Elektromotus CAN bus Quick Start Guide v0.2 rc3

The controller area network (CAN) is a standard for distributed communications with built-in fault handling. The high speed ISO 11898-2 CAN standard defines a single line structure network topology. CAN bus does not support star or even a multi star topologies. The nodes are connected via unterminated drop lines to the main bus. The bus line is terminated at both furthest ends with a single termination resistor as it is shown in Figure 1. Recommended value of the termination resistor is nominally 120Ω . In other case signal reflections will occur on the bus causing significant ringing and error rate. There should be no more than two terminating resistors in the network, regardless of how many nodes are connected. EMUS BMS CAN transceiver is able to drive up to 112 nodes on bus if 120Ω termination resistors are used. However, total number of nodes depends on other devices on the network (CAN transceivers driving capability).
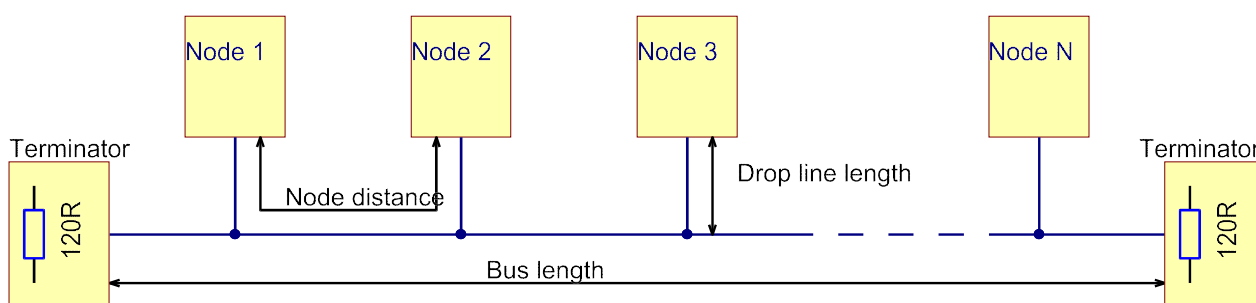

Fig 1. CAN bus topology.

Node distance is distance between two nodes and it must not exceed total bus length. Table 1 presents EMUS BMS CAN bus timing parameters, sampling point position and absolute maximum bus line length values for different baud rates.

Table 1. CAN bus timing parameters and bus length values.

Baud Rate	Nominal bit time	Sampling Point	L_U	$\sum L_U$	Bus length
1 Mbit/s	1 μs	75,00 %	2 m	10 m	30 m
800 kbit/s	1,25 μs	80,00 %	3 m	15 m	50 m
500 kbit/s	2 μs	87,50 %	6 m	30 m	100 m
250 kbit/s	4 μs	87,50 %	12 m	60 m	250 m
125 kbit/s	8 μs	87,50 %	24 m	120 m	500 m
50 kbit/s	20 μs	85,00 %	60 m	300 m	1000 m

L_U - a single node maximum unterminated drop line length. $\sum L_U$ (m) – cumulative maximum length of all nodes drop lines length. Bus Length – terminated bus maximum line length.

CAN bus topology and wiring recommendations:

- Keep node count below 30;
- Design CAN network as close as possible to a single line structure;
- Do not exceed maximum allowed bus line length at certain speed;
- Place termination resistors (120Ω) at furthest points of a bus line;
- Keep maximum unterminated drop line length under 0,3 meters.

To keep it on a safe side, always design system that is considerably reduced in the bus speed or line length compared to the maximum limit.