RIO-2017

Analog Input Remote I/O Module

User Guide

Version 1.0

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1. Introduction

RIO-2017 is an Analog input remote I/O module supports Modbus TCP and Web interface. The analog input channel can be configured as current and voltage and it is auto calibrated and 2500Vrms isolated. In addition to the analog input, RIO-2017 also has one relay output. Therefore it is suitable for remote data acquisition and control. RIO-2017 has a tiny web server built-in which allows user to access it through a web browser. A data exchange can be achieved by AJAX or Modbus TCP.

1.1 Features

- Remote Analog Input Module with Web Access AJAX and Modbus TCP
- One 10/100Mbps Ethernet port
- 8 channels 16-bit A/D
- Isolation up to 2500Vrms
- One channel relay output port
- Form A or form B relay with contact rating 30VDC@1A or 125VAC@0.5A
- Support Web-based I/O control
- DIN Rail mounting
- Windows configuration utility included

1.2 Specification

- **Ethernet:**
  - 10/100Mbps, RJ45
  - Protection: 1500V Magnetic isolation
  - Protocol: Modbus / TCP, UDP, HTTP, DHCP
- **Isolation analog input:**
  - Channel number: 8
  - Input type: Differential input
  - Input mode: Voltage / Current (0~20mA)
  - Resolution: 16-bit
  - Input range:
    - ✓ Unipolar: 0~150mV, 0~500mV, 0~1V, 0~5V, 0~10V
    - ✓ Bipolar: +/- 150mV, +/- 500mV, +/- 1V, +/- 5V, +/- 10V
    - ✓ Current: 0~20mA
  - Input impedance: 20MOhm (voltage), 120Ohm (current)
  - Accuracy: +/- 1% FSR
  - Isolation: 1500VDC
- **Relay output:**
  - Channel number: 1
  - Contact rating: 30VDC@1A or 125VAC@0.5A
- **Power:**
  - 9~48VDC terminal block

  - Protection: Auto polarity and surge protect
- **Dimension:** 108 x 78 x 25mm (H x W x D)

1.3 Packing List

- RIO-2017: Analog Input Remote I/O Module
- Software utility download from Artila FTP

1.4 Optional Accessory

- DK-35A (36-DK35A-000): DIN RAIL Mounting Kit
- PWR-12V-1A (31-62100-000): 110~240VAC to 12VDC 1A Power Adaptor

2. Layout


9~48VDC
Power In
LAN
Relay
Output
A/I
CH7~8
Artila
RIO 2017
Remote I/O Module
LAN
Ready
Power
A/I CH1~6

3. Pin Assignment and Definition

3.1 Power Connector

Connecting 9~48VDC power line to the Power in terminal block. If the power is properly supplied, the Power LED will keep solid green color and a beep will be heard.

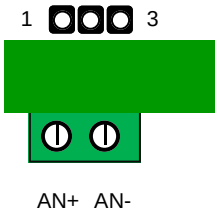
3.2 LED Status

The LED provides the RIO-2017 operation information. The LED status is described as follow:

- **Power LED:** Power LED keeps ON if power (+9VDC to +48VDC) is correct.
- **Ready LED:** Ready LED keeps ON when RIO-2017 firmware is ready for operation.
- **LAN LED:** Link and Activity LED will turn ON when the Ethernet cable is connected. When there is network data traffic, this LED will flash.

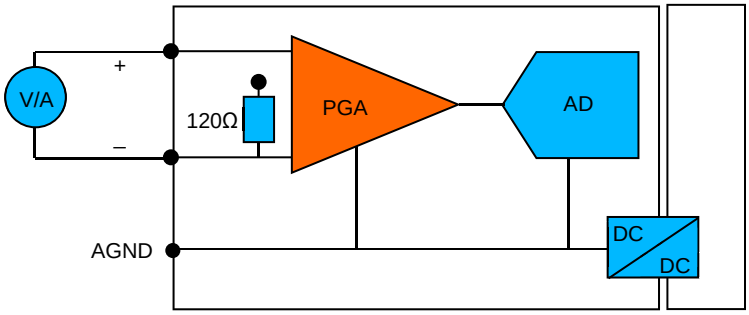
3.3 Input Mode Selection Jumper (JP4 ~ JP11)

To configure the voltage or current input, users need to open the metal case to set the jumper to proper position.



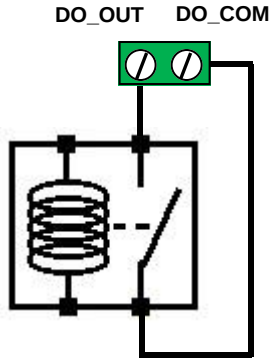
Voltage Input: Short 1-2 (Default setting)

Current Input: Short 2-3 (a 120Ohm resistor in shunt with +/-)



3.4 Relay Output Connector (DO_OUT, DO_COM)

The relay provides normal open output as shown. It can switch voltage source up to 30VDC@1A or 125VAC@0.5A.



3.5 Factory Default Settings

IP Address: 192.168.2.127

Netmask: 255.255.255.0

Modbus mode: Modbus TCP

Port number: 502

Relay output: Normal open

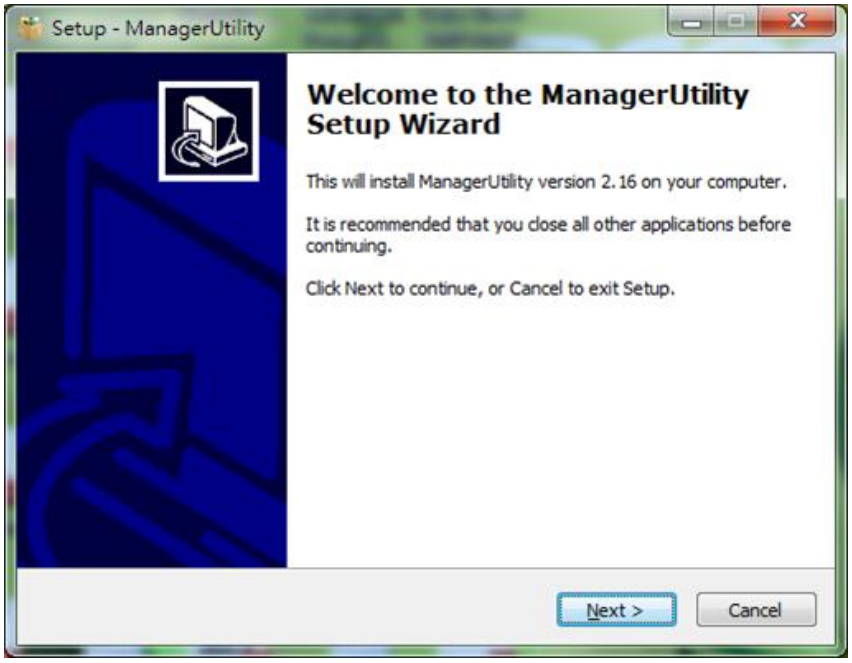
Web server: enabled

Home page: http://192.168.2.127:5003

Telnet console: telnet 192.168.2.127 5001

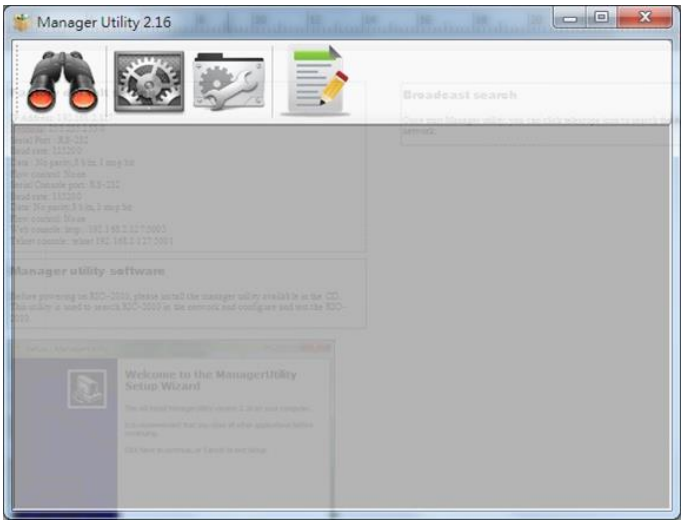
4. Manager Utility Software

Before powering on RIO-2017, please install the manager utility available from Artila Website download section. This utility is used to search RIO-2017 in the network and configure and test the RIO-2017.



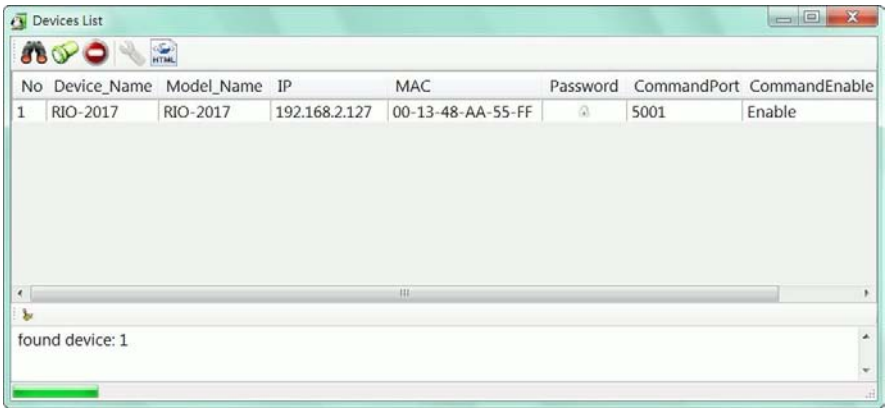
4.1 Broadcast Search

Once start Manager utility, you can click telescope icon to search the RIO-2017 in the network.



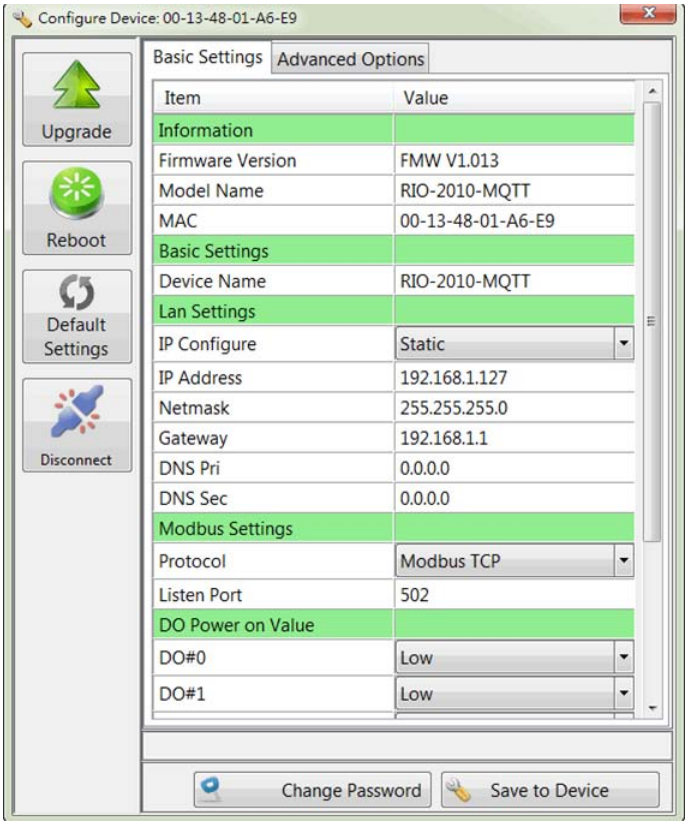
4.2 Configure RIO-2017

Once RIO-2017 is discovered, Manager will show following information.



4.3 Basic Settings

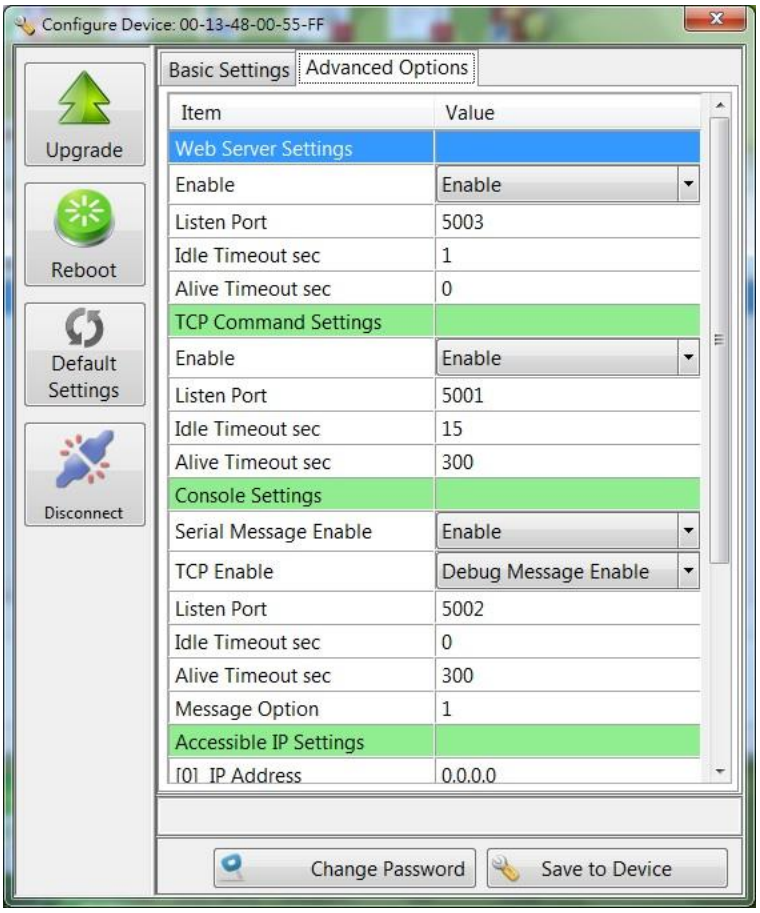
Click the RIO-2017 will open the windows to configure. The Basic settings allows user to configure following settings:



- **Device Name:** user configurable device name
- **IP Configure:** Static IP or DHCP
- **IP Address:** specify IP address
- **Netmask:** Netmask settings
- **Gateway:** Gateway IP address
- **Listen Port:** Modbus Port number
- **AI#:** Analog input range setting

4.4 Advanced Options

The Advanced options allow user to configure following settings:



- **Web Server Settings**
  - Enable: Enable or Disable Web server
  - Listen Port: Web server port
  - Idle Timeout sec: disconnect connection while no data on line and time out occur
  - Alive Timeout sec: disconnect connection while no data on line, time out and no response to Ack signal

- **TCP Command Settings**
  - Enable: Enable or Disable TCP command port
  - Listen Port: TCP command port number
  - Idle Timeout sec: disconnect connection while no data on line and time out occur
  - Alive Timeout sec: disconnect connection while no data on line, time out and no response to Ack signal

- **Console Settings**
  - Console setting is used for RIO-2017 designer to perform system debug
  - Currently it is not open for user's application

- **Accessible IP Settings**
  - RIO-2017 provides access control functionality. User can configure the IP address and Netmask range and masters only with these IP address can access RIO-2017.

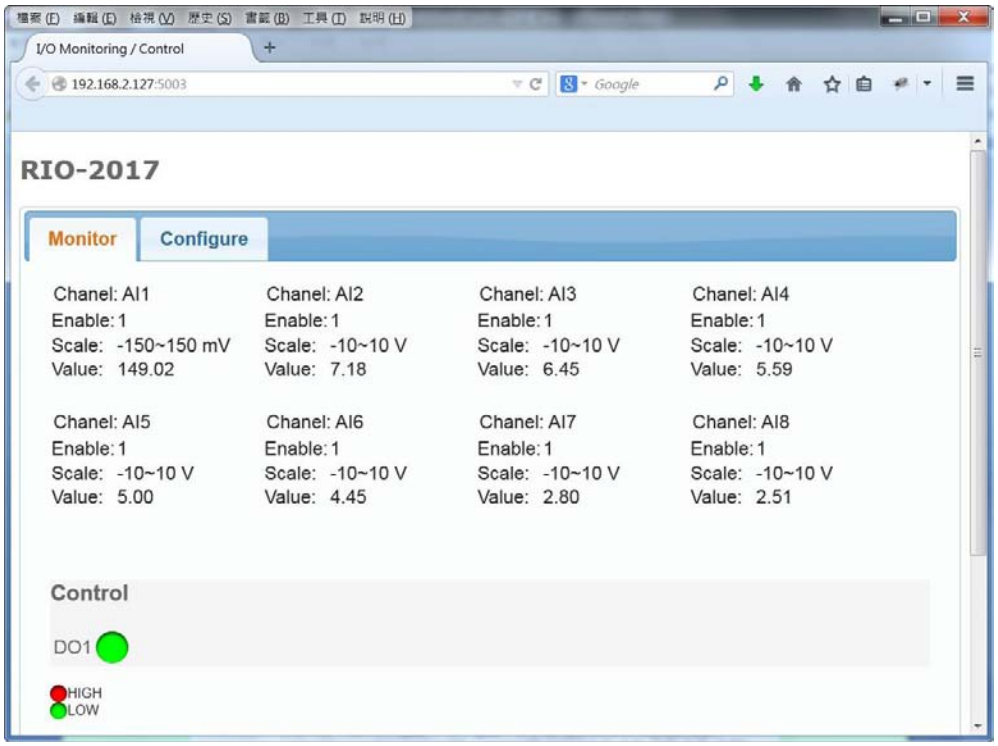
4.5 How to Access the Data of RIO-2017

There are three way to access RIO-2017:

1. **Modbus:** User can use Modbus TCP to access RIO-2017. Using the holding register of RIO-2017, user can read the data of analog channels and control the relay On/Off. The register format of RIO-2017 is available in the appendix.
2. **Web application:** RIO-2017 support AJAX interface. It is designed for user to develop Web based application. A demo web page is available for your reference.
3. **X86 and Matrix ARM Linux API:** For users who want to develop their own application software using C, they can use AIO library which is bundled with RIO-2017. Please refer the on line help of the API for the information of using the AIO library.

4.6 Web-based I/O Control

In addition to Modbus TCP, user can also use Web port to access data and information of RIO-2017. RIO-2017 uses AJAX scheme to read and write I/O of the RIO-2017. Use GET request together with command parameter, you can retrieve data and information from the web server of RIO-2017. Use mouse to click the DO icon can trigger DO on/off.



4.7 AJAX Command

- **GET ALL Value:**

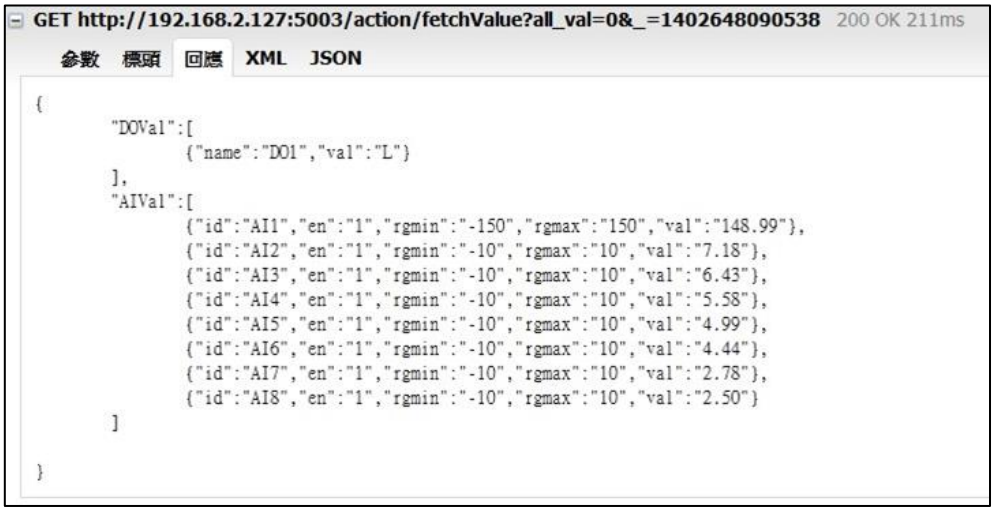
To get all value and settings of analog and digital channels of RIO-2017, you can use

GET URL:port/action/fetchValue?all_val=0

For example:

GET http://192.168.2.127:5003/action/fetchValue?all_val=0

The response data in **JSON** format as follow:



DOVal:

name: DO channel number

val: H (High), L (Low)

AIVal:

id: AI channel number

en: 1 (Enable), 0 (Disable)

rgmin: minimum value

rgmax: maximum value

val: current value

- **GET Analog Input Range:**

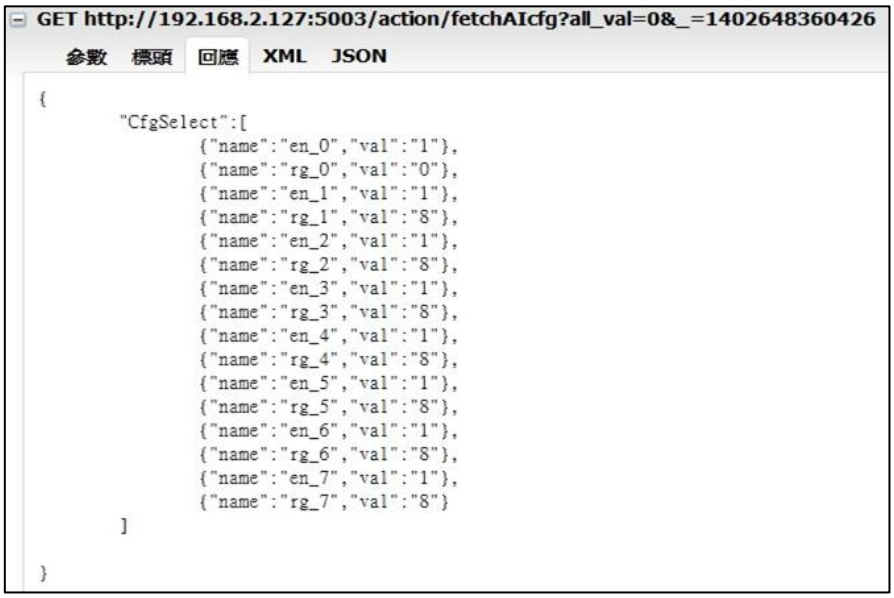
Settings can be done by command:

GET URL:port/action/fetchValue?all_val=0

For example:

GET http://192.168.2.127:5003/action/fetchAIcfg?all_val=0

The response data in **JSON** format as follow:



CfgSelect:

en_X: 1 (Enable), 0 (Disable)

rg_X: 0 (input range: -150mV~150mV)

1 (input range: 0mV~150mV)

2 (input range: -500mV~500mV)

3 (input range: 0mV~500mV)

4 (input range: -1V~1V)

5 (input range: 0V~1V)

6 (input range: -5V~5V)

7 (input range: 0V~5V)

8 (input range: -10V~10V)

9 (input range: 0V~10V)

10 (input range: -0~20mA)

- **SET Analog Input Range:**

Settings can be done by command:

POST URL:port/action/CfgAI

For example:

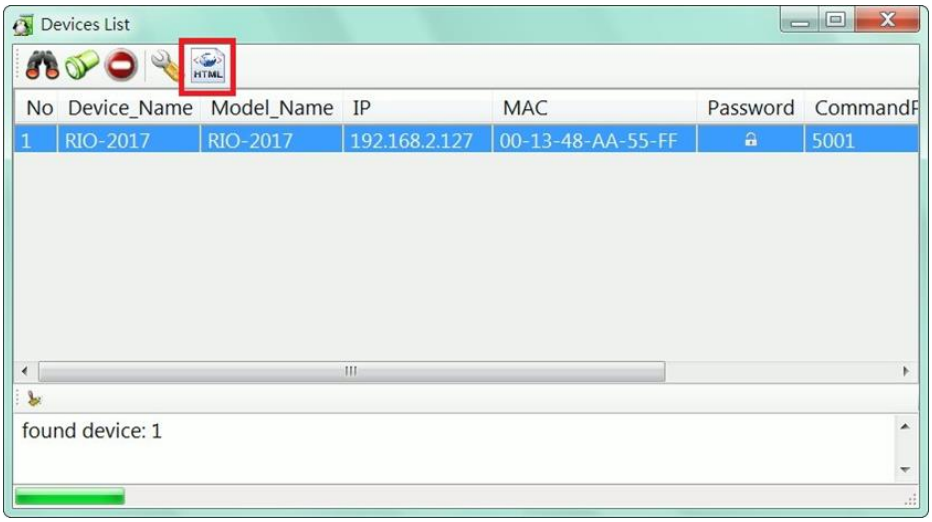
POST http://192.168.2.127:5003/action/fetchAIcfg?all_val=0

- **Set Relay Output:**

POST URL:port/action/CtrlDO1

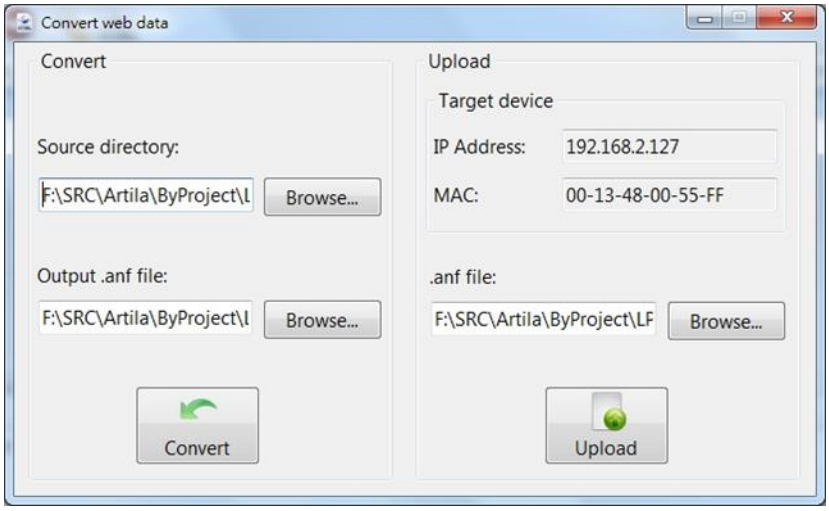
4.8 Convert HTML File to Anf Binary

User can customize web page to access RIO-2017. Once ready, you can use Manager utility to convert the web files to binary file (.anf) to upload to RIO-2017. First to create a folder to save all the Web files and then click the HTML icon to convert web data to .anf file and upload to RIO-2017.



The default web page source is available at Artila Web for download.

Click the HTML icon and use following tool to convert the folder of Web page files to a binary file with extension of anf and upload it to web server of RIO-2017.



4.9 Access RIO-2017 via Modbus TCP

RIO-2017 supports Modbus TCP access. The Holding register is as follow:

Register Map

Starting address	Stopping address		
0x0000	0x000F	Temp sensor 1	RIO-2010 only
0x0010	0x001F	Temp sensor 2	RIO-2010 only
0x0020	0x002F	Temp sensor 3	RIO-2010 only
0x0100	0x0105	AI1	RIO-2017 only
0x0106	0x010B	AI2	RIO-2017 only
0x010C	0x0111	AI3	RIO-2017 only
0x0112	0x0117	AI4	RIO-2017 only
0x0118	0x011D	AI5	RIO-2017 only
0x011E	0x0123	AI6	RIO-2017 only
0x0124	0x012B	AI7	RIO-2017 only
0x012A	0x012F	AI8	RIO-2017 only

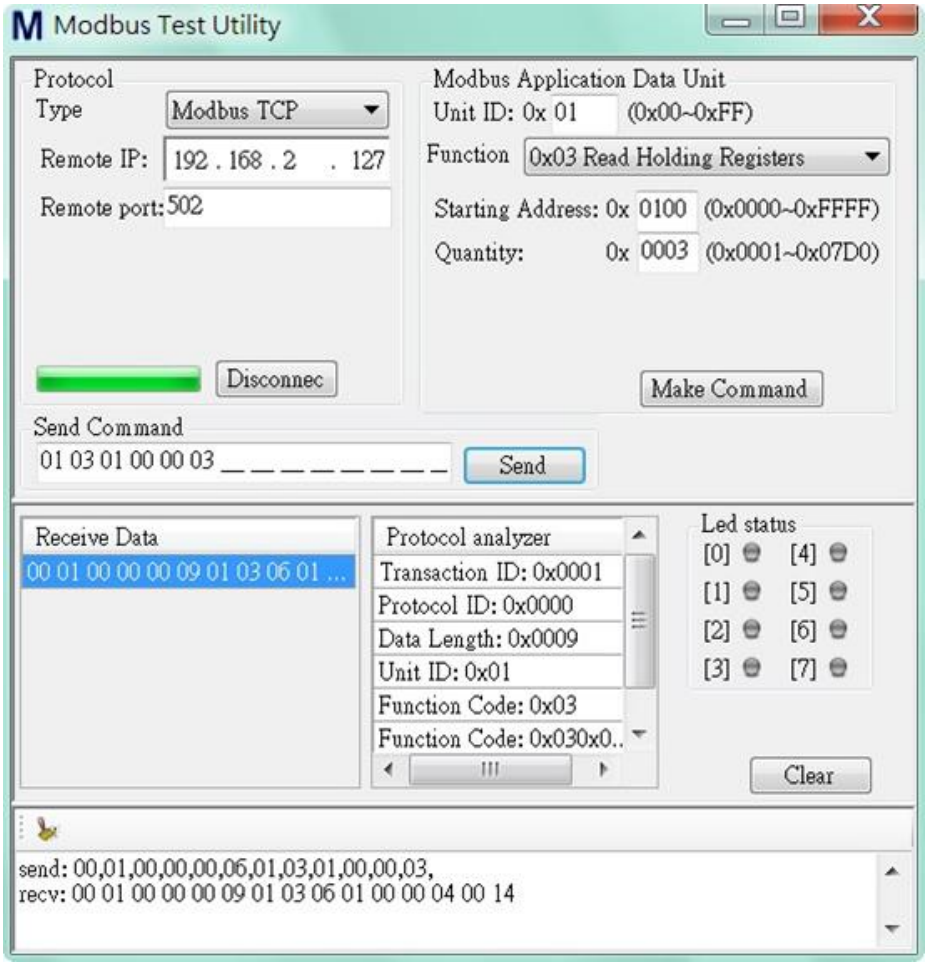
Analog Input Holding Register

Register[0] Hi	AI enable/disable	0x01: enable 0x00: disable	
Register[0] Lo	AI Value flag	0x00: + 0x01: -	
Register[1] Hi	AI integer Hi		
Register[1] Lo	AI integer Lo		
Register[2] Hi	AI decimal Hi		
Register[2] Lo	AI decimal Lo		

Example:

Read AI1: Starting: 0x0100, Quantity: 0x0003

Response: enable, +4.20



Example:

Read AI4 and AI5: Starting: 0x0112, Quantity: 0x0006

Response: AI4: enable, +70.15, AI5: enable, -0.15