ABET TECHNOLOGIES

Function Focused Innovation™

www.abet-technologies.com

DLD-100 SERIES

USER MANUAL

M-DLD Rev B

August 2006

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Introduction,

Thank you for choosing a DLD-100 series Digital Light Detector for your work. Abet Technologies' design goal was to take advantage of the power of digital technologies to create an easy to use instrument. Please tell your friends and colleagues if we succeeded. Please tell us if we missed something and we will try to make it even easier to use.

This family of photo diode instruments is equipped with transimpedance amplifiers with software controlled gain, high speed 16 bit Analog to Digital converters and USB 2.0 communication capability. Synchronous detection can be obtained with the external Sync feature. Data acquired by the instrument is streamed to an ActiveX component allowing the use of the ever increasing PC computing power for signal processing and presentation.

A number of basic data acquisition, display and saving executables are included with the system. The true ActiveX component, with its comprehensive set of properties, allows for easy integration into applications developed using ActiveX compliant software packages, be it LabVIEW™, Excel, MATLAB™, Visual Basic, Visual C++, etc. Explicit script containing examples are included to show the ease of using ActiveX control properties within such programs.

A highly adaptable design allows for easy integration into your optical setup using a number of standard interfaces or one of our inexpensive adapters.

We hope this instrument will serve you well. Please check with us for your other optical, light source or detection needs – Abet Technologies product line is growing.

1 Please read before installing

Your shipment includes the detector you chose, a power supply, any accessories you ordered, and an installation CD. The CD includes driver software for Microsoft® Windows XP or later, a .pdf copy of this manual as well as a number of demonstration and application programs. A USB cable is not included unless ordered separately.

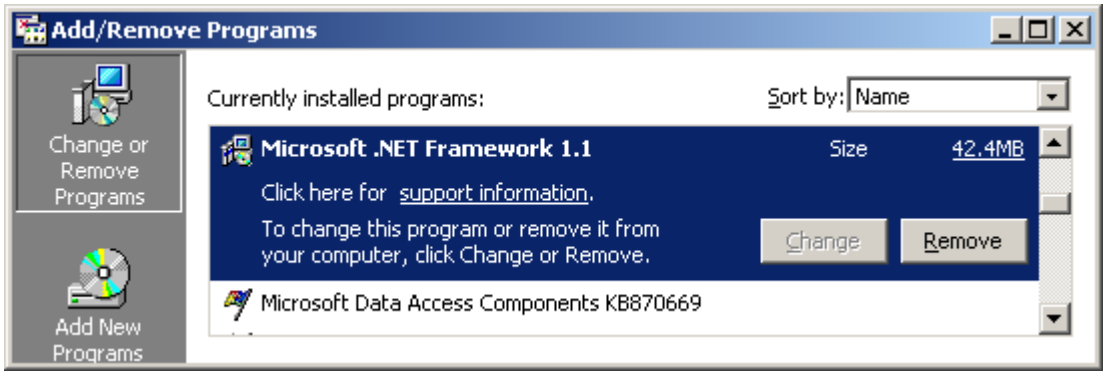
Your Digital Light Detector fully conforms to PnP Windows technology. Here are the minimal system requirements that will assure trouble free operation:

- Windows XP, service pack 2 or higher
- Memory 256 MB or more
- USB 2.0 hub (check your computer documentation to determine the version of your USB hub). **Please note**: add-on USB 2.0 boards can occasionally create communication problems – we strongly suggest that you use this detector with a computer equipped with a manufacturer's installed USB 2.0 hub.
- MFC71.dll, MFC71u.dll and Msvcr71.dll are present in your Windows\System32 folder
- Microsoft .NET Framework 1.1 installed on your computer

Please go to Windows Update Website, http://www.microsoft.com/downloads/search.asp to obtain and install any of the required missing components. For your convenience the installation CD contains a "How to obtain Microsoft support files from online services.htm" document, which can help to guide you through the process if you need extra help.

If any of the MFC71.dll, MFC71u.dll or Msvcr71.dll are needed, reasonably recent versions of those files can be found in the root folder of the installation CD. However, we suggest checking Microsoft web site for their most up to date versions. Please place these .dll's in the Windows\System32\ folder of your computer.

The Microsoft .NET Framework 1.1 is the latest Windows XP technology required by many applications. You can check for its presence by going to the Control Panel and Clicking on Add/Remove Programs. Please use the slider on the right hand side to scroll through all the installed programs since there is often a large empty space between a few initial software names and the rest of the installed programs in this function.



Microsoft .NET Framework 1.1, if missing, needs to be installed after a download from the Microsoft site.

2 Getting started

Things can be quite confusing when first trying to use a highly flexible instrument like this DLD-100 detector. Here is a quick explanation of which instructions below will get you to a quick start.

2.1 I don't like to program

- Follow the installation instructions in section 3 of this manual
- Sections 4 and 4.1 introduce you to the use of the device and its ActiveX control. You do not need to look at sections 4.1.1, 4.1.2, or 4.1.3 – these are for those who like or need to do their own programs.
- Section 4.2.1 guides you through the installation of a simple digital oscilloscope application that you can then start using without any additional programming steps
- If you need to do spectral scans using your DLD-100 detector and a monochromator you will need to follow the steps in section 4.2.2.
- In case of emergency take a look at the troubleshooting sections 5 and 5.1.

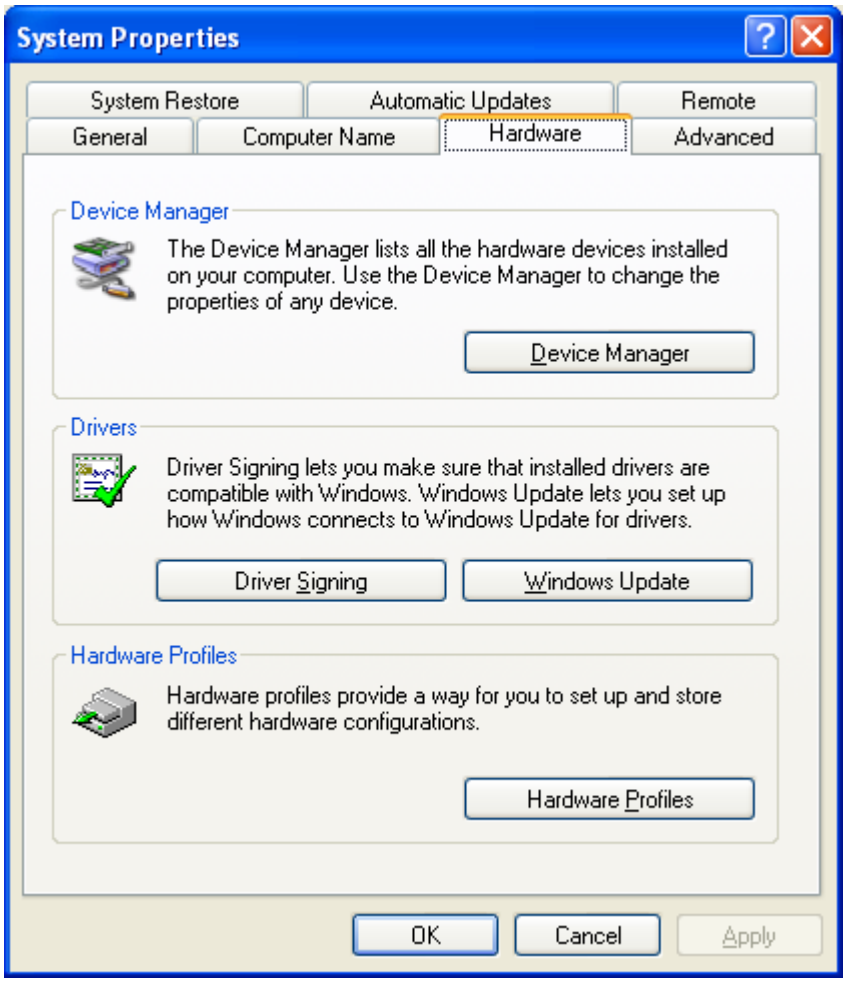
2.2 I like to do things my way

- Follow the instructions in sections 3 and 3.1
- Follow the instructions in section 3.1.1 only if you plan to use any of the .exe applications included with your DLD-100 detector
- Take a look at sections 4 through 4.1.3 for general information on system usage, methods and properties. Section 4.3.4 demonstrates interfacing to multiple DLD-100 detectors and running multiple instances of their ActiveX controls.
- Select a section of this manual that discusses demonstration program matching the programming platform you are using:
    - Section 4.1 and all the subsections apply to all platforms, including LabView
    - Review section 4.3.1 if MatLab is your platform
    - Review section 4.3.2 if Visual Basic and/or Excel are your platforms
    - Review section 4.3.3 if Visual Basic.NET is your platform
- In case of emergency take a look at the troubleshooting sections 5 and 5.1.

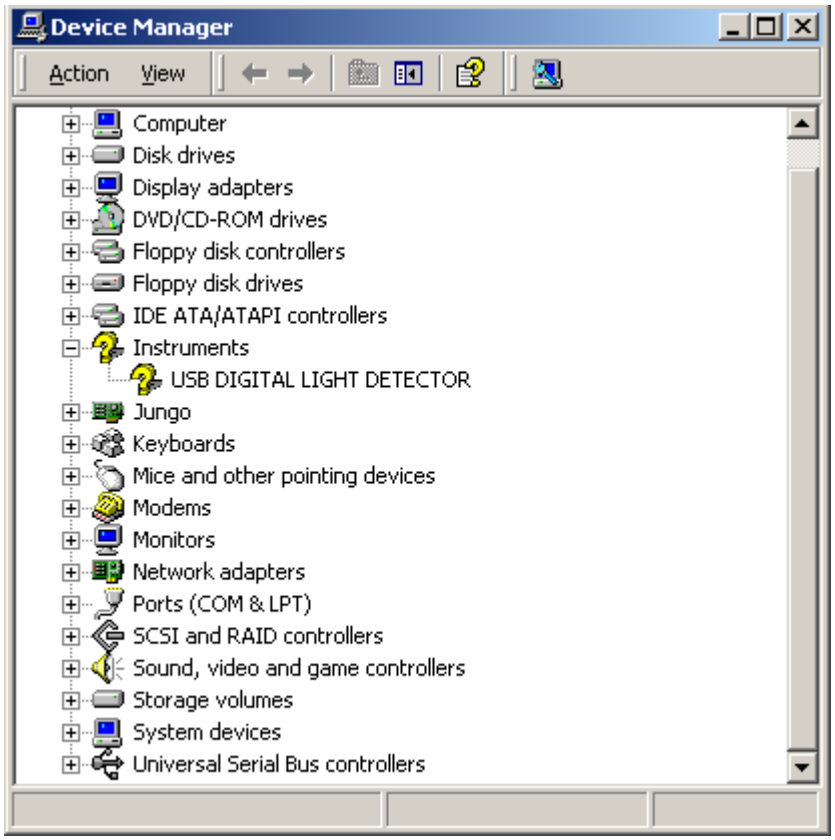
3 Installation

1. Connect your DLD to the USB 2.0 hub
2. Connect the power supply to the DLD and plug the power supply into the mains
3. Windows will recognize the new hardware and request the location of the required drivers. Insert the installation and point to that drive to complete the first installation steps. Follow system instructions. At the end of this step the following should have occurred:
    a. AbetGeneric.inf installation file has been compiled by the system and placed into Windows/INF folder as OEMxx.inf and OEMxx.pnf files
    b. Abet.sys has been copied into Windows/System32/drivers/ folder
    c. DLD_AX.ocx has been copied into Windows/System32 and registered

You can confirm successful installation by opening the Control Panel, System, Device Manager:



and checking the list of registered instruments for the USB Digital Light Detector entry:



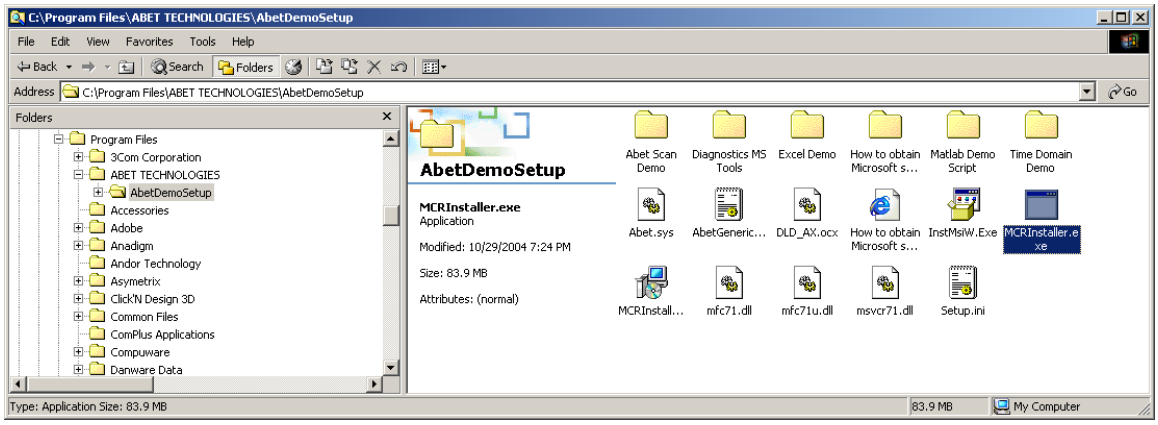
3.1 Installing Application and Demo programs

The installation CD contains a number of demonstration and application programs. Demonstration programs are fairly simple and include source code. Use them to quickly get up to speed on using your unit's ActiveX® interface to integrate its operation into the Windows software environment you are going to use. Application programs come as .exe files and let you start collecting data right out of the box.

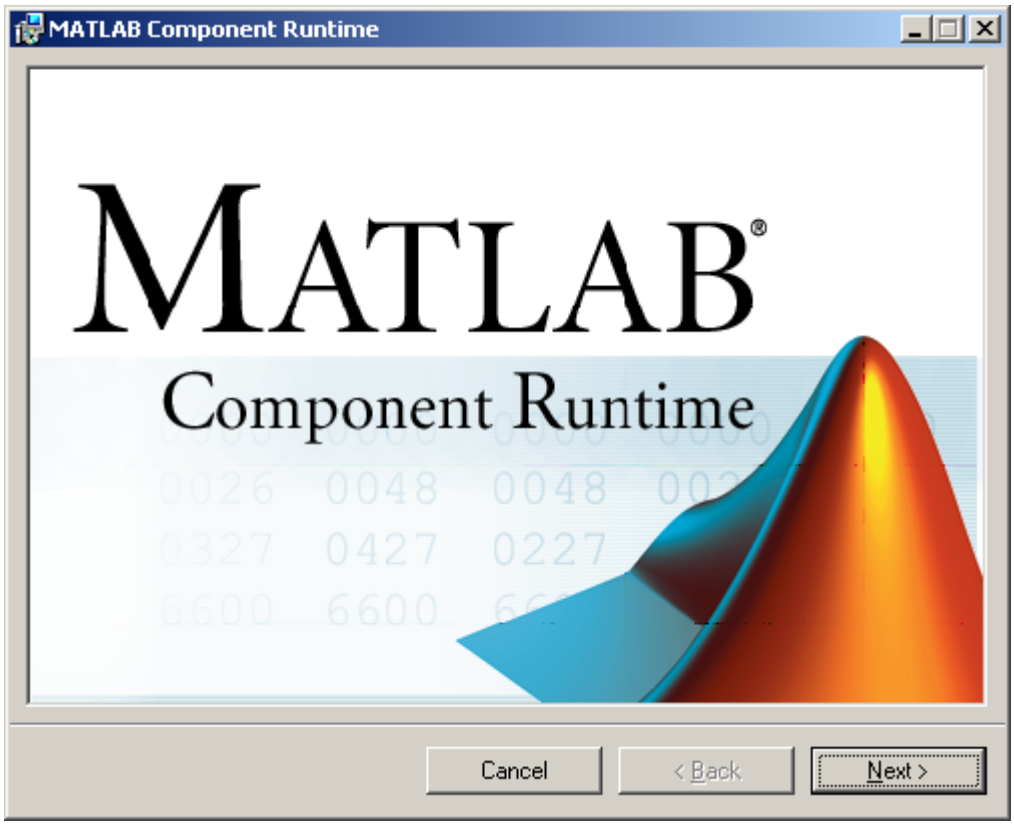
Run the **Setup.exe** program included on your installation CD. This will place all the necessary programs in a new folder. The default path is C:\Program Files\ABET TECHNOLOGIES\AbetDemoSetup\. You will need to go to that folder to run the DLD applications and demos. Once you decide which ones you wish to use more often you can place their shortcuts on your Desktop for fast access.

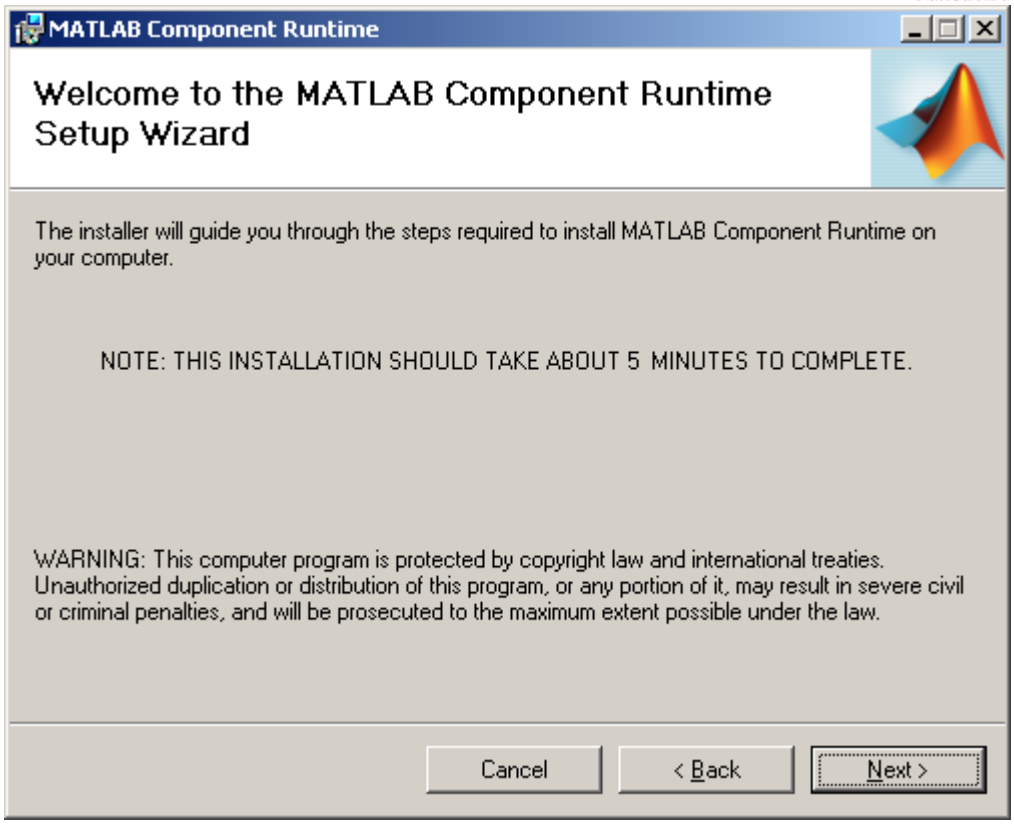
3.1.1 Installing MATLAB™ Component Runtime engine

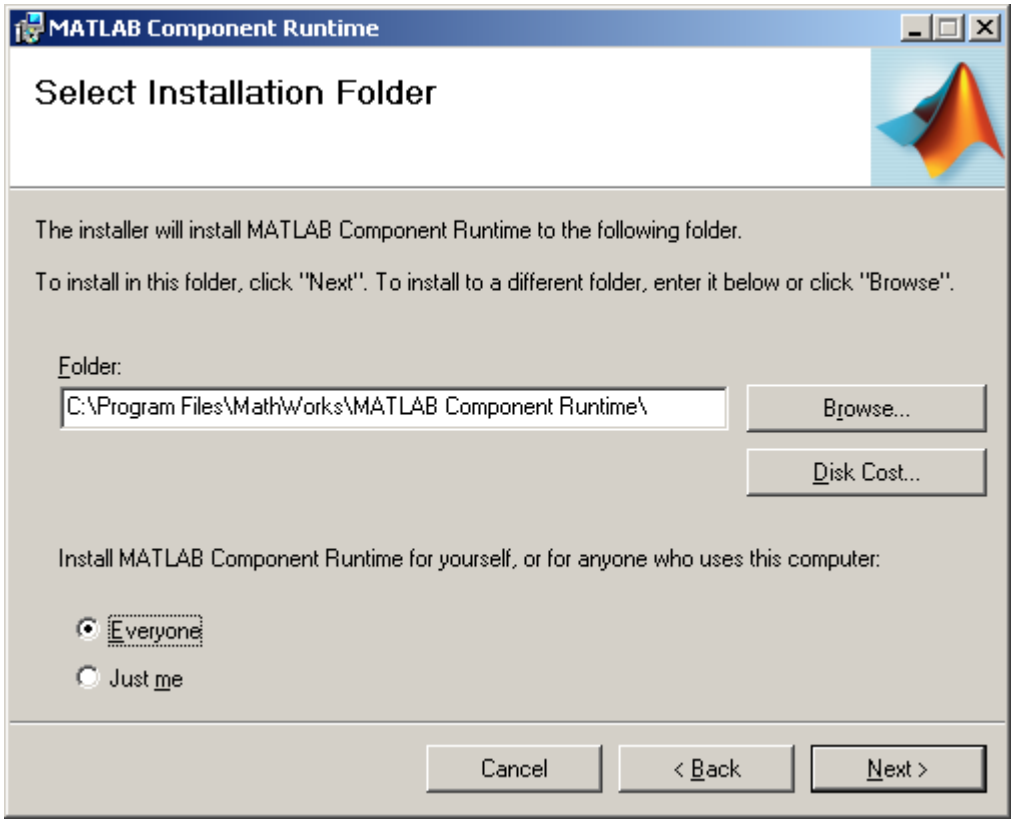
Go to the C:\Program Files\ABET TECHNOLOGIES\AbetDemoSetup\ destination directory (or the directory path and name you chose in the previous step) and execute **MCRInstaller.exe**.

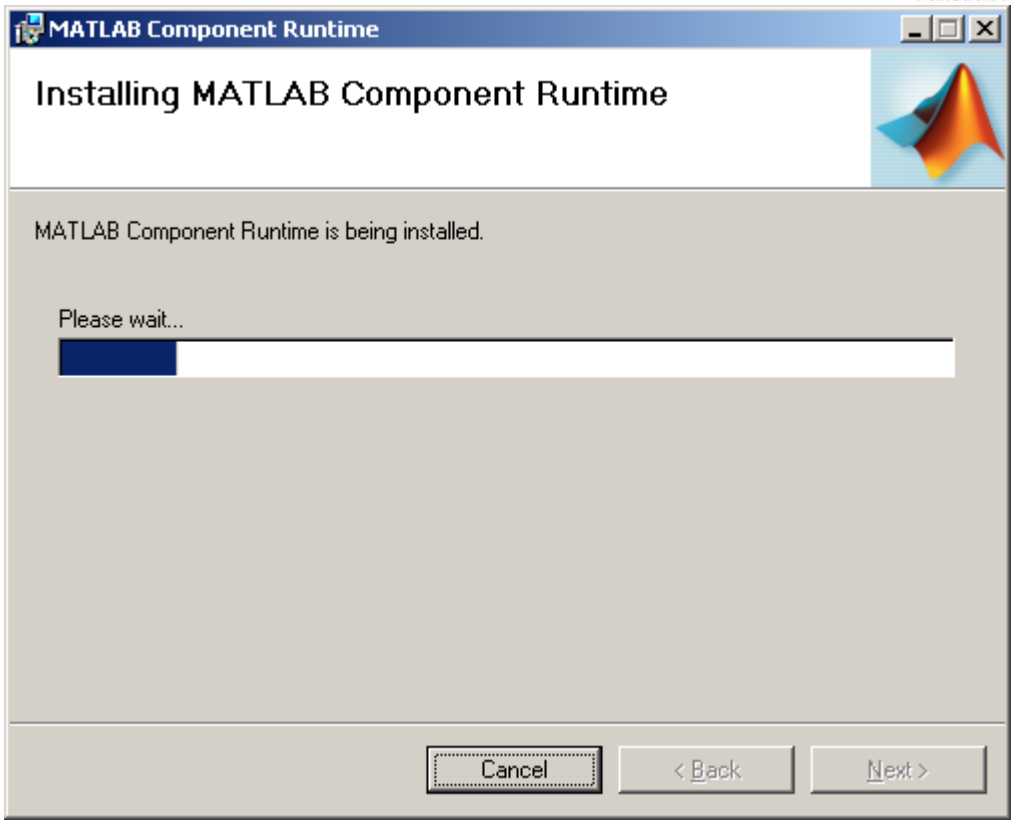


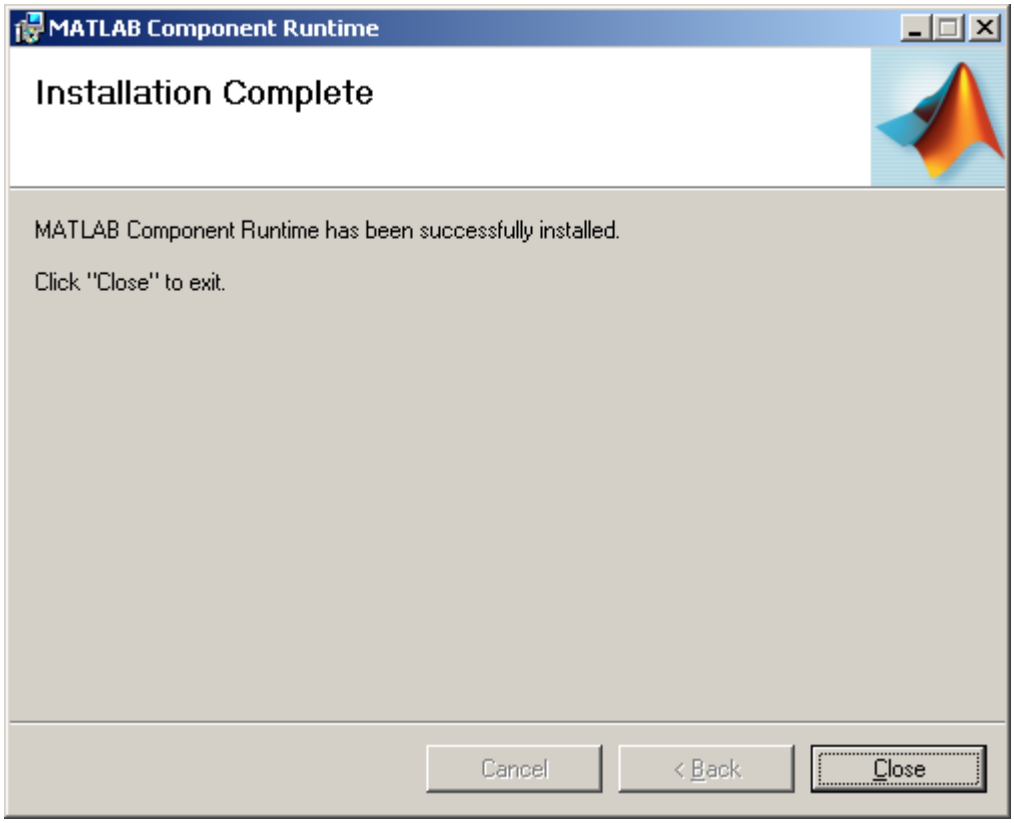
This will install a powerful runtime engine driving the included MATLAB™ based applications. This installation takes a little time and shows its progress as follows:











4 Using your Digital Light Detector

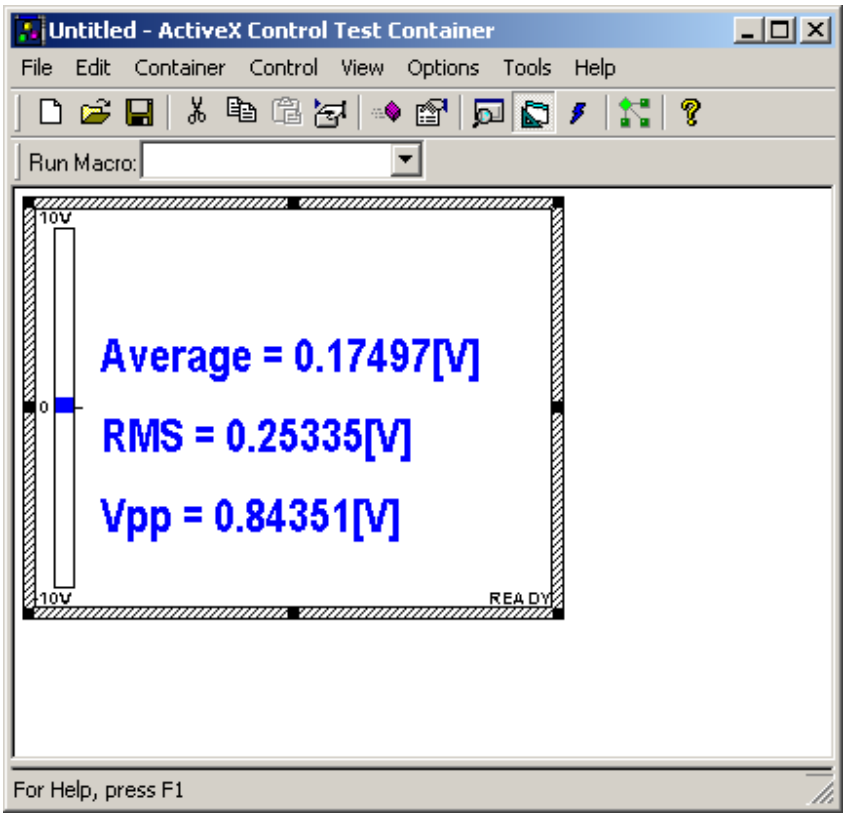
The specification section contains information on the DLD detector mechanical mounting and interfacing features. A number of industry standard optical systems mounts are designed in (post mounting, C-mount, and a 30 mm cage system with 6 mm rods).

Please use normal precautions when mounting and operating the system. Prevent your detector from being exposed to electrical shocks, having its detector element window contaminated, having its ventilation holes covered and overheating, etc.

4.1 ActiveX component

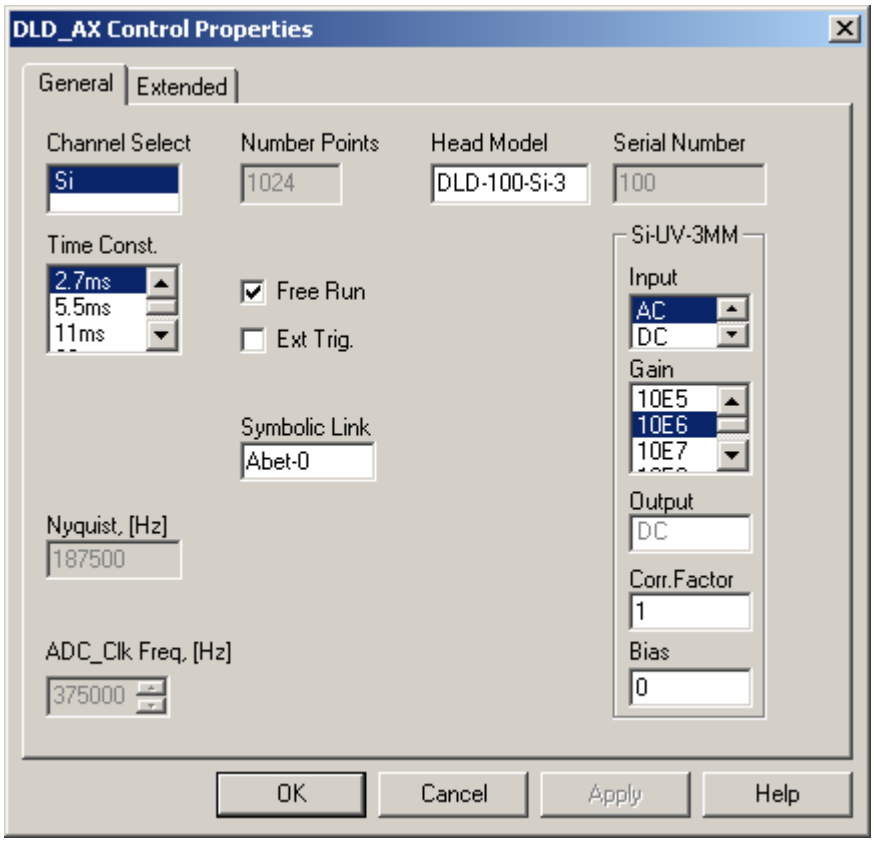
All the power of the DLD-100 detector is available through its ActiveX interface. You will access it through the various demonstration and application programs, ours or yours, as explained below. Here we will introduce its control and property pages. A full list of properties will follow later.

ActiveX can only be accessed from within another program; here we show the DLD_AX within Microsoft ActiveX Control test Container.



DLD_AX always displays the Average, RMS and Vpp (peak to peak) signal voltages of the last acquisition event. An analog bar on the left hand side is used for a visual feedback. Position of the bar represents the Average voltage and its width represents the RMS voltage.

Right clicking within the ActiveX control area brings up the DLD_AX Control Properties page containing information about your detector and also used for setting up your signal acquisition parameters. You need to exit properties page, once all the parameters are selected, before data acquisition can occur.



There are a few information windows and a few adjustable parameter windows on this properties page. Most are self explanatory.

The smallest transmission packet in USB 2.0 is 1024 data points. Rather than sending a single reading and filling the rest of the points with zeros we decided to collect data at the full Analog to Digital chip conversion frequency of 375 kHz and stream packets of data in multiples of 1024. This determines the allowable acquisition window time constants: 2.7 ms, 5.5 ms… 1.4 sec. That is also a reason for the DLD_AX control always displaying averages and RMS instead of a single reading. However, each individual signal reading is accessible from within your application using one of the system properties.

When Free Run is checked data is collected continuously and no application graphics are updated. Use it when only looking at the DLD_AX control and its displayed readings and bar graph. When data is to be displayed or saved by another application Free Run needs to be unchecked.

Synchronized data collection can be driven from a TTL external trigger. When external trigger is used, first point taken is delayed 2.730677 ± .000011 ms. Each following point is then taken at 1/375 kHz A/D digitization cycle increments. **Please note:** do not check Ext Trig. Box if the TTL trigger is not present. This will generate a timeout condition.

AC or DC coupling can be chosen, depending on what kind of signal you are monitoring. Average voltage value is the meaningful reading for DC setting; RMS value is the meaningful reading in AC mode.

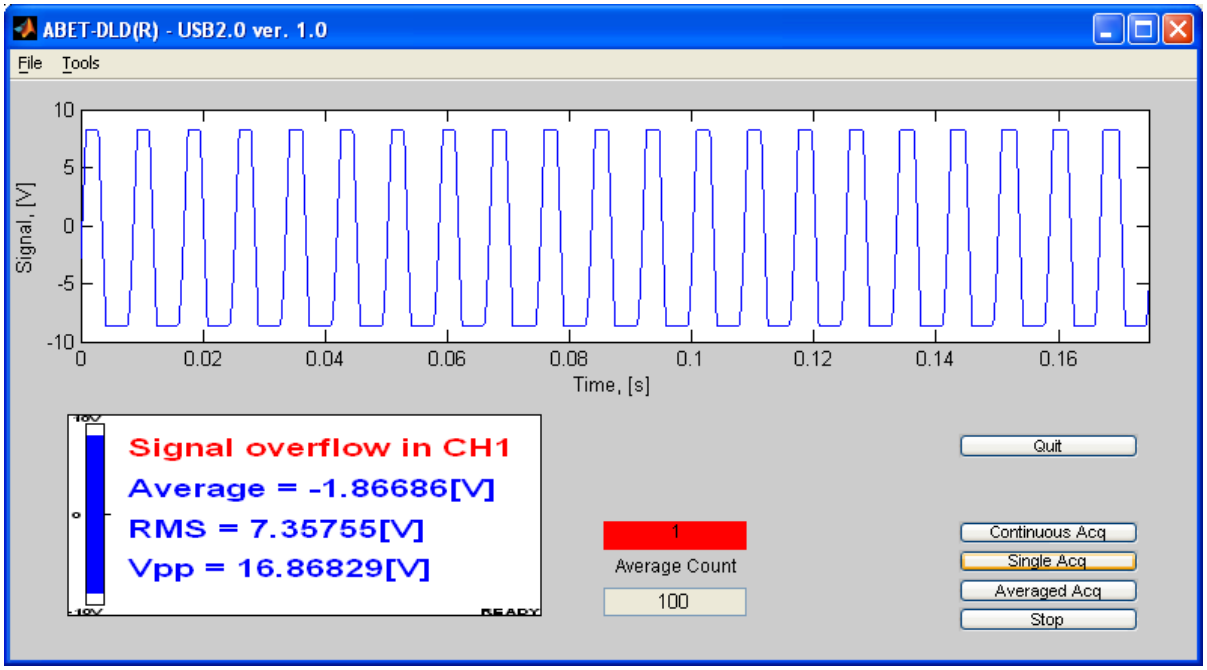
The Gain selection box allows you to choose transimpedance gain, in V/A, depending on your signal conditions. Choose the highest gain compatible with the required time response and staying within the linear range of the instrument (± 7V) to get the most resolution from the 16 bit digitizer's ± 10V input range.

Symbolic link list box displays enumerated devices which can be assigned to this ActiveX instance (useful when more than one DLD detector is being used simultaneously).

Correction factor, associated with the chosen gain, can be used to improve system response linearity when switching gains or provide the means for displaying calibrated values.

Bias window allows for setting offset voltage for a given gain setting which can be used to minimize the impact of amplifier DC bias, dark signal or stray light.

If the signal is too strong for the selected gain, a Signal Overflow warning appears as shown below for data taken with one of the application programs. Lower the gain or attenuate the signal so that meaningful data can be collected.



4.1.1 Methods

Methods	Return Type
AboutBox ( )	void
Acquire ( )	boolean
ReadBufferCH1 (VARIANT BufferA, long BufferSize)	void
ReadBufferCH2 (VARIANT BufferA, long BufferSize)	void
TransferCH1_Point(long index)	double
TransferCH2_Point(long index)	double

4.1.2 Properties

Return Type	Property name
BSTR	SymbolicLink;
BSTR	FirmwareRev;

BSTR	HeadEEPROMRev;
short	TimeConstLBIndex;
BSTR	EnumerationChain;
short	ChannelSelIdx;
double	NyquistSamplFreq;
short	OutputCouplingModeOnCH1_LBIndex
short	OutputCouplingModeOnCH2_LBIndex;
LONG	SerialNumber
boolean	DeviceStatus;
long	NumberPoints;
double	SetTemperature;
double	SetADC_ClkFreq;
long	RawDataBufferCH1;
long	RawDataBufferCH2;
short	CH1_Gain_LBIndex;
short	CH2_Gain_LBIndex;
short	InputCouplingModeOnCH1LBIndex;
short	InputCouplingModeOnCH2LBIndex;
BSTR	Peak2PeakCH1;
BSTR	Peak2PeakCH2;
long	THETA;
boolean	IntExtTrigSel;
VARIANT_BOOL	FreeRun;
BSTR	HeadModel;
BSTR	AmplitudeCH1;
BSTR	AmplitudeCH2;
LONG	FIRFilterBufferPointerCH1;
LONG	FIRFilterBufferPointerCH2;
BSTR	AverageCH1;
BSTR	AverageCH2;
BSTR	OverflowCH1;
BSTR	OverflowCH2;
BSTR	SymbolicLink;
BSTR	RMS_CH1;
BSTR	RMS_CH2;
DOUBLE	UserCalibrationFactorCH1;
DOUBLE	UserBiasCH1;
DOUBLE	UserCalibrationFactorCH2;
DOUBLE	UserBiasCH2;
LONG	LapsTime;

Typical values

TimeConstLBIndex:		Set/Get – List box index selecting duration of the Acquisition window
ChannelSelIdx:		for single channel model
NyquistSamplFreq:	87500	Factory set
OutputCouplingModeOnCH1_LBIndex:	1	0 for AC, 1 for DC
DeviceStatus:	1	Factory use only
NumberPoints:	2048	Read only
SetTemperature:	10	N/A
SetADC_ClkFreq:	375000	N/A: defined by oscillator clock frequency
RawDataBufferCH1:	53346336	Pointer to User Buffer. Read only. System may c crash during attempt to write to it.
CH1_Gain_LBIndex:	1	Gain selection from list box
CH2_Gain_LBIndex:	1	Gain selection from list box

InputCouplingModeOnCH1LBIndex:	0	DC/AC coupling
InputCouplingModeOnCH2LBIndex:	0	DC/AC coupling
Peak2PeakCH1:	'0.010171'	Read property
Peak2PeakCH2:	"	Read property
THETA:	0	Reserved for future use
IntExtTrigSel:	0	Trigger source True or False
FreeRun:	1	Free run, True or False
HeadModel:	'DLD-100-Si-3mm'	Head type
AmplitudeCH1:	'0.002764'	Read property
AmplitudeCH2:	"	Read property
FIRFilterBufferPointerCH1:	157810720	N/A internal pointer
FIRFilterBufferPointerCH2:	61931552	N/A internal pointer
AverageCH1:	'0.001994'	Read property
AverageCH2:	"	Read property
OverflowCH1:	"	Read property. Empty string when OK
OverflowCH2:	"	Read property. Empty string when OK
SymbolicLink:	'Abet-0'	Driver symbolic link. Multiple DLD's will typically enumerate as follows Abet-1, Abet-2… In order to connect ActiveX object with active device this property value must match device name issued by Windows. WinObj.Exe utility allows you to learn about driver names for enumerated devices
EnumerationChain:	'AEAEEEEEEEEEEEE';	String identifying enumerated and active devices on the USB bus. Read only property. In this example Abet-0 and Abet-2 are enumerated. This version of ActiveX can enumerate 16 detectors on the USB bus, assuming that 16 USB 2.0 hubs are available.
EnumerationStatus:	1;	Number of detected devices.
ServiceLinkInfo:	'www.abet-technologies.com';	String which can be used by the application for fetching technical info for your detector model, via Internet Web browser. Read property.
RMS_CH1:	'0.002764'	Read property
RMS_CH2:	"	Read property UserCalibrationFactorCH1: 1.0 Set/Get
UserBiasCH1:	0.0	Set/Get
UserCalibrationFactorCH2:	1.0	Set/Get
UserBiasCH2:	0.0	Set/Get
LapsTime:	20	Free Run refresh rate in ms

Please note:

- Do not use Properties for CH2 in single channel detector models.
- Abet reserves the right to change names of properties in the future as product development needs dictate.
- Set temperature property is only valid for detectors with Thermo Electric Cooler.

In case of overflow condition, excess signal, applications return Not a Number: NaN is the IEEE arithmetic representation for Not-a-Number. A NaN is obtained as a result of mathematically undefined operations like 0/0 or inf-inf.

4.1.3 Usage of methods

DLD_AX1, h_Ax are handles to ActiveX control. Handle name depends on language in use. VB 6.0 provides system dependend name while in Matlab it can be defined as follows:
h_Ax=actxcontrol('DLDAX.DLDAXCtrl.1', rect , ' ');

AboutBox ( ) this method calls AboutBox

Usage:

VC++	AboutBox()
VB 6.0	DLD_AX1.AboutBox
Matlab	invoke (h_Ax, 'AboutBox')

Return Type void

Acquire( ) this method starts data acquisition

Usage:

VC++	Acquire();
VB 6.0	DLD_AX1.Acquire()
Matlab	invoke(h_Ax,Acquire');

Return Type boolean

NumberPoints this property gets the size of the acquired data buffer

ReturnType long

RawDataBufferCH1 this property holds value of the pointer to dynamically allocated user memory size of allocated memory block is equal to NumberPoints property is only for use with Matlab or C/C++.
do not write to this property - the value of this property must be cast to the pointer type 'double* ' within C/C++ code in order to get access to memory

```
double *  p_databuffer;  //declare pointer
p_databuffer = (double*)RawDataBufffer;  /*cast value  of RawDataBuffer as an pointer. Elements of data in buffer can be accessed by de-referencing */
```

getUSB_USERBuffer is a Matlab mex function for use with DLD™

this mex dll which takes care of necessary casting and passing data into matlab compliant variable

Usage:

```
MatLab  A=getUSB_USERBuffer(double(h_Ax.RawDataBufferCH1), double(h_Ax.NumberPoints));
                                                                %Gets Data into MatLab
```

ReadBufferCH1 (VARIANT BufferA, long BufferSize) this method reads data to variant array. Because of the Variant type, memory usage is substantial.

Usage:

VB 6.0 Dim CH1(8192) As Double 'Declare VB Array
Call DLD_AX1.ReadBufferA(CH1, DLD_AX1.NumberPoints)

Return Type void

TransferCH1_Point (long index) this method reads single data point from ActiveX data buffer Because of passing data by value this method is slow for large data vectors

Usage:

```
VB.NET      Dim CH1() As Double      'Declare VB Dynamic Array
            Dim i As Integer

            ReDim CH1(DLD_AX1NumberPoints)

            DLD_AX1.Acquire()        'Acquire data

            For i=0 To DLD_AX1NumberPoints -1
                  CH1(i) = DLD_AX1.TransferCH1_Point( i )  'Transfer raw data
            Next
```

Index i must be lower than DLD_AX1NumberPoints

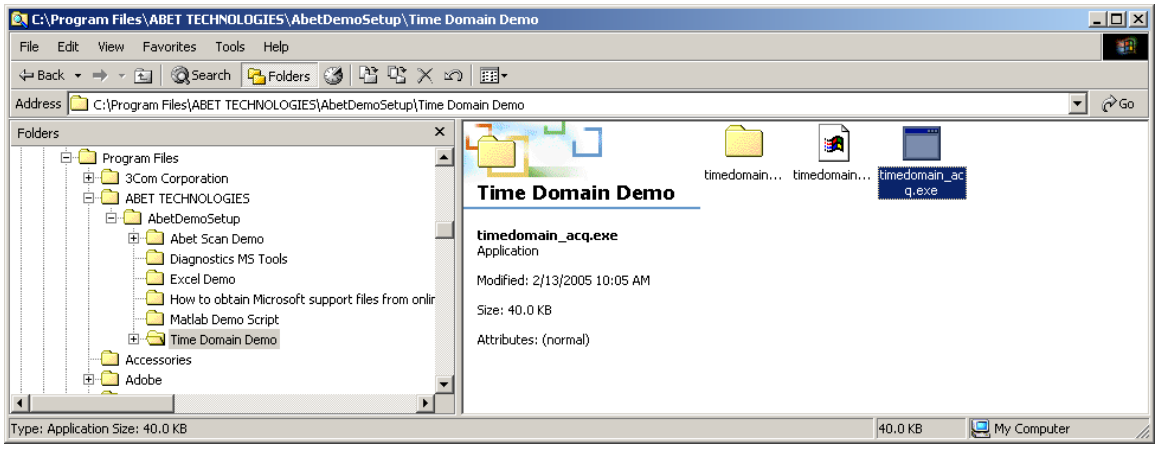
Return Type double

4.2 Applications (.exe programs)

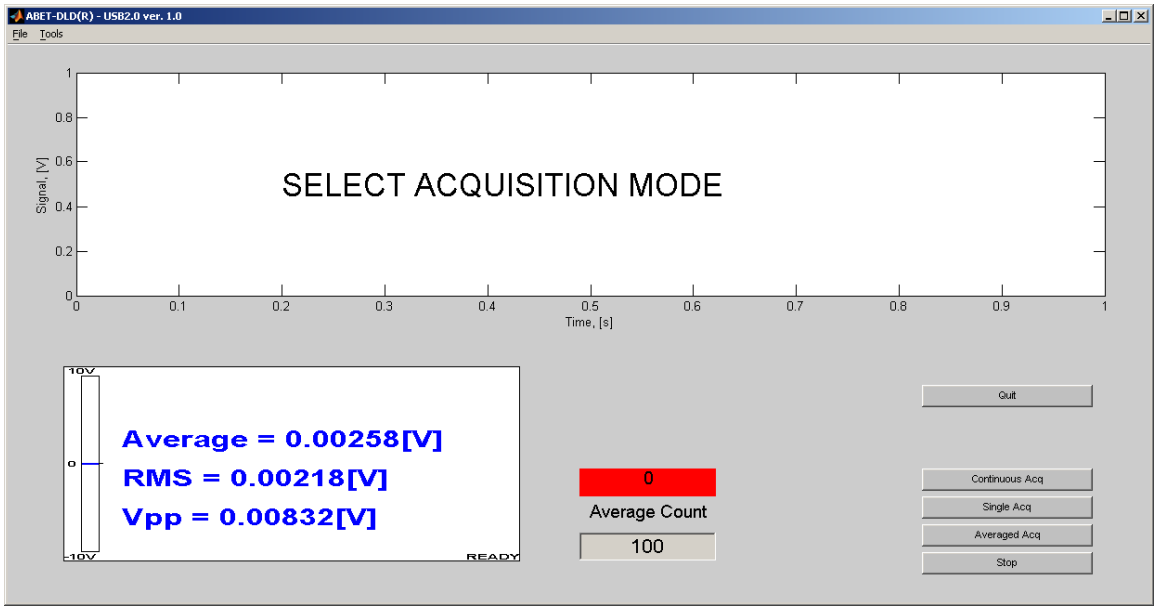
4.2.1 Time Domain application

This application, a form of digital oscilloscope, allows you to acquire, display, average (if you so choose) and save the data.

It requires the previously installed MATLAB™ runtime engine. Starting from the C:\Program Files\ABET TECHNOLOGIES\AbetDemoSetup\ directory (or the path you chose) open the folder Time Domain Demo and run **timedomain_acq.exe.** You may wish to place a shortcut to this application on you desktop if it will be frequently used.



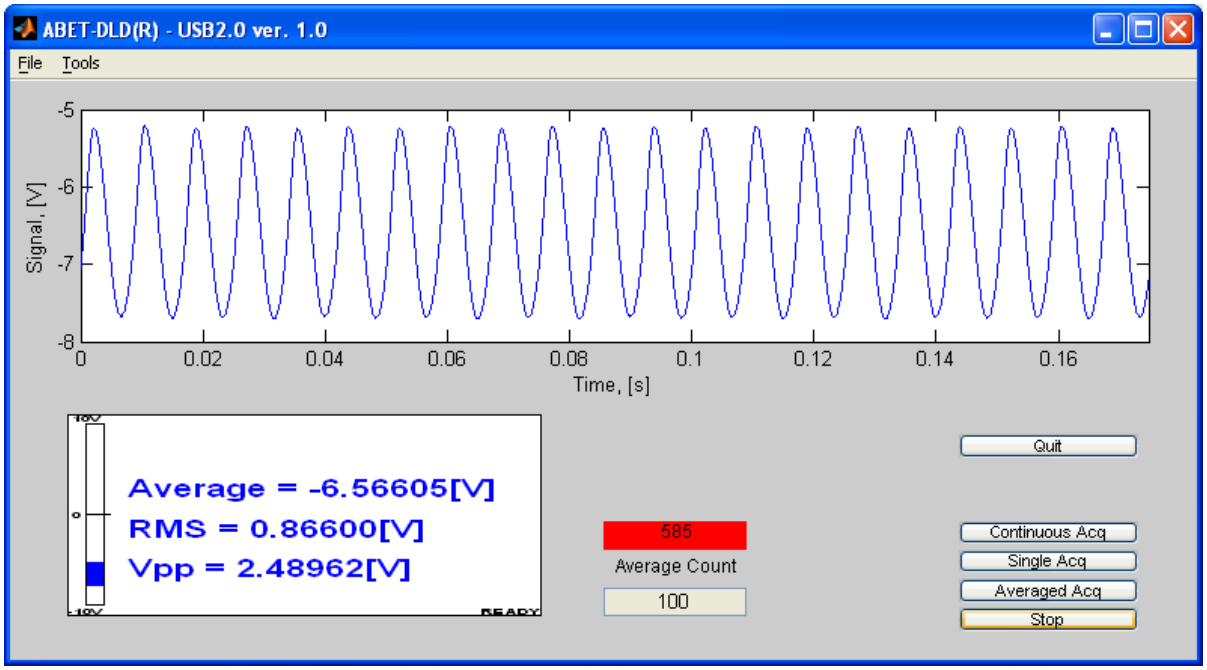
It may take 5 – 40 sec before the program starts depending on your PC speed (the MATLAB™ Control Runtime engine is quite sizeable). Once active, the following screen appears:



DLD_AX starts in a Free Run mode and is continuously updated. Clicking on any of the acquisition mode buttons turns the free running mode off and activates the selected acquisition mode.

Right clicking within the DLD_AX control area, as explained previously, allows you to set acquisition parameters: length of individual data stream, V/A transimpedance gain, AC or DC coupling, and external trigger when present.

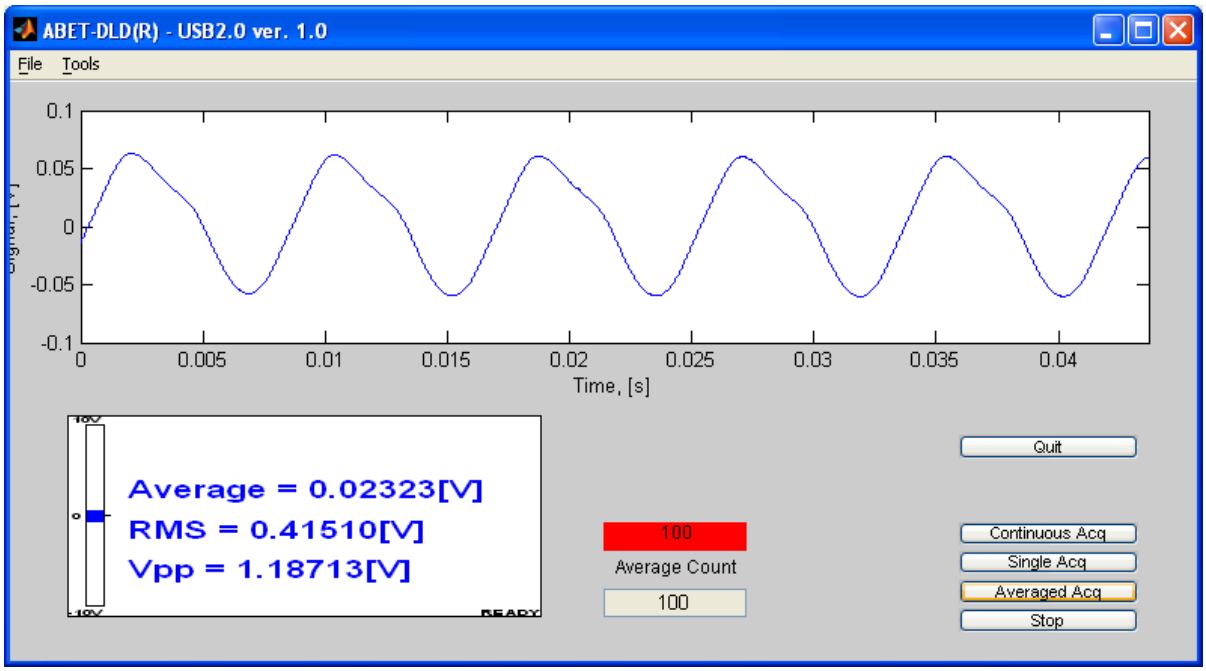
Continuous acquisition: signal is acquired during the selected time window (Time const.) and the acquired waveform display is continuously updated.



Single acquisition - signal is acquired during a single selected time window (Time const.) and the acquired waveform displayed.

Averaged acquisition:

- Enter the number of acquisition time windows you want to average in the **Average Count** cell
- Click **Averaged Acq** button and observe the data being averaged



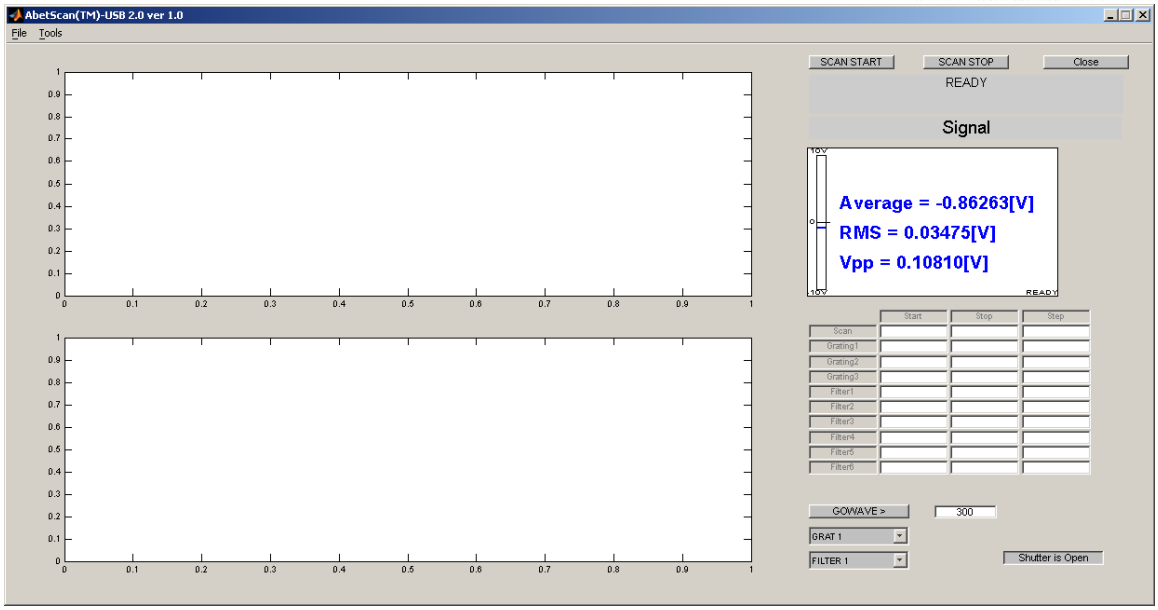
The data for the current waveform can be saved in .txt or .mat format by opening the File drop down menu. This data contains all the individual readings within the acquisition window and can be quite sizeable (1024, 2048, 4096…524288 points, depending on time window selected).

4.2.2 Abet Scan spectral acquisition application

This application allows you to control a monochromator and a DLD-100 series detector to perform spectrometric scans, display the results and save the data.

It requires the previously installed MATLAB™ runtime engine. This version works with Oriel MS260 and MS130 monochromators using RS232 communications. The monochromator needs to be attached to either COM1 or COM2 serial port. Starting from the C:\Program Files\ABET TECHNOLOGIES\AbetDemoSetup\ directory (or another path you chose) open the folder Abet Scan Demo and run **AbetScan.exe.** You may wish to place a shortcut to this application on you desktop if it will be frequently used.

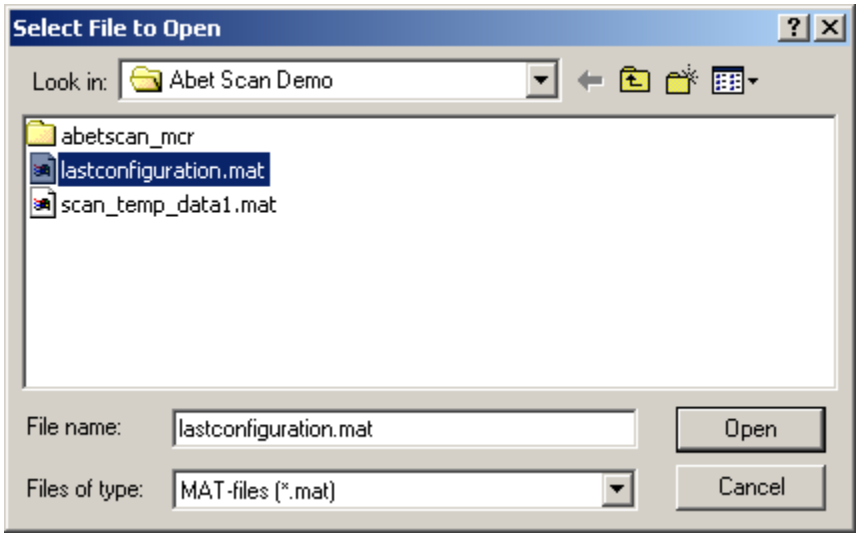
It may take 5 – 40 sec before the program starts depending on your PC speed (The MATLAB™ Control Runtime engine is quite sizeable). Once active, the following screen appears:



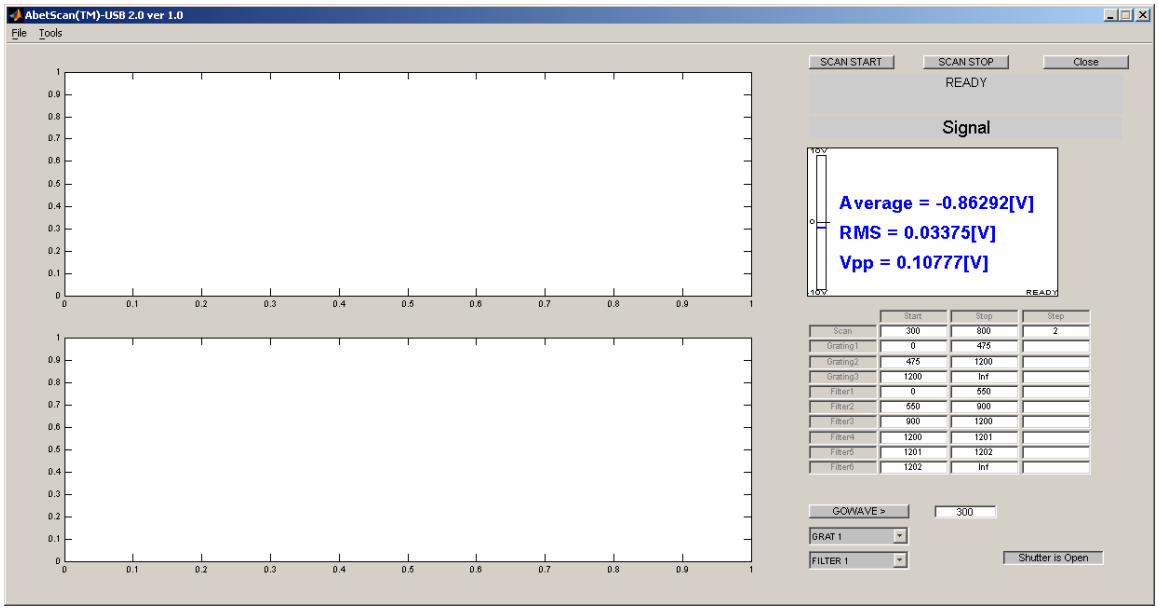
The program checks COM1 and COM2 ports for a connected monochromator and when found displays:

Click OK to continue.

You now need to set up the scan and detector parameters. If you have never run the system before you may go to the file menu and load the last configuration.mat file to see an example of setup information:

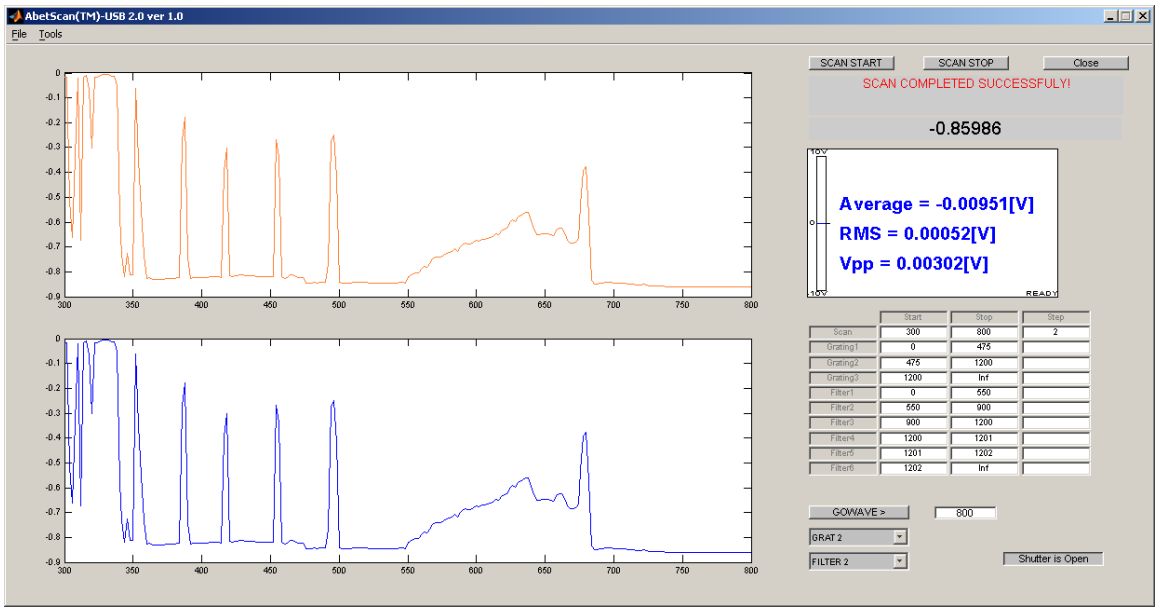


A set of values is loaded into the scan control and detector DLD_AX areas:



This table can be edited by modifying the Scan start, stop and step values (in nm) and the change over wavelengths for gratings and filters. You can modify the detector parameters in the usual way by right clicking on the active area of the DLD_AX control. You can then name and save you new configuration through the File drop down menu.

Click the Scan Start button once you are ready to acquire spectral data:



The Tools menu gives you access to zooming features.

Data for the current scan can be saved in .txt or .mat format by opening the File drop down menu.

If you try to run a monochromator scan without the scan table loaded a warning screen will remind you to do so:

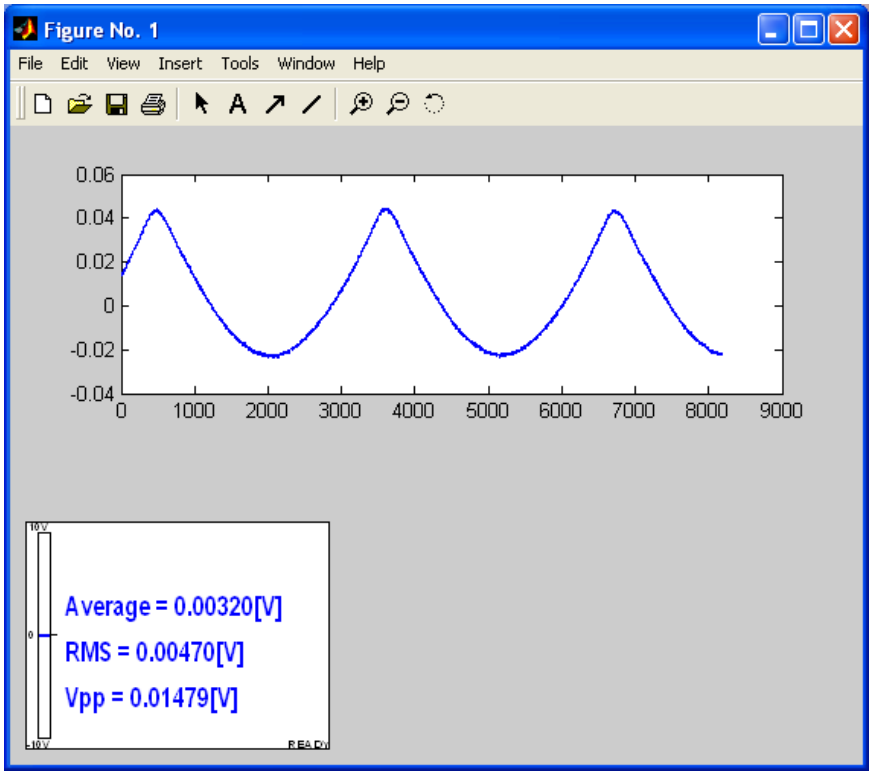
You can also use this application to control the monochromator and detector to look at signal levels at various wavelengths with the available gratings and filters individually settable. A Shutter button allows you to check dark signal level. Please consult you monochromator manual for additional information.

4.3 Demonstration programs

The following programs, with their explicit scripts, demonstrate the simplicity of invoking DLD_AX from various software environments.

4.3.1 MATLAB™ demo

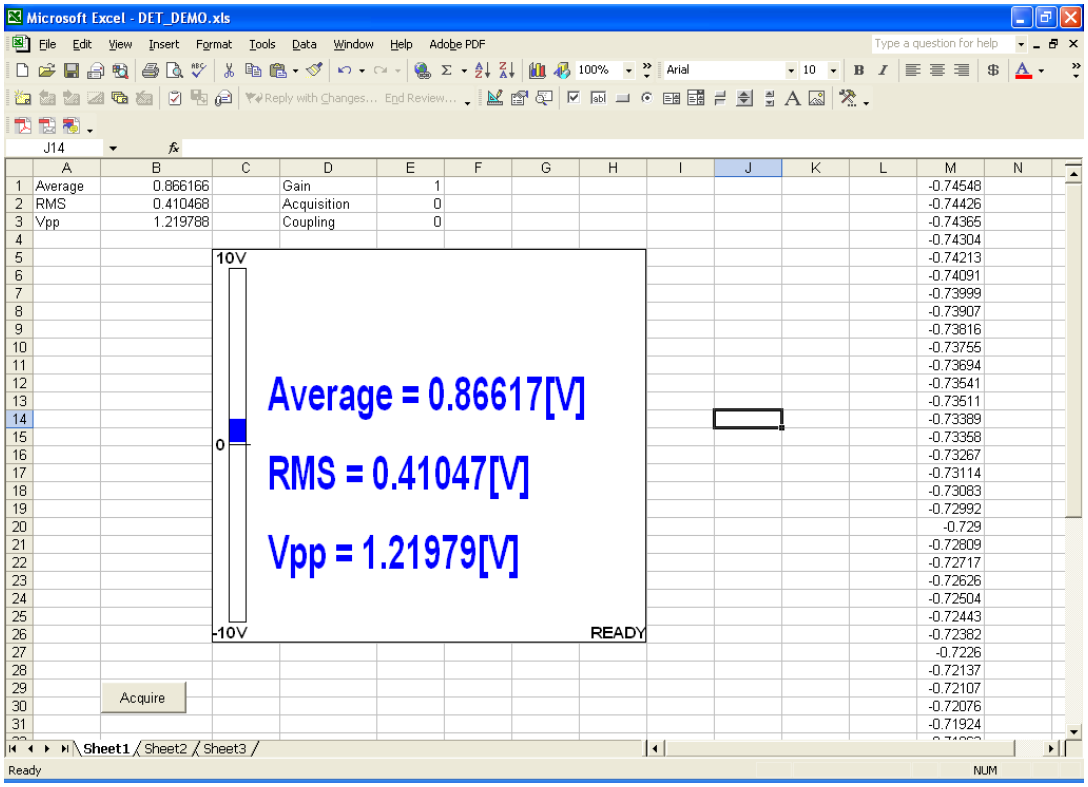
If you are a MATLAB™ user (version 6.5 or above) take a look at the abetdemo.m file in the C:\Program Files\ABET TECHNOLOGIES\AbetDemoSetup \Matlab Demo Script directory (or the path you chose during the installation). This m-file, when executed, collects 8096 data points and displays them in a plot:



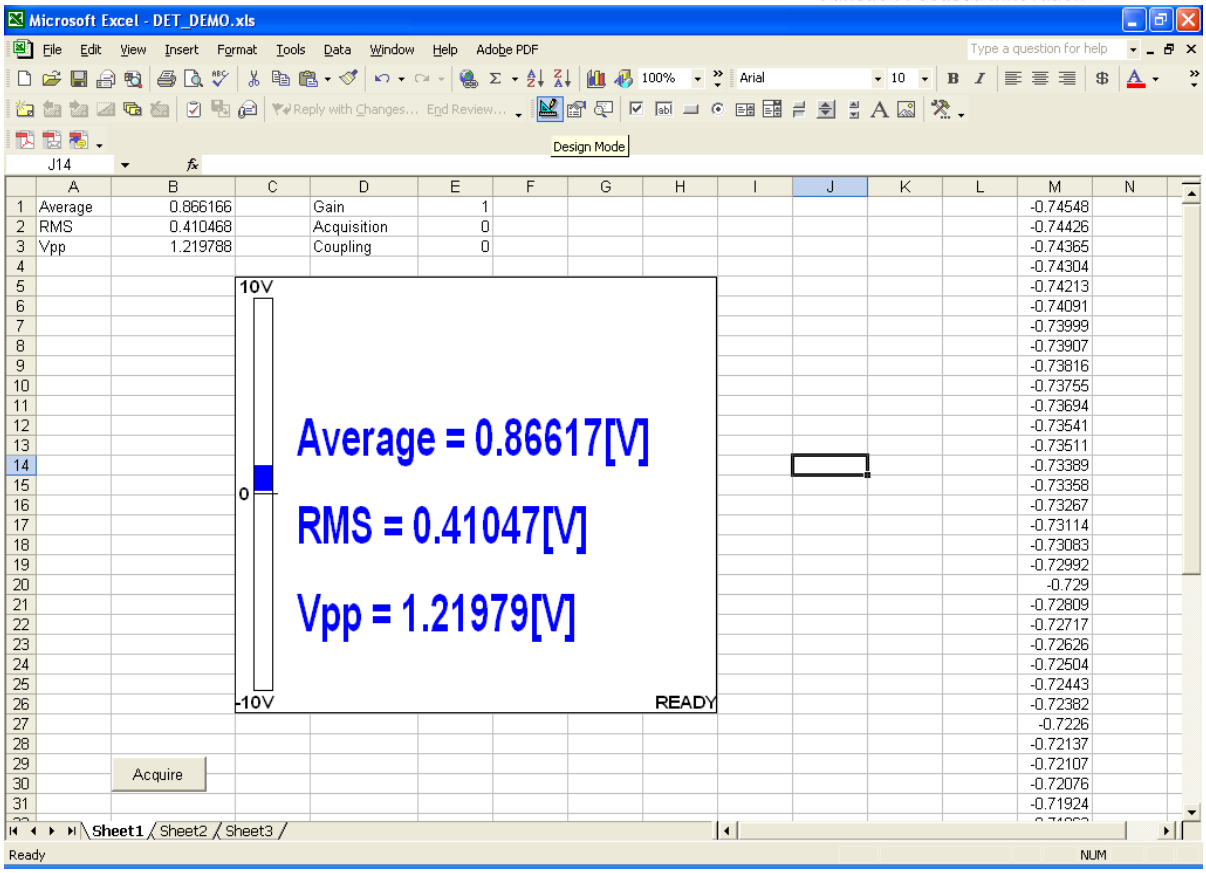
You can use this file as a starting point for your own application development using the example script as a guide for communication with the DLD_AX control.

4.3.2 Visual Basic from within Excel demo

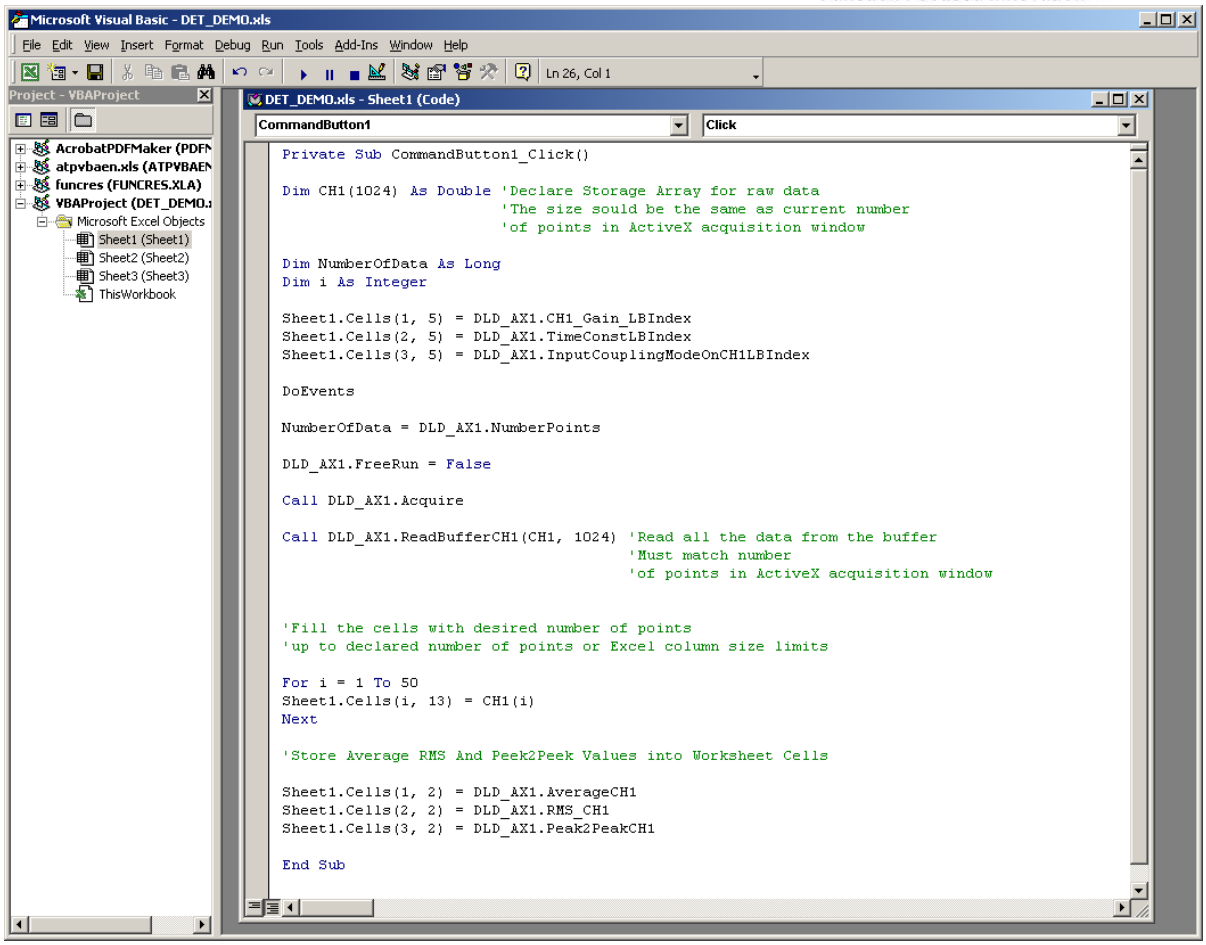
If you are an Excel user take a look at the DET_DEMO.xls file in the C:\Program Files\ABET TECHNOLOGIES\AbetDemoSetup \ Excel Demo directory (or another path you chose during the installation). Please allow macros to be run when Excel asks you to do so. This demo, when the Acquire button is clicked, takes a single reading (of 1024 points) and loads the Average, RMS, peak to peak and first 50 points into the cells as shown below:



To take a look at the Visual Basic script producing these results enter the Design Mode by clicking its button on the Control Toolbox tool bar.



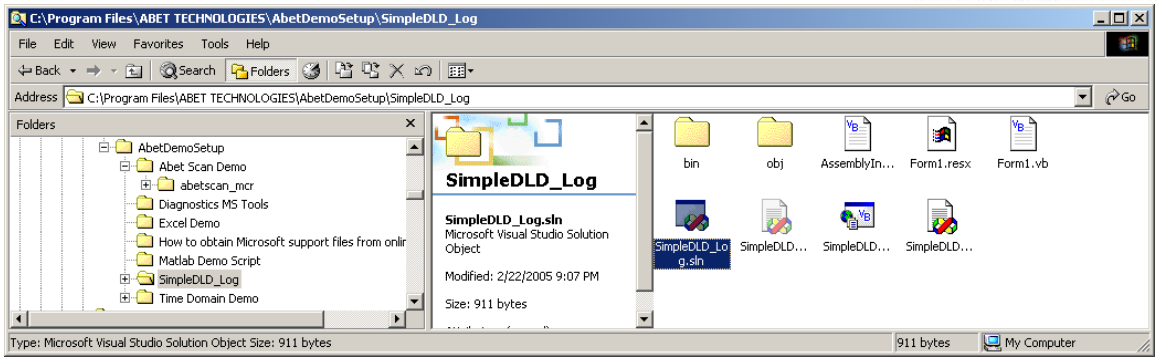
and then double clicking on the Acquire button:



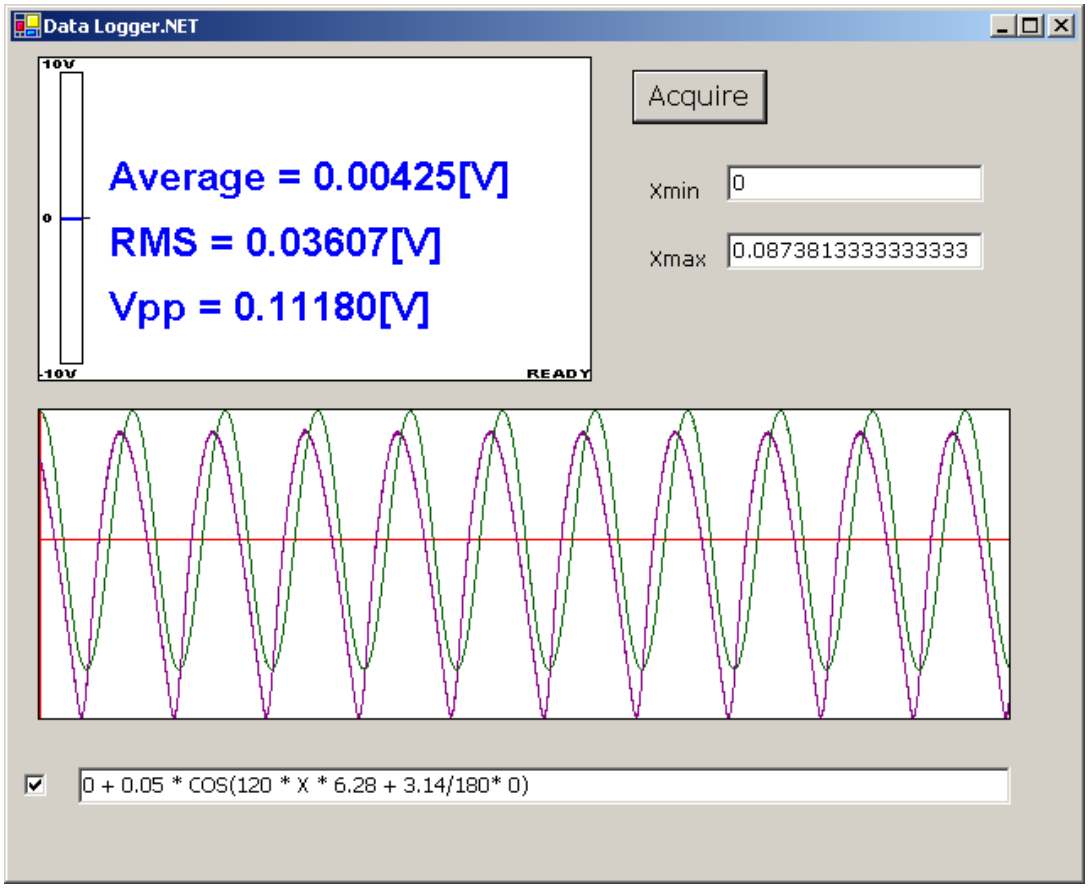
When finished, close the Visual Basic window and click the design button again to return to the application.

4.3.3 Visual Basic.NET Demo

Another datalogger demo is SimpleDLD_Log.sln project in the C:\Program Files\ABET TECHNOLOGIES\AbetDemoSetup \ SimpleDLD_Log directory (or the path you chose during the installation). You will need VB.net 2003 installed on your computer to compile the project. The executable is provided in 'bin' folder. The project needs Microsoft Script Control 1.0 present on your system. If the scripting control is not available through VB.NET toolbox you must download it from http://msn.microsoft.com/, then install and register it. For users interested in VB.NET programming we recommend book Mastering Visual Basic.NET by Evangelos Petroutsos, Published by SYBEX, ISBN 0-7821-2877-7.



This application demonstrates the use of DLD_AX within the VB.NET environment (data takes a long time to refresh – if you are in a hurry use MATLAB).



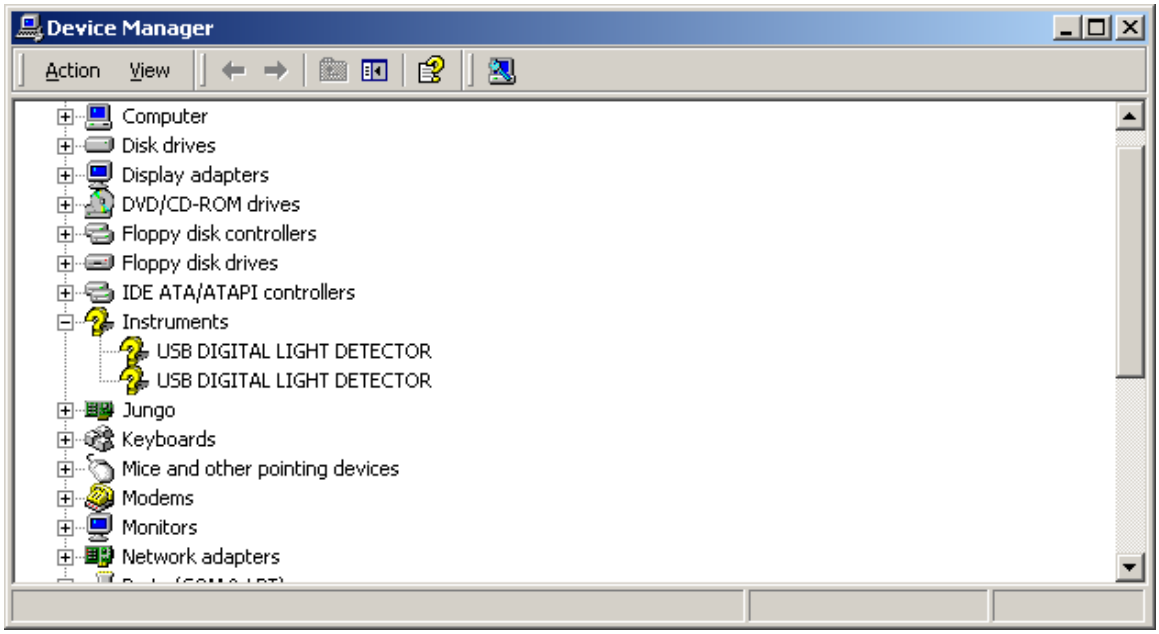
A sinusoidal modeling function is shown since room lights were used for this demo. Any VB recognized arithmetic function can also be used. Chapter 14 of the book mentioned above provides good insight and many examples.

4.3.4 Demo of multiple detector usage

Using multiple DLD devices is quite straight forward under the USB 2.0 standard. Here we show an example of setting up and using two detector heads.

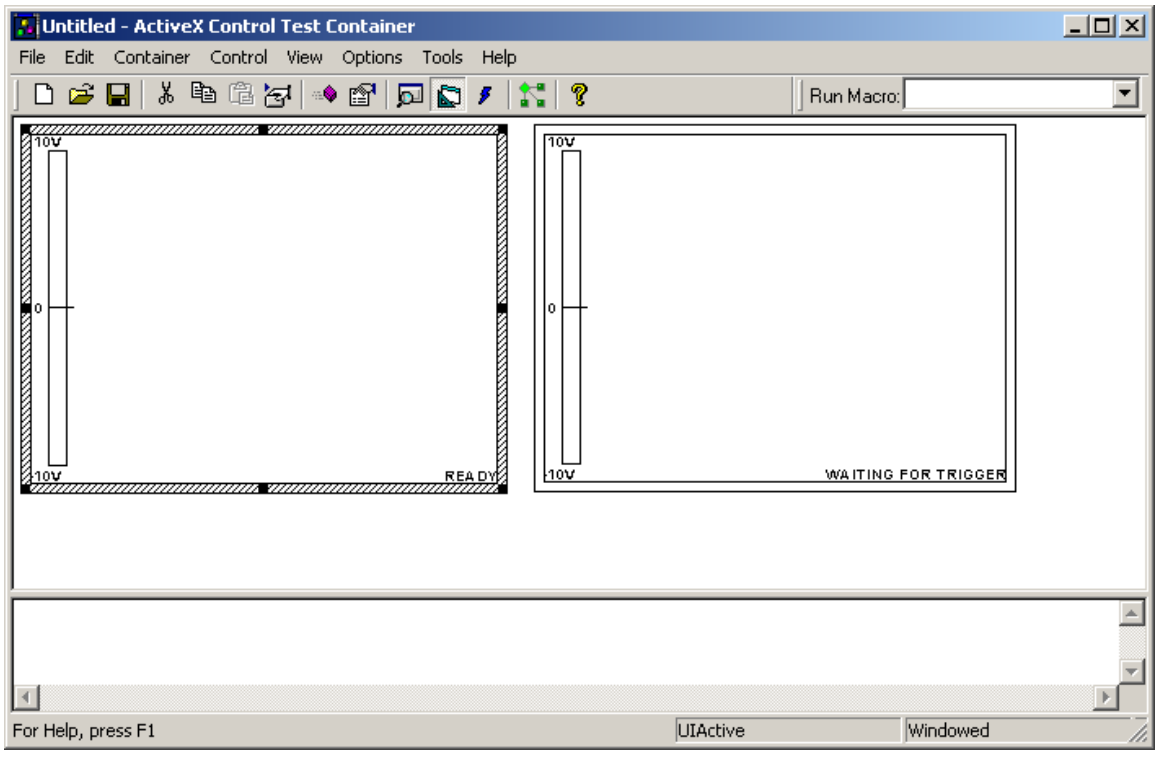
Connect your two detectors to the PC USB 2.0 hub.

Verify the presence of multiple detectors in Device Manager



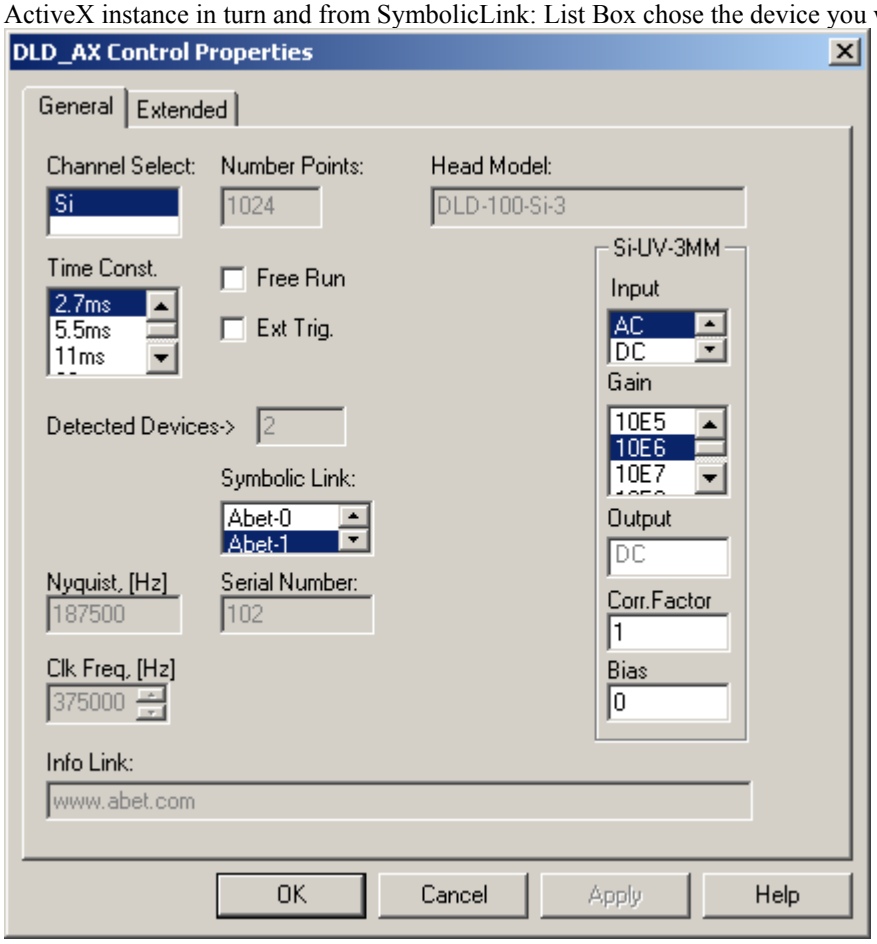
Those devices typically will be enumerated by Windows as Abet-0 and Abet-1. This can be verified by Checking SymbolicLink ListBox in property page. In case of non-sequential enumeration, e.g. Abet-1, Abet-5; or other than starting from Abet-0 enumeration we recommend checking detector model property and serial number for each SymbolicLink. In case of discrepancies please power DLD's down and reboot your computer.

Insert two instances of the same DLD_AX control into the Microsoft ActiveX container:

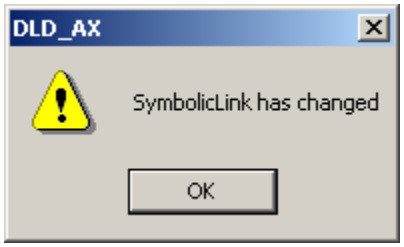


At this point those two ActiveX instances are talking to the same physical device because they are using the same symbolic link e.g. Abet-1.

Enumeration scheme always enables last detected device with its symbolic link. Right click on each ActiveX instance in turn and from SymbolicLink: List Box chose the device you want to enable in each control:

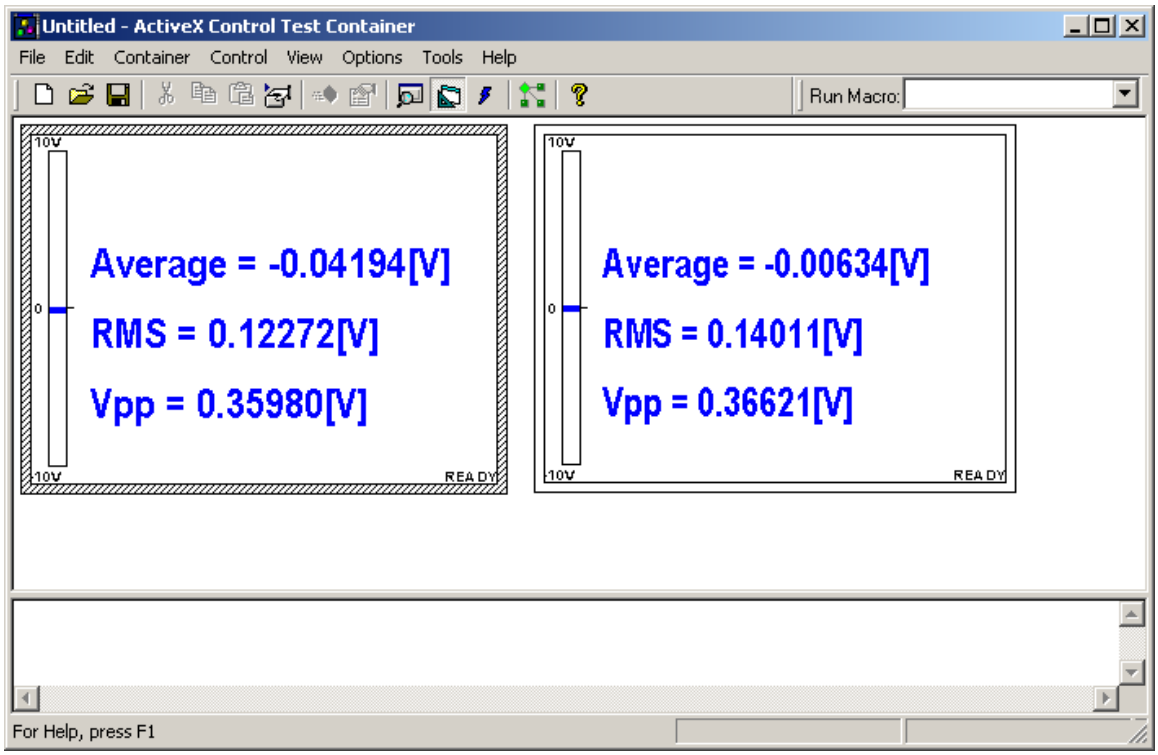


A notification dialog box appears after each selection:

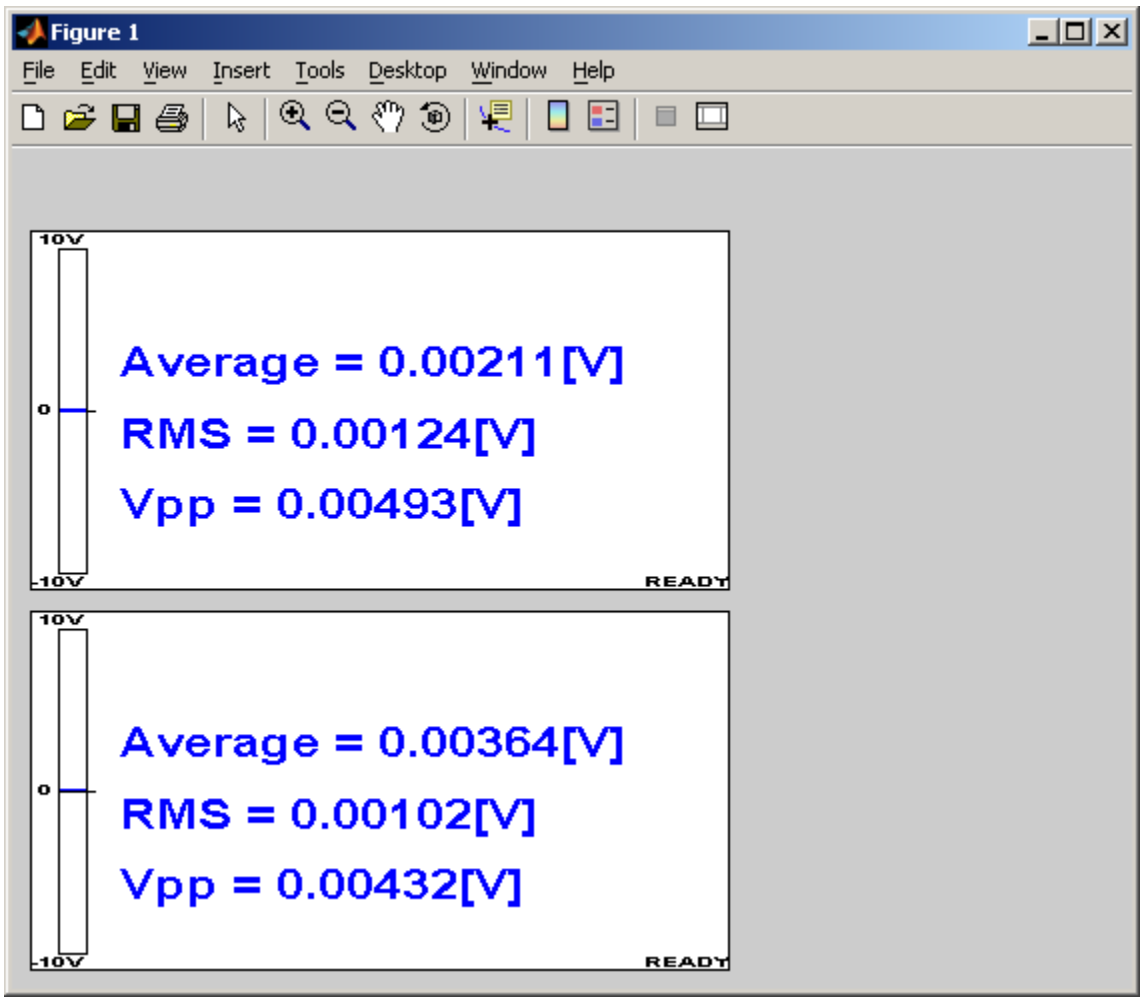


confirming established link with the selected DLD.

Signals measured by the two devices are then displayed individually within their controls:



An example of programmatically instantiated dual detector display is contained in MATLAB™ script twoheads.m which can be found in C:\Program Files\ABET TECHNOLOGIES\AbetDemoSetup \Matlab Demo Script directory (or another path you chose during the installation). When executed, the following figure is produced:



If you are not an MATLAB™ user, you can still view the contents of the twoheads.m file by opening it with any word processor.

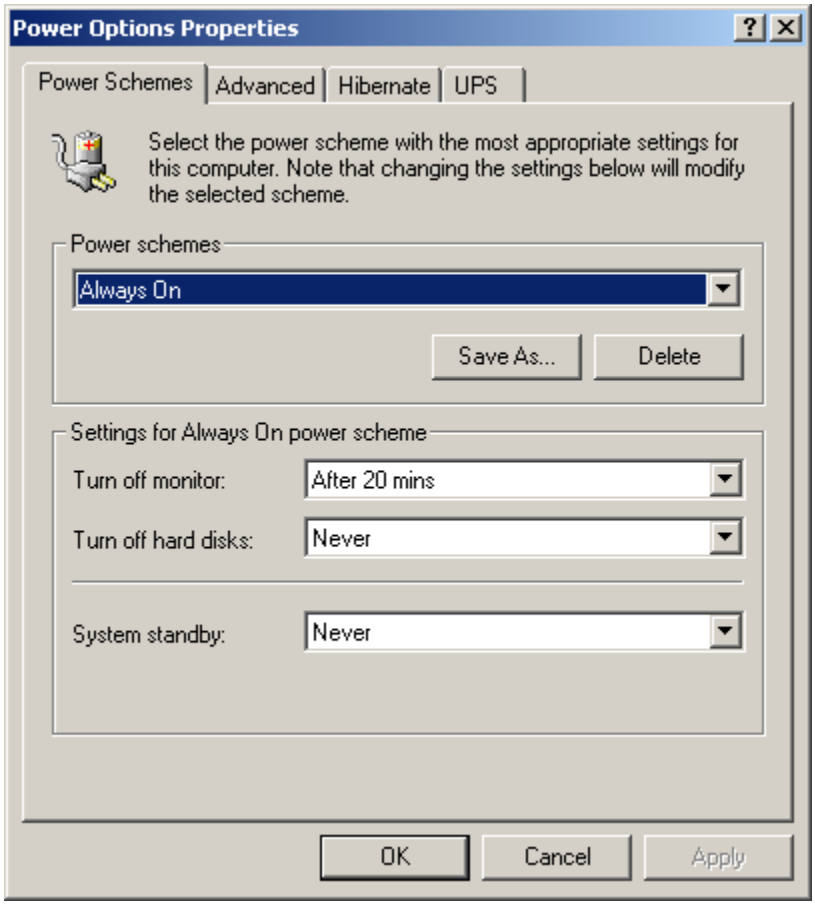
5 Troubleshooting and cautionary notes

USB error messages: Check to be sure that your computer has an original USB 2.0 or higher interface and is not using either USB 2.0 add-on boards or hubs. Add on boards are occasionally not as robust in their communication capabilities. The diagnostic tools discussed in this manual can be used for their error utility capabilities. When all else fails power down and reboot the detector and the computer.

Average reading is not zero in AC coupling mode: When switching from DC to AC mode the decoupling capacitor discharges slowly – let it settle and system will behave.

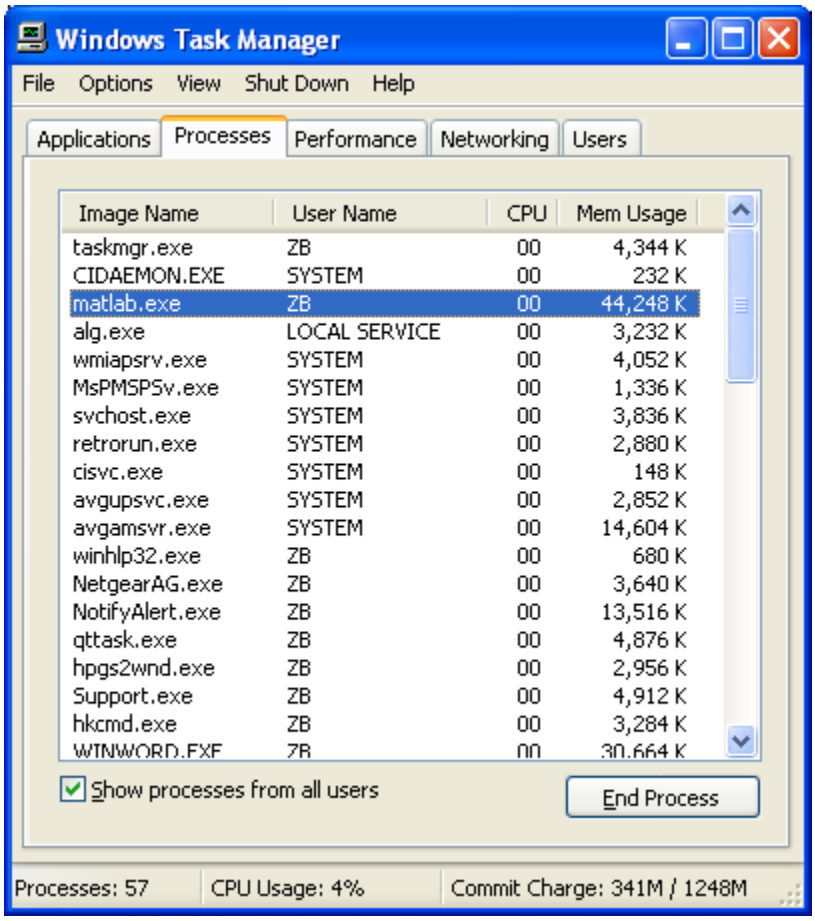
The system may **time out** when external trigger mode is selected and a trigger is not supplied.

During data acquisition the computer should maintain power to the USB Hub. Some computers do not do a very good job of it when various Power Saving options are turned on. We suggest that you set power schemes to always ON (and leave hibernation to the bears):

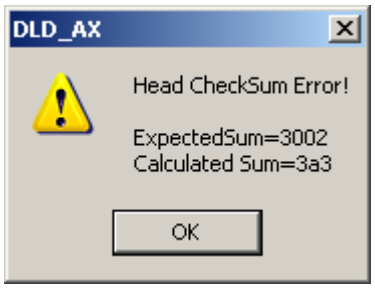


The Windows operating system is not a real time OS. Therefore, one cannot assume that time critical functions will be treated as such. Windows system internal higher priority processes can occasionally cause unpredictable effects in time dependent data collection. Please run a minimum number of programs simultaneously to help assure uninterrupted data acquisition.

If you encounter glitches or discontinuities in your data acquisition you may set your application's priority to "Realtime": Press Ctrl_Alt_Del to invoke Windows task manager, choose Processes tab, find your program and right click it. In properties menu choose Realtime. A warning will appear – disregard it and see if data acquisition performance improves (other running programs may slow down but will typically work OK).



Head Malfunction:



Head EEPROM bytes dump will follow.

Call your sales representative or the factory.

5.1 About the included diagnostics tools:

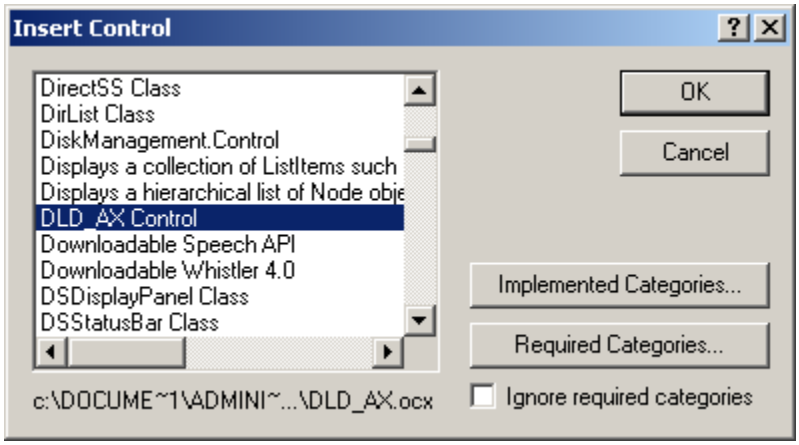
If you ever need to check on the status of the ActiveX world these tools can come in handy.

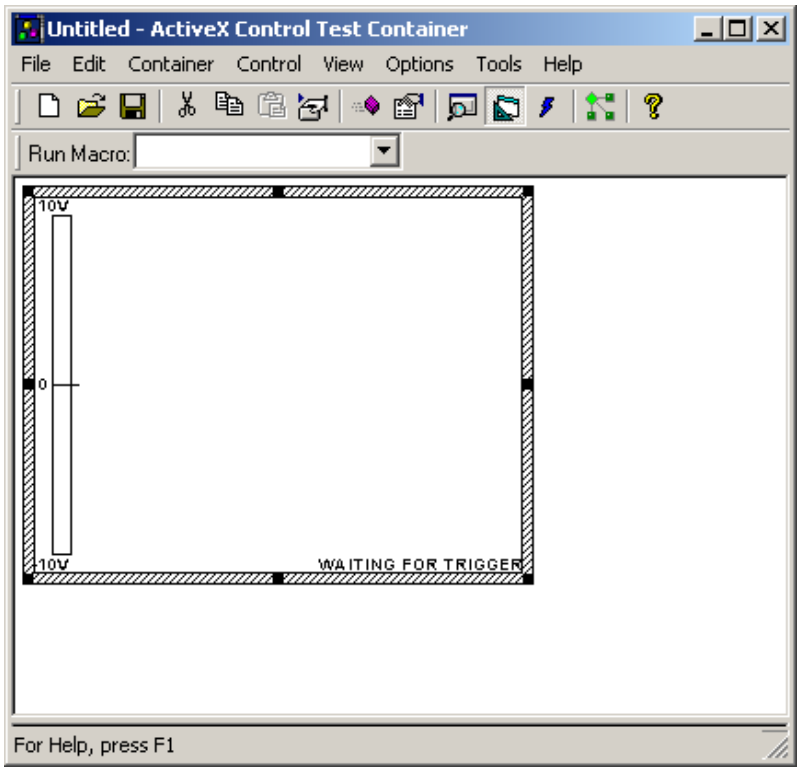
Abet DevCon.exe is a modified Microsoft USB tree interrogator showing properties of installed Abet Devices.

TSTCON32.exe is Microsoft ActiveX test container. Please see Microsoft MSDN documentation for information on how to use it:

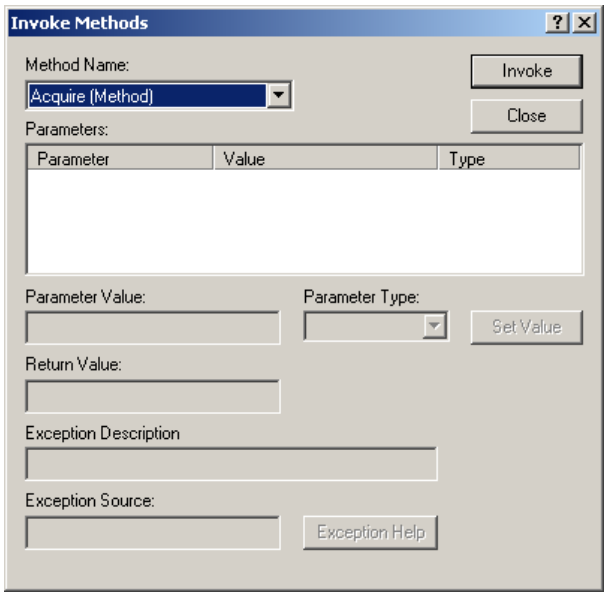
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/vccore98/HTML/_core_test_container.asp

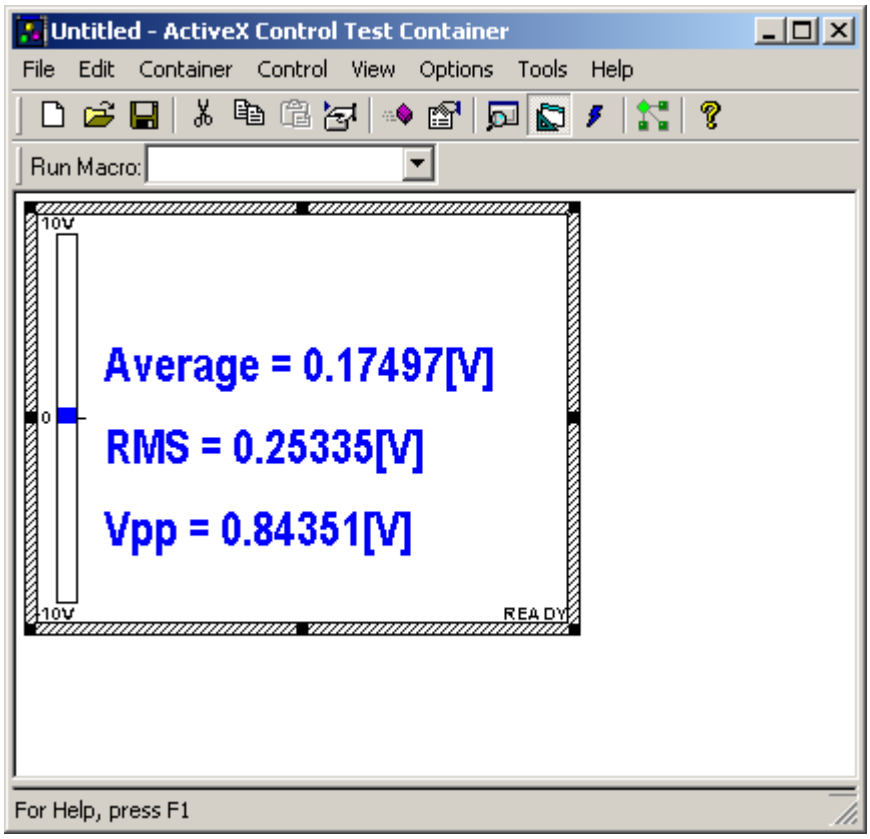
From the Edit menu you can insert Abet Technologies' DLD_AX control





From the Control Menu invoke methods will bring a dialog of available methods and properties:

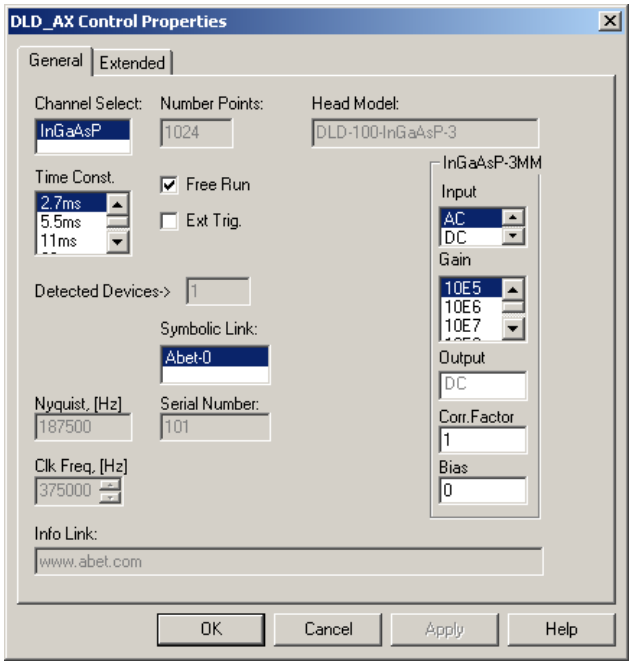


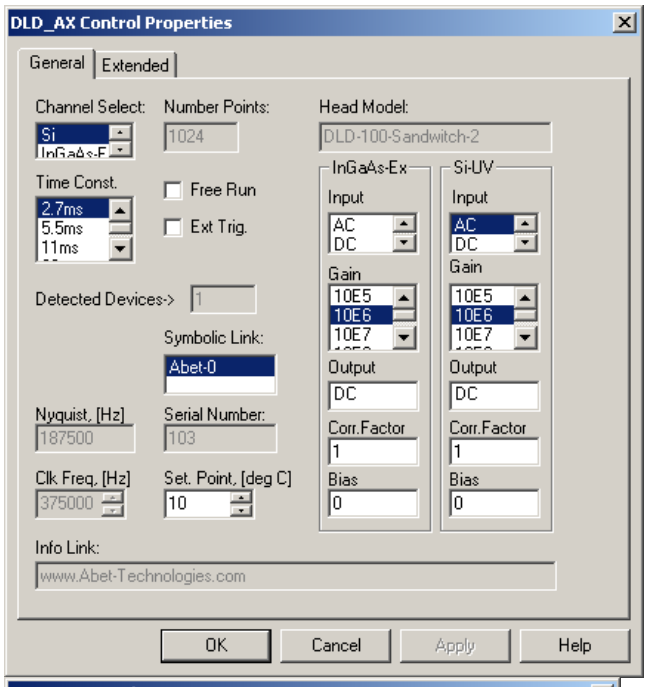


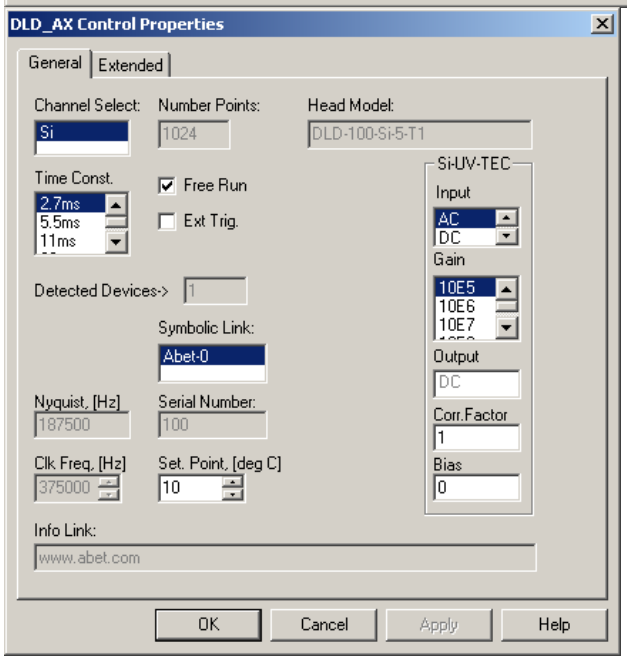
By right clicking the ActiveX control area DLD_AX Control Properties will be shown:

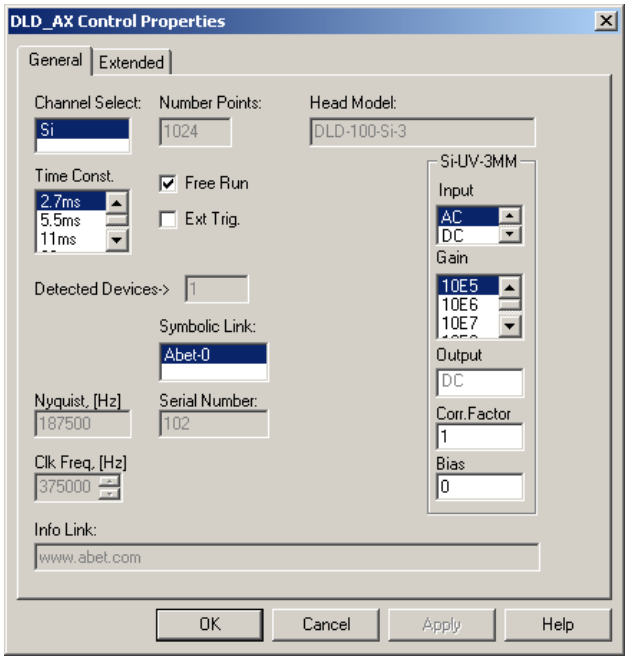
The property page look depends on the type of head you are using

Below are some examples:









Nonsequential Enumeration:

Situation of non sequential enumerations happens when one of DLD's was hot removed or disconnected and then reinserted to the bus. It may lead to some confusion for inexperienced users. Simplest solution: power down detector and PC and start fresh.

To keep track of enumeration scheme in your custom program please interrogate property

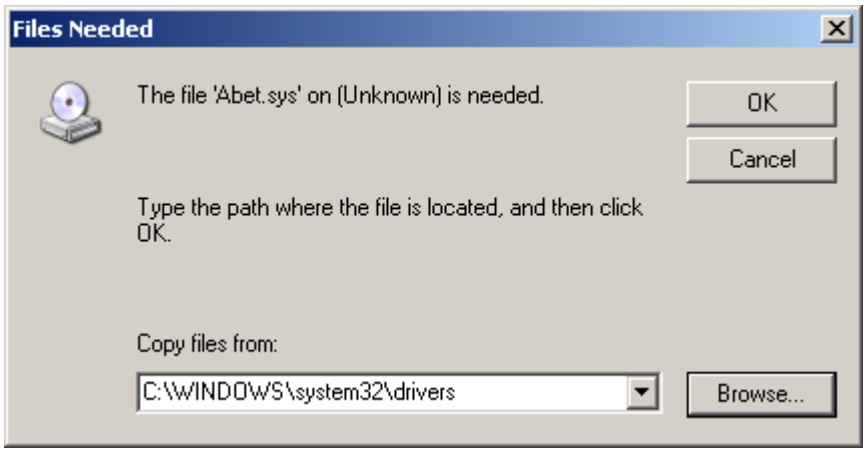
EnumerationChain: 'AEAEEEEEEEEEEEE'

Interpretation of this string is as follows:

Abet-0 Empty Abet- 2 Empty Empty Empty Empty ……..etc.

By issuing the SymbolicLink = "Abet-2" your program will connect you with that device.

If device is plugged into a different hub port than that used during original installation Windows may ask to repeat installation. By pointing to Windows\system32\drivers folder Windows will find the Abet driver and continue installation. No need to use CD-ROM.

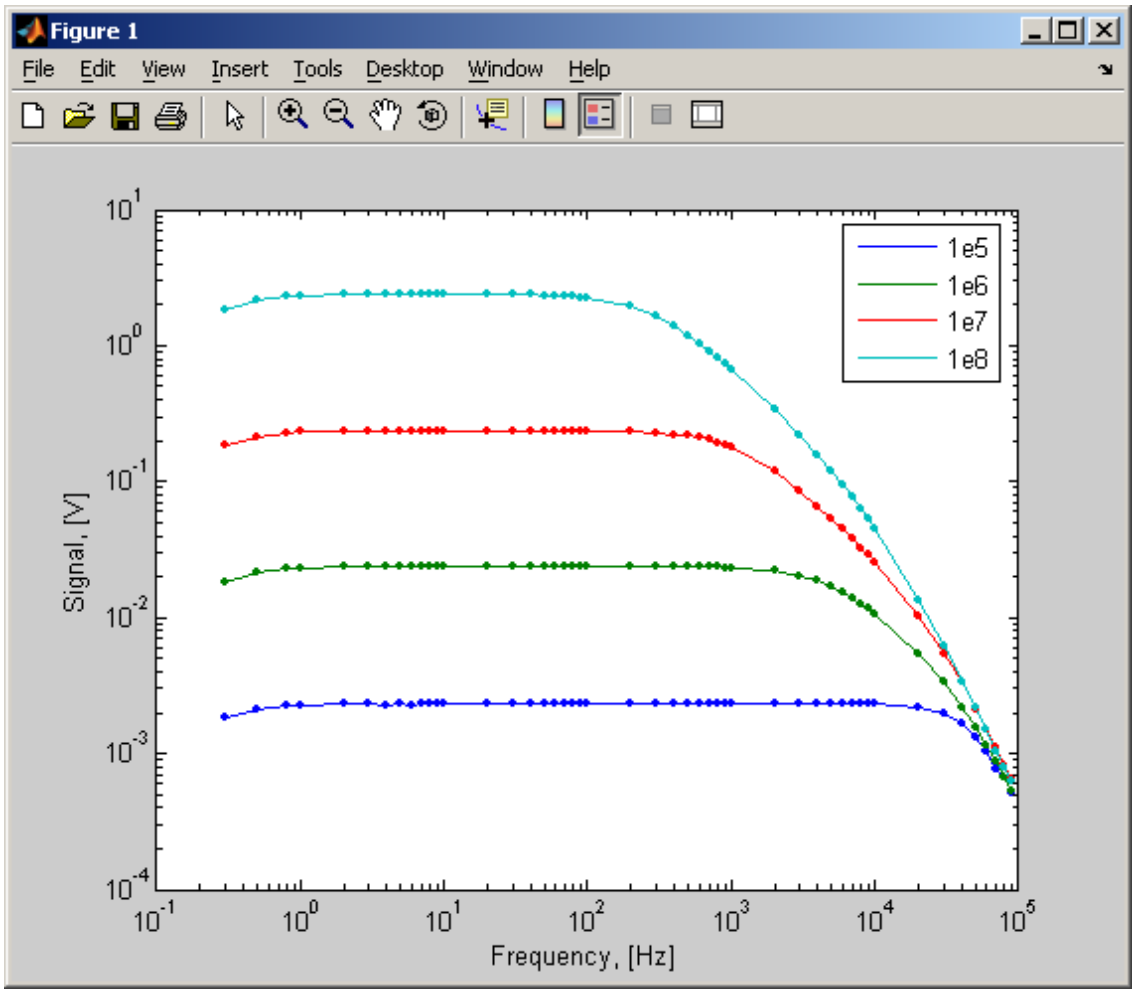


6 Specifications

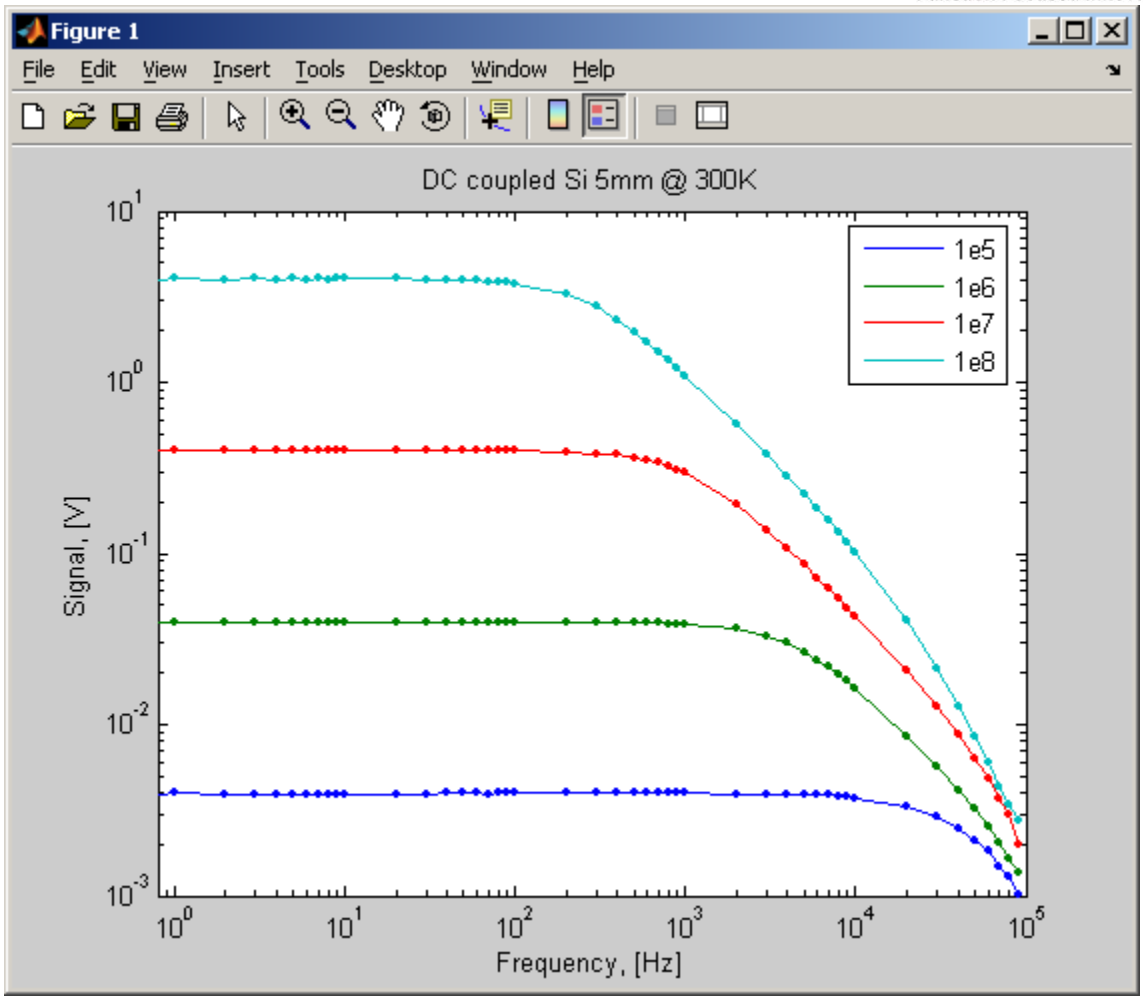
All specifications are subject to model dependent modifications.

- Compatible with PC's running Windows XP or later
- USB 2.0 or higher (cable not included)
- ActiveX interface. Each ActiveX communicates with one DLD at a time. Multiple ActiveX instances can run simultaneously allowing ratiometric measurements.
- A photodiode of your choice (system frequency response depends on diode capacitance and gain – see typical curves below). Just about any diode in a package up to TO-8 size can be accommodated.
- Room Temperature and TE cooled models. TE cooler controller built in
- Software selectable transimpedance gains of 10^5, 10^6, 10^7 and 10^8 V/A
- 16 bit, 375 kHz Analog to Digital Converter.
- Si/InGaAs sandwich models with dual A/D channels - two fully independent transimpedance amplifier and ADC channels are included for sandwich detectors
- TTL Sync through SMA connector. When external trigger is used, first point taken is delayed 2.730677 ± .000011 ms. Each following point is then taken at 1/375 kHz A/D digitization cycle increments.
- Universal voltage power supply. 100 – 240 V, 50/60 Hz
- CE mark

Some typical frequency response curves at various gain settings:

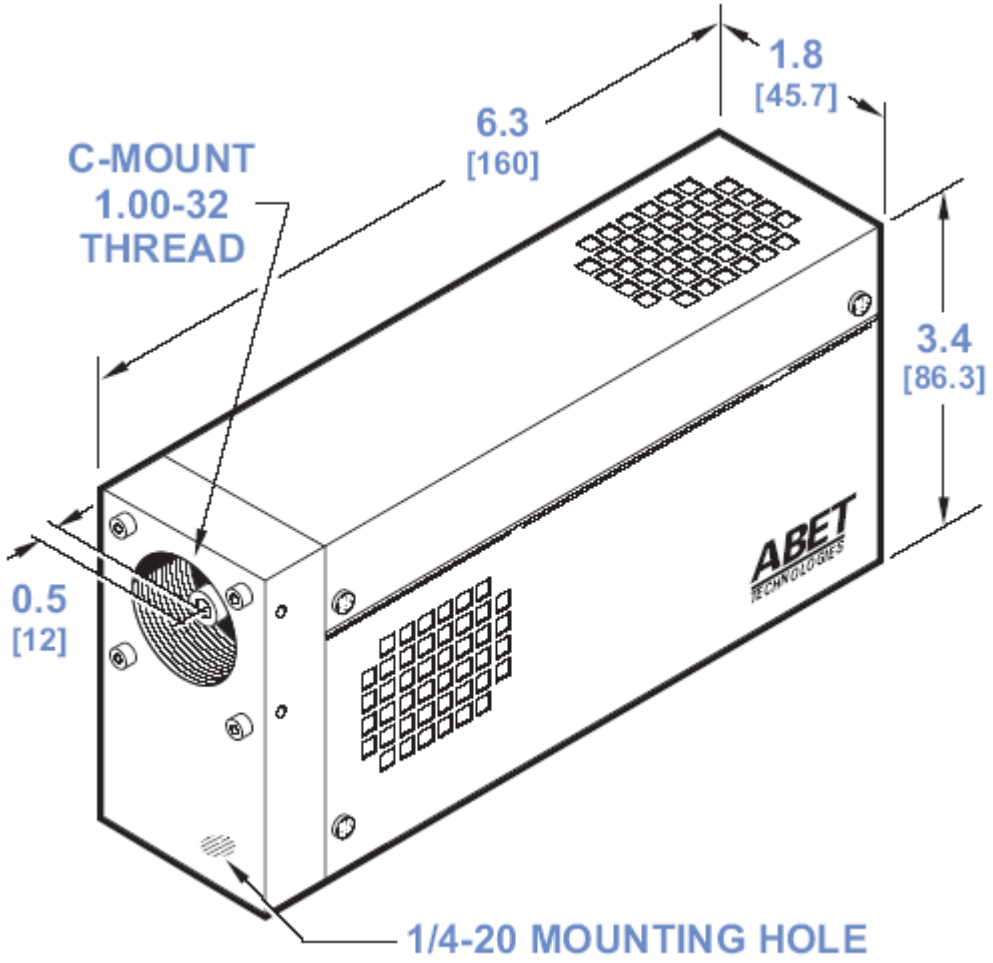


Frequency characteristics of a 3 mm silicon diode, AC coupled



Frequency characteristics of a 5 mm silicon diode, DC coupled

The slight waviness of some of the plots above is in all likelihood the result of source misbehavior rather than that of the detector but we had no easy way of independently verifying it.



Typical dimensions of a DLD. A ¼-20 tapped hole under the detector element allows for mounting of the DLD on an optical bench. ThorLabs ER 6 mm series rod mounting holes on a 30 mm pattern allow adaptation of any optical mount compatible with that caging system. C-mount 1.00-32 threads allow the use of a multitude of commercially available accessories and adapters.

7 Declaration of Conformity

DECLARATION OF CONFORMITY

Manufacturer's name:	Abet Technologies
Manufacturer's address:	282 Cronoque Road
	Milford, CT 06460
	USA
Declares that the product:	
Product Name	Digital Light Detectors
Model Number:	Abet Technologies Model DLD-100 series
Conforms to the following Product Specifications:	
Safety:	EN 61010-1 (2001 – 02)
EMC:	EN 50081-1: 1992
	EN 55022: 1994 / EN 55011: 1993 Class B
	EN 50082-1: 1992
	IEC 801-2:1991 / IEC 1000-4-2: 1995
	ENV 50140: 1993 / EC 1000-4-3: 1995 / EN 61000-4-3: 1995
	IEC 801-4: 1988 / IEC 1000-4-4: 1995
Complies with the following Directives:	
- the EMC Directive	89/336/EEC
- the Low Voltage Directive	73/23/EEC

And accordingly, carries the CE mark.

A

Milford, CT February, 2005

Allen Smith (Signature)

President (Name) (Title)

8 Warranty and Returns

Abet Technologies warrants that all goods described in this manual (except consumables such as lamps, bulbs, filters, ellipses, etc.) shall be free from defects in material and workmanship. Such defects become apparent within the following period:

1. All products described here, except spare parts: one (1) year or 3000 hours of operation, whichever comes first, after delivery of the goods to the buyer.
2. Spare parts: ninety (90) days after delivery of goods to the buyer.

Abet Technologies' liability under this warranty is limited to the adjustment, repair and/or replacement of the defective part(s). During the above listed warranty period, Abet Technologies shall provide all materials to accomplish the repaired adjustment, repair or replacement. Abet Technologies shall provide the labor required during the above listed warranty period to adjust, repair and/or replace the defective goods at no cost to the buyer ONLY IF the defective goods are returned, freight prepaid, to a Abet Technologies designated facility. If goods are not returned to Abet Technologies, and the user chooses to have repairs made at their premises, Abet Technologies shall provide labor for field adjustment, repair and/or replacement at prevailing rates for field service, on a portal-to-portal basis.

Abet Technologies shall be relieved of all obligations and liability under this warranty of:

1. The user operates the device with any accessory, equipment or part not specifically approved or manufactured or specified by Abet Technologies unless buyer furnishes reasonable evidence that such installations were not the cause of the defect. This provision shall not apply to any accessory, equipment or part which does not affect the safe operation of the device.
2. The goods are not operated or maintained in accordance with Abet Technologies' instructions and specifications.
3. The goods have been repaired, altered or modified by other than authorized Abet Technologies personnel.
4. Buyer does not return the defective goods, freight prepaid, to a Abet Technologies facility within the applicable warranty period.

IT IS EXPRESSLY AGREED THAT THIS WARRANTY SHALL REPLACE ALL WARRANTIES OF FITNESS AND MERCHANTABILITY. BUYER HEREBY WAIVES ALL OTHER WARRANTIES, GUARANTEES, CONDITIONS OR LIABILITIES, EXPRESSED OR IMPLIED, ARISING BY LAW OR OTHERWISE, WHETHER OR NOT OCCASIONED BY ABET TECHNOLOGIES' NEGLIGENCE.

This warranty shall not be extended, altered or varied except by a written document signed by both parties. If any portion of this agreement is invalidated, the remainder of the agreement shall remain in full force and effect.

CONSEQUENTIAL DAMAGES

Abet Technologies shall not be responsible for consequential damages resulting from misfunctions or malfunctions of the goods described in this manual. Abet Technologies' total responsibility is limited to repairing or replacing the misfunctioning or malfunctioning goods under the terms and conditions of the above described warranty.

INSURANCE

Persons receiving goods for demonstrations, demo loan, temporary use or in any manner in which title is not transferred from Abet Technologies, shall assume full responsibility for any and all damage while in their care, custody and control. If damage occurs, unrelated to the proper and warranted use and performance of the goods, recipient of the goods accepts full responsibility for restoring the goods to their condition upon original delivery, and for assuming all costs and charges.

RETURNS

Before returning equipment to Abet Technologies for repair, please call the Customer Service Department at (203) 540-9990. Have your purchase order number available before calling Abet Technologies. The Customer Service Representative will give you a Return Material Authorization number (RMA). Having an RMA will shorten the time required for repair, because it ensures that your equipment will be properly processed. Write the RMA on the returned equipment's box. Equipment returned without a RMA may be rejected by the Abet Technologies Receiving Department. Equipment returned under warranty will be returned with no charge for the repair or shipping. Abet Technologies will notify you of any repairs not covered by the warranty, with the cost of the repair, before starting the work.

Please return equipment in the original (or equivalent) packaging. You will be responsible for damage incurred from inadequate packaging, if the original packaging is not used.

Include the cables, connector caps and antistatic materials sent and/or used with the equipment, so that Abet Technologies can verify correct operation of these accessories.

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