



NATIVE COMMUNICATIONS PROTOCOL

For the SLA Product Line

Software Version 2.18

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SightLine Product Export Controls

Exports of SightLine products and technical data are governed by the US Export Administration Regulations (EAR) (15 CFR parts 730-774) administered by the US Department of Commerce. Classification of SightLine products has been defined as ECCN 4A994 for documentation and hardware/firmware, and 4D994 for licensed software. Customers acknowledge re-export responsibility and certify that their sale or distribution of SightLine products (whether incorporated into another system or otherwise) may constitute a new export and as such must be in accordance with the requirements of the EAR.

IMPORTANT NOTIFICATION!

Individual “Getter” commands have been replaced with a single generic getter command () which takes as an input the corresponding “Setter” command type id. For Example:

	<i>Becomes...</i>
Get Version Number	GetParameter(GetVersionNumber)
51,AC,02,00,5E	51,AC,03,28,00,<KK>
Get Ethernet Video Parameters	GetParameters(SetEthernetVideoParameters)
51,AC,02,1b,e3	51,AC,03,1a,<KK>

The objective in making this change is to reduce the number of new command types required in the future. Currently when a new feature is implemented, three new commands are implemented: a setter, getter, and a results reply. With 2.17 and future releases, only a new setter and result reply will be needed. Most of the Getter function did not require any additional parameters, so a single generic getter has been implemented, which takes the Setter command ID as its parameter.

Protocol Changes

Summary of changes to protocol from previous release. See complete history [below](#).

2.18	MOD	Reset (0x01)	Added non-hardware parameter reset, camera reset.
	ADD	GetHardwareVersion (0x50)	New command to get the HWId.
	ADD	Current Tracking Positions (0x51)	New bits for drawing
	MOD	Set ADC Parameters (0x18) Current ADC Parameters (0x47)	New field for mode Adding more values to the reply
	ADD	Set System Type (0x63) Current System Type (0x65)	Configure hardware for specific applications
	ADD	Set Packet Destination (0x64)	Location where Telemetry data will be sent over the network
	MOD	Version Number (0x40)	Added application bits
	ADD	Command Pass-through (0x3D) Set SD Card Recording Parameters (0x1E)	Added ability to write user strings to an SD card log file.
	ADD	Configure Communication Port (0x3E)	Add attNav port setting.
2.17	MOD	Set Stabilization Parameters (0x02)	Color edge option in stabilization
	ADD	Parameter Block (0x6A)	Get entire parameter set in human readable form.
	MOD	Modify Tracking (0x05)	Optionally specify source image coordinates
	MOD	Set Video Mode (0x1F)	Zoom to track picture-in-picture capability added
	MOD	Version Number (0x40)	Added hardware type
	MOD	Reset (0x01)	Added ability to clear parameters
	MOD	Do SnapShot (0x60)	Added frame step and number of frames
	MOD	Set Registration Parameters (0x0E)	Allow ignore edges to ignore more of the image
	ADD	Set Coordinate Reporting Mode (0x0B)	Added get of this type
	MOD	Tracking Position (0x43)	Added frame-to-frame angle, scale and fractional offset plus frame number
	MOD	Draw Object (0x3B)	Added optionally drawing a shadow for vertical and horizontal lines.
2.16	MOD	Set Ethernet Video Parameters (0x1A)	Down Sample and Frame Step
	MOD	Set H.264 Video Parameters (0x23)	Down Sample in Set Ethernet Video Parameters
	MOD	Set Video Mode (0x1F)	Ignore number of network display output channels
	ADD	Set KLV Data (0x61)	Set binary KLV blob to be sent with H.264
	MOD	Length field is expanded to 2-bytes.	Support for longer packet, such as Set KLV Data
	ADD	Set SnapShot (0x5E) , Do SnapShot (0x60)	SnapShot functionality
	ADD	Set Acquisition Parameters (0x37)	PAL video input and output support
	ADD	Draw Object (0x3B)	FilledCircle and FilledRect types
	ADD	Set Moving Target Detection Parameters (0x2D)	New parameters; increases packet length

2.15	ADD	Current Moving Target Detection Parameters (0x54)	Reply changed; increases packet length
	MOD	Configure Communication Port (0x3E)	Enum value change for port type
	ADD	Set H.264 Video Parameters (0x23)	Configure H.264 ethernet video
	ADD	Current H.264 Video Parameters (0x56)	Returned parameters for H.264 ethernet video
	ADD	Set Overlay Mode (0x06)	Ignore edge graphics
	ADD	Set Ethernet Display Parameters (0x29)	Raw JPEG mode

Overview

This document describes the native communications protocol used by the SightLine Applications product line. The native communications protocol is a packet-based messaging protocol utilized for computer control of SightLine Applications' video embedded stabilization and tracking systems.

Coordinate Systems

Image coordinates are referenced as row and column coordinates, with the origin in the upper left corner of the frame. Increasing column values are to the right, and increasing row values are downward in the frame. Unless otherwise identified, a video frame is 640 pixels wide and 480 pixels high.

Bit & Byte Order

All bits are “right aligned”.

0xC9							
7	6	5	4	3	2	1	0
1	1	0	0	1	0	0	1
C				9			

Table 1: Example Bit Order

All multi-byte fields are Least Significant Byte (LSB) followed by MSB unless otherwise noted.

				U16		U32			
Header		Length	Type	LSB	MSB	LSB			MSB
0x51	0xAC			0x80	0x02	0xF3	0xC6	0x96	0x18
				640		412534515			

Packet Header

Every packet begins with a pair of signature header bytes (**0x51**, **0xAC**) and a length field. The length field can be 1 byte or 2 bytes long depending on the length of the packet. If the packet length is greater than 127 bytes, then the length field occupies 2 bytes. The length field is encoded as follows:

		LENGTH	Type	Type dependent			Checksum
0x51	0xAC	len	type	cs

		LENGTH >= 128		Type	Type dependent			Checksum
0x51	0xAC	xx	yy	type	cs

xx: Lower 7 bits of the length, the MSB (bit7) must be set to 1

yy: Upper bits of the length.

To obtain the length from xx and yy, here is a code snippet in C language: `Length = (yy << 7) | (xx & ~0x80);`

For example, 128 bytes is encoded as xx: 0x80, yy: 0x01.

NOTE: two bytes length field could be used for packets whose length is less than 128.

Checksum needs to be calculated for data highlighted in light blue.

The value specified in the length field is the number of bytes that follow up to and including the checksum. To ensure proper packet framing, if checksum fails, the bytes following the faulty signature header should be scanned for the the signature header bytes.

NOTE: The checksum is also necessary when communicating over Ethernet with SightLine hardware.

Length Example:

[Reset \(0x01\)](#):

		LENGTH	Type	Mode	Checksum
0x51	0xAC	0x03	0x01	0x02	0xBC
			<i>3 bytes specified by length</i>		

Table 2: Example Length Calculation

Checksum Calculation

Checksums are calculated over the bytes following the length field, up to but not including the checksum field using the following table and pseudo code:

```
const int8 crc8_Table[ ] =
{
    0,  94, 188, 226,  97,  63, 221, 131, 194, 156, 126,  32, 163, 253,  31,  65,
  157, 195,  33, 127, 252, 162,  64,  30,  95,  1, 227, 189,  62,  96, 130, 220,
   35, 125, 159, 193,  66,  28, 254, 160, 225, 191,  93,  3, 128, 222,  60,  98,
  190, 224,  2,  92, 223, 129,  99,  61, 124,  34, 192, 158,  29,  67, 161, 255,
   70,  24, 250, 164,  39, 121, 155, 197, 132, 218,  56, 102, 229, 187,  89,  7,
  219, 133, 103,  57, 186, 228,  6,  88,  25,  71, 165, 251, 120,  38, 196, 154,
  101,  59, 217, 135,  4,  90, 184, 230, 167, 249,  27,  69, 198, 152, 122,  36,
  248, 166,  68,  26, 153, 199,  37, 123,  58, 100, 134, 216,  91,  5, 231, 185,
  140, 210,  48, 110, 237, 179,  81,  15,  78,  16, 242, 172,  47, 113, 147, 205,
   17,  79, 173, 243, 112,  46, 204, 146, 211, 141, 111,  49, 178, 236,  14,  80,
  175, 241,  19,  77, 206, 144, 114,  44, 109,  51, 209, 143,  12,  82, 176, 238,
   50, 108, 142, 208,  83,  13, 239, 177, 240, 174,  76,  18, 145, 207,  45, 115,
  202, 148, 118,  40, 171, 245,  23,  73,  8,  86, 180, 234, 105,  55, 213, 139,
   87,  9, 235, 181,  54, 104, 138, 212, 149, 203,  41, 119, 244, 170,  72,  22,
  233, 183,  85,  11, 136, 214,  52, 106,  43, 117, 151, 201,  74,  20, 246, 168,
  116,  42, 200, 150,  21,  75, 169, 247, 182, 232,  10,  84, 215, 137, 107,  53
}
```

Table 3: Checksum value lookup table.

To use the table:


```

crc = 0x01;

for ( each byte_Value between length and
checksum fields)
{
    crc = crc8_Table[ crc ^ byte_Value ] ;
}

```

Table 4: Psudo code describing how to generate CRC checksum.

Checksum Calculation Example:

Data	Description	Action	CRC
0x51	Header 1	Ignored	0x01
0xAC	Header 2	Ignored	0x01
0x02	Length	Ignored	0x01
0x07	Type	Used	$0x01 \wedge 0x07 = 0x06$
Lookup result			Table[6] = 221 (0xDD)

Table 5: Example Checksum Calculation

CRC should equal 221.

Serial Port

Serial port parameters are configured:

Baud	57600
Data Bits	8
Stop Bits	1
Parity	None
Handshake	None

Table 6: Default Serial Port Configuration

See [Serial Port Parameters](#) for additional baud rates supported.

- You can set the serial port properties of the unit explicitly using the [Configure Communication Port \(0x3E\)](#) command.
- Refer the specific hardware ICD to determine if serial port is 3.3VTTL or RS-232C level signals.

Ethernet

Command and control is also available over Ethernet.

All commands can be sent as a UDP packet to the IP Address of the system on port **14001**. All replies will be sent to the IP address of the sender on port **14002**. The ports can be changed using Set Network Parameters (0x1C)

Transport Layer	UDP
Inbound Port	14001
Reply Port	14002

Table 7: Ethernet Ports Used

IP Address Assignment

- System will attempt to obtain an IP address using DHCP
- If DHCP fails, system will use a 192.168.1.ddd, where ddd is internally determined using its MAC address. Its subnet mask will be 255.255.255.0 and gateway will be 192.168.1.1
- You can set the static IP address of the unit explicitly using [Set Network Parameters \(0x1C\)](#).

IP Address	192.168.1.ddd
Subnet Mask	255.255.255.0
Gateway	192.168.1.1

Table 8: Fall-back static IP Address Assignment

Discover Protocol

When the SightLine Hardware powers up it will broadcast an SLDISCOVER packet identifying itself. The system also listens for SLADiscover Requests.

Transport Layer	UDP
IP Address	255.255.255.255
Port	51000

Table 9: Discover Protocol Packet

Discover Payload

	3	2	1	0
0	ID			
4	Length			
8	Major Version		Minor Version	
12	Software Features		Hardware Type	
16	MAC ADDRESS			
...				
36	IP ADDRESS			
...				
52	Video Address			
...				
68	NAME			
...				
100	Video Port		Reserved	

Table 10: Discover Protocol Packet Layout

Byte	Length	Name	Description
0	4	ID	Magic identifier number
4	4	Length	Discover message length
8	2	Minor Version	Discover protocol minor version.
10	2	Major Version	Discover protocol major version.
12	2	Software Features	Services provided (internal use only)
14	2	Hardware Type	See below
16	20	MAC	MAC address of sender
36	16	IP Address	IP address of sender
52	16	Video Address	IP Address where images are sent (multicast or unicast)
68	32	Name	Human Readable name of sender
100	2	Video Port	Port number where images are sent
102	2	Coms Port	Port number open to receive commands (default 14001)

Table 11: Discover Protocol Packet Description

Description	ID	Description	ID
SLA-2000-OEM	0	SLA-1500-OEM	7
SLA-2100-OEM	1	SLA-1501-OEM	8
SLA-1000-OEM	4	SLA-UPGRADE-SRV	10
SLA-PC-WIN	5		
SLA-PC-LINUX	6		

Table 12: Hardware Type ID

Commands

Common Commands

For reference purposes, below are a list of the the most frequently used commands.

Basic Stabilization and Tracking:

[Set Registration Parameters \(0x0E\)](#)
[Set Stabilization Parameters \(0x02\)](#)
[Set Tracking Parameters \(0x0C\)](#)
[Set Coordinate Reporting Mode \(0x0B\)](#)
[Modify Tracking \(0x05\)](#)

Moving Target Detection:

Set Stabilization Parameters (0x02)	Make sure you set Mode = 1 in addition to the other parameters
Set Overlay Mode (0x06)	Enable Overlays so you can see the detection boxes
Set Coordinate Reporting Mode (0x0B)	Enable reporting so the SLA-2000 sends back telemetry Flags = 7
Set Moving Target Detection Parameters (0x2D)	Set the Mode = 2 and change the THREASHOLD = 5 (default). You can adjust the threshold down (1 = most sensitive = more false positives).
Then look for the following replies: Current Tracking Positions (0x51)	

See [Set Network Parameters \(0x1C\)](#) and [Set Packet Destination \(0x64\)](#) to define where responses and telemetry will be sent. Querying the state of the hardware is now done using the generalized [Get Parameters Function \(0x28\)](#) which takes the “setter” type ID as an input. In a few cases, some more complicated messages have been implemented to get other types of results or status.version

Get Version (0x00)

Get Parameters Function (0x28)	Get Version (0x00)
--	--------------------

Reset (0x01)

Allow user to reset different aspects of the system.

Byte offset	Description	
2	Packet length = 3	
3	Packet type = 0x01	
4	Reset Type:	
	Value	Description
	0	parameters only reset to factory defaults
	1	video decoder
	2	board soft reset (reboot board with saved defaults)
	3	Stop application (SLA-1500-ONLY)
	4	Deletes any saved parameter files and soft resets the board NEW 2.17
	5	Send reset command to any known camera attached (TAU, Sony, etc) NEW 2.18
	6	Soft parameter only reset to factory defaults (does not reset network, serial port or camera type settings) NEW 2.18
	5 – 255	Reserved

Set Stabilization Parameters (0x02)

Turn on or turn off stabilization and control re-centering rate for output video. Video stabilization smooths out jumpy sequences caused by camera vibration. Default value is “on” with re-centering rate = 50. A low number (approaching 0) = a slow drift to center. A high number (approaching 255) = a fast drift to center (see note [below](#)). Maximum stabilization limit is used to set an upper bound on the time-averaged stabilization solution.

NOTE: Bit 3 of the Mode field in the [Current Stabilization Parameters \(0x41\)](#) packet indicates the state of the Auto-Bias algorithm. See [Set Stabilization Bias \(0x12\)](#) for more information on enabling Auto-Bias.

Byte Offset	Description
2	Packet length = 6

3	Packet type = 0x02	
4	Mode:	
	Bit	Description
	0	0 – Stabilization OFF (default) 1 – Stabilization ON
	1	0 – Enable all (default) 1 – Disable all registration, stabilization, enhancement, and tracking
	2	0 – Previous Images background, with blur and no color (default) 1 – Black background
	3	Reserved - NOTE: Used for Auto-Bias in Current Stabilization Parameters (0x41) .
	4	0 – Grey or black background (see bit 2) 1 - Previous Images background, no blur, with color NEW 2.17
	5 – 6	Reserved
	7	0 – Enable PIP image micro stabilization (default) 1 – Disable PIP image micro stabilization
5	Screen translation re-centering rate 0..255 (default = 50)	
6	Maximum translation stabilization limit, pixels (default = 0 for no clipping)	
7	Maximum rotational stabilization limit, degrees (default none = 0)	

Re-center (Drift) Rate:

Due to the nature of the stabilization process, large panning may cause undesirable rendering effects (display offsets). In layman's terms, the stabilization will “fight you” when you try to pan. This is most pronounced when the re-centering rate is low and there is sustained camera motion (i.e. pan). On the other hand, too high a re-centering rate will cause the stabilization algorithm to allow undesired video jitter.

Reset Stabilization Parameters (0x04)

Reset the internal motion smoothing filters that control video stabilization. Re-center the current video frame in the field of view.

Header 1	Header 2	Length	Type	Checksum
0x51	0xAC	0x02	0x04	0x3F

Set Overlay Mode (0x06)

Byte offset	Description	
2	Packet length = 5	
3	Packet type = 0x06	
4	Bits 0..3 Primary track color mode	0 = off 1 = white (default) 2 = black 3 = auto (white or black) 4 = rainbow 5 = red 6 = orange 7 = yellow 8 = green 9 = blue 10 = violet
	Bits 4..7 Primary track reticle type	0 = box corners (default) 1 = cross 2 = circle 3 = duplex crosshair 4 = modern range 5 = target dot 6..14 = Reserved 15 = box corners plus momentum track
5	Bits 0..3	Secondary track color mode (<i>SLA-2000 only</i>) Same as primary track color mode, above
	Bits 4..7	Secondary track reticle type (<i>SLA-2000 only</i>) Same as primary track reticle type, above
6	Bits 0..2	Reserved = 0
	Bit 3	Overlay Histogram 0 = don't 1 = do
	Bit 4	Overlay track index 0 = don't 1 = do
	Bit 5	Show track motion trails 0 = don't 1 = do
	Bit 6	Reserved = 0

	Bit 7	Show registration ignore edge lines NEW 2.15 0 = don't 1 = do
--	-------	--

Start Tracking (0x08) (Deprecated)

See [Modify Tracking \(0x05\)](#)

Command the system to start a track. Column and Row coordinates correspond to the pixel coordinate within a 640x480 frame of video in display (stabilized) coordinates. The origin is in the upper left corner of the image with values increasing down and to the right. Up to 5 tracks may be simultaneously engaged.

Byte offset	Description	
2	Packet length = 7	
3	Packet type = 0x08	
4	0..639: Column coordinate, LSB	
5	Column coordinate, MSB	
6	0..479: Row coordinate, LSB	
7	Row coordinate, MSB	
8	Track Modifier	
	Bit 0:	0: cursor only 1: initiate tracking
	Bit 1:	0 – Default 1 – Rotate and zoom coordinates with display
	Bit 2:	0 – Default 1 – Replace all tracks with one track at designated coordinates (SLA-2000 only)
	Bit 3:	0 – Default 1 – Add New (SLA-2000 only)
	Bit 4:	0 – Default 1 – Replace Near (SLA-2000 only)
	Bit 5:	0 – Default 1 – Designate Moving Target Near as Primary (SLA-2000 only)
	Bit 6	0 – Default 1 – Kill Near (SLA-2000 only)

Modify Tracking (0x05)

Command the system to modify tracking: start a track, stop a track, designate a track as primary, nudge a track, etc. Column and Row coordinates correspond to the pixel coordinate within a 640x480* frame of video in display (stabilized) coordinates. The origin is in the upper left corner of the image with values increasing down and to the right. Up to 5 tracks may be simultaneously engaged. See the Target Tracking Guide for more details about multiple target tracking.

* see [Current Image Size \(0x4E\)](#) for more information about capture image size

Byte offset	Description	
2	Packet length = 7	
3	Packet type = 0x05	
4	Column coordinate, LSB	
5	Column coordinate, MSB	
6	Row coordinate, LSB	
7	Row coordinate, MSB	
8	Flags	
	0x80	Rotate Zoom Modifier. OR this flag (set high bit to 1) with any any of the flags below to indicate coordinates are rotated and zoomed with the display.
	0x40	Source Coordinates. OR this flag (set bit 6 to 1) with any other of the flags below to indicate that the coordinates specified are in the source image. By default, don't set this flag (bit 6 = 0) for coordinates in the display image space. NEW 2.16
	0x00	Show Cursor only
	0x01	Kill any existing targets and then designate a new primary target at the cursor.
	0x02	Designate another target at the cursor.
	0x03	If there is a track near the coordinates, move track to coordinates.
	0x04	If there is a track near the coordinates, move track to coordinates. Otherwise, add a new track at coordinate location.
	0x05	Designate track near coordinates as primary target.
	0x06	Designate track near coordinates as primary

		target if there is one. If not, add new track at coordinates.
	0x07	If there is a track near coordinates, move track to location of coordinates and designate as primary. Otherwise, add a new track at coordinates and make primary.
	0x08	If there is a track near coordinates, move track to location of coordinates and designate as primary. Otherwise, kill all existing tracks and add a new primary track at location of coordinates.
	0x09	Kill track near coordinates.
	0x0A	Kill all tracks, but the primary track. (Coordinates are ignored).

Modify Track By Index (0x17)

Modify a particular track by its index (stop or designate as primary)

Byte offset	Description
2	Packet length = 4
3	Packet type = 0x17
4	Track Index
5	0 = Stop Track 1 = Make Primary

Stop Tracking (0x09)

Turn off all tracks.

Byte offset	Value	Description
2	0x05	Packet length
3	0x09	Packet type
4	0x00	Reserved
5	0x00	Reserved
6	0x00	Reserved
7	0x1C	Checksum

Nudge Tracking Coordinates (0x0A)

Adjust the primary track's coordinates by adding a nudge in pixel coordinate space to the current

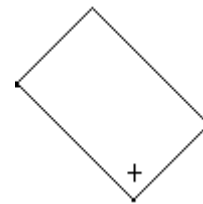
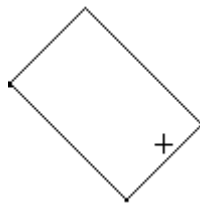
tracking coordinates.

Byte offset	Description
2	Packet length = 5
3	Packet type = 0x0A
4	-128..127: Column adjustment (2's complement signed 8-bit integer)
5	-128..127: Row adjustment (2's complement signed 8-bit integer)
6	<u>Nudge Mode</u> : 0: Do not rotate command with display 1: Rotate command with display

Nudge Mode

Applies the display rotation set using [Set Display Parameters \(0x16\)](#) to the nudge command.

Assume rotation enable to 45°.



Original Image

“Do not rotate command with display”

“Rotate command with display”

Set Coordinate Reporting Mode (0x0B)

Set the reporting rate of [Tracking Position \(0x43\)](#) and [Current Tracking Positions \(0x51\)](#) packets. The [Tracking Position \(0x43\)](#) packet contains measured previous frame to current frame offset, angle and scale, display offset/rotation, and primary track position. The [Current Tracking Positions \(0x51\)](#) packet contains the positions of all targets currently being tracked. All packets will be from the primary camera as selected by [Set Video Parameters \(0x10\)](#). Default reporting rate is “no coordinate reporting”.

Byte offset	Description
2	Packet length = 5
3	Packet type = 0x0B
4	Frame period mode: 0 = no coordinate reporting (default) 1 = report coordinates every frame (29.97 Hz)

	2 = report coordinates every 2 nd frame 3 = report coordinates every 3 rd frame ...	
5	Flags: Types of Output	
	Bit	Description
	0x00 (DEFAULT)	Send Tracking Position and Tracking Positions of primary track only. Same as 0x03
	0x01	Send Tracking Position - sends Tracking Position (0x43)
	0x02	Send Tracking Positions of primary track – sends Current Tracking Positions (0x51)
	0x04	Send Tracking Positions of non-primary tracks – sends Current Tracking Positions (0x51)
	0x20	Prioritize Stab/Track/Telemetry over Render/Enhance/Compress/Display. If this bit is on and telemetry is reported every frame, the system may skip displaying some frames so that it can maintain 30Hz telemetry output rate. NEW 2.17
	0x40	Command Replies NEW 2.18
	Unused Bits	Reserved
6	Reserved = 0	

Set Tracking Parameters (0x0C)

Set parameters used by tracking module.

Byte offset	Description	
2	Packet length = 6	
3	Packet type = 0x0C	
4	Size of object, in pixels, to track. (for user designated tracking)	
5	Mode (see below for description).	
	Bits 0..3	0 = no change FIX 2.17.8 1 = Stationary mode 2 = Vehicle mode 3 = Reserved 4 = Scene mode 5..15 = Reserved

		Note that if tracking mode is set to stationary, then all moving target detection will be turned off if it is on.
	Bit 4	High noise compensation 0 = off (default) 1 = on – improves tracking in very high noise situations
	Bits 5..7	Reserved = 0
6	Size of object of interest, in pixels. (Used for clustering in motion assist and motion detection systems.) 0 = no change.	
7	Maximum number of frames to keep looking for a non-found object before stopping a track. (Default is 45 frames or 1.5 seconds.) Controls how long a track can be off screen or obscured (eg. behind a tree) before the track will give up. 0 = no change	

Tracking Modes

- Stationary Mode** Used to track non-moving object (e.g. door, window, building, etc.).
- Vehicle Mode** Used to track moving objects. Works best with relatively constant velocity objects such as a car.
- Scene Mode** Uses frame-to-frame registration to determine position of target. May work better than Stationary Mode for low-contrast non moving targets.

Set Registration Parameters (0x0E)

Set parameters used by registration module.

Byte offset	Description
2	Packet length = 10
3	Packet type = 0x0E
4	Maximum translation in pixels, LSB – default of 0 is equivalent to 120 for a 480 high image ($\frac{1}{4}$ of the image height)
5	Maximum translation in pixels, MSB
6	Maximum rotation range in degrees per frame: 0..10 (values larger than 10 clipped to 10). 5 is default.
7	Maximum zoom range in percent zoom per frame: 0..10. 0 is default.
8	Left image edge pixel band to ignore. 0..255. Used for overlays or foreground objects that appear near the edge of the image. 0 is

	default. At least $\frac{1}{4}$ of the smaller dimension of the image must be remaining. For NTSC, remaining non-ignored image must be at least 120x120. MOD 2.17
9	Right image edge pixel band to ignore. 0..255 0 is default.
10	Top image edge pixel band to ignore. 0..255 0 is default.
11	Bottom image edge pixel band to ignore. 0..255 0 is default.

Use the “ignore edge pixel band” to indicate that the registration algorithm to not include these pixels when determining the registration match. This can be used to compensate for effects of the optics such as vignetting or when there is an obstruction along an edge of the image.

Set Video Parameters (0x10)

Set parameters used by tracking module. Default values: automatic detection of active video region, apply deinterlacing. Sending this message resets registration and stabilization.

Many cameras produce images with black pixels along one or more edges. It is important to remove these pixels as the hard edge transition can cause frame-to-frame registration to fail. The edge pixels are removed by either setting automatic detection mode or manually specifying top, bottom, left and right edge pixels to remove. For a known camera, manually specifying edge pixels is the most reliable option. If you see black edges in a moving stabilized image, that is an indication that edge pixel removal is not set up correctly.

Byte offset	Description
2	Packet length = 9
3	Packet type = 0x10
4	0 = removed specified edge pixels 1 = automatically detect boundary pixels to remove
5	Top pixels to remove (0..255)
6	Bottom pixels to remove (0..255)
7	Left pixels to remove (0..255)
8	Right pixels to remove (0..255)
9	Deinterlacing mode: 0 = no deinterlacing 1 = apply digital deinterlacing
10	Automatically reset video decoder when failed frame synchronization loss is detected 0 = Never 1 = When frame synchronization loss detected

Set Stabilization Bias (0x12)

Adjust the stabilization solution by adding a constant bias in pixel coordinate space to the current coordinates. This is used to feed forward user controlled camera motion so that stabilization does not “fight” against camera pan and tilt. If manual control information is not available and the camera will experience lots of pan and tilt, set “auto bias” mode to prevent the system from stabilizing against constant motion.

Byte offset	Description
2	Packet length = 5
3	Packet type = 0x12
4	-128..127: Column adjustment (2's complement signed 8-bit integer)
5	-128..127: Row adjustment (2's complement signed 8-bit integer)
6	1 = Enable auto bias (bytes 4 & 5 ignored) 0 = Disable auto bias

Set Metadata Data Values (0x13)

Sets new KLV metadata data values. Latest values are output with h.264 digital video stream. Metadata is generated in accordance with MISB standards 0601, 0604, and RP 0603. For conversion of values see Table 1 on page 15 of: <http://www.gwg.nga.mil/misb/docs/standards/Standard060106.pdf>.

Byte offset	Description
2	Packet length = 44
3	Packet type = 0x13
4 – 5	Valid data bit mask. Update corresponding data element when bit value = 1. Unsigned 16 bit integer
6 – 13	UTC time (bit 0) unsigned 64-bit integer
14 – 15	Platform heading angle (bit 1) unsigned 16-bit integer
16 – 17	Platform pitch angle (bit 2) signed 16-bit integer
18 – 19	Platform roll angle (bit 3) signed 16-bit integer
20 – 21	Sensor latitude (bit 4) signed 32-bit integer
24 – 27	Sensor longitude (bit 5) signed 32-bit integer
28 – 29	Sensor altitude (bit 6) unsigned 16-bit integer
30 – 31	Sensor horizontal field of view (bit 7) unsigned 16-bit integer
32 – 32	Sensor vertical field of view (bit 8) unsigned 16-bit integer

34 – 37	Sensor relative azimuth angle (bit 9) unsigned 32-bit integer
38 – 41	Sensor relative elevation angle (bit 10) signed 32-bit integer
42 – 45	Sensor relative roll angle (bit 11) unsigned 32-bit integer

Set Metadata Static Values (0x14)

Sets new KLV metadata string values. Latest values are output with h.264 digital video stream.

Byte offset	Description
2	Packet length = 4+n
3	Packet type = 0x14
4	Static element identifier: 0 = Mission Identifier 1 = Platform Designation 2 = Image Source Sensor
5	Identifier string length (<i>n</i>)
6 – (6+n-1)	Identifier string

Set Metadata Frame Data Values (0x15)

Sets new KLV metadata frame data values. Latest values are output with h.264 digital video stream.

Byte offset	Description
2	Packet length = 20
3	Packet type = 0x15
4 – 5	Valid data bit mask. Update corresponding data element when bit value = 1. Unsigned 16 bit integer
6 – 9	Frame center latitude (bit 0) signed 32-bit integer
10 – 13	Frame center longitude (bit 1) signed 32-bit integer
14 – 15	Frame center elevation (bit 2) unsigned 16-bit integer
16 – 17	Target width (bit 3) unsigned 16-bit integer
18 – 21	Slant range (bit 4) unsigned 32-bit integer

Set Metadata Rate (0x62)

Sets the frame step rates at which KLV metadata is output.

Byte offset	Description
2	Packet length = 11
3	Packet type = 0x62

4 – 11	Set rate bit mask. Update the rate for the corresponding data element when bit value = 1. The table below describes these bits. Unsigned 64 bit integer
12	Frame step at which to send the specified data values. 0=disable sending KLV metadata, 1=send each frame, etc.

Bit field number

Bit	Field
0	UTC time
1	Mission ID
2	Platform heading angle
3	Platform pitch angle
4	Platform roll angle
5	Platform designation
6	Image source sensor
7	Sensor latitude
8	Sensor longitude
9	Sensor altitude
10	Sensor horizontal field of view
11	Sensor vertical field of view
12	Sensor relative azimuth angle
13	Sensor relative elevation angle
14	Sensor relative roll angle
15	Frame center latitude
16	Frame center longitude
17	Frame center elevation
18	Target width
19	Slant range
20 – 63	Reserved

Set KLV Data (0x61)

Set KLV blob data constructed by user to be sent with H.264 stream. The KLV data will be sent along with the next H.264 frame.

When you use this feature, you may want to disable the transmission of the built-in KLV metadata. You

can do that by setting Frame step to 0 using [Set Metadata Rate \(0x62\)](#) command.

Byte offset	Description
2	KLV data length + 4 (if > 127, see below)
3	Optional high bits of KLV data length (if > 127, see below)
n	Type = 0x61
n+1	Reserved (must be 0)
n+2	Reserved (must be 0)
n+3	KLV data start
...	KLV data continued

The following is used to set the data length:

```
u16 len = KLV_Length + 4;
if(len<=127) {
    data[2] = length;
    data[3] = 0;
} else {
    data[2] = (length & 0x7f) | 0x80;
    data[3] = (length>>7) & 0xFF;
}
```

Example:

The following byte sequence is a packet with KLV data.

```
const unsigned char setKlvDataPacket[] = {
    //TotalPacketLen=163, klvLen=155
    0x51, 0xac,           // Signature bytes
    0x9f, 0x01,           // Length (159 (0x9f) bytes: type(1) + reserved(2) + KLV(155) + checksum(1))
    0x45,                 // Type (SetKlvData)
    0x00, 0x00,           // Reserved (must be 0)
    // KLV Data (155 bytes)
    0x06, 0x0e, 0x2b, 0x34, 0x02, 0x0b, 0x01, 0x01, 0x0e, 0x01, 0x03, 0x01, 0x01, 0x00, 0x00, 0x00,
    0x81, 0x89, 0x02, 0x08, 0x00, 0x04, 0xb2, 0xf0, 0xcc, 0x84, 0xe8, 0x00, 0x03, 0x29, 0x53, 0x61,
    0x6d, 0x70, 0x6c, 0x65, 0x20, 0x4b, 0x4c, 0x56, 0x20, 0x64, 0x61, 0x74, 0x61, 0x20, 0x62, 0x79,
    0x20, 0x53, 0x69, 0x67, 0x68, 0x74, 0x4c, 0x69, 0x6e, 0x65, 0x20, 0x41, 0x70, 0x70, 0x6c, 0x69,
    0x63, 0x61, 0x74, 0x69, 0x6f, 0x6e, 0x73, 0x05, 0x02, 0x00, 0x00, 0x06, 0x02, 0x00, 0x00, 0x07,
    0x02, 0x00, 0x00, 0x0d, 0x04, 0x00, 0x00, 0x00, 0x00, 0x0e, 0x04, 0x00, 0x00, 0x00, 0x00, 0x0f,
    0x02, 0x00, 0x00, 0x10, 0x02, 0x00, 0x00, 0x11, 0x02, 0x00, 0x00, 0x12, 0x04, 0x00, 0x00, 0x00,
    0x00, 0x13, 0x04, 0x00, 0x00, 0x00, 0x00, 0x14, 0x04, 0x00, 0x00, 0x00, 0x17, 0x04, 0x00,
    0x00, 0x00, 0x00, 0x18, 0x04, 0x00, 0x00, 0x00, 0x19, 0x02, 0x00, 0x00, 0x16, 0x02, 0x00,
    0x00, 0x15, 0x04, 0x00, 0x00, 0x00, 0x00, 0x01, 0x02, 0xab, 0x22,
    0x7a                 // Checksum
};
```

Set Display Parameters (0x16)

Sets new display parameter settings. Current rotation is smoothly changed to specified value, digital zoom, and false color modes may be controlled. Test pattern output

Byte offset	Description
2	Packet length = 14
3	Packet type = 0x16
4 – 5	Rotation angle in degrees (0..360) * 128
6 – 7	Rotation rate limit in degrees (0..360) * 128 per frame (29.97 Hz)
8	Decay rate 0.255
9	Lower nibble: False color mode: 0, 1 = no false color 2, 3 = white hot, black hot 4, 5 = rainbow, rainbow inverted 6, 7 = iron, iron inverted 8, 9 = hot/cold, hot/cold inverted 10, 11 = jet, jet inverted 12, 13 = hot, hot inverted 14, 15 = HSV, HSV inverted Bit 4-6: Reserved Bit 7: Zoom mode 0 = zoom to center of display 1 = zoom to tracking box 255 = Test pattern output
10	Zoom – digital image magnification factor (0.0..4.0) * 64. Magnification factors < 1.0 are interpreted as 1.0.
11, 12	Display pan column offset in pixels (-32767 to 32768).
13, 14	Display tilt row offset in pixels (-32767 to 32768).
15	Logical Camera Index Specifies the logical camera to apply the false color field to (byte 9). See Set Video Mode (0x1F) (bytes 8-11) for information about setting logical camera order. Note: 0 is assumed if parameter is not supplied.

Get Display Parameters (0x3A)

Query the system for the current display parameters. Results in the transfer of a [Current Display Parameters \(0x57\)](#) packet.

Byte offset	Description
2	Packet length = 3
3	Packet Type = 0x3A
4	Logical Camera Index. Specifies the logical camera's index to retrieve enhancement parameters of. Note: 0 is assumed if parameter is not supplied.

Set ADC Parameters (0x18)

Set parameters of the video analog-to-digital converter. See also Current ADC Parameters (0x47).
Not functional on Digital Camera Inputs.

Byte offset	Description
2	Packet length = 12
3	Packet type = 0x18
4	Brightness 0 = dark 128 = default 255 = bright
5	Contrast 0 = minimum contrast 128 = default 255 = maximum
6	Saturation 0 = no color 128 = default 255 = maximum
7	Hue 8-bit signed integer (-128..127) 0 = default
8	Luma processing control #1 register (0x07) 96 (0x60) = default
9	Luma processing control #2 register (0x08) 0 = default
10	Luma processing control #3 register (0x0E) 0 = default
11	Chroma processing control #1 register (0x1A) 12 (0x0C) = default
12	Chroma processing control #2 register (0x1B)

	20 (0x14) = default
13	Reserved NEW 2.18

Set Ethernet Video Parameters (0x1A)

Effects the quality (RTP-MJPEG only), size and frame rate of the individual video frames sent over Ethernet. See [Set H.264 Video Parameters \(0x23\)](#) for additional H.264 specific parameters.

Byte offset	Description
2	Packet length = 6
3	Type = 0x1A
4	Quality – MJPEG video only. 0: lowest image quality to 100: highest image quality 0 to 100 (default 80)
5	Foveal – MJPEG video only. Reduces image quality for pixels away from image center. 0: no quality reduction, 100: maximum quality reduction. 0 to 100 (default 0)
6	Frame Step - 1 shows every frame, 2 shows every other frame, etc. Applies to both MJPEG and H.264 Ethernet video. 1 to 120 (default 1) NEW 2.16
7	Down Sample - Whole integer value that image will be down sampled by. 1 – no downsample, 2 – 2x2 downsample, 4 – 4x4 downsample. Applies to both MJPEG and H.264 Ethernet video. NOTE: Down Sample 4 is not supported for MJPEG on SLA-2x00. (default 1) NEW 2.16

Set Network Parameters (0x1C)

Configure the network settings for the device.

NOTE: For parameter changes to take effect, a board soft reset should be performed, by issuing [Save Parameters \(0x25\)](#) and [Reset \(0x01\)](#) (Reset Type = 2, soft reset) messages.

Byte offset	Description
2	Packet length = 20 MOD 2.16
3	Packet type = 0x1C
4	Mode
	0 Use DHCP (remaining field ignored)
	1 Use Static IP address
5 – 8	IP ADDRESS (dot form, eg. 192 168 1 197)

	0 = No Change MOD 2.16	
9 – 12	Subnet (dot form, eg. 255 255 255 0) 0 = No Change MOD 2.16	
13 – 16	Gateway (dot form, eg. 192 168 1 1) 0 = No Change MOD 2.16	
17	MSB	Command and Control Reply Port (0 = No Change) MOD 2.16
18	LSB	
19	MSB	Telemetry Reply Port (0 = No Change) (See Tracking Position (0x43) and Current Tracking Positions (0x51) MOD 2.16
20	LSB	
21	Modes	
	Bit	Description
	0 – 1	Reserved
	2	0 – Last In First Out 1 – Disable Last In First Out
	3 – 7	Reserved
22	Network Interface Index (see GetNetworkInterfaces)	

Command and Control Reply Port – Port on remote device that SLA-HARDWARE will send outbound replies to any received commands. Zero (0) indicates no change. Default port is 14002. Client should create a listening socket on this port. See [Discover Protocol](#) for inbound port that SLA-HARDWARE is listening for commands.

Telemetry Reply Port – Port on remote device that SLA-HARDWARE will send all Telemetry responses (0x43, 0x51, etc.) Zero (0) indicates no change. Default is 14002. If **different** from Command and Control Reply Port telemetry responses will **NOT** be sent to Command and Control Reply Port. Client should create an additional listening socket on this port if different from C2 port.

Get Network Parameters (0x1D)

Generates a [Current Network Parameters \(0x49\)](#) packet.

Header 1	Header 2	Length	Type	Index	Checksum
0x51	0xAC	0x02	0x1D		

Set SD Card Recording Parameters (0x1E)

Modify recording parameters for **on board video** and other data recording to secure digital card. For SnapShot recording see [Set SnapShot \(0x5E\)](#).

Byte offset	Description
-------------	-------------

2	Length = 11 + Length of label (see Byte 12)	
3	Type = 0x1E	
4	Modify Recording State	
	0	Don't Change State
	1	Start Recording (requires mode (byte 10) and filename (byte 12))
	2	Stop Recording
	3	Enable network debug trace of commands and responses
	4	Disable network debug trace of commands and responses
	5	Enable network debug trace of telemetry
	6	Disable network debug trace of telemetry
5	Clear Flash	
	0	Don't clear
	1	Clear flash. If a recording is in progress, it will be stopped.
	2	If a file name is specified, only that file will be deleted.
6	Reserved	
7	Get Directory	
	0	Don't get directory
	1	Get directory information. (See Current SD Card Directory Contents (0x59)) If a file name is specified (byte 12), it will be interpreted as a path (SLA-1500 only?)
8 & 9	Reserved	
10	Record Type – specified as bits, but only commands and telemetry can be recorded together.	
	0x01	H.264
	0x02	JPEG
	0x04	Commands (file name will have .log appended)
	0x08	Output Telemetry
	0x10	Pass-through log file – log data sent by Command Pass-through (0x3D) to an SD card file.
11	Reserved	
12	Length of filename or a path Set to 0 if no label is necessary.	

13...13+labelLength-1	[OPTIONAL] Filename or path name When recording a video, file extension “.ts” is added to the file name. This video can then be played back in VLC.
-----------------------	---

Example 1: Record commands to MicroSD

Start recording Commands to MicroSD

0	1	2	3	4	5	6	7	8	9	10	11	12	13 - 17	18
0x51	0xAC	0x10	0x1E	0x01	0x00	0x00	0x00	0x00	0x00	0x04	0x00	0x05	hello	checksum

Stop Recording Command

0	1	2	3	4	5	6	7	8	9	10	11	12	13
0x51	0xAC	0x0B	0x1E	0x02	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	checksum

At this point the video file *Vid32.sla* and *Vid32_00042_whale.jpg* will found on the MicroSD card.

Example 2: Get the Directory Contents of the MicroSD Card

0	1	2	3	4	5	6	7	8	9	10	11	12	13
0x51	0xAC	0x0B	0x1E	0x00	0x00	0x00	0x01	0x00	0x00	0x00	0x00	0x00	0x05

NOTES:

- System may stall for several seconds while writing video file to MicroSD Card when the STOP RECORDING command is issued.
- File name extension (.ts) is recommended.

Set Video Mode (0x1F)

Configures capture and display options.

Byte offset	Description	
2	Packet length = 16	
3	Type = 0x1F	
4	Number of Input Camera channels (1-5) – this parameter is ignored, hardware determines the number.	
5	NEW 2.16 – this parameter is ignored, Display Destination determines the value for number of network outputs.	
6	Display Mode	
	Value	Description

	0	One UP
	1	Picture In Picture
	2	Two Up
	3	Quad Screen
	4	Blended
	5	Stitch
	6	Side-By-Side
	7 – 15	Reserved
7	Display Destination	
	0,1	Analog Video
	2	Network
	3	Analog and Network
	4	HD-SDI 720P (SLA-2100 only)
	5	HD-SDI 1080P (SLA-2100 only)
	6	HD-SDI 1080I (SLA-2100 only)
	7 – 15	Reserved
8 – 11	Camera Stabilize Order	
12	PiP Scale 0 = don't change 1 = $\frac{1}{4}$ screen size thumbnail of full screen 2 = $\frac{3}{8}$ screen size thumbnail of full screen 3 = $\frac{1}{2}$ screen size thumbnail of full screen 4 = $\frac{1}{4}$ screen size zoom on primary track NEW 2.17 5 = $\frac{3}{8}$ screen size zoom on primary track NEW 2.17 6 = $\frac{1}{2}$ screen size zoom on primary track NEW 2.17	
13	PiP Quadrant	
	Value	Description
	0	Top Right
	1	Bottom Right

	2	Bottom Left
	3	Top Left
14-17	Camera Display Order	

Display Modes

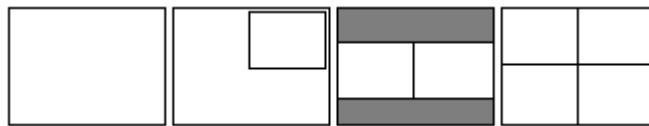


Illustration 1: Display Modes

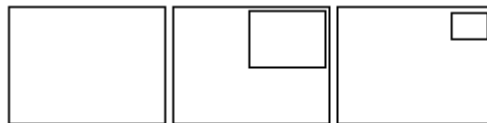


Illustration 2: Picture-In-Picture Scale



Illustration 3: Picture-In-Picture Quadrant

Set Video Enhancement Parameters (0x21)

Set parameters of the video analog-to-digital converter.

Byte offset	Description	
2	Packet length = 6	
3	Packet type = 0x21	
4	Enhancement Mode	
	Bits 0..3	Enhancement filter mode: 0 = None (default) 1 = CLAHE 2 = LAP
	Bits 4..7	Sharpening: 0 (none)..15 (max)
5	Alpha blending term 0..255 (200 nominal):	

	0 = use input frame only 128 = 50/50 mix 255 = use filtered frame only)	
6	Enhancement Parameter (Kernel)	
	Bits 0..6	0..127 None: not used CLAHE: contrast limit (typical 25) LAP: width of high pass kernel, clipped to 0..18. (typical 10)
	Bit 7	Limit Color. Limits the color near edges where aliasing effects might be scene.
7	Denoising coefficient (by running average): 0 = No denoising (default) 128 = 50/50 mix 255 = maximum averaging	

Set H.264 Video Parameters (0x23)

Modify H.264 output behavior. See also [Set Ethernet Display Parameters \(0x29\)](#) to set the receiver IP address, [Set Metadata Frame Data Values \(0x15\)](#) to set KLV meta-data and [Set Ethernet Video Parameters \(0x1A\)](#) to change Down Sample and Frame Step. See also [Current H.264 Video Parameters \(0x56\)](#).

Byte offset	Description	
2	Packet length = 11	
3	Packet Type = 0x23	
4 – 7	Target Bit Rate (bits per second) [LSB] (Default 1500000)	
8	Intra Frame (I-frame) Interval (frames) (Default 30)	
9	LF Disabled IDC	
	0	Filter All Edges (Default)
	1	Disable All Filtering
	2	Disable Slice Edge Filter
	3 – 255	Reserved
10	Adaptive Intra Refresh AIR Mega-Block Period (frames) * (Default 0)	
11	Slice Refresh Row Number – number of rows to coded as each intra-slice* (Default 0)	
12	Reserved – See Set Ethernet Video Parameters (0x1A) to change Down Sample and Frame Step for Ethernet video. MOD 2.16	

13	Checksum
----	----------

NOTES:

- To use Mega-Block Period or Slice Refresh, I-Frames must be set to zero (0).
- Problem: Target bit rate parameter changes don't take affect unless I-frame interval changes.
- Solution: when user commands target bit rate parameter change:
 - Change iframe interval to something random and set target bit rate to desired target bit rate
 - Change iframe interval back to old iframe interval.
 - Maximum bit rate: 10Mbits (10000000)

Save Parameters (0x25)

Commits current parameters to flash. Parameters are then loaded when system restarts.

Byte offset	Value	Description
0	0x51	fixed header byte 1
1	0xAC	fixed header byte 2
2	0x02	Packet length
3	0x25	Packet Type
4	0x42	Checksum

Get Parameters Function (0x28)

The value of the **ID** field corresponds to the “Setter” of the same type. Response packets are unique and have their own ID.

Name	Header		Length	Type	ID	Checksum
Get Version Number	0x51	0xAC	0x02	0x28	0x00	0x73
Set Stabilization Parameters	0x51	0xAC	0x02	0x28	0x02	0xcf
Set Overlay Mode	0x51	0xAC	0x02	0x28	0x06	0xae
Set Tracking Parameters	0x51	0xAC	0x02	0x28	0x0C	0xd0
Set Coordinate Reporting Mode	0x51	0xAC	0x02	0x28	0x0B	0x53
Set Registration Parameters	0x51	0xAC	0x02	0x28	0x0E	0x6c
Set Video Parameters	0x51	0xAC	0x02	0x28	0x10	0xee
Set ADC Parameters	0x51	0xAC	0x02	0x28	0x18	0x2c
Set Ethernet Video Parameters	0x51	0xAC	0x02	0x28	0x1A	0x90
Set Video Mode	0x51	0xAC	0x02	0x28	0x1F	0xaf
Set Video Enhancement Parameters	0x51	0xAC	0x02	0x28	0x21	0x0e
Set H.264 Video Parameters	0x51	0xAC	0x02	0x28	0x23	0xb2
Set Stitch Parameters	0x51	0xAC	0x02	0x28	0x2B	0x70
Set Moving Target Detection Parameters	0x51	0xAC	0x02	0x28	0x2D	0xad
Set Blend Parameters	0x51	0xAC	0x02	0x28	0x2F	0x11
Get Image Size	0x51	0xAC	0x02	0x28	0x31	0x93
Set Ethernet Display Parameters	0x51	0xAC	0x02	0x28	0x29	0xcc
Set SnapShot	0x51	0xAC	0x02	0x28	0x5E	0xb7
Set Parameter Block	0x51	0xAC	0x02	0x28	0x69	0x8a
Get Hardware ID	0x51	0xAC	0x03	0x28	0x50	0xa8

Set Ethernet Display Parameters (0x29)

Sets destination IP address and port number. Indicates whether address is Unicast or Multicast. Configures output format of Ethernet Video.

Byte offset	Description	
2	Packet length = 9	
3	Type = 0x29	
4	Bits	Description

	0..3	Video Mode
	0	RTP MJPEG (default)
	1	H.264
	2	RTP MJPEG Source sends compressed source input image
	3 - 14	RESERVED
	15	NONE
	4..6	Reserved, set to 0
	7	Broadcast Ethernet video
	0	Disable Broadcast Video (default)
	1	Enable Broadcast (e.g. 255.255.255.255) Note setting this option may interact strongly with other network traffic. Use with caution. Effects H.264 video ONLY.
5 – 8	IP Address	
9 – 10	Base Port Number	

Example:

Tell the SLA-HARDWARE to send RTP-MJPEG video to IP address **192.168.1.140** on port **5004**.

Header		LEN	TYPE	MODE	IP Address				Port		CHK
0x51	0xAC	0x09	0x29	0x00	0xC0	0xA8	0x01	0x8c	0x8c	0x13	0x5B
					192	168	1	140	5004		

Set Display Adjustments (0x2A)

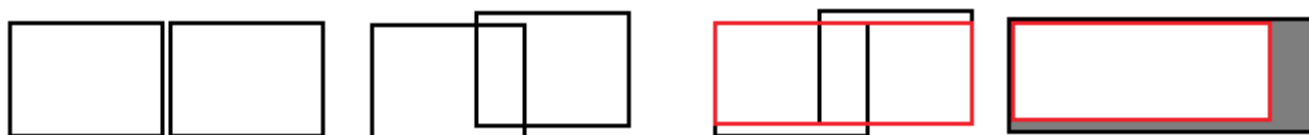
Set the parameters for fine-tuned adjustments of the display.

Byte offset	Description
2	Packet length = 8
3	Packet type = 0x2A
4,5	Ratio of secondary to primary imager zoom levels multiplied by 256
6, 7	Display pan column offset in pixels (-32768 to 32767). Signed 16-bit integer
8, 9	Display tilt row offset in pixels (-32768 to 32767). Signed 16-bit integer

Set Stitch Parameters (0x2B)

Set the parameters for image stitching mode. Requires [Set Video Mode \(0x1F\)](#) be used to set number of camera inputs to 2, display to Network Mode.

Byte offset	Description
2	Packet length = 10
3	Packet type = 0x2B
4	Reserved = 0
5	Shift camera one up. (0 ... 255) number of pixels
6	Shift camera one right. (0 ... 255) number of pixels
7	Shift camera one down. (0 ... 255) number of pixels
8	Shift camera one left. (0 ... 255) number of pixels
9	Reserved = 0
10	Reserved = 0
11	Reset calibration. (1 == reset, 0 == don't)



Two raw images

Right Images is shifted
relative to the left

The maximum overlap is
calculated

Final image is displayed
in a 1280x480 window

Set Moving Target Detection Parameters (0x2D)

Set the parameters for Moving Target Detection. Results in [Current Tracking Positions \(0x51\)](#) results being generated. See also [Set Coordinate Reporting Mode \(0x0B\)](#).

Byte offset	Description
2	Packet length = 8
3	Packet type = 0x2D
4	0 = Don't change motion modes
Bit 0	1 = Disable All (Other bits ignored)
Bit 1	0 = Disable motion watching 1 = Enable motion watching
Bit 2	0 = Disable motion assistance of primary target 1 = Enable motion assistance of primary target

		only
	Bit 3	0 = Disable motion assistance of all targets 1 = Enable motion assistance of all targets
	Bit 4	0 = Disable motion detection 1 = Enable motion detection Note that if any moving target detection mode is enabled, tracking mode will be set to vehicle tracking.
	Bit 5	Reserved
	Bit 6	Enable Small Target Moving Target Indication (MTI) Mode. If this bit is set, the lower order bits will be ignored.
5	0 = Disable MTD debug display (default) 1 = Enable MTD debug display This parameter is ignored if bit 6 of byte 4 is enabled, small target moving target detection mode.	
6	Bit 6 of Byte 4 set to 0	0 = Don't change threshold value. 1...10 Set threshold value. 1 = lowest threshold. 10 = highest threshold. Default threshold is 5. The moving target detection threshold refers to the algorithm's "threshold" for deciding whether a particular candidate moving target is a moving target or a false positive. A lower threshold translates into greater sensitivity to moving targets and faster detection time, but also may introduce more false positives. A higher threshold translates into less sensitivity to moving targets, higher detection time for a given candidate, but less false positives.
	Bit 6 of byte 4 set to 1	MTI sensitivity. 0 = High Sensitivity, 4 = Low Sensitivity This is parameter trades-off between detection performance and frequency of false positives.
7	Small target MTI threshold. This parameter is ignored unless bit 6 of byte 4 is set to 1. This is an advanced a parameter. It controls the threshold at	

	which potential moving targets are generated. The sensitivity parameter controls MTI threshold when this parameter is set to 0. Otherwise, it overrides the sensitivity parameter (byte 6).
8	<p>Small target moving target detection watch frames. This parameter is ignored unless bit 6 of byte 4 is set to 1.</p> <p>This is an advanced parameter. After a potential moving target is generated by the moving target detection system, it is watched by the system for a number of frames. This controls the number the system watches a moving target for before, displaying it. The sensitivity parameter controls MTI watch frames when this parameter is set to 0. Otherwise, it overrides the sensitivity parameter (byte 6).</p>
9	<p>Small target MTI threshold. This parameter is ignored unless bit 6 of byte 4 is set to 1.</p> <p>This is an advanced parameter. It enables or disables the burst frame prevention mechanism. Occasionally, if there is a mis-registration (during a fast pan for example), the MTI system may generate a “burst” of false positives. By default, it should be set to 1 unless there is a specific reason for disabling it.</p>

Set Blend Parameters (0x2F)

Requires [Set Video Mode \(0x1F\)](#) be used to set number of camera inputs to 2.

Byte offset	Description	
2	Packet length = 15	
3	Packet type = 0x2F	
4	1 = Interpret bytes 5&6 as absolute offsets 0 = Interpret bytes 5&6 as incremental offsets	
5	<p>Signed Character</p> <p>Set/Shift IR camera position vertically. (-128...127) number of pixels.</p> <p>Negative number = up Positive number = down</p> <p>If byte 4 is 1, then field is interpreted as absolute offset e.g. new IR horizontal offset (relative to EO image) = byte 5</p> <p>If byte 0 is 1, then field is interpreted as incremental offset e.g. new IR vertical offset (relative to EO image) = old IR vertical position + byte 5</p>	
6	<p>Signed Character</p> <p>Set/Shift IR camera position horizontally. (-128...127) number of pixels.</p> <p>Negative number = left Positive number = right</p> <p>If byte 4 is 1, then field is interpreted as absolute offset e.g. new IR horizontal offset (relative to EO image) = byte 5</p> <p>If byte 0 is 1, then field is interpreted as incremental offset e.g. new IR horizontal offset (relative to EO image) = old IR vertical position + byte 5</p>	
7	Rotation (1 ... 255) maps to (-5 ... 5) degrees	
	0 = don't change rotation/default.	
8	Zoom (1 ... 255) maps to (0.9 ... 1.1).	
	0 = don't change zoom/default.	
9	Blend mode:	
	Value	Description
	0	don't change/default.

	1	FrameBlend
	2	ThermalBlend
	3	NightBlend
10	IR amount (1 ... 255) maps to (0 ... 1). 0 = don't change/default. IR amount means the amount of IR luminance information to include in the blended result. This parameter applies to FrameBlend, NightBlend, and ThermalBlend modes.	
11	Hue scale factor. Amount of yellow hue to apply to the EO camera in FrameBlend and NightBlend modes. 0 = No Change 1 = No Hue ... 255 = Full Hue	
12	Reserved = 0	
13	IR calibration reset (0 or 1). Resets the IR image calibration (zoom, rotate, shift up/down/left/right) back to default.	
14	Reserved = 0	
15	EO Camera Index	
16	IR Camera Index	

Designate Selected Track Primary (0x32)

Command the system to designate the selected track as primary.

Header 1	Header 2	Length	Type	Checksum
0x51	0xAC	0x02	0x32	0x5C

Shift Selected Track (0x33)

Command the system to shift the selected track to the next track. See [Designate Selected Track Primary \(0x32\)](#) and

Header 1	Header 2	Length	Type	Checksum
0x51	0xAC	0x02	0x33	0x02

Set Acquisition Parameters (0x37)

Configure video input for digital camera interfaces.

NOTE: For changes between NTSC and PAL camera mode to take effect, a board soft reset should be performed, by issuing [Save Parameters \(0x25\)](#) and [Reset \(0x01\)](#) (Reset Type = 2, soft reset) messages.

Byte offset	Description
-------------	-------------

2	Length = 9
3	Type = 0x37
4	Video Port Index. 4 for SLA-2000 CameraLink, 2 for SLA-2100 HD-SDI, 0 for SLA-1500.
5	Video Port Types
6 – 7	High (pass 0 for default)
8 – 9	Wide (pass 0 for default)

Video Port Types

Port ID	Description	Hardware Support
0	Disabled	
1	NTSC	SLA-2000, SLA-2100, SLA-1500
2	Generic Digital	SLA-2000 CameraLink
3	Sentech CL33A	SLA-2000 CameraLink
4	Goodrich SU640HSX	SLA-2000 CameraLink
5	Nova Eagle MWIR 640	SLA-2000 CameraLink
6	Sentech STC-HD133DV	SLA-2000 Digital
7	720P	SLA-2100 HD-SDI or SLA-1500-SONY
8	1080P	SLA-2100 HD-SDI or SLA-1500-SONY
9	1080I	SLA-2100 HD-SDI or SLA-1500-SONY
10	FLIR TAU 640 8 Bit	SLA-2000 CameraLink or SLA-1500
11	FLIR TAU 640 14 Bit	SLA-2000 CameraLink or SLA-1500
12	Goodrich SU640HSX (no serial control)	SLA-2000 CameraLink
13	PAL	SLA-2000, SLA-2100, SLA-1500 NEW 2.16 NOTE: Save parameters and reset to change between PAL and NTSC.
14 – 255	<i>Reserved</i>	

Get Acquisition Parameters (0x38)

Get video port configuration. Causes a [Current Acquisition Parameters \(0x4F\)](#) message to be sent.

Byte offset	Description
2	Length = 3
3	Type = 0x38
4	Video Port Index

Draw Object (0x3B)

Draw user specified overlay graphics on the screen.

All coordinates in this message are specified in with the center of the image at (0, 0) and the upper left corner at (-image width/2, -image height/2).

Byte offset	Description	
2	Packet length = 15 (for non-text objects), variable for text object types (>15)	
3	Packet Type = 0x3B	
4	Unique Object ID (1 to 255), refer to this ID to destroy a created graphic object. ID=0 is used for destroying all objects when Action=Destroy.	
5	Action 0 = Destroy 1 = Create Note that if destroy action is specified, then fields following this are ignored.	
6	Coordinate Properties	
	Value = 0	Reserved
	Value = 1	Coordinates are specified in source coordinate space. In addition, draw object is moved with camera motion. This mode is useful for overlays such as laser reticles.
	Value = 2	Coordinates are specified in display coordinate space. In addition, draw object is moved with scene motion. This mode is equivalent to scene mode tracking with a custom overlay.
	Value = 3	Reserved
	Value = 4	Reserved
	Value = 5	This mode should be used for static overlays such as text.
	Bit 7	If bit 7 = 0, then coordinates are specified with the center of the image at (0, 0). This means that the upper-left corner is at (-display width/2, -display height/2) or (-source width/2, -source height/2) depending on the coordinate mode.

		If bit 7 = 1, then coordinates are specified with the upper left corner of the image at (0, 0). This means that the center of the image is at (display width/2, display height/2) or (source width/2, source height/2) depending on the coordinate mode.
7	Object Type 0 = Circle 1 = Rect 2 = Line 3 = Text 4 = FilledCircle 5 = FilledRect 6 = TextEx	
8&9	Object	Interpretation
	Circle, FilledCircle	Center Point X-Coordinate
	Rect, FilledRect	Upper Left Corner X-Coordinate
	Line	End Point 1 X-Coordinate
	Text, TextEx	Upper Left X-Coordinate
10&11	Object	Interpretation
	Circle, FilledCircle	Center Point Y-Coordinate
	Rect, FilledRect	Upper Left Corner Y-Coordinate
	Line	End Point 1 Y-Coordinate
	Text, TextEx	Upper Left Y-Coordinate
12&13	Object	Interpretation
	Circle, FilledCircle	Radius
	Rect, FilledRect	Width
	Line	End Point 2 X-Coordinate
	Text	Length of the text string (referred to as “length” below)
	TextEx	[12] = horizontal scale shifted left 5 (e.g. 32 means no scaling. 0 is also interpreted as no scaling). [13] = vertical scale shifted left 5
14&15	Object	Interpretation
	Circle, FilledCircle	Ignored
	Rect, FilledRect	Height

	Line	End Point 2 Y-Coordinate
	Text	Ignored
	TextEx	[14] = font ID (0=default, 1=bold font, 4=classic font) [15] = font spacing (pixels between a font to the next font. If 0, then uses the font's default spacing)
16	Color (See Table below for color to number mappings)	
	Bits 0-3	Background color. NEW 2.17 for vertical and lines, the background color is drawn as a shadow. Pass Transparent (14) to disable drawing of shadow
	Bits 4-7	Foreground
17 to 17+length-1	Text Object Only: Text string characters	

Color To Number Mapping:

Value	Description	Value	Description
0	White	8	Light Green
1	Black	9	Green
2	Light Gray	10	Dark Green
3	Gray	11	Red
4	Dark Gray	12	Orange
5	Light Blue	13	Yellow
6	Blue	14	Transparent
7	Dark Blue	15	Automatic

Stop Selected Track (0x3C)

Command the system to stop the currently selected track.

Byte offset	Value	Description
2	0x02	Packet length
3	0x3C	Packet type
4	0x43	Checksum

Command Pass-through (0x3D)

Outputs data payload to the port specified. Use [Configure Communication Port \(0x3E\)](#) to setup the inbound and outbound physical ports.

Byte offset	Description
2	Length = 3 + payload length
3	Type = 0x3D
4	Destination Port ID (see below)
5 – 5 + Payload Length	Payload <i>Minimum 1 byte</i> <i>Maximum 80 bytes</i>

NOTE: actual payload length can be anywhere between 1 and 80 bytes.

NOTE: no assumptions are made on terminating characters such as carriage return (0x0D), line feed (0x0A), or null (0x00)

Port ID

Port ID	Description
0	Serial Port 0
1	Serial Port 1
2	Ethernet Port
3	I ² C Port
4	Serial Port 2 (SLA-1500 only)
11	SD Card log file. Start, stop and name this file with Set SD Card Recording Parameters (0x1E)

Example:

Send a 5 byte payload “HELLO” to serial port 1.

Header		LEN	Type	Port	Payload					Checksum
0x51	0xAC	0x08	0x3D	0x01	0x48	0x45	0x4c	0x4c	0x4F	0xCB
					H	E	L	L	O	

Where length = type + dest port + payload + checksum = 1 + 1 + 5 + 1 = 8

Configure Communication Port (0x3E)

Configure one of the communication ports. Current setting can be retrieved using [Get Port Configuration \(0x3F\)](#).

Byte offset	Description
2	Length = 20
3	Type = 0x3E
4	Destination Port ID (see above , currently must be 1)
5	Baud Rate (see below)
6	Data Bits
7	Stop Bits
8	Parity
9	Maximum packet length
10	Maximum packet delay (ms)
11	Protocol parser: 0: SLA Protocol (SLA-1500 at Port 0 only) 1: Scan Eagle Aquarius packet parsing 2: FLIR TAU packet parsing (SLA-1500 only) 3: Reserved 4: Reserved 5: Reserved 6: Pass Through (direct pass-through with no change)
12 – 13	Local inbound port number where UDP packets are expected LSB then MSB <i>Ethernet port where all payload data will be received. Hardware opens a new socket to listen on this port.</i>
14 – 17	Destination IP address of host where UDP packets will be sent
18 – 19	Port number where host is listening. <i>Hardware opens a new socket and sends data to the outbound destination IP Address at the destination port number.</i>
20-21	AttNav port number (default 65100) If configured as Pass Through, data on this port is passed on to the serial port. NEW 2.18

NOTE: Serial ports do not offer hardware or software flow control.

NOTE: For parameter changes to take effect, a board soft reset should be performed, by issuing [Save Parameters \(0x25\)](#) and [Reset \(0x01\)](#) (Reset Type = 2, soft reset) messages.

Example:

Tell the SLA-HARDWARE to send data received on local port 1000 out on to serial port 2 configured at 57600 baud, 8 data bits, 1 stop bit, and no parity. Any data received from serial port 2 will be sent to

the IP address of 192.168.1.119 on port 10000. Raw payload data can now be sent directly to the IP address of the SLA-HARDWARE on port 1234 or data can be sent through the SLA Protocol port (serial port 0 or Ethernet port 14001) using [Command Pass-through \(0x3D\)](#).

Header		LEN	Type	Dest Port	Baud	Data	Stop	Parity	Max	Max	Parser	
0x51	0xAC	0x12	0x3E	0x04	0x03	0x08	0x01	0x00	0x64	0x64	0x02	...
Header				Serial Port 1 configuration								

	Inbound Port		Outbound/Reply IP Address				Outbound Port		Checksum
...	0xe8	0x03	0xc0	0xa8	0x01	0xdb	0x10	0x27	0xc1
	1000		192	168	1	119	10000		

Serial Port Parameters

Baud Rate	
Value	Baud Rate
0	4800 (1500 only)
1	9600
2	38400
3	57600 (Default)
4	115200

Protocol Parser

Index	Name	Description
0	Ignore	
1	Scan Eagle Aquarius	
2	FLIR TAU	
3	SLA Protocol	(SLA-1500 at Port 0 only)

Get Port Configuration (0x3F)

Results in the generation of either a [Current Port Configuration \(0x53\)](#) or a [Current Network Parameters \(0x49\)](#).

Byte offset	Description
2	Length = 3
3	Type = 0x3F
4	Destination Port ID (see above)

Set Snapshot (0x5E)

Set up parameters for image snapshot to an FTP server or onboard MicroSD. For viewing a list of existing files, or recording video see [Set SD Card Recording Parameters \(0x1E\)](#). Image is recorded from the Camera Order 0 set by Set Video Mode (0x1F). When Image source is set to Capture, image contents and size will be the same as the raw image from the camera. For example, if using an Analog Video Source, the image size will be 640x480. If using a digital image from a Sony FCB-EH6300 the image will be 1280x720. When Image Source is set to Display Image, then the image will be a 640x480 image with all the overlay graphics, digital zoom, and other image processing applied.

- Instructions to configure an FTP server are available in **ApplicationNote_FileZilla.pdf**.
- Instructions for formatting a MicroSD card are in **ApplicationNote_FormattingMicroSDCards.pdf**

Byte offset	Description	
2	Packet length = 15 + userLen + passLen	
3	Packet type = 0x5E	
4	Snapshot Destination	
	0	FTP Server
	1	Micro SD Card NEW 2.18
	2 – 15	RESERVED
5	Reserved, set to 0	
6	Image Source	
	0	Reserved
	1	Captured image
	2	Display image
	3 – 15	Reserved
7	Quality – JPEG compression quality level 0 to 100 (default 80)	
8	Down Sample	
	1	Full Resolution
	2	2x2 downsample
	4	4x4 downsample (SLA-1500 SD images only)
	All other values Reserved	

9 – 12	IP ADDRESS of the FTP server. (dot form, eg. 192 168 1 197)	FTP ONLY (Otherwise set to 0's)
13	Server Port MSB (default 0)	
14	Server Port LSB (default 21)	
15	[REQUIRED] Username Length - length of user name string	
16 - 16+userLen-1	[OPTIONAL] User Name – FTP server login user name	
16+userLen	[REQUIRED] Password Length – length of password string	
17+userLen – 17+userLen+passwordLen-1	[OPTIONAL] Password – FTP server login password	

Do SnapShot (0x60)

Execute an image snapshot to an FTP server or the MicroSD Card. Run [Set SnapShot \(0x5E\)](#) first to specify the FTP server, login and other SnapShot parameters.

On the SLA-1500-OEM `/mnt/mmcblk0p1/` or `/mnt/mmcblk0p5/` is automatically prefixed to filename unless you start filename with “/” then no prefix is added and the file *may* be written to NAND FLASH. This is not recommended. If directory/path is specified, it will be created if it doesn't exist.

Byte offset	Description
2	Packet length = 5 + fileNameLen
3	Packet type = 0x60
4	Frame Step – step between frames (e.g. 2 = every other). (default 1)
5	Number of frame snapshots to take. (default 1)
6	[REQUIRED] File Name Length - length of file name string (Default 0)
16 - 6+fileNameLen-1	[OPTIONAL - RECOMMENDED] FileName – Base file name of saved files (see below).

FILE NAMING:

If FileName ends with non-numeric characters, file will save to <FileName>_NN.jpg where NN is an incrementing count, starting at 0. If FileName ends with a numeric character (0-9), file will save to

<FileName>.jpg

If you use...	And then Do Snap (0x60)...	You should see...
Hello		Hello_00.jpg
Hello		Hello_01.jpg
World		World_02.jpg
Hello.jpg		Hello.jpg_03.jpg
Hello_		Hello__04.jpg
Hello42		Hello42.jpg

NOTE: file name count resets to 0 on power up. Files will be overwritten if you use the same file name seed.

EXAMPLE (Single Snap to MicroSD):

Record a single JPEG called “hello_0.jpg”

HEADER		LEN	TYPE	SRC			Q	SMP	IP ADDRESS				port		USRLLEN	PSSLEN	CHK SUM
0x51	0xAC	0x0F	0x5E	0x01	0x00	0x01	0x50	0x01	0	0	0	0	0x00	0x00	0x00	0x00	0xD1

HEADER	LEN	TYPE	Step	numFr	Len	File Name Seed						CHK SUM
0x51	0xAC	0x0a	0x60	0x01	0x01	0x05	0x68	0x65	0x6c	0x6c	0x6f	0x95

File hello_00.jpg is now on the MicroSD card. Sending the same command...

HEADER	LEN	TYPE	Step	numFr	Len	File Name Seed						CHK SUM
0x51	0xAC	0x0a	0x60	0x01	0x01	0x05	0x68	0x65	0x6c	0x6c	0x6f	0x95

hello_01.jpg is now on the MicroSD card.

EXIF HEADER:

Snapshot images are created with EXIF metadata headers populated from the following MISB fields:

MISB data element	EXIF tag
Sensor Latitude	GPS Latitude
Sensor Longitude	GPS Longitude

Sensor Altitude	GPS Altitude
UTC Time	GPS Time
Platform Indicated Air Speed	GPS Speed
Platform Heading	GPS Track Direction

See [Set Metadata Data Values \(0x13\)](#) for more information on populating these fields.

Version Number (0x40)

Get Parameters Function (0x28)	Get Version Number (0x00)
--	---------------------------

Reports software and hardware version numbers.

Byte offset	Description
2	Packet length = 15
3	Packet type = 0x40
4	Software Version Major
5	Software Version Minor
6	Reserved
7	Temperature, degrees F
8 – 10	Hardware UID
11 – 14	Application Bits NEW 2.18 below
15	Hardware Type NEW 2.17 above
16	Software Revision

Bit	Value	Description
0	0x00000001	Reserved
1	0x00000002	Stabilization
2	0x00000004	H.264 video compression in MPEG2-TS network video output
3	0x00000008	Moving target detection of medium sized objects
4	0x00000010	Tracking of objects
5	0x00000020	Moving target indication of small sized objects
6	0x00000040	Telemetry output for gimbal control
7	0x00000080	Enhancement
8	0x00000100	Stitching and blending of multiple images
9	0x00000200	Moving JPEG video compression to ethernet
10	0x00000400	Recording of video and snapshot of still images
11	0x00000800	KLV metadata encoding into MPEG2-TS H.264 network video stream

Table 13: Application Bits

Current Stabilization Parameters (0x41)

Get Parameters Function (0x28)	Set Stabilization Parameters (0x02)
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Describes the current stabilization mode. See also [Set Stabilization Parameters \(0x02\)](#) and [Set Stabilization Bias \(0x12\)](#).

Byte offset	Description	
2	Packet length = 6	
3	Packet type = 0x41	
4	Mode (default 9)	
	Bit	Description
	0	0 – Stabilization OFF 1 – Stabilization ON
	1	0 – Enable 1 - Disable all registration, stabilization, enhancement and tracking
	2	0 – Previous images background 1 - Black background
	3	0 – Auto bias disabled 1 – Auto bias enabled
	Bit 4– 6	Reserved
	Bit 7	0 – Enable PIP image micro stabilization 1 – Disable PIP image micro stabilization
5	Screen re-centering rate 0..255 (default 50)	
6	Limit – maximum stabilization offset in pixels. 0 = no limit. (default 0)	
7	Angle Limit – maximum stabilization rotation angle in degrees. (default 0)	

Current Overlay Mode (0x42)

Get Parameters Function (0x28)	Set Overlay Mode (0x06)
--	---

Byte offset	Description
2	Packet length = 5
3	Packet type = 0x42

4	Bits 0..3	Primary track color mode Same as primary track color mode, above
	Bits 4..7	Primary track reticle type Same as primary track reticle type, above
5	Bits 0..3	Secondary track color mode (<i>SLA-2000 only</i>) Same as primary track color mode, above
	Bits 4..7	Secondary track reticle type (<i>SLA-2000 only</i>) Same as primary track reticle type, above
6	Bit 0	Overlay cursor. 0 = don't, 1 = do
	Bit 1	Overlay track box. 0 = don't, 1 = do
	Bit 2	Overlay track momentum. 0 = don't, 1 = do
	Bit 3	Overlay Histogram 0 = don't 1 = do
	Bit 4	Overlay track index 0 = don't 1 = do
	Bit 5	Show track motion trails 0 = don't 1 = do
	Bit 6	Reserved = 0
	Bit 7	Show registration ignore edge lines NEW 2.15 0 = don't 1 = do

Tracking Position (0x43)

Periodic report of primary track's position, measured scene translation, rotation and scale, and stabilization display offset and rotation of a camera.

Tracking and scene confidence scores indicates the system's confidence between 0 (low) and 100 (high). Tracking position is in camera source (un-stabilized) coordinates.

Scene translation is the frame-to-frame offset, rotation, and scale accumulated over the number of frames since the last Tracking Position report. This interval is controlled by [Set Coordinate Reporting Mode \(0x0B\)](#).

Display offset is the translation applied to the current camera frame to create the current display frame. Positive values of offset indicate shifts down and to the right. In order to render the tracking point of interest in display coordinates use the following equation

$$x = (x_t + x_d - x_c) * \cos(A/128) + (y_t + y_d - y_c) * \sin(A/128) + x_c$$

$$y = (x_t + x_d - x_c) * -\sin(A/128) + (y_t + y_d - y_c) * \cos(A/128) + y_c$$

where (x_t, y_t) are reported tracking coordinates, (x_c, y_c) are the coordinates of the center pixel of the frame, (x_d, y_d) are reported display offsets, and A is the reported screen rotation.

Enabled using the [Set Coordinate Reporting Mode \(0x0B\)](#) command.

Byte offset	Description
2	Packet length = 26 MOD 2.17
3	Packet type = 0x43
4 & 5	Tracking column in camera source coordinates (signed 16-bit integer)
6 & 7	Tracking row in camera source coordinates (signed 16-bit integer)
8 & 9	Horizontal scene translation columns in pixels, positive indicates the scene has moved to the right (equivalent to panning left) (signed 16-bit integer) Fractional portion is in byte 22. See below for how to extract scene translation. MOD 2.17
10 & 11	Vertical scene translation rows in pixels, positive indicates the scene has moved down (equivalent to panning up) (signed 16-bit integer) Fractional portion is in byte 23. See below for how to extract scene translation. MOD 2.17
12 & 13	Display column offset (signed 16-bit integer)
14 & 15	Display row offset (signed 16-bit integer)
16	Bits 0..6 Tracking confidence (0..100) Bit 7 Target not visible flag
17	Scene measurement confidence (0..100)
18 & 19	Current display rotation (0..360 degrees) * 128 (unsigned 16-bit integer)
20	Camera Index
21	Frame number (0 to 255), count wraps to 0 when it exceeds 255. NEW 2.17
22	Horizontal scene translation 8 bit fractional pixel (combine with bytes 8 & 9). See below for how to extract scene translation. NEW 2.17
23	Vertical scene translation 8 bit fractional pixel (combine with bytes 10 & 11). See below for how to extract scene translation. NEW 2.17

24 & 25	Scene frame to frame rotation (-128 to 127 degrees)*128 (signed 16 bit integer) NEW 2.17
26 & 27	Scene frame to frame scale change factor * 256. 1.0*256 indicates no change. (unsigned 16 bit integer) NEW 2.17

NOTE: To extract fixed or floating point scene translation from the Tracking Position packet:

```
// Buffer containing the Tracking Position packet
u8 *buf;
// Fixed point, scaled up by 8 bits
s32 sceneCol8 = ((s32)(buf[ 9]<<24) | (buf[ 8]<<16) | (buf[22]<<8))>>8;
s32 sceneRow8 = ((s32)(buf[11]<<24) | (buf[10]<<16) | (buf[23]<<8))>>8;
// Floating point
f32 sceneColF = sceneCol8/256.0f;
f32 sceneRowF = sceneRow8/256.0f;
```

NOTE: Current display rotation: using command [Set Display Parameters \(0x16\)](#) to rotate the image, the amount of rotation is reported here.

Current Tracking Parameters (0x44)

Get Parameters Function (0x28)	Set Tracking Parameters (0x0C)
--	--

Byte offset	Description
2	Packet length = 6
3	Packet type = 0x44
4	Size of object, in pixels, to track. (default 40)
5	Mode (default 2) Lower nibble: 0 = no change 1 = Stationary mode 2 = Vehicle mode 3 = Person mode 4..15 = Reserved Bit 4: Noise compensation (for LAP mode) 0 = off (default) 1 = on Bits 5..7 Reserved
6	Reserved – set to 0
7	Reserved – set to 0

Current Registration Parameters (0x45)

Get Parameters Function (0x28)	Set Registration Parameters (0x0E)
--	--

Byte offset	Description
2	Packet length = 10
3	Packet type = 0x45
4	Maximum frame to frame translation in pixels, LSB. 0 = the maximum allowed which is ½ of the frame size. (default 0)
5	Maximum translation in pixels, MSB
6	Maximum rotation range in degrees per frame: 0..10. (default 5)
7	Maximum zoom range in percent zoom per frame: 0..10. (default 0)
8	Left image edge pixel band to ignore. 0..255. Used for overlays or foreground objects that appear near the edge of the image. (default 0)
9	Right image edge pixel band to ignore. (default 0)
10	Top image edge pixel band to ignore. (default 0)
11	Bottom image edge pixel band to ignore. (default 0)

Current Video Parameters (0x46)

Get Parameters Function (0x28)	Set Video Parameters (0x10)
--	---

Byte offset	Description
2	Packet length = 9
3	Packet type = 0x46
4	0 = removed specified edge pixels 1 = automatically detect boundary pixels to remove
5	Top pixels to remove (0..255)
6	Bottom pixels to remove (0..255)
7	Left pixels to remove (0..255)
8	Right pixels to remove (0..255)
9	Deinterlacing mode: 0 = no deinterlacing 1 = apply digital deinterlacing

10	Automatically reset video decoder when failed frame unsynchronization detected 0 = Never 1 = When frame unsynchronization detected
----	--

Current ADC Parameters (0x47)

Get Parameters Function (0x28)	Set ADC Parameters (0x18)
--	---

NEW: 2.18 This command now returns all the values that can be set using Set ADC Parameters. See Set ADC Parameters (0x18) for packing order and description of the results.

Current Ethernet Video Parameters (0x48)

Get Parameters Function (0x28)	Set Ethernet Video Parameters (0x1A)
--	--

Format is the same as [Set Ethernet Video Parameters \(0x1A\)](#).

Current Network Parameters (0x49)

Sent in response to a [Get Network Parameters \(0x1D\)](#) command.

Format is the same as [Set Network Parameters \(0x1C\)](#).

Current Video Enhancement Parameters (0x4A)

Get Parameters Function (0x28)	Set Video Enhancement Parameters (0x21)
--	---

Describes the current video enhancement parameters. Under control of the Denoising parameter, a running average of frames is optionally calculated. The denoised frame is then passed through one of several filters to enhance contrast.

Byte offset	Description
2	Packet length = 6
3	Packet type = 0x4A
4	Bits 0..3 Enhancement filter: 0 = None (default) 1 = CLAHE 2 = LAP Bits 4..7 Sharpen level 0..15
5	Alpha blending term 0..255 (200 nominal): 0 = use input frame only 128 = 50/50 mix 255 = use filtered frame only)

6	Bits 0..6	0..127 None: not used CLAHE: contrast limit (typical 25) LAP: width of high pass kernel, clipped to 0..18. (typical 10)
	Bit 7	Limit Color
7	Denoising coefficient (by running average): 0 = No denoising (default) 128 = 50/50 mix 255 = maximum averaging	

Current Video Mode Parameters (0x4B)

Get Parameters Function (0x28)	Set Video Mode (0x1F)
--	---------------------------------------

Byte offset	Description
2	Packet length = 16
3	Packet type = 0x4B
4	Number of Input Camera channels (1-4)
5	Number of Network Output Display channels (1-4)
6	Display Mode
7	Display Destination
8	Camera Index 0
9	Camera Index 1
10	Camera Index 2
11	Camera Index 3
12	PiP Scale
13	PiP Quadrant
14	Display Index 0
15	Display Index 1
16	Display Index 2
17	Display Index 3

Current Stitch Parameters (0x4C)

Get Parameters Function (0x28)	Set Stitch Parameters (0x2B)
--	--

Byte offset	Description
2	Packet length = 13
3	Packet type = 0x4C
4	Reserved
5&6	Camera one up shift. (0...480) number of pixels. (signed 16-bit integer)
7&8	Camera one right shift. (0...640) number of pixels. (signed 16-bit integer)
9&10	Camera one down shift. (0...480) number of pixels. (signed 16-bit integer)
11&12	Camera one left shift. (0...640) number of pixels. (signed 16-bit integer)
13	Reserved
14	Reserved

Current Blend Parameters (0x4D)

Get Parameters Function (0x28)	Set Blend Parameters (0x2F)
--	---

Byte offset	Description
2	Packet length = 14
3	Packet type = 0x4D
4	Reserved
5	IR camera up shift. (0 ... 255) number of pixels
6	IR camera right shift. (0 ... 255) number of pixels
7	IR camera down shift. (0 ... 255) number of pixels
8	IR camera left shift. (0 ... 255) number of pixels
9	Rotation (0 ... 255) maps to (-5 ... 5) degrees
10	Zoom (0 ... 255) maps to zoom factor of (0.9 ... 1.1).
11	Blend mode:
	Value Description
	0 don't change/default.

	1	FrameBlend
	2	ThermalBlend
	3	NightBlend
12	IR amount (0 ... 255) maps to (0 ... 1). IR amount means the amount of IR luminance information to include in the blended result. This parameter only applies in ThermalBlend and FrameBlend modes.	
13	Hue stretch factor (0 ... 255) maps to (1 ... 2). This parameter only applies in ThermalBlend mode.	
14	Reserved	
15	Frame delay of EO camera. (0, 1, 2, or 3) frames	

Current Image Size (0x4E)

[Get Parameters Function \(0x28\)](#)

Applies to the 0th (primary) camera. See Camera Display Order in [Set Video Mode \(0x1F\)](#) for camera selection. The Display Rectangle can change depending on Display Mode (1up, 2Up, Side-by-Side, etc.) also selected by the Set Video Mode command.

Byte offset	Description
2	Packet length = 18
3	Packet Type = 0x4E
4 – 5	Capture Width
6 – 7	Capture Height
8 – 9	Display Width
10 – 11	Display Height
12 – 13	Display Rectangle Column Offset
14 – 15	Display Rectangle Row Offset
16 – 17	Display Rectangle Width
18 – 19	Display Rectangle Height

Current Acquisition Parameters (0x4F)

Sent in response to a [Get Acquisition Parameters \(0x38\)](#) command.

Byte offset	Description
2	Length = 10
3	Type = 0x4F

4	Max Number of Cameras
5	Video Port Index
6	Video Port Types
7 – 8	Capture Height
9 – 10	Capture Width

HardwareID (0x50)

Get Parameters Function (0x28)	Get HardwareID (0x50)
--	-----------------------

Reports the HardwareID.

Byte offset	Description
2	Packet length = 10
3	Packet type = 0x50
4 – 11	Hardware ID

Current Tracking Positions (0x51)

Periodic report of all track's positions. Tracking and scene confidence scores indicates the system's confidence between 0 (low) and 100 (high). Tracking positions are in camera (un-stabilized) coordinates. Enabled using the [Set Coordinate Reporting Mode \(0x0B\)](#) command.

Render Track Points

In order to render the tracking point of interest in display coordinates use the following equation:

$$x = (x_t + x_d - x_c) * \cos(A/128) + (y_t + y_d - y_c) * \sin(A/128) + x_c$$

$$y = (x_t + x_d - x_c) * -\sin(A/128) + (y_t + y_d - y_c) * \cos(A/128) + y_c$$

where (x_t, y_t) are reported tracking coordinates, (x_c, y_c) are the coordinates of the center pixel of the frame, (x_d, y_d) are reported display offsets, and A is the reported screen rotation. This information is contained in the [Tracking Position \(0x43\)](#) packet.

Byte offset	Description	
2	Packet length. Given by the following formula: $(15 * \text{numTracks}) + 4$. NumTracks is given in byte offset 5 of this packet.	
3	Packet type = 0x51	
4	Camera Index {0,1,2,3}	
5	Number of tracks.	
6	Track Index N	
7 – 8	Tracking column in camera coordinates	
9 – 10	Tracking row in camera coordinates	
11 – 12	Track width	
13 – 14	Track height	
15 – 16	Track horizontal momentum multiplied by 256. Positive is to the right. Reported in pixels/frame.	
17 – 18	Track vertical momentum multiplied by 256. Positive is down. Reported in pixels/frame.	
19	Track Confidence (0 ... 100)	
20	Mode	
	Bit	Value
	0	0 = Not Primary 1 = Primary see Designate Selected Track Primary (0x32)
	1	0 = Not Selected 1 = Selected

	2 – 3	SL_TRACK_RESULT_STATE NEW 2.18
	4 – 7	SL_TRACK_STATE NEW 2.18
	Repeat bytes 6 through 20 for each track (see byte offset 5)	

Primary/Not Primary and Selected/Not Selected

Primary	<ul style="list-style-type: none"> This target will be affected by Nudge Tracking Coordinates (0x0A) Telemetry information is reported by Tracking Position (0x43) Reticle color and shape change using Set Overlay Mode (0x06) New user designated tracks will become primary Modify Tracking (0x05) Zoom to track will use Primary Target Set Display Parameters (0x16)
Selected	<ul style="list-style-type: none"> Reticle changes to indicate target is selected Set Overlay Mode (0x06)

You can use the INDEX to kill a track or designate as primary ([Modify Track By Index \(0x17\)](#)).

Current Ethernet Display Parameters (0x52)

Get Parameters Function (0x28)	Set Ethernet Display Parameters (0x29)
--	--

Format is the same as [Set Ethernet Display Parameters \(0x29\)](#).

Current Port Configuration (0x53)

Get Port Configuration (0x3F)	
---	--

Format is the same as [Configure Communication Port \(0x3E\)](#).

Current Moving Target Detection Parameters (0x54)

Get Parameters Function (0x28)	Set Moving Target Detection Parameters (0x2D)
--	---

Byte offset	Description	
2	Packet length = 4	
3	Packet type = 0x54	
4	0 = Don't change motion modes	
	Bit 0	1 = Disable All (Other bits ignored)
	Bit 1	0 = Disable motion watching 1 = Enable motion watching
	Bit 2	0 = Disable motion assistance of primary target

		1 = Enable motion assistance of primary target only
	Bit 3	0 = Disable motion assistance of all targets 1 = Enable motion assistance of all targets
	Bit 4	0 = Disable motion detection 1 = Enable motion detection
5	Current moving target detection threshold	

Current H.264 Video Parameters (0x56)

Get Parameters Function (0x28)	Set H.264 Video Parameters (0x23)
--	---

Format is the same as [Set H.264 Video Parameters \(0x23\)](#).

Current Display Parameters (0x57)

Sent in response to a [Get Display Parameters \(0x3A\)](#) command.

Format is the same as [Set Display Parameters \(0x16\)](#).

Current SD Card Recording Status (0x58)

Sent in response to [Set SD Card Recording Parameters \(0x1E\)](#) command.

Byte offset	Description	
2	Length = 11	
3	Packet Type = 0x58	
4	Recording State	
	1	Recording
	2	Stopped
	0x4	Network trace commands enabled (OR this bit)
	0x8	Network trace telemetry enabled (OR this bit)
5 thru 8	Length of recording in seconds. Unsigned 32 bit integer	
9 thru 12	Recording size in bytes.	

Current SD Card Directory Contents (0x59)

Sent in response to [Set SD Card Recording Parameters \(0x1E\)](#) command. Based on the number of file names that need to be sent, multiple packets (groups) might be needed.

Byte offset	Description
-------------	-------------

2	Length = variable
3	Packet Type = 0x58
4 & 5	Total number of files (16 bit-integer)
6 & 7	Start index in this packet (0 to nfiles-1)
8 & 9	End index in this packet (0 to nfiles-1)
10...10+(endIndex-startIndex+1)	Length of filename start ... Length of filename end
10+(endIndex-startIndex+1)..Variable	Ascii Encoded filename start ... Ascii Encoded filename end

Examples:

Byte	Contents	Description
4 & 5	4	4 files
6 & 7	0	File index 0 is the first file in the group
8 & 9	2	File index 2 is the last file in the group
10	8	Length of file name 0
11	11	Length of file name 1
12	15	Length of file name 2
13 – 21	<i>File.txt</i>	File name 0
22 – 33	<i>Nextfile.ts</i>	File name 1
34 - 46	<i>AnotherFile.ext</i>	File name 2

Byte	Contents	Description
4 & 5	4	4 files
6 & 7	3	File index 3 is the first file in the group
8 & 9	3	File index 3 is the last file in the group
10	8	Length of file name 0
11 – 19	<i>boot.txt</i>	File name 3

Current SnapShot (0x5D)

Get Parameters Function (0x28)	Set SnapShot (0x5E)
--	-------------------------------------

2	Packet length = 18 + uLen + pLen + fLen
3	Packet type = 0x5D
4	Reserved, set to 0
5	Reserved, set to 0
6	Source – 1: Captured image, 2: Display image
7	Quality – JPEG compression quality level 0 to 100 (default 80)
8	Down Sample – 1: none, 2: 2x2 downsample, 4: 4x4 downsample
8– 11	IP ADDRESS (dot form, eg. 192 168 1 197) of the FTP server.
12	Command and Control Reply Port MSB (default 0)
13	Command and Control Reply Port LSB (default 21)
14	uLen - length of user name string
15 to 15+uLen-1	User Name – FTP server login user name
15+uLen	pLen – length of pass word string
16+uLen to 16+uLen+pLen-1	Pass Word – FTP server login pass word
16+uLen+pLen	Frame Step - 1 shows every frame, 2 shows every other frame, etc. 1 to 255 (default 1)
17+uLen+pLen	Num Frames – number of frame snapshots to take. (default 1)
18+uLen+pLen	fLen - length of file name string
18+uLen+pLen to 18+uLen+pLen+fLen-1	File Name – Base file name to save files to on the FTP server. Files will save to FileName_N where N is an incrementing count, starting at 0.

Set System Type (0x63)

Used to configure the primary functionality of a system.

Byte offset	Description	
2	Packet length = 4	
3	Packet type = 0x63 NEW: 2.18	
4 – 5	System Type	
	Bit	Functionality
	0	ANALYZE - System will perform image processing and will produce telemetry
	1	RENDER - System will perform rendering/display

	2	MTI - System will perform Moving Target Indication/Detection
	3 – 15	RESERVED

Set Packet Destination (0x64)

Used to configure the output destination for TELEMETRY or Command and Control Replies. See [Set Coordinate Reporting Mode \(0x0B\)](#) for the types of telemetry output that is available.

Byte offset	Description	
2	Packet length = 4	
3	Packet type = 0x64 NEW: 2.18	
4	Function	
	Value	Description
	0	Unknown or Not Defined
	1	ADD -Add this IP address as telemetry output destination
	2	DELETE - Remove this IP address from receiving telemetry output
	3	DELETE ALL - Remove all IP address from telemetry output list
	4 – 15	Reserved
5	Camera ID - Results from this hardware are reported as cameraID. Receiver can then apply these results to the local camera of the same ID	
6 – 9	IP Address – IP address of the receiver	
10 – 11	Destination Port – data will be sent to this port on the receiver (default: 14001)	
12	Frame period mode	Same as Set Coordinate Reporting Mode (0x0B)
13	Flags	

Current System Type (0x65)

See [Set System Type \(0x63\)](#).

Parameter Block (0x6A)

Get Parameters Function (0x28)	Set Parameter Block (0x69)
--	----------------------------

The entire settings block is sent back in human readable format as a large SLA Protocol packet.

Individual fields are delimited by a semicolon (;) followed by a carriage return line feed.

Byte offset	Description
2 – 3	Packet length = <i>Variable</i>
4	Packet type = 0x6A
5 – N	N bytes which are parameter data strings

Example payload:

```
...
quality = 80;
foveal = 0;
frameStep = 1;
downSampleFactor = 1;
h264.targetBitRate = 1500000;
h264.intraFrameInterval = 30;
h264.lfDisableIdc = 0;
h264.airMbPeriod = 0;
h264.sliceRefreshRowNumber = 0;
vtep[0].denoiseRate8 = 0;
vtep[0].enhanceMode = 0;
...
```

Appendix: History

Changes for recent releases are summarized [above](#).

- 2.06 (03)
 - Change: Current Tracking Positions
- 2.07 (00)
 - Change: Set ADC Parameters and Current ADC Parameters
 - Change: Set Acquisition Parameters and Current Acquisition Parameters
 - Change: Current Tracking Positions
 - Change: Set Moving Target Detection Parameters and Current Moving Target Detection Parameters
 - New: Set Track Order, Get Track Order and Current Track Order
 - New: Modify Tracking
 - New: Modify Track by Index
 - New: Limit Color Enhancement Parameter
- 2.08 (00)
 - Change: Set Blend Parameters.
 - Change: Set Stabilization Bias
 - Change: Set Tracking Parameters
 - Change: Set Blend Mode Description
 - Change: Set Display Parameters
 - Change: Current Display Parameters
 - Change: Set Video Mode
 - Change: Current Video mode
- 2.09 (00)
 - Add: SD Card Recording Parameters
 - Add: Current SD Card Recording Status
 - Add: Current SD Card Directory Contents
 - Add: Set Display Adjustments
- 2.10 (00)
 - Add: new mode for Set Stabilization
- 2.12 (00)
 - Change: Separate typedef in slfip.h for Commands and Responses
 - Change: SetMetadataReportingMode → SetMetadataFrameValues
 - Add: SetRGB565Conversion & DrawObject commands
 - Change: SLFIPSetAVideoParameters cameraType → autoReset
- 2.13 (04)
 - Add: Set Registration Parameters – zoomRange
 - Add: Set Registration Parameters – ignore edge left, right, top, bottom
 - Add: Auto reset video decoder option to Set Video Parameters
 - Change: Corrected Current ADC Parameters
 - Change: Set Network Parameters – reply port and reply mode added.
 - Change: Current Stabilization Parameters - Return auto bias and black background enabled parameters
 - Add: Return of PIP stabilization disable in CurrentStabilizationParameters.
- 2.14 (01)
 - Add RTP MJPEG Source option to Set Ethernet Display Parameters

APPENDIX: CONTACTS

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