Overview

The NI PXIe-6556 digital waveform generator/analyzer features 24 per-pin parametric measurement unit (PPMU)-enabled, bidirectional channels clocked at a maximum of 200 MHz. Voltage levels ranging from -2 V to 7 V work with the most common voltage levels, which makes the NI PXIe-6556 ideal for validation or production test. Each of the 24 data channels features 4-quadrant PPMU capability, so the NI PXIe-6556 can generate, or acquire, digital data or perform DC parametric measurements on the fly. Several NI PXIe-6556 features, such as programmable voltage levels, timing offsets, and parametric measurements, are channel independent.

Application and Technology

<table>
<thead>
<tr>
<th></th>
<th>NI PXIe-6547/48</th>
<th>NI 6551/52</th>
<th>NI PXIe-6556</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Clock Rate</td>
<td>100/200 MHz</td>
<td>50/100 MHz</td>
<td>200 MHz</td>
</tr>
<tr>
<td>Maximum Data Rate</td>
<td>200/400 Mbit/s</td>
<td>50/100 Mbit/s</td>
<td>200 Mbit/s</td>
</tr>
<tr>
<td>Number of Channels</td>
<td>32</td>
<td>20</td>
<td>24</td>
</tr>
<tr>
<td>Direction Control</td>
<td>Per channel, per cycle, hardware controlled</td>
<td>Per channel</td>
<td>Per channel, per cycle, hardware controlled</td>
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<tr>
<td>Voltage Levels</td>
<td>1.2 to 3.3 V in 100 mV steps</td>
<td>-2 to 5.5 V in 10 mV steps</td>
<td>-2 to 7 V in 122 µV steps</td>
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<tr>
<td>Onboard High-Resolution Clock</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
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<tr>
<td>Form Factor</td>
<td>PXI Express</td>
<td>PCI or PXI</td>
<td>PXI Express</td>
</tr>
<tr>
<td>Scripting</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Data Delay</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Real-Time Hardware Compare</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Per-Pin Parametric Measurement Unit (PPMU)</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 1. Module Comparison

High-Signal Quality

The NI PXIe-6556 features an improved architecture that offers not only higher clock rates up to 200 MHz but also superior signal integrity and impedance matching. You can use it to interface to high-speed digital chips that require small setup and hold times. At the maximum clock rates of the NI PXIe-6556, the signal quality becomes an important feature.
Advanced Timing Capabilities

The NI PXIe-6556 also features enhanced timing and synchronization capabilities. The onboard any-rate clock provides subhertz resolution ranging up to 200 MHz, so you can clock data (generation or acquisition) with higher precision without having to use an external clock. Also, you can now test applications requiring arbitrary clock frequencies with these modules. You can share clocks across the PXI backplane or through an SMA connector on the front panel of the device. You also can clock your data by importing an external clock through the front panel or backplane. With these features, you can synchronize the NI PXIe-6556 with other analog or digital instruments. This module is built on the Synchronization and Memory Core (SMC), so you can synchronize multiple SMC-based devices (analog or digital) using the NI-TCLK API. You can achieve subnanosecond resolution while synchronizing multiple devices and create highly synchronized high-channel-count systems in a PXI Express chassis.

Advanced Features

- Adjust data position (acquisition or generation) to precise locations using the data delay capabilities, which help you adjust your data with respect to the edge of the clock with a resolution of better than 150 ps for all internally generated frequencies.
- Link and loop multiple waveforms without any software lag using the scripting features of NI-HSDIO. You can use this feature to write waveforms to the deep onboard memory and then control these waveforms with instructions written in the Script Editor.
- Achieve advanced linking, looping, and data streaming with the 64 Mbits per channel (acquisition or generation) and scripting feature of the NI PXIe-6556.

Supporting Software

With the NI Digital Waveform Editor, an interactive software tool for creating and editing digital waveforms, you can import test patterns from popular spreadsheet and VHDL simulation packages in ASCII or value change dump (VCD) formats. Once you have imported them, you can view the waveforms graphically and edit them interactively for new devices or new test conditions. You also can build new waveforms with built-in patterns such as pseudorandom bit sequences (PRBS) and count up/down patterns. When you are ready to test your device, you can seamlessly import the waveforms into NI LabVIEW, NI LabVIEW SignalExpress, and ANSI C. The Digital Waveform Editor is included with the 8 and 64 Mbits per channel memory models.

With the NI-HSDIO driver, you can use the NI PXIe-6556 module with graphical programming languages such as LabVIEW or text-based languages such as NI LabWindows™/CVI or ANSI C.
Connectivity

To meet connectivity requirements for high-speed digital applications, you can use the NI PXIe-6556 with a variety of accessories such as the following:

- NI CB-2162 connector block
- NI SMB-2163 connector block (rack mountable)
- NI SHC68-H1X38 shielded 50 Ω flying-lead cable
- VHDCI high-density connector

Tight Synchronization Capabilities

The PXI Express backplane offers a built-in common reference clock for the synchronization of multiple digital instruments in a system. You can synchronize multiple analog and digital modules on a picosecond level using the PXI platform. Figure 3 shows how you can synchronize multiple analog and digital instruments using the trigger and clock routes on the PXI backplane.

![Figure 3](image-url)

Easy Integration With Other PXI-Based Instruments

Test systems typically contain many instrument types, including signal sources, measurement devices, and switches. The PXI platform has unparalleled breadth, with modules for analog and digital I/O, high-speed instrumentation, vision, motion, and numerous bus interfaces. More than 1,500 PXI modules are available from the more than 70 members of the PXI Systems Alliance (PXISA). This means you can build a comprehensive test system in a single chassis as well as synchronize modules in that chassis to picosecond-level accuracy when using NI modular instrumentation. In addition, you can use an NI PXIe-6556 with other instruments such as digitizers, power supplies, and switches to create a flexible and powerful mixed-signal test system.

NI PXIe-6556 Advanced Features

Per-Pin Parametric Measurement Unit (PPMU): The PPMU on the NI PXIe-6555/56 modules combines DC measurements with high-speed digital I/O on the PFI 1, PFI 2, PFI 4/DDC CLK OUT, PFI 5/STROBE, and DIO <0..23> channels. The PPMU module acts as a force and measure unit capable of driving and measuring both currents and voltages (although not simultaneously sampled). Using the PMU VIs, or PMU functions, you can independently program the PPMU settings for each channel either to force a constant voltage or to force a constant current and/or to measure the voltage or current. When the PPMU is enabled, the high-speed digital drivers are removed from the I/O path and replaced with a precision DC buffer capable of 4-quadrant operation. Refer to the NI PXIe-6555/56 Specifications for more information about accuracy and range requirements.

Hardware Compare: These modules feature onboard, real-time hardware compare. This feature is ideal for a stimulus/response type application. You can send a stimulus waveform to a device under test (DUT) and compare response data, either on the same channel or on other input channels. This feature combined with per cycle direction control allows for bit error rate testing; custom protocol communication such as SPI, I2C, and JTAG; and stimulus/response tests.

Data Delay: With the NI PXIe-6556, you can configure data delay on each channel and in each session independently. Data delay specifies the delay after the Sample clock rising edge when the device generates or acquires a new data sample. The NI PXIe-6555/56 modules support a data delay range of –1 to 2 clock cycles, which allows for multiple samples of delay.

Data Deskew: Similar to data delay, the NI PXIe-6556 helps you configure data deskew values on each channel and in each session independently. Data deskew specifies the delay after the Sample clock rising edge when the device generates or acquires a new data sample. Data deskew is meant to compensate for constant skew values, such as propagation delay in your cable. The total timing delay applied to the channel is the aggregate total of the data delay and data deskew values. The NI PXIe-6555/56 modules support a data deskew range of –2 to 3 clock cycles, which allows for multiple samples of deskew.

Ordering Information

For a complete list of accessories, visit the product page on ni.com.

<table>
<thead>
<tr>
<th>Products</th>
<th>Part Number</th>
<th>Recommended Accessories</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>NI PXIe-6556</td>
<td></td>
<td></td>
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<tr>
<td>NI PXIe-6556 - 64Mb/s</td>
<td>781949-02</td>
<td>Cable: Shielded - Single-Ended SHC68-C68-D4 Cable (1m) <strong>Also Available: Unshielded</strong></td>
<td>196275-01</td>
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<td></td>
<td></td>
<td>Connector Block: Unshielded - Single-Ended CB-2162 Digital I/O Accessory</td>
<td>778592-01</td>
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<tr>
<td></td>
<td>Requires: 1 Cable, 1 Connector Block</td>
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Support and Services

System Assurance Programs

NI system assurance programs are designed to make it even easier for you to own an NI system. These programs include configuration and deployment services for your NI PXI, CompactRIO, or Compact FieldPoint system. The NI Basic System Assurance Program provides a simple integration test and ensures that your system is delivered completely assembled in one box. When you configure your system with the NI Standard System Assurance Program, you can select from available NI system driver sets and application development environments to create customized, reorderable software configurations. Your system arrives fully assembled and tested in one box with your software preinstalled. When you order your system with the standard program, you also receive system-specific documentation including a bill of materials, an integration test report, a recommended maintenance plan, and frequently asked question documents. Finally, the standard program reduces the total cost of owning an NI system by providing three years of warranty coverage and calibration service. Use the online product advisors at ni.com/advisor to find a system assurance program to meet your needs.

Calibration

NI measurement hardware is calibrated to ensure measurement accuracy and verify that the device meets its published specifications. To ensure the ongoing accuracy of your measurement hardware, NI offers basic or detailed recalibration service that provides ongoing ISO 9001 audit compliance and confidence in your measurements. To learn more about NI calibration services or to locate a qualified service center near you, contact your local sales office or visit ni.com/calibration.

Technical Support

Get answers to your technical questions using the following National Instruments resources.

- Support - Visit ni.com/support to access the NI KnowledgeBase, example programs, and tutorials or to contact our applications engineers who are located in NI sales offices around the world and speak the local language.
- Discussion Forums - Visit forums.ni.com for a diverse set of discussion boards on topics you care about.
- Online Community - Visit community.ni.com to find, contribute, or collaborate on customer-contributed technical content with users like you.

Repair

While you may never need your hardware repaired, NI understands that unexpected events may lead to necessary repairs. NI offers repair services performed by highly trained technicians who quickly return your device with the guarantee that it will perform to factory specifications. For more information, visit ni.com/repair.

Training and Certifications

The NI training and certification program delivers the fastest, most certain route to increased proficiency and productivity using NI software and hardware. Training builds the skills to more efficiently develop robust, maintainable applications, while certification validates your knowledge and ability.

- Classroom training in cities worldwide - the most comprehensive hands-on training taught by engineers.
- On-site training at your facility - an excellent option to train multiple employees at the same time.
- Online instructor-led training - lower-cost, remote training if classroom or on-site courses are not possible.
- Course kits - lowest-cost, self-paced training that you can use as reference guides.
- Training memberships and training credits - to buy now and schedule training later.

Visit ni.com/training for more information.

Extended Warranty

NI offers options for extending the standard product warranty to meet the life-cycle requirements of your project. In addition, because NI understands that your requirements may change, the extended warranty is flexible in length and easily renewed. For more information, visit ni.com/warranty.

OEM

NI offers design-in consulting and product integration assistance if you need NI products for OEM applications. For information about special pricing and services for OEM customers, visit ni.com/oem.

Alliance

Our Professional Services Team is comprised of NI applications engineers, NI Consulting Services, and a worldwide National Instruments Alliance Partner program of more than 700 independent consultants and integrators. Services range from start-up assistance to turnkey system integration. Visit ni.com/alliance.