

D.8.0 Instruction Manual

This manual will be provided to the end-user with each unit sold/leased.



WAVELyNX™ BR132

3.2 Mbps Wireless Ethernet Bridge

QUICK INSTALLATION GUIDE

Limited Warranty

WaveAccess, Ltd. warrants that the hardware incorporated in this product shall be free from defects in workmanship and materials, for the period of one (1) year from the date of original purchase. The foregoing warranty does not apply to any product which has been the subject of misuse (including static discharge), neglect, accident, tampering, or modification. The warranty shall also not apply if WaveAccess' outdoors antennae have been installed by any person other than a professional antenna installer. WaveAccess' sole obligation to you for products failing to meet this warranty shall be, at WaveAccess' discretion, to repair or replace the nonconforming product, where; 1) you have obtained a valid Return Merchandise Authorization (RMA) number from WaveAccess' customer support, 2) you have returned the nonconforming product to WaveAccess, freight and insurance prepaid, and 3) WaveAccess has determined that the product is nonconforming and that such nonconformity is not a result of improper installation, repair or misuse by you or any third party. Any product replaced under this warranty shall become the property of WaveAccess and replacement products may be new or reconditioned products.

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FCC WARNING

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

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

Warning: *Any changes or modifications of equipment not expressly approved by WaveAccess could void the user's authority to operate this equipment.*

Canadian Emissions Requirements:

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

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1. Introduction

This booklet is intended to give a quick overview to installing the *WAVElyNX BR132* high-performance wireless Ethernet bridge. After reading it, you will be able to quickly install your wireless Point-to-Point bridge between two Ethernet networks. If you have a complex system requiring more advanced configuration, use a network management system, or if you need to change the *WAVElyNX BR132*'s settings you should then read the User's Guide in the enclosed diskette. In all cases, it is suggested that you read this booklet first.

1.1 Packing List

The *WAVElyNX BR132* arrives in a single package that includes the following items:

- *WAVElyNX BR132* wireless Bridge,
- A power supply,
- This Guide,
- Software diskette which includes the User's Guide in Adobe Acrobat (PDF) format,
- Two (2) optional omnidirectional dipole antennae for indoor use (if ordered).

You should also have received a second package which includes the *WAVElyNX* antenna and cable kit you ordered with the system. This kit typically includes the antenna, antenna cable(s), transition cable, female-to-female N-type adapter (if necessary), external filter (for certain specific antennae in Europe or ETSI compliant countries), RF cable clamps and a lightning arrestor (if ordered).

[Note:] You should have received all these items. If any of these items is incomplete or missing you might not be able to properly install the *WAVElyNX BR132*. Please contact at once your nearest Customer Support center.

1.2 System Overview

The *WAVElyNX BR132* is a transparent Point-to-Point (P-t-P) wireless bridge between two Ethernet networks. *WAVElyNX* employs Frequency Hopping (FH) Spread-Spectrum technology at data rates of 3.2 and 1.6 Mbps. This high-performance Ethernet bridge links two separate networks at distances of up to 20 miles over line of sight situations. *WAVElyNX BR132* supports industry-standard SNMP network management, and includes both MIB II, the bridge MIB, and a complete WaveAccess proprietary MIB.

The bridge system is composed of a master/slave pair of *WAVElyNX BR132* units. The *WAVElyNX BR132* unit is designed for indoor use with the antenna outdoors.

The antenna type used in the *WAVElyNX BR132* depends on the range required and the geographical characteristics. The *WAVElyNX BR132* adheres (in the US) to the FCC regulations. Other countries have different output limits, *WAVElyNX* has been designed with these constraints in mind, and the configuration sold in each country meets these local regulations.

2. Quick Installation

This chapter is intended to guide users in the basic installation process.

2.1 Wireless Set-Up Information

As part of the installation process, you will be requested to input your *WAVELyNX BR132*'s ESS-ID number. Your wireless bridge comes with a default ESS-ID value, but for security (or non-interference reasons) you might want to assign a different ESS value to your network.

Please inquire from your system administrator what is your network's ESS-ID number. It is suggested you write it down here for quick reference:

Network's ESS-ID Number: _____

2.2 The WAVELyNX Antennae

The *WAVELyNX BR132* has several antenna options.

[Warning:] The antenna connectors on the *WAVELyNX BR132*'s front panel are non-standard. Care should be taken that they are not damaged, since they cannot be replaced. Also antennae other than those supplied with the *WAVELyNX BR132*, will not fit properly and might cause harmful interference.

[Note:] All of the *WAVELyNX BR132*'s outdoor antenna options must be professionally installed. The cable kit provided by WaveAccess with all external antennae, which includes a transition cable from the non-standard connector(s) on the *WAVELyNX BR132* to a standard N-type connector(s), must be used for all outdoor antenna installations. **These antennae must be professionally installed complying with the certified antenna and cable kits.** Please carefully review and follow the installation instructions included with each individual antenna kit. If you have any questions, please contact your nearest Customer Support center.

2.2.1 Antenna and Cable Options

The following tables show the antenna options and their specifications.

Note that these figures reflect a 10 dB margin over ideal free space propagation and use the shortest permitted cable (see minimum cable segment length below). The available antenna options depend on the regulations (i.e., FCC Part 15, ETSI ETR-328, etc.) being used in the country. Not all options may be available in your country.

The minimum segment length listed in Tables 5 and 6 indicates the minimum certified cable length per cable type. You should never attempt to use antenna cables with a loss of less than 1.3dB. For range calculations involving a different set of parameters (antenna types, cable losses, antenna aiming offset, etc.) WaveAccess has provided an Excel-based calculation tool in the enclosed disk. To determine your optimal setup and expected performance, use this spreadsheet or call your Customer Support center.

Antenna Type	Gain	Beamwidth Horizontal/ Vertical ²	Down Tilt	Range 3.2 Mbps (miles)	Range 1.6 Mbps (miles)
Omni ¹	10 dBi	360° / 8°	0, 2, 4°	0.4	1.5
	8.1 dBi	360° / 15°	N/A	0.25	1.0
	5.1 dBi	360° / 38°	N/A	0.12	0.5
Parabolic Grid ¹	24 dBi	10°	N/A	9.7	38.5
	21 dBi	13°	N/A	4.9	19.3
Yagi ¹	14 dBi	34° / 30°	N/A	1.0	3.9
Planar ¹	6 dBi	75° / 65°	N/A	0.15	0.6
Parabolic Dish ¹	19 dBi	18° / 20°	+/- 10°	3.1	12.2
Sector Panel ¹	16.1 dBi	90° / 7°	w/brackets	1.5	6.1
	12.5 dBi	90° / 10°	N/A	0.75	2.7
Narrow Sector Panel ¹	20 dBi	22.5° / 10.5°	w/brackets	3.9	15.3
	17 dBi	22° / 22°	+/- 10°	1.9	7.7
Dipole ¹	2 dBi	360° / 75°	N/A	0.07	0.28

Table 1, US Antenna Options

Antenna Type	Gain	Beamwidth Horizontal/ Vertical ²	Down Tilt	Range 3.2 Mbps (km)	Range 1.6 Mbps (km)
Omni ¹	10 dBi	360° / 8°	0, 2, 4°	0.6	2.5
	8.1 dBi	360° / 15°	N/A	0.4	1.6
	5.1 dBi	360° / 38°	N/A	0.2	0.8
Parabolic Grid ¹	24 dBi	10°	N/A	11.2	39.6
	21 dBi	13°	N/A	7.9	28.1
Yagi ¹	14 dBi	34° / 30°	N/A	1.6	6.3
Planar ¹	6 dBi	75° / 65°	N/A	0.25	1.0
Parabolic Dish ¹	19 dBi	18° / 20°	+/- 10°	5.0	19.9
Sector Panel ¹	16.1 dBi	90° / 7°	w/brackets	2.5	10.0
	12.5 dBi	90° / 10°	N/A	1.1	4.4
Narrow Sector Panel ¹	20 dBi	22.5° / 10.5°	w/brackets	6.3	25.0
	17 dBi	22° / 22°	+/- 10°	3.1	12.5
Dipole ¹	2 dBi	360° / 75°	N/A	0.11	0.45

Table 2, Canada Antenna Options

Antenna Type	Gain	Beamwidth Horizontal/ Vertical ²	Down Tilt	Range 3.2 Mbps (km)	Range 1.6 Mbps (km)
Omni ¹	10 dBi	360° / 8°	0, 2, 4°	0.5	1.8
	8.1 dBi	360° / 15°	N/A	0.4	1.4
	5.1 dBi	360° / 38°	N/A	0.2	0.8
Parabolic Grid ¹	24 dBi	10°	N/A	2.1	7.4
	21 dBi	13°	N/A	1.5	5.2
Yagi ¹	14 dBi	34° / 30°	N/A	0.7	2.3
Parabolic Dish ¹	19 dBi	18° / 20°	+/- 10°	1.2	4.1
Sector Panel ¹	16.1 dBi	90° / 7°	w/brackets	0.8	2.9
	12.5 dBi	90° / 10°	N/A	0.6	2.1
Narrow Sector Panel ¹	20 dBi	22.5° / 10.5°	w/brackets	1.3	4.7
	17 dBi	22° / 22°	+/- 10°	0.9	3.3
Dipole ¹	2 dBi	360° / 75°	N/A	0.11	0.45

Table 3, European (ETSI) Antenna Options

Antenna Type	Gain	Catalog No.	Size (inches)	Mast Outside Diam. (inches)
Omni ¹	10 dBi	OM10	48 x 2.25	0.75-4.0
	8.1 dBi	OM08	30 x 1.5	
	5.1 dBi	OM05	13.5 x 1.3	≤2
Parabolic Grid ¹	24 dBi	PG24	27" x 32"	0.75 - 2
	21 dBi	PG21	20" x 24"	
Yagi ¹	14 dBi	YG14	26" x 3.5"	≤ 2.125
Planar ¹	6 dBi	PN06	4" x 5.5"	N/A
Parabolic Dish ¹	19 dBi	PS19	19.25 F x 10	1.75-4.0
Sector Panel ¹	16.1 dBi	ST16	42 x 6.1 x 2.8	1.25-4.0
	12.5 dBi	ST12	26 x 3 x 1	
Narrow Sector Panel ¹	20 dBi	PN20	24 x 11.8 x 3	0.75-3
	17 dBi	PN17	12.6 x 11.8 x 3	0.75-3
Dipole ¹	2 dBi	DP02	2"	N/A

Table 4, Antenna Physical Characteristics

Notes:

- (1) Some antennae have a female and some have a male N-type connector. In case of the latter a female-to-female N-type adapter should be supplied with the antenna.
- (2) All antennae should be mounted in a vertical polarization configuration (see the installation instructions included with each antenna kit).

Cable Number	Type and Outer Diameter	Attenuation Coefficient (dB/100 ft)	Minimum Segment Length (ft)
LMR-400	Flexible, 0.4"	6.7	20
LMR-600	Flexible, 0.6"	4.4	30
LMR-900	Flexible, 0.9"	2.9	45
LMR-1200	Flexible, 1.2"	2.2	60
LMR-1700	Flexible, 1.7"	1.7	80
LDF4-50A	Heliac 1/2", 0.63"	3.9	35
LDF5-50A	Heliac 7/8", 1.10"	2.2	60
LDF6-50	Heliac 1-1/4", 1.55"	1.6	85

Table 5, US Cable Assembly Options

Cable Number	Type and Outer Diameter	Attenuation Coefficient (dB/10 m)	Minimum Segment Length (m)
LMR-400	Flexible, 0.4"	2.20	6.1
LMR-600	Flexible, 0.6"	1.43	9.1
LMR-900	Flexible, 0.9"	0.97	13.7
LMR-1200	Flexible, 1.2"	0.73	18.3
LMR-1700	Flexible, 1.7"	0.56	24.4
LDF4-50A	Heliac 1/2", 0.63"	1.28	10.7
LDF5-50A	Heliac 7/8", 1.10"	0.72	18.3
LDF6-50	Heliac 1-1/4", 1.55"	0.52	25.9

Table 6, Canada and Europe Cable Assembly Options

2.2.1.1 Parabolic Grid Antenna

These are the highest gain antennae available for the *WAVELyNX BR132*. They are recommended for long range situations. Careful aiming of these antennae (especially of the PG24) is required due to their small coverage angles.

2.2.1.2 Yagi Antenna

The 14dBi Yagi antenna is used for medium range situations. It can be mounted both indoors and outdoors.

2.2.1.3 Omnidirectional Antennae

There are three omnidirectional dipole antennae available for the *WAVELyNX BR132*. The OM10 and OM08 are for external mounting, and the OM05 model can be mounted either indoors or outdoors. When these antennae are mounted on a mast, they should be located as high as possible in order to avoid any other object being located near it.

The OM10 (and to some extent the OM08) omni antenna has very narrow elevation (vertical) beamwidth. Both the height and distance separation between the two sites must be taken into consideration when selecting this antenna. In most cases it is suggested that you order the appropriate down tilt option ahead of time, if available for that particular antenna, in order to maximize the coverage area.

2.2.1.4 Planar Antenna

This antenna is suitable for mounting on a wall. It is the best choice when wide angle coverage is required with good isolation from the back.

2.2.1.5 Direct Attach Dipole Antenna

The smallest, and simplest, antenna option is an omnidirectional dipole antenna. A pair of these antennae attaches directly to the *WAVELyNX BR132*'s front panel. This antenna type is used only indoors, and does not require professional installation. It has a non-standard connector and therefore it cannot, and should, not be replaced with any other antenna.

Carefully position each antenna over one of the screw-in connectors on the front panel, and slowly tighten the antenna nut over the panel connector. Before the final tightening of the connectors, make sure the antennae are perpendicular to the floor.

2.2.1.6 Parabolic Dish Antenna

This is a high-gain directional antenna designed to provide narrow sectorization. This antenna is designed for outdoor mounting and can withstand extreme weather conditions. Please note that this antenna has a very narrow beam (only 18° horizontally) and should, therefore, only be used when conditions actually require it or when a very narrow coverage area is needed.

2.2.1.7 Sector Panel Antennae

These antennae are suitable for sectorization of the Central Unit POP. It is the best choice when several wide angle coverage sectors are required. Please note that at the 90° edges there is a drop in the antenna gain (as much as 3 dB), therefore, it is suggested that you overlap these antennae, and try to use only half the beamwidth as the sector width. With these antennae (especially ST16), down tilt must also be taken into consideration.

2.2.1.8 Narrow Sector Panel Antennae

These antennae are suitable for narrow sectorization of the Central Unit POP. It is the best choice when the remote sites are clustered in small areas. Here too there is a sharp cutoff of the antenna gain and is suggested that you overlap these antennae, using approximately half the beamwidth as the sector width.

2.2.2 Cable Options

All antennae except the direct attach dipole come with a 20' LMR-400 cable kit, unless ordered differently. The standard kit consists of:

- A 2 feet transition cable which connects on one side to the non-standard connector on the panel (“Main”), and on the other side to a standard N-type male connector. This cable is relatively thin and functions as stress relief between the long and thick antenna cable to the box.
- A 20 feet low loss cable with male and female N-type connectors, respectively, on its two ends.

The effect of the standard kit’s losses on the system’s range is already included in the antennae options table above.

[Note:] All RF cables, including the transition cable, have to be anchored down in order to minimize the risk of breaking the *WAVELyNX BR132*’s RF connector(s) and/or having the cables pulling the system. The provided cable clamps should be anchored to a solid object or wall.

In order to cover distances greater than 20 feet between the antenna and the *WAVELyNX BR132*, you may order additional segments of 20 feet LMR-400 cable. All segments have the same male-female N-type connectors, so they can be easily extended to any multiple of 20 feet. Each additional cable segment, on either side of the link, reduces the system’s range by 20%.

You can also use other cable types (see table 6 above) to increase the distance between the antenna and the *WAVELyNX BR132*. Please note the minimum lengths required for each cable type.

2.2.3 Lightning Protection

It is highly recommended that every outdoor installation employ a lightning arrestor. The offered lightning arrestor has the same connector arrangement as the low-loss 20 feet cables (male/female). As a result, it can be installed between any two cable segments (the antenna and the transition cable are also considered “cables” for this purpose). However, the best location for the arrestor is just before the cable’s entry to the building. In any case, the arrestor must be mounted outside the building.

The arrestor offered with *WAVELyNX* is self-resetting, meaning that no maintenance is needed even following a lightning strike. Follow the arrestor’s installation instructions, and make sure that the grounding solution is according to these instructions.

2.3 Initial Installation

Before you install the bridge you must choose a good location for your antenna to ensure a line of sight to the other *WAVELyNX BR132*. You must also ensure the shortest possible distance between the *WAVELyNX BR132* bridge and the antenna to minimize cable-loss.

2.3.1 Placement of the Antenna

[Warning:] The *WAVELyNX BR132* antenna, should be installed **ONLY** by experienced antenna installers that are familiar with local buildings and safety codes, and wherever necessary are licensed by appropriate government regulatory bodies. Failure to do so may void the Product Warranty, as well as expose the end user to legal and financial liabilities. WaveAccess, its agents, resellers, or distributors, are not liable for injury, damage or violation of government regulation associated with the installation of the antenna.

The installer is also responsible that the public is not exposed to radio frequency energy levels in excess of the FCC guidelines. Those guidelines imply that no human may conceivably be found within one foot of the front of the antenna. If such a situation may occur, the installer is responsible for placing the appropriate caution signs to warn the public. WaveAccess, its agents, resellers, or distributors, are not liable for exposure to excessive RF energy levels due to improper antenna installation.

The Maximum Permissible Exposure guidelines, as based on the National Council on Radiation Protection and Measurement (NCRP), are 1 foot or 30 cm for the *WAVELyNX BR132*. If the antenna is in an accessible area, an appropriate warning sign **must** be installed in place.

The front panel of the *WAVELyNX BR132* has two antenna connectors. This allows the installation of two antennae when diversity is needed although, in most cases, one antenna is enough. If you ordered the optional, directly attached, dipole omnidirectional antenna set, this arrives as a pair, all other antenna kits include a single antenna and cable.

If you are using a single antenna, you must connect it to the front panel connector marked **Main** (the rightmost one). Use the leftmost connector, marked **Aux**, for diversity.



Figure 1, Front Panel of the *WAVELyNX BR132*

2.3.1.1 Indoors

For optimal reception when used indoors, the *WAVELyNX BR132*'s antenna should be placed in front of a window or other opening with a clear line of sight path to the other *WAVELyNX* bridge. If using an antenna other than the directly attached dipole omnidirectional antenna pair, make sure that it is solidly attached to a wall or other restraining structure.

[Warning:] The *WAVELyNX BR132* high-gain antennae should be mounted such that the main beam is pointing away from heavy human traffic areas.

2.3.1.2 Outdoors

The use of an outdoor antenna generally allows you to increase the range of your *WAVELyNX* system this is due to several reasons:

- It is possible to install larger (i.e., higher gain) antennae,
- It is less likely that the path is obstructed,
- Improved performance due to height from ground, and
- Multipath problems from reflections from buildings, trees, etc. are reduced.

The *WAVELyNX BR132* has not been designed for outdoor use. It must be installed indoors and connected to the outdoor antenna using the supplied cable (see Figure 2). Installing a *WAVELyNX BR132* outdoors will void its warranty.

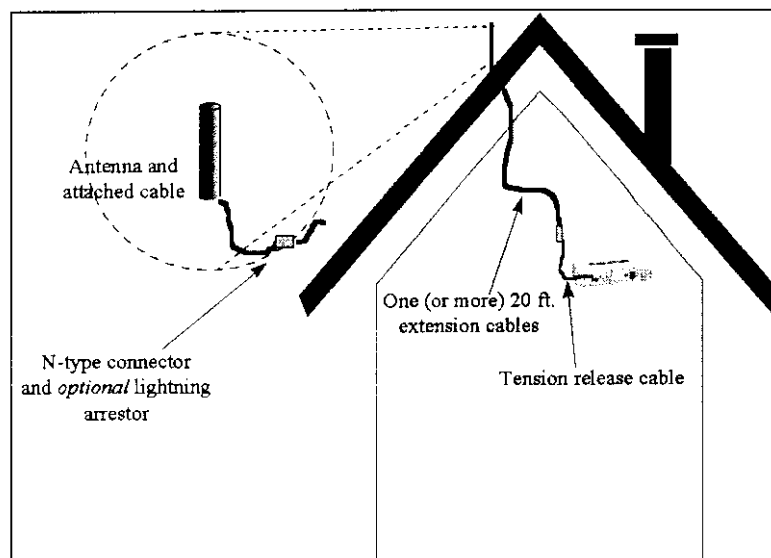


Figure 2, System Installation

Mount the antenna using the enclosed brackets, and according to the instructions included in the antenna and cable kit that you purchased. Align the antenna in the general direction of the other bridge in the pair (this is called the gross adjustment). Try to get the two antennae to point to each other as much as possible, this will speed up the fine adjustment.

Install the *WAVELyNX BR132* as near the antenna as possible to minimize the cable length. If you require longer cables, please contact WaveAccess or your local distributor to get an extension. Do not attempt to use other cables with the *WAVELyNX* bridge, this may cause the system to malfunction and invalidate your warranty.

[Warning:] Using an antenna or cable other than those supplied with the *WAVELyNX BR132*, whether installed indoors or outdoors, could cause degradation of the system and could void the authority to operate this equipment. In addition, **the use of unauthorized antennae or external amplifiers violates Federal law and FCC's regulations.** Doing so may void the Product Warranty, as well as expose the end user to legal and financial liabilities.

[Warning:] The *WAVELyNX BR132* antenna emits high radio frequency energy levels. In situations when unauthorized persons may approach in close proximity to the front of the antenna, an appropriate warning sign to advise against approaching within 1 ft (30 cm) from the front of the antenna, should be placed near the *WAVELyNX* antennae.

The system, if required by regulation, will perform transmit power adjustment based on the installed antenna and cable. The antenna filter unit, if required, goes between the transition cable and the antenna cable and is used to limit the *WAVELyNX BR132*'s emissions to your country's requirements.

Make sure you enter the correct antenna and cable parameters in the antenna configuration software to comply with your national requirements. Also, if it is required, do not attempt to dispense with the use of the filter in conjunction with the *WAVELyNX* bridge. Incorrect antenna parameters and/or dispensing with the use of the filter may cause the system to malfunction and invalidate your warranty.

[Warning:] Willfully entering incorrect values in the antenna parameters software and/or avoiding the use of an antenna filter as supplied with the *WAVELyNX BR132*, could cause degradation of the system and could void the authority to operate this equipment. In addition, **improper transmit power settings and/or the lack of use of a required antenna filter violates unlicensed band radio frequency regulations**. Doing so may void the Product Warranty, as well as expose the end user to legal and financial liabilities.

For safety reasons, an antenna installed outdoors should be fitted with a lightning arrestor. Such devices protect the *WAVELyNX*, as well as the life of any person in contact with the bridge when the antenna is struck by lightning.

[Warning:] A lightning arrestor should be installed on any antenna mounted outdoors. Failure to do so may void the Product Warranty. WaveAccess, its agents, resellers, or distributors, are not liable for injury or damage caused by lightning striking the antenna.

After you have installed the antenna, the installation is a simple process:

2.3.2 Connecting To The Network

The next step is to connect the *WAVELyNX BR132* to your Ethernet network. To do this you need a standard RJ-45 terminated Ethernet cable (not provided).

Connect one end of the cable to the network (this could be to a hub, switch, or any other Ethernet connectivity device but not a computer; to directly connect to a computer a special cross-over cable is required). Connect the other end to the back side of the *WAVELyNX BR132*, to the connector marked *ETHERNET*. The bridge is now connected to the network.

2.3.3 Powering Up The Bridge

Next, connect the round connector of the power supply to the *DC IN* connector in the back of the *WAVELyNX BR132* wireless bridge. After the power supply has been securely connected to the bridge, plug it in to the mains.

[Warning:] Use only the supplied power supply. Using a different power supply may damage the *WAVELyNX BR132* and invalidate the FCC certification.

[Note:] Always connect first the power supply to the bridge. Plug it in only after it has been connected to the bridge.



Figure 3, WAVElyNX BR132 Rear Panel

Once you have plugged it in, raise the power switch in the back of the bridge to turn it on. At this point, the **PWR** LED should have lit up, this signals that the WAVElyNX BR132 Ethernet bridge has powered up.

After a few seconds the **OK** LED will blink. This signals that the initial system software (also called software Version 0) has loaded correctly and the WAVElyNX BR132 has completed its self-test routines. After a few seconds, the programmable system software (or Version 1) will have loaded and the **OK** LED will light continuously. For an explanation of the difference between the initial system software and the programmable system software, see the User's Guide.

If you have connected your WAVElyNX BR132 to the Ethernet network, you will see the **Link** LED light continuously to signal that a hub (or similar device) has been detected over the network.

After you have completed these steps, your WAVElyNX BR132 Wireless bridge is working and ready for final configuration and fine antenna adjustment.

The WAVElyNX BR132 has three other LEDs, **ETX**, **WTX**, and **Sync**. The **ETX** LED will momentarily blink whenever the WAVElyNX BR132 sends a packet over the Ethernet. The **WTX** LED will blink whenever the WAVElyNX BR132 transmits a packet over the radio medium.

The **Sync** LED has two states, either blinking or continuously lit. When this LED is blinking, it signals that the two bridges have not synchronized. Whenever the **Sync** LED lights continuously, it means that the two WAVElyNX bridges have synchronized and are communicating.

Once the **Sync** LED has lit up on both systems, it means that the antennae may be aligned, however fine adjustment of the alignment may still be necessary using the RSSI monitor or the SNMP option as explained in the User's Guide. If the two bridges do not synchronize even though the antennae are perfectly aligned, it could be due to not having performed the basic software configuration. See the section below, and then recheck the **Sync** LED.

2.4 Basic Software Configuration

This section refers to the basic parameters which you must set-up in order to install the WAVElyNX BR132. The two WAVElyNX bridges must work as a master/slave pair.

All the WAVElyNX BR132 bridges are shipped with the default configuration of a master system. In most cases, your distributor or reseller will configure one of the units to work as a slave device. It is suggested that the local or central unit be the master system, thus you do not need to perform any changes to this unit. You may have to configure your remote WAVElyNX BR132 as a slave to ensure that the two systems communicate.

[Note:] If you are installing the *WAVElyNX BR132* bridges using the shipped default values, and your distributor/reseller has configured one of the units to work as a slave device, you can skip this section.

To configure these parameters, you need to either use the ASCII monitor or have a *bootp* server and *tftp* capabilities. These are standard features on many operating systems such as Unix, and are also available as add-ons to Novell NetWare or Windows NT. There are also several Windows-based *bootp* and *tftp* software modules available. In the event that you do not have access to *bootp* and *tftp*, contact Technical Support, for a list of possible sources for this kind of support.

The screenshot shows a window titled "BOOTP Client Configuration". At the top, there are buttons: Next, Prev, Add, Modify, Delete, New, Close, and Help. The window is divided into two main sections. The first section, "BOOTP Client Information", contains fields for: Host Name (LyNX_BR132), Serial Number (empty), IP Address (192.9.200.225), Key Code (empty), Address Type (Ethernet, with a dropdown arrow), Rootfile Name (ds0/bf), and Physical Address (f2:dc:b2:75:00:0a). The second section, "Vendor Area Information", contains fields for: Send Host Name (checkbox), Subnet Mask (255.255.255.0), Gateway(s) (empty), Domain Server(s) (empty), and Domain Name (empty). There is also a "54 Bytes Left" indicator and an "Extra Info..." button.

Figure 4, Example TCP/IP Configuration of *WAVElyNX BR132*

In Figure 4, you can see an example of configuring the *WAVElyNX BR132* bridge's IP address on the *bootp* server. This example is based on NetManage's Chameleon TCP/IP suite, most other *bootp* server software have similar screens that allow you to input your bridge's MAC address and what will be its IP address.

2.4.1 Setting Up *bootp* and *tftp*

The remote bootstrap procedure, *bootp*, needs to request a boot file from the *bootp* server. It does this by sending a request with its proper MAC address (the MAC number in the bridge ID label).

Every *WAVElyNX BR132* has both a MAC address and default IP address, hop sequence and ESS-ID. When setting up your *bootp* and *tftp* server, you decide which bridge (or bridges) to bootstrap and what are their respective *bootp* files and IP addresses.

To indicate the bridge to be bootstrapped, you include the MAC address to bootstrap as well as the name of the *bootp* file (and its path, if needed). Once the *boot* and *tftp* server have this information, all you have to do is turn on the *WAVElyNX BR132*, which will then query the server to receive the information. The server then sends the appropriate information based on the querying MAC address. To create the *bootp* bootstrap file, read the Section below.

2.4.2 The *bootp* Configuration File

The basic configuration changes are performed using a *bootp* file. This feature allows a *WAVElyNX BR132* to boot from an external source instead of using its internally stored data.

When you perform an external boot, the information you give the bridge through the *bootp* file is stored in the *WAVElyNX BR132* and used in all subsequent automatic bootstraps (without any further need for a *bootp* server). To perform an external boot, *bootp* needs a file that will be used to bootstrap the system, this is called the *bootp file*. When setting-up your server the *bootp file*'s name and path must be specified.

```
BASIC_CONFIGURATION      #
    Switch_To_Version 1  #
    SEQ_NO 10            #
    ESS_NO 4198          #
END
```

Figure 5, Typical Master System *bootp* File

The *bootp* (or configuration) file contains a few parameters that are read by the *WAVElyNX BR132* and used to set-up the bootstrap requirements. Other parameters are presently updated only through a SNMP manager or using the ASCII monitor system, for explanation on how to use these configuration systems see the User's Guide.

The first line of the *bootp* configuration file should always include the header line **BASIC_CONFIGURATION**. The last line of the *bootp* configuration file should always be the closing line, **END**. This informs the bridge that the following lines are basic configuration items. Other possible items are:

- **Switch_To_Version** this chooses between initial system software and programmable system software
- **SEQ_NO** this chooses the hop sequence, it should only be used for the master system and not for the slave
- **ESS_NO** this chooses the ESS-ID number
- **#** this is a comment.

The *WAVElyNX BR132* software diskette includes a sample *bootp* file called **br0.bf**. This file can be used as a basis to create your own *bootp* files.

A program called **btptest.exe** is also included in the WaveAccess software diskette, and it is used to check if the *bootp* file is correct or has an error.

[Note:] You **should** use the testing program before performing a *bootp* with your file. This will avoid errors that could take time to correct.

2.4.2.1 Switch_To_Version

This parameter receives a value of either **1** or **0**. Its purpose is to inform the *WAVElyNX BR132* whether it should switch to the programmable system software (Version 1) at the end of the bootstrap, or remain in the initial system software (Version 0). Version 1 is the operational software version typically used at all times, Version 0 is the basic (factory-loaded) software and it is used for support purposes.

A value of **1** causes the Bridge to switch to the programmable system software. This value should always be used in routine work.

A value of **0** causes the Bridge to remain in the initial system software after bootstrap is complete. This value should only be used when instructed to do so by a software update or a Customer Support engineer.

[Note:] In the initial system software (Version 0) the *WAVELyNX BR132* disables the wireless network, and is only accessible through the Ethernet or the monitor ports. Never leave the system in this mode unless requested to do so by WaveAccess' Customer Support. This will avoid errors that could take time to correct.

2.4.2.2 Changing the ESS Number

The ESS-ID number is changed using the *ESS_NO* bootp field. The *WAVELyNX BR132* expects to receive in this field a valid ESS-ID Number.

A valid ESS-ID is any number between **0** and **8191** (13 bits). All *WAVELyNX BR132* bridges are configured at the factory with an ESS-ID of **4198**.

The ESS-ID Number is used to uniquely identify a wireless connection. Both bridges in the pair must have the same ESS-ID number. If you have multiple wireless bridges, or wireless bridges and LANs, each one should have its unique ESS. In any case adjacent bridges should have different hopping sequences (see next Section).

[Note:] For the slave *WAVELyNX BR132* to communicate with the master unit, it must identify itself with the same ESS-ID Number as the master. If they have different ESS-ID Numbers they will reject each other's transmissions and will not communicate.

2.4.2.3 Changing the Hopping Sequence

In order to ensure that adjacent or overlapping wireless Ethernet bridges interfere as little as possible with each other, you must ensure that they have different hopping sequences. The hopping sequence is generated by the master *WAVELyNX BR132* bridge, and the slave unit synchronizes to this sequence.

The hopping sequence is set using a number between **0** and **25**. The hopping sequence is entered on the *SEQ_NO* field.

The *WAVELyNX* Hopping Sequence is a near random pattern of 79 frequency hops. Since each pattern is different, collisions (or interference) on a certain hop will not occur on the next frequency hop since both wireless networks will now be in different frequencies.

2.4.2.4 Entering Comments Using

Any text entered after the **#** sign on a line is considered a comment and is ignored by the *WAVELyNX BR132*. This feature is useful for you to keep track of changes, and to document special features if you have multiple bootp files.

2.4.3 Bootstrapping From the *bootp* File

After the *bootp* file is complete, and has been tested using the *btpstest.exe* program, we can bootstrap the bridge. Turn the *WAVElyNX BR132* off and then back on again using the power switch on the rear of the bridge.

The *WAVElyNX BR132* will now inquire if there is a *bootp* and *tftp* server. If the server is found, it will proceed to receive the appropriate information, and boot according to the information in the *bootp* file.

2.4.4 Loading Software Using *tftp*

WAVElyNX BR132 uses *tftp* (which stands for trivial file transfer protocol) to load software to the bridge. After the system has been assigned an IP address, you start the *tftp* server.

[Note:] For detailed instructions on loading software to the *WAVElyNX BR132*, see the User's Guide.

The WaveAccess software diskette includes both master and slave software. The master software is called *prog_ms.bin*, and the slave software is called *prog_sl.bin*.

[Note:] To ensure proper loading of the *WAVElyNX BR132*'s new software, it must be booted up in the initial system software (Version 0). This is done by sending a *bootp* file with the *Switch_To_Version* parameter set to 0.

2.4.4.1 Clearing the Old Software

Before you attempt to load the slave software, you must clear the old software from the *WAVElyNX BR132*'s flash memory. In order to do this you must **Send** any file (even a zero-length file is possible) to the bridge and name it *erase.exe*.

[Note:] For the *WAVElyNX BR132* to be able to receive new software, it must first clear up space by receiving a file called *erase.exe*. This name has a special meaning, if you do not use this name the bridge will not perform the required task.

Once this has been done, you can proceed and load the software to the *WAVElyNX BR132*.

2.4.4.2 Loading the New Software

In order to load the slave configuration to the bridge, you have to choose to **Send** the *prog_sl.bin* file which is included in the WaveAccess diskette, and it must be given the remote name *prog.bin*.

If at some point you need to reload the master software, repeat the two steps in this Section. The only difference is that you should use the *prog_ms.bin* file.

This concludes the basic installation and configuration for the *WAVElyNX BR132*

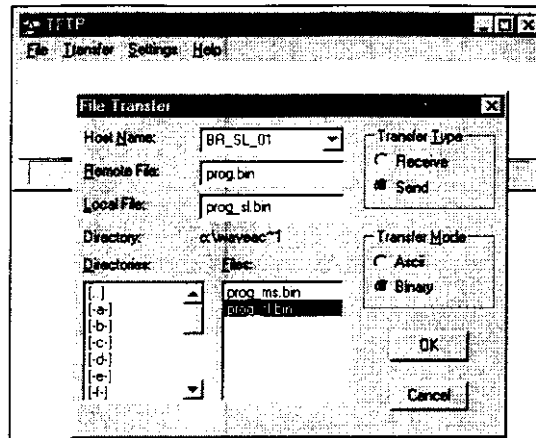


Figure 6, Loading Slave Software Using *tftp*

In Figure 6, you can see an example of configuring the *WAVElyNX BR132* bridge as a slave using the *tftp* server. This example is based on NetManage's Chameleon TCP/IP suite, most other *tftp* server software have similar screens that allow you to input your bridge's IP address, whether to send or receive a file, and the file's local and remote name.

This concludes the basic installation and configuration for the *WAVElyNX BR132* wireless Ethernet bridge.