



# UNIVERSAL SERIAL BUS PROTOCOL SOLUTIONS FOR TESTING AND VERIFICATION



**USBTracer/Trainer™ System**  
**USBMobile™ HS Analyzer**  
**USB Advisor™ Analyzer**  
**USB Chief™ Analyzer**

**Tracer/Trainer™ System**  
**Mobile™ HS Analyzer**  
**Advisor™ Analyzer**  
**Chief™ Analyzer**

CSI CDB										INQUIRY		Time Stamp 00008.0086 3429									
Data bytes										ACK 0x4B		Time Stamp 00008.0086 3429									
OUT		ADDR		ENDP		CRC5		EOP		Idle		Time St									
0x87		4		1		0x19		250.000 ns		166.660 ns		00008.008									
DATA0		Data		CRC16		EOP		Idle		Time S											
00001		0xC3		31 bytes		0xD7A3		250.000 ns		533.330 ns		00008.00									
Sync		ACK		EOP		Time		Time Stamp													
00000001		0x4B		233.330 ns		1.023 ms		00008.0086 5061													
ADDR		ENDP		Mass		INQUIRY		Dev Typ		Rem		Vendor Id		Product Id		Product Rev					
4		1		Storage		Response		0x00		1		M-Sys		DiskOnKey		2.01					
IN		ADDR		ENDP		T		Data		ACK		Time Stamp									
0x96		4		1		0		36 bytes		0x4B		00008.0094 6420									
Packet		Dir		F		Sync		IN		ADDR		ENDP		CRC5		EOP		Idle		Time St	
394		-->		S		00000001		0x96		4		1		0x19		233.330 ns		366.650 ns		00008.009	
Packet		Dir		F		Sync		DATA0		Data		CRC16		EOP		Idle		Time S			
395		<--		S		00000001		0xC3		36 bytes		0x960C		233.330 ns		500.000 ns		00008.00			
Packet		Dir		F		Sync		ACK		EOP		Time		Time Stamp							
396		-->		S		00000001		0x4B		250.000 ns		487.133 µs		00008.0095 0760							

Summary		Go	0	of ### - Packet ###
All reports		Type	Total	
Pkt	Packets	OUT	262	
	Token	IN	2285	
01	Data	SOF	53282	
	Handshake	SETUP	15	
Trs	Transactions	DATA0	1216	
	Handshake	DATA1	1273	
Xfr	Transfers	DATA2	0	
	Control	MDATA	0	
Errors		ACK	2444	
		NAK	118	
		STALL	0	

**LeCroy®**, a worldwide leader in serial data test solutions, creates advanced instruments that drive product innovation by quickly measuring, analyzing and verifying complex electronic signals. With systems available for protocol layer testing, LeCroy offers a complete solution to meet the unique demands of Universal Serial Bus (USB) technology. Our solutions have been used by the industry for over a decade, and have been accepted as the standard for USB development and testing.

### Diverse Systems for USB

LeCroy offers the widest range of USB protocol analyzers and exercisers in the industry. Our low cost and modular solutions are available for use with USB 2.0, 1.1, and On-the-Go (OTG) standards. Each system has a non-intrusive design that preserves the real world timing conditions by monitoring the links without affecting signal timing, thus assuring you uncompromised data integrity. For more unique developments, you can create your own custom class decodes to further extend the capabilities of the system.

### USB All Speed *Tracer/Trainer* System

The USB *Tracer/Trainer* system is built with the CATC™ Protocol Analyzer System 2500H as its foundation for stable and reliable measurements. The industry leading 512 Mbyte of memory and advanced filtering are more than adequate for even the most complex

traffic recordings. With interchangeable plug-ins and field upgradeable firmware, the USB *Tracer* analyzer provides both USB 2.0 and OTG support. The OTG support automatically displays host negotiation protocol (HNP) and session request protocol (SRP), and captures Vbus and Data Line pulses allowing for a complete end to end look at OTG occurrences on the bus.

The USB *Trainer* exerciser is available as a plug-in module, and has both host and device emulation capabilities. It employs an Intelliframe mode that actively searches for a response from the device under test, and issues the next appropriate packet. As a complete solution, the USB *Tracer/Trainer* system gives you the unique ability to record

live traffic and then playback the exact data stream using the *Trainer* exerciser. This saves time in setting up the *Trainer* operations and provides an easy way to recreate problems reported in the field.

### USB Classic *Tracer/Trainer* System

The USB Classic *Tracer/Trainer* system has all the features of the All Speed model, except that it only supports USB 1.1 and OTG, making it the ideal low cost solution for HID (Human Interface Device) developers. They are field upgradeable to the All Speed products for USB 2.0 development and testing.





### USBMobile HS Portable Analyzer

The USBMobile HS module is a highly portable bus and protocol analyzer that connects through your computer's PCMCIA port. This PC card size analyzer supports the USB 2.0 and OTG standards, and is fully compatible with the CATC Trace™ software.



### USB Advisor Protocol Analyzer

The USB Advisor protocol analyzer is an excellent tool for developing USB 2.0 devices. Like all of our USB systems, this stand-alone unit works in conjunction with the CATC Trace display software.



### USB Chief & Chief Plus Protocol Analyzer

The USB Chief analyzer is our lowest cost system for capturing, decoding, and analyzing USB 1.1 full and low speed traffic. The USB Chief Plus analyzer has the added value of USB traffic generation.

## Powerful display views for easy analysis of protocol traffic

LeCroy's *Tracer* analysis software gives you a variety of powerful tools for displaying and analyzing bus traffic. The *Tracer* software allows you to organize and display packets, transactions and transfers hierarchically as well as group split transaction together.

The USB analyzer records all the data on the bus. Unfiltered USB traffic contains thousands of packets, which can make it difficult for you to analyze and discover errors within the trace. Within the CATC Trace™ software display, you can preserve the details, but also have an easy way to view the host and device communications.

For instance, you can:

- Eliminate the idle bus traffic by selecting the SOF icon. This narrows down the displayed information to just those packets that contain relevant host and device communications.
- Simplify the trace by selectively hiding endpoints (addresses) In, Out, or all packets. This is especially useful when analyzing bus traffic when multiple devices are attached.
- Organize the information unique to each USB bus by utilizing the built-in device class decodes. This will greatly enhance your ability to comprehend the bus traffic.

Within the displays, Tooltips pop up to provide you with detailed descriptions of the field, including information about the USB specification. The software supports both vendor specific and custom decodes to ease the development of devices and software.



Command level can be expanded and collapsed to show the packet, transaction and transfer layers.

The CATC Trace display decodes the application layer and alerts you to every potential violation.

CATC USBTracer Bus And Protocol Analyzer - [C:\Program Files\CATC\USBTracer\SampleFiles\DiskOnKeyEnumAndWrite.usb]

File Setup Record Generate Report Search View Window Help

REC STOP

Transfer 16 Bulk ADDR ENDP Mass INQUIRY Dev Typ Rem Vendor Id Product Id Product Rev Time Stamp  
S IN 4 1 Storage Response 0x00 1 M-Sys DiskOnKey 2.01 00008.0094 6420

Transaction 44 IN ADDR ENDP T Data ACK Time Stamp  
S 0x96 4 1 0 36 bytes 0x4B 00008.0094 6420

Packet 394 Dir F Sync IN ADDR ENDP CRC5 EOP Idle Time Stamp  
--> S 00000001 0x96 4 1 0x19 233.330 ns 366.650 ns 00008.0094 6420

Packet 395 Dir F Sync DATA0 Data CRC16 EOP Idle Time Stamp  
--> S 00000001 0xC3 36 bytes 0x960C 233.330 ns 500.000 ns 00008.0094 6616

Packet 396 Dir F Sync ACK EOP Time Time Stamp  
--> S 00000001 0x4B 250.000 ns 487.133 µs 00008.0095 0760

Transfer 17 Bulk ADDR ENDP Mass SBSU Tag Residue Status Time Stamp  
S IN 4 1 Storage 814F81C8 0x0 Passed 00008.0098 7488

Transaction 45 IN ADDR ENDP T Data Status Block Wrapper Signature: dCSWSignature  
S 0x96 4 1 1 13 bytes Command Block Tag: dCSWTag (in Hex)

Packet 397 Dir F Sync IN ADDR ENDP CRC5 EOP Idle Time Stamp  
--> S 00000001 0x96 4 1 0x19 250.000 ns 383.330 ns 00008.0098 7488

Traffic Summary

Go 0 of ### Packet ###

Addr	Endp	OUT	IN	SETUP	PING	S SPLIT	C SPLIT	Total
0	0	1	2	2	0	0	0	5
4	0	12	13	13	0	0	0	38
4	1	249	2270	0	0	0	0	2519
4	1	249	2270	0	0	0	0	2519
		511	4555	15	0	0	0	5081

Ready

Packets are grouped and shown in logical order.

Pop up tooltips provide additional information when desired.

The traffic summary gives you valuable reporting and statistical information.

Hyperlink back to the CATC Trace display to see events in context.

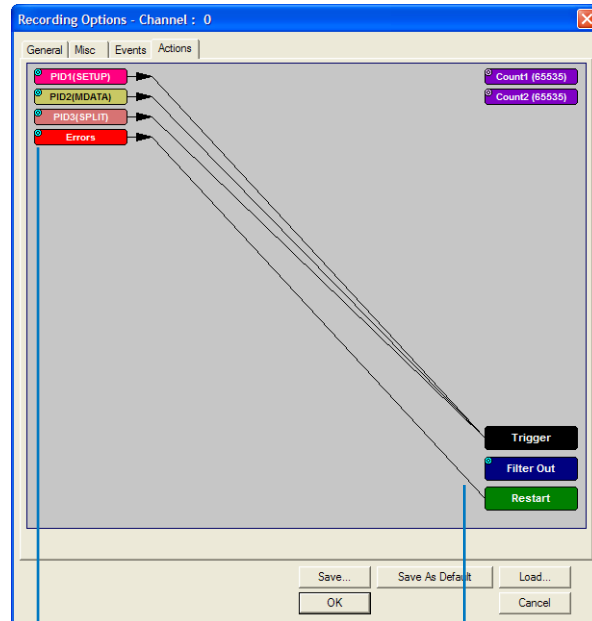
Pop Up Tooltips bring the USB specification to your desktop.

CONFIGURATION Descriptor			
Offset	Field	Value	Description
0	bLength	0x09	The size of this descriptor is 9 bytes
1	bDescriptorType	0x02	CONFIGURATION Descriptor Type
2	wTotalLength	0x0020	The total length of data for this configuration is 32. This includes the combined length of all the descriptors returned
4	bNumInterfaces	0x01	This configuration supports 1 interfaces
5	bConfigurationValue	0x01	The value 1 should be used to select this configuration
6	iConfiguration	0x00	The device doesn't have the string descriptor describing this configuration
7	bmAttributes	0x80	Configuration characteristics : (Bit 7: Reserved (set to one) 1 (Bit 6: Self-powered 0 (Bit 5: Remote Wakeup 0
8	MaxPower	0x2F	Maximum power consumption of the device in this configuration is 94 mA

## Powerful Triggering and Filtering

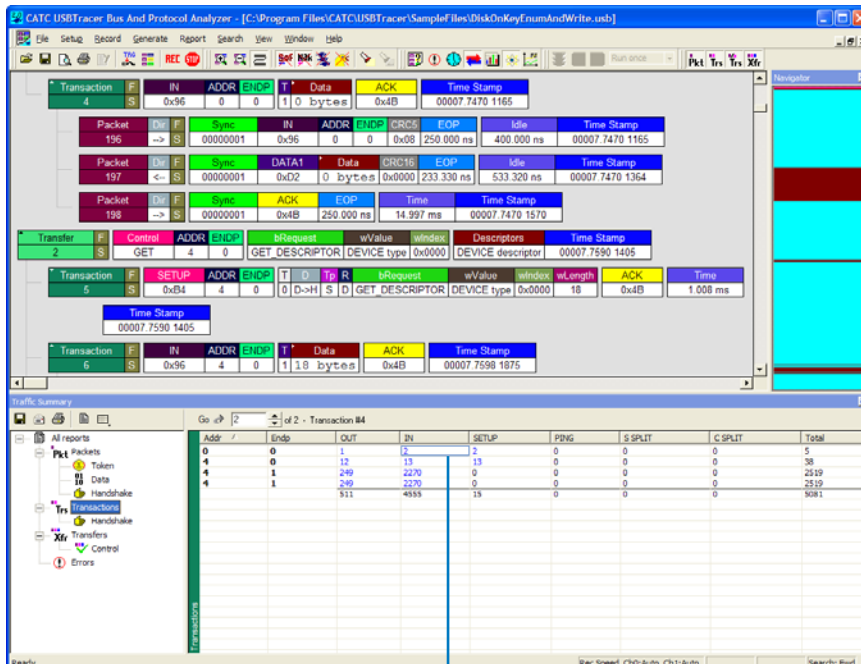
With a wide assortment of triggering options, the *Tracer* software makes it easier to detect software, driver, and firmware problems. You can trigger on a variety of conditions including various packet types, device requests, bus conditions, errors and many others. Triggers can be set up on almost any sequence of events possible. It also allows you to isolate the important part of the traffic stream, and when you open the trace, it jumps right to that portion of the trace.

Full featured filtering capabilities also help you maximize the memory recording capacity by isolating areas of interest and filtering out unwanted traffic. Both features provide for easier access to the valuable traffic for more in depth analysis.



LeCroy's Drag and Drop graphical interface makes sophisticated triggering easy.

In this example, USB *Tracer* analyzer will trigger on three events and restart if an error is detected.



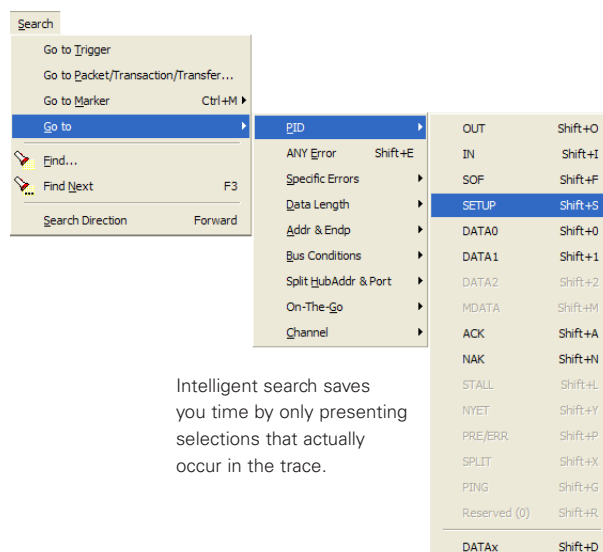
Click on hyperlinks to automatically jump through each occurrence within the trace.

## Comprehensive Traffic Reports and Summaries

Our USB solutions are more than just data recorders. The real value is in the analysis of the data. The *Tracer* software generates detailed reports that provide statistics on the occurrence of errors, abnormal bus or timing conditions, and other protocol events within the trace. You can evaluate these metrics at a glance or use them to navigate through the recording since they are hyperlinked back into the CATC Trace. The traffic summary can be printed or saved to text with a single keystroke.

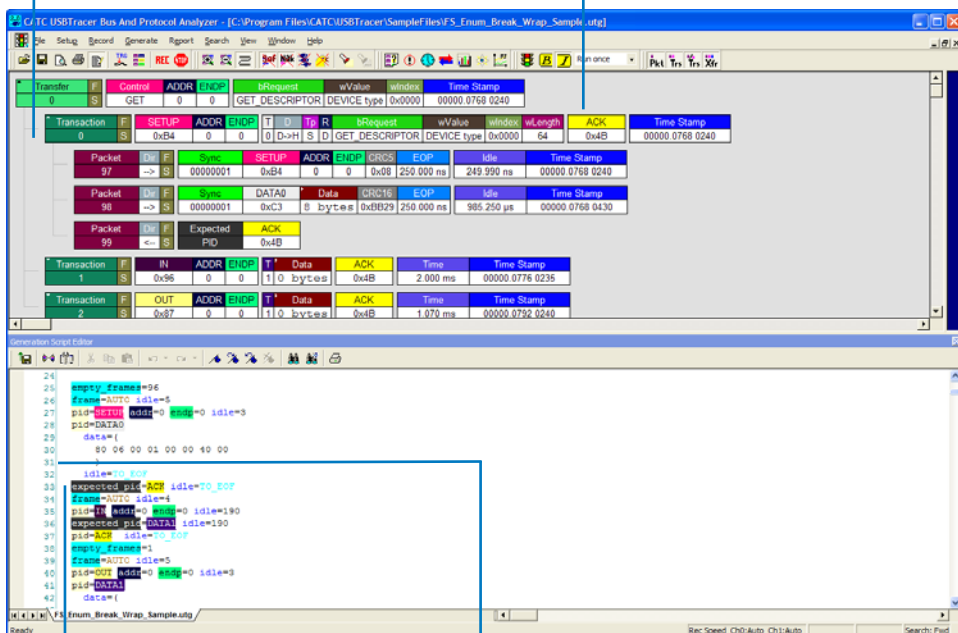
## Search Results Quickly

The advanced search features in the *Tracer* software helps you quickly find what you points of interest. By using the Quick Search, you can select fields right from the drop down menu, such as Go To Trigger, Packet/Transaction/Transfer, Marker or Event. The menus are context sensitive so they only allow you to select events that occurred within the trace.



The CATC Trace display logically groups all transactions that are part of a USB operation.

Colors and graphics are used to represent USB operations and transactions.



## Intelligent Traffic Generation

When using *USB Trainer* or *USB Chief Plus* systems, you have the added value of traffic generation for USB. You can create test patterns or "scripts" by exporting any traffic stream from a previously recorded trace. A text based API can also be used to create packet level traffic files. The ability to insert code errors, or customized data payloads, makes it easy to perform corner-case, stress, and limit testing.

Unique to the *USB Trainer* is an Intelliframe mode, which adds interactivity to the traffic stream. It allows you to programmatically respond to packets transmitted from the device under test.

## A Comprehensive Solution

LeCroy's USB solutions provide you with advanced features necessary to ease the development and testing of USB devices. Combined with powerful hardware, the *Tracer* software makes it

easy to understand what occurred on the bus. At every level, you have the ability to drill deeper into the data, to get additional information about the traffic or even the protocol itself.

Let LeCroy's Serial Data Solutions peel back the layers of your USB device to solve your test and verification challenges.

### Specifications

#### USB/Mobile HS

Host Requirements	Windows 2000, Windows XP or greater, Intel Pentium II processor or greater; with a PCMCIA port
Basic Trigger Events	Packet Identifier, Token Pattern, Frame Pattern, Device Request, Data Pattern, Bus Conditions, Errors, Transactions, Data Length, Splits
Reporting and Statistics	Packet Level, Transaction Level, Transfer Level, Error Reports
Generating Memory Size	64 MB
Power Consumption	Idle: 500 mA (typical) , Active: 560 mA (typical)
Connectors	16-bit Type II PC card, 2 Mini-AB USB receptacles
Temperature: Operating	0 °C to 55 °C (32 °F to 131 °F)
Temperature: Non-Operating	-20 °C to 80 °C (-4 °F to 176 °F)
Humidity: Operating	10% to 90% RH (non-condensing)
Dimensions	5.3" x 2.1" x 0.4" (135 mm x 54 mm x 10.5 mm)
Net Weight	51 g (1.8 oz.)

#### USB Advisor

Host Requirements	Windows 2000, Windows XP or greater, Intel Pentium II processor or greater; with a USB port
Generating Memory Size	128M DRAM for traffic capture, timing, and other data
Power Consumption	90-254 VAC, 47-63 Hz (universal input), 165W
Connectors	AC Power Connection, External Clock Input (EXT CLK, BNC), Host Connection (USB, type B), Data Connection (Data In/Out, 9-pin DB)
Power	On/Off
Manual Trigger	Forces a trigger event
Detach Device	Detaches the device from the host
Power (PWR)	Lights when analyzer is powered on
Record (REC)	Lights when analyzer is actively recording data
Trigger (TRG)	Lights when triggering an event or during power-on testing
Upload (UPLD)	Lights when uploading data to host
Temperature: Operating	0 °C to 55 °C (32 °F to 131 °F)
Temperature: Non-Operating	-20 °C to 80 °C (-4 °F to 176 °F)
Humidity: Operating	10% to 90% RH (non-condensing)
Dimensions	234 mm x 213 mm x 64 mm (9.2" x 8.4" x 2.5")
Net Weight	1.3 kg (2.8 lbs.)

#### USB Chief & Chief Plus

Basic Events Detected	Bus Conditions, Token Packet, Setup Transaction, Data Pattern, Hardware Detected Error, Software-analyzed Error, External Signals
Generating Memory Size	128M DRAM for traffic data capture, timing, and other data
Host Requirements	Windows 2000, Windows XP or greater, Intel Pentium II processor or greater; with a USB port
Power Requirements	90-254 VAC, 47-63 Hz (universal input), 165W maximum
Connectors	AC Power Connection, BNC Connection (Reserved), Host Connection (USB, type B), Data Connection (Data In/Out, 37-pin DB), USB Connections for recording (Secondary Record, Record & Generate, type A and type B)
Power	On/Off
Manual Trigger	Forces a trigger event
Detach Device	Detaches the device from the host
Power (PWR)	Lights when powered on
Record (REC)	Lights when actively recording data
Trigger (TRG)	Lights when triggering an event
Upload (UPLD)	Lights when uploading recording memory to the host
Temperature: Operating	0 °C to 55 °C (32 °F to 131 °F)
Temperature: Non-Operating	-20 °C to 80 °C (-4 °F to 176 °F)
Humidity: Operating	10% to 90% RH (non-condensing)
Dimensions	234 mm x 213 mm x 64 mm (9.2" x 8.4" x 2.5")
Net Weight	1.3 kg (2.9 lbs.)

## Specifications

### CATC 2500H PLATFORM

#### USB Tracer/Trainer

Host Requirements	Windows 2000, or greater, Intel Pentium II processor or greater; USB port
Recording Memory Size	512 MB for trace capture, timing and control information
Power Requirements	90-254 VAC, 47-63 Hz (universal input), 125W maximum
Connectors	AC power connection, External trigger connection (TRIG IN/OUT, BNC), USB type "B" host computer connection, Breakout Board Data Output Connection (RS232)
Power (PWR)	Lights when power is on
Status (STATUS)	Lights during initialization; Blinks if self-test fails
Manual Trigger Switch	Forces a trigger event when pressed
Dimensions	311 mm x 311 mm x 89 mm (12.2" x 12.2" x 3.5")
Net Weight	3.4 kg (7.5 lbs.)
Temperature: Operating	0 °C to 55 °C (32 °F to 131 °F)
Temperature: Non-Operating	-20 °C to 80 °C (-4 °F to 176 °F)
Humidity: Operating	10% to 90% RH (non-condensing)

#### USB Tracer Plug In Module

Connectors	Dual Recording Channels (USB, types "A" and "B")
Basic Trigger Events	Packet Identifiers, Token Patterns, Frame Patterns, Device Request, Data Pattern, Bus Conditions, Errors, Transactions, Splits
Reporting/Statistics	Packet Level, Transaction Level, Transfer Level, Error Reports
REC (green)	Lights when unit is recording
TRG (orange)	Lights when triggering an event or power-on testing
UPLD (green)	Lights when uploading recording memory to the PC
Dimensions	113 mm x 170 mm x 32 mm (4.5" x 6.7" x 1.3")
Net Weight	0.5 kg (1.0 lb.)

#### USB Trainer Plug In Module

Generating Memory Size	256 Mbytes for trace traffic pattern buffering
Connectors	Dual Generating Channels (USB, type "A")
Switches	Start/Stop allows for manual Trace capture
HighSpeed (green)	Lights when hi-speed is being generated
Classic (orange)	Lights when full or low speed is being generated
Intelli Frame (green)	Lights when Intelliframe traffic is being generated
Dimensions	113 mm x 170 mm x 32 mm (4.5" x 6.7" x 1.3")
Net Weight	0.5 kg (1.0 lb.)

## Ordering Information

### LeCroy USB Solutions

USB Tracer/Trainer All Speed Analyzer/Generator System	US005APB-X
USB Tracer All Speed Analyzer System	US005AAB-X
USB Tracer All Speed Analyzer CATC Platform Module with OTG	US006MAA-X
USB Tracer/Trainer Classic Analyzer/Generator System	US006APA-X
USB Tracer Classic Analyzer System	US006AAA-X
USB Trainer Generator CATC Platform Module with Device Emulation	US006MGA-X
USB Trainer Generator CATC Platform Module	US006MGB-X
USB Mobile HS USB 2.0 All Speed Protocol Analyzer	US008UAA-X
USB Advisor All Speed Analyzer	US004UAA-X
USB Chief Plus Classic Analyzer/Generator	US003UPA-X
USB Chief Classic Analyzer	US003UAA-X
USB Parametric Probe	US006UTA-X



1-800-5-LeCroy  
www.lecroy.com