

# **DA-660/662-LX Hardware Manual**

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[www.moxa.com/product](http://www.moxa.com/product)

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# DA-660/662-LX Hardware Manual

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# Table of Contents

|   |            |
|---|------------|
| <b>1. Introduction.....</b>                     | <b>1-1</b> |
| Overview .....                                  | 1-2        |
| Package Checklist .....                         | 1-2        |
| Product Features .....                          | 1-2        |
| Hardware Specifications .....                   | 1-3        |
| <b>2. Hardware Introduction.....</b>            | <b>2-1</b> |
| Appearance.....                                 | 2-2        |
| DA-660 .....                                    | 2-2        |
| DA-662 .....                                    | 2-2        |
| Dimensions .....                                | 2-3        |
| Hardware Block Diagram .....                    | 2-3        |
| DA-660 .....                                    | 2-3        |
| DA-662 .....                                    | 2-4        |
| LED Indicators.....                             | 2-5        |
| Reset Button .....                              | 2-5        |
| LCD Screen.....                                 | 2-5        |
| Push Buttons.....                               | 2-6        |
| Real-time Clock .....                           | 2-6        |
| <b>3. Hardware Connection Description .....</b> | <b>3-1</b> |
| Placement Options .....                         | 3-2        |
| Desktop .....                                   | 3-2        |
| Connecting the Power .....                      | 3-2        |
| Connecting the Hardware.....                    | 3-2        |
| Wiring Requirements .....                       | 3-2        |
| Connecting the Power .....                      | 3-3        |
| Connecting to the Network .....                 | 3-3        |
| Connecting to a Serial Device .....             | 3-3        |
| Connecting to the Console Port .....            | 3-3        |
| USB Host.....                                   | 3-3        |

# 1

## Introduction

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The DA-660/662 embedded computers come with 16 software selectable RS-232/422/485 serial ports, making them suitable for a variety of industrial applications. Models are available with either 2 or 4 10/100 Mbps Ethernet ports. The DA-662 model also comes with USB ports to make it easy to add additional memory. The computers are designed with a standard 19-inch, rugged 1U rackmount case, and are embedded with a 100-240V AC/DC power input. This combination of features gives users a robust and reliable ready-to-run solution for applications such as data acquisition and power substations.

The following topics are covered in this chapter:

- **Overview**
- **Package Checklist**
- **Product Features**
- **Hardware Specifications**

## Overview

The DA-660/662 are RISC-based, ready-to-run embedded computers designed for industrial data acquisition applications. Each model has 16 RS-232/422/485 serial ports, and 2 USB hosts (DA-662 only) based on the Intel XScale IXP425 communication processor. In addition, the DA-660 has two Ethernet ports, the DA-662 has 4 Ethernet ports. The casing is a standard 1U, 19-inch wide rack-mounted rugged enclosure. The robust, rack-mountable mechanism design provides the hardened protection needed for industrial environment applications, and makes it easy for users to install the DA-660/662 on a standard 19-inch rack. The DA-660/662 are ideal for applications that require a distributed embedded technology, such as SCADA systems, plant floor automation, and power electricity monitoring applications.

The DA-660/662 are suitable for IT control room applications, the critical assets used in the control and automation system of industrial plant floors, and in electric power utility substations. The DA-660/662 can accept a wide range of power inputs (from 100 to 240V), which means that they can be connected to AC power lines. Because of the no hard disk, fan-less, energy efficient design, the DA-660/662 minimize heat generation, can operate around the clock, year in and year out, in heavy duty, harsh industrial environments, delivering the kind of reliable computing power expected of a multifunctional controller.

Choose from models of the DA-660/662 that come pre-installed with the open-standard Linux OS. The built-in SDK makes program development easy by allowing you to follow the common programming procedures used on a standard PC. All of the software you develop for your own applications can be stored in the onboard Flash memory. The DA-660/662 embedded computers are ideal for creating control systems with distributed architecture that are based on embedded technologies. Typical applications include SCADA systems, plant floor automation, and power electricity monitoring.

## Package Checklist

Before installing the DA-660/662, verify that the package contains the following items:

- 1 DA-660/662 embedded computer
- 19-inch rackmount Kit
- Quick Installation Guide
- Document & Software CD
- Ethernet Cable: RJ45 to RJ45 cross-over cable, 100 cm
- CBL-RJ45M9-150: RJ45 to DB9 male serial port cable, 150 cm
- CBL-RJ45F9-150: RJ45 to DB9 female console port cable, 150 cm
- Product Warranty Statement

**NOTE:** *Notify your sales representative if any of the above items are missing or damaged.*

## Product Features

- Intel XScale IXP425 533 MHz Processor
- On-board 128 MB RAM, 32 MB Flash ROM
- 16 RS-232/422/485 serial ports
- 2 10/100 Mbps Ethernet (4 10/100 Mbps Ethernet for DA-662 model)
- Standard 19-inch rack-mount installation, 1U height
- Wide range of power input voltages from 100 to 240VAC
- LCD screen and push buttons for HMI
- Ready-to-run Linux platform
- Robust, fanless design

# Hardware Specifications

## Computer

**CPU:** Intel IXP425 533 MHz

**OS (pre-installed):** Embedded Linux

**DRAM:** 128 MB onboard

**Flash:** 32 MB onboard

**USB:** 2 USB 2.0 ports (DA-662 only)

## Ethernet Interface

**LAN:** 2 (DA-660) or 4 (DA-662) auto-sensing 10/100 Mbps ports (RJ45)

**Magnetic Isolation Protection:** 1.5 kV built-in

## Serial Interface

**Serial Standards:** 16 RS-232/422/485 ports, software selectable (8-pin RJ45)

**ESD Protection:** 15 kV for all signals

**Console Port:** RS-232 (all signals), RJ45 connector, supports PPP

## 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<sup>®</sup> (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:** OS Ready

**LAN:**

DA-660: 10/100M x 2

DA-662: 10/100M x 4

**Serial:** TxD, RxD (16 of each)

## Mini Screen with Push Buttons

**LCD Panel:** Liquid Crystal Display on the case, 2 x 16 text mode

**Push Buttons:** Four membrane buttons for convenient on-site configuration

## Physical Characteristics

**Housing:** SECC sheet metal (1 mm)

**Weight:** 2.6 kg

**Dimensions:**

Without ears: 440 x 45 x 198 mm (17.32 x 1.77 x 7.80 in)

With ears: 480 x 45 x 198 mm (18.90 x 1.77 x 7.80 in)

**Mounting:** Standard 19-inch rackmount

## Environmental Limits

**Operating Temperature:**

-10 to 60°C (14 to 140°F)

**Storage Temperature:**

-20 to 80°C (-4 to 176°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 mins 17 sec per axis

**Power Requirements**

**Input Voltage:** 100 to 240 VAC/VDC auto ranging (47 to 63 Hz for AC input)

**Power Consumption:**

DA-660: 12 W

DA-662: 20 W

**Standards and Certifications**

**Safety:** UL 60950-1, CSA C22.2 No. 60950-1-03, EN 60950-1

**EMC:** EN 55022 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):**

DA-660: 124,323 hrs

DA-662: 85,193 hrs

**Warranty**

**Warranty Period:** 5 years

**Details:** See [www.moxa.com/warranty](http://www.moxa.com/warranty)

# Hardware Introduction

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DA-660/662 Series hardware is compact, well-designed, and built rugged for industrial applications. LED indicators help you monitor the performance and identify trouble spots. Multiple ports allow the connection of different devices for wireless operation. With the reliable and stable hardware platform that is provided, you may devote your attention to the development of your application. In this chapter, learn the basics about the embedded computer hardware and its different parts.

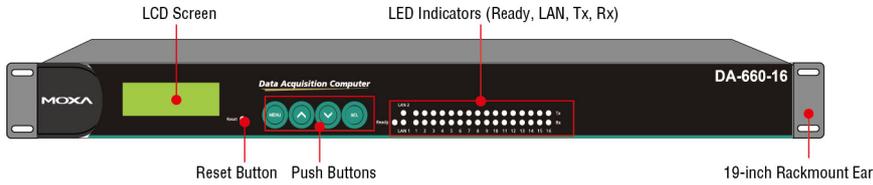
The following topics are covered in this chapter:

- **Appearance**
  - DA-660
  - DA-662
- **Dimensions**
- **Hardware Block Diagram**
  - DA-660
  - DA-662
- **LED Indicators**
- **Reset Button**
- **LCD Screen**
- **Push Buttons**
- **Real-time Clock**

# Appearance

## DA-660

### Front View

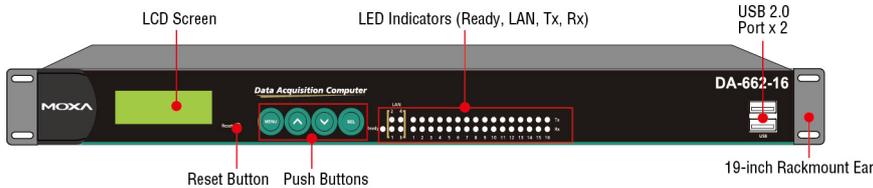


### Rear View

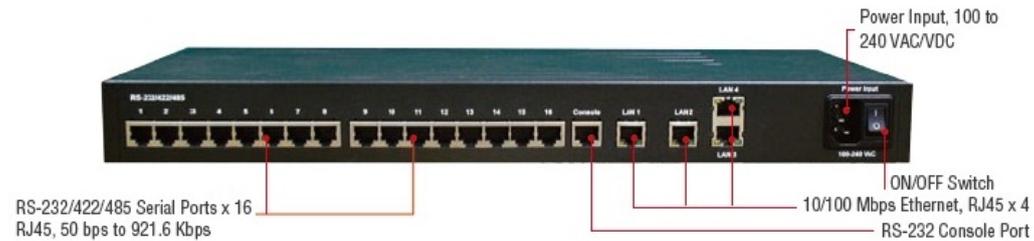


## DA-662

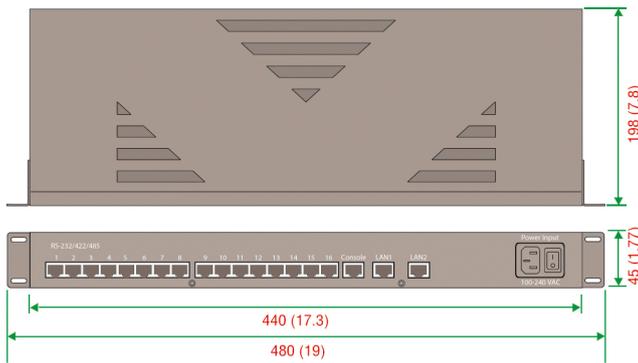
### Front View



### Rear View



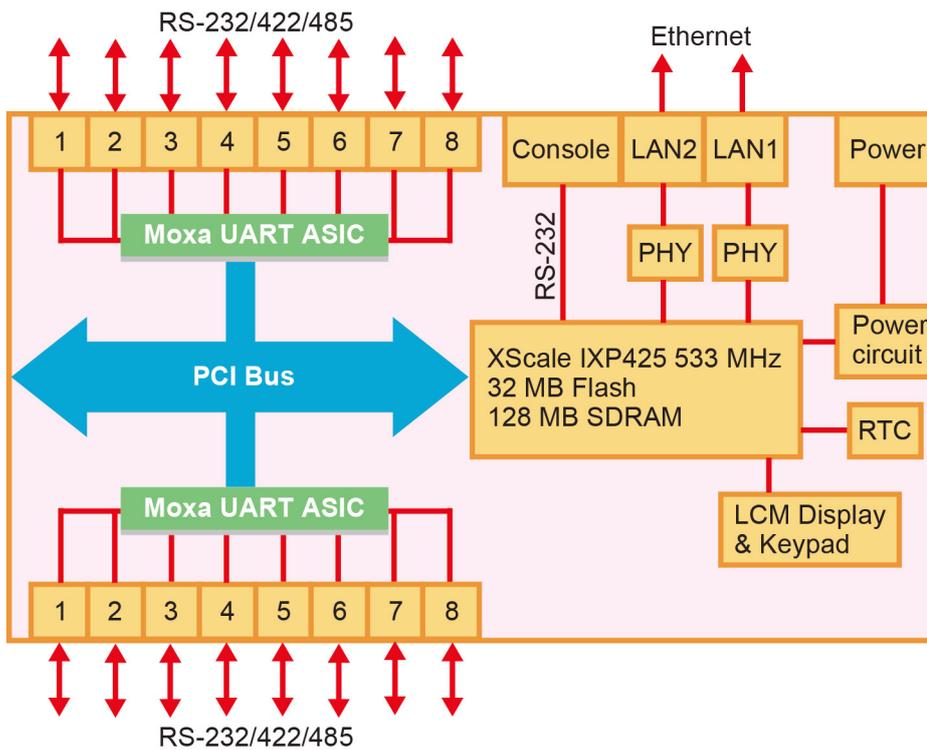
# Dimensions



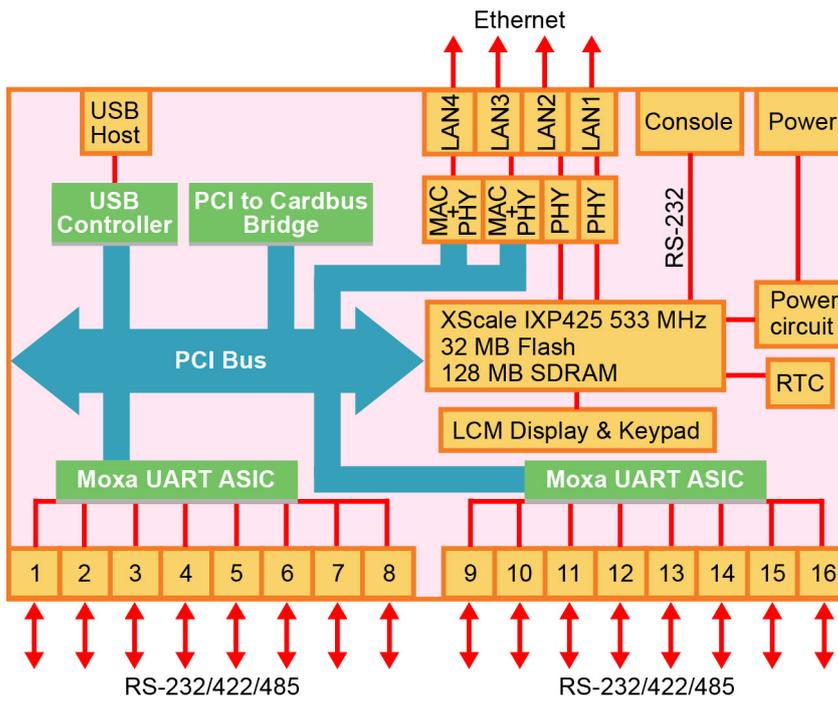
# Hardware Block Diagram

The following block diagrams show the layout of the DA-660/662's internal components.

## DA-660



# DA-662



## LED Indicators

LED indicators are located on the front panel of the DA-660/662. Note that the DA-660 has two LAN ports, and the DA-662 has four LAN ports.

| LED Name                  | LED Color | LED Function  |
|---------------------------|-----------|---|
| Ready                     | Red       | Power is On, and system is ready (after booting up)         |
| LAN1, LAN2,<br>LAN3, LAN4 | Orange    | 10 Mbps Ethernet connection                                 |
|                           | Green     | 100 Mbps Ethernet connection                                |
| P1-P16 (Rx)               | Orange    | Serial port is receiving RX data from the serial device     |
|                           | Off       | Serial port is not receiving RX data from the serial device |
| P1-P16 (Tx)               | Green     | Serial port is transmitting TX data to the serial device    |
|                           | Off       | Serial port is transmitting TX data to the serial device    |

## Reset Button

Press the **Reset** button on the front panel continuously for at least 5 seconds to load the **factory default configuration**. After the factory default configuration has been loaded, the system will reboot automatically. The **Ready** LED will blink on and off for the first 5 seconds, and then maintain a steady glow once the system has rebooted.

We recommend that you only use this function if the software is not working properly and you want to load factory default settings. To reset an embedded Linux system, always use the software reboot command `/>reboot` to protect the integrity of data being transmitted or processed. The Reset button is not designed to hard reboot the DA-660/662.



### ATTENTION

Pressing the Reset button will only load the configuration file. All files in the `/etc` directory will revert to their factory defaults, and *all user data in the Flash ROM will be deleted*.

## LCD Screen

The DA-660/662 has an LCD screen on the front panel. The LCD screen can display 16 columns and 2 rows of text. After the DA-660/662 boots up, the LCD screen will display the model name and firmware version:

|   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|
| D | A | - | 6 | 6 | 2 | - | 1 | 6 |
| V | E | R | . | 1 | . | 0 |   |   |

## Push Buttons

There are four push buttons on the DA-660/662's front panel. The buttons are used to enter text onto the LCD screen. The buttons are MENU, ^ (up cursor), v (down cursor), and SEL:

| Button | Action  |
|--------|---|
| MENU   | Displays the main menu.   |
| ^      | Scrolls up through a list of items shown on the LCD screen's second line.   |
| v      | Scrolls down through a list of items shown on the LCD screen's second line. |
| SEL    | Selects the option listed on the LCD screen.                                |

## Real-time Clock

The DA-660/662's real time clock is powered by a lithium battery. We strongly recommend that you do not replace the lithium battery without help from a qualified Moxa support engineer. If you need to change the battery, contact the Moxa RMA service team.



### **WARNING**

There is a risk of explosion if the battery is replaced by an incorrect type.

# Hardware Connection Description

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The following topics are covered in this chapter:

## □ Placement Options

- Desktop
- Connecting the Power

## □ Connecting the Hardware

- Wiring Requirements
- Connecting the Power
- Connecting to the Network
- Connecting to a Serial Device
- Connecting to the Console Port
- USB Host

# Placement Options

## Desktop

Place your DA-660/662 on a clean, flat, well-ventilated desktop. For better ventilation, attach the 4 pads from the desktop kit to the bottom of the unit, and leave some space between the DA-660/662 and other equipment. Do not place equipment or objects on top of the DA-660/662, as this might damage the computer's internal components.

## Connecting the Power

The DA-660/662 is designed to be mounted on a standard 19-inch rack. Two L-shaped metal plates are included as standard accessories with the DA-660/662. Use the enclosed pair of L-shaped metal plates and screws to fasten your DA-660/662 to the rack cabinet. Two placement options are available. You can either lock the front or the rear panel of the DA-660/662 to the front of the rack. Each L-shaped plate has 6 holes, leaving two outer or inner holes open for your convenience.

# Connecting the Hardware

This section describes how to connect the DA-660/662 to serial devices. The topics covered in this section are: **Wiring Requirements, Connecting the Power, Connecting to the Network, Connecting to a Serial Device, and Connecting to the Console Port.**

## Wiring Requirements



### ATTENTION

#### **Safety First!**

Be sure to disconnect the power cord before installing and/or wiring your DA-660/662.

#### **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 DA-660/662. When plugged in, the DA-660/662's internal components generate heat, and consequently the outer casing may feel hot to the touch.

You should observe the following common wiring rules:

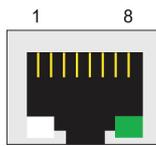
- Use separate paths to route wiring for power and devices. If power wiring and device wiring paths must cross, make sure the wires are perpendicular at the intersection point.  
**NOTE:** Do not run signal or communication wiring and power wiring in the same wire conduit. To avoid interference, wires with different signal characteristics should be routed separately.
- You can 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.
- Where necessary, it is strongly advised that you label wiring to all devices in the system.

## Connecting the Power

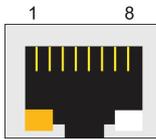
To power on the DA-660/662, use a power cord to connect the power line to the DA-660/662's AC power connector. The power connector is located on the right side of the rear panel. Next, turn on the power switch. The DA-660/662 takes about 30 seconds to boot up. Once the device is ready, the Ready LED on the front panel will light up, and the DA-660/662 model name and firmware version will appear on the LCD screen.

## Connecting to the Network

For DA-660 and DA-662, connect one end of the Ethernet cable to one of the DA-660/662's 10/100M Ethernet ports (8-pin RJ45) and the other end of the cable to the Ethernet network. If the cable is properly connected, the DA-660/662 will indicate a valid connection to the Ethernet in the following ways:



The lower right corner LED indicator in the lower right corner glows a solid green color when the cable is properly connected to a 100 Mbps Ethernet network. The LED will flicker when Ethernet packets are being transmitted or received.

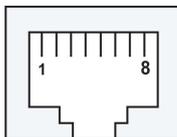


The lower left corner LED indicator glows a solid orange color when the cable is properly connected to a 10 Mbps Ethernet network. The LED will flicker when Ethernet packets are being transmitted or received.

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

## Connecting to a Serial Device

Use properly wired serial cables to connect the DA-660/662 to serial devices. The DA-660/662's serial ports (P1 to P16) use 8-pin RJ45 connectors. The ports can be configured by software for RS-232, RS-422, or 2-wire RS-485. The pin assignments are shown in the following table:



| Pin | RS-232 | RS-422 | RS-485 |
|-----|--------|--------|--------|
| 1   | DSR    | ---    | ---    |
| 2   | RTS    | TXD+   | ---    |
| 3   | GND    | GND    | GND    |
| 4   | TXD    | TXD-   | ---    |
| 5   | RXD    | RXD+   | Data+  |
| 6   | DCD    | RXD-   | Data-  |
| 7   | CTS    | ---    | ---    |
| 8   | DTR    | ---    | ---    |

## Connecting to the Console Port

The DA-660/662's console port is an 8-pin RJ45 RS-232 port. The port can be used to connect to the console utility from a remote console via a V90 or GPRS modem with PPP protocol. The pin definition is the same as for the serial ports (P1 to P16). For normal data acquisition applications, you should connect to the DA-660/662's serial ports (P1 to P16) via a V90 or GPRS modem. If you would like to use the console port for normal data acquisition applications, you can set the console port to start up via PPP protocol.

## USB Host

The DA-662 offers 2 USB 2.0 hosts, allowing you to connect with a USB storage device. The first USB mass storage device to be connected will be mounted automatically by mount to `/mnt/sda`, and the second device

will be mounted automatically to /mnt/sdb. The DA-662 will be un-mounted automatically with the umount command when the device is disconnected.