

Matrix-310

Programmable Industrial IoT Gateway

Hardware Guide



Version: 1.0
2023 January

Artila

Copyright © Artila Electronics Co., Ltd. All Rights Reserved.

Trademarks

The Artila logo is a registered trademark of Artila 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 Artila.

Artila provides this document as is, without warranty of any kind, either expressed or implied, including, but not limited to its particular purpose. Artila 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, Artila 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.

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	2023 Jan.	Initial

Table of Contents

1. Introduction	5
1.1 Features	5
1.2 Specifications (Hardware).....	6
1.3 Specifications (Software).....	8
1.4 Packing List.....	8
1.5 Optional Accessory.....	8
2. Layout	9
2.1 Connector & LED Indicator	9
2.2 Mounting	9
2.3 Dimension	10
3. Pin Assignment and Definitions.....	11
3.1 Power Connector.....	11
3.2 LED Indicators.....	11
3.3 Ethernet LAN Port	12
3.4 Console Port.....	12
3.5 Serial Port	13
3.6 Relay Out	14
3.7 Digital Input	15
3.8 ID Setting	16
3.9 Reset Button.....	17
3.10 SD card Socket	17

1. Introduction

Matrix-310 from Artila provides multi-communication via an Arduino-based, C/C++ programmable industrial IoT gateway. With the integrated ESP32 Xtensa Dual-Core 32-bit LX6 Microprocessor, Artila's IoT gateway provides up to 240 MHz of frequency, as well as Wi-Fi (802.11b/g/n, 2.4GHz single band) and dual-mode Bluetooth.

It features dual available / reliable networks, dual Serial ports and digital In/Out connectivity for transmission of acquired data to the cloud makes it ideal for real-time monitoring and predictive maintenance also optimization and deployment of factory applications, such as industrial automation, environment monitoring and smart city infrastructure.

The gateway provides software via an Arduino IDE. Ideal for real-time monitoring and predictive maintenance functions, which are commonly performed in Industrial IoT environments, the Matrix-310 provides Dual Serial ports and digital In/Out connectivity for data transmission to the cloud. Users can install the ESP32 Arduino core through board manager of the Arduino IDE.

1.1 Features

- Rugged Design for Harsh Industrial Environment
- Arduino-Based Programmable Industrial IoT Gateway
- Espressif ESP32 Xtensa® Dual-Core 32-bit LX6 Microprocessor, 240 MHz
- Onboard 520KB SRAM, 4MB Flash
- Suitable for Accessing Modbus Device
- Easy Software Development (IDE/C-language/Arduino/Micro Python)
- One LAN Port, 10/100Mbps Ethernet
- Two Serial Ports: 1xRS-485 & 1xRS-232
- Wireless: IEEE 802.11b/g/n, 2.4GHz Single
- 2x Digital Inputs and 1xRelay out
- ID Setting by Rotary Switch
- One Micro-SD Socket Internally
- Wide-Range Temperature Operating
- DIN-Rail Mounting, Optional Wall-Mounting
- Protective Earthing Design with Chassis Ground Screw

1.2 Specifications (Hardware)

SOC (ESP32-WROOM-32U)

- MCU: ESP32-D0WD-V3, Xtensa® dual-core 32-bit LX6 microprocessor
- Frequency: Up to 240MHz
- SDRAM: 520KB for data and instructions
- Flash: 448KB for booting and core functions
- Wi-Fi (ESP32): IEEE 802.11b/g/n, 2.4GHz single band
FCC ID: 2AC7Z-ESP32WROOM32U

Network Interface

- Type: 1 x 10/100Mbps Ethernet (SPI interface)
- Connector Type: RJ45

TTY (Serial) Ports

- COM1: Isolated RS-485 (1500Vrms isolation)
- COM2: RS-232
- Direction Control (RS-485): Auto, by software
- RS-485 Signal: Data+, Data-
- RS-232 Signal: TX, RX
- Connector: Terminal block
- LED Indicator: YES

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

Relay Output

- 1 x Digital Output Channels (Signal Relay)
- Contact Rating: 125VAC@0.5A / 30VDC@1.0A
- Max. switching Voltage: 125VAC/60VDC
- Max. switching Current: 2A
- Signals: NC, NO, COM

Digital Input

- 2 x Digital Input Channels
- Isolation Protection: 5000Vrms (Photo Coupler)
- Logical High: 5~24VDC
- Logical Low: 0~1.5VDC

Power Requirement

- Input Voltage: +9~+40VDC
- Connector: Terminal block
- Typical Power Consumption: 12VDC@150mA

Console

- 1 x Micro-USB console port
- Flashing applications to the chip & Debug

SD Slot

- 1 x microSD socket inside (SPI Interface)
- SD 2.0 compliant, supports SDHC

ID Setting

- 1 x 8-position rotary switch
- Device ID setting or Application mode selection

General

- Watchdog (WDT): Yes (ESP32)
- Real-time Clock (RTC): Yes (ESP32)
- Dimensions (W x H x D): 30 x 140 x 95mm (1.18 x 5.51 x 3.74in)
- Net Weight: 424.5g (0.93lb)
- Operating Temperature: 0~70°C (32~158°F)
- Regulation: CE Class A, FCC Class A
- Installation: DIN-Rail mounting or Wall mounting

1.3 Specifications (Software)

Easy to Use C/C++ Platform (Arduino ESP32)

- Matrix-310 is C/C++ programmable, Arduino (ESP32) compatible industrial IoT platform
- Installed Arduino core (ESP32) through board manager of Arduino IDE

Free Application Development Tools

- Free Xtensa® C/C++ toolchain
- Free Arduino official IDE
- Free Microsoft Arduino plugin for VS code

1.4 Packing List

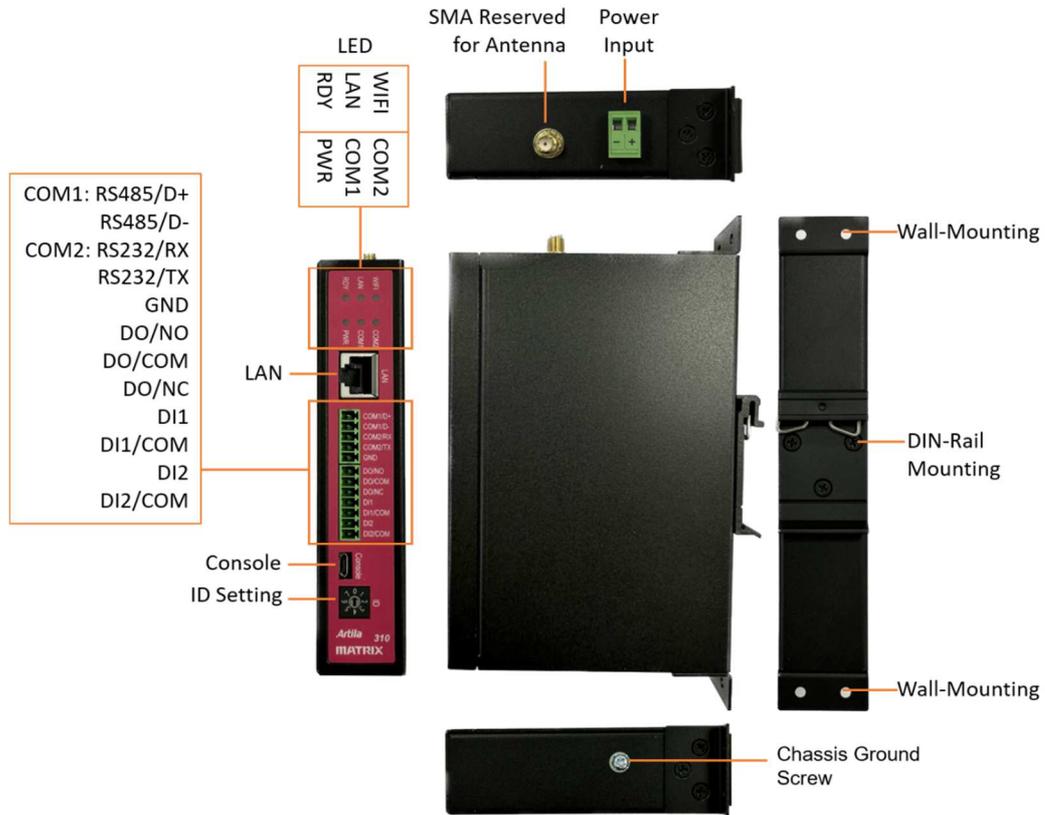
- **Matrix-310:** Programmable Industrial IoT Gateway

1.5 Optional Accessory

- **PWR-12V-1A:** 100~240VAC to 12VDC@1A Power Adaptor

2. Layout

2.1 Connector & LED Indicator

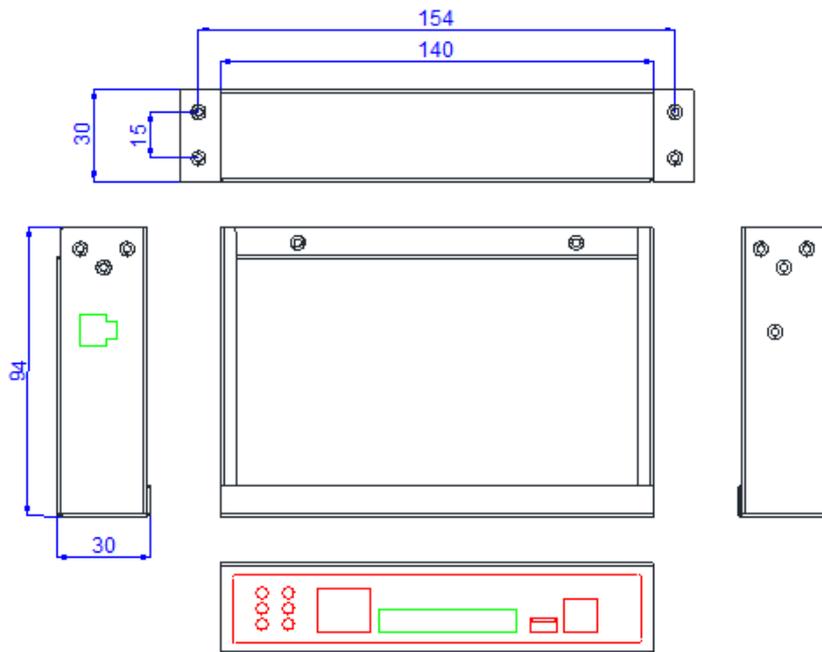


2.2 Mounting



2.3 Dimension

Dimensions (W x H x D): 30 x 140 x 95mm (1.18 x 5.51 x 3.74in)

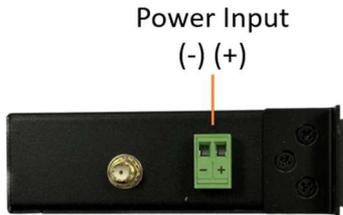


Unit: mm

3. Pin Assignment and Definitions

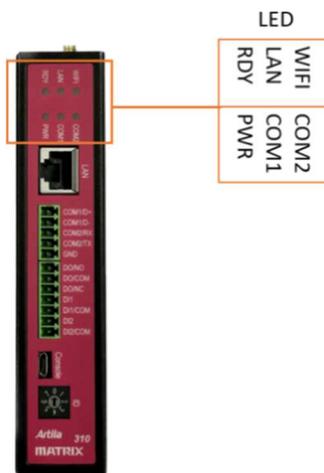
3.1 Power Connector

Connecting +9 ~ +40VDC power line to the Power in terminal block.



3.2 LED Indicators

The LED provides the Matrix-310 operation information. The LED status is described as follow:



- **“PWR”** (Power LED indicator): PWR LED turns on (green color) after 3.3Vdc power activity
- **“RDY”** (Ready LED indicator): RDY LED turns ON (green color) when ESP32 is ready for operating.
- **“COM1” & “COM2”** (Serial Port LED indicator): Bi-color LEDs indicate the data traffic at the serial ports: COM1(RS485) and COM2(RS232).
When D+/RX line is high: Yellow light is ON
When D-/TX line is high: Green light is ON
- **“LAN”** (Network LED indicator): Link and Activity LED will turn ON when the Ethernet cable is connected. When there is network data traffic, this Bi-color LED will light up.
- **“WIFI”** (WIFI LED indicator): This Bi-color LED activity is defined by user after enable “WIFI” function.

3.3 Ethernet LAN Port

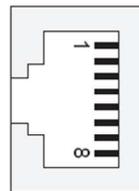
There is a 10/100Mbps Ethernet by RJ45 connectors.

It is designed via SPI interface (Mode 0 & mode 3) connected to MCU (ESP32)



The Ethernet Port use RJ45 connector. Pin-Assignment as below:

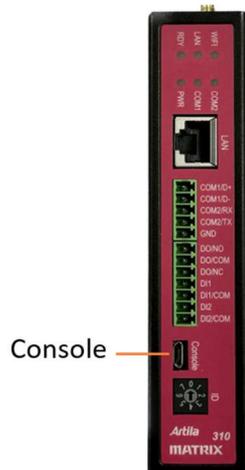
PIN	Signal
1	ETx +
2	ETx -
3	ERx +
6	ERx -



3.4 Console Port

There is one Console port by micro-USB connector.

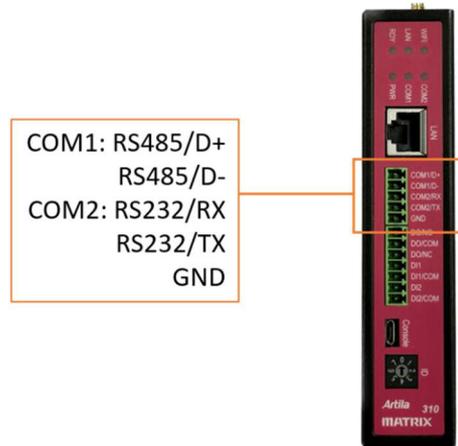
A Micro-USB port is used for power supply (+5VDC) to the board (only basic operation and flashing) and for flashing applications to the MCU (ESP32) as well as the communication with the chip via the on-board USB-to-UART bridge.



3.5 Serial Port

The Matrix-310 has two serial ports:

- One RS-485 port (COM1: D+/D-)
- One RS-232 port (COM2: RX/TX)



RS-485 is designed without isolation that automatically direction controlled via software

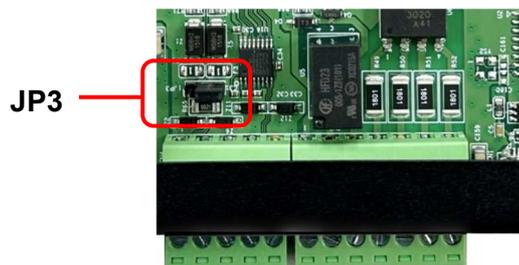
The pin assignment is shown as following table:

Port No.		Pin1	Pin2	Pin3	Pin4	Pin5
COM1	RS-485	D+	D-	--	--	GND
COM2	RS-232	--	--	RX	TX	GND

Enable/Disable Termination resistor for RS-485 (JP3)

The Matrix-310 provides on-board 120Ohm termination resistor for each RS-485 port. To enable the termination resistor, please remove the upper cover of the Matrix-310, and the adjust the associated jumper to short as below:

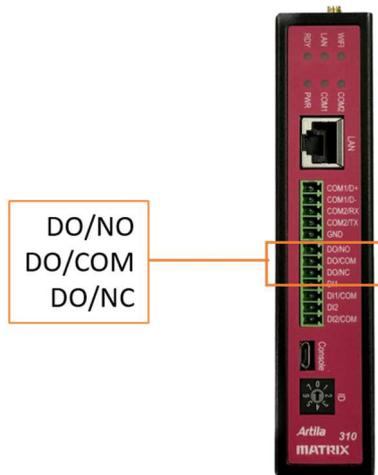
Termination Resistor Disabled (default)	 1 2 3
Termination Resistor Enabled	 1 2 3



3.6 Relay Out

There is one Digital Output Channels (Signal Relay).

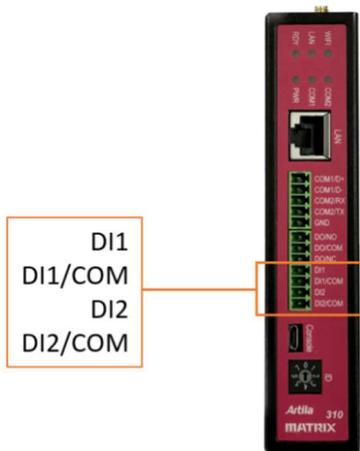
- Contact Rating: 125VAC@0.5A / 30VDC@1.0A
- Max. switching Voltage: 125VAC/60VDC
- Max. switching Current: 2A
- Signals: NC, NO, COM
- 1 Form C configuration



COM: Common ground

3.7 Digital Input

There are two Digital Input channels



The specification of the isolated input channels is:

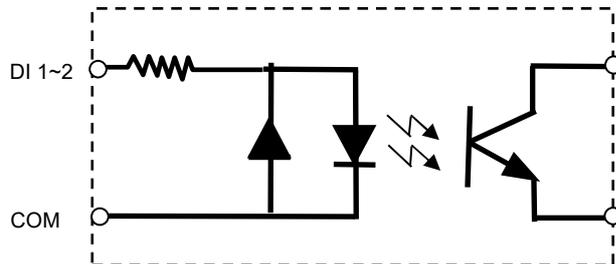
Logical High: 5~24Vdc

Logical Low: 0~1.5Vdc

Isolation resistance: 10^{11} Ohms@500VDC

Response time: 20 μ s (Max.)

Isolation: 5000Vrms (Photo Coupler)



DIx: Isolated digital input channels.

COM: Common ground

3.8 ID Setting

Matrix-310 equips an 8-position rotary switch for Device ID setting or Application mode selection.

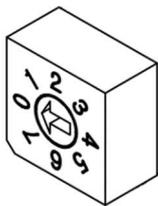


To program/define 8-positions by following the table listed below:

(H: High, L: Low)

ESP32	8 positions (0~7)							
	0	1	2	3	4	5	6	7
Pin06 (GPI34)	H	L	H	L	H	L	H	L
Pin11 (GPIO26)	H	H	L	L	H	H	L	L
Pin07 (GPI35)	H	H	H	H	L	L	L	L

For example,



Set ID at "Position 0" response to MCU is "111" (1=High / H)

3.9 Reset Button

Press this Reset Button (inside the cabinet) to restart the system.



3.10 SD card Socket

There is a micro-SD card socket inside as data storage.
After removed top cover, it can access the SD card.

