Matrix-710

Linux-Ready Cortex-A5 Industrial IoT Gateway

Hardware Guide

Version: 1.2
2023 APRIL

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
V 1.0	2017 July	Initial
V 1.01	2017 Nov.	Product Description updated to “IoT Gateway”
V 1.02	2019 Nov.	FCC instruction, Spec updated
V 1.1	2020 Dec.	Kernel version updated
V 1.2	2023 Apr.	Kernel version and reset function revised

Table of Contents

1. Introduction

Matrix-710 based on ARM Cortex-A5, is a Linux-ready IoT gateway with highly integrated and low power consumption. Matrix-710 provides an ideal building block that easily integrates with a wide range of target markets, such as industrial control, automation, mobile gateway and other 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
- One Gigabit and one 10/100Mbps Ethernet port
- Four USB 2.0 high speed (480Mbps) Host port
- Four Isolated RS-485 serial port and Four RS-485 serial port
- One RS232 port can be set by sharing with RS-485 port
- Two CAN port
- One microSD socket
- One full size miniPCIe socket inside
- +9 to +48VDC power input
- Ultra-low power consumption, less than 3 Watts
- 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: 4
- Supports 480Mbps hi-speed mode

CAN Bus Ports

- Type: 2 x CAN Bus 2.0 A/B compliant ports
- Speed: Up to 1Mbps
- Isolation: 1500Vrms
- CAN 1: 1~2 pin, CAN 2: 3~4 pin, GND: 5 pin

TTY (Serial) Ports

- 4 x Isolated RS-485 (1500Vrms isolation), P1 ~ P4
- 4 x Non-Isolated RS-485, P5 ~ P8
- Port 8 (COM), can be set to RS232 by software
- Direction Control: Auto, by hardware
- Connector: Terminal block

TTY (Serial) Port Parameters

- Baud Rate: Up to 921.6Kbps
- Parity: None, Even, Odd, Mark, Space
- Data Bits: 5, 6, 7, 8
- Stop Bits: 1, 1.5, 2
- Flow Control: RTS / CTS, XON / XOFF, None

Console / Debug Ports

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

SD Slot

- SD 2.0 compliant, supports SDHC
- 1 x microSD socket
- Storage capacity: Support up to 64G

Expansion Slot

- 1 x miniPCIe socket
- Supports Full-size / half-size

Power Requirement

- Input Voltage: 9~48Vdc (terminal block)
- Typical Power Consumption: 230mA@12VDC

General

- Realtime Clock: Yes, backup by super capacitor
- Buzzer: Yes
- Watchdog: Yes
- Dimensions (W x L x H): 166 x 108 x 35mm (6.54 x 4.25 x 1.37in)
- Weight: 340g (0.75lb)
- 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
- 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” SoM (System on Module) information for software operating & utility at following: http://www.artila.com/download/A5D35/Linux/

1.4 Packing List

- **Matrix-710:** Linux-ready Cortex-A5 536MHz Industrial IoT Gateway with 512MB SDRAM, 16GB eMMC Flash

1.5 Optional Accessory

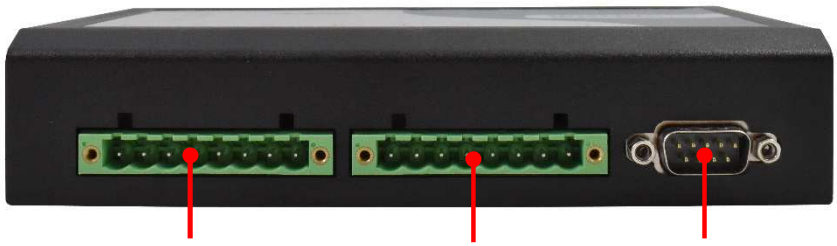
- **DK-35A** (36-DK35A-000): DIN RAIL Mounting Kit
- **PWR-12V-1A** (31-62100-000): 110~240VAC to 12VDC 1A Power Adaptor
- **Console Cable** (CB-PHDF9-050): 4Pin Wafer Box to DB9 Female, 50cm

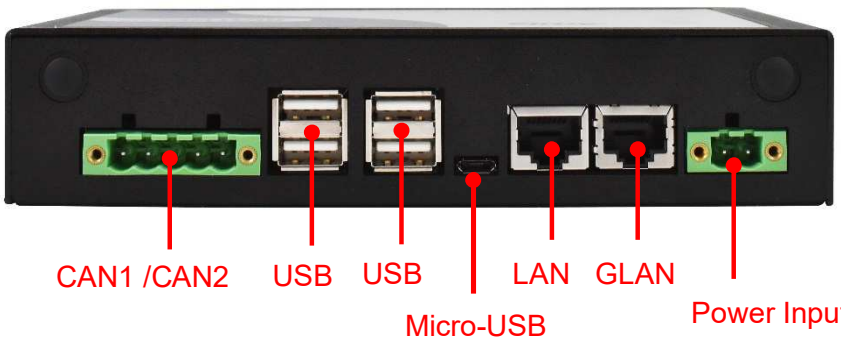
1.6 Optional Communication Module

- 4G/LTE miniPCIe Module with Antenna
- Wifi miniPCIe Module with Antenna

2. Layout

2.1 Connector & LED Indicator





2.2 Dimension

Unit: mm

3. Pin Assignment and Definitions

3.1 Multi-function Reset Button

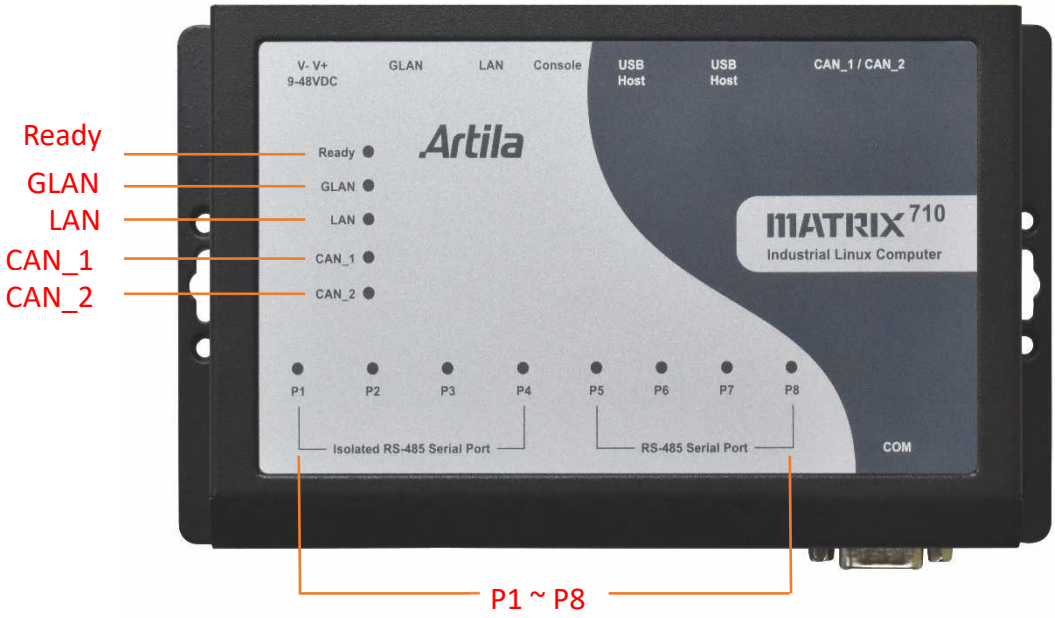
The Matrix-710 provides a multi-function reset button located on the right side of the chassis shown below

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	Re-boot the Matrix-752	Retains last user settings
3~10 seconds then release	Reset the network setting (The same setting as factory default)	eth0 IP: addr. by DHCP eth1 IP: IP192.168.2.127
> 10 seconds then release	Restore and back to factory default. User's data may disappear	eth0 IP: addr. by DHCP eth1 IP: IP192.168.2.127

3.2 LED Indicators

The LED provides the Matrix-710 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.
- **"CAN_1" & "CAN_2"** (CAN bus LED indicator): Link and Activity LED will turn ON when the CAN bus is active. This LED will flash while data communicating.
- **"P1 ~ P8"** (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.

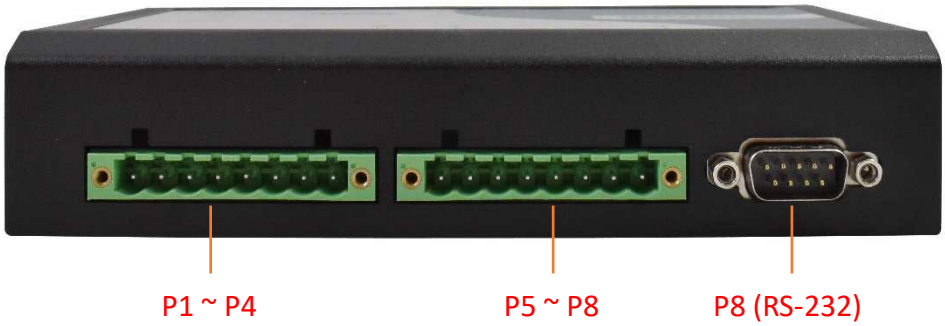
3.3 Serial Port

The Matrix-710 provide total eight RS-485 ports with automatic direction control.

P1 to P4: RS485 with 1500Vrms isolation protection.

P5 to P8: RS485 without isolation.

Meanwhile, P8 can be set as RS-232 using the connector labeled ‘COM’.



The pin assignment is shown as following table.

Port No.	P1	P2	P3	P4	P5	P6	P7	P8
RS-485	1500Vrms Isolation protection				Non-Isolation			
RS-232	-	-	-	-	-	-	-	Yes
Device Mapping	ttyS1	ttyS2	ttyS3	ttyS4	ttyUSB0	ttyUSB1	ttyUSB2	ttyUSB3

Pin assignment of RS-485

P1		P2		P3		P4		P5		P6		P7		P8	
D+	D-	D+	D-	D+	D-	D+	D-	D+	D-	D+	D-	D+	D-	D+	D-

Pin assignment of RS-232 (Port P8 only)

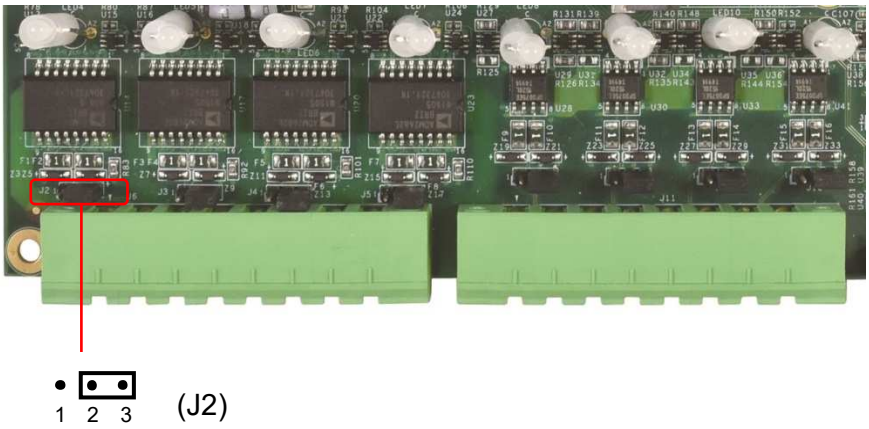
1	2	3	4	5	6	7	8	9
DCD	Rx	Tx	DTR	GND	DSR	RTS	CTS	N/A

Enable/Disable Termination resistor for RS-485

The Matrix-710 provides on-board 120Ohm termination resistor for each RS-485 port. To enable the termination resistor, please remove the upper cover of the Matrix-710, and the adjust the associated jumper to short position1 and position 2, shown below:

Port No.	P1	P2	P3	P4	P5	P6	P7	P8
Jumper No.	J2	J3	J4	J5	J7	J8	J9	J10

Termination Resistor Disabled (default)	
Termination Resistor Enabled	



(J2)

3.4 Power Connector

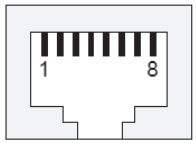
Connecting +9 ~ +48VDC power line to the Power in terminal block. In the meantime, “READY LED” will turn on in green color while power is properly supplied,
After system is ready for operation, “READY LED” will keep in solid orange color and a beep will be heard.

3.5 Ethernet LAN Port

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

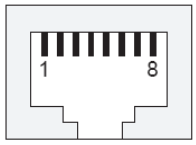
Pin definition of 10/100Base-T LAN port

PIN	Signal
1	ETX +
2	ETX -
3	ERX +
6	ERX -



Pin definition of GigaLAN port

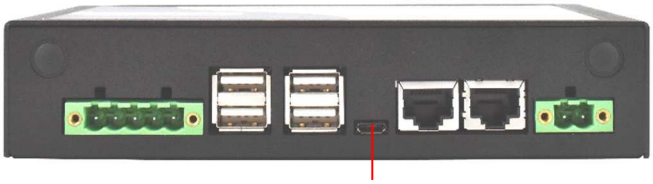
PIN	Signal
1	TP0 +
2	TP0 -
3	TP1 +
6	TP1 -
4	TP2 +
5	TP2 -
7	TP3 +
8	TP3 -



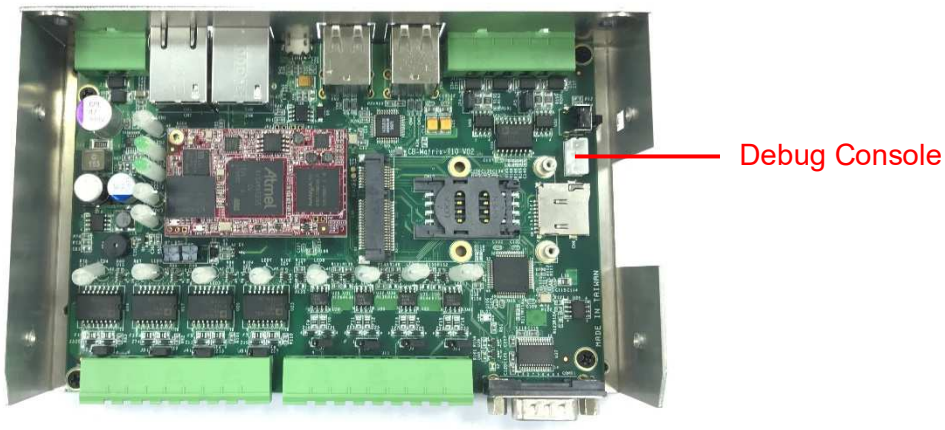
3.6 Console Port

There are two serial console ports for use:

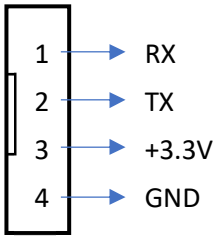
- Micro-USB connector which is USB client acts as serial console port.



- Debug Console: There is a 4-pin wafer box header (JP3) 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

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

3.8 CAN Bus Port

The Matrix-710 comes with two CAN bus ports. Users can open the CAN bus ports as network sockets, the socket names are ‘can0’ and ‘can1’ respectively.

Port Label.	CAN1	CAN2
Socket Mapping	can0	can1

Pin assignment of CAN Bus Port

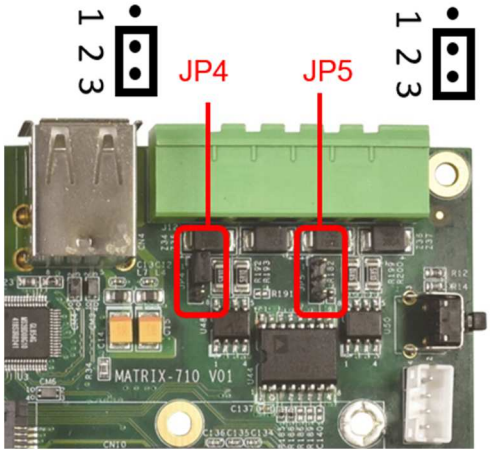
Pin	5	4	3	2	1
Signal	GND	CAN2_Lo	CAN2_Hi	CAN1_Lo	CAN1_Hi

Enable/Disable Termination resistor for CAN bus

The Matrix-710 provides on-board 120Ohm termination resistor for each CAN bus port. To enable the termination resistor, please remove the upper cover of the Matrix-710, and the adjust the associated jumper to short position1 and position 2, shown below:

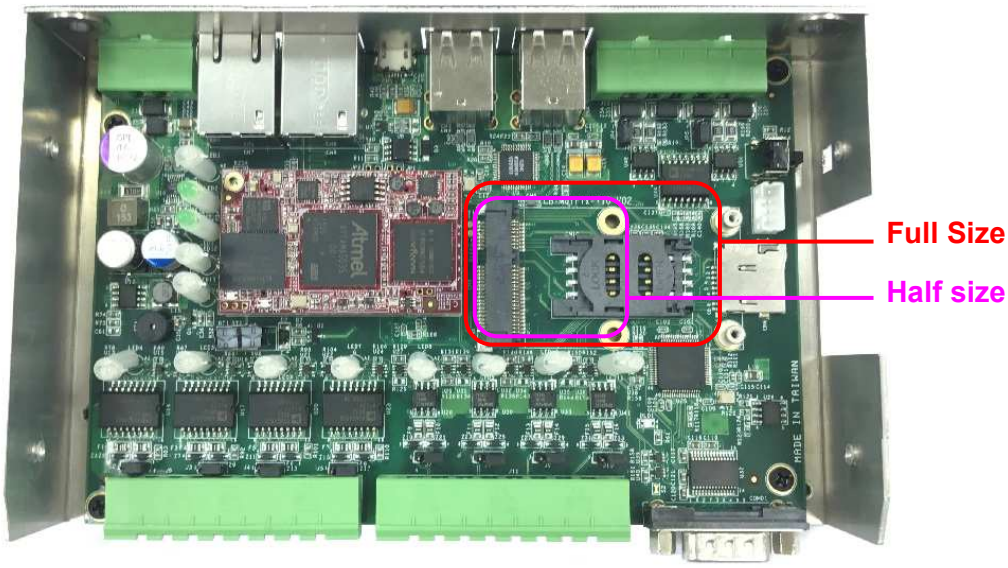
CAN Port No.	CAN2	CAN1
Jumper No.	JP5	JP4

Termination Resistor Disabled (Default)	
Termination Resistor Enabled	



3.9 miniPCIe socket

The Matrix-710 comes with a miniPCIe socket also SIM card socket reserved for communication/networking functionality.



3.10 SD card socket

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