PicoPak

Clock Measurement Module
Model PP1

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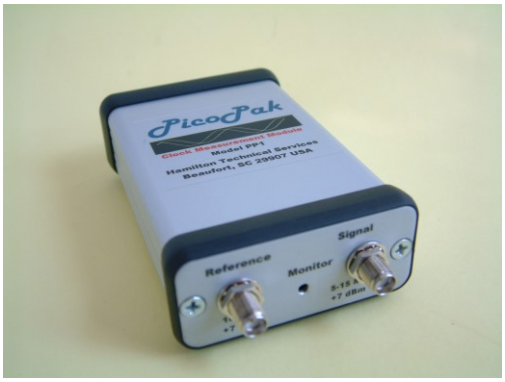

The new PicoPak Module is a small and inexpensive USB instrument for making precise phase and frequency measurements on clocks and oscillators.

The PicoPak Model PP1 uses a unique measurement technique employing phase control of a direct digital synthesizer (DDS) to track and report the phase variations of the signal under test with respect to a 10 MHz reference. These readings are output at 10 ms or 1 s intervals with a resolution of 6.1 picoseconds at 10 MHz to a custom PC application that controls the measurement process, captures and displays the results, and optionally launches the Stable32 or TimeLab program for frequency stability analysis. The module can measure sources having moderate to high stability any nominal frequency between 5 and 15 MHz.

Preliminary Specifications

Parameter			Specification
Signal Input	Frequency		5 to 15 MHz
	Waveform		Sinusoidal
	Level		0 to +10 dBm
	Impedance		50 ohms nominal
	VSWR		≤ 1.5:1 between 5 to 15 MHz
Reference Input	Frequency		10 MHz
	Waveform		Sinusoidal
	Level		0 to +10 dBm
	Impedance		50 ohms
	VSWR		≤ 1.5:1 at 10 MHz
Resolution	Phase		0.022 degrees at signal frequency (6.1 ps at 10 MHz)
	Frequency		$1x10^{-11}$ at 1 second (11 digits/s)
Noise	0.01-10,000 seconds (or longer)		≤ $3x10^{-11}/\tau$, ≤ $1.5x10^{-11}/\tau$ typical , for τ in seconds
	Floor		≤ $1x10^{-15}$ (or lower)
Frequency Slew	Tracking Limit		≤ $3x10^{-8}$/second
Temperature Coefficient	Phase versus Temperature		+5 ps / °C typical
O/P Data Stream (uses standard FTDI PC USB virtual serial port driver)	Sampling Rate		2.5 kHz (τ=400 µs)
	5 documented formats, ASCII characters, 1 row per datum, no timetags	#1: 100/s rate	Signed decimal integer phase increments
		#2: 100/s rate	Hex phase and frequency increments
		#3: 1/s rate	Hex phase increments, frequency adjustments and phase corrections
		#4: 100/s rate	Signed binary phase increments
		#5: 1/s rate	Hex DDS phase word
USB Commands	ASCII Characters		Proprietary documented commands to control PicoPak from PC
Power	Voltage		+5 VDC from USB
	Current		≤ 100 mA (85 mA typical)
Connectors	USB		Type B Male on rear panel
	Signal Input		SMA Female on front panel
	Reference Input		SMA Female on front panel
	Programming		Internal 6-Pin 2 mm header for Microchip PICkit-3 (factory use only)
Indicators	Monitor		LED on front panel
Controls	Reset		Pushbutton on rear panel
Physical	Size (LxWxH)		3.28”x2.25”x1.03” (excluding connectors, feet and trim)
	Weight		≤ 5 oz (extruded aluminum case)
Accessories (Included)	Cable		5’ USB Type A plug to Type B plug with ferrite choke
	Software		PC applications to control and monitor PicoPak module
	Documentation		Papers and application notes describing PicoPak design & use