tSH-700 Series

User Manual

Tiny Serial Port Sharer Jun. 2020 Ver. 1.8

WARRANTY

All products manufactured by ICP DAS are warranted against defective materials for a period of one year from the date of delivery to the original purchaser.

WARNING

ICP DAS assumes no liability for damages consequent to the use of this product. ICP DAS reserves the right to change this manual at any time without notice. The information furnished by ICP DAS is believed to be accurate and reliable. However, no responsibility is assumed by ICP DAS for its use, nor for any infringements of patents or other rights of third parties resulting from its use.

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CONTACT US

If you have any questions, please feel free to contact us via email at:

service@icpdas.com

SUPPORT

This manual relates to the following modules:

tSH-722, tSH-732

tSH-725, tSH-735

tSH-724, tSH-734

tSH-722i, tSH-732i

tSH-725i, tSH-735i

tSH-724i, tSH-734i

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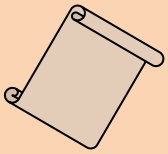
Packing List

The shipping package includes the following items:

	One tSH-700 series hardware module
	One Quick Start Guide
	DC Connector Power Cable (CA-002 Cable)

Note:
If any of these items are missing or damaged, please contact the local distributor for more information. Save the shipping materials and cartons in case you need to ship the card in the future.

More Information

Documentation

https://www.icpdas.com/en/download/index.php?nation=US&kind1=&model=&kw=tSH

Firmware

http://www.icpdas.com/en/download/show.php?num=1519&nation=US&kind1=&model=&kw=tSH

Software

https://www.icpdas.com/en/download/index.php?nation=US&kind1=&model=&kw=eSearch

1. Introduction

Following the success of the original tGW-700/tDS-700 modules, ICP DAS has continued to develop new functions for these products in order to provide increased support for a greater number of applications. The tSH-700 module is a serial port sharer that provides a number of functions, including "Baud Rate Conversion", "Modbus RTU/ASCII Conversion" and "Two Masters Share One Slave". The built-in web server provides easy configuration interface, and no console commands are required.

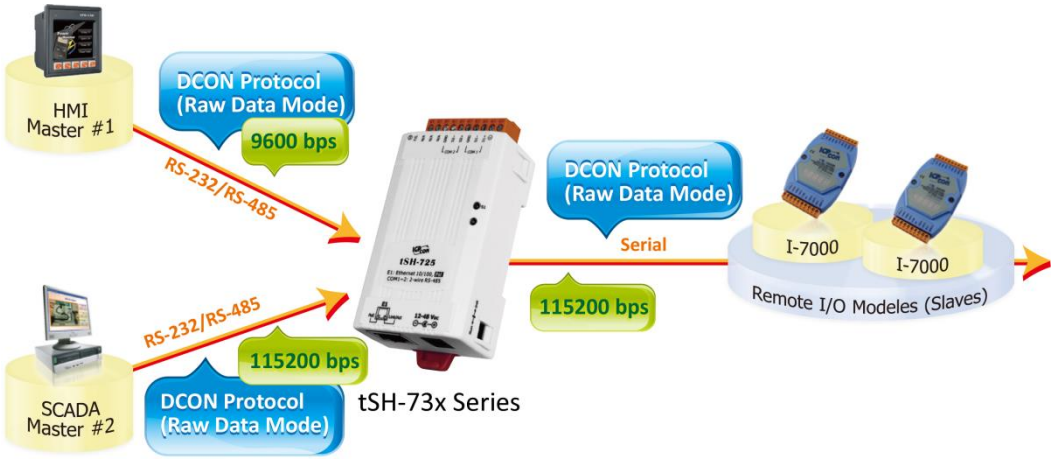
The tSH-700i module also adds 3000 V_{DC} isolation and +/-4 kV ESD protection component that diverts the potentially damaging charge away from sensitive circuit to protects the module and equipment from the sudden and momentary electric current.

- **Baud Rate Conversion:** This function allows a single master device to communicate with slave devices using different baud rates and data formats. Most query-response protocols (half-duplex), e.g. DCON, are supported in the raw data mode. Full-duplex communication should also work when the data size is smaller than the built-in 512 bytes buffer on each serial port.

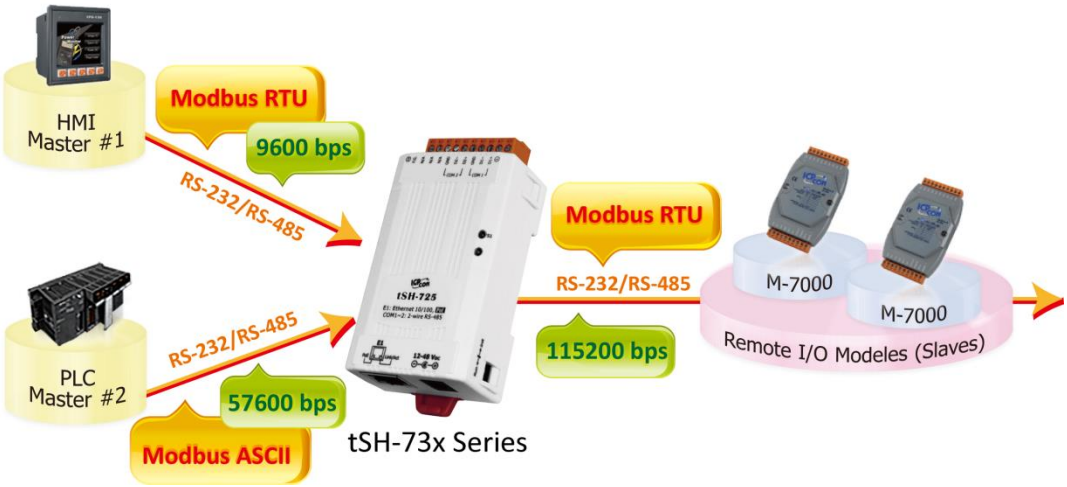
- **Modbus RTU/ASCII Conversion:** This function allows a single Modbus RTU/ASCII master device to communicate with Modbus RTU/ASCII slave devices using different protocols, baud rates and data formats.

➢ **Two Masters Share One Slave:** This function allows two master devices connected to different serial ports to share slave devices. Modbus mode can be used to convert the Modbus RTU/ASCII protocols, while raw data mode can be used for DCON or other query-response protocols. Different baud rates and data formats can also be used on the different serial ports. The built-in cache function reduces the loading of serial communication on the slave port by removing duplicated queries when the two master devices are requesting the same information. *Note: It's recommended to have large timeout value and scan interval settings on the two masters, since the slave port is now having double loadings.*

- **Two Masters Share Slave Devices in Raw Data Mode with Baud Rates Conversion**



- **Two Masters Share Slave Devices with Protocols and Baud Rates Conversion**



1.1 Selection Guide

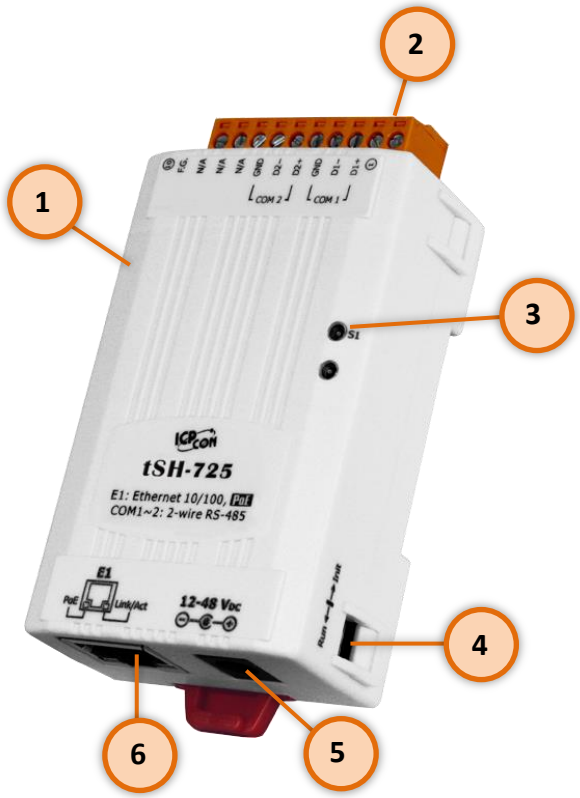
Model		RS-232	RS-485	Application	COM1	COM2	COM3
Non-Isolated	Isolated						
tSH-722	tSH-722i	2	-	Converter	3-wire RS-232	3-wire RS-232	-
tSH-725	tSH-725i	-	2		2-wire RS-485	2-wire RS-485	-
tSH-724	tSH-724i	1	1		2-wire RS-485	3-wire RS-232	-
tSH-732	tSH-732i	3	-	Sharer	3-wire RS-232	3-wire RS-232	3-wire RS-232
tSH-735	tSH-735i	-	3		2-wire RS-485	2-wire RS-485	2-wire RS-485
tSH-734	tSH-734i	2	1		2-wire RS-485	3-wire RS-232	3-wire RS-232

1.2 Specifications

Models		tSH-722 tSH-722i	tSH-732 tSH-732i	tSH-725 tSH-725i	tSH-735 tSH-735i	tSH-724 tSH-724i	tSH-734 tSH-734i
System							
CPU		32-bit ARM					
Communication Interface							
Ethernet		10/100 Base-TX, 8-pin RJ-45 x 1, (Auto-negotiating, Auto-MDI/MDIX, LED indicator) PoE (IEEE 802.3af, Class 1)					
COM1		5-wire RS-232	3wire RS-232	2-wire RS-485	2-wire RS-485	2-wire RS-485	2-wire RS-485
COM2		5-wire RS-232	3wire RS-232	2-wire RS-485	2-wire RS-485	5-wire RS-232	3wire RS-232
COM3		-	3wire RS-232	-	2-wire RS-485		3wire RS-232
Self-Tuner		-		Yes, automatic RS-485 direction control			
RS-485	Bias Resistor	-		Yes, 1 KΩ			
	Node	-		254 (max.)			
UART		16c550 or compatible					
Power Isolation		1000 V_{DC} for tSH-722i / 732i only					
Signal Isolation		3000 V_{DC} for tSH-725i / 735i / 724i / 734i only					
ESD Protection		+/-4 kV					
COM Port Format							
Baud Rate		115200 bps Max.					
Data Bit		5, 6, 7, 8					
Parity		None, Odd, Even, Mark, Space					
Stop Bit		1, 2					
Power							
Power Input	PoE	IEEE 802.3af, Class 1					
	DC Jack	+12 ~ 48 V_{DC}					
Power Consumption		0.07 A @ 24 V_{DC}					
Mechanism							
Connector		10-Pin Removable Terminal Block x 1					
Mounting		DIN-Rail					
Environment							
Operating Temperature		-25 ~ +75 °C					
Storage Temperature		-30 ~ +80 °C					
Humidity		10 ~ 90% RH, Non-condensing					

1.3 Appearance

Front View



1. Robust Insulated Case

2. Serial COM Ports

The number of serial COM Ports available depends on the type of tSH-700 module. For more detailed information regarding the pin assignments for the serial COM ports, refer to Section 1.5 "Pin Assignments".

3. S1: System LED indicator

Once power is supplied to the tSH-700 module, the system LED indicator will illuminate. An overview of the LED functions is given below:

Function	System LED Behavior
Running Firmware	Steady ON
Network Ready	Slow flashing – Once every 3 seconds
Serial Port Busy	Rapid flashing – Once every 0.2 seconds

4. Operating Mode Switch

Init Mode: Configuration mode

Run Mode: Firmware operation mode

For tSH-700 series modules, the operating mode switch is set to the **Run** position by default. In order to update the firmware for the tSH-700 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.

5. +12 to+48 V_{DC} Jack:

The tSH-700 is equipped with a +12V_{DC} to +48 V_{DC} jack that can be used to connect a power supply. If no PoE switch is available on site, a DC adapter can be used to power the tSH-700 module.

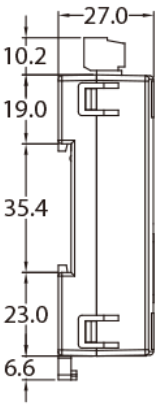
6. PoE and Ethernet RJ-45 Jack

The tSH-700 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 (Orange)** indicator will be illuminated. When power is supplied via PoE (Power-over-Ethernet), the **PoE LED (Green)** indicator will be illuminated.

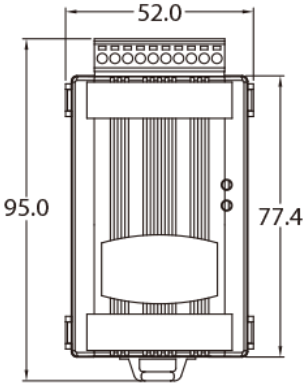
1.4 Dimensions

The following diagrams provide the dimensions of the tSH-700 series module and CA-002 cable that can be used as a reference when defining the specifications and the DC power supply plug for any custom enclosures. All dimensions are in millimeters.

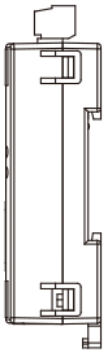
1.4.1 tSH-700 Series Module



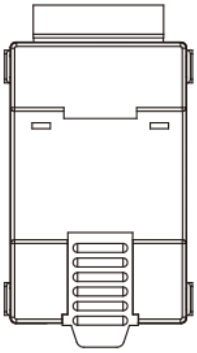
Left Side View



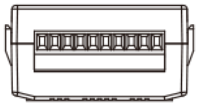
Front View



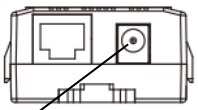
Right Side View



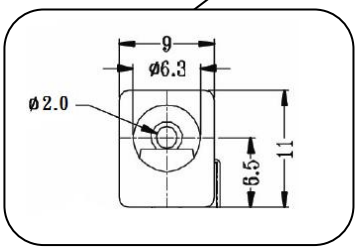
Rear View



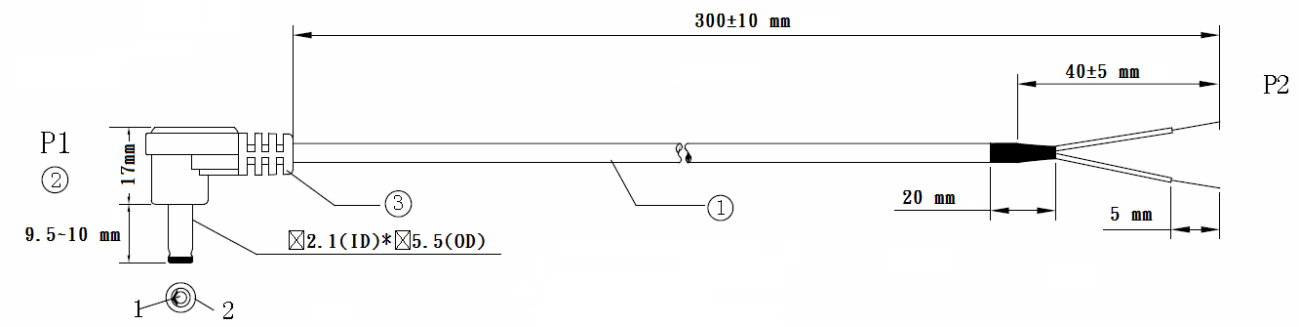
Top View



Bottom View



1.4.2 CA-002 Cable



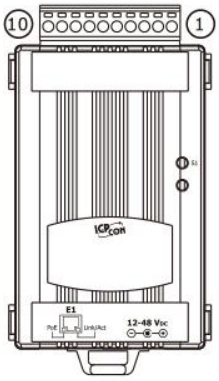
Pin Assignment

P1		P2
1	RED	OPEN
2	BLACK	OPEN

Note: Cable color: BLACK

NO	DESCRIPTION	QTY	UNIT
1	UL2464 18AWG 2C(RED/BLACK) 0D5.0 COLOR BLACK	1	PCS
2	DC PLUG 5.5*2.1	1	PCS
3	PVC:45/P BLACK		G

1.5 Pin Assignments



		tSH-722	tSH-722i
COM2	10	F.G.	F.G.
	09	CTS2	CTS2
	08	RTS2	RTS2
	07	RxD2	RxD2
	06	TxD2	TxD2
COM1	05	GND	ISO.GND
	04	CTS1	CTS1
	03	RTS1	RTS1
	02	RxD1	RxD1
	01	TxD1	TxD1

		tSH-725	tSH-725i
	10	F.G.	F.G.
	09	N/A	N/A
	08	N/A	N/A
	07	N/A	N/A
COM2	06	GND	ISO.GND
	05	D2-	D2-
	04	D2+	D2+
COM1	03	GND	ISO.GND
	02	D1-	D1-
	01	D1+	D1+

		tSH-724	tSH-724i
	10	F.G.	F.G.
	09	N/A	N/A
COM2	08	CTS2	CTS2
	07	RTS2	RTS2
	06	GND	ISO.GND
	05	RxD2	RxD2
	04	TxD2	TxD2
COM1	03	GND	ISO.GND
	02	D1-	D1-
	01	D1+	D1+

		tSH-732	tSH-732i
	10	F.G.	F.G.
COM3	09	GND	GND
	08	RxD3	RxD3
	07	TxD3	TxD3
COM2	06	GND	ISO.GND
	05	RxD2	RxD2
	04	TxD2	TxD2
COM1	03	GND	ISO.GND
	02	RxD1	RxD1
	01	TxD1	TxD1

		tSH-735	tSH-735i
	10	F.G.	F.G.
COM3	09	GND	ISO.GND
	08	D3-	D3-
	07	D3+	D3+
COM2	06	GND	ISO.GND
	05	D2-	D2-
	04	D2+	D2+
COM1	03	GND	ISO.GND
	02	D1-	D1-
	01	D1+	D1+

		tSH-734	tSH-734i
	10	F.G.	F.G.
COM3	09	GND	ISO.GND
	08	RxD3	RxD3
	07	TxD3	TxD3
COM2	06	GND	ISO.GND
	05	RxD2	RxD2
	04	TxD2	TxD2
COM1	03	GND	ISO.GND
	02	D1-	D1-
	01	D1+	D1+

Note that the CTS and RTS pins of the tSH-722/722i and tSH-724/724i are reserved and have no function.

2. Setting up the tSH-700 Module

This chapter provides detailed information about the “Self-Test” process, which is used to confirm that the tSH-700 series module is operating correctly. Before beginning the “Self-Test” process, the wiring test, Ethernet configuration and eSearch utility driver installation procedures must first be fully completed. Follow the procedure described below:

Step 1: Connecting 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 eSearch 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.

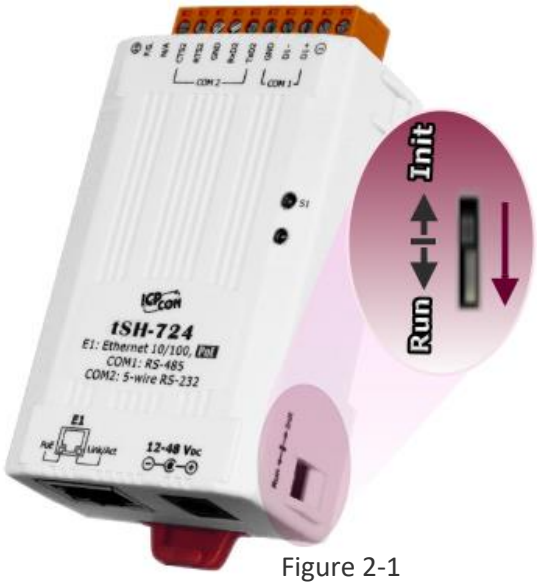


Figure 2-1

4. Connect both the tSH-700 and the Host computer to the same sub-network or the same Ethernet Switch, and then power on the tSH-700. Refer to **Figures 2-2 and 2-3** for illustrations of how to do this.

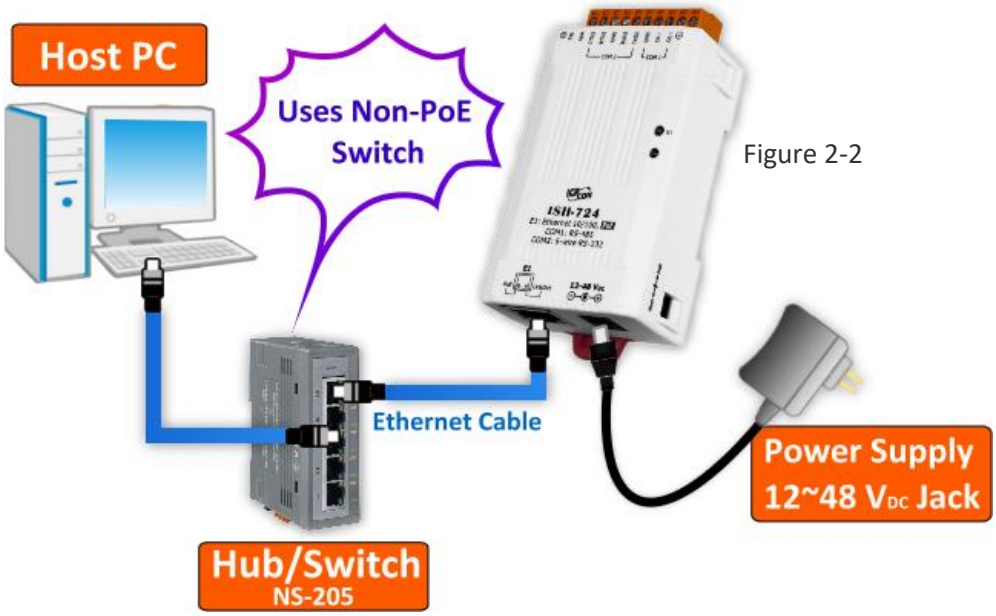


Figure 2-2

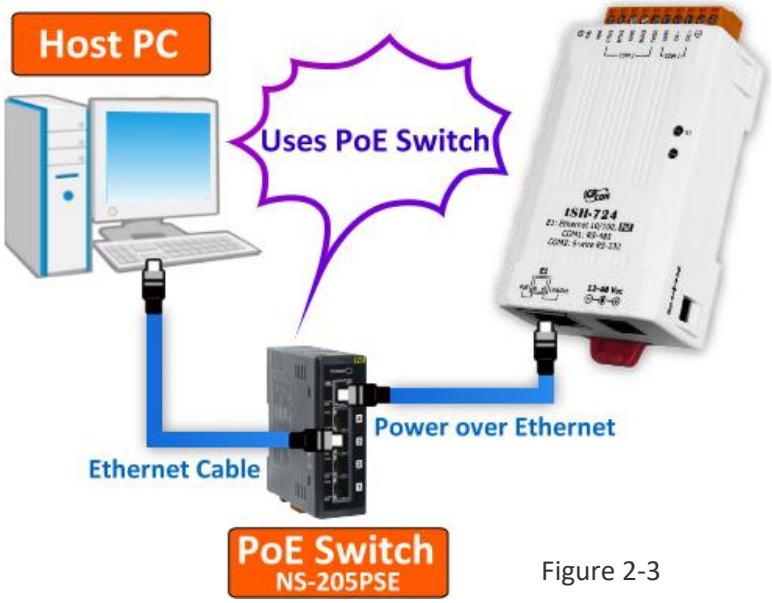


Figure 2-3

Figure 2-4

5. Verify that the System LED indicator is flashing.

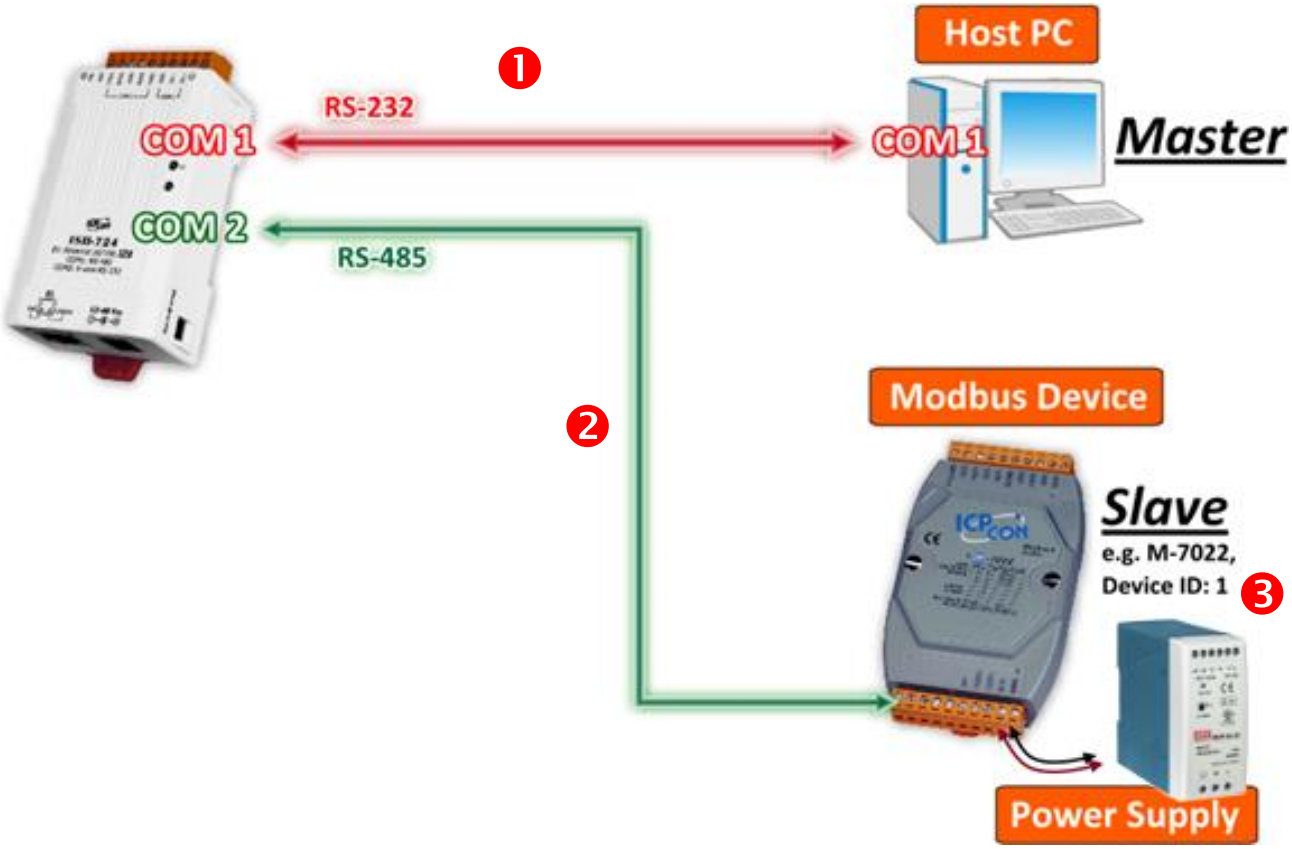
Step 2: Connecting the Master and Slave Devices

1. Connect the serial port of PC (Master) to COM1 on the tSH-700.
2. Connect the Modbus device (Slave, e.g. M-7022, optional) to COM2 on the tSH-700.

tSH-700		RS-485 Modbus Device
DATA1+	● ——— ●	DATA2+
DATA1-	● ——— ●	DATA2-
GND	● ——— ●	GND

tSH-700		RS-232 Modbus Device
RxD	● ← ●	TxD
TxD	● → ●	RxD
GND	● ——— ●	GND

3. Supply power (+10 ~+30 V_{DC}) to the Modbus device (e.g. M-7022, Device ID: 1)



Step 3: Installing the Software on your PC

Install **eSearch Utility**, which can be obtained from the companion the ICP DAS FTP site, or the ICP DAS web site. The location of the download addresses are shown below:

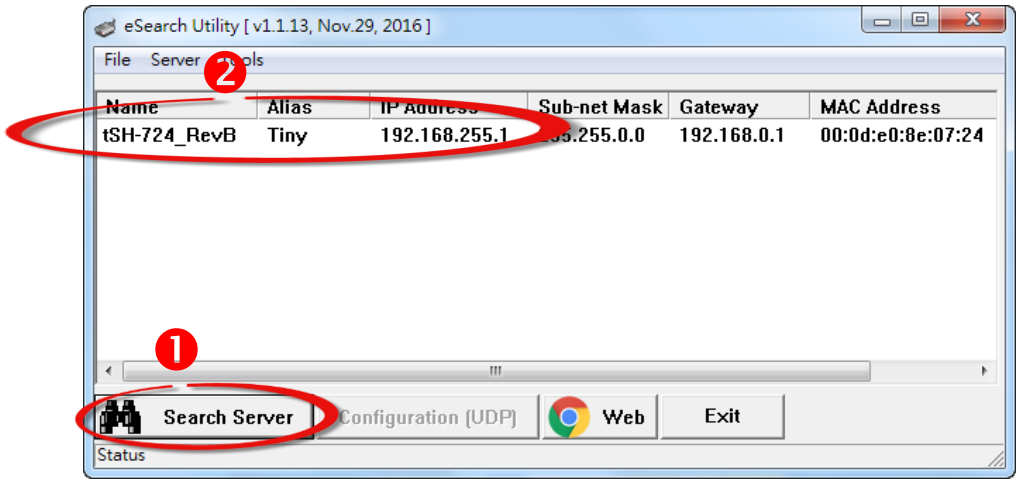
https://www.icpdas.com/en/download/index.php?nation=US&kind1=&model=&kw=eSearch

Step 4: Configuring the Correct Network Settings

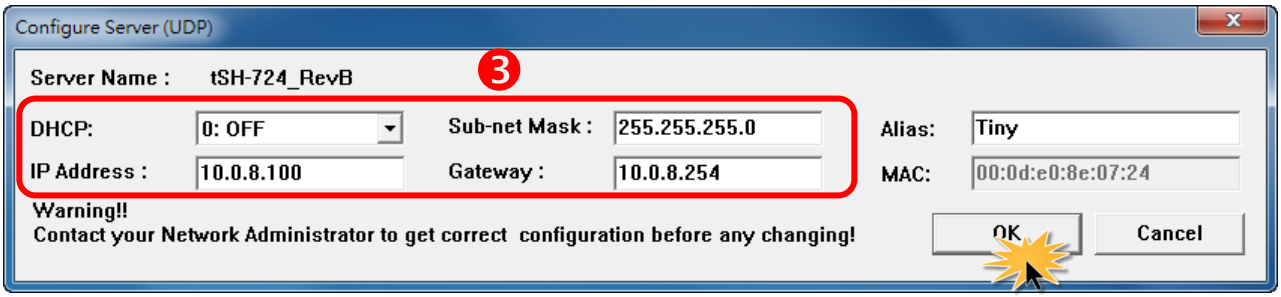
1. Open the eSearch Utility and then click the **"Search Servers"** button to search for the tSH-700 module. Factory Default Settings for the tSH-700:

IP Address:	192.168.255.1
Sub-net Mask:	255.255.0.0
Gateway Address:	192.168.0.1

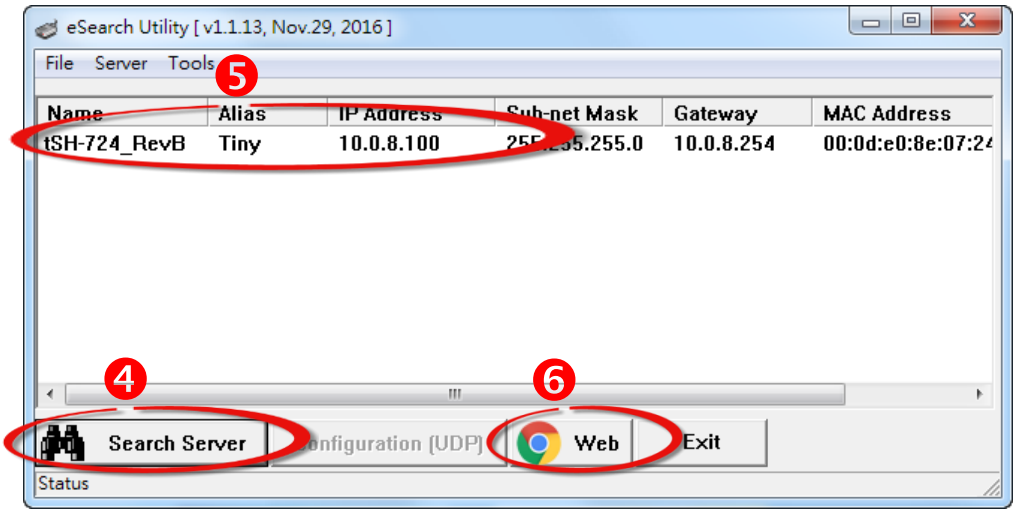
2. Once the search process is complete, double-click the name of the tSH-700 module to open the **"Configure Server(UDP)"** dialog box.



3. Enter the network settings information, including the **IP, Mask and Gateway addresses,** and then click **"OK"** button. The new settings for the tSH-700 will take effect within 2 seconds. If you don't know the correct network configuration information, contact your Network Administrator to obtain the details.

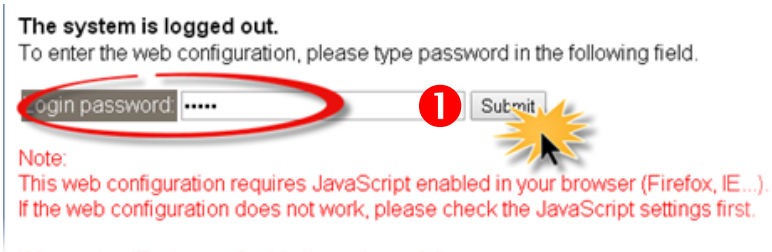


4. Wait 2 seconds and then click the **"Search Servers"** button again to ensure that the tSH-700 is working correctly with the new configuration.
5. Click the name of the tSH-700 to select it.
6. Click the **"Web"** button to log in to the web configuration pages. (Or enter the URL address of the tSH-700 in the address bar of the browser.)

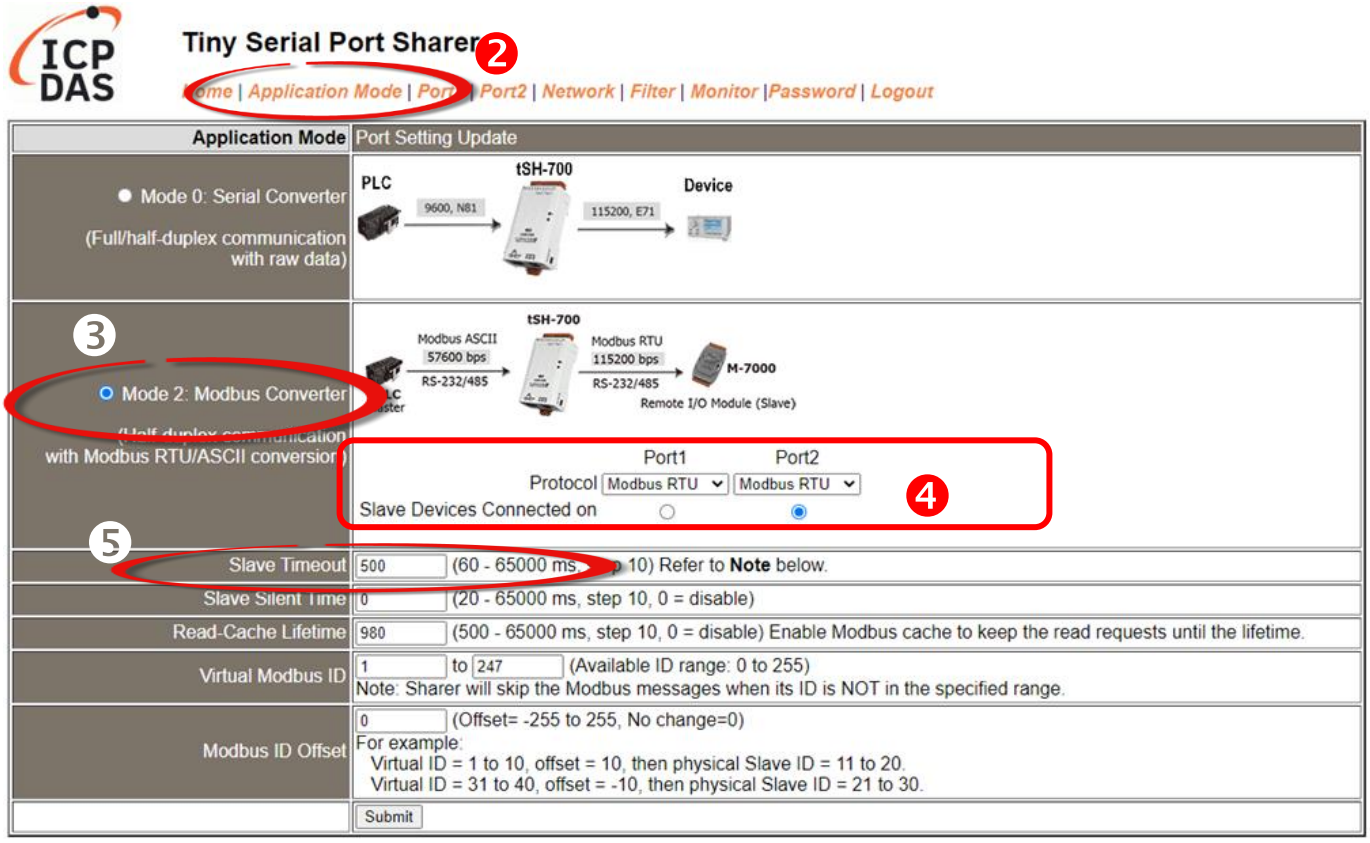


Step 5: Configuring the Application Mode

1. Enter the password (use the default password **"admin"**) in the Login password field and click the **"Submit"** button.

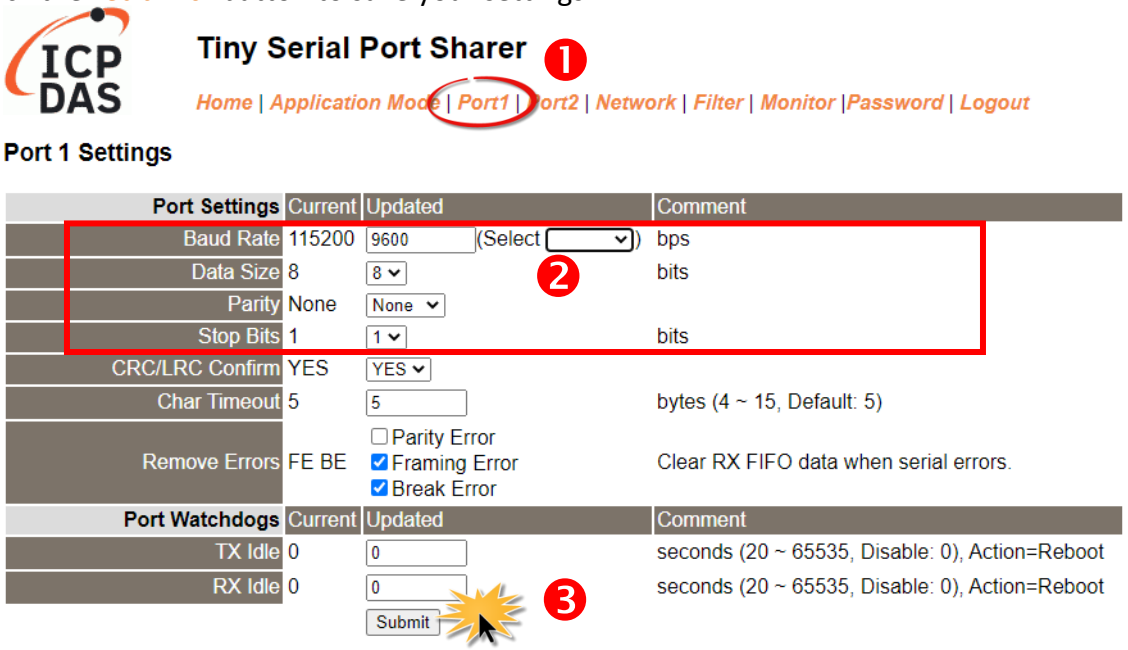


2. Click the **"Application Mode"** tab to display the **Application Mode Settings** page.
3. Check the **"Mode2: Modbus Converter"** option.
   (3-port modules: **"Mode 2: Modbus Sharer "**)
4. Select the M-7022 (slave device) connected to COM port of the tSH-700 **(e.g. "Port2")** from the **"Slave Device Connected on:"** option button.
5. Enter the timeout value of the Port1 **(e.g. "500")** in the **"Slave Timeout (ms)"** field and click the **"Submit"** button to save your settings.

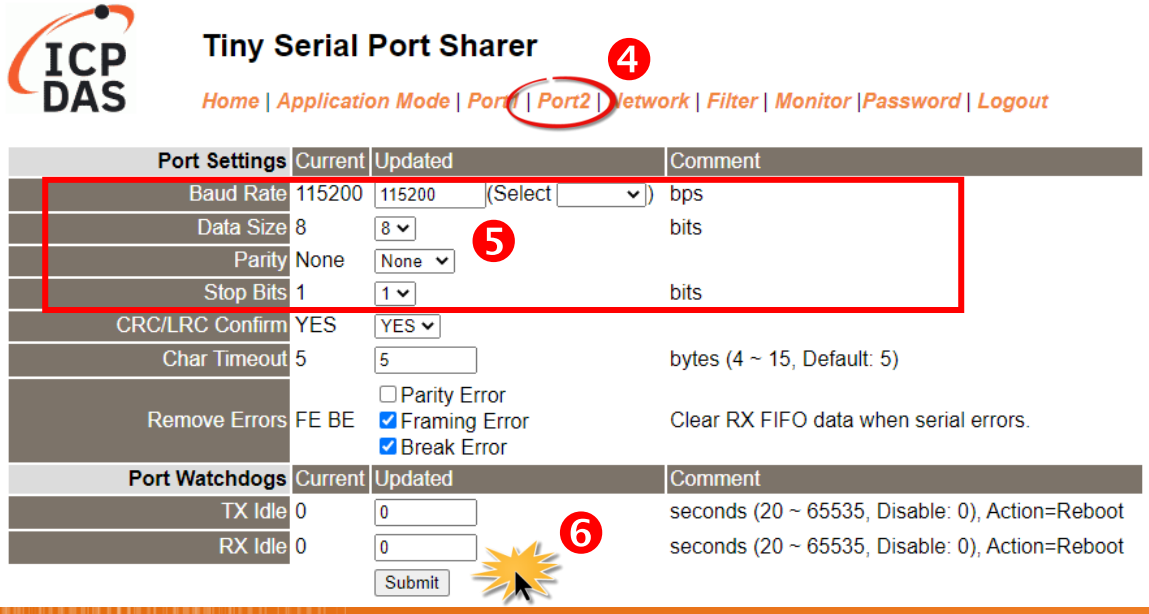


Step 6: Configuring the Serial Port

1. Click the **"Port1"** tab to display the **Port1 Settings** page.
2. Select the appropriate **Baud Rate and Data Format** settings depending on the serial COM Port of PC (Master) from the relevant drop down options. **(e.g. Baud Rate: 9600 and Data Format: 8N1)**
3. Click the **"Submit"** button to save your settings.

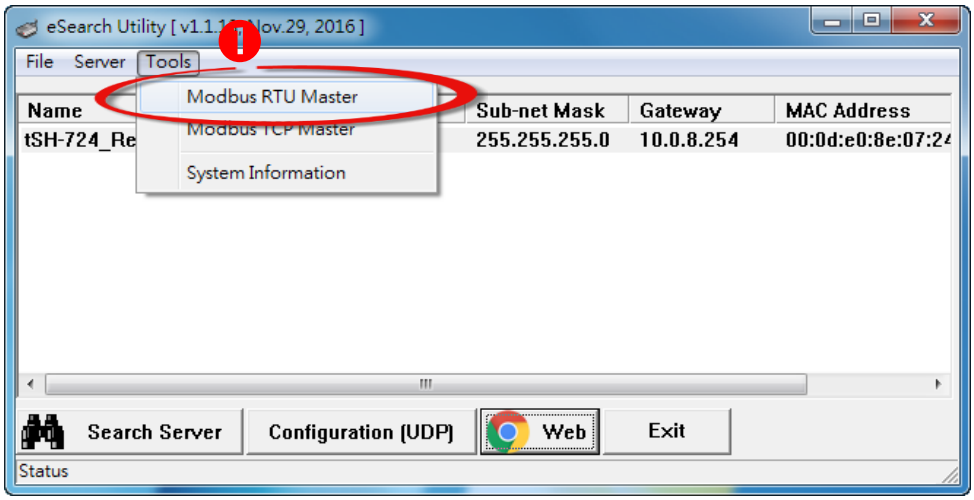


4. Click the **"Port2"** tab to display the **Port2 Settings** page.
5. Select the appropriate **Baud Rate and Data Format** settings depending on the M-7022 (Slave) from the relevant drop down options. **(e.g. Baud Rate: 115200 and Data Format: 8N1)**
6. Click the **"Submit"** button to save your settings.

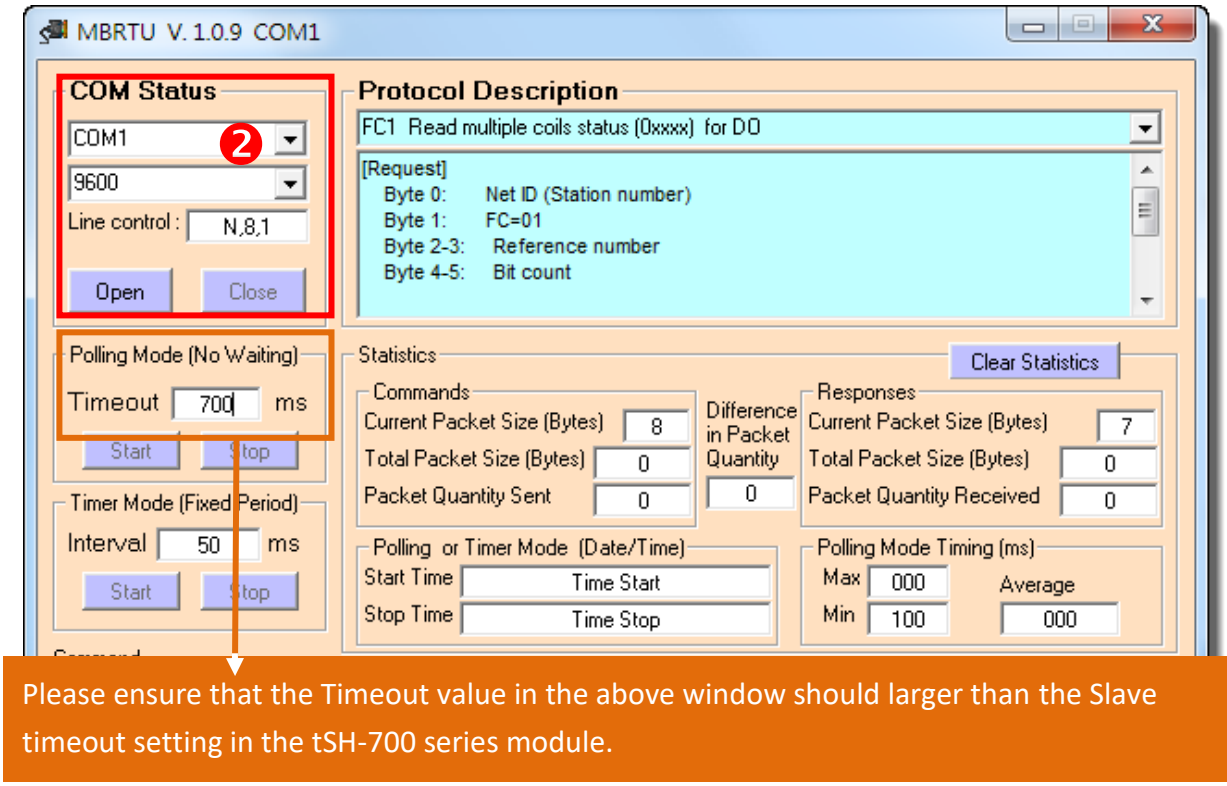


Step 7: Testing your tSH-700 Module

1. In the eSearch Utility, select the **"Modbus RTU Master"** item from the **"Tools"** menu to open the Modbus RTU Master Utility.

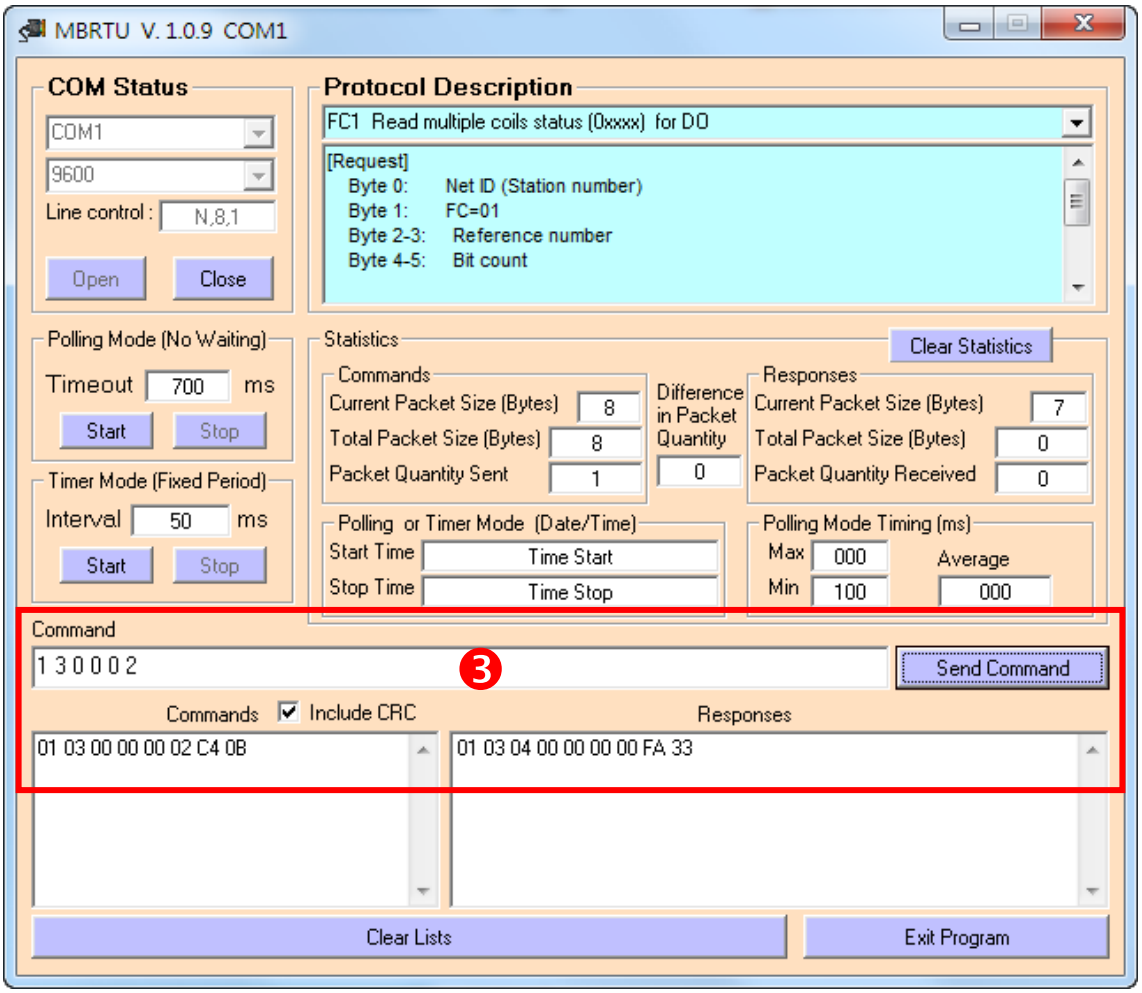


2. Select your COM port, Baud Rate and Data Format **(e.g. COM1/9600/N, 8, 1)** on the PC (Master) and then click the **"Open"** button in the **"COM status"** section.



Please ensure that the Timeout value in the above window should larger than the Slave timeout setting in the tSH-700 series module.

3. Refer to **"Protocol Description"** section and type the command in the **"Command"** field then click the **"Send command"** button. If the response data is correct, it means the test is success.



3. Web Configuration

Once the tSH-700 module has been correctly configured and is functioning on the network normally, the configuration details can be retrieved or modified using either the eSearch Utility or a standard web browser.

***Note** that if the tSH-700 module does not use the power supply via PoE (Power-over-Ethernet), you can remove the Ethernet cable when web configuration is completed.*

3.1 Logging in to the tSH-700 Web Server

The embedded tSH-700 series web server can be accessed from any computer that has an Internet connection.

Step 1: Open a new browser window.

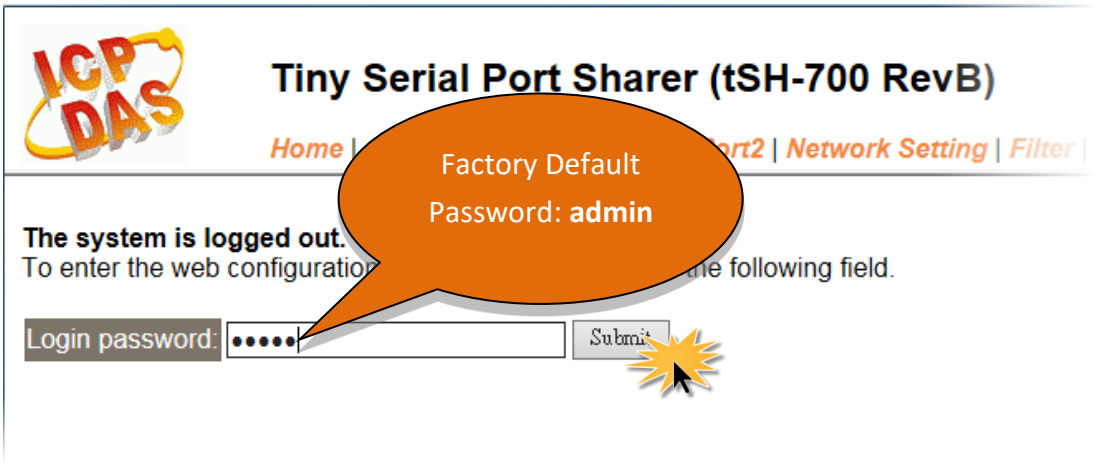
Open a web browser, for example, Google Chrome, Firefox or Internet Explorer, which are reliable and popular Internet browsers that can be used to configure tSH-700 module.

Step 2: Enter the URL for the tSH-700 web server

Ensure that you have correctly configured the network settings for the tSH-700 module (refer to Chapter 3 “Setting up the tSH-700 module” for detailed instructions), and then enter the URL for the tSH-700 web server in the address bar of the browser.

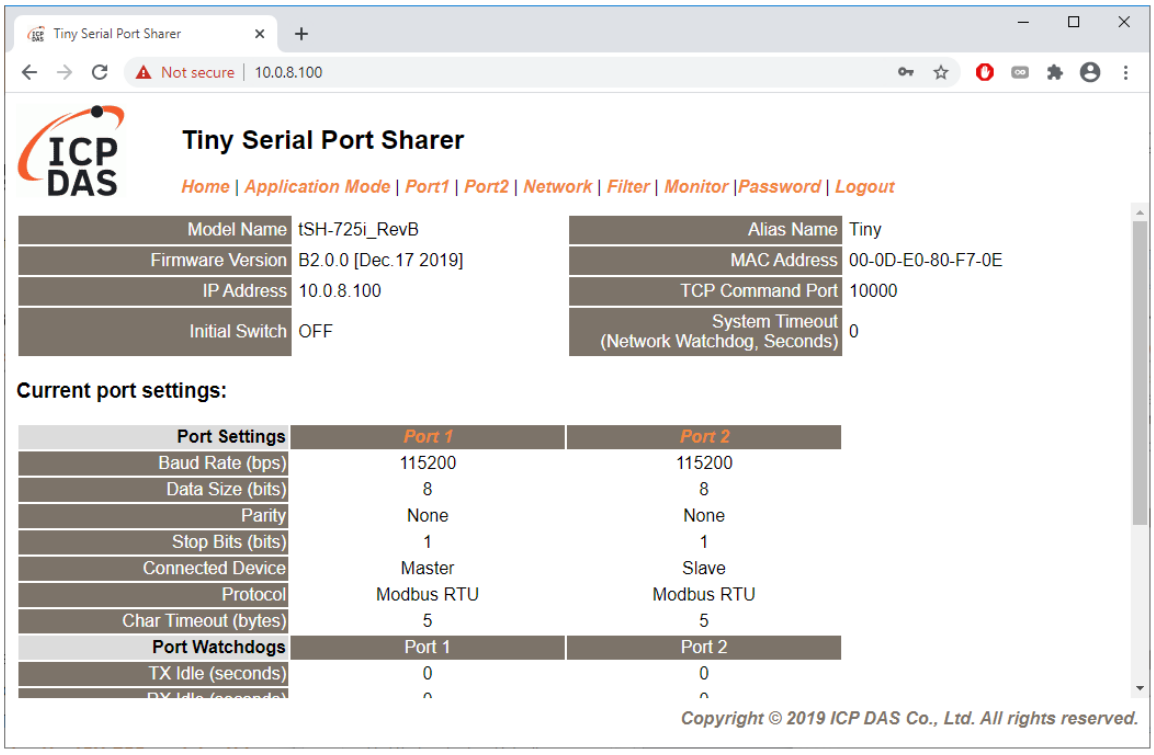
Step 3: Enter the Password

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 tSH-700 Web Server

After logging into the tSH-700 web server, the main page will be displayed.



3.2 Home Page

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

- The first part of this page provides basic information about the tSH-700 hardware and software.

Model Name	tSH-725i_RevB	Alias Name	Tiny
Firmware Version	B2.0.0 [Dec.17 2019]	MAC Address	00-0D-E0-80-F7-0E
IP Address	10.0.8.100	TCP Command Port	10000
Initial Switch	OFF	System Timeout (Network Watchdog, Seconds)	0

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 tSH-700 module, this page can be used to check the version information of the tSH-700 module software.

- The second part of this page provides the status of the port settings and serial data packing.

Current port settings:

Port Settings	Port 1	Port 2
Baud Rate (bps):	115200	115200
Data Size (bits):	8	8
Parity:	None	None
Stop Bits (bits):	1	1
Connected Device:	Master	Slave
Protocol:	Modbus RTU	Modbus RTU
Char Timeout (bytes):	5	5
Port Watchdogs	Port 1	Port 2
TX Idle (seconds):	0	0
RX Idle (seconds):	0	0

- The three part of this page provides the status of the application settings.

Application Settings:

Application Mode	2 (Modbus Converter - Half Duplex)
Port for Slave Device	2
Slave Timeout (ms)	1000
Slave Silent Time (ms)	0
Read Cache Lifetime (ms)	980
Modbus ID Range	1 to 247

3.3 Application Mode

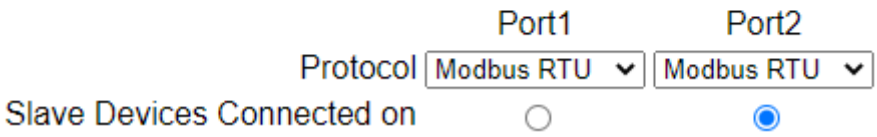
The **Application Mode** section enables user to configure the operations of the module. The available application modes depend on the type of tSH-700 module. The tSH-72x series module is converter application and tSH-73x series module is sharer application.

3.3.1 Converter Application (tSH-72x Series)

Application Mode Settings

Application Mode	Port Setting Update
● Mode 0: Serial Converter (Full/half-duplex communication with raw data)	
○ Mode 2: Modbus Converter (Half-duplex communication with Modbus RTU/ASCII conversion)	 Port1 Port2 Protocol Modbus RTU Modbus RTU Slave Devices Connected on ○ ●
Slave Timeout	1000 (60 - 65000 ms, step 10) Refer to **Note** below.
Slave Silent Time	0 (20 - 65000 ms, step 10, 0 = disable)
Read-Cache Lifetime	980 (500 - 65000 ms, step 10, 0 = disable) Enable Modbus cache to keep the read requests until the lifetime.
Virtual Modbus ID	1 to 247 (Available ID range: 0 to 255) Note: Sharer will skip the Modbus messages when its ID is NOT in the specified range.
Modbus ID Offset	0 (Offset= -255 to 255, No change=0) For example: Virtual ID = 1 to 10, offset = 10, then physical Slave ID = 11 to 20. Virtual ID = 31 to 40, offset = -10, then physical Slave ID = 21 to 30.
	Submit

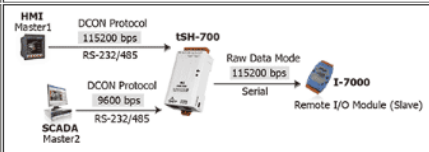
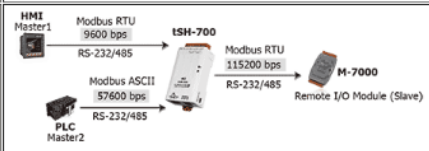
The following is an overview of the parameters contained in the **Application Mode** section:

Item	Description
Application Mode	
Mode 0: Serial Converter (Full/half-duplex communication with raw data)	This function allows two devices to communicate with each other using different baud rates and data formats.  ***Note:*** *The full-duplex communication is only available for RS-232 and RS-422 when data length is smaller than 512 bytes of the serial buffer.*
Mode 2: Modbus Converter	This function allows two masters share slave devices with Modbus protocols and Baud Rates conversion.   In **"Slave Device Connected on:"** option, select the COM port which the slave device connected to. In **"Protocol:"** option, set the Modbus protocol in all port related to master/slave devices.
Slave Timeout (ms)	Set the waiting time after last Tx of the request sent from the tSH-700 to device. If the device does not respond within the timeout value, the tSH-700 will skip and process next request. ***Note*** *that the Slave timeout in the port which the Slave Device connected on must be smaller than the timeout value in your application software (e.g. Modbus Poll, Modbus Utility, etc.). It cannot be less than 100 ms.* Default: 1000 ms

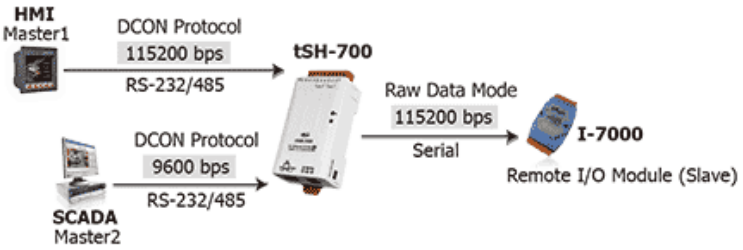
Slave Silent Time	This parameter is used to set the idle time that should elapse before sending each request to the serial port. This causes the serial bus to be "silent" for the specified period, and allows slower slave devices more time to process previous requests and responses, thereby reducing communication problems. Valid range: 10, 20to 65000 (ms);
Read-Cache Lifetime (ms)	When sharing Modbus RTU/ASCII device/data between several master devices, the read-cache function can be used to reduce the loading on the serial communication and ensure faster responses. Valid range: 10, 500 to 65000 (ms) Disable = 0
Virtual Modbus ID	This parameter is used to skip the Modbus messages when Modbus ID of slave device is NOT in the specified range. Available ID range: 0 to 255
Modbus ID Offset	This parameter is used to set the Modbus ID offset. For example: Virtual ID = 1 to 10, offset = 10, then physical Slave ID = 11 to 20. Virtual ID = 31 to 40, offset = -10, then physical Slave ID = 21 to 30. Available offset range: -255 to 255 No change =0 (Default)
Submit	Click this button to save the revised settings to the tSH-700.

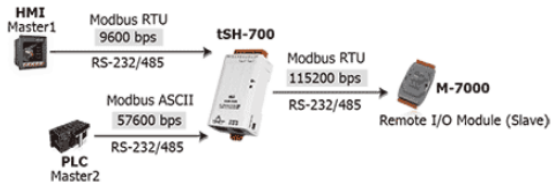
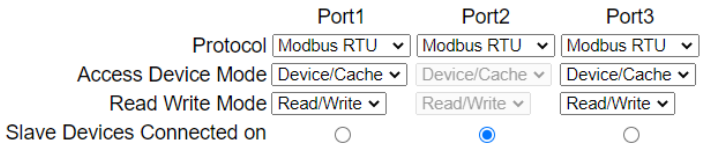
3.3.2 Sharer Application (tSH-73x Series)

Application Mode Settings

Application Mode	Port Setting Update
● Mode 0: Serial Converter (1-to-1 full/half-duplex communication with raw data)	 Port1: Enable , Port2: Enable , Port3: Disable
● Mode 1: Serial Sharer (2-to-1 or 1-to-1 half-duplex communication with raw data)	 Slave Devices Connected on : ○ Port 1 ◉ Port 2 ○ Port 3 Note: Most query-response protocols (like DCON, Modbus...) can be used without conversion.
○ Mode 2: Modbus Sharer (2-to-1 or 1-to-1 half-duplex communication with Modbus RTU/ASCII conversion)	 Port1 Port2 Port3 Protocol: Modbus RTU / Modbus RTU / Modbus RTU Access Device Mode: Device/Cache / Device/Cache / Device/Cache Read Write Mode: Read/Write / Read/Write / Read/Write Slave Devices Connected on ○ ◉ ○
Slave Timeout	1000 (60 - 65000 ms, step 10) Refer to **Note1** below.
Slave Silent Time	0 (20 - 65000 ms, step 10, 0 = disable)
Read-Cache Lifetime	980 (500 - 65000 ms, step 10, 0 = disable) Enable Modbus cache to keep the read requests until the lifetime.
Deferred Cache Deletion	0 (500 - 65000 ms, step 10, 0 = disable) Have longer cache lifetime for the master when it read cache only.
Virtual Modbus ID	1 to 247 (Available ID range: 0 to 255) Note: Sharer will skip the Modbus messages when its ID is NOT in the specified range.
Modbus ID Offset	0 (Offset= -255 to 255, No change=0) For example: Virtual ID = 1 to 10, offset = 10, then physical Slave ID = 11 to 20. Virtual ID = 31 to 40, offset = -10, then physical Slave ID = 21 to 30.
	Submit

The following is an overview of the parameters contained in the **Application Mode** section:

Item	Description
Application Mode	
Mode 0: Serial Converter (1-to-1 full/half-duplex communication with raw data)	This function allows two devices to communicate with each other using different baud rates and data formats.  Port1: Enable , Port2: Enable , Port3: Disable When the status of the COM Port is “enable” that means the data transmission in these two devices can just like Full-duplex, the data can be transmitted in both directions at the same time. ***Note:*** *The full-duplex communication is only available for RS-232 and RS-422 when data length is smaller than 512 bytes of the serial buffer.*
Mode 1: Serial Sharer (2-to-1 or 1-to-1 half-duplex communication with raw data)	This function allows two masters share all slave devices in RAW Data transmission with different Baud Rates. ***Note:*** *this mode for tSH-73x series modules only.*  Slave Devices Connected on : Port 1 Port 2 Port 3 Note: Most query-response protocols (like DCON, Modbus...) without conversion can be used**.** In **“Slave Device Connected on:”** option, select the COM port which the slave device connected to.

Mode 2: Modbus Sharer (2-to-1 or 1-to-1 half-duplex communication with Modbus RTU/ASCII conversion)	This function allows two masters share slave devices with Modbus protocols and Baud Rates conversion.   In **"Protocol:"** option, set the Modbus protocol in all port related to master/slave devices. In **"Access Device Mode:"** option, set access mode for the Master device. ● Device/Cache: If the Cache is existing, adopt the cache; otherwise, access the Slave device. ● Device: Access the Slave device always. ● Cache: Adopt the cache always. In **"Read Write:"** option, set restrict for the Modbus command. ● Read/Write: Allow read/write request. ● Read: Read request only. In **"Slave Device Connected on:"** option, select the COM port which the slave device connected to.
Slave Timeout (ms)	Set the waiting time after last Tx of the request sent from the tSH-700 to device. If the device does not respond within the timeout value, the tSH-700 will skip and process next request. ***Note*** *that the Slave timeout in the port which the Slave Device connected on must be smaller than the timeout value in your application software (e.g. Modbus Poll, Modbus Utility, etc.). It cannot be less than 100 ms.* Default: 1000 ms
Read-Cache Lifetime (ms)	When sharing Modbus RTU/ASCII device/data between several master devices, the read-cache function can be used to reduce the loading on the serial communication and ensure faster TCP responses. Valid range: 10, 20 to 65000 (ms) Disable = 0

Deferred Cache Deletion(ms)	Have longer cache lifetime for the master when it read cache only.
Virtual Modbus ID	This parameter is used to skip the Modbus messages when Modbus ID of slave device is NOT in the specified range. Valid range: 0 to 255 Default: 1 to 247
Modbus ID Offset	This parameter is used to set the Modbus ID offset. For example: Virtual ID = 1 to 10, offset = 10, then physical Slave ID = 11 to 20. Virtual ID = 31 to 40, offset = -10, then physical Slave ID = 21 to 30. Valid range: -255 to 255 No change =0 (default)
Submit	Click this button to save the revised settings to the tSH-700.

3.4 Serial Port Page

The **Port Settings** section provides basic information related to the hardware and software for the tSH-700 module, including the Firmware version and the IP Address, etc. and then provides functions allowing items such as port settings and sharer settings to be configured.

3.4.1 Port Settings

Port 1 Settings

Port Settings	Current	Updated	Comment
Baud Rate	115200	115200 (Select)	bps
Data Size	8	8	bits
Parity	None	None	
Stop Bits	1	1	bits
CRC/LRC Confirm	YES	YES	
Char Timeout	5	5	bytes (4 ~ 15, Default: 5)
Remove Errors	FE BE	☐ Parity Error ☑ Framing Error ☑ Break Error	Clear RX FIFO data when serial errors.
Port Watchdogs	**Current**	**Updated**	**Comment**
TX Idle	0	0	seconds (20 ~ 65535, Disable: 0), Action=Reboot
RX Idle	0	0	seconds (20 ~ 65535, Disable: 0), Action=Reboot
		Submit	

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

Item	Description	Default
Port Settings		
Baud Rate (bps)	This parameter is used to set the Baud Rate for the COM ports.	115200
Data Size (bits)	This parameter is used to set the Data Size for the COM ports.	8
Parity	This parameter is used to set the Parity for the COM ports.	None
Stop Bits (bits)	This parameter is used to set the Stop Bits for the COM ports.	1
CRC/LRC Confirm	This parameter is used to enable or disable CRC/LRC Confirm function. This function can check every request/response in CRC partition. If CRC partition is not correct, the command will be skipped. Yes = Enable; No = Disable	No

Char Timeout (bytes)	This parameter is used to set the waiting time (based on bytes) that should elapse after last byte of data of the response is received from the slave device is activated. If no more data is received before the timeout period expires, then the transmission of this packet is deemed to have been completed and the tSH-700 begins processing the packet. Valid range: 4 to 15 (bytes)	5
Remove Errors	Clear the Rx FIFO when the Parity、Framing、Break Error occurs.	FE, BE
Port Watchdogs		
TX Idle (seconds)	If the Tx does not transmit data for a certain period, the system will be rebooted based on the Tx idle value. Valid range: 20 ~ 65535 (seconds) Disable: 0	0
RX Idle (seconds)	If the Rx does not receive data for a certain period, the system will be rebooted based on the Rx idle value. Valid range: 20 ~ 65535 (seconds) Disable: 0	0
Submit	Click this button to save the revised settings to the tSH-700.	

3.5 Network Setting

3.5.1 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 tSH-700 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.

IP Address Settings

IP Address	
Address Type:	DHCP
Static IP Address:	10 . 0 . 8 . 41
Subnet Mask:	255 . 255 . 255 . 0
Default Gateway:	10 . 0 . 8 . 254
MAC Address:	00-0d-e0-8e-07-34 (Format: FF-FF-FF-FF-FF-FF)
	Update Settings

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 "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 "Dynamic Configuration" for more details.
Static IP Address	Each tSH-700 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 tSH-700 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 IP Address of the Gateway to be used by the tSH-700. A Gateway (or router) is a device that is used to connect an individual network to one or more additional networks.
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.
Update Settings	Click this button to save the revised settings to the tSH-700.

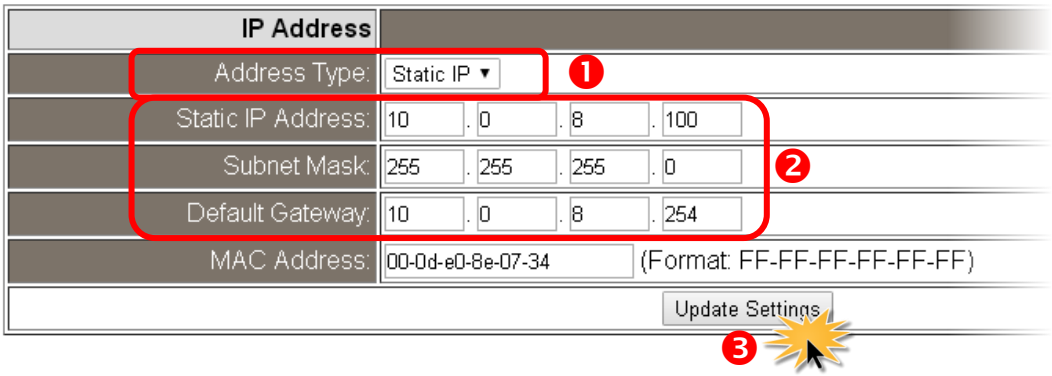
Manual Configuration

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.

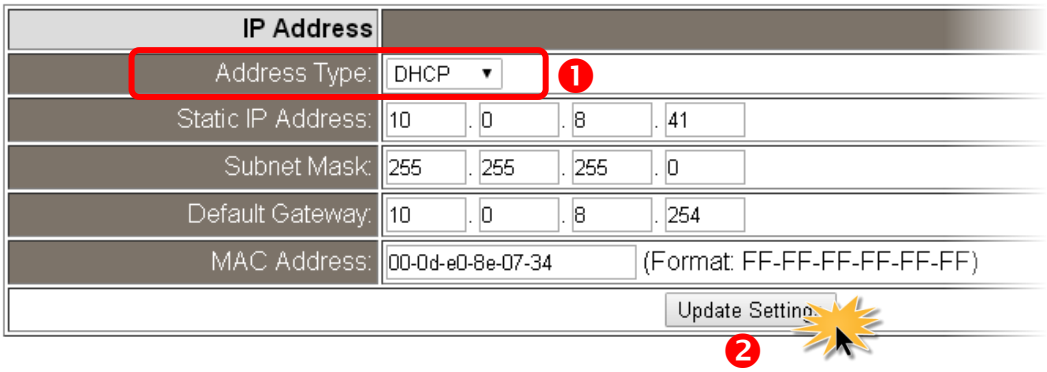


Dynamic Configuration

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.

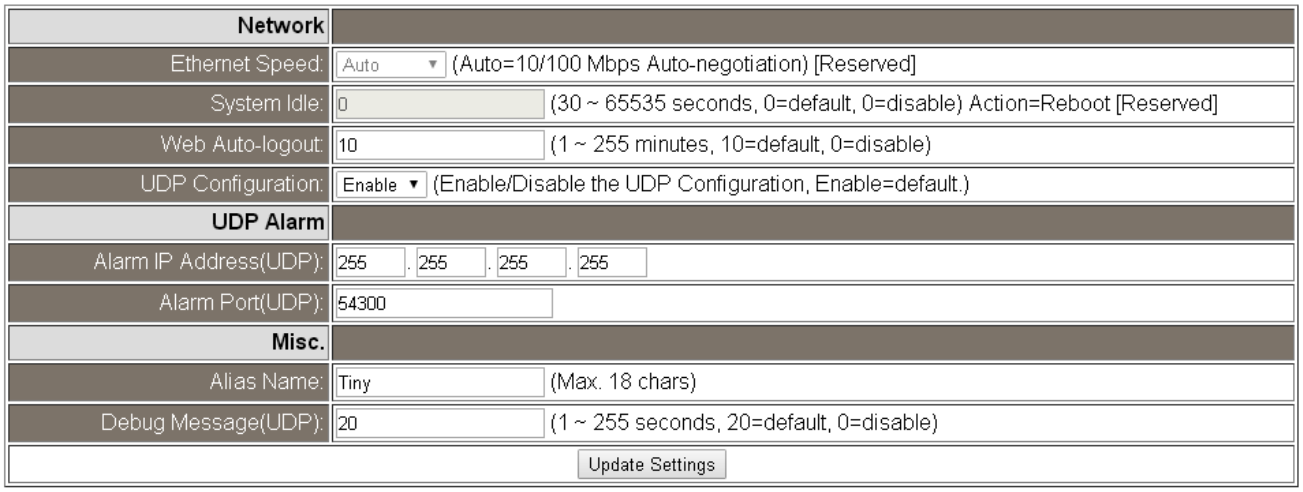
Step 2: Click the **"Update Settings"** button to complete the configuration.



3.5.2 General Settings

The General Settings provides functions allowing items such as the Alias Name, System Timeout value, UART Watchdog value, Auto-logout value and Debug Message (UDP), etc. to be configured.

General Settings



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
System Idle	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 (default)	0
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

UDP Configuration	This parameter is used to enable or disable UDP configuration function.	Enable
UDP Alarm		
Alarm IP Address (UDP)	The tSH-700 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 tSH-700 to assist with easy identification.	Tiny
Debug Message(UDP)	Reserved.	20
Update Settings	Click this button to save the revised settings to the tSH-700.	

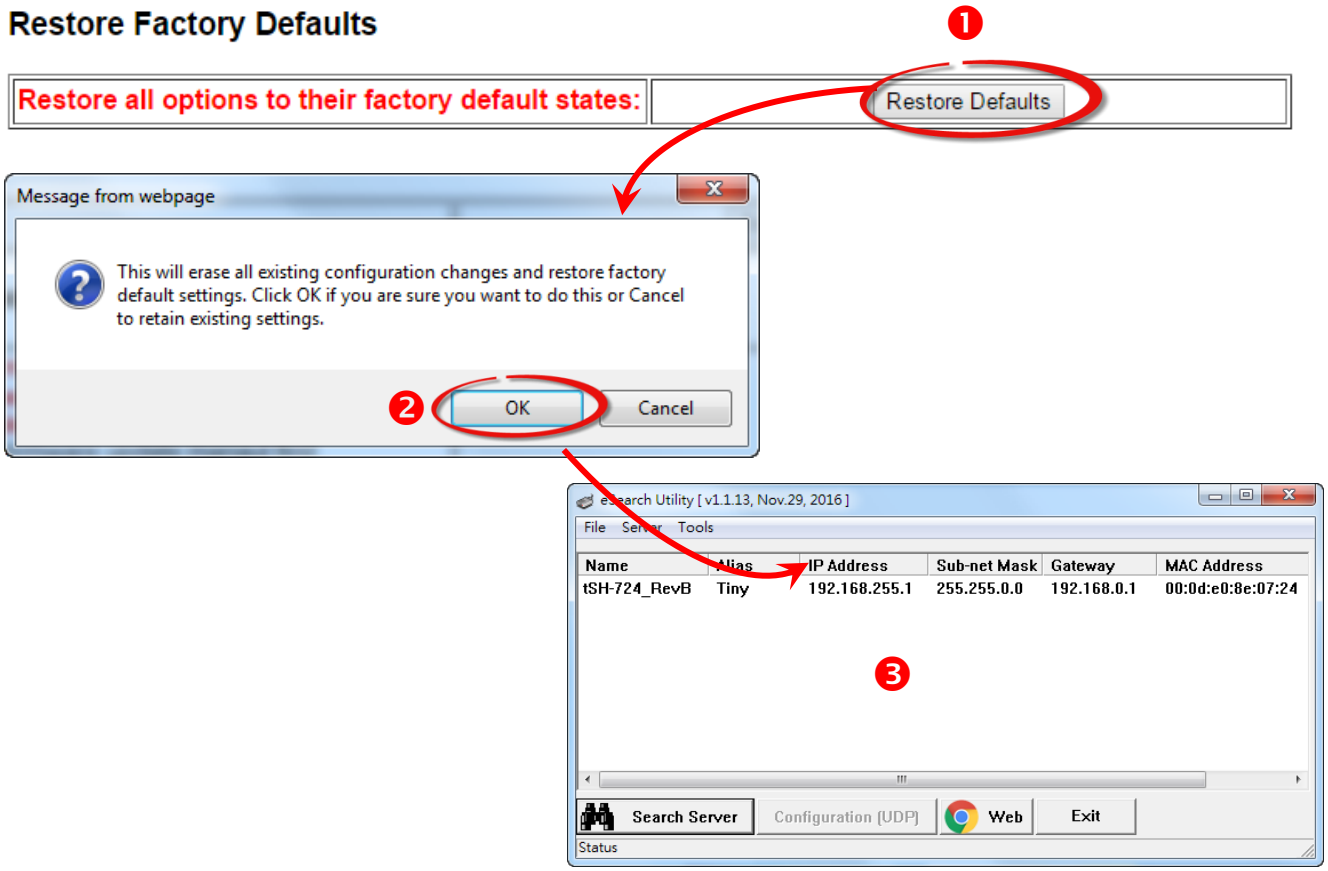
3.5.3 Restore Factory Defaults

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.

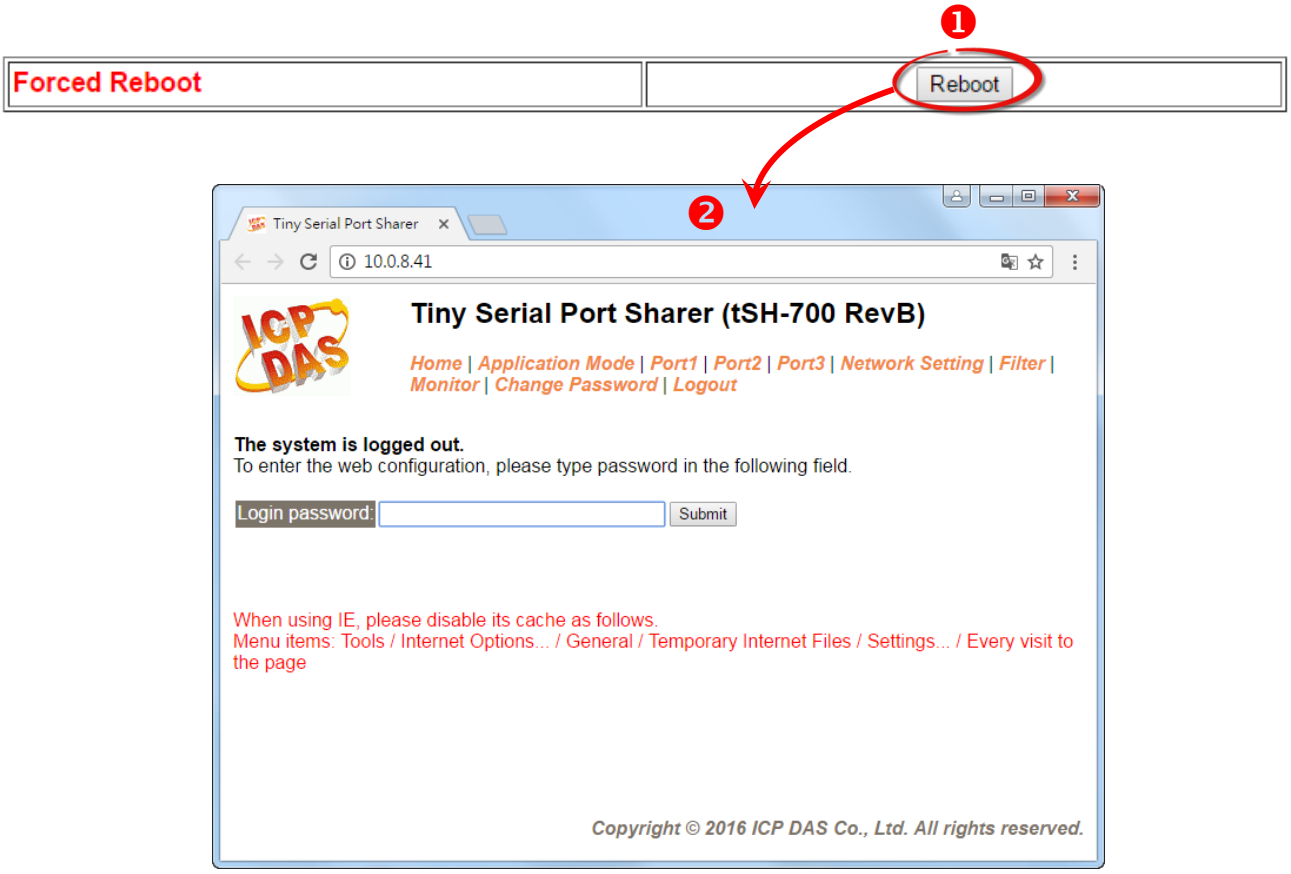
Step 3: Check whether the module has been reset to the original factory default settings for use with the eSearch Utility. Refer to Chapter 3 "Setting up the tSH-700 Module" for more details.



The following is an overview of the factory default settings:

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

The **Forced Reboot** function: can be used to force the tSH-700 to reboot or to remotely reboot the device. After the tSH-700 module has rebooted, the original login screen will be displayed requesting that you enter your Login Password before continuing.

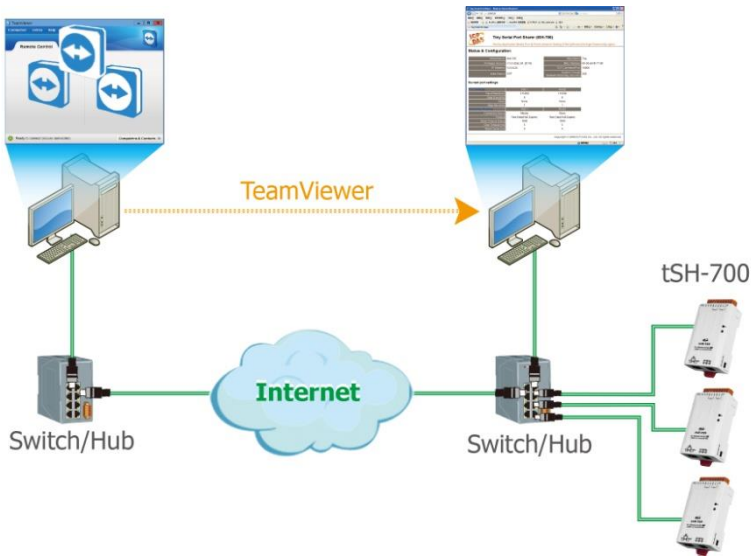


3.5.4 Firmware Update

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.*

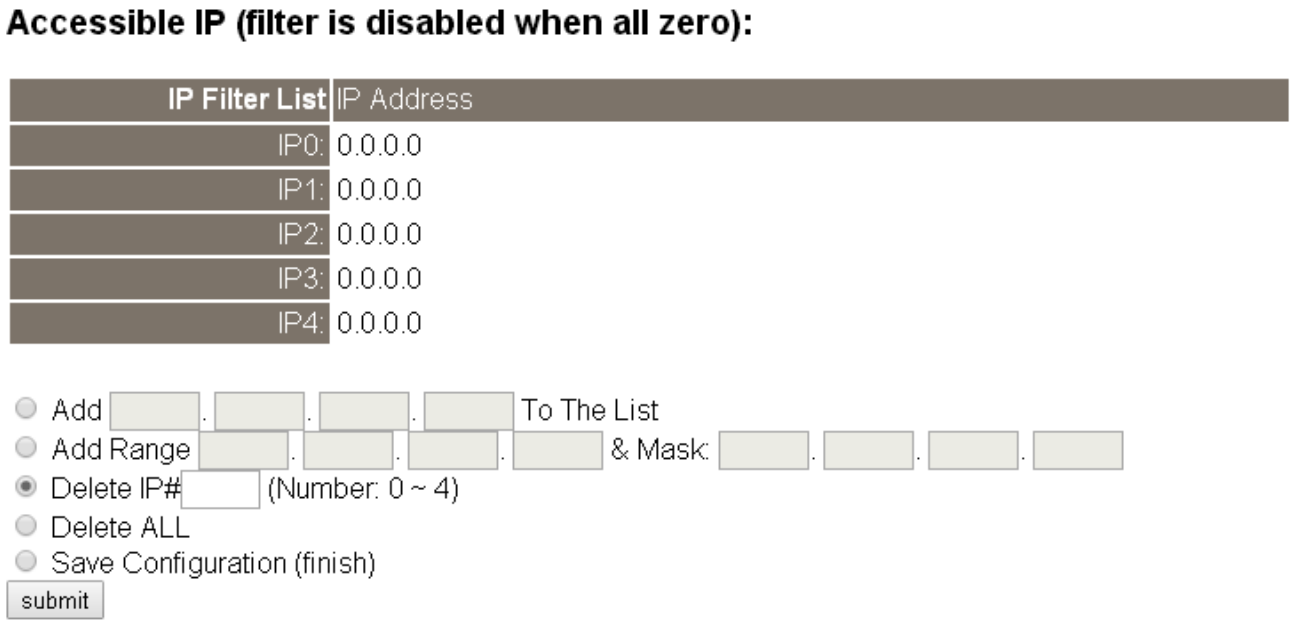
For detailed information regarding how to use this function to update the Firmware for your tSH-700 series module, refer to the **tSH-700 Firmware Update Manual (EN)**. The location of the download address is shown below:

http://www.icpdas.com/en/download/show.php?num=1519&nation=US&kind1=&model=&kw=tSH

3.6 Filter Page

3.6.1 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 tSH-700.

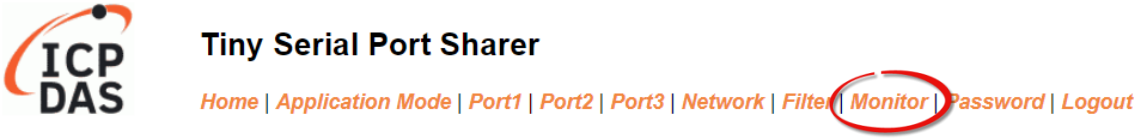


The following is an overview of the parameters contained in the **Accessible IP (filter is disabled when all zero)** section:

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 tSH-700.

3.7 Monitor Page

After clicking the **Monitor** tab, the Current Connection Status page will be displayed showing detailed information regarding the current status of the serial port connection settings for the tSH-700 module.



Current Status(UART):

Port Number	Port 1	Port 2	Port 3
Last Rx Count (bytes)	0	0	0
Last Tx Count (bytes)	0	0	0
Total Rx Count (bytes)	0	0	0
Total Tx Count (bytes)	0	0	0
Remove PE/FE/BE (bytes)	0	0	0
Modbus	Port 1	Port 2	Port 3
Rx Packets	0	0	0
Rx Drop Packets	0	0	0
Read Requests	0	0	0
Cache Hits	0%	0%	0%
No Space	0	0	0
Tx Packets	0	0	0
Tx Exception Packets	0	0	0
First Exception (hex)	00,00,00	00,00,00	00,00,00
Last Exception (hex)	00,00,00	00,00,00	00,00,00
Last Error (hex)	00	00	00
Last Error Message	-	-	-

Other Information

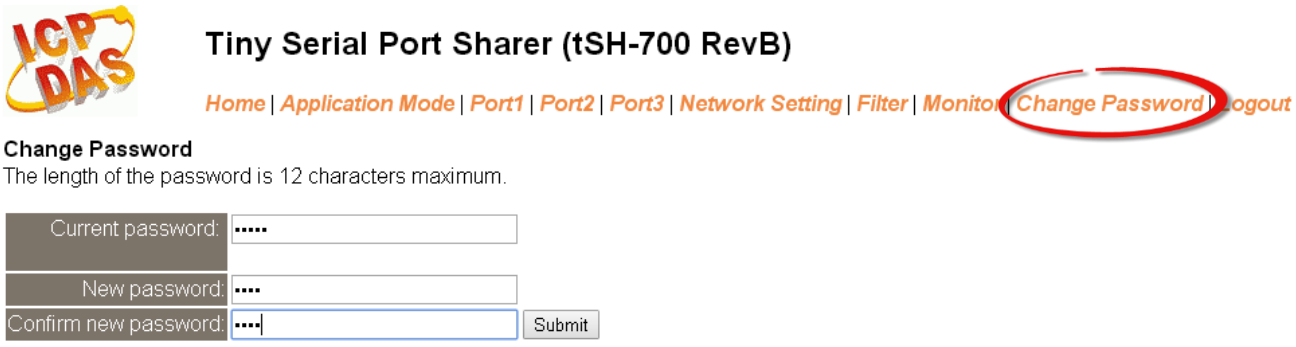
Max. Slave Response Time (ms)	0

Note: The above **Max. Slave Response Time** includes communications of sharer-to-device and device-to-sharer.

Clear

3.8 Change Password

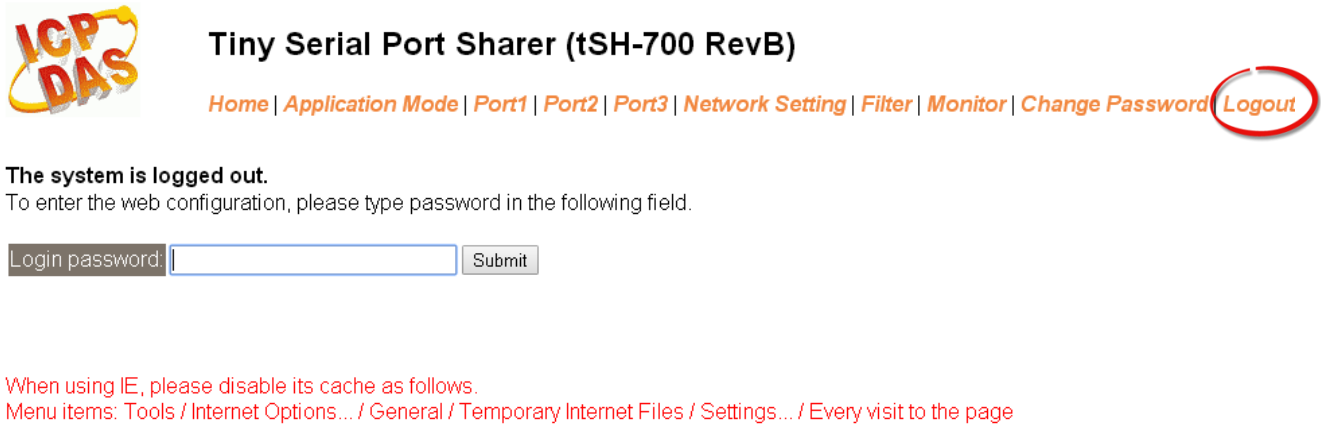
After clicking the **Password** tab, the **Change Password** page will be displayed. To change a password, first enter the old password in the **"Current password** "field (use the default password **"admin"**) and then enter a new password in the **"New password"** field. Re-enter the new password in 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 "How to restore the factory default web password of the module?"*

3.9 Logout Page

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



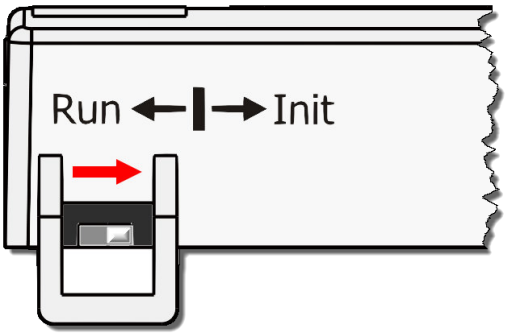
Appendix A: Troubleshooting

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

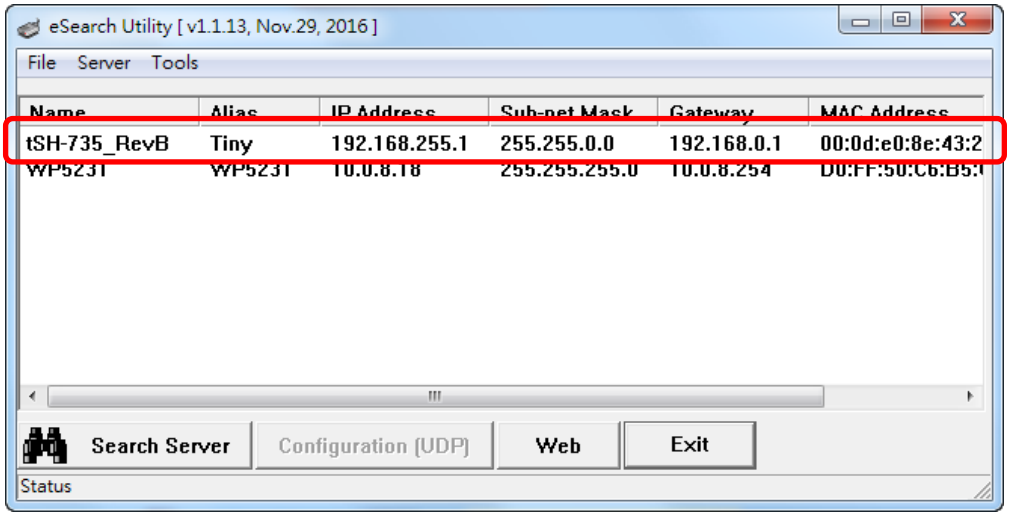
The instructions below outline the procedure for resetting the web password to the factory default value.

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

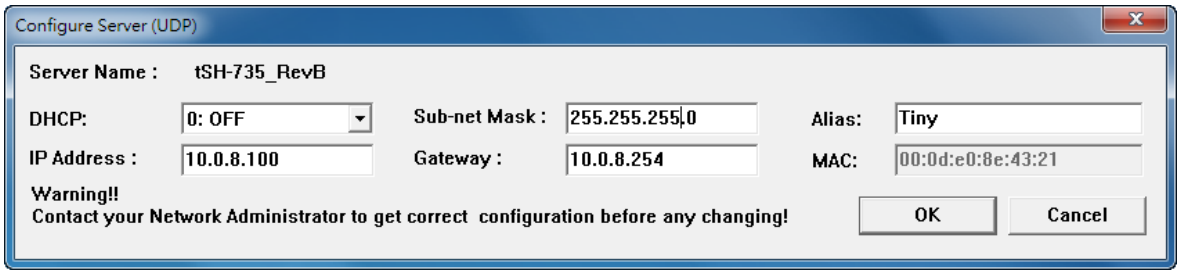
Step 1 Locate the Init/Run switch that can be found on the right-hand side of the tSH-700 module and set it to the **"Init"** position. Reboot the module to **load factory default settings** including default web password.

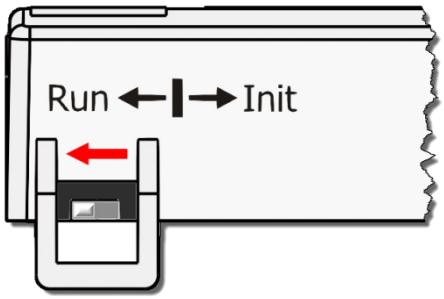


Step 2 Execute the eSearch Utility to search for any tSH-700 modules connected to the network. Verify that the tSH-700 has been reset to the original factory default settings. For example, the module should be shown as having the default IP address, which is 192.168.255.1.



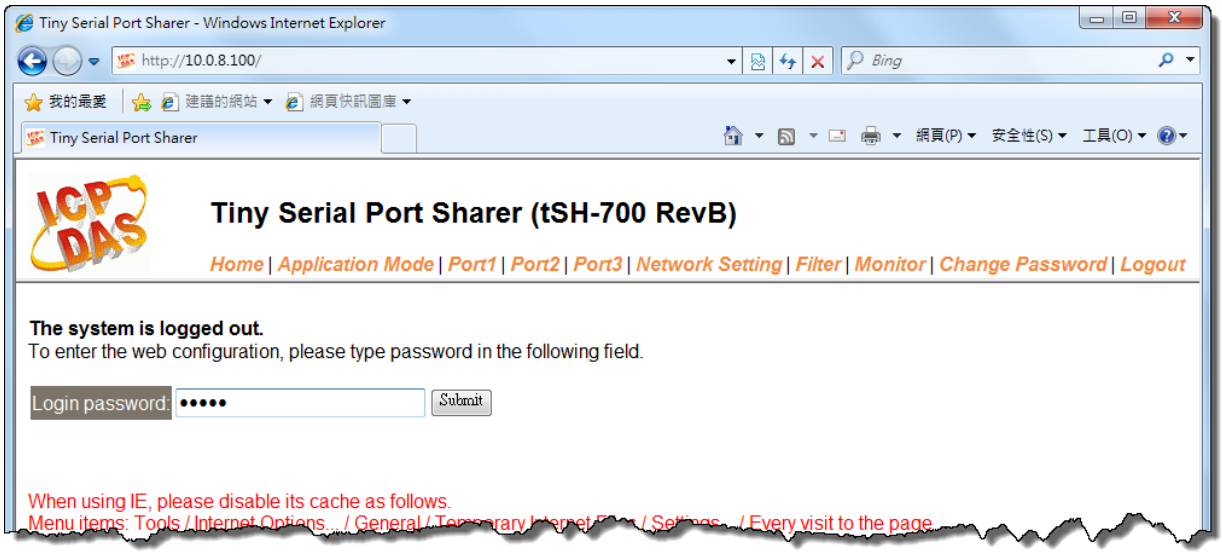
Step 3 Double-click the name of the module to open the Configure Server (UDP) dialog box, and modify the basic settings as necessary, e.g., the IP, Mask and Gateway addresses, and then click the **"OK"** button to **save the new settings**.





Step 4 Reset the Init/Run switch on the tSH-700 module to the **"Run"** position and reboot the device.

Step 5 Log in to the web configuration pages for the tSH-700 module, using the default web password, **"admin"**.



Appendix B: Application Note

How to set the Timeout Value?

Brief formula:

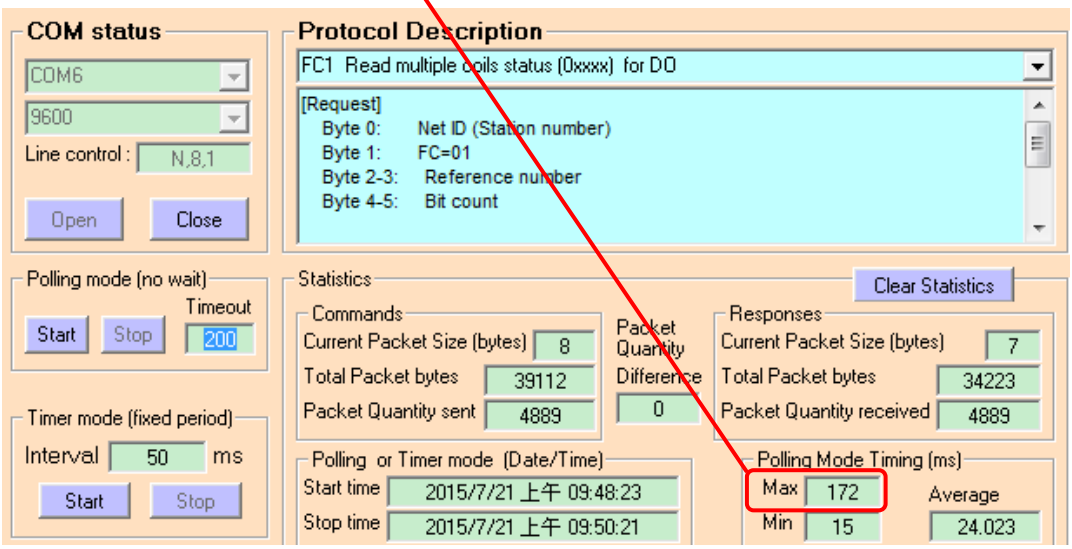
A = **Max. Response time of all Slave devices**

B = A + 100 = **Slave Timeout value in tSH-700**

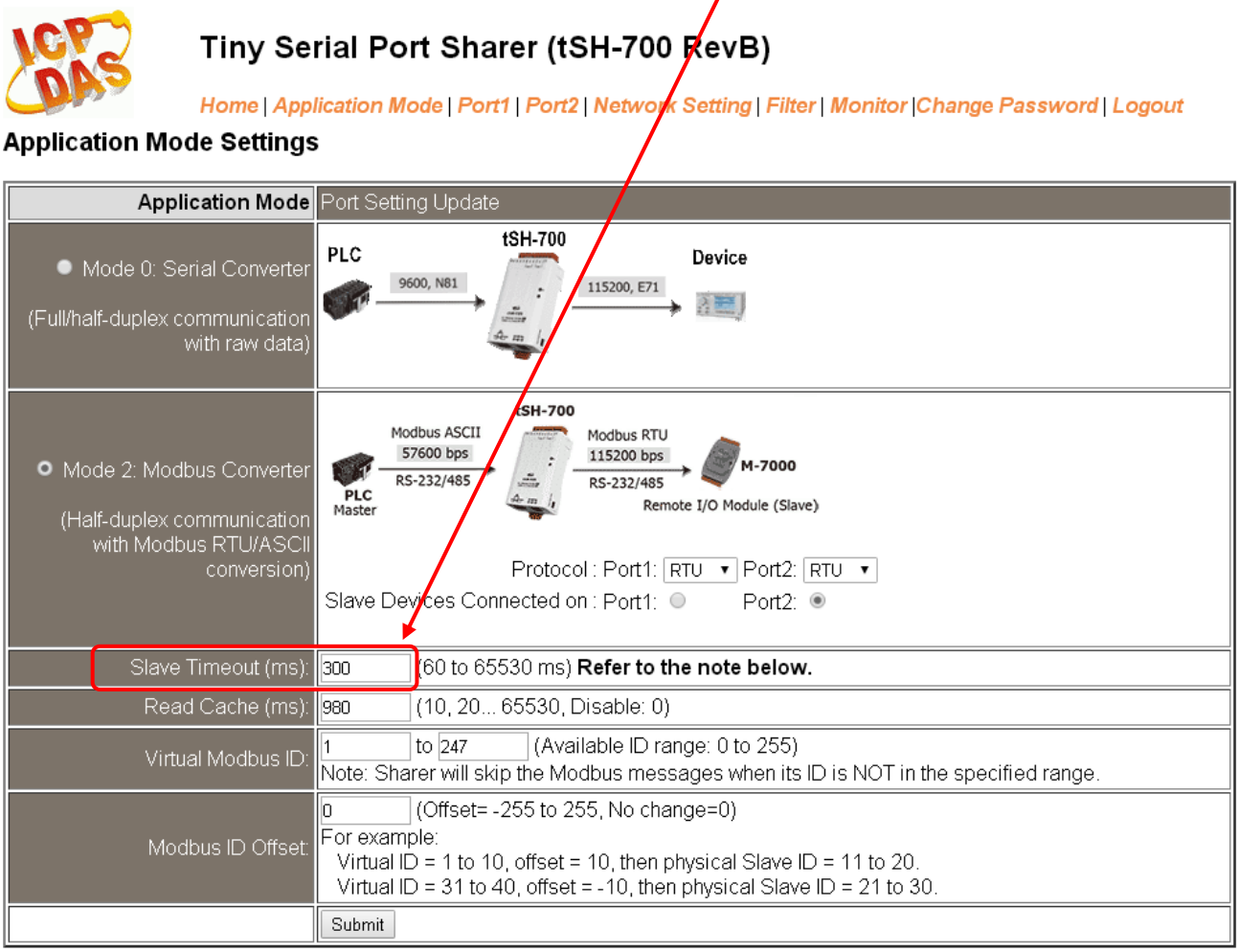
C1 = B + 100 = **Response Timeout value in Master program (Apply in 1 Master to 1 Slave)**

C2 = B + B = **Response Timeout value in Master program (Apply in 2 Masters to 1 Slave)**

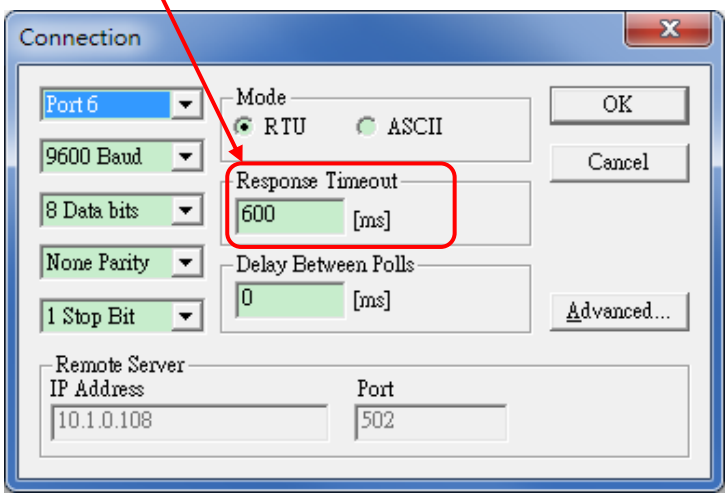
1. Take the PM-3112-100 as example, Wiring PC COM to PM-3112-100 directly to measure value.
   Use **MODBUS RTU program** to measure the response time of PM-3112-100.
   The MAX value is 172 ms. **(A = 172)**



Slave Timeout value in **tSH-700** is **B = A+100** = 272 ≈ 300 ms



2. The Response Timeout value in **Master Program** (Indusoft, Modbus Poll …)
   C2 = B + B = 300 + 300 = 600 (Apply in 2 Masters to 1 Slave)



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	Jan. 2015	Initial issue
1.2	Jul. 2015	Added Chapter Appendix: How to set the timeout value.
1.4	Jan. 2017	Added the software and hardware information about the tSH-722i/732i/725i/735i/724i/734i.
1.5	Feb.2017	Added the Section 1.4 Dimensions (include tSH-700 module and CA-002 cable)
1.6	Aug.2017	1. Added Chapter Appendix A: Troubleshooting. 2. Added Chapter Appendix C: Revision History.
1.7	Mar. 2018	Remove the package CD
1.7.1	Sep. 2018	Modify the isolation specifications as follows: Power Isolation: 1000 V_{DC} for tSH-722i/732i only Signal Isolation: 3000 V_{DC} for tSH-725i/735i/724i/734i only
1.8	Jun. 2020	1. Modify the related links of official website. 2. Added the descriptions for new functions.