DP310
12-bit
100 MHz
400 MS/s

PCI Digitizer for Frequency Domain Applications
Main Features

- Specifically designed for wideband frequency-related measurements
- High-resolution, high-speed, single-channel digitizer
- 12-bit monolithic ADCs, SFDR > 78 dB, SNR > 64 dB
- Up to 400 MS/s sample rate
- Fine-tuneable sample rate with a resolution better than 0.25% of the SR
- 100 MHz DC-coupled standard input, 300 MHz AC-coupled HF input
- 64 kpoint (4 Mpoint optional) acquisition memory per channel
- External clock/reference input for custom or high-precision frequency standard
- 50 Ω mezzanine front end with large full-scale dynamic range and input protection
- Complete pre- and post-triggering
- Low dead-time (< 1 µs) sequential recording with time stamps
- PCI standard
- Low power consumption (< 17 W)
- Device drivers for Windows 95/98/NT4.0/2000/XP, VxWorks and Linux
- Auto-install software with application code examples for C/C++, Visual Basic, National Instruments LabVIEW and LabWindows/CVI
- “Plug & Play” installation
- High-speed PCI bus transfers data to host PC at sustained rates up to 100 MB/s

Unique Tools for Complex Frequency Analysis

High-Resolution Sample Rate

The DP310 12-bit digitizer has its own crystal-controlled high-resolution precision time base. Sampling rates can be precisely tuned with a resolution better than 0.25% (500 kS/s in the 200–400 MS/s range) of the sampling frequency, in the full range between 100 S/s up to 400 MS/s. This unusual time base flexibility is ideal for wideband frequency-related measurements allowing for easy demodulation processing of I/Q modulated carriers like the ones used in QAM or RF/IF digital receivers. The High Resolution Sample Rate (HRes SR) utilization ranges from IF sampling and wireless communication (and derivative applications) to radar identification. The HRes SR can also be exploited to deliver a fine-grained adjustable distance/sample-period ratio in ranging applications.

High Speed and Precision

The Model DP310 12-bit digitizer sets new standards in PCI-based high-resolution data acquisition. The digitizer features one input channel with fast sample rates up to 400 MS/s, broad bandwidth of 100 or 300 MHz for extended frequency-related investigation, and long acquisition memories (64 kpoint standard, optional to 4 Mpoint). High sample rates and wide bandwidth combine to allow the high-resolution capture of signals, up to 100 MHz through standard DC-coupled BNC inputs and up to 300 MHz via high-frequency AC-coupled SMA inputs (HF In), to fully exploit ADC characteristics by providing access to the state-of-the-art chips. High SFDR (> 78 dB) along with high signal-to-noise ratio (SNR > 64 dB) make the Model DP310 ideal for applications in the areas of wireless communication equipment testing, general QAM or RF/IF digital receivers and radar wideband communication and analysis (SIGINT). The high-frequency 300 MHz input is ideal for undersampling techniques.
High-Resolution DAQ Card under PC Control

PC Control and Convenience
Using a DP310 digitizer board is just like driving a familiar digital oscilloscope with the advantage of obtaining high resolution. Windows-based software allows adjustment of the key acquisition settings such as time base, trigger and sensitivity while state-of-the-art front-end electronics enable high-fidelity recording with full control over features such as coupling, gain and offset. Data recorded by the DP310 can be transferred directly to a host PC at rates up to 100 MB/s. Combining the fast transfer rates with today’s most powerful PC processors makes it possible to perform measurements and calculations hundreds of times faster than with conventional instruments.

You can also store hundreds of waveforms directly on the PC’s hard disk or make hard copies instantly on your printer. Archiving important waveforms has never been easier. Furthermore, you can interface directly to your desktop PC and use the Internet (or a local network) to send important information to others anywhere and at anytime. The result is flexibility and performance that can dramatically reduce testing times, increase measurement throughput and lower overall cost. For high resolution in frequency-related (up to 300 MHz) single-channel applications in telecommunications, wireless communication and radar testing, EW and military testing, the DP310 is the digitizer of choice.

The DP Series digitizers use large-scale integrated circuit technology to reduce size and power requirements. This essential technology allows the DP310 to deliver the fastest sampling rate, highest bandwidth and most memory for any 12-bit digitizer in the standard PCI package.

High Reliability

Low Parts Count
A very high degree of integration is needed in order to achieve the level of performance obtained with the Model DP310 digitizer. By drastically reducing the number of components the integration delivers clear benefits in terms of reliability and lowers total power consumption. To maintain quality measurements the DP310 also uses a proprietary cooling scheme. This cooling method allows components to run at safe and stable operating temperatures. It helps to extend component life as well as minimizing measurement errors caused by temperature variation.
Ease of Installation, Ease of Use

Acqiris Software
Installing and operating your data acquisition system is easy thanks to “Plug&Play” modularity and Windows-based installation software (on CD). Just insert the CD in your PC drive, run the installation program, power down and install the digitizers. Installation problems are quickly resolved using the Acqiris diagnostic tool set and on-line help. Use the complimentary digitizer control and waveform display software package to start making acquisitions immediately. Now you can leverage the power of your PC to perform rapid data analysis without paying the overhead costs associated with GPIB-based standalone test instruments.

Advanced Features for Broadband Signal Capturing

Mezzanine Front End
The standard and HF inputs are located on a separate mezzanine hosting the front-end electronics. The standard signal input of the DP310 digitizer has programmable front-end electronics that provide a complete set of input voltage ranges (from 250 mV to 10 V full scale in a 1, 2, 5 sequence) and variable voltage offsets. The HF input bypasses the input stage and gives direct access to the ADCs. Both the standard and HF inputs have 50 Ω impedance and are protected against over-voltage signals.

The amplifier in the standard input features internal calibration (no need to disconnect input signals) and very fast recovery from out-of-range signals. The fact that the input buffer amplifier and ADCs are mounted on a removable mezzanine card guarantees that, in the event of accidental damage or as components fatigue over time, replacement is fast and efficient.

Flexible Trigger
The digitizer includes a precision trigger system with full pre- and post-trigger adjustment. User-selectable coupling is combined with internal or external trigger sources for maximum flexibility. The digitizer also provides a sophisticated sequential trigger mode with less than 1 µs dead-time between successive triggers. This low dead-time enables events, which may occur at very high repetition rates, to be captured and stored in their correct arrival sequence. This trigger mode is perfect for “impulse-response” type applications (radar, lidar, ultrasound, medical and biomedical research, etc.). The sequential trigger mode and very low dead-time greatly extend the digitizer timing range and resolution. Each event can be individually time-stamped and relative time measurements (between events) can be made with better than 100 ps accuracy.

Furthermore, a TV trigger capability has been added. This opens the way to wideband video signal applications such as the ones based on fast CCD cameras for imaging readout. The TV trigger mode is for positive video modulation and allows line and frame selection (odd & even) for the common standards B/G (625 lines/50 frames, PAL), L (625 lines/50 frames, SECAM) and M (525 lines/60 frames, NTSC).

Front-Panel Multi I/O Ports
The control over the trigger and time base is made even more flexible by the addition of high-density, high-frequency front-panel connectors. The four MMCX-type front-panel connectors enable the use of an external clock (up to 400 MHz) or reference signal (10 MHz), a trigger output and two additional I/O digital control lines. The latter can be used for monitoring or modifying the digitizer’s status and configuration; an example of the control available is trigger gating. Furthermore, the I/O outputs can be used as a 10 MHz built-in source for autonomous board test purposes.
**High-Fidelity Frequency-Related Measurements**

**Quality Acquisitions**

Acqiris digitizers are designed to provide superior measurement precision and accuracy. Key acquisition specifications (such as DC accuracy, integral and differential linearity, phase noise) are optimized to deliver maximum measurement fidelity. Careful circuit layout, custom ICs and special packaging techniques are all used to reduce overall system noise.

**FFT Analysis: Standard Input**

FFT analysis of a pure 25 MHz sinewave at 400 MS/s shows amazingly low noise floor, extremely high SFDR and little harmonic distortion for both the standard and high-frequency inputs.

**Frequency Response: Standard Input**

Frequency response for standard input is flat and system bandwidth for 1 V FS exceeds the specified 100 MHz.

**SFDR & THD: Standard Input, HF Input**

SFDR & THD values at 170 MS/s SR and 80% of 1 V FS are remarkably high for both the standard and HF inputs.

**FFT Analysis: HF Input**

**Frequency Response: HF Input**

Frequency response of HF input shows system bandwidth above the specified 300 MHz.

**Effective Bits: Standard Input, HF Input**

Effective bits at 170 MS/s SR and 80% of 1 V FS are well above ≥10 for both the standard and HF inputs.
PCI Digitizer for Frequency Domain Applications
Model DP310

Single-channel, 12-bit, 100 MHz, 400 MS/s, 64 kpoint or 4 Mpoint acquisition memory

### Standard Input - 50 Ω BNC

- **Bandwidth (-3 dB)**
  - DC to 100 MHz
- **Full Scale Range (FSR)**
  - 250 mV, 500 mV, 1 V, 2 V, 5 V and 10 V
- **Impedance**
  - 50 Ω ± 1% @ DC
- **Connector**
  - BNC, gold-plated

- **Offset**
  - ±1 V for 250, 500 mV and 1 V FS
  - ±2 V for 2 V FS
  - ±5 V for 5 V FS
  - ±10 V for 10 V FS
- **Channels**
  - One
- **Coupling**
  - DC into 50 Ω BNC
- **Maximum Input Voltage**
  - ±10 V DC (2 W) or 10 V RMS at 50 Ω
- **Bandwidth Limit Filter**
  - 35 MHz 2-pole Bessel filter

### HF Input - 50 Ω SMA

- **Bandwidth (-3 dB)**
  - 1 to 300 MHz
- **Full Scale Range (FSR)**
  - +8 dBm (1.75 V FS) typical
- **Impedance**
  - 50 Ω ± 5%, AC-coupled
- **Connector**
  - SMA, gold-plated
- **Channels**
  - One
- **Coupling**
  - AC
- **Maximum Input Voltage**
  - 5 V RMS (AC component) at 50 Ω
  - 50 V DC

### Digital Conversion

- **Sample Rate**
  - 100 S/s to 400 MS/s
- **SR Adjustment Granularity**
  - < 0.25% of SR
  - 500 kS/s in 200–400 MS/s range
- **Resolution**
  - 12 bits (1,4096)
- **Sparkle Code Rate***
  - $10^{-1.2}$ typical @ 200 MS/s
  - $10^{-7}$ typical @ 400 MS/s
  - * Probability to exceed a specified deviation threshold for a sample
- **Differential Nonlinearity**
  - ±0.5 LSB
- **Acquisition Memories**
  - 64 kpoints and 4 Mpoints (optional)

### Clock or Reference Input

- **Connector**
  - MMCX, gold-plated
- **Minimum Amplitude**
  - 1 V pk-pk
- **Ext. Clock Threshold**
  - Variable between -2 V and +2 V
- **Impedance**
  - 50 Ω
- **Maximum Input Voltage**
  - ±2 V DC
- **Ext. Reference Frequency**
  - 10 MHz ± 10%
- **Ext. Clock Frequency**
  - From 50 MHz to 400 MHz
  - SR defined with sparsing

### Time Base

- **Clock Accuracy**
  - Better than ±2 ppm
- **Sampling Jitter**
  - < 1 ps RMS for 10 ms record length
- **Acquisition Modes**
  - Single shot
  - Sequence: 1 to 100 segments (optional 8000)
  - Dead-time: < 1 µs
- **Residual Phase Modulation**
  - 0.3° RMS typical @ 400 MS/s
  - 0.2° RMS typical @ 200 MS/s
  - from 100 Hz to 10 MHz

### Control I/O (A & B)

- **Connector**
  - MMCX, gold-plated
- **Signals**
  - TTL & CMOS compatible (3.3 V)
- **Input**
  - Trigger enable
- **Output**
  - 10 MHz reference clock (with 50 Ω output impedance, reverse terminated)
  - Acquisition active
  - Trigger ready
  - Acquisition skipping to next segment
### Trigger (Internal and External)

<table>
<thead>
<tr>
<th>Internal Trigger Input</th>
<th>External Trigger Input</th>
<th>TV Trigger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bandwidth DC to 100 MHz (-3 dB)</td>
<td>BNC, gold-plated</td>
<td>Trigger for positive modulation</td>
</tr>
<tr>
<td>Threshold adjust range: same as vertical FSR</td>
<td>Impedance: 50 Ω/1 MΩ</td>
<td>Line &amp; Frame selection (odd &amp; even)</td>
</tr>
<tr>
<td>Trigger sensitivity DC to 100 MHz &gt; 10% FSR</td>
<td>Bandwidth: DC to 300 MHz (-3 dB)</td>
<td>Standards:</td>
</tr>
<tr>
<td>Trigger on pk-pk signal: &gt; 15% FS</td>
<td>Threshold adjust range: -3/+3 V</td>
<td>B/G (625 lines/50 frames, PAL)</td>
</tr>
<tr>
<td>Pretrigger</td>
<td>Maximum input voltage: ±5 V DC</td>
<td>L (625 lines/50 frames, SECAM)</td>
</tr>
<tr>
<td>Adjustable to 100% of horizontal full scale</td>
<td>Trigger sensitivity DC to 300 MHz &gt; 10% FSR</td>
<td>M (525 lines/60 frames, NTSC)</td>
</tr>
<tr>
<td>Posttrigger</td>
<td></td>
<td>Coupling</td>
</tr>
<tr>
<td>Adjustable up to 100 Mpoints</td>
<td></td>
<td>AC LF Reject and DC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Edge, positive and negative</td>
</tr>
</tbody>
</table>

### Trigger Output

<table>
<thead>
<tr>
<th>Output Level</th>
<th>Connector</th>
<th>Coupling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjustable in range ±2.5 V (no load)</td>
<td>MMCX</td>
<td>DC</td>
</tr>
<tr>
<td>Amplitude ±0.8 V (no load)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>±15 mA max.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### System Performance

<table>
<thead>
<tr>
<th>DC Accuracy</th>
<th>SNR</th>
<th>SFDR (&lt; 25 MHz signal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; ±0.5% of FS (standard input)</td>
<td>&gt; 61 dB (standard input)</td>
<td>&gt; 73 dB (standard input)</td>
</tr>
<tr>
<td>Integral Non Linearity</td>
<td>&gt; 64 dB with BWL @ 35 MHz</td>
<td>&gt; 78 dB (HF In)</td>
</tr>
<tr>
<td>&lt; ±0.025% of FS</td>
<td>&gt; 64 dB (HF In)</td>
<td></td>
</tr>
<tr>
<td>THD (&lt; 25 MHz signal)</td>
<td>&lt; -71 dB (standard input)</td>
<td></td>
</tr>
<tr>
<td>&lt; -73 dB (HF In)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### PC System Requirements

<table>
<thead>
<tr>
<th>Processor</th>
<th>Memory</th>
<th>Hard Drive Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>150 MHz Pentium (or higher)</td>
<td>64 MB RAM (more is recommended when working with several cards with large acquisition memories)</td>
<td>20 MB Minimum</td>
</tr>
<tr>
<td>Operating System</td>
<td>CD Drive</td>
<td></td>
</tr>
<tr>
<td>Windows 95/98/NT4/2000/XP VxWorks or Linux</td>
<td></td>
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</tbody>
</table>

### General

<table>
<thead>
<tr>
<th>Power Consumption (typ.)</th>
<th>Current Requirements (max.)</th>
<th>Warranty</th>
</tr>
</thead>
<tbody>
<tr>
<td>At 1 V FS, 400 MS/s</td>
<td></td>
<td>3 years</td>
</tr>
<tr>
<td>&lt; 15 W with standard memory option</td>
<td>12 V 0.5 A</td>
<td></td>
</tr>
<tr>
<td>&lt; 17 W with maximum memory option</td>
<td>5 V 0.8 A</td>
<td></td>
</tr>
<tr>
<td>3.3 V 1 A (1.5 A with max. memory option)</td>
<td>-12 V 0.1 A</td>
<td></td>
</tr>
</tbody>
</table>

Front-Panel LEDs indicate digitizer status: Green: ready for trigger Yellow: module identification Red: trigger

### Environmental and Physical

<table>
<thead>
<tr>
<th>Operating Temperature</th>
<th>Shock*</th>
<th>EMC Immunity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0° to 40°C</td>
<td>30 G, half-sine pulse</td>
<td>Complies with EN61326-1</td>
</tr>
<tr>
<td>Required Airflow</td>
<td>Vibration*</td>
<td>Industrial Environment</td>
</tr>
<tr>
<td>&gt; 3 L/s (2 m/s)</td>
<td>5–500 Hz, random</td>
<td>EMC Emissions</td>
</tr>
<tr>
<td>Relative Humidity*</td>
<td>Safety</td>
<td>Complies with EN61326-1 Class A for radiated emissions</td>
</tr>
<tr>
<td>5 to 95% (non-condensing)</td>
<td>Complies with EN61010-1</td>
<td>Dimensions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PCI full-length standard</td>
</tr>
</tbody>
</table>

Front panel complies with IEEE1101.10

Certification and Compliance

* As defined by MIL-PRF-28800F Class 3
## Ordering Information

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DP310</td>
<td>Single-channel, 12-bit, 100 MHz, 400 MS/s, 64 kpoint or 4 Mpoint memory PCI digitizer card</td>
</tr>
<tr>
<td>DP310-M4M</td>
<td>4 Mpoint acquisition memory option</td>
</tr>
<tr>
<td>DP310-W5</td>
<td>5-year extended warranty</td>
</tr>
<tr>
<td>DP310-CAL</td>
<td>Calibration certificate</td>
</tr>
<tr>
<td>XA200</td>
<td>Ctrl I/O MMCX to BNC cable (1 m)</td>
</tr>
</tbody>
</table>

Items not listed in the current price list may only be available under specific request. Please contact your local representative for more information.