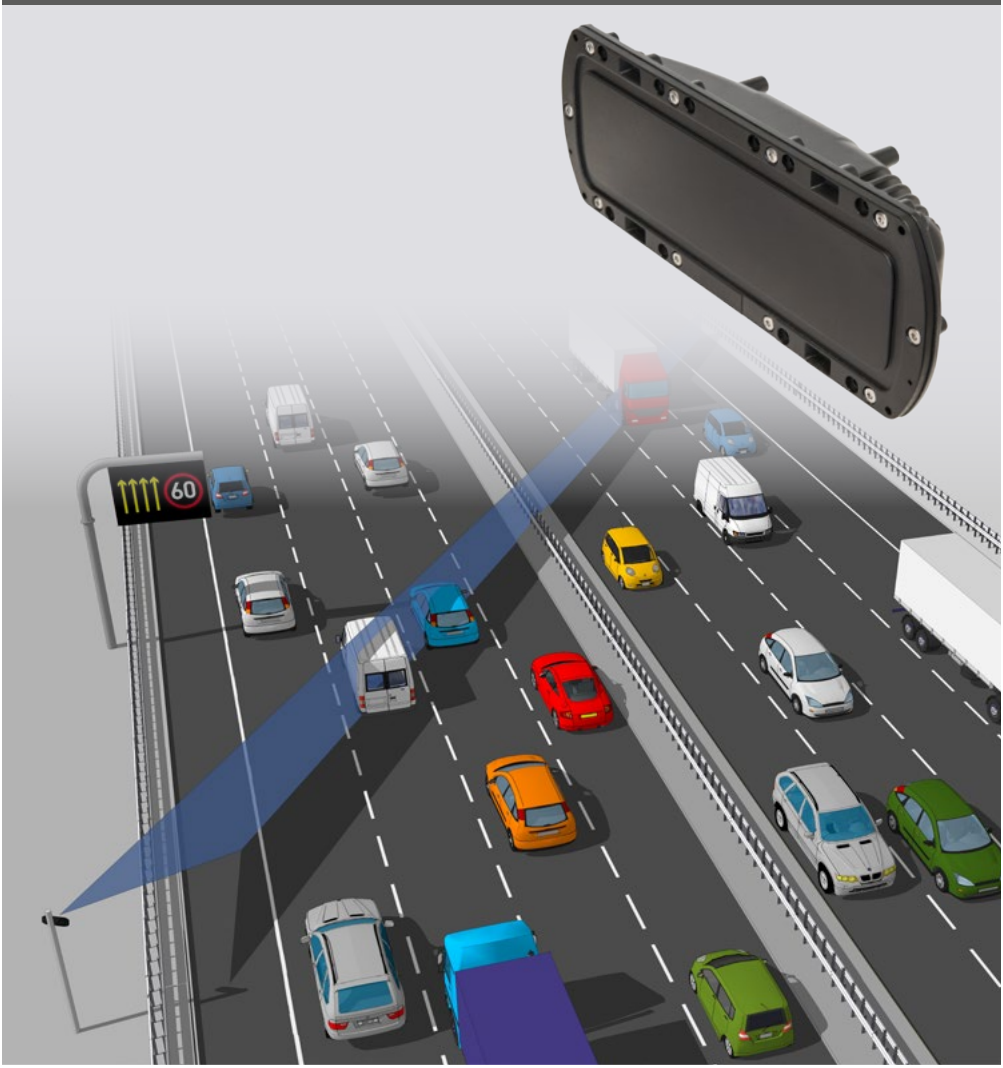
AGD **343**

HIGHWAYS MONITORING RADAR

PRODUCT MANUAL



AGD Align
AN AGD TOUCH-SETUP TOOL

AGD
PRODUCT SOLUTIONS FOR
INTELLIGENT TRAFFIC SYSTEMS

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HIGHWAYS MONITORING RADAR

WiFi®

AGD **Align**
AN AGD TOUCH-SETUP TOOL

safer, greener, more efficient

Introduction

PRODUCT & TECHNOLOGY

AGD **343**
HIGHWAYS MONITORING RADAR

The AGD 343 Highways Monitoring Radar is an easy-to-integrate traffic flow monitoring solution that provides real-time data on multi-lane highways. Designed for traffic profiling and incident detection, the 343 dramatically enhances highways safety, capability and efficiency.

AGD's 343 employs proven enforcement-grade radar & measurement techniques to quantify speed, range and length of passing vehicles. Detailed traffic information - such as, 'is traffic free-moving, slowing or starting-to-queue?' - is available in all weather conditions to inform control rooms and allow instant decision making.

AGD radar can replace intrusive high-maintenance loops, mounting on existing roadside poles or gantries where it 'looks' across the road at 30 degrees. The additional capability to operate at a ≥ 2-metre offset, while maintaining a 6-metre plus mounting height, ensures reliable operation in managed motorway scenarios and ALR (All Lanes Running) schemes. The 343 has been designed to cope with the many difficulties facing international road network installations.

KEY FEATURES

- Flow monitoring solution for multi-lane real-time data
- Traffic Profiling and Incident Detection
- Ten lane highway capability

- Enforcement grade radar & techniques
- Identifies, tracks & measures speed, length, lane/direction of individual targets
- Multi-level incident detection mode

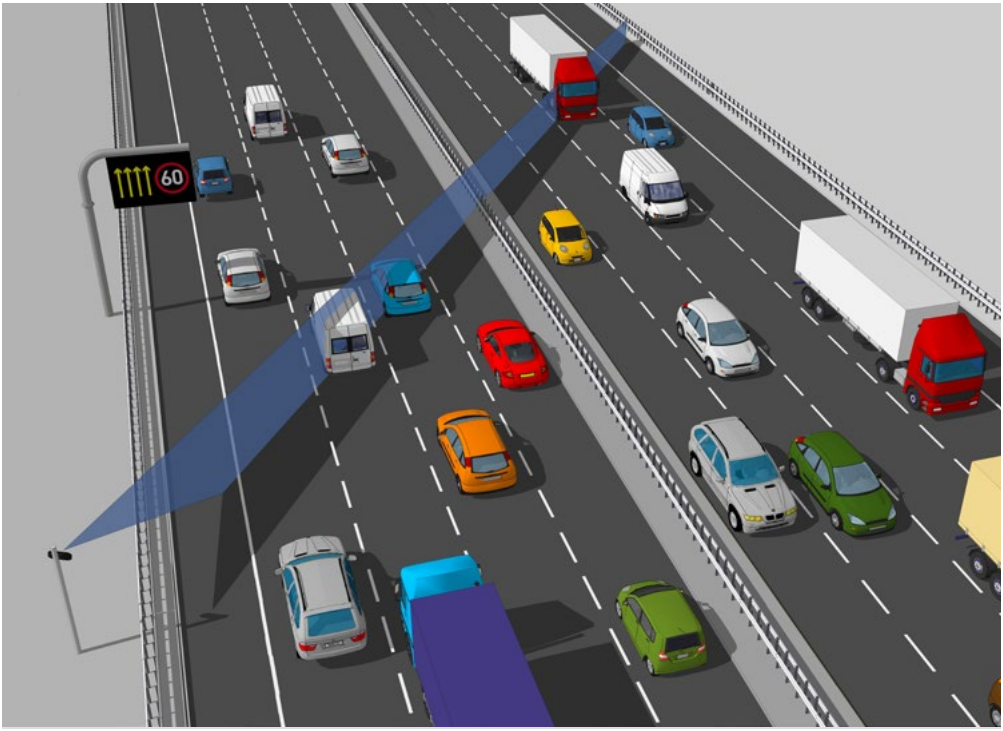
- Non-intrusive loop replacement
- Mounts on existing infrastructure
- Simple to install, setup and configure using AGD Align

Introduction

AGD **343**
HIGHWAYS MONITORING RADAR

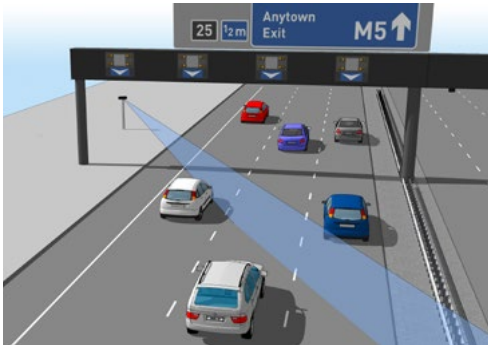
TYPICAL APPLICATIONS

Multi-Lane Highways Monitoring Radar



Caption

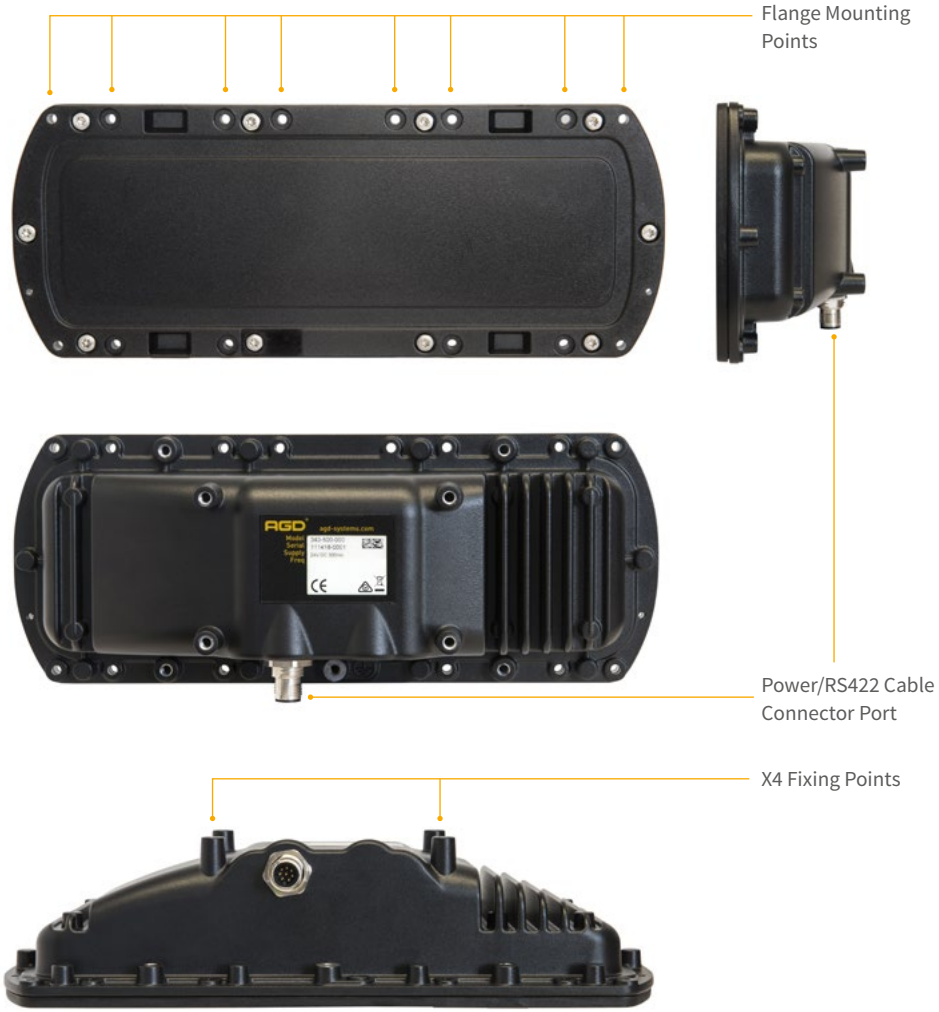
Caption



Introduction

PRODUCT OVERVIEW

AGD **343**
HIGHWAYS MONITORING RADAR



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Installation

AGD **343**
HIGHWAYS MONITORING RADAR

INSTALLATION INFORMATION

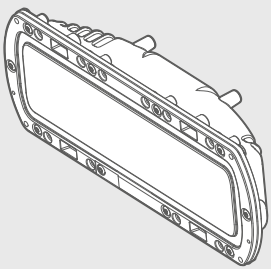
The radar is designed to be mounted to various structures such as a dedicated column, gantry or sign.

To install the radar, the following parts will be required:

No.	Part No	Description	Notes
1	343-500-000	AGD 343 Highways Monitoring Radar	
2	MS-246	343 Mounting Bracket Kit	
3	CA-310	343 Power/RS422 Cable Assembly	
4	MK343-05	Camera Setup Tool	(this is removed upon setup)

To provide power and communication interfaces the following parts will assist in detector integration:

No.	Part No	Description	Notes
5	MK343-01	343 Interface Enclosure	
6	MK343-03	343 Interface Enclosure (c/w 24Vdc PSU)	

1


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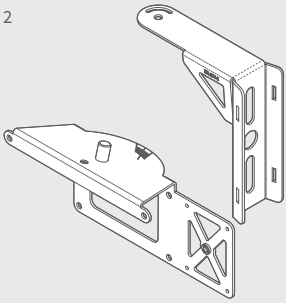

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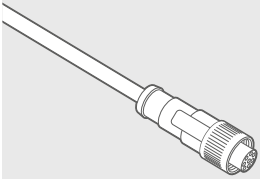

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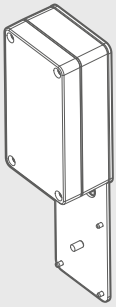
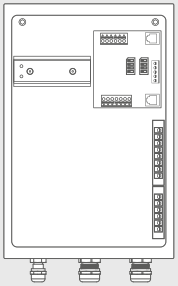
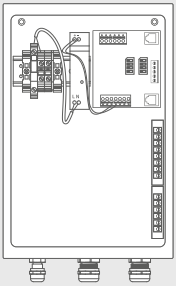


5


6


Installation

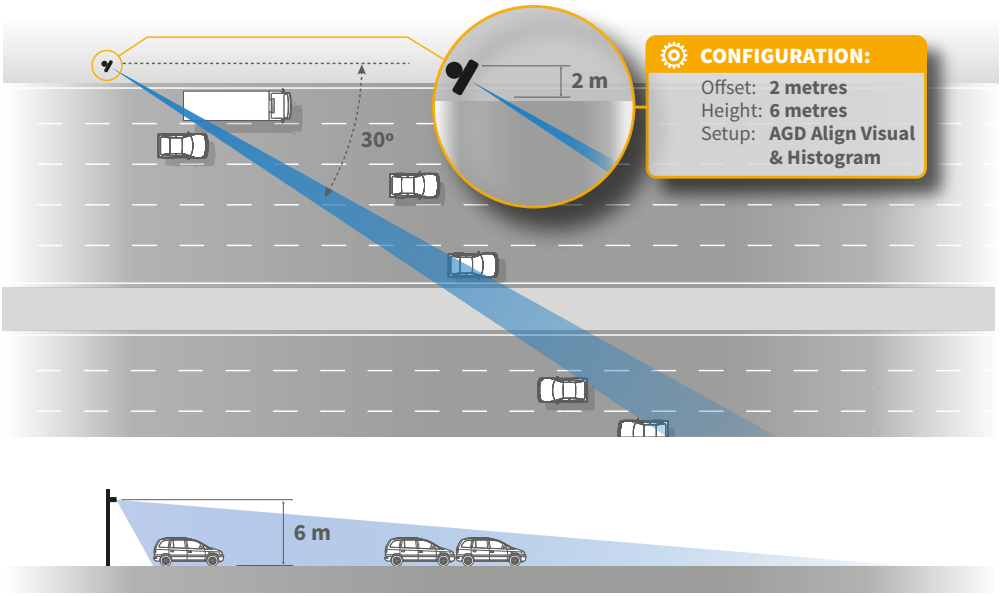
AGD **343**
HIGHWAYS MONITORING RADAR

MOUNTING LOCATION

The AGD 343 has been designed to be mounted on a variety of structures, where it looks across the carriageway at 30 degrees to provide highly accurate traffic data.

The detector must be mounted at a **minimum height of 6m** above the carriageway and at an angle of 30 degrees. The AGD align set-up tool assists in accurate set up of the angle.

Offset	Recommended Mounting Height	Acceptable Mounting Height
2m	6m	6m



Mounting Location Considerations

The detector has been designed to monitor traffic in inter-urban environments while maintaining resilience to external factors, however, care must be taken when choosing a mounting location.

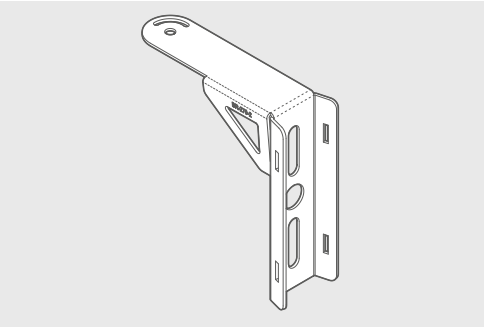
Avoid where possible:

- Installing the detector where it points toward large reflective surfaces (such as signs, barriers and metal retaining walls)

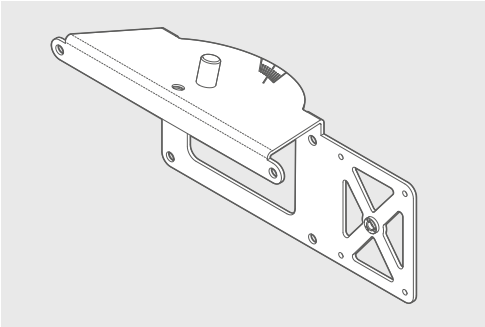
PHYSICAL INSTALLATION

343 Mounting Bracket Kit

The AGD 343 bracket mounting kit (part number **MS-246**) consists of two brackets and all the required fixing hardware.



BR-270 is the component of the bracket kit that fits to the structure you are mounting to.



BR-271 is the component of the bracket kit that fits to the rear of the radar.

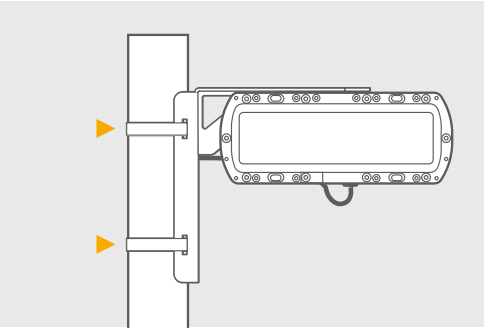
Fixing hardware consists of:

7no. M5 x 10mm Torx T20 A2 Stainless Screws

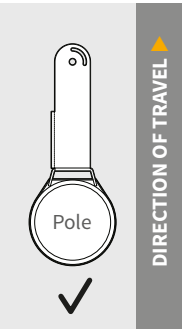
7no. M5 External Shakeproof A2 Stainless Washers

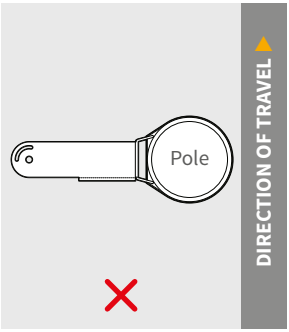
Step 1 – Mount bracket to the pole

Attach BR-270 to the structure you are mounting too using mounting straps (AGD recommends stainless steel sign banding ½" thick).



The position of the bracket should be parallel to the carriageway as in the image below, left. Do not install the bracket as shown in the right hand image.

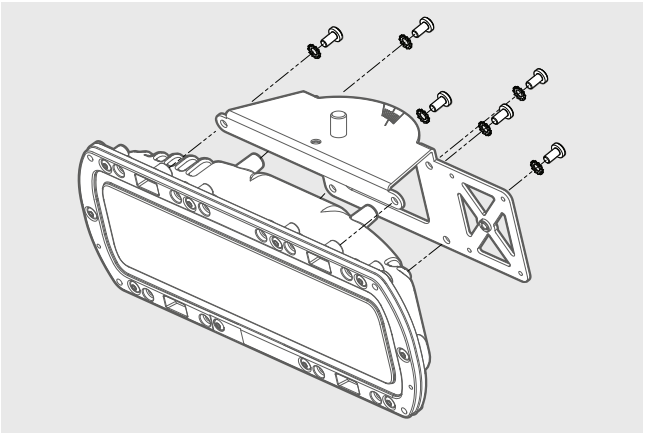




PHYSICAL INSTALLATION

Step 2 – Mount bracket to the radar

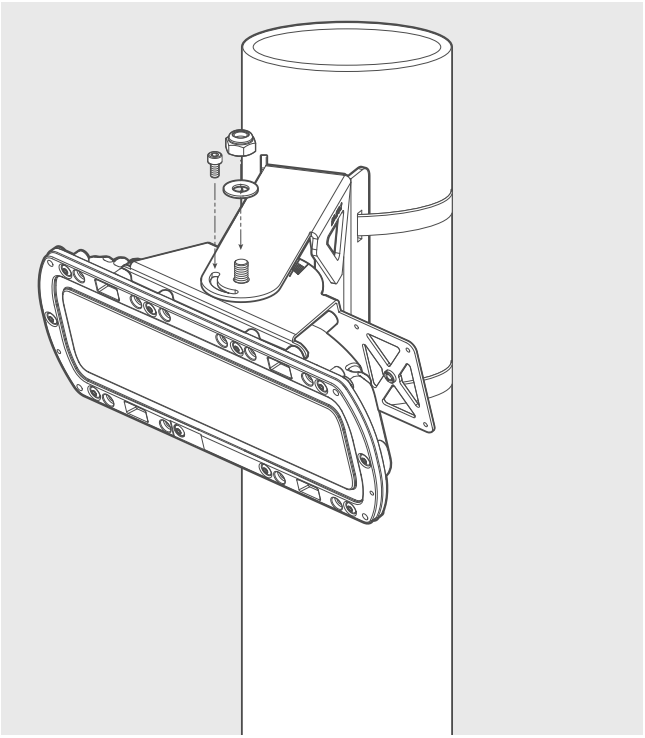
Fit the six torx screws and washers and tighten to a torque of 1.2Nm.



Step 3 – Mount radar to the pole

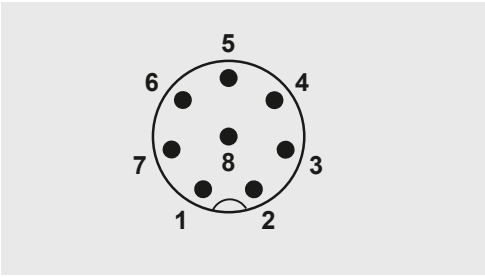
Insert the M10 Mounting Bolt through the hole in the bracket on the pole, loosely tighten the M10 Nyloc Nut.

Position the radar at roughly 30 degrees to the road, the etched marks on top of the bracket will help with alignment.



ELECTRICAL INSTALLATION

The detector is powered using a 24Vdc supply. The power is applied to the detector using the multi-pin mating connector.



The product mating connector is shown above and is located on the bottom of the product.

CONNECTIONS			
Pin No.	**Associated wire colour**	**Function**	**Additional Notes**
1	White	GND (0v)	
2	Brown	GND (0v)	
3	Yellow	Y (TX-)	
4	Green	Z (TX+)	
5	Grey	B (RX-)	
6	Pink	A (RX+)	
7	Blue	Vin	
8	Red	Vin	

343 Power/RS422 Cable Assembly

The cable assembly to connect power and comms to the radar is **Part Number CA-310**. This cable is supplied in a 10m length and is shown below:

CA-310 has the same attributes as shown in the Connections table above.

POWER AND COMMUNICATIONS

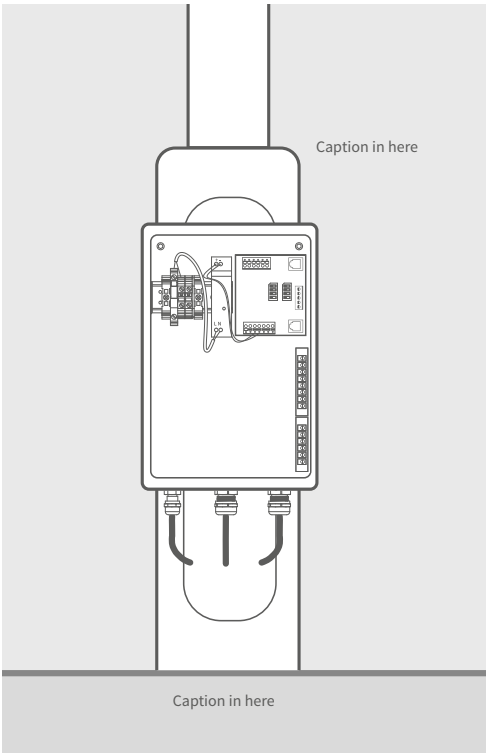
The radar can be powered and communicated with as per the specification, however for ease of installation, AGD provides a series of equipment to support simple integration into the road network and line protection for connected equipment.

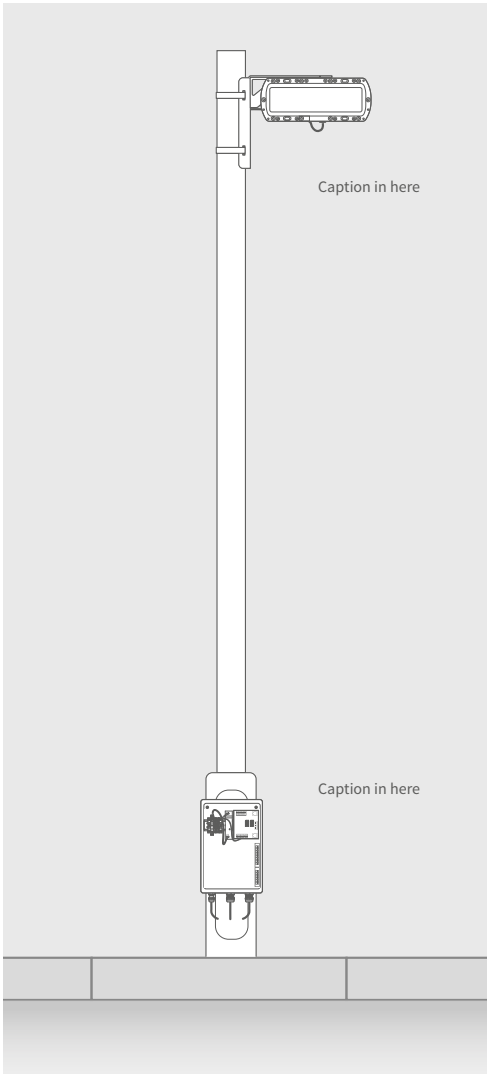
The unit can be installed with or with out existing roadside network infrastructure, so the device can be installed in most situations.

Installation with Interface Enclosure

AGD provide a 343 interface enclosure complete with power, communications and line protection to connect the detector. Part No. MK343-03 - 343 Interface Enclosure (c/w 24Vdc PSU)

The detector, bracket and interface enclosure are secured to the pole using stainless steel banding as described previously. Cable entry glands are provided for the customer to provide power to the device and connect the CA-310 Power/RS422 cable assembly.



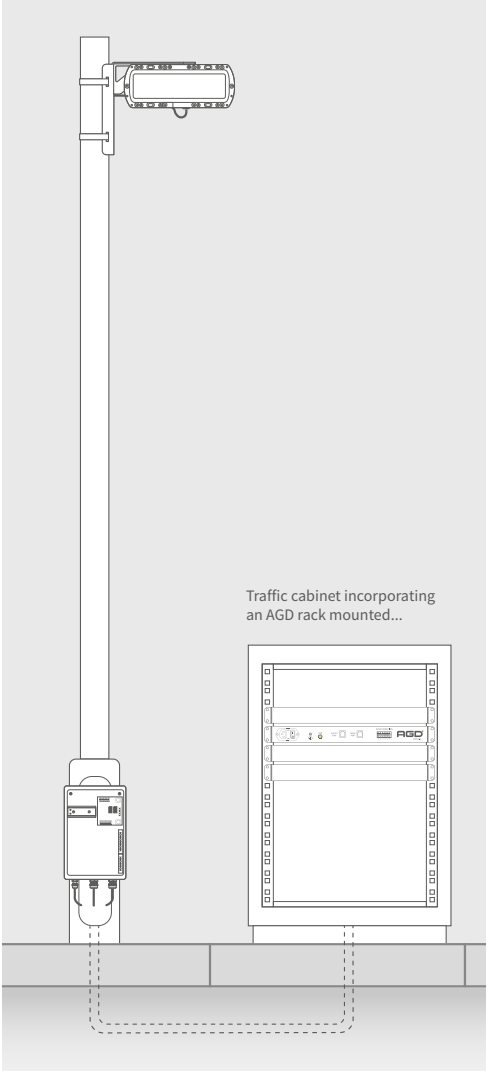


POWER AND COMMUNICATIONS

Installation with Interface Enclosure & Existing Infrastructure

If installing the equipment combined with existing infrastructure (existing traffic cabinet for example). The AGD 343 interface enclosure with communications and line protection would be used. Part No. MK343-01 - 343 Interface Enclosure.

*Please note that this variant, does not have a power supply and is intended for use with an MK343-02 – 343 19” Interface Rack.

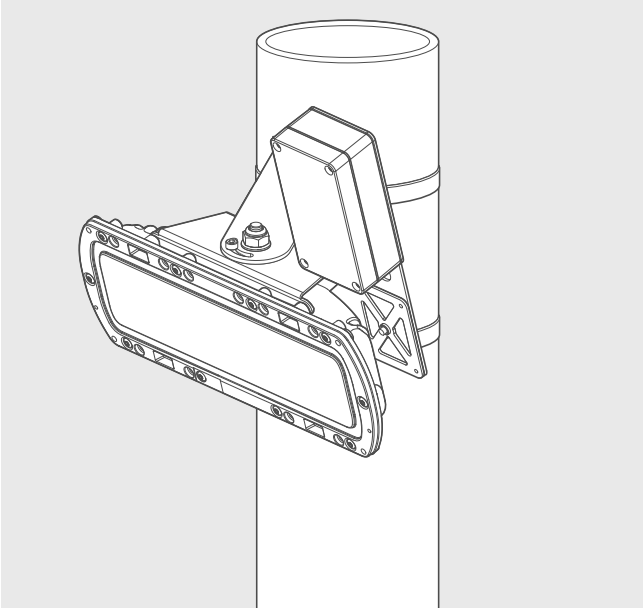


Power connection to existing traffic cabinet

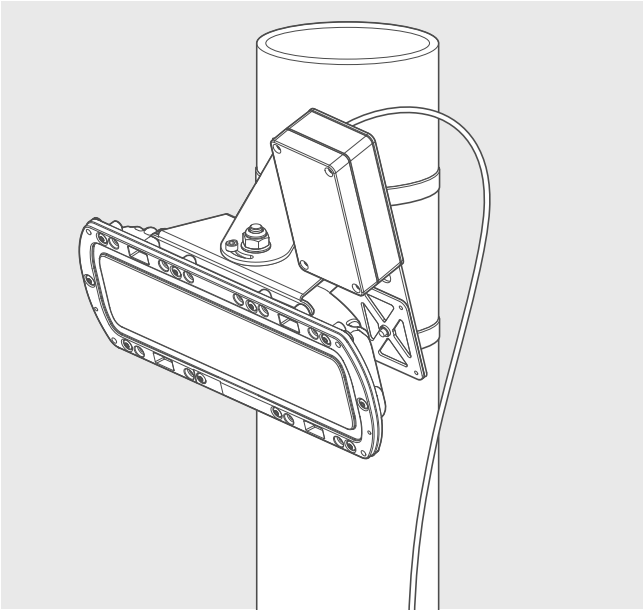
CAMERA CONNECTION

Initial camera mounting paragraph

Step 1 – Mount set-up camera to the radar bracket using the single thumb screw to secure



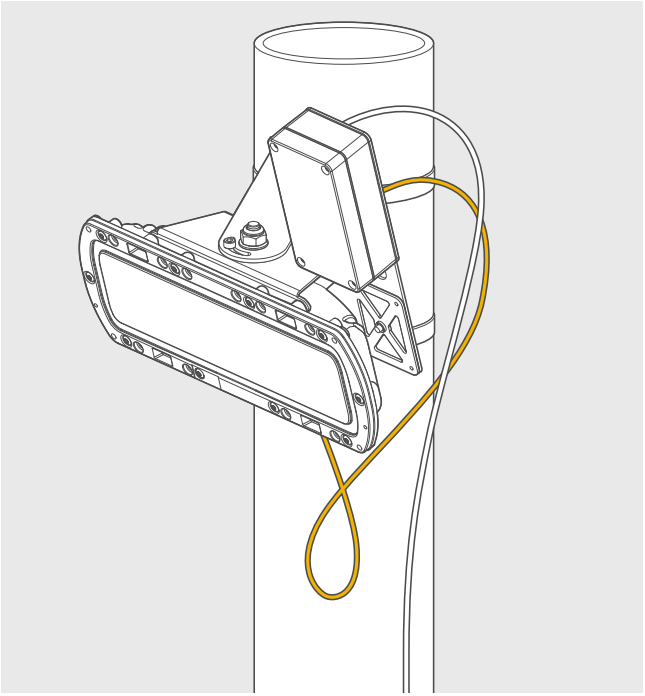
Step 2 – Re-position the radar cable into the the top camera cable port as shown right.



CAMERA CONNECTION

Step 3 - Fit the yellow interrupter cable between the bottom camera port and the radar (the cable is keyed so can only be connected one way)

Once connected and powered the camera will cast a WiFi network that will allow initial alignment to be configured.



WIFI CONNECTION

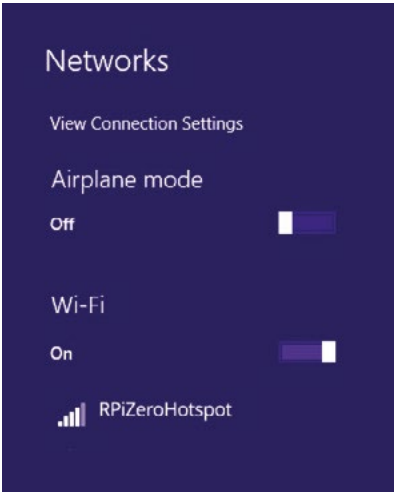
In network WiFi connections search for:

RPiZeroHotspot

Select the network, click 'connect' and input the default password:

AboveGroundSensorsPiZero

***The WiFi connection is hosted by the setup camera and is only used in the setup phase of the device. The radar DOES NOT have WiFi functionality.**

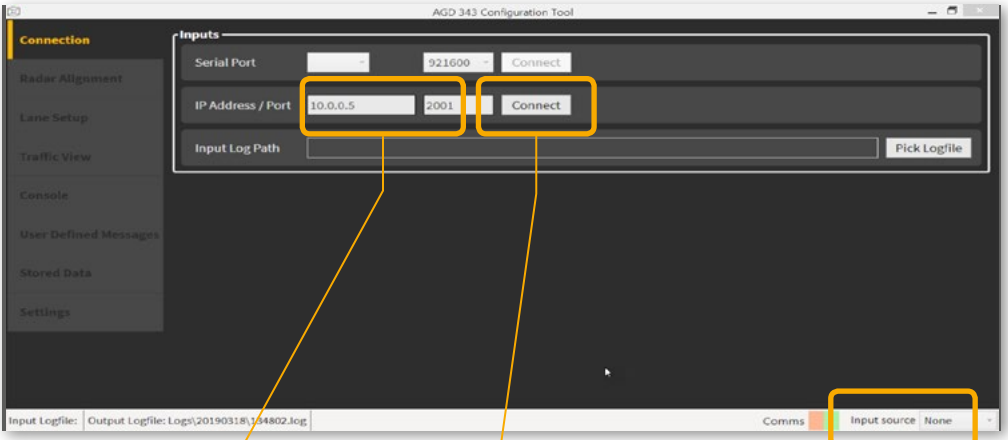


AGD ALIGN SET-UP TOOL

Connection

When launching the GUI, the above window is presented. All options except the '**Connection**' are greyed out.

For initial setup, it is required to connect via the '**TCP**' option to the setup camera.
The fields are automatically populated with the following information:



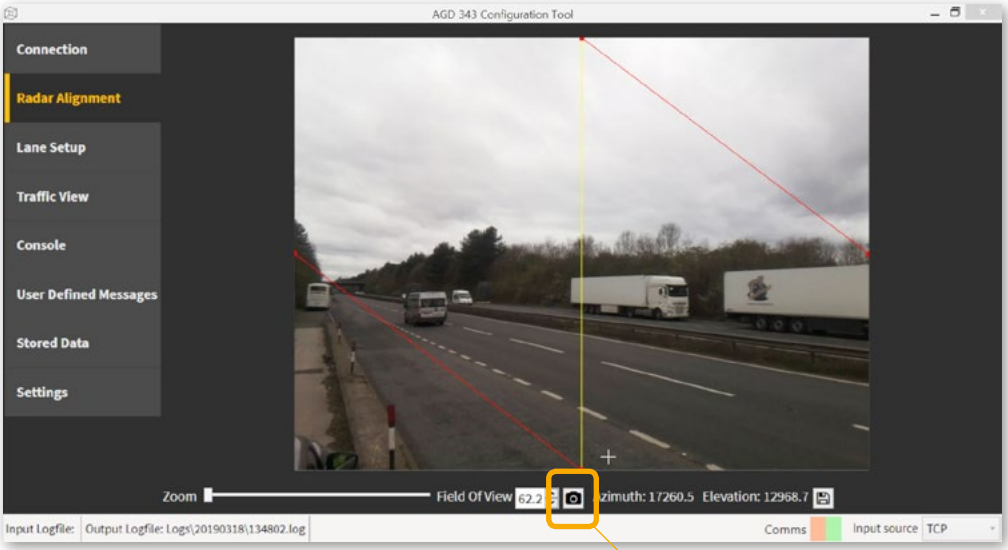
IP Address: 10.0.0.5
Port: 2001

Click '**Connect**' the GUI should show a connected message and the Comms LED bars across the bottom should illuminate red and green to signal communication.

The '**Input Source**' field (bottom right) should also show TCP.

The menu bar on the righ hand side should now be illuminated and able to be selected.

AGD ALIGN SET-UP TOOL



Radar Alignment

The AGD Align set-up software makes this simple following the four points as shown.

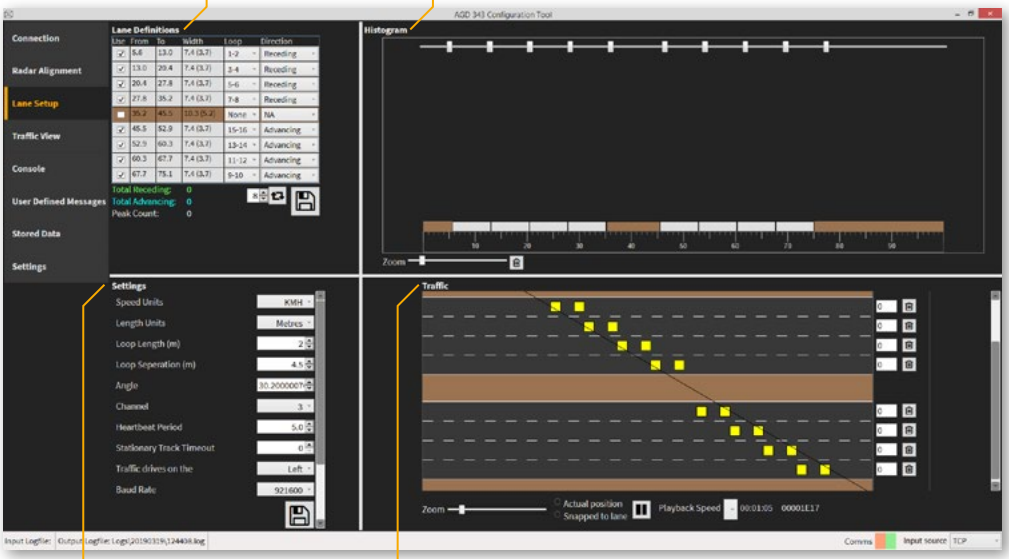
AGD ALIGN SET-UP TOOL

Lane Setup Window

Once connected and powered the camera will cast a WiFi network that will allow initial alignment to be configured.

LANE DEFINITIONS
Text

HISTOGRAMS
Text



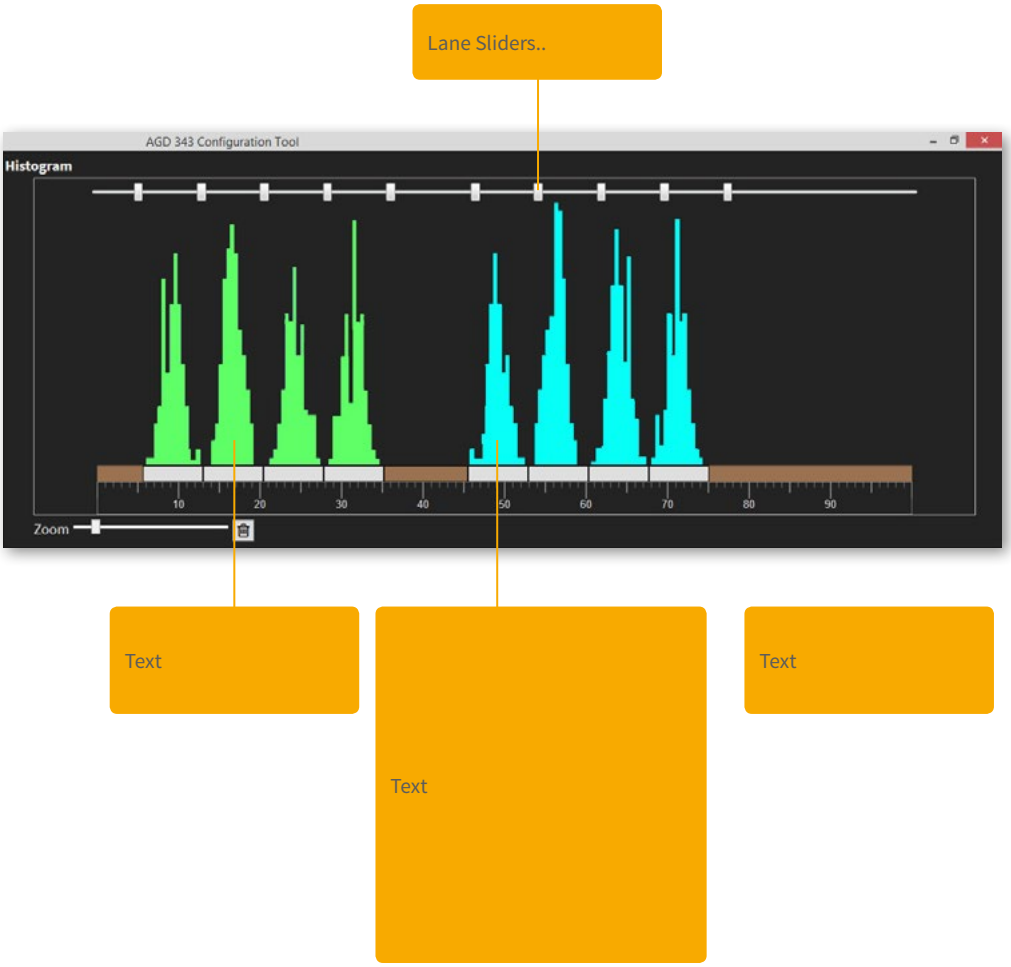
SETTINGS
Text

TRAFFIC
text

AGD ALIGN SET-UP TOOL

Lane Setup - Traffic Histogram

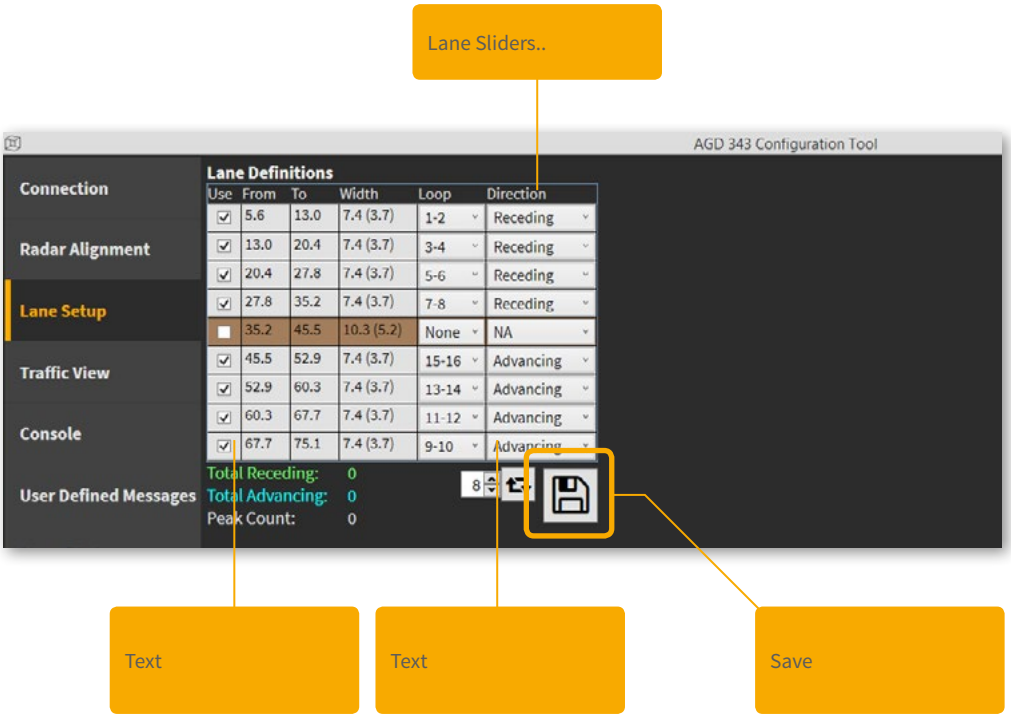
Once connected and powered the camera will cast a WiFi network that will allow initial alignment to be configured.



AGD ALIGN SET-UP TOOL

Lane Setup - Lane Definitions

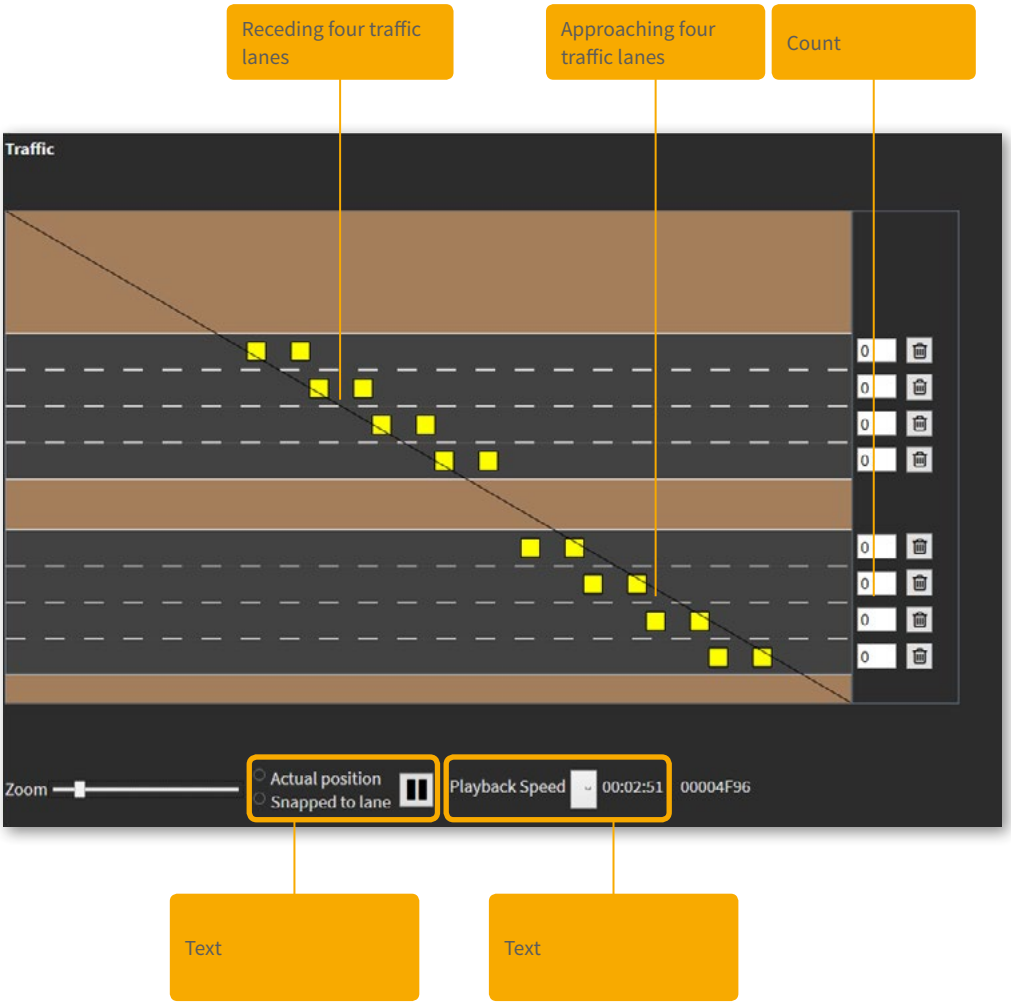
Once connected and powered the camera will cast a WiFi network that will allow initial alignment to be configured.



AGD ALIGN SET-UP TOOL

Lane Setup - Traffic View

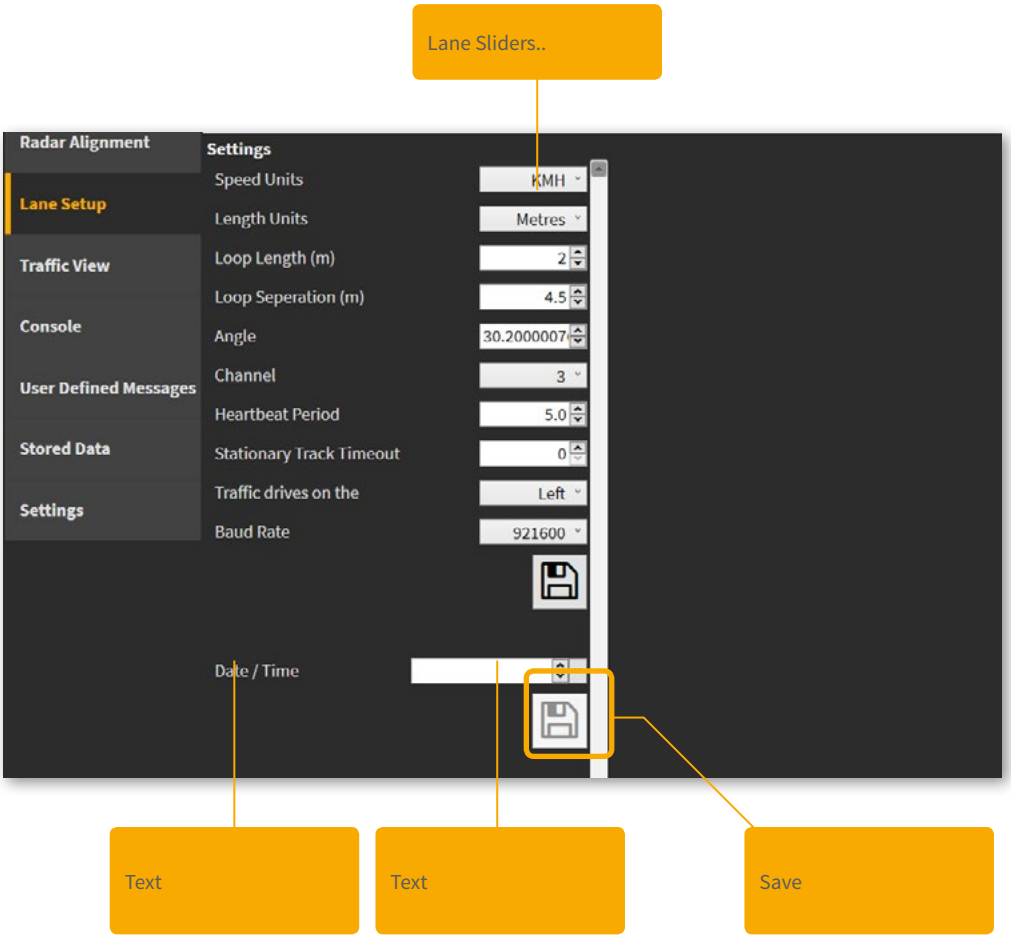
Once connected and powered the camera will cast a WiFi network that will allow initial alignment to be configured.



AGD ALIGN SET-UP TOOL

Lane Setup - Settings

Once connected and powered the camera will cast a WiFi network that will allow initial alignment to be configured.



Troubleshooting

PHYSICAL INSTALLATION

If the unit is not operating correctly, please check the following, has the unit been:

1) Mounted within the recommended height of 6 metres?
2) Angled according to the installation guide to provide good coverage of the detection area?
3) Installed with any obstructions in the viewable area?

ELECTRICAL INSTALLATION

If the unit is not operating correctly, please check the following:

1) Is power present at the unit?
2) Is the red LED illuminated when power is applied to the unit?
3) Is there sufficient current to run the unit - identified by the red LED failing to flash or flashing only once during power-up and the web page not starting correctly? Refer to technical specification table.

CONNECTING / COMMISSIONING

If the unit is not operating in the prescribed manner, please check the following:

1) Is the LED on the front of the unit you wish to connect to illuminated blue to show that the WiFi network is successfully connected?
2) Has the correct IP Address been entered into the browser address bar?
3) Have you followed the AGD Align Touch-setup stages correctly and verified correct operation?

If trouble with operation persists please contact AGD Technical Support.

AGD TECHNICAL SUPPORT

eMail: technical@agd-systems.com

Tel: +44-1452 557404

Radar Characteristics

OPERATING FREQUENCY BAND AND POWER

The radar frequency and power is as follows;

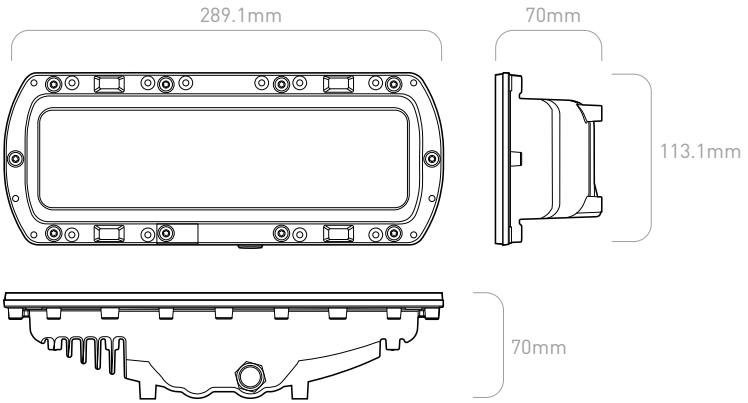
Parameter	Specified	Notes
Centre Frequency (channel 1)	24.077GHz	
Centre Frequency (channel 2)	24.125GHz*	
Centre Frequency (channel 3)	24.175GHz	
Centre Frequency (channel 4)	24.223GHz	
Frequency Modulation (FM)	45MHz	
Power	<100mW eirp	
Field Strength		
ITU Code	45M0FXN	

*Channel for USA & Canadian variant, Channel 2 - 24.125GHz.

Technical Specifications

AGD **343**
HIGHWAYS MONITORING RADAR

PRODUCT DIMENSIONS



SPECIFICATIONS

Description	Highway Monitoring Radar
Technology	24GHz FMCW Radar
Mounting	Pole, portal gantry, MS3, MS4 or other structures
Mounting Height	6 metres nominal
Range	2-100 metres
Speed Range	5-250 kph
Housing Material	Black Polycarbonate / Aluminium
Sealing	IP66
Operating Temp	-20°C to +60°C
Power	6 W @ 24Vdc
Power Supply	12 - 24V dc
Configuration	WiFi AGD Align Touch-Setup
Dimensions	W 113.1mm x D 70mm x L289.1mm
Radar Output	RS422
Weight	1400g
Approvals	ETSI EN 301 489 / BS EN 50293, ETSI 300.440, FCC CFR47 Part 15.245

Owing to the Company's policy of continuous improvement, AGD Systems Limited reserves the right to change their specification or design without notice.

RoHS COMPLIANT
Restriction on Hazardous Substances

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) this device must accept any interference received, including interference, that may cause undesired operation. See 47 CFR Sec. 15. 19

A separation distance of at least 20 centimetres should normally be maintained between this product and the body of users or nearby persons.
Changes or modifications to this equipment, not expressly approved by AGD Systems Ltd, may void the user's authority to operate this equipment.

End Of Life – Disposal Instructions (EOL)

Intentionally left blank

Important

SAFETY PRECAUTIONS

All work must be performed in accordance with company working practices, in-line with adequate risk assessments. Only skilled and instructed persons should carry out work with the product. Experience and safety procedures in the following areas may be relevant:

- **Working with mains power**
- **Working with modern electronic/electrical equipment**
- **Working at height**
- **Working at the roadside or highways**

1. This product is compliant to the Restriction of Hazardous Substances (RoHS - European Union directive 2011/65/EU).
2. Should the product feature user-accessible switches, an access port will be provided. Only the specified access port should be used to access switches. Only non-conductive tools are to be used when operating switches.
3. The product must be correctly connected to the specified power supply. All connections must be made whilst the power supply is off or suitably isolated. Safety must take always take precedence and power must only be applied when deemed safe to do so.
4. No user-maintainable parts are contained within the product. Removing or opening the outer casing is deemed dangerous and will void all warranties.
5. Under no circumstances should a product suspected of damage be powered on. Internal damage may be suggested by unusual behaviour, an unusual odour or damage to the outer casing.
   Please contact AGD for further advice.
6. This device complies with part 15 of the FCC Rules and contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s) .

   • Operation is subject to the following two conditions:

   (1) This device may not cause harmful interference, and

   (2) This device must accept any interference received, including interference that may cause undesired operation.

   • A separation distance of at least 20 centimetres should normally be maintained between this product and the body of users or nearby persons.

   • Changes or modifications not expressly approved by AGD Systems Ltd could void the user's authority to operate the equipment.
7. This Product is Compliant with the European Radio Equipment Directive 2014/53/EU.
   There is no restrictions of use within any EU Member state for this product.
   This product is Receiver Category 2.
8. Indicates compliance with all applicable Australian ACMA technical standards and associated record-keeping (including testing) arrangements.

IMPORTANT INFORMATION

Low Power Non-Ionising Radio Transmission and Safety

Concern has been expressed in some quarters that low power radio frequency transmission may constitute a health hazard. The transmission characteristics of low power radio devices is a highly regulated environment for the assurance of safe use.

There are strict limits on continuous emission power levels and these are reflected in the testing specifications that the products are approved to. These type approval limits are reflected in the product specifications required for a typical geographic area such as those for the EU (ETS300:440), for the USA (FCC part 15c) and for Australia/New Zealand (AS/NZS 4268). The limits adopted in these specifications are typically replicated in many other localized specifications.

The level of safe human exposure to radio transmission is given by the generally accepted guidelines issued by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). This body has issued guidance for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300 GHz) which are quoted below.

	Radar and ICNIRP limit comparison			Typical Informative Limits for Radar Transmission Approval		
	Radar Transmitted Level (Note 4)	ICNIRP Limit (Table 6)	Exposure Margin	ETS300:440	FCC (part15c)	AS/NZS 4268
Power (mW EIRP)	<100mW (<20dBm)	N/A	N/A	100mW (20dBm)	1875mW (Note 1)	100mW (20dBm)
Max Power Density (mW/cm2)	3.18µW/cm2 at 50cm (Note 3)	<50W/m2 (5mW/cm2) (Note 2)	0.064%	N/A	N/A	N/A
Field Strength (V/m) at 3m	<0.58V/m (5.8mV/cm) (Note 1)	<137V/m (1370mV/cm)	0.42%	0.58V/m (5.8mV/cm) (Note 1)	2500mV/m (25mV/cm)	0.58V/m (5.8mV/cm) (Note 1)

Note 1 Values are calculated conversions for comparison purposes.

Note 2 Other equivalent limits include; Medical Research Council Limit of 10mW/cm2, IACP limit of 5mW/cm2 (at 5cm) and UK CAST limit of 5mW/cm2. . Power density at the radome typically 4µW/cm2. .

Note 3 Calculation is made on the assumption antenna is a point source therefore the actual value is likely to be significantly less than that quoted. Note that a theoretical max level at a 5cm distance (which gives 0.318mW/cm2) is at a point in the field where the radar beam is not properly formed.

Note 4 Comparison for product model 343 operating in the band typically 24.050GHz to 24.250GHz

From the table it can be seen that it is extremely unlikely that a potentially hazardous situation could occur owing to the use of such low power devices.

It is considered to be good practice not to subject humans to radiation levels higher than is necessary. In a works environment where multiple equipment on soak test are to be encountered then it is considered good practice to contain the equipment in an appropriate enclosure lined with radar absorbing material.

Notes

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Disclaimer

While we (AGD Systems) endeavour to keep the information in this manual correct at the time of download or print, we make no representations or warranties of any kind, express or implied, about the completeness, accuracy, reliability, suitability or availability with respect to the information, products, services, or related graphics contained herein for any purpose.

Any reliance you place on such information is therefore strictly at your own risk. In no event will we be liable for any loss or damage including without limitation, indirect or consequential loss or damage, or any loss or damage whatsoever arising from loss of data or profits arising out of, or in connection with, the use of this manual.

WARRANTY

All AGD products are covered by a 12 month return to factory warranty. Products falling outside this period may be returned to AGD Systems for: evaluation, repair, update or re-calibration, any of which may be chargeable.

PRODUCT SOLUTIONS FOR
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