APPLICATION*NOTE 188*

Settings for a RS232 network of Motion Controllers

Summary

This application note describes the settings to build a RS232 network of up to 8 Motion Controllers, depending on the cable length and the communication baud rate.

The RS232 network has a master-slave topology, here meaning that the master sends commands to one node at a time and the node only answers if requested by the master.

Applies To

FAULHABER Motion Controllers MC5005, MC5010, MC5004, MCS

Configuration

When operating multiple controllers in network mode, which means to have more than one controller connected to a master, it is necessary to have a unique node address for each controller.

In addition the baud rate has to be the same for all of them.

For the configuration a direct 1:1 communication is needed (PC ←→ Motion Controller). So start with single devices, and create the network of multiple devices after configuration.

The Motion Manager software supports the configuration with the following wizards.

First go to “Configuration” and select “Connection parameters”

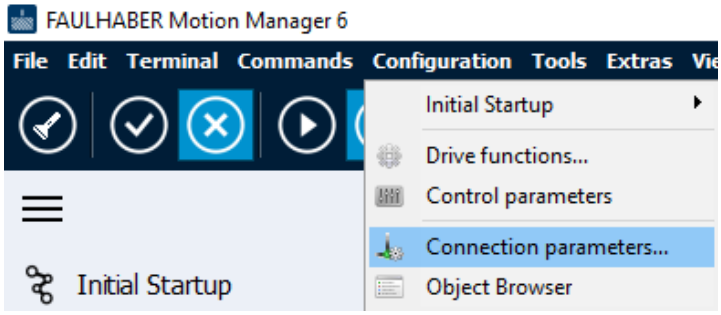


Figure 1: Connection parameters

Here select the baud rate (= transfer rate) and a unique node number for the controller.

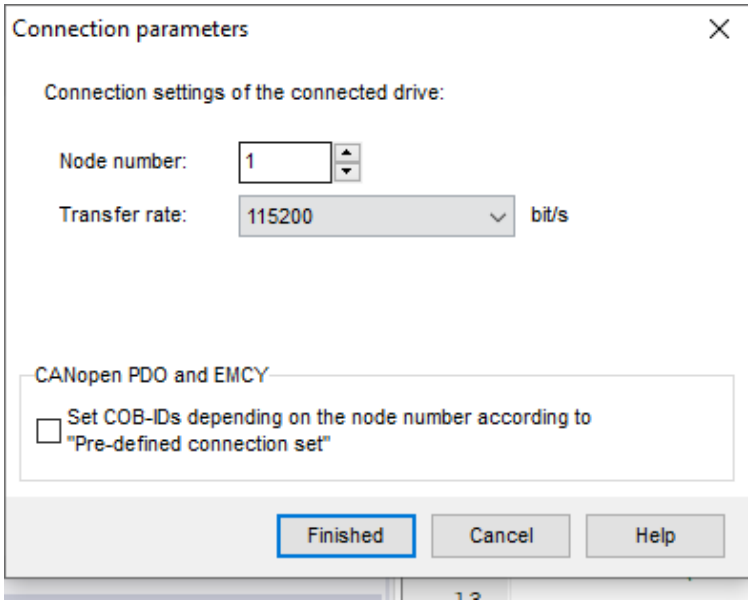


Figure 2: Configuration of the node number and baud rate

Second go to the configuration panel on the left and select: Drive functions / Communication / General

The RS232 NetMode has to be activated ticking the according box as shown in figure 3.

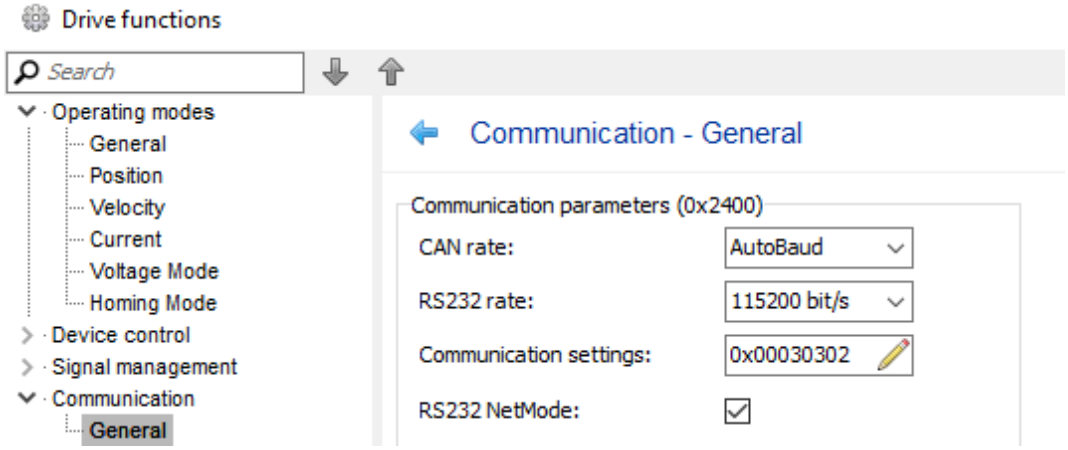


Figure 3: Communication parameters

Repeat these steps with all controllers which will be a part of the network.

Then the basic software configuration is done. The next step is to setup the hardware.

Hardware

General set up

Figure 4 shows a network setup.

It requires a crossover cable connecting TxD / RxD of the nodes to RxD / TxD of the PC or master.

A pull-down resistor is always necessary for termination.

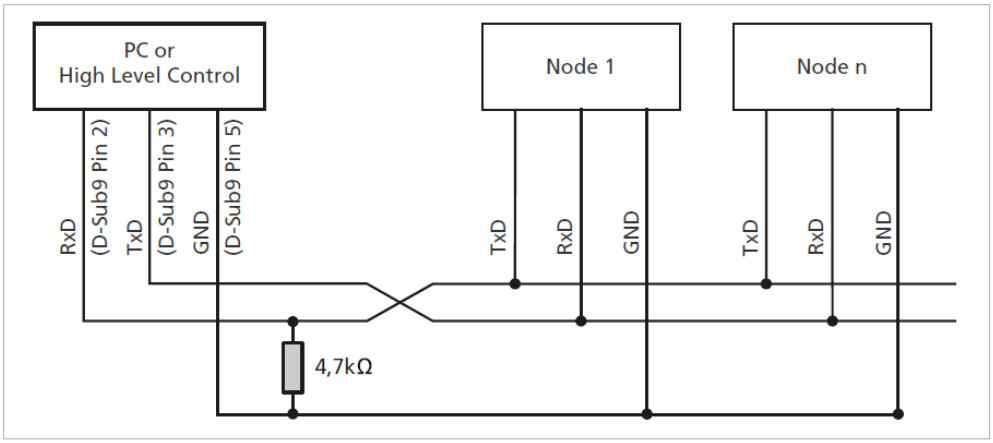


Figure 4: Wiring with several Motion Controllers in RS232 network operation

Depending on your controller type, which could be a MC5004, a MC5005/MC5010 or a MCS with an integrated motor, follow the further guidelines in the related section to realize the hardware setup.

MC5004

FAULHABER provides a motherboard (6500.01676) which can be used in combination with the Motion Controller MC5004. It has slots to plug-in up to 4 controllers and can be configured for network operation.

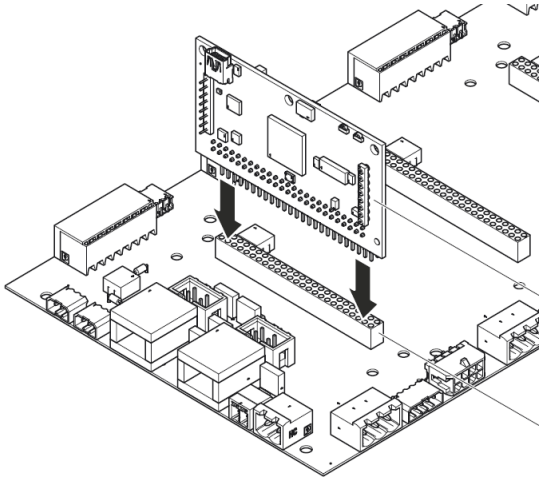


Figure 5: Overview of the motherboard

The **first step** is to plug the controllers into the motherboard.

Second, plug-in the cable connecting the master with the motherboard.

It goes to the RS232 connector X2 (figure 6) on the left side of the motherboard.

Only one cable per motherboard is required here.

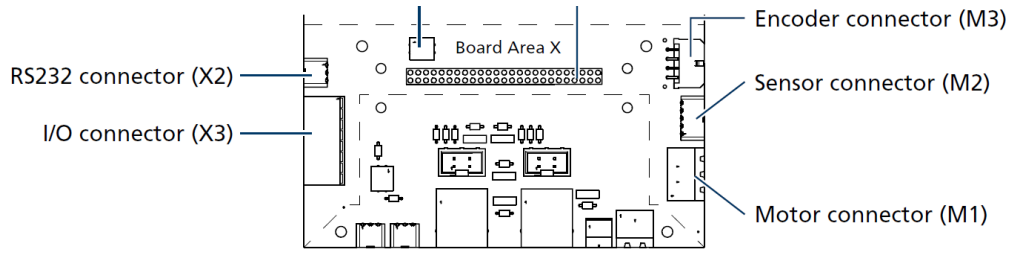
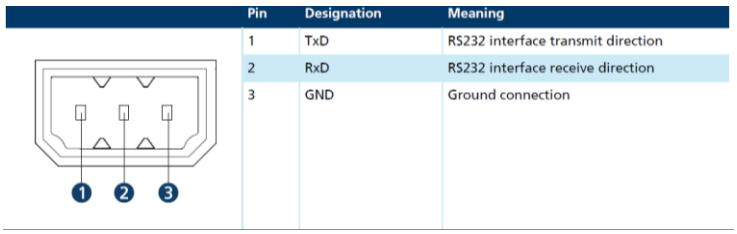


Figure 6: Connector overview of the motherboard

The pin assignment of the RS232 connector is shown in figure 7.



Pin	Designation	Meaning
1	TxD	RS232 interface transmit direction
2	RxD	RS232 interface receive direction
3	GND	Ground connection

Figure 7: Pin assignment of the RS232 connector

FAULHABER provides cables to establish the communication.

In this setup the cable 6501.00268 is connected to the motherboard's RS232 connector (figure 6 ➔ X2).

Cable 6501.00170 is plugged into cable 6501.00268 and establishes a communication via USB using a COM port.

Figure 8: RS232 cable 6501.00268

Figure 9: RS232 to USB converter 6501.00170

The motherboard has an integrated pull-down resistor.

So, the **third step** is to activate one or two pull-down resistors.

This is done by setting the DIP switch to “On” as shown in figure 10.

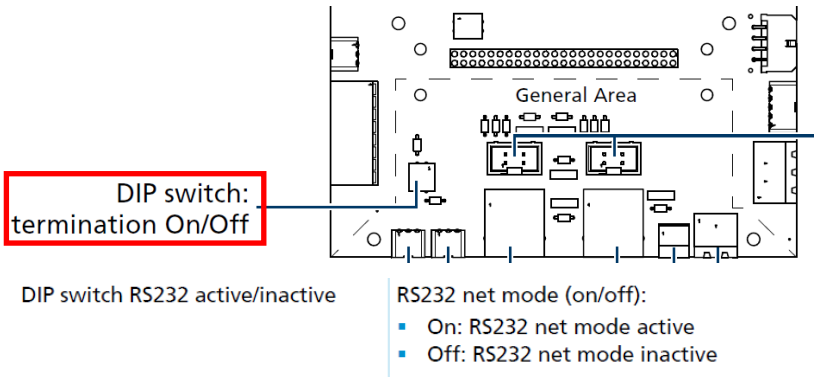


Figure 10: Pull-down resistor for the RS232 network mode

The **last step** is to connect the controllers to the network. This is done by activating the RS232-BUS DIP switches (figure11) next to each controller. Then you are done with the hardware configuration.

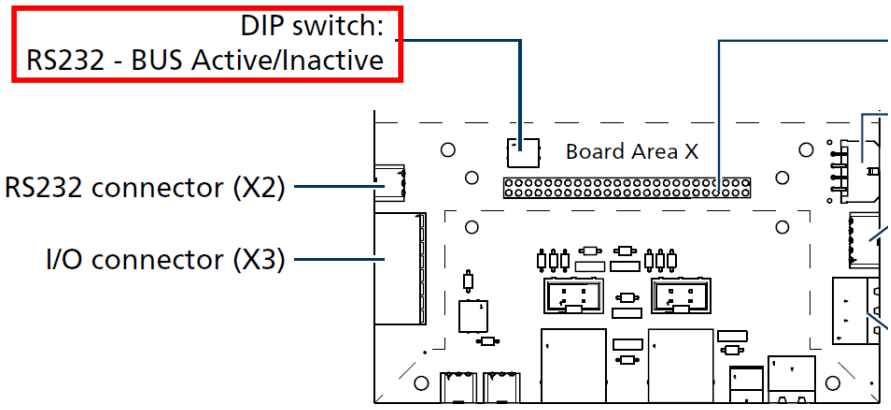


Figure 11: RS232-BUS DIP switches

MC5005/ MC5010

This section explains the wiring necessary to estbalish a RS232 network of MC5005 or MC5010 Motion Controllers.

First, plug-in the cable connecting the master with the Motion Controller.

It goes to the RS232 connector X2 (figure 12).

Figure 12: COM X2 ➔ RS232 connector

The pin assignment of this RS232 connector is shown in figure 13.

Tab. 24: Pin assignment of the COM port (X2) for RS232

Pin	Designation	Meaning
1	TxD	RS232 interface transmit direction
2	RxD	RS232 interface receive direction
3	GND	Ground connection

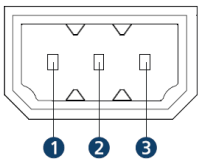


Figure 13: Pin assignment of the RS232 connector

FAULHABER provides cables to establish the connection.

One cable of type 6501.00268 is required per controller.

Figure 14: RS232 cable 6501.00268

Second, a network has to be created. In figure 15 a ribbon cable with Sub-D connectors is used to plug in the connectors coming from the controllers.

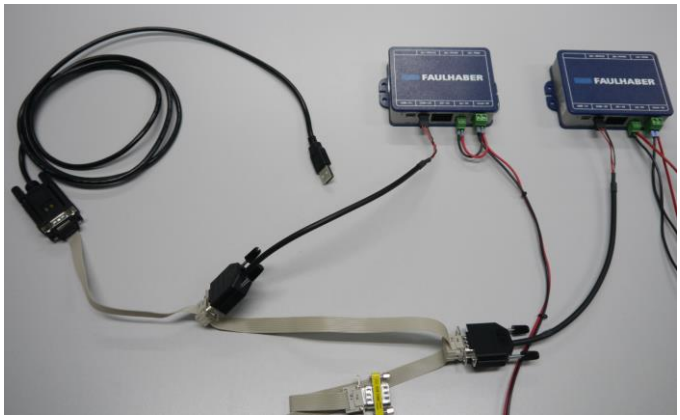


Figure 15: Example of a hardware set-up

Third, for the connection to a PC, cable 6501.00170 (figure 16) is attached to the ribbon cable network and establishes a communication via USB using a COM port.

Figure 16: RS232 to USB converter 6501.00170

And **finally,** a pull-down resistor is required.

Here this is realized by adding a SUB-D Connector with an integrated resistor (figure 17) to the ribbon cable network.

Figure 17: Overview of the needed components

MCS

This section explains the wiring necessary to estbalish a RS232 network of integrated Motion Control Systems (MCS).

FAULHABER provides an adapter board (figure 19) which can be configured for network operation.

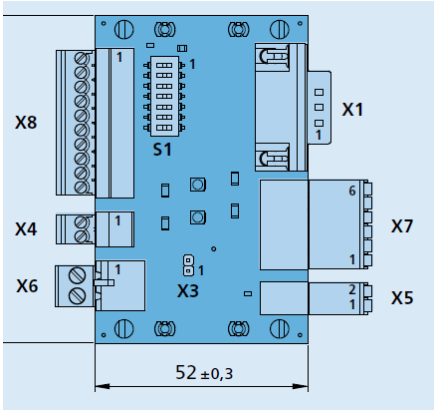


Figure 18: Adapter board 6501.00283

The **first step** is to connect the RxD, TxD and GND signals of the X2 connector (figure 19) of the MCS to the connector X7 of the adapter board. Cable 6501.00257 can be used for this purpose (figure 20). Pin 1 of the connector X2 of the MCS corresponds to pin 1 of the connector X7 on the adapter board, and so on.

6501.00257 (straight) 6501.00258 (angled)	MCS I/O connector, connectors M12, 12-pin	
Function	**Wire colour**	**MCS X2**
GND	Brown	Pin 1
CAN_L / RxD	Blue	Pin 2
CAN_H / TxD	white	Pin 3
U_{DD}	Green	Pin 4
DigOut 1	pink	Pin 5
DigOut 2	Yellow	Pin 6
DigIn 1	Black	Pin 7
DigIn 2	Grey	Pin 8
DigIn 3	red	Pin 9
AnIn 1	Violet	Pin 10
AGND	grey/pink	Pin 11
AnIn 2	red/blue	Pin 12
EGND	-	Shielding

Figure 19: Motor connector X2 (including the RS232 interface)

Figure 20: Interface cable 6501.00257 / 6501.00258

Second, a network has to be created. In figure 21 a ribbon cable with Sub-D connectors is used to connect all the X1 connectors of the adapter boards.

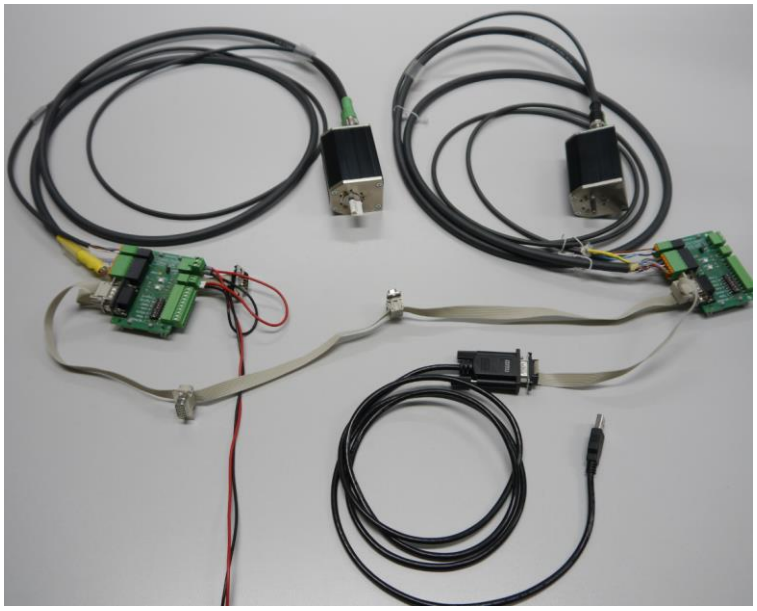


Figure 21: Example of a hardware set-up

Third, for the connection to a PC, cable 6501.00170 (figure 20) is attached to the ribbon cable network and establishes a communication via USB using a COM port.

Figure 20: RS232 to USB converter 6501.00170

The **final steps** are to activate the RS232 operation on each adapter board by setting dip switch 3 to ON as shown in figure 21. And adding one or two pull down resistors to the network by setting dip switch 1 to ON, accordingly.

1: NETMODE	ON	Pull-down resistor (10 kΩ) for RS232 wiring connected. This may only be connected to a node in the RS232 network.
	OFF	Deactivated
2: TERM	ON	120Ω terminating resistor for the final node in the CAN network connected to the programming adapter.
	OFF	Terminating resistor not connected
3: RS232 [1)]	ON	Operation with RS232 interface
	OFF	Deactivated
4: CAN [1)]	ON	Operation with CAN interface
	OFF	Deactivated
5: AGND	ON	AGND and GND interconnected.
	OFF	AGND and GND disconnected (with separate ground).
6: DigOut2	ON	Pull-up resistor with LED connected to programming adapter.
	OFF	Open collector
7: DigOut1	ON	Pull-up resistor with LED connected to programming adapter.
	OFF	Open collector

Figure 21: Description of the DIP switch settings

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