Device Description

NDSB-HMI

NDSB-NET

netDIMM StarterBoard

Edition: 2
Language: English (EN)

Hilscher Gesellschaft für Systemautomation mbH

Web: www.hilscher.com

List of Revisions

Index	Date	Version	Chapter	Revisions
1	02.02.07		all	created
2	25.05.07	1	1.3	Block diagram of NDCM 500-HMI updated Blockdiagram of NDCM 100-NET added

Although this device has been developed with great care and intensively tested, Hilscher Gesellschaft für Systemautomation mbH cannot guarantee the suitability of this device for any purpose not confirmed by us in writing.

Guarantee claims shall be limited to the right to require rectification. Liability for any damages which may have arisen from the use of this device or its documentation shall be limited to cases of intent.

We reserve the right to modify our products and their specifications at any time in as far as this contribute to technical progress. The version of the manual supplied with the device applies.

Table of Contents

1 Description

1.1 Introduction

The purpose of the NDSB starter boards is to provide a low cost and yet extensive possibility to evaluate the NDCM500-HMI and the NDCM100-NET, both members of the netDIMM CPU module family.

The NDSB starter board comes in two different options, both based on the same PCB:

- NDSB-NET
- NDSB-HMI

The only difference between the two starter boards are the Connectors for a Display with Touchpanel and and SD-Card or MMC, which are available on the NDSB-HMI but not on the NDSB-NET. Further, the NDSB-HMI comes mounted to a carrier board, along with a 3.5” TFT Display with Touchpanel.

Both starter boards provide the connectivity of the earlier released NXSB100 starter board, which uses the netX directly on the board, including JTAG, Digital I/O, Analog In, DPM/Extension Bus Interface, UART0, USB, 2 Ethernet Ports, one Devicenet Port and one Profibus Port, whereas the Fieldbus ports can not be used concurrently.

The NDSB-HMI, although intended to be used along with the NDCM500-HMI, can also be used with the NDSB100-NET module, however the Display Connector can not be used to drive a display, as the NDSB100-NET does not provide the appropriate signals.

On the other hand, the Fieldbus Status LED pairs COM and MNS have no function when using the NDCM500-HMI, as this module does not provide the appropriate signals.

NOTE:
These starterboard NDSB-NET and NDSB-HMI use simplified circuits (no galvanic isolation) for their physical fieldbus interfaces and are also in no way optimized in terms of EMC compatibility. These products are intended to be used for evaluation and development purposes in lab environments only and are not suitable for production use!

1.2 Overview NDSB-NET and NDSB-HMI

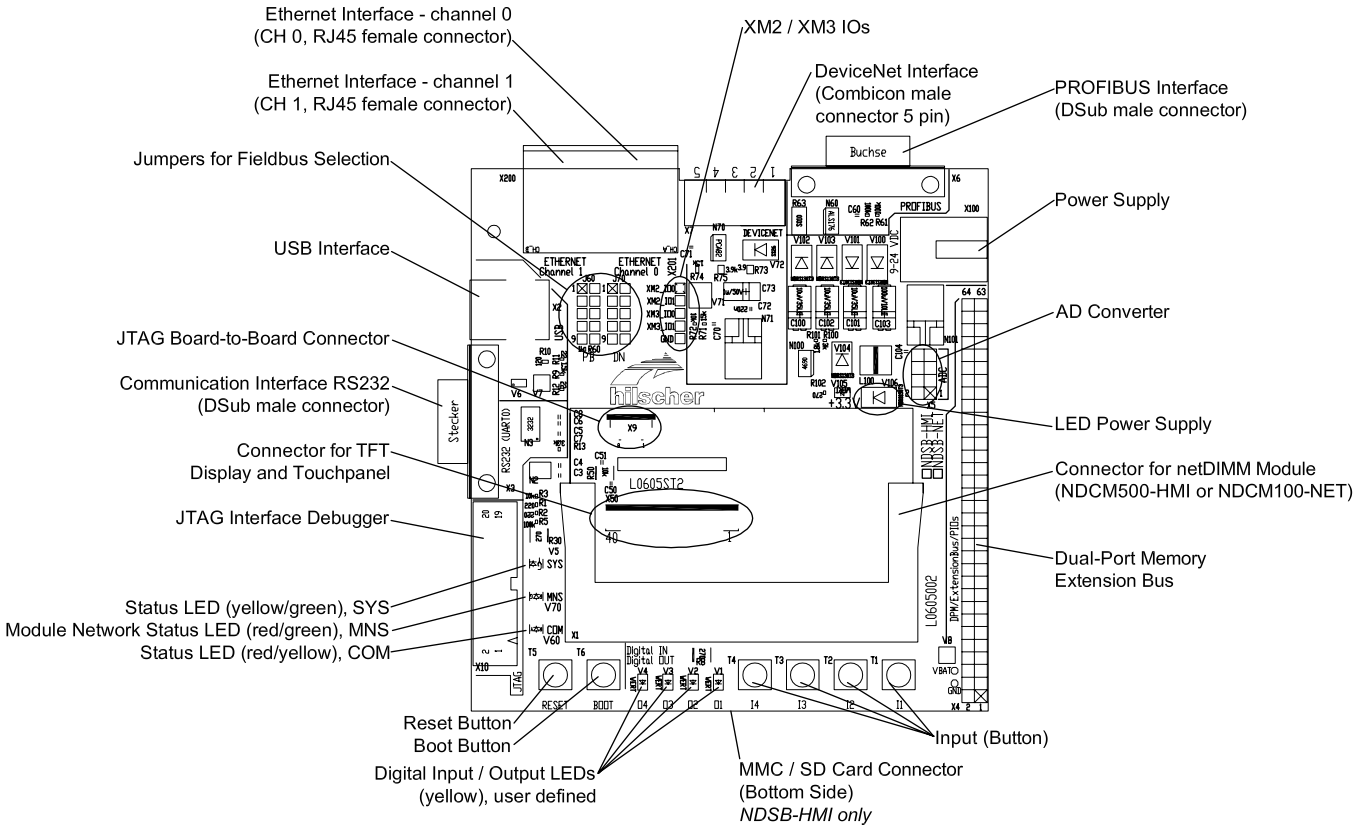


Figure 1: Overview NDSB-NET/HMI

1.3 Block diagram

1.3.1 NDCM 100-NET

The block diagramm shows the netDIMM NDCM 100-NET Module together with the starter board.

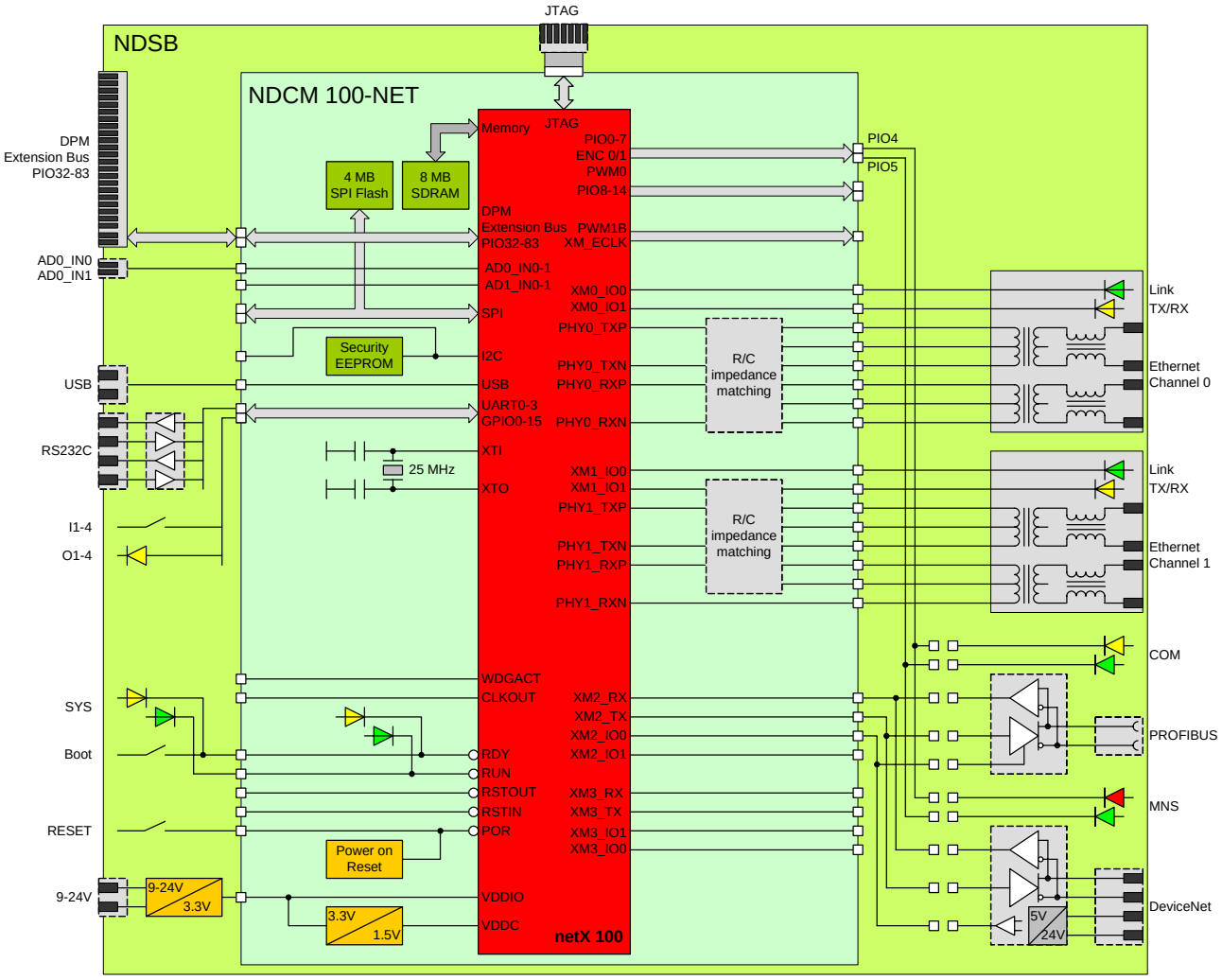


Figure 2: Block Diagram NDCM 100-NET and NDSB

1.3.2 NDCM 500-HMI

The block diagramm shows the netDIMM NDCM 500-HMI Module together with the starter board.

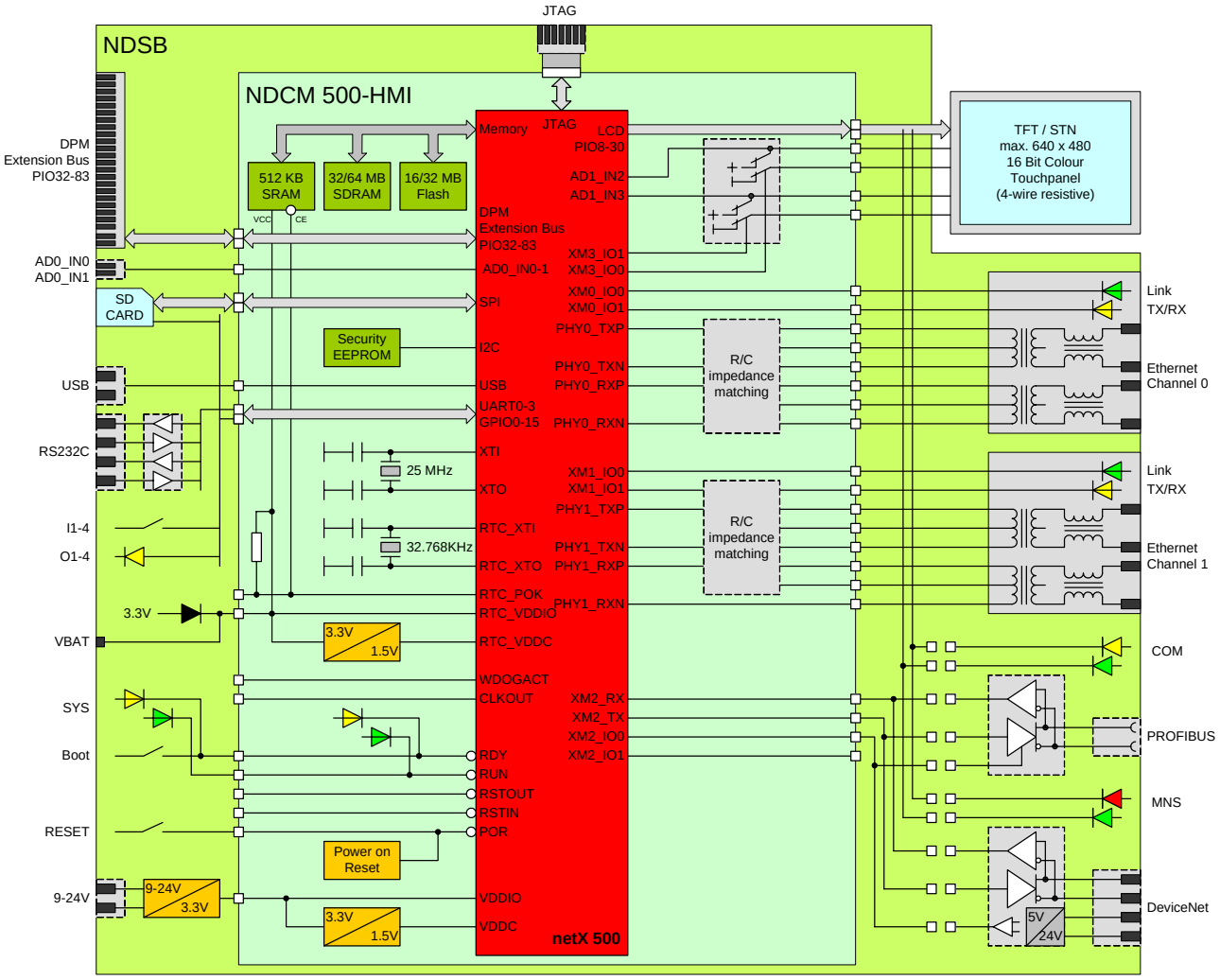


Figure 3: Block Diagram NDCM 500-HMI and NDSB

2 Display and Control Elements

2.1 LEDs

LED	Color	Controlled by
+3.3V	green	Power Supply
SYS: Status LED	yellow / green	RDYn / RUNn
O1: Digital Out	yellow	GPIO 8
O2: Digital Out	yellow	GPIO 9
O3: Digital Out	yellow	GPIO 10
O4: Digital Out	yellow	GPIO 11
MNS: Module Network Status LED	green / red	PIO4 / PIO5
COM: Status LED	yellow / red	PIO4 / PIO5

Table 1: LEDs

2.1.1 Power LED

The green +3.3V LED is lit, when power is applied to the board and the onboard 3.3V power supply is operating.

2.1.2 SYS LED

The SYS Status Dual LED is controlled by the RDYn and RUNn signals from the NDCM module.

Depending on the corresponding status register of the netX, this LED can either show yellow (RDY= 0, RUN=1) or green (RDY=1, RUN=0) colour. If both pins are low or high, the LED will be off.

When the board is in Bootstart mode (see chapter 2.2.2) The yellow SYS LED will flash with a frequency of 1Hz.

2.1.3 Digital Output LEDs

The Digital Output LEDs O1, O2, O3 and O4 can be turned on and off by controlling the appropriate GPIOs (see table 1, above).

2.1.4 Fieldbus Status LEDs

The MNS and COM Dual LEDs can only be used alternatively and are intended to provide fieldbus status information for the DeviceNet (MNS) and the PROFIBUS interface (COM), depending on firmware and the settings of Jumpers J60 and J70 (see Chapter 2.8). They are controlled by PIOs 4 and 5.

2.2 Buttons

2.2.1 Input Buttons

The NDSB-NET/HMI provides four pushbuttons (I1, I2, I3 and I4), which connect to GPIO4, 5, 6 and 7 of the netX. When one of these buttons is pressed, the corresponding GPIO pin is pulled to high level.

2.2.2 Boot Button

This Button is used to enter the serial bootmode of the netDIMM module. To activate the serial bootmode, press the Boot Button and the Reset Button, then release the Reset Button while still holding the Boot Button. Now the Boot Button can be released. The yellow SYS LED on the NDSB-NET/HMI and the module should now flash with a frequency of 1Hz, indicating the netX is in serial bootmode.

Activating the serial bootmode skips any firmware stored in a non-volatile memory connected to the netX and allows firmware download through UART0 or the USB interface (an appropriate software tool (netX Bootwizard) is available for free from the Hilscher website or may be found on your product CD).

2.2.3 Reset Button

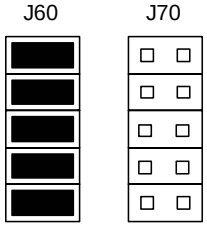
The Reset Button of the NDSB-NET/HMI forces the Power On Reset signal (PORn) of the netDIMM module low (active). It provides basic debouncing only through a 100nF ceramic capacitor.

2.3 Jumpers

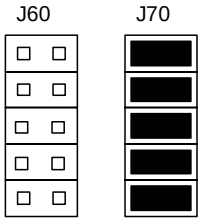
2.3.1 Fieldbus Selection Jumpers

The NDSB-NET/HMI provides a DeviceNet port and a PROFIBUS port (both use XMAC2 of the NDCM module), whereas only one of these ports can be used at a time. In order to use the desired Fieldbus port, the selection Jumpers J60 or J70 must be set accordingly:

When using the starter board with a NDCM100-NET module, the jumpers must be set as shown in the following picture:

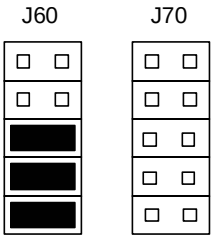


Profibus

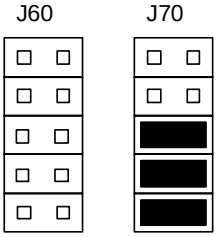


DeviceNet

When using the starter board with a NDCM500-HMI module, the jumpers must be set as shown in the following picture:



Profibus



DeviceNet

Positions 1-2 and 3-4 of Jumpers J60 and J70 are never set, when using the starter board with an NDCM500-HMI, as these jumper positions connect the COM and MNS Dual LEDs. The NDCM500-HMI does not provide the required signals do drive these LEDs, hence the LEDs are left unconnected.

3 Connectors

3.1 Power Supply

For connection to the power supply. The allowed range for the input voltage is 9 - 24 V (DC).

As the input circuit provides a bridge rectifier, the polarity of the power plug does not matter, however an AC supply shall not be used, as the input capacitors are not sufficient for that mode of operation. The current drawn by the NDSB-HMI/NET depends on several factors such as operating mode of the netX, CPU load, use of additional hardware powered by the NDSB-HMI/NET and mainly on the level of the input voltage (the higher the voltage, the lower the current). For standard operation of the board, the power supply that comes with your NDSB-HMI/NET is sufficient. If additional hardware is being powered by the NDSB-HMI/NET, the use of a stronger supply may be required.

Pin	Description
1	Ground
2	9 - 24 V

Table 2: Power Supply, X100

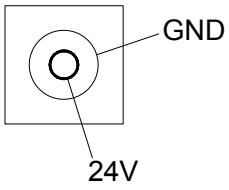


Figure 4: Power Supply, X100

3.2 Communication Interfaces

3.2.1 PROFIBUS Interface

Non-isolated RS-485 interface:

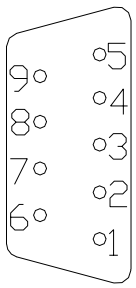


Figure 5: PROFIBUS Interface (DSub female connector), X6

Connection with DSub female connector	Signal	Description
3	RxD/TxD-P	Receive / Send Data-P respectively connection B plug
5	DGND	Reference potential
6	VP	Positive power supply
8	RxD/TxD-N	Receive / Send Data-N respectively connection A plug

Table 3: PROFIBUS Interface, X6

3.2.2 DeviceNet Interface

Non-isolated ISO 11898 interface.

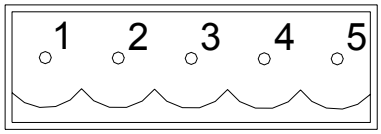


Figure 6: DeviceNet Interface (Combicon male connector, 5 pin), X7

Connection with Combicon male connector	Signal	Description
1	V-	Reference potential DeviceNet power supply
2	CAN_L	CAN Low-Signal
3	Drain	Shield
4	CAN_H	CAN High-Signal
5	V+	+24 V DeviceNet power supply

Table 4: DeviceNet Interface, X7

3.2.3 Ethernet Interface

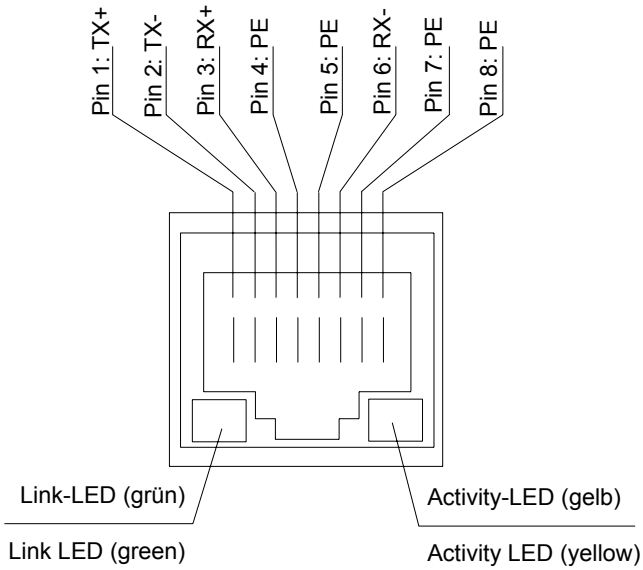


Figure 7: Ethernet Interface- Ethernet pinning at the RJ45 female connector, X 200

Pin	Signal	Description
1	TX +	Transmit Data +
2	TX –	Transmit Data –
3	RX +	Receive Data +
4	-	Connected to each other and terminated to PE through RC circuit
5	-	
6	RX –	Receive Data –
7	-	Connected to each other and terminated to PE through RC circuit
8	-	

Table 5: Ethernet pinning at the RJ45 female connector, X200

3.2.4 RS232 Interface

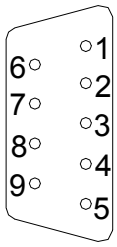


Figure 8: Communication Interface RS232, X3

Pin	Signal	Description
2	RXD	Receive Data
3	TXD	Send Data
7	RTS	Ready to Send
8	CTS	Clear to Send
4	DTR	Data Terminal Ready
5	GND	Signal Ground

Table 6: Communication Interface RS232, X3

3.2.5 USB Interface

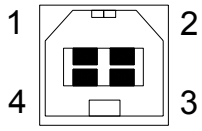


Figure 9: USB Interface female connector Type B, X2

Pin	Name	Description
1	USB_EXT	USB Bus Power (+5V, supplied externally)
2	D-	Data -
3	D+	Data +
4	GND	Ground

Table 7: USB interface, X2

3.2.6 XMAC I/O signals

Certain Real Time Ethernet applications (e.g. EtherCAT) may require additional synchronization signals. If such signals are required, XMAC I/O signals are used for that purpose, which are available at connector X201.

Pin	Name	Description
1	XM2_IO0	IO0 signal of XMAC2
2	XM2_IO1	IO1 signal of XMAC2
3	XM3_IO0	IO0 signal of XMAC3
4	XM3_IO1	IO1 signal of XMAC3
5	GND	Ground

Table 8: XMAC I/Os, X201

3.3 Dual-Port-Memory, Extension-Bus, PIOs

The NDSB-HMI/NET is equipped with a Hostinterface Connector (X4), allowing access to the netX Hostinterface, which can operate as a DPM interface, an Expansion Bus or I/O Port. To allow quick and easy evaluation of the netX DPM mode, this connector can also be used to hook up the NDSB-HMI/NET to the **NXSB-PCA** adapter card (PCI), providing access to the netX virtual DPM through a memory window on a Host PC.

Pin	DPM	Ext. Bus	Prog. I/O
1	+3,3V	+3,3V	+3,3V
2	GND	GND	GND
3	CLKOUT	CLKOUT	CLKOUT
4	RSTOUT	RSTOUT	RSTOUT
5	+VSEXT	+VSEXT	+VSEXT
6	not connected		
7	not connected		
8	*SEL_A19*	EXT_A24	PI040
9	PI036	PI036	PI036
10	GND	GND	GND
11	DPM_INT	EXT_IRQ	PIO47
12	DPM_RDY	EXT_RDY	PIO46
13	DPM_RD	EXT_RD	PIO52
14	DPM_WRH	EXT_WRH	PIO44
15	DPM_WRL	EXT_WRL	PIO45
16	DPM_WIF	EXT_ALE	PIO35
17	DPM_BHE	EXT_BHE	PIO43
18	*SEL_A18*	EXT_CS3	PIO84
19	*SEL_A16*	EXT_CS2	PIO79
20	*SEL_A17*	EXT_CS1	PIO80
21	DPM_CS	EXT_CS0	PIO51
22	GND	GND	GND
23	*SELA_A15*	EXT_A23	PIO72
24	*SELA_A14*	EXT_A22	PIO71
25	*SELA_A13*	EXT_A21	PIO68
26	*SELA_A12*	EXT_A20	PIO67
27	*(DPM_A19)*	EXT_A19	PIO63
28	*(DPM_A18)*	EXT_A18	PIO62
29	*(DPM_A17)*	EXT_A17	PIO59
30	*(DPM_A16)*	EXT_A16	PIO58
31	DPM_A15	EXT_A15	PIO55
32	DPM_A14	EXT_A14	PIO54
33	DPM_A13	EXT_A13	PIO48
34	DPM_A12	EXT_A12	PIO49
35	DPM_A11	EXT_A11	PIO50
36	DPM_A10	EXT_A10	PIO53
37	DPM_A9	EXT_A9	PIO56

Continued on next page.

Pin	DPM	Ext. Bus	Prog. I/O
38	DPM_A8	EXT_A8	PIO57
39	DPM_A7	EXT_A7	PIO60
40	DPM_A6	EXT_A6	PIO61
41	DPM_A5	EXT_A5	PIO64
42	DPM_A4	EXT_A4	PIO65
43	DPM_A3	EXT_A3	PIO66
44	DPM_A2	EXT_A2	PIO69
45	DPM_A1	EXT_A1	PIO70
46	DPM_A0	EXT_A0	PIO73
47	DPM_D15	EXT_D15	PIO41
48	DPM_D14	EXT_D14	PIO42
49	DPM_D13	EXT_D13	PIO37
50	DPM_D12	EXT_D12	PIO38
51	DPM_D11	EXT_D11	PIO39
52	DPM_D10	EXT_D10	PIO33
53	DPM_D9	EXT_D9	PIO34
54	DPM_D8	EXT_D8	PIO32
55	DPM_D7	EXT_D7	PIO74
56	DPM_D6	EXT_D6	PIO75
57	DPM_D5	EXT_D5	PIO77
58	DPM_D4	EXT_D4	PIO77
59	DPM_D3	EXT_D3	PIO78
60	DPM_D2	EXT_D2	PIO81
61	DPM_D1	EXT_D1	PIO82
62	DPM_D0	EXT_D0	PIO83
63	+3,3V	+3,3V	+3,3V
64	GND	GND	GND

Table 9: Pinning Dual Port Memory Extension Bus, X4

3.4 AD Converter

Pin	Signal	Description
1	AD0_IN0	Analog Input, ADC0, Channel 0
2	AD0_IN1	Analog Input, ADC0, Channel 1
3	NC	Not connected
4	NC	Not connected
5	AD_VREFP	ADC Reference Voltage (+3.3V)
6	NC	Not connected
7	AD_VDDIO	ADC Supply Voltage (+3.3V)
8	GND	not separated from digital ground!

Table 10: Pinning ADC, X5

- The ADC Supply Voltage (AD_VDDIO) is provided by the NDCM module and can be used to power additional user specific analog hardware (for maximum current please consult the manual of your NDCM module).

  Do not connect a power source to this pin!

- The ADC Reference Voltage (AD_VREFP) can be used as a reference for additional user specific analog hardware or to apply a different reference voltage supplied by an external source.

3.5 Display/Touchpanel Interface

The Display Connector (X50) is used to directly connect a Hitachi TX09D71VM1CDA TFT-Display with integrated Touchpanel.

Pin	LDC
1	+3,3V
2	+3,3V
3	+3,3V
4	LCD_DCLK
5	GND
6	LCD_HSYNC
7	GND
8	LCD_DTMG
9	GND
10	LCD_VSYNC
11	GND
12	LCD_R5
13	LCD_R4
14	LCD_R3
15	GND
16	LCD_R2
17	LCD_R1
18	LCD_R0
19	GND
20	LCD_G5
21	LCD_G4
22	LCD_G3
23	GND
24	LCD_G2
25	LCD_G1
26	LCD_G0
27	GND
28	LCD_B5
29	LCD_B4
30	LCD_B3
31	GND
32	LCD_B2
33	LCD_B1
34	LCD_B0
35	LCD_PCI
36	LCD_VCTRL
37	TP_XR
38	TP_YD
39	TP_XL
40	TP_YU

Table 11: LC Display, X50

3.6 JTAG Interface

Through connector X10, located near the lower left corner of the board, the user has access to the JTAG interface of the integrated ARM CPU inside the netX. The JTAG port allows the connection of appropriate debugging devices, such as the “Tantino” from Hitex or the “RealView Multi-ICE” available from ARM
The connector pin out follows the common standard for ARM JTAG.

Pin	JTAG Signals	netX Signals
1	VTref	+3.3V
2	Vsupply	+3.3V
3	nTRST	JT_TRSTn
4	GND	VSS
5	TDO	JT_TDO
6	GND	VSS
7	TMS	JT_TMS
8	GND	VSS
9	TCK	JT_TCK
10	GND	VSS
11	RTCK	*Not connected*
12	GND	VSS
13	TDI	JT_TDI
14	GND	VSS
15	nSRST	PORn
16	GND	VSS
17	DBGRQ	*Not connected*
18	GND	VSS
19	DBGACK	*Not connected*
20	GND	VSS

Table 12: JTAG Interface, X10

3.7 JTAG Board-to-Board-Connector

As the NDCM modules provide their JTAG Interface by an 8 pin flex cable connector, located near the upper left corner of the module, the NDSB-NET/HMI starter boards are equipped with an identical connector (X9), so the JTAG port on the starter board and that on module can be connected to each other by the flex cable, that comes with your NDSB-HMI/NET.

Please note, that the contact sides of the flex cable must, on both boards, face the PCB side when being inserted in the connectors!

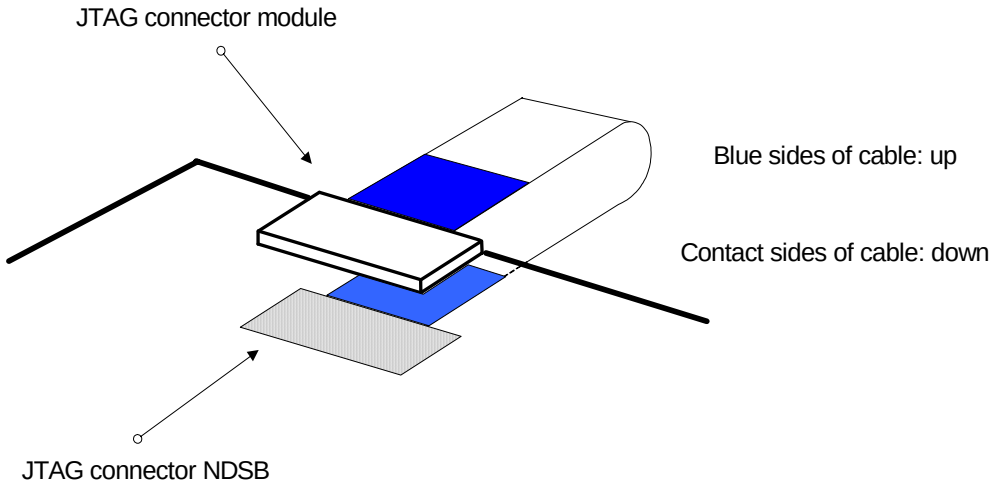


Figure 10: JTAG Board-to-Board Connector, X9

4 Lists

4.1 List of Figures

4.2 List of Tables