AD131

PhotoDetector Module

USB 2.0

User Manual

Ver.1.0

Document # 1092109

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SPECTRAL PRODUCTS

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The staff at Spectral Products will be happy to answer any questions about our products and our services. For immediate assistance, please contact the Spectral Products Group directly at (505) 343-9700, by fax (505) 343-9705, or by e-mail at sales@spectralproducts.com

Warranty

This product is warranted to be free of defects in materials and workmanship for one year from date of purchase.

This manual and the software it describes are provided free of charge as a service to the customer. The software is intended to be used as a tool for development and as an example of one possible method of code implementation. It is not intended to be a comprehensive "user application."

Any software associated with this product is provided "as is" with no warranty, expressed or implied. While it is the intent of Spectral Products to provide error-free development tools, no guarantee is made regarding either the accuracy or usefulness of this material.

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1. Product Overview and Specifications

The AD131-USB is a convenient computer controlled photodiode/photo resistor detection system for use with Spectral Products' Digikrom line of monochromators. It features a detector housing that is easily interchangeable and mounts directly to the exit port of the Digikrom monochromator. Sensors are available separately and are available in different wavelength ranges. The AD131-USB module connects with a USB cable to any functioning USB port on the user's PC. The power supply, (P/N 1109781) provides all of the power requirements for the module (±12V, +5V). The red LED located on the front will be constantly on during power up and normal operation.

The AD131-USB detector module supersedes the discontinued AD131 detector module. The AD131-USB module does not have the sensitivity of the photomultiplier tube, and is therefore not appropriate for some applications.

Wavelength Range	Depends on sensor type
A/D Resolution	16-bit
A/D Conversion Rate	500kSPS
Response Rate	USB 2.0
Time Constant	10uS, 100uS, 1mS, 10mS (selectable)
Low Pass Filter	1/3Hz, 1Hz, 10Hz, 100 Hz (selectable)
Phase Shift	0-180 degrees (selectable)
Amplification Gain	x1 to x10 (selectable)
Phase Lock Loop Voltage Input	0-5V Optical Chopper Reference Signal
Trigger Input Voltage	0-5V DC TTL
Supply Voltage	100-240 VAC
USB 2.0 Transfer Rate	480 Mbits/s

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2. Theory Of Operation

2.1. Signal Sampling

At the heart of the AD131-USB is an A/D converter with 16-bit resolution with a 500kSPS-sampling rate. For each conversion, the input signal current from a photodiode is converted to a voltage when passed through a current-to-voltage converter. A feed back capacitor is used to provide stability to the current-to-voltage converter. This capacitor, which provides a time constant, is user selectable and provides four different time constants. The time constants are: 10us, 100uS, 1mS, and 10mS. The AD131-USB is not an 'event capture' device; for all practical purposes the optical signal must be constant for accurate measurements.

For a photo-resistor sensor measurement, the AD131-USB needs an AC signal. The signal, which can be optically chopped or electronically oscillated at 800Hz, is fed into an AC amplifier. This signal is sampled by a phase sensitive detector, which is controlled by an external reference signal. The AD131-USB has a phase-lock-loop, which locks to the external 800Hz reference signal. The AD131-USB allows the user to control the reference signal phase shift by 180 degrees. After the signal goes through the phase sensitive detector, a low pass filter gets rid of any AC signal leaving only the DC component of the signal. If desired, the AD131-USB allows the user to chop a signal fed to a photodiode.

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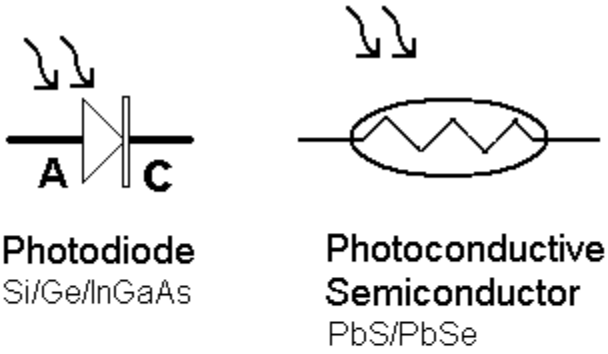
2.2. Sensor Heads

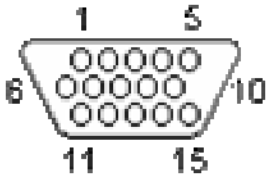
2.2.1. Regular Sensor Heads

There are several sensor head configurations available for the AD131-USB. The devices and their Spectral Products part numbers, the pin out are shown below.



Pin Connector:
1-Si (Anode)
2-Si (Cathode)
3-Ge/InGaAs (Anode)
4-Ge/InGaAs (Cathode)
5- Ground
6- PbS/PbSe
7- PbS/PbSe

Pin out (TE Cooled – Optional)	
8	Anode (reserved)
9	Cathode (reserved)
10	N/C
11	N/C
12	Power
13	Cooler
14	Temperature
15	Stages



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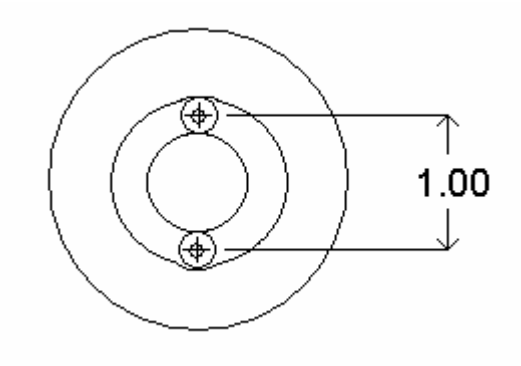

The AD431 sensor head is constructed of an InGaAs and Si device sandwiched one on top of the other; a Silicon photodiode that is IR transparent is overlaid upon the IR sensing InGaAs detector. Responsivity and active area are less for the sandwich detectors (AD431), as can be seen in the following table:

Sensor Head	Responsivity $R_{\lambda p}$ (mA/W @ λ_p)	Photo Sensitivity S(λ=λp) (V/W)	Active Area (mm)	Peak Wavelength λ_p(nm)	Specific Detectivity $D_{\lambda p}$ * (cm $\cdot \sqrt{Hz}$/W)
AD421 (Si)	350	N/A	5.8 x 5.8	720	1.1×10^{13}
AD430 (InGaAs)	950	N/A	Ø3.0	1550	5.0×10^{12}
AD431 (Si side)	450	N/A	2.4 x 2.4	940	1.4×10^{13}
AD431 (InGaAs side)	550	N/A	Ø1.0	1550	3.5×10^{12}
AD427 (PbS)	N/A	1×10^{5}	3x3	2200	1×10^{11}
AD429 (PbSe)	N/A	5×10^{2}	3x3	3800	1×10^{9}

The responsivity tells what photocurrent will be generated by the sensor for a given optical power level, but does not address the issue of thermal detector noise. The specific detectivity D*, on the other hand, is a measure of the intrinsic detector signal to noise ratio. Hence, D* is higher for a better detector. For example, the Si side of the AD431 Si/InGaAs sensor head has a lower responsivity than the InGaAs side, but it has a far higher D*. This means that although the signal from the Si side will be smaller than that from the InGaAs side, its noise level will be far lower. The signal to noise ratio will be much higher for the Si side than for the InGaAs side.

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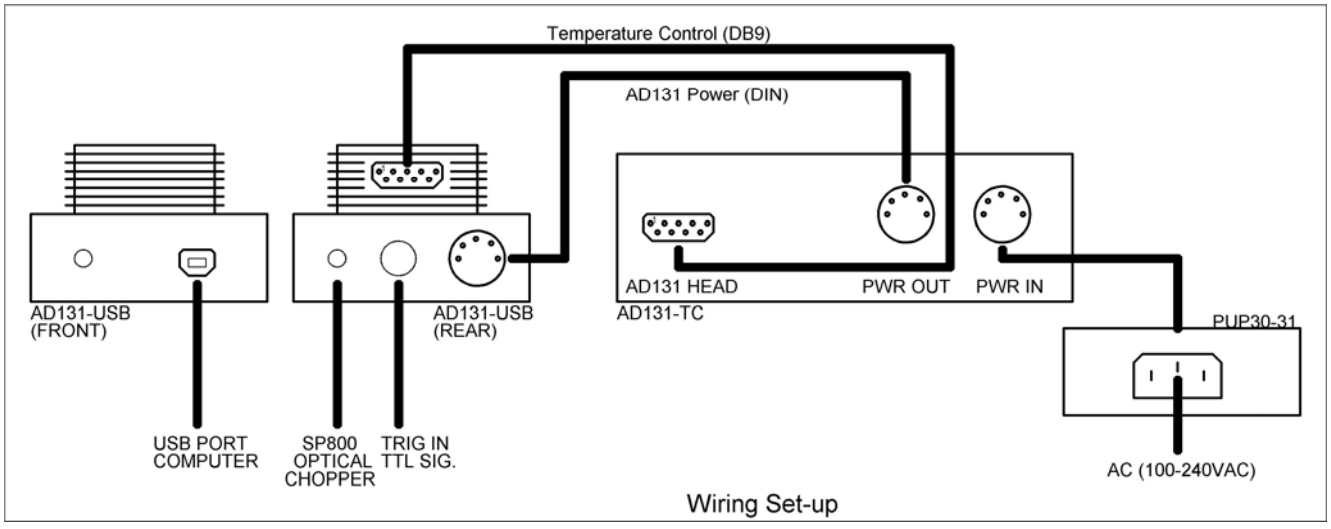
2.2.2. TE Cooled Sensor Heads (optional)

TE-Cooled sensors available (one stage):

		Responsivity $R_{\lambda p}$ (mA/W @ λ_p)	Photo Sensitivity $S(\lambda=\lambda p)$ (V/W)	Active Area (mm)	Peak Wavelength λ_p(nm)	Specific Detectivity $D_{\lambda p}$ * (cm · √Hz/W)
AD430-C (InGaAs)		950	N/A	Ø3.0	1550	2.0×10^{13}
AD427-C (PbS)		N/A	9×10^{4}	4x5	2200	1.0×10^{11}
AD429-C (PbSe)		N/A	1×10^{3}	3x3	3800	3×10^{9}
AD431-C (Si/InGaAs)	Si	450	N/A	2.4x2.4	940	1.4×10^{13}
	InGaAs	550	N/A	Ø1.0	1550	3.5×10^{12}

Cooling the sensor requires using the AD131-TC temperature controller. A DB-9 Cable from the AD131-TC to the TE-Cooled sensor interfaces the AD131-USB Detector Module and the temperature controller. The AD131-USB Detector Module controls the power and temperature of the AD131-TC. Two LED's indicate the status of the controller. The red LED indicates power and the white, which is a two color LED, indicates the temperature status. When the white LED turns red, it indicates temperature is setting on the sensor, and when the LED is green, it indicates temperature is set. The temperature for a one stage TE-Cooled sensor, when set, is -10ºC.



Wiring Set-up

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3. Installation

3.1. Checking System Requirements

Check to make sure that your computer meets the minimum requirements for the AD131CMDK system.

Requirements for the Hardware	Any IBM compatible machine with an 80486 processor or higher A VGA, SVGA display, or 1024x768 A mouse or any other pointing device 1 USB port for AD131 communication 1 serial port if using Digikrom monochromator
Requirements for the software	Microsoft Windows® 2000 or newer in standard or enhanced mode. A hard disk with at least 10MB free space, and 7MB for installation. Minimum of 32 MB of RAM recommended.

3.2. Checking System Package Contents

Your package should contain all of the following components:

1 AD131-USB Detection System
1 Table Top power Supply (+12VDC/-12VDC/+5VDC).
1 USB cable
1 Software CD

Optional, but required to operate AD131-USB
1 Detector housing with sensor (Si/InGaAs/PbS/PbSe)

Optional, required with PbS and PbSe sensors
1 SP-800 Optical Chopper
1 Table Top power Supply (+15VDC)
1 SMB type cable

3.3. Installing Software

Attention: *Software needs to be installed first before installing the hardware*

The supplied control program is a LabVIEW executable that requires either LabVIEW 8.5 or LabVIEW's 8.5 Runtime Engine be loaded on the computer. LabView's 8.5 Runtime Engine is available on the Software CD.

Insert CD into the drive. If the CD does not auto-run, choose "run" from the file menu of the Microsoft Windows Program Manager or File Manager. Type D:\CDSoftware.exe on the line, and click "OK" to continue. (If CD disk drive is different, replace D: with an appropriate drive letter.) The CD Software Main Menu will appear with the software selections available.

To install the LabView 8.5 Runtime Engine select the tab "LABVIEW RUNTIME" and select version 8.5, then "Exit". Follow the Installation Wizard.

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To install the program to run the AD131 as stand alone or in conjunction with a Digikrom monochromator, select the tab "DETECTORS" and select "AD131 CM/DK LabView Exe", then "Exit". Follow the Installation Wizard.

The source code is also available on the CD under the tab "SOURCE CODES".

3.4. HardWare SetUp

The AD131 internal power supply can handle voltages from 100VAC to 240VAC. Make sure you have the appropriate AC cord.

3.4.1. Controller Box Connectors

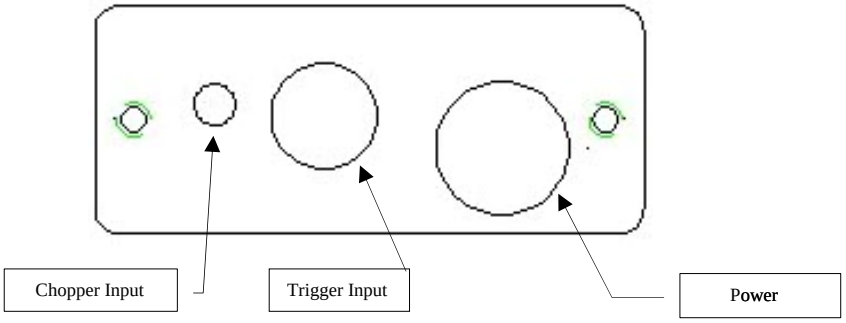

Figure 1. Rear of Controller Box

- **Chopper In:** is a signal input, which can be optically chopped or electronically oscillated at 800Hz, is fed into an AC amplifier.
- **Trig_In:** A TTL external input between 0-5 Vdc. May keep the data acquired in wait mode until this input reaches a specified level.
- **Power Connector:** Connects to the PUP30-31 switching power supply.

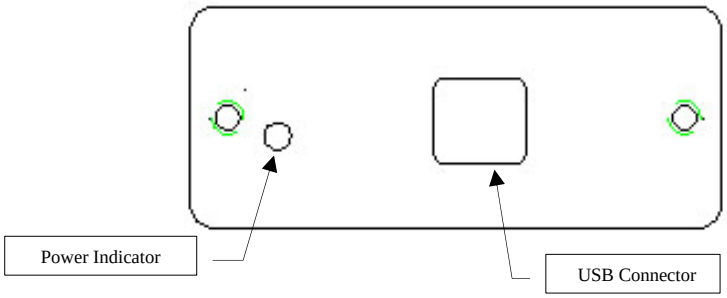

Figure 2. Front of Controller Box

- **Power Indicator:** Indicates the presence of the the power supply.
- **USB:** A USB connector for connection to a USB computer port.

Connect cables in the following order:

1) Power supply cables to AD131 Controller and Digikrom Monochromator (if applicable).
2) Chopper cable (if applicable).
3) RS232 cable between Monochromator and computer (if applicable).
4) USB cable between AD131 Controller and computer

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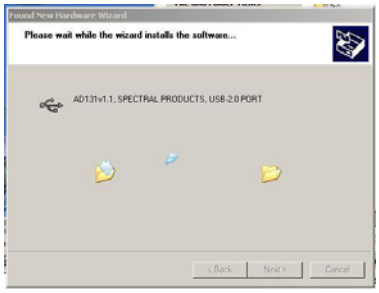
3.4.2. USB Installation Pop-up Windows

After connecting the USB AD131 controller to a computer for the first time the following windows will be displayed if using Windows XP.

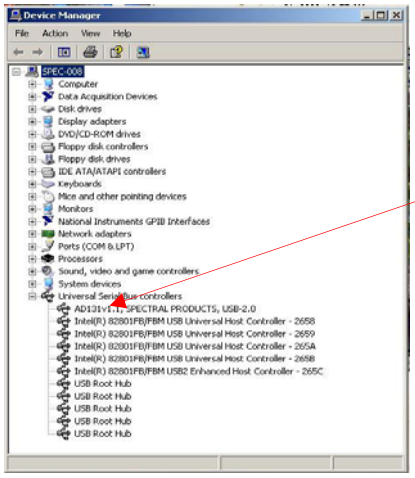
1. Welcome to the Found New Hardware Wizard
   Click 'Next' to continue



2. Found New Hardware Wizard
   Do nothing

3. Hardware Installation
   Click 'Continue Anyway'

4. Found New Hardware Wizard
   Click 'Finish'



To check the installation, open the Windows Device Manager window. The line 'AD131v1.1, SPECTRAL PRODUCTS, USB 2.0' should appear under Universal Serial Bus Controllers.

If the AD131 is not listed, unplug the power supply and USB cable to AD131 controller and then plug back in the two cables.

If the AD131 is still not listed call Spectral Products for support.

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4. Getting Started

4.1. Main Screen

The default screen of the AD131/CM/DK Executable program (**SPAD131.vi)** consists of a display area with active buttons and a menu bar across the top. This and other LabVIEW programs are referred to as Virtual Instruments (VIs) and the control display screen is called the "front panel".

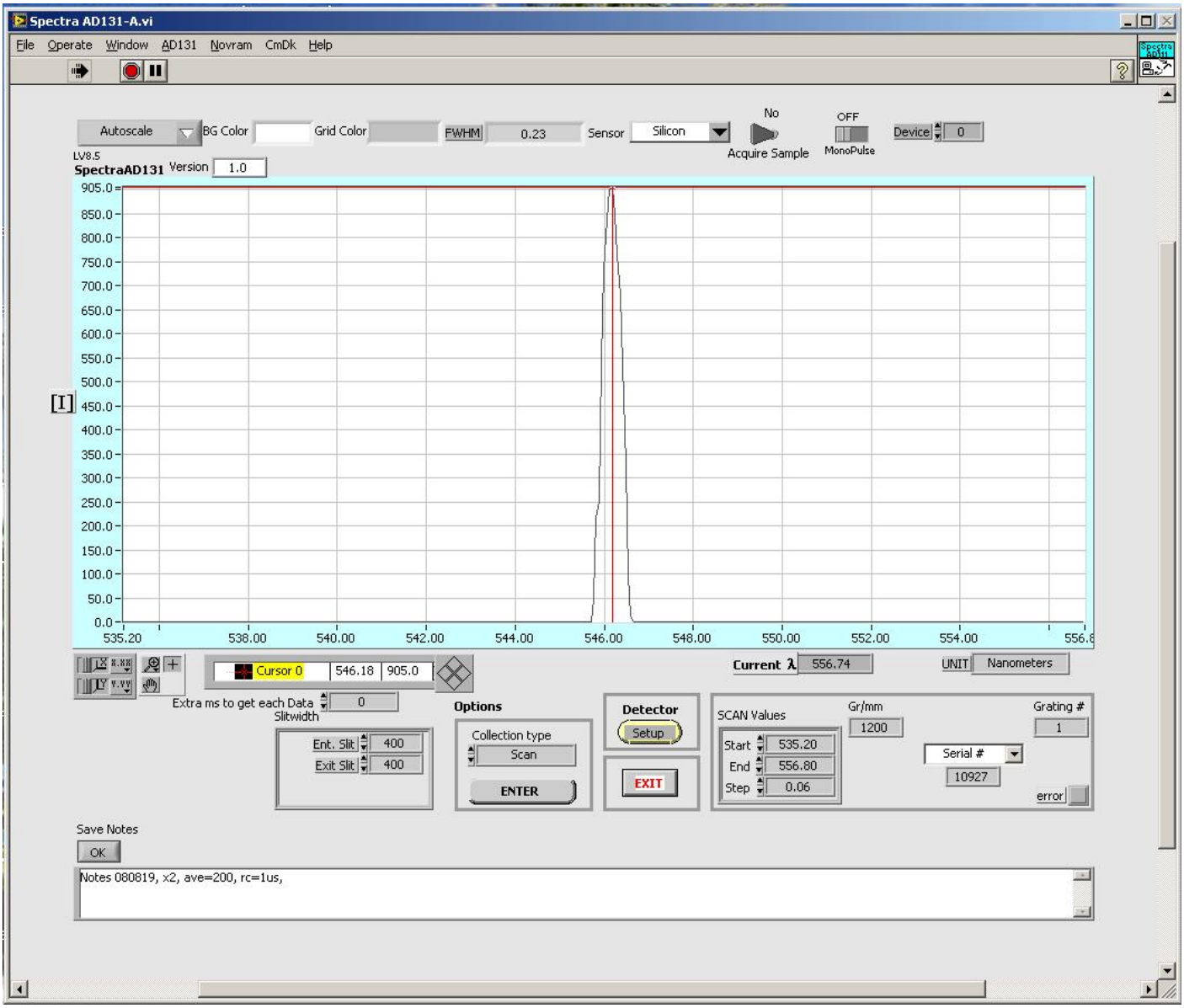

Figure 3. Front panel of program **SPAD131.vi**

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4.2. Setup Screen

The detector setup screen appears first. The following pages assumes the user has selected in this screen a system using the AD131 detector with a CM or DK Digikrom Monochromator.

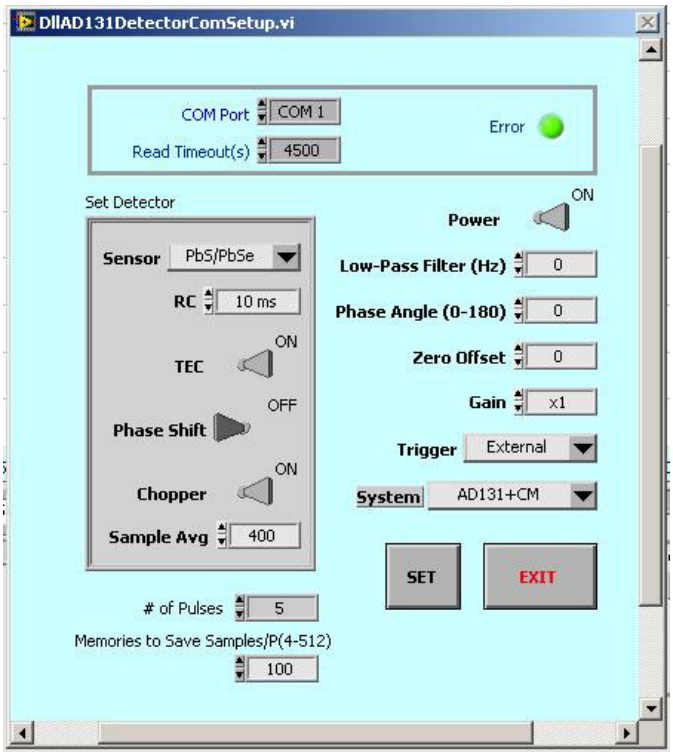

Figure 4 SPAD131.vi Setup Screen

- **COM port:** Set this value to an open com port for the monochromator.
- **time delay** sets the time in ms to wait before echo back.
- **Error:** If it is red, it indicates a communication problem with the monochromator.
- **Sensor** sets the type of sensor. There are Silicon, InGaAs, PbS/PbSe.
- **RC** sets the time constant for detector.
- **TEC** sets for thermal electric cooler.
- **Phase Shift** sets the shifting of the reference signal.
- **Chopper** acquires the chopping signal. It is not turn on/off the chopper.
- **Sample Avg:** Number of readings to average into a single data point
- **Power** shows the current status of the board power supply.
- **Low-Pass Filter (Hz)** sets the frequency for the filter.
- **Phase Angle (0-180)** sets the value of the phase shift angle between (0-180) degree.
- **Zero Offset** sets the value to the offset.
- **Gain** sets the electronic gain for the system. Larger values produce more signal but higher noise.
- **Trigger Source:**
  Internal Trigger: Internal triggering through the software
  Ext. Trigger allows AD131 to operate using an external triggering from the Trigger In port on the controller
- **System** selects the configuration of either using AD131 alone or with a CM or DK series Digikrom Monochromator.
- **# of Pulses** (Ext. Trigger only)**:** sets the number of triggered pulses to be averaged into a single data point.
- **Memories to Save Samples/P(4-512)** (Ext. Trigger only)**:** The system may collect more than one sample for each triggered pulse. The user must set this to a value larger than or equal to the number of samples that will be acquired. Setting this number close to the actual number of samples will save on RAM. Start with the following: [Time between pulses in μs] ÷ 29.

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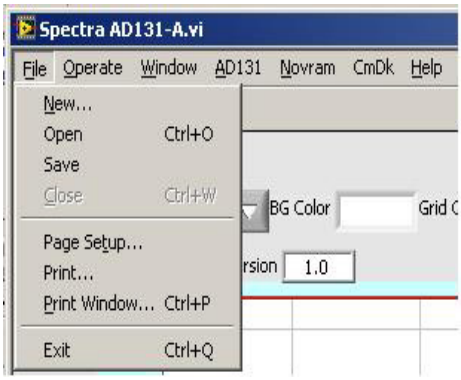
4.3. Menus

4.3.1. File Menu



- **Open** displays data from a x, y data file to the graph
- **Save** saves the current x, y data on the screen into 'x tab y' format file.
- **Close** closes the active window and does not save any changes you have made.
- **Page Setup…** use to set margins, headers, page orientation and other printer options. Setup settings are saved with your VI.
- **Print Window…** prints out the contents of the currently active window. Using this option, you can make a quick printout with the minimum number of prompts.
- **Exit** quits program.

4.3.2. Operate Menu

- **Print at Completion** prints the contents of a VI's front panel after each execution.
- **Log at Completion** logs a time stamp and the data in all front panel controls of a VI to a separate datalog file.
- **Data Logging-** use to set data logging options. (Optional if you have LabVIEW software).
- **Reinitialize All to Default** sets all controls and indicators to their default values

4.3.3. Windows Menu

- **Show VI Info...** displays the VI file path, revision number, and memory usage.
- **Full Size** uses the entire screen to display the active window.

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4.3.4. AD131 Menu

- **ADstatus** reads the data saved in the Eeprom of the AD131. Eeprom values are DC power, sensor, RC constant, TEC, Phase shift, Phase Angle, chopper, low-pass filter, zero offset, gain, sample average, firmware version
- **ADpower** sets the DC power.
- **Power Status** shows the current status DC power

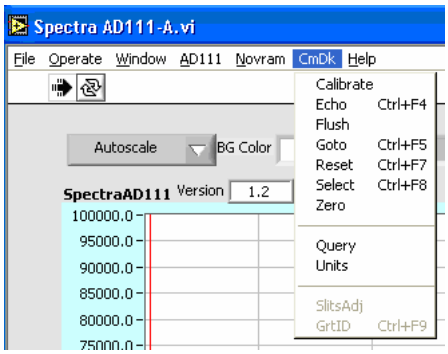
4.3.5. Novram Menu

Nonvolatile memory in the monochromator is accessed by using read and write novram commands.

- **NovRead** reads the memory values from Novram chip and displays the values
- **NovWrite:** Use this command to write 128 (0-127) bytes to the monochromator's non-volatile memory.

4.3.6. CmDk Menu

The dropdown menu controls and calibrates the CM or DK monochromator.



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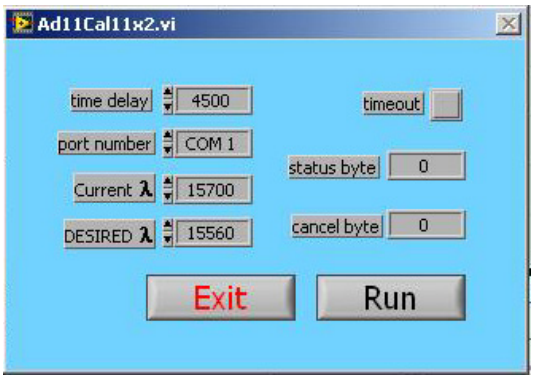
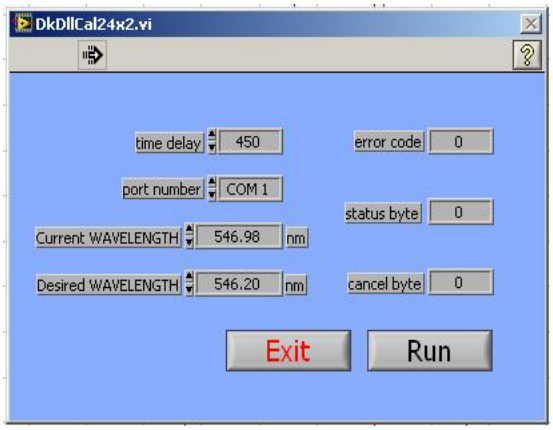
- **Calibrate** allows recalibration of the monochromator positioning scale factor. A source of known wavelength is needed for recalibration. The user must first execute a scan and note the displayed peak value. **Calibrate** should always be used immediately after using the ZERO command.

CM-Series



- **time delay** sets the time in ms to wait before echo back.
- **port number** sets the com port of the monochromator.
- **ACTUAL λ/PEAK λ:** Enter the measured wavelength of the peak from the known source.
- **DESIRED λ:** Enter the theoretical peak wavelength of the known source.
- **time out, echo byte, status byte, and cancel byte** are diagnostic parameters associated with the LabVIEW program.
- **Run** enters the values and recalibrates with the current wavelength.
- **Exit** closes the Command window.

DK Series



- **Echo** verifies communications with the monochromator.
- **Flush** cleans the serial communications receiver buffer.
- **Goto** moves the monochromator to a selected position.
- **Reset** returns the grating to home position.
- **Select** selects the grating that will be used.

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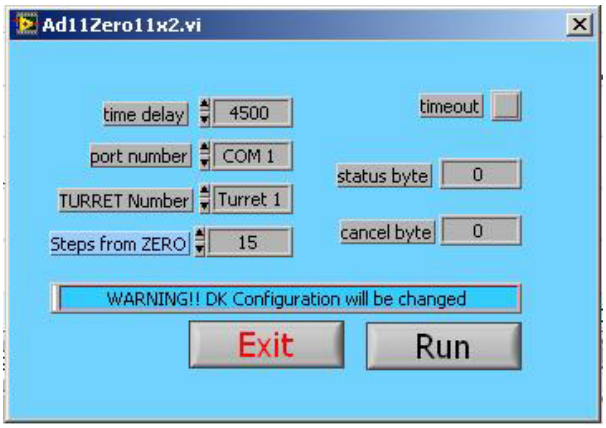
- **Zero** allows the recalibration of the position of the zero order transmission of the monochromator. The user must first execute a Zero Scan and note the value (in steps) of the zero order transmission peak.

CM-Series



- **time delay** sets the time in ms to wait before echo back.
- **port number** sets the com port of the monochromator.
- **TURRET Number:** Use to select Turret 1, Turret 2, or both if you have double monochromator model CM112. For CM110 select Turret 1.
- **MONO Number:** Use to specify DK model. For DK240 or DK480 select 1. For DK242 select 2.
- **Steps from Zero:** Enter the value in steps of the zero order transmission peak from the Zero Scan.
- **time out, echo byte, status byte, and cancel byte** are diagnostic parameters associated with the LabVIEW program.
- **Run** enters the new zero position.
- **Exit** closes the command window.

DK-Series

- **Query** (CM Models only) displays the monochromator status.
- **Units** (CM Models only) sets the units used in the *Goto*, *Scan*, *Size*, and *Calibrate* commands. For DK models the only unit available is nm.
- **SlitsAdj** (DK models only) adjusts all slits to a given width.
- **GrtID** (DK models only) returns the six byte ruling identifier of the current grating.

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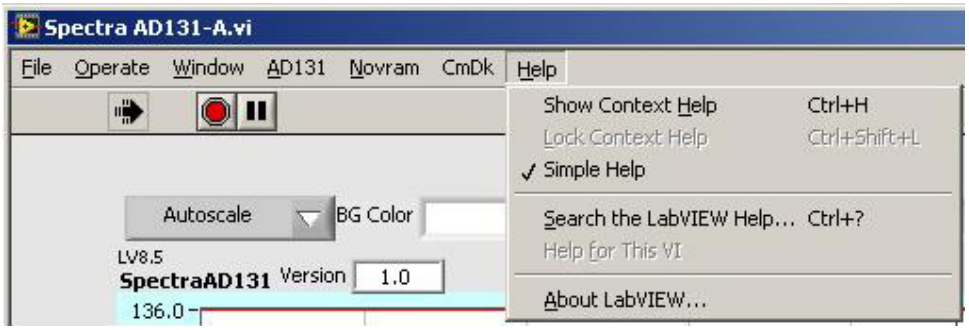
4.3.7. Help Menu

- **Show Context Help:** A Context-sensitive Help window that displays the VI's parameters, parameter type definitions, and the description for the object.
- **About -** Information on LabVIEW software version number and serial number.



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4.4. Front Panel Control and Indicators.

The front panel of the SP AD131.vi displays the graph, graph controls, and collection parameters.

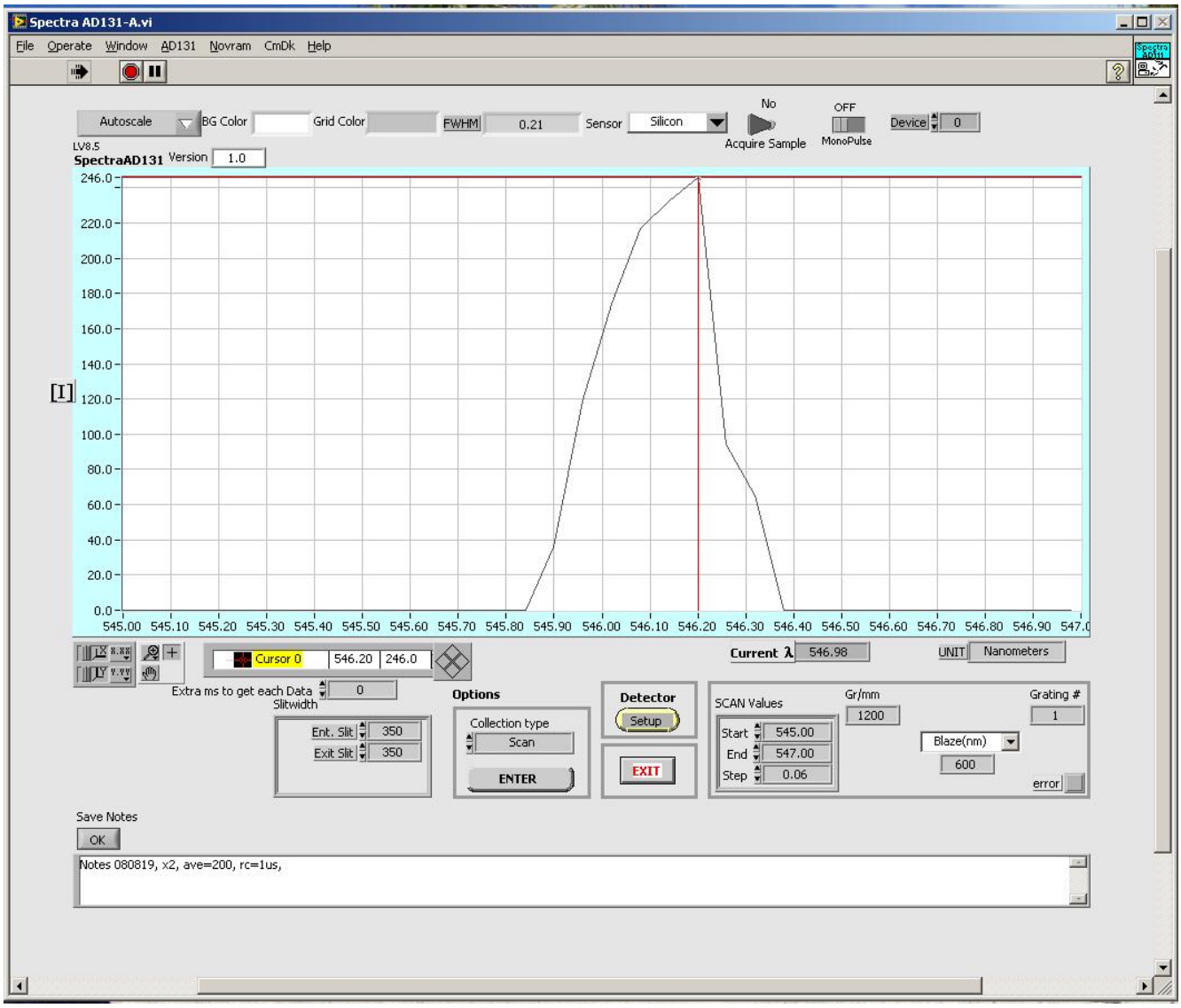
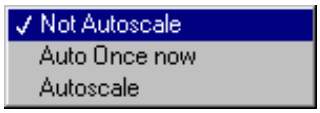


Figure 5. Program **SP AD131.vi** Main Screen

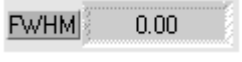
4.4.1. Graph Control



Autoscale Dropdown Box may be used to select autoscaling for the Y axis.

BG Color controls the background color for plotting surface.

Grid Color Controls the grid color.



FWHM automatically displays the Full Width at Haft Maximum of the highest bell shape on the graph.

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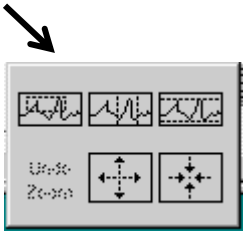
AutoScale (X or Y) turns autoscaling on or off of the appropriate axis. With autoscale off graph scale may be adjusted by highlighting a value along an axis and typing in a new value.

Lock Scale - Clicking the lock switch causes the graph to continuously autoscale (when slider appears to the right).

Scale Format: use to set the format of the x and y scale markers respectively.

Crosshatch and Panning Tool: An either-or pair. When **Crosshatch** is depressed, clicking in the graph area allows cursor movement. Clicking **Panning Tool** switches to a mode that allows scrolling of the visible data by clicking and dragging the plot area of the graph.

Zoom Tool displays a pop-up menu to choose methods of zooming in or out on the graph.



Zoom by rectangle.

Zoom by rectangle; with zooming restricted to x data (the y scale remains unchanged)

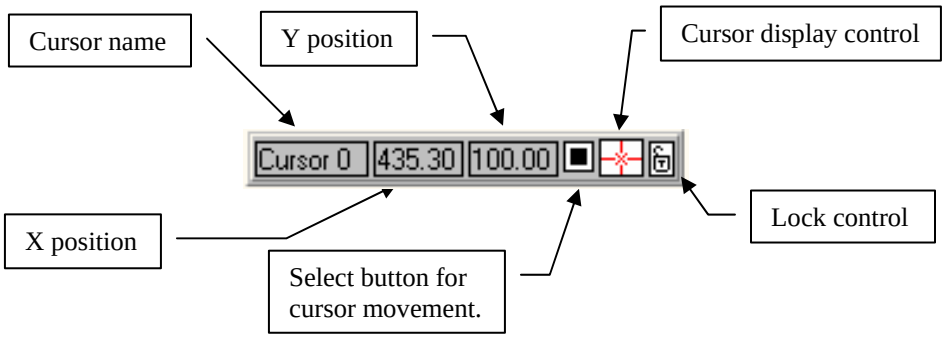
Zoom by rectangle; with zooming restricted to y data (the x scale remains unchanged)

Zoom in about a point. If you hold down the mouse on a specific point, the graph continuously zooms in until you release the mouse button.

Zoom out about a point. If you hold down the mouse on a specific point, the graph continuously zooms out until you release the mouse button.

Cursor movement control: use for fine up, down, left, or right motion of cursor by clicking on corresponding area of the figure.

Cursor Options:



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4.4.2. Data Collection Parameters

Current λ displays the current wavelength of the monochromator

UNIT displays the current units used in the graph and the scan setup screens. (Selectable for CM only under menu item **CmDk:Units**.)

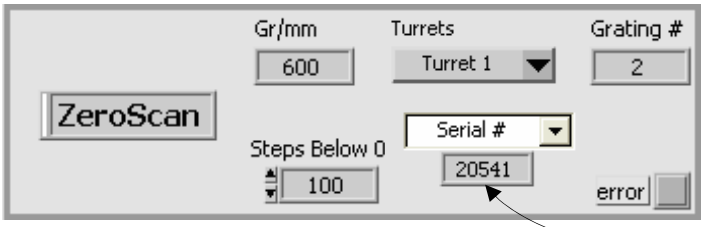
Time delay sets a pause in ms between the grating step and data acquisition. The default value is 0.

There are two options for data collection: *ZeroScan* and *Scan*. To activate one of the options first select the *collection type*, second, click on *ENTER* button.

ZeroScan – Scans the monochromator above and below zero order with the number of steps in the 'Steps Below 0' box.

Scan – Scans the monochromator from the 'Start' to the 'End' wavelength, with the increment in 'Step'.

ZeroScan



Gr/mm displays the current grating ruling (groove/mm).

Grating # displays the number of the current grating (selectable under menu item **CmDk:Select**)

Info allows choice of display between monochromator serial number, the number of gratings, or the blaze wavelength of the selected grating.

Error shows red if an error occurred

Steps Below 0: use to set the number of steps below and above 0nm for zero scan.

Turrets (DK-Series only): use to activate the specified turret in zero scan mode. The selections are:

0: Turret 1&2 (Double monochromator only)
1: Turret 1 (default)
2: Turret 2 (Double monochromator only)

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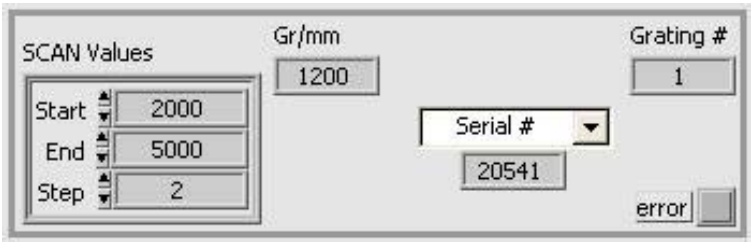
Scan

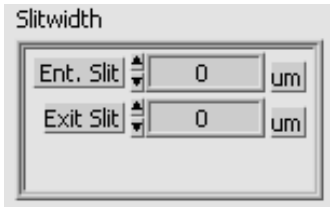


Start: Enter the start wavelength of the scan

End: Enter the end wavelength of the scan

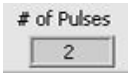
Step: Enter the step size for the scan.

Detector Setup: Opens the Detector Setup Screen (see Figure 4, pg. 13)



Slitwidth: (DK-Series only) Used to adjust the width of entrance and exit slit.

Raw Data displays the data collected in each pulse prior to averaging



# of Pulses sets the number of triggered pulses to be averaged

# of Samples/pulse displays the actual number of data samples collected during each triggered pulse. These samples are summed to make up one Pulse Raw Data Point.

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5. Troubleshooting

No communication with AD131-USB

- Verify USB cable between computer and AD131-USB is properly attached,
- Check AC line voltage
- Check for USB driver. With Windows XP, select Start | Control Panel | System | Hardware | Device Manager. Expand the 'Universal Serial Bus' folder by clicking the plus sign and look for the AD131-USB driver with the name "AD131v1.1, SPECTRAL PRODUCTS, USB-2.0". If you do not see the name, unplug the USB & power cables then plug them back in. If you still cannot find the name, reinstall the AD131-USB driver.
- The AD131-USB does not have user serviceable parts. Please call Spectral Products directly at (505) 343-9700 for service.

No communication with Monochromator

- Verify RS232 cable between computer and monochromator is properly attached.
- Check for appropriate COM port and/or IRQ conflict.
- Unplug AC cord and check all connections.

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6. Appendices

6.1. Appendix A: USB 2.0 Port

A.1. USB2.0 PINOUT

The USB connection requires a cable with a USB type B connector at the AD131-USB detector and a computer USB port type A. Spectral Products supplies a USB 2.0 plug type A to plug type B cable for connecting to AT, PS2, and MAC style computers.

Pin Assignments for the USB Connector at one end of AD131 controller

Table 1. USB Pin Function

Pin	Function
1	USB Power
2	Data out
3	Data in
4	GND

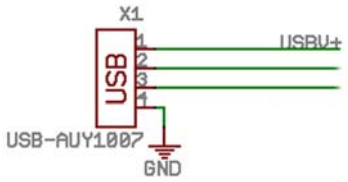

Figure 6. USB Pinout

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6.2. Appendix B: AD131 Reference Drawings

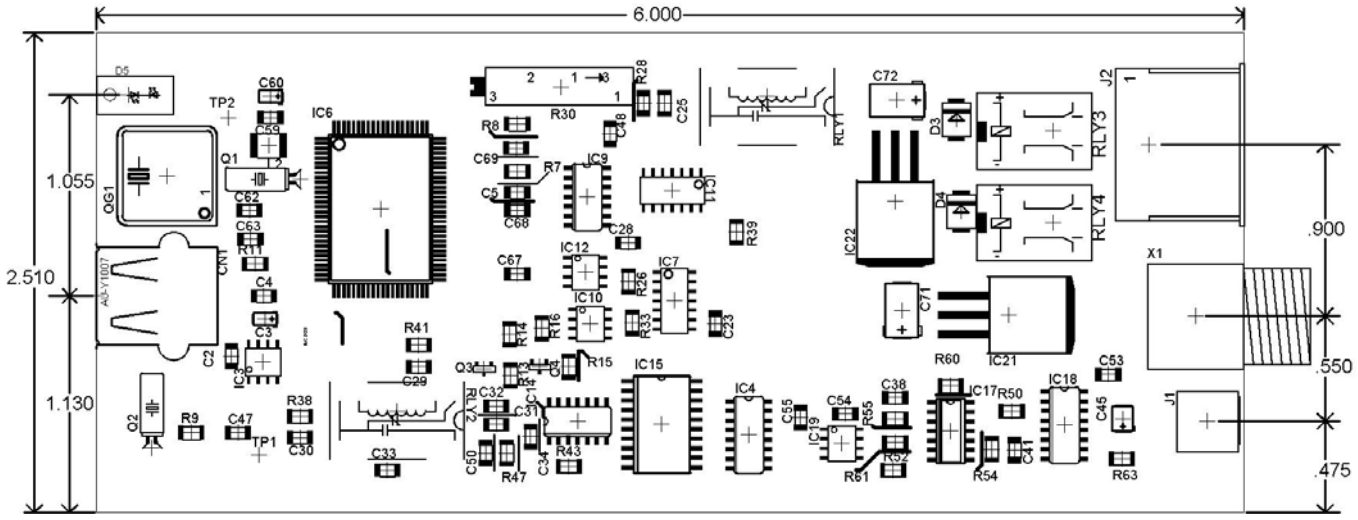

Figure 7. PC Board Layout

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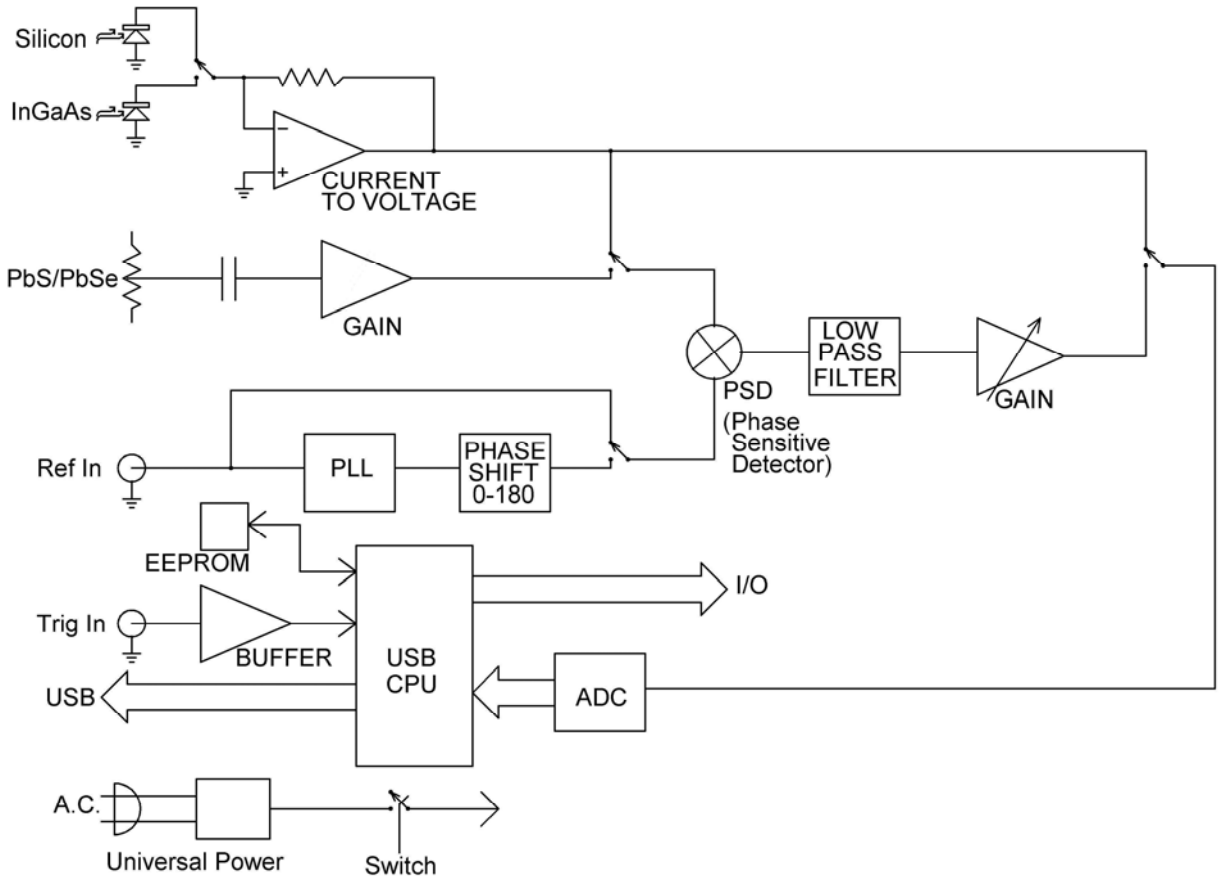

Figure 8. Block Diagram

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C.1. SP SDK functions

The function ad131Device() must be called if there are more than one AD131 connected to the host computer. Otherwise, the device 0 will be used Next, function ad131ReadInfo() should be called to get and set the appropriate information of the board. If the power is off, use ad131Power() to turn the power on. Then, ad131SetDetector(); and any of these functions can be called ad131SetLPFilter(), ad131SetPShift(), ad131ReadData(), ad131ReadInfo(), ad131ResetTrigger(), ad131AcquirePulse(), ad131PulseCmd(), ad131PulseData(), ad131ZOffset(), ad131Gain().

Function Name	Description	RETURN when successful	RETURN when unsuccessful
ad131Device short ad131Device (short sDevice)	Sets the device number to be used. ***sDevice*** can be from (0-63).	Zero	A non-zero number
ad131Power short ad131Power (short sPwr)	This function is called to turn on/off the external power supply. The AD111 has to be on in order to operate. **sPwr** can be 0 for OFF, or 1 for ON.	Zero	A non-zero number
ad131SetDetector short ad131SetDetector (short *sDet)	Sets the data saved in the memory of the interfacing USB board. ***sDet[0]*** is the sensor, where 0: Silicon, 1: InGaAs, 2: PbS/PbSe. ***sDet [1]*** is the RC constant, where 0: 10 ms, 1: 1 ms, 2: 100 us, 3: 10 us. ***sDet [2]*** is the TE Cooler, where 0:Off, 1:On. ***sDet [3]*** is the Phase Shift, where 0:Off, 1:On. ***sDet [4]*** is the Chopper, where 0:Off, 1:On. ***sDet [5,6]*** is the Sample Averaging, where the SA=[5]*256+[6]	Zero	A non-zero number
ad131SetLPFilter short ad131SetLPFilter (short sValue)	Sets the low pass filter values in hertz, which are 0 for 0, 1 for 1, 2 for 10, 3 for 100. ***sValue*** can be from (0-3).	Zero	A non-zero number
ad131SetPShift short ad131SetPShift (short sValue)	Sets the phase shift between input and output signal. ***sValue*** can be from (0-180).	Zero	A non-zero number
ad131ReadData short ad131ReadData (UINT *uiData)	Reads the data from the AD131. ****uiData*** points to a data address.	Zero	A non-zero number

Function Name	Description	RETURN when successful	RETURN when unsuccessful
ad131ReadInfo short ad131ReadInfo (short * sData)	Reads the data saved in the memory of the interfacing USB board . ***sData [0]*** is power, where 0 is Off, 1 is On. ***sData [1]*** is the sensor, where 0: Silicon, 1: InGaAs, 2: PbS/PbSe. ***sData [2]*** is the RC constant, where 0: 10 ms, 1: 1 ms, 2: 100 us, 3: 10 us. ***sData [3]*** is the TE Cooler, where 0:Off, 1:On. ***sData [4]*** is the Phase Shift, where 0:Off, 1:On ***sData [5]*** is the Phase Shift value from 0-180. ***sData [6]*** is the Chopper, where 0:Off, 1:On. ***sData [7]*** is the Lowpass Filter value from 0-3, where 0 for 0, 1 for 1, 2 for 10, 3 for 100. ***sData [8]*** is the zero offset value. ***sData [9]*** is the gain value. ***sData [10,11]*** is the sample averaging, where the SA=[10]*256+[11]. ***sData [12,13]*** is the firmware version, where the FV=[12].[13]	Zero	A non-zero number
ad131ResetTrigger short ad131ResetTrigger ( )	Sets external trigger bit. In order to clear this bit, ad131PulseCmd() and ad131PulseData() must be called.	Zero	A non-zero number
ad131PulseCmd short ad131PulseCmd (long *1Array)	This function is called to send the acquired command only, and not received data. The function must call before calling *ad131PulseData()* function. ***lArray** is the number of samples, which will be passed to the *spPulseData* function. *Note: This function uses together with spPulseData, and for 'External trigger' only.*	Zero	A non-zero number
ad131PulseData short ad131PulseData (ULONG *1Array int iNData)	This function reads data from the AD131 and is called right after the ad131PulseCmd function. ***lArray** points to a data address. Its memory size should be one or bigger. **iNData** number of samples, which gets from ad131*PulseCmd* *Note: This function uses together with ad131PulseCmd, and for 'External trigger' only.*	Zero	A non-zero number

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