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Overview

This technical note provides summarized guidelines and procedures for installing and starting-up a ROTRONIC RS-485 network.

Note: All instruments from ROTRONIC that feature a RS-485 interface use the same RS-485 driver chip: **MAX3471** from Maxim.

Installation Guidelines

The following guidelines are derived from European Standard EN 50170 for the transmission of signals by copper wires. When planning an installation, the rules provided by EN 50170 should be followed under consideration of local circumstances to determine the position of machines and equipment.

All ROTRONIC products are tested for Electromagnetic Compatibility according to EMC Directive 2004/106/EG and following European standards:

- o EN 61000-6-3 + EN 61000-6-1 (residential / résidentiel / Wohnbereich)
- o EN 61000-6-4 + EN 61000-6-2 (industrial / industriel / Industrie)

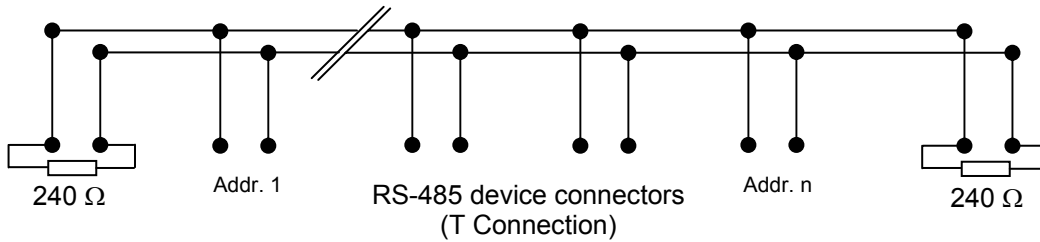
RS-485 Main Data Line Cable:

Use a high grade shielded cable to prevent cross talk between the transmitted signals and reduce the potential of external interference. For the RS-485 cable, we recommend using a cable Cat. 5e ANSI/ TIA /EIA-568-A-5.

In general the RS-485 cable should be shielded and comply with the following specifications:

- Cable capacitance <=300pF/m or 90 pF/ft
- Line impedance 100 Ω \pm 15 Ω
- Line resistance 140 Ω /km or 225 Ω
- Signal lines Twisted pair

RS485 Network:



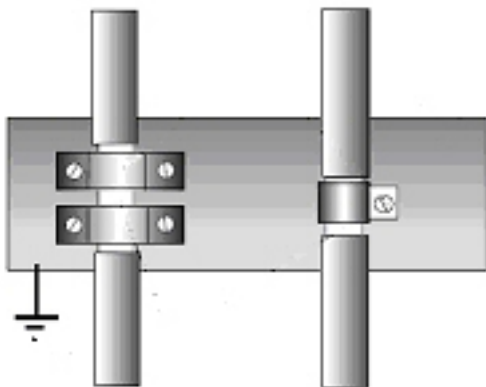
- As far as possible, limit the RS-485 network to a single main data line (one segment)
- Limit the total length of the main data line to a maximum of 1000 m or (3300 ft)
- Limit the length of each T connection to a maximum of 15 m or 50 ft
- Do not connect more than 64 devices to the same main data line
- Terminate each end of the main data line with a 240 Ohm resistor. Termination resistors should be placed only at the extreme ends of the data line, and no more than two terminations should be placed in any single segment of an RS-485 network

If for some reason you must use more than one single RS-485 network segment:

- The total impedance of the network should not be smaller than 120 Ohm
- All termination resistors should have the same value
- For a network with 3 termination resistors use 360 Ohm resistors
- For a network with 4 termination resistors use 480 Ohm resistors

Grounding:

Make sure that all devices on the network are sharing the exact same ground, especially when more than a single power supply is used to power the devices. The shield of the main data line should be connected to the ground at least once and preferably at both ends to the same ground.



Cabling in areas with a risk of lightning: be sure to follow all applicable regulations regarding lightning protection.

In the case of a network running over a long distance, use a low-resistance potential equalization cable. This additional cable should be run parallel and as near as possible to the main data cable, preferably in the same conduit. The shield of the main data cable should under no circumstances be used as equalization cable!

- Select the cross-section of the potential equalization cable according to the maximum equalization current.
- Ideally, the conductors of the potential equalization cable should be stranded in order to be effective also in case of high-frequency interference.
- Connect all devices to the potential equalizing cable as often as possible.
- Electrical conductors such as machine elements, metal tubes or supporting constructions should be integrated into the system.
- Protect the potential-equalization cable and connections against corrosion.

Power Supply:

Be sure to power each ROTRONIC device from a clean, noise-free voltage source.

When using a central power supply to power all devices via the main data cable, pay attention to the voltage drop within the main data cable and make sure that even the most remote device on the network receives at least the minimum supply voltage specified for the device.

Startup Procedure

1. Check the main data cable prior to connecting the devices:
 - Verify the termination resistors are installed and have the correct value
 - Verify the continuity of the main data cable
 - Verify that the resistance between the RS-485 signal wires is at least 120 Ohm
2. If using a common power supply to power all devices via the main data cable:
 - Connect the power supply
 - Verify that there is no voltage potential between the RS-485 signal wires and the power supply ground
3. When the main data cable has been verified, power the master device and connect it to the HW4 PC (at this time, do not connect the master to the RS-485 network)
4. Verify that the HW4 software finds the master device
5. Connect the RS-485 network to the master (at this time, do not connect any slave device) and verify that HW4 still communicates with the master device
6. Connect the first slave device to the RS-485 network and verify that HW4 still communicates with the master device and that HW4 finds the slave device.
7. Connect the second slave device to the RS-485 network and verify that HW4 still communicates with both the master device and the first slave device. Verify that HW4 finds the second slave device
8. Repeat the above step, adding one slave device at a time to the RS-485 network