

SB-X255
PC/104+ Single Board Computer

Reference Guide

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1. Revision Notes

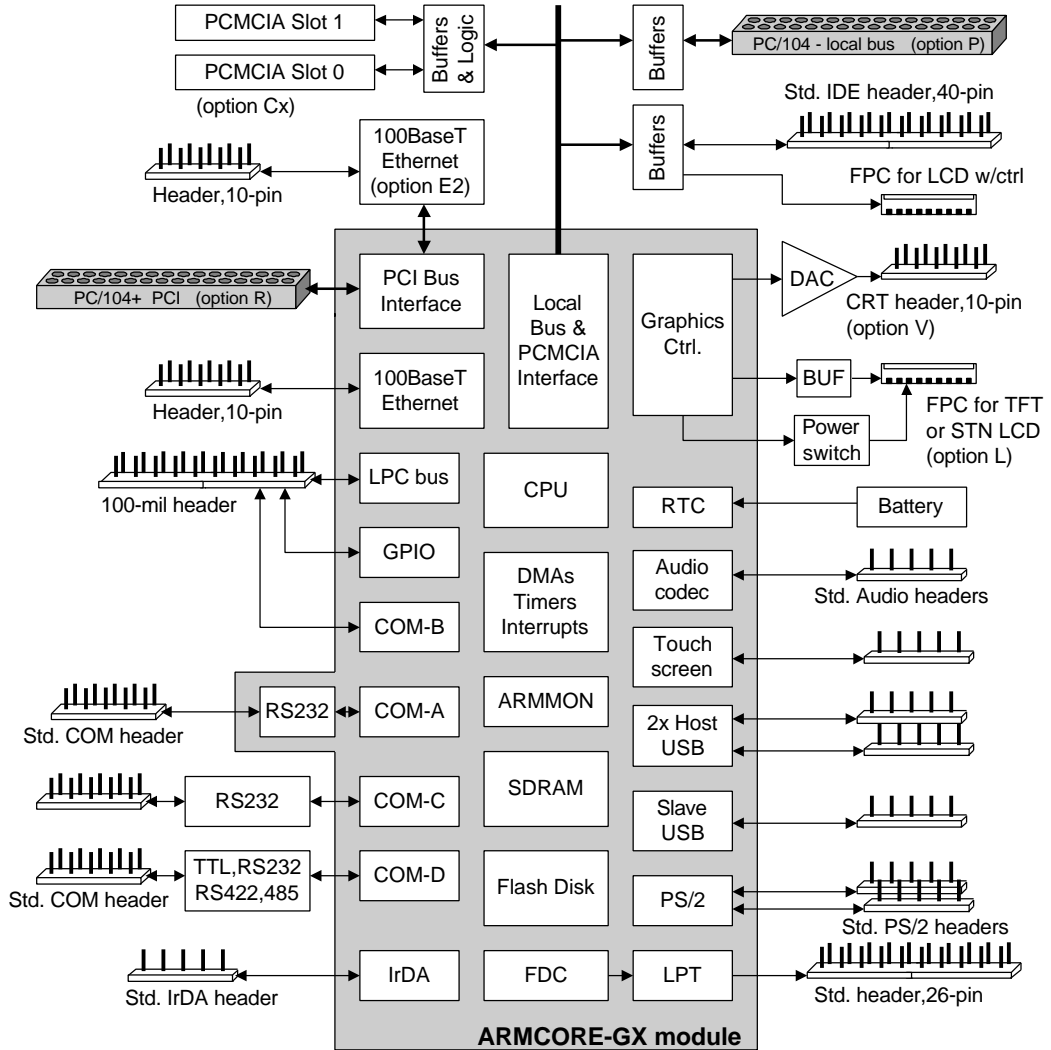
Date	Description
13-Oct-2003	▪ Preliminary release
06-Nov-2003	▪ Added more description about CRT interface
11-Jan-2004	▪ Updated IDE interface description
17-Jun-2004	▪ Added detailed description of RS-422/485 modes
29-Jun-2004	▪ Minor corrections of signals naming of P13 (LCD) connector
30-Jun-2004	▪ Updated P16 signals for PCB rev 1.3. Features list updated to reflect CM-X255 version 3 changes
08-Jul-2004	▪ LCD-R[x] and LCD-B[x] signals indexing of P13 changed, to match CM-X255 indexing.
10-Jul-2004	▪ Added clarification about COM4 switching between RS-232 and RS-485 modes.
12-Feb-2005	▪ Product name changed from ARMBASE to SB-X255
15-Mar-2005	▪ Made clarification about data bus width (16-bit only) of PC/104 interface. ▪ Removed references to ISA LCD connector from documentation.
18-May-2005	▪ Updated P16 documentation to include more information about available GPIO's

2. Introduction

2.1. Highlights

<ul style="list-style-type: none">▪ PC/104+ Single Board Computer using the CM-X255 module▪ Intel's XScale PXA255 CPU, up to 400 MHz▪ 16 - 64 MB SDRAM▪ 1 - 128 MB Flash Disk▪ PCI and Local Bus expansions in PC/104+ format▪ COM1 - 4 with RS232 / RS485 / RS422 / TTL driver options▪ IrDA, LPT, GPIO, PS/2 keyboard and mouse interfaces▪ Host and slave USB ports▪ Hard and floppy disk interfaces▪ Sound I/O (optional)▪ Touchscreen interface (optional)▪ VGA graphics controller. Connectors for LCD panel and CRT monitor (optional)▪ Single or dual 10/100BaseT Ethernet ports (optional)▪ Single or Dual PCMCIA slots (optional)▪ RTC with Lithium battery (optional)▪ Small size - 96 mm x 91 mm	<p>The SB-X255 is a standard PC/104+ compliant, single board computer. It uses an CM-X255 module to implement most of the provided functions and also implements several additional important functions on-board. The rich set of features provided by the SB-X255 is customizable according to the price / performance targets of the user's application.</p> <p>The SB-X255 contains PC/104+ expansion connectors opening it up to the wide range of standard peripheral cards. Furthermore, the SB-X255 contains a PCMCIA controller and slots. A PCMCIA card may be inserted and secured in the slot, with no additional mechanical means. Off-the-shelf PCMCIA modules can extend the system with capabilities such as a larger solid state disk, modem and wireless LAN.</p>
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2.2. Block Diagram



1.5

2.3. Features

The "BASE Option" column specifies the P/N code of SB-X255 required for the particular feature. The "CORE Option" column specifies the P/N code of CM-X255 required for the particular feature. SB-X255 content is the combination of features provided by the attached CM-X255 and the features implemented on the SB-X255 itself. To have the particular feature, both the CORE and BASE options of that feature must be implemented. "+" means that the feature is always available, regardless of P/N code.

Feature	Specification	BASE Option	CORE Option
CPU SDRAM Flash Disk	See Features List of CM-X255 module		
COM 1	Rx/Tx or full modem, RS-232 levels, standard 10-pin header	+	+
COM 2	Rx/Tx only, TTL levels, on common 100-mil header	+	+
COM 3	Full modem, RS-232 levels, standard 10-pin header	+	B
COM 4	Full modem, RS-232 / RS-485 / RS-422 / TTL level options, standard 10-pin header	X	B,S
IrDA	SIR and FIR modes. Standard header for IrDA module	+	+
LPT (Parallel Port)	Standard 26-pin header for DB-25 cable/connector. Shared with FDC	+	B, S
IDE	PIO mode. Derived from local bus. Standard 40-pin header for HDD cable	+	+
FDC	Routed through LPT header	+	B, S
Ethernet	One or two 10/100BaseT Ethernet ports. Realtek RTL8139 controller with MAC and PHY functions, PCI interface. 10-pin header per port. Optional interface module with transformer, RJ-45 connector and activity LED's.	E1 or E2	E or B, E
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 TFT interface by using DAC's. 10-pin header. Optional interface module with standard HD-15 VGA connector.	V	+
Simple LCD Interf.	24-pos FPC connector for direct interface to certain STN panels with built-in controller.	+	+
PS/2	Standard headers for PS/2 cable/connector	+	B, S
GPIO	9 to 14 lines, on common 100-mil header.	+	+

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PCMCIA	Support for 16-bit PCMCIA only. The 32-bit CardBus standard is not supported. Single or dual PCMCIA slot with card guides, for card types I, II and III.	Cx	+
Host USB	Two Host ports, 12 Mbps. Header for Type-A cable/ connector.	+	B
Slave USB	One Slave port, 12 Mbps. Header for Type-A cable/ connector.	+	+
Sound I/O	Header for standard cable/connectors for Microphone (mono), Line input and Speakers (stereo)	+	A
Touchscreen	4-wire interface for resistive touchscreens	+	AT
PC104	Derived from CPU's local bus through buffers. 20 bit address. Few interrupts. No DMA Support. Standard PC/104 connector	P	+
PC104+	PCI bus through standard PC/104+ connector	R	B
RTC Battery	The battery for Real Time Clock (which is located on the CM-X255)	+	R
LPC bus	LPC bus on common 100-mil header	+	B

Electrical, Mechanical and Environmental Specifications

Supply Voltage	5.0V or 3.3V or both. (The 3.3V option is only for cards without Audio and Super-I/O chips)	
Power Consumption	Up to 3.0 W if powered from 3.3V source Up to 4.5 W if powered from 5.0V source	
Dimensions	96 mm x 91 mm x [10-22] mm. Height ranges from 10 mm to 22 mm, depending on the connectors assembled. Height specified includes the CM-X255 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	

3. Connector Description

The SB-X255 uses the attached CM-X255 module to implement most of the provided functions. For these functions, the SB-X255 routes the signals from the CM-X255's miniature connectors to the standard connectors. Each function's description is therefore provided in the CM-X255 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-X255 itself.

PCMCIA, PC/104, IDE and ISA LCD buses share the same address/data lines (CPU local bus). However, they usually pass through buffers/termination and their name is changed accordingly to destination function. Here, for clarity, they are mentioned by their original names as they appear on CM-X255 connectors. Some control signals (read/write/chip select) for these buses are generated by onboard logic. See par. 4.3 for details.

3.1. COM1 Header (P20)

2x5, 100 mil header, compatible with a standard DB9 cable/connector. RS-232 levels. Rx/Tx only, modem control lines are not available.

Pin	Name	Pin	Name
1	-	2	COM1-RX
3	COM1-TX	4	-
5	GND	6	-
7	-	8	-
9	-	10	-

3.2. COM3 Header (P19)

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

Pin	Name	Pin	Name
1	COM3-DCD#	2	COM3-RX
3	COM3-TX	4	COM3-DTR#
5	GND	6	COM3-DSR#
7	COM3-RTS#	8	COM3-CTS#
9	COM3-RI#	10	-

3.3. COM4 Header (P21)

2x5, 100 mil header, compatible with a standard DB9 cable/connector.
RS-232 / RS-422/RS485 / TTL levels. Includes modem control lines.

Pin	Name	Pin	Name
1	COM4-DCD#	2	COM4-RX
3	COM4-TX	4	COM4-DTR#
5	GND	6	COM4-DSR#
7	COM4-RTS#	8	COM4-CTS#
9	COM4-RI#	10	-

3.4. PS/2, Chip selects & Reset (P18)

1x18, 100 mil header. PS/2 pin assignment is directly compatible with standard cables/connectors.

Pin	Name	Wire Color
01	VCC5	
02	VCC-USB3*	
03	-	
04	GND	
05	PS2-MCLK	Orange
06	PS2-MDATA	Black
07	GND	Red
08	VCC5	Brown
09	-	

Pin	Name	Wire Color
10	PS2-KCLK	Orange
11	PS2-KDATA	Black
12	GND	Red
13	VCC5	Brown
14	BOOTCS-OUT	
15	BOOTCS-IN	
16	LB-CS0#	
17	RST-IN#	
18	GND	

- See section 3.13 for comments on the VCC-USB3 signal.
- BOOTCS signals are reserved for CompuLab's use.

3.5. COM, GPIO, Touchscreen, LPC & SSI Header (P16)

2x20 100 mil header

P16 pin	Name	CAMI pin	CPU GPIO
01	VCC3-3	-	
03	LPC-LAD1	P2-09	
05	LPC-LAD3	P2-11	
07	LPC-LDRQ#	P2-17	
09	(reserved)	-	
11	MMDAT	P2-4	
13	MMCMD	P1-12	
15	BTRTS-SCIO	P1-13	[45]
17	BTCTS-SCCLK	P1-16	[44]
19	WP1#	P1-09	
21	DREQ0-SCRST	P1-15	[20]
23	DREQ1-SCPWR	P1-18	[19]
25	PC104-BUFEN#	-	
27	TS-XP	P1-53	
29	TS-YP	P1-57	
31	SUSPEND	P1-21	
33	RS4TD-P	-	
35	RS4RD-P	-	
37	GND	-	
39	COM2-TX		

P16 Pin	Name	CAMI pin	CPU GPIO
02	LPC-LAD0	P2-10	
04	LPC-LAD2	P2-12	
06	LPC-LFRM#	P2-15	
08	LPC-SIRQ	P2-13	
10	GND	-	
12	SSI-CLK	P1-61	[81]
14	SSI-DOUT	P1-60	[83]
16	SSI-DIN	P1-59	[84]
18	ILCD-IRQ	-	
20	GND	-	
22	GPIRQ0	P1-51	[2]
24	GPIRQ1	P1-54	[12]
26	VCC3-3	-	
28	TS-XM	P2-71	
30	TS-YM	P2-73	
32	GND	-	
34	RS4TD-N	-	
36	RS4RD-N	-	
38	RST-OUT#	P1-137	
40	COM2-RX		

Notes

- DREQ0-SCRST, DREQ1-SCPWR, GPIRQ0 & GPIRQ1 lines are by default driven by PC104 bus. If needed for other purposes, these lines can be disconnected from the PC104 bus by shorting pins 25 & 26 of P16.
- Pins 12, 14 and 16 are sampled by ARMmon during powerup, altering ARMmon function. For details please see ARMmon documentation.
- CPU GPIO column indicates GPIO reference number as specified in PXA255 manual.
- LPC pins can also be programmed as GPIO's.

3.6. LPT / FDC Header (P17)

2x13, 100 mil header, directly compatible with a standard LPT cable/connector. This header is used for two different functions:

1. LPT - Parallel Port
2. FDD - Floppy Disk Drive interface

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Selection between these two functions is performed by software setup. Pin functions change according to the mode selected.

When used as an LPT, the connector's pin-out is:

Pin	Name	Pin	Name
1	PP-STROBE#	2	PP-ALF#
3	PP-D0	4	PP-ERROR#
5	PP-D1	6	PP-INIT#
7	PP-D2	8	PP-SLCTIN#
9	PP-D3	10	GND
11	PP-D4	12	GND
13	PP-D5	14	GND
15	PP-D6	16	GND
17	PP-D7	18	GND
19	PP-ACK#	20	GND
21	PP-BUSY	22	GND
23	PP-PE	24	GND
25	PP-SLCT	26	-

When used as an FDC, the header's pin-out is:

Pin	Name	Pin	Name
1	-	2	DENSEL
3	INDEX	4	HDSEL
5	TRK0	6	DIR
7	WP	8	STEP
9	RDATA	10	GND
11	DSKCHG	12	GND
13	-	14	GND
15	MTR0	16	GND
17	MEDIA-ID0	18	GND
19	-	20	GND
21	-	22	GND
23	WDATA	24	GND
25	WGATE	26	-

A ready-to-use LPT (26-pin) to FDD (34-pin) connector format adapter is available from CompuLab.

3.7. IDE – Hard Disk Interface (P9)

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

Pin	IDE signal	CM-X255 connector pin name	Pin	IDE signal	CM-X255 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	N/C
21	DMAREQ	N/C	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#	N/C	30	GND	GND
31	IRQ	IDE-INT	32	IOCS16#	N/C
33	ADDR1	LB-A1	34	PDIAG	N/C
35	ADDR0	LB-A3	36	ADDR2	LB-A2
37	CS0#	IDE-CS#0*	38	CS1#	IDE-CS#1*
39	DASP#	Pullup, LED	40	GND	GND

Note:

- Signals marked in [GRAY] are not supported.
- Signals marked with (*) are generated by onboard logic. See par. 4.3 for details.

3.8. PCMCIA slots (P5, P6)

68-pin PC Card slots which conform to the PCMCIA standard. They include card guides. The SB-X255 can be assembled with either no, one or two PC Card slot(s).

Pin	PCMCIA Signal	CM-X255 connector pin name	Pin	PCMCIA Signal	CM-X255 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#	N/C
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[2]*	50	A21	LB-A21
17	VCC	VCC-P1(see par. 3.9)	51	VCC	VCC-P1(see par. 3.9)
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#	N/C
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	N/C
29	A0	LB-A0	63	BVD1/STS	N/C
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#	N/C
34	GND	GND	68	GND	GND

Notes

- Signals marked in [GRAY] are not supported.
- There are two different interrupt lines PCM-IRQ1 and PCM-IRQ2, one for each slot.

PCMCIA slot types

- In single slot assembly, the slot can accommodate all types of PCMCIA cards - Type I, II or III.
- In dual slot assembly, the inner slot can accommodate Type I and II cards only, due to height limitation, while the outer slot can accommodate all types.

3.9. PCMCIA Power Header (P22)

This header is used to set the VCC voltage for PCMCIA/CompactFlash cards in the PCMCIA slots. The SB-X255 does not support automatic voltage setup, so the user is responsible for setting the correct VCC voltage before inserting the card, by shorting the appropriate pins on P22. VPP is constant at 5V.

Pin	Signal
1	VCC5
2	VCC-P1
3	VCC3-3
4	VCC3-3
5	VCC-P2
6	VCC5

For slot 0:

Required VCC voltage	Pins shorted
5V	1-2
3.3V	2-3

For slot 1:

Required VCC voltage	Pins shorted
5V	5-6
3.3V	4-5

Attention!!!

Do not forget to set the correct voltage before inserting a card, otherwise permanent damage can be caused to the PCMCIA card and to the SB-X255. If you are not sure which VCC setting is correct, set it to 3.3V.

3.10. CRT VGA Header (P12)

2x5, 100 mil header for connection of a 10-wire flat cable to the DB-15 connector. A flat cable to DB-15 adapter is available from CompuLab.

Pin	Name	Pin	Name
1	GND	2	CRT-R
3	GND	4	CRT-G
5	GND	6	CRT-B
7	GND	8	VSYNC (LCD-FRM)
9	VCC3	10	HSYNC (LCD-LP)

RGB signals are generated from TFT signals, by the on-board DAC.

VSYNC and HSYNC are generated from the LCD-FRM and LCD-LP signals.

See note regarding SYNC signals availability in "LCD Panel Connector" section below.

3.11. LCD Panel Connector (P13)

51-pos FPC connector for TFT and STN panels.

An adapter for direct interface to certain panels (such as LP064V1) is available from CompuLab.

Pin	Name
01	LCD-VDD
02	LCD-VDD
03	GND
04	LCD-R1
05	GND
06	LCD-R2
07	LCD-R3
08	GND
09	LCD-R4

Pin	Name
27	LCD-VDD
28	LCD-VDD
29	GND
30	LCD-B1
31	GND
32	LCD-B2
33	LCD-B3
34	GND
35	LCD-B4

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10	LCD-R5
11	GND
12	GND
13	GND
14	GND
15	GND
16	LCD-G0
17	LCD-G1
18	GND
19	LCD-G2
20	LCD-G3
21	GND
22	LCD-G4
23	LCD-G5
24	GND
25	GND
26	GND

36	LCD-B5
37	GND
38	GND
39	GND
40	GND
41	GND
42	LCD-LP
43	LCD-FRM
44	LCD-DE
45	GND
46	LCD-SCK
47	GND
48	(pullup)
49	(pullup)
50	LCD-VDD
51	LCD-VDD

- ENVEE and ENVDD functions (regularly on pins 48, 49) are not supported by CM-X255 / SB-X255.
- SYNC signals availability: P15 connector (see "USB and IR Header" section) contains LCD / CRT supply selection pins - VSRCLCD ("Voltage Source for LCD"), which is routed to the LCD power supply pins - LCD-VDD. User can select either 3.3V or 5V supply by placing a jumper on pins 1-2 or 2-3 of P15. The same supply voltage feeds on-board LCD signal drivers, including data and sync. Note that is jumper if not mounted, there would not be sync signals for CRT, which will prevent its operation.

3.12. USB and IR Interface Header (P15)

1x26, 100 mil header containing an interface of several different functions. Signal pinouts of each function are compatible with standard cables/connectors.

Pin	Name	Description
01	VCC3	LCD / CRT voltage supply selection. Jumper <u>must</u> be mounted in either 1-2 or 2-3 position.
02	VSRC-LCD	
03	VCC5	
04	-	
05	GND	
06	VCC-USB1	USB1 interface
07	USB1-N	
08	USB1-P	
09	GND	
10	SHIELD	
11	VCC-USB2	USB2 interface
12	USB2-N	
13	USB2-P	
14	GND	
15	SHIELD	

Pin	Name	Description
16	VCC-USB3	USB device interface
17	USB3-N	
18	USB3-P	
19	GND	
20	SHIELD	
21	VCC5	IR module interface
22	-	
23	IRDA-RX	
24	GND	
25	IRDA-TX	
26	-	

Notes

- USBx-VCC pins have overcurrent protection as required by USB standard specifications.
- USB3 is a Slave USB device interface. VCC-USB3 is power input from the USB bus. If desired it can be connected to the VCC5 voltage network using pins 1-2 of P18 and provide power to the SB-X255. However, the user should verify that the power consumption of the system falls within the USB spec or should connect an external power supply to the upstream USB hub.

3.13. PC/104 connector (P3)

PC/104 (ISA bus type) stackthrough connector. Provides limited ISA-like functionality. The CM-X255's local bus lines are connected through buffers to their respective counterparts on the PC/104 connector. Supports 16-bit data transfers only, the 8-bit transfers are not supported.

Pin	PC/104 Signal	CM-X255 connector pin name	Pin	PC/104 Signal	CM-X255 connector pin name
A01	IOCHCHK#	N/C	B01	GND	GND
A02	SD7	LB-D7	B02	RESETDRV	RSTDRV
A03	SD6	LB-D6	B03	+5V	VCC5
A04	SD5	LB-D5	B04	IRQ9	GPIRQ0 (using NOR gate)
A05	SD4	LB-D4	B05	-5V	N/C
A06	SD3	LB-D3	B06	DRQ2	N/C
A07	SD2	LB-D2	B07	-12V	N/C
A08	SD1	LB-D1	B08	0WS#	N/C
A09	SD0	LB-D0	B09	+12V	N/C
A10	IOCHRDY	LB-IORDY	B10	KEY	N/C
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	N/C
A17	SA14	LB-A14	B17	DACK1#	Pullup
A18	SA13	LB-A13	B18	DRQ1	N/C
A19	SA12	LB-A12	B19	REFRESH	Pullup
A20	SA11	LB-A11	B20	SYSCLK	CLK8M hz
A21	SA10	LB-A10	B21	IRQ7	GPIRQ0 (using NOR gate)
A22	SA9	LB-A9	B22	IRQ6	GPIRQ0 (using NOR gate)
A23	SA8	LB-A8	B23	IRQ5	GPIRQ1 (using NOR gate)
A24	SA7	LB-A7	B24	IRQ4	GPIRQ1 (using NOR gate)
A25	SA6	LB-A6	B25	IRQ3	GPIRQ1 (using NOR gate)
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-A0	B31	GND	GND

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A32	GND	GND	B32	GND	GND
-----	-----	-----	-----	-----	-----

Pin	PC/104 Signal	CM-X255 connector pin name	Pin	PC/104 Signal	CM-X255 connector pin name
C00	GND	GND	D00	GND	GND
C01	SBHE#	GND	D01	MEMCS16#	N/C
C02	LA23	LB-A23	D02	IOCS16#	N/C
C03	LA22	LB-A22	D03	IRQ10	GPIRQ1 (using NOR gate)
C04	LA21	LB-A21	D04	IRQ11	GPIRQ1 (using NOR gate)
C05	LA20	LB-A20	D05	IRQ12	N/C
C06	LA19	LB-A19	D06	IRQ15	N/C
C07	LA18	LB-A18	D07	IRQ14	N/C
C08	LA17	LB-A17	D08	DACK0#	Pullup
C09	MEMR#	ISA-RD#*	D09	DRQ0	N/C
C10	MEMW#	ISA-WR#*	D10	DACK5#	Pullup
C11	SD8	LB-D8	D11	DRQ5	N/C
C12	SD9	LB-D9	D12	DACK6#	Pullup
C13	SD10	LB-D10	D13	DRQ6	N/C
C14	SD11	LB-D11	D14	DACK7#	Pullup
C15	SD12	LB-D12	D15	DRQ7	N/C
C16	SD13	LB-D13	D16	+5V	
C17	SD14	LB-D14	D17	MASTER#	Pullup
C18	SD15	LB-D15	D18	GND	GND
C19	KEY	N/C	D19	GND	GND

Signals marked in [GRAY] are not supported. In general, functionality of the PC104 bus of the SB-X255 has the following limitations:

- DMA channels are not supported.
- Only eight interrupt inputs are supported.
- Some signals of secondary importance are not supported: MEMCS16, IOCS16#, BALE. The irrelevant signal REFRESH is also not supported.
- Signals marked with (*) are generated by onboard logic. See par. 4.3 for details.

3.14. PC/104+ PCI bus connector (P4)

Standard PC/104+ (PCI bus) connector. The CM-X255's PCI bus lines are connected to their respective counterparts on 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#	Pullup
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#		B23	GND	
A24	GND		B24	REQ2#	N/C
A25	GNT1#		B25	V I/O	3.3V
A26	+5.0V		B26	CLK0	
A27	CLK2		B27	+5.0V	
A28	GND		B28	INTD#	PCI-INTB#
A29	+12V	N/C	B29	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#	Pullup	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#		D23	V I/O	
C24	+5.0V		D24	GNT0#	
C25	GNT2#	N/C	D25	GND	
C26	GND		D26	CLK1	
C27	CLK3		D27	GND	
C28	+5.0V		D28	RST#	
C29	INTB#		D29	INTC#	PCI-INTA#
C30	(reserved)		D30	KEY2	N/C

Note

INTA# is shorted with INTC#, and INTB# is shorted with INTD# due to the limited number of available interrupt inputs on the CM-X255. This limitation has no practical effect on the card's functionality.

3.15. Audio and Power Header (P14)

1x18, 100 mil header having two functions: audio input/output and power supply entry. If audio codec is not assembled on the CM-X255, then the AC'97 bus is routed to audio pins.

Pin	Name	Description
01	OUT-R [AC97-SYNC]	Audio output [AC97 signals]
02	GND	
03	GND	
04	OUT-L [AC97-SDIN]	
05	IN-R [AC97-SDOUT]	Line input [AC97 signals]
06	GND	
07	GND	
08	IN-L*	
09	MIC-VCC	Microphone input [AC97 signals]
10	GND	
11	MIC-IN [AC97-BITCLK]	

Pin	Name	Description
12	VBAT	RTC supply
13	GND	
14	SPDIF	digital audio output
15	GND	
16	VCC5	
17	VCC3	
18	GND	

Notes

- MIC-IN and IN-L signals are connected together; consequently, microphone recording and line-in recording can't be done simultaneously.
- For certain configurations, the VCC3 is optional and for another configurations, the VCC5 is optional. For details, see the "Power Supply Options" section.

3.16. Ethernet Interface Header (P11)

The Ethernet Interface Header provides two separate groups of signals, one per Ethernet port available in the CM-X255 / SB-X255 system. The first port (ETH1) is implemented on the CM-X255 and the second, on the SB-X255.

Pin	Name	Pin	Name
1	ETH2-LINK10#	2	ETH2-TDN
3	ETH2-TDP	4	ETH2-LINK10#
5	ETH2-ACT#	6	ETH2-LINK100#
7	ETH2-RDSHLD	8	ETH2-RDP
9	ETH2-RDN	10	ETH2-RDSHLD
11	-	12	-
13	-	14	-
15	ETH1-LINK10#	16	ETH1-TDN
17	ETH1-TDP	18	ETH1-LINK10#
19	ETH1-ACT#	20	ETH1-LINK100#
21	ETH1-RDSHLD	22	ETH1-RDP
23	ETH1-RDN	24	ETH1-RDSHLD

The header is designed for the connection of two separate 10-wire flat cables, one per port. The flat cable connects the header to the RJ-45 interface module, which includes the RJ-45 connector, transformer and activity LED's. An RJ-45 interface module is available from CompuLab.

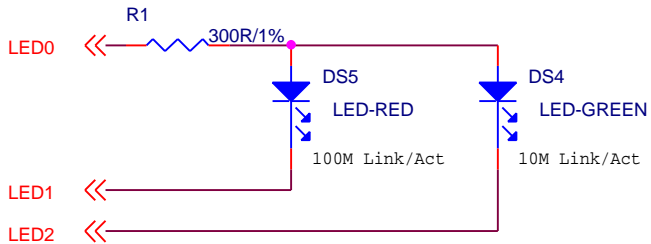
Default settings of activity LEDs are specified in the table below. Settings can be changed by software.

LED0	RX/TX
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.

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The LED signal connections as implemented in CompuLab's RJ-45 interface 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

4. Functions Implemented on the SB-X255

Most of the functions are implemented by the attached CM-X255 module, while the SB-X255 board provides headers to standard cables/connectors. However, several additional functions are implemented on the SB-X255 itself and this section describes them.

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

The CM-X255 module has on-board RS-232 drivers for the Tx/Rx signals of the COM1 port. Other serial ports of the CM-X255 have TTL level interface. The SB-X255 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-X255 name	Origin	Level options		
				RS 232	RS 422/485	TTL
COM1	-	COM-A	PXA255	+	-	-
COM2	-	COM-B	PCI bridge	-	-	+
COM3	+	COM-C	PXA255	+	-	+
COM4	+	COM-D	SIO	+	+	+
COM5	-	IrDA	PXA255	-	-	+

Notes

- COM5 is shared with the IR port.
- If the SB-X255 is assembled with no drivers for a particular COM port, then port signals are available with TTL levels.
- The interface of COM4 port can be either RS-232 or RS-422/485 or both, controlled by assembling the appropriate driver chips. Assembling is done according to SB-X255's configuration code: [none] - drivers are not assembled, "X2" - only RS-232 drivers assembled, "X4" - only RS422/485 drivers assembled, "X6" - both RS-232 and RS-422/485 drivers assembled.

RS-422 and RS-485 modes of COM4

The SB-X255 contains RS-422/485 drivers if its configuration code has "X4" or "X6" option. In case of "X6" option, when both RS-232 and RS422/485 drivers present, the SB-X255 will automatically switch into RS-232 mode on presence of valid voltage levels on RS-232 RX input. In absence of valid input, the card will switch to RS-422/485 mode.

In RS-422/485 modes, TXD outputs of the COM4 port are enabled by RTS4 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, user have physically connect RX and TX lines of the serial driver, i.e. RX+ to TX+ and RX- to TX-. In this case 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 be always enabled, though qualifying it by RTS has no practical effect on system operation. RX and TX lines should not be connected together as in case of RS-485.

For better understanding of RS-422/485 driver operation, please refer to SB-X255 design schematics, available following [developer] >> [CM-X255] >> [Hardware] links in CompuLab's web-site.

4.2. Power Supply Options

The SB-X255 has an optional on-board 5V-to-3.3V linear converter. Supply voltage options are:

1. 3.3V only

In this case, the converter is not assembled. This option can be used only if the selected CM-X255 module doesn't contain "A" option (the "AT" option is okay). Unused 5V power input should be connected to 3.3V.

Note: in this case, USB terminations and LPT terminations are connected to 3.3V instead of nominal 5V. While in general they will work, non-standard termination voltage can affect the reliability of related functions.

2. 3.3V and 5.0V

This option is the same as (1), but it supports all types of CM-X255 configurations, without the above-mentioned restrictions.

3. 5.0V only

In this case, a 5V-to-3.3V linear converter is assembled on the SB-X255. Supports all types of CM-X255 configurations.

Bypassing the on-board converter:

If 3.3V is applied on the power entry connector, the on-board 5V-to-3.3V converter is disabled automatically and doesn't interfere with externally applied power.

Power output specifications:

5V to 3.3V converter maximum output current: 3 A

Power entry specifications:

Power entry pins	Maximum allowed input current	Input tolerance
5.0V	3 A	5 %
3.3V	3 A	5 %

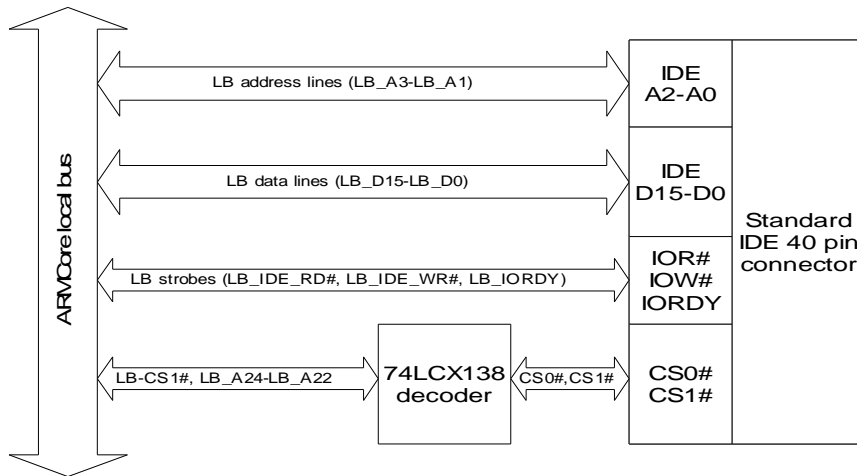
Converter and power entry specifications are designed in excess of CM-X255/BASE requirements. Maximum current drawn by the CM-X255 and SB-X255 together is less than 1 A and maximum power consumption is less than 5 watt. The spare power can be consumed by attached PC/104 or PCMCIA cards.

4.3. IDE, PC/104 and ISA LCD addressing and logic

SB-X255 implements address decoding logic which uses a IDE-CS1# signal from the CM-X255 for driving a number of control signals (OE#, WE#, CS#) to the PC/104, IDE and ISA LCD buses. Below is a memory address map for the above buses and appropriate 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 CS0 region	0x0E000000-0x0E3FFFFFF	IDE-CS#0, IDE-RD#, IDE-WR#
IDE CS1 region	0x0E400000-0x0E4FFFFFF	IDE-CS#1, IDE-RD#, IDE-WR#
ISA LCD region	0x0E800000-0x0E8FFFFFF	LCD-CS#, IDE-RD#, IDE-WR#

IDE Connection



Note for designers of custom baseboards:

The 74LCX138 decoder is required only if baseboard implements PC/104 and ISA-LCD, as in SB-X255. If these additional functions are not required, IDE interface can be simplified and decoder can be removed. Refer to "IDE Interface Implementation" section in CM-X255 Reference Guide. But if decoder is removed, IDE Driver in the operating system should be updated according to the resulting change of address map.

4.4. 10/100 Mbit Ethernet Port

The SB-X255 contains one full-featured, optional 10/100 Mbit Ethernet port. This is in addition to the optional Ethernet port contained in the CM-X255 module. The user can therefore order the CM-X255 / BASE system with none, one or two Ethernet port(s). The Ethernet interface is based on the Realtek RTL8139 MAC/PHY component. In functional terms, it is identical to the Ethernet port available on the CM-X255. Please refer to the CM-X255 Reference Guide for details.

The Ethernet port's interface to the external world is through a 100 mil interface header. The header is designed for connection to a flat cable with a RJ-45 connector on the other end. The cable and RJ-45 module are available from CompuLab.

Note: the operating system assigns the CM-X255's Ethernet to be Port0 and the SB-X255's Ethernet, Port1.

4.5. LCD Power Switch

The graphics controller for TFT / STN panels is located on the CM-X255 module. The SB-X255 adds one feature for LCD panel support - the power switch. Most LCD panels require proper power sequencing in order to avoid panel damage. The power switch is controlled by CM-X255's reset signal and shuts the LCD off while the system is in reset state.

LCD Supply selection: User can select 3.3V or 5V supply by placing a jumper on pins 1-2 or 2-3 of P15.

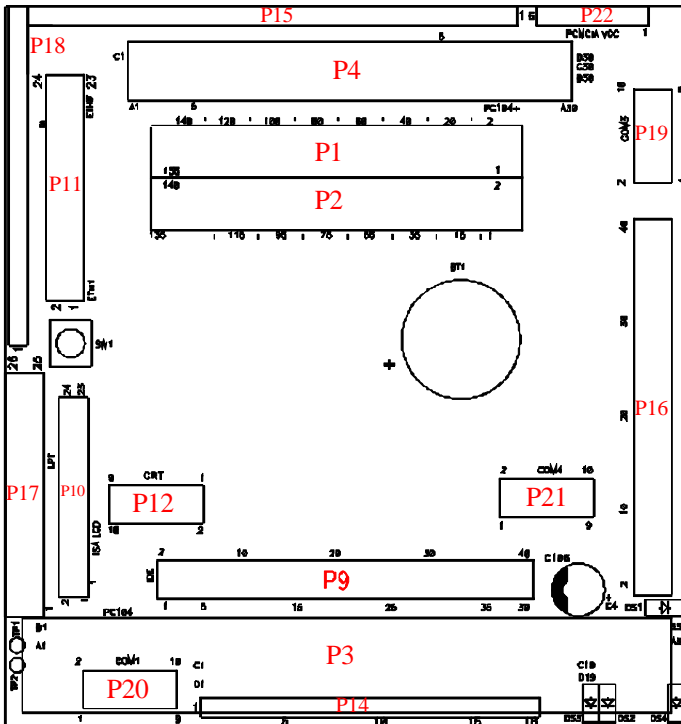
4.6. CRT Interface - Video DAC

The SB-X255 implements an interface to CRT monitor by Video DAC, which converts digital data of CM-X255's TFT output to analog RGB signals. Horizontal and vertical synchronization signals are also generated from the TFT interface. All the CRT interface signals are routed to header P12 as described in par. 3.10. The maximum supported resolution is 1024 x 768.

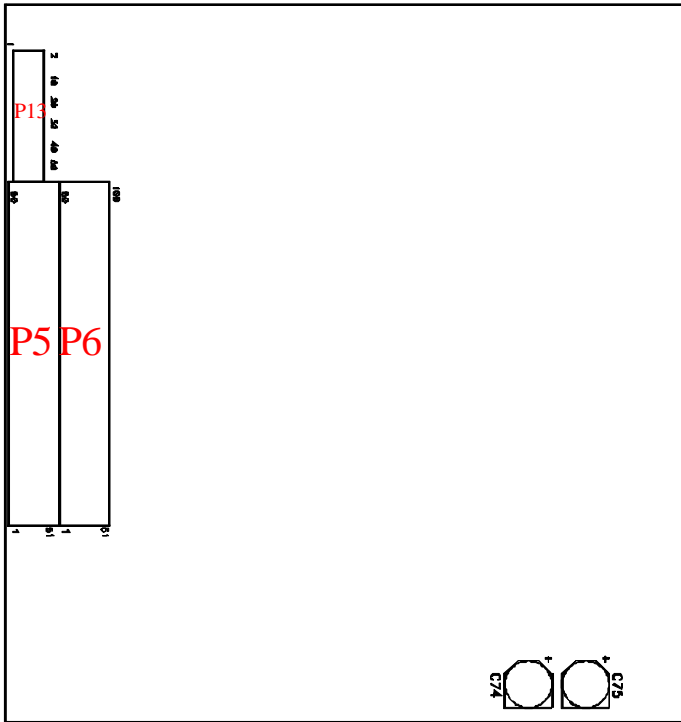
Resolutions of 640 x 480 and above are supported with several limitations. The activity of PS/2 ports (keyboard and mouse) and especially the activity of demanding PCI-bus devices, such as an Ethernet port, creates discontinuity in the display pixel stream which appears as "noise" on the display. CRT displays are the most sensitive to such interference. (LCD displays are less sensitive). The noise level depends on display type, the kind of on-board activity, resolution and number of bits per pixel. In order to reduce noise level it is recommended to setup CM-X255's graphics controller to 4- or 8-bits per pixel, rather than 16.

The above-mentioned problem exists only in CM-X255 version 2 (CM-X255-V2). It is completely resolved in new version 3 - CM-X255.

5. Connector Location



SB-X255 Top side



SB-X255 Bottom side

Reference

P1, P2	CM-X255 CAMI mating connectors
P3	PC/104 (Sub-ISA) connector
P4	PC/104+ PCI bus connector
P5, P6	PCMCIA slot mating connectors
P9	IDE – Hard Disk Interface
P10	ISA LCD Connector
P11	Ethernet Interface Header
P12	CRT VGA Header
P13	TFT Panel Connector
P14	Audio and Power Header
P15	USB, IR, LCD power selection
P16	COM, GPIO, LPC, Touchscreen, SSI
P17	LPT / FDC Header
P18	PS/2 & System Control
P19	COM3 Header
P20	COM1 Header
P21	COM4 Header
P22	PCMCIA power selection header
DS1	Hard disk LED
DS2, DS3	Status Leds
DS4	Power LED
SW1	Reset Switch

6. Operating Temperature Ranges

The SB-X255 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 cards' manufacturing and certification method for each option is explained in the "Operating Temperature Ranges" section of the CM-X255 Reference Guide.

Availability of Industrial temperature range is not limited to certain functions. However, not all components are certified by manufacturers for industrial temperature grade. The table below lists which functional blocks have components certified by manufacturer. For more information refer to the "Operating Temperature Ranges" section of the CM-X255 Reference Guide.

Function	Component certification
Ethernet	-
PCMCIA	-
RS-232	+
RS-422/485	+
Lithium battery (for RTC)	-10° to 85° C
All other functions	According to CM-X255 spec.

The mating CM-X255 module should be ordered for the same as or better than temperature range of the SB-X255. For example, it is not valid to use a SB-X255 manufactured for industrial temp range with a CM-X255 manufactured for commercial temp range. Such a combination is practically limited to the commercial temp range. On the other hand, it is valid to use a CM-X255 manufactured for industrial range while using a SB-X255 manufactured for commercial range, assuming that such a SB-X255 does not contain temperature-dependent functions, as specified in the table above.