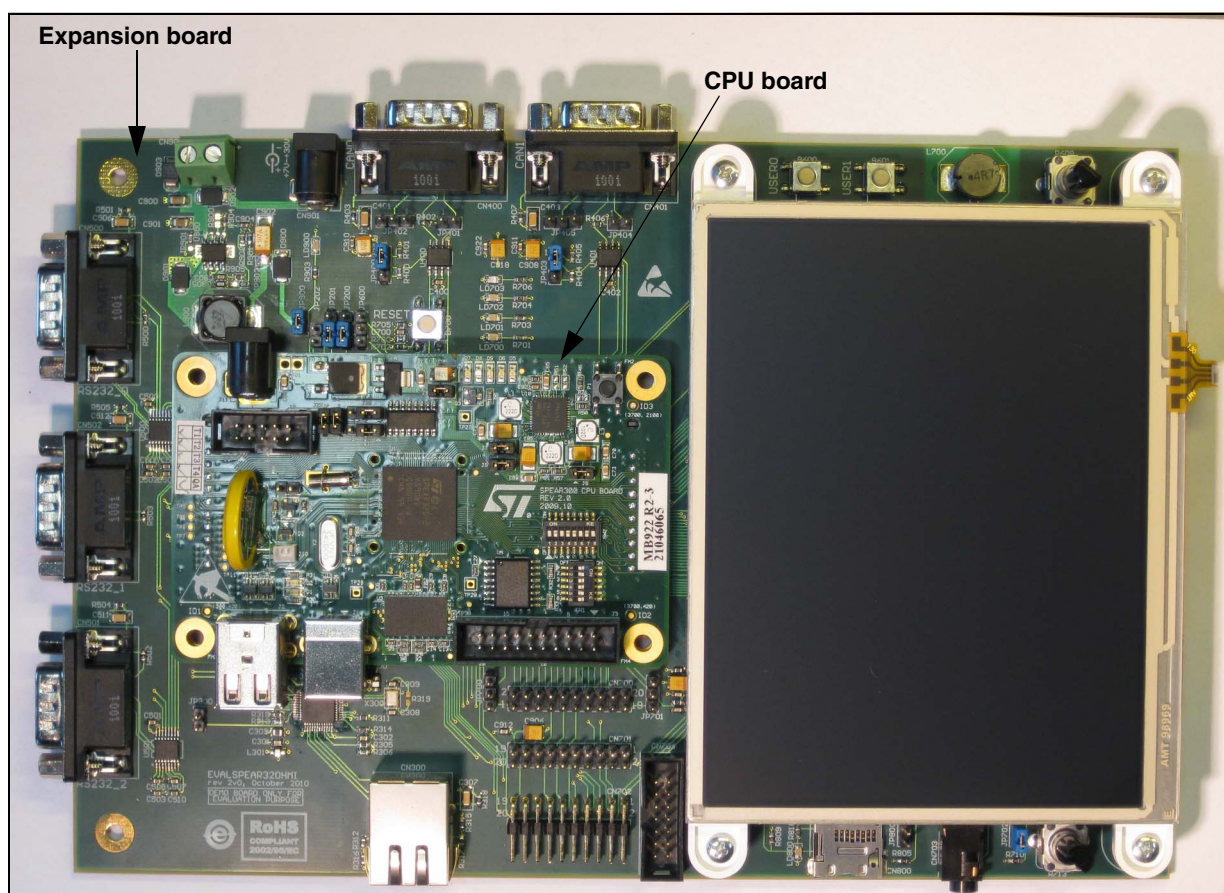EVALSPEAr320HMI

SPEAr320 expansion board for HMI applications, revision 2

Introduction

This document applies to revision 2 EVALSPEAR320HMI expansion boards.

This board is intended to be used in conjunction with a SPEAr320 CPU board (sold separately) to evaluate the SPEAr320 microprocessor with a variety of devices, especially in its SMII automation networking mode.

Note: *The SPEAr320 CPU board order code is EVALSPEAR320CPU.*

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1 Features

- 1 x Ethernet RJ45 connector (ST802RT1A)
- 1x LCD interface for 5.7" 640x480 EDT screen (ET057010DHU)
- 1x Unified LCD interface (EDT displays with Unified interface)
- 1x Resistive touch screen interface (STMPE811)
- 2 x CAN DB9 plug connectors
- 3 x RS232 DB9 plug connectors (ST3232EBTR)
- Onboard temperature sensor and potentiometer (STMPE811)
- 64 Kbit dual interface EEPROM: ISO 15693 and ISO 18000-3 mode 1 compliant contactless interface + I2C (M24LR64)
- 4Gb NAND flash memory
- PWM mono audio output
- Analog extension connector featuring 8 ADC lines
- General purpose extension connector with GPIOs and I2C functionality
- Unified Power Line modem (PLM) connector
- Raisonance Primer2 extension boards interface connector
- DC/DC converter L7986A (+24V/+5V)
- MicroSDcard socket
- 4 LEDs
- 2 general purpose buttons
- System reset button

2 Block diagram and layout

Figure 1.   *Expansion board block diagram*
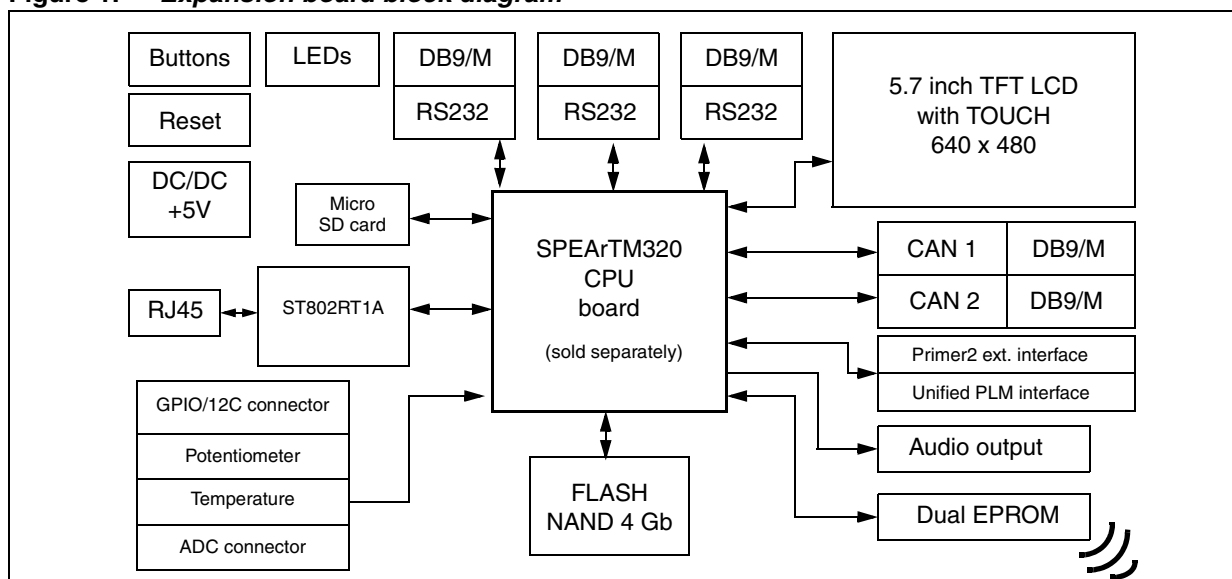
Figure 2. **Expansion board layout**
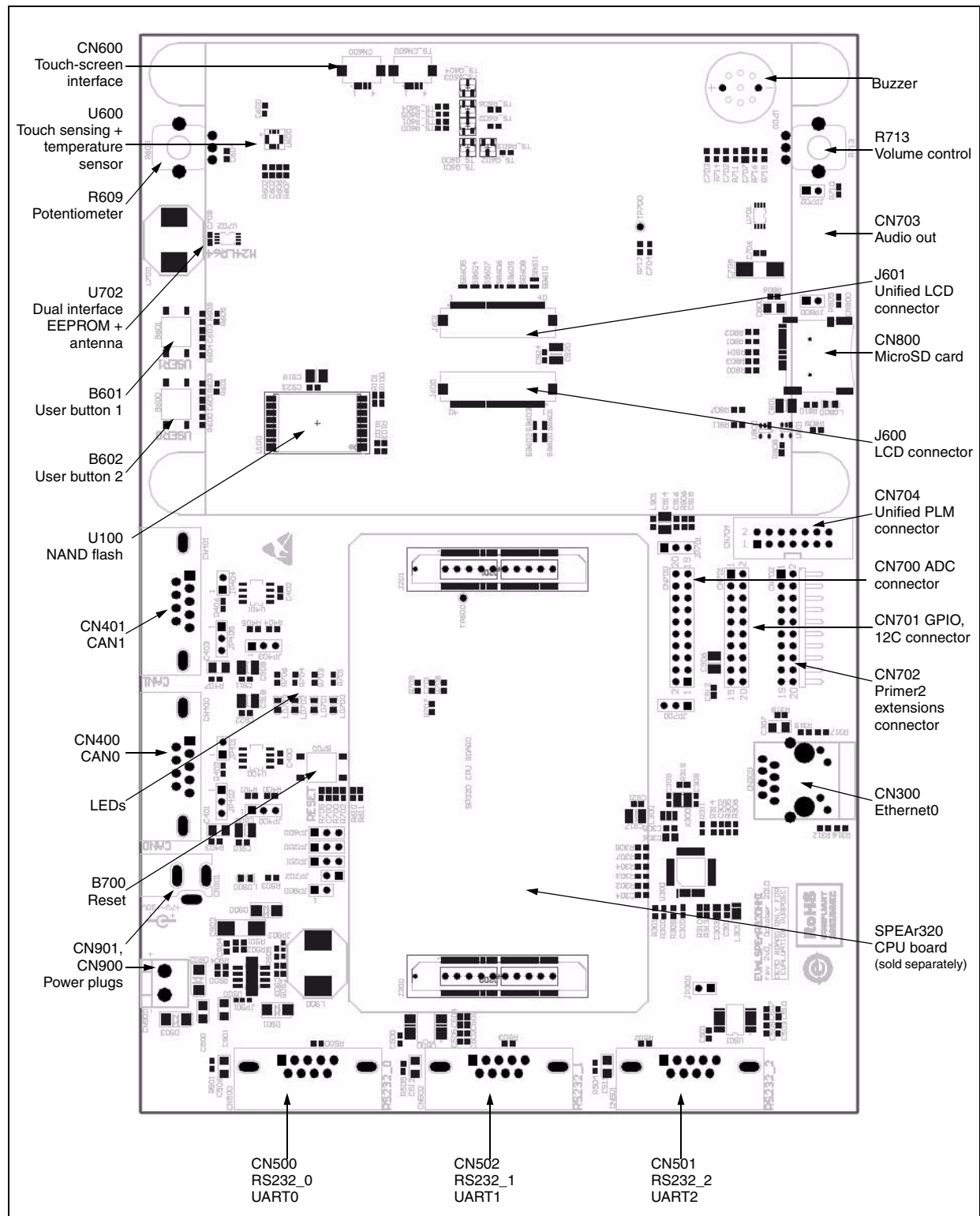
3 Getting started

3.1 Unpacking

Warning: **This board contains static sensitive devices.**

The EVALSPEAr320HMI evaluation board is shipped in protective anti-static packaging. Do not submit the board to high electrostatic potentials, and follow good practices for working with static sensitive devices.

● **Wear an anti-static wristband.** Wearing a simple anti-static wristband can help prevent ESD from damaging the board.

● **Zero potential.** Always touch a grounded conducting material before handling the board, and periodically while handling it.

● **Use an anti-static mat.** When configuring the board, place it on and anti-static mat to reduce the possibility of ESD damage.

● **Handle only the edges.** Handle the board by its edges only, and avoid touching board components.

3.2 Connecting

1. Carefully plug the CPU board into the expansion board.
2. On the EVALSPEAr320CPU board, set Switch 2 to parallel NAND 8 boot mode:

   Positions 1, 4, 6, and 7: Off   Positions 2, 3, 5, and 8: On

3. Connect a serial cable from the expansion board (connector CN500: RS232_0/UART0) to the host PC (see *Figure 2: Expansion board layout*).
4. On the host PC running Windows or Linux, start the Terminal program.
5. Connect a power supply to the SPEAr320 HMI evaluation board as described in *Section 4.6: Power supply on page 15*.
6. Apply power to the board. The Terminal program displays a sequence of boot messages followed by the Linux console prompt.

For more information, refer to user manual UM0844, *Getting started with Linux for SPEAr*, available at *www.st.com/spear*.

3.3 *Booti*ng

The SPEAr320 HMI evaluation board can boot a Linux kernel pre-installed in the parallel NAND Flash. At power on, the serial port outputs a brief header message with some uBoot information (uBoot version, SDK version, and some internal hardware information). At this point you can choose to:

● **Stop the system directly in uBoot**: Before the boot delay time expires (default is 3 seconds), press the spacebar on the host computer's keyboard.

● **Boot Linux**: The system boot is finished when the login prompt appears in the console. The default login user name for super user is *root*; no password is required.

4   Block descriptions and configurations

- *MicroSD card power up*
- *Ethernet on page 10*
- *TFT LCD with touch on page 10*
    - *Connecting an LCD on page 11*
    - *Connecting a touch screen on page 12*
- *CAN on page 13*
- *RS232 transceivers (U500 and U501) on page 14*
- *Power supply on page 15*
- *Dual interface EEPROM (U702) on page 15*
- *NAND flash memory (U100) on page 15*
- *Audio output on page 16*
- *LEDs (LD700 through LD703) on page 16*
- *Reset button (B700) on page 16*

Note: *See also: Chapter 5: Connector pinouts on page 17*

4.1   *MicroSD card power up*

The MicroSD card connector is on the EVALSPEAR320HMI SDIO interface.

To power-up the MicroSD card properly:

1.   Detect card insertion.

     Card detection is managed by the standard SDIO signal *SDCD*.

2.   Enable the single channel power switch U801 by means of PL_GPIO42 (active low).

     By default, U801 power output is disabled by the R808 pull-up resistor connected to the power switch enable pin.

JP800 controls the MicroSD card access that manipulates the MicroSD interface Write Protect signal. By default JP800 is closed, and the card is used in Write-Enabled mode.

See also: *MicroSD card connector (CN800) on page 24*

4.2 *Ethernet*

The board has one Ethernet PHY (U300) connected through the media-independent interfaces (MII) to the Ethernet MAC on the CPU board processor.

Ethernet PHY default MII addresses: 0x01

Two LEDs embedded in the RJ45 connector (CN300) indicate the line status:

● The green LED is on whenever the Ethernet is linked.
● The yellow LED blinks during TX or RX activity.

Table 1 lists the Ethernet Phy default configuration.

Table 1.   Ethernet PHYU300 default configuration

Function	Default configuration
Auto negotiation	Enabled
10/100 Mbits	100 Mbits selected for auto negotiation advertisement
Half/Full duplex	Full duplex selected for auto negotiation advertisement
Internal Loopback	Disabled
Power down	Disabled (PHY is not in Power down)
MII/RMII mode	MII selected

4.3 *TFT LCD with touch*

The expansion board has one 5.7" LCD screen that is attached to the internal SPEAr320 LCD controller.

TFT LCD display characteristics

● Resolution: 640 x 480 pixels
● Display colors: up to 16.7M
● 24-bit RGB parallel interface

The LCD module has white LED backlight and a resistive touch panel. The complete LCD module, including backlight, is connected to the 3.3V power domain. LED backlight can be manually powered on or off using JP600; if JP600 is left open, the backlight can be powered by the microprocessor PWM signal (PWM0). See *Table 2*

Table 2.   LCD module backlight control

Jumper	Description	Configuration
JP600	LCD backlight: on; Intensity: 100%	1 2 3
	LCD backlight: off; Intensity: 0%	1 2 3
	LCD backlight can be controlled using MPU PWM channel 0 Intensity: according to the PWM duty cycle Recommended signal operational frequency: 1.5 kHz	1 2 3

4.3.1 Connecting an LCD

The expansion board has two physical interfaces for Emerging Display Technologies (EDT) LCDs:

● **J600**
– for ET057010DHU
– 24 bpp
– direct 8:8:8 RGB signaling

Table 3 lists J600 configuration options.

See also *ET057010DHU LCD interface connector (J600) on page 19*

● **J601**
– for devices that have EDT displays with a unified interface
– 16 bpp

One bpp is normally not used, but this pixel is still output. It can be used as a bright bit to connect to the *least significant bit* (LSB) of R, G, and B components of a 6:6:6 TFT panel.

– direct 5:5:5 RGB

This interface can cover LCD screens from 3.5 to 7 inches (such as ET057090DHU and ET070080DH6).

Table 4 on page 11 lists J601 configuration options.

See also *EDT unified LCD interface connector (J601) on page 19*

Table 3. J600 configuration options (ET057010DHU)

Jumper	Description	Configuration
SB600, **SB601**: Left/right internal shift register direction settings	STH->S01->…->S0960->STHO (*Default*)	SB600: open SB601: close
	STH->S0960->…->S01->STHO	SB600: close SB601: open
SB602, **SB603**: Up/down scan settings	Reverse scan	SB602: open SB603: close
	Normal scan (*Default*)	SB602: close SB603: open

Table 4. J601 configuration options (unified interface displays)

Jumper	Description	Configuration
SB610, SB611: Rotate settings	L/R: STH->S0960->…->S01->STHO U/D: Reverse Scan	SB610: open SB611: closed
	L/R: STH->S01->…->S0960->STHO U/D: Normal Scan (*Default*)	SB610: closed SB611: open
SB604, SB605: Blue LSB setting	Blue LSB bit connected to the blue MSB bit	SB604: open SB605: closed
	Intensity bit connected to the Blue LSB bit	SB604: closed SB605: open

Table 4.   J601 configuration options (unified interface displays) (continued)

Jumper	Description	Configuration
SB606, SB607: Green LSB setting	Green LSB bit connected to the green MSB bit	SB606: open SB607: closed
	Intensity bit connected to the green LSB bit	SB606: closed SB607: open
SB608, SB609: Red LSB setting	Red LSB bit connected to the red MSB bit	SB608: open SB609: closed
	Intensity bit connected to the red LSB bit	SB608: closed SB609: open

4.3.2   Connecting a touch screen

See also: *STMPE811 touch screen connectors (CN600 & TS_CN600) on page 20*

The expansion board provides two ways to use the SPEAr320 touch screen interface.

● The first is based on the SPEAr320 internal Touch IP block, and can be used by means of the TS_xxx block (in the schematics) and the TS_CN600 interface connector.

● The second uses the standalone external touch screen controller, STMPE811 (U600). STMPE811 is interfaced by means of the I2C bus and interrupt output pin.

The STMPE811 has:

– A 4-wire touch screen controller (CN600)

– A multiplexed general purpose input/output (GPIO) port expander, or an 8-input, 12-bit ADC (the default configuration).

– Temperature sensor

The STMPE811 (U600) internal temperature sensor can be used for informative temperature measurements, such as a reference for compensation of the touch screen parameters.

Temperature measurement is optimized for temperatures from 0 to 85°C.

– User potentiometer

A 10 KΩ potentiometer is available on the board, connected to the analog input AIN0 of the STMPE811 (U600).

– User buttons

The remaining pins of the STMPE811 (U600) touch screen controller are used to service two user buttons (B600, B601) that are connected to the GPIO pins IO2 and IO3.

All temperature measurements, potentiometer voltage measurements, and button status information is available by means of the I2C bus.

Any of these tracked parameters can trigger a preconfigured interrupt event that is subsequently signaled to the SPEAr320 MPU by means of the STMPE811 Interrupt line.

4.4 CAN

The EVALSPEAR320HMI evaluation board supports two channels of CAN2.0A/B compliant CAN bus communication, based on a 3.3 V CAN transceiver.

High-speed mode, standby mode, and slope control mode are selected by setting JP400 and JP403 as shown in *Table 5* and *Table 6*.

See also: *CAN DB9 plug connectors (CN400 and CN401) on page 17*

Table 5.   CAN0 transceiver settings

Jumper	Description	Configuration
JP400	Standby mode	1 2 3
	High-speed mode (*Default*)	1 2 3
	Slope control mode	1 2 3
JP401	Installing JP401 enables the CAN0 terminal 120Ω resistor. Default: installed	1 2 3

Table 6.   CAN1 transceiver settings

Jumper	Description	Configuration
JP403	Standby mode	1 2 3
	High-speed mode (*Default*)	1 2 3
	Slope control mode	1 2 3
JP404	Installed, JP404 enables the CAN1 terminal 120Ω resistor. Default: installed	1 2 3

4.5 RS232 transceivers (U500 and U501)

The board has three RS232 DB9 plug connectors; see also:

- *RS232/UART0 DB9 plug connector (CN500) on page 18*
- *RS232/UART2 DB9 plug connector (CN501) on page 18*
- *RS232/UART1 DB9 plug connector (CN502) on page 18*

Using reduced modem control signals, UART0 can fully utilize the U500 RS232 transceiver; the RS232_0 signals are available through CN500.

Note: *If the U500 RS232 transceiver is not soldered on the board, RS232_TXD and RS232_RXD signals can be brought in from the CPU board to the CN500 connector (see Table 8).*

UART1 and UART2 have only RX/TX functionality, and are connected to the U501 RS232 transceiver; RS232_1 signals are available from CN502, and RS232_2 signals are available from CN501.

Table 7.   UART0 RS232 handshake enable configuration

Jumper	Description	Configuration
JP200	UART0_CTS active	1 2 3
	UART0_CTS inactive (*Default*) The related PL_GPIO38 controls LCD backlight dimming (signal LCD_LEDCTRL)	1 2 3
JP201	UART0_RTS active	1 2 3
	UART0_RTS inactive (*Default*) The related PL_GPIO37 drives the onboard buzzer	1 2 3

Table 8.   Bringing UART0/RS232 transceiver signals from the CPU board

Jumper[1]	Description
JP20	Connects the RS232_TXD signal from the CPU board RS232 transceiver to CN500 (UART0) Default: Not installed
JP21	Connects the RS232_RXD signal from the CPU board RS232 transceiver to CN13 (UART0) Default: Not installed

1. Do *not* install if U10 is soldered to the expansion board.

4.6 *Power supply*

There are two ways to supply power to the SPEAr320 HMI evaluation board:

● Connect the +5 V voltage adapter (included in the EVALSPEAr320HMI package) to the J11 power voltage connector on the CPU board.

● Connect a 7 to 30 V DC power source (not included in the EVALSPEAr320HMI package) to either connector CN900 or connector CN901 on the expansion board.

The input voltage is connected to the DC/DC converter, U900 (either L7986A or L5973A, see *Table 9*).

The board is protected against overvoltage by the D903 Transil diode (SM6T33A), and against possible reverse polarity voltage (from an incorrect power plug-in) by the D902 Schottky diode (STPS3L40U).

See also: *Power supply connectors (CN900 and CN901) on page 24*

Table 9.   U900 DC/DC converter jumpers

Jumper	Description	Configuration
JP900	Disconnects the +5V delivered from the DC/DC converter U900. Default: installed	1 2 3
JP901 (3-pin resistor)	Install to use L7986A *(Default)*	1 2 3
	Install to use L5973A	1 2 3
JP902 (3-pin resistor)	Install to use L7986A *(Default)*	1 2 3
	Install to use L5973A	1 2 3

4.7 *Dual interface EEPROM* (U702)

The expansion board has 64-Kbit EEPROM memory (M24LR64) with password protection and dual interface.

The M24LR64-R device is a dual-access, electrically erasable programmable memory (EEPROM) that features an I2C interface, and can be operated from a VCC power supply. It is a contactless memory, powered by the received 13.56 MHz carrier electromagnetic wave.

The M24LR64-R is organized as 8192 × 8 bits in the I2C mode, and as 2048 × 32 bits in the ISO 15693 and ISO 18000-3 mode 1 RF mode.

4.8 *NAND flash memory* (U100)

The expansion board has a 4-Gbit (512Mx8bit with spare 16Mx8 bit) NAND flash memory device supplied from the 3.3V domain. This memory has a x8 interface, and is divided into blocks that can be erased independently; it is possible to preserve desired data while erasing data that is no longer of interest.

The device contains 4096 blocks, composed of 64 pages.

4.9   *Audio output*

Using PWM modulation, the SPEAr320 HMI board, revision 2.0 has mono audio output on SPEAr320 PWM channel 1. If PL_GPIO37/PWN1 is occupied by an alternate function (UART0_RTS), PWM channel 2 (PWM2) can be used. To use PWM2, install jumper JP202 (default = uninstalled).

The PWM signal is filtered and amplified by operational amplifier U701; output is available either though the on-board buzzer (U700), or at the mono 3.5 mm audio jack connector (CN703). Potentiometer R713 controls the output volume.

If audio output is not used, the amplifier can be bypassed by installing JP702.

See also: *Mono 3.5 mm audio jack connector (CN703) on page 23*

4.10   LEDs (LD700 through LD703)

There are 4 general purpose LEDs on the top of the board. An LED turns on when its related GPIO pin is driven high.

Table 10.   General purpose LEDs

GPIO pin	LED	GPIO pin	LED
PL_GPIO47	LD700	PL_GPIO49	LD702
PL_GPIO48	LD701	PL_GPIO50	LD703

4.11   Reset button (B700)

The manual reset button on top of the board resets the microprocessor on the CPU board. To disconnect the reset button from the CPU board input reset signal, unsolder resistor R702.

4.12   Setting ADC conversion limits

● Lower limit: pin CN700-19, jumper JP700

● Upper limit: CN700-1, jumper JP701
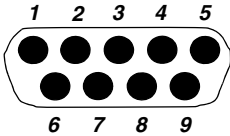
See also: *General purpose ADC connector CN700 on page 21*

Jumper	Description	Configuration
JP701	Connects the expansion board +2V5_ADC ADC supply voltage to the CPU board pin ADC_VREFP *(Default)*	1 2 3
	Connects the external ADC expansion supply voltage to the CPU board pin ADC_VREFP	1 2 3
JP700	Connects the expansion board ADC supply voltage domain GND to the CPU board pin ADC_VREFN *(Default)*	1 2 3
	Connects the external ADC expansion GND (lower limit) supply voltage to the CPU board pin ADC_VREFN	1 2 3

5 Connector pinouts
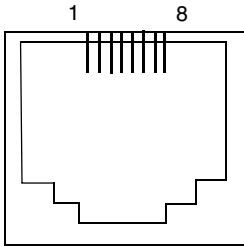
5.1 *CAN DB9 plug connectors (CN400 and CN401)*

Table 11.   CAN DB9 plug connector pinouts (CN400 and CN401)

Pin	Description	Pin	Description
1, 4, 8	NC	7	CANH
2	CANL	3, 6	GND
5	Chassis	9	Optional supply voltage (+3V3 or +5.0V)
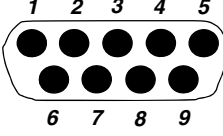
5.2 *Ethernet RJ45 connector (CN300)*

Table 12.   Ethernet RJ45 connector pinout (CN300)

Front View

Pin	Description	Pin	Description
1	TxData+	5	TxData
2	RxData+	6	NC
3	NC	7	RxData
4	NC	8	NC
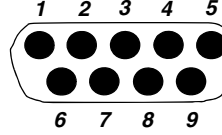
5.3 *RS232/UART0 DB9 plug connector (CN500)*

Table 13.   RS232/UART0 DB9 plug connector pinout (CN500)

Pin	Description	Pin	Description
1	NC (R500 R79 can interconnect this pin with pins 4, 6)	6	Connected to pin 4
2	UART0_RX	7	UART0_RTS
3	UART0_TX	8	UART0_CTS
4	Connected to pin 6	9	NC
5	GND		
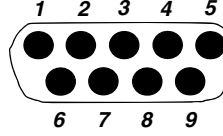
5.4 *RS232/UART2 DB9 plug connector (CN501)*

Table 14.   RS232/UART2 DB9 plug connector pinout (CN501)

Pin	Description	Pin	Description
1	NC (R502 can interconnect this pin with pins 4, 6)	6	Connected to pin 4
2	UART2_RX	7	Connected to pin 8
3	UART2_TX	8	Connected to pin 7
4	Connected to pin 6	9	NC
5	GND		
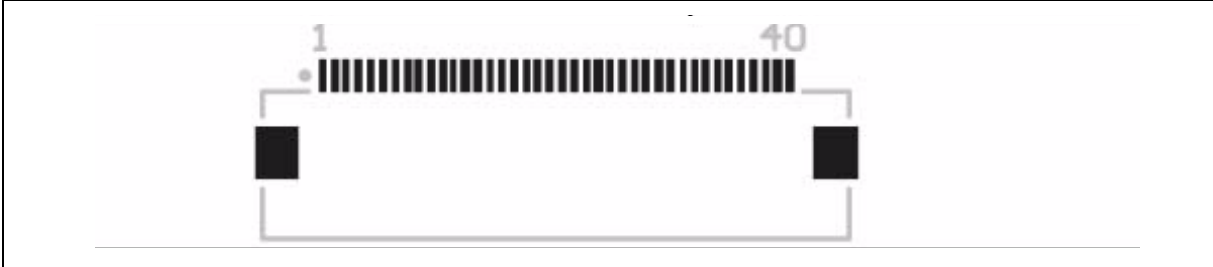
5.5 *RS232/UART1 DB9 plug connector (CN502)*

Table 15.   RS232/UART1 DB9 plug connector pinout (CN502)

Pin	Description	Pin	Description
1	NC (R503 can interconnect this pin with pins 4, 6)	6	Connected to pin 4
2	UART1_RX	7	Connected to pin 8
3	UART1_TX	8	Connected to pin 7
4	Connected to pin 6	9	NC
5	GND		

5.6   *ET057010DHU LCD interface connector (J600)*
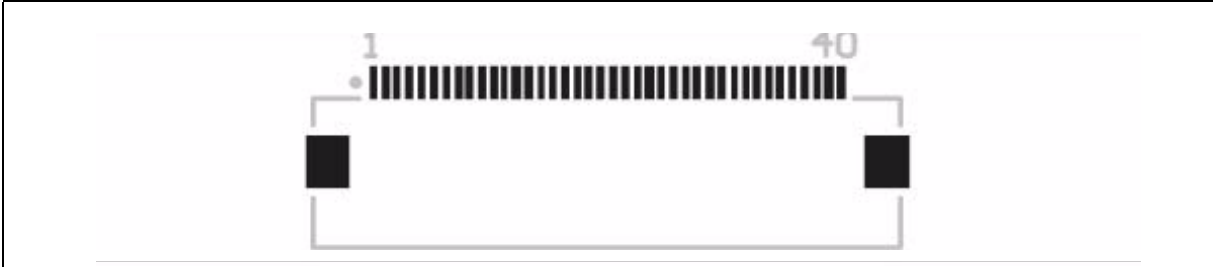
Table 16.   ET057010DHU LCD interface connector pinout (J600)

Pin	Description	Pin	Description	Pin	Description	Pin	Description
1	L/R	11	CLLP (HSYNC)	21	CLD7 (R7)	31	CLD17 (B1)
2	U/D	12	CLCP (DCLK)	22	CLD8 (G0)	32	CLD18 (B2)
3	GND	13	GND	23	CLD9 (G1)	33	CLD19 (B3)
4	GND	14	CLD0 (R0)	24	CLD10 (G2)	34	CLD20 (B4)
5	+3V3	15	CLD1 (R1)	25	CLD11 (G3)	35	CLD21 (B5)
6	+3V3	16	CLD2 (R2)	26	CLD12 (G4)	36	CLD22 (B6)
7	CLPOWER (PWCTRL)	17	CLD3 (R3)	27	CLD13 (G5)	37	CLD23 (B7)
8	LCD_LEDCTRL (LEDCTRL)	18	CLD4 (R4)	28	CLD14 (G6)	38	nRESET
9	CLAC (ENB)	19	CLD5 (R5)	29	CLD15 (G7)	39	GND
10	CLFP (VSYNC)	20	CLD6 (R6)	30	CLD16 (B0)	40	+3V3
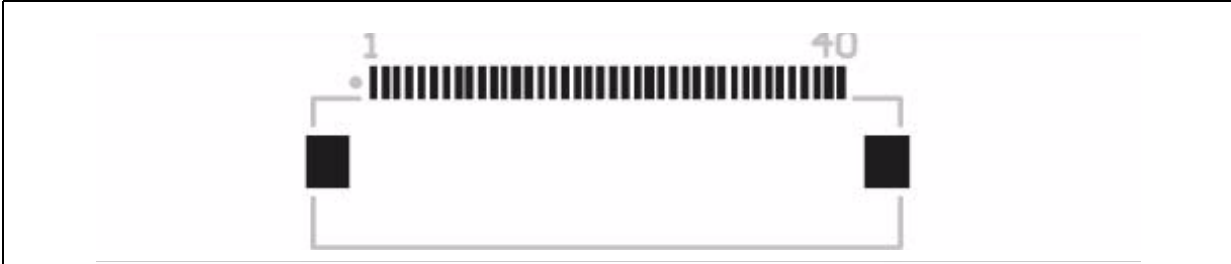
5.7   *EDT unified LCD interface connector (J601)*

Table 17.   EDT Unified LCD interface connector pinout (J601)
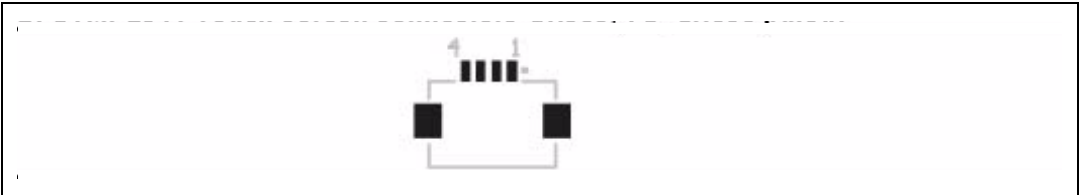
Pin	Description	Pin	Description	Pin	Description	Pin	Description
1	GND	11	CLD14 (B2)	21	GND	31	CLFP (VSYNC)
2	GND	12	CLD13 (B1)	22	CLD5 (R5)	32	CLAC (ENB)
3	+3V3	13	Intensity Bit / CLD17 (B0)	23	CLD4 (R4)	33	Rotate
4	+3V3	14	GND	24	CLD3 (R3)	34	NC
5	CLPOWER (PWCTRL)	15	CLD11 (G5)	25	CLD2 (R2)	35	GND
6	LCD_LEDCTRL (LEDCTRL)	16	CLD10 (G4)	26	CLD1 (R1)	36	+3V3

Table 17. EDT Unified LCD interface connector pinout (J601)

Pin	Description	Pin	Description	Pin	Description	Pin	Description
7	nRESET	17	CLD9 (G3)	27	Intensity Bit / CLD5 (R0)	37	Touch_YU
8	CLD17 (B5)	18	CLD8 (G2)	28	CLCP (DCLK)	38	Touch_XR
9	CLD16 (B4)	19	CLD7 (G1)	29	GND	39	Touch_YD
10	CLD15 (B3)	20	Intensity Bit / CLD11 (G0)	30	CLLP (HSYNC)	40	Touch_XL

5.8 STMPE811 touch screen connectors (CN600 & TS_CN600)

Table 18. STMPE811 touch screen connector pinouts (CN600 & TS_CN600)

Pin	Description	Pin	Description
1	Touch_YU	3	Touch_YD
2	Touch_XR	4	Touch_XL

5.9 General purpose ADC connector CN700

Connector CN700 has eight analog input lines available.

In the expansion, ensure the following relationship between the pins:
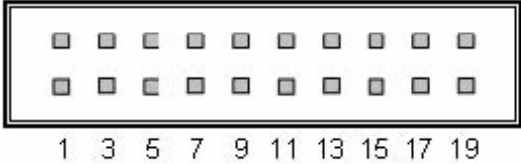
| 0V | ≤ | CN700-1 | ≤ | CN700-3 – CN700-17 | ≤ | CN700-19 | ≤ | +2.5V |
| GND | ≤ | ADC_VREFN | ≤ | AIN0 –AIN7 | | | ≤ | ADC_VREFP | ≤ | +2V5ADC |

Table 19. General purpose ADC connector pinout (CN700)

Pin	Description	Pin	Description	Pin	Description	Pin	Description
1	ADC VREF negative or GND using JP8	6	GND	11	AIN4	16	GND
2	GND	7	AIN2	22	GND	17	AIN7
3	AIN0	8	GND	23	AIN5	18	GND
4	GND	9	AIN3	24	GND	19	ADC VREF positive or +2V5 using JP7
5	AIN1	10	GND	25	AIN6	20	GND

5.10 *General purpose GPIO, I2C connector (CN701)*

Table 20. General purpose GPIO, I2C connector pinout (CN701)
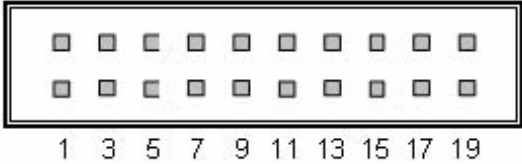
Pin	Description	Pin	Description	Pin	Description	Pin	Description
1	+3V3	6	PL_GPIO5 (I2C_SDA)[1][2]	11	PL_GPIO34	16	GND
2	NC	7	NC	22	GND	17	NC
3	NC	8	NC	23	PL_GPIO35	18	+2V5
4	GND	9	PL_GPIO39	24	GND	19	+5V0
5	PL_GPIO4 (I2C_SCK)[2]	10	GND	25	PL_GPIO21	20	NC

1. R708, R709 -pull-ups for the SCLK and SDA line of I2C

2. R104, C80 -RC filter for the SDA line (R707, C701)

5.11 *Primer2 extension connector (CN702)*

Table 21. Primer2 extension connector pinout (CN702)
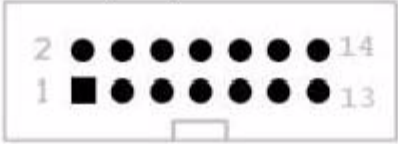
Pin	Description	Pin	Description	Pin	Description	Pin	Description
1	+3V3	6	SSP0_MOSI	11	AIN3	16	UART2_TX
2	GND	7	SSP0_CLK	22	AIN4	17	PL_GPIO_54
3	I2C_SCK[1]	8	SSP0_SS0	23	AIN2	18	UART2_RX
4	I2C_SDA[1][2]	9	P1_CANH	24	PL_GPIO52	19	+5V0
5	SSP0_MISO	10	P1_CANL	25	PL_GPIO53	20	GND

1. R708, R709 -Pull-ups for the SCLK and SDA line of I2C

2. R104, C80 -RC filter for the SDA line (R707, C701)
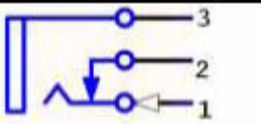
5.12 *Unified power line modem (PLM) connector (CN704)*

Table 22.   Unified power line modem (PLM) connector pinout (CN704)

Pin	Description	Pin	Description
1	+3V3	8	NC
2	NC	9	PL_GPIO34
3	UART2_RX	10	GND
4	NC	11	PL_GPIO35
5	UART2_TX	12	GND
6	NC	13	PL_GPIO21
7	PL_GPIO39	14	GND

5.13 *Mono 3.5 mm audio jack connector (CN703)*
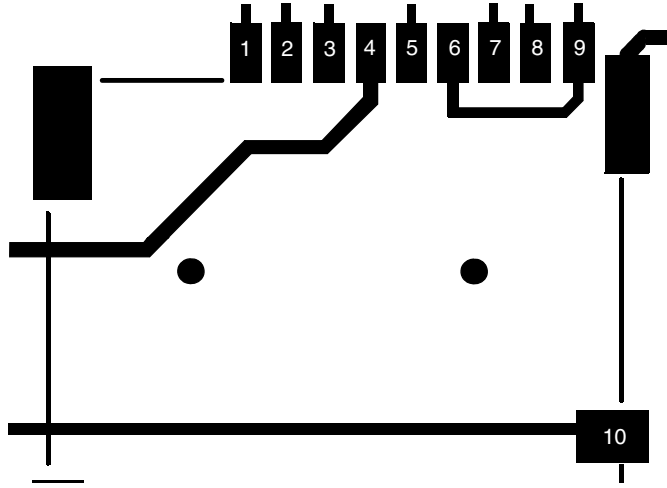
Table 23.   Mono 3.5 mm audio jack connector pinout (CN703)

Pin	Description
1	Speaker+
2	Speaker+ switch
3	Speaker-

5.14   *MicroSD card connector (CN800)*
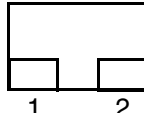
See also: *MicroSD card power up on page 9*.
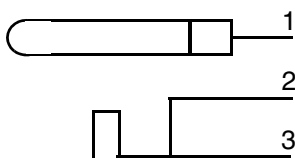
Table 24.   MicroSD card connector pinout (CN800)

Pin number	Description	Pin number	Description
1	SDAT2 (PL_GPIO45)	6	GND
2	SDAT3 (PL_GPIO46)	7	SDAT0 (PL_GPIO43)
3	SDCMD (PL_CLK4)	8	SDAT1 (PL_GPIO44)
4	+3V3 (from U801, single-channel power switch)	9	GND
5	SDCLK (PL_CLK2)	10	SDCD (PL_GPIO51)

5.15   *Power supply connectors (CN900 and CN901)*

Table 25.   Power supply connector pinouts (CN900 and CN901)

Connector CN900

Pin	Description
1	24V DC
2	GND

Connector CN901

Pin	Description
1	24V DC
2	GND
3	GND

5.16 *SPEAr320 CPU board 86-pin connectors (J1 and J2)*

The two 86 pin connectors J1 and J2 are used to connect the expansion board with the SPEAr320 CPU board.

Figure 3. SPEAr320 CPU board 86-pin connector pinouts (J1 and J2)
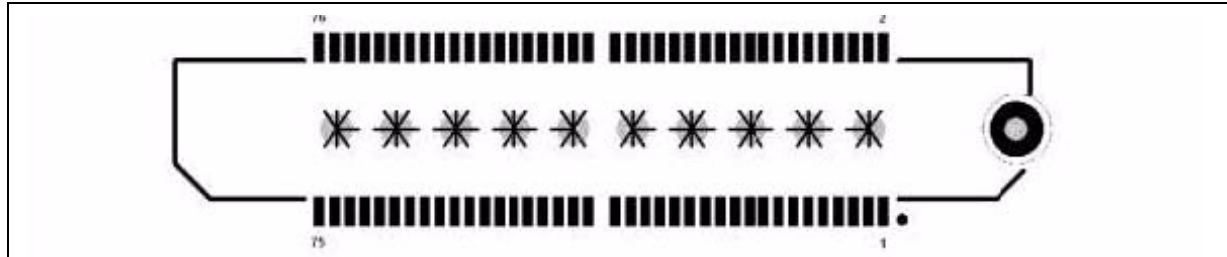
Table 26. SPEAr320 CPU board connectors J1 pins

Pin	Description	Pin	Description	Pin	Description
1	NC	30	SSP_MOSI	59	MII1_RXD0
2	+5V0	31	MII1_TXD3	60	nRESET
3	NC	32	MII1_COL	61	MII1_CRS
4	+5V0	33	MII1_RXER	62	NC
5	NC	34	SSP_CLK	63	MII1_MDIO
6	+5V0	35	MII1_MDC	64	NC
7	NC	36	SSP_MISO	65	SSP_SS0
8	+5V0	37	MII1_RXDV	66	NC
9	UART0_TX	38	I2C_SCL / PL_GPIO4	67	UART2_TX
10	SDAT1 / MicroSD card data 1	39	MII1_RXD2	68	NC
11	UART0_RX	40	I2C_SDA/ PL_GPIO5	69	UART2_RX
12	PL_GPIO39	41	MII1_RXD3	70	+3V3
13	RS232_TXD	42	NC	71	NC
14	PL_GPIO40	43	PL_GPIO36 / TS_X	72	+3V3
15	RS232_RXD	44	NC	73	NC
16	PWM0	45	PL_GPIO41	74	+3V3
17	PL_GPIO42	46	NC	75	NC
18	UART1_TX	47	PL_GPIO35	76	+3V3
19	SDAT0 / MicroSD card data 0	48	NC	77	GND
20	PWM1	49	CAN1_TX	78	GND
21	PL_GPIO34 / PWM2	50	+2V5	79	GND
22	CAN1_RX	51	CAN0_RX	80	GND
23	CAN0_TX	52	+2V5	81	GND
24	UART1_RX	53	MII1_TXD1	82	GND
25	MII1_RXD1	54	+2V5	83	GND
26	MII1_TXD0	55	MII1_TXEN	84	GND

Table 26.   SPEAr320 CPU board connectors J1 pins (continued)

Pin	Description	Pin	Description	Pin	Description
27	MII1_TXD2	56	+2V5	85	GND
28	MII1_TXCLK	57	MII1_TXER	86	GND
29	MII1_RXCLK	58	INRESET		

Table 27.   SPEAr320 CPU board connectors J2 pins

Connector J2					
Pin	**Description**	**Pin**	**Description**	**Pin**	**Description**
1	LED1 / PL_GPIO47	30	CLD21	59	CLD9
2	+3V3	31	FSMC_CS2	60	AIN4
3	LED3 / PL_GPIO49	32	CLD12	61	CLD8
4	FSMC_D05	33	SDCD / MicroSD card detect	62	GND
5	FSMC_RDY/BSY	34	CLD10	63	CLD5
6	SDAT3 / MicroSD card data 3	35	FSMC_CS1	64	AIN5
7	FSMC_RE	36	CLD2	65	CLD4
8	FSMC_CMD_LE	37	CLD23	66	GND
9	FSMC_D04	38	CLD18	67	CLD0
10	FSMC_D07	39	CLD20	68	AIN6
11	SDAT2/ MicroSD data 2	40	CLD3	69	SDCMD / MicroSD command line
12	FSMC_D02	41	CLD19	70	GND
13	LED2 / PL_GPIO48	42	ADC_VREFN	71	SD_SDWP
14	CLPOWER	43	CLD16	72	AIN7
15	LED4 / PL_GPIO50	44	AIN0	73	SDCLK
16	CLFP	45	CLD17	74	GND
17	FSMC_CS0	46	GND	75	CLCP
18	CLAC	47	CLD13	76	ADC_VREFP
19	FSMC_WE	48	AIN0	77	GND
20	CLLE	49	CLD14	78	GND
21	FSMC_ADDR_LE	50	GND	79	GND
22	FSMC_D01	51	CLD11	80	GND
23	FSMC_D03	52	AIN2	81	GND
24	CLLP	53	CLD6	82	GND
25	FSMC_D06	54	GND	83	GND
26	CLD22	55	CLD7	84	GND
27	FSMC_D00	56	AIN3	85	GND
28	CLD15	57	CLD1	86	GND
29	FSMC_CS3	58	GND		

Appendix A   Expansion board components

Table 28.   Expansion board components

Designator	Description	Order
C308, C309	12 pF capacitor	Farnell 1710173
CN704	GM: MLW14G Header, 7-Pin, Dual row	Farnell: 1099256
R609	Potentiometer, 10 KB variable resistor; ALPS -29 0016	Farnell: 1191741
R713	Potentiometer, 100 KB variable resistor; ALPS -29 0024	Farnell: 1191742
C307, C401, C403, C506, C511, C512, C800	10 nF/500 V capacitor	Farnell: 1216456
LD700, LD702	green GaAs LED	Farnell: 1226373
LD800, LD900	red GaAs LED	Farnell: 1226392
LD701, LD703	yellow GaAs LED	Farnell: 1226420
CN703	Lumberg 1503 06 Socket, 3.5mm Jack, Mono	Farnell: 1243243
C901	470 nF Capacitor	Farnell: 1414741
J600	CON40	Farnell: 1435694
CN600	FPC, SMT, 1MM, 4WAY FPC, SMT, 1MM, 4WAY	Farnell: 1757086
C303, C306, C707	10 uF/X5R ceramic capacitor	Farnell: 1463381
U700	KSSG1708 KINGSTATE -KSSG1708 transducer, speaker	Farnell: 1502738
R402, R406	120 Ω resistor	Farnell: 1514716
R305	5.6 KΩ resistor	Farnell: 1514773
L901	BEAD inductor	Farnell: 1515680
R500, R502, R503, R601, R605, R702, R716	0 Ω resistor	Farnell: 1573911
JP202, JP300, JP401, JP404, JP702, JP800, JP900	2-pin jumper wire	Farnell: 1593411
JP200, JP201, JP400, JP402, JP403, JP405, JP600, JP700, JP701	3-pin jumper wire	Farnell: 1593412
CN700, CN701	Header, 10-pin, dual row	Farnell: 1593446
CN702	Header, 10-pin, dual row	Farnell: 1593454
R100, R101, R102, R103, R313, R400, R404, R602, R606, R607, R610, R611, R710, R800, R801, R802, R803, R804, R805, R807, R808, R809, R811, R902	10 KΩ resistor	Farnell: 1601277
C900	10 uF ceramic /35V capacitor	Farnell: 1611967
R318, R403, R407, R501, R504, R505, R806	1 MΩ resistor	Farnell: 1631320
R904	1KΩ28 resistor	Farnell: 1631324 pozor 1k3

Table 28.   Expansion board components (continued)

Designator	Description	Order
R714	22K resistor	Farnell: 1631332
R603, R608, R705, R901	100 Ω resistor	Farnell: 1632390
R707	1K0 resistor	Farnell: 1632391
R300, R314, R712	1.2 KΩ resistor	Farnell: 1632396
R903	1.5 KΩ resistor	Farnell: 1632406
R312, R317	2 KΩ resistor	Farnell: 1632414
R301, R302, R303, R304, R307, R308, R309, R310, R311, R401, R405	2.2 KΩ resistor	Farnell: 1632417
R905	47 KΩ resistor	Farnell: 1632440
L900	33 uH inductor EPCOS b82464z4333m000	Farnell: 1644514
R711	100 KΩ resistor	Farnell: 1646028
R315, R316, R701, R704	220 Ω resistor	Farnell: 1646159
R703, R706, R810	330 Ω resistor	Farnell: 1646224
R906	47 Ω resistor	Farnell: 1646283
R306	91 KΩ resistor	Farnell: 1646361
CN400, CN401, CN500, CN501, CN502	DB9-male connector	Farnell: 1653975
C705, C902	100 uF polarized capacitor (CDE)	Farnell: 1696568
C604, C903, C915, C916	10 nF capacitor	Farnell: 1709948
C701, C905	47 pF capacitor	Farnell: 1710243
C702	470 pF capacitor	Farnell: 1710247
U100	Hynix Semiconductor -HY27UF084G2B-TPCB -memory, Flash NAND 4 GB, TSOP48	Farnell: 1712426
X300	25 MHz epson crystal	Farnell: 1712818
C703	150 nF capacitor	Farnell: 1759018
C904	1 nF capacitor	Farnell: 1759088
C704	33 nF capacitor	Farnell: 1759113
B600, B601, B700	BTN SE pushbutton	Farnell: 177807
CN901	GM: K375A Input power, 4.4V-36V	Farnell: 224960
CN900	MKDS1.5-5.08 or GM: ARK103/2 2 pin terminal block, 5.08mm pitch	Farnell: 3041529
C300, C301, C302, C304, C305, C400, C402, C500, C501, C502, C503, C504, C505, C507, C508, C509, C510, C600, C601, C602, C603, C700, C706, C910, C911, C912, C921, C922, C923, C924	100 nF capacitor	Farnell: 4532004
U400, U401	SN65HVD230 CAN transceiver	Farnell: 8452148
L700	BOURNS -SDR1006-4R7ML power inductor 4.7 uH 7.3A 20% 40MHZ	Farnell: 9315209
R600, R604, R700, R708, R709	4K7 Generic Resistor	Farnell: 9367691

Table 28.   Expansion board components (continued)

Designator	Description	Order
L300, L301	Ferrite bead Ferrite bead	Farnell: 9528172
C801, C906, C908, C909, C914, C917, C918, C919, C920	22uF/6.3V Polarized Capacitor (B)	Farnell:1432361
CN300	RJ45 Ethernet connector with integrated magnetics	Pulse: J00-0086NL
J200, J201	SAMTEC-MIT-038 SAMTEC-MIT-038	Samtec: MIT-38-01-F-D
U800	74V1G125STR non-inverting 3-state buffer	ST: 74V1G125STR
U900	L7986A DC/DC converter	ST: L7986A
U702	64 Kbit EEPROM with password protection & dual interface	ST: M24LR64-R-DW6T
D903	Transil diode	ST: SM6T33A
U500, U501	3.3V/5V Dual RS232 Transceiver w/ Int. Cap.	ST: ST3232EBTR
U300	10/100 Fast Ethernet 3.3 V transceiver	ST: ST802RT1A
U600	Advanced resistive touch screen controller	ST: STMPE811QTR
U801	Single channel power switch	ST: STMPS2141STR
D900, D901, D902	Schottky Diode	ST: STPS3L40UF
U701	Output rail to rail 1W audio power amplifier	ST: TS4871IST
CN800	MicroSD card connector	YAMAICHI: PJS008-2003
SB601, SB602	Solder bridge	
JP901, JP902	3-pin jumper	

Appendix B License agreements

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RECYCLING. The Demo Product is not to be disposed as an urban waste. At the end of its life cycle, differentiated waste collection must be followed, as stated in the directive 2002/96/EC.

In all the countries belonging to the European Union (EU Dir. 2002/96/EC) and those following differentiated recycling, the Demo Product is subject to differentiated recycling at the end of its life cycle, therefore:

It is forbidden to dispose the Demo Product as an undifferentiated waste or with other domestic wastes. Consult the local authorities for more information on the proper disposal channels.

It is mandatory to sort the demo product and deliver it to the appropriate collection centers, or, when possible, return the demo product to the seller.

An incorrect Demo Product disposal may cause damage to the environment and is punished by the law.

10-Nov-2008

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Revision history

Table 29. Document revision history

Date	Revision	Changes
4-Apr-2011	1	Initial release
6-Apr-2011	2	*Section 4.1: MicroSD card power up*: JP800 default changed to *closed*. *Section 4.5: RS232 transceivers (U500 and U501)*: – In note, CN13 changed to CN500 – *Table 8: Bringing UART0/RS232 transceiver signals from the CPU board*: JP17 changed to JP20; JP18 changed to JP21; CN13 changed to CN500 *Table 9: U900 DC/DC converter jumpers*: JP14 changed to JP900; U16 changed to U900
12-Apr-2011	3	Document title changed to *EVALSPEAr320HMI SPEAr320 expansion board for HMI applications* All instances of *application board* changed to *expansion board*

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