

UC-7101 Hardware User's Manual

Edition 6.0, February 2017

www.moxa.com/product



© 2017 Moxa Inc. All rights reserved.

UC-7101 Hardware User's Manual

The software described in this manual is furnished under a license agreement and may be used only in accordance with the terms of that agreement.

Copyright Notice

© 2017 Moxa Inc. All rights reserved.

Trademarks

The MOXA logo is a registered trademark of Moxa Inc.
All other trademarks or registered marks in this manual belong to their respective manufacturers.

Disclaimer

Information in this document is subject to change without notice and does not represent a commitment on the part of Moxa.

Moxa provides this document as is, without warranty of any kind, either expressed or implied, including, but not limited to, its particular purpose. Moxa reserves the right to make improvements and/or changes to this manual, or to the products and/or the programs described in this manual, at any time.

Information provided in this manual is intended to be accurate and reliable. However, Moxa assumes no responsibility for its use, or for any infringements on the rights of third parties that may result from its use.

This product might include unintentional technical or typographical errors. Changes are periodically made to the information herein to correct such errors, and these changes are incorporated into new editions of the publication.

Technical Support Contact Information

www.moxa.com/support

Moxa Americas

Toll-free: 1-888-669-2872
Tel: +1-714-528-6777
Fax: +1-714-528-6778

Moxa Europe

Tel: +49-89-3 70 03 99-0
Fax: +49-89-3 70 03 99-99

Moxa India

Tel: +91-80-4172-9088
Fax: +91-80-4132-1045

Moxa China (Shanghai office)

Toll-free: 800-820-5036
Tel: +86-21-5258-9955
Fax: +86-21-5258-5505

Moxa Asia-Pacific

Tel: +886-2-8919-1230
Fax: +886-2-8919-1231

Table of Contents

1. Introduction	1-1
Overview	1-2
Package Checklist	1-2
Product Features	1-3
Hardware Specifications	1-3
Hardware Block Diagrams	1-5
2. Hardware Introduction	2-1
Appearance.....	2-2
Dimensions	2-2
Panel Views	2-3
LED Indicators.....	2-3
Internal SD Socket.....	2-4
Additional Functions.....	2-4
Reset Button.....	2-4
Real Time Clock	2-4
3. Hardware Connection Description	3-1
Wiring Requirements.....	3-2
Connecting the Power	3-2
Grounding the UC-7101 Embedded Computer	3-3
Connecting Data Transmission Cables	3-3
Connecting to the Network	3-3
Connecting to a Serial Device	3-4
Serial Console Port	3-4
Installing a Secure Digital (SD) Memory Card.....	3-5

Introduction

The Moxa UC-7101 embedded computers are mini, RISC-based, box-type computers that feature 10/100 Mbps Ethernet ports, RS-232/422/485 serial ports, and an ARM9 processor. The computers come with Linux pre-installed. In addition, the UC-7101 has an internal SD socket for storage expansion to offer high performance communication with unlimited storage in a super-compact, palm-size box. The UC-7101 series of embedded computers are the right solution for embedded applications that call for a small computer that can store large amounts of information and provide good computing performance.

The following topics are covered in this chapter:

- ❑ **Overview**
- ❑ **Package Checklist**
- ❑ **Product Features**
- ❑ **Hardware Specifications**
- ❑ **Hardware Block Diagrams**

Overview

The UC-7101 mini, RISC-based communication platforms are ideal for embedded applications. All computers in the series come with RS-232/422/485 serial ports and 10/100 Mbps Ethernet LAN ports to provide users with a versatile communication platform.

The UC-7101 series computers use the Moxa ART ARM9 192 MHz RISC CPU. Unlike the x86 CPU, which uses a CISC design, the ARM9's RISC design architecture and modern semiconductor technology provide these computers with a powerful computing engine and communication functions, but without generating too much heat. The built-in NOR Flash ROM (8 MB) and SDRAM (16 MB) give you plenty of storage capacity, and the SD socket provides greater flexibility for running various applications. The LAN ports built into the ARM9 allow the UC-7101 computers to be used as communication platforms for basic data acquisition and protocol conversion applications, and the RS-232/422/485 serial ports allow you to connect a variety of serial devices.

The UC-7101 comes with the μ Clinux operating system pre-installed. Software written for desktop PCs is easily ported to the UC-7101 computers with a GNU cross compiler, so that you will not need to spend time modifying existing software code. The operating system, device drivers, and your own software can all be stored in the computers' Flash memory.

Package Checklist

The UC-7101 series currently includes two models:

Standard Operating Temperature Models (-10 to 60°C)

UC-7101-LX

Ready-to-run embedded RISC computing platform with 1 serial port, 1 Ethernet port, and μ Clinux OS

Wide Operating Temperature Models (-40 to 75°C)

UC-7101-T-LX

Ready-to-run embedded RISC computing platform with 1 serial port, 1 Ethernet port, μ Clinux OS, and wide temperature tolerance

Each model ships with the following items:

- 1 UC-7101
- 100 cm RJ45-to-RJ45 Ethernet cross-over cable
- 100 cm console port cable (CBL-4PINDB9F-100)
- Universal power adapter
- Documentation and software CD
- Quick installation guide (printed)
- Warranty card

Optional Accessories

- 35 mm DIN-rail mounting kit (DK-35A)

Note: Please notify your sales representative if any of the above items are missing or damaged.

Product Features

UC-7101 series computers have the following features:

- Moxa ART ARM9 32-bit 192 MHz processor
- 16 MB RAM (about 12 MB of user programmable space)
- 8 MB Flash ROM (about 4 MB of user programmable space)
- One 10/100 Mbps Ethernet port for network redundancy
- One software-selectable RS-232/422/485 port
- Variable 50 bps to 921.6 kbps baudrate
- SD socket for storage expansion
- Built-in RTC, buzzer, WDT (watch dog time)
- Built-in μ Clinux Kernel 2.6 platform
- -40 to 75°C wide temperature models available
- DIN rail or wall mountable
- Robust fanless design

Hardware Specifications

Computer

CPU: MOXA ART ARM9 32-bit RISC CPU, 192 MHz

OS (pre-installed): μ Clinux or Linux

DRAM: 16 MB

Flash: 8 MB onboard

Storage

Storage Expansion: SD slot

Ethernet Interface

LAN: Auto-sensing 10/100 Mbps (RJ45), 1 port

Magnetic Isolation Protection: 1.5 kV built-in

Serial Interface

Serial Standards: RS-232/422/485 software-selectable (DB9 male), 1 port

ESD Protection: 15 kV ESD for all signals

Console Port: RS-232 (TxD, RxD, GND) 4-pin pin header output

Serial Communication Parameters

Data Bits: 5, 6, 7, 8

Stop Bits: 1, 1.5, 2

Parity: None, Even, Odd, Space, Mark

Flow Control: RTS/CTS, XON/XOFF, ADDC® (automatic data direction control) for RS-485

Baudrate: 50 bps to 921.6 kbps (supports non-standard baudrates; see user's manual for details)

Serial Signals

RS-232: TxD, RxD, DTR, DSR, RTS, CTS, DCD, GND

RS-422: TxD+, TxD-, RxD+, RxD-, GND

RS-485-4w: TxD+, TxD-, RxD+, RxD-, GND

RS-485-2w: Data+, Data-, GND

LEDs

System: Ready

LAN: LED located on the RJ45 connector

10M/Link x 1, 100M/Link x 1

Serial: TxD x 1, RxD x 1

Physical Characteristics

Housing: Aluminum (1 mm)

Weight: 130 g

Dimensions: 67 x 22 x 100.4 mm (2.64 x 0.87 x 3.95 in)

Mounting: DIN rail, wall

Environmental Limits

Operating Temperature:

Standard Models: -10 to 60°C (14 to 140°F)

Wide Temp. Models: -40 to 75°C (-40 to 167°F)

Storage Temperature:

Standard Models: -20 to 80°C (-4 to 176°F)

Wide Temp. Models: -40 to 85°C (-40 to 185°F)

Ambient Relative Humidity: 5 to 95% (non-condensing)

Anti-Vibration: 1 g @ IEC-68-2-6, sine wave (resonance search), 5-500 Hz, 1 Oct/min, 1 cycle, 13 min 17 sec per axis

Power Requirements

Input Voltage: 12 to 48 VDC

Power Consumption: 4.5 W

- 170 mA @ 24 VDC
- 340 mA @ 12 VDC

Standards and Certifications

Safety: UL 60950, CSA-C22.2 No. 60950-1, EN 60950-1

EMC: EN 55032 Class A, EN 61000-3-2 Class A, EN 61000-3-3, EN 55024, FCC Part 15 Subpart B Class A

Green Product: RoHS, CRoHS, WEEE

Reliability

Alert Tools: Built-in buzzer and RTC (real-time clock)

Automatic Reboot Trigger: Built-in WDT (watchdog timer)

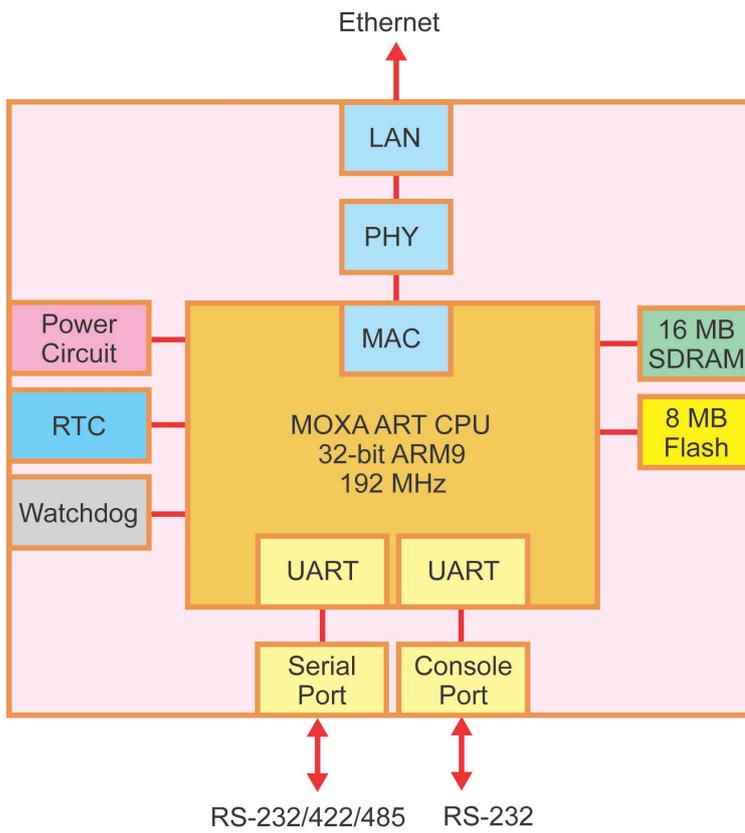
MTBF (mean time between failures): 514,973 hrs

Warranty

Warranty Period: 5 years

Note: The Hardware Specifications apply to the embedded computer unit itself, but not to accessories. In particular, the wide temperature specification does not apply to accessories such as the power adapter and cables.

Hardware Block Diagrams



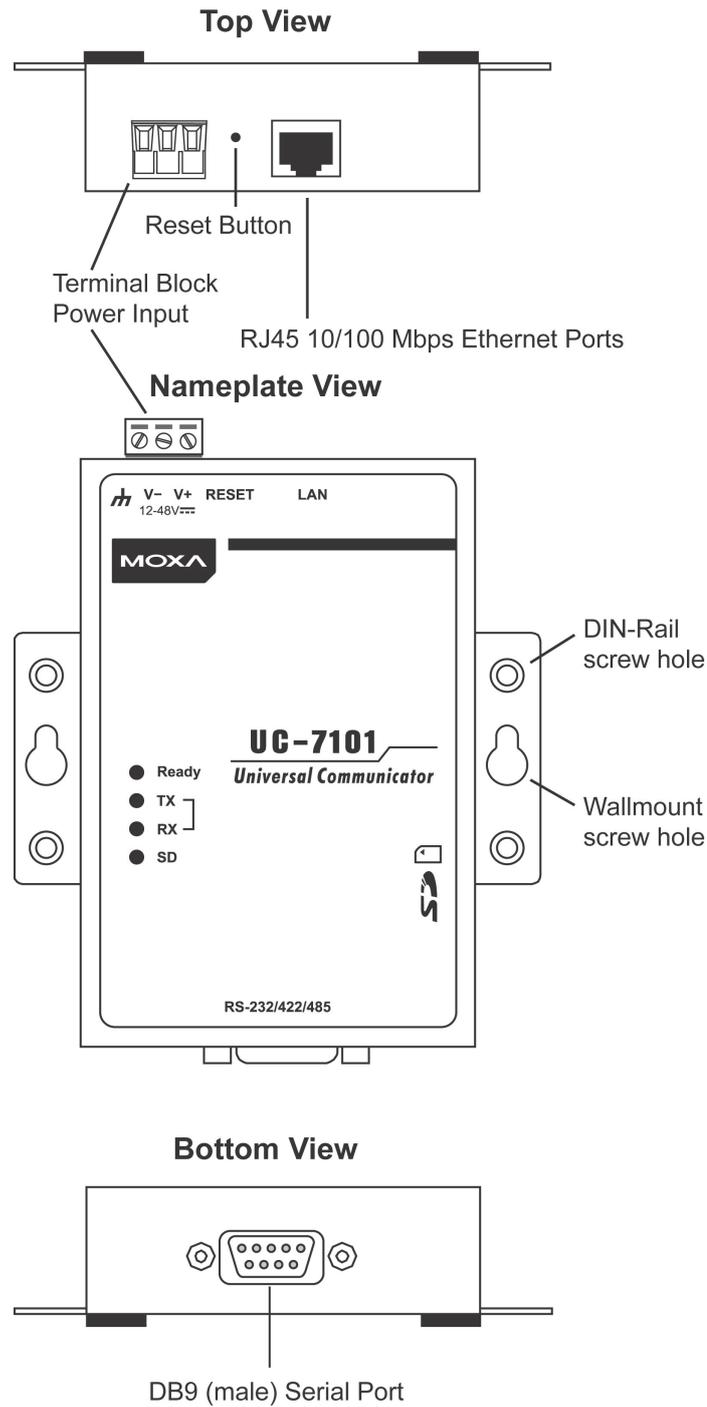
Hardware Introduction

The UC-7101 is a compact, rugged embedded computer designed to customize specialized industrial applications. The LED indicators on the computers' outer casing allow you to monitor performance and assist in identifying trouble spots. The hardware platform is reliable and stable, and provides a strong foundation from which to build custom solutions. In this chapter, we cover basic aspects of the UC-7101's hardware.

The following topics are covered in this chapter:

- ❑ **Appearance**
- ❑ **Dimensions**
- ❑ **Panel Views**
- ❑ **LED Indicators**
- ❑ **Internal SD Socket**
- ❑ **Additional Functions**
 - Reset Button
 - Real Time Clock

Panel Views



LED Indicators

The following table shows the functions of the five LED indicators located on the front panel of the UC-7101 embedded computers.

LED Name	LED Color	LED Function
Ready	Green	Power is on and functioning normally.
P1 (Tx)	Green	Serial port 1 is transmitting data.
	Off	Serial port 1 is not transmitting data.
P1 (Rx)	Yellow	Serial port 1 is receiving data.
	Off	Serial port 1 is not receiving data.

Internal SD Socket

The UC-7101 has an internal SD socket for a Secure Digital High Capacity (SDHC) 2.0 memory card. The SD 2.0 can be used to provide up to 32 GB of additional memory space. To install an SD card, first remove the outer cover of the embedded computer to access the SD slot. The internal SD slot is located on the top side of the UC-7101's main board, in the slot on the right side of the UC-7101. Plug the SD card into the socket directly. The SD card slot is spring-loaded for convenient removal; simply depress the card slightly with your finger, and then quickly remove pressure to allow the card to pop out.

Additional Functions

Reset Button

Press the **RESET** button continuously and hold for more than 5 seconds to load the factory default configuration. After loading the factory defaults, the system will reboot automatically. The **System Ready** LED will blink for the first 5 seconds. We recommend that you only use this function if the software is not working properly. When using the μ Clinux system software, it is safest to always use the reboot command when doing a soft restart / system reset. This will protect the integrity of your system. The reset button is NOT designed as a hard reboot.



ATTENTION

Restoring default settings preserves your data

Resetting the embedded computer to factory defaults will NOT cause the user directory to be reformatted, and the user's data will NOT be deleted. The reset button only causes the default configuration files to be loaded. All files in the /etc directory will revert to their factory defaults, but all other user data will remain intact in the Flash ROM.

Please note that if there is a problem with the /etc directory, the embedded computer may be unable to restore the factory default settings.



ATTENTION

The reset function is only successful when the user directory is working correctly. If the user directory has crashed, the kernel will automatically load the factory defaults.

Real Time Clock

The real time clock in the UC-7101 embedded computers is powered by a lithium battery. We strongly recommend that you get help from Moxa's technical support team to replace the lithium battery. If the battery needs to be changed, contact the Moxa RMA service team for RMA service.



ATTENTION

The battery may explode if replaced by an incorrect type. To avoid this potential danger, always be sure to use the correct type of battery.

Hardware Connection Description

In this chapter, we show how to connect the UC-7101 embedded computer to the network and to various devices.

The following topics are covered in this chapter:

▣ **Wiring Requirements**

- Connecting the Power
- Grounding the UC-7101 Embedded Computer

▣ **Connecting Data Transmission Cables**

- Connecting to the Network
- Connecting to a Serial Device
- Serial Console Port

▣ **Installing a Secure Digital (SD) Memory Card**

Wiring Requirements

This section explains how to connect the UC-7101 to serial devices.

You should heed the following safety precautions before installing any electronic device:

- Use separate paths for power wiring and wiring for devices. If power wiring and device wiring paths must cross, make sure the wires are perpendicular at the intersection point.
NOTE: Do not run signal or communication wiring and power wiring in the same wire conduit. To avoid interference, wires with different signal characteristics should be routed separately.
- Use the type of signal transmitted through a wire to determine which wires should be kept separate. The rule of thumb is that wiring that shares similar electrical characteristics can be bundled together.
- Keep input wiring and output wiring separate.
- It is advisable to label the wiring to all devices in the system.



ATTENTION

Safety First!

Be sure to disconnect the power cord before installing and/or wiring your UC-7101 embedded computer.

Wiring Caution!

Calculate the maximum possible current in each power wire and common wire. Observe all electrical codes dictating the maximum current allowable for each wire size. If the current goes above the maximum ratings, the wiring could overheat, causing serious damage to your equipment.

Temperature Caution!

Be careful when handling the UC-7101 embedded computer. When plugged in, the computer's internal components generate heat, and consequently the outer casing may feel hot to the touch.

Connecting the Power

Connect the "live-wire" end of the 12-48 VDC power adapter to the UC-7101 terminal block. If the power is supplied properly, the "Ready" LED will glow a solid green color after a 25 to 30 second delay.

The power for this product is intended to be supplied by a Listed Power Unit that is rated to deliver 12 to 48 VDC at a minimum of 300 mA for the UC-7101.

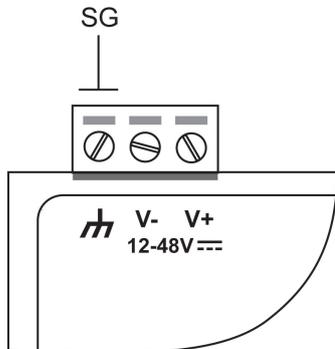
Grounding the UC-7101 Embedded Computer

Grounding and wire routing help limit the effects of noise due to electromagnetic interference (EMI). Run the ground wire from the ground screw to the grounding surface prior to connecting devices.



ATTENTION

This product should be mounted on a well-grounded mounting surface such as a metal panel.



SG: The **Shielded Ground** (sometimes called Protected Ground) contact is the left most contact of the 3-pin power terminal block connector when viewed from the angle shown in the figure at the left. Connect the SG wire to an appropriate grounded metal surface.

Connecting Data Transmission Cables

This section describes how to connect the UC-7101 to the network, to serial devices, and to a serial COM terminal.

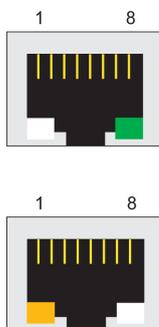
Connecting to the Network

Connect one end of the Ethernet cable to the UC-7101's 10/100M Ethernet port, and the other end of the cable to the Ethernet network. If the cable is properly connected, the UC-7101 will indicate a valid connection to the Ethernet in the following ways:

- The top-right LED on the connector glows a solid green when connected to a 100 Mbps Ethernet network.
- The top-left LED on the connector glows a solid orange when connected to a 10 Mbps Ethernet network.
- The LEDs will flash when Ethernet packets are being transmitted or received.

The 10/100 Mbps Ethernet LAN 1 port uses 8-pin RJ45 connectors. Pinouts for the port are shown in the following diagram.

8-pin RJ45



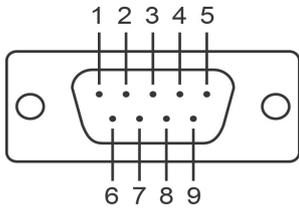
Pin	Signal
1	ETx+
2	ETx-
3	ERx+
4	-
5	-
6	ERx-
7	-
8	-

Connecting to a Serial Device

Connect the serial cable between the UC-7101 and the serial device(s).

The two serial ports (P1 and P2) use male DB9 connectors that can be configured for RS-232/422/485 by software. The pin assignments are shown in the following table:

Male DB9 Port



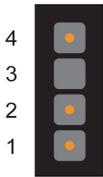
RS-232/422/485 Pinouts

Pin	RS-232	RS-422	RS-485 (4-wire)	RS-485 (2-wire)
1	DCD	TxDA(-)	TxDA(-)	–
2	RxD	TxDB(+)	TxDB(+)	–
3	TxD	RxDB(+)	RxDB(+)	DataB(+)
4	DTR	RxDA(-)	RxDA(-)	DataA(-)
5	GND	GND	GND	GND
6	DSR	–	–	–
7	RTS	–	–	–
8	CTS	–	–	–

Serial Console Port

The serial console port is a 4-pin pin-header RS-232 port. It is designed for serial console terminals, which are useful for identifying the UC-7101 boot up message.

Serial Console Port & Pinouts



Pin	Signal
1	TxD
2	RxD
3	NC
4	GND

Serial Console Cable



Installing a Secure Digital (SD) Memory Card

The SD slot is located on the right side of the UC-7101 enclosure. To install an SD card, you must first remove the protective cover to access the slot, and then plug the SD card directly into the slot.

Step 1: Use a screwdriver to remove the screws holding the SD card slot's outer cover.



Step 2: After removing the cover, insert the SD memory card into the slot.



NOTE To remove the SD card from the slot, press the SD card in slightly forward with your finger, and then remove your finger to cause the card to spring out partially. You may now grasp the top of the card with two fingers and pull it out.