uRAD

User Manual

AUTOMOTIVE version



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About uRAD

1

Congratulations on purchasing uRAD



WARNING: To avoid any injury or damage, read all operating instructions in this guide and, specially, the safety and warranty information in “Chapter 6: Safety and Handling” and “Chapter 7: Product Warranty”, before using uRAD.

Through this manual you will learn how to use uRAD for an unlimited number of applications related with measuring distance, velocity and angle of any element of your surrounding world. uRAD is conceived as an evaluation platform which brings to you radar detecting technology with a simple but high-performance device.

Additional Information

Hardware versions:	URADAWR1843AOP20	15/07/2022
	URADAWR1843AOP25	15/08/2026
Purchase:	www.uRAD.es/en/	
Technical specifications:	www.uRAD.es/en	
Software:	MIT license, no purchase required	
	https://github.com/urad-by-Anteral	
Firmware:	Firmware binaries are published in the releases page of the urad-automotive-sdk repository.	
Contact:	contact@uRAD.es	

Last version: 19/11/2026 (software: urad-mmwave 0.3.0)

uRAD Basics

2

Read this chapter to learn about the features of uRAD, how to use it, and more.

uRAD AUTOMOTIVE is a tiny device which includes outstanding radar technology. However, its operation is simple to understand and easy to control.

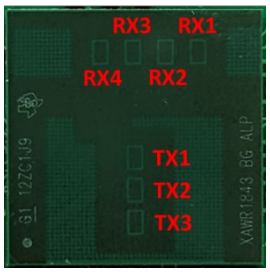
Hardware Description

uRAD is a multilayer printed circuit board composed by many elements:

1. Radar chipset

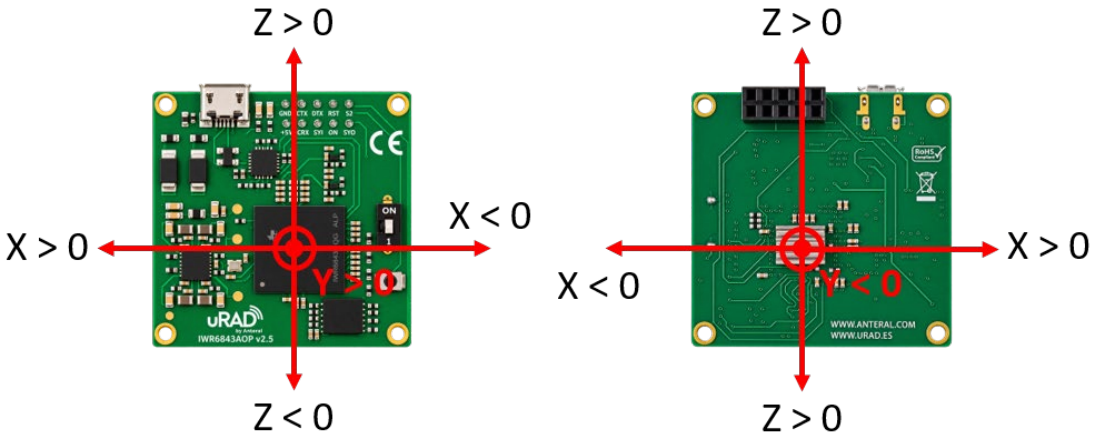
uRAD core is the integrated radar chipset **AWR1843AoP** by **Texas Instruments** (https://www.ti.com/product/AWR1843AOP). This integrated circuit is one of the most advanced radar chipsets in the market because of its high accuracy, small size and sensing simplified.

The AWR1843AoP chip has the antennas integrated on it (Antennas on Package). It has 3 transmitter and 4 receiver antennas. The emitted signal is perpendicular to this chip. Therefore, you should point the top face to the direction of interest. Be careful because it does not emit backwards.



WARNING: Do NOT cover the antennas with any metallic or electronic element, nor electromagnetic absorber. Most thin plastics are practically invisible to emission.

Default firmware considers the orientation of the chip as the following image. With this orientation, XYZ coordinates of the detected point cloud are as indicated in the image. The coordinate (0,0,0) is the center of the antennas. For an observer placed behind the radar, X positive is at the right of the radar, Z positive is above the radar and Y positive is at the front of the radar.



2. USB connector

The micro-USB connector is used for flashing firmware, configuring the radar and getting the results.

The USB is connected with the radar by two different UART channels. uRAD uses the following chip for using the two UART ports with one USB: **Silicon Labs Dual CP2105 USB to UART bridge**. When you connect the radar to a computer, two new USB devices should be detected in the Device Manager:

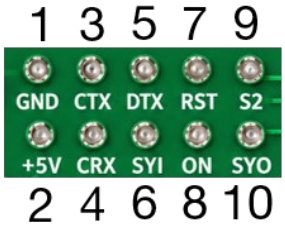
- **Enhanced COM** is the port for sending the configuration from the computer to the radar. It corresponds with the internal UART channels of the AWR1843AoP chip: MSS_UARTA_TX (ball number U16) and MSS_UARTA_RX (ball number V16).
- **Standard COM** is the port for getting the data from the radar. It corresponds with the internal UART channels of the AWR1843AoP chip: MSS_UARTB_TX (ball number E2) and MSS_UARTB_RX (ball number U12).

ADVICE: Install the Virtual COM Port (VCP) drivers of the CP2105 USB to UART bridge from the Silicon Labs website in the case your computer does not recognize the USB port (https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers).

The radar is powered directly by the micro-USB with 5V. The power consumption depends on the operating mode but it is around 340 mA.

3. 10-pin connector

The 10-pin female header connector has one configuration UART channel, the data UART TX line, a sync input, one on/off pin, one reset pin, and the SOP2 and SOP1/Sync Out boot-mode pins. Spacing between the pins is 2.54 mm. The pins distribution is as follows:



1 **GND:** ground plane of the PCB.
2 **+5V**: power the device with this pin. Voltage range is from +4.5 V to +5.5V.
3 **CTX: Configuration TX.** TX line of the UART port used for configuration. It corresponds with the internal UART channel of the AWR1843AOP chip MSS_UARTA_TX (ball number U16).
4 **CRX: Configuration RX.** RX line of the UART port used for configuration. It corresponds with the internal UART channel of the AWR1843AOP chip MSS_UARTA_RX (ball number V16).
5 **DTX: Data TX.** TX line of the UART port used for data output. It corresponds with the internal UART channel of the AWR1843AOP chip MSS_UARTB_TX (ball number E2).
6 **SYI: Sync In.** Hardware-trigger input for time synchronization (Hardware Triggering / Frame Sync) between the radar and other devices or radars (ball number U12).
7 **RST: Reset.** Send a LOW and a HIGH digital pulse to reset the radar. With the rising edge of the pulse, the radar performs a reset. This pin has a pull-up resistor.
8 **ON: on/off.** A HIGH/LOW digital level turns the radar ON/OFF respectively. In OFF state, the radar consumption is reduced to the minimum (< 1 mA). This pin has a pull-up resistor.
9 **S2: SOP2.** Connected to the Sense on Power 2 pin. A HIGH/LOW level sets the boot mode of the radar. Together with SOP1 it sets the radar in functional, flashing or debug mode (ball number V10). This pin is also connected to the DIP switch. It has a pull-down resistor when the DIP switch is OFF.
10 **SYO: Sync Out / SOP1.** Dual function. At power-up it acts as Sense on Power 1: a HIGH/LOW level sets the boot mode of the radar. Together with SOP2 it sets the radar in functional, flashing or debug mode (ball number M3). It has a pull-down resistor. During normal operation it can be programmed as an event/sync output for hardware time synchronization between the radar and other devices or radars.

WARNING: Pins 3 and 5 are TX lines from the chip side. Therefore, they are the RX lines from a computer (or any controller device) perspective. Vice-versa with the RX line of pin 4.

4. DIP switch

uRAD has a DIP switch for establishing the radar mode when the device is powered on (Sense On Power). It connects with the SOP2 line of the chip. There are two modes that can be set, functional and flashing. See how to set the switch for the different modes:

Functional	Flashing
OFF (low)	ON (high)



Functional



Flashing

Flashing is for uploading new firmware and functional is for automatically running the firmware.

This behavior can be complemented with pin 10 (SYO), which has the SOP1 function.

SOP2	SOP1	Boot mode
0	0	Functional
1	0	Flashing
0	1	Debug

SOP1 has a pull-down resistor, so if this pin is not used, the DIP switch controls the Functional and Flashing modes.

SOP2 has a pull-down resistor when the DIP switch is OFF (low), and is connected to +3.3 V when it is ON (high).

5. Reset button

The board has a physical reset button to perform a reset of the device. A reset can be useful, for example, after uploading the firmware and changing the DIP switch to functional mode, to start working with the device without power off.

6. LEDs

The board has two LEDs:

- Red LED: it is connected to the 5V line. It indicates the radar is being powered
- Green LED: it is connected to UART TX data line. It indicates the radar is ready for transmitting data.

In Flashing mode, only red LED must be ON. In Functional mode, both LEDs must be ON.

7. Four holes in the corners

The four holes in the corners are connected to ground. Therefore, they are very useful for heat dissipation. However, take care of this aspect if you use it for clamping purpose.

Firmware Description

As you already know, uRAD is based on the AWR1843AoP chip from Texas Instruments. Therefore, any firmware that it is available for this chip can be easily uploaded by the micro-USB connector.

By default, your uRAD has the Out of Box Demo firmware already uploaded. The binary (out_of_box_1843_aop.bin) is published as a Release asset of the urad-automotive-sdk repository on GitHub, and the urad-mmwave Python package is built and tested against that image. With this firmware you can:

- Upload the configuration to uRAD and start receiving the point cloud of the detected targets very easily.
- Use the urad-mmwave command line tool with its live point cloud viewer. In Chapter 5 you will learn how to use it.
- Use the **mmWave Demo Visualizer** tool to visualize in real time the detected objects and other information. In **Chapter 4** you will learn how to use it.

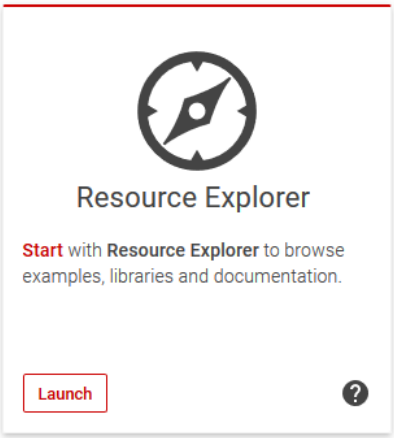


ADVICE: the Texas Instruments MMWAVE-SDK (https://www.ti.com/tool/MMWAVE-SDK) is only needed if you intend to build custom firmware. For normal operation, install the urad-mmwave package (Chapter 5).

The binary of this firmware, out_of_box_1843_aop.bin, can be downloaded from the Releases page of https://github.com/urad-by-Anteral/urad-automotive-sdk.

Moreover, you can upload any firmware of the multiple laboratories that are already programmed for several specific applications (the **Out of Box Demo** is also there):

1. Go to **Texas Instruments Device Tools** website (https://dev.ti.com/)
2. Register as user and launch the **Resource Explorer**.



3. In the folder tree of the left part, go to *mmWave radar sensors > Embedded Software > Radar Toolbox > Examples* and you will find all information and software.
4. uRAD provides a ready-made client for the supported application firmware: urad-level-sensing (High Accuracy Level Sensing, see Chapter 5). Note that application firmwares from the TI Radar Toolbox accept only one configuration per boot: reset the radar between runs. The uRAD level sensing firmware (by Anteral) does not have this limitation.

Finally, you can also create your own firmware or modify an existing one with the **Code Composer Studio**, an integrated development environment (IDE) that supports Texas Instruments' microcontroller and embedded processors portfolio. (https://www.ti.com/tool/CCSTUDIO).

Main Features

Basically, a radar is a device that detects elements which are in its action radius. It works emitting an electromagnetic wave to the air. This wave is reflected by the target and comes back to the radar. The shape of the going and coming wave as well as the radar architecture determines the type of the radar.

uRAD detects the 3D spatial position of the target and the relative radial velocity to it. Moreover, the amount of reflected power and the noise level is also given, that serves as an estimation of the object size or the detection level. Whether not enough power is reflected, the element is not detected. Therefore, very small or very far targets will not be seen.

The main features of uRAD are:

Parameter	*Min.*	*Typ.*	*Max.*	*Unit*
Operating conditions				
Supply voltage	4.5	5	5.5	V
Supply current		340		mA
Digital signals		3.3		V
Operating temperature	-20		+85	ºC
RF Parameters				
Frequency bandwidth	77		81	GHz
Output power		16		dBm
Number of transmitter antennas		3		
Number of receiver antennas		4		
Azimuthal field of view		160		deg
Elevation field of view		160		deg

Parameter	*Value*
Performance	
Mode of operation	Frequency Modulated Continuous Wave
Output data	Distance, velocity, angle and SNR
Distance range	120 m (car), 50 m (people)
Distance accuracy	±1 mm
Distance resolution	5 cm
Velocity range	45 m/s
Velocity accuracy	± 0.15 m/s
Velocity resolution	0.06 m/s
Angle accuracy	1 deg
Azimuthal angle resolution	30 deg
Elevation angle resolution	38 deg

Distance and velocity range, accuracy and resolution values depend on the configuration parameters of the transmitted waveform.

Resolution indicates the minimum distance, velocity or angle that two targets with similar reflectivity must be separated to be discerned as a single target each one.



WARNING: Detected velocity is only radial velocity: the component of the target's velocity that points in the direction of the line connecting the object and the radar.

Uploading Firmware 3

In this chapter, you will learn how to upload new firmware to uRAD.

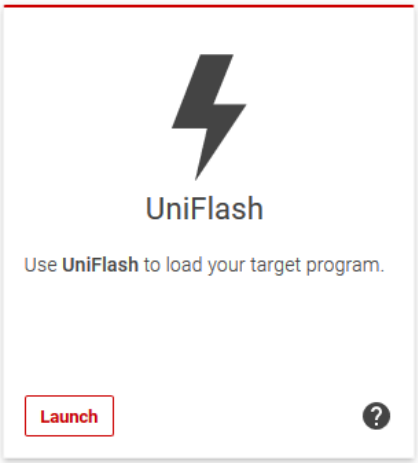
Because uRAD is based on the AWR1843AoP chip, the best way of uploading new firmware is to use the **UniFlash** tool of Texas Instruments.

Using the UniFlash Tool

UniFlash is a standalone tool used to program on-chip flash memory on TI MCUs and on-board flash memory for Sitara processors. **UniFlash** has a GUI, command line, and scripting interface. It is available free of charge.

UniFlash has a desktop version and an online version.

- Desktop version is available at https://www.ti.com/tool/download/UNIFLASH
- Online version is available going to **Texas Instruments Device Tools** website (https://dev.ti.com/), register as user and launch the **UniFlash** tool.



ADVICE: find the **UniFlash** Quick Start Guide at https://downloads.ti.com/ccs/esd/uniflash/docs/latest_qsguide.html.

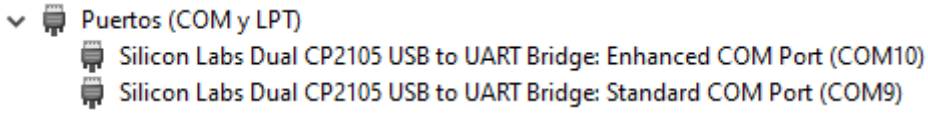
Follow these steps to upload firmware to uRAD:

1. Set the DIP switch in Flashing mode:

Flashing
ON (high)

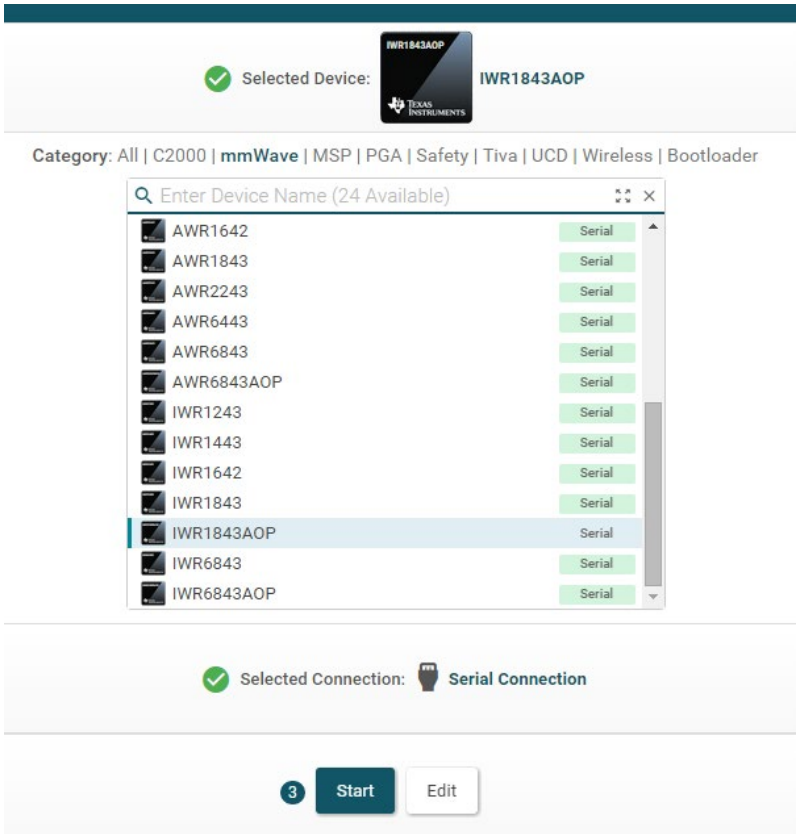


2. Connect uRAD with the USB connector and identify the COM ports with the Device Manager.

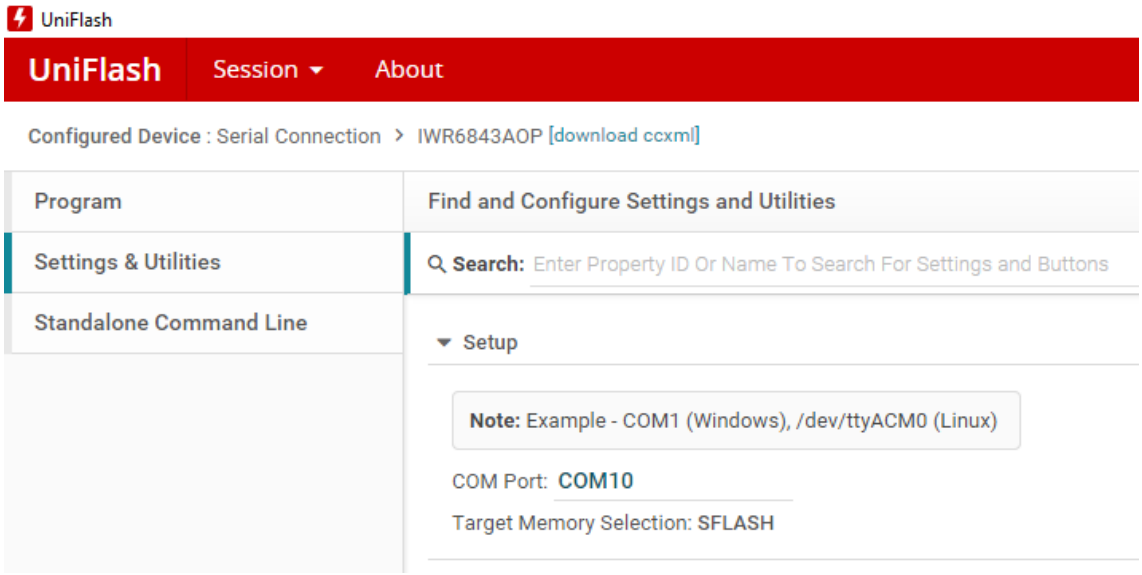


   - Enhanced Port is the configuration port
   - Standard Port is the data port

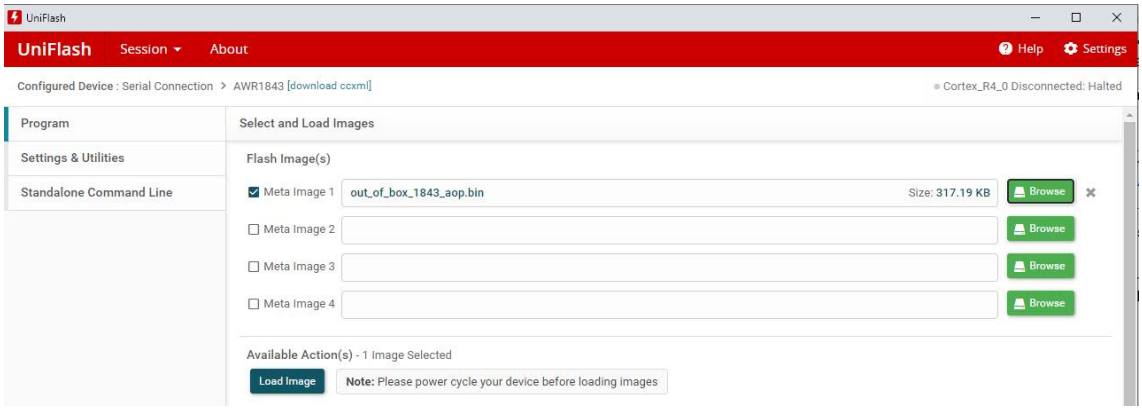
3. Launch **UniFlash**. Select the IWR1843AOP (AWR1843AOP is not available yet but it is equivalent) and click *Start*



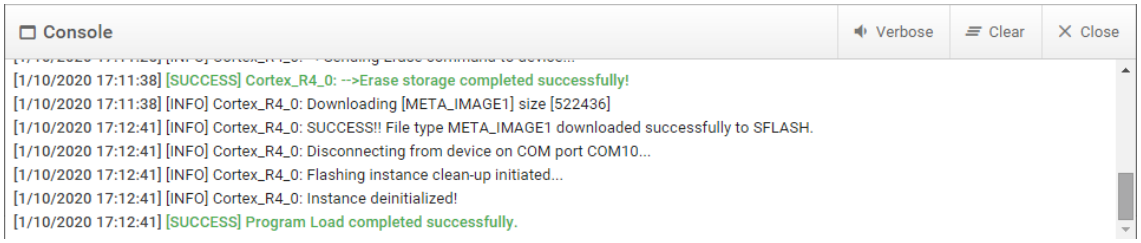
4. Go to Settings *& Utilities* and write the number of your configuration port (Enhanced Port) in the COM Port box.



5. Go to *Program*, browse your *.bin* file and click on *Load Image*.



6. If everything goes well, you will see in the *Console* that the firmware has been successfully uploaded.



7. Change the DIP switch to functional mode, press the reset button and start working.

Demo Visualizer 4

Read how to configure uRAD and visualize point cloud

The fastest way of testing uRAD is the urad-mmwave command line tool with its live viewer (Chapter 5). Alternatively, this chapter describes the mmWave Demo Visualizer, the TI-native browser tool.

Using the mmWave Demo Visualizer App

The **mmWave Demo Visualizer** is an app developed by Texas Instruments to be used in conjunction with the **mmWave SDK demo** firmware running on uRAD. The app is browser-based and can be run on any operating system. Chrome browser is recommended for the best plotting performance. Go to this link for launching the app:

https://dev.ti.com/gallery/view/mmwave/mmWave_Demo_Visualizer/ver/3.6.0/

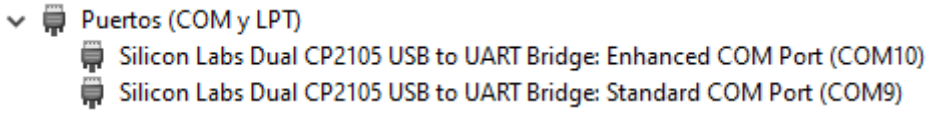
New version 4.2 is not compatible. Use version 3.6. A desktop version is also available at: https://dev.ti.com/gallery/

> *ADVICE:* the *mmWave Demo Visualizer User's Guide* can be found at https://www.ti.com/tool/MMWAVE-STUDIO.

First of all, be sure that:

- **Out of Box Demo** firmware is uploaded in uRAD.
- DIP-switch is in functional mode.

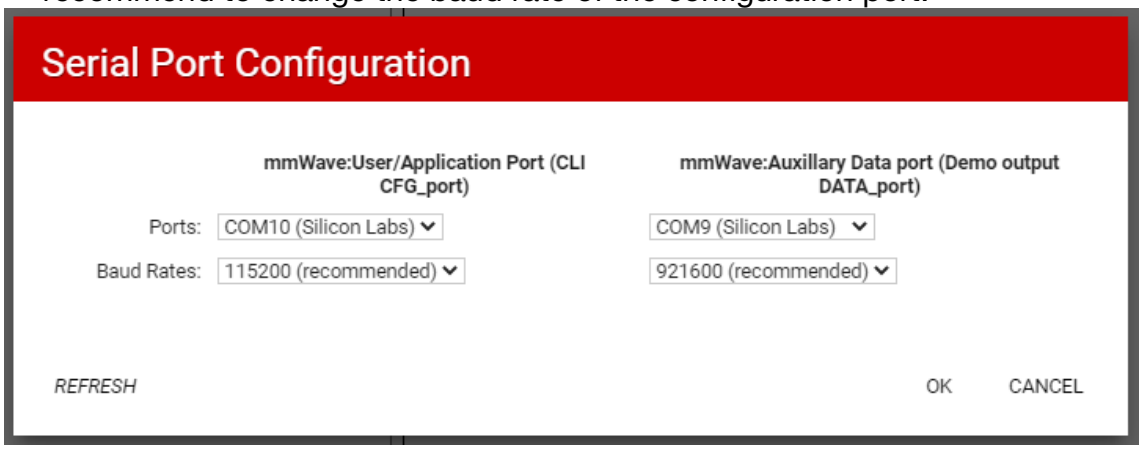
1. Connect uRAD by the USB and identify with the *Device Manager* the COM ports:



   - Enhanced port is the configuration port (CFG_port)
   - Standard port is the output data port (DATA_port)

2. In the browser Demo Visualizer app, go to *Menu > Options > Serial Port* and set up the COM ports as the following image. You can increase the baud rate of the data port by selecting "*custom*" in the drop-down menu

and setting the number manually. Maximum value is 3125000. We do not recommend to change the baud rate of the configuration port.

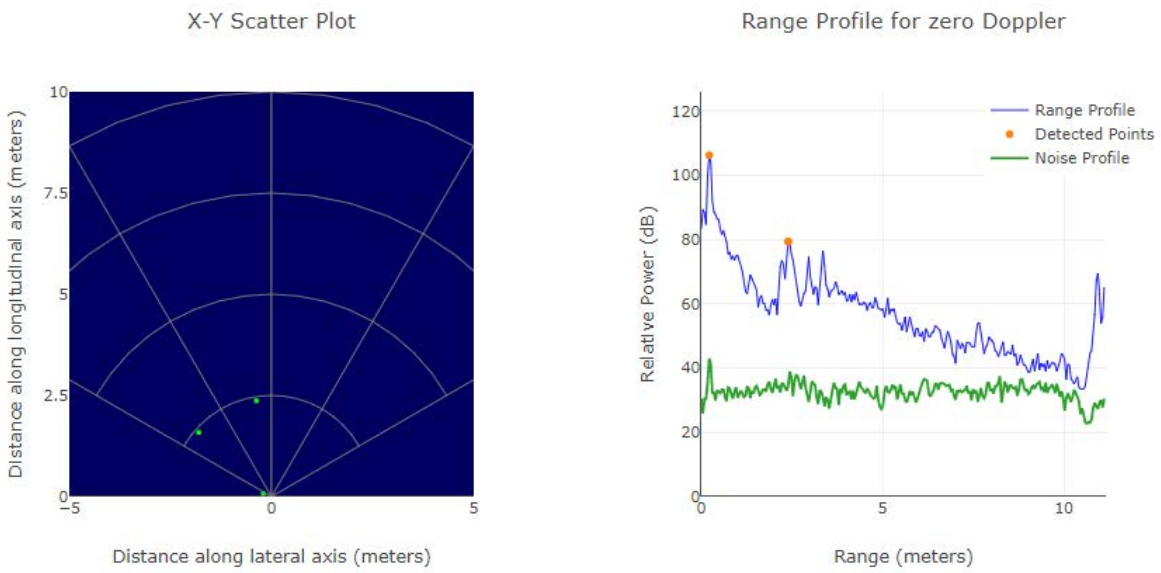


3. In the Configure tab select:
   - Platform: xWR18xx_AOP
   - SDK version: 3.6
   - Other configuration parameters according to your desired configuration.

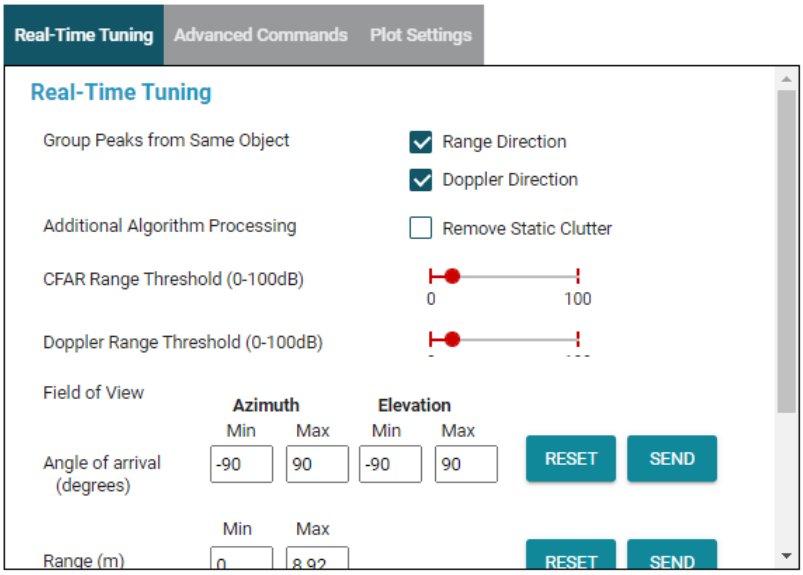
4. Click on SEND CONFIG TO MMWAVE DEVICE button to send the configuration and start measuring.
   You can also save in a .cfg file the configuration with the SAVE CONFIG TO PC button. This is very useful to see what the configuration parameters are and how are the commands that you need to send to uRAD to configure it.

> *ADVICE:* download the *mmwave_sdk_user_guide* at https://software-dl.ti.com/ra-processors/esd/MMWAVE-SDK/latest/index_FDS.html. Go to *Section 3.4* to learn about the configuration parameters and file format.

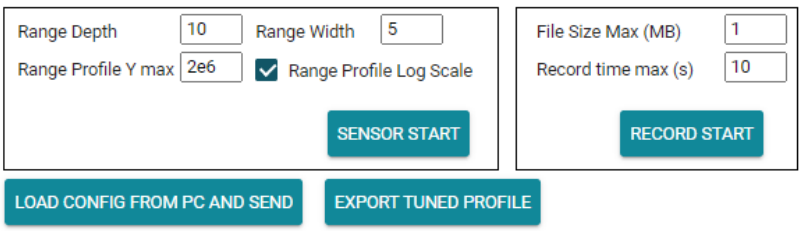
5. Visualize in the Plots tab the 2D or 3D point cloud and range profile for targets with zero velocity and other plots or windows with configuration options.



Bottom right window allows you to change some configuration parameters in real time without stopping the sensor.



You can also create or modify a .cfg file and load it to uRAD with the LOAD CONFIG FROM PC AND SEND button as well as record 10 seconds of the output data in a .dat file.



Programming 5

In this chapter, basic programming of uRAD is explained

uRAD is operated from Python through the urad-mmwave package (Python 3.9 or later; Windows, Linux and Raspberry Pi), published on GitHub under the MIT license. Install it with: pip install git+https://github.com/urad-by-Anteral/urad-mmwave-core.git — add the [gui] extra for the live viewer and the [rpi] extra on Raspberry Pi for GPIO reset support.

Running the out-of-box demo

The urad-mmwave command includes the basis to work with uRAD:

- Send the configuration by the configuration COM port.
- Start receiving the output data by the data COM port.
- Save output data in a .txt file.
- Print in the Python console the results.

Therefore, this simple tool is very useful for development purposes because it is the starting point for any application.

Run it with your product profile, selecting the COM ports:

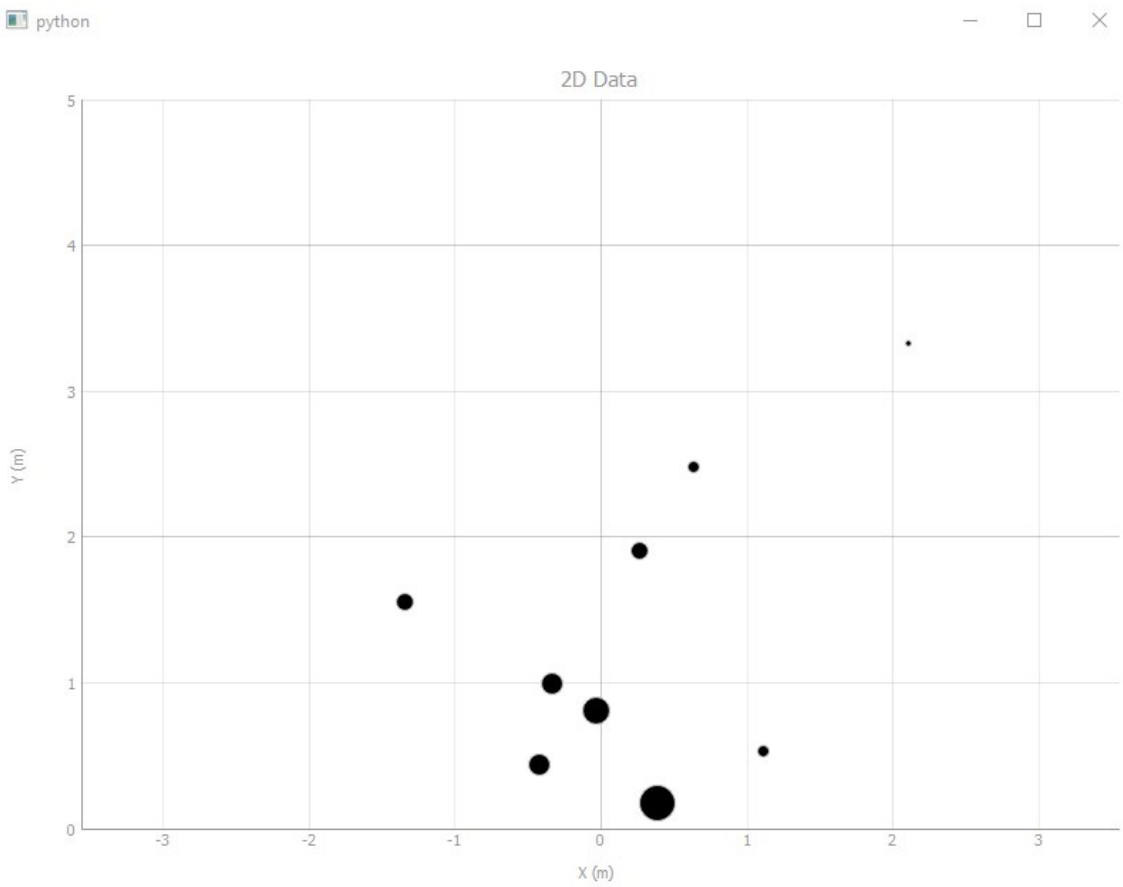
```
urad-mmwave --config profiles/automotive/config_radar.json --control-port COM8 --data-port COM7
```

Useful options: --duration SECONDS or --max-frames N to stop automatically (default: run until Ctrl+C), and --no-save to disable file output. Results are saved to output/PointCloud.txt (and Temperature.txt if enabled) in the classic uRAD text format, and printed to the console.

This tool can be used with uRAD connected by the USB or by the 10-pin header connector. Just take into account to pass the right port names in --control-port and --data-port.

Live point cloud viewer (--gui)

Add --gui to the previous command and the point cloud is plotted in a 2D graph showing the X and Y components in real time, with the marker size proportional to the SNR of each point. It requires the GUI extra: pip install "urad-mmwave[gui] @ git+https://github.com/urad-by-Anteral/urad-mmwave-core.git". Close the window to stop the sensor.



Temperature output

The radar can also report the temperature of its different parts. Enable the temperature TLV in the chirp configuration file by setting the last field of the guiMonitor command to 1:

guiMonitor -1 1 1 0 0 0 1

Then set "save_temperature": true in the output section of the JSON configuration file (and "print_temperature": true in the display section to see the reports in the console). Each profile already includes chirp_config_temperature.cfg with this field enabled; select it with --chirp profiles/automotive/chirp_config_temperature.cfg.

Raspberry Pi and single-UART setups

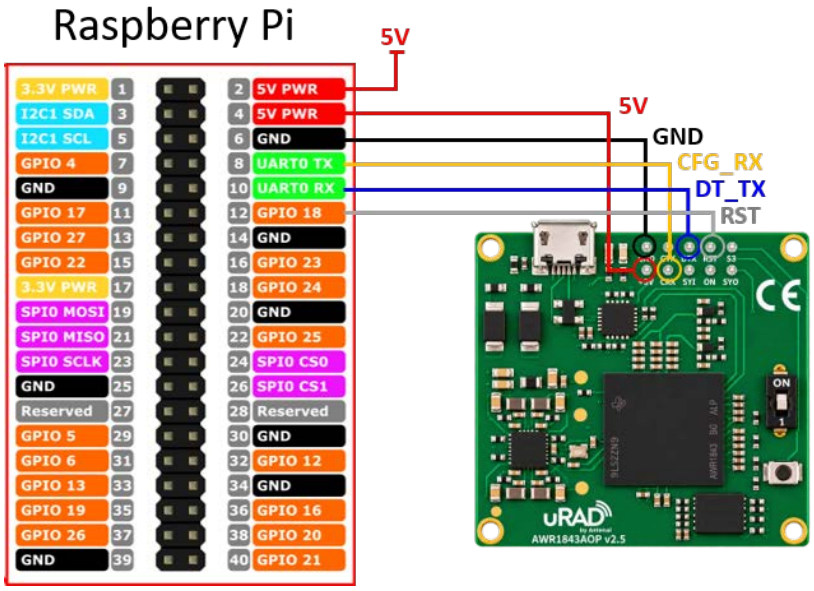
For master devices with a single UART (for example the Raspberry Pi), sending the configuration and receiving the data are done with a single physical port:

- The tool switches the port between the configuration baud rate (115200) and the data baud rate (921600) automatically.
- It is intended for being used with the 10-pin header when only one UART port is available in the master device:

```
urad-mmwave --config profiles/automotive/config_radar.json --
single-port /dev/serial0
```

On Raspberry Pi, install the [rpi] extra so the radar is reset automatically through the RESET pin before each run — set gpio_reset_pin in the JSON configuration file; no user code is required.

This sketch depicts how to connect uRAD with the Raspberry Pi using a single UART.



Configuring uRAD

Each product has a profile in the profiles/ folder of the urad-mmwave-core repository: config_radar.json (serial ports, output files and viewer ranges) and the matching chirp configuration .cfg file, which contains the command list that configures the radar when it is turned on. Pass the JSON file with --config.



ADVICE: examples of configuration files are available in the Texas Instruments SDK. You can also create your own with the **Demo Visualizer** app.

Take into account these considerations:

- Each line describes a command with parameters.
- Lines starting by *%* are not valid. They are for information purposes.
- Send each command line as a string and do not forget to send *\n* after each line.
- After sending each line, you will receive an ACK for confirming proper command.
- Always start with a *sensorStop* and finish with a *sensorStart* command.

WARNING: the command list depends on the firmware. The supplied profiles are only valid for the Out of Box Demo firmware. Application firmwares (e.g. level sensing) use their own command sets and their own uRAD client.

ADVICE: the mmwave_sdk_user_guide is available at https://software-dl.ti.com/ra-processors/esd/MMWAVE-SDK/latest/index_FDS.html. Go to Section 3.4 to learn about each configuration parameter and the file format.

Receiving data

Once uRAD is configured, it starts sending the detected information through the data COM port. The urad-mmwave package already decodes this protocol for you — this section is a reference for users writing their own parser or integrating uRAD into a non-Python system. The packet structure is the following:

Header (40 bytes) + TLVs + Padding Bytes (for 32-byte align)

1. Frame Header (40 bytes)

A frame header is sent at the start of each packet. Use the Magic Word to find the start of each packet.

Value	Type	Bytes	Details
Magic Word	uint16_t	8	Output buffer magic word (sync word). It is initialized to {0x0102, 0x0304, 0x0506, 0x0708}
Version	uint32_t	4	SDK Version represented as (MajorNum x 2^24 + MinorNum x 2^16 + BugfixNum x 2^8 + BuildNum)
Total Packet Length	uint32_t	4	Total packet length including frame header length in Bytes
Platform	uint32_t	4	Device Type
Frame Number	uint32_t	4	Frame number (resets to 0 when device is power cycled or reset. Not when sensor stop/start is issued)
Time	uint32_t	4	Time in CPU cycles when the message was created
Num Detected Obj	uint32_t	4	Number of detected objects (points) for the frame
Num TLVs	uint32_t	4	Number of TLV items for the frame

Subframe Number	uint32_t	4	0 if advanced subframe mode not enabled, otherwise the sub-frame number in the range 0 to (number of subframes – 1)

2. TLV Header (8 bytes)

The number of TLVs in the frame packet is extracted from the Frame Header. For each TLV in the packet, there is a TLV Header containing Type and Length information.

- The Type identifier indicates what kind of information is contained in the payload.
- The Length value gives the length of the payload.

Value	Type	Bytes	Details
Type	uint32_t	4	Indicates types of messages contained in payload
Length	uint32_t	4	Length of the payload in Bytes (does not include length of the TLV header)

3. TLV Type identifier

With the configuration file, you enable or disable whether the TLV type is included in the output frame packet. There are nine types of TLV. Here we describe Type 1 and 7 which are the most interesting related with the point cloud of the detected objects.

Type Identifier	Value Type	Conditions for output
1	Detected Points	<detected objects> is set to 1 or 2 AND there are detected objects for the frame, else this type is not sent for that frame
7	Detected Points	<detected objects> is set to 2 AND there are detected objects for the frame, else this type is not sent for that frame



ADVICE: the information of the remaining TLVs is described in the 'Understanding UART Data Output Format' documentation of the TI Radar Toolbox (https://dev.ti.com). The urad-mmwave package already parses these TLVs, so most users never need it.

4. TLV Payload

- Type 1: detected points
  - Length: 16 Bytes x Num Detected Obj
  - Value: array of detected points. Each point is represented by 16 bytes giving position and radial Doppler velocity

Value	Type	Bytes
X [m]	float	4
Y [m]	float	4
Z [m]	float	4
Doppler [m/s]	float	4

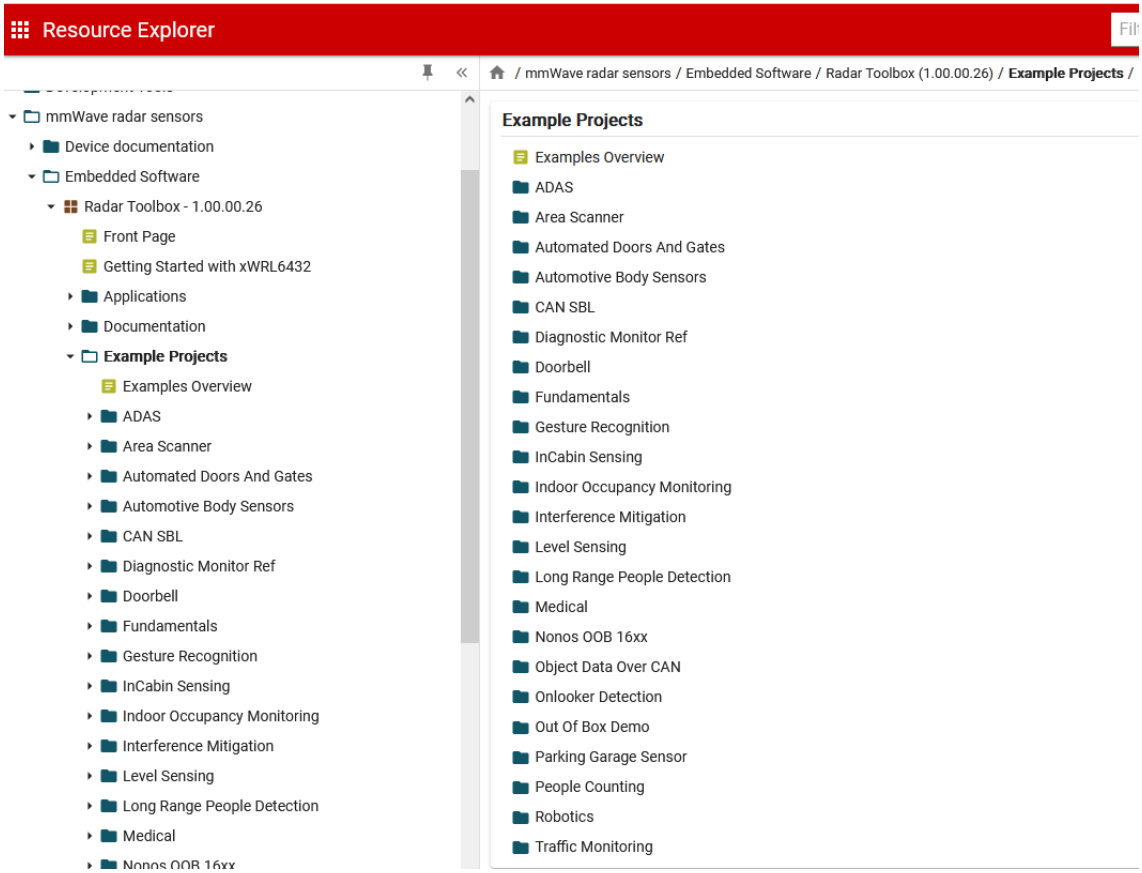
- Type 7: detected points
  - Length: 4 Bytes x Num Detected Obj
  - Value: payload consists of 4 bytes for each point in the point cloud.

Value	Type	Bytes
SNR [0.1 dB]	uint16_t	2
Noise [0.1 dB]	uint16_t	2

Applications

As we already saw in Chapter 2, Texas Instruments offers different application firmwares (laboratories) in the TI Radar Toolbox. uRAD provides a ready-made client for the supported one, installed together with urad-mmwave:

- urad-level-sensing: High Accuracy Level Sensing, with live views of the three ranges over time (--gui) and of the full FFT range profile (--spectrum).
- See the applications/ folder of the urad-automotive-sdk repository for the firmware binaries, chirp configurations and per-application documentation.



These laboratories exploit the most of the radar chips for each of those applications. Check which laboratories can be uploaded to the AWR1843AoP or IWR1843AoP and test them.

Take into account that for each particular firmware, the received information as well as the configuration files are different. But all information can be found in the **Resource Explorer**.

WARNING: application firmwares from the TI Radar Toolbox accept only one configuration per boot. Reset the radar between runs: unplug and replug the USB cable, press the reset button, or drive the RESET pin (automatable on Raspberry Pi via gpio_reset_pin). The uRAD level sensing firmware (by Anteral) does not have this limitation.



ADVICE: contact us at contact@urad.es for helping with any laboratory or application.

Safety & Handling 6

This chapter includes important safety and handling information for uRAD.

Read all safety and handling information below as well as the operating instructions before using uRAD in order to avoid any injury or damage.

Keep this user guide on hand for future reference.

Important Safety Information



WARNING: Failure to follow these safety instructions could result in fire, electric shock, or other injury or damage.

Proper handling uRAD contains sensitive electronic components. Do not drop, disassemble, crush, bend, deform, puncture, shred, microwave, incinerate, paint, or insert foreign objects into uRAD.

Water and wet locations Do not expose uRAD to water or rain, or handle it near washbasins or other wet locations without a proper case. Take care not to spill any food or liquid on uRAD. In case uRAD gets wet, allow it to dry thoroughly before turning it on again. Do not attempt to dry uRAD with an external heat source, such as a microwave oven or hair dryer.

uRAD repairs Never attempt to repair or modify uRAD by yourself. Disassembling may cause damage that is not covered under the warranty. If uRAD is damaged, malfunctions, or comes in contact with liquid, contact us at contact@urad.es.

Radio frequency interference Observe signs and notices that prohibit or restrict the use of radio frequency devices. Emissions from uRAD can negatively affect the operation of other radio frequency equipment operating in the same frequency band. Turn off uRAD when use is prohibited, such as traveling in aircraft, or when asked to do so by authorities.

Important Handling Information



WARNING: Failure to follow these handling instructions could result in damage to uRAD or other property.

Carrying uRAD contains sensitive electronic components. Do not bend, drop or crush it.

Cleaning To clean use a soft lint-free tip and isopropyl alcohol. Dust can be removed with compressed air of low power.

Plugging Never force the connector or apply excessive pressure because this may cause damage that is not covered under the warranty. Check for obstructions.

Operating Temperature Keep uRAD within acceptable temperatures. uRAD components operate from -40ºC to 85ºC but we recommend operating uRAD in the range from -20ºC to 65ºC.

Disposal and Recycling Information Your uRAD must be disposed of properly according to local laws and regulations. Because this product contains electric components, the product must be disposed of separately from household waste. Contact your local authorities to learn about recycling options.

Product Warranty 7

Manufacturing

All components and solder alloys used in this product comply with the RoHS Directive. This directive prevents new electrical and electronic equipment placed on the market in the European Economic Area from containing lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE) above the permitted levels.

Quality Testing

Each uRAD unit undergoes strict testing to make sure it is not faulty:

- It is thoroughly checked for short circuits and open connections.
- It is powered up to check that there are no out-of-range voltages.
- The microcontroller is programmed and debugged.
- Several test programs are run to check its overall functionality.
- Finally, the radiated signal is checked to comply with the limits of the ETSI EN 302 264 standard for this frequency band.

Limited Warranty Statement

IMPORTANT: by placing an order, the Customer accepts the terms of this Limited Warranty Statement. We recommend that you read it before using the products. This Statement is without prejudice to the statutory rights of consumers, which are not limited in any way.

In this Statement, “uRAD” means Anteral S.L. and “the Customer” means the person or company placing the order. A consumer is a Customer who buys for purposes outside their trade, business or profession; any other Customer is a business customer.

1. Warranty periods

1.1 Consumers: 3 years from delivery of the product, under the legal guarantee provided by consumer law.

1.2 Business customers: 1 year from the date of sale.

2. Warranties

2.1 uRAD warrants that its products conform to the specifications detailed in their datasheet. uRAD is not liable for defects caused by neglect, misuse or mistreatment, or for products that the Customer has altered or modified in any way.

2.2 If any uRAD product fails to conform to this warranty, uRAD will repair or replace it and shall be given a reasonable time to do so. If the Customer is a consumer, they may also exercise the other rights granted by law, such as a price reduction or termination of the contract where applicable. Repaired or replaced products are covered by a new full warranty period.

2.3 The Customer agrees not to use uRAD products in applications or components of life-support devices, in the operation of nuclear facilities, or in other mission-critical applications or components where human life or property may be at stake. The Customer acknowledges and agrees that any such use is solely at the Customer's own risk, and that the Customer is solely responsible for compliance with all legal and regulatory requirements related to such use.

2.4 uRAD may provide technical, application or design advice. The Customer acknowledges and agrees that providing these services does not expand or otherwise alter uRAD's warranties set out in this section, and that no additional obligations or liabilities for uRAD arise from them.

2.5 For business customers, and to the extent permitted by law, uRAD disclaims all other warranties, express or implied, regarding the products, including any implied warranties of merchantability or fitness for a particular purpose.

2.6 The Customer acknowledges and agrees that the Customer is solely responsible for compliance with all legal, regulatory and safety requirements concerning the products and their use in the Customer's applications, notwithstanding any application-related information or support that uRAD may provide.

2.7 To the extent permitted by law, uRAD shall not be liable to the Customer or any third party for any special, collateral, indirect, punitive, incidental, consequential or exemplary damages in connection with or arising from the products, even if uRAD has been advised of the possibility of such damages. This section will survive the end of the warranty period.