

4.3 Expansion module MAC00-B41

Only MAC400&800



4.3.1 Expansion module MAC00-B41 — overall description.

The expansion module MAC00-B41 can ONLY be mounted in the MAC400 and newer versions of the MAC800 motor (consult JVL)

This module is among the simplest and lowest cost modules in the product range. The modules contain no intelligence (microprocessor) meaning that all functionality is controlled via the basic motor.

The MAC00-B41 expansion module offers an industrial interface (M12 connectors) and a number of feature enhancements, including:

- Standard M12 connectors for optimum reliability
- Optical isolated communication covering RS232, RS485.
- Full RS232 protocol support for use with standard serial cable.
- Full RS485 protocol support for multipoint communication up to 100m.
- 6 high speed I/O channels that individually can be used as inputs or outputs. Each channel can (when used as output) source up to 300mA.
- Dual supply. The main supply can be removed but the control circuitry is kept active and position data and communication are still functional.
- Standard M12 connectors for optimum reliability

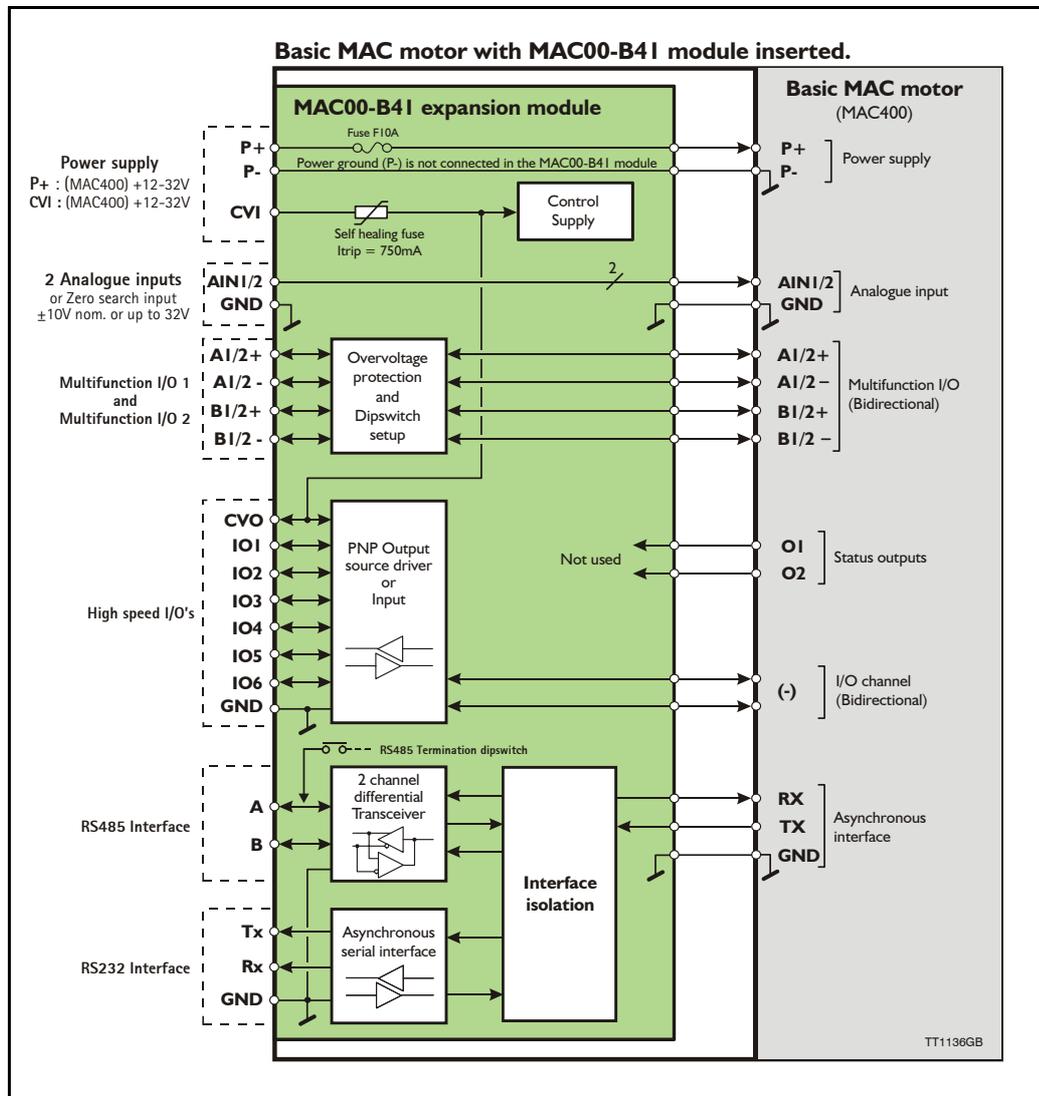
Typical applications for these expansion modules are:

- Closed loop systems with an overall controller involved.
- Replacement for pneumatic cylinders using the “Air Cylinder mode”
- Dispenser systems.
- Machine adjustment/setup by sending RS232 or RS485 commands.
- Standalone PLC with userprogram stored in the basic motor.

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4.3.2 Overall hardware description

All internal and external main connections can be seen in the illustration below.



4.3.3 General hardware description

The MAC00-B41 module offers the following external connections.

- Power supply (P+/P-/CVI)**
 These terminals are used for the main supply of the motor. A voltage between +12 and 32VDC (MAC400) must be connected.
- Analogue inputs (AIN1 and AIN2)**
 The analogue inputs are used either as analogue input or digital input. The primary analogue input is AIN1. When used as analogue input, it can control velocity, torque or position depending on which mode is set for motor operation. When used for digital inputs, it can be used in position-related modes for the external zero-search sensor. Also in "Air Cylinder Mode" the analogue input is used as a trigger input. For a functional description, please refer to *Analogue input*, page 70. (continued)

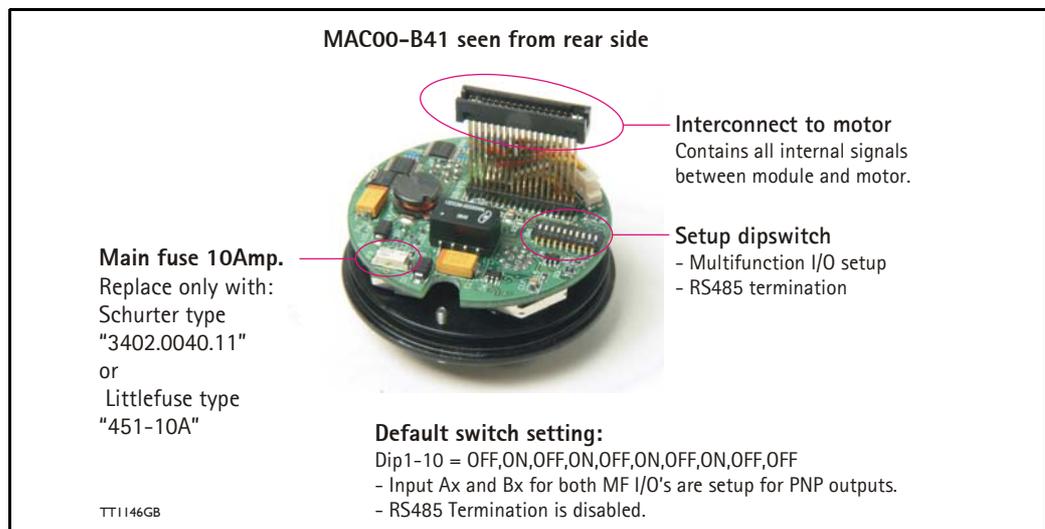
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- **Multifunction I/O1 and 2 (AI/2+, AI/2-, BI/2+ and BI/2-)**
The functionality of these terminals is the same as for the basic MAC motor. They can be set up in 3 different configurations.
 - Pulse inputs - for functional description please refer to *Multifunction I/O used as pulse inputs, page 73* and *General description: "Multifunction I/O" when using a Bx module, page 86*
 - Pulse outputs - for functional description please refer to *Multifunction I/O used as pulse outputs, page 74* and
 - RS422 interface - for functional description please refer to *Multifunction I/O used as serial communication interface, page 75*.**Important !:**
Remember to configure "I/O type" as "Pulse Input" in MacTalk if none of the 8 terminals AI/2+, AI/2-, BI/2+ and BI/2- is used (the multifunction I/O's). This must be done to avoid random function of the motor since the multifunction I/Os are defined as "Serial data" as default.
- **High speed I/O's (IO1, IO2, IO3, IO4, IO5, IO6, CVO, and GND)**
Each of the high speed IO's can be used as either an input or as an output. The I/O's can be read or set from the serial interface (RS232 or RS485) or they can be operated from the user program stored in the motor.
- **RS485 Interface (A-, B+ and GND)**
Serial balanced interface for connection to a PC or a controller. The protocol is similar to the RS232 or USB interface, which means that all registers/parameters in the motor can be monitored or changed. The RS485 is recommended for longer distances or in noisy environments.
- **RS232 Interface (Rx, Tx and GND)**
Serial unbalanced interface for connection to a PC or a controller. The protocol is similar to the USB or RS485 interface, which means that all registers/parameters in the motor can be monitored or changed. RS232 is not recommended for long distances (> 10m).

The MAC motor uses "binary" communication protocol which makes it possible to access all the internal registers. Please consult *MacTalk communication, page 281* for further details.

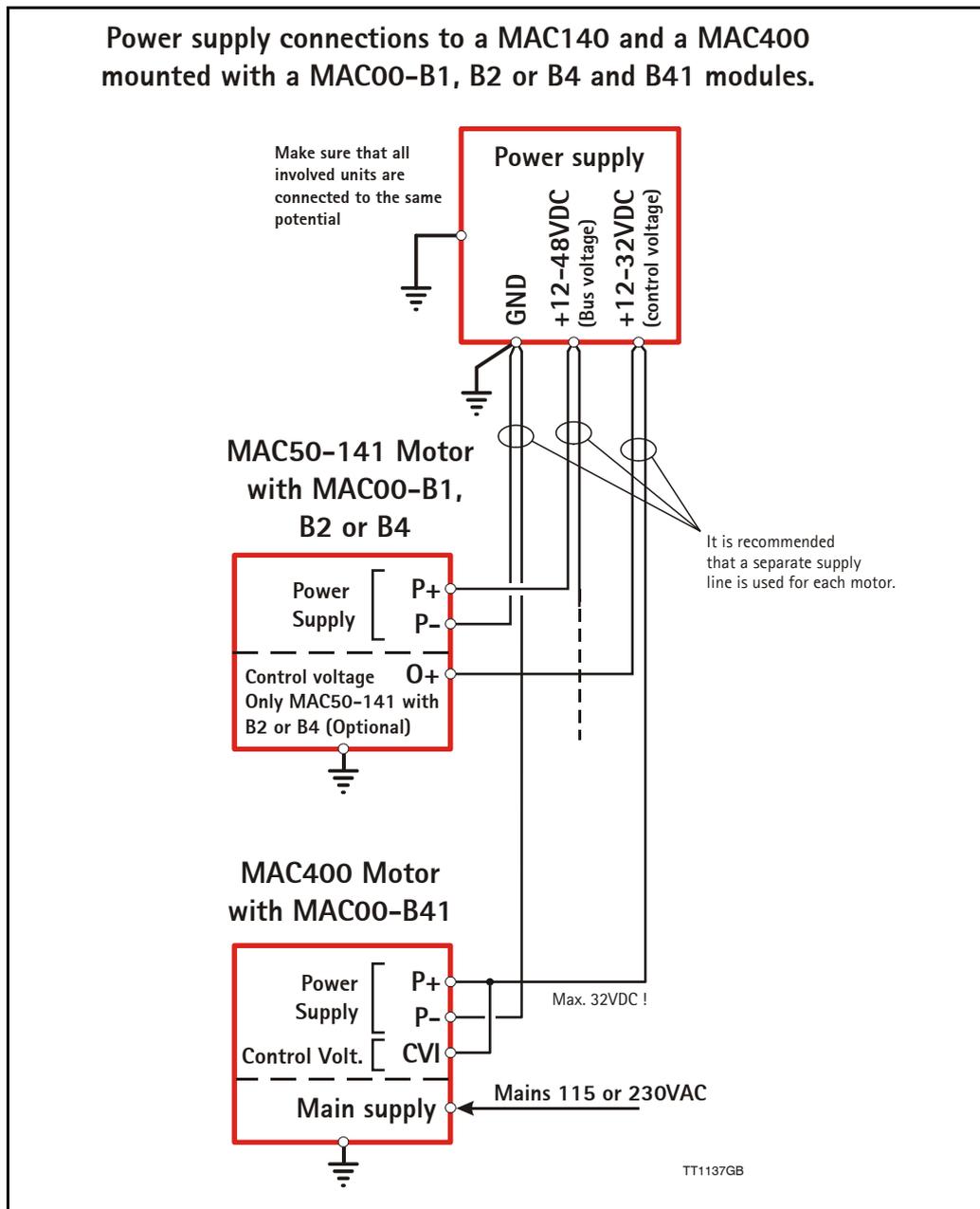
4.3.4 Hardware overview



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4.3.5 General power supply description

The MAC00-B41 module can only be used in the MAC400 motor. The diagram below shows how to connect power to a MAC400 motor mounted with a MAC00-B41. Please notice that the voltage connected to P+ and/or CVI must stay in the range +12-32VDC. Precautions must therefore be taken if the system also contains MAC50, 95, 140 or 141 which may require 48VDC in order to reach maximum motor speed. See also the general power supply description *Power Supply, page 59*.

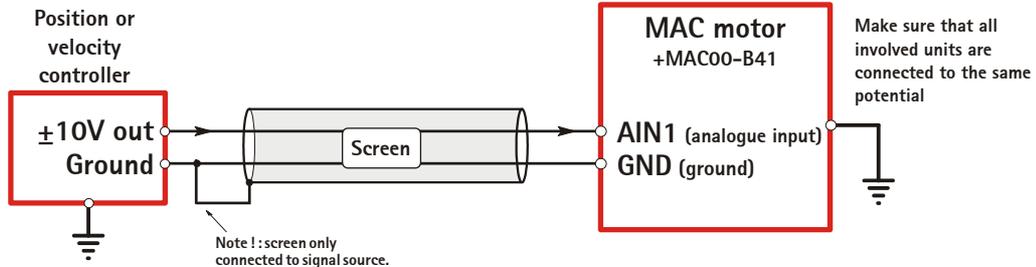


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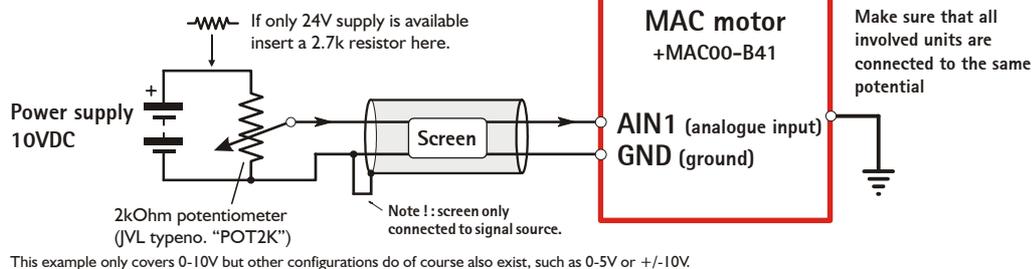
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Analogue input connection at the MAC motor mounted with a MAC00-B41 module.

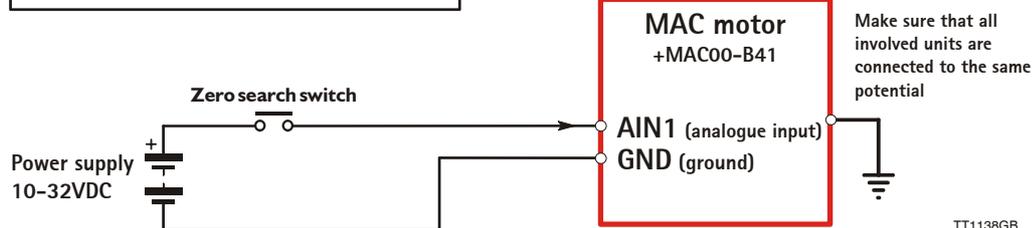
Connected to a external controller



Connected to a potentiometer



Connected to a zero search switch



TT1138GB

Note: Do not apply voltages higher than 32V to the analogue input (AIN)

4.3.6 Using the analogue inputs (AIN1 or AIN2).

When a MAC00-B41 module is mounted in the MAC400 motor, the analogue inputs is available in the same manner as in the basic motor itself.

The analogue inputs can be used for several applications and the function of the analogue input is determined by the mode in which the motor is set to operate.

Typically the inputs is used for controlling the velocity, torque or position of the motor but the input is also used as digital input for zero search or in "Air Cylinder Mode" where it is used as trigger input for the movement done by the motor.

For further information concerning physical connections, see the *Expansion MAC00-B41 connector description, page 105*.

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4.3.7 RS232 - General description when using the MAC00-B41 module

The RS232 interface is considered the main interface to the motor when the motor is set up using the MacTalk windows software from a PC or from any kind of controller using a RS232 interface.

Note: The basic MAC motor does not fully support RS232 since the interface signals are only 5V levels. See also the basic description - Serial interface, page 69.

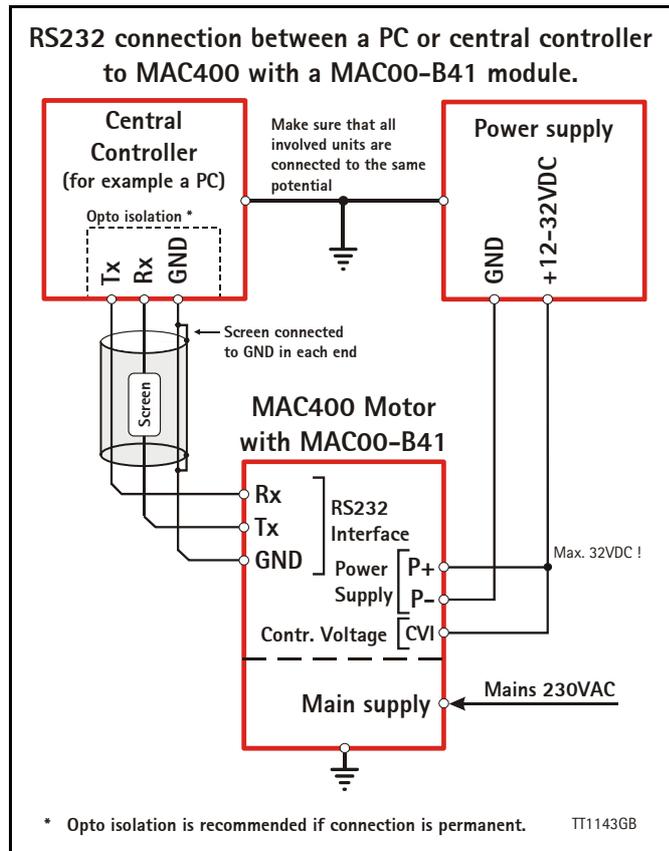
When connecting the RS232 interface to a PC or controller, the following rules must be followed:

- 1 Only one motor can be connected at the interface line. Use the RS485 if multiple units have to be connected at the same time.
- 2 Use screened cable.
- 3 Ensure that GND is also connected.
- 4 Ensure that all units have a proper connection to safety ground (earth) in order to refer to the same potential.
- 5 The RS232 interface cable length should not exceed 10 metres.

Connectors:

To see the specific connector pin-out please see the chapter *Expansion MAC00-B41 connector description, page 105*.

A finished RS232 cable also exist. Please see *Cables for the MAC00-B41, page 107*



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4.3.8 RS485 - General description when using a MAC00-Bx module

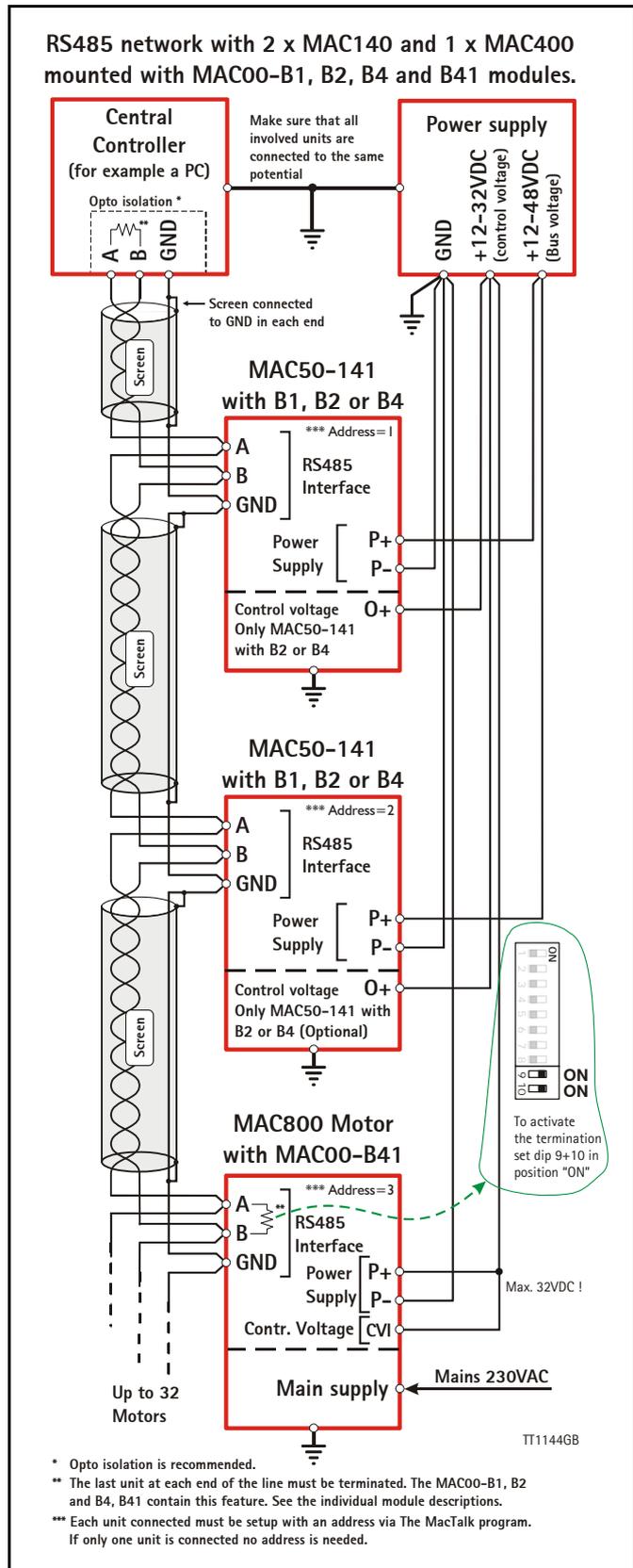
The RS485 offers more noise-immune communication compared to the RS232 interface. Up to 32 motors can be connected to the same line. The RS485 interface in the MAC00-B41 module is galvanically isolated.

When connecting the RS485 interface to a central controller, the following rules must be followed:

- 1 Use twisted-pair cable
- 2 Use screened cable
- 3 Ensure that GND is also connected.
- 4 Ensure that all units have a proper connection to safety ground (earth) in order to refer to the same potential.
- 5 The last unit in each end of the network must be terminated. Note that the B1, B2 and B4, B41 modules all contain a termination resistor which can be activated.
- 6 Ensure that the supply lines are connected individually in order to minimise the voltage drop between the motors.
- 7 Master Controller RS485 interface:
If available, it is strongly recommended a type with optical isolation is used.

Connectors:

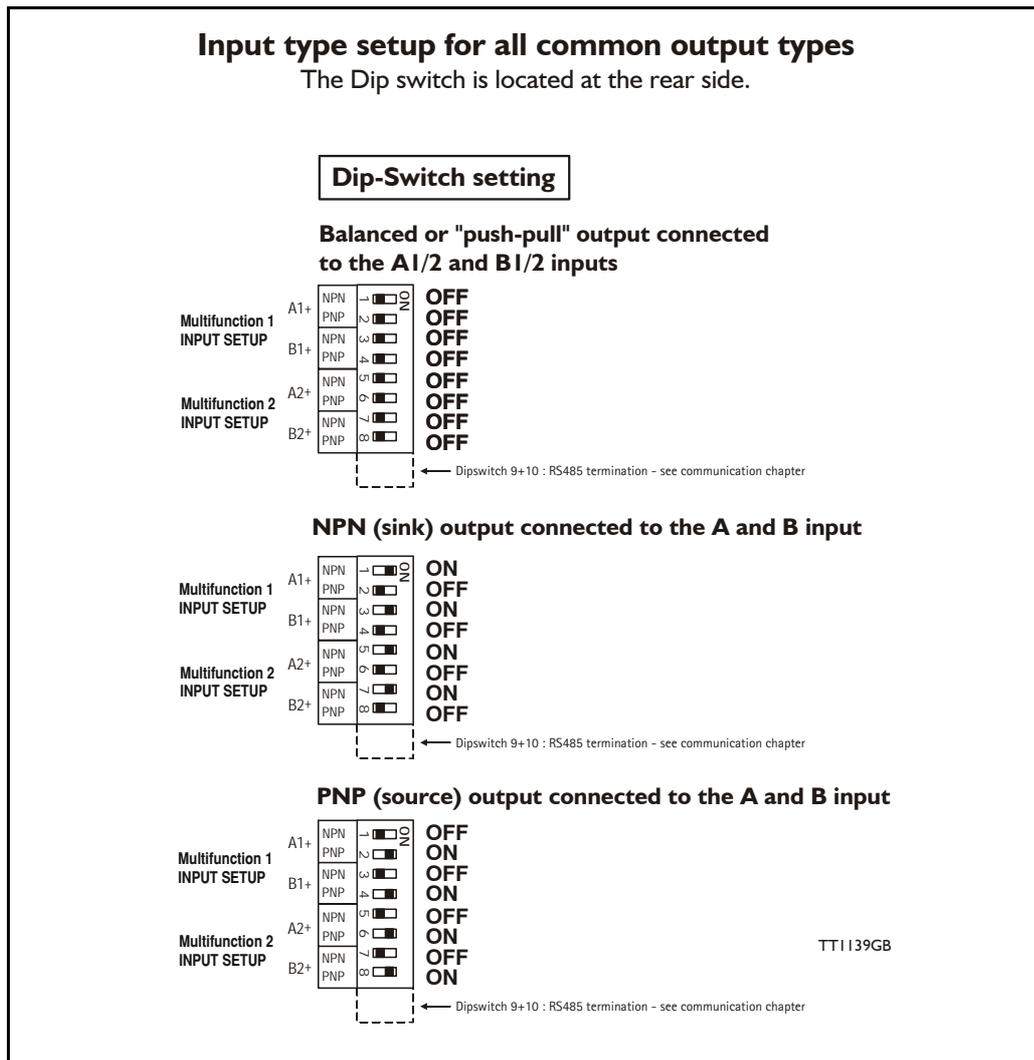
To see the specific connector pin-out please see the chapter *Expansion MAC00-B41 connector description, page 105*. A finished RS485 cable also exist. Please see *Cables for the MAC00-B41, page 107*



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4.3.9

General description: "Multifunction I/O".

The function of the Multifunction I/O is equal to that of the basic motor with the exception that the B41 module include an overvoltage protection and a dip-switch to set up what kind of signal source feeds the input (if the Multifunction I/O is set up as inputs). The illustration above shows how to set up the Multifunction I/O terminals as balanced/push pull, NPN or PNP input. The illustrations below show examples of connections for each of these signal types.

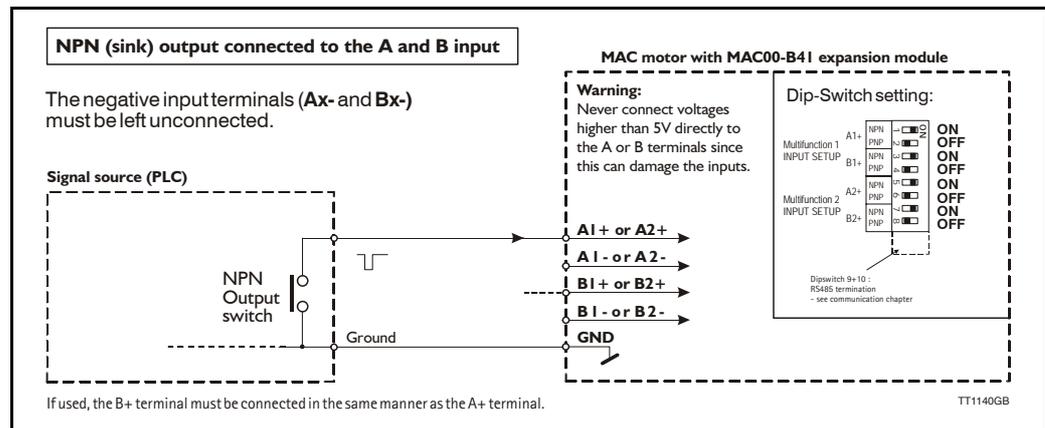
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4.3.10 Connecting an NPN signal source to the Multifunction I/O

The drawing below shows how to connect an NPN source to the MAC00-B41 multifunction I/Os. The diagram shows the A channel. The B channel must be connected in the same manner. Ensure that the Ax- and Bx- terminals are unconnected in order to maintain proper function.

Warning: Voltages higher than 5V must under no circumstance be connected directly to the input since this will damage the input permanently.

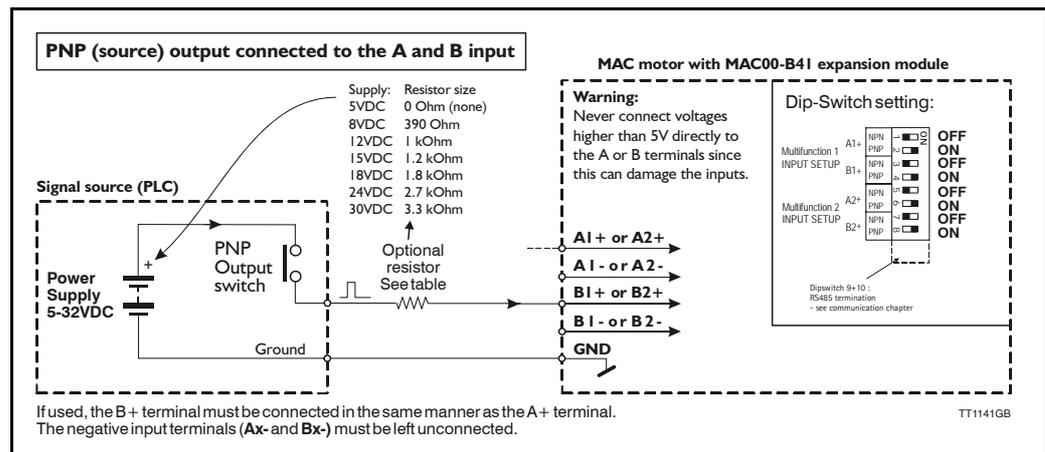


4.3.11 Connecting a PNP signal source to the Multifunction I/O

The drawing below shows how to connect a PNP source to the MAC00-B41 multifunction I/Os. The diagram shows the A channel. The B channel must be connected in the same manner.

Ensure that the Ax- and Bx- terminals are unconnected in order to maintain proper function.

Warning: Voltages higher than 5V must under no circumstance be connected directly to the input since this will damage the input permanently. Use a proper resistor as indicated in the table below.



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4.3.12 Connecting a balanced/push-pull signal to the Multifunction I/O

The drawing below shows how to connect a balanced or push-pull signal source to the MAC00-B41 multifunction I/Os. Use twisted-pair cable for the balanced signals in order to ensure noise immunity.

Note: If inputs are used in pulse-direction format input A (A_{x+}/A_{x-}) is pulse input and input B (B_{x+}/B_{x-}) is direction input.

Warning: Voltages higher than 5V must under no circumstance be connected directly to the input since this will damage the input permanently. Use a proper resistor as indicated in the table below.

