

# DOMINION

USER MANUAL 1.0.1

INTUITIVE AERIAL AB  
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# 1 Introduction

## 1.1 OVERVIEW

The Dominion controller is an all-in-one remote control unit for the Newton stabilized remote head and the Aerigon Gimbal. It allows control and configuration of the remote head as well as control of carried camera and lens systems.

For simplicity in this manual, we will use “remote head” to mean either a Newton remote head or Aerigon Gimbal except in cases where there is differences in functionality or operation.

## 1.2 WARNINGS AND RESERVATIONS



### WARNING

Before connecting or turning on the Dominion controller read this manual carefully.



### WARNING

Do not power or charge the Dominion controller with anything but external power supplies delivered and approved by Intuitive Aerial for use with Dominion. Doing so can permanently damage or destroy your Dominion.



### WARNING

The Dominion is rain protected but it is not water proof, so do not expose it to direct spraying water or submersion into water.

### ! NOTICE !

To get the best possible range, always extend the antennas vertically when using and make sure they have a free line of sight to the remote head.

### 1.3 PHYSICAL LAYOUT

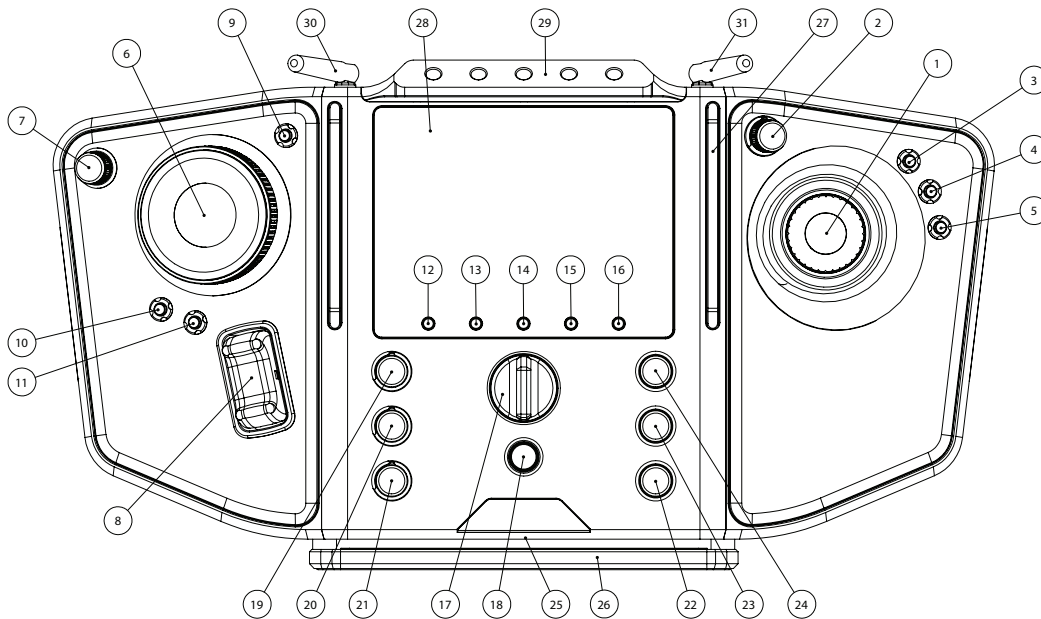


Figure 1.1: Dominion top view

Table 1.1: Top View Descriptions

Item	Description
1	Joystick
2	Not used
3-5	Invert axis
6	Focus wheel
7	Iris wheel
8	Zoom rocker
9-11	Not used
12-16	Menu buttons
17	Mode switch
18	Record switch
19,20,21	Speed for tilt, pan, roll
22	Pan trim compensation
23	Ease in/out
24	Gain
25	SD card slot
26	Extendable support
27	Neck-strap rails
28	Display
29	NATO accessory rail
30,31	Antennas

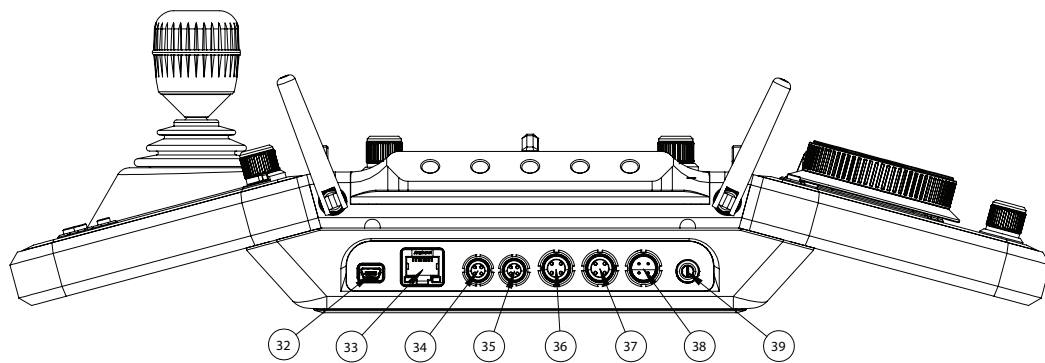


Figure 1.2: Dominion front view

Table 1.2: Front View Descriptions

Item	Description
32	USB connector
33	Ethernet connector
34,35	IA-CAN connectors
36,37	Power output. Limited to 2.5A total
38	Power input
39	Power toggle switch

## 2 Operation

### 2.1 UNBOXING AND SETUP

On delivery the Dominion is placed in a hard plastic case with custom cut foam. To remove it, open the lid and gently pull it out. It is recommended that the Dominion is stored in the case when not in use to make sure no controls are damaged.

When in use place the Dominion on a secure surface, table, in the lap of the operator or on a tripod. There are two UNC-3/8-16 screw posts on the bottom for standard tripod attachment. If carried, attach a supporting neck strap to the two rails next to the display (point 27).

The NATO accessory rail above the display is useful to attach a smaller monitor, video receiver and other smaller accessories.

### 2.2 POWERING AND STARTING

The Dominion has two ways of receiving power. It can either be powered by an external input (point 38) or by the internal Li-on battery. The Dominion will automatically charge the internal battery as soon as there is external power in, no matter if it is turned on or not.

Before first use it is recommended to fully charge the internal battery. That way any accidental disconnection of external power will not result in the Dominion turning off or disconnecting from the remote head. First time it is recommended to let the Dominion charge for at least six hours before use.

To turn on the Dominion press power button (point 39). The same button is used to turn the Dominion off.

### 2.3 CONNECTING

Dominion has two ways to connect to the remote head.

The first one is via a radio link. The Dominion is equipped with a industrial grade 2.4GHz modem with a range up to 2km, even in environments with external interference. To make it possible to use multiple Dominions and remote heads at the same location each Dominion must be paired with the remote head. To start pairing, enter pairing mode through the Settings menu, Radio tab on the Dominion and then set the remote head into pairing mode by turning it on with no other Dominions within range.

The second way of connecting is with an Ethernet cable<sup>1</sup>. Ethernet provides a more robust and lower latency connection compared to the radio link, so if possible it is the preferred method of connecting.

---

<sup>1</sup>Ethernet connection is only supported with the Newton remote head



**! NOTICE !**

Dominion supports a maximum Ethernet cable length of 20m. If a longer connection is needed, place a repeater such as an Ethernet switch close to the Dominion.

To establish an Ethernet connection, plug in the cable and then connect the Dominion through Settings menu, Ethernet tab. On the Ethernet tab you can also activate automatic Ethernet connection.

Note that for best operation the Dominion and the remote head it is connected to must have compatible software releases. See chapter C for a list of compatible versions.

## 2.4 CONTROLS

The Dominion can be used to control both the movement of the remote head and, given compatible lens/camera/FIZ-system and the required interfaces are used, settings and operation of lens and camera.

### 2.4.1 REMOTE HEAD

The main control for the remote head is provided by the joystick. The coupling between the three axes of the joystick and the axes of the remote head depends on which control mode is selected, using mode switch (point 17).

**0 - Motors off** All motors are off and the head is inactive

**1 - Active - Roll Position** The head is active. Joystick left-right controls pan, up-down controls tilt and rotating the joystick controls the roll of the remote head. A given rotation directly match a given roll angle.

**2 - Active - Roll Fixed** The head is active. Joystick left-right controls pan and up-down controls tilt. Roll of the remote head is locked to its current position.

**3 - Active - Roll Velocity** The head is active. Joystick left-right controls pan, up-down controls tilt and rotating the joystick controls the roll of the remote head. A given rotation controls roll speed.

**4 - Active - Camera Frame** Same as **Active - Roll Velocity** with the exception that all controls are relative to the camera/image, not the remote head

**5 - Invalid**

**6 - Motors locked** The head is locked. Depending on the setting **Motor lock mode** this will either be *Home* which means straight forward or *Current* which is the current position when the mode is entered.

In the settings menu, tab **Control**, dead-band and exponential mapping can be set for each joystick axis. In addition to the joystick there is a number of other controls that affects the movement of the remote head. These are as follows:

**Speed dials (point 19-21)** sets the max speed (at full joystick deflection) for each of the tilt, pan and roll axes.

**Ease in/out (point 23)** controls how much filtering is applied when changing velocity. A higher value will result in a smoother operation, but also requires more planning ahead for example when stopping a pan.

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**Motors locked button** Holding this button will cause the remote head to enter the Motors Locked state until the button is released. This is done in order to minimize random walk. When this button is held down, it is not possible to control the remote head using the joystick. This feature can be assigned to a button through the Remap Inputs setting described in the advanced section, 2.5.2.

### 2.4.2 LENS AND CAMERA

Given a compatible lens or camera, and the correct interface dongle, the Dominion can control the following settings:

**RECORD** Start/stop camera record. Controlled by the big record button (point 18)

**FOCUS** Adjust lens focus. Controlled by the large focus wheel (point 6)

**IRIS** Adjust lens iris/aperture. Controlled by the smaller iris wheel (point 7)

**ZOOM** Adjust lens zoom. Controlled by rocker (point 8). The zoom rocker have adjustable dead-band and exponential function that can be adjusted in the settings menu, tab **Lens**.

Note that not all lens/camera interfaces supports all controls. To get exact information which lenses/cameras supported by an interface dongle and which controls it supports, see the documentation for that specific dongle.

## 2.5 USER INTERFACE

The graphical user interface is the main way to interact with and get feedback from the Dominion. User feedback is given on the display (point 28) and input is given using the buttons under it (point 12-16). The exact functionality of the buttons are context dependent and displayed at the bottom of the display.

### 2.5.1 MAIN PAGE

The main page, shown after startup, provides feedback on all major functions. It is divided into two major parts; the left hand part of the screen displays feedback for lens and camera control (collectively referred to as FIZC) while the right hand part provides feedback for the remote head, the Dominion itself and the communication link.

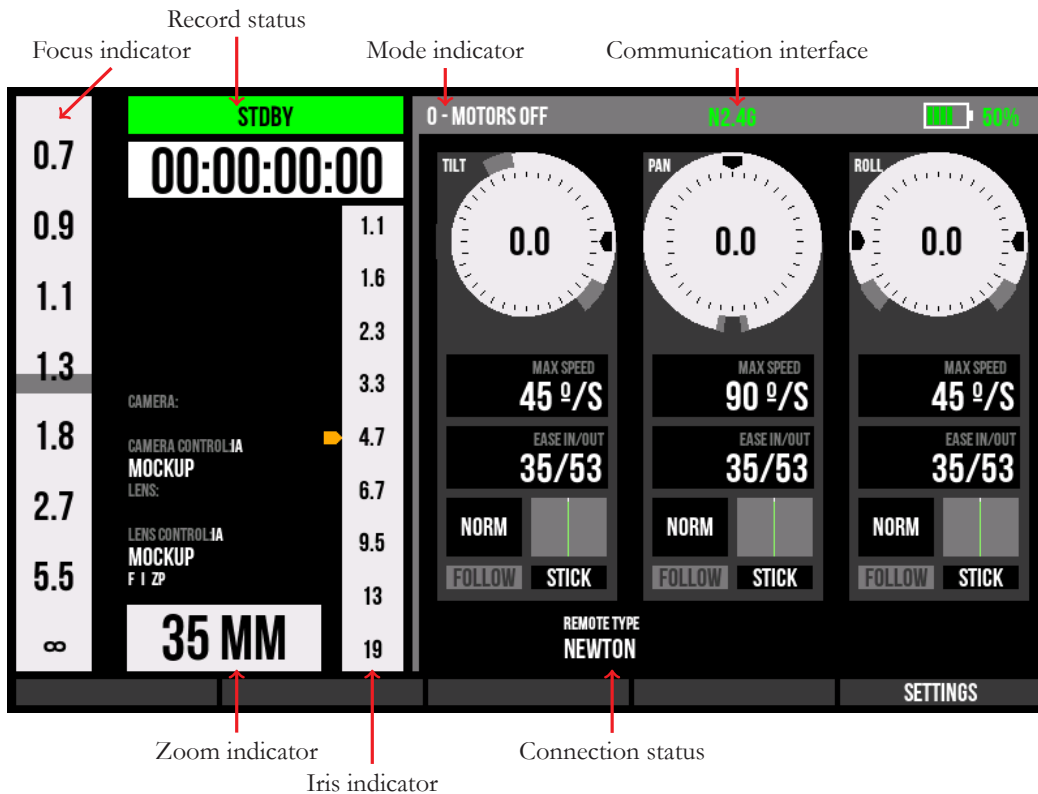


Figure 2.1: Main page

### Left side - FIZC

The left side contains feedback and information about remote lens and camera control. The main parts shown at left, bottom and right side is focus, zoom and iris information respectively. The middle contains more detailed information including:

1. Recording status
2. Recording time and media status
3. Camera and lens control information

### Right side - Remote head

The right side, which contains information about the remote head and the communication link has a number of larger pieces of information<sup>2</sup>, from top-to-bottom, left-to-right:

1. Current control mode
2. Currently active communication link
3. Dominion battery status
4. Per-axis information

<sup>2</sup>Some information might only be displayed when connected

- a) Current angle and set limits
  - b) Maximum speed (at full joystick movement)
  - c) Ease in/out amount
  - d) Normal or inversed mode
  - e) Graph of applied torque
5. Remote head battery status
  6. Remote head type

## 2.5.2 SETTINGS

The settings menu contains all forms of settings for both the Dominion and the remote head. It can be reached from the main page using the **Settings** button.

The settings menu is made up of a number of different tabs, grouping together settings related to each other. Within each page is a number of settings and actions that can be changed or activated. To navigate between tabs, use either the buttons as directed on the display or encoder 1 (point 22). After selecting a tab, navigate between settings using the same keys or encoder 1. To change a setting, select it using button 5, then use either up/down button or encoder 1 to change its value.

### Control

The settings tab **Control** contains settings related to remote head control/steering. For every axis there is a setting for the max speed, ease in/out, inverting the axis, dead-band and exponential.

The **Control** page also allows enabling or disabling the manual pan axis trim.




SETTINGS					
CONTROL	CONTROL				
RMT SETTINGS	TILT				
	MAX SPEED	90 °/S	MODE	NORMAL	
LENS	EASE IN	40	DEADBAND	0 %	
	EASE OUT	60	EXPO	40 %	
RADIO	PAN				
ETHERNET	MAX SPEED	180 °/S	MODE	NORMAL	
	EASE IN	40	DEADBAND	0 %	
ADVANCED	EASE OUT	60	EXPO	40 %	
SERVICE	ROLL				
RMT SERVICE	MAX SPEED	90 °/S	MODE	NORMAL	
	EASE IN	40	DEADBAND	0 %	
	EASE OUT	60	EXPO	40 %	
ABOUT	PANTRIM	DISABLE			
	DOWN	UP		BACK	SELECT

Figure 2.2: Settings - Control tab

Table 2.1: Settings - Control tab

Setting	Range	Description
MAX SPEED	45°/s – 360°/s	Maximum speed for axis
EASE IN/OUT	20 – 500	Maximum ease in/out for axis
MODE	NORMAL INVERTED	Axis invert
DEADBAND	0% – 100%	Axis dead-band in percent
EXPO	–100% – 100%	Axis exponential in percent
PANTRIM	ENABLE DISABLE	Activate manual compensation of drift in pan axis. Amount of trim can be adjusted

### Remote settings

The **Remote settings** (*RMT SETTINGS*) tab allows for tuning of parameters on the remote head.

The top part is common for Newton remote head and Aerigon Gimbal and controls the control system tuning. For each axis, tilt, roll and pan, there are four parameters to set. These values can be modified individually just as any other setting, or as a group of three (P, I and D together) for a given axis. When modifying a group the values are changed by using the three encoders on the right side, point 22-24. In group change mode the up/down buttons switch between the axes.

Other parameters shown, their range and meaning depend on which remote head the Dominion is connected to so for more information see the documentation for the remote head; either Newton user manual or Aerigon Gimbal user manual.

SETTINGS				
CONTROL	RMT SETTINGS - NEWTON			
RMT SETTINGS	SAVE REMOTE			
LENS	TUNE P	TILT	PAN	ROLL
	TUNE I	--	--	--
RADIO	TUNE D	--	--	--
	POS GAIN	--	--	--
ETHERNET				
ADVANCED	MOTOR LOCK MODE	--	AUTO PAN DRIFT COMP	--
	CONTROL FILTER	--		
SERVICE	TILT MIN ANGLE	--		
	TILT MAX ANGLE	--		
RMT SERVICE	ROLL MIN ANGLE	--		
	ROLL MAX ANGLE	--		
ABOUT				
	PAN FOLLOW	--		
	PAN FOLLOW STRENGTH	--		
DOWN	UP		BACK	SELECT

Figure 2.3: Settings - Remote settings tab



Table 2.2: Settings - Lens tab

Setting	Range	Description
FOCUS MIN		Minimum focus value shown in GUI
FOCUS MODE	NORMAL INVERT	Invert mode of focus wheel
FOCUS DRIVE MODE	NORMAL INVERT	Invert mode of focus motor
IRIS CONTROL	ENABLED DISABLED	Enable or disable IRIS control
IRIS OPEN	1.0 – IRIS CLOSED	Open IRIS value shown in GUI
IRIS CLOSED	IRIS OPEN – 64	Closed IRIS value shown in GUI
IRIS STEP	0.5	Step size of values shown in GUI
IRIS MODE	NORMAL INVERT	Invert mode of iris wheel
IRIS DRIVE MODE	NORMAL INVERT	Invert mode of iris motor
ZOOM NEAR	10 – ZOOM FAR	Zoom near value shown in GUI
ZOOM FAR	ZOOM NEAR – 1000	Zoom far value shown in GUI
ZOOM SPEED	10 – 200%	Zoom speed
ZOOM MODE	NORMAL INVERT	Invert mode of zoom
ZOOM DEADBAND	0 – 100%	Zoom control dead-band
ZOOM EXPO	0 – 100%	Zoom control exponential
ZOOM MODE	NORMAL INVERT	Invert mode of zoom wheel
ZOOM DRIVE MODE	NORMAL INVERT	Invert mode of zoom motor
ZOOM SPEED MODE	USE DISABLE	Use speed-based zoom control if available

## Radio

Configuration of the radio modems is done in the **Radio** settings menu. To use a radio modem the modem must be enabled. To save the configuration, select **SAVE CONFIG**.

When the Dominion is used together with a Newton or Aerigon gimbal for the first time the radios must be paired. The pairing procedure works the following way:

1. Turn off the remote head (Newton or Aerigon gimbal)
2. Move the selector to the **DO PAIRING** option using the **DOWN** and **UP** buttons and press **SELECT**. The message “RADIO PAIRING IN PROGRESS” will be displayed
3. Turn on the remote head
4. The pairing procedure can take up to 60 seconds. When the pairing is completed the message “RADIO PAIRING SUCCESSFUL” will be displayed. To abort the procedure, press **CANCEL**

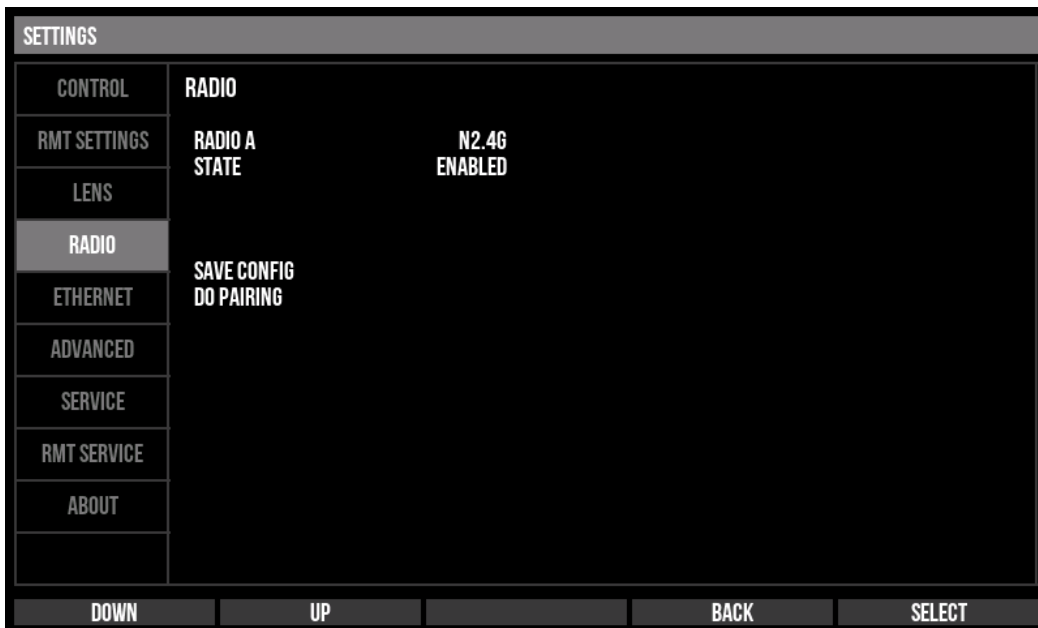


Figure 2.5: Settings - Radio tab

### Ethernet

Under the **Ethernet** (*ETH*) settings page the Ethernet connection is configured, such as the IP address and net-mask of the Dominion as well as the IP address of the remote head. The Dominion and the remote head must be on the same IP subnet. Note that the Dominion and Newton are configured to be compatible with each other as default.

If the setting **AUTOCONNECT** is set to **ENABLE** the Dominion will try to connect as soon as a valid physical link is established. It will also automatically reconnect should the connection break for any reason. When **AUTOCONNECT** is set to **DISABLED**, the Ethernet connection must be manually initiated by selecting **CONNECT**.



#### WARNING

If **AUTOCONNECT** is set to **ENABLE** in a use-case where radio is the preferred transport and an ethernet connection is not expected to be available, it can lead to stutter in control and loss of connection.  
 If using radio, set **AUTOCONNECT** to **DISABLED**.



SETTINGS										
CONTROL	ETHERNET - NOT CONNECTED									
RMT SETTINGS	CONNECT								DISABLE	
LENS										
RADIO	REMOTE						LOCAL			
	IP	192	168	10	32		IP	192	168	
							NMASK	255	255	
							D-GW	0	0	
								10	16	
								0	0	
ETHERNET										
ADVANCED										
SERVICE										
RMT SERVICE										
ABOUT										
	DOWN		UP				BACK		SELECT	

Figure 2.6: Settings - Ethernet tab

### Advanced

This section contains advanced settings for the Dominion.

Table 2.3: Settings - Advanced tab

Setting	Range	Description
REFRESH DONGLES	-	Refresh status of accessory dongles connected to Dominion.
RESET SETTINGS	-	Reset all settings to factory defaults.
REMAP INPUTS	-	Enter the input remapping menu.
LCD BACKLIGHT	10 - 100	Brightness of LCD backlight in percent.

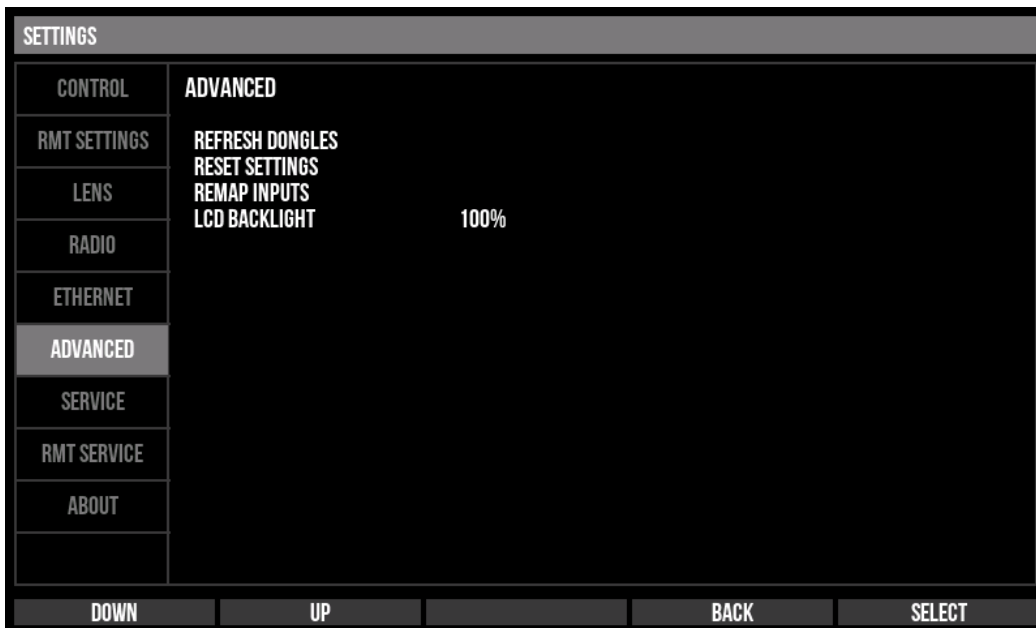


Figure 2.7: Settings - Advanced tab

### Remap inputs

In this menu the mapping of most inputs of the Dominion can be changed. Use **PREV** and **NEXT** to navigate between each input or move any physical input slightly and its automatically selected, indicated by a red marker on the Dominion layout sketch. A list appears to the right where all available functionality that can be mapped to the selected input is shown. Press **CHANGE** and navigate through the menu with **DOWN** and **UP**. To finalize the remapping press **SELECT** or abort by pressing **BACK**.

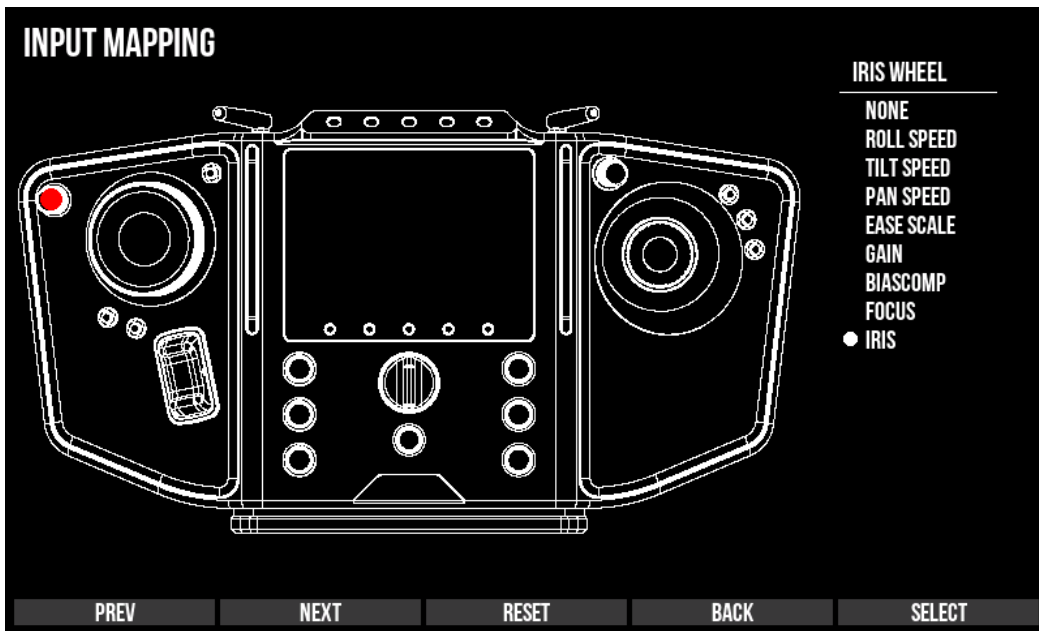


Figure 2.8: Remap input

**About**

This tab contains firmware version and battery information.

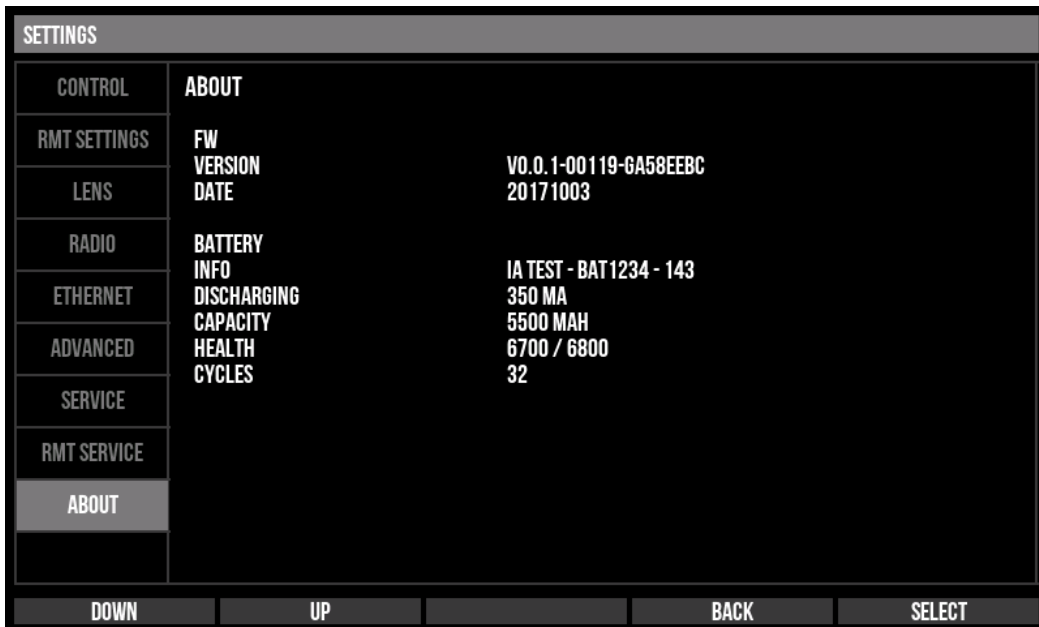


Figure 2.9: About

## 3 Service mode

Certain settings and operations should not be performed during normal operation of the Dominion controller and/or the remote head. These settings and operations are accessible from a “hidden” service mode section within the settings GUI. To enter service mode, make sure the Dominion is turned off, set the mode dial to 6 and hold down the rightmost of the display buttons, then power on the Dominion.



### **WARNING**

If you are not sure of how to use these features, contact IA support.  
Missuse of the calibration and service settings can cause deviant behaviour  
of the Newton system.

### 3.1 SERVICE MODE MENUS

#### 3.1.1 LOCAL SERVICE

The **Service** tab provides settings for the Dominion controls that are not normally exposed. The two first options, “Calibrate” and “Error log” are to calibrate the joystick and analog inputs of the Dominion and to get feedback of any internal errors found during startup self-test.

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SETTINGS			
CONTROL	SERVICE MENU		
RMT SETTINGS	CALIBRATE ERROR LOG		
LENS			
RADIO	FOCUS ENC FILTER 25 HZ ENCODER FILTER 5 HZ JOYSTICK FILTER 100 HZ		
ETHERNET	ZOOM ROCKER FILTER 25 HZ POT FILTER 5 HZ		
ADVANCED			
SERVICE	TILT MIN DEADBAND 2 % PAN MIN DEADBAND 2 % ROLL MIN DEADBAND 2 %		
RMT SERVICE			
ABOUT			
DOWN	UP	BACK	SELECT

Figure 3.1: Settings - Service tab

Table 3.1: Settings - Service tab

Setting	Range	Description
FOCUS ENC FILTER	5 – 45	Low-pass filter frequency for focus wheel
ENCODER FILTER	5 – 45	Low-pass filter frequency for other encoders
JOYSTICK FILTER	5 – 100	Low-pass filter frequency for joystick
ZOOM ROCKER FILTER	5 – 100	Low-pass filter frequency for zoom rocker
POT FILTER	5 – 100	Low-pass filter frequency for potentiometers
TILT MIN DEADBAND	0% – 100%	Minimum deadband on tilt axis
PAN MIN DEADBAND	0% – 100%	Minimum deadband on pan axis
ROLL MIN DEADBAND	0% – 100%	Minimum deadband on roll axis

### 3.1.2 REMOTE SERVICE

The **Remote service** (*RMT SERVICE*) tab allows for triggering calibrations on the remote head. The exact parameters shown, their range and meaning depend on which remote head the Dominion is connected to so for more information see the documentation for the remote head; either Newton user manual or Aerigon Gimbal user manual.



Figure 3.2: Settings - Remote service tab

## 4 Maintenance

The Dominion is a highly technical and very precise equipment with high requirements on exactness and internal tolerances. In addition it contains weather sealing. For this reason it is not recommended to ever disassemble the Dominion or try to perform maintenance on any internal parts.

### 4.1 CLEANING

Clean the Dominion externally using a soft, and if needed slightly damp, cloth. If it is very dirty, use a mild detergent such as washing up soap.



#### **WARNING**

Do not use any cleaning agents containing alcohols, acids or other corrosive chemicals. Using such cleaning agents might damage the paint and/or the display surface.

### 4.2 FIRMWARE UPDATE

Firmware updates are distributed by Intuitive Aerial in a single ZIP archive that contains software for Newton, Dominion and the required updater application for Windows and OSX. Before updating please read the attached release notes for any specific information pertaining to that release. When upgrading the Dominion, make sure to also update any FIZC dongles and the Newton or Aerigon to a matching version.

To upgrade the Dominion controller, follow the procedure below:

1. Connect the USB/CAN dongle to the CAN port on the top of the Dominion
2. Start the upgrade application, named “firmware\_gui.exe” on Windows or “firmware\_gui.app” on OSX.
3. Follow the instructions in the wizard. When asked for firmware file, select “dominion\_<version>.zfv” in the firmware folder
4. When finished, restart the Dominion

## 5 Troubleshooting

Problem	Possible Cause(s)	Solution(s)
Dominion does not start up	Battery is empty	Connect power adapter to charge
	Improper firmware loaded	Reload latest supplied firmware according to instructions
Dominion does not establish radio connection with remote head	Antennas are not extended	Extend antennas
	Antennas are damaged	Contact IA support for replacement
	Dominion and remote head are not paired	Perform pairing procedure, see Section 2.3
There's a constant drift in pan, tilt or roll	Input calibration is not properly done	Immediate solution: Use dead-band setting to compensate. Contact IA support for instructions on how to redo calibration
	There is a very small drift present in pan due to gyro bias	Activate the trim functionality to eliminate drift manually
Camera/lens interface dangle is not recognized by Dominion	Dongle has incompatible firmware	Update dongle firmware to same version as Dominion
	Communication link is not established between Dominion and gimbal	See entry above



# A Connectors and pin-outs

The IA-CAN connector is proprietary to Intuitive Aerial equipment.

## A.1 FRONT CONNECTORS

### A.1.1 POWER IN

**Dominion connector:** LEMO EGJ.1B.304

**Mating connectors:** LEMO FGJ.1B.304 / FHJ.1B.304

**Acceptable voltage:** 12V – 26V

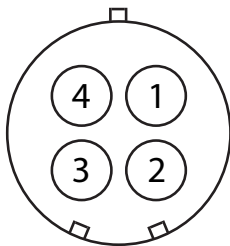


Figure A.1: Power in

Table A.1: Power in, pins

Pin number	Description
1,2	Positive (+)
3,4	Negative (-)

### A.1.2 POWER OUT

**Dominion connector:** LEMO EGG.1B.304

**Mating connectors:** LEMO FGG.1B.304 / FHG.1B.304

**Output voltage:** Unregulated input / battery voltage

**Max current:** 2.5A (combined)

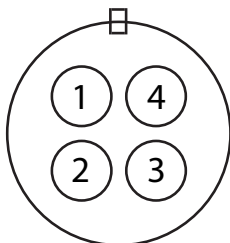


Figure A.2: Power out

Table A.2: Power out, pins

Pin number	Description
1,2	Negative (-)
3,4	Positive (+)

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## B Technical specifications

Table B.1: Mechanical

Parameter	Min	Typ	Max
Width		40 cm	
Depth		21 cm	
Height		6 cm <sup>1</sup>	
Weight		3.2 kg	

<sup>1</sup> 14 cm with joystick

Table B.2: Power supply

Parameter	Min	Typ	Max
<i>Power input</i>			
Input voltage	12 V	18 V	25 V
Input current			6 A
<i>Power out</i>			
Output voltage <sup>1</sup>	12 V	18 V	25 V
Output current			2.5 A
<i>Battery</i>			
Voltage	9.6 V	14.4 V	16.8 V
Capacity		98 Wh	
Charge current			3 A
Charge time		3 h	

<sup>1</sup> Unregulated input/battery voltage

Table B.3: Communication interface

Parameter	Min	Typ	Max
<i>n2420 Modem</i>			
Frequency	2400 MHz		2484 MHz
Power Output		100 mW	1W
Range		1 km	
<i>Ethernet</i>			
Speed			100 Mbit
Cable length			20 m

Table B.4: Shipping/hard-case

Parameter	Min	Typ	Max
Length		45 cm	
Width		30 cm	
Height		30 cm	
Weight <sup>1</sup>		7.6 kg	

<sup>1</sup> Including external power supply

## C Compatible versions

This table lists which firmware versions for Dominion remote head and Aerigon Gimbal that are compatible<sup>1</sup> with this release (1.0.1) of the Dominion software.

<b>Product</b>	<b>Full compatibility</b>	<b>Limited compatibility</b>
Newton	1.0.1	

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<sup>1</sup>Limited compatibility means one or more features might not work as documented

## D Revisions

Rev	Date	Changes
1	2016-08-01	Initial version
2	2017-03-07	Updated for firmware version 0.9.3
3	2018-01-11	Updated for firmware version 0.9.4
4	2018-02-27	Updated for firmware version 0.9.5
5	2018-07-30	Updated for firmware version 1.0.0
6	2018-10-02	Updated for firmware version 1.0.1