

Introduction

OptoEMU Sensor energy monitoring units and Opto 22 Wired+Wireless™ SNAP PAC controllers and brains can communicate wirelessly or on a wired Ethernet network. And they can communicate with other wireless devices in either *infrastructure* or *ad-hoc* mode.

- *Infrastructure mode* requires wireless routers or access points. It is more commonly used in wireless networks because it is generally faster, more secure, can handle a larger number of devices, and provides connections to a wired network.
- In *ad-hoc mode*, two or more wireless devices communicate directly with each other, peer-to-peer. Ad-hoc mode is often used for temporary wireless connections because it can be set up quickly and with minimal configuration.

While most wireless installations will use infrastructure mode, sometimes it may be handy to communicate wirelessly with a Sensor or SNAP PAC in ad-hoc mode using a smart device or a laptop computer, or to have a SNAP PAC controller and brain communicate using ad hoc.

This technical note shows you how to configure ad-hoc mode on the Opto 22 device (OptoEMU Sensor or Wired+Wireless SNAP PAC brain or controller) and also how to configure ad-hoc mode on a smart phone.

WARNING: *Because wireless ad-hoc implementations can vary by device and can potentially cause security risks, we recommend thorough testing with your specific device and careful consideration of the security ramifications before proceeding.*

Step 1: Configuring Your Opto 22 Device for Ad-Hoc Mode


You use PAC Manager software to configure wireless communications. Configuring ad-hoc mode is easier if you first add a custom file to augment PAC Manager's Inspect window. (If you cannot do this, see "Use Generic Read/Write" on [page 4](#).)

Note that the Opto 22 device will be restarted after configuration.

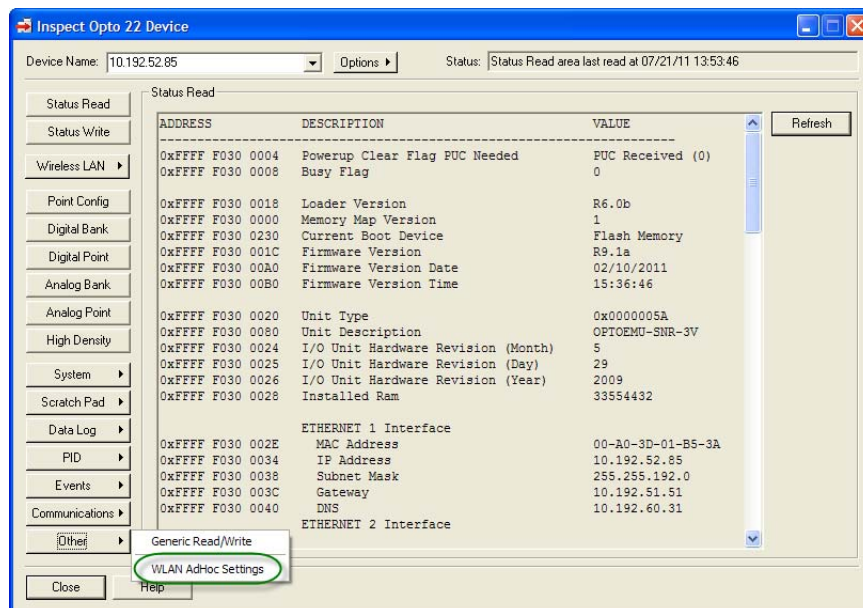
1. Download the file `AdHocConfig.zip` from the [Opto 22 website](#) (Support > Downloads > Samples & Freeware) and unzip it.
2. Copy the `AdHocSettings.ciw` file from the unzipped download to the location where the `Manager.exe` file exists on your PC.

For example, on Windows XP it would be in C:\Program Files\Opto22\PAC Project 9.x\.. To find out the file's location on your PC, go to the Windows Start menu, right-click PAC Manager, and choose Properties.

The `.ciw` file adds a new option to PAC Manager.

3. Launch PAC Manager (Start > Programs > Opto 22 > PAC Project > PAC Manager). In the PAC Manager main window, click the Inspect button .

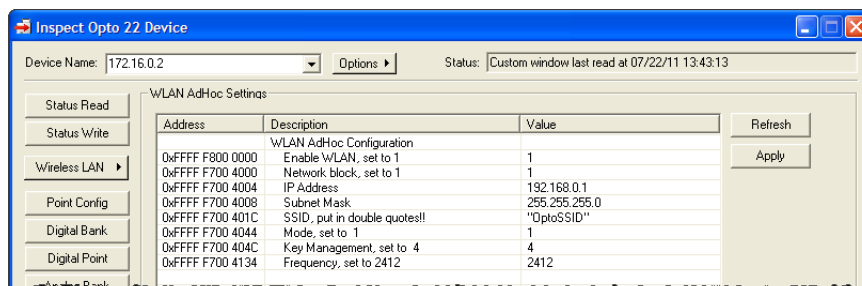
4. In the PAC Manager Inspect window, click the Other button and look for a new option, WLAN AdHoc Settings, in the popup menu:



5. Select that WLAN AdHoc Settings option from the popup menu.
6. Complete all fields as follows:

Enable WLAN	1
Network block	1
IP Address	[Wireless IP address for the Opto 22 device]*
Subnet Mask	[Subnet mask for the ad-hoc wireless network]*
SSID	"[Name of the wireless ad-hoc network]"
Mode	1
Key Management	4
Frequency	2412
* As described in the WLAN section of the <i>PAC Manager User's Guide</i> (form 1704), the IP/Subnet must be on a separate IP subnet from the wired LAN.	

Here's an example of what you might enter:



7. Click Apply.
8. Now click the Status Write button in the upper left. Under Operation Commands, highlight Store configuration to flash. Click Send Command.
9. In the same section, highlight Restart Device from powerup. Click Send Command.

The change is stored to flash memory and the device restarts. The WLAN LED turns green and the device begins SSID broadcasting, ready for the other device to connect to it. (If the WLAN LED does not turn green, check to make sure your configuration settings are correct. For example, did you put double quotes around the SSID name?)

Step 2: Configuring Your Non-Opto 22 Device for Ad-Hoc Mode

iOS Device (iPhone, etc.)

iOS devices (iPhone, iPod Touch, iPad) can communicate with OptoEMU Sensors and SNAP PAC brains and controllers using the Opto iPAC app, which you can get from the iTunes Store. These steps are for an iPhone; other devices will be similar.

1. On your iPhone or similar device, select: Settings > Wi-Fi.
2. Look for `optoSSID` (or whatever name you chose in the previous section for the wireless ad-hoc network) in the Choose a Network list. Click the arrow to the right of this network name.
3. Configure the IP address by selecting Static and then entering an IP address on the same network as the Opto 22 device.
For example, if the Opto device is set to IP address 192.168.0.1, subnet 255.255.255.0, you might choose IP address 192.168.0.2, subnet 255.255.255.0 for the iOS device.
4. (Optional) For convenience, turn on Auto-Join.
5. Go back to the Choose a Network list. Make sure you've selected yours and that there's a check mark to the left of the name.

At this point, your iPAC app should be able to Discover the wireless Opto 22 device.

Laptop Computer

Steps for configuring ad-hoc mode on your computer vary depending on the computer and operating system you are using. Check online for instructions for your system.

Options and Advanced Uses


If you cannot use the custom .ciw file for PAC Manager, you can use Generic Read/Write to configure ad-hoc mode instead (see [page 4](#)).

In addition, advanced users can find options to suit ad-hoc mode usage to their own applications. For example, you can:

- See or even change what's in the .ciw file (see [page 6](#)).
- Make WLAN ad-hoc mode available programmatically, for example by toggling it on and off based on a button in a PAC Display HMI (see [page 6](#)).

Use Generic Read/Write Instead of the .ciw File

If for some reason you cannot copy the .ciw custom file into the location of your PAC Manager executable, you can use standard PAC Manager to configure ad-hoc mode on your Opto 22 device. This method requires two writes to flash and two reboots of the device.

1. If PAC Manager is not already open, choose Start > Programs > Opto 22 > PAC Project Software > PAC Manager.
2. In the PAC Manager main window, click the Inspect button .
3. In the Inspect window, click the Wireless LAN button and then Wireless LAN Configure.
4. As described in the *PAC Manager Users' Guide* (form 1704), in the section on Configuring Wireless LAN Communication, set WLAN Enable to "Enabled." Then enter the Opto 22 device's IP Address, Subnet Mask and Network Name (SSID) for the wireless ad-hoc network. Remember that the IP address and subnet mask must be on a separate IP subnet from the wired LAN.

Leave Encryption Type as None. (Although ad-hoc mode can use WEP, it is generally considered not very secure and not worth the effort.)

NOTE: The View Status button will not be helpful in this case unless your other ad-hoc device is this PC.

5. Click Apply, then Yes to restart the device.

The WLAN LED turns orange, indicating the search in progress for a wireless network.

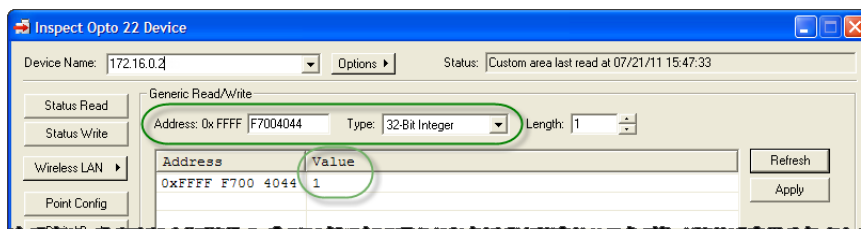
Two additional parameters for configuring ad-hoc mode must be changed using PAC Manager's Generic Read/Write option: the IEEE 802.11 Operation Mode and the Channel for ad-hoc mode. Their memory map addresses, as documented in the

OptoMMP Protocol Guide (form 1465), are F7004044 and F7004134. You should also check to make sure address F700404C has not been changed from the default of 4.

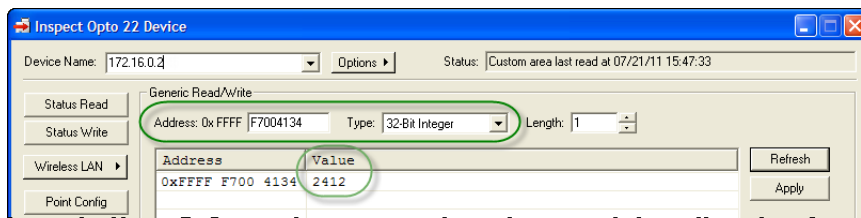
6. Still in PAC Manager's Inspect window, click the Other button and choose Generic Read/Write from the popup menu.

CAUTION: *Be very careful when entering memory map addresses. If you enter the wrong address, you could damage the device's normal functioning.*

7. Enter address: F7004044
Select type: 32-Bit Integer
Enter Value: 1
Click Apply.



8. Enter Address: F7004134
Select type: 32-Bit Integer
Enter value: 2412
Click Apply.



9. Enter Address: F700404C
Make sure the value is: 4
10. Click the Status Write button in the upper left corner of the window. Under Operation Commands, highlight Store configuration to flash. Click Send Command.
11. In the same section, highlight Restart Device from powerup. Click Send Command.
The change is stored to flash memory and the device restarts. The WLAN light turns green and the device begins SSID broadcasting, ready for the other device to connect to it.

See the .ciw File

The .ciw file customizes PAC Manager to add the ad-hoc configuration data, which is written to specific addresses in the memory map. These addresses are shown in PAC Manager's Inspect window and can also be seen if you open the .ciw file in Notepad or another program for viewing text files.

You can even change what appears in PAC Manager's Description column for Ad-Hoc Configuration, if you need to describe it differently for other users, by changing the appropriate string in the .ciw file.

Making WLAN Available Programmatically

WLAN availability on the Opto 22 device can be changed programmatically, for example by having a button in a PAC Display HMI set a flag in a PAC Control strategy. When the flag is set, the strategy flips the WLAN Enable flag in the Opto 22 device, programmatically stores the configuration to flash, and reboots the device.

Enabling WLAN programmatically on the Opto 22 device for limited periods of time has been used successfully to increase WLAN security (in either ad-hoc or infrastructure modes).

However, extreme care must be used when rebooting the controller on which this strategy is running. The strategy must be able to survive the reboot correctly, recognize that it's been rebooted to throw this flag, and later respond properly to disable WLAN again. To disable WLAN, another flag could shut off the WLAN, or a timer could be set and expire after a certain period of time. Then when the WLAN Enable flag is cleared, the configuration change must again be saved to flash and the device restarted.

For Help

If you are having trouble configuring ad-hoc mode on your Opto 22 device and can't find the answers you need in this technical note, please contact Opto 22 Product Support.

Phone: 800-TEK-OPTO (835-6786)
951-695-3080
(Hours are Monday through Friday,
7 a.m. to 5 p.m. Pacific Time)

Fax: 951-695-3017

Email: support@opto22.com

Opto 22 website: www.opto22.com

NOTE: Email messages and phone calls to Opto 22 Product Support are grouped together and answered in the order received.