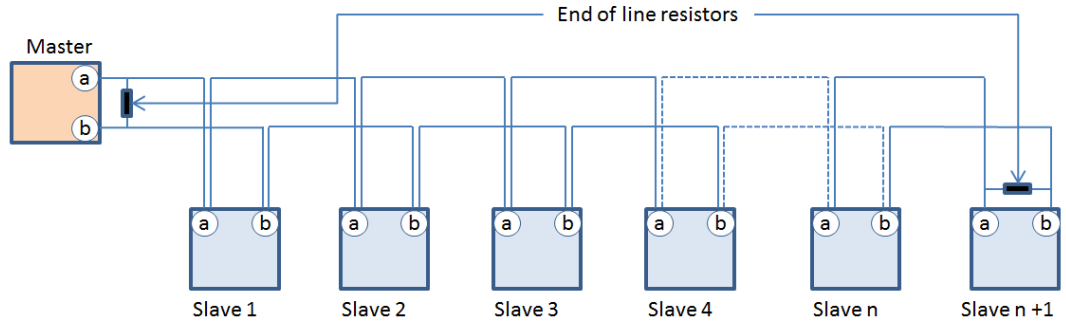
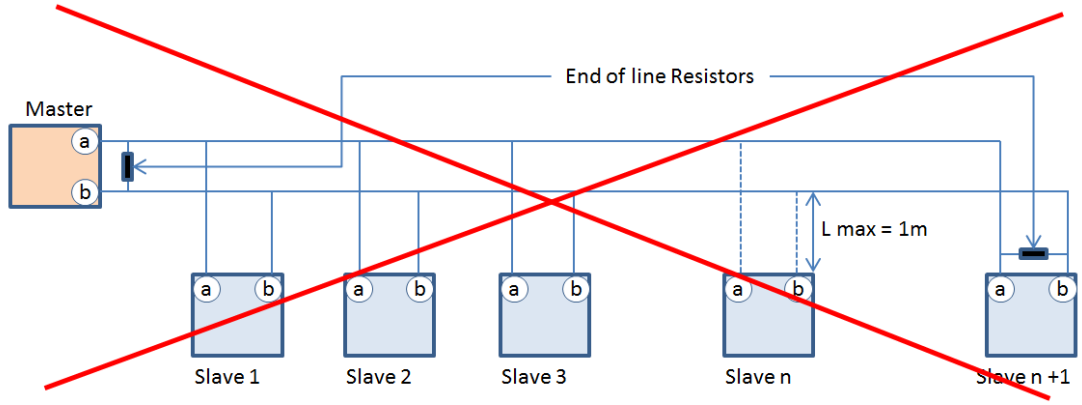
Wiring and line impedance

It is one of the points which it is absolutely necessary to pay attention to during the wiring of your network, as a network correctly wired will avoid most of the problems.
Be careful that the topology of a RS-485 network is a “daisy chain”. That means the network is constructed node by node. It could accept at maximum 32 devices (slaves).
You have to verify that your master and your last slave are well equipped with an end of line resistor and check if they are activated. If they are not equipped you have to add a 120 Ohm resistance between the connectors Ra/Ta and Rb/Tb

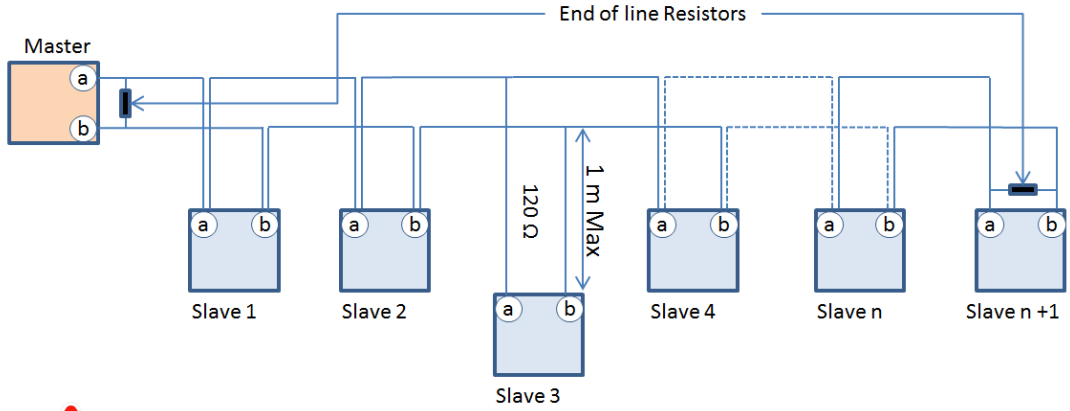
Example of recommended wiring:



Be careful the following wiring is not equivalent to the precedent one: This second one is not recommended:



However if a node must be added in an existing network and it cannot be made otherwise, the node must be connected with the primary network by a cable. This cable must have a maximum length of 1m and an impedance of 120 Ω max:



Just like the instrumentation cables, the communication cables must never be in the near of power supply cables, engine variator cables or high voltage cables.

Shield

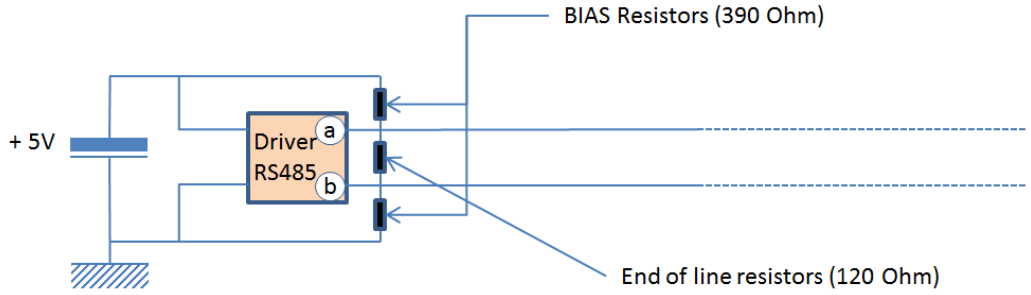
It is highly recommended. It should be connected to the ground on one side. On the other side it should be connected to the ground too but via an insulation capacity (1nF 1kV DC) or a carbon layers resistor of 100 Ohms minimum.
If the cable is exposed to electromagnetic fields, it may be necessary to protect the node with a SPD.

Common mode voltage

It's defined by the RS-485 standards: The common mode voltage must be between -7V and +12V
On long cable distances, this voltage could come out of this range of voltage. In this configuration the RS-485 link doesn't work anymore. If this common mode voltage becomes really too important and overpass the driver characteristics, it could be permanently damaged.
If the common mode voltage is different between 2 nodes (2 slaves), you have to use an opto-isolated RS-485 interface. But this kind of device implies communication delays so it will decrease the maximum baudrate and it will decrease the maximum possible number of nodes on the network too.

BIAS resistors

When the line is at rest, the imposed state must be 0 to avoid failed safe state:
Signal 0 : -0.2V
Signal 1 : >0.2V
If at rest, the line is at a voltage upper than -0.2mv, we are in a failed safe state. The node will never answer to a request because the start bit will never be detected. To avoid that, please verify that your master is equipped with BIAS resistors.



The BIAS resistors you need to install could be between 390 Ohm and 4.7 kOhm depending of resistors already installed on the driver. This modification should be done on the master itself.
The high polarization must be done with the driver's 5V.