

USER GUIDE

INDUSTRIAL DATA COMMUNICATIONS

FastLinc™

FLC810E+

Industrial Wireless Ethernet Modem



GE Fanuc

OMRON®



Schneider Electric
Building a New Electric World



It is essential that all instructions contained in the User Guide are followed precisely to ensure proper operation of equipment.

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Introduction

The FastLinc Family of 802.11b Industrial Ethernet Wireless Modems provide high-speed, secure wireless communications using 2.4 GHz direct sequence technology available in stand-alone Ethernet (FLC810E+ and PCMCIA card (FLC800C) models. With an output power much higher than commercial 802.11b products, they provide longer outdoor range and broader indoor coverage.

The FastLinc 810E+ adds higher RF power (300mW), the ability to connect multiple Ethernet devices in station adaptor mode and a built-in router to the FastLinc Family whose reputation for reliable, robust industrial installations is unsurpassed. Rated at a range up to 6 miles (10 km) with unobstructed line-of-sight (farther using Repeaters), the FLC810E+ is ideal for wireless Ethernet communications in challenging industrial environments.

The FLC810E+ includes inter-building with repeating mode (wireless bridge mode) for linking remote plant networks, access point mode for creating wireless hotspots within industrial plants and station adapter mode for linking one or more devices to the plant network. A built-in Network Address Translations (NAT) router and DHCP server give plant managers the option to create separate private networks.

In inter-building with repeating mode (wireless bridge mode), the FLC810E+ wirelessly connects remote networks using a non-standard transmission technique which enhances security. When in inter-building with repeating mode, The FLC810E+ also acts as a Repeater for extending range or working around obstructions.

The FLC810E+ is housed in a sturdy steel enclosure with an optional DIN rail clip for mounting. It is designed for harsh environments and has an extended operating temperature of -40 to $+65^{\circ}$ C.

The FLC810E+ is easy to configure and troubleshoot using a web browser to access an internal web server. A software configuration utility is also included. As with all Data-Linc Group products, support services such as pre-sale project consultation, post-sale tech support with PLC expertise and site survey planning assistance are part of the Data-Linc Group commitment.

Features and Benefits

- Delivers high output power (300mW) and excellent receiver sensitivity for outstanding in-plant RF coverage and outdoor range
- Station Adapter Mode supports multiple field devices for wireless network bridging
- Functions as a mesh network in Inter-Building with Repeating mode (Wireless Bridge Mode)
- Provides high level of security and repeater function with unique, non-WiFi wireless bridge mode (optional ES-SID beacon suppression)
- Offers a range of 6 miles with unobstructed line-of-sight (farther using Repeaters)
- Supports Network Address Translation (NAT) routing feature and DHCP for dynamic IP address allocation
- Designed with rugged 18 gage steel enclosure, universal mounting including an optional DIN rail clip for compact, flexibility
- Withstands extended temperature of -40° to $+65^{\circ}$ C
- Ensures security through built-in data encryption and authentication

Safety & Operational Notices

FCC Part 15 Notification

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.

Federal Communications Commission (FCC) Statement

This Equipment has been tested and found to comply with the limits for a Class B and C digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult Data-Linc Group or an experienced radio/TV technician for help.

RF Exposure

1. This Transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.
2. This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 23 centimeters between the radiator and your body.

Note: Professional installation of this product, antennas and its antenna accessories is required.

Approved Antennas

2.4 GHz Omni Antennas

DLG Model #	Gain	Manufacturer	MFG Model #
A-FL-OADJ2	2 dBi	Maxrad	MHWS2400MSMARP
A-2.4-OB	5 dBi	Maxrad	MAXC-24505
A-FL-OB-6	6 dBi	Maxrad	MFB24006

2.4 GHz Yagi Antennas

DLG Model #	Gain	Manufacturer	MFG Model #
A-2.4-YB	10 dBi	Maxrad	MYP24010PTNF
A-FL-YB-14M	14 dBi	Maxrad	MYP24014PTNF
A-FL-YB-14C	13.9 dBi	Cushcraft	PC2415NA

Mechanical Description

Led's

Marking	Description
POWER	Power enabled
AP-ACTIVE	The FLC810E+ is in AP mode and Ready
W-LAN	Wireless RX/TX Activity
DATA	Wired LAN Activity Detected
LINK	Established a Wireless Link
ELINK	Wired LAN Link
10/100	Connected to 100M LAN

Power Connector

P-5 Barrel Jack Center Positive, 12VDC Input

Ethernet Connector

RJ45 (8 Position)

Primary Antenna Connector

RPSMA - Reverse Polarity SMA Female

Connect the supplied 0 dbi test/short range antenna or external coax & antenna assemblies

Reset Button

The button labeled "Reset" enables the user to restore the FLC810E+'s default setting, useful for a forgotten password. Please detach the DC power plug and press the "Reset" button on the connection panel of the FLC810E+. Reconnect the power while holding the button in for a few seconds until the "AP Active" LED indicator blinks. This will restore the FLC810E+'s default settings and enable the user to configure the FLC810E+ via the utility software, telnet or web browser again. The default TCP/IP address is 192.168.1.1

Note: Once the FLC810E+ is reset to the factory default all previous configurations will be lost.

Hardware Installation

Take the following steps to set up the FLC810E+.

Site Selection

Before installation, determine the FLC810E+ location. Proper placement of the FLC810E+ is critical to ensure optimum radio range and performance. The Site Survey and Browser Utility shipped with the FLC800C laptop card is typically used to choose a proper placement for the FLC810E+. Generally, the best location to place the FLC810E+ is the center of your wireless coverage area with mobile stations within the line of sight. Obstructions may impede performance of the FLC810E+.

Connect the Ethernet Cable

The FLC810E+ supports 10/100M Ethernet connection. Attach your UTP Ethernet cable to the Ethernet connector on the FLC810E+.

Note: Use a cross-over cable when connecting the FLC810E+ directly to a PC.

Connect the Power Cable

Connect the power adapter to the power socket on the FLC810E+, and plug the other end of the power into an electrical outlet. The FLC810E+ will be powered on and all five indicators on the top panel will flash in sequence to test the functionality of the indicators.

Note: Only use the power adapter supplied with the FLC810E+.

Connect the External Antenna/Coax (Optional)

Mount the external antenna, and route the coax back to the FLC810E+ per electrical standards; Connect the reverse polarity SMA connector to the primary antenna port of the FLC810E+.

Wireless Network Configuration Options

The FLC810E+ can be configured in a variety of radio modes.

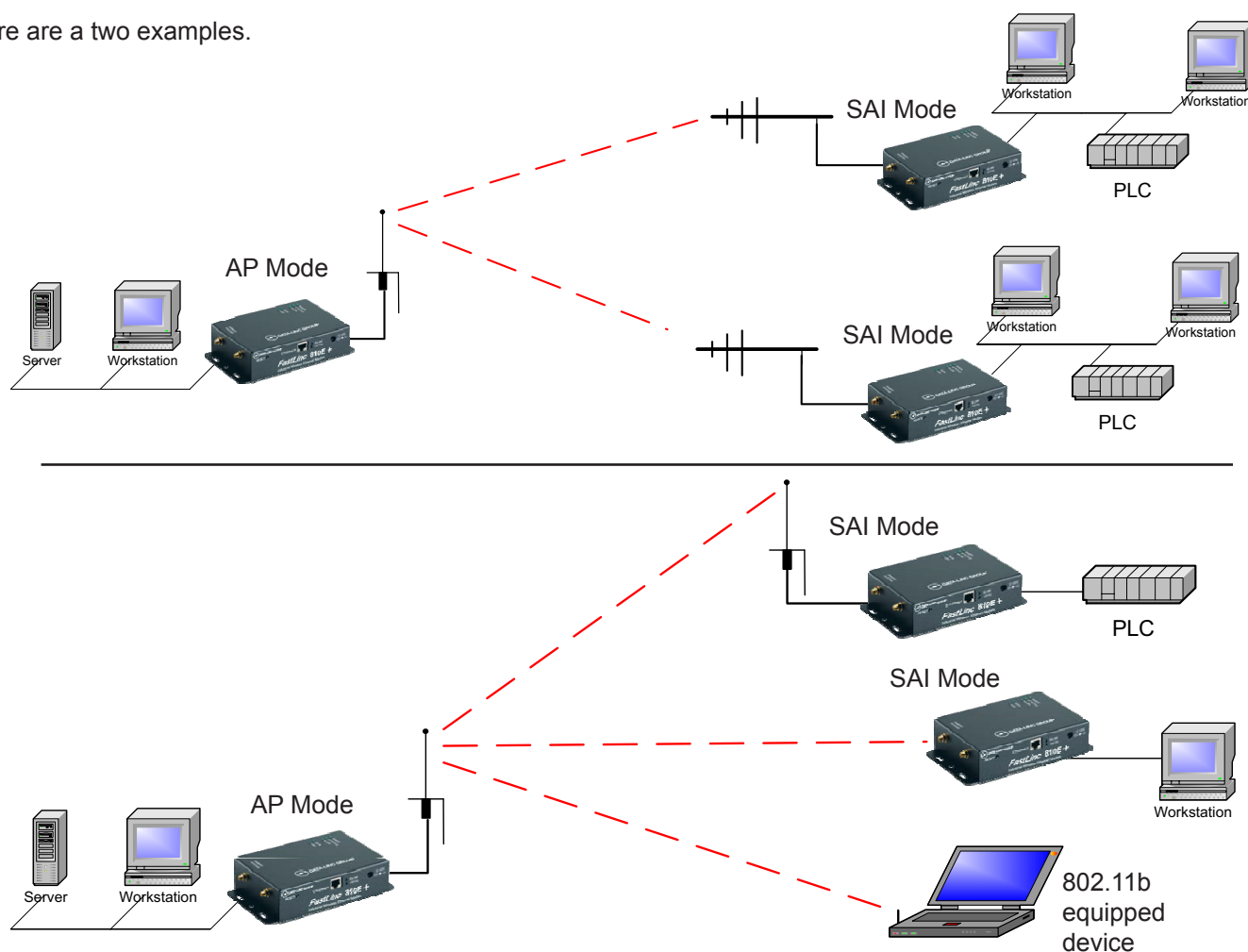
Infrastructure Mode (AP & SAI)

In infrastructure mode (see page 12 for configuration), the FLC810E+ can either act as an Access Point (AP) or an Infrastructure Station Adaptor (SAI).

As an Access Point the FLC810E+ acts as a center point for all wireless communications (hotspot). Allowing FLC810E+'s (SAI mode) or other 802.11b compliant devices to connect and build a network.

As an SAI the FLC810E+ acts as a node to attach an Ethernet device or LAN segment on to a wireless network thru an FLC810E+ AP mode) or other 802.11b compliant Access Points.

Here are two examples.



The basic settings needed in setting up this type of network are:

Radio Mode / ESSID / Channel / IP Address

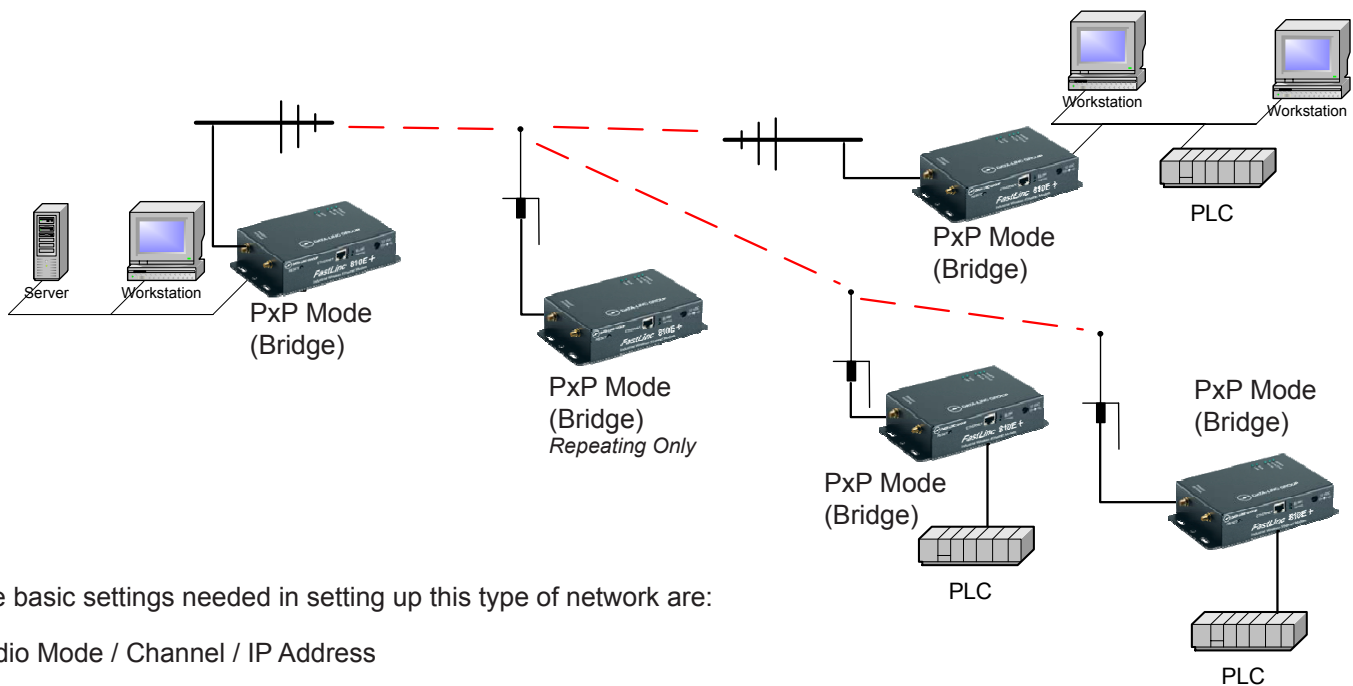
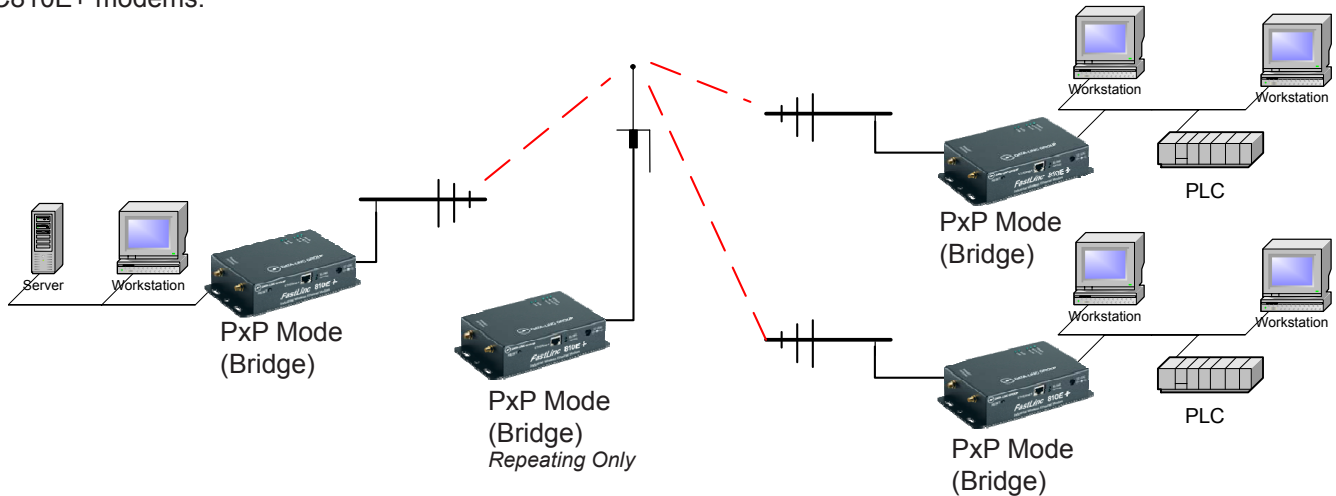
Other settings to consider are:

WEP Security / MAC Access Control / Hide SSID (SSID Beacon Suppression)

Inter-Building with Repeating Mode (PxP) [Wireless Bridge Mode]

In inter-building with repeating mode, the FLC810E+ automatically builds a network mesh by optimally connecting all available FLC810E+s together. In this mode the FLC810E+ will connect to the FLC810E+ with the highest quality link. This is done during power up, or following a dropped link condition.

This mode is proprietary to the FLC810E/FLC810E+ modem family. It has the same performance of an 802.11b network, but does not have the security vulnerabilities of many 802.11b/g networks. This network must consist of all FLC810E/FLC810E+ modems.



The basic settings needed in setting up this type of network are:

Radio Mode / Channel / IP Address

Other settings to consider are:

WEP Security / MAC Access Control

FLC810E+ Configuration

The FLC810E+ is configured by default in station adapter mode. Use one of the three easy configuration options to configure the FLC810E+

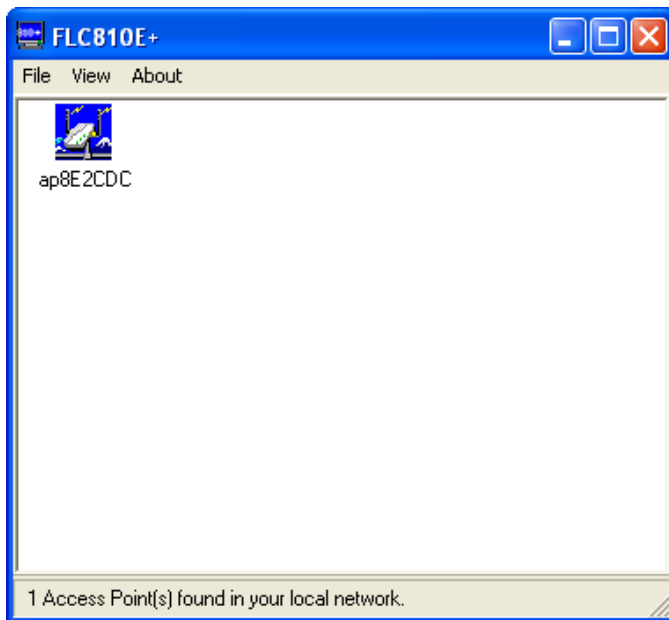
- I - FLC810E+ Utility
- II - Web Management
- III - Telnet

I. Using FLC810E+ Utility

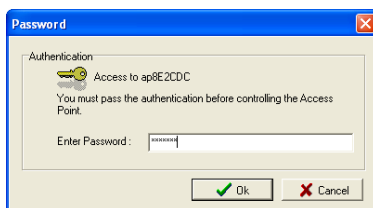
Installed on your Windows based computer, the Windows based utility provides a user-friendly interface. The utility enables the user to configure all of FLC810E+ units on the network.

The following instructions guide the user through the installation of the FLC810E+ utility.

1. Insert the software CD that came with the FLC810E+ in your computer.
2. Choose the FLC810E+ Utility From the AutoRun window
3. Follow the on-screen instructions to install the software.
4. Upon completion, go to Program Files and execute the FLC810E+ software. It will begin to browse all the FLC810E+s available on the network.



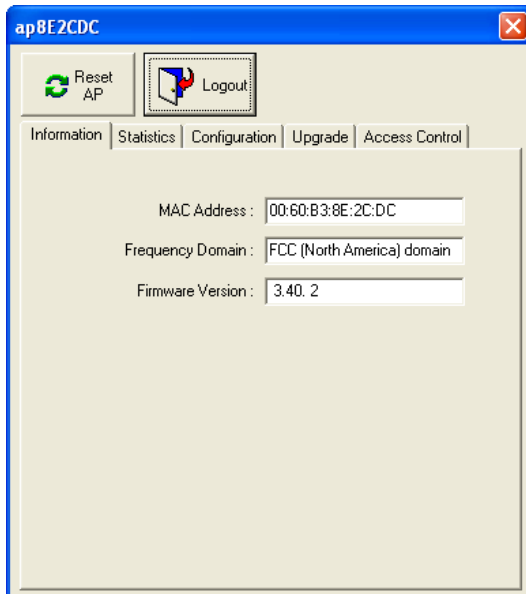
5. Double click an icon to access its property dialog box. Enter the password in the entry field. The default password is "default". If multiple FLC810E+ units are shown, the default name is the last 6 digits of the MAC address found on the bottom of the FLC810E+



6. After entering the correct password, the configuration window appears.

Information Tab

The user will see the basic information of the FLC810E+, such as MAC Address, Frequency Domain and Firmware Version.



MAC Address: Hardware identification number that distinguishes the unit from others. The number label is located on the bottom of the FLC810E+.

Frequency Domain: The regulated operating frequency per country.

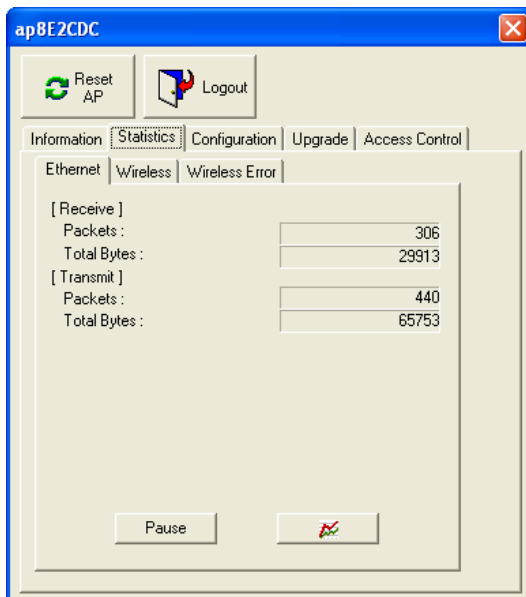
Firmware Version: Displays the firmware version that is loaded in the FLC810E+.

Statistics Tab

The statistics tab contains three items for the user to monitor the Ethernet and wireless network traffic.

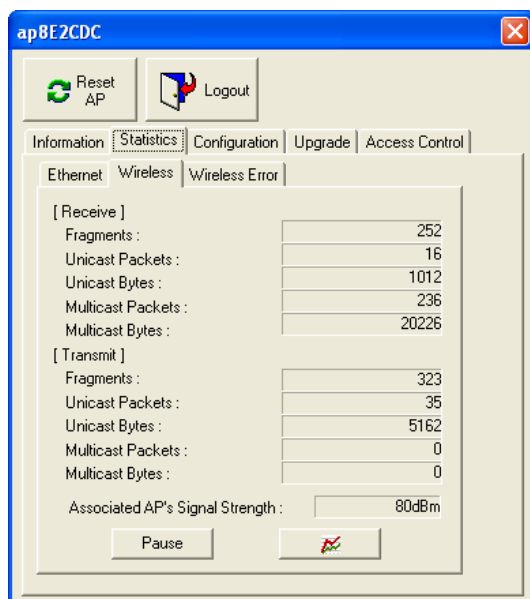
1-Ethernet:

For monitoring the TX/RX on the wired network.



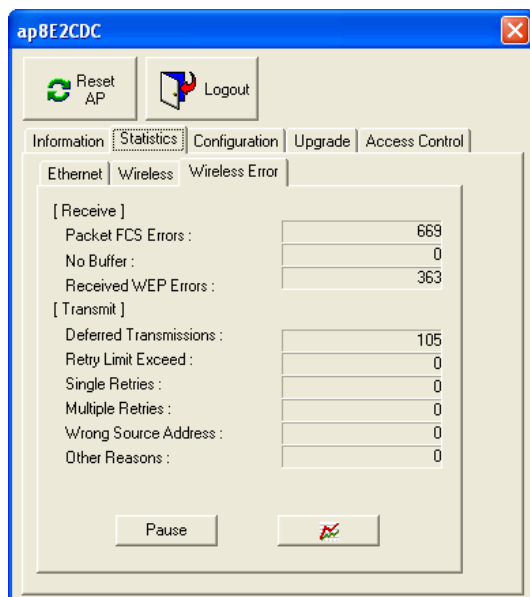
2-Wireless:

For monitoring the TX/RX of the wireless network.



3-Wireless Error:

This item offers detailed information on wireless error packets that the AP (Access Point) receives and transmits.



[Receive]

Packet FCS Errors: The number of wireless packets that fail during FCS transmission (Frame Check Sequence) when accessing the wired network.

No Buffer: The number of wireless packets that the AP ignores due to insufficient memory.

Received WEP Errors: The number of wireless packets that have WEP encryption errors.

[Transmit]

Deferred Transmission: The number of packets that have deferred transmission due to the fact that the medium is busy.

Retry Limit Exceed: The number of packets that are not sent due to the reason that the packets exceed the retry limits.

Single Tries: The number of packets that are successfully sent on the first retry.

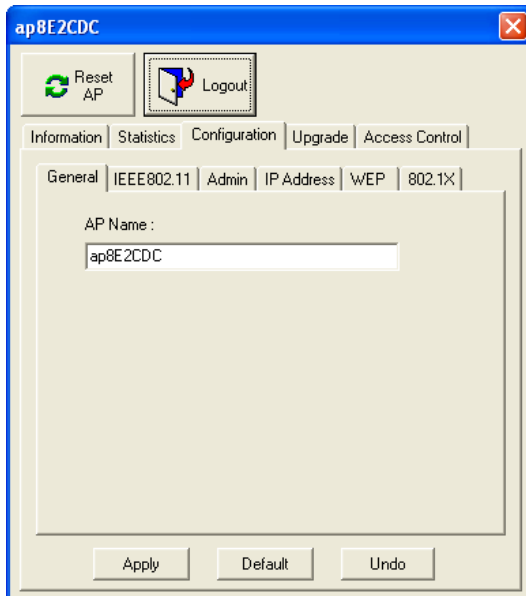
Multiple Retries: The number of packets that are successfully sent after several retries.

Wrong Source Address: The number of packets that are ignored by the FLC810E+ because the source client is not in its BSS.

Configuration Tab

The configuration tab contains 6 sub tabs for easy configuration.

1-General:

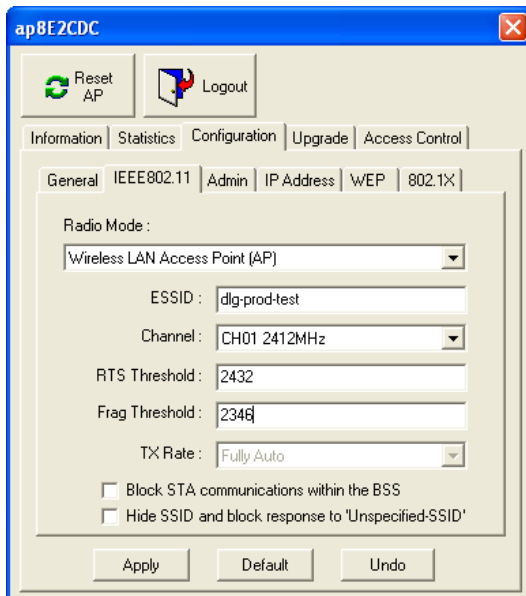


AP Name:

In this entry field, you may enter any name. This will enable you to manage your FLC810E+s with more ease if you have multiple FLC810E+s on the network.

Note: This is a FLC810E+ descriptive name and should not be confused with the ESSID.

2-IEEE 802.11



Radio Mode:

This item enables the user to set the operation mode each FLC810E+

•**Wireless LAN Modem (AP):** Serves as a transparent Media Access Control (MAC) bridge connecting a wireless network and a backbone network.

•**Inter-Building with Repeating (PxP):** Connect two or more separate networks with the FLC810E+.

•**Station Adapter – Infrastructure (SAI):** Serves as a wireless station (infrastructure). Connect the Station Adapter – Infrastructure to a PC with a cross over 10baseT cable, and it is able to access the network via the Access Point (AP).

•**Station Adapter – Ad-Hoc (SAA):** Serves as a wireless station (Ad-Hoc). Connecting to a PC with a cross over 10BaseT cable, the Ad-Hoc Station Adaptor, along with other Ad-Hoc Station Adapters can establish a small wireless network without an Access Point.

•**Station Adapter – 802.11 Ad-Hoc (SAA2):** Same as SAA except that it operates under 802.11 standards.

Note: When setting the operation mode to either PxP or SAA set all devices in the network to the same channel. ESSID can be ignored. When SAA2 is selected set all devices with the same ESSID and channel.

ESSID:

The ESSID is a unique ID given to the FLC810E+. Wireless clients associating to the FLC810E+ must have the same ESSID. The ESSID can have up to 32 characters.

Channel:

You may select any of the available channels as an operational channel for your FLC810E+.

RTS Threshold:

RTS Threshold is a mechanism implemented to prevent the "Hidden Node" problem. "Hidden Node" is a situation in which two stations are within range of the same FLC810E+, but are not within range of each other. Therefore, they are hidden nodes for each other. When a hidden station starts data transmission with the FLC810E+, it might not notice that another station is already using the wireless medium. When these two stations send data at the same time, they might collide when arriving simultaneously at the FLC810E+. The collision will most certainly result in a loss of messages for both stations. Thus, the RTS Threshold mechanism will provide the solution to prevent data collisions. When the RTS is activated, the station and its FLC810E+ will use a Request to Send/Clear to Send protocol (RTS/CTS). The station will send an RTS to the FLC810E+, informing that it is going to transmit the data. Upon receipt, the FLC810E+ will respond with a CTS message to all stations within its range to notify all other stations to defer transmission. It will also confirm to the requesting station that the FLC810E+ has reserved the channel for transmission.

Fragmentation Threshold:

The Fragmentation mechanism is used for improving the efficiency when there is high traffic within the wireless network. If you transmit large files in a wireless network, you can enable the Fragmentation Threshold and specify the packet size. The mechanism will split the packet into the packet size selected.

TX Rate:

Sets the "over the air" speed that the FLC810E+ will operate. "Fully Auto" will let the FLC810E+ set its own speed depending on the quality of the RF link.

Note: If this option is grayed out, then the speed cannot be set.

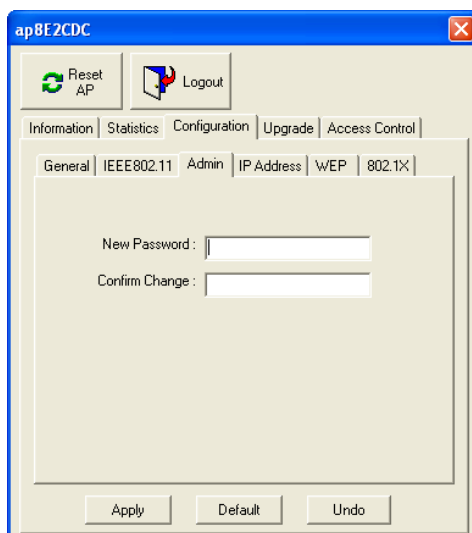
Block STA communications within the BSS (AP only):

When enabled, this prevents any Station Adaptors attached to the Access Point from passing data between each other.

Hide SSID and block response to "Unspecified SSID" (AP only):

When enabled, the SSID beacon is not transmitted and the FLC810E+ will not respond to devices "searching" for available Access Points.

3-Administration:



New Password:/Confirm Change:

The user may change the default password by entering the new password. Enter the new password in the Confirm Change field and click Apply to make the new setting take effect.

4-IP Address:

In the IP Address tab, there are two TCP/IP modes for the FLC810E+: Bridge-Only and IP Router.

The screenshot shows the 'ap8E2CDC' web interface. At the top, there are buttons for 'Reset AP' and 'Logout'. Below these are tabs for 'Information', 'Statistics', 'Configuration', 'Upgrade', and 'Access Control'. The 'Configuration' tab is active, and within it, the 'IP Address' sub-tab is selected. The 'TCP/IP Mode' is set to 'Bridge-Only'. There are radio buttons for 'PPPoE' (Disabled) and 'Enabled', with a 'PPPoE Config...' button next to 'Enabled'. Below this is a 'Status' field. The 'Management Port' section has radio buttons for 'Manual' (selected) and 'DHCP'. Under 'Manual', there are input fields for 'IP Address' (192.168.1.1), 'Netmask' (255.255.255.0), and 'Gateway' (192.168.1.254). Under 'DHCP', there are three input fields for IP address, netmask, and gateway, all showing 0.0.0.0. At the bottom are 'Apply', 'Default', and 'Undo' buttons.

Bridge-Only Mode

To enable remote access to the FLC810E+ using Telnet or Web Management, you need to select the Bridge-Only mode and assign an IP address to the FLC810E+. You may either give a fixed IP address to your FLC810E+ by choosing the Manual item, or set your FLC810E+ to function as DHCP client with the DHCP item selected. It will obtain the IP address automatically from your DHCP server.

The screenshot shows the 'ap8E2CDC' web interface. At the top, there are buttons for 'Reset AP' and 'Logout'. Below these are tabs for 'Information', 'Statistics', 'Configuration', 'Upgrade', and 'Access Control'. The 'Configuration' tab is active, and within it, the 'IP Address' sub-tab is selected. The 'TCP/IP Mode' is set to 'IP Router'. The 'WAN on Ethernet' section has a 'status' dropdown set to 'Manual' and a 'Setup...' button. Below this are input fields for 'IP Address' (192.168.1.1), 'Netmask' (255.255.255.0), and 'Gateway' (192.168.1.254). There are radio buttons for 'WAN on WLA' and 'WAN on ETH' (selected). The 'LAN on Wireless' section has input fields for 'IP Address' (192.168.1.1) and 'Netmask' (255.255.255.0), with a 'Setup...' button. At the bottom are 'Apply', 'Default', and 'Undo' buttons.

IP Router Mode

In the IP Router mode, the FLC810E+ not only acts as a bridge but also manages the IP routing between the WAN and wireless LAN. For example, the Ethernet port of the FLC810E+ is connected to your enterprise TCP/IP network (or WAN with Cable/DSL modem) while all the wireless clients being connected with its own IP sub-network (LAN). The wireless clients can have private IP addresses and access the WAN by sharing the IP address of WAN port with Network Address Translation (NAT).

For advanced configuration on the **IP Router** mode, you need to configure the Ethernet Port (WAN) and Wireless LAN Port by clicking the **Setup...** button.

Ethernet Port (WAN):

The values refer to the outside network you connect to whenever you access the Internet connection. When the IP Router mode is enabled, the FLC810E+ will act as a DHCP client and automatically obtain the IP address. You may also assign a fixed IP address to your FLC810E+ by choosing the Manual item. If you wish to activate the IP sharing, check the NAT (IP Sharing) through this port check box. Moreover, you may have the FLC810E+ bridge the non-TCP/IP traffic by checking the "Enable Bridge" check box.

PPPoE Setup

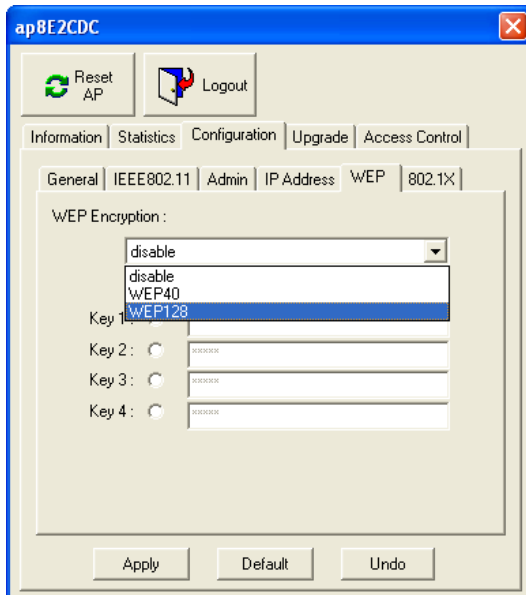
If you wish to have the FLC810E+ connected to a Cable/DSL modem, you will need to manage the PPPoE settings. Once the PPPoE is enabled, the FLC810E+ will get IP configuration through PPPoE regardless of the settings of Manual or DHCP IP Address. When the IP Router mode is selected, the PPPoE will be enabled at the same time (default value). Click the Setup button and set the User Name and Password provided by your ISP. Click Apply to make the changes take effect. The FLC810E+ will then automatically obtain an IP address from the PPPoE server and establish a connection. The wireless clients will be able to access WAN via the FLC810E+. To disconnect the link, click on the Disconnect button. If you want to re-start a connection, click on the Connect button. With Connect on Demand checked, together with defined Max. Idle Time, the PPPoE connection will be automatically disconnected when the FLC810E+ does not transmit or receive data within the specified idle time.

Wireless Port (LAN):

These values refer to your internal network settings. Unless you have specific internal needs, there should be no reason to change these values. The default IP Address is 192.168.1.1. If you wish to have the FLC810E+ act as a DHCP server for the wireless clients, Check the Enable DHCP server (wireless LAN) check box and configure the network parameters such as IP Address Start, IP Address End, DNS server, etc. For other network parameters such as Netmask, Gateway, DNS server, WINS server, you may either choose to set manually or obtain these parameters via your DHCP server.

5-WEP:

The FLC810E+ allows WEP encryption. The user can create up to 4 data encryption keys to secure data from eavesdropping by an unauthorized wireless user.



To activate and set the WEP keys:

1. From the WEP encryption item, pull down the menu and it will list three options:

- Disable- Allows wireless adapters to communicate with FLC810E+s without any data encryption.
- WEP40- Requires wireless stations to use 40 bit data encryption when communicating with the FLC810E+
- WEP128- Requires wireless stations to use 128 bit data encryption when communicating with the FLC810E+

2. WEP encryption is either 40-bit or 128-bit.

The number of characters to enter for 40-bit encryption is five (5) ASCII characters long. However, if the string is preceded by the characters '0x', the characters can be typed as ten (10) hexadecimal characters. Hexadecimal characters must be 0 to 9 or A to F.

The number of characters to enter for 128-bit encryption is thirteen (13) ASCII characters long. However, if the string is preceded by the characters '0x', the characters can be typed as twenty-six (26) hexadecimal characters. Hexadecimal characters must be 0 to 9 or A to F.

You can also enter WEP keys in the Key 2, Key 3 and Key 4 if you wish. WEP will only use one Key. You will have to select one WEP key as an active key before enabling use of encryption.

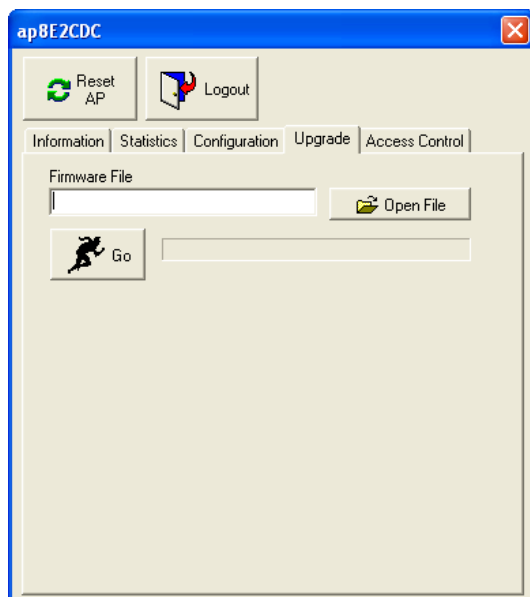
Note: The WEP key must be set up exactly the same on the FLC810E+ as on the wireless client stations. If Key 1 is used on the FLC810E+ and the value is (e.g. MyCar08), the same must be assigned to Key 1 for all client stations.

6-802.1X:

The FLC810E+ supports 802.1X authentication. Use this tab to enable, and set up server parameters

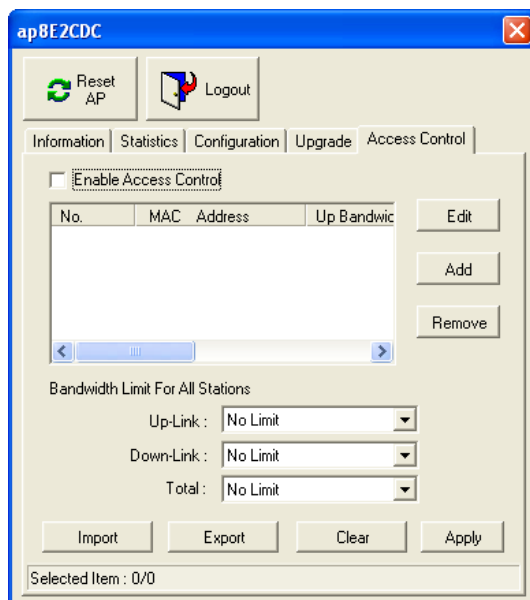
Upgrade Tab

This item is used for uploading the newest firmware version for the FLC810E+. The user may either enter the file name in the entry field or browse for the file by clicking the Open File button. For information about the latest firmware version, contact Data-Linc Group.



Access Control Tab

With the Access Control Table enabled, the user can control access to the FLC810E+ by identifying the MAC address of the wireless devices that are authorized to transmit data.



To create or edit the Access Control Table, do the following:

1.) Go to the Access Control tab and select "Enable Access Control". Note that when you enable the Access Control Table without any MAC address in the table, no device is allowed to communicate with the FLC810E+.

2.) Use the following buttons to manage the Access Control Table:

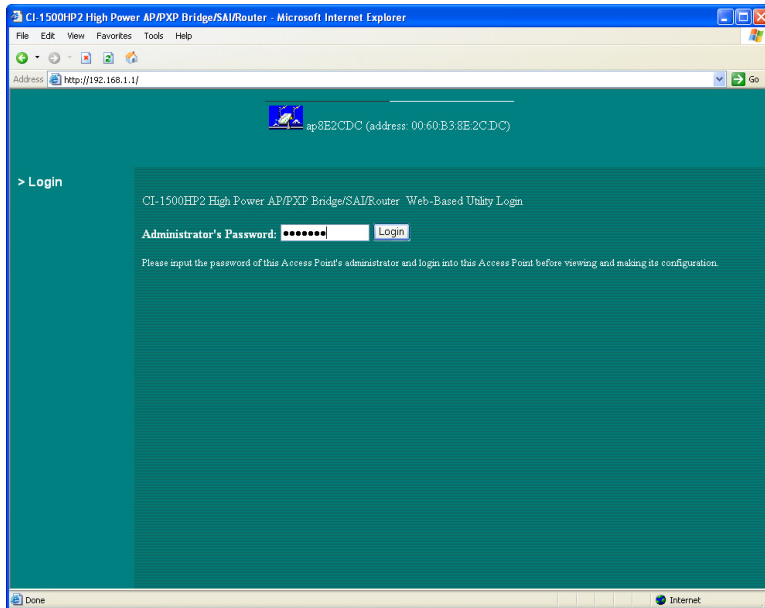
- Add – to enter MAC addresses of authorized wireless devices one at a time.
- Edit – to change the entries in the table if you enter the incorrect MAC address.
- Remove – to remove MAC addresses one at a time.
- Clear – to remove all MAC addresses in the table.
- Import – to import an existing Access Control Table.
- Export – to save the current Access Control Table to a location on your computer. You may save the file as a text document.

Note: When enabled, the MAC addresses of all the equipment attached to the Remote FLC810E+ (PC, PLC, etc.) needs to be entered in this list.

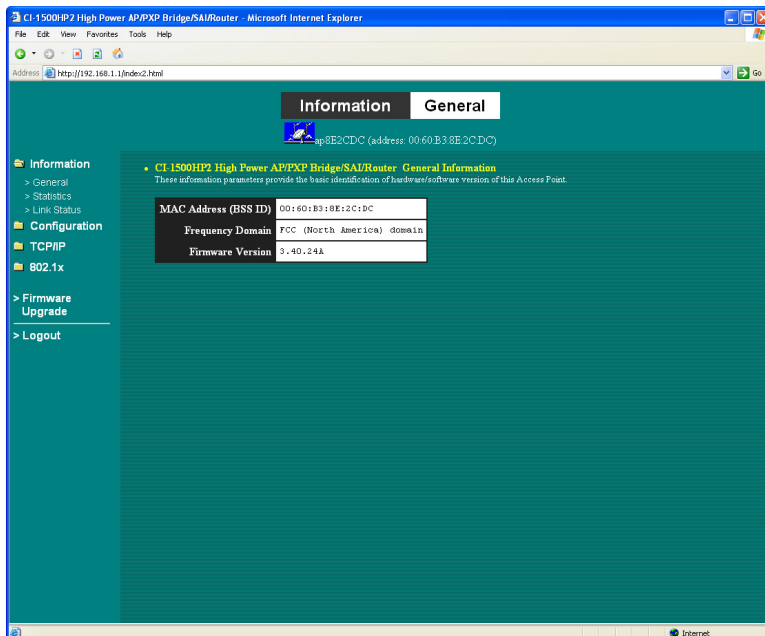
II. Using Web Management

The built-in Web Management provides a user-friendly graphical user interface (web pages) using Internet Explorer to manage and configure your FLC810E+. (For detailed information about these setting refer back to the “Using FLC810E+ Utility” section starting on page 9)

1. Open Internet Explorer.
2. Enter the IP address of your FLC810E+ in the Address bar (the default address is 192.168.1.1).



3. Enter the password to login to the FLC810E+. The default password is “default”.



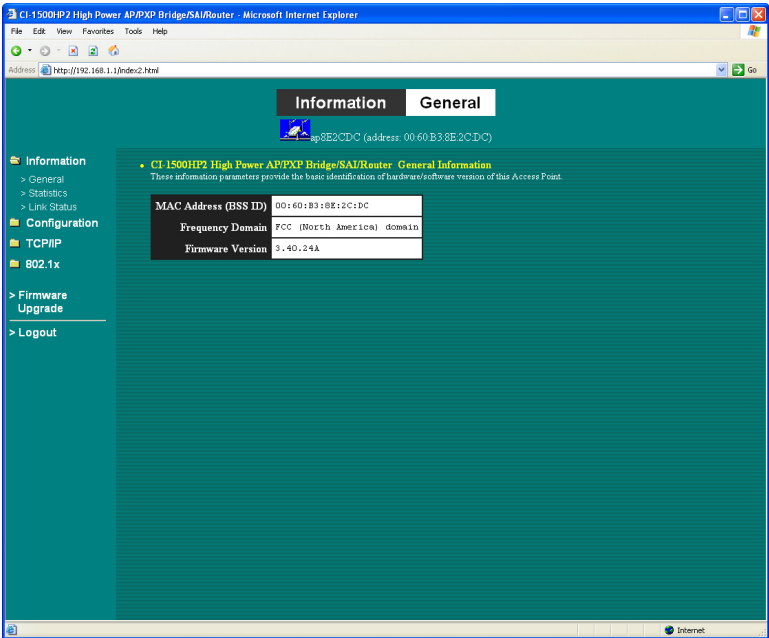
Down the left side of the window appear the following 6 options:

Information, Configuration, TCP/IP, 802.1X, Firmware Upgrade, and Logout.

Information

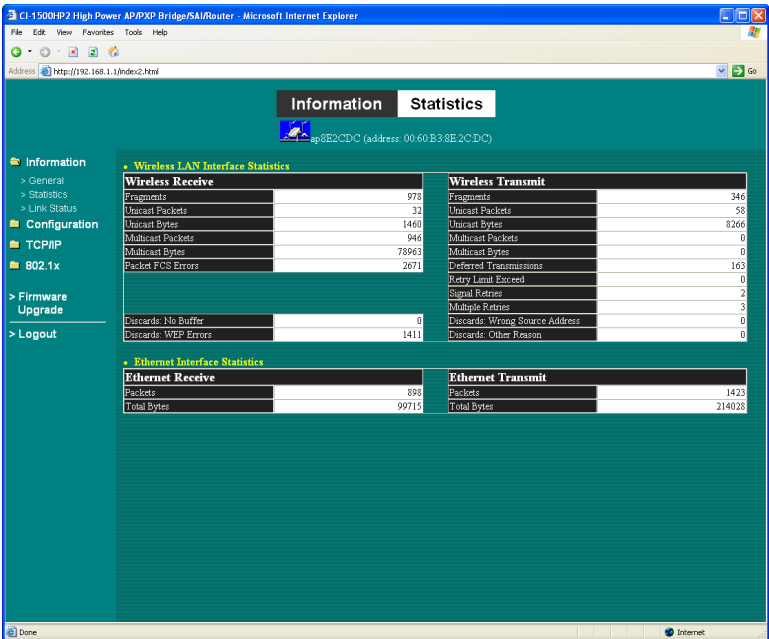
General

This item displays the general information for the FLC810E+ such as the MAC address, Frequency Domain, and Firmware Version.



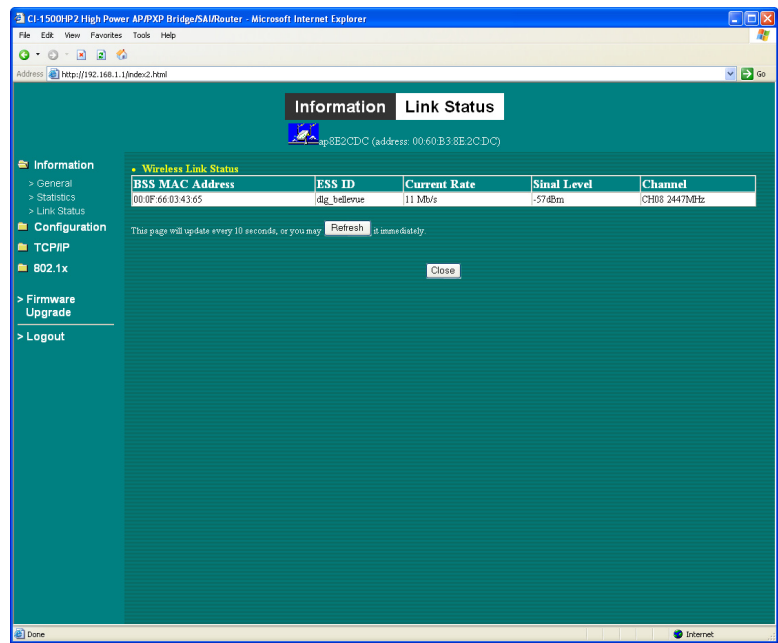
Statistics

This item displays the Ethernet and wireless network traffic.



Link Status

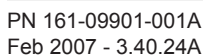
This item displays the current link status of the FLC810E+. This includes the ESSID, Channel Number and Signal Level of the device it is currently connected to.



You may change the settings on the FLC810E+ such as Radio mode, ESSID, channel, RTS threshold, fragment threshold and password.

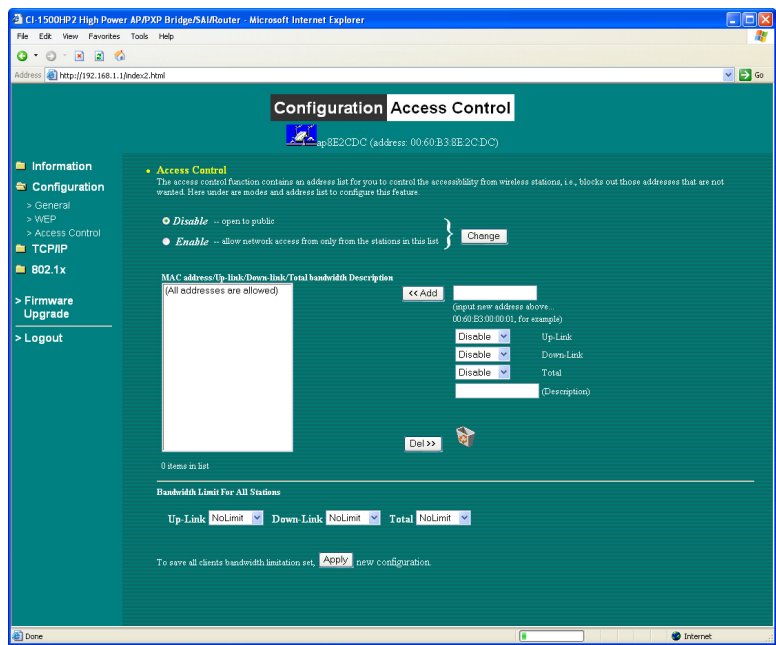


To prevent unauthorized wireless stations from accessing data transmitted over the network, the FLC810E+ offers WEP (Wired Equivalency Privacy). You can set up 4 encryption keys but choose only one key at a time to encrypt your data.



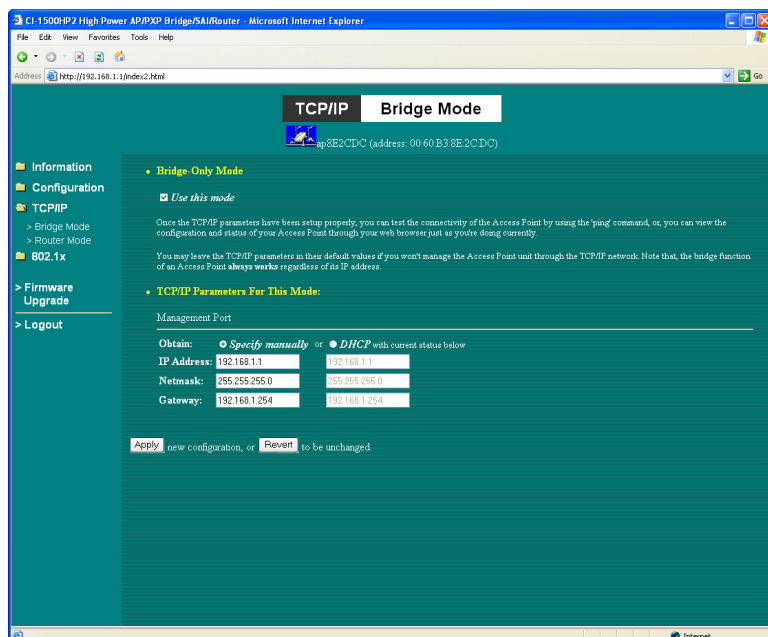
Access Control

The Access Control Table enables you to restrict wireless stations accessing the FLC810E+s by identifying the MAC address of the wireless devices.



TCP/IP

The TCP/IP screen enables you to set the FLC810E+ to act as either a bridge with DHCP client enabled...

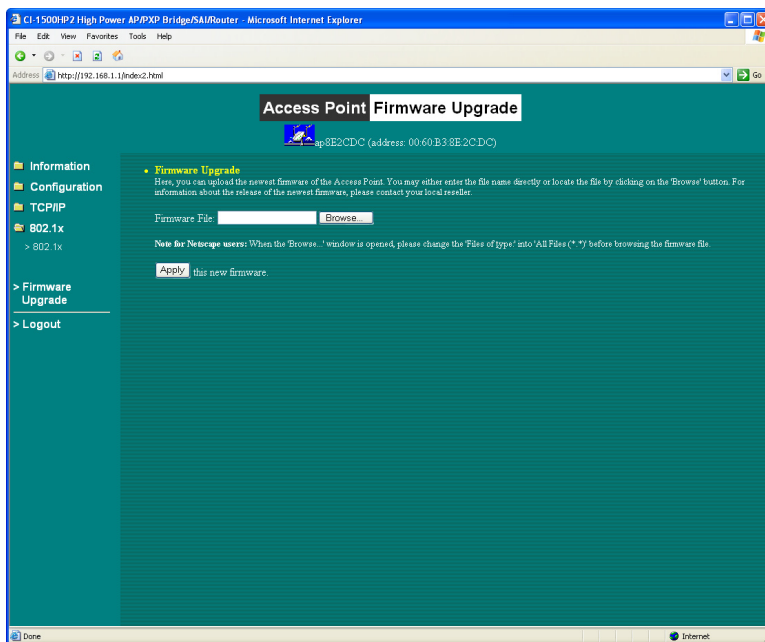


...or a wireless Router with DHCP server and PPPoE enabled.



Firmware Upgrade

Here, you can upload the newest firmware for the FLC810E+. You may either enter the file name in the entry field or browse for the file by clicking the Browse button.

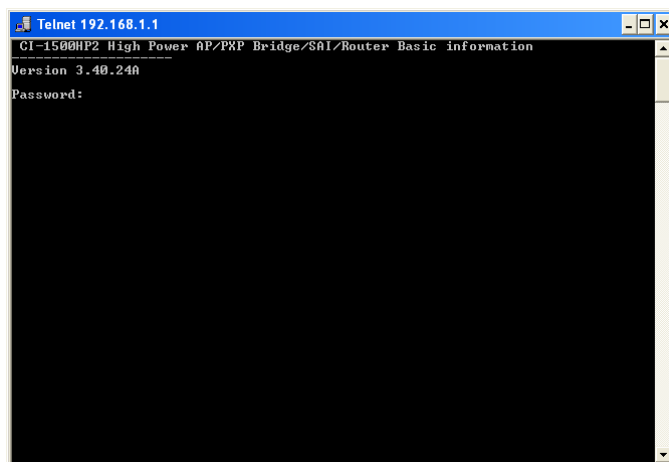


III. Using Telnet

The FLC810E+ can be configured via the command prompt console with TCP/IP:

Telnet (TCP/IP) Connection: Assign an IP address to your FLC810E+ or use the default IP address (192.168.1.1). Telnet to the FLC810E+ to get access to the FLC810E+ console using standard Telnet commands.

1. Telnet to your FLC810E+.
2. Enter the password. The default password is "default".



Basic Commands

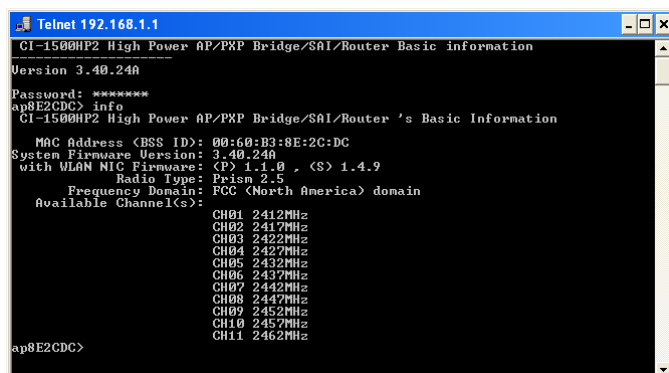
The following are the commands provided for configuring the FLC810E+.

Note: [xxx] stands for optional arguments.

Info

Display some basic information of the FLC810E+, for example, firmware version, frequency domain, etc.

Stat



Display the statistical values for the operation of the FLC810E+, for example, association status, LAN/WLAN interface load, etc.

```

Telnet 192.168.1.1
ap8E2CDC> stat
=== Station Status ===
Host's MAC Address: 00:60:E3:8E:2C:DC
BSS Connected With: 00:0F:66:03:43:65
ESS ID: dfg_bellevue
Current Channel: CH08 2447MHz
Current TxRate: 11 Mb/s
Signal Level: -62dBm

=== System Statistics ===

[ Ethernet Receive ]
Packets : 1356
Total Bytes : 147262

[ Ethernet Transmit ]
Packets : 2084
Total Bytes : 339644

[ Wireless Receive ]
Fragments : 1384
Unicast Packets : 41
Unicast Bytes : 1212
Multicast Packets : 1343
Multicast Bytes : 111793
Packet FCS Errors : 4154

[ Wireless Transmit ]
Fragments : 361
Unicast Packets : 73
Unicast Bytes : 10348
Multicast Packets : 0
Multicast Bytes : 0
Deferred Transmissions : 170
Retry Limit Exceed : 0
Single Retries : 3
Multiple Retries : 3

[ Wireless Receive Discards ]
No Buffer : 0
Received WEP Errors : 1799

[ Wireless Transmit Discards ]
Wrong Source Address : 0
Other Reasons : 0

ap8E2CDC>

```

Ping ip_addr [num_pings] [data_size]

Ping (ICMP echo) to an ip_addr host with optional num_pings times with optional data size in a length of data_size.

```

Telnet 192.168.1.1
ap8E2CDC> ping 192.168.1.1 5 1024
Ping 1: round-trip time = 0 ms
Ping 2: round-trip time = 0 ms
Ping 3: round-trip time = 0 ms
Ping 4: round-trip time = 0 ms
Ping 5: round-trip time = 0 ms
5 (100%) successful pings, average time = 0 ms
ap8E2CDC>

```

Set

Display the current configuration information.

```

Telnet 192.168.1.1
ap8E2CDC> set
Parameter Name      Current Value      New Value      Execute
-----
[ General ]
apname              ap8E2CDC          Save
web_port            80                Save
telnet_port         23                Save
[ IEEE802.11 ]
mode                sai               Reset
ssid                dfg_bellevue      Reset
channel             1                 Reset
basic_rates         1_2              Reset
supported_rates     1_11             Reset
tx_rate             auto              Reset
tx_retry            7                 Reset
antenna             diversity         Reset
rts_threshold       2432             Reset
frag_threshold      2346             Reset
[ Throughput ]
up_band             NoLimit           Save
down_band           NoLimit           Save
total_band          NoLimit           Save
[ LAN Port ]
lan_speed           auto              Reset
telnet_timeout      1                 Reset
[ WLAN Port ]
sta_isolate         disable           Reset
hide_ssid           disable           Reset
ap8E2CDC>

```

Set [Parameter] [Value]

To change factory default settings, type “set [parameter] [value]”.

```

Telnet 192.168.1.1
ap8E2CDC> set mode ap
ap8E2CDC> set essid DataLincGroup
ap8E2CDC> set channel 1
ap8E2CDC> save
Parameter Name      Current Value      New Value      Execute
-----
[ General ]
apname              ap8E2CDC          Save
web_port            88                Save
telnet_port         23                Save
[ IEEE802.11 ]
mode                sai              ap             Reset
essid               dlg_bellevue      DataLincGroup  Reset
channel             7                1             Reset
basic_rates         1_2              Reset
supported_rates     1_11             Reset
tx_rate             auto             Reset
tx_retry            7                Reset
antenna             diversity         Reset
rts_threshold       2432             Reset
frag_threshold      2346             Reset
[ Throughput ]
up_band             NoLimit           Save
down_band           NoLimit           Save
total_band          NoLimit           Save
[ LAN Port ]
lan_speed           auto             Reset
telnet_timeout      1                Reset
[ WLAN Port ]
sta_isolate         disable           Reset
hide_essid          disable           Reset
New configuration saved.
ap8E2CDC>

```

Example:

“set mode ap”, will set the FLC810E+ mode to AP (access point).

“set ESSID DataLincGroup”, will set the ESSID to DataLincGroup.

“set channel 1”, will set the channel to number 1;

Note: Remember that, a “save” command is required for changes to take effect.

The following table is a list of common parameter changes that can be made on the FLC810E+.

Parameter	Description	Default Value
apname	A textual name for the identification of the FLC810E+	apxxxxxx - (where xxxxxx is the last six octets of the FLC810E+'s MAC address)
mode	Operation Mode of the FLC810E+	AP
channel	The 802.11 channel number selected	1
essid	the ESS ID (SSID) of the FLC810E+	My Network
ip_address	ip address of the FLC810E+	192.168.1.1
ip_netmask	subnet mask of the FLC810E+	255.255.255.0
ip_gateway	gateway address	192.168.1.254
hide_essid	When enabled it will hide the SSID from broadcasting “Beacon off”	disable

The following is a list of the commands used with the FLC810E+ during a telnet session.

save

Save your new configuration. Remember that the "save command" is required every time you make configuration changes.

set default

Return the factory default settings of the FLC810E+ except for the IP addresses. A 'save' command is required for changes to take effect.

cls

Clear the console screen.

exit

Exit the console.

? * or help

Print a help screen.

rz

Receive a firmware file by the Zmodem protocol. The console will enter Zmodem receiving mode and then use the "file upload" function of your terminal emulation program to upload a new firmware file (ap.img) to the FLC810E+. Upon completion, always remember to type the 'reset' command for running the FLC810E+ with the new firmware.

reset

Issue a reset command. The FLC810E+ will be reset if user confirms.

Advanced Security Settings

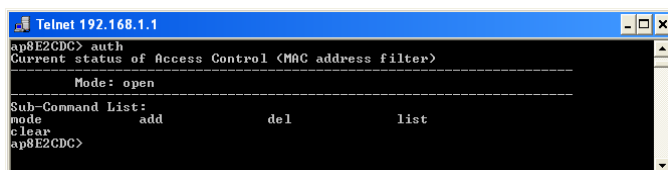
This section describes the commands to control the security for FLC810E+. To prevent unauthorized wireless stations from accessing data transmitted over the network, the FLC810E+ offers the following levels of security options.

- Access Control Table restricts wireless stations access to the FLC810E+.
- Data Encryption, known as WEP (Wired Equivalent Privacy), encrypts wireless data transmitted via wireless medium.

I. Access Control

auth

The “auth” command contains sub-commands that allow you to manage the access control (MAC address filter) of the FLC810E+. The access control table consists of a list for you to control the accessibility of any wireless stations or repeaters.



```

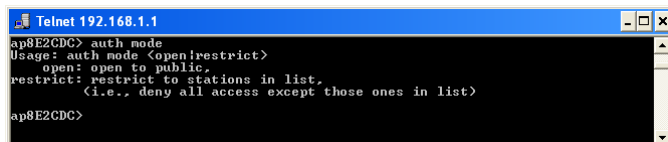
Telnet 192.168.1.1
ap8E2CDC> auth
Current status of Access Control <MAC address filter>
-----
Mode: open
-----
Sub-Command List:
mode      add      del      list
clear
ap8E2CDC>

```

The sub-commands are:

auth mode

Set the access control mode. The definition of each mode is specified as follows:



```

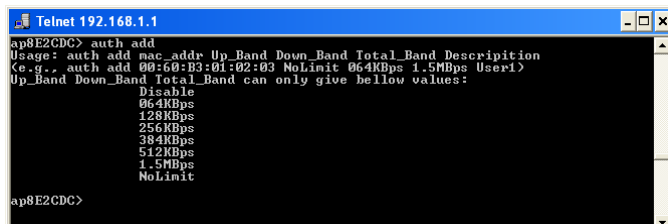
Telnet 192.168.1.1
ap8E2CDC> auth mode
Usage: auth mode <open|restrict>
open: open to public,
restrict: restrict to stations in list.
       (i.e., deny all access except those ones in list)
ap8E2CDC>

```

- **open:** open to public (default)
- **restrict:** only allow access of the authorized stations/repeaters in the table
(no access is allowed if the list stays empty)

auth add

Add an entry into the access control table



```

Telnet 192.168.1.1
ap8E2CDC> auth add
Usage: auth add mac_addr Up_Band Down_Band Total_Band Description
(e.g., auth add 00:50:E3:01:02:03 NoLimit 064KBps 1.5MBps User1)
Up_Band Down_Band Total_Band can only give below values:
Disable
064KBps
128KBps
256KBps
384KBps
512KBps
1.5MBps
NoLimit
ap8E2CDC>

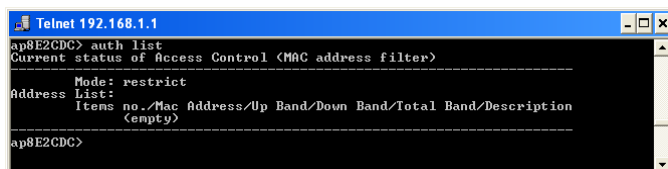
```

auth del

Delete an entry from the access control table

auth list

Display the content of the access control mode and the address list. The optional arguments, start and end, can be affixed to select the range of items to be listed.



```

Telnet 192.168.1.1
ap8E2CDC> auth list
Current status of Access Control <MAC address filter>
-----
Mode: restrict
-----
Address List:
Items no./Mac Address/Up Band/Down Band/Total Band/Description
(empty)
ap8E2CDC>

```

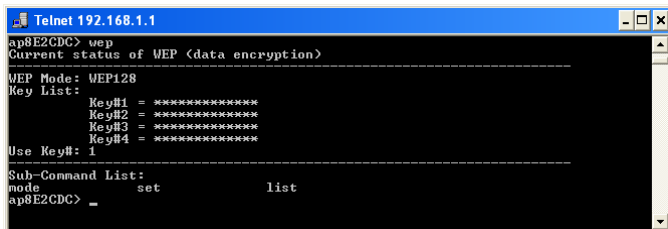
auth clear

Clear all the entries from the access control table.

II. WEP Keys

wep

The 'wep' command contains sub-commands that allow you to manage the data encryption (WEP, Wired Equivalent Privacy) function provided with the FLC810E+.



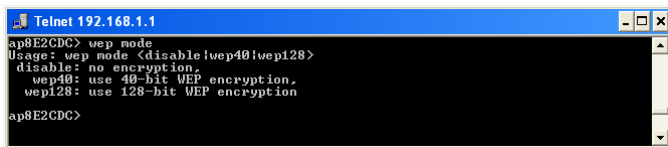
```

Telnet 192.168.1.1
ap8E2CDC> wep
Current status of WEP <data encryption>
-----
WEP Mode: WEP128
Key List:
Key#1 = *****
Key#2 = *****
Key#3 = *****
Key#4 = *****
Use Key#: 1
Sub-Command List:
mode      set      list
ap8E2CDC>
  
```

The sub-commands are listed as follows:

wep mode

Set the wep mode.



```

Telnet 192.168.1.1
ap8E2CDC> wep mode
Usage: wep mode <disable|wep40|wep128>
disable: no encryption.
wep40: use 40-bit WEP encryption.
wep128: use 128-bit WEP encryption
ap8E2CDC>
  
```

The following are the definitions of each data encryption mode.

- **none:** no encryption (default)
- **wep40:** use 40-bit WEP data encryption
- **wep128:** use 128-bit WEP data encryption

wep set

Set value of each WEP key, or what key to use

The number of characters to enter for 40-bit encryption is five (5) ASCII characters long. However, if the string is preceded by the characters '0x', the characters can be typed as ten (10) hexadecimal characters. Hexadecimal characters must be 0 to 9 or A to F.

The number of characters to enter for 128-bit encryption is thirteen (13) ASCII characters long. However, if the string is preceded by the characters '0x', the characters can be typed as twenty-six (26) hexadecimal characters. Hexadecimal characters must be 0 to 9 or A to F.

wep list

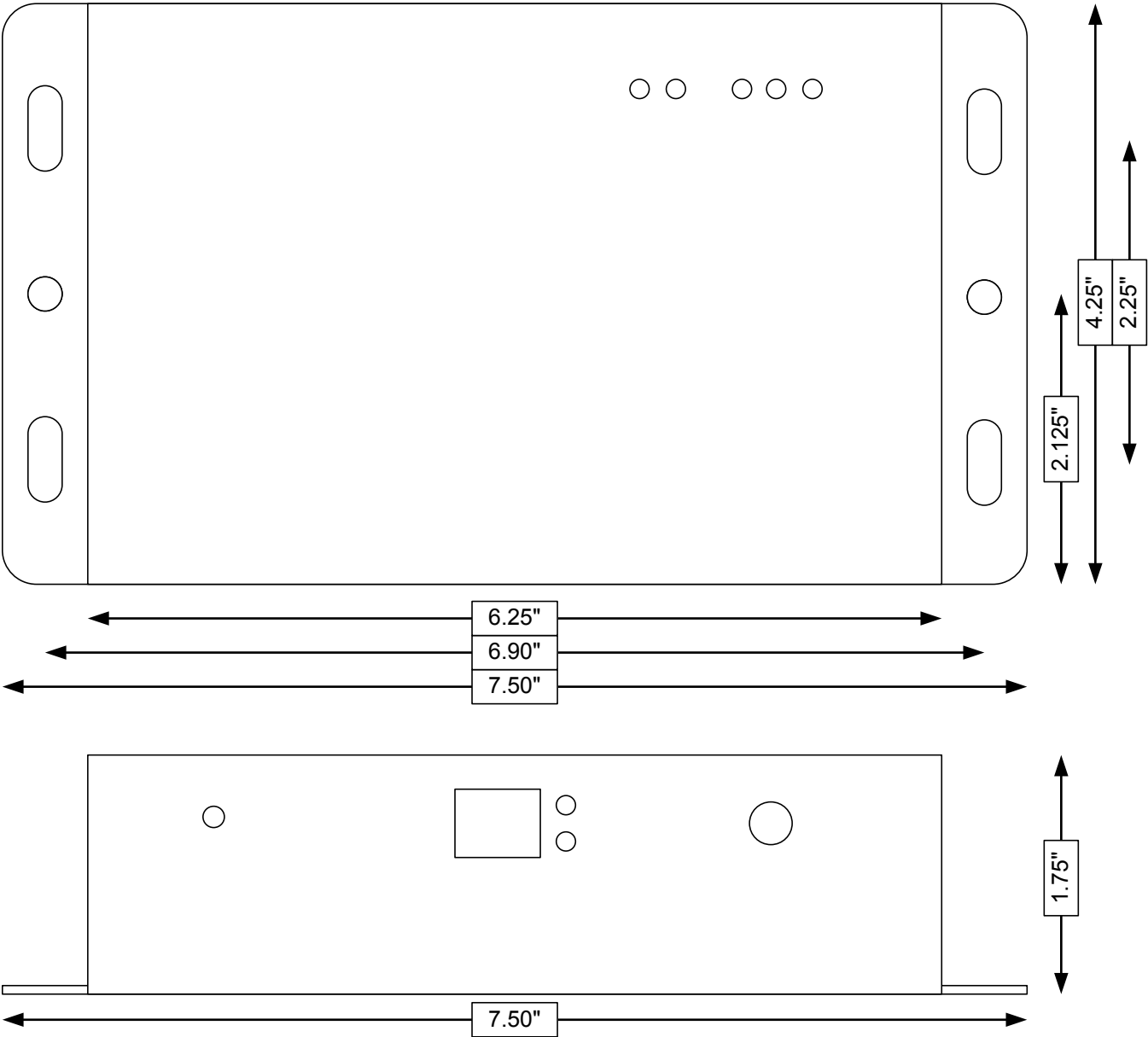
Display current WEP settings.

Note: Your new WEP settings will take effect after resetting the FLC810E+.

Appendix I: Technical Specifications

FLC810E+	Specifications
Operation Modes	AP (Access Point with Routing), PxP (Wireless Bridge with Repeating), SAI (Station Adapter - Infrastructure),
Wired Interface	10/100BaseT, RJ45
DHCP Modes	DHCP Client, DHCP Server (AP Mode)
Wireless Interface	802.11b
Power Interface	12VDC P-5 Barrel Jack (Center Positive)
Antenna Interface	Reverse Polarity SMA Female
Operation Frequency	2.412-2.462 GHz (N. America)
RF Data Rate	11M / 5.5M / 2M / 1M
RF Modulation	DSSS (Direct Sequence Spread Spectrum (CKK, DQPSK, DBPSK)
RF Output Power	300mW (+24.7dBm)
Sensitivity	-89dBm @ 11Mbps, BER $< 8 \times 10^{-2}$
Operating Temperature	-40 to +150 °F (-40 to +65 °C)
Enclosure Weight	2.0 lbs (.91kg)

Appendix II: Enclosure Dimensions



Note: Enclosure Size, Mounting Holes and Locations may change without notice, contact Data-Linc Group (425) 882-2206 for the latest Enclosure Dimensions.

Appendix III: Troubleshooting

If you have trouble using the FLC810E+, the starting point to troubleshoot the problem with your FLC810E+ is looking at the LED activity of the FLC810E+. The following is the "LED Error Table" provided to assist you in diagnosing and solving operational problems.

PWR	AP-ACTIVE	W-LAN	DATA	LINK	Description/Action
On	On	Flashing	Flashing	On	Normal operation where flashing indicates LAN activity
On	On	Off	Off	On	Normal operation with no LAN activity
Off	Off	Off	Off	Off	Power Failure -Check Power Source and Connector
On	Flashing	Off	Off	Off	Default Mode -Check Configuration and Save

If you are still unable to solve the problem by checking the LED activity, the error may be caused from a configuration mismatch, which prevents the FLC810E+ from establishing a wireless connection with the network. You may check the following to ensure normal operation of the FLC810E+:

WEP keys

If data encryption is activated, always remember to set WEP keys exactly the same on the FLC810E+ as are on the wireless stations.

Access Control

Make sure that the MAC address of your FLC810E+ is not included in the Access Control table of other wireless devices.

Appendix IV: Support

Technical Support

Data-Linc Group maintains a fully trained staff of service personnel who are capable of providing complete product assistance. They can provide you with technical, application and troubleshooting, spare parts and warranty assistance. Our technical staff is based in Bellevue, Washington USA and may be reached at (425) 882-2206 or e-mail support@data-linc.com

Product Warranty

Data-Linc Group warrants equipment of its own manufacture to be free from defects in material and workmanship for one year from date of shipment to original user. Data-Linc Group will replace or repair, at our option, any part found to be defective. Buyer must return any part claimed defective to Data-Linc Group, transportation prepaid.

Return Material Authorization

If a part needs to be sent to the factory for repair, contact Data-Linc Group's corporate office and request a Return Material Authorization (RMA) number. The RMA number identifies the part and the owner and must be included with the part when shipped to the factory.

Contact Information

Corporate Office	Data-Linc Group 3535 Factoria Blvd. SE Suite 100 Bellevue, Washington 98006 USA Tel: (425) 882-2206 Fax: (425) 867-0865 E-mail: info@data-linc.com Web site: www.data-linc.com
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