User Manual

Version 1.0.1 Nov. 2019

LRA-900-E

(Ethernet to LoRa Radio Modem)

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Important Information

Warranty

All products manufactured by ICP DAS are under warranty regarding defective materials for a period of one year, beginning from the date of delivery to the original purchaser.

Warning

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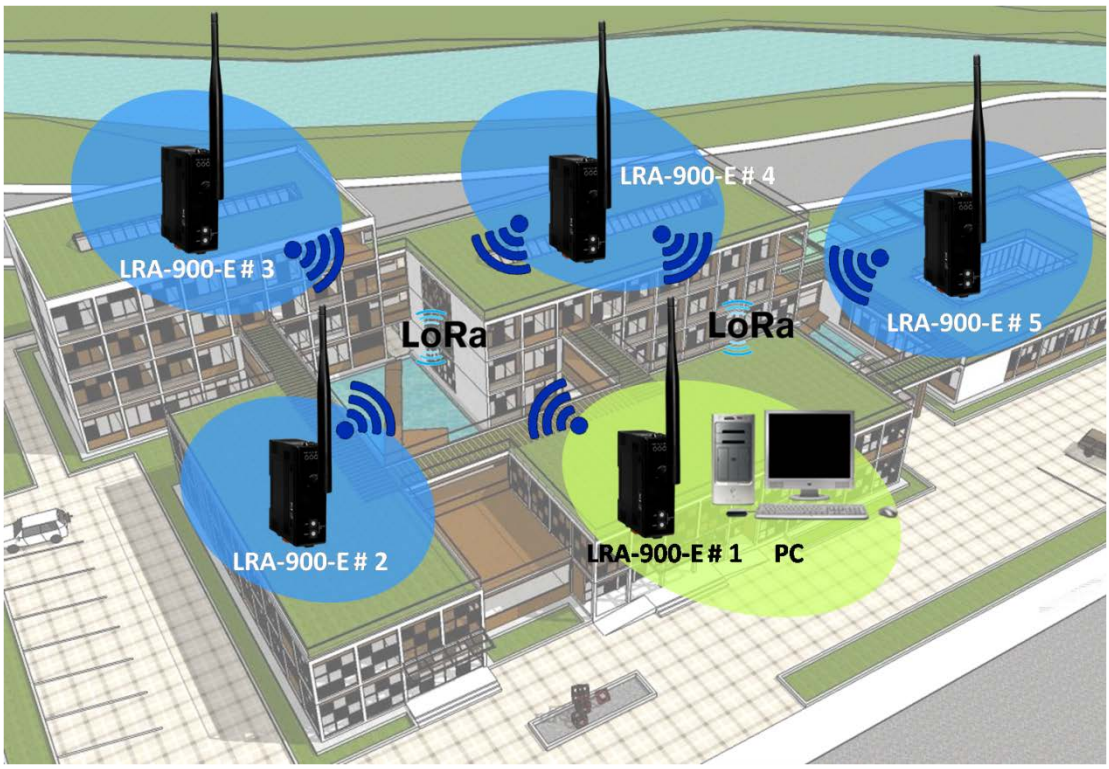
Contact us

If you encounter any problems while operating this device, feel free to contact us via mail at: service@icpdas.com.

1. Introduction

The LRA-900-E is a Ethernet to radio device designed for remote communication operating in a transparent way and exploiting the physical layer of LoRa (Long Range) transmission technology. By using the VxComm Driver/Utility, the built-in RF port of the LRA-900-E can be virtualized to a standard PC COM Port in Windows. Therefore, users can transparently access RF datas over the Internet/Ethernet via COM Port program.

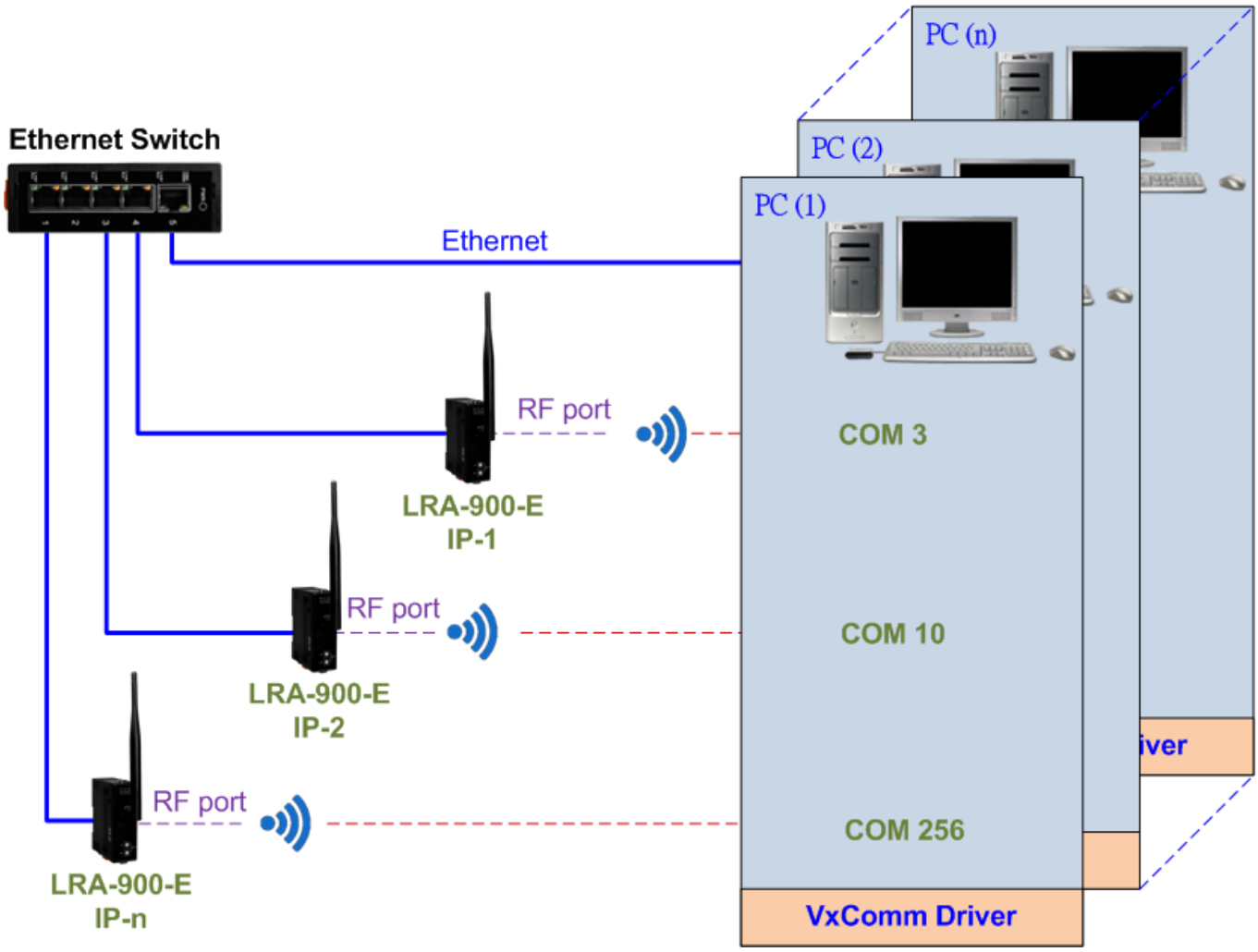
The LRA-900-E provides a maximum line of sight (LOS) transmission distance of 1500 meters at an RF bit rate 10,000 bps. In order to overcome the interference that may be encountered in harsh environments, the LRA-900-E allows the RF transmission bit rate to be configured to a minimum of 250 bps, enhancing the capability of the modem to resist noise and other interference. Additionally, the RF channels and Group IDs are adjustable, which is helpful to avoid interference encountered when two LRA-900-E networks are adjacent. The RF channels and the Group IDs can be configured in order to distinguish and control the different LRA-900-E networks.



1.1. VxComm Technology

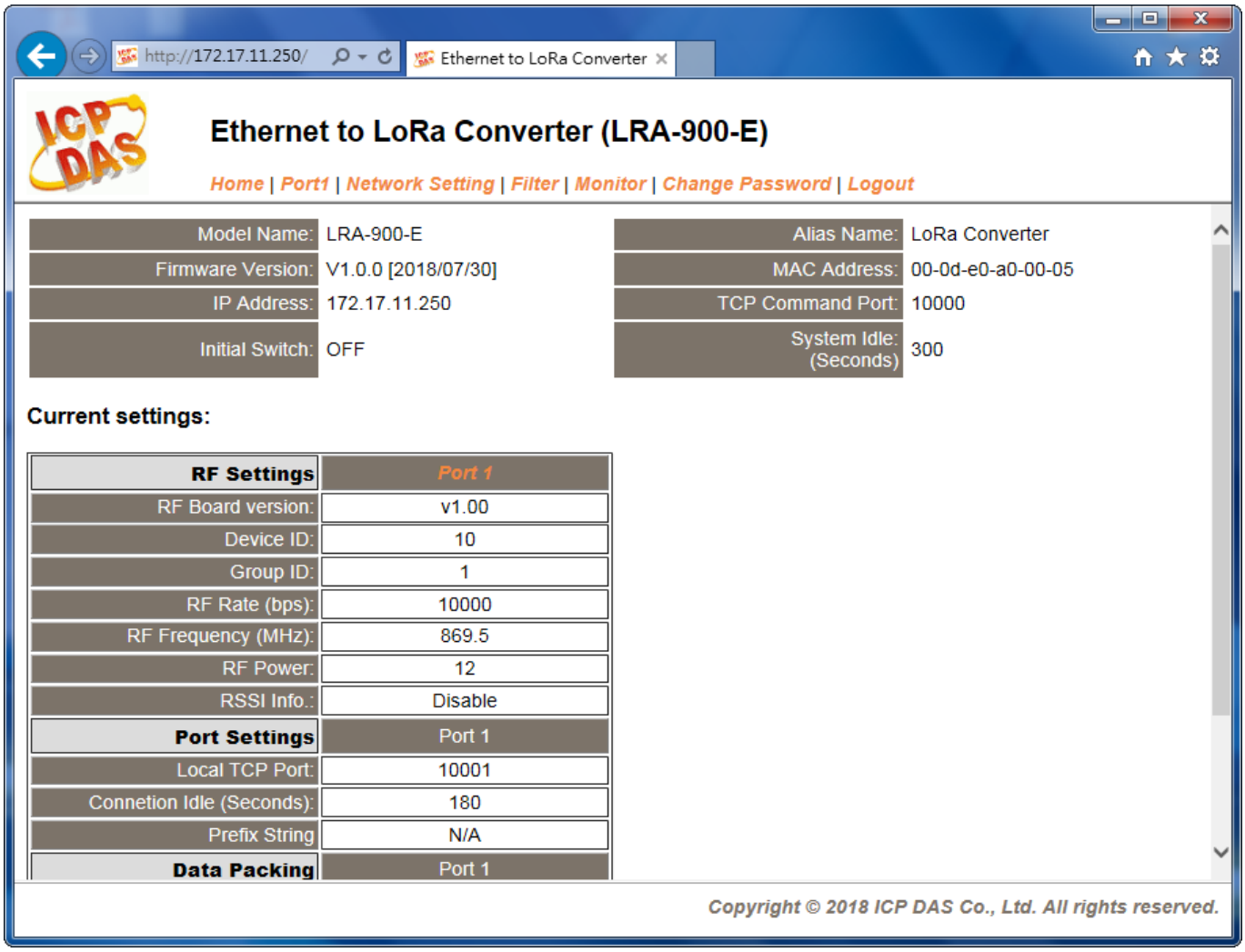
In general, writing a TCP/IP program is more difficult than writing a COM Port program. Another issue is that perhaps the existing the COM Port communication system was built many years ago and is now outdated.

As a result, a new technology, VxComm was developed to virtualize the RF Port of the LRA-900-E to become a COM Port on the PC and allow up to 256 COM Ports to be used on a central computer. The VxComm driver saves time when accessing LRA-900-E devices through the Ethernet without the need for reprogramming the COM Port software on the PC.



1.2. Web Server Technology

Web server technology enables the LRA-900-E to be configured via a standard web browser interface, e.g. Google Chrome, Internet Explorer, or Firefox, etc. This means that it is easy to check the configuration of thet LRA-900-E via an Ethernet network without needing to install any other software tools, thereby reducing the learning curve required for maintaining the device.



2. Hardware Information

This chapter provides a detailed description of the front panel, the hardware specifications and the dimensions for the LRA-900-E module.

2.1. Specifications

RF Interface	
Radio Frequency	864~ 871.5MHz, 915~ 922.5MHz (channel: 32, recommend using 868 +/- 4 MHz)
Baud Rate	10000 ~ 250 bps
Transmission Power	15 dBm (Max.)
Antenna	2 dBi Omnidirectional Antenna
Transmission Distance	up to 1500 m (with 10,000 baud, in free field conditions)
Group ID	0~255
Protocols	Transparent transmit
Configuration	Web Server
Ethernet Interface	
Ethernet	10/100 Base-TX, 8-pin RJ-45 x 1, (Auto-negotiating, Auto-MDI/MDIX, LED indicator)
LED Indicators	
Red/ Green/ Yellow	Power / RF TxD / RF RxD Status
EMS Protection	
ESD	+/- 4 kV Contact
EFT	+/- 1 kV
Surge	+/- 1 kV
Power	
Power Input	+10 V_{DC} ~ +30 V_{DC}
Power Consumption	1.5 W (Max.)
Mechanical	
Dimensions (W x L x H)	110 mm x 83 mm x 33 mm (not include antenna)
Installation	DIN-Rail
Environment	
Operating Temperature	-25 °C ~ +75 °C
Storage Temperature	-30 °C ~ +80 °C
Relative Humidity	10 ~ 90% RH, Non-condensing
Note: RF Port = TCP Port 10001	

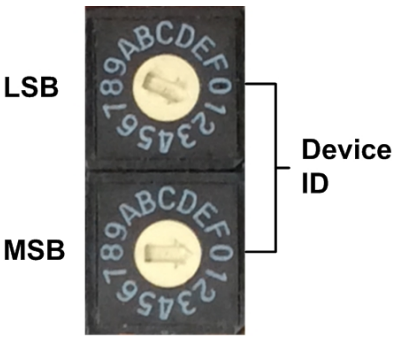
2.2. Features

- LoRa (Long Range) transmission technology
- 32 RF channels (Frequency band : 864~ 871.5MHz, 915~ 922.5MHz)
- RF baud rates (10,000 ~ 250 bps)
- Wireless line of sight (LOS) transmission range of up to 1500 meters at an RF baud rate of 10,000 bps
- Data transmission via Virtual COM or raw TCP connection
- VxComm Driver for 32-bit and 64-bit Windows XP/2003/2008/Vista/7/8/10
- Max. connections: 1 socket is suggested
- Supports TCP server-mode operation
- Supports UDP responder for device discovery (UDP Search)
- Static IP or DHCP network configuration
- Easy firmware update via the Ethernet (BOOTP, TFTP)
- Tiny Web server for configuration (HTTP)
- Contains a 32-bit MCU that efficiently handles network traffic
- 10/100 Base-TX Ethernet, RJ-45 x1 (Auto-negotiating, auto MDI/MDIX, LED Indicators)
- 3000 V_{DC} isolation and +/- 4 kV ESD protection
- RoHS compliant with no Halogen

2.3. Appearance

Front View	1. LED indicator
	Once power is supplied to the LRA-900-E module, the LED indicator will illuminate. An overview of the LED functions is given below:

LED	Behavior	Description
PWR	On	+10 ~ +30 V_{DC} Power On
	Off	Power Off
	Flash	Module into Init mode
RF_Tx	On	RF is transmitting data
	Off	RF is no data to transmit
RF_Rx	On	RF is receiving data
	Off	RF is no data to receive

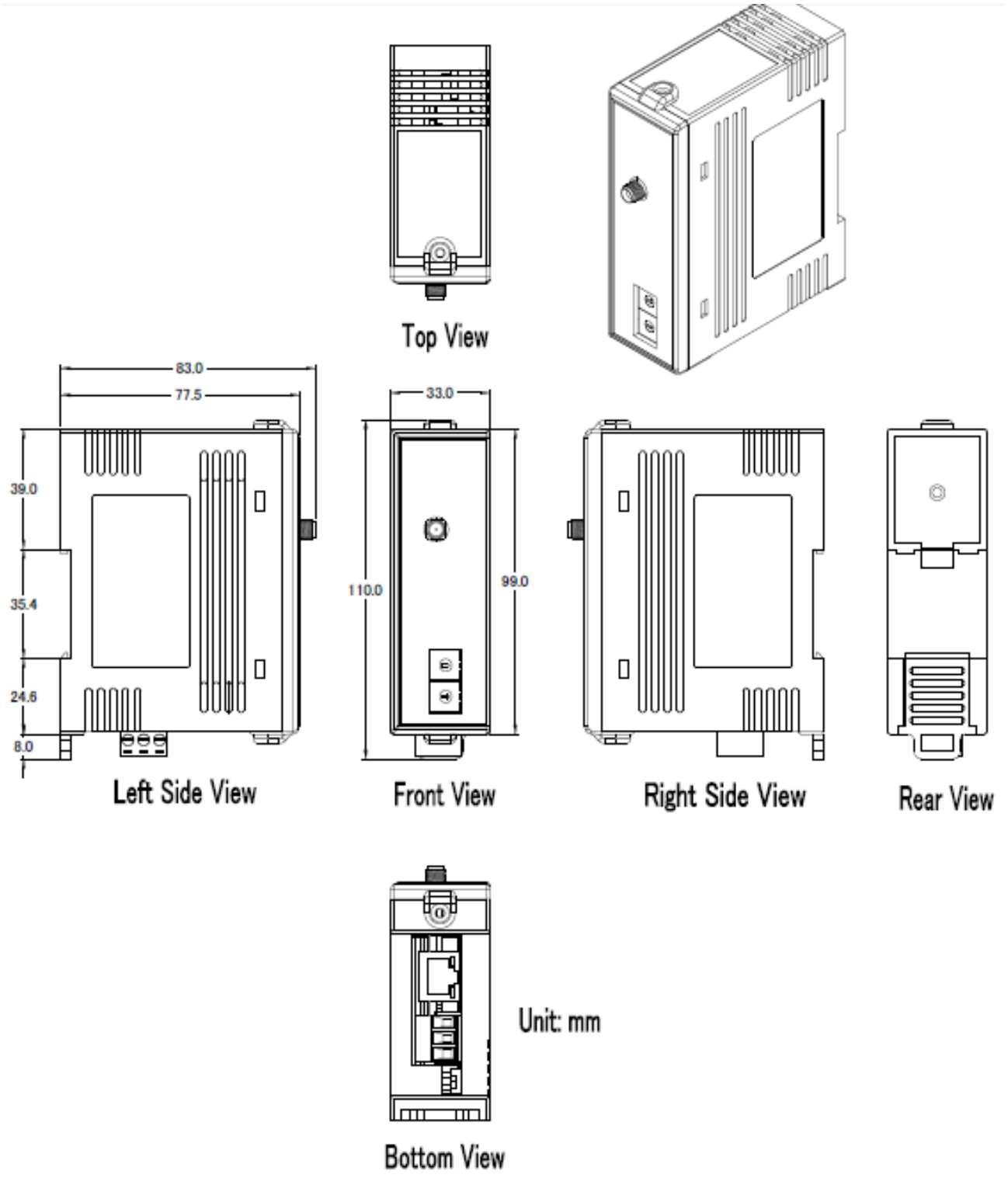
2.	Device ID Switch
	Device ID, 0x01 ~ 0xFE NOTE: ➢ Each module's "Device ID" must be different from each other. ➢ 0x00 and 0xFF are reserved for future used, don't set these two values.

3.	Operating Mode Switch
	**Init Mode:** Configuration mode **Run Mode:** Firmware operation mode For LRA-900-E module, the operating mode switch is set to the Run position by default. In order to update the firmware for the LRA-900-E module, the switch must be moved from the Run position to the Init position. The switch must be returned to the Run position after the update is complete.

4.	+10 to +30 V_{DC} Terminal Block
 F.G. GND +Vs	The LRA-900-E is equipped with a +10V_{DC} to +30 V_{DC} 3-pin terminal block that can be used to connect a DC power supply.
5.	**Ethernet RJ-45 Jack**
	The LRA-900-E module is equipped with an RJ-45 jack that is used as the 10/100 Base-TX Ethernet port and features networking capabilities. When an Ethernet link is detected and an Ethernet packet is received, the Link/Act LED (Green) indicator will be illuminated. When Ethernet running at 100 Mbps, the 10/100M LED (Green) indicator will be illuminated.

2.4. Dimensions

The following diagrams provide the dimensions of the LRA-900-E module. All dimensions are in millimeters.



3. Setting up the LRA-900-E Module

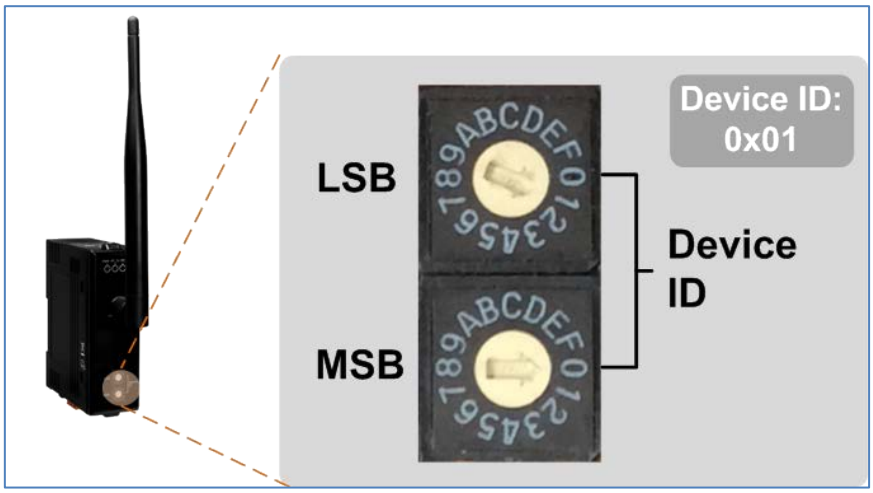
This chapter provides detailed information about how to use the LRA-900-E module. Before using the module, Ethernet configuration and VxComm utility driver installation procedures must first be fully completed. Follow the procedure described below:

Step 1: Connect the Power Supply and the Host PC

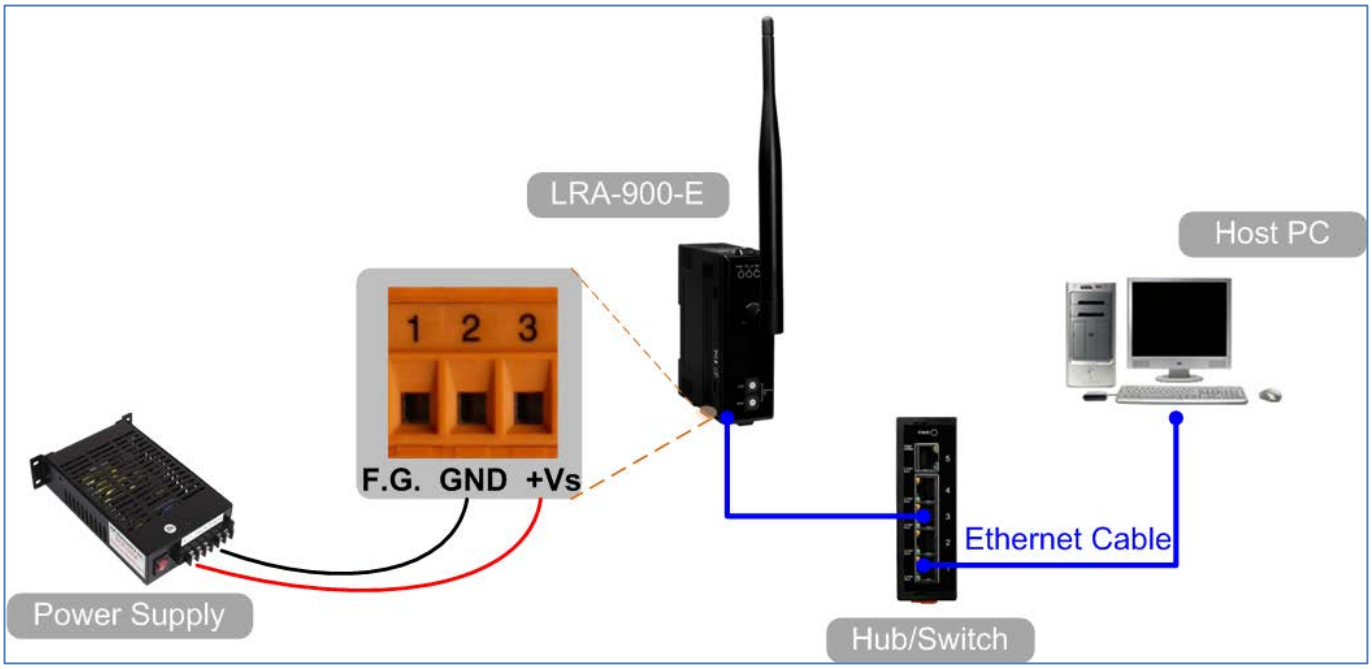
1. Ensure that the network settings on your PC are configured correctly.

2. Ensure that the Windows firewall or any Anti-Virus firewall software is correctly configured or temporarily disable these functions; otherwise the "**Search Servers**" function in the VxComm Utility may not work as required. You may need to contact your System Administrator for more details of how to do this.

3. Check that the Init/Run switch is in the "**Run**" position and set the "Device ID" switch to necessary position.



4. Connect both thet LRA-900-E and the Host computer to the same sub-network or the same Ethernet Switch, and then power on the LRA-900-E. Refer to following figure for illustrations of how to do this.



5. Verify that the PWR LED indicator is illuminated.

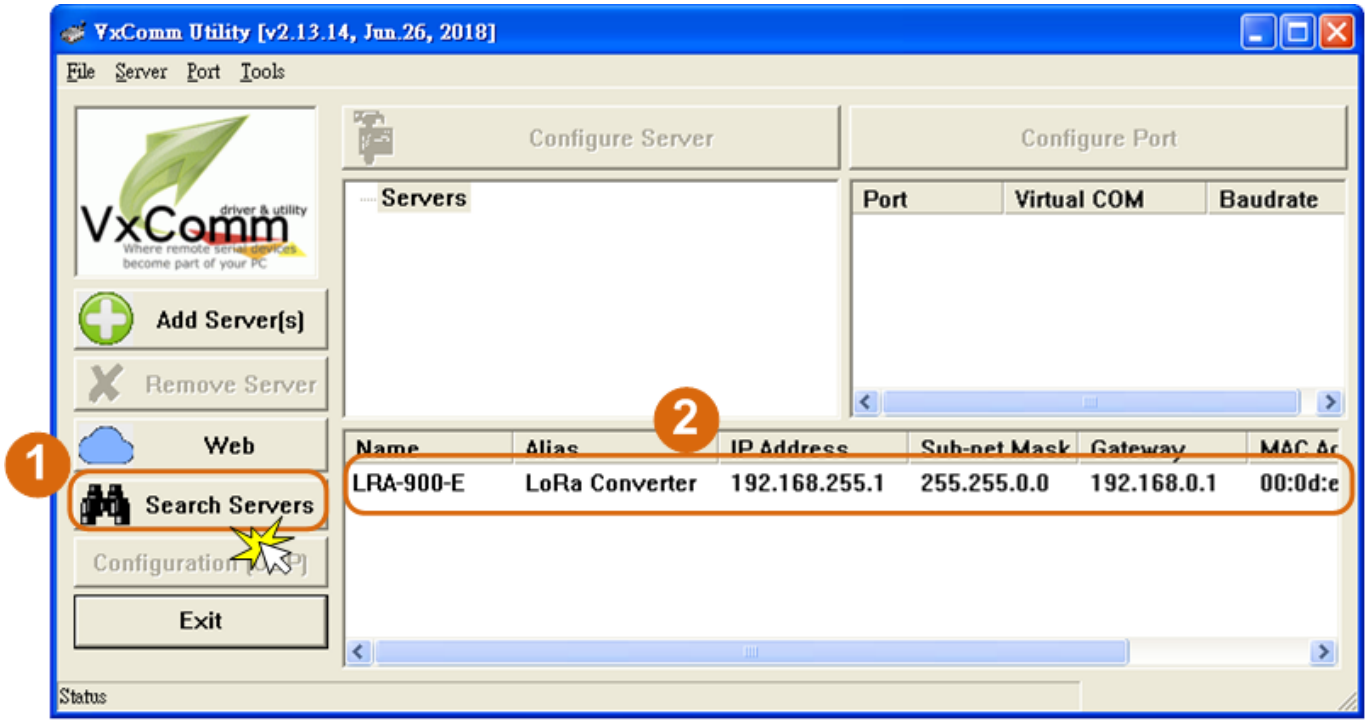
Step 2: Install the VxComm Utility

The VxComm Utility can be obtained from the ICP DAS FTP site, or the ICP DAS web site. The location of the install files on the download addresse is shown below:
http://ftp.icpdas.com/pub/cd/8000cd/napdos/driver/vxcomm_driver/

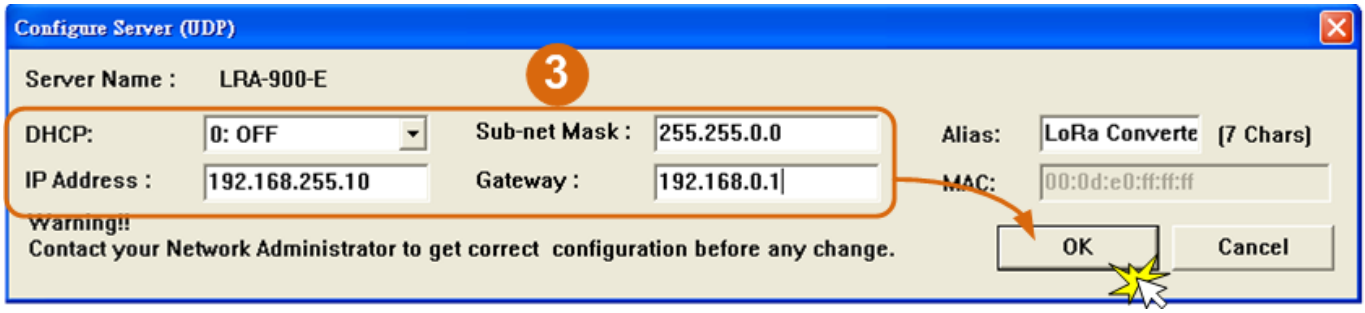
Step 3: Search for the LRA-900-E module on the Ethernet network

1. Open the VxComm Utility and then click the **"Search Servers"** button to search for the LRA-900-E module.

2. Once the search process is complete, double-click the name of the LRA-900-E module to open the **"Configure Server"** dialog box.

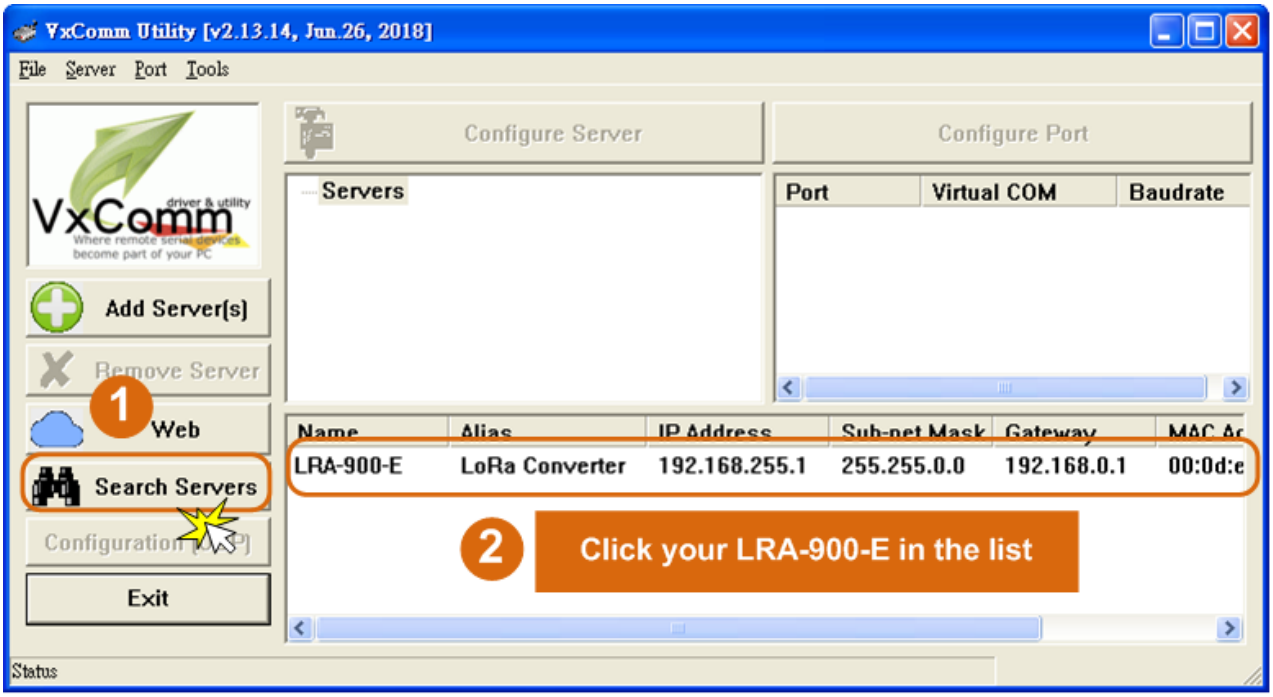


3. Enter the network settings information, including the IP, Mask and Gateway addresses, and then click “OK” button. The new settings for the LRA-900-E will take effect within 2 seconds. If you don’t know the correct network configuration information, contact your Network Administrator to obtain the details.

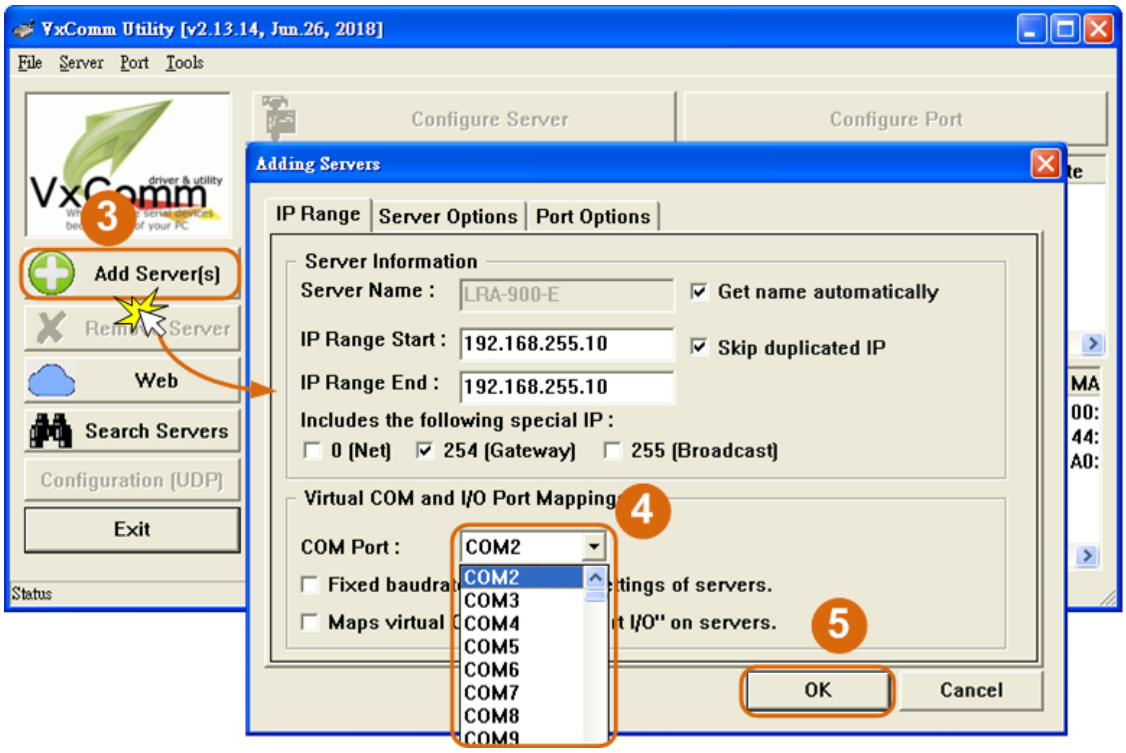


Step 4: Configuring the Virtual COM Ports

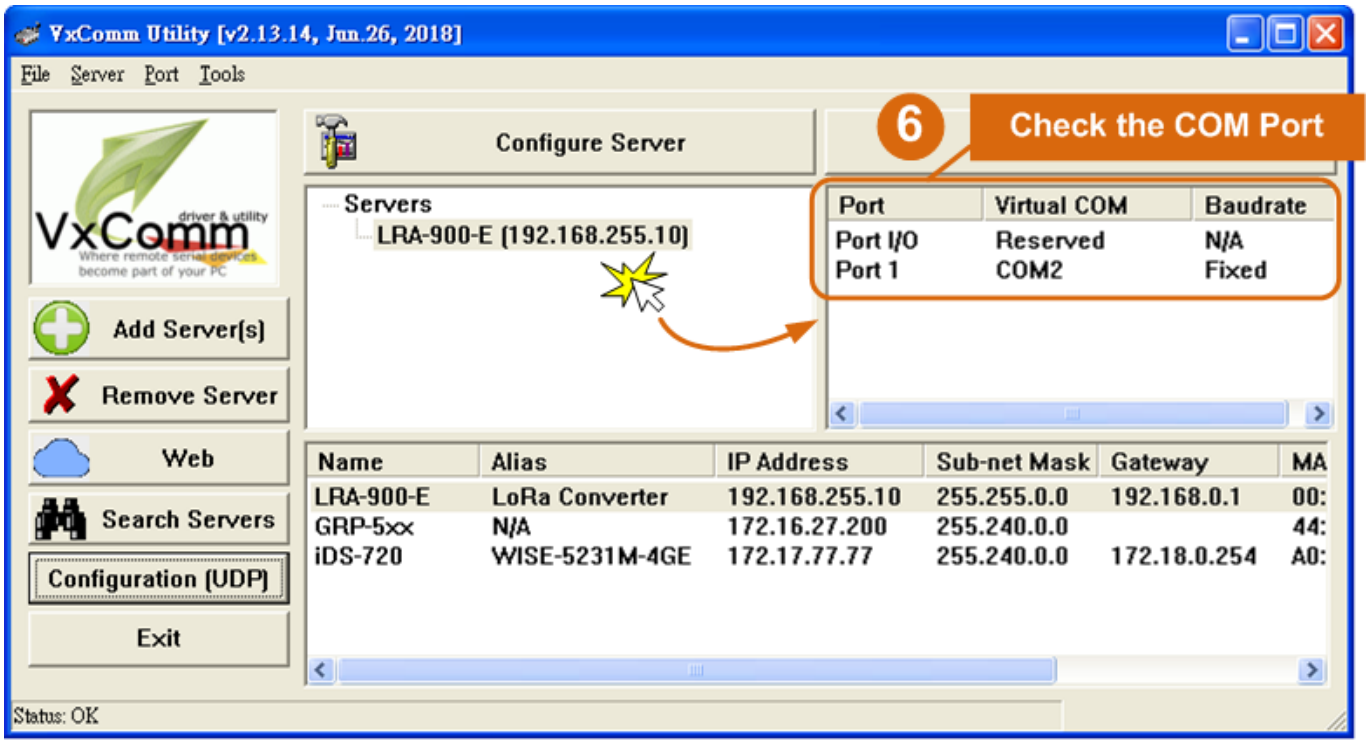
1. Wait 2 seconds and then click the **"Search Servers"** button again to ensure that the LRA-900-E is working correctly with the new configuration.



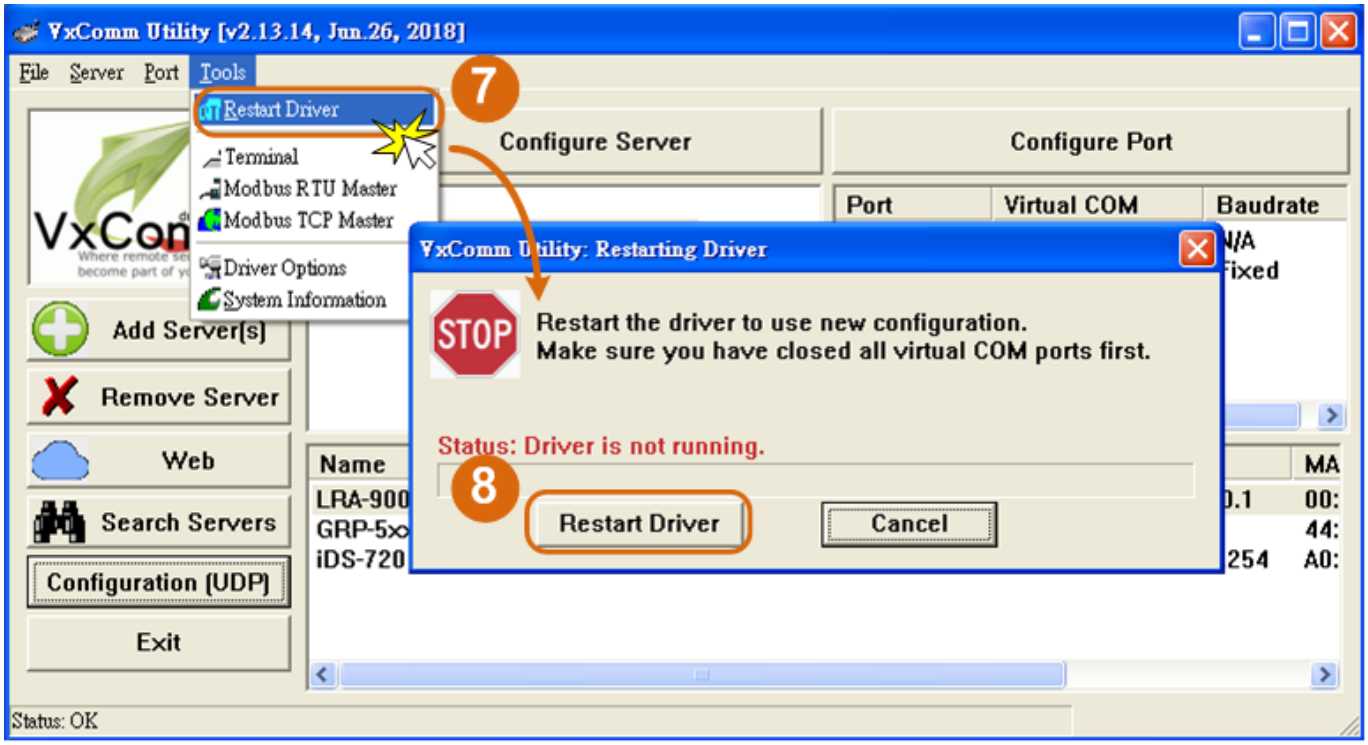
2. Click the "Add Server[s]" button. Assign a COM Port number and click "**OK**" to save your settings.



3. Click on LRA-900-E name and check the virtual COM port mappings on the PC.



4. Click **“Tools” ➔ “Restart Driver”**, and then click the **“Restart Driver”** button.



4. Web Configuration

Once the LRA-900-E module has been correctly configured and is functioning on the network normally, the configuration details can be retrieved or modified using either the VxComm/eSearch Utility or a standard web browser.

4.1. Logging in to the LRA-900-E Web Server

The embedded LRA-900-E web server can be accessed from any computer that has an Internet connection.

Step 1: Open a new browser window.

Open a web browser, for example, Google Chrome, Firefox or Internet Explorer, which are reliable and popular Internet browsers that can be used to configure LRA-900-E module.

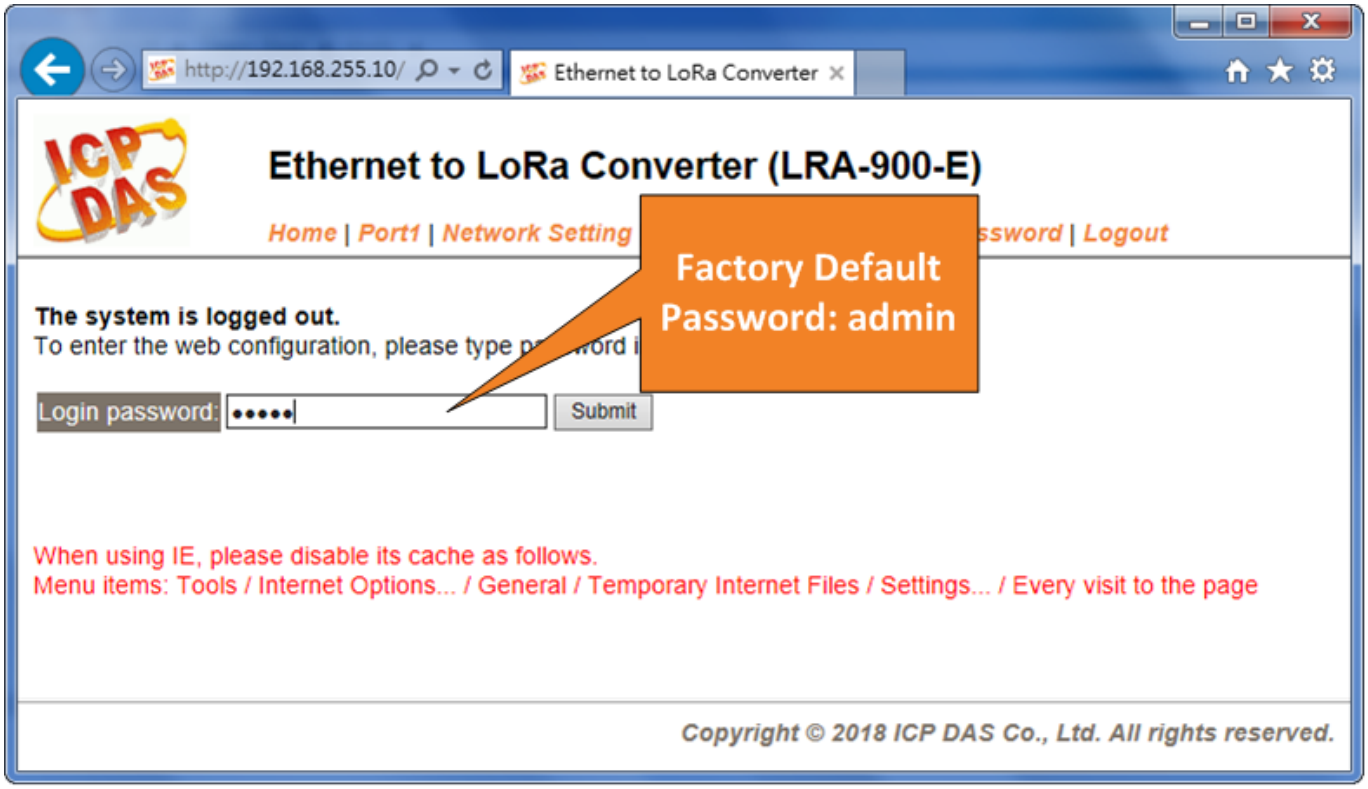
Note that if you intend to use Internet Explorer, ensure that the cache function is disabled in order to prevent browser access errors.

Step 2: Enter the URL for the LRA-900-E web server

Ensure that you have correctly configured the network settings for the LRA-900-E module (refer to Chapter 3 Setting up the LRA-900-E module for detailed instructions), and then enter the URL for theLRA-900-E web server in the address bar of the browser.

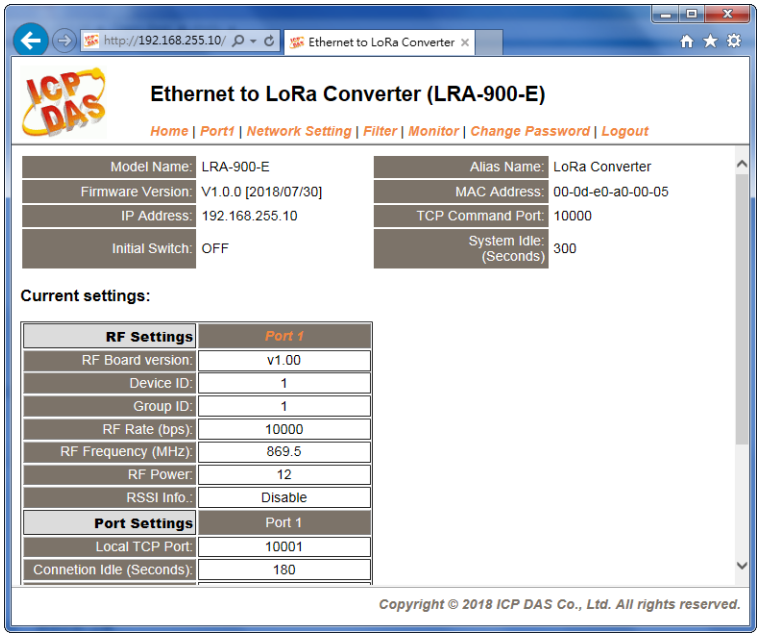
Step 3: Enter the Password

After the main login page is displayed, enter a password (the factory default password is "**admin**"), and then click the **"Submit"** button to continue.



Step 4: Log in to the LRA-900-E Web Server

After logging into the LRA-900-E web server, the main page will be displayed.



4.2. Home Page

The Home link connects to the main page, which contains two parts.

The first part of this page provides basic information about the LRA-900-E hardware and software.

Model Name:	LRA-900-E
Firmware Version:	V1.0.0 [2018/07/30]
IP Address:	192.168.255.10
Initial Switch:	OFF

Alias Name:	LoRa Converter
MAC Address:	00-0d-e0-a0-00-05
TCP Command Port:	10000
System Idle: (Seconds)	300

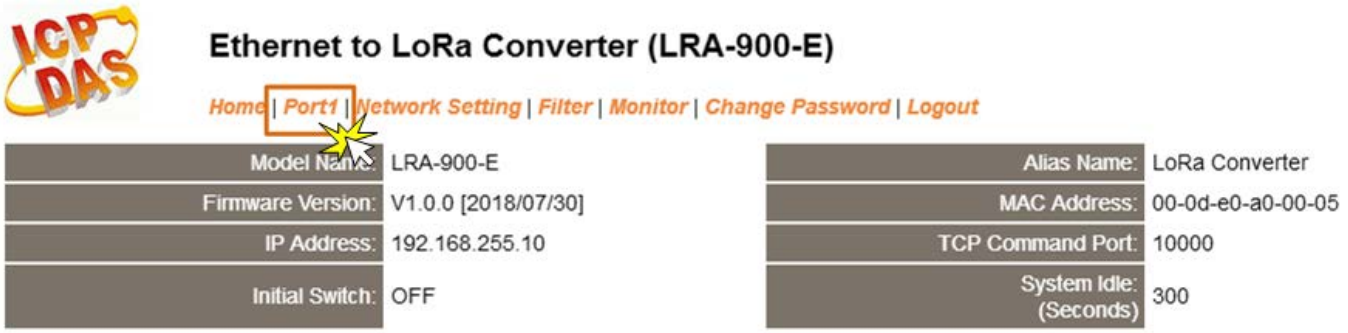
The software and hardware information section includes information related to the Model Name, the current Firmware version, the IP Address, the current position of the Initial Switch, the Alias, the MAC Address, and the TCP Port, and the System Timeout values. **If you update the firmware for the LRA-900-E module, this page can be used to check the version information** of the LRA-900-E software.

The second part of this page provides the status of the port settings.

Current settings:

RF Settings	Port 1
RF Board version:	v1.00
Device ID:	10
Group ID:	1
RF Rate (bps):	10000
RF Frequency (MHz):	869.5
RF Power:	12
RSSI Info.:	Disable
Port Settings	Port 1
Local TCP Port:	10001
Connetion Idle (Seconds):	180
Prefix String	N/A
Data Packing	Port 1
Slave Timeout (ms):	1000
Packing Length (bytes):	0
Ending Chars: (Number[,char1][,char2])	0
Timeout Between Chars (ms):	10

4.3. RF Port Page



The Port 1 Settings section provides functions allowing items such as RF settings, Port settings, RF data packing to be configured.

4.3.1. Port1 Settings

Port 1 Settings

RF Settings	Current	Updated	Comment
Device ID:	1		1~254
Group ID:	1	1	0~255, 255=broadcast group id
RF Rate (bps):	10000	10000	250 ~ 10000 bps
RF Frequency (MHz):	869.5	869.5	recommend using 868.0 +/- 4 MHz
RF Power:	12	12	0~15
RSSI Info.:	Disable	Disable	Enable/Disable RSSI Info., Disable=default.
Port Settings	Current	Updated	Comment
Operation Mode:	0	0	0=Data-sharing, 1=Non-sharing
Local TCP Port:	10001		=TCP Command Port +1
Connetion Idle (seconds):	180	180	1 ~ 65535, 180=default, 0=disable
Prefix String:	N/A	N/A	Max. 7 chars
RF Data Packing	Current	Updated	Comment
Slave Timeout (ms):	1000	1000	After last TX
Packing Length (bytes):	0	0	0 ~ 1024, 0=default=disable
Ending Chars: (Number[,char1][,char2])	0	0	e.g.: 2,0x0D,0x0A
Timeout Between Chars (ms):	10	10	After last RX 10 ~ 65535, 10=default, 0=disable
		Update Settings	

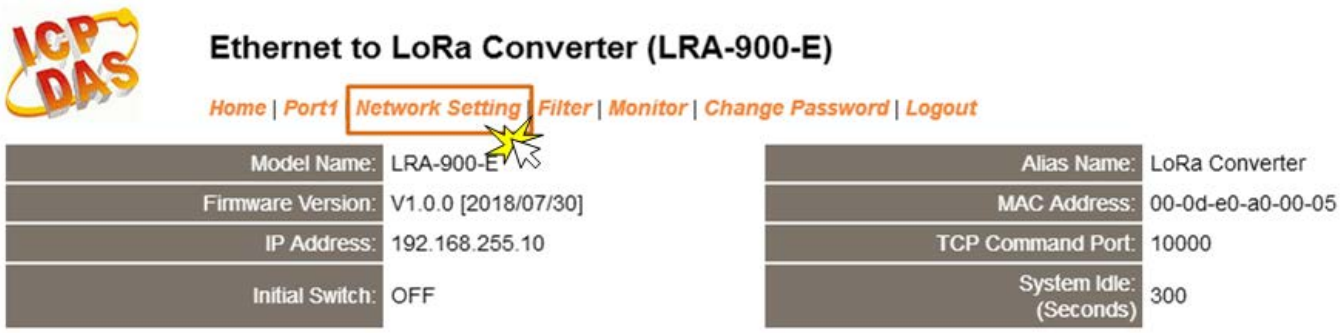
The following is an overview of the parameters contained in the Port1 Settings section:

<table>
<tr><th>Item</th><th>Description</th><th>Default</th></tr>
<tr><td colspan="3">RF Settings</td></tr>
<tr><td>Device ID</td><td>Device ID, valid range: 0x01 ~ 0xFE.
Set by using rotary switch
<table>
<tr><th>Device ID</th><th>Description</th></tr>
<tr><td>1 ~ 254
(0x01 ~ 0xFE)</td><td>Each LRA-900’s “Device ID” must be different from each other in the same RF frequency.</td></tr>
<tr><td>0x00 and 0xFF</td><td>0x00 and 0xFF are reserved for future used, don’t set these two values.</td></tr>
</table></td><td>1</td></tr>
<tr><td>Group ID</td><td>Group ID, valid range: 0 ~ 255 (0x00 ~ 0xFF).
<table>
<tr><th>Group ID</th><th>Description</th></tr>
<tr><td>0 ~ 254
(0x00 ~ 0xFE)</td><td>The module has same group id (0x00 ~ 0xFE) setting can communicate with each other</td></tr>
<tr><td>255
(0xFF)</td><td>The module has the group id (0xFF) setting can communicate with other module which group id setting is 0x00 to 0xFF</td></tr>
</table></td><td>1</td></tr>
<tr><td>RF Rate (bps)</td><td>RF bit rates: 10000, 6000, 3400, 1800, 500, 250 bps
The maximum supported RF receive sensitivities of each baud rate are listed below.
<table>
<tr><th>Baud rate (bps)</th><th>Max. RF Receive Sensitivity (dBm)</th></tr>
<tr><td>10000</td><td>-120.0</td></tr>
<tr><td>6000</td><td>-123.0</td></tr>
<tr><td>3400</td><td>-126.0</td></tr>
<tr><td>1800</td><td>-129.0</td></tr>
<tr><td>500</td><td>-134.0</td></tr>
<tr><td>250</td><td>-137.0</td></tr>
</table></td><td>10000</td></tr>
<tr><td>RF Frequency (MHz)</td><td>32 RF frequencies (864, 864.5, 865, 865.5, 866, 866.5, 867, 867.5, 868, 868.5, 869, 869.5, 870, 870.5, 871, 871.5, 915, 915.5, 916, 916.5, 917, 917.5, 918, 918.5, 919, 919.5, 920, 920.5, 921, 921.5, 922, 922.5 MHz)</td><td>869.5</td></tr>
</table>

<table>
<tr><td>RF Power</td><td>Value 0(0) ~ F(15) are mapping to the RF output power range of 0 ~ 15 dBm.</td><td>12</td></tr>
<tr><td>RSSI Info.</td><td>Enable or disable add “RSSI (Received Signal Strength Indicator, positive number)” and “SNR (Signal-to-noise ratio, 2's complement)”, 2 bytes RF signal information, at the beginning of the received LoRa data when receiving a valid LoRa message.<table><tr><th>SNR (first byte)</th><th>RSSI (second byte)</th></tr><tr><td>SNR byte >= 0</td><td>RSSI = -157 + (16/15 * RSSI byte)</td></tr><tr><td>SNR byte < 0</td><td>RSSI = -157 + (RSSI byte + SNR byte * 0.25)</td></tr></table></td><td>Disable</td></tr>
<tr><td colspan="3">Port Settings</td></tr>
<tr><td>Operation Mode</td><td>M0/Multi-echo: Share received serial data between clients.
M1/Single-echo: Send received serial data to the requested client only.
0 = Data-sharing; 1 = Non-sharing</td><td>0</td></tr>
<tr><td>Local TCP Port</td><td>TCP Command Port +1
Note:
RF port = TCP port 10001</td><td>10001</td></tr>
<tr><td>Connection Idle (seconds)</td><td>If the Local TCP port does not receive any data via the TCP/IP for a certain period, the LRA-900-E will disconnect the socket based on the TCP timeout value.
Settings range: 1 ~ 65535 (seconds); Disabled: 0;</td><td>180</td></tr>
<tr><td>Prefix String</td><td>This parameter is used to set the first character in a line of data.
Settings range: Max. 8 chars.</td><td>N/A</td></tr>
<tr><td colspan="3">RF Data Packing</td></tr>
<tr><td>Slave Timeout (ms)</td><td>Set the waiting time after last Tx of the request sent to the device. If the device does not respond within the timeout value, the LRA-900-E will return existing data via TCP package and process next request.</td><td>1000</td></tr>
<tr><td>Packing Length (bytes)</td><td>When the RF Rx data length reaches to the value, it will be sent out.
Settings range: 0 ~ 1024; Disabled: 0.</td><td>0</td></tr>
<tr><td>Ending Chars</td><td>The LRA-900-E outputs an Ethernet packet immediately after</td><td>0</td></tr>
</table>

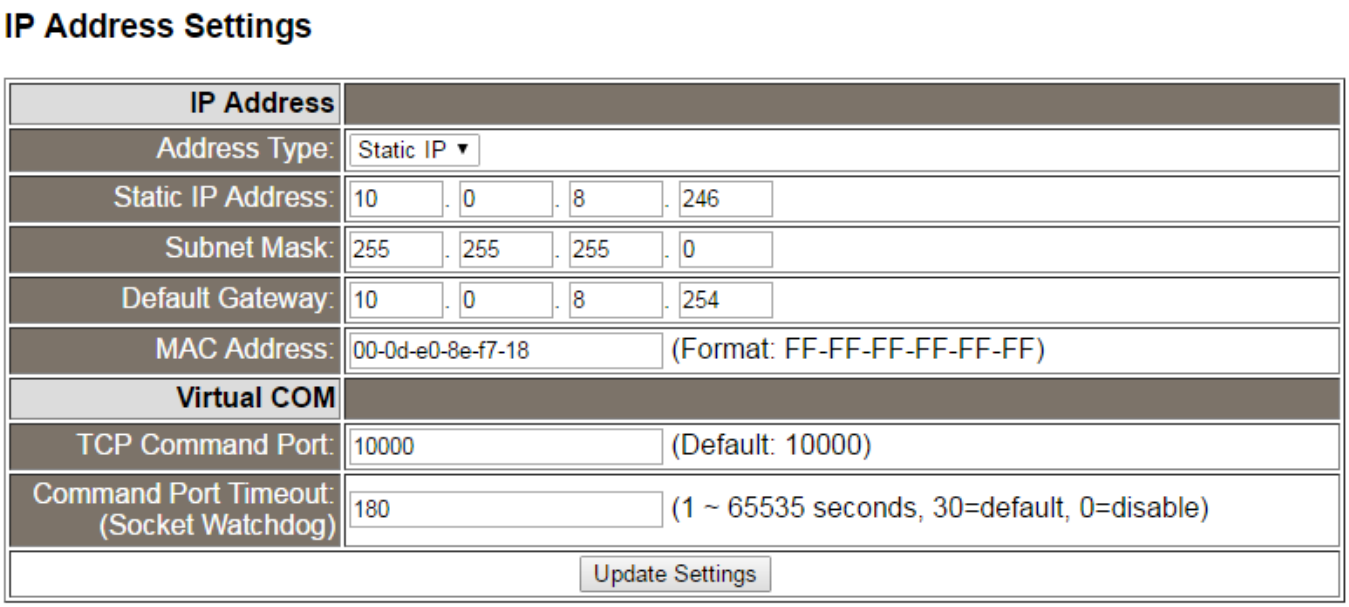
(Number[,char1][,char2])	the ending-chars pattern is identified from the incoming RF data. The number of ending-chars can be 0 (disabled), 1 or 2 chars. Disabled=0; 1 char: **1,0x0D**; 2 chars: **2,0x0D,0x0A**	
Timeout Between Chars (ms)	Set the waiting time after Rx of the response sent from the device. If the device does not respond within the timeout value, the LRA-900-E will process this response. Settings range: 10 ~ 65535; Disabled: 0.	10
Update Settings	Click this button to save the revised settings to the LRA-900-E.	

4.4. Network Setting



4.4.1. IP Address Settings

The **Address Type, Static IP Address, Subnet Mask** and **Default Gateway** values are the most important network settings and should always correspond to the LAN configuration. If they do not match, the LRA-900-E module will not operate correctly. If the settings are changed while the module is operating, any connection currently in use will be lost and an error will occur.



The following is an overview of the parameters contained in the IP Address Settings section:

Item	Description
IP Address	
Address Type	**Static IP:** If no DHCP server is installed on the network, the network settings can be configured manually. Refer to Section 4.4.1.1 Manual Configuration for more details.
	DHCP: The Dynamic Host Configuration Protocol (DHCP) is a network application protocol that automatically assigns an IP address to each device. Refer to Section 4.4.1.2 Dynamic Configuration for more details.
Static IP Address	Each LRA-900-E connected to the network must have its own unique IP address. This parameter is used to assign a specific IP address.
Subnet Mask	This parameter is used to assign the subnet mask for the LRA-900-E device. The subnet mask indicates which portion of the IP address is used to identify the local network or subnet.
Default Gateway	This parameter is used to assign the subnet mask for the LRA-900-E device. The subnet mask indicates which portion of the IP address is used to identify the local network or subnet.
MAC Address	This parameter is used to set a user-defined MAC address, which must be in the format FF-FF-FF-FF-FF-FF.
Virtual COM	
TCP Command Port	This parameter is used to configure the TCP Command Port to a custom value depending on your requirement. Note that if the TCP Command Port configuration setting is completed, the TCP port of RF port will be change, as follows: RF Port (port1) = TCP Command Port + 1 The default TCP Command Port is 10000, Thus, the RF port (port1) is 10001.
Command Port Timeout (Socket Watchdog)	If the command port does not receive any data from the TCP/IP socket for a certain period, the LRA-900-E can disconnect the socket. Settings range value: 1 ~ 65535 (seconds); Default value: 180 (seconds); Disabled: 0;
Update Settings	Click this button to save the revised settings to the LRA-900-E.

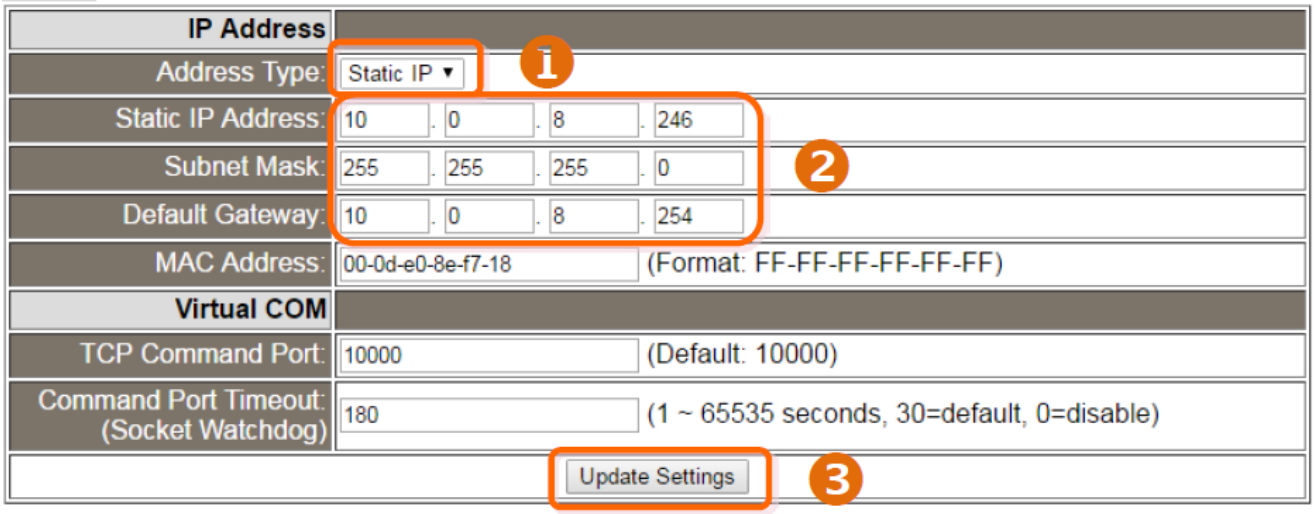
4.4.1.1. Manual Configuration

When using manual configuration, the network settings should be assigned in the following manner:

Step 1: Select the **"Static IP"** option from the **"Address Type"** drop-down menu.

Step 2: Enter the relevant details in the respective **network settings** fields**.**

Step 3: Click the **"Update Settings"** button to complete the configuration.

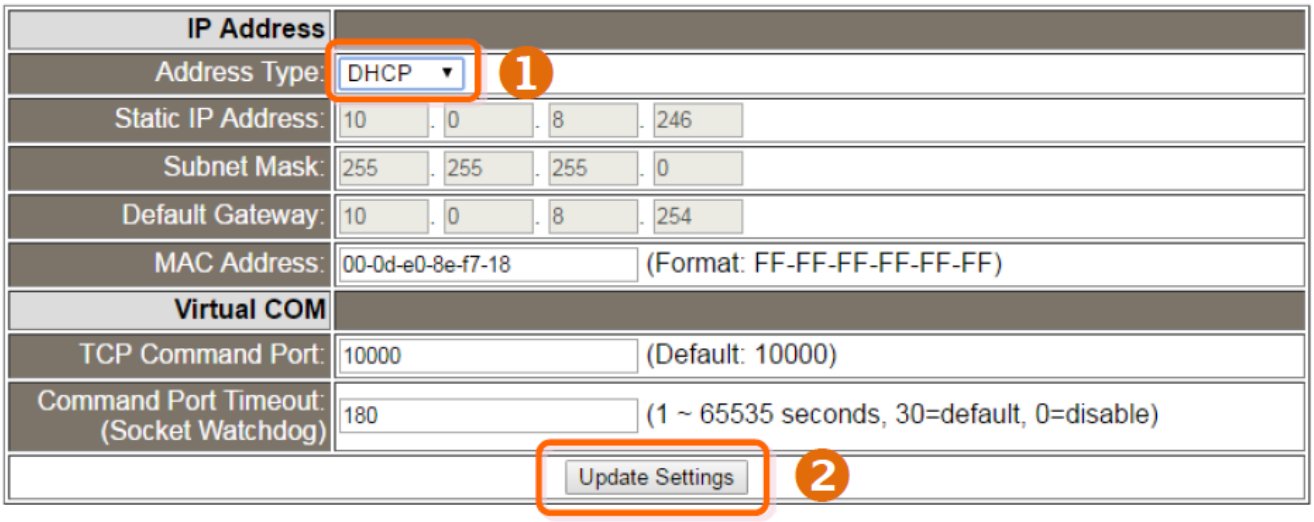


4.4.1.2. Dynamic Configuration

Dynamic configuration is very easy to perform. If a DHCP server is connected to you network, a network address can be dynamically configured by using the following procedure:

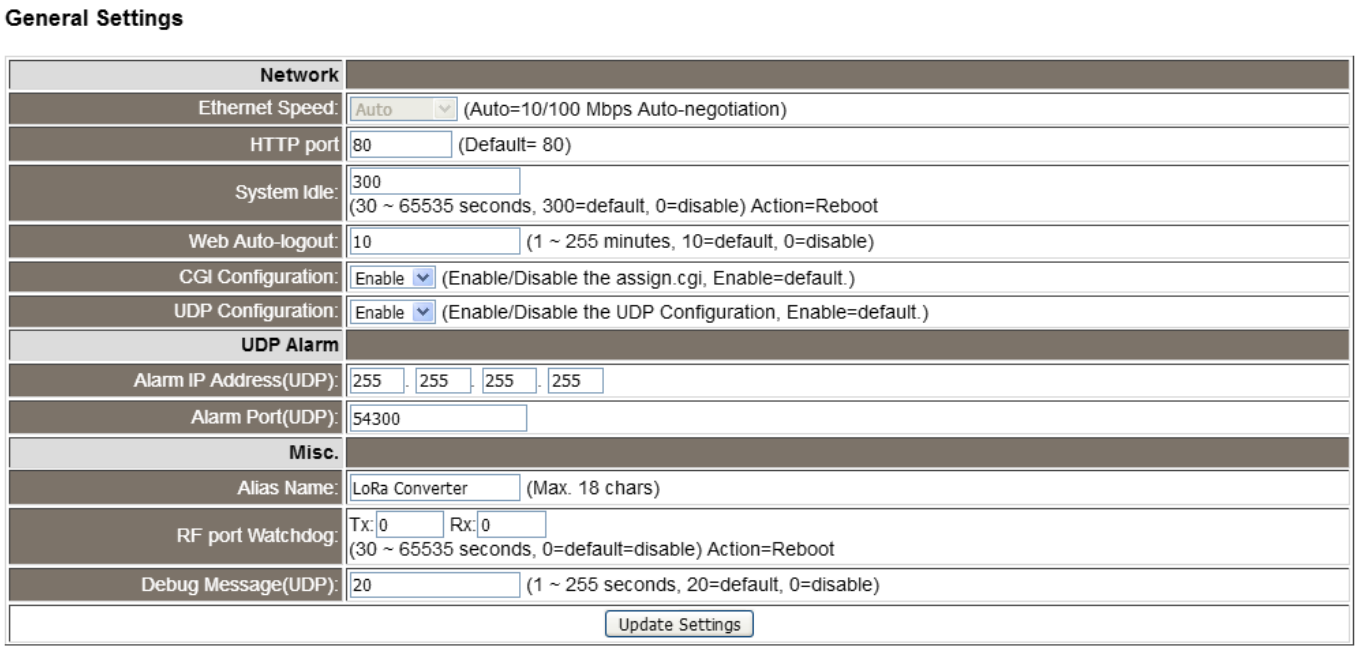
Step 1: Select the **"DHCP"** option from the **"Address Type"** drop-down menu.

Step 2: Click the **"Update Settings"** button to complete the configuration.



4.4.2. General Settings

The General Settings provides functions allowing items such as the Alias Name, System Timeout value, RF port Watchdog value, Auto-logout value, Debug Message and CGI Configuration to be configured.



The following is an overview of the parameters contained in the General Settings section:

Item	Description	Default
Network		
Ethernet Speed	This parameter is used to set the Ethernet speed. The default value is Auto (Auto = 10/100 Mbps Auto-negotiation).	Auto
HTTP Port	The HTTP port number of the Web server function.	80
System Idle (Network Watchdog)	This parameter is used to configure the system timeout value. If there is no activity on the network for a specific period of time, the system will be rebooted based on the configured system timeout value. Timeout value range: 30 to 65535 (seconds); Disable = 0.	300
Web Auto-logout	This parameter is used to configure the automatic logout value. If there is no activity on the web server for a certain period of time, the current user account will be automatically logged out. Range: 1 to 65535 (minutes); Disable = 0.	10

CGI Configuration	The LRA-900-E can be configured by CGI command. For detailed CGI command and configuration information, refer to Chapter 5 "CGI Configuration" Enable/Disable the assign.cgi.	Enable
UDP Configuration	This parameter is used to enable or disable UDP configuration function.	Enable
UDP Alarm		
Alarm IP Address (UDP)	The LRA-900-E can send and UDP package (include alarm message) to specified network location (Alarm IP Address/Port).	
Alarm Port (UDP)		
Misc.		
Alias Name	This parameter is used to assign an alias for each LRA-900-E device to assist with easy identification.	LoRa Converter
RF port Watchdog	If the RF port does not communication occurs for a certain period, the system will be rebooted based on the RF port Watchdog value. Settings range: 30 ~ 65535 (seconds); Disable: 0.	0
Debug Message(UDP)	Reserved.	20
Update Settings	Click this button to save the revised settings to the LRA-900-E device.	

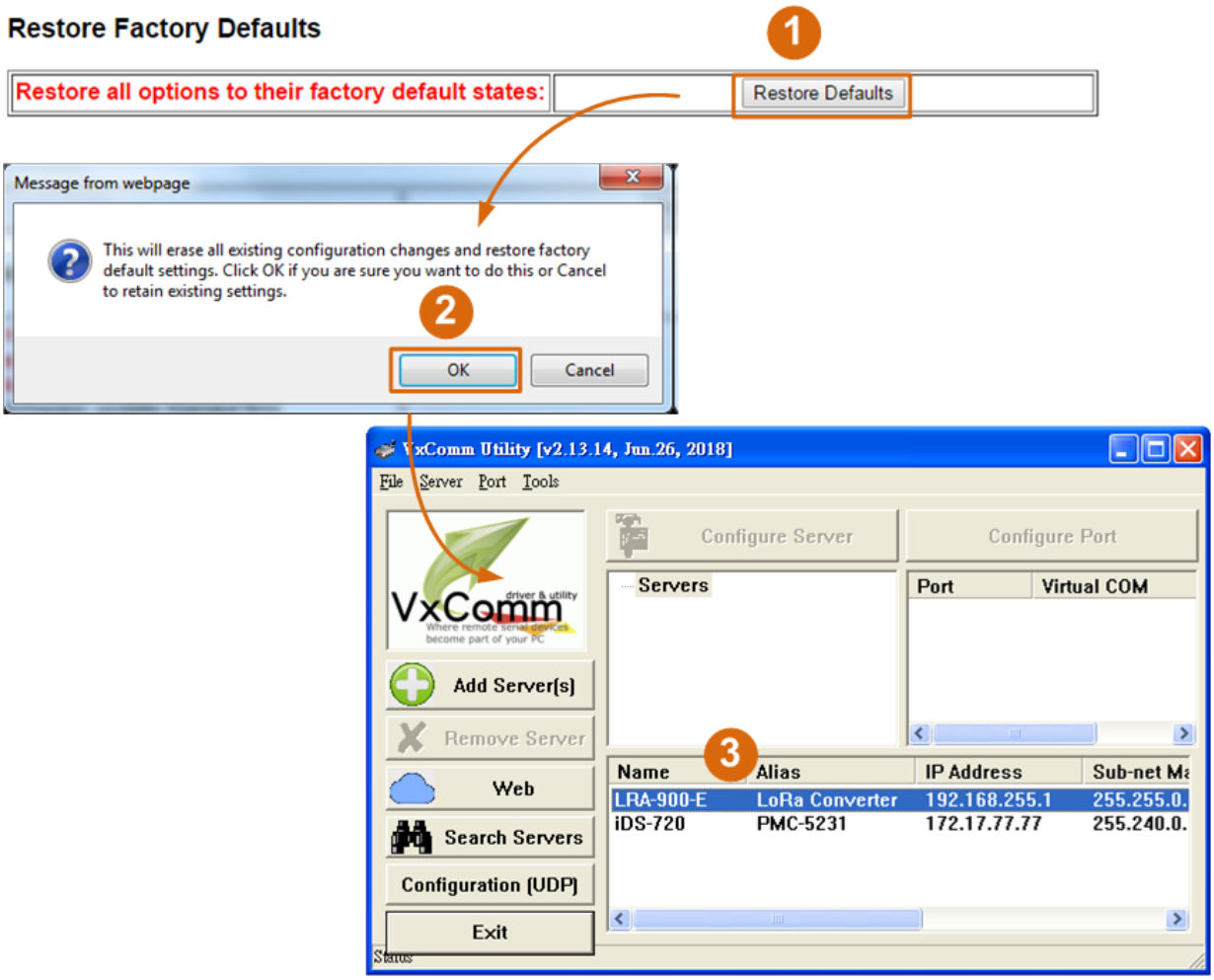
4.4.3. Restore Factory Defaults

Use the following procedure to reset all parameters to their original factory default settings:

Step 1: Click the **"Restore Defaults"** button to reset the configuration.

Step 2: Click the **"OK"** button in the message dialog box.

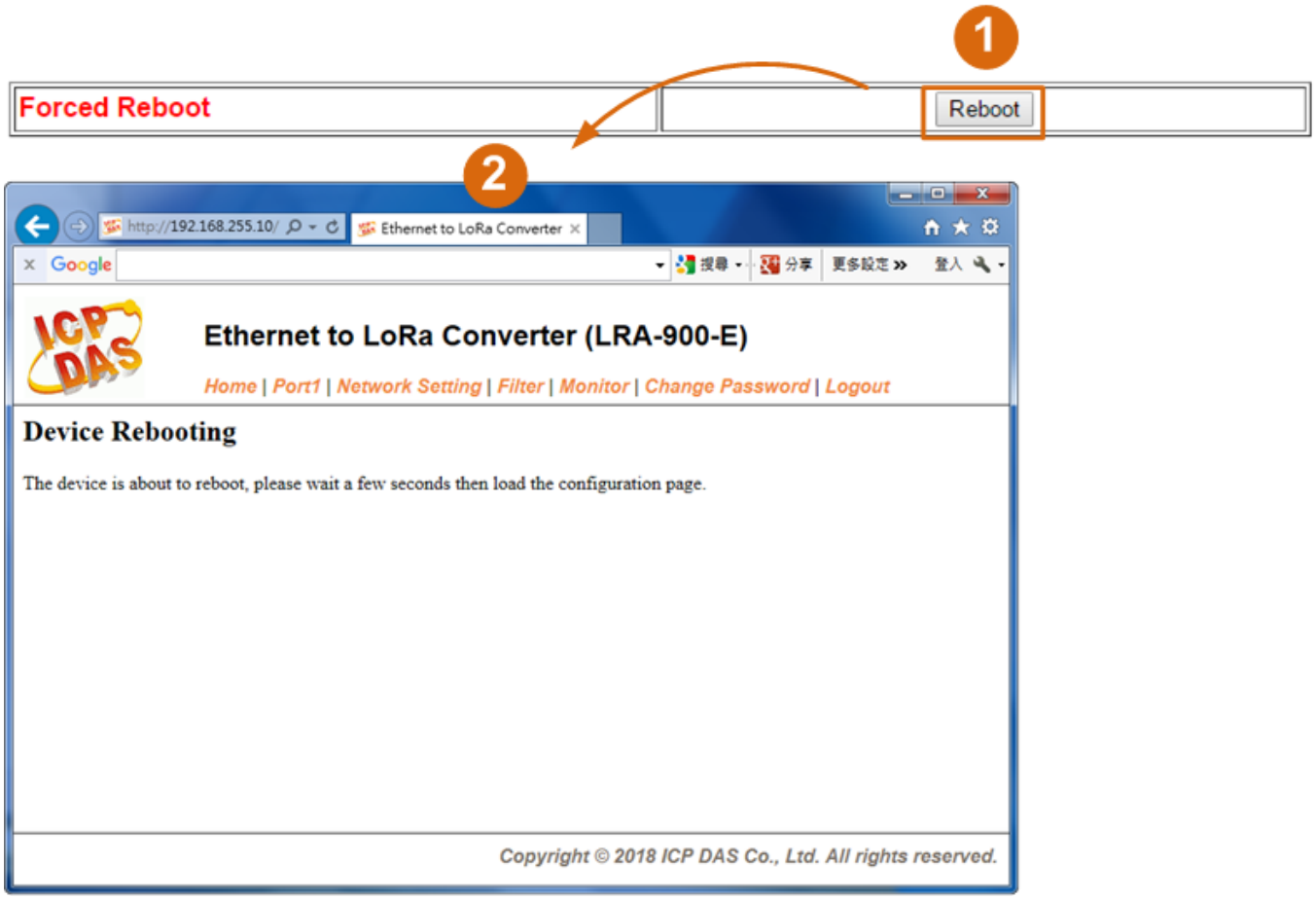
Step 3: Check whether the module has been reset to the original factory default settings for use with the VxComm Utility. Refer to Chapter 3 Setting up the LRA-900-E Module for more details.



The following is an overview of the factory default settings:

Factory Default Settings			
Network Settings		**Basic Settings**	
IP Address	192.168.255.1	Alias	LoRa Converter
Gateway Address	192.168.0.1		
Subnet Mask	255.255.0.0		
DHCP	Disabled		

The **Forced Reboot** function: can be used to force the LRA-900-E to reboot or to remotely reboot the device.

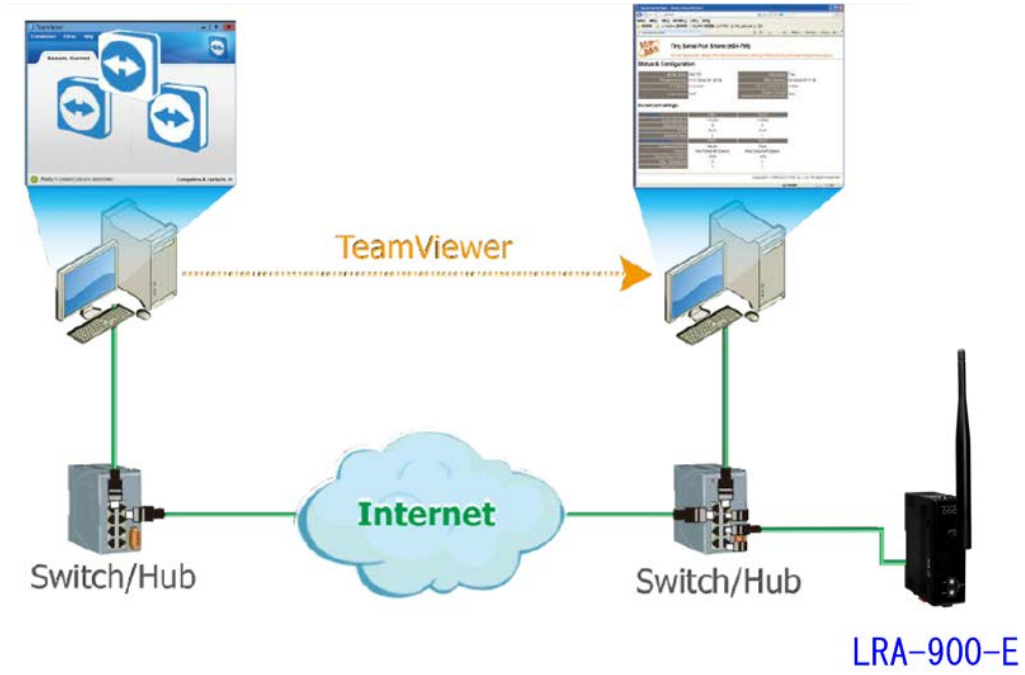


4.4.4. Remote Firmware Update

Remote Firmware Update

If the remote firmware update is failed, then the traditional firmware update (on-site) is required to make the module working again. Step 1: Refer to firmware update manaul first. Step 2: Run eSearch Utility to prepare and wait for update. Step 3: Click the [**Update**] button to **reboot** the module and start update. Step 4: Configure the module again.	Update

Firmware update requires initialization and local network operations. Traditional firmware update requires adjusting the Init/Run Switch and reboots the module manually for the initialization of firmware update, while new firmware allows user to initialize the module via web interface without adjusting the hardware switch. Initialization via web is useful when module is installed in remote site and can be accessed by a remote PC via TeamViewer.

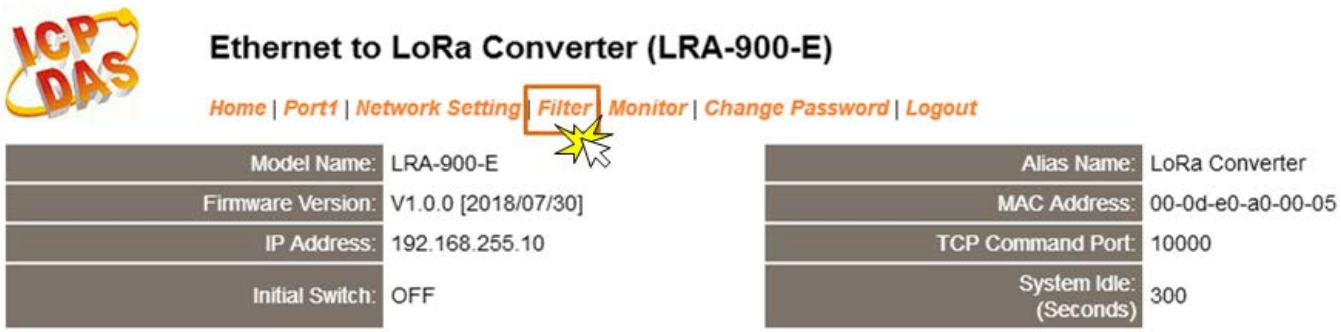


Note: If the remote firmware update is failed, then the traditional firmware update (Local) is required to make the module working again.

For detailed information regarding how to use this function to update the Firmware for your LRA-900-E module, refer to the **LRA-900-E_Firmware_Update_en_vxxx.pdf.** The location of the user manual on the download address are shown below:

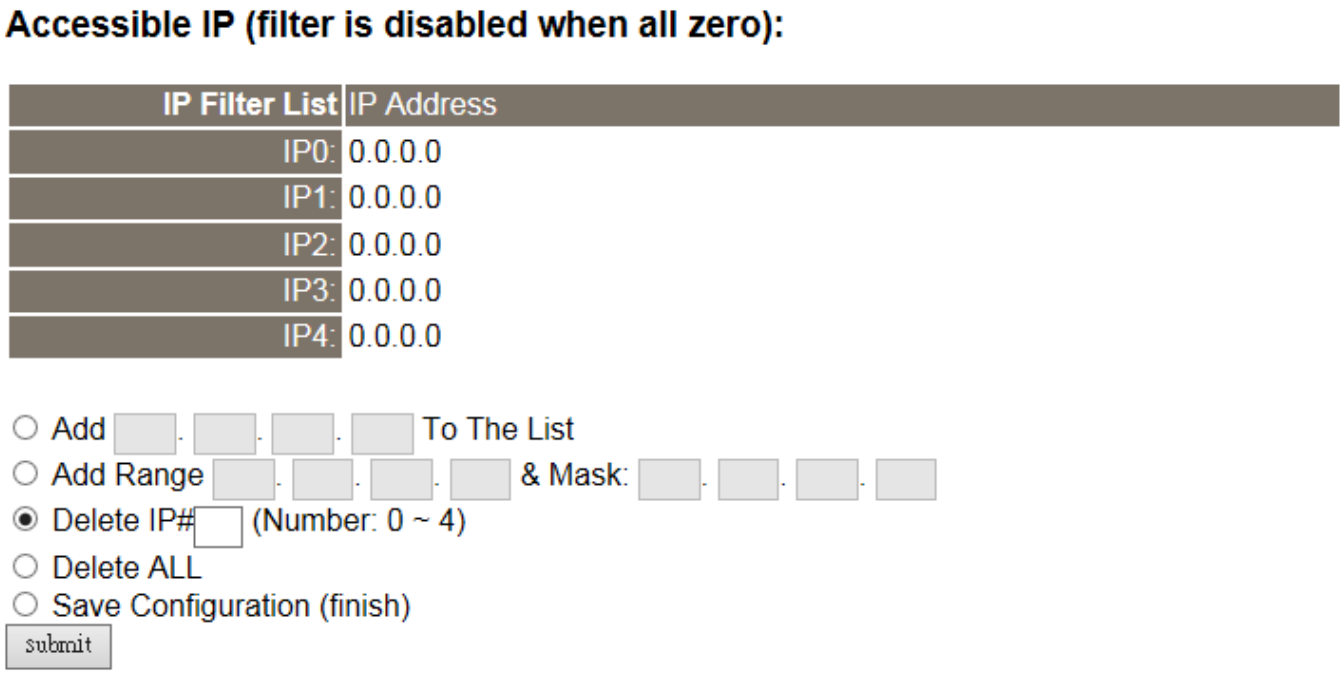
http://ftp.icpdas.com/pub/cd/usbcd/napdos/rf_modem/firmware\lra-900-e

4.5. Filter Page



4.5.1. Accessible IP (filter is disabled when all zero)

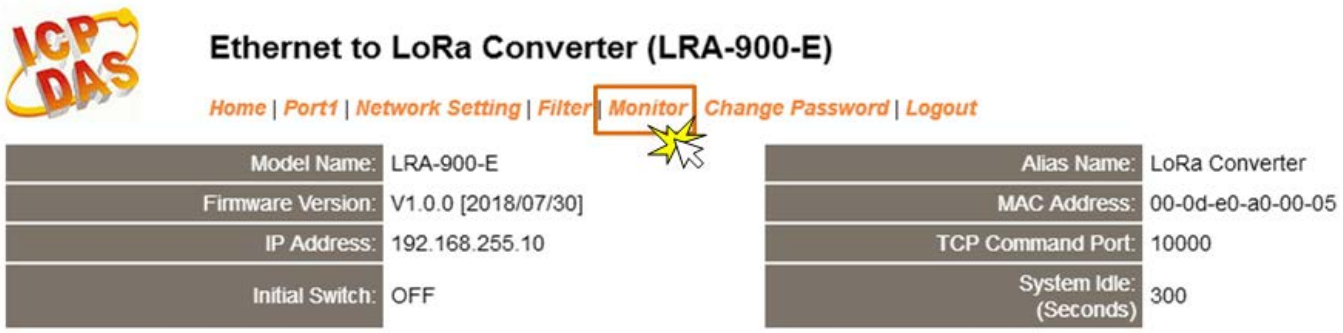
The Accessible IP Settings section is used to query or edit the IP Filter List. The IP Filter List restricts the access of packets based on the IP header. If one or more IP address are saved to the IP Filter table, only clients whose IP is specified in the IP Filter List can access the LRA-900-E.



The following is an overview of the parameters contained in the Filter Settings (white list) section:

Item	Description
Add “IP” To The List	Add an IP address to the IP Filter List.
Add Range “IP”& Mask “IP”	Add an IP address range to the IP Filter List.
Delete IP# “Number”	Delete a specific IP# address from the IP Filter List. (Number: 0 ~ 4)
Delete All	Delete all items from the IP Filter List.
Save Configuration (finish)	Save a new IP Filter List to the Flash memory.
Submit	Click this button to save the revised settings to the LRA-900-E.

4.6. Monitor Page



After clicking the **Monitor** tab, the Current Connection Status page will be displayed showing detailed information regarding the current status of the RF port connection settings for the LRA-900-E module.

Current Status(Socket):

Port Number	Port 1
Application Mode:	Server
Connected IP1:	0.0.0.0
IP2:	0.0.0.0
IP3:	0.0.0.0
IP4:	0.0.0.0

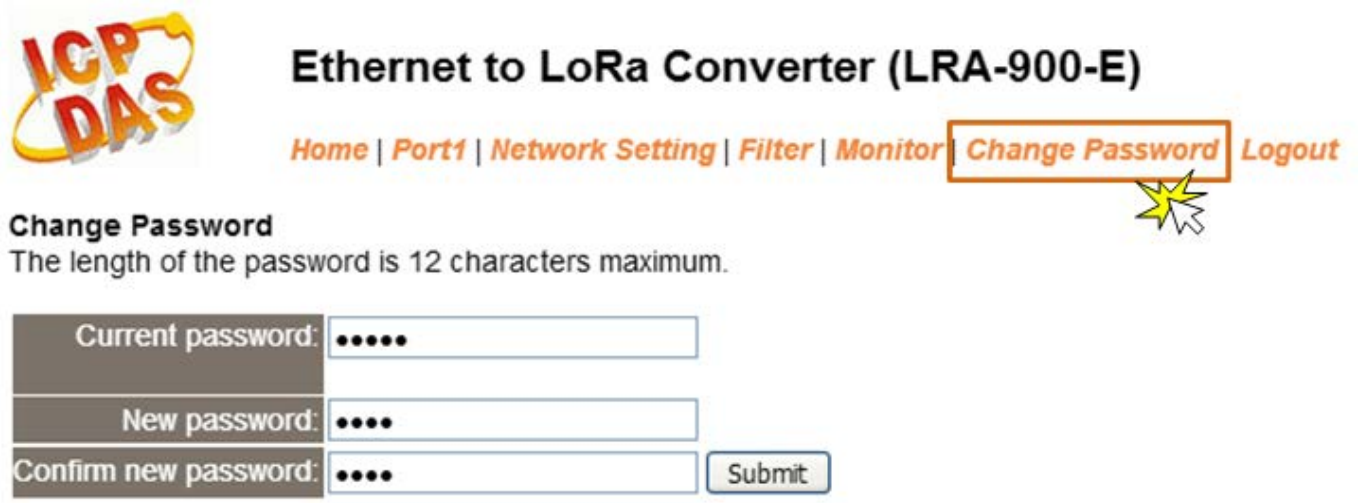
Note: Multi-connection may be used in light-loading communications only, not for heavy-loading.

Current Status(RF port):

Port Number	Port 1
Last Tx Count (bytes):	0
Last Rx Count (bytes):	0
Total Tx Count (bytes):	0
Total Rx Count (bytes):	0

4.7. Change Password

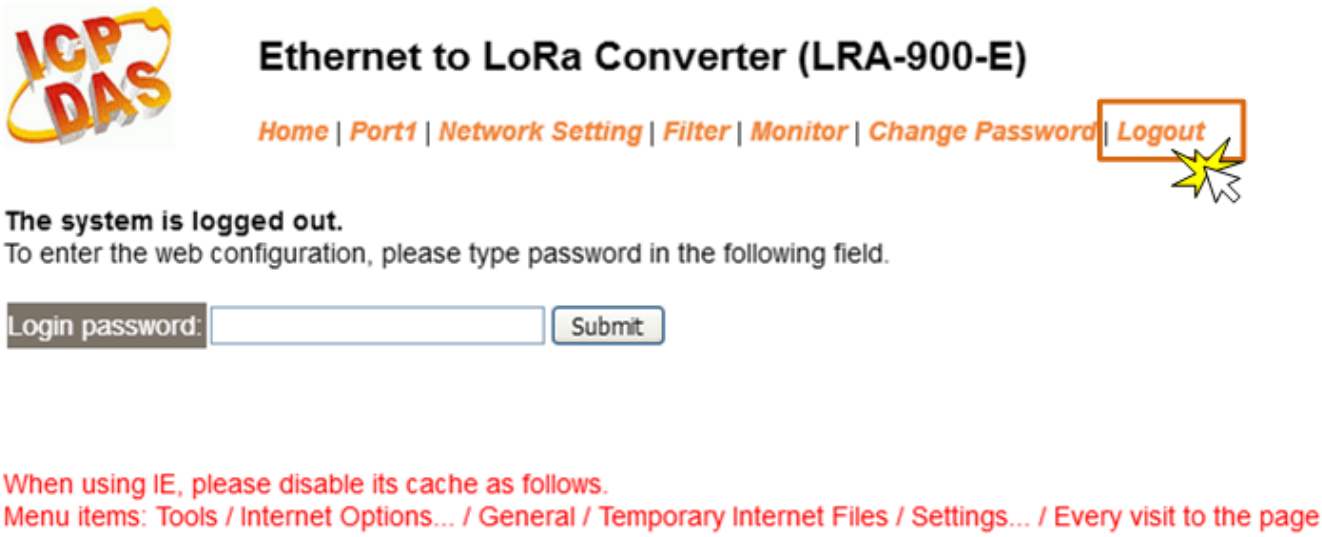
After clicking the **Change Password** tab, the **Change Password** page will be displayed. To change a password, first enter the old password in the **"Current password"** field (use the default password "**admin**") and then enter a new password in the **"New password"** field. Re-enter the new password in the**" Confirm new password"** field, and then click the "**Submit**" button to update the password.



Note: If you forgot your password, please refer to *section A1. How to restore the factory default web password of the module?*

4.8. Logout Page

After clicking the **Logout** tab, you will be immediately logged out from the system and be returned to the login page.

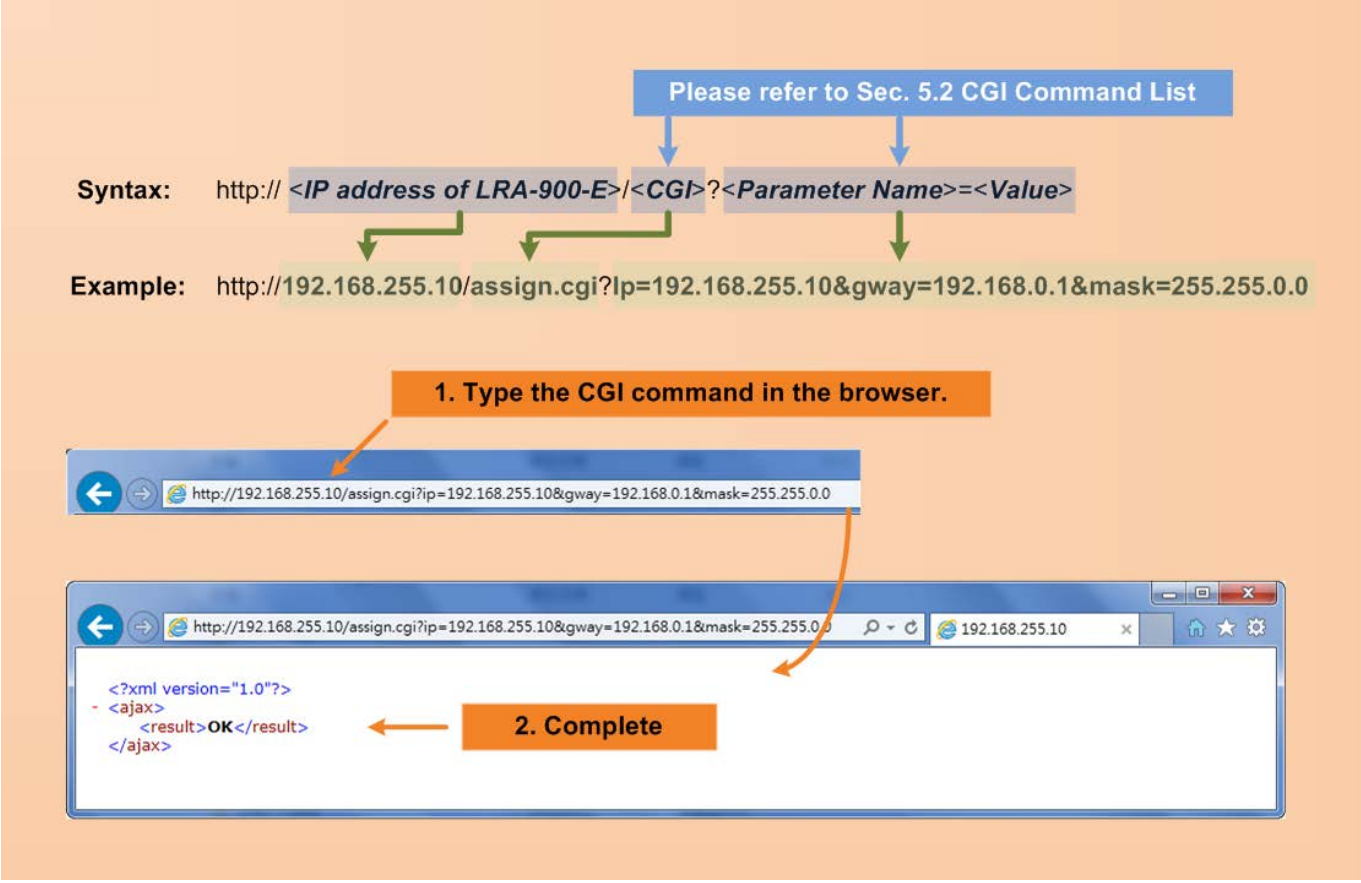


5. CGI Configuration

The LRA-900-E can be configured via convenient URL commands. This section lists the commands in URL format corresponding to the basic functions of LRA-900-E.Please make sure you have correctly configured the network settings for the LRA-900-E before using CGI configuration.

5.1. CGI URL Syntax

Type the CGI URL syntax in the browser, as follows:



5.2. CGI Command List

Network Settings				
No.	Function Name	Parameter Name	Value Constraint	CGI
01	Set Address Type	dhcp	0,1 0: Disable; 1: Enable;	assign.cgi
02	Set IP Address	ip	xxx.xxx.xxx.xxx	
03	Set Gateway	gway	xxx.xxx.xxx.xxx	
04	Set Net Mask	mask	xxx.xxx.xxx.xxx	
05	Set TCP Command Port	cmdport	1~65535 Default: 10000	
06	Set Command Port Timeout (Socket Watchdog)	cmdwdt	1~65535 seconds, Default: 180; Disable: 0;	
07	Set MAC Address	mac	Format: FF-FF-FF-FF-FF-FF	
08	Set Alarm IP Address(UDP)	aip	xxx.xxx.xxx.xxx	
09	Set Alarm Port(UDP)	aport	1~65535 Default: 54300;	

Network Filter Settings				
No.	Function Name	Parameter Name	Value Constraint	CGI
01	Add IP to List (white list)	fip0 ~ fip4 fipm0 ~ fipm4 (mask)	xxx.xxx.xxx.xxx	assign.cgi
02	Delete IP#	delfip	0 ~ 4	
03	Delete All	delfip	all	

<table>
<tr><th colspan="5">General Configuration Settings</th></tr>
<tr><th>No.</th><th>Function Name</th><th>Parameter Name</th><th>Value Constraint</th><th>CGI</th></tr>
<tr><td>01</td><td>Set Alias Name</td><td>aliname</td><td>Max. 18 chars</td><td rowspan="2">assign.cgi</td></tr>
<tr><td>02</td><td>Set System Timeout</td><td>syswdt</td><td>30 ~ 65535 seconds,
Default: 300;
Disable: 0</td></tr>
</table>

<table>
<tr><th colspan="5">RF Port Settings</th></tr>
<tr><th>No.</th><th>Function Name</th><th>Parameter Name</th><th>Value Constraint</th><th>CGI</th></tr>
<tr><td>01</td><td>Set RF Group ID</td><td>rfgid</td><td>Group ID, valid range: 0 ~ 255 (0x00 ~ 0xFF).
<table>
<tr><th>Value</th><th>Description</th></tr>
<tr><td>0 ~ 254 (0x00 ~ 0xFE)</td><td>The module has same group id (0x00 ~ 0xFE) setting can communicate with each other</td></tr>
<tr><td>255 (0xFF)</td><td>The module has the group id (0xFF) setting can communicate with other module which group id setting is 0x00 to 0xFF</td></tr>
</table></td><td rowspan="2">assign.cgi</td></tr>
<tr><td>02</td><td>Set RF Bit Rate</td><td>rfri</td><td>RF bit rates (bps)
<table>
<tr><th>Value</th><th>Bit rate</th></tr>
<tr><td>0</td><td>10000</td></tr>
<tr><td>1</td><td>6000</td></tr>
<tr><td>2</td><td>3400</td></tr>
<tr><td>3</td><td>1800</td></tr>
<tr><td>4</td><td>N/A</td></tr>
<tr><td>5</td><td>500</td></tr>
<tr><td>6</td><td>250</td></tr>
</table></td></tr>
</table>

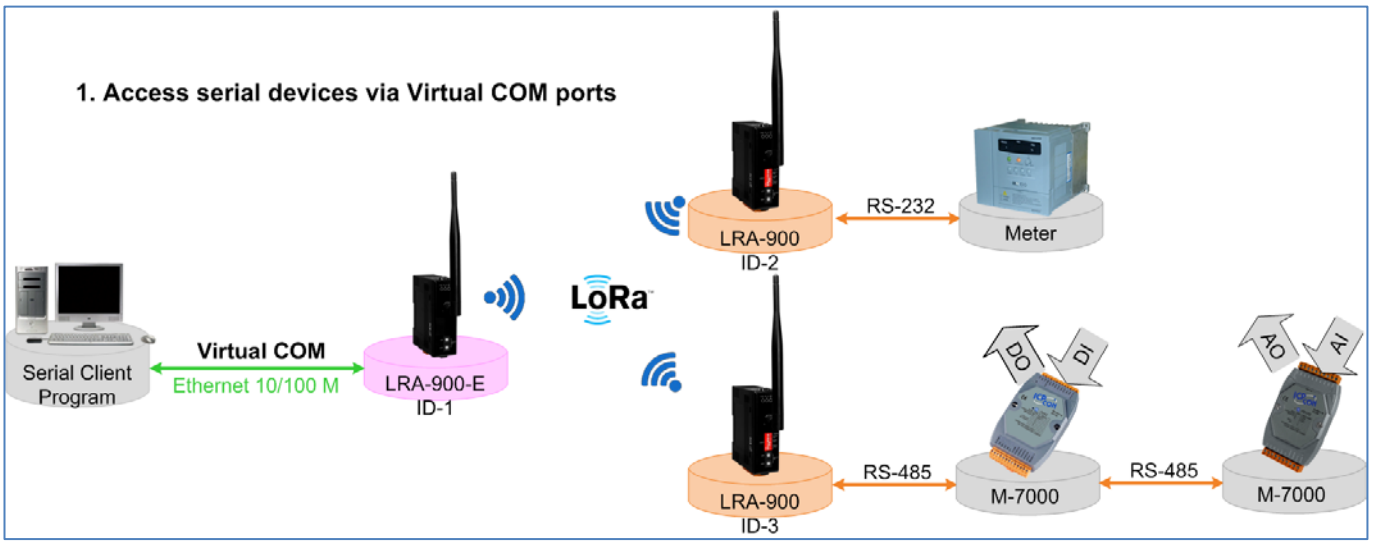
<table>
<tr><td>03</td><td>Set RF Frequency</td><td>rffi</td><td>32 RF frequencies (MHz)
<table>
<tr><th>Value</th><th>Freq.</th><th>Value</th><th>Freq.</th></tr>
<tr><td>0</td><td>864.0</td><td>16</td><td>915.0</td></tr>
<tr><td>1</td><td>864.5</td><td>17</td><td>915.5</td></tr>
<tr><td>2</td><td>865.0</td><td>18</td><td>916.0</td></tr>
<tr><td>3</td><td>865.5</td><td>19</td><td>916.5</td></tr>
<tr><td>4</td><td>866.0</td><td>20</td><td>917.0</td></tr>
<tr><td>5</td><td>866.5</td><td>21</td><td>917.5</td></tr>
<tr><td>6</td><td>867.0</td><td>22</td><td>918.0</td></tr>
<tr><td>7</td><td>867.5</td><td>23</td><td>918.5</td></tr>
<tr><td>8</td><td>868.0</td><td>24</td><td>919.0</td></tr>
<tr><td>9</td><td>868.5</td><td>25</td><td>919.5</td></tr>
<tr><td>10</td><td>869.0</td><td>26</td><td>920.0</td></tr>
<tr><td>11</td><td>869.5</td><td>27</td><td>920.5</td></tr>
<tr><td>12</td><td>870.0</td><td>28</td><td>921.0</td></tr>
<tr><td>13</td><td>870.5</td><td>29</td><td>921.5</td></tr>
<tr><td>14</td><td>871.0</td><td>30</td><td>922.0</td></tr>
<tr><td>15</td><td>871.5</td><td>31</td><td>922.5</td></tr>
</table></td></tr>
<tr><td>04</td><td>Set RF Output Power</td><td>rfp</td><td>Value 0 ~ 15 are mapping to the RF output power range of 2 ~ 17 dBm.</td></tr>
<tr><td>05</td><td>Set RSSI Info. Mode</td><td>rssi</td><td>Disable: 0
Enable: 1</td></tr>
<tr><td>06</td><td>Set Ending Chars</td><td>endchr0</td><td>Number[,char1][,char2]</td></tr>
<tr><td>07</td><td>Set Operation Mode</td><td>opmode0</td><td>0,1</td></tr>
<tr><td>08</td><td>Set Slave Timeout</td><td>slto0</td><td>(ms)</td></tr>
<tr><td>09</td><td>Set Data Buffer Delay Time</td><td>dbdt0</td><td>(ms)</td></tr>
<tr><td>10</td><td>Set Packing Length</td><td>packlen0</td><td>0 ~ 255 bytes</td></tr>
<tr><td>11</td><td>Set TCP Timeout</td><td>tto0</td><td>1~65535 seconds,
Default: 180;
Disable: 0</td></tr>
</table>

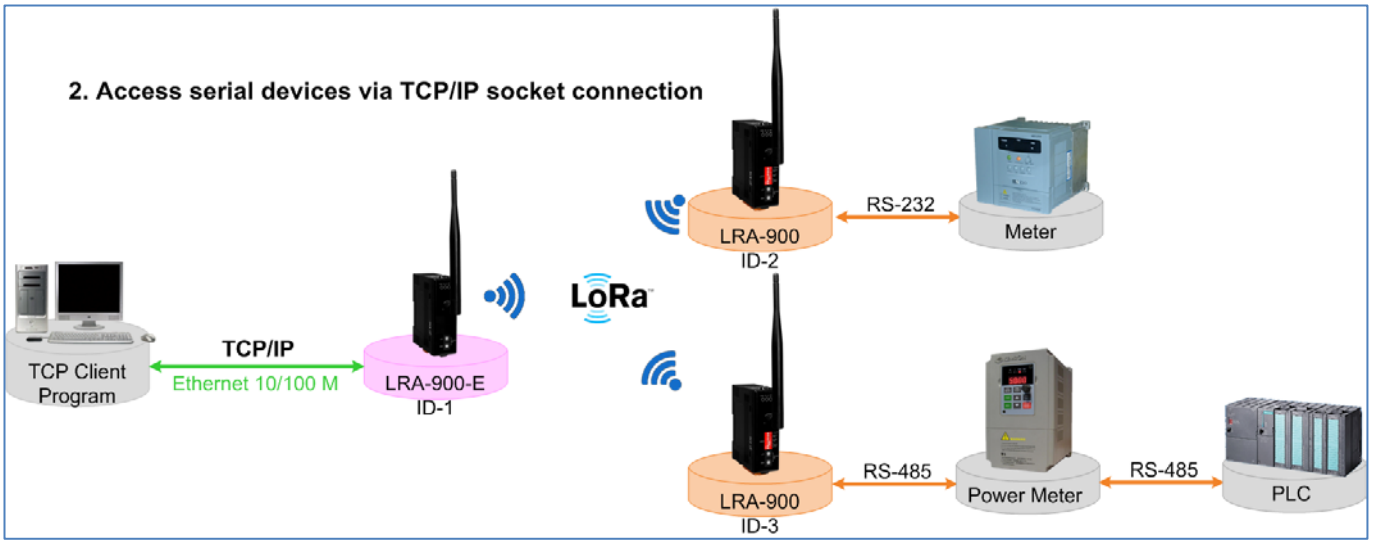
Restore Factory Defaults				
No.	Function Name	Parameter Name	Value Constraint	CGI
01	Reboot	-	-	reboot.cgi
02	Reset To Factory	-	-	reset.cgi

Queries Setting Status				
No.	Function Name	Parameter Name	Value Constraint	CGI
01	Get module status.	-	-	status.cgi
02	Get the RF port configuration information.	-	-	conf_port.cgi
03	Get the network configuration information.	-	-	conf_net.cgi

6. Typical Applications

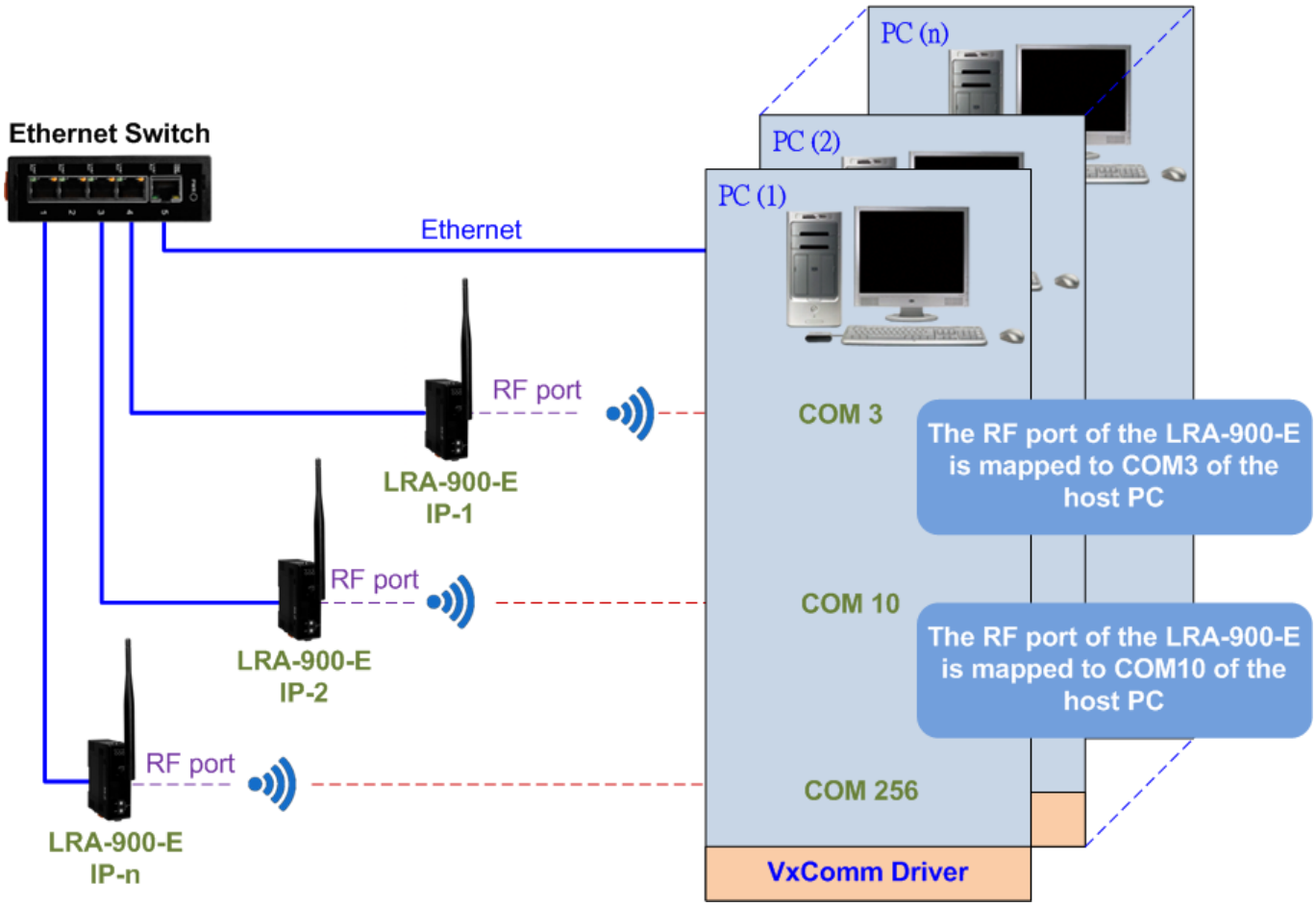
This chapter provides some examples of typical scenarios for the LRA-900-E module, including applications focused on the Virtual COM, Direct Socket Connection, etc...





6.1. Virtual COM Application

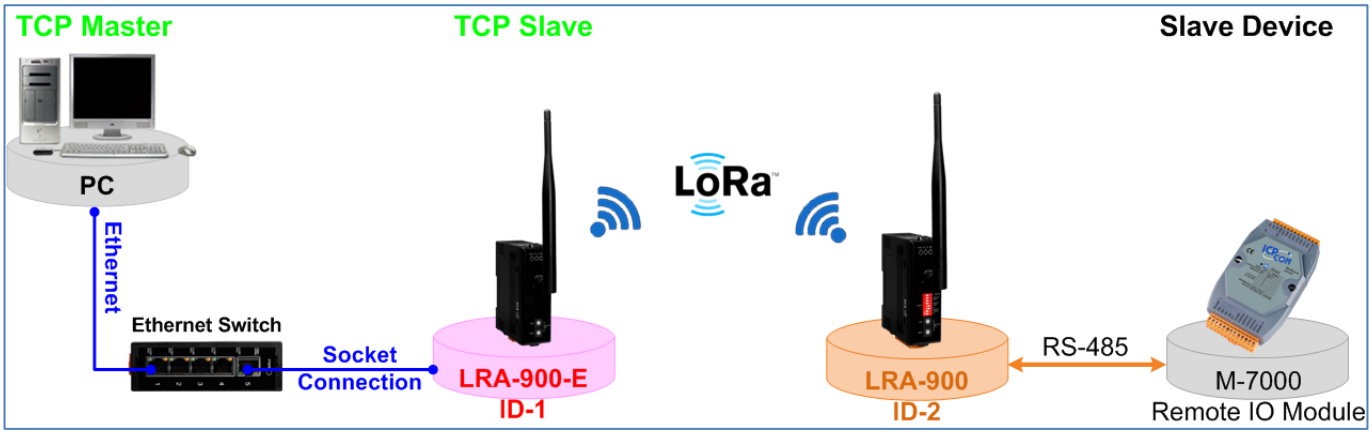
The LRA-900-E is designed to transfer RF signal via an Ethernet network. The VxComm utility allows the built-in LRA-900-E RF Port to be virtualized to a standard COM Port of a host PC, as shown below:



6.2. Direct Socket Connection Applications

LRA-900-E module can accept the TCP connection (include raw data) directly.

For examples of socket connection test as follows:

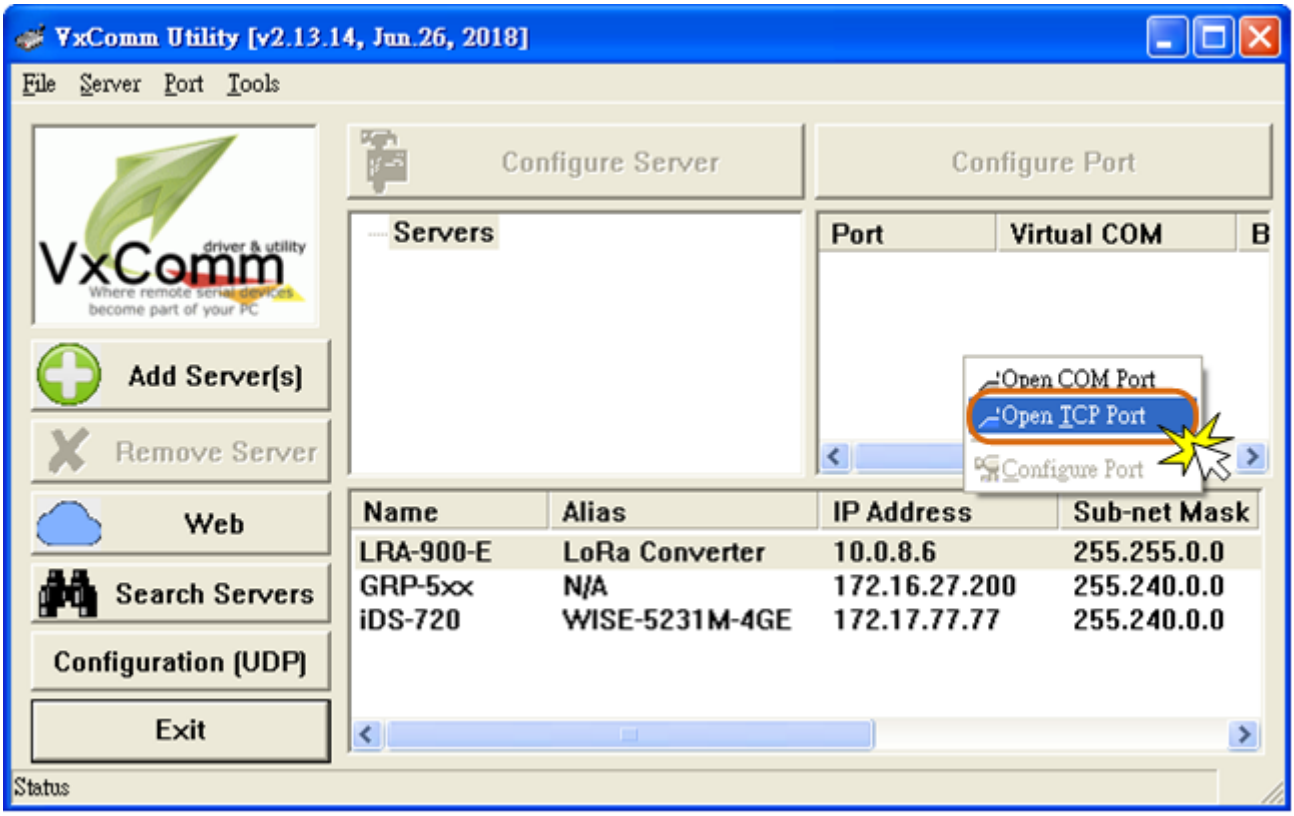


1. Confirm that the LRA-900-E modules are functioning correctly. Refer to Chapter 3 Setting up the LRA-900-E module for more details.
2. Wire the slave device (Ex: M-7015, optional) with the LRA-900 and set the device id of LRA-900 series modules (LRA-900-E ➔ ID: 1, LRA-900 ➔ ID: 2).
3. Supply power to the slave device (Ex, M-7015, Device ID: 2, +10 ~ +30 VDC power used.)
4. Install VxComm utility, and then configuration Ethernet setting (**such as IP/Mask/Gateway details)** for LRA-900-E module; refer to Chapter 3 Setting up the LRA-900-E module.
5. Confirm the serial port settings (**baud Rate and data format**) must be the same between the LRA-900 and slave device (M-7015).

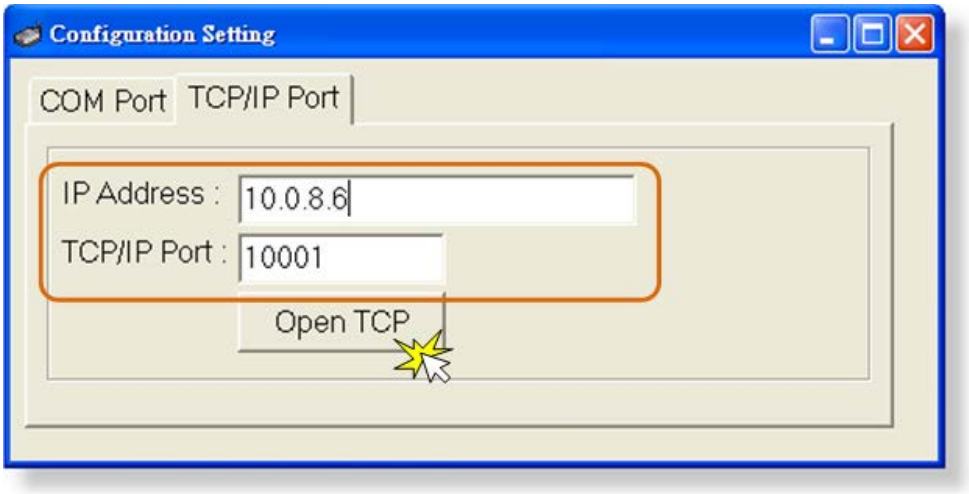
   For example:

Model	Device ID	COM Port Settings		TCP port
		Baudrate	Data format	
LRA-900-E	0x01	-	-	10001
LRA-900	0x02	9600	8,N,1	-
Slave Device (M-7015)	0x02	9600	8,N,1	-

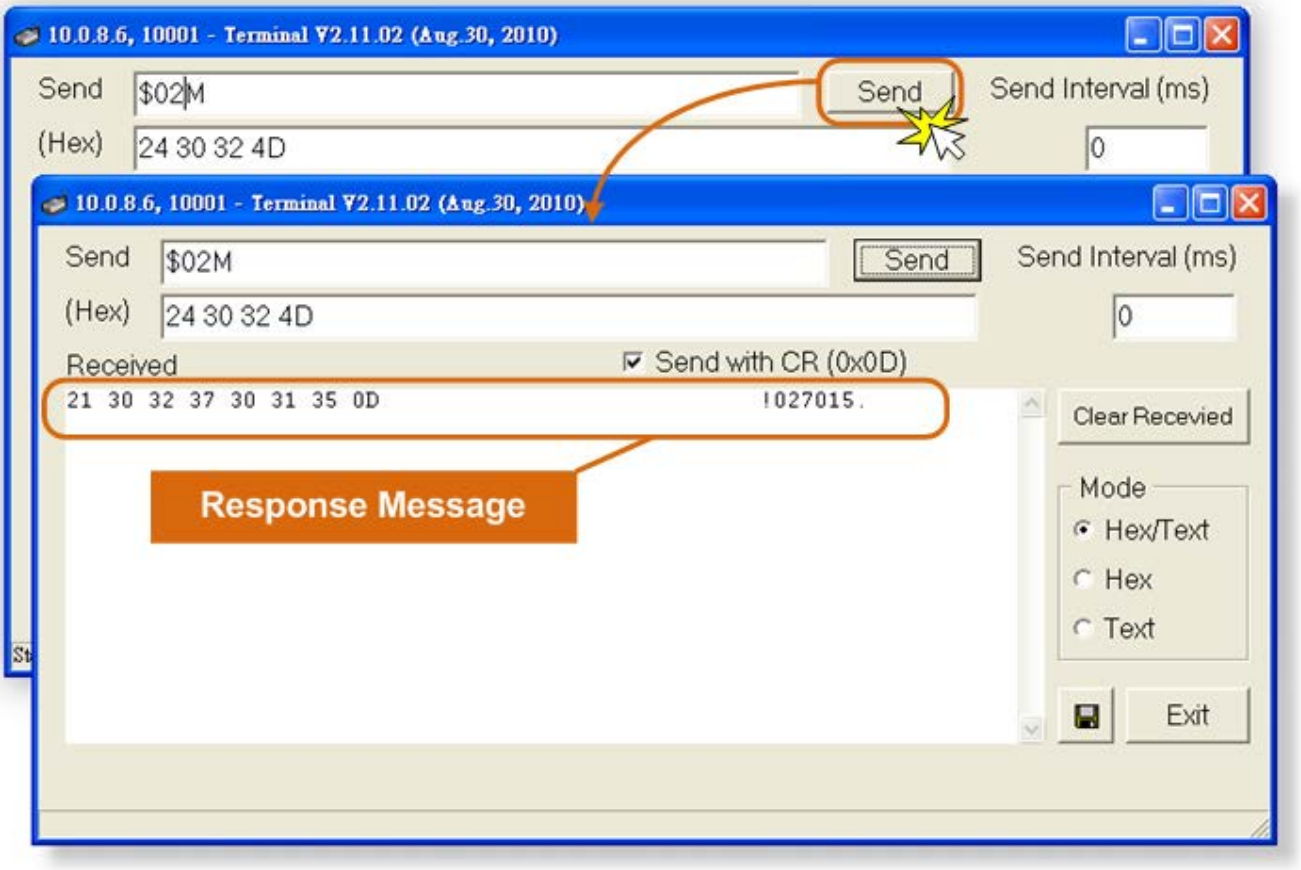
6. Right click in the “Configure Port” area and then choose the “Open TCP Port” item under the VxComm utility.



7. Type the IP address of LRA-900-E in the IP Address field and assign a TCP/IP port of LRA-900-E, and then click the “Open TCP” button.



8. Type a string in the send field then click the “Send” button. If a response is received, it will be displayed in the received field.



Appendix A. Troubleshooting

A.1. How do I restore the web password for the module to the factory default password?

The instructions below outline the procedure for resetting the web password to the factory default value.

Note:

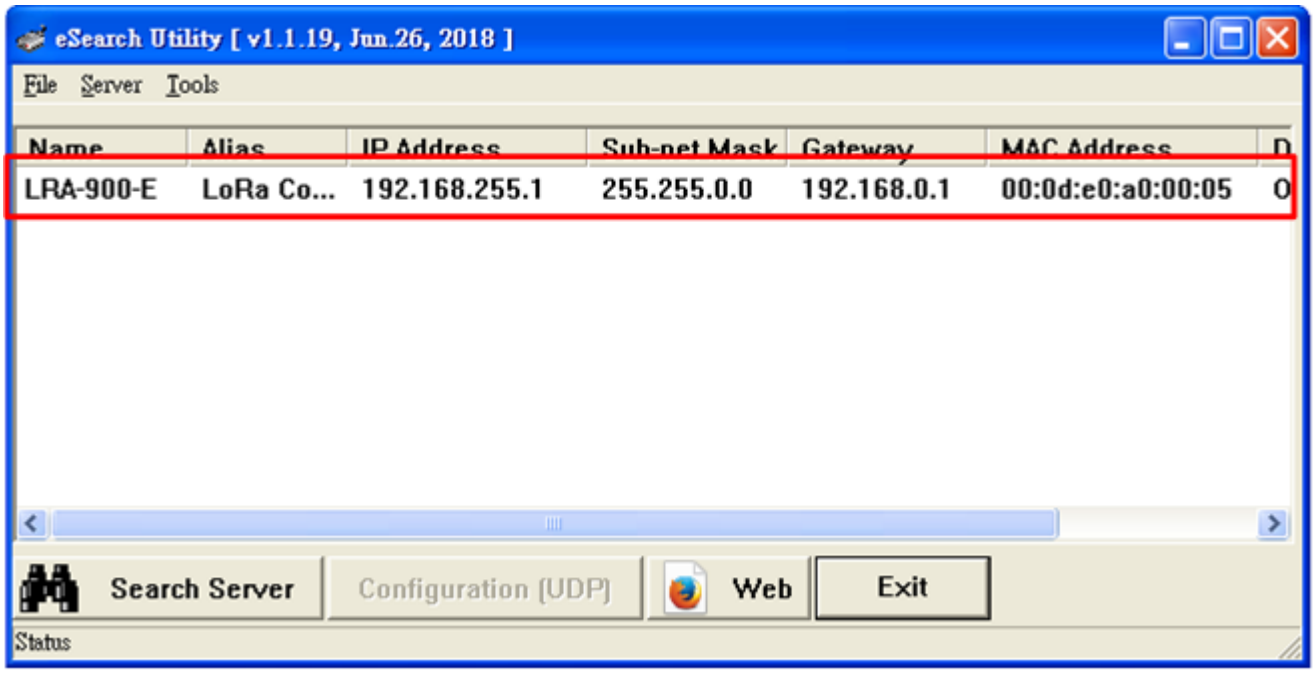
*Be aware that **ALL** settings will be restored to the factory default values after the module is reset.*

Step 1

Locate the Init/Run switch that can be found on the right-hand side of the LRA-900-E module and set it to the **"Init"** position. Reboot the module to **load factory default settings** including default web password.

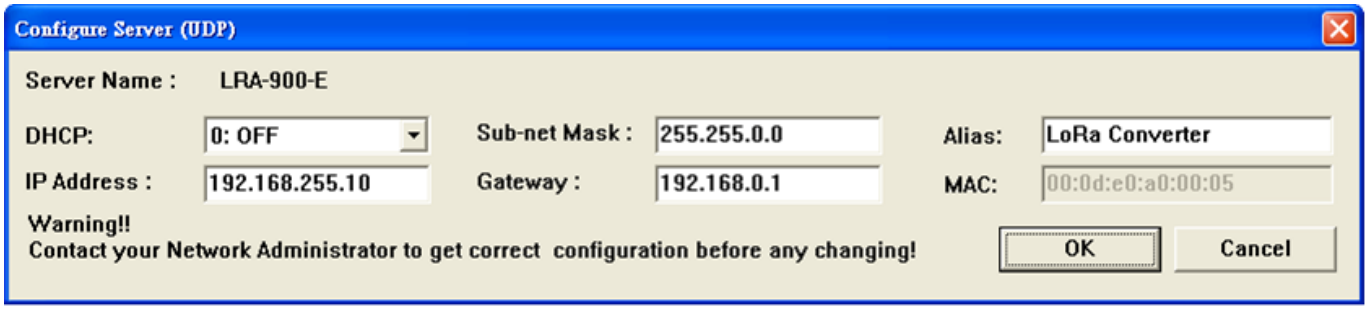
Step 2

Execute either the VxComm Utility or the eSearch Utility to search for any LRA-900-E modules connected to the network. Verify that the LRA-900-E has been reset to the original factory default settings. For example, the module should be shown as having the default IP address, which is 192.168.255.1.



Step 3

Double-click the name of the module to open the Configure Server (UDP) dialog box, and modify the basic settings as necessary, e.g., the IP, Mask and Gateway addresses, and then click the **"OK"** button to **save the new settings**.

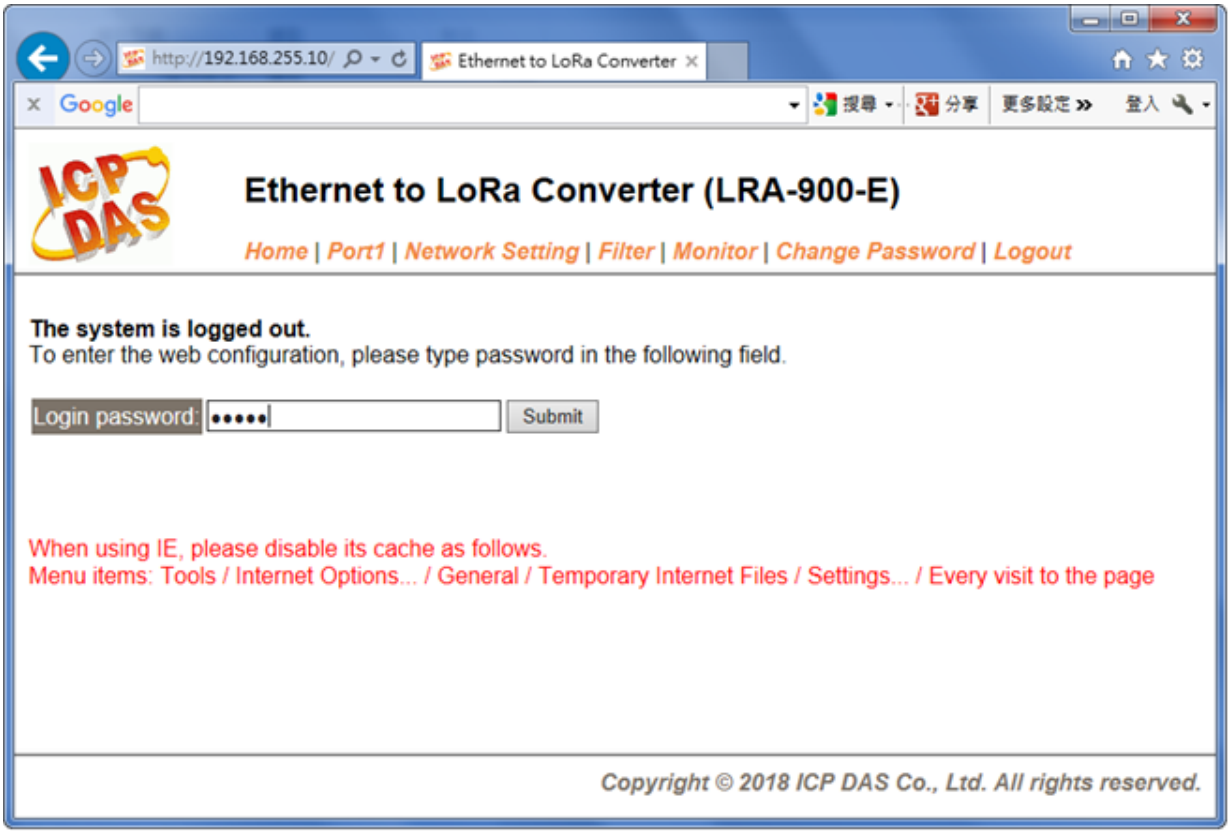


Step 4

Reset the Init/Run switch on the LRA-900-E module to the **"Run"** position and reboot the device.

Step 5

Log in to the web configuration pages for the LRA-900-E module, using the default web password, **"admin"**.



Appendix B. Glossary

1. ARP (Address Resolution Protocol)

The Address Resolution Protocol (ARP) is a telecommunication protocol that is used to convert an IP address to a physical address, such as an Ethernet address.

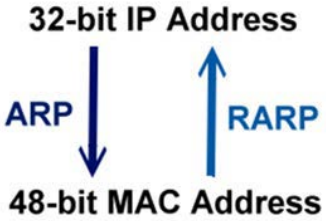
Consider two machines A and B that share the same physical network. Each has an assigned IP address IPA and IPB, and a MAC address, MACA and MACB. The goal is to devise a low-level software application that hides the MAC addresses and allows higher-level programs to work only with the IP addresses. Ultimately, however, communication must be carried out by the physical networks using whatever MAC address scheme the hardware supplies.

Suppose machine a wants to send a packet to machine B across a physical network to which they are both attached, but an only has the Internet address for B, IP_B. The question arises: how does A map that address to the MAC address for B, MAC_B?

ARP provides a method of dynamically mapping 32-bit IP address to the corresponding 48-bit MAC address. The term dynamic is used since the mapping is performed automatically and is normally not a concern for either the application user or the system administrator.

2. RARP (Reverse Address Resolution Protocol)

RARP provides a method of dynamically mapping 48-bit MAC address to the corresponding 32-bit IP address. RARP has now been replaced by the Bootstrap Protocol (BOOTP) and the modern Dynamic Host Configuration Protocol (DHCP).



3. Clients and Servers

The client-server paradigm uses the direction of initiation to categorize whether a program is a client or server. In general, an application that initiates peer-to-peer communication is called a client. End users usually invoke client programs when they use network services.

By comparison, a server is any program that waits for incoming requests from a client program. The server receives a request from a client, performs the necessary action sand returns the result to the client.

4. Ethernet

The term Ethernet generally refers to a standard published in 1982 by Digital Equipment Corp., Intel Corp. and Xerox Corp. Ethernet is the most popular physical layer Local Area Network (LAN) technology in use today.

5. Firmware

Firmware is an embedded software program or set of instructions programmed on a device that provides the necessary instructions for how the device communicated with other computer hardware, and is located or stored in a semi-permanent storage area, e.g., ROM, EEPROM, or Flash memory. Firmware can often be updated by downloading a file from the manufacturer's web site or FTP.

6. ICMP (Internet Control Message Protocol)

ICMP provides a method of communicating between the Internet Protocol software on one machine and the corresponding software on another. It allows a gateway to send error or control messages to other gateways, or allows a host to diagnose problems with the network communication.

7. Internet

Physically, the Internet is a collection of packet switching networks interconnected by gateways that together with the TCP/IP protocol, allows them to perform logically as a single, large and virtual network. The Internet recognizes hosts using 32-bit IP address.

8. IP (Internet Protocol) Address

Each interface on the Internet must have a unique IP address (also called an Internet address). These addresses are 32-bit numbers, and are normally written as four decimal numbers, one for each byte of the address for example “192.168.41.1**”**. This is called dotted-decimal notation.

9. Subnet Mask

A Subnet mask, often simply called the “Mask”, is a 32-bit number that masks and IP address, and divides the IP address into the network address and the host address. Given its own IP address and its subnet mask, a host can determine whether a TCP/IP packet is destined for a host that is (1) on its own subnet, or (2) on a different network. If (1), the packet will be delivered directly; otherwise it, will be delivered via a gateway or a router.

10. Gateway

Computers that interconnect two networks and pass packets from one to the other are called Internet Gateways or Internet Routers. Gateways route packets that are based on the destination network, rather than the destination host.

11. MAC (Media Access Control) Address

To allow a computer to determine which packets are meant for it, each device attached to an Ethernet network is assigned a 48-bit integer known as its MAC address (also called the Ethernet address, the hardware address or the physical address). A MAC address is normally written as eight hexadecimal numbers, for example “**00:71:88:af:12:3e:0f:01**”. Ethernet hardware manufacturers purchase blocks of MAC addresses and assign them in sequence as they manufacture Ethernet interface hardware. Thus, no two hardware interfaces can have the same MAC address.

12. Packet

A packet is the unit of data sent across a physical network. It consists of a series of bits containing data and control information, including the source and the destination node (host) address, and is formatted for transmission from one node to another.

13. Ping

Ping is a network administration utility used to test the whether a host on an Internet network is active, and to measure the round-trip time for messages sent from the originating host to a destination computer. Ping operates by sending an ICMP echo request message to a host, expecting an ICMP echo reply to be returned. Normally, if a host cannot be pinged, Telnet or FTP cannot be used to connect to the host. Conversely, if Telnet or FTP cannot be used to connect to a host, Ping is often the starting point to determine the nature of the problem.

14. Socket

Each TCP segment contains a source and destination port number that can be used to identify the sending and receiving application. These two values, along with the source and destination IP addresses in the IP header, uniquely identify each connection. The combination of an IP address and a port number is called a socket.

15. TCP (Transmission Control Protocol)

TCP is a set of rules used in combination with the Internet Protocol to send data in the form of message units between computers over the Internet. TCP provides a reliable flow of data between two hosts and is associated with tasks such as dividing the data passed to it from an application into appropriately sized chunks for the network layer below, acknowledging received packets, setting timeouts to make certain that the other end acknowledges packets that are sent, and so on.

16. TCP/IP

The Transmission Control Protocol (TCP) and the Internet Protocol (IP) is standard network protocols that are almost always implemented and used together in a formation are known as TCP/IP. TCP/IP can be used to communicate across any set of interconnected networks.

17. UDP (User Datagram Protocol)

UDP is an internet protocol that provides a much simpler service to the application layer as it only sends packets of data from one host to another, but there is no guarantee that the packets will reach the destination host. UDP is suitable for purposes where error checking and correction is either not necessary or is performed in the application.

Appendix C. Revision History

This chapter provides revision history information to this document.

The table below shows the revision history.

Revision	Date	Description
1.0.0	Sep. 2018	Initial issue
1.01	Nov. 2019	Modify supported RF data rate description