SAIA® Process Control Devices

Motion control modules for stepper motors

PCD4.H2x5

with new HSMC20-98-P processor

(Supplement to existing manual 26/730 E)

Edition 26/730 E3 - 10.99

Subject to technical changes

Contents

Notes

1. General

The PCD4.H2x5 modules are reworked versions of the previous PCD4.H2 stepper motor modules. This reworking was necessary because the previous IC controller (Rubran HSMC 20 CP) will no longer be manufactured.

Rubran has developed a successor, the model HSMC20-98-P, which is extensively compatible with the previous controller. The new controller is based on the PIC microchip. (The previous controller was constructed on the old Hitachi processor). The redesign was necessary because the new controller will be supplied in the SMD housing (PLCC44 instead of DIL 40).

During the redesign, the I/O ASICs and various logic ICs were also replaced with a CPLD Xilinx XC9572.

The hardware consists of the CPLD, two stepper motor controller ICs (only one for the H215), 6 inputs for the limit and reference switches, 6 outputs for stepper motor drives and 4 outputs for the PCA2.D14 display module drive.

2. Technical data

2.1 Technical data for hardware

The PCD4.H2x5 module is made up of the following parts:

- CPLD (Complex Programmable Logic Device) with PCD2 bus interface and various logic functions
- 2 stepper motor controllers, HSMC20-98 P (1 for H215)
- 4 digital outputs 24V/100 mA for the PCA2.D14 display
- 6 digital outputs (open collector) for the stepper motor drive
- 6 digital inputs for the limit and reference switches

2.2 Electrical specifications

Internal power consumption

+5 V: 70 .. 95 mA
Uext: 0 .. 24 mA + ext. load current

External supply

Terminals +/- (Uext):
19 .. 32 VDC smoothed,
permissible ripple max. 10% (for display outputs)

Terminals V+1 / V+2
5 .. 32 VDC smoothed,
permissible ripple max. 10%

Digital outputs

Outputs for stepper motor driver:
2 x 3 digital outputs (pul, dir, mot) with pull-up resistors 2.2 kΩ (sink operation)
Voltage range: 5 .. 32 VDC smoothed
max. output current: 20 mA
Output delay: max. 1 µs, longer for an inductive load, due to recovery diode.

Display outputs:
4 digital outputs for max. 100 mA (source operation), not short-circuit proof
Voltage range: 19 .. 32 VDC smoothed

No electrical isolation at outputs.

2.3 Function-specific data

The functions of the new PCD4.H2x5 are extensively compatible with the previous PCD4.H2 module. The homing procedure has had to be adapted and the manual functions are no longer available. It is not therefore possible to execute any manual start or stop of pulse output. Nor is it possible to output an endless pulse string.

The motion profile parameters have been retained:

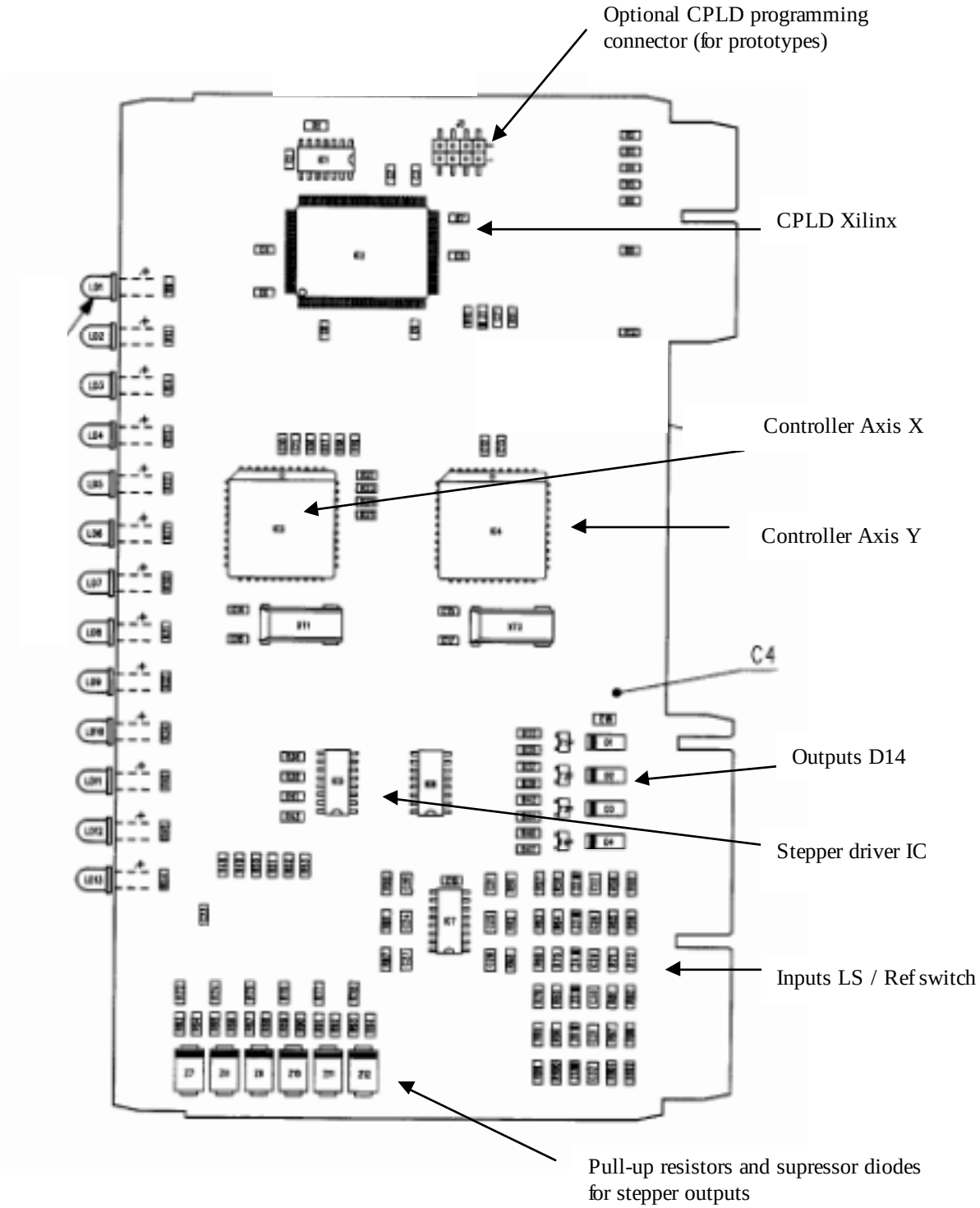
- Max. position : 16 777 215 steps (24 bit)
- Max. frequency : 20 000 Hz
- Max. start/stop frequency : 10 000 Hz
- Acceleration: 1 kHz/s ... 1000 kHz/s (resolution = 1 kHz/s)
- Max. acceleration ramp : 65 535 steps (16 bit)

2.4 Bus addressing

The PCD4.H2x5 occupies 16 addresses on the PCD bus.

Address +BA	**Data read** (inputs)	**Data write** (outputs)
0	Data bit 0 (LSB)	Data bit 0 (LSB)
1	Data bit 1	Data bit 1
2	Data bit 2	Data bit 2
3	Data bit 3	Data bit 3
4	Data bit 4	Data bit 4
5	Data bit 5	Data bit 5
6	Data bit 6	Data bit 6
7	Data bit 7 (MSB)	Data bit 7 (MSB)
8	Busy (low = busy)	Select (low = X, high = Y)
9	Error X (low = error condition)	Write (WR)
10	Halt X (high = halt condition)	Halt command
11	Stop X (low = stop condition)	Reset, low = reset X,Y
12	not used (diagnostic)	Enable D14 1st line
13	Error Y (low = error condition)	Enable D14 2nd line
14	Halt Y (high = halt condition)	Clock D14
15	Stop Y (low = stop condition)	Data D14

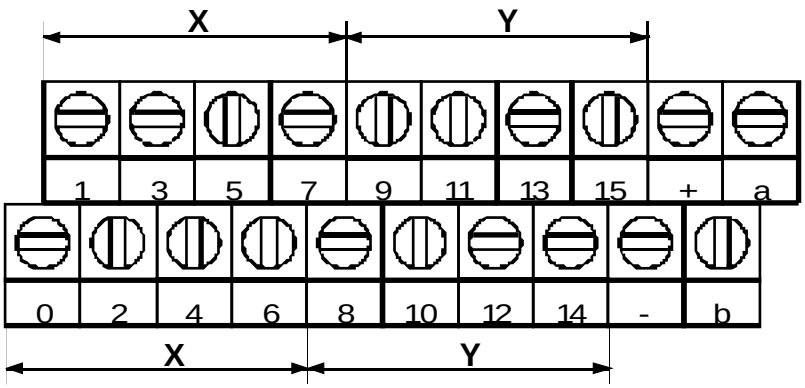
3. Presentation



4. Connections and LEDs

4.1 Terminals (on bus module)

Pin configuration is the same as for the previous PCD4.H2 module.

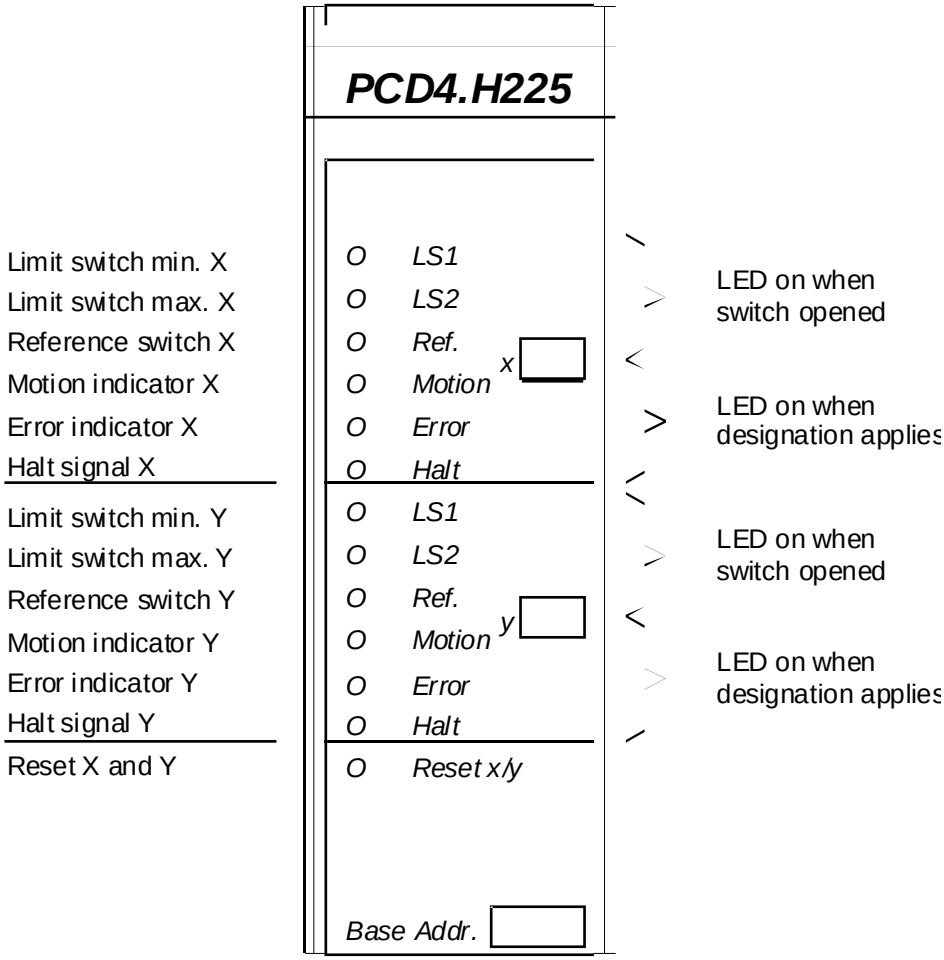


Terminals for X and Y axes

Function		X axis	Y axis
Limit switch min. Limit switch max. Reference switch	LS1 LS2 REF	1 3 5	9 11 13
Step pulses Direction Motion signal	PUL DIR MOT	0 2 4	8 10 12
Supply for signal outputs	V+1/V+2	6	14
Enable signal for PCD2.D14	EN	7	15
Common terminals Supply for PCD2.D14 outputs 0V connection, frame ground signal for PCA2.D14 Data signal for PCA2.D14	Clock		 + - a b

4.2 Front panel and LEDs

The front panel and LED meanings are the same as for the previous PCD4.H2 module.



5. Programming

All FBs have been adapted for the new controller. The new version (for test purposes) is $2.01.

The new FBs are **no longer** compatible with the previous ones. The new FBs make use of the instruction SYSRD. This instruction is only supported by CPUs of the 'Mxx5' series, from firmware version 'V00C'.

In consequence, therefore, the present new FBs can only be used with CPUs 'Mxx5' from firmware version 'V00C'.

5.1 Modified instructions

The following instructions (FBs) have been modified:

RSMC Reset Stepping Motor Controller

Adapted for a longer start-up sequence with the new controller:

Processing time **new: 250 ms**
previously: 0.7 ms

LVP Load Velocity Profile

The velocity profile is now stored in default profile no. 4 (see also 5.2: New instructions)

Processing time: **new: 26 ms**
previously: 14 ms

5.2 New instructions

The following instructions (FBs) are new additions:

- REFUP Reference search in positive direction
- REFDOWN Reference search in negative direction
- LVP0 save velocity profile no.0
- LVP1 save velocity profile no.1
- LVP2 save velocity profile no.2
- LVP3 save velocity profile no.3
- AVP0 activate velocity profile no.0
- AVP1 activate velocity profile no.1
- AVP2 activate velocity profile no.2
- AVP3 activate velocity profile no.3
- AVP activate default velocity profile no.4 (saved with LVP)

After an LVP instruction 'x', the profile specified with 'x' is activated.

Default velocity profile no. 4 comes into use during the homing procedure.

5.3 Instructions no longer supported

The following instructions (FBs) are no longer supported, since they no longer exist in the new controller.

- CAV The frequency profile is always precise
- REF The new instructions
  REFUP / REFDOWN should be used.
- REFLS ditto
- LSREF ditto
- MANCON Manual functions are no longer supported.
- AUTOCON ditto
- OSF ditto
- OSB ditto
- SSFF ditto
- SSFB ditto
- HFF ditto
- HFB ditto

5.4 Homing

The new homing procedure runs at the frequency defined (LVP instruction) in the default velocity profile no.4 as parameter 'para+3' (max. frequency). In order to start up homing, the axis must be in the normal range of motion (no safety limit switches active). The correct search direction (REFUP / REFDOWN) must be selected to prevent travel from ending prematurely when the axis encounters a safety limit switch.

If the reference switch is actuated (L), the axis stops according to the specified ramp and runs freely at the start/stop frequency in the opposite direction from the reference switch. Afterwards, the direction changes again, the axis travels back to the reference switch and stops.

5.5 Frequency profile without CAV

Another small difference compared with the previous version lies in the frequency profile.

With the previous controller, the exact, predefined frequency was only reached after processing of the CAV instruction (Compute Accurate Velocity). If the CAV instruction was not used, the frequency reached deviated somewhat from the programmed frequency (e.g. 960 Hz instead of the programmed 1000 Hz).

In the new controller frequency is always reached exactly. The CAV instruction has been removed.

Notes