335

VEHICLE DETECTION

Low Power Radar Traffic Detector

AGD CERTIFIED
INTELLIGENT DETECTION SYSTEM

PRODUCT MANUAL

AGD®

nqa ISO 9001 Registered Quality Management UKAS MANAGEMENT SYSTEMS 015

nqa ISO 14001 Registered Environmental Management UKAS MANAGEMENT SYSTEMS 015

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PRODUCT & TECHNOLOGY

AGD CERTIFIED INTELLIGENT DETECTION SYSTEM

335

The AGD335 is a compact FMCW low power digital radar which operates in the K-Band 24GHz.

The radar processing consumes approximately 120mW whilst maintaining the detection range of 140m and update rate of 20Hz.

The power can be reduced further by setting the event update rate accordingly between 12-28Hz.

Configuration of operational parameters is via an RS232 serial interface. Detect output options include opto-isolator and RS232 serial communications.

KEY FEATURES

- Vehicle Presence detection up to 140m
- User configurable Low Speed Thresholds between 10-160kph
- Speeds reported in real-time for Vehicle Actuated Sign display
- Vehicle count functionality available
- Typical current draw less than 20mA at 6Vdc
- Suitable for Battery Power & Solar-Powered Installations
- Advanced parameters for power optimisation
- Optional download accessory (MI-102 speedometer application)
- Patent GB2472559 applies

PRODUCT RANGE

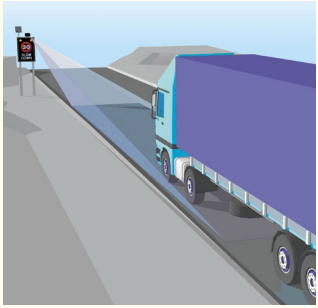
	Series	335-100-000	335-103-000	335-800-000	335-803-000
Options	12V Speed	✓	✗	✗	✗
	12V Speed & Count	✗	✓	✗	✗
	6V Speed	✗	✗	✓	✗
	6V Speed & Count	✗	✗	✗	✓

INTRODUCTION

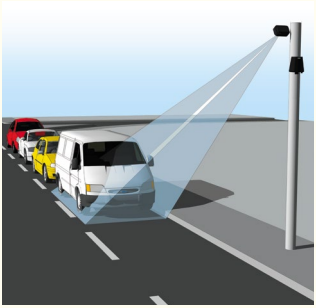
TYPICAL APPLICATIONS

Low Power Applications

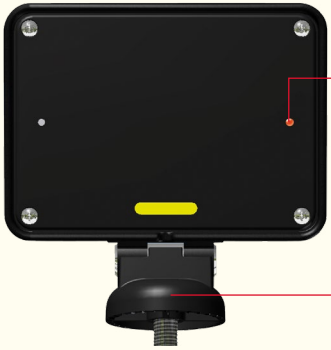
Vehicle Actuated Sign Driver



Vehicle Count



PRODUCT OVERVIEW



Power Up LED

Pan & Tilt
Mounting Foot

Rear Detect LED

RS232 to Laptop

Power Cable
(plus RS232 for TX
Serial Output)

INSTALLATION

QUICKSTART GUIDE

WHAT YOU NEED TO SET UP THE AGD335

The following pages make reference to the AGD335 Trial Kit. If you are not using the detector as part of an evaluation kit, please modify instructions and apparatus accordingly.

INCLUDED IN AGD335 TRIAL KIT

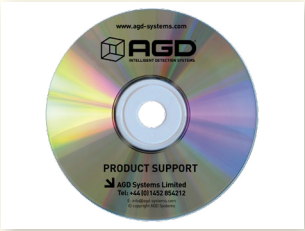
AGD335

CA-183

CA-194

Serial cables to connect the AGD335 to a computer

MS-162 Socket



AGD335 Trial kit disk

Product Manual
(included on disk)

NOT INCLUDED IN AGD335 TRIAL KIT

6V/12V Power supply

Computer or Laptop

INSTALLATION

QUICKSTART GUIDE

1 CONNECTING POWER

Set your power supply to the correct voltage. The radar's voltage of 6V or 12V can be found on the label at the back of the unit.

Connect the red wire from the AGD335 to the positive DC supply. The black wire should be connected to the negative of this same supply.

Once powered, the AGD335 front right LED should flash 5 times.

6V/12V Power supply

AGD335

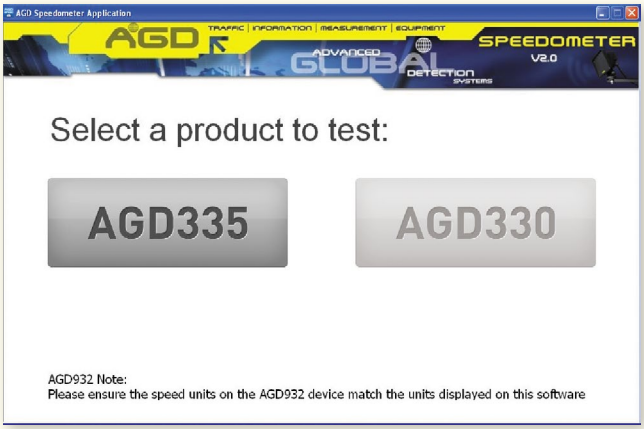
2 INSTALLING THE RADAR DIAGNOSTICS SOFTWARE

Download and install the Radar Diagnostic Software from www.agd-systems.com/downloads or from the AGD335 Trial Kit CD.

Install the Software following the on screen instructions.

Launch the program by clicking the new desktop icon.

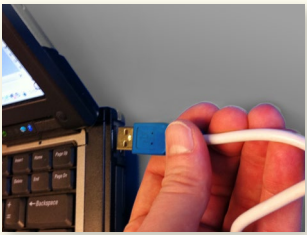
When prompted, select the AGD335 button



QUICKSTART GUIDE

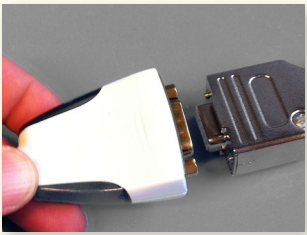
3 CONNECTING THE RADAR TO A COMPUTER

AGD335-100-000 & AGD335-800-000 models;



Plug the USB-end of your CA-194 convertor cable into the USB port of your computer.

Connect the round, blue plug of CA-183 to the AGD335 unit, making sure the plug is screwed down.



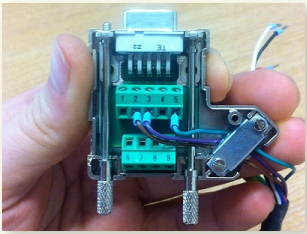
Finally, connect the 9-pin female end of CA-183 to the 9-pin male end of CA-194

AGD335-105-000 & AGD335-803-000 models;

Where the AGD335 has no blue port interface, set up is made via the RS232 connection on the flying lead.

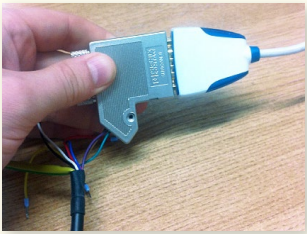
The AGD335 adjustable settings can be configured before connection to the host via a PC interface or directly by the host system, if designed to do so.

For evaluation you can connect the AGD335 directly to the comport via a USB socket on a windows based PC



Connect the following conductors to MS-162

Pin2. Brown
Pin3. Violet
Pin5. Green



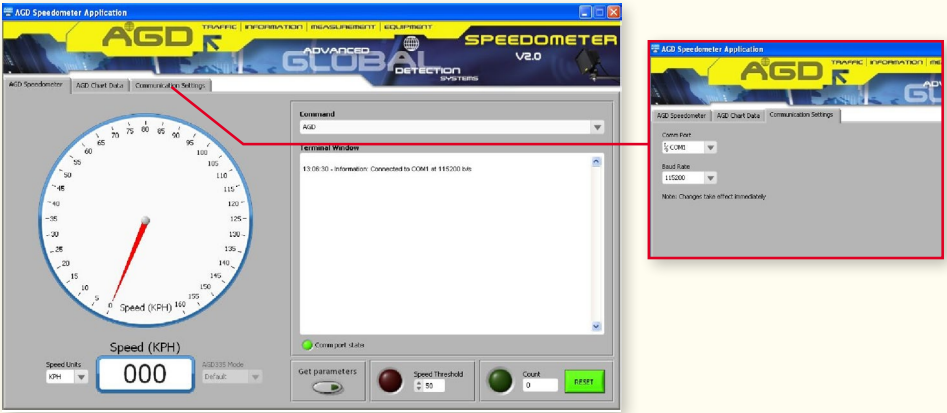
Connect the wired MS-162 to CA-194

Connect CA-194 to the USB on your PC.

For help identifying your computer's COM port, please refer to the Connectivity Section of this manual.

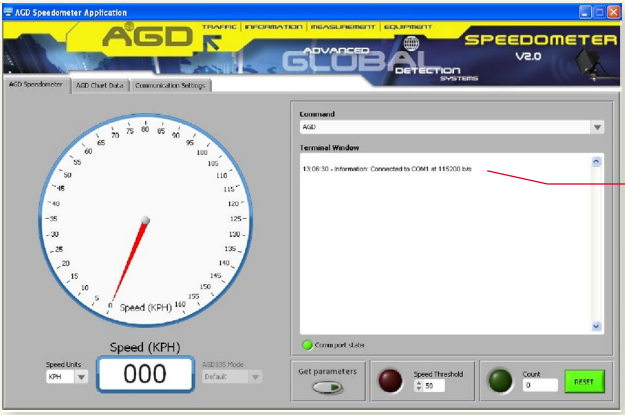
QUICKSTART GUIDE

4 SETTING UP COM PORT USING THE RADAR DIAGNOSTIC SOFTWARE



Having identified the relevant COM Port, select it under the Communications Settings Tab
The software's Baud Rate defaults to 115200 and should need no further adjustment.
You can now select the AGD Speedometer Tab to get real-time radar diagnostics.

5 TESTING THE CONNECTION WITH THE RADAR



Terminal Emulator
(For further guidance please refer to the Connectivity Section)

To test communications with the detector, type AGD into the command line and press <ENTER>
The Radar will respond with its product description in the terminal window.
Please see the User Configuration section for radar commands to set the radar parameters.
The Speedometer needle will reflect the detected speed of any targets.
Please note that hand-wave tests will **not** activate the radar due to its complex nature.

INSTALLATION

MOUNTING HEIGHT, ANGLES, CLEARANCE

The radar should be mounted on a firm structure. The front face of the radar should be vertical i.e. perpendicular to the road before you begin site specific adjustments.

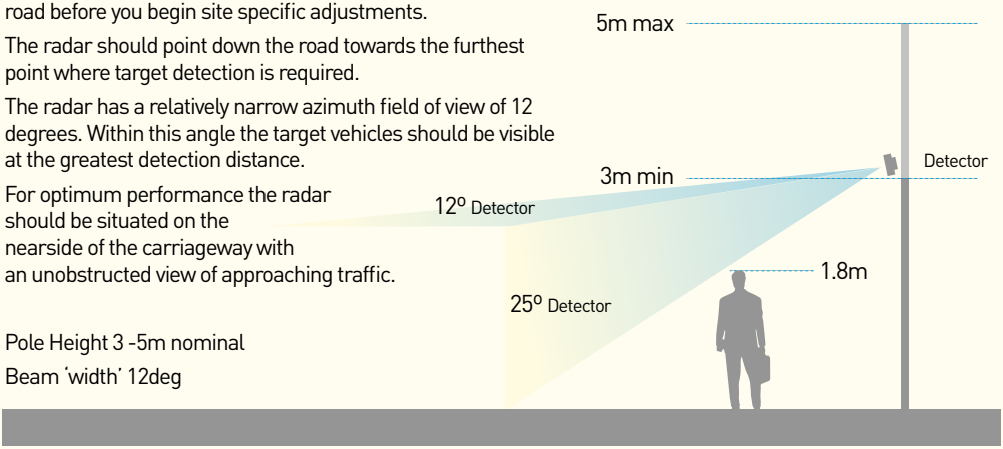
The radar should point down the road towards the furthest point where target detection is required.

The radar has a relatively narrow azimuth field of view of 12 degrees. Within this angle the target vehicles should be visible at the greatest detection distance.

For optimum performance the radar should be situated on the nearside of the carriageway with an unobstructed view of approaching traffic.

Pole Height 3 -5m nominal

Beam 'width' 12deg



POWER & WIRING

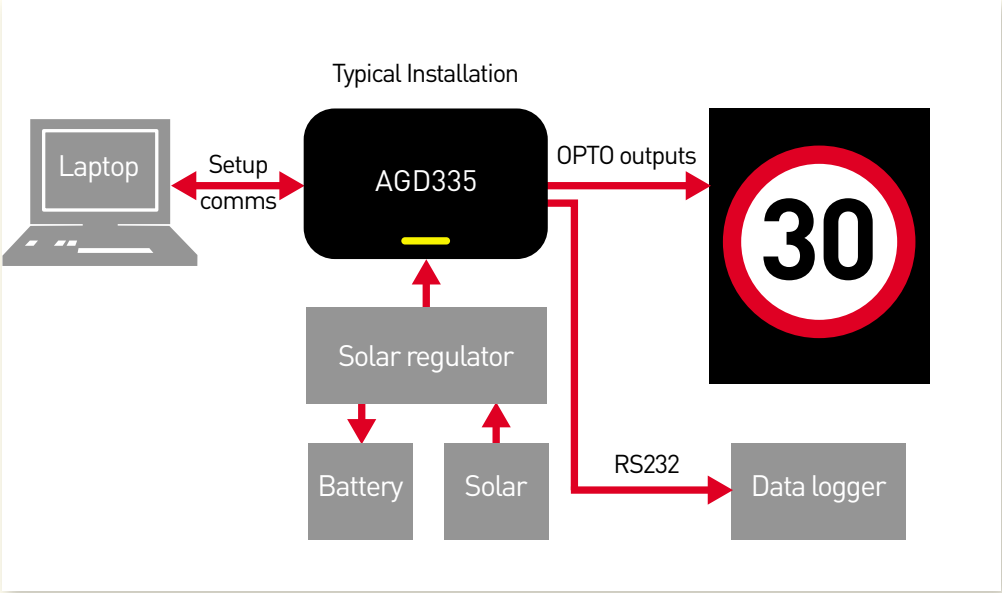
Cable connections for the AGD335 low-power radar are as detailed below.
AGD335-100-000 & AGD335-800-000 models: **5 way** flying lead.
AGD335-105-000 & AGD335-803-000 models: **8 way** flying lead.
The current drawn from the radar is less than 20mA typical at 6Vdc with an update rate set to 20Hz.

Please note the cable screen must be connected to earth.

NB RS232 (PC Rx) line should be held at +5V or -5V to operate correctly. 0V results in nothing being transmitted over the RS232 connection.

Wire Colour	Function	Power Off	Power On-No Detect	Power On-Detect
Red	+6V dc / 12V dc	-	-	-
Black	Vdc Ground	-	-	-
White	Opto Common	-	-	-
Yellow	Opto Contact	N/O	N/C	N/O
Blue	Opto Contact	N/C	N/O	N/C
Green	RS232 Ground			
Brown	RS232 (PC Rx)			
Violet	RS232 (PC Tx)			

TYPICAL INSTALLATION



A typical system can be broken down in to 4 main elements.

- The Power Supply.
- The LED display.
- Data Logger (not always required)
- The Radar.

An Opto output is provided to activate when a valid target is detected above the set threshold. In most applications the Opto switches the control gear to illuminate a Vehicle Actuated Sign or call the appropriate traffic control signal phase, for example.

If fitted, the RS232 bus can be connected to a data logger to capture target data. This communication line is also able to send commands to the detector for configuration.

If the AGD335 does not have an RS232 bus, configuration can be made using the port located at the back of the radar.

CONNECTIVITY

IDENTIFYING COM PORT ON PC

With minor differences, the following instructions can be applied to most Windows versions.

Step 1. Bring up the Computer Management console by right-clicking "My Computer" from the Start Menu and selecting "Manage".

Step 2. Select "Device Manager" from the left-hand tree menu.

Step 3. Within the "Ports (COM & LPT)" heading, select the COM Port you wish to change.

Step 4. Right-click on the selected entry & choose "Properties". Then view the "Port Settings" tab and click the "Advanced..." button.

Step 5. To remap the COM Port assignment, choose a suitable (unused) COM Port within the "COM Port Number" drop-down list. Once completed, select "OK" on each open box, and close the Device Manager.

Note that COM1 & COM2 are typically reserved, though the remainder will only tend to be "in use" if the associated hardware is connected at that time. For example, assigning your USB-Serial cable/convertor to use COM6 will then show COM6 as "in use" whether the cable/convertor is connected or not.

POWER ON TEST (AGD RESPONSE)

When power is established the radar will respond with three actions.

1) Front right LED will flash 5 times
2) Back LED will illuminate for 2 seconds
3) Product and firmware version reported via RS232 port

This report will be done using the radars default baud of 115200. If a different baud rate has been set, the AGD335 will report this value at 115200 before using the set baud rate.

SERIAL CONNECTION

Parameter	Setting
Baud Rate	115200
Data bits	8
Parity	None
Stop bits	1
Flow Control	None

The product will always respond to the "AGD" command via RS232 port.

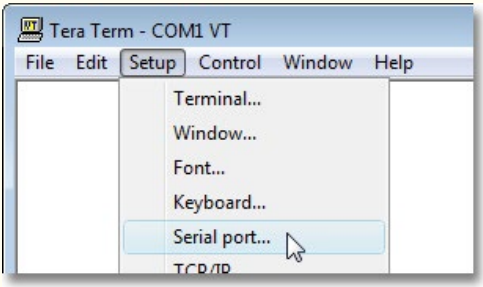
TERMINAL WALKTHROUGH

This guide demonstrates the configuration of a typical Terminal application, Tera Term Pro 2.3 for Windows 95/NT (onwards). This is a license-free serial communication program available from http://www.agd-systems.com/teraterm

The steps below assume that Tera Term has been installed following the onscreen prompts.

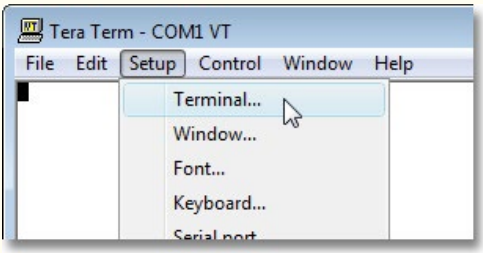
1. SETUP CONNECTION

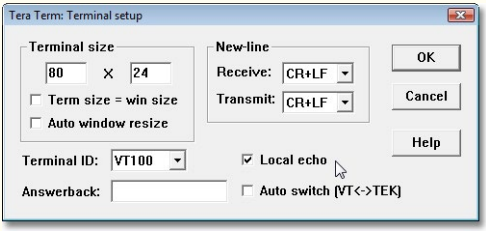
Launch Tera Term and find the menu option to configure the Serial Port. Select the appropriate COM Port & configure the setup as per the screenshot.

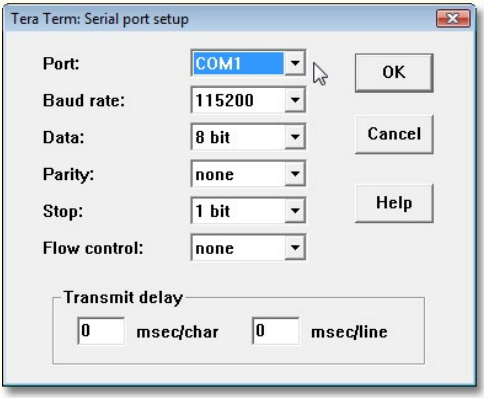


2. SETUP TERMINAL

Find the menu option to configure the Terminal Interface. Setup your system are per the screenshot. This will send & receive messages with the necessary carriage return character & place incoming & outgoing messages onto separate lines.

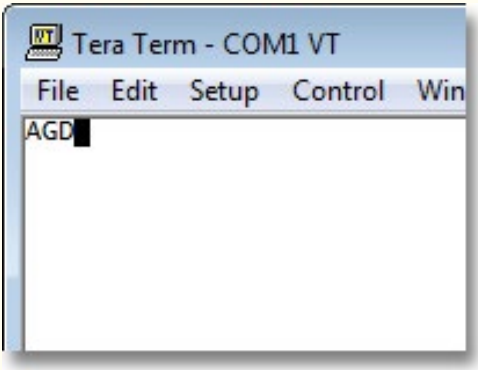


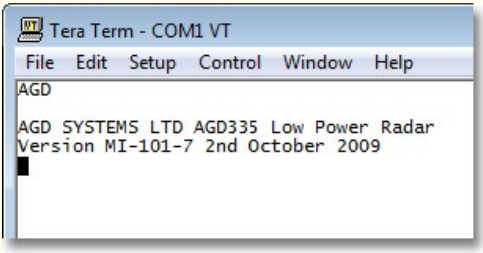




3. TEST CONNECTION

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





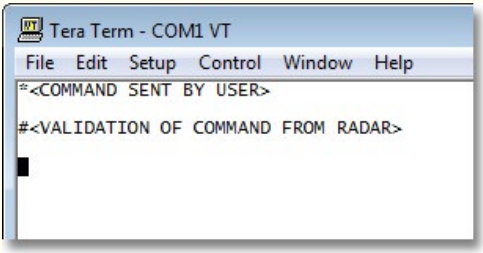
USER CONFIGURATION

COMMAND STRUCTURE

The Radar features user-adjustable Parameters to change the way it operates. These are accessed through Commands, sent via the Serial Connection.

Most commands start with an Asterisk (*).

The radar shows responses to commands using a Hash (#) prefix.

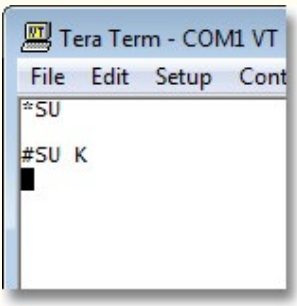
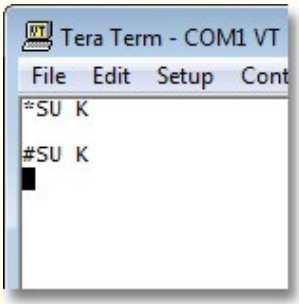
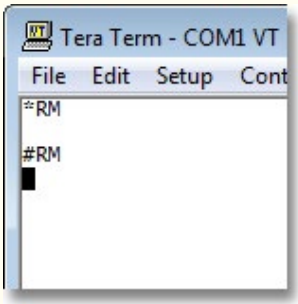


Commands must be terminated with a carriage return character (<CR>), typically sent when using the <Enter> key.

The Radar will send a <CR> (carriage return) at the end of a message.

COMMAND TYPES

There are 3 basic "Types" of commands, refelecting the number of ways to interact with a Parameter:

QUERY	SET	ACTION
Query commands show a Parameter value without changing it	Set commands change a Parameter value	Action commands perform an operation, often on a group of Parameters
		

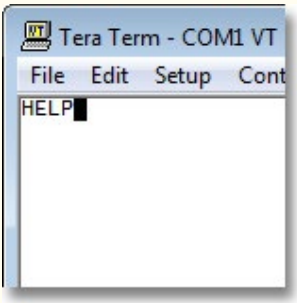
RS232 COMMAND LIST

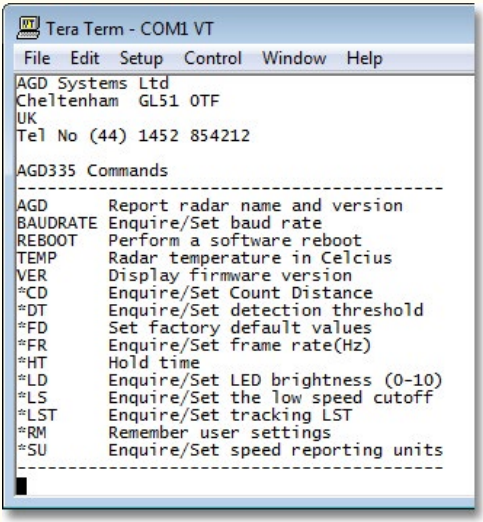
Command	Suffix	Function	Default Value	Min Value	Max Value	Resolution & Units
AGD	?	Report Radar model and version	-	-	-	-
BAUDRATE	? =	Configure Radar's RS232 Baud Rate	115200	9600	-	BPS
HELP	?	View the available commands	-	-	-	-
REBOOT	!	Perform a software reboot of the Radar	-	-	-	-
TEMP	?	Get the Radar temperature in Celsius	-	-	-	-
VER	?	Display Radar firmware details	-	-	-	-
*CD	? =	Set Configure Radar's Count Distance	180	1	499	1 decimeter (0.1m)
*DT	? =	Configure Radar's detection threshold, where lower values are less sensitive than higher	5	0	6	1
*FD	!	Set factory default values	-	-	-	-
*FR	? =	Configure Radar frame rate, Lower values draw less current, though reduces Radar sensitivity	20	12	28	4 Hz increments
*HT	? =	Configure Opto Hold Time - the time the opto is held in detect once a target is no longer in the beam	2000	0	65535	1 millisecond (0.01 sec)
*LD	? =	Configures both front and rear LED brightness, where 0 is off and 10 is the brightest	1	0	10	1
*LS	? =	Configure the low speed cutoff This is the speed below which targets are not reported (OPTO)	16 9	10 6	159 99	1 kph 1 mph
*LST	? =	Configure the low speed cutoff This is the speed below which targets are not reported (RS232)	6	6	99	1 mph
*RM	!	Store user parameters to non volatile memory so that they will be used the next time the radar reboots	-	-	-	-
*SU	? =	Configure radar measurement units.	K	K	M	K = kph M = mph

EXAMPLES

1. GET HELP USING THE RADAR

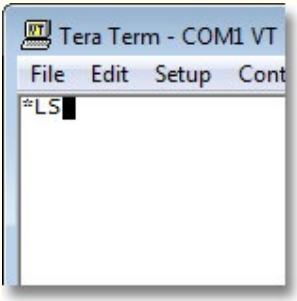
The HELP command Queries the Radar, returning a list of available commands.

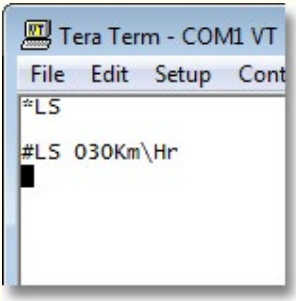




2. QUERYING THE EXISTING LOW SPEED THRESHOLD

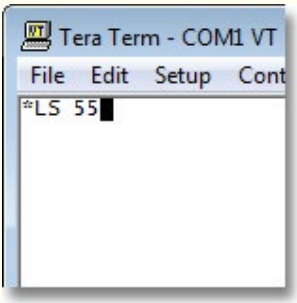
Sending *LS to the detector prompts it to respond with the current Low Speed Threshold.

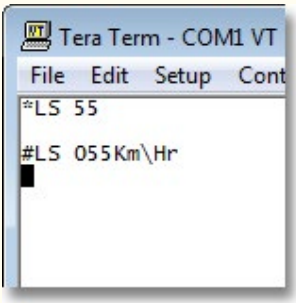




3. CHANGE THE LOW SPEED THRESHOLD

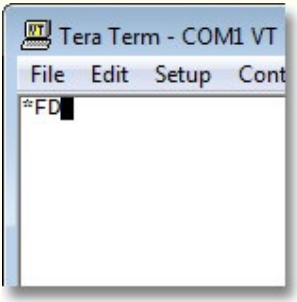
Adding an argument to the *LS command (55 in the example below), the Radar will Set and confirm a new value.

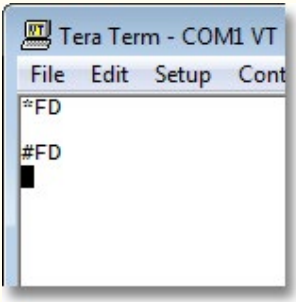




4. SET ALL PARAMETERS TO THEIR FACTORY DEFAULTS

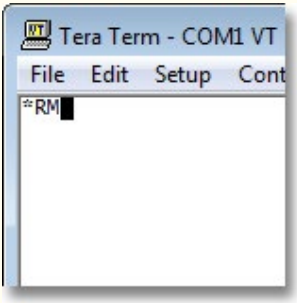
The *FD command Actions the Radar to restore each Parameter to its factory default.

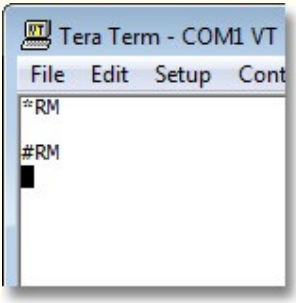




5. SAVE RADAR SETTINGS

Once operating as required, Parameter values must be committed using the *RM command. This Actions the Radar to save all Parameters. They will then be available after a reboot/power-failure.





COMMAND EXPLANATION

AGD <CR>

The AGD335 will respond with the product type and current firmware version

Detectors reply – AGD SYSTEMS LTD AGD335 Low Power Radar
Version MI – 101 – 4 11th March 2009

REBOOT <CR>

The AGD will shut down and restart its firmware as if it is being turned on

Detectors reply – AGD SYSTEMS LTD AGD335 Low Power Radar
Version MI – 101 – 4 11th March 2009

TEMP <CR>

The AGD335 will respond with the current temperature within the radar

Detectors reply - 00025

VER <CR>

The AGD335 will respond with the product type and current firmware version

Detectors reply – 335,APP,MI-101-4,11032009

*CD <CR>

This command will enquire the current value for the count distance (distance from the radar to the location at which count is taken)

Detectors reply - #CD 00180

*CD X <CR>

This command will Set Count Distance to the value of X (for example 150) (distance from the radar to the location at which count is taken)

Detectors reply - #CD 00150

*DT <CR>

This command will enquire the current value for the threshold when a target is seen. (This command can be thought of as range however, targets with greater mass will be seen at a greater distance than targets with a smaller mass)

Detectors reply - #DT 5

*DT X <CR>

This command will Set detection threshold to the value of X (for example 4) (This command can be thought of as range however, targets with greater mass will be seen at a greater location than targets with a smaller mass)

Detectors reply - #DT 4

COMMAND EXPLANATION

*FD <CR>

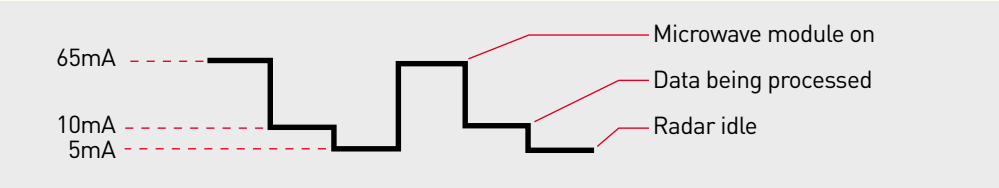
This command will set all values back to default

Detectors reply – Ready

*FR <CR>

This command will enquire the current value for the frame rate
(Frame rate is the number of times the radar's antenna turns on over a period of time to view target information, the greater the frequency the higher the current consumption)

Detectors reply - #FR 020



*FR X <CR>

This command will Set frame rate(Hz) to the value of X (for example 12)
(Frame rate is how many times the radars antenna turns on over a period of time to view target information)

Detectors reply - #FR 012

*HT <CR>

This command will enquire how long the opto stays in demand after the target has left the field of view

Detectors reply - #HT 02000

*HT X <CR>

This command will Set how long the opto stays in demand after the target has left the field of view to the value of X (for example 3)

Detectors reply - #HT 00003

COMMAND EXPLANATION

*LD <CR>

Enquire/Set LED brightness (0-10)
This command will enquire the value of the LED brightness

Detectors reply - #LD 001

*LD X <CR>

This command will set the brightness value for the LED to X (for example 6)

Detectors reply - #LD 006

*LS <CR>

This command will enquire the low speed cutoff value
(The opto will respond when a valid target is detected at or above the value of the low speed cutoff)

Detectors reply - #LS 020Km\Hr

*LS X <CR>

This command will Set the low speed cutoff to the value of X (for example 25)
(The opto will respond when a valid target is detected at or above the value of the low speed cutoff)

Detectors reply - #LS 025Km\Hr

*RM <CR>

The AGD335 requires its settings to be saved to the flash memory after adjustments have been made

This command should only be used when changes have been made to the detectors settings.

*SU <CR>

This command will inquire if the radar is set as kph or mph

Detectors reply - #SU K

*SU K <CR>

Sets the radars to work in kph

Detectors reply - #SU K

*SU M <CR>

Sets the radars to work in mph

Detectors reply - #SU M

LIFE <CR>

Will display life time figures of the AGD335 performance and working conditions such as targets seen and brownouts.

Detectors reply	Power on	00051
	Brown out	00003
	Watchdog	00000
	Software	00012
	External	00000
	Illegal opcode	00000
	Trap reset	00000
	Reboots total	00066

STATUS <CR>

Will list all radar variable settings.

Detectors reply	Low Speed Cutoff	016Km\Hr
	Frame rate	020
	Sensitivity	00010
	Count distance	180
	ADC Count	00080
	Ramp DAC	036
	Offset DAC	096
	LED Brightness	001
	Hold time (ms)	02000
	Noise level	00219
	Tx mode	0002
	Configuration	0013
	Temp comp	+00067
	Error code	00000

SERIAL OUTPUTS

Vehicle speed and count information is sent over the RS232 link. The format of the radar's output is shown below.

Output Message	Format	Comments
Speed Message	*Sxxx<CR>	xxx is the speed of the vehicle in decimal format
Count Message	*C<CR>	A vehicle has been detected at the count distance

<CR> = Carriage return character

TROUBLESHOOTING

I don't see a flashing LED when connecting power

1. Make sure the unit is wired correctly and power supply is set to the correct voltage, & powered on.
2. If a fuse or current limiter is fitted, ensure this is working correctly or set to an adequate value.

I have checked the above & still do not see a flashing LED

It is possible that you may have a faulty unit & it will need to be returned to AGD for inspection.

My unit does not appear to respond to commands

Check that the LED flashes when powering on.

My unit is powered on but will not respond to commands

1. Check the unit is wired correctly for RS232.
2. Check that the correct COM port has been selected on your PC
3. Check that the detector and computer are using the same Baud Rate & port settings.
4. Check RS232 (PC Rx) line held at +5V or -5V. 0V results in nothing being transmitted over the RS232 connection.
5. Check connected to smooth DC power supply. Connection to noisy supplies can result in transmission being blocked.

The Serial output is too fast

1. The speed of serial output is adjustable via the *BAUD command.
2. The rate at which messages are output is dependant on the frame-rate which is adjustable via the *FR command.

My unit won't detect vehicles

1. If you are monitoring the LED for detection confirmation you may need to increase the brightness to suit conditions (via the *LD command).
2. Check the Detection Threshold setting (*DT) , if the value is low increase sensitivity as required.
3. All targets are tracked above the Low Speed Threshold (*LST) value, however only reported above the Low Speed Cutoff (*LS) value. It is important to ensure these are set appropriately where *LST is typically lower than *LS.

Occasional targets are dropped

1. Check the mounting height & alignment.
2. Refer to the Command List to determine current radar parameter settings. Adjust as necessary to suit site topography and operating conditions.

GLOSSARY OF TERMS

VAS
Vehicle Actuated Signs

Bluetooth
Communications protocol that uses low power radio enabling two devices to transfer information

COM port.
Physical connection located on a PC to allow communications using RS232/422/485. A Bluetooth COM port can also be thought of as a Physical connection using Radio waves

<CR> Carriage Return
A command to tell the user to hit the ENTER key

FMCW
Frequency Modulated Continuous Wave

GUI
Graphical User Interface. Software that runs on a PC that is not all text based

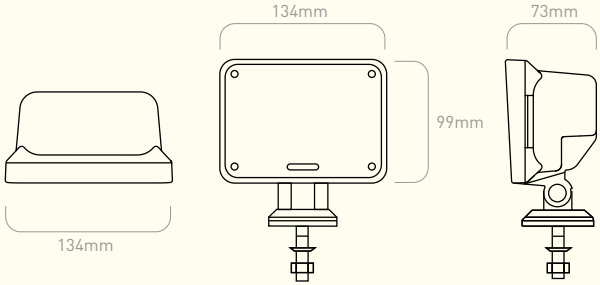
PC
Personal Computer

Tera Term
Freeware terminal emulator application

USB
Universal Serial Bus. Physical connection located on a PC to allow communications between other USB peripherals.

Windows
Microsoft's graphical based operating system that AGD Livewire runs on

TECHNICAL SPECIFICATIONS



SPECIFICATIONS

Technology	Digital Radar
Frequency	K-band 24GHz (see option 1)
Range/Zone	Up to 140m (user adjustable)
Bandwidth	15MHz
Mounting Height	3-5m nominal
Low Speed Threshold	10kph up to 160kph (user adjustable)
Direction	Advance detection
Weight	600g nominal
Product Mounting	Pan and tilt bracket (M10 fixing)
Housing Material	Marine grade aluminium
Housing Finish	Black polyester powder coat
Detect Outputs	Opto maximum voltage 40V Opto maximum current 100mA Opto on state resistance 50Ω Coms version (see option 2)
Sealing	IP67
Operating Temperature	-20°C to +60°C
Power Supply	6Vdc (335-8XX) 5.5V to 7.5Vdc 12Vdc (335-1XX) 9V to 24Vdc
Current	<20mA nominal @6Vdc & 12Vdc
MTBF	>20 years based on field data from 1250 units installed over 4 years
EMC Specification	EN301489-3
User Adjustments via RS232 Comms	• Radar sensitivity (detection range) • Low speed threshold • Speed in kph or mph • Measurement rate (power consumption)
Patent No.	GB 2472559

OPTIONS

1. Frequency option preset to suit local requirements between 24.000GHz and 24.250GHz.
2. RS232 comms output version available.

ACCESSORIES

CA-183 AGD335 RS232 setup port interface cable.

CA-194 USB male type A to RS232 convertor.

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

MANUFACTURING TEST PROCESS

TEST EQUIPMENT:	**HYPERION™**	AGD INTELLIGENT DETECTION SYSTEMS
PRODUCT TEST:	315 | 316 | 317 | 318 | 331 | 335 | 336 | 342	HYPERION was designed and developed by AGD Systems
TEST FUNCTION:	• True range simulation of target • Radar target processing optimisation • Test cycle time 9 minutes • Verification of communication protocols	

Hyperion™ is a bespoke set of test equipment designed and developed by AGD Systems. It is dedicated to the testing of the 'ranging' portfolio of AGD FMCW vehicle radars. 100% of the 335 units manufactured at AGD are Certified by Hyperion.

AGD CERTIFIED
INTELLIGENT DETECTION SYSTEM

FULL RANGE

HYPERION is dedicated to the testing of the AGD portfolio of 'ranging' FMCW vehicle radars. It provides true range simulation and both target speed and direction simulation at a given range

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

- True range simulation of target
- Target speed and direction simulation at a given range
- Radar target processing optimisation
- Transmitted radar power and frequency modulation measurement
- Radar signal to noise level measurement
- Verification of interface and communication protocols
- Test cycle time of 9 minutes

The radar test sequences performed by Hyperion on the radar under test provides a thorough examination of the performance of the 335 radar and specifically the ranging measurement capability provided by the FMCW technology deployed. This gives full control of simulated targets' signal size, speed, direction and range.

Verification of Bluetooth communication to the detector is verified during the test cycle.

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

LIFETIME PRODUCT TRACEABILITY

There are clearly defined pass and fail criteria at all stages within the Hyperion 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.

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.

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/cm^2, IACP limit of 5mW/cm^2 (at 5cm) and UK CAST limit of 5mW/cm^2

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^2) is at a point in the field where the radar beam is not properly formed.

Note 4 Comparison for product model 335 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

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.

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