



X-123 QUICK START GUIDE

For X-123 units with SDD, Si-PIN, or CdTe detectors

Equipment List for an Amptek X-123 system:

- X-123 X-Ray Spectrometer.
- Mini USB cable.
- +5 VDC power supply.
- Amptek Installation CD.
- A PC supplied by the user with Windows XP PRO SP2 or higher recommended.



NOTES:

- The Amptek X-123 is a combination of other Amptek products. The x-ray detector and preamplifier are the same as the XR100. The digital pulse processor is the DP5, and the power supply board is the PC5. In addition to the X-123 User Manual, please refer to the user manuals and specifications of those products for additional information. For help using the software please see the Help File in the ADMCA software.
- In order to be compatible with Windows 7 64-bit, a new USB driver must be used (WINUSB). If you are an OEM and have written custom software using the DPPAPI with the old APAUSB driver and you statically linked the dll, you will have to re-compile your software with the new dll. Dynamically linked software does not require a re-compile, only copying the new dll into your installation. No source code changes are necessary in either case.

Software Installation

1. Install the WINUSB Driver. Please see the "WINUSB Driver Installation Instructions" for this procedure.
2. Install the ADMCA display and acquisition software. Locate the directory called "ADMCA" on the Amptek Installation CD and copy the entire directory onto your computer. In that directory is the "ADMCA.exe" file. Open this file to start the software. You can right-click on the ADMCA.exe file and create a shortcut which can be placed on your desktop for easy access.

X-123 Connection Instructions

1. Verify that the X-123 is completely unplugged (both USB and power).
2. Use the USB cable to connect the X-123 USB connector, which is located on the back panel, to the PC's USB connector.
3. Plug the DC power supply into a 110/220 AC outlet. Connect the other end to the X-123 power supply input, which is labeled "5V" and is located on the back panel.

NOTE: Grounding is critical to obtaining the best performance. Specifically, we strongly recommend using a single point ground for the system. To ensure this, use a 3-prong to 2-prong adapter on the power supply of any notebook computer. This prevents the notebook from introducing a second ground into the system.

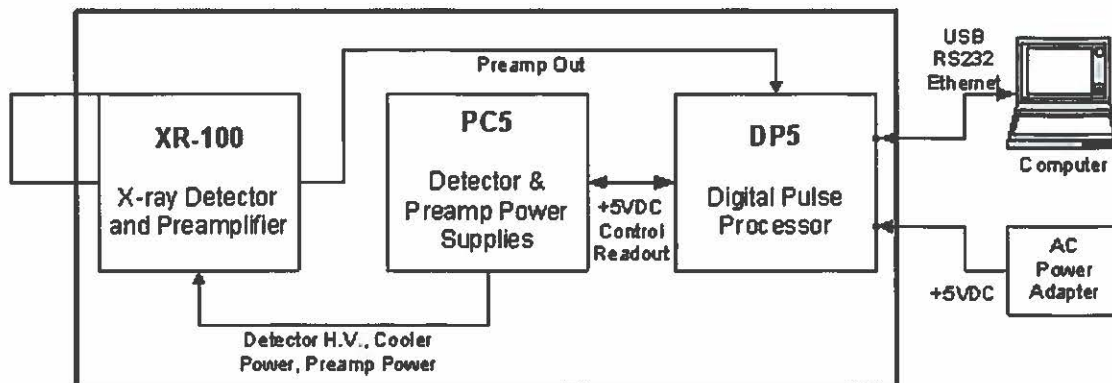


Figure 1: Connection Diagram. The detector can be SDD, Si-PIN, or CdTe.

Quick Use of the X-123

1. Connect the X-123 and PC as described in the previous section.
2. Launch the ADMCA software by opening the ADMCA.exe file.
3. When the "Starting ADMCA" box appears as in figure 2, select "DP5 / X123-SDD" and click on "Connect."

The X-123 unit should now be connected to the software. To verify this, confirm that the correct serial number for the X-123 is shown in the top right corner of the software. The serial number can be found on the side of the X-123. The USB symbol located at the bottom right corner of the software should be green.

4. When shipped from the Now that the X-123 is connected, the proper configuration must be selected for the detector. The ADMCA software includes configurations for most Amptek detectors. These configurations are identified by the detector material, dimensions, and cooler type.

- NOTE: The X-123 remembers the last configuration, so when powering the system for the first time and clicking Connect, the factory configuration is loaded. This is the same configuration that is displayed on test sheet shipped with the detector.

5. To select a configuration select "DPP Setup" under the "DPP" menu in the software or by clicking the "acquisition setup" button on the toolbar. The dialog box shown in Figure 3 will appear. The configurations can be selected through the dropdown menu labeled "Read Amptek Detector Configuration."

6. Once the correct configuration is selected from the dropdown menu the indented grey area above the dropdown menu should read (for example) "Loaded Si 6mm2/500um 2-Stage Cooler configuration." Click "Show Current Configuration" to view the settings. A box will appear with the settings. Click OK to exit the box.

7. To apply the selected configuration, click the "Apply" button. Then select the "OK" button to exit this dialog box.

8. Now that the X-123 has loaded the appropriate configuration for that detector, an acquisition can be started. Place a source in front of the detector. To start an acquisition, press the space bar. The space bar will also stop an acquisition. It may take the detector a few minutes to stabilize, so if the acquisition does not look correct wait a few minutes and then press the "A" key on the keyboard to clear the acquisition and begin a new one. It can take up to 2 minutes for an Amptek detector to stabilize after a configuration has been sent.

- Once the detector has stabilized adjust some of the thresholds which prevent low-end noise and other unwanted counts from affecting the spectrum. This can be done automatically by the software by clicking the "Tune Slow/Fast" button on the toolbar. This must be done with no source in front of the detector.

9. A common adjustment is to change the gain of the X-123. Changing the gain changes the full scale energy range. For example, a gain of 100 may correspond to a full scale energy range of 15 keV, whereas a gain of 50 will have a 30 keV full scale. This can be done in the "Gain & Pole Zero" tab of the DPP properties dialog box or by using the gain buttons on the toolbar. It is necessary to readjust the thresholds whenever the gain is changed. This can be done automatically as explained in the previous step. For more information on gain and calibrating the channel scale to energy please see the document "How to Change the Full Scale Energy Range and Calibration" located on the CD in the "Documentation\Application Notes and FAQs" directory.

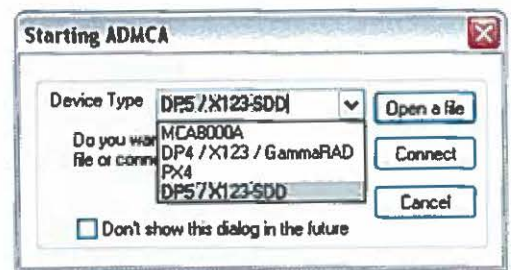


Figure 2: Starting ADMCA

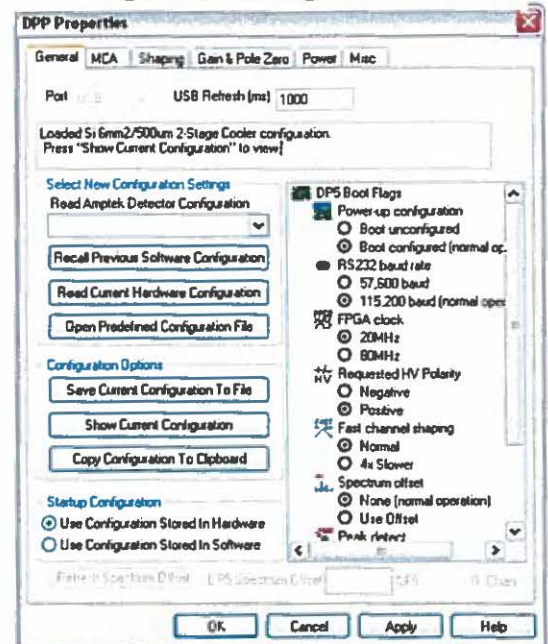


Figure 3: Properties dialog box.

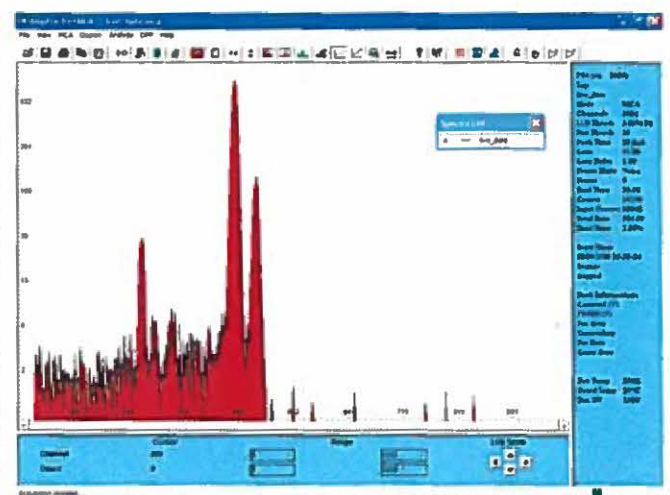


Figure 4: Acquisition spectrum for an ⁵⁵Fe source.



Regions of Interest (ROI)

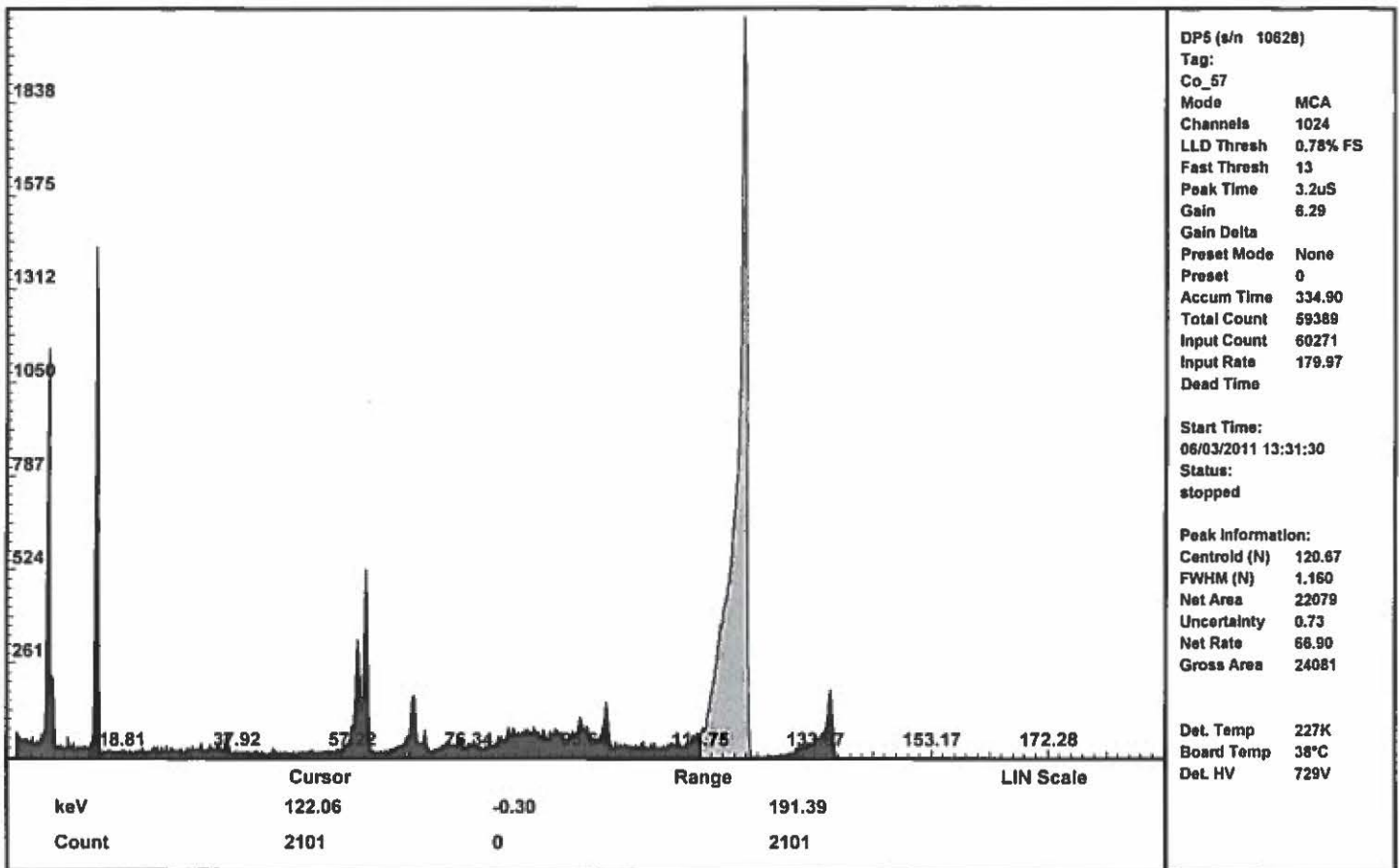
To mark an ROI, click the "Edit ROI" button on the toolbar. The cursor will change to a vertical arrow. Click and hold the left mouse button at the left base of the peak you want to mark and drag the cursor across the peak. You will see the color change as the ROI is marked. Release the mouse button at the right end of the peak. If you click the mouse into the highlighted region, it will become a lighter color indicating that it is the selected ROI. The Peak Information on the right hand info panel is displayed for the selected ROI.

Calibrating the Horizontal Axis

The horizontal (x) axis in the plot window defaults to channels. To calibrate the scale to e.g. energy, you must know the energy of at least two peaks in your spectrum. First mark two regions of interest as described above. Then click on the Calibrate button on the toolbar. Click the cursor into the first ROI in the plot window (it becomes highlighted), and then click Centroid in the Calibrate box. This takes the centroid of the peak and puts it as the channel value of the first point that will be used for the calibration. Enter in the value of that centroid, e.g. the energy of that peak, into the Value box. Now click Add. The first point will appear in the list. Repeat for the second peak you highlighted. There should now be two lines in the list. Enter in the appropriate units in the "Units" box, e.g. "Energy (keV)" and then click OK. The horizontal scale will now be displayed in the calibrated units. To toggle between calibrated and non-calibrated units, press F7 on the keyboard. See the document "How to Change the Full Scale Energy Range and Calibration" located on the CD in the "Documentation\Application Notes and FAQs" directory for more information.

Notes and Troubleshooting:

- By default, the software accumulates the counts (MCA mode). During set-up it may be convenient to use "DELTA" mode, where counts are not integrated but are updated every second (i.e. only one second's worth of data are displayed every second). Click the toolbar icon marked "MCA/DELTA Mode" to toggle between DELTA and MCA mode.
- If no spectrum appears, check that the system is acquiring data. The "Status" on the right hand Info Panel should read "acquiring."
- Sometimes no spectrum will appear if Pile-Up Rejection (PUR) is enabled and the Fast Threshold is set improperly (in the DPP Properties-Shaping tab). Turn PUR off and check if the spectrum appears. If it does then the Fast Threshold needs to be set correctly. Remove any source from in front of the detector and click the "Tune Slow/Fast Thresholds" button on the toolbar. Put the source back and check if the spectrum appears. If it does not then you will have to adjust it manually as described below.
- The Fast and Slow Thresholds can be adjusted manually. First turn off PUR as described above. Then click the cursor to channel 1 and press F8. This will set the Slow Threshold (LLD) to channel 1. This will show the noise of the system. Click the cursor just to the right of the noise and then press F8. Press the "A" key to clear. There should be no counts accumulating. Now put the device into "Delta" mode by clicking the Delta button on the toolbar. Open the DPP Properties and go to the Shaping tab. Adjust the Fast Threshold until 5 to 15 counts per second appear in the Input Counts in the right-hand Info Panel. Now turn on PUR and click OK. Click the Delta button to get back to normal MCA mode and put the source back in front of the detector. The Input Counts should slightly exceed the Counts at low count rate.
- If problems persist there may be a communication or configuration problem. Unplug the X-123 power and close the software. Then open the software and plug in the X-123 power adapter. In the bottom left-hand corner of the software you should see a "1 Detected" for the USB connection. Once you see this, click on Connect. Then go to the DPP Properties page and reload the appropriate default configuration as discussed above and try the acquisition again.
- If the unit does communicate but still no spectrum is seen, take an acquisition for 30 seconds. It does not matter if a spectrum appears. Then go to the File menu and select Save As. Save the .mca file and email it to sales@amptek.com with a description of the setup and the problem.



DP5 (s/n 10628)
Tag:
Co_57
Mode MCA
Channels 1024
LLD Thresh 0.78% FS
Fast Thresh 13
Peak Time 3.2uS
Gain 6.29
Gain Delta
Preset Mode None
Preset 0
Accum Time 334.90
Total Count 59389
Input Count 60271
Input Rate 179.97
Dead Time

Start Time:
06/03/2011 13:31:30
Status:
stopped

Peak Information:
Centroid (N) 120.67
FWHM (N) 1.160
Net Area 22079
Uncertainty 0.73
Net Rate 66.90
Gross Area 24081

Det. Temp 227K
Board Temp 38°C
Det. HV 729V

X-123 S/N: X010628 AXR-CDTE S/N: 97889
Be Window Thickness - 4 mil, Temperature Sensor - Diode, Collimator - No Internal, Cooler Stage - 2 stage,
Detector Thickness - 1mm, Detector Area - 9mm2, Detector Type - CdTe, Feedback Type - T,
Assembly Type - standard 1.5 in EXT
T = 227 Degrees K, FWHM@122.06keV: 1.160eV, Tested with 3.2uS Peak Time, HV Bias: 730 Volts, Sil-Pad Added Underneath Detector,
Amptek Code # ZY-TC2470D-G4BB, Vacuum Grease Added
Co_57 Configuration

COM Port: USB
Rise: 3.2uS
Top: 0.1uS
Fast Threshold: 13
PUR Enable: PUROff
RTD ON/OFF: RTDOFF
RTD Ratio: 25.0%
RTD Slow Thresh: 19% FS
AutoBaseline: Off
BLR: BLR:ON DN:256 UP:256
Acquisition Mode: MCA
MCS Timebase: 10mS/channel
MCA Channels: 1024
Slow Threshold: 0.78% FS
Buffer Select: Buffer A
Gate Input (TTL): GateOff
Preset: None
Coarse Gain: 8.39x
Fine Gain: 0.7500
Input Polarity: Negative
Input Offset: -2.048V
Pole Zero: OFF
Det Rst Lockout: OFF
TEC: 225.0K
HV: 729.5V
Preamp Power: 8.5V
Analog Out: Shaped Pulse
Offset: 101mV
Aux: ICR
Audio: Off

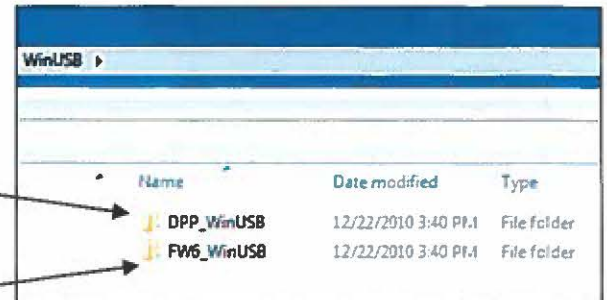


WINUSB Driver Installation Instructions Rev. B

Please follow these instructions for installing the WINUSB driver. The WINUSB driver is compatible with Windows XP, Vista, and Window 7 operating systems, both 32 and 64-bit.

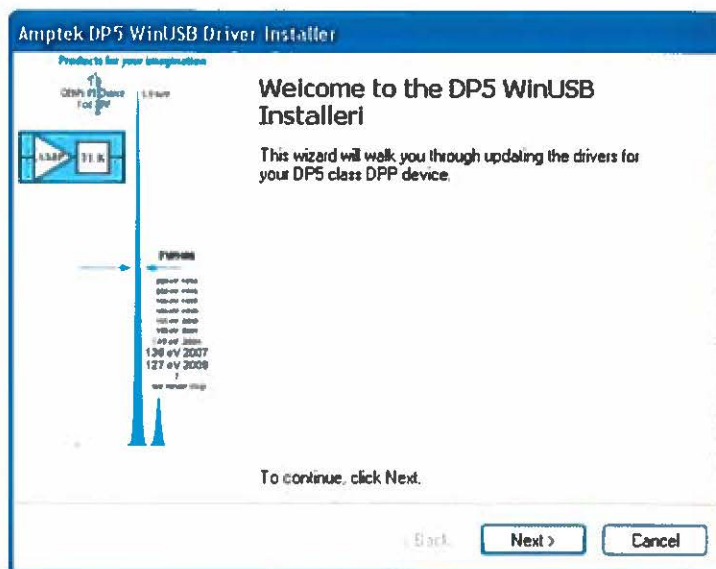
NOTE: There are two options in the “WinUSB” directory.

- Select DPP_WinUSB for:
 - All DP4 and PX4 based products
 - DP5 based products with FW5 (default)
- Select FW6_WinUSB for:
 - DP5 and PX5 based products with FW6 (upgradeable by the user)
 - DPG
 - GAMMA-RAD5



Windows XP Installation

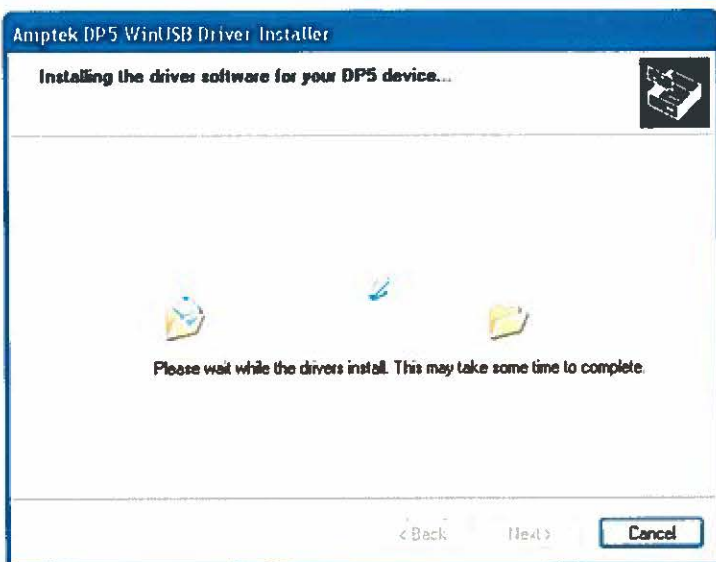
1. Do NOT plug in the USB device.
2. Copy the WinUSB directory to your local hard drive.
3. In the WinUSB directory open the “dppinst.exe” file.
4. Click OK/YES on any security warnings that appear.
5. The Amptek WinUSB Installer will start. Click Next.



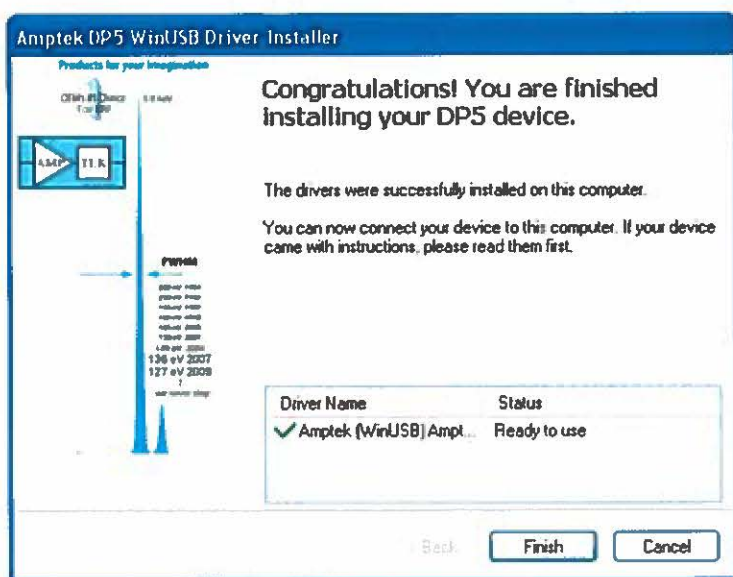
6. The Amptek WinUSB Installer will start. Click Next.



WINUSB Driver Installation Instructions Rev. B



7. The drivers will install.



8. Click Finish.
9. Plug in the USB device.
10. The DPP Digital Pulse Processor USB driver is now installed.
11. To install the ADMCA or DPPMCA (FW6 only) software simply copy the directory to your local machine and run the executable. You can create a shortcut for your desktop by right-clicking on the executable, selecting Create shortcut, and then dragging the shortcut to your desktop. You cannot run the ADMCA or DPPMCA software from CD, it must be installed locally and you must have full read/write access to that directory.



1. Do NOT plug in the USB device.
2. Copy the WinUSB directory to your local hard drive.
3. In the WinUSB directory right click on the “dppinst.exe” file and select “Run as administrator.”
4. Click OK/YES on any security warnings that appear.
5. The Amptek WinUSB Installer will start. Click Next.





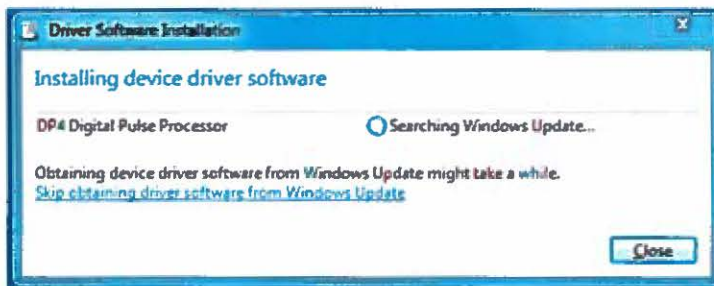
WINUSB Driver Installation Instructions Rev. B



8. Plug in the USB device.



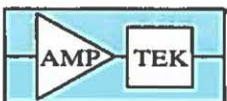
9. HINT: Click on the balloon and click "Skip obtaining software from Windows Update." This will save a few minutes of installation time.



10. The DPP Digital Pulse Processor USB driver is now installed.



11. To install the ADMCA or DPPMCA (FW6 only) software simply copy the directory to your local machine and run the executable. You can create a shortcut for your desktop by right-clicking on the executable, selecting Create shortcut, and then dragging the shortcut to your desktop. You cannot run the ADMCA or DPPMCA software from CD, it must be installed locally and you must have full read/write access to that directory.



Complete X-Ray and Gamma-Ray Spectrometer

X-123CdTe

The X-123CdTe is a complete X-Ray Detector & Gamma-Ray System in one small box that fits in your hand.

INCLUDES

- 1 CdTe X-Ray & Gamma-Ray Detector and Preamplifier
- 2 Digital Pulse Processor and MCA
- 3 Power Supply and Interface with PC

OEM's #1 Choice

Features

- Compact integrated system
- Simple to operate
- Small size (2.7 x 3.9 x 1 in or 7 x 10 x 2.5 cm)
- Low power (2.5 W)
- Light weight (6.3 oz or 180 g)
- USB and RS232 Communication

Applications

- Medical X-Ray & Gamma-Ray Detection, Mammography, Radiology, Conventional X-Ray
- X-Ray Fluorescence Instrumentation
- Art and Archaeology
- Portable X-Ray & Gamma-Ray Instruments
- X-Ray & Gamma-Ray Research
- Teaching
- Nuclear Plant Monitoring
- Uranium and Plutonium Detection

Detector

- CdTe for X-Ray & Gamma-Ray detection
- 2-Stage thermoelectrical cooler
- Area: 9 or 25 mm²
- Thickness: 1 mm

Typical Performance

- Resolution at 122 keV <1.2 keV FWHM
- Optimum energy range: 5 keV to 150 keV
- Max count rate: Up to 2×10^5 cps

Detailed performance depends on detector and configuration, which can be optimized for specific applications.

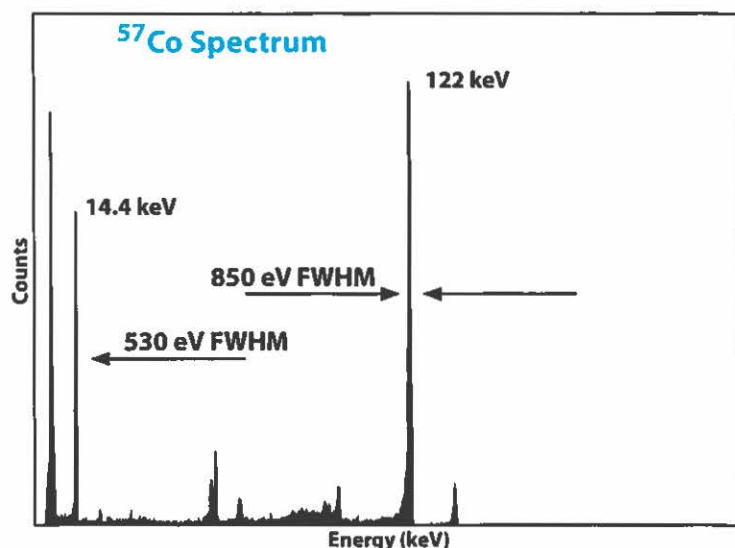
Overview

The X-123 represents the culmination of 14 years of X-ray detector development at Amptek. Our philosophy has always been to create small, low power, high performance instruments while keeping them simple to operate. The X-123CdTe exemplifies this philosophy by providing in a single package the XR-100T-CdTe X-Ray and Gamma-Ray Detector and its Charge Sensitive Preamplifier; the DP5 Digital Pulse Processor with pulse shaper, MCA, and interface; and the PC5 Power Supply. *All that is needed is a +5 Volts DC input and a USB, Ethernet or RS232 connection to your computer.*



No Liquid Nitrogen

The X-123CdTe is capable of detecting energies from a few keV to several hundreds of keV.



AMPTek INC. 14 DeAngelo Drive, Bedford, MA 01730-2204 U.S.A.

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X-123CdTe Specifications

SYSTEM PERFORMANCE	
Energy Resolution @ 122 keV, ⁵⁷ Co	9 mm ² : <1.2 keV FWHM, typical 25 mm ² : <1.5 keV FWHM, typical
Energy Range	5 to 150 keV. May be used at higher energy with lower efficiency, contact Amptek.
Maximum Count Rate Depends on peaking time. Recommended maxima for 50% dead time with pile-up rejection enabled are shown below:	
DPS Peaking Time (μs)	2.4 μs 6.4 μs 25.6 μs
Shaping Time (μs)	1.0 μs 2.9 μs 11.6 μs
Recommended Max Rate	1.2 x 10 ⁵ 4.6 x 10 ⁴ 1.2 x 10 ⁴
DETECTOR AND PREAMPLIFIER	
Detector Type	CdTe (also available with Si-PIN or SDD)
Detector Area	9 mm ² or 25 mm ²
Detector Thickness	1 mm
Be Window Thickness	4 mil (100 μm)
Thermoelectric Cooler	2-stage
Preamplifier Type	Amptek custom design with current feedback.
PULSE PROCESSOR	
Gain	Combination of coarse and fine gain yields overall gain continuously adjustable from 0.84 to 127.5
Coarse Gain	Software selectable settings from 1.12 to 102 in 16 log steps. 1.12, 2.49, 3.78, 5.26, 6.56, 8.39, 10.10, 11.31, 14.56, 17.77, 22.42, 30.83, 38.18, 47.47, 66.26, 102.0
Fine Gain	Software selectable, 0.75 to 1.25, 10 bit resolution
Full Scale	1000 mV input pulse @ x1 gain
Gain Stability	<20 ppm / °C (typical)
Pulse Shape	Trapezoidal
Peaking Time	24 software selectable peaking times between 0.8 and 102 μs, approximately log spaced, corresponding to semi-gaussian shaping times of 0.4 to 45 μs.
Dead Time	Total dead time is 1.05 times the peaking time. No conversion time.
Fast Channel Pulse Pair Resolving Time	120 ns
MCA	
Number of Channels	Software selectable to 8k, 4k, 2k, 1k, 0.5k, or 0.25k channels
Presets	Time, total counts, counts in an ROI, counts in a channel
COMMUNICATIONS	
USB	2.0 full-speed (12 Mbps)
Serial	Standard RS232 at 115.2 k or 57.6 Kbaud
Ethernet	10 base-T

POWER			
Nominal Input	+5 VDC at 500 mA (2.5 W) (typical). Current depends strongly on detector ΔT. Ranges from 300 to 800 mA at 5 VDC. AC adapter provided.		
Input Range	4 V to 6 V (300 to 200 mA, 500 mA max))		
High Voltage Supply	internal multipller, set to 500 V, adjustable to 750 V		
Cooler Supply	Closed loop controller with ΔT _{max} = 85°C		
GENERAL and ENVIRONMENTAL			
Operating Temperature	-20 °C to +50 °C		
Warranty Period	1 year		
Typical Device Lifetime	5 to 10 years, depending on use		
Storage and Shipping	Typical: -20 °C to +50 °C, 10 to 90% humidity non-condensing Long-term storage: 10+ years in dry environment		
Compliance	RoHS Compliant		
CONNECTORS			
USB	Standard USB Mini 1.1 jack		
RS232 Standard 2.5 mm stereo audio jack			
Tip	Transmit	To PC Receive DB9 pin 2 (DB25 pin 3)	
Ring	Receive	To PC Transmit DB9 pin 3 (DB25 pin 2)	
Sleeve	Ground	To PC Ground DB9 pin 5 (DB25 pin 7)	
Ethernet		Standard Ethernet connector (RJ-45)	
Power		Hlrose MQ172-3PA(SS), Mating plug: MQ172-3SA-CV	
Auxiliary 2 x B 16-pin 2 mm spacing (Samtec part number ASP-135096-01). Mates with cable assembly (Samtec P/N TCMD-08-S-XX.XX-01). Top row odd pins, bottom row even pins. Top right pin = 1, bottom right pin = 2.			
Pin #	Name	Pin #	Name
1	SCA1	2	SCA2
3	SCA3	4	SCA4
5	SCA5	6	SCA6
7	SCA7	8	SCA8
9	AUX_IN_1	10	AUX_OUT_1
11	AUX_IN_2	12	AUX_OUT_2
13	IO2	14	ID3
15	GND	16	GND

For full system specifications, please see <http://www.amptek.com>

X-123CdTe Interface Software

ADMCA

The X-123CdTe can be controlled by the Amptek ADMCA display and acquisition software. This software completely controls and configures the X-123CdTe, and downloads and displays the data. It supports regions of interest (ROI), calibrations, peak searching, and so on. The ADMCA software includes a seamless interface to the XRF-FP quantitative X-ray analysis software package. Runs under Windows 98SE or later (32-bit only) on PC compatible computers. Windows XP PRO SP2 or later recommended.

DPP API

The X-123CdTe comes with an Application Programming Interface (API) in the form of a DLL library. The user can use this library to easily write custom code to control the X-123CdTe for custom applications or to interface it to a larger system. Examples are provided in VB, VC++, etc. on how to use the API. A Window CE/Pocket PC version is also provided.

VB Demonstration Software

The VB demonstration software runs on a personal computer and permits the user to set the X-123CdTe parameters, to start and stop data acquisition, and to save data files. It is provided with source code and can be modified by the user. This software is intended as an example of how to manually control the X-123CdTe through either the USB or RS-232 interface using the most basic calls without the DPP API. This is primarily needed as an example when writing software for non-Windows platforms.

X-123CdTe Description

Amptek's specialty is X-ray spectrometers, which are small, low power, high performance, and simple to operate. The X-123CdTe combines in a single package Amptek's standard, high performance X-ray spectroscopy components: the XR100T-CdTe detector and preamplifier, DP5 digital pulse processor and MCA, and PC5 power supply. The result is a complete integrated system which can fit in your hand. In many commercially available systems, the preamplifier alone has more size, mass, and power than this integrated system. It requires only 2 connections to run: +5 VDC power and a standard RS-232 or USB bus. With the X-123CdTe, anyone can rapidly obtain high quality X-ray and Gamma-ray spectra.

X-rays & Gamma-rays interact with CdTe atoms to create an average of one electron/hole pair for every 4.43 eV of energy lost in the CdTe. Depending on the energy of the incoming radiation, this energy loss is dominated by either the photoelectric effect or Compton scattering. The probability or efficiency of the detector to "stop" the incoming radiation and create electron/hole pairs increases with the thickness of CdTe.

The detector is mounted on a thermoelectric cooler along with the input FET and coupled to a custom charge sensitive preamplifier. The thermoelectric cooler reduces the electronic noise in the detector and preamplifier, but the cooling is transparent to the user: it operates like a room temperature system.

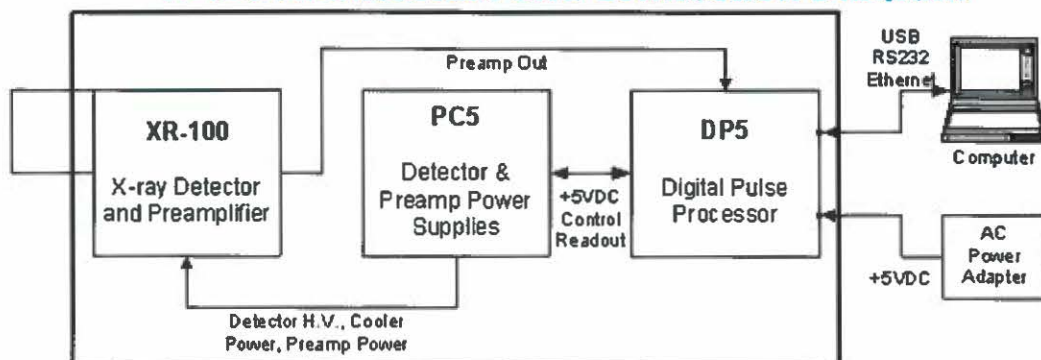
The pulse processor is the DP5, a digital pulse processor which replaces both the shaping amplifier and multichannel analyzer (MCA) found in most analog systems. The use of digital technology improves several key parameters: (1) better performance, specifically better resolution and operation at higher

count rates; (2) greater flexibility since more configuration options are available and they are selected by software over a RS-232 interface, and (3) improved stability and reproducibility. The DP5 digitizes the preamplifier output, applies real-time digital processing to the signal, detects the peak amplitude (digitally), and bins this value in its histogramming memory, generating an energy spectrum. The spectrum is then transmitted over the DP5's interface to the user's computer. The Amptek DP5 has 6 main function blocks to implement these functions: (1) an analog prefilter; (2) an ADC; (3) a digital pulse shaper; (4) pulse selection logic; (5) histogram logic, and (6) interfacing hardware (which includes a microcontroller) and software.

The power supply is Amptek's PC5, a single board. The input is approximately +5 VDC with a current of about 250 mA. The PC5 uses switching supplies to produce all the low voltages required for the digital processor and the preamplifier. It also includes a high voltage multiplier to produce the detector bias voltage, typically 500 V for 1 mm thick CdTe, but variable up to 750 V, and supply for the thermoelectric cooler which provides closed loop control with a maximum temperature differential of 85 °C.

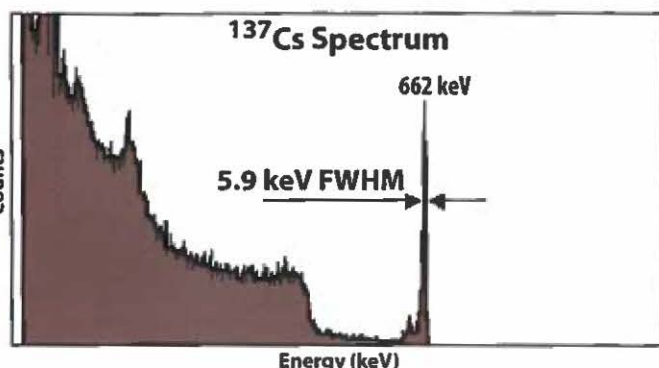
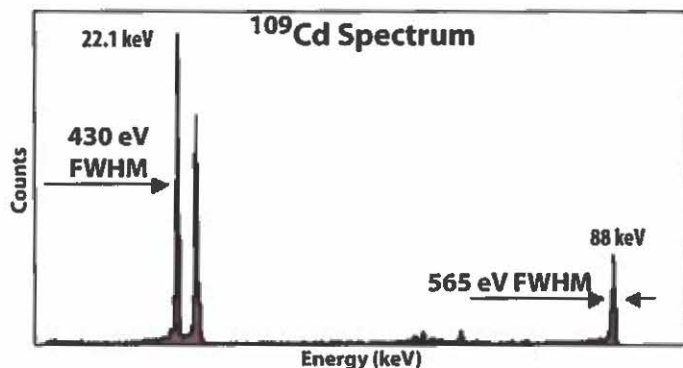
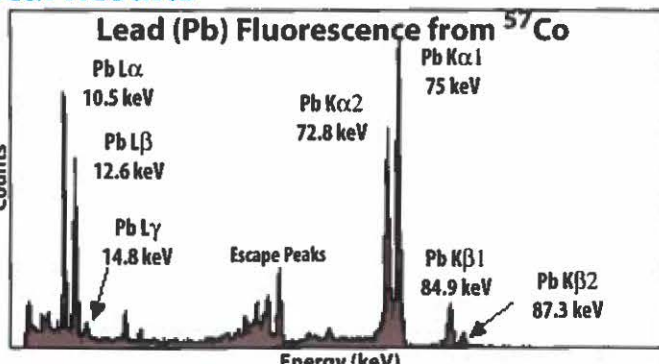
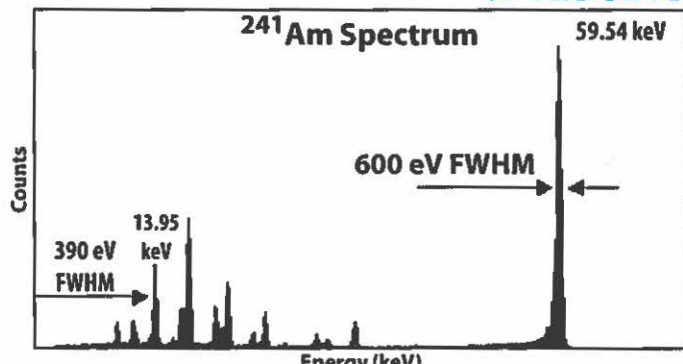
The complete system is packaged in 7 x 10 x 2.5 cm³ aluminum box, with the detector mounted on an extender. In its standard configuration, only two connections are required: power (+5 VDC) and serial (either USB or RS232). The DP5 board supports several additional inputs and outputs, if the X-123CdTe will be integrated with other equipment. This includes an MCA gate, a memory buffer select signal, timing outputs, and SCA outputs.

X-123 Architecture and Connection Diagram

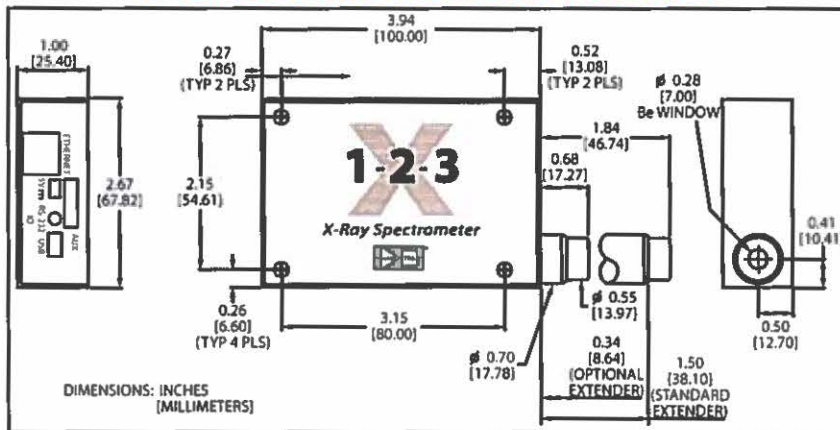


For full system specifications, please see <http://www.amptek.com>

X-123CdTe Typical Results



X-123CdTe Mechanical Dimensions

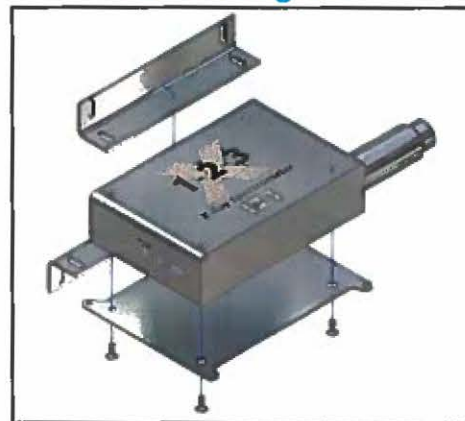


X-123CdTe Experimental Set-up



The X-123CdTe and Mini-X on the MP1 mounting plate.

Mounting Kit

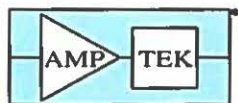


For full system specifications, please see <http://www.amptek.com>

AMPTEK INC.

14 DeAngelo Drive, Bedford, MA 01730-2204 U.S.A.

Tel: +1 (781) 275-2242 Fax: +1 (781) 275-3470 e-mail: sales@amptek.com www.amptek.com

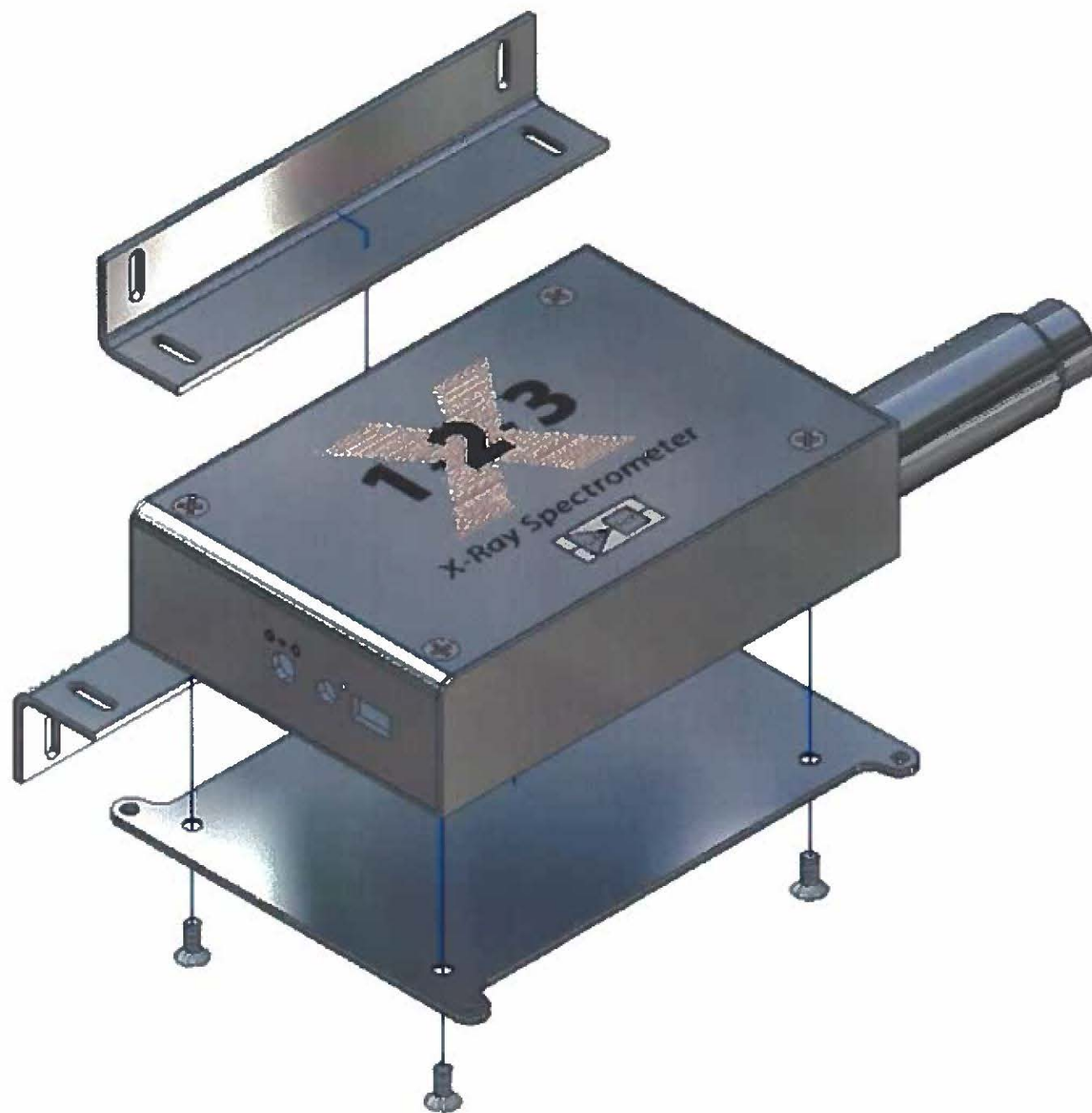




MOUNTING KIT

X-123

Mounting Kit for the X-123



Amptek Inc. 14 DeAngelo Drive, Bedford, MA 01730-2204 USA

Tel: +1 781 275-2242 Fax: +1 781 275-3470 Email: sales@amptek.com <http://www.amptek.com>

Products for your imagination

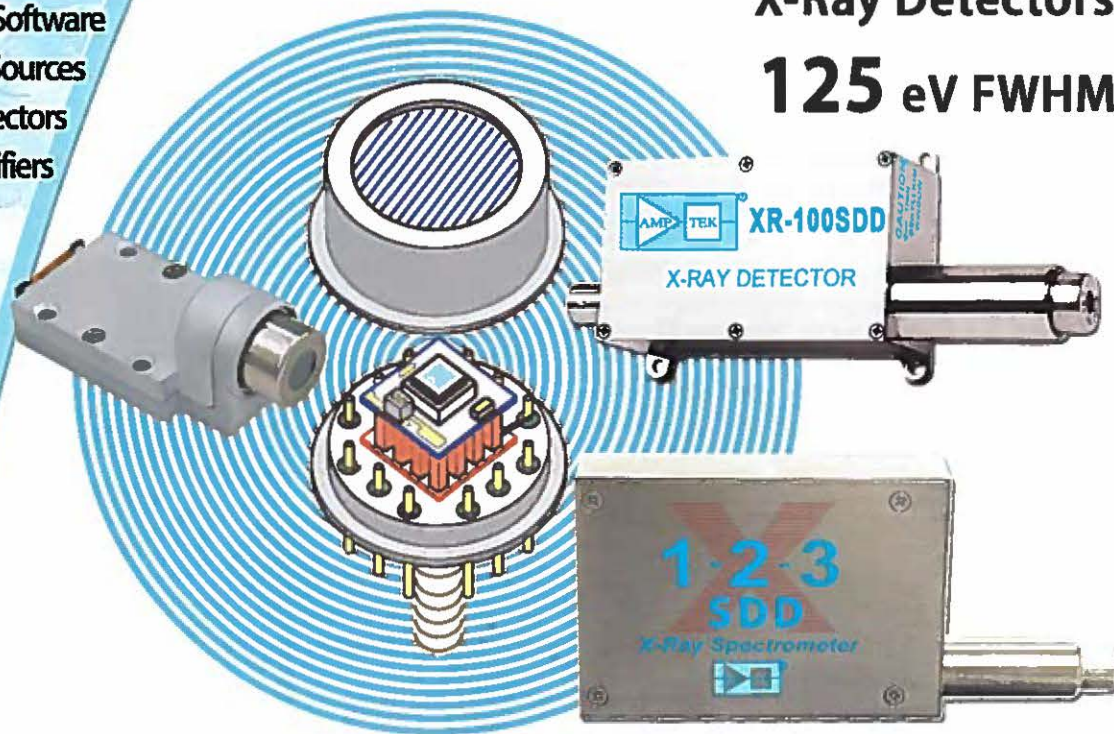
Complete X-Ray Spectrometers
X-Ray and Gamma Ray Detectors
Digital Pulse Processors
Multichannel Analyzer
XRF QA Software
X-Ray Sources
Scintillation Detectors
Charge Sensitive Preamplifiers

New at Amptek

SUPER SDD

X-Ray Detectors

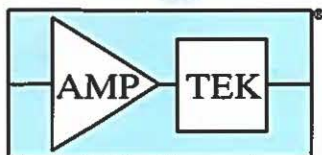
125 eV FWHM



Experimenter's XRF Kits



OEM's #1 Choice
For XRF



Over 30 Years of Innovation
www.amptek.com

New Versions of Top Sellers Inside

X-RAY and GAMMA RAY DETECTORS

X-Ray Fluorescence Made Easy

No Liquid Nitrogen

Low Cost

**OEM's #1 Choice
For XRF**

USB Controlled

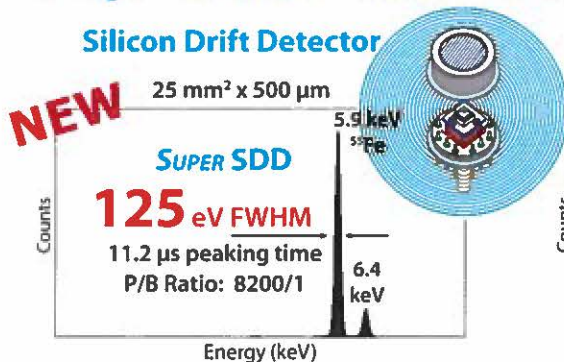
Easy to Use

DETECTOR APPLICATIONS

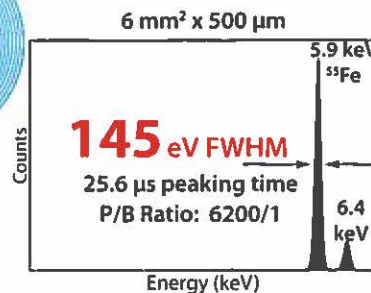
- RoHS / WEEE Compliance
- Restricted Metals Detection
- Vacuum Applications
- Semiconductor Processing
- Paper Analysis
- Research & Teaching
- OEM
- Regulations Compliance
- Environmental Monitoring
- Nuclear Plant Monitoring
- Plastic & Metal Separation
- Smoke Stack Analysis
- X-Ray Fluorescence (XRF)
- X-Ray Tube Beam Monitor
- Nuclear Medicine
- Heavy Metals in Plastic
- Plating Thickness
- Art & Archaeology
- Process Control
- Sulfur in Oil & Coal Detection
- Nuclear Safeguards Verification
- Lead Detectors
- Coal & Mining Operations
- Forensic Investigations

Step 1: Choose Your Detector

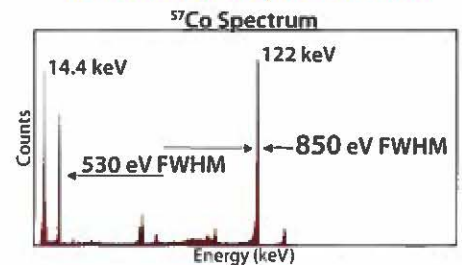
Silicon Drift Detector



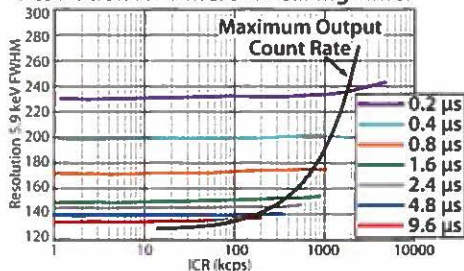
Si-PIN Detector



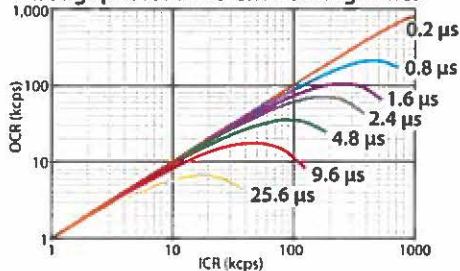
CdTe-diode Detector for Gamma Ray Detection



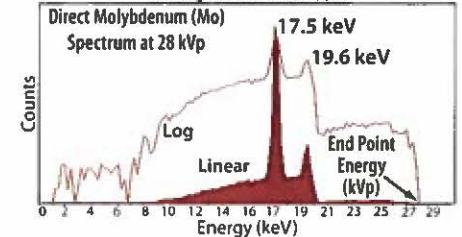
Resolution for Different Peaking Times



Throughput for Different Peaking Times



X-Ray Tube Monitor



Step 2: Choose Your Configuration

XRF System



XR-100CR Si-PIN Detector or
SUPER SDD XR-100SDD Silicon Drift Detector or
XR-100T-CdTe X-ray and γ-ray Detector
and
PX5 Digital Pulse Processor, Power
Supply, Shaping Amplifier and MCA
and
Mini-X Portable X-Ray Tube System
and
XRF-FP Quantitative Analysis Software

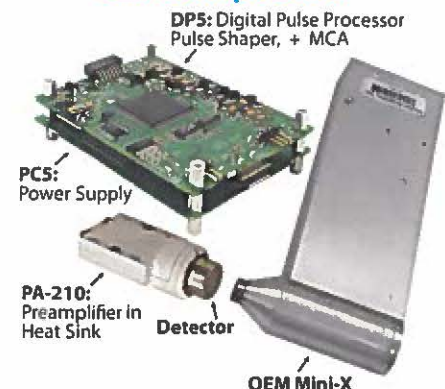
X-Ray Spectrometer



X-123 Includes:

- 1 Detector and Preamplifier
- 2 Digital Pulse Processor and MCA
- 3 Power Supply

OEM Components



visit www.amptek.com for complete specifications

DIGITAL PULSE PROCESSORS

New Version



Digital Pulse Processor
Shaping Amplifier
MCA
Power Supplies



Size: 3.5 in. x 2.5 in.

Features of the PX5:

- Compatible with all Amptek XR100 detectors & detectors from other manufacturers
- 80 MHz ADC
- Trapezoidal and CUSP shaping
- Reduced ballistic deficit
- High count rate capability & stability
- High throughput & pile-up rejection
- MCA with 8 k channels
- USB, RS232 & Ethernet interface
- Software for instrument control, data acquisition, and analysis
- Oscilloscope mode

Features of the DP5:

- 80 MHz ADC
- Replaces both shaping amplifier and MCA
- Supports both reset and feedback preamplifiers of either polarity
- 16 SCAs
- Configurable for use with PMTs
- For OEM or custom laboratory use
- Highly configurable

Also available: XRF-FP Quantitative Analysis Software

Experimenter's XRF Kits

NEW



XRF Kits include:

- X-Ray Detector
- Digital Pulse Processor, MCA, and Power Supply
- Mini-X X-ray Generator
- XRF-FP Quantitative Analysis Software
- MP1 XRF Mounting Plate
- Stainless Steel 316 (SS316) test sample
- Complete documentation with step-by-step instructions
- XRF Kit wizard for quick software setup

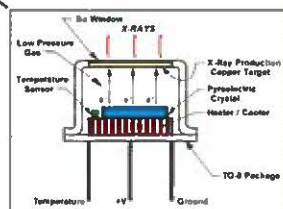
X-RAY GENERATOR

Miniature X-Ray Generator with
Pyroelectric Crystal



Applications

- X-Ray Fluorescence
- Teaching Laboratories
- Instrument Calibration
- Research



Features of the COOL-X:

- Low Power: <300 mW
- Solid state: Pyroelectric Crystal
- No radioactive sources
- Runs on a standard 9V battery
- Variable end point energy: up to 35 kV
- Peak X-Ray flux: 10^8 photons per second (equivalent to a 2 mCi source)
- Small: 0.6" dia x 0.4" (15 mm dia x 10 mm)

GAMMA-RAY DETECTION SYSTEM

Features of the GAMMA-RAD5:

Scintillation Detector (NaI)
& Digital Pulse Processor



- Ruggedized scintillator and PMT
- Gain stabilized in software
- Ethernet, RS232 & USB interfaces for robust communications
- USB powers entire system
- Flexible architecture for tailoring interface
- For OEMs and custom users

**Nuclear Plant
Monitoring**

**Homeland Security
Applications**

New Version X-RAY TUBE

Features of the Mini-X:

- 50 kV/80 μ A
- Silver (Ag) or Gold (Au) target
- USB controlled
- Stable output
- Fast
- Low power
- Small size



Applications

- X-Ray Fluorescence analysis
- Portable systems
- OEM
- Process control
- Research and teaching

Self-contained system includes:

- X-ray tube
- Power supply
- Control electronics
- USB communication

visit www.amptek.com for complete specifications

MULTICHANNEL ANALYZER

Features of the MCA8000A:

- 16k data channels.
- Conversion time $< 5 \mu\text{s}$ ($> 200,000$ cps).
- Two stage input analog pipeline.
- Sliding-scale linearization.
- Differential nonlinearity $< \pm 0.6\%$.
- Integral nonlinearity $< \pm 0.02\%$.
- Two peak detection modes: first peak after the threshold (nuclear spectroscopy) or absolute peak after the threshold (particle counter calibration in clean rooms).
- Two TTL compatible gates for coincidence and anticoincidence.
- Stand-alone data acquisition.
- 115.2 kbps RS232 serial interface.
- Compatible with USB to RS232 adapters.
- Free PC software supports ROI, energy calibration, peak information, peak search, multiple spectra, and mathematical operation.



WORLD'S BEST MCA

FITS IN A SHIRT POCKET!!

The MCA8000A is a full featured, low power multichannel analyzer intended to be used with a wide variety of detector systems.

RUNS FOR 24 HOURS ON 2 AA BATTERIES

Dimensions: 6.5 x 2.8 x 0.8 in / 165 x 71 x 20 mm
Weight (including batteries): < 300 g.

CHARGE SENSITIVE PREAMPLIFIERS

Your complete source for high performance preamplifiers and amplifiers

See <http://www.amptek.com/hybrids.html> for Selection Guide



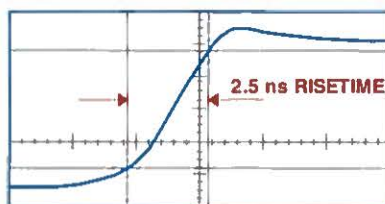
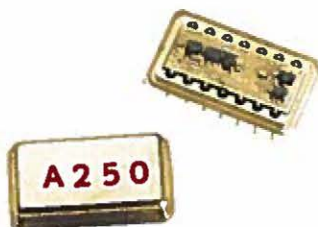
Noise @ 0 pF: 670 eV FWHM (Si)
~76 electrons RMS

Noise Slope: 13 eV/pF with Low C_{iss} FET
11.5 eV/pF with high C_{iss} FET

Fast Rise Time: 2.5 ns

Features of the COOLFET:

- Thermoelectrically Cooled FET
- 3 internal FETs to match detector
- Lowest Noise and Noise Slope
- AC or DC coupling to the detector
- Both Energy and Timing outputs
- Optional input protection
- Easy to use

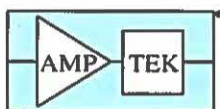
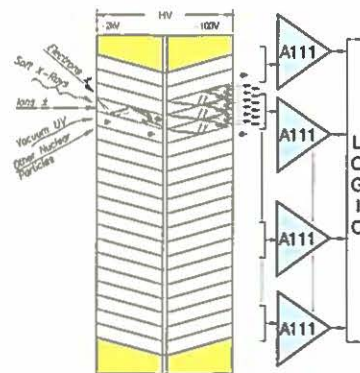


Features of the A250:

External FET
FET can be cooled
Noise: < 100 e RMS (Room Temp.)
 < 20 e RMS (Cooled FET)
Gain-Bandwidth $f_c > 1.5$ GHz
Power: 19 mW typical
Slew rate: > 475 V/ μs



A Microchannel Plate (MCP)
Array Connected to Multiple
A111s



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