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The antenna used for this transmitter must be installed to provide a separation distance of least 20 cm for all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

HelloDevice

LS100W

User Guide

Version 1.2.0

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User Guide for the HelloDevice LS100W

Version 1.2.0

Firmware version 1.2.X

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Changes or modifications to this device not explicitly approved by Sena Technologies will void the user's authority to operate this device.

Technical Support

Sena Technologies, Inc.

210 Yangjae-dong, Seocho-gu

Seoul 137-130, Korea

Tel: (+82-2) 573-5422

Fax: (+82-2) 573-7710

E-Mail: support@sena.com

Website: <http://www.sena.com>

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1: Introduction

1.1 Overview

The HelloDevice LS100W allows you to Wireless-enable a variety of serial devices that were not originally designed to be networked. This capability brings the advantages of remote management and data accessibility to thousands of serial devices over the wireless network.

The LS100W is a most cost effective one port serial wireless LAN communication device. The LS100W supports RS232 serial communication allowing virtually any asynchronous serial device to be accessed over wireless network.

As for the Internet connectivity, the LS100W supports open network protocols such as TCP/IP allowing serial devices to be accessed over 802.11b wireless LAN environment.

The LS100W provides the management console using Telnet and serial console port under the password protection support. And the LS100W also provides the management function using the HelloDevice Manager Software Utility.

The LS100W was designed to accommodate the unique requirements of the Retail POS, Security, Automation and Medical marketplaces.

Parts of this manual assume the knowledge on concepts of the Internetworking protocols and serial communications. If you are not familiar with these concepts, please refer to the standards or the documentation on each subject.

1.2 Package Check List

- LS100W external box
- AC 120V Power supply adapter
- Serial console/data cable
- A hardcopy of Quick Start Guide
- CD-ROM including the COM port redirector and the HelloDevice Manager and User Guide

1.3 Product Specification

Serial Interface	One male DB9 serial port for data communication/serial console
	Serial speeds 1200bps to 115200bps
	Flow Control: None, Hardware RTS/CTS
	Signals: Rx, Tx, RTS, CTS, DTR, DSR, GND
Network Interfaces	IEEE802.11b Wireless LAN 11Mbps
	Supports static and dynamic IP address
Protocols	ARP, IP/ICMP, TCP, Telnet, DHCP client, WEP
Security	User ID & Password, SSID, 64/128-bit WEP key
Management	Telnet or serial console port or HelloDevice Manager
	Full-featured system status display
Diagnostic LED	Power Ready Link Act Serial Rx/Tx
Power	Supply voltage 9V ~ 30V DC
	Supply current 300mA@9VDC
Environmental	Operating temperature: 0 ~ 55 °C Storage temperature: -4 ~ 66 °C
Physical properties	Dimension 100 mm L (3.9 in.) 72 mm W (2.8 in.) 29 mm H (1 in.)
	Weight 300g
Approvals	FCC(A), CE(A), MIC
Warranty	5-year limited warranty

1.4 Terminologies and Acronyms

The Internetworking related terminologies used frequently in this manual are defined clearly to help your better understanding of the LS100W.

MAC address

On a local area network or other network, the MAC (Media Access Control) address is the computer's unique hardware number. (On an Ethernet LAN, it's the same as your Ethernet address.)

It is a unique 12-digit hardware number, which is composed of 6-digit OUI (Organization Unique Identifier) number and 6-digit hardware identifier number. The LS100W has the MAC address of 00-0B-6B-xx-xx-xx, which is labeled on the bottom side of the external box.

Host

A user's computer connected to the network

In Internet protocol specifications, the term "host" means any computer that has full two-way access to other computers on the Internet. A host has a specific "local or host number" that, together with the network number, forms its unique IP address.

Session

A series of interactions between two communication end points that occur during the span of a single connection

Typically, one end point requests a connection with another specified end point and if that end point replies agreeing to the connection, the end points take turns exchanging commands and data ("talking to each other"). The session begins when the connection is established at both ends and terminates when the connection is ended.

Client/Server

Client/server describes the relationship between two computer programs in which one program, the client, makes a service request from another program, the server, which fulfills the request.

A server is a computer program that provides services to other computer programs in the same or other computers, whereas a client is the requesting program or user in a client/server relationship. For example, the user of a Web browser is effectively making client requests for pages from servers all over the Web. The browser itself is a client in its relationship with the computer that is getting and returning the requested HTML file. The computer handling the request and sending back the HTML file is a server.

Table 1-1 Acronym Table

ISP	Internet Service Provider
PC	Personal Computer
NIC	Network Interface Card
MAC	Media Access Control
LAN	Local Area Network
UTP	Unshielded Twisted Pair
ADSL	Asymmetric Digital Subscriber Line
ARP	Address Resolution Protocol
IP	Internet Protocol
ICMP	Internet Control Message Protocol
UDP	User Datagram Protocol
TCP	Transmission Control Protocol
DHCP	Dynamic Host Configuration Protocol
SMTP	Simple Mail Transfer Protocol
FTP	File Transfer Protocol
PPP	Point-To-Point Protocol
HTTP	HyperText Transfer Protocol
DNS	Domain Name Service
SNMP	Simple Network Management Protocol
UART	Universal Asynchronous Receiver/Transmitter
Bps	Bits per second (baud rate)
DCE	Data Communications Equipment
DTE	Data Terminal Equipment
CTS	Clear to Send
DSR	Data Set Ready
DTR	Data Terminal Ready
RTS	Request To Send

2: Getting Started

This chapter describes how to set up and configure the LS100W in the first place.

- 2.1 *Panel Layout* explains the panel layout and LED indicators.
- 2.2 *Connecting the Hardware* describes how to connect the power, the network, and the serial device to the LS100W.
- 2.3 *Accessing Console Port* describes how to access the console port using a serial console at a local site or telnet console at a remote site.
- 2.4 *Command Usages* described how to use command set of the LS100W to configure and view parameter values and status.

Following items are pre-required to get started.

- One DC power adapter (included in the package).
- One serial console cable for configuration (included in the package).
- One RS-232 serial cable for connecting the RS-232 serial device.
- One PC with Network Interface Card (hereafter, NIC) and/or one RS232 serial port.
- Terminal emulation program running on the PC

2.1 Panel Layout

The **LS100W** has 5 **LED** indicator lamps for status display. The top two lamps indicate the status of system power and operation readiness. The next lamp down indicates the receive and transmit status of the serial port for data communication. The final two lamps indicate the **IEEE802.11b Wireless LAN** connection and its activity, respectively. Table 2-1 describes the function of each LED indicator lamp.

Table 2-1. LED Indicator Lamps on the LS100W

Lamps		Functions
Status	Power	Solid RED when power is supplied
	Ready	Solid GREEN when system is running
Serial Ports	Serial Rx/Tx	Blinking when there is any incoming or outgoing data stream through the serial port of the LS100W
Wireless LAN	Link	Solid ORANGE when connected to Wireless LAN Network
	Act	Blinking when there is any activity such as incoming or outgoing packets through the LS100W Wireless LAN port.



Figure 2-1. The panel layout of the LS100W

2.2 Connecting the Hardware

This section describes how to connect the **LS100W** to the serial device for initial testing.

- Connect a power source to the LS100W.
- Connect the LS100W to a serial device through serial data cable.

2.2.1 Connecting the Power

Connect the power jack to the LS100W power plug using the DC power adapter included in the package. If power is supplied properly, the **[Power]** LED lamp on the **LS100W** front panel will remain solid red.

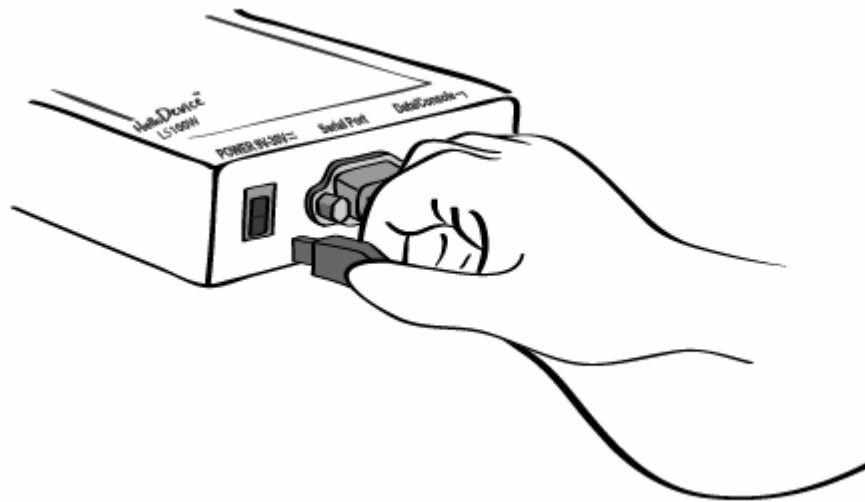


Figure 2-2. Connecting the Power to the LS100W

2.2.2 Connecting to the Wireless LAN

There is built-in 802.11b Wireless LAN module in the **LS100W**. When power is connected correctly, the module will automatically search for the Wireless LAN access point, and then try to connect to the LAN access point. If the Wireless LAN cable is properly connected to the Wireless LAN access points, the LS100W will have a valid connection to the Wireless LAN network and indicates that valid connection with the following indications:

- The **[Link]** LED lamp on the **LS100W** front panel remains solid orange.
- The **[Act]** LED lamp on the **LS100W** front panel continuously blinks to indicate the transfer of the incoming and outgoing Wireless LAN packets.

For users to connect the **LS100W** to a Wireless LAN access point in their environment, they must first set the corresponding information on the **LS100W**, such as the **SSID** of the Wireless LAN access point. Please refer to the **Wireless LAN Settings** section in Chapter 3 for the various parameters needing to be set for Wireless LAN connection.

2.2.3 Connecting to the Device

Connect the serial data cable to the **LS100W** and the serial device as shown below. Ensure that power has been correctly supplied to both the serial device and the **LS100W**.

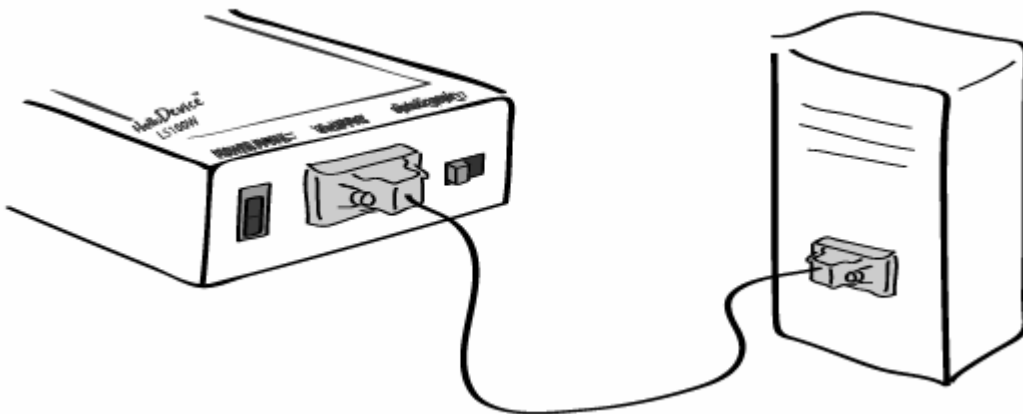


Figure 2-3. Connecting a Serial Device to the LS100W

2.3. Accessing Console Port

There are two ways to access console port of the LS100W depending on whether the user is located at a local site or a remote site.

- Serial console:

Local users can connect directly to the serial console port of the LS100W using serial console/data cable (null-modem cable). The serial port of the LS100W is used as the console port as well as the data port. To use the serial port as the console port, slide Data/Console switch to the Console side.

- Remote console:

Remote users can make a telnet connection to the remote console port (port 23) of the LS100W via TCP/IP network.

Both methods require the user to log into the LS100W in order to continue.

2.3.1 Using Serial Console

- 1) Connect the one end of the serial console cable to the serial port of the LS100W.

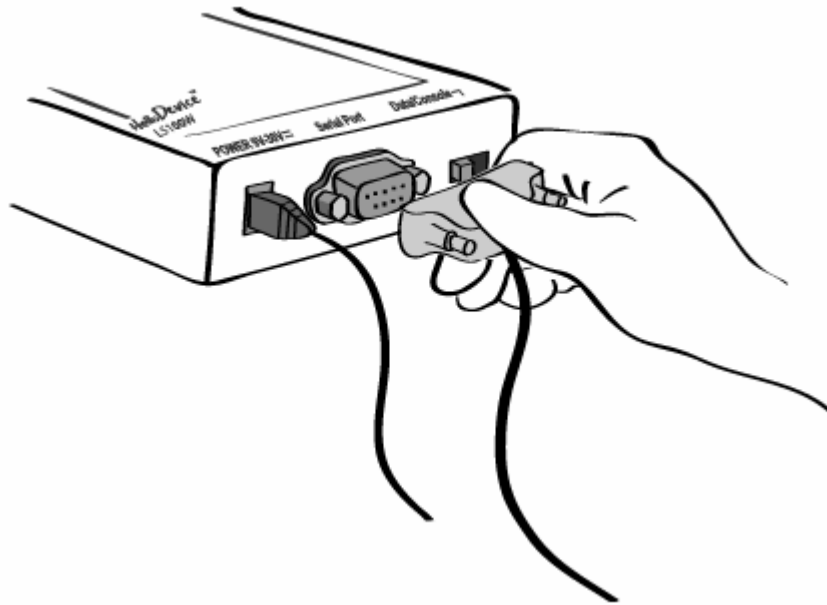


Figure 2-4. Connecting a serial console cable to the LS100W

- 2) Connect the other end of the cable to the serial port of user's computer.
- 3) Slide Data/Console switch to Console side.

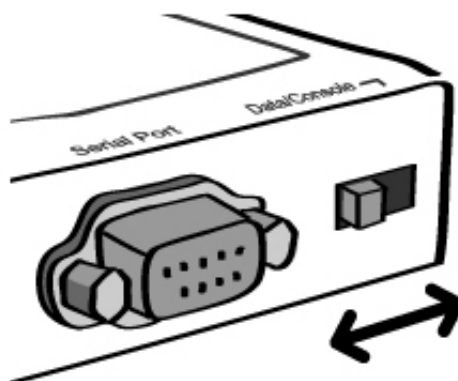


Figure 2-5. Data/Console switch of the LS100W

- 4) Run a terminal emulator program such as HyperTerminal. Set up the serial configuration parameters of the terminal emulation program as follows:
9600 Baud rate, Data bits 8, Parity None, Stop bits 1, No flow control

- 5) Press [ENTER] key.
- 6) Type the user name and password to log into the LS100W. A factory default setting of the user name and password are both **admin**.
- 7) If the user logged into the LS100W successfully, command prompt screen will appear on the computer as shown in Figure 2-6.

```

login: admin
password: *****
Type 'help' to get command usages
> help
set group par1 [par2 ...] + <CR>
- group = 'ip','host','wlan','serial' or 'admin'
- par1 ... = configuration parameters. Use * to keep a parameter's value
get [group] + <CR>
- group = 'ip','host','wlan','serial','admin' or 'status'
- If group is specified, shows settings of the group.
- If group is omitted, shows settings of all groups.
help [group] + <CR>
- If group is omitted, shows this screen.
- If group is specified, shows 'set' command usage of the group.
factorydefault [option] + <CR>
- if option is omitted, all parameters are set with factory default values.
- if option='-ip',
  all parameters except IP settings are set with factory default values.
save + <CR>
- Save changes
exit + <CR>
- Exit without rebooting the device
reboot + <CR>
- Exit and reboot the device
>

```

Figure 2-6. The LS100W console screen

From the command prompt screen, users can set, get and save configuration parameter values using 'set', 'get' and 'save' command. Users also can exit the console or reboot the device using 'exit' and 'reboot' command. The usage of the commands can be found using 'help' command. For command usages description, please refer to section 2.4 *Command usage*.

2.3.2 Using Remote Console

The LS100W provides remote console feature via telnet as well as serial console so that users can access the LS100W at remote site for configuration and monitoring purpose. The IP address of the LS100W must be known before users can access the remote console port. The port number for the remote console is 23, which is a TCP port number assigned for Telnet.

Only one user can log into the remote console or serial console at a time. If the serial console is established while a remote console is established, current remote console will be halted and no more remote console will be established until serial console is finished.

To access remote console of the LS100W, please use the step as follows:

- 1) Run a telnet program or a program that supports telnet functions such as TeraTerm-Pro or HyperTerminal. The target IP address and the port number should be those of the LS100W. If required, specify the port number as 23. Type the following command in the command line interface of your computer.

```
telnet 192.168.1.254
```

Or run a telnet program with parameters as follows.

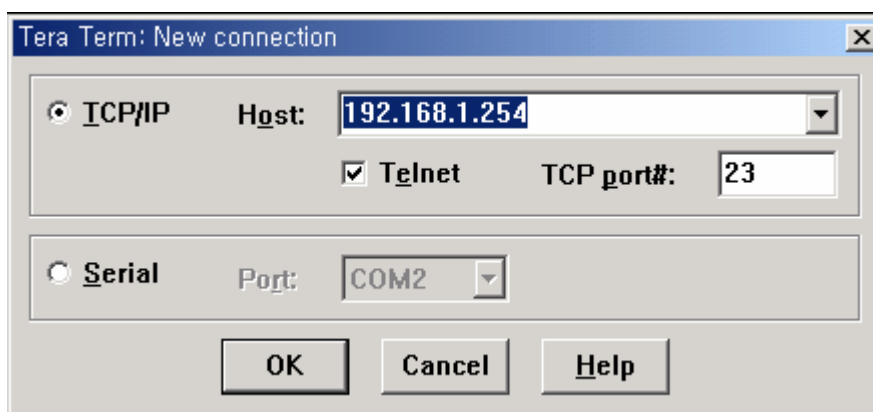


Figure 2-7 Telnet program set up example

- 2) The user has to log into the LS100W. Type the user name and password. A factory default setting of the user name and password are both **admin**.
- 3) If the user logged into the LS100W successfully, the same command prompt screen as the one of serial console will be displayed. The user can set, get, save configuration parameters and exit console, reboot the device as like the serial console.
- 4) If serial console or the other remote consoles are connected already, new console will not be established at all.

2.4 Command Usage

The LS100W provides several simple commands for configuration and control of the LS100W. Table 2-2 summarizes command set which LS100W supports.

Table 2-2 LS100W command set summary

Command	Description	Result
set group par1 [par2 ...] + <CR>	Set configuration parameters - group = 'ip', 'host', 'serial' or 'admin' - par1 ... = configuration parameters. Use * to keep a parameter's value	If success, "OK" + <CR> + <LF> If error "ERROR" + <CR> + <LF>

get [group] + <CR>	Get configuration parameter values - group = 'ip', 'host', 'serial', 'admin' or 'status' - If group is specified, shows settings of the group. - If group is omitted, shows settings of all groups.	Parameter value display
help [group] + <CR>	Shows command usage screen. - If group is omitted, shows help screen. - If group is specified, shows 'set' command usage of the group.	Help message display
factorydefault [option] + <CR>	Restore factory default values - if option is omitted, all parameters are set with factory default values. - if option='-ip', all parameters except IP settings are set with factory default values.	If success, "OK" + <CR> + <LF> If error "ERROR" + <CR> + <LF>
save + <CR>	Save changes	If success, "OK" + <CR> + <LF> If error "ERROR" + <CR> + <LF>
exit + <CR>	Exit without rebooting the device (changes are not applied)	If success, "OK" + <CR> + <LF> If error "ERROR" + <CR> + <LF>
reboot + <CR>	Exit and reboot the device	None

2.4.1 'set' Command

With 'set' command, users can configure parameter values of the LS100W for each environment. Basic 'set' command usage is as follows:

set group par1 [par2 ...] + <CR>

where,

group = 'ip','host', 'wlan','serial' or 'admin'

par1 par2 ... = configuration parameters. Use * to keep a parameter's value

The 'group' is the category where the parameters should be entered. For example, if users want to set parameters related to the IP configuration, use set command as shown in the Figure 2-8.

```
> set ip static 192.168.1.100 255.255.255.0 192.168.1.1
OK
>
```

Figure 2-8 IP configuration example screen

In the above example, the first parameter 'ip' indicates that the following parameters are IP configuration parameters. The second parameter 'static' indicates that the LS100W will use static IP address of the third parameter '192.168.1.100'. The fifth parameter indicates the subnet mask and the

next indicates the default gateway IP address.

If users want to change only one of the parameters of the group, users can omit trailing parameters and/or can use "*" to keep a parameter value. The screen below will show how to change subnet mask only without changing IP address and gateway IP address.

```
> set ip static * 255.255.0.0
OK
>
```

Figure 2-9 Changing only one parameter value example

Command usage of 'set' will differ depending on the groups. Each 'set' command usage of the group can be found using 'help group' command. For example, if users want to know how to use 'set' command to configure IP configuration, typing 'help ip' + <CR> will show 'set' command usage for the IP configuration as shown in Figure 2-10.

```
> help ip
set ip ipmode par1 par2 ...
- ipmode: static=Static IP / dhcp=DHCP / pppoe=PPPoE
- parameters:
if ipmode = static,
    par1 = IP address,
    par2 = subnet mask,
    par3 = gateway
if ipmode = dhcp,
    no parameters required
if ipmode = pppoe,
    par1 = PPPoE username,
    par2 = PPPoE password
>
```

Figure 2-10 Help screen example

Note:

The changed values will not take effect until 'save' and 'reboot' commands are invoked. For more details, please refer to section 2.4.5 ~ 2.4.7.

2.4.2 'get' Command

With 'get' command, users can view the current parameter values and status of the LS100W. Basic 'get' command usage is as follows:

get [group] + <CR>

where,

- group = 'ip', 'host', 'wlan', 'serial', 'admin' or 'status'**
- If group is specified, shows settings of the group.**
- If group is omitted, shows settings of all groups.**

The group means the category where parameters belong to as like 'set' command. For example, if users want to view parameter values related to IP configuration, get command as Figure 2-11 can be used.

```
> get ip
IP_mode: static
IP_address: 192.168.1.100
Subnet_mask: 255.255.255.0
Gateway: 192.168.1.1
>
```

Figure 2-11 Getting ip configuration screen

'status' group is a special group where 'set' command does not apply. 'get status' will show current system status screen.

```
> get status
Serial_no.: LS100W-0207_test
MAC_address: 00-0b-6b-77-88-99
F/W_REV.: V1.2.0
Current_IP: 192.168.0.125
>
```

Figure 2-12 Getting status screen

If group is omitted, get command will show all of the parameter values as shown in Figure 2-13.

```
> get
--- Status ---
Serial_no.: LS100W-023437350
MAC_address: 00-0b-6b-19-16-9e
F/W_REV.: V1.3.2
Current_IP: 192.168.1.103
--- Admin ---
Username: admin
Password: admin
Devicename: LS100W Device
--- IP ---
IP_mode: dhcp
--- Host ---
Host_mode: tcps
Local_port: 6001
Inactivity_timeout(sec): 300
--- Serial ---
Baudrate: 9600
Data_bits: 8_bits
Parity: None
Stop_bits: 1_bit
Flow_control: None
DTR_option: Always_high
DSR_option: None
Interchar_timeout(ms): 50
--- wlan ---
Name: Default
Type: Infrastructure
Encryption: 128bit
PassKey: Alphanumeric
KeyWord: WEP128BitTest
>
```

Figure 2-13 Getting all parameters screen

2.4.3 'help' Command

With 'help' command, users can find command usage help in the console screen. Basic command usage is as follows:

help [group] + <CR>

where,

if group is omitted, overall help screen will be displayed

if group is specified, 'set' command usage of specified group will be displayed.

Figure 2-14 shows help screen when no group is specified while Figure 2-16 shows help screen with 'ip' group specified.

```
> help
set group par1 [par2 ...] + <CR>
- group = 'ip','host','wlan','serial' or 'admin'
- par1 ... = configuration parameters. Use * to keep a parameter's value
get [group] + <CR>
- group = 'ip','host','wlan','serial','admin' or 'status'
- If group is specified, shows settings of the group.
- If group is omitted, shows settings of all groups.
help [group] + <CR>
- If group is omitted, shows this screen.
- If group is specified, shows 'set' command usage of the group.
factorydefault [option] + <CR>
- if option is omitted, all parameters are set with factory default values.
- if option='-ip',
    all parameters except IP settings are set with factory default values.
save + <CR>
- Save changes
exit + <CR>
- Exit without rebooting the device
reboot + <CR>
- Exit and reboot the device
```

Figure 2-14 Help screen

```
> help ip
set ip ipmode par1 par2 ...
- ipmode: static=Static IP / dhcp=DHCP / pppoe=PPPoE
- parameters:
if ipmode = static,
    par1 = IP address,
    par2 = subnet mask,
    par3 = gateway
if ipmode = dhcp,
    no parameters required
if ipmode = pppoe,
    par1 = PPPoE username,
    par2 = PPPoE password
```

Figure 2-15 Help screen with 'ip' group specified

2.4.4 'factorydefault' Command

With 'factorydefault' command, users can load factory default parameter values in console. Command usage of 'factorydefault' is as follows:

factorydefault [option] + <CR>

where,

- if option is omitted, all parameters are set with factory default values.
- if option='-ip', all parameters except IP settings are set with factory default values.

Loaded values are not saved until 'save' command invoked. After 'factorydefault" command, 'save' and 'reboot' commands are required for changes to take effect.

```
> factorydefault (or factorydefault -ip)
OK
> save
OK
> reboot
```

Figure 2-16 Factory default reset screen

2.4.5 'save' Command

With 'save' command, current parameter changes are saved to non-volatile memory. Command usage of 'save' command is as follows:

save + <CR>

Saved changes will be applied if the LS100W is rebooted by 'reboot' command or manual rebooting.

2.4.6 'exit' Command

With 'exit' command, current serial or remote console session will be closed. However, changed parameters are not applied until the LS100W is manually rebooted. Command usage of 'exit' command is as follows:

exit + <CR>

2.4.7 'reboot' Command

With 'reboot' command, the LS100W will be rebooted immediately. Changed parameter values will be applied when the LS100W is up again. Command usage of 'reboot' is as follows:

reboot + <CR>

3: Wireless LAN Configuration

3.1 Overview

IEEE 802.11, a Wireless LAN standard, requires one or more nodes and a wireless LAN access point (hereinafter referred to AP) as basic network elements. Normally, the word “node” refers to the notebook computers, personal computers, and PDAs that have Wireless LAN cards, although “node” refers to **LS100W** devices in this manual.

3.1.1 Infrastructure Mode and Ad-hoc Mode

An AP is used to connect the **LS100W** to the Ethernet. Often it can be used to connect to the Internet as well. This kind of mode is referred as an “**infrastructure mode**.” On wireless computer networks, “**ad-hoc mode**”, also called “peer-to-peer mode”, is a method for **LS100W** devices to directly communicate with each other without an AP device. Ad-hoc mode can be very useful in replacing cables between existing devices with a wireless connection method.

3.1.2 Network Name: SSID (Service Set Identifier)

In the wireless LAN network, users can set up the different names to the wireless LAN AP which will compose the network. **SSID** is ID value for each AP, which is used to differentiate one network from another. If users want to make the **LS100W** operate as an infrastructure mode within certain AP network, users have to set up the SSID of the **LS100W** coincident with that of the AP. Therefore, users have to check out the SSID of the AP first. However, when using ad-hoc mode, users must set the same SSIDs to the **LS100Ws** which will be connected to each other. The maximum length of an SSID that can be set in **LS100W** is 16 bytes. ASCII characters can be used to set it.

3.1.3 Channel

The **LS100W** searches for all accessible **802.11b Wireless LAN** channels periodically, to find the other APs. When the **LS100W** is first booted up, it searches for a preset AP (default value is ‘Default’), and when the AP is found, it accesses that AP automatically. The **LS100W** should use the channel belonging to the network group in which it belongs. In the case of infrastructure mode, the **LS100W** checks the channel values being used in AP, and automatically sets the channel values identical to the AP channels values. In ad-hoc mode, two channels in **LS100W** should be set to identical values.

Even when a certain value or an asterisk (‘ * ’) symbol is entered in a channel value entry using

the 'set' command, the **LS100W** will ignore those values and automatically set the values as the AP channel values of the group in which it belongs.

3.1.4 Security

802.11b based applications are different from wired Ethernet applications in the way they support security functions. The 802.11 Committee recognized that the wired Ethernet supported a very high level of internal security. Therefore, when creating policies for Wireless LAN standards, the Committee tried to ensure the same level of for Wireless as the Ethernet had. **WEP** (wired equivalent privacy) uses **RSA Security's RC4 PRNG** encryption algorithm and 40-bit shared key to encrypt data. Thus, in the LS100W, 5 bytes of ASCII values are used to represent 64 bits of WEP1, and 13 bytes of ASCII values are used to represent 128 bits of WEP1. The shortcoming of WEP is that it can encrypt only the body of the data frame. Frame headers and other types of frames are not encrypted.

3.2 Setting

For proper operation of the **LS100W** in a specific environment, users must set the wireless parameters in the LS100W's Wireless LAN according to the requirements of the designated Wireless LAN network environment. To do that, users must check the following:

- Type of Wireless LAN network (infrastructure/ad-hoc)
- Wireless LAN SSID and channel
- Whether a Wireless LAN WEP is used, and the WEP setting status (number of bits, key values, and coding methods)
- Whether Wireless LAN authentication protocols are used for the Wireless LAN connection.
Some Wireless LAN networks require authentication protocols (like MD5).

Users can check the current Wireless LAN settings by using console commands:

```
> get wlan
Name: Default
Type: Infrastructure
Encryption: 128bit
PassKey: ASCII
KeyWord: WEP128BitTest
>
```

Table 3-1 Wireless Lan Settings Parameters

Parameter	Values
Network Type	Infrastructure mode or Ad-hoc mode
SSID	Default / Max 16 characters

Channel	11 (can check during booting sequence)
WEP	64 or 128 bits
PassKey	ASCII or Hexadecimal

- WEP1

If the WEP function is to be used, a WEP key value must be set. The WEP1 key field is used to select between a 64 bit key or a 128 bit key. If WEP1 is set to '0', the WEP function will be disabled.

- WEP2

The WEP2 field selects whether ASCII code or Hexadecimal code will be used to represent the data values in WEP1.

- Passkey

The Passkey field is for user authentication. If the WEP1 value is 64 bits, the user must enter a 5-digit password in ASCII code. If the WEP1 value is 128 bits, the user must enter a 13-digit ASCII password in ASCII code. For example, if WEP2 is set as a Hexadecimal code type, the user could enter 0x0123456789 (when WEP1 is set to '64 bits'), or 0x0123456789ABCDEF (when WEP2 is set to '128 bits').

The basic 'set' commands for Wireless Lan (WLAN) settings are as follows:

set wlan name type ch WEP1 WEP2 Password

where,

name: Default / user specified network name

type: l=infrastructure / a=Adhoc

ch: set channel number for Adhoc mode / set random channel number for infrastructure mode

WEP1: 0=none/ 1=64bit / 2=128bit

WEP2: a=ASCII type password / h=Hexadecimal type password

Password: example='Max13character' / example='26AABBCCAABBCCFF'

4: IP Address Configuration

A valid IP address of the LS100W needs to be assigned before it starts to work in the user's network environment. A network system administrator may provide the user with this IP address setting information for the network. The IP address must be unique within the network. Otherwise, the LS100W will not have a valid connection to the network.

Users can choose the desired IP mode out of the two IP operating modes, i.e., **Static IP** and **DHCP**. The factory default IP mode is **DHCP** mode. Table 4-1 shows the parameter items for IP configuration.

Table 4-1. The LS100W TCP/IP session modes

Static IP	IP address
	Subnet mask
	Default gateway
DHCP	No parameters required

Basic 'set' command usage for IP configuration is as follows:

set ip ipmode par1 par2 ...

where,

ipmode: 'static' for Static IP / 'dhcp' for DHCP

parameters:

if ipmode = static,

par1 = IP address, par2 = subnet mask, par3 = gateway

if ipmode = dhcp,

no parameters required

4.1 Static IP

4.1.1 Overview

In the **Static IP** mode, users have to manually specify all the parameters such as **IP addresses** of the LS100W, valid **subnet mask** and the **default gateway** IP address.

IP address is an identification number assigned to a computer as a permanent address on the network. Computers use IP addresses to identify and talk to each other on the network. Choose the proper IP address which is unique and valid on the network environment.

A subnet represents all the network hosts at one geographic location, in one building, or on the same local area network. When there is any outgoing packet over the network, the LS100W will check whether the desired TCP/IP host specified in the packet is on the local network segment with the help of the **subnet mask**. If the address is proven to be on the same network segment as the LS100W, the connection is established directly from the LS100W. Otherwise, the connection is established through the given default gateway.

A **gateway** is a network point that acts as an entrance to another network. Usually, the computers that control traffic within the network or at the local Internet service provider are gateway nodes. The LS100W needs to know the IP address of the default gateway computer in order to communicate with the hosts outside the local network environment. For correct information on the gateway IP address, please refer to the network administrator.

4.1.2 Static IP Configuration

To configure IP configuration parameters of the LS100W, use set command as follows:

```
set ip static ip_address subnet_mask default_gateway + <CR>
```

where,

ip_address = IP address of the LS100W

subnet_mask = Subnet mask

default_gateway = Default gateway IP address

Figure 4-1 shows IP configuration command example screen. To apply changes, users have to invoke 'save' and 'reboot' command after changing configuration.

```
> set ip static 192.168.1.10 255.255.255.0 192.168.1.1
OK
```

Figure 4-1. IP configuration parameters setting of Static IP mode

4.2 DHCP

4.2.1 Overview

Dynamic Host Configuration Protocol (DHCP) is a communications protocol that lets network administrators manage and automate the assignment of IP addresses centrally in an organization's network. DHCP lets a network administrator supervise and distribute IP addresses from a central point and automatically send a new IP address when a computer is plugged into a different place in the network.

As described in the section 4.1, the IP address must be entered manually at each computer in Static IP mode and, if computers move to another location in another part of the network, a new IP address must be entered. Meanwhile, all the parameters including the IP address, subnet mask, gateway, DNS servers will be automatically configured when the IP address is assigned in DHCP mode. DHCP uses the concept of a "lease" or amount of time for which a given IP address will be valid for a computer. All the parameters required to assign an IP address are configured on DHCP server side, and each DHCP client computer receives this information when the IP address is provided at its boot-up.

To obtain an IP address, the LS100W sends a corresponding DHCP request as a broadcast over the network after each reset. The reply generated by the DHCP server contains the IP address as well as the subnet mask, gateway address, DNS servers and the lease time. The LS100W immediately places this information in its non-volatile memory. If the operating time reaches the lease time, the LS100W will request the DHCP server for renewal of its lease time. If the DHCP server approves extending the lease, the LS100W can continue to work with the current IP address. Otherwise, the LS100W will start the procedure to request a new IP address to the DHCP server.

A DHCP server assigns IP addresses dynamically from an IP address pool, which is managed by the network administrator. This means DHCP client, i.e. the LS100W, receives a different IP address each time it boots up. To prevent the case that users do not know the IP address of the LS100W in such environments, its IP address should be reserved on the DHCP server side. In order to reserve the IP address in the DHCP network, the administrator needs the MAC address of the LS100W found on the label sticker at the bottom of the LS100:

```
MAC=00:0B:6B:19:16:9E
```

4.2.2 DHCP Configuration

To make the LS100W work in DHCP mode, just set IP mode to DHCP as in Figure 4-2.

```
> set ip dhcp  
OK  
>
```

Figure 4-2. DHCP mode configuration

5. Host Mode Configuration

Host mode represents the operating session mode of the LS100W. Several host modes are available for the data communication between the serial device and remote hosts. Since TCP is connection-oriented protocol, server, client, server/client modes are provided. Table 5-1 shows the brief description of the host modes. A factory default host mode is **TCP Server**.

Table 5-1. The LS100W TCP/IP session modes

Mode	Description
TCP server	Select this mode, when users want the LS100W to operate as a TCP server. The LS100W stands by until there is any TCP connection request. If TCP connection is not already established at that time, the LS100W accepts the request and the session is established. In the established state, it transmits the data through the serial port if there is any data from the remote host. Since the LS100W supports only one TCP session for the serial port, the additional TCP connection request will be rejected if already established. This mode is useful when users want to send data to the serial device at any time they want.
TCP client	Select this mode, when users want the LS100W to operate as a TCP client. When the serial device sends data or pre-defined timer is expired, the LS100W tries to establish a TCP connection to a remote server through its TCP port. If a TCP session is established between them, the LS100W will send data to the server. If there's any data from the server during the session, it will also send the data through the serial port. However, if the LS100W failed to connect to the remote server, the data from the serial port will be discarded. This is useful when the serial device initiates sending data such as data gathering application.
TCP server/client	If you are not sure which mode to choose, select this mode since it will be applied in most applications. In this mode, the LS100W operates as TCP server AND client. If the connection is not established, it will accept all incoming connection and connect to the remote host if there are any data from the serial device. Otherwise, it will send data back and forth. In summary, the LS100W will work as if it is virtually connected to the remote host.

For each host mode, required parameters for configuration is summarized in Table 5-2.

Table 5-2 Host mode configuration parameters

TCP Server	Listening TCP port
	Inactivity timeout (sec)
TCP Client	Destination IP
	Destination TCP Port
	Cyclic connection Interval
	Inactivity timeout (sec)
TCP Server/Client	Listening TCP port
	Destination IP
	Destination TCP Port
	Cyclic connection Interval
	Inactivity timeout (sec)

Basic 'set' command usage for host mode configuration is as follows:

set host hostmode par1 par2 ...

where,

hostmode: tcps=TCP server / tcpc=TCP client / tcpsc=TCP server & client

parameters:

if hostmode = TCP server (tcps),

par1 = listening TCP port,

par2 = inactivity timeout (sec)

if hostmode = TCP client (tcpc),

par1 = destination IP address,

par2 = destination TCP port,

par3 = cyclic connection interval (min),

par4 = inactivity timeout (sec)

if hostmode = TCP server & client (tcpsc),

par1 = listening TCP_port,

par2 = destination IP address,

par3 = destination TCP port,

par4 = cyclic connection interval (min),

par5 = inactivity timeout (sec)

*** set cyclic connection interval to 0 not to use cyclic connection**

*** set inactivity timeout to 0 for unlimited timeout**

For easier understanding of TCP modes, a simplified **State Transition Diagram** is often used. And to help users understand the diagram, the TCP state of the LS100W is briefly described as follows.

- Listen

It represents “a waiting for a connection request from any remote host”. It is a default start-up mode when it is set as *TCP server* mode. This state is valid only in *TCP server* mode operation.

- Closed

It means “No connection state at all”. If the data transfer is completed, the state is changed to this state if one of the host requests disconnection request. If it is in *TCP server* mode, the state is automatically changed to [Listen] mode. It is a default start-up mode when it is set as *TCP client* mode or *TCP server/client* mode.

- Sync-Received

In *TCP server* mode, the state will be changed from [Listen] to [Sync-Received], if any remote host sends connection request. If the LS100W accepts the request, the state will be changed into [Established]. This state is not valid in *TCP client* mode.

- Sync-Sent

If the LS100W sends a connection request to a remote host, the state is changed from [Closed] to [Sync-Sent]. This state is maintained until the remote host accepts the connection request. This state is valid only in *TCP client* mode.

- Established

It represents “an open connection”. If one of the hosts accepts a connection request from the other host, the connection is opened and state is changed into [Established].

- Data

When it is in [Established] state, data from a host will be transferred to the other one. For easier understanding of the TCP session operation, we called the state as [Data] state when actual data transfer is performed. Actually, the [Data] mode is a part of [Established] state as is described in the RFC 793 [Transmission Control Protocol]. This is a normal state for the data transfer phase of the connection.

5.1 TCP Server Mode Operations

5.1.1 Overview

The LS100W works as a TCP server, and the default TCP state is [Listen] in this mode. The LS100W supports only one TCP socket connection per one serial port. If a connection is currently established, the additional connection requests will be rejected. The remote host will be either Ethernet-Serial communication devices acting as a TCP client or a socket program acting as a TCP client running on users' PC.

1) Typical State Transition

[Listen] --> [Sync-Received] --> [Established] --> [Data] --> [Closed] --> [Listen]

At start-up, an initial TCP state is [Listen]. If there is any incoming TCP connection request, the state will be changed into [Sync-Received], then [Established], which means a session is opened. For a while, data will be transferred between the hosts. This is the [Data] state. The session will be disconnected due to the request of one of them, which is [Closed] state. And then, the state is automatically changed to its original state, [Listen].

2) Operations

Serial data transfer

When a session has been established, the LS100W reads the data from the serial port buffer till internal serial buffer is full or inter-character time interval reaches the time specified as *inter-character timeout* value. Then, it transfers the data to the IP address of the remote host. If there's no remote host connected to the LS100W, all the incoming data from the serial port are discarded.

Session disconnection

The connected session will be disconnected when the remote host sends disconnection request or when no data transfer activity is found through the serial port for a certain amount of time, which is "*Inactivity timeout*".

Figure 5-1 shows the State Transition Diagram of the session operations in *TCP server* mode.

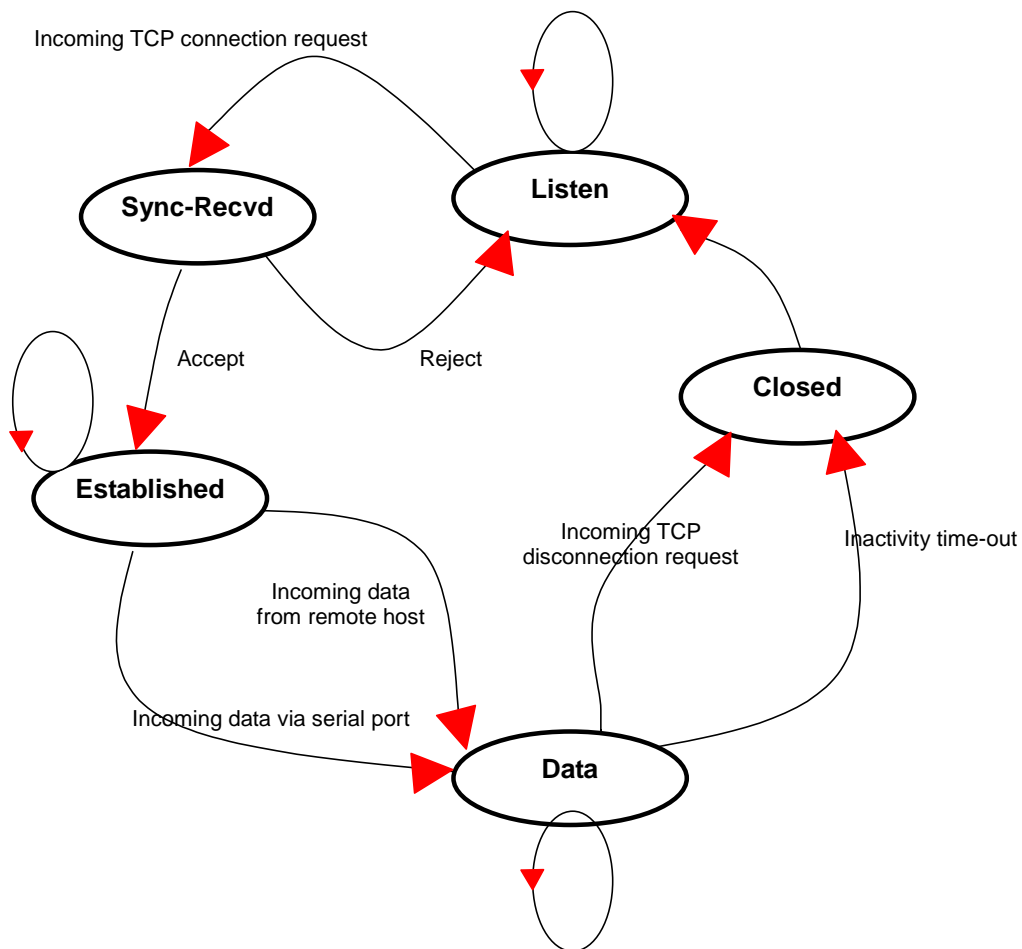


Figure 5-1. State Transition Diagram of TCP server mode

5.1.2 TCP Server Mode Configuration

To configure the LS100W to work as a TCP server, use 'set' command as follows:

set host tcps listening_TCP_port inactivity_timeout + <CR>

where,

listening_TCP_port: Listening TCP port

Inactivity_timeout: Inactivity timeout in seconds.

Listening TCP port is the TCP port number through which remote host can connect a TCP session, and, send and receive data. Incoming connection request to the ports other than *Listening TCP Port* will be rejected. The LS100W does not restrict the number to a specific range, but it is strongly recommended not to use the well-known ports for certain application (See Appendix D. *Well-known Port Numbers*). To change the port number, select menu 2 on the *TCP Server* mode configuration screen.

Inactivity timeout is set to maintain the TCP connection state as *Closed* or *Listen* in TCP host mode unless there is any data transfer between the serial device and the LS100W. If there is no incoming or outgoing data through the serial port during the specified *inactivity timeout* interval, the existing TCP connection will be closed automatically.

If the value of *inactivity timeout* is set to 0, the current TCP connection is maintained unless there's no connection close request. Although *inactivity timeout* is disabled, the LS100W will check the connection status between the LS100W and the remote host by sending "keep alive" packets periodically. If the remote host does not answer the packets, it is regarded that the connection is down unintentionally. Then, the LS100W will force to close the existing TCP connection.

Note:

At least, this value should be set larger than that of *inter-character timeout*. To prevent the unintended loss of data due to the session disconnection, it is highly recommended that this value is set large enough so that the intended data transfer is completed.

Figure 5-2 shows TCP server mode setting example:

```
> set host tcps 6001 300
OK
>
```

Figure 5-2. TCP server mode setting

5.2 TCP Client Mode Operations

5.2.1 Overview

The LS100W works as a TCP client, and the default TCP state is [Closed] in this mode. The remote host will be either Ethernet-Serial communication devices acting as a TCP server or a socket program acting as a TCP server running on users' PC.

1) Typical State Transition

[Closed] --> [Sync-Sent] --> [Established] --> [Data] --> [Closed]

At start-up, an initial TCP state is [Closed]. If there is any incoming data through the serial port, the LS100W will try to connect to a user-defined remote host. Then, the state will be changed to [Sync-Sent], which means the connection request is being sent. If the remote host accepts the request, the state will be changed into [Established], which means a session has been opened. For a while, data will be transferred between the hosts. This is [Data] state. The session will be disconnected due to the request of one of them, which is its original state, [Closed].

2) Operations

Serial data transfer

Whenever the serial device sends data through the serial port of the LS100W, data will be accumulated to the serial port buffer of the LS100W. If the internal serial port buffer is full or inter-character time interval reaches to the time specified as *inter-character timeout* value, it tries to connect to the user-defined IP address of the remote host, if TCP session is not established yet. If the LS100W succeeds in connecting to the remote host, the data in the serial port buffer will be transferred to the host. Otherwise, all the data stored in the buffer will be cleared.

Session disconnection

The connected session will be disconnected when the remote host sends disconnection request or when no data transfer activity is found through the serial port for certain amount of time, which is "*Inactivity timeout*". All the data remained in the serial port buffer will be cleared when it is disconnected.

Connection request from remote host

All the incoming TCP connection requests will be rejected in *TCP client* mode.

Cyclic Connection

If *Cyclic Connection* function is enabled, the LS100W will make an attempt to connect to the user-defined remote host at certain interval even if there's no incoming serial data from the device. If the remote host prepares certain data, it will be transferred to the serial device via its serial port after the connection is established. Eventually, users can monitor the serial device periodically by making the remote host send the serial command to the LS100W whenever it is connected to the

remote host. This option is useful when users need to gather the device information periodically even if the serial device does not send its data periodically. Figure 4-3 shows the State Transition Diagram of the session operations in *TCP client* mode.

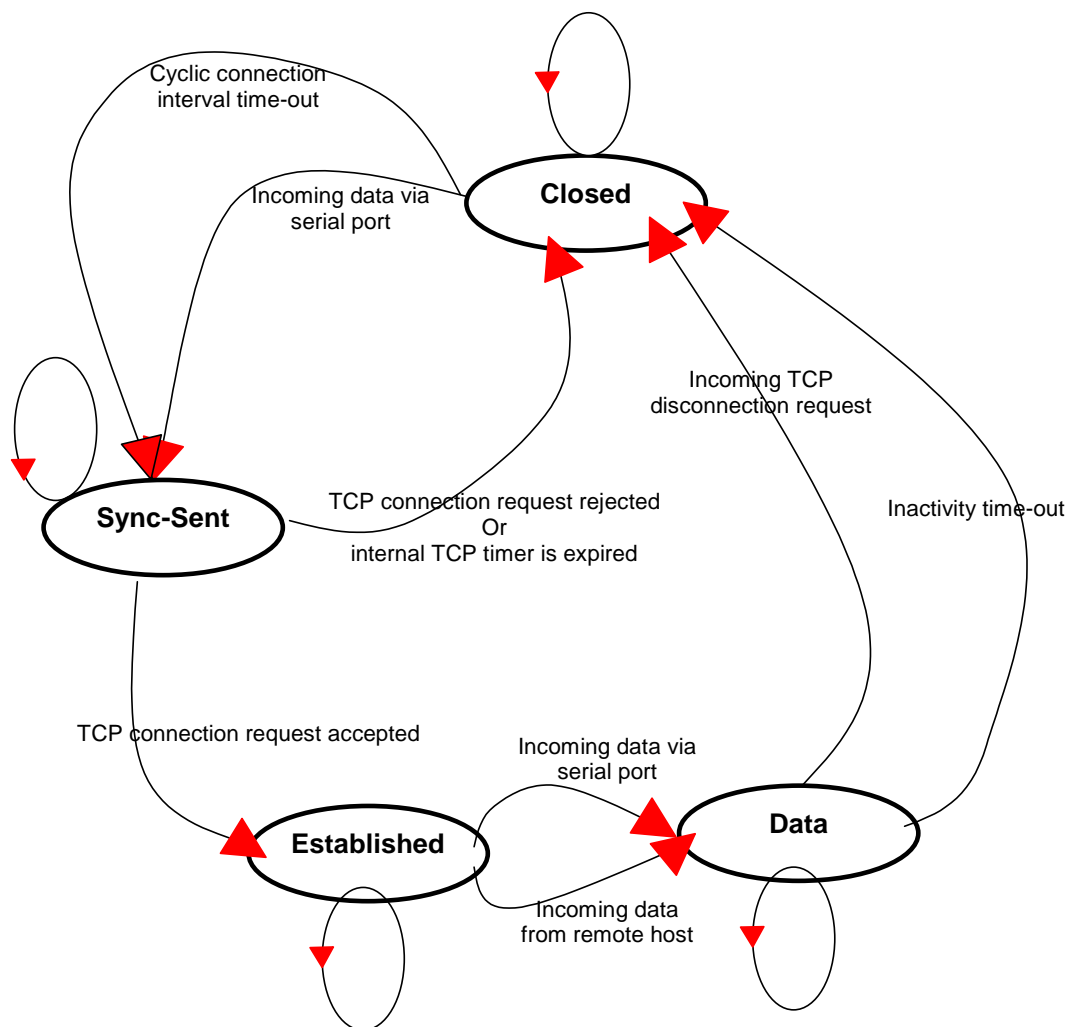


Figure 5-3. State Transition Diagram of TCP client mode

5.2.2 TCP Client Mode Configuration

To configure the LS100W to work as a TCP client, use set command as follows:

set host tcpc dest_ip dest_port cyclic_connection_interval inactivity_timeout + <CR>

where,

dest_ip = destination IP address

dest_port = destination TCP port

cyclic_connection_interval = cyclic connection interval in minutes
inactivity_timeout = inactivity timeout in seconds.

Destination IP address and **destination TCP Port** are the information on the remote host to which the LS100W will try to connect in TCP client mode. The IP address (or domain name) should be specified together with the TCP port number.

Cyclic connection interval is the time interval at which the LS100W will try to connect to the remote host regardless of the existence of incoming data from the serial port. If the interval is specified with a valid value other than 0, the function is enabled. The time interval will be the specified value by the unit of minute. If the interval is entered as 0, cyclic connection feature will be disabled.

Inactivity timeout is the same as described in TCP server mode setting section.

Figure 5-4 shows TCP client mode setting example:

```
> set host tcpc 192.168.1.1 6001 10 300
OK
>
```

Figure 5-4 TCP client mode setting

5.3 TCP Server/Client Mode Operations

5.3.1 Overview

The LS100W works as either TCP server or client according to the situation. This will be the typical mode for most applications, since it will transfer the data either from serial port or from TCP port. The default TCP state is [Listen] which is the same as that of *TCP server mode*.

1) Typical State Transition

[Listen] --> [Sync-Received] --> [Established] --> [Data] --> [Closed] --> [Listen]

Or

[Listen] --> [Sync-Sent] --> [Established] --> [Data] --> [Closed] --> [Listen]

The initial state is [Listen]. If there are data coming from the serial port, it will connect to the remote host as a TCP client. If there is incoming connection request from the remote host, it will accept the connection as a TCP server, and then transfer data through the serial port. Thus, users can assume that the LS100W is always connected to the specified remote host.

2) Operations

The only difference from *TCP server* mode is that the LS100W will try to connect and send serial data to the remote host even if the TCP session is not established. The difference from *TCP client* mode is that it will accept incoming connection request from remote host if the session is not established. The detailed operation principles are the same as that of *TCP server* and *TCP client* mode.

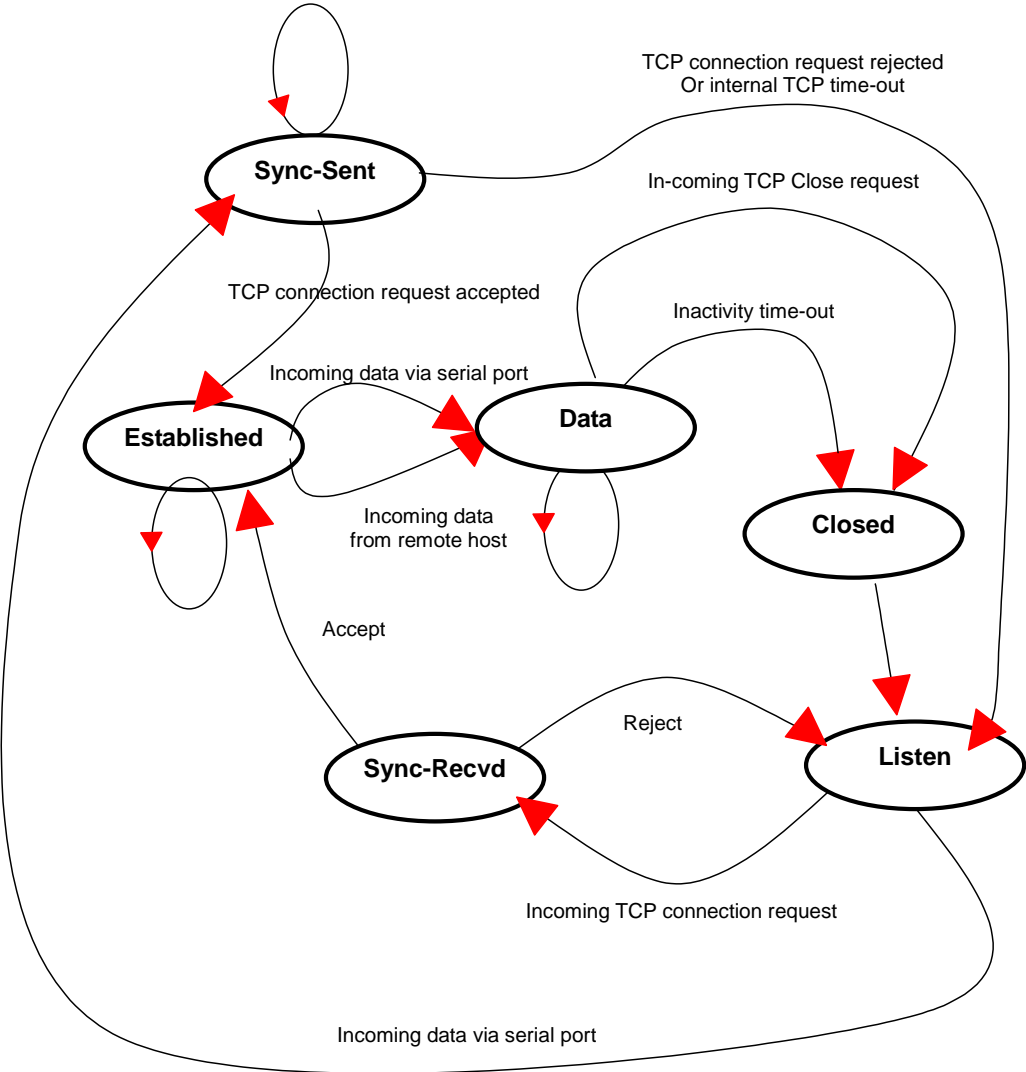


Figure 5-5. State Transition Diagram of TCP server/client mode

5.3.2 TCP Server/Client Mode Configuration

To configure the LS100W to work as a TCP server/client mode, use 'set' command as follows:

set host tcpssc listening_port dest_ip dest_port cyclic_connection_interval inactivity_timeout
where,

listening_port = listening TCP port

dest_ip = destination IP address

dest_port = destination TCP port

cyclic_connection_interval = cyclic connection interval in minutes

inactivity_timeout = inactivity timeout in seconds.

Parameter definitions for TCP server and client mode configuration are the same with TCP server mode and TCP client mode parameters.

Figure 5-6 shows TCP server/client mode setting example:

```
> set host tcpssc 6001 192.168.1.100 7001 10 300
OK
>
```

Figure 5-6 TCP server/client mode setting

6: Serial Port Configuration

To attach the serial device to the LS100W serial port, its serial port operation should match exactly to that of the serial device. Serial port configuration parameters are summarized in Table 6-1.

Table 6-1. Serial Port Configuration parameters

Parameter	Values
Baud rate	1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200
Data bits	7 bits or 8 bits
Parity	None, Even or Odd
Stop bits	1 bit or 2 bits
Flow control	None, Hardware (RTS/CTS)
DTR option	Always HIGH, Always LOW, or Show TCP connection
DSR option	None, Accept TCP connection only by HIGH, or Open/Close TCP connection
Inter-character timeout	Inter-character timeout value in milliseconds

To configure serial port parameters, use 'set' command as follows:

```
set serial baudrate data_bits parity stop_bits flow_control dtr_option dsr_option  
interchar_timeout(ms)
```

where,

baudrate: 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200

data_bits: 7=7-bits / 8=8-bits

parity: n=none / e=even / o=odd

stop_bits: 1=1-bit / 2=2-bits

flow_control: n=none / h=hardware

dtr_option: h=always high / l=always low / s=show tcp connection

dsr_option: n=none / a=accept only by high / o=open,close TCP connection

interchar_timeout: inter-character timeout value in milliseconds

The factory default settings of **baud rate**, **data bits**, **parity** and **stop bits** are *9600*, *8 data bits*, *No-parity* and *1 stop bit* respectively. Among the serial configuration, there are three serial modes the LS100W does not support. The LS100W does not support 7 data bits, No parity, 1 stop bit configuration. In this case, the LS100W will operate as 7 data bits, No parity, 2 stop bit mode. In case the LS100W is configured as 8 data bits, Even(or Odd) parity, 2 stop bits mode, the LS100W will operate as 8 data bits, Even (or Odd) parity, 1 stop bit mode.

The factory default setting of the **flow control** is *None*. Only hardware flow control using RTS/CTS is

supported by the LS100W. Hardware flow control method controls data communication flow by sending signals back and forth between two connected devices.

The purpose of the DTR/DSR pin is to emulate modem signal control or to control TCP connection state by using serial port signal. The DTR is a write-only output signal, whereas the DSR is a read-only input signal in the LS100W side.

The **DTR option** can be set to one of three types: *always high*, *always low* or *show TCP connection*. If the DTR behavior is set to *show TCP connection*, the state of the DTR pin will be maintained high if the TCP connection is established.

The **DSR option** can be set to one of three types: *none*, *allow TCP connection only by high* or *open/close TCP connection*. *Allow TCP connection only by HIGH* is valid only if host mode is TCP server or equivalent. If this option is set, the incoming TCP connection request will be accepted only when the DSR signal is high state. *Open/close TCP connection* is valid only if the host mode is a TCP client or equivalent. If the DSR behavior is set to *open/close TCP connection*, the high state of the DSR pin will make the LS100W send a connection request to the specified destination host, whereas the low state close a connection.

Inter-character timeout defines the interval that the LS100W fetches the overall serial data from its internal buffer. If there is incoming data through the serial port, the LS100W stores data into the internal buffer. The LS100W transfers data stored in the buffer via TCP/IP, only if the internal buffer is full or if the inter-character time interval reaches to the time specified as *inter-character timeout*.

Optimal inter-character timeout would be different according to your application but at least it must be larger than one character interval within specified baud rate. For example, assume that the serial port is set to 1200 bps, 8 Data bits, 1 stop bit, and no parity. In this case, the total number of bits to send a character is 10 bits and the time required to transfer one character is

$$10 \text{ (bits)} / 1200 \text{ (bits/s)} * 1000 \text{ (ms/s)} = 8.3 \text{ ms.}$$

Therefore, you have to set *inter-character timeout* to be larger than 8.3 ms. The *inter-character timeout* is specified in milliseconds and must be larger than 10 ms.

If users want to send the series of characters into a packet, serial device attached to the LS100W should send characters without time delay larger than *inter-character timeout* between characters and the total length of data must be smaller than or equal to the LS100W internal buffer size. The serial communication buffer size of LS100W is 1400 bytes.

Figure 5-1 shows serial port configuration example of 9600 bps, 7 data bits, even parity, 2 stop bits, hardware flow control, DTR shows TCP connection, No DSR behavior and inter-character time out of 10 ms:

```
> set serial 9600 7 e 2 h s n 10
```

```
OK  
>
```

Figure 6-1 Serial port configuration

7: System Administration

Users can configure administrator username, password and device name using set command as follows:

set admin username password devicename

username: login username

password: login password

devicename: device name

Figure 7-1 shows administrative parameters configuration example:

```
> set admin adminuser adminpassword LS100W_test1
OK
>
```

Figure 7-1 Administration parameters configuration

Appendix A: Connections

A.1 Serial Port Pin Outs

The pin assignment of the LS100W DB9 connector is summarized in Table A-1. Each pin has a function according to the serial communication type configuration.

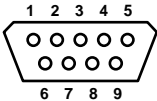


Figure A-1. Pin layout of the DB-9 connector

Table A-1. Pin assignment of the DB-9 connector

Pin	RS232
1	-
2	Rx
3	Tx
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	-

A.2 Serial Wiring Diagram

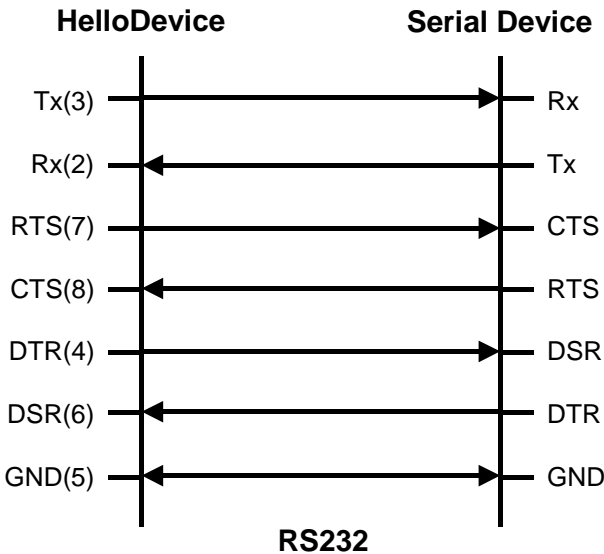


Figure A-2 RS232 wiring diagram

Appendix B: Well-known Port Numbers

The port numbers are divided into three ranges: the Well Known Ports, the Registered Ports, and the Dynamic and/or Private Ports. The Well Known Ports are those from 0 through 1023. The Registered Ports are those from 1024 through 49151. The Dynamic and/or Private Ports are those from 49152 through 65535.

The Well Known Ports are assigned by the IANA, and on most systems, can only be used by system processes or by programs executed by privileged users. Table B-1 shows famous port numbers among the well-known port numbers. For more details, please visit IANA website:

<http://www.iana.org/assignments/port-numbers>

Table B-1 Well-known port numbers

Port number	Protocol	TCP/UDP
21	FTP (File Transfer Protocol)	TCP
22	SSH (Secure SHell)	TCP
23	Telnet	TCP
25	SMTP (Simple Mail Transfer Protocol)	TCP
37	Time	TCP, UDP
39	RLP (Resource Location Protocol)	UDP
49	TACACS, TACACS+	UDP
53	DNS	UDP
67	BOOTP server	UDP
68	BOOTP client	UDP
69	TFTP	UDP
70	Gopher	TCP
79	Finger	TCP
80	HTTP	TCP
110	POP3	TCP
119	NNTP (Network News Transfer Protocol)	TCP
161/162	SNMP	UDP

Appendix C: Troubleshooting

C.1 Power/LED Status Troubleshooting

Problem	Cause	Action
Power LED does not light up	Power cable is not connected	Check power connection
Link LED does not light up	Ethernet cable is not connected	Check Ethernet cable connection
	Invalid Ethernet cable is used	There are two types of Ethernet cables: Straight-through cable and crossover cable. If you are using an Ethernet hub, use straight-through cable. If direct connection between the LS100W and remote host is used, use crossover cable instead.
ACT LED does not blink	Invalid IP configuration	Check IP configuration parameters

C.2 Serial Console Troubleshooting

Problem	Cause	Action
Serial console is not connected	Invalid serial cable	Be sure to use a serial console cable (null-modem cable) for serial console
	Invalid serial port configuration of terminal emulation program	Check serial port configuration of terminal emulation program: 9600 bps, 8 Data bits, No parity, 1 stop bit, Hardware flow control
	Invalid Console/Data switch position	Be sure that Console/Data switch position is Console side.
Serial console is halted for few seconds periodically	IP mode is DHCP, but IP is not assigned	If IP mode is set to DHCP but IP is not actually assigned because of DHCP server failure, serial console is halted for few seconds at every 20 seconds. Change IP mode to the static IP mode
Cannot login to console	Invalid username and/or password	Use valid username and password. If username and/or password are lost, perform factory default reset using factory reset switch. Factory default value of username and password are both <i>admin</i>

C.3 Remote Console Troubleshooting

Problem	Cause	Action
Cannot connect to the LS100W using telnet	The LS100W is not assigned valid IP address	Use serial console to assign valid IP address to the LS100W
	Someone is using serial console	Exit serial console and retry telnet connection

Cannot login to console	Invalid username and/or password	Use valid username and password. If username and/or password are lost, perform factory default reset using factory reset switch. Factory default value of username and password are both <i>admin</i>
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C.4 IP Address Troubleshooting

Problem	Cause	Action
Cannot find IP address of the LS100W		Use serial console to find IP address
		Use HelloDeviceManager program to probe the LS100W on the network
HelloDeviceManager cannot probe the LS100W	The LS100W is not assigned valid IP address	Use serial console to assign valid IP address to the LS100W
	HelloDeviceManager and the LS100W are not on the same subnet	Run HelloDeviceManager on the PC that is on the same subnet with the LS100W

C.5 DHCP Troubleshooting

Problem	Cause	Action
Cannot lease IP address	DHCP server is not working	Check if DHCP server is working correctly
IP address of the LS100W is changed	DHCP server does not extend lease time	Check if DHCP server is working correctly

C.6 TCP Server Mode Operation Troubleshooting

Problem	Cause	Action
Cannot connect to the LS100W	IP configuration of remote host is invalid	Check if IP configuration of the remote host is valid
	Host mode of the LS100W serial port is not TCP server	Change the host mode of the LS100W serial port to TCP server or TCP server/client
	IP address of the LS100W or TCP port number is wrong	Specify valid IP address and TCP port number of the LS100W
	DSR option is set but DSR input is not high	Disable DSR option or make DSR input of the LS100W high
	TCP connection with the other host is established already	Close established TCP connection or connect later

C.7 Serial Communication Troubleshooting

Problem	Cause	Action
Serial data are not transferred by TCP/IP immediately	Too large inter-character timeout	Set inter-character timeout with smaller value
Cannot communicate with the LS100W	Invalid serial port configuration	Check if serial port configuration of the LS100W are the same with that of the serial device
Invalid data transferred	Invalid serial port configuration	Check if serial port configuration is correct.