Seagull #MAP-X2

User Manual

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GENERAL INFORMATION

***** Please read this manual thoroughly before connecting and configuring Seagull #MAP-X2 *****

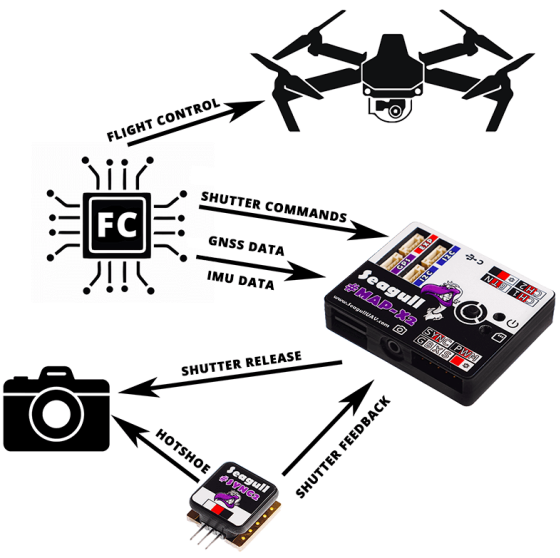
Seagull #MAP-X2 is a camera shutter controller and data logger. It can receive data directly from GNSS receivers or via a MAVLink2 stream. With advanced features like shutter event tracking through your camera's hotshoe or a dedicated pin, it ensures precise logging with a perfect 1:1 match between photos and their coordinates.

NOTE: #MAP-X2 can also log GNSS data without a SYNC event feedback.

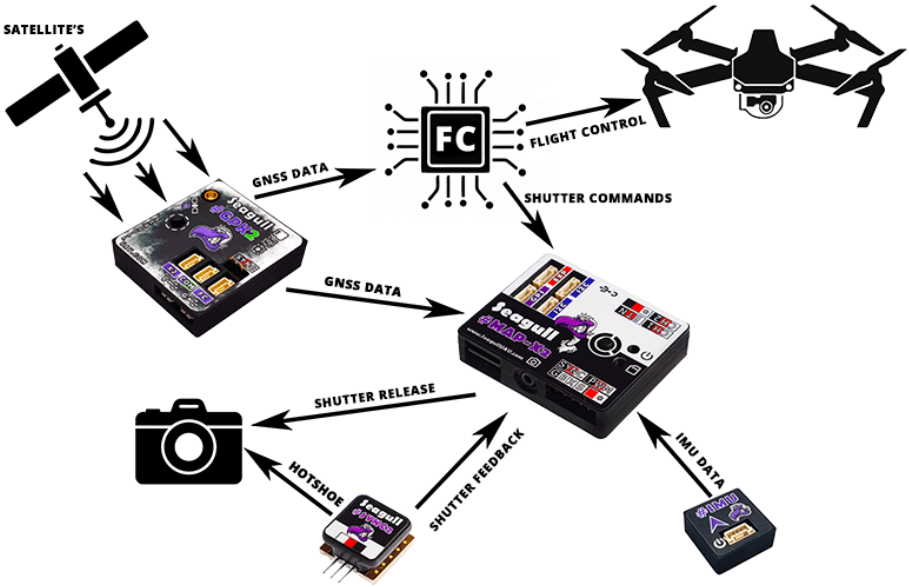
#MAP-X2 features:

- High rate data logging RTK / PPK / MB / GNSS – up to 25Hz !
- Various trigger modes – SHOE-STATE, ACT, PWM, BUTTON, TIMELAPSE
- Trigger and Log – with or without SYNC feedback
- Easy geotagging – Pix4D / EXIF
- Internal data logging – download logs via USB or uSD
- #IMU Logging – increased precision + reduced processing time for ORTOPHOTO and 3D models
- External Altimeter support – LightWare LiDAR
- GNSS receiver messages supported – NMEA-GGA / UBX-NAV-PVT / UBX-RXM-RAWX + UBX-RXM-SFRBX
- MAVLink2 messages supoorted – direct integration with Flight Controllers to read GPS and IMU data

Example: FC MAVLink2 stream



Example: #GPK2 to FC and #MAP-X2



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TRIGGER MODES & COMMANDS

SST

*(**S**hoe **S**ync **T**rigger)*
When operating in SST mode, #MAP-X2 will wait for a SYNC event (hotshoe/event feedback) and will log the data when supplying a LOW (0 volt) condition to the SYNC pin.

SST mode is designed for a scenario where the user is triggering a camera by pressing the shutter button to capture a photo, then the SYNC signal is sent to #MAP-X2, telling that there was a shutter event on the camera, and #MAP-X2 will write coordinates and other data to the log files.

NOTE: This mode is not only limited to a MANUAL TRIGGERING scenario. For example - if you wish to have control functionalities from Seagull #REC / #REC2 and the precision of #MAP-X2 for logging. You may achieve such functionality by using #MAP-X2 in SST mode to handle the logging and simply use one #REC / #REC2 to handle the shutter release and other aspects of the camera.

ACT-PWM

*(**A**utofocus **C**ustom **T**rigger - **P**ulse **W**idth **M**odulation)*
This is the default trigger mode for #MAP-X2. When operating in this mode #MAP-X2 enables ACT mode on HIGHER and PWM mode on LOWER end of signals for CH1 input.

ACT mode is meant for use to trigger cameras that are connected to a camera port on the #MAP-X2, that are listed on the: #MAP-series cable finder

PWM mode is meant to trigger cameras that use PWM signal as a command for triggering, such as the FLIR VUE Pro thermal camera.

ACT+PWM

*(**A**utofocus **C**ustom **T**rigger + **P**ulse **W**idth **M**odulation)*
When operating in this mode it enables both modes ACT and PWM to trigger either on HIGH or LOW end of signal for CH1 input.

ACT mode is meant for use to trigger cameras that are connected to a camera port on the #MAP-X2, that are listed on the: #MAP-series cable finder

PWM mode is meant to trigger cameras that use PWM signal as a command for trigger, such as FLIR VUE Pro thermal camera.

NOTE: When operating in this dual trigger mode, #X2 will wait out until all trigger conditions that are set in settings are met. For example, in a case when SYNC is enabled for AC-T mode and PWM DURATION set to 0.5(seconds): if ACT SYNC event happens before PWM DURATION is over – then #MAP-X2 will log coordinates and wait the remaining time of PWM DURATION before allowing next user input.

TIMELAPSE

(Interval trigger)
Timelapse will only be active when there is a value present in settings of #MAP-X2 and will work with the user input interval value for the following trigger modes: ACT – PWM, ACT + PWM and BUTTON mode.

If the value is set as 0, only a single photo will be captured.

If value is set for example 0.5(seconds) #MAP-X2 will keep taking photos as long as the selected trigger mode is kept in its activation value (PWM input value).

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BUTTON

(Support for an external button for triggering)
BUTTON mode is activated by providing a LOW state (0 volt) to the signal pin of BUTTON channel. When signal is present it will execute a trigger mode that is setup in the settings. Following trigger modes are compatible ACT / PWM, ACT and PWM.

This mode is very useful in a scenario where the user wishes to log and execute triggering commands by a push of a button or simply supplying constant LOW state and using with TIMELPASE setout INTERVAL for continuous photo triggering.

CAMERA ON/OFF

(Feature to control power on/off)
CAMERA ON/OFF command is very useful in scenarios where you have retractable lenses or wish to protect from dust before takeoff or during landing scenarios.

NOTE: Only available with camera cables listed as "Sony S2 w. on/off" for Sony "MULTI" enabled cameras.

LOG START/END

#X2 will only start log generation once the command LOG START/END has been executed, unless one of the AUTO modes are selected. The LOG START/END can be executed via the following options:

Sending **"1800"µS** signal to #MAP-X2 via CH2.
Clicking the **"LOG"** button on #MAP-X2.
Setting "**Logging Activation**" to "**AUTO PWM**" in the settings (*refer to *"SETTINGS AND VALUES TABLE"* in the MANUAL)
Setting "**Logging Activation**" to "**AUTO X2**" in the settings (*refer to *"SETTINGS AND VALUES TABLE"* in the MANUAL)

CH1 & CH2 COMMAND TABLE

CHANNEL	STATE / MODE	ACTIVATION VALUES	SCOPE
CH1	PWM / ACT+PWM	1200 µS	1000 <> 1400 µS
CH1	AC-T / ACT+PWM	1800 µS	1600 <> 2000 µS
CH2	CAMERA ON / OFF *	1200 µS	1000 <> 1400 µS
CH2	LOG START / END	1800 µS	1600 <> 2000 µS
CH1, CH2	NEUTRAL	1500 µS	1400 <> 1600 µS
CH1 / CH2	SIGNAL NOT IN RANGE **	n/a	1<> 1000 µS µS / 2000 <> ∞ µS
CH1 & CH2	NO SIGNAL ***	n/a	0 µS

* ON/OFF only for Sony "Multi" cameras with SMAP-3018/3019 cable!

** Signal not in range will occur when there is signal present, but it is not within any operational modes.

*** There is no input signal detected.

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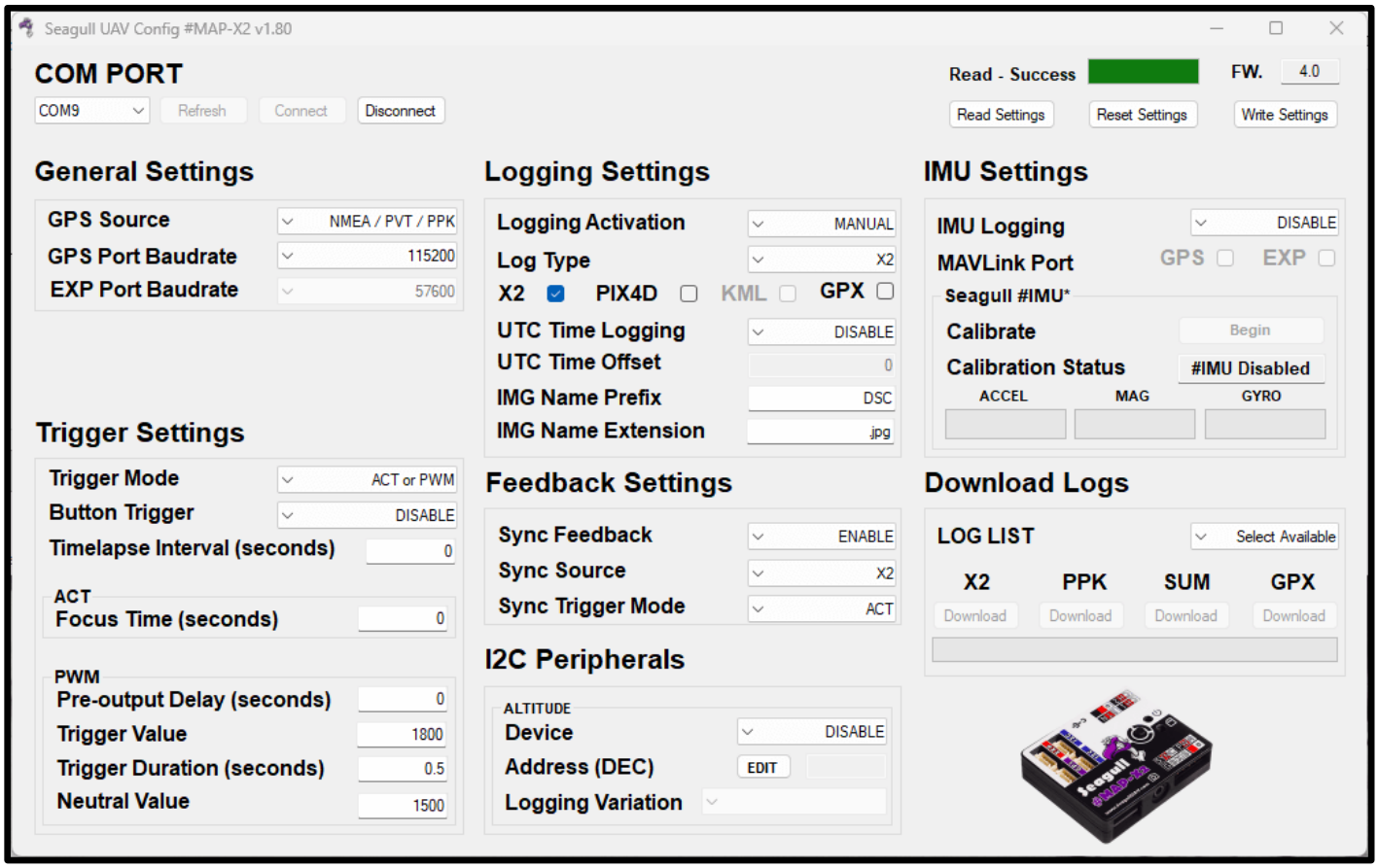
CONFIGURING #MAP-X2

GENERAL

#MAP-X2 can be configured by “Seagull-MAP-X2-Config.exe” that can be downloaded via the following link:
https://www.seagulluav.com/seagull-map-x2-support/

Please use the C USB Port on #MAP-X2 to configure.

Seagull #MAP-X2 Configurator example photo



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SETTINGS AND VALUES TABLE

SETTING NAME	SETTINGS	RANGE	DEFAULT	DESCRIPTION
GENERAL SETTINGS				
GPS Source	NMEA / PVT / PPK or MAVLink2	n/a	NMEA / PVT / PPK	Option to select source of GPS data that is incoming to the #MAP-X2. Any UART port on the Flight Controller can be configured to output MAVLink2 protocol.
GPS Port Baudrate	Value	1200 - 960000	115200	Baud rate setting used for communicating with GNSS receiver connected to #MAP-X2 – MUST BE SAME VALUE AS GNSS RECEIVER BAUD RATE
EXP Port Baudrate	Value	1200 - 960000	115200	Baud rate setting used for communicating with MAVLink2 or other accessories from Seagull UAV that is connected to #MAP-X2 – MUST BE SAME VALUE AS INTERFACING DEVICES BAUD RATE
TRIGGER SETTINGS				
Trigger Mode	SST / ACT or PWM / ACT and PWM	n/a	ACT or PWM	Selection of which trigger mode #MAP-X2 should work in. Read section "TRIGGER MODES & COMMANDS" for description of each individual mode
Button Trigger	DISABLE / ACT / PWM / ACT and PWM	n/a	DISABLE	Button trigger works when enabled in one of the modes and activated at 0V on the SIGNAL line of the BUTTON INPUT PORT. Connect button or external controller between / to SIGNAL and GND on the #MAP-X2 device to activate the mode.
Timelapse Interval	Value in seconds	0 – to disable 0.1 <> *alot (9e+15)	0	When set to 0 TIMELAPSE mode is disabled. If value is higher than 0 and within range, #MAP-X2 will keep triggering until the Trigger mode is exited. Following modes are supported: ACT-PWM, ACT+PWM and BUTTON.
ACT				
ACT Focus Time	Value in seconds	0 <> *alot (9e+15)	0	ACT pre-focus time will focus the camera for a period of time and then activate shutter release. Its best to keep it at 0 and use MANUAL focus on the cameras' settings.
PWM				
PWM Pre-output Delay	Value in seconds	0 <> *alot (9e+15)	0	A delay before executing PWM output commands for triggering the camera.
PWM Trigger Value	Value in µS	550 <> 2400 µS	1800 µS	Trigger value in microseconds that is accepted by your PWM signal driven camera for shutter or other mode activations.
PWM Trigger Duration	Value in seconds	0 <> *alot (9e+15)	0.5	How long the PWM trigger value should be outputted before returning to NEUTRAL mode. NOTE: If SYNC is enabled and event occurs, PWM NEUTRAL is executed and PWM duration ends.
PWM Neutral Value	Value in µS	550 <> 2400 µS	1500	NEUTRAL value for your PWM camera, meaning that when set in this value it will not execute anything and wait for trigger value to occur again.
LOGGING SETTINGS				
Logging Activation	MANUAL / AUTO PWM / AUTO X2	n/a	MANUAL	AUTO PWM: When there is a signal present on CH1 which is above 999 µS and below 2001 µS, #MAP-X2 will start log generation. When the signal is out of these ranges it will end log and write the data to the microSD card. AUTO X2: Logging of data starts when the unit is powered up and uSD card is present/initiated. Data is being written until uSD card is removed. This mode only works with NMEA-GGA or UBX-NAV-PVT sentences.
Log Type	X2 / PPK	n/a	X2	X2: X2/PIX4D, SUM (SUMMARY), KML (*DISABLED). SUM file not generated in AUTO X2 "Logging Activation" mode, unless LOG is terminated manually. PPK: PPK, SUM (SUMMARY), X2/PIX4D (*ONLY IF #IMU IS UTILIZED/ENABLED)
UTC Time Logging	ENABLE / DISABLE	n/a	DISABLE	When enabled it will log UTC time for the X2 format type of logs. Currently supported messages are NMEA-GGA or UBX-NAV-PVT. The following extra fields will be logged for respected messages when enabled: NMEA-GGA: GPS TIME UBX-NAV-PVT: GPS DATE and GPS TIME
UTC Time Offset	Value in decimals	n/a	0	User input to adjust UTC time in order to match their current timezone or camera equipment.

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Image Name Prefix	USER INPUT etc. "DSC"	n/a	DSC	Input the filename prefix used on photos by your camera. #MAP-X2 will log image filename with the following: filename + confirmed photo count etc. Example: "**DSC**00001.JPG"
Image Name Extension	USER INPUT etc. ".jpg"	n/a	.jpg	Input the filename extension used on photos by your camera, for example ".jpg"
FEEDBACK SETTINGS				
Sync feedback	ENABLE / DISABLE	n/a	ENABLE	ENABLE or DISABLE SYNC feedback for precise logging. NOTE: LOW (0 volt) state indicates a SYNC event.
Sync Source	X2 / GNSS	n/a	X2	Choose whether the #SYNC2 (HOTSHOE) is connected to a #MAP-X2 or GNSS receiver. If GNSS is selected please make sure that it is able to output UBX-TIM-TM2 message, as an indicator of an event.
Sync Trigger Mode	ACT / PWM	n/a	ACT	When using trigger mode ACT+PWM and SYNC is ENABLED, indicate which mode your SYNC should react to - ACT driven or PWM driven camera.
SEAGULL #IMU				
IMU Logging	DISABLE / Seagull #IMU / MAVLink2	n/a	DISABLE	If IMU is present and enabled, #MAP-X2 will log extra fields in X2 log with roll, pitch, yaw, horizontal and vertical accuracy.
MAVLink2 Port	GPS / EXP	n/a	DISABLE	If IMU logging is selected as MAVLink – the option becomes available to select from which port the MAVLink2 data is incoming GPS or EXP on #MAP-X2. If GPS Source is selected as MAVLink2 then IMU data will default to GPS port on #MAP-X2.
I2C PERIPHERALS				
ALTITUDE				
Device	DISABLE / LIGHTWARE LIDAR	n/a	DISABLE	External support for altimeters that are working via I2C protocol. When utilizing external altimeter the altitude logged in the log files will be substituting the GNSS ALT reading. Currently only supported options are LightWare LiDAR sensors.
Address	Value in decimals	n/a	102	I2C address of the sensor in DECIMAL - by default values are set to 102 (0x66)
Logging Variation	LiDAR / GPS AMSL+ LiDAR	n/a	LiDAR	When selected GPS AMSL + LiDAR – generated X2 log will contain separate columns with two altitudes logged.

FLIGHT CONTROLLER INTEGRATION

PIXHAWK

#MAP-X2 can be powered via its rails – so when connecting to Pixhawk rails, make sure there is sufficient power to supply #X2. Maximum power that can be applied on Pixhawk 1 rails is 5.7V, follow documentation of the ArduPilot controller that you have. Its recommended to use 5V UBEC to provide power to the rails.

DJI A3

Connect the CHANNEL that you wish to control from #MAP-X2 to the "F port" that you wish to use. DJI A3 can't provide power to the #MAP-X2 through its rails, therefore connect only BLACK – and WHITE signal to the "F port" and power #MAP-X2 via UBEC or such that is within power range limits for #MAP-X2.

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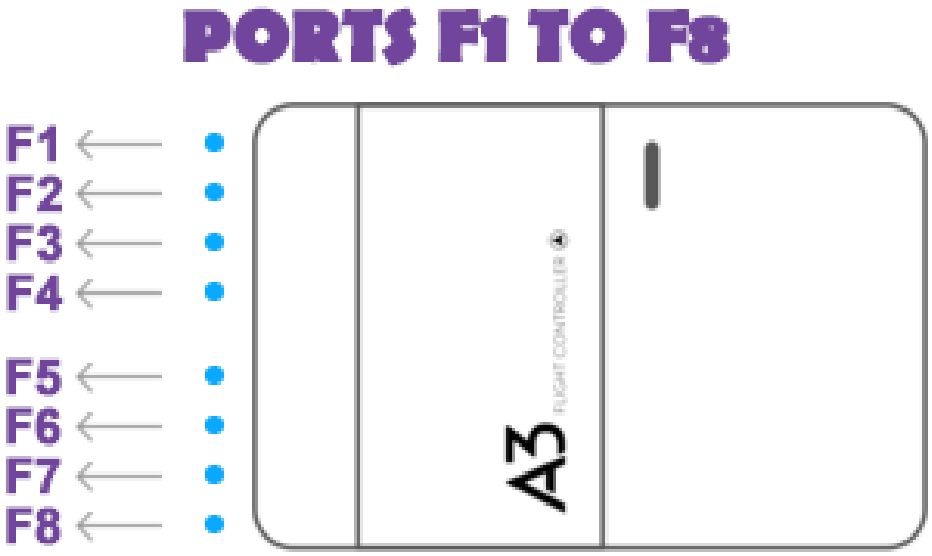

R/C TRANSMITTER INTEGRATION

#MAP-X2 is compatible with all R/C equipment that can supply a PWM/SERVO signal operating at 50Hz and that meets the ranges set out for #MAP-X2 modes. For the modes please refer to CH1 & CH2 COMMAND TABLE in the manual. As well check the conversion table for RC transmitters when adjusting the channel to activate #MAP-X2 modes.

FLIGHT PLANNER SOFTWARE INTEGRATION

MISSION PLANNER

The following example is for setup where automated flight is being executed with the do_digicam_control command.

When a channel is setup via "Camera Gimbal" menu, that channel is occupied by Pixhawk and you will not be able to pass manual trigger commands via R/C transmitter. If you wish to control the channel manually you will need to setup the RC channel as pass through in the Mission Planner.

1. Click on INITIAL SETUP >> OPTIONAL HARDWARE >> CAMERA GIMBAL
2. **"SHUTTER"** - in the drop-down list, chose the channel that Seagull #MAP-X2 is connected to.
3. **"PUSHED"** - Set the "VALUE" for the trigger mode (CH1 & CH2 COMMAND TABLE)
4. **"NOT PUSHED"** – Set the value "**1500**" (NEUTRAL STATE)
5. **"DURATION"** – Set the value "**1**"

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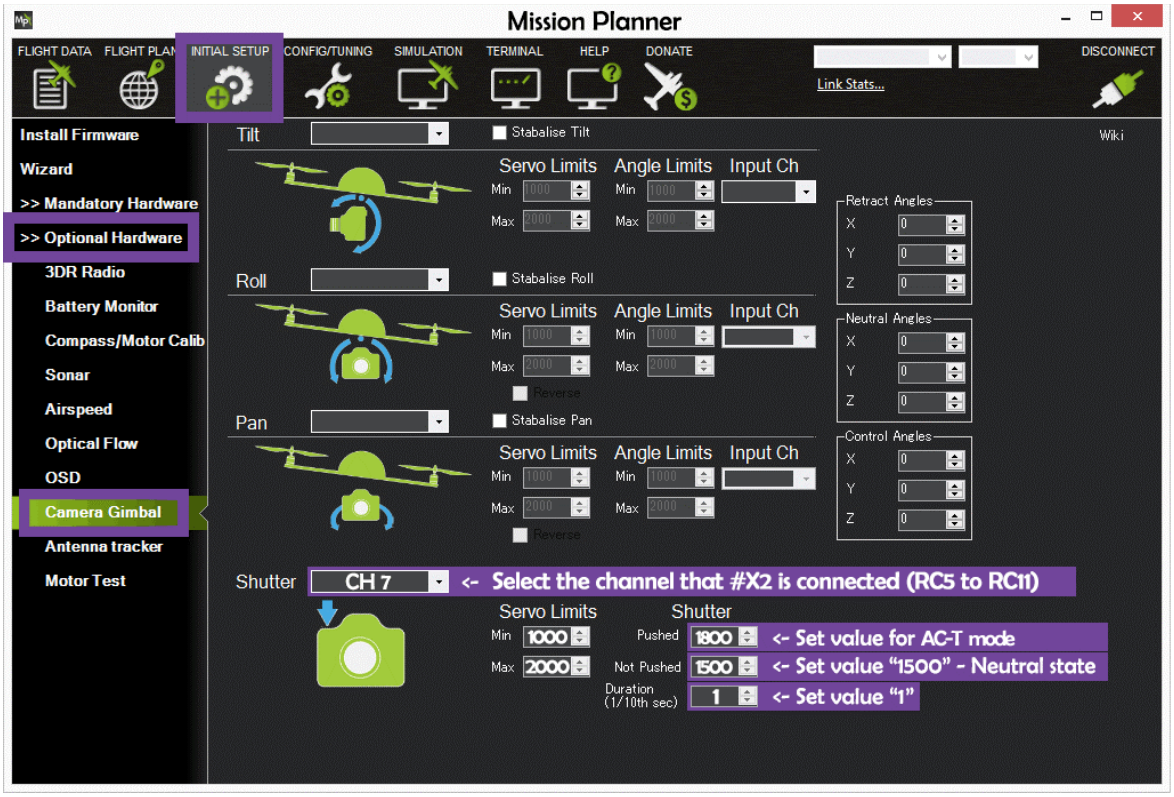
Example from Mission Planner:



NOTE: "Servo Limits" needs to be set to Min: "1000" and Max: "2000" for Pixhawk to react to the entered values!

If the Optional Hardware section's "Camera Gimbal" is greyed out and does not allow configuring settings, then you will have to manually adjust the camera shutter in the parameters **CONFIG → FULL PARAMETER LIST**.
Below you will find a list of parameters that will have to be adjusted accordingly with SERVO10 (AUX2). If you wish to utilize other AUX port then simply change the SERVO* to your desired port:

Example table for manually configuring shutter port:

Parameter	Value
SERVO10_MIN	1000
SERVO10_MAX	2000
SERVO10_TRIM	1500
SERVO10_REVERSED	0
SERVO10_FUNCTION	10
CAM1_TYPE	1
CAM1_DURATION	0.1
CAM1_SERVO_ON	1700
CAM1_SERVO_OFF	1500

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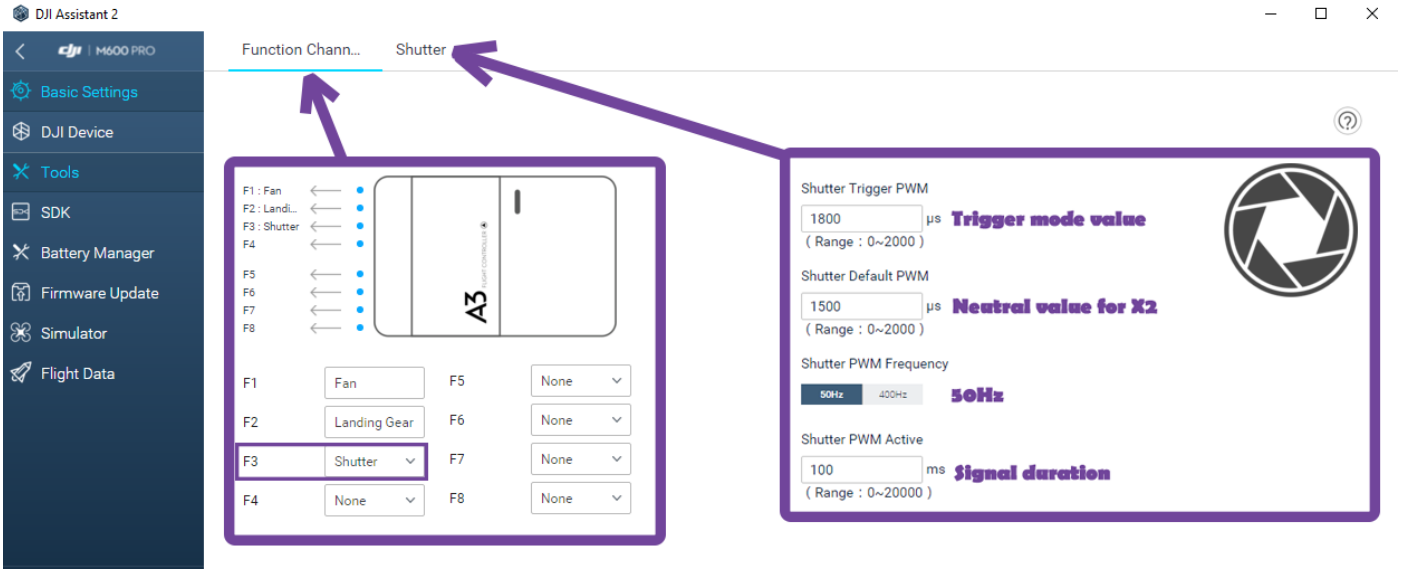
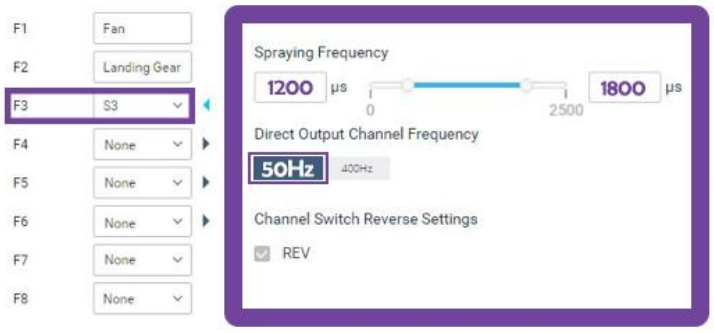
DJI ASSISTANT 2

The following example sets up DJI A3 controller through DJI Assistant 2 for shutter control automated flights.

1. **"SHUTTER"** - in the drop-down list on the "**F port**" that #MAP-X2 is connected to
2. **"SHUTTER TRIGGER PWM"** - Set the "VALUE" for the trigger mode (CH1 & CH2 COMMAND TABLE)
3. **"SHUTTER DEFAULT PWM"** – Set the value "**1500**" (NEUTRAL STATE)
4. **"SHUTTER PWM FREQUENCY"** – Select "**50Hz**" option
5. **"SHUTTER PWM ACTIVE"** – Set the value to "**100**"



It is also possible to map a switch to have manual triggering option, this can be done when selecting the port to operate as "Sx" and inputting the value in LOW and HIGH range. To achieve a NEUTRAL value for the switch it is calculated (LOW+HIGH)/2, in the below example it is set to use "1800" (ACT mode) and value for NEUTRAL is "1500".



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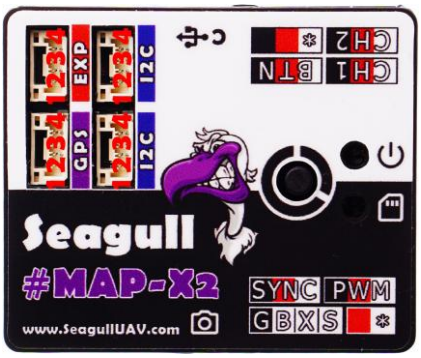
PORT / PIN DEFINITIONS

PORT	DEFINITION	PINS			
GPS	GNSS communication port	1: VIN (3.9 -12V)	2: RX (3.3V)	3: TX (3.3V)	4: GND
EXP	Expansion port	1: VIN (3.9 -12V)	2: RX (3.3V)	3: TX (3.3V)	4: GND
I2C	Interface for I2C modules	1: VIN (3.9 -12V)	2: SCL (3.3V)	3: SDA (3.3V)	4: GND
I2C	Interface for I2C modules	1: VIN (3.9 -12V)	2: SCL (3.3V)	3: SDA (3.3V)	4: GND
CH1	CHANNEL 1 - **INPUT**	SIGNAL	VIN 3.9 – 12V	GND	
CH2	CHANNEL 2 - **INPUT**	SIGNAL	VIN 3.9 – 12V	GND	
BTN	BUTTON TRIGGER - **INPUT**	SIGNAL	VIN 3.9 – 12V	GND	
SYNC	SYNC FEEDBACK - **INPUT**	SIGNAL	X2 – 3.3V OUT	GND	
PWM	PWM TRIGGER - **OUTPUT**	SIGNAL	VIN 3.9 – 12V	GND	
GBXS	ACCESSORY PORT	S: SD LED **OUTPUT**	X: X STATE LED **OUTPUT**	B: LOG BUTTON **INPUT**	G: GND

	LOG START/END BUTTON
C	Controller USB and firmware update port. The unit can be powered via USB as well with following ranges 4.4 – 12V
*	N/C
	VIN 3.9 – 12V
	GND



TROUBLESHOOTING

To determine what Seagull #MAP-X2 is currently doing - simply read the output of the "X STATE" and "SD CARD" LEDs, then match it with the "Action" in the table below.

X STATE	ACTION
Off	There is no signal
Blinking	Signal is present but out of range
Fading	In "Neutral" and Ready - waiting for next command
Faded	Active in a trigger mode – return to "Neutral" before next command
SD CARD	**ACTION**
Blinking	Micro SD card - is not present
Flashing rapidly	Micro SD card initialization error – please check format!
Fading	Micro SD card has been initialized and waiting for log to start
Solid on	Micro SD card – logging has been activated

X STATE	SD CARD	ACTION	ACTION
Blinking	Blinking	I2C device was enabled - but #MAP-X2 **failed to initialize** or **device is disconnected**	
Faded	Faded	LOG START – **No valid GNSS/MAVLink2** sentences or **GPS/MAVLink2 not present**	

TECHNICAL SPECIFICATIONS

- Supply voltage: 3.9 – 12V (5v recommended – do NOT exceed 12V!)
- Current draw: Min: 17mA, Average: 43mA, Max: 55mA
- Input signal: 3.3V standard R/C PWM between 1000 – 2000µS
- Dimensions: 48mm x 40mm x 11mm
- Weight: 20g (without misc. cables)

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