



Product Information

Rear I/O Module • CU7-RS485

Document No. 2685 • Edition 26 November 2010

*The CU7-RS485 is a rear-I/O PHY module, destined for **CompactPCI**® systems, to be used in combination with the serial interface cards CU1-CHORUS and CU2-QUARTET. The CU7-RS485 is provided with an electrically isolated TIA-485 data transceiver for EMI sensitive applications.*

More often known as RS-485, this standard is a popular balanced voltage signal technology for interconnecting devices on an industrial network, up to 1200m cable length. The CU7-1-RS485 allows for connecting various controllers in a daisy-chain fashion across a single twisted pair cable, while the CU7-2-RS485 is suitable for a direct point-to-point interconnection between two devices over a 4-wire line.

Designed for harsh environment, the CU7-RS485 modules are high-reliability, rugged RS-485 interfaces, well suited for industrial and telecommunication purposes.

The RS-485 bus network topology is also known as party-line. Using a half-duplex transmission principle, this method is requiring a single twisted pair cable only, by connecting together driver outputs and receiver inputs. The CU7-1-RS485 allows for up to 32 networking nodes, sharing a common bus. Typically, all devices receive permanently all messages, but there is only one sender allowed to be enabled at a given time.

Point-to-point interconnections however can be established as a full-duplex 4-wire line (sending and receiving data simultaneously). The CU7-2-RS485 is therefore equipped with separated drivers and receivers.

While providing data transfer rates up to 2.5Mbps, both modules are protected against ESD up to 15kV and electrically isolated up to 500V.



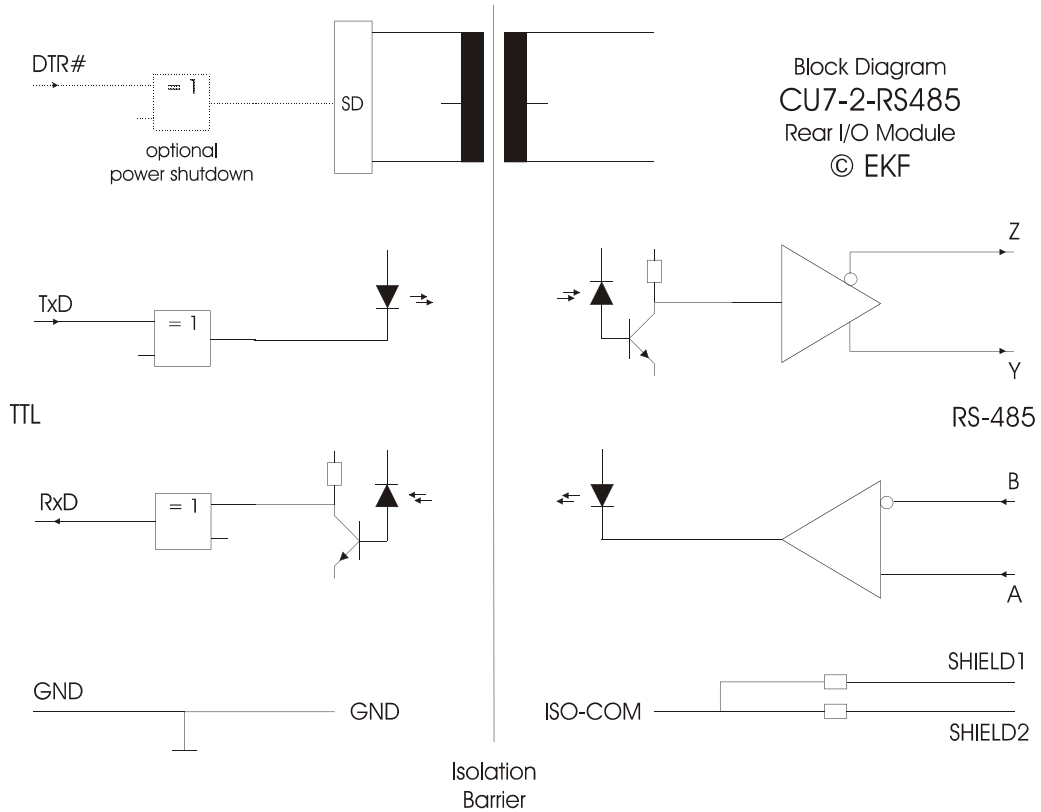
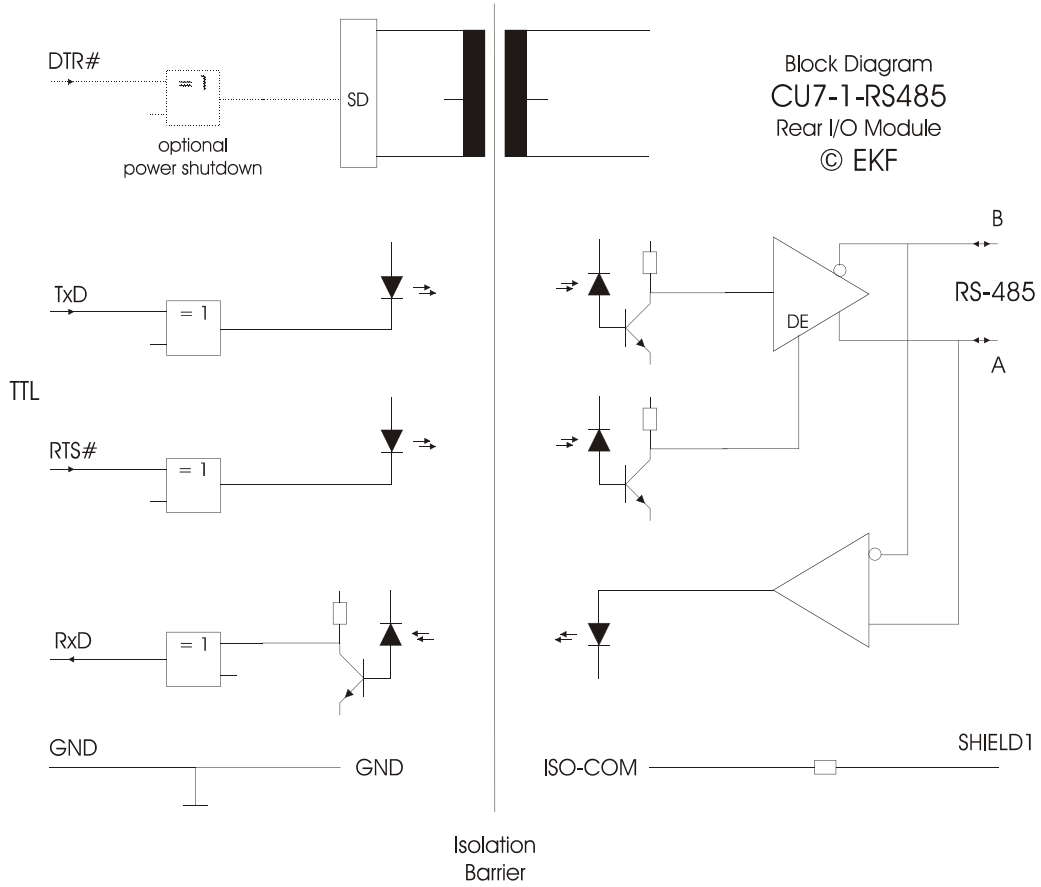
Technical Feature Summary CU7-RS485

Form Factor	Rear-I/O Module (60x31 mm ²)
Function	PHY Transceiver RS-485 (EIA/TIA-485-A)
Chip	Maxim MAX1480EA (CU7-1-RS485) or MAX1490EA (CU7-2-RS485), electrically isolated
RS-485 Interface CU7-1-RS485	2-Wire line TxD/RxD, driver and receiver connected, operation mode half-duplex, the transmitter (driver) is enabled by signal RTS, receiver has a fail-safe feature if the input is open circuit, external connector D-Sub 9-pos. male
RS-485 Interface CU7-2-RS485	4-Wire line TxD/RxD, driver and receiver not connected, operation mode full-duplex, the transmitter (driver) is permanently enabled, receiver has a fail-safe feature if the input is open circuit, external connector D-Sub 9-pos. male
Data Transfer Rate	2.5Mbps max. (CU7-1-RS485), 2 x 2.5Mbps max. (CU7-2-RS485)
ESD Protection	±15kV (Human Body Model)
Isolation Voltage	±500V DC max.
Failure Protection	Short-circuit current limited, protected against excessive power by thermal shutdown
Internal Connector	2mm male metric connector 10-pos., suitable for flat ribbon cable harness to the CU9-BASE
Power Requirements	+5V 0.3A max.
Temperature Humidity	Operating temperature 0-70°C (extended temperature range on request) Relative humidity 5-90%, non-condensing

Technical specifications are subject to change without further notification



Block Diagram CU7-RS485



The CU7-1-RS485 and CU7-2-RS485 modules are intended for use especially with the serial interface board CU4-SOPRANO. This CompactPCI® card has its TTL level serial ports routed to the backplane connector J2, for rear I/O by additional PHY (physical layer) modules.

Mounted onto the CPCI backplane from behind, the additional distribution board CU9-BASE for up to 16 ports is equipped with metric 2mm pin headers, mating the flat ribbon cable assemblies to the particular PHY modules such as the CU7-RS485.

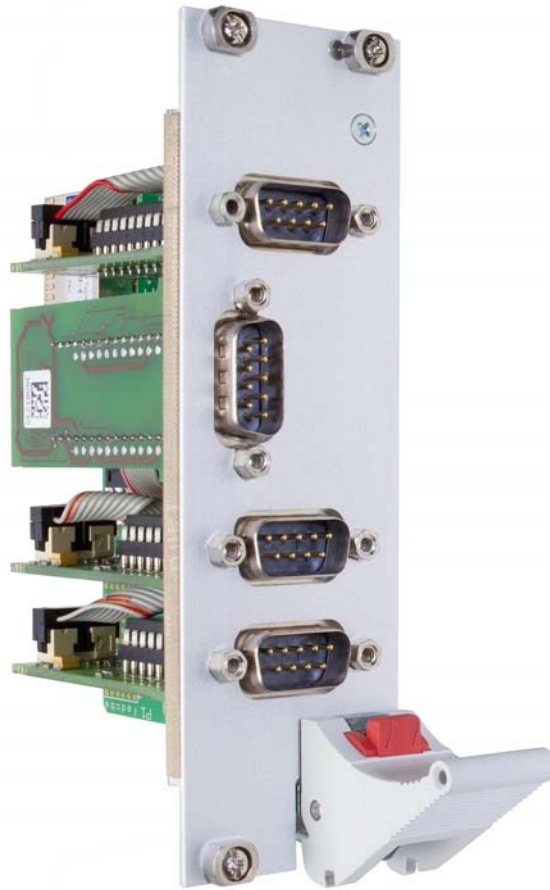


CU4-SOPRANO

www.ekf.com/c/ccom/ccom.html



CU9-4-BASE



CU9-4-BASE



CU9-BASE (Custom Specific)

As data rates increase, proper termination on both ends of the RS-485 bus becomes important. A popular approach is to use external termination, having the resistors located within the shell of the DB9 connectors.

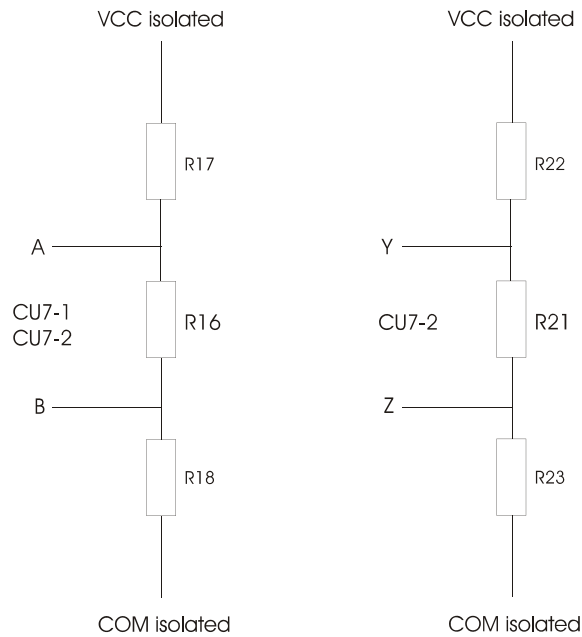
As an alternative, termination resistors can be stuffed directly on the CU7-RS485 board. Due to miniaturized SMD components, a properly equipped working place is highly recommended.

Typically, the termination resistor value is 120 Ohm or 130 Ohm, ideally matching the twisted pair cable impedance. When calculating, the optionally stuffed bias resistors for open-line fail-safe termination would lie in parallel. Normally, this effect can be disregarded.

Any party-line network must be terminated at the extreme ends of its bus. Stubs in order to attach particular nodes are not allowed.

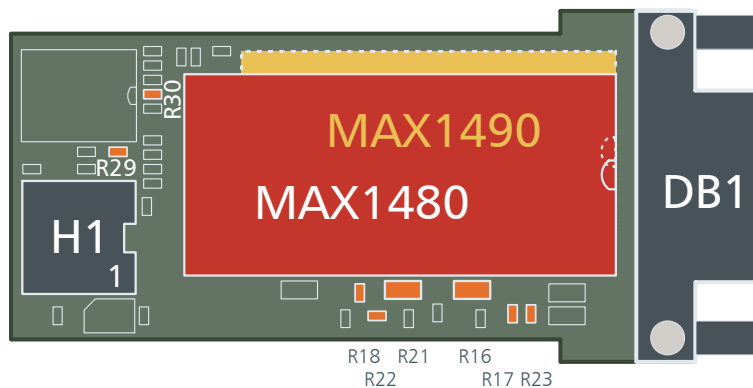
When establishing a point-to-point full-duplex interconnection, both data directions, receiver and driver lines, require termination. This means, in addition to the A/B line also the Y/Z line must be terminated.

The RS-485 receivers used in the MAX1480/MAX1490 have an internal built-in fail-safe feature, so that the resistors R17/R18 and R22/R23 (see figure below) normally should be not stuffed. If for some reason bias resistors for open-line fail-safe termination are required, a nominal value of 750 Ohm or 820 Ohm is recommended.



Optional on-Board Line Termination and Bias

CU7-RS485 • © EKF



Is RS-485 a two-wire or a three-wire system? It is most definitely a three wire system (four plus one wire with respect to full-duplex operation). The TIA standard (ANSI/TIA/EIA-485-A, page 15, A.4.1) requires the presence of a common return path between all circuit grounds along the balanced line for proper operation.

The TIA standard defines a maximum common mode voltage range from -7V to +12V on the signal lines A and B, measured against C (common ground). A TIA/EIA-485 system however with only two wires A and B (C generator and C receiver commons not connected) can result in an unpredictable common mode voltage superimposed on the interface lines A and B, caused either by electrostatic charging or electromagnetic interference.

A 2-wire system often may work though due to idle-line fail-safe resistors at the receiver inputs, which can be considered as a loosely coupled common ground. Nevertheless this operation mode cannot be recommended - what is working flawless in the laboratory may not work reliable under real conditions in an industrial environment.

Where do we get the third wire? Many times the outer cable shield is used as the third (fifth) wire. However, EKF recommends to use a two pair cable (three pairs for full-duplex operation), with one or both wires of the additional pair as the dedicated common ground. Connect these additional wires directly to the pins 3, 6 & 5, 8 of the DB9 connector for proper grounding.

The optimum cable solution would comprise an inner shield for each signal twisted pair. The inner shield can then be used for establishing the common ground between TIA/EIA-485 nodes (connect to pins 3, 6 & 5, 8 of the DB9 connector).

An additional outer cable shield, that may cover the inner signal and ground cable pairs, should be connected to the pin 1 of the connector (it is equivalent and sufficient to connect the shield with the metallic shell of the DB9 connector). This shield should be grounded at one point only (isolate the shield at the opposite cable end in order to avoid any contact with the connector hood).

ANSI/TIA/EIA-485-A
Interconnect Application

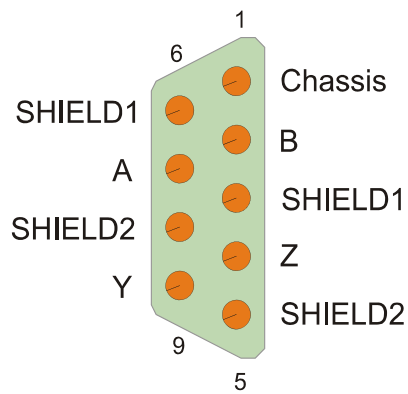


G = Generator • R = Receiver • RT = Termination Resistor
 A/A' = Generator/Receiver Interface Point
 B/B' = Generator/Receiver Interface Point
 C/C' = Generator/Receiver Common

External Documents

TIA-485-A	ANSI/TIA/EIA-485-A Standard • Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems • http://standardsdocuments.tiaonline.org/tia-485-a.htm
MAX1480EA MAX1490EA	Datasheet • 15kV ESD-Protected, Isolated RS-485/RS-422 Data Interfaces • www.maxim-ic.com
Article/ Blog	RS485 Cables – Why you need 3 wires for 2 (two) wire RS485 • www.chipkin.com/articles/rs485-cables-why-you-need-3-wires-for-2-two-wire-rs485

DB1 • D-SUB 9-Position Male Connector			
		1	Chassis Frame GND
Shield1 Isolated Common Return	6		
		2	B RS-485 Inverting Input/Output (CU7-1) RS-485 Inverting Input (CU7-2)
A RS-485 Non-Inverting Input/Output (CU7-1) RS-485 Non-Inverting Input (CU7-2)	7		
		3	Shield1 Isolated Common Return
Shield2 Isolated Common Return	8		
		4	Z RS-485 Inverting Output (CU7-2)
Y RS-485 Non-Inverting Output (CU7-2)	9		
		5	Shield2 Isolated Common Return



DB1
Isolated RS-485
TIA-485-A

H1 • Metric Header 2x5 2.0mm			
+5V	1	2	DSR#
RI#	3	4	RxD
TxD	5	6	DTR#
RTS#	7	8	CTS#
DCD#	9	10	GND

Ordering Information

Ordering No.	Short Description
CU7-1-RS485	RS-485/RS-422 Rear I/O PHY interface module, 1 port, 2.5Mbps two wire transmission line (party line), electrically isolated www.ekf.com/c/ccom/cu7/cu7.html
CU7-2-RS485	RS-485/RS-422 Rear I/O PHY interface module, 1 port, 2.5Mbps 4-wire transmission line (point-to-point), electrically isolated www.ekf.com/c/ccom/cu7/cu7.html
CU4-2-SOPRANO	CompactPCI® quad serial interface, suitable for rear I/O across J2 www.ekf.com/c/ccom/cu4/cu4_e.html
CU9-4-BASE	Transition board, interconnection between CU4-SOPRANO (J2) and rear I/O PHY interface modules, 4 ports, 3U/8HP back panel included www.ekf.com/c/ccom/cu4/cu4_e.html

Please refer also to
www.ekf.com/liste/liste_20.html#CU7

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