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Introduction

Overview

The SE-100M and WE-200M are mini-mighty Serial-to-Ethernet embedded module which adds network and Web server function for legacy RS-232/422/485 devices. The SE-200M provides a transparent data channel between serial device and the TCP/IP network, so that the serial device can be accessed by using standard TCP/IP protocols. The SE-100M can behave as a TCP server, a TCP client or an UDP node on a Ethernet network to fulfill versatile application requirements.

64KB Space for User Web Pages

In addition to provide a transparent data channel from serial to Ethernet, WE-200M features Artilla's unique Web@Module technology to enable RS-232/ 422/485 serial devices to be monitored and controlled through standard Web browsers, anywhere, anytime, without the need to install dedicated application software.

Users can compose web pages using Java applets or ActiveX Controls with preferred tools, then use Artilla's Windows utility to

transfer these files to the web server of the WE-200M through LAN/WAN.

Programmable Digital I/O

Besides, the WE-200M also provides 6 TTL plus 3 CMOS digital I/Os. A pre-defined ASCII command set is provided for users to control these I/Os through LAN/WAN.

Product Specifications

Form Factor

Type: 30-pin dual-inline drop-in module

Pitch: 2.00mm

WxLxH: 40x45x13mm (SE-100M and WE-200M)

Network Interface

Type: 10/100BaseT, auto-detect

Protocols: TCP, UDP, HTTP, Telnet, IP, ICMP, ARP

IP addressing: DHCP, Static IP

Operation Modes

TCP/Server, TCP/Client and UDP mode

User Web Server (WE-200M only)

Space capacity: 64KB in Flash memory

Serial Interface (TTL-level)

Signals: TxD, RxD, RTS, CTS, DTR, DSR, DCD, GND

Baud: 1,200 to 38,400 bps

Parity: None, Even, Odd

Data bits: 7,8

Stop bit: 1,2

Flow control: None, RTS/CTS, XON/OFF

Programmable Digital I/O

PIO0~PIO5: TTL level compatible

PIO6~PIO8: CMOS level compatible

Configuration Methods

Web console, Telnet Console and Serial Console

Windows utility (included in CD)

General

Power input: 5VDC

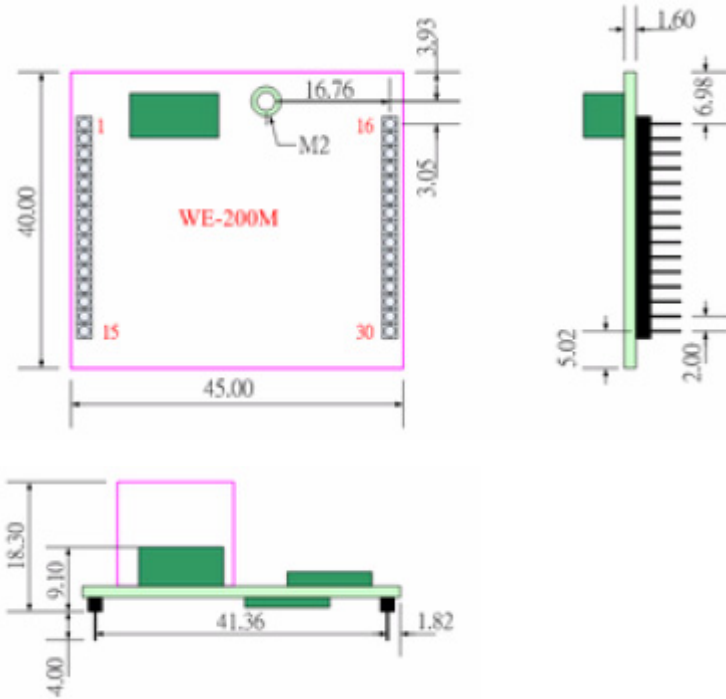
Power consumption: 100mA@+5VDC

Operation temp.: 0~70C, 5~95% RH

Storage temp.: -20~85C, 5~95% RH

Warranty: 2 years

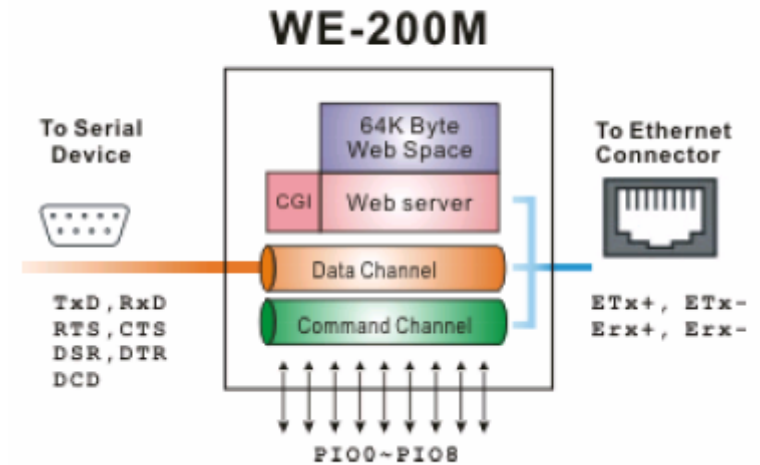
Dimensions



Pin Assignment

1	ETX+		16	RxD
2	ETX-		17	TxD
3	ERX+		18	RTS
4	ERX-		19	CTS
5	Link/Act		20	DCD
6	PIO0		21	DSR
7	PIO1		22	DTR
8	PIO2		23	PIO4
9	PIO3		24	PIO5
10	Reset		25	PIO6
11	Ready		26	PIO7
12	Sw1		27	PIO8
13	Sw2		28	NC
14	GND		29	NC
15	+5V		30	GND

Block Diagram



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Getting Started

Connecting Power

Connecting 9~40VDC power line with the Evaluate Kit (SE-100-EV) terminal block or the power jack. If the power is properly supplied, the Power LED will keep solid yellow color.

Connecting Ethernet Port

Connect a RJ45 Ethernet cable to the Ethernet port of SE-100M-EV. The Link/Activity light will keep solid yellow color if Ethernet cable is connected to the network and this light will keep flashing if there are data transmitted.

Connecting Serial Port

Use a null modem DB9 serial cable to connect a RS232 serial device to SE-100M-EV serial port. The null modem cable will cross over the RxD to TxD connection between the serial device to SE-100M-EV.

Switch SW1 Settings

Set the SW1 setting to RS-232 mode and pin definition of SE-100M-EV serial port is as follow:



SW1 Setting:

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

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 SE-100M-EV via COM1 port. Please refer to Appendix I for the ASCII command



All the settings will not be effective until system reboot



by pressing RESET button

LED Status

The LED provides the SE-100M-EV operation information. The LED status is described as follow:

Power LED: Power LED keeps ON if power (+9VDC to +40VDC) is correctly input to SE-100M-EV.

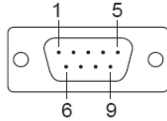
Ready LED: Ready LED keeps ON when SE-100M-EV firmware is ready for operation. Ready LED will be flash when SE-100M-EV in Serial Console mode (SW1 key 4 and key 5 are ON) or Telnet Console mode (Telnet Console port:5001 are connected)

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.

Serial Port Pin Assignments

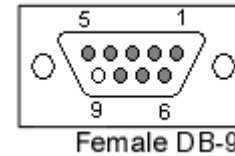
Serial Port COM1 uses a Male DB9 connector and it includes RS-232, RS-422 and RS485 signal and pin assignments are described as follow:



Pin Number	Transmission Signals		
	RS-232	4-wire RS485	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	-	-	-

Digital I/O

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



Pin 5: DIO0

Pin 4: DIO1

Pin 3: DIO2

Pin 2: DIO3

Pin 1: DIO4

Pin 9: DIO5

Pin 8: DIO6

Pin 7: DIO7

Pin 6: GND

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

Factory Default Settings

If you forget your SE-100M-EV 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

Configure SE-100M-EV

SE-100M-EV provides four ways to configure the settings. They are:

1. Java Configuration Utility
2. Web Configuration Utility
3. Serial Console
4. Telnet Console

ATTENTION



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

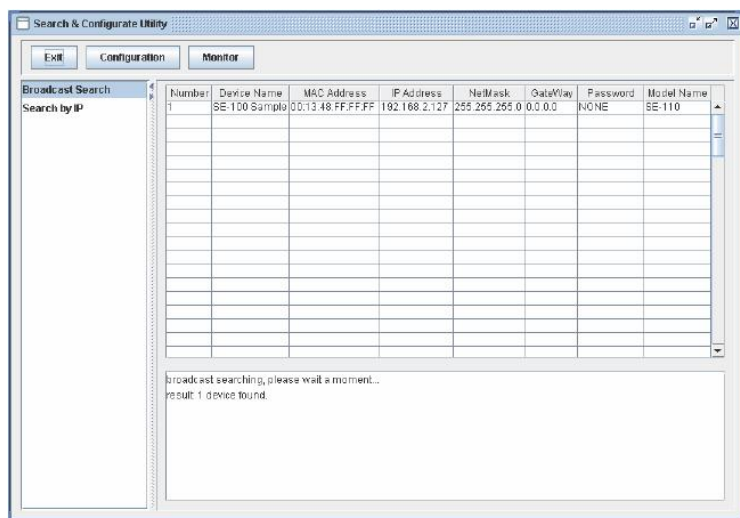
<http://java.sun.com>

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Java Configuration

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**



Once this program started, it will perform a broadcast search to find the SE-100 and WE-200 device in the network. If you cannot find the SE-100 and WE-200 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 SE-100M-EV. The default IP address of SE-100M-EV is **192.168.2.127**.

Click on the row of the SE-100/WE-200 settings, the configuration window will open as follow:



ATTENTION



When the SW1 is set to Console mode, SE-100M-EV 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.

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.

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 SE-100M-EV

Destination IP: The IP address of remote host which SE-100M-EV 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

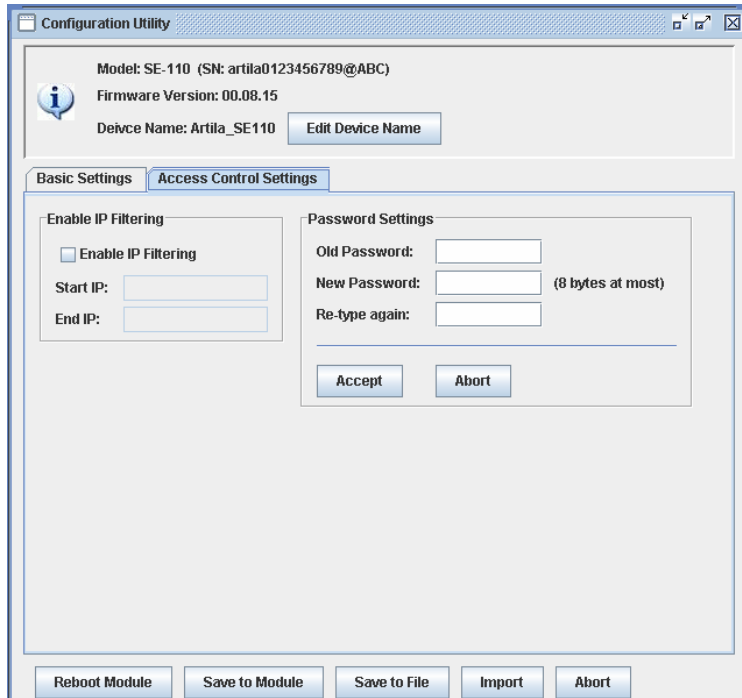
Device Name Settings

Click Edit Device Name button can edit the device name



Access Control Settings

SE-100M-EV provides IP address filtering method and password authentication for access control



Enable IP Filtering: When this option is checked, user can specify the starting IP address and ended IP address which are allowed to access SE-100M-EV TCP port in order to prevent unauthorized access.

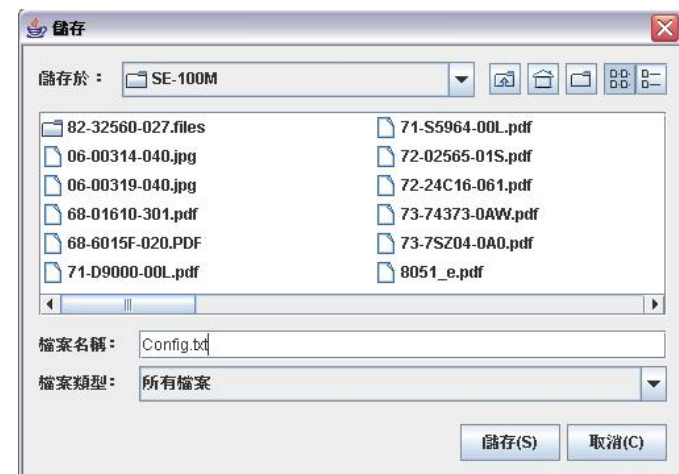
Password Settings: Enter the new password will enable the password authentication. Password is required to login Java Configuration and Web configuration Pages in the next entry.

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 SE-100M-EV module.

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:



Web Configuration

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 SE-100M-EV by using the Import button.



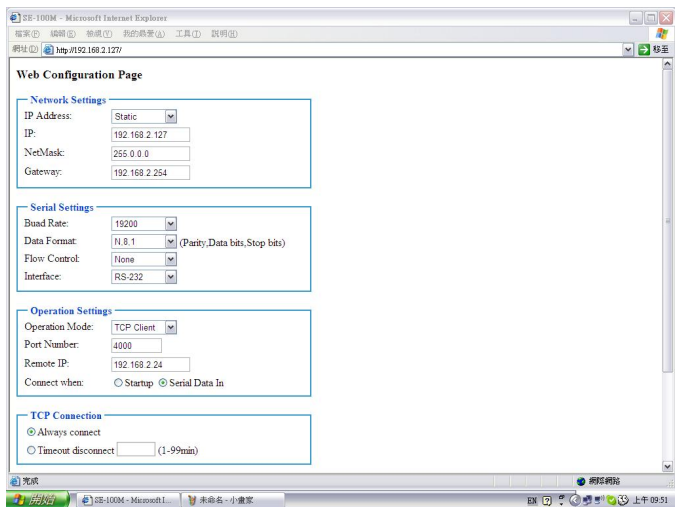
```

Config - 記事本
檔案(F) 編輯(E) 格式(O) 檢視(V) 說明(H)
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
$SUP4000
$SOCAC
$SOD000
$SBP
$SOF0
  
```

Overview

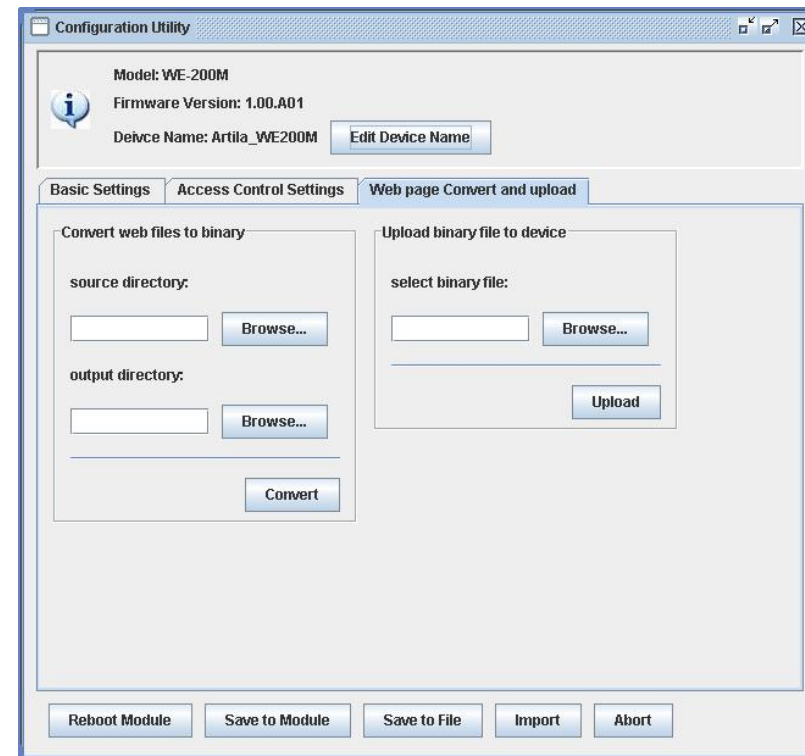
SE-100M-EV can also be configured by Web Browser. The built-in Web server and Web configuration pages makes SE-100M-EV configurable anywhere via a Web browser such as IE and Firefox.

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:



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.

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 SE-100M-EV 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 uploaded 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.

Serial/Telnet Command

Overview

SE-100M-EV 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 SE-100M-EV 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.

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 SE-100M-EV 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 SE-100M-EV.



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.

Telnet Console Mode

SE-100M-EV 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 SE-100M-EV. 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

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.

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 SE-100M-EV 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	<i>G</i>	<i>S</i>	<i>BN</i> : Device Name	Max. 14 bytes
	<i>G</i>		<i>BM</i> : Model Name	Default
		<i>S</i>	<i>BP</i> : Password	Max. 8 bytes
	<i>G</i>		<i>BV</i> : Firmware ver...	Default
Serial	<i>G</i>	<i>S</i>	<i>SB</i> : Baud Rate	<i>1200</i>
				<i>2400</i>
				<i>4800</i>
				<i>9600</i>
				<i>19200</i>
			<i>38400</i>	
	<i>G</i>	<i>S</i>	<i>SD</i> : Data Format (Parity,Data,Stop)	<i>N72</i>
				<i>E71</i>
				<i>O71</i>
				<i>N81</i>
<i>E72</i>				
		<i>O72</i>		
		<i>E81</i>		
		<i>O81</i>		
		<i>N82</i>		
<i>G</i>	<i>S</i>	<i>SF</i> : Flow Control	<i>NONE</i>	
			<i>RTS/CTS</i>	
			<i>XON/XOFF</i>	

	<i>G</i>	<i>S</i>	<i>SI</i> : Interface	<i>RS-232</i> <i>RS-422</i> <i>RS-485</i>
Network	<i>G</i>	<i>S</i>	<i>LI</i> : IP Address	e.g. <i>SSL1192.168.2.127</i>
	<i>G</i>	<i>S</i>	<i>LN</i> : Netmask	e.g. <i>SSLN255.0.0.0</i>
	<i>G</i>	<i>S</i>	<i>LG</i> : Gateway	e.g. <i>SSLG192.168.2.254</i>
	<i>G</i>	<i>S</i>	<i>LC</i> : IP Mode	<i>0</i> : Static IP <i>1</i> : DHCP
	<i>G</i>		<i>LM</i> : MAC	Default
	<i>G</i>		<i>LS</i> : LAN Status	<i>Link fail</i> <i>Link OK,100M</i> <i>Link OK, 10M</i>
	<i>G</i>	<i>S</i>	<i>LW</i> : TCP windows size	<i>0:128, 1:256, 2:512,</i> <i>3:1024</i> e.g. <i>SSLW0</i> means TCP window size 128 bytes
Operation	<i>G</i>	<i>S</i>	<i>OM</i> : Operation Mode	<i>TS</i> :TCP Server <i>TC</i> :TCP Client
	<i>G</i>	<i>S</i>	<i>OC</i> : TCP connection timeout option	<i>AC</i> : always connect <i>TO</i> : Disconnect if timeout
	<i>G</i>	<i>S</i>	<i>OU</i> : Timeout clock	<i>0~65535</i> (unit: ms) e.g. <i>SSOU500</i>

	G	S	OD: Data Packing	Three parameters: { [0]:Delimiter Option [1]: Timeout Option [2]: Length Option }={ <i>I</i> :Enable, <i>0</i> :Disable} e.g. <i>SSOD110</i>
	G	S	OS: Delimiter	Max. two bytes characters e.g. <i>SSOS0D0A</i> (CR/LF)
	G	S	OT: Timeout	<i>0~65535</i> (unit: ms) e.g. <i>SSOT500</i>
	G	S	OL: Data Length	<i>0~1024</i> e.g. <i>SSOL20</i>
Access Control	G	S	OF: IP Filtering	<i>0</i> : Disable <i>I</i> : Enable
	G	S	OI: Authorized IP	e.g. <i>SSOI192.168.2.127:192.168.2.180</i> (Starting IP:Ended IP)
TCP Server	G	S	VP: Listen Port	<i>I~65535</i> e.g. <i>SSVP4000</i>
TCP Client	G	S	CI: Destination IP	e.g. <i>SSCI192.168.1.211</i>
	G	S	CP: Destination Port	e.g. <i>SSCP4001</i>
	G	S	CC: Connection Logic	<i>0</i> : Reserved for PPPoE <i>I</i> : 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. <i>SSDMI:0,4,5</i> set DIO0, DIO4, DIO5 as input <i>SSDMO:1:H,2:L,3:H</i> set DIO1,DIO2,DIO3 as output and initial state are High (H) or Low (L)
		G	DM: Get Digital I/O mode	e.g. <i>SGDM</i> the response is <i>%GDM I,O,O,O,I,I,O,O</i>
		S	DOH: Set DO channel High Output	e.g. <i>SSDOH:1,3,7</i>
		S	DOL: Set DO channel Low Output	e.g. <i>SSDOL:2,6</i>
		G	DO:X	e.g. <i>SGDO:2</i> get DIO2 status
		G	DI: Get DI channel status	e.g. <i>SGDI</i> the response is

				<p><i>%GDI 0=1,4=0,5=1</i></p> <p>It stands for</p> <p>DIO0=1,DIO4=0,DIO5=1</p> <p>e.g. <i>\$GDI:4</i></p> <p>Get DIO4 status</p>
--	--	--	--	---

Remark: *Italic font stands for Command String*

CR/LF (two bytes): Both command from host and echo from SE-100M-EV are terminated with a Carriage Return (ASCII 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.



All command strings are in Upper Case

Echo Syntax

After SE-100M-EV 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

\$\$LI192.168.2.125(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



Always remember to reboot the module by send command ***\$\$YCR*** to use the new configuration

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 $\sqrt{5/4} - 1/2 \sim 0.618034$ 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
```