Aport-211S

Single-Port Serial-to-Ethernet Gateway

User Guide

Version 1.0

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1. Introduction

Aport-211 provides the easiest way to enable serial industrial device with networking capability. Aport-211 converts the serial data to standard TCP/IP protocol therefore the serial device can be accessed everywhere via Internet or Ethernet. In addition, Aport-211 provides an embedded Web server which allows user to save the custom web page therefore user can use a standard Web browser to remote manage the serial device.

1.1 Specification

- **Ethernet:**
  - 10/100 Mbps, RJ45 x 1
  - Protection: Built-in 1500V magnetic isolation
- **Serial:**
  - RS-232/422/485: DB9 connector x 1
  - RS-232: RxD, TxD, RTS, CTS, DSR, DTR, DCD, GND
  - RS-422: RX+, RX-, TX+, TX-, GND
  - RS-485: Data+, Data-, GND
  - Baud Rate: 300~38400 bps
  - Parity: None, Even, Odd
  - Data Bits: 7, 8
  - Stop Bits: 1, 2
  - Flow Control: RTS/CTS, XON/XOFF
  - Protection: 15KV ESD
- **Digital Input / Output:**
  - General Purpose DIO x 8
  - DIO0 to DIO5: Programmable Digital I/O (TTL)
  - DIO6 to DIO7: Programmable Digital I/O (CMOS)
- **Software:**
  - Protocol: TCP, UDP, IP, HTTP, ICMP, DHCP, Telnet
  - Utility: Java Configuration, Web Configuration, Serial Console, Telnet Console
  - Operation Mode: TCP Server, TCP Client, Web Control
- **Power:**
  - Power input: 9~40VDC@100mA
  - Connector: Power Jack or Terminal Block
- **Environment:**
  - Operating Temperature: 0~55°C (32~131°F), 5~95% RH
  - Storage Temperature: -20~85°C (32~131°F), 5~95% RH
- **Dimension:** 108 x 78 x 25 mm (H x W x D) without ear

1.2 Packing List

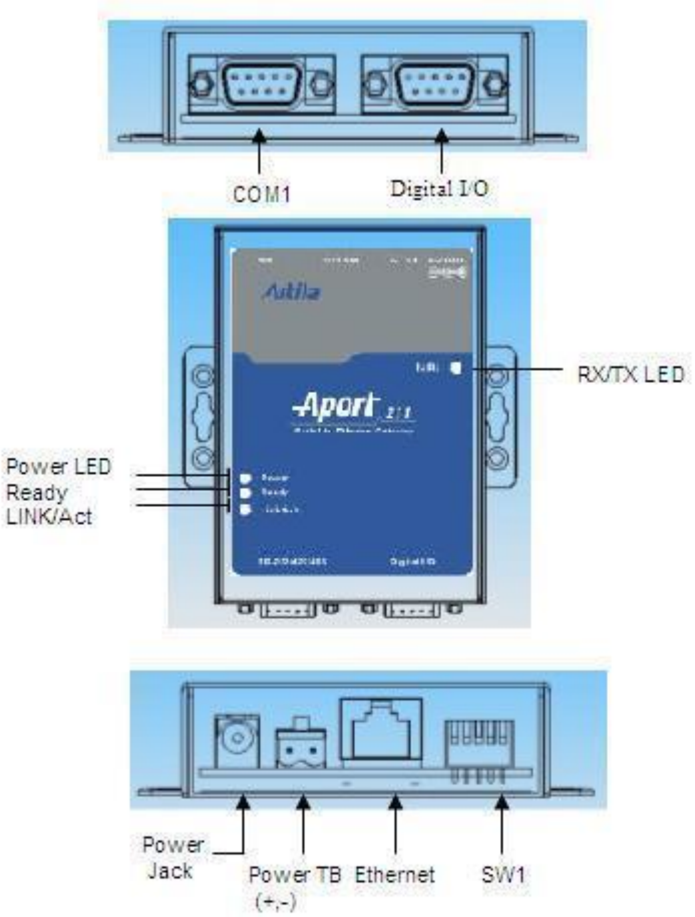
- Aport-211 Single-port Serial-to-Ethernet Gateway

1.3 Optional Accessory

- DK-35A (36-DK35A-000): DIN RAIL Mounting Kit
- PWR-12V-1A (31-62100-000): 110~240VAC to 12VDC 1A Power Adaptor

2. Getting Started

2.1 Panel Layout



2.2 Connecting Power

Connecting 9~40VDC power line with the Aport-211 terminal block or the power jack. If the power is properly supplied, the Power LED will keep solid yellow color.

2.3 Connecting Ethernet Port

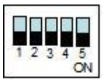
Connect a RJ45 Ethernet cable to the Ethernet port of Aport-211. The Link/Activity light will keep solid yellow color if Ethernet cable is corrected to the network and this light will keep flashing if there are data transmitted.

2.4 Connecting Serial Port

Use a null modem DB9 serial cable to connect a RS-232 serial device to Aport-211 serial port. The null modem cable will cross over the RxD to TxD connection between the serial device to Aport-211.

2.5 Switch SW1 Settings

Set the SW1 setting to RS-232 mode and pin definition of Aport-211 serial port is as follow:



SW1 Key	1	2	3	4	5
RS-232	ON	OFF	OFF	-	-
RS-422	OFF	OFF	OFF	-	-
RS-485	OFF	ON	ON	-	-
Normal	-	-	-	OFF	OFF
DHCP				OFF	ON
Default				ON	OFF
Console				ON	ON

SW1 Setting

- **Normal:** Aport is in Normal Operation Mode
- **DHCP:** Network IP Address is assigned by DHCP Server
- **Default:** All the settings are reset to Factory Default
- **Console:** COM1 serial port is served as console port. User can use ACSII command to configure Aport-211 via COM1 port. Please refer to Appendix A for the ASCII command

☞ **Note**

All the settings will not be effective until system reboot by pressing ***RESET*** button.

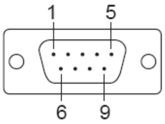
2.6 LED Status

The LED provides the Aport-211 operation information. The LED status is described as follow:

- **Power LED:** Power LED keeps ON if power (+9VDC to +40VDC) is correctly input to Aport-211.
- **Ready LED:** Ready LED keeps ON when Aport-211 firmware is ready for operation. Ready LED will be flash when Aport-211 in Serial Console mode (SW1 key 4 and key 5 are ON) or Telnet Console mode (Telnet Console port:5001 are connected).
- **Link/Act LED:** Link and Activity LED will turn ON when the Ethernet cable is connected. When there is network data traffic, this LED will be flash.
- **RX/TX LED:** The RX/TX LED is a dual color LED that indicates the serial data traffic. In RS-232 mode, the Yellow LED stands for transmitting data and Green LED means receiving data. In RS-422/485 mode, the Yellow LED stands for receiving data and Green LED means transmitting data.

2.7 Serial Port Pin Assignments

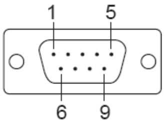
Serial Port COM1 uses a Male DB9 connector and it includes RS-232, RS-422 and RS-485 signal and pin assignments are described as follow:



Pin No.	Transmission Signals		
	RS-232	4-wire RS-485	RS-485
1	DCD	TxD-	-
2	RxD	TxD+	-
3	TxD	RxD+	Data+
4	DTR	RxD-	Data-
5	GND	GND	GND
6	DSR	-	-
7	RTS	-	-
8	CTS	-	-
9	-	-	-

2.8 Digital I/O

Digital I/O uses DB9 connector and the pin assignments are described as follow:



- **Pin 1:** DIO0
- **Pin 2:** DIO1
- **Pin 3:** DIO2
- **Pin 4:** DIO3
- **Pin 5:** DIO4
- **Pin 6:** DIO5
- **Pin 7:** DIO6
- **Pin 8:** DIO7
- **Pin 9:** GND

DIO0 to DIO5 are TTL compatible Programmable DIO and DIO 6 to DIO7 are CMOS compatible Programmable DIO. All the DIO channel are pull up +5VDC with a 4.7K Ohm resistor.

2.9 Factory Default Settings

If you forget your Aport-211 settings, you use SW1 to reset Aport to factory default settings. The factory default settings are:

IP Address: 192.168.2.127

Data Port: 4000

Telnet Port: 5001

Web Port: 80

Baud rate: 19200

Data Format: N, 8, 1 (Parity, Data bits, Stop bits)

Flow Control: None

Interface: RS-232

2.10 Configure Aport-211

Aport-211 provides four ways to configure the settings. They are:

- Java Configuration Utility
- Web Configuration Utility
- Serial Console
- Telnet Console

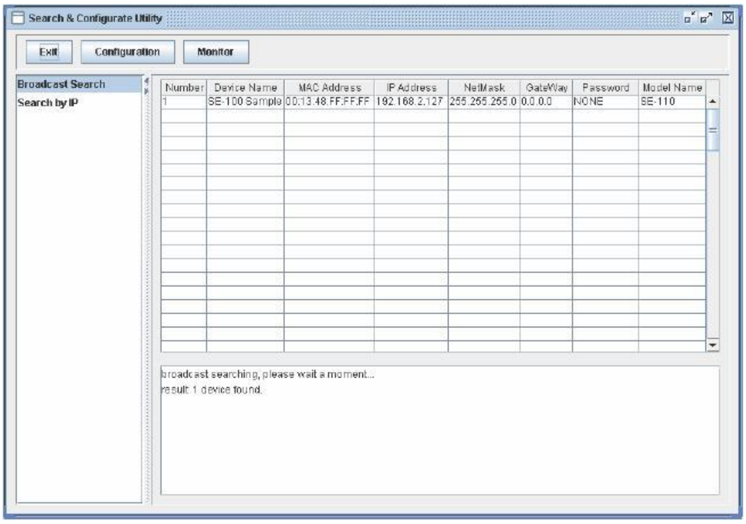
☞ **Note**

To use the Java configuration utility software, you need to install the Java 2 Platform, Standard Edition (J2SE) version 1.4.2 or later. J2SE is free and available at: http://java.sun.com.

3. Java Configuration

3.1 Install Java Configuration Utility

To install the Java Configuration Utility, you can simply copy **manager.jar** to the desired folder. Double click on the icon will start the **manager.jar.**

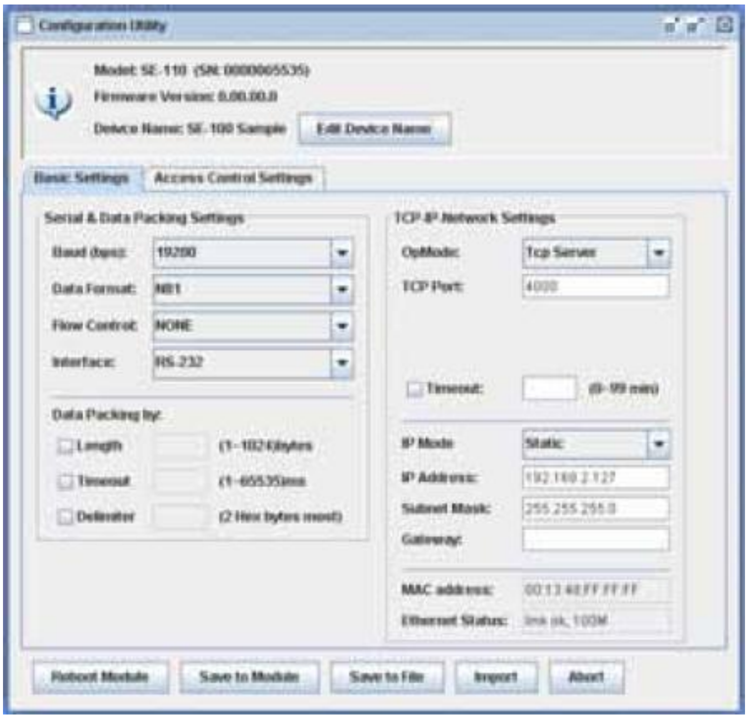


Number	Device Name	MAC Address	IP Address	NetMask	GateWay	Password	Model Name
1	SE-100 Sample	00:13:48:FF:FF:FF	192.168.2.127	255.255.255.0	0.0.0.0	NONE	SE-110

```
broadcast searching, please wait a moment...
result: 1 device found.
```

Once this program started, it will perform a broadcast search to find the Aport device in the network. If you cannot find the Aport module and you know the IP address of the module, you can click ***Search by IP*** item and specify the IP address to find the Aport-211. The default IP address of Aport-211 is ***192.168.2.127.***

Click on the row of the Aport setting, the configuration window will open as follow:



Model: SE-110 (SN: 0000065535)

Firmware Version: 0.00.00.0

Device Name: SE-100 Sample

Baud (bps): 19200

Data Format: N81

Flow Control: NONE

Interface: RS-232

Data Packing by:

□ Length (1~1024bytes)

□ Timeout (1~65535ms)

□ Delimiter (2 Hex bytes most)

OpMode: Tcp Server

TCP Port: 4000

□ Timeout: (0-99 min)

IP Mode: Static

IP Address: 192.168.2.127

Subnet Mask: 255.255.255.0

Gateway:

MAC address: 00:13:48:FF:FF:FF

Ethernet Status: link ok, 100M

☞ **Note**

When the SW1 is set to Console mode, Aport-211 cannot be discovered by the Configuration Utility and the configurations are controlled by serial console.

When enter the configuration mode, the READY LED will be flashing and TCP Data Port will be disabled and data transfer between serial port and Ethernet port will be stopped.

3.2 Serial and Data Packing Settings

The group of setting is to configure the serial interface and data packing settings. Data Packing setting is are as follow:

- **Length:** Pack the length of serial data before forwarding data to Ethernet port
- **Timeout:** the period of time to forward data to Ethernet Port
- **Delimiter:** Wait for the Delimiter Character before forwarding data to Ethernet port. The Delimiters are maximum two bytes Hex format ASCII code. If you use Carriage Return (CR) and Line Feed (LF) as delimiters, you can specify 0D0A or 0d0a.

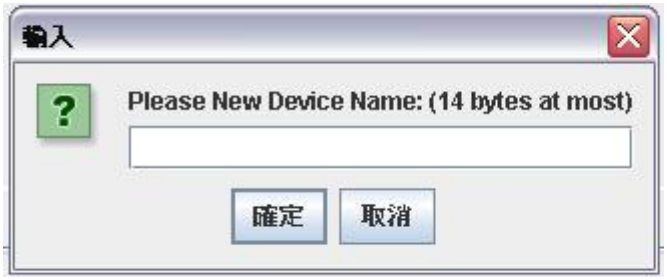
3.3 TCP/IP Network Settings

The group of TCP/IP Network settings are configuring the IP Address, TCP port and operation mode as follow:

- **OpMode:** TCP operation mode setting
- **TCP Port:** TCP Port number of Aport-211
- **Destination IP:** The IP address of remote host which Aport-211 will actively connect to (TCP Client mode only)
- **Connect At:** Startup means TCP connection is established when system starts (TCP Client mode only)
- **Timeout:** When this option is checked, TCP connection will be disconnected if there is no serial data activity before timeout
- **IP Mode:** Configure the IP Address to be Static IP or Dynamic IP by DHCP
- **IP Address:** Set the Static IP Address
- **Subnet Mask:** Subnet Mask setting
- **Gateway:** Gateway address setting

3.4 Device Name Settings

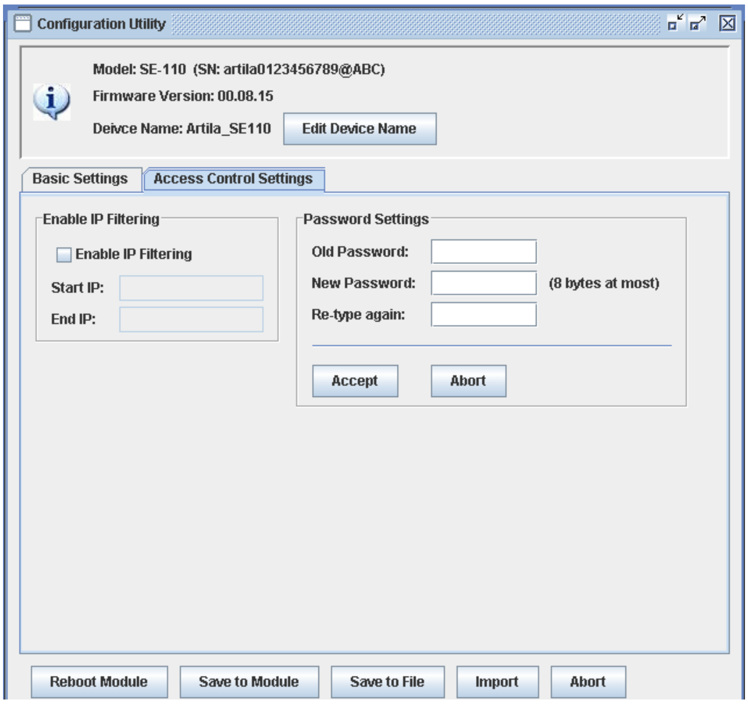
Click Edit Device Name button can edit the device name.



Please New Device Name: (14 bytes at most)

3.5 Access Control Settings

Aport-211 provides IP address filtering method and password authentication for access control.



Model: SE-110 (SN: artila0123456789@ABC)
Firmware Version: 00.08.15
Deivce Name: Artila_SE110

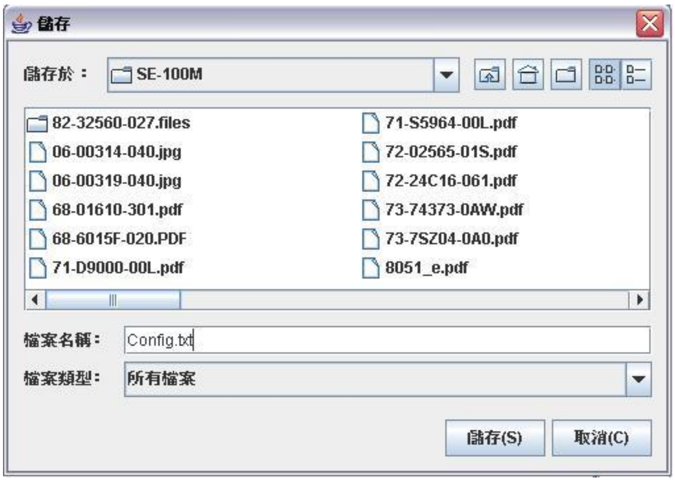
- **Enable IP Filtering:** When this option is checked, user can specify the starting IP address and ended IP address which are allowed to access Aport-211 TCP port in order to prevent unauthorized access.
- **Password Settings:** Enter the new password will enable the password authentication. Password is required to login Java Configuration and Web configuration Pages in the next entry.

3.6 Save Configuration

After the all the settings are configured, click to the **Save to Module button** to save the settings to the module. The new settings will be effective after the reboot of module by clicking the **Reboot Module** button. If the IP address had been modified, please do broadcast search or search by IP again to find the Aport-211 module.

3.7 Save Configuration to File

You can also save current configuration to file by click the **Save to File** button. A new window to specify the path of the file will pop out as follow:

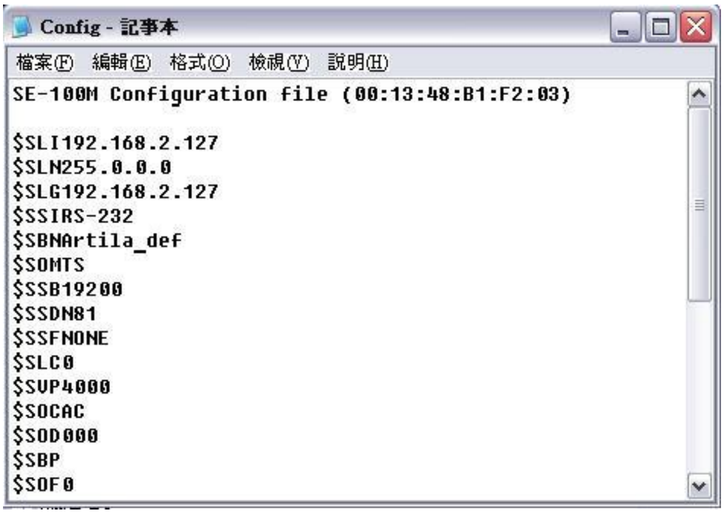


儲存於： SE-100M

檔案名稱： Config.txt

檔案類型： 所有檔案

The configuration is a text file and uses extension of txt. If you use Text editor to open the configuration command, you will notice that the configuration file contains the ASCII command set of the configuration. You can also edit these commands by the text editor to configure the settings and import it to the Aport-211 by using the Import button.



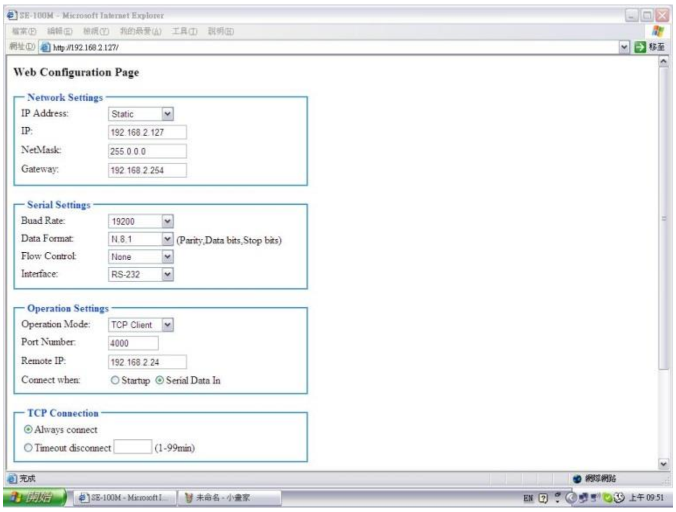
```
SE-100M Configuration file (00:13:48:B1:F2:03)

$SLI192.168.2.127
$SLN255.0.0.0
$SLG192.168.2.127
$SSIRS-232
$SBNArtila_def
$SOMTS
$SSB19200
$SSDN81
$SSFNONE
$SLC0
$SVP4000
$SOCAC
$SOD000
$SBP
$SOF0
```

4. Web Configuration

4.1 Overview

Aport-211 can also be configured by Web Browser. The build-in Web server and Web configuration pages makes Aport-211 configurable anywhere via a Web browser such as IE and Firefox. To open the Web configuration pages, you can simply type the IP address to the Web Address input such as 192.168.2.127. The Login windows will ask you enter password if the password option is enabled. After password confirmed, the web configuration page will show up as follow:



Web Configuration Page

Network Settings

IP Address: Static
IP: 192.168.2.127
NetMask: 255.0.0.0
Gateway: 192.168.2.254

Serial Settings

Buad Rate: 19200
Data Format: N,8,1 (Parity,Data bits,Stop bits)
Flow Control: None
Interface: RS-232

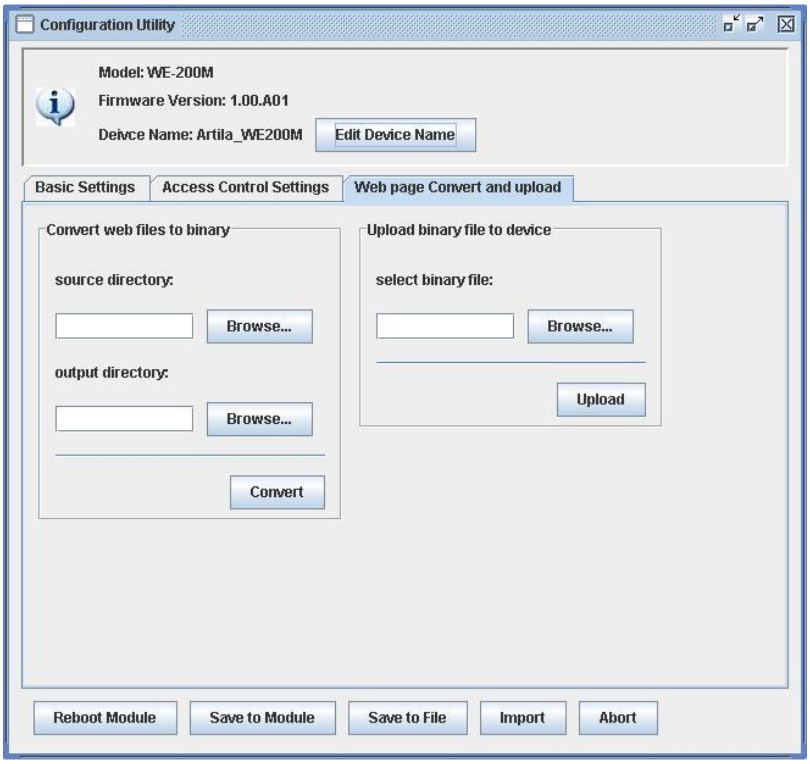
Operation Settings

Operation Mode: TCP Client
Port Number: 4000
Remote IP: 192.168.2.24
Connect when: ○ Startup ● Serial Data In

TCP Connection

● Always connect
○ Timeout disconnect (1-99min)

The configuration is very similar to the Java configuration utility. After completing the settings, click submit button then all the settings will save to the module and the module will reboot automatically to use the new configuration.



Model: WE-200M
Firmware Version: 1.00.A01
Deivce Name: Artila_WE200M

Customize Your Web Page

After you complete your web page design, you can use the Manager Utility (**manager.jar**) to upload the Web page to Aport-211 Web server. The web files need to be converted to binary format first before download to server. Place the web files in the source directory and assign the output directory for the binary file. Pressing the **Convert** button and you can find a binary file, **fsdata.anf** has been created. Use this binary file to upload to Web server. You can see the converted file is available in the Upload binary file to device dialog box. Press Upload and the Web Page Binary files will be upload to server. Manager Utility uses tftp protocol to upload web page. Before uploading the web page, please check if there is any anti virus program which could prevent the tftp file transfer. Shut down the anti virus program first to allow **manager.jar** upload the binary file.

5. Serial / Telnet Command

5.1 Overview

Aport-211 provides a set of ASCII command to configure Aport through a serial and Ethernet port. User can use serial terminal or Telnet command to configure Aport-211 when Web browser and Java utility are available. In addition, these functions provide user the most convenient way to develop their own configuration utility software simply to use the ASCII command.

5.2 Serial Console Mode

To enter the Serial console mode, you can switch SW1 (4~5) to ON position and then serial port will function as a console port. The READY LED will keep flash that indicates Aport is in serial console mode. Please set the serial data setting of the Serial Terminal software (such as Hyper Terminal) to be the same as the Aport-211 serial port. If you forgot the serial port setting, you can use SW1 to reset it to factory default setting as use following setting:

Baud rate: 19200

Data Format: N, 8, 1 (Parity, Data bits, Stop bits)

Flow Control: None

Interface: RS-232

Now you can use serial terminal software to send the ASCII command to Aport-211.

☞ **Note**

In Serial Console Mode, all the network functions will be disabled.

Once the configuration is completed, remember to switch SW1 back to Normal operation mode and reboot the module by Reset Command or push reset button.

5.3 Telnet Console Mode

Aport-211 uses Port number **5001** as telnet console port. Remember to turn on the LOCALECHO before opening the telnet console port. You must login first before sending command to Aport-211. If password is enabled, you need to use the password to log in. The password is encrypted using Tiny Encryption Algorithm (TEA) and the keys are sixteen bytes with low case character from “a” to “p”. The login command format is as follow:

$LOG[16 bytes of TEA Encrypted Password]

or

$LOG

if there are no password settings.

5.4 Forgot Password

If you forgot the Password, you can switch SW1 to Factory Default setting mode and use default IP Address **192.168.2.127** and enter the Web console pages. Once the configuration is completed, remember to switch SW1 back to Normal operation mode and reboot the module by Reset Command or push reset button.

Password is not required for serial console mode. Therefore you can also use serial console to reset the password.

5.5 Command Syntax

The command syntax is:

[Delimiter][Command][Carriage Return/**CR**][Line Feed/**LF**]

- **Delimiter (one byte):** The command begins with a delimiter of dollar sign $ and if Aport-211 receives the correct command it will response with an echo which begins with the delimiter of a percentage sign %.
- **Command:** The command are ASCII string which contains three elements: {Read/Write}{Function}{Parameter} as described as follow:

Command Category	R	W	Function (2 bytes)	Parameters (command related)
Basic	***G***	***S***	***BN:*** Device Name	Max. 14 bytes
	G		***BM:*** Model Name	Default
		S	***BP:*** Password	Max. 8 bytes
	G		***BV:*** Firmware Ver.	Default
Serial	***G***	***S***	***SB:*** Baud Rate	***1200*** ***2400*** ***4800*** ***9600*** ***19200*** ***38400***
	G	***S***	***SD:*** Data Format (Parity, Data, Stop)	***N72*** ***E71*** ***O71*** ***N81*** ***E72*** ***O72*** ***E81*** ***O81*** ***N82***

	G	***S***	***SF:*** Flow Control	***NONE*** ***RTS/CTS*** ***XON/XOFF***
	G	***S***	***SI:*** Interface	***RS-232*** ***RS-422*** ***RS-485***
Network	***G***	***S***	***LI:*** IP Address	***e.g. $SLI192.168.2.127***
	G	***S***	***LN:*** Netmask	***e.g. $SLN255.0.0.0***
	G	***S***	***LG:*** Gateway	***e.g. $SLG192.168.2.254***
	G	***S***	***LC:*** IP Mode	***0:*** Static IP ***1:*** DCHP
	G		***LM:*** MAC	**Default**
	G		***LS:*** LAN Status	***Link fail*** ***Link OK, 100M*** ***Link OK, 10M***
Operation	***G***	***S***	***OM:*** Operation Mode	***TS:*** TCP Server ***TC:*** TCP Client
	G	***S***	***OC:*** TCP connection timeout option	***AC:*** always connect ***TO:*** Disconnect if timeout
	G	***S***	***OU:*** Timeout clock	***0~65535*** (unit: ms) ***e.g. $SOU500***
	G	***S***	***OD:*** Data Packing	Three parameters:{ [0]:Delimiter Option [1]: Timeout Option [2]: Length Option }={1:Enable,0:Disable} e.g. ***$SOD110***
	G	***S***	***OS***: Delimiter	Max. two bytes characters e.g. ***$SOS0D0A (CR/LF)***
	G	***S***	***OT:*** Timeout	***0~65535*** (unit: ms) e.g. ***$SOT500***
	G	***S***	***OL:*** Data Length	***0~1024*** e.g. ***$SOL20***
Access Control	***G***	***S***	***OF***: IP Filtering	***0:*** Disable ***1:*** Enable
	G	***S***	***OI:*** Authorized IP	e.g.***$SOI192.168.2.127:192.168.2.180*** (Starting IP:Ended IP)
TCP Server	***G***	***S***	***VP:*** Listen Port	***1~65535***

				e.g. ***$SVP4000***
TCP Client	***G***	***S***	***CI:*** Destination IP	e.g. ***$SCI192.168.1.211***
	G	***S***	***CP:*** Destination Port	e.g. ***$SCP4001***
	G	***S***	***CC:*** Connection Logic	***0:*** Reserved for PPPoE ***1:*** Establish connection when Serial Data in
System		***S***	***YC:*** System mode	***R:*** Reboot system ***F:*** Reset to default setting and reboot ***D:*** Set current setting as Default setting
		S	***EI:*** Exit console	
DIO		***S***	***DM:*** Set Digital I/O mode	***I:*** Input ***O:*** Output e.g. ***$SDMI:0,4,5*** set DIO0, DIO4, DIO5 as input ***$SDMO:1,2,3,6,7*** set DIO1,DIO2,DIO3,DIO6,DIO7 as output
	G		***DM:*** Get Digital I/O mode	e.g. ***$GDM*** the response is ***%GDM I,O,O,O,I,I,O,O***
		S	***DOH:*** Set DO channel High Output	e.g. ***$SDOH:1,3,7***
		S	***DOL:*** Set DO channel Low Output	e.g. ***$SDOL:2,6***
	G		***DI:*** Get DI channel status	e.g. ***$GDI*** the response is ***%GDI 0=1,4=0,5=1*** It stands for DIO0=1,DIO4=0,DIO5=1

Remark: Italic font stands for Command String

CR/LF (two bytes): Both command from host and echo from Aport-211 are terminated with a Carriage Return (ACSII code Hex 0d) and Line Feed (ASCII code Hex 0a). Therefore please remember to add CR/LF at the end of command line in the terminal emulation program.

☞ **Note**

All command strings are in Upper Case.

5.6 Echo Syntax

After Aport-211 console port received correct command string, it will response Echo String and the Echo Syntax is as follow:

[Delimiter][Function][Status]

- **Delimiter (One byte):** A percentage sign “%”
- **Function (Two bytes):** function string
- **Status:** “OK” or “FAIL”

For example: Set the IP Address by sending command

$SLI192.168.2.125(CR)(LF)

Echo string

%SLIOK(CR)(LF)

means the new IP address is successfully transferred to the module and the new setting will be effective after reboot the module.

To get IP address setting, you can send a command as follow:

$GLI

then the Echo string will be:

%GLI192.168.2.125

> ☞ **Note**
>
> Always remember to reboot the module by send command ***$SYCR*** to use the new configuration.

6. Appendix A: Tiny Encryption Algorithm

1. Example of TEA.C

```
/***********************************************

The Tiny Encryption Algorithm (TEA) by David Wheeler and Roger Needham of the Cambridge
Computer Laboratory.  Placed in the Public Domain by David Wheeler and Roger Needham.

**** ANSI C VERSION (New Variant) ****
Notes: TEA is a Feistel cipher with XOR and addition as the non-linear mixing functions.
Takes 64 bits of data in v[0] and v[1].  Returns 64 bits of data in w[0] and w[1].
Takes 128 bits of key in k[0] - k[3].
TEA can be operated in any of the modes of DES.  Cipher Block Chaining is, for example, simple to
implement.  n is the number of iterations.  32 is ample, 16 is sufficient, as few as eight may be OK.
The algorithm achieves good dispersion after six iterations.  The iteration count can be made variable
if required.
Note this is optimised for 32-bit CPUs with fast shift capabilities.  It can very easily be ported to
assembly language on most CPUs.  delta is chosen to be the real part of (the golden ratio Sqrt(5/4) -
1/2 ~ 0.618034 multiplied by 2^32).
This version has been amended to foil two weaknesses identified by David A.  Wagner
(daw@cs.berkeley.edu): 1) effective key length of old-variant TEA was 126 not 128 bits 2) a related key
attack was possible although impractical.
***********************************************/
//#include "xtea.h"
void encipher(unsigned long *const v,unsigned long *const w, const unsigned long *const k)
{
    register unsigned long      y=v[0],z=v[1],sum=0,delta=0x9E3779B9,n=32;
    while(n-->0)
        { y+= (z<<4 ^ z>>5) + z ^ sum + k[sum&3];
        sum += delta;
        z+= (y<<4 ^ y>>5) + y ^ sum + k[sum>>11 & 3];
        }
    w[0]=y; w[1]=z;
}
void decipher(unsigned long *const v,unsigned long *const w, const unsigned long *const k)
{
    register unsigned long      y=v[0],z=v[1],sum=0xC6EF3720,
                                delta=0x9E3779B9,n=32;
    /* sum = delta<<5, in general sum = delta * n */
    while(n-->0)
```

```
        {
                z-= (y<<4 ^ y>>5) + y ^ sum + k[sum>>11 & 3];
        sum -= delta;
                y-= (z<<4 ^ z>>5) + z ^ sum + k[sum&3];
        }
        w[0]=y; w[1]=z;
}
```

2. The TEA.H

```
#ifndef __XTEA_H__
#define __XTEA_H__
void encipher(unsigned long *const v,unsigned long *const w, const unsigned long *const k);
void decipher(unsigned long *const v,unsigned long *const w, const unsigned long *const k);
#endif
```