

WHITE PAPER

# Location data in body worn systems

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# 1 Summary

Body worn cameras can store various types of metadata in the recordings. Location data is one example. By tying the video to the geographical coordinates where it was filmed, the evidentiary value of the recording can be significantly enhanced.

Body worn cameras from Axis obtain location data through communication with several navigational satellites. When starting up the body worn system, it typically takes up to 15 minutes in clear conditions (or longer, depending on weather and environment) to establish satellite communication and pick up enough data. The waiting time is kept down by use of positioning assistance which pre-downloads satellite data from servers while the cameras are docked.

Unlike many other types of GPS devices, such as smartphones and navigators, Axis body worn cameras cannot use nearby cell towers or Wi-Fi networks to determine their location. Satellite coverage is needed, which means that the cameras can store coordinates only when used outdoors.

## 2 Introduction

With a body worn camera, incidents can be recorded wherever they occur. Mounted on the body of an official, the camera is brought to where it is needed and can capture events that would never have been caught by fixed cameras mounted in predetermined locations.

A recording produced by a body worn camera comprises a piece of trusted and secure evidence, objectively showing what happened at the scene of an incident. The video content itself has the highest evidential value, but the recording contains other data as well, typically information about *when* the recording was made, *by whom*, and perhaps also *how* the recording was started. This type of metadata bears evidentiary value which complements the video.

Knowing *where* an incident occurred is also of interest and this is where location data comes into play. Storing the coordinates, along with the other metadata, increases the value and usability of the recording as evidence.

This white paper provides a brief overview of how location data is obtained and used in body worn cameras. The paper also summarizes the functionality that can be expected with Axis body worn cameras, based on their positioning mechanisms.

## 3 Location data usage

Management software, such as a VMS (video management system) or EMS (evidence management system), can use the location data to display incident locations on a map, for example to enable map-based searches. Video material can also be automatically collected from multiple sources based on the recording location.

This usage of location data is very similar to how a smartphone provides geotagging of photos. The phone stores the coordinates of where the photo was taken in the photo's metadata (Exif), which can then be used to deliver additional functionality, like finding photos from a certain place.

In general, however, devices such as smartphones, sport watches, and GPS navigators use location data primarily for continuous tracking and navigation. A body worn camera uses location data to tie a recording to a specific location.

## 4 Obtaining the data

A body worn camera obtains location data through communication with navigational satellites that are in orbit around Earth. The satellites continuously transmit data about their own time and position. When communication is established with at least four satellites, the camera uses its integrated GNSS (Global Navigational Satellite System) chip to calculate its own precise latitude, longitude, and altitude. The time it takes to find enough satellites and establish communication with them is the *Time to first fix* (TTFF).

The TTFF can vary and is dependent on many factors, such as physical surroundings and weather conditions. It can be hard to obtain clear communication in busy areas or bad weather.

Some types of body worn cameras cannot obtain location data through satellite communication but use a smartphone instead. For that to work, the camera must always maintain an active communication link with the phone.

## 4.1 Techniques for positioning assistance

To facilitate communication with the satellite system and shorten the TTFF, *Assisted GNSS* can be used. It comprises two methods.

**Mobile Station Assisted (MSA)** uses an assistance server to enhance the signals that the device receives from the satellites. The device sends the satellite data to the server over the internet and the server returns the coordinates.

**Mobile Station Based (MSB)**, sometimes called *Assisted GNSS (ephemeris)*, is used to find satellites more quickly. The device uses pre-downloaded satellite orbital data from the internet and can thereby establish a lock to the satellites more rapidly, resulting in a shorter TTFF.

Some mobile phones and sport watches support the ability to combine Assisted GNSS with additional methods to ensure that location data can be attained quicker and in tougher environments. These methods involve using Wi-Fi networks, cell tower data, and Bluetooth sensors.

## 5 Positioning with Axis body worn cameras

Axis body worn cameras feature a built-in GNSS chip which enables a camera to obtain its position based on the availability of satellites. When the user starts and stops a recording, the location data of the camera is captured and stored in the metadata. This location data can be reviewed in the mobile application AXIS Body Worn Assistant and, more importantly, it follows the video recording to the content destination. The coordinates captured at the start of a recording can also be displayed in the video overlay.

Each content destination has its own way of presenting location data. Some do not yet have the capability, some can present the location as coordinates and some in maps, and some allow for more elaborate use of the data, such as searching.

### 5.1 Positioning assistance

Axis body worn system supports Assisted GNSS (ephemeris). AXIS Body Worn Manager can download satellite orbital data from Axis servers and distribute it to the cameras while they are docked. This way the TTFF is reduced when the cameras are used.

A body worn camera from Axis cannot use nearby cell towers or Wi-Fi networks to determine its location. The camera can provide location data only when it has satellite coverage. Indoors, the satellite signals are too weak.

### 5.2 Important considerations

- The positioning system used with Axis body worn cameras works only outdoors.
- *Time to first fix* is up to 15 minutes in clear conditions. It can be longer depending on weather and environment. In rare, difficult cases, no fix is possible.
- Until a camera has a fix, no coordinates will be reported. But once the camera has a fix, it will rarely lose it.
- It is possible to have only a start position or only a stop position in a recording, for instance if the recording is started indoors and stopped outdoors.

# About Axis Communications

Axis enables a smarter and safer world by creating network solutions that provide insights for improving security and new ways of doing business. As the industry leader in network video, Axis offers products and services for video surveillance and analytics, access control, intercom and audio systems. Axis has more than 3,800 dedicated employees in over 50 countries and collaborates with partners worldwide to deliver customer solutions. Axis was founded in 1984 and has its headquarters in Lund, Sweden.

For more information about Axis, please visit our website [axis.com](https://axis.com).