UNC20/UNC90 Base Board

User's Manual

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1. General

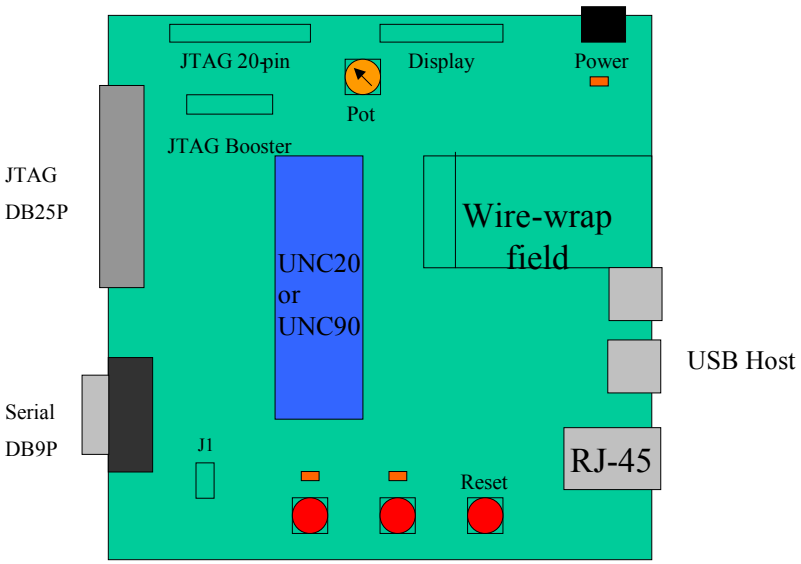
The UNC20 Base Board is the standard carrier board as used in the UNC20 and UNC90 Developer's Kits.

This document refers to the UNCBAS_3 revision of the board, which has the Part Number 358 and a serial number > 0300. The board's name can be found on the label above the combined part number / serial number.

2. Features

- Base board which accommodates one UNC20 / UNC90 Module
- Ethernet interface with RJ45 connector with integrated link LED
- 1 serial communication RS232 interfaces
- JTAG interface
- LEDs for power and communication
- 2 switches for use by application
- Manual reset switch and reset generator
- Support for external Character Display
- Host and device USB support (USB2.0 compliant, only UNC90)

3. Block Diagram Of Base Board



4. Detailed Description

4.1. UNC20 Module

The UNC20 Module is a cost-effective, highly integrated module in a 48-pin dual-inline package.

The salient features of the UNC20 Module, as delivered with the Developer's Kit, are listed below:

- NetSilicon's NS7520 microcontroller based on a 32-bit ARM7TDMI core
- 16 Mbytes SDRAM
- 8 Mbytes Flash
- Ethernet interface
- 2 serial communication interfaces
- I2C interface
- JTAG interface

Please refer to the UNC20 User's Manual for more details on this module.

The pin-out for the UNC20 Module can be found at the end of this Manual.

4.2. UNC90 Module

The UNC90 Module is a cost-effective, highly integrated module in a 48-pin dual-inline package.

The salient features of the UNC90 Module, as delivered with the Developer's Kit, are listed below:

- ATMEL's T91RM9200 microcontroller based on a 32-bit ARM920T core
- 16 Mbytes SDRAM
- 16 Mbytes Flash
- Ethernet interface
- USB 2.0 interface usable as host or device
- 2 serial communication interfaces
- Serial debug interface
- I2C interface
- JTAG interface

Please refer to the UNC90 User's Manual for more details on this module.

The pin-out for the UNC90 Module can be found at the end of this Manual.

4.3. RS232 Serial Interface

NS7520 and AT91RM9200 on the UNC20 or UNC90 module provides two serial ports. Since these ports are multiplexed with the General Purpose I/O pins (ports A and C for UNC20, different port pins on one pin for the UNC90), it was decided only to assemble one serial port and leave the other for the user to configure.

4.3.1. Serial Port 1

Serial Port 1 can be used as a console port to communicate with a host PC.

An RS232 driver, the MAX3320 from Maxim, is assembled on the Base Board. This driver guarantees baudrates up to 250kbps.

This port will operate in asynchronous RS232 full-duplex mode. The RS232 port supports minimal hardware control signals, namely RTS and CTS only, and is derived from the UNC20 module's Port C pins and on the UNC90 module same pins with the same function.

A 9-pin D-type connector (male) is assembled on the base board.

The pin allocation of the 9 way D-type connector X2 is as defined in the table below:

Pin	Function
1	N/C
2	RXD
3	TXD
4	N/C
5	GND
6	N/C
7	RTS (or debug TXD on UNC90)
8	CTS (or debug CTS on UNC90)
9	N/C

If a serial console is not required and the 4 Port C pins are required for GPIO, then the serial driver can be forced into an “off” state, meaning that the on-chip pwer supply is shut down, by connecting a jumper between pins 3 & 4 of J1.

PIN	A	Description when inserted	Factory default
3	▌	Serial driver forced off	Not inserted
4	▌		

Jumper settings for J1 ▌ = *connected pins*

To disable the serial driver, the jumper has to be inserted.

4.3.2. Serial Port 2

Serial Port 2 is available on the UNC20 module's Port A [0-7] pins and on the same pins on the UNC90, which are led out to the wire-wrap area, so that users can configure this port to suit their application. Additionally they are connected to X11 allowing the usage of a level shifter board TTL_232_1 (FS article 0276).

4.3.3. Serial Port 3 (Debug Port, only UNC90)

Port C1 and port C5 have the special function serial debug TXD and RXD on the UNC90. These signals are connected to X12 allowing the usage of a level shifter board TTL_232_1 (FS article 0276). Remove R51 and R52 to prevent contention of the serial port signals RTS1# and CTS1# at X2.

4.4. Ethernet

The 10/100 Ethernet MAC controller and PHY are included on the UNC20 and UNC90 Module.

An RJ45 jack is used with a status LED for Link/Activity which is visible through a light pipe in the jack. A separate Pulse transformer is assembled.

The pin allocation of the RJ45 connector X9 is as defined in the table below:

Pin	Function
1	TD+
2	TD-
3	RD+
4	N/C
5	N/C
6	RD-
7	N/C
8	N/C

4.5. JTAG / Debugging

A JTAG interface is required both for debug purposes and for boundary scan testing of the UNC20 and UNC90 Module during the manufacturing process.

The address lines ADDR[5..9] from the processor are multiplexed with the 5 JTAG lines. The selection is done via the LEDLNK/SEL signal. JTAG is active when the LED, connected to LEDLNK/SEL, is shorted to ground. This is achieved by inserting a jumper (J1) on the base board.

PIN	A	Description when inserted	Factory default
1	▌	JTAG active	Not inserted
2	▌		

Jumper settings for J1 ▌ = *connected pins*

To activate the JTAG interface, the jumper has to be inserted.

There are 3 connectors available on the base board for accessing JTAG: firstly, the ARM-defined 20-pin header; secondly, the 8-pin header for FS Forth-Systeme's JTAG Booster; thirdly, the Parallel Port JTAG adapter (PPJ) is implemented on the board using a buffer together with a standard 25-pin parallel port connector (DB25P).

4.5.4. Parallel Port JTAG Adapter

The parallel port JTAG adapter allows for a direct connection between the host PCs parallel port and the JTAG pins of the UNC20 and UNC90. This allows a number of low-cost Development Tools to be used without additional hardware.

A 25-pin male D-type connector (X5) is provided for this purpose.

Pin	Parallel Function	JTAG Function
2	D0	TDI
3	D1	TMS
4	D2	TCK
5	D3	TRST#
7	D5	Reset#
8	D6	Port Sense
10	ACK#	Port Sense
12	PE	TDO
15	ERROR#	VCC sense

A parallel cable for connecting the host PC's parallel port to X5 is provided with the UNC20 and UNC90 Developer's Kits.

4.5.5. JTAG Booster

FS Forth-Systeme offers a JTAG Booster which allows accelerated programming of the on-board Flash. An 8-pin header (X3) is provided for connecting the JTAG Booster.

Note that the JTAG Booster is not part of the standard UNC20 or UNC90 Developer's Kit.

4.5.6. ARM-standard JTAG Connector

The JTAG connector X4 is a 20-pin header as defined by ARM Ltd. and can be used for connecting a range of development tools such as ARM's Multi-ICE, Abatron's BDI2000 and EPI's JEENI.

Pin	Function	Pin	Function
1	3.3V	**2**	3.3V
3	TRST#	**4**	GND
5	TDI	**6**	GND
7	TMS	**8**	GND
9	TCK	**10**	GND
11	RTCK	**12**	GND
13	TDO	**14**	GND
15	SRST#	**16**	GND
17	N/C	**18**	GND
19	N/C	**20**	GND

The signal RTCK is not used and is connected via a 0R resistor to TCK.

4.6. Peripherals

An 8-bit data bus and 10-bit address bus are provided for connecting external peripherals to the UNC20 and UNC90. Two individually programmable chip selects (CS3# and CS4# for the UNC20 and UNC90) and an OE# (Output Enable) and WE# (Write Enable) signal allow a vast range of 8-bit peripherals to be connected directly to the modules without any glue logic. In addition, every Module has two 8-bit General Purpose I/O ports (GPIO) connected. Some of these 16 GPIO pins are already used on the Base Board. The following table gives an overview, showing those signals which are free to be used by additional hardware in the wire-wrap area X6.

UNC20 and UNC90

Port A	Use	Port C	Use
A0	DCD0# (free if serial port 0 unused)	**C0**	Push-button (free if button unused)
A1	CTS0# (free if serial port 0 unused)	**C1**	CTS1# or debug RXD (only UNC90, free if CTS1# and debug RXD unused)
A2	DSR0# (free if serial port 0 unused)	**C2**	I2C (SDA)
A3	RXD0 (free if serial port 0 unused)	**C3**	RXD1
A4	LED or RI0# (free if jumper removed and serial port 0 unused)	**C4**	Push-button (free if button unused)
A5	RTS0# (free if serial port 0 unused)	**C5**	RTS1# or debug TXD (only UNC90, free if debug TXD and RTS1# unused)
A6	LED or DTR0# (free if jumper removed and serial port 0 unused)	**C6**	I2C (SCL)
A7	TXD0 (free if serial port 0 unused)	**C7**	TXD1 (free if TXD1 unused)

4.6.7. Switches and LEDs

The Base Board contains 2 push-buttons connected to Port C0 and Port C4 which can be used by the application to input information. Also 2 user LEDs are assembled to signal output activity for the applications. The 2 LEDs and 2 switches are connected to 4 GPIO pins. Since the LEDs use Port A4 and Port A6, which might be required by other peripherals in the wire-wrap area, they can be disabled by removing J1/5-6.

PIN	A	Description when inserted	Factory default
5	▌	LEDs active	Inserted
6	▌		

Jumper settings for J1 ▌ = *connected pins*

4.6.8. Character Display

A 16-pin header (X8), with 0.1" (2.54mm) spacing, is available on the Base Board to allow the user to add a simple character display module, e.g. 20 characters by 4 lines or 20 characters by 2 lines. A potentiometer is also assembled for adjusting the contrast (VO). The display uses either CS3# (R24 default fitted) or CS4# (populate R18 and remove R24).

This display module is **not** included with the UNC20 or UNC90 Developer's Kit. Since the pinning is standardized, these modules are readily available.

Pin	Symbol	Description
1	VSS	GND
2	VDD	+5V
3	VO	LCD contrast adjust
4	RS	Register Selection
5	R/W#	Read / Write#
6	E	Enable
7	D0	
8	D1	
9	D2	
10	D3	
11	D4	
12	D5	
13	D6	
14	D7	
15	VLED +	LED Backlight Anode
16	VLED -	LED Backlight Cathode

4.6.9. Wire-Wrap Area

A wire-wrap area is provided on the Base Board to allow users to quickly try out their own peripherals. On the left of the wire-wrap area is the 42-pin header X6, which is not assembled. Pinout of X6 is described below.

Pin	Function	Pin	Function
1	ADDR4	**2**	3.3V
3	ADDR5	**4**	CS4#
5	ADDR6	**6**	CS3#
7	ADDR7	**8**	OE#
9	ADDR8	**10**	WE#
11	ADDR9	**12**	ADDR3
13	PortA0	**14**	ADDR2
15	PortA1	**16**	ADDR1
17	PortA2	**18**	ADDR0
19	PortA3	**20**	D0
21	PortA4	**22**	D1
23	PortA5	**24**	D2
25	PortA6	**26**	D3
27	PortA7	**28**	D4
29	PortC0	**30**	D5
31	CTS1 (PortC1)	**32**	D6
33	SDA_I2C	**34**	D7
35	RxD1 (PortC3)	**36**	RESET#
37	PortC4	**38**	TxD1 (PortC7)
39	RTS1 (PortC5)	**40**	GND
41	SCL_I2C	**42**	GND

4.7. USB (only UNC90)

Originally the UNC20 Module was intended to have a USB1.1-compliant USB controller supporting host mode. However, NetSilicon dropped this feature from the NS7520 processor. Although the current UNC20 Module will now never have USB, 2 of the 48 pins are reserved for USB to allow a future pin-compatible module to support USB. The UNC90 module has a USB 2.0-compliant controller connected to these pins. Therefore, a USB host and device connector is assembled on the UNCBAS_3.

The pin allocation of the USB host connector X7 is as defined in the table below:

Pin	Function
1	+5V, max 100mA
2	USB-
3	USB+
4	GND

The pin allocation of the USB device connector X10 is as defined in the table below:

Pin	Function
1	N/C
2	USB-
3	USB+
4	GND

Only one connector can be used at a time, either in host mode, slow speed device mode or full speed device mode. The used type is selected with quadruple switch S4:

Function	S1	S2	S3	S4
Host	ON	ON	OFF	OFF
Low Speed Device	OFF	OFF	ON	OFF
Full Speed Device	OFF	OFF	OFF	ON

4.8. Power Supply and Reset

The external main power supply is provided by a standard plugable power supply (e.g. Friwo MPP15-FW7555M/06) which is connected to the power socket (X1) on the Base Board.

The Base Board provides the power supply for the UNC20 and UNC90 Module and all onboard devices such as the serial line driver. The external power supply for the board is 5V DC. There is no power switch available. The board is switched on, by plugging in the power supply. A red LED on the base board denotes power-on. A reset button is also provided.

4.8.10. Voltage Requirements

For the UNC20 and the UNC90 module only a single 3.3V DC power supply is needed. However, the character display (X8) requires a 5V supply.

4.8.11. RESET Support

A reset button on the base board allows manual reset of the module. The key pulse is extended with a reset controller to a minum length of 140ms. Necessary for UNC90, which has an open drain reset signal and needs a reset signal with 90µs pulse width minimum. UNC20 has a bidirectional reset signal which is extended on the module by its controller.

5. UNC20 Connector X1

Pin	Signal	Type	Description
1	A4	O	
2	A5/TCK	O/I	**ADDR[5..9] are multiplexed with**
3	A6/TMS	O/I	**JTAG functionality – controlled by**
4	A7/TDI	O/I	**LEDLNK/SEL signal**
5	A8/TDO	O/O	
6	A9/TRST#	O/I	
7	PORTA0	I/O	
8	PORTA1	I/O	
9	PORTA2	I/O	
10	PORTA3	I/O	
11	PORTA4	I/O	
12	PORTA5	I/O	
13	PORTA6	I/O	
14	PORTA7	I/O	
15	PORTC0	I/O	
16	PORTC1	I	RS232 CTS
17	PORTC2	O	Hardwired as I2C data signal (SDA)
18	PORTC3	I	RS232 RXD
19	PORTC4	I/O	
20	PORTC5	O	RS232 RTS
21	PORTC6	I/O	Hardwired as I2C clock signal (SCL)
22	PORTC7	O	RS232 TXD
23	+3.3V	P	Power Supply
24	GND	P	Ground Connection

Pin	Signal	Type	Description
25	RSTIN#	I	Reset Input
26	TPIP	I	Ethernet Input+
27	TPIN	I	Ethernet Input-
28	TPOP	O	Ethernet Output+
29	TPON	O	Ethernet Output-
30	LEDLNK/SEL	O	Ethernet Activity LED; ADDR/JTAG Selection: JTAG active when grounded
31	USB-	I/O	USB differential data negative
32	USB+	I/O	USB differential data positive
33	D31	I/O	Data line D7
34	D30	I/O	D6
35	D29	I/O	D5
36	D28	I/O	D4
37	D27	I/O	D3
38	D26	I/O	D2
39	D25	I/O	D1
40	D24	I/O	D0
41	A0	O	Address Line
42	A1	O	Address Line
43	A2	O	Address Line
44	A3	O	Address Line
45	WE#	O	Write Enable
46	OE#	O	Output Enable
47	CS3#	O	Chip Select 3
48	CS4#	O	Chip Select 4

The UNC20 connector is based on a standard DIP48 socket.

6. UNC90 Connector X1

Pin	Signal	Type	Description
1	A4	O	
2	A5/TCK	O/I	**ADDR[5..9] are multiplexed with**
3	A6/TMS	O/I	**JTAG functionality – controlled by**
4	A7/TDI	O/I	**LEDLNK/SEL signal**
5	A8/TDO	O/O	
6	A9/TRST#	O/I	
7	PORTA0	I/O	PB23: DCD1#; PA5: NPCS2; SPI Enable
8	PORTA1	I/O	PB24: CTS1#
9	PORTA2	I/O	PB25: DSR1#
10	PORTA3	I/O	PB21: RXD1; PA0: MISO
11	PORTA4	I/O	PB22: port; PA2: SPI_CLK, IRQ4
12	PORTA5	I/O	PB26: RTS1#
13	PORTA6	I/O	PD25: DTR1#
14	PORTA7	I/O	PB20: TXD1; PA1: MOSI
15	PORTC0	I/O	PB29: IRQ0
16	PORTC1	I	PA30: CTS2#; DRXD Debug Unit; **used as RS232 CTS on base board**
17	PORTC2	O	PA25: IRQ2; TWD_I2C; **Hardwired as I2C data signal (SDA) on module**
18	PORTC3	I	PA22: RXD2; **used as RS232 RXD on base board**
19	PORTC4	I/O	PA24: port; RESET_OUT#
20	PORTC5	O	PA31: RTS2#; DTXD Debug Unit; **used as RS232 RTS on base board**
21	PORTC6	I/O	PA26: IRQ1; TWCK_I2C; **Hardwired as I2C clock signal (SCL) on module**

Pin	Signal	Type	Description
22	PORTC7	O	PA23: TXD2; IRQ3; **Used as RS232 TXD on base board**
23	+3.3V	P	Power Supply
24	GND	P	Ground Connection
25	RSTIN#	I	Reset Input
26	TPIP	I	Ethernet Input+
27	TPIN	I	Ethernet Input-
28	TPOP	O	Ethernet Output+
29	TPON	O	Ethernet Output-
30	LEDLNK/SEL	O	Ethernet Activity LED; ADDR/JTAG Selection: JTAG active when grounded
31	USB-	I/O	USB differential data negative
32	USB+	I/O	USB differential data positive
33	D7	I/O	Data line D7
34	D6	I/O	D6
35	D5	I/O	D5
36	D4	I/O	D4
37	D3	I/O	D3
38	D2	I/O	D2
39	D1	I/O	D1
40	D0	I/O	D0
41	A0	O	Address Line
42	A1	O	Address Line
43	A2	O	Address Line
44	A3	O	Address Line
45	WE#	O	Write Enable
46	OE#	O	Output Enable

Pin	Signal	Type	Description
47	CS3#	O	Chip Select 3
48	CS4#	O	Chip Select 4

The UNC90 connector is based on a standard DIP48 socket.