slider to a certain position.

If you have connected mechanical limit switches to the controller and slider, you can also start an automatic calibration here. The slider moves until the limit switch is activated. This position is then used as the new zero position.



Invert

Reverses the direction of movement of the motor.

If you use the slide bars inside the app to move the motors and a connected slider moves to the right, the slider will move to the left after an inversion.

Limits

Limits for the motors can be set here. This means that a motor can only move between the two defined limits.

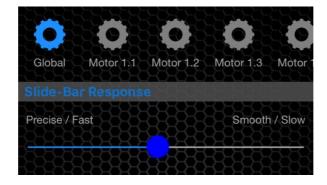
Limits are helpful for sliders if you don't want to worry about driving the slider to the end stop.



If you switch off the controller, it loses its information about the current positions of the motors. If you then restart the controller, the current positions are initialized with zero. If you want to use the previous limit positions again, you must ensure that the zero position is set correctly again.

Global Motor Settings

Within the motor settings, tap the icon on the far left (with the text "Global"). Here you can then change the reaction behavior of the slide bars. These are the slide bars to move the motors within the different application modes. This setting is global and applies to all motors simultaneously.

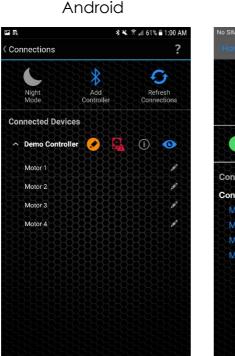


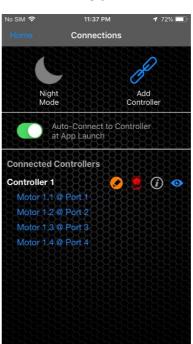


9.7. Connections

Under Connections, the connected controllers and motors are displayed. In addition, information of the controller can be called up here and the controller can be set to firmware update mode. Within the iOS App, the "Auto-Connect" function can be activated and deactivated here as well. If this function is active, the app will automatically connect to the controller after launching the app if the controller is ready.

Furthermore, additional PINE controllers (not PINE LITE or PINE R) can be connected to an existing connection via "Add Controller". All PINE controllers are connected in a chain (daisy chain), while the smartphone is connected to the first controller in the chain.





iOS

Night Mode

When night mode is activated, all LEDs on the controller are switched off. Use the night mode if you want to take pictures in the dark and do not want any interference from external light sources.



Controller Info

The Info symbol provides important information about the connected controller. These are:

- Serial number of the controller
- Firmware version and release date
- Supply voltage

Controller Identification

The status LED of the corresponding controller flashes red 5 times after pressing the symbol. This serves to identify the controller when several devices are connected. This feature is helpful when you use multiple controllers at the same time.

Firmware Update Mode

You can put the controller into firmware update mode by tapping on the red symbol and confirming the appearing message. Do this only if you intend to install a new firmware on the controller.



The entire controller is not functional if it is in firmware update mode. Only when a new firmware has been installed via our update program, the controller will be functional again.

If you put the controller into firmware update mode, the firmware on it will be completely deleted. This is necessary for a new installation. The blue connection LEDs light up slightly while the controller is in firmware update mode.

For more information on how to update the controller firmware, refer to chapter 8 of this manual.

Change Controller Bluetooth Name

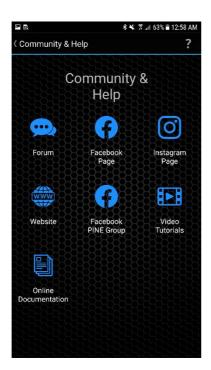
With the icon you can change the Bluetooth name of the controller. This is the name that appears in the list when establishing a connection (after opening the app). After changing the name, the current connection is disconnected and the controller must be restarted.

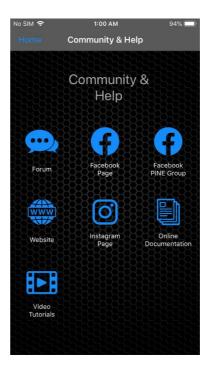


9.8. Community & Help

Under "Community & Help" you will find links to the Black Forest Motion website, social media, forum, and other documentation.

Android iOS





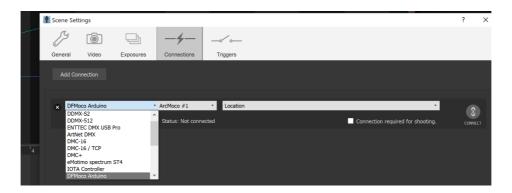


9.9. Dragonframe Mode

Tap the Dragonframe icon (on the Homescreen) to put the PINE Controller in Dragonframe mode. Dragonframe is a computer application for creating stop-motion and time-lapse videos.

Once the controller is in Dragonframe mode, you can connect it to your computer via a simple USB connection and control up to 4 motor axes within Dragonframe. Select "**DFMoco Arduino**" as the device under the "Connections" Settings tab. Additionally, select the corresponding COM port and click on "Connect".

If you have no experience with the Dragonframe software, please refer to the documentation of the Dragonframe manufacturer.





PINE cannot perform real-time video operations within Dragonframe. The use is limited to the so-called **Shoot-Move-Shoot** application.



Within the Dragonframe mode, motor settings such as motor current and energy saving can be changed in the PINE Motion App. All other settings and applications are not accessible.



When Dragonframe Mode is active, the green status LED of the controller flashes more slowly.

To exit Dragonframe mode, tap the Dragonframe icon on the Home screen again.



9.10. Application Modes

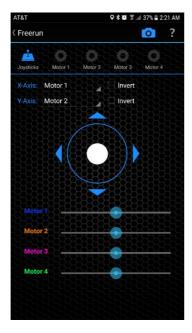
The PINE Motion App offers various applications. These applications can be used to create time-lapse, images, videos or scans. All application modes are explained in this chapter.

9.10.1. Freerun

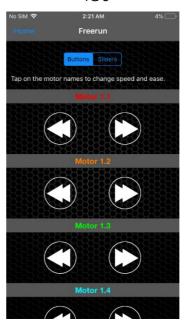
The Freerun mode can be used to move the motors freely in real time. The Android and iOS apps differ within the Freerun mode as shown below.

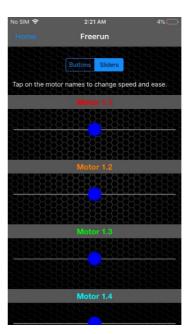
Android





iOS







Both App versions have arrow keys and slide bars to move the individual motors. The slide bars react linearly according to the bar's deflection. This means that the motor rotates slowly when the bar is moved to the right or left only minimally and at the maximum speed with full bar deflection.

Within the Android App you select the motors via the upper motor symbols. With iOS all motors are arranged on one screen.

The Android App also has a virtual joystick. The two axes for X and Y can be freely assigned to motors and the axes can also be inverted.

Motor Speed

With the Android App, you define the motor speed using the provided slide bar.

For the iOS App, tap on the colored motor name. There you can adjust the speed with a slide bar.

Motor Ramps (Ease IN/OUT)

Ramps or Ease-In and Ease-Out define how smoothly the motor starts and stops when the arrow keys or slide bars are operated. A high Ease value causes the motors to start and stop slowly and gently. Both ramp (Ease) values are limited to 100% in total.

With the Android App, you define the motor ramps using the provided slide bars.

For the iOS App, tap on the colored motor name. There the ramp values can be set with slide bars.

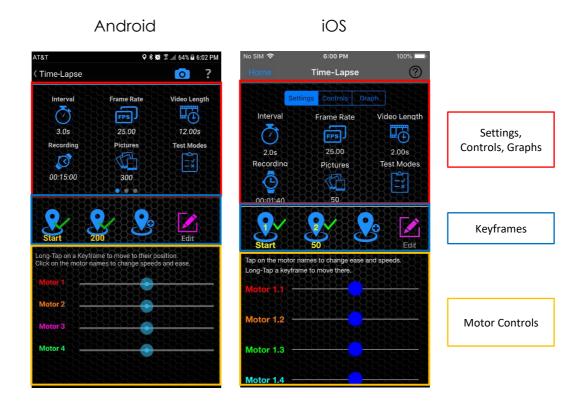
Hold Speed (only Android)

If you have activated this option, the motor will continue to move even if you release the arrow keys or slide bars. Stop the motors by disabling the Hold Speed switch or tapping the
icon.



9.10.2. General Screen Layout

All application modes of the PINE Motion App are similar in their screen layout. This subchapter gives a short overview, which should help you to understand the different areas within the modes.



In the upper graphic, the important parts of the general user interface are colored (using the time lapse mode as an example).

The upper red area is divided into 2 to 4 horizontal sections depending on the mode. Within the Android App you can move to the next view with a swipe to the right or left. Within the iOS version you can get to the next view by using the labeled buttons.



In the red area you can also make important **settings** for the respective mode and change parameters. Tap on the blue symbols to do this.

You can also start, pause and stop recording in this area. You will find the corresponding buttons for Start \triangleright , Pause $\parallel \parallel$, Forward $\triangleright \triangleright$, Backward $\triangleleft \triangleleft$ and Stop \blacksquare .

In some modes you will also find **graphs** in this area that visualize the current motion sequences.

In the blue or middle area, you can add, delete or change keyframe positions. You can find more information on this in the following explanation of the individual modes.

Keyframes are arranged horizontally in this area (provided the mode supports multiple keyframes). You can swipe to the right and to the left to see all keyframes.

In the lower or orange area, you will find slide bars for the motor controls. Motors are arranged vertically one below the other. If not all motors fit on the screen, you can scroll down using a swipe motion.



Tap on the colored motor names in this area. Here you can make other important settings for each motor for each mode. For example, the motor ramps and the motor speed can be adjusted.

Within each mode you will also find a question mark icon on the right side of the status bar. Here you will find further help texts explaining the respective mode.



9.10.3. Time-Lapse

The time-lapse mode is used for motorized time-lapse recordings. An alternative name is for example: SMS or Shoot-Move-Shoot. This means that the camera stands still during recording before it moves a step. This is a fundamental difference to systems with continuous motion. This means that there will be no motion blur in the image.

9.10.3.1. General Operating Method

The PINE controller processes a defined interval several times. This interval includes the triggering of the camera, pause times, and motor movements. Each time the camera is triggered, the motors (and also the camera) are in a new position. The motor movement takes place along a path programmed by the user (via keyframes).

If you now combine all individual images of your camera to a video, you get a moving time-lapse recording.

9.10.3.2. Recommended Workflow

- Set keyframes
- Adjusting Interval and Camera Settings
- Define total recording time (number of images)
- Testing the procedure with the Test Modes
- (Possibly adjust interval, pause times, and speed)
- Start recording

9.10.3.3. Setting Keyframes

Use the motor slide bars to move the motors (or sliders or Pan & Tilt etc.). Think about a motion path or sequence and define keyframe positions. A keyframe is a specific motor position such as the start or end point of a movement.

When all motors are e.g. at the desired start position, you set the first keyframe over the first (left) Symbol. Keyframes are set for all connected motors at the current positions. As soon as a keyframe has been set successfully, a green \checkmark checkmark appears next to the keyframe symbol. Set further keyframes in the same way. In most cases, two keyframes are sufficient.



However, further keyframes can be set via the symbol in order to realize more complex movements.



Hold down the keyframe symbol of a set keyframe (with green checkmark) to let all motors move to the corresponding keyframe.

Already set keyframes can be overwritten at any time by pressing the keyframe symbol again (short tap).

Each keyframe is also assigned a frame or image number. After the corresponding number of frames, the motors will be located at the respective keyframe.

9.10.3.4. Editing and deleting Keyframes

If at least one keyframe has been set, you can use the icon to display an extended view of the keyframes. The corresponding motor positions are now displayed under each keyframe symbol. The position values are assigned to the motors in color (same colors corresponding to the motor names next to the slide bars). The frame numbers assigned to the keyframes are in yellow.



All position values and image numbers can now be changed manually by tapping on the values. A dialog box will appear where you can adjust values. You can also move individual motors to the selected keyframe positions.





Make sure that the correct motor profiles are set or that the gear ratio values under the motor settings are correct. Only then will meaningful position values be displayed here.

Delete keyframes by tapping on the **x** icons while in the extended keyframe view.

When you are finished editing the keyframes, tap the \nearrow icon again.

9.10.3.5. Complex Movements (Reference Positions)

To program more complex movements, certain keyframe positions can be set as reference positions (tap on the Edit icon and then on a desired motor position -> set the position to "Reference" in the dialog box that appears). If a keyframe position is set as reference for a motor, the motor will not stop at this position.

Example:

With a total of 3 keyframes, the slider should move in a continuous movement from keyframe 1 to 3, while the pan axis should start in the middle of the slider movement (at keyframe 2).

- Set the first keyframe to the start position of the slider.
- Set the second keyframe to the desired slider position where you want the pan axis to start moving (set a random time or image value - this value will be automatically calculated later when a reference position is set).
- Set the third keyframe to the end position of the slider and also to the pan end position.
- Then set the slider position of the second keyframe to "Reference". The time/frame value of the second keyframe is now automatically adjusted.



Currently only one motor position per keyframe can be set as reference. Furthermore, the frame count for such a keyframe (with reference position) cannot be adjusted manually.



9.10.3.6. Setting Motor Ramps (Ease IN/OUT)

Tap on the motor names located to the left of the slide-bars. You can then set the percentage values of the motor ramps in the dialog window that appears. These settings allow you to achieve **dynamic time-lapse movements which starts and stops smoothly**.

If both values for IN and OUT are set to 0%, this means that all motion steps of the motor remain constant over the recording time. In this case you will not get a smooth start and stop.

If, however, both values are set to 20%, this means that you will achieve smooth acceleration for the first 20% of the movement and smooth deceleration for the last 20% of the movement.



9.10.3.7. Changing the Motor Speed

Tap on the motor names located to the left of the slider. In the dialog window that appears, you can then adjust the speed of the motor.

A slow motor speed reduces vibrations of the entire structure, but results in longer interval times.

A faster motor speed allows shorter interval times, but can lead to unwanted vibrations of the setup and thus to blurred images.



9.10.3.8. Interval and Camera Settings

Open the Interval settings via the \bigcirc icon. Here you can adjust time values within a single interval. All time values are processed by the controller in the sequence as listed (from top to bottom).

Change the times using the \bigoplus and \bigoplus symbols. A short tap on the symbols increases or decreases the value by 0.1 seconds. If you hold down the symbols, the values change faster.







Camera

Determines how long the trigger signal of the camera is pressed. In time-lapse mode, always set your camera to manual focus and not automatic focus.

If you define the exposure time via your camera, this time serves as a pure trigger impulse and a time of 0.1 to 0.3 seconds is sufficient.

However, if you operate your camera in the so-called Bulb mode, you can set a longer time here. In this case, the exposure time is defined by this time setting. This allows you to set the shutter release time for night shots to more than 30 seconds (the maximum exposure time for most cameras).

Alternatively, you can also take **HRD pictures** with a longer camera time. Set your camera to bracketing mode. Then set the camera time in the app long enough for your camera to complete all bracketing shots.

Delay

This is a waiting time that starts after the camera time has elapsed. After the waiting time has elapsed, the motor movement begins. Set this time so that your camera can complete the current shot before the motors begin to rotate.

If you define the exposure time via your camera, this value must be adjusted to the actual exposure time. For example, if you have set an exposure time of 5 seconds using your camera, set the camera time to 0.1 seconds and the delay time to at least 5.0 seconds.

However, if you operate your camera in Bulb mode, you can set the delay time to a short value such as 0.5 seconds.



Movement

This time signals how long the motors move within an interval. This time cannot be changed directly. It depends on the programmed movement distance, number of images, and motor speed.

Excess

Based on the previously listed times, there is a minimum interval time. The excess time is an automatically calculated time and signals the difference between the set interval time and the minimum interval time. With an excess time of 0.0 seconds, you have reached the minimum interval time.

Interval

This is the total interval time. It determines how long a single interval lasts and thus determines the time difference between the captured images.

As explained under Excess, all set times result in a minimum interval time which cannot be undercut.



9.10.3.9. Slave Mode

The slave mode allows you to operate the PINE controller via an external interval generator such as the VIEW by Timelapse+. Connect the external interval generator to the AUX input of the PINE controller and activate the slave mode in the interval settings (you can switch between "Regular Mode" and "Slave Mode" within the dialog window). The camera can be connected to either PINE or the external interval generator.







Set keyframes in Slave mode in the same way as for normal/regular usage and set the desired number of intervals that should be executed. Then start the PINE sequence first (press) and then the external interval timer sequence.

In slave mode, the PINE controller waits to move the motors until it detects an external signal from the interval generator. In the Interval settings, all times except the Delay time are hidden. With the Delay time you can set how long the PINE controller should wait after receiving the external signal via the AUX input before moving the motors.

For more important information about the AUX input, refer to chapter 7.4 of this manual.



9.10.3.10. Determine the Recording Time

The PINE Motion App gives you several ways to determine the total recording time. Settings for number of frames, time-lapse video duration, and recording time are all linked. So be aware that all parameters will change if you change only one value.

Number of Pictures

Use the \triangle icon to determine the number of images. This also determines the number of intervals.

The total recording time then results from the multiplication of the interval time and the number of images.

Set Recording Time directly

Use the \bigcirc icon to specify directly how long the recording should last. The selection is divided into hours, minutes and seconds.

With the iOS version of the app, the number of images is adjusted after entering the recording time.

With the Android version of the app you can also determine whether the number of images or the interval time should be adjusted, which allows the set recording time.

Time-Lapse Video Time (rendered Time)

Use the icon to specify how long the rendered time-lapse video should be. This setting takes the set frame rate into account.

With the iOS version of the app, the number of images is adjusted after entering the video time.

With the Android version of the app you have the possibility to adjust either the number of pictures or the picture rate, which allows the set video time.



Frame-Rate

The frame rate has no direct influence on the actual time-lapse operation. This setting is only used by the app to calculate the rendered time lapse duration (video time) mentioned above.

It is recommended (but not mandatory) to render the actual time-lapse video in post-production at the same frame rate as the one set within the app.



9.10.3.11. Test Modes 🚉

In time-lapse mode, you can make use of three different test modes before starting the actual recording. This should help you to check if all values have been set correctly and the recording will be successful.

Start the tests by tapping on the blue icons. The icons will then change to STOP fields. You can use these to cancel the tests prematurely.



Exposure Test

Triggers the camera once with the set camera time.

Interval Test

Executes a total of 5 intervals with the current settings. The camera will be triggered, pause times are waited, and the motors are moved. This test is useful to check if e.g. the motors come to a complete stop before a new image is triggered or to check if the camera has enough time to save the created image.

Movement Test

Moves the motors along the programmed distance from start to finish. The total movement time corresponds to the set **video time**. This test gives you an impression of the motion sequences of the finished (rendered) time-lapse video.

If the set video time is too short to perform the movement (because the maximum motor speed would be exceeded), you will be notified. You can then still perform the test, but at reduced speed.

In this test, the motors are first moved to the start position. When all motors have arrived there, you will get another message to start the actual movement test.



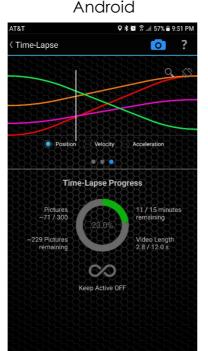
9.10.3.12. Start and Stop the Recording

As soon as all keyframes are set, all settings have been made and the test modes have been checked, the time-lapse recording can be started. This can be done by clicking on the green symbol. The motors are then moved to the start position.

Within the iOS App you can also determine after tapping on the PLAY button whether the recording is started automatically as soon as all motors have arrived at the start position, or whether you want to start the recording manually. Manual start is helpful e.g. for stop motion recordings.

With the Android App the recording starts automatically as soon as all motors are at the start position.

During the recording, you can see the current progress on the screen. Among other things, the remaining recording time and number of pictures as well as a progress loading circle are displayed there. In addition, the current progress will be indicated with a vertical position marker in the graph.







The recording can be paused at any time using the \blacksquare icon. In the paused state, you can use the \blacksquare and \blacksquare icon to manually control the interval sequence. This is useful for **stop motion recordings**.

The \blacksquare icon can also be used to stop the entire recording at any time.

With the symbol you can set whether you want to hear a signal tone on your mobile phone after completion of all images.

The "Keep Active" function can be activated and deactivated via the ∞ icon. If this function is activated, the camera will continue to fire when all the set images have been taken (the motors will then be at a standstill at the last keyframe position). Use this to extend your time-lapse recording, if unexpected events occur, which you want to have in your time-lapse recording.



We recommend using motor ramps (Ease Out) if you plan to use the "Keep active" function. This will slow down the motor movement towards the end and will give you a nice smooth transition.



9.10.4. Video

The video mode is used to create programmed real-time video movements. This mode can be used in video production to realize repeatable and smooth camera movements. Due to the exact repeatability of the movements, this mode is also ideal for special effects video production.

9.10.4.1. General Operating Method

The PINE controller moves the connected motors (or sliders, pan & tilt, or similar) along a distance programmed by the user. The user enters the time required for the movement in seconds. The camera is in video recording mode. The camera video recording must be started manually by the user before the motor movement is started via the PINE Motion App.

9.10.4.2. Recommended Workflow

- Set keyframes
- Determine recording time
- Start recording

9.10.4.3. Setting Keyframes

Use the slide bars to move the motors (or sliders or Pan & Tilt etc.). Think about a motion path or sequence and define keyframe positions. A keyframe is a specific motor position such as the start or end point of a movement.

If all motors are e.g. at the desired start position, you set the first Keyframe over the first (left) Symbol. Keyframes are set for all connected motors at the current positions. As soon as a keyframe has been set successfully, a green

checkmark appears next to the keyframe symbol. Set further keyframes in the same way. In most cases, 2 keyframes are sufficient.

However, further keyframes can be set via the symbol to realize more complex movements.





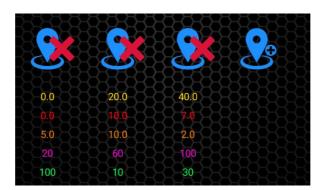
Hold down the keyframe symbol of a set keyframe (with green checkmark) to let all motors move to the corresponding keyframe.

From the second keyframe on, another dialog window appears when setting a keyframe. Here you enter the desired time (in seconds) at which the motors should be at the current position/keyframe.

Already set keyframes can be overwritten at any time by pressing the keyframe symbol again (short tap).

9.10.4.4. Editing and deleting Keyframes

If at least one keyframe has been set, you can use the icon to display an extended view of the keyframes. The corresponding motor positions are now displayed under each keyframe symbol. The position values are assigned to the motors in color (same colors corresponding to the motor names next to the slide bars). The time values assigned to the keyframes are in yellow.



All position values and times can now be changed manually by tapping on the values. A dialog box will appear where you can adjust values. You can also move individual motors to the selected keyframe positions.





Make sure that the correct motor profiles are set or that the gear ratio values under the motor settings are correct. Only then will meaningful position values be displayed here.

Delete keyframes by tapping on the *\times icons while in the extended keyframe view.

When you are finished editing the keyframes, tap the 📝 icon again.

9.10.4.5. Complex Movements (Reference Positions)

To program more complex movements, certain keyframe positions can be set as reference positions (tap on the Edit icon and then on a desired motor position -> set the position to "Reference" in the dialog box that appears). If a keyframe position is set as reference for a motor, the motor will not stop at this position.

Example:

With a total of 3 keyframes, the slider should move in a continuous movement from keyframe 1 to 3, while the pan axis should start in the middle of the slider movement (at keyframe 2).

- Set the first keyframe to the start position of the slider.
- Set the second keyframe to the desired slider position where you want the pan axis to start moving (set a random time or image value this value will be automatically calculated later when a reference position is set).
- Set the third keyframe to the end position of the slider and also to the pan end position.
- Then set the slider position of the second keyframe to "Reference". The time/frame value of the second keyframe is now automatically adjusted.



Currently only one motor position per keyframe can be set as reference. Furthermore, the time value for such a keyframe (with reference position) cannot be adjusted manually.



9.10.4.6. Motor Ramps

Motor ramps can be set for each motor by tapping on the colored motor names to the left of the slide bars. A dialog box will appear where you can find more slide bars for Ease-In and Ease-Out. A high Ease value will cause the motors to **start and stop slowly and gently**. Both ramp (Ease) values are limited to 100% in total.

If both values are set to 20%, this means that you will achieve smooth acceleration for the first 20% of the movement and smooth deceleration for the last 20% of the movement.

9.10.4.7. Start and Stop the Recording

As soon as all keyframes are set, the video recording can be started. You can do this by clicking on the green symbol. The motors are then moved to the start position.

As soon as all motors have arrived at the start position (first keyframe), you can start the video recording on your camera. Then start the motor movements by pressing the symbol again.

During the recording, you can see the current progress on the screen. Among other things, a progress loading circle is displayed there. With Android, the motion graph is also visualized with a current position marker.

The symbol can also be used to end the entire recording at any time.



The PINE Controller will not automatically start the video recording on your camera. You will have to start the recording manually over your camera bevor starting the motor movement from the app.



9.10.4.8. Loop Mode

Use the symbol to activate loop mode when the recording has been started. With this function, all motors change direction when they reach the last keyframe. This means they oscillate permanently between the first and last keyframe until the recording is finished manually by the user. Alternatively, you can deactivate the loop mode at any time by pressing the symbol again. In this case the controller finishes the current move and stops as soon as the motors have reached the first or last keyframe.



9.10.5. Giga-Pixel

With the Giga-Pixel mode you can create high-resolution Giga-Pixel panoramas in combination with a Pan & Tilt head.

For this mode we recommend our NT Head (also known as Nic-O-Tilt) together with the Nodal point adapter rails. It is also recommended (in some cases even absolutely necessary) to align the camera to its **nodal point**.

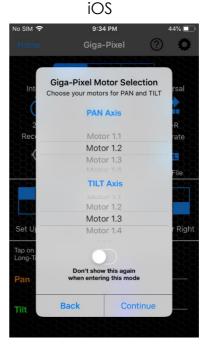
9.10.5.1. General Operating Method

The PINE Controller lets your camera take single images in the form of rows and columns (2-dimensional matrix). The Pan & Tilt head always moves from top left to bottom right. All single images can then be stitched together to a large, high-resolution panorama in post-production using a stitching software (e.g. PTGui or Windows ICE).

9.10.5.2. Determine the Motor Functions

For this mode, the PINE controller needs to know which motor port is used for the Pan (horizontal) axis and which for the Tilt (vertical) axis. When you select the Giga-Pixel mode from the Homescreen, a dialog box appears where you can make this selection.









Make sure that you have selected the correct profiles for the motors. If the profiles are unsuitable, the matrix size (number of rows and columns) will be calculated incorrectly.

If desired, the Giga-Pixel mode can also be used with only one axis (e.g. Pan). In this case select the entry with "---" for the unused motor.

Optionally, you have the possibility to set an option so that the motor selection does not appear again the next time. The app remembers your current selection and sets the motors automatically in the future. You can do this if you always use the same motor ports for Pan and Tilt.

The dialog window for the motor selection can also be viewed at any time within the Giga-Pixel mode via the icon in the status bar.

Confirm the motor selection with "Continue".

9.10.5.3. Recommended Workflow

- Set panorama view-port (keyframes for top left and bottom right)
- Adjust Interval and Camera Settings
- Define camera setup (focal length, sensor size, etc.)
- Determine Matrix Traversal
- Create XML file (optional)
- Start recording

9.10.5.4. Setting the Panorama-View

In this step you determine the horizontal and vertical view of your desired panorama.

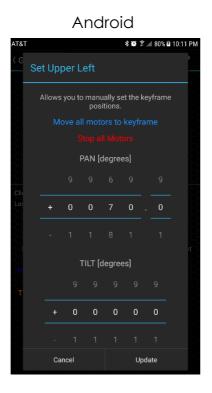
Use the slide bars to move the two motors. Start moving the camera to the desired upper left corner of the panorama. Then place the keyframe with the ____ icon. Do the same for the lower right corner of the panorama and place the keyframe with the ____ icon. Both keyframes (top left and bottom right) can be set in any order.



Successfully set keyframes are indicated by a green \checkmark checkmark next to the keyframe symbol.

Set keyframes can be overwritten at any time by pressing the keyframe symbol again.

If you hold down the field of a set keyframe, a dialog box opens where you can also define keyframe positions manually. You also have the possibility to move motors to the respective keyframe.





9.10.5.5. Interval and Camera Settings

Open the Interval settings via the (icon. Here you can adjust time values within a single interval (consisting of camera trigger, pause times and motor movement). All time values are processed by the controller in the sequence as listed (from top to bottom).

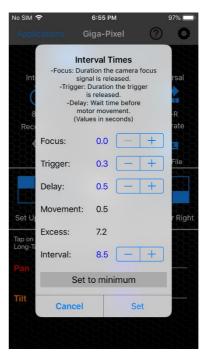
Change the times using the \bigoplus and \bigoplus symbols. A short tap on the symbols increases or decreases the value by 0.1 seconds. If you hold down the symbols, the values change faster.



Android



iOS



Focus

Determines how long the focus signal of the camera is activated. Use this time when operating your camera with automatic focus.

However, we recommend using the camera in **manual focusing** mode for the Giga-Pixel mode. In this case, set this value to 0.0 seconds.

Trigger/ Exposure

Determines how long the trigger signal of the camera is released.

If you define the exposure time via your camera, this time serves as a pure trigger impulse and a time of 0.1 to 0.3 seconds is sufficient.

However, if you operate your camera in bulb mode, you can set a longer time here. In this case, the exposure time is defined by this time setting. This allows you to set the shutter release time for night shots to more than 30 seconds (the maximum exposure time for most cameras).



Alternatively, you can also take **HRD pictures** with a longer release time. Set your camera to bracketing mode. Then set the trigger time in the app long enough for your camera to finish taking all bracketing shots.

Delay

This is a waiting time which begins after the trigger time has elapsed. After the waiting time has elapsed, the motor movement begins. Set this time so that your camera can complete the current shot before the motors start rotating.

If you define the exposure time via your camera, this value must be adjusted to the actual exposure time. For example, if you have set an exposure time of 5 seconds using your camera, set the camera time to 0.1 seconds and the delay time to at least 5.0 seconds.

However, if you operate your camera in Bulb mode, you can set the delay time to a short value such as 0.5 seconds.

Movement

This time signals how long the motors move within an interval. This time cannot be changed directly. It depends on the programmed movement distance (keyframes), number of rows and columns, and motor speed.

Excess

Based on the previously listed times, there is a minimum interval time. The excess time is an automatically calculated time and signals the difference between the set interval time and the minimum interval time. With an excess time of 0.0 seconds, you have reached the minimum interval time.



Interval

This is the total interval time. It determines how long a single interval lasts and thus determines the time difference between the recorded images.

As explained under Excess, all set times result in a minimum interval time which cannot be undercut.

9.10.5.6. Camera Setup / Matrix Size

Once both keyframes have been set for top left and bottom right, the PINE Motion App can determine how many rows and columns are required for the desired panorama entirely from your camera equipment.

Alternatively, you can set the number of rows and columns using the "Set Manually" option. The corresponding selection fields will then appear as soon as you activate the option.

Use the icon to specify the information about your camera equipment for the matrix size.





iOS





Focal Length

Enter the actual focal length of your lens here. There is no need to do any conversions (e.g. the focal length related to 35mm). The Crop factor of the camera sensor does not have to be considered here for the focal length setting.

For very high-resolution panoramas, we recommend using telephoto lenses in the range of 100mm to 400mm in Giga-Pixel mode.

Sensor Size

Tap on the $\binom{\kappa}{k}$ symbol to go through a selection of pre-defined sensor sizes. The most frequently used sensor sizes are stored here. If you are not sure which sensor size to use, consult your camera's manual to find out.

If you have a camera whose sensor size cannot be found in the predefined list, you can define your own sensor sizes using the con. Enter the dimensions of the sensor in mm for width and height and give the sensor a name of your choice. The saved sensor can then also be found in the sensor list. Sensors you have created can be edited and deleted at any time using the corresponding buttons (the currently selected sensor is changed or deleted).

Overlap

Enter the percentage by which the captured images should overlap (vertically and horizontally). The more overlap you specify, the more images will be captured. A larger overlap simplifies the stitching process. We recommend overlaps of at least 20-30%.

Camera Orientation

Determines whether you have mounted your camera in the landscape or portrait orientation. We recommend a portrait orientation.



9.10.5.7. Set Matrix Size manually

You can also manually determine the size of the matrix by specifying the number of rows and columns. Activate the "Set manually" option under the "Matrix Size" settings. The corresponding fields for entering rows and columns will then be displayed. The matrix calculation via the camera equipment like focal length and sensor size (see chapter 9.10.5.6) is deactivated.

9.10.5.8. Matrix Traversal

The PINE Motion App gives you 3 different options for traversing the matrix. Each option has its advantages and disadvantages.







R-L-R (Right – Left – Right)

Single images are captured row by row. The camera is at a standstill during image capture.

Positive:

- + Makes it relatively easy to exclude entire rows from the stitching Process
- + Suitable for all exposure times

Negative:

- Possibly not well suited for scenarios with many moving objects (e.g. clouds)

Diagonal

Single images are captured in a diagonal style starting from top left to bottom right. The camera is at a standstill during image capture.

Positive:

- + Well suited for scenarios with moving objects (e.g. clouds)
- + Suitable for all exposure times

Negative:

- Difficult to exclude individual rows from stitching

Continuous

Single frames are taken row by row. The camera is in a continuous horizontal movement during image capture.

Positive:

+ The recording time can be reduced enormously.

Negative:

- Only suitable for short exposure times of 1/1000s or shorter.



9.10.5.9. Move to specific Matrix Index

When all keyframes are set and the matrix size is defined, you can move to any matrix position via the button. Use the slide bars to select a specific row and column and move the camera to the desired position by pressing the Play button. This function is useful to check your programmed positions.

Look at the current image view of your camera at the approached matrix positions and consider whether the stitching software might have problems merging the images.

9.10.5.10. XML Files

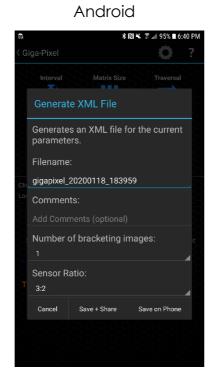
XML files contain special information about the entire panorama image, which is helpful for the stitching process of the individual images via a stitching software.

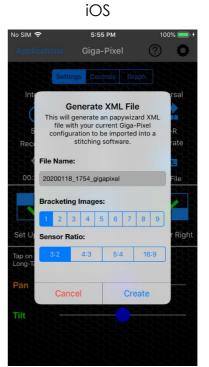
The following information is stored in the files:

- Positions (horizontal & vertical angle) for each image
- Focal length, sensor size, camera orientation
- image overlap
- Location Information

As soon as all keyframes have been set via the PINE app and the matrix size has been determined, an XML file for the current settings can be created. You can do this via the icon.







When creating the XML files, specify a **file name**, the number of **bracketing images** (if HDR was captured), and the **sensor ratio** (according to your camera settings).

After successful creation of the XML file, you can save or share it on your smartphone (Email, Dropbox, etc.). Import this file together with the captured images into your stitching software (e.g. PTGui).



9.10.5.11. Start the Recording

Start the recording with the green icon. You will now be asked if you want to create an XML file for the current recording. If you have not yet created an XML file, do so now (for more information on XML files, see the previous section 9.10.5.10). Then the motors will be moved to the upper left corner of the image section and the recording will start automatically.

On the screen you will now see a progress bar and an animated graph of a virtual matrix. Matrix fields are colored green according to the progress.

If desired, the recording can be paused at any time via the \blacksquare symbol. In the paused state, you can use the \blacksquare and \blacksquare symbol to control the flow of the individual images manually. Continue the process at any time using the \blacksquare icon.

The \blacksquare icon can also be used to stop the entire recording at any time.



9.10.6. 3D-Scan

The 3D scan mode enables the automated acquisition of single images of an object from several viewing angles. With the help of these single images, a virtual 3D model of the scanned object can be created with a photogrammetry software (e.g. Agisoft Photoscan or RealityCapture).

9.10.6.1. General Operating Method

The 3D scan mode can be operated with several motors, depending on requirements and application. In all cases, however, you will need a motorized turntable. We also recommend a vertically aligned slider, a tilt axis (e.g. NT Head unit), and an optional lens motor unit (or macro slide) for optimal results.

The camera must be attached to the slider together with the tilt axis. The camera can so be moved vertically and also tilted up and down with the tilt axis. The object to be scanned is located on the turntable. In addition, focus stacking can be achieved with the connected lens motor unit.

Additional information about the hardware setup can be found in our separate manual about the 3D scan mode.

During each scan process, the turntable will move in steps and the camera will be triggered at each step. With focus stacking, several images with different focus areas are taken per turntable position. After each complete turntable rotation, the remaining motors (slider and tilt) are moved before a new turntable rotation is started. Thus, single pictures of the object (on the turntable) are taken from several horizontal and also vertical angles.

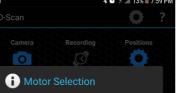


9.10.6.2. Determine the Motor Functions

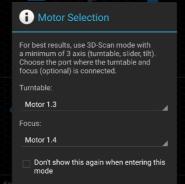
For this mode, the PINE controller needs to know which motor port is used for the turntable and which for the optional focus. If you select the 3D scan mode from the Homescreen, a dialog box appears where you can make this selection.



Make sure that you have selected the correct profiles for the motors.



Android



Back

iOS



If you do not use a focus motor, select the entry with "---".

Continue

Optionally you have the possibility to set an option here so that the motor selection does not appear again the next time. The app remembers your current selection and sets the motors automatically in the future. You can do this if you always operate your motors for Pan and Tilt at the same motor ports.

The dialog window for the motor selection can also be viewed at any time within the 3D-Scan mode via the nature icon in the status bar.

Confirm the motor selection with "Continue".



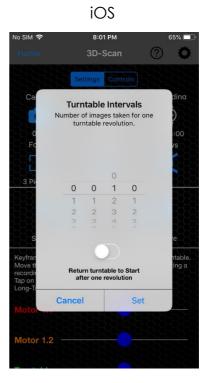
9.10.6.3. Recommended Workflow

- Determination of the number of images per turntable revolution
- Determination of the number of rows and keyframes
- (only with slider and tilt)
- Definition of focus stacking images and focus range
- Adjusting Camera Settings
- Start recording
- 3D Model Creation with Photogrammetry Software

9.10.6.4. Pictures per Turntable Revolution

You can specify how many individual images should be taken for a complete 360-degree rotation of the turntable. Tap the \hookrightarrow icon to do this.





Set the number of turntable-steps over the number fields. For example, if you select 10 turntable steps, the turntable will rotate 36 degrees after each captured image.

Optionally, you can determine whether the turntable should be moved back to its starting position at the end of a complete revolution. Use this option if the turntable cannot rotate several times due to connected cables.

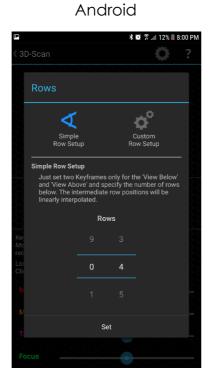


If the "Return to Start" option is deactivated, the turntable continues its movement after one full revolution (provided the number of vertical rows is greater than 1).

9.10.6.5. Number of Vertical Rows

The number of rows determines how many vertical steps a connected slider (and tilt axis) completes during the scanning process. This setting also defines the number of complete turntable revolutions. To adjust the number of rows, tap on the

Symbol.





There are 2 ways to define the vertical rows:

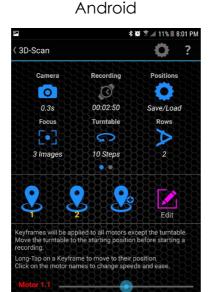
Simple Row Setup

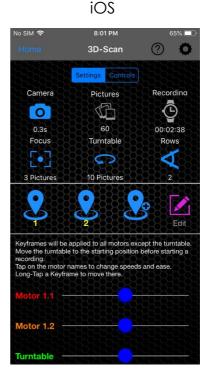
For this option you define the number of rows in the upper dialog window. You also set two keyframes for the "View Below" and "View Above". Move the motors for Slider and Tilt to the desired positions and tap the corresponding — or — icon on the main 3D-mode screen. The intermediate positions for the slider and the tilt axis are linearly interpolated based on the keyframes and number of rows.



Custom Row Setup

With the custom row setup, you can manually set the slider and tilt positions for each row (up to a maximum of 10 rows). The main view of the 3D scan mode will change as shown below.





Move the motors for Slider and Tilt to the desired positions and set keyframes for each row by tapping on the each symbols.

Successfully placed keyframes will be marked with a green \checkmark checkmark next to the keyframe symbol.

Set keyframes can be overwritten at any time by pressing the keyframe symbol again (short tap).



Hold down the keyframe symbol of a set keyframe (with green checkmark) to let all motors move to the corresponding keyframe.



If at least one keyframe has been set, you can use the icon to display an extended view of the keyframes. The corresponding motor positions are now displayed under each keyframe symbol. The position values are assigned to the motors in color (same colors corresponding to the motor names next to the slide bar).



All position values can now be changed manually by tapping on the values. A dialog box will appear in which you can adjust values. You can also move individual motors to the selected keyframe positions.



Make sure that the correct motor profiles are set or that the gear ratio values under the motor settings are correct. Only then will meaningful position values be displayed here.

Delete keyframes by tapping on the **X** icons while in the extended keyframe view.

When you are finished editing the keyframes, tap the 📝 icon again.

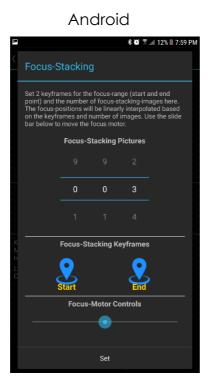


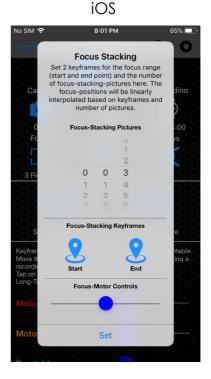
If the 3D scan mode is only used with a turntable (without slider and tilt), no keyframes have to be set.



9.10.6.6. Focus Stacking

If you have a focus motor connected and defined in the motor selection, you have the possibility to capture focus stacking images per turntable step. Tap on the [•] symbol. If no focus motor has been defined, access to this function is blocked or not visible.





Here you can define how many focus stacking images should be taken per turntable position.

In addition, you define the entire focus range by setting keyframes for the two focus end ranges. Use the slide bar to move the focus motor. Then use the symbols to set the keyframes for Start and End.

Successfully set keyframes are indicated by a green checkmark next to the keyframe symbol. In addition, a symbol appears on the main screen as soon as both focus keyframes have been set.

Set keyframes can be overwritten at any time by pressing the keyframe symbol again.

The intermediate focus positions are linearly interpolated based on the keyframes and the number of images.



9.10.6.7. Camera Settings

Open the Camera Settings by clicking the icon. Here you can adjust time values for camera release, pause times and motor movement. All time values are processed by the controller in the sequence as listed (from top to bottom).

Change the times using the \bigoplus and \bigoplus symbols. A short tap on the symbols increases or decreases the value by 0.1 seconds. If you hold down the symbols, the values change faster.





Focus

Determines how long the focus signal of the camera is activated. Use this time when operating your camera with automatic focus.

However, we recommend using the camera in manual focus for 3D scan mode. This is also absolutely necessary if you use focus stacking with a focus motor. In this case, set this time value to 0.0 seconds.



Trigger / Exposure

Determines how long the trigger signal of the camera is released.

If you define the exposure time via your camera, this time serves as a pure trigger impulse and a time of 0.1 to 0.3 seconds is sufficient.

However, if you operate your camera in bulb mode, you can set a longer time here. In this case, the exposure time is defined by this time setting.

Alternatively, you can take **HRD pictures** with a longer shutter release time. To do this, set your camera to bracketing mode. Then set the trigger time in the app long enough for your camera to capture all bracketing shots.

Delay

This is a waiting time which begins after the trigger time has elapsed. After the waiting time, the motor movement begins. Set this time so that your camera can complete the current shot before the motors start rotating.

If you define the exposure time via your camera, this value must be adjusted to the actual exposure time. For example, if you have set an exposure time of 5 seconds using your camera, set the camera time to 0.1 seconds and the delay time to at least 5.0 seconds.

However, if you operate your camera in Bulb mode, you can set the delay time to a short value such as 0.5 seconds.

Standstill

Defines how long the motors should remain at a standstill after the movement has been completed before another image is taken (start of focus time). Use this time to eliminate possible vibrations of the camera caused by the motor movement before a new image is taken.



9.10.6.8. Slave Mode

The slave mode allows you to operate the PINE Controller via an external interval generator. To do this, connect the external Interval device to the AUX input of the PINE Controller and activate the Slave mode under Camera Settings.

In slave mode, the PINE Controller waits to move the motors until it detects an external signal from the interval device. In the Camera Settings, all times except the Delay / Pause time are hidden. With the Delay time you can set how long the PINE controller should wait after receiving the external signal via the AUX input before moving the motors.

For more important information about the AUX input, refer to chapter 7.4 of this manual.

9.10.6.9. Start the Recording

Start the recording with the green symbol as soon as all settings have been made and keyframes have been set. Then the motors are moved to the start position (first keyframe or "below view") and the recording process is started. If the 3D mode is used without slider and tilt, the turntable starts its current rotation immediately after all data has been transferred to the controller.

On the screen you will see a progress circle and information about the remaining recording time.

If desired, the recording can be paused at any time using the \blacksquare icon. In the paused state, you can use the \blacktriangleright and \blacktriangleleft symbol to control the flow of the individual images manually. Continue the process at any time using the \blacktriangleright icon.

The \blacksquare icon can also be used to stop the entire recording at any time.

You can use the (i) icon to set whether a signal tone should sound on your mobile phone after all images have been completed. After capturing all pictures, you will also receive a message informing you about the completion. Additionally, you have the possibility to start another scan process. The motors then move in the inverted direction of the previous scan.



9.10.6.10. Photogrammetry 3D-Model Creation

All single images taken via PINE can be used to create virtual 3D models with the help of a photogrammetry software from third party manufacturers. Suitable applications are e.g. Agisoft Photoscan or RealityCapture.

Black Forest Motion does not offer its own software solution or support for 3D model creation. The end user is therefore dependent on the software applications of third-party manufacturers. However, you are welcome to contact us for advice.



9.10.7.360-Degree

With the 360-degree mode you can create professional and high-resolution 360-degree images with your DSLR or mirrorless camera in combination with a Pan & Tilt head.

For this mode, we recommend our NT Head (also known as Nic-O-Tilt) together with the **Nodal Point** Adapter rails. It is recommended to align the camera to its nodal point so that the images can be easily merged at the end.

9.10.7.1. General Operating Method

The PINE Controller automatically aligns your camera (which is mounted on the pan head) in all directions and creates single images at different positions. The sequence starts with an image vertically upwards (towards the sky) and ends with one or more images vertically downwards (towards the ground). In between, several horizontally aligned images are created in order to obtain the complete 360-degree view of the surrounding. All individual images can then be imported into an appropriate image processing software (stitching software) such as PTGui to combine the images into a 360-degree photo.

The 360-degree mode can also be used to create time-lapse sequences. The process for creating a single 360-degree image is then repeated several times (optionally also with additional slider movement between the individual 360-degree images).

9.10.7.2. Determine the Motor Functions

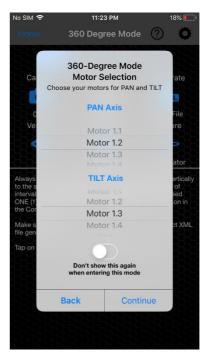
For this mode, the PINE controller needs to know which motor port is used for the Pan (horizontal) axis and which for the Tilt (vertical) axis. When you select the 360-degree mode from the Homescreen, a dialog box appears where you can make this selection.



Android



iOS





Make sure that you have selected the correct profiles for the motors. If the profiles are unsuitable, the Pan and Tilt axis will move incorrectly.

Optionally you have the possibility to set an option here so that the motor selection does not appear again the next time. The app remembers your current selection and sets the motors automatically in the future. You can do this if you always operate your motors for Pan and Tilt at the same motor connections.

The dialog window for the motor selection can also be accessed at any time within the 360-degree mode via the icon in the status bar.

Confirm the motor selection with "Continue".



9.10.7.3. Recommended Workflow

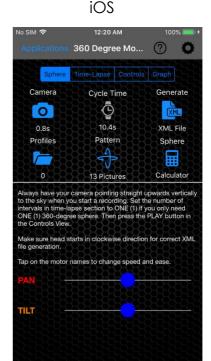
- Use the Sphere Calculator to determine the number of vertical rows and horizontal columns.
- Adjust Camera Settings
- (Set optional keyframes for time lapse and make further timelapse based settings)
- Align camera manually (move to start position)
- Create XML file (optional)
- Start recording

9.10.7.4. Screen Layout

In 360-degree mode, the upper part of the user interface is divided into several views. Under Android, you can select the views by swiping to the right or left. In iOS there are corresponding selection fields (Sphere - Time-Lapse - Controls - Graph).

In the **first view** on the far left, settings are made which influence a single 360-degree photo. Here you can set for example how many rows and columns should be taken per 360-degree photo. You can also make camera settings and create XML files here.







In the **second view** from the left, all Time-Lapse relevant settings are made. **If you only want to create a single 360-degree photo, set the number of intervals to 1**. The remaining settings then do not have to be considered. However, if you want to create several 360-degree photos in sequence, which you finally want to merge into a time-lapse, you can enter the number of total intervals here and also set optional keyframes for a connected slider.



In the **third view** you have as usual the control elements to start and stop recordings.

In the **fourth view** on the right you can see a motion graph if you have set keyframes and you are creating several 360-degree photos in a row (time-lapse).



9.10.7.5. Sphere-Calculator

The Sphere Calculator allows you to automatically calculate and set the number of rows and columns required based on your camera equipment (focal length, sensor size, image overlap, etc.).

If you are in the left view at the top of the screen (or within the Sphere settings in iOS), tap the \blacksquare icon to start the Sphere Calculator.





Within the sphere calculator, you can make various settings regarding your camera equipment (focal length, sensor, etc.). In the lower part of the dialog you will be given recommendations about the number of vertical rows and horizontal columns. The recommendations can be accepted directly via the "Apply" field and you do not have to make any further settings for the rows and columns.

The possible settings in the Sphere-Calculator are listed and explained below:



Focal Length

Enter the actual focal length of your lens here. There is no need to do any conversions (e.g. the focal length related to 35mm). The Crop factor of the camera sensor does not have to be considered here with the focal length setting.



If you want to create a very high-resolution 360-degree photo using a lens with a large focal length, you can also use the Giga Pixel mode. Set the keyframe for "top left" when the camera is facing up towards the sky. Then move the camera 360 degrees horizontally (Pan) and 180 degrees vertically (Tilt) so that the camera is aligned to the ground. Then set the "bottom right" keyframe.

Overlap

Specify the percentage by which the captured images should overlap (vertically and horizontally). The more overlap you specify, the more images will be captured. A larger overlap simplifies the stitching process. We recommend overlaps of at least 20-30%.

In addition, a distinction can be made between average and minimum overlap:

Average

Overlap is calculated in the center of the image section. Depending on the vertical angle for a particular row, the overlap at the top and bottom of the image section may be different. For vertical angles above the horizon, the overlap is greater at the top of the image than at the bottom. For vertical angles below the horizon, the overlap at the bottom of the screen is greater than at the bottom. For average overlap, it is therefore recommended that a higher percentage of overlap be selected to avoid gaps in the 360 degree image.



Minimum

This option creates all single images so that the image overlap never falls below the set percentage value. The overlap will also be above the set value at some points of the images.

Sensor Size

Tap on the $\frac{\kappa}{k}$ symbol to go through a selection of pre-defined sensor sizes. The most frequently used sensor sizes are stored here. If you are not sure which sensor size to use, consult your camera's manual to find out.

If you have a camera whose sensor size cannot be found in the predefined list, you can add your own sensor sizes using the con. Enter the dimensions of the sensor in mm for width and height and give the sensor a name of your choice. The saved sensor can then also be found in the sensor list. Sensors you have created can be edited and deleted at any time using the corresponding buttons (the currently selected sensor is changed or deleted).

Lens Type

Determine whether you are using a fisheye or a regular (rectilinear) lens. Tap on the (a) icon to change settings.

Camera Orientation

Determines whether you have mounted your camera in the landscape or portrait orientation. We recommend a portrait orientation. Tap on the orientation icon to change the settings.

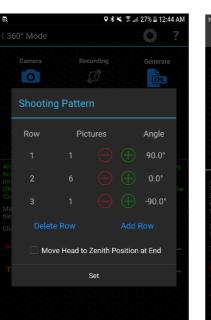
Display of the angle of view (HFOV and VFOV)

Here the horizontal (HFOV) and vertical (VFOV) viewing angle of the camera/lens combination is calculated and displayed.



9.10.7.6. Defining the Shooting Pattern manually

As an alternative (or for fine-tuning) to the Sphere Calculator, you can also manually specify the number of vertical rows and images per row. To do this, touch the sphere settings (top left view).



Android



iOS

Here you can define the number of images for each row. In addition, rows can be added and deleted using the corresponding buttons. For the first and last row the number of images can be reduced to 0. For all other rows the minimum number of images is 2.

Furthermore the vertical angle of the tilt axis is displayed for each row. As you can see, the first row is always positive 90 degrees and the last row negative 90 degrees. So the tilt axis is aligned to the sky (zenith) at the first row and to the ground (nadir) at the last row. The minimum number of rows is 3.

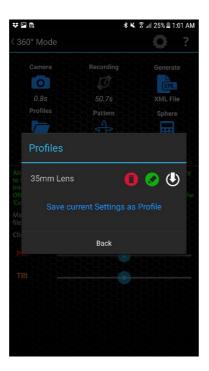
Additionally you have the possibility to determine whether the Pan & Tilt setup should be moved back to its starting position (Zenith) after all frames have been created. This is helpful if you want to create several 360-degree images in sequence.

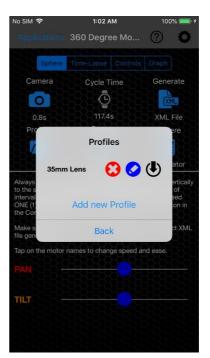


9.10.7.7. Profiles (Shooting Patterns)

Here you can save created recording patterns (number of rows and columns) and load them if required. So you can create a profile for all your camera and lens combinations. So if you change the lens of your camera, you can simply load a previously saved profile without having to determine the number of rows and columns again using the Sphere Calculator.







Save the current settings by tapping on the "Add new profile" button. You can then give the profile a name in the following dialog box.

changed via the symbol.



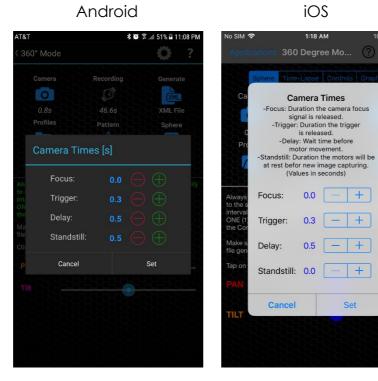
Load profiles using the (1) icon.



9.10.7.8. Camera Settings

Open the Camera Settings by clicking the local icon. Here you can set time values for focus time, shutter release time and pause time. All time values are processed by the controller in the sequence as listed (from top to bottom).

Change the times using the \bigoplus and \bigoplus symbols. A short tap on the symbols increases or decreases the value by 0.1 seconds. If you hold down the symbols, the values change faster.



Focus

Determines how long the focus signal of the camera is activated. Use this time when operating your camera with automatic focus.

However, we recommend that you operate the camera in manual focus for 360-degree mode. In this case, set this time to 0.0 seconds.



Trigger / Exposure

Determines how long the trigger signal of the camera is released.

If you define the exposure time via your camera, this time serves as a pure trigger impulse and a time of 0.1 to 0.3 seconds is sufficient.

However, if you operate your camera in bulb mode, you can set a longer time here. In this case, the exposure time is defined by this time setting. This allows you to set the shutter release time for night shots to more than 30 seconds (the maximum exposure time for most cameras).

Alternatively, you can also take **HRD pictures** with a longer trigger time. Set your camera to bracketing mode. Then set the trigger time in the app long enough for your camera to capture all bracketing shots.

Delay

This is a waiting time which begins after the trigger time has elapsed. After the waiting time, the motor movement begins. Set this time so that your camera can complete the current shot before the motors start rotating.

If you define the exposure time via your camera, this value must be adjusted to the actual exposure time. For example, if you have set an exposure time of 5 seconds using your camera, set the camera time to 0.1 seconds and the delay time to at least 5.0 seconds.

However, if you operate your camera in Bulb mode, you can set the delay time to a short value such as 0.5 seconds.

Standstill

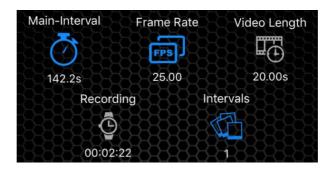
Defines how long the motors should remain at a standstill after the movement has been completed before another image is taken (start of focus time). Use this time to eliminate possible vibrations of the camera caused by the motor movement before a new image is taken.



9.10.7.9. Time-Lapse Settings (optional)

The 360-degree mode allows you to repeat the sequence for capturing a 360-degree photo several times. You create single photos, which you first have to combine to 360-degree photos. Afterwards all 360-degree photos can be combined to a time-lapse.

In the second view at the top of the screen (or under the Time Lapse settings) you will find settings similar to those found in the regular Time-Lapse mode.



We recommend that you start by creating regular time-laps sequences. Please read chapter 9.10.2 of this manual. This should enable you to apply what you have learned in 360-degree mode.

The "Intervals" setting defines the number of 360-degree photos that will be created in sequence. The "Main-Interval" time determines the duration for the creation of a single 360-degree photo. Based on the number of vertical rows and horizontal columns of a 360-degree photo, a minimum main interval time results.

Alternatively, you can use other motor axes such as a slider for 360-degree time-lapse to integrate another movement. Set keyframes (maximum 2) for start and end of additional motors. The slider will then move one step after creating all single frames for a 360-degree photo before starting a new cycle for a 360-degree photo.



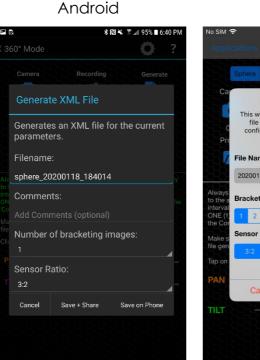
9.10.7.10. XML Files

XML files contain special information about the entire 360-degree recording, which is helpful for the stitching process of the individual images via a stitching software.

The following information is stored in the files:

- Positions (horizontal & vertical angle) for each image
- Focal length, sensor size, camera orientation
- image overlap
- Location Information

As soon as all settings of the vertical rows and horizontal columns have been made via the PINE app, an XML file for the current settings can be created. You can do this using the symbol.



Sphere Tines-Lapse Controls Graph

Ca

Generate XML File

This will generate an papywizard XML file with your current Giga-Pixel configuration to be imported into a stitching software.

File Name:

20200118_1759_sphere

Always to the soft the Controls Graph

Bracketing Images:
interval

1 2 3 4 5 6 7 8 9

Sensor Ratio:

1 2 3 4 5 6 7 8 9

Sensor Ratio:

Tap on

PAN

Cancel

Create

When creating the XML files, specify a **file name**, the number of **bracketing images** (if HDR was captured), and the **sensor ratio** (according to your camera settings).

After successfully creating the XML file, you can save or share it on your smartphone (Email, Dropbox, etc.). Import this file together with the captured images into your stitching software (e.g. PTGui).



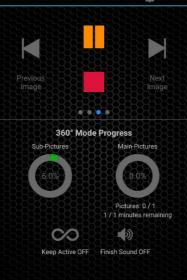
9.10.7.11. Start the Recording

Before starting each shot, always move your Pan & Tilt head so that the camera is pointing vertically upwards towards the sky. Also remember that the horizontal pan axis starts its 360-degree movement in the positive direction (same direction if you move the slide bars to the right). Therefore, make sure that the connected motor cables have enough clearance to allow a complete 360-degree rotation.

Start the recording with the green symbol. You will now be asked if you want to create an XML file for the current recording. If you have not yet created an XML file, do so now (for more information on XML files, please refer to the previous section 9.10.7.10). The data will then be transferred from your mobile phone to the controller. In Android the recording starts by pressing the Play button again and in iOS the recording starts automatically.

On the screen you will see a progress indicator for the creation of the single images of the 360-degree sequence and the entire time-lapse intervals.





iOS



The icon can also be used to stop the entire recording at any time.

Use the symbol to set whether you want to hear a sound on your mobile phone after all images have been captured.



9.10.8. Live

The Live mode is ideal for video recordings of live events such as music concerts or shows.

9.10.8.1. General Operating Method

With the PINE Motion App, you can define several positions / keyframes for all connected motors in live mode. We also call the keyframes "scenes" in live mode. A scene can thus be assigned to a certain view (e.g. view of an individual musician on the stage). In recording mode, you can change scenes at the touch of a button via a simple user interface. The motors then move to the programmed positions / keyframes.

9.10.8.2. Recommended Workflow

- Set keyframes
- Set motor speeds
- Switching between programmed scenes in recording mode

9.10.8.3. Screen Layout

There are two different views in Live mode.



In the "Setup" view, motors can be moved manually and keyframes or scenes can be set. Select this view via the icon.

In the "Recording" view, the motors can then be moved automatically to the programmed scenes by pressing a key. Select this view via the icon.

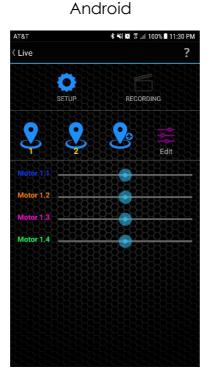


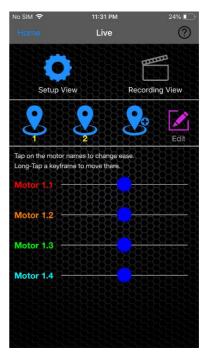
9.10.8.4. Setting Keyframes

Within the "Setup" view, use the motor slide bars to move the motors (or sliders or pan & tilt etc.). Think about interesting views which you want to be able to approach by pressing a button. Then set the keyframes by pressing the \P and \P symbols.

As soon as a keyframe has been set successfully, a green \checkmark checkmark appears next to the keyframe symbol.

Already set keyframes / scenes can be overwritten at any time by pressing the keyframe symbol again (short tap).





iOS



9.10.8.5. Editing and deleting Keyframes

If at least one keyframe / scene has been set, you can use the icon to display an extended view of the keyframes. The corresponding motor positions are now displayed under each keyframe symbol. The position values are assigned to the motors in color (same colors according to the motor names next to the sliders). The keyframe numbers are yellow.



All position values can now be changed manually by tapping on the values. A dialog box will appear in which you can adjust values. You can also move individual motors to the selected keyframe positions.



Make sure that the correct motor profiles are set or that the gear ratio values under the motor settings are correct. Only then will meaningful position values be displayed here.

Delete keyframes by tapping on the **x** icons while in the extended keyframe view.

When you are finished editing the keyframes, tap the 📝 icon again.

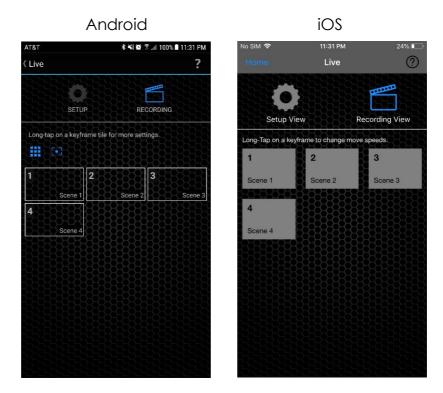


9.10.8.6. Recording View

As soon as all desired scenes have been programmed, you can switch to the recording view via the fine icon. Each scene is now assigned a square tile.

Tap on a tile to move all motors to the programmed scene. While the motors are moving, the text of the scene numbering appears in orange. As soon as all motors in the scene have come to a standstill, the number changes to green. This indicates at which scene the motors are currently located.

To stop a current movement early, tap on any tile.



Press and hold a tile to adjust the motor speed for each scene separately. With the Android version of the app you also have the possibility to assign names (or descriptions) for each scene. Furthermore, background images can be set for the tiles in the Android version and via the icon you can specify how many tiles are displayed horizontally.



9.10.9. Macro

The macro mode, in conjunction with a precise macro rail, is used to create images with extreme depth of field. Especially small objects can so be displayed optimally.

9.10.9.1. General Operating Method

A difficult problem to solve in macro photography is often the narrow focus range of the created images. This prevents an optimal representation of the desired object. However, if the camera is mounted on a movable macro slider, the camera can be moved closer to the object after each image has been taken. The PINE Controller executes an interval defined by you several times. This interval includes triggering the camera, pause times, and motor movements of the macro slide.

If you now "overlay" all the individual images of your camera using special computer software, you will obtain an image with an optimal depth of field.

9.10.9.2. Recommended Workflow

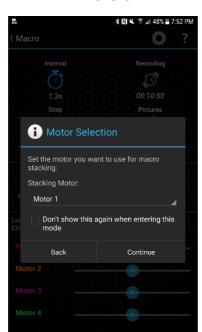
- Set step distance
- (Optional: set keyframes and number of images)
- Set Interval and Camera Settings
- Start recording

9.10.9.3. Determine the Motor Functions

For this mode, the PINE controller must know which motor connector is used for the macro slide (stacking motor). When you enter the macro mode from the home screen, a dialog box appears in which you can make this selection.



Android



iOS





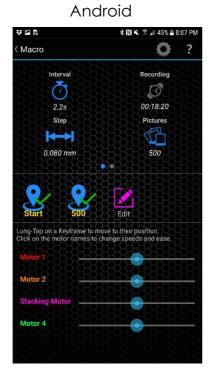
Make sure that you have selected the correct profiles for the motors. If the profiles do not match, the actual step distance will not match the set one.

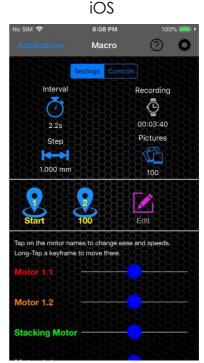
Optionally you have the possibility to set an option here so that the motor selection does not appear again next time. The app remembers your current selection and sets the motors automatically in the future. You can do this if you always connect the macro slide to the same motor connector.

The dialog box for the motor selection can also be called up at any time within the macro mode via the symbol in the status bar.

Confirm the motor selection with Continue.







9.10.9.4. Setting the Step Distance

Tap the icon to set the slider movement per step. The value is in the unit mm.



Note that if both keyframes are set, the number of images will also change when the step is changed. If both keyframes are not set, the number of frames remains unchanged when the step is adjusted.

9.10.9.5. Setting Keyframes (Optional)



The setting of keyframes is not mandatory. If no keyframes are set, recording starts at the current slider position. Then the number of set frames is created and the slider moves by the set step distance after each frame.



Use the motor sliders to move the macro slide.

When the slider is at the desired start position, set the first keyframe by tapping the first (left) symbol. As soon as a keyframe has been successfully set, a green checkmark vappears next to the keyframe symbol. Set the second keyframe, which determines the slider end position, in the same way.



Hold down the keyframe symbol of a set keyframe (with green checkmark) to move all motors to the corresponding keyframe.

Keyframes that have already been set can be overwritten at any time by pressing the keyframe symbol again (briefly).

9.10.9.6. Editing and deleting Keyframes

If at least one keyframe has been set, you can use the icon to display an extended view of the keyframes. Under each keyframe symbol the corresponding motor positions are now displayed. The position values are color assigned to the motors (same colors as the motor names next to the sliders). Frame numbers assigned to the keyframes are in yellow color.



All position values and frame numbers can now be changed manually by tapping on the values. A dialog box will appear in which you can adjust values. You can also move individual motors to the selected keyframe positions.





Make sure that the correct motor profiles are set or the gear ratio values under the motor settings are correct. Only then are meaningful position values displayed here.

Delete keyframes by tapping on the *\times icons while in the extended keyframe view.

When you are finished editing the keyframes, tap the 📝 icon again.

9.10.9.7. Changing the number of Pictures

Tap the icon to change the number of pictures. The number of pictures also corresponds to the number of slider steps taken.



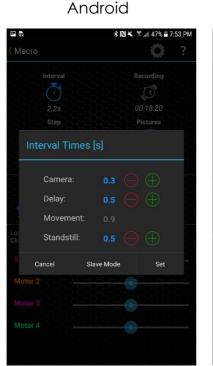
If both keyframes are set and you change the number of frames, the step distance is automatically adjusted accordingly.

9.10.9.8. Interval and Camera Settings

Open the Interval settings via the \circlearrowleft icon. Here you can adjust time values within a single interval. All time values are processed by the controller in the sequence as listed (from top to bottom).

Change the times using the \oplus and \ominus symbols. A short tap on the symbols increases or decreases the value by 0.1 seconds. If you hold down the symbols, the values change faster.







iOS

Camera

Determines how long the trigger signal of the camera is pressed. In time-lapse mode, always set your camera to manual focus and not automatic focus.

If you define the exposure time via your camera, this time serves as a pure trigger impulse and a time of 0.1 to 0.3 seconds is sufficient.

However, if you operate your camera in the so-called Bulb mode, you can set a longer time here. In this case, the exposure time is defined by this time setting.

Alternatively, you can also take **HRD pictures** with a longer camera time. Set your camera to bracketing mode. Then set the camera time in the app long enough for your camera to complete all bracketing shots.



Delay

This is a waiting time that starts after the camera time has elapsed. After the waiting time has elapsed, the motor movement begins. Set this time so that your camera can complete the current shot before the motors begin to rotate.

If you define the exposure time via your camera, this value must be adjusted to the actual exposure time. For example, if you have set an exposure time of 5 seconds using your camera, set the camera time to 0.1 seconds and the delay time to at least 5.0 seconds.

However, if you operate your camera in Bulb mode, you can set the delay time to a short value such as 0.5 seconds.

Movement

This time signals how long the motors move within an interval. This time cannot be changed directly. It depends on the programmed movement distance, number of images, and motor speed.

Standstill

Defines how long the motors should remain at a standstill after the movement has been completed before another image is taken (start of focus time). Use this time to eliminate possible vibrations of the camera caused by the motor movement before a new image is taken.

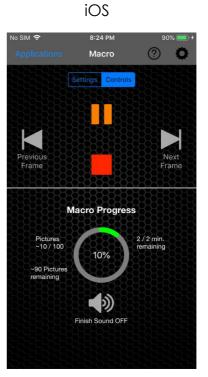


9.10.9.9. Start the Recording

Once all settings have been made, recording can be started. You do this by clicking the green symbol. If both keyframes have been set, the motors are now moved to the start position and recording starts automatically. If no keyframes are set, recording starts at the current slider position.

During recording you can see the current progress on the screen. Among other things, the remaining recording time and number of images as well as a progress bar are displayed.





The recording can be paused at any time using the \blacksquare icon. In the paused state, you can use the \blacksquare and \blacksquare icon to manually control the interval sequence.

The icon can also be used to stop the entire recording at any time.

With the symbol you can set whether you want to hear a signal tone on your mobile phone after completion of all images.

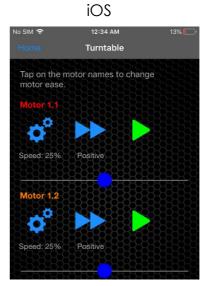


9.10.10. Turntable

In turntable mode, rotary axes can be controlled with a continuous rotary motion. It is important to ensure that the motors and the corresponding mechanical attachments can move freely.

Before entering the turntable mode, the Android App displays a dialog window where you can select all the motors you want to use for the turntable mode. The app will then display the selected motors within the turntable mode. With the iOS App, no dialog window appears and all connected motors are visible within the mode.





Press the symbol to start the motor movement. The symbol then changes to a symbol which can be used to stop the motor again.

Within the Android App, you can make further settings by tapping on the motor names. These are: Speed (positive and negative in percent) and the values for Ease-In and Ease-Out. The latter represent the ramps for smooth starting and stopping of the motors.

Within the iOS App, only the ramps are set after tapping on the motor name. Speeds and direction of rotation can be set directly adjusted via the *\overline{\sigma}^* and *\right* symbols. iOS also has slide bars for each motor, which you can also use to move motors manually.



9.10.11. Astro

With the Astro mode, you can let motors move so slowly that they can compensate the movement of the earth's axis. This way, you can realize long exposure photographs of the night sky.

For astro tracking, you can use an axis of the NT Head from Black Forest Motion, for example. It is important to align the motor axis so that it corresponds to the earth axis. For the alignment you can use e.g. our Astro Finder.



A **separate manual for the Astro Finder** which explains the alignment of the motor axis can be found on our website in the support section.

A dialog window appears under Android when you enter the Astro mode. Select which motors you want to use for the Astro mode (only rotation units are shown here). The selected motors will then be displayed within the mode.

With the iOS App no dialog window appears and all connected motors are visible within the Astro mode.

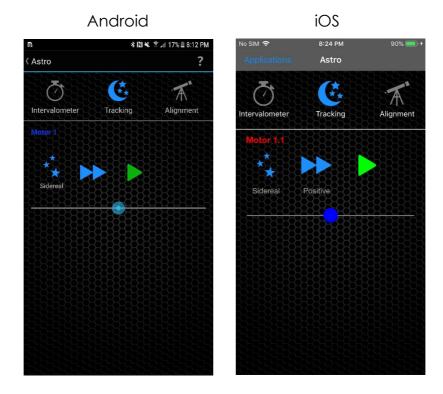


Make sure you have the correct motor profiles selected for the motors in order for the tracking to work correctly.



9.10.11.1. Tracking

Within the tracking view you can control the connected motor, adjust the tracking speed and start/stop the tracking.



Press the symbol to start the motor movement. The symbol then changes to a symbol which can be used to stop the motor again.

The motors move so slowly that a direct movement is hardly visible!

Change the direction of motor rotation by pressing the >> symbols.



The Astro mode gives you the choice of four different tracking speeds. These can be selected by pressing the corresponding icons:

■ Sidereal *★

The tracking is done at star speed. Use this option if you want all stars to be point-shaped.

■ ½ Sidereal **

Tracking takes place at half the speed of a star. Use this option if you want to achieve a foreground in a relatively good sharpness range and at the same time have point-shaped stars. The stars will however not be completely point-shaped.

■ Solar 🔅

Tracking is done at solar speed.

■ Lunar

The tracking is done at moon speed.



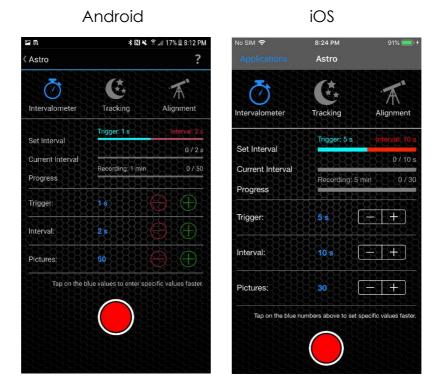
The efficiency of the astro tracking is strongly dependent on a proper alignment of the motor rotary axis. Use great care to make the alignment.

Probably you will need some trials and test runs to get the alignment right.



9.10.11.2. Astro Intervalometer

The Astro mode offers an integrated Intervalometer mode. Tap on the icon to get to the Intervalometer view. Use this mode to trigger your camera once you have started tracking. You can then use this mode to create beautiful astro time-lapse videos.



The Intervalometer provides the basic settings for shutter release time, interval time, and number of frames.

Change the times using the \bigoplus and \bigoplus icons. A short tap on the icons increases or decreases the value by 1 second at a time. If you hold down the icons, the values change faster.

Alternatively, you can tap the blue values. A dialog window will open in which you can enter certain values faster.

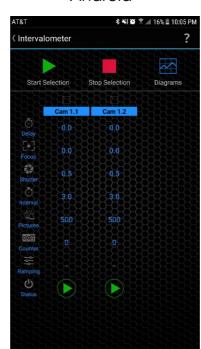
Start the recording via the symbol. In the upper part of the screen you will find information about the current recording progress. You can also tap the cicon when recording is active. The recording will then continue until you stop it manually. Stop the recording at any time using the cicon.



9.10.12. Intervalometer

The Intervalometer mode allows you to use the PINE Controller without motors. This allows you to trigger cameras that are connected to the PINE Controller in a fixed time interval to create static time-lapse.

At the time of writing of this manual, the Intervalometer mode is only available within the Android App. For iOS, this will be available at a later time.



Android

9.10.12.1. Set Parameters

The following parameters can be set for each camera port (the operating sequence is from top to bottom as the parameters are listed). Tap on the blue numerical values to change the values.



Delay

This is a simple pause time that you can use to delay camera triggers. For example, you can operate 2 cameras simultaneously with the same interval time but let one camera trigger before the other. To do this, set the delay time to 0.0s for one camera and to a desired delay value for the other.

Focus

Determines how long the focus signal of the camera is activated. Use this time when operating your camera with automatic focus.

Trigger / Exposure

Determines how long the trigger signal of the camera is released.

If you define the exposure time via your camera, this time serves as a pure trigger impulse and a time of 0.1 to 0.3 seconds is sufficient.

However, if you operate your camera in bulb mode, you can set a longer time here. In this case, the exposure time is defined by this time setting. This allows you to set the shutter release time for night shots to more than 30 seconds (the maximum exposure time for most cameras).

Alternatively, you can also take **HRD pictures** with a longer trigger time. Set your camera to bracketing mode. Then set the trigger time in the app long enough for your camera to connect all bracketing shots.

Interval

This is the total interval time. It determines how long a single interval lasts and thus determines the time difference between the captured images.

Pictures

Here you can define how many images should be created. You can also select the option "Infinite" to trigger the camera for an indefinite time.



Counter

This value counts the captured images. Tap this value to reset the counter.

Ramping

Reserved for later development.

9.10.12.2. Start the Recording

Each camera can be started via a separate icon. These are the icons at the bottom of the screen.

The icon then changes to an icon that can be used to stop recordings at any time.

Alternatively, several cameras can be started and stopped at the same time. To do this, set the checkboxes that are placed above the name of each camera. Then tap on the or symbols in the upper part of the screen with the text addition "Start Selection" and "Stop Selection".



9.11. Multitasking

The PINE Controller is able to operate certain application modes simultaneously. This applies to the Turntable or Astro mode in combination with e.g. the Time-Lapse or Video mode.

To operate for example a motor axis in astro mode and at the same time use the time-lapse mode with other motors, proceed as follows:

- I. First start the Astro mode and activate a desired motor axis there.
- II. Exit the Astro mode and start the Time-Lapse mode.

On the Homescreen, you will now see o icons for currently active modes.

Within the Time-Lapse mode, the motor active in Astro mode will not be visible. Set keyframes as usual and start the recording.

- III. The access to the Astro mode is now blocked until the time-lapse recording has finished.
- IV. As soon as the time-lapse recording is finished, you can enter the Astro mode again and the still active motor can be stopped.

In the same way, the turntable or video mode can also be used for multitasking.



10. Firmware Updates

This chapter explains how you can update the firmware of the PINE Motion Controller.

As the software of the controller is always being developed further by us to improve overall user experience and introduce new features, firmware updates are a way to give our PINE users access to the newest software releases.

Firmware updates are always optional, but we recommend using always the latest releases, so you get access to the newest features.

Most firmware updates also require the latest PINE Motion App updates for Android and iOS in order to obtain access to the new features. Always make sure you are using the newest apps available in the Google Play and App Store.

10.1. Activating the Firmware Update Mode on PINE

Before you can update the firmware, the PINE Controller needs to be set to a special Firmware Update Mode.



Only activate the Firmware Update Mode when you really intend to update the firmware of the controller.

The controller is completely unfunctional once it is in the Update Mode and will only be functional again after a new firmware has been uploaded.

We also recommend that you first install and launch the Update Utility Software listed under Chapters 3 or 4 before activating the Firmware Update Mode.



I. Connect a suitable USB cable to the PINE Controller (micro USB) and your computer.



Make sure you are using a proper USB cable and not one only capable of supplying power. If firmware updates keep failing, try a different USB cable.

- II. Plug in the power supply for the Controller
- III. Connect to the Controller with the PINE Motion App
- IV. Go to the "Connections" Section



V. Tap the Symbol and confirm the appearing Dialog





VI. The PINE Controller should now be in Firmware Update Mode and is ready to receive a new firmware. The blue LEDs on the controller should be on slightly to indicate the update mode.

The controller will now be unfunctional until a new firmware has been uploaded.





10.2. Updating on Windows

For Windows, we have our own Firmware Updater Utility for the PINE Controller.

Go to the Downloads section on our website to download the Updater Utility for Windows.

Install the Utility Software by launching the setup.exe file in the ZIP folder you downloaded. You might need to give permission to install 3rd party apps during the installation process.

Some versions of Windows might require **additional USB drivers**, so the updater utility can detect the PINE Controller. If you are having problems detecting the controller via USB, install the Windows drivers found in our Downloads section. Updates under Windows 10 should work right away without installing any additional drivers, however, on older operating systems, you will likely need to install those drivers.

- I. With your PINE Controller still connected via USB to your computer (and powered over the DC connector), launch the Updater Utility.
 - If you disconnected power from the controller after activating the Update Mode over the App, always first connect the USB cable to the controller and your computer, then connect the power supply.
- II. Expand the Ports List and select the COM port. If the list is empty, click the "Refresh" Button





III. There are 2 options to select the Firmware File:

a. Update from Server

The newest Firmware file is always stored on our server and the update utility will access it and install on the controller after clicking the "Update from Server" button. This option requires an active internet connection.



b. Update from File

Alternatively, you can download the Firmware files from our Downloads section, select their storage location with the "Browse" button, and then install it to the controller after clicking the "Update from File" button.

IV. The Output window will show the progress of the update process.

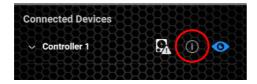


V. At the end of the update process, the PINE Controller needs to be restarted by disconnecting and reconnecting the power supply.

The controller should now boot up again as normal and will have the newest firmware installed.

VI. The currently installed firmware version of the controller can be seen by pressing the

Symbol under the "Connections" section of the App.



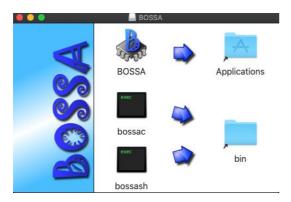


10.3. Updating on Mac OS X

For Mac OS X, you can use a 3rd party software called BOSSA to update the firmware of the PINE Controller.

Go to the Downloads section on our website to download the BOSSA software for Mac OS X.

Install the software by dragging the necessary files to the indicated locations as shown in the image below. You might need to give permission to install 3rd party apps during the installation process.



After installing, launch the BOSSA software



For some versions of Mac OS X (e.g. Mojave), you will receive an error message, which will prevent you from launching the BOSSA software. In this case, do the following steps:

a. Open the Terminal Application following line:



on your mac and copy/paste the

/usr/bin/ruby -e "\$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/master/install)"

Follow the instruction in the terminal window. You have to confirm some things by pressing enter or giving your log-in password.

b. After the above step has concluded, type the following into the terminal prompt and press enter:

brew install wxwidgets

Follow any instructions in the terminal window.



Once you are able to launch the BOSSA software, you will see the following window:

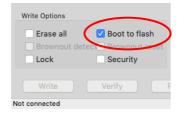


- I. With your PINE Controller still connected via USB to your computer (and powered over the DC connector), launch the Updater Utility.
 - If you disconnected power from the controller after activating the Update Mode over the App, always first connect the USB cable to the controller and your computer, then connect the power supply.
- II. Click the refresh button. When you now expand the Serial Ports list you should see something like the following:



Select the entry which contains the "usbmodem" text.

- III. Download the newest firmware file from our Downloads section and select it with the "Browse" option in the BOSSA Software.
- IV. Make sure you have the "Boot to flash" checkbox activated.



- V. Click the "Write" Button to start the update process.
- VI. At the end of the update process, the PINE Controller needs to be restarted by disconnecting and reconnecting the power supply.

The controller should now boot up again as normal and will have the newest firmware installed.



VII. The currently installed firmware version of the controller can be seen by pressing the (1) Symbol under the "Connections" section of the App.





11. Troubleshooting and FAQs

The connected motors do not rotate properly (block) but make slight noises.

Please make sure that you have selected the correct motor profiles for each motor. Probably a profile with too low an output current is selected. The standard current of the controller after restart is 0.4A. This is not enough for many motors (e.g. NT Head and Slider). By setting the correct motor profiles, the current for the appropriate device is automatically set. The NT Head needs e.g. a current of 1.0A.

Why do my motors turn much slower than expected?

Please make sure that you have selected the correct motor profiles for each motor. To change motor profiles, you can either access the Motor Settings menu or tap the motor icon at the top right of the home screen. This will open the Motor Quick Configuration window, where you can select motor profiles for each motor from a predefined list, or you can create your own profiles by tapping the "plus" icons and following the instructions. Your custom profiles are saved and can be used the next time you use the controller.

Unlike other motion controllers, PINE offers some advanced modes that require absolute position data. Correct motor profiles are also required if you want to use the advanced keyframe functions where absolute positions can be entered.

Why did my recording (Time-Lapse, Giga-Pixel, etc.) suddenly stop unexpectedly and the control doesn't seem to react anymore?

It is very unlikely that the controller will stop recording after startup. If you lose the Bluetooth connection to the controller, the recording will still continue.

However, in some cases we have found that the wrong DC power plugs have been used, resulting in power failures on the controller. PINE requires a 5.5x2.1 mm DC plug for its power connection (middle pin positive). If a 5.5x2.5 mm plug is used, the power supply may be interrupted during movement. In these cases, the controller will shut down because it has no power and may restart afterwards.

If the wrong connector is used, power interruptions are usually only temporary for a few milliseconds, but it is sufficient for the controller to restart.

Please always use the appropriate 5.5x2.1 mm DC connector to power the controller.



My Smartphone/Tablet cannot be connected to the controller. What am I doing wrong?

First, make sure your smartphone or tablet supports the Bluetooth Low Energy 4.1 standard. If your phone detects the PINE controller but has difficulty connecting, try restarting the controller by unplugging and reconnecting the DC power plug. Close the PINE Motion App completely and restart it.

Why don't the motors for my DIY project, that I connected to the PINE controller, work?

Please check the pin assignment of the motor connectors again. Each Hirose plug contains 4 connections for a bipolar stepper motor (current up to approx. 1.2A) and 2 connections for a limit switch.

Why are my motors not recognized (no green motor LED)?

Check again whether all motor cables are firmly connected on both the motor and control sides. Try to supply power to the controller and check whether the motors are now detected. If the motor LED still does not light green after starting up, there may be a defect in your motor. Try using a different motor.

Never attach or disconnect motors while the controller is on. This may damage the internal components of the controller. Motors attached while the controller is already powered on will not be detected until you restart the unit.

My PINE controller gets pretty warm during operation. Is that normal?

When multiple motors with a high motor current are used, the controller delivers a lot of torque and power to the motors. The outside of the housing becomes warm. This is no cause for concern.

Why is my camera not triggered by PINE?

Check that the release cable from the camera to the controller is properly (and all the way) plugged in.



My smartphone does not recognize the PINE controller

In rare cases we have found that the PINE Motion App does not "see" the controller when the phone's location service is turned off. Please make sure that you activate the GPS and location services on your phone to ensure proper functionality.

PINE will only use your location information to include your current location in the XML files in Giga-Pixel and 360-degree mode.

My controller restarts

When your controller restarts, the power supply is usually disconnected. Make sure that the power supply is not interrupted.

This can be caused by a loose contact or bad connectors. The DC connector on the controller must be a 5.5x2.1mm DC jack (positive center).

Giga-Pixel - Matrix was wrongly calculated

If the matrix is incorrectly calculated, the motor profile for the motors is incorrectly set. It is very important for PINE to know the exact implementation of your motors. Without this information, the calculations cannot be performed correctly. In the motor settings, select the correct profile or create a new one. A setup wizard will help you.

Which devices can I connect to the PINE Controller?

Any motorized slider, pan/tilt head, turntable, focus/zoom unit that has a stepper motor can be connected to PINE. Here are some examples of working systems:

- Dynamic Perception Stage Zero Slider
- Dynamic Perception Stage One Slider
- Dynamic Perception Sapphire Pro Pan + Tilt Head
- Dynamic Perception Stage R Rotary System
- MDK V5 Pan & Tilt Head
- MDK V6 Pan & Tilt Head
- Rhino Motion Slider
- PocketSlider PT PRO
- PT Pan Tilt Head (PocketSlider)
- Nic-O-Slider
- Nic-O-Tilt Head
- eMotimo Turntable
- PureMoCo Focus/Zoom Unit
- GVM Slider
- viele mehr



If you have a particular system that you would like to use with PINE, please contact us and we will help you find out if it is compatible.

What happens if my phone's battery runs out during time-lapse, gigapixel, etc. recording?

Once you have everything set up and the system is up and running, the PINE controller runs independently of the smartphone app. You can disconnect your phone from the controller, turn it off, make calls, check your emails, play games,.... PINE will do its job no matter what happens.

Which motors are supported?

PINE can be used with bipolar stepper motors. A good size is NEMA17. The maximum output current is 1.2A per channel.

Why are there 6 contacts in the motor connectors?

Each motor connector contains the 4 wires for the motor itself (pins 1 - 4), plus 2 additional wires for the limit switches (pins 5 and 6). Limit switches can be used for calibration purposes. If you do not use a limit switch, no problem. Simply leave pins 5 and 6 unconnected.

How can I mount the PINE Controller?

The PINE controller has a 1/4" UNC thread and four (4) M4 threads at the bottom.

The four M4 threads are ideal for mounting the Nic-O-Tilt magnetic mounting plate, which is included with the Nic-O-Tilt bundle or available separately in our shop. This allows you to mount the PINE Controller in seconds.

Does the controller have a SLAVE mode?

Yes, you can use the AUX input for applications with devices such as the View by TimeLapse+.

Can I switch off the LED light on the controller?

Yes! activate the night mode in the PINE Motion App and all LED lights will be switched off. Perfect for taking astro pictures.



Do I need batteries to operate the controller?

Yes, PINE has a standard DC connector (2.1×5.5mm - center positive). You can use any battery (PowerBank) or power supply with DC output 10-24V. PINE cannot be operated via the USB socket!

Which smartphones are supported?

The PINE Motion App is available for Android devices (version 4.3 or higher) and iOS devices (iPhone 5 and higher / iOS 10.3 or higher).



12. Index

3

360-Degree · 73 3D-Model · 72

Α

App ⋅ 10, 18 App Store ⋅ 18, 98 Astro ⋅ 92

AUX · 10, 11, 14, 15, 40, 71, 108

В

Bluetooth \cdot 10 Boot to flash \cdot 103 BOSSA \cdot 102, 103

C

Column Pattern · 81 COM port · 100 Continuous · 58 Controller Info · 30 Current · 26, 27 Custom Row Setup · 66

D

daisy chain · 29 Delay · 38, 40, 54, 70, 71, 83, 95 Diagonal · 58

Ε

earth axis · 92
Ease · 32, 48, 91
Energy Saving · 27
Exposure · 43, 53, 70, 83, 95
Exposure Test · 43



F

FAQs · 105
Firmware · 10, 30, 98
Firmware Update Mode · 30, 98, 99
Firmware Updater Utility · 10, 100
Focal Length · 56, 78
Focus · 12, 53, 68, 69, 82, 107
Focus Stacking · 68

G

Freerun · 31

Giga-Pixel · 50 Google Play · 18, 98 graphs · 34

Н

Hirose · 10 Hold Speed · 32 Homescreen · 24 HRD pictures · 38, 54, 70, 83, 95

I

Interval · 35, 37, 39, 40, 43, 51, 52, 55, 71, 84, 95 Interval Test · 43 Intervalometer · 94 Invert · 28

Κ

Keep Active · 45 keyframe · 34, 35, 36, 37, 46, 47, 48, 49, 51, 52, 66, 67, 68, 71, 88, 89, 105 Keyframes · 35, 36, 46, 47

L

Lens Type · 79 Limits · 28 Live · 87 Live mode · 87 Loop Mode · 49 Lunar · 93



Μ

Mac OS X · 102
Matrix · 55, 57
maximum speed · 26, 32
Motor Profiles · 20
Motor Quick Setup · 20
Motor Settings · 25
Motor Speed · 32
Movement Test · 43

Ν

Nadir · 81 Night Mode · 29 nodal point · 50, 73

Multitasking · 97

0

Orientation \cdot 56, 79 Overlap \cdot 56, 78

Ρ

Panorama · 51 PTGui · 50, 60, 73, 85

R

R-L-R · 58

S

Sensor Size · 56, 78
Shoot-Move-Shoot · 35
Sidereal · 93
Simple Row Setup · 65
Slave · 40, 71
Slave Mode · 40, 71
Solar · 93
Sphere · 77
Sphere-Calculator · 77
Standstill · 70
star finder · 92
stepper motors · 8, 11, 12, 108
stop motion · 44, 45



Т

Terminal · 102 Test Modes · 35, 43

Time-Lapse · 35, 41, 75, 76, 84, 105

Traversal · 57
Trigger · 70, 83, 95
Troubleshooting · 105

turntable · 11, 62, 63, 64, 65, 68, 71, 91, 107

Turntable · 12, 91, 107

U

Update from File · 101 Update from Server · 101 USB · 10, 14, 99, 100, 103, 109

USB drivers · 100

W

Windows · 50, 100

Χ

XML · 18, 51, 59, 60, 61, 75, 85, 86, 107 XML files · 18, 59, 60, 61, 75, 85, 86, 107

Ζ

Zenith · 81 Zero Position · 27





Black Forest Motion