

LINKSYS BEFCMU10 ver. 3 Cable Modem
User's Manual

02/26/2003
Rev.02

Safety Notes

For Installation

- Use only the type of power source indicated on the marking labels.
- Use only the power adapter supplied with the product.
- Do not overload wall outlet or extension cords as this may increase the risk of electric shock or fire. If the power cord is frayed, replace it with a new one.
- Proper ventilation is necessary to prevent the product overheating. Do not block or cover the slots and openings on the device, which are intended for ventilation and proper operation. It is recommended to mount the product with a stack.
- Do not place the product near any source of heat or expose it to direct sunshine.
- Do not expose the product to moisture. Never spill any liquid on the product.
- Do not attempt to connect with any computer accessory or electronic product without instructions from qualified service personnel. This may result in risk of electronic shock or fire.
- Do not place this product on an unstable stand or table.

For Using

- Power off and unplug this product from the wall outlet when it is not in use or before cleaning. Pay attention to the temperature of the power adapter. The temperature might be high.
- After powering off the product, power on the product at least 15 seconds later.
- Do not block the ventilating openings of this product.
- When the product is expected to be not in use for a period of time, unplug the power cord of the product to prevent it from the damage of storm or sudden increases in rating.

For Service

Do not attempt to disassemble or open covers of this unit by yourself. Nor should you attempt to service the product yourself, which may void the user's authority to operate it. Contact qualified service personnel under the following conditions:

- If the power cord or plug is damaged or frayed.
- If liquid has been spilled into the product.
- If the product has been exposed to rain or water.
- If the product does not operate normally when the operating instructions are followed.
- If the product has been dropped or the cabinet has been damaged.
- If the product exhibits a distinct change in performance.

Warning

- This equipment must be installed and operated in accordance with provided instructions and a minimum 20 cm spacing must be provided between computer mounted antenna and person's body (excluding extremities of hands, wrist and feet) during wireless modes of operation.
- 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.

Caution

- Any changes or modifications not expressly approved by the party responsible for compliance could void the authority to operate equipment.

NOTE

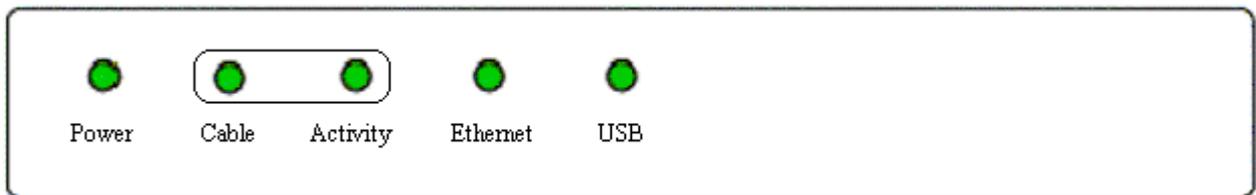
- This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy 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 the dealer or an experienced radio/TV technician for help.

Chapter 1: Overview

1.1 Physical Outlook

1.1-1 Front Panel

The following illustration shows the front panel of the *LINKSYS BEFCMU10 VER. 3 Cable Modem*.

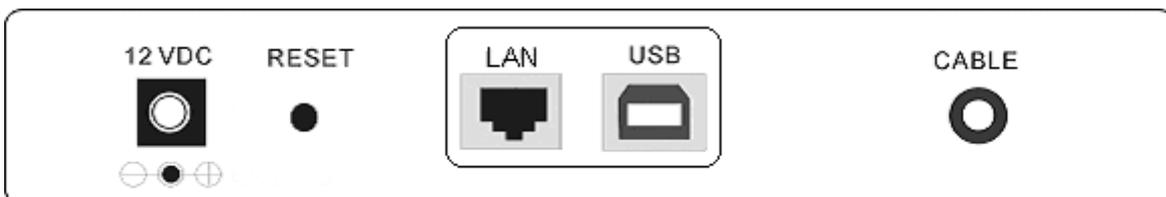


LED Indicators

The LEDs on the front panel are described in the table below (from left to right):

LED	Color	Status	Description
POWER	Green	Off	Power off.
		On	Power on.
Cable	Green	Off	Power off or the initial test is over.
		Blinking	To indicate cable modem is on line.
Activity	Green	Off	Power off or the initial test is over.
		Blinking	To indicate transmit RF US traffic.
Ethernet	Green	Off	Power off or the initial test is over.
		Blinking	To indicate Ethernet data traffic.
		On	Ethernet line is in use.
USB	Green	Off	Power off or the initial test is over.
		Blinking	To indicate USB data traffic.
		On	USB interface is in use.

1.1-2 Rear Panel



12 VDC:	12V Power connector
RESET :	Reset-to-Default push button
LAN :	10/100BaseTX RJ-45 connectors
USB :	USB Connector

CABLE : F-Connector

Chapter 2: Installation

2.1 Connecting the Cable Modem to Your Computer

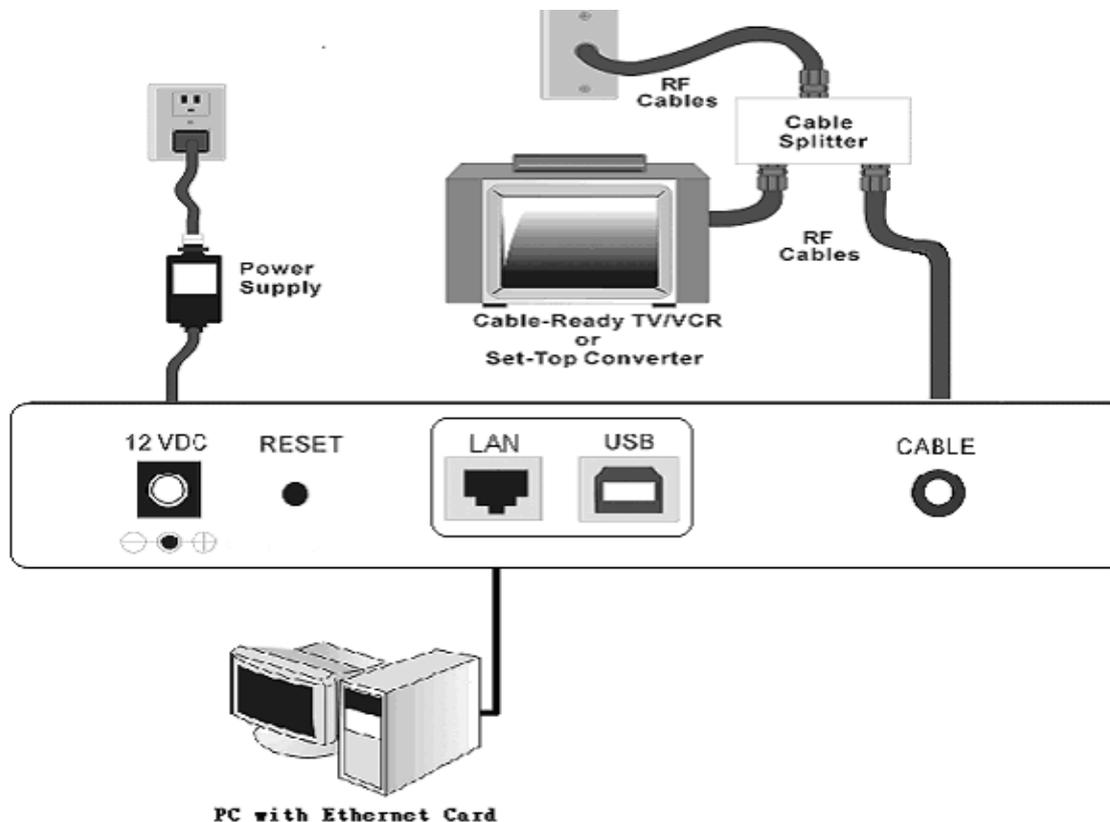
2.1-1 Installation Procedure for Ethernet Interface

Follow the steps below for proper installation:

1. Make sure your computer meets the system requirements.
2. Connect a coaxial cable (supplied by the local Cable Television Company) to the CABLE connector on the modem.
3. Plug the power adapter into the **POWER** connector of the modem.
4. Plug the other end of the power adapter into a power outlet.
5. Check CABLE LED. If it is solid ON, the Cable Modem is on-line now. If it is not, contact your service provider.
5. Connect the RJ-45 Ethernet cable to one of the **ETHERNET** connector on the modem, connect the other end with the 10/100BaseT Ethernet port on your computer.
6. When the connection is established, the client PCs can access the Internet or remote network through the LINKSYS BEFCMU10 ver. 3.

Note: You can go to **Chapter 3.3 “Setting TCP/IP on client PC”** now

Below shows the connection status among the cable modem and your computer.



2.1-2 Installation Procedure for USB Interface

Follow the steps below for proper installation:

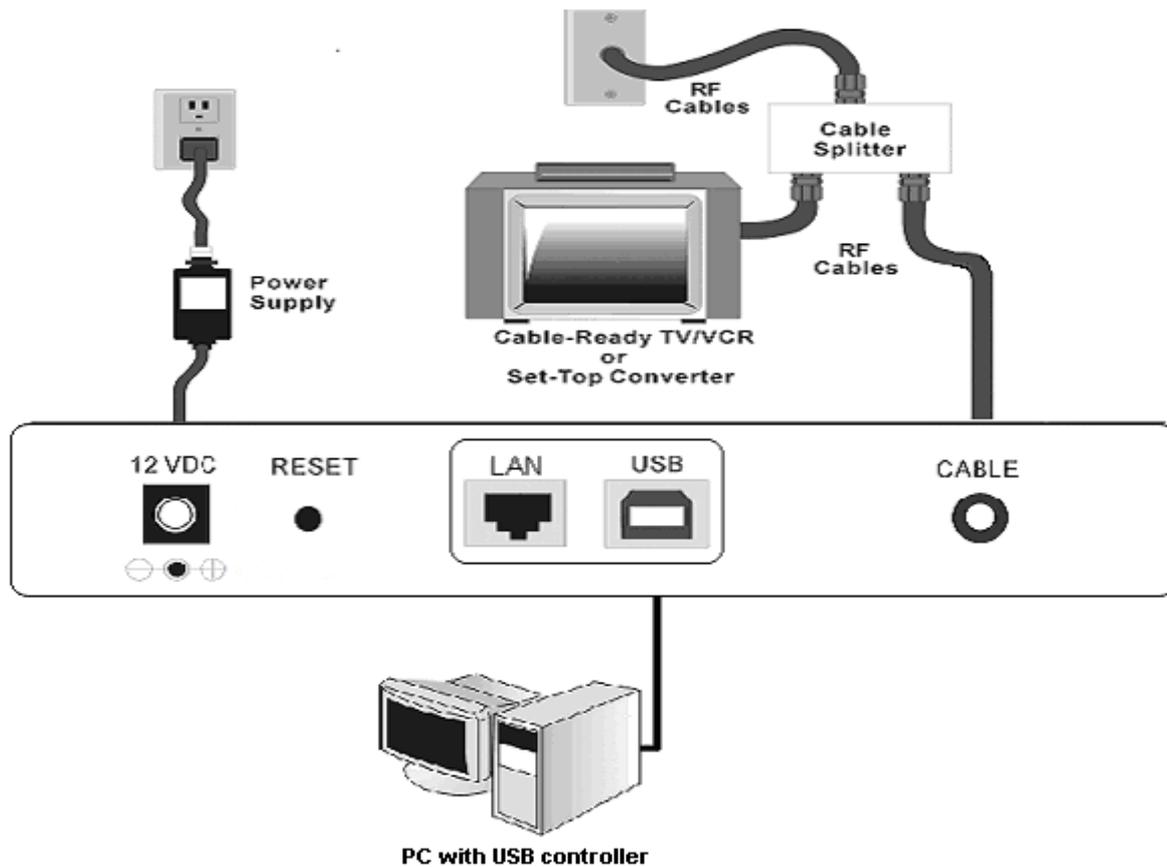
1. Make sure your computer meets the system requirements.
2. Connect a coaxial cable (supplied by the local Cable Television Company) to the CABLE connector on the modem.
3. Plug the power adapter into the **POWER** connector of the modem.
4. Plug the other end of the power adapter into a power outlet.
5. Check CABLE LED. If it is solid ON, the Cable Modem is on-line now. If it is not, contact your service provider.
6. Connect the USB cable to the **USB** connector on the modem.

Note: You can go to **Chapter 3.1 “USB Driver installation”** now

7. When the connection is established, the client PCs can access the Internet or remote network through the LINKSYS BEFCMU10 ver. 3.

Note: You can go to **Chapter 3.3 “Setting TCP/IP on client PC”** now

Below shows the connection status among the cable modem and your computer.



Chapter 3: Software Installation and Configuration

3.1 USB Driver Installation

3.1-1 For Windows 98/Me

1. Wait for the cable modem is running in the operational state (registration O.K.). Plug the



USB cable into your PC USB port. You will see the next page. Click the “Next” button.

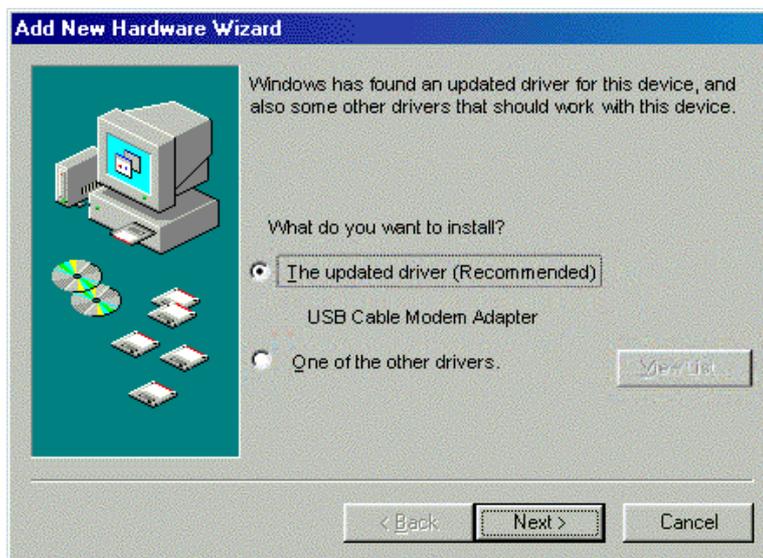
2. Select “Search for the best drivers for your device“ and click the “Next” button.



3. Check “Specify a location” and browse CD-ROM:\Win9x or WinME. Click the “Next” button.



4. Select “The updated driver...” and click the “Next” button.



5. Click the “Next” button.



6. Installation has been completed here. Click the “Finish” button.



7. The system will ask you to restart your computer. Click “Yes” to complete the installation.

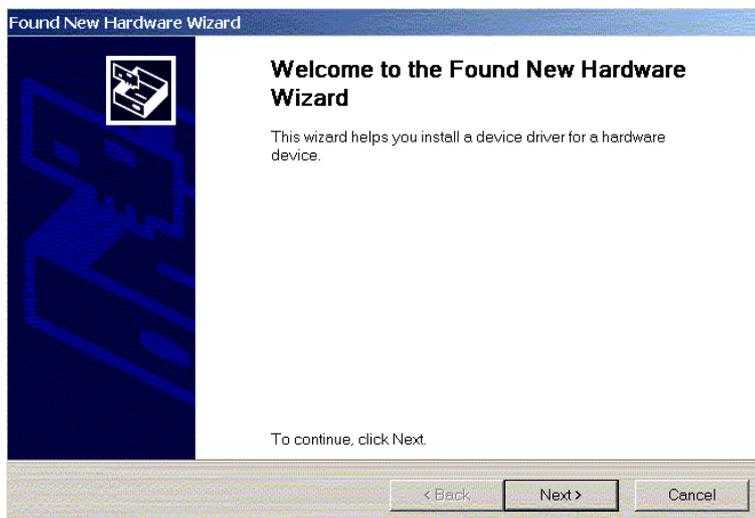


3.1-2 For Windows 2000/XP

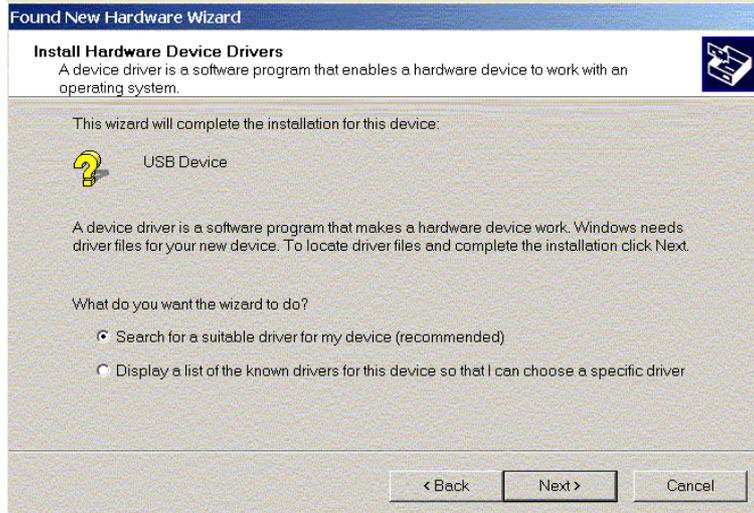
1. Wait for the cable modem is running in the operational state (registration O.K.). Plug the USB cable into your PC USB port.



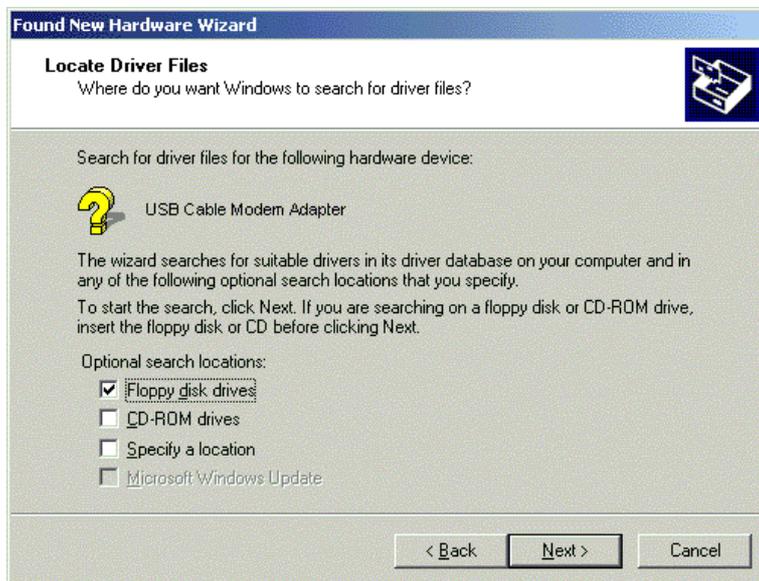
2. You will see the next page. Click the “Next” button.



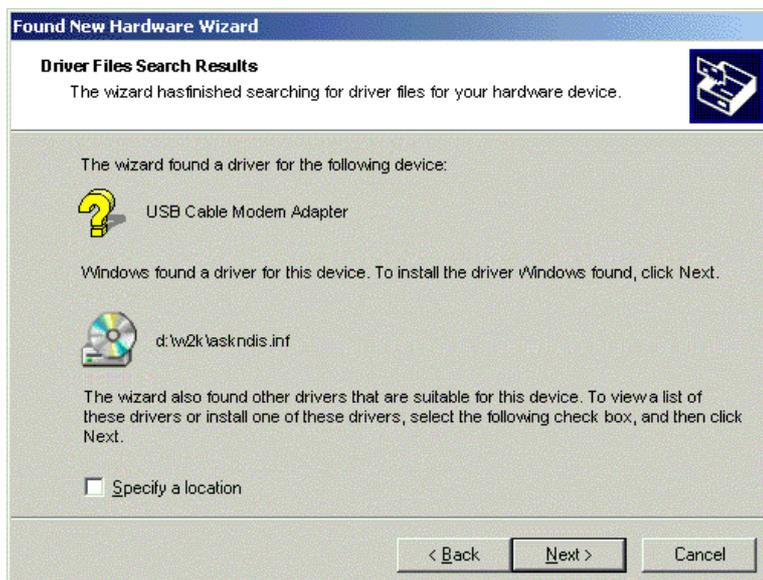
3. Select “Search for a suitable driver for my device” and click the “Next” button.



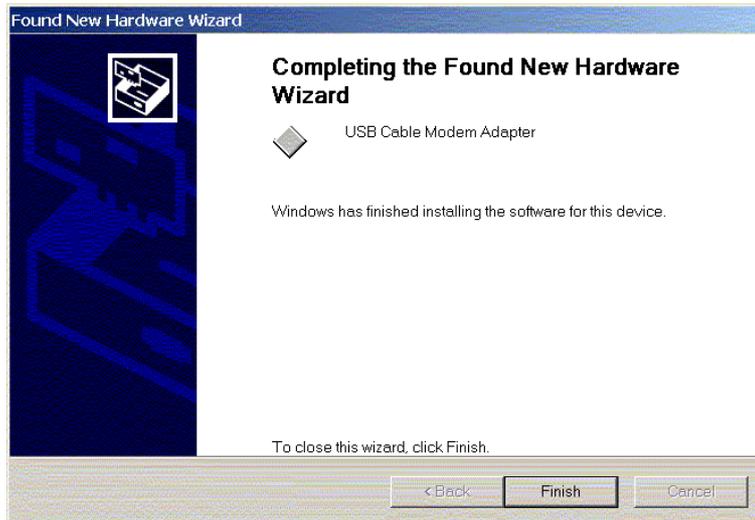
4. Insert the driver CD into CD-ROM. Select “CD-ROM drive” and clicks the “Next” button.



5. Click the “Next” button.



- Installation has been completed here. Click the “Finish” button.



3.2 Uninstall USB Driver

3.2-1 For Windows 98/ME

- Click “Start” button on your computer’s taskbar, point to “Settings”, and then click “Control Panel”.
- Select **Add/Remove Programs**.
- On the **Install/Uninstall** tab, select **USB Cable Modem Adapter** from the list box. Click the **Add/Remove** button.
- A confirmation dialog appears. Click **Yes**.
- A dialog box appears to ask you unplug USB cable, please unplug the cable and click **OK**.

3.2-2 For Windows 2000/XP

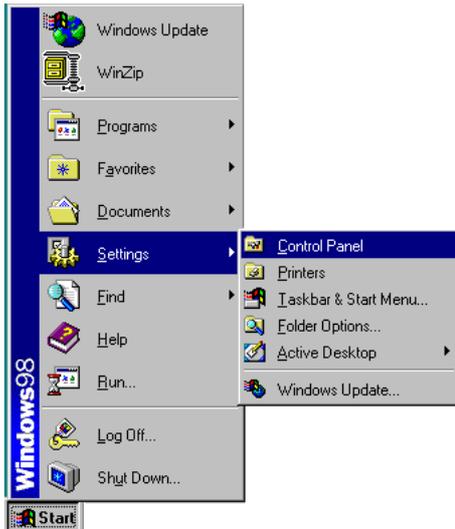
- Click on the **Start** menu, point to **Settings** and click on **Control Panel**.
- Select **Add/Remove Programs**.
- Select **USB Cable Modem Adapter** from the list box.
- Click the **Change/Remove** button.
- Click **Yes** button.
- A dialog box appears to ask you unplug USB cable, please unplug the cable and click **OK**.

3.3 Setting TCP/IP on Client PC

After you successfully complete the network interface card (Ethernet card) installation task, you need to make sure the TCP/IP communications protocol used by the Ethernet card is installed and correctly configured on your system.

3.3-1 For Windows 98/Me

1. Click on the **Start** menu, point to **Settings** and click on **Control Panel**.



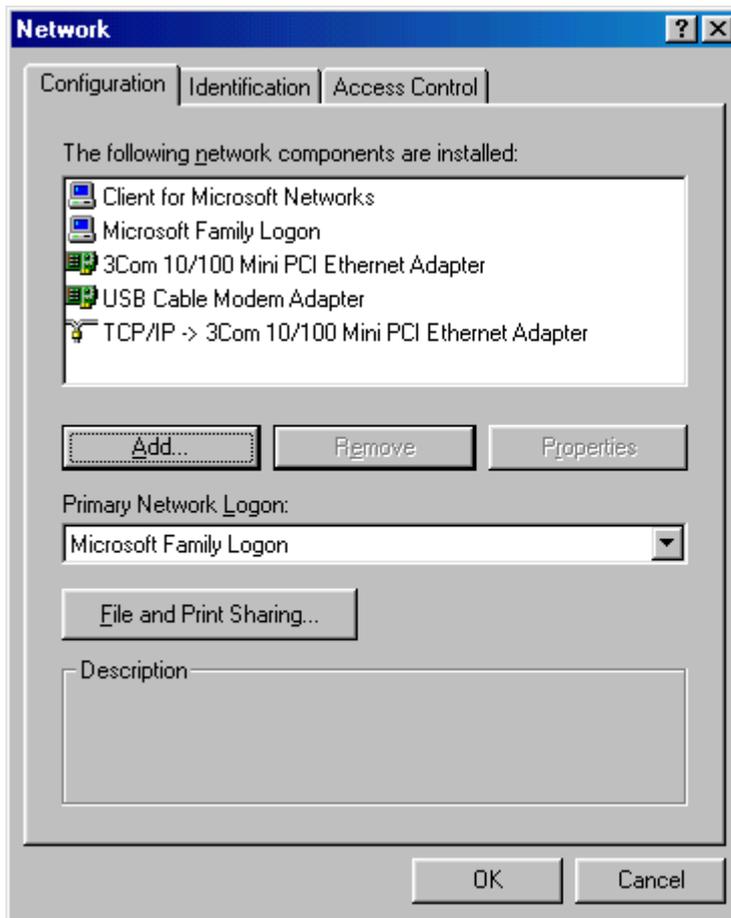
2. The Control Panel window will show up. Double-click the “Network” icon in the Control Panel window.



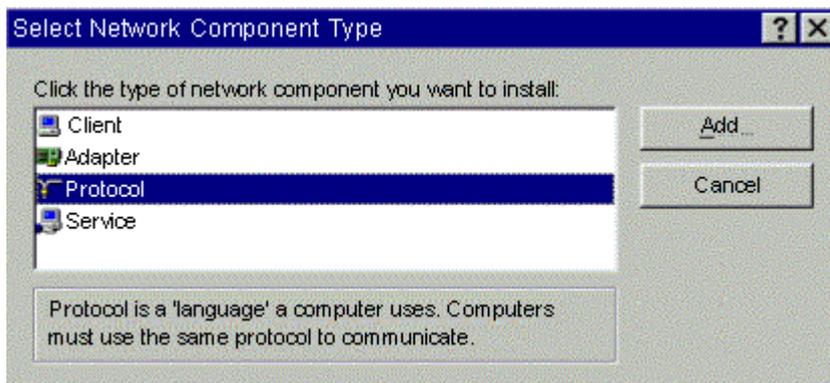
3. Windows will appear the Network dialog box. Click “Configuration” tab to bring it to the front, and on this tab, a list of installed network components appears.

Option 1: If you have **no** TCP/IP protocol, click **Add**.

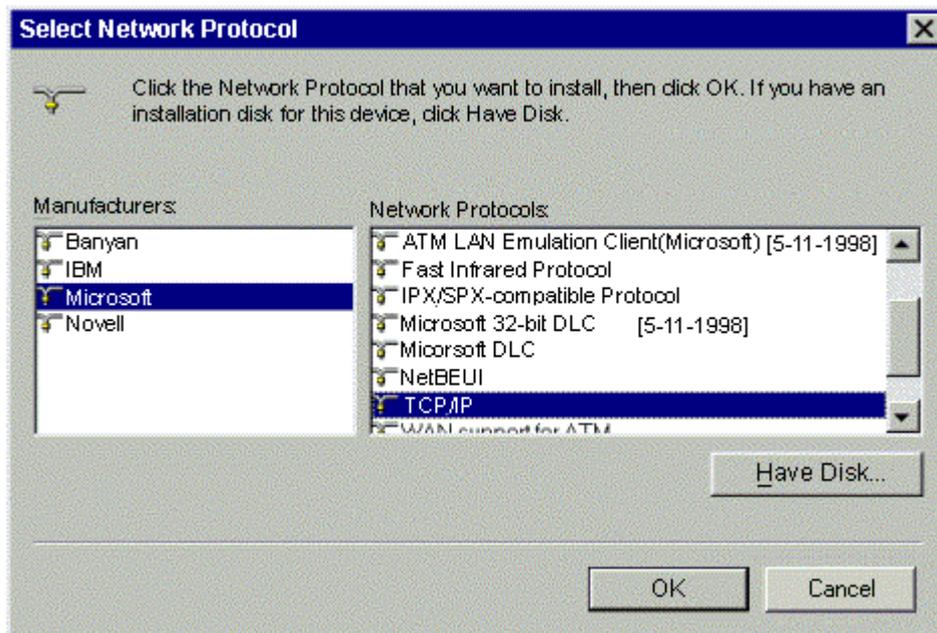
Option 2: If you have TCP/IP protocol, go to Step 7.



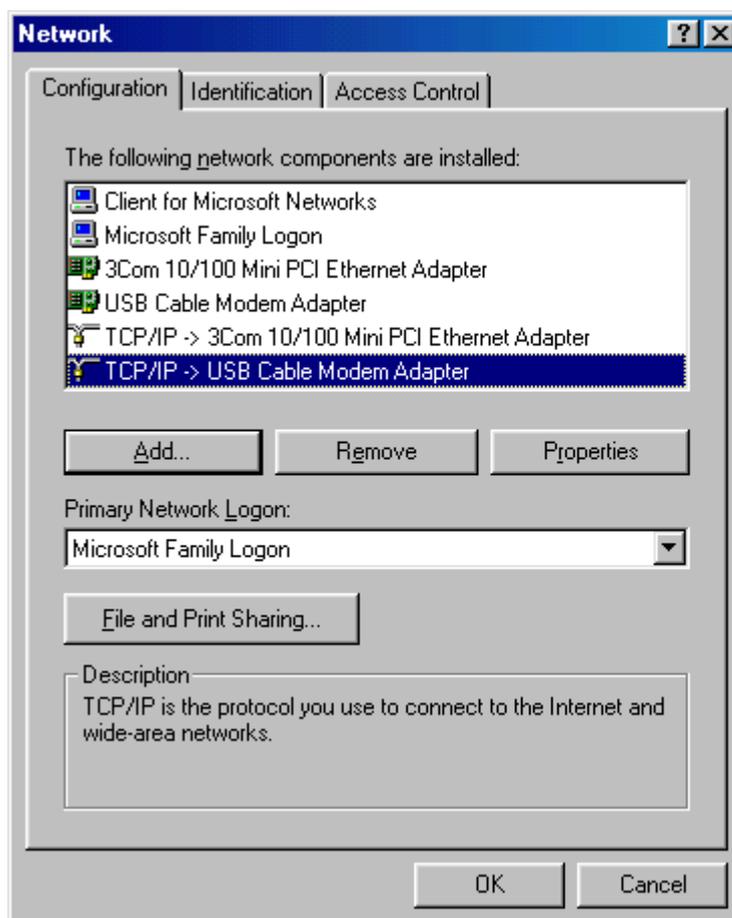
4. The Select Network Component Type dialog box will show up. Click "Protocol", and then click "Add".



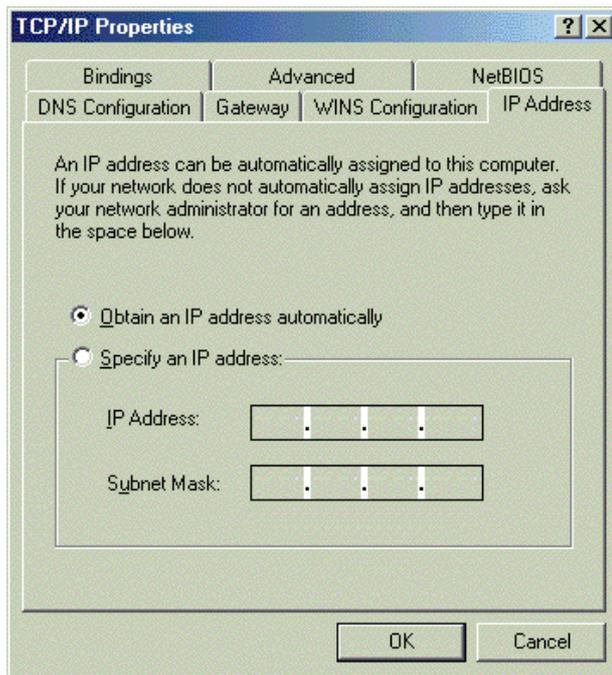
5. You will see the Select Network Protocol dialog box. Click "Microsoft" in the "Manufactures:" list, and then click "TCP/IP" in the "Network Protocols:" list. Click "OK".



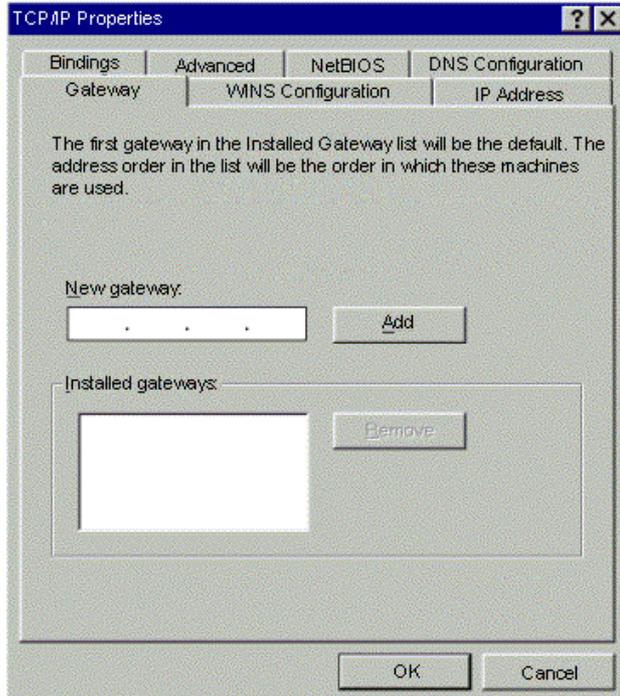
- You will be directed back to the Network dialog box, and on the “Configuration” tab, the entry that includes TCP/IP -> followed by the Ethernet card installed in your computer will appear in the list of installed network components.
- Click TCP/IP -> followed by the Ethernet card installed in your computer, and then click ”Properties”. The TCP/IP Properties dialog box will appear.



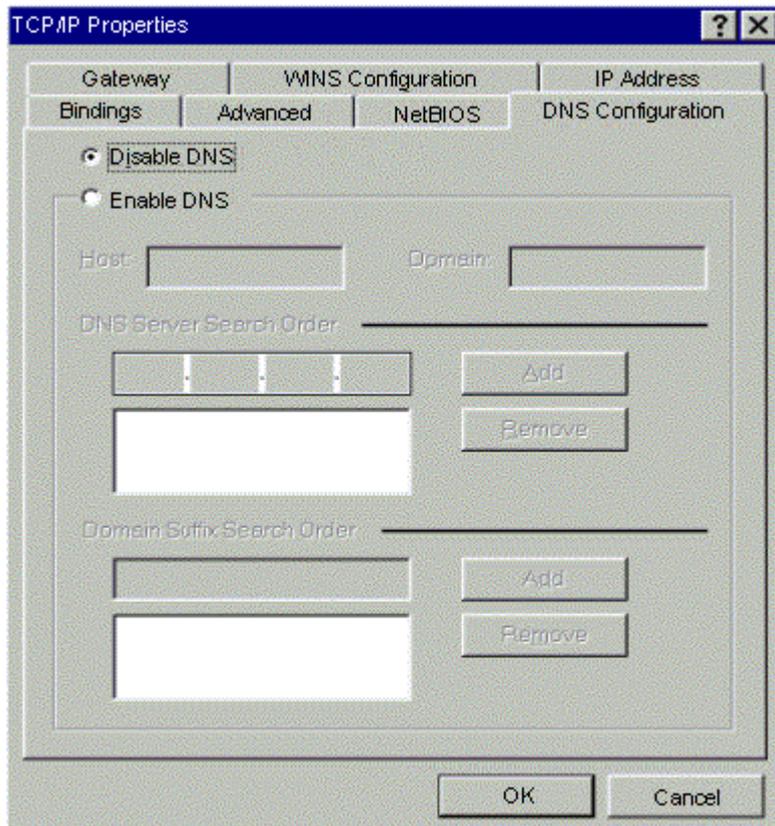
8. In the TCP/IP Properties dialog box, please follow the directions below: Click “IP Address” tab to bring it to the front, and then click “Obtain an IP address automatically” on the tab.



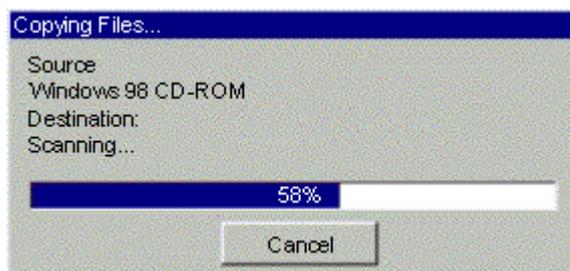
9. Click “Gateway” to bring it to the front. On this tab, leave the “New gateway:” blank. If there is the entry in the “Installed gateway:” list, click it and then click “Remove” to remove all installed gateways.



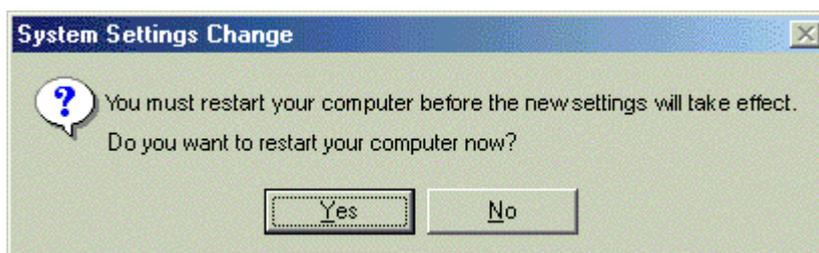
10. Click “DNS Configuration” tabs to bring it to the front, and click “Disable DNS”, then click “OK” to close the dialog box.



11. The Copying Files dialog box will pop up and the system will start copying files from Windows. At the first time you will be asked to insert the Windows 98 CD-ROM into the CD-ROM drive during the files copying, and follow the instructions when they show up, then click "OK". It will prompt another Copying Files dialog box. Please type the command line that Windows files located in the dialog box (For example, D:\win98). Click "OK" to continue the files copying.



12. Windows will appear the System Settings Change dialog box and ask you if you would like to restart your computer. Click "Yes".

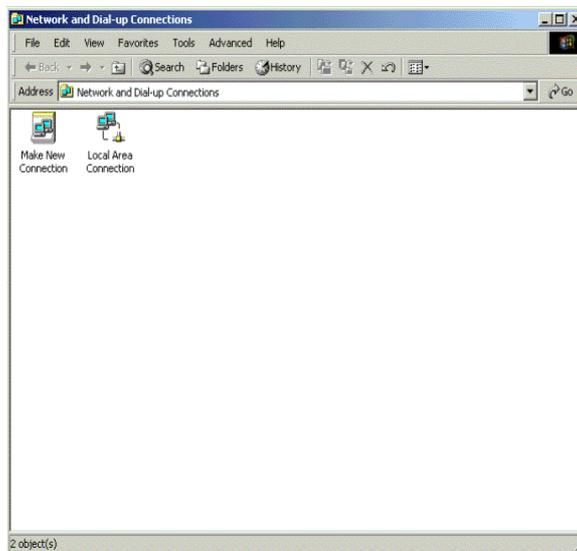


3.3-2 For Windows 2000/XP

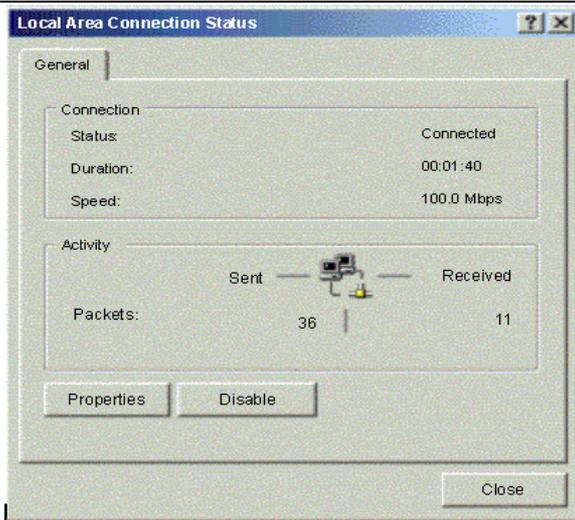
1. Click “Start” button on your computer’s taskbar, point to “Settings”, and then click ”Network and Dial-up Connections”.



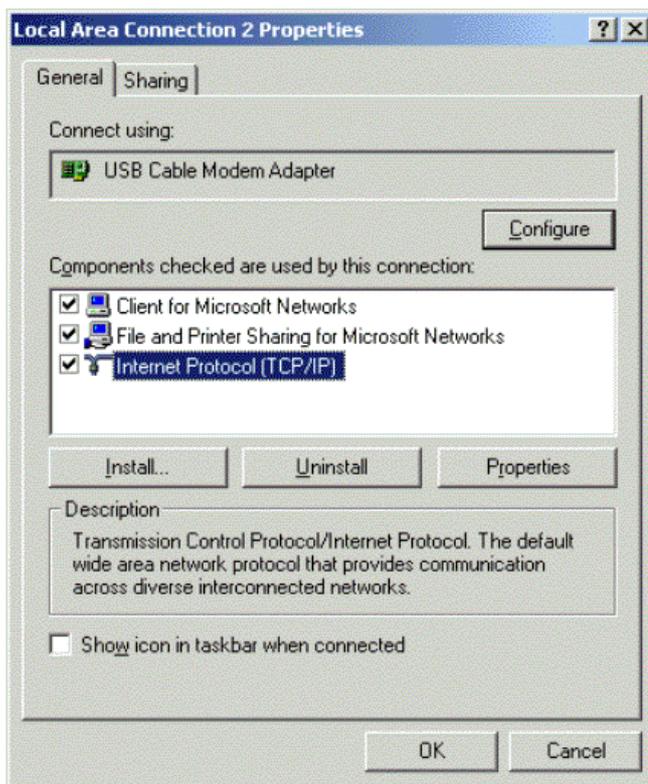
2. The Network and Dial-up Connections window will show up. Double-click “Local Area Connection” icon in the Network and Dial-up Connections window.



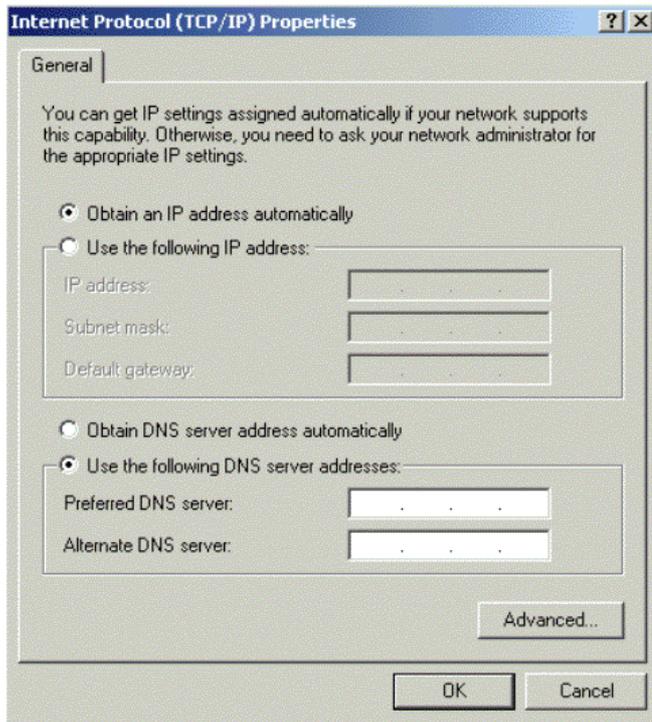
3. The Local Area Connection status window will show up. Click the “Properties” button.



4. Click "Internet Protocol (TCP/IP)" and then click "Properties".



5. The Internet Protocol (TCP/IP) Properties dialog box appears. Click "Obtain an IP address automatically". Click "Obtain DNS server address automatically". Click "OK" to close the dialog box.



6. Windows will appear the System Settings Change dialog box and ask you if you would like to restart your computer. Click "Yes".

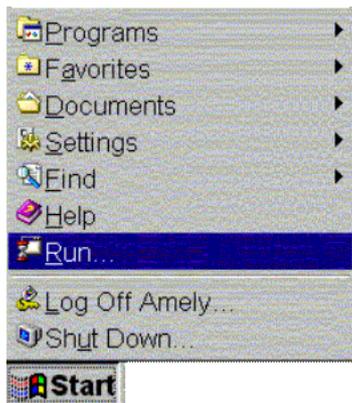


3.4 DHCP Server

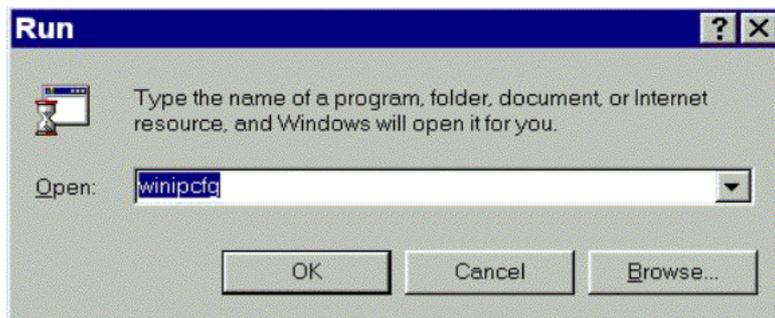
PC connected to the cable modem can automatically get a private IP address from the DHCP server of cable modem before cable modem is on line. The following steps will show you how to get an IP address from DHCP server of cable modem before cable modem is on line.

3.4-1 For Windows 98/Me

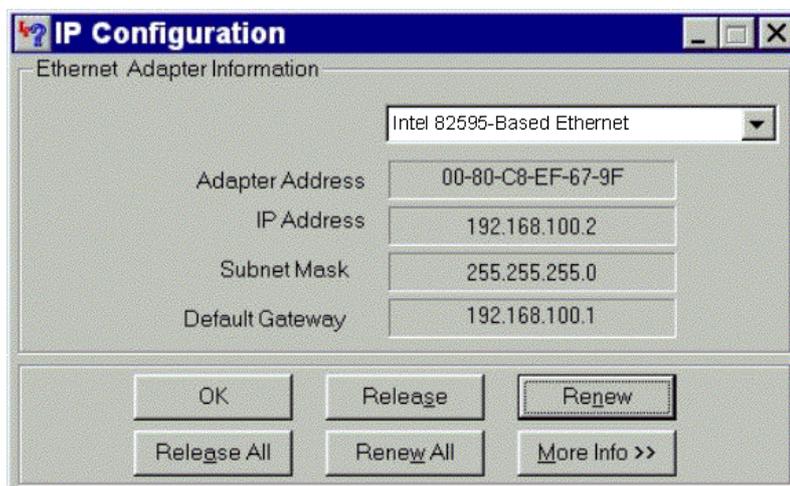
1. Click "Start", point to "Run", and click to open the "Run" windows.



2. Enter "winipcfg" in the "Open" field. Click "OK" to execute the winipcfg and show the "IP Configuration" window.

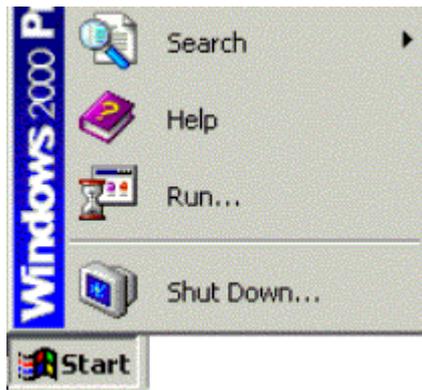


3. Select the "Ethernet adapter" to show the IP address. Press "Release" and "Renew" if the PC is not accessing the Internet. After the cable modem is on line, you need to press the "Release" and "Renew" to get a new IP address from your ISP's server.

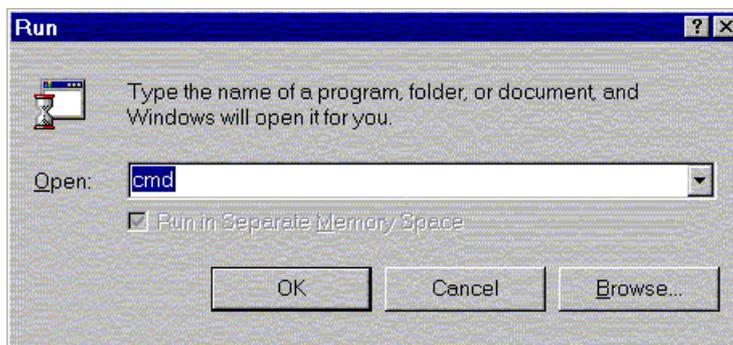


3.4-2 For Windows NT/2000/XP

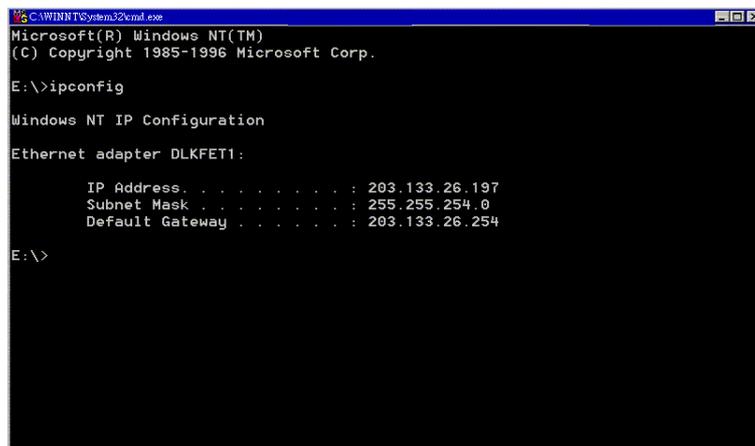
1. Click "Start", point to "Run", and click to open the "Run" windows.



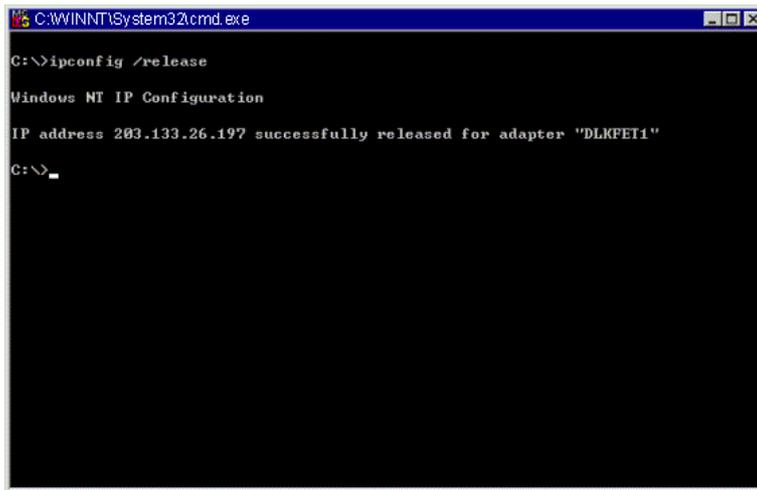
2. The Run dialog box appears. Type “cmd” in the “Open” field, and then click “OK” to execute the command.



3. You will enter the dos mode, type “ipconfig”, press “Enter” on your keyboard, and you will see the IP address your computer get from the cable modem.

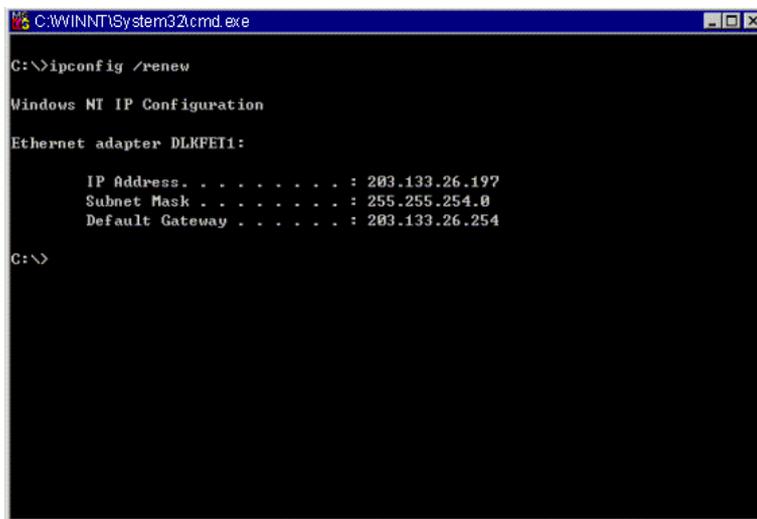


4. If PC is not access Internet, type “ipconfig /release”, and press “Enter” on your keyboard to release the IP.



```
C:\WINNT\System32\cmd.exe
C:\>ipconfig /release
Windows NT IP Configuration
IP address 203.133.26.197 successfully released for adapter "DLKFET1"
C:\>
```

5. Type “ipconfig /renew”, and press “Enter” on your keyboard to renew the IP. You can repeat the steps until your computer gets the correct IP.



```
C:\WINNT\System32\cmd.exe
C:\>ipconfig /renew
Windows NT IP Configuration
Ethernet adapter DLKFET1:

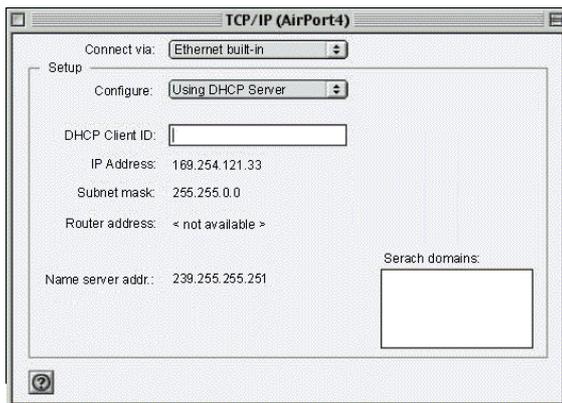
    IP Address. . . . . : 203.133.26.197
    Subnet Mask . . . . . : 255.255.254.0
    Default Gateway . . . . . : 203.133.26.254
C:\>
```

3.4-3 For Apple Macintosh

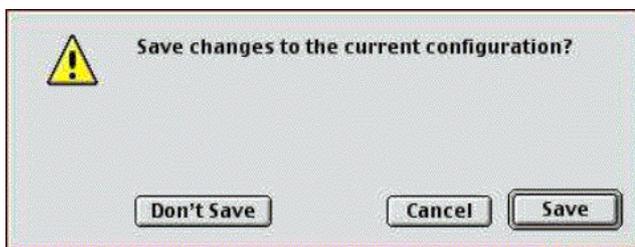
1. Click “Apple menu“, point to “Control Panels“, and click “TCP/IP” to open the “TCP/IP” window.



2. If the iMac gets an invalid IP, select “Using DHCP Server” in “Configure” field. Click the “Close box” at the upper left corner to close the “TCP/IP” window.



3. Click the “Save” in the prompted message box.

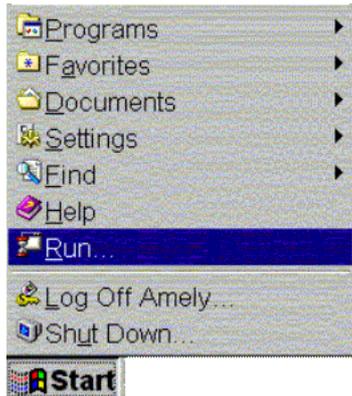


4. You need to wait about 2 minutes and open “TCP/IP” window to see the new TCP/IP status.

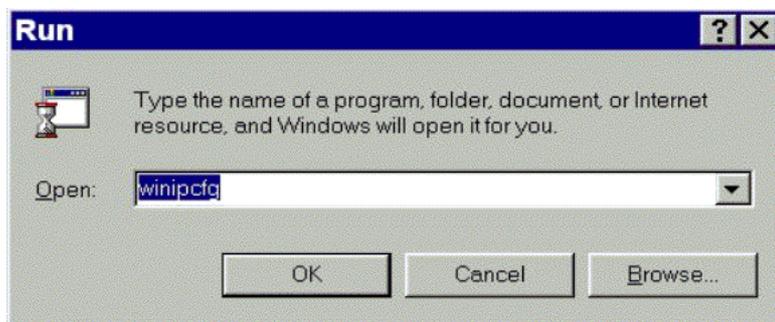
3.5 Renew PC IP Address

There is a chance that your PC does not renew its IP address after cable modem is on line and the PC cannot access the Internet. Please follow the procedures below to renew PC’s IP address after the cable modem is on line.

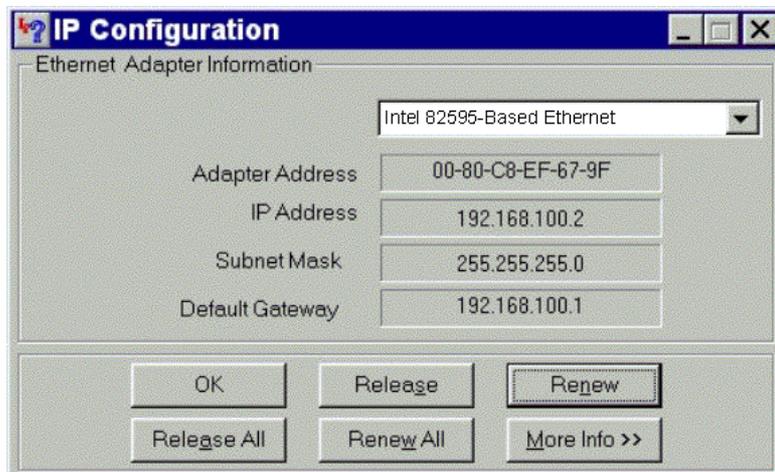
1. Click “Start“, point to “Run“, and click to open the “Run“ windows.



2. Enter winipcfg in the “Open“ field. Click “OK“ to execute the winipcfg and show the “IP Configuration“ window.



3. Select the “Ethernet adapter“ to show the IP address. Press “Release“ and “Renew“ to get a new IP address from your ISP’s server.



4. Select the “OK“ to close the IP Configuration window.

Chapter 4: Access Internet through Cable Modem

For making sure that you can get into Internet successfully, please make sure the following first.

1. Make sure the connection (through Ethernet or USB) between the cable modem and your computer is OK.
2. Make sure the TCP/IP protocol is set properly.
3. Subscribe to Cable Television Company and.

Accessing Internet

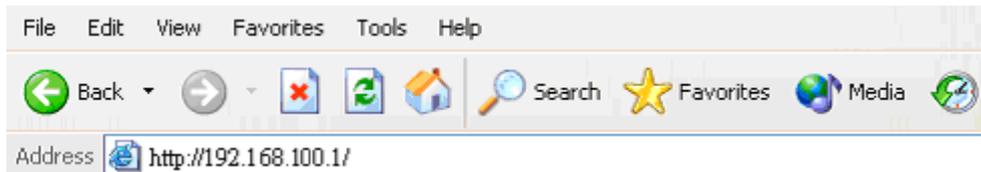
When you are sure all above is Ok, you can open the Browser (such as I.E.) to open the homepage for the browser. See the following example.



Chapter 5: Web Manager

Once your host PC is properly configured, please proceed as follows:

Start your web browser and type the private IP address of the cable modem in the URL field: **192.168.100.1**. Type the IP address as the figure shown below.



After connecting to the device, you will be prompted to enter username and password. By default, the username is **empty** and the password is **empty**. See the following example for running under Windows XP.

5.1 Status

5.1-1 Hardware

This page shows the basic information of your cable modem such as name of your modem, serial number, MAC address, hardware version, software version, receive power level, transmit power level, cable modem status and so on.

 A screenshot of the Linksys Cable Modem Web Manager interface. The top navigation bar includes "Hardware", "Connection", and "Local Network". The "Hardware" tab is selected. The main content area is titled "Hardware" and contains two sections: "Information" and "Status".

Information	
Standard Specification Compliant	DOCSIS 1.1
Lock Status	In Progress
Hardware Version	1.0
Software Version	2.0.2
Cable Modem MAC Address	00:06:25:00:01:20
Cable Modem Serial Number	1234567890123456
CM certificate	Certificate Installed.
USB MAC Address	00:90:00:00:01:21

Status	
System Up Time	0 day 4 hrs 14 mins 24 secs
Network Access	N/A

5.1-2 Connection

The page shows the connection information about the Downstream and Upstream Channel

The screenshot displays the Linksys web interface for a Cable Modem. The top navigation bar includes the Linksys logo, the text "Cable Modem Firmware Version 2.01", and three tabs: "Hardware", "Connection", and "Local Network". The "Connection" tab is active. On the left, there is a "Status" sidebar. The main content area is titled "Connection" and contains three sections: "Startup Procedure", "Downstream Channel", and "Upstream Channel".

Startup Procedure

	Status	Comment
Acquire Downstream Channel	In Progress	55500000 Hz
Connectivity State	In Progress	notSynchronized
Boot State	In Progress	unknown
Latest Adjustment Time	N/A	N/A
Security	Disable	Disable

Downstream Channel

Lock Status	In Progress
Modulation	N/A
Channel ID	1
Symbol rate	5360537 bps
Downstream Power	-21.88 dBmV
SNR	22 dB

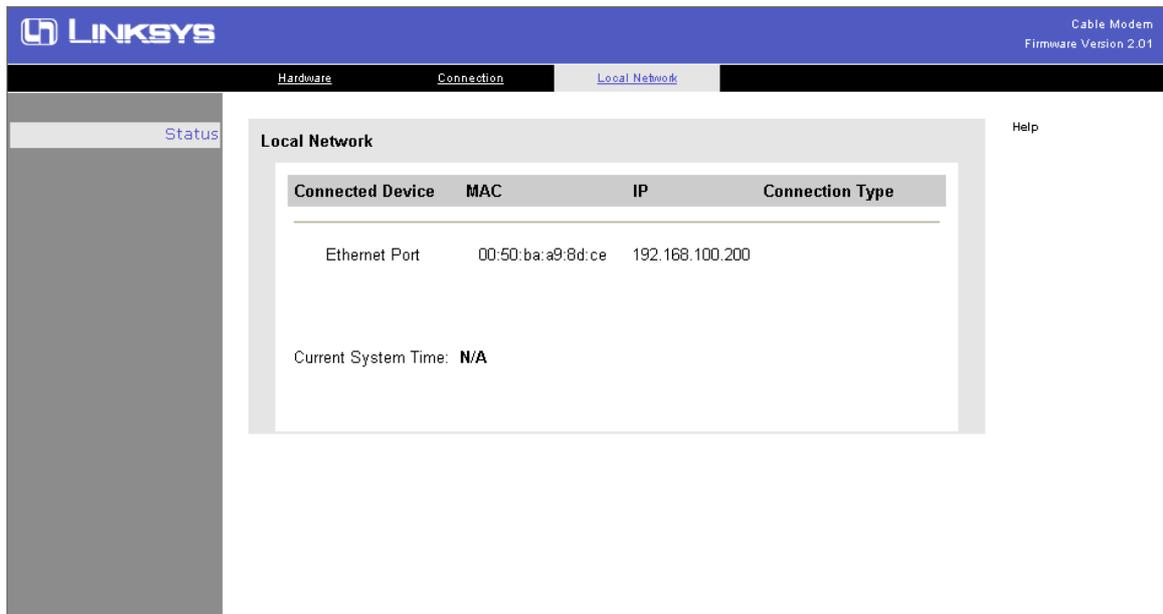
Upstream Channel

Lock Status	In Progress
Modulation	←~T
Channel ID	N/A
Symbol rate	0 ksym/sec
Upstream Power	N/A

[View Cable Modem Event Log](#)
Current System Time: N/A

5.1-3 Local Network

This page shows the Connected Devices with their Mac and IP addresses.



The screenshot shows the Linksys web interface. At the top, there is a blue header with the Linksys logo on the left and "Cable Modem Firmware Version 2.01" on the right. Below the header is a navigation bar with three tabs: "Hardware", "Connection", and "Local Network". The "Local Network" tab is selected. On the left side, there is a vertical menu with a "Status" link. The main content area is titled "Local Network" and contains a table with the following data:

Connected Device	MAC	IP	Connection Type
Ethernet Port	00:50:ba:a9:8d:ce	192.168.100.200	

Below the table, it says "Current System Time: N/A". There is also a "Help" link in the top right corner of the main content area.

Chapter 6: Troubleshooting

If the suggested solutions in this section do not resolve your issue, contact your system administrator or Internet service provider.

Can I use the same cable line for TV and cable modem?

- A. Yes, the TV and cable modem uses the cable line. You need a splitter to use them at the same time. Ask Cable Company to install the splitter for you to avoid signal degradation.

My cable modem cannot get a solid green light on the Status LED when I connect the cable back.

- A. The cable modem lost the signal during the disconnection period and it will keep scanning other available signal. When you connect the cable back, it might take a while to find the correct channel. You can power cycle the modem to speed up the process since the modem will remember the channel last time and it will start from that channel at startup.

How do I see my IP address?

- A. If you are using Windows 95/98/Me, the winipcfg command will show you the IP address of the PC connected to the cable modem. Notice that even though you seem to get the same address all the time, it may still be a dynamic address.

Appendix: Specification

Product Overview

LINKSYS BEFCMU10 ver. 3 is a DOCSIS 2.0-base cable modem that provides high-speed connectivity to residential, commercial, and education subscribers on public and private networks via an existing cable infrastructure. BEFCMU10 ver. 3 uses the advanced PHY (A-TDMA/S-CDMA) technologies to support higher bandwidth in the upstream. BEFCMU10 ver. 3 can inter-operate with any DOCSIS compliant headend equipment. The IP traffic can transfer between BEFCMU10 ver. 3 and DOCSIS compliant headend equipment. The data security secures upstream and downstream communications.

Features

General

- F-Connector for the cable interface
- Standard RJ-45 connector for 10/100BaseT Ethernet with auto-negotiation function and auto-media dependent interface crossover (MDIX)
- USB Connector for USB (12Mbps) interface
- Clear LED Display
- Plug and Play

CableLabs DOCSIS 1.0/1.1/2.0 Standard Compliant

- Up to 42.88 Mbps downstream and up to 30.72 Mbps upstream
- Frequency agility
- Transparent bridging for IP traffic
- Transparent bridging between CPE and RF interface
- Transparent bridging between Ethernet and USB interface
- Packet Filtering Up to 32 CPE MAC filters, 32 LLC filters, 32 IP filters
- Multiple users supported (32 CPEs supported)
- Security with X.509 Authentication / RSA protected Key Exchange / 56 bits DES Data Encryption
- Interoperable with any DOCSIS compatible

headend equipment

- Management & Maintenance
- Support Web pages and private DHCP server for status monitoring
 - SNMP v1/v2c/v3 Management
 - Remote secured operating firmware downloading
 - Reset To Default Settings by RESET Push Button
 - Syslog (Remote)
 - Event Log (Local)

Specifications

Cable RF:

	<u>Downstream</u>	<u>Upstream</u>
Operating Frequency Range	88-860MHz	5-42MHz
Frequency Channel	HRC, IRC, STD	
Frequency Selection	Auto Scanning	Controlled by Headend
Bandwidth	6MHz	Programmable (200*N KHz) N=1, 2, 4, 8, 16, 32
Characteristic Impedance	75Ω Nominal	75Ω Nominal
Signal Level Range	-15 to +15dBmV/64QAM -15 to +15dBmV/256QAM	A-TDMA: +8 to +58dBmV/QPSK +8 to +55dBmV/(8,16)QAM +8 to +54 dBmV/(32,64)QAM S-CDMA: +8 to +53 dBmV/All
Modulation	64QAM/256QAM	QPSK/16,32,64QAM 128QAM for TCM Only
Modulation Rate	5.056941/5.360537 Msym/sec	A-TDMA: 160/320/640/1280/2560/5120 Ksym/sec

		S-CDMA:
		1280/2560/5120 Ksym/sec
Maximum Bit Rate	42.88Mbps/256QAM	30.72Mbps/64QAM
	30.34Mbps/64QAM	
Forward Error Correction (FEC)	RS(128,122)/Trellis	Reed Solomon
Signal to Noise Ratio (SNR)		>30
Bit Error Rate (BER)	1×10 ⁻⁸ @ C/N=23.5dB, 64QAM with FEC	
	1×10 ⁻⁸ @ C/N=30dB, 256QAM with FEC, received power = -6dBmV to +15dBmV	
	1x10 ⁻⁸ @ C/N=33dB, 256QAM with FEC, received power = -15dBmV to -6dBmV	

Physical & Hardware:

- | | |
|------------|---|
| Dimensions | <ul style="list-style-type: none">• L = TBD• W = TBD• H = TBD |
| Weight | <ul style="list-style-type: none">• TBD |
| Ports | <ul style="list-style-type: none">• Ethernet Port (RJ-45)• USB port (Type B) |
| LEDs | <ul style="list-style-type: none">• Power LED<ul style="list-style-type: none">Green Blink - Booting / DiagnosticsGreen ON - Power On / Device Ready |

Orange ON - Error

- Cable LED| Activity LED (Green color)

OFF Blink - Scanning D/S channels

OFF ON - D/S channel acquired / ,
Start ranging process

Blink OFF - Ranging complete , start
DHCP /TFTP/ToD/
Registration

ON OFF - Registered

ON Blink - Traffic (Send / Receive)

- Ethernet LEDs

OFF - No Ethernet Link

Green ON - Ethernet Link

Green Blink - Traffic

Orange Blink- Collision

- USB LED

OFF - No USB Link or PC Off

Orange Blink -USB cable attached / but drivers not
loaded

Green ON - USB Link / drivers loaded and port
functional

Green Blink - Traffic

Reset Button

- Restore Factory Default Settings

Power Supply Adapter
(Output)

- 12VDC, 1A

- Power Consumption • Less than 9.5W

Standards & Protocols:

- Standards
 - DOCSIS 1.0/1.1/2.0 Compliant
 - IEEE 802.3
 - IEEE 802.3u
 - USB v1.1
- Protocols
 - UDP/TCP/IP
 - DHCP
 - TP
 - ICMP
 - ARP
 - SNMP v1/v2c/v3
 - Syslog
 - HTTP
 - TFTP

MIB Support:

- MIB 2
- RFC2786
- RFC2669
- CableLabs Private MIBs

Environment:

- Operating Temperature • 32°F ~ 104°F (0°C to 40°C)
- Storage Temperature • -4°F ~ 158°F (-20°C to 70°C)

Humidity • 20% ~ 90% Non-condensing

Certification:

Standards • DOCSIS / WHQL

Safety • UL 1950

EMC • FCC Part 15 Class B
• CE Class B
• VCCI Class B