Advanced Industrial Electronic Systems

Versatile Frame Grabber Card for MTCA.4

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Outline

- A few words about AIES
- The image acquisition system based on MTCA.4
- Optical MXI-Express Link for NI CompactRIO
- Come visit our Booth

AIES Profile

AIES is a leading provider of embedded systems for industrial applications.

The company specializes in the development of data acquisition and image processing systems based on the following technology and industrial standards:

- MTCA, MTCA.4, ATCA and AMC,
- PXI/PXIe, Compact RIO,
- FMC,
- PCIe, Gigabit Ethernet, RapidIO,
- Camera Link, Camera Link HS, SDI and CoaXPress.

AIES collaborates with industry and is open for the further partnership.

Our Partners

iter
china eu india japan korea russia usa

DESY

INSTITUTE of ELECTRONICS

OPEN RnD

NATIONAL INSTRUMENTS™

PENTAIR

COSYLAB

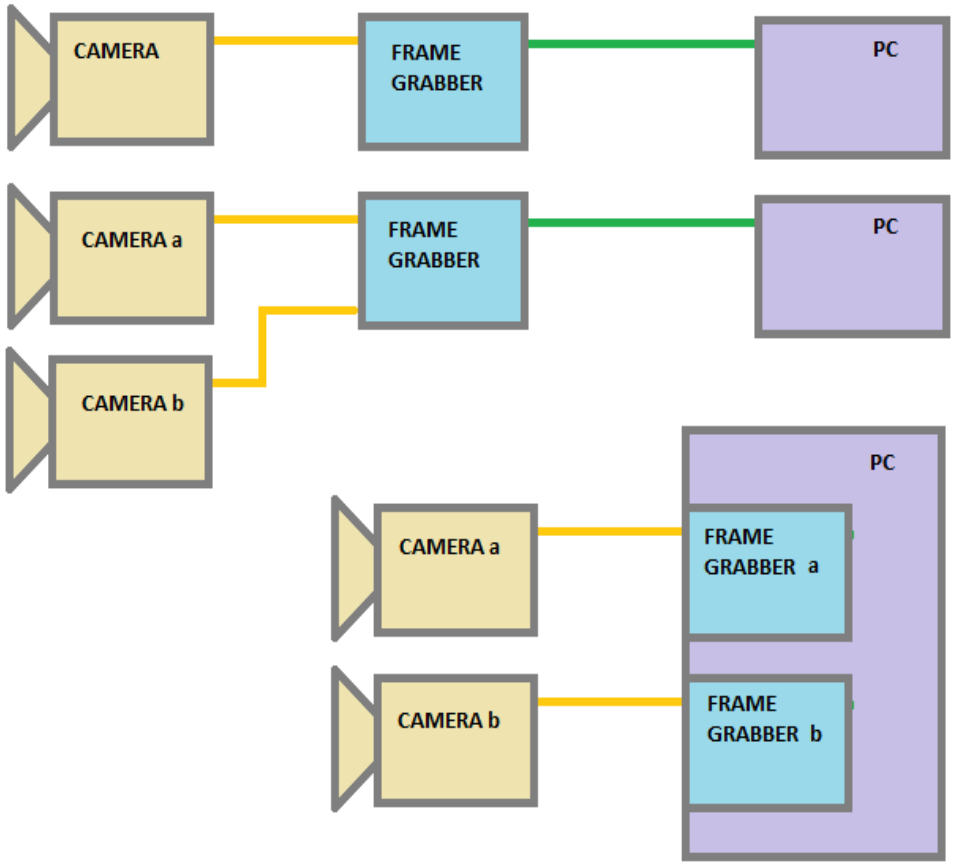
Lodz University of Technology

Institute of Applied Computer Science
Lodz University of Technology

Image Acquisition System

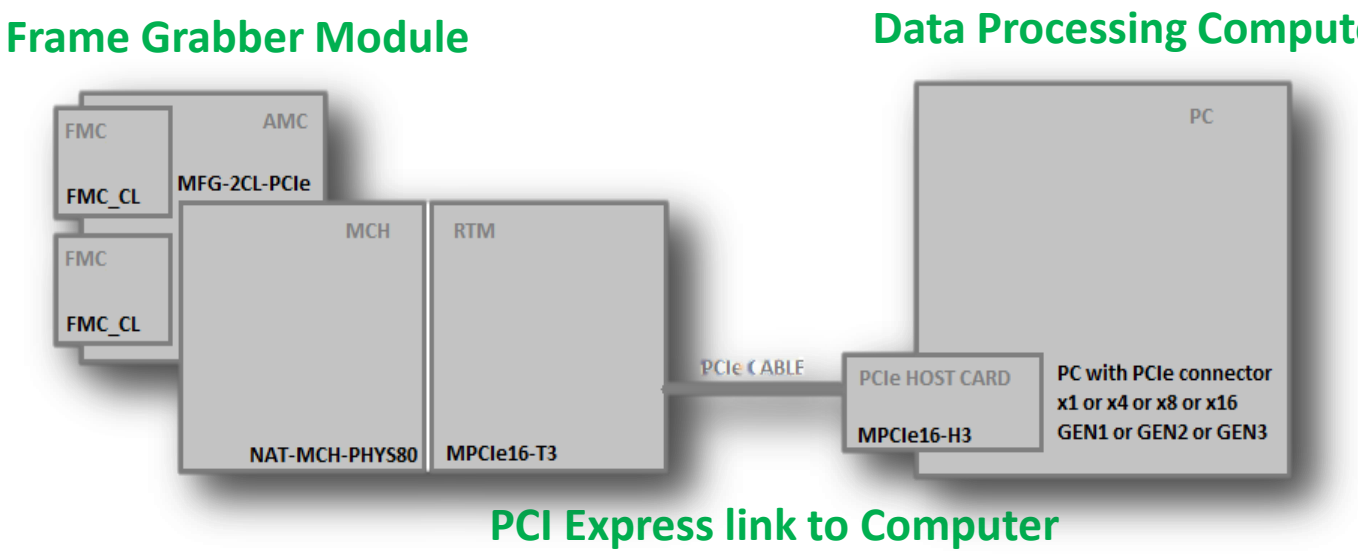
IAS challenges:

- ✓ Number of cameras in the system
- ✓ Amount of transferred data from a single camera
- ✓ Synchronization of camera trigger and timestamping



IAS based on MTCA.4

A block diagram of an example IAS with a connection to PC



Selected Video Interface Standards

Interfaces:

1. Camera Link
2. Camera Link HS
3. CoaXPress
4. GigE Vision
5. USB
6. IEEE1394b Fire Wire

	Throghput	Distance	Power over cable
Camera Link	6.8 Gbps	Approx. 7 to 12 m	PoCL
Camera Link HS	48 Gbps	15 m	PoCL
CoaXPress	25 Gbps	100 m	PoCC
GigE Vision	1.0 Gbps	100 m	PoE

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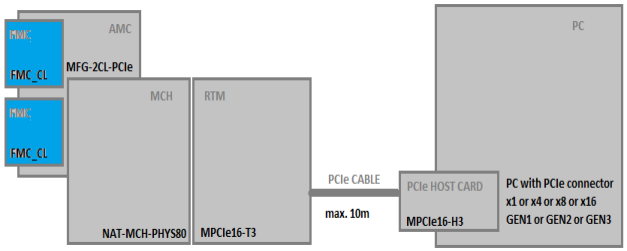
MFG – Frame Grabber Card for MTCA.4

- Cost-effective solution for high-performance image acquisition systems
- Provides all resources for data acquisition and control systems (FPGA processing power, SDRAM, clocks distribution, trigger and interlock signals)
- Designed as dual FMC carrier module
- Single SMB connector on front panel for clock/trigger
- Camera interface available as FMC extension modules
- Available IP cores for selected camera protocols

Frame grabber module with dual Camera Link input

Camera Link Interface Module

- Base, Medium, Full, and Extended-Full Camera Link interface
- Dual SDR connectors supporting single and dual Camera Link modes
- Power over Camera Link (PoCL)
- Also available with other interfaces:
  - CoaXPress
  - Camera Link HS
  - SDI
  - HDMI
  - Digital IO module
- Tested with MTCA.4 FMC carrier (requires LPC connector)



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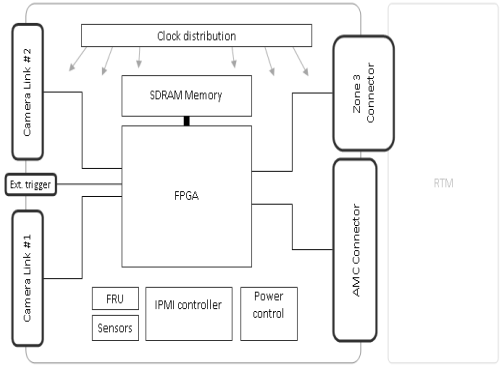
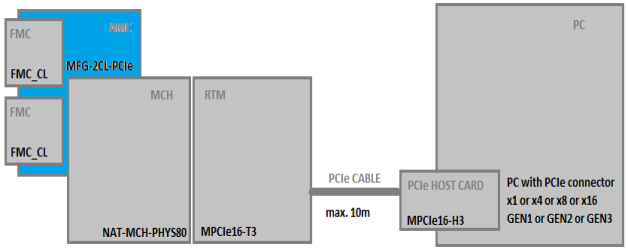
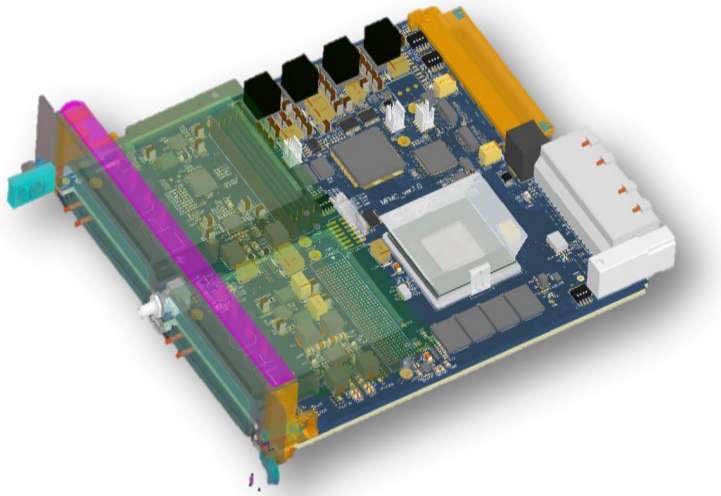
Cost-effective FMC Carrier Module

- Double-width, mid-size AMC card
- Based on Xilinx Artix 7 (XC7A200T) FPGA
- SDRAM DDR3 memory (16 Gb)
- RTM Zone 3 connector (D1.2 digital class)
- Main interface: PCIe x4, gen. 2 (16 Gbps)
- Flexible clock distribution circuit
- Configurable VADJ for both FMC slots







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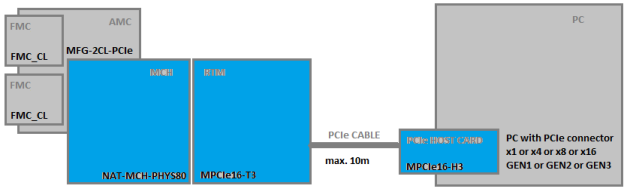
High-performance PCIe Link for MTCA.4

- The PCIe link is composed of:
  - ✓ NAT-PHYS80 MTCA Carrier Hub
  - ✓ MPCIE16-T3 target module
  - ✓ MPCIE16-H3 PC host card
- Supports PCIe x16 (both Gen 2 and Gen 3)
- Data transfer up to 128 Gbps (in Gen 3 mode)
- No additional drivers nor software
- Dedicated for optical fibre and cooper link

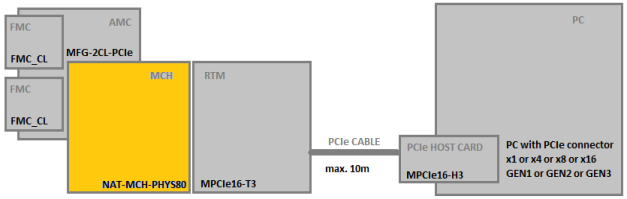


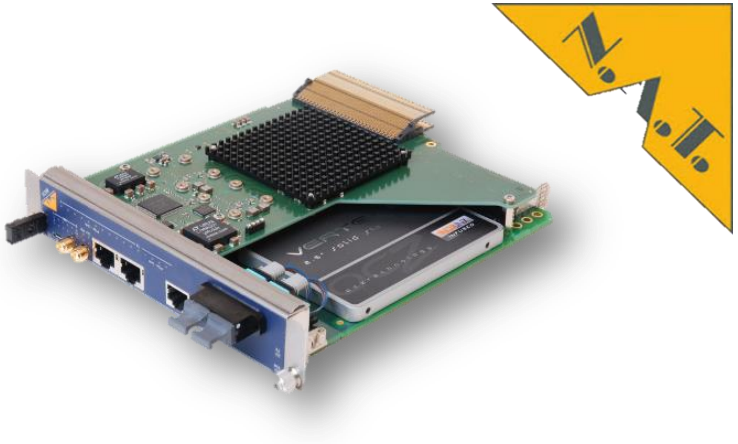
Typical Applications

- Data Acquisition and Control Systems
- Telecommunication
- Image Acquisition and Processing Systems
- High Performance Computing

MCH with PCIe Link

- MTCA Carrier Hub dedicated for high performance systems
- Provides MTCA management with MTCA.4 extensions
- Supports 1 GbE and PCIe gen. 3 interfaces
- Dedicated PCIe x16 uplink on Zone 3 (to RTM card)
- Dual PCIe x8 or single PCIe x16 optical fiber uplink
- Available with extensions for optical and copper PCIe Uplinks
- Dedicated for low latency and low jitter clock module

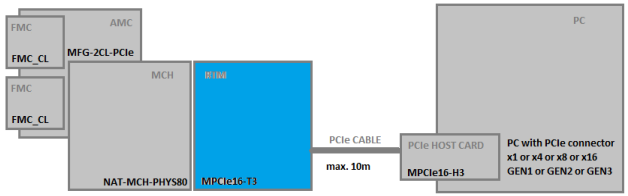


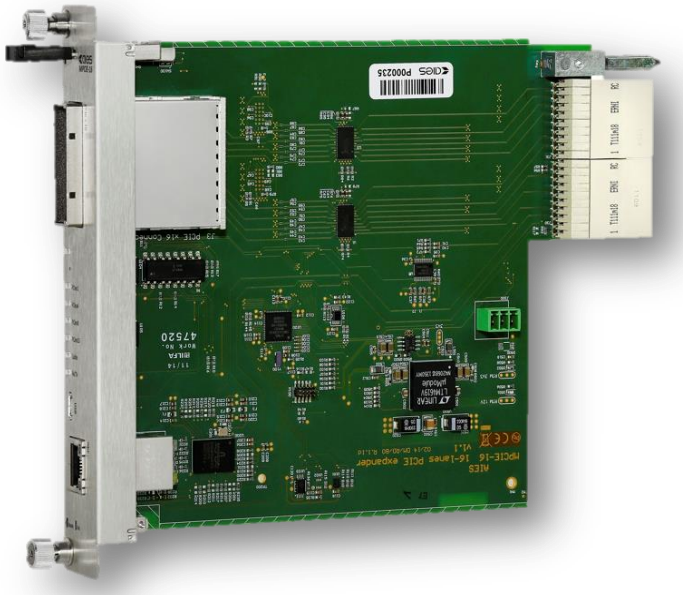


MPCIE16 - T3 Expander Card for MTCA.4

The MPCIE16-T3 is a PCIe target cable adapter dedicated for MTCA.4.

- Designed as double-width, full-size RTM card
- Data transfer up to 128 Gb/s (Gen 3)
- Designed according PCIe External Cabling Specification, Rev. 2.0
- Module management compatible with MTCA.4
- Dedicated for cooper link
- Available PCIe cables: 1, 3, 5, 7 and 11 m





MPCIE16-H3 Host Card with PCIe Cable Connection

The MPCIE16-H3 card is PC host card dedicated for PCIe x16 external cable connection.

- Supports PCIe x4, x8 or x16 link
- Data transfer up to 128 Gb/s (Gen 3)
- Supports PCIe x16 Gen 2 / Gen 3
- Designed according to PCI Express Base Specification, Rev. 3.0
- No additional drivers nor software
- Dedicated for cooper link
- Available PCIe cables: 1, 3, 5, 7 and 11 m

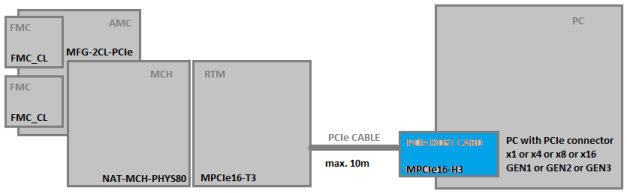
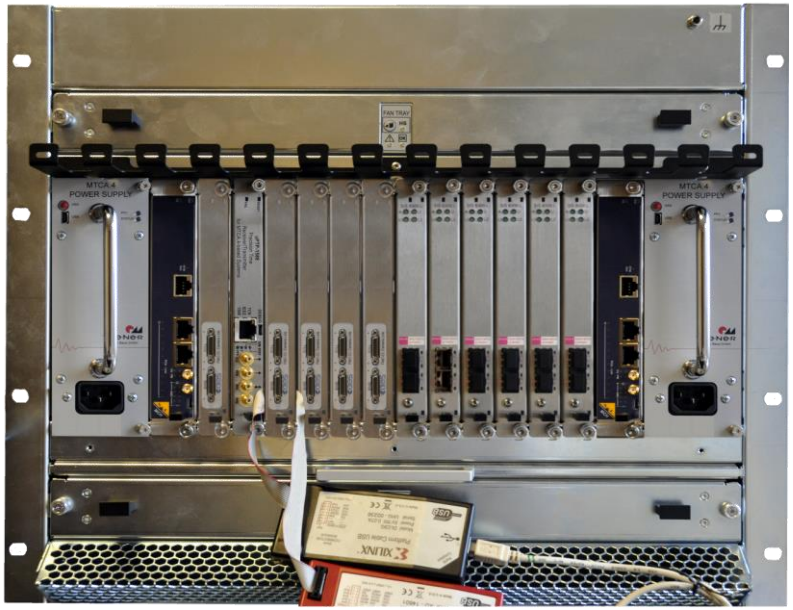


Image Acquisition and Data Processing System

- Based on MTCA.4 standard
- 12--slot MTCA.4 chassis
- Supports
  - Frame Grabber cards
  - Digitizer modules
  - Low speed digital and analogue IO modules
- Synchronisation via PTP-1588 timing module
- Redundant power supply
- Control and monitoring using EPICS
- Data Archiving



An example of a data acquisition system with a thermal imaging camera

Block diagram

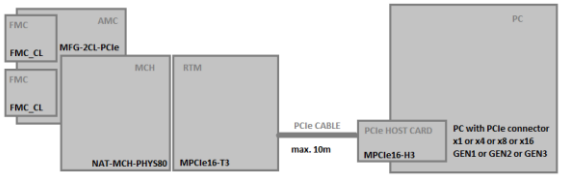
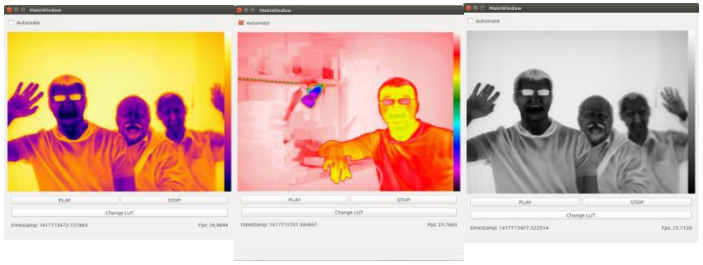


Photo set of the image acquisition

Examples of thermal image from the system



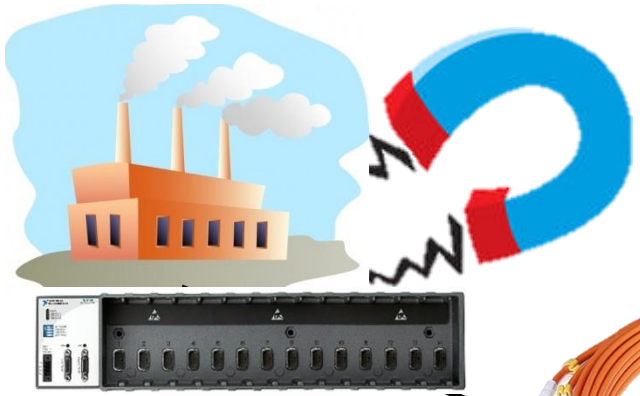
An example of a data acquisition system with a thermal imaging camera

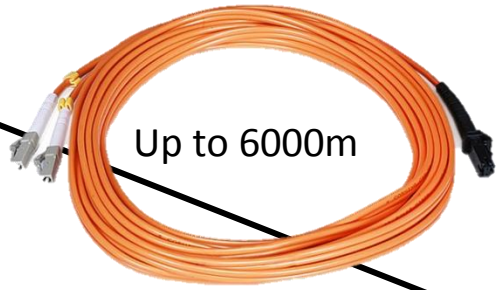
- Examples of thermal image from the system

Optical MXI-Express Link for NI CompactRIO

Module and link challenges:

- ✓ Galvanic isolation
- ✓ Distance form the host computer up to 6000m !
- ✓ Remote power control of the cRIO chasiss
- ✓ High Magnetic Field resistance up to 100mT





Optical MXI-Express Link for NI CompactRIO

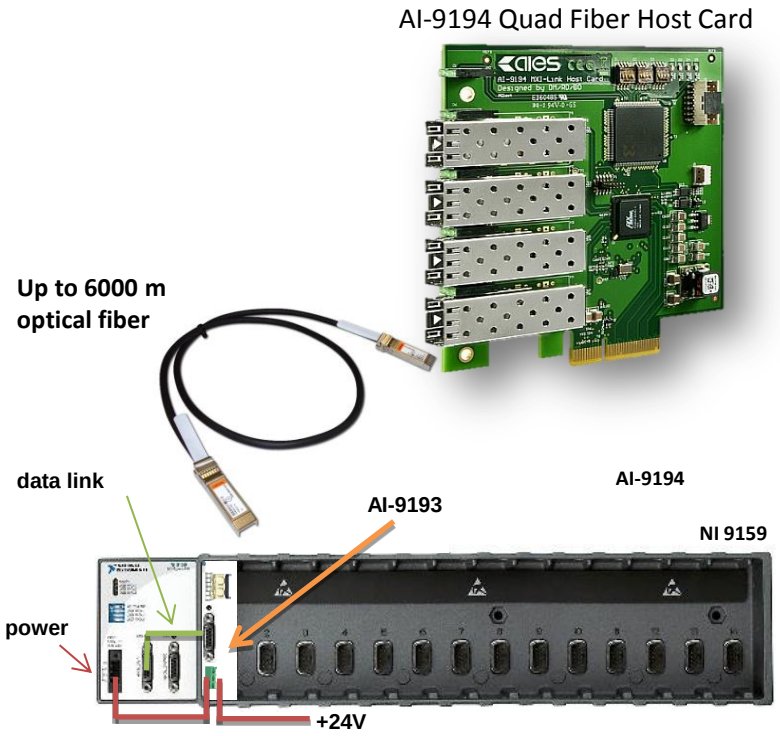
Optical MXI-Express link is ideal for connecting Compact RIO chassis installed in a distance from the host computer using the optical fiber.

MXI-Express link is composed of the AI-9193 Compact RIO module and the AI-9194 CPU Host card.

The PCIe fiber-based connection guarantees galvanic isolation and provides data transmission up to 6000 m.

PCIe optical link hardware is designed to operate reliably in environments with high magnetic fields.

Optical link host controller (AI-9194) provides a power control function of the external Compact RIO chassis. The cRIO chassis can be fully restarted (power cycle) using application running on host computer.



Optical MXI-Express Link for NI CompactRIO Features and Typical Applications

Features

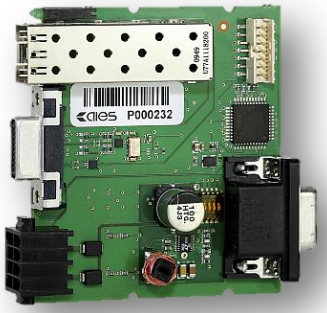
- Data Rate up to 256 MB/s
- Supports PCIe x1, gen. 1
- Dedicated for NI CompactRIO
- Long distance (up to 6000 m) via SFP LC-LC Optical Cable
- MXI-Express connection to cRIO chassis via copper cable

Typical Applications

- Long distance Data Acquisition and Control Systems based on CompactRIO
- Machine protection systems
- Slow feedback control systems

AI-9194 Quad Fiber Host Card

AI-9193 Optical MXI-Express Interface for NI CompactRIO



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