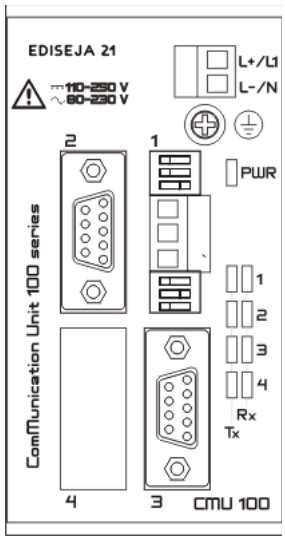
EDISEJA 21

RS485 to 2x RS232 fallback switch User Manual

CMU 100 / 2.5.1.1 - 17
CMU 100 / 4.5.1.1 - 17
CMU 100 / 8.5.1.1 - 17



Device:	Document:	Code:	Date:
CMU 100 / x.5.1.1 - 17	User manual	CMUMU511	28.04.2021

Content

1 PREFACE

Liability statement

We have checked the contents of this manual to ensure that the descriptions of both hardware and software are as accurate as possible. However, deviations may occur so that no liability can be accepted for any errors or omissions contained in the information given.
The contents of this manual will be checked in periodical intervals, corrections will be made in the following editions.
We reserve the right to make technical improvements without notice.

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Copyright

Explanation of the symbols


Read the instructions!

Device was tested with 2,5 kV or 500 V AC voltage to check the device insulation.


Device ground terminal.


Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC; the affixed product label indicates that you must not discard this electrical/electronic product in domestic household waste.

Warnings

In this paper the following terms are used:

Danger
indicates that death, severe personal injury or substantial property damage will result if proper precautions are not taken.

Warning
indicates that death, severe personal injury or substantial property damage can result if proper precautions are not taken.

Caution
indicates that minor personal injury or property damage can result if proper precautions are not taken. This particularly applies to damage on or in the device itself.

General information

These paper contain the information that is necessary for the proper and safe operation of the described devices. This paper is intended for technically qualified personnel.

Warning!
Hazardous voltage is present inside the device during operation. Disregarding of safety rules can result in severe personal injury or property damage.
Only qualified personnel may work with described devices after being familiar with warnings and safety notices in this paper and other safety regulations.

Warning!
Device must operate completely assembled! Device must be used as described. No modifications of the device should be made.

Warning!
Do not open device while it is energized! Hazardous voltage is present inside the device. Disconnect all connectors before opening!

Warning!
If device is damaged disconnect it from power supply! Send it to the manufacturer for inspection.

Warning!
Connect to earth before attaching power supply!

2 CMU 100 SYSTEM

2.1 DESCRIPTION

Communication unit (CMU 100) is modular system of communication devices that can be used for various of tasks such as:

- communication converter (for example RS232 to RS485)
- star coupler (for example 1 fiber optic to 7 fiber optics)
- repeater (for example RS485/485)
- communication isolator (for example for preventing ground loops)
- communication listener - debugger
- PC serial com port extender (for example USB to 4 serial com)

CMU 100 device is a couple of software and hardware. For different purposes, different software versions and different hardware configuration have been developed.

2.1.1 SOFTWARE

Software is application dependent and allows different hardware configurations. Software's task is switching between communication ports and allows almost any combination between them.

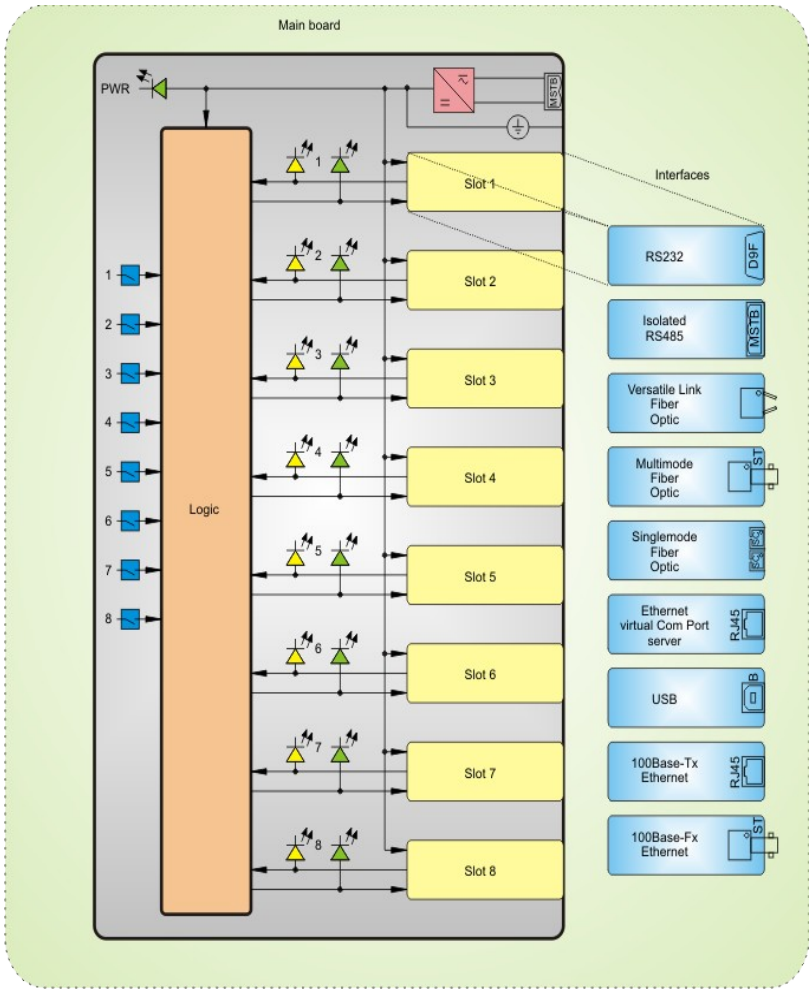
2.1.2 HARDWARE

Hardware is based on main board with power supply and port switching logic. On that board, interface boards are attached. CMU 100 can handle up to 8 different interface boards. Currently available interface boards:

- RS232
- isolated RS485
- Multimode Fiber Optic with ST and SMA connectors
- Singlemode Fiber Optic with ST, FC & SC connectors
- Versatile Link Fiber Optic 1 mm plastic cable
- USB
- ethernet (with one virtual com port)

Housing is aluminium and intended for mount on standard DIN 35 rail (acc. to DIN EN 50022). 3 different housings have been made. Depends on how many interfaces device has, appropriate housing is used.

Hardware settings
All settings on the device can be made from outside by a DIL switch. It is not necessary to open the housing.



Picture 1: CMU 100 system general diagram

3 RS485 TO 2x RS232 FALLBACK SWITCH

3.1 DESCRIPTION

Fallback switch is communication device that transmits data between master port and primary port (if communication is established on this port) or secondary port. This device contains one RS485 and two RS232 interfaces. It is intended to connect:

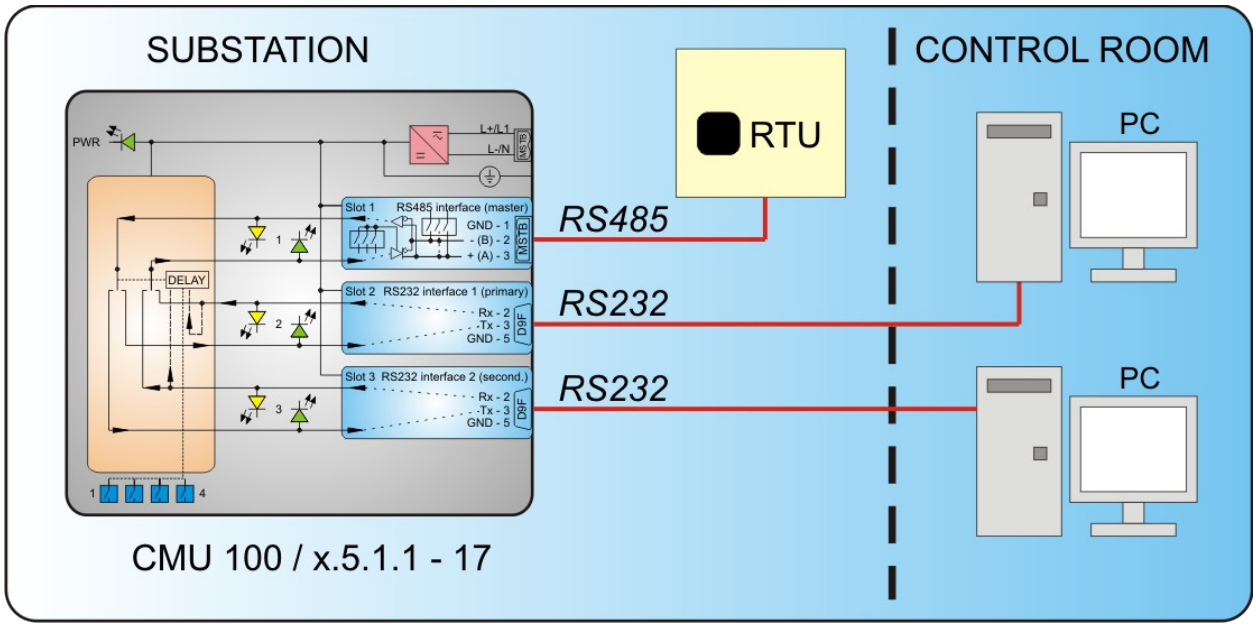
- two master devices (PC) to single device (RTU)
- one master device (PC) to single device (RTU) via two communication links

Port switch time delay is set with switches at the bottom of the device. Possible timer settings are: no delay, 20 ms, 40 ms, 60 ms, 80 ms, 0,1 s, 0,2 s, 0,3 s, 0,4 s, 0,5 s, 1s, 1,2 s, 1,5 s, 2 s, 2,5 s, 5 s.
Wide power supply voltage allows connection to all common station batteries. Additionaly it can be also connected to standard AC voltages.
This device is intended for use in cubicles and cabinets in all kinds of power production, transmission and distribution stations. It requires no maintenace. All normaly used connectors, switches and light indicators are accessed at the front side of the device. One light indicator indicates power supply voltage, others indicate communication transfer.

3.2 TYPICAL APPLICATION

3.2.1 TWO MASTERS (PC) TO ONE DEVICE (RTU)

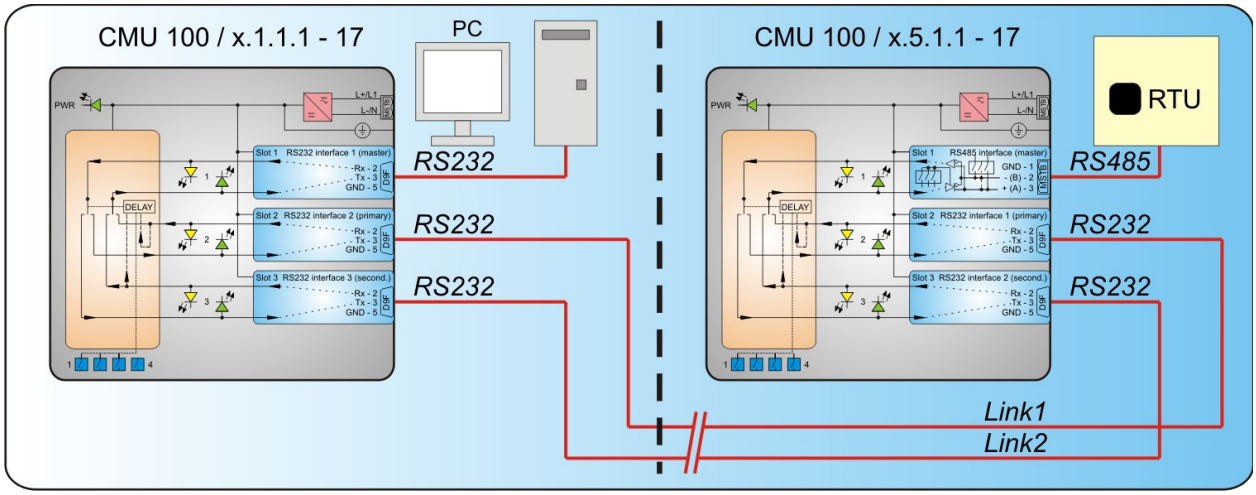
When communication is idle, master port (physical port 1) (RTU) is connected to both primary (physical port 2) and secondary port (physical port 3). When data comes to primary port, data is transferred to master port and vice versa. Secondary port is deactivated. At the same time, timer starts. During timer delay, data from primary port is transferred to the master port and vice versa. Meanwhile secondary port is not active. After timer elapses (communication is idle for elapsed time) secondary port is activated again. Master port is connected to primary and secondary port again.
When data comes to secondary port, data is transferred to master port and vice versa. Primary port is deactivated. At the same time, timer starts. During timer delay, data from secondary port is transferred to the master port and vice versa. Meanwhile primary port is not active. After timer elapses (communication is idle for elapsed time) primary port is activated again. Master port is connected to primary and secondary port again.
If data comes to primary and secondary port simultaneously, primary port has priority.



Picture 2: CMU 100 / x.5.1.1 - 17 typical application

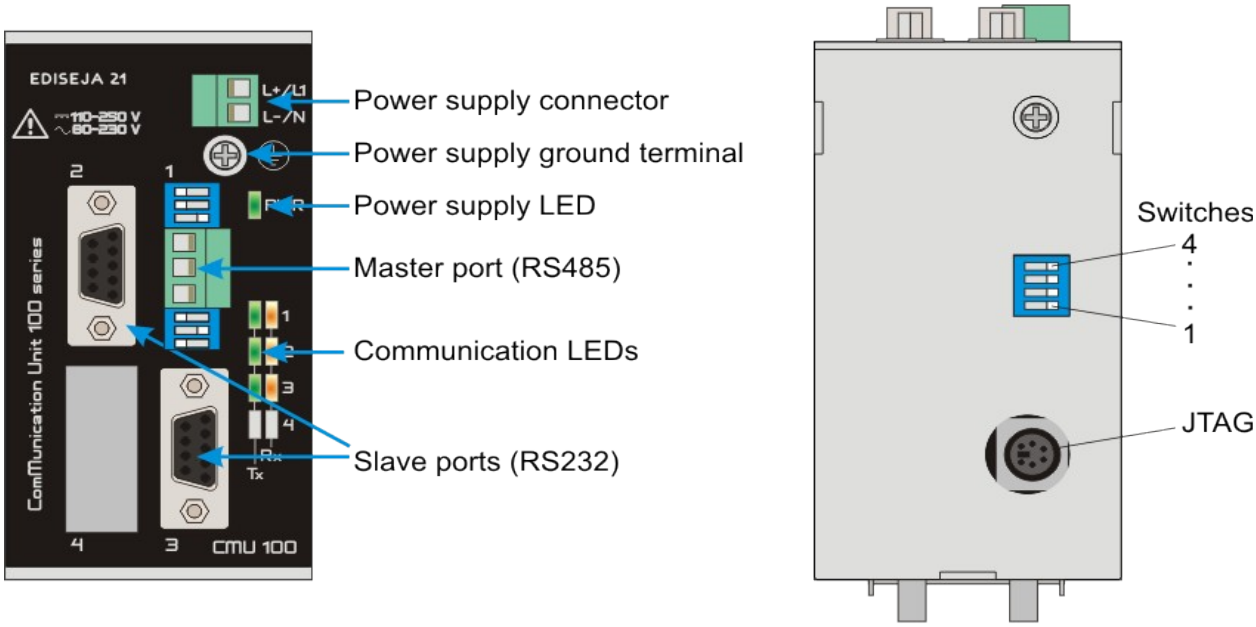
3.2.2 ONE MASTER (PC) TO TWO COMMUNICATION LINKS

When communication is idle, master port (physical port 1) (RTU) is connected to both primary (physical port 2) and secondary port (physical port 3). When data comes to master port, data is transferred to primary and secondary port. If data comes from RTU to primary port, data is transferred to master port and vice versa. Secondary port is deactivated. At the same time, timer starts. During timer delay, data from primary port is transferred to the master port and vice versa. Meanwhile secondary port is not active. After timer elapses (communication is idle for elapsed time) secondary port is activated again. Master port is connected to primary and secondary port again.
If data comes from RTU to secondary port, data is transferred to master port and vice versa. Primary port is deactivated. At the same time, timer starts. During timer delay, data from secondary port are transferred to the master port and vice versa. Meanwhile primary port is not active. After timer elapses (communication is idle for elapsed time) primary port is activated again. Master port is connected to primary and secondary port again.
If data comes to primary and secondary port simultaneously, primary port has priority.



Picture 3: CMU 100 / x.5.1.1 - 17 typical application

3.3 APPEARANCE



Picture 4: CMU 100 / x.5.1.1 - 17 front view (left) & bottom view (right)

3.4 HARDWARE DESCRIPTION

This configuration of device is made from main board (power supply, LEDs, switches and logic witch), one RS485, and two RS232 interface boards.

3.4.1 MAIN BOARD

Power LED indicates that device is turned on. The right LEDs of one port shows activity on receive (Rx) line and the left one shows activity on transmit (Tx) line.
On the bottom side of device are switches and JTAG connector which is intended for downloading necessary software. Do not connect anything to that connector.
Additional switches allows echo on each port. Echo can be set on or off for each port.

Switches

Switch	1	2	3	4
No delay	OFF	OFF	OFF	OFF
20 ms	**ON**	OFF	OFF	OFF
40 ms	OFF	**ON**	OFF	OFF
60 ms	**ON**	**ON**	OFF	OFF
80 ms	OFF	OFF	**ON**	OFF
0,1 s	**ON**	OFF	**ON**	OFF
0,2 s	OFF	**ON**	**ON**	OFF
0,3 s	**ON**	**ON**	**ON**	OFF
0,4 s	OFF	OFF	OFF	**ON**
0,5 s	**ON**	OFF	OFF	**ON**
1 s	OFF	**ON**	OFF	**ON**
1,2 s	**ON**	**ON**	OFF	**ON**
1,5 s	OFF	OFF	**ON**	**ON**
2 s	**ON**	OFF	**ON**	**ON**
2,5 s	OFF	**ON**	**ON**	**ON**
5 s	**ON**	**ON**	**ON**	**ON**
Default position (1 s)	OFF	**ON**	OFF	**ON**

Ports Configuration

Port	1	2	3	4
Interface	RS485	RS232	RS232	/

3.4.2 RS485 INTERFACE BOARD

Description

Single, galvanically isolated, half duplex, RS485 port with Phoenix 3 pin screw connector, with automatic switch to receive after end of transmission and with additional terminating and stabilizating resistors.

Hardware settings

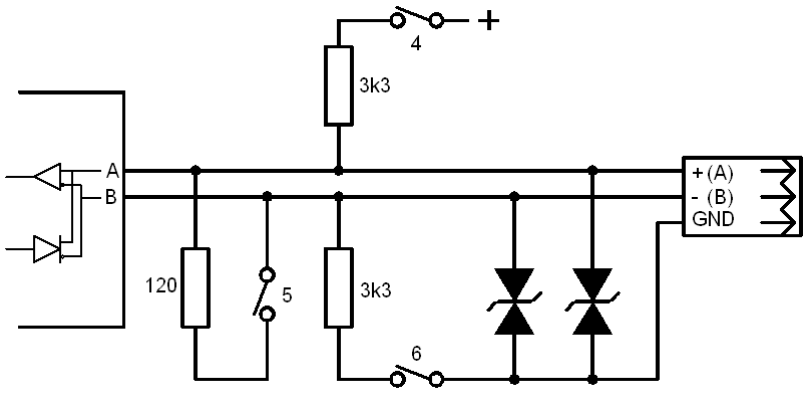
For proper functioning of that board some settings must be done:

- RS485 bus termination and stabilisation
- baud rate

RS485 bus termination and stabilisation

TERMINATION
At high transmission rates or long distance, RS485 bus termination is necessary.
The termination on RS485 bus must be set on both ends of the RS485 bus.

STABILISATION
Some device, to work properly, demands that RS485 must always be in known and valid state. That is, when + (positive) pin is more than 200 mV positive than – (negative) pin. Pins + and – are sometimes marked as A and B. In case that no device on RS485 bus is transmitting or in case of short circuit, there is no voltage difference between those pins and some device do not work correctly.
On this port board so called „true fail-safe“ RS485 chip is used so board works correctly without stabilisation at invalid RS485 bus state. But still switches for stabilisation are provided on port board. **The stabilization on RS485 bus may be set on one device only!**



Picture 5: RS485 BUS schematic

Switches at the lower side of connector:

Switch	4	5	6
Description	RS485 stabilisation	RS485 termination	RS485 stabilisation

Switches at the upper side of connector:

BAUD rate

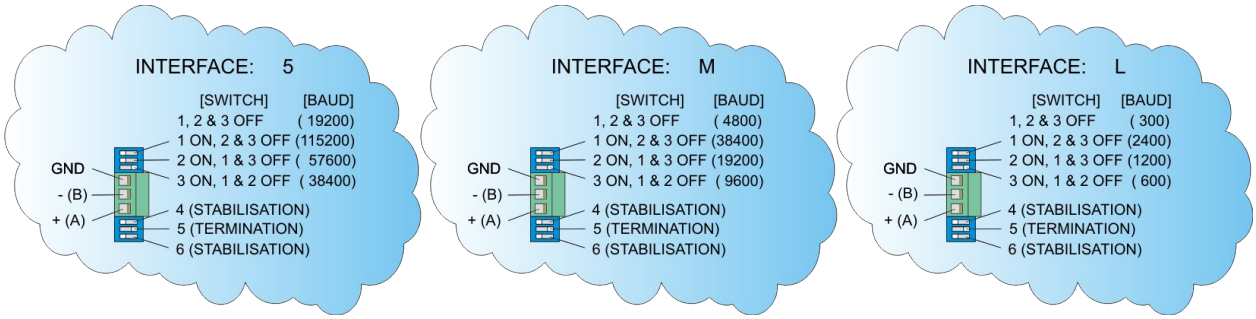
bit/s			Switch		
Interface 5	Interface M	Interface L	1	2	3
19200	4800	300	OFF	OFF	OFF
38400	9600	600	OFF	OFF	ON
57600	19200	1200	OFF	ON	OFF
115200	38400	2400	ON	OFF	OFF

BAUD rate setting 19,2 kbit/s is valid for all standard communication protocols, that do not request special timings. If special protocols (small request-respond time required) are used please note it in order.

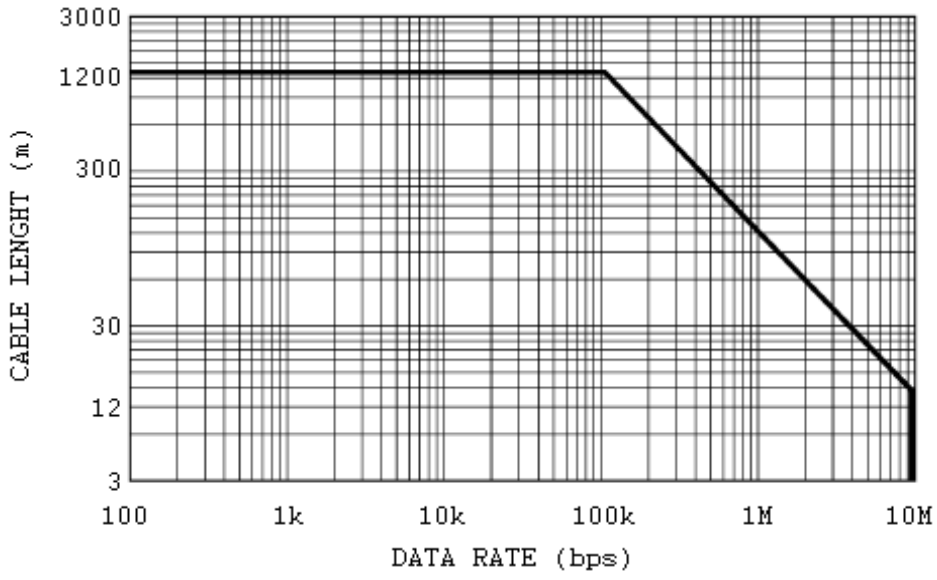
NOTE! If there are problems with communication, try using higher speed setting. Some manufacturer have different markings for B and A line. Try to switch A and B wires. See http://en.wikipedia.org/wiki/RS-485 for detailed information.

Connector pin table

MSTB	1	2	3
Description	GND	- (B)	+ (A)



Picture 6: RS485 interface board appearance with switch settings



Picture 7: Standard data rate vs cable lenght

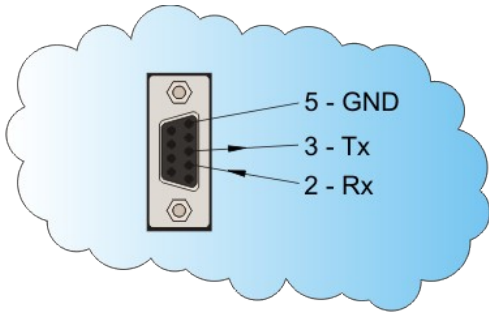
3.4.3 RS232 INTERFACE BOARD

Description

Single, nonisolated, full duplex, RS232 port with DB9 female connector. Supported Rx, Tx and GND pins.

Connector pin table

DB9 F	2	3	5
Description	RX	TX	GND
Direction	IN	OUT	-

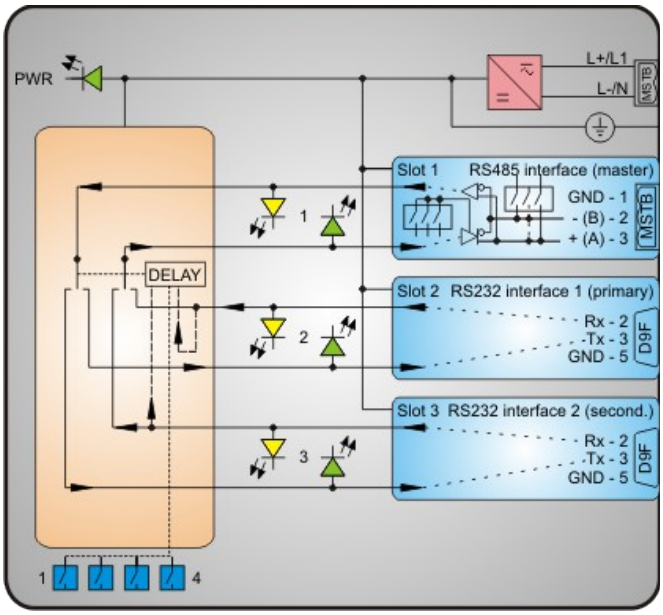


Picture 8: DB9 Female connector

Cable for connection to PC

CMU 100		Direction	PC	
DB9 M pin	Signal		Signal	DB9 F pin
2	RX	<-------	TX	3
3	TX	------->	RX	2
5	GND	<------->	GND	5

4 SCHEMATIC



Picture 9: CMU 100 / x.5.1.1 - 17 schematic

5 INSTALLATION

5.1 INSTALLATION

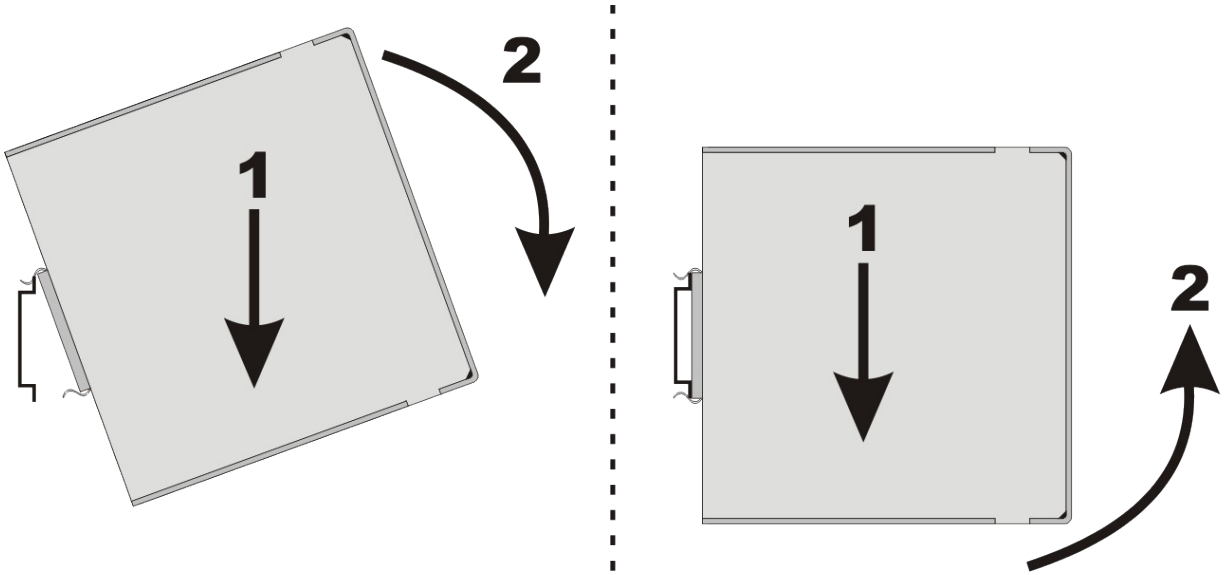
Warning!

Hazardous voltage is present inside the device during operation. Disregarding of safety rules can result in severe personal injury or property damage.

Only qualified personnel may work with described devices after being familiar with warnings and safety notices in this paper and other safety regulations.

Following instruction must be taken into consideration:

- The device must be accessible to qualified personnel only.
- The device is permitted to operate in enclosed housing or cabinet only.
- The device location must be vibration-free.
- The admisible operating temperature must be observed.
- Check the device for damage at unpacking. If device is damaged it must not be installed but it should be send to the manufacturer for repair.
- The device should not be opened.
- The device should be mounted on a 35 mm rail (acc to EN 50022).
- Attach ground wire before attaching power supply. Device must be grounded during operation!
- Single core or stranded wire 0,5 – 2,5 mm^2 must be used for power supply connection. If stranded wire is used, ferrules must be used to prevent fraying. Recommended stripping lenght is 5 mm.
- Protective earthing wire must be terminated with tinned copper ear terminal.



Picture 10: left. installation, right: deinstallation

6 COMMISSIONING & MAINTENACE

6.1 COMMISSIONING

Warning!
Hazardous voltage is present inside the device during operation. Disregarding of safety rules can result in severe personal injury or property damage.

Only qualified personnel may work with described device after being familiar with warnings and safety notices in this paper and other safety regulations.

Following instruction must be taken into consideration:

- Device must operate completely assembled! Device must be used as described. No modifications of the device should be made.
- Attach ground wire before attaching power supply. Device must be grounded during operation!
- Check if the power supply voltage complies with device operation voltage.
- Do not open device while it is energized! Hazardous voltage is present inside the device.

6.2 MAINTENANCE

The device is maintenance-free. Disconnect power supply before cleaning it. Use moist cloth. Do not use liquids.

7 TECHNICAL DATA

Power supply				
		CMU 100 / **2**...	CMU 100 / **8**...	CMU 100 / **4**...
Rated voltage	DC	110 - 250 V	48 - 60 V	24 V
	AC	230 V	48 V	/
Permissible voltage range	DC	88 - 350 V	38 - 72 V	18 - 36 V
	AC	70 - 264 V	30 - 50 V	/
Input current	DC	11 - 8 mA	24 - 22 mA	50 - 33 mA
	AC	14 mA	30 mA	/
Fuse (internal)	2 A T			
Power supply indicator	green LED marked PWR			
Voltage dips	20 ms			
Connector type	screw type „MSTB“ Phoenix 2pin			
Power Supply Wire	crossection		0,5 – 2,5 mm^2	
	type		single or stranded wire	
	voltage rating		500 V	
	colour		see valid standard	
Ground wire	crossection		Cu, 2,5 mm^2	
	colour		see valid standard	

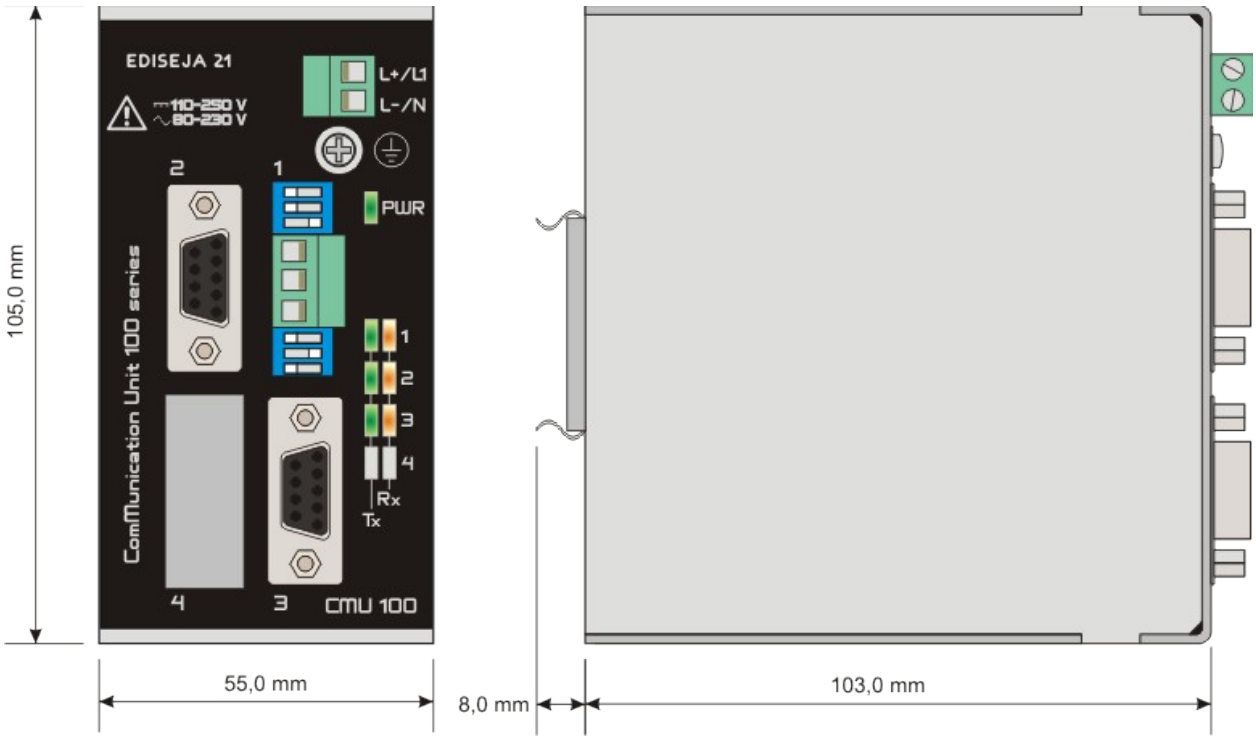
Communication port RS485 (interface type 5, M & L)		
Type	RS485	
Direction	half duplex	
Speed*	Interface type 5	19,2 - 115,2 kbit/s
	Interface type M	4,8 - 38,4 kbit/s
	Interface type L	300 - 2400 bit/s
Distance	up to 1200 m	
Isolation	1000 V DC	
Connector type	„MSTB“ Phoenix 3pin	
Termination	120 Ohm	
Max number of devices on RS485 bus	32	

Communication port RS232 (interface type 1)	
Type	RS232
Direction	full duplex
Speed*	up to 230 kbit/s
Distance	up to 15 m
Isolation	none; (GND earthed)
Connector type	DB9 female
Lines in	1 (Rx)
Lines out	1 (Tx)

* slowest interface defines device's maximum speed

Other data			
Weight	approx. 0,35 kg		
Dimensions (see picture)	(H)	(D)	(W)
	105 mm	111 mm + connectors	55 mm
Temperature range	0 °C to +55 °C		
Humidity operating	up to 95 % (noncondensing)		
Enclosure	Material	Al	
	IP	20	
Mount type	standard DIN 35 rail (acc. to DIN EN 50022)		
Class	I		
Overvoltage category	III		

8 DIMENSIONS



Picture 11: CMU 100 / x.5.1.1 - 17 dimensions

9 ORDERING

ORDERING NUMBER: **CMU 100 /** □ . □ . □ . □ . □ . □ . □ . □ . □ - □ . □

Mother Board + Enclosure + :

Power supply: DC 110 - 250 V or AC 230 V
2 ports converters (no echo possible, mark Function as 0) 1
2 to 8 ports converters, star couplers, ... (echo possible) 2

Power supply: DC 48 - 60 V or AC 48 V
2 ports converters (no echo possible, mark Function as 0) 7
2 to 8 ports converters, star couplers, ... (echo possible) 8

Power supply: DC 24 V
2 ports converters (no echo possible, mark Function as 0) 3
2 to 8 ports converters, star couplers, ... (echo possible) 4

(Device width: 2 ports - 40 mm, 3 ports - 55 mm, 4 - 8 ports - 85 mm)

Interfaces: (up to 8 ports; if more than 8 ports are needed see CMU 200 devices)

None ..... leave empty
RS232 noisolated, Rx & Tx support (up to 230 kbit/s, 15 m) 1
RS232 nonisolated, Rx & Tx support (custom made: LDU version with rectifiers) C
RS485 isolated, half duplex (19,2 kbit/s – 115,2 kbit/s, 1200 m) 5
RS485 isolated, half duplex (4,8 kbit/s - 38400 kbit/s, 1200 m) ..... M
RS485 isolated, half duplex (300 bit/s – 2400 bit/s, 1200 m) L
Versatile (650 nm) fiber optic for 1 mm plastic connector (up to 40 kbit/s, 110 m) ..... P
Multimode (820 nm) fiber optic with ST connector (up to 2,048 Mbit/s, 500 m) 6
Multimode (820 nm) fiber optic with SMA connector (up to 2,048 Mbit/s, 500 m) 7
Singlemode (1310 nm) fiber optic with SC connector (up to 2,048 Mbit/s, 20 km) ..... S
Singlemode (1310 nm) fiber optic with FC connector (up to 2,048 Mbit/s, 20 km) ..... T
Singlemode (1310 nm) fiber optic with ST connector (up to 2,048 Mbit/s, 20 km) ..... U
USB (one virtual com port) 8
Ethernet 10/100Base-TX port server with one virtual com port (100 m) 9
Ethernet 100Base-TX (to be used with F and G interface only) (100 m) ..... E
Ethernet 100Base-FX multimode (1300 nm, 2000 m) (to be used with E interface only) ..... F
Ethernet 100Base-FX singlemode (1310 nm, 20 km) (to be used with E interface only) ..... G

Function:

Converter 2 ports (when Mother Board marked as 1, 3 or 7 is used) 0
Converter 2 ports, 4 groups (4 independent channels) 7
Star coupler (1 master, 2 to 7 slaves) 12
Star coupler (1 master, 4 to 6 slaves, 1 listener) 14
Star coupler (2 masters, 2 to 6 slaves) 5
Star coupler (3 masters, 3 to 5 slaves) 9
Fallback switch (1 master, 2 to 7 slaves) 17
Node 8

Software Version:

Software version ..... leave empty

Additional accessories (order if needed):

- power supply cable with „schuko“ plug, 2 m
- RS232 cable to PC (state the lenght up to 15 m)
- fiber optic cables (state the lenght)

List of the most common devices:

2 ports converters

Port 1	Port 2	Detail	Type
RS232	RS485	*300-2400 bit/s, high voltage power supply*	**CMU 100 / 1.1.L - 0**
RS232	RS485	*4800-38400 bit/s, high voltage power supply*	**CMU 100 / 1.1.M - 0**
RS232	RS485	*19200-115200 bit/s, high voltage power supply*	**CMU 100 / 1.1.5 - 0**
RS232	FO SM	*SC connector, 20 km, high voltage power supply*	**CMU 100 / 1.1.S - 0**
RS232	FO SM	*FC connector, 20 km, high voltage power supply*	**CMU 100 / 1.1.T - 0**
RS232	FO SM	*ST connector, 20 km, high voltage power supply*	**CMU 100 / 1.1.U - 0**
RS232	FO VL	*versatile link plastic fiber optic, high voltage power supply*	**CMU 100 / 1.1.P - 0**
RS232	ETH	*10/100 Mbit/s, virtual com port, high voltage power supply*	**CMU 100 / 1.1.9 - 0**
RS485	FO MM	*ST connector, high voltage power supply*	**CMU 100 / 1.5.6 - 0**
RS485	FO SM	*SC connector, 20 km, high voltage power supply*	**CMU 100 / 1.5.S - 0**
RS485	FO SM	*FC connector, 20 km, high voltage power supply*	**CMU 100 / 1.5.T - 0**
RS485	FO SM	*ST connector, 20 km, high voltage power supply*	**CMU 100 / 1.5.U - 0**
RS485	FO VL	*Versatile link plastic fiber optic, high voltage power supply*	**CMU 100 / 1.1.P - 0**
RS485	ETH	*10/100 Mbit/s, virtual com port, high voltage power supply*	**CMU 100 / 1.5.9 - 0**
FO MM	RS232	*high voltage power supply*	**CMU 100 / 1.6.1 - 0**
FO MM	FO SM	*SC connector, 20 km, up to 2,048 Mbit/s, high voltage power supply*	**CMU 100 / 1.6.S - 0**
FO MM	FO SM	*FC connector, 20 km, up to 2,048 Mbit/s, high voltage power supply*	**CMU 100 / 1.6.T - 0**
FO MM	FO SM	*ST connector, 20 km, up to 2,048 Mbit/s, high voltage power supply*	**CMU 100 / 1.6.U - 0**
FO MM	ETH	*500 m, 820 nm, 10/100 Mbit/s, virtual com port, high voltage power supply*	**CMU 100 / 1.6.9 - 0**
ETH TX	ETH FX	*100 Mbit/s, 1300 nm, ST connector, 2000 m range, high voltage power supply*	**CMU 100 / 1.E.F - 0**
ETH TX	ETH FX	*100 Mbit/s, 1310 nm, ST connector, 20 km range, high voltage power supply*	**CMU 100 / 1.E.G - 0**

3 ports star couplers / converters / nodes

Master	Slave 1	Slave 2	Detail	Type
RS232	RS485	FO MM	*19200-115200 bit/s, high voltage power supply*	**CMU 100 / 2.1.5.6 - 12**
RS232	FO MM	FO SM	*high voltage power supply*	**CMU 100 / 2.1.6.S - 12**
FO MM	RS232	RS485	*19200-115200 bit/s, high voltage power supply*	**CMU 100 / 2.6.1.5 - 12**

ETH	**RS232**	**RS232**	*10/100 Mbit/s, virtual com port, high voltage power supply*	**CMU 100 / 2.9.1.1 - 12**
ETH	**RS232**	**RS485**	*10/100 Mbit/s, virtual com port, 19200-115200 bit/s, high voltage power supply*	**CMU 100 / 2.9.1.5 - 12**
ETH	**RS485**	**FO MM**	*10/100 Mbit/s, virtual com port, 19200-115200 bit/s, high voltage power supply*	**CMU 100 / 2.9.5.6 - 12**
FO SM	**RS232**	**RS232**	*20 km, high voltage power supply*	**CMU 100 / 2.1.1.S - 12**
FO SM	**RS232**	**RS485**	*20 km, 19200-115200 bit/s, high voltage power supply*	**CMU 100 / 2.1.5.S - 12**
FO SM	**FO MM**	**FO MM**	*20 km, up to 2,048 Mbit/s, high voltage power supply*	**CMU 100 / 2.6.6.S - 12**

Star couplers, high voltage power supply

Master(s)	Slaves	Detail	Type
RS232	**2 x RS232**	*RS232 to 2 x RS232*	**CMU 100 / 2.1.1.1 - 12**
	3 x RS232	*RS232 to 3 x RS232*	**CMU 100 / 2.1.1.1.1 - 12**
	4 x RS232	*RS232 to 4 x RS232*	**CMU 100 / 2.1.1.1.1.1 - 12**
	5 x RS232	*RS232 to 5 x RS232*	**CMU 100 / 2.1.1.1.1.1.1 - 12**
	6 x RS232	*RS232 to 6 x RS232*	**CMU 100 / 2.1.1.1.1.1.1.1 - 12**
	7 x RS232	*RS232 to 7 x RS232*	**CMU 100 / 2.1.1.1.1.1.1.1.1 - 12**
	2 x FO MM	*RS232 to 2 x multimode fiber optic*	**CMU 100 / 2.1.6.6 - 12**
	3 x FO MM	*RS232 to 3 x multimode fiber optic*	**CMU 100 / 2.1.6.6.6 - 12**
	4 x FO MM	*RS232 to 4 x multimode fiber optic*	**CMU 100 / 2.1.6.6.6.6 - 12**
	5 x FO MM	*RS232 to 5 x multimode fiber optic*	**CMU 100 / 2.1.6.6.6.6.6 - 12**
	6 x FO MM	*RS232 to 6 x multimode fiber optic*	**CMU 100 / 2.1.6.6.6.6.6.6 - 12**
	7 x FO MM	*RS232 to 7 x multimode fiber optic*	**CMU 100 / 2.1.6.6.6.6.6.6.6 - 12**
	2 x FO VL	*RS232 to 2 x versatile link fiber optic*	**CMU 100 / 2.1.P.P - 12**
	3 x FO VL	*RS232 to 3 x versatile link fiber optic*	**CMU 100 / 2.1.P.P.P - 12**
	4 x FO VL	*RS232 to 4 x versatile link fiber optic*	**CMU 100 / 2.1.P.P.P.P - 12**
	5 x FO VL	*RS232 to 5 x versatile link fiber optic*	**CMU 100 / 2.1.P.P.P.P.P - 12**
	6 x FO VL	*RS232 to 6 x versatile link fiber optic*	**CMU 100 / 2.1.P.P.P.P.P.P - 12**
	7 x FO VL	*RS232 to 7 x versatile link fiber optic*	**CMU 100 / 2.1.P.P.P.P.P.P.P - 12**
RS485	**2 x RS232**	*RS485 to 2 x RS232*	**CMU 100 / 2.5.1.1 - 12**
	3 x RS232	*RS485 to 3 x RS232*	**CMU 100 / 2.5.1.1.1 - 12**
	4 x RS232	*RS485 to 4 x RS232*	**CMU 100 / 2.5.1.1.1.1 - 12**
	5 x RS232	*RS485 to 5 x RS232*	**CMU 100 / 2.5.1.1.1.1.1 - 12**
	6 x RS232	*RS485 to 6 x RS232*	**CMU 100 / 2.5.1.1.1.1.1.1 - 12**
	7 x RS232	*RS485 to 7 x RS232*	**CMU 100 / 2.5.1.1.1.1.1.1.1 - 12**
	2 x FO MM	*RS485 to 2 x multimode fiber optic*	**CMU 100 / 2.5.6.6 - 12**
	3 x FO MM	*RS485 to 3 x multimode fiber optic*	**CMU 100 / 2.5.6.6.6 - 12**

	4 x FO MM	*RS485 to 4 x multimode fiber optic*	**CMU 100 / 2.5.6.6.6.6 - 12**
	5 x FO MM	*RS485 to 5 x multimode fiber optic*	**CMU 100 / 2.5.6.6.6.6.6 - 12**
	6 x FO MM	*RS485 to 6 x multimode fiber optic*	**CMU 100 / 2.5.6.6.6.6.6.6 - 12**
	7 x FO MM	*RS485 to 7 x multimode fiber optic*	**CMU 100 / 2.5.6.6.6.6.6.6.6 - 12**
FO MM	2 x RS232	*Multimode fiber optic to 2 x RS232*	**CMU 100 / 2.6.1.1 - 12**
	3 x RS232	*Multimode fiber optic to 3 x RS232*	**CMU 100 / 2.6.1.1.1 - 12**
	4 x RS232	*Multimode fiber optic to 4 x RS232*	**CMU 100 / 2.6.1.1.1.1 - 12**
	5 x RS232	*Multimode fiber optic to 5 x RS232*	**CMU 100 / 2.6.1.1.1.1.1 - 12**
	6 x RS232	*Multimode fiber optic to 6 x RS232*	**CMU 100 / 2.6.1.1.1.1.1.1 - 12**
	7 x RS232	*Multimode fiber optic to 7 x RS232*	**CMU 100 / 2.6.1.1.1.1.1.1.1 - 12**
	2 x FO MM	*Multimode fiber optic to 2 x multimode FO*	**CMU 100 / 2.6.6.6 - 12**
	3 x FO MM	*Multimode fiber optic to 3 x multimode FO*	**CMU 100 / 2.6.6.6.6 - 12**
	4 x FO MM	*Multimode fiber optic to 4 x multimode FO*	**CMU 100 / 2.6.6.6.6.6 - 12**
	5 x FO MM	*Multimode fiber optic to 5 x multimode FO*	**CMU 100 / 2.6.6.6.6.6.6 - 12**
	6 x FO MM	*Multimode fiber optic to 6 x multimode FO*	**CMU 100 / 2.6.6.6.6.6.6.6 - 12**
	7 x FO MM	*Multimode fiber optic to 7 x multimode FO*	**CMU 100 / 2.6.6.6.6.6.6.6.6 - 12**
Master(s)	**Slaves**	**Detail**	**Type**
RS232, RS485	6 x FO MM	*8 channel star coupler RS232 & RS485 to 6 x multimode fiber optic, high voltage power supply*	**CMU 100 / 2.1.5.6.6.6.6.6.6 - 5**
RS232, FO MM	6 x FO MM	*8 channel star coupler RS232 & multimode fiber optic to 6 x multimode fiber optic, high voltage power supply*	**CMU 100 / 2.1.6.6.6.6.6.6.6 - 5**
4 xFO MM	4x RS232	*4 channel converter multimode fiber optic to RS232, high voltage power supply*	**CMU 100 / 2.6.6.6.6.1.1.1.1 - 7**

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