Demo Kit Quick-Start Guide

Instructions for Using onsemi's CMOS Image Sensor Development Kits

Introduction

Thank you for purchasing an onsemi CMOS image sensor development kit, which are USB-powered camera boards that enable easy testing and characterization of onsemi® sensors.

onsemi's sensor demonstration software, DevWareX, enables you to display images from your sensor. This software is downloaded from onsemi's website.

Follow the instructions below to assemble the kit and to download and install onsemi's DevSuite software.

Note: all Win10 instructions relate directly to Win11 – all Win10 drivers and applications run the same on Win11.

Before continuing, please ensure that you meet the Hardware and Software requirements listed in Appendix A.

For issues with getting the camera to be detected or applications failing to launch, review the "Trouble Shooting Guide".

A common problem with first-time users is their PC/laptop not having the latest USB3 Chipset FW.

Do not connect your kit to your USB3 port until instructed to do so.

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Demo Kit Contents

Before you begin setting up the camera, please verify the components included in your kit.
Please note that there are several types of kits.

Full Demo Kit contents
- onsemi development kit baseboard (Demo3)
- onsemi sensor headboard with lens
- USB3 cable, camera tripod

Headboard-only Demo Kit contents
- onsemi sensor headboard with lens

MARS and Adapter (sold separately) contents – Requires Demo3 baseboard (sold separately)
- onsemi MARS sensor (parallel or MIPI interface)
- onsemi MARS ISP (optional – parallel, MIPI, or Ethernet interface)
- onsemi MARS Adapter
  - Demo3 Adapter; for parallel interface sensor or ISP
  - Demo3-MIPI Adapter; for MIPI interface sensor or ISP
  - ETH Adapter; for Ethernet interface ISP

MARS SERDES (sold separately) contents – Requires contents listed in MARS and Adapter
- onsemi Deserializer
- onsemi Serializer
- onsemi SERDES coax cable

Note on MARS and SERDES; it is best to work with your onsemi representative to ensure you have the correct combination of Demo3, MARS Adapter, SERDES Deserializer/Serializer, and sensor or ISP/Sensor.

Note: Ensure that your Adapter interface matches the MARS or Deserializer purchased – it is printed on the headboard.

Demo Kit Assembly – Full and Headboard-only Demo Kit

1. Connect the headboard and baseboard via the 26-pin female connector located on the back of the baseboard and the 26-pin male header on the back of the sensor headboard.
2. For a full demo kit, screw the mini-tripod into the tripod mounting block.
3. For optional auxiliary boards, refer to their User Guide.

Demo Kit Assembly – MARS Only

1. Connect the headboard and MARS Adapter via the 26-pin female connector located on the back of the baseboard and the 26-pin male header on the back of the adapter.
2. Connect the MARS board to the Adapter via the mini-connector.
   Note; if an ISP / Sensor combination, connect the ISP (no lens) to the Adapter and then the sensor to the ISP.
3. Screw the mini-tripod into the tripod mounting block of the baseboard.

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Demo Kit Assembly – MARS with SERDES

1. Connect the headboard and MARS Adapter via the 26-pin female connector located on the back of the baseboard and the 26-pin male header on the back of the adapter.
2. Connect the Deserializer to the Adapter via the mini-connector.
   Note: the connectors are matched, so it is only possible to connect the Deserializer and not the Serializer.
3. Connect the Serializer to the sensor or ISP (no lens). If ISP, connect the sensor to the ISP.
   Note: the connectors are matched, so it is only possible to connect the Serializer and not the Deserializer.
4. Connect the coax cable to the Deserializer and Serializer.
5. Screw the mini-tripod into the tripod mounting block of the baseboard.

Note; with a MARS ISP and sensor, it is possible to connect the Deserializer and Serializer between the ISP and Sensor.
If this is the case, you will need to receive a specialized initialization file from your onsemi representative.



Diagram of MARS Sensor-only with SERDES

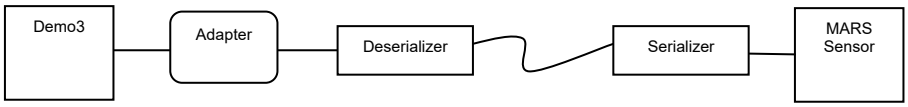
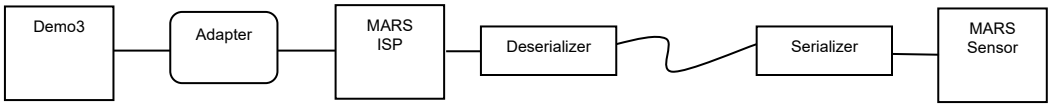


Diagram of MARS ISP and Sensor with SERDES between Adapter and ISP



Diagram of MARS ISP and Sensor with SERDES between ISP and Sensor



Note: this configuration requires a specialized initialization file from your onsemi representative.

SERDES Pairs and Associated Part Numbers

TI 914/931A	AP22022 + AP22019
TI 934/933A	AP22047 + AP22046
TI 954/953A	AP22036 + AP22035
TI 960/953A	AP22079 + AP22035
TI 972/971A	AP22075 + AP22074
MAXIM 9296B/9295A	AP22068 + AP22058
MAXIM 96706/96705	AP22021 + AP22020
MAXIM 96716/96717	AP22094 + AP22095

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Installing DevSuite – Windows OS

Download the base installer from here;
https://www.onsemi.com/pub/Collateral/DEVSUITE_SW.ZIP

Decompress the .zip and read the "Read-Me-First.doc" for information on the installation package.

To install the Software, double-click the file *setup.exe* and follow the instructions on your screen. If you have an earlier version of DevSuite on your computer, you will be prompted to uninstall it before proceeding.

Note: due to installation limitations, it is recommended to install all Software in the same drive and location.
It is **NOT** recommended to install any Software on a Network drive.
If a previous installation does not follow these guidelines, you may need to modify your "PATH" variable to remove the previous location(s).

Additional Product Software Installers

Some products require a separate software installer to be downloaded, and some require an NDA.
In either case, after starting DevWare you will be prompted with instructions if an additional installer is required.

- For products that do not require an NDA, a URL to the additional installer will be displayed.
- For products that do require an NDA, you will be directed to a Web site where you can either login with your assigned credentials or request credentials. Other products require that you contact onsemi support.

Additional Support Software Installers

DevWareX requires Python to be installed for certain products. In these cases, a dialog will appear that contains the URL of the Python installer. Using the provided URL link, download the installer and exit DevWareX. Run the Python installer and select "Install All". When the installer completes, rerun DevWareX. Here's that URL:
https://www.python.org/ftp/python/3.8.2/python-3.8.2-amd64.exe

Our color tuning application SensorTune requires a Matlab Runtime library to be installed.
In these cases, you will be prompted with a URL to use to download the additional installer.
Here is that URL; download, decompress, and double-click "Install" and follow the instructions.
https://ssd.mathworks.com/supportfiles/downloads/R2019a/Release/6/deployment_files/installer/complete/win64/MATLAB_Runtime_R2019a_Update_6_win64.zip

Other OS Platforms

DevWareX can also be run on MacOS and Linux Ubuntu. Use the following link for information and instructions;
https://aptina.atlassian.net/wiki/display/DEVS/Software+Downloads?src=contextnavpagetreemode

Python Version Control

If you have multiple versions of Python installed, use menu item "Python -> Browse Python Environment" to navigate to version 3.8.2 or any other version from python.org (we support versions 3.4 to 3.24).
If you do have multiple versions, ensure that any environment variables such as PYHOME and PATH point to version running in DevWareX as Python uses those to load other modules. Otherwise, DevWareX may not run.

Note that packages such as Anaconda use a Python version that does not work with DevWareX, don't select those.
You can see the active Python version by opening the Python console via "Python -> Python Console" – the version will be displayed in the Title.

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You can now connect your kit to your USB3 port.

Installing the Demo3 Driver – Win10/Win11 Systems

Plug the kit into your computer using the USB cable provided. After a few seconds, your computer should detect new hardware and attempt to download the appropriate USB driver from the Microsoft driver server, during which this dialog should appear – if it doesn't then follow the instructions in this link as you many have to install the Demo3 driver.

Launching the DevSuite Application

1. On the Desktop, double-click the shortcut for DevWareX.



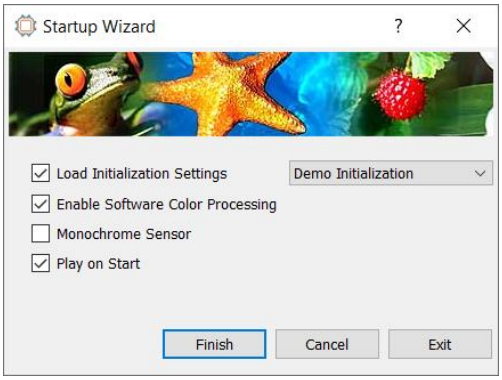
2. You'll next see the Popup in Figure 1.

Figure 1: DevWareX Popup – Searching for Attached Devices



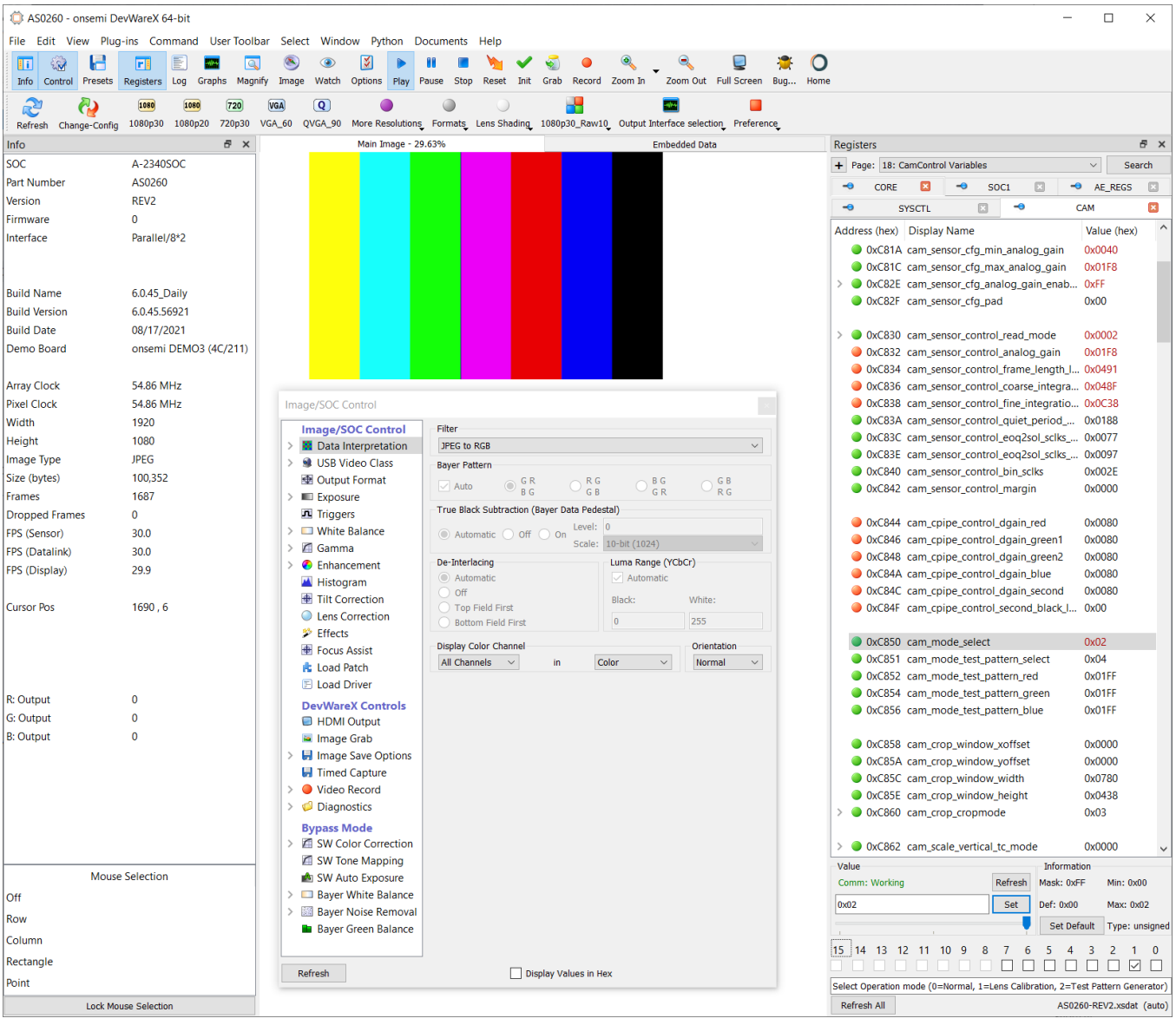
3. After the software has found an attached device, the Startup Wizard dialog appears (Figure 2) select the settings shown. Click "Finish and you'll next see the DevWareX Main Screen.

Figure 2: Startup Wizard Dialog



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Figure 3: DevWareX Main Screen



The installation is complete.

For assistance using DevWareX, see the help files within the application. Users will also notice that tooltip" pop-ups" are available for many controls; simply pause the cursor over the control to read the tooltip.

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Start-up Issues

For any OS, if there is no indication of new HW being present, unplug and plug-in the USB cable.

If there is still no indication of new HW, see section “Trouble Shooting / Camera Not Found” under the 2nd dash “Outdated USB3 FW drivers on the PC”.

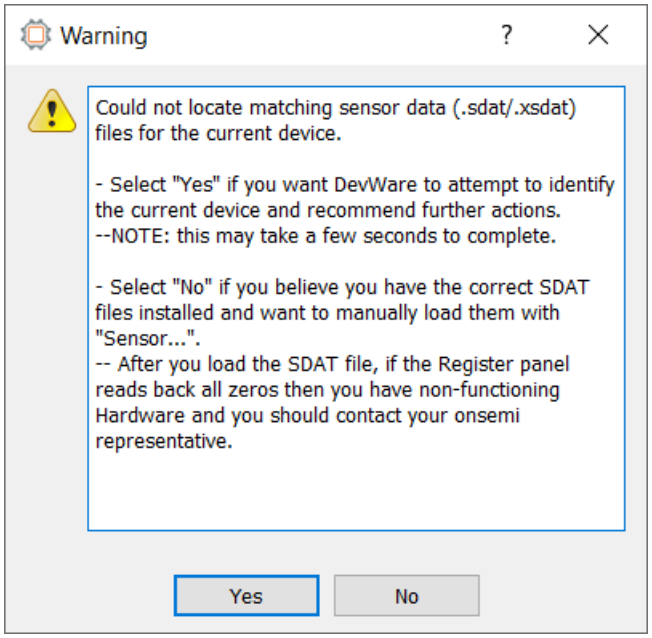
If the DevWareX doesn’t start-up, see section “Trouble Shotting / DevWareX fails to start-up” for solutions.

Warning Dialogs

If you see a warning dialog with “DEMO3 does not run reliably on USB 2.x port;

1. Ensure you are truly connected to a USB3 port.
2. If you are, then update your USB3 Chipset FW as documented in “Trouble Shooting / Camera not found” under the 2nd dash “Outdated USB3 FW drivers on the PC”.
3. If you still see the warning, contact your onsemi representative and request a new Demo3 of Revision 7 or newer.

If you see the following Warning dialog;



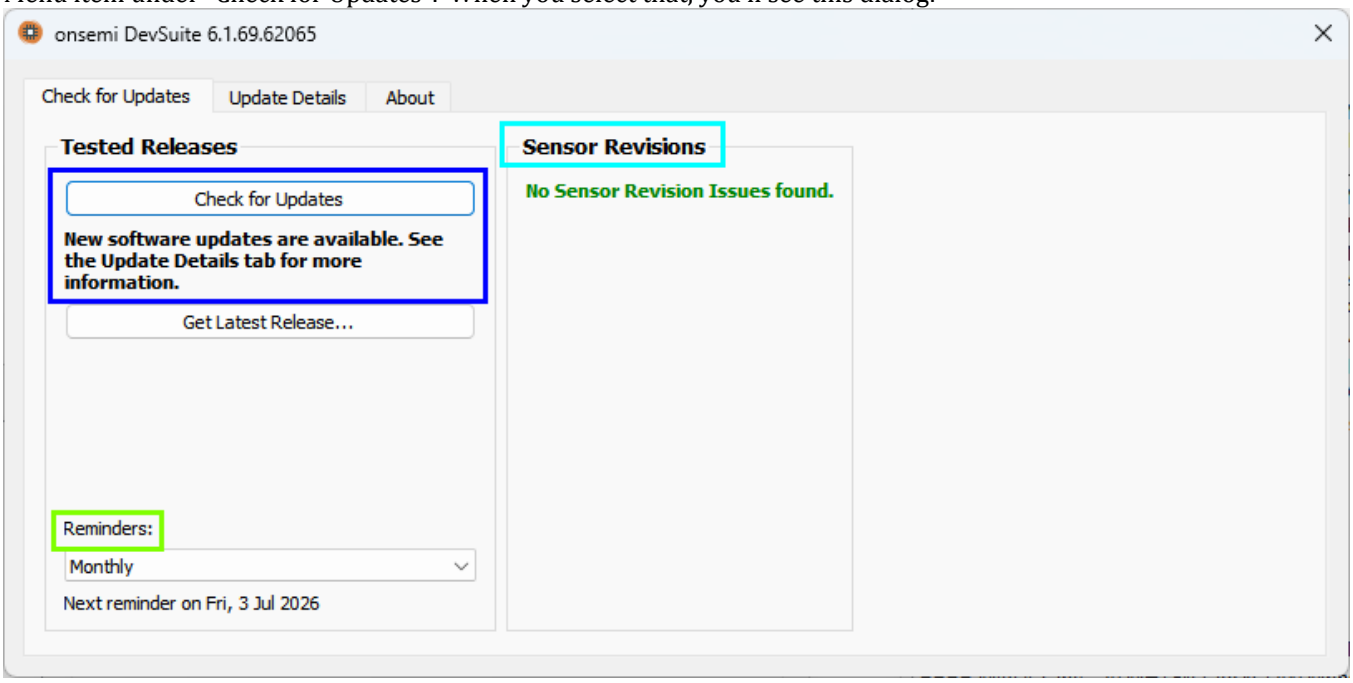
In most cases, this indicates that you did not run the sensor-specific installer which includes the sensor data file required to demonstrate the sensor.

1. Select “Yes” so DevWareX can attempt to identify the attached sensor and recommend corrective action.
2. If the sensor is unidentifiable or you are certain the correct sensor data file has been run, it most likely indicates a defective sensor headboard – if that is the case, you’ll need to contact your onsemi representative.

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Checking for Updates

DevWareX can automatically check for updates to both Software and Sensor Revisions. It is available via the Help Menu item under “Check for Updates”. When you select that, you’ll see this dialog:



The main Tab “Check for Updates” has the following fields.

Reminders: use this to set when the automatic check is performed. The default is “Monthly” as DevWareX has monthly releases of new Software which includes alerts to new Sensor Revisions.

Note that on installation of a new version of DevWareX that the Check for Updates dialog will appear regardless of the Reminder settings.

Tested Releases: this field will indicate if new versions of installed software are available. If so indicated, you are directed to select the "Update Details” Tab which will identify the down-revision software and provide a URL to download the latest version.

Also, available via the Help dialog, use “About” to see the current version of DevWareX and the versions of all other installed software.

Sensor Revisions: this field indicates if a new sensor revision is available. If that is indicated, it will display the newest revision. Use that information when contacting your onsemi representative.

The Tab “Update Details” provides the details of new software versions as described under “Tested Release”.

The Tab “About” provides information about this dialog.

New Features

Use this link for a description of all of the recently added features.

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Additional Applications and Resources

There are several additional DevSuite applications and resources that are useful for demonstrating and configuring sensors.

Register Wizard

This application produces register settings given the sensor's parameters; width/height, mode, output type, etc.

SensorTune

This application produces the Color Correct Matrix (CCM) for a sensor or ISP.

FlashTool

This application configures and produces the binary image for Flash storage of ISP and SOCs that support it.

Side-by-Side Demo

This application allows two onsemi Imaging Demo cameras to be simultaneously displayed side-by-side. It is useful for comparing differences in equal sized sensors, although dissimilar sensors may also be used. Synchronous control of both images is provided for panning, zooming and play-state. Side-by-Side can be launched via the desk-top shortcut.

Software Development Kit (SDK) - ApBase

ApBase provides an API of the main functions of DevWare and is available for users to write their own applications to interface to onsemi sensors. Information can be found via the shortcut:
Start->All Programs-> Aptina Imaging->SDK.

ApBase files are included in the General Software installer, but a stand-alone installer is available for only the API files. ApBase stand-alone; download and install the API.

AiViewer

A video viewing application is available for installation via this link.

IQWare

An image quality evaluation tool, with documentation found here.

LensTools

A stand-alone installer of the Lens Shading Correction command-line tool, available for installation via this link.

Training Videos

A set of training videos can be found via the shortcut:
Start->All Programs-> Aptina Imaging->Training->DevWare Training.

Documentation

There are various sets of documentation, including User and Development Guides, found via the Windows shortcut:
Start->All Programs->Aptina Imaging->Docs.

The documentation is also available from within DevWareX from the "Documentation" menu item.

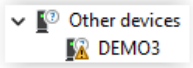
Tools Shortcut

There are various other applications that can be found via the shortcut:
Start->All Programs-> Aptina Imaging->Tools. Each has its own "Help" file

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Trouble Shooting

- DevWareX fails to start up
  - Ensure all sensor-specific Software Installers are at the same revision as DevWareX.
    - Start DevWareX and at the "Startup Wizard", select "Continue",
    - Select "Help / About"; the sensor-specific Software Installers are listed under "Installed Modules".
      - Ensure each Installed Version is the same as DevWareX (listed under "Version:").
  - Install Python as described in section "Python Version Control".
    - Found mostly in cases when the Python Anaconda package is installed, or when the version selected for DevWareX is different than the version pointed to by environment variables such as PYHOME and PATH.
  - Follow the instructions here to do a "factory reset" and remove all DevWareX configuration settings.
  - Before you take this step as a last resort, ensure you have access to all Software Installers.
    - Remove all Software Installers, delete the installation folder, and then rerun all Software Installers.
- Applications warn of a missing entry point.
  - Ensure all SW installers are at the same version as DevWareX.
- "Camera not found"
  - If a Demo3 baseboard is attached and this error appears, there are 3 possible causes.
    - USB3 driver start-up; simple disconnect and reconnect the USB3 cable and retry.
    - The Demo3 driver isn't installed. In the Windows search bar, enter "Device Manager" to start that application. If you see this entry, then follow the instructions in this document.

    - Outdated USB3 FW drivers on the PC. If this is first time you've installed DevWare and/or the first time you've attached a Demo3, it is possible you need to update the USB3 FW driver on your PC.
      Do a Web search of "<Your PC manufacturer> <Your PC Model> USB3 FW driver update".
      Find a search result that either matches your PC or one for "Intel" (most common USB3 chipset).
- Demo3 won't stream data or stops streaming data
  - Ensure that you are connected to a USB3 port on your PC. This can be identified as either having a blue connector, or with a label of "SS" (for Super Speed). Some USB2 port implementations are not backward compatible to USB3.
- "Unable to identify attached device".
  - Read the "Read-Me-First.doc" from the installation package to ensure that all required files have been installed.
  - Ensure that the installation package name is matched to the sensor.
  - Another possible cause is non-working Hardware; if you already have the required SDAT file, then do the following;
    - Start DevWare and when the warning dialog appears select "No".
    - When the "Startup Choices" dialog appears, select "Sensor…" and select the SDAT that matches your sensor.
    - When the "Startup Wizard" dialog appears, unselect all check-boxes and select "Finish".
    - In the "Registers" dialog, select any page; if the values are all zero, then you have non-working Hardware.

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- Image won't display / DevWare exits before displaying an image.
  - Outdated Graphics display drivers on the PC. If this is first time you've installed DevWare and/or the first time you've attached a Demo3, it is possible you need to update the Graphics driver on your PC.
    Do a Web search of "<Your PC manufacturer> <Your PC Model> Graphics driver update".
    Also, if samples\SimpleQT shows an image, then check for other graphics-based libraries installed on your PC.
- Windows 7: the USB driver can't be found, or device not recognized.
  - Run the "Hardware Update Tool" to ensure the correct version of FW is installed; see "USB Driver User Guide" for details. Accessed via: *Start->All Programs->Aptina Imaging->Docs->User Guides*
- The Frame Rate is very low.
  - The amount of data being processed is quite significant for large display sizes, especially on larger sensors. Lower the size of the displayed image.
  - Ensure that the HW and SW requirements as defined in Appendix A are met.
- Win10/Win11 and ApBaseCOM.
  - If your Matlab application can't connect to ApBaseCOM, do the following to ensure it is registered.
    - Search for "Command Prompt" from Start menu, right click on it and select "Run as administrator".
    - Navigate to the installation folder, usually "C:\Aptina Imaging\bin".
    - Enter; %SystemRoot%\system32\regsvr32 apbasecom.dll
    - A "RegSvr32" dialog will appear with "DllRegisterServer in apbasecom.dll succeeded".
- 32-bit is no longer supported.
  - Starting with 6.0.12; all executable files and libraries are 64-bit and located in the "bin" or "lib" folders, all 32-bit files have been removed.
  - As a one-time-action; remove all previously installed sensor-specific installers and install the latest ones

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Reporting Bugs

If you are having issues with any of the applications, please use the “Bug” icon  on the menu bar to open “Bug Report” dialog. Your system and sensor configuration information will be filled-in automatically.
Please enter information in to “Bug Description” and “How to reproduce the bug” fields, select the “Copy to Clipboard” button, and then paste that information in to an Email using the address provided in the dialog.

If you experience a “Crash”, please follow the instruction provided via the link.

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Appendix A

Requirements

Hardware and software requirements for onsemi's development kit are detailed below.

Hardware Requirements

- In general, a desktop or laptop manufactured in 2016 or later will suffice.
- Processor i3 or better (a faster processor will improve the displayed frame rate on the PC). Advanced noise reduction, sophisticated demosaic, and high dynamic range processing are very CPU-intensive.
- Available C: disk space of at least 600Mb. Network drive installation is NOT recommended.
- Installed Memory: 8GB minimum. Available RAM at least sensor size times 40 bytes. For example 600MB available RAM for a 14MP sensor. Remember to account for RAM needed by the system and by other applications or memory-resident software when calculating total system RAM requirements.
- Compatible USB3.0 or USB3.1 host controller. Most new PCs and Laptops have Intel Integrated Chipsets, which will work with the Demo3. Use this link to review known supported systems.

Note: some USB2 port implementations are not backward compatible to the Demo3, and may cause loss of data streaming and/or poor performance. It is highly recommended that you DO NOT connect the Demo3 to a USB2 port.

- 1280 x 1024 minimum resolution. Graphics card and drivers capable of handling the images from the sensor; some graphics cards or drivers will not display images much larger than about 8MP.

Software Requirements

- Windows 7 with a minimum of Service Pack 1 or
- Windows 10 or Windows 11 with or without Service Packs.
- The latest Chipset drivers for the USB3.0 or USB3.1 host controller.

Do a Web search of "<Your PC manufacturer> <Your PC Model> USB3 FW driver update".

- Python; for products that require it, you will be prompted with the URL for the location of where to download the installer.
- Matlab Runtime Library; DevSuite's SensorTune application requires this.

You will be prompted with the URL for the location of where to download the installer.

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