High-Speed 32-bit Digital Pattern I/O and Handshaking

NI 653x

- 32 (5 V TTL/CMOS) digital input/output lines
- 20 MHz (80 Mbytes/s) maximum transfer rate
- 8, 16, or 32-bit transfers
- Start and stop triggering, pattern and change detection
- 32 MB onboard memory per data path (group) (NI 6534 only)
- NI-DAQ driver simplifies configuration and measurements

Models

NI 6534
- NI PCI-6534
- NI PXI-6534

NI 6533
- NI PCI-DIO-32HS
- NI PXI-6533
- NI DAQCard-6533
- NI AT-DIO-32HS

Operating Systems
- Windows 2000/NT/XP/Me/9x
- Mac OS 9*
- Real-time performance with LabVIEW (page 56)

Recommended Software
- LabVIEW
- LabWindows/CVI
- Measurement Studio for Visual Basic (NI 6533 only)

Other Compatible Software
- Visual Basic
- C/C++

Driver Software (included)
- NI-DAQ

*See ordering information

Family	Bus	Digital I/O Lines	Maximum Rate	Onboard Memory	Logic Level	Isolation	Handshaking I/O	Pattern I/O	Messaging	Triggering
NI 6534	PCI, PXI	32	20 MHz (80 Mbytes/s for 32-bit transfers)	64 MB[2]	5 V TTL/ CMOS	–	✓	✓	✓	✓
NI 6533	PCI PXI ISA PCMCIA	32	Up to 5 MHz[2] (pattern I/O) Up to 19.9 MHz[2] (handshaking)	–	5 V TTL/ CMOS	–	✓	✓	✓	✓

[1]Configured as 32 MB/group. [2]Rates may depend on application, computer, and software. See detailed specifications on page 390.

Table 1. NI 653x Specifications Overview (See page 391 for detailed specifications)

INFO CODES
For more information or to order products online, visit *ni.com/info* and enter:

pci6534
pxi6534
pcidio32hs
pxi6533
daqcard6533
atdio32hs

BUY ONLINE!

Overview and Applications

The NI 653x devices are high-speed, 32-bit, parallel, digital I/O interfaces for PCI, PXI, PCMCIA, and ISA. They incorporate the National Instruments DAQ-DIO ASIC, specifically designed to deliver high performance on plug-in DIO devices. The NI 653x devices perform unstrobed I/O, pattern I/O, and handshaking at speeds up to 20 MHz, or 80 Mbytes/s for 32-bit transfers (NI 6534). The NI 6534 family delivers digital I/O coupled with large onboard memory for high-speed pattern I/O at deterministic rates.

Features

Data Latches and Drivers

The 32 digital I/O lines are divided into four 8-bit ports. For pattern I/O or handshaking, the ports can be grouped into two 8-bit or 16-bit groups, or a single 32-bit group. When configured for output, each data line can sink or source up to 24 mA when set logic low or high, respectively. When configured as inputs, the 653x data lines are diode-terminated to dampen the input signals at TTL levels.

When performing static or unstrobed I/O, you can individually configure each of the 32 I/O lines as input or output.

Pattern I/O and Handshaking I/O

With pattern I/O, you can input or output patterns under timing control of a clock signal. When using handshaking I/O to interface your NI 653x to a peripheral device, data is transferred when both the NI 653x and the peripheral are ready. See page 376 in the Digital I/O overview and page 787 in the Digital I/O tutorial for more information.

Change Detection

You can program the 653x devices to acquire data when one or more user-specified digital input lines changes state. See page 377 in the Digital I/O overview and page 787 in the Digital I/O tutorial for more information.

High-Speed 32-bit Digital Pattern I/O and Handshaking

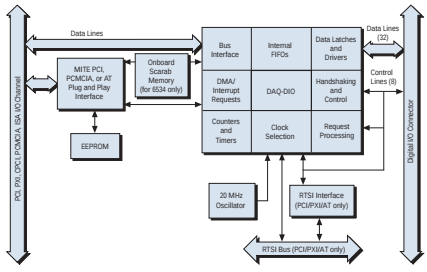

Figure 1. NI 653x Hardware Block Diagram

Messaging

You can develop event-driven application programs with NI 653x devices by programming them to generate a message when conditions you specify are met. The messages can be generated when a specified number of bytes have been transferred, when a specified input pattern is matched, or when a measurement operation completes.

Onboard Memory

NI 6534 devices provide two groups of 32 MB of onboard memory, so you can perform pattern I/O at deterministic high rates as long as the patterns can fit in one of these memory locations. To improve system performance for repetitive pattern output applications, you can load your patterns into the onboard memory once and then output them repeatedly, without reloading them across the computer bus.

DMA Control Circuitry

NI 653x devices for PCI and PXI use the National Instruments MITE PCI interface. The MITE provides bus-master operation, PCI burst transfers, and high-performance DMA controllers for fast, continuous, scatter-gather DMA.

Multidevice Synchronization

All NI 653x devices except the DAQCard-6533 use the PXI trigger bus or RTSI Bus to send and receive clock and trigger signals to and from other devices in your system. Using these buses, you can create synchronized systems with large numbers of digital I/O lines and systems in which digital I/O is synchronized with other types of measurements. The PXI-653x modules feature phase-lock loop (PLL) circuitry to tightly synchronize with other PLL devices.

I/O Connector and Power-Up States

All digital I/O is through a 68-pin cable connector. See pin assignments and descriptions in Figure 2 and Table 2. You can independently select the power-on state for the control and data lines through the use of CPULL and DPULL, respectively.

DIOD7	34	68	GND
GND	33	67	DIOD6
DIOD4	32	66	DIOD5
DIOD3	31	65	GND
GND	30	64	DIOD2
DIOD0	29	63	DIOD1
DIOC7	28	62	GND
GND	27	61	DIOC6
DIOC4	26	60	DIOC5
DIOC3	25	59	GND
GND	24	58	DIOC2
DIOC0	23	57	DIOC1
DIOB7	22	56	RGND
DIOB6	21	55	GND
GND	20	54	DIOB5
RGND	19	53	DIOB4
GND	18	52	DIOB3
DIOB1	17	51	DIOB2
DIOB0	16	50	GND
DIOA7	15	49	GND
GND	14	48	DIOA6
DIOA4	13	47	DIOA5
DIOA3	12	46	GND
GND	11	45	DIOA2
DIOA0	10	44	DIOA1
REQ2	9	43	RGND
ACK2	8	42	GND
STOPTRIG2	7	41	GND
PCLK2	6	40	CPULL
PCLK1	5	39	GND
STOPTRIG1	4	38	DPULL
ACK1	3	37	GND
REQ1	2	36	GND
+5 V	1	35	RGND

Figure 2. NI 653x I/O Connector

Driver Software

With NI-DAQ driver software, you can configure your devices interactively, write custom programs, and perform digital I/O transfers easily. With NI-DAQ, the NI 6533 and NI 6534 devices are software-compatible, providing a seamless upgrade path. Sharing clocks and triggers between NI 653x and other measurement devices is also greatly simplified. To get you started with your application quickly, NI-DAQ includes numerous example programs for LabVIEW and other ADEs.

Signal Names	Signal Types	Signal Descriptions
DIOAx, DIOBx, DIOCx, DIODx	data	Digital input/output lines
REQ1, REQ2, ACK1, ACK2	control	Handshaking, timing and trigger lines
STOPTRIG1, STOPTRIG2	control	Trigger lines
PCLK1, PCLK2	control	Handshaking timing lines
CPULL, DPULL	power-up	Lines determine power-up states

Table 2. Signal Names and Descriptions

Related Products

High-Speed Digitizers .....see page 440
Arbitrary Waveform and Function Generators.....see page 467
Multifunction Data Acquisition .....see page 188

Ordering Information

NI PCI-6534* 778287-01
NI PXI-6534* 778288-01
NI PCI-DIO-32HS 777314-01
NI PXI-6533 777429-01
NI DAQCard-6533.....777315-01
NI AT-DIO-32HS* 777313-01

Includes NI-DAQ driver software.

*Windows only

For information on extended warranty and value added services, see page 20.

Recommended Configurations

Family	DAQ Device	Accessory	Cable
NI 6534	PCI-6534	SCB-68 (776844-01)	SH68-68-D1 (183432-01)
	PXI-6534	TB-2715 (778242-01)	N/A*
NI 6533	PCI-DIO-32HS	SCB-68 (776844-01)	SH68-68-D1 (183432-01)
	PXI-6533	TB-2715 (778242-01)	N/A*
	DAQCard-6533	SCB-68 (776844-01)	PSHR68-68-D1 (777420-01)
	AT-DIO-32HS	SCB-68 (776844-01)	SH68-68-D1 (183432-01)

*TB-2715 plugs directly into device; no cable required.

See page 384 for accessory and cable information.