JetWeb

JX6-SM1

User Information

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1 Safety Instructions

This user information is only valid in connection with the safety instructions and the operating parameters of the higher level control (D-CPU, JX6-CPU200, JX6-CPU2 or JetControl 647).

This user information will later be replaced by an extended and corrected complete operator's instruction.

In this preliminary version, the functions of the JX6-SM1 expansion module will be described; it will also contain a function description of the JX6-CON software version 2.804. This expansion module can only be used in connection with the following controllers or devices:

System Requirements	
Controller Cards	**Starting from version**
JX6-CON	2.00
JX6-CON1	2.804
JX6-CON+	2.00
External module *bus* carrier	

These controls will be called JX6-CON in the description following.

2 Technical Data

Mechanical and Electrical Specifications	
Power supply	+5V -4% / +4%
Connections	DIR- and STEP-signal as OpenCollector and as RS422
Dimensions (H x W x D in mm)	17 mm x 54,51 mm x 120 mm
Power consumption	approx. 2 W
Ground	60 g

3 Hardware Description

3.1 Digital Inputs (End and Reference Switches)

All inputs are 24 V signals (related to 0 V current supply, respectively earth).
The end and reference switches are connected to the digital inputs of the JX6-CON and are therefore not available for further tasks any more.

Axis 1	Input 1	positive limit switch
	Input 2	negative limit switch
	Input 3	reference switch
Axis 2	Input 4	positive limit switch
	Input 5	negative limit switch
	Input 6	reference switch
Axis 3	Input 7	positive limit switch
	Input 8	negative limit switch
	Input 9	reference switch

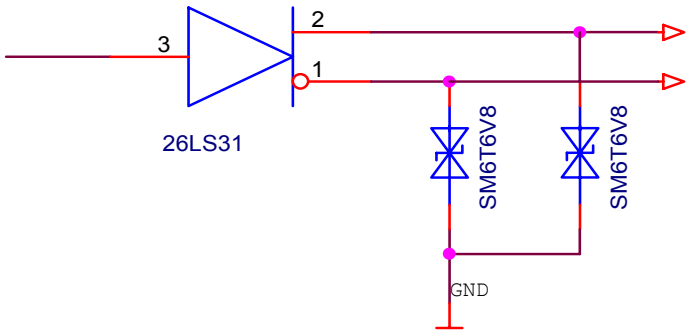
3.2 Outputs

There are two possibilities of supplying an output stage with step and direction signals.

1. RS 422
2. Open Collector (here, the 5 V output for the pull-up resistors can be used)

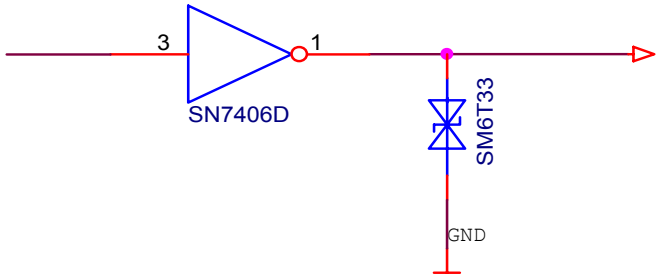
3.2.1 RS422 Outputs

The RS422 outputs have been physically established by the following output circuit:



3.2.2 OpenCollector Outputs:

The OpenCollector outputs have been physically established by the following output circuit:



The maximum collector current is 30 mA. For operation, an external PullUp resistor must be connected to 28 V max.

3.3 15-Pin Female SUB-D Connector

Pin 1	Ground
Pin 2	Step (Open Collector)
Pin 3	Dir (Open Collector)
Pin 4	K1+ (Option)
Pin 5	K1 - (Option)
Pin 6	K2+ (Option)
Pin 7	K2 - (Option)
Pin 8	+Step (RS 422)
Pin 9	- Step (RS 422)
Pin 10	+5 V output (option)
Pin 11	+ Dir (RS 422)
Pin 12	- Dir (RS 422)
Pin 13	N.C.
Pin 14	N.C.
Pin 15	N.C.

3.4 9-Pin Female SUB-D Connector

Pin 1	- Step (RS 422)
Pin 2	- Dir (RS 422)
Pin 3	Step (Open Collector)
Pin 4	Ground
Pin 5	5 V output (50 mA) (option)
Pin 6	+Step (RS 422)
Pin 7	+ Dir (RS 422)
Pin 8	Dir (Open Collector)
Pin 9	Ground

4 Light-Emitting Diodes

Axis 1

S1:	The positive limit switch is or was active
S2:	AXARR status: ON, if axis is positioned
S3:	The negative limit switch is or was active

Axis 2

S4:	The positive limit switch is or was active
S5:	AXARR status: ON, if axis is positioned
S6:	The negative limit switch is or was active

Axis 3

S7:	The positive limit switch is or was active
S8:	AXARR status: ON, if axis is positioned

The limit switches can be in the following statuses:

permanently ON:	The axis stands on the limit switch
flashing regularly:	The axis has recognized the limit switch; yet, it does not stand on the limit switch any more
flashing irregularly:	The axis has recognized the software limit switch

5 Software-Addressing

5.1 Axis Number

The first digit specifies the slot number of the controller card where the SM-module is located. The last digit specifies the number of the axis which is to be addressed by the module.

Axis xy
x = slot number
y = axis number (1...3)

5.2 Register Number

The registers are addressed with the help of five-digit numbers. The first digit always stands for the slot number. The second digit specifies the axis number. The last three digits make up the number of the axis register:

REG 1xyzzz
x = Module number
y = Axis number (1...3)
zzz = Number of the axis register

6 Register Description

Register 1xy000: Status register	
Function	**Description**
Read	Present status
Write	Assignment of individual bits
Value range	bit-coded, Bit 0 .. Bit 23
Value after reset	1024 (Bit 10 has been set)

This register is bit-coded:

Bit 0: Reference has been set

Bit 1: AXARR = the position has been reached. At the beginning of a positioning run, the bit will be cleared. It will be set again, when the destination window has been reached.

Bit 2: The actual position is in the destination window

Bit 3: unused

Bit 4: The negative limit switch is active

Bit 5: The positive limit switch is active

Bit 6: The reference switch is active

Bit 7: The software limit switch was or is active.

Bit 8: The hardware limit switch was or is active.

Bit 9: Enable (the position controller has been enabled)

Bit 10: unused

Bit 11: unused

Bit 12: Reference run error

Bit 13: Busy (only valid for commands 9 through 12 and 42)

Bit 14: The software limit switch has been enabled (this function is activated by writing 1 into this bit)

Bit 15: unused

Bit 16: The axis is in the deceleration ramp

Bit 17 - 23 unused

Register 1xy001: Command register	
Function	**Description**
Read	Latest command
Write	New command
Value range	0 ... 255
Value after reset	0

The following commands have been defined:

0: Stop with deceleration ramp:
1: Activate the axis
3: Set the reference
4: Clear the reference
5: AXARR
9 - 12: Automatic machine referencing (see description of DELTA-SV)
17: Relative positioning
18: Absolute positioning
19: Continue the interrupted positioning run
22: Stop at the reference position - ON
23: Stop at the reference position - OFF
90: Activate the third axis

Register 1xy002: Set position	
Function	**Description**
Read	Latest set position
Write	New set position
Value range	-8388608 ... +8388607
Value after reset	0

Register 1xy003: Set speed (stepper frequency)	
Function	**Description**
Read	Present set speed
Write	New set speed
Value range	Start-stop-frequency ... register 1xy021
Value after reset	300

The nominal speed will not, as usually, be defined in Hz but in rpm. Nevertheless, it can easily be converted into a frequency parameter.

$$Frequency[Hz] = \frac{1xy018 \bullet 1xy017 \bullet 4 \bullet 1xy003}{60 \bullet 1xy021}$$

The frequency is the respective maximum value; this means of course, that for acceleration or deceleration there will also be other values.

Example:

If now, after starting up the controller, the maximum frequency is calculated, there will be the following result:

Frequency = 3000*500*4*300 / (60*1000) = 30 kHz

Register 1xy004: Control register	
Function	**Description**
Read	Present control value
Write	New control value
Value range	bit-coded, Bit 0 .. Bit 23
Value after reset	3

This register is bit-coded:

Bit 0: 0 = Reference switch 0 V is active
1 = Reference switch 24 V is active

Bit 1: 0 = Limit switches are 0 V-active
1 = Limit switches are 24 V-active

Bit 3: 0 = DIR signal equals logic 1, if positioning in positive direction is made
1 = DIR signal equals logic 0, if positioning in positive direction is made

Bit 5: 0 = The limit switches are active
1 = The limit switches have been deactivated; the digital inputs can be used for other purposes.

Bit 7 0 = The reference switch is active
1 = The limit switch has been deactivated; the digital input can be used for other purposes.

Register 1xy005: Acceleration ramp	
Function	**Description**
Read	Present acceleration ramp
Write	New acceleration ramp
Value range	2...32767 (Hz / 4ms)
Value after reset	10

The peak value of 32767 (Hz / 4 ms) is dependent on registers 1xy008, 1xy017 and 1xy018.

The time to reach the peak frequency, which is the start ramp time T_{Start}, is calculated as follows:

$$T_{Start}[s] = \frac{\frac{1xy018 \bullet 1xy017 \bullet 4 \bullet 1xy003}{60 \bullet 1xy021} - 1xy008}{1xy005 \bullet 250}$$

Register 1xy006: Deceleration ramp	
Function	**Description**
Read	Present acceleration ramp
Write	New acceleration ramp
Value range	2 ... 32767 (Hz / 4ms)
Value after reset	10

The peak value of 32767 (Hz / 4 ms) is dependent on registers 1xy008, 1xy017 and 1xy018. If the ramps are very steep, they can overshoot. In this case, no AXARR signal will be output in the status register.

The time from peak frequency to standstill, which is the deceleration ramp time T_{Stop}, is calculated as follows:

$$T_{Stop}[s] = \frac{\frac{1xy018 \bullet 1xy017 \bullet 4 \bullet 1xy003}{60 \bullet 1xy021} - 1xy008}{1xy006 \bullet 250}$$

Register 1xy007: Destination window	
Function	**Description**
Read	Present destination window
Write	New destination window
Value range	-8388608 ... +8388607
Value after reset	0

Register 1xy008: Start-stop frequency	
Function	**Description**
Read	Present start-stop frequency
Write	New start-stop frequency
Value range	3 ... 4800 Hz
Value after reset	300

Attention:

In this register, the maximum frequency to be output is defined. If, for example, a linear interpolation is active, at which an axis is to receive a setpoint value smaller than the value defined in register 1xy008, the frequency will be output to register 1xy008.

Register 1xy009: Actual position	
Function	**Description**
Read	Present actual position
Write	illegal
Value range	-8388608 ... +8388607
Value after reset	0

Register 1xy014: Positive software limit switch	
Function	**Description**
Read	Present positive software limit switch
Write	New positive software limit switch
Value range	-8388608 ... +8388607
Value after reset	0

Register 1xy015: Negative software limit switch	
Function	**Description**
Read	Present negative software limit switch
Write	New negative software limit switch
Value range	-8388608 ... +8388607
Value after reset	0

Register 1xy017: Encoder line number	
Function	**Description**
Read	Present encoder line number
Write	New encoder line number
Value range	0 ... 10000*
Value after reset	500

Here, the value must be calculated by the following formula:
Register 1xy017 = Lines/Rotation / 4

Register 1xy018: Maximum speed	
Function	**Description**
Read	Present maximum speed
Write	New maximum speed
Value range	0...32767 rpm*
Value after reset	3000 rpm

*** Note:**

The product of registers 1xy017 and 1xy018 must not exceed the value of 15,359,000.

Register 1xy021: Scaling of the set speed value	
Function	**Description**
Read	Present scaling
Write	New scaling
Value range	0...32767
Value after reset	1000

Register 1xy069: Impulse width of the step signal	
Function	**Description**
Read	Present impulse width
Write	New impulse width
Value range	2...65535
Value after reset	10

This register has got the following unit: [1xy069*100*ns]
This results in a maximum Low Period of 65535*0,1*us=6,55 msec.

Register 1xy119: Actual position of the incremental encoder [optional]	
Function	**Description**
Read	Enquire for present value
Write	Definition of a new value
Value range	-8388608 ... +8388607
Value after reset	0

7 Limitations

1. The shortest calculated semicircular arc length must not be smaller than 6000 increments (as of version 2.064). Up to version 2.064, it is 600 increments.
2. If a lower start-stop-frequency has been defined, a delay may occur in this proportion as well.
3. In a linear interpolation, the ratio between the virtual axis and an interpolated axis must not be greater than 256. (Internal limitation
4. The lowest start-stop-frequency is 3 Hz.

Revision #	Name	Date	Alterations
2		25.07.2000	Calculation of start-, stop-time
3	Seher	15.01.2001	Reg 4: Bit0 = Ref, Bit1 = End
4	Seher	28.05.2001	Integrated output circuit
5	Seher	28.06.2001	Command 90 integrated
6	Seher	28.02.2002	Limit and reference switch can be deactivated
7	Seher	08.03.2002	New format
8	Seher	27.03.2002	Safety Instructions
9	Seher	19.11.2002	Command 1