SightLine APPLICATIONS

EAN-KLV-Metadata

PN: EAN-KLV-Metadata

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Alerts

The following notifications are used throughout the document to help identify important safety and setup information to the user:

⚠ **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 reminds 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.

Contents

List of Figures

List of Tables

Appendix

1 Overview

This document describes commands used to set MISB metadata fields for SightLine products. SightLine products can support many simultaneous sources for metadata (serial, Ethernet). Sources can include GPS devices transmitting NMEA 0183 strings, raw KLV packets from gimbal, or directly set using SightLine command and control protocol from an autopilot. KLV is then transmitted in an MPEG2-TS elementary stream along with H.264 video or by itself. Additionally, a limited set of Metadata can be selected for onscreen display.

This document also describes how to extract track box information from KLV metadata for user drawn track box overlays.

1.1 Associated Documents

EAN-Startup Guide 1500-OEM: Describes steps for connecting, configuring, and testing the 1500-OEM video processing board on the 1500-AB accessory board.

EAN-Startup Guide 3000-OEM: Describes steps for connecting, configuring, and testing the 3000-OEM video processing board on the 3000-IO interface board.

EAN-Startup Guide 4000-OEM: Describes steps for connecting, configuring, and testing the 4000-OEM video processing board

EAN-Ethernet and Serial Communication: Describes how to setup serial communications for cameras or other payload devices from SightLine hardware.

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 Download page.

Panel Plus User Guide: A complete overview of settings and dialog windows located in the Help menu of the Panel Plus application.

1.2 SightLine Software Requirements

ⓘ **IMPORTANT:** The Panel Plus software version should match the firmware version running on the board.

1.3 Application Bit Requirements

The functions described in this EAN require Application Bits (app bits) purchased from SightLine. App bits are enabled with a license file provided by SightLine at initial unit purchase or during a license upgrade process. License files use a hardware ID that is applicable to a specific hardware serial number. For questions and upgrade support contact Sales.

Table 1: Application Bits Requirement Table

Functions	Initial Software Release	Required Application Bit(s) v7 License
Encoding KLV Metadata Telemetry Output Telemetry Output (Basic)	2.22.xx	Encoding (H.264) 0x0000 0004 Encoding (H.265) 0x0001 0000 KLV 0x0000 0800 Telemetry 0x0000 0040 / Telemetry (Basic) 0x0000 8000

2 Related Commands

Set Metadata Data Values (0x13)	Sets new metadata related to airframe and converts to KLV
Set Metadata Static Values (0x14)	Sets new metadata that don't change very frequently
Set Metadata Frame Data Values (0x15)	Sets metadata related to image and object inside image
Set Metadata Rate (0x62)	Rate at which each element is injected into the stream (deprecated from firmware version 2.25, use 0x97 Set Tag Data Rate instead)
Set KLV Data (0x61)	KLV blob data constructed by user
Draw Object (0x3B)	Render text overlays automatically from Metadata
Set Appended Metadata (0x89)	Set Application Specific Metadata (user data blob)
Set Tag Data (0x96)	Set the data value of a KLV tag and KLV Subtag
Set Tag Data Rate (0x97)	Set the Tag Data Rate for klv tags
Set Tag Source Selector (0x98)	Set the tag source selector of a KLV Tag or range of tags.

2.1 Additional Related Commands

Configure Communication Port (0x3E)	KLV Passthrough
Set Advanced Moving Target Indication Parameters (0x76)	Control how many MTI tracks will be output in telemetry and KLV messages
Set Ethernet Display Parameters (0x29)	Latest values are output in MPEG2-TS
Do SnapShot (0x60)	Images can be created with EXIF metadata headers populated from MISB fields. KML or NITF files can be used as input to Google Earth or any number of GIS applications. *See EAN-File-Recording to configure Snapshot settings in Panel Plus.*
Streaming Control (0x90)	Enable / Disable streaming of KLV

3 MISB

Metadata is generated in accordance with MISB Standards in the following publications: ST 0102.10, ST 0601.11, ST 0603.2, ST 0604.3, and ST 0903.3. Published standards are available on the MISB website.

Selectable KLV elements may be chosen from a superset of the Motion Imagery Sensor Minimum Metadata Set defined in publication ST 0902.3.

For conversion of values see *Table 1: UAS Datalink Local Metadata Set data elements* in publication ST 0601.1.

For non-string values, data encoding is big-endian as defined by publication ST 0603.2. For example, to encode Target Error Estimate CE90 – specified as a uint16 value – *identifier string length* should be set to 2 (byte 6 to the most significant byte of the value and byte 7 to the least significant byte of value).

Per publication ST 0601, version identifier fields for the UAS Local Data Set, Security Metadata Local Set, and Motion Imagery Track Metadata Local Set are emitted with elements of each local set:

- Implements UAS Datalink Local Set MISB ST 0601.7 (TAG 65 = 7)
- Implements Security Local Set MISB ST 0102.10 (TAG 22 = 10)
- Implements Video Moving Target Indicator and Track Local Set MISB ST 0903.3 (TAG 4, version = 3)

3.1 Auto-Calculation of Tags

Tags such as Offset Corner Latitude and Longitude can be calculated from other tags. These can be enabled using **Set Metadata Frame Data Values (0x15)**. All four corners of the frame are assumed to be at the same elevation as the frame center for these calculations.

Tags such as Target Location and by internal tracking position and box size. Target elevation is assumed to be the same as frame center elevation, and target latitude and longitude are calculated in a manner similar to the four corners. Track gate width and height are in pixels, derived directly from target box size.

VMTI tags are calculated from internal tracking information. Multiple targets (either user designated or automatically generated) are indicated. Pixel coordinates are in display coordinates suitable for directly rendering over streamed digital video.

These tags are calculated internally from values supplied by **Set Metadata Values (0x13)** and **Set Metadata Frame Data Values (0x15)**. Their source should be set to VIDEOTRACK_INTERNAL (VT) using the Tag Source Selector (0x98) command.

3.2 Setting UTC Time

UTC is the number of microseconds which have elapsed since midnight (00:00:00), January 1, 1970 (1970-01-01T00:00:00Z). Setting the UTC time will then be used to timestamp video and snapshots by updating the system time internally.

3.3 Sample Code

Sample code for working with streaming MPEG2-TS data is available in the PC Code Support examples available on the SightLine Command / Control page.

SightLine recommends updating the Video Decoder library (SLA-Decode) to take advantage of constant improvements and new features.

4 Metadata

4.1 Standard Supported Metadata Fields

MISB Standard specifies ST 0601.11 (UAS Datalink local set) specifies 105 tags. Following tags are supported by the Sightline as default. Support for any non-default tags from the MISB set of 105 tags can be added by extending the tag support by using the command Set Tag Data (0x96).

Table 2: Standard Supported Metadata Fields

Current Metadata Data Values (0x13)	TAG	Subtag	Notes	Default Value[1]	Default Rate	ST 0902.6
UTC time	2	NA	µs	2011-11-30 10:00:00	1	Y
Platform Heading Angle	5	NA			1	Y
Platform Pitch Angle	6	NA			1	Y
Platform Roll Angle	7	NA			1	Y
Sensor latitude	13	NA			1	Y
Sensor longitude	14	NA			1	Y
Sensor True Altitude	15	NA	See Note[3]		1	Y
Sensor horizontal field of view	16	NA			1	Y
Sensor vertical field of view	17	NA			1	Y
Sensor relative azimuth angle	18	NA			1	Y
Sensor relative elevation angle	19	NA			1	Y
Sensor relative roll angle	20	NA			1	Y
Set Metadata Static Values (0x14)	**TAG**	NA	**Notes**	**Default Value**	**Default Rate**	**ST 0902.6**
Mission Identifier	3	NA	127 characters max		300	Y
Platform Designation	10	NA	127 characters max	h.264/KLV Demonstration	300	Y
Image Source Sensor	11	NA	127 characters max	Image Source Sensor	300	Y
Image Coordinate System	12	NA			300	Y
Security: Classification[2]	48	1		UNCLASSIFIED// (0x01)	300	Y
Security: Classifying country coding method[2]	48	2		STANAG 1059 Mixed (0x0C)	300	Y
Security: Classifying country[2]	48	3			300	Y
Security: SCI/SHI information[2]	48	4			300	Y
Security: Caveats[2]	48	5			300	Y

[1] Unless otherwise specified, default value will be set to zero (0).
[2] See Table 2 in MISB ST0102.10 for data type, allowed values and length

(Set Metadata Static Values (0x14) continued)

Security: Releasing Instructions[2]	48	6			300	Y
Security: Object Country Coding Method[2]	12	NA			0	Y
Security: Object Country[2]	13	NA		STANAG 1059 Mixed (0x0C)	0	Y
Motion Imagery Core Identifier	94	NA		ST-1204	300	Y
Platform Tail Number	4	NA	127 characters max		0	
Target Error Estimate CE90	45	NA			0	
Target Error Estimate LE90	46	NA			0	
Generic Flag Data	47	NA		See below	0	
Platform Call Sign	59	NA			0	
Set Metadata Frame Data Values (0x15)	**TAG**	**Subtag**	**Notes**	**Default Value**	**Default Rate**	**ST 0902.6**
Frame center latitude	23	NA			1	Y
Frame center longitude	24	NA			1	Y
Frame center elevation	25	NA	See Note[4]		1	Y
Target width	22	NA			1	
Slant range	21	NA			1	Y
User-supplied metadata flags		NA			0	
Target location specification mode latitude / row	40	NA			0	
Target location specification mode longitude / column	41	NA			0	
Target location specification mode elevation	42	NA			0	
Target track gate height	44	NA			0	
Target track gate width	43	NA			0	
Offset corner latitude points 1	26	NA			0	
Offset corner longitude points 1	27	NA			0	
Offset corner latitude points 2	28	NA			0	
Offset corner longitude points 2	29	NA			0	
Offset corner latitude points 3	30	NA			0	
Offset corner longitude points 3	31	NA			0	
Offset corner latitude points 4	32	NA			0	
Offset corner longitude points 4	33	NA			0	
VMTI LDS targets	74	NA	Variable		0	
Sensor Ellipsoid Height	75	NA	See Note[3]		0	Y
Frame Center Height Above Ellipsoid	78		See Note[4]		0	Y
Set Appended Metadata (0x89)	**TAG**		**Notes**	**Default Value**		
Application Specific Metadata Appending	100		127 characters max		0	

[3] [MISB 0601] For legacy systems, Tag 15 and Tag 75 | Tag 104 are allowed with preference for Tag 75 | Tag 104. For improved modeling accuracy use Sensor Ellipsoid Height (Tag 75) or Sensor Ellipsoid Height Extended (Tag 104).

[4] [MISB 0601] For legacy purposes, both MSL (Tag 25) and HAE (Tag 78) representations of Frame Center Elevation MAY appear in the same MISB ST 0601 packet. A single representation is preferred favoring the HAE version (Tag 78).

4.1.1 Multi Byte Data Order in SLA Command Messages (Endianness)

The SightLine Command and Control IDD specifies that all multi-byte fields are encoded with the Least Significant Byte (LSB) first, followed by MSB. This is true for the following KLV data messages as well. While the MISB specification requires big-endian format for multi-byte data fields, the SightLine command requires little endian format for multi-byte data fields.

For example, a latitude value of 305419896 (0x12345678) will be sent in a **SetMetadataValues (0x13)** message in the order 78,56,34,12. This data will be output in the MPEG2-TS KLV stream in big-endian format as per the MISB standard.

4.1.2 Set KLV Data (0x61)

This command allows for the raw input of a KLV data that was generated by a 3rd party device. The user specified KLV data will sent with MPEG2-TS stream will be sent along with the next H.264 frame.

The KLV data is not modified. It is pushed out with the KLV stream, so the multi-byte data is in the big-endian format as required by MISB. See Appendix A for an example of this command.

When using this feature, consider disabling the transmission of the built-in KLV metadata unless KLV parsing is enabled as described in section 8. To disable the built-in KLV, set Frame step (Byte 12) to 0 using command Set Metadata Rate (0x62).

4.1.3 Set Metadata Rate (0x62)

This command is deprecated in v2.25. See Set Tag Data Rate (0x97). Sets the frame step rates at which the KLV metadata is output. This allows users to control the bandwidth used by the KLV elementary stream in accordance with ST 0902.6.

4.1.4 Metadata Overlays (0x84)

Enable / disable predefined overlay graphics for Metadata.

*Starting in 2.24 this has been replaced by more flexible features in **Draw Object (0x3B)**.*

4.1.5 Set Appended Metadata (0x89)

Set application specific appended metadata. For an example of generating this message see Appendix B.

This binary message content uses Tag 100. The content must be in MISB KLV metadata format. See below for content format. Following this format is required for this message to be decoded by a MISB standard ground station.

ST0601.11.pdf

See section 6.5.4 Segment LS/Amend LS within the UAS Datalink LS

ST1607.pdf

4.1.6 Extending Default Metadata Set Using Set Tag Data (0x96)

MISB Standard specifies ST 0601.11 (UAS Datalink local set) specifies 105 tags. A subset of tags is supported by the SightLine by default using the **Set Metadata Values (0x13)**, **Metadata Static Values (0x14)**, and **Set Metadata Frame Values (0x15)**. Support for any non-default tags from the MISB set of 105 tags can be added by extending the tag support by using the command Set Tag Data (0x96).

Set Tag Data (0x96) can be used to set any value to a KLV tag and subtag as specified in 0601.11. It can also be used to set values to one of the supported default KLV tags as well.

Set Tag Data (0x96) is only supported from 2.25 firmware. For an example of generating this message see Appendix C.

4.1.7 Set Tag Data Rate (0x97)

Sets the frame step rates at which KLV metadata is output in the MPEG2-TS stream. This allows users to control the bandwidth used by the KLV elementary stream in accordance with ST 0902.6. For an example of generating this message see Appendix C. Setting the FrameStep (rate) to zero for any tag implies that it will never be sent.

4.1.8 Metadata Tag Source Selector (0x98)

Select the source for a KLV tag or a range of KLV tags. Once a source is set for a KLV tag, only that source can set values for that tag. Attempts by any other sources to set the value for the same KLV tag are ignored. This allows multiplexing KLV values set by different sources. Source selector IDs are mutually exclusive and multiple sources to the same KLV tag cannot be set.

4.1.8.1 Valid Source Selector IDs:

Command ID	= 0x01	Used by KLV related SLA commands (0x13, 0x14, 0x15)
NMEA	= 0x02	Used by NMEA
VIDEOTRACK_INTERNAL	= 0x04	Used by VideoTrack (VT) internally to update KLV tags
KLV_BLOB	= 0x08	Used for KLV passthrough and **Set KLV Data (0x61)** to send the KLV blob mixed with KLVs from other sources
VBI	= 0x10	KLV set through VBI, internal source
TEST	= 0x20	For use with unit test, 3rd party apps. Internal any APP using SightLine command and control for KLV should set selector as 1
GIMBAL	= 0x40	Reserved

See Appendix E for more details and example on setting the source multiplexer.

4.1.9 Data Synchronization

When sending KLV data to the SightLine processor it is important to understand that the packet processing and video output are asynchronous processes. As a result, even though sending one packet immediately followed by another the data could end up split between KLV packets on the output. Placing all KLV commands in one UDP packet ensures the data is processed at the same time and ends up together in the output. This synchronization is not possible if using a serial connection for command and control, or if receiving metadata from multiple sources.

5 ISO and MISB References

MPEG2-TS: ISO/IEC 13818-1

KLV Metadata

MISB standards:

0102.10 Security Metadata Universal and Local Sets for Digital Motion Imagery

0601.7 UAS Datalink Local Set

0603.2 Common Time Reference for Digital Motion Imagery Using Coordinated Universal Time (UTC)

0604.3 Timestamps for Class 1/Class 2 Motion Imagery

0903.3 Video Moving Target Indicator and Track Metadata

Selectable KLV Elements

The Motion Imagery Sensor Minimum Metadata Set is defined in the Motion Imagery Sensor Minimum Metadata Set in publication ST 0902.3.

6 User Rendering of Track Box Overlays

This section references the Panel Plus software and requires a connection to the video processing board. See the appropriate OEM startup guide for connection instructions.

It is possible to enable VMTI targets in the metadata stream and then extract this data from the resultant KLV encoded video for user rendering track boxes. This eliminates the need for a separate communication channel for receiving SLA Protocol messages for displaying track boxes.

Much of the KLV data[5] is enabled by default, however the VMTI data is not. To enable VMTI targets in the metadata stream:

1. Panel Plus main menu » *Configure* » *KLV setup* » *Frame Values.* Check the *VMti Targets* box.

Be sure to enable the frame step for VMti data to a non-zero value.

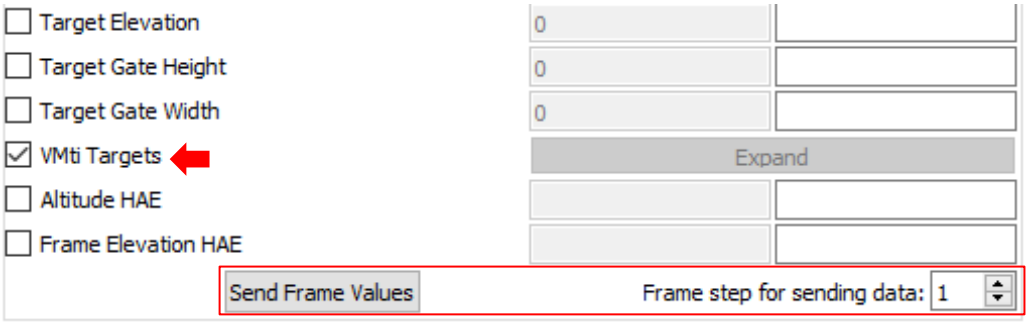
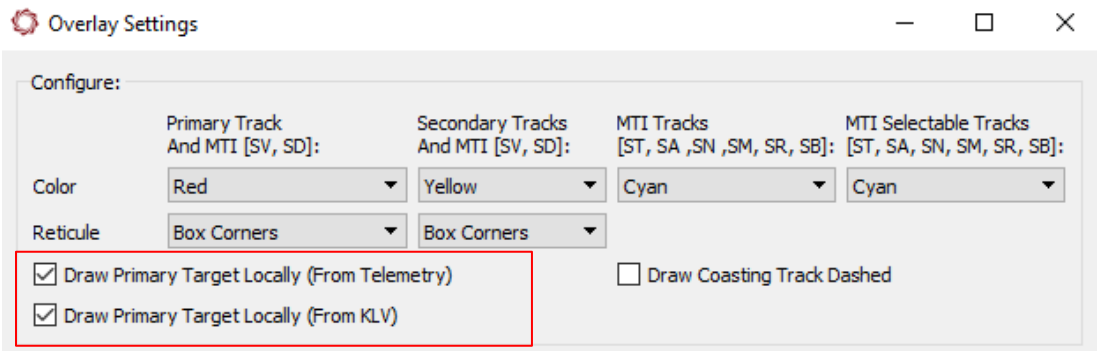


Figure 1: KLV Data Fields in Panel Plus

[5] *The SightLine SLA-Decode library can be used to register a callback to provide the decoded image and the KLV data. The KLV data is returned in the structure defined in SLAKlv.h.*

2. Panel Plus main menu » *Configure* » *Overlays.*
3. Enable the following checkboxes shown in the *Overlay Settings* dialog.



4. To convert from VMTI to display coordinates, use a similar code that gives the track box center, width and height.

```
if(m_Data.VMti.nTargets >= 1){
  s32 rowTop = m_Data.VMti.Target[0].BoundingBoxTopLeftPixelNumber / m_Data.VMti.FrameWidth;
  s32 colTop = m_Data.VMti.Target[0].BoundingBoxTopLeftPixelNumber - (rowTop*m_Data.VMti.FrameWidth);

  s32 rowBot = m_Data.VMti.Target[0].BoundingBoxBottomRightPixelNumber / m_Data.VMti.FrameWidth;
  s32 colBot = m_Data.VMti.Target[0].BoundingBoxBottomRightPixelNumber - (rowBot*m_Data.VMti.FrameWidth);

  width = colBot - colTop;
  height = rowBot - rowTop;
  row = ((rowTop+rowBot)>>1);
  col = ((colTop+colBot)>>1);
}
```

If the video is scaled in any way, it should be accounted for in the code.

5. Save and activate the settings:
   a. Main menu » *Parameters* » *Save to Board*.
   b. Main menu » *Reset* » *Board*.
   c. Wait for the system to boot, and then reconnect to the board.

7 KLV Passthrough

For additional KLV information and serial passthrough examples see EAN-Ethernet and Serial Communication .

Formatted KLV metadata may be generated by an external device. The KLV data is parsed for the Universal Key (16-bytes), the length field, and the final checksum. There is no other parsing or validation of the KLV data unless it is explicitly enabled through the Tag Source Selector (0x98).

When using this mode, internally generated KLV metadata is skipped for the frame that received the data, and then reengages for the next frame except if parsing of KLV blob is enabled as described in the next section. When passthrough of raw KLV data is used, no additional SightLine headers or checksums are necessary.

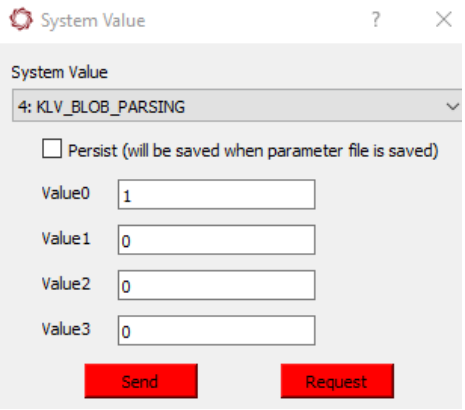
As an alternative to sending raw KLV over the serial or Ethernet, use the **Set KLV Data (0x61)** command from the SightLine Protocol, which allows the data to be sent over an Ethernet connection along with other SightLine commands.

8 Parsing KLV BLOB from Set KLV Data (0x61) or KLV Passthrough

The KLV blob received through **Set Klv Data (0x61)** or KLV passthrough is sent once. It does not get mixed with the KLV packets that are received and configured through other methods.

The system parses the received KLV blob and validates it. It then sends its component MISB tags as part of the built in KLV. To enable this feature:

1. Set the KLV_BLOB_PARSING system value to 1. From the Panel Plus main menu » *Configure* » *System Value* as shown and click *Send*.



2. Configuring the KLV tags to receive through the KLV blob using the KLV Source Multiplexer command.

Users should configure the KLV Source Multiplexer (0x98) command to enable KLV passthrough for a set of tags. The rate for the tags can be set through Set Tag Data Rate or Set Metadata Rate.

Set the selector ID as KLV_BLOB for tags that need to receive data from the KLV blob. Tags received from SightLine command and control or Video Track should be set to the corresponding selector. The KLV Source Multiplexer chooses the KLV tag values for tags based on the selector, and then sets interleaving tags parsed from KLV blob with other KLV tags.

9 KLV Blob Examples

Total Length = 43

Contains UTC (Tag 2), Sensor Latitude (Tag 13), and Sensor Longitude (Tag 14)

```
06 0e 2b 34 02 0b 01 01 0e 01 03 01 01 00 00 00 1a 02 08 00 05 70 30 04 0e 42
eb 0d 04 3f f9 00 1b 0e 04 3f f9 00 1b 01 02 c9 a2
```

10 Questions and Additional Support

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

Appendix A - Set KLV Data (0x61) Example

This command is in firmware 2.24.10 and later.

The following example describes how to include a user specified KLV blob of data in the Set KLV Data (0x61) command.

Set KLV Data (0x61) packet lengths may exceed 127 bytes. SLA commands with packet lengths greater than 127 bytes use the 2-byte packet length format. See the Sightline Applications IDD for details.

To turn off other KLV metadata sources, use the following **Set MetaData Rate (0x62)** command:

- 3000-OEM = 51,AC,0D,62,00,00,00,00,00,00,00,00,82,00,C0
- 1500-OEM = 51,AC,0B,62,00,00,00,00,00,00,00,00,00,FA

There are some KLV metadata sources that are currently not disabled with these commands and can be ignored. See SLATagDataRate (0x97).

KLV Blob

The KLV blob in the example shown below is from sightline EAN-Ethernet and Serial Communication document and contains the following data:

- 16-byte universal key: 06 0e 2b 34 02 0b 01 01 0e 01 03 01 01 00 00 00
- 3-bytes of BER long form encoding for the length (0x183): 92 01 83
- 387 bytes of data (0x183)

The following symbols are used represent the KLV blob length and the klv blob:

- <klvblob length> = 16 + 3 + 387 = 406 (0x196) bytes
- <klvblob> =

Table A1: Raw KLV Blob

```
06 0e 2b 34 02 0b 01 01 0e 01 03 01 01 00 00 00 82 01 83 03 7f 49 73 73 75 65 20 73 70 65 65 64
69 6e 67 20 74 69 63 6b 65 74 73 20 2d 2d 20 74 68 69 73 20 69 73 20 61 20 6c 6f 6e 67 20 73 74
72 69 6e 67 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 0a 7f 53 4c 41 20 53 75 70 65 72 20
45 61 67 6c 65 20 2d 2d 20 74 68 69 73 20 69 73 20 61 20 6c 6f 6e 67 20 73 74 72 69 6e 67 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 0b 7f 41 6c 74 69 63 61 6d 20 27
32 37 20 2d 2d 20 74 68 69 73 20 69 73 20 61 20 6c 6f 6e 67 20 73 74 72 69 6e 67 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

SetKLVData Command Format

The following example describes how to create a 0x61 command using the following syntax:

51 ac <len> 61 82 00 <klv blob> <chk sum>

<len> will be a 2-byte length since it is > 127

<len> = 1(61) + 2(82 00) + <klvblob length> + 1(chksum)

<len> = 1 + 2 + 406 + 1 == 410 bytes (0x19A)

<displayId> = 82 00 (for 1500 use 82 00 since this is ignored) order is LSB MSB

(3000 only) Network Display ID (0x0002=Net0, 0x0080=Net1,0x0082=both) (see the IDD)

If <displayId> is changed from this value, the checksum will need to be recalculated.

Extended length bytes from the IDD:

yy=Upper 7 bits of <len> is 0x036 m

xx=Lower 7 bits of <len> is 0x1A, with upper bit set (to indicate extended message) == 0x9A

The SetKLVData message will be: 51 ac 9a 03 61 82 00 <KLV Blob> cksum

The cksum is calculated on data starting with message ID (including 61). For this example, the cksum will be 80.

The total length of the message (including the 51 ac 9a 03 and cksum) will be 414 bytes.

The 414 bytes can be sent to the SightLine hardware and included in the network video stream through Panel Plus (header and checksum have already been added). From the main menu go to *File » Send Command.* Copy and paste command bytes into the *Send Raw Message* field.

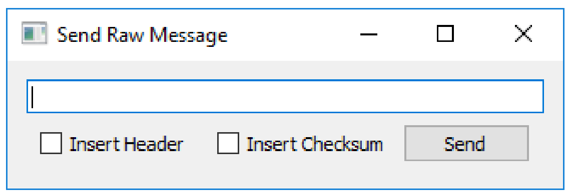


Figure A1: Send Command

If the parameters change you can use Panel Plus to calculate the checksum. Omit the final 80 in the data below, and then check the *Insert Checksum* checkbox in the *Send Raw Message* window.

```
51 ac 9a 03 61 82 00 06 0e 2b 34 02 0b 01 01 0e 01 03 01 01 00 00 00 82 01 83 03 7f 49 73 73 75 65
20 73 70 65 65 64 69 6e 67 20 74 69 63 6b 65 74 73 20 2d 2d 20 74 68 69 73 20 69 73 20 61 20 6c 6f
6e 67 20 73 74 72 69 6e 67 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 0a 7f 53 4c 41 20 53 75 70 65
72 20 45 61 67 6c 65 20 2d 2d 20 74 68 69 73 20 69 73 20 61 20 6c 6f 6e 67 20 73 74 72 69 6e 67 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 0b 7f 41 6c 74 69 63 61 6d 20 27 32 37
20 2d 2d 20 74 68 69 73 20 69 73 20 61 20 6c 6f 6e 67 20 73 74 72 69 6e 67 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 80
```

Appendix B - Set Appended Metadata (0x89) Example

This command is in firmware 2.24.10 and later. The following example describes how to create a 0x89 command using the following syntax:

51 ac <len> 89 <dataLen> <binaryData> <displayId> <chk sum>

Binary data will be embedded into KLV tag 100.

This example assumed 5 bytes of binary data (max is 127):

<binaryData> = 01 02 03 04 05

<dataLen> = 5

<displayId> = 82 00 (for 1500 use 82 00 since this is ignored) order is LSB MSB

(3000 only) Network Display ID (0x0002=Net0, 0x0080=Net1,0x0082=both) (see the IDD)

<len> = 1(89) + 1(X = data Len) + X(data Len) + 2(displayId) + 1(cksum)

1 + 1 + 5 + 2 + 1 = 10 = 0xA

Example command bytes: 51 AC 0A 89 05 01 02 03 04 05 82 00 3E

These bytes can be sent to the SightLine hardware and included in the network video stream through Panel Plus (header and checksum have already been added). Main menu *File* » *Send Command.* Copy and paste command bytes into the *Send Raw Message* field.

In 2.24.10 software the SLADecoder will decode the appended metadata and make the data available in the KLVData *struct.*

Appendix C - Set Tag Data (0x96) Example

This command is in firmware 2.25 and later. The following example describes how to create a 0x96 command using the following syntax:

51 ac <len> 96 <reserved1> <reserved2> <tagId> <tagSubId><reservedInternal ><displayId><klvdata> <chk sum>

<tagId> and <tagSubId> are the tags and subtags as specified in MISB Specification 0601.11. For the tags that do not have sub tags (for example platform heading angle) <tagSubId> value is ignored.

<ReservedInternal> should be set to 0

<Klvdata> is for the form

{ unsigned char tagLen, unsigned char tagVal[255] }

For example, if type of the tag is uin16 then <tagLen> will be 2 followed by first two bytes of <tagVal> filled with the <tagdata>. If the type of the tag is variable in length or if it is a string (similar to image coordinate system tag) then <tagLen> will be the length of the valid <tagVal> in the <tagVal> buffer.

Example 1:

Command bytes: 0x51 0xAC 0x0D 0x96 0x00 0x00 0x26 0x00 0x00 0x00 0x02 0x00 0x02 0x40 0x01 0xe2

Packet length	0x0D
Reserved1	0x00
Reserved2	0x00
Tag	0x26 (Density Altitude)
SubTag	0x00
ReservedInternal	0x00 0x00 (2 bytes - should be set to 0)
displayId	0x02 0x00 (2 bytes)
tagLen in klvData	0x02 (Density Altitude is of type uint16)
tagVal	0x40 0x01 (corresponds to a value of 320 in big-endian)
checksum	0xe2

Example 2:

Command bytes: 0x51 0xAC 0x1D 0x96 0x00 0x00 0x46 0x00 0x00 0x00 0x02 0x00 0x12 0x53 0x69 0x67 0x68 0x74 0x6C 0x69 0x6E 0x65 0x20 0x73 0x79 0x73 0x74 0x65 0x6D 0x73 0x00 0x74

Packet Length	0x1D
Reserved1	0x00
Reserved2	0x00
Tag	0x46 (Alternate platform name)
Sub Tag	0x00
ReservedInternal	0x00 0x00 (2bytes should be set to 0)
Display id	0x02 0x00 (2bytes for display id)
TagLen in klvData	0x12
tagVal	0x53 0x69 0x67 0x68 0x74 0x6C 0x69 0x6E 0x65 0x20 0x73 0x79 0x73 0x74 0x65 0x6D 0x73 0x00 (Corresponds to string Sightline systems.”)
Checksum	0x74

Bytes can be sent to the SightLine hardware and included in the network video stream through Panel Plus (header and checksum have already been added). From the main menu, go to *File* » *Send Command.* Copy and paste command bytes into the *Send Raw Message* field.

Appendix D - Set Tag Data Rate (0x97) Example

This command is in firmware 2.25 and later. The following example describes how to create a 0x97 command using the following syntax:

51 ac <len> 97 <reserved1> <reserved2> <mode> <tagId1><tagId2> <frameStep> <dispId><checksum>

<mode> is used to set rate for a range of tags.

0 Setting the rate of a single KLV tag. <tagId1> is used. <tagId2> is ignored in this case.

1 Setting the rate of a range of KLV tags to the frameStep value (tagId1, tagId1 +1, ….. , tagId2)), where <tagId1> is the start of the range and <tagId2> is the end of the range.

Example 1:

Command bytes: 0x51 0xAC 0x0B 0x97 0x00 0x00 0x01 0x02 0x69 0x01 0x00 0x02 0x00 0x27

Packet length	0x0B
Reserved1	0x00
Reserved2	0x00
mode	1
tagId1	0x02
tagId2	0x69 (105 max tag in misb 0601.11)
frameStep	0x01 0x00
displayId	0x02 0x00 (2 bytes)
checksum	0x27

All the supported tags in the range 0x02 to 0x69 will be sent at the rate of 1. KLV data for the supported tags will be sent in every frame.

Appendix E - Metadata Tag Source Selector (0x98) Example

This command is in firmware 2.25 and later. The following example describes how to create a **Tag Source Selector 0x98** command using the following syntax:

51 AC 0B 98 <reserved1> <reserved2> <mode> <tagId1><tagId2> <selector source> <dispId> <checksum>

<mode> is used to set rate for a range of tags.

0 Setting the selector of a single KLV tag. <tagId1> is used. <tagId2> is ignored in this case.

1 Setting the source of a range of KLV tags to the selector value (tagId1, tagId1 +1, ..., tagId2), where <tagId1> is the start of the range and <tagId2> is the end of the range.

Example 1:

Command bytes: 0x51 0xAC 0x0B 0x98 0x00 0x00 0x01 0x02 0x69 0x01 0x00 0x02 0x00 0x59

Packet length	0x0B
Reserved1	0x00
Reserved2	0x00
Mode	1
tagId1	0x02 - start at tag 02
tagId2	0x69 (105 - max tag supported now in 0601.11) - end at tag 105
source	0x01 0x00 - value corresponding to SightLine command and control
displayId	0x02 0x00 (2 bytes)
checksum	0x59

The command shown above will set the entire range of KLV to SightLine command and control. **Set Metadata Values (0x13)**, **Set Metadata Static Values (0x14)**, and **Set Metadata Frame Values (0x15)** packets use SightLine command and control and can be used to set the values for KLV tags.

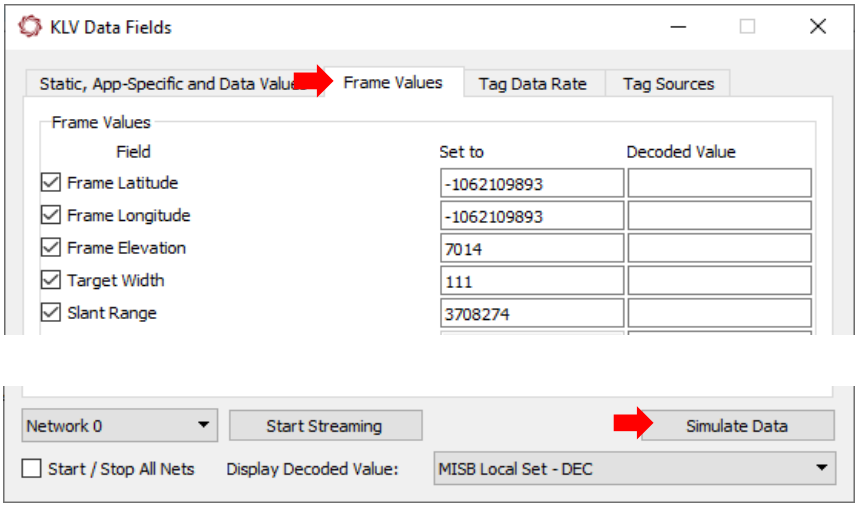
Appendix F - Validate SightLine KLV Streams

GV3.0 is a third-party tool that can be used to validate SightLine KLV streams. It is a licensed product and requires registration. If you do not have a license, you can request one via the License Request Form on their Downloads page. A specific government contract number is helpful.

SightLine has identified some instability issues with this application. If you are having issues and require additional support, please contact SightLine Technical Support.

Connect to an OEM board over an Ethernet connection using the Panel Plus application. See the appropriate OEM startup guide for connection instructions. In the example below the 3000-OEM board is used.

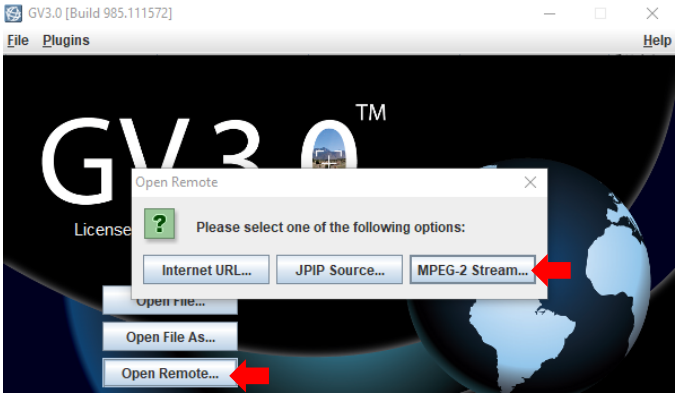
1. Set up a 3000-OEM to send simulated KLV data from Panel Plus to the OEM. From Panel Plus go to main menu » *Configure* » *KLV Setup.*
2. In the *KLV Data Fields* window click the *Frame Values* tab. Click *Simulate Data*.



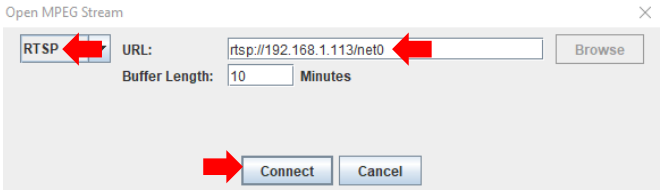
3. From the *KLV Data Fields* window, the returned data appears in the *Decoded Value* column on the *Frame Values* tab and the *Static, App-Specific and Data Values* tab.

Set to	Decoded Value
1549327714000000	1549327713985870
20206	20206
18021	18021
-7208	-7208
1020480690	1020480690
1020480690	1020480690
17184	17184
13471	13471
9830	9830
1717986918	1717986918
524940447	524940447
3770026849	3770026849

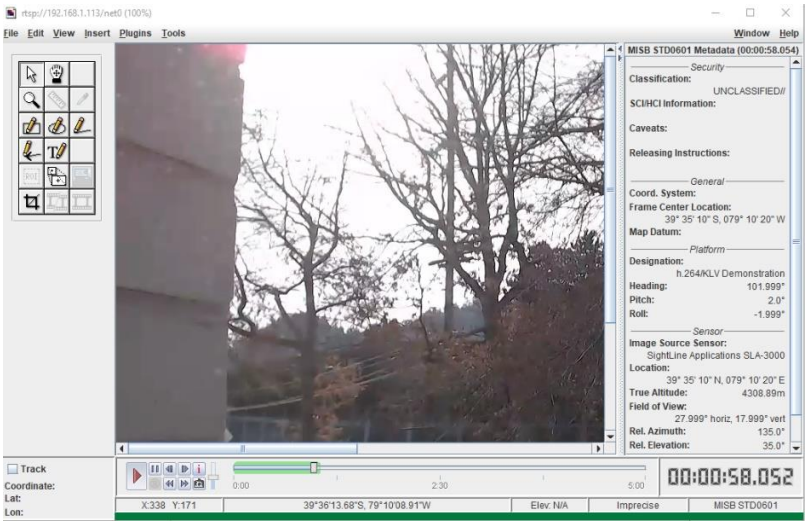
4. Install the GV3.0 application. During installation, select all plugins.
5. From Panel Plus plus click the *Compression* tab. From one of the RTP choices select a *Codec / Transport* that includes *TS*. Click *Send*.
6. Open the GV3.0 application. Select *Open Remote* » *MPEG-2Stream*.



7. From the *Open MPEG Stream* dialog window, select *RTSP* and enter the network address of the 3000-OEM board. Click *Connect*.



8. After a short delay verify video and metadata are displaying from the GV3.0 main screen.

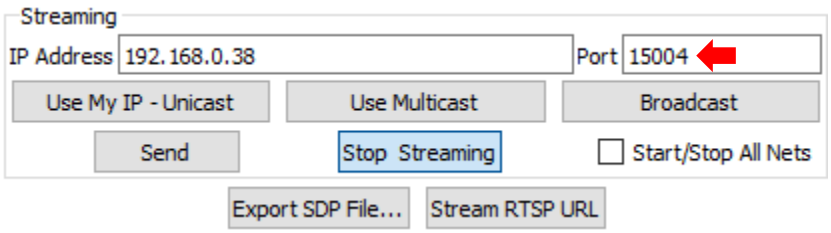


To stop streaming to GV3.0 go to File » Close. To exit GV3.0 go to File » Exit.

***IMPORTANT:** Closing the GV3.0 application using the close window icon (X) in the upper right corner can lock up the program.*

Viewing telemetry Data:

1. Start the GV3.0 application. Go to *Open Remote* » MPEG-*2 Stream*.
2. From the *Open MPEG Stream* dialog window, select *Unicast* and enter the port number found in the *Compression* tab in Panel Plus.



In some cases, streaming to the same PC in Panel Plus may need to be turned off to clear the port for the GV3.0 application. On the Multi Camera tab select the network that the PC and GV3.0 application are not running on.

The GV3.0 application will open and display the video stream and the KLV data that is being sent by Panel Plus and the Panel Plus KLV data simulator.

3. From the GV3.0 main menu » *Plugins* » *Alternate KLV Metadata Viewer* to open a window showing KLV metadata. Use the *Show Key as* drop down menu at the bottom of the window to show keys by *Name* or *UL Key* number.

Show Key as: Name

KLV (Std0601) Metadata (00:11:13.500)

Key	Value
unix time stamp	01:10:22.081 Z 05 Feb...
platform heading angle	103.99816891737238
platform pitch angle	3.999755851924192
platform roll angle	-3.999450666829432
platform designation	h.264/KLV Demonstrat...
image source sensor	SightLine Applications...
sensor latitude	34.562938676477856
sensor longitude	69.12587735295571
sensor true altitude	4310.711833371482
sensor horizontal field ...	29.998626688029297
sensor vertical field of ...	19.998168917372396
sensor relative azimut...	136.99999999650754
sensor relative elevati...	36.999999991152436
sensor relative roll ang...	323.00000010128133
slant range	4310.999066641321
target width	10.986495765621424
frame center latitude	-34.56293867647785

Show Key as: UL Key

KLV (Std0601) Metadata (00:12:10.300)

Key	Value
02	1549329079006180
05	111.99633783474479
06	11.999877925962096
07	-11.999877925962096
0A	h.264/KLV Demonstrat...
0B	SightLine Applications...
0D	34.205904805197335
0E	68.41180961039467
0F	4318.910505836576
10	37.9995422293431
11	27.999084458686198
12	145.00000002444722
13	45.00000002095476
14	315.00000007334165
15	4318.999127559131
16	18.921187151903563
17	-34.20590480519734