



USER Guide

Access Node-50

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Redline Access Node-50

USER Guide

Version 19

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This user guide was designed to help you install, use and troubleshoot the Redline AN-50 Fixed Wireless Access (FWA) PTP system. Every effort has been made to ensure the accuracy of the material provided herein, however, Redline assumes no responsibility regarding the use of the material. Additionally, Redline makes no representations or warranties, either expressed or implied, regarding the contents of this product. Redline Communications shall not be liable for any misuse regarding this product.

If you have any comments or suggestions concerning this guide, please Email them to: support@Redlinecommunications.com.

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Getting Started

This user manual is designed to get you quickly started with the Redline Access Node-50 Point to Point (PTP) Fixed Wireless Access (FWA) system. The AN-50 is a high performing Ethernet Bridge terminal system configurable to operate as a high speed point to point link or switched point to point (S-PTP) system¹, providing the Industry's first true low-cost and scalable multi-service platform to support both backhaul and access functions from a common equipment infrastructure and management system. The system can deliver a net data throughput of up to 54 Mbps (72 Mbps raw), with a non-line of sight (NLOS) capability to address challenging deployment scenarios.

The AN-50 operates in the unlicensed UNII band of 5.8 GHz and includes patented technologies to address any potential inter-cell interference issues. The system also features adaptive modulation in both directions for automatic selection of modulation schemes, including BPSK, QPSK, 16 and 64 QAM, to maximize spectral efficiency and hence increase revenue potential for a given deployment scenario.

The AN-50 is equipped with a narrow beam antenna to provide high directivity for long-range operations, beyond 50 km in line of sight (LOS) conditions, and up to 10 km in NLOS.

The guide will help you with the following:

- Unpacking the AN-50 System
- Set-up and Connections
- System Configuration and Operation
- Trouble Shooting Tips
- Understanding Fixed Wireless Access Systems
- Glossary of Terms
- AN-50 Specifications

¹ Future software upgrade.

2. Important Safety Information



- 1 Read the user's manual and follow all operating and safety instructions.
- 2 Keep all information for future reference.
- 3 This product is supplied with a grounding power plug. Do not defeat this important safety feature.
- 4 The power requirements are indicated on the product-marking label. Do not exceed the described limits.
- 5 Replace the fuse with the correct type and current rating.
- 6 Position the power cord to avoid possible damage and do not overload wall outlets.
- 7 Do not place this product on or near a direct heat source.
- 8 Do not operate this device near water or in a wet location.
- 9 Use only a damp cloth for cleaning. Do not use liquid or aerosol cleaners. Disconnect power before cleaning.
- 10 Protect the unit by disconnecting the power during a lightning storm or if it is not used for long periods of time.
- 11 Locate the AN-50 on a stable horizontal surface or securely mount it in a 19" Telco rack.
- 12 The T-58 Series Transceiver unit must not be located near power lines or other electrical power circuits.
- 13 The T-58 Series Transceiver units must be properly grounded to protect against power surges and accumulated static electricity. It is the user's responsibility that this device is installed in accordance with Section 810 of the National Electrical Code, ANSI/NFPA No. 70-1984 or Section 54 of the Canadian Electrical Code. These codes describe correct installation procedures for grounding of the transceiver unit, mast, lead in wire and discharge unit, location of discharge unit, size of grounding conductors and connection requirements for grounding electrodes. It is recommended that the installation of a transceiver unit be contracted to a professional installer.

3. Important Service Information



- 1** Refer all repairs to qualified service personnel. Do not remove the covers or modify any part of this device.
- 2** Disconnect the power to this product and return for it for service, if the following conditions apply:
 - a) The unit does not function by following the operating instructions outlined in the user's manual.
 - b) Liquid has been spilled, an object is inside or rain has been exposed to the AN-50 Access Node unit.
 - c) The product has been dropped or the housing is damaged.
 - d) The power cord or plug is damaged.
- 3** Ensure that only parts that are specified by the product manufacturer are used for replacement.

NOTICE

1 - This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

2 - A Class A digital device is marketed for use in a commercial, industrial or business environment, exclusive of a device which is marketed for use by the general public or is intended to be used in the home.

3 - Changes or modifications not expressly approved by Redline Communications Inc. could void the user's authority to operate the equipment.

4. Unpacking the AN-50 System

The AN-50 product comes packaged with the following items (refer to Figure 1 for a pictorial view):

- AN-50 Terminal (indoor unit)
- Transceiver mounted to Antenna (outdoor units)
- Antenna mounting Kit
- Power Cord and IF Cable (100 ft)
- User manual

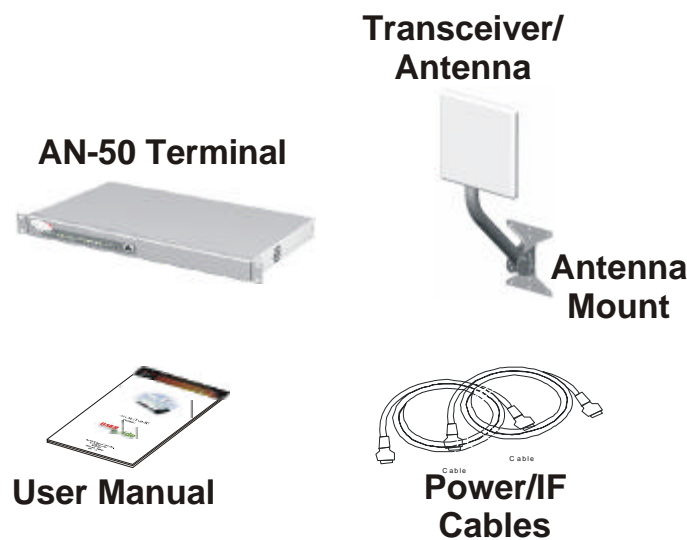


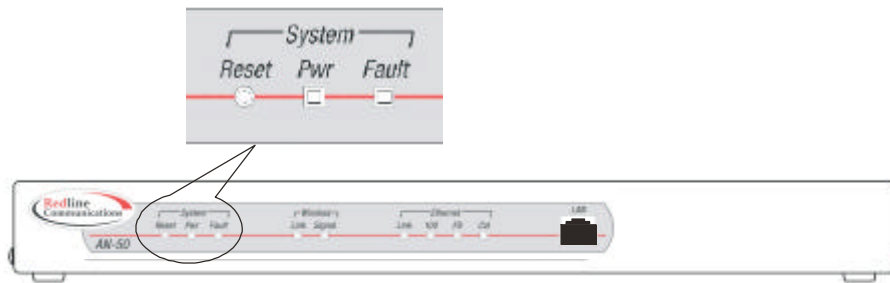
Figure 1 The AN-50 System out of the box.

4.1. The AN-50 Terminal at a Glance

The front panel of the AN-50 terminal comprises three main status indicators: System, Wireless, and Ethernet and a LAN interface.

a) System

The system portion of the front panel features a reset switch, and two LEDs; Pwr and Fault, as shown in the figure below. Note, at power on, all LEDs will light for a brief moment to indicate the LEDs are properly functioning.



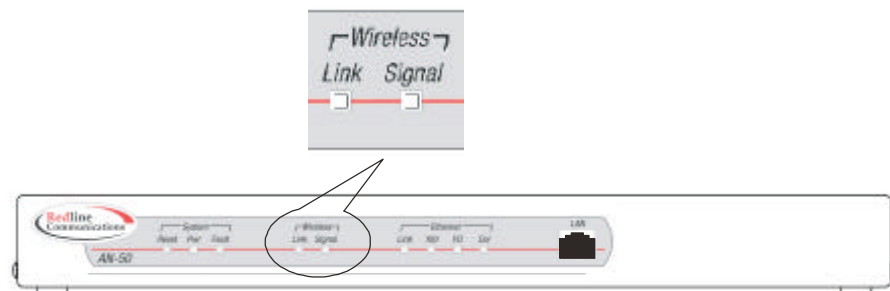
Reset – A paper clip, or similar object, can be used to reset the system by depressing the “Reset” button recessed in the front panel. The reset button is used to reactivate the terminal in the event that it is functioning improperly or is in a state of suspension. Depressing the reset button for more than 5 seconds will restore the unit’s operating system back to the last successfully loaded software revision.

Pwr – The “Pwr LED” lights solid and green when the AC power is properly applied to the terminal. In the event the power fails or the cord is disconnected, the “Pwr LED” light will not illuminate.

Fault – The “Fault LED” will light solid and red when a serious fault is detected within the system. If this occurs, depress the “Reset” button for more than 5 seconds to try to restore the terminal. If the problem persists, then contact the Redline support line.

B) Wireless

The wireless portion of the front display contains two LEDs, one for the Link and the other for Signal, as shown below.



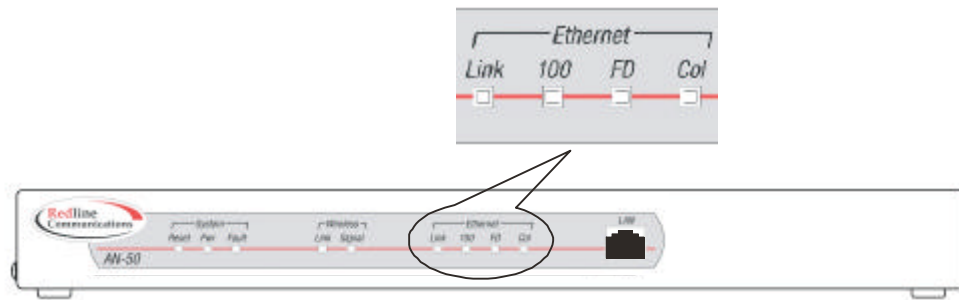
Link – The “Link” LED lights solid and green when the communication link to the remote terminal is functioning properly at the specified data rate (refer to the Configuration section for details regarding data rate). The LED will flash green when the system operates at a lower data rate.

When the link is compromised, the LED stops illuminating.

Signal – The “Signal” LED flashes in amber when signal errors are detected due to degradation in the communication link.

C) Ethernet

The Ethernet portion of the front panel display comprises four main LEDs, including Link, 100, FD and Col, as shown below.



Link – The “Link” illuminates solid and green when the Local Area Network (LAN) connection to the remote terminal is functioning properly.

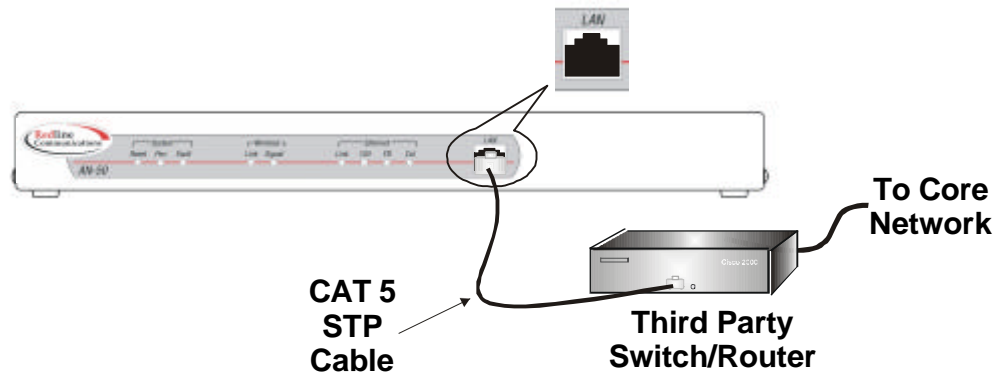
100 – The “100” LED lights solid and green when the Ethernet port is operating at 100 Mb/s. The LED will not illuminate if the port is operating in 10 Mb/s mode. Note the Ethernet port automatically selects the speed through auto-negotiation with either the host computer/server or router/switch.

FD – The “FD” LED illuminates solid and green when the LAN connection is operating in Full Duplex mode. The LED will not illuminate if the system is operating in Half Duplex mode. The system automatically selects the duplex mode through auto-negotiation with the host computer or switch.

Col – The “Col” LED flashes in amber when collisions occur in the LAN traffic.

D) LAN Interface

The LAN interface is an Ethernet port, also known as a 10BaseT port, which is used to connect the AN-50 to either the core network or to a host computer. A router or switch will likely be used to complete the connection to the core network, as shown in the next figure.



The rear of the terminal comprises two interfaces; the power cord interface, and F-Type female connector to which the IF cable attaches.

4.2. The AN-50 Transceiver/Antenna at a Glance

The AN-50 transceiver is mounted to the back of the flat plate antenna, as shown in Figure 2. The antenna features a bracket to mount onto a 1-inch pole.

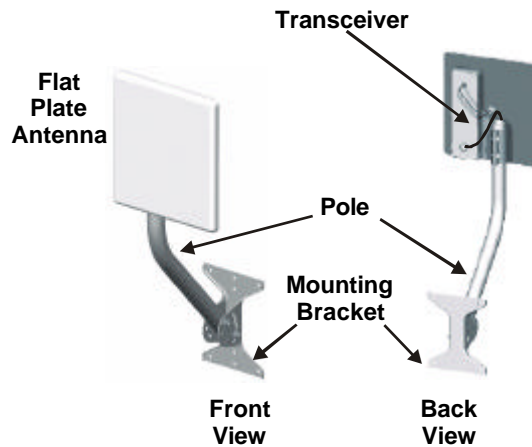


Figure 2 Antenna/Transceiver close up.

The pole is approximately three (3) feet in length and features a curve profile to facilitate protruding building infrastructures, such as eaves. A mounting bracket at the bottom of the pole is used to attach the antenna to sides of buildings or onto other poles of varying diameters.

Before connecting the AN-50 system, it is important to review the important safety tips provided in the beginning of this manual.

5. AN-50 Terminal Installation

This section describes the easy steps to follow to install the AN-50 terminal and associated equipment. A Class A digital device that is marketed for use in a commercial, industrial or business environment.

Figure 3 illustrates the three primary cables that are required to complete the installation including; Power, IF and CAT 5 (not included). The power cord connects to a standard North American 120 VAC power outlet, the IF cable connects the terminal (located indoors) to the transceiver (located outdoors), and the CAT 5 which connects the terminal to a switch or router for interface to the core network.

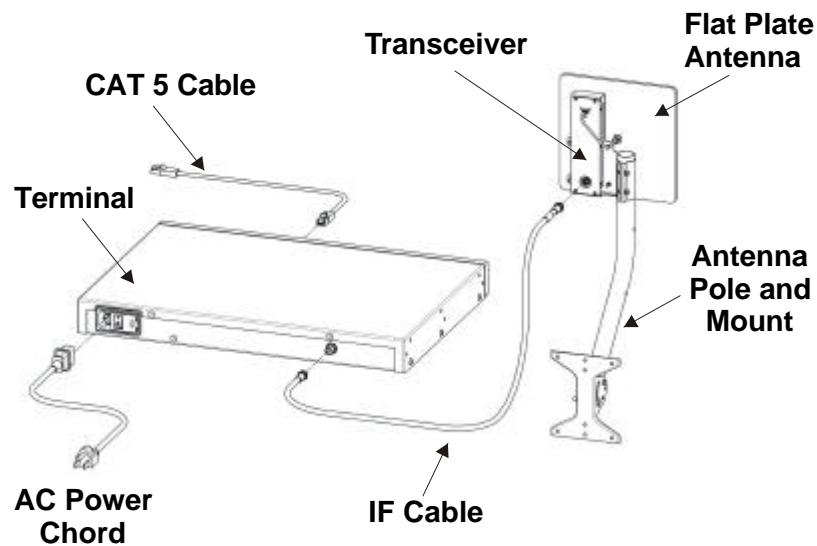


Figure 3 AN-50 installation.

The terminal is for indoor installation only while the transceiver and antenna are mounted externally. The principal steps in installation are:

1. Conduct a general site survey
2. Install the antenna
3. Run the IF cable
4. Install the terminal

Each step is addressed in more detail below.

5.1. General Site Survey

The first step in installing the AN-50 system is to conduct a general site survey. Although the installation steps are relatively straightforward, they do involve

some construction and electrical work, which can be best performed by professional installers.

The following site survey steps should be followed:

Determine the optimum location: The first key step in the deployment exercise is to determine and identify building candidates that can be used to support the PTP link. A critical parameter to consider is the range at which the two terminals are required to operate. Range performance is determined by empirical formulas that consider a number of equipment and environmental factors described in Section 8 of this manual. Ensure that the installation sites meet the above range performance requirements before moving to the next step. There are a number of cell planning tools available in the market today, which make use of topographic data to help with the cell planning.

Obtain a copy of the facility blueprints and verify their accuracy. The installation process will require penetrating the building to run the IF cable between the outdoor and indoor units. In this regard, it is imperative that the blueprints of the building are up to date and accurate.

Identify a Clear Line of Sight Path. For maximum performance, it is recommended to mount the antenna in a location where there is line of sight to the remote terminal. If possible, the antenna should be positioned such that there is maximum clearance within the first Fresnel zone of the direct path. Refer to Section 8 for a full description of Fresnel zone clearance and its impact on signal propagation. The best means of achieving Fresnel zone clearance is to mount the antennas as high as possible, on either a tall building or tower, as shown in Figure 4. Although the system is designed to operate in obstructed line of sight (NLOS) conditions, as a result of the OFDM technology it incorporates, LOS deployments provide much greater throughput capability.

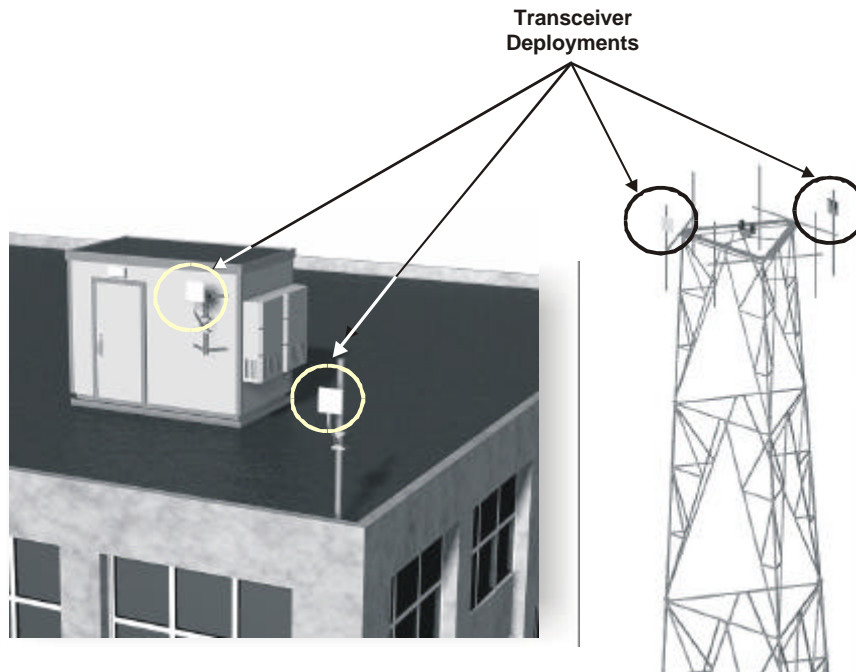


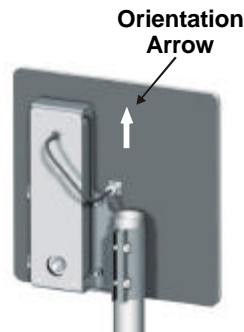
Figure 4 Antenna deployment options.

Identify potential sources of RF interference. Measure for any possible RF interference on the roof-top or tower by utilizing a RF power meter or spectrum analyzer. RF interference arises from any other wireless system operating within the same frequency band of the AN-50. Note that the AN-50 can operate in any one of the four channels designated for UNII band, therefore, there is some flexibility in addressing or avoiding the interference should other transmitters, in relatively close proximity, pose a problem.

Verify the location of access points. With the remote terminal transmitting, use a spectrum analyzer to ensure there is adequate signal strength arriving at the candidate location for the antenna.

5.2. Installing the Antenna

Once the site survey has been completed, and the exact location of the antenna identified, the next step is to mount the AN-50 transceiver/antenna onto either a building structure or pole. The antenna and mounting brackets have been designed to withstand strong winds (see specifications at the end of this user guide). It is imperative that all bolts and nuts are securely fastened to avoid any movement that could introduce misalignment. Note that there is an arrow on the back of the antenna, which must be pointing upwards to indicate proper orientation when the antenna is deployed.



For building mounts, ensure the surface to which the mounting bracket will be attached is flat and vertical (use a level). Install the bracket using four lag screws, with washers. There are two center holes that can be used to mount the bracket onto a 2x4 stud. Make sure the surface to which the bracket is attaching is structurally sound and can withstand the specified wind loading.

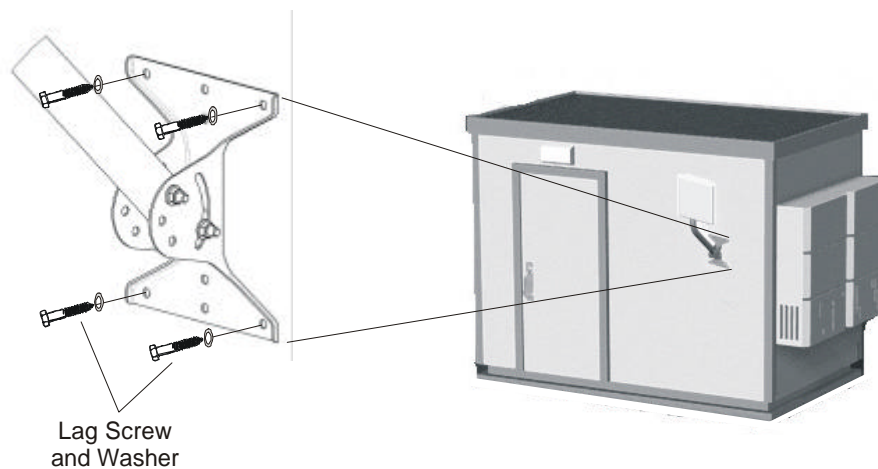


Figure 5 Mounting the antenna on a building structure.

Once the antenna is mounted, it has to be aligned in both the azimuth and elevation planes. The elevation alignment is accomplished by loosening the two bolts attached to the mounting bracket, as shown in Figure 6, and slanting the pole until the antenna is aligned in elevation towards the remote terminal. The azimuth alignment is achieved by loosening the two bolts on the antenna bracket, and rotating the antenna until alignment is achieved.

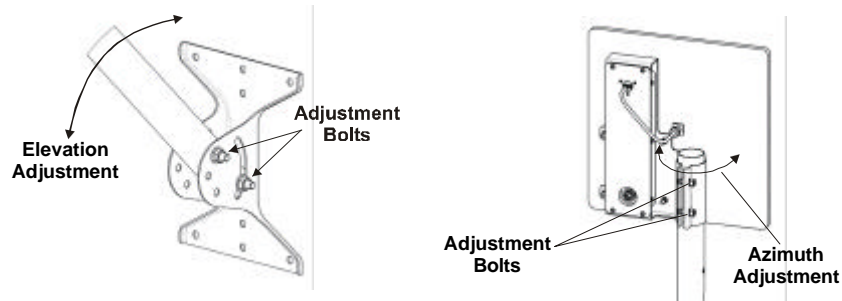


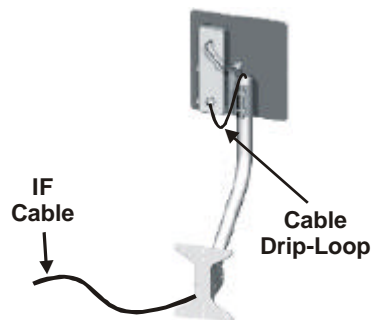
Figure 6 Aligning the antenna.

Note that the antenna can also be mounted onto another pole separate from the one supplied with the system. Contact Redline for different antenna mounting options.

5.3. Running the IF Cable

The system is equipped with a 100 foot of RF cable to interconnect the transceiver and terminal. The following steps define the cable installation:

1. Run the cable through the antenna pole as shown below. Add extra cable length to produce a drip-loop, as shown, to prevent water from accumulating onto the connector. The IF cable is equipped with 75 ohm F-type connectors at both ends, however, it is important to note that one end of the cable is designated for outdoors, as it is a specialized weather proof design, while the other end is to be connected to the indoor terminal unit. A label is attached to one end of the cable to clearly indicate the connector that is intended for outdoors. Make certain the 'Outdoor' label is attached to the end of the cable that you plan to connect to the radio.



2. Connect the F-type male connector from the cable to the female connector attached to at the bottom of the transceiver. Note the connector at the top end of the transceiver is connected via cable to the antenna itself.

3. Run the cable into the building by drilling a hole in the wall, where you want the RG-6 to enter, or through an existing conduit. Local codes require, at a minimum, that a ground cable be used, with a grounding block installed as close as possible to the point of cable entry. An optional lightning arrester may be used to protect the terminal and other indoor equipment from sudden electrical surges. There are a variety of choices for lightning arresters – it is recommended to use a professional installer to determine the optimized solution.
4. Once inside the building, connect the cable to the F-type female connector located on the back of the terminal.

5.4. Install the Terminal

Once the IF cable is connected, the terminal is ready to be installed and configured. The first step is to connect a CAT 5 cable from the Ethernet port to the host IP appliance. Note a CAT 3 cable can be used if the terminal operates in 10BT mode (10 Mb/s data rate). However, even with 10BT connections today, it is recommended to use CAT 5 cabling initially in anticipation for the increased speed in the future. As noted previously, the data rate is determined automatically, depending on the type of IP device connected to the system.

If the terminal is used for connection to a core network, then the IP appliance is likely to be a router or switch as shown in Figure 7. In this configuration, a cross-over Ethernet cable is required.

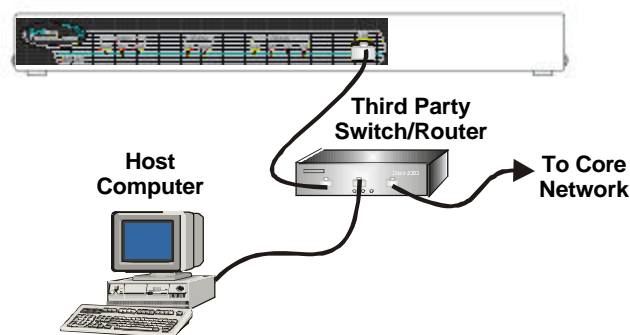


Figure 7 AN-50 connected to switch/router

For the remote terminal, the AN-50 may be connected directly to the host computer, as shown in Figure 8. In this configuration, a straight-through Ethernet cable is required.

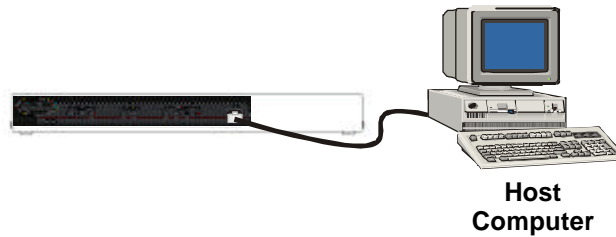


Figure 8 AN-50 connected to host computer.

The remote terminal may also be connected to a simple hub, for distribution to several computers in a local network configuration, as shown in Figure 9. If the terminal is connected to simple, hub, then a cross-over cable is required.

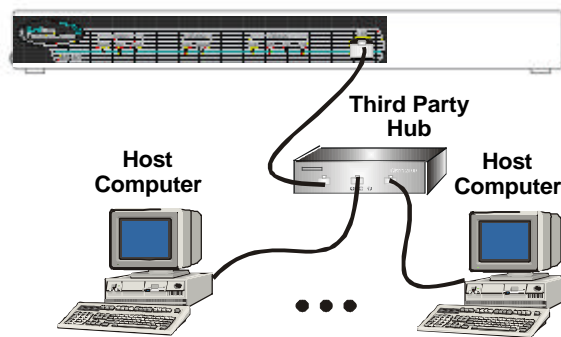


Figure 9 AN-50 connected to a hub.

Figure 10 provides an illustration of the pin-out designation for the AN-50 LAN interface, to help you establish other implementations that are not addressed in this manual.

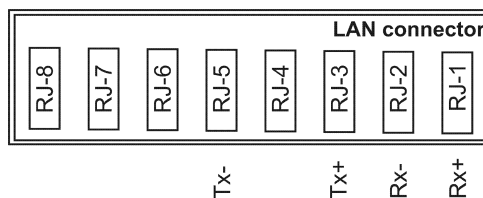


Figure 10 AN-50 LAN Ethernet Port pin-out.

Now connect the AC cord to the 120 VAC outlet and turn the terminal on using the toggle switch at the rear of the unit. The system “Pwr” LED should illuminate green to indicate proper power to the unit. If this LED is not on and/or the “Fault” LED illuminates red, then there is a problem with the unit. Refer to the diagnostics section, Section 7 on page 32, for further details on how to address system faults. The system is now ready to be configured.

NOTICE

- 1** - The Model AN-50 is used as a fixed, point-to-point device that required to be professionally installed by Redline Communications Inc. or trained professional sub-contractors.

- 2** - For Compliance with FCC RF Exposure Requirements, the transmitting antenna is required to be mounted outdoor on the building roof or antenna tower and located at a safety distance of more than 1.5 meters (5 feet) from the transmitting antenna to any person's body

- 3** - The Model AN-50 is a fixed, point-to-point device that is certified by FCC and Industry Canada with the 5.8 GHz Directional Antennas, Models MT-486001 (28 dBi Gain) and MT-485002 (23 dBi)

6. System Configuration and Operation

This section describes the procedures for configuring and operating the AN-50 terminal. All communication to the AN-50 is achieved over the Ethernet port, using Hypertext transfer protocol (HTTP). This offers the advantage of allowing the operator to access and control the AN-50 remotely from any geographical location, providing the operator at the remote site has access to the Internet. It is important to note, for the initial set-up, the operator must connect the host computer locally to the AN-50 as shown in Figure 8.

Although the procedures to configure the AN-50 are relatively straightforward, some familiarity with basic computer networks and administration would be helpful.

6.1. Home Page Screen

The first step is to log onto the AN-50 home page from a web browser, such as Microsoft Internet Explorer, by typing in the system's IP address. The system's default address (from the manufacturer) is 192.168.25.2, which will take you to the screen shown in Figure 11.

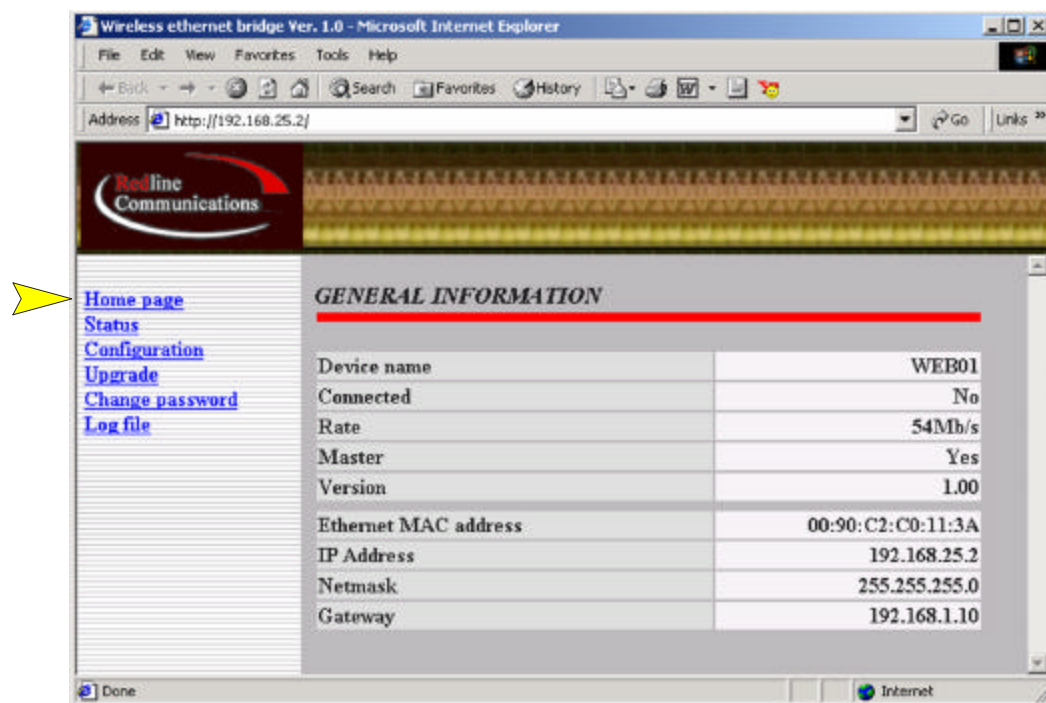


Figure 11 AN-50 Home Page.

If the screen does not match the illustration in the figure, then check for possible entry errors and retype if necessary, otherwise refer to the diagnostics section, Section 7, for further assistance.

The home page main menu includes the following selections:

- *Home Page*
- *Status*
- *Configuration*
- *Change Password*
- *Log File*

Located to the right of the main menu is a summary of general information related to the configuration and status of the local unit. This page only presents information, and does not accept inputs from the user. Data, shown on this screen, is entered via the **Configuration** screen, described later. The following is a brief description of each field in the **General Information** screen:

Device Name is the name of the device specified by the user. The name can consist of any combination of letters or numbers.

Connected: Yes indicates the terminal is communicating properly to the distant terminal. **No** indicates there is no communication with the distant terminal.

Rate: Indicates the current data throughput of the system. With adaptive modulation, this data rate may change over time, depending on the prevailing propagation conditions.

Master: Indicates if the system is serving as the master or slave. Note that in a point-to-point link only one AN-50 terminal can be the master.

Ethernet MAC address: Specifies the Ethernet address of the local host computer or server.

IP Address: Specifies the IP address of the local host computer or server.

Netmast: Sets the IP network mast for the local host computer or server.

Gateway: Specifies the local gateway IP address.

Note that a password is required to enter into any of the following user screens:

- Configuration
- Upgrade
- Change Password

An example of the username and password screen is shown in Figure 12. The default value (set from the factory) for both **username** and **password** is **'admin'**. Refer to the Change Password screen to change this value for future sessions. Also, note that the User Name cannot be changed from **admin**.



Figure 12 Username and password screen.

6.2. Bridge Status Screen

Clicking on *Status* in the main menu will bring up the Bridge Status screen. This screen provides a status on General Info, Ethernet LAN statistics and Wireless Statistics, as shown in Figure 13.

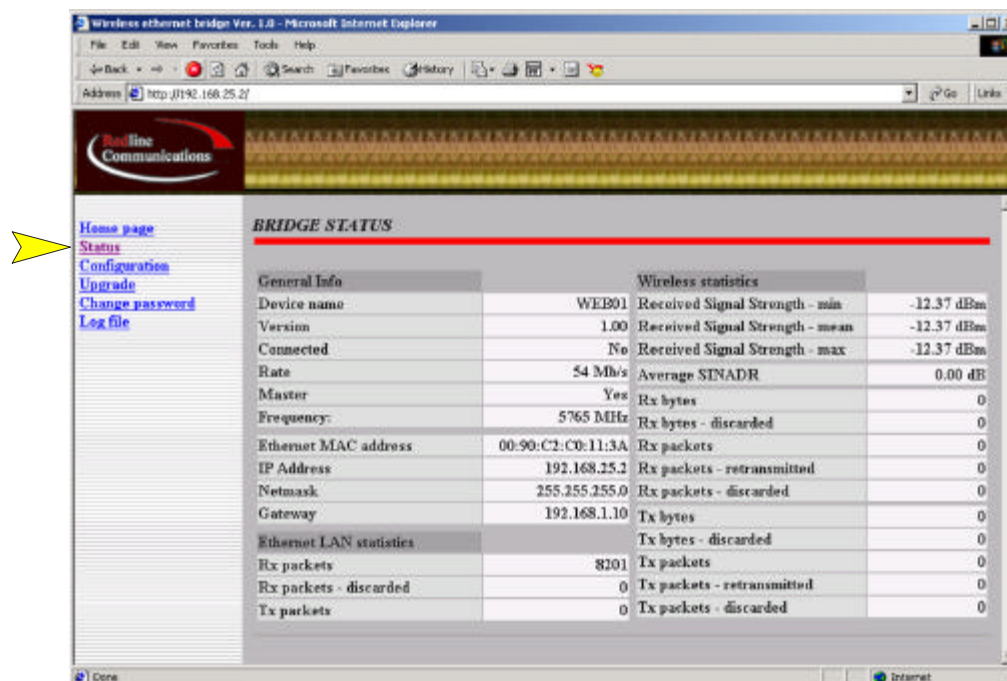


Figure 13 Bridge status screen.

General Info: Identical to the information found on the home page, with the addition of **Frequency**, which represents the operating channel of the link. The system can be configured to operate over 9 distinct channels, as described below.

Ethernet LAN Statistics:

Rx packets: Counts the number of packets successfully received by the local system.

Rx packets - discarded: Counts the number of packet errors received by the local system.

Tx packets: Counts the number of Ethernet packets transmitted by the local system.

Wireless Statistics:

Received Signal Strength – min: Indicates the minimum received signal strength measured over time.

Received Signal Strength – mean: Indicates the average received signal strength received, averaged over time.

Received Signal Strength – max: Indicates the maximum received signal strength measured over time.

Average SINADR: Indicates the average signal to noise ratio measured over time. The ratio is based on the digital information provided from the output of the A/D converter.

Rx bytes: Indicates the total number of bytes received over the air.

Rx bytes - discarded: Indicates the number of bytes with errors received over the air from the remote terminal.

Rx packets: Indicates the number of packets received over the air from the remote terminal.

Rx packets - retransmitted: Indicates the number of packets retransmitted over the air from the remote terminal.

Rx packets - discarded: Indicates the number of packets, originating from the remote terminal that is lost over the air due to degradation in the RF link.

Tx bytes: Indicates the total number of bytes transmitted over the air.

Tx bytes - discarded: Indicates the number of bytes with errors transmitted over the air to the remote terminal.

Tx packets: Indicates the number of wireless packets (including Ethernet frames and error correction bytes) transmitted over the air by the local terminal.

Tx packets - retransmitted: Indicates the number of packets retransmitted over the air by the local terminal. The retransmission scheme is based on the Acknowledge/Request (ARQ) algorithm that detects when packets are lost and makes a request to the MAC scheduler to repeat transmission of the lost packets.

Tx packets - discarded: Indicates the total number of packets lost over the air due to degradation in the RF link.

6.3. Configuration

The configuration page provides a simple to use Graphical User Interface (GUI) for the operator to input the complete set of system parameters for both the Ethernet and Wireless components of the AN-50 unit (refer to). To store the parameters into memory, press the '***Save Configuration***' button from the bottom of this page. This operation will be recorded into the '***Log file***'.

The Ethernet configuration includes the following fields:

Ethernet Configuration:

Device name: The device name is an alphanumeric identifier for the local terminal, which can consist of any combination of letters and numbers. The default name for the AN-50 system from the factory is set to WEB01. The device name remains with the system, even during power off states, until the operator re-types a new name using this menu field.

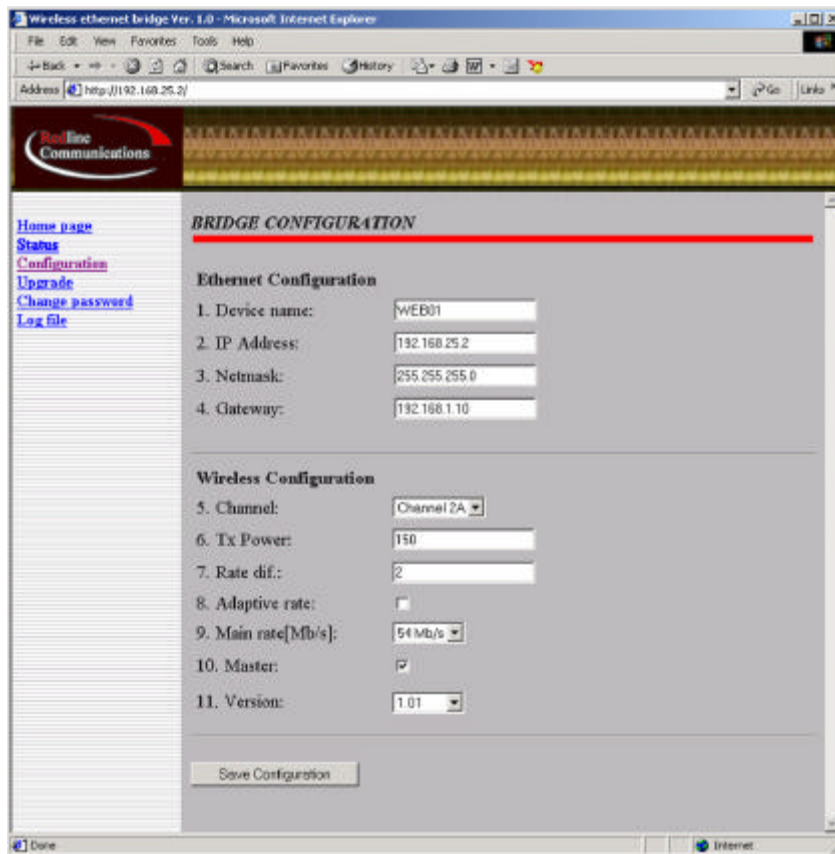


Figure 14 Bridge configuration screen.

IP address: This field is used to provide an IP address for the local AN-50 terminal. The default address from the factory is 192.168.25.2. For the initial set-up, the terminal should not be connected to the Internet network, i.e. the host computer should be connected directly to the terminal Ethernet port, to avoid address conflicts with other devices in a public network. Once the IP address has been set, the terminal can be connected to the core network, where it can receive either static or dynamic addressing (DHCP) in future configuration updates.

Netmask: This field is used by the operator to set the desired network mask. The netmask value is typically set to "255.255.255.0 (Class C subnet), which prevents certain local devices from going out into the wireless network.

Gateway: This field is used to specify the IP address of the gateway with which the AN-50 is communicating through the core network.