Spectral DEVICES INC.

Product Sheet

MSDC

Version 002

Revised March 11, 2023

Table of Contents

1. Background information

Trademarks

Spectral Devices, MSDC, MSC2

2. Preface

About this manual

This product sheet provides detailed information on the MSDC product from Spectral Devices Inc. The MSDC is a turnkey solution for multispectral drone applications that enables the capture of geotagged multispectral images. This product sheet describes specifications and models in the MSDC product line. It also briefly describes installation and operation with Pixhawk flight controllers as well as capturing and geotagging multispectral images. If errors or omissions in this manual are found during use, then please contact us for the most up to date information. Please refer to the support section below for contact information.

Assumptions

This document assumes that users have a good understanding of the Ardupilot or Pixhawk flight controllers.

Support

Contact Type	Contact Information
Email	sales@spectraldevices.com support@spectraldevices.com
Knowledge Base and Downloads	www.spectraldevices.com
Main Office	Spectral Devices Inc. 700 Collip Circle, Suite 125 London, Ontario, Canada N6G 4X8 1-888-988-2077

Table 2.1: Contact information.

3. Introduction

The multispectral drone camera is a turnkey multispectral imaging solution for easy integration into drones with PixHawk flight controllers enabling capture of geotagged aerial images for further analysis in data mapping software. Each MSDC includes a snapshot multispectral camera, a lens, a vision computer, and a high-performance 3-axis gimbal (optional). Systems are compatible with common drone platforms and available for a variety of spectral ranges and uses. These systems are energy-efficient, lightweight, and come fully configured with camera control and image capture software. Images can be saved to SD card at up to 10 FPS. Start and stop buttons control image capture on demand. A live multispectral video feed is available for downlink.

4. Specifications

- Snapshot Multispecral Camera
    - Lens Mount C-mount
    - Sensor Type CMOS
    - Sensor Format 1-inch
    - Maximum Frame Rate 89 FPS (10 FPS sustained)
    - Interface USB3.0
    - Weight 55 g

- Vision Computer
    - Real-time HDMI output of multispectral images
    - Power: 5V/4A input
    - Sustained frame rates of up to 10 FPS (8bit, decimated) with simultaneous recording to SD card
    - Over 8 h of sustained frame recording at 1 FPS
    - Weight 140 g
- Gimbal
    - Maximum Payload 465 g
    - Input Voltage UBEX 14 – 52 V
    - Input Voltage Gimbal 12V / 5A
    - Connection USB, CAN, UART, HDMI
    - Single Operator Follow Mode / LB2
    - Dual Operator SBUS / Spektrum / PPM / LB2
    - Pan Range +/- 330
    - Tilt Range -45 degree / +135 degree
    - Roll Range -90 degree / +45 degree
    - Weight 465 g

5. Models

Several models of the MSDC are available. The main difference between models is the spectral sensitivity of the camera. Each model utilizes one of Spectral Devices MSC2 cameras. Table 5.1 describes the different models available.

Table 5.1. List of different MSDC camera models and specifications

MODEL	CAMERA	TYPE	#BANDS	BANDS	BANDWIDTH
MSDC-AGRI-1-A	MSC2-AGRI-1-A	Area scan	4	580, 660, 735, 820 nm	~25 nm
MSDC-RGBN-1-A	MSC2-RGBN-1-A	Area scan	4	450, 550, 650, 800 nm	~70 nm
MSDC-NIR8-1-A	MSC2-NIR8-1-A	Area scan	8	720, 760, 800, 840, 860, 900, 940, 980 nm	~20 nm
MSDC-VIS8-1-A	MSC2-VIS8-1-A	Area scan	8	474, 495, 526, 546, 578, 597, 621, 640 nm	~20-35 nm
MSDC-BIO-1-A	MSC2-BIO-1-A	Area scan	4	735, 800, 865, 930 nm	~25 nm
MSDC-UN-1-A	MSC2-UN-1-A	Area scan	2	400, 800 nm	~60-120 nm
MSDC-AGRI-1-L	MSC2-AGRI-1-L	Line scan	4	580, 660, 735, 820 nm	~25 nm
MSDC-CUS-1-A(L)	MSC2-CUS-1-A(L)	Area or Line scan	2, 4, 8, or 16	Specified at time of order	Specified at time of order

6. Package Contents

The MSDC is shipped with several items including a multispectral camera integrated with a vision computer, a lockable ruggedized lens, a 128GB microSD card with microSD adaptor, a Pixy U Gremsy Gimbal (optional), Camera and Vision Computer Cables to the camera gimbal end, Camera Trigger IN/OUT from the QR gimbal end to Pixhawk, gimbal other accessories, power adaptor, a country-specific power cord, and a USB Wi-Fi dongle (see Fig. 6.1).

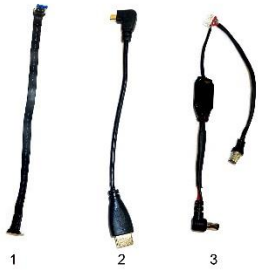
Camera and Vision Computer	Lockable, Ruggedized Lens	128 GB MicroSD card & Adaptor
		
Gimbal	Camera and Vision Computer Cables to Bottom Gimbal End	Camera Trigger IN/OUT from Gimbal to Pixhawk
		
Gimbal Accessories	5V 4A power adaptor	USB WiFi dongle
		

Figure 6.1. Items shipped with MSDC multispectral drone cameras

7. Installation and Operation

Hyper Quick Release Mechanism

Mount the top part of the hyper quick release onto the frame or damping isolator on the drone (Fig. 7.1). Insert and twist the gimbal portion of the hyper quick release into the top part (Fig. 7.2). Reverse to disconnect. Setup and wiring details available in the MSDC Manual.

Fig. 7.1. Hyper quick release mechanism installation.

Fig. 7.2. Gimbal attachment using hyper quick release mechanism.

Vision Computer

The vision computer offers simple operation using three buttons and four LED indicators located on the *side panel* (Fig. 7.3). Camera setup is performed with a configuration file on the supplied SD card. Camera output is to the SD card. Alternatively, users can control the camera using simple commands over a network connection. Button operation follows a simple procedure:

1. Access SD card on a computer system, such as a laptop.
2. Modify the configuration file with a text editor such as Windows Notepad modifying the desired acquisition parameters in the /cfg/mscapture.cfg file, such as exposure time (ExposureTime key), interval between frames (InterFrameInterval key), trigger mode (TriggerMode key). See User Manual for complete list of keys.
3. Eject the SD card and insert it into the microSD slot of the vision computer.

4. Power up the vision computer and wait for LED1 to blink slowly. The 5V POWER LED will glow blue when power is applied to the barrel connector even with the vision computer is shutdown. This provides a quick check of availability of external power to the vision computer.
5. Click SWITCH2 to begin acquisition. LED2 will blink during acquisition.
6. Click SWITCH2 a second time to stop acquisition. LED2 will stop blinking.
7. Steps 5 and 6 can be repeated many times to start/stop image acquisition. Files will be saved with unique filenames. However, old files will be overwritten if the vision computer is shut down and restarted.
8. Click SWITCH1 (1 time) until a fast blink on LED1 is observed. The vision computer is now in shut down mode.
9. Click SWITCH2 once to shut down the vision computer.
10. Remove the SD card from the vision computer.
11. Image and log files available on SD card in /frames and /logs folders for viewing, transfer, and analysis.

Power up of the vision computer takes approximately 15 s to complete. Shutdown takes approximately 5 s to complete. Do not remove the SD card while the vision computer is powered on or off since data loss could occur.

Other operational modes such as black level calibration and flat field calibration are accessible through the configuration file on the SD card.

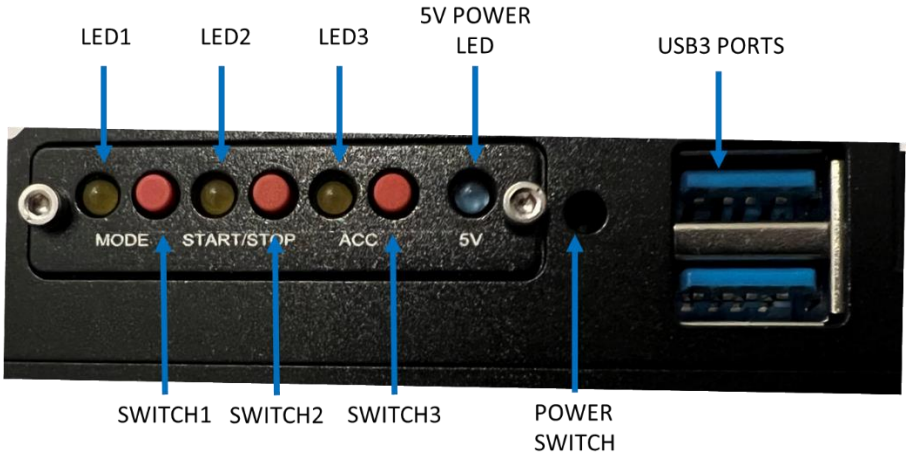


Fig. 7.3. Side panel buttons and LEDs for controlling vision computer. LED3 and SWITCH3 are inactive and reserved for future use.

Summary of acquisition operation

After connecting the system to the power, the vision computer boots up in under 20 seconds and LED 1 on the vision computer starts blinking slowly (normal acquisition mode). To begin image capture, click the start/stop button, the camera goes to capture mode and it waits to receive a trigger from Pixhawk. IF the configuration file has been set for timed mode, the images will be collected at a set Interframe Interval. In this state, both LED 1 and LED2 blink slowly. Once the camera receives a trigger signal from Pixhawk, the camera captures an image and saves the image in the frames folder

on the SD card. At the same time, the camera sends a trigger signal back to the Pixhawk that the frame was captured. The pixhawk records a CAM_message that the image was captured successfully. In order to go back to normal acquisition mode and stop capture mode, click on start/stop button again. LED 1 will blink slowly.

To shut down the vision computer, click the MODE button. LED1 will blink rapidly. Press the start/stop button. The vision computer will shut down. In this state, only the blue LED will remain on. It is safe to remove the SD card after LED 1, LED 2, and LED 3 go dark.

Real-Time Video Display

During image acquisition, the vision computer provides a real-time multispectral video output to the HDMI port. Users can observe the camera frames as they are acquired as well as supporting information in a table to the left of the frame. This feature is useful for focusing the camera lens and testing camera settings. Pixels in a frame with values at the top of the dynamic range will be highlighted in red. These red pixels may indicate areas of over-exposure. The HDMI port video can be downlinked to the ground controller using one of several available transceivers (contact us for options). Details of downlink setup are available in the MSDC manual.

Geotagging Images with Mission Planner

Users can geotag images post flight using *Mission Planner* to inject data from telemetry logs into their EXIF image tags. Geo-tagging images makes it easier to merge images taken during a camera mission, and is important for applications including photogrammetry, orthomosaic map generation, 3D terrain modeling, and large surveys.