SPEC_SOFT Manual

源祿光譜儀器使用説明書

Gratingworks LLC

源祿光電有限公司

Catalogue

目錄

1. Spectrometer Overview

光譜儀綜述

The spectrometer is powered through USB. Current consumption is under 150mA at 5Vdc. USB is either 2.0 Full Speed or 2.0 High Speed depending in the model.

光譜儀使用 USB 供電，電壓為 5V 直流電壓，工作電流小于 150 毫安。型號決定了傳輸速度是 USB2.0 全速還是 USB2.0 高速。

Terminal block interface

接口排綫

Pin 0 5Vdc from USB. Can be used as power supply for external units (<100mA) or as a input for 5Vdc power supply. (Closest to the USB connector).

USB5V 直流電壓的接入，用于電流小于 100 毫安的元器件，也可以作為 5V 直流電源使用。（靠近 USB 接頭一側。）

Pin 1 External Acquisition Trigger, Falling Edge.

獲取外部觸發，下降沿。

Pin 2-7 GPIO 0-5. Output is 3.3Vdc, Input is 3.3-5Vdc compatible. Current is limited by the microcontroller.

0-5 號輸入輸出控制端，輸出為 3.3V 直流電，輸入為 3.3-5Vdc，電流由微型控制器控制。

Pin 8 Lamp PWM Strobe, can be used to control Xenon/LED lamps.

脈冲信號燈控制信號，可以控制氙燈或者 LED 燈。

Pin 9 RS232 RX, Not implemented, OEM only.

RS232 信號接收，僅 OEM 使用。

Pin 10 RS232 TX, Not implemented, OEM only.

RS232 指令發送，僅 OEM 使用。

Pin 11 GND.

接地。

2. Software Usage Overview

軟件使用綜述

Spec_soft GUI on windows provides a basic interface to the CONCAVUS and PSP family of spectrometers. It has the following functions.

本軟件為 CONCAVUS 和 PSP 系統光譜儀提供在電腦上的基本操作，功能如下：

- Graphical display of the spectrum in pixel or wavelength.

  光譜在像素或波長上的圖形顯示。

- Averaging, dark noise subtraction, CCD dark pixel subtraction.

  求平均值，減去暗噪音，減去 CCD 暗噪音。

- Wavelength Calibration.

  波長校準。

- Find peaks and measure FWHM.

  尋找峰值和測量半高寬。

- Absorbance, Transmittance, Reflectance or oscilloscope measurement.

  吸收、透射、反射以及示波器測量。

- 3D display of the spectrum.

  光譜三維顯示。

- DFT of the spectrum.

  光譜的離散型傅里葉變換。

- Pixel linearity correction.

  像素綫性修正。

- Filter out the Nyquist noise from CCD.

  過濾來自 CCD 的尼奎斯特噪音。

- Supports multiple CONCAVUS/PSP spectrometers.

  支持多臺 CONCAVUS、PSP 光譜儀的光譜分析。

- We can help customer implement new features if needed.

  我們能够支持客戶添加新軟件功能

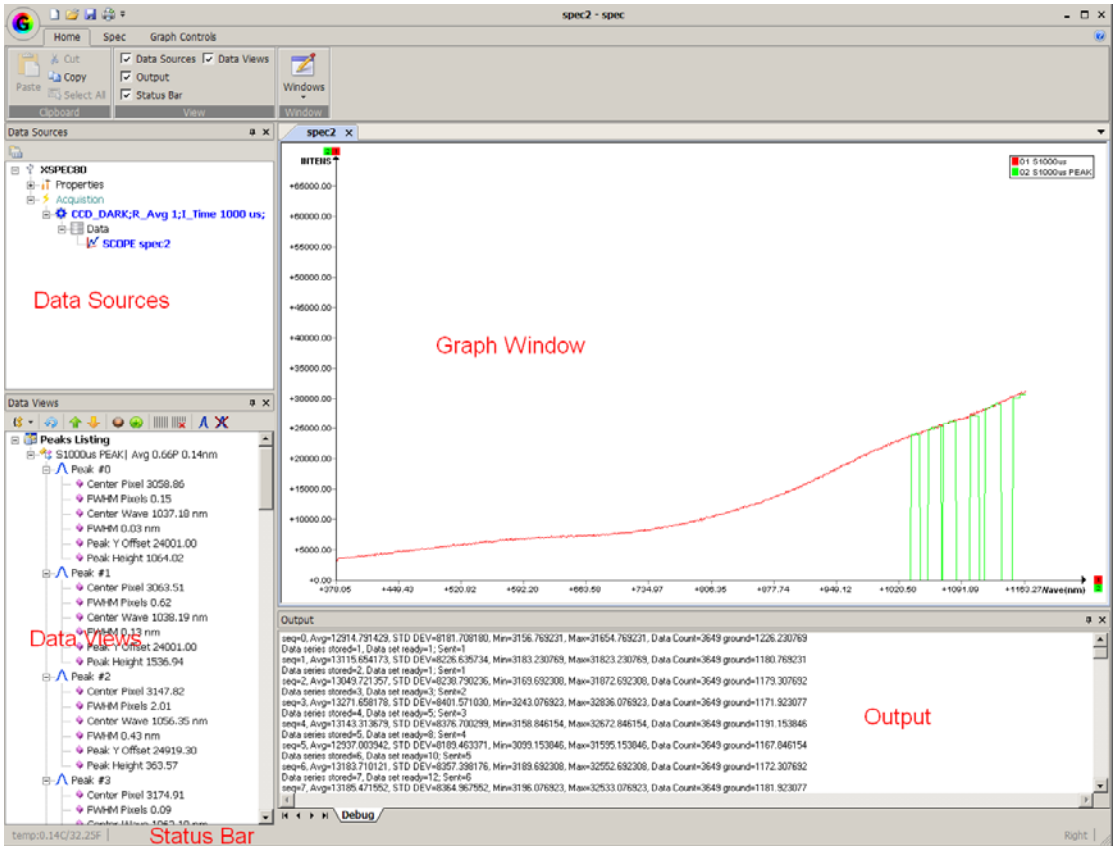


Figure 2.1 Main Screens

圖 2.1 軟件主界面

2.1 Home

主頁

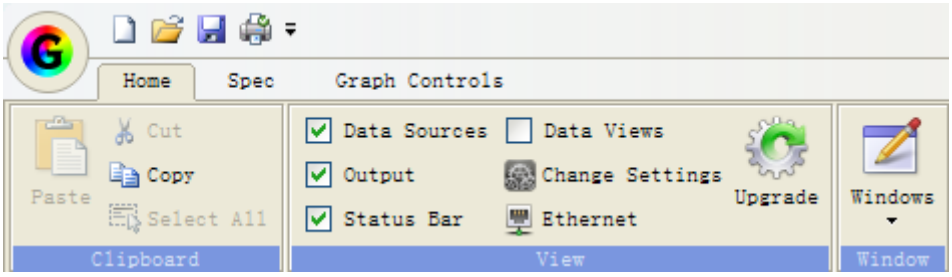


Figure 2.2 Home Panel controls

圖 2.2 主頁控制面板

2.1.1 Data Sources

數據源

List all the spectrometers connected.

列出了所有已連接的光譜儀。

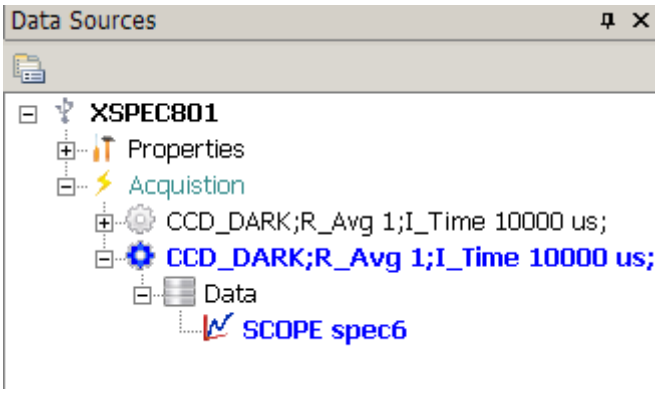


Figure 2.3 Data Sources

圖 2.3 數據源

Name of the spectrometer The name “XSPEC801” is user configurable. Right mouse click on “XSPEC801” to rename. The name is saved in the firmware.

右鍵單擊“XSPEC801”進行重命名，新名稱將保存在光譜儀中。

Properties List the properties of the spectrometer.

列出了光譜儀的各項性能。

Acquisition

- Add Profile, F8. Add an acquisition profile with different parameters.

  單擊 F8，添加不同參數的譜綫。

- Terminate Acquisition, F5, stop acquisition.

  單擊 F5，停止測量。

Profile Profile name contains the description of the acquisition. Subtracting CCD Dark, Running Average, Integration Time, FIR filtering.

譜綫信息，包含減去 CCD 暗噪音、取平均值、積分時間、FIR 濾波器。

- Use it as Dark Spectrum.

將其作為暗噪音光譜。

- Use it as Reference Spectrum.

  將其作為參考譜綫。

- Delete this Profile.

  刪除此譜綫。

- STOP F5.

  F5 鍵停止測量。

- Run Once F6.

  F6 鍵測量一次。

- Run continuously F7.

  F7 鍵持續測量。

Data Export the data to a text file for Excel import.

為 Excel 的輸入，輸出文本文件。

SCOPE spec6

- Overlay Saved File.

  覆蓋保存的文件。

- Overlay Exported File.

  覆蓋輸出的文件。

- Remove Overlay File.

  刪除覆蓋文件。

2.1.2 Data Views

數據視圖

Figure 2.4 Data Views

圖 2.4 數據視圖

List the data related to the spectrometer selected in the Data Sources.

列出了光譜儀從數據源挑選出來的數據。

First Button

- Peak Zoom. Default is on. Zoom in on each peak when click on 3rd & 4th buttons.

  放大波峰，默認為開，點擊第三、四個按鈕，放大各個波峰。

- Only show peak information in a single line.

  只顯示波峰單行信息。

- Continuously find peak. Used during assembly.

  連續檢測波峰，組裝、調試時使用。

- Inset Hg/Ar lines. Inset the reference Hg/Ar line to the check the calibration.

  插入汞、氬參考譜綫來檢查校正。

- Export Peak. Export the peak data in a text file.

  以文本文件的方式輸出峰值數據。

2nd Button Refresh Peak.

刷新波峰。

3rd Button Select the above peak.

選擇前一個波峰。

4th Button Select the next peak.

選擇后一個波峰。

5th Button Open the calibration dialog.

打開校準對話框。

6th Button Add the select peak for calibration.

加入選定的波峰進行校準。

7th Button Add a marker for each peak.

為每個波峰添加一個標記。

8th Button Remove all markers.

移除所有標記。

9th Button Do a peak calculate and add the peak curve to the graph.

檢測波峰，將峰值曲綫加入圖表。

10th Button Remove the peak curve.

移除峰值曲綫。

In the peak below, you can right mouse click on a peak and select:

在列出的峰值中，右擊選中一個波峰：

- Use the peak for calibration.

  使用此波峰進行校準。

- Insert all the peaks for calibration.

  添加所有波峰進行校準。

2.1.3 Calibration

校準

The calibration method use the data points given, let the select a polynomial from 1st order to 5th order. It can graph the original data points with fitted data points so user can select the best fit.

運用所給的數據點，選擇一到五級的多項式進行標定，這可以使用戶在原始的波峰中選擇合適的波峰來進一步標定。

First row has the pixel number. Second row has corresponding wavelength.

第一列為像素，第二列為對應的波長。

To achieve a good calibration:

通過以下幾點，可以獲得更精確的校準：

- More points the better.

  盡可能多的點。

- Have points cover the beginning and end of the wavelength range.

  選擇的波峰最好覆蓋波段的起點和終點。

- Use graph to check the data points. If a point has a deviation from the calibrated line, then the validity of the point is put into question and maybe it should be removed.

通過圖表檢查波峰點。如果所加的點離標準綫太遠，則此點的正確性要加以考慮，或者直接刪除。

- From the graph, select an order that give a good STD DEV and also does not deviate at the wavelength range ends. You might not have data points at the two ends of the wavelength range and the polynomial fitting has no constraint at the ends.

  通過圖表，在譜綫兩端選出一個能給出好的標準偏差的波峰。如果譜綫的兩端沒有波峰，那么多項式計算在兩端就沒有約束。

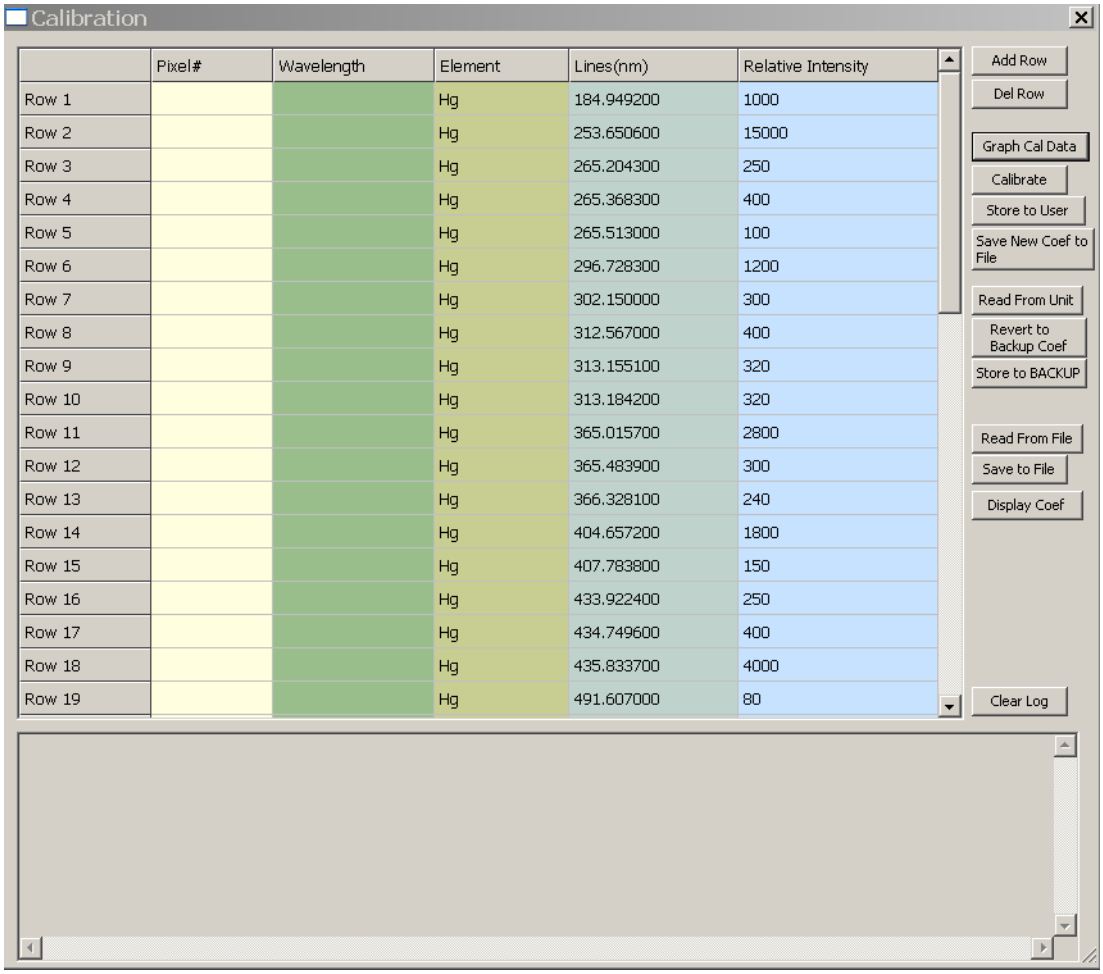


Figure 2.5 Calibration Dialog

圖 2.5 校準對話框

After calibration is done, click on both “Store to User” and “Store to BACKUP” to save the data into the firmware. Or only “Store to User” if you don’t want to erase the backup.

標定完之后，點擊“ Store to User ”和“ Store to BACKUP ”將資料保存到軟件上。

如果不想覆蓋之前的備份，可以只點擊“ Store to User ”。

To enable the Output, select the Output Spectrum Info checkbox in the Graph Control Panel.

為了能輸出數據，需勾選“ Graph Controls ”面板中的“ Output Spectrum Info ”復選框。

2.1.4 Graph Window

譜綫視圖

Show the spectrum graph.

顯示譜綫。

Figure 2.6 Graph Window

圖 2.6 譜綫窗口

2.1.5 Status Bar

狀態欄

Control the On/Off of the status bar on the bottom. There is a temperature sensor inside the Analog to Digital Converter. And it shows the temperature reading on the left side.

控制底部狀態欄的開關。在 A/D 轉換器里有一個溫度傳感器，在狀態欄左邊顯示讀取的溫度。

2.1.6 Output

輸出

Show some statistic information about the spectrum.

顯示光譜儀的統計數據。

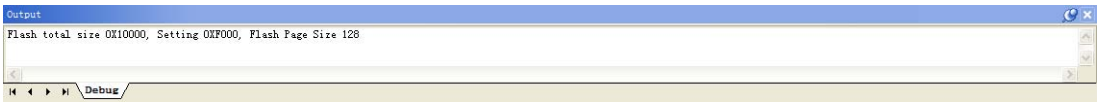


Figure 2.7 Output Window

圖 2.7 輸出窗口

2.2 Spec Panel

操作面板

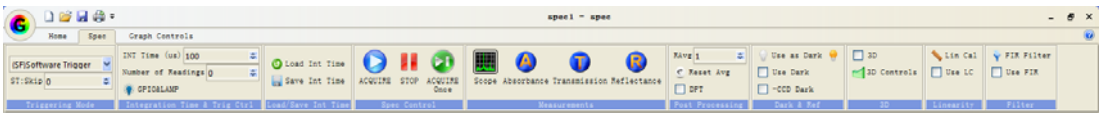


Figure 2.8 Spec Panel

圖 2.8 操作面板

Trigger

- Software Trigger: Acquisition initiated by software by sending over a command.

  軟件觸發器：通過軟件發送一個指令觸發。

- External Hardware Trigger: Pin #2 (2nd PIN from left, closest to the USB connector) Negative edge trigger the start of Single/Continuous acquisition. Single/Continuous mode is still controlled by the software command.

  外部硬件觸發：2 號針頭（左數第二個針頭，靠近 USB 接頭）觸發單個、連續測量的脈冲。單個、連

續測量依然受軟件指令控制。

Skip To slow down the reading rate, #number of reading are thrown away inside the firmware and are not sent to the USB.

減慢數據流量，直接過濾掉光譜儀里讀取到的數值，而且不發送給 USB 端。

INT Time In micro second 10us to 65000000us. Change the integration time here. To take effect, change the number and press enter. To save to the firmware, press “Save INT Time” button.

以微秒為單位，範圍在 10 微秒到 65 秒之間，在此改變積分時間。按下回車鍵，新的積分時間生效。點擊“Save Int Time”保存積分時間到光譜儀里。

Number of Readings Take # of reading and then stop.

測量設定的次數后停止。

GPOP & LAMP Open the GPIO&LAMP control dialog.

打開“GPIO&LAMP”控制對話框。

Load INT Time Load the Integration Time stored in the firmware and display/use them on the GUI.

加載保存在光譜儀里的積分時間，并將其顯示和應用與譜綫中。

Save INT Time Save the current Integration Time to the firmware.

將現有的積分時間保存到光譜儀中。

ACQUIRE Continuously acquire data.

連續檢測數據。

STOP Stop the acquisition.

停止檢測數據。

ACQUIRE ONCE Acquire once.

只檢測一次數據。

Scope	Display in Scope mode. Default Mode. 普通模式顯示，預定義模式。
Absorbance	Absorbance mode. Make sure there is a Reference data set saved. 吸收測量，使用時確保有參考數據保存在里面。
Transmission	Transmission Mode. Make sure there is a Reference data set saved. 透射測量，使用時確保有參考數據保存在里面。
Reflectance	Reflectance Mode. Make sure there is a Reference data set saved. 反射測量，使用時確保有參考數據保存在里面。
Running Avg #	Display the graph in running average mode. The weight of the latest reading has 1# weight in the averaging. Averaging calculation is done on PC. 運行平均值模式，顯示譜綫圖。最近一次測量的數據也算在其中。計算機上算平均。
Firmware Avg #	Averaging is done in the firmware. 光譜儀內部算平均。
DFT	Display the graph in Directe Fourier Transform. 顯示譜綫的傅里葉變換。
Use as Dark	Save the current display spectrum as the dark spectrum. 將當前顯示的譜綫作為暗噪音譜綫保存。
Use Dark	Check box to enable subtracting the dark spectrum. 選中后將當前譜綫減去已保存的暗噪音譜綫。
Use as REF	Save the current displayed spectrum as the reference spectrum. 將當前顯示的譜綫作為參考譜綫保存。
3D	Check box to enable the 3D display. 選中后進入三維顯示界面。
3D Controls	Open the 3D control dialog.

打開三維控制對話框。

-CCD Dark Subtract the dark pixel reading from each data pixel.

將當前譜綫減去暗噪音。

2.3 Graph Controls

譜綫控制

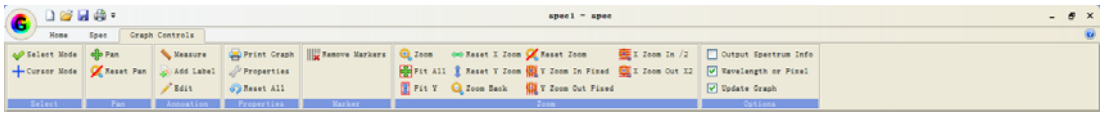


Figure 2.9 Graph Controls

圖 2.9 譜綫控制面板

Select Mode Cursor in select mode.

以光標模式顯示。

Cursor Mode XY cursor mode. Display cursor x,y, Integration time, Data point x,y.

以 XY 坐標模式顯示，數據包含：X、Y 坐標值，積分時間，X、Y 數據點。

Pan Pan graph.

平移譜綫。

Reset Pan Reset Pan.

重置平移后的譜綫。

Measure Measure distance.

測量距離。

Edit Edit the data point. Change the value of a data point.

編輯數據點，更改數據點上的值。

Print Graph Send the graph to a printer.

將譜綫發送至打印機打印。

Properties Open the properties dialog. Change properties for the chart, axis, curve, and peak.

	打開屬性對話框，更改圖表、軸、曲綫、峰值的屬性。
Reset ALL	Reset all the default. 將所有的缺省值重新設定。
Remove Markers	Remove all markers. Markers can be added by click on the X or Y axis first. 移除所有標記。標記可以通過點擊 X、Y 軸添加。
Zoom Controls	Various zoom controls. 多種縮放控制。
Output Spectrum Info	Check box to enable/disable the output of the statistical data of the spectrum. Disable for performance. 選中后輸出譜綫的統計數據。
Wavelength or Pixel	Set the X axis as Wavelength or Pixel. 將橫坐標設為波長或者像素。
Update Graph	Enable/Disable update of the graph. Can be disable to achieve the fastest data throughput. 勾選復選框能及時獲取最新數據。

3. Graph Control

譜綫控制

3.1 Peak

峰值

In turn, click Graph Controls, Properties, and the Peak.

依次點擊“Graph Control”,“Properties”, 選擇“Peak”標簽頁。

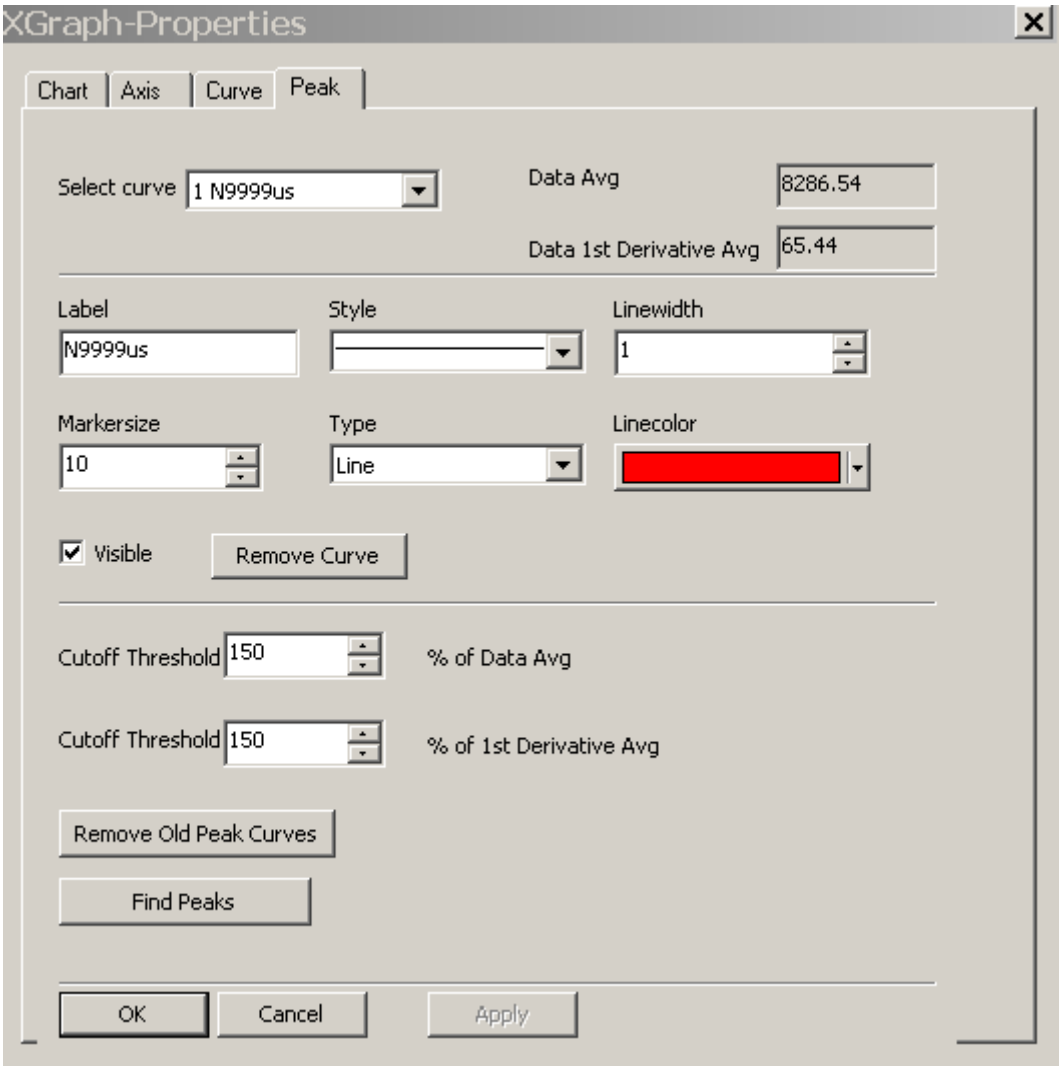


Figure 3.1 Peak Controls

圖 3.1 波峰控制

There are 2 threshold settings that control the peak selection. Peaks below the threshold are ignored. They are used to filter out the noise. First one is the data average, 2nd one is the average of the 1st derivative. Default settings are 150 for both.

波峰由兩個臨界值確定，臨界值以下的波段將被忽略，由此過濾噪音。第一個是平均值，第二個是平均值的導數，兩個默認值均為 150。

3.2 GPIO & Lamp Control
輸入輸出和燈源控制

In turn, click Spec, and the GPIO&LAMP.

依次點擊“Spec”,“GPIO&LAMP”，打開輸入輸出和光源控制對話框。

GPIO control the input and output of the signal. When set to output, click on the “Write to Unit” to output the setting. When set to input, click “Write to Unit” to change to input and then “Read from Unit” to read the GPIO value.

此窗口控制輸入、輸出的信號。當設置為輸出時，點擊“Write to Unit”輸出設定；當設置為輸入時，點擊“Write to Unit”更改輸入，然后點擊“Read from Unit”讀取數據。

Bias Setting

Every TCD1304 CCD detector has small variation on the output bias voltage. The bias voltage also changes with temperature. Adjust the PWM or DAC setting so the output has the lowest dark reading (Closest to zero) at 10 us integration. During the adjustment, make sure uncheck the –CCD Dark at the right corner of the Spec panel.

每個 TCD1304 CCD 探頭的輸出電壓之間都存在一定的差別，同時溫度也會影響這個偏壓。調整 PWM 或 DAC 設定，使輸出在 10 微秒積分時間內保持最低的暗電流（接近于零）。調整時，確保操作面板右上角的“CCD Dark”復選框未被選中。

Negative Voltage Setting

This is a factory setting. Adjust the negative voltage for the OPAMP so it can work in the 0Vdc region.

這是出廠前設定好的，為運算放大器調整負電壓，

使其能在零電壓時工作。

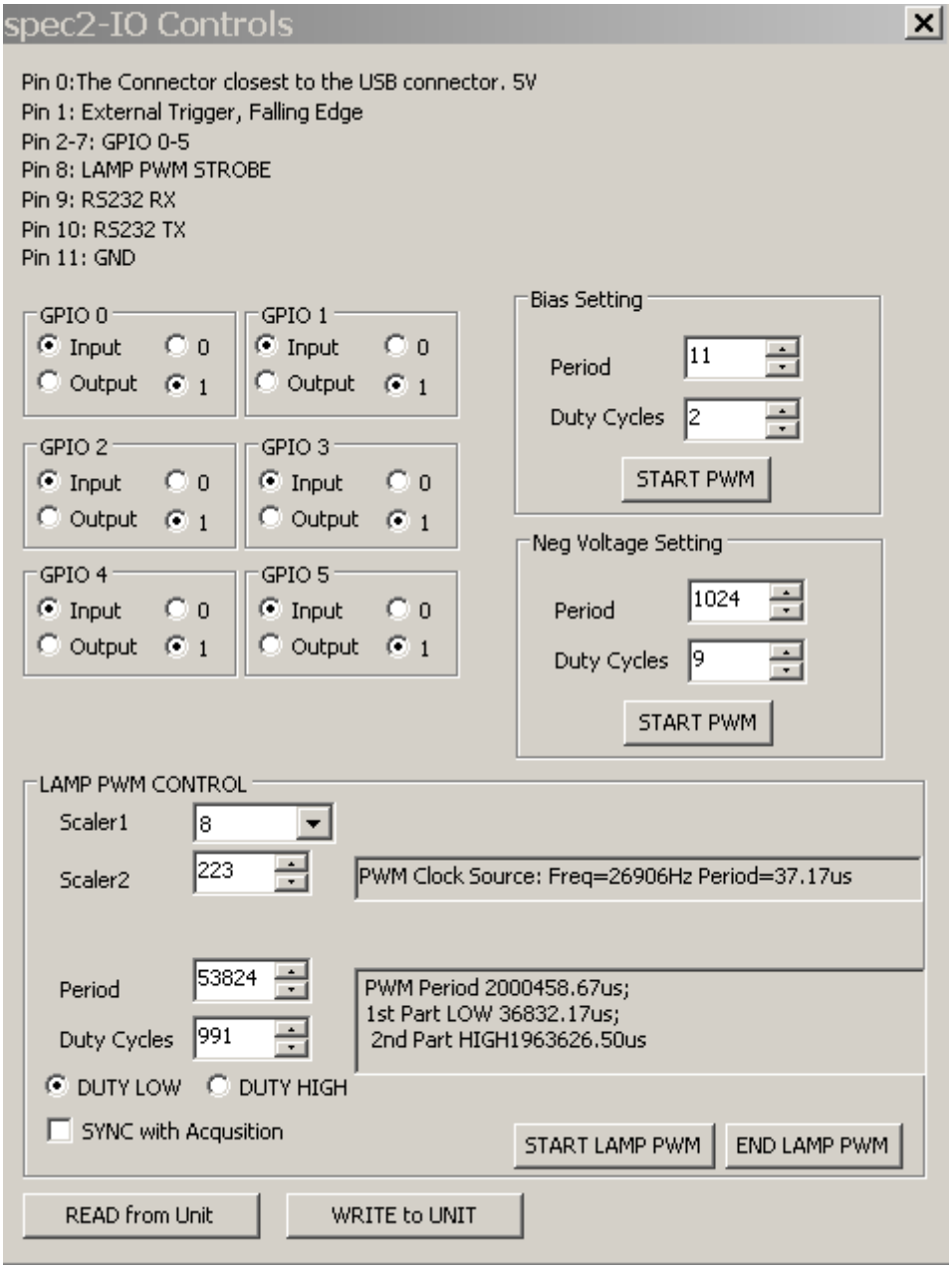


Figure 3.2 GPIO&LAMP Controls

圖 3.2 輸入輸出和燈源控制

4. Firmware Settings

光譜儀設置

In turn, click Home, Change Settings.

依次點擊“Home”,“Change Setting”，打開設置對話框。

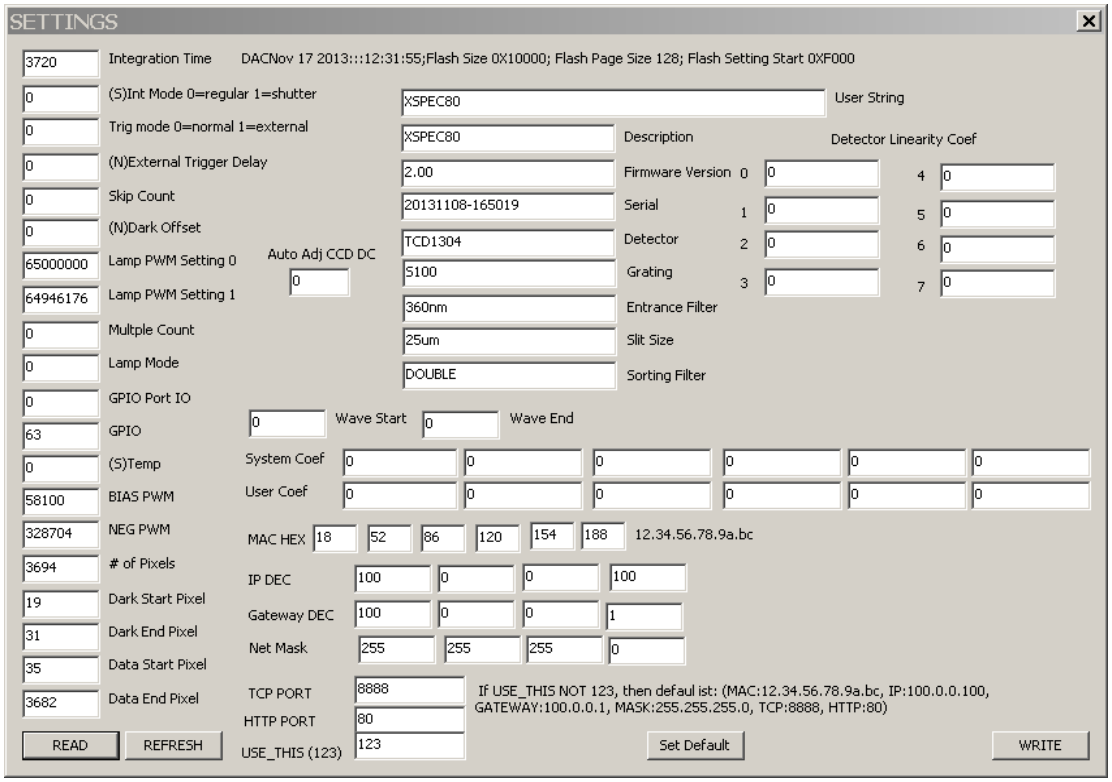


Figure 4.1 SETTINGS

圖 4.1 設置

Read/Refresh Read and refresh the values.

讀取、更新數據。

Set Default Change the values to system defaults values before initial calibration.

更改當前數據位初始校準前的系統預設值。

Write Write to firmware.

將當前數據寫入光譜儀中。

Note User can change all the values on this dialog, including the calibration values.

用戶可以改變對話框中的所有數據，包括校準值。

5. Setup the CCD DC Bias

CCD 直流偏壓設置

In turn, click Spec, GPIO&LAMP.

依次點擊“Spec”,“GPIO&LAMP”，打開設置對話框。

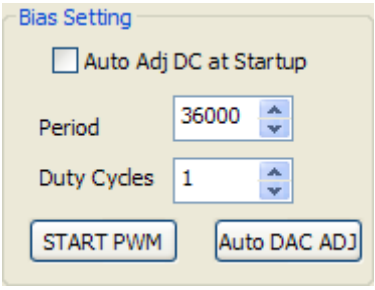


Figure 5.1 Bias Setting

圖 5.1 設置偏壓

To set the DC bias, Set INT time to 10us, and block all light input into the SMA fiber connector. You can either manually change the period values or click on “START PWM” button to change the DC bias. Then observe the spectrum taken with 10us INT time, the spectrum should be flat, and set average DC value to 100-200 range.

設置直流偏壓時，將積分時間設為 10 微秒，并確保光纖接口沒有任何光進入，然后既可以手動更新數據，也可以點擊“START PWM”按鈕更改直流偏壓，觀察在 10 微秒積分時間下的光譜，此時光譜應該變平。一般來說，直流偏壓數值應該在 100-200 之間。

If you enable the “Auto Adj DC at startup”, every time the unit is powered up by plug in the USB cable; it will perform an auto DC bias adjustment.

如果將“Auto Adj DC at Startup”復選框選中，光譜儀將在每次連接上 USB 時，自動調節直流偏壓。

6. GPIO Controls

輸入輸出控制

In turn, click Spec, GPIO&LAMP.

依次點擊“Spec”,“GPIO&LAMP”，打開設置對話框。

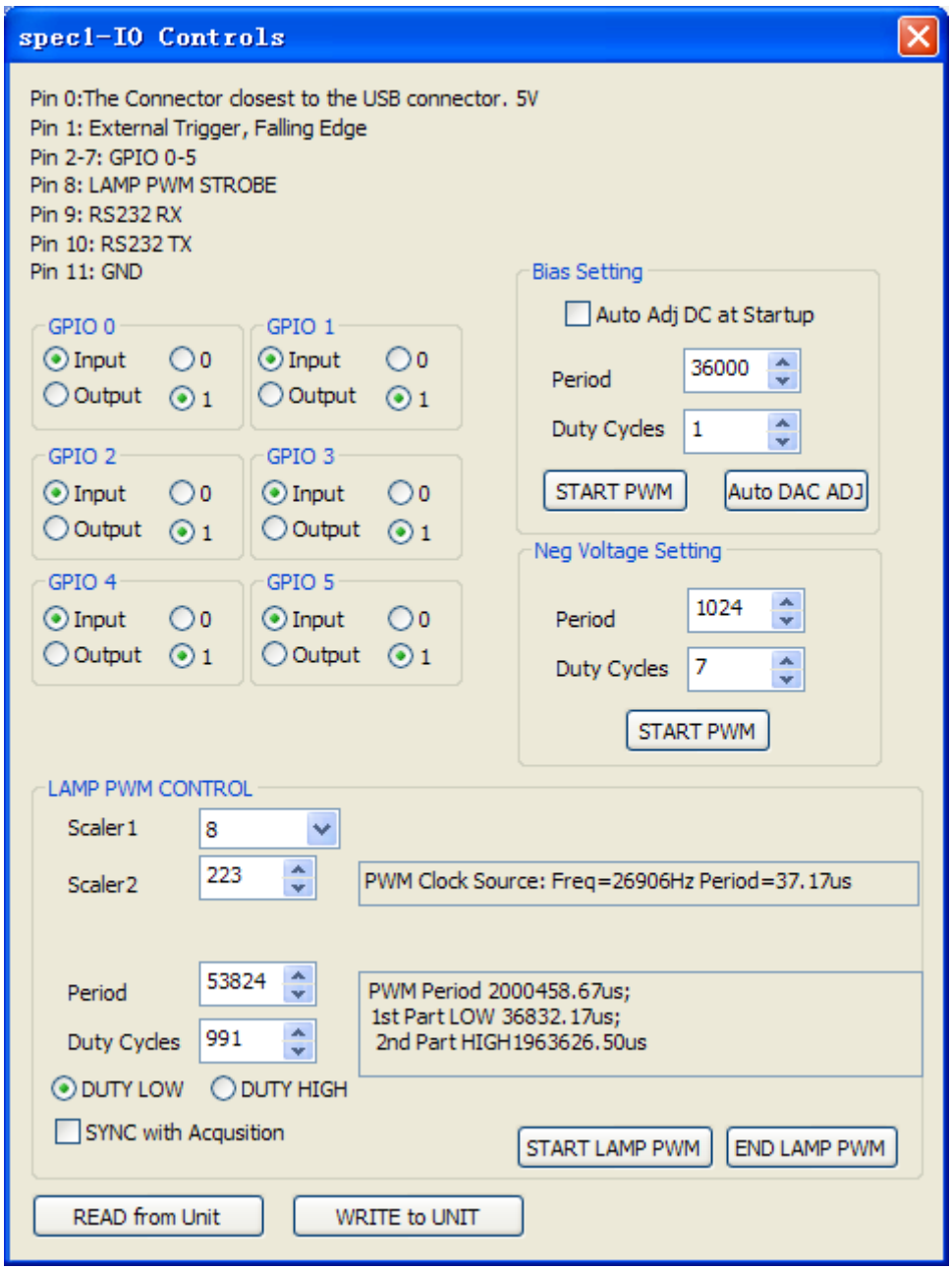


Figure 6.1 GPIO Controls

圖 6.1 輸入輸出控制

Change the input/output status for GPIO 0-5. If set to input, “WRITE to UNIT” first to change the state to INPUT, then do “READ from UNIT” to read the GPIO values. If set to output, set the value as well and then click “WRITE to UNIT”.

總共有 0-5 號六個控制端，可以更改輸入輸出的狀態。如果設置為輸入，則

“WRITE to Unit”將更改為輸入狀態，“READ from Unit”將讀取譜綫數據。如果設置為輸出，則反之，最后點擊“WRITE to UNIT”寫入數據。

Read from Unit Load the setting from the firmware.
從光譜儀中加載設定。

Write to Unit Save the setting to the firmware.
保存設定到光譜儀中。

7. PWM Control

脈寬調變控制

In turn, click Spec, GPIO&LAMP.

依次點擊“Spec”,“GPIO&LAMP”，打開設置對話框。

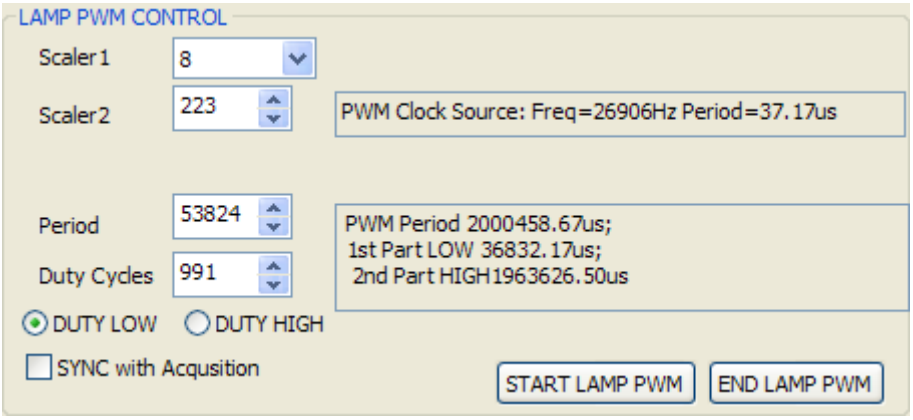


Figure 7.1 PWM Controls

圖 7.1 脈寬調變控制

Scaler1,2

Change the scaler, divider for the input clock for the PWM. See the right text for the resulted frequency and period.

更改計數器的輸入頻率。頻率和周期見右邊的文本框。

Period, Duty Cycle

Change the period and duty cycle for the PWM signal.

為脈冲信號更改周期和工作周期。

Duty Low/High

Set to low/high during the Duty cycle.

設置工作周期中的高、低頻率。

SYNC with Acquisition

When checked, a pulse rising edge occurs at the start of integration, and falling edge occurs at the end of the data acquisition, which is 3.7ms. In another word, the on time of the pulse for every integration is 3.7ms. If uncheck, PWM pulse turns on after user update the setting.

如果選中此復選框，在開始讀取的時候有一個上升沿，在結束讀取的時候有一個下降沿；如未選中，PWM 脈冲將在用戶更新設定后打開。

Start/End LAMP PWM	Send command to firmware to start/end the PWM. 發送開始、停止 PWM 指令到光譜儀中。
Read/Write from/to Unit	Load/Save the setting from/to the firmware. 從光譜儀中加載設定，或保存設定到光譜儀中。

8. Measurements

測量

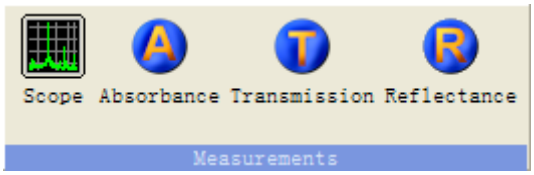
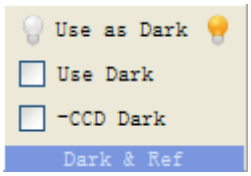


Figure 8.1 Measurements

圖 8.1 測量

8.1 CCD Dark

CCD 暗噪音



CCD TCD1304DG has some pixels that are light blocked and are used as dark reference. Dark current is temperature sensitive and values changes with temperature. To keep reading constant over a temperature range, enable –CCD Dark during measurement.

CCD TCD1304DG 探頭中某些沒有光找到的像素被用作暗噪音參考。暗電流對溫度極其敏感，并會隨着溫度的變化而變化。為了讀取數據時保持在一定的溫度範圍內，必須在測量時減去 CCD 暗噪音。

- Dark Noise
  If you intend to use a spectrum as Dark noise, click on “Use as Dark”, then enable “Use Dark”.

  點擊“Use as Dark”，將所選的譜綫作為暗噪音譜綫，然后勾選“Use Dark”。

- Reference
  If you intend to use a spectrum as reference, click on “Use as REF”.

  點擊“Use as REF”，將所選譜綫作為參考譜綫。

8.2 Scope measurement

普通測量模式

Default setting is Scope mode. Click on ACQUIRE or ACQUIRE Once to acquire data and STOP to stop acquiring.

預設是普通模式。點擊“ACQUIRE”或者“ACQUIRE Once”以獲取數據，點

擊“STOP”停止獲取。

A. Make sure you see a spectrum when there is no light signal into the SMA connector, when –CCD Dark, and Use Dark are not enable. If all pixel readings are zero, adjust the DC Bias according to section 5.

不要選中“-CCD Dark”和“Use Dark”復選框，確保沒有光信號進入光纖接頭，并且能看到譜綫。如果沒有看到譜綫，則參考第五部分，調整直流偏壓。

B. Enable –CCD Dark.

勾選“-CCD Dark”復選框。

C. Set the INT time, and click on ACQUIRE, make sure there is no light signal into the SMA connector. And click on “Use as Dark”, and “Use Dark”. The signal should fluctuate around zero.

設置積分時間，點擊“ACQUIRE”，確保沒有光信號進入光纖接頭，點擊“Use as Dark”，并選中“Use Dark”。信號波動將趨向于零。

D. Turn on the light input and start Acquire.

打開燈源，開始測量。

E. If you change the INT time, make sure you repeat C&D again.

如果改變積分時間，則需重復第三、四步。

8.3 Absorbance

吸收測量模式

A. Use Scope measurement to get a reference curve with maximum value around 60000.

用普通測量獲取一個最大值大約為 60000 的参考曲綫。

B. Click on “Use as Ref”.

點擊“Use as Ref”。

C. Click on Absorbance button. You should now a get a curve around zero. If the reference signal is very weak, you will get noisy readings.

點擊“ Absorbance ”按鈕，獲取一個零附近的曲綫。如果參考信號非常弱，則會得到有噪音的數據。

D. Insert a filter or a solution in the light path that needs to be measured.

放入需要檢測的過濾器。

E. Click on ACQUIRE.

點擊“ ACQUIRE ”。

8.4 Transmission

透射測量模式

A. Use Scope measurement to get a reference curve with maximum value around 60000.

用普通測量獲取一個最大值大約為 60000 的參考曲綫。

B. Click on “Use as Ref”.

點擊“ Use as Ref ”。

C. Click on Transmission button. You should now a get a curve around 100%. If the reference signal is very weak, you will get noisy readings.

點擊“ Transmission ”按鈕，得到一個大約為 100%的曲綫。如果參考信號非常弱，則會得到有噪音的曲綫。

D. Insert a filter or a solution in the light path that needs to be measured.

放入需要檢測的過濾器。

E. Click on ACQUIRE.

點擊“ ACQUIRE ”。

8.5 Reflectance

反射測量模式

A. Use Scope measurement to get a reference curve with maximum value around 60000.

用普通測量獲取一個最大值大約為 60000 的參考曲綫。

B. Click on “Use as Ref”.

點擊“ Use as Ref ”。

C. Click on Reflectance button. You should now a get a curve around 100%. If the reference signal is very weak, you will get noisy readings.

點擊“ Reflectance ”按鈕，得到一個大約 100%的曲綫。如果參考信號非常弱，則會得到有噪音的曲綫。

D. Insert a filter or a solution in the light path that needs to be measured.

放入需要檢測的過濾器。

E. Click on ACQUIRE.

點擊“ ACQUIRE ”。

9. Calibration

校準

Calibration is done in the factory. The following description is a guide only. Make sure you save the coefficients before any modifications.

出廠前已經進行了校準，以下僅作為說明，如需改動，請做好數據備份。

In turn, click Data Views, and then the 5th Button, open the Calibration dialog.

點擊“ Data Views ”，然后點擊操作面板上的第五個按鈕，打開校準對話框。

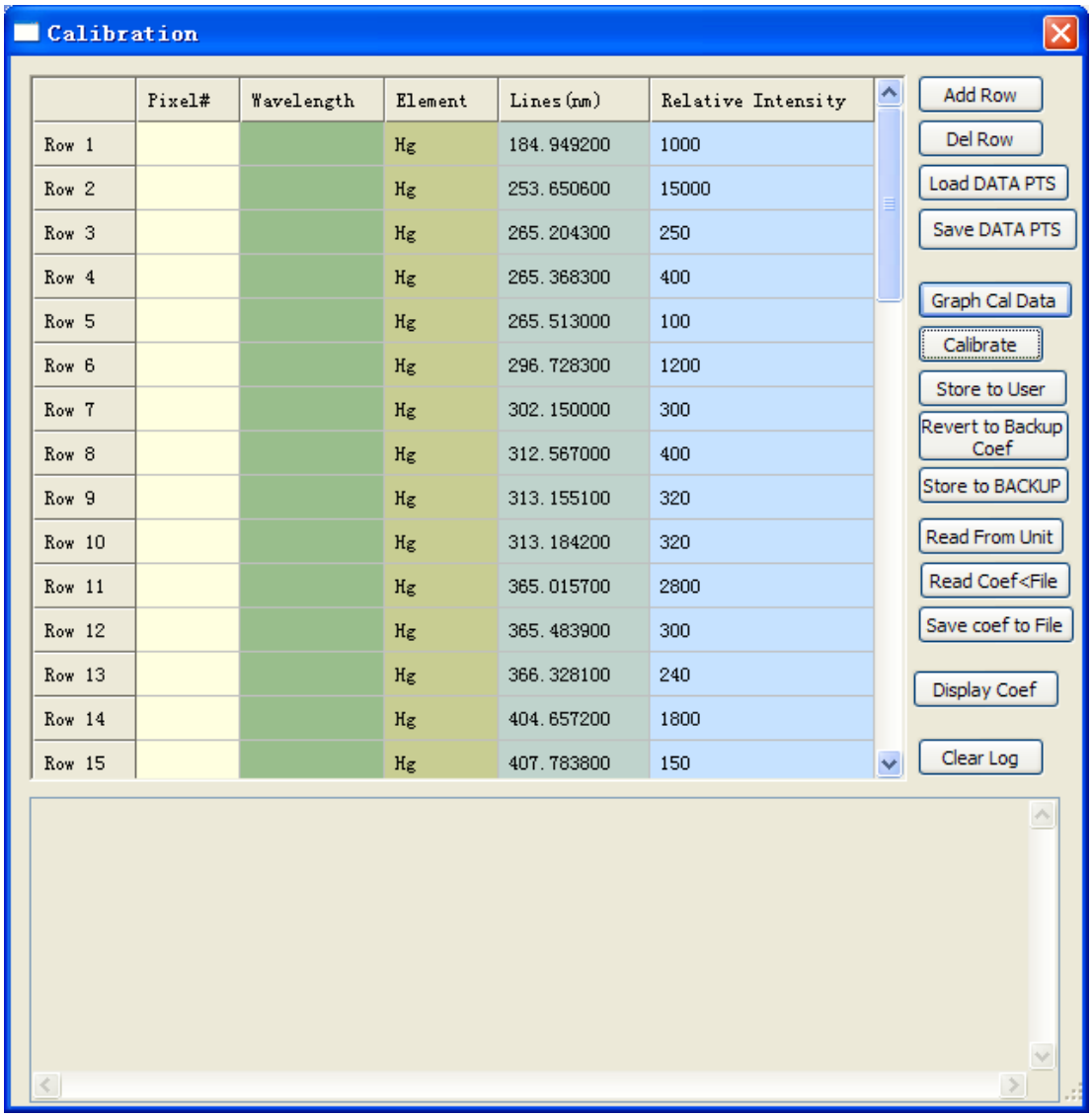


Figure 9.1 Calibration Dialog

圖 9.1 校準對話框

A. Click on “Read From Unit”.

   點擊“ Read From Unit ”。

B. Click on “Display Coef”.

   點擊“ Display Coef ”。

C. Click on “Save Coef to File”, then input pixel/wavelength pairs into the Excel-like spreadsheet in the Calibration dialog.

點擊“ Save Coef to File ”，輸入像素和波長將一起保存到校準對話框的表格中。

D. Click on “Calibrate”.

點擊“ Calibrate ”。

E. Click on “Store to user”.

點擊“ Store to user ”。

F. Click on “Store to BACKUP” if you wish to replace the BACKUP.

如果要替換備份，點擊“ Store to BACKUP ”。

10.Linearity

綫性

In turn, click Spec, and then Lin Cal, open the Detector Linearity dialog.

依次點擊“ Spec ”,“ Lin Cal ”, 打開綫性檢測對話框。

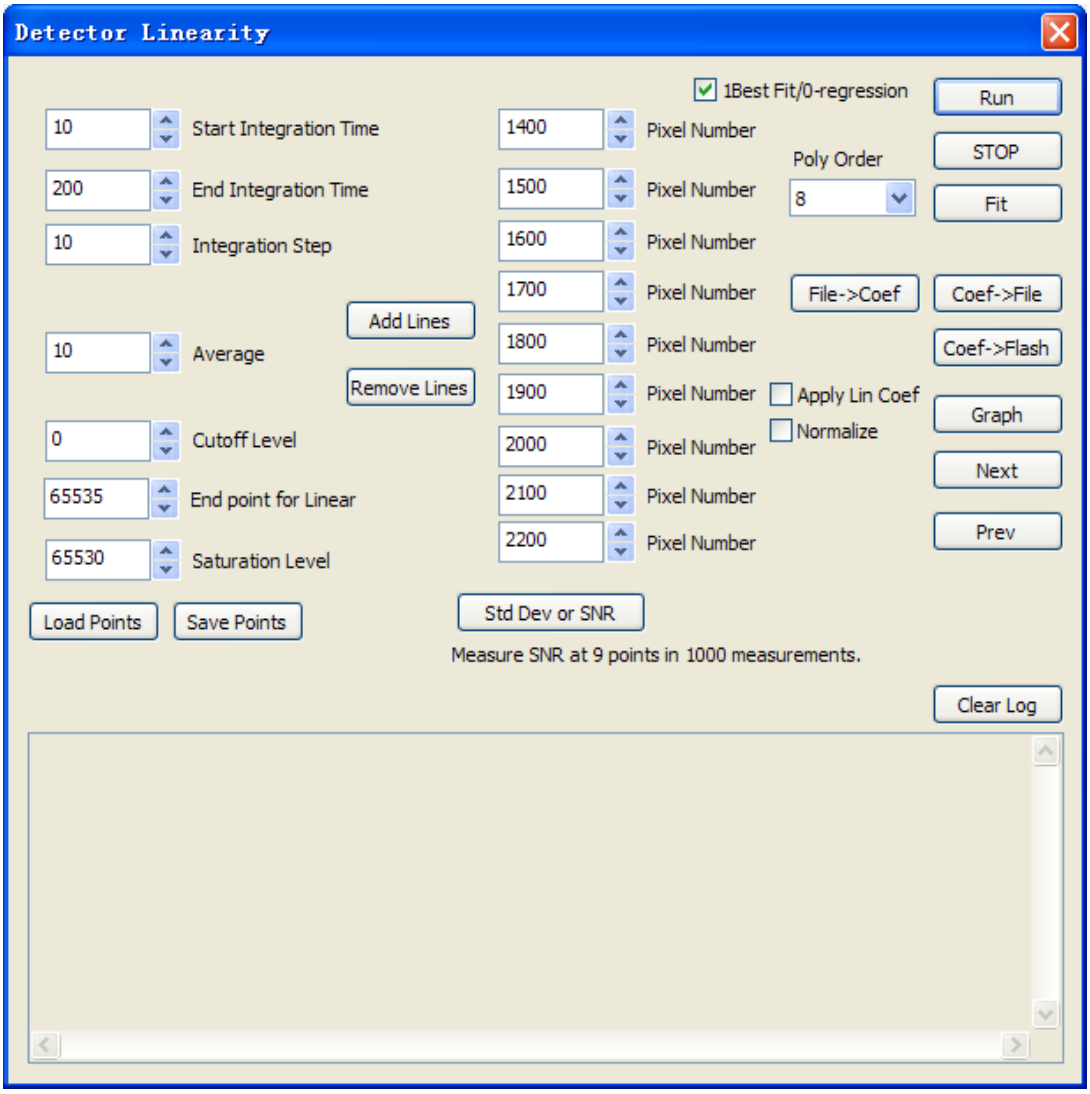


Figure 10.1 Detector Linearity

圖 10.1 綫性檢測

For fixed pixels, diagnose the linearity of readings of each pixel with respect to integration time. We found the linearity of TCD1304 is excellent that requires no linearity correction.

對于固定像素，讀取數據的綫性診斷都是和積分時間相關的。我們 TCD1304 探頭的綫性是非常好的，不需要任何修正。

11. SNR measurement

信噪比测量

You can also measure the SNR at certain points. Make sure the signal strength is close

to saturation to get the best SNR.

用戶可以用軟件測量某個點的信噪比。為了得到最好的信噪比，請確保信號強度接近于飽和。

Click Spec, then Lin Cal, open the Detector Linearity dialog. As shown in the Figure 10.1.

依次點擊“Spec”，“Lin Cal”，打開綫性檢測對話框，見圖 10.1。

Click Std DEV or SNR, the software will automatically measure SNR at the nine specified pixel number. You can switch to pixel display setting under Graph Controls-Wavelength or Pixel.

點擊“Std DEV or SNR”，軟件將會自動測量上面九個像數的信噪比。

12.FIR filtering

FIR 濾波器

In turn, click Spec, and then FIR Filter, open the Filter Setting dialog.

依次點擊“Spec”,“FIR Filter”，打開濾波器設置對話框。

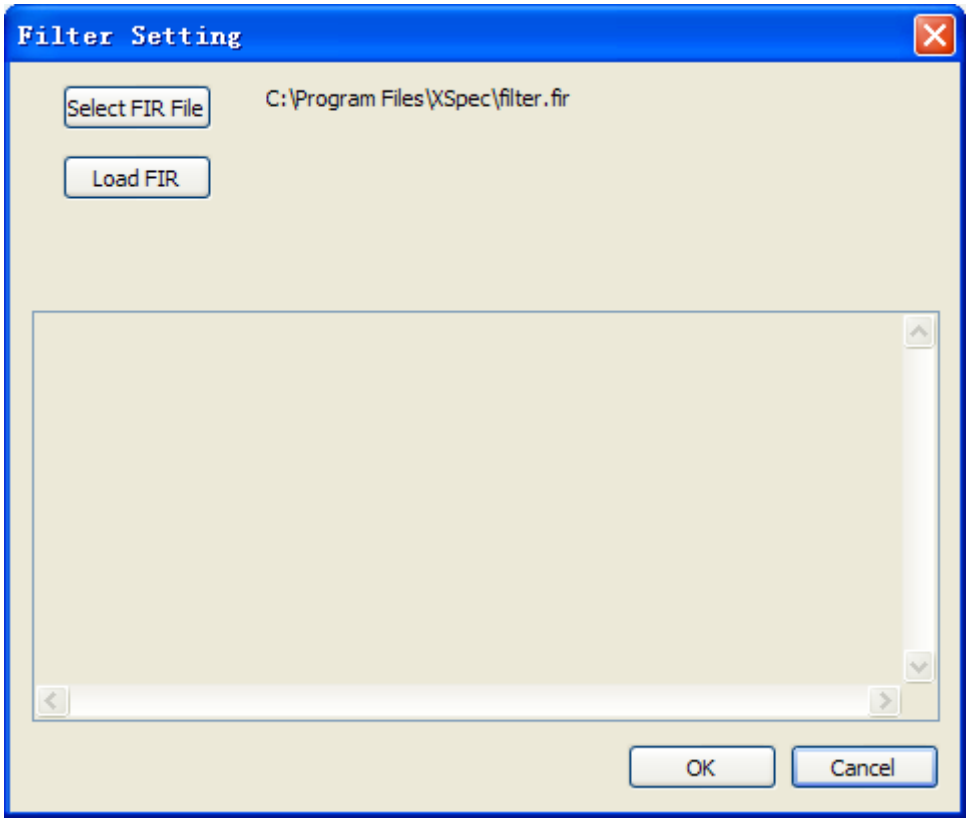


Figure 12.1 Filter Setting

圖 12.1 濾波器設置

Select a file with FIR coefficients, Format of the file:

選擇一個 FIR 過濾器文件，文件格式如下:

#comments 450000 is the cutoff frequency, ADC is 1MHz. 32 is number of taps.
“Description” 450000 32
Coef 0
Coef 1
…
Coef 32

Enable “Use FIR” to apply the FIR. The defaults FIR file is used to remove the CCD Nyquist noise at 500 KHz.

勾選“Use FIR”復選框，預設的 FIR 過濾器將移除 CCD 500KHZ 的“尼奎斯特”

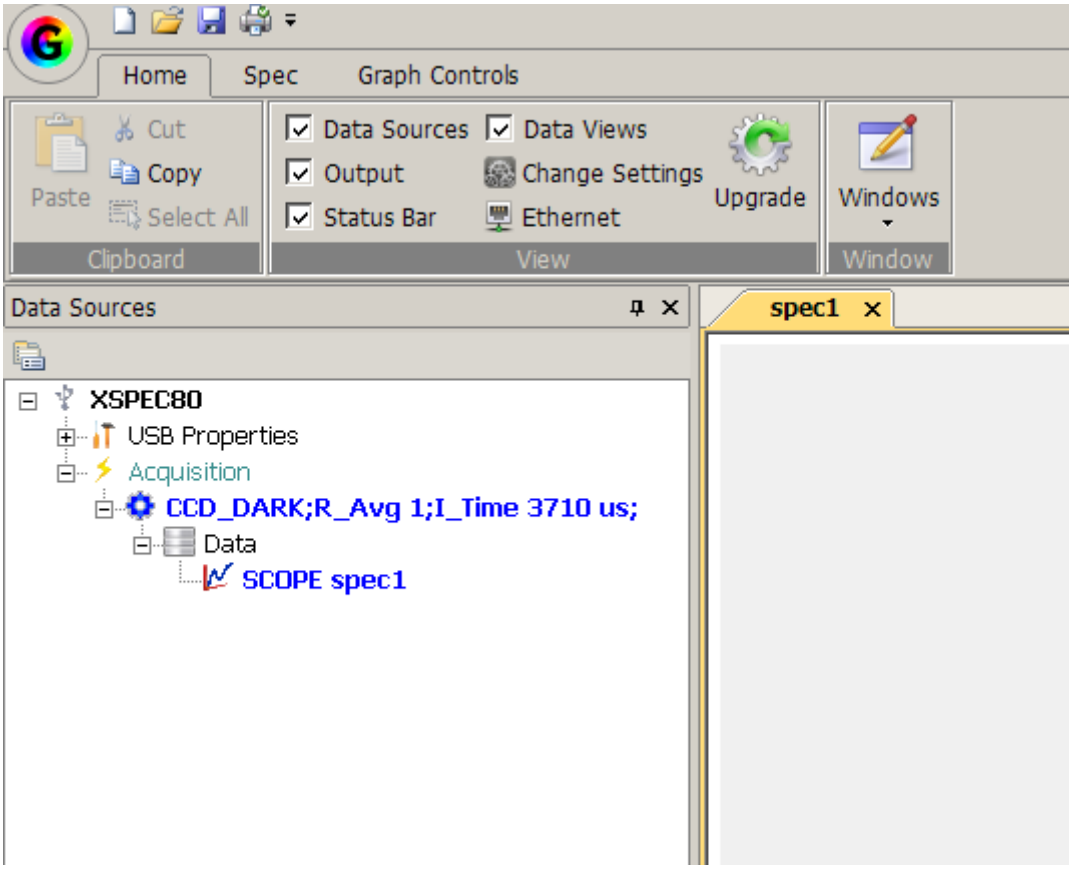
噪音。

13.Firmware Upgrade

光譜儀升級

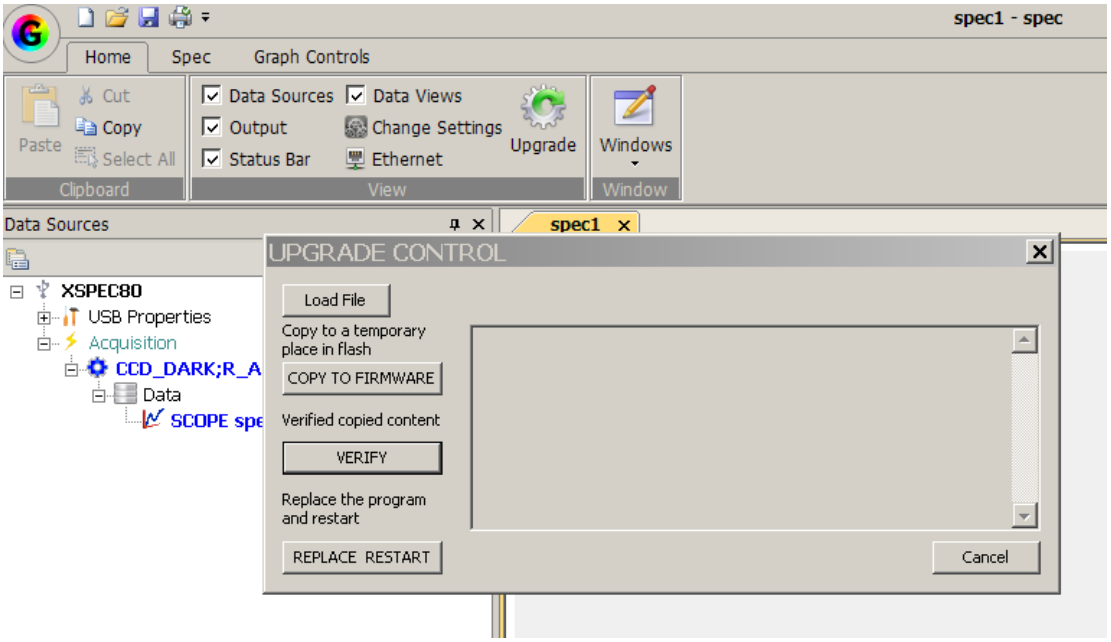
A. Connect device, make sure you see the device.

連接光譜儀，確認軟件中能看到光譜儀。



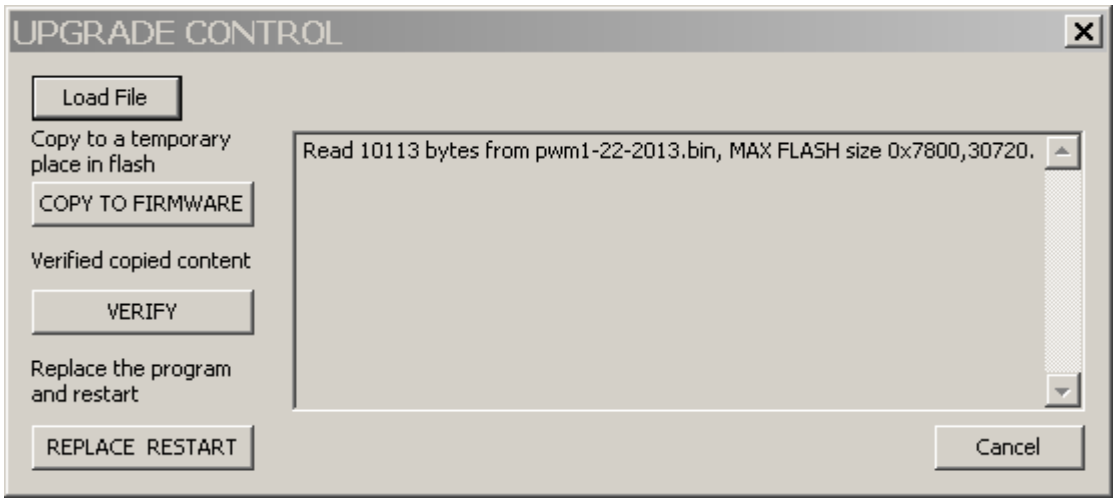
B. On Home TAB, click on Upgrade.

在 Home 標簽頁，點擊“ Upgrade ”進行升級。



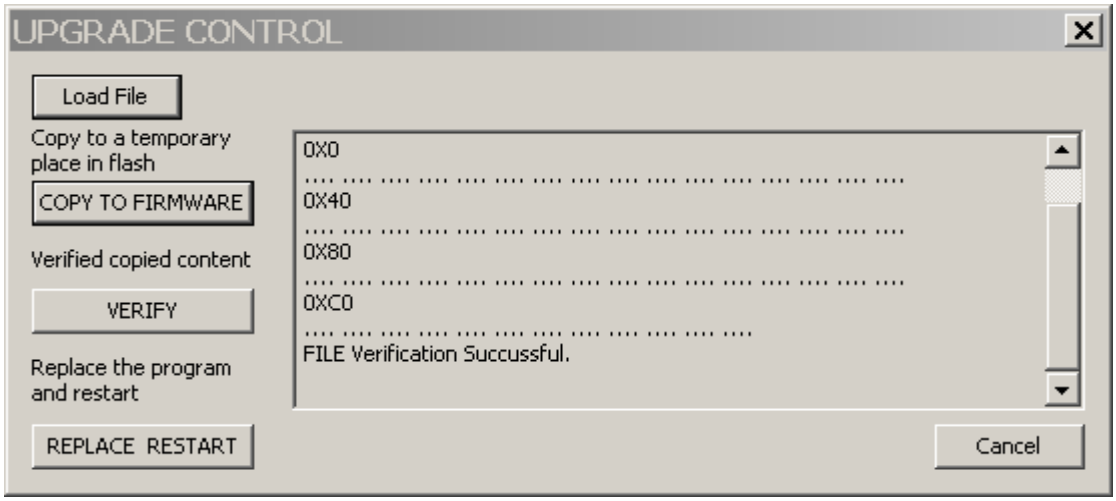
C. Load File, Download Firmware file from http://www.gratingworks.com/products/tech.htm, unrar and load the bin file.

從網址 http://www.gratingworks.com/products/tech.htm 下載光譜儀文件，解壓并加載 bin 文件。



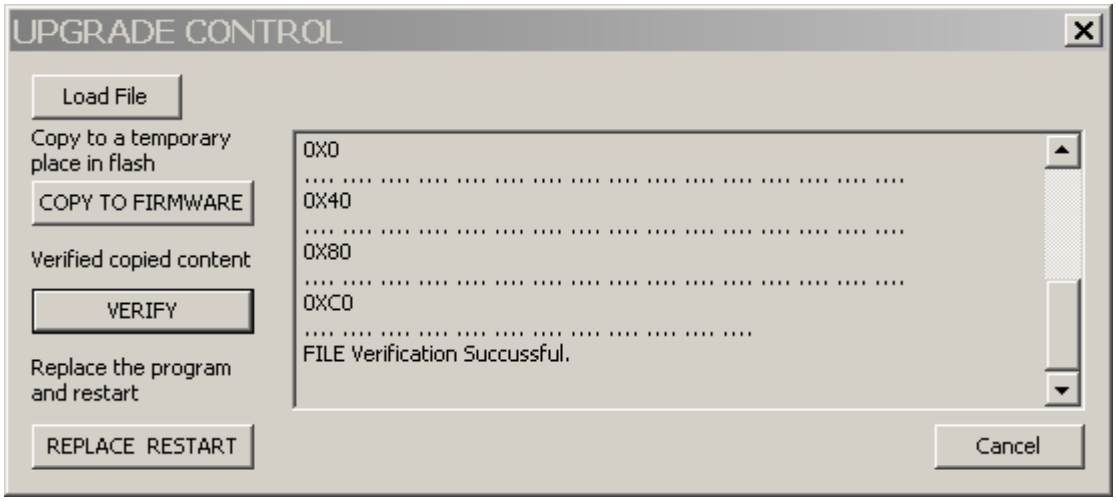
D. Click on copy to firmware, it will copy the new file to a temporary place in flash. It does not replace the running program yet. If you see X or error, pull put the USB cable and restart the operation.

點擊“Copy to Firmware”，將會復制新文件到閃存里，但是不會替換正在運行的程序。如果彈出 X 或者錯誤，拔出 USB 數據綫，重新操作。



E. Verify, make sure download is correct.

確認文件下載正確。



F. Click on REPLACE&RESTART to replace the running program and restart the unit. You will hear the USB power off/on sound.

點擊“REPLACE&RESTART”替換正在運行的程序，并且重啟程序，此時會有 USB 電源聲音響起。

G. UPGRADE DONE.

升級完成。