

	<b>307</b>	
	VEHICLE DETECTION	
	Radar Traffic Detector	



# PRODUCT MANUAL



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# INTRODUCTION

## PRODUCT & TECHNOLOGY



# 307

The 307 is a compact Doppler vehicle radar which operates in the K-Band at 24GHz.

It is designed to be robust, cost effective and highly versatile offering outstanding detection performance for multiple Intelligent Transport Systems (ITS) management applications.

Configuration of the unit is via a set of user selectable switches or RS422. Detect state is returned via a switched relay or opto isolator output. RS422 versions provide a serial interface for parameter setup and for vehicle speed outputs.

## KEY FEATURES

- Vehicle presence detection up to 150m
- Advance or bi-directional detection
- User configurable low speed threshold between 4 -120 kph
- Speeds reported in real-time for vehicle actuated sign display (RS422 versions)
- Typical current of 43mA at 24Vdc
- Suitable for battery power and solar-powered installations at 12Vdc

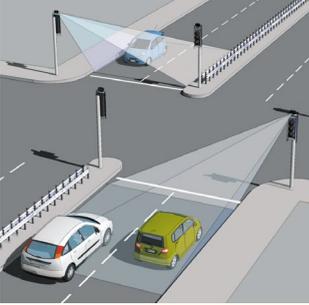
## PRODUCT RANGE

Series	307-5xx-xxx	307-3xx-xxx
Options		
12Vdc/24Vac/dc	✓	✗
230Vac	✗	✓
Configuration switches	✓	✓
RS422	✓	✗
Customer bespoke requirement	✓	✓

# INTRODUCTION

## TYPICAL APPLICATIONS

Intersection control



Vehicle Actuated Sign driver

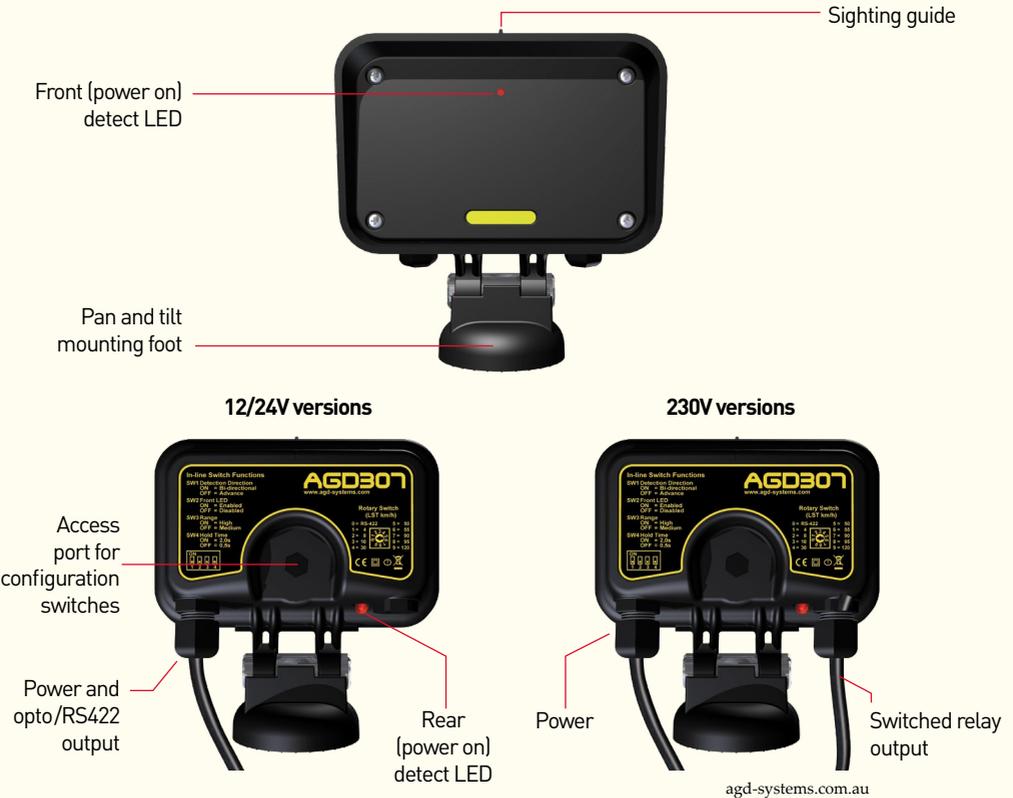


Temporary applications

\*optional version available on request



## PRODUCT OVERVIEW

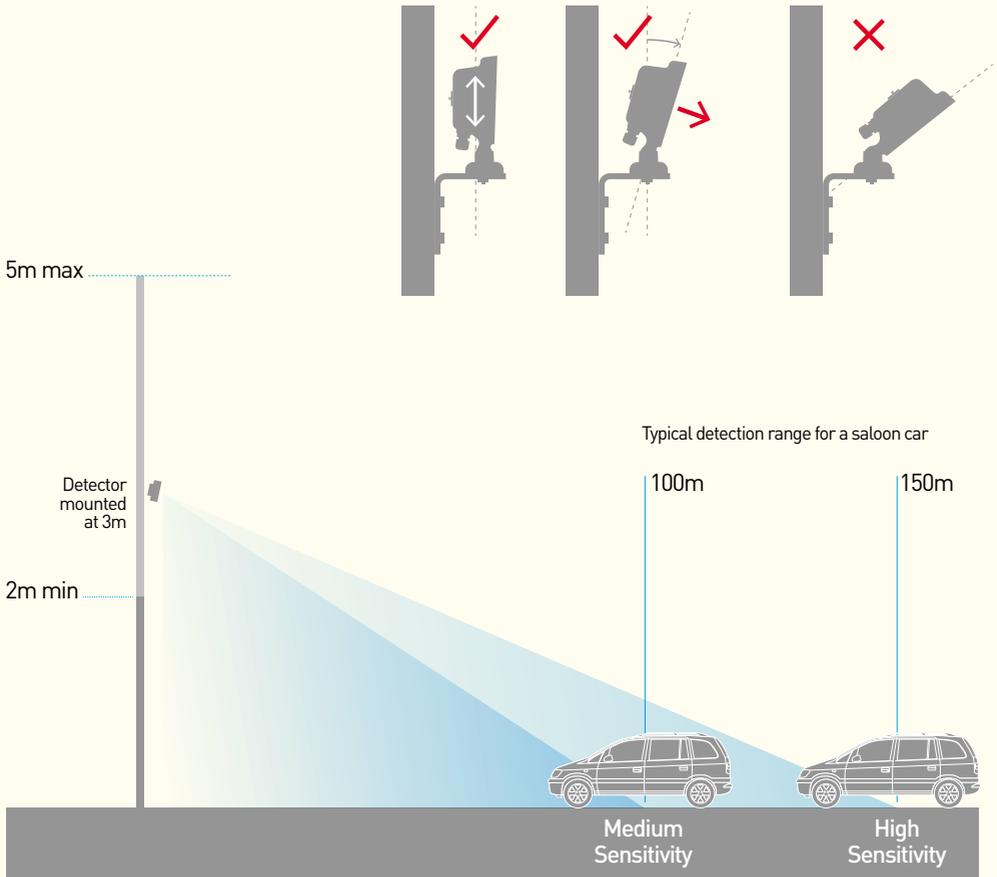


# INSTALLATION

## MOUNTING HEIGHT, ANGLES, CLEARANCE

Mount the radar on a firm structure within a recommended height range of 2m-5m. For optimum performance the radar should be situated on a pole adjacent to the carriageway with an **unobstructed** view of advancing traffic. Point the radar down the road towards the furthest point where vehicle detection is required. This is aided by using the sighting guide on top of the detector. The front face of the radar should be vertical i.e. perpendicular to the direction of traffic flow before site specific adjustments are made.

The radar has a relatively wide field of view of allowing good vehicle detection coverage of single or dual lane approaches for the applications indicated. Typical ranges are as shown based on the sensitivity setting selected.



Not to scale

# INSTALLATION

## CONNECTING POWER

- Set your power supply to the correct voltage, which can be found on the label on the top of the unit.
- Connect the unit to the supply.
- Once powered, the front LED will flash five times whilst the radar performs its self check routines.



12/24V or 230V Power supply



307

## POWER & WIRING

### 6 WAY 12/24Vdc & 24Vac

Wire Colour	Function		Power Off	Power On No Detect	Power On Detect
Red	12/24Vdc	24Vac			
Black	0V	24Vac			
White	Opto Common				
Yellow	Opto		N/O	N/C	N/O
Blue	Opto		N/C	N/O	N/C

### 10 WAY RS422 12/24Vdc & 24Vac

Wire Colour	Function		Power Off	Power On No Detect	Power On Detect
Red	12/24Vdc	24Vac			
Black	0V	24Vac			
Green	Ground				
White	Opto Common				
Yellow	Opto		N/O	N/C	N/O
Blue	Opto		N/C	N/O	N/C
Brown	RS422 RXA				
Violet	RS422 RXB				
Orange	RS422 TXZ				
Pink	RS422 TXY				

# INSTALLATION

## POWER & WIRING (CONTINUED)

3+2 WAY 230Vac				
Wire Colour	Function	Power Off	Power On No Detect	Power On Detect
Brown	230Vac live			
Blue	230Vac neutral			
Red	Relay common			
Green	Relay	N/O	N/C	N/O
Blue	Relay	N/C	N/O	N/C

N/O = High Impedance switched output N/C = Low Impedance switched output

Power Options	12Vdc	24Vdc	24Vac	230Vac*
Switch only versions	84mA	43mA	35mA	16mA
RS422 plus switch versions	100mA	50mA	42mA	N/A
Supply Tolerances	10V - 14Vdc	19V - 29Vdc	19V - 29Vac	90V - 264Vac

\*Standard product safety rating 100 - 240Vac

## POWER ON TEST



- Front LED will flash 5 times and rear LED will stay on for 1 - 2 seconds

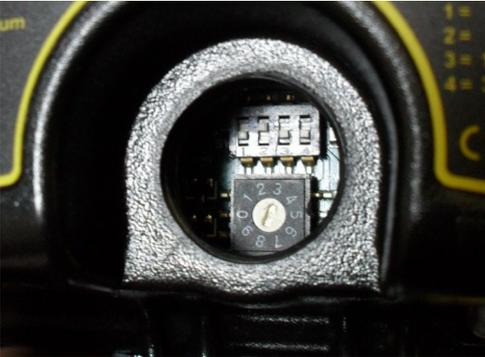
# USER CONFIGURATION

## SETTING SWITCH PARAMETERS

### ROTARY SWITCH FUNCTIONS

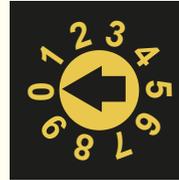


- Remove blanking plug using 8mm hex key to gain access to rotary and DIP switches.



- Select settings required.
- Replace and tighten blanking plug securely.

Rotary switch (10-way)



Rotary switch position	Low speed threshold kph	Rotary switch position	Low speed threshold kph
	4		55
	8		90
	10		95
	30		120
	50		RS422 Mode switches in-operable

agd-systems.com.au

# USER CONFIGURATION

## DIP SWITCH FUNCTIONS

### DIP Switch (4-way)

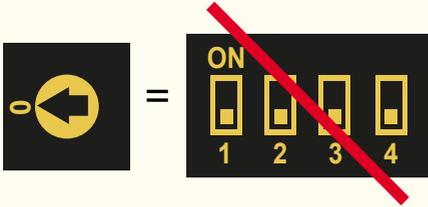


DIP Switch number	Parameter	Switch off value (bottom position)	Switch on value (top position)
<p>A diagram showing four DIP switches labeled 1, 2, 3, and 4. Switch 1 is in the 'ON' position (top), while switches 2, 3, and 4 are in the 'OFF' position (bottom).</p>	Detection direction <i>Detect targets that are...</i>	Advance only	Bi-directional
<p>A diagram showing four DIP switches labeled 1, 2, 3, and 4. Switch 2 is in the 'ON' position (top), while switches 1, 3, and 4 are in the 'OFF' position (bottom).</p>	Front detect LED <i>Illuminate during detection?</i>	No	Yes
<p>A diagram showing four DIP switches labeled 1, 2, 3, and 4. Switch 3 is in the 'ON' position (top), while switches 1, 2, and 4 are in the 'OFF' position (bottom).</p>	Sensitivity / range	Medium (Typically up to 100m for a saloon car)	High (Typically up to 150m for a saloon car)
<p>A diagram showing four DIP switches labeled 1, 2, 3, and 4. Switch 4 is in the 'ON' position (top), while switches 1, 2, and 3 are in the 'OFF' position (bottom).</p>	Hold time <i>Time to hold in detect state after targets have passed</i>	0.5 sec	2 sec

## SWITCH FUNCTIONS

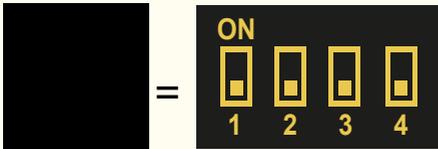
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### RS422 Mode (switch override)



Switch bank **disabled**

When the rotary switch is set to <0>, all switches become inactive. RS422 commands configure the unit.

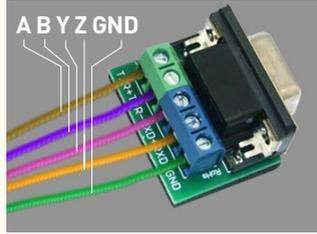


Switch bank **enabled**

When the rotary switch is set to a value other than <0>, switches control the unit. Related RS422 commands are inaccessible.

# USER CONFIGURATION

## RS422 VERSION - CONNECTING THE RADAR TO A COMPUTER



- Plug the USB and RS422 converter cable CA-250 into the USB port of your computer.
- Connect the ten-way RS422 cable from the radar to the terminals of the D-type wireable socket making reference to the Power & Wiring section on P6.
- Connect the 9-pin D-socket to the 9-pin D-plug of CA-250.

## RS422 - PREPARING THE CONNECTION

A terminal emulator is needed to use RS422 commands. The software allows the computer to send and receive serial commands with a unit. AGD's recommended software can be downloaded and installed from [www.agd-systems.com/teraterm](http://www.agd-systems.com/teraterm). Common alternatives include HyperTerminal and PuTTY.

The product and firmware version will be reported via RS422 using the radar's default baud rate of 9600. If a different baud rate has been requested or set then the radar will report this value.

{see \*BAUD command on page 19}

The product will always respond to the "AGD" command via RS422.

All outgoing commands should end with a carriage return <CR> character; this is typically the enter/return key of a keyboard, though may be an advanced option in some emulators.

See Command Details section for more details.

### SERIAL PORT CONFIGURATION

Parameter	Setting
Baud rate (BPS)	9600
Data bits	8
Parity	None
Stop bits	1
Flow control (handshaking)	None

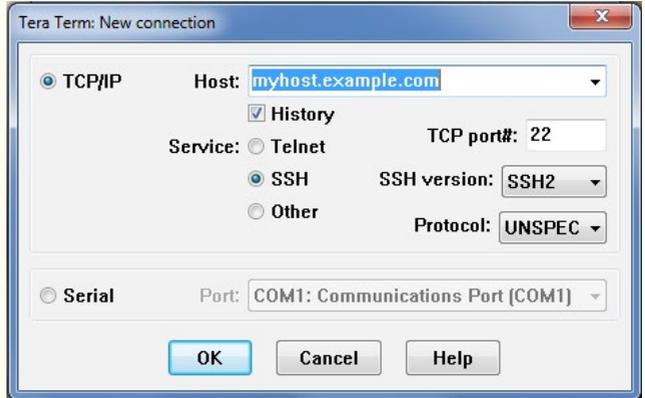
# USER CONFIGURATION

## TERMINAL SETUP

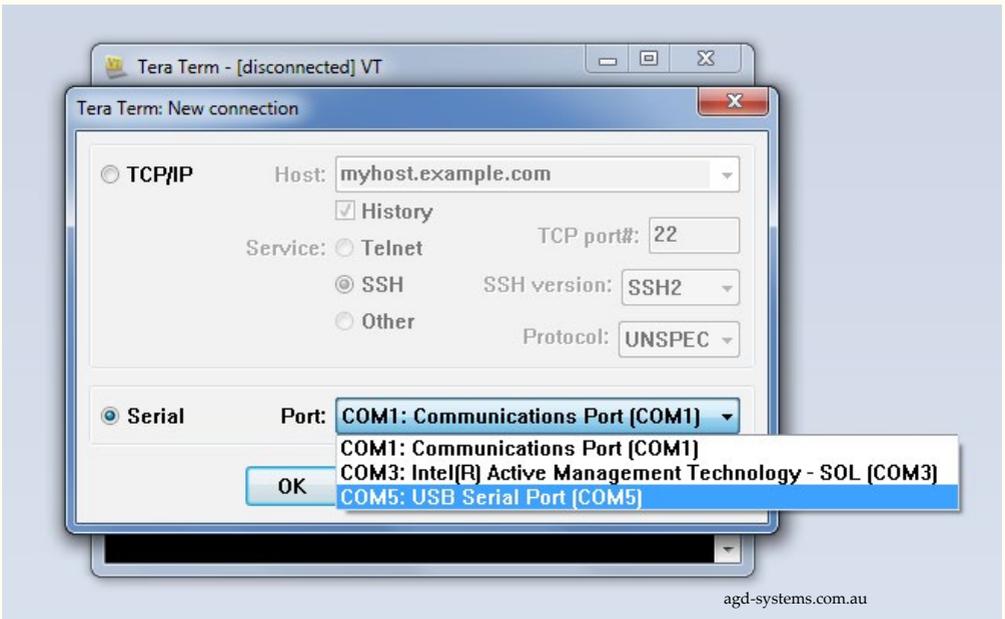
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The following Tera Term screenshots will show how to set up and configure the 307 radar detector. These screenshots were produced using the following terminal settings, in order that the commands sent to the 307 would be shown on the terminal screen along with the responses from the radar.

1: Upon opening TeraTerm, you will be presented with the following window



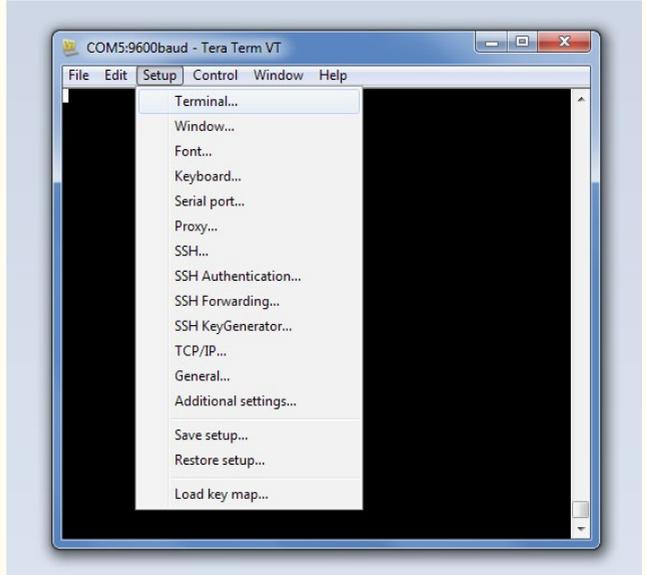
2: Select the "Serial" option and choose which COM port you require



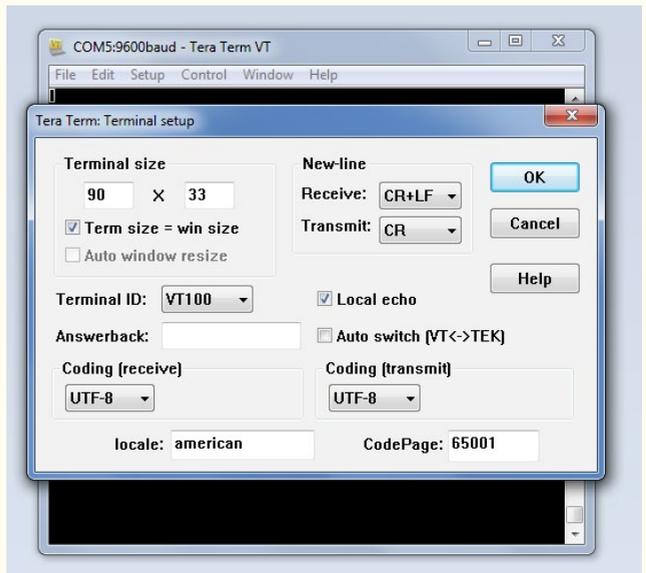
## TERMINAL SETUP

---

3: In the main window, select 'Setup' from the top menu and left click on 'Terminal'



4: In the Terminal setup window, ensure that Receive is set to CR+LF and that local echo is active



# USER CONFIGURATION

## TERMINAL SETUP

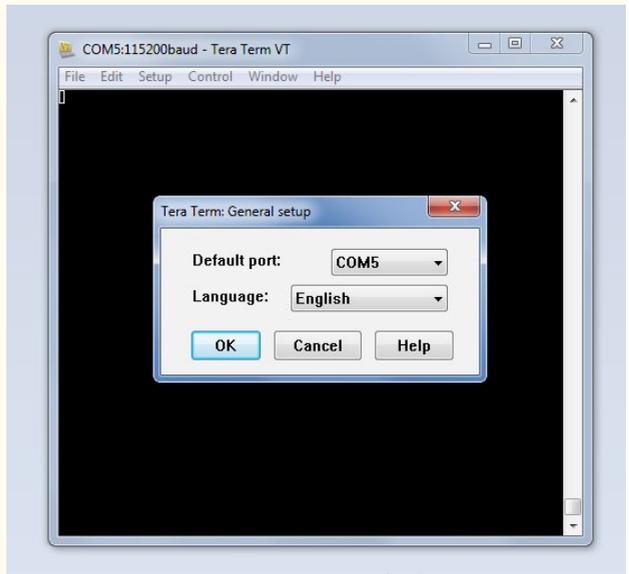
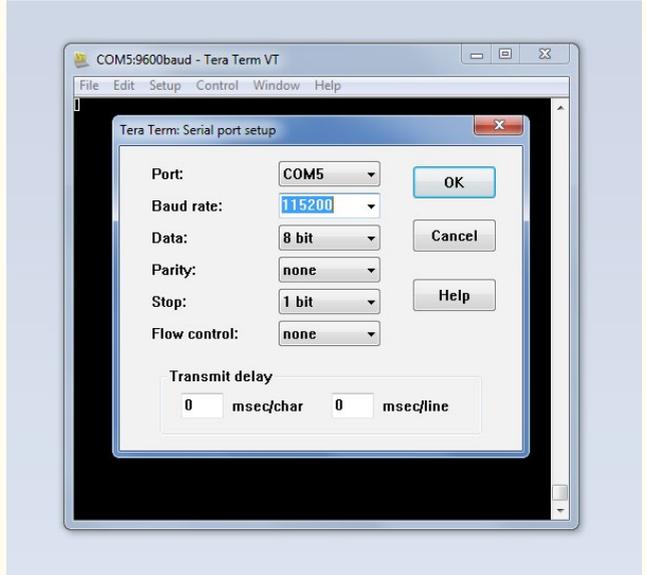
5: In the main window, select 'Setup' and 'Serial port setup'. Ensure that the correct COM port is selected and that the options are configured as below;

### SERIAL PORT CONFIGURATION

Parameter	Setting
Baud rate	9600
Data bits	8
Parity	None
Stop bits	1
Flow Control (handshaking)	None
Transmit Delay	0

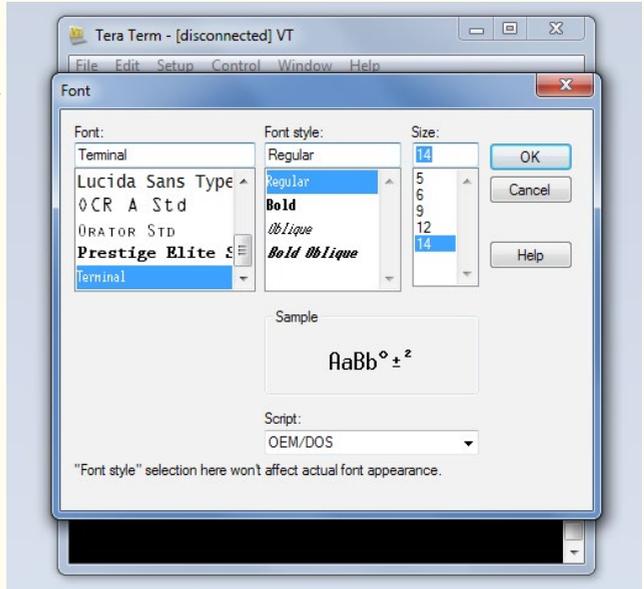
Note that the baud rate contained in this table is indicative of the factory default setting and not necessarily what the radars RS422 interface is set to.

6: In the main window, select 'Setup' and 'General setup'. Ensure that the correct COM port is selected and use the drop down menu to select your required language.



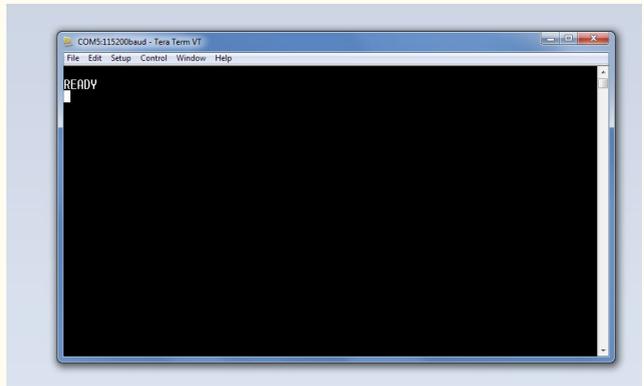
## TERMINAL SETUP

7: If you find the display to be too small or difficult to read, select 'Setup' and 'Font' and set the font size to suit your needs.

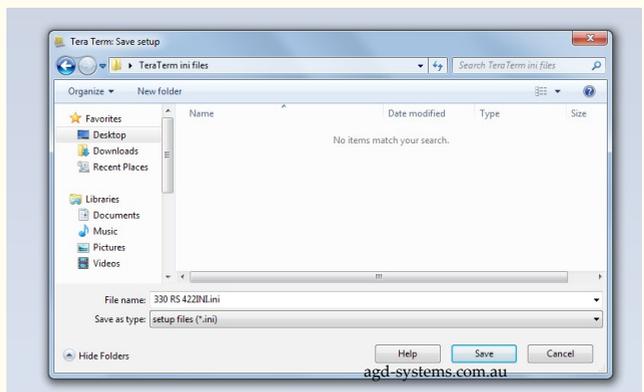


8: Once you have configured TeraTerm correctly, and the 307 is connected to your computer and powered up, press the ENTER key and TeraTerm should display the READY message.

Once you have confirmed that the COM port is configured and working correctly, it is possible to save the current settings of the emulator. This will allow you to quickly re-load the parameters you have set in order to facilitate greater ease of maintenance.



9: In the main window, select 'Setup' and 'Save setup'. Select the location where you want to save the \*.ini file, confirm the filename and click 'save'.



10: If you want to restore a previous connection, select 'Setup' and 'Restore setup'. Navigate to the folder in which you have previously saved the \*.ini file and select the required file. TeraTerm should now be configured as per your previous session.

# USER CONFIGURATION

## TEST CONNECTION

---

Test the connection by typing AGD and pressing the <Enter> key. The detector will respond with model and version details. If not, check communication and power cables and ensure Tera Term is configured correctly from the previous steps.

```
AGD
```

```
AGD
```

```
AGD SYSTEMS LTD AGD 307  
RADAR Version MI-122-X  
- 04th August 2011
```

## RS422 COMMAND EXAMPLES

---

Examples:

**SET =**

Change a parameter to the specified value

```
*L0WSPEED=16
```

```
#L0WSPEED=16
```

```
█
```

**QUERY ?**

Show a parameter's value without changing it

```
*L0WSPEED?
```

```
#L0WSPEED?4
```

```
█
```

**ACTION !**

Run a preset operation (often affecting a group of parameters)

```
*SAVE !
```

```
#SAVE !
```

```
█
```

**INFO \$**

Show more information on a command or parameter

```
*L0WSPEED$
```

```
#L0WSPEED$Targets At/  
Above this threshold  
are reported (Km/Hr
```

```
█
```

**DEFAULT ^**

Set a parameter back to its default value

```
*L0WSPEED^
```

```
#L0WSPEED^16
```

```
█
```

## RS422 COMMAND STRUCTURE

---

- Most commands start with an asterisk <\*>
- The radar responds using a hash <#> prefix
- Commands are sent to the radar using the <Enter> key. (Terminated by the carriage return character <CR>)
- The radar will send a <CR> at the end of its response

```
*<COMMAND SENT BY USER>  
#<VALIDATION OF COMMAND FROM RADAR>
```

Commands are built from a few basic blocks:

Suffix Character	Action	Description
?	Query	Get current value or status information
=	Set	Set new value
\$	Info	Get more information about command
^	Default	Set value to default
!	Do	Action / Execute the command

# USER CONFIGURATION

## RS422 COMMAND LIST

Command	Suffix	Function	Min value	Max value	Units, resolution or values
* BAUD	? = \$ ^	Baud rate (bits per second) of RS422 connection	0	4	1 = 9600 2 = 19200 3 = 115200 4 = 230400
* BIDI	? = \$ ^	Report targets travelling in the chosen direction to /from the detector	0	1	0 = advance only 1 = advance & recede
* DETECTTHRESH	? = \$ ^	Sets sensitivity of the radar to detect valid targets. Higher sensitivity provides extended range.	0	1	0 = medium (normal range) 1 = high (long range)
* FACTORYDEFAULTS	! \$	Restore factory defaults for all parameters	-	-	-
* HELP	? \$ ^	Display help for user commands	-	-	-
* HOLDTIME	? = \$ ^	Time to hold in detect state after targets have passed	0	32766	In milliseconds
* LED	? = \$ ^	Use front LED during detect state	0	1	0 = off 1 = on
* LOWSPEED	? = \$ ^	Speed threshold above which targets are reported	4	120	kph
* MM	? = \$ ^	Output speed message mode	1	3	1 = fastest track 2 = longest track 3 = avg speed of longest track
* MS	? = \$ ^	Output speed message format	0	12	Please refer to Command Details section
* MONITOR	? = \$ ^	Monitor fault timeout / time since last detect	0	32766	In minutes, where 0=off
* REBOOT	! \$	Restart the detector software - uses parameter values from last *SAVE!	-	-	-
* SAVE	! \$	Remember settings on next power-up. (commit all parameters to non-volatile memory)	-	-	-
* NUDGE	? = \$ ^	Prompt controller for demand by briefly entering detect state. Occurs every 150sec after last detection.	0	1	0 = off 1 = on

 Command applicable to optional version

AGD		Report radar model and version	-	-	-
-----	--	--------------------------------	---	---	---

## RS422 COMMAND DETAILS

---

### AGD

All AGD detectors respond to the basic AGD command. Each unit will respond with specific model details and firmware version.

Typical response – AGD SYSTEMS LTD 307 Radar Version MI-122-X 30th August 2011

### \*BAUD

The RS422 output can operate at a number of baud rates. When setting a new baud rate, the unit will acknowledge the request at the current baud rate, before switching to the new value.

A power-cycle or \*REBOOT! command is not normally required after the \*BAUD= command.

Typical response – #BAUD?1

### \*BIDI

An advancing target is one that travels towards the front-face of the detector. A receding target is one that travels away from the front-face. The 307 can be configured to report advancing targets only, or both advancing and receding targets. Note that this parameter is also accessible via the switch settings.

Typical response – #BIDI?0

### \*DETECTTHRESH

Select '0' = medium setting (less sensitive i.e. shorter range typically 100m for a saloon car) or alternatively select '1' = high setting (more sensitive i.e. longer range typically up to 150m for a saloon car). Note these settings are synonymous with the RS422 commands if using this option.

Typical response – #DETECTTHRESH?0

### \*FACTORYDEFAULTS

This command will set all parameters back to their default values and commit them to flash memory. A \*SAVE! command is not required after issuing this command.

Typical response – #FACTORYDEFAULTS!Done

### \*HELP

This displays a table of valid commands along with a short description of each.

Typical response – #HELP...

### \*HOLDTIME

Hold Time states how long the unit stays in detect after the target has left its field of view. Hold Time is expressed in milliseconds, where 1000ms = 1s. Note that this parameter is also accessible via the switch settings.

Typical response – #HOLDTIME?500

## RS422 COMMAND DETAILS

---

### \*LED

This command will determine whether the front LED is illuminated during a detect state. Note that this parameter is also accessible via the switch settings.

Typical response – #LED?0 where 0 = off and 1 = on

### \*LOWSPEED

This command accesses the Low Speed threshold/cutoff in kph. The radar will ignore targets travelling below this value, and respond when a target is detected above this speed.

Typical response – #LOWSPEED?33

### \*MM

This command states which value to output over an RS422 connection, where:

- 1 = Instantaneous speed of the fastest target
- 2 = Current speed of the oldest/longest target tracked (recommended)
- 3 = Average speed of the of the oldest/longest target tracked

Typical response – #MM?1

### \*MS

This command dictates how the radar reports targets over an RS422 connection. It offers a number of speed message formats at varying Frames Per Second (fps), or one per detect state.

Note that 'd' represents a decimal digit and 'x', a Hex character:

0	none	
1	DCFMSxx.xx	20 fps
2	dd	20 fps
3	*Sddd	20 fps
4	DCFMSxx.xx	10 fps
5	dd	10 fps
6	*Sddd	10 fps
7	DCFMSxx.xx	5 fps
8	dd	5 fps
9	*Sddd	5 fps
10	DCFMSxx.xx	one per detect state
11	dd	one per detect state
12	000,0000000000,A,ddd,-,-,-,-,-,-,-	once per second

## RS422 COMMAND DETAILS

---

### **\*MONITOR**

The monitor fault timeout is measured in minutes. If used, the unit will enter a 'fault state' (permanent detect) when no targets have been detected for this consecutive number of minutes. Advancing or receding targets travelling above or below the low speed threshold will reset the monitor timer. The default setting for monitor is off. (i.e. 0 minutes)

Typical response – #MONITOR?0

### **\*REBOOT**

The detector will shut down and restart its firmware as if being turned on. The parameter values will be loaded from the most recent \*SAVE! (or \*FACTORYDEFAULTS!)

Typical response – #REBOOT!...

### **\*SAVE**

The 307 needs its settings to be saved after adjustments have been made. Changes not committed with the \*SAVE! command will be forgotten on the next power-cycle or \*REBOOT!. To maximise the detector's flash memory, this command should only be used when changes have been made.

Typical response – #SAVE!Done

### **\*NUDGE**

The NUDGE facility is primarily intended for temporary traffic applications. It is designed to prompt the controller for green-time even though no targets are present. When enabled, the detector enters a full detect state for 700ms, every 150seconds without a valid target. A valid target will cause a normal detect state, zeroing the 150sec timer.

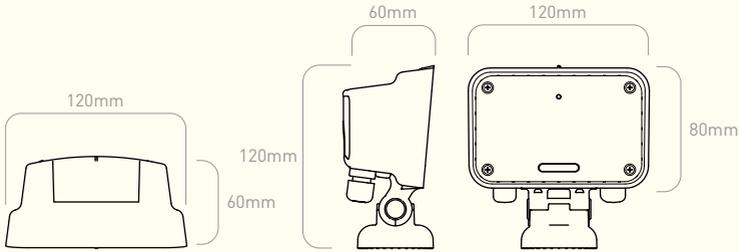
Typical response - #NUDGE=1

## SERIAL OUTPUTS

---

Please refer to the **\*MS** command within the "Command Details" section

# TECHNICAL SPECIFICATIONS



## SPECIFICATIONS

<b>Technology</b>	CW Doppler Radar
<b>Frequency</b>	K-band 24GHz
<b>Range/Zone</b>	Up to 150m (user selectable)
<b>Mounting Height</b>	2-5m nominal
<b>Low Speed Threshold</b>	4 kph to 120 kph (user selectable)
<b>Direction</b>	Advancing or bi-directional (user selectable)
<b>Weight</b>	0.4 Kg nominal
<b>Housing Material</b>	Polycarbonate (UL94 V-2)
<b>Housing Finish</b>	Self coated black
<b>Sealing</b>	IP65
<b>Operating Temperature</b>	-25°C to +60°C
<b>Power Supply</b>	12Vdc /24Vac/dc/230Vac (see Power Options P7)
<b>Detect Output</b>	Opto-Isolator/Relay/RS422 (speed output)
<b>Configuration Interface</b>	DIP switch and rotary switch access on rear face or optional RS422
<b>MTBF</b>	Based on a similar product for which we have field data from 10,000 units installed over 3 years we are able to provide with a 90% confidence that the AGD 307 will achieve an MTBF of greater than 20 years.
<b>EMC Specification</b>	EN301-489 and BSEN50293
<b>Radio Specification</b>	ETS 300.440
<b>Electrical Safety</b>	EN60950

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



Restriction on Hazardous Substances

## TROUBLESHOOTING

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Please refer to the safety warning at the end of this manual.

### **Power on LEDs do not flash during start-up**

1. Make sure the unit is wired correctly to the power source. An incorrect connection may cause unexpected or dangerous behaviour.
2. Operating voltages are labelled at the top or rear of the unit. Ensure the power source is able to output a suitable voltage.
3. Where applicable, ensure the power source is current limited to a reasonable value. The unit may draw twice the typical operating current during start-up.
4. Successfully powering a servicable unit may confirm a fault with another. Please contact AGD for further advice.

### **Toggling a switch has no effect / A valid command returns an error**

1. When the rotary switch is set to <0>, all switches become inactive. RS422 commands configure the unit.
2. When the rotary switch is set to a value other than <0>, the switches control the unit. Related RS422 commands are inaccessible.

### **Unit will not output on RS422 connection**

1. Ensure the unit is powered on. Check the front power-on LED flashes 5 times during start-up.
2. Ensure the detector is wired correctly into an RS422 serial interface. Note that RS232 uses different connections and voltage levels than RS422. For this reason most RS232 interfaces will not be suitable.
3. When the unit receives an AGD command it will always return a legible response. Send an AGD command to ensure the serial connection is setup correctly. Try sending at each baud rate to identify whether unit has changed from the default value.
4. If interfacing to a sign or controller, use a known-good laptop to confirm both the unit and controller work independently. This may help to identify the source of a problem.

### **Unit does not detect vehicles / not output speeds**

1. Ensure the unit is powered on. Check the front power-on LED flashes 5 times during start-up.
2. Ensure the low speed threshold is set to a suitable value. Only targets travelling at or above the low speed threshold will cause detects.
3. The rear detect LED will always illuminate during detect. This should be used as a reference for when the unit is in detect. The front detect LED is configurable and may not be enabled.
4. When monitoring an opto / relay output, ensure they are connected correctly to external equipment. The common line must always be used whether normally open or normally closed is required. Check that the outputs toggle when the rear detect LED changes.
5. When monitoring RS422 speed message outputs, ensure the serial connection is setup correctly. Sending an AGD command will always prompt a legible response. Speed messages will only be output when the unit is in detect. Speed messages are enabled with the \*MS command.
6. Detecting smaller or distant targets may require higher radar sensitivity.

## TROUBLESHOOTING

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### **RS422 speed messages cause problems with connected equipment**

1. The \*MS command controls how often the radar sends a speed message. Sending fewer messages each second may help connected equipment.
2. The \*MS command also controls the format of each message. Choosing a format with fewer characters will reduce message overhead.
3. Using a higher baud rate will transmit characters faster. This may offer more time between messages for external processing.

### **Targets occasionally drop / gap during approach**

1. Check the mounting height and alignment of the unit. Radar sensitivity might be reduced at dips or bends in the road. Directing the unit at these areas may improve performance.
2. Even in ideal conditions reflected radar signals naturally fluctuate. Occasionally a 'null point' will cause a target to briefly appear invisible. Using a longer holdtime is the most effective way to reduce this effect.
3. A higher sensitivity setting may also allow more targets to be seen for longer.

### **Unit enters detect without any targets / intermittently**

1. Check the immediate mounting area for potential sources of interference. Unwanted noise may be caused by high-power radio / telecommunication transmissions or very high current / voltages sources. Using the lower sensitivity setting may help to reject such interference. Repositioning the unit or the interference source may be required.
2. Ensure the field of view is free from obstruction. In particular, swaying cables or branches may cause intermittent detection. Increasing the low speed threshold will help to reject such interference. A minimum of 8kph is recommended wherever possible. Increasing to the maximum value suitable will improve performance.
3. Extreme weather may affect radar performance. Hail, snow and heavy rain make it more difficult for the detection algorithms to make accurate decisions. Increasing the low speed threshold and decreasing radar sensitivity will improve reliability.
4. Fast-moving pedestrians, joggers and runners may appear as valid targets to the radar. Raising the low speed threshold and reducing the radar sensitivity will improve pedestrian rejection.

# TRIAL AND EVALUATION

## SET UP TOOLS

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### ALL VERSIONS

307 Radar



Product support



8mm Allen/hex key

### FOR RS422 VERSIONS



CA-250 adapter cable including D-type wireable socket

### ▼ NOT INCLUDED TRIAL KIT



12/24V or 230V Power supply



932 Target simulator



Computer or Laptop

[agd-systems.com.au](http://agd-systems.com.au)

# MANUFACTURING TEST PROCESS

	TEST EQUIPMENT:	<b>SATURN™</b>	 <small>SATURN was designed and developed by AGD Systems.</small>
	PRODUCT TEST:	307   308   330	
	TEST FUNCTION:	<ul style="list-style-type: none"> <li>• Simulated speed range 4-200 kph</li> <li>• Optimisation of frequency signals</li> <li>• Signal size and direction control</li> <li>• Test cycle time 7 minutes</li> </ul>	



**Saturn™** is a bespoke set of test equipment designed and developed by AGD Systems. It is dedicated to the testing of the 307 detector range and 100% of these units manufactured at AGD are Certified by Saturn.

The key test functions performed by Saturn to Certify the premium performance of your Intelligent Detection System are:

- Simulated speed range from 4-200kph
- Optimisation of frequency signals
- Transmitted radar power and frequency measurement
- Radar signal to noise level measurement
- Verification of DIP and rotary switch parameter operation
- >15hr hour burn-in
- Test cycle time of 7 minutes

The AGD designed vehicle radar target simulator which forms part of the Saturn test equipment enables reliable simulation of a range of vehicle speeds in quick succession during the test process. This gives full control of simulated targets' signal size, speed and direction.

Optimisation of frequency signals on Saturn ensures full compatibility with different country requirements within the 24GHz radar operating band.

All DIP switch parameters and detect output LED operation are verified during the test cycle.

## LIFETIME PRODUCT TRACEABILITY

There are clearly defined pass and fail criteria at all stages within the Saturn test process. The test results in association with the product build revision are recorded on a product serial number basis. The full suite of test measurements is instantly sent to the dedicated product database within the AGD secure server facility, providing full traceability during the product lifetime.

The AGD Certified symbol is your mark of assured performance.

# 100%



SATURN is a bespoke set of test equipment designed and developed by AGD Systems dedicated to the testing of the 307 detector range. 100% of these units manufactured at AGD are certified by Saturn

# IMPORTANT SAFETY INFORMATION

## SAFETY PRECAUTIONS

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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 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.



# IMPORTANT SAFETY 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/cm <sup>2</sup> )	3.18μW/cm <sup>2</sup> at 50cm (Note 3)	<50W/m <sup>2</sup> (5mW/cm <sup>2</sup> ) (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/cm<sup>2</sup>, IACP limit of 5mW/cm<sup>2</sup> (at 5cm) and UK CAST limit of 5mW/cm<sup>2</sup>*

*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/cm<sup>2</sup>) is at a point in the field where the radar beam is not properly formed.*

*Note 4 Comparison for product model 307 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.







# DISCLAIMER

While we (AGD Systems) endeavour to keep the information in this manual correct at the time of 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

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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  
INTELLIGENT TRAFFIC SYSTEMS

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