UC-7101

Hardware User's Manual

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UC-7101 Hardware User's Manual

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Introduction

The Moxa UC-7101 series of 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, but that can store large amounts of memory and provide good computing performance.

In this chapter, we cover the following topics:

❑ **Overview**
❑ **Package Checklist**
❑ **Product Features**
❑ **Product Specifications**
   ➢ Hardware Specifications
   ➢ Software Specifications—UC-7101 (µClinux)
❑ **Hardware Block Diagrams**

Overview

The UC-7101 series of 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 for UC-7101) and SDRAM (16 MB for UC-7101) 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 platform 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 μClinux operating system pre-installed. Software written for desktop PCs is easily ported to the UC-7101 computers with a GNU cross complier, 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
Mini RISC-based Ready-to-Run Embedded Computer with 1 Serial Port, 1 Ethernet Port, μClinux OS.

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

UC-7101-T-LX
Mini RISC-based Ready-to-Run Embedded Computer with 1 Serial Port, 1 Ethernet Port, μClinux OS, Wide Temperature.

Each model is shipped with the following items:

- 1 UC-7101
- Quick Installation Guide
- Document & Software CD
- 100 cm RJ45-to-RJ45 Ethernet cross-over cable
- 100 cm console port cable (CBL-4PINDB9F-100)
- Universal Power Adaptor
- Product Warranty Statement

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

The 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 ports
- Select Any Baudrate from 50 bps to 921.6 Kbps
- SD socket for storage expansion
- Built-in RTC, Buzzer, WDT
- Built-in µClinux Kernel 2.6 platform
- -40 to 75°C wide temperature models available
- DIN-Rail or wall mountable
- Robust fanless design

Product Specifications

Hardware Specifications

System

CPU	Moxa ART ARM9 32-bit RISC CPU, 192 MHz
DRAM	UC-7101: 16 MB
Flash	UC-7101: 8 MB
Storage Expansion	UC-7101: SD slot × 1
Console port	RS-232 × 1 (TxD, RxD, GND), 4-pin header output, "19200, n, 8, 1"
Button	Reset button × 1, supports "Reset to Factory Default"
Other	RTC, buzzer, Watchdog Timer
OS	UC-7101: Built-in µClinux, based on Linux Kernel 2.6

Network Communication

LAN	UC-7101: 10/100 Mbps RJ45 × 1, auto-sensing
Protection	1.5 KV built-in magnetic isolation protection

Serial Communication

Serial Port	UC-7101: Software-selectable RS-232/422/485 DB9 male × 1
Protection	15 KV built-in ESD protection for all signals
Data bits	5, 6, 7, 8
Stop bit(s)	1, 1.5, 2
Parity	None, Even, Odd, Space, Mark
Flow Control	RTS/CTS, XON/XOFF, RS-485 ADDC™
Speed	50 bps to 921.6 Kbps; ANY BAUDRATE supported

LEDs

System	Ready × 1
LAN	10 M/Link× 1, 100 M/Link × 1 (located on RJ45 connector)
Serial	TxD × 1, RxD × 1 (UC-7101)

Power Requirements

Power Input	12 to 48 VDC
Power Consumption	300 mA @ 12 VDC (UC-7101)

Mechanical

Dimensions (W×D×H)	67 × 100.4 × 22 mm (UC-7101)
Weight	130 g
Construction Material	aluminum, 1 mm
Mounting	DIN-rail, Wall-mounting

Environment

Operating Temperature	-10 to 60°C (14 to 140°F), 5 to 95% RH -40 to 75°C (-40 to 167°F) for -T models
Storage Temperature	-20 to 80°C (-4 to 176°F), 5 to 95% RH -40 to 85°C (-40 to 185°F) for -T models
Anti-Vibration	1 g @ IEC-68-2-6, sine wave(resonance search), 5-500 Hz, 1 Oct/min, 1 Cycle, 13 mins 17 sec/axis

Regulatory Approvals

EMC	FCC, CE (Class A) FCC Part 15, CISPR 22 Class A CE Class A: EN55022 Class A, EN61000-3-2 Class A, EN61000-3-3, EN55024
Safety	UL/cUL: UL60950, CAN/CSA-C22.2 No. 60950-00, LVD: EN60950-1
Other	RoHS, CRoHS, WEEE
Warranty	5 years

Software Specifications—UC-7101 (µClinux)

Kernel Version:	2.6.19
Protocol Stacks:	TCP, UDP, IPv4, SNMP V1/V2c, ICMP, ARP, HTTP, CHAP, PAP, DHCP, NTP, NFS, SMTP, Telnet, FTP, PPP, PPPoE
File System:	JFFS2 (on-board flash) for Kernel, Root File System (Read Only) and User Directory (Read / Write)
System Utilities:	msh, busybox, tinylogin, telnet, ftp

Supported Services and Daemons:

> telnetd: Telnet Server daemon
> ftpd: FTP server daemon
> Boa: Web server daemon
> pppd: dial in/out over serial port daemon & PPPoE
> snmpd: snmpd agent daemon
> inetd: TCP server manager program

Application Development Environment:

> Moxa Linux API Library
> Linux Tool Chain:
> > Arm-elf-gcc: C/C++ PC Cross Compiler
> > µClibc: POSIX Standard Library

Device Drivers:	UART, RTC, Buzzer, SD Card

Hardware Block Diagrams

**UC-7101**
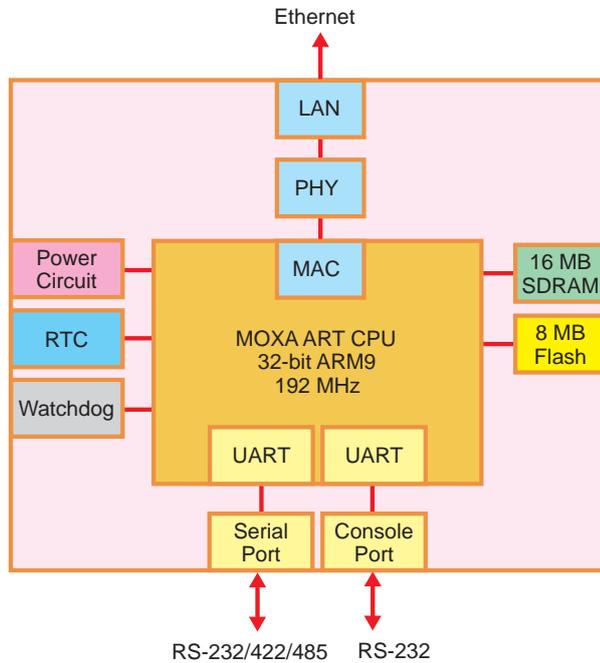
2

Hardware Introduction

The UC-7101 is compact, rugged embedded computers designed for industrial applications. The LED indicators on the computers' outer casing help you monitor the performance of the computers, and assist in identifying trouble spots. The hardware platform is both reliable and stable, and allows you to devote the bulk of your attention to developing your own application. In this chapter, we cover the basic hardware of the UC-7101 series embedded computers.

In this chapter, we cover the following topics:

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

Appearance

UC-7101
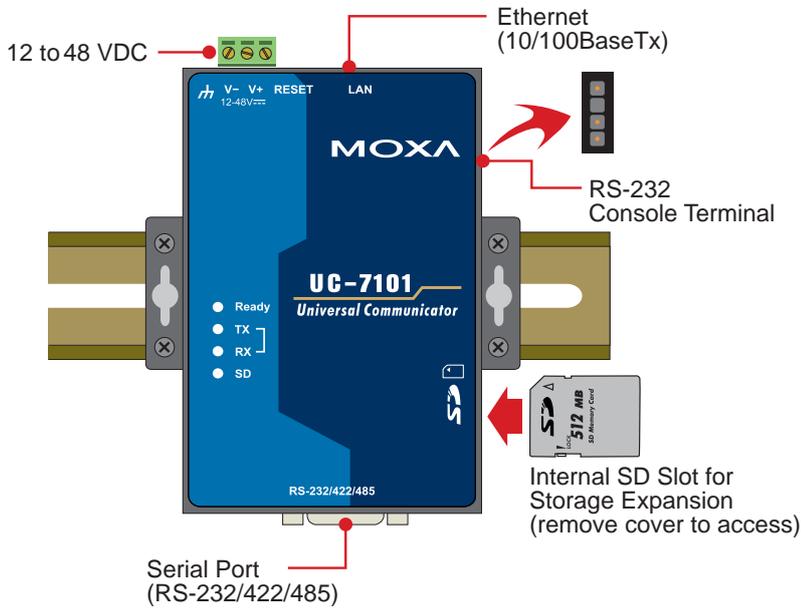
Dimensions

UC-7101

unit = mm (inch)
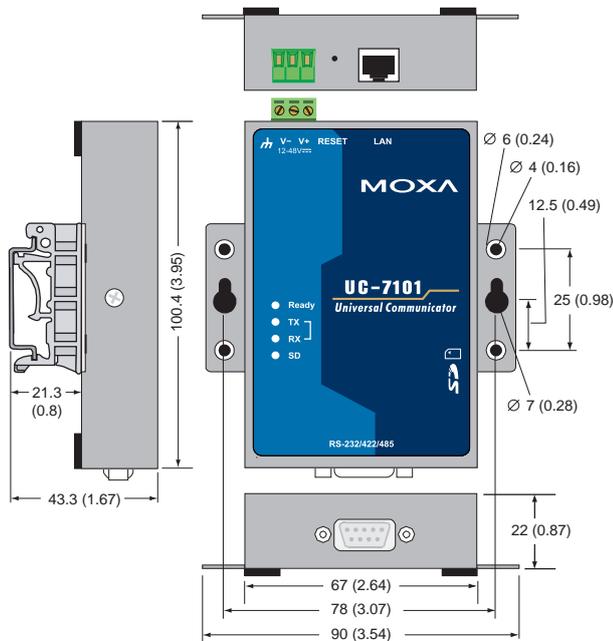
Panel Views

UC-7101

Top View

Reset Button

Terminal Block
Power Input

RJ45 10/100 Mbps Ethernet Ports

Nameplate View

V− V+ RESET   LAN
12-48V===

MOXA

UC-7101
Universal Communicator

● Ready
● TX
● RX
● SD

RS-232/422/485

DIN-Rail
screw hole

Wallmount
screw hole

Bottom View

DB9 (male) Serial Port
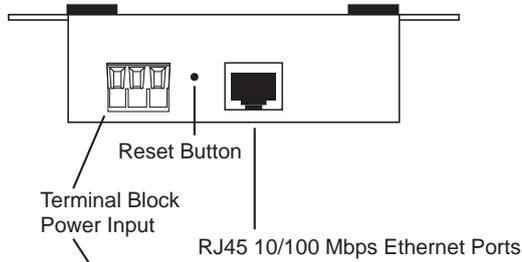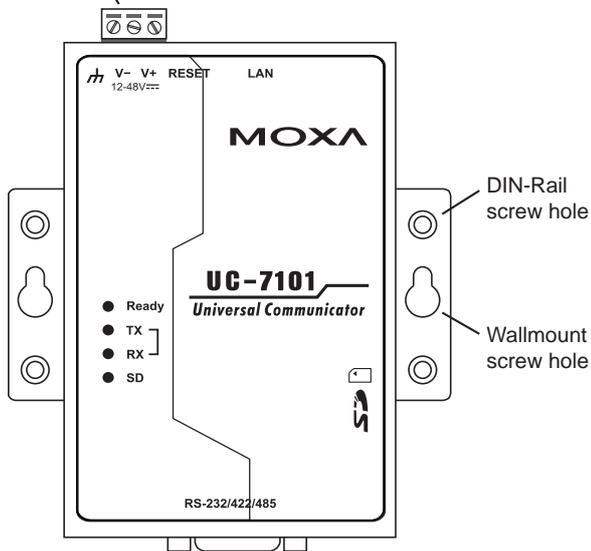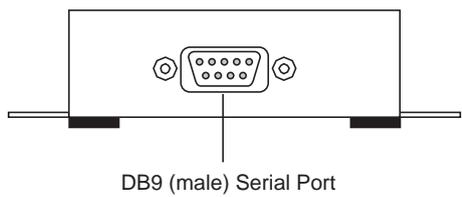
LED Indicators

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 storage expansion. A Secure Digital (SD) memory card compliant with the SD 1.0 standard can be used to provide up to 1 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 UC-7101 main board, in the slot on the right side of the UC-7101, but lower than the cover screw. Plug the SD card into the socket directly. In addition, remember to "push in" the SD card first if you want to remove it.

Additional Functions

Reset Button

Press the "RESET" button continuously 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. To reset the μClinux system software, always use the software reboot command (reboot) to protect the integrity of data that is being transmitted. The reset button is NOT designed to Hard Reboot the UC-7101 series embedded computer.

⚠️ **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 a configuration file 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

This function only takes effect 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.

3

Hardware Connection Description

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

In this chapter, we cover the following topics:

❑ **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 adaptor 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
>
> **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.
>
> V-   V+
> 12-48V ⎓
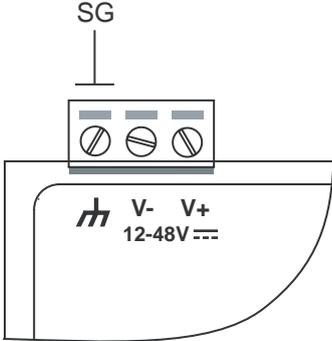
Connecting Data Transmission Cables

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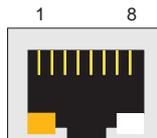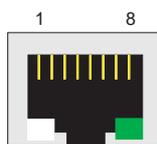
| Pin	Signal
1	ETx+
2	ETx-
3	ERx+
4	---
5	---
6	ERx-
7	---
8	---

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, and can be configured for RS-232/422/485 by software. The pin assignments are shown in the following table:
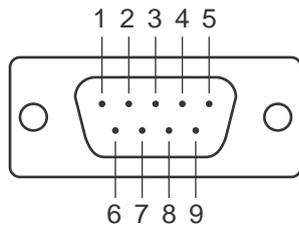
Male DB9 Port   **RS-232/422/485 Pinouts**

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   **Serial Console Cable**
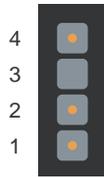
Pin	Signal
1	TxD
2	RxD
3	NC
4	GND

Installing a Secure Digital (SD) Memory Card

UC-7101

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.