

SBC

User Manual



SBC-C90

3.5" SBC with AMD Ryzen™ Embedded R1000 /
V1000 family of SOCs



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REVISION HISTORY

Revision	Date	Note	Ref
1.0	11 th March 2021	First Official Release.	AR
1.1	19 th October 2021	Removed SW1 Minor corrections	SB
1.2	8 th November 2021	CN33, CN34 and CN8 pictures updated, Mechanical drawing updated	SO

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Our team is ready to assist.

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Chapter 1. INTRODUCTION

- Warranty
- Information and assistance
- RMA number request
- Safety
- Electrostatic discharges
- RoHS compliance
- Terminology and definitions
- Reference specifications



1.1 Warranty

This product is subject to the Italian Law Decree 24/2002, acting European Directive 1999/44/CE on matters of sale and warranties to consumers.

The warranty on this product lasts for 1 year.

Under the warranty period, the Supplier guarantees the buyer assistance and service for repairing, replacing or credit of the item, at the Supplier's own discretion.

Shipping costs that apply to non-conforming items or items that need replacement are to be paid by the customer.

Items cannot be returned unless previously authorized by the supplier.

The authorization is released after completing the specific form available on the web-site <https://support.seco.com/> (Online RMA). The RMA authorization number must be put both on the packaging and on the documents shipped with the items, which must include all the accessories in their original packaging, with no signs of damage to, or tampering with, any returned item.

The error analysis form identifying the fault type must be completed by the customer and has must accompany the returned item.

If any of the above-mentioned requirements for the RMA is not satisfied, the item will be shipped back and the customer will have to pay any and all shipping costs.

Following a technical analysis, the supplier will verify if all the requirements, for which a warranty service applies, are met. If the warranty cannot be applied, the Supplier will calculate the minimum cost of this initial analysis on the item and the repair costs. Costs for replaced components will be calculated separately.



Warning!

All changes or modifications to the equipment not explicitly approved by SECO S.p.A. could impair the equipment's functionalities and could void the warranty

1.2 Information and assistance

What do I have to do if the product is faulty?

SECO S.p.A. offers the following services:

- SECO website: visit <http://www.seco.com> to receive the latest information on the product. In most cases it is possible to find useful information to solve the problem.
- SECO Sales Representative: the Sales Rep can help to determine the exact cause of the problem and search for the best solution.
- SECO Help-Desk: contact SECO Technical Assistance. A technician is at disposal to understand the exact origin of the problem and suggest the correct solution.

E-mail: technical.service@seco.com

Fax (+39) 0575 340434

- Repair centre: it is possible to send the faulty product to the SECO Repair Centre. In this case, follow this procedure:
 - Returned items must be accompanied by a RMA Number. Items sent without the RMA number will be not accepted.
 - Returned items must be shipped in an appropriate package. SECO is not responsible for damages caused by accidental drop, improper usage, or customer neglect.

Note: Please have the following information before asking for technical assistance:

- Name and serial number of the product;
- Description of Customer's peripheral connections;
- Description of Customer's software (operating system, version, application software, etc.);
- A complete description of the problem;
- The exact words of every kind of error message encountered.

1.3 RMA number request

To request a RMA number, please visit SECO's web-site. On the home page, please select "Online RMA" and follow the procedure described.

A RMA Number will be sent within 1 working day (only for on-line RMA requests).

1.4 Safety

The SBC-C90 board uses only extremely-low voltages.

While handling the board, please use extreme caution to avoid any kind of risk or damages to electronic components.



Always switch the power off, and unplug the power supply unit, before handling the board and/or connecting cables or other boards.

Avoid using metallic components - like paper clips, screws and similar - near the board when connected to a power supply, to avoid short circuits due to unwanted contacts with other board components.

If the board has become wet, never connect it to any external power supply unit or battery.

Check carefully that all cables are correctly connected and that they are not damaged.

1.5 Electrostatic discharges

The SBC-C90 board, like any other electronic product, is an electrostatic sensitive device: high voltages caused by static electricity could damage some or all the devices and/or components on-board.



Whenever handling a SBC-C90 board, ground yourself through an anti-static wrist strap. Placement of the board on an anti-static surface is also highly recommended.

1.6 RoHS compliance

The SBC-C90 board is designed using RoHS compliant components and is manufactured on a lead-free production line. It is therefore fully RoHS compliant.

1.7 Terminology and definitions

ACPI	Advanced Configuration and Power Interface, an open industrial standard for the board's devices configuration and power management
AHCI	Advanced Host Controller Interface, a standard which defines the operation modes of SATA interface
API	Application Program Interface, a set of commands and functions that can be used by programmers for writing software for specific Operating Systems
BIOS	Basic Input / Output System, the Firmware Interface that initializes the board before the OS starts loading
CEC	Consumer Electronics Control, an HDMI feature which allows controlling more devices connected together by using only one remote control
DDC	Display Data Channel, a kind of I2C interface for digital communication between displays and graphics processing units (GPU)
DDR	Double Data Rate, a typology of memory devices which transfer data both on the rising and on the falling edge of the clock
DDR4	DDR, 4th generation
DP	Display Port, a type of digital video display interface
ECC	Error Correcting Code, a peculiar type of memory module with 72-bit of data instead of 64, where the additional 8 bit are used to detect and correct possible errors on the remaining 64-bit data bus
GBE	Gigabit Ethernet
Gbps	Gigabits per second
GND	Ground
GPI/O	General purpose Input/Output
HD Audio	High Definition Audio, most recent standard for hardware codecs developed by Intel® in 2004 for higher audio quality
HDMI	High Definition Multimedia Interface, a digital audio and video interface
I2C Bus	Inter-Integrated Circuit Bus, a simple serial bus consisting only of data and clock line, with multi-master capability
Mbps	Megabits per second
N.A.	Not Applicable
N.C.	Not Connected
OpenCL	Open Computing Language, a software library based on C99 programming language, conceived explicitly to realise parallel computing using Graphics Processing Units (GPU)
OpenGL	Open Graphics Library, an Open Source API dedicated to 2D and 3D graphics
OS	Operating System
PCI-e	Peripheral Component Interface Express
PSU	Power Supply Unit

PWM	Pulse Width Modulation
PWR	Power
PXE	Preboot Execution Environment, a way to perform the boot from the network ignoring local data storage devices and/or the installed OS
SATA	Serial Advance Technology Attachment, a differential full duplex serial interface for Hard Disks
SD	Secure Digital, a memory card type
SDHC	Secure Digital Host Controller
SIM	Subscriber Identity Module, a card which stores all data of the owner necessary to allow him accessing to mobile communication networks
SPI	Serial Peripheral Interface, a 4-Wire synchronous full-duplex serial interface which is composed of a master and one or more slaves, individually enabled through a Chip Select line
TBM	To be measured
TMDS	Transition-Minimized Differential Signaling, a method for transmitting high speed serial data, normally used on DVI and HDMI interfaces
UEFI	Unified Extensible Firmware Interface, a specification defining the interface between the OS and the board's firmware. It is meant to replace the original BIOS interface
UIM	User Identity Module, an extension of SIM modules.
UMA	Unified Memory Architecture, synonym of Integrated Graphics, uses a portion of a computer's system RAM dedicated to graphics rather than using dedicated graphics memory only.
USB	Universal Serial Bus
V_REF	Voltage reference Pin

1.8 Reference specifications

Here below it is a list of applicable industry specifications and reference documents.

Reference	Link
ACPI	https://uefi.org/specifications
AHCI	http://www.intel.com/content/www/us/en/io/serial-ata/ahci.html
DDC	http://www.vesa.org
DP	http://www.vesa.org
Gigabit Ethernet	https://standards.ieee.org/standard/802_3-2018.html
HD Audio	http://www.intel.com/content/dam/www/public/us/en/documents/product-specifications/high-definition-audio-specification.pdf
HDMI	http://www.hdmi.org/index.aspx
I2C	https://www.nxp.com/docs/en/user-guide/UM10204.pdf
M.2	http://www.pcisig.com/specifications/pciexpress
OpenCL	http://www.khronos.org/opencl
OpenGL	http://www.opengl.org
PCI Express	http://www.pcisig.com/specifications/pciexpress
SATA	https://www.sata-io.org
SD Card Association	https://www.sdcard.org
TMDS	https://www.cablestogo.com/learning/library/digital-signage/intro-to-tmds
UEFI	http://www.uefi.org
USB 2.0 and USB OTG	https://www.usb.org/sites/default/files/usb_20_20190524.zip
USB 3.0	https://usb.org.10-1-108-210.causewaynow.com/sites/default/files/usb_32_20191024.zip
Ryzen™ Embedded R1000 family	AMD Ryzen™ Embedded R1000 Series AMD
Ryzen™ Embedded V1000 family	Ryzen™ Embedded V1000 Processor AMD

Chapter 2. OVERVIEW

- Introduction
- Technical specifications
- Electrical specifications
- Mechanical specifications
- Block diagram



2.1 Introduction

SBC-C90 is a Single Board Computer in 3.5" form factor (146 x 102mm) based on the AMD Ryzen™ Embedded R1000 / V1000 family of System-on-Chips (SOCs), a series of multicore CPUs with a powerful mobile GPU - AMD Radeon™ Vega 11, AMD Radeon™ Vega 8 or AMD Radeon™ Vega 3 Graphics.

The SBC-C90 can mount a Dual-Core Quad-Thread or a Quad-Core eight-thread SoCs, base frequency up to 3.35 GHz (Turbo boost 3.8 GHz), with 64-bit instruction set. This single chip solution includes the memory controller, which gives support for up to 32GB of DDR4-2400 MT/s memory on two SO-DIMM Slots, also capable of supporting ECC memory.

All SoCs embed an AMD Radeon™ Vega Graphics controller, with up to 11 Execution units, which offers extremely high graphical performances, supporting also High Dynamical range (HDR) Imaging. DirectX® 12, EGL 1.4, OpenCL™ 2.1, OpenGL® ES 1.1/ 2.x / 3.x (Halt), OpenGL® Next (Vulkan®), OpenGL® 4.6 are also supported by this GPU, which can also offer H.265 10-bit video decoding and 8-bit encoding.

Finally, this embedded GPU is able to drive four 4K independent displays, by using the 4x DP++ interfaces available (3 with R1000 SoCs).

Mass Storage capabilities of the board include two external S-ATA Gen3 channels (available on two standard SATA 7p Male connectors). In addition, SBC-C90 offers an M.2 Key M Slot, which allows the plugging of M.2 High Capacity SSD drives with PCI-e x4 interface. Finally, a microSD Card slot is available for a standard 4-bit SD interface.

Networking capabilities of the board include up to two Gigabit Ethernet ports, available on 2x RJ-45 connectors, one WWAN M.2 Socket 2 Key B Slot connected to a miniSIM card slot for modems and one M.2 Socket 1 Key E Slot for WiFi+BT M.2 modules.

Further features usable on SBC-C90 board are four USB ports (two USB 3.0 and two USB 2.0 only), HD Audio, 2x RS-232/RS-422/RS-485 UARTS, 8 x GPIOs, 2x I2C, one Antitamper connector, and optional TPM 1.2 or 2.0 on board.

The board is available both in commercial and in industrial temperature range.

Please refer to following chapter for a complete list of all peripherals integrated and characteristics.

2.2 Technical specifications

SOC

AMD Ryzen™ Embedded V1000 family SoCs:

- AMD Ryzen™ Embedded V1807B with AMD Radeon™ Vega 11 Graphics, Quad Core Dual Thread @ 3.35GHz (3.8 Boost), TDP 35-54W
- AMD Ryzen™ Embedded V1756B with AMD Radeon™ Vega 8 Graphics, Quad Core Dual Thread @ 3.25GHz (3.6 Boost), TDP 35-54W
- AMD Ryzen™ Embedded V1605B with GPU AMD Radeon™ Vega 8, Quad Core Dual Thread @ 2.0GHz (3.6 Boost), TDP 12-25W
- AMD Ryzen™ Embedded V1202B with GPU AMD Radeon™ Vega 3, Dual Core Dual Thread @ 2.3GHz (3.2 Boost), TDP 12-25W

AMD Ryzen™ Embedded R1000 family SoCs:

- AMD Ryzen™ Embedded R1606G with GPU AMD Radeon™ Vega 3, Dual Core Dual Thread @ 2.6GHz (3.5 Boost), TDP 12-25W
- AMD Ryzen™ Embedded R1505G with GPU AMD Radeon™ Vega 3, Dual Core Dual Thread @ 3.25GHz (3.6 Boost), TDP 12-25W

Memory

2x DDR4 ECC and non-ECC SODIMM Slots

Support DDR4-2400 memories (DDR4-3200 with V1807B and V1756B), up to 32GB total

Graphics

GPU AMD Radeon™ VEGA with up to 11 Compute Units

DirectX® 12 supported

H.265 (10-bit) decode and 8-bit video encode, VP9 decode

4 independent displays supported (3 with R1000 SoCs)

Video Interfaces

4x DP++ connectors (only 3 working with R1000 SoCs)

Video Resolution

DP++, resolution up to 4096x2160 @ 60Hz

Mass Storage

M.2 NVMe slot (Socket 2 Key M Type 2280), PCI-e x4 interface

microSD Card slot (combo with miniSIM slot)

2x SATA 7p M connectors w/ 1x power connector

Networking

Up to 2 x Gigabit Ethernet ports

M.2 WWAN slot (Socket 2 Key B Type 2242/3042) for Modems

M.2 Connectivity Slot (Socket 1 Key E Type 2230)

USB

2 x USB 3.0 Host ports on USB 3.0 Type-A sockets

2 x USB 2.0 Host ports on internal pin header

1 x USB 3.0 (V1000 SoCs) / USB 2.0 (R1000 SoCs) Host port on WWAN M.2

1 x USB 2.0 Host port on M.2 Connectivity Slot

Audio

HD Audio codec

Line Out + Microphone + S/PDIF Out interfaces on internal pin header

PCI

1 x PCI-e x4 port on M.2 NVMe Slot

1 x PCI-e x1 port on M.2 WWAN Slot

1 x PCI-e x1 port on M.2 Connectivity Slot

2x PCI-e x1 on Gigabit Ethernet Controllers

Serial Ports

2 x RS-232/RS-422/RS-485 Serial ports on internal pin header

Other Interfaces

miniSIM slot for M.2 modems (combo with microSD slot)

8 x GPI/Os connector

FAN connector

Switch / LED Front Header connector

2x I2C on internal pin header

Antitamper connector

Optional TPM 1.2 or 2.0 onboard

Power supply voltage: +12V_{DC} ÷ +24 V_{DC}, RTC battery

Operating temperature **:

0°C ÷ +60°C (Commercial temperature)

-40° ÷ +85°C (Industrial temperature, only for future SoCs in extended temperature range and with TDP ≤ 25W)

Dimensions: 146 x 102 mm (3.5" form factor)

Supported Operating Systems:

Microsoft® Windows 10 (64-bit)

Linux Ubuntu



*** Measured at any point of SECO standard heatspreader for this product, during any and all times (including start-up). Actual temperature will widely depend on application, enclosure and/or environment. Upon customer to consider application-specific cooling solutions for the final system to keep the heatspreader temperature in the range indicated. Please also check paragraph 5.1*

2.3 Electrical specifications

SBC-C90 board can be supplied using any voltage in the range +12 – 24V_{DC}. All the others voltages necessary for the working of the board and of the connected peripherals are derived from the main V_{IN} power rail

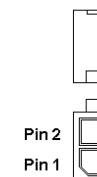
Power Connectors – CN8/CN9

Pin Signal

1	GND
2	V _{IN}

Power Connector is type Molex Mega-Fit® connector, and can be available, as a factory option, in Straight version (p/n 76829-0102 or equivalent, connector CN8) or in the right angle version (p/n 76825-0002 or equivalent, connector CN9)

In both cases, the pin-out is indicated in the table here on the left, and the mating connector will be MOLEX p/n 171692-0102 or equivalent, with female crimp terminal MOLEX series 172063 or 78623.



2.3.1 Power consumption

The power consumption has been measured for the following two SBC configurations, by using three different power input values (12V, 19V, 24V):

- SBC-C90 with AMD Ryzen Embedded V1807B @ 3.35GHz, TPM 1.2 onboard (CONFIG 1)
- SBC-C90 with AMD Ryzen Embedded R1606G @ 2.6GHz (CONFIG 2)

Status (CONFIG 1)	VIN = 12V				VIN = 19V				VIN = 24V			
	Avg Value		Peak Value		Avg Value		Peak Value		Avg Value		Peak Value	
Idle (Win10), power saving configuration	6.86W	0.57A	10.87W	0.9A	8.49W	0.45A	18.4W	0.97A	9.5W	0.4 A	22.3W	0.93A
OS Boot (Win10)	22.48W	1.87A	63.66W	5.3 A	23 W	1.21A	65.5W	3.45A	26.2W	1.09A	63 W	2.63A
Video reproduction 4K, power saving configuration	14.4W	1.2A	17.9W	1.5A	16.2W	0.85A	31.3W	1.65A	17W	0.71A	22.1W	0.93A
AMD System Stress Test, high performance config.	39.4W	3.28A	52.16W	4.3A	43.5W	2.3 A	65.83W	3.46A	4W	1.8A	72W	3A

Battery Backup power consumption: TBM
 Soft-Off State power consumption: 163mA
 Suspend State power consumption: 178mA

Status (CONFIG 2)	VIN = 12V				VIN = 19V				VIN = 24V			
	Avg Value		Peak Value		Avg Value		Peak Value		Avg Value		Peak Value	
Idle (Win10), power saving configuration	6.11W	0.5A	12.2W	1.01A	7W	0.37A	13.2W	0.7A	7.8W	0.32A	12.3W	0.51A
OS Boot (Win10)	20W	1.68A	37W	3.08A	21W	1.11A	37.2W	1.96A	22.3W	0.93A	38.5W	1.6A
Video reproduction 4K, power saving configuration	10.8W	0.9A	17W	1.4A	11.5W	0.6A	17W	0.9A	13.4W	0.56A	31.5W	1.31A
AMD System Stress Test, high performance config.	15.4W	1.29A	23.6W	1.97A	16.3W	0.86A	24.9W	1.3A	17.3W	0.72A	26.4W	1.1A

Battery Backup power consumption: TBM
 Soft-Off State power consumption: 105mA
 Soft-Off State power consumption: 119mA

2.3.2 RTC Battery

For the occurrences when the module is not powered with an external power supply, on board there is a cabled coin Lithium Battery to supply, with a 3V voltage, the Real Time Clock embedded inside the SoC.

Battery used is a cabled CR2032S-LD Lithium coin-cell battery, with a nominal capacity of 220mAh.

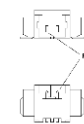
Battery connector - CN31

Pin	Signal
1	V _{RTC}
2	GND

The battery is not rechargeable and can be connected to the board using dedicated connector CN31 which is a 2-pin p1.27 mm type HR p/n A1250WRA-S-02PNLNG1G00R or equivalent, with pinout shown in the table on the left.

In case of exhaustion, the battery should only be replaced with devices of the same type. Always check the orientation before inserting and make sure that they are aligned correctly and are not damaged or leaking.

Never allow the batteries to become short-circuited during handling.



! CAUTION: handling batteries incorrectly or replacing with not-approved devices may present a risk of fire or explosion.

Batteries supplied with SBC-C90 are compliant to requirements of European Directive 2006/66/EC regarding batteries and accumulators. When putting out of order SBC-C90, remove the batteries from the board in order to collect and dispose them according to the requirement of the same European Directive above mentioned. Even when replacing the batteries, the disposal has to be made according to these requirements.

2.3.3 Power rails naming convention

In all the tables contained in this manual, Power rails are named with the following meaning:

_RUN: Switched voltages, i.e. power rails that are active only when the board is in ACPI's S0 (Working) state. Examples: +3.3V_RUN, +5V_RUN.

_ALW: Always-on voltages, i.e. power rails that are active both in ACPI's S0 (Working), S3 (Standby) and S5 (Soft Off) state. Examples: +5V_ALW, +3.3V_ALW.

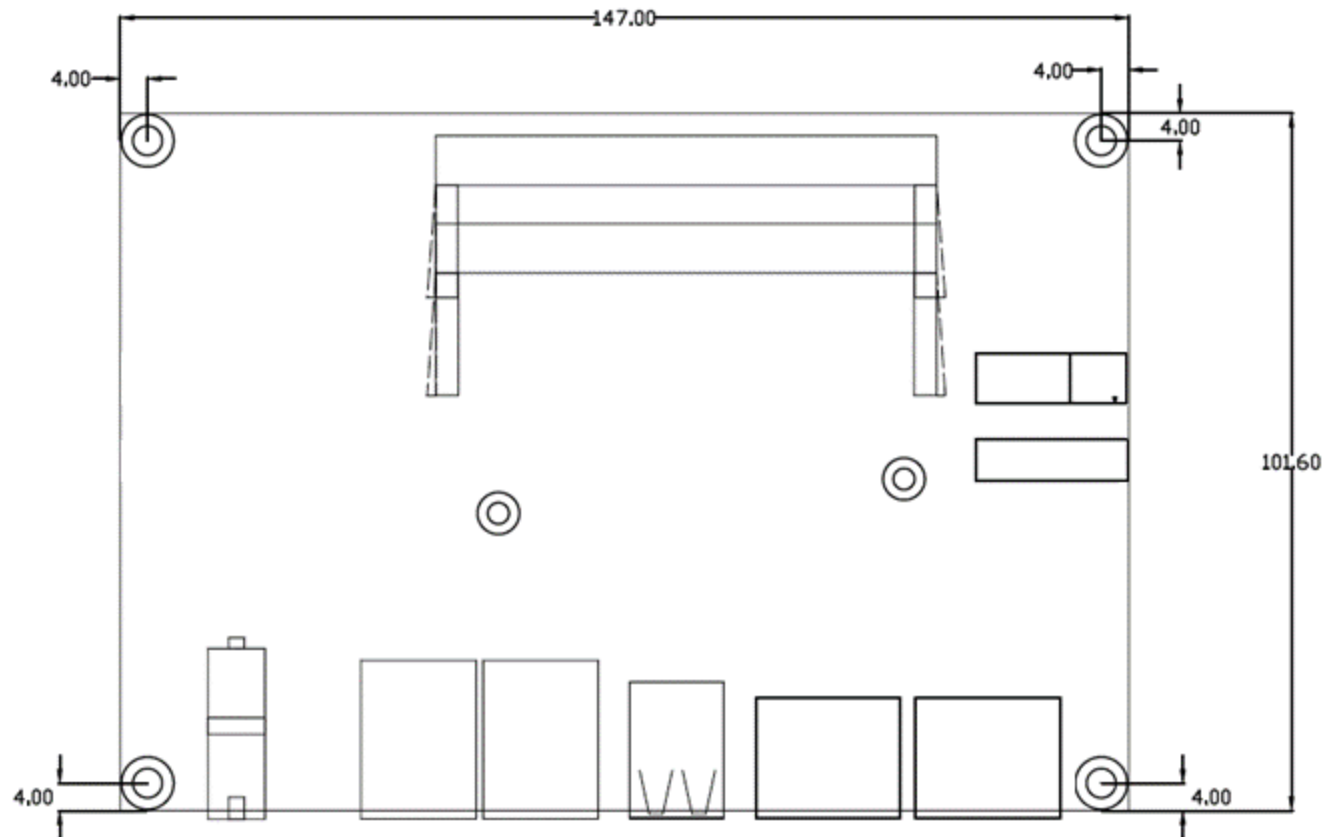
_U: unswitched ACPI S3 voltages, i.e. power rails that are active both in ACPI's S0 (Working) and S3 (Standby) state. Examples: +1.5V_U

Other suffixes are used for application specific power rails, which are derived from same voltage value of voltage switched rails, if it is not differently stated (for example, +5V_{HDMI} is derived from +5V_RUN, and so on).

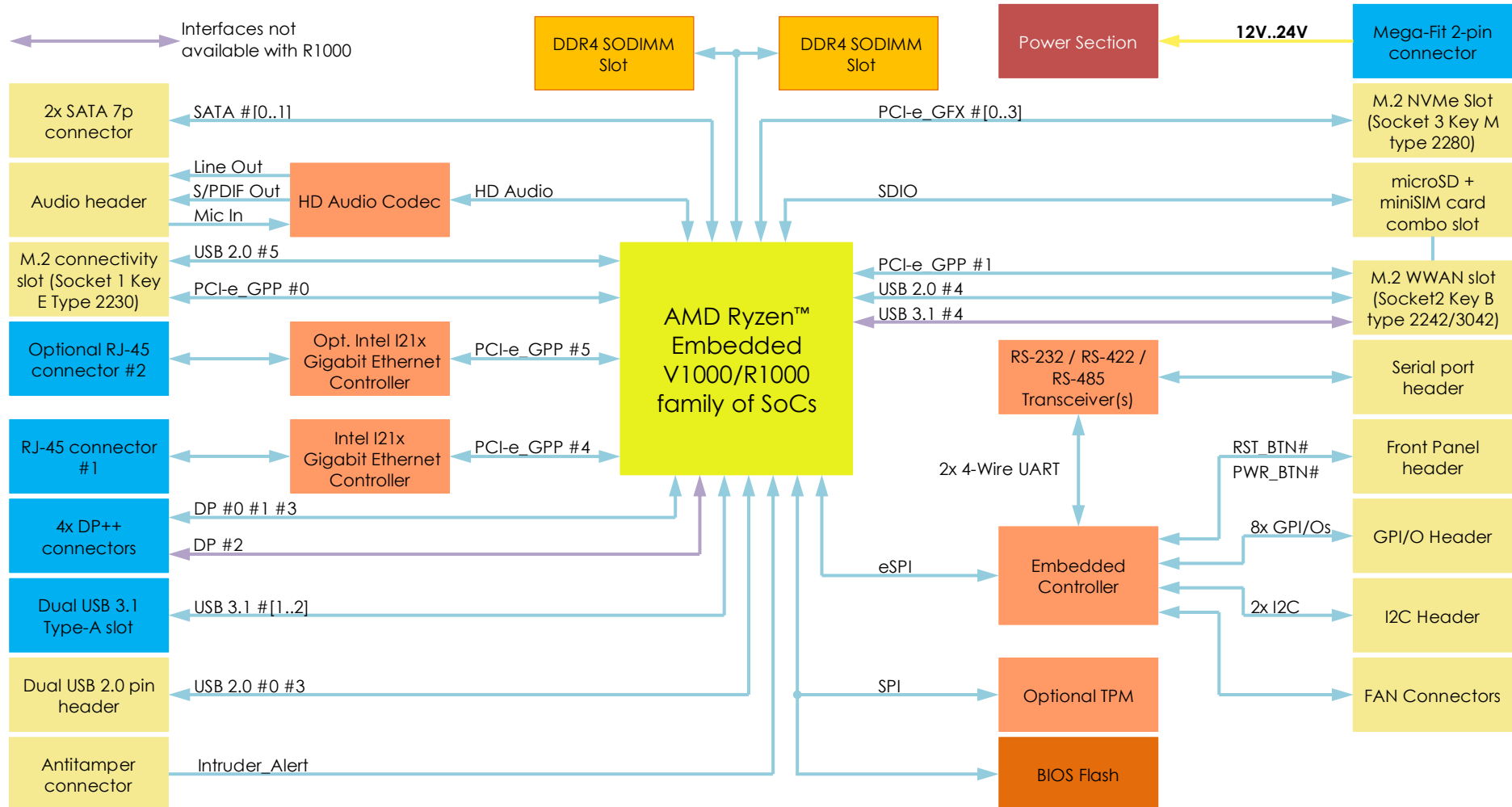
2.4 Mechanical specifications

Board dimensions are 146 x 102 mm (5,75" x 4,02").

The printed circuit of the board is made of ten layers, some of them are ground planes, for disturbance rejection.



2.5 Block diagram



Chapter 3. CONNECTORS

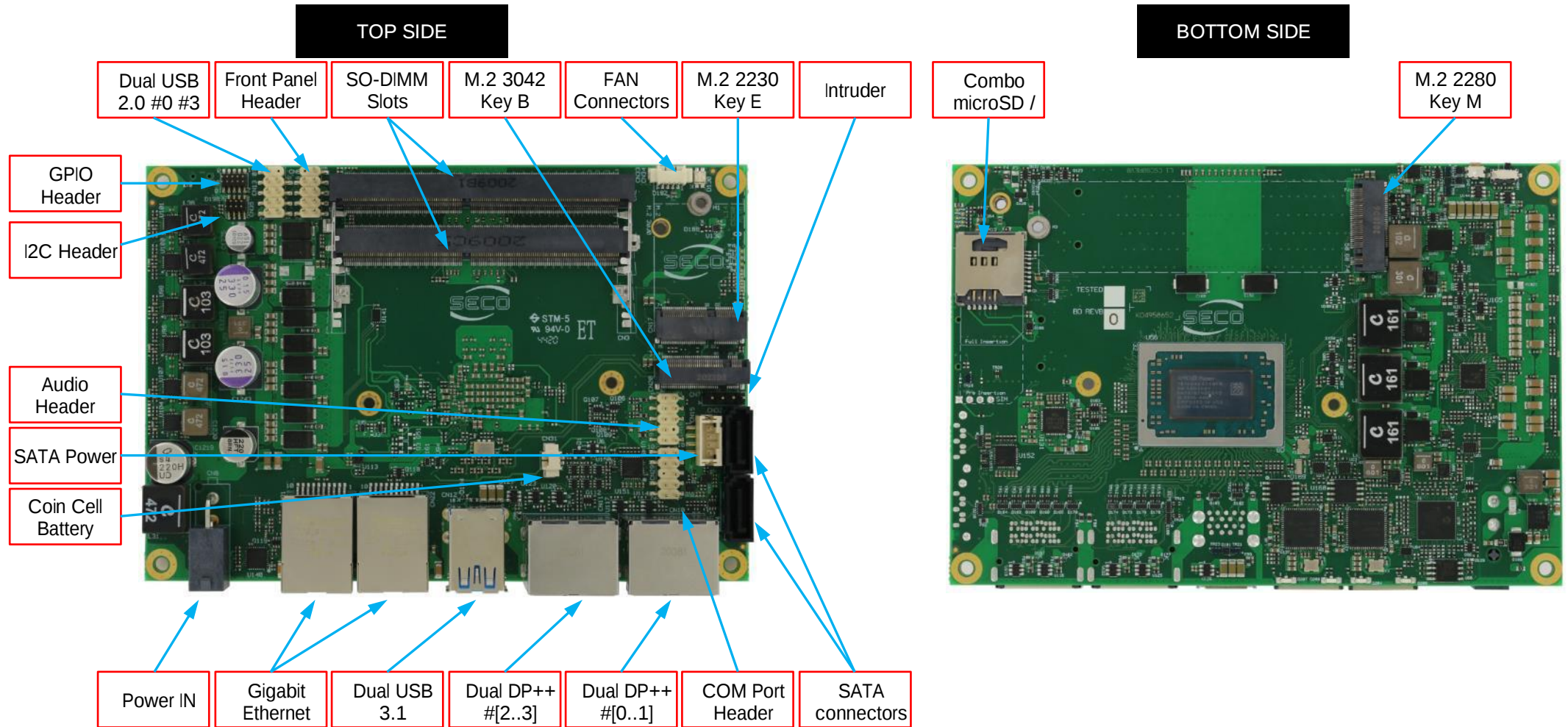
- Introduction
- Connectors overview
- Connectors description



3.1 Introduction

On SBC-C90 board, there are several connectors located on the lower plane. Standard connectors are placed on the same side of PCB, so that it is possible to place them on a panel of an eventual enclosure.

! Please be aware that, depending on the configuration purchased, the appearance of the board could be slightly different from the following pictures.



3.2 Connectors overview

Name	Description	Name	Description
CN2	SODIMM DDR4 Slot #A	CN18	M.2 2280 Socket 3 Key M (NVMe Slot)
CN3	SODIMM DDR4 Slot #B	CN19	Combo microSD / microSIM Slot
CN6	Front Panel Header	CN20	M.2 3042 Socket 2 Key B (WWAN)
CN7	Intruder	CN21	GbE #1 RJ-45 Connector
CN8 / CN9	Power IN	CN22	GbE #2 RJ-45 Connector
CN10	Dual DP++ Connector #[0..1]	CN28	GPIO Header
CN11	Dual DP++ Connector #[2..3]	CN29	COM Port Internal Header
CN12	Dual USB 3.1 Front connector [1..2]	CN31	Coin Cell Battery
CN13	Dual USB 2.0 Internal Header #0 #3	CN32	SATA 7p M Connector Port #0
CN14	SATA 7p M Connector Port #1	CN33	4-Wire FAN connector
CN15	SATA Power Connector	CN34	3-Wire FAN connector
CN16	Audio Header	CN35	I2C Header
CN17	M.2 2230 Socket 1 Key E (Connectivity Slot)	SW2	Power Button

3.3 Connectors description

3.3.1 DDR4 SO-DIMM Sockets

CPUs used on the SBC-C90 board provide support to DDR4 SO-DIMM Memory Modules, up to 32GB total, which can be integrated by using the dedicated DDR4 SO-DIMM sockets CN2 and CN3. Both ECC and non-ECC memory modules are supported.

All processors support DDR4-2400 memory module, with the exception of V1807B and V1756B, which are able to support DDR4-3200 modules.

For use of these memories, on board there are two SO-DIMM DDR4 sockets.

CN2 is type LOTES p/n ADDR0110-P003A or equivalent, a right angle, high profile socket, h = 9.2mm.

CN3 is type LOTES p/n ADDR0067-P005A or equivalent, a right angle, high profile socket, h = 5.2mm.

Both of them are usually used for high speed system memory applications.

3.3.2 Front Panel Header

Buttons / LED Header – CN6

Pin	Signal	Pin	Signal
1	HD_LED_P	2	FP PWR_P/SLP_N
3	HD_LED_N	4	FP PWR_N/SLP_P
5	RST_SW_N	6	PWR_SW_P
7	RST_SW_P	8	PWR_SW_N
9	---		

To allow the integration of the SBC-C90 board inside a box PC-like, there is a connector on the board that allows to remote signals for the Power Button (to be used to put the system in a Soft Off State, or awake from it), for the Reset Button, and the signal for optional LED signaling activity on SATA Channel and Power On states.

The pinout of this connector complies with Intel® Front Panel I/O connectivity Design Guide, Switch/LED Front Panel section, chapter 2.2. It is shown in the table on the left.

Connector CN6 is an internal 9-pin standard male pin header, p 2.54 mm, 5+4 pin, h= 6mm, type NELTRON p/n 2213SM-10G-E10 or equivalent.



The power button input (pins #6 and #8) is also connected to the on-board power button SW2, located on the top side of the board.

Signals Description:

HD_LED_P: Hard Disk Activity LED signal's pull-up to +5V_RUN voltage (510Ω pull-up).

HD_LED_N: Hard Disk Activity LED output signal

RST_SW_N: Reset Button GND

RST_SW_P: Reset button input signal. This signal has to be connected to an external momentary pushbutton (contacts normally open). When the pushbutton is pressed, the pulse of Reset signal will cause the reset of the board. +3.3V_ALW electrical level with 4.7kΩ pull-up.

PWR_SW_P: Power button input signal, +3.3V_ALW electrical level with 4.7k Ω pull-up. This signal has to be connected to an external momentary pushbutton (contacts normally open). Upon the pressure of this pushbutton, the pulse of this signal will let the switched voltage rails turn on or off.

PWR_SW_N: Power button GND

FP PWR_P/SLP_N: Power/Sleep messaging LED terminal 1 with 510 Ω pull-up resistor to +5V_ALW voltage. Connect it to an extremity of a dual-color power LED for power ON/OFF, sleep and message waiting signaling. Please refer to Intel® Front Panel I/O connectivity Design Guide, chapter 2.2.4, for LED functionalities and signal meaning.

FP PWR_N/SLP_P: Power/Sleep messaging LED terminal 2 with 510 Ω pull-up resistor to +5V_ALW voltage. Connect it to the other extremity of the dual-color power LED above mentioned.

3.3.3 Intruder header

Intruder header- CN7	
Pin	Signal
1	+3.3V_BATT
2	INTRUDER
3	SPARE0
4	GND

In case it is important to monitor the security of the board, when closed inside a system, it is possible to use a dedicated header for connecting anti-tampering switches.

The header is a 4-pin standard male pin header (CN7), p 2.54 mm, h= 6mm, type NELTRON p/n 2211S-04G, with the pinout shown in the table on the left.

Signals Description:

INTRUDER: Hardware monitoring signal to be connected to anti-tampering switches, +3.3V_BAT electrical level. Leave unconnected to disable

SPARE0: General Purpose Input/Output, +3.3V_RUN electrical level with 10k Ω pull-up resistor.



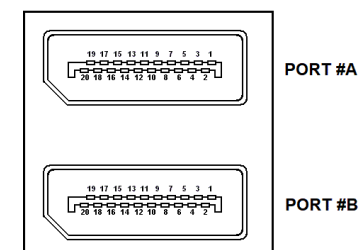
3.3.4 Multimode Display Port Connectors

SBC-C90 board can offer up to four independent DP++ interfaces (only three with Ryzen™ Embedded R1000 processors).

These interfaces are available on two Dual DP++ connectors, type FOXCONN 3VD11203-DPA1-4H.

Connector CN10 will make available DP Port #0 and DP Port #1, which will be available respectively on Port #A and on Port #B of the dual connector (see image on the right).

Connector CN11, instead, will make available DP Port #2 and DP Port #3, which will be available respectively on Port #A and on Port #B of the dual connector. With Ryzen™ Embedded R100 processor, the upper connector of CN11 (i.e. Port #A, or DP Port #2) will be not working.



3.3.5 Audio Header

HD Audio Front Panel Header - CN16			
Pin	Signal	Pin	Signal
1	Mic_In_L	2	Audio_GND
3	Mic_In_R	4	S/PDIF_Out
5	Line_Out_R	6	Sense1_Return
7	Audio_GND		
9	Line_Out_L	10	Sense2_Return

Signals Description

Mic_In_L: Analog Port 1 - Microphone Left Channel.

Mic_In_R: Analog Port 1 - Microphone Right Channel.

Sense1_Return: Analog Port 1 - Jack detection return signal.

Line_Out_L: Analog Port 2 - Headphone Left Channel.

Line_Out_R: Analog Port 2 - Headphone Right Channel.

Sense2_Return: Analog Port 2 - Jack detection return signal.

S/PDIF_Out: S/PDIF AC-coupled output.

SBC-C90 board integrates an High Definition Audio Codec, Cirrus Logic CS4207-CNRZ, for high quality audio implementation.

In order to give the maximum flexibility to SBC-C90 board, it is available a dedicated 9-pin 2.54mm pitch Pin header for external connection of a Line Out output, a Mic In input and also an S/PDIF Output.



Pinout hereby shown is compliant to "Intel® Front Panel I/O connectivity Design Guide" specifications, par. 2.3.5 Table 7.

Using this dedicated connector, it will be possible to connect any Azalia compliant panel audio jack to remote audio connectors in the preferred position.

3.3.6 USB Connectors

The SBC-C90 board offers the possibility of connecting to many standard USB ports.

USB 3.0 ports Type-A double receptacle - CN12

Pin	Signal	Pin	Signal
1	+5V _{USB1}	10	+5V _{USB2}
2	USB_H1-	11	USB_H2-
3	USB_H1+	12	USB_H2+
4	GND	13	GND
5	USB_SSRX1-	14	USB_SSRX2-
6	USB_SSRX1+	15	USB_SSRX2+
7	GND	16	GND
8	USB_SSTX1-	17	USB_SSTX2-
9	USB_SSTX1+	18	USB_SSTX2+

Dual USB 2.0 Internal Header #0 #3 – CN13

Pin	Signal	Pin	Signal
1	+5V _{USB0}	2	+5V _{USB3}
3	USB_P0-	4	USB_P3-
5	USB_P0+	6	USB_P3+
7	GND	8	GND
		10	---

Signal description:

USB_H1+/USB_H1-: USB 2.0 Port #1 differential pair

USB_SSRX1+/USB_SSRX1-: USB Super Speed Port #1 receive differential pair

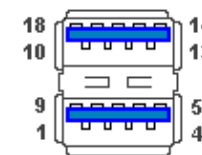
USB_SSTX1+/USB_SSTX1-: USB Super Speed Port #1 transmit differential pair

USB 3.1 Gen2 ports are carried to a double type-A USB 3.0 receptacle, CN12, type Würth Elektronik p/n 692141030100 or equivalent.

More specifically, USB 3.1 port #1 is carried to the lower USB receptacle of CN12, while USB 3.1 port #2 is carried to the upper USB receptacle of CN12.

Since this connector is a standard type receptacle, it can be connected to all types of USB 1.1 / USB 2.0 / USB 3.0 devices using Standard-A USB 3.0 or USB 2.0 plugs.

For USB 3.0 connections it is mandatory the use of SuperSpeed certified cables, whose SuperSpeed differential pairs are individually shielded inside the global cable's external shielding.



There are also two additional USB 2.0 ports (USB #0 and USB #3), which are hosted on a 9-pin p2.54mm pin header, h= 6mm, type NELTRON p/n 2213SM-10G-E9-CR or equivalent, with the pinout shown in the tables on the left (it is a common pinout for USB headers in PC motherboards).

All USB ports' voltages (+5V_{USBx}) are derived from +5V_ALW standby voltages. This means that the ports can be powered also when the OS is in Suspend-to-RAM (S3) state in order to support (if enabled) the "Wake-Up on USB" functionality.

USB_H2+/USB_H2-: USB Port #2 differential pair;

USB_SSRX2+/USB_SSRX2-: USB Super Speed Port #2 receive differential pair

USB_SSTX2+/USB_SSTX2-: USB Super Speed Port #2 transmit differential pair

USB_P1+/USB_P1-: USB Port #1 differential pair

USB_P2+/USB_P2-: USB Port #2 differential pair

Common mode chokes are placed on all USB differential pairs for EMI compliance.

For ESD protection, on all data and voltage lines are placed clamping diodes for voltage transient suppression.

3.3.7 SATA Connectors

The AMD Ryzen™ Embedded V1000 and R1000 family of SoCs offers two SATA III, 6.0 Gbps interfaces.

Both of them are carried out to as many standard male 7p S-ATA connector, CN14 (SATA Port #1) and CN32 (SATA Port #0)

S-ATA #0 Connector – CN32	
Pin	Signal
1	GND
2	SATA0_Tx+
3	SATA0_Tx-
4	GND
5	SATA0_Rx-
6	SATA0_Rx+
7	GND

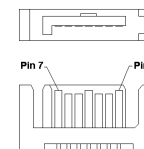
S-ATA #1 Connector – CN14	
Pin	Signal
1	GND
2	SATA1_Tx+
3	SATA1_Tx-
4	GND
5	SATA1_Rx-
6	SATA1_Rx+
7	GND

Here following the signals related to SATA interface:

SATAx_TX+/SATAx_TX-: Serial ATA Channel #x Transmit differential pair

SATAx_RX+/SATAx_RX-: Serial ATA Channel #x Receive differential pair

10nF AC series decoupling capacitors are placed on each line of SATA differential pairs.

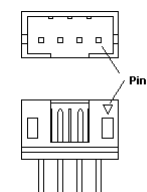


S-ATA Power Connector – CN15	
Pin	Signal
1	---
2	GND
3	GND
4	+5V_SATA (1.8A max)

A dedicated power connector, CN 15, can be used to give supply to external Hard Disks (or Solid State Disks) connected to the SATA male connector.

The dedicated power connector is a 4-pin male connector CN15, type HR p/n A2001WV-S-04 or equivalent, with pinout shown in the table on the left.

Mating connector: HR A2001H-04P housing with HR A2001 series crimp terminals.



3.3.8 M.2 2230 Socket 1 Key E Connectivity Slot

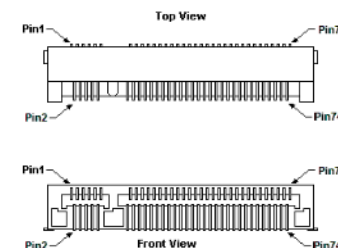
M.2 Connectivity Slot (Socket 1 Key E type 2230) - CN17

Pin	Signal	Pin	Signal
1	GND	2	+3.3V_ALW
3	USB_P5+	4	+3.3V_ALW
5	USB_P5-	6	---
7	GND	8	---
9	---	10	---
11	---	12	---
13	---	14	---
15	---	16	---
17	---	18	GND
19	---	20	---
21	---	22	---
23	---	32	---
33	GND	34	---
35	PCle0_Tx+	36	---
37	PCle0_Tx-	38	---
39	GND	40	---
41	PCle0_Rx+	42	---
43	PCle0_Rx-	44	---
45	GND	46	---
47	PCle0_CLK+	48	---
49	PCle0_CLK-	50	SUS_CLK
51	GND	52	PCIE_RST#
53	CLK_REQ0#	54	BT_DISABLE#
55	PCle_WAKE#	56	WIFI_DISABLE#
57	GND	58	---

It is possible to increase the connectivity of the SBC-C90 board by using M.2 Socket 1 Key E connectivity slot.

The connector used for the M.2 Connectivity slot is CN17, which is a standard 75 pin M.2 Key E connector, type LOTES p/n APCI0076-P001A, H=4.2mm, with the pinout shown in the table on the left.

On the SBC-C90 board there is also a Threaded Spacer which allows the placement of M.2 Socket 1 Key E connectivity modules in 2230 size.



59	---	60	---
61	---	62	---
63	GND	64	---
65	---	66	---
67	---	68	---
69	GND	70	---
71	---	72	+3.3V_ALW
73	---	74	+3.3V_ALW
75	GND		

Signal Description

USB_P5+ / USB_P5-: USB Port #5 differential pair;

PCle0_Tx+/PCle0_Tx-: PCI Express lane #0, Transmitting Output Differential pair

PCle0_Rx+/PCle0_Rx-: PCI Express lane #0, Receiving Input Differential pair

PCle0_CLK+/ PCle0_CLK-: PCI Express Reference Clock for lane #0, Differential Pair

PCle_WAKE#: Board's Wake Input, it must be externally driven by the module inserted in the slot when it requires waking up the system. Active low signal, electrical level +3.3V_RUN with a 47K Ω pull-up resistor

CLK_REQ0#: PCI-e Clock Request Input. Active low signal, electrical level +3.3V_RUN with a 10K Ω pull-up resistor. This signal shall be driven low by any module inserted in the connectivity slot, in order to ensure that the SoC makes available the reference clock.

PCIE_RST#: Reset Signal that is sent from the SoC to all PCI-e devices available on the

board. It is a +3.3V_RUN active-low signal.

SUS_CLK: 32.768kHz Clock provided by the SBC-C90 board to the module plugged in the slot CN17. +3.3V_ALW electrical level

BT_DISABLE#: M.2 Key E Bluetooth module functionality disable signal #1, active low signal, +3.3V_ALW electrical level

WIFI_DISABLE#: M.2 Key E Wireless module functionality disable signal #2, active low signal, +3.3V_ALW electrical level

3.3.9 M.2 2280 Socket 3 Key M NVMe Slot

M.2 NVMe Slot (Socket 3 Key M type 2280) – CN18

Pin	Signal	Pin	Signal
1	GND	2	+3.3V_RUN
3	GND	4	+3.3V_RUN
5	PCIE_GFX_Rx3-	6	---
7	PCIE_GFX_Rx3+	8	---
9	GND	10	---
11	PCIE_GFX_Tx3-	12	+3.3V_RUN
13	PCIE_GFX_Tx3+	14	+3.3V_RUN
15	GND	16	+3.3V_RUN
17	PCIE_GFX_Rx2-	18	+3.3V_RUN
19	PCIE_GFX_Rx2+	20	---
21	GND	22	---
23	PCIE_GFX_Tx2-	24	---
25	PCIE_GFX_Tx2+	26	---
27	GND	28	---
29	PCIE_GFX_Rx1-	30	---
31	PCIE_GFX_Rx1+	32	---
33	GND	34	---
35	PCIE_GFX_Tx1-	36	---
37	PCIE_GFX_Tx1+	38	---
39	GND	40	---
41	PCIE_GFX_Rx0-	42	---
43	PCIE_GFX_Rx0+	44	---
45	GND	46	---
47	PCIE_GFX_Tx0-	48	---
49	PCIE_GFX_Tx0+	50	PCIE_RST#
51	GND	52	CLK_REQ4#

Another possibility for connecting mass storage devices is given by the M.2 Key M Slot, which allows the plugging of M.2 High Capacity SSD drives with PCI-e x4 interface

The connector used for the M.2 SSD slot is CN18, which is a standard 75 pin M.2 Key M connector, type LOTES p/n APCI0079-P001A, H=3.2mm, with the pinout shown in the table on the left.

On the board, a Threaded Spacer allows the placement of M.2 Socket 3 Key M PCI-e SSD modules in 2280size.

53	NVME_CLK-	54	---
55	NVME_CLK+	56	---
57	GND	58	---
67	---	68	---
69	---	70	+3.3V_RUN
71	GND	72	+3.3V_RUN
73	GND	74	+3.3V_RUN
75	GND		

Signal Description

PCIE_GFX_Tx0+/ PCIE_GFX_Tx0-: PCI Express lane #0, Transmitting Output Differential pair

PCIE_GFX_Tx1+/ PCIE_GFX_Tx1-: PCI Express lane #1, Transmitting Output Differential pair

PCIE_GFX_Tx2+/ PCIE_GFX_Tx2-: PCI Express lane #2, Transmitting Output Differential pair

PCIE_GFX_Tx3+/ PCIE_GFX_Tx3-: PCI Express lane #3, Transmitting Output Differential pair

PCIE_GFX_Rx0+/ PCIE_GFX_Rx0-: PCI Express lane #0, Receiving Input Differential pair

PCIE_GFX_Rx1+/ PCIE_GFX_Rx1-: PCI Express lane #1, Receiving Input Differential pair

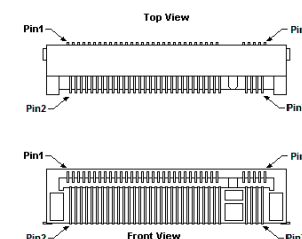
PCIE_GFX_Rx2+/ PCIE_GFX_Rx2-: PCI Express lane #2, Receiving Input Differential pair

PCIE_GFX_Rx3+/ PCIE_GFX_Rx3-: PCI Express lane #3, Receiving Input Differential pair

NVME_CLK+ / NVME_CLK-: PCI Express Reference Clock, Differential Pair

CLK_REQ4#: PCI-e Clock Request Input. Active low signal, electrical level +3.3V_RUN with a 10K Ω pull-up resistor. This signal shall be driven low by any module inserted in the connectivity slot, in order to ensure that the SoC makes available the reference clock.

PCIE_RST#: Reset Signal that is sent from the SoC to all PCI-e devices available on the board. It is a +3.3V_RUN active-low signal.



3.3.10 M.2 3042 Socket 2 Key B WWAN Slot

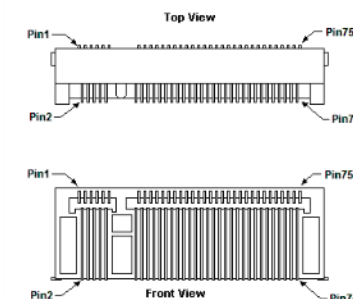
M.2 WWAN Slot (Socket 2 Key B type 3042) - CN20

Pin	Signal	Pin	Signal
1	CONFIG_3	2	+3.3V_ALW
3	GND	4	+3.3V_ALW
5	GND	6	PWR_OFF#
7	USB_P4+	8	W_DISABLE1#
9	USB_P4-	10	---
11	GND	20	---
21	CONFIG_0	22	---
23	WAKE_ON_WWAN#	24	---
25	---	26	W_DISABLE2#
27	GND	28	---
29	USB_SSRX4-	30	UIM_RST#
31	USB_SSRX4+	32	UIM_CLK
33	GND	34	UIM_DATA
35	USB_SSTX4-	36	UIM_PWR
37	USB_SSTX4+	38	---
39	GND	40	---
41	PCIe1_Rx-	42	---
43	PCIe1_Rx+	44	---
45	GND	46	---
47	PCIe1_Tx-	48	---
49	PCIe1_Tx+	50	PCIE_RST#
51	GND	52	CLK_REQ1#
53	PCIe1_CLK-	54	M.2_WAKE#
55	PCIe1_CLK+	56	---
57	GND	58	---
59	---	60	---

It is possible to increase the networking possibilities of SBC-C90 board by using M.2 Socket 2 Key B WWAN modules (i.e. modem modules).

The connector used for the M.2 WWAN slot is CN20, which is a standard 75 pin M.2 Key B connector, type LOTES p/n APCI0087-P001A, H=8.5mm, with the pinout shown in the table on the left.

On the SBC-C90 board there is also a Threaded Spacer which allows the placement of M.2 Socket 2 Key B WWAN modules in 2242 or 3042 size.



61	---	62	---
63	---	64	---
65	---	66	---
67	---	68	SUS_CLK
69	CONFIG_1	70	+3.3V_ALW
71	CLK_REQ2#	72	+3.3V_ALW
73	GND	74	+3.3V_ALW
75	CONFIG_2		

Signal Description

USB_P4+ / USB_P4-: USB Port #4 differential pair

USB_SSRX4+/USB_SSRX4-: USB Super Speed Port #2 receive differential pair

USB_SSTX4+/USB_SSTX4-: USB Super Speed Port #2 transmit differential pair

PCIe1_Tx+/PCIe1_Tx-: PCI Express lane #1, Transmitting Output Differential pair

PCIe1_Rx+/PCIe1_Rx-: PCI Express lane #1, Receiving Input Differential pair

PCIe1_CLK+/PCIe1_CLK-: PCI Express Reference Clock for lane #1, Differential Pair

WAKE_ON_WWAN#: Board's Wake Input, 1.8V_ALW active low signal with 100kΩ pull-up resistor. It must be externally driven by the Connectivity module plugged in the slot when it requires waking up the system.

PWR_OFF#: Power Off signal for plugged modules, usually used in battery-powered systems. Fixed 20k Ω pull-up @ 3.3V_ALW

W_DISABLE1#: M.2 Key B module disable signal #1, active low output

W_DISABLE2#: M.2 Key B module disable signal #2, active low output

UIM_RST#: Reset signal line, sent from M.2 WWAN card to the UIM module.

UIM_DATA: Bidirectional Data line between M.2 WWAN card and UIM module.

UIM_CLK: Clock line, output from M.2 WWAN card to the UIM module.

UIM_PWR: Power line for UIM module.

PCIE_RST#: Reset Signal that is sent from the SoC to all PCI-e devices available on the board. It is a +3.3V_RUN active-low signal.

CONFIG_[0..3]: Configuration inputs, +3.3V_ALW signals with 10k Ω pull-up. These signals are used to configure properly the Main Host interface according to the Add-in Card plugged in CN20 Slot. These configuration pins are managed according to PCI Express M.2 Specifications Table 5.5.

3.3.11 microSD + miniSIM Combo Slot

μ SD + miniSIM Combo Card Slot – CN19			
Pin	Signal	Pin	Signal
S1	UIM_PWR	T3	SDIO_CMD
S2	UIM_RST#	T4	SDIO_VDD
S3	UIM_CLK	T5	SDIO_CLK
S4	GND	T6	GND
S5	---	T7	SDIO_DAT0
S6	UIM_DATA	T8	SDIO_DAT1
T1	SDIO_DAT2	ST1	SDIO_CD#
T2	SDIO_DAT3	ST2	GND

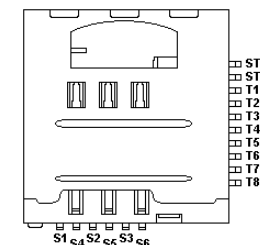
On SBC-C90 board there is also a socket, for the use of standard SD cards, to be used as Mass Storage Device and/or Boot Device.

Moreover, SBC-C90 board can accept also miniSIM cards, for use of M.2 Key B modems.

Both these cards can be inserted in the dedicated slot of connector CN19, which is a combo μ SD/MMC + miniSIM connector, push-push type, 2.7 mm global height, type ATTEND p/n 112G-TA00-R or equivalent. Pinout here reported is related only to signal routing on specific connector; internally the pin-out is the same of any standard SD/MMC 4.0 and miniSIM card.

For ESD protection, on all signal lines are placed clamping diodes for voltage transient suppression.

Signals related to UIM (SIM) card are described in paragraph 3.3.10 for description.



Signals related to SD cards are the following:

SDIO_CD#: Card Detect Input.

SDIO_CLK: SD Clock Line (output).

SDIO_CMD: Command/Response bidirectional line.

SD_DATA[0÷3]: SD Card data bus. SD_DATA0 signal is used for all communication modes. SD_DATA[1÷3] signals are required for 4-bit communication mode.

SDIO_VDD: +3.3V_RUN SD dedicated Power rail

3.3.12 Gigabit Ethernet connectors

Gigabit Ethernet Port #1 – CN21

Pin	Signal	Pin	Signal
1	GBE1_MDI0+	5	GBE1_MDI2-
2	GBE1_MDI0-	6	GBE1_MDI1-
3	GBE1_MDI1+	7	GBE1_MDI3+
4	GBE1_MDI2+	8	GBE1_MDI3-

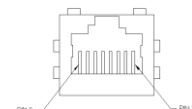
Optional Gigabit Ethernet Port #2 – CN22

Pin	Signal	Pin	Signal
1	GBE2_MDI0+	5	GBE2_MDI2-
2	GBE2_MDI0-	6	GBE2_MDI1-
3	GBE2_MDI1+	7	GBE2_MDI3+
4	GBE2_MDI2+	8	GBE2_MDI3-

On board, there are two Gigabit Ethernet connectors, for the direct connection of the SBC-C90 to two different wired LANs.

The Ethernet connection is managed directly by the Soc, through the 2x PCI-e x1 interfaces, plus two dedicated Gigabit Ethernet Transceivers.

First connection is available on connector CN21, and is always available, The second connection, available on RJ-45 connector CN22, instead, is available only as a factory option



This interface is compatible both with Gigabit Ethernet (1000Mbps) and with Fast Ethernet (10/100Mbps) Networks. They will configure automatically to work with the existing network.

Please be aware that it will work in Gigabit mode only in case that it is connected to Gigabit Ethernet switches/hubs/routers. For the connection, cables category Cat5e or better are required. Cables category Cat6 are recommended for noise reduction and EMC compatibility issues, especially when the length of the cable is significant.

Placed behind each GbE connector there are also two bicolour Green/Yellow LEDs, signaling 100Mbps (green LED) / 1Gbps (yellow LED) connection and ACTIVITY presence (green LED).

GBEx_MDI0+/GBEx_MDI0-: Ethernet Controller #x Media Dependent Interface (MDI) I/O differential pair #0. It is the first differential pair in Gigabit Ethernet mode, and the Transmit differential pair in 10/100 Mbps modes.

GBEx_MDI1+/GBEx_MDI1-: Ethernet Controller #x Media Dependent Interface (MDI) I/O differential pair #1. It is the second differential pair in Gigabit Ethernet mode, and the Receive differential pair in 10/100 Mbps modes.

GBEx_MDI2+/GBEx_MDI2-: Ethernet Controller #x Media Dependent Interface (MDI) I/O differential pair #2. It is the third differential pair in Gigabit Ethernet mode; it is not used in 10/100Mbps modes.

GBEx_MDI3+/GBEx_MDI3-: Ethernet Controller #x Media Dependent Interface (MDI) I/O differential pair #3. It is the fourth differential pair in Gigabit Ethernet mode; it is not used in 10/100Mbps modes

3.3.13 COM Port Header

Dual RS-232/RS-422/RS-485 pin header- CN29			
Pin	Signal RS-232 mode	Signal RS-422 mode	Signal RS-485 mode
1	COM1_RxD	COM1_Rx+	
2	COM2_RxD	COM2_Rx+	
3	COM1_TxD	COM1_Tx-	COM1_Data-
4	COM2_TxD	COM2_Tx-	COM2_Data-
5	GND	GND	GND
7	COM1_RTS#	COM1_Tx+	COM1_Data+
8	COM2_RTS#	COM2_Tx+	COM2_Data+
9	COM1_CTS#	COM1_Rx-	
10	COM2_CTS#	COM2_Rx-	

Signals Description

COM1_RxD/COM2_RxD: COM port #1 / #2 RS-232 Receive data

COM1_TxD/COM2_TxD: COM port #1 / #2x RS-232 Transmit data

COM1_RTS#/COM2_RTS#: COM port #1 / #2 RS-232 Request to Send handshaking signal.

COM1_CTS#/COM2_CTS#: COM port #1 / #2x RS-232 Clear To Send handshaking signal

COM1_RX+/COM1_RX-: COM port #1 RS-422 receive differential pair

COM1_TX+/COM1_TX-: COM port #1 RS-422 Transmit differential pair

COM2_RX+/COM2_RX-: COM port #2 Full Duplex RS-485 (RS-422) Receive differential pair

COM2_TX+/COM2_TX-: COM port #2 Full Duplex RS-485 (RS-422) Transmit differential pair

COM1_Data+/COM1_Data-: COM Port #1 Half Duplex RS-485 Differential Pair

COM2_Data+/COM2_Data-: COM Port #2 Half Duplex RS-485 Differential Pair

The embedded controller of SBC-C90 board manages two 4-wire legacy UARTs, which are carried to as many multistandard RS-232/RS-422/RS-485 transceivers, allowing the implementation of two multistandard serial ports (from now on respectively named COM1 and COM2).

These ports are available on dedicated connector CN29, which is an internal 9-pin standard male pin header, p 2.54 mm, 5+4 pin, h = 6mm, type NELTRON p/n 2213S-10G-E06 or equivalent.

The selection of the kind of interface (RS-232, RS-422 or RS-485) can be made via BIOS.

Please be aware that for proper RS-485 working, the RTS# signals must be used as a handshaking signal, i.e. it is used to control the data flow direction. When RTS# signal is driven low, then the RS-485 port is in receiving mode, when RTS# signal is driven high then the RS-458 port is in transmitting mode.



3.3.14 FAN Connectors

4-Wire FAN Connector – CN33

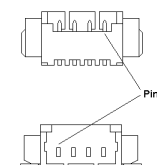
Pin	Signal
1	GND
2	FAN_POWER
3	FAN_TACHO_IN
4	FAN_PWM

3-Wire FAN Connector – CN34

Pin	Signal
1	GND
2	FAN_POWER
3	FAN_TACHO_IN

Depending on the usage model of SBC-C90, for critical applications/environments on SBC-C90 it is available a 4-pin dedicated connector for an external +12V_{DC} FAN.

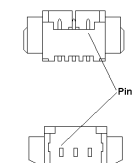
The default FAN Connector is a 4-pin single line SMT connector, type HR p/n A1250WRA-S-04PNLNG1G00R or equivalent, with pinout shown in the table on the left.



Alternatively, as a factory option, the SBC-C90 module can be equipped with a 3-pin single line SMT connector, type MOLEX 53261-0371 or equivalent, with pinout shown in the table on the left.

Mating connector: MOLEX 51021-0300 receptacle with MOLEX 50079-8000 female crimp terminals.

Please be aware that the use of an external fan depends strongly on customer's application/installation.



Please refer to chapter 5.1 for considerations about thermal dissipation.

FAN_POWER: +12V_{IN} derived power rail for FAN, managed by the embedded microcontroller via PWM signal

FAN_TACHO_IN: tachometric input from the fan to the embedded microcontroller, +3.3V_{RUN} electrical level signal with 10k Ω pull-up resistor.

FAN_PWM: PWM output from the embedded microcontroller to the FAN (4-pin connector only).

3.3.15 GPIO Header

GPIO Header – CN28			
Pin	Signal	Pin	Signal
1	+3.3V_EXT	2	GND
3	EXT_GPIO0	4	EXT_GPIO7
5	EXT_GPIO1	6	EXT_GPIO6
7	EXT_GPIO2	8	EXT_GPIO5
9	EXT_GPIO3	10	EXT_GPIO4

Managed by the Embedded Controller, on SBC-C90 board there are 8 (eight) GPIOs at electrical level 3.3V (5V tolerant).

Access to these General Purpose I/Os comes through a dual-row 10-pin SMT male pin-header, p. 1.27mm, type NELTRON 2199SB-10G-SM-3021-CR or equivalent, with pinout shown in the table on the left.



EXT_GPIO_[0..7]: I/O Expander Input/Output [0..7], voltage reference level: +3.3V_ALW

+3.3V_EXT: Dedicated +3.3V power rail for external use, obtained by +3.3V_ALW through a power switch (limited to 0.6A)

3.3.16 I2C Header

I2C Header – CN35			
Pin	Signal	Pin	Signal
1	+3.3V_EXT	2	+3.3V_EXT
3	I2C1_SCL	4	I2C2_SCL
5	I2C1_SDA	6	I2C2_SDA
7	GND	8	GND

Managed by the Embedded Controller, on SBC-C90 board there also two General Purpose I2C interfaces.

Access to these I2C interface through a dual-row 8-pin SMT male pin-header, p. 1.27mm, type TOWNES P1035-2*04MGF-084-D or equivalent, with pinout shown in the table on the left.



+3.3V_EXT: Dedicated +3.3V power rail for external use, obtained by +3.3V_ALW through a power switch (limited to 0.6A)

I2C1_SCL: general purpose I2C#1 Bus clock line. Output signal, electrical level +3.3V_ALW with a 2k2Ω pull-up resistor.

I2C1_SDA: general purpose I2C#1 Bus data line. Output signal, electrical level +3.3V_ALW with a 2k2Ω pull-up resistor.

I2C2_SCL: general purpose I2C#2 Bus clock line. Output signal, electrical level +3.3V_ALW with a 2k2Ω pull-up resistor.

I2C2_SDA: general purpose I2C#2 Bus data line. Output signal, electrical level +3.3V_ALW with a 2k2Ω pull-up resistor.

Chapter 4. BIOS SETUP

- Aptio setup Utility
- Main setup menu
- Advanced menu
- Chipset menu
- Security menu
- Boot menu
- Save & Exit menu



4.1 Aptio setup Utility

Basic setup of the board can be done using American Megatrends, Inc. “Aptio Setup Utility”, that is stored inside an onboard SPI Serial Flash.

It is possible to access to Aptio Setup Utility by pressing the <ESC> key after System power up, during POST phase. On the splash screen that will appear, select “SCU” icon.

On each menu page, on left frame are shown all the options that can be configured.

Grayed-out options are only for information and cannot be configured.

Only options written in blue can be configured. Selected options are highlighted in white.

Right frame shows the key legend.

KEY LEGEND:

← / →	Navigate between various setup screens (Main, Advanced, Security, Power, Boot...)
↑ / ↓	Select a setup item or a submenu
+ / -	+ and - keys allows to change the field value of highlighted menu item
<F1>	The <F1> key allows displaying the General Help screen.
<F2>	Previous Values
<F3>	<F3> key allows loading Optimised Defaults for the board. After pressing <F3> BIOS Setup utility will request for a confirmation, before loading such default values. By pressing <ESC> key, this function will be aborted
<F4>	<F4> key allows save any changes made and exit Setup. After pressing <F10> key, BIOS Setup utility will request for a confirmation, before saving and exiting. By pressing <ESC> key, this function will be aborted
<ESC>	<Esc> key allows discarding any changes made and exit the Setup. After pressing <ESC> key, BIOS Setup utility will request for a confirmation, before discarding the changes. By pressing <Cancel> key, this function will be aborted
<ENTER>	<Enter> key allows to display or change the setup option listed for a particular setup item. The <Enter> key can also allow displaying the setup sub-screens.

4.2 Main setup menu

When entering the Setup Utility, the first screen shown is the Main setup screen. It is always possible to return to the Main setup screen by selecting the Main tab.

In this screen, are shown details regarding BIOS version, Processor type, Bus Speed and memory configuration.

Only two options can be configured:

4.2.1 System Date / System Time

Use this option to change the system time and date. Highlight System Time or System Date using the <Arrow> keys. Enter new values directly through the keyboard, or using + / - keys to increase / reduce displayed values. Press the <Enter> key to move between fields. The date must be entered in MM/DD/YY format. The time is entered in HH:MM:SS format.

Note: The time is in 24-hour format. For example, 5:30 A.M. appears as 05:30:00, and 5:30 P.M. as 17:30:00.

The system date is in the format mm/dd/yyyy.

4.3 Advanced menu

Menu Item	Options	Description
Battery Failure Manager	See submenu	Sets the action to be performed in case of battery failure
Trusted Computing	See submenu	Trusted Computing Settings
TPM selection	See submenu	TPM selection
ACPI Settings	See submenu	System ACPI parameters
SATA presence	See submenu	SATA devices Configuration
DXIO Settings	See submenu	PEG, PCIE and DDI Lanes configuration
S5 RTC Wake Settings	See submenu	Enable System to wake from S5 using RTC alarm
CPU Configuration	See submenu	CPU Configuration Parameters
AMI Graphic Output Protocol Policy	See submenu	User Selected Monitor Output by Graphic Output protocol
PCI Subsystem Settings	See submenu	PCI Subsystem Settings
USB Configuration	See submenu	USB Configuration Parameters
CSM Configuration	See submenu	Compatibility Support Module (CSM) Configuration: Enable/Disable, Option ROM execution Settings, etc...
NVMe Configuration	See submenu	NVMe Device Options Settings
SDIO Configuration	See submenu	SDIO Configuration Parameters
Main Thermal Configuration	See submenu	Main thermal Configuration
SMBIOS Information	See submenu	SMBIOS Information
Embedded Controller	See submenu	Embedded Controller Parameters
HSUART Transceiver Configuration	See submenu	HSUART Transceiver Configuration Utility
M.2 peripheral management	See submenu	M.2 peripheral management
Network Stack Configuration	See submenu	Network Stack Settings
AMD CBS	See submenu	AMD CBS Setup Page
AMD Platform	See submenu	AMD Platform Setup Page
RAM Disk Configuration	See submenu	Settings for add/remove RAM disks

4.3.1 Battery Failure Manager submenu

Menu Item	Options	Description
Battery Failure Action	None Restore Defaults Restore NVRAM	Sets the action that must be done when a backup battery failure occurs. None: no action Restore defaults: restore BIOS factory default, preserving the password(s) Reset NVRAM: restore all factory defaults, clearing also the password(s)

4.3.2 Trusted Computing submenu

Menu Item	Options	Description
Security Device Support	Enabled / Disabled	Enables or Disables BIOS support for security device. OS will not show the Security Device. TCG EFI protocol and INT1A interface will not be available. When enabled all the following items will be available.
SHA-1 PCR Bank	Enabled / Disabled	Enables or Disables SHA-1 PCR Bank
SHA256 PCR Bank	Enabled / Disabled	Enables or Disables SHA256 PCR Bank
Pending Operation	None / TPM Clear	Schedule an Operation for the Security Device. NTE: your Computer will reboot during restart in order to change State of Security Device.
Platform Hierarchy	Enabled / Disabled	Enables or Disables the Platform Hierarchy
Storage Hierarchy	Enabled / Disabled	Enables or Disables the Storage Hierarchy
Endorsement Hierarchy	Enabled / Disabled	Enables or Disables the Endorsement Hierarchy
TPM2.0 UEFI Spec Version	TCG_1_2 TCG_2	Select the TCG Spec Version support. TCG_1_2 is the compatible mode for Windows 8 / Windows 10. TCG 2 supports the new TCG2 protocol and event format for Windows 10 or later.
Physical Presence Spec Version	1.2 / 1.3	Select to tell OS to support PPI Spec Version 1.2 or 1.3. Please note that some HCK tests might not support 1.3
Device Select	Auto TPM 1.2 TPM 2.0	TPM 1.2 will restrict the support to TPM 1.2 devices only, TPM 2.0 will restrict the support to TPM 2.0 devices only, Auto will support both with the default set to TPM 2.0 devices if not found, TPM 1.2 devices will be enumerated

4.3.3 TPM selection submenu

Menu Item	Options	Description
TPM selection	AMD CPU fTPM SPI TPM	Allows to choose whether using AMD processor Firmware TPM or use onboard (optional) SPI TPM

Erase fTPM NV for factory reset	Disabled / Enabled	When New CPU is installed, Select "Enabled" to reset fTPM, if you have BitLocker or encryption-enabled system, the system will not boot without a recovery key. Select "Disabled" to keep previous fTPM record and continue system boot, fTPM will NOT be enabled with new CPU unless fTPM is reset (reinitialized).
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4.3.4 ACPI Settings submenu

Menu Item	Options	Description
Enable ACPI Auto Configuration	Disabled / Enabled	Enables or Disables BIOS ACPI Auto Configuration. The following menu items will appear only when this menu item is Disabled
Enable Hibernation	Disabled / Enabled	Enables or disables system ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some OS.
ACPI Sleep State	Suspend Disabled S3 (Suspend to RAM)	Select the highest ACPI Sleep state the system will enter when the SUSPEND button is pressed.
Lock Legacy resources	Disabled / Enabled	Enables or Disables Lock of Legacy resources

4.3.5 SATA Settings submenu

Menu Item	Options	Description
Standard (CN32) SATA #0 Standard (CN14) SATA #1		Shows information related to eventual devices connected to SATA ports 0 or 1.

4.3.6 DXIO Settings submenu

Menu Item	Options	Description
DDI Port	See submenu	Allows enabling and configuring the single DDI ports
PEG Port	See submenu	Allows enabling and configuring the PEG port(s)
PCI-E Port	See submenu	Allows enabling and configuring the PCI-e ports

4.3.6.1 DDI Port submenu

Menu Item	Options	Description
DP0 (CN10A) State DP1 (CN10B) State DP2 (CN11A) State DP3 (CN11B) State	Disabled Enabled	Enable or Disable DDI ports 0, 1, 2 and 3.

4.3.6.2 PEG Port submenu

Menu Item	Options	Description
M.2 x4 (CN18 Key M)	Disabled / Enabled	Enable / Disable Device
ASPM Mode Control	Disable L0s Entry L1 Entry L0s and L1 Entry Auto	Disable or Enable PCI Express Active State Power Management
Link Speed	PCIe Gen1 PCIe Gen2 Max Speed Auto	Configures NB Root Port PCIe Link Speed, which can however be overwritten by PSPP Settings
Hot Plug Mode Control	Auto Disabled Hotplug Basic Hotplug Server Hotplug Enhanced Hotplug Inboard	PCI Express Root Port Hot Plug Mode Control
Compliance Mode	Disabled / Enabled	If enabled, forces port into compliance mode

4.3.6.3 PCIe Port submenu

Menu Item	Options	Description
M.2 x1 (CN17 Key E) M.2 x1 (CN20 Key B) Internal GBE4 (CN21) Internal GBE5 (CN22)	Enabled / Disabled	Enable or disable each single PCIe port. When enabled, all following items will appear.
ASPM Mode Control	Disable L0s Entry L1 Entry L0s and L1 Entry Auto	Disable or Enable PCI Express Active State Power Management
Link Speed	PCIe Gen1 PCIe Gen2 Max Speed Auto	Configures NB Root Port PCIe Link Speed, which can however be overwritten by PSPP Settings

Hot Plug Mode Control	Auto Disabled Hotplug Basic Hotplug Server Hotplug Enhanced Hotplug Inboard	PCI Express Root Port Hot Plug Mode Control
Compliance Mode	Disabled / Enabled	If enabled, forces port into compliance mode

4.3.7 S5 RTC Wake Settings submenu

Menu Item	Options	Description
Wake System from S5	Disabled By Every day By Day of Month	Enables or Disables System wake on alarm event. When not disabled, the following items will appear
Wake up hour	0..23	Select the wake up hour in range 0..23. Enter 3 for 3am, 15 for 3pm.
Wake up minute	0..59	Select the wake up hour in range 0..59
Wake up second	0..59	Select the wake up hour in range 0..23. Enter 3 for 3am, 15 for 3pm.
Day of Month	1..31	Only available when "Wake System from S5" is set to "By Day of Month". Set the wake up day of month in range 1..31. Error checking will be done against mm/dd/yr combinations that are not valid).

4.3.8 CPU Configuration submenu

Menu Item	Options	Description
Detailed CPU Information		Shows board's specific SoC information
PSS Support	Disabled / Enabled	Enable/Disable the generation of ACPI_PPC, _PSS, and _PCT objects
PPC Adjustment	PState 0 PState 1 PState 2	Only Available when PSS Support is enabled. Provide to adjust _PPC object
NX Mode	Enabled / Disabled	Enables or Disables No-execute Page Protection Function
SVM Mode	Enabled / Disabled	Enables or disables CPU Virtualization
Node 0 Information		Opens an information page with the Memory Information details related to Node 0

4.3.9 AMI graphic Output Protocol Policy submenu

Menu Item	Options	Description
Output Select	<i>List of available / connected module's video interfaces</i>	Output video interface selection

4.3.10 PCI Subsystems Settings

Menu Item	Options	Description
Above 4G Decoding	Enabled / Disabled	Globally Enables or Disables 64bit capable Devices to be Decoded in Above 4G Address Space (Only if System Supports 64 bit PCI Decoding)
SR-IOV Support	Enabled / Disabled	If system has SR-IOV capable PCIe Devices, this option Enables or Disables Single Root IO Virtualization Support
BME DMA Mitigation	Enabled / Disabled	Re-enable Bus Master Attribute, disabled during Pci enumeration for PCI Bridges after SMM Locked

4.3.11 USB Configuration submenu

Menu Item	Options	Description
Legacy USB Support	Enabled / Disabled / Auto	Enables Legacy USB Support. AUTO Option disables legacy support if no USB devices are connected. DISABLE option will keep USB devices available only for EFI applications.
XHCI hand-off	Enabled/ Disabled	This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.
USB Mass Storage Driver Support	Enabled/ Disabled	Enables or disables USB Mass Storage Driver Support
Port 60/64 Emulation	Enabled/ Disabled	Enables I/O port 60h/64h emulation support. This should be enabled for the complete USB keyboard legacy support for non-USB aware OSes.
USB Transfer time-out	1 sec / 5 sec / 10 sec / 20 sec	Sets the time-out value for Control, Bulk and Interrupt transfers
Device reset time-out	10 sec / 20 sec / 30 sec / 40 sec	USB mass storage device Start Unit command time-out
Device power-up delay	Auto / Manual	Sets the maximum time that the device will take before it properly reports itself to the Host controller. 'Auto' uses the default value (for a Root port it is 100ms, for a Hub port the delay is taken from the Hub descriptor).
Device power-up delay in seconds	[1..40]	Delay range in seconds, in one second increment

4.3.12 CSM configuration submenu

Menu Item	Options	Description
CSM Support	Enabled / Disabled	Enables or disables the Compatibility Support Module (CSM) Support. When enabled, the following menu items will appear
GateA20 Active	Upon Request Always	Upon Request: GateA20 can be disabled using BIOS services, Always: do not allow disabling GateA20; this option is useful when any RT code is executed above 1MB.
INT19 Trap Response	Immediate Postponed	BIOS Reaction on INT19 trapping by Option ROM: IMMEDIATE - execute the trap right away; POSTPONED - execute the trap during legacy boot
HDD Connection Order	Adjust Keep	Some OS require HDD handles to be adjusted, i.e. OS is installed on drive 80h
Boot option filter	UEFI and Legacy Legacy only UEFI only	This option controls Legacy / UEFI ROMs priority
Network Stack	Do not launch UEFI Legacy	Controls the execution of UEFI and Legacy PXE OpROM
Storage Hierarchy	Do not launch UEFI Legacy	Controls the execution of UEFI and Legacy Storage OpROM
Video	Do not launch UEFI Legacy	Controls the execution of UEFI and Legacy Video OpROM
Other PCI devices	Do not launch UEFI Legacy	Determines the OpROM execution policy for devices other than Network, Storage or Video

4.3.13 NVMe configuration submenu

NVMe Device Options Settings, depend on NVMe Devices found in the system.

4.3.14 SDIO configuration submenu

Menu Item	Options	Description
SDIO Access Mode	Auto	Auto Option: Access the SD Device in DMA mode if the controller supports it, otherwise in PIO Mode.

	ADMA SDMA PIO	DMA Option: Access the SD Device in DMA mode ADMA Option: Access the SD Device in Advanced DMA mode PIO Option: Access the SD Device in PIO mode
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4.3.15 Main Thermal Configuration submenu

Menu Item	Options	Description
Passive Cooling Temperature (°C)	Settable Threshold (°C) [70 .. 90]	Above this threshold, an ACPI aware OS begins to lower the CPU speed. Allowed range is from 70 to 90 included, where values not below Critical Temperature mean disabled.

4.3.16 SMBIOS Information submenu

Display only screen, shows information about the current Single Board Computer.

4.3.17 Embedded Controller submenu

Menu Item	Options	Description
Power Fail Resume Type	Always ON Always Off Last State	Specify what state to go to when power is re-applied after a power failure (G3 state). If Batteryless Operation, the chipset always powers on after a power failure: Always Off Resume Type or Last State when Last State was OFF will therefore require an immediate shutdown
No C-MOS battery handling	Disabled / Enabled	In systems with no C-MOS battery, the chipset always powers on after a power failure: Always OFF Resume Type or Last State when Last State was OFF will therefore require an immediate shutdown
OUT 80 redirection port	None / 1 / 2 / 1+2	Selects which Embedded Controller's UART(s) will receive OUT80 Post Codes: it can be none, 1, 2 or 1+2
Hardware Monitor	See Submenu	Monitor hardware parameters and settings
Reset Causes Handling	See Submenu	Reset Causes Handling
Super IO Configuration	See Submenu	Super IO Configuration
Internal FAN Settings	See Submenu	Internal FAN Settings
Watchdog Configuration	See Submenu	Configure the Watchdog Timer
GPIO Configurations	See Submenu	GPIO Configurations

4.3.17.1 Monitor hardware parameters and settings submenu

This submenu contains Monitor hardware parameters and settings information:

- CPU FAN speed
- CPU Temperature

- RAM Temperature
- APU_VDDCPU_RUN
- APU_VDDNB_RUN
- MEM_VDDIO_SUS
- VDDP_ALW
- MEM_VPP_SUS
- 1.8V_ALW
- MEM_VTT_RUN
- VDDP_RUN

4.3.17.2 Reset Causes Handling submenu

Menu Item	Options	Description
Reset Button Pressed	Happened / Not happened	If Reset button is pressed, this parameter will automatically be set as Happened
Clear from log	Enabled / Disabled	If Reset button is pressed and Clear from log parameter is enabled, this will require system reset
WDT Timeout Expired	Happened / Not happened	If Watchdog Timer (WDT) timeout has expired, this parameter will automatically be set as Happened
Clear from log	Enabled / Disabled	If Watchdog Timer (WDT) timeout has expired, and Clear from log parameter is enabled, this will require system reset
Power Failure	Happened / Not happened	If a Power Failure occurs, this parameter will automatically be set as Happened
Clear from log	Enabled / Disabled	If a Power Failure occurs and Clear from log parameter is enabled, this will require system reset
E.C. soft reset	Happened / Not happened	If the Embedded Controller (E.C.) is reset, this parameter will automatically be set as Happened
Clear from log	Enabled / Disabled	If the Embedded Controller (E.C.) is reset and Clear from log parameter is enabled, this will require system reset

4.3.17.3 Super IO Configuration submenu

Menu Item	Options	Description
Serial Port 1	Enabled/Disabled	Enables or Disables Serial Port # 1
Address	0X3F8, 0x3E8, 0x2F8, 0x2F0, 0x2E8, 0x2E0,	Select the Base address for Serial Port #1, if enabled.

	0x2A8, 0x2A0, 0x288, 0x280	
IRQ	3 / 4 / 5 / 6 / 7 / 10 / 11 / 14 / 15	Select the IRQ line to assign to Serial Port #1, if enabled.
Serial Port 2	Enabled/Disabled	Enables or Disables Serial Port # 2
Address	0X3F8, 0x3E8, 0x2F8, 0x2F0, 0x2E8, 0x2E0, 0x2A8, 0x2A0, 0x288, 0x280	Select the Base address for Serial Port #2, if enabled.
IRQ	3 / 4 / 5 / 6 / 7 / 10 / 11 / 14 / 15	Select the IRQ line to assign to Serial Port #2, if enabled.

4.3.17.4 Internal FAN Settings submenu

Menu Item	Options	Description
FAN_PWMOUT device type	3-WIRE FAN 4-WIRE FAN Generic PWM	Specifies if FAN_PWMOUT is connected to a 3-wire or 4-wire FAN or to a generic PWM
Internal FAN Control	Enabled / Disabled	Disable or Enable Thermal Feedback FAN Control
AC0 Temperature (°C)	70 / 75 / 80 / 85 / 90 / 95 / 100	Only available when "Internal FAN Control" is Enabled Select the highest temperature above which the onboard fan must work always at Full Speed
AC1 Temperature (°C)	5 / 10 / 15 / 20 / 25 / 30 / 35 / 40 / 45 / 50 / 55 / 60 / 65 / 70 / 75 / 80 / 85 / 90 / 95 / 100	Only available when "Internal FAN Control" is Enabled. Select the lowest temperature under which the onboard fan must be OFF.
Temperature Hysteresis	0 .. 10	Only available when "Internal FAN Control" is Enabled. Value added (when temperature is growing) to the ACx thresholds or subtracted from them (when temperature is decreasing) to avoid oscillations.
FAN Duty Cycle (%) Above AC1	0 .. 100	Only available when "Internal FAN Control" is Enabled. Use this item to set the Duty Cycle for the fan when the CPU temperature is between AC1 and AC0 threshold. Above AC0, the fan will run at full speed.
FAN PWM Frequency	[1...60000] Hz	Sets the frequency of the FAN_PWMOUT signal. Typical values are 100 for a 3-wire device and 20000 for a 4-wire one. Allowed range is 1-60000.
FAN Duty Cycle	0 .. 100	Only available when "Internal FAN Control" is Disabled.

		Default FAN Duty Cycle (%).
Speed Change Duration	0 .. 50	Duration in seconds of linear FAN Speed Change.

4.3.17.5 Watchdog Configuration submenu

Menu Item	Options	Description
Watchdog	Disabled / Enabled	Enables or disables the Watchdog Timer mechanism. When enabled, the following parameters will appear.
Event action	Raise WDT Signals Power Button Pulse	Select the Watchdog action when Event time-out expires
Reset action	System Reset Power Button Override Raise WDT Signal	Select the Watchdog action when Reset time-out expires
Watchdog delay	[0..60]	Minutes before watchdog normal operations starts. During delay time-out, a refresh operation will immediately trigger normal operation. Valid range is from 0 to 60.
Event time-out	[0..60]	Minutes without refresh before triggering selected event action. Refresh will restart the time-out. Valid range is from 0 to 60
Reset time-out	[1..60]	Minutes without refresh before triggering selected reset action, this timer will start when event time-out is expired. Refresh will restart the time-out. Valid range is from 1 to 60

4.3.17.6 GPIO Configurations submenu

Menu Item	Options	Description
GPIOx	Input Output Low Output High Output Last	Configure GPIOx pin as input or output with a fixed starting value. Last means no changes with respect to the last boot.

4.3.18 HSUART Transceiver Configuration submenu

Menu Item	Options	Description
HSUART #0 HSUART #1	RS-232 RS-422 RS-485	Select among RS-232 (default), RS-422 or RS-485 interface for HSUART port 0 and 1.
Rx Termination	Disabled / Enabled	Option available when selecting RS-422 or RS-485 mode.

		Disable (default) or enable 120 Ohm Rx termination.
Tx Termination	Disabled / Enabled	Option available when selecting RS-422 mode. Disable (default) or enable 120 Ohm Tx termination.

4.3.19 M.2 peripheral management submenu

Menu Item	Options	Description
M.2 Key E		Options available for devices on M.2 Key E
Wifi on M.2	Disabled / Enabled	Enable Wifi capabilities from Wifi M.2 card
Bluetooth on M.2	Disabled / Enabled	Enable bluetooth capabilities from bluetooth M.2 card .
M.2 Key B		Options available for devices on M.2 Key B
WWAN on M.2	Disabled / Enabled	Enable WWAN capabilities from a WWAN M.2 card

4.3.20 Network Stack configuration submenu

Menu Item	Options	Description
Network Stack	Enabled / Disabled	Enables or disables UEFI Network Stack. When enabled, following menu items will appear
Ipv4 PXE Support	Enabled / Disabled	Enables or disables IPV4 PXE Boot Support. If disabled, IPV4 PXE boot option will not be created
Ipv4 HTTP Support	Enabled / Disabled	Enables or disables IPV4 HTTP Boot Support. If disabled, IPV4 HTTP boot option will not be created
Ipv6 PXE Support	Enabled / Disabled	Enables or disables IPV6 PXE Boot Support. If disabled, Ipv6 PXE boot option will not be created
Ipv6 HTTP Support	Enabled / Disabled	Enables or disables IPV6 HTTP Boot Support. If disabled, Ipv6 HTTP boot option will not be created
IPSEC Certificate	Enabled / Disabled	Enables or disables IPSEC certificate for Ikev
PXE boot wait time	[0..5]	Wait time to press ESC key to abort the PXE boot
Media detect count	[1..50]	Number of times that the presence of media will be checked

4.3.21 AMD CBS submenu

Menu Item	Options	Description
NBIO Common options	See submenu	NorthBridge IO Configuration Options
FCH Common options	See submenu	Firmware Controller Hub Configuration options

4.3.21.1 NBIO Common Options submenu

Menu Item	Options	Description
GFX Configuration	See submenu	GFX Configuration options
IOMMU	Auto / Disabled / Enabled	Enable or disable the support for IOMMU (IO Memory Management Unit. Also known as AMD Virtualization™ Technology).
PSPP Policy	Disabled Performance Balanced Power Saving Auto	PCIe Speed Power policy: the processor can dynamically support the changing to the link frequency due to changes in system configuration and power policy.
System Configuration	12W POR Configuration/ 15W POR Configuration/ 25W POR Configuration/ 35W POR Configuration/ 45W POR Configuration/ 54W POR Configuration/ Auto	Allows selecting the Power Scheme configuration for the CPU. Warning: by selecting a precise configuration, may cause the system to hang, as some System Configurations may not be supported by your OPN.
Audio Codecs	Enabled / Disabled	Disable/Enable Audio Codecs input signals SDINx

4.3.21.1.1 GFX Configuration submenu

Menu Item	Options	Description
Integrated Graphics Controller	Auto / Disabled / Forces	Enable Integrated Graphics Controller. If disabled, all the remaining options except UMA Above 4G will disappear
UMA Mode	Auto / UMA_Specified / UMA_Auto	Only available when Integrated Graphics Controller is set to "Forces". Allows setting the Unified Memory Architecture (UMA) Frame Buffer Size or Display Resolution
UMA Version	Legacy / Non-Legacy / Hybrid Secure / Auto	Only available when Integrated Graphics Controller is set to "Forces". Sets the supported UMA compatibility.
Integrated HD Audio Controller	Auto / Disabled / Enabled	Enables or disabled integrated HD Audio Controller
UMA Above 4G	Auto / Disabled / Enabled	If requested UMA frame buffer size can't be fit under 4GB or the system has enough available memory above 4GB, this option may be set to TRUE to allow UMA frame buffer size to be allocated successfully

4.3.21.2 FCH Common Options submenu

Menu Item	Options	Description
SATA Configuration Options	See submenu	SATA Configuration Options
XGBE Configuration Options	See submenu	XGBE Configuration Options
eMMC Options	See submenu	eMMC Options

4.3.21.2.1 SATA Configuration Options submenu

Menu Item	Options	Description
SATA Controller	Auto / Disabled / Enabled	Enable or Disable on-chip SATA controller
SATA Mode	AHCI AHCI as ID 0x7904 Auto RAID	Only available when SATA Controller is set to "Enabled". Select on-chip SATA Type

4.3.21.2.2 XGBE Configuration Options submenu

Menu Item	Options	Description
XGBE0 (CN21) XGBE1 (CN22)	Enabled / Disabled	Enable or Disable Ethernet controller

4.3.21.2.3 eMMC Options submenu

Menu Item	Options	Description
eMMC/SD Configure	Disabled SD Normal Speed SD High Speed SD UHSI-SDR50 SD UHSI-DDR50 SD UHSI-SDR104	

4.3.22 AMD Platform submenu

Menu Item	Options	Description
AMD Firmware Version		Opens an information page with all details about the Firmware
Primary Video Adaptor	Int. Graphics (IGD) Ext. Graphics (PEG)	Allows to select if Internal Graphics controller (IGD) or external PCI-e Graphic Controller x8 (PEG) should be used as a Primary display

4.3.23 RAM Disk Configuration submenu

Menu Item	Options	Description
Disk Memory Type	Boot Service Data Reserved	Specifies type of memory to use from available memory pool in system to create a disk.
Create raw		Create a raw RAM disk
Size (Hex)		If Create raw is selected, this option will be enabled. The valid RAM disk size should be multiples of the RAM disk block size.
Create & Exit		If Create raw is selected, this option will be enabled. Create a new RAM disk with the given starting and ending address
Discard & Exit		Discard and exit
Create from file		Create a RAM disk from a given file.
Remove selected RAM disk(s)		Remove selected RAM disk(s)

4.4 Chipset menu

Menu Item	Options	Description
South Bridge		South Bridge Parameters
North Bridge		North Bridge Parameters

4.4.1 South Bridge submenu

Menu Item	Options	Description
SB USB Configuration	See submenu	USB configuration Settings

4.4.1.1 SB USB Configuration submenu

Menu Item	Options	Description
Internal USB2 (CN13 odd PINs) Front Panel USB0 (CN12A) Front Panel USB1 (CN12B) Internal USB3 (CN13 even PINs) M.2 x1 (CN17 Key E) USB state	Enabled / Disabled	Enables or Disables every USB Port / group of USB ports.

4.4.2 North Bridge Configuration submenu

Menu Item	Options	Description
Socket 0 Information		By selecting this item, an information screen with all information related to the memory module plugged in Socket #0 will appear

4.5 Security menu

Menu Item	Options	Description
Setup Administrator Password		Set Setup Administrator Password
User Password		Set User Password
Secure Boot	See Submenu	Customizable Secure Boot Settings

4.5.1 Secure Boot submenu

Menu Item	Options	Description
Attempt Secure Boot	Enabled / Disabled	Secure Boot is activated when the Platform Key (PK) is enrolled, System Mode is User/Deployed and CSM function is disabled.
Secure Boot Mode	Standard / Customized	Set UEFI Secure Boot Mode to STANDARD Mode or CUSTOM mode. This change will be effective after save. And after reset, the mode will return to Standard
Key management	See submenu	Enable expert users to modify Secure Boot Policy variables without full authentication

4.5.1.1 Key Management submenu

Menu Item	Options	Description
Provision Factory Default keys	Enabled / Disabled	Provision factory default keys on next re-boot only when System in Setup Mode
Install Factory Default Keys		Force System to User Mode. Configure NVRAM to contain OEM- defined factory default Secure Boot keys
Enroll Efi Image	<i>File System Image</i>	Allow the selected image to run in Secure Boot mode. Enrol SHA256 Hash Certificates of the Image into Authorized Signature Database (db)
Restore DB defaults		Restore DB variable to factory defaults
Platform key Key Exchange Keys Authorized Signatures Forbidden Signatures Authorized Timestamps OS Recovery Signatures	Set New Var Append Key	Enrol factory Defaults or load certificates from a file: 1. Public Key Certificate in: a) EFI_SIGNATURE_LIST b) EFI_CERT_X509 (DER encoded) c) EFI_CERT_RSA2048 (bin) d) EFI_CERT_SHA256,384,512 2. Authenticated UEFI variables 3. EFI PE/COFF Image (SHA256), Key Source: Factory, External, Mixed

4.6 Boot menu

Menu Item	Options	Description
Setup Prompt Timeout	0 .. 65535	Number of seconds to wait for setup activation key. 65535 means indefinite waiting.
Bootup NumLock State	On / Off	Select the Keyboard NumLock State at boot
Quiet Boot	Enabled / Disabled	Enables or Disables Quiet Boot options
Fast Boot	Enabled / Disabled	Enables or disables boot with initialization of a minimal set of devices required to launch active boot option. Has no effect for BBS boot options.
SATA Support	Last Boot SATA Devices Only / All SATA Devices	If Last Boot SATA Devices Only, Only last boot SATA device will be available in Post. If All SATA Devices, all SATA devices will be available in OS and Post
NVMe Support	Enabled / Disabled	If Disabled, NVMe device will be skipped
VGA Support	Auto / EFI Driver	If Auto, only install Legacy OpRom with Legacy OS and logo would NOT be shown during post. Efi driver will still be installed with EFI OS
USB Support	Disabled Full Initial Partial Initial	If Disabled, all USB devices will NOT be available until after OS boot. If Partial Initial, USB Mass Storage and specific USB port/device will NOT be available before OS boot. If Enabled, all USB devices will be available in OS and Post.
PS2 Devices Support	Enabled / Disabled	If Disabled, PS2 devices will be skipped.
Network Stack Driver Support	Enabled / Disabled	If Disabled, NetWork Stack Driver will be skipped
Redirection Support	Enabled / Disabled	If disable, Redirection function will be disabled
Boot Mode Select	LEGACY UEFI	Select the boot mode between Legacy and UEFI
Boot Option #1 Boot Option #2 Boot Option #3 Boot Option #4 Boot Option #5 Boot Option #6 Boot Option #7 Boot Option #8	SATA 1 HD SATA 0 HD NVME CD/DVD SD/eMMC USB Device Network Other Device Disabled	Select the system boot order

4.7 Save & Exit menu

Menu Item	Options	Description
Save Changes and Exit		Exit system setup after saving the changes.
Discard Changes and Exit		Exit system setup without saving any changes.
Save Changes and Reset		Reset the system after saving the changes.
Discard Changes and Reset		Reset the system without saving any changes.
Save Changes		Save the changes done so far to any of the setup options.
Discard Changes		Discard the changes done so far to any of the setup options.
Restore Defaults		Restore/Load Default values for all the setup options
Save as User Defaults		Save the changes done so far as User Defaults
Restore User Defaults		Restore the User Defaults to all the setup options
<i>List of EFI boot options</i>		
Launch EFI Shell from filesystem device		Attempt to Launch the EFI Shell application (Shell.efi) from one of the available filesystem devices

Chapter 5. APPENDICES

- Thermal Design



5.1 Thermal Design

A parameter that has to be kept in very high consideration is the thermal design of the system.

Highly integrated modules, like SBC-C90 board, offer to the user very good performances in minimal spaces, therefore allowing the system's minimization. On the counterpart, the miniaturizing of IC's and the rise of operative frequencies of processors lead to the generation of a big amount of heat, that must be dissipated to prevent system hang-off or faults.

The board can be used along with specific heatspreaders, but please remember that they will act only as thermal coupling device between the board itself and an external dissipating surface/cooler. The heatspreader also needs to be thermally coupled to all the heat generating surfaces using a thermal gap pad, which will optimize the heat exchange between the module and the heatspreader.

The heatspreader is not intended to be a cooling system by itself, but only as means for transferring heat to another surface/cooler, like heatsinks, fans, heat pipes and so on.

When using SBC-C90 boards, it is necessary to consider carefully the heat generated by the module in the assembled final system, and the scenario of utilization.

Until the board is used on a laboratory shelf, on free air, just for software development and system tuning, then a heatsink with integrated fan could be sufficient for board's cooling. Anyhow, please remember that all depends also on the workload of the processor. Heavy computational tasks will generate much heat with all SOC's versions. Therefore, it is always necessary that the customer studies and develops accurately the cooling solution for his system, by evaluating processor's workload, utilization scenarios, the enclosures of the system, the air flow and so on.

SECO can provide SBC-C90 specific passive heatspreaders and active heatsinks with fan, but please remember that their use must be evaluated accurately inside the final system, and that they should be used only as a part of a more comprehensive ad-hoc cooling solutions.

Ordering Code	Description
SC90-DISS-1	SBC-C90 Heat Spreader (PASSIVE)
SC90-DISS-3	SBC-C90 Heat Sink (ACTIVE)



Warning!

The thermal solutions available with SECO boards are tested in the commercial temperature range (0-60°C), without housing and inside climatic chamber. Therefore, the customer is suggested to study, develop and validate the cooling solution for his system, considering ambient temperature, processor's workload, utilisation scenarios, enclosures, air flow and so on.

In particular, the heatspreader is not intended to be a cooling system by itself, but only as the standard means for transferring heat to cooler, like heatsinks, cold plate, heat pipes and so on.