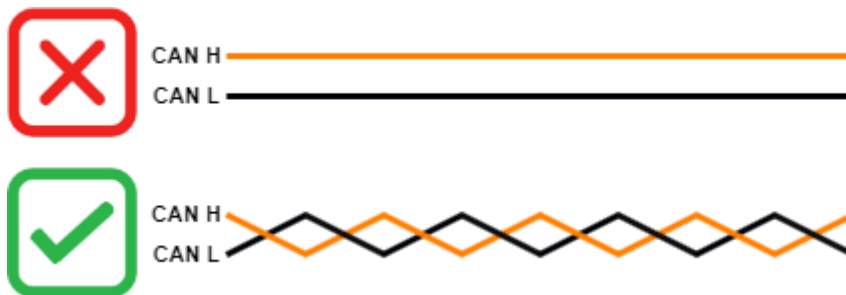


CANTCU - CAN-bus Wiring

CAN-bus

The CAN-bus is an information data bus used in the automotive sector, in which data is transferred using copper conductors (wires). The copper conductors are wired between all the different **nodes** (control units) in the bus. The bus physically consists of two conductors (wires), **CAN H** (High) and **CAN L** (Low), which are arranged in a twisted-pair configuration. The twisted-pair arrangement of the conductors is a requirement, as it plays a critical part of noise cancellation, affecting signal quality.

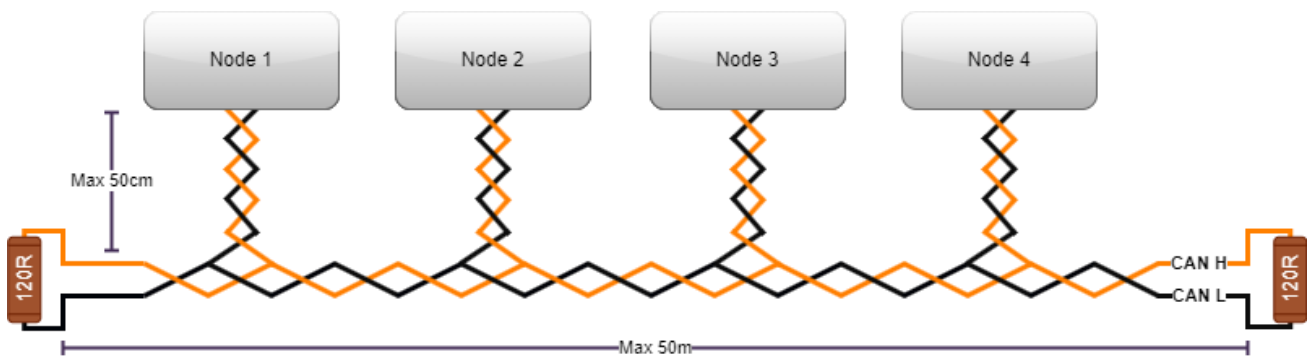


CAN-bus twisted pair wiring arrangement

Topology

In the CAN-bus, every node is a master device. This means that every node has the equal rights and possibility to send and receive all the messages available on the CAN-bus. It is up to the configuration/software of every node to decide which CAN-messages are received and further processed in the node.

An **ideal CAN-bus layout** consists of a main bus, terminated at both ends using 120 ohm resistors, resulting in a bus resistance of **60 ohm**. Devices are spliced into the bus. The maximum recommended lengths of both the main bus and device stub vary depending on bus speed.



Ideal CAN-bus layout (500kb/s)

Due to physical limitations, it is often impossible to achieve a fully ideal CAN-bus layout, especially regarding stub lengths. Thankfully, CAN-bus is not too sensitive about this and will usually work fully normally even when outside the specified lengths.

Termination resistors

A CAN-bus is always required to have a resistance of **60 ohms**. This resistance is achieved by using two 120 ohm resistors placed at the ends of the CAN-bus, hence called **Termination Resistors**. The main purpose of these resistors is to absorb energy created by the CAN signals. Without resistors at the ends of the CAN-bus, there is a risk of the CAN signals reflecting back from the end of the bus cables, which could result in communication errors or even total loss of communication. Regarding resistor wattage, a standard 1/4W (0.25W) resistor is adequate and easy to wire in.

A lot of OEM, and even aftermarket ECUs, have built-in termination resistors. On OEM, this usually depends on the placement in the car. Aftermarket ECUs sometime have a software-activated termination resistor. This is something that needs to be taken into consideration when planning the wiring harness and/or before adding any resistors to an existing CAN-bus.

CANTCU has built-in 120 ohm resistors on CAN1 and CAN2, and is supplied with 4x 120 ohm resistors to be wired in where necessary.

CAN-bus	Termination Resistor
CAN1	X
CAN2	X
CAN3	-

CANTCU built-in termination resistors

Measuring resistance

Use a suitable multimeter with a resistance-measurement (ohm) function. Before measuring resistance, make sure that all devices are connected to the CAN-bus, and that all devices are powered OFF.

Bus Reading	Explanation	Solution
0 ohm	Short in the wiring	Fix CAN wiring
60 ohm	Bus terminated correctly	-
120 ohm	Only one termination resistor on the bus	Add another termination resistor on the opposite end of the bus
Infinite ohm	No termination resistors on the bus	Add termination resistors to both ends of the bus

Practical Guidelines

- Use twisted-pair conductors/wiring
- Make sure the total resistance of the CAN-bus is 60 ohm
- Keep device stubs as short as possible