Eclipse

2 GSa/s Digital Signal Averager

SIGNAL RECOVERY

FEATURES

- **2 GSa/s (500 ps per point) effective sampling rate (500 MSa/s real-time sampling rate)**
- **Long record lengths**
- **1 to 65,536 sweeps averaged per record**
- **<1 µs end-of-scan deadtime during averaging (<1 % idle time)**
- **Averaged records continuously streamed to hard disk at 4 MB/s**
- **Precision Enhancer transforms 8-bit ADC into 12-bit ADC, for 16 times greater dynamic range**
- **Live or post-acquisition trend display**
- **Computes and displays an FFT of recorded waveforms**
- **Complete with software**
- **ActiveX Controls compatible with LabVIEW, C++, Visual Basic and other languages**

APPLICATIONS

- **Dielectric studies**
- **Time-of-flight measurements**
- **Fundamental particle studies**

DESCRIPTION

Eclipse is a high performance, digital signal averager supplied as a compact line-powered console designed to be operated from a personal computer via the supplied PCI-bus plug-in card and connecting cable. The instrument is supplied with a full applications software package, designed for Windows 98/XP, which gives access to all its controls and graphically displays the acquired records, as well as allowing live or post acquisition trend analysis. In addition, an FFT display mode calculates and displays the intensity versus frequency spectrum of recorded waveforms. Alternatively, the user can develop his or her own software using the supplied ActiveX controls, which are compatible with most modern programming languages.

The outstanding performance of the Eclipse is demonstrated by the very low deadtime of less than 1 µs when averaging. This feature is the key figure of merit when comparing the Eclipse with other techniques, such as digital storage oscilloscopes, which often require significant times - up to milliseconds in some cases - after each sweep in order to perform the averaging process. Because of this low deadtime, the overall data throughput rate can be very high, allowing higher repetition rates and shorter experiment times than are possible when using other methods.

This very low deadtime is achieved by averaging sweeps as they are acquired. The input signal, after amplification, is digitized with an 8-bit flash ADC and the resulting sample added to a the sum of all previous samples at the same point in time in a 24-bit deep output memory. The sampling process is repeated to record the input waveform versus time, so that by choosing the number of samples taken and the sampling rate the time span being monitored can be adjusted.

In order to deliver the best possible time resolution the Eclipse has to operate as the source of trigger signals for the experiment, but this should rarely cause a problem since it is usually possible to configure the experiment to accept a trigger.

The Eclipse is suitable for use in any application requiring on-line averaging and/or high repetition rates, especially those with noisy repetitive signals of a transient nature. In these cases, where measurement times are necessarily short, the low deadtime and high data throughput will make it the instrument of first choice.

Specifications

General

Single-channel digital signal averager with 500 MSa/s 8-bit ADC but giving effective 2 GSa/s 12-bit performance. Line powered console controlled entirely from host computer via PCI-bus computer card and UTP cable link. Full applications software package supplied. ActiveX controls for incorporating into custom programs.

Measurement Modes

The instrument generates a trigger pulse and then starts digitizing the applied signal waveform for a preset period. The acquired waveform is stored to memory.

The cycle repeats for the preset number of sweeps to average, with each new record being added to those already in the buffer memory. On completion the averaged record is

transferred to the PC for display and processing.

The supplied software can display the averaged record (waveform mode) or the history of a particular feature, such as pulse area or peak amplitude (trend mode). It can also perform an FFT on the displayed waveform plot to ease identification of the frequencies present in a signal.

Signal Channel

Channels	One
Modes	Single-ended voltage input
Full-scale Sensitivity	± 0.5 V fixed @ 0.0 V offset
Impedance	50 Ω
Offset Control	
Range	- 0.4 V to + 0.4 V
Resolution	0.25 mV
Bandwidth	DC to 450 MHz
Rise Time	< 1ns
Equivalent Input Noise	
Uncorrelated	< 2 mV rms
Correlated	< 0.2 mV rms

Precision Enhancer

Extends the limiting ADC resolution to 12 bits (for input noise << 4 mV) when 256 or more records are averaged. May be turned on or off.

Analog to Digital Converter

Type	8-bit flash
Sampling period	0.5 ns, 1.0 ns or 2.0 ns effective
Differential non-linearity	Within ±0.15 LSB referred to the 8-bit ADC
Integral non-linearity	Within ±0.4% of full-scale

Trigger

Trigger Enable Input	
Function	Rear-panel BNC accepts TTL logic pulse to enable or disable the Trigger Output
Level	Enable state can be set High or Low under computer control.
Impedance	1 kΩ to 5 V or 50 Ω to ground (internal jumper select)
Pulse Width	> 50 ns
Delay from Trigger Enable to Trigger Output	< 200 ns with a variation of up to 34 ns
Trigger Output	
Function	Trigger pulse from Eclipse to trigger experiment
Level	Positive TTL pulse
Impedance	50 Ω
Pulse Width	64 ns
Busy Output	
Function	Signal indicates when trigger enable has been detected and a scan has started
Level	Active TTL high
Start Output	
Function	Indicates when software Start command has been received
Level	
Start	TTL high
Stop	TTL low
Abort Input	
Function	Aborts acquisition of averaged record
Level	Active TTL high
Duration	> 50 ns
Impedance	1 kΩ

Memory

Record Length	512 to 262,000 in 16 ns increments
Data Acquisition Delay	
Computer selectable digital delay after trigger from 0 to 1048.56 µs in 16 ns increments	
Time Span	
0.5 ns sampling	0.256 µs to 131.0 µs
1.0 ns sampling	0.512 µs to 262.0 µs
2.0 ns sampling	1.024 µs to 524.0 µs
Scans per complete record	
0.5 ns sampling	4
1.0 ns sampling	2
2.0 ns sampling	1
End of scan deadtime	
Minimum time between end of scan and generation of next Trigger Output is selectable from 0.544 µs to 8.544 µs in 32 ns increments	

Timing Clock

Frequency	500 MHz ±100 ppm
Stability	±10 ppm/°C
Trigger to Clock Synchronization	
Jitter	< 50 ps FWHM
Systematic error in interlacing offset	Within ±20.0 ps over 0 - 50°C; typically within ±5 ps at 22°C

Preamp Power Output

Type	9-pin subminiature D connector
Voltage	pin 4: +12 V, pin 9: -15 V, pins 1 & 2: ground

Interfaces

High speed proprietary interface via UTP cable to PCI-bus interface card, provided with instrument.

RS232 port for diagnostic purposes.

Software

Full operating package for Windows 98/ XP including programmer's toolkit. Package includes software controls to access every hardware control, averaged record and trend mode displays, and data storage to hard disk. Free LabVIEW driver available from **www.signalrecovery.com** website.

General

Power Requirements	
Voltage	110/120/220/240 VAC
Frequency	50/60 Hz
Power	150 VA max
Dimensions	
Width	17" (425 mm)
Depth	17½" (445 mm)
Height	4½" (111 mm)
Weight	18 lb (8.2 kg)

Why should you choose *SIGNAL RECOVERY* products?

Eclipse Digital Signal Averager

SIGNAL RECOVERY **Product Features**	**Benefit to you**
◆ Very low end-of-scan deadtime	Experiments can be run at high repetition rates
◆ Rapid data transfer to disk	Eliminates data acquisition bottleneck common in transfer of data from oscilloscopes to computer
◆ 0.5 ns effective sampling time	Capture spectra at higher time resolution than other digitizers