Pendulum
Test & Measurement

PicoTime™
Pico Second Resolution Test Set

- Clock characterization such as quartz crystal oscillator, Rubidium atomic clocks and cesium clocks
- Calibration of quartz crystal oscillator, and atomic clocks
- ADEV, Phase and Frequency
- DUT Frequency Range: 1MHz to 30 MHz
- Phase time resolution and frequency
- System noise: <2ps rms
- Automatic operation

The PicoTime™ is a low-cost, high-performance measurement test set. It features a cutting-edge 1ps resolution and an easy-to-use software application for performance analysis. Combined with the CNT-91 Frequency Counter/Analyzer, it enables very high resolution measurements of ADEV from 1ms and up, TIE, plus frequency.

System Description
The system is designed to make a direct frequency measurement in comparison with an external 10 MHz frequency reference. Picotime is based on a heterodyne system using direct digital synthesizer (DDS) technology to allow measurements in the range of up to 30 MHz. The external 10 MHz reference divided by 2x10^7 is used to make time interval measurement each second.

Direct frequency measurement is used for programming DDS. The DDS divides the device frequency around 1kHz by using two mixers. As indicated in the block-diagram, the whole system is based on a heterodyne architecture with a double frequency conversion.

Three outputs are available:
- 1kHz where a crystal filter based PLL is used to restrict the bandwidth to only 1Hz
- 1kHz with about several 100 kHz bandwidth
- 1pps reference

The system is controlled with the PC COM interface. When connecting an external CNT-91 Frequency Counter/Analyzer, other types of measurements can be performed. For example TIE and ADEV from 1ms and up, plus frequency measurements with a resolution of 2E-13 (1s meas time).

Figure 1: Block diagram

Figure 2: System Noise in ideal conditions

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Technical Specifications: PicoTime

### Electrical

<table>
<thead>
<tr>
<th>Specification</th>
<th>Standard version</th>
</tr>
</thead>
<tbody>
<tr>
<td>DUT Center Frequency Range</td>
<td>1MHz to 30 MHz</td>
</tr>
<tr>
<td>Measurement Noise in filtered mode [1Hz bandwidth] @10 MHz [Maximum Relative Frequency Deviation During Measurements &lt;1 x10^-9]</td>
<td>&lt;2ps</td>
</tr>
<tr>
<td>Measurement Noise in unfiltered mode (&gt;3kHz bandwidth) @10 MHz (Maximum Relative Frequency Deviation During Measurements &lt;1 x10^-7)</td>
<td>&lt;10 ps</td>
</tr>
<tr>
<td>Reference Frequency</td>
<td>10 MHz</td>
</tr>
<tr>
<td>Phase time sensitivity versus temperature</td>
<td>&lt;20 ps /°C</td>
</tr>
<tr>
<td>Input Signal Level</td>
<td>+3dBm to 17 dBm</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>50 Ω</td>
</tr>
<tr>
<td>Connector Type</td>
<td>BNC</td>
</tr>
<tr>
<td>PC Port</td>
<td>Standard – Serial (COM1 or COM2 or COM3 or COM4)</td>
</tr>
</tbody>
</table>

### Environment

<table>
<thead>
<tr>
<th>Condition</th>
<th>Temperature</th>
<th>Relative Humidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating</td>
<td>15°C to 30°C</td>
<td>10% - 85%</td>
</tr>
<tr>
<td>Storage</td>
<td>-25°C to 55°C</td>
<td></td>
</tr>
<tr>
<td>Transportation</td>
<td>-25°C to 70°C</td>
<td></td>
</tr>
</tbody>
</table>

### Power Requirements

<table>
<thead>
<tr>
<th>Specification</th>
<th>Standard version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Supply</td>
<td>AC input 85-264V</td>
</tr>
<tr>
<td>Power Input Fluctuation</td>
<td>±10% of nominal supply voltage (230 V~)</td>
</tr>
<tr>
<td>Input Frequency</td>
<td>47 – 63 Hz</td>
</tr>
<tr>
<td>Power Consumption @25°C</td>
<td>&lt;10 W after warm-up</td>
</tr>
<tr>
<td>Connector Type</td>
<td>IEC plug</td>
</tr>
</tbody>
</table>

### General Specifications

#### Dimensions and Weight

**Width x Height x Depth:**
445 x 300 x 44 mm (1U)
(17.52 x 11.81 x 1.73 in)

**Weight:**
Net 3.5 kg (7.7 lb)

### Software Upgrades

The latest software upgrades can be downloaded – free of charge from www.pendulum-instruments.com

### Ordering Information

#### Basic Model

**PicoTime:**
Picosecond resolution test set

**Included with shipment:**
- Power cable (EU type is standard)
- Users manual on CD
- RS232 communication cable to PC
- Picotime installation SW on CD

#### Options and accessories

- **Option US:** US Power cable
- **Option CN:** Chinese Power cable
- **Option CH:** Swiss Power cable
- **Option E:** 19” Rack mount ears
- **Option ExtW-3:** Extended warranty to 3 years
- **Option ExtW-5:** Extended warranty to 5 years

Figure 3: CNT-91 + PicoTime. A high resolution Frequency Comparator and ADEV test set