DCA1000 Debugging Handbook

This handbook provides solutions and workarounds to many common issues that may occur when using the DCA1000EVM tool.

Before proceeding with this handbook, please review the following items that can provide information on using the DCA1000EVM with your AWR/IWR EVM and may solve your issue.

Collateral	Location
DCA1000EVM Tool Page	http://www.ti.com/tool/DCA1000EVM
DCA1000EVM Quick Start Guide	http://www.ti.com/lit/ml/spruik7/
DCA1000EVM User's Guide	http://www.ti.com/lit/ug/spruij4a/
DCA1000EVM Training Video	https://training.ti.com/dca1000-training-video

If your issue still remains unresolved, you can select from the list of topics shown below and jump to the corresponding section.

Hardware Setup Issues

Carrier Card Setup

Issue Description	Root Cause	Solution	Additional Notes
Unable to use the DCA1000EVM when connected to the MMWAVEICBOOST (Carrier Card)	Switch 1 is not set for DCA1000 Mode	Refer to Table 1 "Switch Settings" in the MMWAVEICBOOST User Guide to confirm the correct switch positions	http://www.ti.com/lit/pdf/swru546
Is raw data capture possible with just the MMWAVEICBOOST and IWR6843ISK	DCA1000EVM is the only data capture platform for single chip devices	To capture raw data using mmWave Studio, the following devices are required: IWR6843ISK, MMWAVEICBOOST, and DCA1000EVM	

Cascade Setup

Issue Description	Root Cause	Solution	Additional Notes
Connecting the cascade RF EVM board (MMWCAS-RF-EVM) to the DCA1000EVM	DCA1000EVM is designed for single chip device data capture	Using the cascade RF EVM board requires the companion DSP evaluation (MMWCAS-DSP-EVM). The DCA1000EVM will not work in this scenario.	http://www.ti.com/lit/pdf/swru546

Connection Issues

Issue Description	Root Cause	Solution	Additional Notes
When the mmWave board and the DCA1000 board are connected to the PC using USB cables, not all 4 COM port entries are observed in the Device Manager.	Issue may be with the USB port on the PC	Try a different USB port on the PC	
When the mmWave board and the DCA1000 board are connected to the PC using USB cables, not all 4 COM port entries are observed in the Device Manager.	Issue may be with the USB cable used	Change the USB cable	
When the mmWave board and the DCA1000 board are connected to the PC using USB cables, not all 4 COM port entries are observed in the Device Manager.	Issue may be with the FTDI drivers	Make sure to download the latest FTDI drivers	http://software-dl.ti.com/ra-processors/esd/MMWAVE-STUDIO/latest/exports/ftdi_driver_2_12.zip
When using either the AWR1843-AOP or IWR6843-AOP, mmWave Studio does not automatically detect the "Operating Frequency" or "Device Variant" in the "Connection" tab of mmWave Studio.	This is a current limitation of mmWave Studio for AWR1843-AOP ES 2.0 and IWR6843-AOP ES 2.0 devices	Manually select the "Operating Frequency" and "Device Variant" values	Step 1: Choose the “Operating Frequency”, click on 60GHz for xwr6843 AOP and click on 77GHz for xwr1843AOP Step 2: Choose the “Device Variant”, click on xWR6843 or xWR1843 Step 3: Load the BSS and MSS firmware based on your specific device. Note: Execute the above steps in this exact order to ensure proper operating behavior

Device Versions

Issue Description	Root Cause	Solution	Additional Notes

When using AWR1243, SPI Connect fails after loading the provided BSS and MSS firmware in mmWave Studio	The firmware version does not align with the silicon version	Refer to the device errata for AWR1243 to determine your silicon version	https://www.ti.com/lit/pdf/swrz071
When using AWR1443, SPI Connect fails after loading the provided BSS and MSS firmware in mmWave Studio	The firmware version does not align with the silicon version	Refer to the device errata for AWR1443 to determine your silicon version	https://www.ti.com/lit/pdf/swrz075
When using AWR1642, SPI Connect fails after loading the provided BSS and MSS firmware in mmWave Studio	The firmware version does not align with the silicon version	Refer to the device errata for AWR1642 to determine your silicon version	https://www.ti.com/lit/pdf/swrz072
When using AWR1843, SPI Connect fails after loading the provided BSS and MSS firmware in mmWave Studio	The firmware version does not align with the silicon version	Refer to the device errata for AWR1843 to determine your silicon version	https://www.ti.com/lit/pdf/swrz089
When using IWR1443, SPI Connect fails after loading the provided BSS and MSS firmware in mmWave Studio	The firmware version does not align with the silicon version	Refer to the device errata for IWR1443 to determine your silicon version	https://www.ti.com/lit/pdf/swrz074
When using IWR1642, SPI Connect fails after loading the provided BSS and MSS firmware in mmWave Studio	The firmware version does not align with the silicon version	Refer to the device errata for IWR1642 to determine your silicon version	https://www.ti.com/lit/pdf/swrz073
When using IWR1843, SPI Connect fails after loading the provided BSS and MSS firmware in mmWave Studio	The firmware version does not align with the silicon version	Refer to the device errata for IWR1843 to determine your silicon version	https://www.ti.com/lit/pdf/swrz093
When using IWR6843, SPI Connect fails after loading the provided BSS and MSS firmware in mmWave Studio	The firmware version does not align with the silicon version	Refer to the device errata for IWR6843 to determine your silicon version	https://www.ti.com/lit/pdf/swrz087

Software Setup Issues

mmWave Studio Version

Issue Description	Root Cause	Solution	Additional Notes
Particular version of mmWave Studio does not work with my radar device	The version of mmWave Studio, specifically the provided firmware, is not compatible with the radar studio	Refer to the Release Notes for mmWave Studio to determine if that particular release is compatible with the radar device. Revert to an earlier version of mmWave Studio if the current version is not compatible.	The release notes will specify the compatibility for each device platform and silicon version.

Startup Errors

Issue Description	Root Cause	Solution	Additional Notes
When launching mmWave Studio, the following error message appears: ("System.FormatException: Input string was not in a correct format").	RSTD folder was corrupted by previous installation	Delete entire RSTD folder located at *C:\Users\<username>\AppData\Roaming* Launch mmWave Studio as an administrator	Original Screenshot
When launching mmWave Studio, the following message appears: "Object reference not set to an instance of an object"	DCA1000 has not been connected to PC for the first time OR RSTD folder was corrupted by previous installation	Connnect DCA1000 to PC and power on the device. Allows Windows to find the device and install the drivers. Update the FTDI drivers if needed. Delete entire RSTD folder located at *C:\Users\<username>\AppData\Roaming* Launch mmWave Studio as an administrator	Original Screenshot FTDI Drivers Download link: http://software-dl.ti.com/ra-processors/esd/MMWAVE-STUDIO/latest/exports/ftdi_driver_2_12.zip
mmWave Studio raises errors regarding MATLAB and Python when mmWave Studio is not installed on the main drive partition (C:\ drive)	mmWave Studio works under the assumption that it is installed to the main C:\ drive along with all other software dependencies	Remove any previous installations and install mmWave Studio to the C:\ drive Using a second partition is not recommended with this software	

MATLAB Runtime

Issue Description	Root Cause	Solution	Additional Notes
There is an error message when the "Starting Matlab Engine" appears in the console output	The correct MATLAB runtime is not installed	Install MATLAB runtime v8.5.1 (32-bit)	MATLAB Runtime Download Link
There are still MATLAB errors even though runtime 8.5.1 (32-bit) is installed	This issue can occur when multiple MATLAB runtime versions are installed.	Make sure the Windows PATH variable lists this version first if multiple installations of MATLAB runtime are installed	
Error messages are displayed after "Starting Matlab engine" message	There is a missing "IsFPGA.txt" file in two separate folder locations	Create "IsFPGA.txt" file and populate it with "0" and no other content. Place copies of this file in the following locations: C: \ti\mmwave_studio_<version_number>\mmWaveStudio\Clients\AR1xController C:\ti\mmwave_studio_<version_number>\mmWaveStudio\RunTime	

Device Firmware

Issue Description	Root Cause	Solution	Additional Notes
There are issues when loading an binary image from the SDK or Automotive/Industrial Toolboxes in mmWave Studio.	Attempting to flash application binary to device instead of functional firmware.	When using mmWave Studio, only load the functional firmware provided in the "rf_eval_firmware" directory of mmWave Studio. Do not flash any application binaries from the SDK or Automotive/Industrial Toolboxes.	

Configuration Issues

Capture Issues

Issue Description	Root Cause	Solution	Additional Notes
When pressing "Start Frame" or issuing the Start Frame command, the device responds with an RESP TIMEOUT	There might not be sufficient power supplied to the mmWave EVM to support RF transmission	A power supply rated for 5V/3A should be used	
The Raw Data Capture File is empty	In some cases, no error is reported but the raw data capture file is empty. This could be related to the UDP packet delay length.	Increase the Packet Delay in the DCA1000 configuration window to 100-300 us	
I receive the following error message: RECORD_PKT_OUT_OF_SEQ_ERROR_CODE Async event received(195)	This message is received when capturing and/or framing data. The packet reorder utility was not able to run properly.	Increase the packet delay from 25us to 50us or 75us until the error message is eliminated.	The packet delay calibration varies by PC.
When triggering a frame, the following errors messages are received: "Timeout Error! System disconnected" "Error : The number of files captured is zero!"	SW2.5 on DCA1000 set to hardware mode instead of software mode	Set SW2.5 to software mode	Refer to Table 6. "Switch 2.5 Functionality Information" in the DCA1000 User Guide for more information
When triggering a frame, the following errors messages are received: "Timeout Error! System disconnected"	There may be a disconnect between the version of mmWave Studio and the corresponding firmware version used.	Refer to the release notes of mmWave Studio along with determining your silicon version to figure out the correct version of mmWave Studio to use.	
Unable to observe static objects at expected range when modifying mmWave Studio default configurations	Depending on the distance of the objects from the radar and the profile configuration used, there may be an issue with the ADC configuration format used. Specifically, using complex1x versus using complex2x mode. Complex2x mode has half the range of complex1x mode keeping all other profile parameters the same.	Change the ADC Config format to complex1x mode from complex2x mode	
When triggering a frame, the following error message is received: "Invalid lvdsMode value (0). [error -4016]"	This could be related to selecting the wrong device variant in mmWave Studio or not arming the DCA1000 in the correct order.	Make sure correct device variant is selected in "Connection" tab of mmWave Studio. Make sure to press "Set up DCA1000" before pressing "DCA1000 ARM" when preparing to trigger a frame.	Console Messages
ADC file size does not match the expected file size	Understand the relationship between the various parameters and their impact on file size	ADC_Data_Size = sizeof (real_part) * sizeof (imaginary_part) * num_adc_samples * num_chirps * num_TX * num_RX * num_frames The assumption here is that the ADC is configued in Complex Mode. The real and imaginary values are each 2 bytes.	When configured in complex mode, each sample will have a size of 4 bytes. When configured in real mode, each sample will have a size of 2 bytes.

ADC file size does not match the expected file size when using LUA script	Provide adequate time in LUA script for capture to complete before executing next instruction	Expected total frame time = number of frames * frame periodicity Completed in "SensorConfig" tab of mmWave Studio Provide enough margin in RSTD.Sleep() function for capture to complete before executing next instruction. RSTD.Sleep(1000) = 1 second delay	
Using the DCA1000 and mmWave Studio for real-time processing	As designed, mmWave Studio and the DCA1000 are not live processing tools.	mmWave Studio and the DCA1000 are architected for offline processing. Any application can be used to access this data provided it can access the UDP port.	Live processing requires that the raw data be captured directly from the Ethernet port using some other application not provided by TI.

Chirp Parameters and Constraints

Issue Description	Root Cause	Solution	Additional Notes
Unable to set a valid profile configuration	Various parameters that compromise a particular profile do not adhere to BSS firmware limitations	Refer to SDK Doxygen for rlProfileCfg_t Struct Reference for detailed information	Relationship between the various parameters is explained here: http://www.ti.com/lit/an/swra553a/swra553a.pdf
Understanding the various elements of profile/chirp/frame definitions and how they correlate to FFT calculations	1D FFT, referred to as the range FFT, is determined by the number of ADC samples per chirp. 2D FFT, referred to as the doppler FFT, is determined by the number of chirps in a frame. 3D FFT, referred to as the angle FFT, is determined by the number of virtual channels, particularly the number of RX channels that are enabled.	In the 1D FFT, the number of ADC samples per chirp determines the number of range bins. In the 2D FFT, the number of defined chirps coupled with the number of chirp loops determines the number of doppler bins. In the 3D FFT, the number of enabled RX channels determines the number of angle bins.	

COM Port Connections

Issue Description	Root Cause	Solution	Additional Notes
When mmWave Studio is launched and the DCA1000 and mmWave board are powered on, the "No. of Devices Detected" is "0" and the "FTDI Connectivity Status" shows as "Disconnected"	USB Connections are not correct	Ensure USB cable to the DCA1000 is connected to the FTDI connector	
RS232 Connection step fails	Not connecting to the correct COM port entry	Make sure to connect to "Application/UART" COM port entry in Windows Device Manager	
RS232 Connection step fails with the following error message: "Error: Connection failed: Calling_ConnectTarget returned 3"	Incorrect physical connections Another program may be accessing the "Application /UART" COM port The SOP pins are not set correctly	Check all physical connections (USB cables, power cables) Close any other programs that may be accessing the serial ports for the mmWave device Ensure that both SOP0 and SOP1 are jumpered across or set to "ON" position	

Ethernet Issues

Issue Description	Root Cause	Solution	Additional Notes
Receive the following error message: "Ethernet Cable is disconnected"	Firewall may be blocking the ports used by the DCA1000EVM	Disable the firewall	
Receive the following error message: "Ethernet Cable is disconnected"	WiFi or other local network connection is enabled	Disable WiFi and disconnect other Ethernet cables	
Receive the following error message when using a laptop docking station: "Ethernet Cable is disconnected"	Ethernet cable is connected to laptop PC instead of to the docking station	Connect the Ethernet cable to docking station and configure the static IP address according to the instructions in the Quick Start Guide	
Receive the following error message: "Timeout Error! System disconnected"	Firewall may be blocking the ports used by the DCA1000EVM	Disable the firewall	
TCP/IP ping to DCA1000 fails and disconnects	The DCA1000 does not support TCP/IP link.	Only UDP packets are supported on the DCA1000	

Firmware Versions

Issue Description	Root Cause	Solution	Additional Notes
SPI Connect times out or returns an error	The wrong version of firmware has been flashed to the device. There may be a mismatch between the firmware and the silicon version the firmware is compatible with.	Refer to your device errata to determine your silicon version and compare against the release notes of mmWave Studio to ensure the supported device firmware matches your own device.	Refer to "Device Versions" section of this document for more information.
MSS firmware version reads as 0.0.0.0 for AWR1243 /AWR1443	Flash memory needs to be erased before connecting and loading device firmware.	Set mmWave device SOP mode to flashing mode. Use Uni-flash tool to erase flash . Then close Uniflash and change SOP mode to development mode and proceed as normal.	
SPI connect times out when using AWR1243 /AWR1443	Flash memory needs to be erased before connecting and loading device firmware.	Set mmWave device SOP mode to flashing mode. Use Uni-flash tool to erase flash . Then close Uniflash and change SOP mode to development mode and proceed as normal.	

FPGA Issues

Issue Description	Root Cause	Solution	Additional Notes
Receive the following error message: "Unable to read FPGA version. [error -5]"	FPGA may have become corrupted	Reflash the FPGA following the instructions provided in the DCA1000 User Guide	FPGA binaries are located in the following directory: C: \ti\mmwave_studio_<version_number>\mmWaveStudio\PlatformBinaries\DCA1000FPGA
Receive the following error message: "Unable to read FPGA version. [error -5]"	Firewall may be blocking the ports used by the DCA1000EVM	Disable the firewall	
EEPROM_RD_Fail LED on the DCA1000 turns on after about 30 seconds of use	FPGA may not use using the latest firmware release.	Update by flashing the FPGA with the latest firmware included in mmWave Studio	FPGA binaries are located in the following directory: C: \ti\mmwave_studio_<version_number>\mmWaveStudio\PlatformBinaries\DCA1000FPGA

Profile/Chirp/Frame Issues

Issue Description	Root Cause	Solution	Additional Notes
Setting the device in receive only mode	TX antennas were not deselected in StaticConfig tab	When using mmWave Studio, do not select any of the TX antennas in the "StaticConfig" tab.	
Setting the device in continuous wave (CW) mode	Using "SensorConfig" tab to setup device instead of "ContStream" tab.	To use a the device in continuous mode navigate to the "ContStream" tab in the mmwave studio.	Note that up to 2 GB of data can be captured in continuous mode. Make sure to press "Set Up DCA1000" and connect the device before following the five steps/button presses in the "ContStream" tab.
Configuring BPM chirps	Only a single chirp was defined for a given frame. Applying a phase shift using only one chirp definition will not achieve a BPM shceme.	At least two chirps need to be defined to create a BPM scheme. BPM chirps can be configured in the "BPMConfig" tab of mmWave Studio, using either the BPM Chirp Config or Chirp Based Phase Shifter setting.	BPMConfig Tab

Miscellaneous Issues

CLI Control Interface

Issue Description	Root Cause	Solution	Additional Notes
Alternative to using mmWave Studio for capturing LVDS data, both HW and SW session data	Use the DCA1000 CLI control executable to run the SDK OOB Demo and stream data out over LVDS and bypass mmWave Studio. The lvdsStreamCfg CLI command needs to be modified to enable LVDS streaming	Executable is included in mmWave Studio installation here: C:\ti\mmwave_studio_<version_number>\ mmWaveStudio\PostProc\ DCA1000EVM_CLI_Control.exe Note: the DCA1000 needs to start capturing before the sensor start in order to capture the start of the frame	Refer to SDK User Guide, specifically the section entitled "mmWave demo with LVDS-based instrumentation" DCA1000EVM_CLI_Control.exe User Guide location: *C:\ti\mmwave_studio_<version_number>* *mmWaveStudio\ReferenceCode\DCA1000\Docs* DCA1000EVM_CLI_Control.exe source code location: *C:\ti\mmwave_studio_<version_number>* *mmWaveStudio\ReferenceCode\DCA1000\SourceCode*
When using the DCA1000EVM to capture the SDK OOB LVDS output, CLI console outputs message: "Debug: Init Calibration Status = 0xffe" sensorStart command does not receive a "Done" response and no data is captured on DCA1000	Attempting to use a profile configuration that was not compatible given the constraints of the OOB demo.	Load the program executable using Code Composer Studio. Refer to section "CCS development mode" in the SDK User's Guide for specific instructions on how to complete this step. Send the desired CLI inputs over serial communication software, like Tera Term. Observe the output window in Code Composer Studio. Code Composer Studio will provide an output error number that can be used to determine the issue with the profile/chirp/frame configuration.	Refer to "mmwave_error.h" to understand the base error code. You can find this source file in this folder location; C:\ti\mmwave_sdk_<version_number>\packages\ti\common For error codes relating to the DPC and respective DPUs, refer to "dp_error.h" to understand the DPC/DPU error codes. You can find this source file in this folder location: C: \ti\mmwave_sdk_<version_number>\packages\ti\datapath\dpif
Error message when using Command Prompt with the DCA1000 CLI Control tool: "Unable to open the JSON file (configFile.json). error [-4049]	JSON file to configure the DCA1000EVM is not present in the same directory as the executable.	Create JSON file to configure the DCA1000EVM based on the instructions provided in the SDK User's Guide. This file will be located in the same directory as the DCA1000EVM_CLI_Control.exe file.	Command Prompt Screenshot Refer to SDK User Guide, specifically the section entitled "mmWave demo with LVDS-based instrumentation"
Interpreting the data that is being sent out over LVDS in the SDK OOB Demo.	Unclear on what kind of data is sent out over LVDS using the SDK OOB Demo	LVDS sessions consist of HW sessions and SW sessions. HW sessions are used primarily for sending out ADC data. SW sessions are used for sending out TLVs similar to UART output in the OOB Demo.	Refer to SDK OOB Demo Doxygen for more information on the differences between LVDS HW and SW sessions. Look at the "Streaming data over LVDS" section.

Mem_Capture Example

Issue Description	Root Cause	Solution	Additional Notes
Alternative to DCA1000EVM raw data capture would be analyzing a single frame of data using the mem_capture demo	For ADC raw data capture, refer to the mem_capture test example under: C: \ti\mmwave_sdk_<version_number>\packages\ti\drivers\test\mem_capture	Refer to the "Developing Using SDK" section of the SDK User's Guide for detailed instructions on setting up your build environment and generating the binaries for your specific mmWave device.	http://www.ti.com/lit/an/swra581b/swra581b.pdf

Packet Reorder Zero Fill

Issue Description	Root Cause	Solution	Additional Notes
Captured Binary file appears to be corrupted	Prior to mmWave Studio version 2.1, an additional step is required for running the captured raw binary through the post-processing too.	Run the packet reorder and zero fill utility located in the following file location: C: \ti\mmwave_studio_<version_number>\mmWaveStudio\PostProc\Packet_Reorder_Zerofill.exe;	This step is not needed when using mmWave Studio version 2.1 or higher

DCA1000 Data Format

Issue Description	Root Cause	Solution	Additional Notes
Understanding the difference in the data formats between the TSW1400 and the DCA1000	When comparing the data format structures, the TSW1400 captured data samples are two bytes long and in a offset binary format. This means that each sample has an extra 2^15 added to it. That is why the script for TSW1400 uses the following: dataChunk = dataChunk - 2^15	The DCA1000 captured data samples are two bytes long and in the two's complement format. That is why the script for DCA1000 uses the following: dataChunk = dataChunk - (dataChunk >= 2^15) * 2^16;	http://www.ti.com/lit/an/swra581b/swra581b.pdf

CQ Data Capture

Issue Description	Root Cause	Solution	Additional Notes
DFE Energy Monitor returns the same graph every time	CQ Data Stream is not enabled in the LVDS data path configuration in mmWave Studio.	Select the "CP_ADC_CQ" option for Packet 0 in mmWave Studio. Select the RX_Saturation_Detector_Mon_Config and RX_Signal_and_Image_Mon_Config under the AnalogRxMon tab Additionally, select CalMonTimeUnitConfig set the rate at which CQ data will be refreshed.	mmWave Studio Settings

Test Source

Issue Description	Root Cause	Solution	Additional Notes
Range doppler plots are the same from frame to frame, even with moving test subject in field-of-view	Test Source is enabled in mmWave Studio.	Ensure that Test Source is not enabled when configuring the frame in mmWave Studio	