Electrical Clock Recovery Module

80A05 – Electrical Clock Recovery Module for 8000 Series Communications Signal Analyzers and Sampling Oscilloscopes

Features & Benefits

Electrical Clock Recovery for Bit Rates Between 50 Mb/s and 12.6 Gb/s

Single-ended and Differential Clock Recovery

Trigger Clock Out

Internal Trigger Path to the 8000 Series Sampling Oscilloscope or Communications Analyzer Mainframe

High Fidelity 50% Through Signal Out

Low Jitter: ($\leq$ 2.0 $psec_{RMS}$ at 10 Gb/s)

High Input Signal Sensitivity (8 mV_{p-p}*1)

Applications

High-speed Serial Data Links for Computer and Communications Applications

Conformance Testing of Electrical Signaling

Testing of Frequency Agile or Multi-rate Devices

Recovered Clock Outputs Can Be Used to Clock and Trigger Other Instruments

Single Module Solution for All of Your Multi-gigabit Electrical Clock Recovery Needs

*1 2.5 Gb/s signal on both ±Data In.

The *80A05 Electrical Clock Recovery Module* enables clock recovery for electrical signals, as well as internal triggering on the recovered clock for the *8000 Series Communications Signal Analyzers and Sampling Oscilloscopes*.

This module recovers clocks from serial data streams for all of the most common electrical standards in the 50 Mb/s to 4.25 Gb/s range.

Option 10G adds support for other standard rates up to 12.6 Gb/s.

In addition to standard rate support, users can specify custom bit rates in order to test devices, modules and systems running at emerging or non-standard rates.

The wide clock recovery range and support for user-specified bit-rates – all in a single module – provides a complete clock recovery solution for testing of a whole range of computer and communications signaling rates and standards.

The module accepts either single-ended or complementary (±Data In) signals at its input. In the case of differential signaling the clock recovery is a true-differential clock recovery; single-ended recovery is performed on single-ended signals.

With either single-ended or complementary input signals, the unmodified input signal is available at approximately 50% amplitude on the front panel ±Data Out "through" outputs.

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The signal path to these front panel outputs is carefully designed to preserve signal fidelity well beyond the frequency corresponding to the maximum bit rate addressed by the clock recovery circuit. The front-panel output signals can therefore be connected to a high frequency sampling module (for example, the 80E03 (20 GHz) Electrical Sampling Module) and be acquired for analysis while preserving high frequency features of the signal.

The 80A05 Electrical Clock Recovery Module combines simplicity of use with excellent flexibility; the full-rate recovered clock or its sub-rate is available on the module's front panel to clock and/or trigger other equipment.

80A05 - Highly Flexible Electrical Clock Recovery Module

The 80A05 Electrical Clock Recovery Module recovers clock for all of the most common standards in the range from 50 Mb/s to 12.6 Gb/s. This wide range, available in a single module, provides complete clock recovery support for acquisition of communications and computer electrical signal.

▶ Characteristics

Product Feature/Characteristic	Specification	
Enumerated Standards *(without Option 10G)* These rates are selectable directly from the graphical user interface and the programmatic interface. Non-enumerated rates are supported as user-specified numeric values for the supported ranges shown below	**Standard** OC3/STM1 OC12/STM4 Fibre Channel Gigabit Ethernet 2 Gigabit Fibre Channel OC48/STM16 2 Gigabit Ethernet InfiniBand® 2.5G G.709 FEC 4 Gigabit Fibre Channel	**Rate** 155.52 Mb/s 622.08 Mb/s 1.063 Gb/s 1.250 Gb/s 2.125 Gb/s 2.488 Gb/s 2.500 Gb/s 2.500 Gb/s 2.666 Gb/s 4.250 Gb/s
	Additional enumerated standard rates are supported with 8000 Series Firmware Releases higher than 2.0.1.5	
Clock Recovery Ranges without Option 10G for custom (user specified) rates. (These are in addition to the enumerated list above)	**Range** 50 Mb/s to 2.700 Gb/s 3.00 Gb/s to 3.188 Gb/s	**Emerging Standards** VSR5 PCI Express, SATA SATA-2, XAUI, 4-lane 10GFC
Enumerated Standards Added with Option 10G	**Standard** OC192/STM64 10GBase-W 10GBase-R 10G Fibre Channel G.975 FEC G.709 FEC 10GbE w/FEC	**Rate** 9.953 Gb/s 9.953 Gb/s 10.31 Gb/s 10.51 Gb/s 10.66 Gb/s 10.71 Gb/s 11.10 Gb/s
	Additional enumerated standard rates are supported with 8000 Series Firmware Releases higher than 2.0.1.5	
Clock Recovery Ranges Added with Option 10G for custom (user specified) rates. (These are in addition to the enumerated lists above)	**Range** 2.7 Gb/s to 3.0 Gb/s 3.267 Gb/s to 4.250 Gb/s 4.900 Gb/s to 6.375 Gb/s 9.800 Gb/s to 12.60 Gb/s	**Emerging Standards** SATA-3, 2x XAUI, PCI Express 2 OC192 Super FEC
Sensitivity (clock recovery will lock), 50 Mb/s to 2.70 Gb/s 2.70 Gb/s to 11.19 Gb/s 11.19 to 12.60 Gb/s	**Differential** ≤8 mV_{p-p} (on each input) ≤12 mV_{p-p} (on each input) ≤15 mV_{p-p} (on each input)	**Single-ended** 10 mV_{p-p} 15 mV_{p-p} 20 mV_{p-p}
Jitter (max.) Bit rate: 50 Mb/s to 2.70 Gb/s Bit rate: 2.70 to 6.375 Gb/s Bit rate: 9.80 to 12.60 Gb/s	≤1.0% of Unit Interval or "bit-time" (RMS); 0.50% typ. ≤2.5 $psec_{RMS}$; 1.5 psec typ. ≤2.0 $psec_{RMS}$; 1.0 psec typ.	

▶ Characteristics (continued)

I/O Characteristics

Input/Output Connectors	SMA
Input/Output Impedance	50 Ω

Input Characteristics

Inputs	**+Data In** and **–Data In**: complementary signals	
Input Voltage:		
Absolute Maximum non-destructive	2.5 V_{p-p} (each input)	
Maximum operational (input to ground)	2.0 V_{p-p} (either input); 1.0 V_{p-p} differential	
Maximum Input Signal Skew		
(+Data In to **–Data In)** under which the unit will still meet its sensitivity specification	50 Mb/s to 2.70 Gb/s: 2.70 Gb/s to 12.6 Gb/s:	20% of Unit Interval 20 psec
Coupling		
Clock Recovery internally to mainframe	AC	
To Data Out	DC	

Output Characteristics

+Data Out and **–Data Out** (complementary signals)

Attenuation **+Data In** to **+Data Out**, **–Data In** to **–Data Out**	6.6 dB ±0.6 dB (ratio of **+Data Out** to **+Data In**)
Bandwidth (–3 dB) **+Data In** to **+Data Out**, **–Data In** to **–Data Out**	≥20 GHz
Recovered **TRIGGER CLOCK** Output	
Output Frequency	
Input bit rate <2.70 Gb/s	Input bit rate
Input bit rate ≥2.70 Gb/s	Input bit rate/16
Jitter (max.)	
Bit rate 155 Mb/s to 2.70 Gb/s	≤1.0% of Unit Interval or "bit-time" (RMS)
Bit rate 2.70 to 6.38 Gb/s	≤2.5 $psec_{RMS}$
Bit rate 9.80 to 12.6 Gb/s	≤2.0 $psec_{RMS}$
Amplitude	>400 mV (typ)
Recovered **10G Clock Out** *(Option 10G only)*	
Jitter (max.) (SMA, internal trigger)	
Bit rate 2.70 to 3.14 Gb/s	4 x input bit rate; 2.5 $psec_{RMS}$
Bit rate 3.27 to 4.25 Gb/s	3 x input bit rate; 2.5 $psec_{RMS}$
Bit rate 4.90 to 6.38 Gb/s	2 x input bit rate; 2.5 $psec_{RMS}$
Bit rate 9.80 to 12.6 Gb/s	1 x input bit rate; <2.0 $psec_{RMS}$
Amplitude	>500 mV (typ)

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Physical Characteristics

Dimensions	mm	in.
Width	165	6.5
Height	25	1.0
Depth	305	12.0

▶ Ordering Information

80A05

Multi-rate Electrical Clock Recovery Module.

Includes: User Manual.

Product Options

Opt. 10G – Add bit rates above 4.25 Gb/s and ranges above 3.1875 Gb/s.

Service Options

Opt. C3 – Calibration Service 3 Years.

Opt. C5 – Calibration Service 5 Years.

Opt. D1 – Calibration Data Report.

Opt. D3 – Calibration Data Report 3 Years (with Option C3).

Opt. D5 – Calibration Data Report 5 Years (with Option C5).

Opt. R3 – Repair Service 3 Years.

Opt. R5 – Repair Service 5 Years.

Product Pre-requisites

This module is supported on 8000 Series Communications Signal Analyzers and Sampling Oscilloscopes running Firmware Release 2.0.1.5 or later.

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

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.

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