FX-DS110-APL

Access Point

User's Guide

CONTEC

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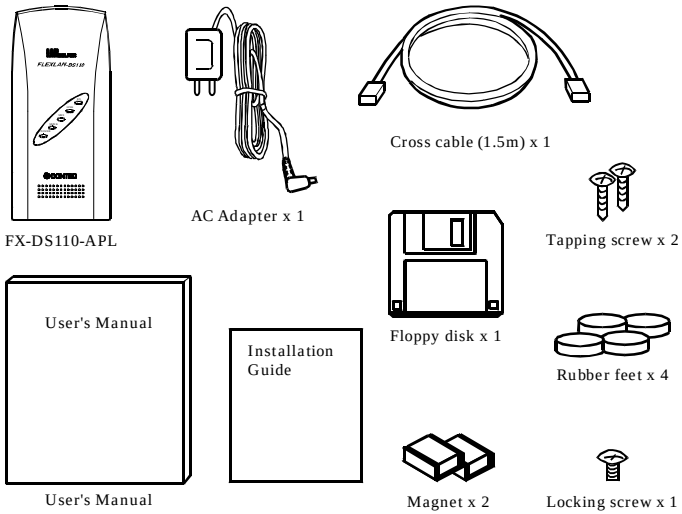
Product Configuration

- FX-DS110-APL …1
- AC Adapter with 1.8m cable …1
- Cross cable(1.5m) …1
- Tapping screws (for mounting on wall, etc.) …2
- Locking screw (for connecting to ground wire) …1
- Magnets (for mounting on metallic surfaces) …2
- Rubber feet …4
- Floppy disk …1
- User's Manual (this booklet)…1
- Installation Guide …1



Check the contents to make sure that you have everything listed above. If you do not have all the items, contact your distributor or CONTEC group office where you purchased.

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1. Introduction

Thank you for purchasing the FX-DS110-APL access point.

This product is a wireless LAN access point using the 2.4GHz spectrum diffusion system, and is compatible with IEEE Standard 802.11b for wireless LAN.

The FX-DS110-APL is designed for use as an access point as well as a station (Ethernet ⇔ wireless converter). It is independent of operating systems or protocols, so that it can be connected by UTP cable to any Ethernet-compatible desktop computer, workstation, point-of-sale terminal, printer, etc. for immediate wireless LAN use. This product can also enable wireless communications from any PC previously unsuitable for wireless communications due to lack of a PC card slot or expansion bus slot.

Of course the FX-DS110-APL also operates as an access point, allowing the user to configure a small wireless LAN system using the product by itself.

This document explains how to use the FX-DS110-APL. Be sure to read it carefully so that you can use the product correctly.

Features

- Ultra-compact antenna (micro access point)
  Space-saving design allows installation anywhere (wall, magnet, desktop)
- Operates as a LAN station
- Optional power supply from LAN cable
  Uses compact, lightweight AC adapter.
- Full range of functions (roaming, 11 or 13-channel support)
- Automatic transmission speed (wireless) switching
  Automatically switches transmission speeds from 11Mbps to 5.5Mbps, 2Mbps, 1Mbps according to conditions.
- Built-in SNMP agent
  Uses SNMP compatible software for easy network management.
- Can be used with higher level model FX-DS110-APE.

Terminology/Abbreviations

The following terms and abbreviations are used in this manual for convenience.

Full term	Term used in this manual
FX-DS110-APL	Access point/AP/APL
FX-DS110-APL or a device containing the above	User unit / Wireless terminal
Personal computer	PC

Limited One-Year Warranty

CONTEC Interface boards are warranted by CONTEC Co., LTD. to be free from defects in material and workmanship for up to one year from the date of purchase by the original purchaser.

Repair will be free of charge only when this device is returned freight prepaid with a copy of the original invoice and a Return Merchandise Authorization to the distributor or the CONTEC group office, from which it was purchased.

This warranty is not applicable for scratches or normal wear, but only for the electronic circuitry and original boards. The warranty is not applicable if the device has been tampered with or damaged through abuse, mistreatment, neglect, or unreasonable use, or if the original invoice is not included, in which case repairs will be considered beyond the warranty policy.

How to Obtain Service

For replacement or repair, return the device freight prepaid, with a copy of the original invoice. Please obtain a Return Merchandise Authorization Number (RMA) from the CONTEC group office where you purchased before returning any product.

*** No product will be accepted by CONTEC group without the RMA number.**

Liability

The obligation of the warrantor is solely to repair or replace the product. In no event will the warrantor be liable for any incidental or consequential damages due to such defect or consequences that arise from inexperienced usage, misuse, or malfunction of this device.

Handling Precautions

Take the following precautions when handling this board.

- Do not attempt to modify this device. The manufacturer will bear no responsibility whatsoever for the device if it has been modified.
- Do not store this device in high temperature or low temperature surroundings, or expose it to rapid temperature changes. (Operating temperature range: 0° to 50°C)
- Do not use or store this device where it is exposed to direct sunlight or near stoves or other sources of heat.
- Do not use or store this device where it is exposed to dust or high humidity. (Operating humidity range: 10-90%RH, without condensation)
- This product contains precision electronic elements and must not be used in locations subject to physical shock or strong vibration.
- Do not use or store this device near strong magnetic fields or devices emitting electromagnetic radiation.
- If abnormal smells or heat are noticed, disconnect the power supply immediately.
- In case of abnormal operation or failure, contact the store where this product was purchased.

Precautions for Use

This product is classified as "wireless equipment for stations of low-power data transmissions systems" under the Wireless Telegraphy Act, and does not require a radio transmission license. The law prohibits modification of the interior of this product.

Precautions Related to Service

Clean the FX-DS110-APL by wiping lightly with a soft cloth moistened with water or a cleaning solution.
Take care to avoid the use of benzene, thinners or other volatile solutions which may cause deformation or discoloration.

Notes!

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Precautions Related to Electromagnetic Interference

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions : (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment complies with part 15 of the FCC rules. Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

CAUTION: To comply with FCC RF exposure compliance requirements, a separation distance of at least 5 cm must be maintained between this device and all persons.

About the Manual

This manual consists of the following chapters:

Chapter 1 Introduction

Chapter 2 Overview

Chapter 3 Operating Modes

Chapter 4 Placement

Chapter 5 Setting Up

Chapter 6 Spanning Tree Algorithm

Chapter 7 SNMP Agent Functions

Chapter 8 Troubleshooting

Chapter 9 Appendix

Chapter 10 Index

2. Overview

Component Locations

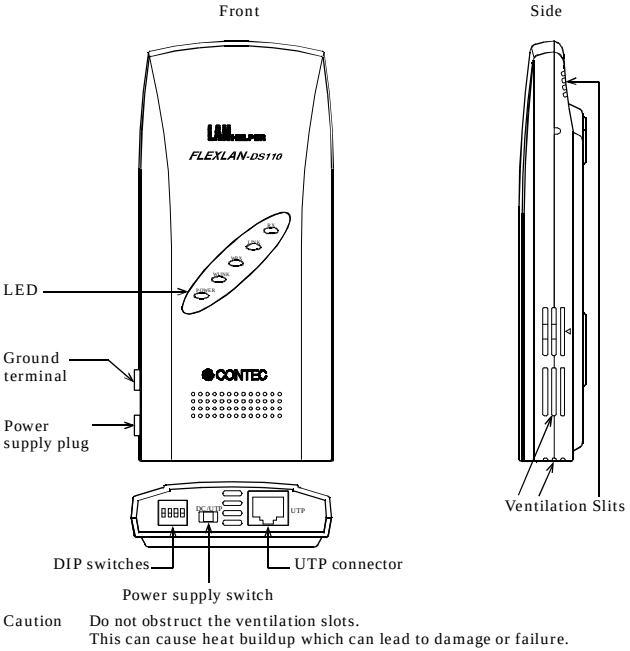


Figure 2.1. Component Locations

LED Indicators

The five LED indicators indicate the sending /receiving status of the wireless or wired LAN, power supply, LAN connection status, etc.

DIP Switches

The DIP switches are used for initialization, unit type selection, and operating mode selection.

Power Supply Switch

Selects power supply from the AC adapter, or a UTP cable (requires the POW-CB10, sold separately).

LED Indicators

Table 2.1. ADHOC (Simple Mode)

Name	Status	Indicator
POWER	Flashing	Startup, or startup error
	On	Operating
WLINK	On	Operating
WRX	Flashing	Receiving wireless LAN data
LINK	On	Wire LAN connection normal
RX	Flashing	Receiving wire LAN data

Table 2.2. Infrastructure (Standard Mode) / (Compatible Mode) [Unit Type AP]

Name	Status	Indicator
POWER	Flashing	Startup, or startup error
	On	Operating
WLINK	On	Wireless LAN connection normal
WRX	Flashing	Receiving wireless LAN data
LINK	On	Wire LAN link connection normal
RX	Flashing	Receiving wire LAN data

Table 2.3. Infrastructure (Standard Mode) / (Compatible Mode) [Unit Type Station]

Name	Status	Indicator
POWER	Flashing	Startup, or startup error
	On	Operating
WLINK	On	Wireless LAN connection normal
WRX	Flashing	Receiving wireless LAN data
LINK	On	Wire LAN link connection normal
RX	Flashing	Receiving wire LAN data

Table 2.4. Other

Name	Status	Indicator
POWER	Flashing 2 times	Initialization error
	Flashing 3 times	Firmware writing error
POWER WLINK WRX	All flashing at the same time	Firmware writing in progress

DIP Switches

The DIP switches are used to make AP settings.

The default setting for the utility software gives priority to the DIP switch settings. The factory setting for all DIP switches is OFF.

At the factory, the unit is set to ADHOC Mode. The unit can be used with the factory settings, by setting only the DIP switches. However, security is not assured.

Table 2.5. DIP Switches

	ON	OFF	Description
1	INIT	–	Used to initialize APs. When this switch is turned on, the POWER, WLNK, and WRX LED will start flashing. If this switch is turned off while the LED's are flashing (about 3 seconds), then all AP settings will be restored to default values after the next startup. Before resetting or turning off the power, wait until the POWER, WLINK, and WRX LEDs have stopped flashing and the unit has returned to its state prior to initializing.
2	IP LESS	–	If this switch is on, the AP can operate without an IP address. However the utility software cannot use the SNMP agent functions.
3	AP	ST	This switch sets the unit type. It is valid when operating in infrastructure (standard mode). AP… Controls APs used on other user units or STs. ST… Treated as a user unit (controlled by (logged in) AP).
4	INFRA	ADHOC	This switch sets the mode. INFRA… Selects infrastructure (standard mode). All wireless terminals communicate through unit type AP. ADHOC… Selects ADHOC (simple mode). All terminal are paired, communicate only as paired units.

All switches are set to OFF at factory.

Multi-channel Operation

By changing channels on adjacent access points, it is possible to obtain higher throughput per wireless terminal than when is channels are not changed, even when the number of wireless terminals is increased.

The 2.4G ISH band (2400 to 2483.5 MHz) in which this product operates is subdivided into 11 (FCC model) or 13 (CE model) channels, numbered 1 to 11 or 13, by IEEE standard 802.11. Because each frequency has sidebands around its central frequency, sidebands on adjacent channels overlap. Overlapping frequencies can adversely affect communications by interference with each other's transmissions.

Refer to Figure 2.3 when selecting channels, to ensure that frequency bands do not overlap.

The maximum number of channels that can be used simultaneously without interference is four, by using a combination of channels 1, 6, 11. Channel numbers can be set from 1 to 11 using utility software.

Two wireless terminals on the same network cannot use the same frequency.

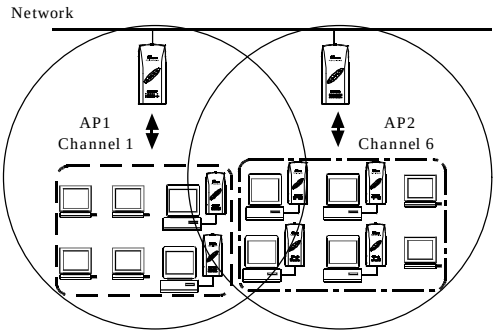


Figure 2.2. Multi-channel Operation

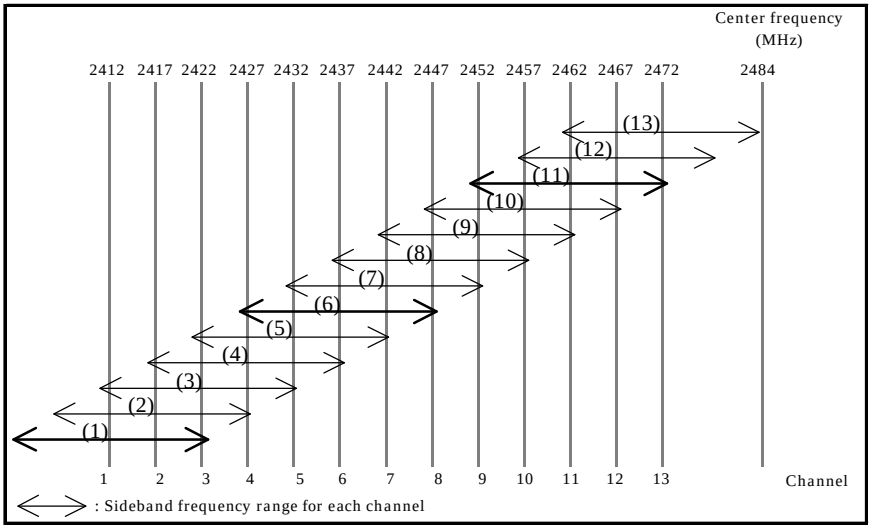


Figure 2.3. Channel Frequencies

3. Operating Mode Descriptions

ADHOC (Simple Mode)

The following example shows a relatively small network configured using ADHOC mode.

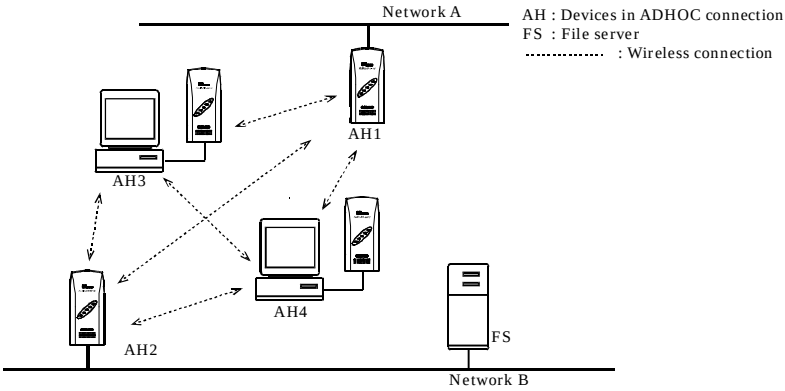


Figure 3.1. ADHOC Mode

In ADHOC (simple mode), all wireless devices are paired, and can use wireless communication with the other device in the pair. Lines can be duplicated using a spanning tree if bridges are constructed using AP connections.

- Advantages

(1) Requires virtually no setup work to start.

(2) Can bridge multiple wired LAN's, allows duplication of lines.

- Disadvantages

(1) When the AP is a relay point the available communication range is narrower than in infrastructure mode.

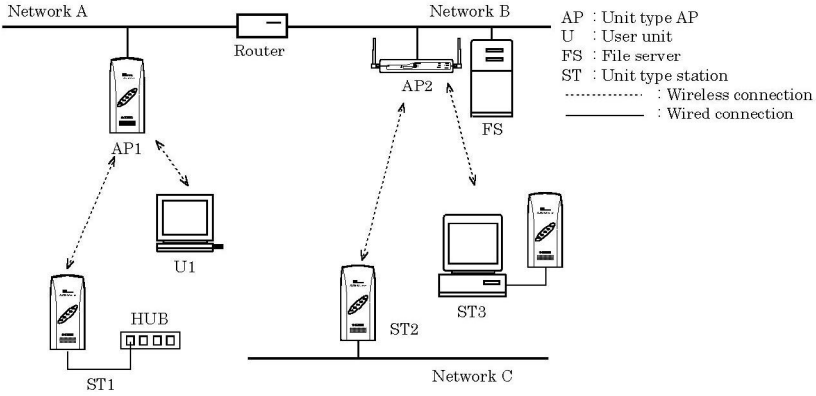
(2) Not suited to construction of large wireless LAN environments.

Note!

When configuring a wireless LAN in simple (ADHOC) mode, be sure to place all wireless terminals within effective communication range. If units are too far apart, communications can be hindered by partitions or other obstacles causing some terminals to be unreachable and reducing system throughput.

Infrastructure (Standard Mode / Compatible Mode)

This mode allows the use of multiple AP's to configure wide-area wireless LAN's. All communication between wireless terminals must go through an AP.



Note : An AP operating as a station has the same status as a user unit, as an AP managed by (logged in with) an AP.

Figure 3.2. Infrastructure Mode

Roaming functions are supported, allowing log-in on any unit type AP.

- Advantages

(1) Allows multiple AP's to be set up to configure wide-are wireless LAN's.

(2) Allows log-in restrictions on unit type AP's (security function).

- Disadvantages

(1) All AP's must be IP controlled, requiring many settings.

Note!

When set as a station in Infrastructure (Compatible Mode), only one PC can be connected via Ethernet.

Operating Modes and Communications

The following operating modes allow communications with APL and other FLEXLAN products.

Table 3.1. Operating Modes and Communications

FX-DS110-APL	FX-DS110-PCC	FX-DS110-APE
ADHOC (Simple Mode)	ADHOC (Simple Mode)	Simple Mode
Infrastructure (Standard Mode)	Infrastructure (Standard Mode, Brouter Mode)	Standard Mode, Brouter Mode
Infrastructure (Compatible Mode)	Compatible Infrastructure (Standard Mode, Brouter Mode)	Interconnection Mode

4. Setup

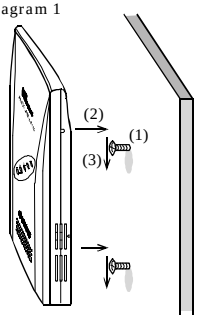
Wall Installation

Using the Mounting Screws (Included)

Place the screws in the wall according to the mounting diagram, then mount the unit.

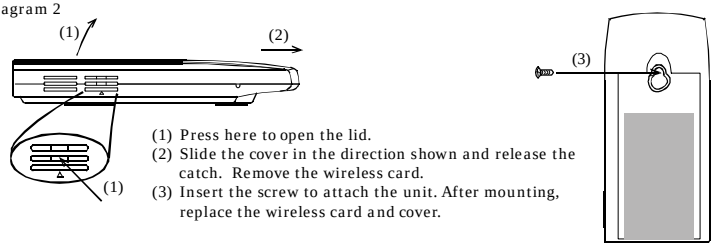
It is also possible to remove the cover from the unit, then remove the wireless card and screw the unit onto the wall directly.

Diagram 1



(1) Place the screws in the wall according to the mounting diagram (2 screws).
(2) Position the AP unit so that the two wall mount holes in the AP unit fit over the two screws in the wall.
(3) Slide the AP unit down to hold it in place.

Diagram 2



(1) Press here to open the lid.
(2) Slide the cover in the direction shown and release the catch. Remove the wireless card.
(3) Insert the screw to attach the unit. After mounting, replace the wireless card and cover.

Figure 4.1. Wall Installation

Note!

Do not obstruct the ventilation slits. This can cause the temperature inside the product to rise and can damage the components inside.

Caution!

Do not install this unit upside down. This will cause heat to accumulate and possible cause fire.

Using the Magnets (Included)

The magnets included with this product can be used for easy mounting and removal on steel desks, partitions, or other metal surfaces.

Notes!

- *Do not place magnets near monitors, floppy disks, or other sensitive objects.*
- *Moving the AP while it is mounted on a steel desk or similar surface can cause paint scratching.*

Attaching and Removing Magnets

To mount the unit using a magnet, push the magnet into the magnet mounting hole in the direction of arrow 1 as shown in Figure 4.2. , then insert the entire magnet into the mounting hole.

Next, slide the magnet in the direction of arrow 2 to hold the unit in place.

To remove, slide the magnet in the direction of arrow 1 in Figure 4.3. , then lift in the direction of arrow 2.

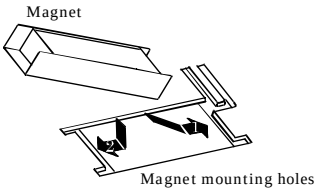


Figure 4.2. Attaching Magnets

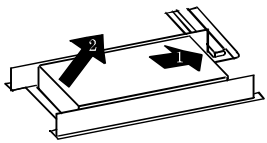


Figure 4.3. Removing Magnets

Mounting on Steel Desks or Partitions

The unit can be mounted directly on steel desks or partitions. Pull lightly to make sure that the AP does not come off easily.

For better receiving sensitivity, mount the antenna against the steel surface.

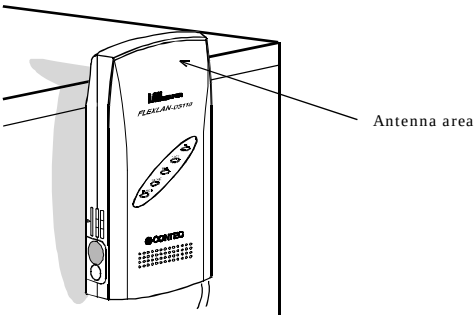


Figure 4.4. Installation on a Steel Desk

Table Top Installation

Use the rubber pads included with the unit.

To install on a table top, choose a sturdy, level surface with a well-ventilated space (approx. 5 cm.) in all directions. Wireless equipment has a larger sending and receiving range when it is in a highly visible location. Choose a location where the sight lines are as clear as possible.

Note!

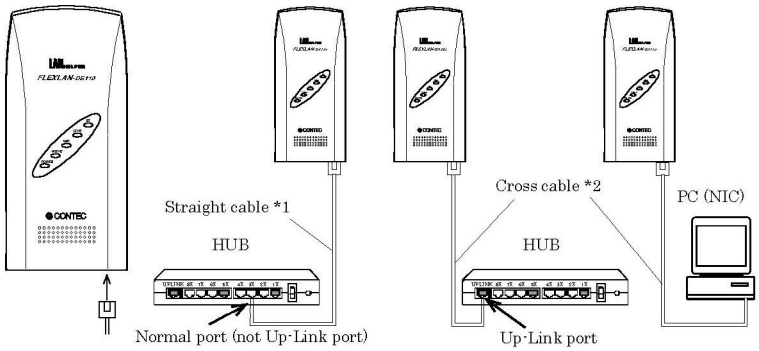
Do not obstruct the ventilation slits. This can cause the temperature inside the product to rise and can damage the components inside.

Cable Installation

Connect the UTP connector to the UTP cable.

Notes!

- When connecting this product to a personal computer or hub use a twisted pair cable no more than 100m in length.
- Use UTP cable having category 3, 4, or 5 specifications. (If using a 10BASE-T power supply, use a UTP cable with category 5 specifications.)
- When connecting with a personal computer (NIC) or hub up-link port, use a UTP cross cable (TP-X).
- When connecting with a hub (other than up-link port), use a UTP straight cable.



*1 Operates with the separately available cables TP-03 (3m), TP-05 (5m), TP-10 (10m), TP-20 (20m), TP-50 (50m), TP-100 (100m)
*2 Operates with the separately available TP-X (30cm cross cable and attachment)
Note : The cable length between the unit and PC or hub should not exceed 100m.

Figure 4.5. Cable Connection

Power Supply Connection

There are two ways to connect the APL power supply.

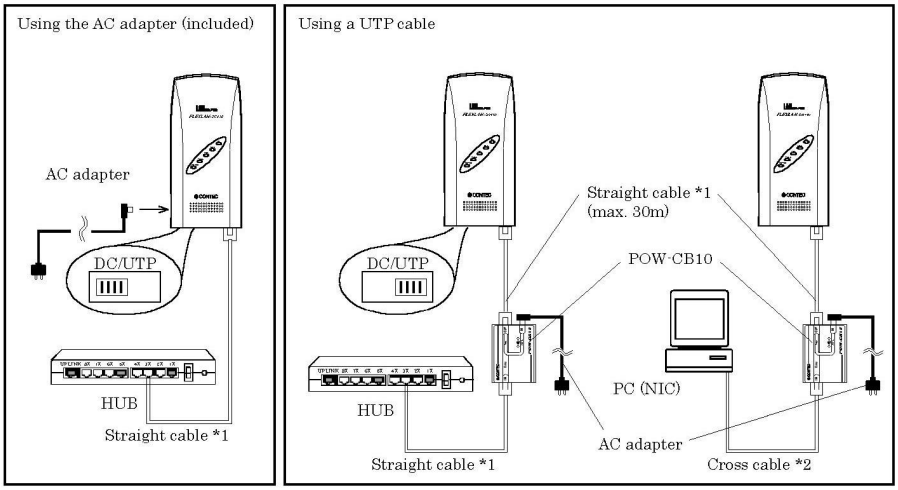
Using the AC adapter provided with the unit

Connect the power adapter to a power outlet, and set the power switch to 'DC.'

Using a UTP cable (requires the POW-CB10, sold separately)

To receive power from the UTP, set the power switch to 'UTP.'

The cable between the FX-DS110-APL and POW-CB10 should be a UTP cable with category 5 specifications (maximum 30m).



*1 Operates with the separately available cables TP-03 (3m), TP-05 (5m), TP-10 (10m), TP-20 (20m), TP-50 (50m).
*2 Operates with the separately available TP-X (30cm cross cable and attachment)
Note : The cable length between the unit and PC or hub should not exceed 90m.

Figure 4.6. Power Supply Connection

Notes!

Never use any AC adapter other then listed below. Unauthorized adapters may cause damage or accidents due to overheating.

- *If the cable length between APL and POW-CB10 is 10m less, use the AC adapter supplied with the FX-DS110-APL.*
- *If the cable length between APL and POW-CB10 is between 10 and 30m, use the AC adapter supplied with the POW-CB10.*

Ground Connection

Remove the rubber cover from the ground terminal, and connect the ground wire using the locking screws (included).

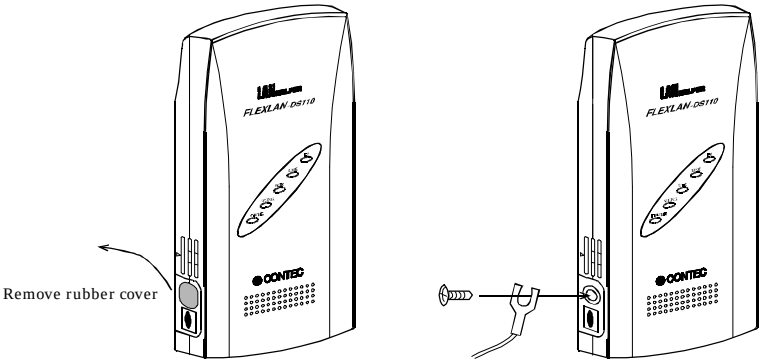


Figure 4.7. Ground Connection

Note!

In some installation environments, the ground terminal may become hot.

5. Settings

The utility software settings require the use of one personal computer.

Preparing the Utility Software

(1) Insert the floppy disk (provided) in the A: drive of the computer.

(2) Open the Explorer.

(3) Use Explorer to copy the file 'APUTIL.EXE' from the floppy disk to the appropriate directory.
Example: C:\WLANUTIL\

Utility Software Settings

Double click on the APUTIL.EXE file to open the Access Point Maintenance Utility.

You will see the following main menu.
* When operating as a “Station” in Compatible Mode, maintenance cannot be performed from the wireless system side.

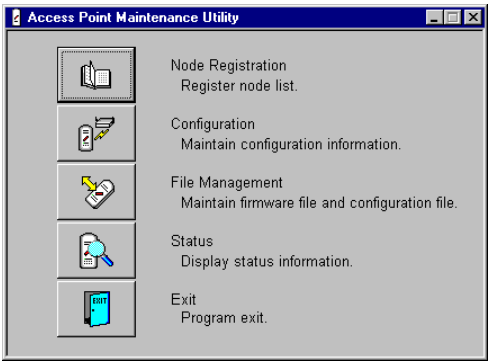


Figure 5.1. Main Menu

Node Registration

Edits the access point name list.
This list is used to detect devices connected by wired or wireless connection. Device names are added or deleted using the edit function.

Configuration

Maintains configuration information.
View or enter settings for the selected devices.

File Management

Used for firmware maintenance.
View firmware version, or write firmware.

Status

Displays access point information.
View and verify information about the selected device.

Exit

Exits the program.

Node Registration

This registers data for the devices on the network. Maintenance operations such as changing settings or upgrading the firmware are performed based on the data registered here. You must always perform node registration
Assigning names to the devices found by the automatic search makes it easier to identify the devices on the network.
Enter a name of up to 32 characters. A maximum of 1024 devices can be registered.

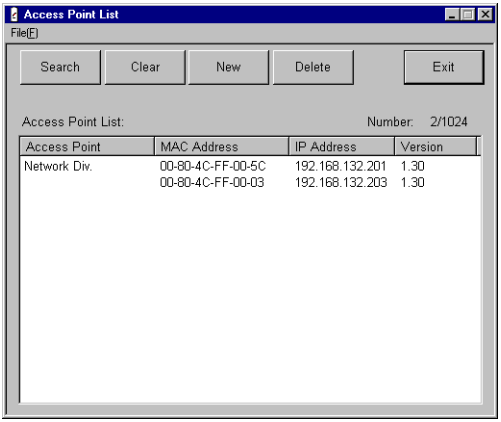


Figure 5.2. Node Registration

Button	Description
Search	This automatically detects and registers all devices connected to the same network group. If you also wish to manage devices located on the far side of an IP router, use the "New" button to register each device directly.
Clear	Deletes all registered data.
New	Registers data for a new device to be managed.
Delete	Deletes the data for the device selected in the Access point list
Exit	Returns to the main menu.

To modify the data displayed in the Access Point list, double click on the Access Point you wish to modify to open an edit window. You can also use the "File" menu to save the current Access Point list data to the hard disk or load a previously saved file.

Configuration

This reads and writes the settings for the device selected in the "Access Point" field.
You can set basic parameters such as the operating mode as well as SNMP and other detailed parameters. To apply your changes, write the settings to the device and then reboot it.
You can also use the "File" menu to save the currently displayed settings to the hard disk or load a previously saved file.

Button	Description
Password	Change the password for the selected device. To change, enter the current password and new password. The new password does not become active until the device is rebooted. The password can be up to 6 alphanumeric characters and is case sensitive.
Read	Read the settings for the selected device.
Write	Write the currently displayed settings to the selected device. The new settings do not become active until the device is rebooted.
Default	Restore the factory default settings. To apply these settings, write the settings to the device and then reboot it.
Reboot	Reboot the selected device.
Exit	Returns to the main menu.

* Password input is required for the "Password", "Read", "Write", and "Reboot" commands.
The factory default setting is no password. In this case, you do not need to enter anything.

Base

This sets the IP parameters, Wireless parameters and other basic operating settings for the device. You must always set the IP parameters, Wireless parameters if installing the device in an existing network.

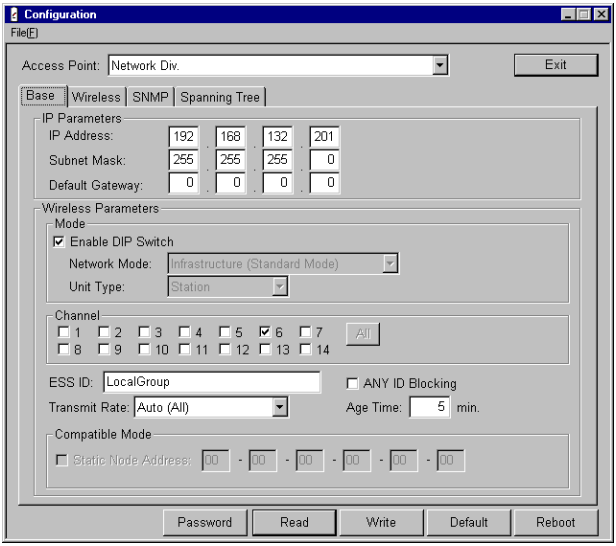


Figure 5.3. Configuration (Base)

Wireless

Sets the wireless parameters for the device.

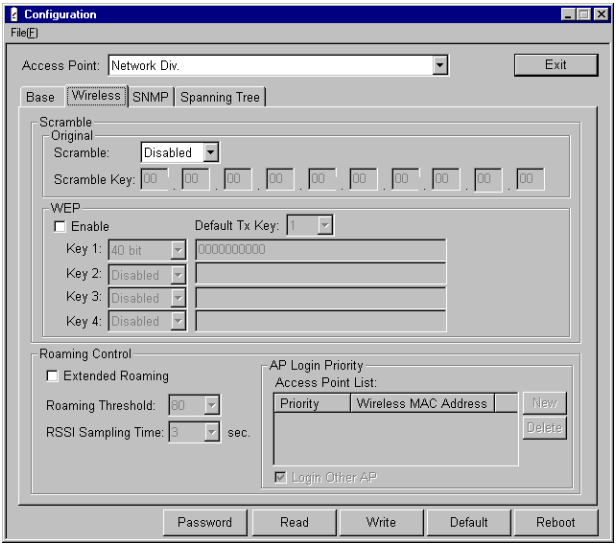


Figure 5.4. Configuration (Wireless)

Parameters	Factory settings	Input range	Description
Scramble	Disabled	Disabled/ Type 1/ Type 2	Set a proprietary encryption procedure for wireless data. Typically, "Type 2" is specified when encryption is enabled. However, select "Type 1" if communicating with devices that do not support type 2. * You cannot communicate with devices that have a different encryption setting. Also note that, when "Type 1" is set, bridge data is padded to an even number.
Scramble	Set 0 to all	Hexadecimal value (0 to 9, A to F)	Set the key to use for wireless data encryption.
Enable (WEP)	Disabled	Enabled/ Disabled	Specify whether to use the WEP function.
Default Tx Key	1	1 to 4	Specify the WEP key number to use for data transmission.
Key1	Set 0 to all 40 bits.	Hexadecimal value (0 to 9, A to F)	Specify the WEP key for WEP encryption. To perform communications using the WEP function, the key placed in the default send key number used for transmission must be the same as the key placed in the same location on the receiver.
Key2 to 4	Disabled	Hexadecimal value (0 to 9, A to F)	
Extended Roaming	Disabled	Enabled/ Disabled	Sets the AP roaming method. *1 If enabled, preferred APs to log into can be specified.
Roaming Threshold	Cannot be set (80)	50 to 150	Set the threshold value for initiating roaming. *2 Roaming is performed if the average RSSI value during the RSSI sampling time is less than this value.
RSSI Sampling Time	Cannot be set (3 seconds)	1 to 10	Set the sampling time (seconds) for obtaining the RSSI value to use for initiating roaming. *2
AP Login Priority	Cannot be set (no registration)		Set the preferred APs to log into. *2 Up to 5 APs can be specified. APs in lower numbered positions have higher priority.
Login Other AP	Cannot be set (log in)	Enable (log in)/Disable (do not log in)	Specify whether logging in to other than the specified APs is permitted. *2

*1: Only applicable when set as a station in infrastructure mode.

*2: Can only be set when enhanced roaming is enabled.

SNMP

Set when using the SNMP agent function.

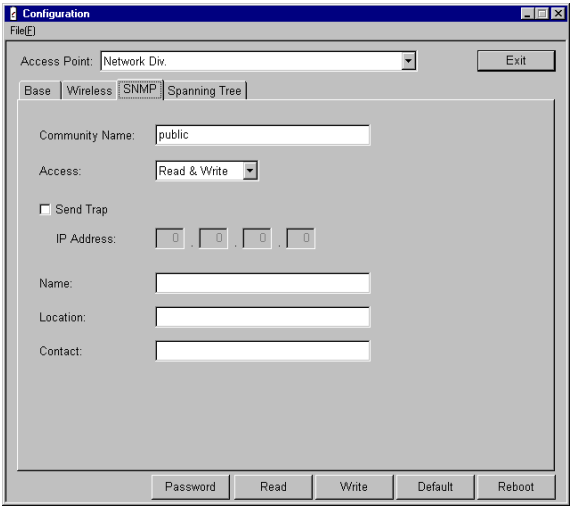


Figure 5.5. Configuration (SNMP)

Parameters	Factory settings	Input range	Description
Community Name	"public"	31 standard alphanumeric characters (case sensitive)	SNMP verification string. This acts like a password for access using SNMP. The SNMP administrator can use this name to access the device's MIB information.
Access	Read & Write	Read & Write / Read Only	Set access permissions for community name. Set whether "Read Only" or "Read & Write" is permitted.
Send Trap	Enabled	Enabled./Disabled	Specify whether to notify the SNMP administrator of MIB data access errors and startup (coldStart).
IP Address	With no setup		Set the IP address to which to send SNMP trap packets. Can only be set when "Send Trap" above is enabled.
Name	With no setup	A character string of up to 31 characters	Set the SNMP device name for the network device.
Location	With no setup	A character string of up to 31 characters	Set the physical location of the network device. For example, "Development Dept., 8th Floor"
Contact	With no setup	A character string of up to 31 characters	Set the administrator contact details for the network device. For example, set the network administrator's name and telephone number.

Spanning Tree

Set when using the spanning tree function. This function is only available when ADHOC (Simple Mode) is set.

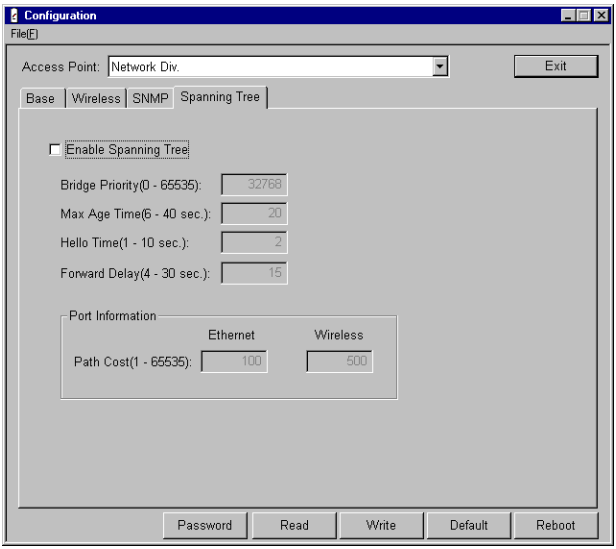


Figure 5.6. Configuration (Spanning Tree)

Parameters	Factory settings	Input range	Description
Enable Spanning Tree	Enabled	Enabled/ Disabled	Specify whether to use the spanning tree function. This setting is only applicable when ADHOC (Simple mode) is set.
Bridge Priority	32768	0 to 65535	Sets the priority order for the spanning tree. Lower numbers have higher priority. Changing the priority order causes the root bridges to be reset for all bridges in the network.
Max Age Time	20 seconds	6 to 40	Set the maximum length of time that data obtained from the BPDU can be used before being discarded.
Hello Time	2 seconds	1 to 10	Set the send interval (seconds) for sending BPDUs for the spanning tree root and when attempting to establish the root.
Forward Delay	15 seconds	4 to 30	Set the time (seconds) for changing from the Blocking state to the Forwarding state.
Path Cost	Ethernet=100 Wireless=500	1 to 65535	Set the costs assigned to the Ethernet and wireless port. The lower the cost allocated to a port, the more likely that port is to be accessed. Setting the following value is recommended in the IEEE802.1D standard. COST = 1000 / Attached LAN Speed in Mbps

File Management

This dialog is used to get the version numbers of the devices connected to the network and to upgrade the firmware or read/write the settings file for the device selected in the “Access Point List”.

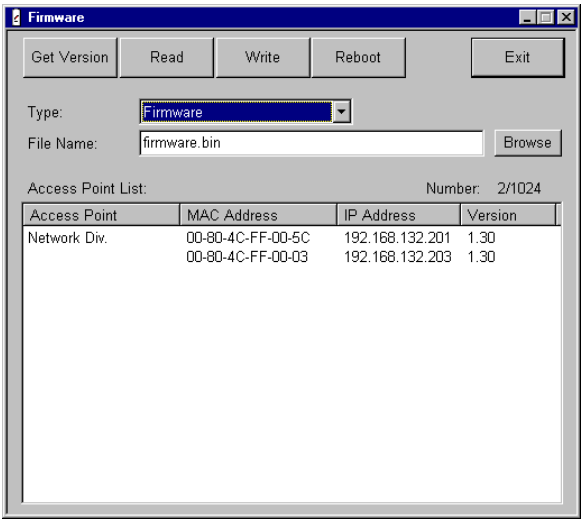


Figure 5.7. File Management

Button	Description
Get Version	This gets the version numbers from all devices connected to the network group or from a specified device only. To get data from a device on the other side of a router, always select the device first. In this case, the IP parameter must be set correctly.
Read	This loads the firmware or settings file and saves on the hard disk. *1
Write	This writes the firmware or settings file from the hard disk to the selected device. *1
Reboot	Reboot the selected device.
Exit	Returns to the main menu.
Browse	Select a file or directory name. Type: Firmware → Selected file: File Name Type: Settings file → Selected file: Directory Name

*1: File name
The file name contains the lower 3 bytes of the MAC address of the selected device.
(ex.) 00-80-4C-4D-20-5E → 4D205E.TXT

Status

This periodically reads operational data including send and receive counters from the device specified in “Access Point” and displays on the screen. Also, the send and receive counter values can be cleared. However, clearing data can only be performed when scanning is stopped.

Button	Description
Exit	Returns to the main menu.
Scan Start	Periodically reads and displays data (the refresh interval is specified in “Interval”(seconds)). If “Interval” is “0”, data is only read once.
Stop	Halts reading of data.

Environment

Displays device information including operating mode, version number, and IP address.

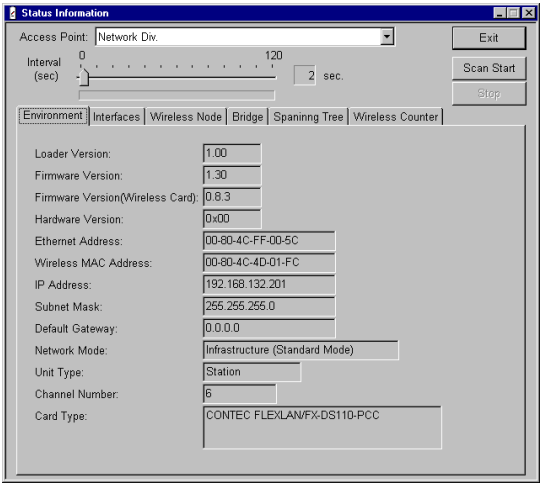


Figure 5.8. Status (Environment)

Parameters	Description
Loader Version	Version number of program for executing firmware
Firmware Version	Firmware version number
Firmware Version(Wireless Card)	Version number of wireless card firmware
Hardware Version	Hardware version number
Ethernet Address	Ethernet address assigned to device
Wireless MAC Address	Wireless MAC address assigned to device
IP Address	Current IP address of this device
Subnet Mask	Current subnet mask
Default Gateway	Current default gateway IP address
Network Mode	Current operating mode
Unit Type	Current unit type
Channel Number	Current wireless channel number
Card Type	Wireless card type

Interfaces

Displays data such as send and receive counters for the device's Ethernet and wireless interfaces.
The counter values can be cleared when scanning is stopped.

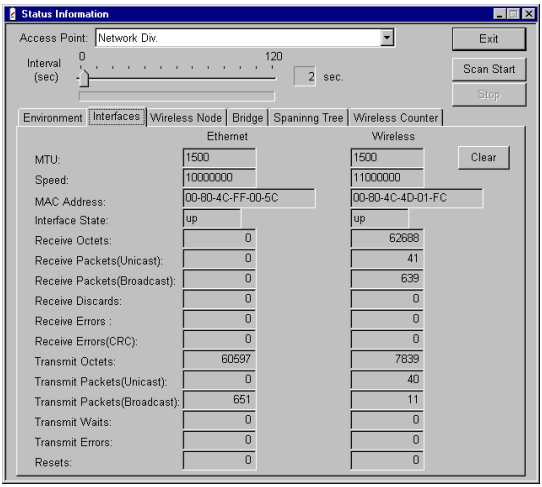


Figure 5.9. Status (Interfaces)

Parameters	Description
MTU	Maximum data size able to be set by this interface
Speed	Transmission speed for sending data from this interface
MAC Address	MAC address assigned to this interface
Interface State	Interface operation state State: up — Interface operating State: down — Not operating or no link
Receive Octets	Number of bytes received
Receive Packets	Number of packets received
Receive Discards	Number of packets discarded due to insufficient memory or similar
Receive Errors	Number of packets with receive errors
Receive Errors(CRC)	Number of packets received with CRC errors. If a large number of errors are recorded on the wireless interface, this may indicate communications with a device using a different encryption setting.
Transmit Octets	Number of data bytes sent
Transmit Packets	Number of packets sent
Transmit Waits	Number of packets waiting to be sent
Transmit Errors	Number of packets with transmit errors
Resets	Number of times this interface has been reset

Wireless Node

Displays a list of logged in wireless devices and associated data such as link quality.
The wireless device list can also be cleared when scanning is stopped.

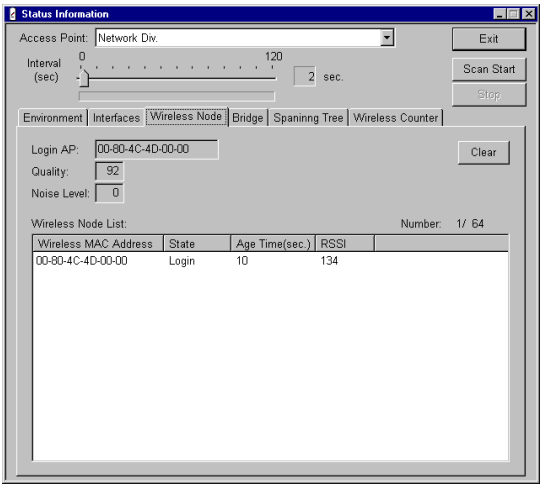


Figure 5.10. Status (Wireless Node)

Parameters		Description
Login AP		MAC address of currently logged-in AP *1
Quality		Quality of link to logged-in AP *1
Noise Level		Station-side noise level
Wireless Node List		- Infrastructure [Unit Type Station] Information of logged-in AP. - Infrastructure [Unit Type AP] Information on wireless device. - ADHOC Information on devices located within radio range of this device.
	Wireless MAC Address	MAC address of wireless device
	State	Login status. Only applicable when infrastructure mode is set.
	Age Time	Length of time this device information has been stored (seconds) Saved when communication performed with device. Deleted when time reaches zero.
	RSSI	Reception level for device (maximum = 150) Higher values indicate higher reception sensitivity.

*1: Only applicable when infrastructure [unit type station] mode is set.

Bridge

Displays the MAC address data managed by this device.
The MAC addresses can also be cleared when scanning is stopped.

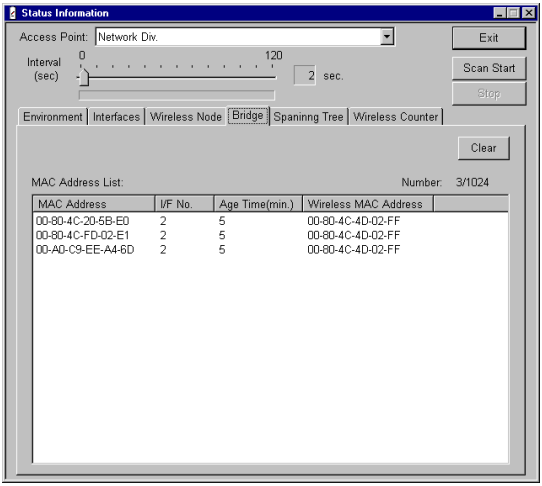


Figure 5.11. Status (Bridge)

Parameters	Description
MAC Address	MAC addresses of devices connected to network
I/F No.	Interface number "1" indicates the device is on the Ethernet side and "2" indicates the device is on the wireless side.
Age Time	Time for which this device information has been held (minutes) Saved when communication performed with device. Deleted when time reaches zero.
Wireless MAC Address	MAC addresses of logged-in wireless devices Only displayed for devices on the wireless side.

Spanning Tree

Displays the spanning tree data stored by the device.
Used to view the root and port data in the spanning tree.

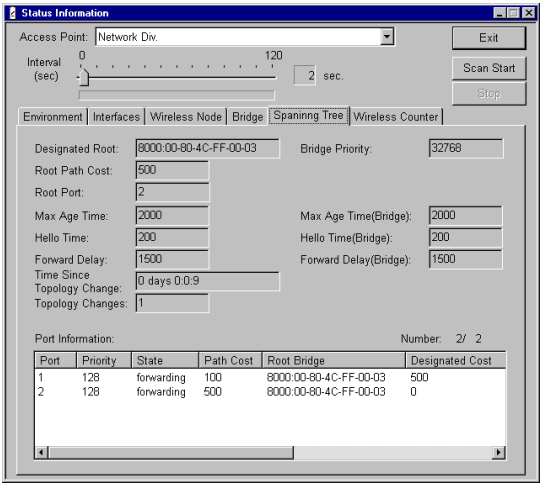


Figure 5.12. Status (Spanning Tree)

Parameters	Description
Designated Root	Root bridge identifier
Root Path Cost	Total path cost to root bridge
Root Port	Port number for root bridge
Max Age Time	Length of time that BPDU data is kept (BPDU effective time)
Hello Time	BPDU send interval
Forward Delay	Time until changing from Blocking to Forwarding state
Bridge Priority	Priority assigned to this device
Max Age Time (Bridge)	BPDU effective time set for this device
Hello Time (Bridge)	BPDU send interval set for this device
Forward Delay (Bridge)	Transfer delay time set for this device
Time Since Topology Change	Time since network topology changed
Topology Changes	Number of times network topology has changed

Wireless Counter

Displays the number of packets, errors, and similar for wireless communications. The counter values can be cleared when scanning is stopped.

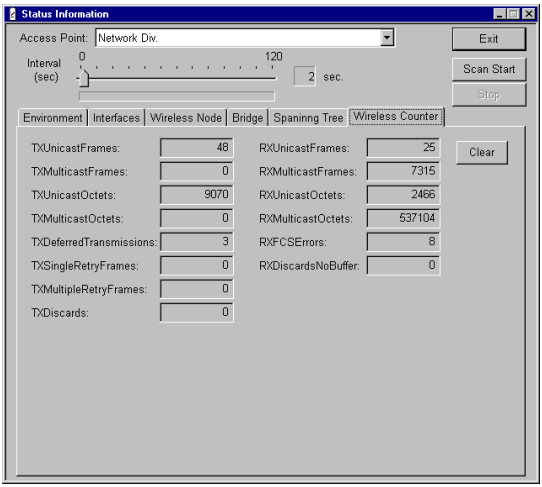


Figure 5.13. Status (Wireless Counter)

Parameters	Description
TXUnicastFrames	Number of packets sent by opposing station using unicast address
TXMulticastFrames	Number of packets sent by opposing station using multicast address
TXUnicastOctets	Number of data bytes sent by opposing station using unicast address
TXMulticastOctets	Number of data bytes sent by opposing station using multicast address
TXDeferredTransmissions	Number of packets for which a send delay occurred
TXSingleRetryFrames	Number of packets resent once only
TXMultipleRetryFrames	Number of packets resent two or more times
TXDiscards	Number of packets discarded
RXUnicastFrames	Number of packets received by opposing station using unicast address
RXMulticastFrames	Number of packets received by opposing station using multicast address
RXUnicastOctets	Number of data bytes received by opposing station using unicast address
RXMulticastOctets	Number of data bytes received by opposing station using multicast address
RXFCSErrors	Number of packets with FCS (Frame Check Sequence) errors
RXDiscardsNoBuffer	Number of packets with buffer errors

To Register or Set Up a New Access Point

(1) Start the utility software. From the main menu, select Edit, and use Search to find the desired APL.

If the access point name has not been set up, the MAC address and IP address will be displayed. Assigning an access point name will make the access point easier for the network to identify.

(2) From the main menu, select Configuration, then use the Base tab to enter the appropriate settings for the network environment (IP address, network mode, data scramble, ESS ID, transmit rate, channel).

Also, enter any necessary settings on the SNMP and Spanning Tree tabs.

*Note that the spanning tree can only be used when the network mode is ADHOC' mode.

(3) When the settings are complete, select [Write]. The settings will be valid when the device is rebooted.

To Edit Settings for an Existing Access Point

(1) Start the utility software. From the main menu, select Configuration, and then select the access point you wish to edit from the access point name list.

*Once an APL on the network has been located using Search, its settings are stored in a file. It is not necessary to use Search each time the utility software is started.

(2) Edit the settings as desired.

(3) When the settings are complete, select [Write]. The settings will be valid when the device is rebooted.

To Use Data scramble Functions for Better Security

(1) Start the utility software. From the main menu, select Configuration, and then select the access point you wish to edit from the access point name list.

*Once an APL on the network has been located using Search, its settings are stored in a file. It is not necessary to use Search each time the utility software is started.

(2) On the Base tab, use the Data Scramble checkbox and set the scramble key.

(3) When the settings are complete, select [Write]. The settings will be valid when the device is rebooted.

To Use SNMP Agent Functions

(1) Start the utility software. From the main menu, select Configuration, and then select the access point you wish to edit from the access point name list.

*Once an APL on the network has been located using Search, its settings are stored in a file. It is not necessary to use Search each time the utility software is started.

(2) On the SNMP tab, make the necessary settings (Community Name, Access, Send Trap, Name, Location, Contact).

(3) When the settings are complete, select [Write]. The settings will be valid when the device is rebooted.

To Use Spanning Tree

Spanning tree is enabled when the APL operating mode is ADHOC mode.

(1) Start the utility software. From the main menu, select Configuration, and then select the access point you wish to edit from the access point name list.

*Once an APL on the network has been located using Search, its settings are stored in a file. It is not necessary to use Search each time the utility software is started.

(2) On the Base tab, set the network mode to 'ADHOC(Simple Mode).'

Or use the DIP switch setting to select ADHOC.

Then make the necessary settings on the Spanning Tree tab.

*Note that all settings other than check boxes may be left at their factory settings.

(3) When the settings are complete, select [Write]. The settings will be valid when the device is rebooted.

To Access the APL from a Different Router

This requires setting the IP parameters on the Base tab (IP Address, Subnet Mask, Default Gateway). This is also necessary when configuring a network using the FX-DS110-APE.

(1) Start the utility software. From the main menu, select Configuration, and then select the access point you wish to edit from the access point name list.

*Once an APL on the network has been located using Search, its settings are stored in a file. It is not necessary to use Search each time the utility software is started.

(2) On the Base tab, set the IP parameters (IP Address, Subnet Mask, Default Gateway).

(3) When the settings are complete, select [Write]. The settings will be valid when the device is rebooted.

6. Spanning Tree Algorithms (STA)

This chapter describes spanning tree algorithms (STA's) supported by this product.

What is an STA?

Communication between nodes on two bridged LAN segments must take place on one path. If two or more paths exist, packets may get caught in the loop and the network, unable to eliminate the packets, may crash. If the network can be configured in such a way as to eliminate the possibility of network loops this problem cannot occur, but if spare paths are provided and used, it is necessary to switch routes manually. The problem can be avoided if the bridge has the following functions.

Network Loop Detection and Avoidance

This function detects path that are involved in network loops and keeps only one path active. The other path is kept available for backup but cannot be used.

Automatic Topology Reconfiguration

This function reconfigures the network topology when a fault occurs on a backup route.

This method of resolving problems is called an STA, and has been standardized by the spanning tree protocol (STP) established in IEEE 802.1D. STP can enhance network reliability.

Note!

For STA's to function properly, all bridges in a network must support STP.

STA Parameters

STA's function on two levels, bridge level and port level. Multiple timers are used to periodically check the proper operation of bridges and ports. The following section describes the parameters and terms used in this product.

Bridge Level

Root Bridge

First, the bridge is determined using the bridge identifier (bridge priority level and Ethernet address) of the bridge. The bridge identifier of the root bridge is the smallest.

If more than one bridge exists with the same priority level, the root bridge is determined by Ethernet address.

Designated Bridges

In each LAN segment, the bridge having the lowest root path cost to the root bridge is the designated bridge. The designated bridge serves to carry the packages of that LAN segment.

If more than one bridge is connected to the same LAN segment, and the root path costs are exactly the same, the bridge with the smallest bridge identifier becomes the designated bridge.

Bridge Priority

The priority level can be set in the range 0 to 65535. The smaller this number, the higher the priority. If priorities are changed, all bridges and root bridges in the network will be re-determined.

Root Path Cost

The total path cost from the designated bridge to the root bridge is the root path cost. The root path cost of the root bridge is zero.

BPDU Effective Time (Max Age Time)

Set in the range from 6 to 40 (seconds). If the bridge does not receive a packet notifying the existence of a root bridge within this time, the system assumes there is a failure in the root bridge, and determines a new root bridge.

BPDU Send Interval (Hello Time)

Set in the range from 1 to 10 (seconds). This determines the interval within which a bridge that is the root bridge sends a packet notifying its existence. This parameter may not exceed the Max Age Time.

Forward Delay Time

Set in the range 4 to 30 (seconds). When the ports of a bridge change from blocking to forwarding status, this determines the time in which they will remain in listening status.

Note!

The following conditions must be observed when making changes to the above time settings.

$$Max\ Age\ Time \leqq 2\ x(Forward\ Delay\ Time - 1)$$
$$Max\ Age\ Time \geqq 2\ x(Hello\ Time + 1)$$

Port Level

Root Port

On each bridge, the port having the lowest path cost to the root bridge is called the root port.

If more than one port has the same path cost, the port with the smallest port identifier (port priority and assigned port ID) is the root port.

Designated Port

The port on the designated bridge connected to the LAN segment is called the designated port.

On the bridge, packages are only transferred on the port that is the root port, and other ports are blocked.

Port Priority

Set in the range 0 to 255. The lower the number, the higher the priority level.

Path Cost

The port cost on a path is called the path cost, and is set as follows when this product is initialized. This value is based on IEEE standard 802.1D, but can be changed.

- 10Mbps LAN segment 100

Sample STA Application

This section describes examples of configurations in which network loops occur, and how the application of an STA determines the backup path.

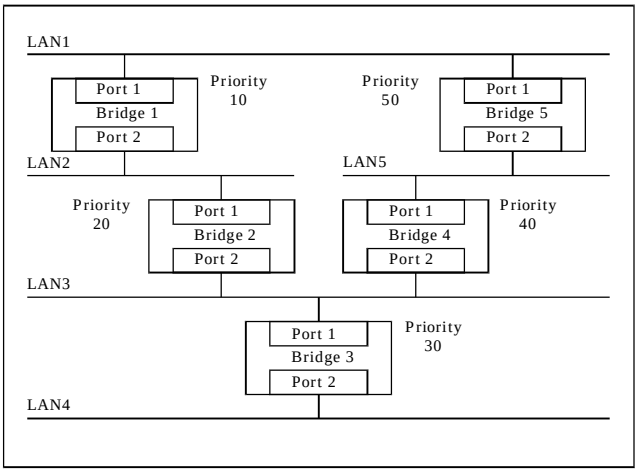


Figure 6.1. Sample STA Application

All settings other than bridge priority settings are identical.

The root bridge is determined by the priority settings of each bridge.

Root bridge	Bridge 1

The designated bridge for each LAN segment is determined by root path cost.

LAN1	Bridge 1
LAN2	Bridge 1
LAN3	Bridge 2
LAN4	Bridge 3
LAN5	Bridge 5

The designated port for each bridge is determined by the designated bridge.

Bridge 1 Ports 1, 2

Bridge 2 Port 2

Bridge 3 Port 2

Bridge 5 Port 2

The root port of each bridge is determined by its path cost to the root bridge.

Bridge 2 Port 1

Bridge 3 Port 1

Bridge 4 Port 1

Bridge 5 Port 1

Ports that are neither designated ports nor root ports are backup paths.

Backup path Bridge 4, port 2

After application of the STA, the network configuration looks like this.

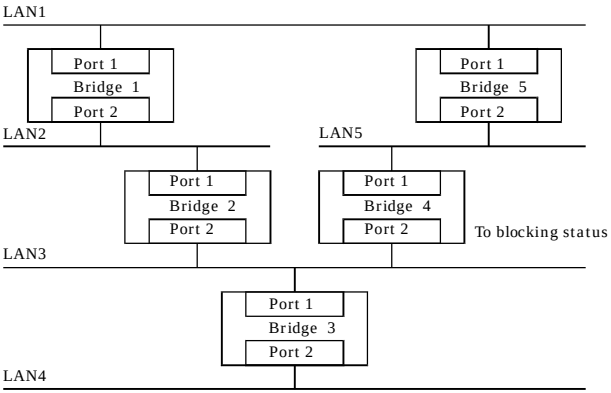


Figure 6.2. After STA Application

After STA application, if a fault occurs at bridge 5 port, the STA will be applied again to reconfigure the network topology. The reconfigured network would then look like this.

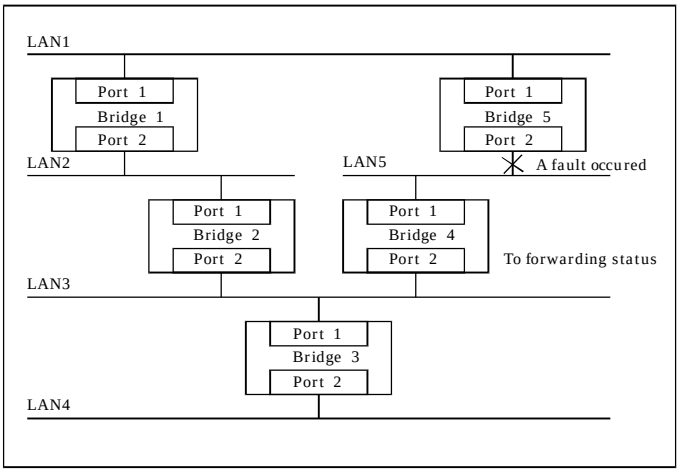


Figure 6.3. Reconfigured After STA Application

7. SNMP Agent Functions

This chapter describes the SNMP functions of this product, and explains how they can be built in using the SNMP Manager SNMPc by CONTEC.

SNMPc Overview

SNMPc is network control software for SNMP that runs on Windows and controls all network devices that have SNMP agent functions. SNMPc can be used to perform the following control functions.

- Monitoring unit startup status
- Monitoring port operating status
- Indicating MIB information
- Displaying log files of traps, events, etc.

For instructions on installing and operating SNMPc, refer to the SNMPc documentation. Note that a bitmap display of this product can be displayed on SNMPc by installing it from the floppy disk provided with this product.

MIB Support

This product provides MIB support for MIB-II (RFC1213), bridge MIB (RFC1493), and private MIB. Support is provided for the following group names.

Table 7.1. Group Names

MIB Group name	Description
system	Information related to AP, including AP control name, operating time etc.
interfaces	Basic information related to the physical interface layer, including MAC address etc.
at	Information corresponding to the ARP cache
ip	Information related to IP protocol, including IP address information etc.
icmp	Information related to ICMP protocol, including ICMP message TX/RX count, etc.
udp	Information related to UDP protocol, including UDP message TX/RX count, etc.
snmp	Information related to SNMP, including SNMP message count, etc.
Bridge MIB	
dot1dBase	Information related to bridge, including MAC address, port count, etc.
dot1dStp	Information rlated to spanning tree.
dot1dTp	Information related to transparent bridges.
Private MIB	
miscroapEnvironment	Operating environment information.
microapStatusInfo	Status information including LED, DIP switch status.
mistoapPriEthInterfaces	Information related to wired side interface.
microapPriWLInterfaces	Information related to wireless side interfaces.
mircoapPriWLLoginApInfo	Information related to controlling AP.
miscroapPriWLNodeTable	Wireless station information.
microapPriCamTable	Information related to bridge.

Control Using SNMPc

Install SNMPc on a personal computer in the network to which this product is connected. Read the SNMPc manual carefully.

Once installation is complete, you can operate the PC on which SNMPc is installed as a network manager, analyzing network status and error information from this device as shown below.

Also, you can install the maintenance tools provided with this product on SNMPc, to display information about this product in graphic form as shown below.

Note!

In order to control this product, its IP address and community name must be entered accurately in the Settings.

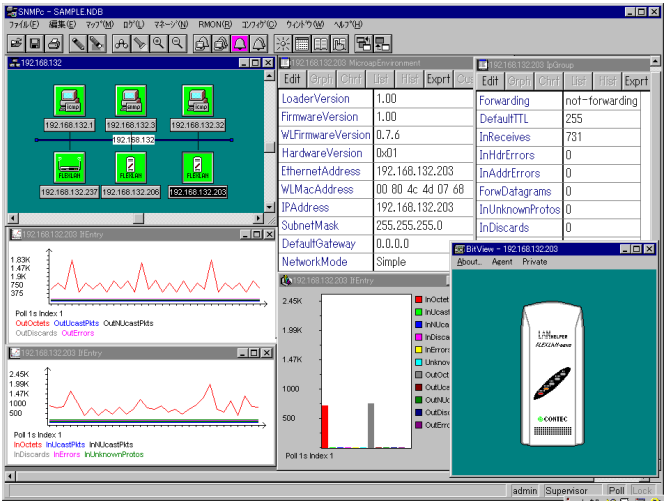


Figure 7.1. Settings

Building-in to SNMPc

Follow these steps to install SNMPc Ver. 4.

(1) Start the SNMPc Setup program.

To start SNMPc Ver. 4, select [Start] – [SNMPc 4.0] – [Setup]. After startup, verify the user registration information.

(2) Insert the Maintenance Tools floppy disk provided with this product into the floppy disk drive. Enter the floppy disk drive path name followed by SNMPc.4\, and click 'OK.'

Example: If the floppy disk drive is the A: drive, enter A:\SNMPc.4\.

(3) Select [CONTEC FX-DS110-APL], and click [OK] to start installation.

(4) When the following message appears, click [No] to exit the program.

[Do you want to install additional vendors?]

MIB Database Updates

After installing a new vendor, you will have to update the MIB database the next time SNMPc is started.

Follow these steps to update the MIB database. In this description we use 'SNMPc Ver.4' as an example.

(1) Start SNMPc.

To start SNMPc Ver. 4, select [Start] – [SNMPc 4.0] – [SNMPc].

(2) Click [Yes] to update the MIB database.

(3) When you are finished updating the MIB database, click [OK]. The build-in to SNMPc is not complete.

8. Troubleshooting

This chapter describes common problems that may occur with this product and what to do about them. If any problems occur that are not described here, check to confirm that the re-occur, then contact the store where you purchased the product, or the CONTEC information center.

When Communication Fails

Check hardware

- Check that the LAN cables are connected correctly.

Check software

- The FLEXLAN-DS110 series is designed to handle a variety of operating formats, and requires software setting for each type of operation. Check that the settings are appropriate for the type of operation, and check the format in which communication is being attempted. Also check DIP switch settings.
- The terminals that cannot communicate with each other may have the same ESS ID. Two terminals with the same ESS ID cannot communicate with each other.
- Check that the APL IP address and subnet settings have been entered.
- Check that the operating mode setting has been correctly entered.
- Check whether communication is restricted by security functions.
- Check whether the data encryption setting is the same as that of the recipient.
- Check that the channel setting has been correctly entered.
- Check that the communication speed setting has been correctly entered.

Check the peripheral environment and place of installation

- A nearby source of electromagnetic interference can prevent communication. In general locations (excluding factories) the following may be sources of electromagnetic emissions.
  - 2.4GHz band wireless networks not compatible with IEEE 802.11b.
  - Microwave ovens
  - Security gates
  - Copiers
  - Elevator motors

Most electromagnetic sources other than wireless networks are local and not continuous, and therefore by moving the location of the unit and waiting briefly, communication may be possible.

Also, do not place wireless devices too close together. A distance of at least 1m should be allowed.

- Sometimes communication is hindered by attenuation of electric waves. Attenuation occurs naturally as distance from the source of transmission increases, but may also be caused by objects in the path of the transmission. The objects primarily responsible for attenuation are the following.
  - Concrete walls
  - Metallic surfaces around antennas

Stable transmission at 11Mbps requires an RSSI value of at least 80. The RSSI value can be verified on the Wireless Device Information tab on the Status screen using the utility software.

When SNMP Connections Fail

- It is possible that the device cannot locate a control parameter, or that a private MIB has not been compiled. See Chapter 6.
- If MIB settings have not been made, the correct community name may not have been entered. Be sure the community name setting agrees with the network manager's setting.
- Check the SNMP settings that are being used.

When the APL Will Not Start

Check the power LED

- Be sure the power LED is on. If it is not on, check the AC adapter, be sure it is correctly plugged into an outlet, and that the power supply type agrees with the power supply switch setting.
- Check whether the power LED is flashing. If the power LED is still flashing more than 10 minutes after the power is switched on, the problem may be an APL firmware failure. Use the utility software to upgrade the firmware version.

9. Appendix

Product Specifications

Table 9.1. Physical Specifications

Specification		FX-DS110-APL
Wired LAN unit	Ethernet standard	IEEE 802.3
	Data transmission speed	10Mbps
	Access method	CSMA/CD
Wireless LAN unit	Transmission format	IEEE 802.11b standard DS spectrum diffusion
	Data transmission speed	11, 5.5, 2, 1Mbps(fixed/automatic)
	Access method	CSMA/CA + ACK(RTS/CTS)
	Transmission packet	IEEE 802.11b frame
	Wireless category	ISM Baud 2400~2483.5 MHz
	Aerial power	10mW/MHz or less
	Security	Proprietary scramble/WEP
Antenna		Flat surface diversity antenna
Operating modes		Ad hoc, Infrastructure/Station settings available
Dimensions (mm)		81(W) x 26.5(D) x 175(H)
Weight		0.2kg

Table 9.2. Software Specifications

Specification	FX-DS110-APL
Protocols	IP(RFC 791), ICMP(RFC 792), UDP(RFC 768), ARP(RFC 826), SNMP(RFC 1157), MIB II(RFC 1213)

Table 9.3. Installation Environment Conditions (Environment Specifications)

Specification	FX-DS110-APL
Supply voltage	5.5 to 7.0VDC (using AC adapter)
Current consumption	0.6A(Max.)
Operating temperature	0 to 50°C(main unit) 0 to 40°C(AC adapter)
Operating humidity	10 to 90%RH (without condensation)
Airborne dust	Not extreme
Corrosive gases	None
Other	Do not obstruct ventilation slits Leave 5cm open space in all directions

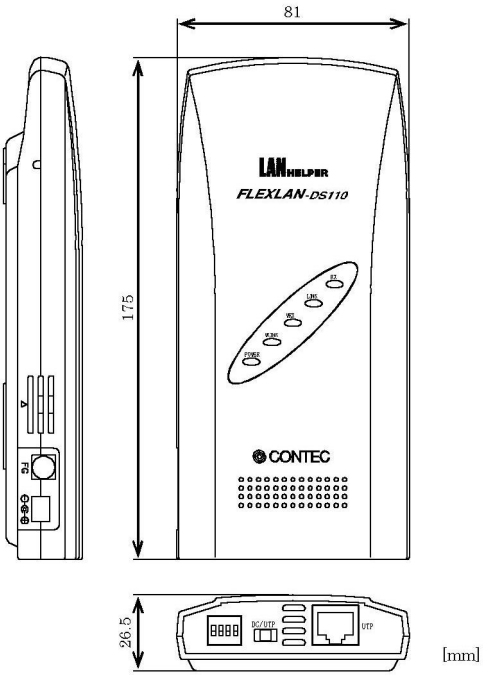


Figure 9.1. External Dimensions

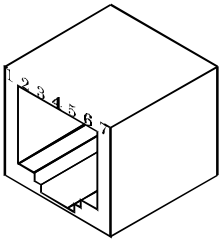
Input/Output Interface

UTP Port Pin Assignments

Table 9.4. UTP Port Pin Assignments

Pin no.	Signal
1	TD +
2	TD –
3	RD +
4	Not used (VCC)*1
5	Not used (GND)*1
6	RD–
7	Not used (VCC)*1
8	Not used (GND)*1

*1 : These pin assignments are used when power is supplied from 10BASE-T using POW-CB10.



Glossary

IEEE (Institute of Electrical Electronics Engineers)

"I-triple-E," involved in a wide range of fields from communications and computer to medicine and biology, with primary activities related to publishing articles and sponsoring conferences, but also recommending and setting of standards. The organization sponsoring Committee 802, which is responsible for LAN related matters.

IEEE 802.11/ IEEE 802.11b

The wireless LAN standard established by the IEEE.

MIB (Management Information Base)

The value of a MIB is determined by the Internet standard control information structure.

SNMP (Simple Network Management Protocol)

A function necessary for network control, provides three functions: Get (acquire), Set (modify), and Trap (notify event). Conceived as an easily installable control protocol that places as little load on the network as possible.

Diversity

A method of using multiple antennas, and selecting the one with the best receiving conditions.

Router

A device for relaying between LAN's. The router determines data addresses by the combination of a network address assigned to the network and an individual computer address. Used particularly in medium-scale and larter LAN systems with very large number of clients, to reduce traffic (congestion) on communication lines.

Bridge

A device for relaying between LAN's. The bridge determines whether to relay data based on the address of the computer to which the data is being sent. It can be used to connect networks having different protocols, or when data for broadcast to all computers is received, can send this to all connected networks.

LAN (Local Area Network)

A network configured from mutual connections between computers within a limited area. Also called an "intranet" or "business or regional data communications network."

RSSI (Receive Signal Strength Indication)

A numeric indicator of incoming signal strength.

Spectrum diffusion transmission

A method of transmission in which signals that are normally transmitted over a given limited frequency band undergo narrow band modulation (primary modulation), then again diffuse modulation (secondary modulation) to intentionally diffuse the signal over a broad frequency spectrum.

DS (Direct Sequence)

A type of spectrum diffusion signal using narrow band modulation with phase modulation, in which the diffusion is by means of phase modulation using a broad band diffusion signal (pseudo random strings).

CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance)

CSMA is a method of avoiding collision by which wireless terminals listen before transmitting and do not transmit if they can year transmissions from other wireless terminals. CSMA/CA is CSMA plus additional collision avoidance functions.

Hidden Terminal Problem

When wireless terminals are farther apart then their electric signals can reach, or their signals are obstructed by objects, neither may be able to receive the other's signals. Any two such wireless terminals are said to be hidden from each other. In Ad Hoc mode, because the carrier sense function is not effective between hidden terminals there is a higher probability of collisions and throughput (the volume of information sent in a given time interval) is reduced.

RTS (Request to Send)

In communication via AP, transmission is controlled by CSMA/CA plus RTS. In RTS, a wireless terminal asks the AP if it is all right to transmit, and only transmits after an OK-to-send acknowledgement signal is returned. This serves to avoid unnecessary collisions when hidden terminals exist because hidden terminals cannot transmit.

Roaming

This term has the same meaning as roaming for a portable phone or PHS. The AP is in the role commonly called the 'antenna/base station' for the phone or PHS, and the user unit is in the role of the phone itself.

Peer-To-Peer

A network in which two or more nodes can communicate directly with each other without going through another device.

AP (Access Point)

In the FLEXLAN-DS110 series, access points serve as the bridge between wired networks and wireless networks, as well as providing bridge functions between segments and IP tunnel functions indispensable to the building of versatile, large-scale networks.

User Unit

In the FLEXLAN-DS110 series, this refers to the FX-DS110-PCC or a device with the FX-DS110-PCC built in.

ESS ID (Extended Service Set ID)

In the FLEXLAN DS110 series, the ESS ID is like a name assigned to the wireless LAN network to which a unit belongs. The same name must not be given to more than one wireless terminal. Conversely, a wireless network can be partitioned by using different ESS ID names.

Channel

This term has the same meaning as a television or radio channel. In the 2.400 to 2483.5GHz ISM band used by this product, the IEEE 802.11 standard provides for division into 11 (FCC model) or 13 (CE model) channels numbered 1 to 11 or 13. Even on the same network, wireless devices operating on different channels cannot communicate with each other.

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