CompuLab

SBC-X270
PC/104+ Single Board Computer

Reference Guide

Table of Contents

1. Revision Notes

Date	Description
12-May-2006	▪ First release
21-Jun-2006	▪ Updated with WiFi feature
27-Sep-2006	▪ Added E2 jumper description to GPIO section. ▪ Added a note regarding PC-Card voltage constraint to 3.3V only.
04-Dec-2006	▪ Removed irrelevant mentioning of MMC/SD power switch.
21-Dec-2006	▪ Added a note about touchscreen capacitors removal.
4-Jun-2007	▪ Added a comment regarding the availability of PC-104+ slots.
17-Jun-2007	▪ Removed the incorrect comment regarding compatibility with OV9653 camera module.
02-Jul-2007	▪ Added instructions for front panel removal
10-Sep-2007	▪ GPIO references (P16 connector) were changed to match those of PXA270. ▪ Added a comment about GPIO usage limitation with CM-X270L
23-Oct-2007	Changes for SB-X270 rev 1.3: ▪ Removed VIP ▪ Added SIM card connector. ▪ Added 40 pos FPC LCD connector. ▪ Added 40 pos FPC IDE connector. ▪ Added A/D connector. ▪ Added mini-USB connector. ▪ Added Bluetooth and GPRS LEDs. ▪ JTAG connector pinout changed.
23-Dec-2007	▪ Removed mentioning of extended graphics controller (2700G, MG option), as it has been discontinued in CM-X270W module.
31-Mar-2008	▪ Added GPRS voltage modification instructions
13-May-2008	▪ Clarifications made about USB1 and USB4 ports availability on P15 ▪ P16-20 changed from GND to VCC3-3

2. Introduction

2.1. Highlights

- **Single Board Computer implemented by combination of CM-X270 module and SB-X270 baseboard. Compatible with both X270W and X270L module version**
- **Available in two form-factors:**
  - Standard PC/104+
  - PC/104+ with front panel
- **Intel's XScale PXA270 CPU @ 520 MHz, 128 MB SDRAM, 512 MB Flash Disk**
- **WLAN/WiFi interface**
- **GPRS/GSM MODEM***
- **Bluetooth 2 EDR***
- **VGA graphics controller with connectors for LCD panel and CRT monitor**
- **Video input**
- **PCI and Local Bus expansions in PC/104+ format**
- **COM1 - 4 with RS232 / RS485 / RS422 / TTL driver options**
- **Host and slave USB ports including keyboard & mouse support**
- **Touchscreen interface**
- **Hard disk interface**
- **Sound I/O**
- **Single or dual 100 Mbps Ethernet ports**
- **PCMCIA, CardBus & MMC/SDIO slots**
- **RTC with lithium battery**
- **Switched power supply, 3.3V to 48V operating range**

The SBC-X270 is a standard PC/104+ compliant, single board computer. It is implemented by CM-X270 module providing most of the functions, including an integrated wireless LAN (WiFi) interface, GPRS/GSM modem and Bluetooth transmitter. The SB-X270 carrier board providing connectors and several additional functions. The rich features set of the SBC-X270 is customizable according to the price / performance targets of the user's application.

The unique mechanical design of the SB-X270 allows selecting between two popular form factors: either a standard PC/104+ with headers, or an extended PC/104+ with front panel connectors.

The SB-X270 contains PC/104+ expansion connectors opening it to the wide range of standard peripheral cards. Furthermore, the SB-X270 contains an electrical interface and slots for PCMCIA, CardBus and MMC/SDIO extension cards, which may be inserted and secured in the slot with no additional mechanical means, extending the system with capabilities such as a larger solid state disk, GPS or GSM modem.

Notes: *some of above specified features are optional.* ** with CM-X270W rev 2 only*	

2.2. Features

The "SB Option" column specifies the P/N code of the SB-X270 required for the particular feature. The "CM Option" column specifies the P/N code of CM-X270 required for the particular feature. SB-X270 content is the combination of features provided by the attached CM-X270 and the features implemented on the SB-X270 itself. To have the particular feature, both the CM and SB options of that feature must be implemented.
"+" means that the feature is always available, regardless of P/N code.

Feature	Specification	SB Option	CM Option
CPU SDRAM Flash Disk	See Features List of CM-X270 module		
COM-A	Full modem controls, RS-232 levels, RJ11 or DB9 connector	+	+
COM-B	Rx/Tx , RS232 & TTL levels, on 100-mil header	+	B
COM-C	Full modem, RS 232/422/485 levels, standard 10-pin header	+	+
COM-D	Rx/TX, RS-232 & TTL levels, on 100-mil header	X	+
IrDA	SIR and FIR modes. Shared with COM-D	+	+
IDE	PIO mode. Derived from local bus. Standard 40-pin header	+	+
Ethernet	One or two 10/100BaseT Ethernet ports: 1. Module's port - DM9000, local bus interface 2. Baseboard port Realtek RTL8139 controller PCI interface RJ-45 connector and activity LED's provided in two options: - From baseboard's front panel - Through FPC and optional extension module	+ E2 F1 +	E E,B
LCD Panel	STN and TFT panel support. 51-pos FPC connector for direct interface to certain TFT panels	L	+
CRT Monitor	RGB signals are derived from the TFT interface using DAC's. Interface through DB15 on the front panel or through FPC and optional module	V	+
GPIO	9 to 14 lines, on common 100-mil header.	+	+
PCMCIA & CardBus	Slots with card guides, for card types I, II and III. Two options: - One slot for PCMCIA / CompactFlash (16-bit) card. - One PCMCIA slot and one CardBus (32-bit) slot	C1 C2	+ B

Host USB	Two (default) or four (with "B" option) Host ports, 12 Mbps. Header for Type-A cable/ connector. Two ports on front panel.	+	+
Slave USB	Slave port shared with USB3 host, 12 Mbps.	+	+
Touch Panel	UCB1400 controller for resistive panels, pins on 100-mil header	+	AT
Sound I/O	Header for standard cable/connectors for Microphone (mono), Line input and Speakers (stereo)	+	A
PC104	Standard PC/104 connector. Signals are derived from the CPU's local bus through buffers. 20 bit address. No DMA Support.	P	+
PC104+	PCI bus through standard PC/104+ connector	R	B
RTC Battery	Real time clock operated from on-board lithium battery	+	R
LPC bus	LPC bus on common 100-mil header	+	B
WiFi Interf	WLAN / WiFi including connectors, provided by CM-X270L	+	W

Electrical, Mechanical and Environmental Specifications

Supply Voltage	High efficiency switched power supply. Support of sleep mode. Three supply options: - Regulated 3.3V (valid only when the module doesn't contain the "A" option) - Regulated 5.0V - Unregulated 12V to 48V
Power Consumption	2W to 5W in full activity, depending on CPU speed and selected features Below 50mW in sleep mode
Dimensions	Without front panel - 96 x 91 mm With front panel - 111 x 91 mm Height ranges from 10 mm to 22 mm, depending on the connectors assembled. Height specified includes the CM-X270 module.
Operation temp (case)	Commercial: 0° to 70° C Extended: -20° to 70° C Industrial: -40° to 85° C
Storage temperature	-40° to 85° C
Relative humidity	10% to 90% (operation) 05% to 95% (storage)
Shock	50G / 20 ms
Vibration	20G / 0 - 600 Hz

MTBF	> 100,000 hours

2.3. Block Diagram
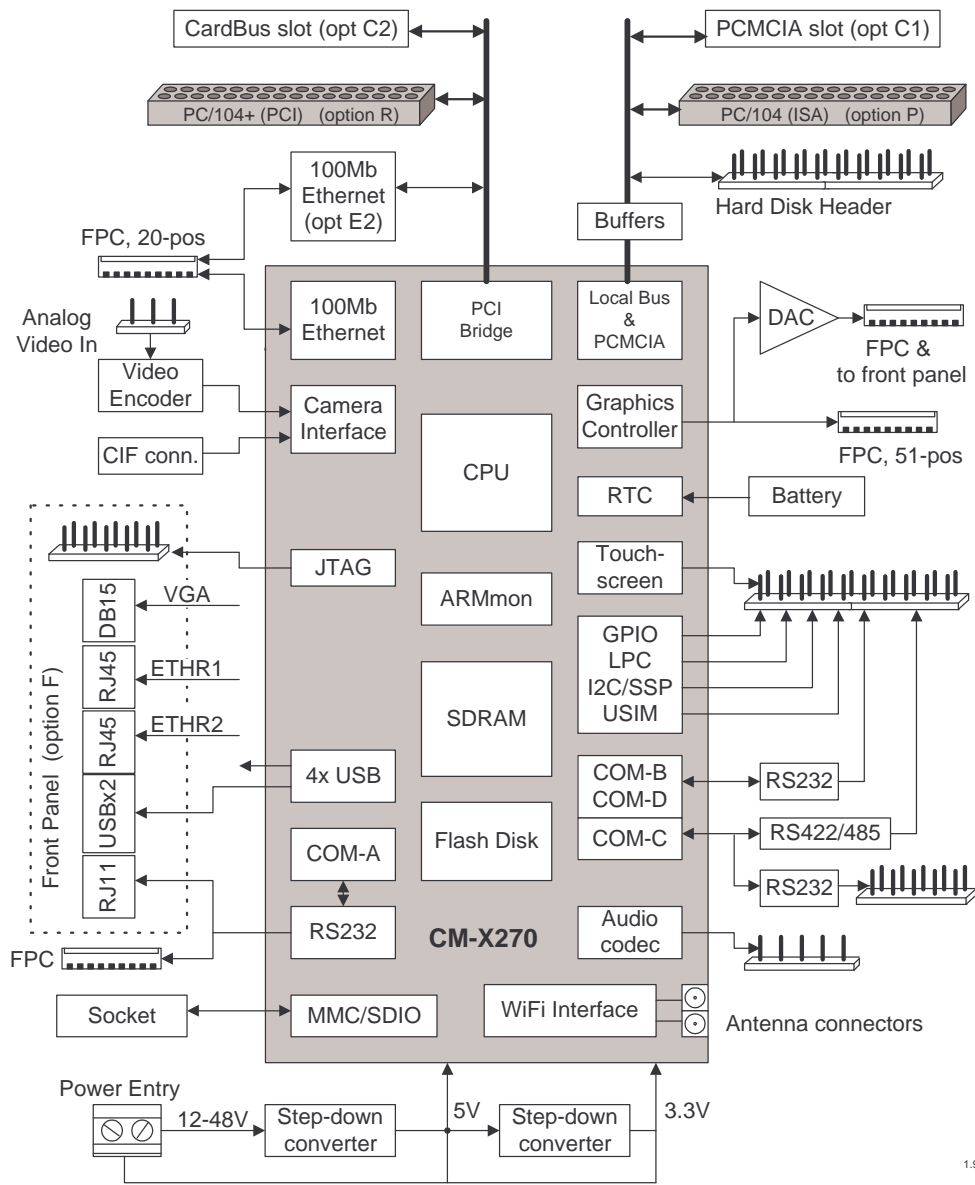
3.   Connector Description

The SB-X270 uses the attached CM-X270 module to implement most of the provided functions. For these functions, the SB-X270 routes the signals from the CM-X270's miniature connectors to the standard connectors. The function's description is therefore provided in the CM-X270 Reference Guide. The section below provides only the description of the external interface connectors. The subsequent section provides the specifications of those functions implemented on the SB-X270 itself.

3.1.   COM-A Connector on Front Panel (P27)

RJ-11 6-pin connector, compatible with a standard RJ11 / DB9 cable (available from CompuLab). RS-232 level Rx/Tx/RTS/CTS are provided, other modem control lines are not available. This connector is available only with the front panel option.

Pin	Name	Pin	Name
1	COM-A-RTS#	2	GND
3	COM-A-TX	4	COM-A-RX
5	GND	6	COM-A-CTS#
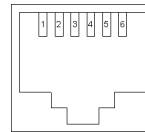
3.2.   COM-C Header (P21)

2x5, 100 mil header, compatible with a standard DB9 cable/connector. RS-232 or TTL levels, depending on assembled option. Includes modem control lines.

Pin	Name	Pin	Name
1	COM-C-DCD#	2	COM-C-RX
3	COM-C-TX	4	COM-C-DTR#
5	GND	6	COM-C-DSR#
7	COM-C-RTS#	8	COM-C-CTS#
9	COM-C-RI#	10	-

COM-C is also routed to the P16 header (see below) for interfacing RS485/422.

3.3. USB header & LCD voltage control (P15)

1x26, 100 mil header. USB pin assignment is directly compatible with standard cables/connectors.

Pin	Name	Wire Color	Pin	Name	Wire Color
01	VCC3.3		14	USB3-P	Green
02	VSRC-LCD		15	GND	Black
03	VCC5		16	SHIELD	
04	GND		17	VCC-USB2	Red
05	VCC-USB1	Red	18	USB2-N	White
06	USB1-N	White	19	USB2-P	Green
07	USB1-P	Green	20	GND	Black
08	GND	Black	21	SHIELD	
09	SHIELD		22	VCC-USB4	Red
10	VCC-USB3		23	USB4-N	White
11	VCC-USB3-BUS		24	USB4-P	Green
12	VCC-USB3-BUS	Red	25	GND	Black
13	USB3-N	White	26	SHIELD	

Notes

- An LCD power supply voltage selection jumper <u>must</u> be assembled in either 1-2 or 2-3 position for normal LCD functionality.
- A jumper must be assembled on pins 10-11 to provide power, if USB3 is used in host mode. A jumper must be removed when USB3 is used in slave mode. Jumper only selects power; the switching between host and slave modes is controlled by ARMmon command.
- If card includes "F" (front panel) option, then USB1 is routed to the front panel rather than to P15 header. To change this assignment, user must remove RN40 bypass and solder it in RN38 location. In cards without "F" option, this is a default assignment.
- USB4 port is available only with CM-X270W module.

3.4. Audio, Touchscreen, Write-protect (P14)

P14 - 1x18 100 mil header

Pin	Name	Pin	Name
1	TSMX	10	GND
2	TSMY	11	GND
3	TSPY	12	LOUT-L
4	TSPX	13	LIN-R
5	NAND-WP#*	14	GND

6	GND	15	GND
7	NOR-WP#*	16	LIN-L-MIC*
8	GND	17	VCC5
9	LOUT-R	18	GND

Notes

- Pull pins 5 & 7 low to write protect CoM's NAND and NOR flashes respectively. For this purpose jumpers can be assembled on P14 5-6 and/or P14 7-8.
- MIC-IN and IN-L signals are connected together; consequently, microphone recording and line recording can't be done simultaneously.
- In early versions of SB-X270 there are 4 capacitors assembled, which sometimes affect touchscreen operation. If you are facing touchscreen problems, please remove C140, C143, C150, C151. For capacitors location refer to [Developer] >> [X270] >> [SB-X270 Design] links in CompuLab's web-site.

3.5.   RTC, Audio (P18)

1x3 100 mil header

Pin	Name
1	GND
2	VBAT
3	SPDIF

3.6. IDE – Hard Disk Interface (P8, P34)

P8 - Standard 40-pin header, directly compatible with an IDE flat cable

Pin	IDE signal	CM-X270 connector pin name	Pin	IDE signal	CM-X270 connector pin name
1	RESET#	RST-OUT#	2	GND	GND
3	DATA7	LB-D7	4	DATA8	LB-D8
5	DATA6	LB-D6	6	DATA9	LB-D9
7	DATA5	LB-D5	8	DATA10	LB-D10
9	DATA4	LB-D4	10	DATA11	LB-D11
11	DATA3	LB-D3	12	DATA12	LB-D12
13	DATA2	LB-D2	14	DATA13	LB-D13
15	DATA1	LB-D1	16	DATA14	LB-D14
17	DATA0	LB-D1	18	DATA15	LB-D15
19	GND	GND	20	KEY	-
21	DMAREQ	-	22	GND	GND
23	IOW#	LB-IDE-WR#	24	GND	GND
25	IOR#	LB-IDE-RD#	26	GND	GND
27	IOCHRDY	LB-IORDY	28	CSEL	GND
29	DMAACK#	-	30	GND	GND
31	IRQ	IDE-INT	32	IOCS16#	-
33	ADDR1	LB-A4	34	PDIAG	-
35	ADDR0	LB-A3	36	ADDR2	LB-A5
37	CS0#	IDE-CS0#	38	CS1#	IDE-CS1#
39	DASP#	(Pullup, LED)	40	GND	GND

* Signals marked in gray are not supported.

P34 - 40-pin FPC connector, for IDE interface module available from CompuLab.

Pin	IDE signal	Pin	IDE signal
1	DATA8	21	DATA2
2	VCC5	22	DATA1
3	DATA9	23	GND
4	DATA10	24	DATA0
5	VCC5	25	CS0#
6	DATA11	26	GND
7	DATA12	27	IOCHRDY
8	GND	28	IRQ

9	DATA13	29	IOW#
10	DATA14	30	GND
11	GND	31	ADDR0
12	DATA15	32	IOR#
13	DATA7	33	GND
14	GND	34	CS1#
15	DATA6	35	DMAACK#
16	DATA5	36	ADDR2
17	GND	37	GND
18	DATA4	38	ADDR1
19	DATA3	39	DMAREQ
20	GND	40	RESET#

3.7. PC Card - PCMCIA slot (P6)

The 68-pin PC Card slot conforms to the PCMCIA standard. It includes card guides.

Pin	PCMCIA Signal	CM-X270 connector pin name	Pin	PCMCIA Signal	CM-X270 connector pin name
1	GND	GND	35	GND	GND
2	D3	LB-D3	36	CD1#	PCM-CDA#
3	D4	LB-D4	37	D11	LB-D11
4	D5	LB-D5	38	D12	LB-D12
5	D6	LB-D6	39	D13	LB-D13
6	D7	LB-D7	40	D14	LB-D14
7	CE1#	PCM-CE1#	41	D15	LB-D15
8	A10	LB-A10	42	CE2#	PCM-CE2#
9	OE#	PCM-MEMR#	43	VS1#	-
10	A11	LB-A11	44	IOR#	PCM-IOR#
11	A9	LB-A9	45	IOW#	PCM-IOW#
12	A8	LB-A8	46	A17	LB-A17
13	A13	LB-A13	47	A18	LB-A18
14	A14	LB-A14	48	A19	LB-A19
15	WE#	PCM-MEMW#	49	A20	LB-A20
16	RDY# IREQ#	PCM-IRQ1	50	A21	LB-A21
17	VCC	VCC-P1*	51	VCC	VCC-P1*
18	VPP1	5V	52	VPP2	5V
19	A16	LB-A16	53	A22	LB-A22

20	A15	LB-A15	54	A23	LB-A23
21	A12	LB-A12	55	A24	LB-A24
22	A7	LB-A7	56	A25	LB-A25
23	A6	LB-A6	57	VS2#	-
24	A5	LB-A5	58	RESET	PCM-RST
25	A4	LB-A4	59	WAIT	PCM-WAIT#
26	A3	LB-A3	60	INPACK#	N/C
27	A2	LB-A2	61	REG#	PCM-REG#
28	A1	LB-A1	62	BVD2/SPK	-
29	A0	LB-A0	63	BVD1/STS	-
30	D0	LB-D0	64	D8	LB-D8
31	D1	LB-D1	65	D9	LB-D9
32	D2	LB-D2	66	D10	LB-D10
33	WP/IOIS#	PCM-IOS16#	67	CD2#	-
34	GND	GND	68	GND	GND

* See section 3.8

3.8. PCMCIA Power Header (E4)

This header selects the VCC voltage for PCMCIA / CompactFlash cards in the PCMCIA slot. The SB-X270 does not support automatic voltage selection, so the user is responsible for setting the correct VCC voltage before inserting the card, by shorting the appropriate pins on E4. For 5V supply, short pins 1-2 and for 3.3V supply short pints 2-3. VPP is constant at 5V.

Pin	Signal
1	VCC5
2	VCC-P1
3	VCC3-3

3.9. CardBus Slot (P7)

68-pin PC Card / CardBus slot including card guides.

The SB-X270 implements a simplified CardBus interface, which connects the CardBus socket directly to the PCI bus of CM-X270. The provided CardBus implementation doesn't support hot plug, thus the card has to be inserted before powering the system. The enumeration sequence is performed using on-board glue logic which controls the CB-FRAME# signal by software.

Pin	Signal	Pin	Signal

	Name		**Name**
1	GND	35	GND
2	PCI-AD0	36	N/C
3	PCI-AD1	37	PCI-AD2
4	PCI-AD3	38	PCI-AD4
5	PCI-AD5	39	PCI-AD6
6	PCI-AD7	40	N/C
7	PCI-CBE0#	41	PCI-AD8
8	PCI-AD9	42	PCI-AD10
9	PCI-AD11	43	N/C
10	PCI-AD12	44	PCI-AD13
11	PCI-AD14	45	PCI-AD15
12	PCI-CBE1#	46	PCI-AD16
13	PCI-PAR	47	N/C
14	PCI-PERR#	48	PCI-LOCK#
15	PCI-GNT0#	49	PCI-STOP#
16	PCI-INTB#	50	PCI-DEVSEL#
17	VCC3-3	51	VCC3-3
18	VCC3-3	52	VCC3-3
19	CB-CLK	53	PCI-TRDY#
20	PCI-IRDY#	54	CB-FRAME#
21	PCI-CBE2#	55	PCI-AD17
22	PCI-AD18	56	PCI-AD19
23	PCI-AD20	57	N/C
24	PCI-AD21	58	SYS-RST#
25	PCI-AD22	59	PCI-SERR#
26	PCI-AD23	60	PCI-REQ0#
27	PCI-AD24	61	PCI-CBE3#
28	PCI-AD25	62	N/C
29	PCI-AD26	63	N/C
30	PCI-AD27	64	PCI-AD28
31	PCI-AD29	65	PCI-AD30
32	N/C	66	PCI-AD31
33	PU	67	N/C
34	GND	68	GND

3.10. CRT VGA Connector on Front Panel (P24)

A standard DB-15 connector on front panel enables CRT display. This connector is available only with the front panel option.

Pin	Name
1	RED
2	GREEN
3	BLUE
4	N/C
5	GND
6	GND
7	GND
8	GND
9	N/C
10	GND
11	N/C
12	N/C
13	HSYNC
14	VSYNC
15	N/C

3.11. LCD Panel Connectors (P13, P20)

P13 - 51-pos FPC connector for LCD panels

Pin	Name	Pin	Name
01	LCD-VDD	27	LCD-VDD
02	LCD-VDD	28	LCD-VDD
03	LCD-R2	29	LCD-B2
04	LCD-R3	30	LCD-B3
05	GND	31	GND
06	LCD-R4	32	LCD-B4
07	LCD-R5	33	LCD-B5
08	GND	34	GND
09	LCD-R6	35	LCD-B6
10	LCD-R7	36	LCD-B7
11	GND	37	GND
12	LCD-R0	38	LCD-B0
13	LCD-R1	39	LCD-B1

14	GND		40	GND
15	GND		41	GND
16	LCD-G2		42	LCD-LP
17	LCD-G3		43	LCD-FRM
18	GND		44	LCD-DE
19	LCD-G4		45	GND
20	LCD-G5		46	LCD-SCK
21	GND		47	GND
22	LCD-G6		48	LCD-ENVDD
23	LCD-G7		49	LCD-ENVEE
24	GND		50	LCD-VDD
25	LCD-G0		51	LCD-VDD
26	LCD-G1			

P20 - 40-pin FPC connector for TFT panels

Pin	Name		Pin	Name
01	NC		21	LCD-VDD
02	LCD-VDD-EN		22	TSPY
03	GND		23	TSMY
04	LCD-R0		24	TSPX
05	LCD-R1		25	TSMX
06	LCD-VDD		26	LCD-B0
07	LCD-R2		27	LCD-VDD
08	LCD-R3		28	LCD-B1
09	GND		29	LCD-B2
10	LCD-R4		30	GND
11	LCD-R5		31	LCD-B3
12	LCD-VDD		32	LCD-B4
13	LCD-G5		33	GND
14	LCD-G4		34	LCD-B5
15	GND		35	LCD-DE
16	LCD-G3		36	LCD-VDD
17	LCD-G2		37	LCD-LP
18	LCD-VDD		38	LCD-FRM
19	LCD-G1		39	GND
20	LCD-G0		40	LCD-SCK

LCD-VDD-EN is an active low ENAVDD signal to be used in conjunction with the CONLCD-GEN-V2 adapter module, available from CompuLab.

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3.12. PC/104 connector (P4)

A PC/104 (ISA bus type) stackthrough connector provides limited ISA-like functionality. The CM-X270's local bus lines are connected through buffers to their respective counterparts on the PC/104 connector.

Pin	PC/104 Signal	CM-X270 connector pin name	Pin	PC/104 Signal	CM-X270 connector (or other origin) name
A01	IOCHCHK#	-	B01	GND	GND
A02	SD7	LB-D7	B02	RESETDRV	RSTDRV
A03	SD6	LB-D6	B03	+5V	VCC5
A04	SD5	LB-D5	B04	IRQ9	-
A05	SD4	LB-D4	B05	-5V	-
A06	SD3	LB-D3	B06	DRQ2	-
A07	SD2	LB-D2	B07	-12V	-
A08	SD1	LB-D1	B08	0WS#	-
A09	SD0	LB-D0	B09	+12V	-
A10	IOCHRDY	LB-IORDY	B10	KEY	-
A11	AEN	GND	B11	SMEMW#	ISA-WR#*
A12	SA19	LB-A19	B12	SMEMR#	ISA-RD#*
A13	SA18	LB-A18	B13	IOW#	ISA-IOW#*
A14	SA17	LB-A17	B14	IOR#	ISA-IOR#*
A15	SA16	LB-A16	B15	DACK3#	Pullup
A16	SA15	LB-A15	B16	DRQ3	-
A17	SA14	LB-A14	B17	DACK1#	Pullup
A18	SA13	LB-A13	B18	DRQ1	-
A19	SA12	LB-A12	B19	REFRESH	Pullup
A20	SA11	LB-A11	B20	SYSCLK	CLK8Mhz
A21	SA10	LB-A10	B21	IRQ7	-
A22	SA9	LB-A9	B22	IRQ6	-
A23	SA8	LB-A8	B23	IRQ5	GPIRQ1*
A24	SA7	LB-A7	B24	IRQ4	-
A25	SA6	LB-A6	B25	IRQ3	GPIRQ1*
A26	SA5	LB-A5	B26	DACK2#	Pullup
A27	SA4	LB-A4	B27	TC	GND
A28	SA3	LB-A3	B28	BALE	Pullup
A29	SA2	LB-A2	B29	+5V	VCC5
A30	SA1	LB-A1	B30	OSC	CLK16M hz
A31	SA0	LB-A21	B31	GND	GND
A32	GND	GND	B32	GND	GND

Pin	PC/104 Signal	CM-X270 connector pin name	Pin	PC/104 Signal	CM-X270 connector pin name
C00	GND	GND	D00	GND	GND
C01	SBHE#	GND	D01	MEMCS16#	-
C02	LA23	LB-A23	D02	IOCS16#	-
C03	LA22	LB-A22	D03	IRQ10	-
C04	LA21	LB-A21	D04	IRQ11	GPIRQ1*
C05	LA20	LB-A20	D05	IRQ12	-
C06	LA19	LB-A19	D06	IRQ15	GPIRQ1*
C07	LA18	LB-A18	D07	IRQ14	-
C08	LA17	LB-A17	D08	DACK0#	Pullup
C09	MEMR#	ISA-RD#*	D09	DRQ0	-
C10	MEMW#	ISA-WR#*	D10	DACK5#	Pullup
C11	SD8	LB-D8	D11	DRQ5	-
C12	SD9	LB-D9	D12	DACK6#	Pullup
C13	SD10	LB-D10	D13	DRQ6	-
C14	SD11	LB-D11	D14	DACK7#	Pullup
C15	SD12	LB-D12	D15	DRQ7	-
C16	SD13	LB-D13	D16	+5V	
C17	SD14	LB-D14	D17	MASTER#	Pullup
C18	SD15	LB-D15	D18	GND	GND
C19	KEY	-	D19	GND	GND

Signals marked in gray are not supported. In general, functionality of the PC104 bus of the SB-X270 has the following limitations:

- DMA channels are not supported.
- Only four interrupt inputs are supported. B23, B25, D04, D06 pins are consolidated to GPIRQ1 through OR gate.
- Some signals of secondary importance are not supported: MEMSC16, IOCS16#, BALE. The irrelevant signal REFRESH is also not supported.
- Signals marked with (*) are generated by on-board logic. See section 4.3 for details.
- The PXA-270 CPU does not support 8-bit granularity accesses. In order to make attaching 8-bit PC-104 cards to the SB-X270 possible, LB-A21 was connected to SA0.

3.13. PC/104+ PCI bus connector (P5)

Standard PC/104+ (PCI bus) connector. The CM-X270 PCI bus lines are directly connected to the PC/104+ connector. All non-obvious connections are mentioned in notes.

Pin	Name	Notes	Pin	Name	Notes
A01	KEY2	N/C	B01	(reserved)	
A02	V I/O	3.3V	B02	AD02	
A03	AD05		B03	GND	
A04	CBE0#		B04	AD07	
A05	GND		B05	AD09	
A06	AD11		B06	V I/O	3.3V
A07	AD14		B07	AD13	
A08	+3.3V		B08	CBE1#	
A09	SERR#		B09	GND	
A10	GND		B10	PERR#	
A11	STOP#		B11	+3.3V	
A12	+3.3V		B12	TRDY#	
A13	FRAME#		B13	GND	
A14	GND		B14	AD16	
A15	AD18		B15	+3.3V	
A16	AD21		B16	AD20	
A17	+3.3V		B17	AD23	
A18	IDSEL0	AD28 via 150R	B18	GND	
A19	AD24		B19	CBE3#	
A20	GND		B20	AD26	
A21	AD29		B21	+5.0V	
A22	+5.0V		B22	AD30	
A23	REQ0#	PCI-REQ0#	B23	GND	
A24	GND		B24	REQ2#	PCI-REQ2#
A25	GNT1#	PCI-GNT1#	B25	V I/O	3.3V
A26	+5.0V		B26	CLK0	
A27	CLK2		B27	+5.0V	
A28	GND		B28	INTD#	PCI-INTD#
A29	+12V	N/C	B29	INTA#	PCI-INTA#
A30	-12V	N/C	B30	(reserved)	

Pin	Name	Notes	Pin	Name	Notes
C01	+5.0V		D01	AD00	
C02	AD01		D02	+5.0V	

| | | | | | | |
|-----|------------|----------------|-----|----------|----------------|
| C03 | AD04 | | D03 | AD03 | |
| C04 | GND | | D04 | AD06 | |
| C05 | AD08 | | D05 | GND | |
| C06 | AD10 | | D06 | M66EN | GND |
| C07 | GND | | D07 | AD12 | |
| C08 | AD15 | | D08 | +3.3V | |
| C09 | SB0# | N/C | D09 | PAR | |
| C10 | +3.3V | | D10 | SDONE | N/C |
| C11 | LOCK# | | D11 | GND | |
| C12 | GND | | D12 | DEVSEL# | |
| C13 | IRDY# | | D13 | +3.3V | |
| C14 | +3.3V | | D14 | CBE2# | |
| C15 | AD17 | | D15 | GND | |
| C16 | GND | | D16 | AD19 | |
| C17 | AD22 | | D17 | +3.3V | |
| C18 | IDSEL1 | AD29 via 150R | D18 | IDSEL2 | AD30 via 150R |
| C19 | V I/O | | D19 | IDSEL3 | AD31 via 150R |
| C20 | AD25 | | D20 | GND | |
| C21 | AD28 | | D21 | AD27 | |
| C22 | GND | | D22 | AD31 | |
| C23 | REQ1# | PCI-REQ1# | D23 | V I/O | |
| C24 | +5.0V | | D24 | GNT0# | PCI-GNT0# |
| C25 | GNT2# | PCI-GNT2# | D25 | GND | |
| C26 | GND | | D26 | CLK1 | |
| C27 | CLK3 | | D27 | GND | |
| C28 | +5.0V | | D28 | RST# | |
| C29 | INTB# | PCI-INTB# | D29 | INTC# | PCI-INTC# |
| C30 | (reserved) | | D30 | KEY2 | N/C |

Note

Due to limited amount of PCI request/grant pairs, the number of supported PC104+ slots is limited. The availability of the slots depends on the module type and the presence of RTL8139 Ethernet controller onboard the SB-X270 (option E), as described in the table below. The numbers denote the amount of slots available for use.

	SB-X270 "E"- option	
	E1	E2
CM-X270W	3	2
CM-X270L	2	1

3.14. USB Dual Connector on Front Panel (U25)

A standard dual USB Type-A stacked connector on the front panel, used for USB1 and USB3 interfaces.

USB interface 2		USB interface 1	
Pin	Name	Pin	Name
1	VBUS	5	VBUS
2	USB3-N	6	USB1-N
3	USB3-P	7	USB1-P
4	GND	8	GND
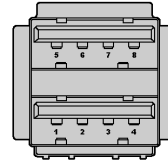
* USB3 can function either as Host or Slave (see P15).

3.15. Mini-USB type AB connector (P36)

A standard mini-USB Type-AB connector on the front panel, used for USB3 interface.

Pin	Signal Name
1	USV_VCC
2	USB3-N
3	USB3-P
4	NC
5	GND

3.16. Ethernet Port 1 on Front Panel (P25)

A standard RJ45 connector provides an interface for the first Ethernet port available on the CM-X270 module.

Pin	Name
1	TXD+
2	TXD-
3	RXD+
4	-
5	-
6	RXD-
7	-
8	-

3.17. Ethernet Port 2 on Front Panel (P26)

A standard RJ45 connector provides an interface for an Ethernet port implemented on the SB-X270 board.

Pin	Name
1	TXD+
2	TXD-
3	RXD+
4	-
5	-
6	RXD-
7	-
8	-

3.18. Ethernet FPC Connector (P11)

The Ethernet FPC connector is used as an alternative for the front panel Ethernet connectors when the front panel is not available (as in standard PC/104 form factor). It is impossible to use the FPC connector if the front panel connectors are assembled. Ethernet FPC connector provides two separate groups of signals, one per Ethernet port available in the CM-X270 / SB-X270 system.

Pin	Name	Pin	Name
1	ETH1-LINK10#	11	ETH2-TX-VCC
2	ETH1-RDP	12	ETH2-TDP
3	ETH1-RDN	13	ETH2-TDN
4	ETH1-LINK10#	14	ETH2-TX-VCC
5	ETH1-LINK100#	15	ETH2-ACT#
6	ETH1-ACT#	16	ETH2-LINK100#
7	ETH1-TX-VCC	17	ETH2-LINK10#
8	ETH1-TDN	18	ETH2-RDN
9	ETH1-TDP	19	ETH2-RDP
10	ETH1-TX-VCC	20	ETH2-LINK10#

The connector matches with 20-wire 0.5 mm FPC cable. Ethernet signal routing is implemented through the following scheme:
FPC connector >> FPC cable >> RJ45 module >> standard Ethernet cable
CompuLab provides the required FPC cables and RJ45 modules for single or dual Ethernet ports. The modules include an FPC mating connector, one or two RJ45 connector/s with transformer/s and activity LED's.

The default settings of activity LEDs for the SB-X270 on-board Ethernet interface are specified in the table below. Settings can be changed by software.

Signal Name	Indications
LED0	RX/TX activity
LED1	Link 100
LED2	Link 10

Note: LED signal wires in flat cable are also used as secondary shielding, so their locations on the header may appear non-obvious.

The LED signal connections, as implemented in CompuLab's RJ-45 module, are:
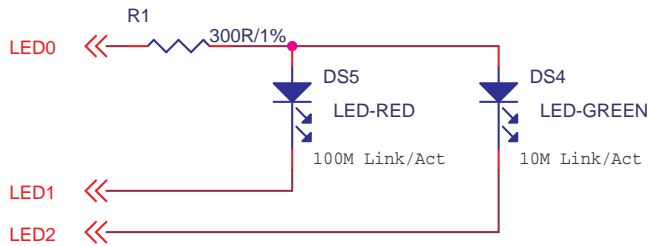
This connection supplies full information about speed / link / activity.

LED-RED: 100 Mbps activity indicator
LED-GREEN: 10 Mbps activity indicator

Activity	LED (Red/Green)
none	off
Link (only)	on
Tx / Rx (and Link)	blink

3.19. CIF - Camera Interface connector (P22)

P22 allows a connection of a CMOS sensor to the CM-X270 QuickCapture interface in order to display/capture video stream and still images.

Pin	Name	Pin	Name
1	N/C	13	CLK-IN
2	GND	14	D6
3	SDA	15	GND
4	VCC2-5V	16	D5
5	SCL	17	PCLK
6	RST	18	D4
7	VSYNC	19	D0
8	N/C	20	D3
9	HSYNC	21	D1
10	VCC1-8V	22	D2
11	VCC3-3V	23	N/C
12	D7	24	N/C

3.20. Analog video input (P23)

A 1x3, 100 mil header provided for connecting analog video input to the Video Input Processor available on the SB-X270

Pin	Name
1	VID-IN1
2	GND
3	VID-IN2

3.21. GPIO, COM ports and Special Functions (P16)

A 25x2 100 mil connector

Revision comment: pay attention that GPIO references in "Name" column were changed to match those of PXA270.

Pin	Name	GPIO reference in SB-X270 schematics	Pin	Name	GPIO reference in SB-X270 schematics
01	VCC3-3		02	GPRS_LED_DRIVE	
03	VCC-USIM		04	BT_LED_DRIVE	
05	UIO		06	GPIO104	12
07	GPIO86	11	08	GPIO106	13
09	GPIO105	10	10	GPIO52	14
11	GPIO12	9	12	GPIO103	15
13	(reserved)		14	GPIO99	16
15	GPIO14 (45)	7	16	GPIO87	17
17	GPIRQ0 / GPIO1		18	GPIO97 / DREQ1	18
19	VDD-FAULT#		20	VCC3-3	
21	SYS-RST#		22	SYS-EN	
23	PME#		24	GND	
25	GPCS0#		26	GPIO19 (44)	5
27	GPCS1#		28	GPIO102	4
29	GPIO101	6	30	GND	
31	COM-D-RX		32	COM-D-TX	
33	COM-B-RTS#		34	COM-B-CTS#	
35	COM-B-RX		36	COM-B-TX	
37	SDA		38	SCL	
39	RST-IN		40	GND	
41	SSPCLK		42	SSPTXD	
43	SSPFRM		44	SSPRXD	
45	GPIO107	19	46	GND	
47	RS485-TX-P		48	RS485-RX-P	
49	RS485-TX-N		50	RS485-RX-N	

Notes:
- GPIO reference in "Name" column - according to PXA270 naming.
- For SIM operation, a jumper should be assembled between pins 1 & 3.
- For GPIO 14(45) and 19(44) values in parentheses are for the CM-X270L module.

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- If pins 1-2 of E2 are shorted using a shunt jumper, GPIRQ1 and DREQ1 lines are not driven by onboard buffers. With CM-X270W module, shorting pins 1-2 of E2 enables the use of PXA270 GPIO101 and GPIO97.
- PXA270 GPIO 14, 19, 87, 102, 103 are available only with CM-X270W.

3.22. JTAG connector (P19)

A 7x2 100 mil connector. The CM-X270W JTAG interface is routed here.

Pin	Name	Pin	Name
01	VCC3_3SBY	02	GND
03	TRST#	04	GND
05	TDI	06	GND
07	TMS	08	GND
09	TCK	10	GND
09	TDO	10	RST_IN
09	VCC3_3SBY	10	GND

3.23. MMC/SDIO socket (P30)

The CM-X270 MMC/SDIO interface is connected to this standard MMC/SDIO socket.

Pin	Name
1	DAT3
2	CMD
3	GND
4	VCC-SD
5	CLK
6	GND
7	DAT0
8	DAT1
9	DAT2
10	GND
11	CD
12	WP
13	GND
14	GND
15	GND

3.24. LPC connector (P17)

A 5x2 100 mil connector providing the CM-X270's LPC interface

Pin	Name	Pin	Name
01	LAD0	02	LFRAME#
03	LAD1	04	SERIRQ
05	LAD2	06	VCC5
07	LAD3	08	LPC-CLK
09	GND	10	VCC3-3

3.25. P35 – A/D Input

Four A/D inputs available on the WM9715 AC'97 CODEC of the CM-X270W rev 2.

Pin	Name
01	AD4
02	AD3
03	GND
04	AD2
05	AD1
06	GND

3.26. VGA & COM-A FPC Connector (P31)

The VGA & COM-A FPC connector provides two separate groups of signals, one for a COM-A serial port and another for a VGA (analog RGB) output. Two different groups of signals are consolidated in order to save board space. This connector delivers the same signals as are routed to the front panel. It can be used whether the front panel is assembled or not.

Pin	Name	Pin	Name
1	COM-A-DCD	11	HSYNC
2	COM-A-RX	12	GND
3	COM-A-TX	13	VSYNC
4	COM-A-DTR	14	GND
5	GND	15	BLUE
6	COM-A-DSR	16	GND
7	COM-A-RTS	17	GREEN
8	COM-A-CTS	18	GND
9	COM-A-RI	19	RED
10	GND	20	GND

The connector matches with a 20-wire FPC cable. Signal routing is implemented through the following scheme:

FPC conn >> FPC cable >> DB15 & DB9 Interface module >> standard VGA and RS232 cables

CompuLab provides VGA and RS232 interface modules in three varieties: a VGA only module with DB15 connector, a RS232 only module with DB9 connector and a combined module with both connectors.

3.27. SIM Card Socket (P12)

Connector P12, standard SIM card socket:

Pin	Signal Name	Pin	Signal Name
1	GPRS_SIMVCC	7	GPRS_SIMIO
2	GPRS_SIMRST	8	GND
3	GPRS_SIMCLK	9	GND
4	-	10	GND
5	GND	11	GND
6	NC		

Reference connector data:

Manufacturer	Mfg. P/N	Mating connector
Astron	5190006-006-R	Standard SIM card.

3.28. Power Connectors

P29: The 2-node terminal block is used as a main power connector.

Pin	Name
1	VCC5
2	GND

P28: The 2-node terminal block is used as a low and high voltage power connector.

Pin	Name
1	12V-48V
2	3.3V
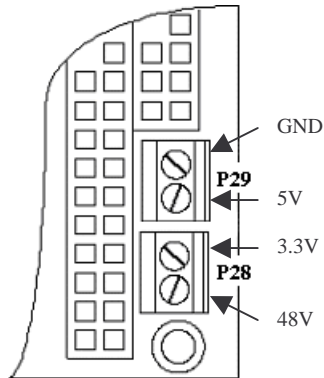
4. Functions Implemented on the SB-X270

Most of the functions are implemented by the attached CM-X270 module, while the SB-X270 board provides connectors or headers. Several additional functions are implemented on the SB-X270 itself and are described in this section.

Note: The SB-X270 uses a CPLD (programmable logic IC) in order to implement combinatory logic functionality. This is done in order to reduce component count and add some flexibility to the design. The usage of a CPLD is not obligatory and can be replaced by discrete logic IC's. The internal design description of the CPLD is attached to the SB-X270 schematics package.

4.1. PC/104 and IDE addressing and logic

The SB-X270 implements address decoding logic by GPCS and IDE-CS signals from the CM-X270 for driving a number of control signals (OE#, WE#, CS#) to the PC/104 and IDE buses. Below is a memory address map for the above buses and relevant active control signals:

Description	Address range	Active control signals
PC/104 memory access region	0x0C000000-0x0CFFFFFF	ISA-RD#, ISA-WR#
PC/104 IO access region	0x0D000000-0x0DFFFFFF	ISA-IOR#, ISA-IOW#
IDE CS1 region	0x0E000000-0x0EFFFFFF	IDE-CS#1, IDE-RD#, IDE-WR#
IDE CS0 region	0x0F000000-0x0FFFFFFF	IDE-CS#0, IDE-RD#, IDE-WR#

4.2. PC-Card CardBus socket

The SB-X270 implements a custom solution allowing usage of standard 32bit CardBus cards without a need for dedicated CardBus controller.
The cards are connected directly to the PCI bus and dedicated logic blocks the CB-FRAME# signal during irrelevant PCI configuration cycles. The O/S drivers have been slightly modified but, in general, the solution acts as a standard CardBus interface. The CARDBUS-CTL signal is used to control the CB-FRAME# blocking. Please refer to the SB-X270 schematics for implementation details. Only 3.3V PC-Cards are supported.

NOTE: this solution <u>does not allow card insertion/removal (hot-plug) while the system is powered.</u>

4.3. 10/100 Mbit Ethernet Port

The SB-X270 contains one optional 100 Mbit Ethernet port. This is in addition to the optional Ethernet port contained in the CM-X270. The user can therefore order the CM-X270 / SB-X270 combination with none, one or two Ethernet port(s). The Ethernet interface is based on the Realtek RTL8139 chip.

The Ethernet port's interface is either through the standard RJ45 connector on the front panel or through 20-pin FPC connector P31. If the P31 interface used, the appropriate FPC cable and RJ-45 module can be obtained from CompuLab.

4.4. RS-232 and RS-422/485 Serial Port Drivers

The CM-X270 module has on-board RS-232 drivers for the COM-A port. Other serial ports of the CM-X270 have TTL level interfaces. The SB-X270 adds several driver options for some of the serial ports as specified in the table below. Driver support includes modem control lines.

Port	Modem control	CM-X270 name	Origin	Level options		
				RS 232	RS 422/485	TTL
COM-A	+	COM-A	PXA270	+	-	-
COM-B	-	COM-B	PCI bridge	+	-	+
COM-C	+	COM-C	PXA270	+	+	+
COM-D	-	COM-D	PXA270	+	-	+

Notes

- COM-D is shared with the IR port.
- If the SB-X270 is assembled with no drivers for a particular COM port, then the port signals are available with TTL levels (except for COM-A).
- The interface of the COM-C port can be either RS-232 or RS-422/485 or both, controlled by assembling the appropriate driver chips. Assembling is done according to the SB-X270's configuration code: [none] - drivers not assembled, "Y2" - only RS-232 drivers assembled, "Y4" - only RS422/485 drivers assembled, "Y6" - both RS-232 and RS-422/485 drivers assembled.

RS-422 and RS-485 modes of COM-C

The SB-X270 contains RS-422/485 drivers if its configuration code has the "Y4" or "Y6" option. In the case of "Y6" option, when both RS-232 and RS422/485 drivers are present, the SB-X270 will automatically switch into RS-232 mode on the presence of valid voltage levels on RS-232 RX input. In the absence of valid input, the card will switch to RS-422/485 mode.

In RS-422/485 modes, TXD outputs of the COM-C port are enabled by the RTS2 signal. RTS "1" level enables TX output, RTS "0" disables it.

In RS-485 (half duplex) mode, transmit and receive operations are performed on TX lines. To achieve this, the user must physically connect the RX and TX lines of the serial driver, i.e., RX+ to TX+ and RX- to TX-. In this case, the selection between receive and transmit operations is performed by RTS.

In RS-422 (full duplex) mode, transmit and receive operations are performed on separate line pairs. TX output can always be enabled, though qualifying it by RTS has no practical effect on system operation. RX and TX lines should not be connected together as in the case of RS-485.

For a better understanding of RS-422/485 driver operation, please refer to the SB-X270 design schematics, available following the [developer] >> [X270] links in CompuLab's web-site.

4.5. LCD Power Switch and VDD selection

The graphics controller for TFT panels is located on the CM-X270 module. The SB-X270 adds the power switch required for certain LCD panels.

Many LCD panels require proper power sequencing in order to avoid panel damage. The graphics controller of the CM-X270 module provides the LCD-ENVDD signal, which can be used to indicate when power should be applied. The LCD-ENVDD signal is AND'ed with the system's RESET-OUT# signal.   The LCD power switch circuit on the SB-X270 applies a VDD on the LCD interface connector under the control of ENVDD and RESET-OUT# .

LCD Supply selection: the user can select 3.3V or 5V supply by a jumper on the P15 header, pins 1-2 for 3.3V or 2-3 for 5V.

Note: although it is possible to supply 5V to the LCD, the CM-X270 supplies LCD signals at a 3.3V level. The LCD should be compatible with these levels in order to operate properly.

4.6. Power Supply Options

Supply voltage options are:

1. **5V only**
   In this case, 3.3V is generated on-board, by a step-down converter.
   Note: additional cards, like PC/104+ or PCMCIA should not draw more than 3A from 3.3V.

2. **3.3V and 5.0V**
   3.3V and 5V can be supplied via the power connectors or PC/104+ connector.

3. **12V-48V input**
   The "S48" option allows the assembly of a versatile step-down switching converter. It permits unregulated DC input in the range of 12V-48V and delivers a regulated 5V supply to the system. Connector P28 should be used for high-voltage DC input.

GSM / GPRS supply

CM-X270W modules featuring the GSM / GPRS (K) option require 3.6V voltage for proper operation. Replace R55 shown below with a 20k resistor to provide 3.6V to the CM-X270. Cards are shipped by default voltage supply set to 3.3V rather than to 3.6V. Without R55 modification, GSM / GPRS option would not work.
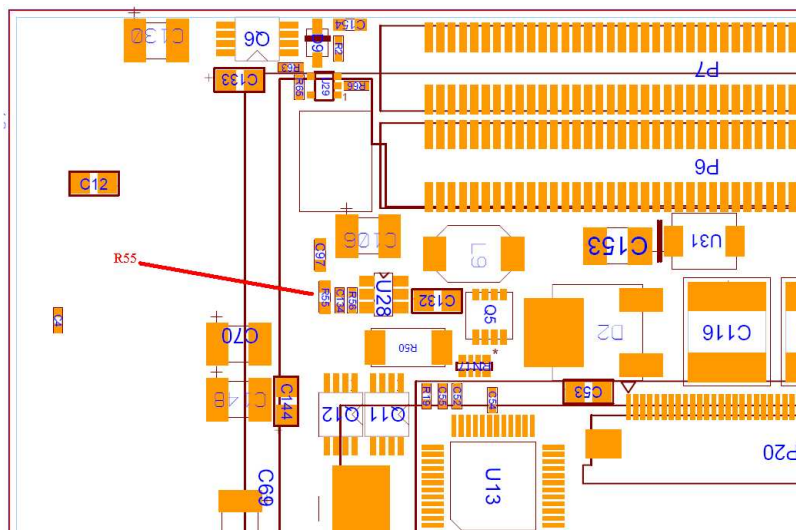
4.7.   CRT Interface - Video DAC

The SB-X270 implements an interface to CRT monitor by Video DAC, which converts digital data of CM-X270's TFT output to analog RGB signals. Horizontal and vertical synchronization signals are also generated from the TFT interface. All CRT interface signals are routed to CRT connector P24 and FPC connector P31 as described in chapter 3.

4.8.   Front Panel

The unique mechanical design of the SB-X270 allows selecting between two popular form factors – either a standard PC/104+ with headers or an extended PC/104+ with front panel connectors.

The SB-X270 printed circuit board has an extension used for the assembling of standard connectors - two Ethernet ports, serial port, two USB ports and CRT monitor. If a front panel is not required, this extension can be removed, either before assembling or even on an already assembled card. If the front panel is removed, the SB-X270 remains fully functional while the functions of front panel connectors are available through FPC connectors P31 and P11.

Instructions for front panel removal

If you have the board with front panel and you need to remove it, follow these steps:

1. The board has the v-groove cut lines along the front panel, on the both sides of PCB. Deepen these cut lines using sharp knife. Exert significant pressure. Be careful not to hurt yourself !
2. Fix the front panel (the part to be removed) in carpentry vice.
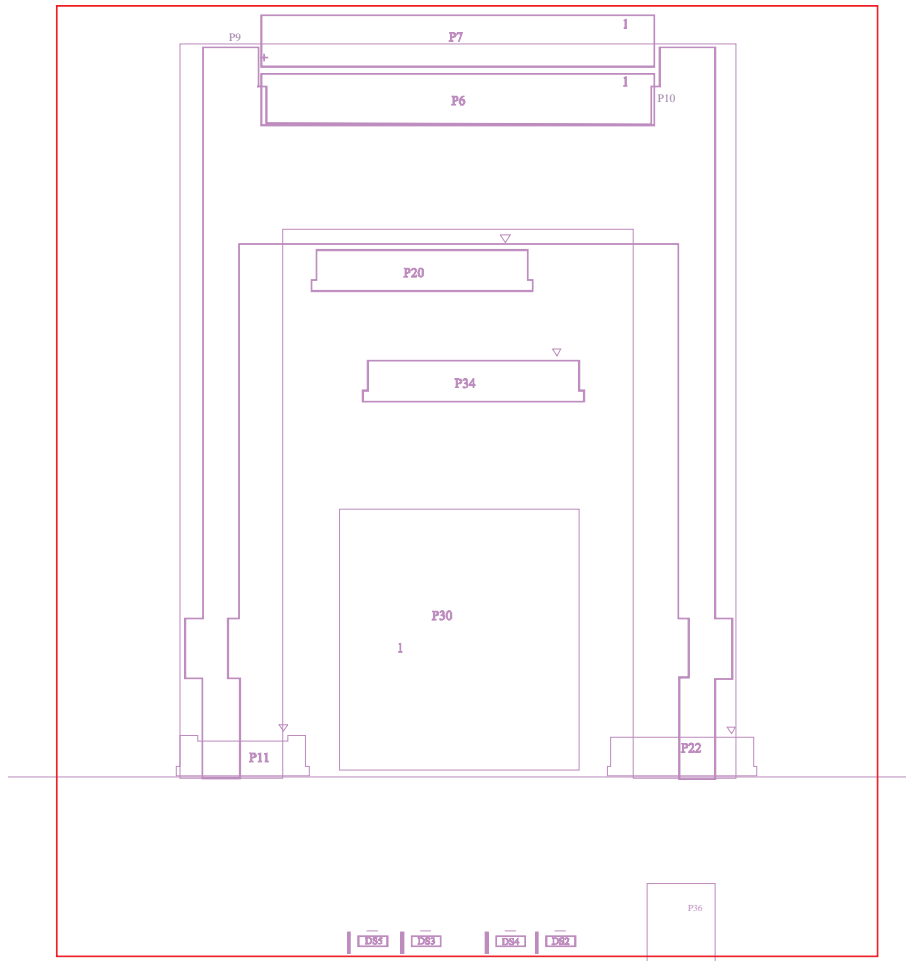3. Gently push the board backward and forward until it breaks along the cut line.

Note: trace wiring inside the PCB are designed to support this method of front panel removal.

5. Connector Location

SB-X270 Top side
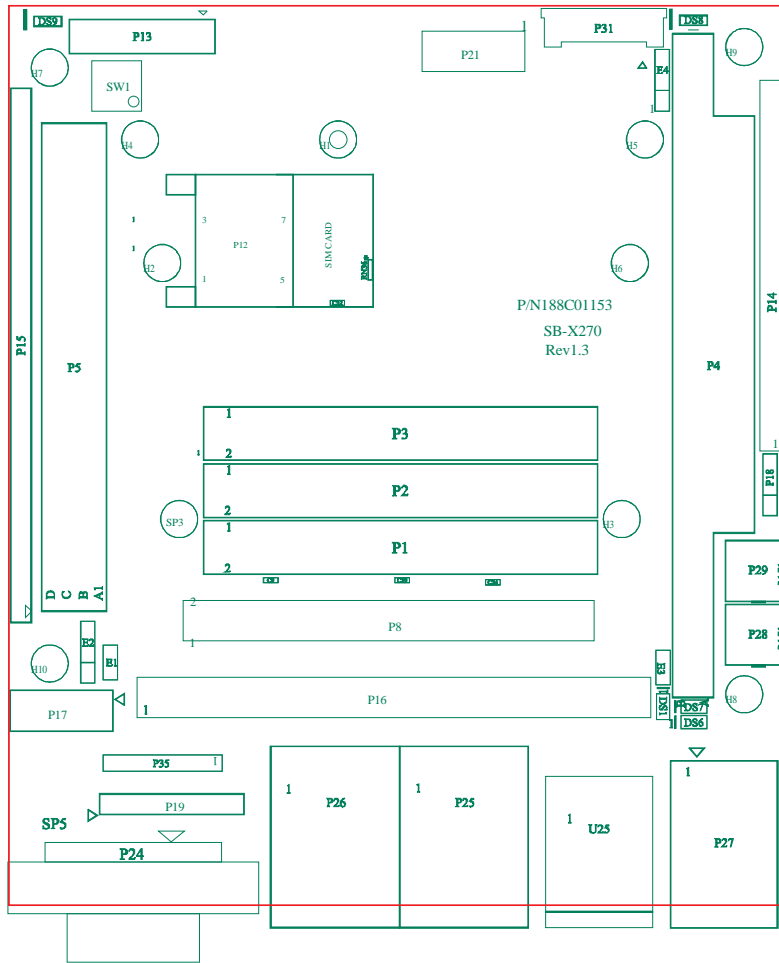
SB-X270 Bottom side

Reference

P1, P2, P3	Computer-on-module CAMI mating connectors
P4	PC/104 connector
P5	PC/104+ PCI bus connector
P6+P10	PC-Card PCMCIA socket
P7+P9	PC-Card CardBus socket
P8	IDE connector (100 mil)
P11	Ethernet Interface FPC connector
P12	SIM card socket
P13	LCD connector (51 pos FPC)
P14,P18	Audio, T/S and misc. connector
P15	USB and LCD supply selection connector
P16	GPIO and special functions
P17	LPC connector
P19	JTAG connector
P20	LCD connector (40 pos FPC)
P21	COM-C connector
P22	CIF (QuickCapture) connector
P24	CRT connector
P25	CoM Ethernet
P26	SB-X270 Ethernet
P27	COM-A connector
P28	Power connector (48V, 3.3V)
P29	Power connector (5V, GND)
P30	MMC/SDIO connector
P31	COM-A / CRT FPC connector
P34	IDE connector (40 pos FPC)
P35	A/D connector
P36	Mini-USB connector
E2	GPIO drive control
E3	CLOCK-OPTION
E4	PCMCIA power
U25	USB connector
DS1	IDE activity
DS2	CM-X270 Ethernet 100Mb Link/Act
DS3	SB-X270 Ethernet 100Mb Link/Act
DS4	CM-X270 Ethernet 10Mb Link/Act
DS5	SB-X270 Ethernet 10Mb Link/Act
DS6	VCC3-3 rail indicator
DS7	VCC5 rail indicator
DS8	GPRS status

DS9	Bluetooth activity
SW1	Reset Switch

6. Operating Temperature Ranges

The SB-X270 is available with three options of operating temperature range:

Commercial	0° to 70° C
Extended	-20° to 70° C
Industrial	-40° to 85° C

The temperature testing and certification method is explained in the "Industrial Temperature Support" page, available following the [Products] >> [Industrial Temperature] links in CompuLab's web-site.

The mating CM-X270 should be ordered for the same temperature range as the SB-X270. For example, it is not valid to use a SB-X270 manufactured for industrial temp range with a CM-X270 manufactured for commercial temp range. Such a combination is practically limited to the commercial temp range.