EAN-Target Tracking

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Contact:

Web: sightlineapplications.com

Sales: sales@sightlineapplications.com

Support: support@sightlineapplications.com

Phone: +1 (541) 716-5137

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Alerts

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

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

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

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

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1 Overview

This document provides guidelines for optimal target tracking and scene tracking performance, as well as a list of commands used for tracking.

Tracking scenarios are an exercise in judgment and understanding the tracking software limitations. What works best in one tracking case may not be ideal in another. The best way to learn and get better at target tracking is through experimentation.

In cases where the tracker is not tracking effectively, send SightLine Support a copy of the original video (without stabilization or overlays if possible) for review. This will help to improve and refine the tracking algorithms for future updates.

1.1 Additional Support Documentation

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

The Panel Plus User Guide provides a complete overview of settings and dialog windows located in the Help menu of the Panel Plus application.

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

1.2 SightLine Software Requirements

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

1.3 Application Bit Requirements

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

Table 1: Application Bits Requirement Table

Tracking Features	Initial Software Release	Required Application Bit(s) v7 License
Vehicle	2.22.xx	
Stationary		
Scene		
No Registration		Full Tracking 0x0000 0010
Static		
Acquisition Assist		
Intelligent Assist		
Drone	2.24.xx	
Person	3.01.xx	

2   Target Tracking Best Practices

It is important to configure the system for the type of tracking that fits the conditions. Setting the size of the track box is important. It encompasses the area within the frame that the tracker is constantly attempting to track. This is only relevant to the Vehicle, Stationary, No Registration and Drone tracking modes (see Tracking Modes for descriptions).

The optimal size of the box should encompass the entire object being tracked. A slight (~10%) region around the object is optimal to provide a good foreground/background difference. In certain situations, this may not always be possible. Users should focus on including features with high contrast within the track box. These include corners (for example windows in a car) or other edges.

Once a track has been initiated and the tracker is following the target, it is possible to nudge the track box to get better coverage of the entire target. It is also possible to resize the existing target. The tracker uses the existing target position and retrains a model on the new adjusted location and size.

Nudging and resizing the target is preferable to re-designating the target due to latency (user input) and pixel coordinates being received by the hardware. When nudging or resizing, ensure the object being tracked is completely visible to avoid retraining the model on something else.

Processing at a constant frame rate is important for tracking performance. The display processing load can be reduced by:

- setting a display frame step or capture frame step (see EAN-Performance-and-Latency)
- turning off enhancement
- choosing a faster encoder (MPEG4 for 1500-OEM board) and smaller output frame size
- reducing registration search space (set Maximum Zoom to 0 and if there is no rotation, set Maximum Rotation to 0)

📄 *The Show Performance Graph in Panel Plus shows the time used by the processing steps. From the main menu Display » Show Performance Graphs.*

3   Tracking Modes

The following tracking modes are supported in SightLine software.

Vehicle: Used for tracking any type of moving object. The camera may be stationary or moving in this instance.

Stationary: Used for tracking a fixed object such as a house. The camera may be stationary or moving in this instance. If the object is sometimes stationary and sometimes moving, use Vehicle or Drone mode.

Scene: Also known as Scene Tracking. Keeps the entire scene in the frame. The camera platform is moving, and no single object is selected to track. Although it is a mode exposed by the tracker, it can also be implemented by using the scene translation results directly. SightLine recommends using the scene translation results directly for a more tightly integrated solution (see FAQ below for details).

No Registration: Used to track moving or non-moving objects when it is difficult to accurately estimate frame-to-frame registration. For example, when attempting to track an airplane against a blue sky. It should only be used as needed since it can lead to additional track failures in cluttered environments. Advancements to Vehicle and Drone mode in 2.25 and 3.00 reduce the need for this mode.

Static: Not an object tracking mode. It is used to specify specific camera coordinates for temperature data reporting, for more details see the EAN-Infrared Temperature.

Drone (new in 2.24): Optimized for fast and inconsistently moving objects such as quad copters. It can handle objects that quickly change in size and appearance. Designed to work either as part of a ground based or aerial system.

Person (new in 3.01): Optimized for tracking slow and inconsistently moving objects such as people. It is better at handling quick changes in appearance as a person rotates, bends, etc. Designed to work either as part of a ground based or aerial system. The default overlay for Person mode is a different color to help indicate the mode it is in. Use the **Set Overlay Mode (0x06)** message to adjust the reticle color.

4   Track Box Selection

The diagram below shows six examples of attempts to initialize a track. In all cases, the object being tracked is represented by the dark rectangle. The tracking box is depicted in red.
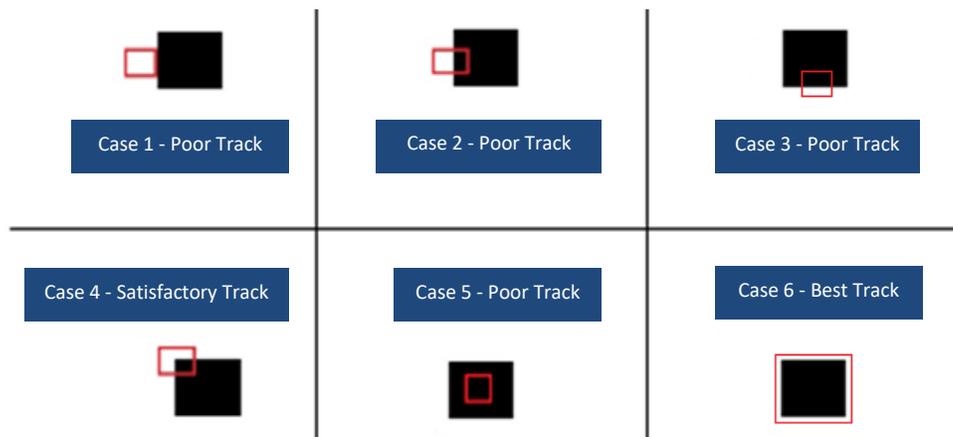
Figure 1: Designating Targets Example

Case 1: The tracking was not initialized on the object. The tracker stays on the edge of the object. If there are other good features in the background, the tracker may follow them instead of the tracked object. This often happens when there is a delay in the communication to the tracker or latency in the video because the object moves from the time the user sees it on the display to the time the track command reaches the tracker.

Case 2 and Case 3: A slightly better initialization of track. Notice that the only feature to track is a single edge. The tracker will likely drift up and down (or left and right) along that edge resulting in an erratic track.

Case 4: Better than Case 2 and 3. There are two edges (a corner) for the tracker to follow. Tracking should be good if the background has no stronger features.

Case 5: Since there are no visible features for the tracker to work with. The tracker will either fail to initialize altogether, or it will drift to an edge or corner of the rectangle.

Case 6: Optimally, the tracking box is sized to encompass the entire object that is being tracked. This gives the tracker the most features to work with, and a minimum number of features from the background.

4.1 Vehicle Track Mode Examples

The examples shown in this section are real world examples.

In this example the car is not fully enclosed by the tracking box, but there are still good features with high contrast. This is not optimal but still works well.

Figure 2: Tracking Box too Small

In this example the tracking box is too large and encompasses more than the vehicle, but the tracking area contains enough good features and still tracks well.

Figure 3: Tracking Box too Large

In this example the tracking box is sized for optimal tracking performance. It includes the object and a small amount of background features allowing the track to persist through occlusions and background changes.

Figure 4: Tacking Box Optimal

4.2 Person Track Mode Examples

New in 3.01.x software.

Many of the principles discussed in track box selection for vehicle mode apply for Person track mode, however when tracking people a few additional aspects should be taken into consideration.

The example in Figure 5 shows a square track box. The square track box includes a lot of background and is more likely to fail over time. This example will track well for a few minutes then slide off the person.

The example in Figure 6 shows a track box sized for optimal performance with minimal background. It is placed on the upper half off the body with a rectangular shape. This track works well through background changes, quick changes in velocity, and if the person bends over and stands up.

Figure 5: Person Tracking Box Too Large   Figure 6: Person Tracking Box Optimal

4.3 Acquisition Assist

New in 2.22.xx software.

Acquisition Assist is designed to help users select an optimal size and location for track boxes. When this mode is enabled through the **Set Tracking Parameters (0x0C)** message, an algorithm runs on track-start that will search an area around the initial track location for the optimal track box size and location. The size of the search region is based on the track box size setting, so it is still important to set the size and location. This algorithm is designed to be set close and still get good tracking results.

Tracking moving objects from a moving platform creates challenging issues. Over time, the optimal track box at initialization may not last. To resolve this, manually re-designate the track, nudge the track, or adjust the track size. Another option is to use **Modify Track Index (0x17)** message and send the *Reinitialize* command. This will rerun the acquisition assist logic. If successful, it will replace the current track box with the new optimal track box. Another option is to use intelligent assist to automatically readjust under certain conditions.

4.3.1   Acquisition Assist On

In this example the track box is centered on the car and contains enough background for optimal tracking.

Figure 7: Acquisition Asist On

4.3.2   Acquisition Assist Off

In this example the track box is centered but contains too much background content and will not track as well as the example shown in Figure 7.

Figure 8: Acquisition Assist Off

4.3.3   Resizing with Acquisition Assist Enabled

New in 3.00.xx software.

There are cases when running acquisition assist will not result in an optimal track box size. Once you are tracking if you send the **Set Tracking Parameters (0x0C)** message to adjust the size this will result in acquisition assist logic running again and you may still not end up with an optimal track box size. Alternatively, once a track is started use the **Modify Track Index (0x17)** message with flags 8 or 9 to adjust the track size with or without re-running acquisition assist. A common use case is to start the track with acquisition assist enabled to get a good initial estimate and then adjust with the **Modify Track Index (0x17)** message without acquisition assist to get an optimal track box.

4.4 Intelligent Assist

New in 2.22.xx software.

Intelligent Assist is designed to automatically reinitialize targets when changes are detected in the target appearance. These changes are currently limited to turning objects in vehicle mode and changing sizes in drone mode. This will be expanded to cover other cases in the future.

Enabling this mode is designed to be low risk, instead of swapping out the old track for the new one it migrates to the new track over time. Intelligent assist requires acquisition assist to be enabled since it uses the acquisition assist algorithm to estimate the new optimal track box size and position.

Drone tracking can handle quickly changing target sizes. In most cases it is recommended to use intelligent assist to optimize the track box size while in drone mode. There are some cases where the background clutter is very high, which could negatively impact performance.

4.5 Reinitialize Primary

New in 2.22.xx software.

If acquisition assist does not provide the optimal track box size, reinitializing the track is a low risk way to update the track box size.

Sending the reinitialize command as part of the **Modify Track Index (0x17)** message causes the acquisition assist logic to run again. A new track will start in the background. If there is high confidence that this track is better than the original it will replace the original after ~1 second.

It is important to note that acquisition assist has limits and will not find an optimal track box size much different from the current size. In this case, adjusting the track box size is the best option. Adjusting the track box with acquisition assist enabled causes acquisition assist to run instantaneously instead of in the background.

4.6 Detection Track Cueing

Starting a track on a moving target can be difficult. Using any of the detection modes outlined in EAN-Detection-Modes can make this easier. Vehicle and Drone MTI modes were specifically designed to aid in starting tracks on moving objects, however the following logic could be used for any of the other modes as well. The following sections outline a couple of different ways to transition a detection to a primary track.

4.6.1 Mouse Click or Joystick

To turn a detection into a primary track, use the **ModifyTracking (0x05)** or **StartTracking (0x08)** command with a modify mode value of 5 or 6.

📑 *For this to work correctly it is important to setup a nearVal using the **SetTrackingParameters (0x0C)** command for your particular application*.

NearVal defines the area around an existing target that interactions can take place. For example, if using a joystick as a primary controller, setup the *Near Value* in Panel Plus and then create an overlay on the video with a circle in the middle of the screen with the radius equal to the *nearVal*. The example in Figure 9 has a *Near Value* of 200 pixels.

To make a track primary when running vehicle MTI, drive it near the center of the screen with the joystick. Click a button to send a message to start a track with the correct modify mode and coordinates at the center of the screen.

Alternately, this can work with a mouse or a touchscreen screen by simply clicking within the nearVal pixels of the detected target.
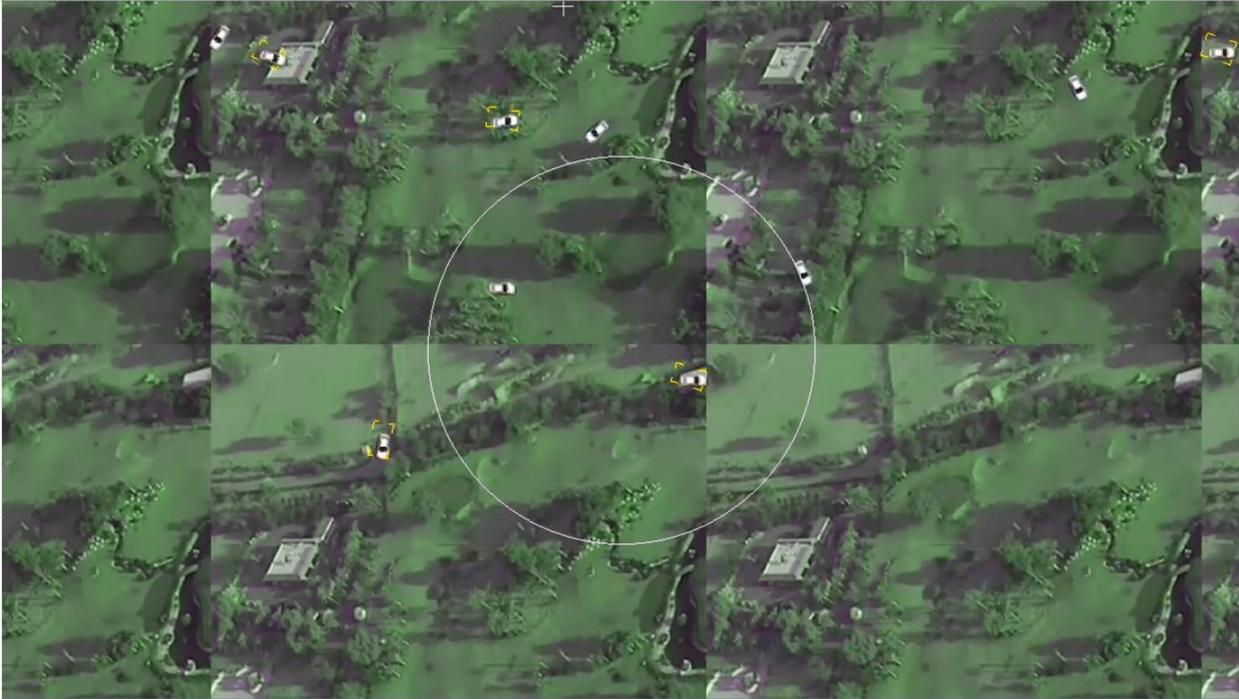
Figure 9: Starting a Track Using Near Value

4.6.2   Starting from PiP

New in 3.00.xx software.

When using any of the Picture-in-Picture (PiP) modes in the drop-down menu, the location of the track in the PiP windows can be used to start a track on that target.

Use the **ModifyTrackIndex (0x17)** message and specify the PiP index in the message. With this feature a user interface can be designed that allows you to click on the PiP targets instead of clicking on the moving object to start a track.

Starting with 3.00 software, this can be done in Panel Plus by setting up PiP and then checking the *Track from PiP* checkbox on the *Tracking* tab. In this mode, left click on the PiP window to change the track to a primary target (Figure 10). Each PiP location has a specific index, which can be found in the IDD under the **MultDisplay (0xA5)** message.
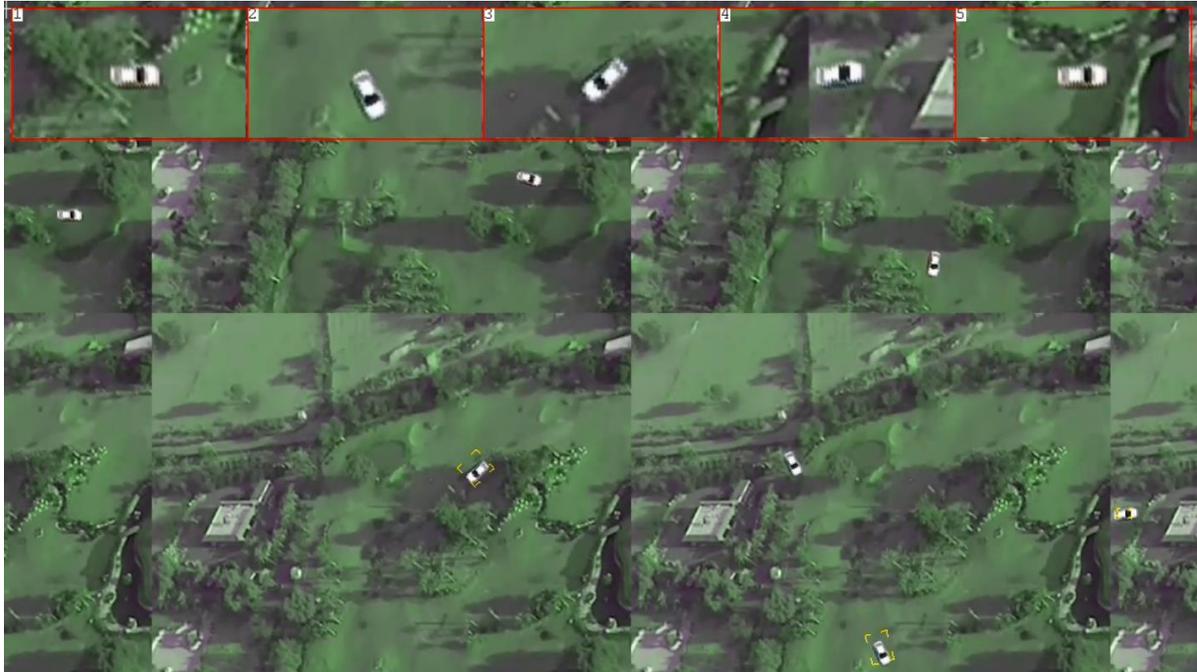
Figure 10: Start Track from PiP

4.6.3 Selected Track

New in 3.00.07 software.

When using Vehicle or Drone detection mode use the **ShiftSelectedTrack (0x33)** and **DesignateSelectedTrackPrimary (0x32)** messages to toggle through the tracks and designate a track as primary.

This makes it easy for joystick users to allocate one button to toggle through tracks, and one button to start a track.

By default, selected tracks appear just like any other non-primary track, however they can be configured to have a unique overlay using the **SetOverlayMode (0x06)** message (Figure 11).
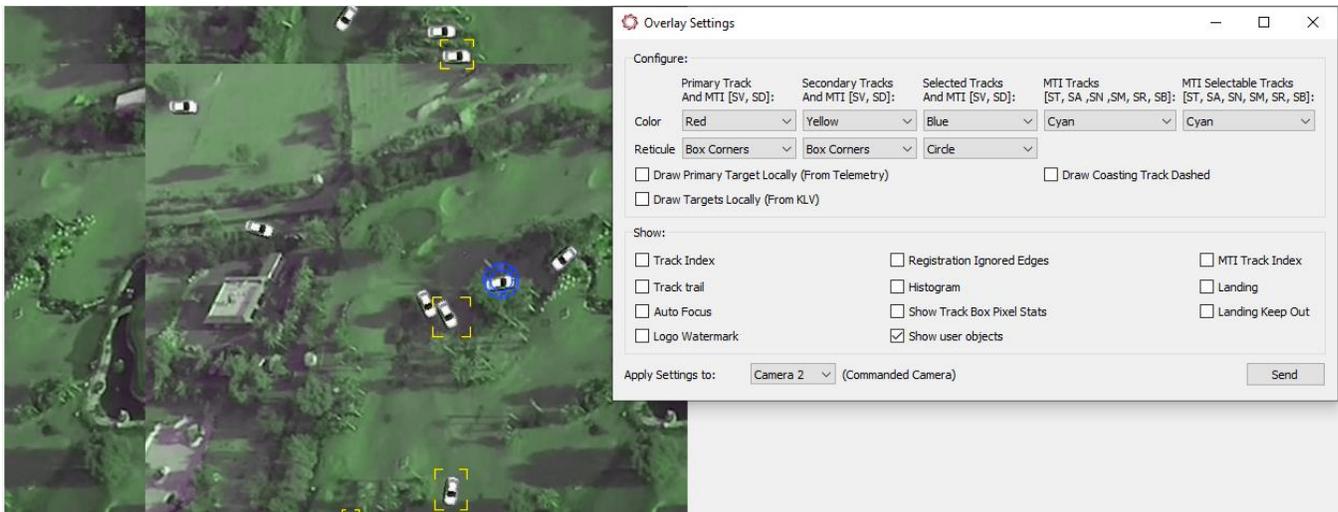
Figure 11: Selected Track

5   Tracking Through Zoom and Rotation

The tracker works through slow changes in zoom and/or rotation. To track through faster changes the tracker must have an accurate estimate of the changes. Set the registration parameters *Maximum Zoom* and/or *Maximum Rotation* to non-zero values (5 is a good starting point). Increasing these values will increase the overall system processing load. Look at system performance in the Performance Graph before and after adjusting the parameters.

The tracker will often fail through large jumps in zoom. If it is not possible to reduce the step size or use a continuous zoom, re-designating the track after the zoom with the estimated size and location may be required for optimal performance.

6   Tracking Through Occlusions

The ability to track through occlusions is a key feature of the tracker but there are a couple of things that can be done at a system level to improve performance.

6.1 Coasting State

It is important to understand when the tracker is in a coasting state. Look for the high bit of the track confidence to be set in the telemetry messages to indicate that the tracker is coasting. Using hard coded values is not enough since the confidence used internally may vary by algorithm.

6.2 Nudging / Resizing During Coast

While coasting it is important not to adjust the track box size. Adjusting the tracker box during coasting may cause the track to be lost because the tracker will refocus on the object that is occluding the target causing the track to be lost.

Nudging the track will have a similar effect in version 2.25 and earlier. Starting in version 3.00, nudging during a coast will adjust the estimated target position but will not cause the tracker to re-train. If the tracker velocity estimate is off by a small trace and the track box is drifting from the target during a long occlusion, this can be a useful way to correct these errors. To do this it may be required to use larger nudge values then you may typically use during active tracking.

7 Additional Tracking Parameters

Panel Plus » *Tracking* tab » *Manual* tab.

Figure 12: Manual Track Initialization

7.1 Max Missed Frames

Max Missed Frames controls the maximum number of frames to keep searching for a track after the software stops discovering it. The default setting is 45, which corresponds to 1.5 seconds with 30 Hz video. Once the tracker has failed to find the track for *Max Missed Frames* it will drop the track.

Tuning this parameter correctly depends on the use case scenario. If it is important to know that the track is lost, and long occlusions are unlikely, either leave the number at the default setting or make it smaller. If longer occlusions are needed increase the number.

📄 *Improvements to velocity estimation in the tracker algorithm in 3.00.xx software helps it to reacquire the track after a larger number of missed frames.*

7.2 NearVal

NearVal defines the radius of engagement used with the **Modify Tracking (0x05)** or **Start Tracking (0x08)** message. Once the radius has been set, clicking anywhere within this range of an existing target designates it as primary, stop the track, etc.

A use case example would be running Vehicle MTI and using a large *nearVal* to designate tracks near the center of the frame as primary. *Nearval* works in tandem with the modify mode parameter. See the [Interface Command and Control (IDD)](#) for specifics on the modify mode options. For more information on modify modes see the [Appendix](#).

7.3 Rotate Nudge

Enable this option in the **Nudge Track Coordinates (0x0A)** message to send nudge commands in display coordinates instead of camera coordinates. For example, if a 180° rotation of the display is required because the camera is mounted upside down, this option ensures that the nudge commands are handled correctly.

7.4 Forced Coasting

New in 2.24.xx and 3.00.xx software.

Forced Coasting was introduced in 2.24 software with the Freeze Updates mode. Freeze Search mode was added in 3.00 software. These modes can be set or cleared from the **Modify Track Index (0x17)** packet.

For more information about whether this feature can help with specific use case scenarios, send a video to SightLine [Support](#) for review and recommendations.

7.4.1 Freeze Updates

The software searches for the object in every frame, updates its position and momentum, etc., but the model will not update as new data is obtained. In most cases using this feature will decrease tracking performance because model updates are required to maintain persistent tracks. However, there are cases where temporarily stopping the updates can be beneficial (~1 sec or less). For example, if there is a cloud of smoke between the camera and the target or some other known disturbance.

It can also be helpful to enter this mode prior to the target being partially occluded. This is not a recommended normal mode of operation to deal with full occlusion. The tracker is already designed to manage this type of situation.

7.4.2   Freeze Search

The software will not search for the target or update any target state in this mode. The reported position in this mode will be the estimated position based on the current target velocity when this state was entered and the frame to frame registration values. If the number of frames since entering this mode reaches the *Max Missed Frames* value the mode will be exited automatically and the tracker will search for the target, if it fails to find it the track will be dropped at this point.

7.5 Transitioning Between Person and Vehicle Mode

New in 3.2.x software.

When switching tracking modes, the track that is active is reset. In most situations this is acceptable behavior. However, in some situations it may be desirable for the track state to persist when switching between vehicle and person modes. To persist the track state when switching between these modes, see the **SetTrackingParameters (0x0C)** message.

8   Tracker-Only Configurations

The tracker only configuration provides a solution for customers who need an object tracking algorithm and telemetry data, but do not need another video processing functionality.

Tracker-only configurations use the same tracking algorithms as the full featured SLA configuration. The tracker-only option is outlined in the Appendix. Because the tracker runs on the same low SWaP 1500-OEM and 1500-SOM hardware, units can be easily upgraded to full SLA functionality.

9   Command and Control

The following packets are used to setup and control the tracking algorithms. Details can be found in the web based Interface Command and Control (IDD).

📄 *A downloadable PDF version is also available on the Software Downloads page.*

9.1 IDD Menu

Within the IDD the main menu references Modules (a category sort of commands and data) and Classes (packets, structs, unions and interfaces in the form of SLA*[name of class]_*t).

9.2 Reporting Results

Telemetry data related to tracking.

Message Name (Class)	Message ID	Module
Tracking Position	(0x43)	Telemetry
Tracking Positions	(0x51)	Telemetry
Tracking Positions Extended	(0xA0)	Telemetry
Coordinate Reporting Mode	(0x0B)	Telemetry
Set Telemetry Destination	(0x64)	Telemetry

9.3 Display Related Commands

Message Name (Class)	Message ID	Module
Set Overlay Mode	(0x06)	Overlays

9.4 Tracking Related Commands

Message Name (Class)	Message ID	Module
Modify Tracking	(0x05)	Tracking
Start Tracking	(0x08)	Tracking
Modify Track Index	(0x17)	Tracking
Stop Tracking	(0x09)	Tracking
Set Tracking Parameters	(0x0C)	Tracking
Nudge Tracking Coordinates	(0x0A)	Tracking
Shift Selected Track	(0x33)	Tracking
Designate Selected Track Primary	(0x32)	Tracking
Stop Selected Track	(0x3C)	Tracking
Registration Parameters	(0x9E)	Stabilization

10 Troubleshooting

Question	Answer
It is too complicated to always switch tracking modes. Which tracking mode would work well for most tracking scenarios?	Although the tracking mode is important, using vehicle mode tracks moving or stationary targets in many different scenarios and is a good choice for many tracking applications. Choosing stationary mode would result in poor tracking performance on moving objects
What is the difference between scene tracking mode and using the registration results to implement a scene tracker?	The scene tracking mode is a simple implementation of a scene tracker that takes the registration information and outputs the results in the **Tracking Position (0x43)** packet in camera coordinates. Using the registration results directly still requires looking at the **Tracking Position (0x43)** packet, but uses the scene translations as opposed to the tracking row and col. The Tracking Position packet contains additional fractional information about scene translation. See the IDD page on **Tracking Position (0x43)** for an example of generating floating point scene translations using sceneCol, sceneRow, sceneColFrac8, sceneRowFrac8. The benefit to using the registration results directly is having more control managing feed-forward user commands. For example, to drive the scene to the right in Scene Tracking mode using the nudge commands will result in a jumpy move. Using the registration results directly makes it easier to incorporate user commands in the control loop to provide smoother gimbal control.
How can a track box be set up with a different width and height?	This is supported in 2.24. In previous versions use Acquisition Assist or Vehicle MTI to adjust the track box.
When using intelligent Assist is the Near Value important?	No, Near Value has no relationship with intelligent assist. Intelligent assist is designed to optimize the track box size under a specific set of conditions after tracking has been active for a while. Near value starts new tracks or transitioning a track from a detection to a primary track.
What is the minimum size object that can be tracked?	Tracking has been shown to work with as few as 4 pixels (2x2 box). For more robust tracking, track objects that are at least 100 pixels (10x10 box).

10.1 Questions and Additional Support

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

Appendix A - Tracking Only Comparison

Table A1: Tracking-Only and SLA Comparison

Attribute	Full SLA	Tracker Only
Application Bits	0x0052	0xC010
Tracker modes supported	Vehicle Stationary Scene No Registration Drone Person	Vehicle Stationary No Registration Drone Person
Maximum number of simultaneous tracks	5	1
Frame size processed	HD or SD	SD
Track box size adjust	✓	✓
Track box nudging	✓	✓
Track through zoom and rotation	✓	✓
Acquisition assist	✓	✓
Intelligent assist	✓	✓
Scene Tracking (aka Scene Steering and Scene Lock)	✓	
Detection Track Cueing	✓	
Hardware platforms supported	1500, 3000, 4000	1500 only
Other video processing functions that can be added to the unit.	All SightLine's functions can be added.	None. Functions limited to tracking only. Units can be updated to full performance through a license file purchase.

Appendix B - Modify Modes

This section explains the relationship between the modify mode values and the **ModifyTracking (0x05)** or **StartTracking (0x08)** messages. Refer to the [Interface Command and Control (IDD)](#) to help choose the one that is suitable for your particular application.

B1   Modify Modes Version 3.00

Table B1 shows how each modify mode can be implemented through a different combination of settings in Panel Plus.

Table B1: Modify Modes 3.00

Modify Mode Value	Panel Plus Tab	Panel Plus Controls
0 - Show Cursor only. If in this mode Display Coordinate and Source Coordinate bits are ignores.	Overlay	
1 - Kill any existing targets and then designate a new primary target at the cursor.	Tracking	
2 - Designate a primary target at the cursor.	Tracking	
3 - If there is a track near the coordinates, move track to coordinates and make secondary.	Tracking	

(Table B1: Modify Modes 3.00 continued)

Modify Mode Value	Panel Plus Tab	Panel Plus Controls
4 - If there is a track near the coordinates, move track to coordinates and make secondary. Otherwise, add a new secondary track at coordinate location.	Tracking	Mode: Vehicle / Remove All Tracks / All But Primary. Left mouse click: Adds a track (up to 5); One track only; Move nearest; ● Move nearest or make new ←. Right mouse click: Removes a track; Mode 8; ● Re-Designate nearest; Re-Designate or make new. Acquisition Assist: Acquisition Assist; Intelligent Assist; Reinitialize Track. Designate new track as: Primary; ● Secondary ←
5 - Designate track near coordinates as primary target. Also supports starting primary tracks from SA or ST MTI tracks.	Tracking	Mode: Vehicle / Remove All Tracks / All But Primary. Left mouse click: Adds a track (up to 5); One track only; Move nearest; ● Move nearest or make new. Right mouse click: Removes a track; Mode 8; ● Re-Designate nearest ←; Re-Designate or make new. Acquisition Assist: Acquisition Assist; Intelligent Assist; Reinitialize Track. Designate new track as: ● Primary ←; Secondary
6 - Designate track near coordinates as primary target if there is one. If not, add new track at coordinates and make primary. Also supports starting primary tracks from SA or ST MTI tracks.	Tracking	Mode: Vehicle / Remove All Tracks / All But Primary. Left mouse click: ● Adds a track (up to 5); One track only; Move nearest; Move nearest or make new. Right mouse click: Removes a track; Mode 8; Re-Designate nearest; ● Re-Designate or make new ←. Acquisition Assist: Acquisition Assist; Intelligent Assist; Reinitialize Track. Designate new track as: ● Primary ←; Secondary
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.	Tracking	Mode: Vehicle / Remove All Tracks / All But Primary. Left mouse click: Adds a track (up to 5); One track only; Move nearest; ● Move nearest or make new ←. Right mouse click: Removes a track; Mode 8; ● Re-Designate nearest; Re-Designate or make new. Acquisition Assist: Acquisition Assist; Intelligent Assist; Reinitialize Track. Designate new track as: ● Primary ←; Secondary

(Table B1: Modify Modes 3.00 continued)

Modify Mode Value	Panel Plus Tab	Panel Plus Controls
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.	Tracking	
9 - Kill track near coordinates	Tracking	
10 - Kill all tracks but the primary track.	Tracking	
11 - Reserved	N/A	N/A
12 - Designate track near coordinates as secondary target. Also support starting secondary tracks from SA or ST MTI tracks.	Tracking	

(Table B1: Modify Modes 3.00 continued)

Modify Mode Value	Panel Plus Tab	Panel Plus Controls
13 - Designate track near coordinates as secondary target if there is one. If not, add new track at coordinates and make secondary. Also support starting secondary tracks from SA or ST MTI tracks.	Tracking	

B2 Modify Modes Version 2.25 and Earlier Versions

Panel Plus support for the various modify modes was limited in 2.25 and earlier versions. The modify modes shown in this table covers the most common use cases. To implement other modes requires user code or custom macros/send commands.

Table B2: Modify Modes 2.25 and Earlier Versions

Modify Mode Value	Panel Plus Tab	Panel Plus Controls
0 - Show Cursor only. If in this mode Display Coordinate and Source Coordinate bits are ignores.	Overlay	
1 - Kill any existing targets and then designate a new primary target at the cursor.	NA	Not supported in this version of Panel Plus.
2 - Designate a primary target at the cursor.	NA	Not supported in this version of Panel Plus.
3 - If there is a track near the coordinates, move track to coordinates and make secondary.	NA	Not supported in this version of Panel Plus.
4 - If there is a track near the coordinates, move track to coordinates and make secondary. Otherwise, add a new secondary track at coordinate location.	Tracking	

(Table B2: Modify Modes Version 2.25 and Earlier Versions continued)

Modify Mode Value	Panel Plus Tab	Panel Plus Controls
5 - Designate track near coordinates as primary target. Also supports starting primary tracks from SA or ST MTI tracks.	NA	Not supported in this version of Panel Plus.
6 - Designate track near coordinates as primary target if there is one. If not, add new track at coordinates and make primary. Also supports starting primary tracks from SA or ST MTI tracks.	Tracking	
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.	Tracking	
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.	NA	Not supported in this version of Panel Plus.
9 - Kill track near coordinates	Tracking	
10 - Kill all tracks but the primary track.	NA	Not supported in this version of Panel Plus.
11 - Reserved	NA	N/A

(Table B2: Modify Modes Version 2.25 and Earlier Versions continued)

Modify Mode Value	Panel Plus Tab	Panel Plus Controls
12 - Designate track near coordinates as secondary target. Also support starting secondary tracks from SA or ST MTI tracks.	NA	Not supported in this version of Panel Plus.
13 - Designate track near coordinates as secondary target if there is one. If not, add new track at coordinates and make secondary. Also support starting secondary tracks from SA or ST MTI tracks.	NA	Not supported in this version of Panel Plus.