Phase Reference Module for the DSA8200[*1] Sampling Oscilloscope

▶ 82A04

Extremely Low Jitter, Flexible Signal Acquisition Solution

The 82A04 Phase Reference Module extends the capability of the DSA8200 digital serial analyzer sampling oscilloscope mainframe by providing extremely low jitter/low drift sample position information to the mainframe. This sample position information is based on the phase of a clock the user provides to the 82A04 input.

The benefits of using the sample position information based on a clock signal are two-fold: an extremely low jitter of <200 fs_{RMS} (typical) and the possibility of a triggerless acquisition. The typical application is the acquisition and analysis of very high-speed optical and electrical signals in high-speed communication devices and systems and similar areas.

The 82A04, together with the DSA8200, implements the phase reference timebase functionality in a novel way, giving the user the freedom to select from timebase and acquisition modes without compromises; any phase-reference frequency within the operating range is accommodated, and even the advanced features, such as FrameScan, remain available. The separate DSP-per-acquisition slot architecture of the DSA8200 enables the acquisition rate in the phase reference mode to reach over 40 kS/s.[*2]

*1 Also compatible with TDS/CSA8200, TDS/CSA8000B and TDS/CSA8000 sampling oscilloscopes.

*2 Typical performance, some settings will lower the throughput.

▶ **Features & Benefits**

Extremely Low Jitter <200 fs_{RMS} (Typical)

Flexible Operation
– Triggered
– Un-triggered (Free-running) Acquisition Without Trigger Signal

Support for Enhanced Acquisition Modes (FrameScan®)

Wide and Continuous Frequency Range: 2 GHz – 60 GHz

Small Module Implementation Allows:
– Acquisition on Six Other Channels
– Placement Close to the DUT with Module Extender Cable

Fast Acquisition Rate

▶ **Applications**

Design, Verification and Manufacturing of Telecom and Datacom Components and Systems Operating at 10 Gb/s and Faster

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Modes of Operation

The operation of the phase reference is based on the acquisition of a clock synchronous to the signal under observation. This clock can be a user-supplied signal (e.g., a clock from a BERT) or the Clock Output of one of the DSA8200 clock recovery or optical modules. In addition, the user can also provide a traditional external trigger signal either to the Direct Trigger input, or to the Trigger Prescaler input of the mainframe.

Phase Ref Free-Run – With no external trigger to the DSA8200 mainframe needed, the 82A04 module can, together with the mainframe, create a timebase based on the phase of the reference clock (effectively the timebase of the instrument functions as a "Phase-base" instead). The signal displayed on the screen will therefore repeat after one period of the reference clock. All user controls remain enabled, even while the horizontal position has relative meaning only. The timing information presented by the oscilloscope is based solely on the phase reference clock frequency as entered by the user in the Input Freq field of the Phase Reference Setup dialog.

Phase Ref Triggered – When the DSA8200 mainframe is supplied with both the reference clock and a traditional external trigger, the mainframe triggers on the trigger signal and uses the phase reference information from the 82A04 to minimize the jitter. Otherwise the acquisition process doesn't change from traditional acquisition; the signal remains referenced to the trigger point.

Characterize – To operate properly in either the Phase Ref Triggered or the Phase Ref Free-Run modes, the Phase Reference module has to first characterize the Phase Reference signal. The signal needs to be stable during the characterization and afterwards. The instrument indicates when characterization is necessary.

▶ Characteristics

Acquisition Modes –
Free Run Synchronous, Triggered Synchronous. Mainframe resources: Any one active[3] small (electrical) module slot. Both acquisition channels associated with the slot became unavailable. Only one 82A04 module can be activated in a mainframe at a time. Compatible mainframes: DSA8200, CSA/TDS8200. Does not operate in the CSA/TDS8000 or 8000B mainframes.

Reference Clock Parameters Supported

Amplitude: Operational: 100 mV$_{pk-pk}$ to 1.8 V$_{pk-pk}$. Jitter performance guaranteed from 600 mV$_{pk-pk}$ to 1.8 V$_{pk-pk}$.
Guaranteed Frequency Range: 2 GHz to 25 GHz continuous; for non-sinewave reference clock signal in the 2 GHz to 8 GHz range, an additional filter[3] typically is required.
Guaranteed Frequency range is 2 to 60 GHz continuous with Option 60G; for non-sinewave reference clock signal in the 2 GHz to 8 GHz range, an additional filter[4] typically is required.

[3] Channels not displaced by a large (optical) module.

[4] See list of accessories at the end of this datasheet for recommended filters.

System Performance

Jitter: System jitter of 200 fs$_{RMS}$ typical, on a 10 GHz or faster acquisition module, in DSA8200 mainframe, with f ≥8 GHz, VREF ≥0.6 V Phase Reference Signal.

Jitter: System jitter of 280 fsRMS typical, on a 10 GHz or faster acquisition module, in DSA8200 mainframe, with 2 GHz ≤ f <8 GHz, VREF ≥0.6 V Phase Reference Signal.

Time Accuracy (timebase) and Timing Deviation (phase reference).

Phase Reference Timebase –
Triggered: Maximum timing deviation relative to phase reference signal:
Horizontal position >40 ns after trigger event:
0.2% of phase reference signal period (typical).
Horizontal position ≤40 ns after trigger event:
0.4% of phase reference signal period (typical).

Phase Reference Timebase –
Free Run: maximum timing deviation relative to phase reference signal:
0.1% or better of phase reference signal period (typical).

Input

Input Impedance –
50 Ω ±0.5 Ω AC (5 pF typical AC coupling).
1.85 mm female ("V") connector.
Precision adapter to 2.92 mm female included with 50 Ω SMA termination.

Environmental

Matches the mainframe specifications.

Dimensions	mm	in.
Width	79	3.1
Height	25	1.0
Depth	135	5.3
Weight	**kg**	**oz.**
Net	0.4	13

► Ordering Information

82A04

Phase Reference Module.

Includes: User manual (1); Precision adapter 1.85/2.4 mm male to 2.92 mm female included with 50 Ω SMA termination (1).

82A04 Options

Opt. 60G – Extends the BW range to 60 GHz.

Filter – For non-sinusoidal phase reference clock signal with frequency below 8 GHz please also order appropriate filter from the accessory list below.

Service Options

Opt. C5 – Calibration service 5 years.

Opt. R3 – Repair service 3 years.

Opt. R5 – Repair service 5 years (including warranty).

Other Accessories

82A04 Filter 2 GHz – Filter kit for non-sinusoidal phase reference clock signal with frequency between 2 GHz and 4 GHz. Order 020-2566-00.

82A04 Filter 4 GHz – Filter kit for non-sinusoidal phase reference clock signal with frequency between 4 GHz and 6 GHz. Order 020-2567-00.

82A04 Filter 6 GHz – Filter kit for non-sinusoidal phase reference clock signal with frequency between 6 GHz and 8 GHz. Order 020-2568-00.

Sampling Module Extender Cable (2 meter)[5] – Order 80N01.

Connector Adapter – (2.4 mm or 1.85 mm male to 2.92 mm female) DC to 40 GHz. Order 011-0157-00.

Interconnect Cables (Third Party)[5]

Tektronix recommends using quality high performance interconnect cables with these high bandwidth products in order to minimize measurement degradation and variations. The W.L. Gore & Associates' cable assemblies, accessible at http://www.gore.com/tektronix, are compatible with the 2.92 mm, 2.4 mm and 1.85 mm connector interface of the 80E0x modules. Assemblies can be ordered by contacting Gore, at the URL above.

[5] The 82A04 module does not require particularly high spectral fidelity in the clock signal passed to it; the signal can be BW limited (e.g., by the cable) since there can be no ISI issues (as the signal is a clock); it is sufficient to supply a signal that is stable, free from unstable moding and has the appropriate amplitude. Similarly the module extender cables are of lesser benefit to the 82A04 than to the usual acquisition modules.

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Our most up-to-date product information is available at:
www.tektronix.com

CE ISO 9001 GPIB

Product(s) are manufactured in ISO registered facilities.

Product(s) complies with IEEE Standard 488.1-1987, RS-232-C, and with Tektronix Standard Codes and Formats.

4/07   HB/WOW   85W-17640-4

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