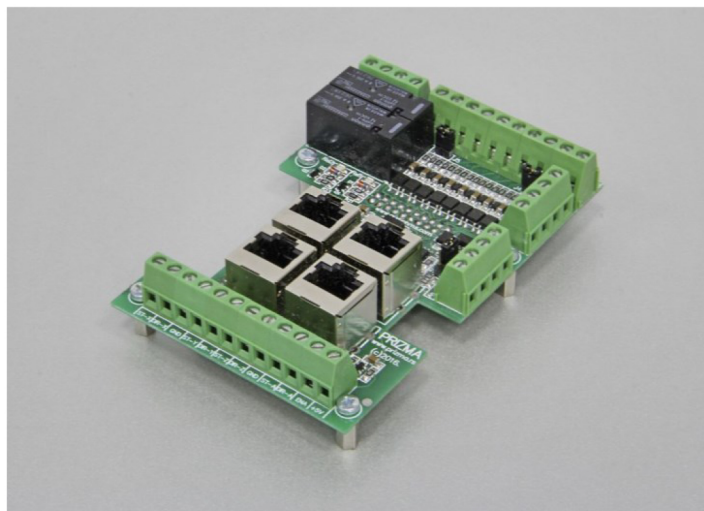




Advanced breakout for USB motion card is designed for use with USB motion card to enable connection of CNC controlling system which has up to 4 microstep drives MST-107 and/or DC servo drives DCS-3010 and/or DC servo drives with analog output DCS-100-A. The board can be used also for drives from other manufacturers that have opto-isolated STEP/DIR/ENA inputs and that require up to 15mA current for control signals.

Advanced breakout for USB motion card has two relay outputs that can be used for switching two loads (electro motors for spindle, vacuum scrap collector or similar). Status of relays is indicated by two LED indicators positioned on the board.

Advanced breakout for USB motion card can accept connection of 12 digital inputs, from which 8 is opto-isolated intended for voltage levels 15 – 24 VDC and 4 are TTL digital inputs.

The board has analog output with output voltage range of 0 – 5 V or 0 – 10 V which enables software control of spindle rotation speed, also analog input which accepts voltage in range 0 – 5 V.

For relays operation, also for operation of opto-isolated inputs, it is necessary to provide external power supply using appropriate connector on USB motion card.

Technical specifications

Function	Description
Number of axes	4 Every axis has dedicated STEP/DIR outputs ENABLE output is common for all axes
Number of digital inputs	12 in total - 8 opto-isolated inputs (24V logic) - 3 TTL general purpose inputs (with pull-up resistors 4.7 kΩ) - 1 Error input from DC servo drive control connector
Analog input	0–5 V
Analog output	Range 0–5 V or 0–10 V can be selected using jumper (For analog signal generation PWM signal from USB motion card is used)
Number of relay outputs	2
Rating for one relay output	250 VAC / 8A max – one NO (normally open) contact
On board power supply	+ 5 VDC / 150 mA max
Power supply	From power source 8 – 24 VDC / 250 mA that is connected to motion controller USB-MC
Dimensions	75 mm x 114 mm x 27 mm
Weight	150 g

NOTE: Shown specifications are subject to change without prior notice

Attaching Advanced breakout for USB motion card

Advanced breakout for USB motion card is delivered with fitted spacers 10 mm long (Figure 1 – detail 1) which needs to be disassembled. Figure 2 – detail 2 shows 4 spacers and 4 screws after disassembly.

Spacers should be installed onto threaded part of spacers that are positioned on USB motion card (Figure 2 – detail 3). It is important to notice that nuts that fasten spacers to USB-MC controller should be left in place (Figure 3 – enlarged detail 3).

Figure 3 – detail 4 shows properly installed spacer. Repeat procedure for 3 remaining spacers like it is shown on positions 6 (Figure 3).

Advanced breakout for USB motion card should be now placed on USB motion card (path 7 – Figure 3).

Using 4 screws (position 8 – Figure 4) fasten breakout board Advanced breakout for USB motion card (position 9 – Figure 4). Figure 5 presents Advanced breakout for USB motion card installed onto USB motion card.

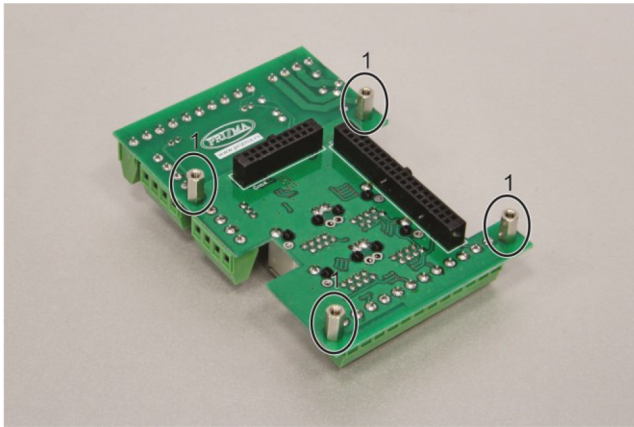


Figure 1

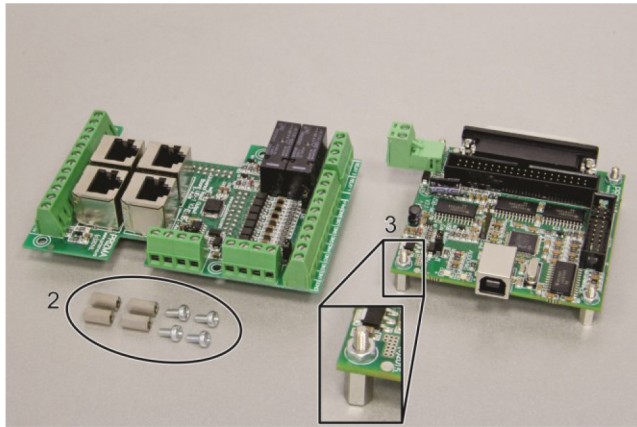


Figure 2

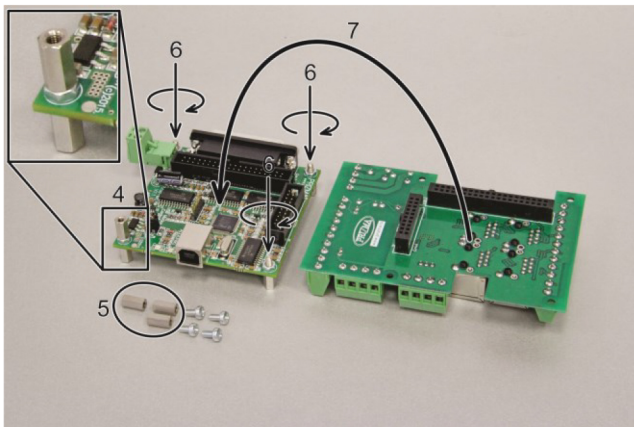


Figure 3

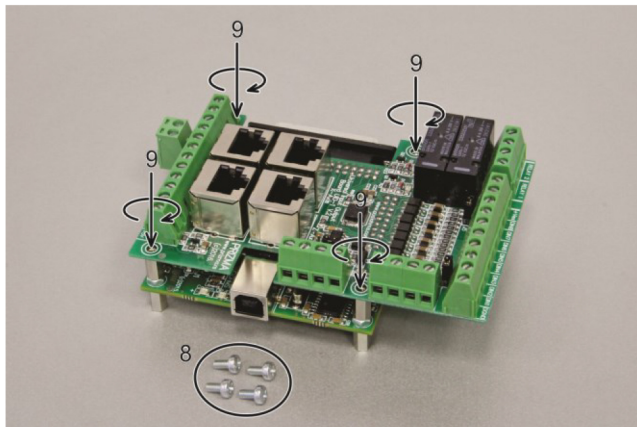


Figure 4

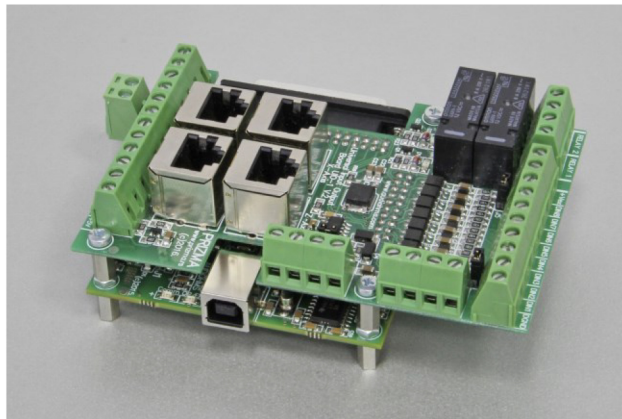


Figure 5

INPUT AND OUTPUT TERMINALS LAYOUT

Table 1 and Table 2 present layout of input and output lines on Advanced breakout for USB motion

card. Table 1 Output lines description – Port 1

Description	Mach3 pin (Pin#)	Output type
Step X	1	TTL
Dir X	2	TTL
Step Y	3	TTL
Dir Y	4	TTL
Step Z	5	TTL
Dir Z	6	TTL
Step A	7	TTL
Dir Z	8	TTL
PWM out	11	For analog output 0–5 V or 0–10 V
ENABLE	12	TTL open collector PNP
Relay out 1	13	250 VAC / 5 A – NO*
Relay out 2	14	250 VAC / 5 A – NO*
Not used	9, 10, 15 and 16	-

* NO – Normally Open

Table 2 Input lines description – Port 1

Description	Mach3 pin (Pin#)	Input type
DIN1	7	Opto-isolated, filtered inputs, 24V Minimum voltage level for logic one ≈14 VDC
DIN2	8	
DIN3	9	
DIN4	10	
DIN5	11	
DIN6	12	
DIN7	13	
DIN8	14	
DIN9	1	TTL, +5V pull-up resistor 4,7 kΩ
DIN10	2	TTL, +5V pull-up resistor 4,7 kΩ
DIN11	3	TTL, +5V pull-up resistor 4,7 kΩ
Error	5	TTL, +5V pull-up, resistor 4,7 kΩ; Line that is activated when error occurs on DC servo drive
Not used	4 and 6	-

State of input and output lines can be monitored from Mach3 software via window that is opened by selecting option **PlugInControl\USB-MC status...**

CONNECTION DIAGRAM FOR CNC CONTROLLING SYSTEM

WITH Advanced breakout for USB motion card

Input-output Advanced breakout for USB motion card can accept connection of 1 to 4 microstep drives MST-107. Figure 6 shows connection diagram for STEP/DIR/ENABLE command lines from Advanced breakout for USB motion card to MST-107 microstep drive for stepper motors.

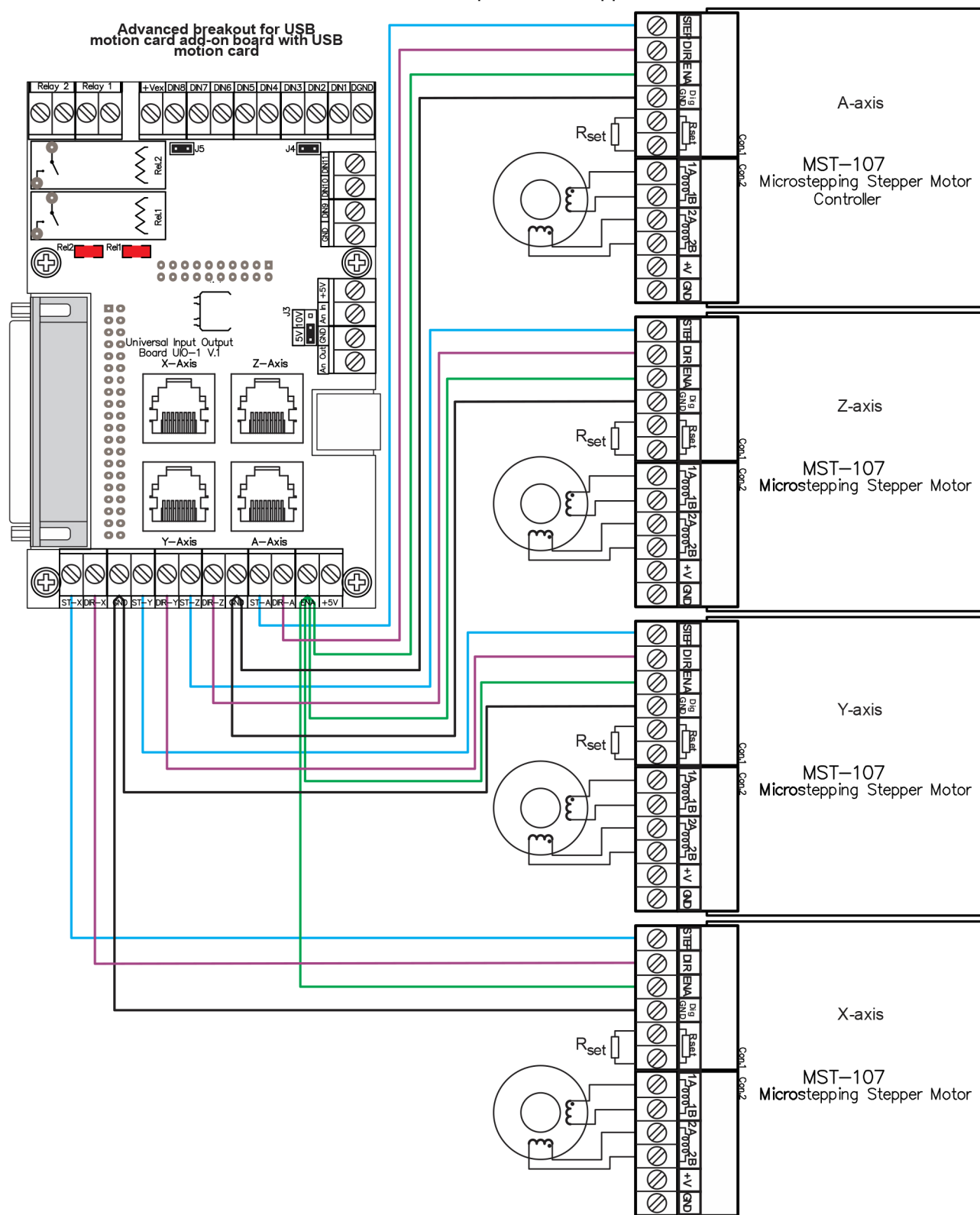


Figure 6

For supplying power to breakout board Advanced breakout for USB motion card and up to 4 microstep drives MST-107, it is recommended to use PSB-1 power supply board with built-in motor brake (Figure 7). More details about this power supply board and connection method can be found in user's manual for PSB-1.

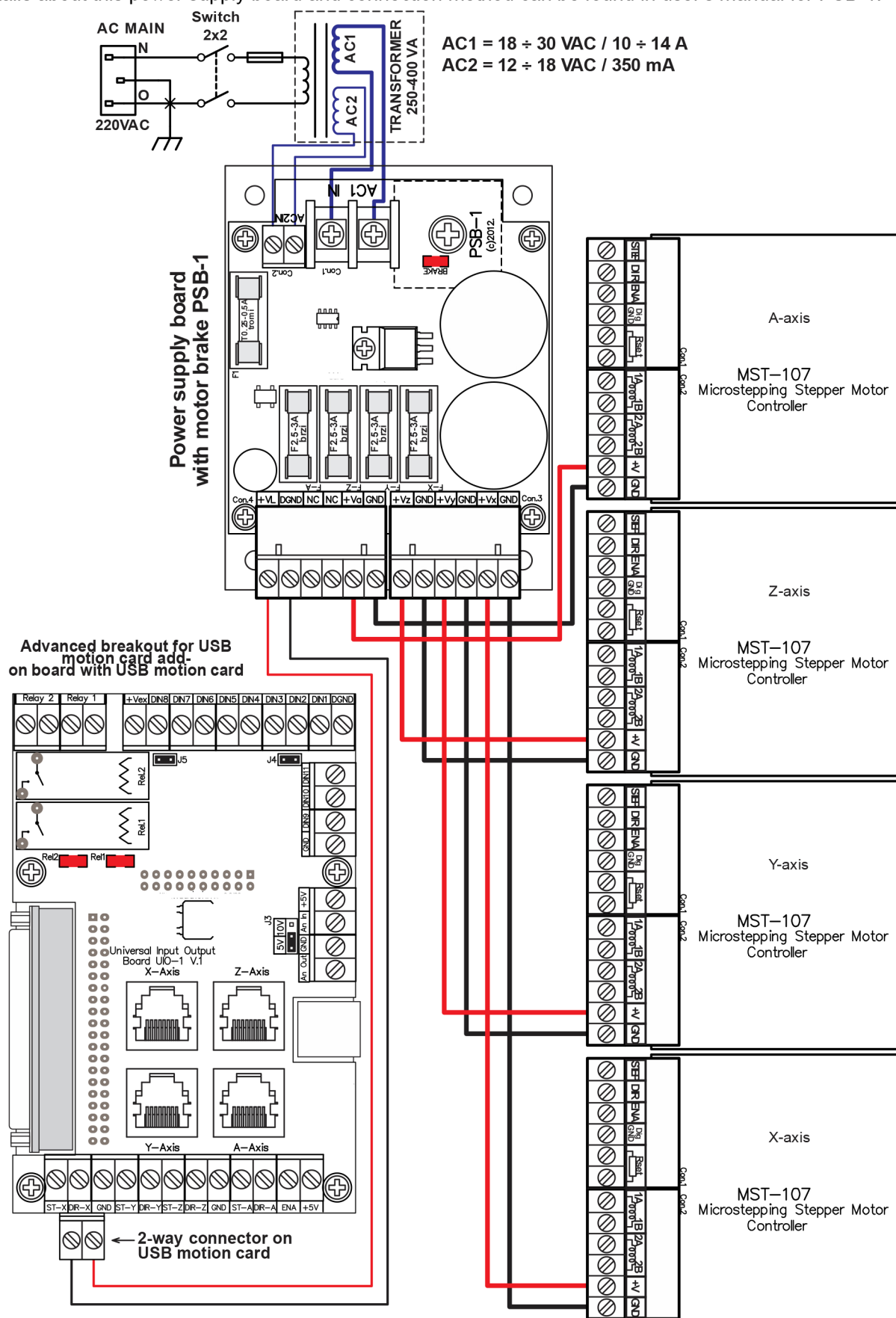


Figure 7

Users can also provide their own power supply. In that case Figure 8 shows recommended connection diagram for breakout board Advanced breakout for USB motion card and up to 4 drives MST-107. Power supply must have two independent sources, one for powering Advanced breakout for USB motion card (15 – 24 VDC / 500 mA) and other for supplying power to MST-107 drive (20 – 40 VDC, current depends on motors used – see manual for microstep drive MST-107). On +V supply line, for every drive MST-107, it is recommended to use fast-melting fuses that protect drives in case of overload.

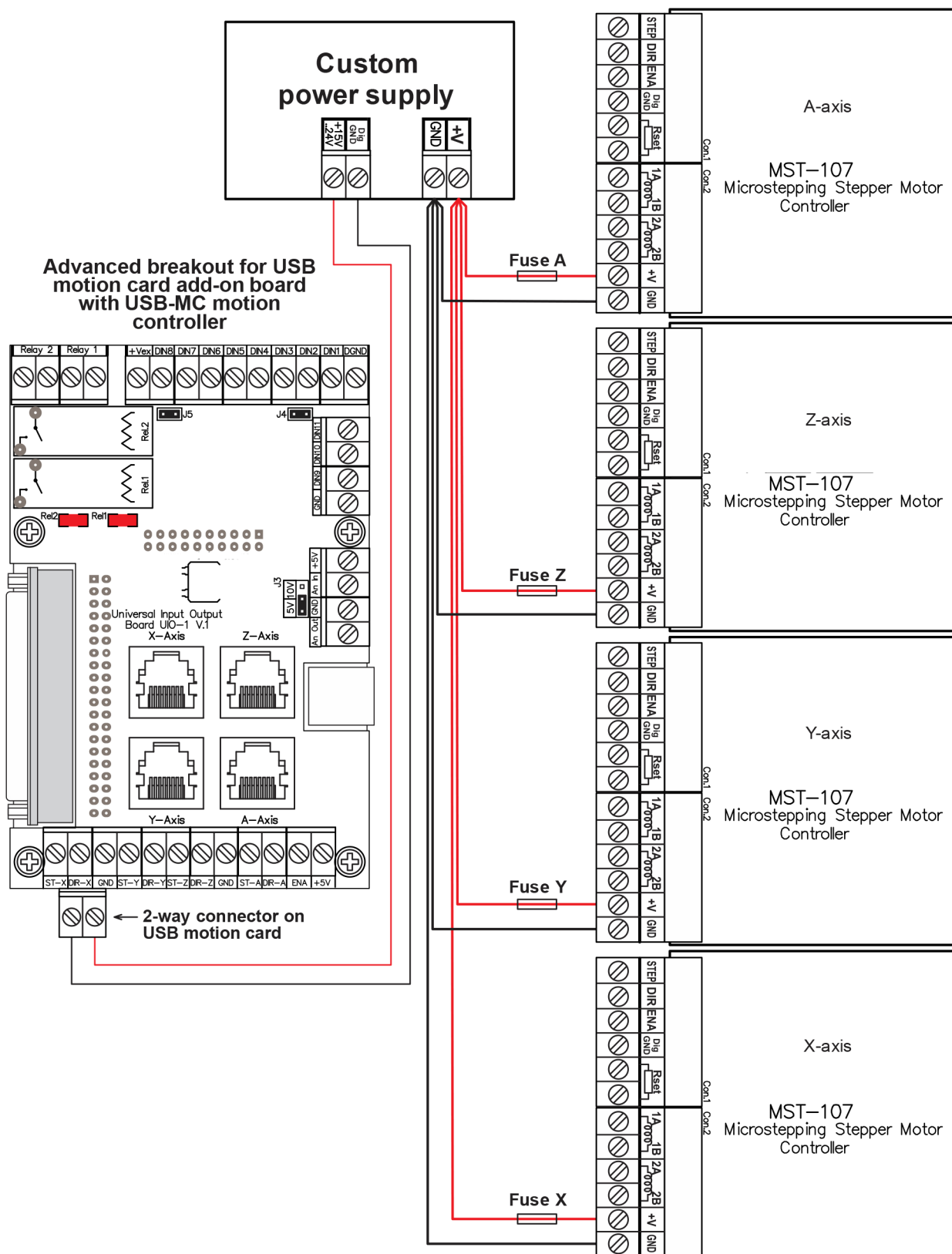


Figure 8

Figure 9 shows connection diagram for Advanced breakout for USB motion card with PC computer, connection of relay outputs and also analog input and analog output.

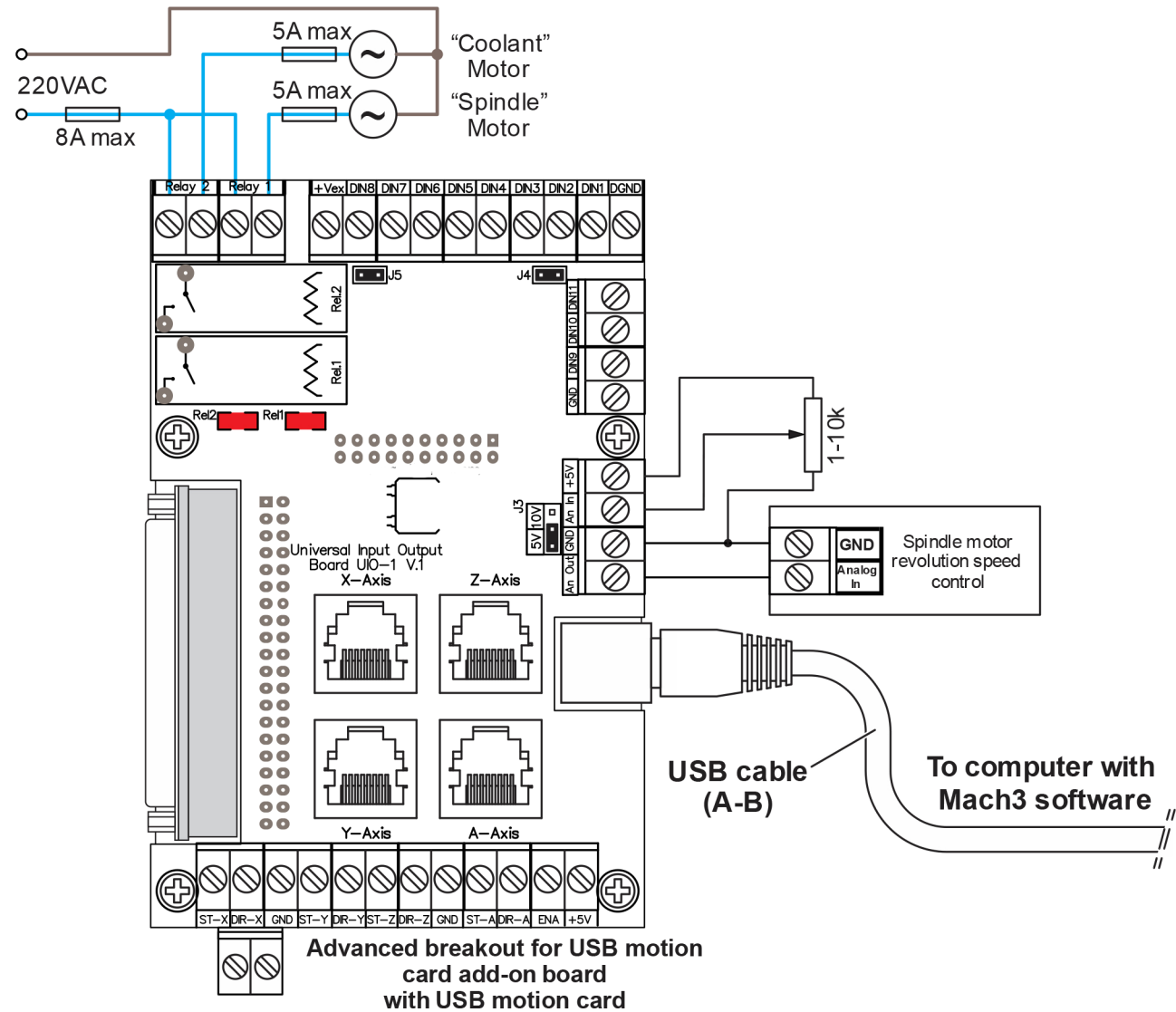


Figure 9

Maximum current through every individual relay is 5A, while total current for both relays should not exceed 8A. For currents greater than 5A it is recommended to use external relays with higher current rating and in that case these external relays could be switched by relays built in Advanced breakout for USB motion card.

NOTE: Negative contact of analog output (An Out) is galvanically connected to ground of Advanced breakout for USB motion card.

Figure 10 shows wiring diagram for breakout board Advanced breakout for USB motion card and 3 DC servo drives DCS-3010, also recommended configuration for power supply. Galvanically isolated power supplies are recommended for every individual DC servo drive DCS-3010, also independent galvanically isolated power supply for Advanced breakout for USB motion card.

DC motors can be powered from one common power supply. It is recommended to put protection fuses on every +Vmot supply line, for every DCS-3010 drive individually.

Advanced breakout for USB motion card can also accept connection of DC servo drives with analog output DCS-100A.

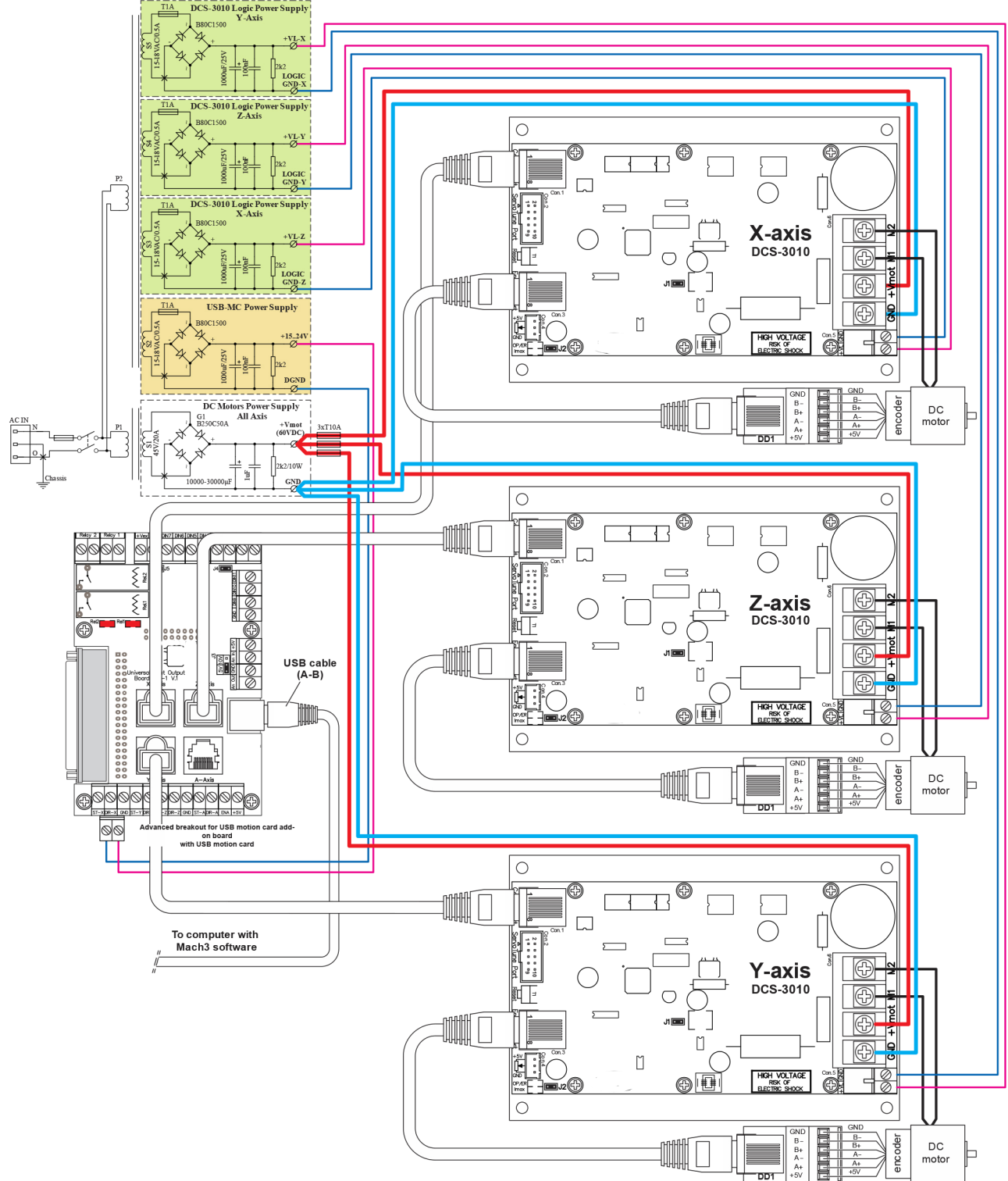


Figure 10

CONNECTING LIMIT SWITCHES

There are 2 modes for connection of limit switches:

- non-isolated mode and
- opto-isolated mode.

Figure 11 shows wiring diagram for the case of **non-isolated mode** for connection of limit switches. Digital inputs from DIN1 to DIN8 can accept electro-mechanic and also inductive limit switches with PNP type of output.

IMPORTANT NOTE: When connecting limit switches, like it is shown on Figure 11, it is required to set jumpers J4 and J5 in position. That way, for operation of limit switches DIN1 to DIN8 it is used power supply that is supplied to 2-pin connector on USB-MC controller board.

Digital inputs from DIN9 to DIN11 are of TTL type with built-in pull-up resistors of 4.7 k Ω , so Figure 11 shows one possible way of their connection.

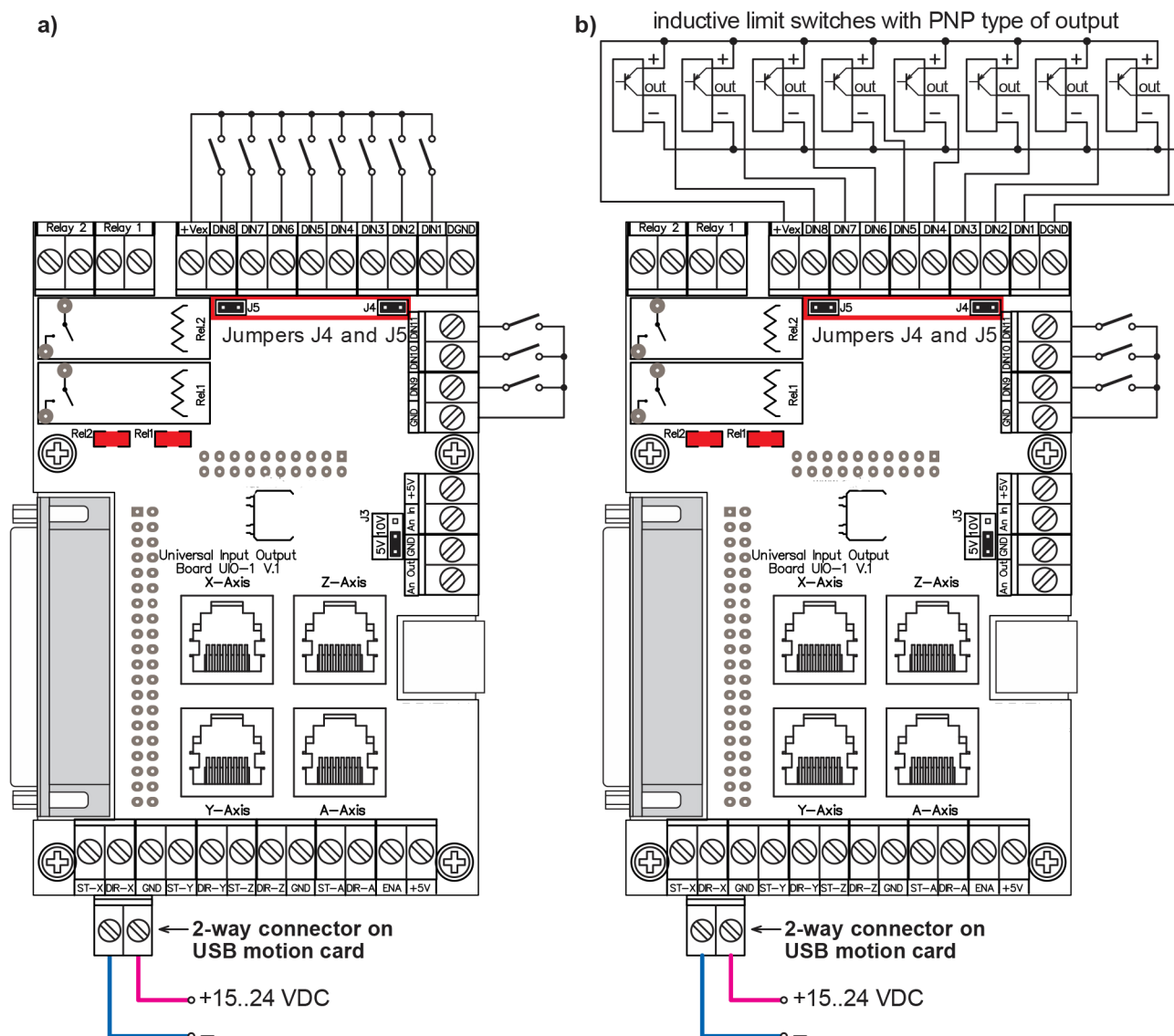


Figure 11 Non-isolated connection mode, a) electro-mechanical limit switches and b) inductive limit switches

Figure 12 shows diagram for connection of limit switches to digital inputs from DIN1 to DIN8 in **opto-isolated mode**. In this case it is required to provide external power supply 15 ÷ 24 VDC.

IMPORTANT NOTE: When connecting limit switches like shown on Figure 12 it is required to remove jumpers from positions J4 and J5. That way galvanic isolation is ensured between power supply for limit switches DIN1 to DIN8 and power for USB motion card (+Vs USB-MC).

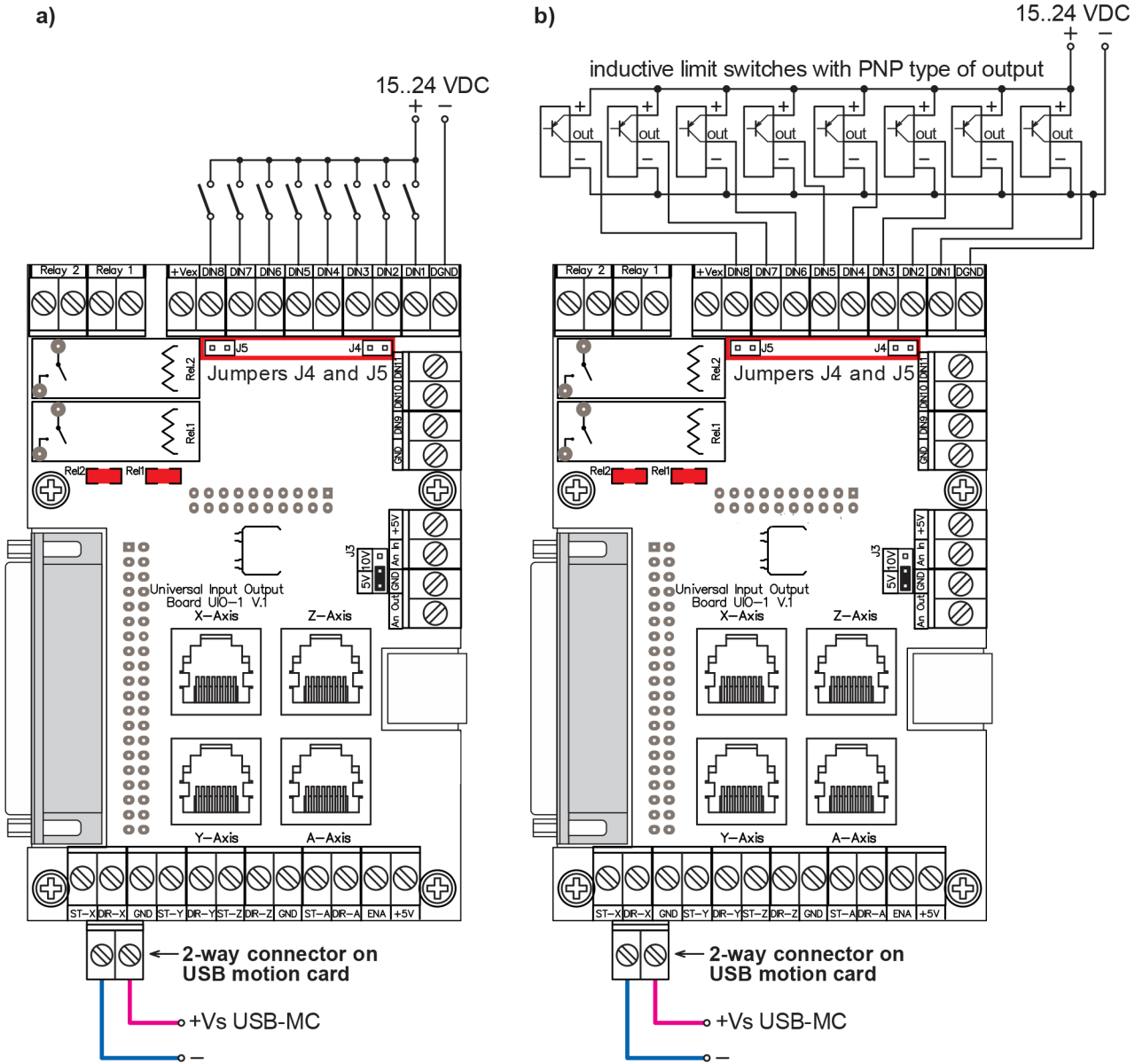


Figure 12 Opto-isolated connection mode, a) electro-mechanical limit switches and b) inductive limit switches

DOCUMENT REVISIONS:

- Ver. 1.0, August 2016., Initial version
- Ver. 1.1, February 2017., Minor revisions

