EAN-USB Video Class (UVC) Cameras

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Exports: Export Summary Sheet

EULA: End User License Agreement

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CAUTION: Alerts to a potential hazard that may result in personal injury, or an unsafe practice that causes damage to the equipment if not avoided.

IMPORTANT: Identifies crucial information that is important to setup and configuration procedures.

Used to emphasize points or remind the user of something. Supplementary information that aids in the use or understanding of the equipment or subject that is not critical to system use.

1 Overview

The USB Video Class (UVC) describes USB streaming video devices that comply with the USB video class specification standards defined by the USB-IF. USB video class devices include webcams, still-image cameras, analog video converters, digital camcorders, and transcoders.

This document describes how to configure the 4000-OEM to receive video from USB video class cameras through the J8 USB 3.0 (Type-C) port.

For cameras that are based on the USB3 Vision standard see EAN-USB3-Vision-Cameras.

Before configuring the camera, it is important to know the type of USB camera being used. Check the camera specification supplied by the manufacturer to determine the camera type.

1.1 Additional Support Documentation

Additional Engineering Application Notes (EANs) can be found on the Documentation page of the SightLine Applications website.

The Panel Plus User Guide provides a complete overview of settings and dialog windows. It can be accessed from the Help menu of the Panel Plus application.

The Interface Command and Control (IDD) describes the native communications protocol used by the SightLine Applications product line. The IDD is also available as a PDF download on the Software Downloads page.

1.2 SightLine Software Requirements

The 4000-OEM requires firmware 3.00.xx and higher.

IMPORTANT: The Panel Plus software version should match the firmware version running on the board. Firmware and Panel Plus software versions are available on the Software Download page.

1.3 Third Party Software

Tera Term (recommended) or PuTTY: Terminal emulator programs used for debug output, or to issue commands on SightLine hardware.

2 Safe Device Handling

CAUTION: To prevent damage to hardware boards, disconnect all input power to OEMs and adapter boards before connecting or disconnecting cables including all FFC, FPC, KEL, HDMI, MIPI, and round wire (Molex) cables.

CAUTION: To prevent damage to hardware boards, use a conductive wrist strap attached to a good earth ground. Before picking up an ESD sensitive electronic component, discharge built up static by touching a grounded bare metal surface or approved antistatic mat.

3 4000-OEM USB Overview

The J8 USB 3.0 (Type-C) port on the 4000-OEM can be used with USB Video Class (UVC) cameras. The 4000-OEM only supports dual USB cameras. This camera will appear as either *CAM 2* or *CAM 3*.

IMPORTANT: The USB port (J8) should not be connected directly to a PC. This port cannot be used for serial command and control directly.

USB 5V output can source 900mA max. 5V is also used for J9 connected MIPI interface boards and combined maximum is 1.2A.

CAUTION: Do NOT connect an external 5V power source to the USB-C connector! Damage to the OEM may occur.

The 4000-OEM USB J8 port can also be used to connect to other USB devices:

- GPS devices
- USB to RS-232 converters
- Other devices that present themselves as serial ports such as the FLIR Boson 640 camera
- USB hubs
- Human Machine Interfaces (HMI) such as keyboards
- USB storage devices

Not all these devices are accessible from VideoTrack but should connect and enumerate in the Linux OS. These devices can then be used by custom applications hosted on the processor.

3.1 Connector J7: Debug only

A USB 2.0 port is exposed on connector J7 and should only be used for serial debugging. This is not a serial port that can be used for command and control, and it cannot be repurposed by another application on the 4000-OEM.

4 4000-OEM USB Camera Bench Setup

USB adapters:

- SLA-CAB-TC2USB (USB C to USB 3.0 Type-A Adapter) / camera specific USB 3.0 cable: Connects the USB-C port (J8) on the 4000-OEM to USB video class cameras or other USB devices.

Cable connections:

- SLA-CAB-0403: Connects to J4 on 4000-OEM board. Provides an RJ45 Ethernet connection.
- SLA-CAB-1504 / SLA-PWR-B12V-36W (110-250VAC input / 12VDC output): Connects to J50 on the 4000-OEM board.

Power and network connectivity LEDs:

A green light (D1) on the 4000-OEM board indicates that all boards are powered on. An amber light (D5) verifies network connection.

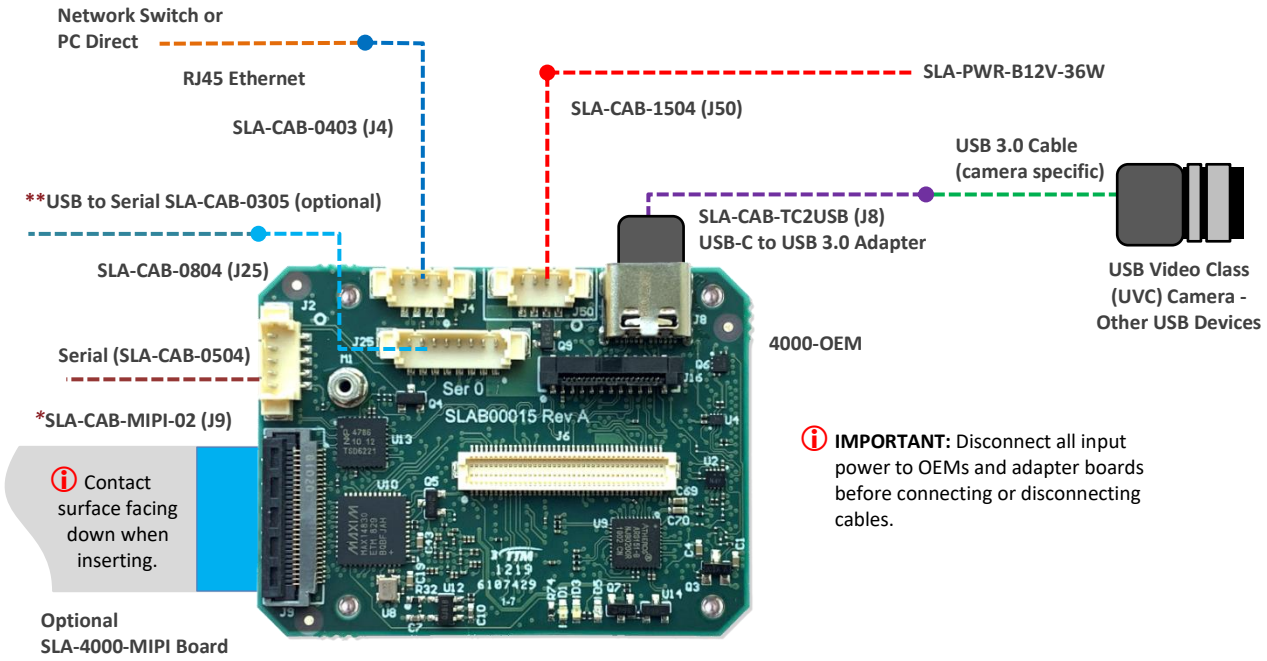


Figure 1: 4000-OEM USB Camera Bench Setup

**SLA-CAB-MIPI-02 FFC cable must be connected correctly. See the FFC cable instructions before connecting the SLA-4000-MIPI board.*

***SLA-CAB-0305 can connect to SLA-CAB-0804 to facilitate a PC/USB connection to serial port 0 on the 4000-OEM. See the Serial Communications section in the EAN-Startup-Guide-4000-OEM for more information.*

Additional non-USB cameras can be connected to the 4000-OEM on J6 and using the SLA-4000-MIPI board on J9. See the ICD-3000-4000 Adapter Boards for more information.

5 Configuration Settings Overview

This section covers the basic camera configuration settings in Panel Plus for the 4000-OEM video processing board.

See the EAN-Startup Guide 4000-OEM for connection and video streaming instructions.

For compatibly questions regarding specific camera models contact Support.

Before connecting with the Panel Plus software, the OEM board should be powered up and connected through:

- a network switch or directly to the host PC (preferred) or,
- Direct serial connection (for troubleshooting or if a network connection cannot be established).

IMPORTANT: This procedure assumes that the customer has read the OEM startup guide and has a basic understanding of the following fundamentals:

- Completed a functional connection between the SightLine video processing board and Panel Plus application.
- Familiar with Panel Plus controls.
- Successfully streamed video in Panel Plus.

For help with basic connection and streaming fundamentals contact Support.

5.1 Acquisition Settings

1. From the main menu in Panel Plus go to *Configure* » *Acquisition Settings*.
2. In the *Camera Index* drop-down menu select *Cam 2* or *Cam 3*.
3. In the Camera Type drop-down menu select *USB Webcam*.

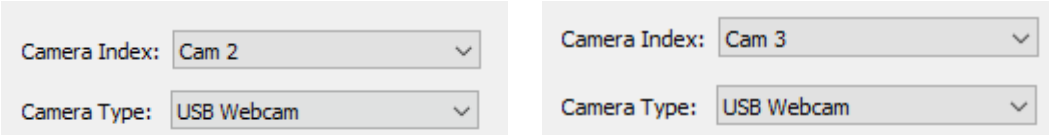


Figure 2: Camera Index and Camera Type - USB Webcams

4. If available, use the *Auto Fill* drop-down menu in the *Acquisition Settings* dialog to automatically populate the relevant fields with the correct settings.

The settings can also be manually entered as shown in the camera configuration table.

IMPORTANT: If the camera is not available in Panel Plus *Auto Fill* see the Camera Discovery section to verify and modify camera resolutions, formats and frame rates that are available for a selected camera.

For information about acquisition fields in Panel Plus see EAN-Digital Video Configuration.

IMPORTANT: Save parameters and reset the board when changing parameters. Cycle system power when changing resolution.

If video does not display, try saving and activating the settings again. Check the encoding settings on the Compress tab and review the network addresses for the destination video.

6 Camera Discovery

See the basic camera configuration table for validated webcams. For compatibly questions regarding specific camera models contact Support.

This section describes how to determine camera resolutions, formats, and frame rates that are available for UVC cameras that are not preconfigured in Panel Plus *Auto Fill*.

Webcams normally send compressed video at full frame rate (e.g., 30 fps) or raw video at reduced frame rate (e.g., 5 fps). Some models may send faster rate raw video. SightLine 4000-OEM boards are compatible with UVC 1.1 and newer cameras.

Camera control can be done through the optArgs string argument to SetAcquisitionParameters (0x37) or using the *Options* field in the *Acquisition Settings* dialog in Panel Plus.

1. Establish an SSH session to the OEM hardware with Tera Term.

Username and password for 4000-OEM is slroot.

2. Discover camera and device node name:
   a. From the root@sla-alip:~# prompt type:

   ```
   media-ctl -p
   ```

   There can be multiple media devices enabled. The default is /dev/media0.

The console displays the device node name and camera name as shown in Figure 3. The device node name can change between power cycles.

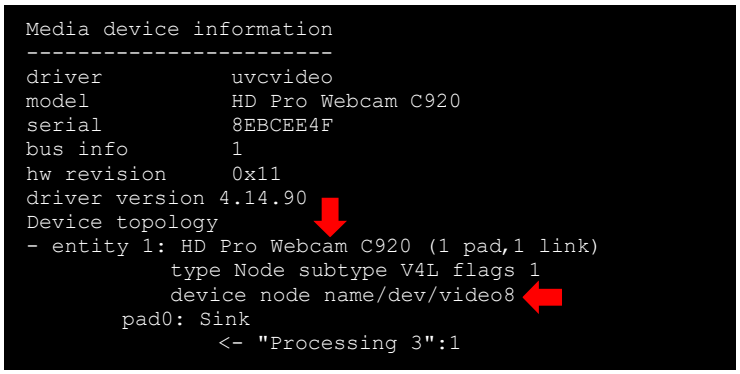


Figure 3: Discover Camera and Device Node Name

b. If the command in the previous step does not show the connected USB camera, search on other media devices. To list available media devices, type:

`ls /dev/media*`

`media-ctl -p -d /dev/mediaX` (mediaX is media1 or media2)

Figure 4: USB Camera Search on Media Devices

c. As an alternate option to find the device node name, type:

`v4l2-ctl --list-devices`

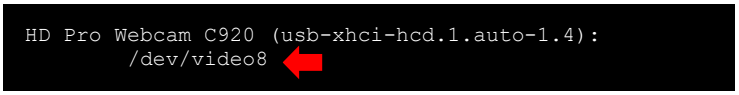


Figure 5: Discover Camera and Device Node Name - Alternate Option

3. List available formats. From the root@sla-alip:~# prompt type:

`v4l2-ctl --list-formats-ext -d /dev/video8`

The resultant listing will show video format, resolution, and FPS support.

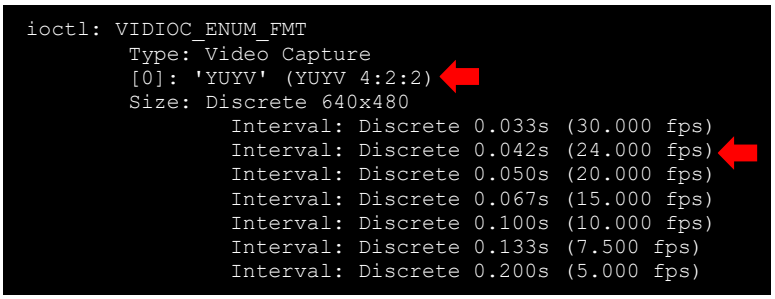


Figure 6: List Available Formats

4. Show current format. From the root@sla-alip:~# prompt type:

```
v4l2-ctl --all -d /dev/video8
```

```
Priority: 2
Video input : 0 (Camera 1: ok)
Format Video Capture:
        Width/Height      : 1920/1080
        Pixel Format      : 'YUYV' (YUYV 4:2:2)
        Field             : None
        Bytes per Line    : 3840
        Size Image        : 4147200
        Colorspace        : sRGB
        Transfer Function : Default (maps to sRGB)
        YCbCr/HSV Encoding: Default (maps to ITU-R 601)
        Quantization      : Default (maps to Limited Range)
        Flags             :
Crop Capability Video Capture:
        Bounds      : Left 0, Top 0, Width 1920, Height 1080
        Default     : Left 0, Top 0, Width 1920, Height 1080
        Pixel Aspect: 1/1
Selection: crop_default, Left 0, Top 0, Width 1920, Height 1080, Flags:
Selection: crop_bounds, Left 0, Top 0, Width 1920, Height 1080, Flags:
Streaming Parameters Video Capture:
        Capabilities     : timeperframe
        Frames per second: 5.000 (5/1)
```

Figure 7: Show Current Format

7 Advanced Configuration Options

7.1 Determining Supported Formats - Frame Rates - Resolutions

1. Use Tera Term to establish an SSH session to the target.
2. Type the command:

```
v4l2-ctl --list-formats-ext -d /dev/video0
```

/dev/video0 may be replaced with /dev/videoN where N is 0 to 10.

In this example the camera supports UYVY and MJPEG formatted video transfer at various resolutions and frame rates.

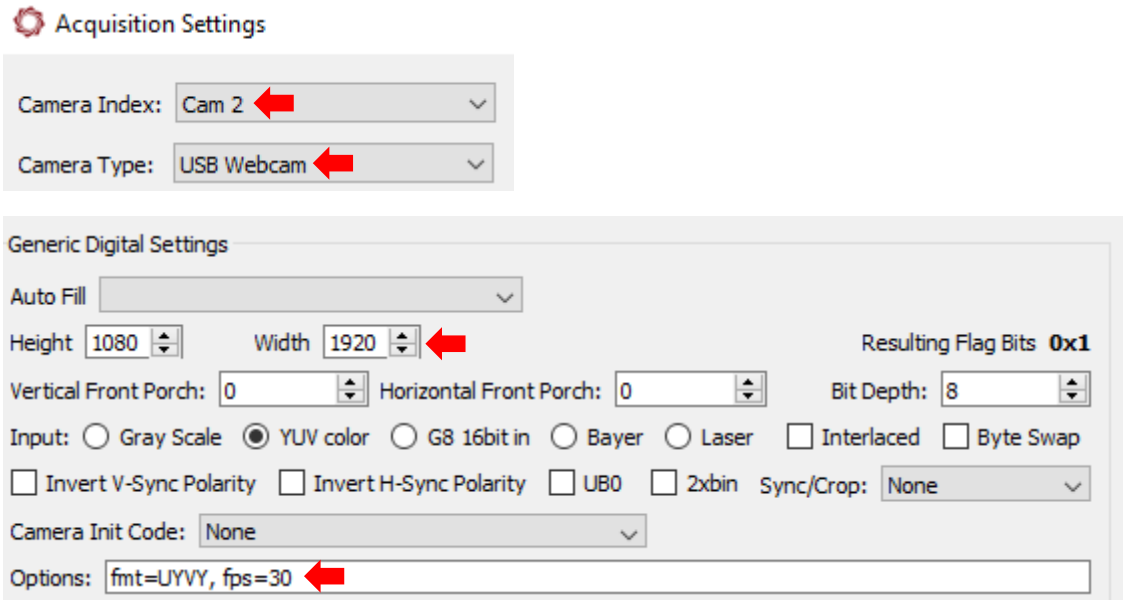
```
SD> v4l2-ctl --list-formats-ext -d /dev/video0
ioctl: VIDIOC_ENUM_FMT
        Index       : 0
        Type        : Video Capture
        Pixel Format: 'UYVY'
        Name        : UYVY 4:2:2
                Size: Discrete 1280x720
                        Interval: Discrete 0.017s (60.000 fps)
                        Interval: Discrete 0.033s (30.000 fps)
                Size: Discrete 1920x1080
                        Interval: Discrete 0.017s (60.000 fps)
                        Interval: Discrete 0.033s (30.000 fps)
                        Interval: Discrete 0.067s (15.000 fps)

        Index       : 1
        Type        : Video Capture
        Pixel Format: 'MJPG' (compressed)
        Name        : Motion-JPEG
                Size: Discrete 1280x720
                        Interval: Discrete 0.017s (60.000 fps)
```

Figure 8: USB Webcam Supported Formats, Frame Rates and Resolutions

7.2 Configuring Format - Frame Rates - Resolutions

1. From the main menu in Panel Plus » *Configure* » *Acquisition Settings*.
2. Choose format and frame rate with the string in the *Options* field, e.g., <*fmt=UYVY, fps=30*>.



3. Click *Apply*. Main menu » *Parameters* » *Save to Board*.
4. Main menu » *Reset* » *Board*.
5. After the system reboots reconnect to the board. Make sure the board connects. In the bottom status bar in Panel Plus main window, verify that the frame rate is as expected.

If the Options filed is left empty, the system will look for a supported format in the following order: MPEG2, MPEG4, H264, H265, MJPEG, NV12, YUYV, UYVY, YUV420.

If an unsupported format is chosen, the camera will not capture video. If an unsupported frame rate is chosen, the closest frame rate to the one chosen will be selected.

7.3 ELP-SUSB1080P01-LC1100 Webcam Configuration Example

This example describes how to determine formats, frame rates, and resolutions for the ELP-SUSB1080P01-LC1100 UVC USB webcam.

Before starting, verify the camera is operating correctly using the Windows camera app. Connect the camera to a PC running Windows and run the camera app. If video is being displayed the camera is working.

1. Verify the camera is properly connected to the 4000-OEM. Since the USB port on the 4000-OEM is a USB-C, a USB 3.0 to USB-C adapter is required to connect the camera to the board (SLA-CAB-TC2USB).
2. Apply power to the board.

3. Use Tera Term to establish an SSH session to the OEM board.

Username and password is slroot

4. From the root@sla-alip:~# prompt type: `lsusb`

This step verifies that the device is connected and detected. The camera is on the same bus as the USB 3.0 root hub. This enables the camera to reach USB 3.0 speeds.

```
Bus 002 Device 004: ID 15aa:1555 Gearway Electronics (Dong Guan) Co., Ltd.
Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
```

Figure 9: Verify Device Connection and Detection

5. Find the camera and device node shown in the Camera Discovery section.
   The camera is available on `/dev/video8` shown in Figure 11.

```
Media controller API version 4.14.90
Media device information
------------------------
driver          uvcvideo
model           3.0 USB Camera: 3.0 USB Camera
serial
bus info        1
hw revision     0x1002
driver version  4.14.90
Device topology
- entity 1: 3.0 USB Camera: 3.0 USB Camera (1 pad, 1 link)
            type Node subtype V4L flags 1
            device node name /dev/video8
        pad0: Sink
                <- "Extension 4":1 [ENABLED,IMMUTABLE]
```

Figure 10: Camera and Device Node Name

6. Follow the steps in the Determining Supported Formats - Frame Rates - Resolutions section to list available formats for this device.

   This camera supports MJPEG and YUYV output formats, at 1920x1080, 1280x720, and 640x480 shown in Figure 12. While the list suggests a maximum framerate of 60 fps, the manufacturer advertises the camera as reaching a framerate of 50 fps. In this example 50 fps will be the frame rate target.

```
ioctl: VIDIOC_ENUM_FMT
        Type: Video Capture

        [0]: 'MJPG' (Motion-JPEG, compressed)
                Size: Discrete 1920x1080
                        Interval: Discrete 0.017s (60.000 fps)
                Size: Discrete 1280x720
                        Interval: Discrete 0.017s (60.000 fps)
                Size: Discrete 640x480
                        Interval: Discrete 0.017s (60.000 fps)
        [1]: 'YUYV' (YUYV 4:2:2)
                Size: Discrete 1920x1080
                        Interval: Discrete 0.017s (60.000 fps)
                Size: Discrete 1280x720
                        Interval: Discrete 0.017s (60.000 fps)
                Size: Discrete 640x480
              Interval: Discrete 0.017s (60.000 fps)
```

Figure 11: Available Formats

7. Configure *Acquisition Settings* through Panel Plus as shown in the *camera configuration table* for the ELP-SUSB1080P01-LC1100 camera:
   a. Set *Camera Index* to *Cam 2* and *Camera Type* to *USB Webcam*.
   b. Set *Auto Fill* to *USB Webcam 1080P*.
   c. Click *Apply*.
   d. From the main menu in Panel Plus » *Parameters* » *Save to Board*.
   e. Main menu » *Reset* » *Board*.
   f. From the *Connect* tab reconnect to the board. Select *Video Output* » *Cam 2*.
   g. Click *Stream Network Video to This PC* to see output video.
8. Check the frame rate at the bottom of the Panel Plus window. In this configuration the frame rate only reaches ~20 fps.

```
Streaming Camera: 2. Commanded Camera: 2
Frame Rate: 22.86[frames/sec]. Data rate: 5667.38[Kb/sec]
```

9. Test available output formats for increasing the frame rate. In the *Acquisition Settings* dialog add a format specifier to the *Options* field. For more information on this field see SetAcquisitionParameters (0x37) in the IDD. In this example the MPEG output is tested.
   a. In the *Options* field type the options string: *fmt=MJPEG*.
   b. Click *Apply*.
   c. Main menu » *Parameters* » *Save to Board*.
   d. Main menu » *Reset* » *Board*.
10. Check the frame rate at the bottom of the Panel Plus window. In this configuration the frame rate only reaches ~20 fps.

```
Streaming Camera: 2. Commanded Camera: 2
Frame Rate: 20.05[frames/sec]. Data rate: 5368.76[Kb/sec]
```

    Repeat the above steps and use the option string *fmt=YUYV* to test the YUYV format. Check the frame rate at the bottom of the Panel Plus window. In this configuration the frame rate reaches ~50 fps.

```
Streaming Camera: 2. Commanded Camera: 2
Frame Rate: 48.38[frames/sec]. Data rate: 5714.73[Kb/sec]
```

8 FLIR Boson 640 Camera USB Interface

8.1 RHP-BOSON VPC Interface Module - FLIR Boson 640 Camera

OEM Cameras provides a USB interface for the FLIR Boson 640 camera to the 4000-OEM through the RHP-BOSON VPC TTL interface module.

The custom cable harnesses included in the kit provide 3.3V TTL serial communication for command and control, USB for video streaming, and external power.

USB adapters:

- SLA-CAB-TC2USB (USB-C to USB 3.0 Type-A Adapter) / 6-pin JST to USB: Connects the USB-C port (J8) on the 4000-OEM to the RPH-Boson VPC interface module.

Cable connections:

- SLA-CAB-0504: Serial Port/GPIO 4000-OEM (J2). Connects to the 7-pin JST PicoBlade pigtail.
- SLA-CAB-0403: Connects to J4 on 4000-OEM board. Provides an RJ45 Ethernet connection.
- SLA-CAB-1504 / SLA-PWR-B12V-36W (110-250VAC input / 12VDC output): Connects to J50 on the 4000-OEM board.

Power and network connectivity LEDs:

A green light (D1) on the 4000-OEM board indicates that all boards are powered on. An amber light (D5) verifies network connection.

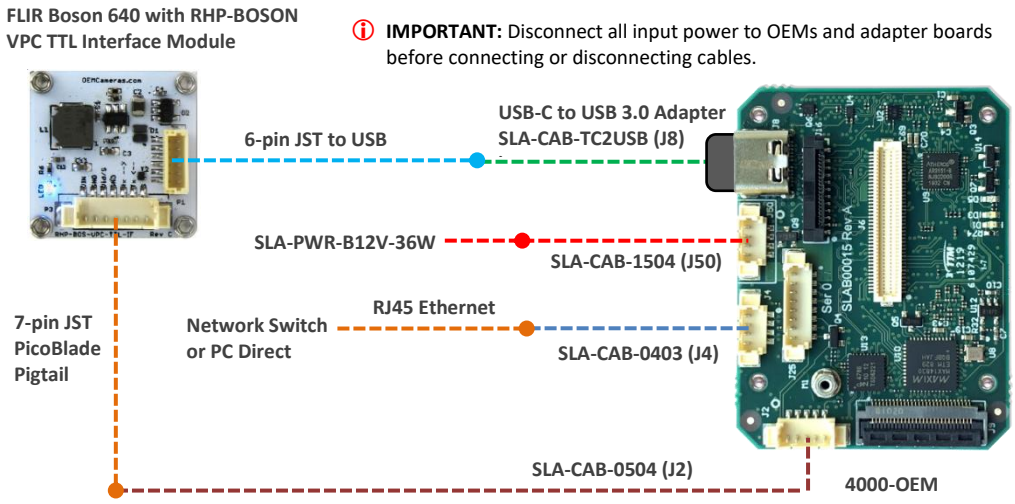


Figure 12: RHP-BOSON VPC TTL Interface Module - 4000-OEM USB Connection

8.2 FLIR VPS Kit - FLIR Boson 640 Camera

FLIR provides a USB-C interface for the FLIR Boson 640 camera to the 4000-OEM through a VPC Kit (PN: 421-0061-00).

USB adapters:

- SLA-CAB-TC2USB (USB C to USB 3.0 Type-A Adapter) / USB-C to USB-A cable: Connects the USB-C port (J8) on the 4000-OEM to the USB-C camera adapter board.

Cable connections:

- SLA-CAB-0403: Connects to J4 on 4000-OEM board. Provides an RJ45 Ethernet connection.
- SLA-CAB-1504 / SLA-PWR-B12V-36W (110-250VAC input / 12VDC output): Connects to J50 on the 4000-OEM board.

Power and network connectivity LEDs:

A green light (D1) on the 4000-OEM board indicates that all boards are powered on. An amber light (D5) verifies network connection.

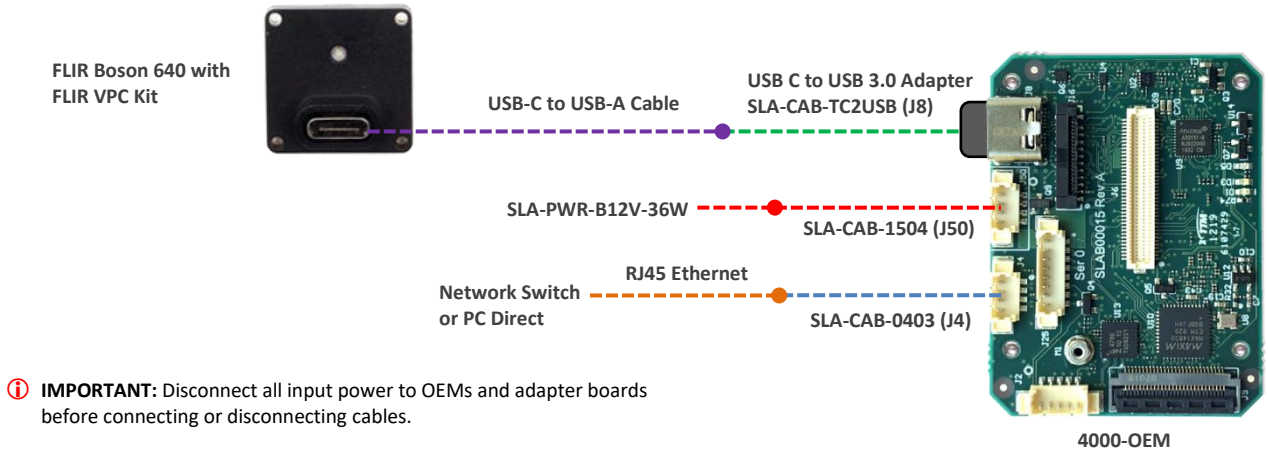


Figure 13: FLIR Boson 640 with FLIR USB VPC Kit - 4000-OEM USB Connection

8.3 Sierra-Olympic USB-C Adapter Board - DRS Tenum 640 Camera

Sierra-Olympic provides a USB-C interface for the DRS Tenum 640 camera to the 4000-OEM through a USB-C adapter board.

USB adapters:

- SLA-CAB-TC2USB (USB C to USB 3.0 Type-A Adapter) / USB-C to USB-A cable: Connects the USB-C port (J8) on the 4000-OEM to the USB-C camera adapter board.

Cable connections:

- SLA-CAB-0403: Connects to J4 on 4000-OEM board. Provides an RJ45 Ethernet connection.
- SLA-CAB-1504 / SLA-PWR-B12V-36W (110-250VAC input / 12VDC output): Connects to J50 on the 4000-OEM board.

Power and network connectivity LEDs:

A green light (D1) on the 4000-OEM board indicates that all boards are powered on. An amber light (D5) verifies network connection.

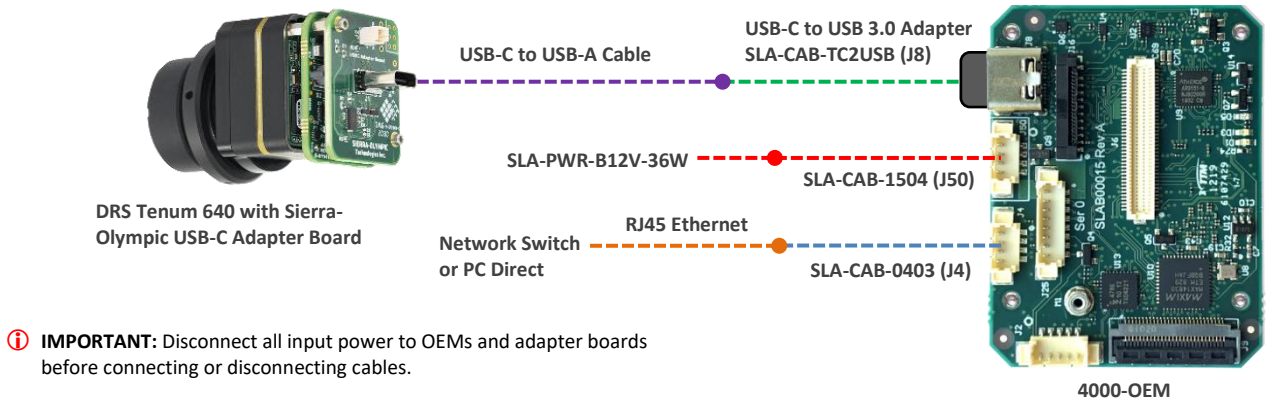


Figure 14: DRS Tenum 640 with USB-C Adapter Board - 4000-OEM USB Connection

8.4 FLIR Boson 640 and DRS Tenum Camera Configuration Notes

- Connect the camera to PC and verify it is functioning using the camera control GUI.
- Use the camera control GUI to reset the camera to factory defaults to ensure compatibility.
- In Panel Plus *Acquisition Settings* use *Cam 2* for *Camera Index.* For *Camera Type* use *USB Webcam*.
- In the *Acquisition Settings* dialog, the DRS Tenum USB camera and the FLIR Boson USB camera both use the *FLIR Boson 640 USB* option in the *Auto Fill* drop-down menu. This automatically populates the relevant fields with the correct settings.
- The *Options* field of the *Acquisition Settings* dialog can be used to change the image format captured by the system. If no options are specified (recommended) the default capture will be the raw full bit depth grayscale image.

The settings can also be manually entered as shown in the camera configuration table.

In the Video Output section of the Connect tab be sure to select CAM 2 as the Command Camera when using SightLine video processing tools.

8.5 FLIR Boson 640 and DRS Tenum USB Camera Serial Port Configuration

In addition to video over USB the FLIR Boson 640 and DRS Tenum USB camera present a serial port to the Linux OS for command and control. The 4000-OEM can be configured to pass through data to this serial port. Command and control may be established through the following methods:

- FLIR Boson Application (v3.0) / DRS camera control GUI.
- User implementation of the FLIR Boson command packet (FLIR Serial Line Packet FSLP).
- User implementation of the Tenum command packet.

1. From the main menu in Panel Plus » *Configure* » *Serial Ports*.
2. Select Port as */dev/ttySL0.*
3. Configure the protocol for *TCP Pass Through.*

A default baud rate of 115200 was used for the FLIR Boson 640 in this example. The actual baud rate may be different.

4. Click *Send*.

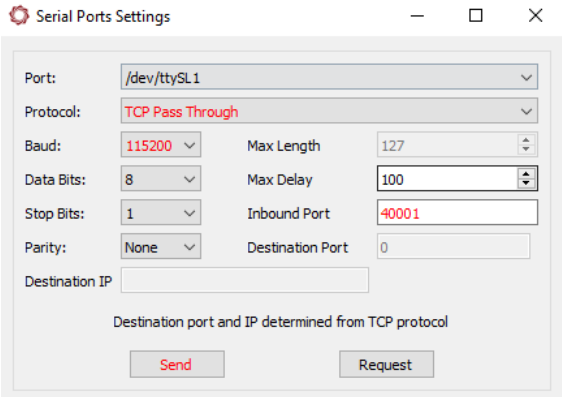


Figure 15: Configure Serial Ports

5. Save the parameters to the board and rest the board. Main menu » *Parameters* » *Save to Board*. Main menu » *Reset* » *Board*.

The Reboot step can be combined with the reboot step of the acquisition setup.

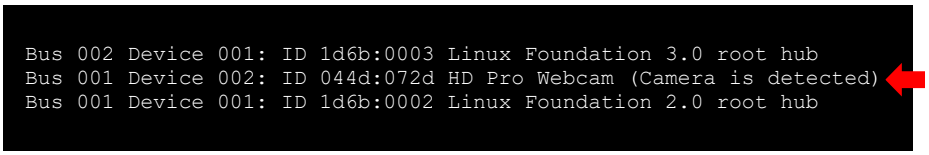
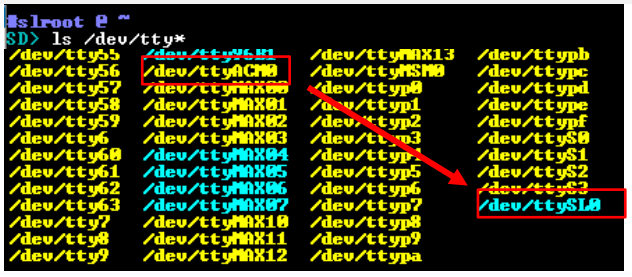
6. The OEM is now configured to send and receive data over a TCP connection.

Other passthrough options such as Serial-to-Serial are also available. For more information see EAN-Ethernet-and-Serial-Communication.

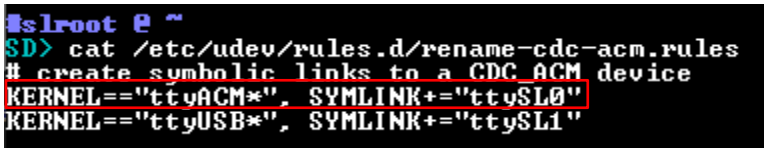
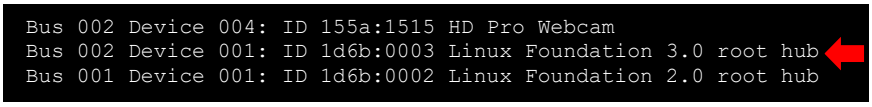
7. See *Appendix C - Virtual Com Port Setup* in EAN-Ethernet-and-Serial-Communication to set up the virtual COM port.
8. Run the FLIR Boson Application on the host PC using the new virtual serial port.

ⓘ **IMPORTANT:** When the Boson camera is connected to 4000-OEM and configured to pass through data limited functionality is expected in the FLIR Boson application. Video will also not be available in the application. Panel Plus can be used to view video. Other settings may not take affect depending on the capture mode that was selected.

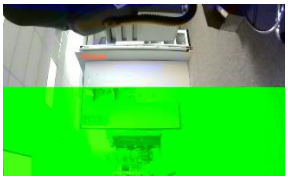
9 Troubleshooting

Video issues: • Video is not showing false color. • Video is saturated or does not look as good as the FLIR Boson application. • Some FLIR format commands do not change the video.	The default capture is raw gray scale. In the *Acquisition Settings* dialog, change the image format using the *Options* field: *fmt=NV12*.
To verify device is connected and enumerated.	1. Apply power to the board. 2. Use Tera Term to establish an SSH session to the OEM board. 3. From the root@sla-alip:~# prompt type: `lsusb`  **Figure 16: Verify Device Connected and Enumerated**
To verify serial - (/dev/ttyACM0)	1. List the available serial devices. From the root@sla-alip:~# prompt type: `ls/dev/tty*`  */dev/ttySL0 is a representational link to /dev/ttyACM0 that is automatically configured by a udev rule.*

(Troubleshooting continued)

To verify the */etc/udev/rules.d/rename-cdc-acm.rules* file exists.	Verify the contents of *rename-cdc-acm.rules* matches the following: `KERNEL==”ttyACM*”, SYMLINK+=”ttySL0”`  *The UDEV rule maps newly connected devices by matching the ttyACM* string to the new ttySL0 device.*
To verify video - (/dev/videoN)	From the root@sla-alip:~# prompt type: `ls/dev/video*` The camera should list as a video device. 
No Video, video quality is bad, video artifacts.	Connect the camera to a Windows desktop and test the camera using the Windows camera app. If any issues exist when the camera is connected to a Windows desktop and 4000-OEM, the issue may be the camera. If using a USB-C to USB 3.0 adapter, unplug the adapter from the 4000-OEM USB-C input. Turn it over and then plug it back in.
Check multiple input modes.	If the camera supports multiple output formats, it can be valuable to test all available formats for changes in performance and video quality. Follow the steps in the Camera Discovery section to list available formats for this device.
Verify cables support the USB camera.	Verify that all the cables or adapters used to connect the camera to the 4000-OEM support the USB camera being used. If an adapter or hub that only supports USB 2.0 is used with a USB 3.0 camera, the camera will not reach full framerate. Verify that the USB 3.0 camera can reach USB 3.0 speeds by ensuring the camera is on the same bus as the USB 3.0 root hub. 1. Apply power to the board. 2. Use Tera Term to establish an SSH session to the OEM board. 3. From the root@sla-alip:~# prompt type: `lsusb`  **Figure 17: Verify USB Cable Support**
Video flickering in ELP camera configuration.	Check the connection quality of the USB cable to the camera. The ELP camera has a default framerate of <30 fps. In the *Acquisition Settings* dialog window make to use *fmt=YUYV,fps=60* in the *Options* field.

(Troubleshooting continued)

Color artifacts in Kayeton camera configuration. 	Set *False Color* to *White Hot* from the *Enhance* tab in Panel Plus. Alternately, in the *Acquisition Settings* dialog window, configure the camera for 480x640 out shown in Figure 19.

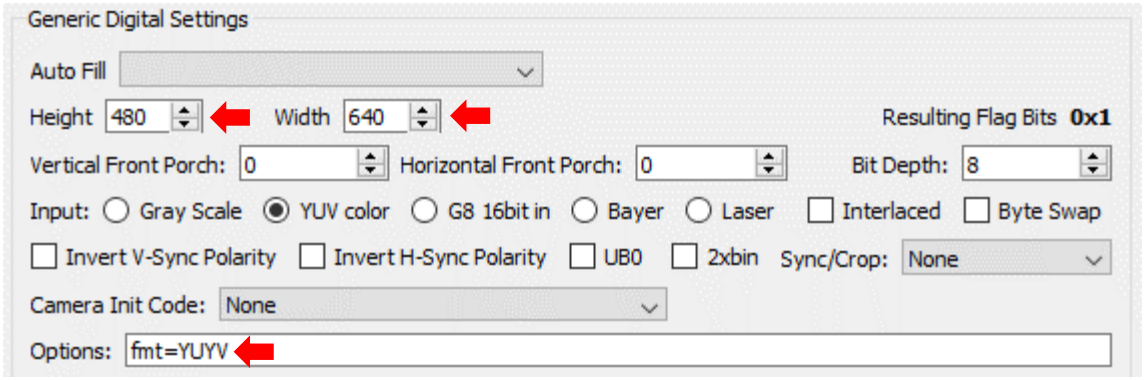


Figure 18: Kayeton 480 x 640 Camera Configuration

9.1 Questions and Additional Support

For questions and additional support, please contact SightLine Support. Additional support documentation and Engineering Application Notes (EANs) can be found on the Support pages of the SightLine Applications website.

Appendix A: 4000-OEM Dual USB Camera Limitations and Troubleshooting

In 3.5.x software and above Cam2 and Cam3 can both be configured for USB cameras, but have the following are limitations:

- Both Cam2 and Cam3 cannot have a width greater than 1280 or a height greater than 720.
- When USB 2.0 cameras are used for Cam2 and Cam3, there is a bandwidth limitation of 480Mbps resulting in unexpected framerates.

Some USB cameras that output video in a YUYV format, e.g., the Logitech C615 webcam, exceed the required bandwidth limitation and may not be compatible with a dual USB camera configuration.

Framerate troubleshooting:

With both cameras connected to the 4000-OEM, start video track. If the following error message displayed in the terminal window:

```
FATAL: VIDIOC_STREAMON returned error -1
VIDIOC_STREAMON: No space left on device
```

Try lowering the framerate of each camera using the following steps:

1. Panel Plus main menu » *Configure* » *Acquisition Settings*.

2. From the *Camera Index* drop-down menu select the index for one of the connected cameras.
3. In the Options field enter *fps=* followed by the new framerate, e.g., *fps=24*.
4. Click *Apply*.
5. Repeat the above steps for each camera. The video feed should display.
6. If video is still not displaying, see if the error message was output to video track in the terminal window.
7. If the error message persists, try lowing the resolution of one or both cameras:
   a. Panel Plus main menu » *Configure* » *Acquisition Settings*.
   b. From the *Camera Index* drop-down menu select the index for one of the connected cameras.
   c. Enter a resolution in the *Height* and *Width* fields.
   d. Click *Apply*. The video feed should display.
8. If the same error message persists, try swapping one or both cameras for a different camera.
9. Reboot the 4000-OEM.
10. In an SSH connection verify that */dev/video14* and */dev/video15* devices have been created by executing *ls -l /dev/video**.
11. If they have not been created, try disconnecting and reconnecting the video devices, and/or rebooting the 4000-OEM again.

Appendix B - USB Use Case Scenarios

B1 Use Case: USB to RS-232

The USB port (J8) cannot be connected directly to a PC. This port also cannot be used for SightLine serial command and control. However, a USB to RS-232 device can be connected to the USB port. This is accessible as */dev/ttySLn* to VideoTrack and as a normal COM port to the PC. */dev/ttySLn* can then be set for SightLine protocol for command and control or any other protocol.

B2 Use Case: USB Hubs

A USB hub can be connected to the 4000-OEM to extend the number of devices that the system can use.

SightLine recommends that any USB hub be powered separately to provide enough power to those connected devices.

B3 Use Case: Cameras with Serial Ports

USB webcams can present as both a camera (*Cam 2*) and a serial port (*/dev/ttySL0*). In this case, the camera can be setup as a standard USB webcam and the serial port can be configured for any SightLine protocol such as TCP passthrough. This would allow for commands to be sent from a client (PC or similar device) to the SightLine system and then sent to the camera. Data from the camera is then sent back to the client.

There is some latency involved in this method and care should be taken for time critical applications.

B3 Use Case: USB GPS

The example described in this section uses the Onyehn VK-162 G-Mouse USB GPS dongle with the U-blox UBX-G70xxx GNNS internal chip.

The Onyehn GPS device will output NMEA 0183 compatible strings that can be used as KLV Metadata input to the SightLine system to setup up the following:

- Set the onboard clock for timestamped video and snapshots.
- Geotag snapshots with EXIF data.
- Output as STANG compatible KLV in the MPEG2-TS along with H.264/H.265 compressed video.
- Onscreen Display (OSD) graphics such as time, altitude, and location.

Configuration and setup:

1. Configure the hardware as shown in 4000-OEM USB Camera Bench Setup.
2. Use the SLA-CAB-TC2USB adapter to the GPS device and the J8 on the 4000-OEM.
3. Apply power to the 4000-OEM.
4. The GPS device will be powered over USB.
5. Configure the serial port settings. Panel Plus Main menu » *Configure Serial Ports.*

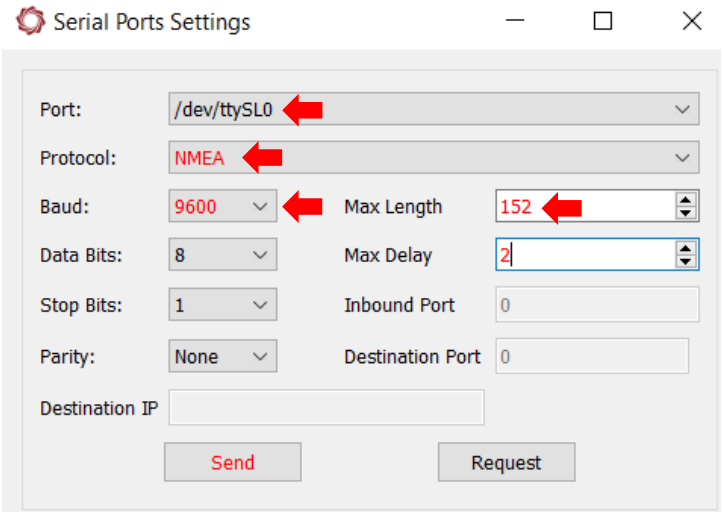


Figure B1: Serial Port Configuration - GPS Device Example

USB GPS device serial port configuration notes:

- The GPS device shows up as /dev/ttyACM0 in Linux file system. /dev/ttyACM0 is mapped to /dev/ttySL0 (port ID == 11) for use in Panel Plus or SightLine Command and Control.
- Mapping is done through a UDEV rules file (<<file name here>>)
- See SetPortConfiguration (0x3E) for details on configuring serial port settings for ttySL0.
- In this example, the GPS baud rate is set to 9600. Other devices may default to other baud rates (e.g., 4800 baud). Refer to GPS device documentation.
- This device will occasionally generate long strings rather than the usual 82 characters, so the max length has been extended to 152 characters.

6. Configure metadata sources. From Panel Plus go to main menu » *Configure* » *KLV Setup.*
7. Use the KLV Data Fields dialog window to select the MISB Tag IDs and set the source to NMEA. See EAN-KLV-Metadata for more information.

8. In Panel Plus confirm which output stream is being used and then click *Send*.

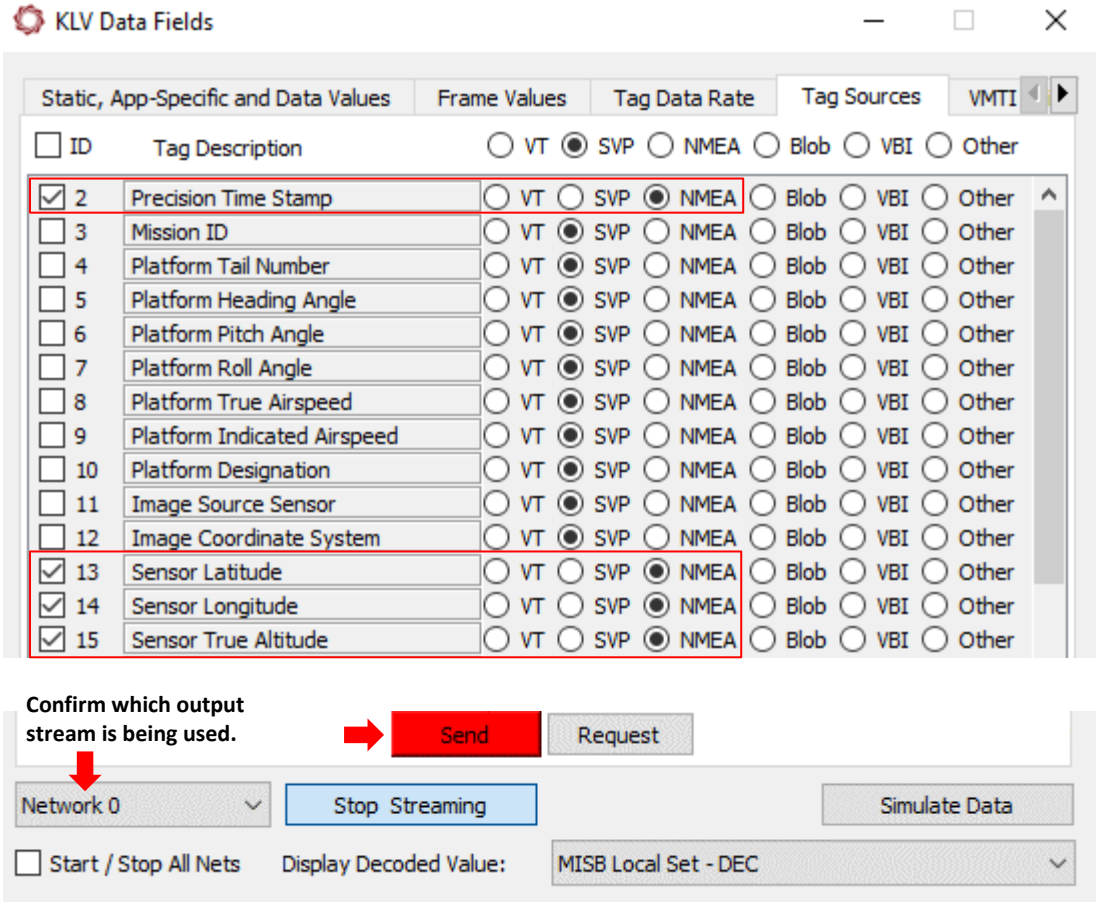


Figure B2: Configure Metadata Sources - Example

KLV data can also be used as on-screen display (OSD) overlays such as UTC, Latitude and Longitude, etc. See the KLV Data Overlays section in the EAN-Overlay-Graphics for more information.