

# Lumatrack

## Technical Description

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*Performer Tracking Made Simple*

Mount the device, connect it to your network, and your console knows where your performers are.

## 1. What Is Lumatrack?

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Lumatrack is a real-time AI performer tracking system designed for live events, theater, corporate presentations, touring productions, and immersive experience installations. It automatically detects and follows people on stage using a built-in camera and an onboard AI chip — with no wearables required on performers.

Position data is transmitted over standard Ethernet to lighting consoles, media servers, and custom systems using the industry-standard PosiStageNet (PSN) protocol. For custom or non-standard integrations, additional output modules can be added to transmit position data in other protocols such as Art-Net, OSC, or HTTP/WebSocket.

## 2. How It Works

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### 2.1 Detection — AI Vision, No Wearables

Most competing tracking systems require performers to wear hardware: infrared beacons, UWB radio tags, or other electronic devices. Lumatrack uses computer vision instead.

A high-resolution camera captures continuous video of the stage. An onboard AI inference chip analyzes video frames in real time and detects people using a neural network trained on thousands of human poses and body shapes. No special clothing, no batteries to charge, nothing for performers to put on or forget backstage.

### 2.2 Tracking — Persistent Identity Across Frames

Detecting a person in a single frame is straightforward; knowing it is the same person across hundreds of frames is the hard part. Lumatrack uses a lightweight tracking algorithm that assigns each detected person a persistent ID from the moment they enter the frame until they leave. If someone briefly leaves view and returns, the system re-associates them to the correct track.

Re-identification (re-ID) and appearance-based recognition — which allow the system to recognize a specific performer even after a prolonged absence from view or after crossing paths with another tracked person — are features for upcoming Pro versions and custom integrations.

### 2.3 Smoothing — Physics-Based Motion Prediction

Raw detection coordinates jump slightly frame-to-frame due to natural variation in the AI output. Lumatrack applies a smoother that models each performer as a moving object with velocity and momentum. This produces fluid, predictable position data — essential for smooth following spotlights.

### 2.4 Coordinate Mapping — Stage Space, Not Pixel Space

Cameras see the world in pixels. Lighting consoles and media servers work in stage meters. Lumatrack includes a calibration step where you mark known physical reference points on stage (e.g. downstage center, stage left edge). The system uses these to build a precise pixel-to-stage coordinate transformation, so every position output is in real-world stage units.

### 2.5 Output — Standard Protocols, Any System

Lumatrack sends position data as PosiStageNet (PSN) packets over UDP multicast. PSN is an open, royalty-free protocol (MIT License, VYV Corporation) supported by all major lighting consoles and media servers. No proprietary receiver hardware needed on the console side.

For custom installations — such as interactive art, museum exhibits, or immersive experiences — the output layer is modular. Additional protocol modules can be enabled to transmit position data via Art-Net, OSC, or HTTP/WebSocket, allowing integration with game engines, media servers, custom software, and interactive control systems.

### 3. Technical Specifications

<b>Output Protocol</b>	PosiStageNet (PSN) v2
<b>Network Connection</b>	Ethernet (100/1000 Mbps)
<b>Power</b>	5 V / 3 A
<b>Camera</b>	Built-in
<b>Configuration</b>	Web browser interface — no software install required
<b>Physical Size</b>	Compact, single-unit enclosure
<b>Compatible Consoles</b>	grandMA3, ChamSys, disguise (d3), any PSN-enabled system

## 4. Setup Requirements

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### 4.1 Physical Installation

- Mount the Lumatrack unit with a clear, unobstructed top-down or elevated angled view of the tracking area
- Recommended mounting height: 4–8 m above stage floor
- Field of view should cover the full performance area
- Avoid mounting directly in front of strong backlights pointed at the camera lens

### 4.2 Network

- Standard Ethernet switch
- PSN uses UDP multicast — ensure your network switch has multicast forwarding enabled (or use a simple unmanaged switch on a dedicated network segment)
- Lumatrack and your lighting console must be on the same network subnet
- Static IP or DHCP — both supported

### 4.3 Lighting Console Configuration

1. Enable PosiStageNet (PSN) input on your console
2. Enable XYZ positioning for the fixtures you wish to automate
3. Perform stage calibration: mark 4 reference points on stage and enter their real-world coordinates
4. Assign PSN tracker IDs to fixture target slots

Documented console workflows are available for grandMA3, ChamSys MagicQ, and disguise d3.

### 4.4 Lighting Environment

- Works best under standard stage wash illumination (front wash or overhead)
- Very dark scenes (below ~10 lux at stage level) will reduce detection confidence
- Fast strobe sequences can reduce effective frame rate; use with caution
- Haze/fog machines do not affect detection at typical densities
- The system does not require any special performer lighting

## 5. Calibration Workflow

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Calibration takes approximately 5–10 minutes and only needs to be repeated when the camera position changes.

5. **Open the web interface** Open the web interface on any device connected to the same network (<http://<device-ip>>)
6. **Click the corresponding points** on the camera image in the web UI and enter their stage coordinates (X/Y in meters, with stage center as origin)
7. **Save calibration** — the system immediately begins outputting calibrated PSN coordinates
8. **Verify in console** — observe that the PSN position values match the physical stage positions

## 6. Web Interface

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Lumatrack is configured and monitored entirely through a web browser — no software installation required on your laptop or console workstation.

### **Features available in the web interface:**

- Live camera view with detection overlay
- Performer track status (active targets, track IDs, confidence)
- 3D stage visualization showing current performer positions
- PSN output configuration (IP, port, universe)
- Calibration tool (point mapping, coordinate entry)
- Detection zone masking (exclude areas from tracking, e.g. audience, wings)
- Smoothing and tracking parameter adjustment
- Network configuration
- Performance metrics and diagnostics

## 7. Competitor Comparison

### No wearables — nothing on performers

This is the fundamental differentiator. Competing systems require performers to carry, charge, and correctly wear hardware for every show. With Lumatrack, performers interact with the technology only by walking on stage. This eliminates:

- Pre-show beacon/tag distribution and charging logistics
- Risk of a performer forgetting or incorrectly wearing a tag
- Costume design constraints around concealing hardware
- Tag damage and replacement costs
- Battery failure mid-show

### Zero infrastructure

Other tracking solutions require multiple anchors professionally mounted and cabled throughout the venue, plus a dedicated server and camera rig. Lumatrack is a single compact unit that connects via a single Ethernet cable — comparable to installing a network switch or a Wi-Fi access point.

For custom installations requiring full coverage of larger areas, multiple Lumatrack units can be deployed with each covering a defined zone, providing scalable tracking without complex centralized infrastructure.

### Instant setup for corporate and touring

For productions that move venue-to-venue, setting up and tearing down anchor arrays or truss-mounted IR cameras takes hours. Lumatrack can be mounted and calibrated in 15–30 minutes, making it practical for single-day corporate events and touring shows where turnaround time is critical.

### Self-contained, no server required

All processing happens on the device. There is no external PC, server, or cloud service to manage, license, or maintain.

## 8. Frequently Asked Questions

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### **Does Lumatrack work in total darkness?**

The standard unit relies on visible-light camera footage and works best under standard stage wash lighting. For custom projects, low-light or near-darkness operation can be enabled by pairing the camera with infrared illuminators — contact us to discuss your specific requirements.

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### **Can it track someone wearing all black or a costume that fully obscures the face?**

Yes. The AI model detects full body silhouettes, not faces. It does not perform facial recognition. Tracking is based on body shape, movement, and spatial continuity.

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### **What happens if the performer walks behind a set piece?**

The track is suspended while the performer is fully occluded. When they re-enter the camera's field of view, the system re-associates them using position proximity and movement prediction.

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### **Is calibration permanent?**

Calibration is saved to the device and persists across reboots. It only needs to be repeated if the camera is physically moved or the stage layout changes significantly.

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### **Can I run two Lumatrack units to cover a wider stage?**

Yes. Each unit outputs its own PSN data stream independently. Multi-unit stitching — combining multiple cameras into a single unified coordinate space — is available for custom projects. Contact us to discuss coverage requirements for your installation.

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### **Does it require internet access?**

No. Lumatrack operates entirely on your local network. No cloud connectivity is required for any function.

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### **What is the privacy posture?**

All processing is on-device. No video or tracking data is transmitted off-site. The camera view is accessible only within your local network via the web interface.

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