317

VEHICLE DETECTION

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

317

This product has been designed specifically to measure the speed and range of passing vehicles in multiple lanes. The radar is able to track up to ten target signals in either approaching or receding directions (limited to 5 targets in each direction when using bi-directional mode).

The 317 radar is a frequency modulated continuous wave, FMCW, radar that operates in the 24GHz band.

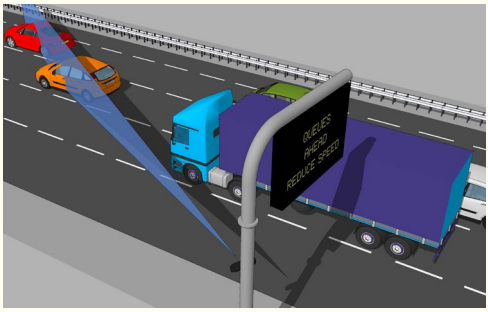
KEY FEATURES

- Speed measurement from 12kph to 300kph across multiple lanes
- Target range measurement from 6-70 metres
- Can discriminate between approaching and receding traffic
- Custom designed planar antenna
- Ease of integration to host system
- High speed RS422 serial communications to host equipment
- Hardware target simulation built into the radar

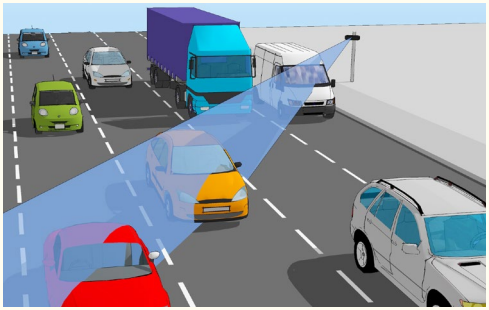
INTRODUCTION

TYPICAL APPLICATIONS

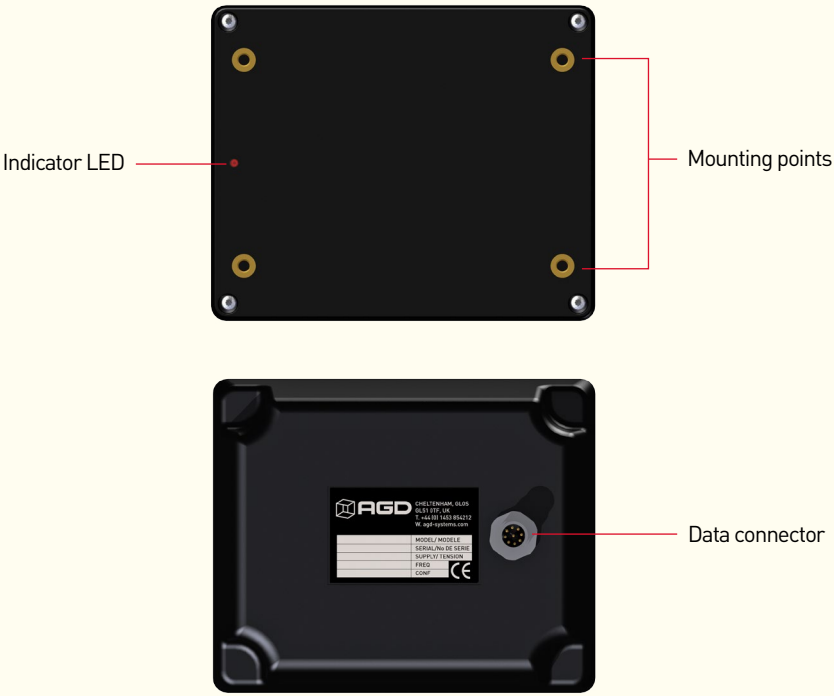
Speed enforcement radar traffic detection - receding



Speed enforcement radar traffic detection - receding



PRODUCT OVERVIEW



RADAR CHARACTERISTICS

The radar has been designed to have a specific set of functional characteristics which make it suitable for range & speed measurements of multiple targets.

RADAR ANTENNA

The antenna design is a planar patch array with the following performance;

Parameter	Specified	Notes
Horizontal Beam-width	7°	-3dB
Vertical Beam-width	28°	-3dB
Side-lobe Suppression	>15dB	
E-Field	Vertical	Plane Polarised

OPERATING FREQUENCY BAND AND POWER

The transmitter is interlocked as a closed loop system with the hardware processor. This enables full monitoring of the transmitter frequency which ensures the transmission remains in the intended transmission band. The design confidence means that the nominal centre frequency of the transmission shall remain within a 10MHz window for the required 7 years for a radar functioning normally.

The change in frequency with temperature is measured to be <140KHz/°C

The radar frequency and power is as follows;

Parameter	Specified	Notes
Centre Frequency	24.125 GHz	
Frequency Modulation	44MHz	
Power	<100mW eirp	
Field Strength	Typically 750m V/m	At 3m
ITU Code	44M0FXN	

RADAR CHARACTERISTICS

FREQUENCY MODULATION

The radar is an FMCW radar where the Frequency Modulation (FM) characteristics give the radar a transmit bandwidth of 44MHz. The FM is such that it is symmetric about the centre frequency of the band it is operating in.

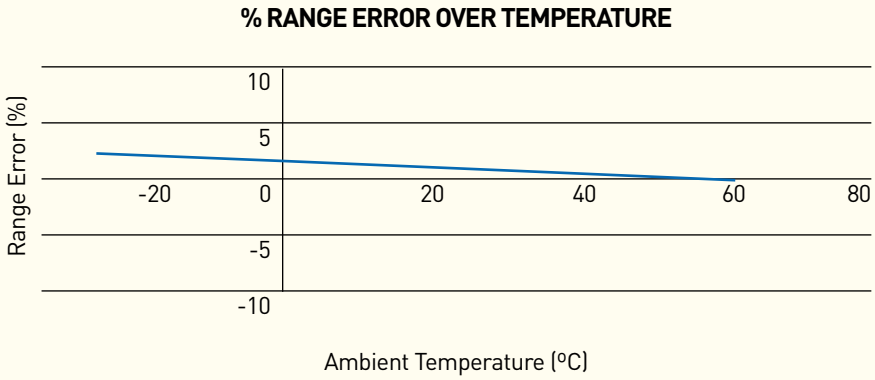
The change in transmit bandwidth with temperature is measured to be typically 30KHz/°C. The stability of the bandwidth over time is anticipated being better than 3% in the first year and lower for each subsequent year.

Bandwidth control over temperature

The bandwidth control over temperature (44MHz at 24.125GHz) has been specifically designed to minimise any range error over the working temperature range.

This performance ensures correct range to target measurement of the radar under the operating conditions.

The following graph illustrates the performance of a typical unit over the temperature range of -30 to +60 degrees.



RADAR PERFORMANCE

Signal to Noise (Detection Range)

A series of radar techniques have been used in the 317 to maximise the signal to noise ratio for a given target. The range performance of the 317 is tested at manufacture by simulation over the range 6 to 70m.

Range Measurement

The range resolution is largely a function of the bandwidth. The range is reported in units of metres. The range of a target is reported to the nearest 0.1m. The range accuracy of any particular measurement is dependent on the signal to noise ratio of the received signals. These can vary by a large amount.

Speed Measurement

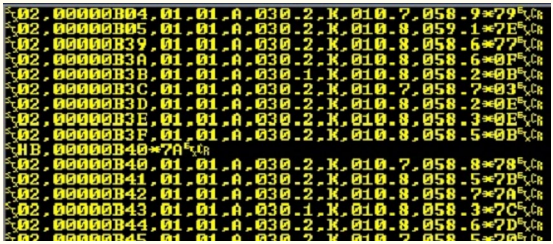
The speed measurement is fully instrumented over the range 12 to 300km/hr in both directions. The speed measurement is reported to the nearest 0.1km/hr and is corrected for the 22° mounting angle as its default setting. The angle can be adjusted with the appropriate command. The speed is reported in Km/hr and there is an option to convert the speed reading to mph with the appropriate command.

Frame Rate

The frame rate of the radar is the rate at which the radar takes speed and range measurements, it is fixed at 48 frames/sec.

Typical Radar Output

The following image shows the typical output from the 317 displaying the 'Target detect' and 'Heart-beat' messages.



RADAR INSTALLATION & ALIGNMENT

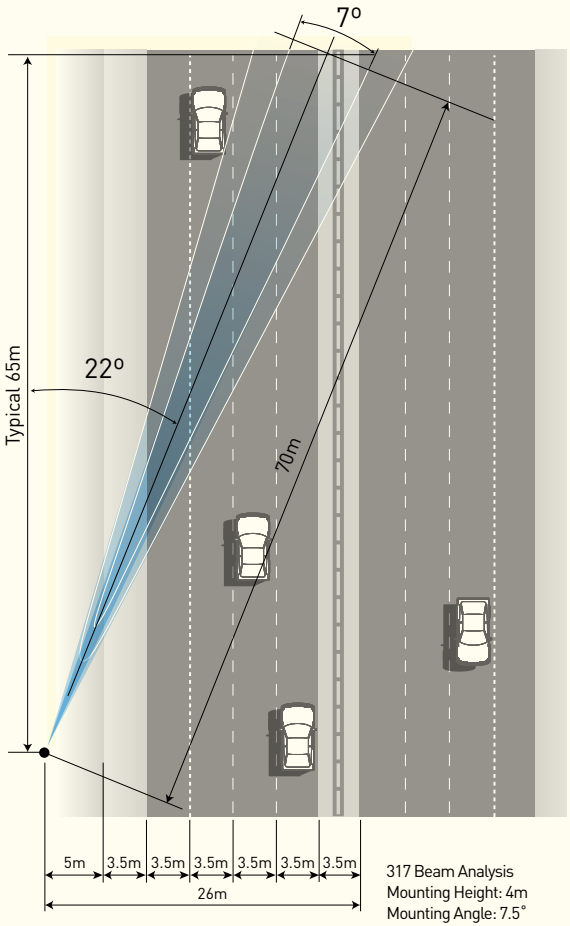
For best detection performance the radar must be setup correctly. Failure to do so can result in inaccurate or false detections.

System Integration

The AGD317-105 has been designed to be used in conjunction with the AGD340 and a host system. It is the responsibility of the supplier of the host system to ensure that data fusion \ correlation of the speed and range data from the AGD317-105 and speed data from the AGD340 is done in such a manner as to be 'fit for purpose'.

Radar Mounting Angle

Radars are supplied factory programmed to be used for a specific mounting angle, usually to 22 degrees. This angle is the angle the radar points across the road from the direction of the road (see diagram). The command *ANGLE may be used to query or set the angle. This angle is used by the radar to adjust the speed the radar measures to the actual target speed and therefore it is important the radar is setup with the correct angle. If the radar is setup with an angle that is less than the mounting angle then the radar will measure speeds that are larger than the vehicles true speed, while if the angle is greater than the mounting angle the radar will measure speeds that are less than the vehicles true speed.



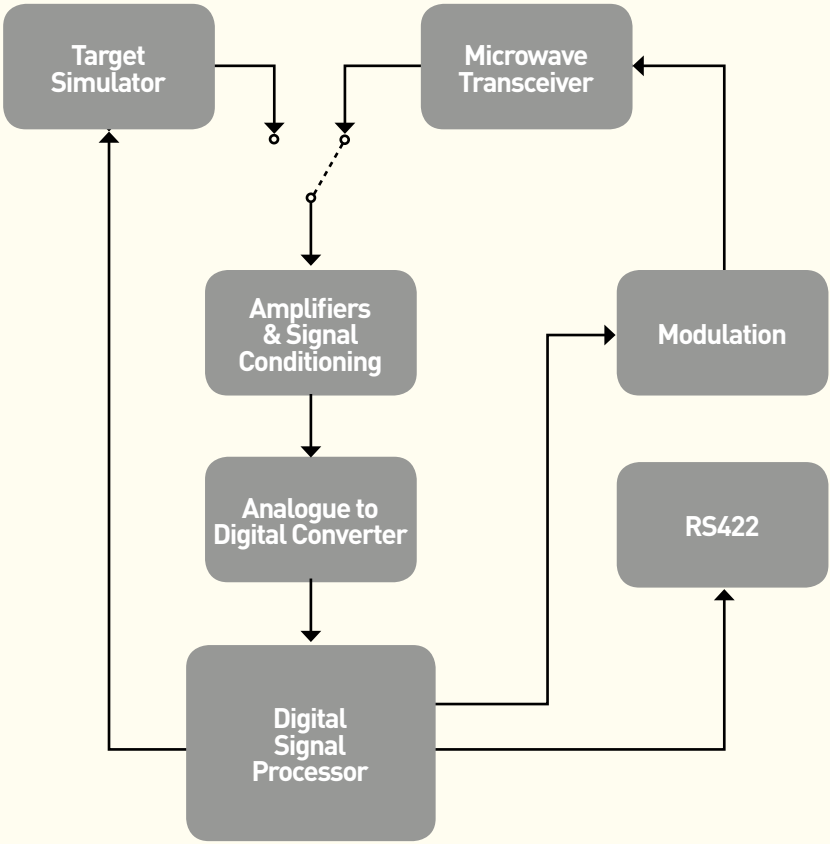
317 Beam Analysis
Mounting Height: 4m
Mounting Angle: 7.5° below horizontal
Targets: vehicle reflection assumed from a height of 1m

The radar transmits a radio beam across the road that has a horizontal beam width of ~7 degrees. The vertical beam width of the radar beam is relatively large at 28degrees so although the radar should be made level this is not crucial for correct operation. For a fixed camera installation often the radar is mounted relatively high (~3m) and in this case it is desirable to point the radar more down towards the ground. In this application careful consideration of the radar beam and its shape is required to ensure that all the lanes of the road are covered.

Mounting Height

The radar should be mounted at a height of between 1 and 3 metres. Mounting at a height >3 metres is not precluded dependant on the minimum offset adopted.

SYSTEM HARDWARE OVERVIEW



RS422 SERIAL INTERFACE

A UART interface is provided that uses RS422 voltage levels on the communications connector. At power-on a Boot-loader program is executed and uses a fixed Baud rate of 115200,N,8,1. The Boot-loader executes the main application code which uses a default baud rate for of 460800 8 data bits with odd parity. The Baud rate of the application code may be changed using the *BAUD command to speeds of up to 921600. The baud rate settings are saved into non-volatile memory of the radar ready for the next time the radar is powered on.

The serial interface default setup during normal operation is shown in the table below.

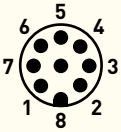
DEFAULT UART SETTINGS	
Parameter	**Value**
Baud rate	460800
Data bits	8
Parity bits	odd
Stop bits	1
Flow control	None

The RS422 provides the primary output of the radar in the form of ASCII messages.

Connector

The connector on the rear of the 317 is a Lumberg RSFM 8/0.5 M

8 Poles

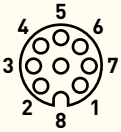


1 - white
2 - brown
3 - green
4 - yellow
5 - grey
6 - pink
7 - blue
8 - red

Connector Mating Cable

The cable assembly required to mate with the Lumberg connector used is RKT 8-282

8 Poles



1 - white
2 - brown
3 - green
4 - yellow
5 - grey
6 - pink
7 - blue
8 - shield

RS422 SERIAL INTERFACE (CONTINUED)

317 Connection Details

RS422 CONNECTOR CONNECTIONS		
Pin No	**Cable colour**	**Description**
1	White	422 Rx A non-inverting input to 317
2	Brown	422 Rx B inverting input to 317
3	Green	422 Tx Z inverting output from 317
4	Yellow	422 Tx Y non-inverting output from 317
5	Grey	0v DC
6	Pink	+12v DC
7	Blue	n/c
8	Shield	n/c

Power supply

The radar is powered using a DC voltage in the range of 10.8 to 16 Volts. At 12V the current consumption of the radar is typically 225mA.

Reverse polarity protection is included in the design. The radar can take a large current during power up that is of the order of amps which only lasts for ~1ms and as such should not affect most applications.

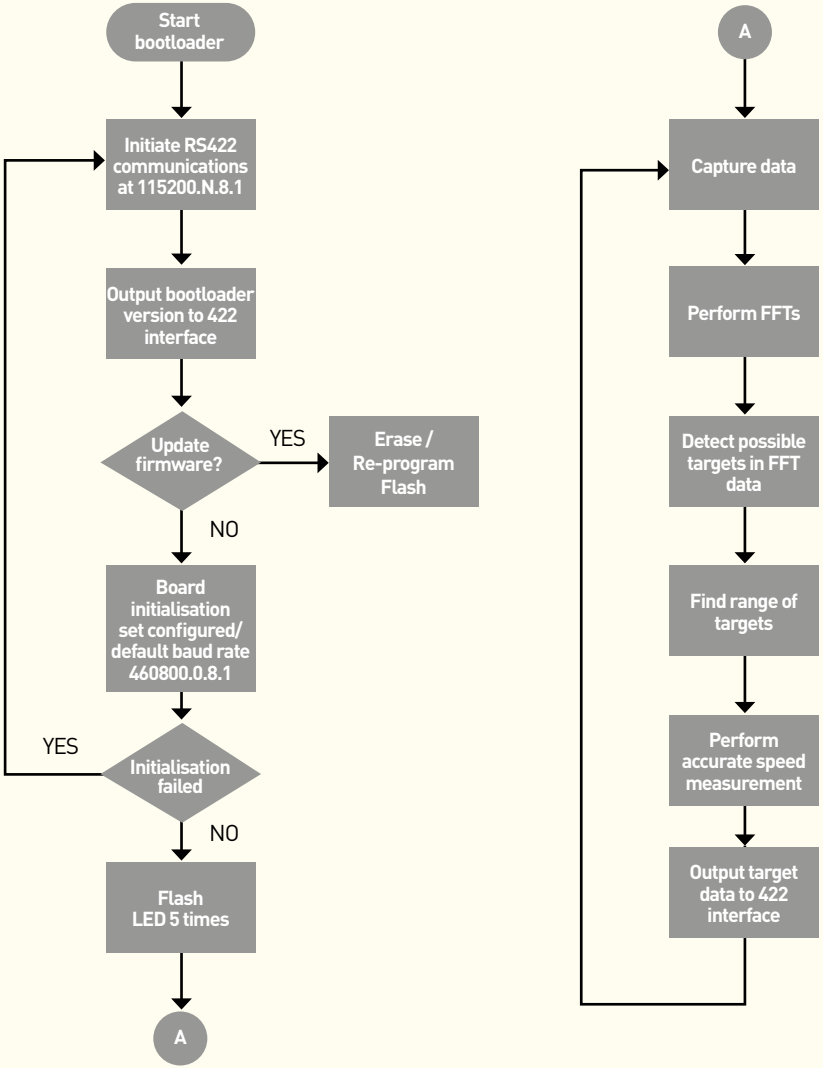
A thermal fuse with a 750mA rating has been installed to protect against electrical short circuit fault conditions.

SOFTWARE FUNCTIONALITY

OVERVIEW

At power-on the 317 radar executes a Boot-loader program which communicates at a fixed Baud rate of 115200, no parity, 8 data bits and 1 stop bit over the RS422 interface. The Boot-loader provides facilities for erasing the Flash and updating the firmware.

The 317 radar uses a real time operating system and is continuously performing a number of tasks simultaneously using a time multiplexing method. The Boot-loader and the main data capture processing task flow diagram are shown below.



RADAR COMMAND OVERVIEW

Commands are used to control the operation of the radar. These are sent over the RS422 UART link.

Commands are immediately followed by an operator that indicates the required action. Not all operators are supported for all commands. Where an operator is used and it is not supported the radar will respond with a warning message. The table shows the operators that are used by the radar.

Operator	Operation
=	Set something to a value e.g. *DIR=A<CR> sets detect direction to approaching
?	Respond with value or values
^	Set default value for parameter
$	Provide help on the command e.g. *DIR$<CR>
!	Do something e.g. *REBOOT! Reboots the radar

Command Operators

Where a command is used to enquire or set a radar parameter the radar will respond in a set way. The radar will respond with a hash, #, followed by the command name, operator used and then the value of parameter or parameters.

For example

***DIR=A<CR>** **Radar responds with #DIR=A<CR>**

***DIR?<CR>** **Radar responds with #DIR?A<CR>**

Checksum Calculation

The unsolicited messages and the Serial Number output by the 317 contain a checksum. The checksum is performed as an exclusive OR (XOR) sum of each of the characters in the message excluding the header and termination characters. The checksum is then appended to the message as a 2 character hexadecimal number.

e.g. Consider a Heartbeat message prior to the header and termination

HB,0000133*

'H' = 0x48

'B' = 0x42

An XOR operation on these two characters results in 0x0A which is then used in the XOR with the next character (',' = 0x2C) and so on until all of the characters have been summed.

The result is appended to the message following the '*' character and the message is transmitted with the 'STX' and 'ETX' characters.

STXHB,00001334*25ETX

RADAR COMMAND LIST

Command	Type	Function	Default Value	Min Value	Max Value	Units, Resolution or Values
AGD		Provides the firmware version				
***ANGLE**	? / =	Enquire / set the radar mounting angle	22.0	0	89.0	Degrees
***BAUD**	? / =	Enquire / set the BAUD rate of the radar. The programmed value is stored in non-volatile memory and is used the next time the radar is powered on. *BAUD=<baud>,<flow_control>, <parity>,<number_of_data_bits> e.g. *baud=115200,0,NONE,8	baud 460800 flow control 0 parity ODD no. of data bits 8	 2400 0 NONE 7	 921600 1 EVEN 8	Baud rate values: 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600 flow control: 0 = no control 1 = flow control number of data bits: 7,8
***CD**	? / = ('=' for AGD only)	Enquire / set the Calibration Date and calibration certification number. Format is: DD,MM,YYYY, certificate_no e.g. *CD? #CD?04,12,2012,31700001		1 1 2012 31700001	31 12 2100 31799999	DD MM YYYY Certificate_no
***CRC32**	?	Calculates and verifies the 32 bit CRC code and data checksums.				
***DIR**	? / =	Enquire / set the radar direction detection mode. The programmed value is stored in non-volatile memory and is used the next time the radar is powered on.	B	A	R	A = Approaching R = Receding B = Bi_directional N = No Detection
***HBP**	? / =	Enquire / set the heart beat period in seconds. Setting the value to zero turns off the heartbeat message. The programmed value is stored in non-volatile memory and is used the next time the radar is powered on.	60	5 (0=off)	600	1 Second
***HELP**		List all commands along with command help information.				
***REBOOT**	!	Force a reboot of the radar				
***SN**	?	Read the serial number. The serial number includes a checksum calculated using the XOR function ('reference page 12') of all the characters in the serial number up to and including the '*' character.				
***SU**	? / =	Enquire / set the speed units used in the messages. The programmed value is stored in non-volatile memory and is used the next time the radar is powered on.	K	K	M	K = KPH M = MPH
***TEXT**	? / =	read / write free-form text to non-volatile memory. *TEXT=<string> Space for 64 characters is reserved in non-volatile memory but 2 characters are reserved for NULL termination and '\r' character.			62	characters
***TS**	=	Uses the internal Target Simulator to simulate a target. *TS=<target number><dir>		1	12	Target Number (see target simulator section) dir = A or R
***VER**	?	Provides the product number, firmware version and date.				

*TS COMMAND & HARDWARE SELF-TEST

The radar has a built in hardware based target simulator. This command is used to perform a self-test using this built in target simulation hardware. There are twelve targets that maybe simulated in either receding or approaching directions

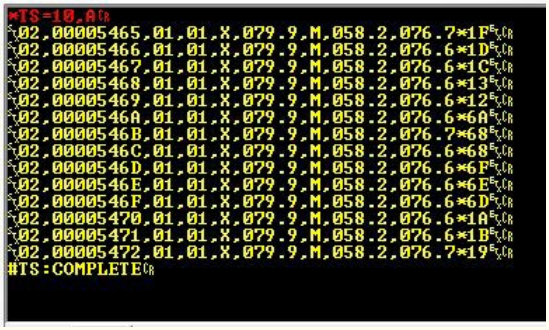
The format of the command is: ***TS=<Target Number>,<Direction><CR>**

The target parameters for each target are shown in the table below.

Target Number	Speed(MPH)	Range (Metres)	Distance travelled in beam (metres)
1	50	17	25
2	80	17	10
3	120	17	10
4	190	17	10
5	50	34	25
6	80	34	10
7	120	34	10
8	190	34	10
9	50	58	25
10	80	58	10
11	120	58	10
12	190	58	10

E.g. Self-test as follows; ***TS=10,A**

Radar Response



*TS COMMAND & HARDWARE SELF-TEST (CONTINUED)

When in Advance Mode the radar will only accept and report simulated targets that are advancing. If a recede simulated target is requested the radar processing will reject the target as 'wrong direction' and only the

#TS:COMPLETE<CR>

message will be sent as confirmation that the simulation has been completed. When in Recede mode vice versa.

It is recommended that the system uses the following pass/fail criteria for acceptance to specification for a radar self-test. It is also recommended that after power-up of the radar, the host system calls the radar self-test function to simulate at least one approaching and one receding target. When in Bi-Directional mode the radar will report both advancing and receding simulated targets.

Parameter	Pass Criteria
Direction	100% correct
Speed	≤ ± 1.0mph
Target Range	≤ ± 1.0m
Target Amplitude	N/A
Checksum	100% correct

The hardware target simulator is fully independent of the radar measurement system. This is used to verify the operation of the radars measurement circuitry. The self-test does NOT operate automatically on power-up of the radar. During simulation the microwave front end is disconnected from the ADC to avoid any possible interference with the simulation.

The radar self-test function can be called at any time using the *TS command.

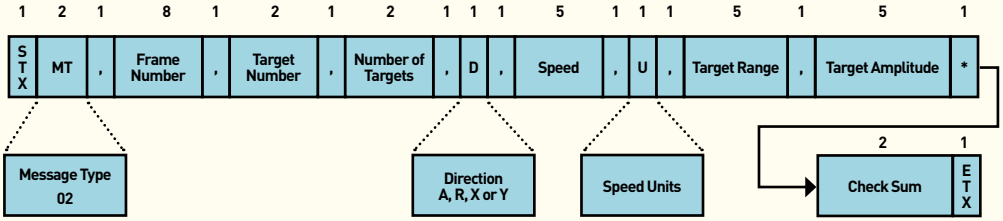
The *TS command calls a pre-loaded simulated test target condition. There is a selection of pre-loaded test target conditions as set out.

To distinguish real targets from simulated targets the radar inserts an X or a Y in the direction fields of all related messages produced.

TARGET DETECT MESSAGE

Target Detect Message

This message is sent after the radar has established that a vehicle has entered the radar's beam.
The numbers above the boxes in the diagram below indicate how many bytes are used for each field.

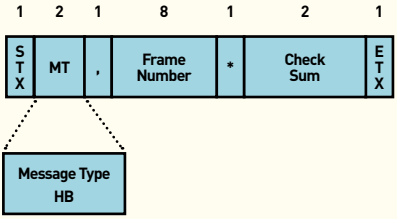


Name	Size / Bytes	Value	Notes
STX	1	2	Start of message byte
MT	2	02	Message type
,	1	','	Comma
Frame Number	8	XXXXXXXX	Frame number in hexadecimal format
,	1	','	Comma
Target Number	2	XX	Target number
,	1	','	Comma
Number of Targets	2	XX	Total number of targets in the current frame
,	1	','	Comma
Direction	1	'A' = Approaching Target 'R' = Receding Target 'X' = Simulated approaching target 'Y' = Simulated receding target	Direction the target is travelling.
,	1	','	Comma
Speed	5	'DDD.D'	Target speed to one decimal place in decimal format
,	1	','	
Speed Units	1	'M'=MPH 'K'=KPH	The speed units used for the measurement
,	1	','	Comma
Target Range	5	'DDD.D'	Target range in metres
,	1	','	Comma
Target Amplitude	5	'DDD.D'	Target power amplitude in dB
*	1	'*'	Asterisk
Check Sum	2	'XX'	Check sum in hexadecimal format
ETX	1	3	End of message byte

RADAR EVENT MESSAGES

Heart Beat message

This message is sent each time the heart period expires. The heart beat message period is controlled using the *HBP command. The heart beat period is measured in seconds.



Heart Beat message format

Name	Size / Bytes	Value	Notes
STX	1	2	Start of message byte
MT	2	'HB' = Heart Beat	Message type
,	1	','	Comma
Frame Number	8	XXXXXXXX	Frame number in hexadecimal format
*	1	'*'	Asterisk
Check Sum	2	'XX'	Check sum in hexadecimal format
ETX	1	3	End of message byte

UPDATING APPLICATION CODE

The 317 contains Bootloader firmware resident in Non-volatile memory which allows the main application firmware to be updated over the RS422 port. The Bootloader firmware is completely independent from the main application so it is always possible to re-load code.

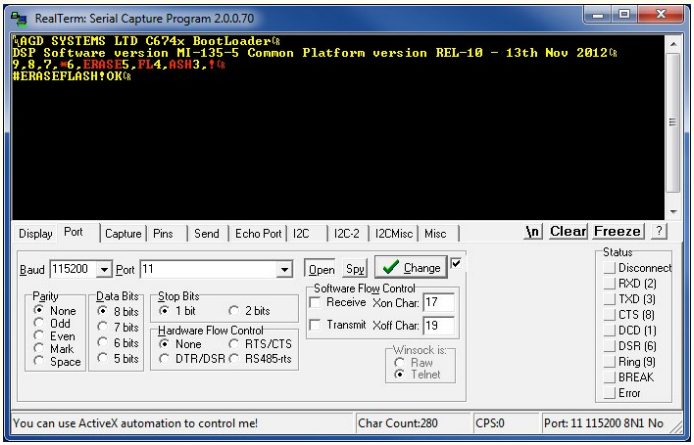
- Configure a terminal communications port to a baud rate of 115200, No Parity, 8 data bits and 1 stop bit. AGD recommends using RealTerm as this allows delays to be inserted after End of Line transmissions.
- Power on the AGD 317 unit with the comms cable attached to the PC. The Bootloader version information is displayed and a countdown is started to boot the main application.

Before the countdown reaches zero type the command:

*ERASEFLASH!

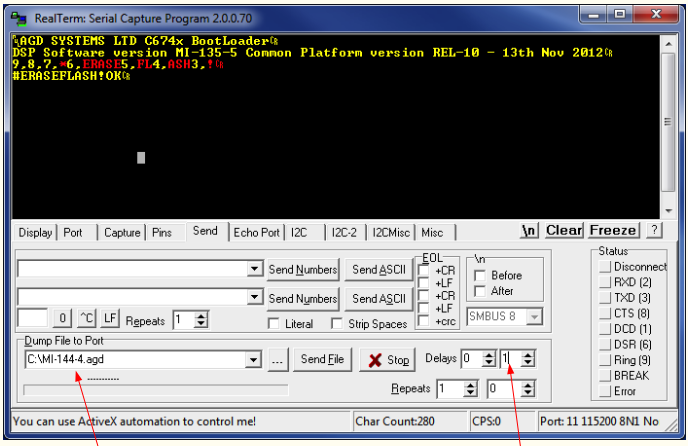
The response is:

#ERASEFLASH!OK

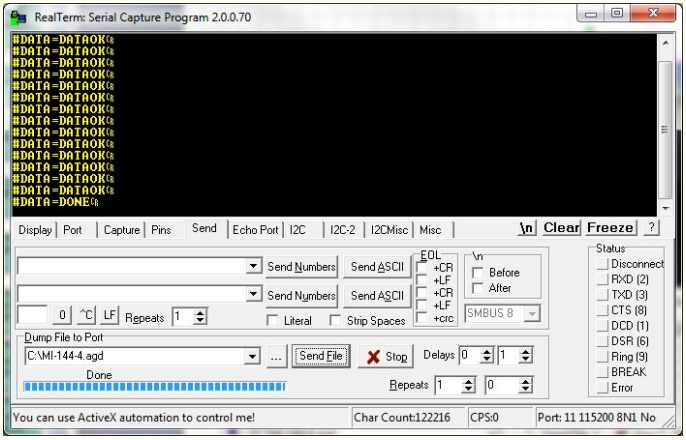


UPDATING APPLICATION CODE

- Send the application file (MI-144-x.agd) over the port. AGD recommends inserting a delay of 1ms between each line as shown in the following screen-shot



- The Bootloader responds with #DATA=DATAOK for each line of the file. The final response at the end of the file transmission is #DATA=DONE

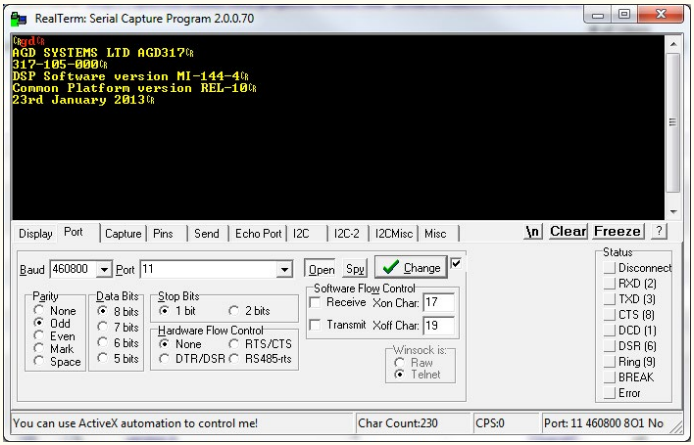


- To load the main application type

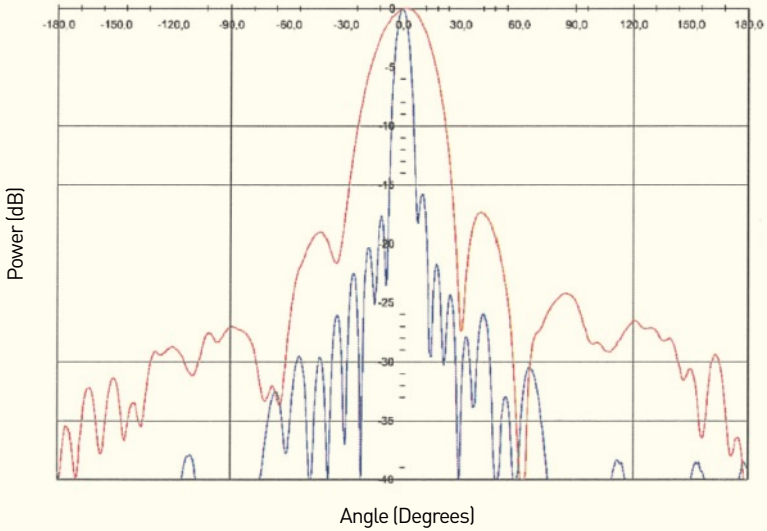
*LOADAPP!

UPDATING APPLICATION CODE

- Change the BAUD rate for the main application to 460800, ODD parity, 8 data bits and 1 stop bit (if using RealTerm you need to hit the 'Change' button after changing the settings.
- Type AGD to confirm the code version



ANTENNA PLOTS

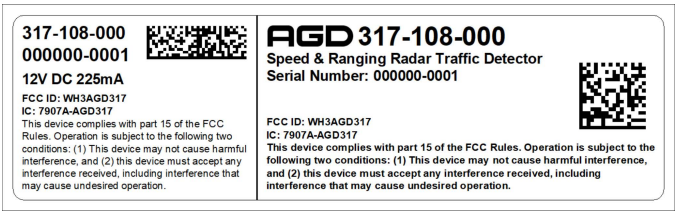


LABELS

The 317 radar is supplied with a series of labels on the radar and on the packaging to satisfy various legislative requirements.

The following are the main labels:

Product **Packaging**



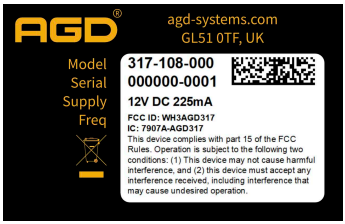
Demonstrates compliance with the European Radio Eqipment Directive 2014/53/EU.
There are no restrictions of use within any EU Member state for this product.
This product is Receiver Category 2

Indicates compliance with all applicable Australian ACMA technical standards and associated record-keeping (including testing) arrangements.

Demonstrates compliance with the UK Radio Equipment Regulations 2017 (SI2017/1206)

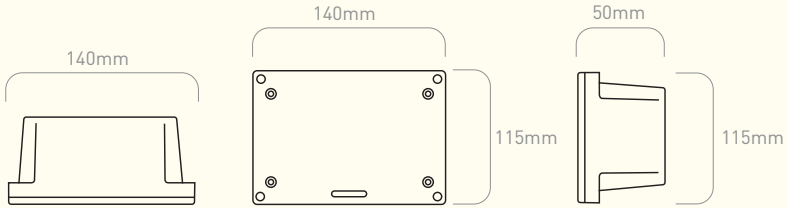
Demonstrates under the WEEE Directive that this product at its 'end of life' must be recycled separately from normal municipal waste (see relevant section in this manual.)

Also attached is FCC compliance labelling, as shown below:



In addition a calibration label is attached to the radar where the radar has been calibrated.

TECHNICAL SPECIFICATIONS



SPECIFICATIONS

Technology	FMCW Radar
Radiated Power	<100mW EIRP
Centre Frequency	24.125GHz
Bandwidth	44MHz
Range	6 to 70m
Mounting	Flange fixing (4 x M4)
Mounting Height	1 - 3m nominal
Speed Range	12 to 300 kph
Weight	0.7 Kg nominal
Housing Material	UV Stable Polycarbonate
Housing Finish	Self coated black
Sealing	IP66
Operating Temperature	-20°C to +60°C
Power	2.7W at 12V dc
Power Supply	10.8 - 16V dc (12V nominal)
Radar Output	RS422
EMC Specification	ETSI EN 301 489 and BS EN 50293
Radio Specification	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

TEST & CALIBRATION

DEDICATED TEST EQUIPMENT

The key test functions performed by Hyperion to Certify the premium performance of the 317 are:

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

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 AGD portfolio of 'ranging' FMCW vehicle radars. 100% of the 317 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 frequency modulation 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 317 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.

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

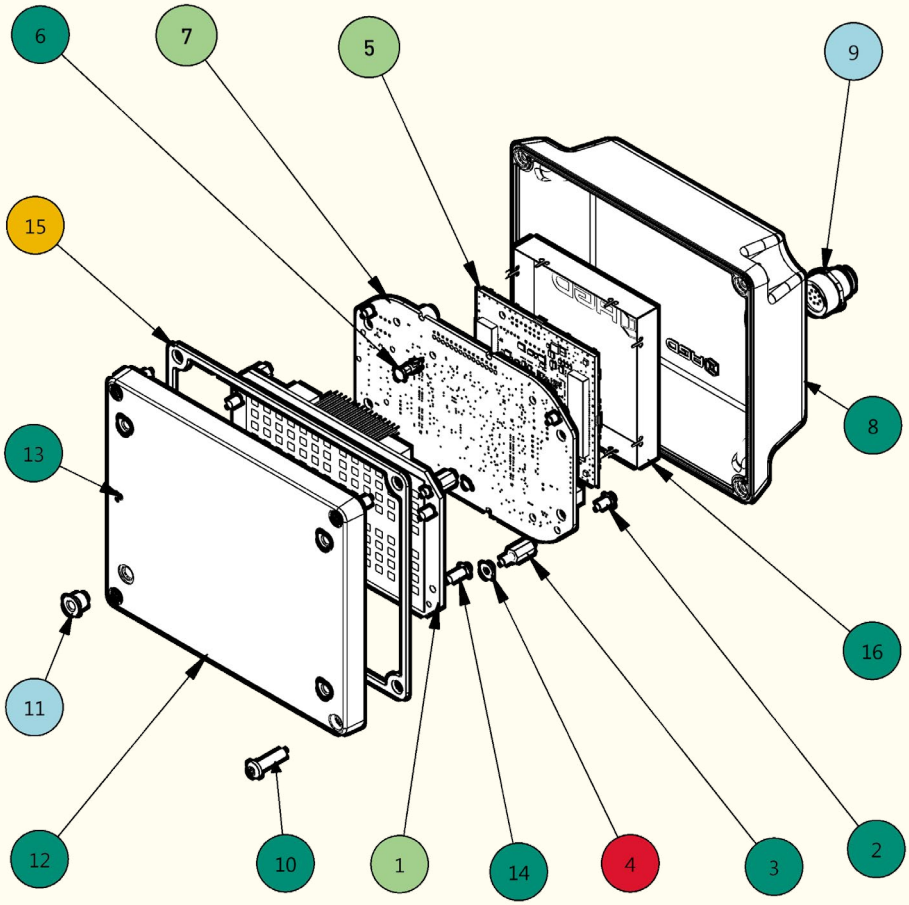
LIFETIME PRODUCT TRACEABILITY

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.

END OF LIFE – DISPOSAL INSTRUCTIONS (EOL)

AGD317 RADAR TRAFFIC DETECTOR



Item	Qty	Material
1	1	Electronic Assembly - Mixed metal+ printed circuit board
2	4	Steel
3	4	Brass
4	4	Vulcanised Fibre
5	1	Printed Circuit Board
6	2	Nylon
7	1	Printed Circuit Board
8	1	Polycarbonate

Item	Qty	Material
9	1	Cable Assembly - Mixed Metal + PVC
10	4	Stainless Steel
11	4	Brass
12	1	Polycarbonate
13	1	Polycarbonate
14	4	Steel
15	1	Neoprene
16	1	Nickel Silver

- Reuse / Recycle
- Separate & Recycle
- Downcycle
- Hazardous Recovery
- Non- Recyclable

This document serves as a guideline only for EOL procedures and further guidance may need to be sought from the appropriate authority or agency.

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.

   Le présent appareil est conforme aux CNR d'ISDE Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

7. 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.

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 317 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.

CERTIFICATION

EU Declaration of Conformity

Certificate No: CE-061 Issue: 2

PRODUCT SOLUTIONS FOR
INTELLIGENT TRAFFIC SYSTEMS

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We AGD SYSTEMS LTD
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GL51 0TF
UNITED KINGDOM

as manufacturer hereby declare that the following product(s)

Equipment Model Type(s): a) AGD317-107-000

Equipment Description: a) Speed and Ranging Radar - Traffic Detector

conform with the provisions of the following EC Directive(s), including all amendments, and with national legislation implementing this / these directive(s):

2014/53/EU relating to Radio Equipment.

2011/65/EU RoHS Directive

and that the following harmonised standards and Technical Specifications have been applied:

EMC (Art 3.1(b)):	EN50293:2012
	EN301 489-51 V2.1.0
	EN301 489-1 V2.1.1
Health & Safety (Art 3.1(a)):	EN 60950-1:2006 +A1:2010 +A11: 2011 +A12:2011 +AC:2011 +A2:2013
	EN 50556:2011
	EN 62479:2010
Spectrum (Art 3.2):	EN300 440 V2.2.0
ROHS	EN 50581:2012

Notified Body Element Materials Technology 0891

EU type certificate EMT18RED1088

Signed

Dated: 13th September 2018

For and on behalf of AGD Systems Ltd
P M Hutchinson
Managing Director

NOTES

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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