CityRadar Guide

How to set up a TagMaster CityRadar

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https://tagitalia.com/ | info@tagitalia.com | +39 0574 81 64 34

Nr: 1122-222

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About this guide

This guide gives advice and best practice about how to set up and use the TagMaster CityRadar, ensuring maximum performance and satisfaction.

The CityRadar is designed and optimised for counting bicycles and pedestrians on dedicated or mixed paths. The unit is optimal for all Active Travel applications without the need for in-ground sensors, making it quick and easy to install for both temporary and permanent installations.

Please note that CityRadar performance vary depending on the mounting, set up and power consumption. For more information than this guide covers, please consult the product manual.

How a CityRadar works

The CityRadar contains a radio transmitter and receiver combined into one unit. The unit emits a low power radio wave and listens for any echo. If there is a cyclist or pedestrian in the path of the radio wave, a part of the radio wave will bounce back. Depending on how long it takes for the signal to return, the radar calculates how far away the object is and in what direction it travels. Based on the profile of the echo, the radar also calculates what type of object that passes in front of it.

Reach and reflectivity

The strength of the radio wave diminishes with the distance. The further the signal must travel, the less energy it'll have when it gets there. The radio wave also must have enough strength to bounce back to the CityRadar, if not, the cyclist or pedestrian is out of range.

Detection Modes

The CityRadar is configured for three types of traffic situations: Dedicated bicycle paths, Dedicated pedestrian paths or a Mixed bicycle and pedestrian paths. It is not recommended to use the CityRadar in a mixed zone, where bicycles and other vehicles are travelling on the same road or very close to each other. Furthermore, The CityRadar is not designed for mixed bicycle and road traffic applications. For traffic monitoring we recommend the TagMaster TrafficRadar.

Range Finding

With its Range Finding abilities the CityRadar is able to track the actual position of all targets and enables true lane detection. For example, bicycles typically travel in both directions on a bicycle path, so being able to determine the flow in each direction is critical to understanding the use of bicycle paths. The City Radar's Range Finding ability sets it apart from all similar radar detection products in today's market.

Power and battery

Power saving

The CityRadar has built in power saving functionality that extends the operating time:

1. Radar sensor On/Off. As pedestrians and cyclists are not normally out late at night, the radar operator can choose to power down the sensor for a period of time to extend the overall survey period. For example, turn of the sensor between 00.00 and 05.00.
2. 4G On/Off. The modem can be disabled during periods of the day to reduce the power consumption. The modem can also be set to transmit data periodically. For example, be set to send information once an hour.

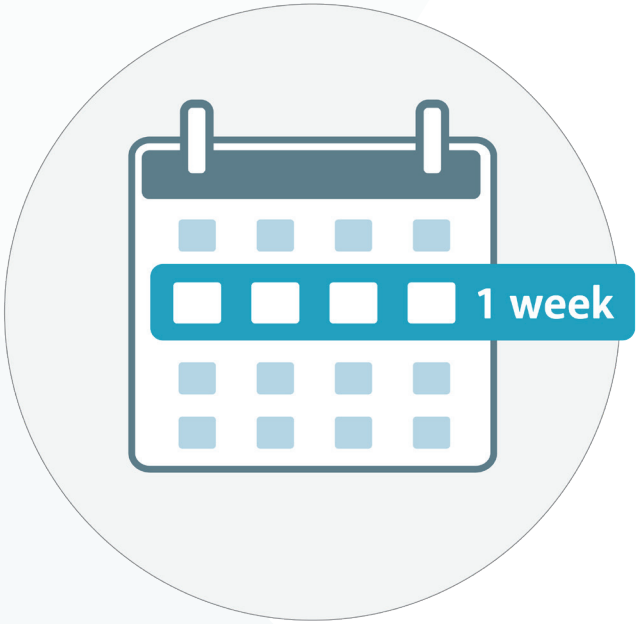
Battery

The unit can be operated on mains (24V DC supply), battery, PoE or solar power. It is recommended to always include a battery in the configuration, even if it isn't going to be the primary power source. All power sources charge the internal battery.

In case of short-term power failure, the battery will take over and will allow the unit to continue to operate until power is returned. If the power failure is long term, the unit will detect that the battery power is failing and perform a controlled shut down.

Important: Always make sure to use a battery in good condition and that the battery is fully charged before mounting the radar unit. Batteries lose capacity over time and number of recharges. A typical battery life is about 3 years.
The City Radar's operating time depend on several factors, such as pedestrian volume, type of battery, communications, nominal and actual battery capacity, age and temperature. The total operating time can increase, as mentioned above, by turning off the radar head at night.

Energy consumption and Operating time



Below you will find a typical use case that outlines the expected operating time:

- Survey type: Temporary Survey with local data recording
- A typical path with approximately 1,000 cycles / pedestrians a day, Bluetooth enabled, and the modem turned off.
- Battery: 12v, 18Ah lead-acid.
- Energy consumption: 70 mAh
- Effective battery capacity: 75%
- 18Ah / 0.07A * 0.75 = 193h

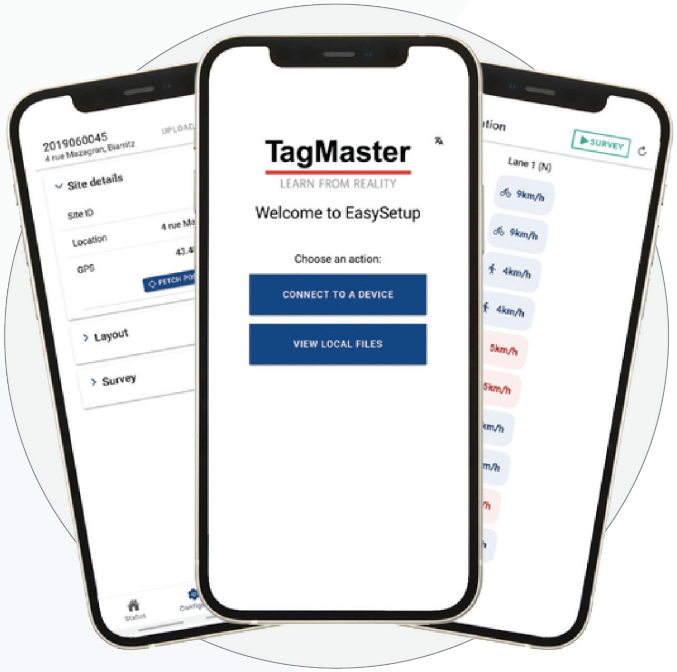
⟶ Operating time is approximately 8 days

When doing surveys with real time server data upload over 3G/4G with a battery as the only power source, set the data reporting interval to once every 15 minutes. Real time/continuous data upload risk decreasing the survey length by several days.

Note: The expected operating time above are based on TagMaster's tests under normal conditions and user experience. TagMaster cannot guarantee any specific operating time. Contact TagMaster for more information and/or advice.

Please, also note that some 4G sim-cards can increase power consumption, as they communicate more frequently with the network, which will affect survey time. TagMaster recommends testing before implementing on a large scale.

Easy Set Up App



Configuration made easy

The CityRadar is configured with the EasySetup App. The App makes it easy to set up your survey hardware from your Android Smartphone or mobile device using Bluetooth.

With the EasySetup App you can configure the site layout. You can set the above ground height, traffic direction, number of monitored lanes as well as entering additional information about the specific survey and setup the server communications. The App also allows for retrieval of data files when local surveys are being performed. Basically, you can fully configure the unit for the desired operation.

Survey validation on site

Once the survey configuration is defined and uploaded to the radar, it is **strongly recommended** to validate the settings and make sure the radar is collecting data according to your specifications. The App will in real time display detected pedestrians and bicycles for visual validation on your device before activating the survey.

Free of charge

The EasySetup App is free of charge for all TagMaster's customers, and the App is available for download on Google Play Store. Search for "TagMaster EasySetup".

Come prepared

It is good practice to download the app, make sure it is installed properly and enter as much information about the survey as possible before going out to the site. Don't forget to bring a bracket, banding straps of various diameters and the right tools.

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Data and Survey

Data collection

The primary purpose of CityRadar is to collect traffic data. The CityRadar is purpose built for directional and simultaneous counting of bicycles and pedestrians.

The CityRadar is designed without traditional low speed cut-out filters to be able to very accurately handle both dedicated and mixed paths with cycles and pedestrians.

The detection of cycles and pedestrians can even be done with a backdrop of normal road traffic. The CityRadar's ability to count groups of cyclists and carbon fibre bikes is superior to other known sensor technologies thanks to its advanced radar sensor and sophisticated discrimination algorithms.

The CityRadar creates three data classes, Pedestrian, Bicycle and Other. "Other" is normally objects that can't be classified in the two previous categories, such as road traffic vehicles.

Three scenarios

The CityRadar is developed and optimised for three monitoring scenarios:

- Dedicated Cycle Path. In this mode the Radar assumes that targets are more likely to be cycles than pedestrians, so unless it is a strong pedestrian profile, it will be seen as a bicycle.
- Dedicated Pedestrian Path. In this mode the radar assumes that targets are more likely to be pedestrians rather than cyclist, so unless it is a strong bicycle profile, it will be seen as a pedestrian.
- Mixed Cycle and Pedestrian Path. In this mode there is no bias, the target type is based on what the Radar thinks is most likely.

Data and Survey

Survey Selection

The CityRadar has two operation modes: Real-time data collection and Historical data collection:

1. Real-time counting / Server upload with EasyData

   The Real-time data collection is a common application for this product, as it is designed for permanent sites with communications back to a central server over 3G/4G or Ethernet. In this mode data is collected for periods (typically 5 minutes) and automatically sent to a central server. In real-time mode it is possible to select the reporting period as 1, 5,10, 15, 30 and 60 minutes intervals. Real-time counting is labelled “Server Upload” in the EasySetup App. Server upload requires a third party, compatible server application.

   TagMaster has developed a special software, EasyData, a free of charge and purpose built middleware to integrate the collected data to 3rd party solutions and systems.

2. Historical counting /Local Recording and EasyAnalysis

   The historical data collection mode is typically used for temporary surveys with manual data collection. The survey data files are easily retrieved via Bluetooth by using the EasySetup App.

   Each retrieved data file contains information about the site, such as site and device ID, location, and GPS position. For later reference, it is possible to click on the GPS coordinates and Google Maps will very accurately pinpoint the position of the survey and show the street view. Historical counting is labelled “Local Recording” in the EasySetup App. It is recommended to log all data using the highest resolution for maximum flexibility when analysing the data.

EasyAnalysis

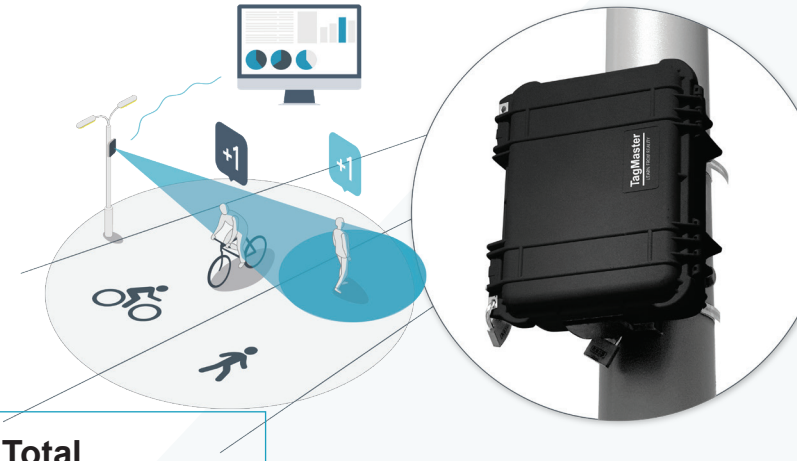
The retrieved data can easily be converted to an Excel report by using the free of charge, TagMaster web service, EasyAnalysis. The service is purpose built for TagMaster products and will automatically generate a report for any selectable period. The web service has a number of built-in options and settings with embedded tables and graphs. ea.tagmaster.com

Survey Data Example

High Granularity Data Insights

The CityRadar can provide a number of high granularity data insights such as:

- Hourly number of observations, by direction and type
- Classification – pedestrian and bicycle
- Speed
- Lane number
- Direction
- Gap & Headway
- Time stamp



	Lane 1 - West			Lane 1 - East			Total		
	🚶	🚲	Total	🚶	🚲	Total	🚶	🚲	Total
Wednesday 03/02	91	24	115	65	17	82	156	41	197
Thursday 04/02	138	46	184	91	42	133	229	88	317
Friday 05/02	143	58	201	101	52	153	244	110	354
Saturday 06/02	153	32	185	95	30	125	248	62	310
Sunday 07/02	252	24	276	173	20	193	425	44	469
Monday 08/02	102	22	124	67	19	86	169	41	210
Tuesday 09/02	0	0	0	0	0	0	0	0	0
Total	**879**	**206**	**1085**	**592**	**180**	**772**	**1471**	**386**	**1857**
Mean Daily Flow	152,5	35,7	188,3	102,7	31,2	134,0	255,3	67,0	322,3
Average speed (mph)	4,0	11,4	5,4	4,3	11,0	5,8	4,1	11,2	5,6

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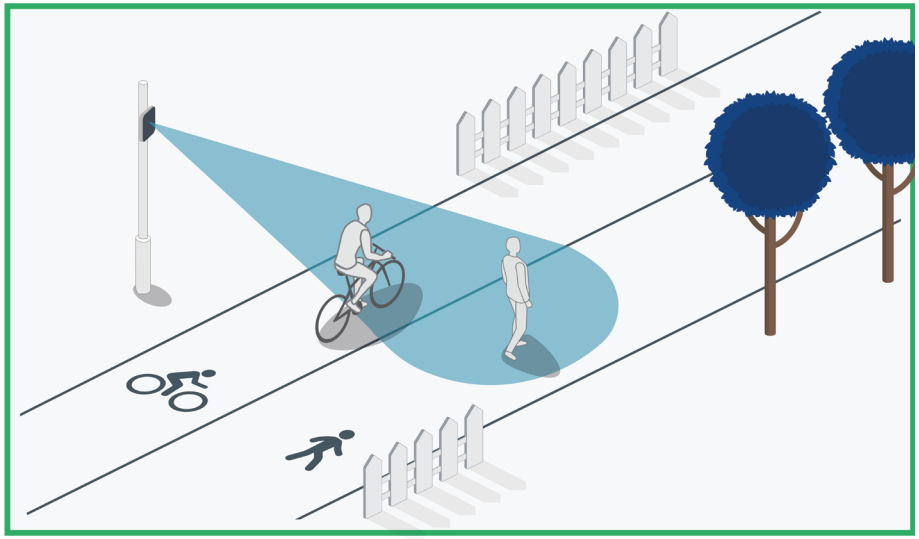
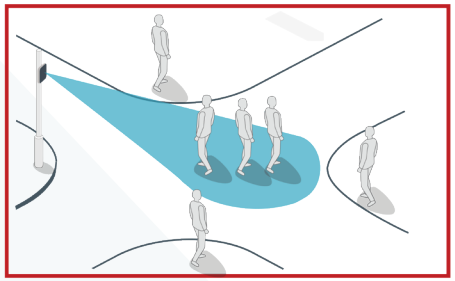
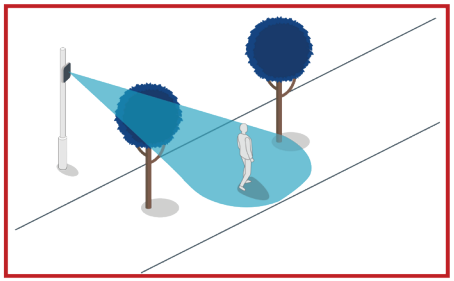
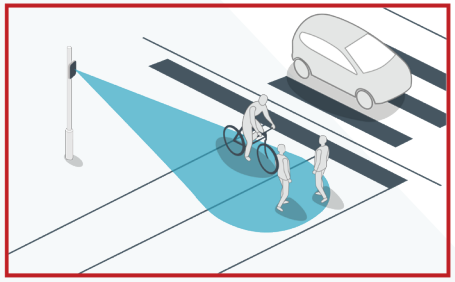
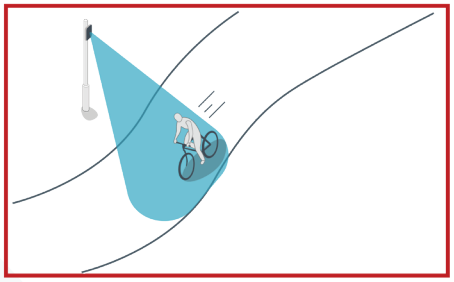
How to find the best location











Ideal location

At any given location, there may be sources of interference that can affect the CityRadars' sensitivity which in turn affects the performance.

The ideal position for the radar is beside a flat, straight walkway or bicycle path as the radar algorithm assumes that the bicycles and pedestrians travel in parallel to the radar. Consideration should also be taken to what other objects and movements the radar has in its "view".

The CityRadar copes with vehicles in the background without affecting the performance of the cycle and pedestrian monitoring. The monitored paths need to be away from live traffic, at least a 1m gap, to ensure passing vehicles don't affect the survey. Vehicles entering the detection zone may be counted as multiple bicycles.

Unwanted locations

First and foremost, anything that moves slowly will trigger the Radar unit. Therefore, avoid locations where trees or bushes keep the radar "awake", meaning that the Radar detects the movement and process data, which in turn when running on battery power, will affect power consumption and decrease the operational time.

Avoid junctions and places where bikes may turn, or pedestrians may drift away from the path. Don't locate the radar where bikes or pedestrians stop, for example at a traffic light before crossing a road. Furthermore, avoid hills where bike speed increase or decrease. And finally, there should be no obstacles between the radar and the pedestrians or bikes. Alway remember to do a live validation before starting the survey.

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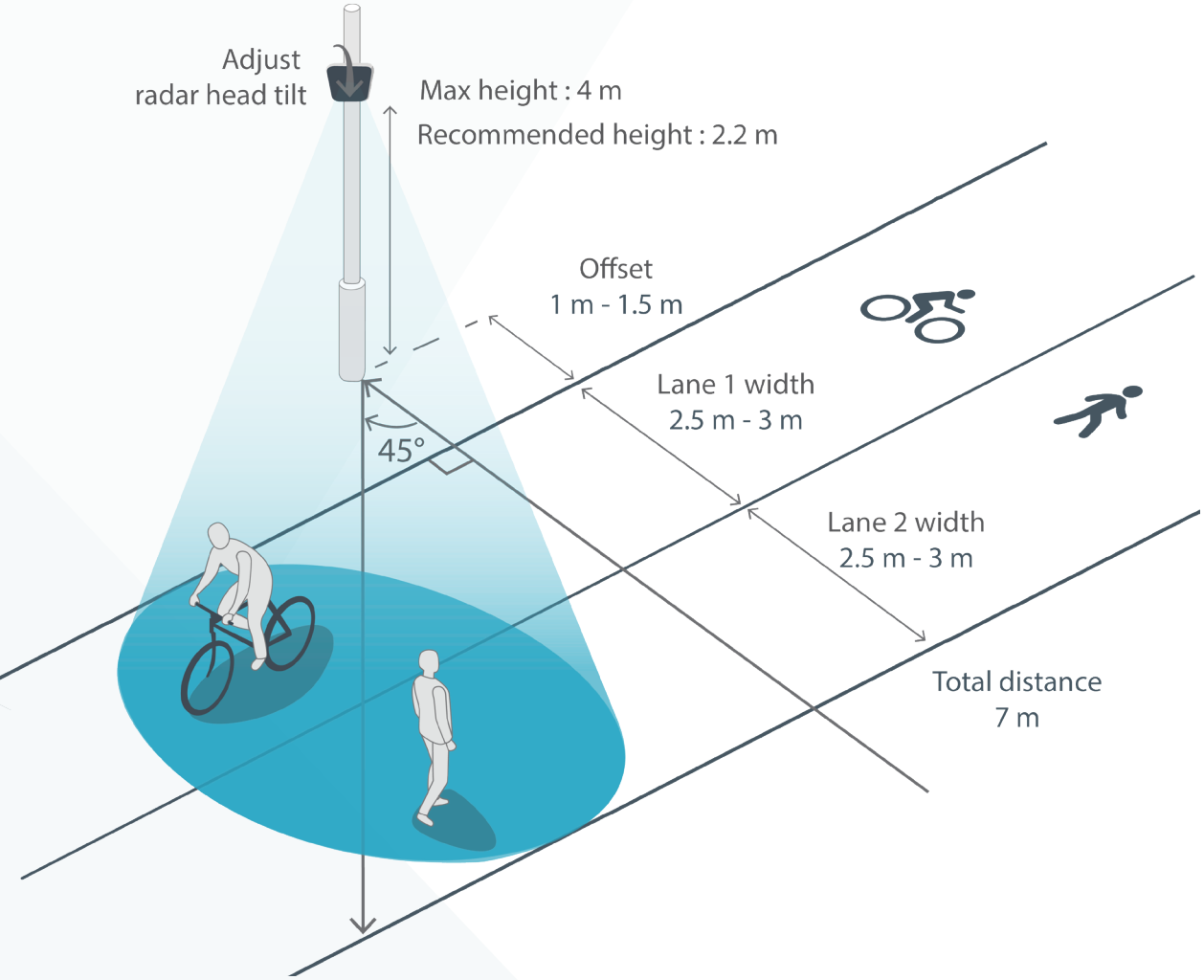
Set up and Positioning



This is a basic description of how to set up and position the CityRadar.

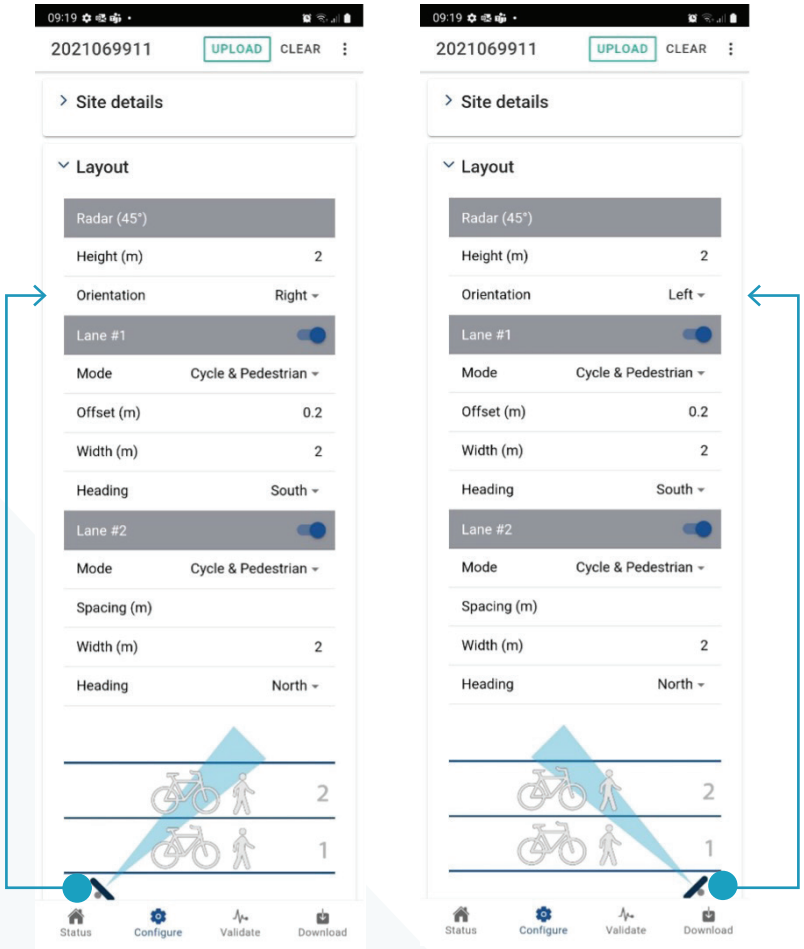
Direction

The radar unit must be directed in the same direction as specified in the EasySetup App in order to function correctly. (Directed 45 degrees to the right or left when you stand with the pole behind your back with your face directed towards the path). For more in-depth information, please refer to the product manual.

Horizontal orientation

Important: The CityRadar must be oriented 45° to the right or left. The radar accepts a margin of error +/- 5 degrees. Deviation exceeding this level may affect the accuracy of the data. TagMaster provides a special 45-degree bracket to ensure the correct angle.

Set up and Positioning



- The image illustrates the pole with the CityRadar and the direction of the radar in relation to the pathways. In this case both examples are set to Cycle & Pedestrian mode.

Paths / Lanes

The definition of the lanes in the Setup app is very important. The CityRadar can distinguish several lanes, but in most cases only two lanes are used. The lanes can be in opposite or in the same direction. The maximum total radar range is 7 metres, which gives about 2.5-3.0 metres per lane.

The radar can be set up to monitor a dedicated cycle path with one or two lanes, a dedicated pedestrian path with one or two lanes, or a mixed path with one or two lanes. Anything outside the defined lanes will be ignored or filtered out.

Road Traffic

If there is a cycle lane within a road traffic lane or very close to road traffic, some of the road traffic might be detected as being in the cycle lane and cause an over count. If there is no physical barrier between the bicycle path lanes, errors may occur. The amount of error will depend upon how many vehicles enter the cycle lane.

Mounting height

The optimum height of the CityRadar (from the path surface to the bottom of the case) is 2,2m. The CityRadar can be mounted on a pole, or any other street furniture on the side of the road at a hight between 2 and 2.5 metres. If the height is above 2,5m, the offset may need to be greater than 1.5m to ensure that the nearside of the path can be monitored. If not, bikes and pedestrians' risk to pass under the radar without detection.

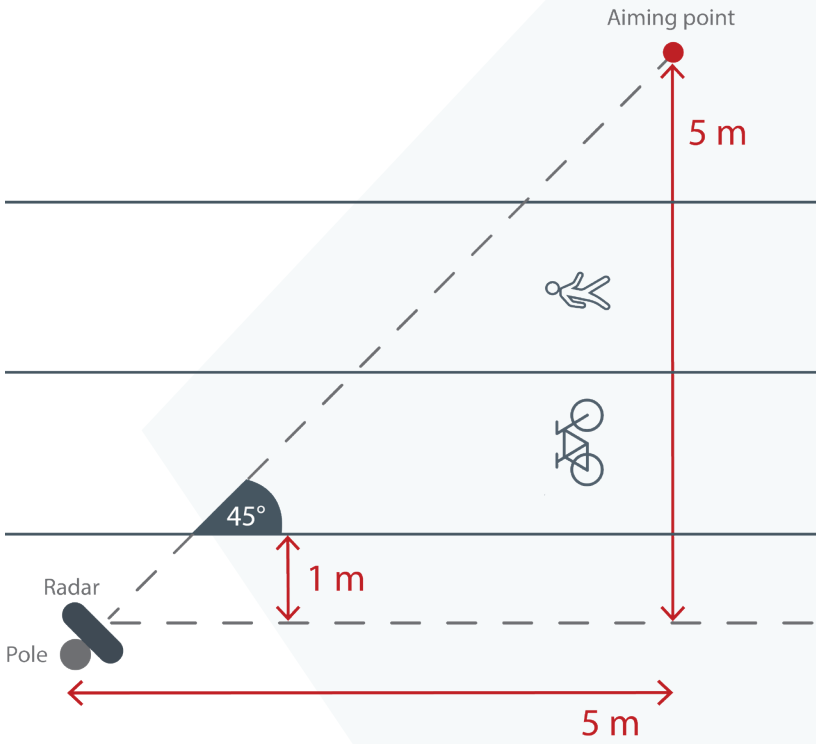
Set up and Positioning

Offset and distance covered

The unit has a maximum/total range of 7m. The offset (distance from the radar/pole to the near edge of the path) should ideally be 1.0-1.5m. The width of the monitored lanes plus the offset distance should not exceed 7-7.5 metres. Note: Too much down tilt may decrease radar signal reach and may cause over count.

Vertical orientation

The radar head should be tilted slightly downwards and aimed at a point on the ground 5 meters to the right (or left) and 5 metres out. This must be done manually after fastening the device on the road furniture. With insufficient down tilt, the near side pedestrians or bicycles risk not being measured properly. Too much downward tilt may cause over count from false radar echoes.



Validation

Always make sure the radar is collecting data according to your specifications. The Setup App will in real time display detected pedestrians and bicycles for visual validation on your device before activating the survey.

Test procedure

Monitor the captured data for approximately 10 bicycles and 10 pedestrians in each direction to make sure the counting is accurate and that the radar head is set correctly.

You can also walk back and forth through the detection zone yourself 10-15 times. Test both near and far from the radar in both directions. Make sure to exit the sight of the Radar before turning round and walking back. If needed, make minor adjustments, and check the accuracy again. Check that the bicycles and pedestrians are detected in the right lanes and in the right direction
When you are satisfied with the setup and data collection, select Start.

Why use TagMaster CityRadar

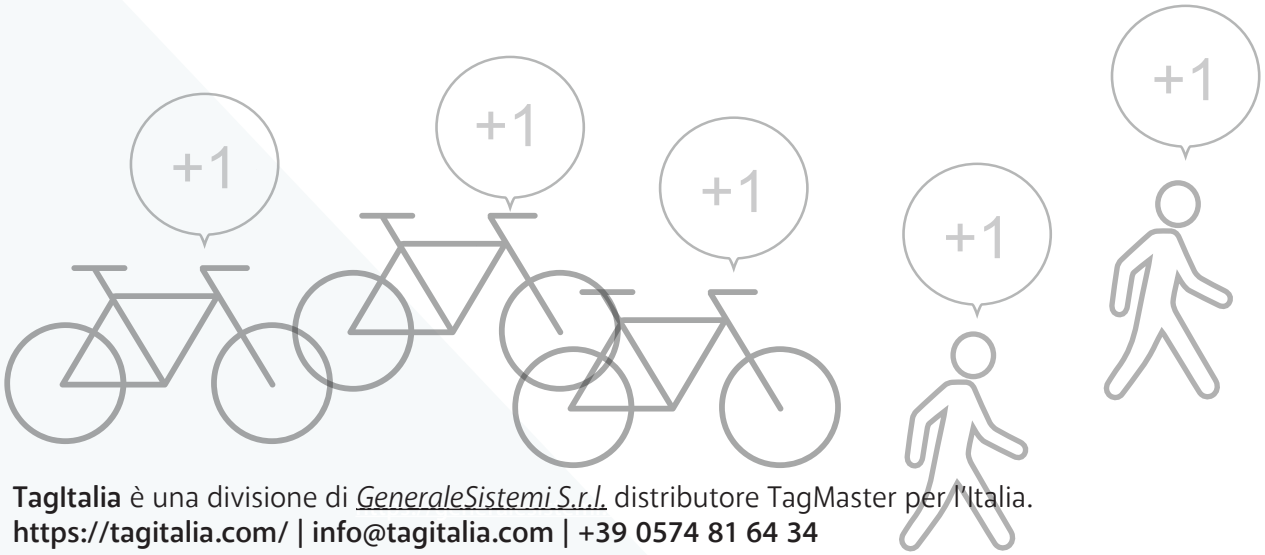
This is why TagMaster CityRadar is the best choice for you and your organisation:

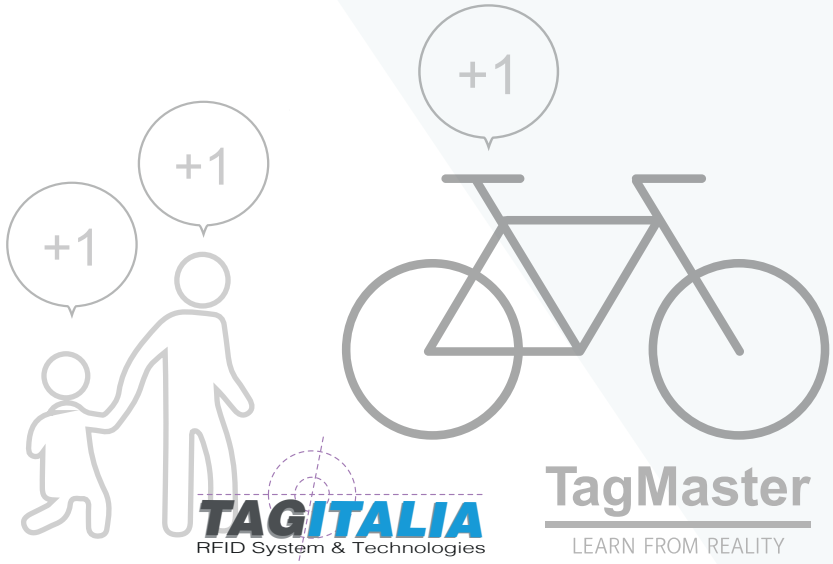
Data Capture Capabilities

- Accurate measurement with classification of travellers
- Monitors time, number of passing individuals, both pedestrians and bicycles
- Lane designation, direction of travel, reverse vehicle flags
- Real time data transfer or historic survey (file download)
- Unique range finding algorithm tracks the actual position of all targets and mitigates over count
- Manages several lanes, same or opposite direction
- Monitors each lane separately

Installation and Technology

- Very easy to install
- Non-intrusive technology
- No work in live carriageways
- No in-ground sensors
- Free Android, Bluetooth Setup App
- Robust and weatherproof design
- Built in 3G/4G modem
- Mains, PoE, battery or solar powered





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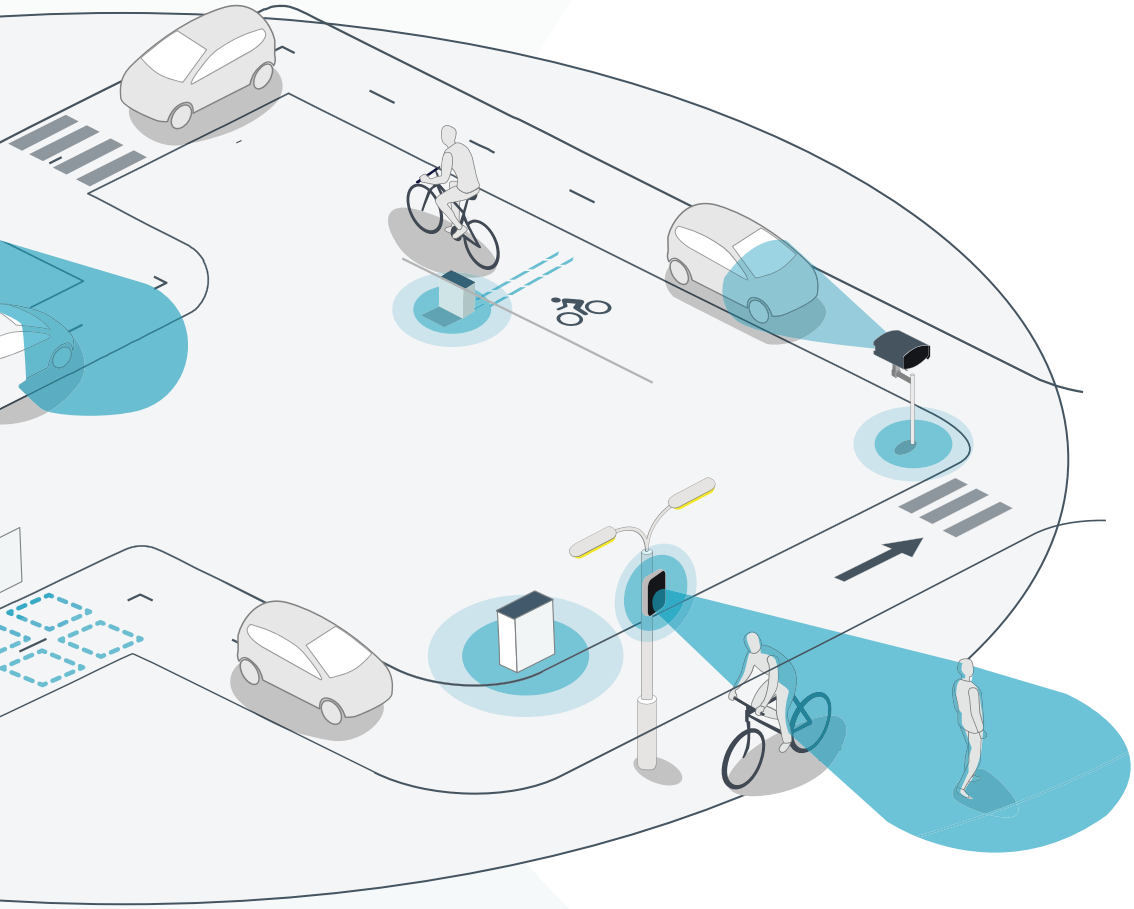

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Sede centrale
Via fra i Campi 13/C
Prato, PO, 59100
Italia