DDA
Disk Drive Analyzers

DDA 5005
Disk Drive Analyzer

LEADING FEATURES

- *5 GHz Bandwidth*
- *10 GS/s sample rate/channel*
- *20 GS/s dual channel mode*
- *48 Mpts in dual channel mode*
- *5 GHz trigger bandwidth*
- *10.4" TFT SVGA color display with 800 x 600 resolution*
- *100 Base T Ethernet*
- *One button access to innovative and unique Disk Drive Analyzer tools*
- *The graphical interface provides direct access to Channel Emulation, Servo Analysis, Drive Measurements, and drive-specific graphical analysis of drive parameters*
- *Drive-specific triggers simplify and speed up your work*
- *Intuitive, easy to use graphical user interface with one-button access to online help*
- *Windows 2000 OS provides flexible connectivity to networks, peripheral devices, documentation, and engineering analysis tools such as MATLAB*
- *Customizable with user-defined parameters and math functions*

There is only one way to perform Disk Drive Analysis — use a DDA, now powered by X-Stream technology for next generation channels and head media designs.

Maximum Performance

The Disk Drive Analyzer 5005, with 5 GHz bandwidth, includes LeCroy's newest and most powerful Disk Drive Analysis toolset. Capture, view, and analyze the WaveShape of high-speed, complex drive signals with speed and integrity.

The X-Stream™ architecture integrates SiGe "digitizer on a chip" technology and a specialized high-speed streaming bus design to transfer data from the ADC to a proprietary acquisition memory. The X-Stream architecture enables disk drive engineers to quickly and easily measure and analyze disk drive signals. With 10 GS/s and 24 Mpts/Ch — up to 20 GS/s and 48 Mpts on two channels — you can be assured drive signals are captured with accuracy and precision.

Easy to Use with Maximum Power

The drive oriented graphical interface is designed specifically for drive engineers. The familiar controls on the front panel coupled with a powerful, efficient, easy-to-use graphical user interface lets you simply and quickly control the DDA from the touch screen, front panel, mouse, or any combination.

The high-performance and highly stable Windows OS and Intel Pentium III-based platform with 512 MB of memory help you achieve the highest productivity.

Maximum Benefits

There is one certainty about tomorrow — you will need more capability and flexibility than you have today. The DDA 5005 allows you a variety of ways to customize the scope with innovative features such as parameter math, user-defined parameters, and math functions.

LeCroy

DDA 5005

Easy, Powerful Disk Drive Analysis

The X-Stream architecture makes the flawless execution of Disk Drive Analysis possible — never before has a scope been optimized to process and display your disk drive signals this fast and painlessly. Finally — you have the performance and capabilities needed to focus on your complex drive signals, and not on driving a scope.

Of course, LeCroy's extensive variety of standard measurements and math functions is included, but now LeCroy takes Disk Drive Analysis to a whole new level. Zoom, math, and measurements are now more accessible and easier than ever to use. Sophisticated measurement sets and chained math functions can easily be set up, with common functions at your fingertips. Innovative and intuitive measurement views give you quick insight into statistical phenomenon. Advanced drive analysis functions including Drive Specific Triggers, noise analysis, such as FFTs, JitterTracks, and Histograms can be quickly deployed with a minimum of search and setup. Enjoy the power that X-Stream architecture provides!

Natural Graphical Interface

One press of the DDA button takes you directly to the Disk Drive Analyzer features. The familiar controls on the front panel coupled with a natural, context-sensitive graphical user-interface reacts quickly to your commands. Functionality is exactly where you expect it to be. If you have questions, context-sensitive online help gives immediate assistance.

Cursors

Finally — a company has responded to your needs with dedicated cursor knobs and the most flexible cursors. Different cursor modes are easily recalled and set. They are easily accessed from the front panel or the graphical user interface. Set up basic time or amplitude cursors on a single waveform, or choose to use independent cursors on different waveforms.

Measurement Accuracy – Stable and Precise

The DDA 5005 hardware is designed for low noise, high timing accuracy throughout its components. High quality clock sources with jitter <= 1 psec over a 1 msec period and low trigger jitter (2 ps max) ensure that the sampling points are accurately captured, ensuring high accuracy vertical and timing measurements.

Exceptional Trigger Performance

The drive-specific triggers are defined in disk drive terminology just as they are in the other LeCroy Drive Analyzers. Drive triggers include: Sector, Servo Gate, PES Trigger, and Read Gate Trigger. Setup of trigger conditions is easier then ever.

The standard edge trigger will trigger on signals of up to 5 GHz and SMART Triggers®

ProLink™ Signal Inputs

ProLink inputs provide a high integrity, high bandwidth interchangeable interface to SMA or BNC cables, probes, and accessories. ProLink supports ProBus™ for direct, automatic control of LeCroy probes and accessories.

Flexible Connectivity

The DDA 5005 comes complete with a 100BT/10BT ethernet connection, a built-in hard drive for waveform storage and a 3.5 inch floppy drive. At the press of a button, you can even email the measurement result and scope screen to other engineers or your notebook. Attach any USB device for extended connectivity for network printing, or attaching additional storage or pointing devices.

With the Master Analysis (XMAP) software option, you are not limited in the analysis you perform on your signals. Add your own calculations to do math functions on the parameters in the scope. Or add a visual basic script as your own signal analysis processing function. LeCroy's MAUI software is tightly integrated with X-Stream architecture, to give you high-speed throughput and customizable analysis never before seen in an oscilloscope.

DDA 5005
Specifications

Vertical System	DDA 5005
Analog Bandwidth @ 50 Ω (-3 dB)	5 GHz
Input Channels	4
Bandwidth Limiter	20 MHz; 200 MHz; 500 MHz
Input Impedance	50 Ω ± 1.5%
Input Coupling	DC, GND
Maximum Input	2.5 Vrms; ±4 Vpeak
Vertical Resolution	8 bits; up to 11 bits with enhanced resolution (ERES)
Sensitivity	2 mV – 1 V/div fully variable; Full bandwidth at ≥10mV
Offset Range	2 mV – 99 mV/div: ±750 mV; 100 mV – 1 V/div: ±4 V
Horizontal System	
Timebases	Internal timebase common to 4 input channels; An external clock may be applied at the Auxilary Input
Math & Zoom Traces	8 math/zoom traces
Clock Accuracy	≤1 ppm @ 0-40 degrees C.
Time Interpolator Resolution	1 ps
External Clock Frequency	2 GHz maximum, 50 Ω impedance
Roll Mode – Operating Range	time/div 500 ms – 1000 s/div or sample rate < 100 kS/s max
Acquisition System	
Single-Shot Sample Rate/Ch	10 GS/s
2 Channel Max	20 GS/s
Maximum Acquisition Points/Ch	100 Mpts/ 2 Ch, 50 Mpts/ 4Ch
Acquisition Modes	
Random Interleaved Sampling (RIS)	200 GS/s for repetitive signals: 20 ps/div – 1 µs/div
Single-Shot	For transient and repetitive signals: 20 ps/div – 1000 s/div
Sequence	2 – 20,000 segments
Intersegment Time	Typically 5 µs
Acquisition Processing	
Averaging	Summed averaging; Continuous averaging with weighting range from 1:1 to 1:1023
Enhanced Resolution (ERES)	From 8.5 to 11 bits vertical resolution
Envelope (Extrema)	Envelope, floor, roof for up to 10^6 sweeps
Triggering System	
Modes	Normal, Auto, Single, and Stop
Sources	Any input channel, External, Ext x 10, Ext/10, or line; slope and level unique to each source (except line trigger)
Coupling mode	DC
Pre-trigger delay	0 – 100% of horizontal time scale
Post-trigger delay	0 – 10,000 divisions
Hold-off by time or events	Up to 20s or from 1 to 99 999 999 events
Internal trigger range	±5 div
Max trigger frequency	5 GHz with Edge Trigger; 750 MHz with SMART Trigger
External trigger input range	Ext ±0.4; Ext x 10 ±0.04; Ext / 10 ±4 V
Automatic setup	
Auto Setup	Automatically sets timebase, trigger, and sensitivity to display a wide range of repetitive signals
Vertical Find Scale	Automatically sets the vertical sensitivity and offset for the selected channels to display a waveform with maximum dynamic range
Probes	
Probes	A variety of passive and active probes are optional
Probe System: ProLink with Probus	Automatically detects and supports a variety of compatible probes; Supports ProLink SMA or BNC input adapters
Scale Factors	Automatically or manually selected depending on probe used

DDA 5005
Specifications (continued)

Color Waveform Display	
Type	Color 10.4" flat-panel TFT-LCD with high resolution touch panel
Resolution	SVGA; 800 x 600 pixels
Realtime Clock	Dates, hours, minutes, seconds displayed with waveform
Number of Traces	Display a maximum of eight traces. Simultaneously display channel, zoom, memory, and math traces.
Grid Styles	Single, Dual, Quad, Octal, XY, Single + XY, Dual + XY
Waveform Styles	Sample dots joined or dots only
Analog Persistence Display	
Analog & Color-Graded Persistence	Variable saturation levels; stores each trace's persistence data in memory
Persistence Selections	Select Analog or color positive
Trace Selection	Activate Analog Persistence on all or any combination of traces.
Persistence Aging Time	Select from 500 ms to infinity
Sweeps Displayed	All accumulated or all accumulated with last trace highlighted
Zoom Expansion Traces	
	Display up to 4 Zoom and 4 Math/Zoom traces (8 Math/Zoom traces available with Master Analysis option)
Rapid Signal Processing	
Processor	Intel Pentium with MS Windows Platform
Processing Memory	512 Mbytes
Internal Waveform Memory	
	M1, M2, M3, M4 Internal Waveform Memory (Store full-length waveforms with 16 bits/data point)
	Or store to any number of files limited only by data storage media.
Setup Storage	
Front Panel and Instrument Status	Store to the internal hard drive, floppy drive or to a USB connected peripheral device.
Interface	
Remote Control	Full command set for all front panel controls and internal functions via GPIB, or Ethernet
GPIB Port (Optional)	Full control via IEEE – 488.2
Ethernet Port	10/100 BaseT Ethernet interface
Floppy Drive	Internal, DOS-format, 3.5" high-density
USB Ports	Minimum of 2 USB ports supports Windows compatible devices
External Monitor Port Standard	15-pin D-Type SVGA-compatible
Parallel Port	1 standard
Auxiliary Output	
Signal Types	Select from calibrator or control signals output on front panel
Calibrator Signal	500 Hz – 5 MHz square wave or DC Level 0.0 to +0.5 Volts (Selectable) into 50 Ω
Control Signals	Trigger ready, trigger out, pass/fail status
Auxiliary Input	
Signal Types	Select from External Trigger or External Clock input on front panel
General	
Auto Calibration	Ensures specified DC and timing accuracy is maintained for 1 year minimum
Power Requirements	100–120 V AC at 50/60/400 Hz; 200–240 V AC at 50/60 Hz; Power consumption: < 1 kVA , 940 Watts max
Physical Dimensions	
Dimensions (HWD)	264 mm x 397 mm x 491 mm; 10.4" x 15.65" x 19.25" (height excludes feet)
Weight	18 kg; 39.5 lbs
Shipping Weight	24 kg; 53 lbs
Warranty and Service	
	3 Year Warranty; calibration recommended annually
	Optional service programs include extended warranty, upgrades, and calibration services

Specifications are subject to change.

DDA 5005
Specifications (continued)

Basic Triggers

Edge/Slope/Line	Triggers when signal meets slope and level condition

SMART Triggers

State or Edge Qualified	Triggers on any input source only if a defined state or edge occurred on another input source. Delay between sources is selectable by time or events.
Dropout	Triggers if signal drops out for longer than selected time between 2 ns and 20 s
Pattern	Logic combination (AND, NAND, OR, NOR) of 5 inputs (4 channels and external trigger input). Each source can be high, low, or don't care. Trigger at start or end of the pattern.

SMART Triggers with Exclusion Technology

Glitch	Triggers on positive or negative glitches with widths selectable from 600 ps to 20 s or on intermittent faults.
Signal or Pattern Width	Triggers on positive or negative pulse widths selectable from 600 ps to 20 s or on intermittent faults.
Signal or Pattern Interval	Triggers on intervals selectable between 2 ns and 20 s

Disk Drive Triggers

Sector	Trigger on the n'th sector pulse after index. Index and sector pulse polarity and sector pulse number are selectable.
Servo Gate	Trigger on the n'th servo gate after index and every m'th thereafter. Index and servo gate pulse polarity are selectable.
PES Triger	Trigger on Position Error Signal(PES) exceeding an adjustable voltage window. Servo gate can be selected as qualifier.
Read Gate Trigger	Trigger on any read gate longer then an adjustable Sector ID filed length.

Math Tools

Display up to eight math function traces (F1 - F8); The easy to use graphical interface simplifies setup of up to two operations on each function trace and function traces can be chained together to perform math-on-math.

absolute value
average (summed)
Average (continuous)
difference (-)
differentiate
enhanced resolution (to 11 bits vertical)
envelope
exp (base e)
exp (base 10)
FFT
floor
identity
integrate
log (base e)
log (base 10)
negate
product (x)
ratio (/)
reciprocal (invert)
resample (deskew)
rescale (with units)
roof
sin x/x
square
square root
sum (+)
histogram
trend (datalog)
Auto-correlation

FFT includes: power averaging, power density, real and imaginary components, and frequency domain parameters.

Pass/Fail

Test waveforms by comparing their shape to test templates and simultaneously check multiple parameters versus selectable parameter or mask limits. Pass or fail conditions can initiate actions including document::local or networked files, or email the image of the failure, saving waveforms, or send a GPIB SRQ, or pulse to trigger another device.

Automated Disk Drive Measurements

TAA
TAA+
TAA-
PW50
PW50+
PW50-
Resolution
Overwrite
lbase
lbsep
lmax
lmin
lnum
lpp
ltbe
ltbp
ltmn
ltmx
ltot
ltpt
lttp
ltut
NLTS
ACSN
msnr
rsnr
m_to_r
nbph
nbpw

Standard Automated Measurements

amplitude
area
base
cycles
cycle std. deviation
cycle mean
cycle median
cycle rms
data
delay
duty cycle
duration
falltime
frequency
first
maximum
mean
minimum
+overshoot
–overshoot
peak-to-peak
period
risetime
rms
std. deviation
top
width
last
median
number of points
phase
time @ minimum (min)
time @ maximum (max)
Δ delay
Δ time @ level
Δ time @ level from trigger
Δ time from clock to data
+ (setup time)
Δ time from clock to data - (Hold time)
18 Histogram Parmeters

Jitter measurement for parameters including: period, cycle-cycle, frequency, and edge@lv, with JitterTrack up to 200 edges.

Advanced Drive Analysis

Advance Drive Analysis capabilities of the DDA 5005 include:

- Head Filter/ Equalizer Emulation
- Channel Emulation
- SAM Histograms
- Plot of SAM Values
- PES Runout Analysis
- Analog Compare

Additional waveshape analysis capabilities include:

- FFT capability includes: power averaging, power density, real and imaginary components, and frequency domain parameters
- Parameter Math – add, subtract, multiply or divide two different parameters
- User-definable parameter measurements
- User-definable math functions

Ordering Information

DDA 5005 Four Channel Disk Drive Analyzer	Product Code
5 GHz, 20 GS/s 2 Ch; 10 GS/s Ch, Color DSO 48 Mpts 2Ch; 24 Mpts/ch Standard	DDA 5005

Included with Standard Configuration:

LeCroy ProLink Adapter SMA and BNC
Operators Manual; Quick Reference Guide; CD-ROM with OM/ RCM and Utility software
Remote Control Manual
Floppy Disk Drive
Optical 3 button Wheel Mouse-USB
Standard Ports; 10/100 BaseT Ethernet, Parallel, SVGA Video Output, USB
Protective Front Cover
Standard Commercial Calibration and Performance Certificate
Three-Year Warranty

Hardware Options

LeCroy ProLink Adapter BNC	LPA-BNC

Optional Software Packages

Jitter and Timing Analysis Package	JTA2

Selected Accessories

Keyboard	KYBD-1
LeCroy ProLink Adapter BNC	LPA-BNC
LeCroy ProLink Adapter BNC kit of 5	LPA-BNC-Kit
2.5 GHz Active Voltage Probe	HFP2500
7.5 GHz Passive Probe	PP066
Differential Probe	AP034
Oscilloscope Cart	OC1021
Oscilloscope Cart with additional shelf and drawer	OC1024
Rackmount Kit - 25" Slide	RMA-25
Rackmount Kit - 30" Slide	RMA-30

Warranty & Calibration

NIST Traceable Calibration and Certificate	CCNIST
MIL Standard Traceable Calibration and Certificate	CCMIL
5-Year Repair Warranty	W5
5-Year NIST Traceable Calibration Contract	C5
5-Year Warranty with NIST Traceable Calibration Contract	T5

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