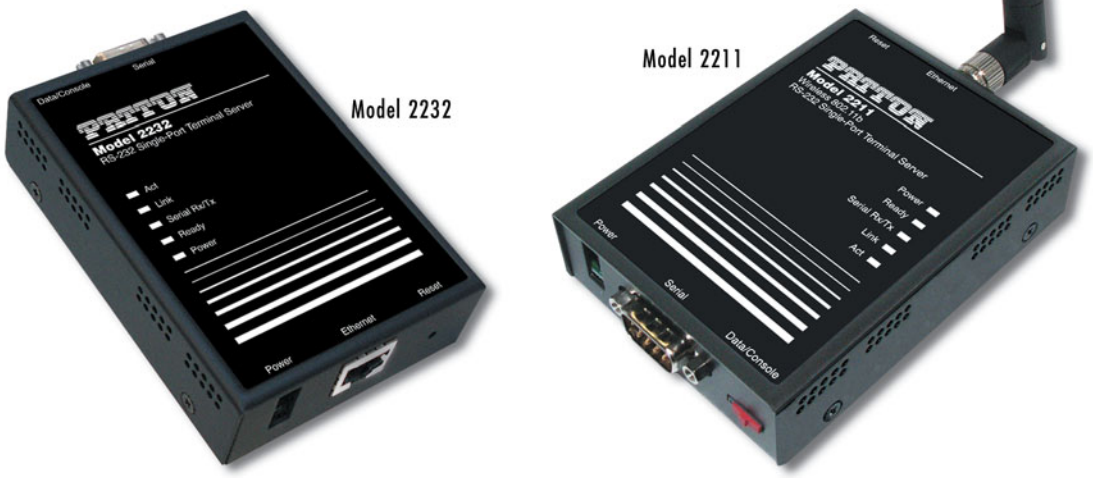
PATTON Electronics Co.

Model 2211
EtherBITS™ Wireless 802.11b RS-232 Single-Port Device Server

Model 2232
EtherBITS™ RS-232 Single-Port Device Server

Getting Started Guide



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Note Conformity documents of all Patton products can be viewed online at www.patton.com under the appropriate product page.

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About this guide

This guide describes installing and configuring a Patton Electronics Model 2211 EtherBITS™ Wireless 802.11b RS-232 Single-Port Device Server or Model 2232 EtherBITS RS-232 Single-Port Device Server. By the time you are finished with this guide, your device server will be fully connected and able to transfer data.

Audience

This guide is intended for the following users:

- Operators
- Installers
- Maintenance technicians

Structure

This guide contains the following chapters and appendices:

For best results, read the contents of this guide *before* you install the device server.

Precautions

Notes, cautions, and warnings, which have the following meanings, are used throughout this guide to help you become aware of potential problems. ***Warnings*** are intended to prevent safety hazards that could result in personal injury. ***Cautions*** are intended to prevent situations that could result in property damage or impaired functioning.

Note A note presents additional information or interesting sidelights.


IMPORTA

The alert symbol and IMPORTANT heading calls attention to important information.


CAUTI

The alert symbol and CAUTION heading indicate a potential hazard. Strictly follow the instructions to avoid property damage.


CAUTI

The shock hazard symbol and CAUTION heading indicate a potential electric shock hazard. Strictly follow the instructions to avoid property damage caused by electric shock.


WARNI

The alert symbol and WARNING heading indicate a potential safety hazard. Strictly follow the warning instructions to avoid personal injury.


WARNI

The shock hazard symbol and WARNING heading indicate a potential electric shock hazard. Strictly follow the warning instructions to avoid injury caused by electric shock.

Safety when working with electricity


WARNIN

This device contains no user serviceable parts. The equipment shall be returned to Patton Electronics for repairs, or repaired by qualified service personnel.


WARNIN

Do not work on the system or connect or disconnect cables during periods of lightning activity.

The external power adaptor shall be a listed limited power source that incorporates a disconnect device and shall be positioned within easy reach of the operator. The mains outlet shall be within 10 feet (3 meters) of the device, shall be easily accessible, and protected by a circuit breaker.

Hazardous network voltages are present in WAN ports regardless of whether power to the unit is ON or OFF. To avoid electric shock, use caution when near WAN ports. When detaching the cables, detach the end away from the device first.

In accordance with the requirements of council directive 2002/96/EC on Waste of Electrical and Electronic Equipment (WEEE), ensure that at end-of-life you separate this product from other waste and scrap and deliver to the WEEE collection system in your country for recycling.

General observations

Clean the case with a soft slightly moist anti-static cloth

Place the unit on a flat surface and ensure free air circulation

Avoid exposing the unit to direct sunlight and other heat sources

Protect the unit from moisture, vapors, and corrosive liquids

Factory default parameters

device server EtherBITS Universal Single-Port Device Server have the following factory default parameters.

Ethernet IP address: **192.168.161.5**

Login: **root**

Password: **root**

Static IP address

Filter: “All services and ports are accessible from any host.”

Serial port: 9600 data rate , 8-bits, no parity, 1 stop bit, no flow control

Typographical conventions used in this document

This section describes the typographical conventions and terms used in this guide.

General conventions

The procedures described in this manual use the following text conventions:

Table 1. General conventions

Convention	Meaning
Garamond blue type	Indicates a cross-reference hyperlink that points to a figure, graphic, table, or section heading. Clicking on the hyperlink jumps you to the reference. When you have finished reviewing the reference, click on the **Go to Previous View** button  in the Adobe® Acrobat® Reader toolbar to return to your starting point.
Futura bold type	Commands and keywords are in **boldface** font.
Futura bold-italic type	Parts of commands, which are related to elements already named by the user, are in ***boldface italic*** font.
Italicized Futura type	Variables for which you supply values are in *italic* font
Futura type	Indicates the names of fields or windows.
Garamond bold type	Indicates the names of command buttons that execute an action.

Chapter 1 Overview

Chapter contents

Introduction

The EtherBITS 2211 and 2232 enable you to network-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 network.

Figure 1. Model 2211 EtherBITS device server

Both devices are cost-effective single-port serial-Ethernet communication devices. The Model 2211 (see figure 1) connects to the network via 802.11b wireless transmission. The Model 2232 (see figure 2) connects to the network through an RJ-45 connector. Both devices support RS-232 serial communications that enable virtually any asynchronous serial device to be accessed over a network.

Figure 2. Model 2232 EtherBITS device server

As for the Internet connectivity, the devices open network protocols such as TCP/IP allowing serial devices to be accessed over broadband network or conventional LAN (local area network) environment.

The device servers provides a management console, by using Telnet and the serial console port, which is under password protection. The device servers also provide a management function with the use of the EtherBITS Manager Software Utility.

The device servers accommodate the requirements of the Retail POS, Security, Automation and Medical marketplaces.

Note This manual assumes user knowledge of Internetworking protocols and serial communications

Glossary

This section defines commonly used terms in this manual. These terms are related to Internetworking, and defined in regards to their use with device server.

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 is the same as the 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 MAC address can be found on the bottom of the original package.

Host

A user's computer connected to the network

Internet protocol specifications define *host* as any computer that has full two-way access to other computers on the Internet. A host will have 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. If the specified end point replies, and agrees to the connection, the end points then 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 on one or many computers. The 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.

Acronyms

Acronym	Definition
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
PPPoE	Point-To-Point Protocol over Ethernet
HTTP	HyperText Transfer Protocol
DNS	Domain Name Service
DDNS	Dynamic Domain Name Service
SNMP	Simple Network Management Protocol
RADIUS	Remote Access for Dial-In User Service
SSH	Secure Shell
NTP	Network Time 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
DCD	Data Carrier Detect

Chapter 2 Getting started

Chapter contents

Introduction

This chapter describes how to set up and configure the device server.

- "Unpacking the device server"—lists the contents of the device server's shipping container
- "Controls, ports, and indicators"—Explains the layout of the device server controls and LED indicators
- "Connecting the hardware" on page 20—Describes how to connect the power, the network, and the serial device to the EtherBITS device server.
- "Accessing the Console Port" on page 22—Describes how to access the console port by using a serial console at a local site or telnet console at a remote site.
- "Command usage" on page 25—Describes how to use command set of the device server to configure and view parameter values and status.

The following items are 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 Ethernet cable
- One PC with network interface card (hereafter, NIC) and/or one RS-232 serial port.
- Terminal emulation program running on the PC

Unpacking the device server

Inspect the shipping carton for external damage. Note any damage before removing the container contents. Report equipment damage to the shipping carrier immediately for claim purposes. Save all packing materials in case you need to return an item to the factory for servicing.

The device server comes with the following items:

- device server
- External 110 VAC (or 230 VAC) power supply
- Serial cable kit
- CD-ROM containing the Serial/IP, EtherBITS Device Manager, device server Quick Start Guide, and device server Getting Started Guide

Controls, ports, and indicators

The device server has five LEDs that display the current system status (see figure 3). The serial port status LEDs are described in table 2.

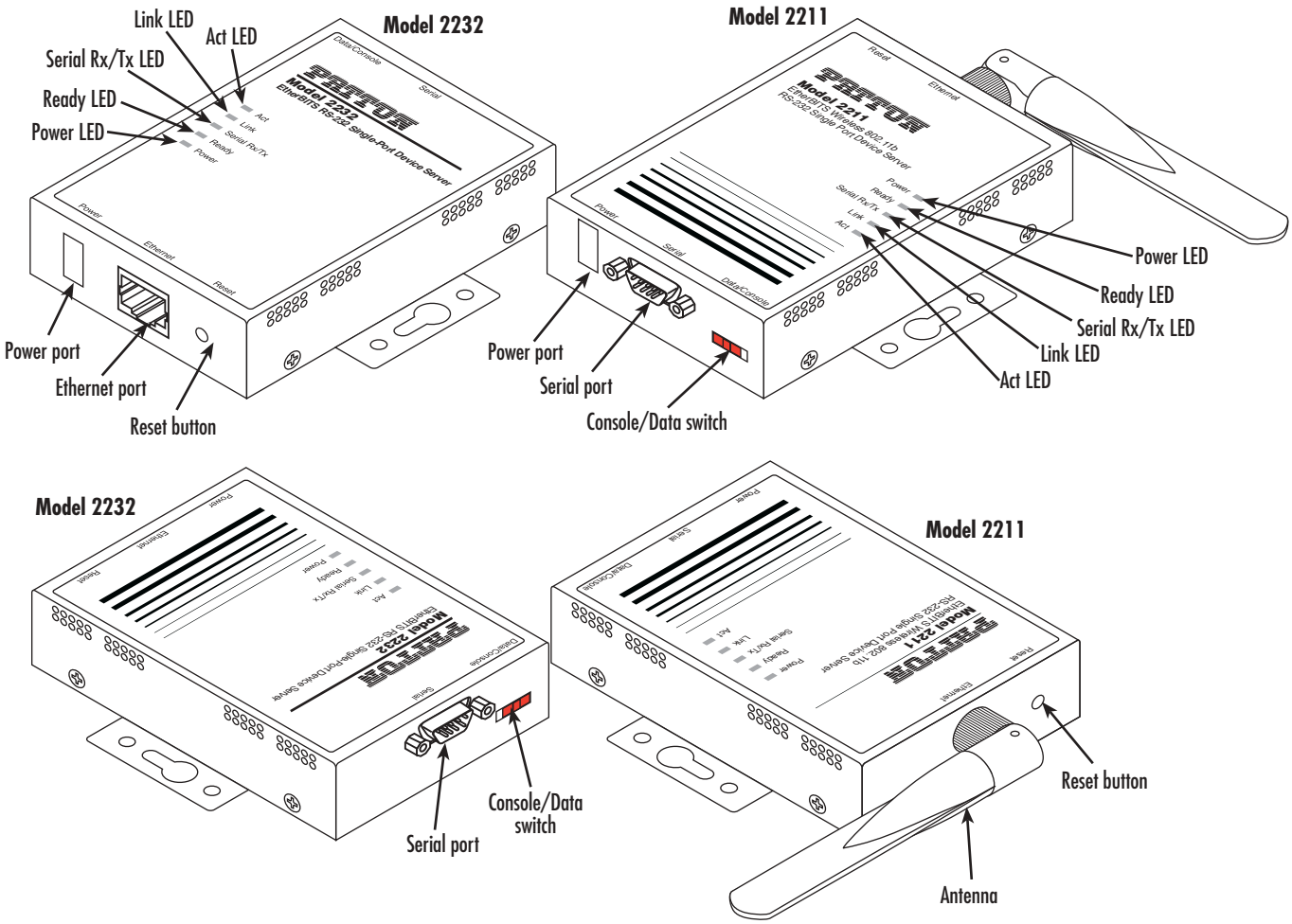

Figure 3. Device server LEDs, switches, and ports

Table 2. Device server LEDs

Lamps		Function
10 Base-T	Link	Green if connected to 10 Base-T Ethernet network.
	Act	Blinks whenever there is any activities such as incoming or outgoing packets through the device server's Ethernet connection.
Serial port	Rx/Tx	Blinks whenever there is any incoming or outgoing data stream through the serial port of the device server.
Status	Ready	Green if the device server is operating.
	Power	Red when power is supplied.

The *Factory Reset* button on the device server (see figure 4) is used to restore the device server to the factory default configuration.

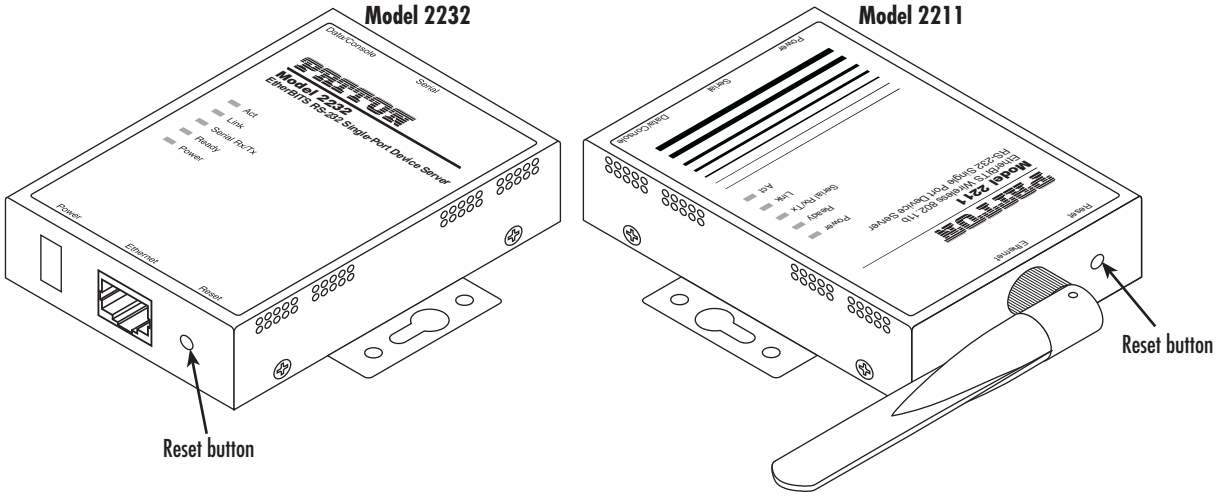

Figure 4. *Factory Reset* button location

The *Console/Data* switch (see figure 3 on page 19) enables a user to set the serial port for console or data mode. (Refer to section "Accessing the Console Port" on page 22 for more information on serial console access)

Connecting the hardware

This section describes how to connect the device server to your equipment for initial testing.

- Connecting a power source to the device server (see section "Connecting power").
- Connecting the device server to the network:
  - Model 2232: See section "Connecting the Ethernet cable (Model 2232 only)" on page 21 to connect an Ethernet cable between the Model 2232 and Ethernet hub or switch
  - Model 2211: See section "Connecting to the wireless LAN (Model 2211 only)" on page 21 to connect the Model device server to the wireless LAN
- Connecting the device server to a serial device through serial data cable (see "Connecting to the serial device" on page 22).

Connecting power

CAUTI

The interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

1. Plug the DC power supply cable connector into the device server's *Power* port (see figure 3 on page 19).

2. Verify that the power cord included with your device server is compatible with local standards. If it is not, refer to chapter 5, "Contacting Patton for assistance" on page 32 to find out how to replace it with a compatible power cord.
3. Connect the male end of the DC power supply power cord to an appropriate AC power outlet. Verify that the *Power* LED maintain a solid red.

Connecting the device server to the network

Refer to the appropriate section below to connect your device server to the network:

- Model 2232: See section "Connecting to the wireless LAN (Model 2211 only)" on page 21 to connect an Ethernet cable between the Model 2232 and Ethernet hub or switch
- Model 2211: See section "Connecting to the wireless LAN (Model 2211 only)" on page 21 to connect the Model device server to the wireless LAN

Connecting the Ethernet cable (Model 2232 only)

The interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

Connect the one end of the Ethernet cable to the Model 2232 10Base-T *Ethernet* port (see figure 3 on page 19) and the other to the Ethernet network. If the cable is properly connected, the Model 2232 will indicate a valid connection to the Ethernet network as follows:

- *Link* LED of the Model 2232 maintains solid green
- *Act* LED continuously blinks to indicate the incoming/outgoing Ethernet packets

If either of the above do not occur, the Model 2232 is not properly connected to the Ethernet network.

Connecting to the wireless LAN (Model 2211 only)

When power is connected correctly, the Model 2211 will automatically search for the 802.11b wireless local area network (LAN) access point (AP) and attempt to connect to the wireless LAN AP. The Model 2211 will indicate a valid connection to the wireless LAN AP as follows:

- The *Link* LED lamp on the 2211 front panel will remain solid orange.
- The *Act* LED lamp on the 2211 front panel will blink continuously to indicate that incoming and outgoing wireless LAN packets are being transferred

Before connecting the Model 2211 to a wireless LAN access point, users must first set the corresponding information on the 2211, such as the SSID of the Wireless LAN access point.

Refer to chapter 3, "Wireless LAN configuration (Model 2211 only)" on page 30 to set the appropriate parameters for a wireless LAN connection.

Connecting to the serial device

The interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

Connect the serial cable to the device server *Serial* port (see figure 3 on page 19). To connect to the serial port of the device, the user needs to consider the type of console port provided by the device itself. Refer to appendix C, "Cable Recommendations" on page 64 for details.

Note If the configuration of the device server through the serial console is required, connect the serial cable to the serial port of user's computer first. And push the *Console/Data* switch (see figure 3 on page 19) to the *Console* side.

Accessing the Console Port

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

- **System console**: Local users can connect directly to the system console port of the device server using a serial/data console cable (null-modem cable). To use the serial port as the console port, slide *Data/Console* switch to the *Console* side. The serial port of the device server is used as the console port as well as the data port.
- **Remote console**: Remote users can make a telnet connection to the remote console port (port 23) of the device server via a TCP/IP network.

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

Using the System console

1. Connect one end of the console cable to the *Serial* port on the device server (see figure 3 on page 19).

The interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

2. Slide the *Console/Data* switch to the *Console* side.
3. Set the position of DIP switch for serial mode to RS-232 mode. Configuration of DIP switch is discussed in appendix C, "Cable Recommendations" on page 64.
4. Connect the other end of the cable to the serial port of the user's computer.
5. Run a terminal emulator program (i.e. HyperTerminal). Set the serial configuration parameters of the terminal emulation program as follows:
   - 9600 Baud rate
   - Data bits 8

– Parity None

– Stop bits 1

– Hardware flow control

6. Press the [ENTER] key.
7. Enter your username and password to log into the device server. The factory default user settings are as follows.

   – Login: **admin**

   – Password: **admin**

8. After login, the command prompt screen will appear as follows:

```
login: admin
password: *****
Type 'help' to get command usages
> help
set group par1 [par2 ...] + <CR>
- group = 'ip','host','serial' or 'admin'
- par1 ... = configuration parameters. Use * to keep a parameter's value
get [group] + <CR>
- 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.
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.
help [group] + <CR>
- If group is omitted, shows this screen.
- If group is specified, shows 'set' command usage of the group.
save + <CR>
- Save changes
exit + <CR>
- Exit without rebooting the device
reboot + <CR>
- Exit and reboot the device

>
```

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 "Command usage" on page 25.

Using remote console

The device server provides remote console feature via telnet as well as serial console so that users can access the device server at remote site for configuration and monitoring purposes. The IP address of the device server 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 the remote console of the device server, do the following:

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 device server. 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 the parameters shown in figure 5:

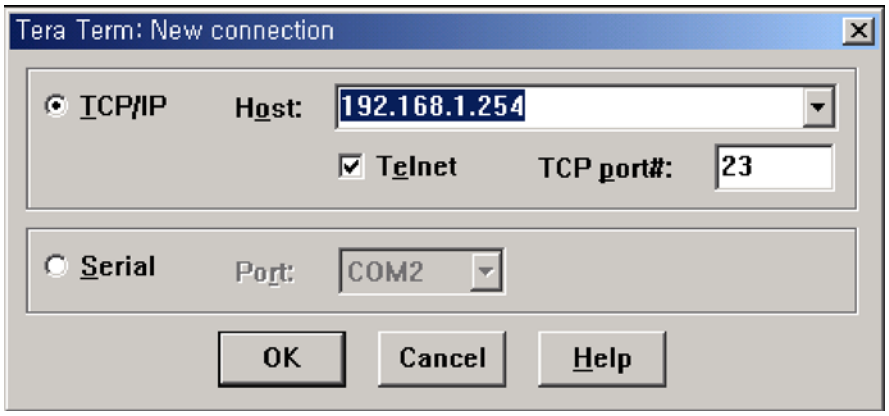

Figure 5. Telnet program set up example (TeraTerm Pro)

2. The user has to log into the device server. 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 device server 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.

Command usage

The device server provides several simple commands for configuration and control of the device server. Table 3 summarizes command set which the device server supports.

Table 3. Device server 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

'set' Command

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

```
set group par1 [par2 ...] + <CR>
where,
group = 'ip','host','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 following example.

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

In the above example, the first parameter 'ip' indicates that the following parameters are IP configuration parameters. The second parameter 'static' indicates that the device server 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 example below shows how to change subnet mask only without changing IP address and gateway IP address.

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

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 below.

```
> 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

>
```

Note The changed values will not take effect until **save** and **reboot** commands are invoked. For more details, refer to section "'save' Command" on page 29 and section "'reboot' Command" on page 29.

'get' Command

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

```
get [group] + <CR>
where,
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.
```

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, use the **get** command as shown below.

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

'status' group is a special group where **set** command does not apply. **get status** will display current system status as shown below (example shows Model 2232 information):

```
> get status
Serial_no.: 2232-0207_test
MAC_address: 00-01-95-77-88-99
F/W_REV.: V1.2.0
Current_IP: 192.168.0.125
>
```

If *group* is omitted, **get** command will show all of the parameter values as shown below (example shows Model 2232 information).

```
> get
--- Status ---
Serial_no.: 2232-0207_test
MAC_address: 00-01-95-77-88-99
F/W_REV.: V1.2.0
Current_IP: 192.168.0.125
--- Admin ---
Username: admin
Password: admin
Devicename: 2232 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
>
```

'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.
```

The following shows the help screen when no group is specified

```
> help
set group par1 [par2 ...] + <CR>
- group = 'ip','host','serial' or 'admin'
- par1 ... = configuration parameters. Use * to keep a parameter's value
get [group] + <CR>
- 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.
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
```

The following shows the help screen with 'ip' group specified.

```
> 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
```

'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 the **save** command is invoked. After the **factorydefault** command has been used, the **save** and **reboot** commands are required as follows for changes to take effect.

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

'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 device server is rebooted by **reboot** command or manual rebooting.

'exit' Command

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

```
exit + <CR>
```

'reboot' Command

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

```
reboot + <CR>
```

Chapter 3 **Wireless LAN configuration (Model 2211 only)**

Chapter contents

Introduction

IEEE 802.11, a wireless LAN standard, is the basic network element used by this device. It requires one or more nodes and a wireless LAN access point (AP). Often, the word *node* refers to the notebook computers, personal computers, and PDAs that use wireless LAN cards. In this guide, *node* will refer to the Model device server device server.

Infrastructure Mode and Ad-hoc Mode

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

Network Name: SSID (Service Set Identifier)

A wireless LAN network can be configured under different names at depending on the AP's configuration. SSID is an ID value that distinguishes one wireless network from another. If a network is configured in the infrastructure mode, users need to input and set the target AP's SSID into device server so that the device server can communicate with the target AP. Therefore, users need first to check the target AP's SSID. On the other hand, when using the ad-hoc mode, inter-communicating device servers should have the same SSID. The SSID can be set to a maximum length of 32 bytes, and it can be set using ASCII characters or hexadecimal (hex) numbers.

Channel

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

Even when a certain value or an asterisk ('*') symbol is entered in a channel value entry using the **set** command, the device server will ignore those values and automatically set the values as the AP channel values of the group in which it belongs.

Security

802.11b based applications are different from wired Ethernet applications in the way they support security functions. The 802.11 Committee recognizes that the wired Ethernet supports a very high level of internal security. Therefore, when creating policies for wireless LAN standards, the Committee has aimed to ensure that Wireless has the same high level of security as that of the Ethernet.. WEP (wired equivalent privacy) uses RSA Security's RC4 PRNG encryption algorithm and 40-bit shared key to encrypt data. Thus, in the device server, 5 bytes of ASCII characters or 10-digit hex numbers are used to represent 64 bits of WEP1, and 13 bytes of ASCII characters or 26-digit hex numbers 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.

Settings

For proper operation of the device server in a wireless environment, users must set the wireless parameters in the device server's wireless LAN according to the requirements of the designated wireless LAN network environment. To do this, 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
SSID: Default
Type: Infrastructure
National Code: Korea
Encryption Type: 64bit
Key Input Method: Hexadecimal
WEP Key: 1234567890
>
```

Table 4. Wireless LAN setting parameters

Parameter	Values
SSID	Default / (Max 16 32 characters)
Type	Infrastructure mode or Ad-hoc mode
Channel	CH .1-CH.13 (can be checked during booting sequence)
Encryption Type	None(0), 64 or 128 bits
Key Input Method	ASCII or Hexadecimal

Table 4 parameters are described in the following sections.

SSID

Factory default value of SSID is *Default*. User can change this value according to the SSID of his AP to be used. If the value of SSID in device server is not changed from factory default value, *Default*, device server scans APs in the neighborhood and selects the AP that has the strongest signal level automatically. This auto scan and selection is continued until the valued of SSID is changed from *Default* at every reboot. But if there is an AP with *Default* SSID, device server will connect to this AP first.

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.

WEP Key

The WEP Key field is for user authentication. If the WEP1 value is 64 bits, the user must enter a 5-characters ACSII password in ASCII mode or 10-digit hexadecimal password in hexadecimal mode. If the WEP1 value is 128 bits, the user must enter a 13-characters ASCII password in ASCII mode or 26-digit hexadecimal password in hexadecimal mode. For example, if WEP2 is set as a hex code type, the user could enter 0123456789 (when WEP1 is set to *64 bits*), or 0123456789ABCDEF0123456789 (when WEP2 is set to *128 bits*).

The basic **set** commands for wireless LAN (wlan) settings are as follows:

```
set wlan SSID type National_code ch WEP1 WEP2 WEP_Key
- SSID: Max 32 character(Use double quotation mark to include space character)
- type: i=infrastructure / a=AdHoc
- National_Code:
 1.USA/2.Canada/3.EU,Australia/4.Spain/5.France/6.Korea/7.Japan/8.Others
- ch: set channel number when adhoc mode
- WEP1: 0=none / 1=64bit / 2=128bit
- WEP2: a=ASCII type pass,h=Hexdecimal type pass
- WEP_Key: ASCII type = 5(64bit) or 13(128bit) character input,
- Hexdecimal type = 10(64bit) or 26(128bit) number input
```

Note If the type is set as infrastructure, channel will be set to the same value of the connected AP internally regardless of the value set by the user.

The following examples show the commands needed to configure the device server's wireless LAN settings:

- SSID=Default, National Code=Korea, infrastructure , arbitrary channel number, WEP Key disabled

```
> set wlan Defalut i 6 * 0(National Code: Korea, WEP Key disabled)
```

- SSID=Default, National Code=Korea, Adhoc , channel number=4, WEP Key disabled

```
> set wlan Default a 6 4 0
```

- SSID=Default 1, National Code=Korea, Adhoc , channel number=4, WEP Key disabled (If there are space characters in SSID, you should use a double quotation mark to set SSID.)

```
> set wlan “Default 1” a 6 4 0
```

Chapter 4 IP address configuration

Chapter contents

Introduction

A valid IP address of the device server 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 device server 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 5 shows the parameter items for IP configuration.

Table 5. IP configuration parameters

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
```

Static IP

In the *Static IP* mode, users have to manually specify all the parameters such as *IP addresses* of the device server, 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 a proper IP address which is unique and valid for your 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 device server 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 device server, the connection is established directly from the device server. 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 device server 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, refer to the network administrator.

Static IP configuration

To configure IP configuration parameters of the device server, use **set** command as follows:

```
set ip static ip_address subnet_mask default_gateway + <CR>
where,
ip_address = IP address of the device server
subnet_mask = Subnet mask
default_gateway = Default gateway IP address
```

To apply changes, users have to invoke **save** and **reboot** commands after changing configuration.

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

DHCP

Dynamic Host Configuration Protocol (DHCP) is a communications protocol that allows network administrators to manage and automate the assignment of IP addresses centrally in an organization's network. DHCP allows a network administrator to 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 are assigned by the DHCP server, and each DHCP client computer receives the proper network information at boot-up.

To obtain an IP address, the device server 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 device server immediately places this information in its non-volatile memory. If the operating time reaches the lease time, the device server will request the DHCP server for renewal of its lease time. If the DHCP server approves extending the lease, the device server can continue to work with the current IP address. Otherwise, the device server will start the procedure to request a new IP address to the DHCP server.

A DHCP sever assigns IP addresses dynamically from an IP address pool, which is managed by the network administrator. This means DHCP client, i.e. the device server, receives a different IP address each time it boots up. To prevent the case that users do not know the IP address of the device server 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 device server found on the label sticker at the bottom of the device server:

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

DHCP Configuration

To set the device server to work in DHCP mode, just set IP mode to DHCP as follows:

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

IP Filtering

The device server has an IP address based filtering feature to prevent unauthorized remote hosts from accessing device server. The user can allow one of the following scenarios by changing the parameter settings:

- Only one host of a specific IP address can access the device server
- Hosts on the a specific subnet can access the device server
- Any host can access the device server

The user may allow a host or a group of hosts to access the device server. Then the user must enter the IP address and subnet to be allowed for accessing.

To allow only a specific host to the device server, enter the IP address of the specific host and just give 255.255.255.255 for the subnet. To allow any hosts to the device server, give 0.0.0.0 for both of the IP address and subnet. Refer to table 6 for more details.

Table 6. Input examples of allowed remote hosts

Allowable Hosts	Input format	
	Base Host IP address	Subnet mask
Any host	0.0.0.0	0.0.0.0
192.168.1.120	192.168.1.120	255.255.255.255
192.168.1.1-192.168.1.254	192.168.1.0	255.255.255.0
192.168.0.1-192.168.255.254	192.168.0.0	255.255.0.0
192.168.1.1-192.168.1.126	192.168.1.0	255.255.255.128
192.168.1.129-192.168.1.254	192.168.1.128	255.255.255.128

For example, to allow only a 192.168.1.120 host for accessing, enter the following commands,

1. DHCP mode

```
> set ip dhcp 192.168.1.120 255.255.255.255
OK
> save
OK
> reboot
```

2. Static IP mode (ip: 192.168.161.5 , subnet: 255.255.0.0 , gateway:192.168.1.1)

```
> set ip static 192.168.161.5 255.255.0.0 192.168.1.1 192.168.1.120 255.255.255.255
OK
> save
OK
> reboot
```

Chapter 5 Host Mode configuration

Chapter contents

Introduction

Host mode represents the operating session mode of the device server. 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 7 shows the brief description of the host modes. A factory default host mode is *TCP Server*.

Table 7. Device server TCP/IP session modes

Mode	Description
TCP server	Select this mode, when users want the device server to operate as a TCP server. The device server stands by until there is any TCP connection request. If TCP connection is not already established at that time, the device server 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 device server 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 device server to operate as a TCP client. When the serial device sends data or pre-defined timer is expired, the device server tries to establish a TCP connection to a remote server through its TCP port. If a TCP session is established between them, the device server 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 device server 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 device server 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 device server will work as if it is virtually connected to the remote host.

For each host mode, required parameters for configuration is summarized in table 8.

Table 8. 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 too help users understand the diagram, the TCP state of the device server is briefly described as follow:

- **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 device server accepts the request, the state will be changed into [Established]. This state is not valid in *TCP client* mode.
- **Sync-Sent:** If the device server 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.

TCP Server Mode Operations

The device server works as a TCP server, and the default TCP state is [Listen] in this mode. The device server 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 device server 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 device server, 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 6 shows the State Transition Diagram of the session operations in TCP server mode.

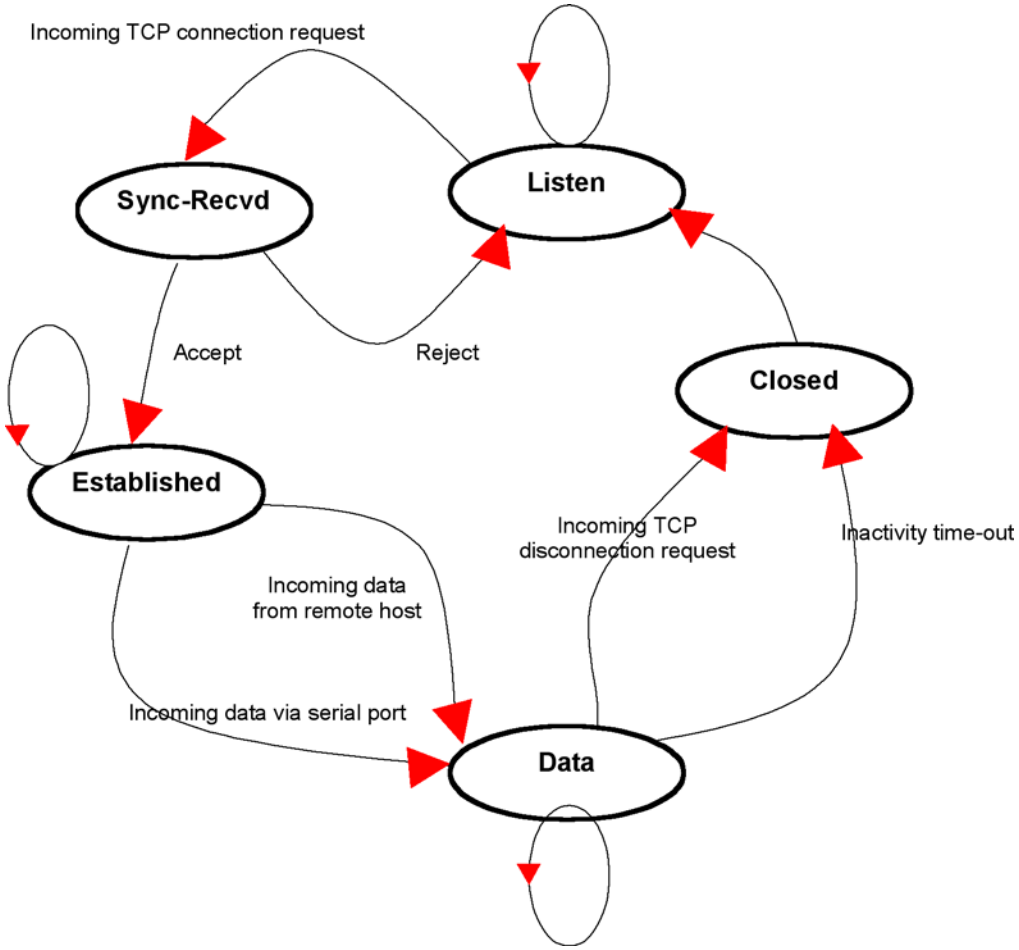

Figure 6. State Transition Diagram of TCP server mode

TCP Server Mode Configuration

To configure the device server 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 device server 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 device server. 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 device server will check the connection status between the device server 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 device server 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.

The following example shows how to set TCP server mode:

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

TCP Client Mode Operations

The device server 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 device server 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 device server, data will be accumulated to the serial port buffer of the device server. 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 device server successfully connects 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 time-out*". 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 device server will make an attempt to connect to the user-defined remote host at certain interval even if there is 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 device server 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 7 shows the State Transition Diagram of the session operations in *TCP client* mode.

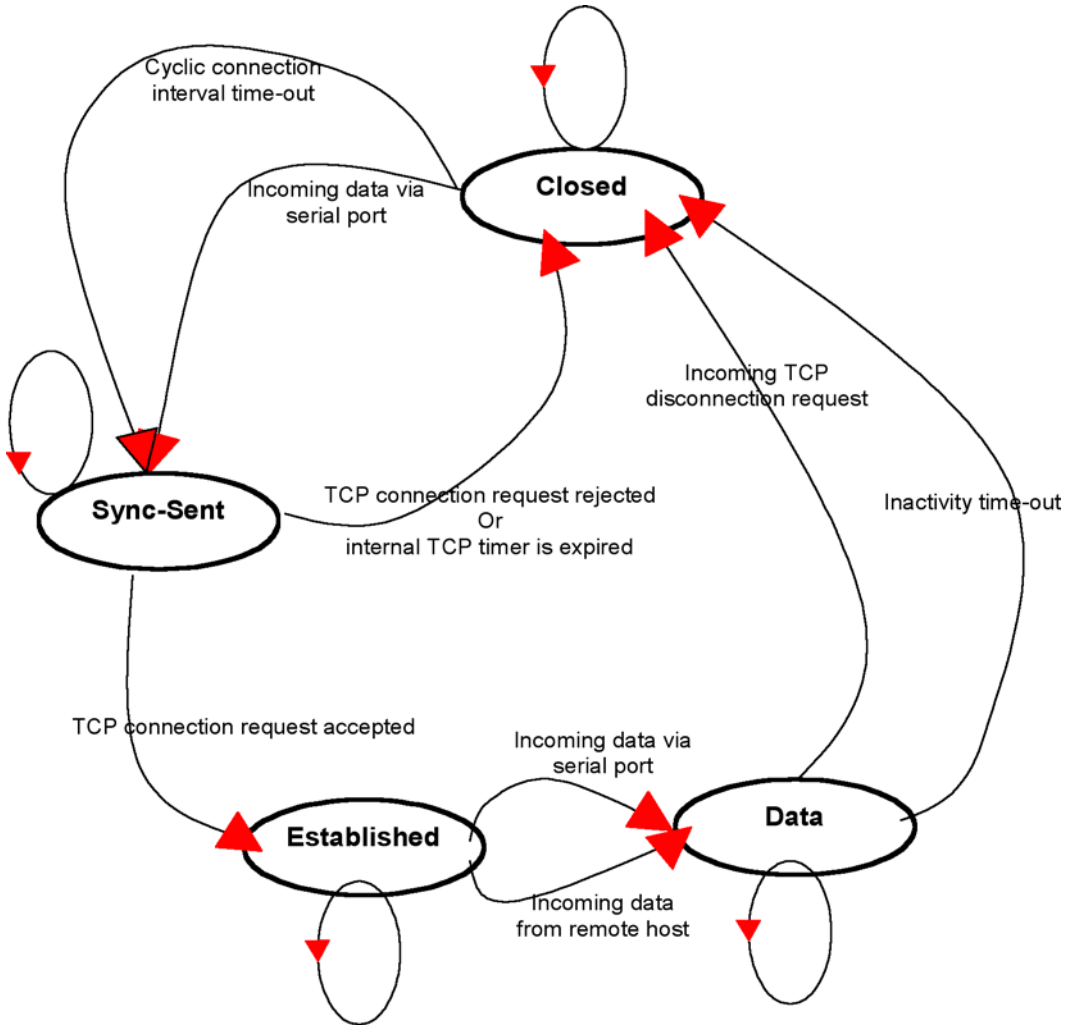

Figure 7. State Transition Diagram of TCP client mode

TCP Client Mode Configuration

To configure the device server 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 device server 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 device server 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.

The following example shows how to set TCP client mode:

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

TCP Server/Client Mode Operations

The 2211 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 2211 is always connected to the specified remote host.

2) Operations

The only difference from *TCP server* mode is that the 2211 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.

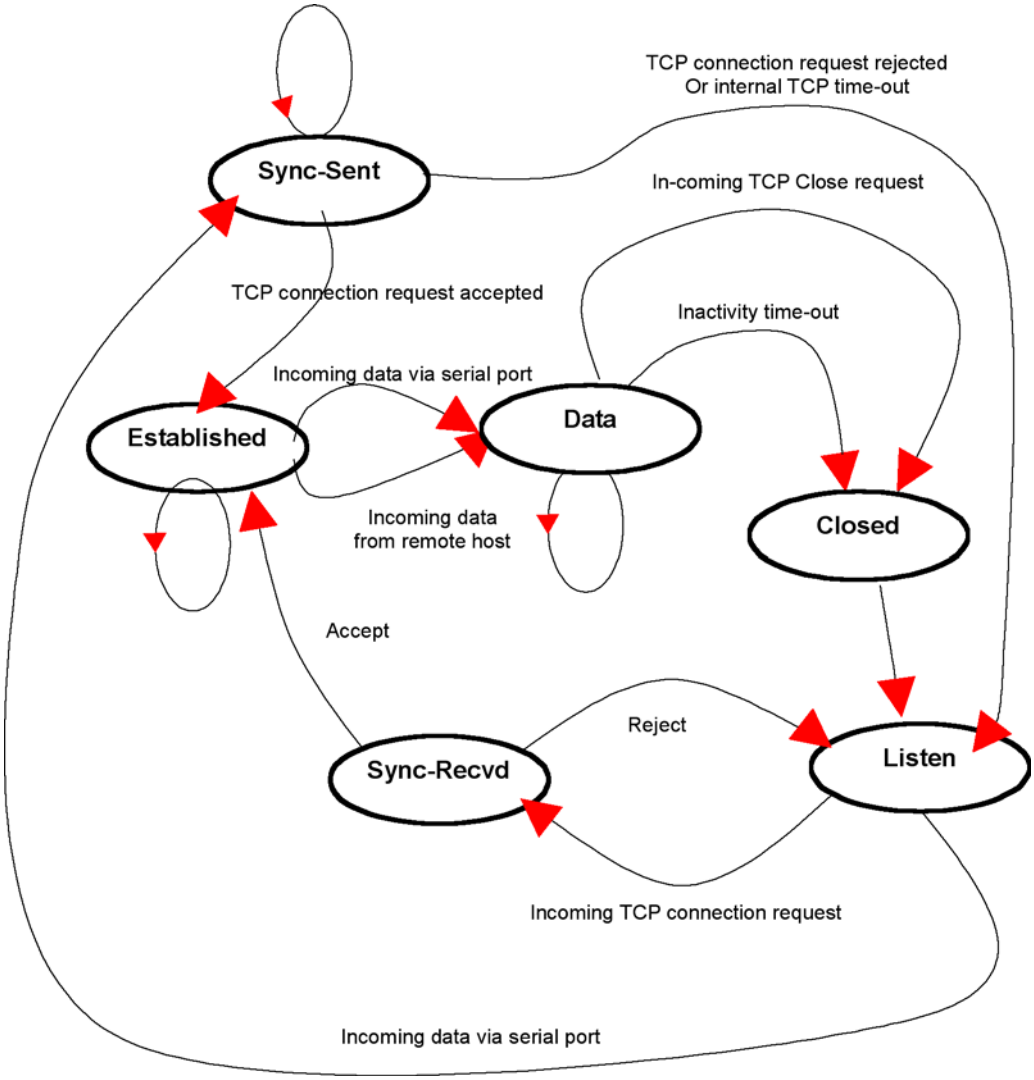

Figure 8. State Transition Diagram of TCP server/client mode

TCP Server/Client Mode Configuration

To configure the 2211 to work as a TCP server/client mode, use **set** command as follows:

```
set host tcpsc 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.

The following example shows how to configure server/client mode:

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

Chapter 6 Serial port configuration

Chapter contents

Introduction

To attach the serial device to the 2211 serial port, its serial port operation should match exactly to that of the serial device. Serial port configuration parameters are summarized in table 9.

Table 9. 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 2211 does not support. The 2211 does not support 7 data bits, No parity, 1 stop bit configuration. In this case, the 2211 will operate as 7 data bits, No parity, 2 stop bit mode. In case the 2211 is configured as 8 data bits, Even(or Odd) parity, 2 stop bits mode, the 2211 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 2211. 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 2211 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 2211 send a connection request to the specified destination host, whereas the low state close a connection.

Inter-character timeout defines the interval that the 2211 fetches the overall serial data from its internal buffer. If there is incoming data through the serial port, the 2211 stores data into the internal buffer. The 2211 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 (bits) / 1200 (bits/s) * 1000 (ms/s) = 8.3 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 2211 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 2211 internal buffer size. The serial communication buffer size of 2211 is 1400 bytes.

The following example shows a serial port configuration 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
>
```

Chapter 7 System administration

Chapter contents

Introduction

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
```

The following example shows how to configure administrative parameters:

```
> set admin adminuser adminpassword 2211_test1
OK
>
```

Chapter 8 Contacting Patton for assistance

Chapter contents

Introduction

This chapter contains the following information:

- "Contact information"—describes how to contact Patton technical support for assistance.
- "Warranty Service and Returned Merchandise Authorizations (RMAs)"—contains information about the RAS warranty and obtaining a return merchandise authorization (RMA).

Contact information

Patton Electronics offers a wide array of free technical services. If you have questions about any of our other products we recommend you begin your search for answers by using our technical knowledge base. Here, we have gathered together many of the more commonly asked questions and compiled them into a searchable database to help you quickly solve your problems.

Patton support headquarters in the USA

- Online support—available at **http://www.patton.com**
- E-mail support—e-mail sent to **support@patton.com** will be answered within 1 business day
- Telephone support—standard telephone support is available 5 days a week, from 8:00am to 5:00pm EST (1300 to 2200 UTC/GMT)—by calling **+1 (301) 975-1007**
- Fax—+1 (253) 663-5693

Alternate Patton support for Europe, Middle East, and Africa (EMEA)

- Online support—available at **http://www.patton-inalp.com**
- E-mail support—email sent to **support@patton-inalp.com** will be answered within 1 day
- Telephone support—standard telephone support is available five days a week—from 8:00 am to 5:00 pm CET (0900 to 1800 UTC/GMT)—by calling +41 (0)31 985 25 55
- Fax—+41 (0)31 985 25 26

Warranty Service and Returned Merchandise Authorizations (RMAs)

Patton Electronics is an ISO-9001 certified manufacturer and our products are carefully tested before shipment. All of our products are backed by a comprehensive warranty program.

> **Note** If you purchased your equipment from a Patton Electronics reseller, ask your reseller how you should proceed with warranty service. It is often more convenient for you to work with your local reseller to obtain a replacement. Patton services our products no matter how you acquired them.

Warranty coverage

Our products are under warranty to be free from defects, and we will, at our option, repair or replace the product should it fail within one year from the first date of shipment. Our warranty is limited to defects in workmanship or materials, and does not cover customer damage, lightning or power surge damage, abuse, or unauthorized modification.

Out-of-warranty service

Patton services what we sell, no matter how you acquired it, including malfunctioning products that are no longer under warranty. Our products have a flat fee for repairs. Units damaged by lightning or other catastrophes may require replacement.

Returns for credit

Customer satisfaction is important to us, therefore any product may be returned with authorization within 30 days from the shipment date for a full credit of the purchase price. If you have ordered the wrong equipment or you are dissatisfied in any way, please contact us to request an RMA number to accept your return. Patton is not responsible for equipment returned without a Return Authorization.

Return for credit policy

- Less than 30 days: No Charge. Your credit will be issued upon receipt and inspection of the equipment.
- 30 to 60 days: We will add a 20% restocking charge (crediting your account with 80% of the purchase price).
- Over 60 days: Products will be accepted for repairs only.

RMA numbers

RMA numbers are required for all product returns. You can obtain an RMA by doing one of the following:

- Completing a request on the RMA Request page in the *Support* section at **www.patton.com**
- By calling **+1 (301) 975-1000** and speaking to a Technical Support Engineer
- By sending an e-mail to **returns@patton.com**

All returned units must have the RMA number clearly visible on the outside of the shipping container. Please use the original packing material that the device came in or pack the unit securely to avoid damage during shipping.

Shipping instructions

The RMA number should be clearly visible on the address label. Our shipping address is as follows:

Patton Electronics Company
RMA#: xxxx
7622 Rickenbacker Dr.
Gaithersburg, MD 20879-4773 USA

Patton will ship the equipment back to you in the same manner you ship it to us. Patton will pay the return shipping costs.

Appendix A **Compliance information**

Chapter contents

Compliance

Model 2211

FCC Part 15C (FCC ID: TXU2211)

EN 301 489-1 V1.6.1:2003 (EMC)

EN 301 490-17 V1.2.1:2002 (EMC)

EN60950-1 (Safety)

EN 300 328 V1.4.1 (Radio)

EN 50371 (Health)

Model 2232

FCC Part 15, Class A

EN 55022:1998/A1:2000/A2:2003 (Class A)

EN61000-3-2:2000

EN61000-3-3:1995/A1:2001

EN 55024:1998/A1:2001/A2:2003

Radio and TV Interference (FCC Part 15)

This equipment generates and uses radio frequency energy, and if not installed and used properly-that is, in strict accordance with the manufacturer's instructions-may cause interference to radio and television reception. This equipment has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection from such interference in a commercial installation. However, there is no guarantee that interference will not occur in a particular installation. If the equipment causes interference to radio or television reception, which can be determined by disconnecting the cables, try to correct the interference by one or more of the following measures: moving the computing equipment away from the receiver, re-orienting the receiving antenna, and/or plugging the receiving equipment into a different AC outlet (such that the computing equipment and receiver are on different branches).

CE Declaration of Conformity

We certify that the apparatus identified in this document conforms to the requirements of Council Directive 89/336/EEC, as amended by Directives 92/31/EEC, 93/68/EEC, and 2004/108/EC on the approximation of the laws of the member states relating to electromagnetic compatibility.

The safety advice in the documentation accompanying this product shall be obeyed. The conformity to the above directive is indicated by the **CE** sign on the device.

Appendix B **Specifications**

Chapter contents

Serial interface

- One male DB-9 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 interface

Model 2211

- Network InterfacesWireless LAN Specification: IEEE802.11b Wireless LAN 11Mbps
- Frequency Band: 2400–2485 MHz
- Channels Support
  - US: 11 (1–11)
  - ETSI: 13 (1–13)
  - Korea: 13 (1–13)
- Operating Range
  - Indoor: 164 feet (50 meters) at 11 Mbps
  - Outdoor: 984 feet (300 meters) at 11 Mbps
- Radio Power
  - US: 0.021 Watts
  - ETSI: 0.01 Watts
  - Korea: 0.008 Watts
- Channel Spacing: 5 MHz
- Operation Mode: Infrastructure, Ad Hoc
- Wired Equivalent Privacy(WEP): MD5 Auto Generate, Hex or ASCII 64bits, 128bits
- Supports static and dynamic IP address

Model 2232

- 10Base-T Ethernet with RJ-45 Ethernet connector
- Supports static and dynamic IP address

Protocols

Model 2211

- ARP, IP/ICMP, TCP, Telnet, DHCP client, WEP

Model 2232

- ARP, IP/ICMP, TCP, Telnet, DHCP client, PPPoE

Security

- SecurityUser ID & Password

Management

- Telnet or serial console port or EtherBITS Manager
- Full-featured system status display

Diagnostic LEDs

- *Power* LED
- *Ready* LED
- *Serial Rx/Tx* LED for data serial port
- *Link* LED for10Base-T
- *Act* LED for 10Base-T

Environmental

- Operating temperature: 32 to 131°F (0 to 55°C)
- Storage temperature: 25 to 151°F (-4 to 66°C)
- Humidity: 90% (Non-condensing)

Physical

Model 2211

- Dimensions: 3.22W x 4.48D x 1.02H in. (82W x 114D x 26H mm)
- Weight: 10.6 ounces (300 g)

Model 2232

- Dimensions: 3.9L x 2.8W x 1H in. (100L x 72W x 22H mm)
- Weight: 8.1 ounces (230 g)

Power

Model 2211

- Supply voltage: 9.0–30 VDC
- Supply current: 300 mA at 9 VDC

Model 2232

- Supply voltage: 7.5–15 VDC
- Supply current: 140 mA (nom.)

Appendix C **Cable Recommendations**

Chapter contents

Ethernet pin-outs (Model 2232 only)

The Model 2232 uses a standard Ethernet connector, which is a shielded connector that is compliant with the AT&T258 specifications. Table 10 shows the pin assignment and wire color.

CAUTI

The interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

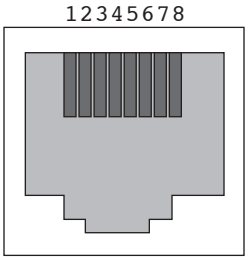

Figure 9. Pin layout of the RJ45 connector

Table 10. Pin assignment of the RJ45 connector for Ethernet

Pin	Description	Color
1	Tx+	White with orange
2	Tx-	Orange
3	Rx+	White with green
4	NC	Blue
5	NC	White with blue
6	Rx-	Green
7	NC	White with brown
8	NC	Brown

Serial port pin-outs

The pin assignment of the device server DB9- connector is summarized in table 11. Each pin has a function according to the serial communication type configuration.

CAUTI

The interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

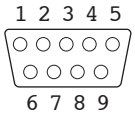

Figure 10. Pin layout of the DB-9 connector

Table 11. Pin assignment of DB-9 connector

Pin	RS-232
1	–
2	Rx
3	Tx
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	–

Ethernet wiring diagrams (Model 2232 only)

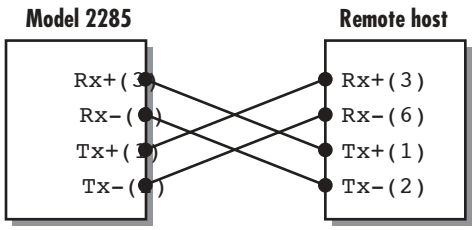

Figure 11. Ethernet direct connection using crossover Ethernet cable

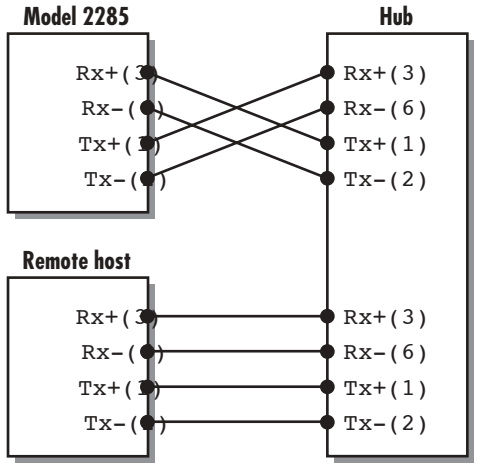

Figure 12. Ethernet connection using straight through Ethernet cable

Serial wiring diagram

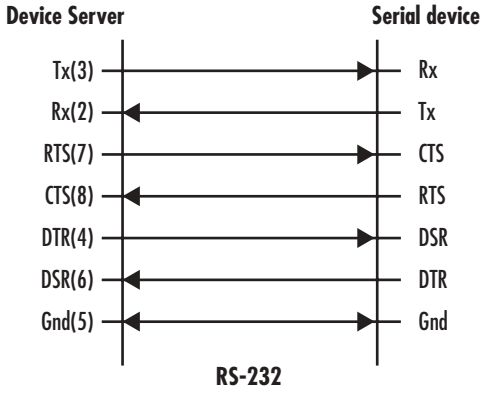

Figure 13. RS-232 wiring diagram

Appendix D **Well-known port numbers**

Chapter contents

Introduction

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

Well Known Ports are assigned by IANA, and on most systems, can only be used by system processes or by programs executed by privileged users. Table A-3 shows some of the well-known port numbers. For more details, please visit the IANA website: **http://www.iana.org/assignments/port-numbers**

Table 12. 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
443	HTTPS	TCP

Appendix E **Troubleshooting**

Chapter contents

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.	Model 2232: Ethernet cable is not connected	Check Ethernet cable connection.
	Model 2232: 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 2232 and remote host is used, use crossover cable instead.
	Model device server: An invalid wireless connection state.	Check your wireless configuration.
ACT LED does not blink.	Model 2232: Invalid IP configuration	Check IP configuration parameters.
	Model device server: device server is not connected to a wireless network.	Check your wireless configuration.

Serial Console Troubleshooting

Problem	Cause	Action
PowSerial 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 Con.sole/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 *admin*.

Remote Console Troubleshooting

Problem	Cause	Action
Cannot connect to the device server using telnet.	The device server is not assigned valid IP address.	Use serial console to assign valid IP address to the device server.
	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 *admin*.

IP Address Troubleshooting

Problem	Cause	Action
Cannot find IP address of the 2232.		Use serial console to find IP address.
		Use EtherBITSManager program to probe the 2232 on the network.
Cannot find IP address of the 2211.	2211 is disconnected from your Wireless network.	Use serial console to find IP address
		Use EtherBITSManager program to probe the 2211 on the network.
EtherBITSManager cannot probe the device server.	The device server is not assigned valid IP address.	Use serial console to assign valid IP address to the device server.
	EtherBITSManager and the device server are not on the same subnet.	Run EtherBITSManager on the PC that is on the same subnet with the device server.

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 device server is changed	DHCP server does not extend lease time.	Check if DHCP server is working correctly.

TCP Server Mode Operation Troubleshooting

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

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 device server.	Invalid wireless or serial port configuration.	Check if wireless and check to see that the serial port configuration of the device server are the same with that of the serial device.
Invalid data transferred.	Invalid serial port configuration.	Check if serial port configuration is correct.