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PRODUCT FLYER

Industrial Controllers

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Industrial Controllers

IC-3120, IC-3121, IC-3171, IC-3172, and IC-3173



- Processor—Up to 2.2 GHz 5th Gen Intel Core i7 dual-core processor, 8 GB DDR3 RAM, 64 GB storage
- FPGA—Up to Kintex-7 160T for custom I/O timing, synchronization, control, and image processing
- Open connectivity so you can use the camera vendor of your choice
- Rugged, fanless design with up to 0 °C to 55 °C operating temperature
- Up to 4 GigE PoE, 2 USB 3.0, 4 USB 2.0, 2 DisplayPort, 1 RS232/RS485, and 1 network port
- OS—Windows Embedded Standard 7 and NI Linux Real-Time

The Perfect Combination of Ruggedness and Performance

NI Industrial Controllers are high-performance, fanless devices that offer the highest level of processing power and connectivity for automated image processing, data acquisition, and control applications in extreme environments. These controllers feature up to a 2.2 GHz Intel Core i7 dual-core processor, 8 GB DDR3 RAM, 64 GB storage in a rugged design with no moving parts, and an IP rating up to IP67. A Kintex-7 FPGA improves system performance by providing custom I/O timing, synchronization, control, and image co-processing.

NI Industrial Controllers give you the ideal connectivity for communication and synchronization to Time Sensitive Networking (TSN)-enabled CompactDAQ chassis, EtherCAT and Ethernet CompactRIO chassis, EtherCAT motion drives, GigE Vision and USB3 Vision cameras, and other automation equipment. In addition, this controller has onboard ISO, TTL, and differential digital I/O, so it can perform synchronization and control tasks without additional tethered I/O.

These controllers can run either Windows Embedded Standard 7 (WES7) or NI Linux Real-Time, so you can choose the familiarity of a Windows user interface or the reliability of a real-time OS. The NI Linux Real-Time OS gives you access to the Linux community's massive software ecosystem. The embedded user interface capability of NI Linux Real-Time enables the implementation of a local human machine interface to simplify your application development.

You can use LabVIEW system design software to create, debug, and deploy logic to NI Industrial Controllers through hundreds of prewritten libraries for analysis, control, logging, motion, and image processing. With these validated software libraries, you can reduce the time you spend piecing together software components from different vendors and troubleshooting compatibility issues.

Table 1. NI Industrial Controller Specifications

	IC-3120	IC-3121	IC-3171	IC-3172	IC-3173
Processor	1.9 GHz Quad-Core Intel Atom	1.9 GHz Quad-Core Intel Atom	1.9 GHz Dual-Core Intel Celeron	1.8 GHz Dual-Core Intel i5	2.2 GHz Dual-Core Intel i7
OS	WES 7 or NI Linux Real-Time	WES 7 or NI Linux Real-Time	WES 7 or NI Linux Real-Time	NI Linux Real-Time	WES 7 or NI Linux Real-Time
RAM Size	4 GB	4 GB	4 GB	8 GB	8 GB
Onboard Storage	Up to 32 GB	Up to 32 GB	Up to 32 GB	4 GB	Up to 64 GB
FPGA	Spartan-6 LX25	Spartan-6 LX25	Kintex-7 160T	Kintex-7 160T	Kintex-7 160T
Industrial I/O	8 ISO In, 8 ISO Out, 8 TTL, 2 DIFF QE	8 ISO In, 8 ISO Out, 8 TTL, 2 DIFF QE	8 ISO In, 8 ISO Out, 8 TTL, 2 DIFF QE	8 ISO In, 8 ISO Out, 8 TTL, 2 DIFF QE	8 ISO In, 8 ISO Out, 8 TTL, 2 DIFF QE
Camera Interface	GigE Vision	USB3 Vision	GigE Vision, USB3 Vision	GigE Vision, USB3 Vision	GigE Vision, USB3 Vision
GigE PoE Ports	2	--	4	4	4
USB 3.0 Ports	--	2	2	2	2
USB 2.0 Ports	1	1	4	4	Up to 4
IEEE 1588	Software Timed	Software Timed	Hardware Timed	Hardware Timed	Hardware Timed
Power	10.8 to 26.4 V DC	10.8 to 26.4 V DC	9 to 30 V DC	9 to 30 V DC	9 to 30 V DC
Temperature Range	0 °C to 55 °C	0 °C to 55 °C	0 °C to 55 °C	0 °C to 55 °C	0 °C to 55 °C (IP20) 0 °C to 45 °C (IP67)
Display	VGA	VGA	DisplayPort (x2)	DisplayPort (x2)	DisplayPort (x2)
IP Rating	IP40	IP40	IP20	IP20	IP20/IP67
Size	10.8 cm × 6.1 cm × 13.0 cm	10.8 cm × 6.1 cm × 13.0 cm	17.4 cm × 9.3 cm × 16.8 cm	17.4 cm × 9.3 cm × 16.8 cm	17.4 cm × 9.3 cm × 16.8 cm (IP20) 32.1 cm × 9.3 cm × 19.3 cm (IP67)

Detailed Views of Industrial Controllers

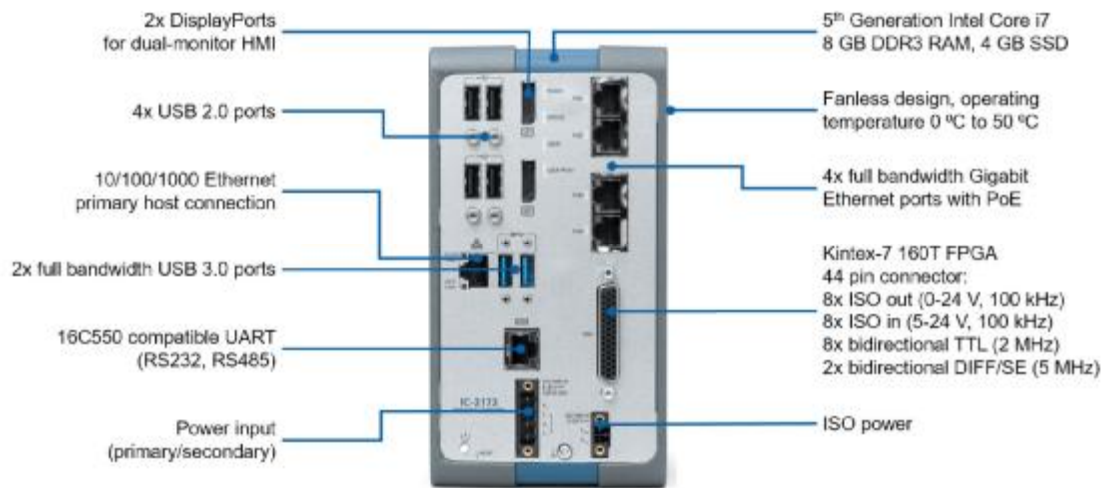
IC-3120



IC-3121



IC-3173



IC-3173 (IP67)



Key Features

Performance

NI has strong relationships with key technology providers like Intel and Xilinx. For example, NI is an associate member of the Intel Embedded Alliance, which offers access to the latest Intel product roadmaps and samples. These relationships allow the company to integrate the latest technology into their products shortly after they release, which provides a performance edge in the industry.

Unlike many industrial controllers on the market today, NI Industrial Controllers feature a heterogeneous processing architecture that contains two processing units: (1) a processor running Windows or a real-time OS for communication and signal processing and (2) an FPGA for use as a co-processor that implements high-speed control and custom timing and triggering directly in the hardware.

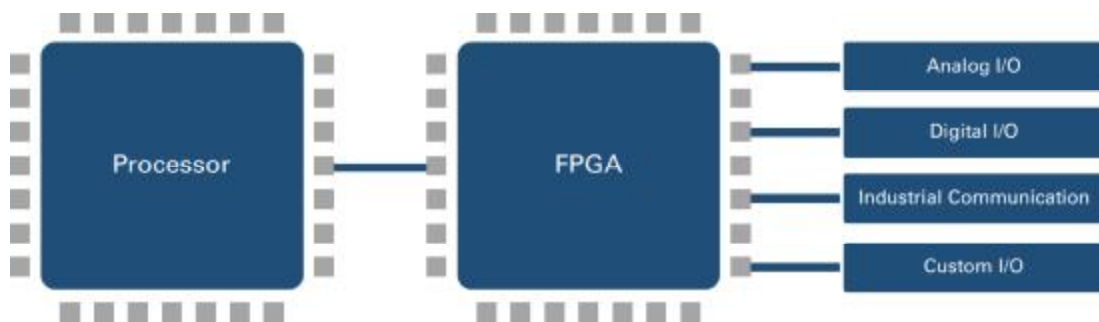


Figure 1. Use the heterogeneous architecture of the Industrial Controller to meet your processing needs.

Processor

NI Industrial Controllers contain up to a 2.2 GHz dual-core Intel Core i7 high-performance processor with lower power consumption in an industrial form factor.

FPGA

The onboard FPGA options include Xilinx Spartan-6 LX25 or Kintex-7 160T. Though you can use either FPGA for tasks such as high-speed control and custom timing and triggering, the Kintex-7 is the ideal choice for co-processing, especially for image processing applications.

Table 2. Xilinx FPGA Specifications

FPGA	Flip-Flops	6-Input LUTs	DSP48 Slices	Embedded Block RAM (kb)
Spartan-6 LX25	30,064	15,032	38	936
Kintex-7 160T	202,800	101,400	600	11,700

FPGA Co-Processing

In an FPGA co-processing architecture, the FPGA and CPU work together to share the processing load. This architecture is most commonly used with GigE Vision and USB3 Vision cameras because their acquisition logic is best implemented using a CPU. After acquiring the image using the CPU, you send the image to the FPGA via DMA so the FPGA can perform operations such as filtering or color plane extraction. Then you can send the image back to the CPU for more advanced operations such as optical character recognition (OCR) or pattern matching. In some cases, you can perform all the processing

steps on the FPGA, and only the processing results are sent back to the CPU. This allows the CPU to devote more resources to other operations such as motion control, network communication, and image display.

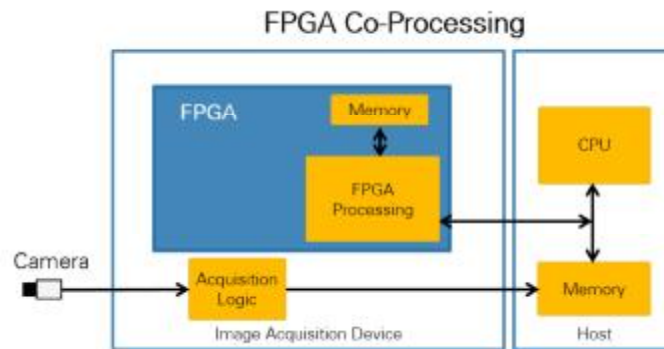


Figure 2. In FPGA co-processing, you acquire images using the CPU and then send them to the FPGA via DMA so the FPGA can perform operations.

Using the FPGA as a co-processor for machine vision applications can significantly decrease the processing time for a particular algorithm. Because FPGAs are massively parallel in nature, they can offer significant performance improvements, in some cases more than 10X, over CPUs for certain algorithms.

Optimized for Machine Vision

NI Industrial Controllers can be used in a wide variety of applications ranging from data acquisition to control. However, the connectivity options and the unique design make them especially useful in machine vision applications. These controllers support the GigE Vision and USB3 Vision standard, so you can choose the compliant camera of your choice.

GigE Vision

NI Industrial Controllers feature up to four PoE ports per controller, each with dedicated bandwidth. If you require more than four GigE Vision cameras, you can use a hub to connect additional cameras with shared bandwidth.

USB3 Vision

In addition to GigE Vision ports, NI Industrial Controllers feature up to two dedicated bandwidth USB 3.0 ports for connecting USB3 Vision cameras. Furthermore, NI is one of the few vendors that offer cable retention on USB 3.0 ports, which increases the reliability of the connection in industrial environments.

FPGA-Enabled I/O

NI Industrial Controllers give developers the ability to use the onboard FPGA for more powerful I/O. The controllers include a prebuilt FPGA personality called Vision RIO, which is a turnkey IP set that allows you to take advantage of FPGA-enabled I/O without ever having to program the FPGA. Vision RIO allows you to configure a queue of pulses, set line states, and enable hardware-timed IEEE 1588, so, without FPGA programming knowledge, you can achieve a reliable, hardware-timed method of synchronizing I/O with visually inspected parts. Using the Vision RIO API, you can configure several different scenarios, including triggered acquisition with multiple encoder- and proximity-controlled ejectors, and manage ejectors controlled with PLC-issued timestamps.