# SC19-022-14 FIELD DOLLY PLUS

## USER MANUAL

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# VERSION CONTROL

| # | Date | User | Changelog |
|---|---|---|---|
| 0.1 | 06.11.2018 | MIM | Initial draft |
| 0.9 | 12.11.2018 | MIM | Final draft |
| 1.0 | 14.11.2018 | HN | Authorization |
| 1.1 | 26.11.2018 | MIM | Content list updated, undefined bookmark removed |
| 1.2 | 5.11.2019 | DAF | Adaptations regarding new controller box and redesign of the raincover, title change |
| 1.3 | 15.11.2019 | MIM | Minor changes to version 1.2 to release manual |
| 1.4 | 20.04.2020 | MIM | - Newton pan box rain cover mounting added<br>- Chapter “Balancing” moved from point 4.6 to 4.8<br>- Minor changes<br>- Some figures changed to actual dolly version |

# CONTENT

# 1. INTRODUCTION

## 1.1. PURPOSE OF DOCUMENT

This document gives the user a basic information about the components, installation and usage of the Spidercam® Field Dolly Plus.

Please note that there is no detailed information about the operation of the Newton remote head. For more details about the Newton please refer to its own user manual.

## 1.2. DISTRIBUTION OF DOCUMENT

This document is intended to be used by all users of the Field Dolly Plus. The document will be delivered with the dolly. If necessary, all other forms of distribution can be used to ensure that the user can read this manual before setup und operation.

# 2. OVERVIEW

The Field Dolly Plus (hereinafter FD+) consist of the 2 axes stabilized carrier frame and the 3 axes stabilized Newton remote head.

The FD+ is carried in the center of gravity which allows high operation speeds and dynamics.

# 3. Main Parts

The FD+ consists of three main parts. The carrier frame, the Newton remote head and the camera kit.

## 3.1. Carrier Frame

The carrier frame is the two axes stabilized transport platform for the remote head. It contains the dolly suspension, communication equipment, controller for the stabilization and the power supply for the complete unit.

FIGURE 2: CARRIER FRAME

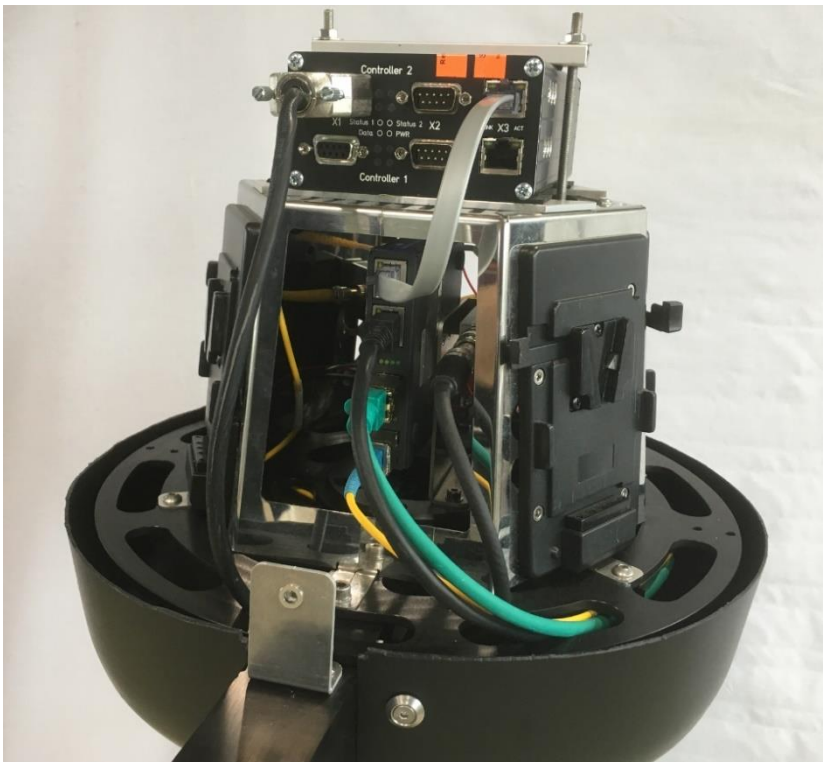


FIGURE 1: TOP PLATFORM

### 3.1.1. Controller and Communication

On the top platform the controller box and the communication devices are placed. The two communication devices are the “Multiway” ethernet switch / media converter and the “Silverbullet 3G SDI” media converter.

The controller box consists two identical controller boards whereof one is active and the other is a spare one. It also provides the power supply for the communication devices and the remotehead is powered through the box

### 3.1.2. Power Supply

The complete unit is powered by four changeable batteries mounted at the 4 V-mounts located at the top platform.

**Important:**

The standard supply voltage is 28.8 Vdc (nom.) which is indicated by a yellow and black Anderson-connector.

The Newton S1 needs a power supply voltage of 14.4 Vdc and is not compatible with 28.8 Vdc.

If you need to change from 28.8 Vdc to 14.4 Vdc you are obligated to contact the R&D department of Spidercam.

### 3.1.3. Different Supply Voltages

To ensure that the Newton gets properly powered and to avoid wrong supply voltage a color coding for different supply voltages for the power connector was introduced.

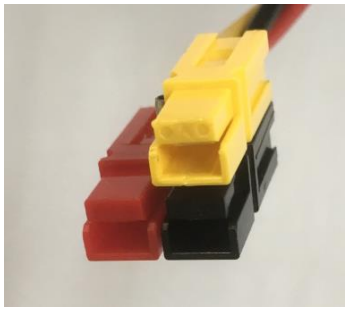

FIGURE 3: NEWTON SUPPLY CON

The Yellow (+) / Black (-) combination is providing the standard power supply voltage of 28.8 Vdc – 32.0 Vdc on FD+ equipped with the power board version 2 or higher.

A power supply of 14.4 Vdc – 16.0 Vdc from the batteries is provided by the Red (+) / Black (-) power connector pin combination. On the FD+ only one type of supply voltage is present at a time. To change the power supply voltage contact the Spidercam R&D department.


FIGURE 4: PWR BOARD VERSION 1


FIGURE 5: PWR BOARD VERSION 2

### 3.1.4. Overvoltage Protection

To protect the controller and the supplied devices from too high voltage the circuit is protected by a fast-acting SMD-fuse. The fuse is triggered at about 36.8 V. If the fuse is broken the following procedure is recommended to change it:

- Disconnect the controller box
- Fix the potential source causing the fuse to trigger if known

- Remove the power-module as described in section 7.3
- The fuse is located on the top board as highlighted it Figure 6
- Remove the fuse with small screwdriver and add a new one (a bag of spare fuses is fixed on the dolly head (top platform) next to the batteries as seen in Figure 7
- Reassemble the controller box in reverse order

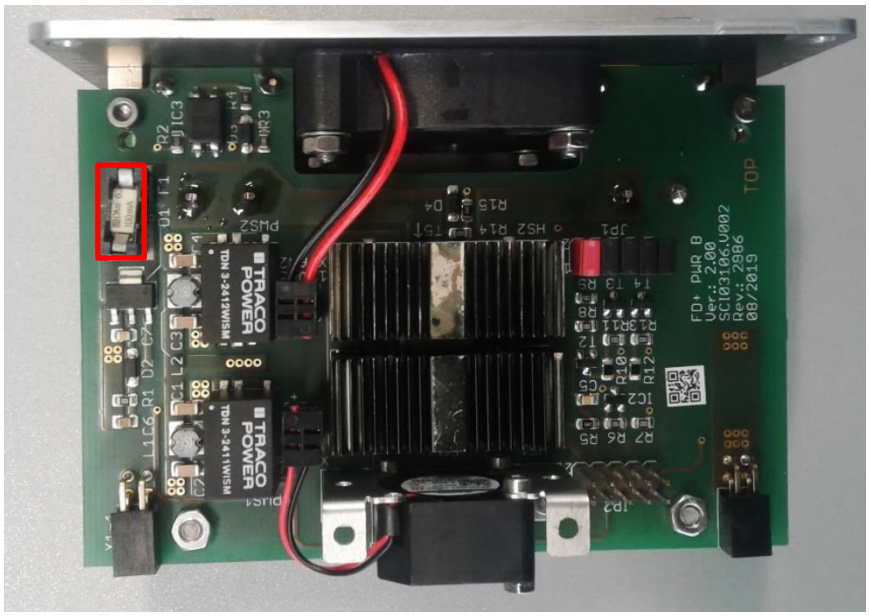


**FIGURE 6: FUSE-LOCATION ON THE TOP POWER-BOARD**

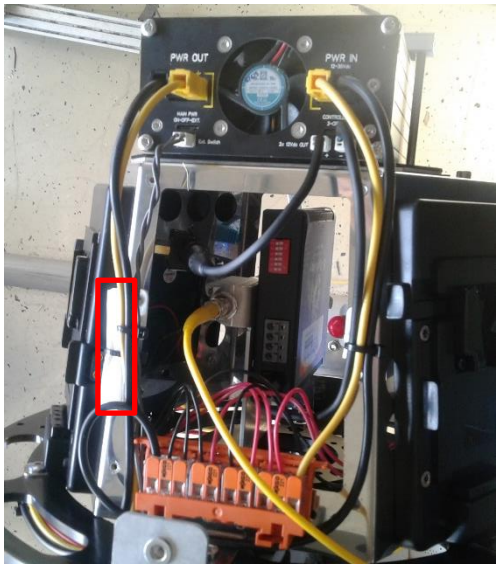


**FIGURE 7: LOCATION OF THE SPARE-FUSES**

### 3.1.5. SUSPENSION

The active suspension stabilizes the dolly in pitch- and roll-direction. The catenary cables are connected to the suspension by using the winding terminations. The suspension is equipped with a connector connected to the carrier frame. This makes an exchange of the suspension much easier.

**FIGURE 8: SUSPENSION**

### 3.1.6. REMOTE HEAD ADAPTER PLATE

The remote head adapter plate is designed to connect the Newton head to the carrier frame mechanically. The electrical and fiber connections for the power and data connection of the remote head are also located in that area. The Newton head pan box rain protection is mounted on the adapter plate.

**FIGURE 9: REMOTE HEAD ADAPTER PLATE**

## 3.2. NEWTON REMOTE HEAD

The Newton is a three-axis stabilized remote head. For more information please refer to the Newton user manual.

## 3.3. CAMERA KIT

The camera kit consists of the camera, a suitable lens and all needed equipment to operate the camera.

# 4. Setting Up The Dolly

The carrier frame will be transported separately from the remote head and camera. Therefore, the FD+ must be assembled before usage.

## 4.1. Mounting The Camera And Balancing The Remote Head

Before the Newton head will be mounted on the carrier frame the camera must be mounted and balanced on the remote head. To do this please follow the Newton user manual. It's recommended to do this with the Newton head laying upside down on its baseplate on a table. Make sure that all additional equipment and all needed cables are mounted on the remote head. Otherwise a rebalancing could be necessary.

## 4.2. Tools And Parts Preparation

- Make sure that the four 3/8'' screws, washers and spring washers are ready and handy
- Keep the 5/16'' Allen key ready
- Setup the dolly stand
- Place the remote head close to your working area
- Make sure that the batteries are not mounted on the carrier frame

## 4.3. Mechanical Mounting Of The Remote Head

- Place the dolly carrier frame in the stand. Be aware that the frame without remote head is top – heavy!!
- Remove the remote head rain covers.
- Mount the remote head with the four 3/8'' screws to the mounting plate. The connectors of the remote head must face the data cables.


**FIGURE 10: MOUNTED NEWTON HEAD**

## 4.4. Power and Data Connections

- Connect the BNC cable to the Newton head.
- Connect the 2 Ethernet cables. The cable colors are not assigned to a specific port. It doesn't matter which cable is connected to which RJ45 socket. The different colors only used to identify the cables at both ends.
- In the FD+-setup the Newton head must be powered externally. Use the LEMO/Anderson adapter cable to power the Newton via its power in socket. The Newton batteries are not used in this use case.
- If a camera with fiber connection is used also connect the fiber adapter of the Newton.

## 4.5. Connect Dolly To Catenary Cables

Connect the dolly to the catenary cables as usual.

## 4.6. Fiber Connection To Control Station

The fibers from the control station running through the catenary cables must be connected to the corresponding couplers mounted in the carrier frame. Make sure that the fiber on the connector side is strain relieved. The cable from the winding termination to the coupler must be long enough to give the dolly the needed freedom of movement.

## 4.7. Power On And Final Steps

To power the dolly please follow the steps below.

- Make sure that the dolly power button is switched to OFF
- Place the 4 batteries in the provided V-mount supports
- Switch on the remote head if not already on ON-position
- Switch on by pressing the dolly power button
- Perform function test
- Mount all rain and dolly covers
- Do a great job!

## 4.8. Balancing

If needed move the dolly suspension to find the center of gravity. Scales are attached to the dolly frame to ensure that the same numbers are used to prevent the suspension from tensioning.

# 5. 4K SETUP

For 4K operation the fiber connection to the camera must be established. Besides a 4K camera with single strand fiber connection a 4K remote head providing a fiber transmission is needed.

The fiber located at the Newton adapter plate must be connected to the remote head. The other end of that fiber must be connected to the fiber running to the catenary cable fiber coupler in the carrier frame.

To do that, the fiber connected to the 3G SDI media converter (e.g. Silverbullet) must be unplugged and connected to the 4K fiber. The 4K fiber is located at the electronic platform and already attached to a coupler. The coupler position differs from the FD+ models.

| Model | S/N (FD+nn) | Coupler position |
|---|---|---|
| Series 0 | 01, 02 | No specific position |
| Series 1 | 03, 04 | Underneath the electronic platform |
| Series 1.1 | 05 and higher | Inside battery mounting frame |

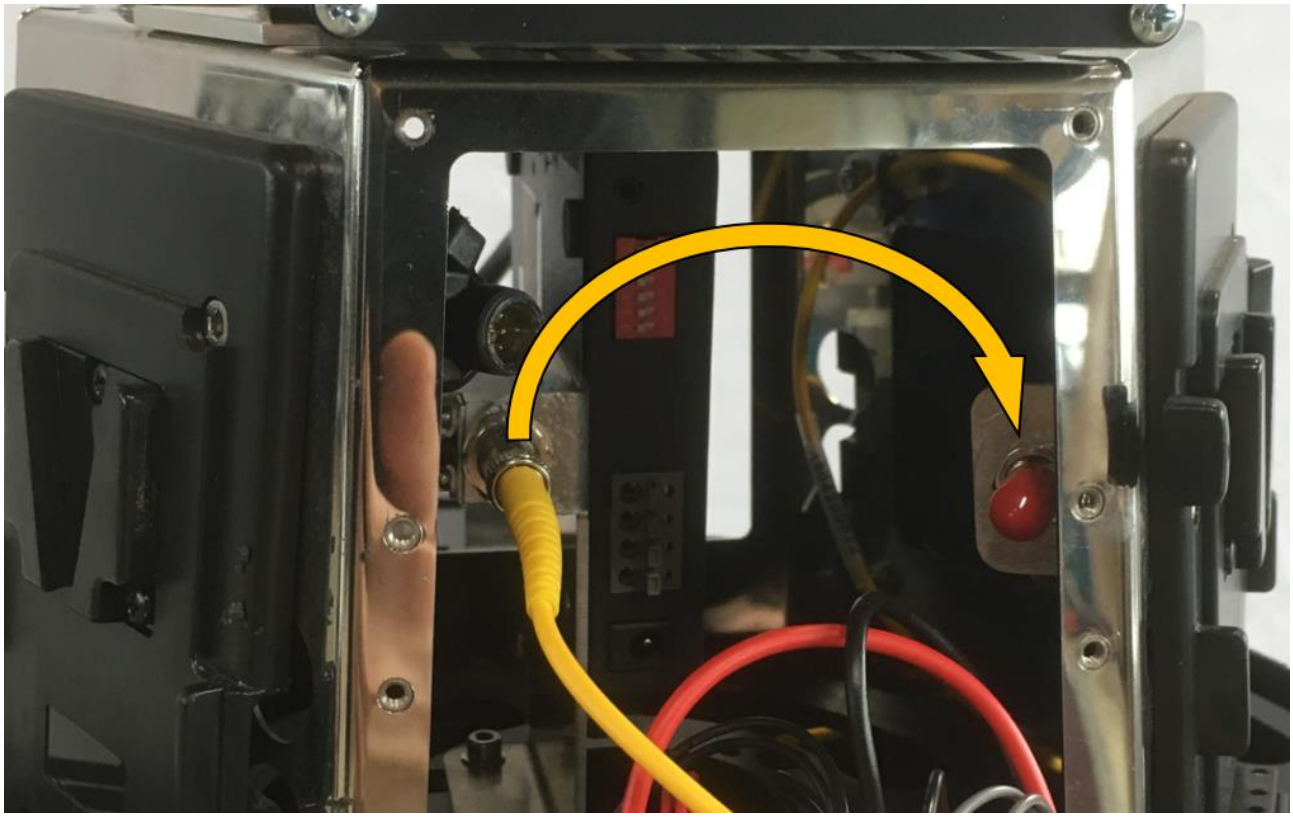

**FIGURE 11: CHANGE OVER TO 4K CONNECTION**

# 6. NEWTON PAN BOX RAIN COVER

To protect the Newton pan box from rain the FD+ is equipped with an according rain cover which will be mounted on the Newton Adapter plate since the remotehead was installed and functionality is given.

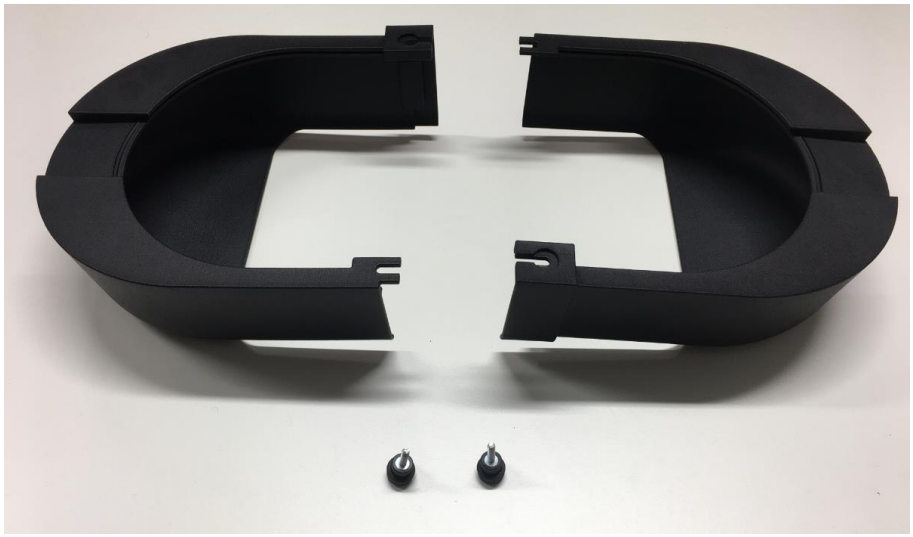

FIGURE 12: NEWTON PAN BOX RAIN COVER

To mount the cover follow the next steps.

- Place the two mounting screws in the windings with enough space that the protection can go underneath the screw head.
- Slide one of the two identical halves over the adapter plate. Make sure that the plate is sitting in the slot with the sealing.

FIGURE 13: FIRST HALF MOUNTED

- Slide over the 2nd half and secure them with the screws.

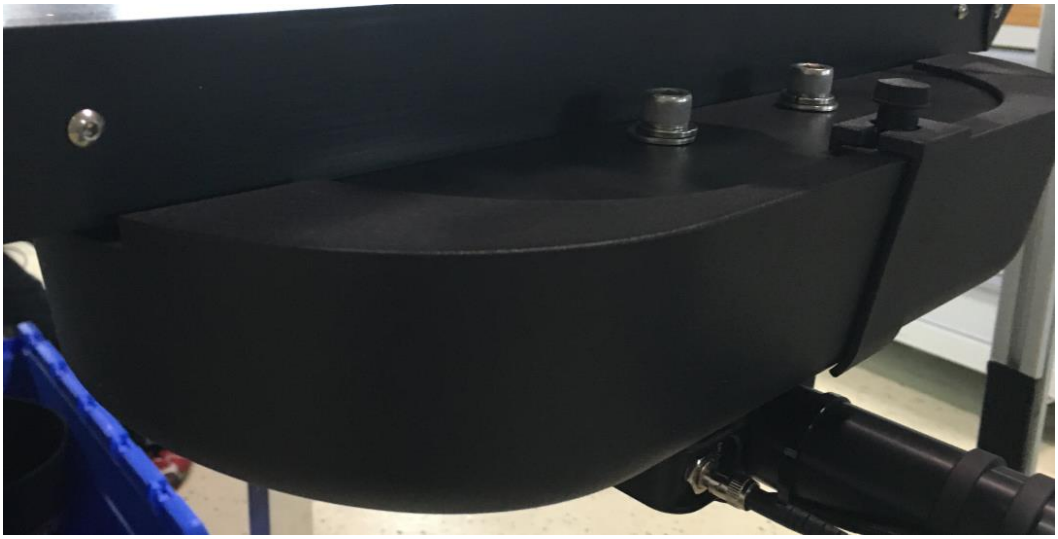

**FIGURE 14: COVER MOUNTED**

# 7. CONTROLLER BOX

The controller box is mounted on the battery mounting frame. For dolly balancing the box can be moved lengthwise.

The box contains two identical controller boards and one power supply board.

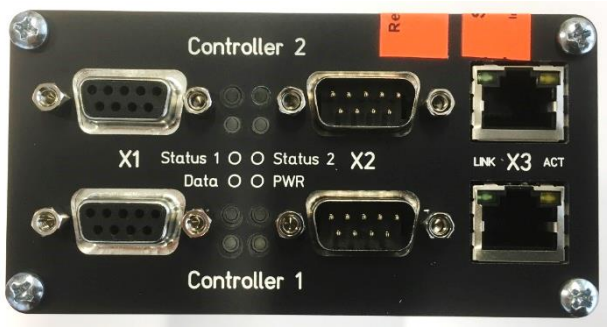


FIGURE 16: CONTROLLER BOX FRONT


FIGURE 15: CONTROLLER BOX BACK

## 7.1. CONTROLLER BOARDS

At any time only one controller board is powered and in operation. The 2nd serves as spare board if needed. To switch from one to the other reconnect the data connectors at the front to the new controller and switch over both toggle switches at the back. Note the controller and switch labels.

In factory default both controllers have the same settings. It might be that after operation the settings for the active controller are different to the spare one. In case of a controller swap a readjustment of the settings might be necessary.

### 7.1.1. CONTROLLER CONNECTORS

X1 Suspension motor supply

X2 Additional Sensor interface

X3 10/100 BASE-T Ethernet connection

### 7.1.2. LEDs

Each controller board has 4 LEDs:

Status 1 ● ● Status 2

Data ● ● PWR

| LED | Color / Blink Code | Description |
|---|---|---|
| Status 1 | Orange, stable<br>Green, blinking<br>Green, stable | Parameters for frame stabilization missing<br>Parameters valid, no sensor found<br>Dolly is working |
| Status 2 | blinking | Controller is running |
| Data | flickering | Valid data packets from control station received |
| PWR | on | Power for controller is available |

## 7.2. Power Board

The power board provides the power supply for the controller boards and the peripheral communication devices and media converters.

### 7.2.1. Power Board Connectors

| | |
|---|---|
| PWR OUT | Power output to supply the Newton |
| PWR IN (12-36 Vdc) | Power supply for the controller box ranging from 12-36 Vdc |
| MAIN PWR (Switch) | **EXT** (default): The controller is switched on and off by the push-button on the dolly-frame.<br>**OFF:** The controller is permanently off<br>**ON:** The controller is permanently on and providing power at the PWR OUT as soon as it gets powered through PWR IN |
| COTROLLER (Switch) | This switch is used to change from one controller board to the other. At neutral position (OFF) none of the controller boards is active. The power outputs are still active if the main power is switched on. |
| Ext. Switch | Connector for external main switch if the MAIN PWR switch is set to EXT. |
| 2x 12Vdc OUT | Two identical 12 Vdc outputs. The sum current of both outputs must not exceed 1A. |

## 7.3. Removing Boards

In the unlikely case that a board must be removed or access to the board is needed follow the steps below.

- Take off the controller box from the dolly and place it on a table or similar.
- Remove the 4 lens head screws holding the controller-/power-panel
- Gently pull out the boards by pulling the panel outwards.

- If the top plate of the case should be removed please make sure that you remove all the lens head screws at the top additionally to one panel inclusive the attached boards. Now you can pull out the cover plate of the case

To assemble the box, follow the steps above in the logical reversed order and make sure to use screw locking on all appropriate places. If in any doubt, please contact Spidercam for support.

# 8. FLYIT DOLLY SETTINGS

The control performance of the two axes carrier frame stabilization can be adjusted in the dolly settings menu in the FlyIt user interface.

This manual will only describe parameters used with FD+.

## 8.1. SETTINGS

All parameters located in the “Settings” tab sheet are inoperable in combination with a FD+.

## 8.2. CONTROL LOOP PARAMETERS

The main PID – control loop parameters for the pitch and roll axes. Each axis can be adjusted separately. A full PID – control loop is implemented but in a balanced system only the P value will be adjusted.

| Parameter | Value Range | Std. Value | Description |
|---|---|---|---|
| P | 0,00 – 65,00 | 1,00 | Proportional gain |
| I | 0,00 – 65,00 | 0,00 | Integral gain |
| D | 0,00 – 65,00 | 0,00 | Derivative gain |

## 8.3. ADDITIVE CONTROL LOOP PARAMETERS

### 8.3.1. ADDITIVE CONTROL LOOP PARAMETERS

The deviation the controller reacts on is calculated from the actual angle of the frame and its angular rate. To get a good control loop performance it is necessary to adjust these values to an appropriate ratio.

The maximum controller output sets the deviation value causing the maximum controller output. Diagram 1 shows the relationship between a high value (90) and a lower one (50).

| Parameter | Value Range | Std. Value | Description |
|---|---|---|---|
| Angle weighting | 0,00 – 65,00 | 3,00 | Angle weighting. The deviation angle will be multiplied with that value. |
| Rate weighting | 0,00 – 65,00 | 4,00 | Angular rate weighting. The frame rotation speed will be multiplied with that value. The result |
| Max. contr. Output | 0 – 90 | 90 | Deviation value for maximum controller output |

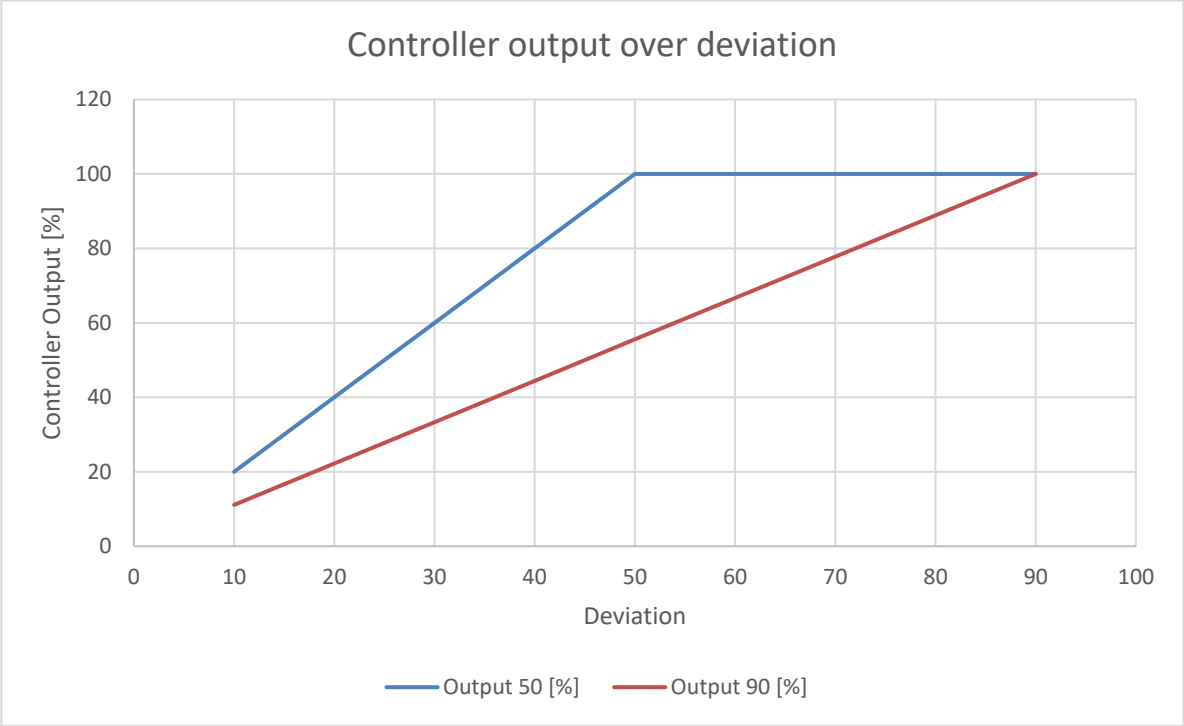


**DIAGRAM 1**

### 8.3.2. 0-POINT SPREADING

With FD+ these values will be kept 0.

### 8.3.3. HORIZONTAL ANGLE OFFSET

An offset can be set if the sensor drifts or is mounted out of angle. The values can be set between ±10°.

## 8.4. USE FACTORY SETTINGS

It is not recommended to use this function in FlyIt 2.X.