



Field Deployable Hyperspectral SWIR System



Overview

The Field Deployable Hyperspectral SWIR System is specially designed for use in outdoor locations for agricultural, mining or other environmental measurements. The system consists of a SWIR camera, a pan and tilt scanner, a battery system, a heavy-duty tripod, and the necessary cables and mechanical adaptors to make the system operational in the field. A laptop computer with a frame grabber and LVDS converted operates the camera and controls the pan and tilt scanner. The system includes three individual padded carrying cases that can be rolled or transported as backpacks. The heavy-duty tripod is packaged in its own case and can be attached to one of the backpacks or transported separately. The system also includes the necessary power supplies to operate in a laboratory or industrial setting from line voltage.

Hyperspectral System

The SWIR region (1000-2500 nm) is the most useful wavelength range to identify environmental materials and their composition. This wavelength range has been used in near-infrared spectroscopy laboratory and process environments to measure pharmaceuticals, food and agricultural products and minerals. Plastics, minerals and other materials are sorted on an industrial scale using the near-infrared region. The SWIR camera can be used in a industrial setting to identify mineral ingredients of core drill samples that can be traced back to identify specific mineral deposit locations.

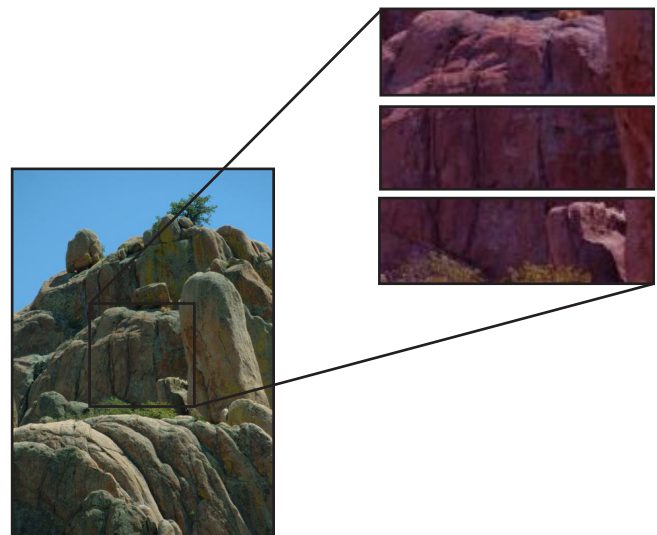
The battery system provides enough power to operate the scanner and the SWIR camera for a few hours. The batteries are easily exchangeable, so additional batteries can be used to extend the useful operational life of the system in the field. A generator can also be used if sustained operation in the field is necessary.

Scanning

The push-broom hyperspectral camera senses the full spectra of a line imaged to its entrance slit. The advantageous arrangement for scanning in most cases is to arrange the camera sensing line vertically, so that the line can be scanned horizontally by the scanner to collect a whole image. For narrow angle scanning, the surface can be scanned in several swaths using the vertical scanning of the pan/tilt scanner. Alternative scanner options, such as the mirror scanner are available.

Field Setup

The portable system is intended to be carried in the backpack to the field and assembled on site. The tripod holds all key components: the scanner, the camera on top of the tripod, the camera controller, the batteries, and the computer. The camera and scanner are connected to the computer, which contains the frame grabber. The system is powered by a bank of rechargeable batteries. All of these components are attached to the tripod to provide balance and weight to stabilize the system. The equipment is intended for outdoor use but is not watertight. Use of the SWIR camera in very dusty or wet environments is not recommended.



Carrying

The system is contained in three wheeled backpacks for maximum portability. System packaging is padded for ease of carrying. The padding around the sensitive optoelectronic equipment is intended as protection from the normal vibration of vehicles or manual transport. For long term shipping, the camera equipment or the backpacks need to be placed inside a padded carrying case, such as MRC-316-003-03.

Backpack Contents

Backpack dimensions: 16 x 14 x 30 in.

Backpack	Contents	Weight
1	SWIR sensor, cable	23.1 lbs
2	SWIR controller, Pan/Tilt, adapters, laptop and frame grabber	27 lbs
3 ⁺	Batteries and base	12.8 lbs

⁺ Tripod in its carrying bag (17.6 lbs) can also be attached to Backpack 3.



Field Deployable System Ordering Information

Part Number	Description
MRC-920-038	Field Deployable Hyperspectral SWIR System

SWIR Camera Specifications

Optical Characteristics *	SWIR-LVDS-100-N25E
Range (nm)	1000-2500
Resolution (spatial x spectral)	320 x 256 (240 active)
Spectrograph	ImSpector N25E
Spectral Resolution	10 nm (30 µm slit)
Spectral Sampling	6.3 nm/pixel
Spatial Resolution	RMS spot diameter < 30 µm
Aberrations	Insignificant astigmatism, smile or keystone < 5 µm
Numerical Aperture	F/2.0
Slit Width, default	30 µm (50 or 80 µm available on request)
Effective Slit Length	9.6 mm
Total Efficiency (typical)	> 50 %, independent of polarization
Stray Light	< 0.5 % (halogen lamp, 1400 nm notch filter)

Electrical Characteristics

Sensor	MCT camera
Interface	LVDS
Camera Output	14-bit LVDS
Frame rate (full / binning)	100 Hz
Cooling	4-stage Peltier for detector array, additional Peltier for active cooling of the detector package
Frame Grabber	NI-PCI 1422
Pixel Size	30 x 30 µm (pixel size)
Camera Control	Serial Port
Exposure Time Range	0.1 - 20 ms
Power Consumption	< 200 W
Input Voltage	24 V
Signal-to-noise ratio	800:1 (at max. signal level)
Data cable	length: 5 m

Environmental Characteristics

Storage	-20 to 50 C
Operating	5 to 40 C, non-condensing

Mechanical Characteristics

Size (LxWxH)	Sensor: 329 x 170 x 151 mm Power supply: 120 x 240 x 70 mm Control module: 260 x 260 x 95 mm
Weight	Sensor: 8.5 kg, Power supply: 1.9 kg, Control box: 3.4 kg
Body	Anodized Al and painted steel with mounting screw holes
Lens Mount	Standard C-mount
User Adjustments	No
Shutter	Yes

* Different focal lengths and field of view enhanced SWIR lenses are also available.