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SAN TELEQUIP

USER MANUAL FOR RIO MTCP

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1. Introduction

Sensors are used to continuously monitor and control various process parameters. These measurements help improving processes for adhering to product specifications & improve product quality. Monitoring and controlling Temperature, Pressure, Level, Flow etc. are common occurrences for any process. IO Converters convert the Analog & Digital data from Sensors to Modbus to be taken to SCADA for further processing RIO MTCP is used to monitor field inputs and control outputs through Modbus.

It acts as a Modbus slave and updates status of Analog and Digital inputs in predefined Modbus registers. Digital outputs can be controlled through Modbus registers. It is designed to be used in Industrial panels and operates on 24V DC Power supply.

2. Features

- Supports up to 6 IO Cards of any combination.
- Wide range of IO modules.
- Modbus Slave interface for SCADA.
- Configurable Modbus Interface settings via Web Page.
- Robust design with Rack type mounting.
- Industrial screw type Power terminal block for 24V DC operation.
- Highly Modular.
- 6 slots for IO Boards. Can use any combination of 6 IO boards.
- DI Board with 12 inputs, DO board with 12 Outputs, AI board with 8 Inputs & AO board with 4 outputs PWM & RTD inputs also available on request.
- File storage SD card up to 4GB.
- USB for Device data transfer.

3. Operation

RIOMTCP is Modbus slave device. It is configured using Modbus predefined registers. Device ID baud rate, parity and stop bits, IP Address can be configured.

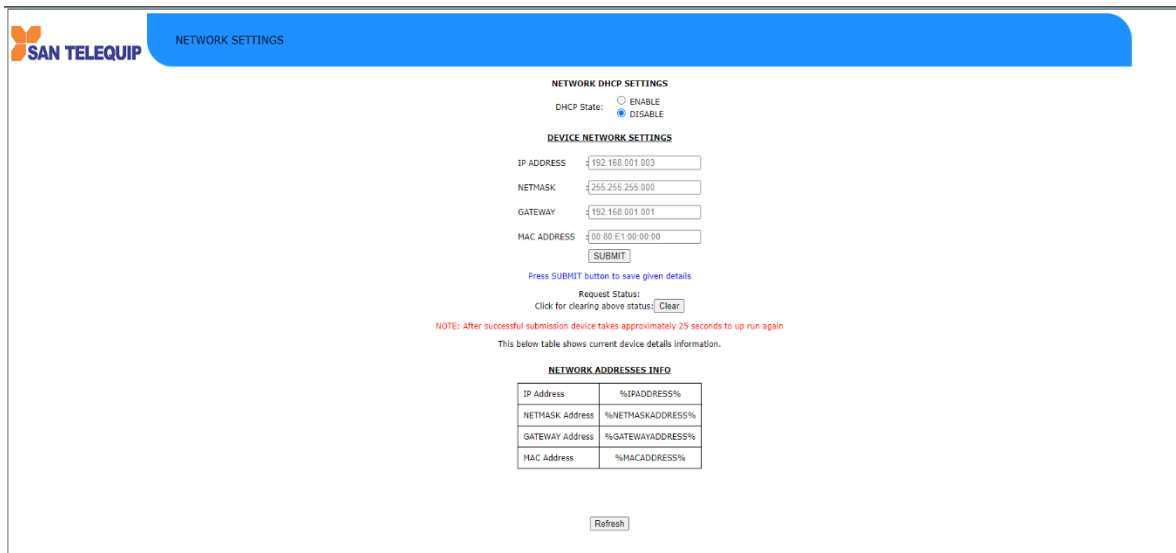
After configuration, status of Analog inputs, Digital inputs and Digital outputs is shown in predefined Modbus registers which can be observed in Modscan software.

Digital outputs can be controlled by updating the value in predefined Modbus registers of digital outputs.

4. Configuration Details

4.1 Configuration to change IP address:

Default IP address of RIOMTCP is 192.168.1.8. Set your PC IP in the range of 192.168.1. xx. Access the RIO MTCP IP address in Google chrome/Microsoft Edge etc.



NETWORK SETTINGS

NETWORK DHCP SETTINGS
 DHCP State: ☐ ENABLE ☒ DISABLE

DEVICE NETWORK SETTINGS

IP ADDRESS:
 NETMASK:
 GATEWAY:
 MAC ADDRESS:

Press SUBMIT button to save given details

Request Status:
 Click for clearing above status:

NOTE: After successful submission device takes approximately 25 seconds to up run again

This below table shows current device details information.

NETWORK ADDRESSES INFO	
IP Address	%IPADDRESS%
NETMASK Address	%NETMASKADDRESS%
GATEWAY Address	%GATEWAYADDRESS%
MAC Address	%MACADDRESS%

5. Modbus Register Address for IO's

5.1 Digital Inputs:

Number of Channels: 12.

- High Switching/ Gnd Switching Inputs
- Card Level Isolation: 1.5KV
- Inputs High: 5V
- Maximum inputs level: 24V
- Status LED for each Input
- Card Status indication with CPU

5.1.1 Modbus Register Address

Function code -02: Input Status
Register Address: 10001-10072

Digital Input	Modbus Address
DI1	10101
DI2	10102
DI3	10103

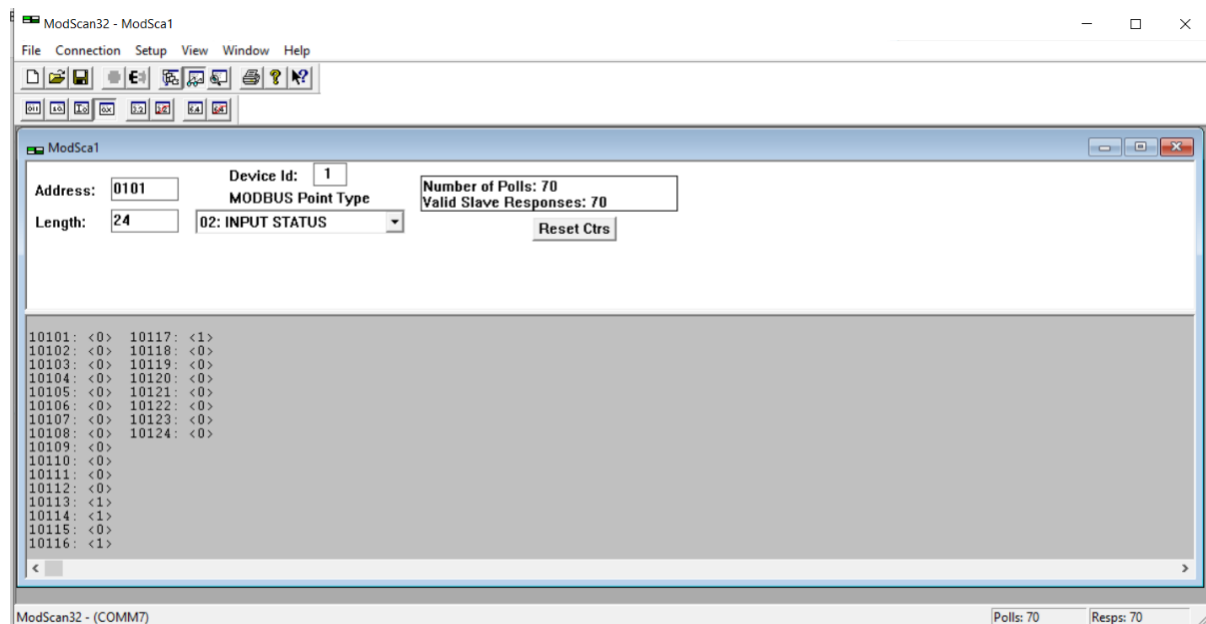
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DI4	10104
DI5	10105
DI6	10106
DI7	10107
DI8	10108
DI9	10109
DI10	10110
DI11	10111
DI12	10112
DI13	10113
DI14	10114
DI15	10115
DI16	10116
DI17	10117
DI18	10118
DI19	10119
DI20	10120
DI21	10121
DI22	10122
DI23	10123
DI24	10124

5.1.2 Modbus Setting

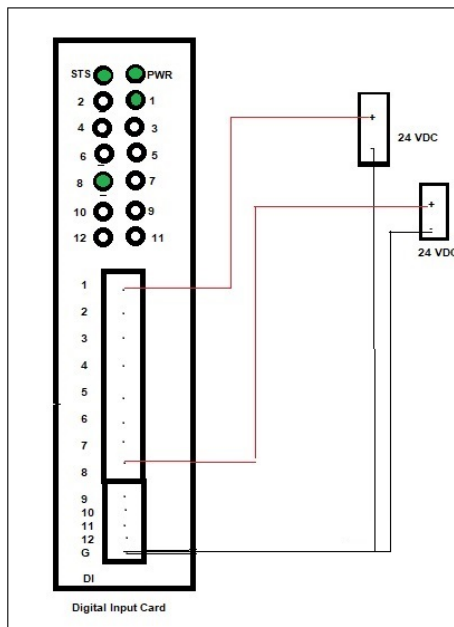
To observe Digital input value, open Modscan. Configure the device ID, Modbus address, Function code 02 and length 12/24/36/48/72 as per Number of DI.



5.1.3 Connection Schematic

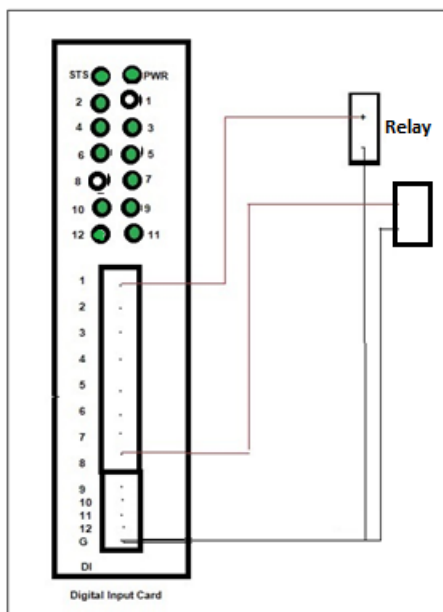
DI State: Sourcing

Status LED Default State: OFF



DI State: Sinking

Status LED Default State: ON



5.2 Digital Output

Number of Channels: 12.

- Sourcing/ Sinking Outputs
- Card Level Isolation: 1.5KV
- Output High maximum: 24V
- Status LED for each Output
- Card Status indication with CPU

5.2.1 Modbus Register address

Function code -01: Coil

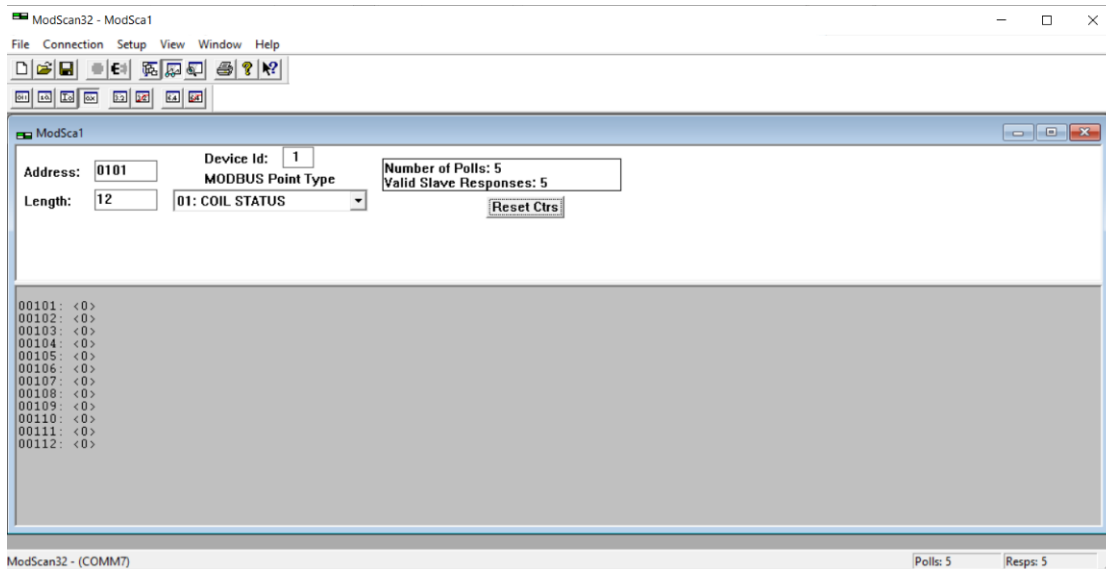
Register Address: 1-72

Digital Output	Modbus Address
DO1	101
DO2	102
DO3	103
DO4	104
DO5	105
DO6	106
DO7	107
DO8	108
DO9	109
DO10	110
DO11	111
DO12	112
DO13	113
DO14	114
DO15	115
DO16	116
DO17	117
DO18	118
DO19	119
DO20	120
DO21	121
DO22	122
DO23	123
DO24	124

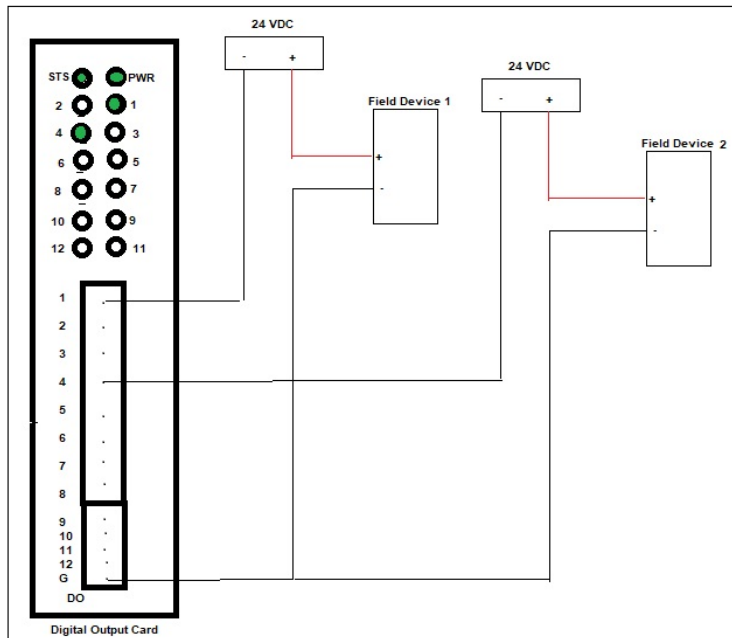
To observe Digital output status, open Modscan with device address, Function code 01 and length 12/24/36/48/72 as per Number of DO.

To change the Digital output value, change it through Modscan by updating Coil Status.

5.2.2 Modbus Setting



5.2.3 Connection Schematic



5.3 Analog Input: 4-20mA/ 0-10V

Number of Channels: 8

- 4-20mA / 0 to 10V Input
- Card Level Isolation: 1.5KV
- Maximum sampling rate 50ksps/channel

- 16 Bit ADC
- Status LED for Card to CPU communication
- Field signal indication for Current Inputs

5.3.1 Modbus Register Address

Function code -04: Input Register

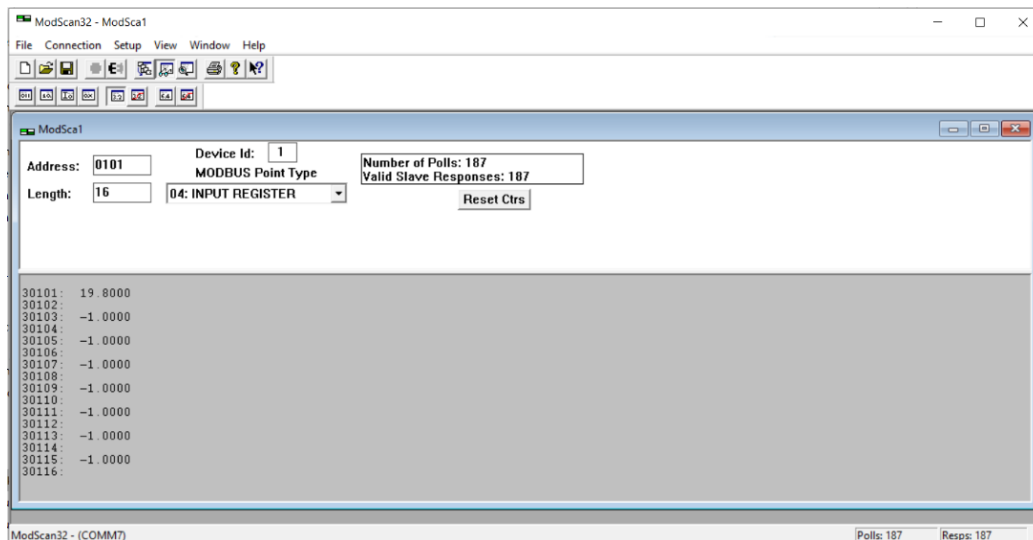
Register Address: 30001-30032

Data Type: Float

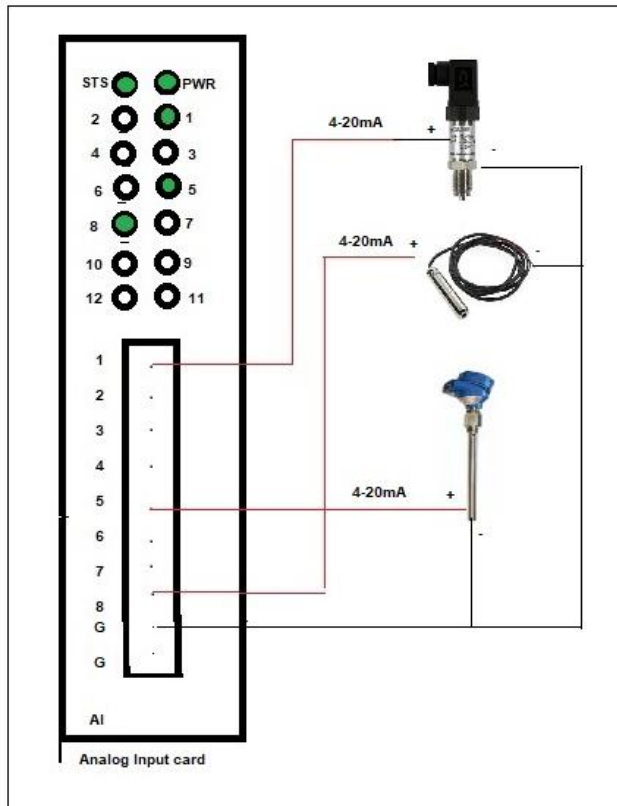
Analog Input	Modbus Address (Float)
AI1	30101
AI2	30103
AI3	30105
AI4	30107
AI5	30109
AI6	30111
AI7	30113
AI8	30115

To observe Analog Input status, open Modscan with device address, Function code 04 and length 8/16/24/32/40 as per Number of AI.

5.3.2 Modbus Setting



5.3.3 Connection Schematic



5.4 Analog Output

Number of Channels: 4

- 4-20mA / 0 to 5V Output
- Card Level Isolation: 1.5KV
- Maximum Output rate: 1000Samples/channel
- 16 Bit DAC
- Status LED for Card to CPU communication
- Field signal indication for Current inputs

Function code -03: Holding Register

Register Address: 40201-40208

Data type: Float

5.4.1 Modbus Register Address

Analog Output	Modbus Address (Float)
AO1	40201
AO2	40203
AO3	40205
AO4	40207

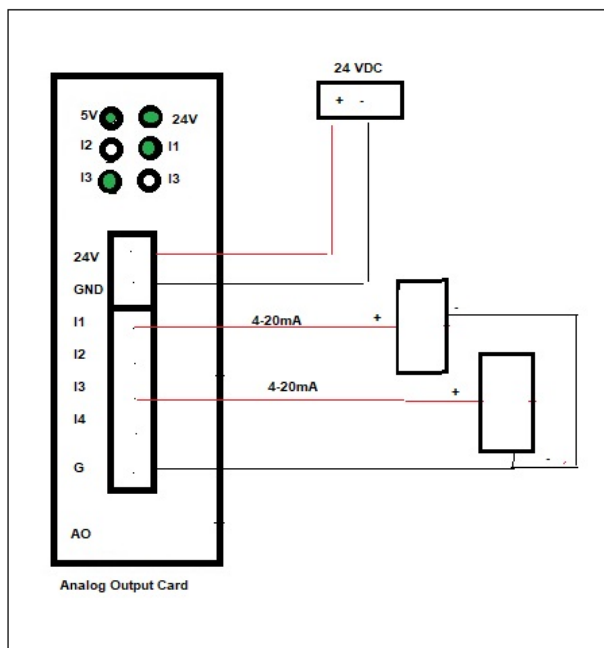
5.4.2 Modbus Setting

ModSca2

Address: Device Id: Number of Polls: 59533
 Length: MODBUS Point Type: 03: HOLDING REGISTER Valid Slave Responses: 59465
 Reset Ctrs

40201: 1000.0000
 40202: 100.0000
 40203: 100.0000
 40204: 200.0000
 40205: 200.0000
 40206: 0.0000
 40207: 0.0000
 40208: 0.0000

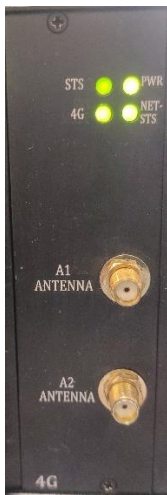
5.4.3 Connection Schematic



6. MQTT Configuration

For MQTT configuration, need to provide internet to RIO MTCP via SIM card or LAN.
For inserting SIM, the 4G card should be available on RIO MTCP rack.

4G Card

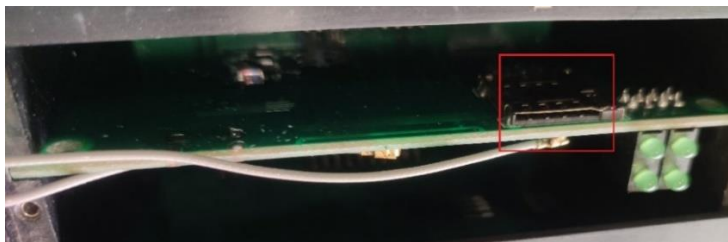


6.1 Procedure to Insert SIM card

1. Open the cover of 4G card.
2. To open the cover, remove the screw as shown in below picture.

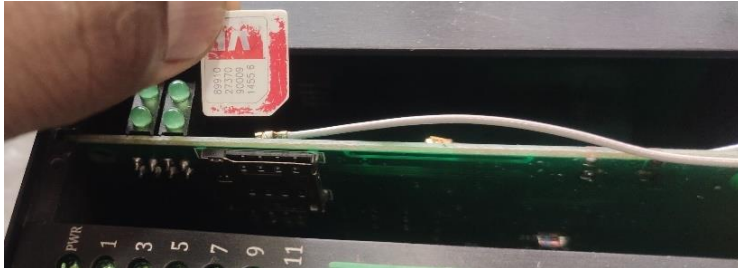


3. After open the cover the SIM holder will be visible.

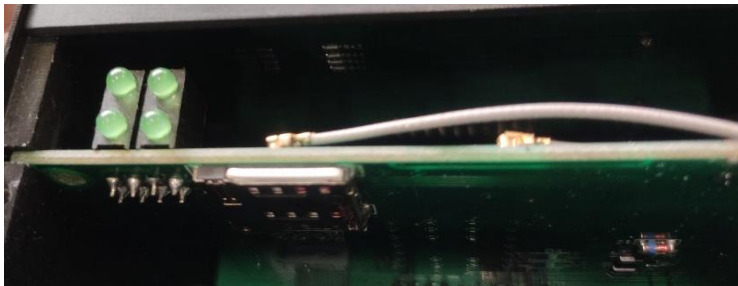


4. Make sure you have a micro-SIM card. Locate the SIM card slot on your device. Refer to the image below for the correct position.

Insert the micro-SIM card into the SIM card slot, aligning it with the indicated position in the image. Apply gentle pressure to push the SIM card until it is securely locked in the SIM holder.



5. After SIM insert successfully.



6.2 Use of RFU

RFU simulator is used to configure MQTT setting, To Calibrate AI, AO, To check, Modbus RTU & Modbus TCP configuration.

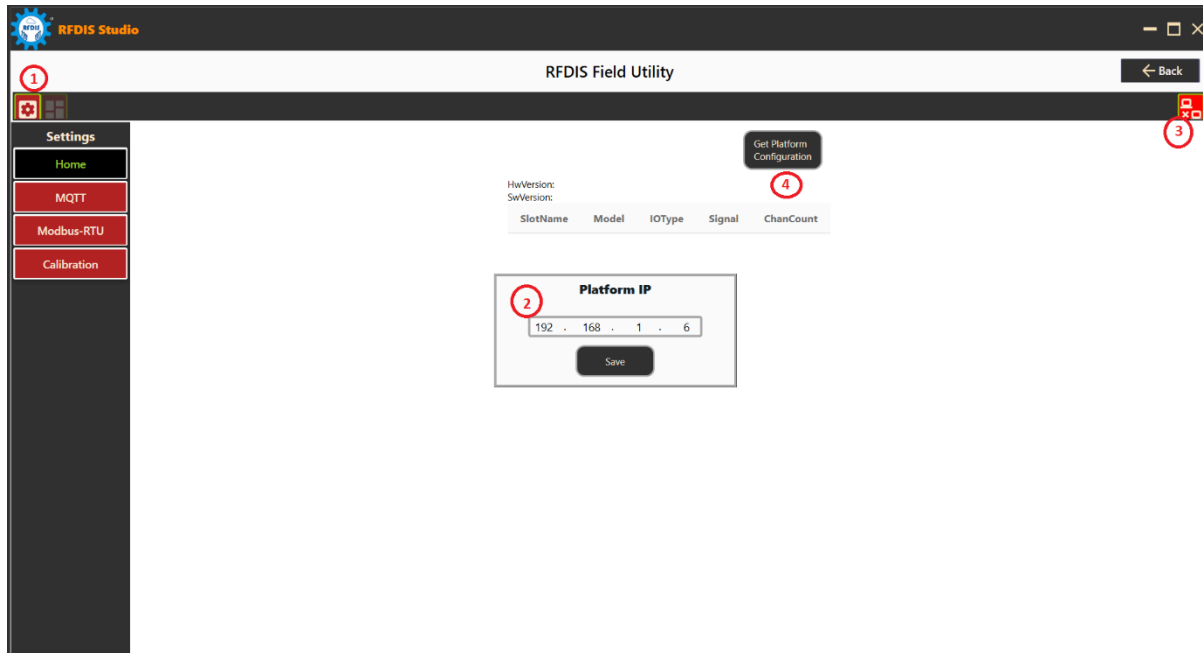
You can download Rfu utility by below link.

<https://www.santelequip.com/GSCSV/RIOMTCP/RFU.rar>

6.2.1 Connect RFU

Open **RFU simulator** and put IP address of RIO. Procedure is as below.

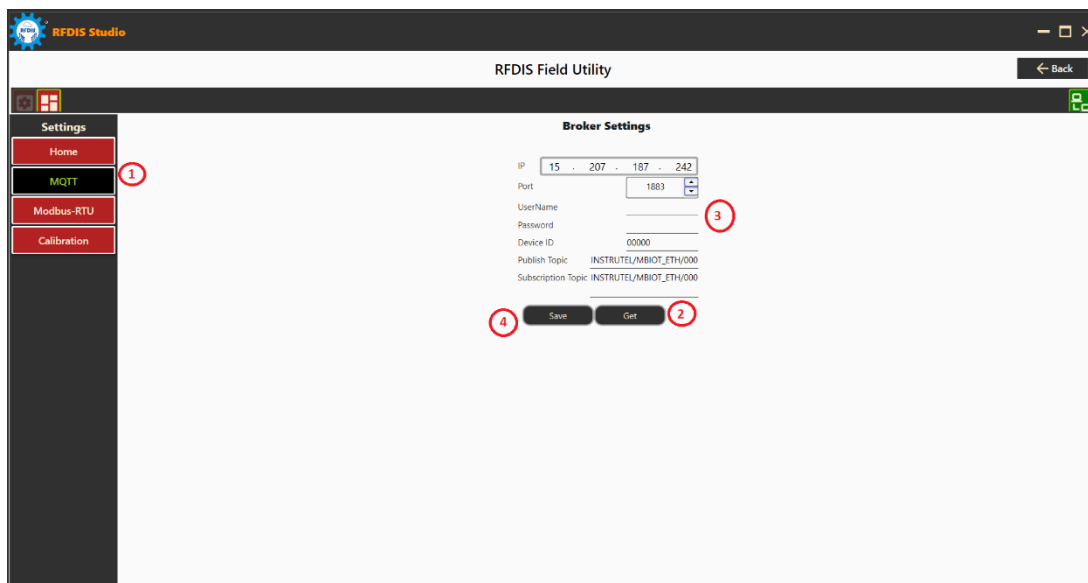
1. Click on setting Icon.
2. Put IP Address of RIO MTCP
3. Click on PC Icon to connect RIO to RFU. Once RIO connect the RED color will become green.
4. Click on "Get Platform Configuration" to load current configuration RIO to RFU.



6.2.2 MQTT Configuration

To configure MQTT Details, Open Rfu utility.

1. Click on MQTT
2. Click on Get to check the current MQTT details.
3. Configure MQTT details. If the default configuration details not changeable then no need to change it.
4. Click on save if any change in Configuration.

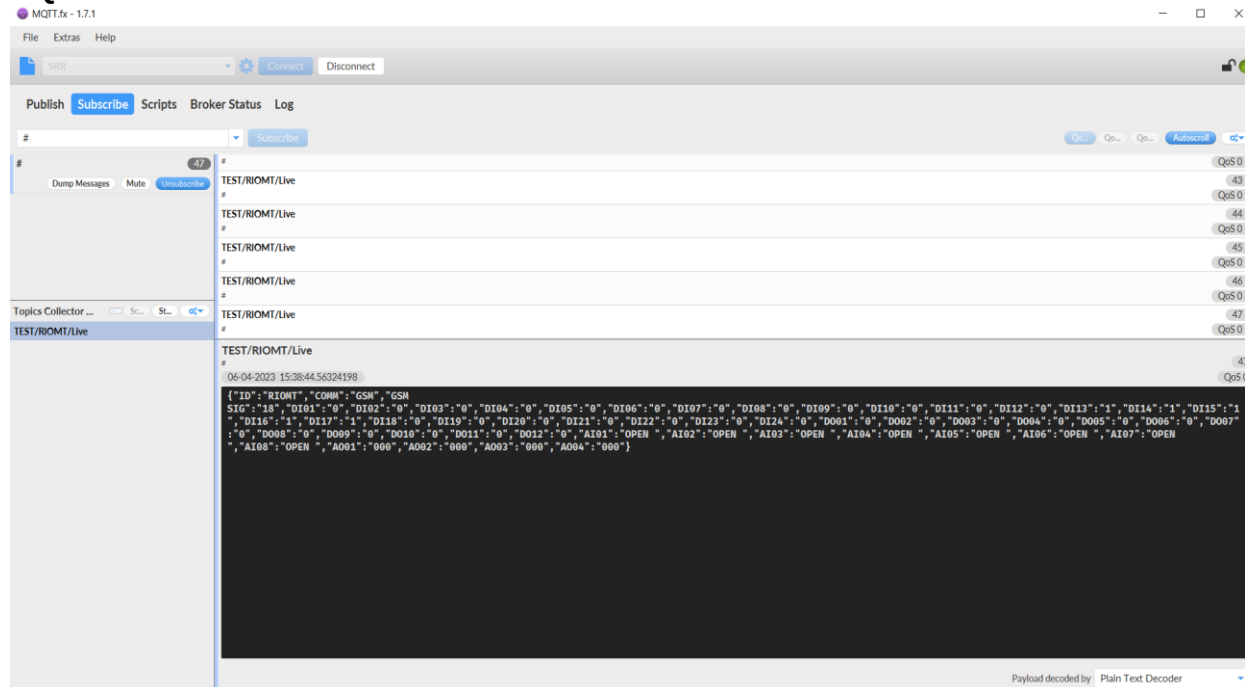


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We can Subscribe the IO's data on MQTT as below.
 As per above details the RIO MTCP publish topic will be **TEST/RIOMT/Live**.

MQTT DATA:

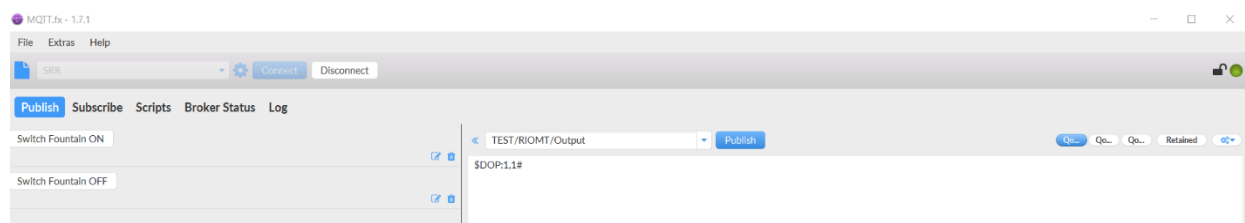


We can control the DO from MQTT. Need to publish **TEST/RIOMT/Output**.

To Activate DO 1 need to publish following frame: \$DOP:1,1#

& To Deactivate the DO 1 \$DOP:1,0#.

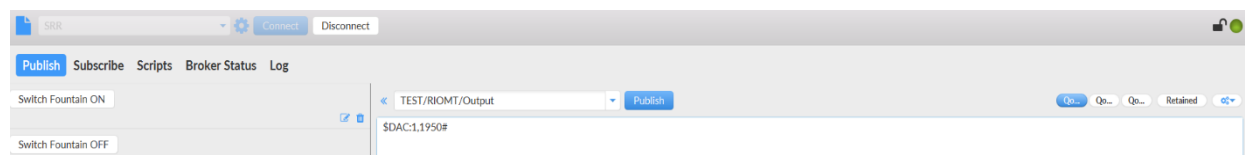
For 2nd DO the commands should be \$DOP:2,1#. And Same for all other DO's.



To control AO from MQTT:

For AO 1: \$DAC:1,1950#

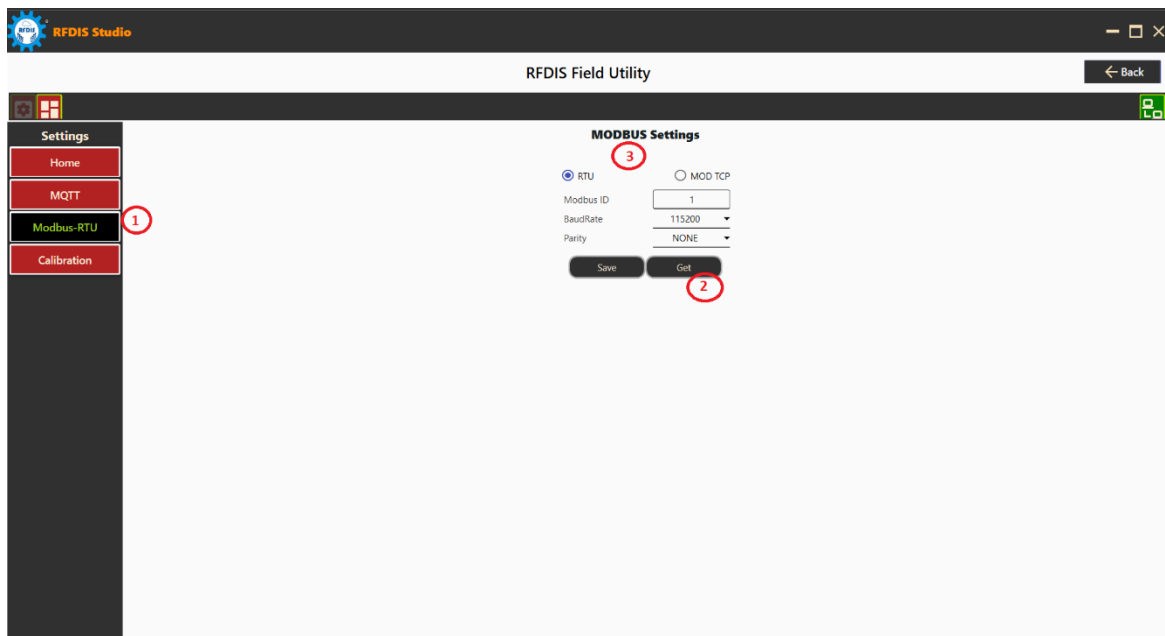
For AO 2: \$DAC:2,1000#



6.2.3 Modbus Protocol Selection

User can do the protocol selection between Modbus RTU and Modbus TCP. The protocol selection procedure is as below.

1. Click on Modbus RTU
2. Click on et to check default protocol selection.
3. Click on the protocol whichever required.

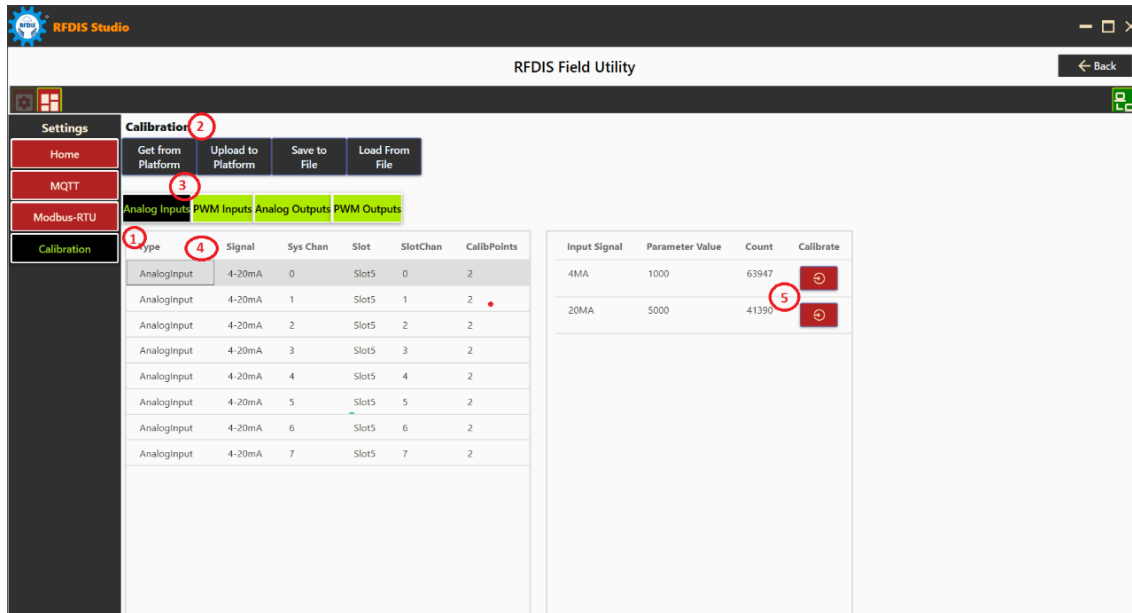


For Modbus TCP Device ID is set by default as 1.

6.2.4 Calibration

Calibration is used to calibrate the 4-20mA in term of required field values.

1. Click on Calibration.
2. Click on get from platform.
3. Click on the card which needs to calibrate.
4. Click on the channel which needs to calibrate.
5. Click on the 4mA and 20mA alternately and configure the Calibrated value.
For 4 mA put the calibrated value and set analog source to 4mA.
For 20 mA put the calibrated value and set analog source to 20 mA.

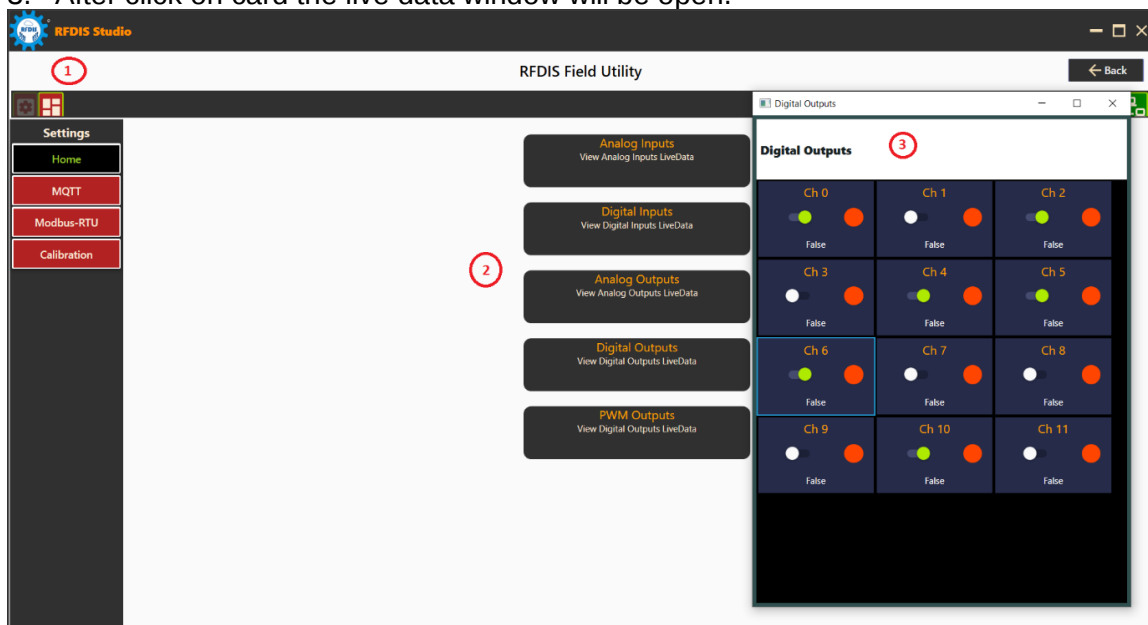


6.2.5 Internal Dashboard

Internal dashboard is used to monitor and control the IO's status. User can monitor DI, AI data also can control DO and AO.

Follow below steps to access internal dashboard.

1. Click on Live Data Menu
2. Chose the card which need to monitor or control
3. After click on card the live data window will be open.



7. Connector Details

7.1 RTU interface

RIOMTCP models -RTU has RS485 interface using 3 Pin connector.

PIN no.	PIN details
1	D+ (RS485)
2	D- (RS485)
3	GND

7.2 Power connector

RIO models work on +24V DC supply using 3 Pin Connector.

PIN no.	PIN details
1	+24 V DC IN
2	GND

7.3 IO Connector

For DI/DO: 13 Pin connector.

PIN no.	PIN details
1	DI/DO 1
2	DI/DO 2
3	DI/DO 3
4	DI/DO 4
5	DI/DO 5
6	DI/DO 6
7	DI/DO 7
8	DI/DO 8
9	DI/DO 9
10	DI/DO 10
11	DI/DO 11
12	DI/DO 12
13	GND

For AI: 10 Pin connector.

PIN no.	PIN details
1	AI 1
2	AI 2
3	AI 3
4	AI 4
5	AI 5

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6	AI 6
7	AI 7
8	AI 8
GND	GND
GND	GND

For AO:2 Pin Connector

PIN no.	PIN details
1	24 VDC
2	GND

This is input power for AO card to power up the internal module.

Pin Connector: 2 NOS 5 Pin

PIN no.	PIN details
1	I1/V1
2	I2/V2
3	I3/V3
4	I4/V4
5	GND

7.4 Antenna for 4G Connectivity

Connector	PIN details
A1	Main Antenna
A2	Auxiliary Antenna

8 LED Indication

LED Name	Details	
PWR	ON	Unit is powered on
RTU LEDs (Tx, Rx)	Blinking	When RS485 /RS232Communication takes place
3V and 5V	ON	Internal Board powered ON successfully.
ETH	Blink	Ethernet Connectivity
GSM	ON	Show GSM/GPRS Connectivity
STS on IO cards	Blink	Card is communicating with CPU
PWR on IO cards	ON	Card Powered ON
1-12 LED	Blink	Show IO Status