

# Calibration files for the DIY HCFR style Colorimeter

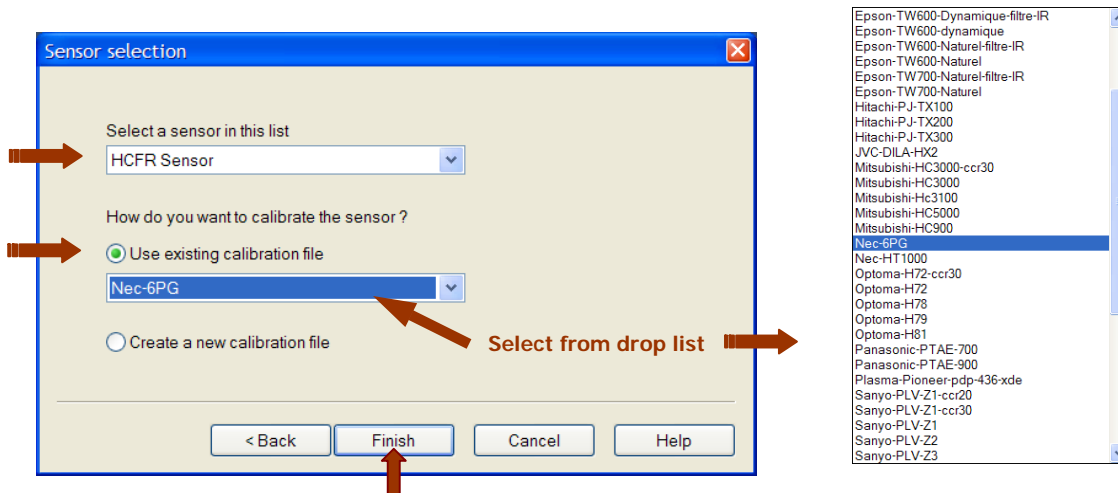
This document attempts to describe some methods and procedures to produce and use calibration files for the DIY HCFR Colorimeter using the ColorHCFR application. This document and screenshots reference V1.22 of the HCFR application.

As of V1.22, the HCFR based sensor and application uses a calibration profile (sensor conversion matrix coefficients) for each display it is to be used with. These matrix conversion coefficients are stored as a binary \*.thc file. The low unit-to-unit variation of the TAOS photo diode array affords a method of creating a conversion matrix based on the spectrum characteristics of a display rather than an individual colorimeter.

Presently, there are (4) methods in the HCFR application to either select or create a calibration file for the HCFR sensor. The remaining sections will outline the procedure for each of the methods.

## ***Method 1- Select a calibration file created by the HCFR group or another user.***

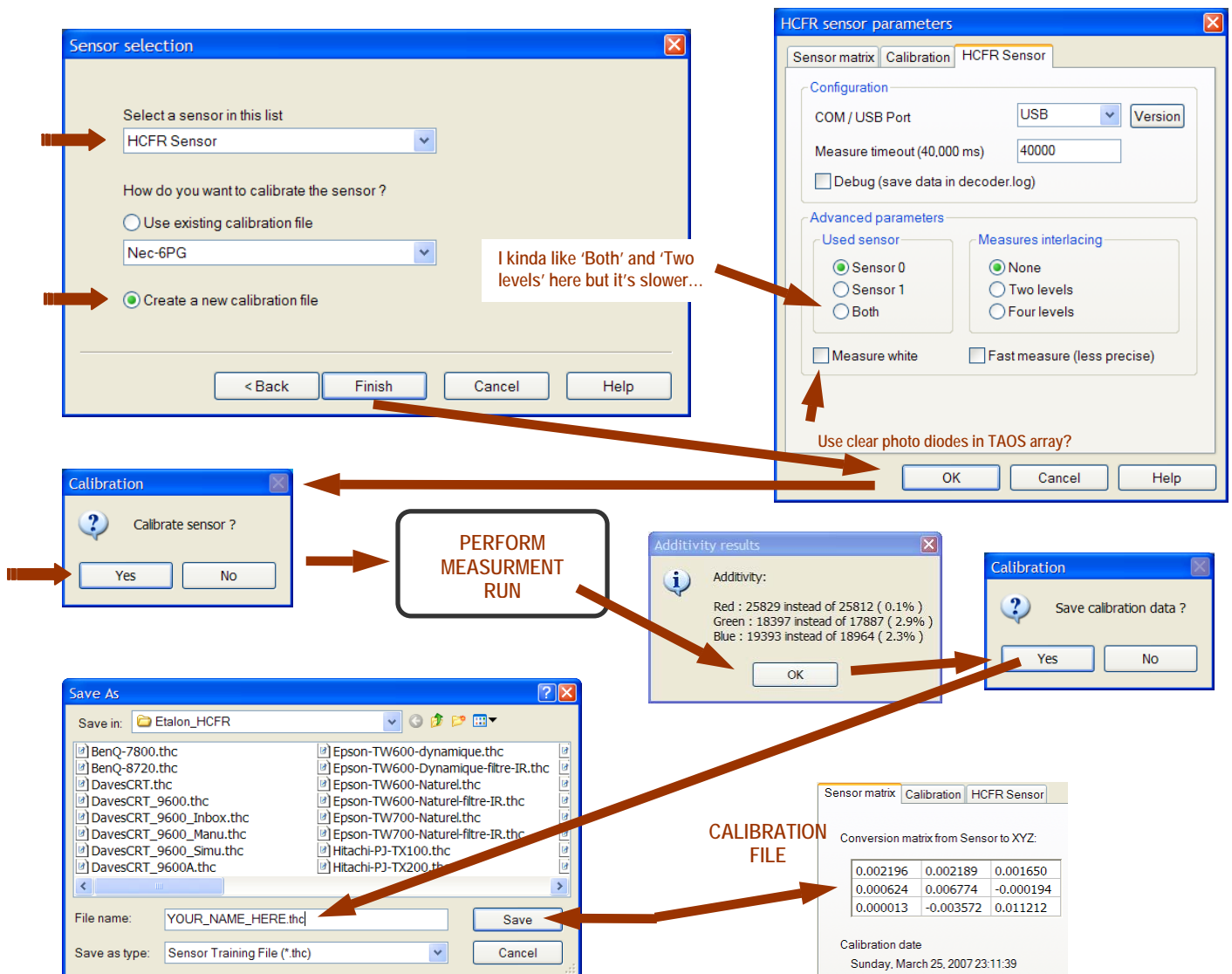
The HCFR application includes many pre-made calibration files for various displays for the HCFR style sensor. As the HCFR probe calibration file is based and balanced against the spectrum characteristics of the display, the pre-made calibration files are created and named based on the make and model of display. If this is your first or only colorimeter, this will be the only option as the other methods are based on training the HCFR to a reference display or characterizing and training to a second sensor. The HCFR application includes an auto-update feature will download the latest calibration files from the HCFR group and the HCFR forum has several threads where users are sharing .thc files for various displays that aren't included in the HCFR app. I'm not aware if there is a 'verification' process for the included .thc files.



## ***Method 2- Create a new calibration file by training on a 'reference' displayed image.***

This method will train and create a new calibration file by training the HCFR sensor to a display that is already setup to display a reference (selectable, usually D65) full field (or windowed) 100IRE (selectable) image. A short, automated calibration routine is run where the sensor is presented with

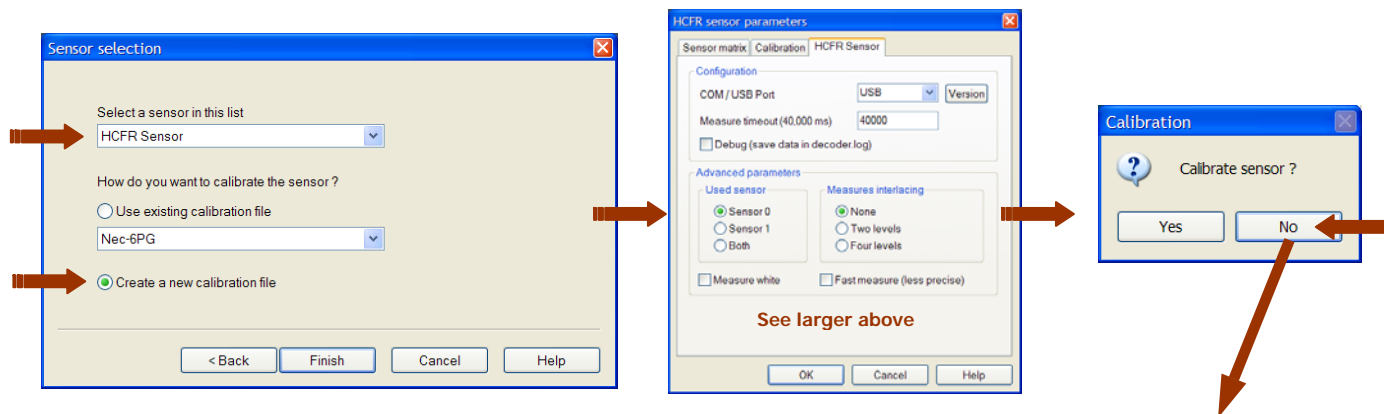
the reference white image followed by individual RGB component colors that comprise it. The offset coefficients for the sensor conversion matrix will be calculated and a calibration file will be created specific to that display. An additive results report summary will be displayed as a figure of merit of the fitability of the generated matrix coefficients. These measurements from the reference calibration images will be considered 'as reference' by the application and all further measurements will be relative to that reference. If looking at the sensor data in xyY color space using this method, the Y(luminance) data will be normalized to a relative ~0..1 range.



**Method 3- Create a new calibration file by connecting both the HCFR sensor and a second supported colorimeter simultaneously.**

This method opens two simultaneous documents or sessions in HCFR with each session connected to a different supported sensor. The 'trainer' probe is selected by checking 'reference measure'. Position both sensors as close together as possible and oriented the same relative to the screen and the image. A calibration run is then made where the images are presented to both probes

'simultaneously' (measured sequentially) and at the end an option is offered to create a new calibration file for the HCFR sensor. An additive results report summary will be displayed as a figure of merit of the fitability of the generated matrix coefficients. As a further figure-of-merit, the data from both sensors can be plotted simultaneously and the delta deltaE between the two sensors can be computed and plotted.



**File... > New**

- Calibration file
  - Build using simultaneous measures
  - Build manually using reference colorimeter
- Simultaneous measures
  - Build manually using reference colorimeter
- Updates

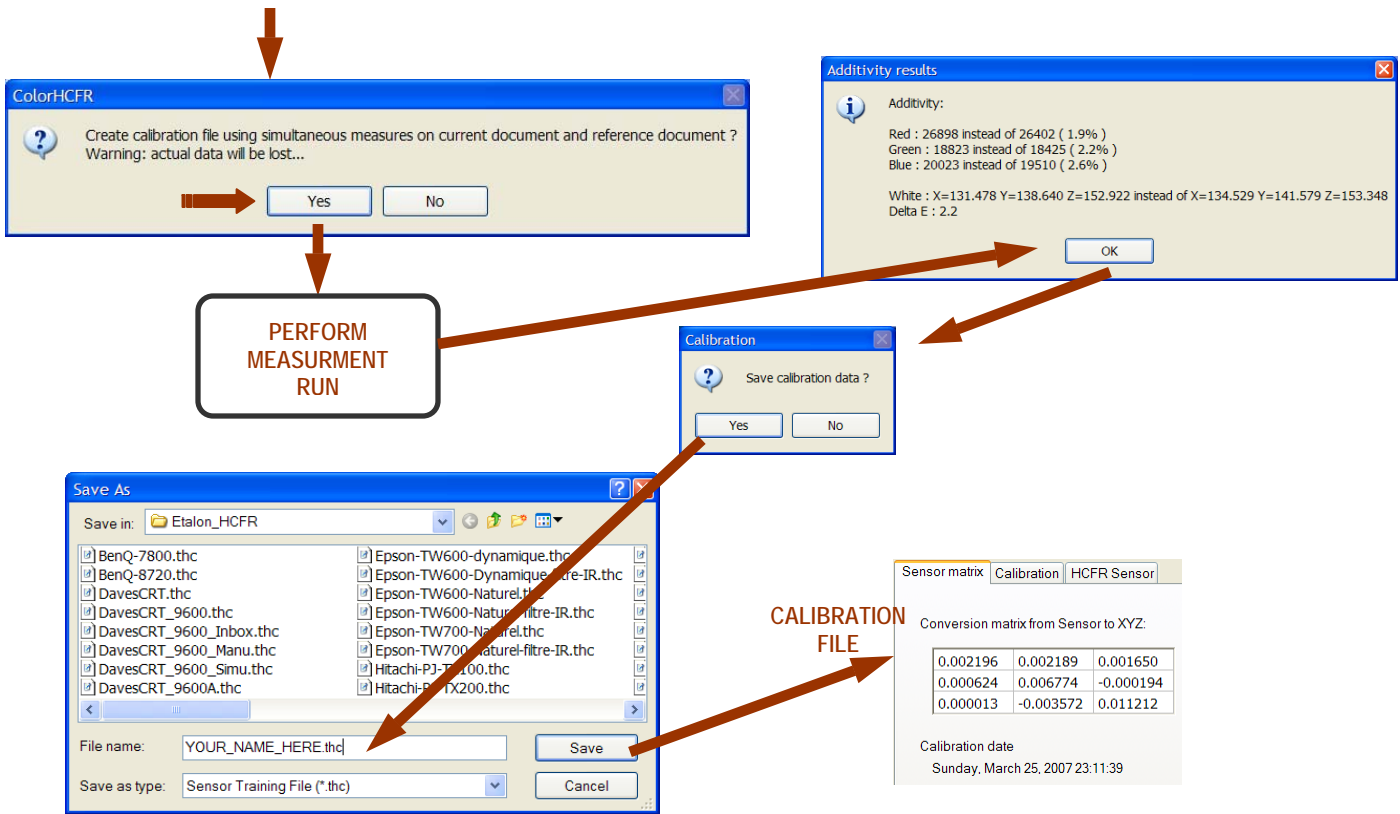
**SESSION DOCUMENT CONNECTED TO REF SENSOR (INACTIVE)**

| IRE | 0 | 1 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
|-----|---|---|----|----|----|----|----|----|----|----|-----|
| x   |   |   |    |    |    |    |    |    |    |    |     |
| y   |   |   |    |    |    |    |    |    |    |    |     |
| Y   |   |   |    |    |    |    |    |    |    |    |     |

**SESSION DOCUMENT CONNECTED TO HCFR SENSOR (ACTIVE)**

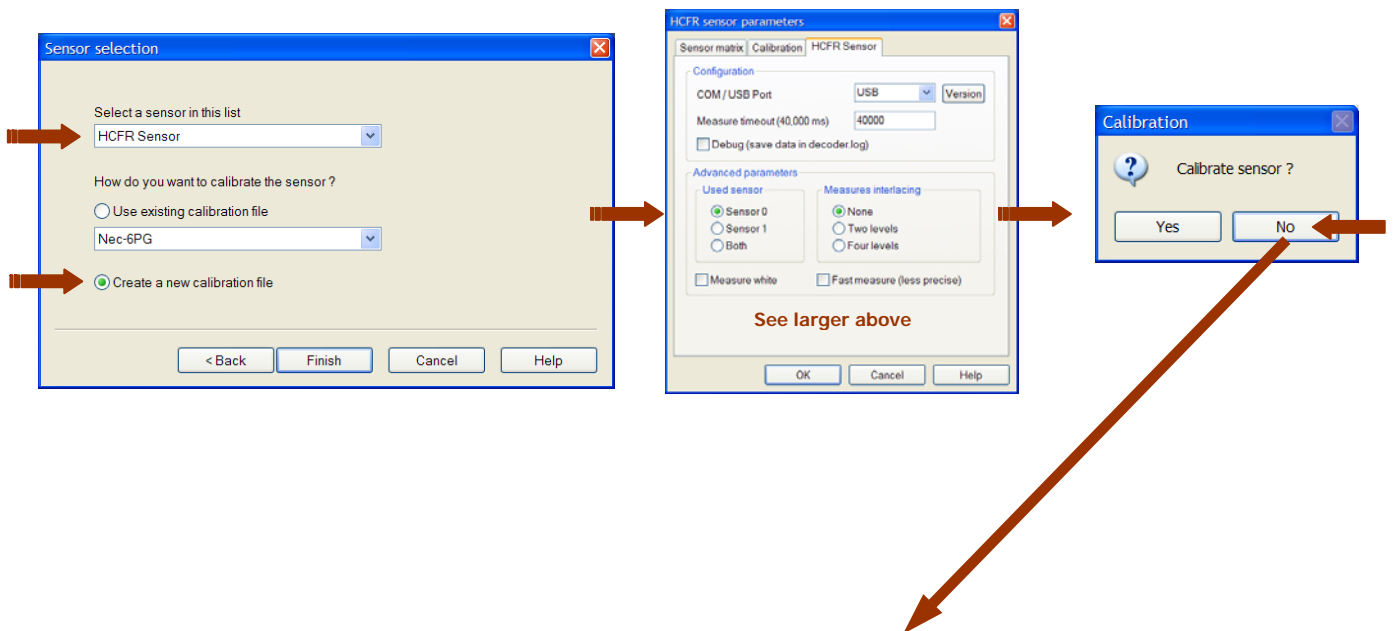
| IRE | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
|-----|---|----|----|----|----|----|----|----|----|----|-----|
| x   |   |    |    |    |    |    |    |    |    |    |     |
| y   |   |    |    |    |    |    |    |    |    |    |     |
| Y   |   |    |    |    |    |    |    |    |    |    |     |

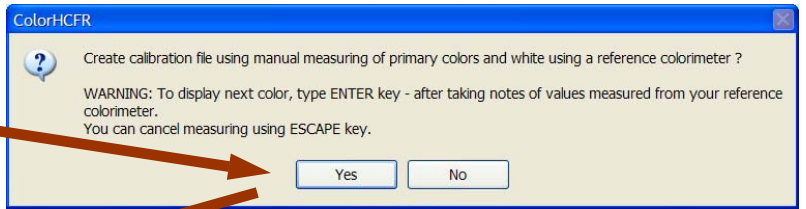
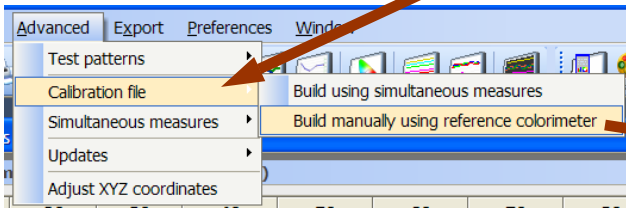
Build a calibration file using simultaneous measures between current document and another document using a reference sensor



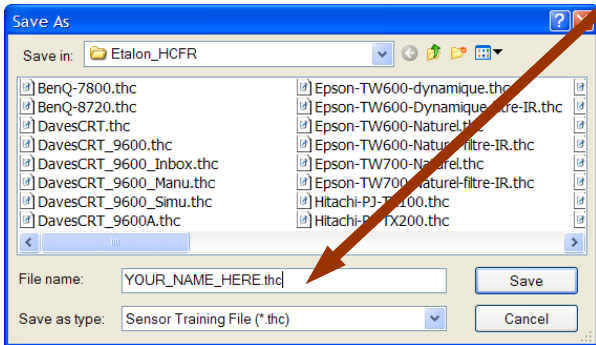
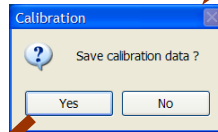
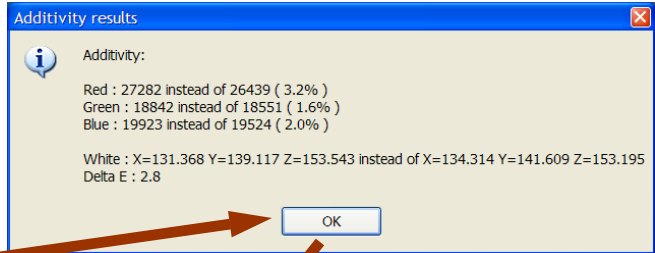
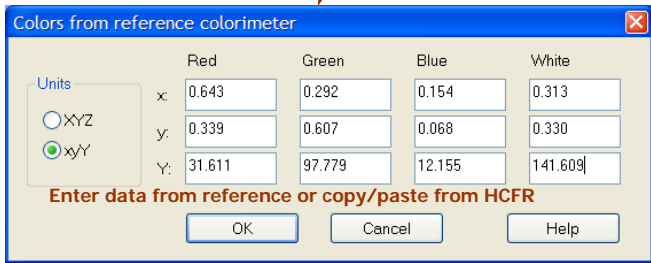
**Method 4- Create a new calibration file by manually entering colorimetry from a second colorimeter (HCFR supported or manual)**

With this method, you enter colorimetry into a table by either copy-n-paste from a HCFR session using an alternate sensor, or by manual notation from a reference colorimeter. An option is offered to create a new calibration file for the HCFR sensor and an additive results report summary will be displayed as a figure of merit of the fitability of the generated matrix coefficients.





**PERFORM MEASUREMENT RUN**



**CALIBRATION FILE**

