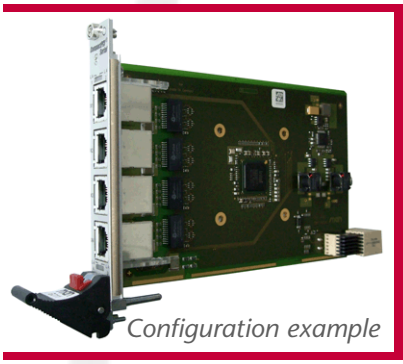
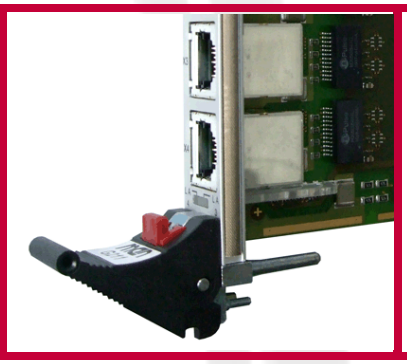
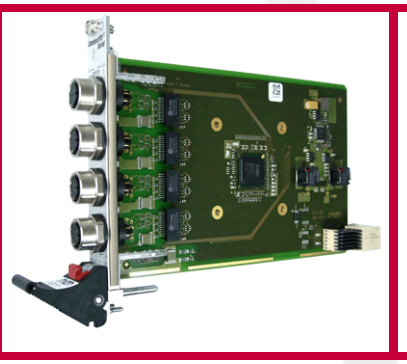
User Manual

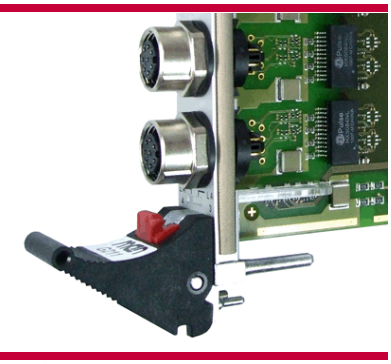
G211 – 3U CompactPCI® Serial Quad Gigabit Ethernet Interface



Configuration example







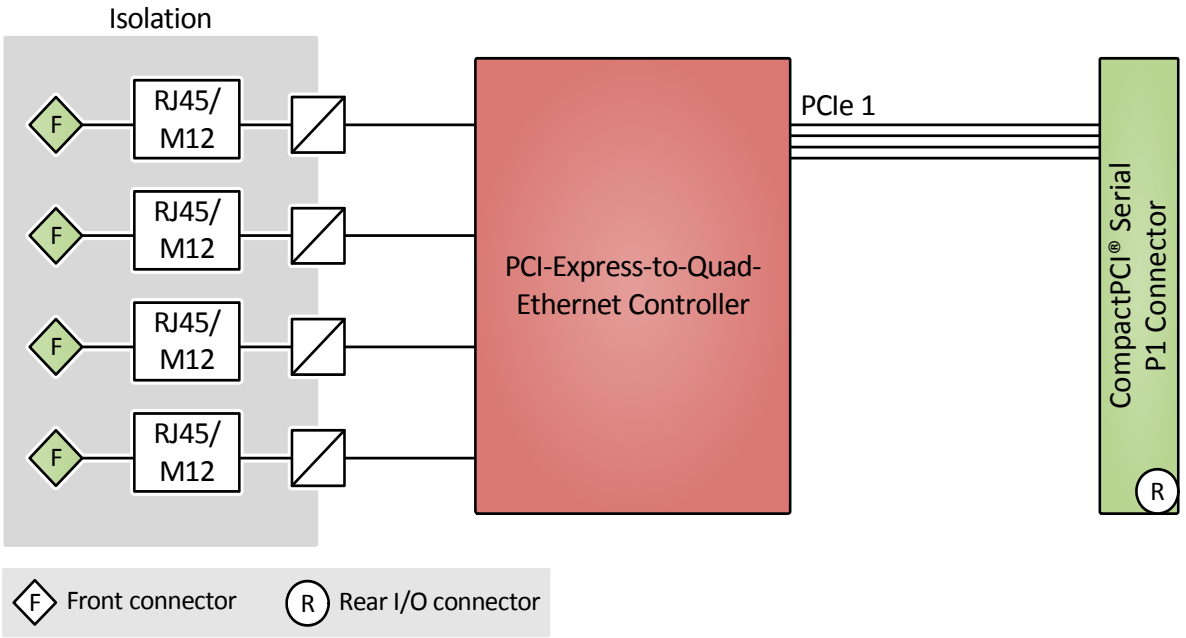
G211 – 3U CompactPCI® Serial Quad Gigabit Ethernet Interface

The G211 quad Ethernet interface is a rugged single Eurocard CompactPCI® Serial peripheral board. It can be used in combination with a CompactPCI® Serial or CompactPCI® PlusIO CPU board in a CompactPCI® Serial or hybrid system.

It provides four Gigabit Ethernet interfaces at the front panel which can be accessed either on four RJ45 or four M12 connectors making it especially suited for applications in harsh environments. All four interfaces are controlled by one Ethernet controller which is connected to the backplane via a x4 PCI Express® link and supports the IEEE 802.3x standard. Each interface supports a data transfer rate of 1 Gbit/s, even if all interfaces are used simultaneously. Two LEDs show the link and activity status of every interface.

The G211 is screened for extended operating temperature and prepared for conformal coating for use in harsh and mobile environments.

Diagram


Isolation
F
RJ45/
M12
F
RJ45/
M12
F
RJ45/
M12
F
RJ45/
M12
PCI-Express-to-Quad-
Ethernet Controller
PCIe 1
CompactPCI® Serial
P1 Connector
R
F Front connector
R Rear I/O connector

Technical Data

Ethernet Interfaces

- Four 10/100/1000Base-T interfaces
- IEEE802.3x support
  - Full-duplex flow control
  - Half-duplex back pressure collision flow control
  - 1 Gbit/s data transfer rate for each interface, even if all 4 interfaces are used simultaneously
- 4x2 status LEDs to signal link status and activity

Front Connections

- Four standard 8-pin RJ45 or M12 receptacle connectors

CompactPCI® Serial

- Compliance with CompactPCI® Serial PICMG CPCI-S.0 Specification
- Peripheral slot
- Host interface: One PCI Express® x4 link
  - PCIe® 2.0 support
  - Data rate up to 2 GB/s in each direction (5 Gbit/s per lane)

Electrical Specifications

- Isolation voltage: 1500V between Ethernet links and between Ethernet links and shield or ground
- Supply voltage/power consumption:
  - +12V (-5%/+5%), 3.5 W typ/ 6 W max.

Mechanical Specifications

- Dimensions: conforming to CompactPCI® Serial specification for 3U boards
- Weight: 240 g (with heat sink)

Environmental Specifications

- Temperature range (operation):
  - -40..+85°C (screened)
  - Airflow: min. 1.0 m/s
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% non-condensing
- Relative humidity (storage): max. 95% non-condensing
- Altitude: -300 m to + 3,000 m
- Shock: 15 g, 11 ms
- Bump: 10 g, 16 ms
- Vibration (sinusoidal): 2 g, 10..150Hz
- Conformal coating on request

MTBF

- MTBF: 324,639h @ 40°C according to IEC/TR 62380 (RDF 2000)

Safety

- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Tested according to EN 55022 (radio disturbance), EN 61000-4-2 (ESD), EN 61000-4-4 (burst) and EN 61000-4-5 (surge)

Software Support

- Windows®
- Linux
- For more information on supported operating system versions and drivers see online data sheet.

Configuration Options

Ethernet

- Four RJ45 connectors at the front panel
- Four M12 connectors at the front panel

Operating Temperature

- Depends on system configuration
- Maximum: +85°C
- Minimum: -50°C

Cooling Concept

- Also available with conduction cooling in MEN CCA frame

Please note that some of these options may only be available for large volumes. Please ask our sales staff for more information.

For available standard configurations see online data sheet.

Product Safety

Electrostatic Discharge (ESD)

Computer boards and components contain electrostatic sensitive devices. Electrostatic discharge (ESD) can damage components. To protect the board and other components against damage from static electricity, you should follow some precautions whenever you work on your computer.

- Power down and unplug your computer system when working on the inside.
- Hold components by the edges and try not to touch the IC chips, leads, or circuitry.
- Use a grounded wrist strap before handling computer components.
- Place components on a grounded antistatic pad or on the bag that came with the component whenever the components are separated from the system.
- Store the board only in its original ESD-protected packaging. Retain the original packaging in case you need to return the board to MEN for repair.

About this Document

This user manual is intended only for system developers and integrators, it is not intended for end users.

It describes the hardware functions of the board, connection of peripheral devices and integration into a system. It also provides additional information for special applications and configurations of the board.

The manual does not include detailed information on individual components (data sheets etc.). A list of literature is given in the appendix.

History

Issue	Comments	Date
E1	First issue	2010-07-16
E2	Changed 500 Mbit/s to 1 Gbit/s data transfer rate	2014-05-22

Conventions

This sign marks important notes or warnings concerning the use of voltages which can lead to serious damage to your health and also cause damage or destruction of the component.

This sign marks important notes or warnings concerning proper functionality of the product described in this document. You should read them in any case.

italics — Folder, file and function names are printed in *italics*.

bold — **Bold** type is used for emphasis.

`monospace` — A `monospaced` font type is used for hexadecimal numbers, listings, C function descriptions or wherever appropriate. Hexadecimal numbers are preceded by "0x".

comment — Comments embedded into coding examples are shown in green color.

hyperlink — Hyperlinks are printed in blue color.

The globe will show you where hyperlinks lead directly to the Internet, so you can look for the latest information online.

IRQ# /IRQ — Signal names followed by "#" or preceded by a slash ("/") indicate that this signal is either active low or that it becomes active at a falling edge.

in/out — Signal directions in signal mnemonics tables generally refer to the corresponding board or component, "in" meaning "to the board or component", "out" meaning "coming from it".

Vertical lines on the outer margin signal technical changes to the previous issue of the document.

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Conformity

MEN products are no ready-made products for end users. They are tested according to the standards given in the Technical Data and thus enable you to achieve certification of the product according to the standards applicable in your field of application.

RoHS

Since July 1, 2006 all MEN standard products comply with RoHS legislation.

Since January 2005 the SMD and manual soldering processes at MEN have already been completely lead-free. Between June 2004 and June 30, 2006 MEN's selected component suppliers have changed delivery to RoHS-compliant parts. During this period any change and status was traceable through the MEN ERP system and the boards gradually became RoHS-compliant.

WEEE Application

The WEEE directive does not apply to fixed industrial plants and tools. The compliance is the responsibility of the company which puts the product on the market, as defined in the directive; components and sub-assemblies are not subject to product compliance.

In other words: Since MEN does not deliver ready-made products to end users, the WEEE directive is not applicable for MEN. Users are nevertheless recommended to properly recycle all electronic boards which have passed their life cycle.

Nevertheless, MEN is registered as a manufacturer in Germany. The registration number can be provided on request.

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Figures

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1 Getting Started

This chapter gives an overview of the board and some hints for first installation in a system.

1.1 Map of the Board

Figure 1. *Map of the board – front panels*

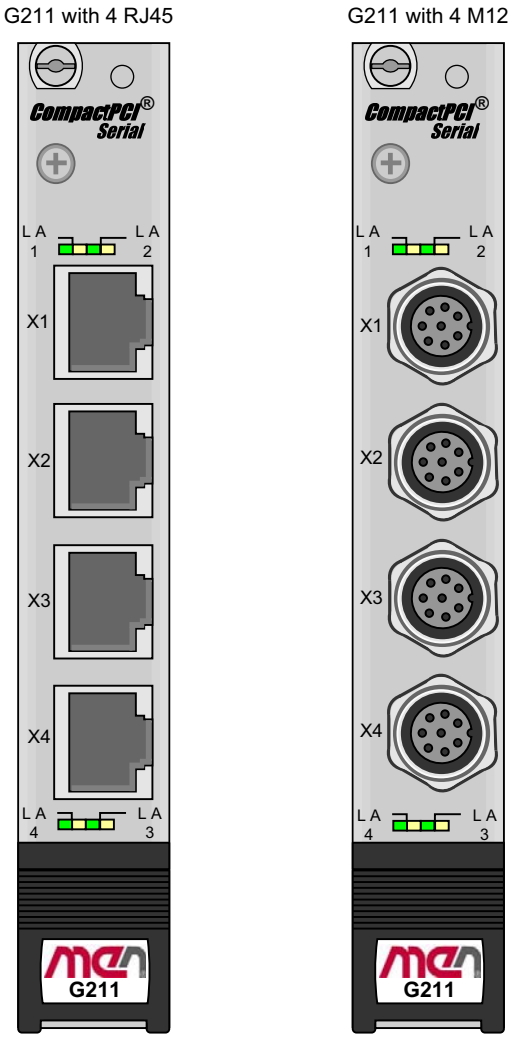


Figure 2. *Map of the board with RJ45 front connectors – top view*

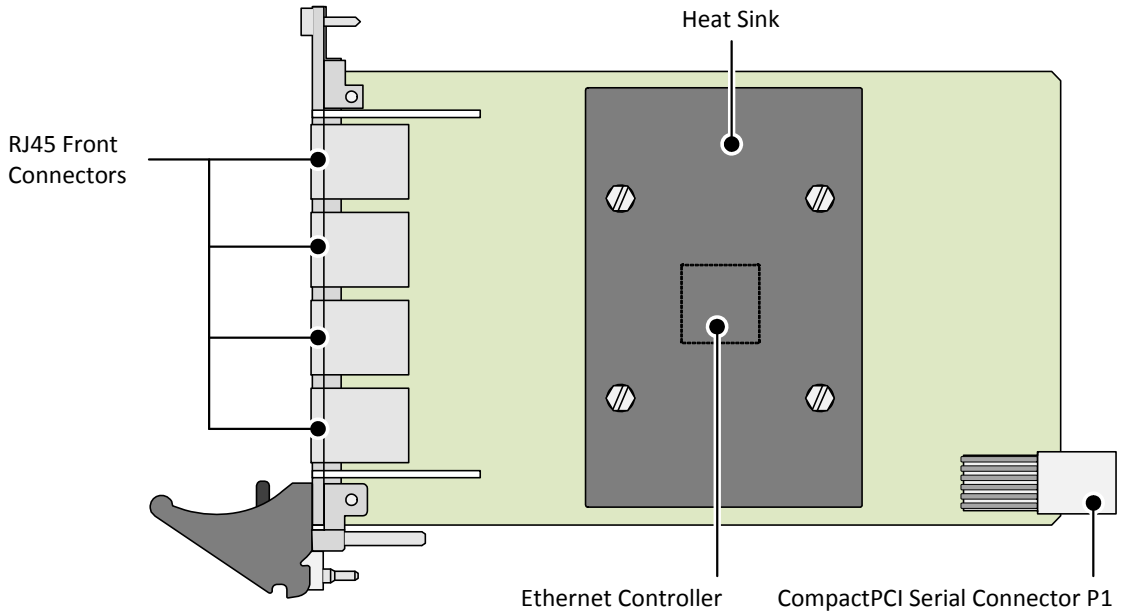
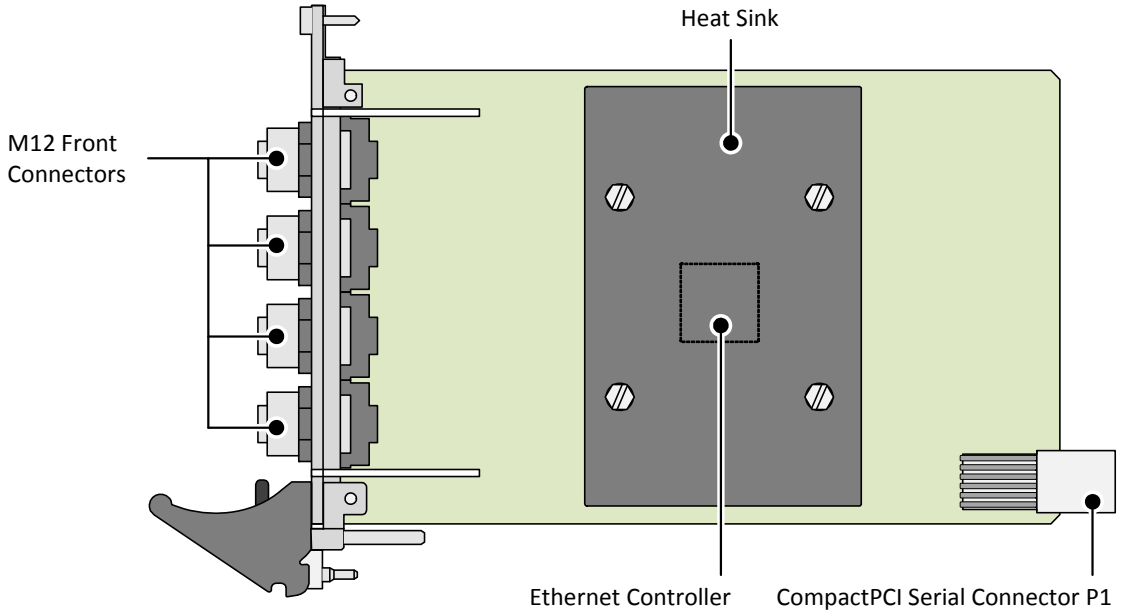


Figure 3. *Map of the board with M12 front connectors – top view*



1.2 Integrating the Board into a System

You can use the following "check list" when installing the G211 in a CompactPCI Serial system for the first time.

- ☑ Power-down the system.
- ☑ Insert the G211 into a peripheral slot of your CompactPCI Serial system, making sure that the CompactPCI Serial connectors are properly aligned.

  Note: The peripheral slots of every CompactPCI Serial system are marked by a circle ○ on the backplane and/or at the front panel.
- ☑ Power-up the system.
- ☑ You can now install driver software.

1.3 Installing Driver Software

For a detailed description on how to install driver software please refer to the respective documentation.

You can find any driver software available for download on MEN's website.

2 Functional Description

2.1 Power Supply

The G211 is supplied with a primary +12V voltage via the CompactPCI Serial connector P1.

2.2 Ethernet Interfaces

The G211 has four Gigabit Ethernet interfaces controlled by the Intel 82580 Dual/ Quad Gigabit Ethernet Controller. All channels support 10/100/1000Base-T physical layers, and half-duplex and full-duplex operation complying with IEEE802.3x. Each of the four channels reach a performance of 1 Gbit/s read and/or write, even when all four interfaces are used simultaneously.

The unique MAC address for every interface is set at the factory and should not be changed. Any attempt to change this address may create node or bus contention and thereby render the board inoperable. The MAC addresses on G211 are:

- Interface X1: `0x 00 C0 3A 9D 0x xx`
- Interface X2: `0x 00 C0 3A 9D 1x xx`
- Interface X3: `0x 00 C0 3A 9D 2x xx`
- Interface X4: `0x 00 C0 3A 9D 3x xx`

where "00 C0 3A" is the MEN vendor code, "9D" is the MEN product code. The last four digits depend on the interface and the serial number of the product. The serial number is added to the offset, for example for X2:

• Serial number 0042: `0x xx xx = 0x1000 + 0x002A = 0x 10 2A.`

(See Chapter 3.2 Finding out the Product's Article Number, Revision and Serial Number on page 21.)

2.2.1 Connection

The G211 is available in two standard versions: one provides four standard RJ45 connectors and one four 8-pin M12 connectors at the front panel.

The pin assignments correspond to the Ethernet specification IEEE802.3.

Table 1. *Signal mnemonics of Ethernet front-panel connectors*

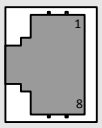
Signal	Direction	Function
BI_Dx+/-	in/out	Differential pairs of data lines for 1000Base-T
RX+/-	in	Differential pair of receive data lines for 10/ 100Base-T
TX+/-	out	Differential pair of transmit data lines for 10/ 100Base-T

Pin Assignment of RJ45 Connectors

Connector types:

- Modular 8/8-pin mounting jack according to FCC68
- Mating connector:
  Modular 8/8-pin plug according to FCC68

Table 2. *Pin assignment of Ethernet front-panel connectors*

		1000Base-T	10/100Base-T
	1	BI_DA+	TX+
	2	BI_DA-	TX-
	3	BI_DB+	RX+
	4	BI_DC+	-
	5	BI_DC-	-
	6	BI_DB-	RX-
	7	BI_DD+	-
	8	BI_DD-	-

Pin Assignment of M12 Connectors

Connector types:

- 8-pin M12 receptacle A-coded 90°
- Mating connector:
  8-pin M12 plug A-coded 90°

Table 3. *Pin assignment of Ethernet front-panel connectors*

		1000Base-T	10/100Base-T
	1	BI_DC-	
	2	BI_DD+	
	3	BI_DD-	
	4	BI_DA-	TX-
	5	BI_DB+	RX+
	6	BI_DA+	TX+
	7	BI_DC+	-
	8	BI_DB-	RX-

2.3 Status LEDs

The front panel includes two status LEDs for each channel. They signal the link and activity:

Table 4. *Status LEDs*

LED Color	LED State	Function
Yellow	Blinking	Activity (RX and TX)
Green	On	Link (all speeds)

2.4 CompactPCI Serial Interface

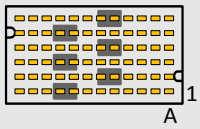
The G211 uses up to four PCI Express lanes at the backplane according to the CompactPCI Serial specification (PICMG CPCI-S.0, proposed standard under development).

Connector type of P1:

- 72-pin Airmax VS 4 pair, right angle header, 6 IMLA with end walls

See the following table for the pin assignment of the P1 connector:

Table 5. *Pin assignment of CompactPCI Serial P1 connector*



PE_ Rx03-	PE_ Rx03+	GND	PE_ Tx03-	PE_ Tx03+	GND	PE_ Rx02-	PE_ Rx02+	GND	PE_ Tx02-	PE_ Tx02+	GND	6
GND	PE_ Rx01-	PE_ Rx01+	GND	PE_ Tx01-	PE_ Tx01+	GND	PE_ Rx00-	PE_ Rx00+	GND	PE_ Tx00-	PE_ Tx00+	5
-	-	GND	-	-	GND	PE_ REFCLK-	PE_ REFCLK+	GND	-	-	GND	4
-	-	-	GA2	-	-	GA1	-	-	GA0	-	-	3
-	PCIE_ EN#	GND	-	RST_ IN#	GND	-	-	GND	IPM- B_SDA	IPMB_ SCL	GND	2
GND	+12V	+12V	GND	+12V	+12V	GND	+12V	+12V	GND	-	-	1
L	K	J	I	H	G	F	E	D	C	B	A	

For a more detailed description of the signals refer to the CompactPCI Serial specification.

3 Appendix

3.1 Literature and Web Resources

- G211 data sheet with up-to-date information and documentation:
  www.men.de/products/02G211-.html

3.1.1 Ethernet

- Intel 82580 Dual/Quad Gigabit Ethernet Controller
  www. intel.com
- ANSI/IEEE 802.3-1996, Information Technology - Telecommunications and Information Exchange between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications; 1996; IEEE
  www.ieee.org
- Charles Spurgeon's Ethernet Web Site
  Extensive information about Ethernet (IEEE 802.3) local area network (LAN) technology.
  www.ethermanage.com/ethernet/
- InterOperability Laboratory, University of New Hampshire
  This page covers general Ethernet technology.
  www.iol.unh.edu/services/testing/ethernet/training/

3.2 Finding out the Product's Article Number, Revision and Serial Number

MEN user documentation may describe several different models and/or design revisions of the G211. You can find information on the article number, the design revision and the serial number on two labels attached to the board.

- **Article number:** Gives the product's family and model. This is also MEN's ordering number. To be complete it must have 9 characters.
- **Revision number:** Gives the design revision of the product.
- **Serial number:** Unique identification assigned during production.

If you need support, you should communicate these numbers to MEN.

Figure 4. *Labels giving the product's article number, revision and serial number*