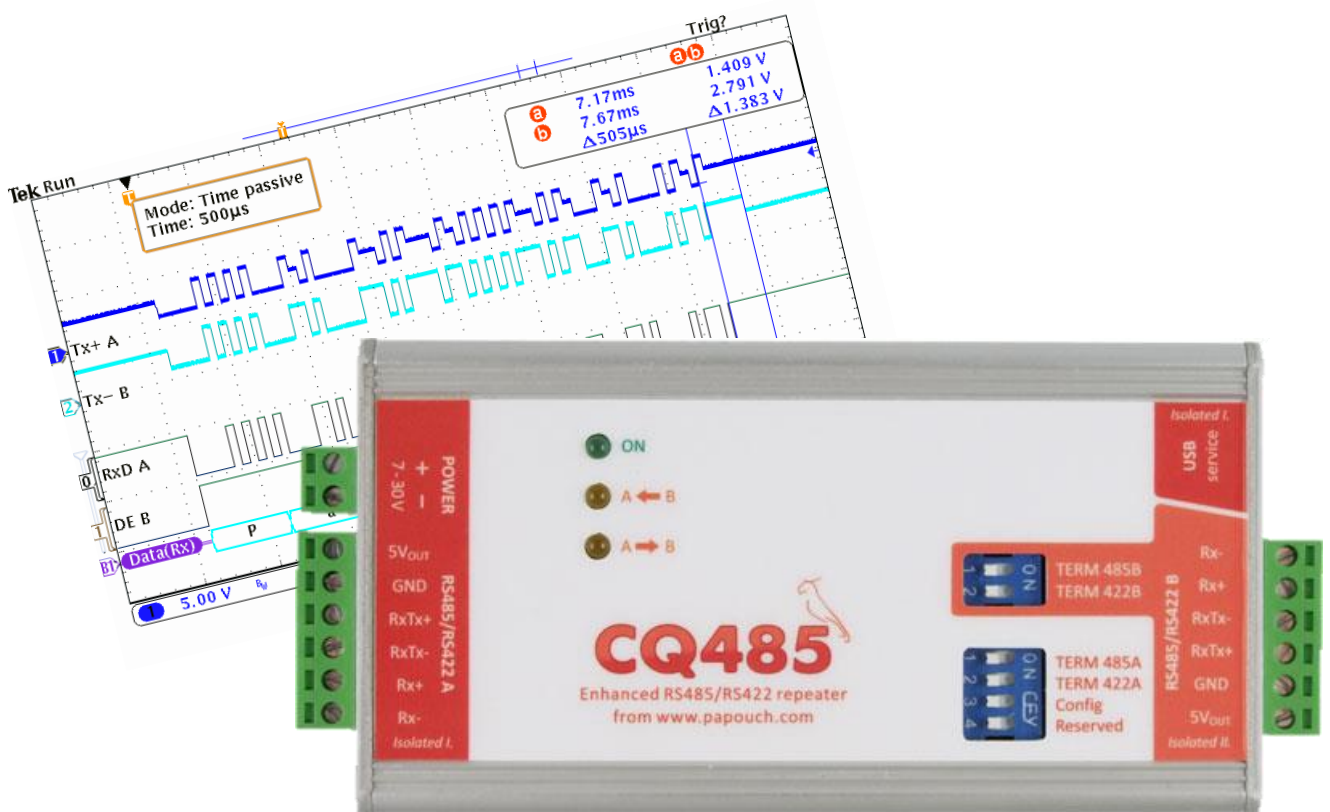




CQ485

RS485 and RS422 converter, repeater, isolator

Active and passive data recovery



CQ485

Datasheet

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Papouch s.r.o.

Address:

**Strasnicka 3164
102 00 Prague 10
Czech Republic**

Phone:

+420 267 314 267

Web:

en.papouch.com

Mail:

info@papouch.com



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DESCRIPTION

CQ485 is an RS485 and RS422 repeater, converter and isolator in one device. Both sides are galvanically isolated. Device parameters are software configurable from PC via USB.

CQ485 module can work in these three data transfer modes: *Passive mode*, *Passive mode with timing* and *Active mode*.

Tip: Do you need an advice to choose the right mode? We are happy to help you out!

Data transfer modes

Passive data transmission

Data are shaped by TTL circuits; converter does not introduce any delay to the signal.

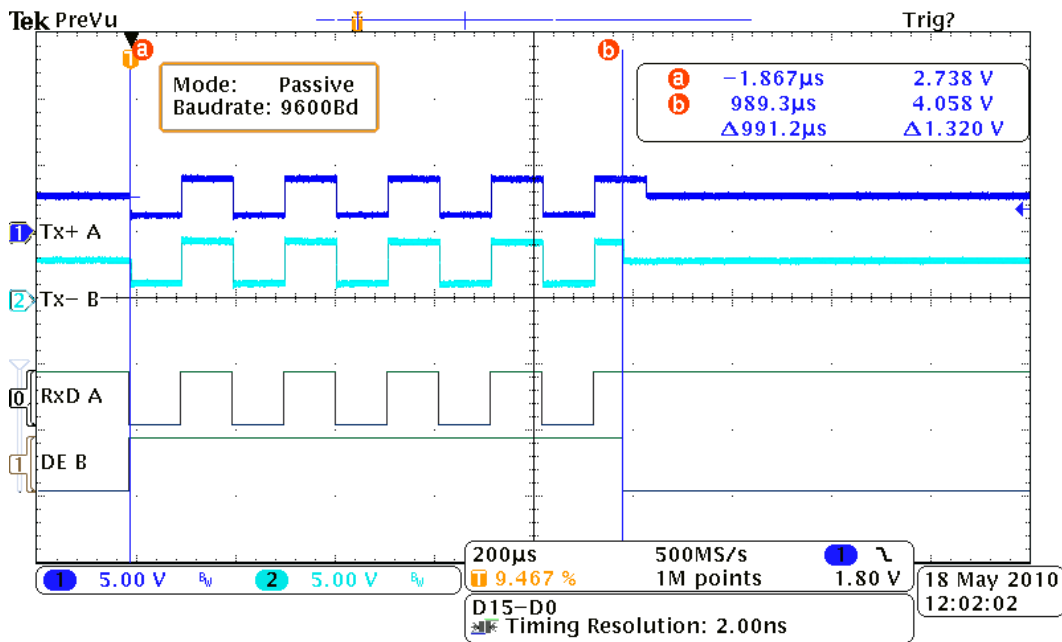


fig. 1 - Passive data transmission

Passive mode with timing

This mode works very similar to the passive mode. The addition is in setting delay after receiving stop bit. Following example shows converter with 400µs delay.

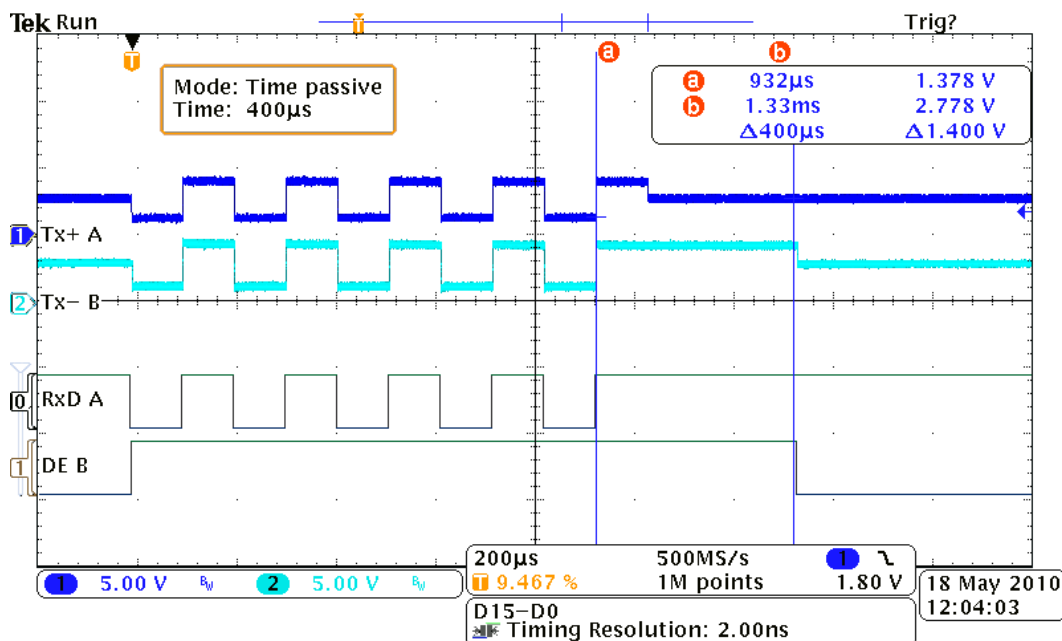


fig. 2 - Passive mode with timing

This mode is suitable for special communication lines as CC-Link from Mitsubishi, or in special types of MODBUS RTU where there is need to separate individual packets. CQ485 inserts a delay of set-up length behind last stop bit. During this time CQ485 holds the line for itself. In the following picture shows 500µs delay at the end of the packet.

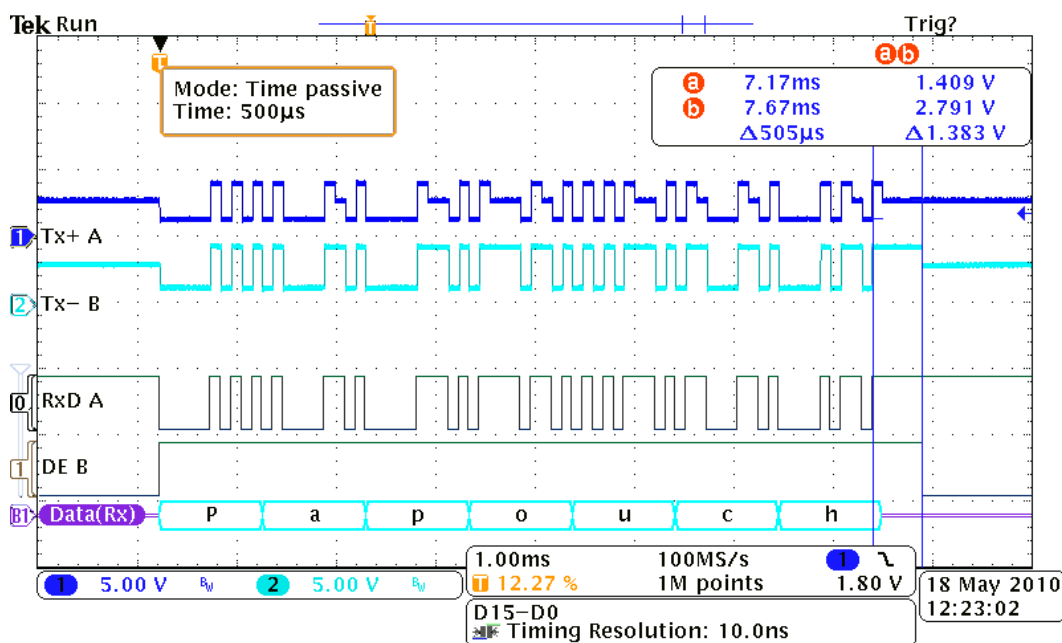


fig. 3 - Pasivní režim přenosu s časováním - prodleva na konci

Active mode

Data are received and transmitted by a processor where those are completely reconstructed. The delay coming from that process is one byte.

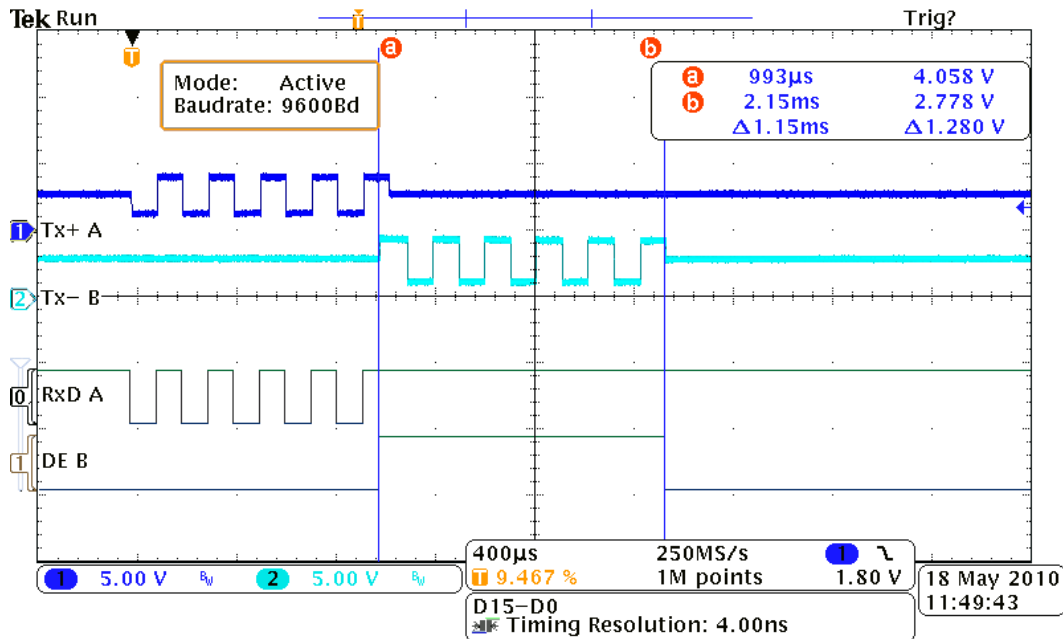


fig. 4 - Active mode

Features

- Complete galvanic isolation (including the GND) of both lines from each other and from power circuits.
- Second galvanic isolation of both lines from power GND (optional)
- The RS485/422 line (including the grounding) is completely isolated from RS232 and from the power supply (this isolation is provided as standard for all types)
- Optionally, second galvanic isolation of both lines from the power supply ground.
- Transmission speed up to 921,6 kBd
- Enhanced overvoltage protection for both lines.
- Automatic direction control with no delay.
- Wide supply voltage range - standard 7 to 30 V DC (5 to 75 V DC variants available)
- Easy setting using supplied software (or via terminal) over a USB.
- Easy installation.
- Adjustable termination including resistors defining the idle state of the line.
- All signals connected via a slip-on terminal.

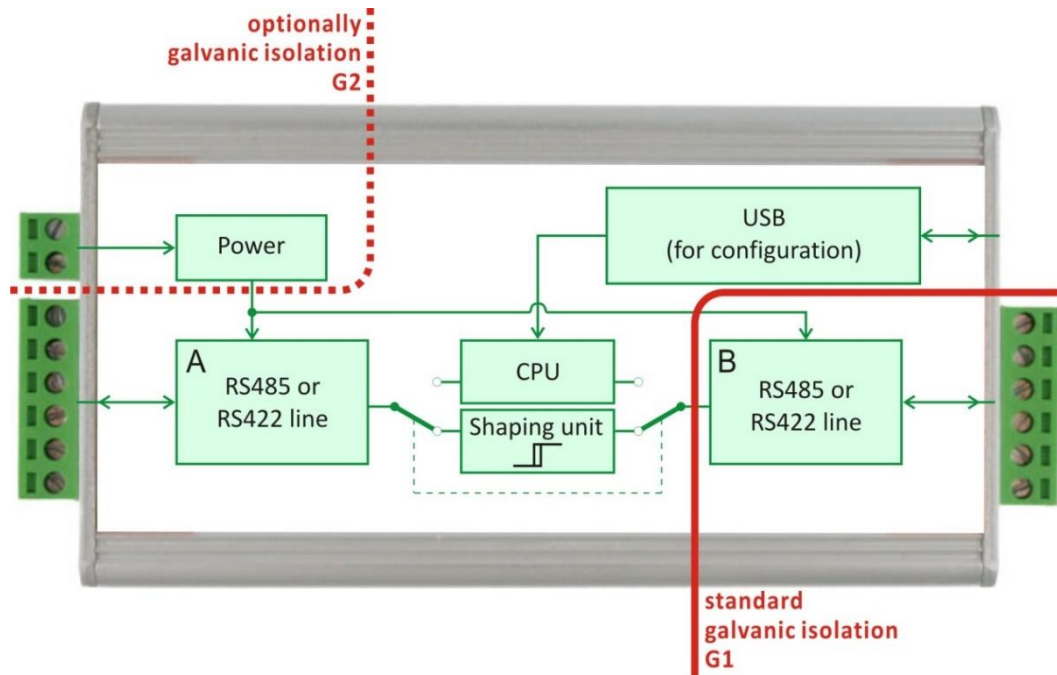
Galvanic isolation

Fig. 1 – Galvanic isolation

Block schematics of the galvanic isolation. Isolation G1 (full line) is in CQ485 unit as a standard. Optionally it is possible to add G2 isolation (dotted line).

Note: USB is always galvanic connected with the RS4xx line A.

CONNECTIONS

(Each connector's label is also displayed when pointing the cursor on the given connector in Configuration software window. – see Fig. 8)

Power:

Power source is connected via a slip-on terminal on the side of CQ485. (Fig. 5 – also see the polarity marks). Input is protected from polarity reversal.

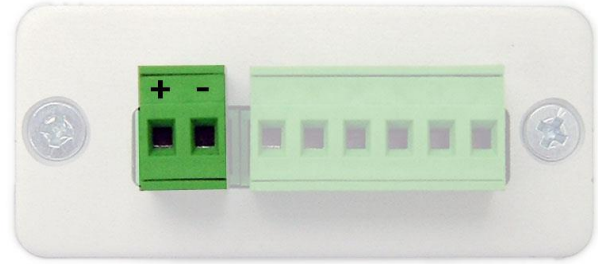


Fig. 5 – Power supply connector

Lines RS485/422:

Both connectors for RS485/422 lines are wired identically. See connectors on Fig. 6. Pin number one is marked with the number 1. Each pin is described in tab.1.

pin	description
1	U _{OUT} (5V/15mA)
2	GND
3	Tx+/RxTx+ (A)
4	Tx-/RxTx- (B)
5	Rx+
6	Rx-

tab.1 – Connectors RS485/422

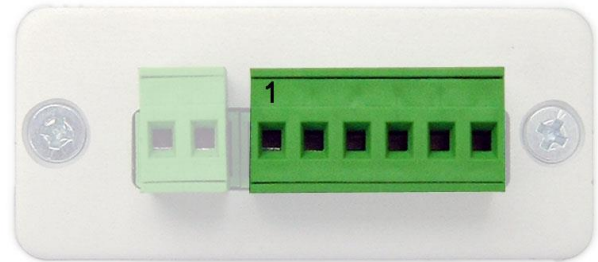


Fig. 6 – connector RS485/422 A

USB Configuration:

The configuration interface is accessible via a USB connector on the side of the device.

(To configure just connect the USB interface only – the device is powered from USB during the configuration.)

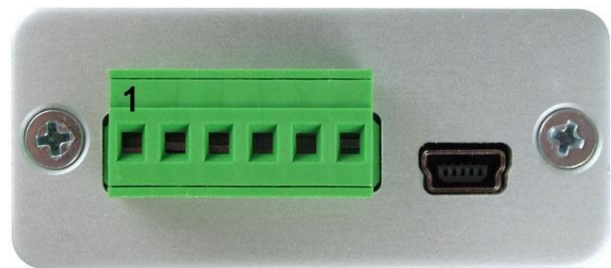


Fig. 7 – connector RS485/422 B and USB

SETTINGS

Most of the parameters (besides termination and idle-state-defining resistors) are adjustable via USB on the side of CQ485 module.¹

To do that, you can use added software (Fig. 8) or any terminal program (for example Hyperterminal, which is contained in OS Windows).

Configuration software

You can see the window of the CQ485 configuration software, which is contained in the delivery.

Terminal

Here you can see complete printout of the settings and help that you can get from CQ485 using terminal program.

Commands for communication via terminal:

- C – Current configuration printout. (In the upper part of the picture – until the line “Mode setting”)
- ? – help and configuration printout. (from the line “mode setting”)

Communication parameters

How do I change communication parameters?

1. Disconnect the RS485/422 **A** line. (Recommended for prevention of grounding loops.)
2. Turn ON the “Config” switch on the module.
3. Connect CQ485 to PC via mini USB cable (included). The ON light will turn on and then the drivers will be installed automatically.²
4. (No power is required to configure CQ485 – the unit is powered via USB.)

¹ Installation goes fully automatic through Windows Update web on Windows 7. Should you ever need the driver, it can be downloaded from www.papouch.com.

² RTS signal of the virtual COM port will also be set.

- Run a service program on your PC. Choose a COM port which CQ485 is connected to and press the “Connect” button.

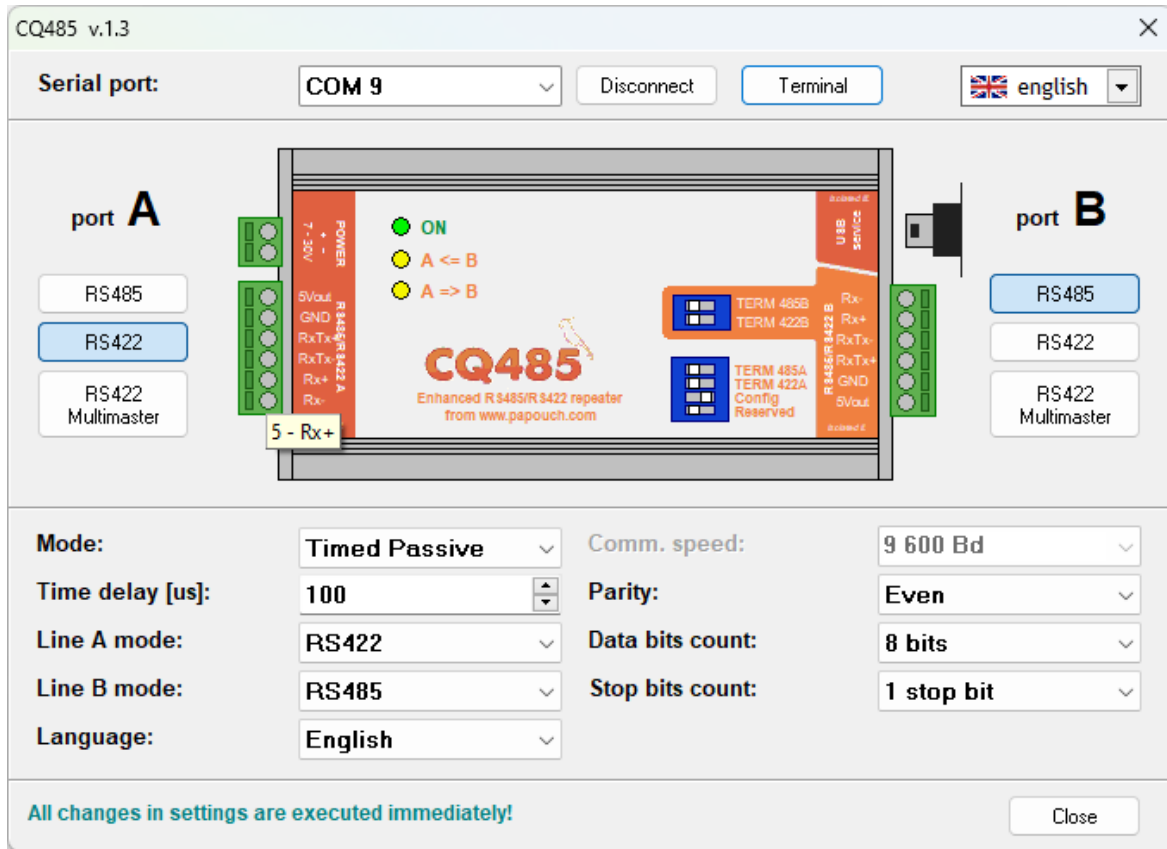


Fig. 8 – Configuration software

- Change the desired settings.
- Turn OFF the “Config” switch on the module.
- Disconnect the service cable from the „RS232 service“ terminal.

“Config” switch can be turned ON even when the device is operating, however data loss can occur.

Line A mode

Defines the type of communication line of the port A on CQ485. Following modes are available: RS485, RS422, RS422 Multimaster.³

Configuration via software:

Mode of the line can be adjusted by pressing the given button under the label „port A“ in the left part of the window or by choosing from the list next to the label „line A mode:“. (See Fig. 8.)

Configuration via terminal:

Send following code from the terminal:

Syntax:L<port><mode>↵

<port>Letter of the communication port. Options: A, B.

<mode>.....Mode of the port. Options: 0 (RS485), 1 (RS422), 2 (RS422 Multimaster)

³ Each port can be configured as a different type of line. CQ485 works as a line converter. See the description of all line types on the page 18 in chapter RS485 and RS422.

Example: ..LB0 – sets the line B to RS485

Line B mode

Defines the type of communication line of the port B on CQ485. Following modes are available: RS485, RS422, RS422 Multimaster.⁴

Configuration via software:

Mode of the line can be adjusted by pressing the given button under the label „port B“ in the left part of the window or by choosing from the list next to the label „line B mode:“. (See Fig. 8.)

Configuration via terminal:

Send following code from the terminal:

Syntax:L<port><mode>↵

<port>Letter of the communication port. Options: A, B.

<mode>Mode of the port. Options: 0 (RS485), 1 (RS422), 2 (RS422 Multimaster)

Example: ..LB0 – sets the line B to RS485

Transfer mode

Sets up the transfer mode: either the data are received, reconstructed and transmitted by processor (active mode), or they are only shaped by TTL circuits (passive mode), or they are shaped by TTL circuits and a delay is added behind the last stop bit (passive mode with timing).

Configuration via software:

Line mode can be adjusted by choosing from the list next to the label “Mode”. (See Fig. 8.)

Configuration via terminal:

Send following code from the terminal:

Syntax:M<mode>↵

<mode>Transfer mode. Options: A (Active), P (Passive), T (Time Passive)

Example: ..MA – sets the active mode

Setting up the delay

Sets up the delay after the last stop bit in passive mode with timing.

Setup via terminal:

Send this code from terminal:

Syntax:T<dt>↵

<dt>Length of the delay in microseconds, ranging from 10 to 400 000

Example: ..T800 – sets the delay to 800 μs

⁴ Each port can be configured as a different type of line. CQ485 works as a line converter. See the description of all line types on the page 18 in chapter RS485 and RS422.

Communication speed

Communication speed of both ports can be adjusted using this option. Speed can range from 30 Bd to 115,2 kBd. All standard speeds are supported including a variety of non-standard speeds.

Configuration via software:

Select the desired speed from the list next to the label "Comm. Speed". (see Fig. 8.) Speed can be also typed: Type your speed and press Enter. If the speed is supported, it will appear in the field as new speed. Else the original speed will remain.

Configuration via terminal:

Send following code from the terminal:

Syntax:.....B
↵

Communication speed. Options: Any supported speed as number in Bd

Example:..B115200 – sets communication speed to 115 200 Bd

Note: Any integer number can be entered. If the speed is supported, CQ485 answers „Ok“. If the speed is invalid, CQ485 answers error message.

Parity

This setting changes the mode of parity check for both ports. Available options are: even, odd, none.

Configuration via software:

Choose the parity mode next to the label "Parity". (See Fig. 8.)

Configuration via terminal:

Send following code from the terminal:

Syntax:.....P<par>↵

<par>Parity. Options: N (None), E (EVEN), O (Odd)

Example:..PE – sets even parity

Data bits count

Data bits can be also adjusted for both lines. This option is only active when passive mode is used. Options: 1 through 9.

Configuration via software:

Desired Data bits count can be selected from the list next to the label "Data Bits". (See Fig. 8.)

Configuration via terminal:

Send following code from the terminal:

Syntax:.....N<bits>↵

<bits>Data bits count. Options: 1 through 9.

Example:..N7 – sets seven data bits.

Stop bits count

Sets stop bits for both lines. Options: 1, 2.

Configuration via software:

Choose desired stop bits count from the list next to the label "Stop bits count". (See Fig. 8.)

Configuration via terminal:

Send following code from the terminal:

Syntax:.....S<sbits>↵

<sbits>stop bits count. Options: 1,2.

Example:..S1 – sets 1 stop bit

Other parameters

Language

This parameter switches between languages. Options: Czech, English.

Configuration via software:

Choose your language from the list next to the label “Language”. (See Fig. 8.)

Configuration via terminal::

Send following code from the terminal:

Syntax:.....G<lang>↵

<lang>.....Language code. Options: E (English), C (Czech).

Example:..GC – sets Czech language

Line termination and idle mode definition

Impedance termination

It prevents signal from reflecting at the line ends. These resistors should be connected at both ends of the communication line.

These are connected via switches on the top side of CQ485 module. There are „IMP 485A“ and „IMP 422A“ for communications port A (right side of the module). Choose the switch according to the currently configured line. Switches „IMP 485B“ and „IMP 422B“ are to be used in the same fashion for the line B.



Fig. 9 – switches

Idle mode definition

When communicating on the RS485 line or the RS422 multimaster line, there may be a no transmission status (all lines are in the receiving mode). In this case, the status of the line is undefined and it is extremely sensitive to any induced voltage (interference), which appears to be

an incoming signal. Therefore, an idle mode should be defined by connecting suitable resistors to a line. If the line is long, the best point is at the CQ485 end-of-line modules or equipment.

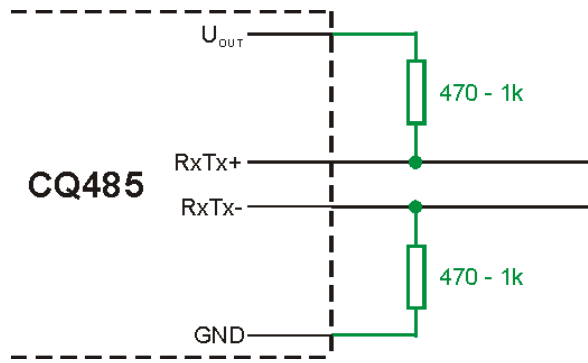


fig. 10 - external resistors

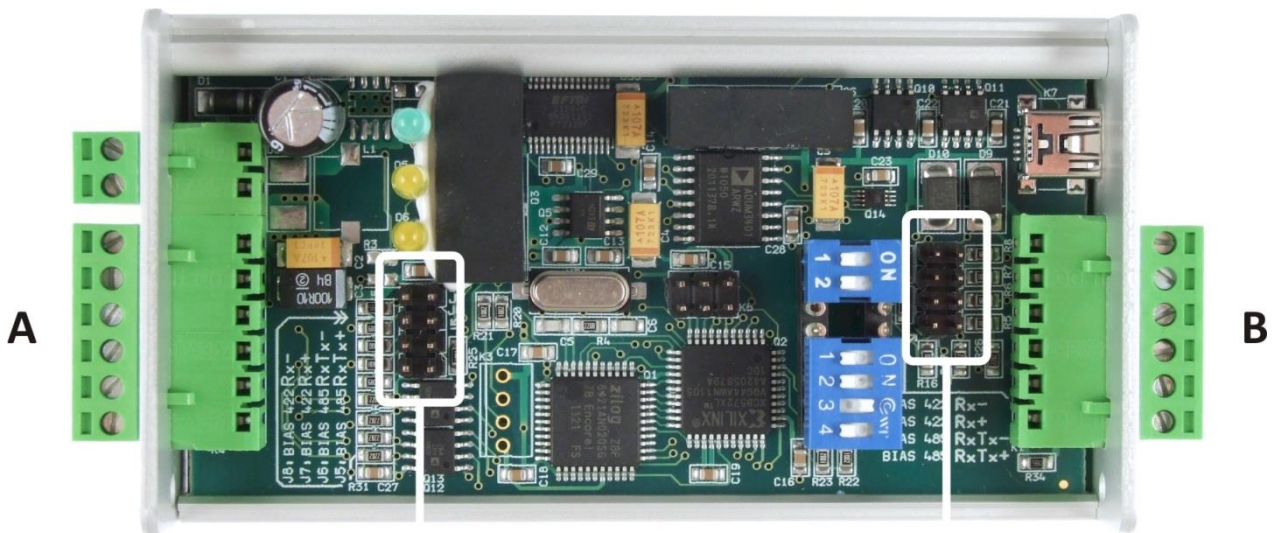
With the CQ485 converter, built-in resistors can be used or the resistors may be connected directly to the RS485 connector (see fig. 10). For long lines, the resistor values should be higher and the termination should be connected simultaneously. SGND can also be used for connection of the cable shielding contact.

Connecting resistors:

First open the housing of the module by unscrewing two screws holding the top of the module. Loosen the other two screws on the bottom of the module and uncover the device (see fig. 11).



fig. 11 – Position of the screws holding the top of the box



Idle resistors
line A



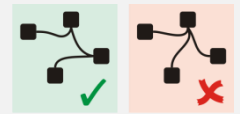
Idle resistors
line B

Fig. 12 – idle resistors jumpers

RS485 AND RS422 LINES

Some basic recommendation about connecting RS485 line:

- Standard TP cable is recommended to run RS485 line (or any PC network cable – UTP, STP, FTP) and use any twisted **PAIR** as RS485 line.
- All devices on one line are to be connected from one to another, **NOT** in a star topology (see the connection diagram right). Maximum length of the line is 1200m (0.74 mile).
- Termination has to be connected on all ends of the line (IMP jumper).
- If the cable is shielded, only connect the **shielding on one side** of the line.



An RS485 line consists of a pair of wires, denoted by symbols RxTx+ and RxTx- , preferably by a twisted pair. In the idle mode, the RxTx+ wire's potential is more positive than that of RxTx- . The topology is a stem line with short branches. Impedance termination devices should be connected at both ends of the stem line. The RS485 line is a half-duplex bus: data is sent and received on the same wires. Therefore the communication direction must be switched between transmission and receipt.

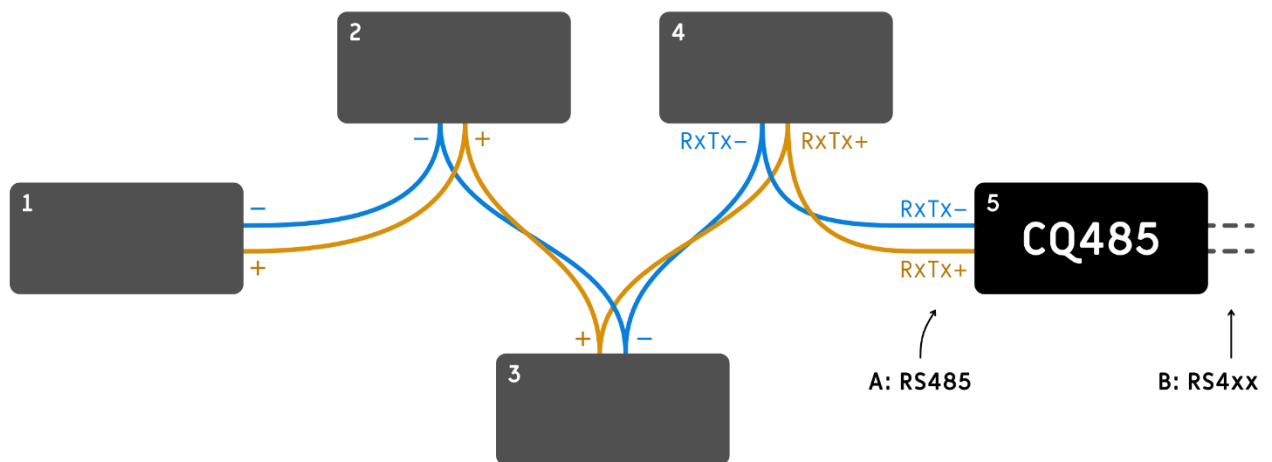


fig. 13 - Example of system wired with RS485 line. End modules 1 and 5 should have a termination connected.

The DTR signal of the RS232 line can be used for the direction control, or automatic (time) control can be used.

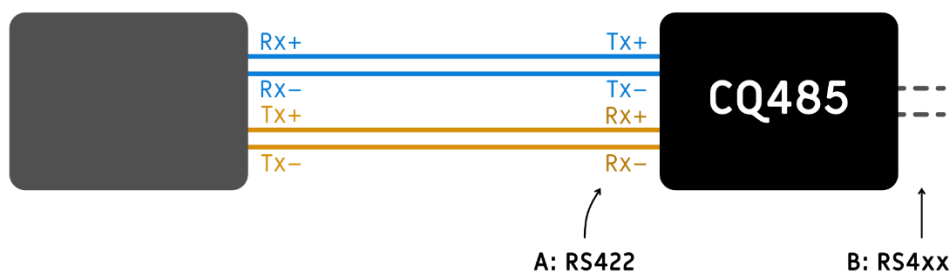


fig. 14 - Example of system wired with RS422 line. Both modules are terminating, so they should have a termination connected.

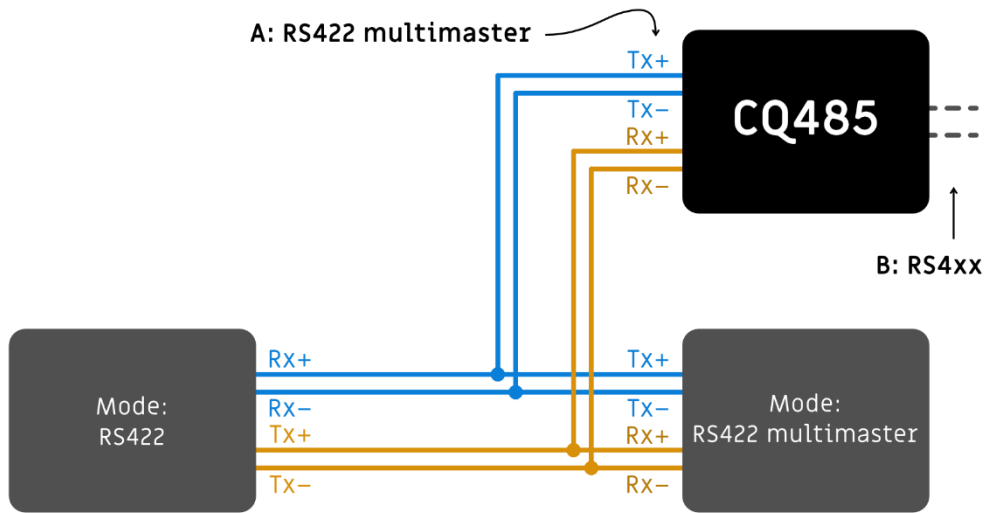


fig. 15 - Example of a system connected via RS422 in multimaster mode

An RS422 line consists of two symmetric pairs of conductors. It is duplex line and directly substitutes the RxD and TxD signals of the RS232 lines; one pair is used for data receipt, the other pair for transmission. The transmission conductors are denoted by symbols Tx+ and Tx-; the receipt pair are denoted Rx+ and Rx-. In the idle mode, the + wire's potential is more positive than the - wire. Impedance terminations are connected to the line endpoints. An RS422 line can have branches; in this case, transmitters must be disconnected – Multimaster mode.

INDICATORS

There are three indicators on the CQ485 module.

ON (green)indicates the power input

A ← B (yellow)transmission on line A (next to the PSU terminal)

A → B (yellow)transmission on line B (next to the RS232 line)



Fig. 16 - indicators

TECHNICAL PARAMETERS

General

Environment

Power supply voltage	standard 7 to 30 V DC (see variants on next page)
Power consumption	typ. 60 mA at 12 V DC
Operation temperatures.....	-20 °C through +70 °C (-4F through 158F)
Operating humidity	0 to 90% RH, non-condensing
Dimensions.....	121 × 56 × 24 mm (4.76 x 0.86 x 0.74 in)
Weight	150 g (0.33 lb)
Make.....	metallic box (anodized aluminum)
IP coverage	IP 40

RS485/422:

Maximal communication speed in active mode	115.2 kBd
Maximal communication speed in passive mode.....	921.6 kBd
Minimal communication speed	30 Bd
Line termination resistors value	120 Ω (optional – see page 13)
Resistors defining the idle state.....	680 Ω (optional – see page 13)
Maximum of connected devices	31
Voltage overprotection.....	yes, 12 V bipolar transile diodes
Power supply connector	slip-on terminal

USB configuration interface:

Connector type	Mini USB (cable in delivery)
Interface.....	USB 1.1 (USB 2.0 a 3.0 compatible)

Virtual port settings:

Communication speed.....	115 200 Bd
Data bits	8
Parity	none
Stop bits.....	1
Flow control	none

Available Designs

Assembly:

- Without a holder (*standard design*)
- With a DIN rail holder



Fig. 17 – module with DIN rail holder

- With a wall holder

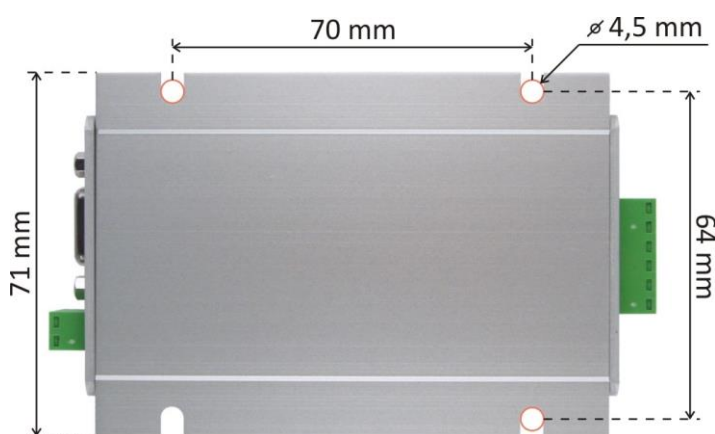


Fig. 18 – module with wall holder

Power:

- 7 to 30 V ⁵ (*standard design*)
- 5 V $\pm 10\%$ ^{1,6}
- 4,5 to 9,0 V ^{2,7}
- 9 to 18 V ^{2,3}
- 18 to 36 V ^{2,3}
- 36 to 75 V ^{2,3}

Do not hesitate to contact us in case of any other special requirements concerning the CQ485 module's design and functions.

⁵ Complete galvanic isolation (grounding included) of line B from power circuitry (isolation G1 on Fig. 1). Grounding of the line A is galvanic connected with grounding of the power circuitry.

⁶ Lead time for this workmanship is from seven days to three weeks.

⁷ Grounding of the line A is galvanic isolated from grounding of the power circuitry (isolation G2 on Fig. 1).

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Industrial data transmission, line and protocol converters, RS232, RS485, RS422, USB, Bluetooth, Ethernet, LTE, WiFi, measurement modules, smart temperature sensors, I/O modules, custom development and manufacturing.

Address:

**Strasnicka 3164
102 00 Prague 10
Czech Republic**

Phone:

+420 267 314 267

Web:

en.papouch.com

Mail:

info@papouch.com

