Explore the next sense

Oct 2018



Getting Started Guide
Acconeer XC111-XR111 &
XC112-XR112
Radar Sensor Evaluation Kit



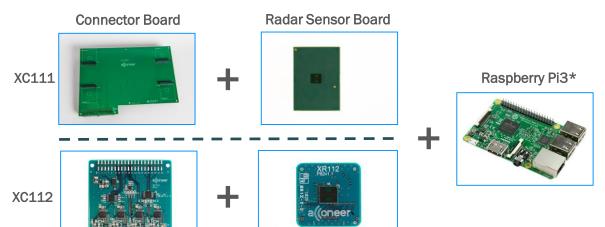
Installation guide

This is an installation quick guide for the Acconeer XC111-XR111 and XC112-XR112 Radar Sensor Evaluation Kit (EVK). For a hands-on instruction video, please visit https://youtu.be/OuKrm_RAV_c.



Preparing the HW Installation

To complete a successful installation of Acconeer EVK, the following HW components will be required:



Additionally*:

- SD Card
- SD Card Holder
- USB Keyboard
- USB Mouse
- Flex Cable, 1 per XR112
- Power Supply for Raspberry Pi**
- Monitor with HDMI cable

^{*} Not provided by Acconeer except flex cable

^{**} Raspberry Pi original Power Supply is recommended



Preparing the SW installation

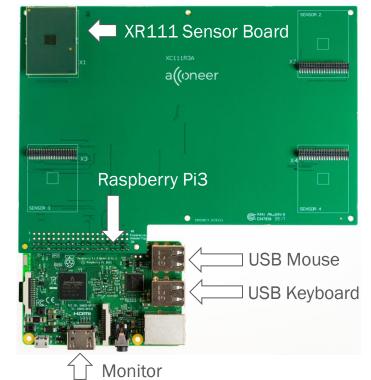
The following applications will be required to complete an installation. Also, they will be very useful when working with the Radar Sensor EVK. Please download and install:

- Acconeer SW for EVK: Available from http://developer.acconeer.com
- For all users (Windows, Linux, IOS)
- Raspbian OS: Available from <u>www.raspberrypi.org</u>
- Etcher: Available from <u>www.etcher.io</u> for flashing the Raspbian OS
- For Windows users (Linux/IOS users use SSH and SCP)
- PuTTY: Available from <u>www.putty.org</u> used for connecting to the Raspberry Pi
- WinSCP: Available from <u>www.winscp.net</u> used for transferring files to Raspberry Pi



Assemble the HW XC111/XR111

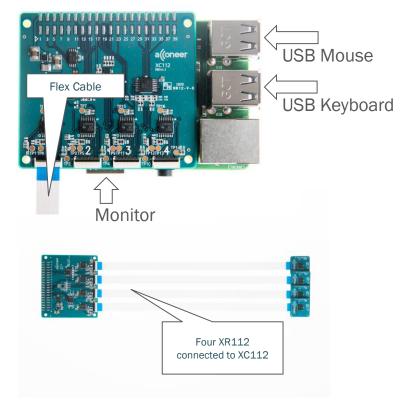
- Connect the XR111 Radar Sensor
 Board to the XC111 Connector Board.
- Connect the Raspberry Pi3 to the XC111 Connector Board.
- The end result is illustrated in the picture to the right.
- Also, connect mouse and keyboard as illustrated.





Assemble the HW XC112/XR112

- Connect the XR112 Radar Sensor
 Board to the XC112 Connector Board using the provided flex cable.
- Connect the Raspberry Pi3 to the XC112 Connector Board.
- Also, connect mouse and keyboard in the same way as on previous page.





Installing the Raspbian

- 1. Insert the SD-Card in the PC. When prompted to format the card, please ignore/cancel.
- 2. Open Etcher.
- 3. Drag the Raspbian flash image, zipped, to Etcher.
- 4. Make sure the SD card is the selected destination.
- 5. Click flash. Flashing will begin and take a few minutes. When flashing is done, Etcher can be closed.



Depending on the security settings in Windows, you may need to click <u>Yes</u> in the confirmation popup to grant permission for the flashing process.



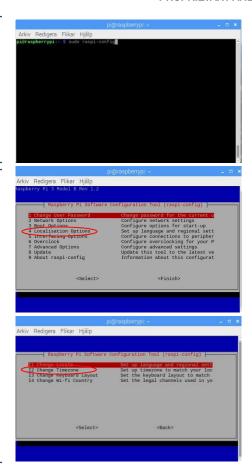
- Pull the SD card from the PC.
- 2. Insert into the Raspberry Pi.
- 3. Plug in the monitor, using the HDMI cable.
- 4. Plug in the power supply to the Raspberry Pi.
- 5. Boot of the Raspberry Pi will initiate automatically.



Installing the EVK

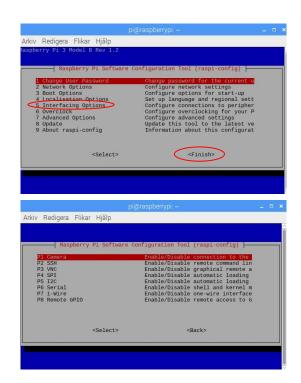
- Once booting is complete, you can start up the Raspberry Pi Terminal Window.
- On the prompt, type sudo raspi-config. The configuration menu will appear.

- From the menu, choose #4 Localization options.
- From the next menu choose #2 Change Time zone.
- Set the appropriate Time zone.



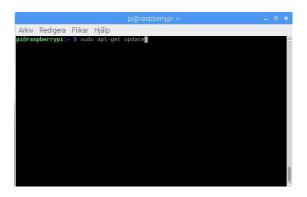


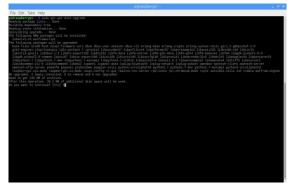
- Go to #5 Interfacing options.
- Enable the following interfaces:
 - P2 SSH
 - P4 SPI
 - P5 I2C
- When done, click <finish> to close the config menu.





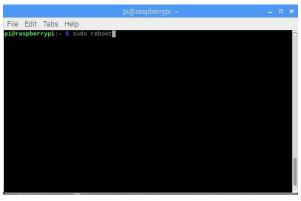
- Make sure your PC and Raspberry Pi is connected to wifi. If that is not an option, use an Ethernet cable to connect your PC to the Raspberry Pi.
- To make sure that you are using the latest version of Raspbian, type sudo apt-get update.
 This command will present the latest update.
- Type sudo apt-get dist-upgrade to start the upgrade and confirm, when prompted, with a Y.







- Once the command prompt appears, the installation is complete.
- To reboot the Raspberry Pi, type sudo reboot in the console.
- Once the reboot has been done, open the terminal window again. Now we need to find the Raspberry Pi IP adress.
 - Type ifconfig wlan0 the IP adress will appear in the terminal window.
 - If you do not use a wifi but have your raspberry connected by means of an Ethernet cable, type *ifconfig eth0*.
- In both cases, the Raspberry IP is visible as inet xxx.xx.xxxx



```
File Edit Tabs Help
        errypi:~ $ ifconfig wlan0
lags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet 172.20.0.163 netmask 255.255.252.0 broadcast 172.20.3.255
        inet6 fe80::768f:2889:1a0c:c2e prefixlen 64 scopeid 0x20<link>
       ether b8:27:eb:44:2a:e7 txqueuelen 1000 (Ethernet)
       RX packets 313 bytes 39576 (38.6 KiB)
       RX errors 0 dropped 2 overruns 0 frame 0
       TX packets 33 bytes 5417 (5.2 KiB)
       TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
      flags=4163<UP, BROADCAST, RUNNING, MULTICAST> mtu 1500
       inet 10.42.0.146 netmask 255.255.255.0 broadcast 10.42.0.255
       inet6 fe80::c3ce:ded3:74fe:13ca prefixlen 64 scopeid 0x20<link>
       ether b8:27:eb:11:7f:b2 txqueuelen 1000 (Ethernet)
       RX packets 3870 bytes 5608373 (5.3 MiB)
       RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1589 bytes 126238 (123.2 KiB)
       TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
pi@raspberrypi:~ 5
```



 If everything is completed up to this point, you could disconnect both mouse and keyboard, as you now can control the setup remotely.

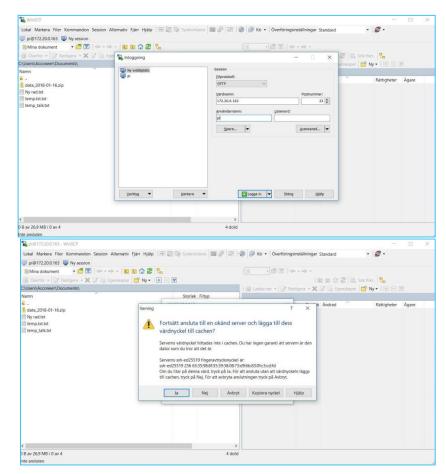
 Now let us continue by installing the Acconeer SW.





Installing the EVK SW

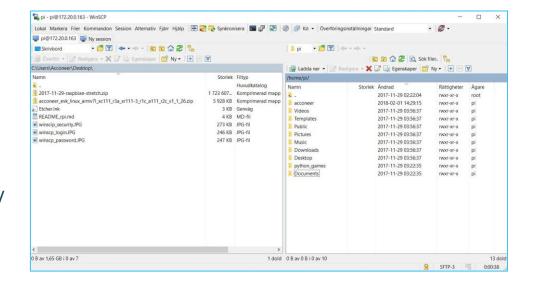
- Open up WinSCP.
- For Host name, enter the IP address retrieved from the Raspberry Pi.
- The Port should remain as default: 22
- Username and password are by default:
 - Username: pi
 - Password: raspberry
- Click Login.
- If you receive a Warning, simply click Yes or Update.





Installing the EVK Software

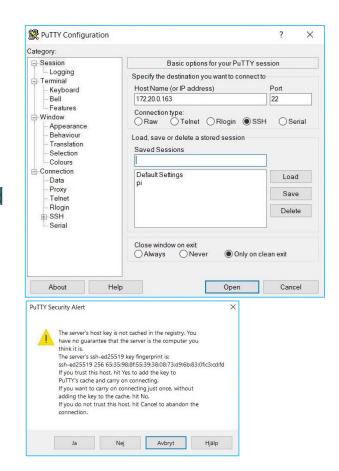
- Once logged in, you can see your local PC to the left and the Raspberry to the right.
- Locate the Acconeer SW zip on your local computer.
- Drag the file to the raspberry and release it in the /home/pi/ folder, as shown in the picture.





Installing the EVK Software

- Now open PuTTY.
- Enter the same IP address as previously and click Open.
- If prompted by a Warning, click Yes.





Installation the EVK Software

- A terminal window opens and you can login with the user name pi and password raspberry.
- The command Is will give you a list of all files/folders in the root of the raspberry.
- To unzip the Acconeer SW, type sudo unzip [filename]
- Once unzipped, you can enter the SW directory by using sudo cd EVK....

```
pi@raspberrypi:~ $ ls
acconeer
acconeer_evk_linux_armv7l_xcl11_r3a_xrl11-3_r1c_a111_r2c_v1_1_26.zip
Desktop
Documents
Downloads
evk_linux_armv7l_xcl11_r3a_xrl11-3_r1c_a111_r2c
Music
Pictures
Public
python_games
Templates
Videos
pi@raspberrypi:~ $ cd evk_linux_armv7l_xcl11_r3a_xrl11-3_r1c_a111_r2c/_
```



Installation the EVK Software

- From within the directory, you can activate different services.
- The illustration below shows activation of the distance detector:
 ./out/example_detector_distance_rpi_xc111_r3a_xr111-3_r1c_a111_r2c*

```
pi@raspberrypi: ~/evk_linux_armv7l_xc111_r3a_xr111-3_r1c_a111_r2c
pi@raspberrypi:~/evk linux armv7l xc111 r3a xr111-3 r1c a111 r2c $ ./out/example detector distance rpi xc111 r3a xr111-3 r1c a111 r2c
18:37:28.062 [17716] (I) (example detector distance): Acconeer software version v1.1.26
18:37:28.434 [17717] (I) (message router): Loaded internal driver (dummy)
18:37:28.437 [17716] (I) (acconeer): acc start() Detected 4 sensor(s)
18:37:28.437 [17788] (I) (request sensor preparation): Performing sensor preparation, sensor 1
18:37:28.519 [17788] (I) (core all1 r2c): Margin test status (99, 99, 100, 84)
18:37:28.566 [17788] (I) (acc alg dly coarse selection): Dly coarse calibration status: 5 5 5
 18:37:28.653 [17788] (I) (acc alg rx fine dip selection): Rx fine dip calibration status: 45
18:37:28.842 [17788] (I) (acc alg area selection): selected area index=2
18:37:28.937 [17788] (I) (core all r2c): Offset calibration status: 10605
18:37:28.938 [17788] (I) (request sensor preparation): Sensor preparation done, sensor 1
18:37:28.941 [17716] (I) (example detector distance): Get distance from sensor 1, range 200-400 mm
18:37:28.941 [17789] (I) (core all 1 r2c): request envelope: sensor 1 config: 7 1 12 0 0 3 1 1
18:37:28.972 [17789] (I) (request envelope): Request running, sensor 1
18:37:28.973 [17789] (I) (request envelope): Request stopped, sensor 1
18:37:28.981 [17716] (I) (example detector distance): Detector distance (200-400 mm): No object found
18:37:29.981 [17716] (I) (example detector distance): Get distance from sensor 1, range 200-400 mm
18:37:29.981 [17790] (I) (core all r2c): request envelope: sensor 1 config: 7 1 12 0 0 3 1 1
18:37:30.015 [17790] (I) (request envelope): Request running, sensor 1
18:37:30.017 [17790] (I) (request envelope): Request stopped, sensor 1
18:37:30.022 [17716] (I) (example detector distance): Detector distance (200-400 mm): No object found
 Cpi@raspberrypi:~/evk linux armv7l xcll1 r3a xrl11-3 rlc all1 r2c $
```

*Please note that the path name might change slightly depending on SW version and HW variant



Installation EVK SW

The picture to the right shows how to start the envelope:
./out/example_envelope_rpi_xc11
1_r3a_xr111-3_r1c_a111_r2c*

ni@rasnhem/ni	i: ~/evk linuv armu	71_xc111_r3a_xr111-3_r	1c a111 r2c					
_				-1111 -0-	C / 1 / 1 / 2 / 2 / 2 / 2 / 2 / 2 / 2 / 2			
		x armv71 xc111 r3a xr111-3 r1c a111 r2c \$./out/example_envelope_rpi_xc111_r3a xr111-3 r1c a111 r2c (example_envelope): Acconeer_software_version_v1.1.26						
		(example_envelope): Acconeer soltware version v1.1.26 (message router): Loaded internal driver (dummy)						
		(acconeer): acc start() Detected 4 sensor(s)						
		(request sensor preparation): Performing sensor preparation, sensor 1						
		(request_sensor_preparation): Performing sensor preparation, sensor 1 (core all1 r2c): Margin test status (100, 100, 100, 81)						
		(acc alg dly coarse selection): Dly coarse calibration status: 5 5 5						
		(acc_alg_rx_fine_dip_selection): Rx_fine_dip calibration status: 45						
		(acc_alg_area_selection): selected_area_index=1 (core_all1 r2c): Offset_calibration_status: 10451						
		(request_sensor preparation): Sensor preparation done, sensor 1 (example envelope): Get envelope from sensor 1						
		(core all1 r2c): request envelope: sensor 1 config: 7 1 12 0 0 3 1 1						
		(request_envelope): Request running, sensor 1						
		(request_envelope): Request_stopped, sensor 1						
		(example_envelope): Actual start range: 60 mm (example_envelope): Actual end range: 400 mm						
18:38:26.629	911	(example_envelo	ope): Actual 1108		1303	1207	1488	
				1206		1397		
1574	1655	1732	1802	1868	1928	1982	2032	
2076		2151	2183	2211	2236	2258	2278	
2296 2397		2327	2340	2353	2365	2377	2387 2431	
	2406	2415	2422	2427	2431	2432		
2428	2421	2412	2400	2384	2366	2345	2321	
2294 2021	2265 1983	2234 1944	2202 1906	2167 1867	2132 1828	2096 1789	2059 1750	
1710	1671	1632	1593	1554	1515	1476	1438	
1399		1322	1284	1247	1209	1172	1136	
1100	1064	1029	994	960	927	894	861	
830	798	768	738	708	680	651	624	
597	570	544	518	493	469	445	421	
399	377	356	335	316	297	280	264	
249		224	214	205	197	191	187	
184	182	181	181	182	184	186	188	
190	193	195	196	198	198	198	198	
196		191	187	182	177	171	164	
157	149	141	133	125	117	110	103	
97	92	88	85	83	82	82	83	
85	89	93	98	104	111	118	126	
134	142	151	159	168	177	186	195	
204	213	221	229	237	245	252	258	
265	270	275	280	283	287	289	291	
292	293	293	292	291	289	286	282	
278	274	269	263	257	251	244	237	
230		215	208	201	194	187	181	
175		164	160	156	153	150	148	ا
146		144	144	145	145	146	147	ا
149		153	155	157	159	162	147	
166		171	173	175	176	178	178	
179	179	178	177	175	172	169	165	
161	156	151	145	140	135	129	125	

^{*}Please note that the path name might change slightly depending on SW version and HW variant.



Exploration Tool

Acconeer has developed a tool that let the user view the data from our service and detectors.

The tool can be downloaded from:

https://github.com/acconeer/acconeer/acconeer-python-exploration

There you will also find an Installation guide and support.



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