

# **SST-2450 Wireless Modem User's Manual**

## **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.

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# **1. Introduction**

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SST-2450EXT is a spread spectrum radio modem with controlling an RS-232/RS-485 interface port. It is designed for data acquisition and control applications between a host and remote sensors. It is also useful for those applications where the installation of cable wire is inconvenient. The SST-2450 can be used not only in peer-to-peer mode (refer to page 8), but also in a multi-point structure (refer to page 13).

The SST-2450 is based on a direct sequence spread spectrum and RF technology, operating in the ISM bands with a Frequency Range of 2410.496MHz~2471.936MHz. The Channel Spacing is 4.096MHz.

The SST-2450 is similar to the SST-2400, with the major difference being the setting control method. The SST-2400 is set using jumpers, whereas the SST-2450 is set using a software utility. The older SST-2400 can work in conjunction with the new SST-2450 by changing its internal 8051 chip. The new chip includes updated firmware, so please contact us and we will send a new chip. Refer to page 26 for detail.

## 2. Specifications

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**Frequency Range:** 2.4GHz (2410.496MHz~2471.936MHz)

**Channel Spacing:** 4.096MHz

**Output Power:** 0.1W

**Transmit power :** 19dBm  $\pm$  1dBm

**Modulation technique:** GMSK

**Radio technique:** Direct sequence spread spectrum

**Duplex Mode:** TDD (for Full-duplex)

**Number of channels:** 16

**Number of PN codes:** 16

**PN code rate:** 1.365 Mchips /sec.

**Interface:** RS-232/RS-485

**Communication range:** Dependent upon the external antenna (the default is 300M)

**Maximum data transfer rate in asynchronous mode:**

Full-duplex mode: 9.6Kbps; Half-duplex mode: 28.2Kbps

**Maximum data transfer rate in synchronous mode:**

Full-duplex mode: 19.2Kbps; Half-duplex mode: 57.6Kbps

**Setting Method:** Software utility

**Antenna type:** Flexible

**Data Format:** N, 8,1 or E, 8,1 dependent upon the software setting

**Data bit error rate**→ AFTER DSST PROCESSING:

BER of RF Module : < 1/1000 @ -90  $\pm$  2dBm

Processing Gain : ~12dB

**Input voltage:** 10~30V DC

**Input current:** 250mA (Typical)

**Power Consumption:** 1.5W

**Size:** 121.5mm (L) x 72mm (W) x 33mm (H)

**Weight:** 200g

**Operating temperature range:** 0~50C

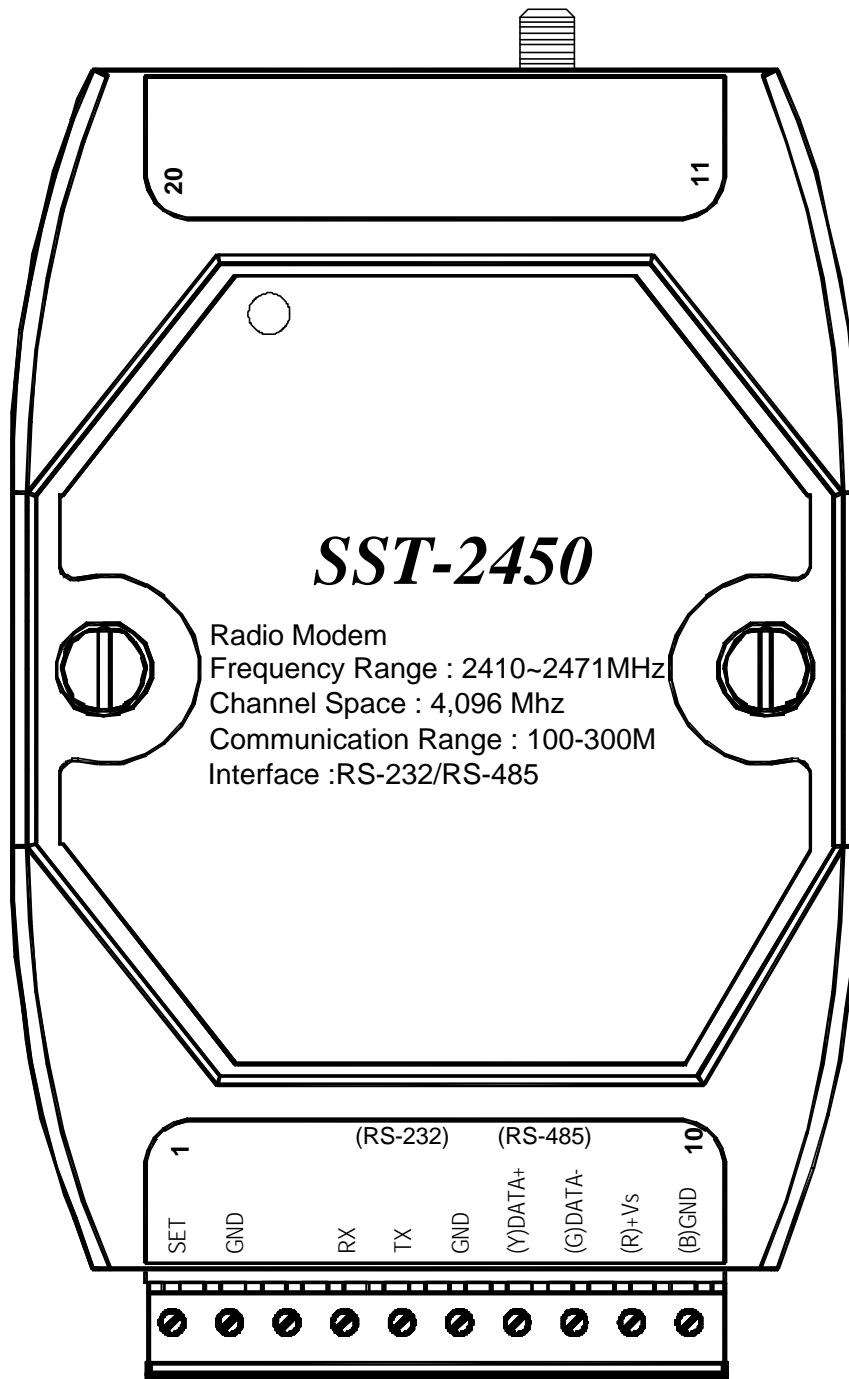
**Operating humidity range:** 0~90%

◆ **SST-2450 can work together with SST-2400 (however the 8051 chip in the SST-2400 must be changed).**

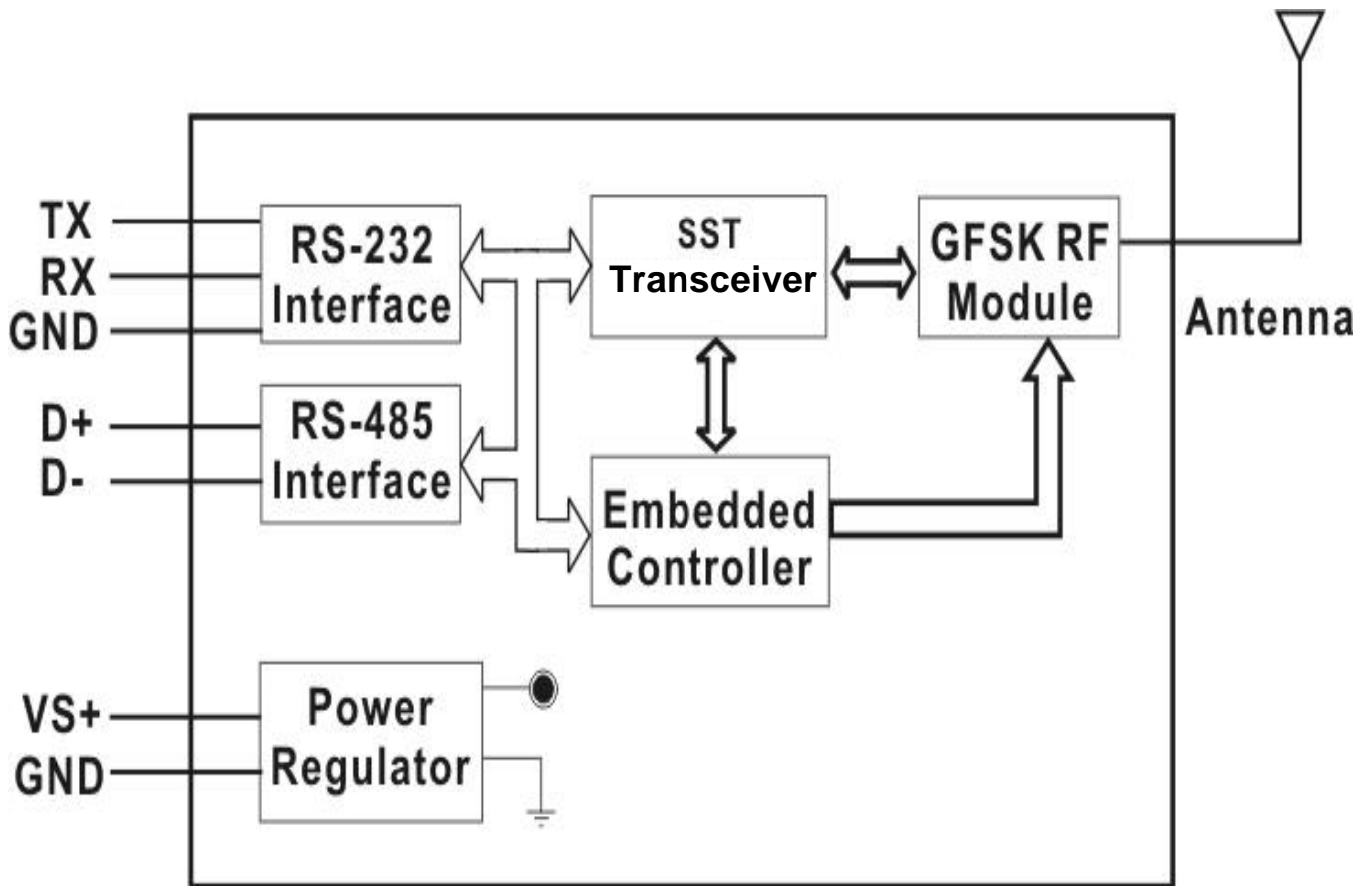
### 3. Product Description

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#### 3.1. Pin assignment



## 3.2. Block diagram



The SST-2450 wave signal cannot pass through metallic obstacles. So this product is not suitable for this type of metallic environment.

The signal can pass through a cement wall, but will be weakened to half its efficiency for every 15cm of the wall's thickness.

## 4. Applications

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### 4.1. Peer to Peer

There are three types of peer to peer operational modes to choose from. The following table outlines the settings information and limitations.

Mode	Description:
1	<p>In this mode, the SST-2450 can accept and transmit any signal from the device. This mode works by using a sample and rebuild. The SST module samples the input signal then converts it into a wave signal technique before transmitting it to another SST module. When the other SST module receives the wave signal, it transforms the signal back into the original format. The sample rate used is 32kb per second, so the device can't accept higher speed signals. The maximum signal speed is less than 9600 bps. Any data format may be need in this mode.</p> <p><b>Setting Limitative:</b> Baud Rate must be 9600bps or below; Full-duplex; Asynchronous; One SST-2450 is the Master the other is the Slave.</p>
2	<p>This mode simulates the Full-duplex mode. The device can transmit and receive signals at the same frequency. The RF processor uses the timer controller to simulate Full-duplex. Initially, the module that has been set as the master is in transmission mode. After 4ms, it switches to receive mode. The slave module is inverse to thus. For example if the master is in transmission mode but a signal need to be transmitted by the slave at the same time; the slave will store the signal in it's buffer and will transmit once the master is in the receive mode. In Mode 2, the RF signal will be processed by the 8051 CPU so requires the fixed data format to be either N, 8,1 or E, 8,1.</p> <p><b>Setting Limitative:</b> Full-duplex; Synchronous; One SST-2450 is the Master and the other is the Slave.</p>
3	<p>This mode simulates the Half-duplex mode. One device will respond when it receive a command from another device. This is the only mode which supports a SST-2450 network (refer to page 13). This mode is also requires a fixed data format to be either N, 8,1 or E, 8,1.</p> <p><b>Setting Limitative:</b> Half-duplex; Synchronous; Both SST-2450s are slaves.</p>

◆ Refer to chapter 5 for further setting argument information.

### 4.1.1. PC to PC connections -- *Using Mode 1*



**Full-Duplex**

**Asynchronous**

**Master**

**Baudrate: 9600bps Max.**

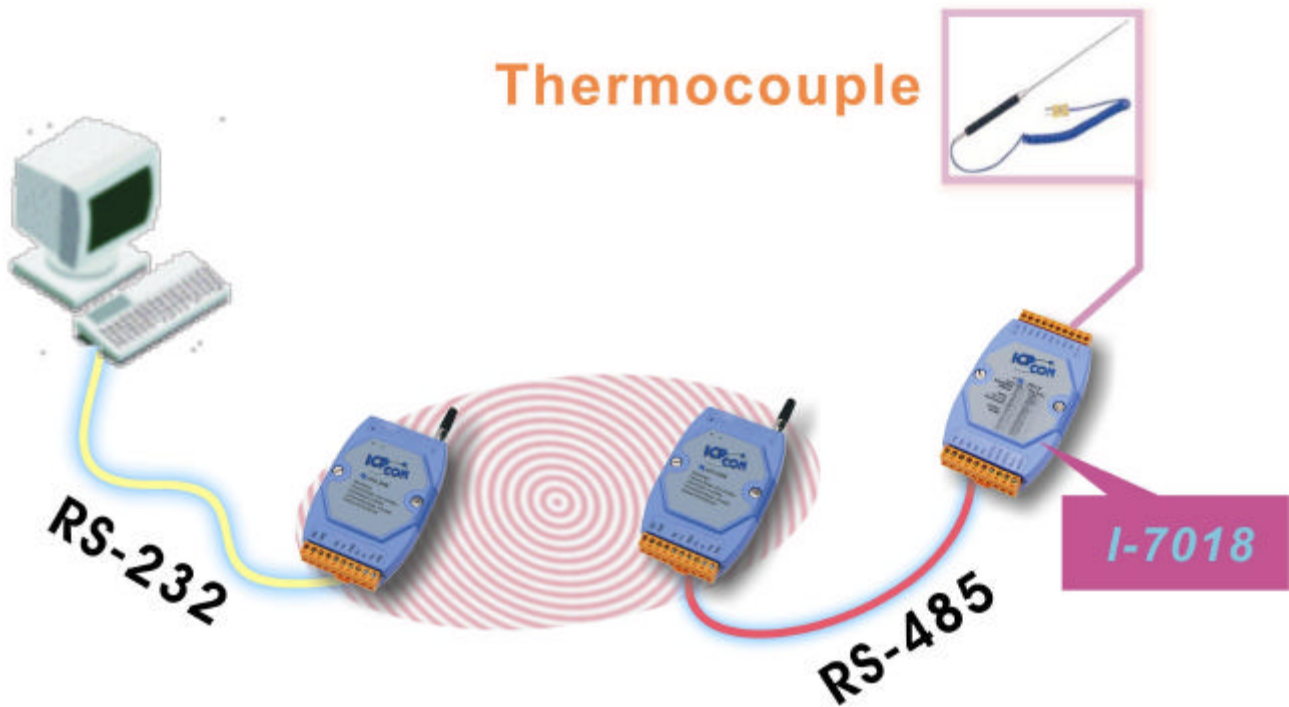
**Full-Duplex**

**Asynchronous**

**Slave**

**Baudrate: 9600bps Max.**

## 4.1.2. Connecting a PC to the 7000 module – Using Mode 2



**Full-Duplex**

**Synchronous**

**Master**

**Baudrate: 57600bps Max.**

**Full-duplex**

**Synchronous**

**Slave**

**Baudrate: 57600bps Max.**

### 4.1.3. Connecting the 7188 Embedded Controller to the 7000 module – *Using Mode 3*



**Both SST-2450 modules are setting as follows:**

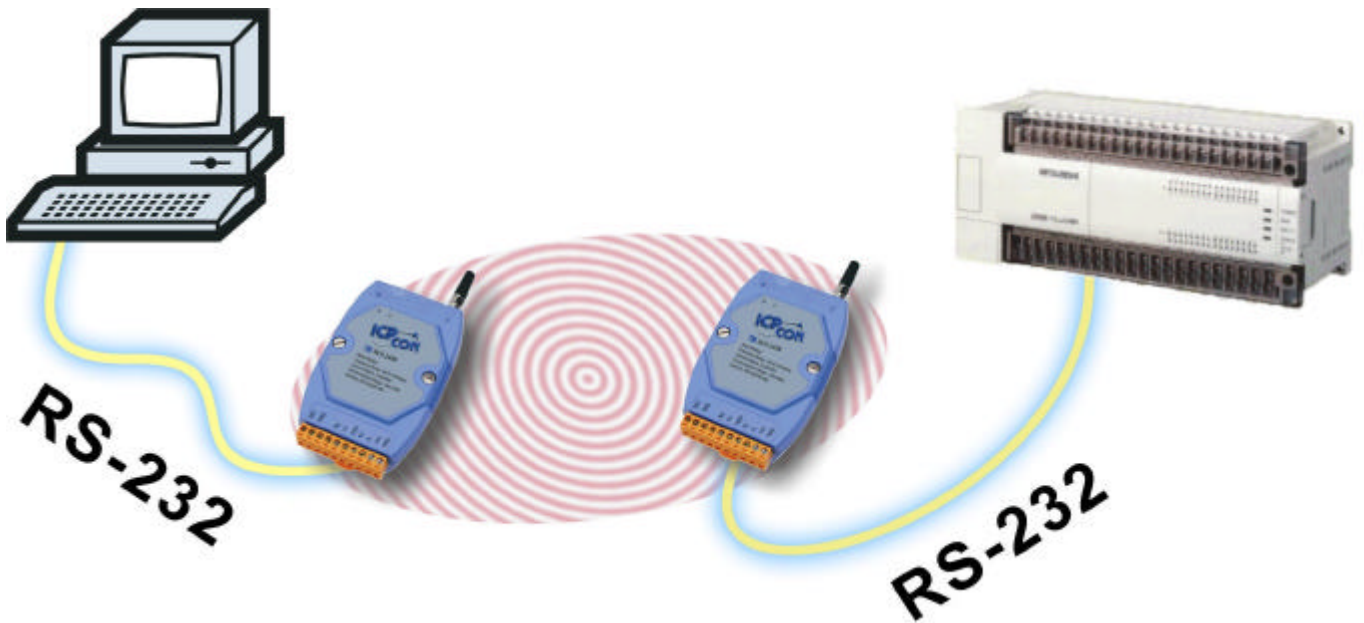
Half-Duplex

Synchronous

Slave

Baudrate: 57600bps Max.

#### 4.1.4. Connecting a PC to a PLC – *Using Mode 3*



**Both SST-2450 modules settings are as follows:**

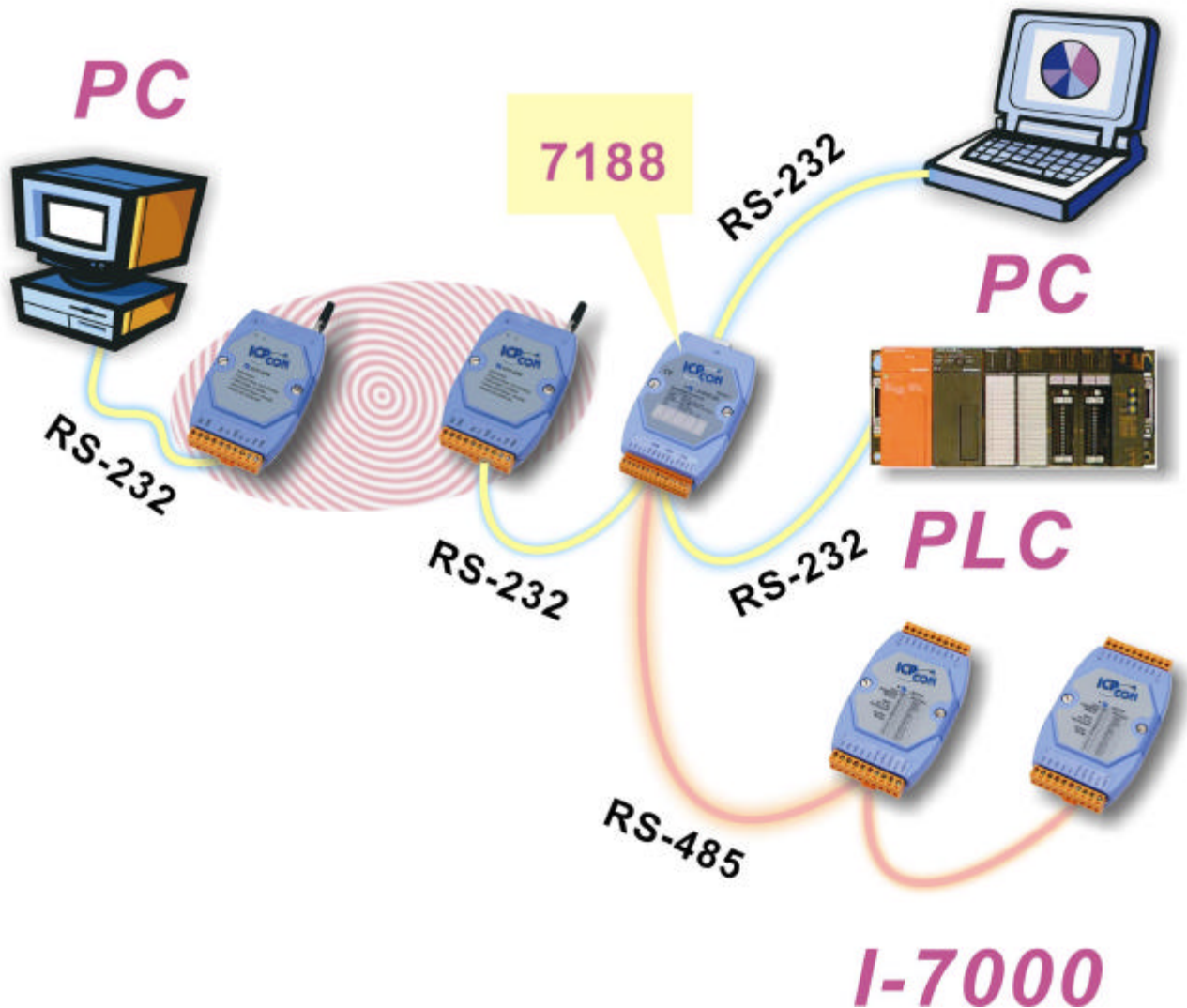
**Half-Duplex**

**Synchronous**

**Slave**

**Baudrate: 57600bps Max.**

#### 4.1.5. Using the 7188 as a Bridge -- Using Mode 3



**Both SST-2450 modules settings are as follows:**

**Half-duplex**

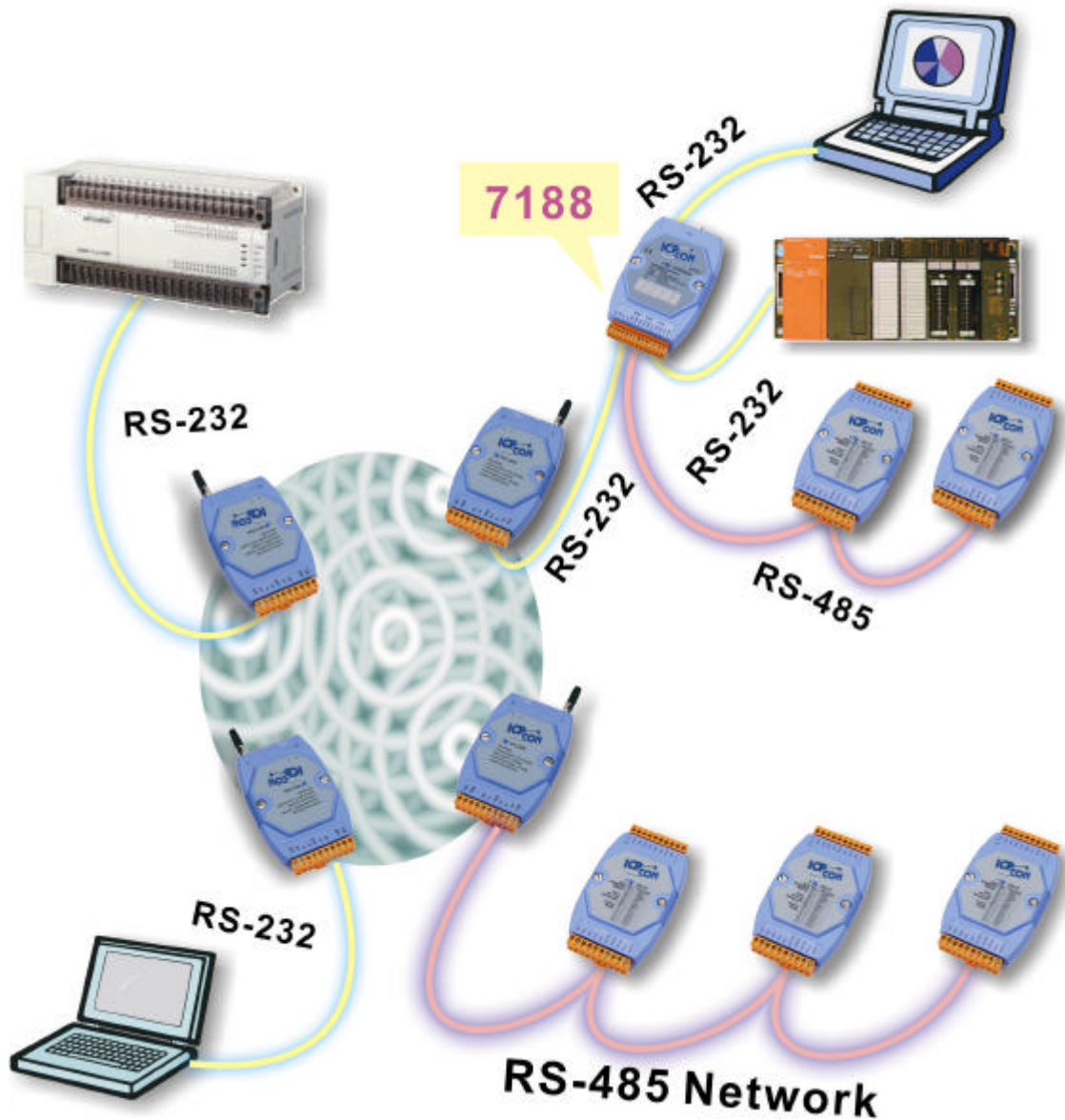
**Synchronous**

**Slave**

**Baudrate: 57600bps Max.**

## 4.2. Network communication

### 4.2.1. Application 1



**All SST-2450 modules settings are as follows:**

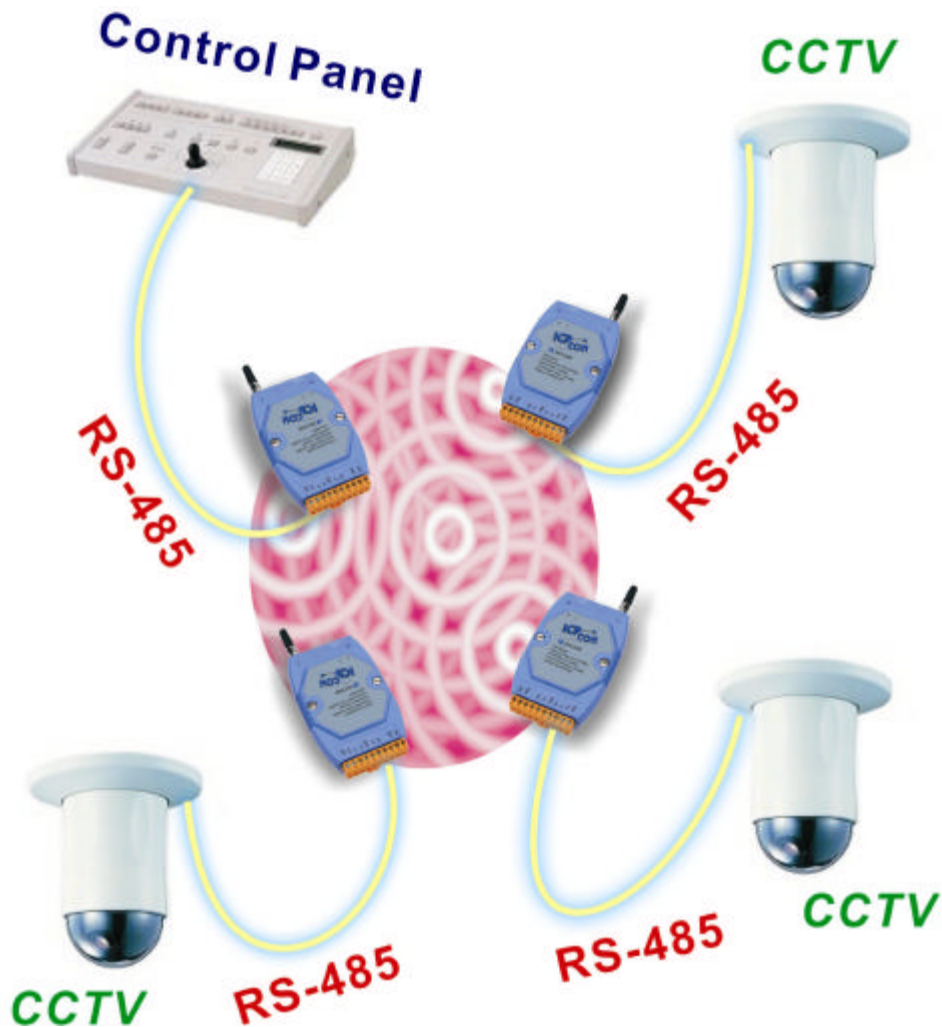
**Half-Duplex**

**Synchronous**

**Slave**

**Baudrate: 57600bps Max.**

## 4.2.2. Application 2



**All SST-2450 modules settings are as follows:**

**Half-duplex**

**Synchronous**

**Slave**

**Baudrate: 57600bps Max.**

**Data Format: E,8,1**

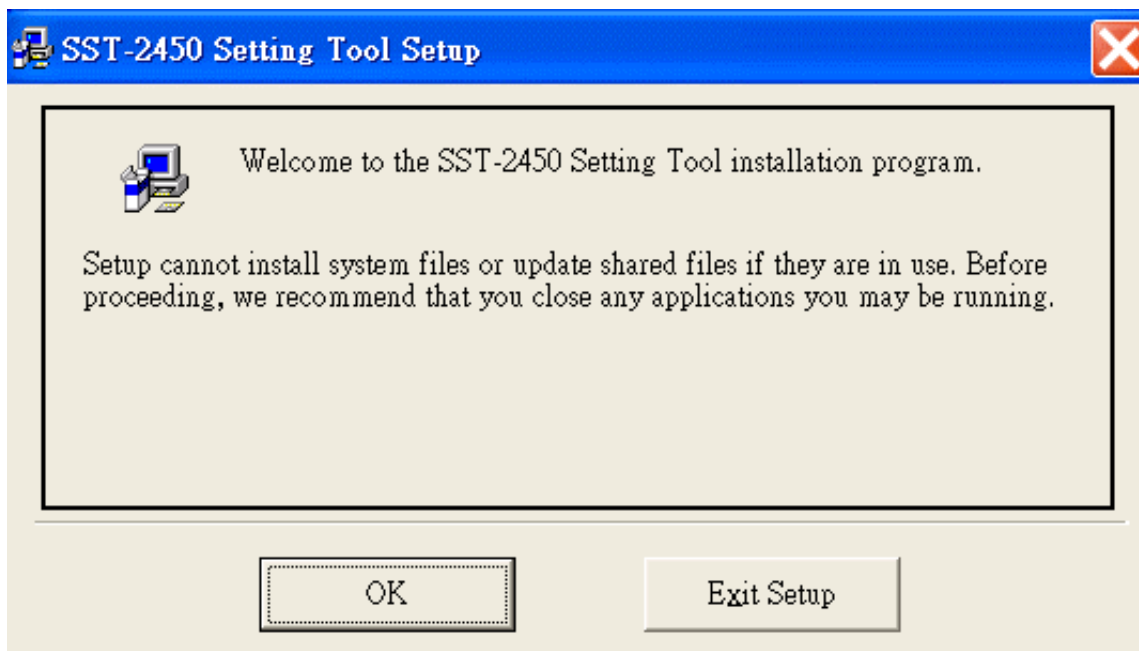
## 5. Quick Start instructions for the SST-2450

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The SST-2450 is set by using a software utility. By using this tool, you are able to avoid disassembling the case. The utility not only provides a setting interface but also a testing interface. When you have finished making the settings, you can simply click a button to test the SST-2450 using the same software.

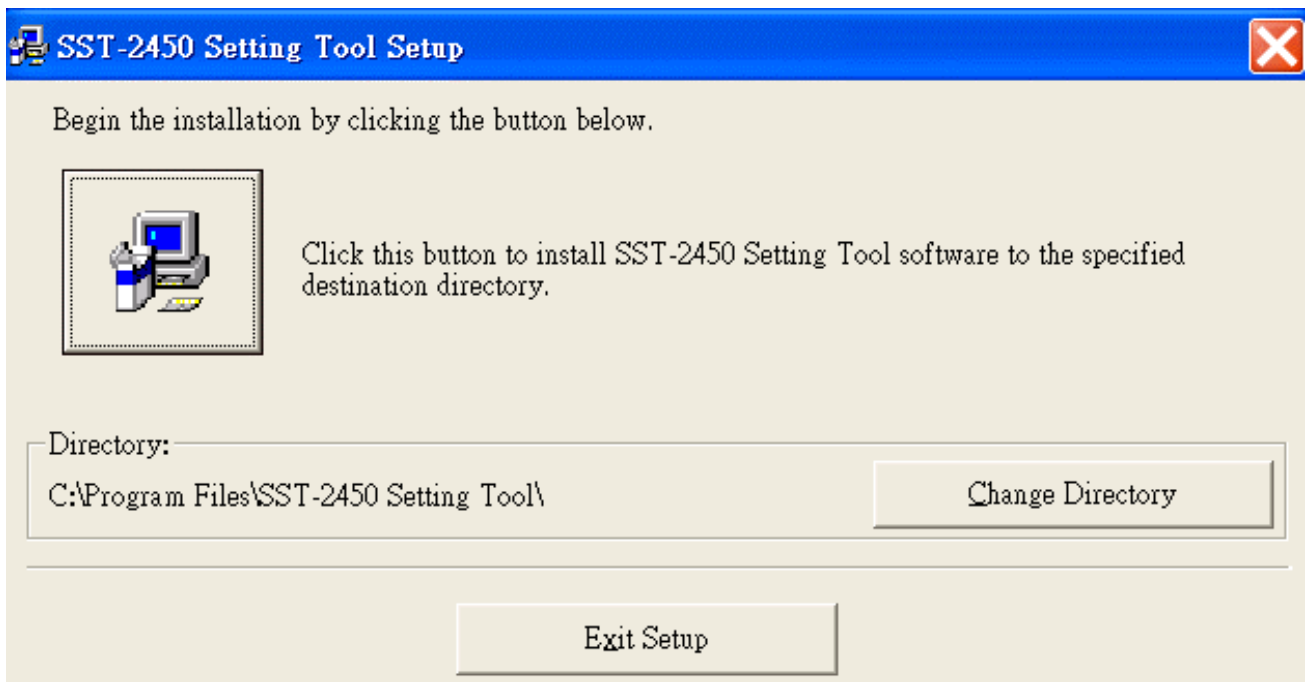
### 5.1. Installing the software

- ◆ Double clicks the **Setup.exe** file which is found in the *Napdos\Wireless\Wireless Modem\SST-2450\SettingTool* folder on the attached CD, or download the compressed file **2450Tool.exe** from [ftp://ftp.icpdas.com/pub/cd/8000cd/napdos/wireless/wireless modem/sst-2450/settingtool/](ftp://ftp.icpdas.com/pub/cd/8000cd/napdos/wireless/wireless%20modem/sst-2450/settingtool/), Once you see the screen shown below, click “**OK**”. Click “**Exit Setup**” to cancel the installation:



The following screen will then be shown.

1. We recommend installing the software into the default directory. However, you may choose a different directory by clicking the “**Change Directory**” button and selecting the directory where you want to install the software.
2. Click the  button to install the software.
3. Click “**Exit Setup**” to cancel the installation.



◆ Once the software has been installed, you will be able to find the executable file in **Start → Application file → SST-2450 Setting Tool**.

## 5.2. SST-2450 Settings

When setting the SST-2450, you should first use a wire to connect the SET and GND pins. Quickly power off and power on the SST-2450, then launch the setting software program. There are only 3 steps required to make your settings.

1. *Open a Serial Port.*
2. *Setting the operating mode.*
3. *Exit the program.*

When setting the operating mode, please refer to the following steps:

***When you set the SST-2450, you should never use the following settings:***

<b>SST-2450 (A)</b>	<b>SST-2450 (B)</b>
<b><i>Half-duplex</i></b>	<b><i>Half-duplex</i></b>
<b><i>Master</i></b>	<b><i>Slave</i></b>

***These settings will cause the SST-2450 set as the Master to be always on high power status and will cause the SST-2450 to fail. Please note that this situation isn't covered by our warranty.***

***The correct settings are as follows:***

<b>SST-2450 (A)</b>	<b>SST-2450 (B)</b>
<b><i>Full-duplex</i></b>	<b><i>Full-duplex</i></b>
<b><i>Master</i></b>	<b><i>Slave</i></b>

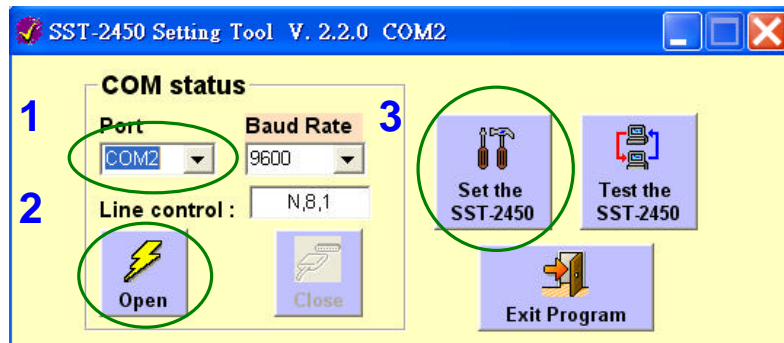
***or***

<b>SST-2450 (A)</b>	<b>SST-2450 (B)</b>
<b><i>Half-duplex</i></b>	<b><i>Half-duplex</i></b>
<b><i>Slave</i></b>	<b><i>Slave</i></b>

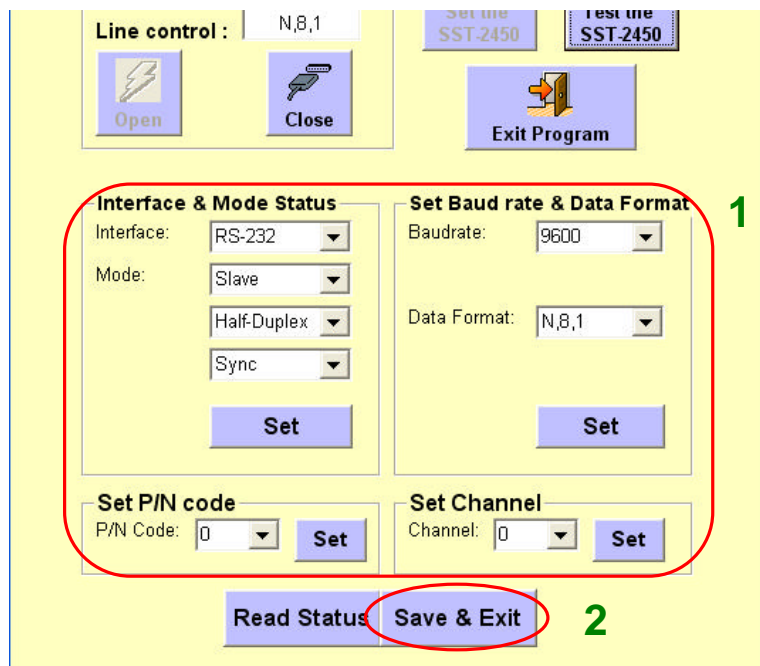
***If you have a SST-2450 Network (i.e. more than 2 SST-2450 devices), you are only able to use the following specific setting for all of your SST-2450 devices:***

<b><i>Half-duplex</i></b>
<b><i>Slave</i></b>

1. Select a COM port from which your SST-2450 is connected to the PC. In the setting mode, the baud rate must be set at 9600bps and the **Line control** values must be N, 8,1. Click the **“Open”** button to open a connection to the device then click the **“Setting SST-2400”** button to continue.



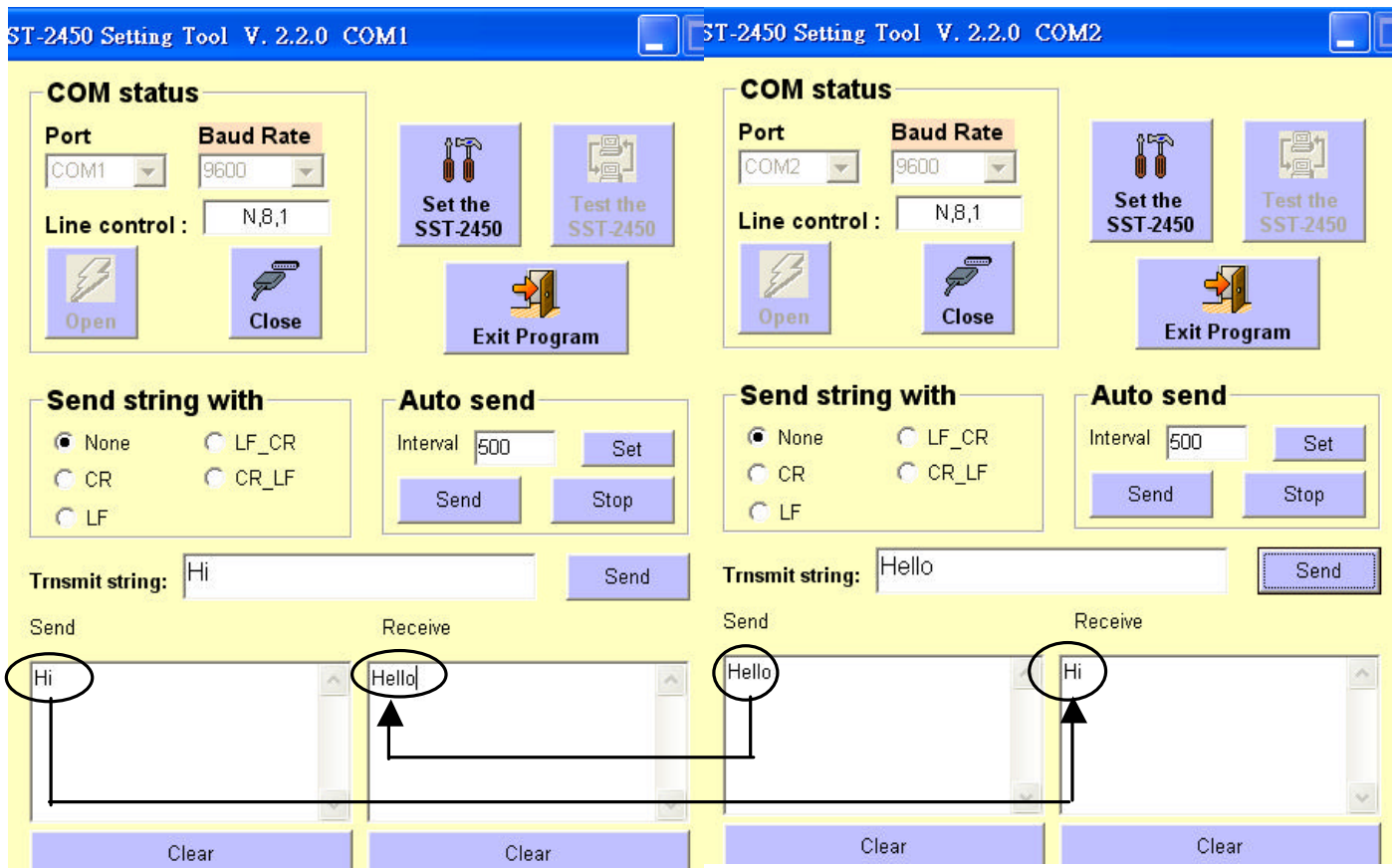
2. The following screen will appear. From the options shown in the **Interface & Mode status** panel, choose a suitable operational mode for your system. After making your selections, click the **“Set”** button. Repeat this procedure for **Set Baud rate & Data Format**, **Set P/N code** and **Set Channel**, making sure you click the **“Set”** button each time, otherwise the amended values will be lost. Click the **“Save & Exit”** to close the setting screen. All settings not saved will be lost. Click the **“Save & Exit”** button to save the new setting values.



### 5.3. Testing the SST-2450

This tool is for testing the transmissions between two PCs using the SST-2450. Please note that before you use this function, you must make sure that you have removed the wire that you used to connect the **SET** and **GND** pins. The testing method is as follows:

1. Launch two copies of the SST-2450 setting tools,
2. Click the “**Testing SST-2450**” button on each and the following screens will appear.
3. Attempt to send data to each port in the following manner:
  - In the COM1 window, type “Hi” in the field, the click the “**Send**” button.
  - In the COM2 window, type “Hello” in the field, the click the “**Send**” button.
4. If the transmission has been successful, the messages should appear in the **Send** and **Receive** fields as indicated below. Click the “**Clear**” button to clear these fields.
5. Click the “**Close**” button to close the connection.
6. Click the “**Exit Program**” button to quit.



## 6. *Troubleshooting*

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### Setting error

If you are attempting to set your SST-2450 using the software, but are unable to access the setting tool, the following screen will appear.



Follow the steps shown on the error screen.

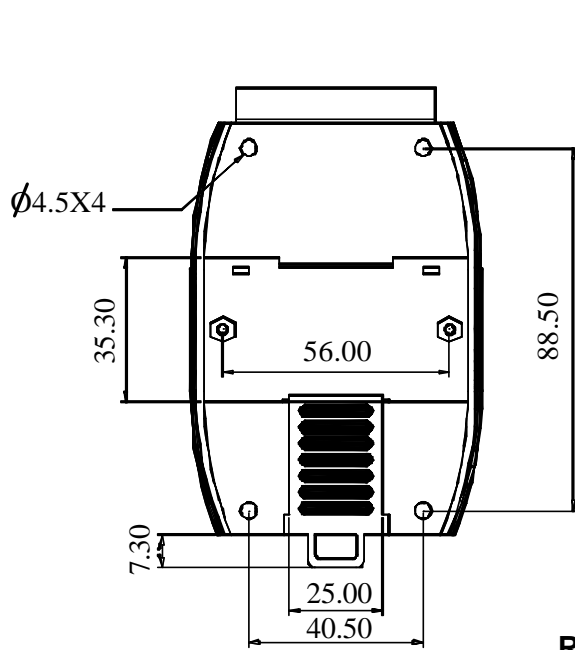
### Testing error

If you are attempting to test your SST-2450 using the software, but are unable to access the testing tool, the following screen will appear.

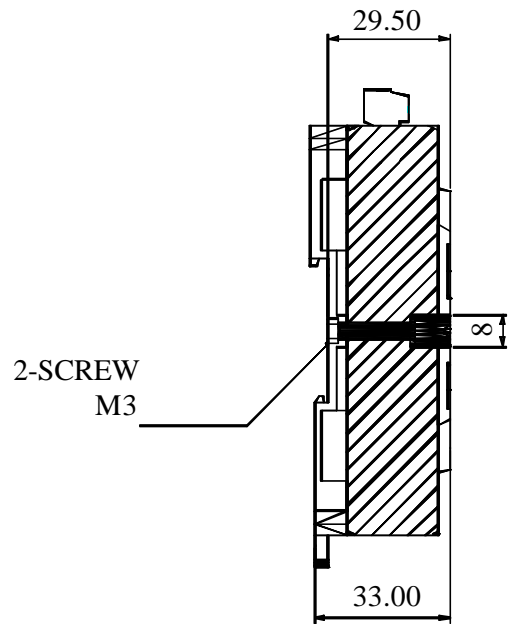


Follow the steps shown on the error screen.

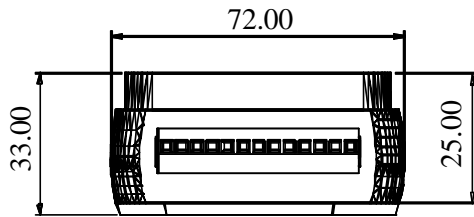
# 7. Dimensions



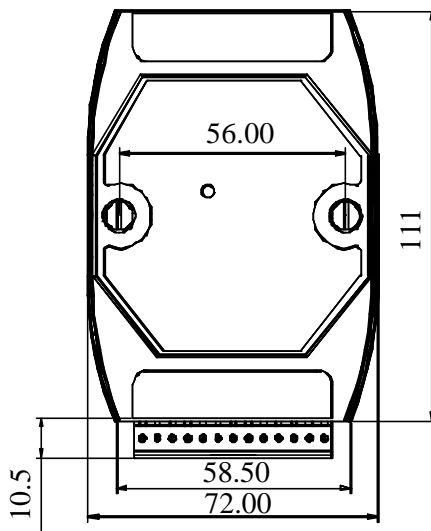
Rear View



Side View



Top View

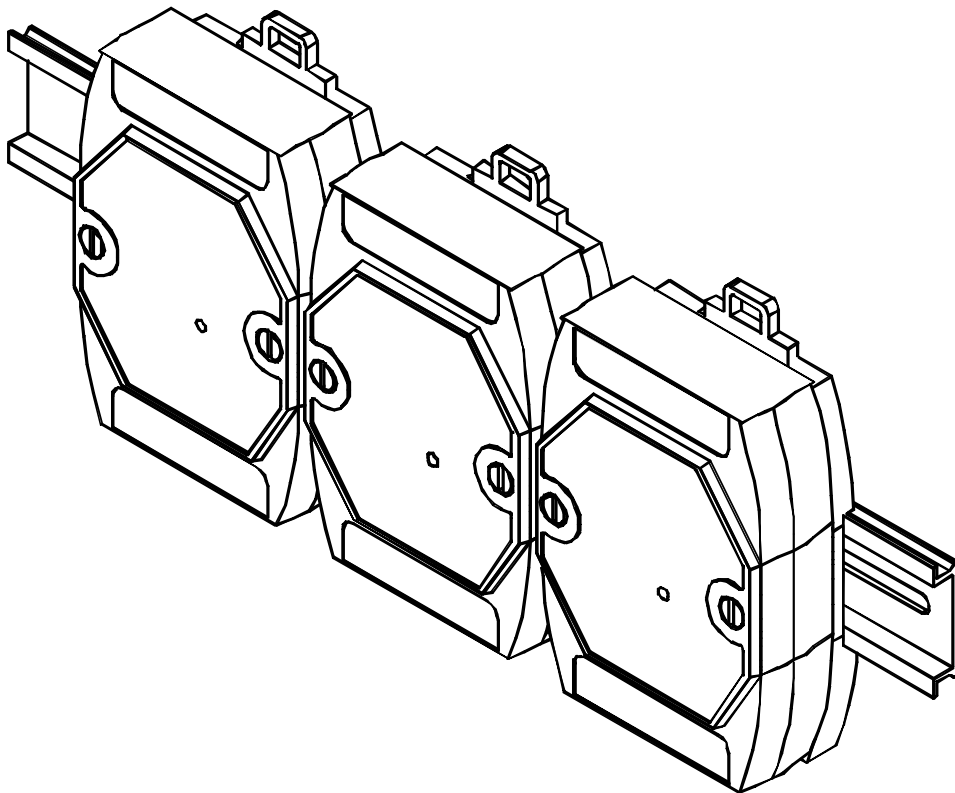
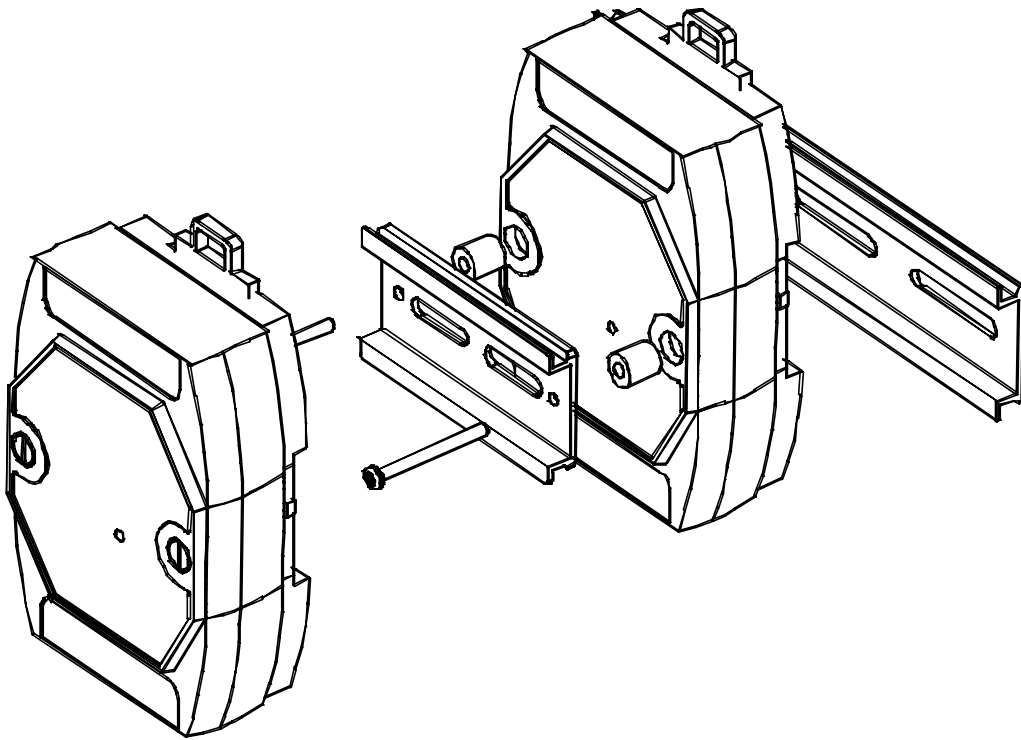


Front View

*Unit : mm*

## 8. Din-rail Mounting

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## 9. External Antenna

Using an external antenna in conjunction with the SST-2450 allows the device to be used outdoors. The antenna is even water resistant. Simply replace the default antenna with an external antenna and you will be able to transmit data across distances of up to 1KM.

### 9.1. ANT-3 (Directional)

**Gain:** 3dBi

**Polarization:** circular

**Power handling:** 5W

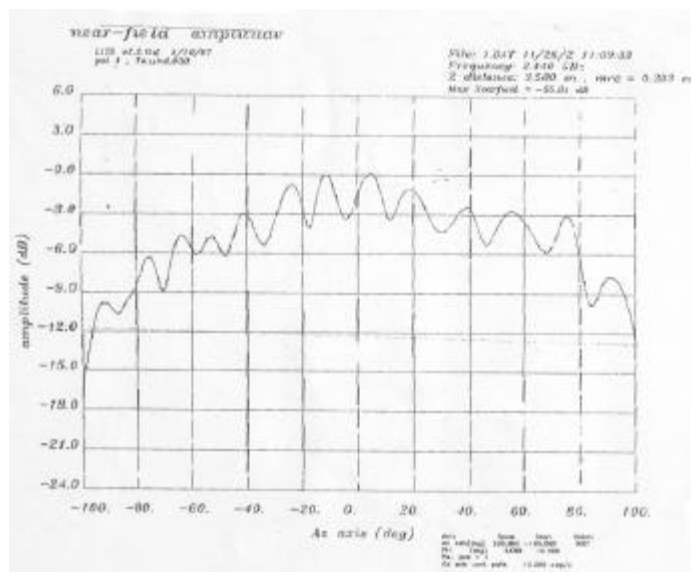
**Impedance:** 50 Ohms

**Connector:** SMA

**Cable:** RG-58, 100cm



#### Gain Pattern



#### Usage Diagram



## 9.2. ANT-8 (Omni directional)

**Gain:** 8dBi

**Polarization:** Linear

**Power handling:** 10W

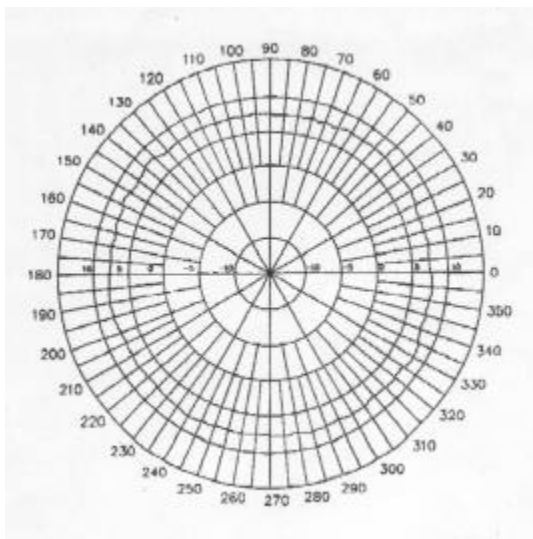
**Impedance:** 50 Ohms

**Connector:** SMA

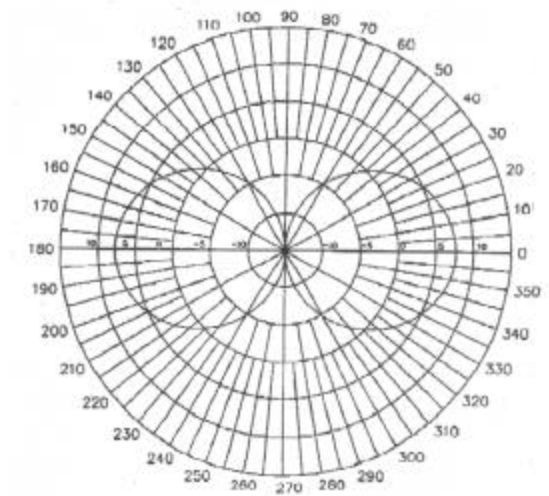
**Cable:** RG-58, 100cm



### Gain Pattern

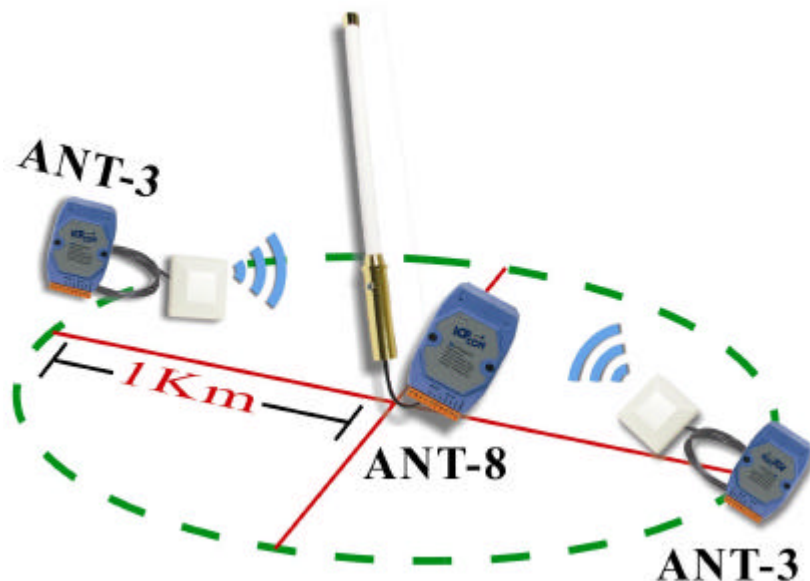


*H-Plane Field Patterns*



*V-Plane Field Patterns*

### Usage Diagram



### 9.3. ANT-12P (*Directional*)

**Gain:** 12dBi

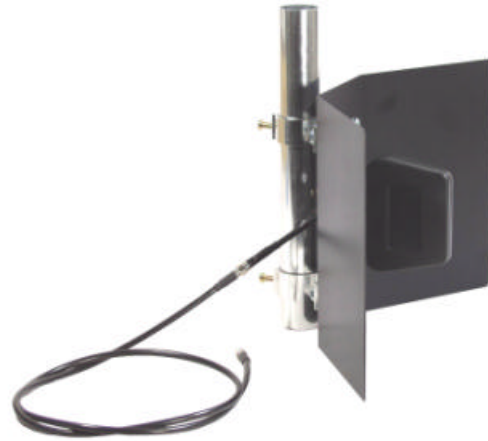
**Polarization:** Linear

**Power handling:** 10W

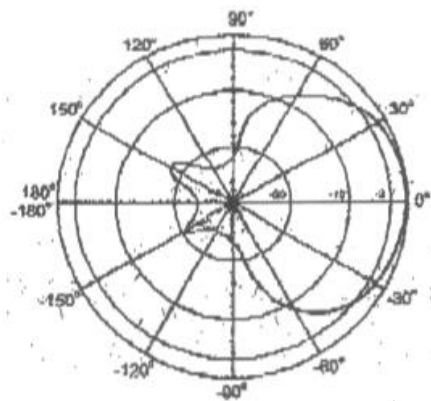
**Impedance:** 50 Ohms

**Connector:** SMA

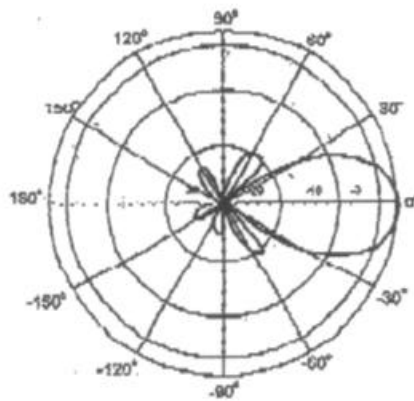
**Cable:** RG-58, 100cm



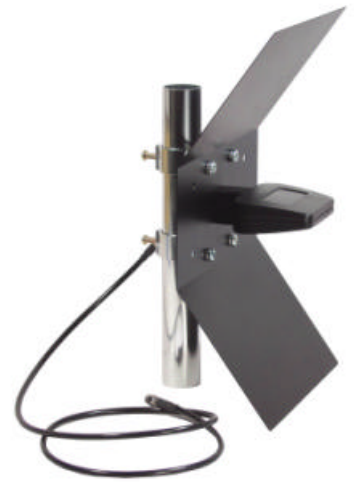
#### Gain Pattern



*H-Plane Field Patterns*



*V-Plane Field Patterns*



#### Usage Diagram



# 10. Appendix

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## How should I communicate between the SST-2450 and the SST-2400?

If you want to use the SST-2400 to communicate with the SST-2450, you need to contact the local distributor to get new chip with new firmware. Then refer to Figure 10.1, Figure 10.2 and Table 10.1 to adjust the suitable SST-2400 jumper values

### SST-2400 Jumper definition:

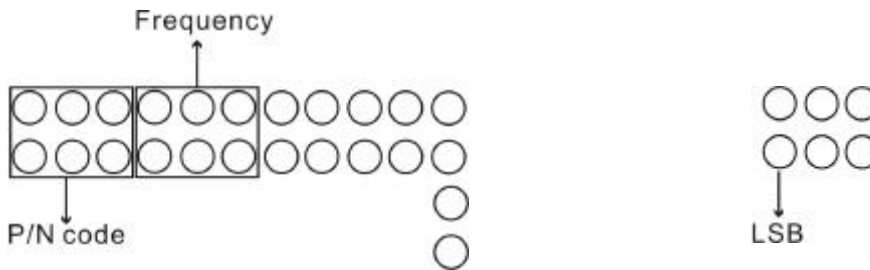


Figure 10.1

### Jumper values SST-2400 P/N code and Frequency:

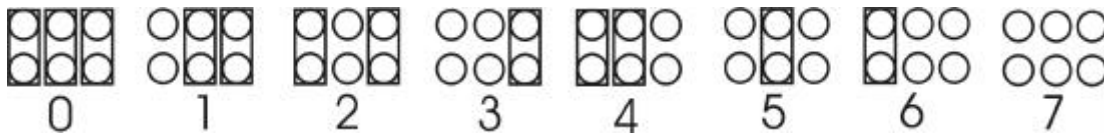


Figure 10.2

### SST-2400 and SST-2450 P/N code and Frequency reciprocal table:

P/N code		Frequency	
SST-2400	SST-2450	SST-2400	SST-2450
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7

Table 10.1