Matrix-704

Linux-Ready Cortex-A5 Industrial IoT Gateway

Hardware Guide

Version: 1.1

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Artila

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FCC AND IC INFORMATION:

This Class A digital apparatus complies with Part 15 of the FCC rules and with Canadian ICES-003

Operation is subject to the following two conditions:

1. This device may not cause interference and
2. This device must accept any interference. Including interference that may cause undesired operation of the device.

Document Amendment History

Revision	Date	Remark
V1.0	2020 June	Initial
V1.1	2024 Jan.	Information updated

Table of Contents

1. Introduction

Matrix-704 based on ARM Cortex-A5, is a Linux-ready IoT gateway with highly integrated and low power consumption. Matrix-704 is a reliable industrial IoT gateway with Surge-protected RS-485 serial ports that secure the data transmission to increase system reliability in a wide range of demanding industrial applications.

1.1 Features

- ATMEL ATSAMA5D35 536MHz Cortex-A5 Processor
- Linux kernel 5.10.x and file system
- Support Toolchain: gcc 9.3.0 + glibc 2.31
- 512MB LPDDR2 SDRAM
- 16GB eMMC Flash and 8MB DataFlash for system backup
- 4 x RS-485 serial port with Surge-protected.
  Signal Surge Waveform: Up to +/-6KV (10/700 us Combination Wave)
- 1 x Gigabit Ethernet port and 1x 10/100Mbps Ethernet port
- 1 x USB 2.0 high speed (480Mbps) Host port
- 1 x full-size miniPCIe socket inside, 1 x Micro-SIM slot inside
- Reserved 2 x holes for external Antenna through SMA connector
- 1 x Serial Console port (Micro-USB)
- 1 x Micro-SD socket inside
- +9 to +48VDC power input
- Wall-mounting, Optional DIN RAIL mounting adaptor

1.2 Specifications (Hardware)

CPU / Memory

- CPU: ATMEL ATSAMA5D35 536MHz w/MMU
- SDRAM: 512MB, LPDDR2
- Flash: 16GB, eMMC
- DataFlash: 8MB, for system backup

Network Interface

- Type: 1 x Gigabit and 1 x 10/100Mbps Ethernet
- Connector Type: RJ45

USB 2.0 Host Interface

- Host Ports: 1
- Supports 480Mbps hi-speed mode

Console / Debug Ports

- Support micro-USB console port
- Serial console port (inside the box)

Serial Ports

- 4 x RS-485 ports
- Signal: Data+, Data-
- Baud Rate: Up to 921.6Kbps
- Surge-protected design

SD Slot

- SD 2.0 compliant, supports SDHC
- 1 x microSD socket

Power Requirement

- Input Voltage: +9~+48VDC (terminal block)
- Typical Power Consumption: 12VDC@250mA

General

- Real-time Clock (RTC): Yes
- Buzzer: Yes
- Watchdog: Yes
- Reset button
- LED Indicators: Ready, GLAN, LAN, RS-485 ports
- Dimensions (W x L x H): 119.5 x 140 x 35.2mm (4.7” x 5.5” x 1.38”)
- Weight: 620g (1.36lb)
- Operating Temperature: 0~70°C (32~158°F)
- Regulation: CE Class A, FCC Class A
- Installation: Wall mounting, DIN-rail mounting (with optional kit)

1.3 Specifications (Software)

Operation System

- Linux kernel 5.10.x or up
- Supports bootup from eMMC or SD card
- Support Backup/Restore from SD card or USB device
- Boot Loader: Barebox
- File System: EXT4

Software Development

- Toolchain: gcc 9.3.0 + glibc 2.31
- Supports in-place C/C++ code compilation

Package Management

- Package repository: Artila self-maintained repository
- Command: Using standard apt-get command

Popular Packages

- Web server: Apache/Nginx/Lighttpd
- Database: MySQL/SQLite3/PostgreSQL
- Script Language: PHP/Python/Perl/NodeJS
- Text editor: vim/nano/sed
- Administration: Webmin

Software Operating & Utility

Please refer to “M-A5D35” system on module information for software operating & utility at following: http://www.artila.com/download/A5D35/Linux/

1.4 Packing List

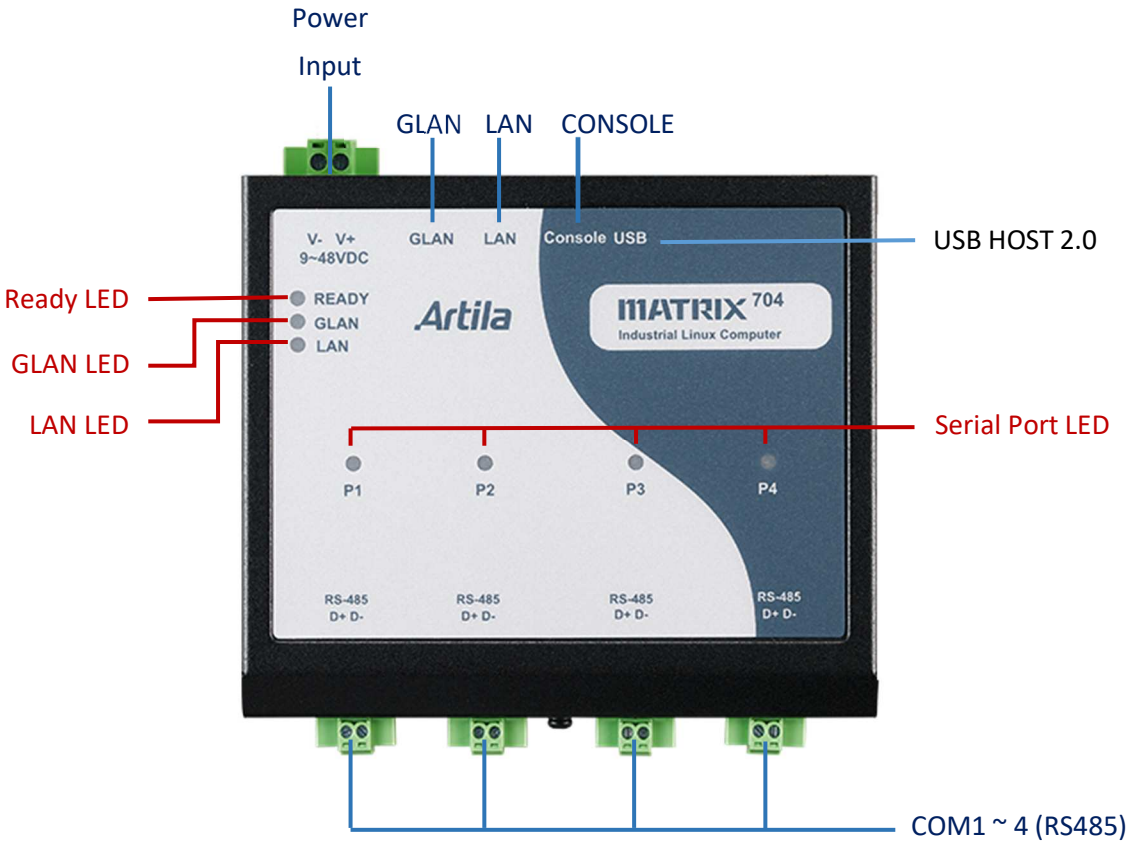
- **Matrix-704**: Linux-ready Cortex-A5 536MHz Industrial IoT Gateway with 512MB SDRAM, 16GB eMMC Flash
  with four Surge-protected RS-485 serial ports

1.5 Optional Accessory

- **DK-35A** (36-DK35A-000): DIN RAIL Mounting Kit
- **PWR-12V-1A** (31-62100-000): 110~240VAC to 12VDC 1A Power Adaptor
- **Console Cable** (91-PHDF9 -050): Console cable 50cm (Wafer box to DB9 Female)

2. Layout

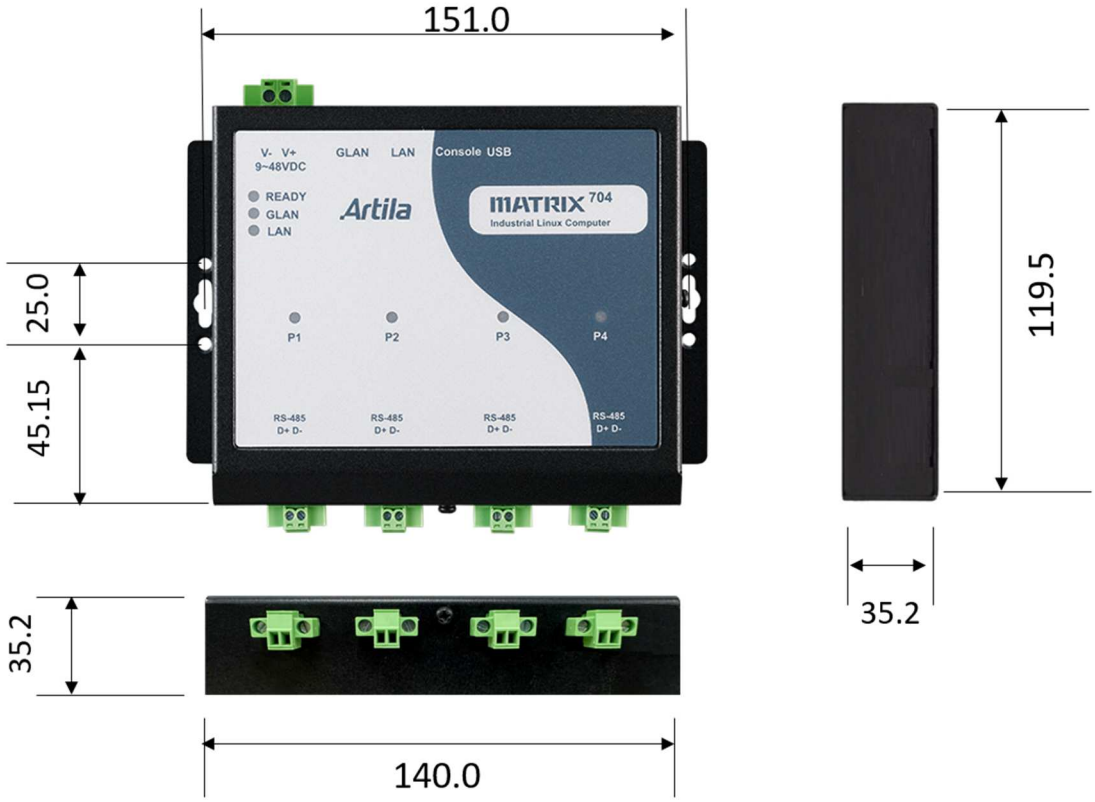
2.1 Connector & LED Indicator



2.2 Dimensions

Unit: mm

Mounting hole: M3 Screw



3. Pin Assignment and Definitions

3.1 Multi-function Reset Button

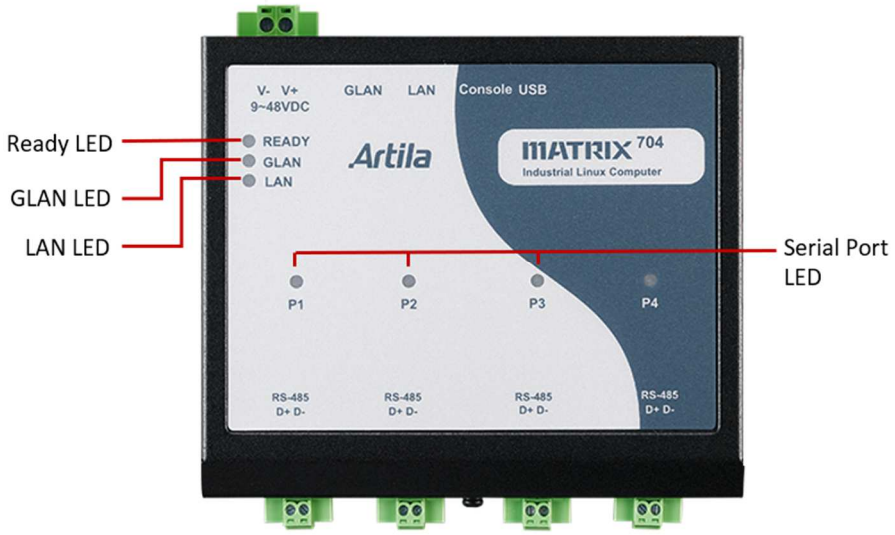
The Matrix-704 provides a multi-function reset button located on the right side of the chassis shown below:

The behavior of the reset button depends on how long you press the reset button.

Press and hold the reset button	Behavior	Network settings after reboot
< 3 seconds then release	will re-boot the Matrix-704	Retains last user settings
3~10 seconds then release	will reset the network setting to the factory default	eth0 IP: addr. by DHCP eth1 IP: IP192.168.2.127
> 10 seconds then release	will re-boot the Matrix-704 and restore the FW image from the SD card (If image not exist or incorrect will cause system boot up fail.)	eth0 IP: addr. by DHCP eth1 IP: IP192.168.2.127

3.2 LED Indicators

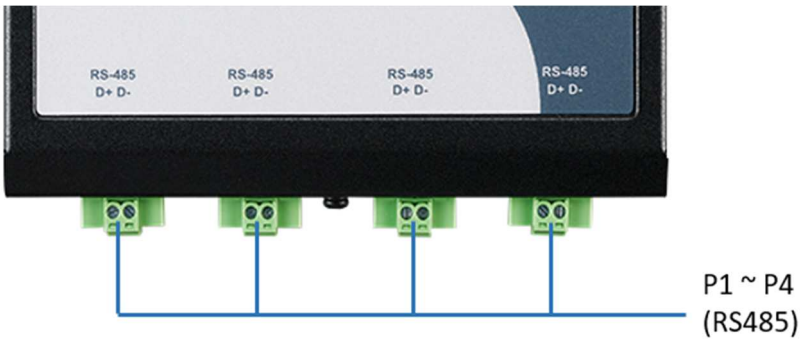
The LED provides the Matrix-704 operation information. The LED status is described as follow:



- **"Ready"** (Ready LED indicator): Ready LED will turn on in green color while power is properly supplied. After system is ready for operation, Ready LED will keep in solid orange color and a beep will be heard
- **"GLAN" & "LAN"** (Network LED indicator): Link and Activity LED will turn ON when the Ethernet cable is connected. When there is network data traffic, this LED will flash.
- **"P1 ~ P4"** (Serial Port LED indicator): These eight dual color LEDs indicate the data traffic at the serial ports. When RXD line is high then Green light is ON and when TXD line is high, Yellow light is ON.

3.3 Serial Port (RS-485)

The Matrix-704 provide total four RS-485 ports with surge-protected designed.



3.3.1 Pin assignment of RS-485

P1		P2		P3		P4	
D+	D-	D+	D-	D+	D-	D+	D-

The pin assignment is shown as following table.

Port No.	P1	P2	P3	P4
Device Mapping	ttyS1	ttyS2	ttyS3	ttyS4

3.3.2 Enable/Disable Termination resistor for RS-485

The Matrix-704 provides on-board 120Ohm termination resistor for each RS-485 port.

The default mode is “Disabled” the Termination Resistor (no Jumper-setting)

To enable the termination resistor, please remove the upper cover of the Matrix-704, and add jumper-setting that inside the packing.

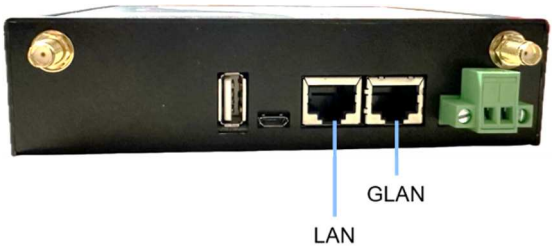
3.4 Power Connector

Connecting +9 ~ +48VDC power line to the Power in terminal block. In the meantime, Ready LED will turn on in green color while power is properly supplied.

After system is ready for operation, Ready LED will keep in solid orange color and a beep will be heard.

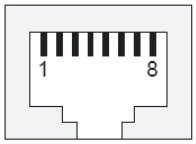
3.5 Ethernet LAN Port

The Ethernet Port use RJ45 connector for both 10/100LAN port (LAN) and GigaLAN port (GLAN).



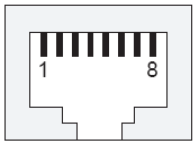
Pin definition of 10/100LAN connector.

PIN	Signal
1	ETx +
2	ETx -
3	ERx +
6	ERx -



Pin definition of GigaLAN port

PIN	Signal
1	TP0 +
2	TP0 -
3	TP1 +
6	TP1 -
4	TP2 +
5	TP2 -
7	TP3 +
8	TP3 -

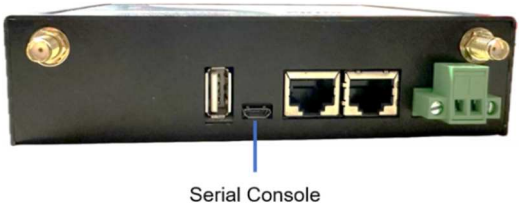


3.6 Console Port

There are one Serial Console port and one Debug Console port for programming debugging.

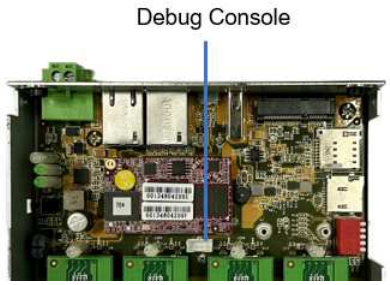
3.6.1 Serial Console Port

Serial Console port (Micro-USB connector) which located on Matrix-704 cabinet.

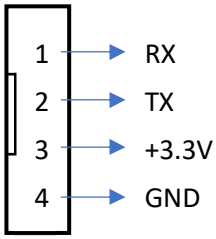


3.6.2 Debug Console Port

Debug Console: There is a 4-pin wafer box header (JP2) inside the box.



Pin assignment is: RX, TX, +3.3V, GND.



Therefore, you need to open the upper metal case and prepare or purchase a serial console cable to use the serial console port.

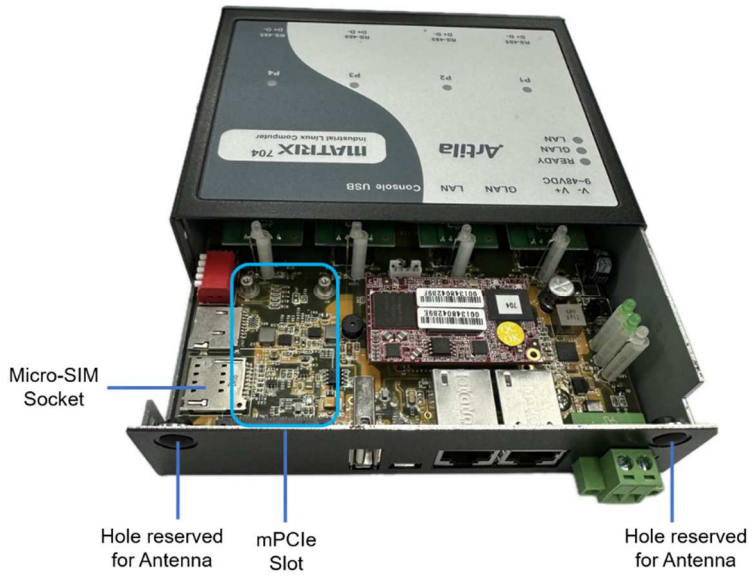
Or, it can be purchased “Console Cable” from Artila, P/N is CB-PHDF9-050.

3.7 USB Port

One type-A USB 2.0 ports are built for operation.

3.8 miniPCIe Slot

The Matrix-704 comes with one miniPCIe (mPCIe) slot and dual holes for antenna reserved for communication/networking functionality.



3.8.1 SIM card Socket

There is a micro-SIM card socket inside. (refer to above figure)

After removed top cover, it can be inserted a micro-SIM card accompanying LTE/4G module.

3.9 SD card socket

There is a SD card socket inside as data storage. It can be accessed by opening top cover for better security.