Wiring and powering of the Ampio installation

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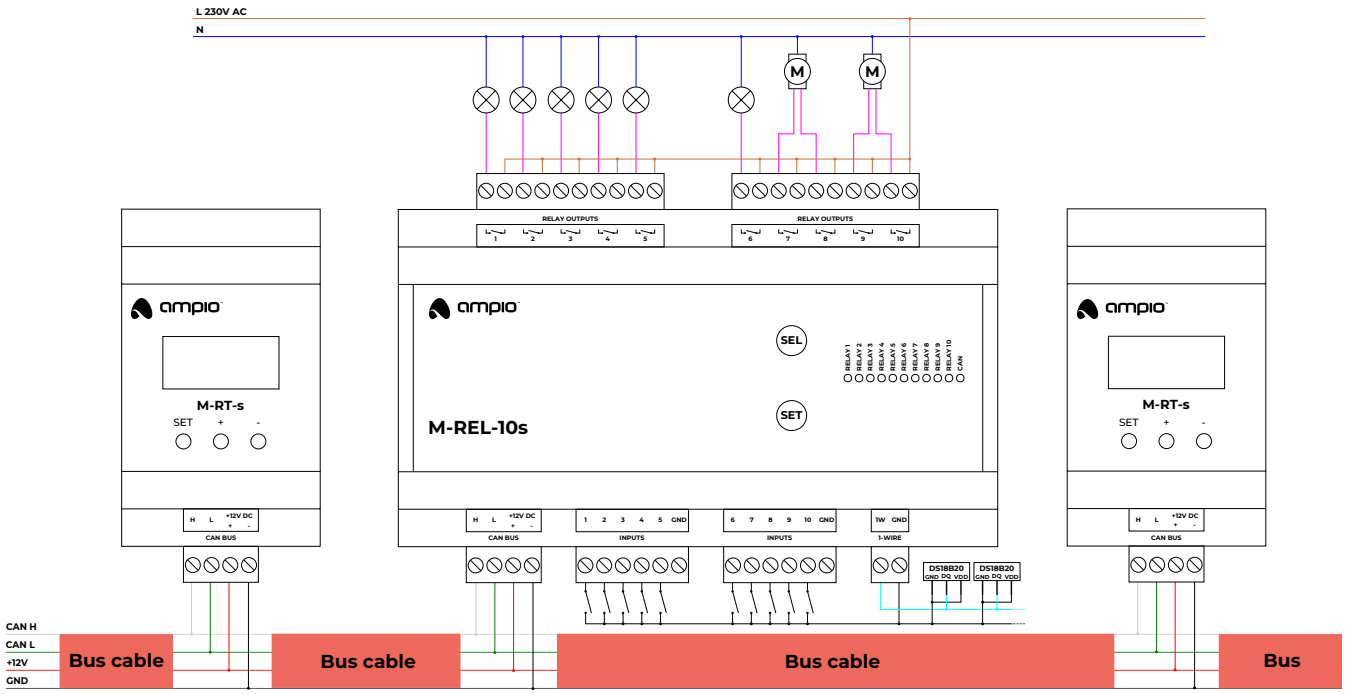
Connecting the bus to Ampio modules

The Ampio system uses a CAN bus for the modules to communicate. A suitable cable for sending information via the CAN bus is a CAT5 (or higher) twisted-pair cable. We recommend using one pair of wires to transmit the CAN signal and the other three pairs to supply power. This means that one wire will be responsible for *CAN Low*, another one twisted with the first one will transmit the *CAN High* signal. The next three wires will be connected to *+* of the power supply, and the remaining three to its -. It must be born in mind that loop resistance of wires in the twisted-pair cable on a one-kilometre stretch is usually around 190 Ohm.



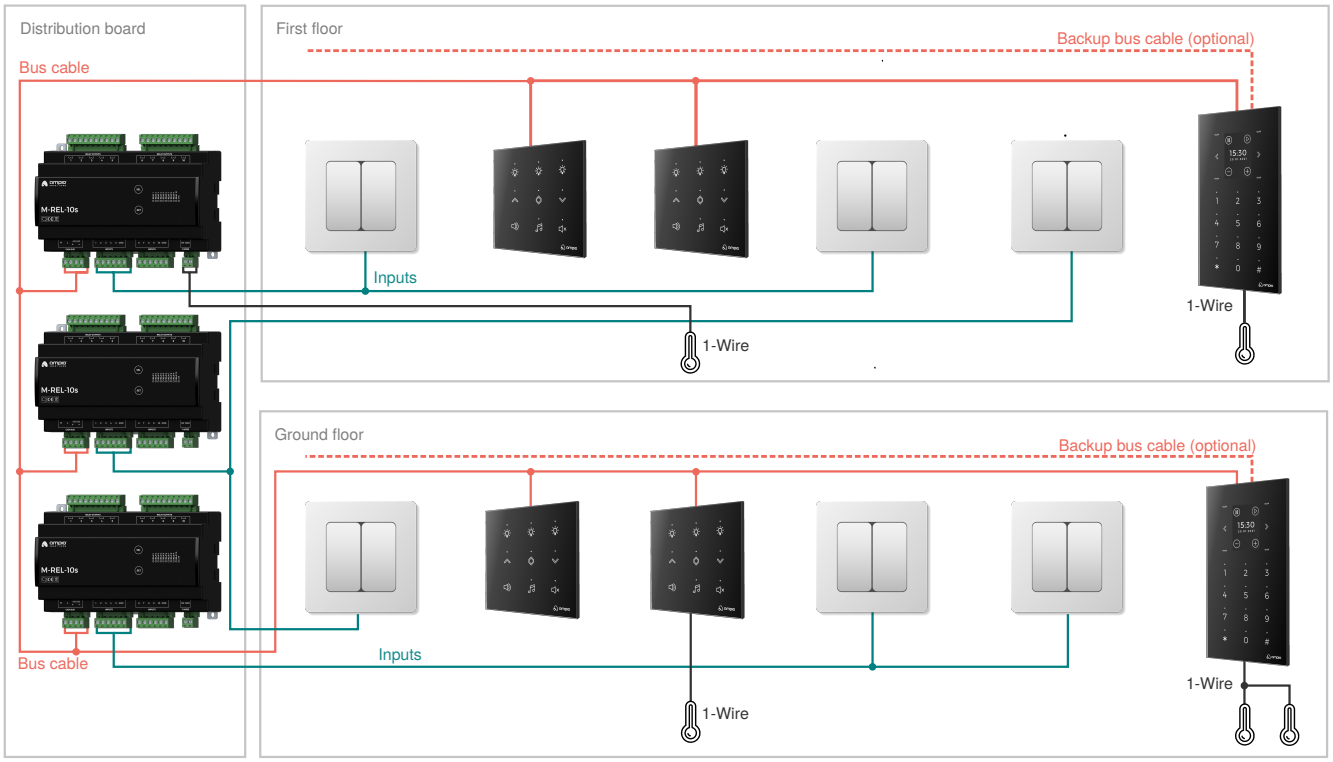
Basic rules of connecting modules

Below are a couple of important guidelines in terms of connecting the Ampio modules:

- The length of a single bus segment connecting two modules must not be greater than 1 km. In case of an installation that requires a longer connection, it must be divided with the use of a bridge module (M-CON-CAN-s), which in the Ampio system fulfils the role of a galvanic separator. A maximum of 100 Ampio modules are permited, for longer connections, the separator must be used. Separation is performed actively, which allows the module to also serve as an amplifier for longer stretches of the CAN bus.
- The network topology can take the form of a line topology, a star topology, or mixed.
- The bus cable, as it is the case with any other multi-core cable, has its capacitance - the longer the segment, the greater the capacitance. In order to reduce the capacitance, you should add a terminating resistor to the CAN terminals (H and L) at the end of the bus. It is also a good idea to add a resistor onto the bus in the distribution board itself. This can be done directly in the Ampio's redundancy module (M-RDN-5s). It should be remembered that the total resistance of all terminators must not exceed 60 Ohm.
- While connecting modules, when clamping more than one wire in a single clamp, always twist and solder together wires or clamp them in the clamping device first. Otherwise, in case of loosening of the clamp, it is possible to disrupt the communication of the rest of automation modules.

Preparation of wiring for switches and touch panels

When preparing the wiring, you should lead the bus cable to each module or touch panel installed in an appropriate junction box. For regular wall switches you can lead any two-core cable to each of the junction box housing a switch, a separate cable leading from each box (one cable per box) to the distribution board. With the use of this cable, you can connect the switches to digital inputs of modules installed in the distribution board. An example of such a connection is presented in the figure below.



Another method of connecting wall switches, which makes better use the dispersed nature of the Ampio system and simplifies the wiring process, is leading only the bus cable to each of the switches and using the (M-IN-2p) or (M-INOC-4p) modules, or any other module installed in a junction box that has bistate inputs to which switches can be connected. Additionally, lead the bus cable, or a shielded cable from the temperature sensors to the nearest junction box with a touch panel or a module that has an input for the temperature sensor. The majority of junction box modules and touch panels have a 1-Wire connector, which can accommodate up to 6 temperature sensors.

Temperature sensors

Temperature sensors must be placed 120-150 cm above the floor, preferably in the middle of the room that is not exposed to sunlight (temperature sensors should also not be installed above touch panels as the panel's heat may distort the temperature reading). We have a special casing for temperature sensors that is made of a small metal sheet that is fixed to the wall, and phased lacobel glass fixed to the sheet with strong neodymium magnets (M-SENS's casing alone may be purchased). The casing can also accommodate other miniature sensors e.g., a humidity sensor, or an air-quality sensor with an analogue output.

A cable for a 1-Wire temperature sensors should be at least a 2-core cable, and of the lowest capacitance possible. If it is a UTP cable (twisted-pair cable), then the 1-Wire signal should be transmitted by two separate UTP pairs. The sensor must not be connected on one twisted pair. Also, you must not use an alarm cable for this purpose due to the cable's high capacitance. A basic 2-core supply cable is also a good choice, e.g. OMY, due to its thick isolation and related to it low capacitance. The maximum recommended length of a cable for one temperature sensor is 20m.

It must be remembered that the 1-Wire communication bus is not designed for sending signals on long distances. We recommend using the shortest connections possible and an individual consideration for each installation.

CAN bus

The CAN bus should be lead to each junction box with a touch panel and:

- to junction boxes housing wall switches - when putting into practice the solution of using Ampio junction box modules with bistate inputs
- to junction boxes near audio/video systems (also for projectors)
- to recuperation systems
- to air-conditioning units if they are to be integrated
- to gas fireplaces that can be controlled
- to electricity meters, PV frequency inverters
- other building automation device that are to be integrated

Power supply for the CAN bus

The Ampio system is a system with a structure of dispersed logic. It makes the system reliable thanks to the fact that in the event of a potential server, or any other module's malfunction, only the circuit for which the damaged module is responsible is affected, not the entire system. However, there is one thing in dispersed/distributed systems that may stop the entire installation, namely bus power supply failure. Therefore, you have to make sure that this does not happen.

Each smart bus-based system should be powered by at least two power supplies working in parallel. One of the power supplies should be a buffer PSU (with emergency voltage control). What we suggest, is using modules from the Ampio offer that support the bus power supply redundancy with advanced voltage analysis and overvoltage and overload protection (M-RDN-5s, M-SERV-s). It should be borne in mind that the Ampio system is supplied by 12V. Each of the above-mentioned PSUs should be fed from an independent phase, an independent overcurrent circuit breaker and an independent differential switch, so that the failure of any of these elements does not disturb the installation's operation. The output voltage of both PCUs should be fed into the bus through a redundancy module - a module that controls both voltages and in case of a failure of any of the power supplies, it allows the functioning power feeder to work, informing the system, at the same time, about the failure with the use of a transmitter contact.