


EMC Technologies Report Number: M040222_Cert_Mace_Atheros_5.2

APPENDIX O2 – WLAN USER MANUAL





Appendix

Wireless LAN* User's Guide

* Optional device



FCC REGULATORY INFORMATION

Please note the following regulatory information related to the optional wireless LAN module.

Regulatory Notes and Statements Wireless LAN, Health and Authorization for use

Radio frequency electromagnetic energy is emitted from Wireless LAN devices. The energy levels of these emissions, however, are far much less than the electromagnetic energy emissions from wireless devices such as mobile phones. Wireless LAN devices are safe for use by consumers because they operate within the guidelines found in radio frequency safety standards and recommendations. The use of Wireless LAN devices may be restricted in some situations or environments, such as:

- On board an airplane, or
- In an explosive environment, or
- In situations where the interference risk to other devices or services is perceived or identified as harmful.

In cases in which the policy regarding use of Wireless LAN devices in specific environments is not clear (e.g., airports, hospitals, chemical/oil/gas industrial plants, private buildings), obtain authorization to use these devices prior to operating the equipment.

Regulatory Information/Disclaimers

Installation and use of this Wireless LAN device must be in strict accordance with the instructions included in the user documentation provided with the product. Any changes or modifications made to this device that are not expressly approved by the manufacturer may void the user's authority to operate the equipment. The manufacturer is not responsible for any radio or television interference caused by unauthorized modification of this device, or the substitution or attachment of connecting cables and equipment other than those specified by the manufacturer. It is the responsibility of the user to correct any interference caused by such unauthorized modification, substitution or attachment. The manufacturer and its authorized resellers or distributors will assume no liability for any damage or violation of government regulations arising from failure to comply with these guidelines.

This device must not be co-located or operating in conjunction with any other antenna or transmitter.

For Atheros Wireless LAN:

For operation within 5.15–5.25GHz frequency range, it is restricted to indoor environment, and the antenna of this device must be integral.

Federal Communications Commission statement

This device complies with Part 15 of FCC Rules.

Operation is subject to the following two conditions: (1) This device may not cause interference, and, (2) This device must accept any interference, including interference that may cause undesired operation of this device.

FCC Interference Statement

This equipment has been tested and found to comply with the limits for a Class B 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. If not installed and used in accordance with the instructions, it 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 and correct the interference by one or more of the following measures:

1. Reorient or relocate the receiving antenna.
2. Increase the distance between the equipment and the receiver.
3. Connect the equipment to an outlet on a circuit different from the one the receiver is connected to.
4. Consult the dealer or an experienced radio/TV technician for help.

FCC Radio Frequency Exposure statement

This Wireless LAN radio device has been evaluated under FCC Bulletin OET 65C and found compliant with the requirements as set forth in CFR 47 Sections 2.1091, 2.1093, and 15.247 (b) (4) addressing RF Exposure from radio frequency devices. The radiated output power of this Wireless LAN device is far below the FCC radio frequency exposure limits.

The maximum SAR values measured from the devices are:

- Intel PROSet Wireless LAN: 0.262 W/kg
- Atheros Wireless LAN: 1.03 W/kg

Export restrictions

This product or software contains encryption code which may not be exported or transferred from the US or Canada without an approved US Department of Commerce export license. This device complies with Part 15 of FCC Rules, as well as ICES 003 B / NMB 003 B. 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 undesirable operation. Modifications not expressly authorized by Fujitsu PC Corporation may invalidate the user's right to operate this equipment.

Canadian Notice

To prevent radio interference to the licensed service, this device is intended to be operated indoors and away from windows to provide maximum shielding. Equipment (or its transmit antenna) that is installed outdoors is subject to licensing.

Before Using the Wireless LAN

The Integrated Wireless LAN is an optional device available for Fujitsu mobile computers. This manual describes the basic operating procedures for the Wireless LAN (referred to as the "wireless module" in this manual) and how to set up a wireless LAN network. Before using this wireless module, read this manual carefully to ensure correct operation of the device. Keep this manual in a safe place for reference while using the wireless module.

Types of Wireless LANs Covered by this Document

This document is applicable to systems containing one of the following two wireless modules. Most of the procedures are identical. Sections that differ between the two devices have been noted in the text:

Intel PROSet Wireless LAN

Atheros Wireless LAN

If your system is a T 3010 model, your wireless module is the Intel PROSet wireless LAN; if your system is a T 3010D model, your wireless module is the Atheros wireless LAN.

Characteristics of the Wireless Module

This wireless module is a mini-PCI card attached to a mini-PCI slot inside the computer.

The main characteristics are as follows:

It operates in the 2.4 GHz Industrial, Scientific, and Medical (ISM) RF band; additionally, the Atheros wireless LAN operates in the 5 GHz RF band.

It does not require an FCC license to operate.

It uses Direct Sequence Spread Spectrum (DSSS), an RF modulation scheme that is resistant to noise.

This wireless module is Wi-Fi compliant. The Intel PROSet module can communicate at a maximum data rate of 11 Mbps; the Atheros module can communicate at the maximum data rate of 54 Mbps.

The maximum communication range is approximately 80 feet (25 meters) inside a building. Please note that the range you achieve may be shorter or longer than 80 feet, depending on factors such as obstructions, walls, columns, construction material, and reflective objects.

The wireless modules support a number of industry-standard security mechanisms, including WEP, TKIP, and 802.1x/EAP (LEAP, TLS, PEAP, MD5).

Wireless LAN Modes Using this Wireless Module

Ad Hoc Mode (See Figure A-1)

"Ad Hoc Mode" refers to a type of wireless network that involves connecting multiple computers without the use of an Access Point. Network connectivity between computers can be established using only wireless LAN cards in a peer-to-peer fashion.

Ad Hoc networks are an easy and inexpensive method for establishing network connectivity between multiple computers.

In Ad Hoc mode, you can use Microsoft Network functions, such as File and Print Sharing to share folders, printers, or other peripheral devices, and exchange files with other computers.

To use Ad Hoc Mode, you must set the same SSID and the same encryption key for all the computers that are connected. Communication between computers in an Ad Hoc network will occur provided they are within each other's RF coverage area.

Figure A-1. Ad Hoc Mode Network

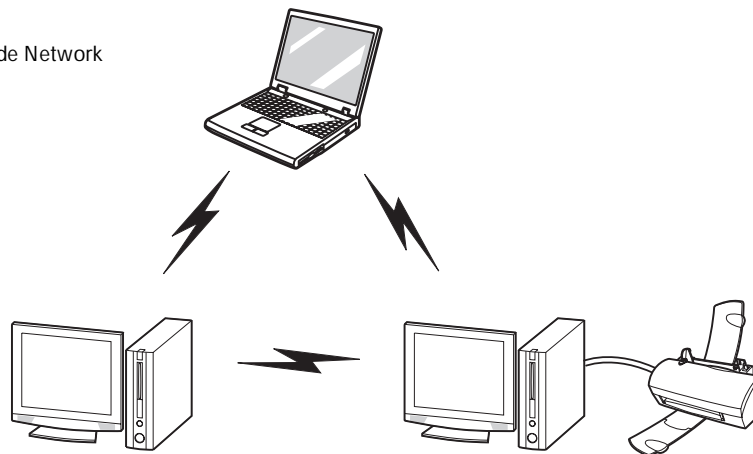
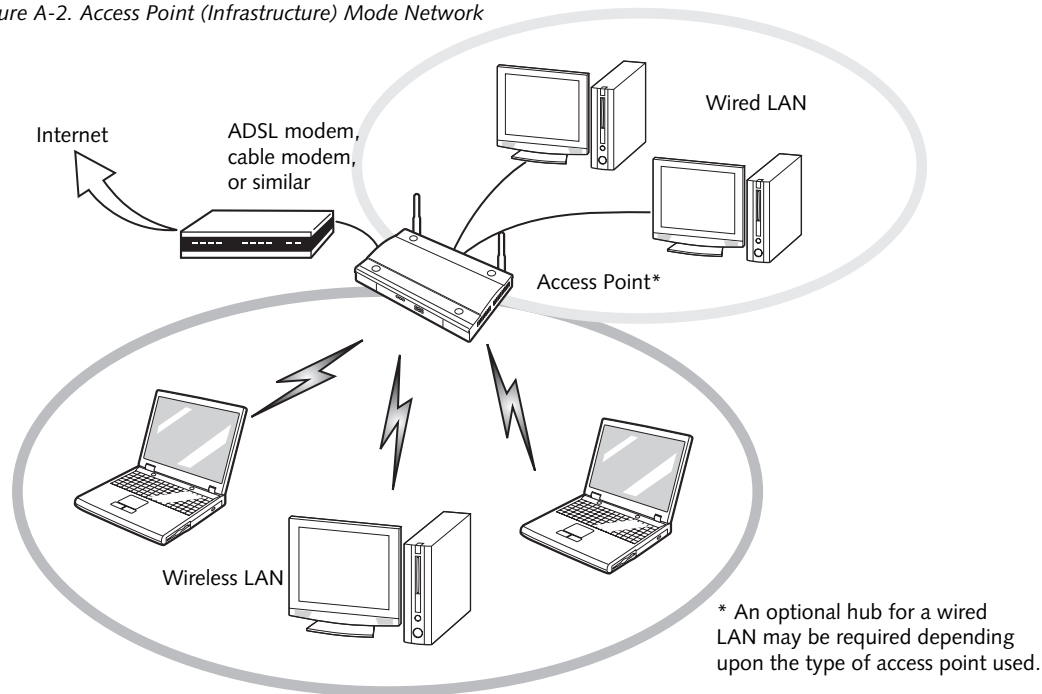


Figure A-2. Access Point (Infrastructure) Mode Network



Access Point (Infrastructure) Mode (See Figure A-2)

If a number of computers are connected simultaneously in the Ad Hoc mode, the transfer rate may be reduced, communications may become unstable, or the network connection could fail. This is because all wireless LAN cards are using the same radio frequency in the network.

To improve this situation, you can use a wireless LAN access point, which is sold separately. The wireless LAN network is in the “Access Point mode” when it uses an access point, and such a connection is called the “Access Point Network” or “Infrastructure Network”.

By using an access point, you can set and use a different communication channel for each network group. Each channel is given a different radio frequency, and it eliminates the collision of communications and provides a more stable communications environment.

How to Handle This Wireless Module

The Integrated Wireless LAN device is already installed in your mobile computer. Under normal circumstances, it should not be necessary for you to remove or re-install it. The wireless LAN has been configured to support the operating system with which your system shipped.

FOR BETTER COMMUNICATIONS

This personal computer may not operate properly due to the operating environment. It is highly recommended that you observe the following precautions when using your wireless LAN module:

- For optimum wireless communications, it recommended that operation of the wireless LAN module occur within 25 meters of the Access Point. Wireless range is dependent on a multitude of factors including number of obstructions, walls, type of construction material, reflective objects, etc.
- If the computer is unable to communicate properly, change the channel to be used or the installation location. During the use of a microwave oven or other equipment generating strong high-frequency energy, in particular, the personal computer may be highly susceptible to the energy and unable to communicate properly.
- Broadcast stations or wireless communication equipment that operate in the 2.4GHz or 5GHz RF Frequency band may interfere with the operation of the wireless LAN module. Increasing of transmit power or relocating Access Points may be necessary to combat the effects of the interference.

STOPPING TRANSMISSION

To use this product inside hospitals, clinics, or airplanes, or in other places where the use of electronic equipment is regulated, stop the transmission of radio waves from the wireless LAN beforehand.

Deactivation using the wireless switch

The transmission of radio waves from the wireless LAN can be stopped by setting the wireless switch to the Off position. Note that the wireless LAN On/Off switch has no effect on non-wireless LAN models.

(See Figure 3 for Wireless LAN switch location.)

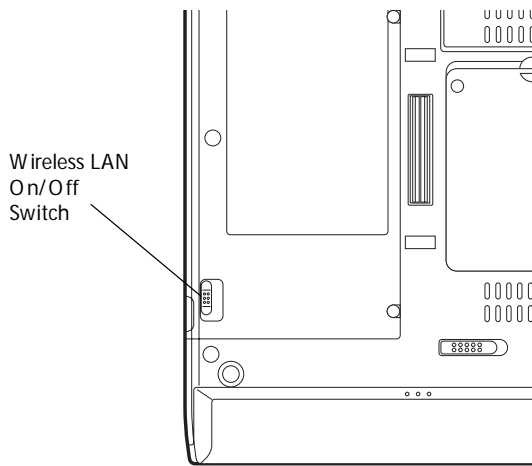


Figure A-3. Wireless LAN On/Off Switch

Deactivation using Windows

Intel PROSet Wireless LAN:

1. Click [Start] --> [(All) Programs] --> [Intel Network Adapters] --> [Intel(R) PROSet]. The Intel(R) PROSet window will be displayed.
2. Click the General tab.
3. Select [Off] for the wireless communications Switch Radio: function, and then click the [OK] button. Wireless communications on/off switching will be deactivated and the transmission of radio waves from the wireless LAN will be stopped.



To restart transmission, select [On] for the wireless communications Switch Radio: function, and then click the [OK] button.

Atheros Wireless LAN

1. Click [Start] --> [Control Panel] --> [Atheros Client Utility]. The Atheros Wireless Configuration Utility window will be displayed.
2. Click the Wireless Networks tab.
3. Click the [Enable Radio] box to clear it, then click the [OK] button. Wireless communications on/off switching will be deactivated and the transmission of radio waves from the wireless LAN will be stopped.



To restart transmission, check the [Enable Radio] checkbox to select it., then click the [OK] button.

STARTING TRANSMISSION

To communicate using the wireless LAN function, set the computer to a status from which it can transmit, as follows:

Intel PROSet Wireless LAN:

1. Set the wireless switch to the On position.
2. Click [Start] --> [(All) Programs] --> [Intel Network Adapters] --> [Intel(R) PROSet]. The Intel(R) PROSet window will be displayed.
3. Click the [General] tab if it is not already selected.
4. Select [ON] for the Switch radio: function, then click [OK]. Wireless communications on/off switching will be activated and the transmission of radio waves will be restarted.

Atheros Wireless LAN:

1. Click the Wireless Network Connection icon in the system tray at the lower right of your screen.
2. Click [Enable Radio]. The radio will be turned on. Access Point Mode: Transmission is enabled. Ad Hoc Mode: Restart your computer to enable the radio.

Connecting the WLAN

FLOW OF OPERATIONS

The wireless LAN connection procedure contained in this section is outlined below.

1. Make sure the mobile computer is ready for the transmission of radio waves from the wireless LAN. For further details, see *(See Starting Transmission on page 54 for more information.)*.
2. Assign the parameters required for wireless LAN connection. *(See Preparation for wireless LAN connection on page 55 for more information.)*
 - Configure network name (SSID).
 - Configure wireless LAN security parameters as appropriate (e.g., WEP, TKIP, 802.1x/EAP).
3. Perform setting operations relating to network connection. *(See Connection to the network on page 57 for more information.)*
 - Specify TCP/IP as the protocol, and confirm the name of the work group and other settings.
 - Enter the data required for file/printer sharing on the network. Perform this operation as required.
 - For access point (or “infrastructure”) connection, configure the wireless module with appropriate parameters required to associate to the access point network.
 - Verify that you are able to connect your computer to the network.

PREPARATION FOR WIRELESS LAN CONNECTION

This section explains the preparations required to use the wireless LAN when using the Windows XP Wireless Zero Configuration Tool. Configuration can also be accomplished using the wireless module (Intel or Atheros) configuration utility.

Assigning parameters

Enter the network name (SSID), the network key, and other data required for wireless LAN connection. If there is the administrator of the network, contact the network administrator for data settings.



- To use access point (infrastructure) connection, refer to the access point manual for the access point-setting procedure.
- You do not need to set the channel when using access point (infrastructure) mode. Channel selection is controlled by the access point. In ad hoc networks, channel selection defaults to channel 11; however, channel selection can be manually changed if desired. This can be accomplished only when using the client utility.

If it is necessary to change the channel, change the setting of the access point. For the setting procedure, refer to the manual of the access point.

1. Make sure the Wireless LAN switch is switched on.
2. Click the [Start] button first and then [Control Panel].
3. If the Control Panel is in Category view, switch to Classic view by clicking “Switch to Classic View” under Control Panel the left frame. (If you are already in Classic view, “Switch to Category View” will be displayed instead.)
4. Double-click the Network Connections icon. A list of currently installed networks will be displayed.
5. Right-click [Wireless Network Connection] in the list, and then click [Properties] in the menu displayed. The [Wireless Network Connection Properties] window will be displayed.
6. Click the [Wireless Networks] tab.
7. Click [Refresh], then choose the correct SSID from the [Available Networks] window. Click [Configure] and proceed to step 7. If the SSID of your access point does not appear in the list, click [Add]. The [Wireless Network Properties] window will be displayed.
8. Select the Association tab if it is not already selected.
9. Enter the information required for connection to the wireless LAN.
 - a. Enter the network name (SSID). (i.e., Enter the name of the desired network in less than 33 ASCII characters).

For ad hoc connection: Assign the same network name to all the personal computers to be connected.

For access point (infrastructure) connection: Assign the appropriate SSID. The SSID must be identical to the SSID of the access point. Refer to the access point manual, or contact your network administrator.

- b. For ad hoc connection, check the following field. For access point (infrastructure) connection, clear the check mark for the following field:

[This is a computer-to-computer (ad hoc) network; wireless access points are not used.]

10. Enter the WEP key for encoding communications data.



It is strongly recommended that you enter the network key for encoding communications data. If the network key is not entered, since the network can be accessed from all personal computers containing the wireless LAN function, there is the danger of your data being stolen or damaged by other users.

- a. Check the [Data encryption (WEP enabled)] check box

For ad hoc connection: Clear the check mark from the [Network Authentication (Shared mode)] check box.

For access point (infrastructure) connection: If the access point to be accessed is configured for shared-key authentication, check the [Network Authentication (Shared mode)] check box.

For open-system authentication, clear the check mark. For access point setting, refer to the manual of the access point.

- b. Clear the check mark from the [The key is provided for me automatically] check box.

- c. Enter data in [Network Key]. Depending on the number of entered characters or digits, whether the key is an ASCII character code or a hexadecimal code will be identified automatically.

Use five or thirteen characters to enter the key in the ASCII character code format. The characters that can be used as the "network key" are as follows: 0 - 9, A - Z, _ (underscore), or,

Use 10 or 26 characters to enter the key in the hexadecimal character code format. The characters that can be used as the "network key" in

this case are as follows: 0- 9, A - Z, a - f

For ad hoc connection: Assign the same network key to all the personal computers to be connected.

For access point (infrastructure) connection: Assign the identical network key that is programmed into the access point. For this setting, refer to the access point manual or contact your network administrator.

- d. Confirm the Network key by re-entering the same data in the [Confirm network key:] field.

- e. Make sure that [Key index (advanced)] is set to "1". (Any value from "1" to "4" can be assigned to [Key index (advanced)]. "1" is usually assigned, however).

11. Click the [Authentication] tab and then verify the settings of [Enable network access control using IEEE 802.11x].

For internal use at an organization such as a company, when access by wireless LAN clients is to be limited using IEEE 802.11x authentication, check the [Enable network access control using IEEE 802.11x] check box.

For home use, clear the check mark from [Enable network access control using IEEE 802.11x].

For the setting method relating to IEEE 802.11x authentication, refer to the manual of the access point which you are using.

12. After completion of setting operations, click the [OK] button. Processing will return to the [Wireless Network Connection Properties] window.

13. Verify that the network name entered in step 7 above is added in [Preferred Networks], and then click the [OK] button.



In [Preferred Networks], register only the desired connection settings.

14. Close the [Wireless Network] window.

CONNECTION TO THE NETWORK

This section explains connection to the network.

If there is an administrator of the network, contact the network administrator for data settings.

Setting the network

Perform the “Setting TCP/IP” and “Confirming the computer and work group names” operations required for network connection.

Setting TCP/IP



To change the setting of the IP address, you need to be logged in from Windows as an administrator.

1. Click the [Start] button first and then [Control Panel].
2. If the Control Panel is in Category view, switch to Classic view by clicking “Switch to Classic View” under Control Panel the left frame. (If you are already in Classic view, “Switch to Category View” will be displayed.)
3. Double-click [Network Connections]. A list of currently installed networks will be displayed.
4. Right-click [Wireless Network Connection] in the list, and then click [Properties] in the menu displayed. The [Wireless Network Connection Properties] window will be displayed.
5. Click the [General] tab if it is not already selected.
6. Click [Internet Protocol (TCP/IP)] and then click [Properties]. The [Internet Protocol (TCP/IP) Properties] window will be displayed.
7. Set the IP address as follows:
 - **For ad hoc connection:** Select [Use the following IP address:] and then enter data for [IP address] and [Subnet mask]. See page 66 for IP address setting.
 - **For access point (infrastructure) connection:** If your network uses DHCP, select [Obtain an IP address automatically] and [Obtain DNS server address automatically]. If your network uses static IP addresses, consult with your network administrator for the correct IP address settings.
8. Click the [OK] button. Processing will return to the [Wireless Network Connection Properties] window.
9. Click the [OK] button.
10. Close the [Network Connection] window.

Following this operation, confirm the names of the computer and the workgroup as follows.

Confirming the computer and work group names



To modify the computer name and/or the work group name, you need to be logged in from Windows as an administrator.

1. Click the [Start] button, then [Control Panel].
2. If the Control Panel is in Category view, switch to Classic view by clicking “Switch to Classic View” under Control Panel the left frame. (If you are already in Classic view, “Switch to Category View” will be displayed.)
3. Double-click the [System] icon. The [System Properties] window will be displayed.
4. Click the [Computer Name] tab.
5. Confirm the settings of [Full computer name:] and [Workgroup:].
 - a. The setting of [Full computer name:] denotes the name for identifying the computer. Any name can be assigned for each personal computer.



To change the name, click [Change] and then proceed in accordance with the instruction messages displayed on the screen.

- Enter the desired name in less than 15 ASCII character code format. Identifiability can be enhanced by entering the model number, the user name, and other factors.
 - [Workgroup name] is the group name of the network. Enter the desired name in less than 15 ASCII character code format.

For ad hoc connection: Assign the same network name to all personal computers existing on the network.

For access point (infrastructure) connection: Assign the name of the work group to be accessed.
6. Click the [OK] button. If a message is displayed that requests you to restart the personal computer, click [Yes] to restart the computer.

Setting the sharing function

Set the sharing function to make file and/or printer sharing with other network-connected personal computers valid.

This operation is not required unless the sharing function is to be used.

The folder and printer for which the sharing function has been set will be usable from any personal computer present on the network.



To share a file and/or the connected printer, you need to be logged in as an administrator.

Setting the Microsoft network-sharing service

1. Click the [Start] button first and then [Control Panel].
2. If the Control Panel is in Category view, switch to Classic view by clicking "Switch to Classic View" under Control Panel the left frame. (If you are already in Classic view, "Switch to Category View" will be displayed.)
3. Double-click [Network Connections]. A list of currently installed networks will be displayed.
4. Right-click [Wireless Network Connection] in the list, and then click [Properties] in the menu displayed. The [Wireless Network Connection Properties] window will be displayed.
5. If [File and Printer Sharing for Microsoft Networks] is displayed, proceed to step 6. If [File and Printer Sharing for Microsoft Networks] is not displayed, skip to step 7.
6. Make sure that the [File and Printer Sharing for Microsoft Networks] check box is checked, and then click the [OK] button. Skip to "Setting file-sharing function".
7. Click [Install]. The [Select Network Component Type] window will be displayed.
8. Click [Service], then click the [Add] button. The [Select Network Service] window will be displayed.
9. Click [File and Printer Sharing for Microsoft Networks] and then click the [OK] button. Processing will return to the [Wireless Network Connection Properties] window, and [File and Printer Sharing for Microsoft Networks] will be added to the list.
10. Click the [Close] button.

Setting the file-sharing function

The procedure for setting the file-sharing function follows, with the "work" folder in drive C: as an example.

1. Click the [Start] button first and then [My Computer].

2. Double-click [Local disk (C:)].
3. Right-click the "work" folder (or whichever folder you want to share), and then click [Sharing and Security...] in the menu displayed. The [Folder Name Properties] window will be displayed.



Setting the file-sharing function for the file which has been used to execute Network Setup Wizard is suggested on the screen. For the wireless LAN, however, since security is guaranteed by entry of the network name (SSID) and the network key, the steps to be taken to set the file-sharing function easily without using Network Setup Wizard are given below.

4. Click [Sharing] if it isn't already selected.
5. Click the link stating "If you understand the security risks, but want to share files without running the wizard, click here".
6. Click "Just enable file sharing" and click [OK].
7. Check the [Share this folder on the network] check box.



To specify the corresponding folder as a read-only folder, select the [Read only] checkbox under the General tab.

8. Click the [OK] button. The folder will be set as a sharable folder, and the display of the icon for the "work." folder will change.

Setting the printer-sharing function

1. Click the [Start] button first and then [Printers and FAX]. A list of connected printers will be displayed.
2. Right-click the printer for which the sharing function is to be set, and then click [Sharing] in the menu displayed. The property window corresponding to the selected printer will be displayed.



Setting the printer-sharing function when Network Setup Wizard has been executed is suggested on the screen. For the wireless LAN, however, since security is guaranteed by entry of the network name (SSID) and the network key, the steps to be taken to set the printer-sharing function without using Network Setup Wizard are laid down below.

3. Click the [Sharing] tab.
4. Click [Share this printer].

5. Enter the sharing printer name in [Share name].
6. Click the [OK] button.

Confirming connection

After you have finished the network setup operations, access the folder whose sharing has been set for other personal computers. Also, confirm the status of the radio waves in case of trouble such as a network connection failure.



In the case of access point (infrastructure) connection, enter the necessary data for the access point before confirming connection. Refer to the manual of the access point for the access point setup procedure.

Connecting your personal computer to another personal computer

1. Click [Start] first and then [My Computer]. The [My Computer] window will be displayed in the left frame.
2. Click [My Network Places] in the “Other Places” list. The window [My Network Places] will be displayed.
3. Click [View workgroup computers] under Network Tasks in the left frame.
4. Double-click the personal computer to which your personal computer is to be connected. The folder that was specified in “Setting the file-sharing function” on page 58 will be displayed.
5. Double-click the folder to be accessed.

Confirming the status of the radio

Intel PROSet Wireless LAN:

1. Click [Start] -> [All Programs] -> [Intel Network Adapters] -> [Intel(R) PROSet]. The [Intel(R) PROSet] window will be displayed.
2. Click the [General] tab and confirm radio status in the window displayed. The current connection status will be displayed.
 - **Signal Quality**
The quality of the signals is displayed on a graph.
 - **Network name (SSID)**
The connected network name (SSID) is displayed.
 - **Profile name**
“<No profile>” is displayed.

- **Mode**

If access point (infrastructure) connection is in use, “Infrastructure (AP)” will be displayed. If ad hoc connection is in use, “Ad hoc (Peer-to-peer)” will be displayed.

- **Security**

Displays the encryption type currently used by the radio.

- **Speed**

Displays the current data rate used by the radio to transmit and receive data.

- **Band (Frequency)**

The current operating frequency band is displayed. When communication is possible, “802.11b (2.4 GHz)” is displayed.

- **Channel**

The channel number currently being used for the communications is displayed.

If connection cannot be made to the network or if you want to check for normal connection, see “Troubleshooting” on page 62.

Atheros Wireless LAN:

1. Right-click the Atheros icon in the lower right corner of the screen.
2. Click [Open Client Utility]. The Atheros Wireless Configuration Utility window opens.
3. Contained within the Current Status tab and Advanced Current Status, you will find the current operating status of the radio. (When the radio is turned off or the computer is not yet connected, some of the conditions will not be displayed.)

- **Profile Name**

The current configuration profile is displayed.

- **Network Type - Configured Network Type**

[Access Point] or [AdHoc] will be displayed.

- **Current Mode**

Indicates the frequency and data rate currently used by the radio.

- **Current Channel**

The channel number currently used by the radio.

- **Link Status**

Displays the current connected state of the WLAN module.

- **Encryption Type**

Displays the encryption type currently used by the radio.

IP Address

Displays the current TCP/IP address assigned to the WLAN adapter.

Country

The country with the country code for which the radio is configured.

Transmit Power Level

Displays the current transmit power level of the radio.

Network Name (SSID)

Displays the Network Name (SSID) currently used by the radio.

Power Save Mode

Displays the configured Power Save Mode currently used by the radio. [Off], [Normal], or [Maximum] will be displayed.

BSSID

Displays the Basic Service Set Identifier. This is typically the MAC address of the Access Point or in the case of AdHoc networks, is a randomly generated MAC address.

Frequency

Displays the center frequency currently being used by the radio.

Transmit Rate

Displays the current data rate used by the radio to transmit data.

Receive Rate

Displays the current data rate used by the radio to receive data.

Other settings

SETTING OF POWER-SAVING FUNCTION

You can set the power-saving function of wireless LAN. Default setting is auto-setting. In case of using the power-saving function, manually control the communication performance.

Intel PROSet Wireless LAN:

1. Click [Start] -> [(All) Programs] -> [Intel Network Adapters] -> [Intel(R) PROSet]. The Intel(R) PROSet window will be displayed.
2. Click the [Adapter] tab.
3. Click the [Configure] button in [Power settings]. The [Power settings] window will be displayed.
4. Select [Manual], and adjust the bar to set the power-saving function.

Setting of transmission power during ad hoc connection

By controlling the transmission power during ad hoc connection, you can broaden or narrow the communication range. This setting is only effective during ad hoc connection. It will be ineffective during access point connection.

Intel PROSet Wireless LAN:

1. Click [Start] -> [(All) Programs] -> [Intel Network Adapters] -> [Intel(R) PROSet]. The Intel(R) PROSet window will be displayed.
2. Click the [Adapter] tab.
3. Click the [Configure] button in [Power settings]. The [Power settings] window will be displayed.
4. Adjust the "Transmission Power (Ad Hoc)" bar to set the transmission power.

Setting of channels during ad hoc connection

You can set channels during ad hoc connection. Channel 11 is set by default. When connecting to an existing ad hoc network, no channel setting will be effective.

This setting is only effective during ad hoc connection; it will be ineffective during access point connection.



When changing channels during ad hoc connection, change the channel settings of all connected computers with the same Network name (SSID) at the same time. After changing the channels, turn off all computers and -- after they are all turned off -- turn them back on.

Intel PROSet Wireless LAN:

1. Click [Start] -> [(All) Programs] -> [Intel Network Adapters] -> [Intel(R) PROSet]. The Intel(R) PROSet window will be displayed.
2. Click the [Adapter] tab.
3. Click the [Configure] button in [Ad hoc settings]. The [Ad hoc settings] window will be displayed.
4. Change channels during ad hoc connection by selecting a new channel from the drop down list.
5. Click [OK].

Atheros Wireless LAN:

1. Click on the My Computer icon. Select [View system information] from the left frame.
2. Select the Hardware tab and click [Device Manager].
3. Double-click "Atheros Wireless LAN Adapter" under [Network Adapters].
4. In the Atheros Wireless LAN Adapter window, select the Advanced tab.
5. Select IBSS Channel Number from the list, and change the value from the [Value:] dropdown list to the desired channel.
6. Click [OK].

Troubleshooting

Causes and countermeasures for troubles you may encounter while using your wireless LAN are described in the following table.

Problem	Possible Cause	Possible Solution
Unavailable network connection	Incorrect network name (SSID) or network key	<p>Ad hoc connection: verify that the network names (SSID's) and network keys (WEP) of all computers to be connected have been configured correctly. SSID's and WEP key values must be identical on each machine.</p> <p>Access Point (Infrastructure) connection: set the network name (SSID) and network key to the same values as those of the access point.</p> <p>Set the Network Authentication value identically to that of the Access Point. Please consult your network administrator for this value, if necessary.</p> <p>For the method of setting network authentication, refer to the following pages: "Assigning parameters" on page 55.</p>
	Poor radio wave condition	<p>Ad hoc connection: Retry connection after shortening the distance to the destination computer or removing any obstacles for better sight.</p> <p>Access Point (Infrastructure) connection: Retry connection after shortening the distance to the access point or removing any obstacles for better sight.</p> <p>To check the wave condition, refer to the following pages: "Confirming the status of the radio waves" on page 59.</p>
	Radio wave transmission has stopped	Check if the wireless switch is turned ON. Also verify "Disable Radio" is not checked in "Network setting" window. Refer to "Starting Transmission" on page 54.
	The computer to be connected is turned off	Check if the computer to be connected is turned ON.
	Active channel duplication due to multiple wireless LAN networks	If there is any other wireless LAN network nearby, change channels to avoid active channel duplication. For the method of checking active channels, refer to the following pages: "Confirming the status of the radio waves" on page 59.
	No right of access to the network to be connected	Check if you have a right of access to the network to be connected with.
	Incorrectly-performed network setting	<p>Check the protocol, work group name or shared setting.</p> <p>For the method of checking, refer to the following pages: "Connection to the Network" on page 57.</p>
	Unmatched [Network authentication (shared mode)] settings in Windows XP	If the setting of [Network authentication (shared mode)] is not matched with that of access point or computer to be connected with, no communication can be established. Check the parameter setting. Refer to "Assigning parameters" on page 55.

Problem	Possible Cause	Possible Solution
Unavailable network connection (continued)	It takes too long to retrieve the network and display the connected computers.	Retrieve computers as follow: 1. Click [Start] button, then click [Search]. 2. Click [Computers or people]. 3. Click [Computers on the network]. 4. Input the name of computer to be connected with in [Computer name] and click [Search]. 5. Double-click the icon of connected computer.
	Incorrect setting of IP address	Check the network setting. "Setting the network" on page 57. In case of using TCP/IP protocol, you can check IP address as follows: 1. Click [Start] -> [All programs] -> [Accessories] -> [Command prompt]. 2. In [Command prompt] or [MS-DOS prompt] window, input [IPCONFIG] command as follows, then press [Enter] key. Example: In case of C drive being the hard disk: C:\ipconfig [Enter] Check that the IP address is correctly displayed:. IP Address.....: 10.0.1.3 Subnet Mask.....: 255.255.255.0 Default Gateway.....: 10.0.1.1 When IP address is displayed as [169.254.XXX.YYY] or [0.0.0.0], IP address is not correctly fetched from the access point. In that case, restart the computer itself. If the display is still unchanged, check the setting of TCP/IP. If [Cable Disconnected] or [Media Disconnected] is displayed without showing IP address, check the setting of network name (SSID) and network key. Also, set the network authentication according to the access point.
Communication is disconnected soon after connection to the access point	Access control may be disabled	Check the setting of "Enable network access control using IEEE 802.1X". Refer to "Assigning parameters" on page 55. When restricting the access of wireless LAN clients using IEEE802.1X authentication, put a check mark on "Enable network access control using IEEE 802.1X". When using at home, remove a check mark on "Enable network access control using IEEE802.1X". For the method of setting related with IEEE802.1X authentication, refer to the access point manual.
	Authentication method may have been entered incorrectly	Re-enter your WEP key and verify that your authentication method (Open or Shared) is correct.

Wireless LAN Glossary

Access point

A designation of wireless LAN network configurations. It indicates a form of communication using an Access Point. For details, refer to "access point connection" on page 52.

Ad hoc

A designation for wireless LAN network configuration. It indicates a form of communication limited to those personal computers which have wireless LAN function. For details, refer to "Ad hoc connection" on page 52.

Channel

The frequency band of wireless LAN to be used in communications over wireless LAN or at the access point.

DHCP (Dynamic Host Configuration Protocol)

A protocol used for automatically fetching communication parameters such as IP addresses. The side which assigns IP address is called DHCP server and the side that is assigned it is called DHCP client.

DNS (Domain Name System)

A function that controls the correspondence of IP addresses assigned to a computer with the name. Even for those computers whose IP addresses are unknown, if their names are known, it is possible to communicate with them.

IEEE802.11a

One of the wireless LAN standards prescribed by the 802.11 committee in charge of establishing standards of LAN technology in IEEE (Institute of Electrical and Electronic Engineers). It allows communications at the maximum speed of 54 Mbps by using a 5GHz band which can freely be used without radio communication license.

IEEE802.11b

One of the wireless LAN standards prescribed by the 802.11 committee in charge of establishing standards of LAN technology in IEEE (Institute of Electrical and Electronic Engineers). It allows communications at the maximum speed of 11Mbps by a band of 2.4 GHz (ISM band) which can freely be used without radio communication license.

IP address

An address used by computers for communicating in TCP/IP environment. IP addresses have global and

private addresses. A global address is a unique address in the world. A private address is a unique address within a closed network.

LAN (Local Area Network)

An environment connecting computers within a relatively small range, such as the same floor and building.

MAC address (Media Access Control Address)

A physical address inherent to a network card. For Ethernet, the top three bytes are controlled/assigned as a vendor code. The remaining three bytes comprise the code uniquely (to avoid duplication) controlled by each vendor. As a result, there is no Ethernet card with the same physical address in the world. In Ethernet, the frame transmission/reception is performed based on this address.

MTU (Maximum Transmission Unit)

The maximum size of data which can be transmitted at one time in networks including the Internet. In an environment whose maximum size of data is too large to correctly receive data, normal communications can be restored by setting the size of MTU to a smaller value.

Network authentication

The method of authentication performed by wireless LAN clients to connect with the access point. There are two types: open system authentication and shared key authentication. The type of authentication must be set to each client and also coincide with the setting of access point with which to communicate. Network authentication is sometimes called authentication mode.

Network key

Data that is used for encrypting data in data communication. The personal computer uses the same network key both for data encryption and decryption, therefore, it is necessary to set the same network key as the other side of communication.

Network name (SSID: Service Set Identifier)

The network name is a unique identifier attached to the WLAN packet header that acts as a password when the client attempts to connect to a WLAN. The SSID differentiates one WLAN from another so all WLAN devices attempting to connect to a specific WLAN must use the same SSID. SSID's are transmitted in clear text, thus supplying no security to the WLAN.

Open system authentication

An 802.11 wireless LAN authentication method. Open System does not exchange any key or other information, it is a simple request by the mobile station to be authenticated without verifying identity.

PPPoE (Point to Point Protocol over Ethernet)

A method of allowing the authentication protocol adopted in telephone line connection (PPP) to be used over an Ethernet.

Protocol

A procedure or rule of delivering data among computers. Ordered data communication is allowed by making all conditions required for communication including the method of data transmission/reception and actions upon communication errors into procedures.

Shared key authentication

An 802.11 wireless LAN authentication method. When a client attempts to associate to an access point, the access point will send a challenge to the client. The client encrypts the challenge with the network key and sends it back to the access point. If the access point can decrypt the challenge, then authentication has succeeded.

SSID (Service Set Identifier)

See “Network name”

Subnet mask

TCP-IP network is controlled by being divided into multiple smaller networks (subnets). IP address consists of the subnet address and the address of each computer. Subnet mask defines how many bits of IP address comprise the subnet address. The same value shall be set among computers communicating with each other.

TCP/IP (Transmission Control Protocol/Internet Protocol)

A standard protocol of the Internet.

Wi-Fi

Short for “Wireless Fidelity”. A term meant to be used generically when referring to any type of 802.11 network, whether 802.11b, 802.11a, 802.11g, etc.

IP address information



IP addressing is much more complicated than can be briefly explained in this document. You are advised to consult with your network administrator for additional information.

If IP address is unknown, set IP address as follows:

If you have an access point (DHCP server) on the network, set the IP address as follows:

[Obtain an IP address automatically]



A DHCP server is a server that automatically assigns IP addresses to computers or other devices in the network. There is no DHCP server for the AdHoc network.

If the IP address is already assigned to the computer in the network, ask the network administrator to check the IP address to be set for the computer.

If no access point is found in the network:

An IP address is expressed with four values in the range between 1 and 255.

Set the each computer as follows: The value in parentheses is a subnet mask.

<Example>

Computer A: 192.168.100.2 (255.255.255.0)

Computer B: 192.168.100.3 (255.255.255.0)

Computer C: 192.168.100.4 (255.255.255.0)

:

:

Computer X: 192.168.100.254 (255.255.255.0)

Specifications

Item	Specification
Type of network	Conforms to IEEE 802.11a/802.11b/g (Wi-Fi based)*
Transfer rate	(Automatic switching) 54 Mbps maximum data rate
Active frequency	802.11b/g: 2400~2473 MHz 802.11a: 4900 ~ 5850 MHz
Number of channels	802.11a: 8 independent channels 802.11b/g: 11 channels, 3 non-overlapping channels
Security	Network name (SSID) Network key (64 bits/128 bits)** WPA 1.0 compliant Supports TKIP and WEP encryption algorithms 802.1x/EAP
Maximum recommended number of computers to be connected over wireless LAN (during ad hoc connection)	10 units or less ***

* "Wi-Fi based" indicates that the interconnectivity test of the organization which guarantees the interconnectivity of wireless LAN (Wi-Fi Alliance) has been passed.

** Encryption with network key (WEP) is performed using the above number of bits, however, users can set 40 bits/104 bits after subtracting the fixed length of 24 bits.

*** The maximum number of computers that can be supported by an Access Point is highly variable, and can be affected by such factors as application bandwidth utilization, broadcast packet traffic, type of applications used, etc. The number of 10 provided by this document is meant only as a guideline and not a limitation of the technology.