VirTra

V-TRACKING™ USER MANUAL

USER MANUAL

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HOW TO USE THIS MANUAL

This manual was designed and created for quick and easy navigation when viewed electronically. First, read the introductory table of contents. The table of contents is designed so as to group related topics together in one section of the manual. Forms are cross-referenced and a copy of the form is in the appendix to each manual where applicable.

For quick navigation, locate the **TABLE OF CONTENTS** page. Simply click on the topic of interest and the manual will direct the user to that page, eliminating the need for scrolling.

To return to the Table of Contents page, click on the **TABLE OF CONTENTS** words located on the upper right corner of every page following the TOC page.

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Table of Contents

I.   OVERVIEW

A.   Introduction

V-Tracking™ is a custom shot tracking system developed for the NaturalPoint OptiTrack range of motion capture cameras. Instead of mapping and tracking every single screen or camera pixel, this tracking solution maps a low-resolution grid of screen locations to a matching grid of camera locations.

B.   Features

- Multi-camera hardware support in both USB and Ethernet connectivity
- Simplifies and speeds up the calibration process.
- Enhanced precision weapon recognition
- Speeds up the computer system compared to other shot recognition systems
- Customizable camera frame-rate
- **Laser ID**: Tracking of 'passive' weapons which fire a fixed laser pulse of a given length when shot is triggered
- **Trace ID**: Tracking of instrumented weapons which fire a continuous laser beam that tracks their aim in real time

C.   Components

The V-Tracking Shot Tracking solution consists of the following components:

- **VirTra Tracking Service**: A windows service running in the background that contains the actual shot tracking logic
- **V-Tracking Calibration**: A Windows application for calibrating the camera with the screen for correct shot mapping
- **V-Tracking Diagnostics**: A Windows application to communicate with the shot tracking service and display advanced settings for diagnostics, development and troubleshooting problems
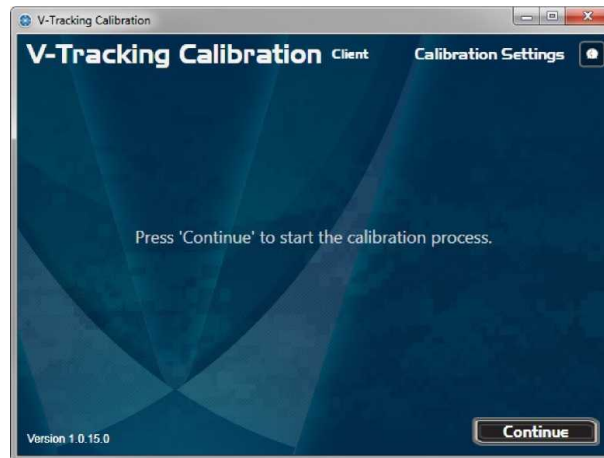
II. CALIBRATING A SINGLE SCREEN SYSTEM: BASIC

A. Calibrating a Single Screen System with Basic Settings

V-100 products running on a single computer system should be calibrated in the following manner.

- To begin, launch **V-Tracking Calibration** located on the desktop
- The calibration tool will open to the start screen

- Drag the calibration tool to the screen that is to be calibrated. The window will use its current location to determine on which screen to present the calibration points for the process.
    - o <u>Hint</u>: Move it by clicking and holding the window's title bar.
- On the start screen, press 'Continue' to go to the **Calibration Focus** screen.

Note: The tool may bring up an error message dialog if either of the following conditions are not met:

1. Tracking service is not running
2. No camera is connected. In this case, go to the Troubleshooting section

B. Calibration Focus Screen

This section explains how to adjust the focus on the calibration screen. The image below shows the ideal focused screen.

Adjust to the optimal image focus by rotating the lens on the camera.
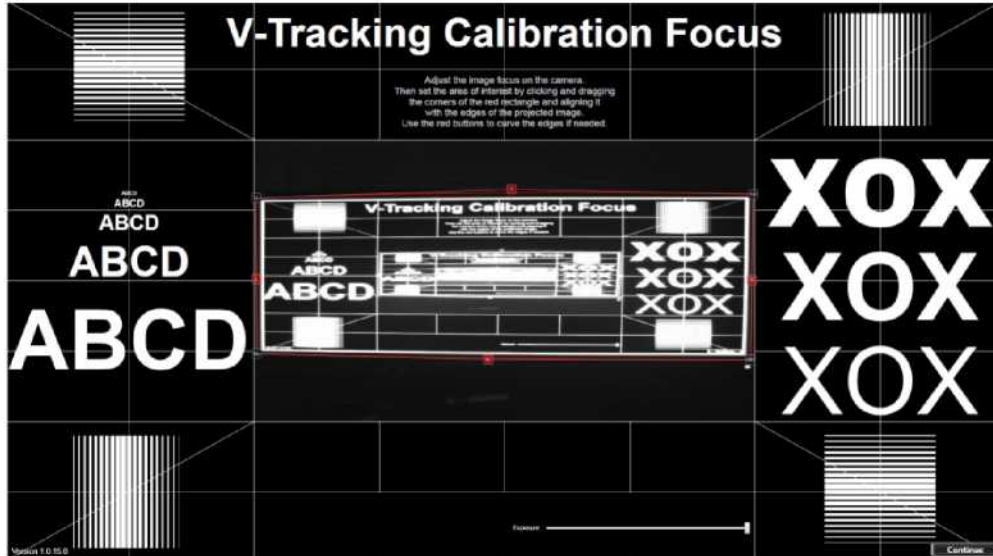
C. Exposure Adjustment

Use the exposure slider at the bottom to select an exposure level that makes the details on the recorded camera image in the center clearly visible.


D. Camera Location

Move the camera to a location where the focus image can be seen in its entirety on the recorded image. Make sure the image is not angled and uses up as much of the recorded area as possible.

It is ok to mount the camera at any 90-degree angle, including upside-down or at the back of the screen to create a mirrored image. However, the edges should be parallel to the recorded image frame as much as possible.

E. Area of Interest

- Click and drag the four corner buttons labeled **TL**, **TR**, **BL** and **BR** of the area of interest outlined in red so that it contains the entire projected image including the thick white border as seen in the screenshot. See image below.
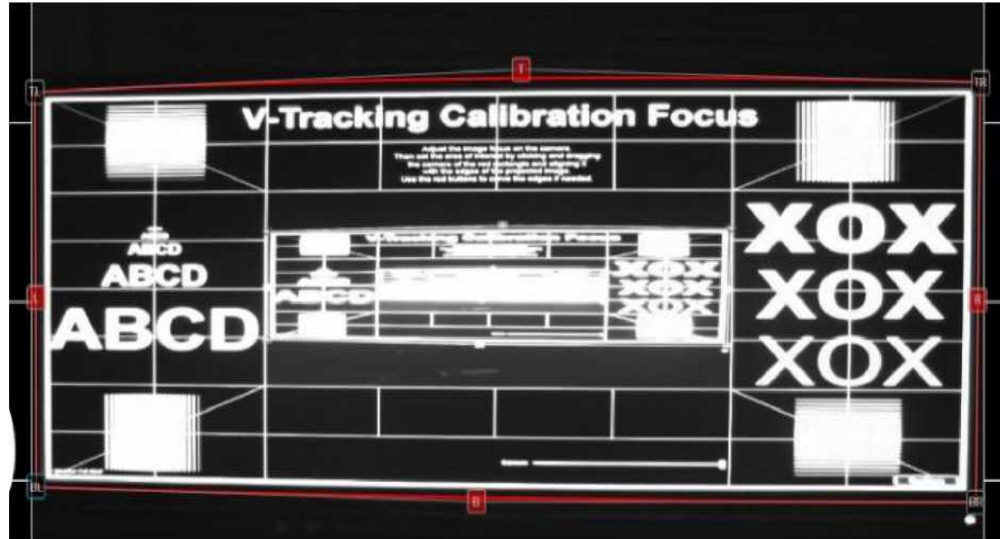
- Make sure any potential light source or reflections visible in the recorded image are **outside** the red boundary.
- In situations where multiple screens border each other or unwanted IR sources can come very close to the screen it is <u>ok</u> to move the red outline on top of the thick white image frame.
- If a camera lens is being used that shows a wide angle, distorted image, the four red buttons labeled **T**, **B**, **L** and **R** can be used to curve the edges to match the outline with the potentially curved edges of the recorded image.

F.   Automatic Calibration

- Click 'Continue' to launch the calibration process.
- The system will go through a number of black screens which are blank or show white dots. The amount of time for this process to complete depends on the room lighting and can take up to a minute.

NOTE: **The room should be as dark as possible.**
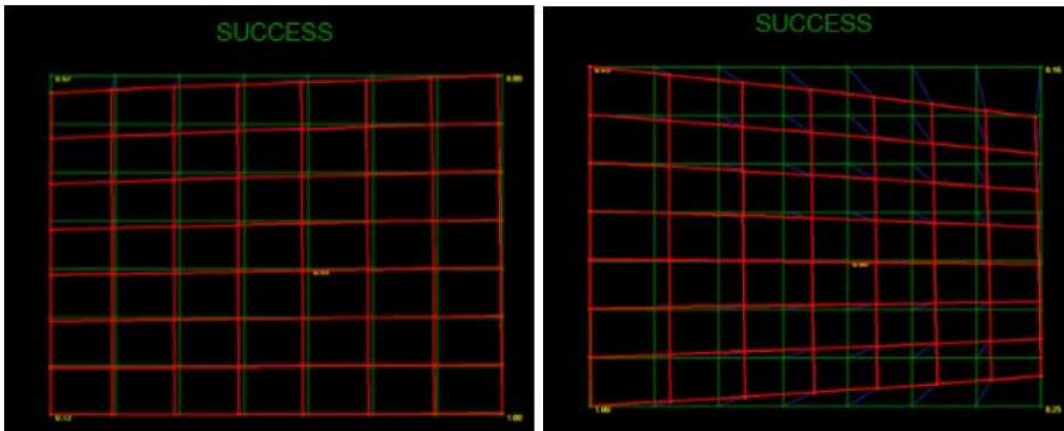
i.   Calibration Results
- If the calibration concludes with an error message dialog box, repeat the calibration process and make the appropriate adjustments to either the projector, camera or lighting conditions.
- Upon success, the calibration process concludes with a dialog giving the option whether to accept or reject the calibration data.
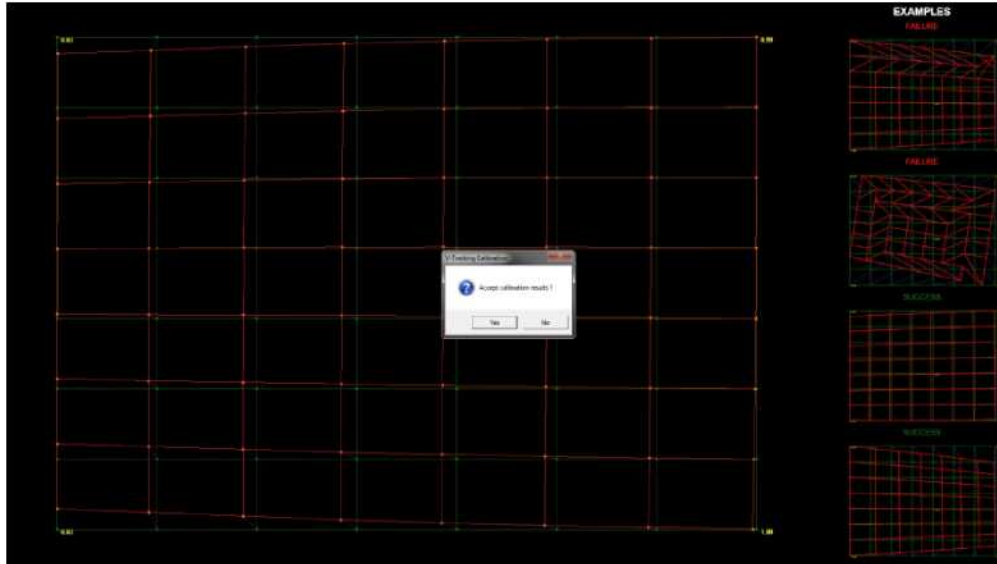
ii.   Examples of Successful & Failed Calibration Results

Successful Calibration Result:

The screen will present a green and red grid to verify the success of the calibration process. The green grid represents the projected grid; the red grid represents the grid the camera was able to read. The red grid may be slightly distorted based on the camera angle in relation to the screen. See the photo below for an example of successful calibration results.

Unsuccessful Calibration Result:

The calibration is only successful if the red grid represents a uniform grid that may be somewhat skewed. If individual points are missing or if they appear to not be in the expected location, the calibration needs to be repeated. See image below.
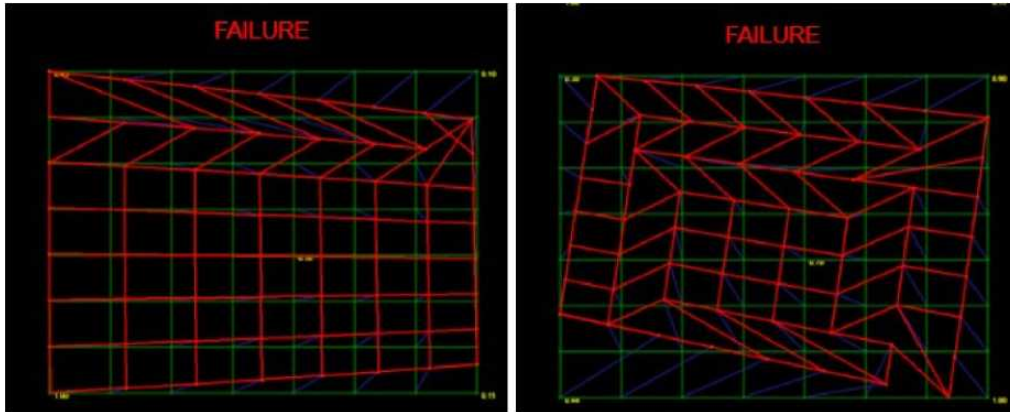
III. CALIBRATING A SINGLE SCREEN SYSTEM: ADVANCED

A. Calibration Settings

For particular situations, a number of additional calibration options are available. In order to access these options, the calibration tool must be started in advanced mode.

To do so, **hold down the shift key while double clicking the V-Tracking Calibration desktop icon**.
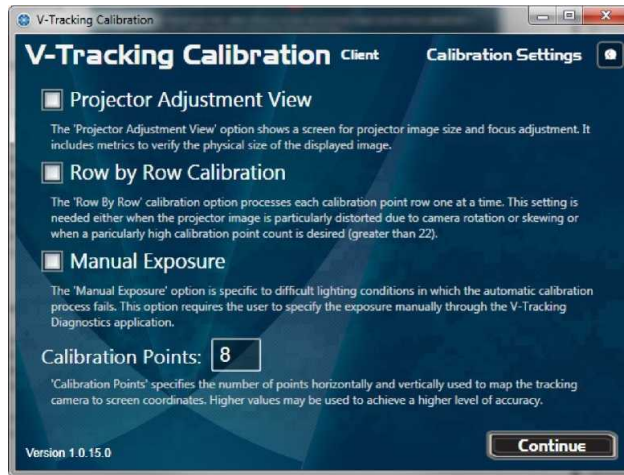
B. Projector Adjustment View

Projects a full-screen image showing boxes with the desired real-world measurements based on custom screen layout information specified by VirTra Support. This view can be used to modify the projector settings until the size of the projected boxes and screen are exactly of the desired size.

C. Row-By-Row Calibration

This feature can be used if the camera had to be mounted at a particularly awkward angle that makes it difficult for the calibration system to recognize the location of the calibration points with a single image.

In this case, the calibration points are determined row by row, which slows down the calibration process and allows for successful calibration with rotated or skewed camera angles. It is useful in situations where Automatic Calibration fails.

D.   Manual

This is needed when the lighting situation is such that the automatic calibration process fails and the camera settings need to be tweaked manually for the calibration program to correctly recognize the calibration points. This is explained in the section below.

E.   Additional Focus Options
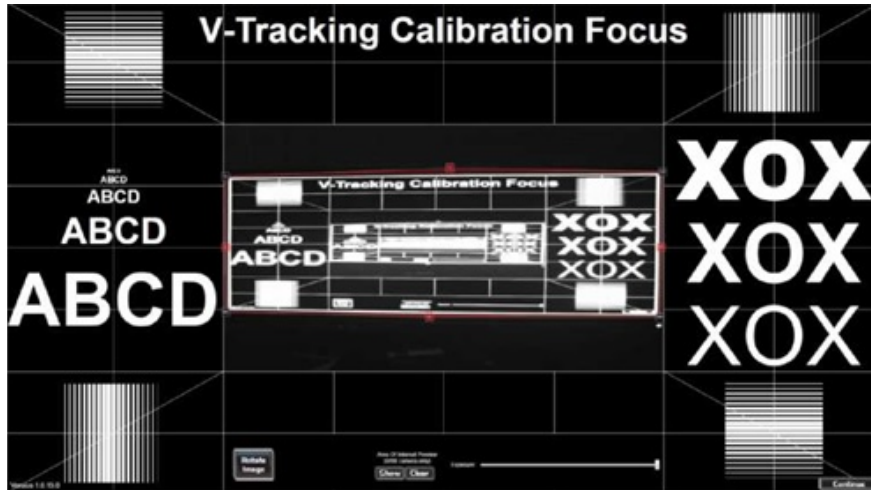
Use the **Rotate Image** button for a correct view if the camera is mounted at 90 or 180 degrees. This feature does not affect calibration and is not required to rotate the image appropriately.

For USB camera applications only, use the Show and Clear buttons to preview or clear the actual area of camera pixels the camera will ignore. Since the area of interest resolution for this camera is lower than the actual camera resolution, it might be important to see which exact pixels are being ignored.

IV.   MANUAL CALIBRATION PROCESS

When the Automatic Calibration process fails because of difficult lighting conditions or projector issues, VirTra support may attempt calibration by manually adjusting the exposure and threshold values. Due to the technical nature of this process, please Contact VirTra for support.

V.   CALIBRATING A MULTI-SCREEN SYSTEM

Calibration of a multi-screen system is being performed by controlling a separate calibration tool instance on each image generator remotely through a calibration tool running in host mode on the multi-screen system's host computer.

In essence, the calibration process for each individual screen is exactly the same as for the single screen system except that all user input is handled through the host calibration tool.

A.   Running the Calibration Tool in Host Mode

To run the calibration tool in host mode start it on the host computer system with the **Calibration HOST** desktop shortcut.
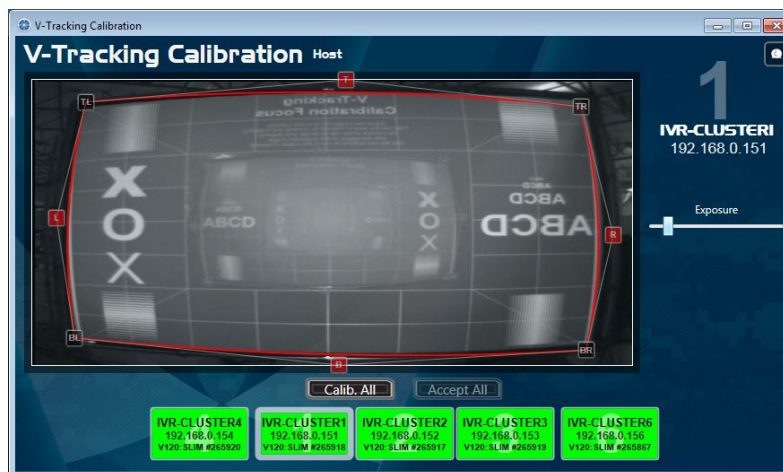
When running in host mode the calibration tool shows an alternate user interface that allows for individual control of each connected image generator system.

The host calibration tool continuously tries to communicate with the selected clusters and shows the status of each in the bottom button row.

- A **RED** button means that either the client cannot be found on the network or the client could be found but does not run the Tracking Service.
- A **YELLOW** button means that the client is connected and the host can communicate with its Tracking Service, but no camera is actively being processed by it.
- A **GREEN** button means that the client is connected, its Tracking Service running and a camera is active. The camera name will be displayed in the button.

Once a client is connected and its button is turning green, the host tries to remotely launch the calibration tool on that screen. If the calibration tool is not launching, please contact VirTra support.

B.   Controlling the Client Calibration Settings

Click on the desired client button in the bottom row to select a specific client. The video screen will show a video feed and area of interest indicator from the selected client. Much like the Single Screen Calibration process already outlined, use the **Area of Interest** controls and the **Exposure Control** to the right of the video screen to calibrate each screen.

After making all the desired adjustments on some or all clients, use the button row below the video screen and above the client buttons to control the calibration process on an individual or all clients.

- **Calib All** launches the calibration process on all connected clients.
- **Accept All** accepts the calibration result on all connected clients and closes their calibration tool instances.

For potential issues with the tracking service or the remote calibration tool on any of the remote system, two context menu options are available when right clicking on any of the individual remote client buttons:

- **Restart Remote VirtraTrackingService**: Completely stops and restarts the tracking service running on the selected client. The client button color will change accordingly during this process.
- **Restart Remote Calibration Tool**: Restarts the remote calibration tool on the selected client.

After acceptance the remote systems will confirm successful saving of the new calibration data with a dialog.

The dialogs can be responded to by simply closing the calibration host which will close the remote calibration tools and the system calibration is complete.
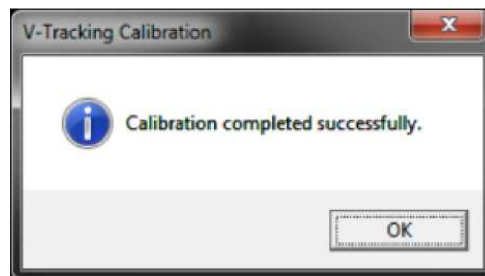

C.   Advanced Options for The Calibration Tool in Host Mode

Just like in single screen mode, a number of additional calibration options are available for particular situations. In order to access these options, the calibration tool must be started in advanced mode. To do so, hold down the **shift key** while double clicking the **Calibration HOST** desktop icon.

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      i.   Advanced Mode Interface
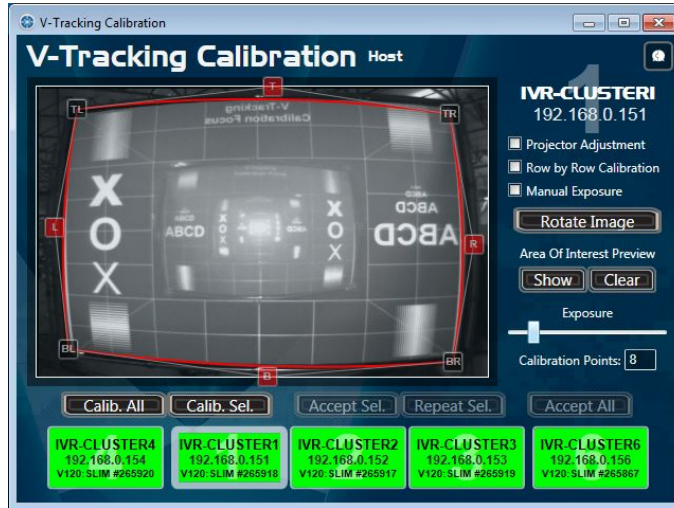
- To the right of the video screen, a list of options identical to the ones in single screen more appears. All functions, including the manual exposure settings, are available.
- The **Projector Adjustment** checkbox toggles the client back and forth, in and out of the projector adjustment view.
- **Calib. All** launches the calibration process on all connected clients.
- **Calib. Selected** launches the calibration process on the selected client only.
- **Accept Sel**. accepts the calibration result on the selected client only and closes the client's calibration tool instance.
- **Repeat Sel**. allows for repeating the calibration process after a failure on the selected client.
- **Accept All** accepts the calibration result on all connected clients and closes their calibration tool instances.

VII.   EXPOSURE OPTIMIZATION ISSUE

A.   Overview of the Issue

V-Tracking can run into an issue where the cameras do not seem to be operating correctly. First, we will explore identification of the issue, then we will outline the resolution.

B.   Identification of the Issue

- With VOS open, go to Administration
- Go to V-Tracking Control Panel
- Check on the Camera Status

If your cameras have different exposure values, some environmental issue has occurred. If you have this problem, follow this manual to the resolution section. They should all show <u>480ps.</u>

B.   Examples of Environmental Light

- Sunlight saturation of VirTra Training room:
- Direct sunlight emerging from open windows or open doors can cause a tracking issue.
- IR based security equipment:
- Security alarm system sensors and IR based cameras are known to cause tracking issues.
- Power surges or brown outs:
- Power fluctuations can cause secondary issues with technology, like computer boards or camera systems. If your training building has power issues, you might have to reset the exposure settings on a daily basis.
- LED/UV based room lighting:
- Flashlights, desk lights, overhead lighting including LED lighting can overwhelm the camera system. We always recommend ensuring all room lighting and windows/doors are secured from cracks where light can shine through.
- Remote controls and laser pointers. Barrel mounted laser sights or remote controls that emit IR can cause stray shots or other issues with our tracking system.

- All VirTra products have been tested to ensure their LCD, laser, or indicator lights do not interfere with the tracking system.

NOTE: An image of a flashing camera with an 'X' might appear on the top left corner of the system if any of the following conditions are present:

- V-Tracking Service is not running
- No camera is connected
- The tracking cameras are being flooded with too much environmental light
- The low light configuration is starting up, which restarts the V-Tracking service. This is by design.

C.   Exposure Optimization Resolution

- With VOS open, go to Administration
- Go to V-Tracking Control Panel
- Find the Exposure Optimization Tab
- Find the All Cameras slider
- Move the Slider indicator all the way to the LEFT
- Move the Slider indicator all the way to the RIGHT
- The system will work normally without any further action

NOTE: If the Calibration Host continues to behave inconsistently, please contact VirTra Support.

VII.   TROUBLESHOOTING

Is the tracking service running properly?

Open the Windows Task Manager, go to the Services tab and verify that the VirTra Tracking Service is Running. Do not confuse this service with the Basler shot tracking service called FIRE TRACKING or VIRTRA FIRE TRACKING.

Run the diagnostics tool on the same system running the tracking service. By default, it will try to connect to the local tracking service upon startup. After a few seconds the status should go from Opening... to Connected. If it does not, the tracking service is not running.

Why is the tracking service not running or not launching?

If the VirTra Tracking Service is will not launch and continue running after install or after trying to restart it with the Windows Task Manager or the Windows Services administration tool, restart the affected system.

Is the tracking service recognizing the currently attached camera correctly?

Open the file VirTraTrackingService.log in the folder C:\VirTra\LOGS and check if a camera was successfully launched.

Run the diagnostics tool and connect to the shot tracking computer as outlined in the steps for the manual calibration process. If there is no camera name listed after the word Connected, no camera is being recognized by the tracking service. If no camera is recognized follow the steps under Testing if the camera was properly recognized by the computer in the Installation guide. If no camera is found, verify the USB driver for a USB camera or the network settings for an Ethernet camera.

Why is the Prime 13 camera not recognized by the system?

The NaturalPoint Camera SDK has issues with certain NICs which may cause them to not see the Prime 13 camera.

If V-Tracking does not appear to recognize the attached Prime 13 camera and the camera goes through a repeating cycle of Green, Yellow and blinking Red LED colors of the switch on its back, make the following change to the NIC settings:
- In Windows, open the camera NICs adapter properties.
- Disable the automatic speed negotiation and force to a speed of 100Mbit
- The location of this setting might be different for different NIC manufacturers.

What modifications might help to calibrate when automatic and manual processes fail?
- Verify and adjust the area of interest to avoid any light from areas outside the calibration screen.
- Decrease the light level in the environment.
- Use a brighter projector or increase the projector brightness for the purpose of calibration.
- Experiment with different locations for the camera.

How can the calibration process be cancelled before completion?

Focus on the calibration screen and press Alt-F4 to close the full screen window.

IV. CONTACT

For Additional Questions and Troubleshooting Assistance, Contact Service at

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