SightLine Applications Command and Control Protocol

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Summary

This document describes the packet-based messaging command and control protocol used by the SightLine Applications video stabilization and tracking systems. This protocol is valid for this release and any prior release. Changes between revisions are noted throughout the document.

IMPORTANT NOTIFICATON!

Individual "Getter" commands have been replaced with a single generic getter command Get Parameters Function (0x28) which takes as an input the corresponding "Setter" command Type ID.

For Example:

	Becomes...
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, a 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.

Document Style Guide

In document Links	Used to link to other command or sections within the document
SLA-3000 Only	Indicates fields are for SLA-3000
Revision Indication	Indicates field or command changed for a particular revision
Emphasis	Indicates local emphasis
TIP / NOTE / WARNING / NYI	Indicates that text following is special information or Not Yet Implemented feature.

Sample Code

For development of C/C++ command and control applications, SightLine provides sample code for writing applications that implement our protocol. This is primarily available in **slfip.h** and **slfip.cpp** and can be downloaded as part of the **SLA Example Code** sample. This code can be used as a starting point for writing your own application and is also useful for conforming to any changes to the protocol that may take place over time. ***SLA Command and Control Example Code & Resources*** can be downloaded from our web site (http://sightlineapplications.com).

Protocol Changes

Summary of changes to the protocol from previous releases. Please also refer to the Sample Code for additional details. The table below indicates messages that have changed in behavior from previous version.

2.22	MOD	Set Video Mode (0x1F)	Added 1080P50 and 720P50 output options for HD-SDI and HDMI. Added 1080P30 output option for HDMI.
	MOD	Current Acquisition Parameters (0x4F)	Added valid row, col, high, and wide parameters.
	ADD	Set Landing Aid (0x81)	Added landing aid detection
	ADD	Current Overlay Objects (0x6B) [NYI] Current Overlay Object Ids (0x68) [NYI]	Get all parameters relating to an overlay object
	MOD	Current Acquisition Parameters (0x4F)	Fixed description of current acquisition parameters.
	MOD	Set Advanced Moving Target Indication Parameters (0x76)	Downsample now applies to Vehicle MTI as well.
	ADD	Set Advanced Moving Target Indication Parameters (0x76)	Added hide overlap tracks parameter. Replaces byte 18 which was reserved.
	MOD	Set Overlay Mode (0x06)	Moved display MTI indices from advanced moving target indication parameters to overlay mode. Added ability to set the color of MTI tracks and MTI selectable tracks.
	MOD	Modify Tracking (0x05)	Added ability to start objects tracks from SA or SV MTI under certain conditions.
	MOD	Current Tracking Parameters (0x44)	Fixed errors in packet description.
	MOD	Current Tracking Positions (0x51)	Fixed errors in description of number of tracks and added clarification to track index description.
	ADD	Display Resolution	Add table for SLA-3000 describing display resolution.
	ADD	Parameter File Format	Section describing parameter files.
	MOD	Current Video Mode Parameters (0x4B)	Add HD-SDI Display Image
	MOD	SummarySet Ethernet Display Parameters (0x29)	Clarification on Video Encoding and new codecs
	MOD	Set Video Mode (0x1F)	Add HD-SDI Display Image
	MOD	Set Packet Destination (0x64)	Add flag bit to control saving to parameter file
	MOD	Set Network Parameters (0x1C)	Remove Last In First Out (LIFO) telemetry mode
	MOD	Configure Communication Port (0x3E)	Fixed Protocol Type enumeration documentation
	MOD	Set Tracking Parameters (0x0C)	Added “No Registration” tracking mode Byte 6 correctly marked as reserved
	ADD	User Warning (0x7F)	New message from board to user only.
	MOD	Modify Track By Index (0x17)	Added reinitialize option to message. Added option to specify primary or selected instead of specific index.

	MOD	Set Tracking Parameters (0x0C)	Added acquisition assist mode. Added intelligent assist mode.
2.21	MOD	Focus Stats (0x55)	Added camera index
	MOD	Set Acquisition Parameters (0x37)	Add TAU Direct Connect and CameraLink Flags
	MOD	Set Stabilization Parameters (0x02)	Add disable pan-tilt in zoom to track mode control
	ADD	Analyze Render Synch (0x7E)	Mechanism to synchronize to distributed analyze and render systems.
	MOD	Do SnapShot (0x60)	Additional details regarding file naming.
	MOD	Set SnapShot (0x5E)	Add Support for JPEG/PNG file format
	MOD	Set SnapShot (0x5E)	Modified default recording to MicroSD card
	FIX	Start Up Behavior	All systems send Version Number (0x40) on ready.
	ADD	Get Ethernet Display Parameters (0x39)	Description. Function was introduced earlier
	MOD	Set Moving Target Indication Parameters (0x2D)	Add frame step parameter.
	MOD	Set Moving Target Indication Parameters (0x2D)	Added reset MTI flag.
	MOD	Set Coordinate Reporting Mode (0x0B)	Added max number of tracking positions to report.
	MOD	Set Advanced Moving Target Indication Parameters (0x76)	Added down sample options.
	MOD	Set Moving Target Indication Parameters (0x2D)	Added suspicious score from advanced MTI message.
	MOD	Current Moving Target Indication Parameters (0x54)	Changed from 2.20 to match Set Moving Target Indication Parameters (0x2D).
	MOD	Set Advanced Moving Target Indication Parameters (0x76)	Added parameters to control how many MTI tracks will be output in telemetry and KLV messages.
	MOD	Set Lens Mode (0x6C)	Add in set focus and zoom positions
	MOD	Set Lens Params (0x6E)	Add Zoom/Focus Speed
	MOD	Current Lens Params (0x6F)	Add Zoom/Focus Speed
	ADD	Current Stabilization Bias (0x7A)	Return stabilization bias
	ADD	Set Advanced Capture Parameters (0x7B)	Advanced analog capture control for image stretching.
	MOD	Set Tracking Parameters (0x0C)	Object size = 255 will output pixel stats for full image
	MOD	Set Metadata Values (0x13) Current Metadata Values (0x13) Set Metadata Static Values (0x14) Set Metadata Frame Data Values (0x15) Current Metadata Frame Data Values (0x15) Set Metadata Rate (0x62) Set KLV Data (0x61)	Added additional parameter to support configuration of the independent KLV streams on SLA-3000.
	ADD	Set MTI Region of Interest (0x7C) Current MTI Region of Interest (0x7D)	Added MTI region of interest parameters.
	ADD	Set Video Enhancement Parameters (0x21)	Added high bit depth CLAHE enhancement modes.
	ADD	Set Stabilization Bias (0x12)	Added auto bias update rate
	ADD	Focus Stats (0x55)	Added focus statistics telemetry output.

	MOD	Set Blend Parameters (0x2F)	Added new blend modes for Fixed EO.
	ADD	Set Display Angle (0x5C)	Set display angle for one or all cameras.
2.20	MOD	Set Acquisition Parameters (0x37)	Add Frame Step Parameter.
	MOD	Set Acquisition Parameters (0x37)	Add InitPhoton to Flags in Generic Digital Interface
	ADD	Directory Statistics Reply (0x79)	Report back the total "disk" space available (2.20.12)
	MOD	Current SD Card Recording Status (0x58)	Deprecated file size and time params (RESEREVED)
	MOD	Set SD Card Recording Parameters (0x1E)	Byte 6 sends Current SD Card Recording Status (0x58) Byte 7 can result in Directory Statistics Reply (0x79)
	MOD	Set Acquisition Parameters (0x37)	Add InitCameraLinkLowSpeed Flag
	MOD	Set Network Parameters (0x1C)	Add NIC index
	MOD	Set Tracking Parameters (0x0C)	Added new parameter Near Value
	ADD	Set Acquisition Parameters (0x37)	New Camera Types (SLA-2000/2100)
	MOD	Version Number (0x40)	Add "Other Version" for hardware dependent version information. e.g. FPGA version on SLA1500
	ADD	Set Host Name (0x66) Current Network List (0x67)	Ability to name a Network Interface / Device
	MOD	Set Acquisition Parameters (0x37)	Add SLA 1500 generic digital, add params for horizontal and vertical front porch, flags.
	MOD	Tracking Box Pixel Stats (0x78)	Add Tracking Box Pixel Stats message for 14 bit digital camera mean,max,min
	ADD		Add SLA-3000 specific protocol (beta)
	MOD	Set Blend Parameters (0x2F) Current Blend Parameters (0x4D)	Enable SD / HD image blending. Changed to warp the EO image. Added bit for alternate zoom control for HD. Returning EO/IR indicies.
	MOD	Set Moving Target Indication Parameters (0x2D)	New MTI modes for small target detection.
	NEW	Set Advanced Moving Target Indication Parameters (0x76)	Beta advanced MTI control

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 value specified in the length field is the number of bytes that follow up to and including the checksum. 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.

Length Example:

		LENGTH	Type	Mode	Checksum
0x51	0xAC	**0x03**	0x01	0x02	0xBC
			3 bytes specified by length		

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. To ensure proper packet framing, if the checksum fails, the bytes following the faulty signature header (0x51, 0xAC) should be scanned for the signature header bytes again.

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

The checksum can be calculated 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: Pseudo 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 ^ 0x07 = 0x06
Look up 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 Baud Rates 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 3.3V TTL 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

- You can set a **STATIC IP** address of the SLA-HARDWARE explicitly using Set Network Parameters (0x1C).
- If no STATIC IP address has been set, the SLA-HARDWARE will attempt to obtain an IP address using **DHCP**.
- If DHCP fails, the SLA-2000 will use a **192.168.1.ddd**, where *ddd* is internally determined using its MAC address.
  - SLA-1500 (etc.): If DHCP fails, the system will use a specific **Link Local (RFC 3927)** type address **169.254.1.180**.

Summary Table

			If DHCP Fails try...	
	If Static...	**Else try DHCP...**	**SLA-2000**	**All Other**
IP Address	User Defined	DHCP Defined	192.168.1.ddd	169.254.1.180
Subnet Mask	User Defined	DHCP Defined	255.255.255.0	255.255.0.0
Gateway	User Defined	DHCP Defined	192.168.1.1	*NOT DEFINED*

Table 8: IP Address Assignment

> ***TIP:*** *Use this table as guidance for setting the IP address of your PC.*

Discover Protocol

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

Transport Layer	UDP
IP Address	255.255.255.255
Port	51000

Table 9: Discover Protocol Packet

Discover Packet 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 (see Set Network Parameters (0x1C))			
...				
52	Video Address (See Set Ethernet Video Parameters (0x1A))			
...				
68	HOST NAME (see Set Host Name (0x66))			
...				
100	Video Port (see Video Address)		C2 Port	

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	Host Name	Human Readable name of hardware
100	2	Video Port	Port number where images are sent
102	2	C2 Port	Port number open to receive commands (default 14001)

Table 11: Discover Protocol Packet Description

SightLine Hardware Types

See also Version Number (0x40).

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-3000-OEM	12
SLA-PC-LINUX	6		

Table 12: Hardware Type ID

Host Name

Default Host Name	SLA<*HARDWARE TYPE*>_<*MAC*>

Where MAC is last 3 octets of the MAC address. This host name be changed to something more unique or applicable to your application by using Set Host Name (0x66).

Network Interface Controllers (NIC):

SLA-HARDWARE may contain one or more physical network interfaces. For example, a system may include one wired Ethernet interface and one wireless interface. Alternately, a system can be Multihomed, have a number of VLANs, or other mechanisms to create additional network interfaces. Most systems will have only one NIC (index = 0).

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 Indication Parameters (0x2D)	Set the Mode = 2 and change the Threshold = 5 (default). You can adjust the threshold down (1 = most sensitive and more false positives).
Current Tracking Positions (0x51)	Then look for these replies.

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.

Start Up Behavior

On start up, the SLA-HARDWARE will send the Version Number (0x40) packet after the 3rd frame is acquired. At this time the system is ready to receive commands.

Get Version (0x00)

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

Returns a Version Number (0x40) reply message.

Reset (0x01)

Allow user to reset different aspects of the system. See Save Parameters (0x25) for information on persisting parameters.

Byte offset	Description	
2	Packet length = 3	
3	Packet type = 0x01	
4	Reset Type:	
	Value	**Description**
	0	parameters only reset to factory defaults
	1	Resets the onboard video decoder only.
	2	Reboot board with saved parameters
	3	DEPRECATED NEW 2.20
	4	Deletes any saved parameters and reboot the board
	5	Send reset command to any known camera attached (TAU, Sony, etc)
	6	Soft parameter only reset to factory defaults (does not reset network, serial port or camera type settings)
	7 – 255	*Reserved*

Reset Type

Value	Parameter file / Flash Memory	1500 / 3000	2000
0	No Change	Reset ALL parameters to factory defaults. Application continues to run.	
1	No Change	Not Used	Onboard ADC is reset.
2	No Change	Performs Linux Reboot	Application is reset. Does not run Upgrade Client.
4	Will be deleted	Reset run-time parameters to factory defaults.	
		Performs Linux Reboot	Application is reset. Does not run Upgrade Client.
5	No Change	Sends command to resets any digital camera if that known camera support a reset command.	Not used.
6	No Change	Run-time (video processing) parameter are reset to factory defaults. Does not reset network, serial port or camera type settings.	

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.

NOTE: For 2000/1500 "Enable all" and "Background" controls are applied to all cameras. All other parameters are applied only to the Error: Reference source not found Camera 0 Index.

NOTE: For 3000, all parameters are applied only to the Command Camera.

<table>
<tr><th>Byte Offset</th><th colspan="2">Description</th></tr>
<tr><td>2</td><td colspan="2">Packet length = 6</td></tr>
<tr><td>3</td><td colspan="2">Packet type = 0x02</td></tr>
<tr><td rowspan="9">4</td><td colspan="2">Mode:</td></tr>
<tr><td>Bit</td><td>Description</td></tr>
<tr><td>0</td><td>0 – Stabilization OFF (default)
1 – Stabilization ON</td></tr>
<tr><td>1</td><td>0 – Enable all (default)
1 – Disable all registration, stabilization, enhancement, and tracking</td></tr>
<tr><td>2</td><td>0 – Previous Images background, with blur and no color (default)
1 – Solid gray background</td></tr>
<tr><td>3</td><td>Reserved - NOTE: Used for Auto-Bias in Current Stabilization Parameters (0x41).</td></tr>
<tr><td>4</td><td>0 – Blurred or solid background (see bit 2)
1 - Previous Images background, no blur, with color</td></tr>
<tr><td>5</td><td>0 – Apply display pan-tilt in zoom to track mode (default). Offsets the display from the track center.
1 – Disable applying display pan-tilt in zoom to track mode. Allows "calibration" in normal stabilization for an offset image center with pan and tilt display controls, but the image will still center on the track in zoom to track mode. NEW 2.21
See Set Display Parameters (0x16), bit 7 of byte 9 controls Zoom to Track and bytes 11 to 14 control pan and tilt offset.</td></tr>
<tr><td>6</td><td>Reserved</td></tr>
<tr><td>7</td><td>0 – Enable PIP image micro stabilization (default)
1 – Disable PIP image micro stabilization</td></tr>
</table>

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)

NOTE: These settings are applied all cameras.

Bit 9 (Logo): On SLA-1500 and SLA-3000 can be a file loaded by user as "userLogo.png".

It must be 640 pixels wide by 150 pixels tall.

To load this file, place it in the user\AppData\Roaming\SightLineApplications directory, and use the firmware upgrade application to put the file on the SLA hardware, or to get it from the hardware (to the same location).

Byte offset	Description	
2	Packet length = 8 MOD 2.22	
3	Packet type = 0x06	
4	Bits 0..3	Primary Track Color Modes
	Bits 4..7	Primary Track Reticle Type
5	Bits 0..3	Secondary Track Color Modes
	Bits 4..7	Secondary Track Reticle Type
6	Bits 0..1	*Reserved* = 0
	Bit 2	Overlay Tracking Box Pixel Stats (0x78) NEW 2.22

		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	Show auto focus metric and ROI 0 = don't 1 = do
	Bit 7	Show registration ignore edge lines 0 = don't 1 = do
	Bit 8	Show MTI track index NEW 2.22 0 = don't 1 = do
	Bit 9	Show Logo NEW 2.22 0 = don't 1 = do
	Bit 10	Show Landing Aid NEW 2.22 0 = don't 1 = do
	Bit 11 – 15	*Reserved* NEW 2.22
8	Bits 0..3	MTI Track Color Modes (default is Cyan) NEW 2.22
	Bits 4..7	Reserved
9	Bits 0..3	MTI selectable Track Color Modes (default is Cyan) NEW 2.22
	Bits 4..7	Reserved

Track Color Modes

Value	Description
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
11	Cyan (Cyan is NEW 2.22)

Track Reticle Type

Value	Description
0	Box corners (default)
1	Cross
2	Circle
3	Duplex cross-hair
4	Modern range
5	Target dot
6 – 15	Reserved

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.

NOTE: Applied to the Camera Stabilization Order Camera 0 Index.

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. To control specifying tracks "near" existing tracks is available, see: *Near Value*.

** See Current Image Size (0x4E) for more information about capture image size.*

NOTE: Applied to the Camera Stabilization Order Camera 0 Index.

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	Flag – controls how tracks are modified
	Coordinate Space Bits – OR these with any modify mode NOTE: Do not set both Display and Source Coordinates

	0x80	Display Coordinates - Rotate Zoom Modifier. OR this flag (set bit 7 to 1) with any any of the modify modes to indicate coordinates are rotated and zoomed with the display. By default, set this flag (bit 7 = 1) for coordinates in the display image space.
	0x40	Source Coordinates. OR this flag (set bit 6 to 1) with any of the modify modes 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.
	Modify Modes	
	0	Show Cursor only
	1	Kill any existing targets and then designate a new primary target at the cursor.
	2	Designate another target at the cursor.
	3	If there is a track "near" the coordinates, move track to coordinates. See Near Value
	4	If there is a track "near" the coordinates, move track to coordinates. Otherwise, add a new track at coordinate location. See Near Value
	5	Designate track "near" coordinates as primary target. See Near Value Also supports starting tracks from SA or ST MTI tracks. MOD 2.22
	6	Designate track "near" coordinates as primary target if there is one. If not, add new track at coordinates. See Near Value Also supports starting tracks from SA or ST MTI tracks. MOD 2.22
	7	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. See Near Value
	8	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. See Near Value
	9	Kill track "near" coordinates. See Near Value
	10	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)

NOTE: Applied to the Camera Stabilization Order Camera 0 Index.

Byte offset	Description
2	Packet length = 4
3	Packet type = 0x17
4	Track Index

	0..253 By Index 254 Selected NEW 2.22 255 Primary NEW 2.22	
5	0	Stop Track
	1	Make Primary
	2	Reinitialize: This runs the acquisition assist logic to optimize track box location and size. NEW 2.22

Stop Tracking (0x09)

Turn off all tracks.

NOTE: Applied to the Camera Stabilization Order Camera 0 Index.

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.

NOTE: Applied to the Camera Stabilization Order Camera Index 0.

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	Nudge Mode: 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°...

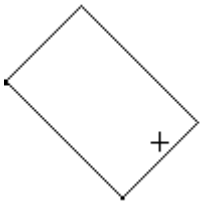
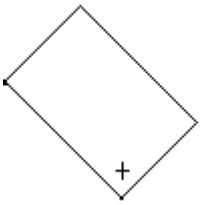
		
Original Image	“Do not rotate command with display”	“Rotate command with display”

Table 13: Example of Nudge Mode

Set Coordinate Reporting Mode (0x0B)

Set the reporting rate of Tracking Position (0x43), Current Tracking Positions (0x51), Tracking Box Pixel Stats (0x78), Focus Stats (0x55), and Landing Position (0x83) 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”.
NOTE: Applied to the Camera Stabilization Order Camera Index 0.

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 2nd frame 3 = report coordinates every 3rd 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 (0x43)
	0x02	Send Current Tracking Positions (0x51) of primary track
	0x04	Send Current Tracking Positions (0x51) of non-primary tracks
	0x10	Report Landing Position (0x83) results. NEW 2.22.

	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. **NOTE:** For SLA-1500 and SLA-3000, telemetry frames can still occasionally skip even with this feature enabled with high processor load. **NOTE:** To get full rate telemetry with high processor load, the best practice is to increase display frame step in Set Ethernet Video Parameters (0x1A) until telemetry is full rate. This additionally provides evenly spaced output frames and consistent system timing.
	0x40	Report Tracking Box Pixel Stats (0x78) over Track Box Area NEW 2.20 To report stats over the entire image area, set "size of object" to 255 in Set Tracking Parameters (0x0C) NEW 2.21
	0x80	Report Focus Stats (0x55) focus measurement statistics. NEW 2.21
6	Maximum number of tracking positions to report 0 - 100. (pass 0 for default of 10). NEW 2.21	

Set Tracking Parameters (0x0C)

Set parameters used by tracking module. See also Tracking Position (0x43).
NOTE: For 2000/1500, these parameters are applied to all cameras. For 3000, these parameters are applied only to the Camera Stabilization Order Camera Index 0.

Byte offset	Description	
2	Packet length = 8 NEW 2.20	
3	Packet type = 0x0C	
4	Size of object, in pixels, to track. (for user designated tracking)	
5	Mode (see below for description).	
	Bits	**Description**
	0..3	Tracking Modes 0 = no change 1 = Stationary mode 2 = Vehicle mode 3 = *Reserved* 4 = Scene mode 5 = *Reserved* 6 = Static mode 7 = No Registration NEW 2.22 8..15 = *Reserved* Note that if tracking mode is set to stationary, then all moving target detection

		will be turned off if it is on.
	4	High noise compensation 0 = off (default) 1 = on – improves tracking in very high noise situations
	5	Acquisition Assist NEW 2.22 0 = off (default) 1 = on – assists initialization of the track box size and location. Impacts user-designated targets in all tracking modes as well as targets auto designated by SV, SA, or ST MTI.
	6	Intelligent Assist NEW 2.22 0 = off (default) 1 = on. When enabled the tracker will look for turning tracks and if detected will attempt a reacquisition. The new track will be followed for a period of time before replacing the current track. Requires Acquisition Assist to be enabled. (May be expanded in the future).
	7	*Reserved* = 0
6	*Reserved*	
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. Valid range is 15-255.	
8	Near value, LSB (Default = 65) NEW 2.20	
9	Near value, MSB	

Near Value

Near value is the "radius of engagement" used with Modify Tracking (0x05) modes. This is the area around an existing target that interactions can take place. Large values allow greater tolerance in selecting tracks.

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.
Static Mode	Fixed location non-moving track box used for Tracking Box Pixel Stats (0x78).
No Registration Mode	Use to track moving or non-moving objects when it is difficult to accurately estimate frame-to-frame registration. NEW 2.22

Set Registration Parameters (0x0E)

Set parameters used by registration module. **NOTE:** Applied to the Camera Stabilization Order Camera Index 0.

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 (¼ 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 ¼ of the smaller dimension of the image must be remaining. For NTSC, remaining non-ignored image must be at least 120x120.
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

(auto-chop) and apply deinterlacing as it assumes an interlaced analog video input.
NOTE: Applied to the Camera Stabilization Order Camera Index 0.

WARNING: Sending this message resets registration and stabilization.

Byte offset	Description	
2	Packet length = 9	
3	Packet type = 0x10	
4	Auto-Chop	
	Value	**Description**
	0	Manual chop - removed specified edge pixels (**recommended**)
	1	automatically detect boundary pixels to remove (default)
5	Top pixels to remove (values 8 to 64)	
6	Bottom pixels to remove (values 8 to 64)	
7	Left pixels to remove (values 8 to 128)	
8	Right pixels to remove (values 8 to 128)	
9	**Deinterlacing mode:**	
	Value	**Description**
	0	no deinterlacing
	1	apply digital deinterlacing (default)
10	Automatically reset video decoder when failed frame synchronization loss is detected.	
	Value	**Description**
	0	Never (default)
	1	When frame synchronization loss detected

Chop

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 (byte 4)** or **manually specifying top, bottom, left and right (bytes 5,6,7,8) 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. Number of pixels to remove are rounded down to the nearest 8.

Set Stabilization Bias (0x12)

Adjust the stabilization solution by adding a constant bias in pixel coordinate space to the current coordinates each frame. This is used to feed forward user controlled camera motion so that

stabilization does not "fight" against camera pan and tilt. Set "auto bias" mode to automatically prevent the system from stabilizing against constant motion. Some amount of motion lag will still be experienced in "auto bias" mode.

Manual bias offsets may be used together with "auto bias" mode. Changes to the column and row bias values will be added to the "auto bias" solution. In "auto bias" mode, set column and row bias to 0 for "auto bias" only. Bias offsets may need to be scaled to up as the operational frame rate decreases.

NOTE: For 2000/1500, these parameters apply to all cameras. For the 3000, passing a camera index controls which camera(s) the parameters are set for.

Byte offset	Description
2	Packet length = 6 (7 for 3000)
3	Packet type = 0x12
4	-128..127: Per frame column adjustment (bias) in pixels (signed 8-bit integer)
5	-128..127: Per frame row adjustment (bias) in pixels (signed 8-bit integer)
6	1 = Enable auto bias (combined auto + manual bias) 0 = Disable auto bias (manual bias only)
7	Auto bias update rate 0..255 (default = 50) NEW 2.21
8	3000 only: [Optional] Camera index to set bias for. 255 = All cameras.

Set Metadata Values (0x13)

Getter						
Header		**Length**	**Type**	**ID**	**Data**	**Checksum**
0x51	0xAC	0x03 or 0x05	Get Parameters Function (0x28)	0x13	Display ID (Optional)	Compute
Reply: Current Metadata Values (0x13)						

Sets new KLV metadata data values. Latest values are output MPEG2-TS digital video stream (Set Ethernet Display Parameters (0x29)) or as EXIF HEADER in Do SnapShot (0x60). Metadata is generated in accordance with MISB standards 0102.10, 0601.7, 0603.2, 0604.3, and 0903.3. Selectable KLV elements may be chosen from a superset of the Motion Imagery Sensor Minimum Metadata Set defined in ST 0902.3. For conversion of values see Table 1 on page 16 of: http://www.gwg.nga.mil/misb/docs/standards/ST0601.7.pdf.

Byte offset	Description	Valid Data Bit
2	Packet length = 44, or 46	

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 unsigned 64-bit integer	0
14 – 15	Platform heading angle unsigned 16-bit integer	1
16 – 17	Platform pitch angle signed 16-bit integer	2
18 – 19	Platform roll angle signed 16-bit integer	3
20 – 23	Sensor latitude signed 32-bit integer	4
24 – 27	Sensor longitude signed 32-bit integer	5
28 – 29	Sensor altitude unsigned 16-bit integer	6
30 – 31	Sensor horizontal field of view unsigned 16-bit integer	7
32 – 33	Sensor vertical field of view unsigned 16-bit integer	8
34 – 37	Sensor relative azimuth angle unsigned 32-bit integer	9
38 – 41	Sensor relative elevation angle signed 32-bit integer	10
42 – 45	Sensor relative roll angle unsigned 32-bit integer	11
46 – 47	3000 only: [Optional] Network Display ID (0x0002=Net0, 0x0080=Net1,0x0082=both, else the command will be ignored), if not present, then applies to both	

Current Metadata Values (0x13)

NOTE: Get response for Set Metadata Values (0x13) uses the same ID (0x13).

Byte offset	Description
2	Packet length = 42, or 44
3	Packet type = 0x13
4 – 11	UTC time unsigned 64-bit integer
12 – 13	Platform heading angle unsigned 16-bit integer
14 – 15	Platform pitch angle signed 16-bit integer
16 – 17	Platform roll angle signed 16-bit integer
18 – 19	Sensor latitude signed 32-bit integer
22 – 25	Sensor longitude signed 32-bit integer
26 – 27	Sensor altitude unsigned 16-bit integer
28 – 29	Sensor horizontal field of view unsigned 16-bit integer
30 – 31	Sensor vertical field of view unsigned 16-bit integer

32 – 35	Sensor relative azimuth angle unsigned 32-bit integer
36 – 39	Sensor relative elevation angle signed 32-bit integer
40 – 43	Sensor relative roll angle unsigned 32-bit integer
44 – 45	3000 only: [Optional] Network Display ID (0x0002=Net0, 0x0080=Net1,0x0082=both, else the command will be ignored), if not present, then applies to both

Set Metadata Static Values (0x14)

Getter							
Header		**Length**	**Type**	**ID**	**Data**		**Checksum**
0x51	0xAC	0x04 or 0x06	Get Parameters Function (0x28)	0x14	Static Element Identifier	Display ID (Optional)	Compute
Reply: Set Metadata Static Values (0x14)							

Sets new KLV metadata values. Latest values are output with MPEG2-TS H.264 digital video stream, at the rate for each element specified by Set Metadata Rate (0x62). For non-string values, data encoding is big-endian as defined by MISB 0603. For example, to encode Target Error Estimate CE90 which is 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.

Byte offset	Description
2	Packet length = 4+n, or 6+n
3	Packet type = 0x14
4	**Static Element Identifier** 0 = Mission Identifier 1 = Platform Designation 2 = Image Source Sensor 3 = Image Coordinate System 4 = Security: Classification 5 = Security: Classifying country coding method 6 = Security: Classifying country 7 = Security: SCI/SHI information 8 = Security: Caveats 9 = Security: Releasing Instructions 10 = Security: Object Country Coding Method 11 = Security: Object Country 12 = Motion Imagery Core Identifier 13 = Platform Tail Number 14 = Target Error Estimate CE90 15 = Target Error Estimate LE90

	16 = Generic Flag Data 01 17 = Platform Call Sign
5	Identifier string length (*n*)
6 – (6+*n*-1)	Identifier string
6+n - 6+n+1	3000 only: [Optional] Network Display ID (0x0002=Net0, 0x0080=Net1,0x0082=both, else the command will be ignored), if not present, then applies to both

Set Metadata Frame Data Values (0x15)

Getter						
Header		**Length**	**Type**	**ID**	**Data**	**Checksum**
0x51	0xAC	0x03 or 0x05	Get Parameters Function (0x28)	0x15	Display ID (Optional)	Compute
Reply: Current Metadata Frame Data Values (0x15)						

Sets new KLV metadata frame data values. Latest values are output with MPEG2-TS Ethernet stream. Set the rate at which these are transmitted using Set Metadata Rate (0x62).

Byte offset	Description	Valid Data Bit
2	Packet length = 20, 21, 33, 49, or 51	
3	Packet type = 0x15	
4 – 5	**Valid data bit** mask (see column). Update corresponding data element when bit value = 1. Unsigned 16 bit integer	
6 – 9	Frame center latitude signed 32-bit integer	0
10 – 13	Frame center longitude signed 32-bit integer	1
14 – 15	Frame center elevation (bit 2) unsigned 16-bit integer	2
16 – 17	Target width unsigned 16-bit integer	3
18 – 21	Slant range unsigned 32-bit integer	4
22	User-supplied metadata flags	+
23-26	Target location specification mode: 0: field ignored 1: Target location latitude signed 32-bit integer in MISB format 2: Target location row unsigned 32-bit integer	+
27-30	Target location specification mode: 0: field ignored	+

+ Always updated if present – No Valid Data Bit

	1: Target location longitude signed 32-bit integer in MISB format 2: Target location column unsigned 32-bit integer	
31-32	Target location specification mode: 0, 2: field ignored 1: Target location elevation unsigned 16-bit integer	+
33	Target track gate height unsigned 8-bit integer	+
34	Target track gate width unsigned 8-bit integer	+
35-36	Offset corner latitude point 1 signed 16-bit integer	+
37-38	Offset corner longitude point 1 signed 16-bit integer	+
39-40	Offset corner latitude point 2 signed 16-bit integer	+
41-42	Offset corner longitude point 2 signed 16-bit integer	+
43-44	Offset corner latitude point 3 signed 16-bit integer	+
45-46	Offset corner longitude point 3 signed 16-bit integer	+
47-48	Offset corner latitude point 4 signed 16-bit integer	+
49-50	Offset corner longitude point 4 signed 16-bit integer	+
51-52	3000 only: [Optional] Network Display ID (0x0002=Net0, 0x0080=Net1,0x0082=both, else the command will be ignored), if not present, then applies to both	

User-supplied metadata flags

Bits	Description
0	0 → calculate frame center lat/long from other metadata 1 → user-supplied frame center lat/long
1 - 2	Target location specification mode:
	0 - calculate target information from other metadata
	1 - user-supplied target metadata in MISB format
	2 - user-supplied target row, column, height, width; target metadata calculated using these values. This mode provides a mechanism so that an encode-only system may be informed about target location in pixel coordinates, while still calculating MISB fields.
	3 - Undefined
3	0 → calculate 4-corner metadata values 1 → user-supplied 4-corner metadata values
4 – 7	reserved, set to 0

NOTE:

The length of this packet is variable, depending on which fields are present. Beginning with release

2.20.21, the source of several data elements may be either automatically-generated from other KLV data elements, or user-supplied. Before 2.20.21, the elements shown in the colored regions above (Frame center latitude, Frame center longitude, target location, target size, and offset corners) were calculated using a flat-earth model utilizing platform angles and position, sensor field of view, and pixel track positions where appropriate.

This automatic behavior is still achievable by either setting all bits in the User-supplied metadata flags field to 0 (or equivalently, sending the pre-2.20.21 version of the packet which is truncated before that field).

Current Metadata Frame Data Values (0x15)

NOTE: Get response for Set Metadata Frame Data Values (0x15) uses the same ID (0x15).

Byte offset	Description
2	Packet length = 49
3	Packet type = 0x15
4 – 7	Frame center latitude signed 32-bit integer
8 – 11	Frame center longitude signed 32-bit integer
12 – 13	Frame center elevation unsigned 16-bit integer
14 – 15	Target width unsigned 16-bit integer
16 – 19	Slant range unsigned 32-bit integer
20	User-supplied metadata flags
21-24	Target location latitude signed 32-bit integer
25-28	Target location longitude signed 32-bit integer
29-30	Target location elevation unsigned 16-bit integer
31	Target track gate height unsigned 8-bit integer
32	Target track gate width unsigned 8-bit integer
33-34	Offset corner latitude point 1 signed 16-bit integer
35-36	Offset corner longitude point 1 signed 16-bit integer
37-38	Offset corner latitude point 2 signed 16-bit integer
39-40	Offset corner longitude point 2 signed 16-bit integer
41-42	Offset corner latitude point 3 signed 16-bit integer
43-44	Offset corner longitude point 3 signed 16-bit integer
45-46	Offset corner latitude point 4 signed 16-bit integer
47-48	Offset corner longitude point 4 signed 16-bit integer
49-50	3000 only: [Optional] Network Display ID (0x0002=Net0, 0x0080=Net1,0x0082=both,

	else the command will be ignored), if not present, then applies to both

Set Metadata Rate (0x62)

Getter							
Header		**Length**	**Type**	**ID**	**Data**		**Checksum**
0x51	0xAC	0x04 or 0x06	Get Parameters Function (0x28)	0x62	Bit field number	Display ID(Optional)	Compute
Reply							
0x51	0xAC	0x04 or 0x06	Set Metadata Rate (0x62)	Bit field number	Frame Step	Display ID (opt)	Compute

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

Byte offset	Description
2	Packet length = 11, or 13
3	Packet type = 0x62
4 – 11	Set rate bit mask. Update the rate for the corresponding data element when bit value = 1. See Bit field number for a list of 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.
13 – 14	3000 only: [Optional] Network Display ID (0x0002=Net0, 0x0080=Net1,0x0082=both, else the command will be ignored), if not present, then applies to both

Bit field number

BIT	TAG	Field	BIT	TAG	Field
0	2	UTC time	26	48/6	Security: Releasing instructions
1	3	Mission ID	27	48/12	Security: Object country coding method
2	5	Platform heading angle	28	48/13	Security: Object country
3	6	Platform pitch angle	29	48/22	Security: Metadata version
4	7	Platform roll angle	30	65	UAS local set version
5	10	Platform designation	31	94	Motion imagery core identifier
6	11	Image source sensor	32	4	Platform tail number
7	13	Sensor latitude	33	26	Offset corner latitude point 1 *
8	14	Sensor longitude	34	27	Offset corner longitude point 1 *
9	15	Sensor true altitude MSL	35	28	Offset corner latitude point 2 *

10	16	Sensor horizontal field of view	36	29	Offset corner longitude point 2 *
11	17	Sensor vertical field of view	37	30	Offset corner latitude point 3 *
12	18	Sensor relative azimuth angle	38	31	Offset corner longitude point 3 *
13	19	Sensor relative elevation angle	39	32	Offset corner latitude point 4 *
14	20	Sensor relative roll angle	40	33	Offset corner longitude point 4 *
15	23	Frame center latitude	41	40	Target location latitude **
16	24	Frame center longitude	42	40	Target location longitude **
17	25	Frame center elevation MSL	43	42	Target location elevation **
18	22	Target width	44	43	Target track gate width **
19	21	Slant range (21)	45	44	Target track gate height **
20	12	Image coordinate system (12)	46	45	Target error estimate CE90
21	48/1	Security: Classification	47	46	Target error estimate LE90
22	48/2	Security: Classifying country coding method	48	47	Generic flag data 01
23	48/3	Security: Classifying country	49	59	Platform call sign
24	48/4	Security: SCI/SHI information	50	74	VMTI LDS targets ***
25	48/5	Security: Caveats			

*Values are calculated from platform angles, sensor angles, sensor position, frame center position, and slant range that are supplied by Set Metadata Values (0x13) and Set Metadata Frame Data Values (0x15). All four corners are assumed to be at the same elevation as the frame center for these calculations.

**Values are calculated from values supplied by Set Metadata Values (0x13) and Set Metadata Frame Data Values (0x15), 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.

***Values 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.

Frame step

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

Set KLV Data (0x61)

The KLV blob data is constructed by user to be sent with MPEG2-TS stream (see (Set Ethernet Display

Parameters (0x29)). 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 (Byte 12) to zero 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 – n+2	3000 only: Network Display ID (0x0002=Net0, 0x0080=Net1,0x0082=both, else the command will be ignored).
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, 0x00, 0x17, 0x04, 0x00,
    0x00, 0x00, 0x00, 0x18, 0x04, 0x00, 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.

NOTE: For 2000/1500, these parameters are applied to the Camera Stabilization Order Camera Index 0 except for the rotation parameters which apply to all cameras. For 3000, all of these parameters are applied only to the Command Camera.

Byte offset	Description
2	Packet length = 14
3	Packet type = 0x16
4 – 5	Rotation angle in degrees (0..360) * 128 **NOTE:** SLA-2000/SLA-1500 – Applies to all cameras SLA-3000 – Applies to command camera only. See Set Display Angle (0x5C)
6 – 7	Rotation rate limit in degrees (0..360) * 128 per frame (29.97 Hz) See Rotation angle NOTE above.
8	Decay rate 0 to 255 See Rotation angle NOTE above.
9	Bits 0 - 6: False Color Modes Bit 7: Zoom mode 0 = zoom to center of display 1 = zoom to tracking box
10	Zoom – digital image magnification factor times 64. 0 to 15 – No zoom (1X) (*subject to change*) 16 to 31 – SLA-2000/SLA-1500 No zoom (1X), SLA-3000 Zoom out by 0.25 to 0.48 32 to 63 – Zoom out by 0.5 to 0.98 64 – No zoom (1X) 65-255 – Zoom in by 1.01 to 3.98 NOTE: Zoom factors may be further limited for some HD camera and hardware combinations.
11, 12	Display pan column offset in pixels (-32767 to 32768).
13, 14	Display tilt row offset in pixels (-32767 to 32768).
15	*Reserved, should be 0* (Used to be “Logical Camera Index” but no longer supported)

False Color Modes

Value	Description	Value	Description
0, 1	no false color	20, 21	Color2, Color2 inverted
2, 3	white hot, black hot	22, 23	Color3, Color3 inverted

4, 5	rainbow, rainbow inverted	24, 25	hot iron, hot iron inverted
6, 7	iron, iron inverted	26, 27	ice fire, ice fire inverted
8, 9	hot/cold, hot/cold inverted	28, 29	IDDEF, IDDEF inverted
10, 11	jet, jet inverted	30, 31	Iron256, Iron256 inverted
12, 13	hot, hot inverted	32, 33	Rain256, Rain256 inverted
14, 15	HSV, HSV inverted	34, 35	XVolcano, XVolcano inverted
16, 17	470CLR_S, 470CLR_S inverted	36, 37	Red, Red inverted
18, 19	Color1, Color1 inverted	38, 39	Green, Green inverted
		40, 41	Blue, Blue inverted
127	User Palette. See Set User Palette (0x72) command.		

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 = 2 or 3
3	Packet Type = 0x3A
4	Camera Index. Command camera is assumed if parameter is not supplied. Ignored by 2000.

Set Display Angle (0x5C)

3000 Only NEW 2.21 Set display rotation angle settings for a single camera or for all cameras. See also Set Display Parameters (0x16).

Byte offset	Description
2	Packet length = 8
3	Packet type = 0x5C
4	Camera index to set angle for. 255 = ALL.
5 – 6	Rotation angle in degrees (0..360) * 128
7 – 8	Rotation rate limit in degrees (0..360) * 128 per frame (29.97 Hz)
9	Decay rate 0 to 255

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.

NOTE: Applied to the Camera Stabilization Order Camera 0 Index.

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*

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 (or 8 for 3000)
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	**Display Frame Step** - 1 shows every frame, 2 shows every other frame, etc. Applies to Analog, HDMI, HD-SDI and Ethernet video display. 1 to 120 (default 1). NOTE: This feature is useful for freeing processor load from display so that telemetry output can maintain full rate output for camera gimbal control. It also provides consistent display timing that can look better than alternating between showing and skipping frames.
7	Down Sample & Frame Size **NEW 2.20**

7	6	5	4	3	2	1	0
Output Frame Size				**Down Sample**			

8 – 9	3000 only: [Optional] Network Display ID (0x0002=Net0, 0x0080=Net1,0x0082=both, else the command will be ignored), if not present, then applies to both

Down Sample & Frame Size

Lower nibble: Down Sample

Whole integer value that image will be down sampled by. Applies to both MJPEG and H.264 Ethernet video.

Value	Description
0 or 1	No down-sample
2	2x2 down-sample
4	4x4 down-sample

NOTE: Down Sample 4 is not supported for MJPEG on SLA-2x00. (default 1)
Down sample is not supported on SLA-3000.

Upper nibble: Output frame size

Size of destination video. Works only when Video Format is set to a compatible format (see Set Ethernet Display Parameters (0x29)).

Value	Description
0	Default (1500/2000: 640x480 in NTSC mode, 720x576 in PAL mode; 3000:output size==input size)

1	SD (1500/2000: 640x480 in NTSC mode, 720x576 in PAL mode; 3000: 640x480)
2	720x572 (3000 only)
3	720p (1280x720)
4	720p cropped (960x720)
5	1080p (1920x1080)
6	1080p cropped (1440x1080)

SLA-2x00: only size 0 is valid
SLA-1500: size 0 always valid. Sizes 1, 2 are valid when Video Format is set to H.264 (HD)
NEW 2.20

Set Network Parameters (0x1C)

Configure the network settings for the device. See also Discover Protocol. Some SightLine products can support multiple physical/virtual network interface controllers; these can be itemized by their NIC index. However, for most applications, there will be only 1 NIC (index 0).

IMPORTANT: For parameter changes to take effect, a board reboot should be performed, by issuing Save Parameters (0x25) and Reset (0x01) (Reset Type = 2, reboot) messages.

Byte offset	Description	
2	Packet length = 22 NEW 2.20	
3	Packet type = 0x1C	
4	Mode	
	0	Use DHCP (bytes 5 -16 ignored)
	1	Use Static IP address
5 – 8	IP ADDRESS (dot form, e.g. 192 168 1 197) 0 = No Change	
9 – 12	Subnet Mask (dot form, e.g. 255 255 255 0) 0 = No Change	
13 – 16	Gateway (dot form, eg. 192 168 1 1) 0 = No Change	
17	MSB	Command and Control Reply Port (0 = No Change)
18	LSB	
19 – 20	*Reserved*	
21	Modes	
	Bit	**Description**

	0 – 1	*Reserved*
	2	0 – Enable Last In First Out (LIFO) - No longer supported MOD 2.22 1 – Disable LIFO (only option 2.22 and later) (See LIFO discussion below)
	3 – 7	*Reserved*
22	Network Interface Controller Index (default 0) -- not supported (see Set Host Name (0x66))	

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.

Disable Last In First Out (LIFO) (LIFO functionality removed n 2.22)

In 2.22 and later releases or if the disable LIFO field is set to 1 in 2.21 and earlier releases, the client must add themselves to the telemetry output list via Set Packet Destination (0x64).

In 2.21 and earlier releases:
With the disable LIFO field set to 0, the last client to send a command packet automatically receives a telemetry stream.

For example, Client A sends commands to the SLA-HARDWARE for configuring stabilization and Set Coordinate Reporting Mode (0x0B) frequency to 10 Hz. Client A then gets all the Tracking Position (0x43) responses as expected. Client B sends a Get Version (0x00) command to the SLA-Hardware. Client B receives the Version Number (0x40) response as expected, but then begins getting all of the tracking position responses. Client A will no longer get NO tracking position responses, since Client B was the "Last In".

Always in 2.22 and later releases or if Client A had set the disable LIFO bit to 1 and then added itself to the Packet Destination list, Client A would continue to get tracking position responses from the SLA-HARDWARE even if Client B sends it commands.

Get Network Parameters (0x1D)

Generates a Current Network Parameters (0x49) packet.

Header 1	Header 2	Length	Type	NIC Index	Checksum
0x51	0xAC	0x03	0x1D	*NN*	*MM*

Set SD Card Recording Parameters (0x1E)

Modify recording parameters for **on board video** and other data recording to secure digital card (MicroSD Card). For SnapShot recording see Set SnapShot (0x5E). See File Recording for additional

details.

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	Get Status – see Current SD Card Recording Status (0x58)	
7	Get Directory	
	Value	**Description**
	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)
	2	Get directory statistics (see Directory Statistics Reply (0x79) NEW 2.20
	3 – 15	*Reserved*
8 & 9	*Reserved*	
10	Record Type – specified as bits, but only commands and telemetry can be recorded together.	
	0x01	H.264
	0x02	JPEG (SLA-1500 only)
	0x04	Commands (file name will have ***.log*** appended, not supported on 3000)

	0x08	Output Telemetry (not supported on 3000)
	0x10	Pass-through log file – log data sent by Command Pass-through (0x3D) to an SD card file (not supported on 3000)
11	3000 only: Network display index (0 = Net0, 1 = Net1, otherwise command is ignored). NEW 2.22 Other systems: should be set to 0.	
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 H.264 video to MicroSD

Start recording video 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	0x01	0x00	0x05	hello	chksum

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	chksum

At this point the video file **hello_0000.ts** will be 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

Set Video Mode (0x1F)

Configures capture and display options.

Byte offset	Description
2	Packet length = 16 (or 21 for 3000)
3	Type = 0x1F
4	***This parameter is ignored.*** This parameter must be set to 0.
5	***This parameter is ignored.*** This parameter must be set to 0.
6	Display Modes

7	Display Destination or Resolution
8	Camera Stabilization Order - Camera 0 index.
9	2000 only: Camera Stabilization Order - Camera 1 index. (Otherwise set to 0)
10	2000 only: Camera Stabilization Order - Camera 2 index. (Otherwise set to 0)
11	2000 only: Camera Stabilization Order - Camera 3 index. (Otherwise set to 0)
12	PiP Scale
13	PiP Quadrant
14	**2000/3000 only**: Camera Display Order - Camera 0 index.
15	**2000/3000 only**: Camera Display Order - Camera 1 index. (Otherwise set to 0)
16	**2000 only**: Camera Display Order- Camera 2 index.(Otherwise set to 0)
17	**2000 only**: Camera Display Order - Camera 3 index. (Otherwise set to 0)
18	**3000 only**: Analog Destination - Display Image Mode
19	**3000 only**: HDMI Destination - Display Image Mode
20	**3000 only**: Network 0 Destination - Display Image Mode
21	**3000 only**: Network 1 **Destination -** Display Image Mode
22	**3000 only**: HD-SDI Destination - Display Image Mode NEW 2.22

Display Modes

Value	Description
0	One UP (1-UP) [Default]
1	Picture In Picture
2	Two Up
3	Quad Screen
4	Blended (see also Set Blend Parameters (0x2F)) (see 3000 exception below)
5	*Reserved*
6	Side-By-Side
7– 15	*Reserved*

NOTE: For the SLA-3000 Blend isn't a display mode, set Display Mode to zero (1-UP) and use Display Image Mode to enable blending.

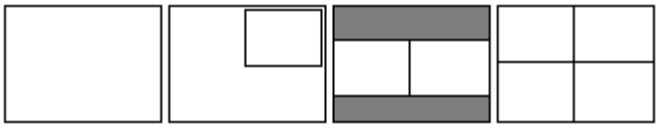


Illustration 1: Display Modes

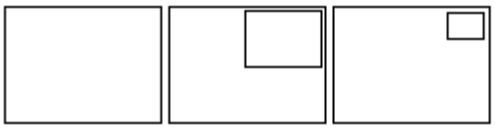


Illustration 2: Picture-In-Picture Scale

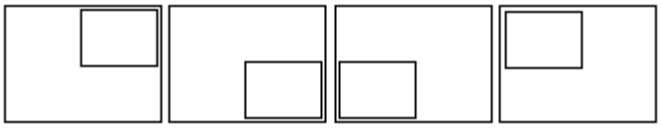


Illustration 3: Picture-In-Picture Quadrant

Display Destination or Resolution

SLA-1500

Bits	7	6	5	4	3	2	1	0
Description	0	0	0	0	NTSC_VBI	Display Destination		

SLA-2000

Bits	7	6	5	4	3	2	1	0
Description	0	Non-square	0	0	NTSC_VBI	Display Destination		

SLA-3000

Bits	7	6	5	4	3	2	1	0
LEN = 16	Display Destination							
LEN > 16 (2.21)	Display Resolution (SLA-3000 Only)							

Display Destination

Value	Description
0	NONE
1	Analog Video

2	Network
3	Analog and Network
4	*Reserved*
5	HD-SDI 1080P
6	*Reserved*
7	*Reserved*

NOTE: When bits 0 – 2 are set to **Network** or **Analog and Network**, you will also need to configure the protocol for using Set Ethernet Display Parameters (0x29).

NTSC_VBI

NTSC VBI output (1500 & 2000 only). Works with "Analog Video" and "Analog and Network" display destinations for NTSC output only (not PAL). **Requires save parameters and power cycle.**

Non-square

Non-square pixel 720 wide output mode (2000 only) NEW 2.20

Display Resolution

SLA-3000 ONLY (See Bytes 19 and 22), otherwise this field is ignored..

Values	Description
0x04	720P60 HDMI or HDSDI
0x05	1080P30 HDMI or HDSDI (not all monitors will support this format)
0x07	1080P60 HDMI or HDSDI
0x08	720P50 HDMI or HDSDI (not all monitors will support this format)
0x09	1080P50 HDMI or HDSDI (not all monitors will support this format)
Other values	Not defined

Display Image Mode

Value	Description
0, 1 or 2	Camera 0, 1, 2
4	Multi-Camera (PiP or Two-Up)
8	Blend
255	None

NOTE: For the SLA-3000, if Multi-Camera or Blend is set for Display Image, single Camera displays

may not work.

NOTE: 3000 cannot display to all combinations of Analog, HDMI, and HD-SDI at the same time. If two or more of these display types are specified, results are unpredictable.

Camera Stabilization Order

Camera 0 index identifies the camera that the Tracking Position (0x43) telemetry output comes from . It also indicates which camera channel receives camera specific parameters settings (each command will indicate if it applies to a specific camera or if it applies to all cameras).

NOTE: This is also known as the “Command Camera”. For the 3000, this can also be set with Command Camera.

PiP Scale

Value	Description
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
5	$\frac{3}{8}$ screen size zoom on primary track
6	$\frac{1}{2}$ screen size zoom on primary track

PiP Quadrant

Value	Description
0	Top Right
1	Bottom Right
2	Bottom Left
3	Top Left

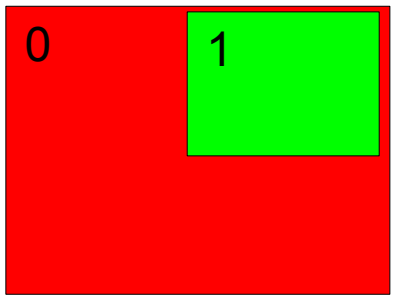
Camera Display Order

Camera 0 Index identifies which camera to display for single camera display (1-UP mode). In multi-camera display modes such as PiP or Quad0 screen, this will be camera 0. Identifies Camera 1 for

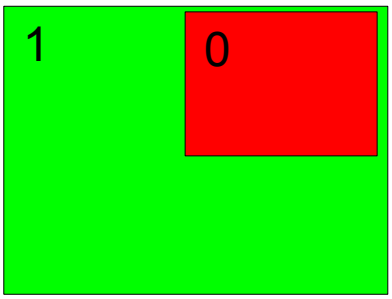
multi-camera display (PiP, Two Up and 2000 only - Quad modes). Identifies Camera 2 for Quad camera display mode. Identifies Camera 3 for Quad camera display mode.

Camera Display Order (2000 Only)

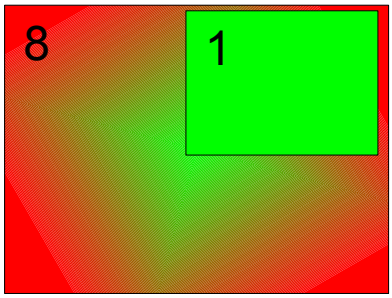
Defines the order in which cameras will be displayed for display mode. For Example:



Display Order: 0,1,2,3
0 = Camera 0 image



Display Order: 1,0,2,3
1 = Camera 1 image



Display Order: 8,1,2,3
8 = **Blend** image

When using **Blend** mode, the first field for **Camera Display Order** value should be set to "**8**". This indicates that the primary display will contain the blended image. For example:

Display Mode	Display Dest	Camera Order				...	Camera Display Order			
0x04	0x01	0x00	0x01	0x02	0x03	. . .	**0x08**	0x01	0x02	0x03

Command Camera

Many parameters are only applied to the "Command" camera. This is set by byte 8 of Set Video Mode (0x1F) or by Set Command Camera (0x5B)

Set Command Camera (0x5B)

3000 Only. Sets which camera channel receives camera specific parameter settings. For 2000/1500, use byte 8 of Set Video Mode (0x1F). The response packet has the same format.

Byte offset	Description
2	Packet length = 3
3	Type = 0x5B
3	Camera Index - Indicates which camera channel receives camera specific parameters settings. **NOTE:** Same as byte 8 of Set Video Mode (0x1F).

Set Video Enhancement Parameters (0x21)

Set up enhancement of the display video.
NOTE: NEW 2.21 CLAHE 9 and 10 bit modes are only valid for high bit depth cameras. Selecting normal CLAHE for a high bit depth camera converts the video to 8 bits first then runs CLAHE. 9 bit

CLAHE is slower than 8 bit, 10 bit is slower than 9 bit. "Saturation" from Set ADC Parameters (0x18) byte 6 is used in CLAHE 9 and 10 bit modes to control the mix between down-conversion of bits using mean and spread and the min and max pixels. 255 = 100% min/max based (allows you to see detail on very bright or very dark objects. 0 = 100% spread based (high contrast image, may be saturated in some areas). 128 => even mix of the two methods.
NOTE: Applied to the Camera Stabilization Order Camera 0 Index.

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 3 = CLAHE 9 Bit (for >8 bit cameras) 4 = CLAHE 10 Bit (for >8 bit cameras)
	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 KLV Data (0x61) 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 (or 13 for 3000)	
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	Bits 0..3	0 = Filter All Edges (Default) 1 = Disable All Filtering 2 = Disable Slice Edge Filter Other values = *Reserved*
	Bits 4..6	*Reserved*, set to 0
	Bit 7	0 = Default 1 = Apply encoder fix to support hardware decoders (SLA-1500 only, SLA-2xxx set to 0)
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.	
13 - 14	3000 only: [Optional] Network Display ID (0x0002=Net0, 0x0080=Net1,0x0082=both, else the command will be ignored), if not present, then applies to both. (MSB then LSB)	

Target Bit Rate

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 I-Frame interval to something random and set target bit rate to desired target bit rate
- Change I-Frame interval back to old I-Frame interval.
- Maximum bit rate: 10MBits/sec (10000000)

NOTES:

- The **I-Frame** contain the full image and does not require any additional information to reconstruct it. **P-Frames** contains motion-compensated difference information relative to previously decoded pictures. No B-Frames are generated.
- To use Mega-Block Period or Slice Refresh, I-Frames must be set to zero (0).
- When using H.264 (HD) (below), Block and Slice are not available.
- The GOP (Group of Pictures) size is the I-Frame Interval, with only P-frames in-between (IPPPP....IPPPP....)
- When setting the Target Bit Rate, consider the impact on all the devices on the network from the encoder all the way to the ground station (radios, switches, etc.) These devices may limit or burst network traffic to maintain quality of service on other network traffic, or impose other

limitations. Setting too high a bit rate may result in bursts of packets resulting in choppy video.

Save Parameters (0x25)

Commits current parameters to flash. Parameters are then loaded when system restarts. See Reset (0x01) for different options to reset parameters.

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

Parameter Files

System	Storage Mechanism	Notes
SLA-2000	NOR Flash	Can also be removed using Upgrade Server (-d)
SLA-1500	NAND Flash file system	Can be modified by using SSH or FTP or similar
SLA-3000		

Get Parameters Function (0x28)

The value of the **ID** field corresponds to the "Setter" of the same type. Some commands take additional argument(s). Response packets are unique and usually have their own type ID.

Byte	0	1	2	3	4	5	6...	Resp
Name	Header		Len	Type	ID	(chksum)		Type
Version Number	0x51	0xAC	3	0x28	0x00	(0x73)		0x40
Get Configuration (0x01) (3000 only)	0x51	0xAC	3	0x28	0x01	(0x2d)		0x01
Stabilization Parameters	0x51	0xAC	3	0x28	0x02	(0xcf)		0x41
Overlay Mode	0x51	0xAC	3 or 4	0x28	0x06	[ObjID]		0x42
Tracking Parameters	0x51	0xAC	3	0x28	0x0C	(0xd0)		0x44
Coordinate Reporting Mode	0x51	0xAC	3	0x28	0x0B	(0x53)		0x0B
Registration Parameters	0x51	0xAC	3	0x28	0x0E	(0x6c)		0x45
Video Parameters	0x51	0xAC	3	0x28	0x10	(0xee)		0x46
Metadata Data Values (*1)	0x51	0xAC	3 or 5	0x28	0x13	[NetDispID]		0x13

Metadata Static Values (*1)	0x51	0xAC	4 or 6	0x28	0x14	see →	0x14
Metadata Frame Data Values (*1)	0x51	0xAC	3 or 5	0x28	0x15	[NetDispID]	0x15
Metadata Rate (*1)	0x51	0xAC	4 or 6	0x28	0x62	see →	0x62
ADC Parameters	0x51	0xAC	3	0x28	0x18	(0x2c)	0x47
Ethernet Video Parameters (*1)	0x51	0xAC	3 or 5	0x28	0x1A	[NetDispID]	0x48
Video Mode	0x51	0xAC	3	0x28	0x1F	(0xaf)	0x4B
Video Enhancement Parameters	0x51	0xAC	3 or 4	0x28	0x21	[CamIdx]	0x4A
H.264 Video Parameters (*1)	0x51	0xAC	3	0x28	0x23	[NetDispID]	0x56
Moving Target Indication Parameters	0x51	0xAC	3	0x28	0x2D	(0xad)	0x54
Blend Parameters	0x51	0xAC	3	0x28	0x2F	(0x11)	0x4D
Get Image Size	0x51	0xAC	3	0x28	0x31	(0x93)	0x4E
Ethernet Display Parameters (*1)	0x51	0xAC	3 or 5	0x28	0x29	[NetDispID]	0x52
Acquisition Parameters	0x51	0xAC	3 or 4	0x28	0x37	[CamIdx]	0x4F
Display Parameters	0x51	0xAC	3 or 4	0x28	0x3A	[CamIdx]	0x57
Display Angle (3000 only)	0x51	0xAC	3 or 4	0x28	0x5C	[CamIdx]	0x5C
SnapShot	0x51	0xAC	3	0x28	0x5E	(0xb7)	0x5D
Hardware ID (1500/3000 only)	0x51	0xAC	3	0x28	0x50	(0xa8)	0x50
System Type	0x51	0xAC	3	0x28	0x63	(0xf4)	0x65
Command Camera (3000 only)	0x51	0xAC	3	0x28	0x5B	(Calc)	0x5B

(*1) SLA-3000 only: optionally takes additional argument(s).

Obj ID – Graphics Object ID. If not present, then returns all objects.
Net Disp ID - Network Display ID (0x0000=Net0, 0x0080=Net1). If not present, then Net0 is assumed.
Cam Idx - Index of the camera to get the value from. If not present, then the current Camera Stabilization Order Camera 0 Index is assumed.

Get Configuration (0x01) (3000 only)

This packet gets sent from SLA-3000 as a response to the Get Parameter / Get Configuration command.

Byte offset	Description
2	Packet length = 14
3	Type = 0x01
4	Max number of camera inputs (always 3)

5 – 7	*Reserved*
8 – 11	Camera present bit pattern, bit0=Cam0, bit1=Cam1,... (e.g. 0x00000005 indicates Cam0 and Cam2 are connected)
12 – 15	Display present bit pattern (e.g. 0x00000083 indicates Analog, Net0 and Net1 are available). See Display Destination in Set Ethernet Display Parameters command for display type values.

Set Ethernet Display Parameters (0x29)

Configures output format of Ethernet Video. Set the destination IP address and port number where the video will be sent. See also Set Video Mode (0x1F) to set the Display Destination mode. Video quality settings can be set using Set Ethernet Video Parameters (0x1A) or Set H.264 Video Parameters (0x23) depending on which Video Mode is selected.

Byte offset	Description
2	Packet length = 9 (or 11 for 3000)
3	Type = 0x29
4	Video Encoding
5 – 8	IP Address
9 – 10	Base Port Number
11 – 12	3000 only: [Optional] Network Display ID (0x0002=Net0, 0x0080=Net1, else the command will be ignored), if not present, then applies to both (Net1 uses Base Port Number + 1 in the case)

Video Encoding

7	6	5	4	3	2	1	0
Broadcast Ethernet Video	***Reserved***			Video Codec & Transport			

Video Codec & Transport

Value	Description
0	RTP MJPEG (default) - Send compressed **Display** image
1	MPEG2-TS H.264 [LEGACY] – Baseline encoding for SD images only
2	RTP MJPEG Source - Sends compressed **Source** (RAW) input image
3	MPEG2-TS H.264 (HD) – Baseline for SD or HD encoding
4	MPEG-4
5	RTP-H.264 NEW 2.22

6	RTP-MPEG2-TS-H.264 NEW 2.22
7	RTP-MPEG2-TS-MPEG4 NEW 2.22
8 – 14	*RESERVED*
15	NONE

Base Port Number

Network port on remote station where network packets will be received (e.g. on the Ground Station). Below is a list of default ports chosen for a particular protocol. You may change these as needed with caution as other software may be using these ports.

Codec	Recommend Port Number
0	5004
1	15004
2	5004
3 – 7	15004

Broadcast Ethernet Video

Value	Description
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. Affects H.264 video ONLY.

IP Address

Any valid IPv4 address. If Broadcast Ethernet Video bit is set to 1, then you must set the IP address to 255.255.255.255.

Multicast:

If bytes 5 - 8 are set to an IP address within the valid Multicast range the video will be sent as a multicast packet. Internally, we determine if the IP address is within the Multicast range, so no additional setting are needed to use those addresses. For example: we default use 224.10.10.10 as the IP address and the destination MAC will be in the 01:00:52:xx:xx:xx range.

The Time To Live (TTL) for all Multicast packets has been reduced to four (4), so this will limit how many intermediate hops between the source (VPU) and the destination (the PC).

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		

NOTES:

- When Video Codec & Transport is not H.264, down sample must be either 0 or 2 (above).

Get Ethernet Display Parameters (0x39)

DEPRECATED: Use Set Ethernet Display Parameters (0x29). Use with Get Parameters Function (0x28). Returns a Current Ethernet Display Parameters (0x52).

[SLA-3000] Pass display destination in additional argument field to return parameters for each network destination (see Set Video Mode (0x1F) Byte 7).

EXAMPLE

SLA HEADER		Length	Type	ID	Additional Args		checksum
0x51	0xAC	0x05	0x28	0x39	0x02	0x00	0x02

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 Moving Target Indication Parameters (0x2D)

Set the parameters for Moving Target Indication (MTI). Results in Current Tracking Positions (0x51) results being generated. See also Set Coordinate Reporting Mode (0x0B).

NOTE: Applied to the Camera Stabilization Order Camera 0 Index.

Three modes of automatic moving target indication are available, depending on the security bits enabled.

Vehicle Medium Moving Target Indication.

This mode works best when finding moving vehicles in a moving scene. It works well from a moving aerial platform for finding vehicles that are typically 10 to 100 pixels long in the scene. It does not work as well at finding very small, very large, slow or erratically moving objects. Available with SLA Baseline MTI Application Bits (App Bits).

Staring Small Moving Target Indication

This mode works well for a ground camera that is either stationary or moves then stares for an extended time at a scene. It can find objects that are small and move at slow, fast or varying rates or that temporarily stop. Available with SLA Baseline MTI Application Bits (App Bits).

Aerial Small Moving Target Indication

This mode works from a moving platform and can find small and slow, fast or erratically moving objects. It is capable of handling scene motion with frame to frame perspective change. It will lose objects that stop moving. This mode takes the most compute resource and is the most likely to run at less than full frame rate if other processing is also enabled (such as network video output). Available with SLA Enhanced MTI Application Bits (App Bits).

Byte offset	Description	
2	Packet length = 9	
3	Packet type = 0x2D	
4	0 = Don't change motion modes **Note:** Only choose one of bits 4 (MTD), 5 (Staring MTI), 6 (Mobile MTI).	
	Bit 0	1 = Disable All (Other bits ignored)
	Bit 1	1 = Reset MTI (Other bits ignored). This will clear all tracks, except in Vehicle mode the primary track will persist. NEW 2.21
	Bit 2	0 = Disable motion assist of primary target 1 = Enable motion assist for primary target only
	Bit 3	0 = Disable motion assist of all targets 1 = Enable motion assist for all targets
	Bit 4	***Vehicle*** Medium Moving Target Indication – for use on a mobile platform 0 = Disable, 1 = Enable **Note:** if enabled, tracking mode will be set to vehicle tracking.
	Bit 5	***Staring*** Camera Small Moving Target Indication - for use with a fixed camera or a ground mounted camera that moves then “stares”. 0 = Disable, 1 = Enable
	Bit 6	***Aerial*** Platform Small Moving Target Indication – for use with an aerial moving camera. 0 = Disable, 1 = Enable

	Bit 7	*Reserved*
5	0 = Disable moving target debug display (default) 1 = Enable moving target debug display	
6	Sensitivity 0 = Don't change sensitivity value. 1...10 Set sensitivity value. 1 = highest sensitivity 10 = lowest sensitivity. Default is 5.	
7	MTI Threshold. (Not used in ***Vehicle*** MTI mode) This is an advanced 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	MTI Watch Frames. (Not used in ***Vehicle*** MTI mode) This is an advanced parameter. After a potential moving target is generated by the moving target indication system, it is watched by the system for a number of frames. This controls the number of frames the system watches a moving target 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).	
9	MTI Suspicious Score. MOD 2.21. Was SuspScore16 in the advanced message. (Not used in ***Vehicle*** MTI mode) The sensitivity parameter controls MTI Suspicious Score when this parameter is set to 0. Otherwise, it overrides the sensitivity parameter (byte 6).	
10	Frame Step. NEW 2.21 (Not used in ***Vehicle*** MTI mode) Step between frames. 1 processes every frame, 2 processes every other frame, etc. (1 to 5). Default 1.	

Sensitivity

The moving target indication **sensitivity** refers to the algorithm's "threshold" for deciding whether a particular candidate target is a moving target or a false positive. A lower value translates into greater sensitivity to moving targets and faster detection time, but also may introduce more false positives. A higher value translates into less sensitivity to moving targets, higher detection time for a given candidate, but less false positives.

Selectable

SA and ST MTI are capable of tracking very small objects, these objects typically wouldn't be tracked

well by the object tracker. These MTI modes can also track larger objects and be used to aid in track designation much like SV mode. The term “selectable”" is used to describe tracks that can be handed off to the object tracker with a reasonably high level of confidence that they will continue to track well.

Suspicious Score

This is an advanced parameter. It controls the level at which we consider a track suspicious. Valid range is 0-10. Setting this value higher will result in more false positives.

0	Automatically set based on the Sensitivity value. Otherwise, it overrides the sensitivity parameter (byte 6).
1	Anything that doesn't move consistently is suspicious (typically 1 is good for cars)
3-5	good for people
10	track can move very erratically

Current Moving Target Indication Parameters (0x54)

Get Parameters Function (0x28)	Set Moving Target Indication Parameters (0x2D)

Format is the same as Set Moving Target Indication Parameters (0x2D). MOD 2.21. Updated to correctly match Set Moving Target Indication Parameters format.

Set Advanced Moving Target Indication Parameters (0x76)

This packet provides advanced control of the MTI parameters. MOD 2.22 Most of these parameters only apply to Staring and Aerial mode except where explicitly stated otherwise.

NOTE: Applied to the Camera Stabilization Order Camera 0 Index.

Byte Offset	Name	Type	Description
2	Length	u8	Packet length = 40
3	Type	u8	Packet type = 0x76
4,5	MinVel8	s16	Minimum target velocity (256*pixels/frame) (-1 = not set)
6,7	MaxVel8	s16	Minimum target velocity (256*pixels/frame) (-1 = not set)
8,9	MaxAccel8	s16	Maximum target acceleration (256*pixels/frame^2) (-1 = not set)
10,11	MinWide	s16	Minimum target width (pixels) (-1 = not set)
12,13	MaxWide	s16	Maximum target width (pixels) (-1 = not set)
14,15	MinHigh	s16	Minimum target height (pixels) (-1 = not set)

16,17	MaxHigh	s16	Maximum target height (pixels) (-1 = not set)
18	HideOverlapTrks	u8	1 = Hide targets that overlap with object tracks. These will not be displayed or reported in telemetry. 0 = Don't hide. NEW 2.22
19	NFramesBack	u8	Number of frames to go back in time to compare frames in MTI difference mode. (1 to 15). Default 15. This parameter only applies to Aerial MTI mode (above). Use 15 for small slow moving object detection and smaller numbers for faster larger objects.
20	MergeRadius	u8	Maximum distance between targets at which they can be merged into a single target. (0 to 255 pixels) 0 = automatic, default = 0, typical is 10 to 25.
21	MergeDirTol	u8	Maximum angle heading difference between targets at which they can be merged. (0 to 180 degrees). Default = 45 degrees.
22	Reserved	u8	*Reserved* NEW 2.21
23	Reserved	u8	*Reserved* NEW 2.21
24,25	Reserved	s16	*Reserved* NEW 2.21
26,27	BgTimeConst	u16	Time constant (in frames) at which frames are averaged into the background model. At the default value of 600, the background will mostly be replaced after about 20 seconds. This parameter only applies to Staring MTI.
28	BgEdgePenalty6	u8	Penalty to apply to edges in background model mode. Typical values are 0 (no edge penalty) to 64 (full edge penalty). Default 64. This parameter only applies to Staring MTI.
29	BgResetConf	u8	Reset background model if registration confidence falls below this value for BgResetFrames frames. 0 to 100, default 40
30	BgResetOff	u8	Reset background model if the registration column or row offset exceeds this value for BgResetFrames frames. 0 to 255, default 100
31	BgResetAng	u8	Reset background model if the registration angle in degrees exceeds this value for BgResetFrames frames. 0 to 180, default 1
32	BgResetFrames	u8	Reset background model if the above conditions are met for this number of consecutive frames. 0 to 255, default 2. Allows for recovery from temporary bad frames or temporary large motion, but resets when there is a large amount of motion.
33	BgWarpConf	u8	Warp the background model if registration confidence falls below this value for BgWarpFrames frames. 0 to 100, default 85

34	BgWarpOff	u8	Warp the background model if the registration column or row offset exceeds this value for BgWarpFrames frames. 0 to 255, default 32
35	BgWarpAng	u8	Warp the background model if the registration angle in degrees exceeds this value for BgWarpFrames frames. 0 to 180, default 1
36	BgWarpFrames	u8	Warp the background model if the above conditions are met for this number of consecutive frames. 0 to 255, default 1. Allows for ignoring a small number of bad frames or temporary large motion, but warps when there is a significant amount of motion.
37	MaxTrackFrames	u8	Number of frames to keep tracking once target has disappeared. 1 to 244. 0 = automatic, 255 = don't drop.
38	Reserved	u8	*Reserved* NEW 2.22. (See Set Overlay Mode (0x06) to display MTI track indices).
39	Downsample	u8	Down Sample: NEW 2.21 0: None 1: 2x2 downsample, 2: 4x4 downsample 3: 8x8 downsample 255: Auto based on frame size **Note**: None is not supported for frame sizes greater than 1280x720. New 2.22 Applies to Staring, Aerial, and Vehicle mode.
40	MaxTrackTelem	u8	Maximum number of MTI tracks reported in the Current Tracking Positions (0x51) message. Default 10. NEW 2.21
41	MaxTrackKlv	u8	Maximum number of MTI tracks reported in the KLV data. Default 10. NEW 2.21

Current Advanced Moving Target Indication Parameters (0x77)

Get Parameters Function (0x28)	Set Advanced Moving Target Indication Parameters (0x76)

Format is the same as Set Advanced Moving Target Indication Parameters (0x76).

Set MTI Region of Interest (0x7C)

NEW 2.21 Sets the parameters for Moving Target Indication (MTI) Region of Interest (ROI).

The search ROI is the area that the MTI algorithms will look for motion in. The detection ROI is the area that the MTI algorithms will report motion in. Having a search area larger then the detection area allows the MTI to report motion as soon as it enters the detection area, whereas having the two areas equal in size reduces the overall processing load.

NOTE: Applied to the Camera Stabilization Order Camera 0 Index.

Byte offset	Description

2	Packet length = 19	
3	Packet type = 0x7C	
4	Flags	
	Bit 0	0 = Disable debug display 1 = Enable debug display
	Bit 1-7	*Reserved*
5,6	Upper left row of the search region. Default = 0	
7,8	Upper left column of the search region. Default = 0	
9,10	Height of the search region. Default = 0 (use entire height)	
11,12	Width of the search region. Default = 0 (use entire width)	
13,14	Upper left row of the detect region. Default = 0	
15,16	Upper left column of the detect region. Default = 0	
17,18	Height of the detect region. Default = 0 (use entire height)	
19,20	Width of the detect region. Default = 0 (use entire width).	

Note: The detect region must be fully contained inside of the search region. If it is not the settings will be ignored.

Current MTI Region of Interest (0x7D)

Get Parameters Function (0x28)	Set MTI Region of Interest (0x7C)

Format is the same as Set MTI Region of Interest (0x7C).

Set Blend Parameters (0x2F)

Requires Set Video Mode (0x1F) be used to set Display Modes to Blend. See also Current Blend Parameters (0x4D).

NOTE: SLA-2000/3000 Only

Blend an EO (visible) and an IR camera.

NEW 2.20 The EO camera can now be an HD digital camera. When both cameras are standard definition with similar fields of view, set Absolute Zoom Mode off to scale the EO camera to match the IR. When the warp camera is HD, Absolute Zoom Mode can be turned on to achieve a more significant zoom factors. For example, if a 1280x720 HD camera is to be blended with a 640x480 camera where the horizontal fields of view match, pass zoom=128 and zoom absolute = 1 to get a zoom factor of 0.5 which will scale the HD image to 640x360 before blending.

Byte offset	Description		
2	Length = 18 MOD 2.20		
3	Packet type = 0x2F		
4	Bit 0	Offset Mode (see examples below)	
		0	Interpret bytes 5&6 as incremental offsets
		1	Interpret bytes 5&6 as absolute offsets
	Bit 1	Absolute Zoom Mode NEW 2.20	
		0	Zoom (1 … 255) maps to (0.9 … 1.1). Usually used when both cameras are SD or have matching pixel size on target.
		1	Zoom (1 … 255) maps to (0.004 … 0.996). Usually used when one camera is HD and the other is SD.
	2-7	*Reserved*	
5	Shift EO camera position vertically.		
	(-128...127) number of pixels.		
	Negative number = up Positive number = down		
6	Shift EO camera position horizontally.		
	(-128...127) number of pixels.		
	Negative number = left Positive number = right		
7	Rotation of EO camera (1 … 255) maps to (-5 … 5) degrees		
	0 = don't change rotation (default)		
8	Zoom scale factor applied to EO camera (1 … 255). Maps to (0.9 … 1.1) or to (0.004 to 0.996), depending on Absolute Zoom Mode in byte 4		
	0 = don't change zoom (default)		
9	Blend mode:		
	Value	Description	
	0	Don't change (default)	
	1	Frame Blend Warped EO – basic percentage (controlled by Amount) blending of the warped EO and fixed IR images, Optionally applies yellow Hue from bright areas in the warped EO image to the output.	
	2	Thermal Blend Warped EO – blends hot pixels from the fixed IR camera (shown in red) with the warped EO image. Typically used to highlight hot areas in a daytime EO image.	

	3	Night Blend Warped EO – blends bright areas from the warped EO camera (modify color with Hue) with the fixed IR image. Typically used to highlight bright lights in a night time IR image.
	4	Color Blend Warped EO - percentage (controlled by Amount) blending of the warped EO and fixed IR images like Frame Blend, but the color from the warped EO image is also passed to the output (also controlled by Amount).
	5	*Reserved*
	6	Frame Blend Fixed EO – basic percentage (controlled by Amount) blending of the fixed EO and warped IR images, Optionally applies yellow Hue from bright areas in the IR image to the output. NEW 2.21
	7	Thermal Blend Fixed EO – blends hot pixels from the fixed EO camera (shown in red) with the warped IR image. Typically used to highlight hot areas in a daytime EO image. NEW 2.21
	8	Night Blend Fixed EO – blends bright areas from the fixed EO camera (modify color with Hue) with the warped IR image. Typically used to highlight bright lights in a night time IR image. NEW 2.21
	9	Color Blend Fixed EO - percentage (controlled by Amount) blending of the fixed EO and warped IR images like Frame Blend, but the color from the fixed EO image is also passed to the output (also controlled by Amount). NEW 2.21
10	Amount defines the amount of luminance information from the EO (visible) camera to include in the blended result.	
	0 = don't change/default.	
	(1 … 255) maps to (0 … 1).	
	Applies to: FrameBlend, NightBlend, ColorBlend and ThermalBlend modes.	
11	Hue scale factor. Amount of yellow hue to apply from bright areas in the EO camera.	
	0 = No Change	
	1 = No Hue ... 255 = Full Hue	
	Applies to: FrameBlend and NightBlend modes.	
12	*Reserved* (set to 0)	
13	Calibration reset (0 or 1). Resets the image warp calibration (zoom, rotate, shift up/down/left/right) back to default.	
14	*Reserved* (set to 0)	
15	Warp camera index. This camera is warped into the space of the other camera through	

	the calibrations settings before blending. MOD 2.20	
16	Fixed camera index. This camera is not warped before blending. MOD 2.20	
17	Image Alignment Parameter Index NEW 2.20	
	0	Use the alignment parameters in this packet (default)
	1	Use a preset alignment (defined by Set Multiple Alignment (0x74)) and set index of preset alignment parameters in byte 18 below.
18	Indicate index of preset alignment parameters. This byte ignored if byte 17 above is set to zero. NEW 2.20	
19	Horizontal zoom scale applied to EO camera (1 … 255) on top of Zoom in byte 9. Maps to (0.9 … 1.1). Vertical zoom = Zoom Horizontal zoom = HorizontalZoom*Zoom NEW 2.20	
	0 = don't change zoom (default)	

Offset Mode Examples

If byte 4 is 1, then field is interpreted as absolute offset e.g. new warp horizontal offset (relative to fixed image) = byte 5
If byte 4 is 0, then field is interpreted as incremental offset e.g. new warp vertical offset (relative to fixed image) = old warp vertical position + byte 5

Designate Selected Track Primary (0x32)

Command the system to designate the selected track as primary.

NOTE: Applied to the Camera Stabilization Order Camera 0 Index.

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).

NOTE: Applied to the Camera Stabilization Order Camera 0 Index.

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

Set Acquisition Parameters (0x37)

Configure video input for digital camera interfaces. See also Set Advanced Capture Parameters (0x7B).

NOTE: For changes between NTSC and PAL camera mode to take effect, a board reboot should be performed, by issuing Save Parameters (0x25) and Reset (0x01) (Reset Type = 2, reboot) messages.
NOTE: systems cannot support different analog video formats on different analog ports. For example, when one analog video port is set to NTSC, all of the analog video ports are set to NTSC.
NOTE: Image Height, Width, and Bit Depth are ignored except in **Generic Digital Mode**.

Byte offset	Description
2	Length = 25
3	Type = 0x37
4	Camera Index
5	Camera Types (SLA-2000/2100) Camera Types (SLA-1500/SLA-3000)
6 – 7	Image Height (0 for default)
8 – 9	Image Width (0 for default)
10	Bit Depth (0 for default)
11 – 12	Vertical Front Porch (in lines) (0 for default)
13 – 14	Horizontal Front Porch (in pixels) (0 for default)
15 – 16	Flags (0 for No change)
17	Frame Step – step between frames – 0 means ignore (e.g. 2 = every other). (default 1) 0 → 255
18	Reserved, should be set to 0
19-20	Valid ROI – Row (SLA-3000 only)
21-22	Valid ROI – Column (SLA-3000 only)
23-24	Valid ROI – Height (SLA-3000 only)
25-26	Valid ROI – Width (SLA-3000 only)

Valid ROI specifies a dynamically changeable subregion of the complete acquired image frame. Unlike other parameters in this message, the Valid ROI parameters take effect immediately, rather than require a system restart.

Camera Index

Please refer to the Hardware ICD for additional information about video ports and capabilities.

Board	Analog Ports	Digital Port
SLA-2000	Analog 0 to Analog 3	Digital 4

SLA-2100	Analog 0 and Analog 1	Digital 2
SLA-1500	Analog 0 and Analog 1	Digital 2
SLA-3000	See below	

SLA-3000 Video Ports

	When used as one 16-/24-bit input...	When used as two 8-bit inputs...
Connector...	**Appears in Software As...**	
J3 (Vin0)	Cam 0	Cam 0 and Cam 1
J4 (Vin1)	Cam 2	Cam 2 and Cam 3

Camera Types (SLA-2000/2100)

NOTE: Save parameters and reset to change between PAL and NTSC.

Type ID	Description	Hardware Support
0	Disabled	
1	NTSC	Sets all analog camera ports to NTSC.
2	Generic Digital	SLA-2000 CameraLink NOTE: Uses High, Wide, and Bit Depth
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
8	1080P	SLA-2100 HD-SDI
9	1080I	SLA-2100 HD-SDI
10	FLIR TAU 640 8 Bit	SLA-2000 CameraLink
11	FLIR TAU 640 14 Bit	SLA-2000 CameraLink
12	Goodrich SU640HSX (no serial control)	SLA-2000 CameraLink
13	PAL	Sets all analog camera ports to PAL.
14	*Reserved*	
15	HD Hitachi 720 P	Hitachi Block camera NEW 2.20
16 – 255	*Reserved*	

Camera Types (SLA-1500/SLA-3000)

NOTE: Save parameters and reset to switch between PAL/NTSC.

Type ID	Description	Hardware Support
0	Disabled	
1	NTSC (Auto)	Automatically detect NTSC or PAL. Defaults to NTSC if no analog camera is connected. Analog video output type is matched to analog video input type. NOTE: Sets all analog camera ports to NTSC.
2	Generic Digital	Generic Digital Interface. NOTE: Uses High, Wide, Bit Depth, Vertical and Horizontal Front Porch, Flags
3 – 6	*Reserved*	
7	720P	SONY[1] FCB-EH 6000 series, FCB-EH 3150
8	1080P	SONY[1] FCB-EH 6000 series
9	1080I	SONY[1] FCB-EH 6000 series
10	FLIR TAU 640 8 Bit	
11	FLIR TAU 640 14 Bit	
12	*Reserved*	
13	PAL	Forces analog video input and output to PAL mode. NOTE: Sets all analog camera ports to PAL.
14	*Reserved*	
15	HD Hitachi 720 P	Hitachi Block camera
16	DRS Tam 640 8 bit	DRS Tamarisk 640
17	DRS Tam 640 14 bit	DRS Tamarisk 640
18	DRS Tam 320 8 bit	DRS Tamarisk 320
19	DRS Tam 320 814 bit	DRS Tamarisk 320
20	Alticam Barracuda 600P	Alticam Barracuda
21	HD-SDI 720P 30	
22	NTSC VBI	NTSC camera with VBI data
23	HD SONY 7500 720P 30	SONY[1] 7000 series
24	HD SONY 7500 1080P 30	SONY[1] 7000 series
25 – 255	*Reserved*	

1 All Sony cameras requires a power cycle when changing between 720 and 1080 mode.

Flags

Bits	Description	
0..2	Input Data Mode (SLA-1500) 0=Greyscale 1= YUV Others = Reserved	
3	0 = progressive	
	1 = interlaced	
4	Vertical Sync Polarity (1 = inverted) (for Sony 7500, etc.)	
5	Horizontal Sync Polarity (1 = inverted) (for Sony 7500, etc.)	
6..9	Camera initialization routine. Called with parameters specified above in this message.	
	0	No Initialization Routine (InitNoop)
	1	InitSony(resolution(High))
	2	InitDRS(Bit Depth)
	3	InitQuark(Bit Depth) – Quark and other (non-Tau) FFC cameras
	4	InitPhoton(Bit Depth)
	5	InitCameraLinkLowSpeed(Bit Depth)
	6	InitTau(Bit Depth) Direct Connect, Tau-FFC SLA1500
	7	Reserved
	8 – 15	Future
10	Use Data Valid signal (SLA-3000)	
11..14	Reserved	
15	Reserved Special (SLA-3000)	

Camera initialization routine

Assuming the appropriate adapter board or communication signals are connected, the VideoTrack software will try to configure the camera with the specified values or other known settings. This is done in order to improve the user experience by removing the need for the customer to pre-configure the camera. For example, the FLIR TAU is set to CMOS mode and 8-bit output.

See also Command Pass-through (0x3D).

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.
NOTE: For SLA-3000 Picture in Picture, graphic objects are not drawn to the PIP window.
NOTE: When using this packet code for GetParameters(DrawObject), an additional parameter is expected: Use 0 to get all Ids of currently drawn objects, or a valid object ID to receive the object's parameters.

SEE Current Overlay Objects (0x6B) [NYI]

NOTE: Applied to the Camera Stabilization Order Camera 0 Index.

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. NOTE: Maximum number of simultaneous drawn objects is 64.	
5	Action 0 = Destroy 1 = Create Note that if destroy action is specified, then following fields are ignored.	
6	Coordinate Properties	
7	Object Type	
8 – 15	**See below**	
16	Color To Number Mapping	
	Bits 0-3	Background color. For vertical and horizontal lines, the background color is drawn as a shadow. Pass Transparent (14) to disable drawing of shadow.
	Bits 4-7	Foreground color.

17 to 17+length-1	Text Object Only: Text string characters

Bytes 8 – 15 Interpretation

NOTE: x = column and y = row

	Bytes							
Object Type	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Circle	Center Point X		Center Point Y		Radius		Ignored	
Filled Circle								
Rectangle	Upper Left Corner X		Upper Left Corner Y		Width		Height	
Filled Rectangle								
Line	End Point 1 X		End Point 1 Y		End Point 2 X		End Point 2 Y	
Text	Upper Left X		Upper Left Y		String length		Ignored	
Text Extended					H Scaling	V Scaling	Font ID	Spacing

String length

Length of the text string (referred to as “length” below). Maximum length of text is 64 characters. NOTE: For Object Type Text, string length is specified. For Object Type Text Extended, we calculate it from the packet length.

H Scaling

Horizontal scale shifted left 5 (e.g. 32 means no scaling. 0 is also interpreted as no scaling).

V Scaling

Vertical scale shifted left 5.

Font ID

Values	Description
0	Courier (Default)
1	Courier Bold
4	Classic
Special (Bit 7)	
0x80	Enable shadow effect - Shadow effect only applicable when background is set to transparent.

Spacing

Pixels between a font to the next font. If 0, then uses the font's default spacing.

Coordinate Properties

VALUE	Description
0	Reserved
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.
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.
3	*Reserved*
4	This mode should be used for static overlays such as text.
5 - 127	reserved
Bit 7	0 (DEFAULT) - coordinates are 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. 1 - coordinates are specified relative to the 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.

Object Type

Value	Description
0	Circle
1	Rectangle
2	Line
3	Text
4	Filled Circle
5	Filled Rectangle
6	Text Extended
7 to 254	*Reserved*
255	*Error or Object Not Found*

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.

NOTE: Applied to the Camera Stabilization Order Camera 0 Index.

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 *Minimum 1 byte* *Maximum 80 bytes*

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

NOTE: See Hardware specific ICD to see which ports your hardware currently support.

Port ID	Description
0	Serial Port 0
1	Serial Port 1
2	Ethernet Port
3	Reserved
4	Serial Port 2 (1500/3000 only)
6	Serial Port 3 (3000 only)
7	Serial Port 4 (3000 only)
11	SD Card log file. Start, stop and name this file with Set SD Card Recording Parameters (0x1E)
12	USB Port (1500 only)

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	Port ID (see above)
5	Baud Rate (see below)
6	Data Bits
7	Stop Bits
8	Parity
9	Maximum packet length
10	Maximum packet delay (ms)

11	Protocol Type
12 – 13	Local inbound port number where UDP/TCP packets are expected LSB then MSB *Ethernet port were all payload data will be received.* *Hardware opens a new socket to listen on this port.*
14 – 17	Destination IP address of host where UDP packets will be sent
18 – 19	Destination port number (port number where host is listening). *Hardware opens a new socket and sends data to the outbound destination IP Address at the destination port number.*
20-21	AttNav port number (default 65100) If configured as Pass Through, data on this port is passed on to the serial port.

NOTE: Serial ports do not offer hardware or software flow control.
NOTE: For parameter changes to take effect, a board reboot should be performed, by issuing Save Parameters (0x25) and Reset (0x01) (Reset Type = 2, reboot) messages.

Protocol Type

A number of protocol parsers have been implemented. Not all protocols are available on all platforms.

Value	Description
0	SLA Protocol
1	Scan Eagle Aquarius packet parsing & SLA Protocol
2	Reserved 0
3	Reserved 1
4	Port Not Used (allows use by other applications)
5	TCP Pass Through
6	Raw Pass Through (direct pass-through with no change)
7	KLV data received on serial or udp receive port injected into MP2TS stream
8	Serial-to-Serial (send output to another serial, 1500/3000 only)
9	USB/PTP camera

SLA Protocol

Ports using this protocol type will accept SightLine Application commands (0x51 0xAC) specified in this document and may also generate telemetry data.

KLV PASS-THROUGH

KLV Pass-through receives formatted KLV metadata via serial port generated by an external processor. This KLV metadata is injected into the MPEG2-TS stream along with compressed digital video. When

using this mode, internally-generated KLV metadata should be disabled via Set Metadata Rate (0x62).

Serial-to-Serial PASS-THROUGH

Serial-to-Serial sends output from one serial port to another serial port specified in Destination port number (must be set to one of the Port ID values, 4 for Serial Port 2 for example). Maximum packet length, inbound port, destination IP and AttNav are ignored. By configuring two ports to output to each other, the two ports act like they are "piped" together.

Example:

Tell the SLA-HARDWARE to send data received on local UDP 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 1000 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 2 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		

Baud Rates

Baud Rate	
Value	**Baud Rate**
0	4800 (1500 only)
1	9600
2	38400
3	57600 (Default)
4	115200
5	19200

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	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. See File Recording for additional details.

Byte offset	Description	
2	Packet length = 15 + userLen + passLen	
3	Packet type = 0x5E	
4	Snapshot Destination	
	0	FTP Server
	1	Micro SD Card **(default)**
	2 – 15	*Reserved*
5	File Format	
	Value	**Format**
	0	JPEG
	1	PNG NEW 2.21
	2 – 15	Reserved
6	Image Source	
	0	*Reserved*
	1	Captured image (default)
	2	Display image
	3 – 15	*Reserved*
7	Quality – JPEG compression quality level 0 to 100 (default 80) – PNG compression (default 80) see below	
8	Down Sample	

	1	Full Resolution (default)
	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, e.g. 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] User name Length length of user name string	
16 to (16 + userLen - 1)	[OPTIONAL] User Name String FTP server login user name	
16 + userLen	[REQUIRED] Password Length length of password string	
17 + userLen to (17 + userLen + passLen - 1)	[OPTIONAL] Password String FTP server login password	

File Format

JPEG/JPG

A form of lossy compression defined by the Joint Photographic Experts Group (JPEG). See also EXIF HEADER for information on embedded metadata.

NOTE: JPEG Snap Shots of capture (source) image only works when image depth is 8-bits. For example, JPEG capture of 14-bit TAU digital image will not work.

PNG Snapshot Compression Settings

The Quality value will affect the size of the PNG.

- PNG uses lossless compression. If you want smaller files, it will take longer to generate the PNG.
- A Quality setting of 100 will correspond to an uncompressed file
  - height*width*2 for 16 bit grayscale output
  - height*width*3 for RGB output
- Recommend leaving the Quality at default of 80, this gives the best file size and performance.
- Setting below 60 not recommended.

NOTE: When saving a 14-bit grayscale capture source, the PNG will be 16-bits.
NOTE: When working with 16-bit PNG file, we recommend NOT using Microsoft Windows Paint.

Do SnapShot (0x60)

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

See File Recording for additional details.

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 (1 to 254). (default 1) 255 = continuous. 0 = Stop. NEW 2.22
6	File Name Length - length of file name string
7 to 7+fileNameLen-1	FileName – Base file name of saved files (see below).

EXAMPLE (Single Snap to MicroSD)

Record a single JPEG called “hello_0000.jpg”

HEADER		LEN	TYPE	SRC			Q	SMP	IP ADDRESS				port		USRLEN	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	Base File Name					CHK SUM
0x51	0xAC	0x0a	0x60	0x01	0x01	0x05	0x68	0x65	0x6c	0x6c	0x6f	0x95

File hello_0000.jpg is now on the MicroSD card. Sending the same command...

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

hello_0001.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 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. The Version Number packet is automatically sent after the first three frames of acquisition.

TIP: Use the Version Number (0x40) packet as a mechanism to know the system is ready to receive commands.

Byte offset	Description
2	Packet length = 17
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 (app bits) below
15	Hardware Type above
16	Software Revision (Release number)
17-18	Other Version (Used for FPGA on SLA1500) NEW 2.20

Application Bits (App Bits)

Bit	Value	Description
0	0x00000001	HD output (1500) NEW 2.20
1	0x00000002	Stabilization
2	0x00000004	H.264 video compression in MPEG2-TS network video output
3	0x00000008	Baseline MTI – ***Vehicle*** and ***Staring*** moving target indication
4	0x00000010	Tracking of objects
5	0x00000020	Advanced MTI – ***Aerial*** moving target indication of small sized objects
6	0x00000040	Stabilization and tracking telemetry output for gimbal control
7	0x00000080	Enhancement + high bit depth image + temperature telemetry output
8	0x00000100	Blending of images
9	0x00000200	HD input NEW 2.20
10	0x00000400	Recording of video (requires compression bit) and snapshot of still images
11	0x00000800	KLV metadata encoding into MPEG2-TS H.264 network video stream
12	0x00001000	Auto Focus lens control and telemetry output NEW 2.22
13	0x00002000	Landing Aid detection NEW 2.22

Table 14: Application Bits (App Bits)

Current Stabilization Parameters (0x41)

Get Parameters Function (0x28)	Set Stabilization Parameters (0x02)

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 – Blurred previous image background 1 – Solid gray background
	3	0 – Auto bias disabled 1 – Auto bias enabled
	4 – 6	*Reserved*
	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)

Format is the same as Set Overlay Mode (0x06) .

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. For reporting telemetry to multiple destinations see Set Packet Destination (0x64). Multiple tracks (or MTI Tracks) result in a Current Tracking Positions (0x51).

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. Track column and row is the center of the track box. See also Set Tracking Parameters (0x0C) and Modify Tracking (0x05).

Scene translation is the frame-to-frame offset, rotation, and scale accumulated over the number of frames since the last Tracking Position report. This is 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, with (0;0) being the top left pixel, 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.

Byte offset	Description

2	Packet length = 26
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.
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.
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.
22	Horizontal scene translation 8 bit fractional pixel (combine with bytes 8 & 9). See below for how to extract scene translation.
23	Vertical scene translation 8 bit fractional pixel (combine with bytes 10 & 11). See below for how to extract scene translation.
24 & 25	Scene frame to frame rotation (-128 to 127 degrees)*128 (signed 16 bit integer)
26 & 27	Scene frame to frame scale change factor * 256. 1.0*256 indicates no change. (unsigned 16 bit integer)

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 = 8	
3	Packet type = 0x44	
4	Size of object, in pixels, to track. (default 40)	
5	0..3	Tracking Modes 0 = no change 1 = Stationary mode 2 = Vehicle mode 3 = *Reserved* 4 = Scene mode 5 = *Reserved* 6 = Static mode 7 = No Registration NEW 2.22 8..15 = *Reserved* Note that if tracking mode is set to stationary, then all moving target detection will be turned off if it is on.
	4	High noise compensation 0 = off (default) 1 = on – improves tracking in very high noise situations
	5	Acquisition Assist NEW 2.22 0 = off (default) 1 = on – assists initialization of the track box size and location. Impacts user-designated targets in all tracking modes as well as targets auto designated by vehicle MTI.
	6	Intelligent Assist NEW 2.22 0 = off (default) 1 = on. When enabled the tracker will look for turning tracks and if detected will attempt a reacquisition. The new track will be followed for a period of time before replacing the current track. (May be expanded in the future).

	7	*Reserved* = 0
6	*Reserved* – set to 0	
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.	
8	Near value, LSB (Default = 65) NEW 2.20	
9	Near value, MSB NEW 2.20	

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)

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 (21 for 3000)
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 (SLA1500/2000) or Display Resolution (SLA-3000) NEW 2.22
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

18	3000 only: Analog Display Image 0, 1, 2 = Camera 0, 1, 2 4 = Multi Camera (PiP or Two-Up) 8 = Blend 255 = None
19	3000 only: HDMI Display Image (0, 1, 2, 4, 8, 255) NOTE: 3000 cannot display to Analog and HDMI at the same time. If both are specified, then HDMI is ignored.
20	3000 only: Network 0 Display Image (0, 1, 2, 4, 8, 255)
21	3000 only: Network 1 Display Image (0, 1, 2, 4, 8, 255)
22	3000 only: HD-SDI Display Image (0, 1, 2, 4, 8, 255) NEW 2.22

Current Blend Parameters (0x4D)

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

Byte offset	Description		
2	Packet length = 17 MOD 2.20		
3	Packet type = 0x4D		
4	Bit 0	*Reserved*	
	Bit 1	Zoom Mode NEW 2.20	
		0	Zoom (1 … 255) maps to (0.9 … 1.1).
		1	Zoom (1 … 255) maps to (0.004 … 0.996).
	Bits 2-7	*Reserved*	
5	EO camera up shift. (0 … 255) number of pixels		
6	EO camera right shift. (0 … 255) number of pixels		
7	EO camera down shift. (0 … 255) number of pixels		
8	EO camera left shift. (0 … 255) number of pixels		
9	Rotation of EO camera (1 … 255) maps to (-5 … 5) degrees		
10	Zoom scale factor applied to EO camera (1 … 255). Maps to (0.9 … 1.1) or to (0.004 to 0.996), depending on Absolute Zoom Mode in byte 4		
11	Blend Mode		
	Value	**Description**	
	0	don't change/default.	

	1	FrameBlend Warped EO
	2	ThermalBlend Warped EO
	3	NightBlend Warped EO
	4	Color Blend Warped EO
	6	FrameBlend Fixed EO MOD 2.21
	7	ThermalBlend Fixed EO MOD 2.21
	8	NightBlend Fixed EO MOD 2.21
	9	Color Blend Fixed EO MOD 2.21
12	Amount defines the amount of luminance information from the EO (visible) camera to include in the blended result. Applies to: FrameBlend, NightBlend, ColorBlend and ThermalBlend modes.	
13	Hue scale factor. Amount of yellow hue to apply from bright areas in the EO camera. Applies to: FrameBlend and NightBlend modes.	
14	*Reserved*	
15	*Reserved*	
16	EO camera index (0 to 4, default 1). This camera is warped into the space of the other camera through the calibrations settings before blending. It is assumed that this is the EO or visible camera input for Thermal and Night blend modes. NEW 2.20	
17	IR camera index (0 to 4, default 0). This camera is not warped before blending. It is assumed that this is the IR or infrared camera input for Thermal and Night blend modes. NEW 2.20	
19	Horizontal zoom scale applied to EO camera (1 … 255) on top of Zoom in byte 9. Maps to (0.9 … 1.1). Vertical zoom = Zoom Horizontal zoom = HorizontalZoom*Zoom NEW 2.20	

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 Modes (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. See Set Acquisition Parameters (0x37) for additional notes and details on the camera types.

Byte offset	Description
2	Length = 26 MOD 2.22
3	Type = 0x4F
4	Number of input cameras
5	Camera Index
6	Camera Types (SLA-2000/2100) Camera Types (SLA-1500/SLA-3000)
7 – 8	Image Height (0 for default)
9 – 10	Image Width (0 for default)
11	Bit Depth (0 for default)
12 – 13	Vertical Front Porch (in lines) (0 for default)
14 – 15	Horizontal Front Porch (in pixels) (0 for default)
16 – 17	Flags (0 for No change)
18	Frame Step – step between frames – 0 means ignore (e.g. 2 = every other). (default 1) 0 → 255 NEW 2.20
19	Reserved, should be set to 0
20-21	Valid ROI – Row (SLA-3000 only)
22-23	Valid ROI – Column (SLA-3000 only)
24-25	Valid ROI – Height (SLA-3000 only)
26-27	Valid ROI – Width (SLA-3000 only)

Hardware ID (0x50)

Get Parameters Function (0x28)	Get Hardware ID (0x50)

Obtain the 64-bit unique hardware identifier. Returns a **Get Hardware ID (0x50)** reply packet (below). See also Get Version (0x00).

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. For reporting telemetry to multiple destinations see Set Packet Destination (0x64).

Render Track Points

In order to render the tracking point of interest in display coordinates , with (0;0) being the top left pixel, 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*numTracks)+4 if (15*numTracks)+4 < 127 Lower 7 bits of (15*numTracks)+4 if (15*numTracks)+4 >= 127 NumTracks is given in byte offset 5 of this packet. (see pseudo-code below for explanation of length field).
3	Optional high bits of packet length (if > 127, see below)
n	Packet type = 0x51
n+1	Camera Index {0,1,2,3}
n+2	Number of tracks. If high bit is set, packet also contains MTI tracks. MOD 2.22
n+3	Track Index *N*. 0-9 = Object tracker or SV MTI MOD 2.22 10-109 = SA or ST MTI MOD 2.22

<table>
<tr><td>n+4 – n+5</td><td>Tracking column in camera coordinates</td></tr>
<tr><td>n+6 – n+7</td><td>Tracking row in camera coordinates</td></tr>
<tr><td>n+8 – n+9</td><td>Track width</td></tr>
<tr><td>n+10 – n+11</td><td>Track height</td></tr>
<tr><td>n+12 – n+13</td><td>Track horizontal velocity multiplied by 256. Positive is to the right. Reported in pixels/frame. For stationary tracks, returns position rather than velocity.</td></tr>
<tr><td>n+14 – n+15</td><td>Track vertical velocity multiplied by 256. Positive is down. Reported in pixels/frame. For stationary tracks, returns position rather than velocity.</td></tr>
<tr><td>n+16</td><td>Track Confidence (0 … 100)</td></tr>
<tr><td>n+17</td><td>Mode
<table>
<tr><th>Bit</th><th>Value / Description</th></tr>
<tr><td>0</td><td>0 = Not Primary
1 = Primary
see Designate Selected Track Primary (0x32)</td></tr>
<tr><td>1</td><td>0 = Not Selected
1 = Selected</td></tr>
<tr><td>2 – 3</td><td>SL_TRACK_RESULT_STATE</td></tr>
<tr><td>4 – 7</td><td>SL_TRACK_STATE</td></tr>
</table></td></tr>
<tr><td></td><td>Repeat bytes n+3 through n+17 for each track
(see byte offset n+2)</td></tr>
</table>

Length Handling Pseudo-code

```
int offset = 0;
int length = data[2];
if(length&0x80 > 0) {   //means high-bit is set and therefore length is extended
   length = (0x7F&data[2])+(data[3]<<7);
   offset = 1;
}
int type = data[3+offset];
int nTracks = data[4+offset];
etc...
```

Primary/Not Primary and Selected/Not Selected

Primary	• 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	• 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) Get Ethernet Display Parameters (0x39)

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).

Focus Stats (0x55)

Periodic report of focus statistics. Enabled using the Set Coordinate Reporting Mode (0x0B) command. Set the region of interest with Set Lens Params (0x6E). NEW 2.21 - Beta Functionality, subject to change

Byte offset	Description
2	Packet length = 15.
3	Packet type = 0x55
4	Camera Index {0,1,2,3} NEW 2.21
5 – 8	Focus metric * 256, signed 32 bit integer scaled up by 8 bits.
9 – 16	64 bit micro-second time at which this frame was captured.

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) (byte 6) command. See also Directory Statistics Reply (0x79)

Byte offset	Description	
2	Length = 11	
3	Packet Type = 0x58	
4	Recording State	
	1	Recording
	2	Stopped
	0x04	Network trace commands enabled (OR this bit)
	0x08	Network trace telemetry enabled (OR this bit)
5 – 8	RESERVED NEW 2.20	
9 – 12	Recording size in bytes. NEW 2.20	

Recording State

The recording state (byte offset 4) can be used to determine the presence or absence of the MicroSD Card. Bit 1 or bit 2 will be set if the MicroSD card is present.

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.
NOTE: A maximum of 1024 file names will be returned.

Byte offset	Description
2, 3	Packet length. Note: extended size packet. MOD 2.22
4	Packet Type = 0x59
5 & 6	Total number of files (16 bit-integer)
7 & 8	Start index in this packet (0 to nfiles-1)
9 & 10	End index in this packet (0 to nfiles-1)
11...11+(endIndex-startIndex+1)	Length of filename start … Length of filename end
11+(endIndex-startIndex+1)..Variable	Ascii Encoded filename start … Ascii Encoded filename end

Examples:

Byte	Contents	Description
5 & 6	*4*	4 files
7 & 8	*0*	File index 0 is the first file in the group
9 & 10	*2*	File index 2 is the last file in the group
11	*8*	Length of file name 0
12	*11*	Length of file name 1
13	*15*	Length of file name 2
14 – 22	*File.txt*	File name 0
23 – 34	*Nextfile.ts*	File name 1
35 - 47	*AnotherFile.ext*	File name 2

Byte	Contents	Description

5 & 6	*4*	4 files
7 & 8	*3*	File index 3 is the first file in the group
9 & 10	*3*	File index 3 is the last file in the group
11	*8*	Length of file name 0
12 – 20	*boot.txt*	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)

Get Parameters Function (0x28)	Set System Type (0x63)

Used to configure the primary functionality of a system. See also Current System Type (0x65). Default System Type is **0x03** (Analyze and Render). The Analyze Render Synch (0x7E) packet is sent by an Analyze system in order to synchronize between the Analyze system and the Render system.. If the Force Synchronization bit is set, Analyze Render Synch (0x7E) packets are sent for Analyze and Render systems as well, in effect allowing two functional render systems.

Byte offset	Description	
2	Packet length = 4	
3	Packet type = 0x63	
4 – 5	System Types	
	Bit	**Functionality**
	0	Analyze
	1	Render
	2	Force Synchronization
	3 – 15	*Reserved*

System Types

Defines the primary functionality of the system. Useful when distributing functionality amongst multiple units on a network.

Analyze	System will perform image processing and will produce telemetry
Render	System will perform rendering, display, encoding or similar

Set Packet Destination (0x64)

Used to configure the output destination for telemetry. See Set Coordinate Reporting Mode (0x0B) for the types of telemetry output that are available.

Byte offset	Description	
2	Packet length = 12	
3	Packet type = 0x64	
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

<table>
<tr><td></td><td>4 – 15</td><td>Reserved</td></tr>
<tr><td>5</td><td colspan="2">Camera ID
1500/2000 - Results from this hardware are reported as cameraID in Tracking Position (0x43) and Current Tracking Positions (0x51).
3000 Only – Indicates the index of the camera to send telemetry from.</td></tr>
<tr><td>6 – 9</td><td colspan="2">IP Address – IP address of the receiver</td></tr>
<tr><td>10 – 11</td><td colspan="2">Destination Port – data will be sent to this port on the receiver (default: 14001)</td></tr>
<tr><td rowspan="4">12</td><td colspan="2">Flags NEW 2.22</td></tr>
<tr><td>Bit</td><td>Description</td></tr>
<tr><td>0</td><td>0 – Don't save this packet destination (default)
1 – Save and restore this packet destination when the parameter file is saved and loaded
SLA-Panel Connect passes 0 (don't save)
SLA-Panel → Device → Network → Add passes 1 (save)</td></tr>
<tr><td>1</td><td>0 – Don't apply the camera ID. Send back the actual camera index in the telemetry packets.
1 – Apply the camera ID (use for multi-board setup with multiple cameras). Send the Camera ID specified in this message in the telemetry packets.
Ignored on 3000</td></tr>
<tr><td></td><td>2 – 7</td><td>Reserved</td></tr>
<tr><td>13</td><td colspan="2">Reserved</td></tr>
</table>

Current System Type (0x65)

See Set System Type (0x63).

Set Host Name (0x66)

Get Parameters Function (0x28)	Host Name (0x66)

See also Set Network Parameters (0x1C) and Discover Protocol.

Byte offset	Description
2	Packet length = 33
3	Packet Type = 0x66 NEW 2.20
4	Index Network Interface Controllers (NIC) (default 0)
5 - 37	NIC Name (variable length string) 32-bytes ('\0' for any unused bytes)

Set Name Example:

Length	Type	Index	"SLAWEST"							\0	...	\0	chk
0x20	0x66	0x00	0x53	0x4c	0x41	0x57	0x45	0x53	0x54	0x00	. . .	0x00	0xNN

Current Network List (0x67)

Sends back the names of all network interfaces controllers in response to:

Get Parameters Function (0x28)	Network List (0x67)

Byte offset	Description
2	Packet length = 3 + Length of Names
3	Packet Type = 0x67 NEW 2.20
4	Number of Network Interface Controllers (NIC)
5 - N	NIC Name (variable length string) separated by '\0'

Reply Example:

Length	Type	# of NICs	"SLAWEST"							\0	"wifi0"					\0	chk
0x11	0x67	0x02	0x53	0x4c	0x41	0x57	0x45	0x53	0x54	0x00	0x77	0x69	0x66	0x69	0x30	0x00	0xNN

Current Overlay Object Ids (0x68) [NYI]

A list of used object ids as a 255 long bit array (in four u64 chunks). Use this information to then request the properties of a particular object ID. '1' means it is drawn, '0' means it is not.

Byte	Description
2	Packet Length = 18
3	Packet Type = 0x68 NEW 2.22
4 – 7	ID's 1 through 63
8 – 11	ID's 64 through 127
12 – 15	ID's 128 through 191
16 – 19	ID's 192 through 255

Current Overlay Objects (0x6B) [NYI]

Get Parameters Function (0x28)	Draw Object (0x3B)	Object ID (optional)

Returns the properties of a particular graphic overlay specified by its Object ID.

Byte	Description

2	Packet Length = VARIABLE
3	Packet Type = 0x6B NEW 2.22
4	Object Type
5	Object ID – unique index assigned at creation
6	Move With Camera
7	Static Object
8 – 15	See above
16	Color To Number Mapping
17 – N	Text String

When no Object ID is specfied a lits of used indexes are returned (see Current Overlay Object Ids (0x68) [NYI])

Set Lens Mode (0x6C)

Used to control a lens mechanism. If any data needs to be sent along with a command, this data will be in the bytes following the LensMode.

Byte offset	Description
2	Packet length = 3 + **Data Bytes** length
3	Packet type = 0x6C
4	Lens Mode
5,6 ...	Optional Data Byte(s)

Lens Mode

Value	Description	Data Bytes	Data
0	Unknown or Not Defined	0	
1	*Reserved*	0	
2	Reset Lens Mechanism	0	
3	Request Lens Status	0	
4	Zoom in Wide Direction	0	
5	Zoom in Narrow Direction	0	
6	Stop Zoom Motion	0	
7	Focus in Far Direction	0	
8	Focus in Near Direction	0	

9	Stop Focus Motion	0	
10	One Push Auto Focus	0	
11	N/A	1	0 = disabled 1 = enabled
12	Lens NUC (IR camera)	1	0 = no shutter 1 = shutter
13	Set Zoom Position	2	U16 (LSB,MSB) – Motor pulse counts
14	Set Focus Position	2	U16 (LSB,MSB) – Motor pulse counts

Current Lens Status (0x6D)

Returns current focus and zoom position. This is sent as a response to a GetParameters(CurrentLensStatus) request.

Byte offset	Description
2	Packet length = 6
3	Packet type = 0x6D
4,5	Focus Position Unsigned 16 bit (LSB,MSB) – Motor pulse counts
6,7	Zoom Position Unsigned 16 bit (LSB,MSB) – Motor pulse counts

Set Lens Params (0x6E)

Set the current parameters for controlling the lens mechanism

Byte offset	Description
2	Packet length = 11 Updated 2.21
3	Packet type = 0x6E
4	Lens Types
5	AutoFocus Metric Region Size % of screen (0 to 100)
6	Zoom Track Focus (0= disabled, 1= enabled)
7	Autofocus method (0=scan far to near, 1=seek)
8	Autofocus Rate Adjust (0 to 255) 100 = default speed of motion
9	Autofocus Change Percent (0 to 255) in 1/10ths of a percent. 40 (default) = 4%
10	Zoom speed (0=use default, 1=min 255=max) NEW 2.21
11	Focus speed (0=use default, 1=min 255=max) NEW 2.21

Current Lens Params (0x6F)

Return the current Lens Parameters persisted in the SLA1500. This is sent as a response to a GetParameters(CurrentLensParams) request.

Byte offset	Description
2	Packet length = 11 Updated 2.21
3	Packet type = 0x6F
4	Lens Type, 0= none, 1 = Tamron SC001
5	AutoFocus Metric Region Size % of screen (0 to 100)

6	Zoom Track Focus (0= disabled, 1= enabled)
7	Autofocus method (0=scan far to near, 1=seek)
8	Autofocus Rate Adjust (0 to 255) 100 = default speed of motion
9	Autofocus Change Percent (0 to 255) in 1/10ths of a percent. 40 (default) = 4%
10	Zoom speed (0=use default, 1=min 255=max) NEW 2.21
11	Focus speed (0=use default, 1=min 255=max) NEW 2.21

Lens Types

A set of known lenses or cameras with integrated lenses for which command and control has been implemented. Assumes the lens is connected to a known serial port (e.g. Tamron SC001 is connected to Serial 1 on SLA-1500). This serial port will be automatically configured to the correct baud rate, etc. Command pass-through and similar commands will not be available.

Value	Device	Serial Port
0	None	NA
1	Tamron SC001	1
2	Sony	2
3	Hitachi	2

Set Digital Camera Parameters (0x70)

Set parameters that pertain to a specific digital camera. ROI (Region Of Interest) for autogain statistics is used to indicate a part of image to be used in calculations. This is defined as an offset from the relevant edge as a percentage of the full width/height of image.

Note: setting both “Autogain Max value” and “Autogain Min Value” to 0 will result in these parameters being ignored.

Byte offset	Description
2	Packet length = 12
3	Packet type = 0x70
4	Camera Id of digital camera (SLA1500 = 2)
5	Mode (1 = freeze Autogain at min/max below)
6,7	Autogain Max value (max value maps to 255 in 8 bit output)
8,9	Autogain Min Value (min value maps to 0 in 8 bit output)
10	Row ROI for Autogain stats. Row Offset in % of image height (255=100%)

	Full image (default) = 0
11	Col ROI for Autogain stats. Col Offset in % of image width (255=100%) Full image (default) = 0
12	High ROI for Autogain stats. Height in % of image height (255=100%) Full image (default) = 255
13	Wide ROI for Autogain stats. Width in % of image width (255=100%) Full image (default) = 255

Current Digital Camera Parameters (0x71)

Get current parameters that pertain to the currently selected digital camera. This is sent as a response to a Get Parameters Function (0x28) (Current Digital Camera Parameters (0x71)) request.

Byte offset	Description
2	Packet length = 11
3	Packet type = 0x71
4	Mode (1 = freeze Auto-gain at min/max below)
5,6	Auto-gain Max value (max value maps to 255 in 8 bit output)
7,8	Auto-gain Min Value (min value maps to 0 in 8 bit output)
9	Row ROI for Auto-gain stats. Row Offset in % of image height (255=100%) Full image (default) = 0
10	Column ROI for Auto-gain stats. Col Offset in % of image width (255=100%) Full image (default) = 0
11	High ROI for Auto-gain stats. Height in % of image height (255=100%) Full image (default) = 255
12	Wide ROI for Auto-gain stats. Width in % of image width (255=100%) Full image (default) = 255

Set User Palette (0x72)

Set the Y, U, V values for the user false color palette.

Byte offset	Description
2, 3	Packet length = 770. Note: extended size packet.
4	Packet type = 0x72 NEW 2.20
5	Y value for first entry
6	U value for first entry
7	V Value for first entry

...	
770	Y value for last entry
771	U value for last entry
772	V Value for last entry

Current User Palette(0x73)

Return the current user palette in YUV values.

Byte offset	Description
2, 3	Packet length = 770. Note: extended size packet.
4	Packet type = 0x73 NEW 2.20
5	Y value for first entry
6	U value for first entry
7	V Value for first entry
...	
770	Y value for last entry
771	U value for last entry
772	V Value for last entry

Set Multiple Alignment (0x74)

Set the (5) alignment sets for a dual camera setup. See details for bytes 5 through 9 in Set Blend Parameters (0x2F). The length of the packet is fixed, so sending zero values for sets not used is fine.

Byte offset	Description
2	Packet length = 28
4	Packet type = 0x74 NEW 2.20
5	Vertical offset for first set
6	Horizontal offset for first set
7	Rotation for first set.
8	Zoom for first set.
9	Horizontal zoom scale for first set
...	
25	Vertical offset for last set
26	Horizontal offset for last set

27	Rotation for last set.
28	Zoom for last set.
29	Horizontal zoom scale for last set

Current Multiple Alignment (0x75)

Return the current multiple alignment sets. See details for bytes 5 through 8 in Set Blend Parameters (0x2F).

Byte offset	Description
2	Packet length = 23
4	Packet type = 0x75 NEW 2.20
5	Vertical offset for first set
6	Horizontal offset for first set
7	Rotation for first set.
8	Zoom for first set.
...	
21	Vertical offset for last set
22	Horizontal offset for last set
23	Rotation for last set.
24	Zoom for last set.

Tracking Box Pixel Stats (0x78)

Periodic report of pixel statistics within track boxes. Only reports for 14 bit digital camera data. Enabled using the Set Coordinate Reporting Mode (0x0B) command.

Byte offset	Description
2	Packet length. Given by the following formula: (7*numTracks)+4
3	Packet type = 0x78
4	Camera Index {0,1,2,3}
5	Number of tracks.
6	Track Index *N*
7 - 8	Mean value over tracking box area. Unsigned 16 bit integer
9-10	Max value over tracking box area. Unsigned 16 bit integer
11-12	Min value over tracking box area. Unsigned 16 bit integer
	Repeat bytes 6 through 12 for each track

Directory Statistics Reply (0x79)

Sent in response to a Set SD Card Recording Parameters (0x1E) byte 7 request. See Current SD Card Directory Contents (0x59) to get the list of files.

Byte offset	Description
2	Packet length = 10
3	Packet type = 0x79
4 – 7	Maximum Disk Size (bytes)
8 – 11	Total Space Used (bytes)

Example:

SLA Header		Length	Type	Maximum Space Available				Total Space Used				
0	1	2	3	4	5	6	7	8	9	10	11	
81	172	10	121	3814088				10408				
0x51	0xAC	0x0A	0x79	0xc8	0x32	0x34	0x00	0xA8	0x28	0x00	0x00	

Current Stabilization Bias (0x7A)

Get Parameters Function (0x28)	Set Stabilization Bias (0x12).

Format is the same as Set Stabilization Bias (0x12).

Set Advanced Capture Parameters (0x7B)

Set advanced analog video decoding parameters for the **TVP5154** video decoder. More details can be found in http://www.ti.com/lit/ds/symlink/tvp5154.pdf. For cameras that have significant amounts of black data on the left or right side, setting these values can stretch the image horizontally to get rid of the black edges. If the image is stretched, the pixels will no longer be square, so objects in the scene will appear slightly wider than they actually are.

NOTE: SLA-2000: for this parameter change to take effect, a board reboot should be performed, by issuing Save Parameters (0x25) and Reset (0x01) (Reset Type = 2, reboot) messages. SLA-1500: Save and reset is not necessary. SLA-2000: This parameter is shared for all analog cameras. SLA-1500: This parameter is per-camera and will be set for the primary camera only.
Get the current advanced capture parameters using Get Parameters Function (0x28) (7B). The return will be the same format as Set Advanced Capture Parameters.

Byte offset	Description
2	Packet length = 8
3	Packet type = 0x7B NEW 2.20
4 – 5	Horz Control - Unsigned 16 bit (LSB,MSB) - Horizontal Scaling Control Register 3AD Value = 720*1024/Desired_Pixels. Standard for square pixels: 720*1024/640 = 1152 Slightly stretched pixels: 720*1024/657.5 = 1121 Default = 0 for standard square pixel operation.
6 – 7	XStart - Horizontal Pixel Start - Unsigned 16 bit (LSB,MSB) – adjust this value to move the starting left edge of the image Standard for square pixels: 0 Slightly stretched pixels: 8 (cuts off 8 pixels from the left) *Ignored if HorzControl==0*
8 – 9	YStart - Vertical Field Line Start - Unsigned 16 bit (LSB,MSB) – adjust this value to move the top line of the image. Standard for square pixels: 3 Slightly stretched pixels: 4 (cuts off 4 lines from the top of each field) *Ignored if HorzControl==0*

Analyze Render Synch (0x7E)

This packet is sent periodically in order to synchronize two or more units on the same network that have been configured for Analyze and Render modes (see Set System Type (0x63)).

Byte offset	Description
2	Packet length = 11
3	Packet type = 0x7E NEW 2.21
4	Sync Type
5 – 12	64-bit timecode (LSB)

Sync Type

Value	Name	Description
0	SL_SYNC_FAST	Synchronization packet sent at time of acquisition complete
1	SL_SYNC_TELEMETRY	Synchronization packet sent at time of telemetry output
2 – 255		*Reserved*

User Warning (0x7F)

NEW 2.22 Enable/disable User Warning Packets sent from SLA hardware.

Byte offset	Description
2	Packet length = 4
3	Packet type = 0x7F NEW 2.22
4 – 5	Warning level bits (values can be ORed)

User Warning Packet: This packet is sent from the SLA hardware to notify users of any issues or system status which may not be obtained any other way. Examples could be: a non-licensed feature was requested, or an out-of-index-range camera was specified.
NOTE: This packet is sent only to Ethernet *Command and Control Reply Port*, and never sent to a Serial port.

Byte offset	Description
2 [2 – 3]	Packet length = length of message+3 Length field can be 1 or 2 bytes based on the message length.
n	Packet type = 0x7F NEW 2.22
n+1 - n+2	2 bytes: Warning level bits (one of the following bits is set)
n+3...	Text characters for the message itself. The Text may not have a terminating null character. The Text may includes multiple lines of strings delimited by '\n' character.

Warning level bits

Value	Name	Description

0x0000	SL_USER_WARN_NONE	Disable all User Warning Packets
0x0001	SL_USER_WARN_FYI	An informative user message follows
0x0004	SL_USER_WARN_WARN	A Warning message follows
0x0008	SL_USER_WARN_CRITICAL	A critical message follows

System Status (0x80)

NEW 2.22 Enable/disable System Status packets sent from the SLA hardware:

Byte offset	Description
2	Packet length = 8
3	Packet type = 0x80
4 – 5	System Status Modes
6 – 9	System Debug Flags

System Status packet: This packet is sent from the SLA hardware. It is used to report diagnostic information about the hardware, such as CPU load and temperature, or the performance of software tools. This information can be used to measure and track performance of the system over time under different conditions.
NOTE: This packet is sent only to Ethernet *Command and Control Reply Port*, and never sent to a Serial port.

Byte offset	Description		
2	Packet length = 13		
3	Packet type = 0x80 NEW 2.22		
4	Temperature (degrees F)		
	SLA-1500	**SLA-2000**	**SLA-3000**
5	ARM CPU Load %	DSP Load %	ARM CPU Load %
6	DSP Load %	Reserved	DSP 1 Load %
7	Reserved	Reserved	DSP 2 Load %
8	Reserved	Reserved	DSP 3 Load %
9...12	Reserved		

System Status Modes

BIT	Description
0	0 – Enable System Status messages 1 – Disable System Status messages

1 – 15	*Reserved*

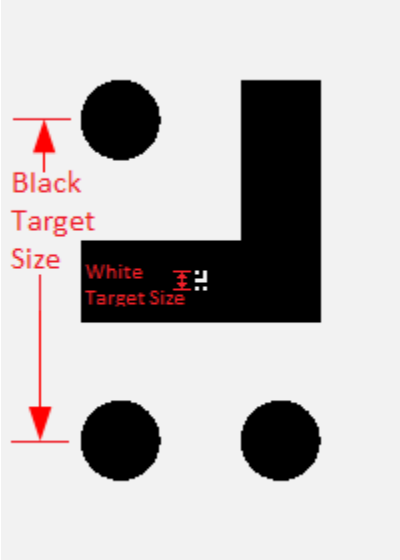
System Debug Flags

Debug flags can be OR'd together.

Value	Description
0x00000400	DSP and ARM Detailed timing measurement
All other bits are reserved	

Set Landing Aid (0x81)

NEW 2.22 Control landing aid detection. SightLine's Patent Pending Landing Aid detection is capable of finding, tracking and measuring the distance and angle to a SightLine specific target. The target can be printed or painted or constructed of light or heat elements.
The target size measurements are taken from circle center to circle center in the printed target as shown below.



NOTE: It is important to pick units for the target size that will not overflow the distance value returned in Landing Position (0x83). Eg. if the target size is specified in meters, the maximum distance possible to report is 65536 meters. If the units are specified in cm, the maximum distance is 65536 cm = 655 meters.

Byte offset	Description
2	Packet length = 16
3	Packet type = 0x81

4	Landing Aid mode 0 = off 1 = run
5 & 6	Camera horizontal field of view in degrees * 256 (default 30*256 → 30 degrees) 0 = no change
7 – 10	Black target size * 65536 (default 0.175f*65536 → 0.175 meters = 17.5 cm) 0 = no change
11 – 14	White target size * 65536 (default 0.00875*65536 → 0.00875 meters = 8.75 mm) 0 = no change
15	Match threshold, 0 to 100 (default 50) 0 = no change
16	*Reserved* (set to 0)
17	*Reserved* (set to 0)

Landing Position (0x83)

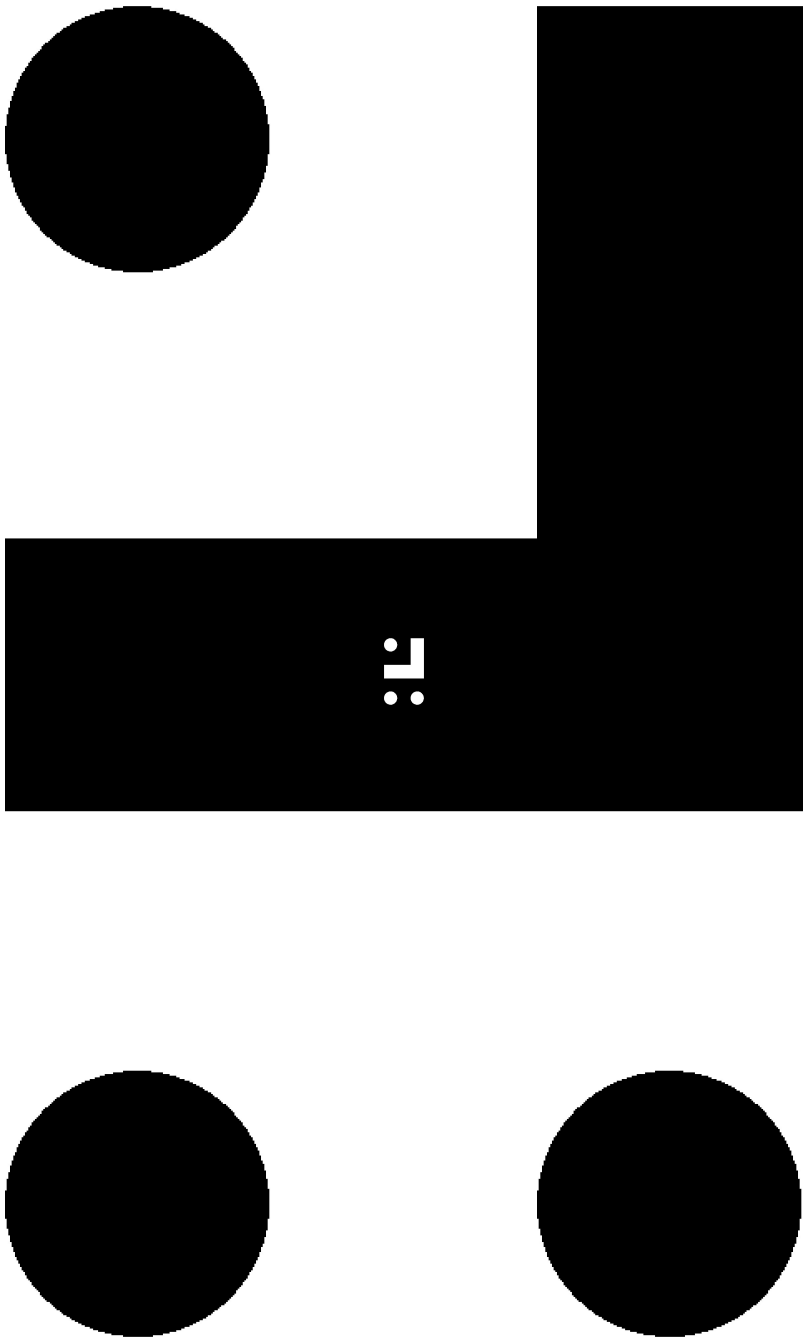
Periodic report of landing aid location, orientation, distance and match score.

The position and angle are reported in camera source (un-stabilized) pixel coordinates. The confidence score indicates the system's confidence between 0 (low) and 100 (high). The distance to target units match those specified for black and white target size in Set Landing Aid (0x81) .

The interval at which Landing Position is reported is controlled by Set Coordinate Reporting Mode (0x0B). For reporting to multiple destinations see Set Packet Destination (0x64).

Byte offset	Description
2	Packet length = 14
3	Packet type = 0x83
4	Camera Index {0,1,2,3}
5 & 6	Center of landing aid column in camera source coordinates (signed 16-bit integer)
7 & 8	Center of landing aid row in camera source coordinates (signed 16-bit integer)
9 & 10	Landing aid angle (counter clockwise) in the source image (0..360 degrees) * 128 (unsigned 16-bit integer)
11 – 14	Distance to landing aid target * 65536 (units match those for the target size specified in Set Landing Aid (0x81)). (unsigned 32 bit integer)
15	Landing aid match confidence (0..100)

Landing Aid Image



Parameter File Format

SLA-1500 & SLA3000

Name	param51ac9a4a.txt
Format	ASCII TEXT

Contents

Header	<Identifier>,<length>,<version><LF>
Fields	<field> = <value>;<LF>
Comments	<Comments><LF>

Identifier	51ac9a4a
Length	Number of characters of all the Fields section (including white space and semicolons, and LF) and Comments section. NEW 2.22 **Ignore this value by setting it to 0**.
Version	A unique number indicating the format of the contents of this parameter file. Must be 1.
LF	Line Feed (Linux)
Field	Human readable parameter name
Value	Data that will be assigned to the field
;<LF>	Semicolon followed by Line Feed terminates statement
Comments	Any text following the field/value statements. These are ignored by the parameter file parser.

Customized Parameter Files

Customers may create customized parameter files that can be loaded onto their systems. This can assist in manufacturing processes or in testing certain features. The parameter file can include as many or as few settings as you wish. The parameter file is plane text and can be edited manually using just about any editor (e.g. Windows Notepad).

TIP: When configuring multiple systems, create multiple parameter files to separate the camera , communication, and algorithm commands. You can then use your text editor to copy and paste together the features you need into the final **param51ac9a4a.txt** that will installed on the SLA-HARDWARE.
TIP: Use SLA-PANEL-PLUS, FTP, or SCP to move parameter files to and from SLA-HARDWARE.

WARNING: An incorrect or corrupted parameter file can cause the system to become unstable or locked up requiring that the entire system be reset to factory defaults. Please refer to **EAN-SLA-1500-UpdateRecovery-Firmware-MSD.pdf** or other support documents found on our web site.

EXAMPLES

A minimal parameter file to configure system for PAL analog input and output video.

```
51ac9a4a,90,1
cam[0].type = 13;
cam[1].type = 13;
SLA_LIB_VERSION = 2.21.7 (001)
SL_BOARD_TYPE = SLA1500
```

A minimal parameter file to configure system with static IP address.

```
51ac9a4a,166,1
net.mode = 1;
net.ipaddr = 192.168.1.246;
net.mask = 255.255.255.0;
net.gateway = 192.168.1.1;
net.iname = eth0;
net.mac = 16:01:30:2A:01:5A;
net.hostname = SLA1500_;
```


File Recording

This section tries to consolidate information related to file recording (SnapShots and Video).

NOTES

- System may stall for several seconds while writing video file to MicroSD Card when the STOP RECORDING command is issued (byte 4).
- System may stall for several seconds when files are deleted (byte 5).
- Current maximum diskspace that can be used. is 2.0 Terabytes. If more than 2 TB are used, system will report errors.
- The file name count resets to 0 on power up. Files will be overwritten if you use the same base file name after a power cycle.
- Recording of video and commands to SD Card is not available on the SLA-2000.
- Recording Commands file name will have ".log" appended
  - Recording to .log file is not supported on the SLA-3000. Instead, use network debug trace and save to a log file on the client side. That is a preferred method for other platforms as well.
- Instructions for formatting a MicroSD card are in EAN-FormattingMicroSDCards.pdf
- When recording a video, file extension ".ts" is added to the file name. This video can then be played back in VLC.
- When performing a directory listing, if a file name is specified, it will be interpreted as a path (SLA-1500 only)
- Recording output Telemetry to file is also available on some platforms.
- Pass-through data to a log file is available on some platforms. Log data sent by Command Pass-through (0x3D) to an MicroSD card file. (not supported on 3000)
- 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.

FILE NAMING

If File Name ends with non-numeric characters, file will save to <FileName>**_NNNN.jpg** where NNNN is an incrementing count, starting at 0 and maxing out at 4294967295. If FileName ends with a numeric character (0-9), file will save to <FileName>.jpg. For values of NNNN less than 10,000 the file name count will pad 0's.

If you use FileName...	And then: Do Snap (0x60)	You should see...	Note
Hello		Hello_0000.jpg	Count starts at 0
Hello		Hello_0001.jpg	Count increments
World		World_0000.jpg	Count restarts when FileName changes

Hello42		Hello42.jpg	Count is not appended for FileName ending in a numeric character.
Hello_		Hello__0000.jpg	Count restarts when FileName changes
Hello		Hello_0000.jpg	Count restarts when FileName changes. This overwrites the previous Hello_0000.jpg.

Additional References

MPEG2-TS	ISO/IEC 13818-1	
KLV Metadata	MISB standards:	
	0102.1	Security Metadata Universal and Local Sets for Digital Motion Imagery
	601.8	UAS Datalink Local Set
	0603.2	Common Time Reference for Digital Motion Imagery Using Coordinated Universal Time (UTC)
	0604.3	604.3
	0903.3	Video Moving Target Indicator and Track Metadata
Selectable KLV elements	Motion Imagery Sensor Minimum Metadata Set defined in ST 0902.3 For conversion of values see Table 1 on page 16 of: http://www.gwg.nga.mil/misb/docs/standards/ST0601.7.pdf.	
RTP	RFC 3550	
Link Local	RFC 3927	

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