DC240

500 MHz
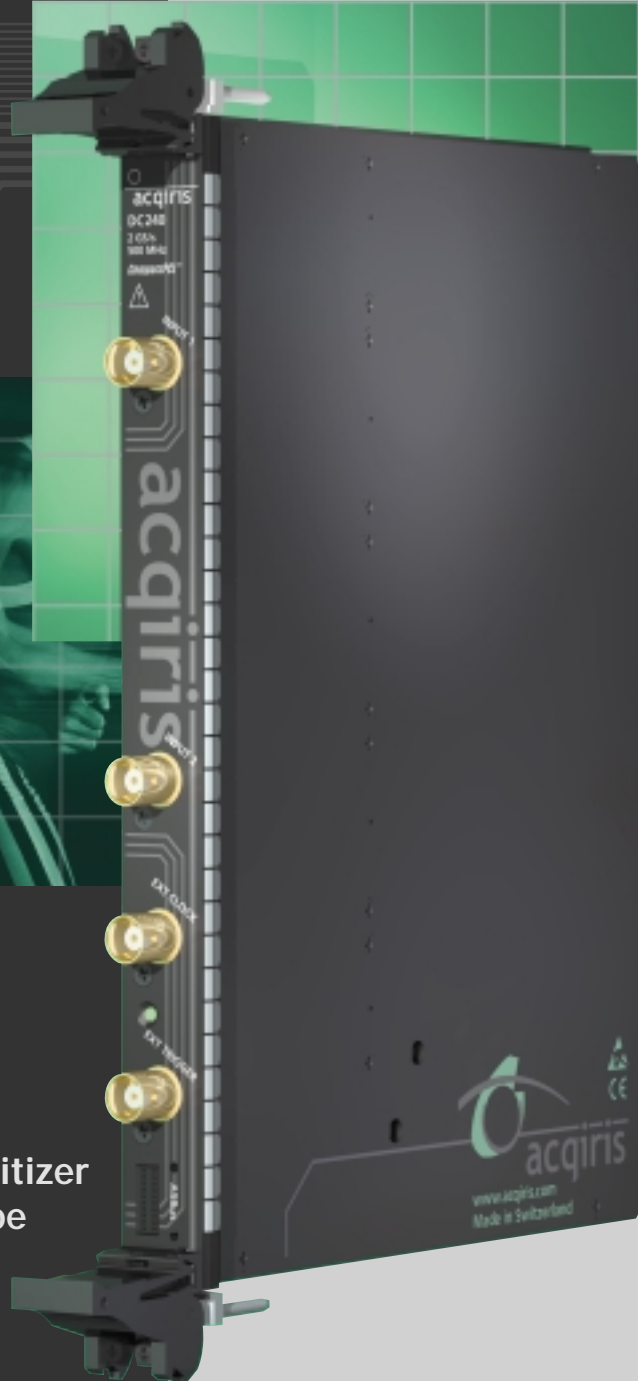## 2 GS/s

acqiris

Modular
Dual-Channel
CompactPCI Digitizer
with Oscilloscope
Characteristics

DC240

Main Features

- 2 GS/s Sampling Rate (Simultaneous on 2 Channels)
- 500 MHz Bandwidth
- 256 kpoints Acquisition Memory per Channel (4 Mpoints optional)
- Memory Battery Backup Option
- Up to 14 Channels in One 8 Slot Crate
- Full Front-end Amplification with Internal Calibration
- 50Ω and 1MΩ Input Impedance
- < ±1% DC Accuracy for Precise Voltage Measurement
- Mezzanine Front-end with Input Protection
- Complete Pre and Post Triggering

- ±2 ppm Clock Accuracy
- Built-In 5 ps Trigger Time Interpolator (TTI) for Accurate Timing Measurements
- Low dead-time (<500 ns) Sequential Recording with Time Stamps
- 1 GHz Auto-Synchronization-Bus (ASBus) for Trigger and Clock Signal Distribution
- Modular, 6U CompactPCI
- Low Power (<40 W)
- AcqirisLive Software for Windows Complete with Source Code Examples
- "Plug & Play" Installation
- National Instruments LabVIEW and LabWindows/CVI Drivers
- Very high Data Transfer Rate to Host PC

High Frequency Waveform Recording

High Speed and Precision - The Model DC240 Digitizer sets new standards in CompactPCI/PXI based data acquisition. The digitizer features two input channels, each with fast sampling rate (up to 2 GS/s), 8 bit resolution, wide bandwidth (500 MHz) and long 256 kpoints acquisition memory (optional to 4 Mpoints). The fast sampling rate and wide bandwidth combine to allow the accurate capture of signals up to 500 MHz in frequency.

Waveforms are stored directly into the digitizer's large acquisition memories enabling complex signals to be acquired over very long time periods. Only large memories allow digitizers to maintain fast sampling rates (and therefore high timing resolution) over long time periods. For example, a Model DC240 with 4 Mpoints of memory can record a signal over a 2 ms period with a sampling rate of 2 GS/s (0.5 ns per point). The fast sampling rate ensures all high frequency signal components, up to the full bandwidth (500 MHz) of the digitizer, are accurately recorded. If the memory was reduced to 20 kpoints the sampling rate would have to fall to just 10 MS/s (20,000 points / 2 ms). Frequencies above 5 MHz would then be incorrectly digitized and important events may be missed completely. The Model DC240 delivers high-speed performance, over long time periods, without compromising on acquisition memory or signal quality.

Up to 14 Channels in One Crate - The Model DC240 is a dual CompactPCI/PXI (6U) module that is ideal for use in multi-channel applications. For example, a single 8-slot 6U PXI crate (CC108) can house up to 7 modules (plus an interface) to make an 14 channel bench-top data acquisition system. The low power consumption of the DC240 (typically 40 W) results in an 14 channel system that uses the same power than most comparable 4 channel bench-top oscilloscopes. For high-density rack mounted applications multiple crates can even be daisy-chained. This makes it possible to build a system containing hundreds of channels of data acquisition that is totally controlled over a single bus!

The Model DC240 includes Acqiris' ASBus, a proprietary high bandwidth auto-synchronous bus system. In multi-channel applications, ASBus is a vital tool that takes care of the distribution of all necessary trigger and clock signals. The system improves trigger flexibility by allowing any modules input to be used as the trigger source for all the digitizers. For synchronous data acquisition, ASBus allows all the digitizers to be clocked at precisely the same time. Synchronous digitizing improves the accuracy of cross-channel measurements and is essential for accurate time correlation. The ASBus can also be used to phase-synchronize all the digitizers to an external standard (such as a 10 MHz reference).

PC Control and Convenience – Using a DC240 Digitizer is just like driving a familiar digital oscilloscope. Windows based software allows adjustment of the key acquisition settings such as time-base, trigger and sensitivity while state-of-the-art front-end electronics enables high fidelity recording with full control over features such as input impedance, coupling, gain and offset. Data recorded by the DC240 can be transferred directly to a host PC at rates up to 100 Mbytes/s. Combining the fast transfer rates with today's most powerful PC processors makes it possible to perform measurements and calculations hundreds of times faster than with conventional instruments.

You can also store hundreds of waveforms directly on the PC's hard disc or make hard copies instantly on your printer. Archiving important waveforms has never been easier. Furthermore, you can interface directly to your desktop PC and use the Internet (or a local network) to send important information to others anywhere and at anytime. The result is flexibility and performance that can dramatically reduce testing times, increase measurement throughput and lower overall cost. For high-frequency applications (up to 500 MHz) in Telecommunications, Magnetic Media, Automotive, Time of Flight Mass Spectroscopy, Computing, Particle Physics, Military, Explosive-Weapons and Ballistic Testing, the DC240 is the digitizer of choice.

Scope Like Characteristics: Amplifier, Trigger and Time Base

Mezzanine Front-end - The signal input of each DC240 Digitizer has programmable front-end electronics that provides a complete set of input voltage ranges (from 50 mV to 5 V full scale in a 1, 2, 5 sequence) and variable voltage offset. The inputs have selectable impedance (50 W or 1 MW) and are fully protected against over-voltage signals. The amplifiers feature internal calibration (no need to disconnect input signals) and fast recovery from out-of-range signals. The input buffer is mounted on a removable mezzanine card so, in the event of accidental damage or as components fatigue over time (e.g. relays in high duty cycle automated testing applications), replacement is fast and efficient.

Flexible Trigger - The digitizers include a precision trigger system with full pre and post trigger adjustment. User selectable coupling is combined with internal or external trigger sources for maximum flexibility. The digitizers also provide a sophisticated sequential trigger mode with less than 500 ns dead time between successive triggers. This extremely low dead time enables events, which may occur at very high repetition rates, to be captured and stored in their correct arrival sequence. This trigger mode is perfect for "impulse-response" type applications (RADAR, SONAR, LIDAR, Time-of-Flight, Ultrasonic, Medical & Biomedical research, etc.). The sequential trigger mode and very low dead time greatly extend the digitizers timing range and resolution. Each event can be individually time stamped and relative time measurements (between events) can be made with less than 1 ns resolution.
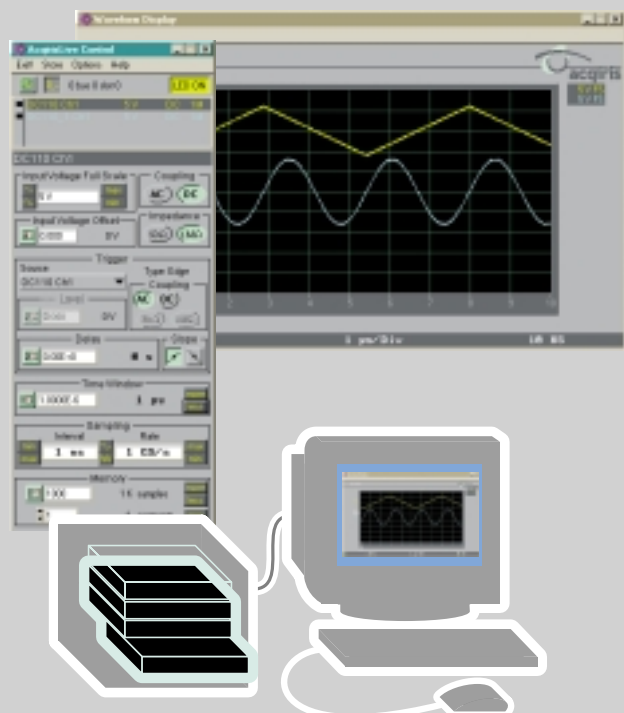
Precision Time Base - Each digitizer also has its own crystal-controlled precision time base better than ± 0.0002% accuracy. The high accuracy improves measurement precision and is extremely important

when working with complex signals that are recorded over long time periods. Sample rates can be selected, in a 1, 2, 2.5, 4, 5 sequence, from 100 S/s to 2 GS/s. An internal Trigger Time Interpolator (TTI) with high timing resolution is used to assist with timing calibration and trigger positioning. The TTI permits accurate positioning of the trigger signal with regards to the internal clock (sampling time). The sample rate can also be generated externally, using the external input connector, for applications where the sample rate must be synchronized with the signal to be acquired.

*Modular CompactPCI 6U System*

High Fidelity Measurements

DC240

Quality Acquisitions - Acqiris digitizers are designed to provide superior measurement precision and accuracy. Key acquisition specifications (such as DC accuracy, Integral and differential linearity) are optimized to deliver maximum measurement fidelity. Careful circuit layout, custom IC's and special packaging techniques are all used to reduce overall system noise.

The low noise and low harmonic distortion are best demonstrated by the following Fourier Transform performed on an acquired signal. Other important qualities of the digitizer are demonstrated by its step response, frequency response and high effective bit score. The following figures depict typical measurements.
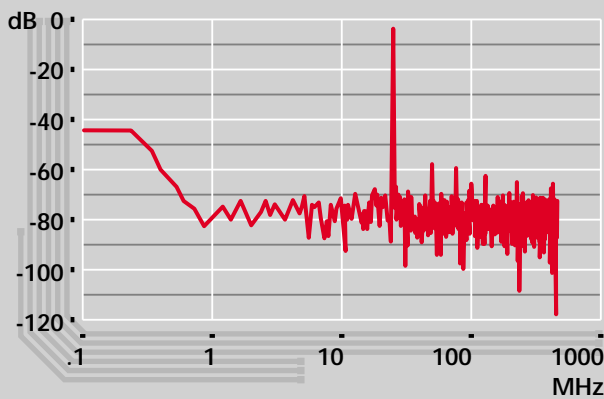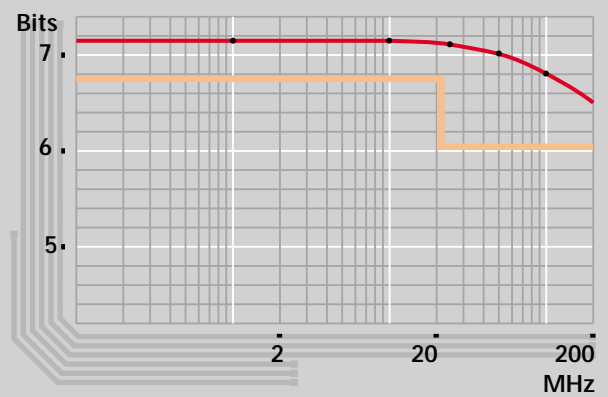

FFT analysis of a pure 25MHz sinewave, measured at 500 mV full scale, shows very low noise floor and little harmonic distortion
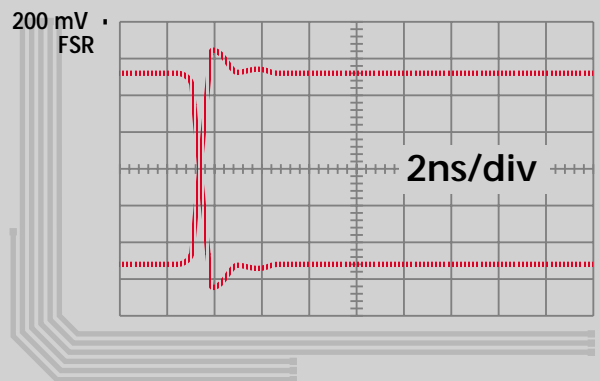
Positive and negative step responses show minimal overshoot and undershoot
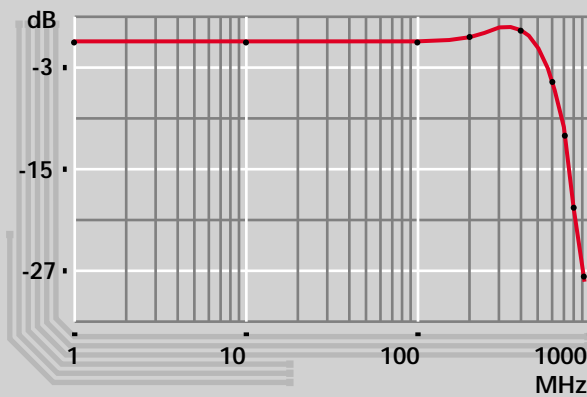
Frequency response is flat and system bandwidth reaches beyond the specified 500 MHz

Effective bits (top graph) are significantly higher than the minimum guaranteed performance (bottom graph)

High Reliability and Low Power Design

Low Parts Count - A very high degree of integration is needed in order to achieve the level of performance obtained with the Model DC240 digitizer. By drastically reducing the number of components the integration has clear benefits on reliability and lowers total power consumption. To maintain quality measurements the DC240 also use a proprietary-cooling scheme. This cooling method allows components to run at safe and stable operating temperatures. It helps to extend component life as well as minimizing measurement errors caused by temperature variation.
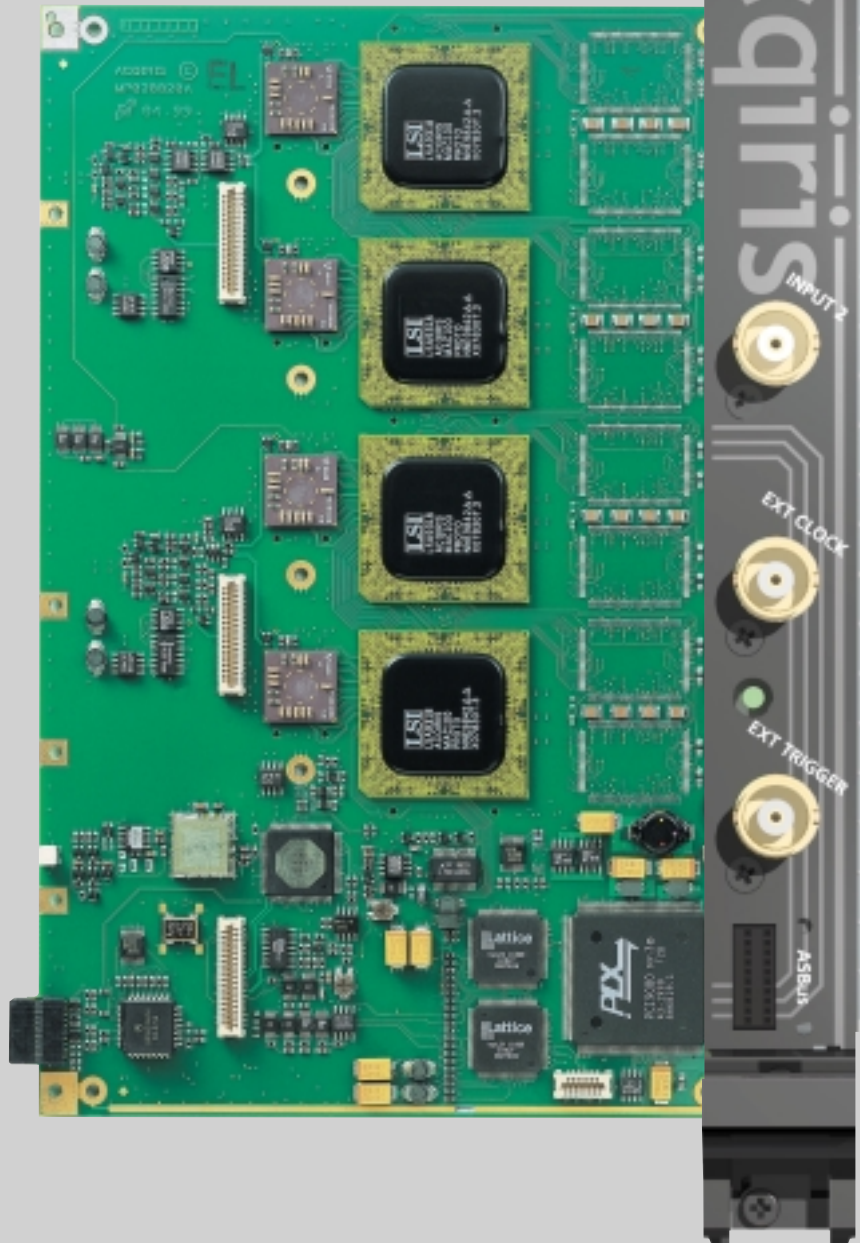
Ease of Installation, Ease of Use and AcqirisLive

Ease of use - Installing and operating your data acquisition system is easy thanks to "Plug&Play" modularity and Windows based installation software (on CD). Just insert the CD in your PC's drive, run the installation program, and power down and install the digitizers. Installation problems are quickly resolved using Acqiris' diagnostic tool-set and on-line help. Run AcqirisLive, a complimentary digitizer control and waveform display software package, and start making acquisitions immediately. Now you can leverage the power of your PC to perform rapid data analysis without paying the overhead costs associated with GPIB based stand-alone test instruments.

Getting Started - Acqiris also supplies simple application examples in source code as a starting-point for application-specific developments in C/C++ or Visual BASIC, as well as with test environment such as LabWindows/CVI and LabView. The software drivers make system integration fast and affordable. Acqiris data acquisition systems are ideal in applications (laboratory or production) where low cost and high-speed measurements are required.

The installation and operation of the Model DC240 is supported by the following software components:

- An automatic installation program (on CD) for the software components listed below.
- Plug&Play drivers for Windows 95/98, capable of managing several digitizers simultaneously. The drivers work with Visual C++ as well as Visual BASIC.
- Drivers for National Instruments' LabView and LabWindows/CVI environments .
- AcqirisLive, which permits the interactive operation of the digitizers 'right-out-of-the-box'. Data files can be stored in ASCII format for convenient use in spreadsheet programs such as Excel.

DC240 Waveform Digitizer

500 MHz, 8 bit, 2 GS/s, 256 kpoints or 4Mpoints, Dual Channel

Signal Input

Bandwidth (-3 dB)
DC to 500 MHz in 50 Ω
DC to 400 MHz in 1 MΩ

Full Scale Range (FSR)
50 mV, 100 mV, 200 mV,
500 mV, 1 V, 2 V and 5 V

Impedance
1 MΩ//10 pF; 50 Ω ±0.5%

Connectors
Gold plated BNC's

Offset
±2 V at 500 mV FSR and
±20 V above

Channels
Two

Coupling
AC, DC

Maximum Input Voltage
100 V (DC + peak AC < 10 kHz)
at 1 MΩ
±5 V DC (500 mW) or 5 V RMS
at 50 Ω

Digital Conversion

Conversion Rate
100 S/s to 2 GS/s Synchronous
on all chanels in 1, 2, 2.5, 4, 5
sequence

Resolution
8 bits (1:256)

Aperture Uncertainty
±1 ps

Differential Linearity
±0.7 LSB

Acquisition Memories
256 kpoints and 4 Mpoints
(optional) per channel

Battery Backup
Holds acquisition data for up to
5 days without external power
(with BB200 option)

Time Base

Range
Up to 128 us at 2 GS/s, (2 ms opt.)
Up to 2560 s at 100 S/s, (40 ks opt.)

Clock Accuracy
Better than ±2 ppm

Trigger Time Interpolator
5 ps resolution

Acquisition Modes
Single shot,
Sequence: 1 to 200 segments
(8000 optional)
Dead Time: < 500 ns

A high-speed front-panel bus (ASBus) distributes clock and trigger to synchronize multiple modules.

Trigger (Internal + External)

Slope
Positive and Negative

Coupling
AC LFReject and DC

Pre-Trigger
Adjustable to 100% of full scale

Post-Trigger
Adjustable up to 200 Mpoints
in 16 point increments

Trigger Sensitivity
From DC to 500 MHz:
Triggers on signals
> 15% FSR of channel setting
> 500 mV in External

External Input for Trigger

Bandwidth
500 MHz (-3 dB)

Maximum Input Voltage
±5 V DC (500 mW)

Impedance
1 MΩ or 50 Ω

Connector
Gold plated BNC

External Trigger Threshold
Variable between −3 V and +3 V

External Input Clock & Reference

External Clock Frequency
10 MHz to 500 MHz (clock)

External Reference Frequency
10 MHz

Maximum Input Voltage
±5 V DC (500 mW)

Impedance
50 Ω

Connector
Gold plated BNC

Minimum Clock/Ref Amplitude
500 mV pkpk

External Clock/Ref Threshold
Variable between –3 V and +3 V

System Performance

DC Accuracy
±2% FSR
< ±1% typical

Integral Linearity
< ±1% FSR

Effective Bits (at 2GS/s)
DC-20 MHz: > 6.5
20-200 MHz: > 6.0

PC System Requirements

Processor
150 MHz Pentium (or higher)

Operating system
Windows 95/98/NT4 and VxWorks

Memory
32 Mbyte RAM (more is
recommended when working
with several cards with 4M
acquisition memories)

Hard Drive Space
20 Mbyte Minimum

Display Resolution
At least 800 x 600
(for use of AcqirisLive)

CD Drive

General

Power
< 40 W
< 45 W with 4 Mpoints memory

Current Requirements
+12 V   1.3 A
+5 V   3 A
+3.3 V   2 A   (< 3.5 A with M4M)

Warranty
3 years

High-speed PCI bus transfers data at rates up to 100 Mbytes/s peak to local CompactPCI processor

Front Panel led indicates digitizer status
green: ready for trigger   yellow: module identification   red: triggered

Environmental and Physical

Operating Temperature
0° to 50°C

Required Airflow
> 10 l/s (2 m/s)

Relative Humidity*
5% to 95% (non-condensing)

Shock*
30 G, half-sine pulse

Vibration*
5-500 Hz, random

EMC Immunity
Complies with EN50082-1

EMC Emissions
Complies with EN50081-1,
EN55022 Class B for radiated
emissions
Front panel complies with
IEEE1101.10

Dimensions
6U CompactPCI ® standard
(233 mm x 160 mm x 20 mm)

Certification and Compliance CE

* As defined by MIL-T-28800E Class 3

DC240

Ordering Information

Model Number	Description
DC240	Dual-channel, 500 MHz, 2 GS/s, 256 kpoints CompactPCI digitizer
DC240-M4M	4 Mpoints/channel acquisition memory option
DC240-W5	5 years repair warranty
DC240-CAL	Calibration certificate
BB200	Battery Backup for DC200 series digitizers
P001	300 MHz 10:1 10 MΩ passive probe

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