



## Access Point Mode Application Notes

### INTRODUCTION

WiSnap modules support several methods for accessing Wi-Fi networks. In addition to infrastructure mode and ad hoc mode, the modules now support access point (AP) mode. You implement AP mode using special firmware, which is currently in beta development. In the future, AP mode will be released as part of the standard firmware and will replace ad hoc mode.

AP mode provides several advantages over ad hoc mode. In AP mode:

The module creates a soft AP network to which Android devices (smartphones and tablets) can join. (Android devices do not support ad hoc networking.)

The module runs a DHCP server and issues IP addresses, which is much faster than automatic IP in ad hoc mode.

The WiSnap module supports security, unlike ad hoc, which is an open mode.

The module supports routing between clients.

This document describes how to use AP mode with WiSnap products, including configuring the module to act as an AP, enabling AP mode in hardware and software, and sending data to the module from a remote host. Refer to “Appendix: Downloading Firmware to WiSnap Modules” for instructions on downloading the beta release firmware that enables AP mode.

NOTE: This application note assumes that you have read the WiSnap advanced user manual and have a good understanding of the ASCII command interface. You can download the user manual from the Support page at SerialIO.com <http://serialio.com/support/WiSnap/index.php>

### ENABLING AP MODE

There are two methods for enabling AP mode, hardware and software, as described in the following sections. Before enabling AP mode, you must download and install the beta firmware that supports it

#### DOWNLOADING FIRMWARE TO WiSnap MODULES

You can use the module’s built-in FTP client to download the firmware. First, you associate the module to an access point that has Internet connectivity. Then, you issue commands to download the AP mode firmware to your device. To upload the firmware, perform the following steps:

1. Reset the module to the factory defaults and set up the network SSID and passphrase using the following commands:

- **factory R** // Reset device to factory defaults
- **set wlan ssid** <string> / Set up network SSID
- **set wlan pass** <string> // Set up network passphrase (if needed)
- **save** // Save network settings
- **reboot** // Reboot device with stored settings
- After rebooting, the module should be associated with your network.
- Enter command mode and redirect the FTP server using the following commands:

\$\$\$ // Enter command mode

set ftp address 208.109.14.133 // Set new FTP address

save // Save address in memory

Retrieve the new firmware using the command:

ftp u <filename> // update the module to AP mode

where <filename> is:

- **wifly-242.img** for RN-131 based products, such as the RN-134, Rn-121, RN-123, and RN-123
- **wifly7-242.img** for RN-171 based products, such as the RN-174

After issuing the **ftp u** command and specifying the correct filename, the terminal screen displays a progress bar followed by the messages **FTP OK** and **UPDATE OK**.

Reboot the module:

**reboot** // Reboot the device in AP mode firmware The device is now loaded with the AP mode firmware.

Restore the module to the factory defaults before using it: **\$\$\$** // Enter command mode

**factory R** // Reset device to factory defaults **NOTE:** You **MUST** reset the module to factory defaults before you begin using it.

You are now ready to begin using the module in AP mode.

## Enable in Hardware

To enable AP mode in hardware, hold GPIO9 high at 3.3 V and then reboot (or power cycle) the module. The module boots up in AP mode with the DHCP server enabled.

**NOTE:** Refer to the documentation for your module on the Support page of SerialIO.com website at <http://serialio.com/support/WiSnap/index.php> for more details on programming/configuring the module.

## Enable in Software

You enable AP mode in software using the **set wlan join 7** command. You can customize network settings such as the SSID, channel, and IP address in software to create a custom AP mode. For example, the following commands create a custom AP mode in software:

```
set wlan join 7 set wlan channel <value> set wlan ssid <string> set ip dhcp 4 set ip address <address> set ip net <address> set ip gateway <address> save reboot
```

After rebooting, the module is in AP mode.

## AP Mode Defaults

Setting	AP Mode Default
SSID	WiSnapAP-XX, where XX is the last two bytes of the module's MAC address
Channel	1
DHCP server	Enabled
IP address	1.2.3.4
Netmask	255.255.255.0
Gateway	1.2.3.4

When the module boots, other Wi-Fi-enabled devices (PC, iPhone, iPad, Android tablet, etc.) should be able to see the module when they scan for access points.

## USING AP MODE

```
// Enable AP mode // Specify the channel to create network // Set up network SSID // Enable DHCP server // Specify the IP address // Specify the subnet mask // Specify the gateway // Store settings // Reboot the module in AP mode
```

The following sections describes how to use AP mode, including connecting to the module, checking for the last device connected over TCP, viewing associated devices, enabling the link monitor, and routing data between clients.

## Connect to the Module

Once the module boots up in AP mode, any client device can associate with the network the module is broadcasting. Once associated, the module's DHCP server assigns an IP address to the client device.

The default lease time is 1 day i.e., 86,400 seconds. You can configure the lease time using the **set dhcp lease <value>** command, where <value> is the time in seconds. To view a list of devices associated with the module, use the **show lease** command. The command output is in the following format with commas delimiting the fields:

Figure 1 shows example output from the **show lease** command. *Figure 1. Show Lease Command Example*

## Output

IP address assigned	Client MAC address	Remaining lease time (in seconds)	Host name
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```
<2.42> show lease 1.2.3.10,f0:cb:a1:2b:63:59,153,*
```

```
1.2.3.11,00:00:00:00:00:00,0,
```

```
1.2.3.12,00:00:00:00:00:00,0,
```

```
1.2.3.13,00:00:00:00:00:00,0,
```

```
1.2.3.14,00:00:00:00:00:00,0,
```

```
1.2.3.15,00:00:00:00:00:00,0,
```

```
1.2.3.16,00:00:00:00:00:00,0, <2.42>
```

**NOTE:** In AP mode, the module can assign a DHCP lease to 7 clients. However, not all clients report the host name. In this case, the module reports the name as an asterisk (\*).

Once a client is associated to the network, it can open a TCP connection to the WiSnap module. After successfully opening a TCP connection, the client receives a **\*HELLO\*** message. The WiSnap module prints **\*OPEN\*** on the UART, indicating an open TCP connection.

## Check for the Last Connected Device over TCP

In some cases, it is beneficial to know the IP address of last device that connected to the module over TCP or the last device to which the module connected over TCP. To find this address, use the **show z** command. This command does not survive a power cycle or reboot.

Upon power up, if no device is connected over TCP, the **show z** command returns **0.0.0.0**.

## View Associated Devices

To see a list of devices associated with the module, use the **show associated** command. The command output is in the following format with commas delimiting the fields:

Connection number	Host MAC address	Received byte count	Transmitted byte count	Seconds since last packet received
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```
<2.42> show associated
```

```
1, f0:cb:a1:2b:63:59,36868,0,7
```

```
2, 00:24:8c:31:e5:27,76168,0,2
```

```
3, 98:4b:4a:6b:e0:0f,1992,0,0 <2.42>
```

Figure 2 shows example output from the **show associated** command. *Figure 2. Show Associate Command Example Output*

You can use the **Seconds since last packet received** parameter to check for stale connections. **Enable the Link Monitor**

In the beta firmware version 2.42 and higher, AP mode supports a link monitor feature. The link monitor is a

timer (in seconds) that checks to see if any packets are received from an associated device. When the timer expires, the AP module de-authenticates the client(s). You enable the link monitor using the **set wlan link** <value>, where <value> is the link monitor timer in seconds. **NOTE: Serial IO** recommends that you set the link monitor timer value to at least 300 seconds to avoid de-authenticating clients frequently.

## Turn Parity On/Off

In the beta firmware version 2.42 and higher, AP mode supports parity using the **set uart flow** command. The setting is | the upper nibble of the hardware flow control setting. For example, the following commands control the parity:

```
set uart flow 0x21// Even parity with flow control
```

```
set uart flow 0x20// Even parity without flow
```

```
set uart flow 0x31/ Odd parity with flow control
```

```
set uart flow 0x30 // Odd parity with flow control //
```

## Route Data between Clients

In the beta firmware version 2.42 and higher, AP mode supports routing between clients. Clients can ping each other via the AP module and can also send data to each other over TCP and UDP.

## KNOWN ISSUES WITH AP MODE BETA RELEASE

The AP mode firmware beta release has the following known issues:

- Security is not supported; AP mode creates an open network.
- AP mode does not support the **scan** command.

## RELEASE NOTES

The following sections provide the release notes for the AP mode firmware.

### Version 2.42 05/25/12

- Added support for routing data between clients.
- Added support for link monitor feature.
- Added support for parity, which you set with the **set uart flow** command.
- Fixed a bug in ping function to support pinging hosts on the Internet.
- Fixed a bug wherein the module would sometimes revert to factory default settings.
- Fixed a bug in AP mode to improve stability.
- AP mode supports up to 7 clients.

### Version 2.41 04/01/2012

- Added stability improvements to AP mode beta firmware. AP mode supports up to 10 clients.
- Modified the **show association** command to give details such as the client MAC address, received byte count, transmitted byte count, and seconds since the last packet was received. The format is:
  - Modified the **show lease** command to show the client IP address, client MAC address, remaining lease time (in seconds) and the host name (client name). The format is:

- Added the command **show z** command to display the IP address of the last connected client over TCP.
- Ping command is simplified to save memory.
- Changed the default DHCP lease time to 1 day i.e., 86,400 seconds.
- Added a new feature wherein RTS is high (inactive) when the module does not have a TCP connection; it goes low once a TCP connection is made. To use this command, use the **set uart flow 2** command.