AXIS D2210-VE Radar

User manual

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Installation

This video shows an example of how to install the radar.

For complete instructions on all installation scenarios as well as important safety information, see the installation guide on *axis.com/products/axis-d2210-ve-radar/support*

To watch this video, go to the web version of this document.

Considerations

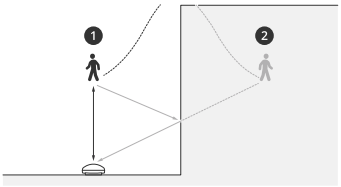
Where to install the product

Area or road monitoring

The radar is intended for monitoring open areas and you can use it either for area monitoring or road monitoring. The radar has two profiles to optimize the performance for each one of the scenarios. For more information about detection range, installation examples and use cases, see *Radar profiles, on page 7*.

Avoid solid and reflective objects

Most solid objects (such as walls, fences, trees, or large bushes) in the coverage area will create a blind spot (radar shadow) behind it. Metal objects in the field of view cause reflections that affect the ability of the radar to perform classifications. This can lead to ghost tracks and false alarms in the radar stream.



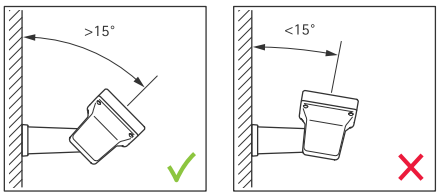
1 *Actual detection*
2 *Reflected detection (ghost track)*

For information about how to handle solid and reflective objects, see *Add exclude zones, on page 20*.

Positioning

Install the product on a stable pole or a spot on a wall where there are no other objects or installations. Objects within 1 m (3 ft) to the left and right of the product, that reflect radio waves, affect the performance of the radar.

If you install the product on a wall, it needs to point away from the wall at least 15°.

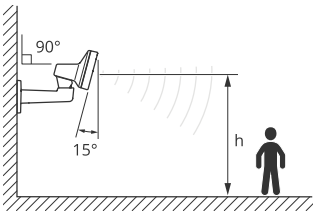


Roll angle

The product's roll angle must be nearly equal to zero, which means that radar should be level with the horizon.

Tilt angle

The radar can be tilted 0-30°, but the recommended mounting tilt of the device is 15°. To help you achieve 15° tilt, make sure the back part of the chassis is level, as shown in the illustration.



You can add an overlay in the radar's live view that shows the tilt angle of the radar. For instructions, see *Show a text overlay with the tilt angle of the radar, on page 21*

Coexistence

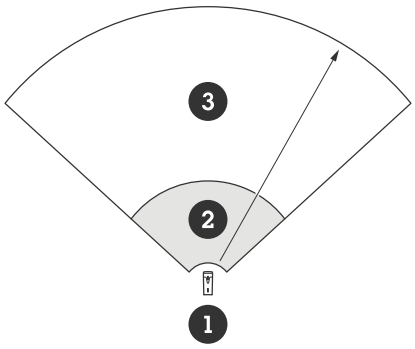
If you mount more than eight Axis radars operating on the 60 GHz frequency band close together, they may interfere with each other. To avoid interference, see *Install multiple radars, on page 5*.

Install multiple radars

You can install multiple radars to cover areas such as the surroundings of a building or the buffer zone outside a fence.

Coexistence

The radar's radio waves continue beyond the detection area, and can interfere with other radars up to 350 m (380 yd) away. This is called a coexistence zone.

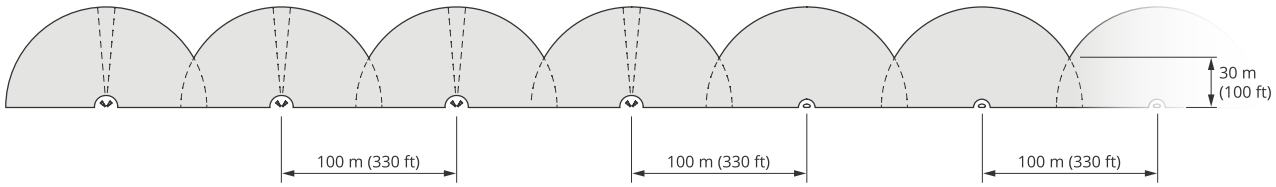


1 Radar
2 Detection area
3 Coexistence zone

This radar operates on the 60 GHz frequency band. You can install up to eight radars operating on the 60 GHz frequency band close to each other, or facing each other, without causing problems. The built-in coexistence algorithm can find a suitable time slot and frequency channel that will minimize interference.

If an installation contains more than eight radars operating on the same frequency band, and many of the devices are pointing away from each other, there is less risk of interference. In general, radar interference will not cause the radar to stop functioning. There is a built-in interference mitigation algorithm that tries to repair the radar signal even when interference is present. A warning about interference is expected to happen in an environment with many radars operating on the same frequency band in the same coexistence zone. The main impact of interference is deterioration of the detection performance, and occasional ghost tracks.

Axis radars operating on different frequency bands will not interfere with each other. For example, you can combine AXIS D2210-VE with multiple AXIS D2110-VE Security Radar, which operates on the 24 GHz frequency band, without interference.



Four pairs of AXIS D2210-VE and multiple AXIS D2110-VE Security Radars mounted side-by-side.

Note

AXIS D2110-VE Security Radar requires additional configuration when more than two AXIS D2110-VE are mounted in the same coexistence zone. To learn more, see *AXIS D2110-VE Security Radar user manual*.

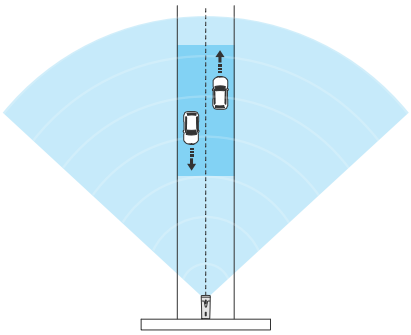
Environment

There are also other design factors to check when placing multiple radars in a site, like the surrounding environment, swaying objects, flag poles, and swaying vegetation. In some cases you need to filter out swaying objects from the radar stream to avoid false alarms.

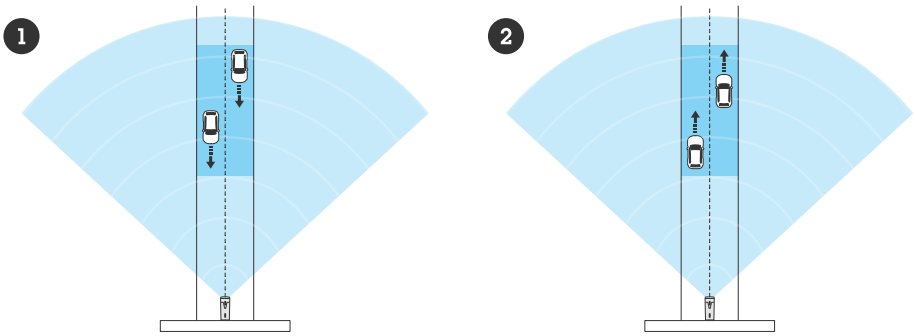
Radar profiles

You can use the radar for area monitoring or road monitoring. There are three radar profiles available in this device:

Two-directional road monitoring – Default profile. Use this profile to track vehicles moving in both directions at up to **200 km/h (125 mph)**. Speed accuracy: ±2 km/h (1.25 mph).



One-directional road monitoring – Use this profile to track oncoming traffic (1) at up to **360 km/h (224 mph)**, or departing traffic (2) at up to **280 km/h (174 mph)**. Speed accuracy: ±3 km/h (1.86 mph).



Area monitoring – Use this profile to track humans, vehicles, and unknown objects moving at up to **55 km/h (34 mph)**. Speed accuracy: ±2 km/h (1.25 mph).

Select the monitoring profile in the radar's web interface. For instructions, see *Select a radar profile, on page 17*.

Area monitoring profile

The **area monitoring profile** is optimized for objects moving at up to 55 km/h (34 mph). This profile allows you to detect whether an object is human, vehicle, or unknown. A rule can be set to trigger an action when any of these objects is detected. To track vehicles moving in higher speeds, use the *Road monitoring profile, on page 10*.

Area of coverage

AXIS D2210-VE has a horizontal field of detection of 95°. The area of coverage corresponds to 2700 m^2 (29000 ft^2) for humans and 6100 m^2 (65600 ft^2) for vehicles.

Note

Optimal area coverage applies when the radar is mounted at 3.5–7 m (11–23 ft). The mounting height will affect the size of the blind spot below the radar.

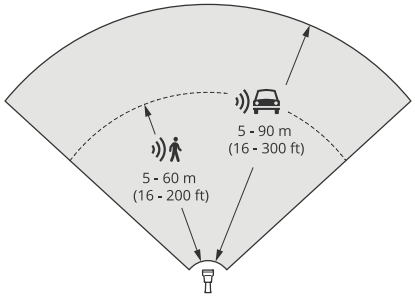
Area detection range

The detection range is the distance within which an object can be tracked and can trigger an alarm. It is measured from a near detection limit (how close to the device a detection can be made) to a far detection limit (how far from the device a detection can be made).

The **area monitoring profile** is optimized for human detection, however, it will also allow you to track vehicles and other objects moving at up to 55 km/h (34 mph) with a speed accuracy of +/- 2 km/h (1.24 mph).

When mounted at the optimal installation height, the detection ranges are:

- 5 – 60 m (16–200 ft) when detecting a human
- 5 – 90 m (16–300 ft) when detecting a vehicle



Note

- Enter the mounting height in the web interface when you calibrate the radar.
- The detection range is affected by the scene and the product's tilt angle.
- The detection range is affected by the moving object type and size.

The radar detection range was measured under these conditions:

- The range was measured along the ground.
- The object was a person with a height of 170 cm (5 ft 7 in).
- The person was walking straight in front of the radar.
- The values were measured when the person entered the detection zone.
- The radar sensitivity was set to **Medium**.

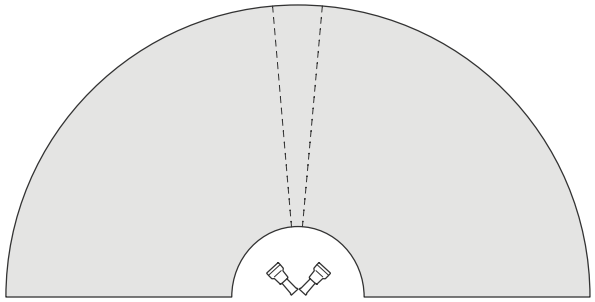
Mounting height	0° tilt	5° tilt	10° tilt	15° tilt	20° tilt	25° tilt	30° tilt
3.5 m (11 ft)	6.0–60+ m (19–196+ ft)	5.0–60+ m (16–196+ ft)	4.0–60+ m (13–196+ ft)	4.0–60 m (13–196 ft)	4.0–55 m (13– 180 ft)	4.0–40 m (13–131 ft)	4.0–30 m (13–98 ft)
4.5 m (14 ft)	6.0–60+ m (19–196+ ft)	6.0–60+ m (19–196+ ft)	5.0–60+ m (16–196+ ft)	4.0–60+ m (13–96+ ft)	4.0–60 m (13–196 ft)	4.0–45 m (13–147 ft)	4.0–40 m (13–131 ft)
6 m (19 ft)	10–60+ m (32–196+ ft)	9.0–60+ m (29–196+ ft)	7.0–60+ m (22–196+ ft)	6.0–60+ m (19–196+ ft)	6.0–60 m (19–196 ft)	5.0–55 m (16–180 ft)	5.0–55 m (16–180 ft)
8 m (26 ft)	16–60 m (52–196 ft)	14–60 m (45–196 ft)	10–60 m (32–196 ft)	8.0–60+ m (26–196+ ft)	8.0–60+ m (26–196+ ft)	7.0–60 m (22–196 ft)	7.0–60 m (22–196 ft)
10 m (32 ft)	21–60 m (68–196 ft)	19–60 m (62–196 ft)	14–60 m (45–196 ft)	12–60+ m (39–196+ ft)	10–60+ m (32–196+ ft)	9.0–60 m (29–196 ft)	9.0–60 m (29–196 ft)
12 m (39 ft)	25–60 m (82–196 ft)	23–60 m (75–196 ft)	19–60 m (62–196 ft)	16–60+ m (52–196+ ft)	13–60+ m (42–196+ ft)	11–60+ m (36–196+ ft)	11–55 m (36–180 ft)

Note

- Setting the radar sensitivity to **Low** will decrease the detection range by 20% while setting it to **High** will increase the detection range by 20%.

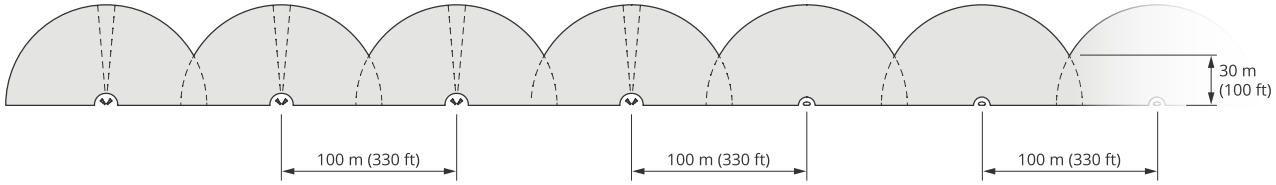
Area installation examples

To create a virtual fence, for example along or around a building, you can place up to eight AXIS D2210-VE Radars side-by-side. When you place two AXIS D2210-VE next to each other, you will get 180° coverage.



Two AXIS D2210-VE mounted side-by-side for 180° coverage.

When you install more than one pair of AXIS D2210-VE side-by-side, we recommend that you place them with 100 m (330 ft) spacing between each pair.



Four pairs of AXIS D2210-VE and multiple AXIS D2110-VE Security Radars mounted with 100 m (330 ft) spacing.

Axis radars operating on different frequency bands will not interfere with each other. This means that you can combine AXIS D2210-VE, which operates on the 60 GHz frequency band, with AXIS D2110-VE Security Radar, which operates on the 24 GHz frequency band in the same coexistence zone.

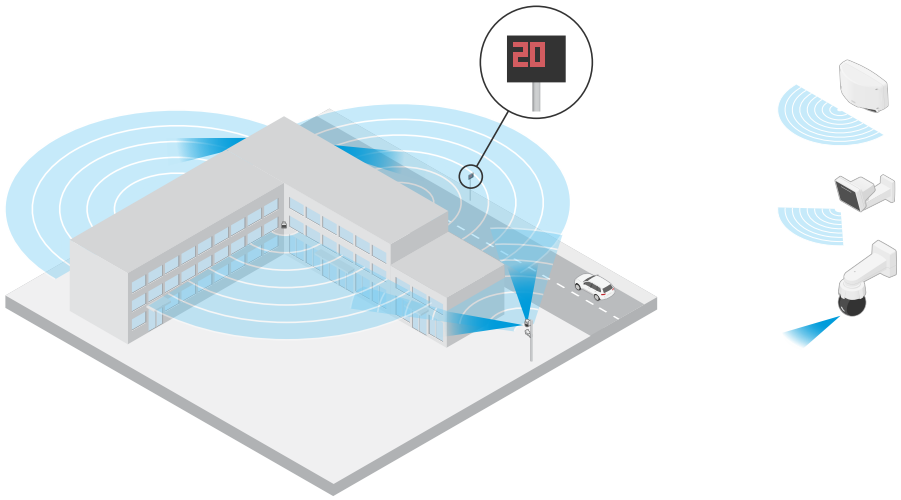
For more information about coexistence and interference, see *Install multiple radars, on page 5*.

Area monitoring use cases

Cover the area around a building

A company in an office building needs to secure the premises from intrusion and vandalism, particularly after working hours. To cover the area around the building, they install a combination of radars and PTZ cameras. They use AXIS D2110-VE Security Radars with 180° coverage to cover the long sides of the building, and AXIS D2210-VE Radar with 95° coverage for the shorter sides and corners. They configure the radars to trigger an alarm when humans approach the building after working hours. To make sure they get visual confirmation of potential intruders, they add two PTZ cameras. The radars can steer the PTZ cameras through *AXIS Radar Autotracking for PTZ*.

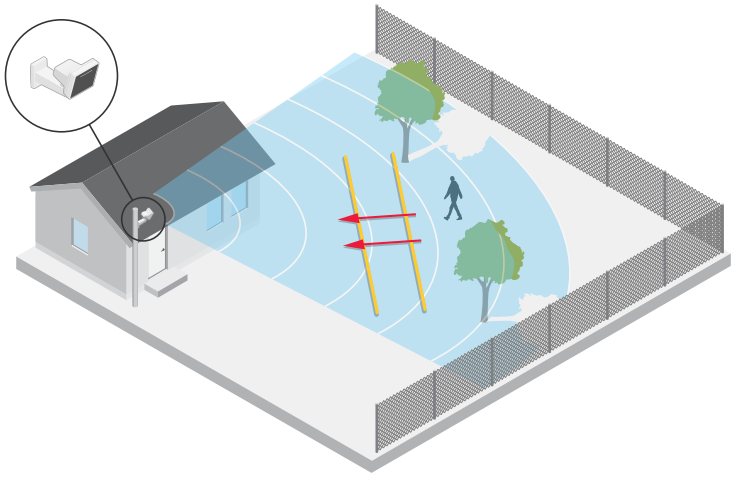
Additionally, the company wants to keep the premises safe during working hours. To make sure that vehicles passing the road on the side of the building are within the speed limits, they pair one of the AXIS D2110-VE Security Radars with a speed sign from Microbus, using *AXIS Radar Integration for Microbus*.



Cover a complex scene

A company that keeps critical equipment in a building on the premises is surrounded by a fence to keep intruders away. To avoid tampering and sabotage, they need additional protection. Their wish is to trigger an alarm when humans approach the building. However, the scene contains trees with swaying branches, a metal fence that could cause reflections, and even small animals moving around the site, which all could cause false alarms.

To reduce false alarms, they configure a scenario in the radar's web interface so that an approaching object must cross two virtual lines before an alarm is triggered. This will help to trigger on objects that intentionally move towards the building, while objects that just happen to cross one of the virtual lines are filtered out.



In sites where there are no fences, the two lines could act as a virtual fence. To learn more about adding two lines to a scenario in the radar's web interface, see *Add scenarios, on page 18*.

Road monitoring profile

The **road monitoring profile** is optimized for tracking vehicles moving at up to 200 km/h (125 mph) on suburban roads and highways. To track humans and other objects moving at lower speeds, use the area monitoring profile. For more information, see *Area monitoring profile, on page 7*.

Road detection range

The radar's road monitoring profiles are optimized for detecting and tracking vehicles. We recommend them when you use the device for speed measurement. When you use the device for license plate capture, we recommend the two-directional road monitoring profile.

The mounting height of the radar and the vehicle speed will impact the detection range. When mounted at an optimal installation height, the radar detects approaching and departing vehicles with a speed accuracy of +/- 2 km/h (1.24 mph) within the following ranges:

- **25–100 m (82–328 ft)** for vehicles moving at 50 km/h (31 mph).
- **40–80 m (131–262 ft)** for vehicles moving at 100 km/h (62 mph).
- **50–70 m (164–230 ft)** for vehicles moving at 200 km/h (125 mph).
- **60–70 m (197–230 ft)** for vehicles moving at 280 km/h (174 mph).
- **30–40 m (98–131 ft)** for oncoming vehicles moving at 360 km/h (224 mph).

Note

To minimize the risk of missed detections of vehicles travelling in high speeds, set up a scenario in the radar that triggers on the object types **Vehicle** and **Unknown**. For more information about how to set up a scenario, see *Add scenarios, on page 18*.

Road installation examples

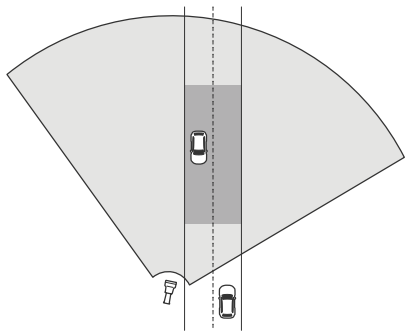
When monitoring roads and highways, make sure to mount the radar at a sufficient height to avoid blind spots (radar shadow) behind the vehicles.

Note

The size of the radar shadow depends on the radar's mounting height and the vehicles' height and distance from the radar. For example, when a vehicle with a height of 4.5 m (15 ft) is 50 m (164 ft) away from a radar that is mounted at a height of 8 m (26 ft), the radar shadow behind the vehicle will be 50 m (164 ft). However, if the radar is mounted at a height of 12 m (39 ft), the shadow behind the same vehicle will only be 23 m (74 ft).

Side mounted

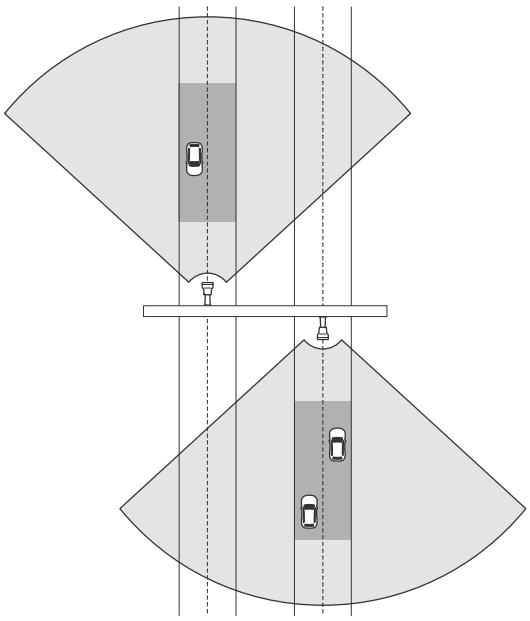
To monitor vehicles travelling along a road you can mount the radar on the side of the road, for example on a pole. In this type of installation, we recommend a pan angle of max 25°.



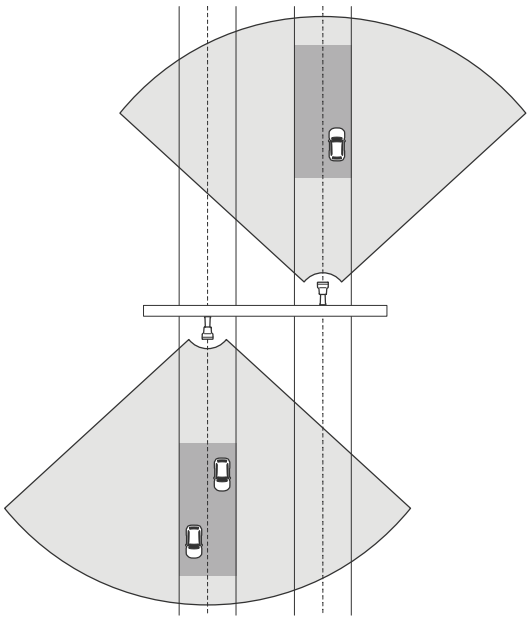
To measure high speeds accurately, position the radar within a lateral distance of 10 m (32 ft) from the vehicles. For more information about detection range and speed accuracy, see *Road detection range, on page 10*.

Center mounted

To monitor vehicles on a multi-lane road, you can mount one or more radars on a gantry above the road.



The same type of installation is possible if you want to monitor vehicles that drive away from the radar, instead of driving towards it.



To measure high speeds accurately, position the radar within a lateral distance of 10 m (32 ft) from the vehicles. For more information about detection range and speed accuracy, see *Road detection range, on page 10*.

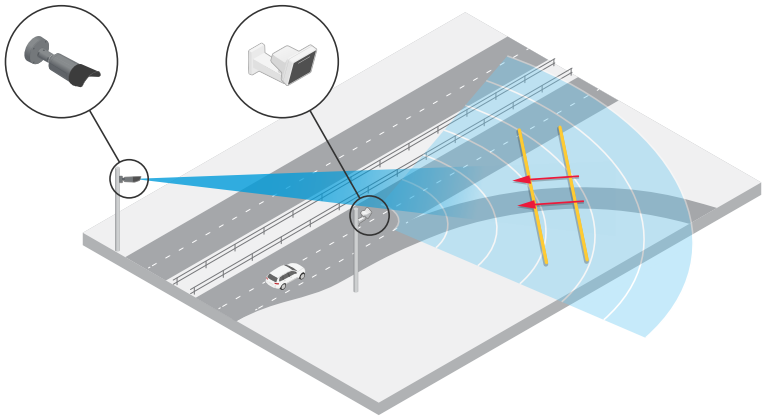
Road monitoring use cases

A common use case for AXIS D2210-VE Radar and the road monitoring profile is to track and measure the speed of vehicles. You can visualize the speed of vehicles or log the radar tracks for statistical processing. Add speed visualization in **Radar > Overlays**. Turn on statistics collection in **Radar > Settings > Speed statistics**. Statistics collection requires an SD card. You can get the same functionality with AXIS Speed Monitor. For a list of compatible devices, see *axis.com/products/axis-speed-monitor#compatible-products* For more information, see the *user manual for AXIS Speed Monitor*.

For more examples of how you can set up the radar when using the road monitoring profile, see the following use cases:

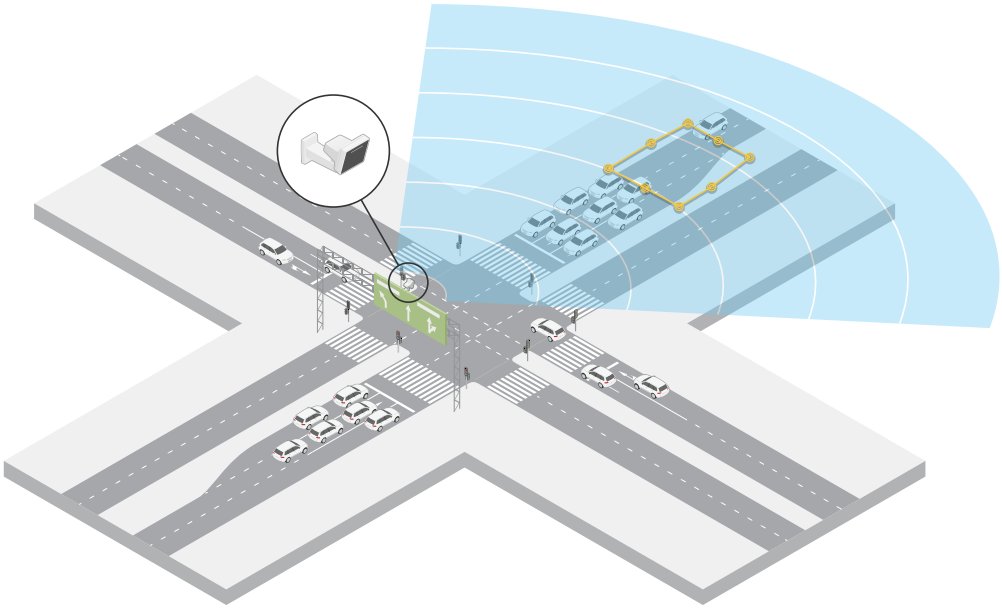
Wrong-way detection on a highway ramp

To detect and identify vehicles driving in the wrong direction on a highway ramp, traffic control uses an AXIS D2210-VE and an Axis bullet camera. They mount the radar on a pole facing the ramp to detect vehicles driving in the wrong direction. For reliable detections, they set up a line crossing scenario and configure the radar so that vehicles must cross two lines to trigger an alarm. In the scenario, they position the two lines on the ramp as seen in the illustration. They also specify the driving direction and speeds to trigger on. When the radar triggers an alarm, the Axis bullet camera can provide visual identification of the vehicle on the ramp.



Monitor traffic flow at an intersection – queue build-up

To monitor how and when queues build up in a busy intersection, traffic control installs a radar on a gantry above the intersection. They set up a scenario in the radar's web interface and configure it to trigger on vehicles moving in an area. They shape the scenario to only cover the part of the road leading up to the intersection. To trigger an alarm when queues start to build up, they configure the scenario to trigger on vehicles moving at speeds below 5 km/h (3 mph).



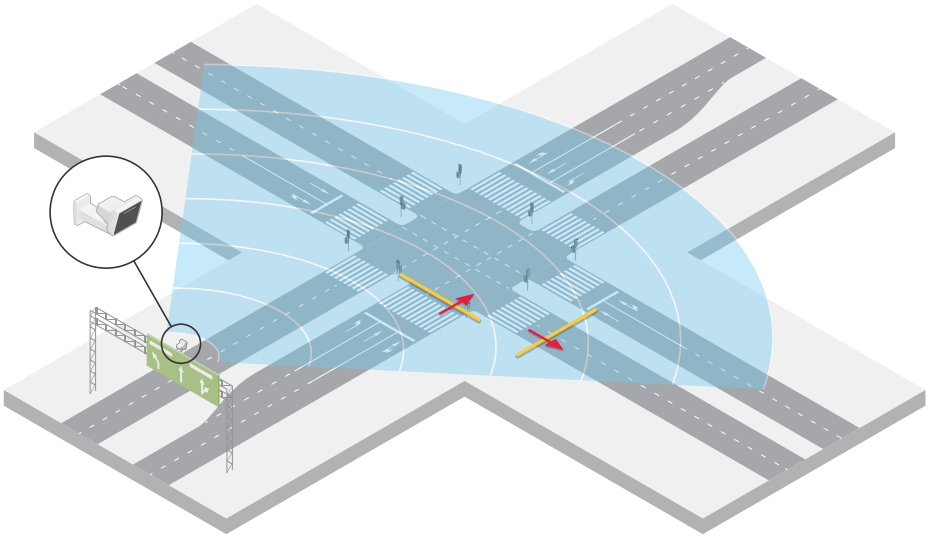
Monitor traffic flow at an intersection – direction

To get an overview of the traffic flow and the direction vehicles travel in a busy intersection, traffic control installs a radar on a gantry above the road leading up to the intersection. They set up a line crossing scenario in the radar's web interface where vehicles must cross two lines to trigger an alarm. When they configure the scenario, they place the first of the two lines over the lanes leading up to the intersection, after the pedestrian crossing to avoid vehicles stopping at the line. They place the second line over the lanes leading to the right. The vehicles must cross both lines in the specified direction to trigger an alarm. To avoid triggering on more than one vehicle per crossing, they lower the minimum trigger duration in the scenario from 2 to 0 seconds.

To monitor the traffic flow in all directions, they create one scenario for each direction.

Note

The scenario doesn't count the vehicles crossing the lines, instead you can use the event system in the radar's web interface to keep count. One way to count vehicles is to send an MQTT message each time the scenario triggers, and count the triggers on the MQTT receiver side.



Get started

Find the device on the network

To find Axis devices on the network and assign them IP addresses in Windows®, use AXIS IP Utility or AXIS Device Manager. Both applications are free and can be downloaded from *axis.com/support*.

For more information about how to find and assign IP addresses, go to *How to assign an IP address and access your device*.

Browser support

You can use the device with the following browsers:

	Chrome™	Edge™	Firefox®	Safari®
Windows®	✓	✓	*	*
macOS®	✓	✓	*	*
Linux®	✓	✓	*	*
Other operating systems	*	*	*	*

✓: Recommended

*: Supported with limitations

Open the device's web interface

1. Open a browser and type the IP address or host name of the Axis device.
   If you don't know the IP address, use AXIS IP Utility or AXIS Device Manager to find the device on the network.
2. Type the username and password. If you access the device for the first time, you must create an administrator account. See *Create an administrator account, on page 15*.

For descriptions of all features and settings in the web interface of devices with AXIS OS, see *AXIS OS web interface help*.

Create an administrator account

The first time you log in to your device, you must create an administrator account.

1. Enter an account.
2. Enter a password. See *Secure passwords, on page 16*.
3. Re-enter the password.
4. Accept the license agreement.
5. Click **Add account**.

Important

The device has no default account. If you lose the password for your administrator account, you must reset the device. See *Reset to factory default settings, on page 42*.

Secure passwords

Important

Use HTTPS (which is enabled by default) to set your password or other sensitive configurations over the network. HTTPS enables secure and encrypted network connections, thereby protecting sensitive data, such as passwords.

The device password is the primary protection for your data and services. Axis devices do not impose a password policy as they may be used in various types of installations.

To protect your data we strongly recommend that you:

- Use a password with at least 8 characters, preferably created by a password generator.
- Don't expose the password.
- Change the password at a recurring interval, at least once a year.

Make sure that no one has tampered with the device software

To make sure that the device has its original AXIS OS, or to take full control of the device after a security attack:

1. Reset to factory default settings. See *Reset to factory default settings, on page 42*.
   After the reset, secure boot guarantees the state of the device.
2. Configure and install the device.

Web interface overview

This video gives you an overview of the device's web interface.



Axis device web interface

Configure your device

Select a radar profile

In the web interface:

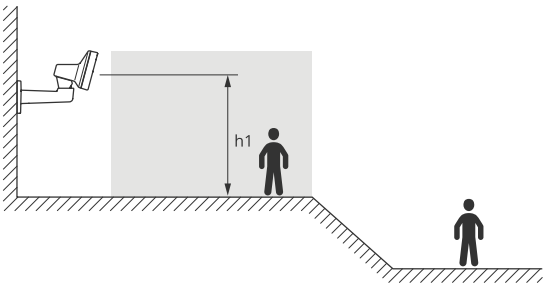
1. Go to **Radar > Settings > Detection**.
2. Select a profile under **Radar profiles**.

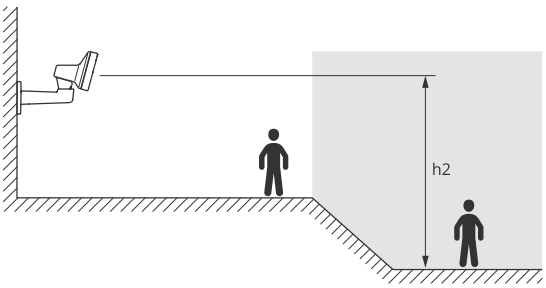
Set the mounting height

The mounting height information helps the radar detect and measure the speed of passing objects correctly.

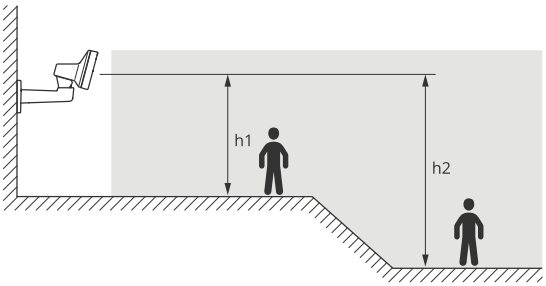
Measure the height from the ground up to the radar as accurately as possible. For scenes with uneven surfaces, set the value that represents the average height in the scene.

Example:
In this example, the mounting height (h1 and h2) is different in different parts of the scene.





If the surface in the area of interest is uneven, add the average height (in this case (h1 + h2) / 2) when you configure the radar.



Set the mounting height:

1. Go to **Radar > Settings > General**.
2. Set the height under **Mounting height**.

Calibrate a reference map

To make it easier to see where detected objects are moving, you can upload a map for reference. You can use a ground plan or an aerial photo that shows the area covered by the radar. Calibrate the map so the radar view

fits the position, direction, and scale of the map, and zoom in on the map if you're interested in a specific part of the scene.

You can either use a setup assistant that takes you through the map calibration step by step, or edit each setting individually.

Use the setup assistant:

1. Go to **Radar > Map calibration**.
2. Click **Setup assistant** and follow the instructions.

To remove the uploaded map and the settings you have added, click **Reset calibration**.

Edit each setting individually:
The map will calibrate gradually after you adjust each setting.

1. Go to **Radar > Map calibration > Map**.
2. Select the image you want to upload, or drag and drop it in the designated area.
   To reuse a map image with its current pan and zoom settings, click **Download map**.
3. Under **Rotate map**, use the slider to rotate the map into position.
4. Go to **Scale and distance on a map** and click on two pre-determined points on the map.
5. Under **Distance**, add the actual distance between the two points you have added to the map.
6. Go to **Pan and zoom map** and use the buttons to pan the map image, or zoom in and out on the map image.

Note

The zoom function doesn't alter the radar's area of coverage. Even if parts of the coverage is out of view after zooming, the radar will still detect moving objects in the entire area of coverage. The only way to exclude detected movement is to add exclude zones. For more information, see *Add exclude zones, on page 20*.

7. Go to **Radar position** and use the buttons to move or rotate the position of the radar on the map.

To remove the uploaded map and the settings you have added, click **Reset calibration**.



The video shows an example of how to calibrate a reference map in an Axis radar or radar-video fusion camera.

Set detection zones

To determine where to detect motion, you can add one or more detection zones. Use different zones to trigger different actions.

There are two types of zones:

- A **scenario** (previously called include zone) is an area in which moving objects will trigger rules. The default scenario matches the entire area covered by the radar.
- An **exclude zone** is an area in which moving objects will be ignored. Use exclude zones if there are areas inside a scenario that trigger a lot of unwanted alarms.

Add scenarios

A scenario is a combination of triggering conditions and detection settings, which you can use to create rules in the event system. Add scenarios if you want to create different rules for different parts of the scene.

Add a scenario:

1. Go to **Radar > Scenarios**.
2. Click **Add scenario**.
3. Type the name of the scenario.
4. Select if you want to trigger on objects moving in an area or on objects crossing one, or two, lines.

Trigger on objects moving in an area:

1. Select **Movement in area**.
2. Click **Next**.
3. Select the type of zone that should be included in the scenario.
   Use the mouse to move and shape the zone so that it covers the desired part of the radar image or reference map.
4. Click **Next**.
5. Add detection settings.

1. Add seconds until trigger after under **Ignore short-lived objects**.
2. Select which object type to trigger on under **Trigger on object type**.
3. Add a range for the speed limit under **Speed limit**.

6. Click **Next**.
7. Set the minimum duration of the alarm under **Minimum trigger duration**.
8. Click **Save**.

Trigger on objects crossing a line:

1. Select **Line crossing**.
2. Click **Next**.
3. Position the line in the scene.
   Use the mouse to move and shape the line.
4. To change the detection direction, turn on **Change direction**.
5. Click **Next**.
6. Add detection settings.
   6.1. Add seconds until trigger after under **Ignore short-lived objects**.
   6.2. Select which object type to trigger on under **Trigger on object type**.
   6.3. Add a range for the speed limit under **Speed limit**.
7. Click **Next**.
8. Set the minimum duration of the alarm under **Minimum trigger duration**.
   The default value is set to 2 seconds. If you want the scenario to trigger every time an object crosses the line, lower the duration to 0 seconds.
9. Click **Save**.

Trigger on objects crossing two lines:

1. Select **Line crossing**.
2. Click **Next**.
3. To make the object cross two lines for the alarm to trigger, turn on **Require crossing of two lines**.
4. Position the lines in the scene.
   Use the mouse to move and shape the line.
5. To change the detection direction, turn on **Change direction**.
6. Click **Next**.
7. Add detection settings.

7.1. Set the time limit between crossing the first and the second line under **Max time between crossings**.

7.2. Select which object type to trigger on under **Trigger on object type**.

7.3. Add a range for the speed limit under **Speed limit**.

8. Click **Next**.
9. Set the minimum duration of the alarm under **Minimum trigger duration**.
   The default value is set to 2 seconds. If you want the scenario to trigger every time an object has crossed the two lines, lower the duration to 0 seconds.
10. Click **Save**.

Add exclude zones

Exclude zones are areas in which moving objects will be ignored. Add exclude zones to ignore, for example, swaying foliage on the side of a road. You could also add exclude zones to ignore ghost tracks caused by radar-reflective materials, for example a metal fence.

Add an exclude zone:

1. Go to **Radar > Exclude zones**.
2. Click **Add exclude zone**.
   Use the mouse to move and shape the zone so that it covers the desired part of the radar view or reference map.

Minimize false alarms

If you notice that you get too many false alarms, you can filter out certain types of movement or objects, change the coverage, or adjust the detection sensitivity. See which settings work best for your environment.

- Adjust the detection sensitivity of the radar:
  Go to **Radar > Settings > Detection** and select a lower **Detection sensitivity**. This decreases the risk of false alarms, but it could also cause the radar to miss some movement.
  The sensitivity setting affects all zones.
  - **Low**: Use this sensitivity when there are a lot of metal objects or large vehicles in the area. It will take longer time for the radar to track and classify objects. This can reduce the detection range, especially for fast moving objects.
  - **Medium**: This is the default setting.
  - **High**: Use this sensitivity when you have an open field without metal objects in front of the radar. This will increase the detection range for humans.
- Modify scenarios and exclude zones:
  If a scenario includes hard surfaces, such as a metal wall, there may be reflections that causes multiple detections for a single physical object. You can either modify the shape of the scenario, or add an exclude zone that ignores certain parts of the scenario. For more information, see *Add scenarios, on page 18* and *Add exclude zones, on page 20*.
- Trigger on objects crossing two lines instead of one:
  If a line crossing scenario includes swaying objects or animals moving around, there is a risk that an object will happen to cross the line and trigger a false alarm. In this case, you can configure the scenario to trigger only when an object has crossed two lines. For more information, see *Add scenarios, on page 18*.
- Filter on movement:
  - Go to **Radar > Settings > Detection** and select **Ignore swaying objects**. This setting minimizes false alarms from trees, bushes, and flagpoles in the coverage zone.
  - Go to **Radar > Settings > Detection** and select **Ignore small objects**. This setting is available in the area monitoring profile and minimizes false alarms from small objects in the coverage zone, such as cats and rabbits.
- Filter on time:

- Go to **Radar > Scenarios**.
- Select a scenario, and click ⋮ to modify its settings.
- Select a higher value under **Seconds until trigger**. This is the delay time from when the radar starts tracking an object until it can trigger and alarm. The timer starts when the radar first detects the object, not when the object enters the specified zone in the scenario.

- Filter on object type:
  - Go to **Radar > Scenarios**.
  - Select a scenario, and click ⋮ to modify its settings.
  - To avoid triggering on specific object types, deselect the object types that should not trigger events in the scenario.

Adjust the radar image

This section includes instructions about configuring the radar image. If you want to learn more about how certain features work, go to *Learn more, on page 34*.

Show an image overlay

You can add an image as an overlay in the radar stream.

1. Go to **Radar > Overlays**.
2. Click **Manage images**.
3. Upload or drag and drop an image.
4. Click **Upload**.
5. Select **Image** from the drop-down list and click + .
6. Select the image and a position. You can also drag the overlay image in the live view to change the position.

Show a text overlay

You can add a text field as an overlay in the radar stream. This is useful for example when you want to display the date, time or a company name in the radar stream.

1. Go to **Radar > Overlays**.
2. Select **Text** and click + .
3. Type the text you want to display, or select modifiers to show for example the current date.
4. Select a position. You can also click-and-drag the overlay in the live view to change the position.

Show a text overlay with the tilt angle of the radar

You can add an overlay in the radar's live view that shows the tilt angle of the radar. This is helpful during installation, or whenever you need to know the tilt angle of the device.

Note

The tilt angle overlay shows "90" when the device is horizontal. If the overlay shows "75", the tilt angle of the radar is 15° below the horizon.

1. Go to **Radar > Overlays**.
2. Select **Text** and click + .

3. Type **#op**.
   You can also click **Modifier** and select **#op** from the list.
4. Select a position. You can also drag the overlay field in the live view to change the position.

View and record video

This section includes instructions about configuring your device. To learn more about how streaming and storage works, go to *Streaming and storage, on page 34*.

Reduce bandwidth and storage

Important

Reducing the bandwidth can result in loss of details in the image.

1. Go to **Radar > Stream**.
2. Click  in the live view.
3. Select **Video format H.264**.
4. Go to **Radar > Stream > General** and increase **Compression**.

Note

Most web browsers don't support H.265 decoding and because of this the device doesn't support it in its web interface. Instead you can use a video management system or application that supports H.265 decoding.

Set up network storage

To store recordings on the network, you need to set up your network storage.

1. Go to **System > Storage**.
2. Click + **Add network storage** under **Network storage**.
3. Type the IP address of the host server.
4. Type the name of the shared location on the host server under **Network share**.
5. Type the username and password.
6. Select the SMB version or leave it on **Auto**.
7. Select **Add share without testing** if you experience temporary connection issues, or if the share is not yet configured.
8. Click **Add**.

Record and watch video

Record video directly from the radar

1. Go to **Radar > Stream**.
2. To start a recording, click .
   If you haven't set up any storage, click  and . For instructions on how to set up network storage, see *Set up network storage, on page 22*
3. To stop recording, click  again.

Watch video

1. Go to **Recordings**.
2. Click  for your recording in the list.

Set up rules for events

You can create rules to make your device perform an action when certain events occur. A rule consists of conditions and actions. The conditions can be used to trigger the actions. For example, the device can start a recording or send an email when it detects motion, or show an overlay text while the device is recording.

To learn more, see *Get started with rules for events*.

Trigger an action

1. Go to **System** > **Events** and click **+ Add a rule**. The rule defines when the device will perform certain actions. You can set up rules as scheduled, recurring, or manually triggered.
2. Enter a **Name**.
3. Select the **Condition** that must be met to trigger the action. If you specify more than one condition for the rule, all of the conditions must be met to trigger the action.
4. Select which **Action** to perform when the conditions are met.

Note

If you change the definition of a stream profile that is used in a rule, you need to restart all the rules that use that stream profile.

Record video from a camera when motion is detected

This example explains how to set up the radar and a camera so that the camera starts recording to the SD card five seconds before the radar detects motion and stops one minute after.

Connect the devices to each other:

1. Connect a wire from an I/O output on the radar to an I/O input on the camera.

Configure the I/O port of the radar:

2. Go to **System > Accessories > I/O ports** and configure the I/O port as an output and select the normal state.

Create a rule in the radar:

3. Go to **System > Events** and add a rule.
4. Type a name for the rule, for example Record video upon motion.
5. In the list of conditions, select a scenario under **Radar motion**.
6. In the list of actions, select **Toggle I/O while the rule is active** and then select the port that is connected to the camera.
7. Click **Save**.

Configure the I/O port of the camera:

8. Go to **System > Accessories > I/O ports** and configure the I/O port as an input and select the normal state.

Create a rule in the camera:

9. Go to **System > Events** and add a rule.
10. Type a name for the rule.
11. In the list of conditions, select **Digital input is active** and then select the port that should trigger the rule.
12. In the list of actions, select **Record video**.
13. In the list of storage options, select **SD card**.
14. Select an existing stream profile or create a new one.
15. Set the prebuffer to 5 seconds.
16. Set the postbuffer to 1 minute.

17. Click **Save**.

Record video from a camera when a vehicle drives in the wrong direction

This example explains how to set up the radar and a camera so that the camera starts recording to an SD card when the radar detects a vehicle that drives in the wrong direction.

Before you start

- Create a scenario in the radar's web interface that triggers on line crossing and vehicles crossing two lines.
  See *Add scenarios, on page 18* for more information.
- Make sure to position the two lines over the traffic lane where you want to detect vehicles driving in the wrong direction. Use a reference map, such as an aerial photo, to make it easier to see where objects are moving.
  See *Calibrate a reference map, on page 17* for more information.

1. Create two recipients in the radar.
   1.1. In the radar's device interface, go to **System > Events > Recipients** and add the first recipient.
   1.2. Add the following information:
   - **Name**: Activate virtual port
   - **Type**: **HTTP**
   - **URL**: http://<IPaddress>/axis-cgi/virtualinput/activate.cgi
     Replace <IPaddress> with the address of the camera you want to start recording.
   - The username and password of the camera.

   1.1. Click **Test** to make sure all data is valid.
   1.2. Click **Save**.
   1.3. Add a second recipient with the following information:
   - **Name**: Deactivate virtual port
   - **Type**: **HTTP**
   - **URL**: http://<IPaddress>/axis-cgi/virtualinput/deactivate.cgi
     Replace <IPaddress> with the address of the camera.
   - The username and password of the camera.

   1.1. Click **Test** to make sure all data is valid.
   1.2. Click **Save**.
2. Create two rules in the radar.
   2.1. In the radar's device interface, go to **System > Events > Rules** and add the first rule.
   2.2. Add the following information:
   - **Name**: Activate virtual IO1
   - **Condition**: Select the scenario you created under **Radar motion**.
   - **Action**: **Notifications > Send notification through HTTP**
   - **Recipient**: **Activate virtual port**
   - **Query string suffix**: schemaversion=1&port=1

   2.1. Click **Save**.
   2.2. Add another rule with the following information:
   - **Name**: Deactivate virtual IO1
   - **Condition**: Select the scenario you created under **Radar motion**.
   - Select **Invert this condition**.

- **Action**: **Notifications > Send notification through HTTP**
- **Recipient**: **Deactivate virtual port**
- **Query string suffix**: schemaversion=1&port=1

2.1. Click **Save**.

3. Create a rule in the camera.
   3.1. In the camera's device interface, go to **System > Events > Rules** and add a rule.
   3.2. Add the following information:
   - **Name**: Trigger on virtual input 1
   - **Condition**: **I/O > Virtual input is active**.
   - **Port**: **1**
   - **Action**: **Recordings > Record video while the rule is active**
   - **Storage options**: **SD_DISK**
   - Select **Camera** and a **Stream profile**.

   3.1. Click **Save**.

Activate a sweeping red light on the radar

You can use the dynamic LED strip on the front of the radar to indicate that the area is monitored.

This example explains how to activate a red sweeping light after working hours on weekdays.

Create a schedule:
1. Go to **System > Events > Schedules** and add a schedule.
2. Type a name for the schedule, for example `Weekday nights`.
3. Under **Type**, select **Schedule**.
4. Under **Recurrence**, select **Daily**.
5. Set the start time to 06:00 PM.
6. Set the end time to 06:00 AM.
7. Under **Days**, select Monday to Friday.
8. Click **Save**.

Create a rule:
1. Go to **System > Events** and add a rule.
2. Type a name for the rule, for example `Red sweeping light`.
3. In the list of conditions, under **Scheduled and recurring**, select **Schedule**.
4. In the list of schedules, select **Weekday nights**.
5. In the list of actions, under **Radar**, select **Dynamic LED strip**.
6. Select the pattern **Sweeping red**.
7. Set the duration to 12 hours.
8. Click **Save**.

Send an email if someone covers the radar with a metallic object

This example explains how to create a rule that sends an email notification when someone tampers with the radar by covering it with a metallic object, such as metallic foil or a metallic sheet.

Add an email recipient:
1. Go to **System > Events > Recipients** and add a recipient.

2. Type a name for the recipient.
3. Under **Type**, select **Email**.
4. Type an email address to send the email to.
5. Fill in the rest of the information according to your email provider.
   The radar device doesn't have its own email server, so it needs to log into an email server to send emails.
6. To send a test email, click **Test**.
7. Click **Save**.

Create a rule:

8. Go to **System > Events** and add a rule.
9. Type a name for the rule, for example `Tampering mail`.
10. From the list of conditions, under **Device status**, select **Radar data failure**.
11. Under **Reason**, select **Tampering**.
12. In the list of actions, under **Notifications**, select **Send notification to email**.
13. Select the recipient you created.
14. Type a subject and a message for the email.
15. Click **Save**.

Turn on a light when motion is detected

Turning on a light when an intruder enters the detection zone can have a deterring effect, and will also improve the image quality of a visual camera recording the intrusion.

This example explains how to set up the radar and an illuminator so that the illuminator turns on when the radar detects motion and turns off after one minute.

Connect the devices:

1. Connect one of the illuminator cables to the power supply via the relay port on the radar. Connect the other cable directly between the power supply and the illuminator.

Configure the relay port of the radar:

2. Go to **System > Accessories > I/O ports** and select **Open circuit** as the normal state of the relay port.

Create a rule in the radar:

3. Go to **System > Events** and add a rule.
4. Type a name for the rule.
5. From the list of conditions, select a scenario under **Radar motion**.
   To set up a scenario, see *Add scenarios, on page 18*.
6. From the list of actions, select **Toggle I/O once** and then select the relay port.
7. Select **Active**.
8. Set the **Duration**.
9. Click **Save**.

Control a PTZ camera with the radar

It's possible to use the information about objects' positions from the radar to make a PTZ camera track objects. There are two ways to do this:

- *Control a PTZ camera with the built-in radar autotracking service, on page 27*. The built-in option is suitable when you have a PTZ camera and radar mounted very close together.
- *Control a PTZ camera with AXIS Radar Autotracking for PTZ, on page 27*. The Windows application is suitable when you want to use multiple PTZ cameras and radars for tracking objects.

Note

- Neither option supports radar-video fusion.
- Use an NTP server to synchronize the time on the cameras, radars and the Windows computer. If the clocks are out of sync, you may experience delays in the tracking, or ghost tracking.

Control a PTZ camera with the built-in radar autotracking service

The built-in radar autotracking creates an edge-to-edge solution where the radar directly controls the PTZ camera. It supports all Axis PTZ cameras.

Note

You can use the built-in radar autotracking service to connect one radar with one PTZ camera. For a setup where you want to use more than one radar or PTZ camera, use AXIS Radar Autotracking for PTZ. For more information, see *Control a PTZ camera with AXIS Radar Autotracking for PTZ, on page 27*.

This instruction explains how to pair the radar with a PTZ camera, how to calibrate the devices, and how to set up the tracking of objects.

Before you start:

- Define the area of interest and avoid unwanted alarms by setting up exclude zones in the radar. Make sure to exclude zones with radar-reflective materials or swaying objects, like foliage, to prevent the PTZ camera from tracking irrelevant objects. For instructions, see *Add exclude zones, on page 20*.

Pair the radar with the PTZ camera:

1. Go to **System > Edge-to-edge > PTZ pairing**.
2. Enter the IP address, username and password for the PTZ camera.
3. Click **Connect**.
4. Click **Configure Radar autotracking** or go to **Radar > Radar PTZ autotracking** to set up radar autotracking.

Calibrate the radar and the PTZ camera:

5. Go to **Radar > Radar PTZ autotracking**.
6. To set the mounting height of the camera, go to **Camera mounting height**.
7. To pan the PTZ camera so that it points in the same direction as the radar, go to **Pan alignment**.
8. If you need to adjust the tilt to compensate for a sloping ground, go to **Ground incline offset** and add an offset in degrees.

Set up the PTZ tracking:

9. Go to **Track** to select if you want to track humans, vehicles and/or unknown objects.
10. To start tracking objects with the PTZ camera, turn on **Tracking**.
    The tracking automatically zooms in on an object, or a group of objects, to keep them in the view of the camera.
11. Turn on **Object switching** if you expect multiple objects that won't fit in the camera view.
    With this setting, the radar gives priority of the objects to track.
12. To determine how many seconds to track each object, set **Object hold time**.
13. To make the PTZ camera return to its home position when the radar no longer tracks any objects, turn on **Return to home**.
14. To determine how long the PTZ camera should stay at the tracked objects last known position before returning to home, set **Return to home timeout**.
15. To fine tune the zoom of the PTZ camera, adjust the zoom on the slider.

Control a PTZ camera with AXIS Radar Autotracking for PTZ

AXIS Radar Autotracking for PTZ is a server-based solution that can handle different setups when tracking objects:

- Control several PTZ cameras with one radar.
- Control one PTZ camera with several radars.
- Control several PTZ cameras with several radars.
- Control one PTZ camera with one radar when they are mounted in different positions covering the same area.

The application is compatible with a specific set of PTZ cameras. For more information, see *axis.com/products/axis-radar-autotracking-for-ptz#compatible-products*.

Download the application and see the user manual for information about how to set up the application. For more information, see *axis.com/products/axis-radar-autotracking-for-ptz/support*.

Use MQTT to send radar data

Use the radar with the application AXIS Speed Monitor to collect radar data for detected objects and send it over MQTT.

This example explains how to set up an MQTT client in the device where you have installed AXIS Speed Monitor, and how to create a condition that will publish the radar data collected in AXIS Speed Monitor as a payload to an MQTT broker.

Before you start:

- Install AXIS Speed Monitor in your radar, or install it in a camera that you connect to your radar. For more information, see *AXIS Speed Monitor user manual*.
- Set up an MQTT broker and get the broker's IP address, username and password. Learn more about MQTT and MQTT brokers in *AXIS OS Knowledge Base*.

Set up the MQTT client in the web interface of the device where you have installed AXIS Speed Monitor:

1. Go to **System > MQTT > MQTT client > Broker** and enter the following information:
   - **Host**: The broker IP address
   - **Client ID**: The ID of the device
   - **Protocol**: The protocol the broker is set to
   - **Port**: The port number used by the broker
   - The broker **Username** and **Password**
2. Click **Save** and **Connect**.

Create a condition that publishes the radar data as a payload to the MQTT broker:

3. Go to **System > MQTT > MQTT publication** and click **+ Add condition**.
4. In the list of conditions, under **Application**, select **Speed Monitor: Track exited zone**.

The device will now be able to send information about the radar tracks for every moving object that exits a scenario. Every object will have its own radar track parameters, for example **rmd_zone_name**, **tracking_id**, and **trigger_count**. You can find the full list of parameters in *AXIS Speed Monitor user manual*.

Connect to a strobe siren

Network pairing allows you to pair a camera with a compatible Axis device with light and siren functionality. Once paired, the camera can configure and maintain both devices.

Pair the camera with a strobe siren:

1. Go to **System > Edge-to-edge > Pairing**.
2. Click + **Add** and select the pairing type **Network pairing** from the drop-down list.
3. Type the IP address, username and password of the strobe siren.
4. Click **Connect**. A confirmation message appears.

To find devices directly on the network, click **Discover devices**.

Note

- The list shows all Axis devices that are found, not only devices that can be paired.
- An info icon is shown for devices that have already been paired. Hover over the icon to get information about pairings that are already active.
- Make sure the paired devices run the same AXIS OS version.

Important

- It's only possible to discover devices where Bonjour is enabled. To enable Bonjour for a device, open its web interface and go to **System > Network > Network discovery protocols**.

Monitor speed

You can visualize the speed of vehicles, and log the radar tracks for statistical processing.

Show vehicle speed in the live view

To show the speed and other data about vehicles:

1. Go to **Radar > Overlays**.
2. In **Add overlay**, select **Speed visualizer (radar data)**.
3. Click **+**.
4. Select a scenario.
5. To choose what data to show, click **Modifiers** and select the data you are interested in.
6. Adjust the text color, size, and placement.

Collect speed statistics

To collect and save speed statistics on the device's SD card:

1. Go to **Radar > Settings > Speed statistics**.
2. Turn on **Collect statistics**.
3. Select a time period to download statistics for.

You can download the data as a comma separated file (.csv). The downloaded file includes all detected moving objects within range, and when those objects entered or exited a particular radar scenario's inclusion zone or virtual line.

Parameters in the file:

- **rmd_zone name**: Name of the scenario.
- **tracking_id**: The object ID in the radar metadata stream. Restarting the radar will reset the counter to 1.
- **trigger_count**: The number of times the scenario has been triggered while there is an active tracked object in the scenario.
- **object_class**: The available object classes are "Human", "Vehicle" and "Unknown". Select the class you would like to count in the scenario.
- **weekday**: The weekday when the **track_id** entered the scenario.
- **date**: The date the **track_id** entered the scenario.
- **time**: The time when the **track_id** entered the scenario in HH:MM:SS.
- **duration**: How long the **track_id** spent inside the scenario. Given in seconds.
- **enter_bearing** and **exit_bearing**: The direction the object was pointing when it first entered and exited the scenario. The bearing is given in degrees, and follows the same convention as radar metadata.
- **enter_direction** and **exit_direction**: A textual description of the movement, such as "departing", "rightwards", "approaching" and "leftwards".

- **min_speed**, **avg_speed**, **max_speed**: The minimum, average and maximum speed, respectively, that the object travelled while inside the scenario. Given in kilometers per hour (km/h) or miles per hour (mph) depending on your regional settings.
- **speed_delta** The difference between the speed the object exited the scenario versus when it entered the scenario. Given in kilometers per hour (km/h) or miles per hour (mph) depending on your regional settings. A positive number means acceleration, and a negative means deceleration.
- **alarm**: Denotes whether the object has travelled at an unacceptable speed while inside the scenario. 0 means acceptable speed and 1 unacceptable speed at one point.

The web interface

To read about all the features and settings available in the web interface of devices with AXIS OS, go to *AXIS OS web interface help*.

Validate your installation

Validate the installation of the radar

Note

This test helps you to validate your installation under current conditions. The everyday performance of your installation can be affected by changes in the scene.

The radar is ready to use as soon as it is installed. However, we recommend that you perform a validation before you start to use it. This can increase the accuracy of the radar by helping you to identify any problems with the installation or manage objects (such as trees and reflective surfaces) in the scene.

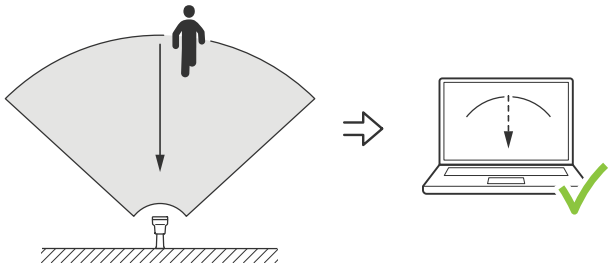
Calibrate the radar before you attempt the validation. Then follow these steps:

Check that there are no false detections

1. Check that the detection zone is clear from human activity.
2. Wait for a few minutes to ensure that the radar is not detecting any static objects in the detection zone.
3. If there are no unwanted detections you can skip step 4.
4. If there are unwanted detections, learn how to filter out certain types of movement or objects, change the coverage, or adjust the detection sensitivity in *Minimize false alarms, on page 20*.

Check for the correct symbol and direction of travel when the radar is approached from the front

1. Go into the radar's web interface and record the session. For help doing this, go to *Record and watch video, on page 22*.
2. Start up to 60 m (196 ft) in front of the radar and walk directly towards the radar.
3. Check the session in the radar's web interface. The symbol for a human classification should appear when you are detected.
4. Check that the radar's web interface shows the correct direction of travel.



Check for the correct symbol and direction of travel when the radar is approached from the side

1. Go into the radar's web interface and record the session. For help doing this, go to *Record and watch video, on page 22*.
2. Start 30 m (98 ft) out from the radar and walk straight across the radar coverage area.
3. Check that the radar's web interface shows the symbol for a human classification.
4. Check that the radar's web interface shows the correct direction of travel.

Create a table similar to the one below to help you record the data from your validation.

Test	Pass/Fail	Comment
1. Check that there are no unwanted detections when the area is clear		
2a. Check that the object is detected with the correct symbol		

for 'Human' when the radar is approached from the front		
2b. Check that the direction of travel is correct when the radar is approached from the front		
3a. Check that the object is detected with the correct symbol for 'Human' when the radar is approached from the side		
3b. Check that the direction of travel is correct when the radar is approached from the side		

Complete the validation

Once you have successfully completed the first part of the validation, perform the following tests to complete the validation process.

1. Make sure you have configured your radar and followed the instructions.
2. For further validation, add and calibrate a reference map.
3. Set the radar scenario to trigger when an appropriate object is detected. By default, **seconds until trigger** is set to two seconds but you can change this in the web interface if needed.
4. Set the radar to record data when an appropriate object is detected.
   See *Record and watch video, on page 22* for instructions.
5. Set the **trail lifetime** to one hour so that it will safely exceed the time it takes for you to leave your seat, walk around the area of surveillance, and return to your seat. The **trail lifetime** will keep the track in the radar's live view for the set time and, once you have finished the validation, it can be disabled.
6. Walk along the border of the radar coverage area and make sure that the trailing on the system matches the route that you walked.
7. If you are unsatisfied with the results of your validation, re-calibrate the reference map and repeat the validation.

Learn more

Streaming and storage

Video compression formats

Decide which compression method to use based on your viewing requirements, and on the properties of your network. The available options are:

Motion JPEG

Motion JPEG, or MJPEG, is a digital video sequence that is made up of a series of individual JPEG images. These images are then displayed and updated at a rate sufficient to create a stream that shows constantly updated motion. For the viewer to perceive motion video the rate must be at least 16 image frames per second. Full motion video is perceived at 30 (NTSC) or 25 (PAL) frames per second.

The Motion JPEG stream uses considerable amounts of bandwidth, but provides excellent image quality and access to every image contained in the stream.

H.264 or MPEG-4 Part 10/AVC

Note

H.264 is a licensed technology. The Axis product includes one H.264 viewing client license. To install additional unlicensed copies of the client is prohibited. To purchase additional licenses, contact your Axis reseller.

H.264 can, without compromising image quality, reduce the size of a digital video file by more than 80% compared to the Motion JPEG format and by as much as 50% compared to older MPEG formats. This means that less network bandwidth and storage space are required for a video file. Or seen another way, higher video quality can be achieved for a given bitrate.

H.265 or MPEG-H Part 2/HEVC

H.265 can, without compromising image quality, reduce the size of a digital video file by more than 25% compared to H.264.

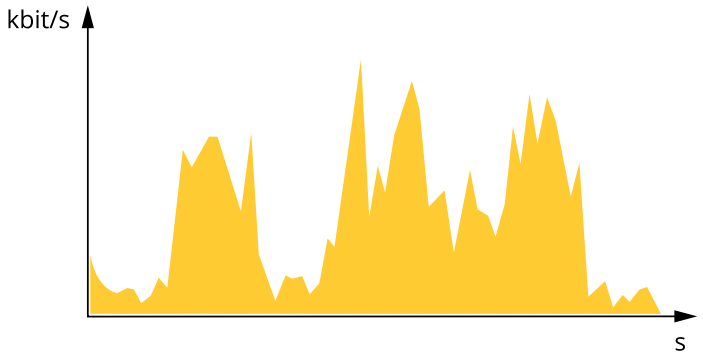
Note

- H.265 is licensed technology. The Axis product includes one H.265 viewing client license. Installing additional unlicensed copies of the client is prohibited. To purchase additional licenses, contact your Axis reseller.
- Most web browsers don't support H.265 decoding and because of this the camera doesn't support it in its web interface. Instead you can use a video management system or application supporting H.265 decoding.

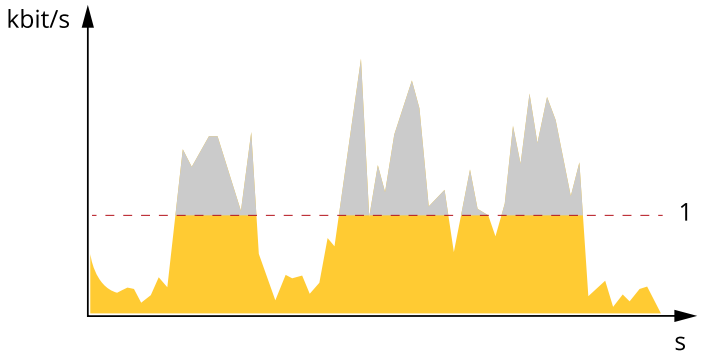
Bitrate control

Bitrate control helps you to manage the bandwidth consumption of your video stream.

Variable bitrate (VBR)
Variable bitrate allows the bandwidth consumption to vary depending on the level of activity in the scene. The more activity, the more bandwidth you need. With variable bitrate you are guaranteed constant image quality, but you need to make sure you have storage margins.



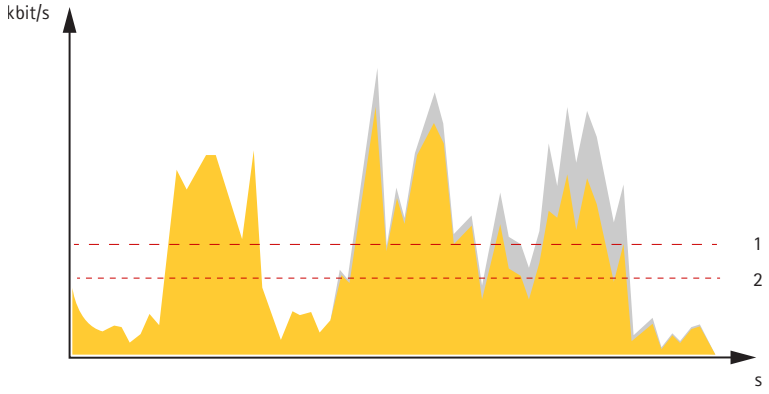
Maximum bitrate (MBR)
Maximum bitrate lets you set a target bitrate to handle bitrate limitations in your system. You might see a decline in image quality or frame rate as the instantaneous bitrate is kept below the specified target bitrate. You can choose to prioritize either image quality or frame rate. We recommend that you configure the target bitrate to a higher value than the expected bitrate. This gives you a margin in case there is a high level of activity in the scene.



1 Target bitrate

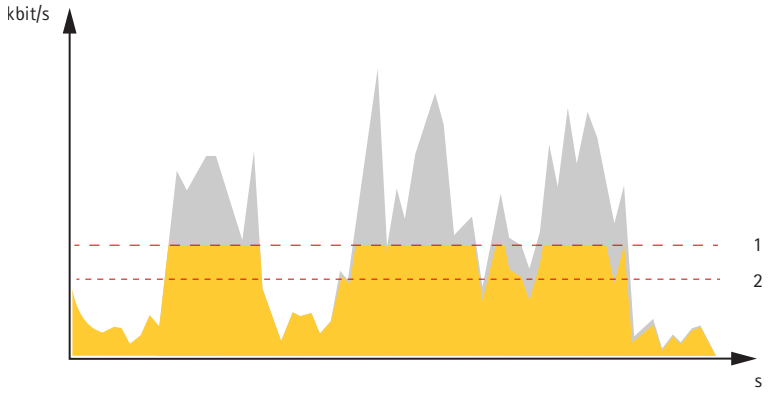
Average bitrate (ABR)
With average bitrate, the bitrate is automatically adjusted over a longer period of time. This is so you can meet the specified target and provide the best video quality based on your available storage. Bitrate is higher in scenes with a lot of activity, compared to static scenes. You are more likely to get better image quality when in scenes with a lot of activity if you use the average bitrate option. You can define the total storage required to store the video stream for a specified amount of time (retention time) when image quality is adjusted to meet the specified target bitrate. Specify the average bitrate settings in one of the following ways:

- To calculate the estimated storage need, set the target bitrate and the retention time.
- To calculate the average bitrate, based on available storage and required retention time, use the target bitrate calculator.



1 Target bitrate
2 Actual average bitrate

You can also turn on maximum bitrate and specify a target bitrate within the average bitrate option.



1 *Target bitrate*
2 *Actual average bitrate*

Overlays

Overlays are superimposed over the video stream. They are used to provide extra information during recordings, such as a timestamp, or during product installation and configuration. You can add either text or an image.

Edge-to-edge technology

Edge-to-edge is a technology that makes IP devices communicate directly with each other. It offers smart pairing functionality between, for example, Axis cameras and Axis audio or radar products.

Note

Make sure the paired devices run the same AXIS OS version.

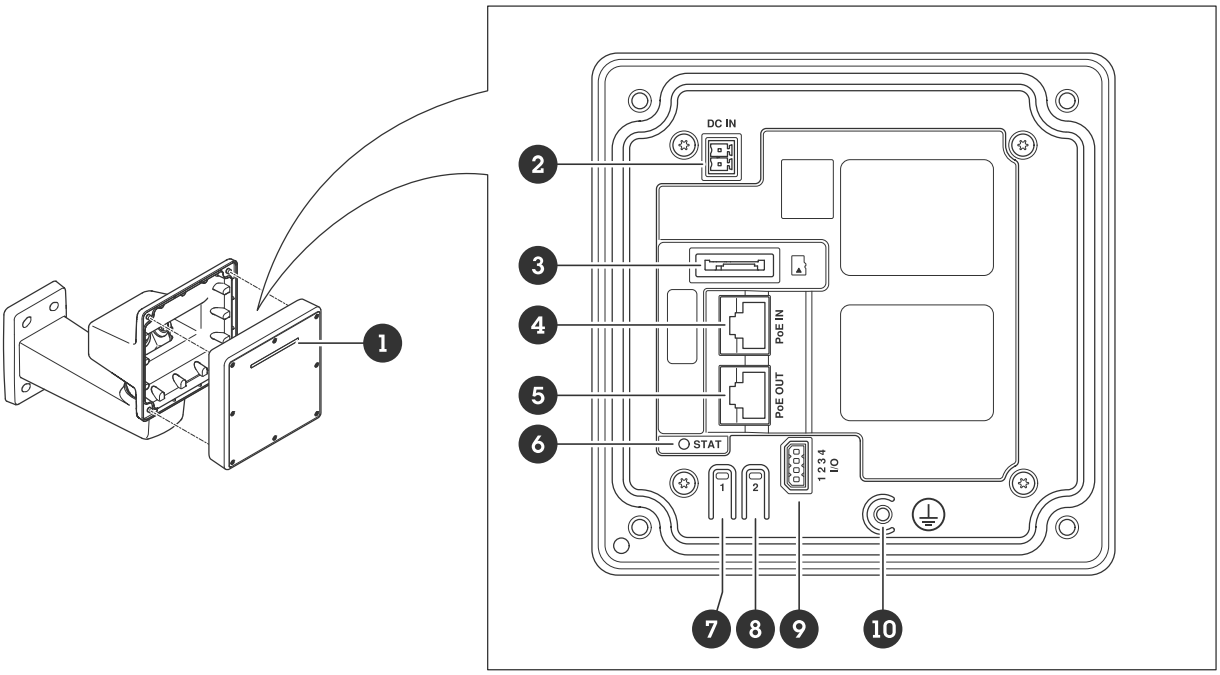
For more information, see the white paper "Edge-to-edge technology" at *whitepapers.axis.com/edge-to-edge-technology*.

Network pairing

With edge-to-edge network pairing, you can connect your camera to a compatible Axis device with light and siren or illuminator light functionality and benefit from its integrated features.

Specifications

Product overview



1 *Dynamic LED strip*
2 *Power connector (DC)*
3 *microSD card slot*
4 *Network connector (PoE in)*
5 *Network connector (PoE out)*
6 *LED status indicator*
7 *Control button*
8 *Action button*
9 *I/O connector*
10 *Grounding screw*

LED indicators

Note

- The Status LED can be configured to flash while an event is active.

Status LED	Indication
Green	Steady green for normal operation.
Amber	Steady during startup. Flashes during device software upgrade or reset to factory default.
Red	Device software upgrade failure.

Dynamic LED strip patterns
Red
Green
Blue
Yellow

White
Flashing red, blue, white
Pulsating red
Pulsating green
Pulsating blue
Sweeping red
Sweeping green
Sweeping blue

SD card slot

This device supports microSD/microSDHC/microSDXC cards.

For SD card recommendations, see *axis.com*.

microSD, microSDHC, and microSDXC Logos are trademarks of SD-3C LLC. microSD, microSDHC, microSDXC are trademarks or registered trademarks of SD-3C, LLC in the United States, other countries or both.

Buttons

Control button

The control button is used for:

- Resetting the product to factory default settings. See *Reset to factory default settings, on page 42*.
- Connecting to a one-click cloud connection (O3C) service over the internet. To connect, press and release the button, then wait for the status LED to flash green three times.

Connectors

Network connector (PoE in)

RJ45 Ethernet connector with Power over Ethernet IEEE 802.3bt, Type 3 Class 6.

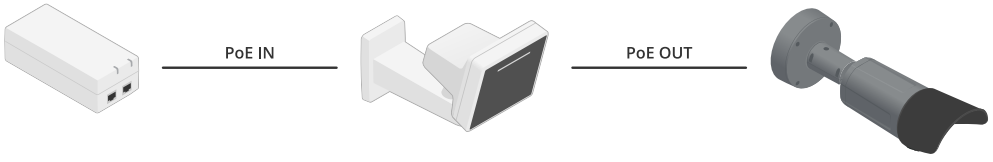
Note

Power over Ethernet IEEE 802.3bt, Type 3 Class 6, is required for PoE out. When not powering a second device, Power over Ethernet IEEE 802.3at, Type 2 Class 4, is sufficient.

Network connector (PoE out)

RJ45 Ethernet connector supplying Power over Ethernet IEEE 802.3at, Type 2 Class 4, max 30 W.

Use this connector to supply power to another PoE device, for example a camera, a horn speaker, or a second Axis radar.



Note

The PoE output is enabled when the radar is powered by a 60 W midspan (Power over Ethernet IEEE 802.3bt, type 3).

Note

If the radar is powered by a 30 W midspan or DC power, the PoE out is disabled.

Note

Maximum Ethernet cable length is 100 m in total for PoE out and PoE in combined. You can increase it with a PoE extender.

Note

If the connected PoE device requires more than 30 W, you can add a 60 W midspan between the PoE out port on the radar and the device. The midspan will power the device while the radar will provide the Ethernet connection.

I/O connector

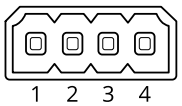
Use the I/O connector with external devices in combination with, for example, event triggering and alarm notifications. In addition to the 0 VDC reference point and power (DC output), the I/O connector provides the interface to:

Digital input – For connecting devices that can toggle between an open and closed circuit, for example PIR sensors, door/window contacts, and glass break detectors.

Supervised input – Enables possibility to detect tampering on a digital input.

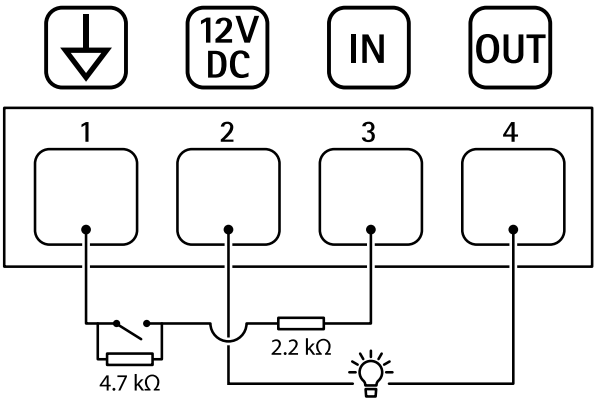
Digital output – For connecting external devices such as relays and LEDs. Connected devices can be activated by the VAPIX® Application Programming Interface, through an event or from the device's web interface.

4-pin terminal block



Function	Pin	Notes	Specifications
DC ground	1		0 VDC
DC output	2	⚠ Can be used to power auxiliary equipment. Note: This pin can only be used as power out.	12 VDC Max load = 25 mA
Digital Input	3	Connect to pin 1 to activate, or leave floating (unconnected) to deactivate.	0 to max 30 VDC
Digital Output	4	Internally connected to pin 1 (DC ground) when active, and floating (unconnected) when inactive. If used with an inductive load, e.g., a relay, connect a diode in parallel with the load, to protect against voltage transients.	0 to max 30 VDC, open drain, 100 mA

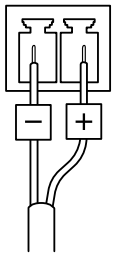
Example:



1 *DC ground*
2 *DC output 12 V, max 25 mA*
3 *Supervised input*
4 *Digital output*

Power connector

2-pin terminal block for DC power input. Use a Safety Extra Low Voltage (SELV) compliant limited power source (LPS) with either a rated output power limited to ≤100 W or a rated output current limited to ≤5 A.



Clean your device

You can clean your device with lukewarm water.

NOTICE

- Harsh chemicals can damage the device. Don't use chemicals such as window cleaner or acetone to clean your device.
- Avoid cleaning in direct sunlight or elevated temperatures, since this can cause stains.

1. Use a can of compressed air to remove dust and loose dirt from the device.
2. If necessary, clean the device with a soft microfiber cloth dampened with lukewarm water.
3. To avoid stains, dry the device with a clean, nonabrasive cloth.

For more information about cleaning of Axis devices, see the white paper *Chemical resistance to common cleaning agents*.

Troubleshooting

Reset to factory default settings

Important

Reset to factory default should be used with caution. A reset to factory default resets all settings, including the IP address, to the factory default values.

To reset the product to the factory default settings:

1. Disconnect power from the product.
2. Press and hold the control button while reconnecting power. See *Product overview, on page 37*.
3. Keep the control button pressed for 15–30 seconds until the status LED indicator flashes amber.
4. Release the control button. The process is complete when the status LED indicator turns green. If no DHCP server is available on the network, the device IP address will default to one of the following:
   - **Devices with AXIS OS 12.0 and later:** Obtained from the link-local address subnet (169.254.0.0/16)
   - **Devices with AXIS OS 11.11 and earlier:** 192.168.0.90/24
5. Use the installation and management software tools to assign an IP address, set the password, and access the device.
   The installation and management software tools are available from the support pages on *axis.com/support*.

You can also reset parameters to factory default through the device's web interface. Go to **Maintenance** > **Factory default** and click **Default**.

Check the current AXIS OS version

AXIS OS determines the functionality of our devices. When you troubleshoot a problem, we recommend that you to start by checking the current AXIS OS version. The latest version might contain a correction that fixes your particular problem.

To check the current AXIS OS version:

1. Go to the device's web interface > **Status**.
2. Under **Device info**, see the AXIS OS version.

Upgrade AXIS OS

Important

- When you upgrade the device software, your preconfigured and customized settings are saved. Axis Communications AB can't guarantee that the settings are saved, even if the features are available in the new AXIS OS version.
- Starting from AXIS OS 12.6, you must install every LTS version between your device's current version and the target version. For example, if the currently installed device software version is AXIS OS 11.2, you have to install the LTS version AXIS OS 11.11 before you can upgrade the device to AXIS OS 12.6. For more information, see *AXIS OS Lifecycle guide: Upgrade path*.
- Make sure the device remains connected to the power source throughout the upgrade process.

Note

- When you upgrade the device with the latest AXIS OS version in the active track, the product receives the latest functionality available. Always read the upgrade instructions and release notes available with each new release before you upgrade. To find the latest AXIS OS version and the release notes, go to *axis.com/support/device-software*.

1. Download the AXIS OS file to your computer, available free of charge at *axis.com/support/device-software*.

2. Log in to the device as an administrator.
3. Go to **Maintenance > AXIS OS upgrade** and click **Upgrade**.

When the upgrade has finished, the product restarts automatically.

Technical problems and possible solutions

Problems upgrading AXIS OS

AXIS OS upgrade failed

If the upgrade fails, the device reloads the previous version. The most common reason is that the wrong AXIS OS file has been uploaded. Check that the name of the AXIS OS file corresponds to your device and try again.

Problems after AXIS OS upgrade

If you experience problems after the upgrade, roll back to the previously installed version from the **Maintenance** page.

Problems setting the IP address

Can't set the IP address

- If the IP address intended for the device and the IP address of the computer used to access the device are located on different subnets, you can't set the IP address. Contact your network administrator to obtain an IP address.
- The IP address could be in use by another device. To check:
  1. Disconnect the Axis device from the network.
  2. In a Command/DOS window, type `ping` and the IP address of the device.
  3. If you receive: `Reply from <IP address>: bytes=32; time=10...` this means that the IP address might already be in use by another device on the network. Obtain a new IP address from the network administrator and reinstall the device.
  4. If you receive: `Request timed out`, this means that the IP address is available for use with the Axis device. Check all cabling and reinstall the device.
- There could be a possible IP address conflict with another device on the same subnet. The static IP address in the Axis device is used before the DHCP server sets a dynamic address. This means that if the same default static IP address is also used by another device, there could be problems accessing the device.

Problems accessing the device

Can't log in when accessing the device from a browser

When HTTPS is enabled, make sure that you use the correct protocol (HTTP or HTTPS) when you try to log in. You might need to manually type `http` or `https` in the browser's address field.

If you've lost the password for the root account, you must reset the device to the factory default settings. For instructions, see *Reset to factory default settings, on page 42*.

The IP address has been changed by DHCP

IP addresses obtained from a DHCP server are dynamic and could change. If the IP address has been changed, use AXIS IP Utility or AXIS Device Manager to locate the device on the network. Identify the device using its model or serial number, or by the DNS name (if the name has been configured).

If required, you can assign a static IP address manually. For instructions, go to *axis.com/support*.

Certificate error when using IEEE 802.1X

For authentication to work properly, the date and time settings in the Axis device must be synchronized with an NTP server. Go to **System > Date and time**.

The browser isn't supported

For a list of recommended browsers, see *Browser support, on page 15*.

Can't access the device externally

To access the device externally, we recommend you to use one of the following applications for Windows®:

- AXIS Camera Station Edge: free of charge, ideal for small systems with basic surveillance needs.
- AXIS Camera Station Pro: 90-day trial version free of charge, ideal for small to mid-size systems.

For instructions and download, go to *axis.com/vms*.

Problems with MQTT

Can't connect over port 8883 with MQTT over SSL

The firewall blocks traffic that uses port 8883 since it's regarded insecure.

In some cases the server/broker might not provide a specific port for MQTT communication. It might still be possible to use MQTT over a port normally used for HTTP/HTTPS traffic.

- If the server/broker supports WebSocket/WebSocket Secure (WS/WSS), typically on port 443, use this protocol instead. Check with the server/broker provider to see if WS/WSS is supported and which port and basepath to use.
- If the server/broker supports ALPN, the use of MQTT can be negotiated over an open port, such as 443. Check with your server/broker provider to see if ALPN is supported and which ALPN protocol and port to use.

If you can't find what you're looking for here, try the troubleshooting section at *axis.com/support*.

Performance considerations

When you set up your system, it's important to consider how different settings and situations affect the required bandwidth (bitrate).

The most important factors to consider:

- Heavy network utilization due to poor infrastructure affects the bandwidth.

Contact support

If you need more help, go to *axis.com/support*.

Cybersecurity

Cybersecurity supports a successful product lifecycle with minimized risks. You can find in-depth information and documentation about our cybersecurity approach at *axis.com/about-axis/cybersecurity*. Follow the cybersecurity guidelines below to receive product security notifications from Axis and to configure your product for a secure lifecycle and decommissioning.

At *Axis Trust Center*, you can find information about how Axis implements security compliance, transparency, data protection, and privacy.

Vulnerability management

Axis is a *Common Vulnerability and Exposures (CVE) Numbering Authority (CNA)*. To minimize your risk of exposure, we follow industry standards when identifying and resolving vulnerabilities in our devices, software, and services. Refer to *axis.com/vulnerability-management* for information about our vulnerability management policy or to report a vulnerability.

Security notifications

Subscribe to Axis security notification emails at *axis.com/security-notification-service*. We will send you information about vulnerabilities, corresponding security advisories, and other security-related matters for your Axis product.

Secure product lifecycle

Axis minimizes risks throughout the lifetime of our products through secure lifecycle management. Use our hardening guides at *help.axis.com* to more securely configure and operate your Axis products and to find information about:

Secure first-use – Axis products are pre-configured with high default protection to allow for secure initialization and encrypted communication from the very start.

Intended use and common configuration mistakes – Our guides provide information about the intended usage of Axis products, including common security-relevant misuse and configuration mistakes that should be avoided.

Managing vulnerabilities and supply chain transparency – A Software Bill of Material (SBOM) is published with every software release on *axis.com* to disclose vulnerabilities and improve supply chain transparency.

Decommissioning and the secure erasure of data – To securely decommission a product when it reaches the end of its lifecycle, reset it to factory default settings. This erases your configurations, stored data, and sensitive information.

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