UM-003 OPS243-A User Manual

OmniPreSense OPS243-A short range radar sensor has an easy to use API to control the output of the sensor. Simple commands can be used to configure the operation and output information provided by the sensor. Default settings are noted below. Upon powering on the module, the default settings are used.

Installation Instructions

The OPS243-A provides a complete radar module on a single board. The coverage area or field of view (FOV) for the OPS243-A is 20° in the azimuth (horizontal) and 24° elevation (vertical). Install the OPS243-A facing the direction of the FOV to be covered. The antenna gain for the radar sensor is 11dBi.

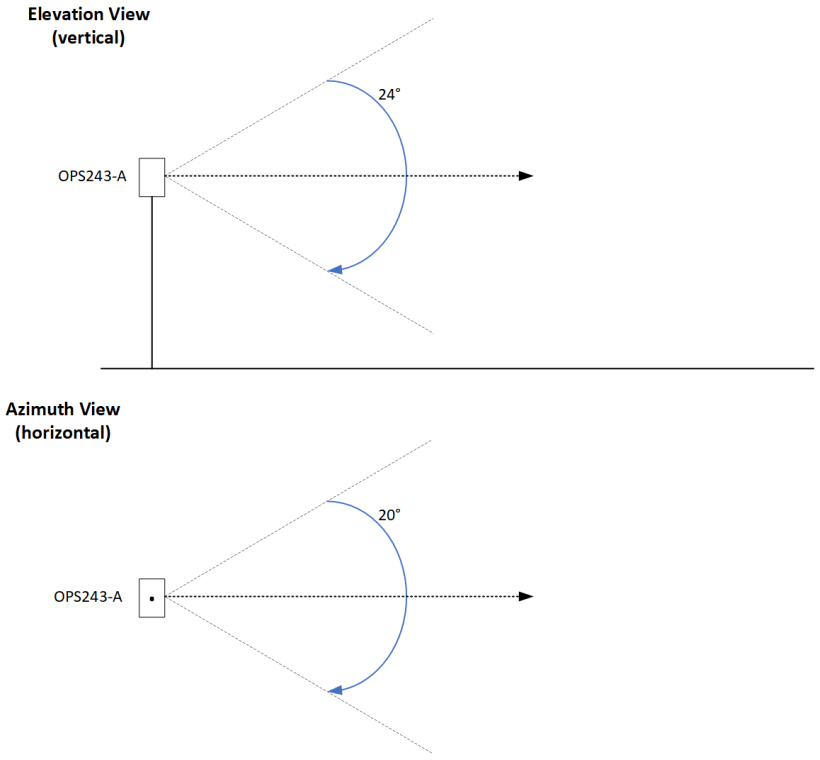

Figure 1. OPS243-A Beamwidth

The OPS243-A can generally can be placed behind most any material (plastic, glass, wood, etc.) depending on thickness. Typical applications will use plastics such as ABS or PVC at 3 or 6mm thickness. Some materials will block the signal and the OPS243-A should not be placed behind these. Examples of these are metal, concrete or brick.

Radar Sensor Types

OmniPreSense provides two different types of sensors, Doppler radar sensor reporting motion and speed and FMCW radar sensors reporting range. The feature differences for these sensors is shown in Table 1. The following API commands pertain to both types of sensors except for special cases. In these cases, this document will call out the special command for either a Doppler (-A), FMCW (-B), or both Doppler and FMCW (-C) radar.

Table 1. Radar Sensor Feature Matrix

Sensor	Type	Motion	Speed	Direction	Signal Magnitude	Range	FCC/IC Modular Approval	Detection Range (RCS = 10)
OPS243-A	Doppler	●	●	●	●		●	75-100m
OPS243-C	Doppler & FMCW	●	●	●	●	●	● (pending)	50-60m

Terminal Control

A simple Command Terminal can be used to control the module operation with the API commands. Examples of simple but very useful Command Terminals are Tera Term and PuTTY. Both are free, open source terminal tools for the PC/Mac which can easily connect to a serial port and accept data over USB from the OmniPreSense module.

To begin using the OmniPreSense sensor, first download Tera Term or PuTTY onto your PC/Mac. With the OmniPreSense sensor plugged into the USB port of your PC/Mac, start Tera Term or PuTTY. A configuration window such as Figure 2 or Figure 3 will appear. Tera Term can detect the active COM port (greyed out to right of Serial button if TCP/IP is selected). Select the Serial button and press OK. For PuTTY, you'll need to know which COM port is used, set its value, select the Serial button, and Open.

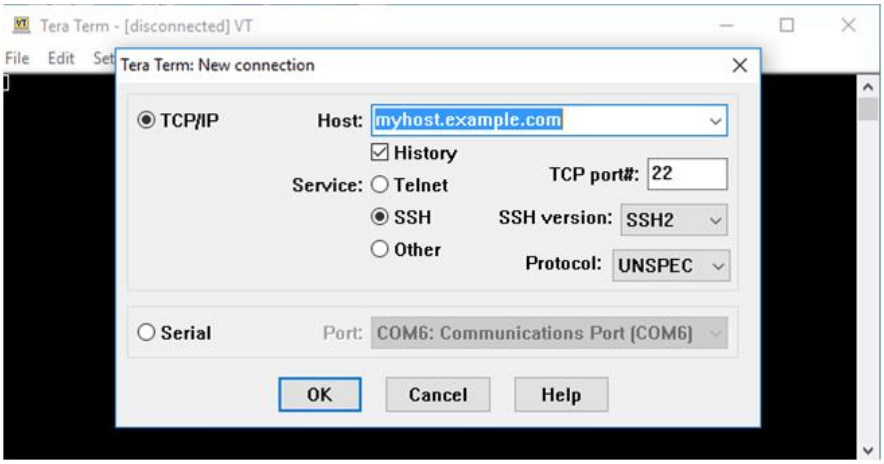

Figure 2. Tera Term Startup Menu

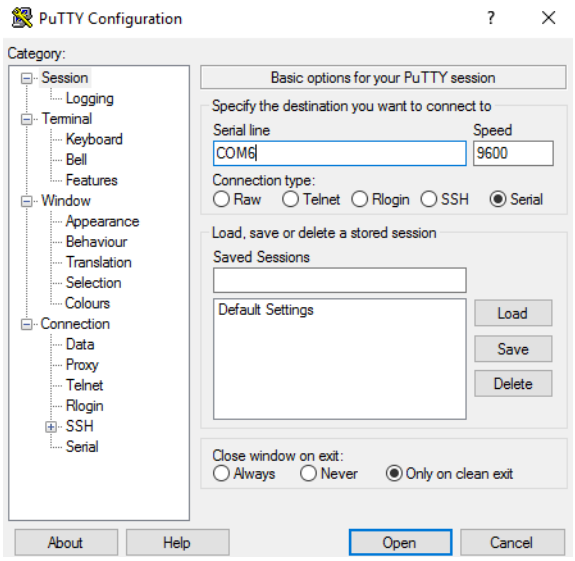

Figure 3. PuTTY Startup Menu

Once connected, the data reported by the sensor will start streaming to the terminal when an object either in motion appears (-A, -C Doppler radar sensors) or there are objects in the sensors field of view (-B, -C FMCW radar) to report the range to. The default settings are shown in Table 2. If there is no object moving in front of the sensor or it's not pointing at any object, no data is reported or streamed to the terminal. A simple wave of the hand will show data like that shown in Figure 4. Any of the API commands can now be executed to change the output data or query the configuration.

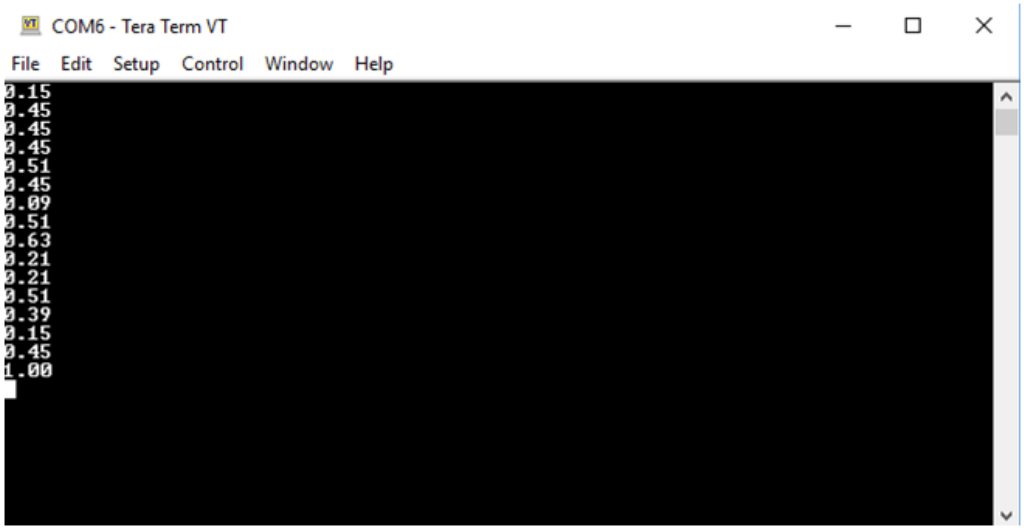

Figure 4. Streaming Data with Tera Term

Figure 5. Streaming Data with PuTTY

Default Settings

The default settings of the module are set to provide solid performance over a wide range of applications. Upon power-up the default settings are used, and operation begins. Future updates will allow the module to retain the settings of the module from the last operation. The default settings are listed in Table 2.

Table 2. Default Settings

API Command	API Command	Doppler (-A) Default Value	FMCW (-B) Default Value
Output Units	UM/uM	m/s	m
Data Precision	F2	2	2
Sampling Rate	SX	10,000	N/A
Sampling Buffer Size	S>	1024	N/A
Simple Motion Interrupt	IG	Off	Off
Reported Speed Filter	R>n, R<n	Off	N/A
Reported Direction Filter	R|	Off	N/A
Reported Range Filter	r>n, r<n	N/A	Off
Magnitude Filter	M>n, M<n (Doppler) or m>n, m<n (FMCW)	>10	>100
JSON Output	OJ	Off	Off
LED Control	OL	On	On
Magnitude Report	OM	Off	Off
Number Reports	On	1	1
Raw Data Output	OR	Off	Off
Post FFT Data Output	OF	Off	Off
Speed or Range Report	OS/OD	On	On
Time Report	OT	Off	Off
Output Units	OU	N/A	On
Sensor Power Mode	PA	Active	Active
Power Level	PX	On	On

Speed Operating Range (-A Doppler only)

The maximum speed reported is determined by the Sampling Frequency. For slow moving objects, a sample rate of 5,000 (SV command) is perfectly fine. The default setting of 10,000 (SX command) provides a detectable speed of up to 31.1 m/s (69.5 mph) while 20,000 (S2 command) provides up to 62.2 m/s (139.1 mph). The resolution of the reported speed increases as the sample frequency goes down. The range of values is summarized in Table 3.

Table 3. Maximum Operating Speeds

Sample Frequency	API Command	Maximum Speed (m/s)	Maximum Speed (mph)	Resolution* (m/s)	Resolution* (mph)
1,000	SI	3.1	7.0	0.006	0.014
5,000	SV	15.5	34.8	0.030	0.068
10,000	SX	31.1	69.5	0.061	0.136
20,000	S2	62.2	139.1	0.121	0.272
50,000	SL	155.4	347.7	0.304	0.679
100,000	SC	310.8	695.4	0.608	1.358

* 1024 buffer size, 512 buffer size accuracy will be twice these values, 256 four times

API Commands

The following are the API commands supported by the OPS243. These commands can be sent by typing into the command terminal to change settings on the sensor or control its operation. The commands provided include simple queries to fetch information about the sensor and its settings or write commands which control or change the operation of the sensor.

Module Information – returns information about the module and its setting.

Command	Name	R/W	Value
??	Module Information	Read	{"Product":"OPS243"} {"Version":"1.0.0"} {"SamplingRate":10000, "resolution":0.0607} {“SampleSize”:1024} {"Clock":"54"} {"Q2COUNT":"1149 (~22980 counts/sec) @t=37"} {"PowerMode":"Continuous"} {"Squelch":"100"} {“RequiredMinSpeed”:”0.000”}
?R	Reset Reason	Read	Provides the reason why sensor reset. { "ResetReason": "Status from bitmask", "Power On" : true, "Supply Watchdog" : true, "Power Validation" : true }

Module Part Number – returns model number of sensor.

Command	Name	R/W	Value
?P	Module Part Number	Read	{"Product":"OPS243 Doppler"}

Firmware Version/Board ID – returns current firmware version of the module. Firmware version consists of a major revision, minor revision, and patch revision in the form of xx.yy.zz.

Command	Name	R/W	Value
?V	Firmware Version Number	Read	{"Version":"1.3.1"}
?B	Firmware Build Number	Read	{"Build":"20181005_1335"}
?U	Unique Board ID	Read	{"UID":"b2000040b7a12400d5188041"}

Speed Output Units (-A, -C Doppler only) – read or set the units for the velocity output. Units supported include m/s (default), cm/s, ft/s, km/hr, and miles per hour.

Command	Name	R/W	Value
U?	Current Velocity Units	Read	{"Units":"m-per-sec"}
UC	Centimeters per second	Write	{"Units":"cm-per-sec"}
UF	Feet per second	Write	{"Units":"ft-per-sec"}
UK	Kilometers per hour	Write	{"Units":"km-per-hr"}
UM	Meters per second	Write	{"Units":"m-per-sec"}
US	Miles per hour	Write	{"Units":"mph"} Calculations are based on the international mile (1,609.344 m per mile).

Range Output Units (-B, -C FMCW only) – read or set the units for the range output. Units supported include meter (default), centimeter, feet, inch, and yards.

Command	Name	R/W	Value
u?	Current Range Units	Read	{"Units":"Value", "RangeUnit":"m"} {"Resolutions":"Value", "RangeResolution_m":0.0777}
uM	Meters	Write	{"Units":"Value", "RangeUnit":"m"} {"Resolutions":"Value", "RangeResolution_m":0.0777}
uC	Centimeters	Write	{"Units":"Value", "RangeUnit":"cm"} {"Resolutions":"Value", "RangeResolution_cm":7.7710}
uF	Feet	Write	{"Units":"Value", "RangeUnit":"ft"} {"Resolutions":"Value", "RangeResolution_ft":0.2550}
uI	Inch	Write	{"Units":"Value", "RangeUnit":"in"} {"Resolutions":"Value", "RangeResolution_in":3.0594}
uY	Yards	Write	{"Units":"Value", "RangeUnit":"yd"} {"Resolutions":"Value", "RangeResolution_yd":0.0850}

Data Precision – set the number of digits for the data reported.

Command	Name	R/W	Value
Fn	Decimal Places	Write	Set n to the number of decimal places to be reported. For example, setting to F2 will report 2 decimal places (ex. 10.35). F0 will provide the integer value only. Valid values of n are 0-5.
F?	Decimal Place Setting	Read	Query the number of decimal places set.

Sampling Rate/Buffer Size (-A, -C Doppler only) – set these values to control the sample rate of the module. This setting influences the output data and the rate at which the data is reported. The buffer size influences the report rate and resolution. A buffer size of 512 will have a report rate between 5-30Hz. The resolution becomes worse by a factor of two with a 512-buffer size versus 1024 (Figure 6) and worse again at 256 buffer size.

Command	Name	R/W	Notes
SI	1K samples/second	Write	
SV	5K samples/second	Write	
SX or S1	10K samples/second	Write	
S2	20K samples/second	Write	
SL	50K samples/second	Write	
SC	100K samples/second	Write	
S>	1024 buffer size	Write	1024 samples are collected before processing
S<	512 buffer size	Write	512 samples are collected before processing
S{	256 buffer size	Write	256 samples are collected before processing

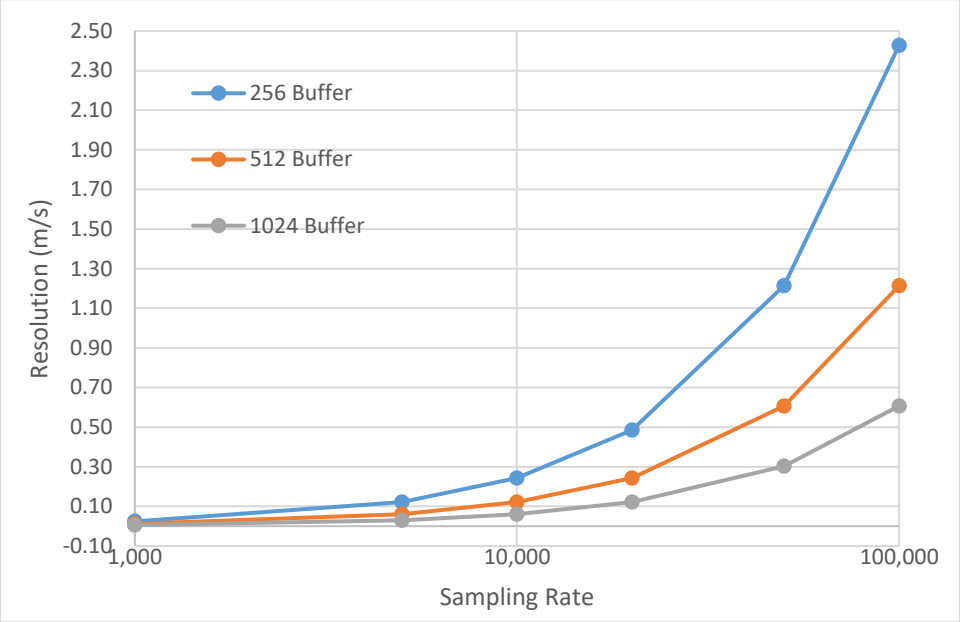

Figure 6. Doppler (-A) Buffer Size versus Resolution

Reported Speed/Range/Direction Filter – use these settings to set the range of data to report. Settings are available for either a minimum or maximum value below or above which data will not be reported. Commands are available to set speed, range, and direction of speed filters. These filters can be used to help set sensitivity levels of detection. This command requires a return (↵) after the number. Direction filter allows reporting only a single direction or both.

Command	Name	R/W	Notes
R>n	Reported Minimum Speed Filter	Write	n is any number upon which no detected speeds below that number will be reported. R>0 resets to no limit. Doppler (-A, -C) radar only.
R<n	Reported Maximum Speed Filter	Write	n is any number upon which no detected speeds above that number will be reported. R<0 resets to no limit. Doppler (-A, -C) radar only.
r>n	Reported Range Filter	Write	n is any number upon which no detected range below that number will be reported. r>0 resets to no limit. FMCW (-B, -C) radar only.
r<n	Reported Range Filter	Write	n is any number upon which no detected range above that number will be reported. r<0 resets to no limit. FMCW (-B, -C) radar only.
R?	Report Current Speed Filter	Read	Reports current settings of the speed filter
r?	Report Current Range Filter	Read	Reports current settings of the range filter
R+	Inbound Only Direction	Write	Only reports inbound direction
R-	Outbound Only Direction	Write	Only reports outbound direction
R|	Clear Direction Control	Write	Reports both directions

Frequency Control (-A, -C Doppler only) – use this setting to set the desired transmit frequency. Set *n* to a positive or negative number to set the frequency. T=0 is the default setting targeting 24.125GHz. Each increment steps approximately 18MHz. The programming steps are limited to 24.0 through 24.25GHz for the OPS243. The limits on *n* are -2 (~24.0GHz) to 2 (~24.25GHz) for the OPS243 which has some guard banding to ensure it stays within the 24.0-24.25GHz ISM band. Depending on the spread between the current frequency and the newly set frequency, there may be a long settling time on the order of 5-10 seconds or longer based on the size of the jump in values. Writing ?F will provide the current transmitter output frequency.

Command	Name	R/W	Value
T=*n*	Frequency Setting	Write	T=0 is the default setting for 24.125GHz.
?F	Frequency Output	Read	?F returns the output frequency of the transmitter in GHz.

Data Output – set to control the data output.

Command	Name	R/W	Value
OD	Range Report	Write	Turn range reporting on or off. Default operation range is reported. Use Od to turn it off and OD to turn it back on. FMCW (-B, -C) radar only.
OS	Speed Report	Write	Turn speed reporting on or off. Default operation speed is reported. Use Os to turn it off and OS to turn it back on. Doppler (-A, -C) radar only.
OF	FFT Output On	Write	Results from the FFT processing of each buffer is sent. Data is output with json output format. Use Of to turn FFT output off. It's not recommended to use OF with UART, especially at low baud rates.
OG	Object Sensor Light	Write	Enables White light when Object Sensor is enabled (IG) and an object is detected. Disable the light with Og. By default, the object sensor light is disabled.
OC	Processing Light Activity	Write	Enables lights showing processing activity. Disable the lights with Oc. By default, the processing activity lights are disabled.
OJ	JSON Mode On	Write	Turns on output to format data in JSON format. An example would output: {"speed":0.58, "direction":"inbound", "time":105, :tick":135}. Use Oj to turn off JSON mode.

Command	Name	R/W	Value
OR	Raw ADC Output On	Write	I and Q output buffers from the ADC will be sent. Data output will alternate between the I and then Q buffer. Or turns off raw ADC reporting. It's not recommended to use OF with UART, especially at low baud rates.
OL	LED Control	Write	Turn the LEDs on (OL) or off (Ol). Turning off the LED's can save approximately 10mA of current consumption.
OM	Magnitude Report	Write	Turn on reporting of the magnitude associated with the speed. The magnitude is a measure of the size, distance, and reflectivity of the object detected. Type Om to turn magnitude off. When turned on, magnitude information is reported before speed/range information.
On	Number of Reports	Write	Define how many reports to provide. n is a number between 1 and 9. The number n applies to magnitude and speed reports.
OT	Time Report	Write	Turn the time report on. Time is reported as the seconds and milliseconds since the last reboot or power on. For example, 137.429, 3.6 is read as 137 seconds and 429 milliseconds with a speed of 3.6 m/s. If magnitude is turned on, the data is provided as time, magnitude, speed.
OU	Units Report	Write	Report the current unit setting with each report. Default units is turned on. Use Ou to turn off. FMCW (-B) radar only.
OV	Range Report Order	Write	Changes the default order of the range reported to largest range value first to smallest as opposed to using largest signal magnitude. Use Ov to return to ordering by signal magnitude. Use O/ to report smallest range first to largest or turn back to largest first with O\. FMCW (-B, -C) radar only.
BZ BL BS BC BT BV	Blank Data Reporting	Write	If measured data does not meet filtering criteria, sensor will report out a character with every sampling interval. BZ will report zero value. BL will report blank lines. BS will report a space. BC will report with a comma. BT will report a timestamp. Use BV to turn off.

UART Control – set to control the UART interface. The default configuration is 8-bits, no parity, 19,200 baud rate, and 1 stop bit. The OPS243 will start reporting out on the UART immediately after power on. If the USB is enumerated, the UART reporting will be shut off and data will be reported out USB. It's not recommended to use OF with UART, especially at low baud rates.

Command	Name	R/W	Value
I?	Query Baud Rate	Read	Outputs current baud rate and oversampling setting.
In	Baud Rate	Write	Set n to values 1, 2, 3, 4, or 5 based on desired baud rate. I1 = 9,600 I2 = 19,200 (default) I3 = 57,600 I4 = 115,200 I5 = 230,400

Simple Object Detection Interrupt – a simple output which trips if an object in motion or object in range is detected. The signal is toggled on the interrupt pin. For the Doppler (-A, -C) radar sensors, the pin is high when no motion is present and low when motion is detected. For the FMCW (-B, -C) radar sensors, the pin is high when no object is in detected region and set low when and object is detected in the detection region. For Doppler (-A, -C) radar sensors the interrupt can be filtered on speed (R>n, R<n), signal magnitude (M>n, M<n), and direction (R+, R-, R|). For FMCW (-B, -C) radar sensors, the interrupt can be filtered on range (r>n, r<n) and signal magnitude (m>n, m<n). Figure 7 shows how filtering can allow detection for certain objects and mask out others.

Command	Name	R/W	Value
IG	Object Detection Interrupt	Write	Turn object detection interrupt on. Use "Ig" to turn off.

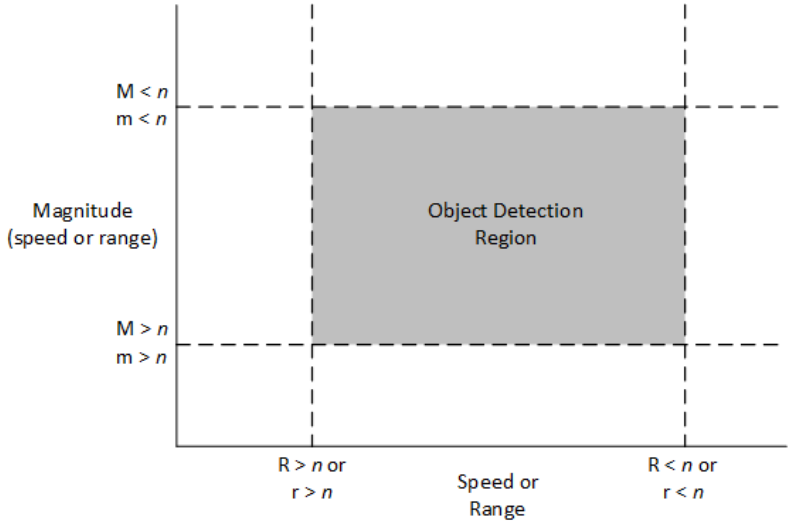

Figure 7. Speed, Range and Magnitude Filtering

Simple Counter – counts objects which meet the speed/range and signal magnitude filtering settings. The counter will count the number of objects over time which meet the filtering settings for speed/range and signal magnitude. The count is not reported but can be queried with the N? command. The count can be reset with the N! command. A count is triggered if 2 or more consecutive reports meet the threshold limits. Once detected, the object is set to be counted until 4 reports missing the threshold limits are seen. The value to start a count (default 2) can be set with the N>*n* command. The value to end a count (default 4) can be set with the N<*n* command. To start a new count, clear the running count with the N! command.

Command	Name	R/W	Value
N?	Query Count	Read	Reports number of objects counted. {"DetectedObjectCount":3}
N!	Reset Count	Write	Resets the number of objects in counter. {"DetectedObjectCount":0}
N>*n*	Count Start Threshold	Write	{"MotionSignal":"Status", "CountToPass":2, "CountToFail":4}
N<*n*	Count End Threshold	Write	{"MotionSignal":"Status", "CountToPass":2, "CountToFail":3}

Clock – set to control the reporting of the time. The time is measured in seconds/milliseconds from power on of the module. Use the OT command to report the time in seconds and milliseconds. When the module is put in low power state (PI), the clock will continue counting. If you wish for the module to provide "the real time", then set it to "the Unix Epoch time" (see wikipedia.org/wiki/Unix_time).

Command	Name	R/W	Value
C?	Query Time	Read	Ex. {"Clock":"50"} reports 50 seconds since power on.
C=n	Set Time	Write	Reset the clock start time. For example, n = 10 will start the clock at 10 seconds and then continue counting.

Module/Transmit Power – set to control the operating mode (PA, PI, PP) or the transmit power. The typical maximum transmit power is 9 dB. Reducing the transmit power does not reduce the overall power consumption of the module. Note that the detection range will decrease with decreased transmit power.

Command	Name	R/W	Value
P?	Active Power State	Read	Reports current power state.
PA	Active Power Mode	Write	Normal operating mode.
PI	Idle Power Mode	Write	No activity, waits for Active Power command. The RF is powered down for further power savings.
PP	Single Pulse	Write	Use to capture and process a single pulse and buffer of data. Use when the sensor is set to PI mode.
P7 or PN	Transmit Power Control or Min Power	Write	Transmit is set at -9 dB below max power.
P6	Transmit Power Control	Write	Transmit is set at -6 dB below max power.
P5	Transmit Power Control	Write	Transmit is set at -4 dB below max power.
P4	Transmit Power Control	Write	Transmit is set at -2.5 dB below max power.
P3 or PD	Transmit Power Control or Mid Power	Write	Transmit is set at -1.4 dB below max power.
P2	Transmit Power Control	Write	Transmit is set at -0.8 dB below max power.
P1	Transmit Power Control	Write	Transmit is set at -0.4 dB below max power.
P0 or PX	Transmit Power Control or Max Power	Write	Transmit power is set at its maximum value with maximum range. PX has additional “overdrive” of 0.2 dB when utilized.
PO	Transmit Off	Write	Turn transmit off and put in sensor in receive only mode. Use P! to turn transmit back on.
P!	System Reset	Write	Full system reset including the clock.

Short Duty Cycle Control – set to control duty cycle operation under 1 second. The time set is the amount of time the sensor will delay between outputting the last report and starting the next report.

Command	Name	R/W	Value
W?	Current Delay time	Read	
W0	0 delay between reports	Write	
WI	1ms delay	Write	
WV	5ms delay	Write	
WX	10ms delay	Write	
W2	20ms delay	Write	
WL	50ms delay	Write	
WC	100ms delay	Write	
WD	500ms delay	Write	
WM	1000ms delay	Write	
Wn	n*100ms delay	Write	0 ≤ n ≤ 9

Long Duty Cycle Control – set to control the duty cycle operation greater than or equal to 1 second. The time set is the amount of time the module will sleep between transmit/receive pulses and processing. For settings longer than 1 second, the RF will be powered off to save power. In this manner, lower power operation may be achieved.

Command	Name	R/W	Value
Z?	Current sleep setting	Read	
Z0	Sleep 0 Second	Write	Use to set back to normal operation.
ZI	Sleep 1 Second	Write	
ZV	Sleep 5 seconds	Write	
ZX	Sleep 10 seconds	Write	
ZL	Sleep 50 seconds	Write	
ZC	Sleep 100 seconds	Write	
Z2	Sleep 200 seconds	Write	
Zn	Sleep n*100 seconds	Write	0 ≤ n ≤ 9
Z=n	Set Sleep Time	Write	Set the amount of time to sleep between data processing. Ex., n = 5 would set the module to sleep for 5 seconds (RF powered off) between a transmit/receive pulse and processing. 0 ≤ n ≤ 4,294,967

Magnitude Control – provides control over the sensitivity of the module to detect moving objects. Low numbers are most sensitive, high numbers are least sensitive. Magnitude is related to Squelch as the square root of the number. For example, a magnitude setting of 10 is equal to a Squelch setting of 100 (QI).

Command	Name	R/W	Value
M?	Current speed magnitude setting	Read	Doppler (-A, -C) radar only.
m?	Current range magnitude setting	Read	FMCW (-B, -C) radar only.
M>n	Low Speed Magnitude Filter	Write	n is any number upon which no detected magnitudes below that number will be reported. M>0 resets to no limit. Doppler (-A, -C) radar only.
M<n	High Speed Magnitude Filter	Write	n is any number upon which no detected magnitudes above that number will be reported. M<0 resets to no limit. Doppler (-A, -C) radar only.
m>n	Low Range Magnitude Filter	Write	n is any number upon which no detected magnitudes below that number will be reported. m>0 resets to no limit. FMCW (-B, -C) radar only.
m<n	High Range Magnitude Filter	Write	n is any number upon which no detected magnitudes above that number will be reported. m<0 resets to no limit. FMCW (-B, -C) radar only.

Persistent Memory – saves current configuration into flash memory and is retained even if power is removed.

Command	Name	R/W	Value
A!	Save Configuration	Write	Saves current configuration settings in flash memory. Upon power loss or recycling power, the saved configurations will be used as the default.
A.	Read Settings	Write	Read the current flash settings.
AX	Reset Flash Settings	Write	Will overwrite current saved settings and return to the factory default settings.

FCC 15B Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/TV technician for help.

FCC 15C Statement

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

FCC RF Exposure Statement

This transmitter must be installed to provide a separation distance of at least 20cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users must be provided with transmitter operation conditions for satisfying RF exposure compliance.

IC Statement (English and French):

This device complies with ISED Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'ISED 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'utilisateur de l'appareil doit accepter tout brouillage radio électrique subi, même si le brouillage est susceptible d'en comprom-ettre le fonctionnement.

Non-modification Statement

OmniPreSense Corporation has not approved any changes or modifications to this device by the user. The antenna design is intended to be used as is with no modifications. Any changes or modifications could void the user's authority to operate the equipment.

The final product containing the modular transmitter must be labeled with the following statement:

"Contains FCC ID: 2ALLL243A"

"Contains IC: 24107-243A"

Appendix

Table 4. OPS243 Code Version Matrix

Feature	V1.0.0	Notes
Module Information	•	
Module Part Number	•	
Firmware Version	•	
Firmware Build	•	
Speed Output Units	•	
Data Precision	•	
Sampling Rate	•	
Buffer Size	•	
Reported Speed Filter	•	
Reported Direction Filter	•	
Frequency Control	•	OPS243 limited to 24-24.25GHz
Frequency Reporting	•	
256 Buffer Size	•	
LED Control	•	
Number Reports	•	
Magnitude Report	•	
Speed Report	•	
Time Report	•	
Zero Reporting	•	
Timing Report	•	
Module Power	•	
Transmit Power	•	
Duty Cycle Control	•	
Debug Modes	•	
UART Interface	•	
Maximum Speed	•	
Motion Interrupt	•	
Min/Max Magnitude Filter	•	
Watchdog Timer	•	
Persistent Memory	•	
System Reset	•	
Simple Counter	•	

Revision History

Version	Date	Description
A	November 14, 2019	Initial release.