LANCOM L- 54ag Wireless
LANCOM L- 54g Wireless
LANCOM IAP- 54 Wireless

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110275/1104

Preface

Thank you for placing your trust in this LANCOM product.

A LANCOM base station by LANCOM Systems makes available numerous central functions and services to the participants of wireless networks. The base station convinces by a simple configuration and a reliable continious operation. With high-effective technologies, it ensures data security within the whole wireless network.

Security settings

For a carefree use of your device, we recommend to carry out all security settings (e.g. Firewall, encryption, access protection, charge lock), which are not already activated at the time of purchase of your device. The LANconfig wizard 'Check Security Settings' will support you accomplishing this. Further information regarding this topic can be found in chapter 'Security settings' →page 40.

We ask you additionally to inform you about technical developments and actual hints to your product on our Web page www.lancom.de, and to download new software versions if necessary.

User manual and reference manual

The documentation of your device consists of two parts: the user manual and the reference manual.

You are now reading the user manual. It contains all information you need to start your LANCOM 54 Wireless. It also contains the most important technical specification for the device.

The reference manual can be found on the CD as an Acrobat (PDF) document. It is designed as a supplement to the user manual and goes into detail on topics that apply to a variety of devices. These include for example:

- Systems design of the LCOS operating system
- Configuration
- Management
- Diagnosis
- Security
- Routing and WAN functions
- Firewall

- Quality of Service (QoS)
- Virtual Private Networks (VPN)
- Virtual Local Networks (VLAN)
- Wireless networks (WLAN)
- LANCAPI
- Further server services (DHCP, DNS, charge management)

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Model variants

This documentation is for users of LANCOM 54 Wireless base stations. The base station LANCOM 54 Wireless is to choose from different models. These are:

- LANCOM L-54ag Wireless, complying to the 802.11g standard in the 2,4 GHz band, which is downward-compatible to 802.11b devices.
- LANCOM L-54g Wireless operates alternatively either in 802.11g mode in the 2,4 GHz band, or in 802.11a mode in the 5 GHz band as well.
- A LANCOM IAP-54 Wireless also operates like a LANCOM L-54ag Wireless either according to the 802.11g standard with 2.4 GHz or according to the 802.11a standard in at 5 GHz. It is additionally equipped with a specialized housing (IP50) for use in industrial environments such as in warehouses or production facilities.

Model restriction

The sections of the documentation that refer only to a range of models are marked either in the corresponding text itself or with appropriate comments placed beside the text.

In the other parts of the documentation, all described models have been classified under the general term LANCOM 54 Wireless.

This documentation was compiled …

…by several members of our staff from a variety of departments in order to ensure you the best possible support when using your LANCOM product.

In case you encounter any errors, or just want to issue critics or enhancements, please do not hesitate to send an email directly to:

info@lancom.de

Our online services (www.lancom.de) are available to you around the clock should you have any queries regarding the topics discussed in this manual or require any further support. In addition support from

LANCOM Systems is also available to you. Telephone numbers and contact information for LANCOM Systems support can be found on a separate insert, or at the LANCOM Systems website.

Notes symbols	
	Very important instructions. If not followed, damage may result.
	Important instruction that should be followed.
	Additional instructions which can be helpful, but are not required.

Contents

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1 Introduction

1.1 What is a Wireless LAN?

The following sections describe the functionality of wireless networks in general. The functions supported by your device are listed in the table 'What can your LANCOM 54 Wireless do?' →page 9.

A Wireless LAN connects single terminals (e.g. PCs or notebooks) to a local network (also LAN – **L**ocal **A**rea **N**etwork). In contrast to a conventional LAN, communication takes place via radio links rather than via network cables. This is the reason why a Wireless LAN is also called a **W**ireless **L**ocal **A**rea **N**etwork (WLAN).

All functions of a cable-bound network are also available in a Wireless LAN: access to files, servers, printers etc. is as possible as the connection of individual stations to an internal mail system or to the Internet access.

The advantages of Wireless LANs are obvious: notebooks and PCs can be set up just where they are needed. Due to Wireless LANs, problems with missing connections or structural alterations belong to the past.

1.1.1 Which hardware to use?

Each station of the Wireless LAN needs access to the Wireless LAN in the form of a wireless interface. Devices which have no built-in wireless interface can be upgraded with a supplement card or an adapter.

LANCOM Systems offers wireless adapters by its AirLancer product line. An AirLancer wireless adapter enables a device (e.g. PC or notebook) for access to the Wireless LAN.

1.1.2 Operation modes of Wireless LANs and base stations

Wireless LAN technology and base stations in Wireless LANs are used in the following operation modes:

- Simple direct connections between terminals without base station (ad-hoc mode)
- Larger Wireless LANs, connection to LANs with one or more base stations (infrastructure network)

- Passing-through of VPN-encrypted connections with VPN pass-through
- Setting-up of an Internet access
- Connecting two LANs via a direct radio link (point-to-point mode)
- Connecting of devices with Ethernet interface via base stations (client mode)
- Extending an existing Ethernet network with WLAN (bridge mode)

In this chapter we will show you briefly the technology of wireless networks. In addition, we give you an overview of the various applications, functions and abilities of your base station.

1.2 What can your LANCOM 54 Wireless do?

The following list shows you properties and functions of your device.

	LANCOM L-54ag Wireless	LANCOM L-54g Wireless	LANCOM IAP-54 Wireless
Wireless LAN			
Wireless transmission by IEEE 802.11g and IEEE 802.11b	✓	✓	✓
Wireless transmission by IEEE 802.11a		✓	✓
Turbo Mode	✓	✓	✓
Super AG	✓	✓	✓
Multi SSID	✓	✓	✓
Roaming function	✓	✓	✓
802.11i / WPA	✓	✓	✓
WEP encryption (to 128 Bit key length, WEP152)	✓	✓	✓
IEEE 802.1x/EAP	✓	✓	✓
MAC address filter (ACL)	✓	✓	✓
Individual passphrases per MAC address (LEPS)	✓	✓	✓
Access to RADIUS server	✓	✓	✓
Closed network function	✓	✓	✓

	LANCOM L-54ag Wireless	LANCOM L-54g Wireless	LANCOM IAP-54 Wireless
VLAN	✓	✓	✓
Traffic lock function	✓	✓	✓
Connection to the LAN			
Fast-Ethernet-connection (10/100base-TX)	✓	✓	✓
Power-over-Ethernet (PoE)	✓	✓	✓
DHCP and DNS server	✓	✓	✓
Internet access (IP router)			
Connection for DSL modem (DSLoL)	✓	✓	✓
Stateful Inspection Firewall	✓	✓	✓
Firewall filter (address, port)	✓	✓	✓
IP masquerading (NAT, PAT)	✓	✓	✓
Quality of Service	✓	✓	✓
Configuration and firmware			
Configuration under Windows or with web browser	✓	✓	✓
Configuration wizards	✓	✓	✓
FirmSafe	✓	✓	✓
Serial interface for configuration via outband cable	✓	✓	✓
Optional software extensions			
LANCOM Public Spot Option	✓	✓	✓
Optional hardware extensions			
AirLancer Extender antennas for extended range	✓	✓	✓
Housing			
IP50-standard dust resistant metal housing			✓

2 Installation

This chapter will assist you to quickly install hardware and software. First, check the package contents and system requirements. The device can be installed and configured quickly and easily if all prerequisites are fulfilled.

2.1 Package contents

Please check the package contents for completeness before starting the installation. In addition to the base station itself, the package should contain the following accessories:

	LANCOM L-54ag Wireless	LANCOM L-54g Wireless	LANCOM IAP-54 Wireless
Power adapter	✓	✓	✓
LAN connector cable (green plugs)	✓	✓	✓
2 external single-band diversity antennas to screw (2,4 GHz) with reverse SMA connection	✓		
2 external dual-band diversity antennas to screw with reverse SMA connection		✓	✓
Serial configuration cable (black)	✓	✓	✓
Mast-, wall- and rail mount accessories			✓
1 Port PoE Power Injector			✓
LANCOM-CD	✓	✓	✓
Printed documentation	✓	✓	✓

If anything is missing, please contact your retailer or the address stated on the delivery slip of the unit.

2.2 System preconditions

Computers that connect to a LANCOM 54 Wireless must meet the following minimum requirements:

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- Operating system that supports TCP/IP, e.g. Windows XP, Windows Millennium Edition (Me), Windows 2000, Windows 98, Windows 95, Windows NT, Linux, BSD Unix, Apple Mac OS, OS/2.
- Wireless LAN adapter or access to the LAN (if the base station will be connected to the LAN).

The LANtools also require a Windows operating system. A web browser is required for access to WEBconfig.

2.3 Introducing the LANCOM 54 Wireless

This section introduces your device. We will give you an overview of all status displays, connections and switches.

While the information in this section is useful for the installation of the device, it is not absolutely essential. You may therefore skip this section for the time being and go straight forward to the 'Hardware installation' →page 19.

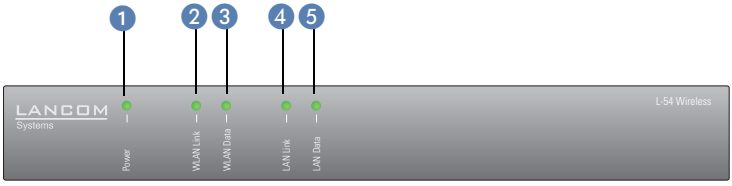
2.3.1 Status displays

The front and the rear panels of the unit feature a series of LEDs that provide information on the status of the device.

Front side

The LANCOM L-54g Wireless and LANCOM L-54ag Wireless have status displays on the front panel.

LANCOM L-54g Wireless, LANCOM L-54ag Wireless



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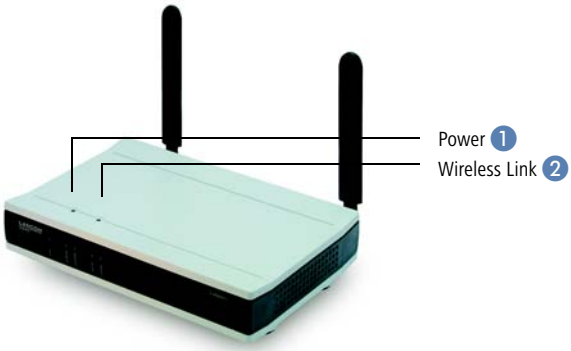
Top panel

Two additional LEDs on the top panel provide a convenient overview of the most important status information, especially when the device is mounted vertically.

LANCOM L-54g Wireless, LANCOM L-54ag Wireless



LANCOM IAP-54 Wireless

Meanings of the LEDs

In the following sections we will use different terms to describe the behaviour of the LEDs:

- **Blinking** means, that the LED is switched on or off at regular intervals in the respective indicated colour.
- **Flashing** means, that the LED lights up very briefly in the respective colour and stay then clearly longer (approximately 10x longer) switched off.
- **Inverse flashing** means the opposite. The LED lights permanently in the respective colour and is only briefly interrupted.

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▶ **Flickering** means, that the LED is switched on and off in irregular intervals.

Power 1

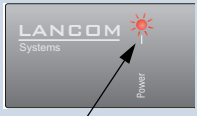
This LED indicates that the device is operational. After the device has been switched on, it will flash green for the duration of the self-test. After the self-test, either an error is output by a flashing red light code or the device starts and the LED remains lit green.

off		Device off
green	blinking	Self-test when powering up
green		Device ready for use
red/green	blinking alternately	Device insecure: configuration password not assigned
red	blinking	Time or connect-charge reached

The power LED flashes red/green in alternation until a configuration password has been specified. Without a configuration password, the configuration data of the LANCOM is insecure. Under normal circumstances, you would assign a configuration password during the basic configuration (instructions in the following chapter).

Flashing Power LED but no connection?

There is no need to worry, if the Power LED of a LANCOM 54 Wireless base station blinks red and you can no longer connect to the WAN. This indicates that a preset time or connect-charge limit has been reached. There are three methods available for unlocking:



Signal for a time limit or connect charge limit that has been reached

- ▶ Reset time limit.
- ▶ Increase the limit that has been reached.
- ▶ Completely deactivate the lock that has been triggered (set limit to '0').

If a time limit has been reached, you will be notified in LANmonitor. To reset the connect charge protection, select **Reset Charge and Time Limits** in the context menu (right mouse click). You can configure the connect charge settings in LANconfig under **Management** ▶ **Costs** (you will only be able to access this configuration if 'Complete configuration display' is selected under **View** ▶ **Options…**).

You will find connect charge protection reset in WEBconfig and all parameters under **Expert Configuration** ▶ **Setup** ▶ **Charge-module**.

WLAN Link 2

Gives information about the Wireless LAN access of the internal wireless network adapter of the base station.

The WLAN link display can assume three different conditions:

off		no Wireless LAN adapter found
green		Wireless LAN adapter ready for use
green	blinking	activity in the Wireless LAN (blink frequency indicates the number of registered stations)

WLAN Data 3

Gives information about data traffic in the Wireless LAN access.

The wireless link display can assume three different conditions:

off		no data traffic
green	flickering	data traffic
red	flashing	error in the Wireless LAN (e.g. sending error due to a bad connection)

LAN Link 4

Condition of the LAN interface:

off		no network device connected
green	constantly on	network device connected; transfer rate 100 Mbps
green	regularly blinking	connection establishing DSL over LAN
green	on with short interruptions	DSL over LAN active (e.g. PPPoE via LAN access)
orange		network device connected; transfer rate 100 Mbps (The device cannot function as directed, since a 10 Mbps fast connection is too slow for a 54 Mbps fast WLAN data transmission in the LAN.)

LAN Data 5

Indicating data traffic on the LAN interface:

off		no data traffic
green	flickering	data traffic

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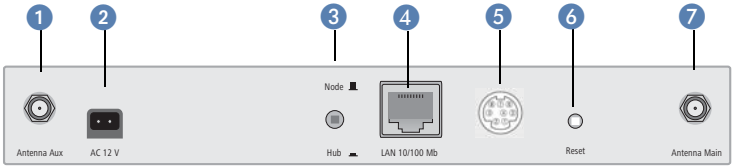
2.3.2 The connectors

LANCOM L-54g Wireless, LANCOM L-54ag Wireless

With the LANCOM L-54g Wireless and LANCOM L-54ag Wireless the connections and switches of the base station are located on the back panel:



1. Connection for diversity antenna
2. Connection for the included power adapter
3. Node/hub switch – the sending and receiving lines of the LAN connector (4) can be crossed within the device for a direct connection of a PC ('hub' setting ▂). For connection to a hub or a switch, the switch should be turned to 'node' setting ▮ (presetting). When using the operating mode DSLoL, the switch must be turned to 'hub' ▂ for a directly connected DSLmodem.
4. 10/100base-Tx for the connection to the LAN. 10Mbp- or 100Mbp connections are supported. The used transfer speed will automatically be identified (autosensing).

   The LAN connector of the LANCOM 54 Wireless base station supports the Power-over-Ethernet standard (PoE). You find further information about operating with PoE in the info box 'Power-over-Ethernet – elegant power supply through the LAN wiring' →page 17.

   By activated DSLoL option, the LAN connector can also be used for connecting the LANCOM 54 Wireless base station to a broadband modem.
5. Connection for the serial configuration cable.
6. Reset switch – has two different functions depending on the length of time that it is pressed:
7. Connector for main antenna (if necessary is here the spot to connect AirLancer Extender additional antennas)

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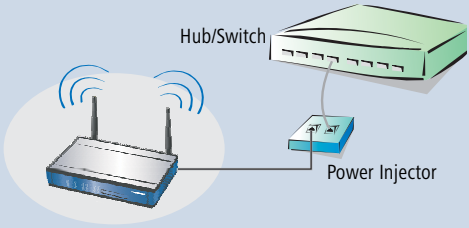
Power-over-Ethernet – elegant power supply through the LAN wiring

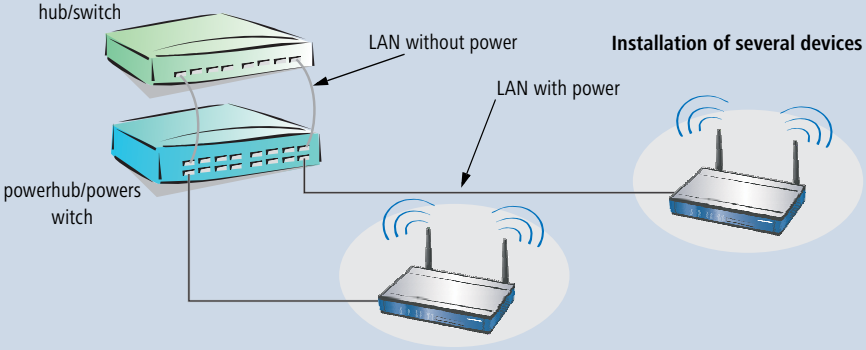
LANCOM 54 Wireless base stations are prepared for the PoE power supply (Power-over-Ethernet), corresponding to the 802.3af standard. PoE-enabled network devices can be comfortably supplied with power feeding through the LAN wiring. A separate external power supply for each base station is unnecessary, which reduces the installation complexity considerably.

The power feeding into the LAN happens at a central position, either via a PoE power injector, or via a so-called powerhub/powerswitch. For the LAN wiring is to note that all 8 wires must be available by the cabling. PoE feeds the power over those four wires, which are normally not used for data transfer.

The PoE supply works only in such network segments, in which exclusively PoE-capable devices are operating. The protection of network devices without PoE support is guaranteed by an intelligent mechanism, that tests the network segment for devices without PoE support before starting the PoE power feeding. The power is only switched onto the segment, if no devices without PoE support were detected.

Installation of single devices





In a PoE installation use exclusively devices which correspond to the 802.3af standard! For damages caused by inadmissible devices no warranty may be claimed.

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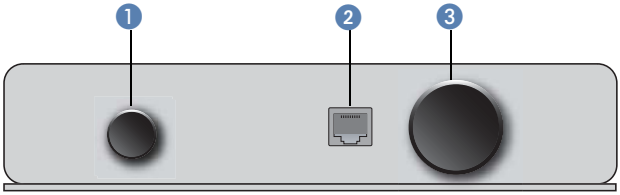
LANCOM IAP-54 Wireless

With the LANCOM IAP-54 Wireless the access point's connectors are located on the base of the device:



1. Voltage connector for an external power supply as with the LANCOM 54 Wireless, protected by an IP50 sealing cap.

2. 10/100Base-Tx for connection to the LAN. Supported are 10-Mbit or 100-Mbit connections. The data transfer speed is recognized automatically (autosensing).

   The LANCOM IAP-54 Wireless LAN connector supports the Power-over-Ethernet standard (PoE). Further information about PoE is available in the info box 'Power-over-Ethernet – elegant power supply through the LAN wiring' →page 17.

   By activated DSLoL option, the LAN connector can also be used for connecting the LANCOM 54 Wireless base station to a broadband modem.

3. Connection for the serial configuration cable and access to the reset button, protected by an IP50 sealing cap.

The function of the reset button

The reset button has two different functions depending on how long it is pressed:

- **Restarting the device** (soft reset) – push the button for less than five seconds. The device will restart.
- **Resetting the configuration** (hard reset) – push the button for more than five seconds. All the device's LEDs will light up green and stay on. As soon as the reset switch is released, the device will restart with factory settings.

Note that resetting the device leads to a loss on the WLAN encryption settings within the device and that the default WEP key is active again ('Standard WEP encryption' →page 43).

2.4 Hardware installation

2.4.1 LANCOM L-54g Wireless, LANCOM L-54ag Wireless

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The installation of the LANCOM 54 Wireless base station takes place in maximum five steps:

① **Antennas** – Screw on the both included diversity antennas at the back of the LANCOM 54 Wireless base station.

② **LAN** – You can first connect the LANCOM 54 Wireless base station to your LAN. For that purpose, plug the included network cable (green plugs) into the LAN connector of the device 4 and the other end into a free network connecting socket of your local network (resp. into a free socket of a hub/switch). In this case, the node/hub switch 5 remains in the presetting 'node' (▀).

Alternatively, you can connect also a single PC. In this case, turn the node/hub switch 5 on 'hub' (▄).

The LAN connector identifies automatically the transfer rate (10/100 Mbps) of the connected network device (autosensing).

For information about the installation of PoE see the info box 'Power-over-Ethernet – elegant power supply through the LAN wiring' →page 17.

③ **DSLoL** – If you want to use your LANCOM 54 Wireless base station in DSLoL mode, you can either connect the device directly to the DSL modem (exclusive mode) or to a hub resp. switch of the cable-bound LAN (automatic mode).

For the exclusive mode insert the included network cable (green plugs) into the LAN connector of the device 4 and the other end into the corresponding interface of the DSL modem. In this case, turn the node/hub switch 5 on 'hub' (▄).

For the automatic mode for simultaneous operating with LAN and DSLoL insert the included network cable (green plugs) into the LAN connector of the device 4 and the other end into a free network connecting socket of

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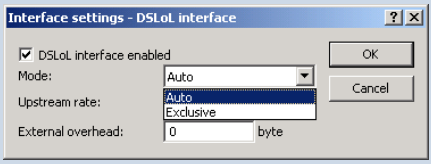
LAN interface: exclusive or in parallel for DSLoL

There are two principle DSLoL operation modes available. Either use the exclusive mode when connecting your LANCOM 54 Wireless directly to a DSL modem, or use the automatic mode when connecting the LANCOM 54 Wireless to a hub or switch of a cable-bound LAN, and connect this hub/switch again to the DSL modem. If the LANCOM 54 Wireless is broadcasted as gateway via DHCP, computers in LAN and WLAN can use the internet connection **simultaneously** via one physical interface. Set the desired mode in LANconfig in the Interface settings of the DSLoL interface.



DSLoL supports all PPPoE-based Internet access lines, as well as those that are supplied with a access router with multiple fixed IP addresses (such as many SDSL business lines).

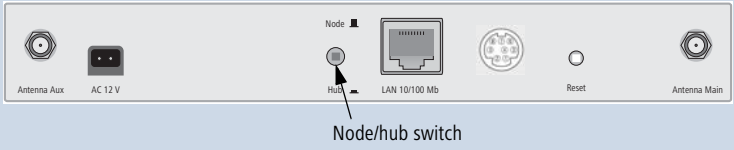
your local network (resp. into a free socket of a hub/switch). In this case, the node/hub switch 5 remains in the presetting 'node' (■).

④ **Connect to power** – Connect socket 2 of the unit to a power supply using the included power adapter.

Use the supplied power supply unit only! Using an unsuitable power supply unit may cause damage or injury.

Note the setting of the node/hub switch

If the node/hub switch for your application is not in the right position, no correct connection will be established between the LANCOM 54 Wireless base station and other devices of the cable-bound LAN and/or a DSL modem.



The node/hub switch is always in position 'node', when the LANCOM 54 Wireless base station is connected to a network. The setting 'hub' is needed, when the base station will be directly connected to another device like a single PC or a DSL modem.

⑤ **Operational?** – After a short device self-test the Power LED will be permanently lit green resp. will blink alternately red and green as long as no configuration password has been given.

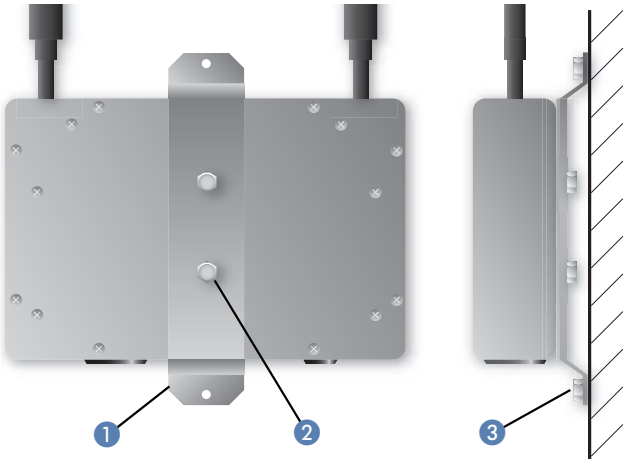
2.4.2 LANCOM IAP-54 Wireless

Wall mounting

① Fit the wall-mounting bracket 1 with the help of the two M6 hexagonal screws 2 to the reverse side of the housing.

② Mount your LANCOM IAP-54 Wireless on the wall with suitable fixing screws/bolts 3 in the location. The wall-mounting screws are not supplied as standard.

Wall mounting



Pole mounting

① Place the hose clip 1 that is best suited to the size of your pole around the pole-mounting bracket 2. Two hose clips for posts of differing diameter are supplied as standard.

② Fix the pole-mounting bracket 2 with the two M6 hexagonal screws 3 to the reverse size of the housing.

③ Finally, mount your LANCOM IAP-54 Wireless with the hose clip 1 in the position required on the post.

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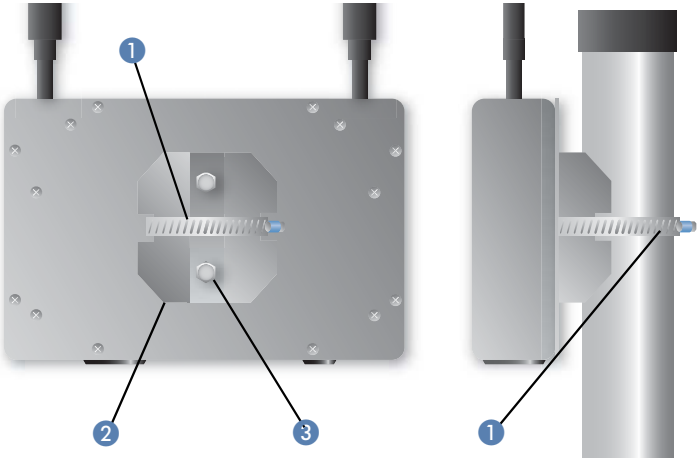
Pole mounting

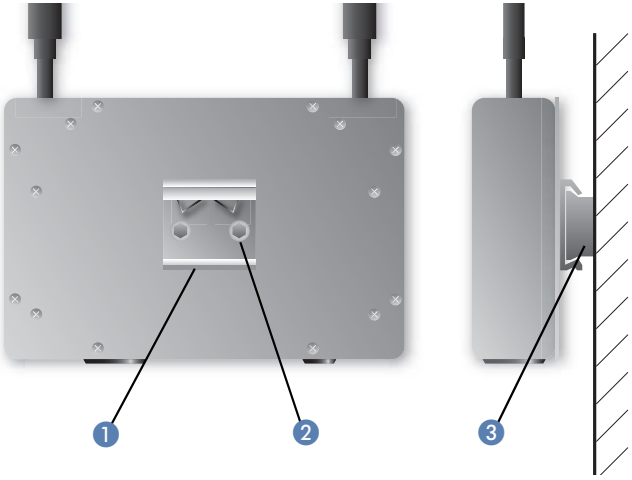


Top-hat rail mounting

① Fix the bracket for top-hat rail mounting 1 with the two M6 hexagonal screws 2 to the reverse side of the housing.

② Now mount your LANCOM IAP-54 Wireless in the desired position on the top-hat rail 3.

Top-hat rail mounting



Connecting up

① Plug the supplied network cable (green plug) into the LAN connector of the LANCOM IAP-54 Wireless and into the 'Data/Power Out' socket of the PoE Power Injector.

② Connect the 'Data In' connector on the PoE Power Injector with an available network socket of your local network (or a free socket of a hub or switch). The cable to connect the PoE Power Injector to the LAN is not supplied.

If the PoE Power Injector is not connected to a switch or hub but directly to a computer's network connector, please be sure to use a suitable crossover cable.

③ Connect the PoE Power Injector to the power supply (as described in the manual supplied with the PoE Power Injector).

④ After a brief self-test, the device illuminates the power LED on the LANCOM IAP-54 Wireless with a steady green, or blinks alternately in green and red if the configuration password has not been set.

Remove the sealing caps for the serial connector and reset button

The connector for the serial configuration cable and the reset button are recessed into the housing and are protected by two black plastic screws.

If necessary, undo the sealing screws carefully with a suitable screwdriver. After resetting or carrying out the configuration via the serial cable, you should seal the device again carefully with the sealing screws.

Information about the function of the reset button can be found under 'The function of the reset button' →page 18.

2.5 Software installation

This section covers the installation of the included system software LANtools for Windows.

You may skip this section if you use your LANCOM 54 Wireless exclusively with computers running operating systems other than Windows.

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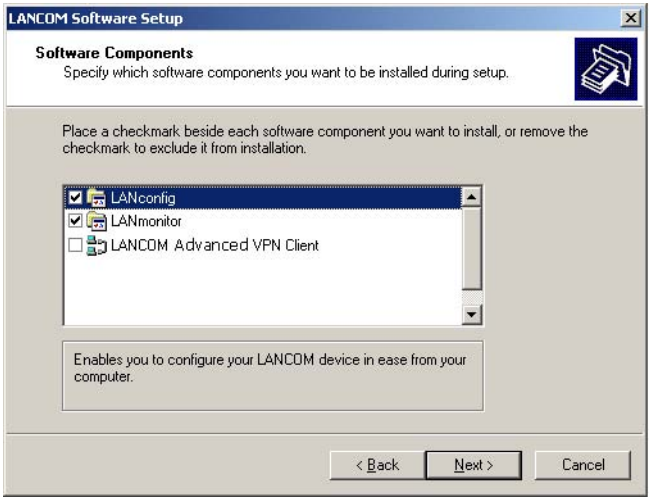
2.5.1 Starting LANCOM setup

Place the LANCOM CD in your CD drive. The LANCOM setup program will start automatically.

If the setup program does not start automatically, run AUTORUN.EXE in the root folder of the LANCOM CD.

In Setup select **Install LANCOM Software**. The following selection menus will appear on the screen:



2.5.2 Which software should you install?

- **LANconfig** is the configuration program for all LANCOM routers and LANCOM 54 Wireless base stations. WEBconfig can be used alternatively or in addition via a web browser.
- **LANmonitor** lets you monitor on a Windows PC all LANCOM routers and LANCOM 54 Wireless base stations.
- The **LANCOM VPN Client** enables a setting of VPN connections from a remote workstation via Internet to a router with LANCOM VPN Option.
- With **LANCOM Online Documentation,** you can copy the documentation files on your PC.

Select the appropriate software options and confirm your choice with **Next**. The software is automatically installed.

3 Basic configuration

The basic configuration can be performed on a step-by-step basis using a convenient setup wizard to guide you through the setup process and prompt you for the required information.

First, this chapter will tell you which information is required for the basic configuration. Use this section to assemble the information you will need before you launch the wizard.

Next, enter the data in the setup wizard. Launching the wizard and the process itself are described step by step — with separate sections for LANconfig and WEBconfig. Thanks to the information that you have collected in advance, the basic configuration is quick and effortless.

At the end of this chapter we will show you the settings that are needed for the LAN's workstations to ensure trouble-free access to the router ('TCP/IP settings to workstation PCs' →page 34).

3.1 Which information is necessary?

The basic configuration wizard will take care of the basic TCP/IP configuration of the router and protect the device with a configuration password. The following descriptions of the information required by the wizard are grouped in these configuration sections:

- TCP/IP settings
- protection of the configuration
- information related to the Wireless LAN
- information on DSL connection
- configuring connect charge protection
- security settings

3.1.1 TCP/IP settings

The TCP/IP configuration can be realized in two ways: either as a fully automatic configuration or manually. No user input is required for the fully automatic TCP/IP configuration. All parameters are set automatically by the setup wizard. During manual TCP/IP configuration, the wizard will prompt you for the usual TCP/IP parameters: IP address, netmask etc. (more on these topics later).

Fully automatic TCP/IP configuration is only possible in certain network environments. The setup wizard therefore analyses the connected LAN to determine whether it supports fully automatic configuration.

New LAN—fully automatic configuration possible

If all connected network devices are still unconfigured, the setup wizard will suggest fully automatic TCP/IP configuration. This may be the case in the following situations:

- a single PC is connected to the router
- setup of a new network

Fully automatic TCP/IP configuration will not be available when integrating the LANCOM 54 Wireless in an existing TCP/IP LAN. In this case, continue with the section 'Information required for manual TCP/IP configuration' →page 26.

The result of the fully automatic TCP/IP configuration: the router will be assigned the IP address '172.23.56.1' (netmask '255.255.255.0'). In addition, the integrated DHCP server will be enabled so that the LANCOM 54 Wireless can automatically assign IP addresses to the devices in the LAN.

Configure manually nevertheless?

The fully automatic TCP/IP configuration is optional. You may also select manual configuration instead. Make your selection after the following considerations:

- Choose automatic configuration if you are **not** familiar with networks and IP addresses.
- Select manual TCP/IP configuration if you are familiar with networks and IP addresses, and one of the following conditions is applicable:
  - You have not yet used IP addresses in your network but would like to do so now. You would like to specify the IP address for your router, selecting it from the address range reserved for private use, e.g. '10.0.0.1' with the netmask '255.255.255.0'. At the same time you will set the address range that the DHCP server uses for the other devices in the network (provided that the DHCP server is switched on).
  - You have previously used IP addresses for the computers in your LAN.

Information required for manual TCP/IP configuration

During manual TCP/IP configuration, the setup wizard will prompt you for the following information:

- **IP address and netmask for the LANCOM 54 Wireless**
  Assign a free IP address from the address range of your LAN to the LANCOM 54 Wireless and specify the netmask.
- **Enable DHCP server?**
  Disable the DHCP server function in the LANCOM 54 Wireless if you would like to have a different DHCP server assign the IP addresses in your LAN.

3.1.2 Configuration protection

The password for configuration access to the LANCOM 54 Wireless protects the configuration against unauthorized access. The configuration of the router contains a considerable amount of sensitive information such as your Internet access information. We therefore strongly recommend protecting it with a password.

3.1.3 Settings for the Wireless LAN

The network name (SSID)

The basic configuration wizard asks for the network name of the base station (often designated as SSID – **S**ervice **S**et **Id**entifier). The network name will be registered in the base stations of the Wireless LAN. You can choose any name. Several base stations with the same network name form a common Wireless LAN.

Open or closed Wireless LAN?

Mobile radio stations dial-in the wanted Wireless LAN by declaration of the network name. The specification of the network name is facilitated by two technologies:

- Mobile radio stations can search for Wireless LANs in the environs („scan") and offer for selection the found Wireless LANs in a list.
- By using the network name 'ANY', the mobile radio station will enrol in the next available Wireless LAN.

The Wireless LAN can be „closed" to prevent this procedure. In this case, no enrolment with the network name 'ANY' will be accepted.

For standard, LANCOM base stations are responsive under the network name 'LANCOM'. The wireless basic configuration of a base station takes therefore place via this network name. If another network name is set during the basic configuration, also the Wireless LAN

access of the configuring mobile base station must be changed to this new network name after closing the basic configuration.

Selection of a radio channel

The base station operates in a certain radio channel. The radio channel will be selected from a list of up to 11 channels in the 2,4 GHz frequency range or up to 19 channels in the 5 GHz frequency range. (in various countries some radio channels are restricted, see appendix).

The used channel and frequency range define the operating of the common radio standard, in doing so the 5 GHz frequency range correspond to the IEEE 802.11a standard and the 2,4 GHz frequency range to the IEEE 802.11g and IEEE 802.11b standard.

If no further base stations operate in reach of the base station, any radio channel can be adjusted. Otherwise, the channels in the 2,4 GHz band must be chosen in the way that they preferably do not overlap one another or have a distance as great as possible respectively. The automatic setting is normally enough in the 5 GHz band, in which the LANCOM 54 Wireless base station itself adjust the best channel via TPC and DSF.

3.1.4 Connect charge protection

Connect charge protection blocks DSL connections that go beyond a previously set limit, thus protecting you from unexpectedly high connection charges.

If you run the LANCOM 54 Wireless via DSL access with a flat-rate tarriff, you can set the maximum connecting-time in minutes.

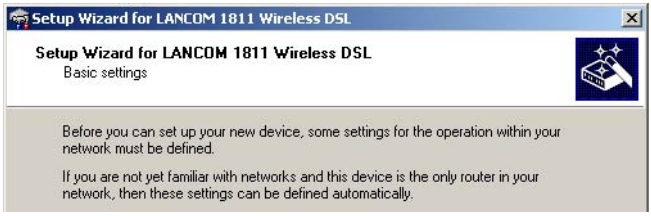
Any budget can be deactivated by entering the value '0.'

In basic settings the charge protection is defined to maximum 600 minutes within seven days. Adapt this setting to your personal needs or deactivate the charge protection if you have arranged a flatrate with your provider.

3.2 Instructions for LANconfig

① Start up LANconfig by clicking **Start** ▶ **Programs** ▶ **LANCOM** ▶ **LANconfig**

LANconfig automatically detects the new LANCOM 54 Wireless in the TCP/IP network. Then the setup wizard starts that will help you make the basic settings of the device or will even do all the work for you (provided a suitable network environment exists).



If the setup wizard does not start automatically, start a manual search for new devices on all ports (if the LANCOM 54 Wireless is connected via a serial port) or in the network (**Device** ▶ **Find**).

If you cannot access an unconfigured LANCOM 54 Wireless, the problem may be due to the netmask of the LAN: with less than 254 possible hosts (netmask > '255.255.255.0'), please ensure that the IP address 'x.x.x.254' is located in your own subnet.

If you have chosen automatic TCP/IP configuration, please continue with Step ④.

② If you would like to configure the TCP/IP settings manually, assign an available address from a suitable address range to the LANCOM 54 Wireless. Confirm your choice with **Next**.

③ Specify whether or not the router should act as a DHCP server. Make your selection and confirm with **Next**.

④ In the following window, specify the password for configuration access. Note that the password is case-sensitive and ensure that it is sufficiently long (at least 6 characters).

In addition, you may specify whether the device may only be configured from the local network or whether remote configuration via the WAN (i.e. a remote network) is also permissible.

Please note that enabling this will also permit remote configuration via the Internet. You should always make sure that the configuration access is protected with a password.

⑤ Enter the wireless parameters. Select a network name (SSID) and a radio channel. Turn on if necessary the function for 'closed network'. Confirm your choice with **Next**.

⑥ In the next window, select your DSL provider from the list that is displayed. If you select 'My provider is not listed here,' you must enter the transfer protocol used by your DSL provider manually. Confirm your choice with **Next**.

⑦ Connect charge protection can limit the cost of DSL connections to a predetermined amount if desired. Confirm your choice with **Next**.

⑧ Complete the configuration with **Finish**.

Section 'TCP/IP settings to workstation PCs' →page 34 will describe the settings required for the individual workstations in the LAN.

3.3 Instructions for WEBconfig

To configure the router with WEBconfig you must know how to address it in the LAN. The reaction of the devices, as well as their accessibility for configuration via web browser is dependent on whether a DHCP server and a DNS server are already active in the LAN, and whether these two server processes exchange the assignment of IP addresses to symbolic names within the LAN between each other.

After powered on, unconfigured LANCOM devices check first, whether a DHCP server is already active in the LAN. Dependent on the situation, the device is able to switch on its own DHCP server or, alternatively, to activate its DHCP client mode. In this second operating mode, the device itself can obtain an IP address from a DHCP server already existing in the LAN.

Network without DHCP server

In a network without DHCP server, unconfigured LANCOM devices activate their own DHCP server service after starting, and assign appropriate IP addresses and gateway information to the other workstations within the LAN, provided that the workstations are set to obtain their IP address automatically

(auto-DHCP). In this constellation, the device can be accessed with any web browser from each PC with activated auto-DHCP function through the name **LANCOM** or by its IP address **172.23.56.254**.

If the configuration PC does not obtain its IP address from the LANCOM DHCP server, figure out the current IP address of this PC (with **Start** ▶ **Execute** ▶ **cmd** and command **ipconfig** at the prompt under Windows 2000 or Windows XP, with **Start** ▶ **Execute** ▶ **cmd** and the command **winipcfg** at the prompt under Windows Me and Windows 9x, or with the command **ifconfig** on the console under Linux). In this case, the LANCOM is reachable under the IP address **x.x.x.254** ("x" stands for the first three blocks in the IP address of the configuration PC).

Network with DHCP server

If a DHCP server is active in the LAN to assign IP addresses, an unconfigured LANCOM device will turn off its own DHCP server. It will change into DHCP client mode and will obtain an IP address from the DHCP server of the LAN. This IP address is not known at first. The accessibility of the device depends on the name resolution:

- If there is a DNS server for name resolution in the LAN, which interchanges the assignment of IP addresses to names with the DHCP server, then the device can be accessed by the name "LANCOM <MAC address>" (e.g. "LANCOM-00a057xxxxxx").

The MAC address can be found on a label at the bottom of the device.

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- If there is no DNS server in the LAN, or it is not linked to the DHCP server, then the device can not be reached by the name. The following options remain in this case:
  - Figure out the DHCP-assigned IP address of the LANCOM by suitable tools and contact the device directly with this IP address.
  - Use LANconfig.
  - Connect a PC with a terminal program via the serial configuration interface to the device.

Starting the wizards in WEBconfig

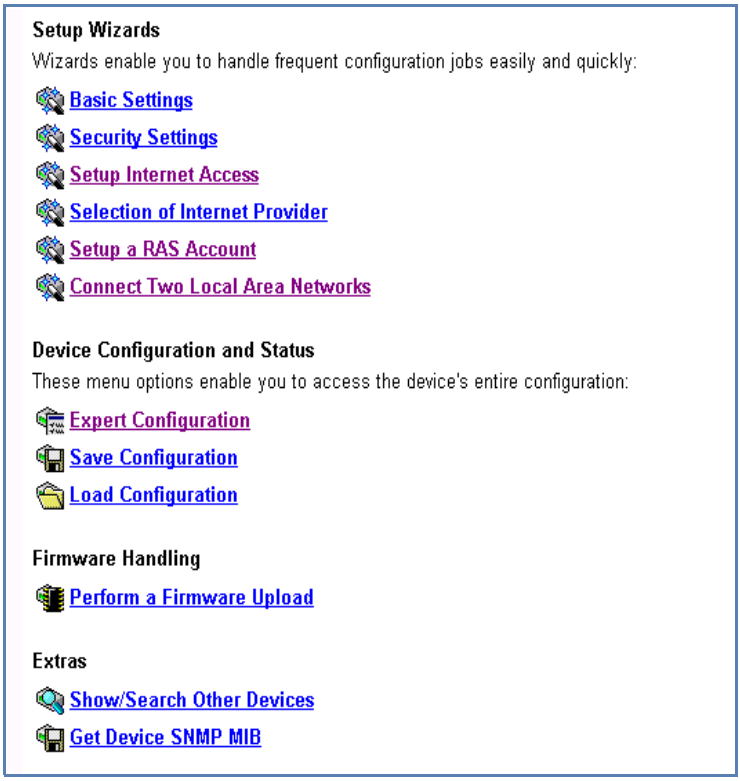
① Start your web browser (e.g. Internet Explorer, Netscape Navigator, Opera) and call the LANCOM 54 Wireless there:

```
http://<IP address of the LANCOM>
```

(or with a name as discribed above)

If you cannot access an unconfigured LANCOM 54 Wireless, the problem may be due to the netmask of the LAN: with less than 254 possible hosts (netmask > '255.255.255.0'), please ensure that the IP address 'x.x.x.254' is located in your own subnet.

The WEBconfig main menu will be displayed:



The setup wizards are tailored precisely to the functionality of the specific LANCOM 54 Wireless. As a result, your device may offer different wizards than those shown here.

If you have chosen automatic TCP/IP configuration, please continue with Step ③.

② If you would like to configure the TCP/IP settings manually, assign an available address from a suitable address range to the LANCOM 54 Wireless. Also set whether or not it is to operate as a DHCP server. Confirm your entry with **Apply**.

③ Enter the wireless parameters. Select a network name (SSID) and a radio channel. Turn on if necessary the function for 'closed network'. Confirm your choice with **Next**.

④ In the following 'Security settings' window, specify a password for configuration access. Note that the password is case-sensitive and ensure that it is sufficiently long (at least 6 characters).

You may specify whether the device may only be configured from the local network or whether remote configuration via the WAN (i.e. a remote network) is also permissible.

Please note that enabling this will also permit remote configuration via the Internet. You should always make sure that the configuration access is suitably protected, e.g. with a password.

⑤ In the next window, select your DSL provider from the list that is displayed. Confirm your choice with **Apply**.

If you select 'My provider is not listed here,' you must enter the transfer protocol used by your DSL provider manually in the next window. Confirm your choice with **Apply**.

⑥ Connect charge protection can limit the cost of DSL connections to a predetermined amount if desired. Confirm your choice with **Apply**.

⑦ The basic setup wizard reports that all the necessary information has been provided. You can end the wizard with **Go on**.

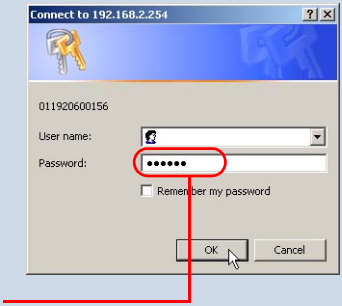
3.4 TCP/IP settings to workstation PCs

The correct addressing of all devices within a LAN is extremely important for TCP/IP networks. In addition, all computers must know the IP addresses of two central points in the LAN:

Entering the password in the web browser

When you are prompted for a user name and password by your web browser when accessing the device in the future, enter your personal values to the corresponding fields. Please note that the password is case-sensitive.

If you are using the common configuration account, enter the corresponding password only. Leave the user name field blank.



Entering the configuration password

- Default gateway – receives all packets that are not addressed to computers within the local network.
- DNS server – translates network names (www.**lancom.de**) or names of computers (**www**.lancom.de) to actual IP addresses.

The LANCOM 54 Wireless can perform the functions of both a default gateway and a DNS server. In addition, as a DHCP server it can also automatically assign valid IP addresses to all of the computers in the LAN.

The correct TCP/IP configuration of the PCs in the LAN depends on the method used to assign IP addresses within the LAN:

- **IP address assignment via the LANCOM 54 Wireless (default)**

  In this operating mode the LANCOM 54 Wireless not only assigns IP addresses to the PCs in the LAN, it also uses DHCP to specify its own IP address as that of the default gateway and DNS server. The PCs must therefore be configured so that they automatically obtain their own IP address and the IP addresses of the standard gateway and DNS server (via DHCP).

- **IP address assignment via a separate DHCP server**

  The workstation PCs must be configured so that they automatically obtain their own IP address and the IP addresses of the standard gateway and DNS server (via DHCP). The IP address of the LANCOM 54 Wireless must be stored on the DHCP server so that the DHCP server transmits it to the PCs in the LAN as the standard gateway. In addition, the DHCP server should also specify the LANCOM 54 Wireless as a DNS server.

- **Manual IP address assignment**

  If the IP addresses in the network are assigned static ally, then for each PC the IP address of the LANCOM 54 Wireless must be set in the TCP/IP configuration as the standard gateway and as a DNS server.

For further information and help on the TCP/IP settings of your LANCOM 54 Wireless, please see the reference manual. For more information on the network configuration of the workstation computers, please refer to the documentation of your operating system.

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4 Setting up Internet access

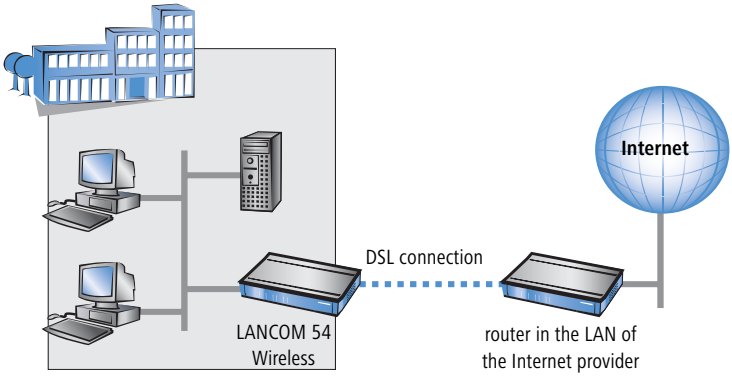
4.1 What does a router do?

Routers connect LANs at different locations and individual PCs to form a Wide Area Network (WAN). With the appropriate rights, any computer in this WAN can access the other computers and services of the complete WAN.

A special feature of the router is to send only the data with the connection of the networks via WAN connection, that should reach the other network. All other data is held back in its own network.

Connecting a LAN to the Internet does not differ technically from the coupling of two LANs. The only difference is that not just a handful of computers, but the ultimate WAN can be found behind the Internet provider's router.

All routers have at least two connections: one for the LAN and at least one for WAN connections. In addition to the wireless interface for WLAN the models in the LANCOM 54 Wireless series each also offer an 10/100 Mbps Ethernet LAN interface, which can be used as DSLoL connector alternatively or simultaneously for WAN and LAN connectivity.



The task of a LANCOM 54 Wireless is to transfer data from the local network to the target network via a suitable WAN connection. Data is also transferred from the WAN to the desired recipients in the LAN.

4.2 Setting up the Internet access with DSLoL

All computers in the LAN can take advantage of the central Internet access of the LANCOM 54 Wireless. The connection to the Internet provider can be established via DSL connection. Therefore, the LAN connector of the LANCOM 54 Wireless is connected with a suitable DSL modem.

Does the setup wizard know your Internet provider?

A convenient wizard is available to help you set up Internet access for your LANCOM 54 Wireless. The wizard knows the access information of major Internet providers and will offer you a list of providers to choose from. If you find your Internet service provider on this list, you normally will not have to enter any further transmission parameters to configure your Internet access. Only the authentication data (like user name and password) that are supplied by your provider are required.

Additional information for unknown Internet providers

If the setup wizard does not know your Internet provider, it will prompt you for all of the required information step by step. Your provider will supply this information.

- **Connection to a DSL modem**
  - protocol: PPPoE
- **Connection to an access router with fixed IP addresses**
  - protocol: Plain Ethernet

Additional connection options

You may also enable or disable further options in the wizard, depending on whether or not they are supported by your Internet provider:

- Time-based billing or flat rate – select the accounting model used by your Internet provider.
  - When using time-based billing, you can set the LANCOM 54 Wireless to automatically close existing connections if no data has been transferred within a specified time (the so-called idle time).

    In addition, you can activate a line monitor that identifies inactive remote stations faster and therefore can close the connection before the idle time has elapsed.

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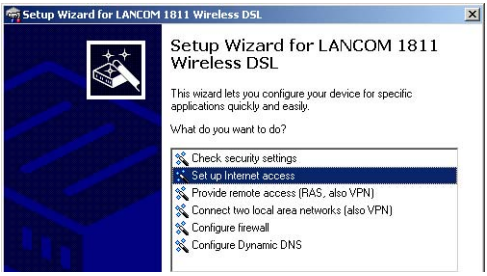
▷ Active line monitoring can also be used with flat rate billing to continuously check the function of the remote station.

You also have the option of keeping flat rate connections alive if required. Dropped connections are automatically reestablished.

4.3 Instructions for LANconfig

① Highlight the LANCOM 54 Wireless in the selection window. From the menu bar, select **Tools** ▶ **Setup Wizard**.



② From the menu, select the **Setup Internet access** wizard and click **Next**.

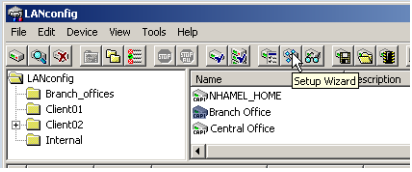
③ In the following window select your country and your Internet provider if possible, and enter your access information.

④ Depending on their availability, the wizard will display additional options for your Internet connection.

⑤ The wizard will inform you as soon as the entered information is complete. Complete the configuration with **Finish**.

LANconfig:
Quick access to the setup wizards

Under LANconfig, the fastest way to launch the setup wizards is via the button on the toolbar.



4.4 Instructions for WEBconfig

① In the main menu, select **Setup Internet access**.

② In the following window select your country and your Internet provider if possible, and enter your access information.

③ Depending on their availability, the wizard will display additional options for your Internet connection.

④ The wizard will inform you as soon as the entered information is complete. Complete the configuration with **Apply**.

5 Security settings

Your LANCOM 54 Wireless base station has numerous security functions. You find in this chapter all information needed for an optimal protection of the base station.

5.1 Security for the Wireless LAN

Reflecting on Wireless LANs often entails substantial doubts concerning security. Many people suppose that abuse of data transmitted via radio links is relatively simple.

Wireless LAN devices by LANCOM Systems permit the employment of modern security technologies:

- Closed network
- Access Control (via MAC-addresses)
- LANCOM Enhanced Passphrase Security
- Encryption of data transfer (802.11i/WPA or WEP)
- 802.1x / EAP
- optional IPSec over WLAN (VPN), in combination with external VPN gateway

5.1.1 Closed network

Each Wireless LAN according to IEEE 802.11 has its own network name (SSID). This network name serves as identification and enables administration of Wireless LANs.

A Wireless LAN can be established in such a way that any user gets access to this network. Such networks are called open networks. Any user can access an open network also without knowledge of the WLAN network name reserved specifically for this network. Only requirement is the input of the network name 'ANY'.

In a closed network the access via 'ANY' is not possible. User have to specify the correct network name. Unknown networks stay hidden to them.

Ad-hoc-networks are automatically installed as closed networks and cannot be opened. Infrastructure networks can be run either in open or closed condition. You make the settings for this at the respective base station.

5.1.2 Access control via MAC address

Each network device has an special identification number. This identification number is the so-called MAC address (**M**edia **A**ccess **C**ontrol), which is world-wide unique per device.

The MAC address is programmed into the hardware and cannot be changed. Wireless LAN devices by LANCOM Systems have got a MAC address label on the casing.

The access to an infrastructure network can be restricted to known MAC addresses for certain Wireless LAN devices solely. To do so, Access Control lists are available within the LANCOM base stations, in which the granted MAC addresses can be deposited.

This method of access control is not available for ad-hoc networks.

5.1.3 LANCOM Enhanced Passphrase Security

With LEPS (**L**ANCOM **E**nhanced **P**assphrase **S**ecurity) LANCOM Systems has developed an efficient method which uses the simple configuration of IEEE 802.11i with passphrase and yet which avoids the potential error sources of passphrase sharing. LEPS uses an additional column in the ACL to assign an individual passphrase consisting of any 4 to 64 ASCII characters to each MAC address. The connection to the access point and the subsequent encryption with IEEE 802.11i or WPA is only possible with the right combination of pass-phrase and MAC address.

LEPS can be used locally in the device and can also be centrally managed with the help of a RADIUS server, and it works with all WLAN client adapters currently available on the market without modification. Full compatibility to third-party products is assured as LEPS only involves configuration in the access point.

An additional security aspect: LEPS can also be used to secure single point-to-point connections (P2P) with an individual passphrase. Even if an access point in a P2P installation is stolen and the passphrase and MAC address become known, all other WLAN connections secured by LEPS remain protected, particularly when the ACL is stored on a RADIUS server.

5.1.4 Encryption of the data transfer

A special role comes up to the encryption of data transfer for Wireless LANs. For IEEE 802.11 radio transfer the supplementing encryption standards are

802.11i/WPA and WEP. The function of the encryption is to ensure the security level of cable-bound LANs also in Wireless LANs.

- Use encryption on the data transferred in the WLAN. Activate the strongest possible encryption available to you ((802.11i with AES, WPA or WEP) and enter the appropriate keys or passphrases into the access point and the WLAN clients.
- Regularly change the WEP keys in your access points. The passphrases for 802.11i or WPA do not have to be changed regularly as new keys are generated for each connection anyway. This is not the only reason that the encryption with 802.11i/AES or WPA/TKIP is so much more secure than the now aged WEP method.
- If the data is of a high security nature, you can further improve the encryption by additionally authenticating the client with the 802.1x method ('802.1x / EAP' →page 43) or activate an additional encryption of the WLAN connection as used for VPN tunnels ('IPSec over WLAN' →page 44). In special cases, a combination of these two mechanisms is possible.

Further details to WLAN security and the used encoding methods can be found in the LCOS reference manual.

Please take note of the information in the box "Standard WEP encryption".

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Standard WEP encryption

As of LCOS version 4.0, WEP128 encryption is activated for every unconfigured device as standard.

The key consists of the first letter "L" followed by the LAN MAC address of the access point in ASCII characters. The LAN MAC addresses of the LANCOM devices always begin with the character string "00A057". You will find the LAN MAC address on a sticker on the base of the device. **Only** use the number labeled as "MAC address" that starts with "00A057". The other numbers that may be found are **not** the LAN MAC address!

A device with the LAN MAC address "00A0570FB9BF" thus has a standard WEP key of "L00A0570FB9BF". This key is entered into the 'Private WEP settings' of the device for each logical WLAN network as 'Key 1'.

To use a WLAN adapter to establish a connection to a new LANCOM access point, the WEP128 encryption must be activated for the WLAN adapter and the standard 13-character WEP key entered.

Note that a reset also causes the WLAN key settings to be lost from the device and the standard WEP key comes into effect again. WLAN access can only work after a reset if the standard WEP key is programmed into the WLAN adapter as well.

5.1.5 802.1x / EAP

The international industry standard IEEE 802.1x and the **E**xtensible **A**uthentication **P**rotocol (EAP) enables the realization of reliable and secure access controls for base stations. The access data is centrally administered on a RADIUS server then, and can be retrieved by the base station if required.

Moreover, this technology makes enables a secured dispatch and a regular automatic change of WEP keys. In this way IEEE 802.1x improves the protection efforts of WEP.

In Windows XP the IEEE-802.1x technology is already integrated by default. For other operating systems 802.1x client software is available.

5.1.6 IPSec over WLAN

By means of IPSec over WLAN a radio network can be optimally secured in addition to the already introduced securing mechanisms.

In order to run IPSec over WLAN you have to upgrade the base stations of the with the LANCOM VPN option and the LANCOM Advanced VPN Client, which runs under the operating systems Windows 98ME, Windows 2000 and Windows XP. For other operating systems client software from other manufacturers is available. The drivers for the LANCOM AirLancer wireless adapter are already equipped with a 802.1x client.

5.1.7 Tips for handling keys

The security of encryption procedures can be substantially increased the by paying attention to some important rules for handling keys.

- **Keep keys as secret as possible.**
  Never note a key. Popular, but completely unsuitable are for example: notebooks, wallets and text files in PCs. Do not share a key unnecessarily.
- **Select a random key.**
  Use randomized keys of character and number sequences. Keys from the general linguistic usage are insecure.
- **Change a key immediately in case of suspicion.**
  It is time to change the key of the Wireless LAN if an employee with access to a key leaves your company. The key should also be renewed in case of smallest suspicion of a leak.

5.2 The security settings wizard

Access to the configuration of a device permits not only to read out critical information such as WEP key or Internet password. Rather, also the entire settings of the security functions (e.g. firewall) can be altered then. So an unauthorized configuration access endangers not only a single device, but the entire network.

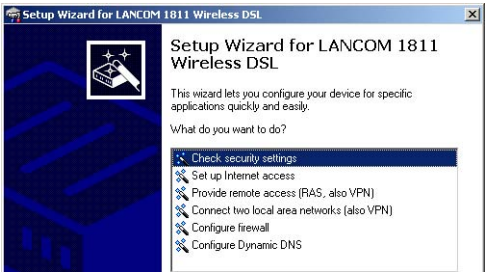
Your LANCOM 54 Wireless has a password protection for the configuration access. This protection is already activated during the basic configuration by entering a password.

The device locks access to its configuration for a specified period of time after a certain number of failed log-in attempts. Both the number of failed attempts and the duration of the lock can be set as needed. By default, access is locked for a period of five minutes after the fifth failed log-in attempt.

Besides these general settings you can also check the security settings of the wireless network with the security wizard as far as your device has a WLAN interface.

5.2.1 Wizard for LANconfig

① Mark your LANCOM 54 Wireless in the selection window. Select from the command bar **Extras** ▶ **Setup Wizard**.



② Select in the selection menu the setup wizard **Control Security Settings** and confirm your choice with **Next**.

③ Enter your password in the following windows and select the allowed protocols for the configuration access from local and remote networks.

④ In a next step parameters of the configuration lock like number of failed log-in attempts and the duration of the lock can be adjusted.

⑤ Now you can set the security settings for the WLAN. These include the name of the wireless network, the closed network function and the WEP encryption. You can type in the parameters for both wireless networks separately on devices with the option of a second WLAN interface.

⑥ Now you specify filter lists for stations (ACL) accessing the WLAN and protocols. Thereby, you restrict data exchange between the wireless network and the local network.

⑦ Now activate Stateful Inspection, ping-blocking and Stealth mode in the the firewall configuration.

⑧ The wizard will inform you when entries are complete. Complete the configuration with **Finish**.

5.2.2 Wizard for WEBconfig

Under WEBconfig you have the possibility to run the wizard **Security settings** to control and change the settings. The following values are handled:

- password for the device
- allowed protocols for the configuration access of local and remote networks
- parameters of configuration lock (number of failed log-in attempts and duration of the lock)
- security parameters as WLAN name, closed network function, WEP key, ACL list and protocol filters

5.3 The firewall wizard

The LANCOM 54 Wireless incorporates an effective protection of your LAN and WLAN when accessing the Internet by its Stateful Inspection firewall and its firewall filters. Basic idea of the Stateful Inspection firewall is that only self-initiated data transfer is considered allowable. All unasked accesses, which were not initiated from the local network, are inadmissible.

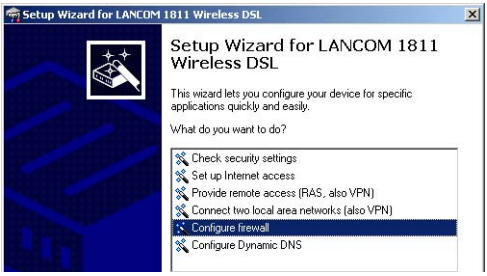
The firewall wizard assists you to create new firewall rules quickly and comfortably.

Please find further information about the firewall of your LANCOM 54 Wireless and about its configuration in the reference manual.

5.3.1 Wizard for LANconfig

The firewall wizard assists you to create new firewall rules quickly and comfortably.

① Mark your LANCOM 54 Wireless in the selection window. Select from the command bar **Extras** ▶ **Setup Wizard**.



② Select in the selection menu the setup wizard **Configuring Firewall** and confirm your choice with **Next**.

③ In the following windows, select the services/protocols the rule should be related to. Then you define the source and destination stations for this rule and what actions will be executed when the rule will apply to a data packet.

④ You finally give a name to the new rule, activate it and define, whether further rules should be observed when the rule will apply to a data packet.

⑤ The wizard will inform you as soon as the entries are complete. Complete the configuration with **Finish**.

5.3.2 Configuration under WEBconfig

Under WEBconfig it is possible to check and modify all parameters related to the protection of the Internet access under **Configuration** ▶ **Firewall / QoS** ▶ **Rules** ▶ **Rule Table.**

5.4 The security checklist

In the following checklist you will find an overview of the most important security functions. That way you can be quite sure not to have overlooked anything important during the security configuration of your LANCOM.

▶ **Have you assigned a password for the configuration?**

The simplest option for the protection of the configuration is the establishment of a password. As long as a password hasn't been set, anyone can change the configuration of the device. The box for entering the password is located in LANconfig in the 'Management' configuration area on

the 'Security' tab. It is particularly advisable to assign a password to the configuration if you want to allow remote configuration.

- **Have you permitted remote configuration?**

  If you do not require remote configuration, then deactivate it. If you require remote configuration, then be sure to assign a password protection for the configuration (see previous section). The field for deactivating the remote configuration is also contained in LANconfig in the 'Management' configuration area on the 'Security' tab.

- **Have you permitted the configuration by the wireless network?**

  If you do not require configuration by the wireless network, then deactivate it. The field for deactivating the configuration by the wireless network is also contained in LANconfig in the 'Management' configuration area on the 'Security' tab. Select here under 'Access rights - from Wireless LAN' for all types of configuration the option 'not allowed'.

- **Have you assigned a password to the SNMP configuration?**

  Also protect the SNMP configuration with a password. The field for protection of the SNMP configuration with a password is also contained in LANconfig in the 'Management' configuration area on the 'Security' tab.

- **Have you activated the Firewall?**

  The Stateful Inspection Firewall of the LANCOM ensures that your local network cannot be attacked from the outside. The Firewall can be enabled in LANconfig under 'Firewall/QoS' on the register card 'General'.

- **Do you make use of a 'Deny All' Firewall strategy?**

  For maximum security and control you prevent at first any data transfer through the Firewall. Only those connections, which are explicitly desired have to allowed by the a dedicated Firewall rule then. Thus 'Trojans' and certain E-mail viruses loose their communication way back. The Firewall rules are summarized in LANconfig under 'Firewall/Qos' on the register card 'Rules'. A guidance can be found in the reference manual.

- **Have you activated the IP masquerading?**

  IP masquerading is the hiding place for all local computers for connection to the Internet. Only the router module of the unit and its IP address are visible on the Internet. The IP address can be fixed or assigned dynamically by the provider. The computers in the LAN then use the router as a gateway so that they themselves cannot be detected. The router separates Internet and intranet, as if by a wall. The use of IP masquerading is set individually for each route in the routing table. The routing table can be

found in the LANconfig in the 'IP router' configuration section on the 'Routing' tab.

- **Have you closed critical ports with filters?**

  The firewall filters of the LANCOM 54 Wireless devices offer filter functions for individual computers or entire networks. Source and target filters can be set for individual ports or for ranges of ports. In addition, individual protocols or any combinations of protocols (TCP/UDP/ICMP) can be filtered. It is particularly easy to set up the filters with LANconfig. The 'Rules' tab under 'Firewall/QoS' can assist you to define and change the filter rules.

- **Have you excluded certain stations from access to the router?**

  Access to the internal functions of the devices can be restricted using a special filter list. Internal functions in this case are configuration sessions via LANconfig, WEBconfig, Telnet or TFTP. This table is empty by default and so access to the router can therefore be obtained by TCP/IP using Telnet or TFTP from computers with any IP address. The filter is activated when the first IP address with its associated network mask is entered and from that point on only those IP addresses contained in this initial entry will be permitted to use the internal functions. The circle of authorized users can be expanded by inputting further entries. The filter entries can describe both individual computers and whole networks. The access list can be found in LANconfig in the 'TCP/IP' configuration section on the 'General' tab.

- **Is your saved LANCOM configuration stored in a safe place?**

  Protect the saved configurations against unauthorized access in a safe place. A saved configuration could otherwise be loaded in another device by an unauthorized person, enabling, for example, the use of your Internet connections at your expense**.**

- **Have you secured your wireless network encryption, an ACL and LEPS?**

  With the help of 802.11i, WPA or WEP, you can encrypt the data in your wireless network with different encryption methods such as AES, TKIP or WEP. LANCOM Systems recommends the strongest possible encryption by using 802.11i and AES. If the WLAN client adapters do not support these, then you should use TKIP or at least WEP. Make sure that the encryption function in your device is activated, and that at least one passphrase or WEP key has been entered and selected for application.

As of LCOS version 4.0, WEP128 encryption is activated for every unconfigured device as standard (‘Standard WEP encryption’ →page 43).

To check the WEP settings, open LANconfig, go to the configuration area and select 'WLAN security' on the '802.11i/WEP' tab to view the encryption settings for the logical and physical WLAN interfaces.

With the Access Control List (ACL) you can permit or prevent the access to your wireless LAN by individual clients. The decision is based on the MAC address that is permanently programmed into wireless network adapters. To check the Access Control List, go to the configuration area in LANconfig and select 'WLAN security' on the 'Stations' tab.

The LANCOM Enhanced Passphrase Security (LEPS) uses an additional column in the ACL to assign an individual passphrase consisting of any 4 to 64 ASCII characters to each MAC address. The connection to the access point and the subsequent encryption with IEEE 802.11i or WPA is only possible with the right combination of passphrase and MAC address.

▶ **Have you set the 802.1x functions for particularly sensitive data exchange in the wireless network?**

If you have a particularly sensitive data exchange in your wireless network, you can use the IEEE-802.1x technology for a more extensive protection. To control or to activate the IEEE-802.1x settings, select in LANconfig the configuration area 'User registration'.

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6 Options and accessories

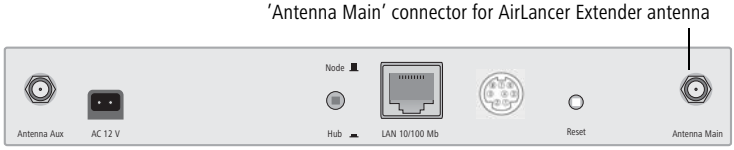
Your LANCOM 54 Wireless base station has numerous extensibilities and the possibility to use a broad choice of LANCOM accessories. You find in this chapter information about the available accessories and how to use them with your base station.

- The range of the base station can be increased by optional antennas of the AirLancer Extender series and can be adapted to special conditions of environs.
- With the LANCOM Public Spot Option option it is possible to extend the LANCOM 54 Wireless for additional billing and accounting functions in order to upgrade it to a Wireless Public Spot.

6.1 Optional AirLancer Extender antennas

To increase the range of the LANCOM 54 Wireless base station or to adapt the base station to special conditions of environs, you can connect AirLancer Extender antennas at the base station. An overview of suitable antennas can be found on the LANCOM web site under www.lancom.de.

For installation of an optional AirLancer Extender antenna turn off the LANCOM 54 Wireless by pulling out the power supply cable of the device. Remove now carefully the two diversity antennas on the back by screwing them out. Connect the AirLancer Extender antennas to the antenna connector with the inscription 'Antenna Main'.



For help with calculating the correct antenna setup for external LANCOM AirLancer Extender antennas or for antennas of other vendors, please refer to www.lancom.de

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6.2 LANCOM Public Spot Option

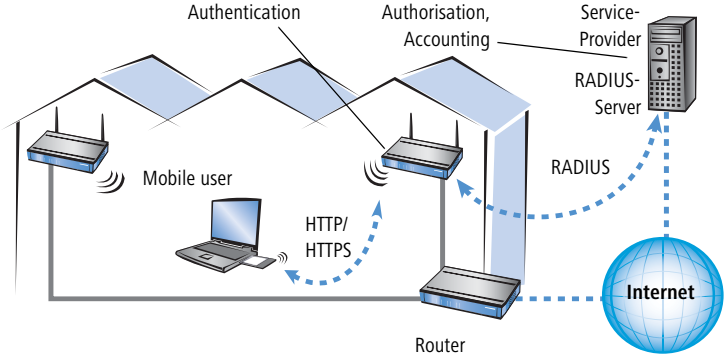
Wireless public spots are publicly accessible points, at which users with their own mobile computers can dial wirelessly into a network, usually into the Internet.

The Wireless LAN technology is ideally suitable to offer wireless Internet services to the public at places such as airports, hotels, stations, restaurants or cafés, so-called Public Hot Spots. The LANCOM Public Spot Option is intended for operators of public wireless networks, and unveils additional functions for authentication and billing of public Internet services for the LANCOM 54 Wireless base station, thus enabling a simple set-up and maintenance of public hot spots.

The authentication and billing of the individual users is realized via user-friendly web sites, so that client PCs with a Wi-Fi certificated radio card (e.g. AirLancer) and a standard Internet browser can directly go online.

The LANCOM Public Spot Option is the optimal solution for public Wireless LANs. Wireless LANs are very suitable for company networks and for wireless networking at home. But for public access services, there is a lack of mechanisms for authentication and billing of single users (AAA - Authentication / Authorisation / Accounting). This lack remedies the LANCOM Systems Open User Authentication (OUA), the main part of the LANCOM Public Spot Option. The OUA procedure realizes the authentication of all wireless clients via user name and password, and checks the authorization of single users via RADIUS. Accounting data (online time and data volume) can be transferred per user and per session to a central RADIUS server. Client PCs need only radio card (e.g. AirLancer), TCP/IP and an Internet browser. Additional software is not needed. Therefore, the public spot option is ideally suitable to install wireless

Internet access services in hotels, restaurants, cafés, airports, stations, exhibition centres or universities.



With the LANCOM Public Spot Option you extend a base station additionally with these functions and upgrade it to a Wireless Public Spot.

7 Troubleshooting

In this chapter, you will find suggestions and assistance for a few common difficulties.

7.1 No WAN connection is established

After start-up the router automatically attempts to connect to the access provider. During this process, the Online LED will blink green. If successful, the LED will switch over to steady green. If, however, the connection can't be established, the Online LED will light up red. The reason for this is usually one of the following:

Problems with the cabling?

Only the cable provided with your device should be used to connect to the WAN. This cable must be connected to the Ethernet port of your broadband access device. The WAN link LED must light green indicating the physical connection.

Has the correct transfer protocol been selected?

The transfer protocol is set along with the basic settings. The basic setup wizard will enter the correct settings for numerous DSL providers automatically. Only if your DSL provider is not listed, you will have to enter manually the protocol being used. In any case, the protocol that your DSL provider supplies you with should definitely work.

You can monitor and correct the protocol settings under:

Configuration tool	Run command
LANconfig	Management ▶ Interfaces ▶ Interface settings ▶ WAN Interface
WEBconfig	Expert Configuration ▶ Setup ▶ Interfaces ▶ WAN Interface

7.2 DSL data transfer is slow

The data transfer rate of an broadband (Internet) DSL connection is dependent upon numerous factors, most of which are outside of one's own sphere of influence. Important factors aside from the bandwidth of one's own Internet connection are the Internet connection and current load of the desired target.

Numerous other factors involving the Internet itself can also influence the transfer rate.

Increasing the TCP/IP window size under Windows

If the actual transfer rate of a DSL connection is significantly below the fastest rate listed by the provider, there are only a few possible causes (apart from the above-mentioned external factors) which may involve one's own equipment.

One common problem occurs when large amounts of data are sent and received simultaneously with a Windows PC using an asynchronous connection. This can cause a severe decrease in download speed. The cause of this problem is what is known as the TCP/IP receive window size of the Windows operating system that is set to a value too small for asynchronous connections.

Instructions on how to increase the Windows size can be found in the Knowledge Base of the support section of the LANCOM web site (www.lancom.de).

7.3 Unwanted connections under Windows XP

Windows XP computers attempt to compare their clocks with a timeserver on the Internet at start-up. This is why when a Windows XP in the WLAN is started, a connection to the Internet is established by the LANCOM.

To resolve this issue, you can turn off the automatic time synchronization on the Windows XP computers under **Right mouse click on the time of day ▶ Properties ▶ Internet time**.

8 Appendix

8.1 Performance data and specifications

		LANCOM L-54g Wireless	LANCOM L-54ag Wireless	LANCOM IAP-54 Wireless
Frequency band		2400 - 2483,5 MHz (ISM) or 5150 - 5750 MHz		
Standards		IEEE 802.11g downwards-compatible to IEEE 802.11b	IEEE 802.11a or IEEE 802.11g / IEEE 802.11b	IEEE 802.11a or IEEE 802.11g / IEEE 802.11b
Transfer rates*		Up to 108 Mbps according to IEEE 802.11g (fallback to 48, 36 , 24, 18, 12, 11, 9, 6 Mbps, automatic rate selection) downwards-compatible to IEEE 802.11b 802.11 b/g compatibility mode or pure g or pure b selectable, Super A/G	Up to 108 Mbps after IEEE 802.11a (fallback to 48, 36 , 24, 18, 12, 9, 6 Mbps, automatic rate selection), or up to 108 Mbps after IEEE 802.11g (fallback to 48, 36 , 24, 18, 12, 11, 9, 6, 5,5, 2, 1 Mbps, Automatic Rate Selection) compatible to IEEE 802.11b, 802.11 b/g compatibility mode or pure g or pure b selectable, Super A/G	
Ranges*		Up to 150 m (up to 30 m in buildings)		
Transmitting power		Up to 19 dBm	Up to 19 dBm in 2,4 GHz band, up to 18 dBm in 5 GHz band	
Radio channels		Up to 14 channels (3 non-overlapping)	Up to 19 non-overlapping channels (5 Ghz band), or up to 14 channels (2,4 GHz band)	
Roaming		Changing between radio cells (seamless handover), IAPP support, IEEE 802.11d support		
Operating modes	WLAN access point	up to 255 clients		
	WLAN bridge	Point to multipoint networking of up to 7 Ethernet LANs (mixed operation possible), broken link detection, blind mode, up to 32 VLAN connections for WLAN		
	WAN router (in the DSL-over-LAN mode)	Use of the LAN connector for simultaneous DSL-over-LAN, IP router, NAT/ reverse NAT (IP masquerading) DHCP server, DHCP client, DHCP- relay server, DNS server, PPPoE client, PPTP-Client, NetBIOS-Proxy, DynDNS client, NTP		
	WLAN client	Client mode for the connecting of printers or PCs with Ethernet connection		

		LANCOM L-54g Wireless	LANCOM L-54ag Wireless	LANCOM IAP-54 Wireless
Security	WLAN	IEEE 802.11i / WPA with passphrase or 802.1x and hardware encrypted AES, closed network, WEP64, WEP128, WEP152, access control lists, RADIUS client,user authentication, 802.1x / EAP, LEPS		
	Router, LAN (in DSL-over-LAN mode)	Stateful inspection firewall, IP masquerading, (NAT/PAT), inverse masquerading, packet filtering, login rejection, URL- blocking, denial of service protection, intrusion detection, QoS with VLAN priority for VoIP and VoWLAN		
	Configuration	Password protection, configuration protection		
Management		LANtools (professional management software for Windows), WEBconfig (HTTP / HTTPS), Telnet, TFTP, SNMP (MIB II, 802.11, 802.1D, 802.3, private MIB), RADIUS, syslog		
Connections	LAN	10/100base-TX, autosensing, node/hub switch		10/100base-TX, autosensing
	Configuration	Serial V.24/RS-232 outband interface with mini-DIN8 connection		
	Power supply	12V AC over external power adapter, or Power-over-Ethernet compliant to IEEE 802.3af		Power-over-Ethernet compliant to IEEE 802.3af
Antenna connection		Two reverse SMA connectors for external LANCOM AirLancer Extender antennas or for antennas of other vendors. Please respect the restrictions given in your country when setting up an antenna system. For help with calculating the correct antenna setup, please refer to www.lancom.de.		
Antennas		Two 3 dBi dipol antennas.	Two 3 dBi dipol dual band antennas.	
Approvals		CE compliant according to ETS 300 328, ETS 300 826, EN 55022, EN 55024, EN 60950		
Regulations		Notified in Germany, Belgium, France, Switzerland, Netherlands, Luxemburg, Austria, United Kingdom, Italy, Malta, Czech Republic		
Housing		210 mm x 143 mm x 45 mm (BxHxT), rugged plastic case, stackable, provision for wall mounting		IP50 protected housing, 225 mm x 145 mm x 45 mm (BxHxT), rugged metal case, stackable, provision for wall, mast and pole mounting
Environment		Temperature range 0 °C to +50 °C at 95 % max. humidity (non condensing)		

		LANCOM L-54g Wireless	LANCOM L-54ag Wireless	LANCOM IAP-54 Wireless
Package contents		LAN cable (CAT.5, STP, 3 m), serial cable for out-band interface, external power adapter (12V AC, 1,2 A), printed manual (English, German), software CD		LAN cable (CAT.5, STP, 3 m), 1 port PoE Power Injector, Material for wall, mast and 35 mm rail mount, printed manual (German, English), software CD
Options		LANCOM Public Spot Option (authentification and accounting software for hotspots) Item no.: 60642 LANCOM Service Option (24h product replacement, 4 years warranty - not for PoE injector) Item no.: 61401		
Service		Warranty: 3 years for LANCOM L-54g Wireless, LANCOM L-54ag Wireless and LANCOM IAP-54 Wireless; 2 years for PoE injector Support via hotline and Internet		
Optional antennas and accessories		2,4 GHz indoor antenna AirLancer Extender I-180 Item no.: 60914 2,4 GHz dual band indoor antenna AirLancer Extender I-60 Item no.: 61214 2,4 GHz outdoor antenna AirLancer Extender O-30 Item no.: 60478 2,4 GHz outdoor antenna AirLancer Extender O-70 Item no.: 60469 5 GHz outdoor antenna AirLancer Extender O-18a Item no.: 61210 Lightning protection AirLancer Extender SA-5 Item no.: 61212		

*)The effective range and data transfer rate depend on site conditions and possible disturbances.

8.2 Radio channels

8.2.1 Radio channels in the 2,4 GHz frequency band

In the frequency range from 2400 to 2483 MHz are up to 13 channels available. The following overview shows which channels are supported by the dif-

ferent regions (EU/WORLD). The last column shows which channels can be used without overlapping.

Frequency range	2400–2500 MHz		no overlapping with
Channel No.	EU (ETSI)	WORLD (ETSI + FCC)	
1	2412	2412	6, 11
2	2417	2417	7
3	2422	2422	8
4	2427	2427	9
5	2432	2432	10
6	2437	2437	1, 11
7	2442	2442	2
8	2447	2447	3
9	2452	2452	4
10	2457	2457	5
11	**2462**	**2462**	1, 6
12	2467	–	–
13	2472	–	–

Bold values indicate the default setting of the AirLancer radio adapters when utilized in a base station.

8.2.2 Radio channels in the 5 GHz frequency band

In the frequency range from 5,13 to 5,805 GHz up to 19 non-overlapping channels are available in Europe, defined as the sub-bands as follows:

- Band 1: 5150 - 5350 MHz (channels 36, 40, 44, 48, 52, 56, 60 and 64)
- Band 2: 5470 - 5725 MHz (channels 100, 104, 108, 112, 116, 120, 124, 128, 132, 136 und 140)
- Band 3: 5725 - 5875 MHz (channels 147, 151, 155, 167)

Please note that frequency ranges an radio channels in band 3 are reserved for operation in UK only!

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The following overview shows which channels are allowed in different regions.

	Channel No.	Frequency	ETSI (EU)	FCC (US)
Band 1	36	5,180 GHz	yes	yes
	40	5,200 GHz	yes	yes
	44	5,220 GHz	yes	yes
	48	5,240 GHz	yes	yes
	52	5,260 GHz	yes	yes
	56	5,280 GHz	yes	yes
	60	5,300 GHz	yes	yes
	64	5,320 GHz	yes	yes
Band 2	100	5,500 GHz	yes	no
	104	5,520 GHz	yes	no
	108	5,540 GHz	yes	no
	112	5,560 GHz	yes	no
	116	5,580 GHz	yes	no
	120	5,600 GHz	yes	no
	124	5,620 GHz	yes	no
	128	5,640 GHz	yes	no
	132	5,660 GHz	yes	no
	136	5,680 GHz	yes	no
	140	5,700 GHz	yes	no
Band 3 (UK only)	147	5,735 GHz	no	yes
	151	5,755 GHz	no	yes
	155	5,775 GHz	no	yes
	167	5,835 GHz	no	yes

8.2.3 Radio channels and frequency ranges for Indoor and Outdoor operating

In several countries specific regulations are valid concerning the use of frequency ranges and radio channels for indoor and outdoor operating. The following table gives information on the permitted application:

Country	Band (GHz)	Subband	Frequency	Channels	Turbo channels	Emitted power (dBm)	Indoor/ Outdoor
Germany	2,4	1	2,4-2,4835	1-13	6	100/20	I+O
	5	1	5,15-5,35	36-64	42-58	200/23	I
		2	5,470-5,725	100-140	106-130	1000/30	I+O
Austria	2,4	1	2,4-2,4835	1-13	6	100/20	I+O
	5	1	5,15-5,25	36–44	–	60/17,5	I
Switzerland	2,4	1	2,4-2,4835	1-13	6	100/20	I+O
	5	1	5,15-5,35	36-64	42-58	200/23	I
Netherlands	2,4	1	2,4-2,4835	1-13	6	100/20	I+O
	5	1	5,15-5,35	36-64	42-58	200/23	I+O
		2	5,470-5,725	100-140	106-130	1000/30	I+O
Belgium	2,4	1	2,4-2,4835	1-13	6	100/20	I+O
	5	1	5,15-5,35	36-64	42-58	120/20,8	I
Luxembourg	2,4	1	2,4-2,4835	1-13	6	100/20	I+O
	5	1	5,15-5,35	36-64	42-58	200/23	I
		2	5,470-5,725	100-140	106-130	1000/30	I+O
UK	2,4	1	2,4-2,4835	1-13	6	100/20	I+O
	5	1	5,15-5,35	36-64	42-58	200/23	I
		2	5,470-5,725	100-140	106-130	1000/30	I+O
		3	5,725-5,585	147, 151, 155, 167	–	2000/33,1	(only fixed WLAN outdoor installations!)
Czechia	2,4	1	2,4-2,4835	1-13	6	100/20	I+O
	5	1	5,15-5,35	36-64	42-58	200/23	I
Italy	2,4	1	2,4-2,4835	1-13	6	100/20	I+O

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Country	Band (GHz)	Subband	Frequency	Channels	Turbo channels	Emitted power (dBm)	Indoor/ Outdoor
	5	1	5,15-5,35	36-64	42-58	200/23	I
		2	5,470-5,725	100-140	106-130	1000/30	I+O
France	2,4	1	2,4-2,4835	1-13	6	100/20	I
	2,4	1	2,4-2,454	1-9	6 (up to max. 10 dBm only!)	100/20	O
	2,4	1	2,454-2,4835	10-13		10/10	O
	5	1	5,15-5,35	36-64	42-58	200/23	I
Malta	2,4	1	2,4-2,4835	1-13	6	100/20	I+O
	5	1	5,15-5,35	36-64	42-58	200/23	I
		2	5,470-5,725	100-140	106-130	1000/30	I+O

Further details to the restrictions for the use of wlan adapters within th EU can be found in the internet:

Country	Organisation	Link
Belgium	Institut Belge des Postes et Telecommunications (BIPT)	www.bipt.be
Denmark	National Telecom Agency	www.tst.dk
Finland	Finnish Communications Regulatory Authority (FICORA)	www.ficora.fi
France	Autorité de Régulation des Télécommunications (ART)	www.art-telecom.fr
Greece	National Telecommunications Commission (EET)	www.eett.gr
Great Britain	Office of Telecommunications (Oftel)	www.oftel.gov.uk
	Postal Services Commission (Postcomm)	www.postcomm.gov.uk/
	Radiocommunications Agency	www.open.gov.uk/radiocom
Ireland	Commission for Communications Regulation (ComReg)	www.comreg.ie
Iceland	Post and Telecom Administration (PTA)	www.pta.is

Country	Organisation	Link
Italy	L'Autorità per le garanzie nelle comunicazioni (AGC)	www.agcom.it
Latvia	Telecommunication State Inspection	www.vei.lv
Liechtenstein	Amt für Kommunikation (AK)	www.ak.li
Lithuania	Radio Administration	www.rrt.lt/
Luxembourg	Institut Luxembourgeois des Télécommunications (ILT)	www.etat.lu/ILT
Netherlands	Onafhankelijke Post en Telecommunicatie Autoriteit (OPTA)	www.opta.nl
	Agentschap Telecom	www.agentschap-telecom.nl
	Ministerie Economische Zaken	www.ez.nl
Norway	Norwegian Post and Telecommunications Authority (NPT)	www.npt.no
Austria	Rundfunk und Telekom Regulierungs-GmbH	www.rtr.at
	Bundesministerium für Verkehr, Innovation und Technologie	www.bmvit.gv.at
Poland	Urzad Regulacji Telekomunikacji (URT)	www.urt.gov.pl
Portugal	Autoridad Nacional De Comunicações (ICP-Anacom)	www.anacom.pt
Sweden	National Post and Telecom Agency	www.pts.se
Switzerland	Bundesamt für Kommunikation	www.bakom.ch
Slowenia	Agencija za telekomunikacije, radiodifuzijo in pošto	www.atrp.si
Spain	Comision del Mercado de las Telecomunicaciones (CMT)	www.cmt.es
Tschechien	Czech Telecommunication Office	www.ctu.cz
Ungarn	Communication Authority (HIF)	www.hif.hu

Please inform yourself about the current radio regulations of the country you want to operate a Wireless LAN device.

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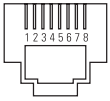
8.3 Contact assignment

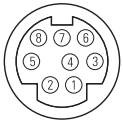
8.3.1 LAN interface 10/100base-TX

8-pin RJ45 socket, as per ISO 8877, EN 60603-7

Connector	Pin	Line
	1	T+
	2	T-
	3	R+
	4	PoE/G
	5	PoE/G
	6	R-
	7	PoE/-48 V
	8	PoE/-48 V

8.3.2 Configuration interface (Outband)

8-pin mini-DIN socket

Connector	Pin	Line
	1	CTS
	2	RTS
	3	RxD
	4	RI
	5	TxD
	6	DSR
	7	DCD
	8	DTR
	U	GND

8.4 Declaration of conformity

CE

This product corresponds to the requirements of the guide line about radio installations and telecommunication sending installations (FTEG) and to the guide line 1999/5/EG (R&TTE).

This product has been notified in the countries of Germany, Great Britain, Belgium, Netherlands, Luxembourg, Austria, Switzerland, France and Malta.

The CE declarations of conformity for your device are available for download on the LANCOM Systems Systems web site (www.lancom.de).

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EN