PICOBOX

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REMOTE EXCHANGE CONTROLLER

USER MANUAL VERSION 1.1

Model: REX

Please read this user manual carefully before using the device.

Table of Contents

CHAPTER 1 : INTRODUCTION

Thank you for your purchase of PICOBOX Remote Exchange Controller (REX). This device is a miniature DIN rail mounting controller designed for Critical Alarm Monitoring application. It is powerful in so many ways and yet easy to setup and use. You are advised to read through this manual to understand each feature in detail so as to fully utilize the capabilities of this product.

REX is a standalone alarm monitoring controller with 8 digital inputs, 2 analog inputs and 2 relay output. Up to 8 switch contact type of sensor can directly connect to REX. The user can define each input according to the type of equipment the inputs are interfaced to. When the input changes state from normal to alarm or vice-verse, SMS are sent out to recipient's mobile phone. REX has powerful features and is flexible, allowing users to decide how the message will be sent. In addition to SMS, REX is also capable on sending E-mail. This can be done over Ethernet or mobile data. REX also has 2 analog inputs, allowing the user to interface any industrial standard 4-20mA transmitter / sensor. Some examples are temperature, humidity, flow, current, power, pressure and so on. Aside from digital and analog signal, REX is capable on reading data using MODBUS serial (Modbus Master Only).

CHAPTER 2 : SAFE USE OF DEVICE

The following section contains important operating and maintenance (servicing) instructions. Please read it carefully.

WARNING:

To reduce the risk of electric shock:

- Do not remove the cover (or back) of this device. There are no user-serviceable parts inside. Refer servicing to the manufacturer.

NOTE:

The serial number of this device is shown at the side of the product. You should record the number and other vital information here and retain this booklet as a permanent record of your purchase.

Model No.:

Serial No.:

Date of Purchase:

Dealer Purchased from:

Important Safety Instructions

In this safety instructions, the word [device] refers to REX and all of its accessories.

Read Instructions-Read all safety and operating instructions before operating the device.

Retain Instructions - Save the safety and operating instructions for future reference.

Heed Warnings - Heed all warnings on the device and in the operating instructions.

Follow Instructions - Follow all operating and maintenance instructions.

Cleaning - Cut the supply before cleaning. Wipe the device with a clean soft cloth. If necessary, put a cloth in a diluted neutral detergent and wring it well before wiping the device with it. Finally, clean the device with a clean cloth. Do not use benzene, thinner or other volatile liquids or pesticides as they may damage the products finishing. When using chemically treated cleaning cloths, observe their precautions accordingly.

Accessories – Use only accessories recommended on this manual. Always use specified connection cables. Be careful to connect devices correctly.

Water and Moisture (Hazard of electric shock) – Do not use the device near water or in rainy or moist situations.

Ambient Temperature – Do not put the device near a heater.

Placing or Moving – Do not place this device on an unstable cart, stand, tripod, bracket or table. The device may fall and cause serious damage or injury. A device and cart combination should be moved with care. Quick stops, excessive force and uneven surfaces may cause this device and cart to overturn.

Power Sources – The AC adapter should be operated only from the type of power source indicated on the marking label. If you are not sure of the type of power supply to your premises, consult your device dealer or local power company.

Power Cord Protection – Power cords should be routed so that they are not likely to be walked on, or pinched by items placed upon or against them. Pay particular attention to plugs and the point from which the cords exit the device.

Outdoor Antenna Grounding – If an outside antenna is connected to the device, be sure the antenna is grounded so as to provide some protection against voltage surges and built-up static charges.

Lighting – For added protection of this device during lightning storm, or when it is left unattended and unused for long period of time, disconnect it from the wall outlet and disconnect the antenna. This will prevent damage to the device due to lightning and power line surges.

Power Lines – An outside antenna system should not be located in the vicinity of overhead power lines or other electric light or power circuits, or where it can fall into such power lines or circuits. When installing an outside antenna system, extreme care should be taken to keep from touching such power lines or circuits, as contact with them might be fatal.

Overloading – Do not overload wall outlets and extension cords as this can result in a risk of fire or electric shock.

Object and Liquid Entry – Never push objects of any kind into this device through openings as they may touch dangerous voltage points or short out parts that could result in a fire or electric shock. Be careful not to spill liquid of any kind onto the device.

Servicing – Do not attempt to service this device yourself as opening or removing covers may expose you to dangerous voltage or other hazards. Refer all servicing to qualified personnel. Opening the cover may void your warranty.

Do not install the device in the following locations as this can cause a fire or electric shock:

- Hot locations
- Close to a fire
- Very humid or dusty locations
- Locations exposed to direct sunlight
- Locations exposed to salt spray
- Close to flammable solvents (alcohol, thinners, etc.)

If any of the following occurs, immediately switch the device OFF, unplug it from the main power supply and contact your distributor or agent:

- The device emits any smoke, heat, abnormal noise, or unusual odor
- A metal object falls into the device
- The device is damaged in some way

Do not continue to use the device as this can cause a fire or electric shock.

Please observe the following when using the device. Failure to do so can result in a fire or electric shock.

- Do not use flammable sprays near the device.
- Do not subject the device to strong impact.

CHAPTER 3 : PRODUCT OVERVIEW

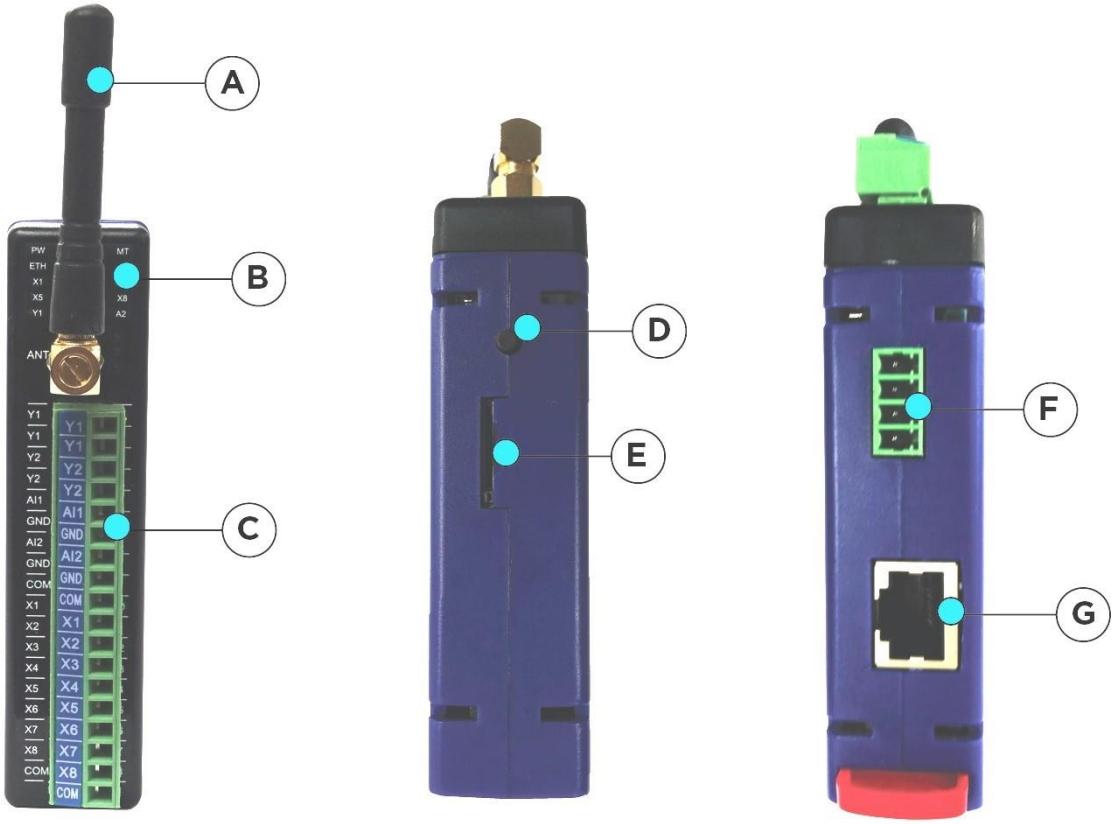
REX is a standalone device built around a 32 bit micro controller. It has a built-in 3G modem along with associated circuitry like switching power supply, optically coupled digital inputs, relay outputs, indicators, etc. REX is IP based (Internet Protocol), comes with user friendly web user interface and powerful feature set.

Features

Physical	
Operating Voltage	12 to 24VDC, 5W max power consumption
Processor	32 bit high speed micro controller
Cellular modem	UTMS 900/2100 (3G), GSM 900/1800 (2G)
Humidity	0 - 90% non condensing
Operating Temperature	0 - 55 degree Celsius
Physical size	70 (L) x 110 (H) x 60 (D) mm
Weight	200 gm
Mounting	Industrial standard ABS housing with Din rail mounting, Pluggable 3.5 mm screw terminal block
Connectors	4way and 18way 3.5mm Plug gable Connector
Security Feature	2 Level security, Administrator and User level
Date & Time	Support NTP server time zone synchronization
Real Time Clock	Date time with Super cap backup
LED Indicators	PW = Power, MR = Modbus Receive, MT = Modbus Transmit, ETH = Ethernet, TC = Telco Status, X1-X8 = Digital Inputs, Y1-Y2 = Relay Outputs, A1-A2 = Analog Inputs
Communication port	1 x RJ45 port, Ethernet 10/100Mbit
Interface	HTML interface, accessible via web browser software
Network	
Network support	Static and Dynamic IP support
Network protocol	a) TCP (Transmission Control Protocol)
	b) IP (Internet Protocol)

	c) HTTP (Hyper Text Transfer Protocol)
	d.) Modbus Serial
Digital Input	
No of Input points	8 optically coupled dry contacts digital inputs, onto-isolated
Configuration	Independent configuration of input description, open/close status description
Relay Output	
No of Output points	2 relay outputs, contact rated at 24 VDC 1A
Configuration	User defined output description
Output control	Through SMS or locally On / Off relay outputs through web browser
Analog Input	
No of Analog points	2 analog inputs, 4-20mA
Configuration	Configurable input description, scaling, trigger delay, high/low alarm points.
Remote Management	
Remote Command	a) Add / Edit / Delete mobile phone groups, repeat time
	b) Query Operational / Authorizer / Forwarder mobile phone numbers
	c) Query health check
	d) Query input / output / analog status
	e) On / Off output equipment / devices
	f) Acknowledgments
SMS Alert	
Phone Groups	a) 10 Operation Numbers
	b) 3 Authorized Numbers
	c) 4 Escalation Numbers
	d) 1 Forwarding Number
	d) Accepts International Phone Number format and support Auto Roaming
Configurable SMS Message	Digital inputs, relay outputs & analog input (2 messages per input, "Low Alarm" and "High Alarm" Triggering)
Auto Health Check	Programmable daily/weekly system health check
Time Stamp	SMS sent & received with time stamps

Table 3.1 Product Features



	Description	Comment
A	Antenna	IO connectors
B	LED Indicators	Device IO status
C	18 way plug-gable screw connector	8DI, 2AI, 2 Relay Out
D	FN button	Push button
E	Micro SIM slot	
F	4 way plug-gable screw connector	Power and RS-485
G	RJ45	10/100 Mbits

Table 3.2

LED Indicators Description

Table 3.3 shows the description of the LED Indicators and its functions.

Name	Color	Function
PW	OFF = Power Off, ON = Device is Turned ON	
TC	No SIM (Fast blinking, 50ms On, 50ms Off) Network Signal Low, <30% (Slow blink 200ms On, 200ms Off) Network Signal Good, Steady On	
ETH	OFF = Ethernet cable unplugged. On = Cable Plugged, Blinking = Network activity	
MR	OFF = RS485 Idle. Blinking. Data Received.	
MT	OFF = RS485 Idle. Blinking. Data Transmitted.	
X1 - X8	OFF = Input contact is Open, No Alarm ON = Input contact is Closed, No Alarm Fast Blinking (100ms On, 100ms Off), Input Contact is Closed, Alarm condition Slow Blinking (800ms On, 200ms Off), Input Contact is Open, Alarm condition	
Y1, Y2	OFF=Relay Off (Contact Open), ON = Relay On (Contact Closed)	
A1, A2	OFF = No input On = Analog Input Present, no alarm Fast Blinking (100ms On, 100ms Off) = High Value Slow Blinking (800ms On, 200ms Off) = Low Value	

Table 3.3

CHAPTER 4 : HARDWARE INSTALLATION

This section will guide you through the installation of your REX. Follow the instructions here and you will have your REX installed very quickly.
Before starting installation, ensure that the unit is powered OFF and the power adapter plug disconnected from the POWER connectors of the unit

Mounting
Determine a suitable location for REX. Mount REX on the Din-Rail as illustrated below.

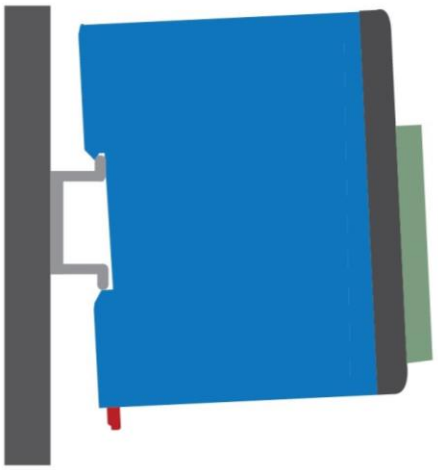


Figure 4.1

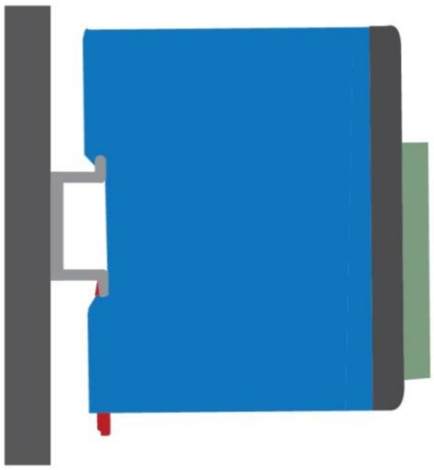


Figure 4.2

1 – Slide the top of REX on to the DIN-rail (Figure 4.1)
2 – Push the bottom of REX on to the DIN-rail (Figure 4.1)
3 – Use a screw driver to push the lock upwards. (Figure 4.2)

Follow the following steps in installing REX.

Step 1. Determine a suitable location for REX when selecting a location, remember that you will need to connect the power adapter, termination blocks and Ethernet cable, and have suitable GSM reception. Follow carefully the instructions provided earlier in this manual on the safe use of this device and the instructions above on mounting REX on to the Din-Rail.

Step 2. Insert a valid 3G or 2G Micro SIM card into the SIM card socket slot on top of REX.

- The side printed label shows the exact orientation of how the Micro SIM card should be inserted into the SIM card slot.

- Slide it in all the way until you feel it touching the end. To remove, gently press on the SIM card using a small slot head screwdriver.

Step 3. Attach the antenna provided in the package onto the antenna socket. If an external antenna is required, contact your distributor for more information on external high gain antenna.

Figure 4.3 SIM Card Slot

DC Input

Power to REX is supplied from the 12VDC power adapter via the DC jack input. If using user-supplied power supply, observe voltage polarity and voltage level. REX operates on 12VDC input but can accept supply voltage up to 24VDC. Do not exceed the recommended input voltage, exceeding which will damage REX.

Ethernet

The RJ-45 connector connects REX to the computer or network using Cat5 UTP cable. For connection to a single PC, use a Ethernet cable supplied with the unit. A hub or Ethernet switch is not necessary for direct REX to PC interface. REX can be used as a standalone system, or connected to the local area network (LAN). A LAN connection gives greater flexibility as well as enabling REX to work with other networking devices.

Antenna

This SMA connector interfaces the external antenna to the internal GSM modem of REX. Choose suitable antenna for your installation. The SMA mount Antenna supplied, as standard accessory is the unity gain antenna. This antenna is suitable for most installation. If the location has low GSM signal strength, use high gain antenna or outdoor type. Check with your distributor for suitable antenna alternatives.

FN Button (Function Button)

This button lets user check the IP address of the REX and to reset the IP address to factory default.

To check the current IP address:

1) Power ON the device
2) Push and hold the FN button for > 5 seconds and release
3) The LEDs on the right panel will display the IP in numeric sequence.
4) Double-click the FN button again to exit this function.

Resetting the IP to default or setting IP to DHCP:

1) Power ON the device.
2) Push and hold the FN button for > 10 seconds and release once you see the six LED lights at the middle blink.
3) Push the FN button once to reset the IP address.
4) Push the FN button twice to set the IP to DHCP.

Note: To prevent unauthorized reset, the device should be installed in ABS housing with lock.

Interfacing to Equipment

(Figure 4.4) shows how alarm inputs are wired to REX. Up to 8 dry contacts can be monitored simultaneously. The contacts shown are either relay contact or switches from within the equipment. Cabling distance of up to 50 meters between the equipment and REX is possible without causing false triggering. In noisy environment, shielded cables are recommended. Unused inputs can be left unconnected.

Wiring Instruction: Example

(Figure 4.4) shows the IO connection to REX. Power to REX can be from 12-24 VDC via a 4 way Pluggable connector at the below part of REX. A 12VDC adapter is supplied as a standard accessory. The digital inputs are dry contacts type.

The two outputs are relay types with contact ratings of 24V, 1 amp DC max.

Also shown in this figure are two 4-20mA transmitters, 2-wire loop powered. Depending on the power requirement of the transmitter, a higher voltage may be needed. In this case, change the power supply to a higher voltage type, but not higher than 24 volts.

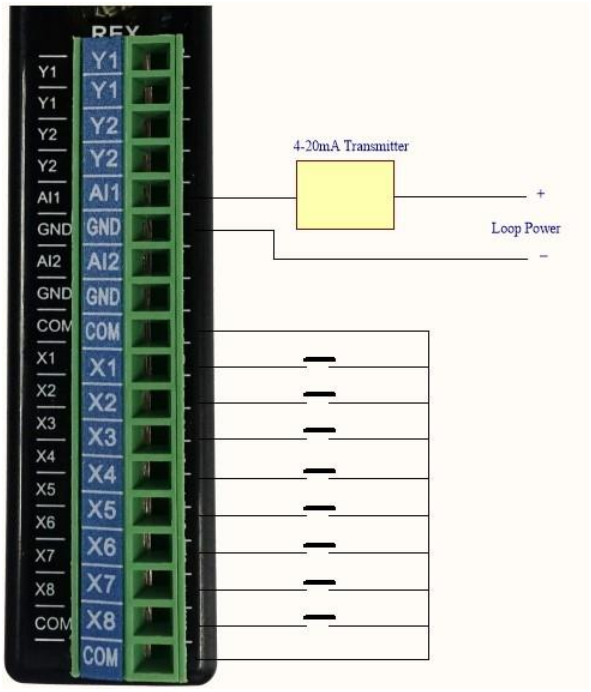


Figure 4.4 Wiring Diagram Example

CHAPTER 5 : SOFTWARE CONFIGURATION

Configuration of messages, phone groups etc are done via the Ethernet port.

Alarm Triggering

An alarm event happens when any one or more digital and analog input changes state. REX continuously monitor the input for these events. When an alarm event occurs, it picks up information from the configuration memory and performs the necessary SMS actions. In such an event, all mobile phone numbers stored in the memory will receive the SMS alert.

The format of the message is

[Date/Time]
[Device ID]
[Alarm Status]
[Input description]

Date/Time

The time of alarm event occurs. The real-time clock within REX provides the time stamping information.

Device ID

The identity assigned by the user during software configuration.
The user defines input description and status during software configuration. Each digital input will have its own unique input description name and status text.

Example of an SMS alarm message:

29/12/12 14:39> (REX) Power Supply in Basement 1 → Fault

Up to 10 mobile phones can be alerted to. This group of phone numbers is known as operation phones. Additionally, if a forward phone number is specified, it will receive the alarm notification as well.

Configuring the Device

REX is a web-based product. Using any web-browser on the PC, the user with administrative rights can access all the user configuration pages.

IP Address

Setup the device with the RJ45 Ethernet cable plugged onto the RJ45 socket of the device on one end and the other either to the network Ethernet switch or directly to a PC.

REX has static IP capability. Its default IP address is **192.168.1.31.**

Standalone Configuration: Static IP

An Ethernet cable (provided together with REX unit) is required to connect REX to a standalone PC.

In order for the PC and REX to connect to each other, the PC must be manually set to a static IP address that is within the same subnet as REX. Given the default IP address 192.168.1.31 and 255.255.255.0 for the subnet mask, a suitable IP addresses for the PC would be 192.168.1.1 or any other IP address other then 192.168.1.31.

Warning

Remember that you SHOULD NOT use the same IP address for your PC and REX and both PC and REX need to be within the same subnet.

If you are unsure of how to set static IP address for your PC, please consult your PC operating system's documentation for details.

Accessing REX Web Pages

Once the IP address of the PC has been configured, the user can setup the device using the PC browser. The PC IP address must be in the same network range as the device.

Open the web browser application on your PC. It can be Internet Explorer (version 6 and above), Firefox, Safari, Netscape, Opera or any other standard web browser. Open your web browser, at the address bar, type in the IP address of REX and press Enter, the Login Page is then loaded.

CHAPTER 6 : LOG-IN PAGE

Enter the User Name and Password on the text box. The default user name for administrator is admin. Password: admin. Guest user login user name is guest. Password: guest. Administrator user can change the password in the Administration page.

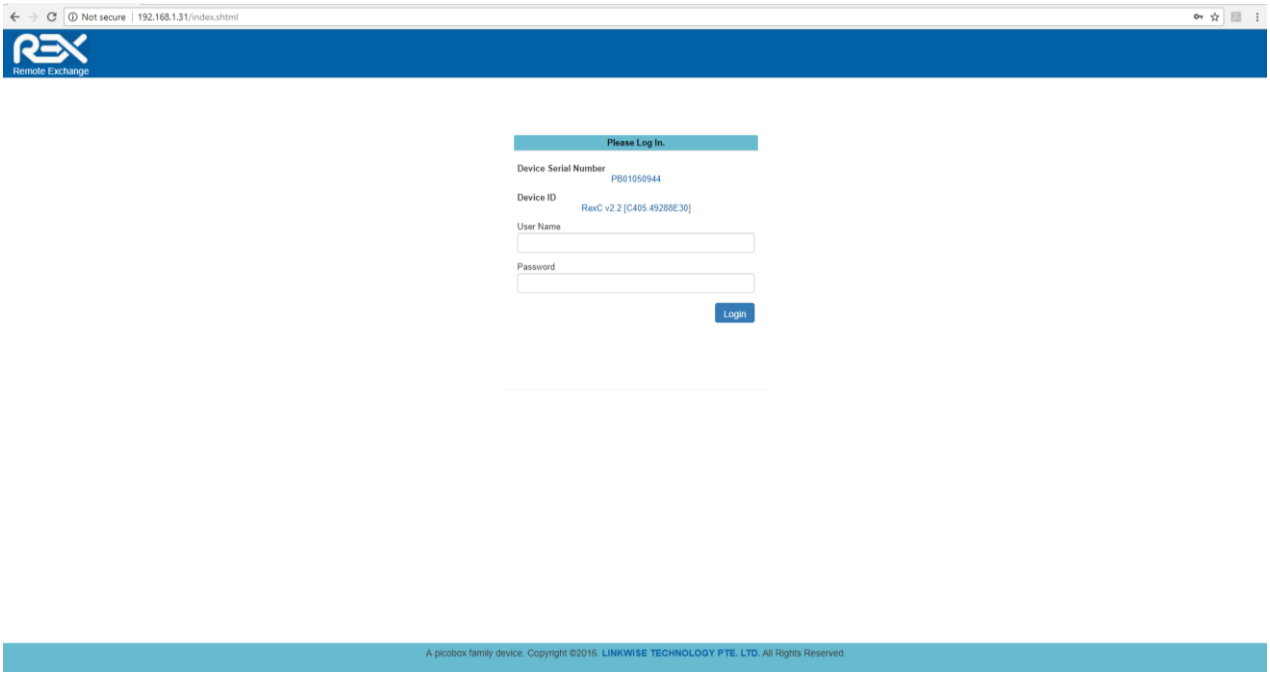


Figure 6.1: Login Page

Follow through the various pages to setup the parameters according to the user requirement.

CHAPTER 7 : DASHBOARD PAGE

Once the user successfully logs in, the Dashboard page appears. In a new un-configured unit, the status page shows all preset information about the input and output states.

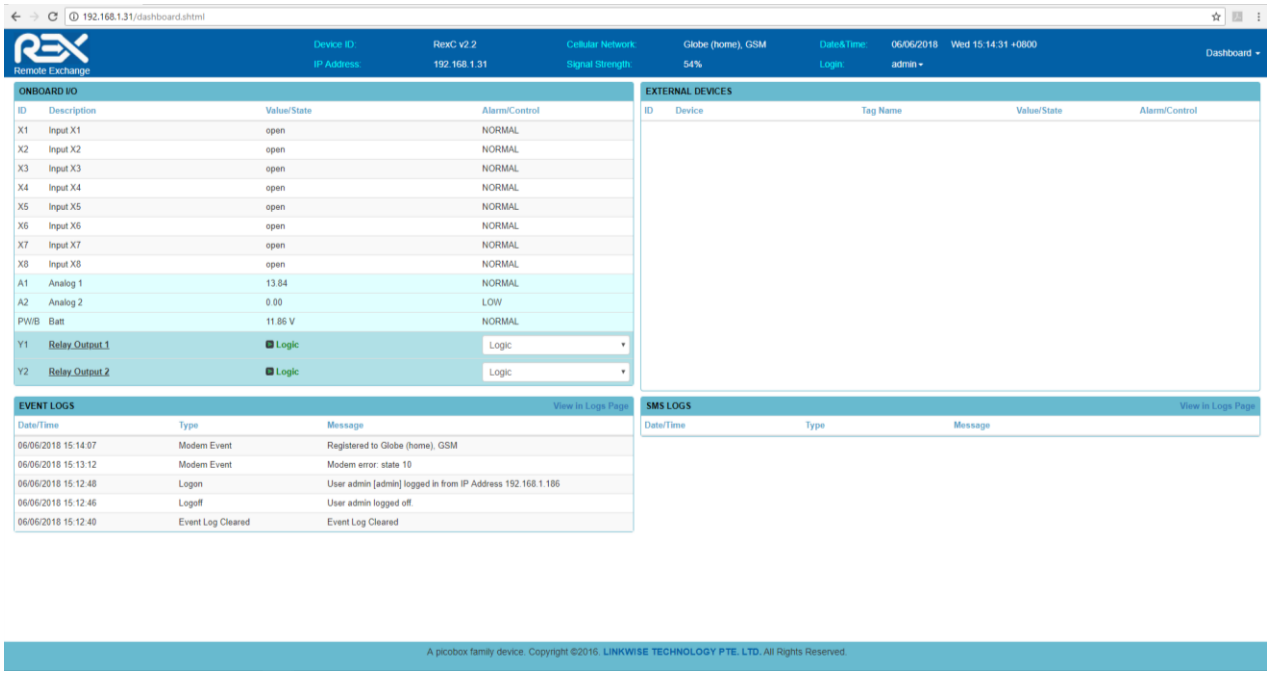


Figure 7.1 Dashboard Page

The top of the page contains the device information like Device ID, IP address, Telco Network name, Signal Strength, Login user and Date/time. Navigation to other pages are accessed using the drop down menu on the top right of the UI page.

In a configured unit, the status of the inputs, outputs and analog channels are displayed. Any change in the digital input, output and analog state are automatically updated live.

Digital input (DI): This field displays the DI descriptions, open/close descriptions and alarm status as configured in the IO configuration page.

Description

These fields display what has been typed into the description field of digital input on IO configuration.

Value/State

This field displays the status of each equipment connected to REX, either open or close.

Alarm/Control

For digital input this field will display what has been typed into the open / close fields of digital input (IO Configuration page).

Analog input (AI): This field displays the AI descriptions and their respective values. It also indicates whether the values are within low alarm or high alarm range, depending on the IO configuration.

Description

These fields display what has been typed into the description field of digital input on IO configuration.

Value/State

Displays the computed value of sensors connected to the analog termination of REX.

Alarm/Control

For analog input this field will display Normal when the reading is within the normal range. High (Alarm) when reading rises the preset High Alarm and Low (Alarm) when reading falls to the preset Low Alarm.

Digital output (DO): This field displays the DO descriptions. The status of the DO displays either "ON" (the contact of the DO is closed), "OFF" (the contact of the DO is open), or "Logic" (the DO is logic controlled).

Description

These fields display what has been typed into the description field of digital input on IO configuration.

Value/State

This field is a drop down menu wherein the user can choose to make the DO to turn ON or OFF manually or automatically by using logic expressions.

Alarm/Control

For digital output this field will display either ON (the contact of the output is close), OFF (contact of the output is opened) or logic controlled.

CHAPTER 8 : IO CONFIGURATION PAGE

Click on the IO Configuration button on the Menu buttons. The Input configuration page will appear. This page and all other pages are designed for ease of use. Explanation is provided whenever necessary.

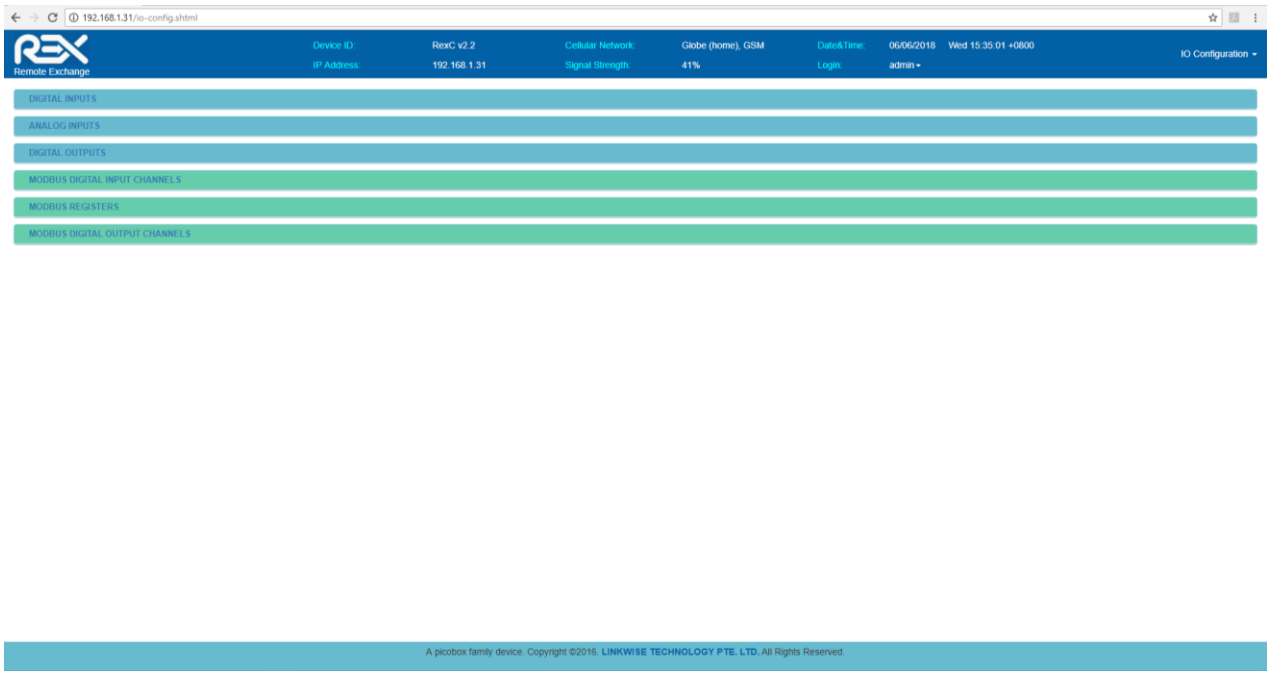


Figure 8.1 IO Configurations

The Modbus configuration has a separated chapter

Digital Input

This page shows the template for defining input description as well as the status. Each input can assume 2 states, one is when the input contact is closed, and another when the input contact opens. The administrator is free to define the labels according to the device characteristics.

Each digital alarm input has a set of variables for the user to enter. Following is the description of each field that the user can configure. REX has 8 digital inputs X1-X8.

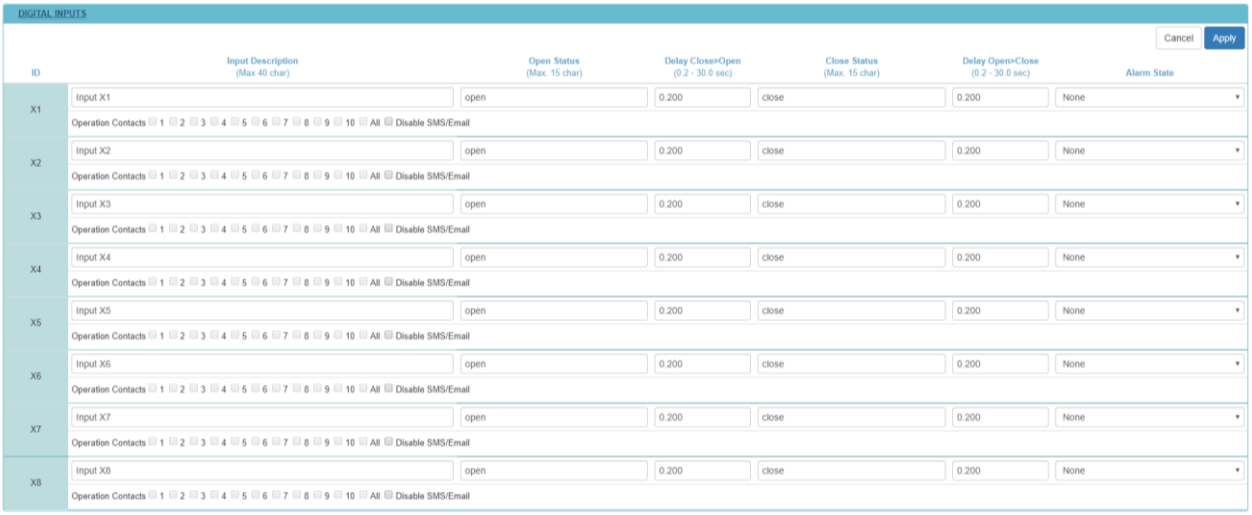


Figure 8.2 Digital Input Configurations

Input Description: This field is for the user to provide meaningful name for the point to be monitored. The description can be up to 40 characters long.

Open Status: This field describes the state of the input when the contact is in an open state. It can be of any wordings up to 15 characters long. Examples are: Alarm, Normal, Start Stop, System reset, Fault, etc.

Close Status: This field describes the state of the input when the input contact is in a close state. It can be of any wordings up to 15 characters long. Examples are: Alarm, Normal, Start Stop, System reset, Fault etc.

Alarm state: Three possible settings can be selected – None, Open, Close. This setting defines what the alarm state is. The status page will show the state of the input, based on the state description configured.

Delay: A unique feature of REX is allowing user to define the valid input change time. This is useful to delay triggering an alarm until the input change is stabilized. For example, door opening. One might not want to trigger an alarm if the door is opened momentarily. If the door is opened for, say 20 seconds, then an alarm is considered valid. These open to close and close to open trigger delay can be set for each individual digital inputs.

Operation Contacts: Ten (10) check boxes allow SMS to be sent to one, many or all phone numbers when the digital input changes state. (Normal to alarm, or vise-verse) There is a check box for enabling the selecting of all phone contacts. And also another check box for disabling SMS.

Analog Inputs

Two channels of 4-20mA analog input interface to any industrial standards transmitter. Any such transmitters can be used with REX to monitor temperature, humidity, pressure, current, voltage, power, etc. Setting up is very easy. Refer to the transmitter manufacturer specification for help in inputting the fields in this page.

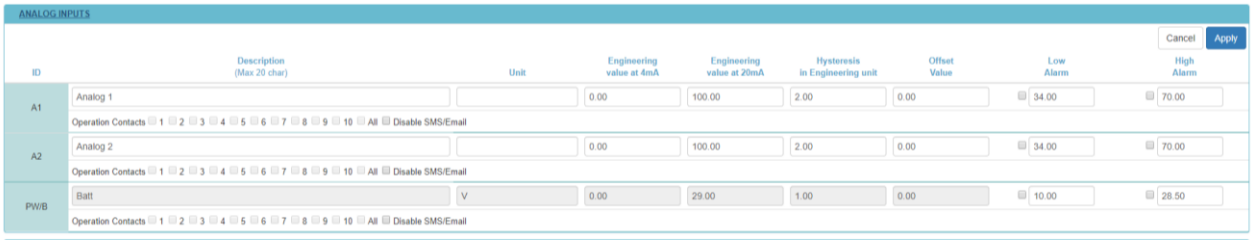


Figure 8.3 Analog Input Configurations

Unit: Input the unit for the analog input value.

Engineering Value at 4mA – 20mA: Refer to the transmitter manufacturer specification.

Hysteresis: Set the minimal change required to revert from High/Low alarm state.

Low Alarm: Set the minimum analog input Low Alarm value.

Low Alarm check box: Check this box to enable Low Alarm. SMS will be sent out when the Analog input state changes from Normal to Low.

High Alarm: Set the maximum analog input High Alarm value.

High Alarm checkbox: Check this box to enable High Alarm. SMS will be sent out when the Analog input state changes from Normal to High.

Tips and Example:
Set the Hysteresis higher to prevent the transmitter from flickering between two states.

For example, if you set the Hysteresis at 3 degrees, High Alarm is set to 30 degrees and the room temperature varies between 27 and 30 you could be faced with a very large number of SMS and events logged.

If hysteresis is set to 4 then the transmitter would have to drop from 30 to 26 before the status would change from High (Alarm) back to normal.

Warning and Error Messages: If the user input any values that are out of range, REX will prompt an error. The user must re-enter the correct value.

Digital Output

REX has 2 relay outputs. These outputs can be turn on, off, or pulse remotely via SMS commands. It can also be controlled from locally in or remotely from the web page access (Status page).

Figure 8.4 Digital Output Configuration

The 2 relay outputs are Y1 and Y2. The user can create a description for each input of up to 20 characters long. The two output description should not be identical. Each Relay output has its own sets of settings.

Enable Logic: When enabled, REX will evaluate the logic expression and perform necessary action.

Remote Override: When enabled users with right privilege will have the power to turn ON and OFF digital output by texting REX.

Logic Expression: Logical expression to turn ON or OFF an output.

Output Type: Select the type of output when logic expression is true.

a. ON – When logic expression is true, the output will turn ON and stays ON until the logic expression becomes false.
b. Pulsating – When logic expression is true, the output will turn ON and OFF until the logic expression becomes false. The frequency of pulse will depend on the "Pulsating ON and OFF".
c. Delay ON – When logic expression is true, the output will turn on after "x" time has passed. The delay will depend on the value of inputted on "Delay On".
d. One-Shot – When logic expression is true, the output will immediately turn ON and will turn OFF depending on "x" time in "One-Shot On"

Remote Control Output using SMS

This feature enables user to switch any of the 2 outputs on (contacts close), off (contacts open) by sending the appropriate Action SMS message to REX unit. REX is non-case sensitive to the received Action SMS messages. After performing the required action, REX replies to the sender with the corresponding Reply SMS message.

Another way to control output relay without going through SMS is by clicking on the output control section in the Status page.

Buzzer

Buzzer is a unique feature of REX. REX is equipped with an internal buzzer which is triggered by remote control via SMS or logic expression.

CHAPTER 9 : PHONE GROUP PAGE

This page shows phone group types, organized into 10 Operational Numbers, 4 Escalation Numbers, 3 Authorized numbers and 1 Forwarding number. Click Apply for any changes to take effect. For each number, an optional name can entered for easy identification of the contact person.

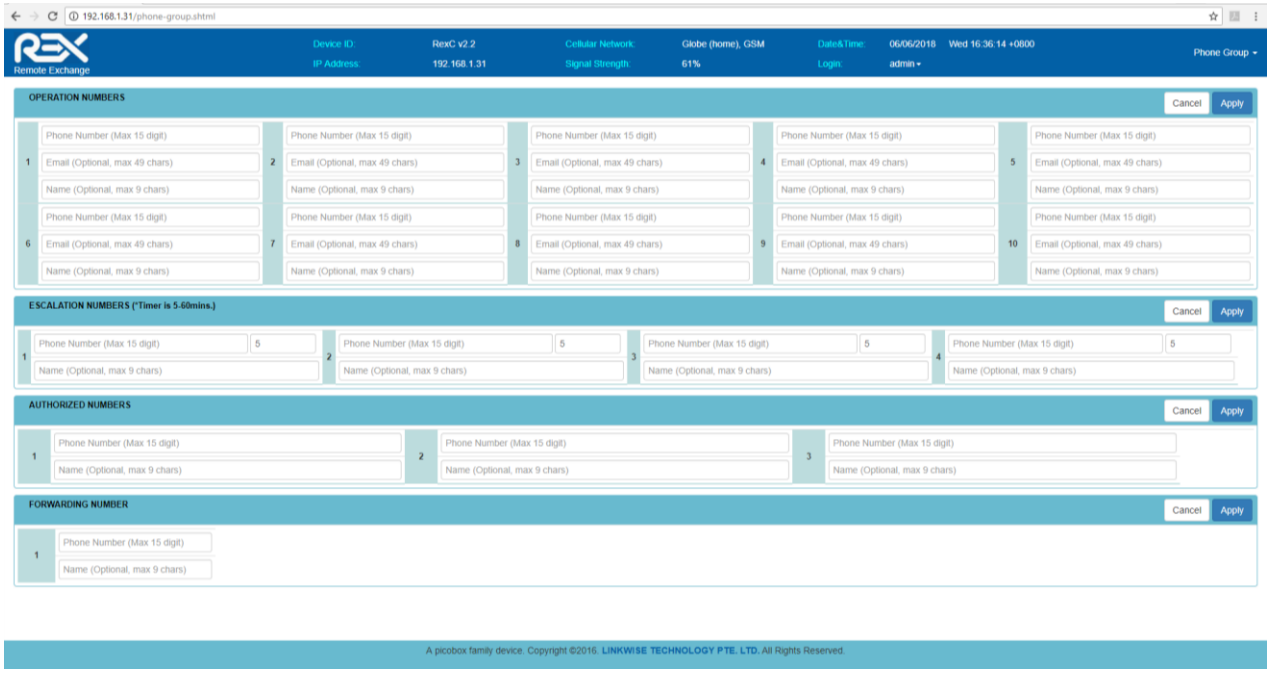


Figure 9.1 Phone Group Page

Operation Numbers: This group of users are those who will receive alarm SMS when one or more digital inputs are activated (open → close, close → open). Analog Input are activated (normal → high, high → normal, normal → low, low → normal). Up to 10 mobile phone numbers can be assigned to this group. Phone numbers of up to 15 digits and (+) are valid formats. Example 09123456789, +65987654321.

Escalation Numbers: When an alarm is triggered, escalation group timers is also activated. If none of the operation numbers who received the SMS response to REX with an acknowledgment reply when the escalation timer expires, the alarm message will be sent to the escalation number(s). There are 4 escalation numbers with individual configurable timers form 5-60 minutes.

Authorized Numbers: There are 3 Authorized numbers in this group. They have administrator privileges. They are able to perform all remote commands available within REX. For example, changing a phone number a group.

Forward Number: This number (if assigned) will receive alarm SMS like the operation numbers. Any incoming SMS to REX will also be forwarded to this number as well. This is a very useful feature where an organization wishes to have a central logging of all activities (alarms, in-out SMS) of REXs. When many REXs are deployed in the field, the usefulness becomes more evident.

All incoming SMS either correct or invalid commands as well as any other SMS messages from any mobile phones will be forwarded to this number for logging. This function is in effect serves as a remote event logger.

WARNING

Never set the forward mobile phone number to be the same as the SIM card number in REX. This will cause the device to send no-ending SMS to itself.

CHAPTER 10 : MODBUS CONFIGURATION

The following steps are used to configure a MODBUS device.

1. Click the Modbus Configuration located at the drop down menu on the upper right side of the user interface. You will be directed to the page below.

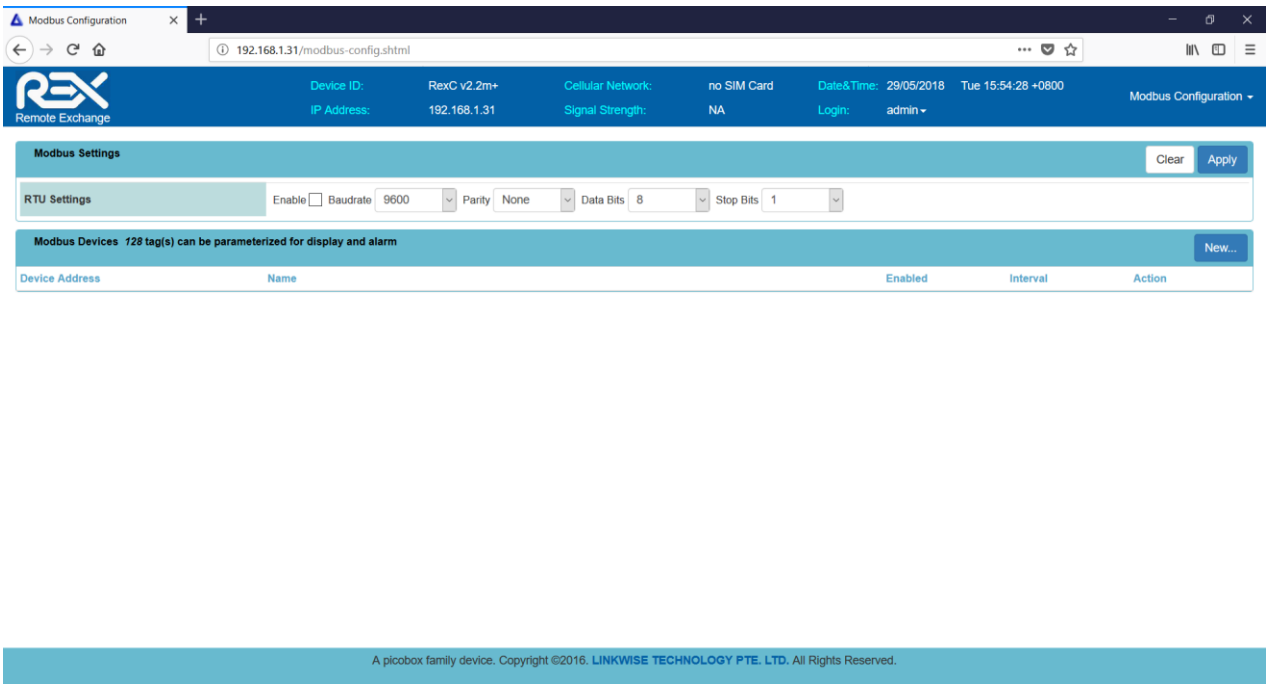


Figure 10.1 Modbus Configuration default page

2. Configure the REX RTU setting. Please be reminded that REX and the device integrated with REX via Modbus should have the same RTU settings.
    - **Baudrate:** the rate of the data transferred through Modbus
    - **Parity:** type of check bit used to detect error on data transmission.
    - **Data Bits:** Size of the data.
    - **Stop Bit:** Basic error check to detect baud rate or byte length.

3. Click “New” under Modbus Devices.

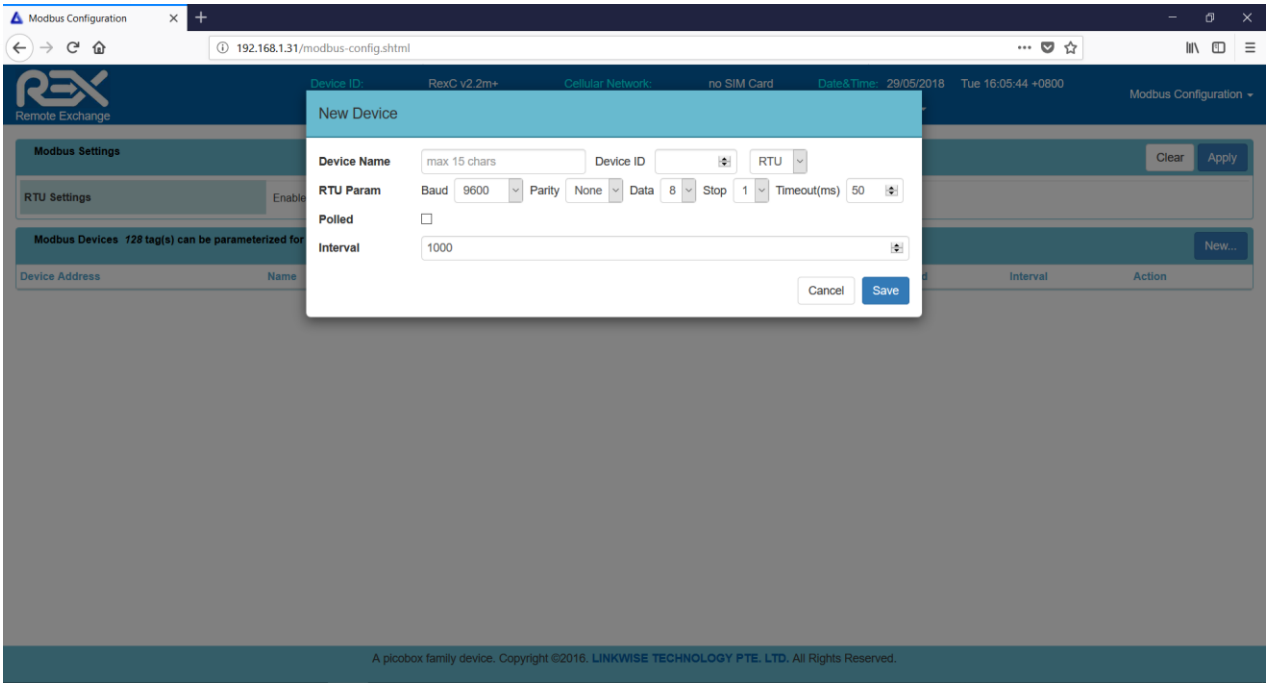


Figure 10.2 Adding New Devices

- **Device name** – a name used to alias a device connected to REX
- **Device ID** – slave ID of the device connected to Rex
- **Modbus Type** – either RTU or TCP (TCP is unavailable right now)
- **Baud Rate** – the rate of the data transferred through Modbus
- **Parity** – type of check bit used to detect error on data transmission.
- **Data** – size of the bit.
- **Stop –** basic error check to detect baud rate or byte length.
- **Timeout** – the amount of time REX will wait for the device to response.
- **Polled** – check to start polling data from the device connected to REX.
- **Interval** – the time interval by which REX will query the devices under Modbus.

4. After setting up the parameters of the device, you may now proceed on configuring each tags of the device. First click the link of your chosen device below Device Address.

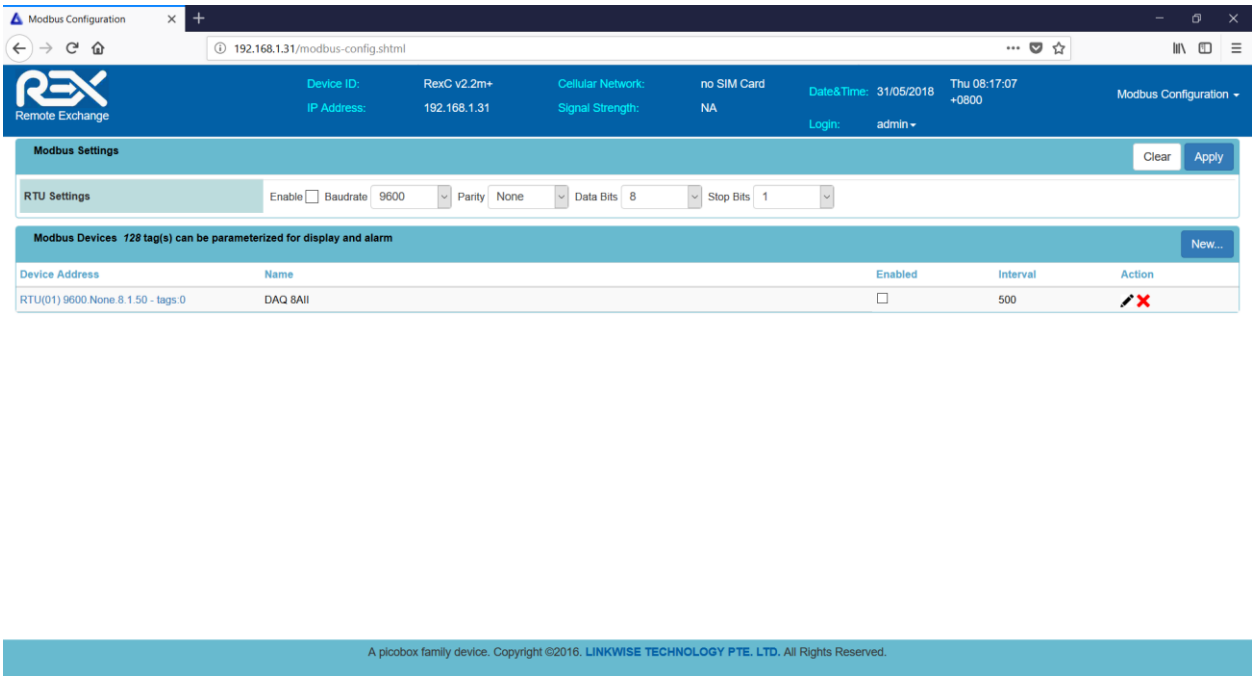
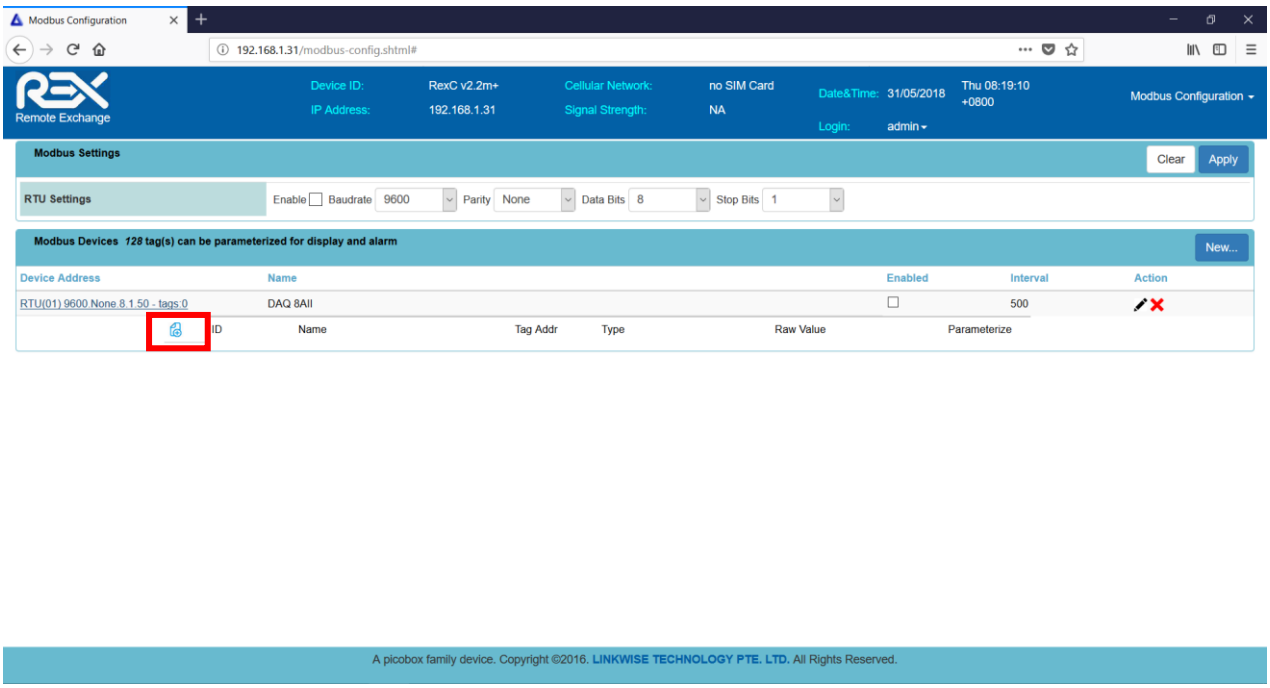
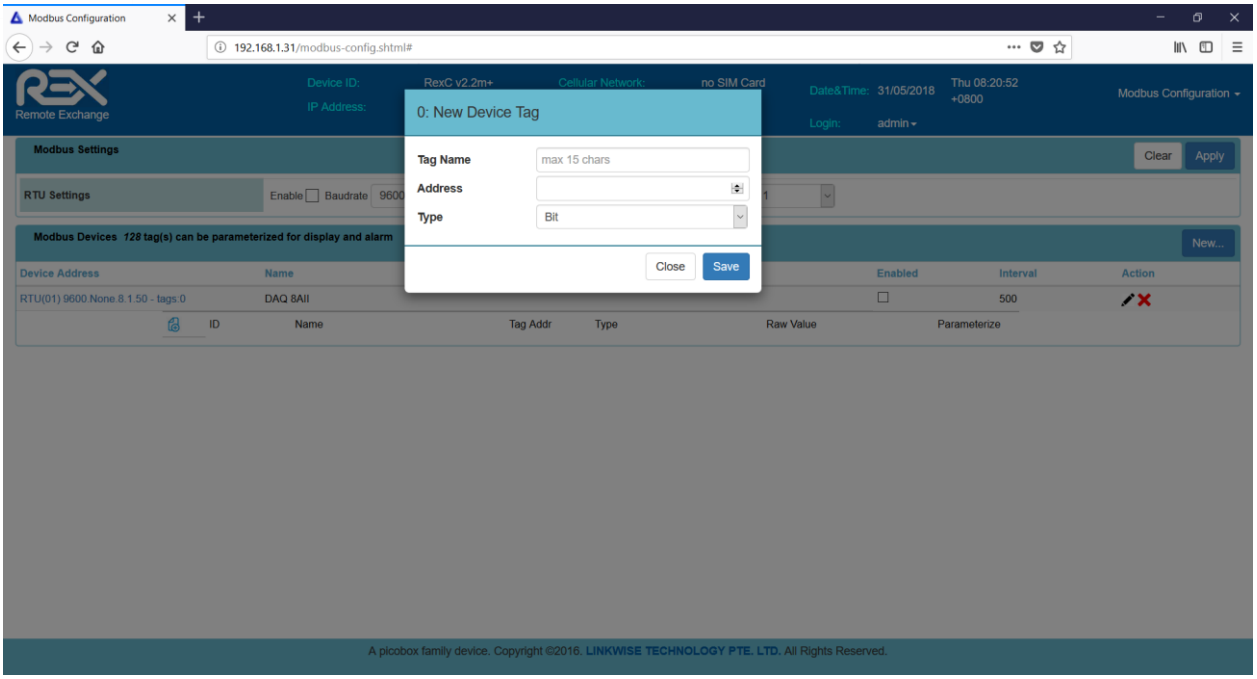


Figure 10.3 Phone Group Page

5. Click add new tag as high lightened below.

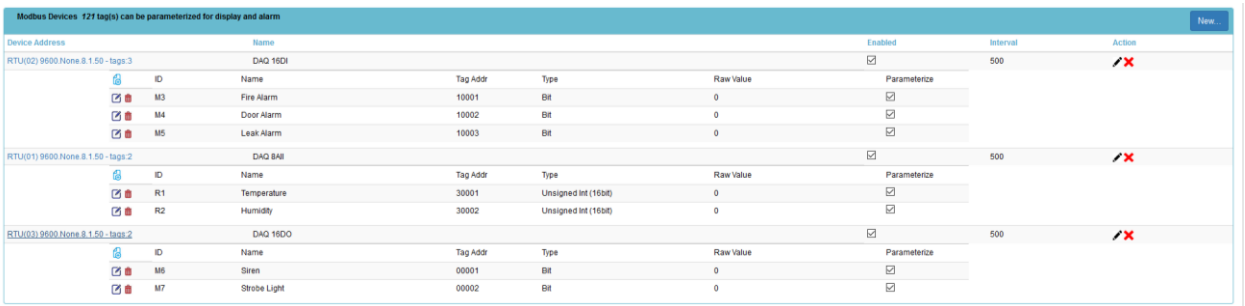


6. Fill the necessary fields on the pop up menu.



- **Tag Name –** Tag description, this depends on what device is connected to this tag.
- **Address –** Please ask your device supplier for the Modbus Address Mapping. For Picobox DAQ users please refer to PicoboxDAQ_UserManual for the mapping.
- **Type –** Size of the data to be polled.

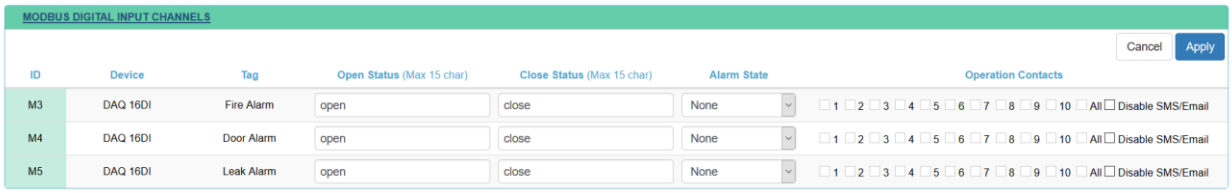
7. Check parameterize to move the specific tag at the IO configuration and dashboard.
8. Click enable polling for each devices.
9. Click the checkbox at the RTU setting to enable the Modbus function.
10. Below is an example Modbus configuration of REX with Picobox DAQ8AII, DAQ16DI and DAQ16DO.



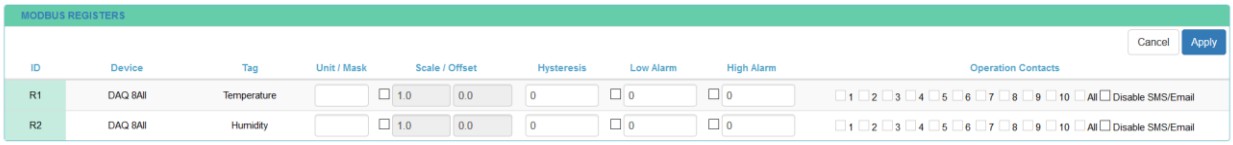
MODBUS IO Configuration

After establishing the communication. You will need to configure the I/O state of the Modbus. Proceed to IO configuration by clicking it at the upper right side of the UI.

Modbus Digital Input Channels – are tags that sends Bit Inputs on REX.



Modbus Registers – are tags that sends registers (integers, words, double words etc.) to the REX.



Unit – This field is for the user to define the unit of analog input.

Scale – This field is for the user to input value to multiply to the raw value before determining the state of analog input.

Offset – This field is for the user to input value to add/subtract to the final value after scaling before determining the state of analog input.

Hysteresis - This field is for the user to set a threshold from alarm value to normal value to prevent spurious triggering of analog alarms.

Low Alarm – This field is for the user to define the low value of analog input. Tick the box beside the value to enable low alarm.

High Alarm – This field is for the user to define the high value of analog input. Tick the box beside the value to enable high alarm.

Modbus Digital Output Channels – are tags that sends Bit Outputs on REX.

Errors on Modbus

EXTERNAL DEVICES

ID	Device	Tag Name	Value/State	Alarm/Control
M3	DAQ 16DI	Fire Alarm	open	alarm disabled
M4	DAQ 16DI	Door Alarm	open	alarm disabled
M5	DAQ 16DI	Leak Alarm	open	alarm disabled
R1	DAQ 8AII	Temperature	0	alarm disabled
R2	DAQ 8AII	Humidity	0	alarm disabled
M6	DAQ 16DO	Siren	Off	Off
M7	DAQ 16DO	Strobe Light	Off	Off

If you see a yellow circle with 'question mark' besides a tag, then it means either there is something wrong on the configuration or the device is disconnected to REX.

EXTERNAL DEVICES

ID	Device	Tag Name	Value/State	Alarm/Control
M3	DAQ 16DI	Fire Alarm	open	alarm disabled
M4	DAQ 16DI	Door Alarm	open	alarm disabled
M5	DAQ 16DI	Leak Alarm	open	alarm disabled

The red circle with a 'pause' sign means that you did not checked the poll check box of a device.

EXTERNAL DEVICES

ID	Device	Tag Name	Value/State	Alarm/Control
M3	DAQ 16DI	Fire Alarm	open	alarm disabled
M4	DAQ 16DI	Door Alarm	open	alarm disabled
M5	DAQ 16DI	Leak Alarm	open	alarm disabled

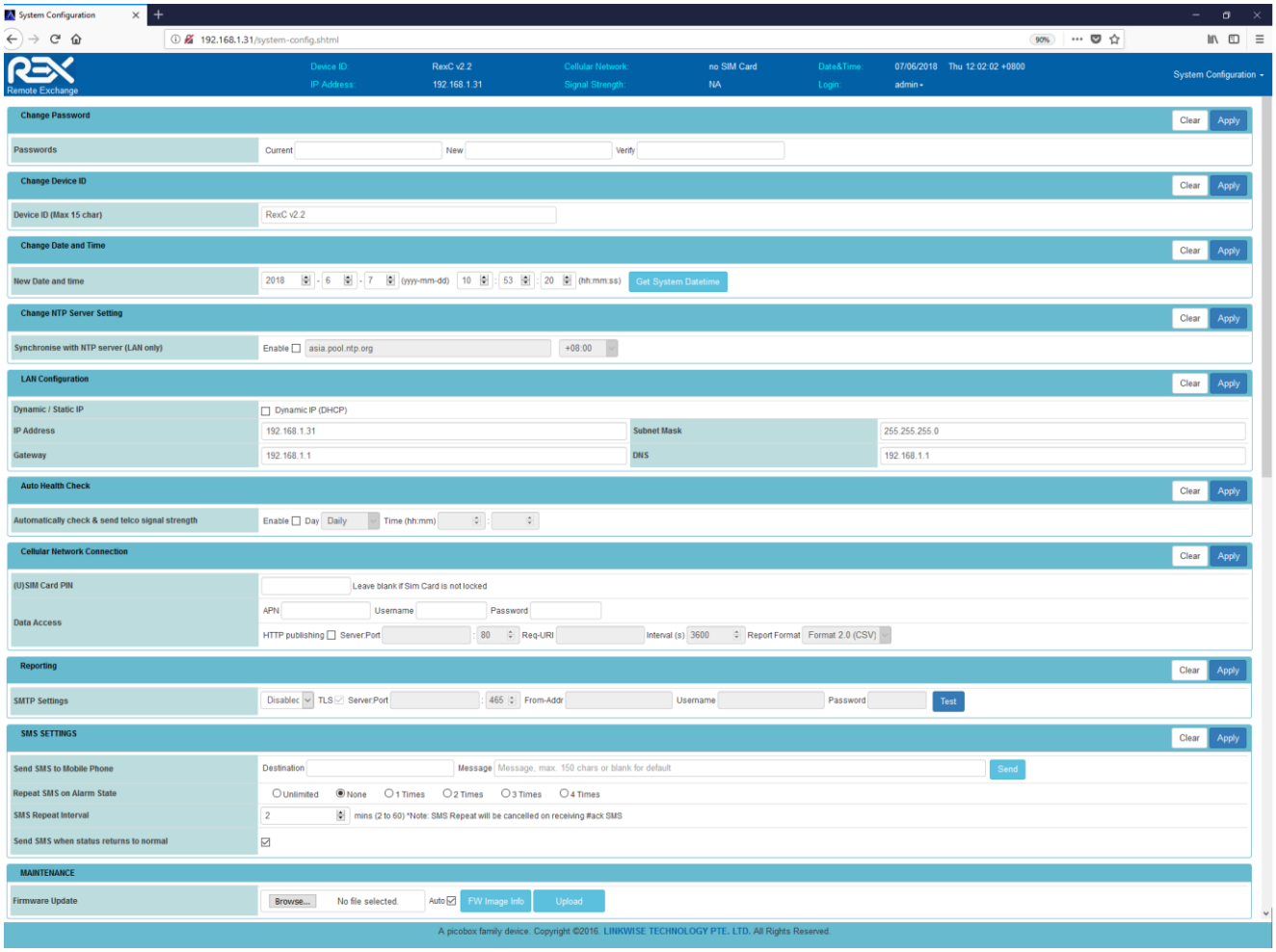
A good Modbus Communication will have a green circle with a 'play' sign inside.

EXTERNAL DEVICES

ID	Device	Tag Name	Value/State	Alarm/Control
M3	DAQ 16DI	Fire Alarm	open	alarm disabled
M4	DAQ 16DI	Door Alarm	open	alarm disabled
M5	DAQ 16DI	Leak Alarm	open	alarm disabled

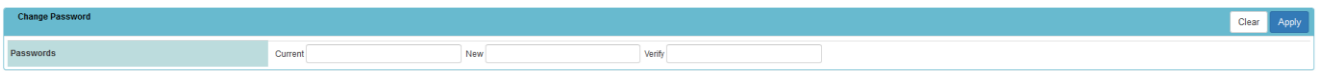
CHAPTER 11 : SYSTEM CONFIGURATION

This page gives you administrator control over REX.



Change Password

To change the Guest/Admin password, type a new password in both New Password and Verify Password fields, then click on the Apply button.

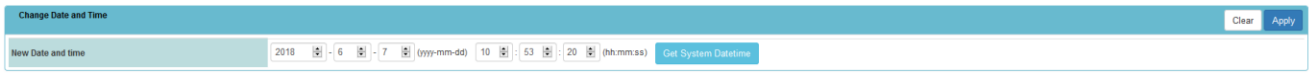


Change Device ID

This entry is for the Administrator to assign a unique name to REX. It accepts up to 15 alphanumeric characters. The device's name will be SMS along with other information when an alarm is triggered. It is advisable to change the Device ID according to the location or site name, as the user will still know which location the SMS alert came from even if there was a change in the device's SIM card number.

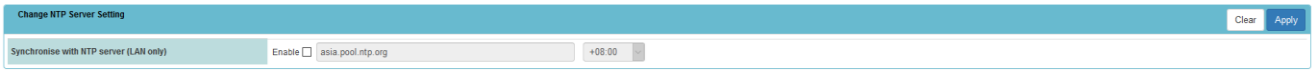
Change Date & Time

Enter the new date and time in this field. The date and time should use the following format: date/month/year (yyyy-mm-dd) and hour:minute:second (hh:mm). For setting the real-time clock of REX. Date and time information are also sent to mobile phone(s) when an alarm is triggered.



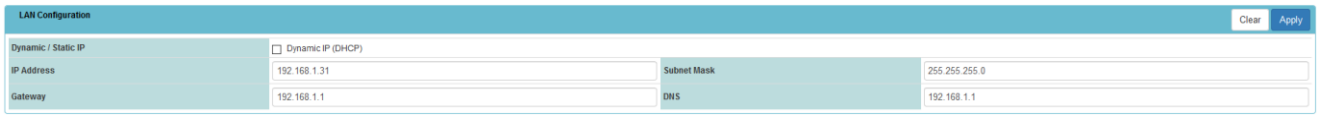
NTP server

To enable time synchronize with NTP server. Set the Host or IP address of the NTP server to be used. Select the GMT from the drop down box and check the Enable checkbox. The NTP will synchronize the time with the server that has less number of the stratum.



LAN Configuration

This setting is self-explanatory. Care is to be exercised in setting the IP address and subnet mask values. Incorrect IP address /subnet mask setting will render REX inaccessible from the network. Invalid IP/Subnet range will also cause REX to be inaccessible from the network. REX do have error trapping and will warn of any invalid settings. If for some reason, the trapping misses and the invalid values are accepted by the unit and cause network connection difficulties, contact your distributor for assistance.



By default, REX's IP address is 192.168.1.31 and the default subnet mask is 255.255.255.0. This means the IP address of your PC may be set in the range 192.168.1.1 to 192.168.1.254 inclusive but obviously excluding 192.168.1.31, which is the address for REX.

IP Address

You can change the IP address of REX using this option. Enter the new IP address.

Subnet Mask

Set the subnet mask of the device using this option.

Gateway

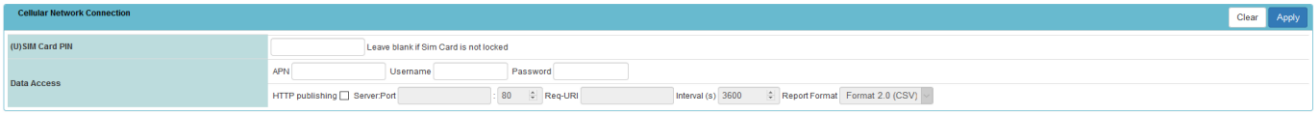
Set the default gateway of the device using this option.

Auto Health Check

This feature automatically reports to recipients the telco signal strength of REX over SMS: If enabled, REX will send an SMS message on the preset day and time. The Enable checkbox enables the auto health check SMS to be sent at the scheduled date & time and to the appointed operation phone group.

Cellular Network Connection

This feature must be enabled if user wants to use mobile data to send E-Mail either standalone system or connected to corporate network. When this feature is enabled, REX will send E-Mail via mobile internet. Remember to press 'Apply' button for any changes to take effect.

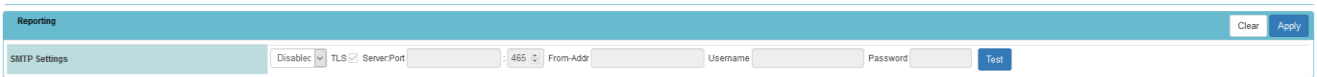


Data Access

REX can push reports to remote servers. Each report contains current status information of the tags. The report format is in easy to parse text format, the format is available on request from Linkwise Technology. For communicating with new REX has 4 formats: CSV, URL encoded Form, JSON and XML.

Reporting

Enable the SMTP to start sending email via REX.



TLS – Tick this box if your email is encrypted.

Port – The port to use, default for SMTP without encryption is 25 (584, 2525 are also used). For encrypted TLS usually 587.

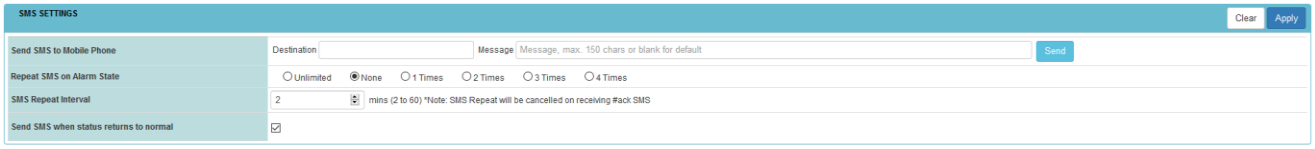
From Address – The e-mail address in which REX uses to send email notification.

Username – The log in credentials to use when authenticating.

Password – The Password credentials to use when authenticating.

Test – Input an email address that you want to send test e-mail.

SMS Settings



Repeat SMS on Alarm State

If set, when an alarm is triggered, the SMS will be sent repeatedly according to the number of times specified, to the operation and forward group. Choice of repeating once to 4 times, or unlimited repeating. The repeat will cancel when a user reply with an acknowledge command.

SMS Repeat Interval

SMS repeat duration (2- 60mins).

To cancel repeat sending, any mobile phone from the operation or forward must acknowledge to REX by replying the acknowledge command (#ack). This command is non-case sensitive. #ack, #ACK, #Ack are valid strings. REX upon receipt of the acknowledge command stop sending further SMS to this alarm.

Send SMS when status returns to normal

If Yes is selected, SMS will be sent once when status of Digital Input or Analog Input changes from Alarm to Normal state. There is no repeat for this 'Normal' SMS. If No is selected, SMS will not be sent out when status of Digital Input or Analog Input changes from Alarm to Normal state.

CHAPTER 12 : TEXT COMMANDS

REX allows a number of important functions to be accessed and controlled remotely via SMS by the listed and authorized mobile phones. The three categories of users (Operation, Forward, and Authorizer) have specific rights in the use of various remote control functions. This page summarizes each function and rights.

Two important arguments are used in conjunction with the action commands. [?] Is a query and [#] is a set argument.

Example: ?ROP is to query the device: Read Operation Phone
#WOP is to write to the device: Write Operation Phone

Note: If a command sent to REX does not match the required format or is invalid, REX will not respond to the querying mobile phone and no action is taken by it. Similarly, if any unauthorized mobile phones try to query a status or to do a set command, it will also not respond to that mobile phone.

Query Mobile Phone Numbers

An authorized person can perform query and hanging of Operation, Forward, and Authorizer mobile phone numbers stored in the unit's memory.

SMS Remote Action	SMS Command	Sample Command	Comment	Rights	
				Operation	Authorizer
Query Operation numbers	?rop	?rop	Returns all numbers stored in Operation group	yes	yes
Query Escalation Numbers	?rep	?rep	Returns all numbers stored in Escalation group	yes	yes
Query Forward Number	?rfp	?rfp	Returns the Forward number	yes	yes
Query Authorized Numbers	?rap	?rap	Returns all numbers stored in Authorized group	no	yes

Phone Management

An authorized person can remotely phone manage the Operation, Forward, and Authorizer mobile phone numbers stored in the unit's memory. The Authorizers are allowed to perform Addition, Replacement, and Deletion of mobile phone numbers remotely using SMS commands.

SMS Remote Action	SMS Command	Sample Command	Comment	Rights	
				Operation	Authorizer
Add / Delete / Replace Operation number	#wop N,phn_number	#wop 1,98765432	N = Operation phone 1-10 Delete number leave phn_number empty	no	yes
	#wop N,	#wop 1,			
Add / Delete / Replace Escalation number	#wep N,timer,phn_number	#wep 1,15,98765432	N = Escalation phone 1-4 timer = Escalation time (5 to 60 minutes) Delete number leave phn_number empty	no	yes
	#wep N,	#wep 1,			
Add / Delete / Replace Forward number	#wfp N,phn_number	#wfp 1,98765432	N = Forward phone 1 Delete number leave phn_number empty	no	yes
	#wfp N,	#wfp 1,			
Add / Delete / Replace	#wap N,phn_number	#wap 1,98765432	N = Authorizer phone 1-3 Delete number leave	no	yes
Authorizer number	#wap N,	#wap 1,	phn_number empty		

Query IO & system status

Operation and authorized users can query the status of Inputs/outputs and perform system checks. REX will reply the current state of the Input and Output, and the System status using the respective commands.

SMS Remote Action	SMS Command	Sample Command	Comment	Rights	
				Operation	Authorizer
Query Input status	?ip N	?ip 1	N = input 1 - 8 input_alarm = none or open or close	yes	yes
	?ip input_name	?ip ups			
Query Output status	?op N	?op 1	N = output 1 or 2 output_name = output description	yes	yes
	?op output_name	?op siren			
Query Analog Input status	?ai N	?ai 1	N = analog input 1 or 2 analog_input_name = analog description	yes	yes
	?ai analog_input_name	?ai room temp			
Query Analog Input Settings	?aic N	?aic 1	N = analog input 1 or 2	yes	yes
Query Analog Input alarms value/status	?aia N	?aia 1			
Query all I/Os	?io	?io	System reply with IO status N = Normal or A = Alarm	yes	yes
Query system status	?syscheck	?syscheck	System reply with Telco signal strength	yes	yes

Output Control

Operation and authorized users can switch the 2 outputs ON or OFF by sending the commands below.

SMS Remote Action	SMS Command	Sample Command	Comment	Rights	
				Operation	Authorizer
Switch on output	#op N|"name"|'name'|name on	#op siren on	N = output number name = output description on_dur = duration in ON state (in seconds) off_dur = duration in OFF state (in seconds) num_pulse = number of pulses	yes	yes
Switch off output	#op N|"name"|'name'|name off	#op siren off		yes	yes
Pulse output pulseon/pulseoff : start in ON/OFF state	#op N|"name"|'name'|name pulseon on_dur off_dur [num_pulse] #op N|"name"|'name'|name pulseoff on_dur	#op siren pulseon 0.5 0.2 50		yes	yes
	off_dur [num_pulse]				
Delay-On output	#op N|"name"|'name'|name delayon off_dur	#op 1 delayon 4		yes	yes
One-Shot output	#op N|"name"|'name'|name oneshot on_dur	#op 1 oneshot 10		yes	yes
Release output (return output to logic engine control)	#op N|"name"|'name'|name release	#op 1 release		yes	yes

IO Configuration

Authorized users can change IO configuration description and alarm state by sending the commands below.

SMS Remote Action	SMS Command	Sample Command	Comment	Rights	
				Operation	Authorizer
Add / Replace Input description	#ipd N,d,o,c	#ipd 1,UPS,Normal,Alarm #ipd 1,UPS,Alarm,Normal	N = input 1- 8 d = description o = open state c = close state	no	yes
Add / Replace Output description	#opd N,d	#opd 1,siren	N = output 1 or 2	no	yes
Set / Change Input alarm state	#ipa N,input_alarm	#ipa 1,close #ipa 2,open	N = input 1 - 8 input_alarm = none or open or close	no	yes
Set / Change Analog Input settings	#aic N,d,u,el,eh,h,o	#aic 1,Battery,Volts,0,12,2,0	N = Analog input 1-2 d = Description; u = Unit el = Engrg Low eh = Engrg High h = Hysteresis o = Offset	no	yes
Set / Change Analog Input alarms	#aia N,l,h	#aia 1,25,36	N = Analog input 1-2 l = low alarm val h = high alarm val	no	yes
Enable / Disable Analog Input alarms	#aie N,le,he	#aie 1,0,1	N = Analog input 1-2 le = low alarm enable he = high alarm enable	no	yes

Repeat Configuration

Authorized users can change the SMS alarm repeat settings sending the commands below. To cancel repeat sending, any mobile phone from the operation or forward must acknowledge to REX by replying the acknowledge command (#ack).

SMS Remote Action	SMS Command	Sample Command	Comment	Rights	
				Operation	Authorizer
Set number of repeat times	#rpt N	#rpt 2	N = number of times SMS repeat	no	yes
		#rpt 0	0= disable repeat		
Set repeat interval	#rpt-time N	#rpt-time 5	N = repeat time interval in minutes	no	yes
Query repeat status	?rpt	?rpt	System reply with repeat interval	yes	yes
Acknowledge repeat alarm for DIn (Xn) or AIn (An)	#ack Xn | An	#ack X1	System reply with Ack received. Sms repeat stops	yes	yes

Table 12.6 Repeat Configuration

Remote SMS command Benefits

With the remote command functionality above it saves time and effort.

- Re-assigning of operation personnel, a change of mobile phone number is also common. Rather than having to physically go to the installation site with a notebook computer, the authorized personnel can perform the change from anywhere using their mobile phone. Where there are many installed sites this becomes very efficient.

- Remotely add, change or clear any setting of repeat time interval in REX memory. Flexibility to change / clear the repeat SMS, once users are familiar with the monitored site and wish to stop receiving repeat SMS . Or a new site that you wish to receive the repeat SMS. All these control are just as simple by using the above remote command from anywhere using you mobile phone.