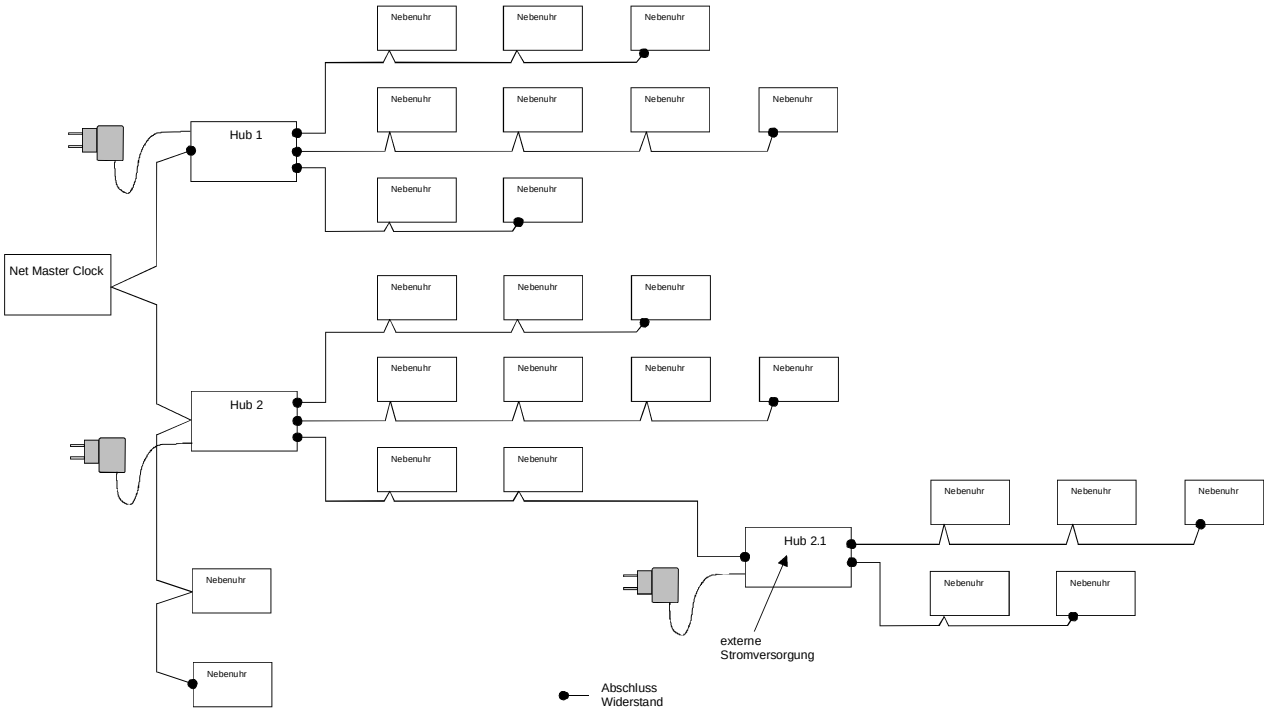
RS 485 Wiring Instructions



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1 RS 485 Network

Two-wire RS 485 networks operate in half-duplex mode on one twisted pair. Data may only travel in one direction at a time. All device on the network can be transmitters or receivers, but only one may transmit at any given time. The network must have a master device, the Master Clock. The master distributes the time information and polls the slave clocks and the slave clock then responds. Slave clocks are normally receivers while the master normally transmits. All slave clocks on the network receive any transmitted data. The clock for which the data is intended responds if necessary.

2 Cable and Hub selection

A low capacitance, shielded twisted pair cable is recommended for installations. One twisted pair is used for the signals, a second pair for the signal ground or it is used to supply a Hub.

2.1 Cable specifications

Parameter	Value
Cable type	Twisted-pair conductors within a cable shield and jacket
Conductor type	Stranded cores within insulation
Conductor gauge	24 AWG (0.22 mm2)
Characteristic impedance (Z0)	120 Ω
Ohmic resistance	96 Ω / km
Certification	UL-listed or Recognized Wire

2.2 Cable sources

Manufacturer	Part number	
Belden	9842	www.belden.com
Belden	8102	www.belden.com
Alpha	5472C	www.alphawire.com

2.3 Hub specification

Parameter	Value
Type	Hub / Repeater isolated
Input	RS485
Outputs	RS485, each channel has its own driver and can drive 1200m
Baud rate	19200
Power requirements	+10VDC ~ +30VDC 50mA
Operating temperature	-25° – +75°C

2.4 Hub sources

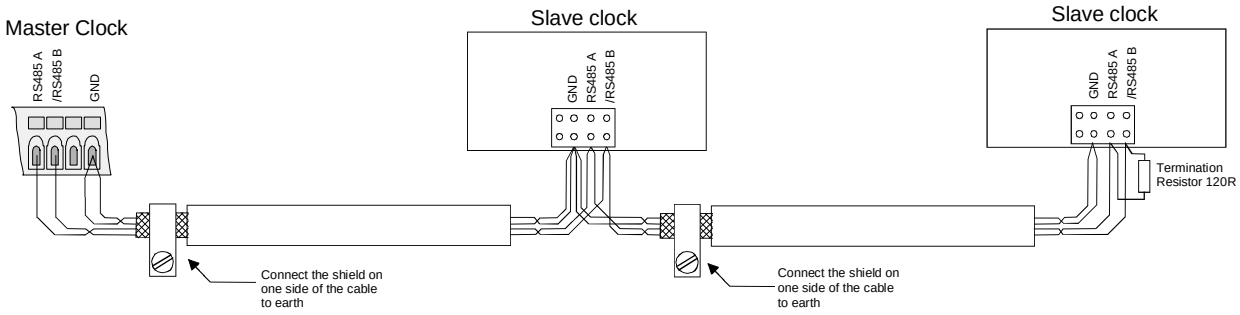
Manufacturer	Part number	
ICP DAS ICPDAS Europe GmbH	I-7513	www.icpdas.com www.icpdas-europe.com

Distributor	Part number	
Spectra Computersysteme GmbH	I-7513	www.spectra.de www.spectra.ch
Inovis Live Automation	I-7513	www.inovis.ch www.inovis-group.de www.inovis-group.at

3 Connection Method

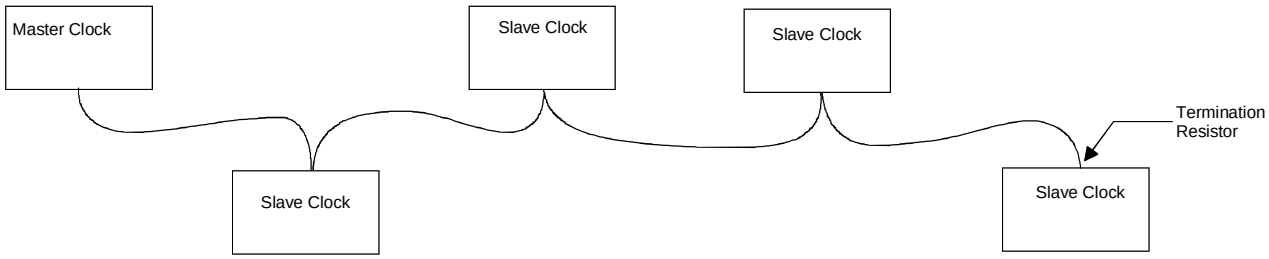
3.1 Network wiring

The finished network should have all RS485A connections linked to the RS485A-line and all /RS485B connections linked to the /RS485B–line via one twisted pair of the cable. Use the second pair for the GND connection. The shield should be connected with the protective earth at one side of the cable.

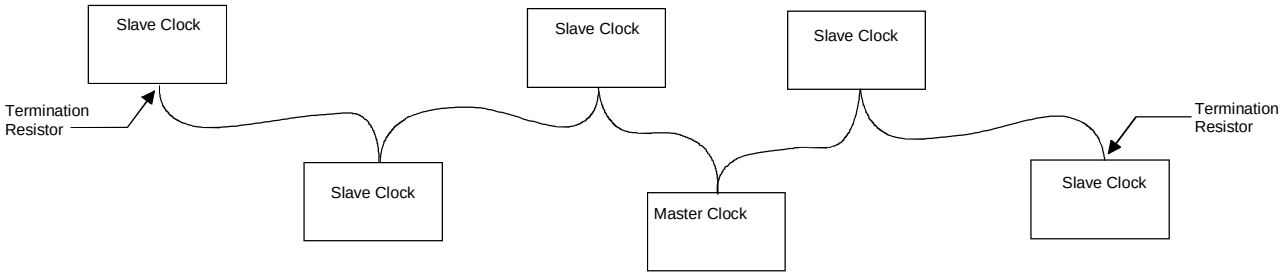


3.2 Network topology

The RS 485 cable must be connected in a daisy chain configuration. The line connects from one receiver to the next according the following diagram:

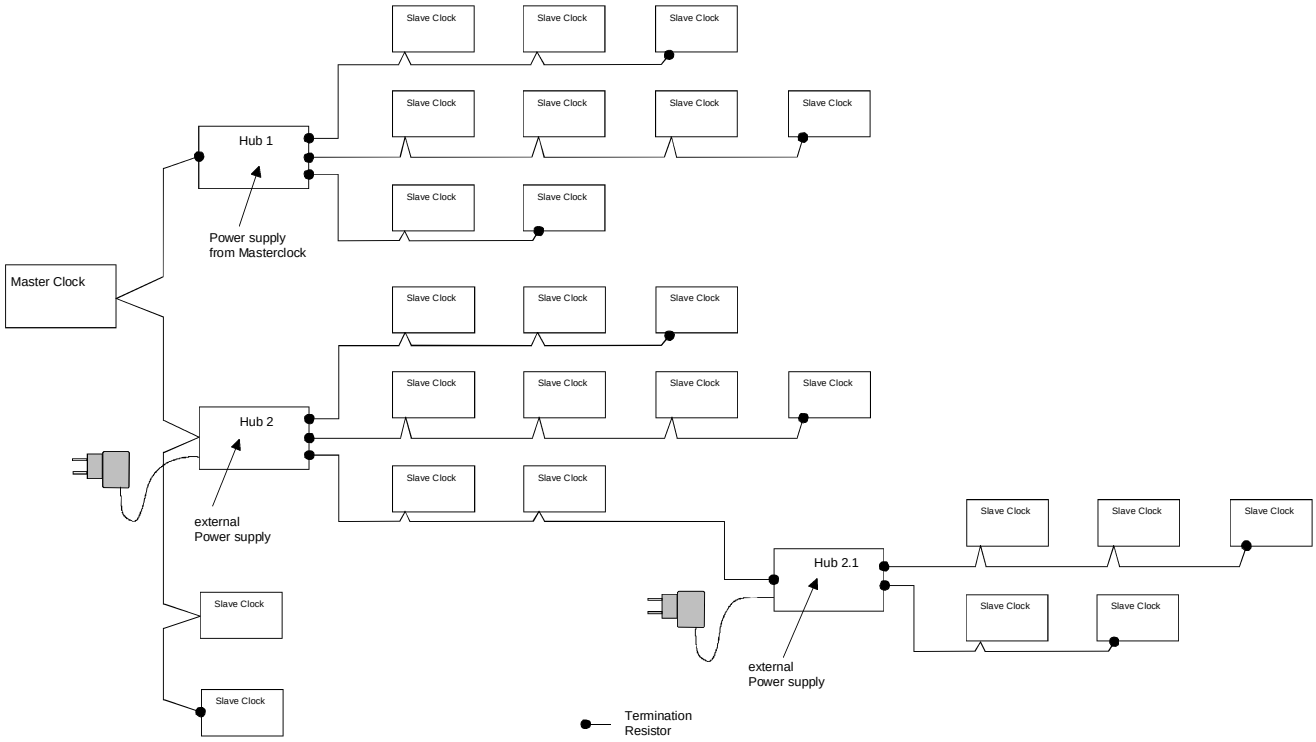


The RS 485 time source can be placed between two receivers (bus splitting). Avoid star or tree configuration.



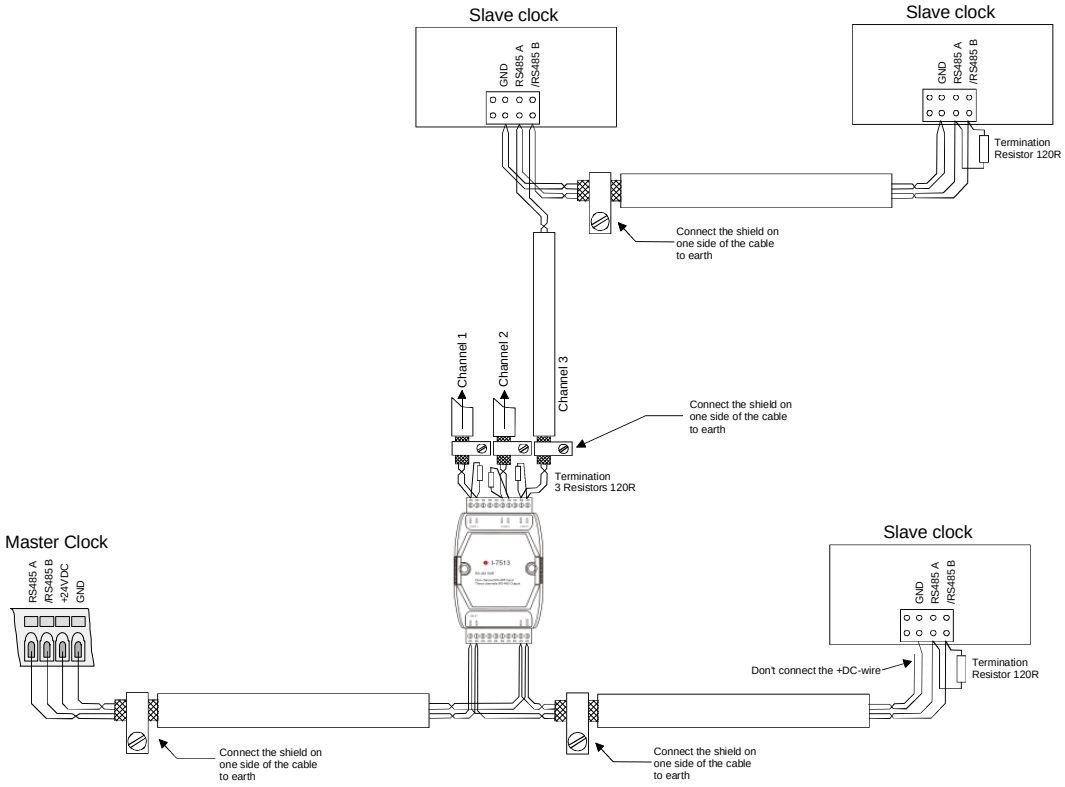
3.3 Network with Hubs

Complex Networks can be divided in segments by using RS-485 Hubs. Every segment must also wired in daisy chain configuration.



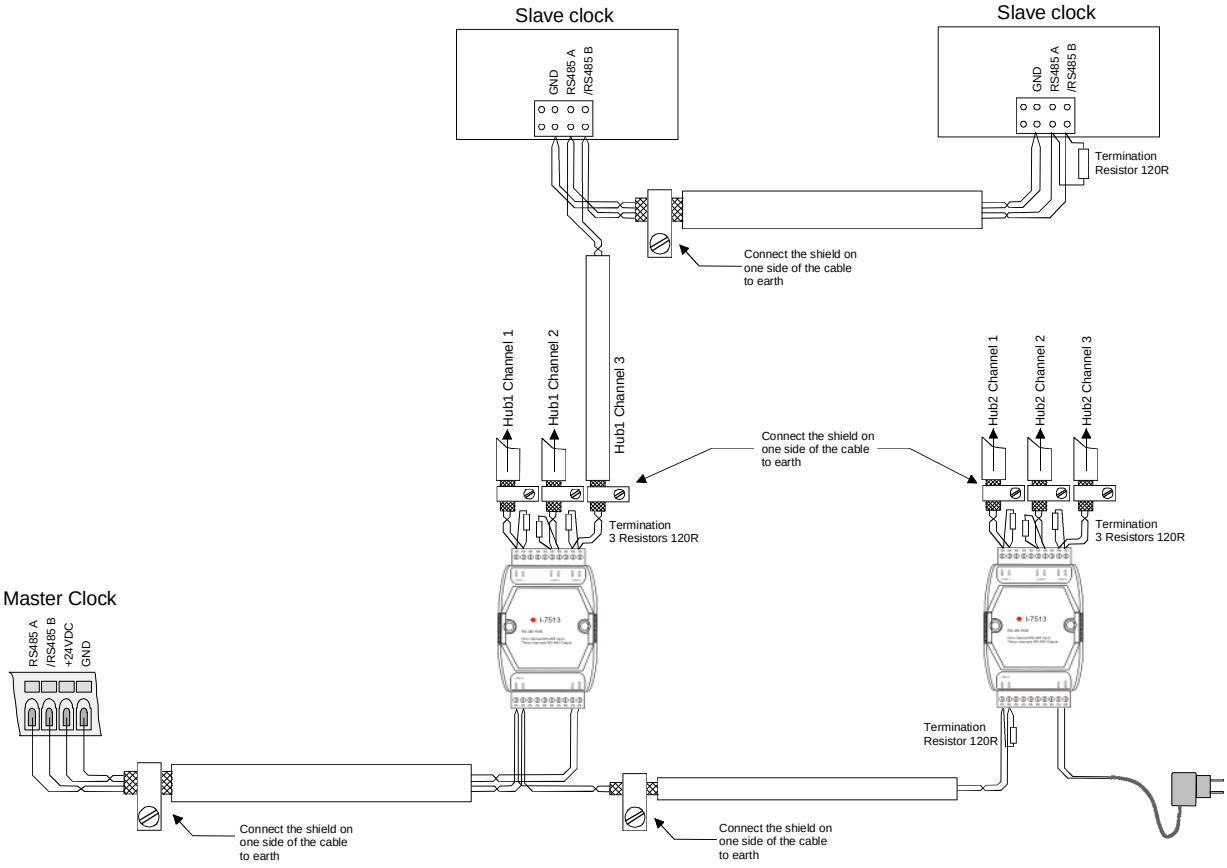
3.4 Wiring with a Hub

Wiring sample of a RS485-connection with Masterclock, RS-485 Hub and a slave clock.



3.5 Wiring with two Hubs

Wiring sample of a RS485-connection with Masterclock, two RS-485 hubs and slave clocks.



3.6 RS-485 Termination

In some cases it can be necessary to terminate a RS-485 segment. A termination resistor is required on slave clocks located at ends of the RS 485 line. Some slave clocks are equipped with a termination jumper. Disable this jumper on any slave clock not at the end of a line. Where termination is required but no jumper available on the end slave clock, install a 120 Ω Resistor between the + and – network connectors. Very short connections can be done without termination.

4 Addressing

For correct network operation it is important that each slave clock has a unique address. This address does not correspond to physical location. The network may have 31 devices with addresses in the range from 1 to 31. Please refer to the movement manual for the correct addressing.

5 Troubleshooting

- If the slave clocks does synchronize in broadcast mode but gives errors in supervised mode, the wiring may be wrong. The network should have all RS485A connections

linked to the RS485A-line or on a hub to Data+ and all /RS485B connections linked to the /RS485B–line or on a hub to Data-.

- On the hub the supply voltage is to be checked. The red LED on the hub must be illuminated continuously, it expires only briefly with data traffic. If the LED is not illuminated, the connection from the main clock to the hub is incorrect.
- If the clocks indicate wrong time, how if another time zone would be adjusted, probably two clocks are set to the same address. In the slave clock display on the master clock it is clearly visible which slave clocks have a wrong setting.
- If a clock announces a device error, this can be also because of the lighting. The lamp is supervised with a photosensor. After modifications it can also be that the sensor was connected wrongly.
- Check in case of malfunctioning also the configuration of the main clock. The RS485-clock line must be switched on and each slave clock must be configured.

6 Technical Data

6.1 RS-485

Parameter	Value
Maximum theoretical cable length @ 100Kbit/s Length of a segment between two termination resistors, can be extended with a hub	1200m
Maximum cable length to Hubs powered from Masterclock Cable with conductor gauge 24 AWG	600m
Maximum common-mode voltage	+/-7V
Driver differential output level	1.5 – 5V
Receiver sensitivity	+/-200mV

6.2 RS-485 Hub

Parameter	Value
Maximum number of hubs powered from a Masterclock	1
Maximum number of hubs cascaded	8
Supply voltage range	10 – 30VDC
Power consumption	2.2W (max)
Isolation voltage	3000V
Operating temperature	-25° – +75°C

Subject to be change without notice

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