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IPC/OEMS8xxx-Axxxx

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1.0	12.02.2020	U. Müller	Release
1.1	31.03.2020	U. Müller	added tooling and torque for service cover
1.2	30.09.2020	D. Scheiwiller	added operating conditions for ext. temp.
1.3	18.11.2020	U. Müller	added DP_PWR errata
1.4	18.02.2021	D. Scheiwiller	added instructions to open and close the device
1.5	27.08.2021	U. Müller	added Ethernet standards, new BIOS release
1.6	28.01.2022	D. Scheiwiller	Added wireless options
1.7	07.11.2022	U. Müller	Delivery/Mounting Kits clarified, PF levels corrected

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1 Introduction

1.1. General Remarks

The content and presentation of this document has been carefully checked. No responsibility is accepted for any errors or omissions in the documentation.

Note that the documentation for the products is constantly revised and improved. The right to change this documentation at any time without notice is therefore reserved.

Syslogic is grateful for any help referring to errors or for suggestions for improvements.

The following registered trademarks are used:

IBM-PC, PC/AT	trademarks of IBM Corporation
I²C	trademark of Philips Corporation
CFast	trademark of CompactFlash Association
PCIe	trademark of PCI-SIG

1.2. Contents of this Documentation

This document addresses to system integrators, programmers and instructed installation and maintenance personal working with the industrial PC system. It provides all information needed to configure, setup and program the IPC/OEMS8xxx-AxxxE systems. For complete information also the documentation of the mounted communications and I/O boards must be consulted. In the following paragraphs all descriptions referenced to OEM8x apply to all IPC/OEMS8xxx-AxxxE product variants, if not declared otherwise.

1.3. Additional Products and Documents

1.3.1. Hardware Products

The following hardware products are useful together with the OEM8x system:
 − Syslogic USB I/O boards (see product catalog)
 − Mounting Kits IPC/MKITCP-2G41 (DIN rail bottom mount) and IPC/MKITCP-2H (DIN rail rear mount)

1.3.2. Software Products

Please check our website www.syslogic.com for software products for the OEM8x system.

1.3.3. Documents

The following additional documents are *useful* for correct installation and operation of the OEM8x system:
 − Syslogic USB I/O board user documentation

The following documents are *useful* for additional information about MiniPCIe:
 − PCIe Base Specification Version 1.1
 − PCIe Mini Card Electromechanical Specification Version 1.2

The MiniPCIe Specification may be downloaded from the Internet (see address below).
 − PCI-SIG Consortium
   www.pcisig.com/specifications/pciexpress/base

1.3.4.   Datasheets

For additional and more detailed information on the Intel Atom processor and chipset the following documents are of interest:

−   Datasheet Intel Atom Processor E39xx Series
    https://www.intel.com/content/www/us/en/embedded/products/apollo-lake/overview.html
−   Datasheet Intel I210 GbE Controller Family
    http://www.intel.com/content/www/us/en/embedded/products/networking/ethernet-controller-i210-i211-family.html

1.3.5.   White Papers and FAQs

The following links provide additional information and documents for the operation of the RSL81 system:

https://www.syslogic.com/eng/white-papers_24442.shtml

https://www.syslogic.com/eng/downloads_24265.shtml

1.4.   Items delivered

The OEM8x comes with a mating power connector.

Not included are mounting kit, power supply and external cabling. These additional items must be ordered separately and installed according to the respective user documentations.

1.5.   Installation

The installation of the OEM8x system is described in chapter 5 of this documentation.

Important Note

Before applying power to the OEM8x system, all installed boards must be correctly configured and mounted.

1.6.   Safety Recommendations and Warnings

1.6.1.   General safety recommendations

The products are intended for measurement, control and communications applications in industrial environments. The products must be assembled and installed by specially trained people. The strict observation of the assembly and installation guidelines is mandatory.

The use of the products in systems in which life or health of persons is directly dependent (e.g. life support systems, patient monitoring systems, etc.) is not allowed.

The use of the products in potentially explosive atmospheres requires additional external protection circuitry which is not provided with the products.

In case of uncertainty or of believed errors in the documentation please immediately contact the manufacturer (address see chapter 10). Do not use or install the products if you are in doubt. In any case of misuse of the products, the user is solely liable for the consequences.

1.6.2.   Safety warnings

Check chapter 5 for detailed installation and cabling requirements.

Do not operate this product outside of the recommended operating conditions according to the technical data specified in paragraph 6.

Do not touch the surface of this product without precaution, it may be hot and burn your skin. Cool it down before touching.

Do not touch any connector unless you have verified that no dangerous voltage is around. Disconnect cabling first.

Do not open any part of the enclosure while power is applied.

Do not try to repair any defective product by yourself. There is no replaceable service part inside.

Do not open the service cover unless you are instructed and entitled to do this. The service cover is intended for inserting the CFast software storage card on initial operation of the product by an instructed person only.

Use an overload protected power supply to prevent damage in case of a short inside the system.

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1.7. Electro-static discharge

Electronic boards are sensitive to Electro-Static Discharge (ESD). Please ensure that the product is handled with care and only in a ESD protected environment. Otherwise a proper operation is not guaranteed and the warranty is not applicable.

1.8. Life Cycle Information

1.8.1. Transportation and Storage

During transportation and storage, the products must be in their original packing. The original packing contains antistatic and shock-absorbing material. It is recommended, to keep the original packing in case of return of the product to the factory for repair. Note that the packing is recyclable.

1.8.2. Assembly and Installation

Observe the EMI-precautions against static discharge. Carefully read the assembly and installation documentation (see chapter 5) before unpacking the products. Make sure that you have all the necessary items ready (including all the small parts). Follow the assembly guidelines in chapter 5 strictly.

Important Note

The installation procedures must be strictly observed. Note that deviations from the installation guidelines may result in degraded operational reliability or in unfavourable EM-radiation or EM-susceptibility.

1.8.3.   Operation

The operating environment must guarantee the environmental parameters (temperature, power supply, etc.) specified in the technical specification section of the product manuals.

The main functionality of the OEM8x system is defined by the application programs running on the processor board. The application programs are not part of the delivery by Syslogic but are defined, developed and tested by the customer or a system-integrator for each specific application. Refer to the respective documentation for more information.

1.8.4.   Maintenance and Repair

The IPC system features error- and malfunction-detection circuitry. Diagnostic information gathered is transferred to the applications software where it can be used. In the rare case of a module hardware-failure or malfunction, the complete system should be exchanged. The faulty system must be returned to the factory for repair. Please use whenever possible the original packing for return of the product (EMI and mechanical protection).

1.8.5.   Disposal

At the end of the lifespan the OEM8x products must be properly disposed. OEM8x products contain a multitude of elements and must be disposed like computer parts. Some of the OEM8x products contain batteries which should be properly disposed.

1.8.6.   RoHS

The products of the OEM8x family are designed and produced according to the Restriction of Hazardous Substances (RoHS) Directive (2011/65/EU).

1.8.7.   WEEE

The products of the OEM8x family are not designed ready for operation for the end-user and are not intended for consumer applications. According to Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC) Syslogic takes back defective devices for proper disposal at the point of sale.

1.8.8.   EMI/EMC

This product fulfills all EMI/EMC requirements for industrial applications. This is a Class A product and not intended to be used in domestic environments. The product may cause electromagnetic interference. Appropriate measures must be taken.

> **WARNING**
>
> *This equipment is compliant with Class A of EN55032. In a residential environment this equipment may cause radio interference.*

Attention: Be aware of the local laws and standards while using wireless communication. Compliance to a certain standard normally does not comply operating or importing the device into a country. Always check local laws. If required register the device at its destination.

2 Product Description

2.1.   Features

The OEM8x system is an x86 based industrial PC. Its many different variants allow to build up various industrial controls based on the standard PC/AT architecture.

The OEM8x offers the following main features:

– low power industrial processor board eliminating the need for enforced cooling
– high performance 64-bit Intel Atom based processor core with integrated floating point unit
– up to 2 GHz processor clock
– up to 8 Gbyte DRAM on board
– 64-bit graphics controller with backwards compatibility to VGA and SVGA standards
– graphics controller supporting up to 4096x2160 dots resolution on DisplayPort port
– SATA interface supporting one CFast card socket
– integrated peripheral controller (IPC) with PC/AT compatible DMA controllers (2 x 8237), interrupt controllers (2 x 8259) and timer/counter channels (8254)
– one serial RS232 ports (COM1) with 16 byte receive and transmit fifo (16C550A)
– one USB V3.0/ V2.0 port (XHCI-Hostcontroller) with Super-, High-, Full- and Low-Speed support
– up to three USB V2.0 ports (OHCI/EHCI-Hostcontroller) with High-, Full- and Low-Speed support
– up to two CAN 2.0b compatible standalone PCIe CAN controllers
– up to four 10/100/1000Mbit Ethernet LAN interfaces
– Year 2000 compliant Real Time Clock (PC/AT compatible)
– User programmable hardware watchdog
– temperature supervisor for software controlled power management
– Flash for BIOS and BIOS extensions
– one MiniPCIexpress socket for expansion with standard mPCIe communications and I/O boards
– optional TPM 2.0 chip

Fig. 1   Block Diagram OEM8x (all functions)

Important Note
Check the product variant carefully for the supported functions.

2.2. Product Variants

The OEM8x is available in different functional variants and enclosures.

The following tables show the functional differences. Bold printed functions are available on a front or rear connector, italic printed functions are available as internal interfaces only. See figure Fig. 2 for location of the internal interfaces.

Function	IPC/OEMS8H19-A101S/-A101E	IPC/OEMS81G13-A101S/-A101E	IPC/OEMS81H18-A101S/-A101E	IPC/OEMS81I20-A101S/-A101E
CPU	*Atom E3845 1.9GHz*	*Atom E3930 1.3GHz*	*Atom E3940 1.8GHz*	*Atom E3950 2.0GHz*
Memory	*4 GByte*	*2 GByte*	*4 GByte*	*8 GByte*
LAN1	**LAN1**	**LAN1**	**LAN1**	**LAN1**
LAN2	**LAN2**	**LAN2**	**LAN2**	**LAN2**
LAN3	**LAN3**	**LAN3**	**LAN3**	**LAN1**
LAN4	**LAN4**	**LAN4**	**LAN4**	**LAN2**
COM1	*P41/RS232*	*P41/RS232*	*P41/RS232*	*P41/RS232*
COM2	-	-	-	-
CAN1	**CAN1/2**	**CAN1/2**	**CAN1/2**	**CAN1/2**
CAN2	**CAN1/2**	**CAN1/2**	**CAN1/2**	**CAN1/2**
USB1/2	**USB1/2**	**USB1/2**	**USB1/2**	**USB1/2**
USB3/4	**USB3/4**	**USB3/4**	**USB3/4**	**USB3/4**
USB4	*P26*	*P26*	*P26*	*P26*
USB5	*P22*	*P22*	*P22*	*P22*
USB6	*P23*	*P23*	*P23*	*P23*
DisplayPort	**DISPLAY**	**DISPLAY**	**DISPLAY**	**DISPLAY**
I2C	*P46*	*P46*	*P46*	*P46*
CFast	*P8*	*P8*	*P8*	*P8*
uSDCard	*P7*	*P7*	*P7*	*P7*
miniSIM	*P60*	*P60*	*P60*	*P60*
mPCIe Slot	*P52*	*P52*	*P52*	*P52*
RTC Backup	Li battery	Li battery	Li battery	Li battery
TPM	-	✓	✓	✓

Tab. 1   Product Variants OEM8x A101S

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Function	IPC/OEMS8H19-A102S/-A102E	IPC/OEMS81G13-A102S/-A102E	IPC/OEMS81H18-A102S/-A102E	IPC/OEMS81I20-A102S/-A102E
CPU	*Atom E3845 1.9GHz*	*Atom E3930 1.3GHz*	*Atom E3940 1.8GHz*	*Atom E3950 2.0GHz*
Memory	*4 GByte*	*2 GByte*	*4 GByte*	*8 GByte*
LAN1	**LAN1**	**LAN1**	**LAN1**	**LAN1**
LAN2	**LAN2**	**LAN2**	**LAN2**	**LAN2**
LAN3	-	-	-	-
LAN4	-	-	-	-
COM1	-	-	-	-
COM2	-	-	-	-
CAN1	-	-	-	-
CAN2	-	-	-	-
USB1/2	**USB1/2**	**USB1/2**	**USB1/2**	**USB1/2**
USB3/4	-	-	-	-
USB4	-	-	-	-
USB5	-	-	-	-
USB6	-	-	-	-
DisplayPort	**DISPLAY**	**DISPLAY**	**DISPLAY**	**DISPLAY**
I2C	*P46*	*P46*	*P46*	*P46*
CFast	*P8*	*P8*	*P8*	*P8*
uSDCard	*P7*	*P7*	*P7*	*P7*
miniSIM	*P60*	*P60*	*P60*	*P60*
mPCIe Slot	*P52*	*P52*	*P52*	*P52*
RTC Backup	Li battery	Li battery	Li battery	Li battery
TPM	-	✓	✓	✓

Tab. 2   Product Variants OEM8x A102S

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Function	IPC/OEMS8H19-A103S/-A103E	IPC/OEMS81G13-A103S/-A103E	IPC/OEMS81H18-A103S/-A103E	IPC/OEMS81I20-A103S/-A103E
CPU	*Atom E3845 1.9GHz*	*Atom E3930 1.3GHz*	*Atom E3940 1.8GHz*	*Atom E3950 2.0GHz*
Memory	*4 GByte*	*2 GByte*	*4 GByte*	*8 GByte*
LAN1	**LAN1**	**LAN1**	**LAN1**	**LAN1**
LAN2	**LAN2**	**LAN2**	**LAN2**	**LAN2**
LAN3	**LAN3**	**LAN3**	**LAN3**	**LAN1**
LAN4	**LAN4**	**LAN4**	**LAN4**	**LAN2**
COM1	*P41/RS232*	*P41/RS232*	*P41/RS232*	*P41/RS232*
COM2	-	-	-	-
CAN1	-	**CAN1**	**CAN1**	**CAN1**
CAN2	-	-	-	-
USB1/2	**USB1/2**	**USB1/2**	**USB1/2**	**USB1/2**
USB3/4	-	-	-	-
USB4	*P26*	*P26*	*P26*	*P26*
USB5	*P22*	*P22*	*P22*	*P22*
USB6	*P23*	*P23*	*P23*	*P23*
DisplayPort	**DISPLAY**	**DISPLAY**	**DISPLAY**	**DISPLAY**
I2C	*P46*	*P46*	*P46*	*P46*
CFast	*P8*	*P8*	*P8*	*P8*
uSDCard	*P7*	*P7*	*P7*	*P7*
miniSIM	*P60*	*P60*	*P60*	*P60*
mPCIe Slot	*P52*	*P52*	*P52*	*P52*
RTC Backup	Li battery	Li battery	Li battery	Li battery
TPM	-	✓	✓	✓

Tab. 3   Product Variants OEM8x A103S

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3 Hardware Description

3.1. Overview

The OEM8x hardware may be configured by software (CMOS setup) and by switch settings. Custom BIOS configuration can be programmed into the BIOS flash on request (ask Syslogic technical support for custom BIOS configuration).

The switch and connector locations are shown in the board layout drawing (Fig. 2).

Important Note

Always check the jumper configuration of a freshly received board to comply with your system requirements before applying power, otherwise the system may get damaged or may fail to operate.

Fig. 2 Board Layout OEM8x (all functions)

3.2. Memory and I/O Resources

3.2.1. General Memory Layout and Configuration

The OEM8x uses the same memory layout as a standard desktop PC. Three onboard devices, DRAM, graphics controller, and BIOS, make use of the 4 Gbyte (32-bit mode) / 64Gbyte (64-bit mode) addressable memory space.

Address	Device / Register	Remarks
0000'0000..0009'FFFFH	640 kbyte Main Memory (DRAM)	
000A'0000..000B'FFFFH	VGA Video Memory	
000C'0000..000F'FFFFH	Configurable memory range (BIOS, BIOS Extensions, DRAM or redirected to PC/104 bus)	
0010'0000.. FFFF'FFFFH	2-4 Gbyte Main Memory (DRAM)	including graphics memory (UMA)
0000'0001'0000'0000.. 0000'0001'FFFF'FFFFH	optional 4 Gbyte Main Memory (DRAM)	64-bit mode only
0000'0002'0000'0000.. 0000'000F'FFFF'FFFFH	up to top	64-bit mode only

Tab. 4   Physical Memory Address Space Layout

3.2.2. General I/O Layout and Configuration

The OEM8x's 64 kbyte I/O address space is mapped to the PC/104 bus address space as indicated in the table below. Note that 16 bit address decoding should be used on all PC/104 expansion boards to make efficient use of the I/O address space.

Address	Device / Register	Remarks
0000..001FH	DMA Controller 1	
0020..0021H	Master Interrupt Controller	
0022H	Configuration Address Register	
0023H	Configuration Data Register	
0024..003FH	reserved	
0040..0043H	Timer/Counter	
0044..005FH	reserved	
0060H	Keyboard/Mouse Controller	
0061H	Port B Register	
0062..0063H	reserved	
0064H	Keyboard/Mouse Controller	
0065..006FH	reserved	
0070H	Bit 6..0 = RealTimeClock/CMOS-RAM Address Register Bit 7 = Non Maskable Interrupt (NMI) Mask (write only)	
0071H	RealTimeClock/CMOS-RAM Data Register	
0072..007FH	reserved	
0080..0091H	DMA Page Registers / reserved	
0092H	Port 92h System Control Register	
0093..009FH	reserved	
00A0..00A1H	Slave Interrupt Controller	
00A2..00BFH	reserved	
00C0..00DFH	DMA Controller 2	
00E0..010FH	reserved	
0110..016FH	reserved	
0170..0177H	Secondary IDE Channel	
0178..01EFH	reserved	
01F0..01F7H	Primary IDE Channel	
01F8..01FFH	reserved	
0200..0207H	reserved for Serial Port (COM3)	
0208..020FH	reserved for Serial Port (COM4)	
0210..026FH	not used	
0278..027FH	reserved for Parallel Port (LPT2) and Plug'n Play	
0280..02E7H	reserved	
02E8..02EFH	reserved for Serial Port (COM4)	
02F0..02F7H	reserved	
02F8..02FFH	reserved for Serial Port (COM2)	
0300..036FH	not used	

0370..0377H	reserved for external Secondary Floppy Controller	
0376..0377H	reserved for external Secondary IDE Channel	
0378..037FH	Parallel Port (LPT1)	
0380..03AFH	reserved	
03B0..03BBH	VGA registers (MDA)	
03BC..03BFH	reserved for Parallel Port (LPT3)	
03C0..03CFH	VGA registers (EGA)	
03D0..03DFH	VGA registers (CGA)	
03E0..03E7H	reserved	
03E8..03EFH	reserved for Serial Port (COM3)	
03F0..03F7H	reserved for external Primary Floppy Controller	
03F6..03F7H	Primary IDE Channel	
03F8..03FFH	Serial Port (COM1)	
0400..042FH	reserved	
0430..04EFH	reserved	
0480..048FH	DMA High Page Registers / reserved	
0490..049FH	Instruction Counter Registers / reserved	
04A0..04CFH	reserved	
04D0..04D1H	IRQ Edge/Level Control	
04D2..04FFH	reserved	
0500..08FFH	reserved	
0900..0A77H	reserved	
0A78H	Plug'n Play configuration port	
0A79..0BFFH	reserved	
0C00..0CF7H	reserved	
0CF8..0CFFH	PCI configuration registers	
0D00..0FFFH	reserved	
1000..3FFFH	reserved	
4000.. 46E7H	reserved	
46E8H	reserved	
46E9..47FFH	reserved	
4800..6FFFH	reserved	
7000..7FFFH	not used	
8000..81FFH	reserved	
8200..821FH	reserved	
8220..83FFH	reserved	
8400..BFFFH	reserved	
C000..FFFFH	reserved for PCI devices (VGA, Ethernet, USB, SATA)	

Tab. 5   I/O Address Space Layout

The processor module on the OEM8x board offers a JTAG interface for factory operations on the internal header P12. These pins **must not** be connected by the user.

Pin Number	Signal	Remarks
1	TCK (do not connect)	
2	TDO (do not connect)	
3	TMS (do not connect)	
4	TDI (do not connect)	
5	JTAG_VCC (do not connect)	
6	JTAG_GND (do not connect)	

Tab. 6   Factory Programming Header P12 (1x6 pin)

The power management controller on the OEM8x board is factory programmed using the internal header P17. This header **must not** be connected by the user.

Pin Number	Signal	Remarks
1	VPP/MCLR# (do not connect)	PICkit3 pin 1
2	VCC (do not connect)	PICkit3 pin 2
3	GND (do not connect)	PICkit3 pin 3
4	PGD (ICSPDAT, do not connect)	PICkit3 pin 4
5	PGC (ICSPCLK, do not connect)	PICkit3 pin 5
6	PGM LVP (SCL, do not connect)	PICkit3 pin 6
7	-- (SDA, do not connect)	--

Tab. 7   Factory Programming Header P17 (1x7 pin)

3.3. Peripheral Devices

3.3.1. DisplayPort Interface

The DisplayPort signals are available on the DisplayPort connector P5 for direct connection of DisplayPort compatible monitors. The controller uses the standard VGA register interface. All configuration is done by software (BIOS, VGA-BIOS, OS driver).

Device Connection

Pin Number	Signal	Remarks
1	ML Lane 0 +	Lane 0 (positive)
2	GND	Ground
3	ML Lane 0 -	Lane 0 (negative)
4	ML Lane 1 +	Lane 1 (positive)
5	GND	Ground
6	ML Lane 1 -	Lane 1 (negative)
7	ML Lane 2 +	Lane 2 (positive)
8	GND	Ground
9	ML Lane 2 -	Lane 2 (negative)
10	ML Lane 3 +	Lane 3 (positive)
11	GND	Ground
12	ML Lane 3 -	Lane 3 (negative)
13	CONFIG1	Configuration input 1
14	CONFIG2	Configuration input 2
15	AUX CH +	Auxiliary channel (positive)
16	GND	Ground
17	AUX CH -	Auxiliary channel (negative)
18	Hot plug	Hot plug dectect
19	Return	Return for power
20	DP_PWR	Power for connector (3.3V, 500mA)

Tab. 8   DisplayPort connector P5

> **Important Note**
>
> Maximum cable length for DisplayPort connection is dependent on pixel clock frequency (about 3 m
> for full bandwidth transmission, up to 15m for reduced bandwidth transmission1920x1080 resolution
> with a refresh rate of 60Hz).
> Use high quality shielded DisplayPort cables for maximum EMI protection.
> Do not feed any voltage into pin 20 (DP_PWR), it is a supply output only for an optional external
> DisplayPort adapter.

3.3.2. CFast-Interface

The OEM8x features a SATA generation 2 or 3 host controller having assigned the base address and IRQ at
boot time by the PCI-BIOS.
Channel 0 of the SATA controller serves the CFast socket P8. The CFast card behaves like a standard SATA disk.

Tested CFast cards are:
- Cactus Technologies KC-series

Device Connection (CFast)

Pin Number	Signal	Pin Number	Signal
S1	SGND	PC1	CDI
S2	RxP	PC2	GND
S3	RxN	PC3	nc
S4	SGND	PC4	nc
S5	TxN	PC5	nc
S6	TxP	PC6	nc
S7	SGND	PC7	GND
		PC8	LED1
		PC9	LED2
		PC10	IO1
		PC11	IO2
		PC12	IO3
		PC13	PWR
		PC14	PWR
		PC15	PGND
		PC16	PGND
		PC17	CDO

Tab. 9   CFast Connector P8 (SATA Channel 0)

Important Note

Do not insert or remove the CFast card when power supply is on. This interface does not support hot-plugging.

3.3.3. Serial Ports

One serial port is available with standard RS232 signals on an internal header. The serial port has a fixed base addresse of 3F8H for COM1 and uses hardware interrupt 4. Only RXD/TXD/RTS/CTS signals are supported.

Device Connection RS232

The Serial Port COM1 is available on the internal header P41.

Pin Number	Signal	Pin Number	Signal
1	-	6	CTS*
2	-	7	-
3	RXD	8	-
4	RTS*	9	GND
5	TXD	10	VCC (5V)

Tab. 10 Serial Ports COM1 on internal header (10 pin)

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3.3.4. USB Interface

The OEM8x features an OHCI/EHCI and a XHCI compatible USB host controller having assigned the base address and IRQ at boot time by the PCI-BIOS. All ports support USB 2.0 devices and port 1 supports USB 3.0 devices with Superspeed. Port 6 (P23) supports higher supply current.

Device Connection

The USB interface uses two standard A type double USB connector on the front side for USB ports 1/2 and on the back side for USB ports 3/4. Port 4 optionally can be connected on internal connector P26, but do not connect both! Ports 5 and 6 are located on two internal 4 pin connectors.

Mating connector type for P22, P23: Housing Molex 505565-0401, Crimp contacts Molex 505431-1100. Recommended wire type: 26-30AWG, D+/D- wires twisted.

P20 bottom Pin Number	USB port 1 Signal	P20 top Pin Number	USB port 2 Signal
1	VBUS	1	VBUS
2	D-	2	D-
3	D+	3	D+
4	GND	4	GND
5	SSRX-	5	-
6	SSRX+	6	-
7	SSGND	7	-
8	SSTX-	8	-
9	SSTX+	9	-

Tab. 11 USB1/2 Interface Connector P20 (Dual Type A)

P21 bottom Pin Number	USB port 3 Signal	P21 top Pin Number	USB port 4 Signal
1	VBUS	1	VBUS
2	D-	2	D-
3	D+	3	D+
4	GND	4	GND

Tab. 12 USB3/4 Interface Connector P21 (Dual Type A)

Pin Number	Signal	Remarks
1	VBUS	
2	D-	
3	D+	
4	GND	

Tab. 13 USB4/5/6 Interface Connector P26, P22 and P23 (1x4pin)

Important Note

Maximum cable length allowed for USB connection is 3 m. If longer cables are used, special overvoltage and filtering elements have to be installed to comply with the requirements of EMI/RFI "CE"-certification. Only use high quality industrial USB devices with sufficient EMI compatibility.
Use shielded cables for maximum EMI protection.
Drawing excessively power might disturb operation.

3.3.5.   CAN Interfaces

Up to two CAN 2.0b / ISO 11898-1/2 interfaces using standalone SJA1000-similar PCIe CAN controllers.
The controllers of the A101S product variants are compatible with PEAK-System PCIe CAN controllers and include a license to use the PEAK-System OS drivers. CAN i/o base address and interrupts are enumerated by PCIe BIOS.
The controller of the A103S product variants is compatible with the NXP SJA1000 CAN controller. It uses i/o address range 340-35FH and hardware interrupt 15.
No configuration options are available for the CAN devices.

Device Connection CAN

The CAN interfaces are available on one common connector P14.
120 Ohm termination resistors must be connected externally!

Pin Number	Signal	Pin Number	Signal
1	CAN2 Low	6	CAN2 Ground
2	CAN1 Low	7	CAN1 High
3	CAN1 Ground	8	CAN2 High
4	no connection	9	no connection
5	no connection		

Tab. 14 CAN ports CAN1/2 on DSUB-9 male P14 (9 pin)

3.3.6. Ethernet LAN Interface

The OEM8x features up to four PCIe Ethernet controller having assigned the base address and IRQ at boot time by the BIOS. The Ethernet interface drives two LED's (yellow and green) integrated into the RJ45 connector for status information. The meaning of the LED activity is programmable (normally set by the low level driver).

LAN1, LAN2, LAN3 and LAN4 feature Intel I210 Ethernet controllers supporting standard IEEE 802.3 Ethernet interfaces for 10/100/1000Mb/s 10BASE-T, 100BASE-TX, 1000BASE-T connections. All interfaces support Auto Negotiation and Auto MDIX functions as well as Audio-Video Bridging (AVB) and IEEE 802.1AS precision timestamping. Check manufacturer's datasheets for detailed information.

No configuration options are available for the Ethernet device.

Device Connection

The Ethernet interfaces use the standard RJ45 Gigabit connector P18, P19, P27 and P28 on the front for 100 Ohm shielded or unshielded Twisted Pair cabling.

Pin Number	Signal	Remarks
1	MD0+	
2	MD0-	
3	MD1+	
4	MD2+	
5	MD2-	
6	MD1-	
7	MD3+	
8	MD3-	

Tab. 15 Ethernet Twisted Pair Interface Connector P18, P19, P27 and P28 (RJ45)

3.3.7. LTE (optional)

An optional LTE Interface is provided by complete and certified mPCIe LTE module. For detailed information refer to the module's documentation. The modem is connected to USB and appears as a virtual serial interface and as a virtual network interface.

The LTE antenna input is available on a designated SMA connectors. The antenna must match the requirements according to the module's documentation.

Important Note

The antennas for LTE may be harmful if people are exposed to the radiation for too long. Therefore place the antennas that way that there is always a distance of 45cm to places people stay.

Important Note

LTE Antennas must meet the requirements of the module's documentation. Especially check SWR, gain, maximum Power and impedance.

Important Note

The LTE Modem provides a diversity antenna input. It is required to disable the RX-Diversity antenna using AT-commands if this input is not connected to an antenna.

Important Note

Chassis and logic ground are connected (see also 7.1). Depending on the installation situation the use of DC blockers on the antenna ports might be necessary.

Important Note

Terminate unused ports with a 50Ω resistor

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Important Note

At the place where the SIM-Cards are installed it may get up to +85°C. Make sure the inserted SIM Card fulfills this requirement to avoid errors.
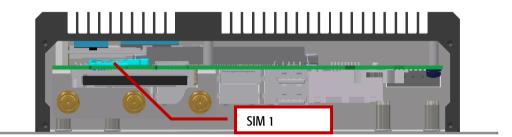

SIM 1

Fig. 3   Location of SIM Card holder

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3.3.8.   WLAN (optional)

An optional WLAN Interface is provided by complete and certified mPCIe WLAN module. For detailed information refer to the module's documentation. The modem is connected to the PCI subsystem and appears as a standard WiFi network interface.

The WLAN antenna input is available on two designated SMA-RP connectors. The antennas must match the requirements according to the module's documentation.

Important Note

The antennas for WLAN may be harmful if people are exposed to the radiation for too long. Therefore place the antennas that way that there is always a distance of 45cm to places people stay.

Important Note

WLAN antennas must meet the requirements of the module's documentation. Especially check SWR, gain, maximum Power and impedance.

Important Note

Chassis and logic ground are connected (see also 7.1). Depending on the installation situation the use of DC blockers on the antenna ports might be necessary.

Important Note

Terminate unused ports with a 50Ω resistor

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3.3.9. I2C Interface

The OEM8x features one I2C interface on an internal connector. The interface is integrated into the processor module (see processor module datasheet for details). The signals are non-buffered 3.3V LVCMOS interfaces with integrated pullups.

Consult processor module datasheet for programming details.

Device Connection I2C

The first I2C interface uses connector P46. Mating connector type: Housing Molex 51021-0400, Crimp contact Molex 50058-8100. Wiring: AWG26.

Pin Number	Signal	Remarks
1	VCC (3.3V)	not fused!
2	SDA	3.3V LVCMOS with integrated pullup
3	SCL	3.3V LVCMOS with integrated pullup
4	GND	

Tab. 16 I2C Interface Connector P46

Important Note

This interface is intended for case internal use only.

3.3.10. Watchdog

The watchdog timer is dependent on the integrated Qseven CPU board.

See separate documentation for details.

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3.3.11. Power supply

The processor and its peripherals are powered by a non-isolated, integrated power supply which generates all the necessary voltages.
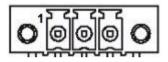
The power must be connected using the following mating connector:

Weidmueller BCZ 3.81/03/180F SN BK (Ordercode 1792960000).

 The mating connector can be ordered directly at your local Weidmueller distributor.

Pin Number	Signal	Remarks
1	Power Fail/Remote on/off	Power fail input
2	+24VDC	+9V..+30V DC
3	GND	

Tab. 17 Power supply connector

For normal operation the external power supply has to be connected to the pins 2 (+24VDC) and 3 (GND) of the connector.

Pin 1 is used as an input for either a power fail or remote on/off signal and may be left open if not used. This signal is fed to the power management control unit (PCU) and to the power button input of the processor chipset. The function is dependent on configuration of the PCU and the chipsets power button function.

3.3.12. Power supervision

The power management control unit (PCU) can be operated in two modes: power fail mode or remote on/off mode. The following two chapters describe their functionality in detail.

Switch	Configuration	Remarks
S14	position '0' = bypass mode	check chapter
	position '1' to 'F' = remote on/off mode	3.3.13/3.3.14

Tab. 18 Power fail mode configuration

3.3.13. Power Fail

In bypass mode the external power fail signal acts as power button input to the CPU. Dependent on ACPI configuration the signal may initiate a shutdown or poweroff operation.

3.3.14. Remote On/Off

With the remote on/off function the system can be switched on and off through an external control signal. When active the internal software goes from the run state into the shutdown state. After a predefined timeout the PCU switches the main power supply off. The timeout can be configured through S14. Mode 6-9 are controlled by a 250ms Impulse of the external control signal. Mode 8 and 9 have the feature to do a hard power off when the Impulse is longer than 5 seconds.

Config switch S14 position	$t_{debounce\_on}$ On debouncing (setup)	$t_{debounce\_off}$ Off debouncing (hold)	$t_{startup}$ Hold time until switch off signal is routed to processor, if system is still booting	t_{hard_off} Timeout until switch off signal is generated from processor (after that hard off)
0	-	-	-	-
1	2 s	60 s	5 s	60 s
2	2 s	60 s	60 s	300 s
3	2 s	60 s	60 s	120 s
4	1 s	5 s	5 s	60 s
5	5 s	5 s	60 s	60 s
6	0 s	0 s	60 s	60 s
7	0 s	0 s	60 s	60 s
8	0 s	0 s	60 s	60 s
9	0 s	0 s	60 s	0 s
5 – F	n/a	n/a	n/a	n/a

Tab. 19 PCU timing configuration through S14

When switch S14 is in position 0 the PCU is in bypass mode.
Please check the separate documentation and sample code for details about the programming of the power management control unit.
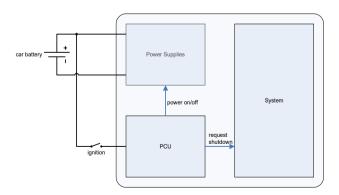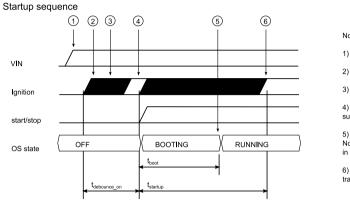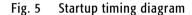
Application example

Fig. 4   Application example: CAR PC

Startup sequence

Notes:

1) VIN supply must be present

2) Ignition on starts debouncing sequence

3) glitches/bounces are ignored during $t_{debounce\_on}$

4) if ignition signal is stable after $t_{debounce\_on}$, supply is switched on and the system starts

5) during $t_{startup}$, ignition switch is ignored
Note: system might have finished booting well in advance before startup phase is over

6) after $t_{startup}$, the power management circuit resumes tracking of the ignition switch signal

Fig. 5   Startup timing diagram

Forced shutdown sequence

Ignition off starts debouncing sequence glitches/bounces are ignored during $t_{debounce\_off}$

if ignition signal is stable after $t_{debounce\_off}$, powerfail is indicated to the system

if the operating system ignores the powerfail signal or is not able to shut down within thard_off, a stop signal is sent from the power management unit to the power supply which cuts off power to the system

VIN supply may be removed now

Fig. 6   Shutdown timing diagram

Important Notes

The operating system must support the remote on/off function.

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Frontside Status LEDs

The four colored LEDs on the front side show the following states:

LED	Signal	Remarks
Red up	Error signal	programming see Control register in chapter 4
Green down	Board ready	programming see Control register in chapter 4
Green up	Aux LED	programming see Control register in chapter 4
Yellow down	Disk activity	CFast only

4 Programming Information

4.1. Overview

The programming of the OEM8x board is done with standard memory and I/O read and write operations. Most configuration options are handled by the BIOS. For detailed information refer to related documents as listed in paragraph 1.3.

Please contact Syslogic technical support if you need special BIOS configuration.

4.2. Interrupt, Memory and I/O Resources

4.2.1. Interrupt Resources

The following table shows the usage of the interrupt resources. Interrupts marked 'free' are not used by onboard devices if they are not assigned to a PCI device in the BIOS configuration. Interrupts for use on the PC/104 bus must be configured as 'reserved' in CMOS setup legacy interrupt configuration and must not be used by SIO peripherals (check SIO configuration in CMOS setup).

Interrupt	Interrupt Source	Remarks
Master		
IRQ0	Timer Channel 0	
IRQ1	PS/2-Controller (Keyboard)	check CMOS setup
IRQ2	Slave Interrupt Controller Cascading	
IRQ3	available for PCI	check CMOS setup
IRQ4	COM1	check CMOS setup
IRQ5	available for PCI	Check CMOS setup
IRQ6	available for PCI	check CMOS setup
IRQ7	available for PCI	check CMOS setup
Slave		
IRQ8	Real Time Clock	
IRQ9	ACPI/PCI	do not use
IRQ10	available for PCI or CAN controller	check CMOS setup
IRQ11	available for PCI	check CMOS setup
IRQ12	available for PCI	check CMOS setup
IRQ13	Floating Point Unit	
IRQ14	Primary IDE/SATA Channel in legacy mode	do not use
IRQ15	available for PCI	check CMOS setup
Special		
NMI		

Tab. 20 Interrupt Usage

4.2.2. Memory Resources

The general memory layout is shown in paragraph 3.2.1. The configuration of the memory layout is done by programming processors internal configuration registers and board configuration registers (see paragraph 4.2.3). This is done completely by the BIOS on system startup and must not be changed during operation. For operating systems requiring memory configuration (e.g. Windows Compact) the memory layout shown in paragraph 3.2.1 must be considered.

4.2.3. I/O Resources

This paragraph describes only the OEM8x system register and support functions not directly related to a specific peripheral device. These registers are located in an onboard TCA9554 I/O expander chip connected to the internal Q7-I2C interface. For detailed programming information and drivers check http://www.ti.com/product/TCA9554 .

The general I/O layout is shown in paragraph 3.2.2. Peripheral devices are discussed in paragraph 3.3.

I2C-Address	Register	Device / Register	Remarks
27h	00h	Status Register (Input Port, not used)	Reset state = xxh
	01h	Control Register (Output Port)	Reset state = FFh
	03h	Polarity Inversion Register (not used)	Reset state = 00h
	04h	Configuration Register	Reset state = FFh

Tab. 21 OEM8x System Registers

Important Note

Before using the the system registers, the I/O expander chip must be initialized correctly by first programming the required startup value of the Control Register and then configuring the I/O pins by programming the Polarity Inversion Register followed by programming the Configuration Register.

For default behavior, set Control Register to1Fh, Polarity inversion Register to 00h (reset state) and Configuration Register to 00h (all outputs).

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Control Register 01h (Output Register)

D7	D6	D5	D4	D3	D2	D1	D0	Access
reserved	USBEN2	USBEN1	USBEN0	reserved	AUX	ERROR	READY	Read
reserved	USBEN2	USBEN1	USBEN0	reserved	AUX	ERROR	READY	Write
1111'1111 (FFh)								Reset

Description:

USBEN2   USB4/5 Power enable

Read	Write
0 = USB5/6 power off 1 = USB5/6 power on	0 = disable USB5/6 power 1 = enable USB5/6 power

USBEN1   USB2/3 Power enable

Read	Write
0 = USB3/4 power off 1 = USB3/4 power on	0 = disable USB3/4 power 1 = enable USB3/4 power

USBEN0   USB0/1 Power enable

Read	Write
0 = USB1/2 power off 1 = USB1/2 power on	0 = disable USB1/2 power 1 = enable USB1/2 power

AUX   Auxiliary LED, green LED

Read	Write
0 = Inactive, green AUX LED off 1 = Active, green AUX LED on	0 = Deactivate green AUX LED 1 = Activate green AUX LED

ERROR   Boot/Error LED, red LED

Read	Write
0 = Inactive, red LED off 1 = Active, red LED on	0 = Deactivate red LED 1 = Activate red LED

READY   Ready/Run bit, green LED

Read	Write
Reserved, RUN-LED is directly driven by hardware	Reserved, RUN-LED is directly driven by hardware

reserved   Reserved, always write 0

Important Note

Be careful when disabling USB power by setting USBENx=0 since this will disable any all devices connected to the two related USB ports. Always use a program sequence which automatically reenables USB power some seconds later.

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Peripheral Devices

4.2.4. DisplayPort-Interface

The DisplayPort interface uses the standard PC/AT VGA register set. For detailed programming information please refer to the IBM PC/AT Technical Reference or similar documentation.
Low level programming is handled by the VESA compatible VGA-BIOS.
For detailed programming information please refer to the Intel Atom E38xx/E39xx technical reference or similar documentation. Legacy support and low level programming is handled by the BIOS and standard OS drivers.

4.2.5. SATA/CFast-Interface

For detailed programming information please refer to the Intel Atom E38xx/E39xx technical reference or similar documentation. Legacy support and low level programming is handled by the BIOS and standard OS drivers.

4.2.6. Serial Ports

The Serial Port interfaces use the standard PC/AT register set. The Serial Port controller is compatible with the standard 16C550A UART with 16 bytes receive and transmit fifos. For detailed programming information please refer to the IBM PC/AT Technical Reference or similar documentation. Legacy support and low level programming is handled by the BIOS and standard OS drivers.

4.2.7. Ethernet Interface

The Ethernet interfaces use the Intel I210IT Ethernet Controller. For detailed programming information and drivers check www.intel.com .

4.2.8. USB Interface

The USB interfaces use the standard OHCI/EHCI/XHCI register set. Legacy support and low level programming is handled by the BIOS and standard OS drivers.

4.2.9. CAN Interface

The CAN interfaces of the A101S product variants are compatible with PEAK-System PCIe CAN controllers and include a license to use the PEAK-System drivers. For detailed programming information and drivers check PCAN-miniPCIe download section on www.peak-system.com .
The controller of the A103S product variants is compatible with the NXP SJA1000 CAN controller. Please contact support@syslogic.com for programming information and OS driver options.

4.2.10.   I2C

The I2C interface operation is dependent on the integrated Qseven CPU board. A special software library must be used. Contact Syslogic support for additional information.

4.2.11.   Watchdog

The watchdog timer is dependent on the integrated Qseven CPU board. A special software library must be used. Contact Syslogic support for additional information.

5 Installation and cabling

5.1. Introduction

Installation and cabling of the OEM8x system has to be done with great care; the correct cabling is essential for high operational reliability and the correct grounding is necessary for protection. To meet the requirements of "CE"-certification all cables have to be shielded. The enclosure has to be connected to ground via the DIN-rail or mounting kit.

Important note

Before applying power to the OEM8x system, the main board must be configured correctly.

Important notes

To meet the requirements of EMI/RFI "CE"-certification, correct mounting, installation and cabling of the OEM8x system according to these guidelines is absolutely necessary.

5.2. Powering the OEM8x System

The "logic supply voltage", i.e. the power driving the electronic circuits (CPU and base board) is internally generated from the 12/24VDC power supply input. Remember that the power supply is non-isolated. For an isolated version please contact the manufacturer.

The power supply has to be connected according to paragraph 3.3.11. Maximum allowed cable length between ac/dc power supply and system power input is 30 m. If the cable is longer than 30 m or routed outside the building, special overvoltage and filtering elements have to be installed to comply with the requirements of EMI/RFI "CE"-certification. Use AWG18/0.75mm^2 wires at minimum to comply with the safety requirements and follow the connector manufacturers instruction guide.

When selecting the external power supply the maximum power dissipation of the system has to be considered.

Important notes

Please make sure that the input voltage does not exceed the recommended operating range otherwise the electronics board could get damaged and correct operation cannot be guaranteed.
Use an overload protected power supply to prevent damage in case of a short inside the system.
The ac/dc power supply must fulfill the requirements for EMI/RFI "CE"-certification.

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5.3.   Cabling the interfaces

Use appropriate cabling for all interfaces. Shielded cabling is required to meet the EMI/EMC limits.

5.4.   Grounding

In some cases, it is recommended to connect the shields of the cables to chassis potential at the entry point into the housing cabinet as shown in Fig. 7. If the cables enter a hermetically closed cabinet, use special 360 degree metal clamps (EMI/RFI protected types which contact to the cable shield).

Important notes

Grounding of the cable shields using "pig-tail wires" are not recommended because of their high impedance at high frequencies. It is better to clamp the shields onto a grounded copper rail.
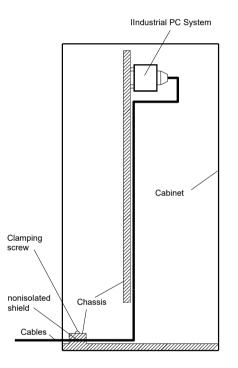

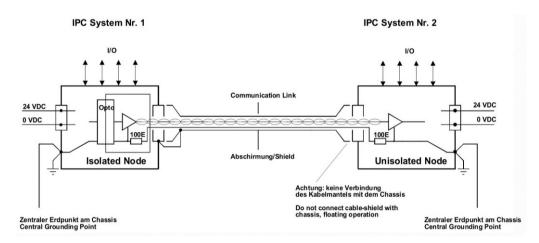Fig. 7   Additional grounding of the cable shields at the entry point of a cabinet.

5.5.   Cabling of communication links

If the communication ports are unisolated ports, cable shields have to be connected to chassis potential on both sides of the interconnection cable. If the cable is very long, a thick copper wire (10 mm^2) for potential adjustment is highly recommended. Fig. 8 shows a non-isolated system with common chassis ground.
Some of the communication ports are galvanically isolated ports. In such cases the shield of the interconnection cable must be wired to chassis potential only on one side of the cable. Fig. 9 shows an isolated system with independent grounds.

Important notes

Grounding of cable shields using "pig-tails wires" are not recommended because of their high impedance at high frequencies. It is recommended to clamp the shields onto a grounded copper-rail.
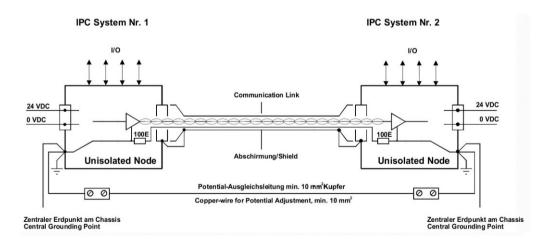

Fig. 8   Isolated communication link

Fig. 9   Non-isolated communication link with common chassis potential

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6 Service

To replace the battery, SIM card or the C-Fast data storage it is required to remove the service cover.

⚠️	Shutdown the system and disconnect from power supply and all other connections
⚠️	Make sure the device has cooled down to room temperature
⚠️	Only open the device in an ESD protected area
⚠️	Danger of explosion if battery is incorrectly replaced. Replace only with same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

6.1. Replaceable Parts

This OEM8x system contains the following replaceable parts:
- CFast flash card
- uSD flash card
- miniSIM card
- Litium battery
- Main fuse

To replace a flash or SIM card power off the system and remove the service cover. After having unlocked the clip, the flash card may be removed. When inserting a new CFast flash card be sure that it is fully compliant with the CFast standard. Syslogic highly recommends CFast flash cards specified for industrial use by the card manufacturer. Check temperature range and durability to comply with your requirements.

To replace the battery power off the system and remove the service cover. Pull out the battery carefully. Replacement battery must be one of the following types:
- Renata CR2450N (3V, 540mAh)

Because the self-discharge of all Lithium Batteries increases rapidly at high temperatures the battery lifetime decreases by a great amount. To prevent battery leakage scheduled service/replacement is recommended. Please contact the battery manufacturer for further details and calculation assistance for battery lifetime calculation.

The main fuse protects the system against destruction in case of high energy distortions on the power line. For replacement, the system must be opened in an ESD protected environment. Only an entitled instructed person is allowed for this operation. Replacement fuse type is Littelfuse 452004.MRL (4A slow-blow).

Safety warnings and installation guidelines must be followed according to paragraphs 1.6, 1.8 and 5.

Fig. 10   Service parts replacement

For closing the service cover use Torx T6 tool with 0.2Nm torque.

6.2.   Opening the device

Loosen the screws to disassemble the housing

Tool: Torx T6

Tool: nut 4.5mm

Tool: Torx 10

6.3. Closing the device

1. Remount the housing
2. Make sure the blue securing patch on the screws is still intact
   The sealing is made for re-using several times without losing its characteristic.

Torque: 0.2Nm
Tool: Torx T6

Torque: 0.5 Nm
Tool: nut 4.5mm

Torque: 0.8Nm
Tool: Torx 10

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7 Technical Data

7.1. Electrical Data

Important Note

Do not operate the OEM8x system outside of the recommended operating conditions. Otherwise lifetime and performance will degrade. Operating the board outside of the absolute maximum ratings may damage the hardware.

Absolute Maximum Ratings (over free-air temperature range)

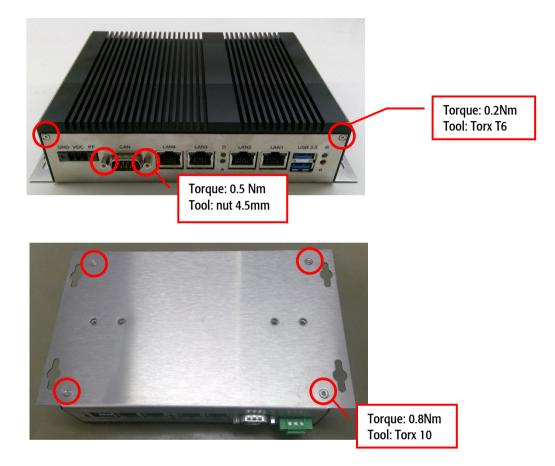| Parameter	Symbol	min	nom	max	Unit
power supply voltage	Vcc	-0.5		30	Vdc
isolation logic to chassis (AC, 60s, 500m a.s.l., Ta=25°C)		100			Vrms
isolation LAN/RJ45 to logic (AC, 60s, 500m a.s.l., Ta=25°C)		1500			Vrms
isolation LAN/RJ45 to chassis (AC, 60s, 500m a.s.l., Ta=25°C)		500			Vrms
isolation CAN to logic (AC, 60s, 500m a.s.l., Ta=25°C)		500			Vrms
isolation CAN to chassis (AC, 60s, 500m a.s.l., Ta=25°C)		500			Vrms
isolation CAN1 to CAN2 (AC, 60s, 500m a.s.l., Ta=25°C)		500			Vrms
creepage distances:					
logic to chassis and PCB boarder		1.0			mm
logic to mounting holes		1.0			mm
Standard temperature versions					
operating free-air temperature (Ambient)	Ta	0		60	°C
storage temperature range[1]	Tst	0		60	°C
Extended temperature versions					
operating free-air temperature (Ambient)	Ta	-40		70	°C
storage temperature range[1]	Tst	-40		85	°C

Tab. 22 General Absolute Maximum Ratings

[1]Due to the large effect of self-discharge at high temperature of the Lithium Battery it is recommended to store the device at around +25°C.

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Recommended Operating Conditions

Parameter	Symbol	min	nom	max	
power supply voltage	Vcc	9.5	12/24	30	Vdc
battery backup voltage (Io=100uA)	Vbatt	2.7	3.0	3.3	Vdc
operating free-air temperature range	Ta				°C
IPC/OEMS8H19S 50% CPU load, high GPU load [1]		0		55	
IPC/OEMS8H19S 50% CPU load, low GPU load [1]		0		60	
operating free-air temperature range	Ta				°C
IPC/OEMS8H19E 50% CPU load, high GPU load [1]		-40		60	
IPC/OEMS8H19E 50% CPU load, low GPU load [1]		-40		65	
operating free-air temperature range	Ta				°C
IPC/OEMS81G13S 50% CPU load, high GPU load [1]		0		55	
IPC/OEMS81G13S 50% CPU load, low GPU load [1]		0		65	
operating free-air temperature range	Ta				°C
IPC/OEMS81G13E 50% CPU load, high GPU load [1]		-40		60	
IPC/OEMS81G13E 50% CPU load, low GPU load [1]		-40		70	
operating free-air temperature range	Ta				°C
IPC/OEMS81H18S 50% CPU load, high GPU load [1]		0		55	
IPC/OEMS81H18S 50% CPU load, low GPU load [1]		0		60	
operating free-air temperature range	Ta				°C
IPC/OEMS81H18E 50% CPU load, high GPU load [1]		-40		60	
IPC/OEMS81H18E 50% CPU load, low GPU load [1]		-40		65	
operating free-air temperature range IPC/OEMS81I20S 50% CPU load, low GPU load [1]	Ta	0		55	°C
operating free-air temperature range IPC/OEMS81I20E 50% CPU load, low GPU load [1]	Ta	-40		60	°C

(1) this parameter is highly dependent on mounting, air flow and GPU load; with the Intel SpeedStep technology the processor automatically reduces the internal cpu clock down to 500MHz when the critical thermal trip points are reached to prevent damage.

Tab. 23 Recommended Operating Conditions (standard temperature version)

**Electrical Characteristics
(over recommended operating range, unless otherwise noted)**

Parameter	Symbol	min	typ	max	Unit
general parameters					
full load power dissipation (worst case, no external loads, IPC/OEMS8H19-A101S)	Pmax		15	18	W
full load power dissipation (worst case, no external loads, IPC/OEMS81I20-A101S)	Pmax		16	20	W
power supply current (Vcc=24V, no external loads, IPC/OEMS8H19-A101S)	Icc		0.3		A
power supply current (Vcc=12V, no external loads, IPC/ OEMS8H19-A101S)	Icc		0.5		A
power supply current (Vcc=24V, no external loads, IPC/OEMS81I20-A101S)	Icc		0.4		A
power supply current (Vcc=12V, no external loads, IPC/OEMS81I20-A101S)	Icc		0.8		A
power fail / remote on/off					
inactive state, powerfail application	V(PFhigh)	3	open	Vp	V
active state, powerfail application	V(PFlow)	-0.5		1.5	V
input current, active state, powerfail application	I(PFlow)			-5	mA
RTC backup battery					
Vbatt loading (Vcc=off)	Ibat(off)		4	5	uA
Vbatt loading (Vcc=on)	Ibat(on)		2	4	uA
Backup time with new CR2450N battery (Ta=25°C)	t(rtcbup)	6	7		years
Backup time with new CR2450N battery (Ta=50°C)	t(rtcbup)	3	3.5		years
VRT trip point (RTC Valid RAM and Time Flag)			1.3		V
USB Overcurrent Limit					
USB6 on internal connector P23	Ilimit			2.8	A
USB1/2 on connector P20	Ilimit	1.0		2.7	A
all other USB connectors	Ilimit	0.5		2.0	A
CAN Isolation					
Isolation resistance CAN signals to case/shield	R(iso)		33		MOhm

Tab. 24 General Electrical Characteristics

Important Note
Battery backup time is highly dependent on temperature and on/off cycling profile.

Switching Characteristics
(over recommended operating range, unless otherwise noted)

Parameter	Symbol	min	nom	max	
processor characteristics					
processor clock (IPC/OEMS8H19-xxx)	fcpu		1.9	1.9	GHz
processor clock (IPC/OEMS81G13-xxx)	fcpu		1.3	1.8	GHz
processor clock (IPC/OEMS81H18-xxx)	fcpu		1.6	1.8	GHz
processor clock (IPC/OEMS81I20-xxx)	fcpu		1.6	2.0	GHz
communication interface characteristics					
LAN1/LAN2/LAN3/LAN4 data rate			10/100/1000		Mbit/s
UART base clock	fuart		1.8459		MHz
COM1 baud rate				115.2	kbaud
CAN baud rate				1	Mbps
timer/clock characteristics					
Timer base clock	ftimer		1.19318		MHz
Timer base clock accuracy				+/-100	ppm
Timer base clock aging				+/-5	ppm/year
Real Time Clock base clock	frtc		32.768		kHz
Real Time Clock accuracy (25°C)				+/-20	ppm
Real Time Clock temperature coefficient				-0.04	ppm/(°C)^2
Real Time Clock aging				+/-3	ppm/year

Tab. 25 General Switching Characteristics

7.2.   EMI/EMC Data

The OEM8x system fulfills the following standards:

Emission: EN55032 / CISPR 32 Class A

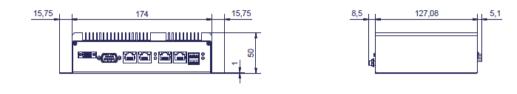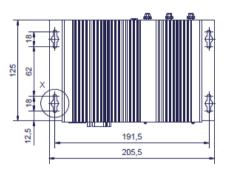Immunity: EN55035 / CISPR 35 Class A

Important Note

The OEM8x system is a class A system for industrial applications. It is not indented for use in residential or home applications.
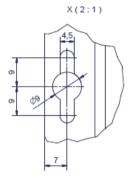
Mechanical Data
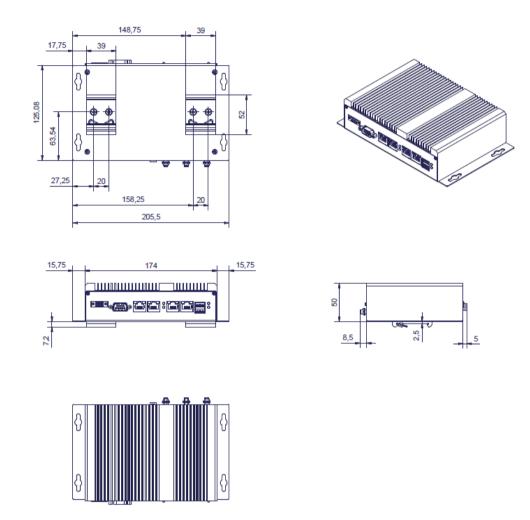
Fig. 11   Mechanical Outline Enclosure OEM8x

Fig. 12   Mounting Option with DIN Rail Clamps

8 Firmware

8.1. Software Structure

The x86 CPU board based PC/104 system is based on the following software structure:

BIOS (Basic Input/Output System)
- Power On Self Test (POST)
- Initialization of standard peripheral devices
- Boot procedure for the Operating System
    Note : Refer to the BIOS documentation for detailed information

OS (Operating System)
- Initialization of additional peripheral devices
- Start procedure for the Application Programs
    Note : Refer to the OS documentation for detailed information

Application Programs
- Initialization of OEM8x system, communications and external devices
- Start procedure for the Control Tasks
    Note : Refer to the Application Programs documentation for detailed information

8.2. Firmware Functions

The OEM8x system is setup with BIOS firmware. Some standard PC/AT peripheral devices (e.g. DisplayPort, Serial Ports, CFast interface) are directly supported by the BIOS, BIOS extensions and Operating Systems. Some peripheral devices (e.g. Ethernet) are directly supported by standard communication software (e.g. TCP/IP stacks, TCP packet drivers) others need special programming according to freely available sample software. Please refer to the appropriate documentation for detailed information.

8.3. Application Programming Interface (API)

The OEM8x system does not contain any special API beside the installed BIOS. Refer to the BIOS and Operating System documentation for API specifications.

⬥ **syslog**ic

9 Product Revision History

9.1. Hardware

This paragraph lists the different hardware revisions of the OEM8x systems delivered beginning with the first production lot. Note that prototyping boards are not included and must be returned to factory for upgrade or replacement. All information listed in this document relies on definitive state hardware. Therefore this information may be incompatible with the prototyping board hardware.

Board Identification (see product label)	Product Revision		Remarks
IPC/OEMS81xxx-Axxxx #1.0	1.0		Original Release
IPC/OEMS81xxx-Axxxx #1.1	1.1		DisplayPort errata corrected

Tab. 26 Hardware Revision State

9.2. Firmware

This paragraph lists the different firmware versions of the OEM8x systems delivered beginning with the first production lot. Note that prototyping boards are not included and must be returned to factory for upgrade or replacement. All information listed in this document relies on definitive state hardware. Therefore this information may be incompatible with the prototyping board hardware.

Board Identification (see product label)	BIOS Version	Build Date	Remarks
IPC/OEMS81xxx-Axxxx #1.0	SYQ7ALi2.01	26.11.2019	
IPC/OEMS81xxx-Axxxx #1.1	SYQ7ALi3.01	21.07.2021	

Tab. 27 Firmware Revision State

9.3. Erratas

This paragraph lists some important erratas of the current OEM8x systems to enable workarounds in user software. Additional erratas might be present but a workaround already implemented in the BIOS. It is important therefore that neither the application software nor the operating systems reprograms the processor chipset's configuration registers.

Note that prototype board erratas (boards with revision #0) are not listed here. Contact Syslogic technical support for prototype board information.

Additional erratas of the processor chipsets can be found at:

https://www.intel.com/content/dam/www/public/us/en/documents/specification-updates/atom-e3800-family-spec-update.pdf

https://www.intel.com/content/www/us/en/embedded/products/apollo-lake/technical-library.html

SDCard Interface errata (not working with some SDCard types)	
Problem	The Intel processor chipset contains several issues in SD and SDIO Hostcontroller which can disturb normal operation of the SDCard interface.
Implication	Some SDCard types will not work reliable.
Workaround	Some of the issues have already been solved by a BIOS workaround, some are dependent on OS drivers and some are not fixable. Check with Syslogic for a list of working SDCard types.
Correction	Some of the issues might be solved by new BIOS and/or OS driver releases, but some are not fixable.

DisplayPort DP_PWR errata (not working with some external DisplayPort to HDMI or VGA adapters)	
Problem	When the external adapter draws much current out of DP_PWR, the voltage drop may be high.
Implication	External adapter not working.
Workaround	Use external adapter with very low power demand or with separate power supply.
Correction	This issue is corrected in systems version 1.1 or higher.

Important Note

This document always covers the latest product revision listed in Tab 23, 246.
Please contact the manufacturers technical support for upgrade options.

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10 Manufacturer Information

10.1. Contact

Our distributors and system integrators will gladly give you any information about our products and their use. If you want to contact the manufacturer directly, please send an email message containing a short description of your application and your request to the following address or use one of the information or technical support request forms on our internet homepage:

Syslogic Datentechnik AG, Switzerland

Web:	http://www.syslogic.com
Email:	info@syslogic.com
Technical support:	support@syslogic.com

10.2. Warranty

Our products are covered by a world-wide manufacturer's warranty. The warranty period starts at the delivery time from our official distributor to the customer. The duration of the warranty period is specified in the respective product catalogs and the offers. All products carry a job number for identification. The manufacturing data and deliveries are registered in a high level quality management system.

The warranty covers material and manufacturing defects. All products must be returned via the official distributor to the factory for repair or replacement. The warranty expires immediately if the products are damaged of operation outside of the specified recommended operating conditions. The warranty also expires if the date code or job number listed on the product is altered or rendered unintelligible. The warranty does not include damage due to errors in firmware or software delivered with the products.

10.3. RMA Service

Syslogic offers a Return Material Authorization process to simplify handling of devices that needs to be returned to the manufacturer. Please follow the instructions on our web page: https://www.syslogic.com to get best service.