SIERRA-OLYMPIA TECHNOLOGIES INC.

VENTUS HD6-2.4
USER GUIDE

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1 SAFETY CONDITIONS

Read all instructions prior to use.

Observe electrostatic discharge (ESD) precautions when handling.

The camera requires reasonable thermal sinking when operating. Use stirred air and conduction to outside environment when installed in an enclosure.

The camera must be operated within its environmental limits.

Repairs and service are to be completed only by Sierra Olympia Technologies. Please refer any technical issues to support@sierraolympia.com.

2 EXPORT NOTICE

Product Export Classification Control Number (ECCN): 6A003.b.4.a. This document is provided for operation purposes only and does not contain export-controlled technology.

3 REFERENCE DOCUMENTS

Document Number	Document Title
20-70037	Mechanical ICD, Ventus HD6-2.4
S-D03-10409	WIND Firmware API
S-D07-10496	WIND Viewer User Guide
20-70005	Electrical ICD, Ventus HD6
1043862	ICD for the HexaBlu Baseline OEM Camera Core (by DRS)

4 INTRODUCTION

The Ventus HD6-2.4 is ready to operate out of the box. This guide will provide a walkthrough of the minimum setup to begin imaging.

The Ventus HD6-2.4 is an MWIR imager designed to be integrated into end-user products by integrators and OEMs. This user guide will cover basic usage and limits of the product. More detailed technical information (including software protocol, connector locations and pinouts, etc.) may be found in the referenced ICDs (interface control documents).

The main elements of the Ventus HD6-2.4 camera are the DRS HexaBlu Sensor, calibration shutter, lens, chassis, and a video processing engine which is referred to as the SightLine processor, or SLA. The SLA serves as the central processor for the camera and performs video render/processing, IP encoding, and control of the sensor subsystem. Control commands are sent to the SLA and may be passed through to subsystems in a fashion further described the WIND Firmware API.

WARNING! Do not update Sightline firmware without consulting Sierra-Olympia Technical Support. Update with an unqualified firmware version can interrupt camera functionality.

A sample user interface (WIND Viewer) is included on the delivery disk to demonstrate functionality of video encoding and control command structure. This quick start guide will describe camera operation using WIND Viewer.

The Ventus HD6-2.4 should be installed in an enclosure that protects the camera from the elements and provides field-friendly connectors using patch cables to the camera's interfaces as defined by the electrical ICD. The command interface and protocol are suitable to build camera functionality into end-user applications.

5 INCLUDED ITEMS

The packaging contains:

- Ventus HD6-2.4 camera
- Cable kit (optional)
- USB Delivery drive
  - WIND Viewer
  - ICDs and documentation

5.1 Recommended Equipment

Optional cables are available. See 20-70005 Electrical ICD, Ventus HD6 for additional connection information.

Item Name	SOTI PN	Manufacturer PN
Input Power Cable	S-A07-10237	NA
Serial camera control	S-A07-10236	NA
Ethernet	S-A07-10240	NA
HDMI	NA	Tripp-Lite P142-06N-Micro
Camera Link Adapter Kit	S-A07-10251	NA
SDI Cable	S-C11467	Pasternack PN PE3W01637-36
HD-SDI Assembly, SLA 4000, Ventus HD6	60-40058	NA
Silicon Window, AR-DLC, 90mm DIA, 3mm THK	80-20154-90	NA

6 QUICK START GUIDE

6.1 Connect the Ethernet cable.

6.1.1 Connect a Picoblade-terminated Ethernet cable to J11. The camera can be connected to a managed network, a switch or directly to a computer. The ethernet interface is preconfigured to obtain an IP address automatically from a DHCP server or from link-local addressing.

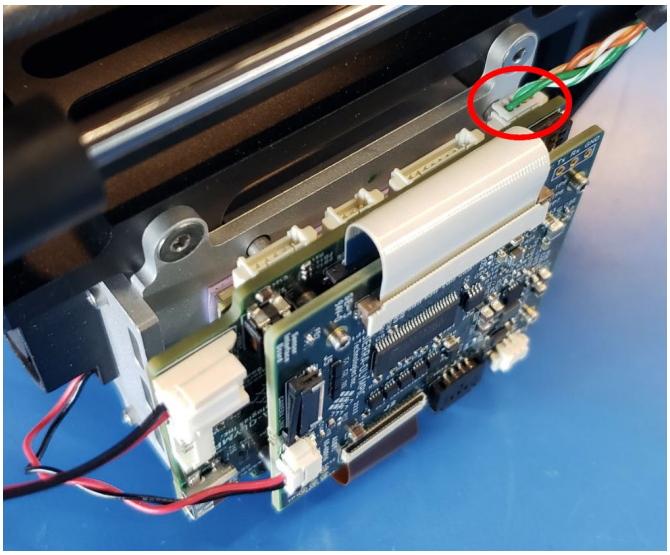

Figure 1: Ethernet Connection

6.2 Connect power cable.

6.2.1 Connect a Sherlock-terminated power cable to J1 as shown in Figure 2. The nominal input voltage is 12VDC (max 14V) with a minimum 3A supply.

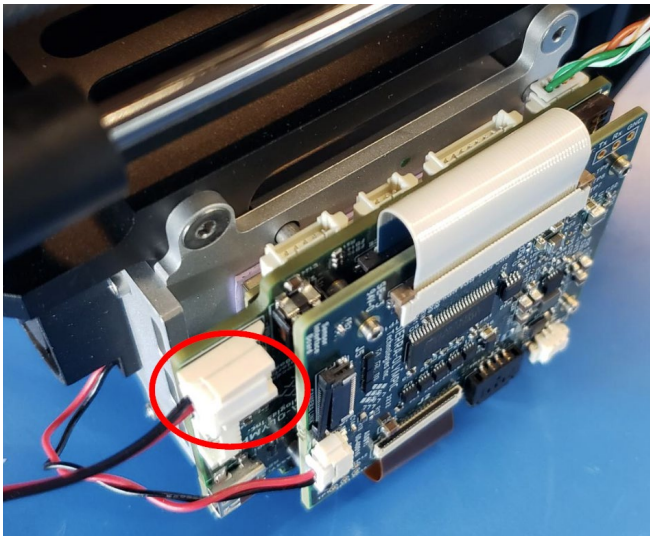

Figure 2: Power Connection

6.3 Optional HDMI Connection

6.3.1 Enable HDMI. To do this in SLA Panel Plus connect to the camera and then in the Video Output drop down select HDMI or HDMI & Net.

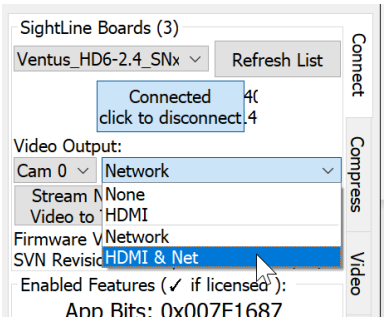

Figure 3 SightLine Enable HDMI

6.3.2 If HDMI will be used regularly, under parameters select save to board, then select reset and click reset board. We recommend that the "separate net/HDMI resolutions" box is checked before saving to board, this will keep the sensor cooldown graphics properly aligned. Panel Plus has a known issue with failing to remember this setting, we recommend always making sure that the box has been set as intended.

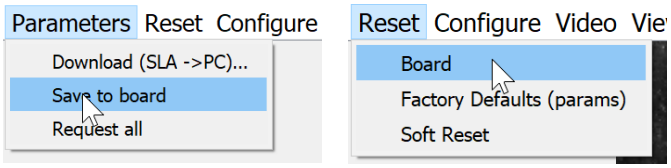

Figure 4 Save Parameter to Board

6.3.3 Connect a type D Micro-HDMI cable to J16. The HDMI output may be connected to an HDMI monitor or capture card.

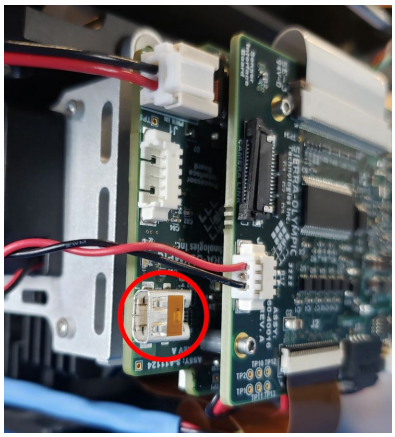

Figure 5: HDMI Connection

6.4 WIND Viewer – Connection Procedure

6.4.1 Establish IP Connection

6.4.1.1 Install WIND Viewer from the USB delivery drive.

6.4.1.2 Launch WIND Viewer.

6.4.1.3 All available SLA-equipped cameras on the network will appear in the "SLA Boards" dropdown list, identified by IP address and serial number. The camera has been preconfigured to obtain an IP address automatically from a DHCP server or from link-local addressing.

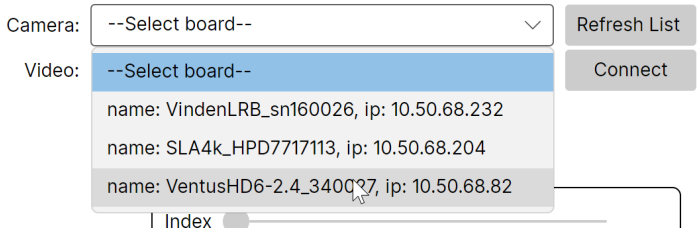

Figure 6: Connection Dropdown

6.4.1.4 If the camera does not appear in the list, do the following:

- Verify the camera has had enough time to initialize. The cooling fan will start after initialization (approximately 1 minute after power on).
- Click **Refresh**.
- Make sure that your computer is on the same subnet as the camera.

- Verify ethernet cable was connected to both the camera and the network/computer prior to power being applied.

6.4.1.5 To connect to the camera, select the camera from the drop-down and click **Connect**.

6.4.1.6 When the Connect button changes to Disconnect, you have successfully established connection.

6.4.2 Stream Video

The Ventus HD6 utilizes H.265 encoding by default, which is more processor intensive than H.264 encoding. This can be modified on the SLA if your decoder struggles with the H.265 data stream.

6.4.2.1 H.265 video begins streaming immediately over UDP to the local computer's IP address on port 15004.

6.4.2.2 Live video should appear in the WIND Viewer main window.

6.4.2.3 Video streaming may be more intricately configured through the full communication protocol.

6.4.2.4 Explore camera functions in WIND Viewer. There is nothing in this application that can damage the camera or is irreversible.

7 WIND VIEWER SENSOR TAB

WIND Viewer 3 is under development and adds functionality to communicate directly to the sensor core. See DRS ICD PN 1043862 ICD for the HexaBlu Baseline OEM Camera Core for command details. These are available on the "Sensor" tab which allows for simplified communication to the sensor.

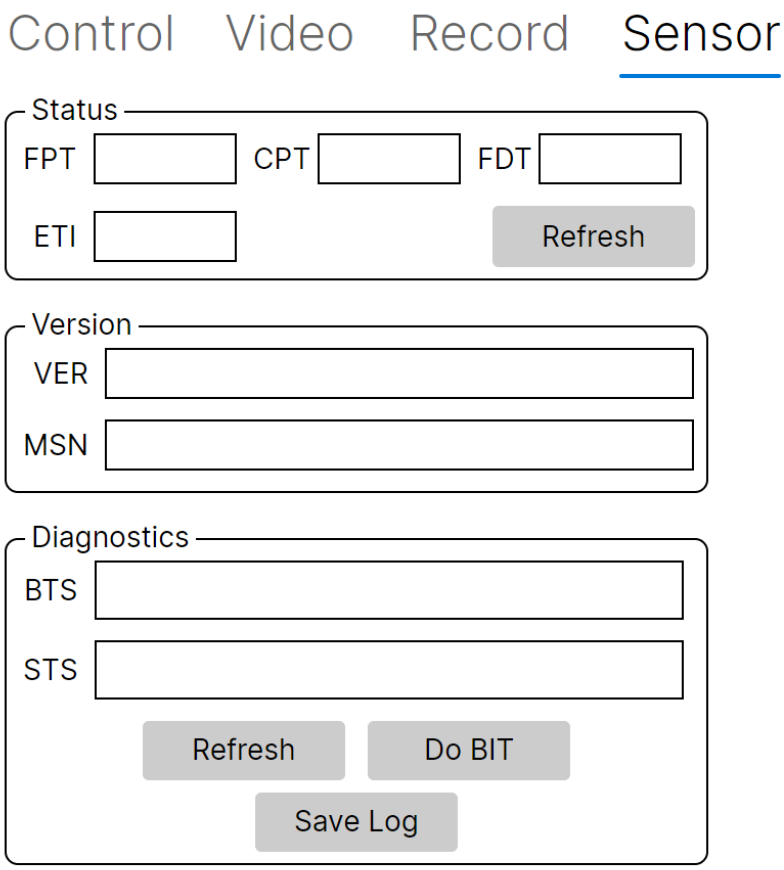

Figure 7 WIND Viewer Sensor Tab

Wind Viewer 2.x is supported for playback, but will not receive updates.

8 3G/HD-SDI ACCESSORY INSTALLATION

A kit is available for separate purchase to enable SDI output (configured by the Sightline). The kit contains electronics, mounting equipment, and cables. The following instructions are provided to mount the kit on the chassis; the kit may also be remote mounted.

HDMI and SDI can not be operated simultaneously. The camera is configured to operate HDMI by default.

8.1.1 Install the SDI bracket with two M2.5 4mm flat head screws. Apply loctite 242 and torque to 2.8 in-lbs.

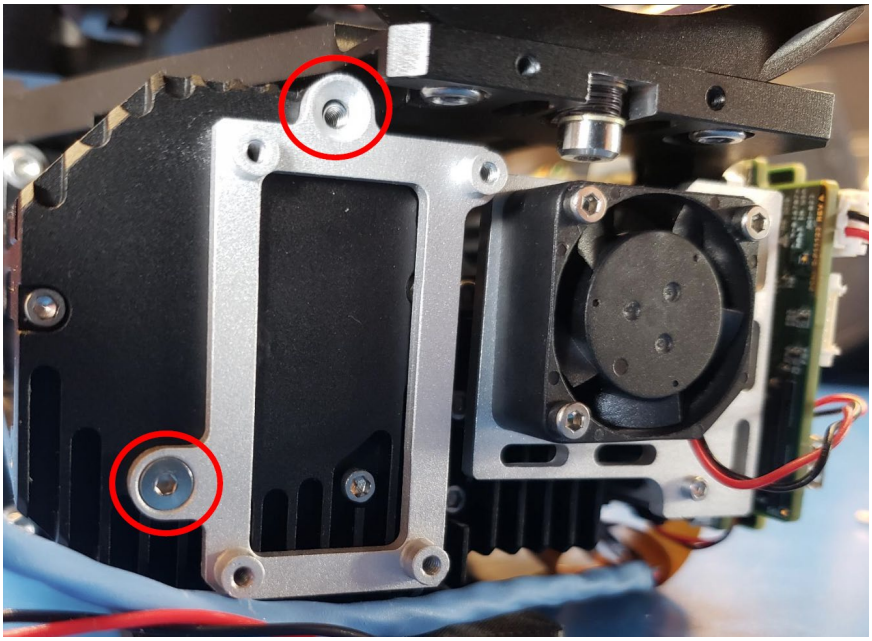

Figure 8 SDI Bracket

8.1.2 Install the SDI board with four 2-56 1/4in socket head screws. Apply loctite 242 and torque to 2.1 in-lbs.

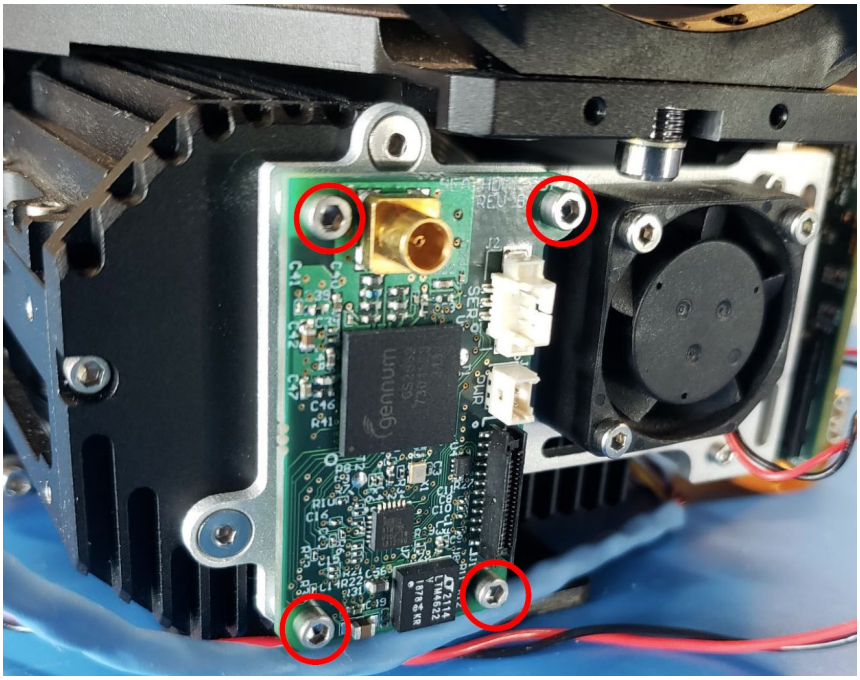

Figure 9 Install SDI board.

8.1.3 Install the FFC and power cables

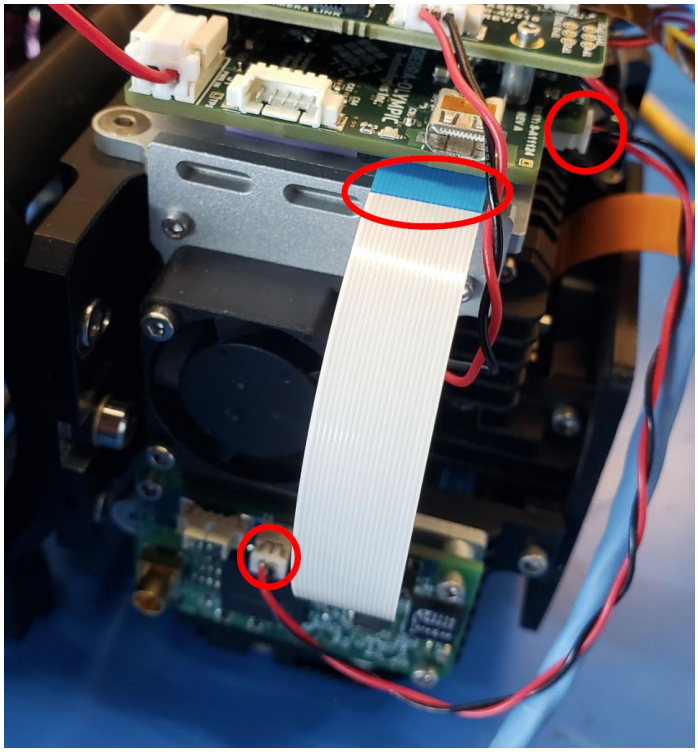

Figure 10 FCC and Power Cable Installation

8.1.4 Plug in the SDI cable to the SDI connector.

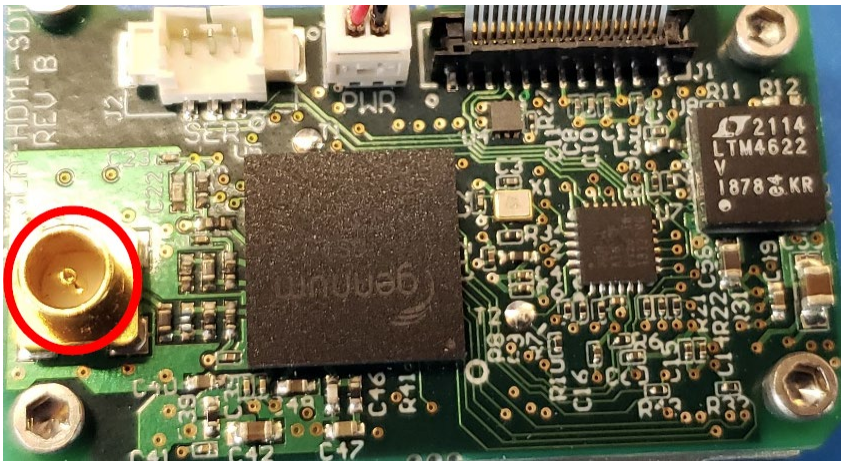

Figure 11 SDI connector

8.1.5 Once the SDI accessory kit is installed, apply power to the camera.

9 WINDOW PLACEMENT

If the Ventus HD6 2.4 is mounted behind a window, we recommend that it satisfies the following two conditions (figure 12. Shows an example configuration). Sierra Olympia offers a customer window that will work for some configurations of enclosures. This is available as part number 80-20154-90, contact sales@sierraolympia.com for price and lead time information.

1. The window is tilted by at least ½ the Vertical FOV in the vertical dimension (~9.5 deg) in order to prevent narcissus
2. The Window's clear aperture is at least as large at the ray bundle extent at its location. This will depend on the distance from the lens to the window. This corner ray bundle is 73mm diameter at WFOV, at the front element's vertex. This ray bundle grows at the rate of the Diagonal FOV (30.8 deg full angle)

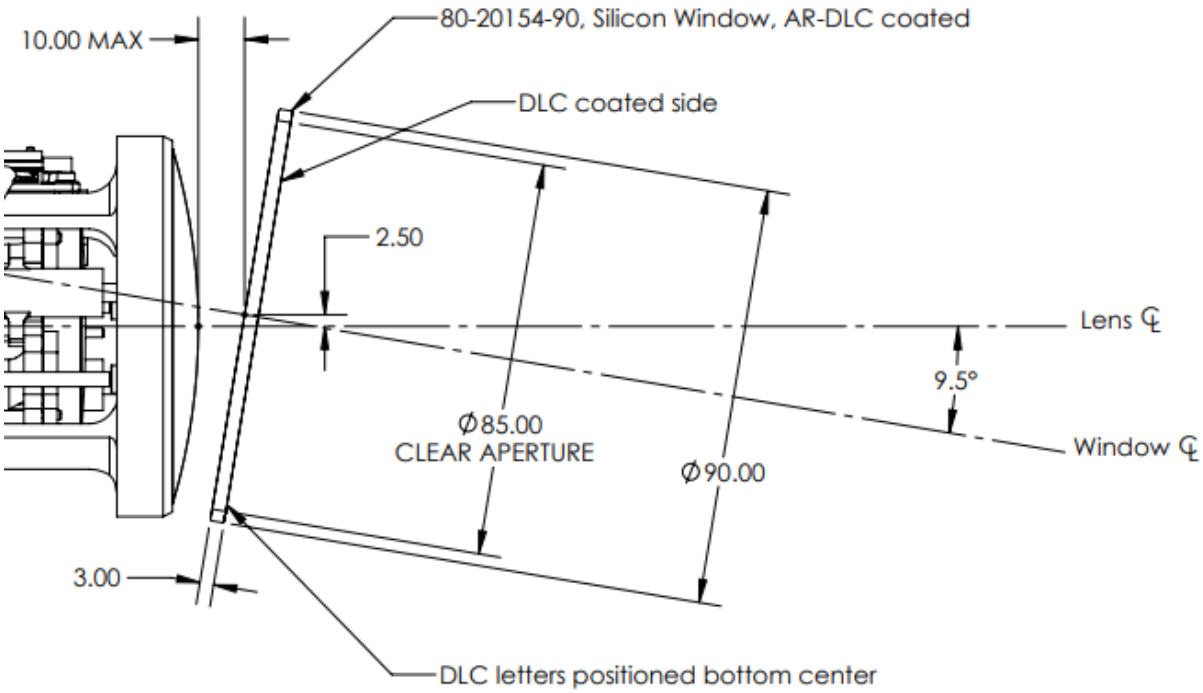

Figure 12 Ventus HD6-2.4 Window Placement

10 NONUNIFORMITY CORRECTION

10.1 NUC

The Hexablu sensor has multiple modes that correspond to 2-point (gain) NUC tables and integration times. The Ventus HD6-2.4 is calibrated with through-lens NUC at the integration

times listed below. It is recommended to change modes based on scene temperature / photon flux. Table 0 is the default table at power on.

Scene temperatures were determined from room temperature radiometry data. Results may vary depending on weather (rain, humidity etc) and range (atmospheric attenuation and turbulence). According to the Beer-Lambert Law, approximately 85% of mid-wave infrared (MWIR) light is transmitted per kilometer, which increases the recommended scene temperature range for distant targets. Table 2 will look best in most situations. On Wind Firmware 1.1.170 and earlier, table 0 is default. On Wind Firmware 1.1.172 and later, the default table is set by the DefaultNUCTable param in the SotiParams.xml file.

NUC Table	Integration Time	Frame Rate	Calibration Temperature	Recommended Scene Temperature, ~1km target
0	10ms	60Hz	50 to 90C	35 to 110C
1	16ms	60Hz	30 to 70C	5 to 95C
2	32ms	30Hz	10 to 40C	-30 to 65C

10.2 FFC

The Ventus HD6-2.4 is equipped with a shutter to perform Flat Field Corrections (FFCs). By default, the camera will automatically perform an FFC 20 seconds after the sensor finishes initializing, and 1 second after the camera is commanded to switch NUC tables.

These automatic FFCs can be configured or disabled by editing the SotiParams.xml file stored on the camera's filesystem, located in the /home/slroot/soti directory.

The StartupFFCDelay param sets the delay of the post initialization FFC in seconds, if it is set to 0 this feature will be disabled.

The TableSwitchFFCDelay param sets the delay of the automatic FFC after commanding a new NUC table in seconds, if it is set to 0 the feature will be disabled.

Values for both params are limited to integers between 0 and 4,000,000.

FFCs may be commanded manually with the **Execute FFC** button in Wind Viewer, or via the Do Flat Field Correction (0x82) command in the Wind API.

The Ventus HD6-2.4 supports four modes when using the 0x82 command: internal, external, zoom, and reset. Note that the zoom and reset modes are only available on Wind Firmware 1.1.172 or later.

Internal FFCs use the shutter to correct drift in the sensor. This type of FFC is performed automatically as described above.

External FFCs first perform a shutter FFC, then perform a second FFC through the lens. This type of FFC should be performed against a thermally uniform source, such as painted plate

placed in front of the lens. Note that external FFCs will be lost when the NUC table or zoom index is changed.

When the environmental temperature is far from the factory calibration environment the image quality (residual spatial non-uniformity) may degrade. This can be corrected by performing a Zoom FFC. Zoom FFCs first perform a shutter FFC, then perform a through lens FFC at each zoom position. Unlike the External FFC, this calibration is stored on the camera and will persist through power cycles. The calibration process takes up to 1 minute and should be performed against a uniform source. For best performance, the camera should be in its intended operating environment, and the thermally uniform source should be a similar temperature to the intended scene. Note that this mode only calibrates the current active NUC table, other tables will not be modified.

Reset mode restores the factory NUC tables, undoing any changes from previous Zoom FFCs.

11 FOCUS

The Ventus HD6-2.4 is capable of several types of focus adjustment. Focus may be adjusted manually with the Set Focus Motor Position (0x48) command, which accepts values ranging from 15 to 50. A value of 50 represents the nearest focus, 25 represents infinity focus, while values less than 25 represent focus positions beyond infinity focus. Positions from 26 to 50 may be mapped to an approximate focus range in meters with the following equation:

$$Focus\ Range\ (m) = \frac{648\ m}{Focus\ Position - 25}$$

Note that a negative number indicates a focus beyond infinity. Also note that the Focus range represents the nominal range of peak focus while a larger area will appear in focus (Depth of Field) depending on the zoom position.

11.1 Autofocus

One touch autofocus on the Ventus HD6-2.4 commands the lens to search for the best focus position. The autofocus search is started with the Run Autofocus (0x4C) command. This command will run until the search is complete, or until the Abort Autofocus (0x4D) command is sent. Autofocus uses multiple search windows to narrow in on the sharpest focus position, reducing time spent in out of focus regions of the focus range.

Focus quality is evaluated at each autofocus position by calculating a metric for sharpness of the frame. Low contrast scenes decrease the difference in focus metric between in focus and out focus frames, and may prevent the autofocus algorithm from finding the peak focus position. Similarly, changing scenes while autofocus is running can cause the metric to change, leading autofocus to end in an out of focus position.

11.2 Continuous Autofocus

Continuous autofocus runs a search for the best focus position, then holds that position, re-entering a search mode periodically, or if the scene changes. This search mode scans a small

area around the current focus position, and only searches a wider area if the peak focus position has shifted.

Continuous autofocus is started with the Run Continuous Autofocus (0x57) command, and will keep running until Abort Continuous Autofocus (0x58) or another lens command is sent.

12 INTEGRATION CONSIDERATIONS

- The Ventus HD6-2.4 dissipates approximately 11.5W of heat, please see the corresponding 20-70037 Mechanical ICD, Ventus HD6-2.4 for heatsinking surfaces. When enclosed, stirred air is recommended, the volume wall should promote conduction to ambient air.
- The Ventus HD6-2.4 includes a removable tripod mount with a ¼-20 threaded hole for convenience of mounting for demonstration. In integration it is recommended to use the primary mounting holes identified on 20-70037 Mechanical ICD, Ventus HD6-2.4.
- The DRS HexaBlu sensor may be accessed using 'pass-through' commands in the WIND protocol. Please reference the WIND Firmware API (S-D03-10409) and DRS ICD (1043862) documents for additional information
- The below table lists the Effective Focal Length (EFL) as a function of Zoom Index. The EFL values are reported from the lens manufacturer and the Horizontal Field of View (HFOV) values are calculated (without accounting for optical distortion). The as-measured FOV may differ slightly due to as-built tolerances. This data is only provided for the purpose of understanding the design and behavior of the zoom function.

Zoom Index	EFL (mm)	HFOV (deg)	FOV ratio (Z/(Z-1))
0	18.0	24.09	
1	22.7	19.20	1.25
2	28.5	15.35	1.25
3	35.9	12.21	1.25
4	45.2	9.71	1.25
5	56.9	7.72	1.25
6	71.7	6.13	1.25
7	90.2	4.88	1.25
8	113.6	3.87	1.25
9	143.0	3.08	1.25
10	180.0	2.44	1.25

13 REVISION HISTORY

Revision	Date	Description	ECO
Rev A	2023-09-20	Initial Release	1530
Rev B	2023-10-17	Update section 9	1573
Rev C	2024-05-22	Update sections 5, 9, 10, and 11	1665
Rev D	2024-09-26	Added section 11	1781
Rev E	2025-03-10	Update section 10	1838