NEC Display Solutions
SpectraView II for Linux x64
Version 1.1.34

Installation Guide

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1 About SpectraView II

SpectraView II provides automatic display monitor color calibration and profiling functions for supported models of NEC displays.

SpectraView II uses a two-way communications link with the display monitor to perform adjustments in the display hardware. Two different methods of communications are possible:

- USB (Universal Serial Bus) - Communicates with the display via a USB connection from the host PC. A USB cable must be connected between the host PC and one of the upstream USB ports on the display. The display will also function as a USB hub. USB communications is only available on supported models. See the “Supported NEC Display Models” list later in this document.
- DDC/CI (Display Data Channel - Command Interface) - Communicates via the video graphics adapter and normal video cable. No extra cables are necessary. Support is required in the video graphics display driver in order to provide this functionality. This communications link is an industry standard developed by VESA (Video Electronics Standards Association).

2 System Requirements

Operating System	64-bit Linux v. 10.04 or higher[1] (Other variants such as RedHat, CentOS, Linux Mint, and SUSE Linux should also work but may need to have specific system libraries installed. The configuration steps may differ from those described in this document.)	
NEC Display	Supported NEC display model – refer to the list below "Supported NEC Display Models"	
Communications to the Display	USB Communications • One available USB port on the PC to connect to the USB upstream input on the display. • This is the preferred method of communication if the display models support USB communications.	DDC/CI communications: • NVIDIA card with NVIDIA proprietary video drivers installed. • Other video cards/chipsets may also work. ATI cards are not currently supported.
Supported Calibration Sensor	• X-Rite iOne Display V2 (i1d2 based) • X-Rite iOne Display Pro (i1d3 based) • NEC MDSVSENSOR (i1d2 based) • NEC SpectraSensor Pro (i1d3 based) • NEC MDSVSENSOR3 (i1d3 based) • Photo Research PR-655, PR-670, PR-680, PR-730, or PR-740 spectroradiometer	

2.1 Software license and serial number

SpectraView II for Linux requires a software license and serial number. The serial number is printed on the CD-ROM jacket or USB card containing the Windows / Mac version of SpectraView II, or from the online software purchase confirmation email from NEC. A serial number may also have been provided directly by NEC personnel.

[1] 32-bit versions of Linux are ***not*** supported.

2.2 Supported NEC Display Models

- **EA244UHD** [1]
- **EA245WMI** [2]
- **EA275UHD** [1]
- **EA275WMi** [1]
- **EA304WMi** [1]
- **EA305WMi** [1]
- **EX241UN** [2]
- **EX341R** [2]
- **LCD1980FXi** [3]
- **LCD1980SXi** [3]
- **LCD1990SX** [3]
- **LCD1990SXi** [3]
- **LCD1990SXp** [3]
- **LCD2090UXi** [3]
- **LCD2180UX** [3]
- **LCD2180WG-LED** [3]
- **LCD2190UXi** [3]
- **LCD2190UXp** [3]
- **LCD2490WUXi** [3]
- **LCD2490WUXi-2** [3]
- **LCD2690WUXi** [3]
- **LCD2690WUXi-2** [3]
- **LCD3090WQXi** [3]
- **LCD4020** [3]
- **LCD4020-2** [3]
- **LCD4620** [3]
- **LCD4620-2** [3]
- **LCD5220** [3]
- **LCD6520** [3]
- **M40** [3]
- **M401** [3]
- **M40-2** [3]
- **M40B** [3]
- **M46** [3]
- **M461** [3]
- **M46-2** [3]
- **M46B** [3]
- **M521** [3]
- **MD301C4** [1]
- **P212** [1]
- **P221W** [3]
- **P232W** [1]
- **P241W** [1]
- **P242W** [1]
- **P401** [3]
- **P404** [2]
- **P461** [3]
- **P484** [2]
- **P521** [3]
- **P551** [3]
- **P554** [2]
- **P701** [3]
- **PA231W** [1]
- **PA241W** [1]
- **PA242W** [1]
- **PA271W** [1]
- **PA272W** [1]
- **PA301W** [1]
- **PA302W** [1]
- **PA322UHD** [1]
- **PA322UHD-2** [1]
- **S401** [3]
- **S461** [3]
- **S521** [3]
- **V404** [2]
- **V404-T** [2]
- **V484** [2]
- **V484-T** [2]
- **V554** [2]
- **V554-T** [2]
- **X431BT** [3]
- **X461HB** [3]
- **X461UN** [3]
- **X462UN** [3]
- **X551UHD** [2]
- **X651UHD** [2]
- **X651UHD-1** [2]
- **X841UHD** [2]
- **X841UHD-1** [2]
- **X981UHD** [2]
- **X981UHD-1** [2]

[1] The display supports both USB and DDC/CI communications.
[2] The display only supports USB communications.
[3] The display only supports DDC/CI communications.

3 Support and Troubleshooting

Please read through this guide for installation instructions as well as the included User's Guide.

For assistance with this Linux software, the most efficient method is to use the feedback form on the SpectraView II web page (see below). Be sure to include a valid email address when submitting the form.

3.1 Known Issues

Test Pattern size

The test patterns generated by SpectraView II may not completely fill up the screen, and the reported resolution may not be correct due to the desktop window management in the OS.

Calibration fails

On some systems if both an X-Rite i1d2 and i1d3 sensor are connected at the same time, the sensors may not be detected correctly, or the display calibration may fail soon after it starts. Disconnect the unused sensor from the system. If this problem occurs when only one sensor is connected, reopen SpectraView and retry the calibration.

3.2 Feedback

NEC Display Solutions welcomes your feedback on SpectraView II. Please visit the SpectraView II support page and give us your comments and feedback via the feedback form.

4 Installation and Configuration

Installation and configuration consists of these main steps:

- Color sensor library installation
- Set USB device permissions
- Verify system libraries
- Configure display communications
- Configure color sensor

Two differently compiled versions of SpectraView are provided for use with different Linux versions, “BUILD_A” and “BUILD_B”. Select the most appropriate version for the system being used.

Linux compatibility

Linux version	BUILD_A version	BUILD_B version
Ubuntu 10.x	Yes	No
Ubuntu 12.x	Yes	Yes
Ubuntu 13.x	No	Yes
Ubuntu 14.x	No	Yes
Other versions and variants	Use `ldd` to determine most appropriate version	

System library requirements

Library	BUILD_A version	BUILD_B version
libQt*	Uses static linked	Requires Qt4 v4.8.1 or higher
libudev.so.0	Required	Not required
libc.so.6		Requires GLIBC_2.14 or higher

4.1 Installation

The following steps describe the installation and configuration steps for standard installations of Ubuntu 10.04 through 13.10. Different Linux versions may require these steps to be modified.

Note:

Command sequences entered into a terminal window are shown highlighted.

1. Extract the files from the archive.
2. Open a terminal window (`CTRL+ALT+T`), and `cd` to the extracted `NEC_SpectraView_II_x64` folder.

3. If using the X-Rite i1 Display V2 color sensor (NEC MDSVSENSOR or X-Rite iOne Display V2), copy the contents of the "`libraries to install/i1d2`" folder to the "`/usr/lib`" folder or other suitable library location.

   ```
   $ sudo cp -r "libraries to install/i1d2" "/usr/lib"
   ```

   Use `ldconfig` to add a temporary path to the library and refresh the library paths.

   ```
   $ sudo ldconfig /usr/lib/i1d2
   ```

   Note: This sets a temporary path. See note below for setting a permanent path.

4. If using the X-Rite i1 Display V3 color sensor (NEC SpectraSensor Pro, NEC MDSVSENSOR3, or X-Rite iOneDisplay Pro), copy the contents of the "`libraries to install/i1d3`" folder to the "`/usr/lib`" folder or other suitable library location.

   ```
   $ sudo cp -r "libraries to install/i1d3" "/usr/lib"
   ```

   Use `ldconfig` to add a temporary path to the library and refresh the library paths.

   ```
   $ sudo ldconfig /usr/lib/i1d3
   ```

   Note: This sets a temporary path. See note below for setting a permanent path.

   Important note: To add a permanent link to the libraries, create a new `.conf` file in the `/etc/ld.so.conf.d` folder containing the library paths using a text editor. The steps to do this may be different on other Linux versions.

   For example, use gedit or other text editor and open a new file called i1d using sudo

   ```
   $ sudo gedit /etc/ld.so.conf.d/i1d.conf
   ```

   and add the following lines to the file and save it:

   ```
   /usr/lib/i1d2
   /usr/lib/i1d3
   ```

   Then run `ldconfig` to update the library links and cache:

   ```
   $ sudo ldconfig
   ```

5. Set the device permissions to allow communications access from a user account to the display via USB and DDC/CI, and color sensor via USB.

   a. As su root or sudo, copy the `55-NEC.rules` file to `/etc/udev/rules.d/`

      ```
      $ sudo cp "55-NEC.rules" "/etc/udev/rules.d"
      ```

      Important: On Ubuntu 13.04 and higher, the rules directory has been changed to `/lib/udev/rules.d/` so use

      ```
      $ sudo cp "55-NEC.rules" "/lib/udev/rules.d"
      ```

   b. The device permissions need to be reloaded by either:

      i. Disconnecting and reconnecting the USB cable to the display.

      or

      ii. As su root or sudo, run `/sbin/udevadm trigger` to load the changes

      ```
      $ sudo /sbin/udevadm trigger
      ```

      On some systems these command may be used instead:

      ```
      $ sudo /sbin/udevtrigger trigger
      ```

      Or

```
$ sudo udevadm control --reload-rules
```

6. If using a Photo Research spectroradiometer, connect it to the system via USB. The USB device will appear as a TTY device to the system.

   On some versions of Linux, this TTY device will not have Read+Write permissions for user accounts and the permissions will need to be changed to allow the device to be accessed. One simple but temporary way is to change the file permissions on the device using chmod. The device will appear as a file in the `/dev` folder, with a name starting with "tty". Change the file permissions using `chmod a+rw ttyXYZ` (where ttyXYZ is the name of the file for the device. To find the file name, use `ls -l /dev/tty*` to list all TTY devices. The file date and time will give a clue as to which file the device is since it will be the time the device was connected.) Note that if the device is reconnected the permissions may need to be set again using this method.

7. Select the appropriate version "BUILD_A" or "BUILD_B" as detailed earlier in this document.

   From a terminal widow, change to either the "BUILD_A" or "BUILD_B" directory where the application files are located.

   Verify that the required system libraries exist for SpectraView II by using the "ldd" command.

   a. Enter `ldd SpectraView` and look for any "not found" errors.

   b. Enter `ldd cmdlineddclite` and look for any "not found" errors.

   c. If using an i1d2 based color sensor, enter `ldd i1d2` and look for any "not found" errors.

   d. If using an i1d3 based color sensor, enter `ldd i1d3` and look for any "not found" errors.

   e. Download and install any missing system libraries.

4.2 Configure Communications

Depending on the display model, SpectraView II can communicate with the display via DDC/CI or USB. Using DDC/CI will require a compatible graphics adapter and video drivers.

A communications verification tool is included called `cmdlineddclite`, which can be used to confirm communications with the display via both USB and DDC/CI.

Follow these steps to use this tool and verify communications with the display:

1. To use DDC/CI to communicate with the display:

   Load the i2c module responsible for DDC/CI communications as sudo using:

   ```
   $ sudo modprobe i2c-dev
   ```

2. Run `cmdlineddclite` from the terminal window using:

   ```
   $ ./cmdlineddclite
   ```

3. The application should detect the display and show the model name and serial number.

If the display is not detected:

1. Verify that the model being used is supported by this version. See the list of supported models at "Supported NEC Display Models".

2. As su root or sudo run `cmdlineddclite` again using:

   ```
   $ sudo ./cmdlineddclite
   ```

3. If it now detects a display then the device access permissions are not set correctly. Verify the installation of the `55-NEC.rules` file in the previous steps. Try restarting the PC to refresh the device permissions for the display.

If the display is still not detected:

- If using DDC/CI, the video drivers being used may not support DDC/CI. Try using the vendor specific drivers, or use USB if supported by the display.
- If using USB, verify that the USB upstream port from the display is connected to the PC.
- If using USB, disconnect and reconnect the USB upstream port on the display.
- If using USB, try connecting to the other USB upstream port on the display.

Note:

If using DDC/CI, `modprobe i2c-dev` should be added to the system's startup script so that it will be loaded automatically whenever the system is restarted. This could be done for example by entering `i2c-dev` into the `/etc/modules` file.

---

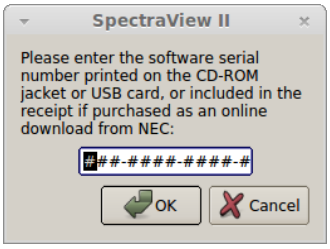
5 Running SpectraView II

After communications with the display has been verified and any necessary libraries have been installed, run the `SpectraView` application from the terminal window using:

```
$ ./SpectraView
```

Do ***not*** run SpectraView as a “sudo” as it will create preference files with su only permissions.

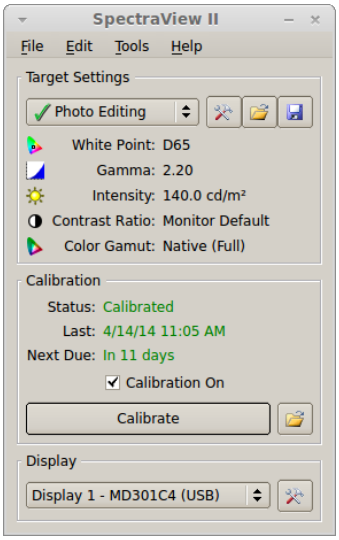
The first time the application is run, it will prompt for a serial number.



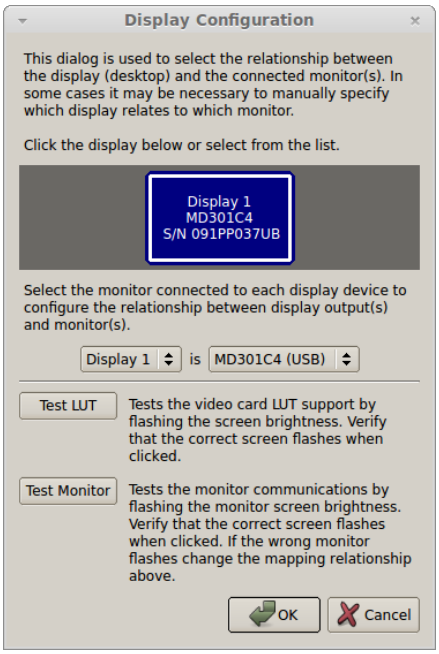
Input the serial number, which can be found:

- Printed on the CD-ROM jacket or USB card containing the Windows / Mac version of SpectraView II
- From the online software purchase confirmation email from NEC
- Provided directly by NEC personnel

The splash screen will show any detected displays, and the main window will open.

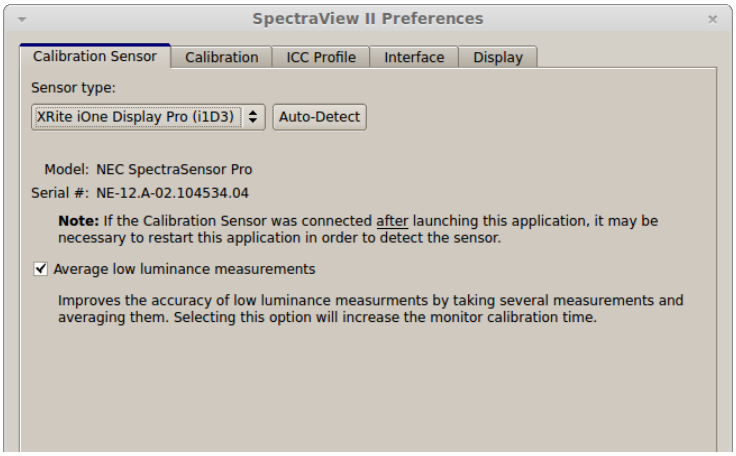


Important: A message box may appear indicating no displays were detected, even though the splash screen showed that one was detected. In this case the relationship between the desktop and the detected displays may need to be configured in SpectraView. Open the "Display Configuration" dialog by selecting "Display Configuration" from the "Edit" menu. Then select the display on the list on the right for the selected display. Click "Test Monitor" to verify communications with the display. Both USB and DDC/CI connections may be listed. Choose the USB connection if available.



5.1 Color sensor configuration

To verify that the color sensor is detected correctly, select "Preferences" from the "Edit" menu. The sensor should be selected and the model and serial number shown, similar to that shown below.



Check these items if the color sensor is not detected.

For X-Rite or NEC i1d2 or i1d3 based color sensors:

1. Verify that "`i1d2`" and/or "`i1d3`" applications are in the same directory as "`SpectraView`" application and have “executable” file permissions.
2. If using an i1d3 based color sensor, verify that the "`i1d3 support files`" folder and contents are in same folder as the "`SpectraView`" application.

3. Perform a "`ps -A`" and look for any instances of "`i1d2`" or "`i1d3`" running. If any are running, kill them.
4. Verify that the device is connected directly to the PC or USB hub in the display, and not via an unpowered USB hub.
5. Exit SpectraView and run the relevant sensor support application from a terminal window using either `./i1d2` or `./i1d3`. If the support application runs correctly it will show the version information and a prompt Command:. Enter `i` and <RETURN> to try and detect the sensor. Enter `q` and <RETURN> to quit. If the sensor was not detected then run the application again but using `sudo ./i1d2` or `sudo /i1d3`. If it detects the sensor now then the USB device permissions are not set correctly in the previous step of installing the `55-NEC.rules` file.

For Photo Research spectroradiometers:

1. Verify that the device is connected via USB and powered up.
2. Verify that you have Read+Write permissions for the device. See the “Installation and Configuration” section for details.
3. In the Preferences dialog, select Photo Research as the Sensor Type, then select the correct tty device as the COM Port.
4. SpectraView does not change any of the measurement settings on the device such as the standard observer setting, and measurement times. Be sure to set the observer setting to 2°.

5.2 Using SpectraView II

Once communications with the display and color sensor have been correctly configured and established, the “Calibrate” button will be enabled.

The functionality of SpectraView II for Linux is identical to the Mac and Windows versions, except where noted below. Please refer to the included SpectraView II User’s Guide PDF document.

Video card LUT API

Depending on the version of Linux and video drivers being used, setting the video card LUTs may use different protocols to the X window server. The SpectraView Preferences allows the selection between using *XRandR* and *XF86VIDMODE* protocols on the “Calibration” tab.

SpectraView always sets the video card LUTs to linear when calibrating the display since all adjustments are made within the display hardware.

Use the “Test LUT” button in the “Display Configuration” dialog to test which protocol is supported.

Note: Some systems may not correctly support setting the LUTs on a multi-display system.

ICC Profile Location

The location where any ICC Profiles generated by SpectraView are stored can be set in the SpectraView Preferences on the “ICC Profile” tab. SpectraView will also attempt to register the ICC Profile with the system by using the "_ICC_PROFILE" atom. Some color managed applications will use this to determine the current display’s color profile.

Default UI theme

The SpectraView II application uses the Qt “cleanlooks” UI style by default. This can be overridden by using the command line to either specify another supported Qt style using the “-style” switch, or adding any “default” to the command line will use the system default UI theme.

Examples:

```
$ ./SpectraView –style “plastique”
```

```
$ ./SpectraView –style “motif”
```

```
$ ./SpectraView default
```
(**Note**: This may cause a crash on some systems due to an issue with Qt and some desktop environments)

6 Revision History

V1.1.01: February 11 2009

- Fixed an issue that caused calibrations using the L* and NTSC custom curves not to be stored correctly.
- Fixed an issue that caused duplicate displays to be listed when dual displays are used on some video cards.
- Fixed an issue that caused the Calibrate button to incorrectly remain enabled even if communications with the display was not possible.

V1.1.02: May 6 2009

- Added support for the NEC LCD2490WUXi-2.
- Added support for the NEC X461UN.
- Corrected support for the NEC LCD5220 and NEC LCD6520.
- Fixed an issue that caused the serial number not to be read correctly from the NEC MultiSync P221W.
- Improved the grayscale calibration accuracy on the NEC LCD4020, LCD4620, M40 and M46.
- Changed the lower color temperature limit for the white point from 4000K to 2500K.

V1.1.03: August 28 2009

- Added support for the NEC X461HB, P401, and P461 displays.
- Fixed issue that caused power on hours to be misreported on some very early LCD 90 series models that was reintroduced in V1.1.00.
- Fixed an issue that prevented the LCD2490WUXi-2 from being detected if the Analog video input was being used.
- Fixed an issue that caused an "Error -32" during calibration under certain circumstances.
- Improved reporting of communications errors.
- Changed the X-Rite iOne support application to use the official Linux interface SDK from X-Rite.
- Added support for Ambient light measurements.
- Added support for measuring wide gamut displays using the NEC MDSVSENSOR custom calibrated iOne Display v2 sensor.

V1.1.04: April 19 2010

- Added support for the NEC PA241W and PA271W displays. Please see the User's Guide for specific information on these models.
- Added support for the NEC P521 and P701 displays.

V1.1.05: May 20 2010

- Added "sRGB Emulation" target support for the NEC PA241W and PA271W displays.

V1.1.07: November 15 2010

- Added support for the following NEC displays: PA231W, PA301W, M401, M461, M521, P551, X461UNV, X462UN, X431BT, S401, S461, and S521.
- Added color gamut setting function for the MultiSync PA series models.
- Added display warmup warning message.
- Added iOne Display warning message to remove sensor cover before use.
- Added protection to prevent overwriting preset Targets.
- Corrected DICOM calibration when a specific contrast ratio was chosen on MultiSync PA series models.

V1.1.08: July 22 2011

- Added support for the NEC P241W.
- Information window title now shows the Target name.
- Fixed frozen progress bar during calibration.
- Added new Diagnostics feature.

V1.1.08: Build 110811, August 11 2011

- No changes for Linux.

V1.1.09-1: Build 111201, December 1 2011

- x64 build for Linux.
- Added i1d3 (iOne Display Pro / NEC SpectraSensor Pro) color sensor support.

V1.1.12.1: Build 120811, August 11 2012

- Added USB support for PA and newer P series models.
- Added support for the NEC P232W display.
- Added 6 Axis Color Trim controls.
- Added automatic check for updates.
- Fixed a bug with the i1d3 support that caused the wide color gamut correction to not be selected correctly.

V1.1.14: February 27 2013

- Added support for the NEC P242W display.
- Added support for the NEC MDSVSENSOR3.

- Improved color measurement accuracy when using the X-Rite iOne Display Pro or NEC SpectraSensor Pro with the NEC P232W display.
- Fixed an issue when calibrating the NEC P232W display.
- Improved the calibration accuracy for PA and newer P series displays.
- Application is now static linked with Qt 4.7.5. No need to install Qt libraries.

V1.1.15: May 31 2013

- Added support for the NEC PA242W display.
- Added support for setting the integration time with the i1d3 / MDSVSENSOR3 / SpectraSensor Pro.
- Added support for the custom i1d3 calibration for the PA242W LED panel.

V1.1.16: November 20 2013

- Added support for the NEC PA272W and PA302W displays.

V1.1.16.02: January 6 2014

- Improved USB support and fixed a potential random crash issue.
- Improved the X-Rite i1d3 sensor detection on slow systems.
- Automatically re-enumerate displays if no supported displays were found.
- Force “cleanlooks” Qt UI style to avoid system crash issues on some Linux releases.
- Generated ICC profiles are now automatically registered with the OS using the "_ICC_PROFILE" atom.
- Improved support for multi-monitor systems.
- Added a preference option of using XRandR or XF86VIDMODE APIs to set the video card LUTs to linear.
- Fixed Test Pattern screen resolution indicator “off by one” bug.
- Improved calibration accuracy on the PAxx2 series under certain conditions.

V1.1.17: April 7 2014

- Added support for Photo Research spectroradiometers.
- Improved the "Update Internal Calibration" function calibration accuracy on PAxx2 series displays.
- Added support for the EA244UHD and EA304WMi displays.
- Added BT.1886 gamma curve preset.
- Improved UI layout and support for using large fonts.
- Fixed USB detection of the i1d2 sensor.

V1.1.18: October 24 2014

- Added support for the NEC X841UHD and PA322UHD displays.
- Minor bug fixes and improvements.

V1.1.30: November 13 2015

- Multi-language version (English, German, French, Spanish, Italian, Russian, and Chinese).
- Added support for the X651UHD, X981UHD, EA275WMi, EA305WMi, P212 and PA322UHD-2 displays.
- Test Patterns are now shown on all displays simultaneously on multi-monitor systems.
- Other displays show black when performing ambient light measurements on multi-monitor systems.
- Various User Interface improvements.
- Each display's OSD (On Screen Display) lock setting is changed right away if the preference setting is changed.
- Accuracy of calibrating to a Target with a specific Contrast Ratio is improved in some cases.
- Color Sensor measurements can now be checked as part of the diagnostic tests.

V1.1.34: March 31 2017

- Added support for the EA245WMi, EX241UN, EX341R, P404, P484, P554, V404, V404-T, V484, V484-T, V554, V554-T, X551UHD, X651UHD-2, X841UHD-2, and X981UHD-2