LoopStar™ LPS-20xR

Span-Powered Access Point

Technical Practice

12A-LPS20xR1

Model	xDSL	List	CLEI Code
LPS-200R	G.SHDSL	1A(x)	WDMFA00A~~
LPS-200R	G.SHDSL	1B(x)	WDMFB00A~~
LPS-202R	ADSL	1A(x)	WDUIAAAA~~
LPS-202R	ADSL	1B(x)	WDUIAABA~~

Section SCP-LPS20x-011-012-01H

Revision History

Revision	Release Date	Revisions Made
01	December 20, 2004	Initial Release.

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Using this Technical Practice

The following style conventions and terminology are used throughout this guide.

Element	Meaning
Bold font	Text that you must input exactly as shown (e.g., type **1** for card 1), menu buttons (e.g., **ACCEPT SHELF OPTIONS**) or menu screen options (e.g., **ALARMS** screen) that you must select
Italic font	Variables that you must determine before inputting the correct value (e.g., *Password*)
Monospace font	References to screen prompts (e.g., Invalid Password...Try Again:.)

Reader Alert	Meaning
📝	Alerts you to supplementary information
IMPORTANT ⚠	Alerts you to supplementary information that is essential to the completion of a task
ATTENTION	Alerts you to possible equipment damage from electrostatic discharge
CAUTION	Alerts you to possible data loss, service-affecting procedures, or other similar type problems
WARNING	Alerts you that failure to take or avoid a specific action might result in hardware damage or loss of service
DANGER	Alerts you that failure to take or avoid a specific action might result in personal harm

EU Compliance

This product has been CE marked in accordance with the requirements of European Directive 73/23/EEC; the following mentioned product is in conformity with Low Voltage Directive 73/23/EEC in order to comply with the requirements in the Council Directive 73/23/EEC relating to electrical equipment designed for use within certain voltage limits and the Amendment Directive 93/68/EEC.

For safety evaluation of the compliance with this Directive 73/23/EEC, these standards were applied: IEC 60950:1999, EN 60950:2000.

InspectingYour Shipment

Upon receipt of the equipment:

- Unpack each container and visually inspect the contents for signs of damage. If the equipment has been damaged in transit, immediately report the extent of damage to the transportation company and to ADC. Order replacement equipment, if necessary.
- Check the packing list to ensure complete and accurate shipment of each listed item. If the shipment is short or irregular, contact ADC as described in Product Support on page 177. If you must store the equipment for a prolonged period, store the equipment in its original container.

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INTRODUCTION

There are several versions of Access Points (APs) and AP/Access Controllers (ACs) available: the LPS-20xR L1A(x) Outdoor and the LPS-20xR L1B(x) Low Profile powered units series (Table 1) and the LPS-21xR L1A(x) Outdoor and the LPS-21xR L1B(x) Low Profile powered units Table 2 on page 2.

xDSL is used to indicate G.SHDSL and/or ADSL transport technologies unless otherwise specified.

Table 1. LPS-20x Versions

xDSL	Catalog Number	Country Code	CLEI for FCC	xDSL
G.SHDSL Outdoor	LPS-200R L1A1	North America	WDMFA00A~~	G.SHDSL Outdoor
	LPS-200R L1A2	ETSI	N/A	
	LPS-200R L1A3	France		
	LPS-200R L1A4	Japan		
	LPS-200R L1A5	Spain		
G.SHDSL Low Profile	LPS-200R L1B1	North America	WDMFB00A~~	G.SHDSL Low Profile
	LPS-200R L1B2	ETSI	N/A	
	LPS-200R L1B3	France		
	LPS-200R L1B4	Japan		
	LPS-200R L1B5	Spain		
ADSL Outdoor	LPS-202R L1A1	North America	WDUIAAAA~~	ADSL Outdoor
	LPS-202R L1A2	ETSI	N/A	
	LPS-202R L1A3	France		
	LPS-202R L1A4	Japan		
	LPS-202R L1A5	Spain		
ADSL Low Profile	LPS-202R L1B1	North America	WDUIAABA~~	ADSL Low Profile
	LPS-202R L1B2	ETSI	N/A	
	LPS-202R L1B3	France		
	LPS-202R L1B4	Japan		
	LPS-202R L1B5	Spain		

Table 2. LPS-21x Versions

xDSL	Catalog Number	Country Code	CLEI for FCC	xDSL
G.SHDSL Outdoor	LPS-210R L1A1	North America	WDMFD00A~~	G.SHDSL Outdoor
	LPS-210R L1A2	ETSI	N/A	
	LPS-210R L1A3	France		
	LPS-210R L1A4	Japan		
	LPS-210R L1A5	Spain		
G.SHDSL Low Profile	LPS-210R L1B1	North America	WDMFE00A~~	G.SHDSL Low Profile
	LPS-210R L1B2	ETSI	N/A	
	LPS-210R L1B3	France		
	LPS-210R L1B4	Japan		
	LPS-210R L1B5	Spain		
ADSL Outdoor	LPS-212R L1A1	North America	WDMFF00A~~	ADSL Outdoor
	LPS-212R L1A2	ETSI	N/A	
	LPS-212R L1A3	France		
	LPS-212R L1A4	Japan		
	LPS-212R L1A5	Spain		
ADSL Low Profile	LPS-212R L1B1	North America	WDMFG00A~~	ADSL Low Profile
	LPS-212R L1B2	ETSI	N/A	
	LPS-212R L1B3	France		
	LPS-212R L1B4	Japan		
	LPS-212R L1B5	Spain		

This technical practice covers all AP versions. These versions include both G.SHDSL and ADSL (xDSL), outdoor and low profile enclosures, and the LPS-20x software.

OVERVIEW

The LPS-20xR is an outdoor/low profile span-powered Access Point (AP). The LPS-300C Central Office (CO) power module provides span powering to the LPS-20x. Each LPS-300 can power two individual LPS-20xs. There are currently two types of APs available: the LPS-20xR L1A Outdoor series and the LPS-20xR L1B Low Profile series units.

Telco carriers in the Wireless Fidelity (Wi-Fi®) market can create a carrier class access point with the following features:

- Span powering over symmetric or asymmetric, rate adaptive Digital Subscriber Loop (DSL) from any Digital Subscriber Line Access Multiplexer (DSLAM) supporting xDSL transport
- Hardened outdoor packaging
- Roadmap support for class Quality of Service (QoS) in the Asynchronous Transfer Mode (ATM) DSL backhaul
- Simple Network Management Protocol (SNMP) Management Information Base (MIB), allowing integration into their management system
- Product family support for fatter pipe, NxDS1 backhaul
- Low first-cost deployment from remote cabinet DSLAM and Digital Loop Carrier (DLC) platforms
- NEBS and OSMINE compliant

Wi-Fi deployment fits into the overall DSLAM broadband services market. It allows Telco carriers to use their existing infrastructure to easily be part of the public Wi-Fi arena. The LPS-20x is a simple end device that, with the exception of the span powering, uses standards based interfaces. This permits it to be deployed directly from existing DSLAM equipment without the need to introduce new CO ATM switching elements into the Telco carrier's network.

The two-wire dry xDSL interface from the DSLAM is routed through a power shelf co-located in the CO (Figure 1). The LPS-300C located in the power shelf does not regenerate the xDSL signal; rather, it superimposes a Class A2, DC powering voltage on the outside plant (OSP) interface. This is a standard xDSL signal since it comes from a DSLAM. Therefore, there is no proprietary signal added to the stream.

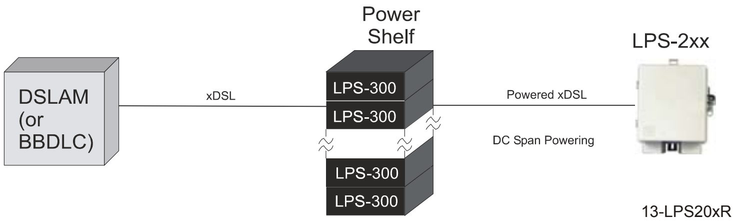


Figure 1. CO-Based DSLAM Deployment

DESCRIPTION

WI-FI CO-BASED DSLAM DEPLOYMENT

Using existing DSLAMs, a G.SHDSL or ADSL pair is routed to the LPS-300C power card in the HMS-318 power shelf (Figure 2). The LPS-300C is a 3192 double-wide card that supports two powered xDSL pairs per module. A total of 11 LPS-300C cards can be installed in the UL-60950 compliant HMS-318 power shelf for a total of 22 span-powered pairs. The LPS-300C, without affecting the xDSL signal, adds power to the span to operate the LPS-20x.

The access point converts the ATM data coming in on the span and bridges it an Ethernet transparent bridge broadcasting via 802.11b Wi-Fi standards to any client who has a wireless Network Interface Card (NIC).

The Access Controller forwards to the RADIUS Server authentication requests, then the RADIUS Server authenticates the user. Once authenticated, the user has access to the internet. The Access Server tracks the connection time for billing purposes. Some applications may include the replacement of pay phones with LPS-20xs to create a wireless public hotspot.

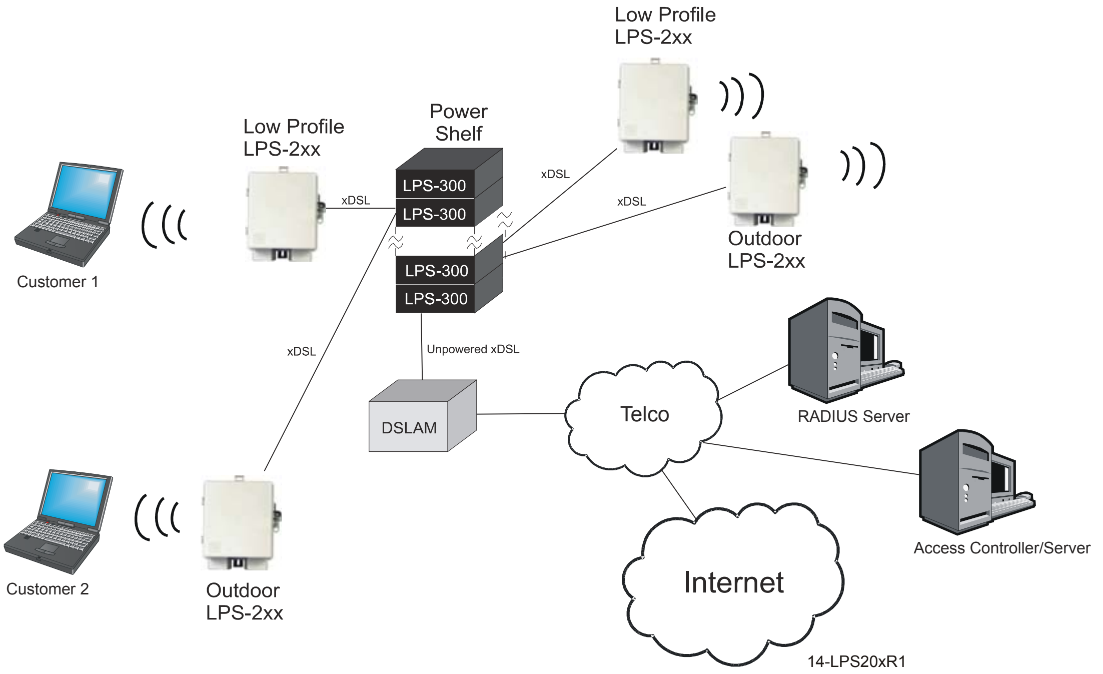


Figure 2. Wi-Fi CO-Based DSLAM Deployment

G.SHDSL RATE/REACH

G.SHDSL is a symmetrical rate adaptive transport technology and ranges from 72 kb/s to 2.368 Mb/s in 64 kb/s increments over a single twisted pair. The LPS-20x defaults to rate adaptive mode for best link speed. The range on an unimpaired G.SHDSL cable is shown in Table 3. The G.SHDSL attenuation is less than 0.5 dB.

Table 3. G.SHDSL Reach/Rate

Cable Gauge	Reach (kft)	Rate (kb/s)
26 AWG	1-7	2320
	8	1808
	10	1048
	12	656
	14	464
	16	336

ADSL Rate/Reach

ADSL is an asymmetrical rate adaptive transport technology and ranges from 288 kb/s to 8000 kb/s downstream and 128 kb/s to 800 kb/s upstream. The range on an unimpaired ADSL cable (Fast Mode) is shown in Table 4 and (Interleaved Mode) in Table 5.

Table 4. ADSL Reach/Rate - Fast Mode

Cable Gauge	Reach (kft)	Rate - Upstream (kb/s)	Rate - Downstream (kb/s)
26 AWG	1-8	800	8000
	10	736	5728
	12	608	3200
	14	450	1728
	16	256	768
	18	128	288

Table 5. ADSL Reach/Rate - Interleaved Mode

Cable Gauge	Reach (kft)	Rate - Upstream (kb/s)	Rate - Downstream (kb/s)
26 AWG	1-8	800	8000
	10	736	5728
	12	608	3520
	14	480	1728
	16	288	768
	18	128	288

LPS-20x

The power function within the LPS-20x removes the line power provided by the LPS-300C and generates the DC voltage for the LPS-20x functions (Figure 3). As shown in Figure 3, the power function is integrated with the xDSL modem circuit board. The ATM function of the modem maps all users to a single Virtual Circuit (VC) with Unspecified Bit Rate (UBR) services.

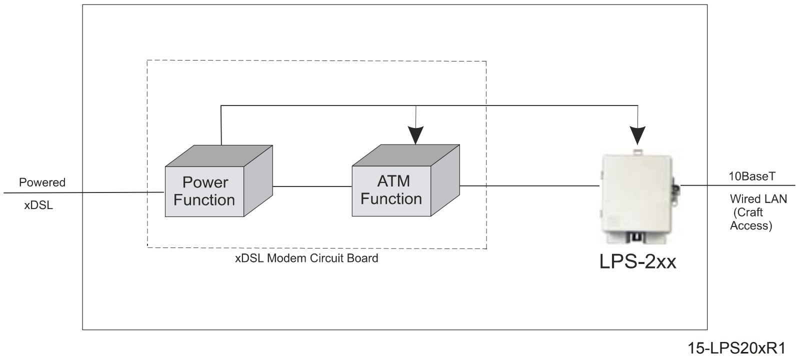


Figure 3. LPS-20x Functional Diagram

SPECIFICATIONS

Table 6 lists the specifications for the LPS-20x.

Table 6. Specifications

Category	Item	Value
Operational	RFT Circuit Voltage	± 135 Vdc
	Effective Capacitance between the tip and ring connection points of the xDSL conductors of the Telecommunication Network	
	Effective Capacitance between the tip or ring connection and earth of the xDSL conductor of the Telecommunication Network	
Power	Power Mode(s)	Span powered (local power in future)
	Power Consumption	<13 W total for AP
	Power-on operating voltage range	± 100 to ± 135 Vdc (nominal)
	Polarity	Tolerant of Tip/Ring reversals between CO power module and AP
	Voltage Class (Span Powering)	NEBS Class A2
xDSL Line	Attenuation	< 0.5 dB
	Line Code	TC-PAM
Protection	AP	Gas tube primary with secondary protection
Environmental	Temperature	-4° F to +149° F -20° C to +65° C
	Humidity	5% to 95% (non-condensing)
	Altitude	-200 ft. MSL to 13,000 ft. MSL; -60 m MSL to 4,000 m MSL
Compliance	NEBS	GR-63-CORE, Issue 2 GR-1089-CORE, Issue 3 SR-3580, Level 3
	Safety	UL/cUL 60950-1 UL/cUL 60950-21 EN 60950-1:2001 EN 60950-21:2003
	EMC	EN 300/328-2, V1.1.1:July 2000 EN 301 489-1, V1.2.1:August 2000 EN 301 489-17 V1.1.1:September 2000 EN 300 386-2 V1.1.3:December 1997

Category	Item	Value
Connectors	xDSL	1/2” terminal nuts
	Wired Local Area Network (LAN) (Craft Access)	10BaseT RJ-45 Jack
	Antenna	Dual spatial diversity internal, external antennas via dual SMA female jack connectors
Mounting	Two point wall or pole mount requiring no template	

Category	Item	Value
Physical – Low Profile	Height	10.25 in. (26.0 cm.)
	Width	8.5 in. (21.6 cm.)
	Depth	3.0 in. (7.62 cm.)
	Weight	4.0 lbs. (1.81 kg.)
Physical – Outdoor	Height	10.25 in. (26.0 cm.)
	Width	8.5 in. (21.6 cm.)
	Depth	4.8 in. (12.2 cm.)
	Weight	4.0 lbs. (1.81 kg.)

SPAN-POWERED xDSL MODEM

INTERFACE - (G.SHDSL)

On the network side, the LPS-20x supports one High-Speed Digital Subscriber Line (G.SHDSL) pair. The LPS-20x conforms to the G.SHDSL ITU-T G.991.2, Annex A and Annex B standards. However, by default, the LPS-20x comes up in auto mode, which means it automatically detects and switches to the Annex being used on the pair.

On the client side, it supports a Local Area Network (LAN) interface that is compliant with the IEEE 802.3 (10BaseT) standards and a Wireless Local Area Network (WLAN) interface that is compliant with IEEE 802.11b standards.

INTERFACE (ADSL)

On the network side, the LPS-20x supports one Asymmetric Digital Subscriber Line (ADSL) pair. The LPS-20x conforms to the ADSL ITU G.992.1, G.dmt, ANSI T1.413i2, Alcatel, Alcatel 1.4, ADI standards. However, by default, the card comes up in auto mode, which means it automatically detects and switches to the line coding type being used on the pair.

On the client side, it supports a Local Area Network (LAN) interface that is compliant with the IEEE 802.3 (10BaseT) standards and a Wireless Local Area Network (WLAN) interface that is compliant with IEEE 802.11b standards.

ATM

The ATM specifications are listed in Table 7. The LPS-20x provides Unspecified Bit Rate (UBR) service on two Virtual Circuits (VCs) – one User VC and one Management VC.

Table 7. LPS-20x ATM Requirements

Parameter	Specification
UNI	ATM Forum UNI Version 3.1 and 4.0
Signaling	ITU-T Q.2931
ATM Adaptation Layer 5	ITU I.363.5
Cell Delineation and HEC	ITU I.432
ATM Cell Format	ITU I.361
Classes of Service	UBR (CBR and VBR-nrt in future)
User VC	1 UBR bridge session
Management VC	1 UBR bridge session management can be accessed.
ATM Provisioning	Virtual Circuit Identifier (VCI)/Virtual Path Identifier (VPI) are assignable
Network Management	SNMP V2, RFC-1213, MIB II, RFC-1493 Bridge, RFC-3276 G.SHDSL, IEEE 802DOT11
Standards - G.SHDSL	ITU-T G.991.2, Annex A, B
Standards - ADSL	ITU-T G.992.1, (ADSL G.dmt), Annex A ITU G.992.5 (ADSL +) ANSI T1.413 i2 ITU G.992.3 (ADSL2, G.dmt.bis) (future)

DSL - Wide Area Network (WAN) Side

Transparent bridging is supported. The default for the management IP address is statically defined as 192.168.1.1.

ATM Internetworking Requirements (Table 8)

Table 8. LPS-20x Internetworking Specifications

Parameter	Specification
Protocol	RFC 1483 Bridged Ethernet over ATM
Encapsulation	Logical Link Control (LLC) or VC-Mux

SNMP Management

Remote SNMP v2c is supported over all interfaces (user configurable). SNMP supports all applicable groups of the following MIBs: RFC-1213 MIB II, RFC-1493 Bridge, RFC-3276 G.SHDSL and RFC-2662 ADSL. For a complete list of MIBs, refer to Configuring the SNMP Interface on page 132.

HTTP Management

This interface is used to access and configure the LPS-20x. Access to the management screens is protected with a simple username and password login. The web browser-based screens are accessible over the LAN, WAN or WLAN.

Configuration changes are done via webpages served up by the LPS-20x.

Software Download

GUI Methods

There are three supported methods to download software (under Maintenance\Firmware Updates):

- upload an image from a local drive
- immediately download an image from a remote server
- periodically download an updated image from a remote server

SNMP Method

All variations supported by the Graphical User Interface (GUI) Method are also available via SNMP. See COLUBRIS-MAINTENANCE-MIB for more information.

Start-Up

xDSL start-up is totally transparent and requires no provisioning by the customer.

Performance Monitoring

The LPS-20x collects xDSL performance metrics. Refer to Network|Ports|Status for more information.

Wi-Fi LPS-20x

Wireless Interface

Refer to Table 9 for LPS-20x Wi-Fi specifications.

Table 9. LPS-20x Wi-Fi Specifications

Parameter	Specification
Wireless Standard	IEEE 802.11B Unlicensed ISM radio band
Frequency Band	2.4 GHz to 2.4835 MHz
Range	Up to 100 meters (300 feet)
Modulation	Direct Sequence Spread Spectrum (DSSS) supporting three non-overlapping channels (CCK, DQPSK, DBPSK)
Networking	• DNS Relay • DHCP Client • IP Routing: Static and RIP v1 (RFC 1058), RIP v2 (RFC 1723) • SNMP v2c • RADIUS Client (RFC 2865 and RFC 2866) • ICMP (RFC 792) • ARP (RFC 826) • CIDR (RFC 1519) • VLAN support (static or dynamically assigned per user via RADIUS) • Up to 16 simultaneous wireless networks with distinct SSIDs/configurations • Wireless bridging with up to 6 other units
Communication	• Communicates with all Wi-Fi certified wireless adapters • Supports all operating systems
Security	• Secure connection (SSL) to on-board web based management tools • Wireless forwarding between client stations disabled by default • Optional filters to block traffic not addressed to the access controller
Management	• Web-based management tool • Secure local and remote management via HTTPS • Remote Syslog • Web-based firmware upgrades • Real-time status and information protocol traces
Interfaces	• 10BaseT port used for craft access
Media Access Protocol	CSMA/CA with ACK

Parameter	Specification
Data Rate	11 Mb/s with fallback to 5.5, 2 and 1 Mb/s
Transmit Power	23 dBm (200 mW)* 20 dBm (100 mW) (Europe) 17 dBm (50 mW) 13 dBm (20 mW)
Antennas	Dual internal antennas for receive path spatial diversity with support for external antennas
Number of Clients	254
Global Market Requirements	Complies with R&TTE Directive, EN 300-328-2 V1.2.1, EN 301 489-1, EN301 486-17

* Used in North America only. All others are 100 mW maximum (refer to Table 1 on page 1 and Table 2 on page 2).

IP Address

The default for management IP address assignment is provisioned statically.

Output Power and Range

The radio output power is software controlled and can be set to 23, (20 dBm - Europe) 17 and 13 dBm. Free air distances of 100 m can be expected when set to 23 dBm. The range varies depending on the power output. Refer to Overview on page 3 and to Introduction to the Wireless Access Point on page 29 for more information.

ANTENNA

The enclosure supports dual internal dipole antennas for diversity (Table 10). The LPS-20x always transmits on one antenna. However, dual antennas allow diversity in the receive direction. Spatial diversity in the receive path improves overall system performance by switching from one antenna to the other and selecting the antenna offering the best receive signal. The access point electronics makes this selection. You have the option to attach one or two external antennas via dual SMA connectors. One antenna is always used for transmission and reception. Therefore, for single external antenna installations, make sure that the antenna intended as the transmit/receive antenna is connected to the SMA connector labeled XMIT/RECEIVE.

Table 10. Antenna Specifications

Parameter	Specification
Frequency	2.4 to 2.5 GHz
VSWR	2.0:1
Peak Gain	2 to 3 dBi
Radiation Pattern	Omni-directional
Polarization	Vertical or Horizontal

INSTALLATION AND TEST

The LPS-20xR can be mounted to either a wall or pole.

To ensure the safety of personnel and equipment, observe the following safety rules:

DANGER ***Always treat the xDSL pair as if it were live with high voltage present. Follow local practice when installing a xDSL pair because voltages up to ±135 Vdc may be present.***

All wiring external to this product should conform to local wiring codes and practices.

ATTENTION ***STATIC SENSITIVE DEVICE – DO NOT HANDLE ANY MATERIAL WITHOUT FIRST TAKING PROPER STATIC CONTROL PRECAUTIONS.***

FOR EQUIPMENT USING AN RFT CIRCUIT

At the time of installation, a system assessment must be carried out to ensure that the effective capacitance of the total system, including the capacitance if the AP does not exceed 400 µf line to earth and 13 µf line to line.

At the time of installation, you must ensure that the voltage rating of the wiring of the AP is adequate for the normal RFT circuit voltage along with superimposed transients and that the circuits to be connected together are either all RFT-C circuits or all RFT-V circuits.

WARNING ***Maintain a minimum distance of 20 cm when operating this device to avoid RF Exposure.***

Required Tools

- (2) #10 x 1-1/2” wood screws
- (2) #10 x 1” anchors
- (2) #10 flat washers
- 1/4-inch flat-head screwdriver
- No. 1 Phillips screwdriver
- 216 Tool (can wrench) or 3/8” insulated nut driver
- 5/32-inch hex key, drilled for tamper-proof fasteners
- insulated-handle wire stripper
- insulated-handle needlenose pliers
- insulated-handle wire cutter

PREPARING THE UNIT

Step	Action
1	The xDSL wiring is threaded through the left rubber grommet at the bottom of the unit.
2	Use a knife to slice a small cross or “x” between the four small round punchouts in the left rubber grommet.

Mounting the Unit

Step	Action
1	Use the two No. 10 x 1.5-inch wood screws and flat washers provided in the Mounting Kit to attach the unit to the side of the wall or pole (Figure 4).
2	For mounting on stucco or other similar surfaces, use the two No. 10 x 1-inch anchors from the kit.

Mount the unit as shown in Figure 4, with all access openings facing down. Refer to Table 6 on page 8 for dimensions.

Open the Unit

Step	Action
1	You have full access to the interior of the unit by loosening the tamper proof screw from the front cover (Figure 4). The tamper proof screw requires a 5/32-inch drilled hex key. The tamper proof screw is preferred for improved security.
2	Push in the main access latch and open the cover.

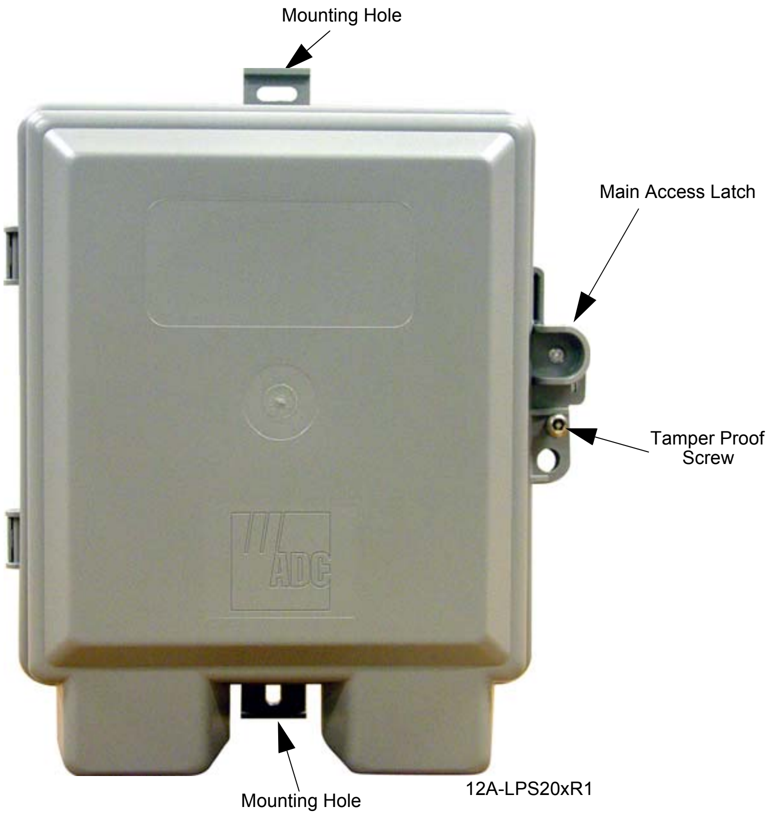
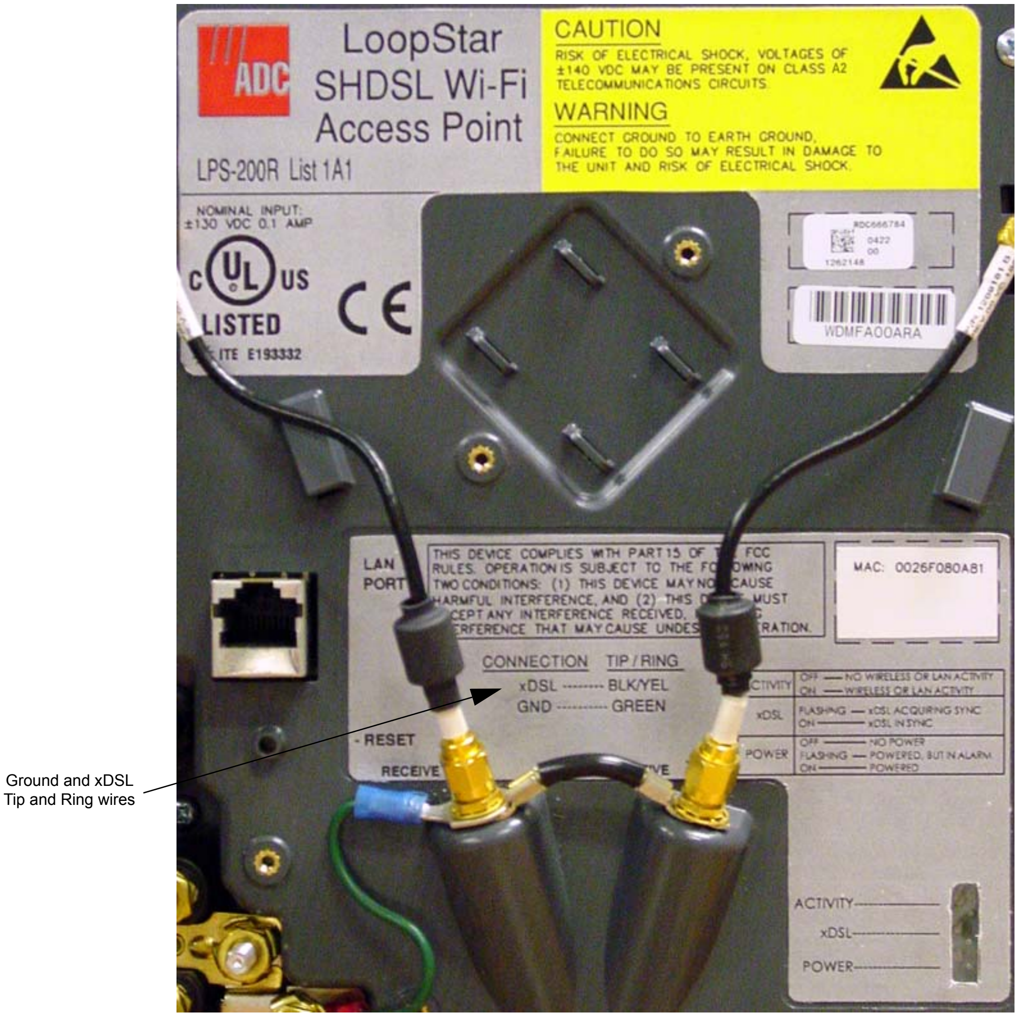


Figure 4. Main Access Door

Reference Labels

During installation, refer to the Reference labels (Figure 5) affixed on the electronics cover. The bottom label (middle section of the Reference Label) identifies the Ground and xDSL Tip and Ring wires.



30-LPS20xR1

Figure 5. Reference Labels

The reference labels for the following models will look similar to the ones above:
LPS-200R L1B(x) (G.SHDSL)
LPS-202R L1A(x) (ADSL)
LPS-202R L1B(x) (ADSL)

Attach the Ground Wire

WARNING ***The ground termination on the unit is also used for the primary gas-tube protectors for the xDSL circuit.***

Use #10 AWG wire to ensure a good ground connection to the unit.

Step	Action
1	Route the ground wire through the bottom left rubber grommet of the unit (Figure 6 on page 23). A 10 AWG (25.8 mm) solid copper ground wire is recommended.
2	Use a 216 tool to loosen the nut and the top two washers from the ground lug.
3	Loop the ground wire around the ground lug.
4	Tighten the nut with a 216 tool.
5	Connect the other end of the ground wire to a suitable ground termination point such as a ground rod, following local practice.

Attach the xDSL Tip and Ring Wires

DANGER ***Always treat the xDSL pair as if it were live with high voltage present. Review the safety precautions at the beginning of this section before preceeding.***

To avoid electrical shock, handle the stripped xDSL wire by its insulation with insulated-handled needlenose pliers.

Step	Action
1	Route the service cable through the bottom left rubber grommet of the unit (Figure 6 on page 23).
2	Use a 216 tool to loosen the nuts on the xDSL tip and ring termination posts in the unit.
3	Prepare the xDSL tip and ring conductors in the service cable using insulated wire strippers.
4	Use insulated needle nose pliers to loop the tip and ring conductors around the xDSL tip and ring termination posts between the first and second washers.
5	Tighten both nuts with a 216 tool.

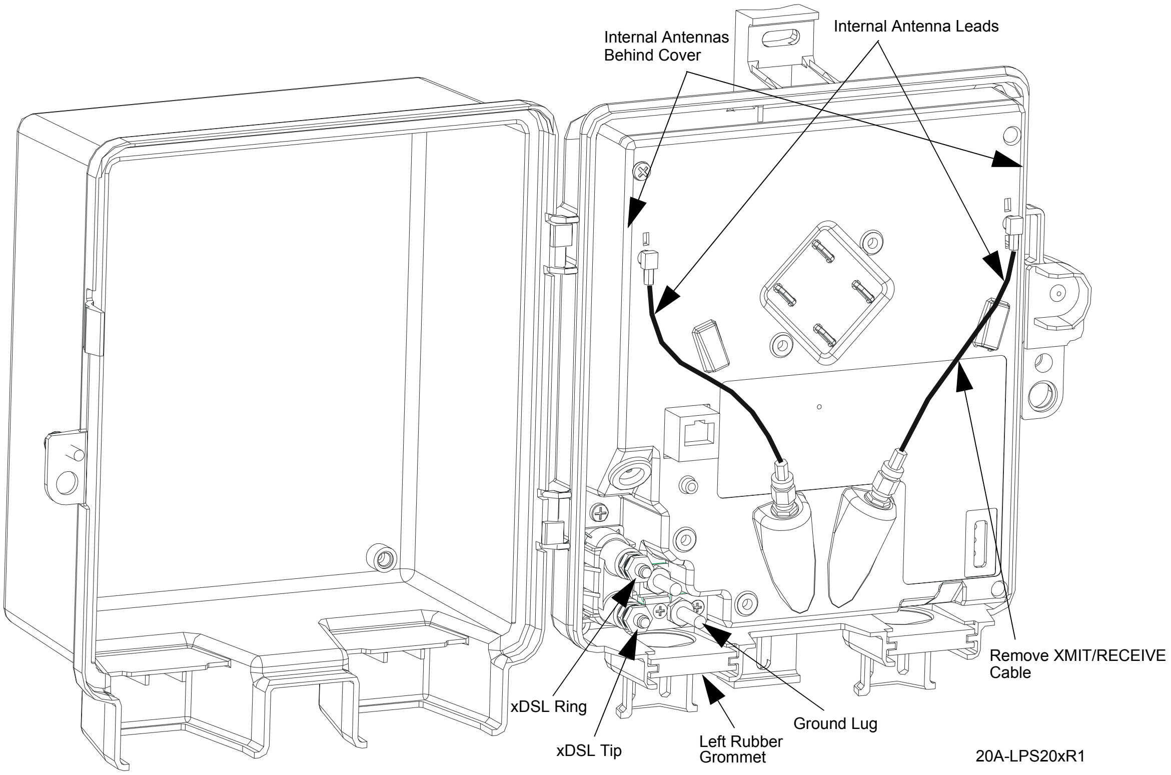


Figure 6. Attach Frame-Ground Wire and xDSL Tip and Ring Wires, Disconnect Right Internal Antenna

Using External Antenna(s)

Typical single external antenna applications use only the XMIT/RECEIVE antenna connection. The second antenna connection can be used when receive diversity is desired with dual external antennas.

The receive-only internal antenna (left cable) should be removed when directional radiation patterns are required for the external antenna application. Consult your appropriate engineering guide.

Attach External N-Type Single Antenna (Optional)

The external antenna mounting kit is an optional item that can be purchased from ADC (LPS-299 L1). This kit is used when you are connecting an external antenna that has an N-Type connector. Refer to Product Support on page 177. If the unit is not opened, refer to Open the Unit on page 20.

Step	Action
1	Disconnect the right internal antenna (XMIT/RECEIVE) cable connections on both ends (Figure 6 on page 23). Store in a safe place for later use. The left internal antenna (receive only) cable should be left attached (refer to Note above for exception).
2	Remove the right rubber grommet at the bottom of the unit (Figure 7 on page 25).
3	Use a knife to slice a small cross or “x” between the four small round punchouts in the rubber grommet.
4	Route the external antenna lead end connector through the grommet and pull the cable assembly up into the middle of the unit.
5	Seat the rubber grommet into the right grommet slot at the bottom of the unit (Figure 7 on page 25).
6	Connect the N-Type external antenna connector to the LPS-299 L1 SMA to N-Type adapter assembly (Figure 7 on page 25).
7	Screw the SMA connector of the adapter assembly to the right side SMA connector of the LPS-20x (Figure 7 on page 25).
8	Tie wrap connectors to the electronics cover with those supplied in the mounting kit.

Attach External SMA-Type Antenna (Optional)

The external antenna mounting kit is an optional kit that can be purchased from ADC (LPS-299 L1). This kit is used when you are connecting an SMA-Type external antenna only. Refer to Product Support on page 177. If the unit is not opened, refer to Open the Unit on page 20.

Step	Action
1	Disconnect the right internal antenna (XMIT/RECEIVE) cable connections on both ends (Figure 6 on page 23). Store in a safe place for later use. The left internal antenna (receive only) cable should be left attached. (Refer to Note under Using External Antenna(s) on page 24 for exception).
2	Remove the right rubber grommet at the bottom of the unit (Figure 7 on page 25).
3	Use a knife to slice a small cross or “x” between the four small round punchouts in the rubber grommet.
4	Route the external antenna lead end connector through the grommet and pull the cable assembly up into the middle of the unit.
5	Seat the rubber grommet into the right grommet slot at the bottom of the unit (Figure 7 on page 25).
6	Screw the SMA connector of the external antenna to the right side SMA connector of the LPS-20x (Figure 7 on page 25).
7	Tie wrap connectors to the electronics cover with those supplied in the mounting kit.

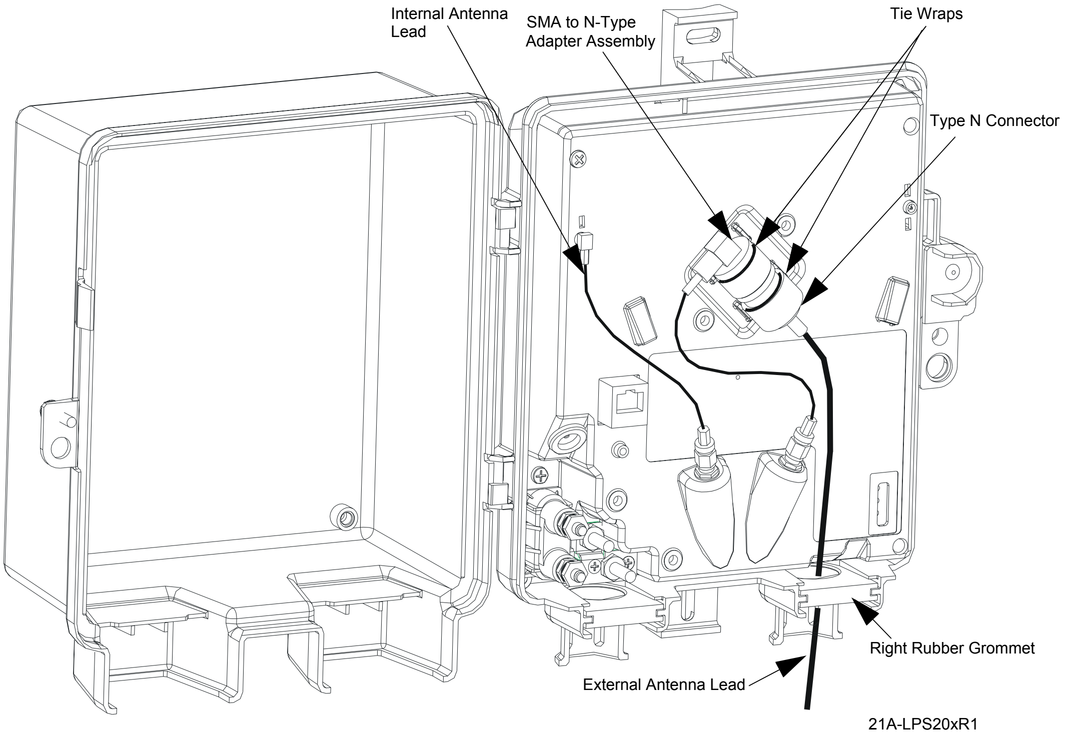
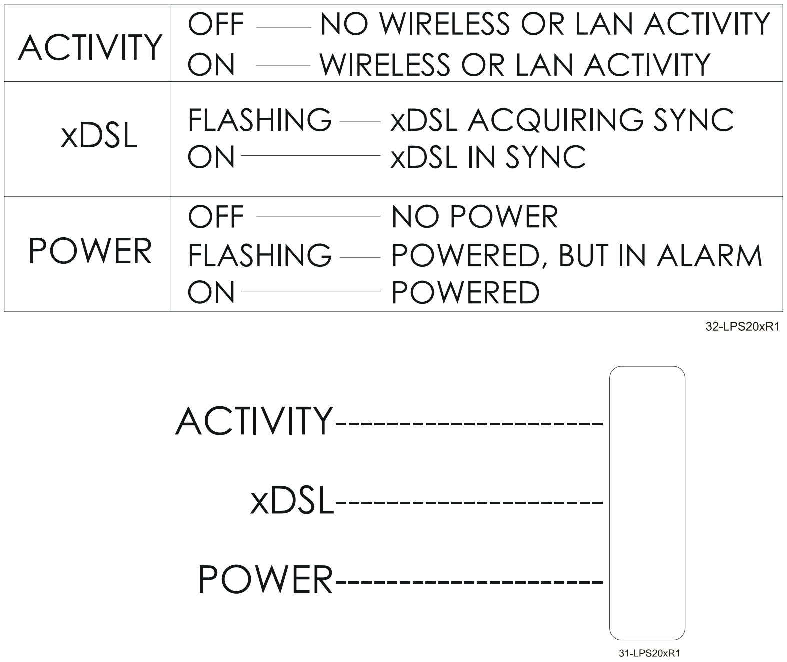


Figure 7. Attach N-Type and SMA-Type Single External Antennas

System Status Window and LEDs

The electronics enclosure has a System Status window through which Status LEDs can be viewed. The Status LEDs indicate different system states. The top portion of the reference label provides a guide to what the Status LEDs indicate (Figure 8).



ACTIVITY	OFF	NO WIRELESS OR LAN ACTIVITY
	ON	WIRELESS OR LAN ACTIVITY
xDSL	FLASHING	xDSL ACQUIRING SYNC
	ON	xDSL IN SYNC
POWER	OFF	NO POWER
	FLASHING	POWERED, BUT IN ALARM
	ON	POWERED

Figure 8. System Status Window

RESET BUTTON

WARNING ***Do not press the reset button for more than 5 seconds. Doing so will cause the LPS-20x to revert to the factory defaults.***

CAUTION ***Resetting the LPS-20x deletes all your configuration settings, resets the Administrator username and password to 'admin' , and sets the Wireless port and LAN port IP address to 192.168.1.1.***

The management tool can also be used to restart or reset the LPS-20x.

The reset button is located on the lower left side of the inside of the LPS-20x (Figure 9). Use the end of a paper clip or another pointed object to press the button.

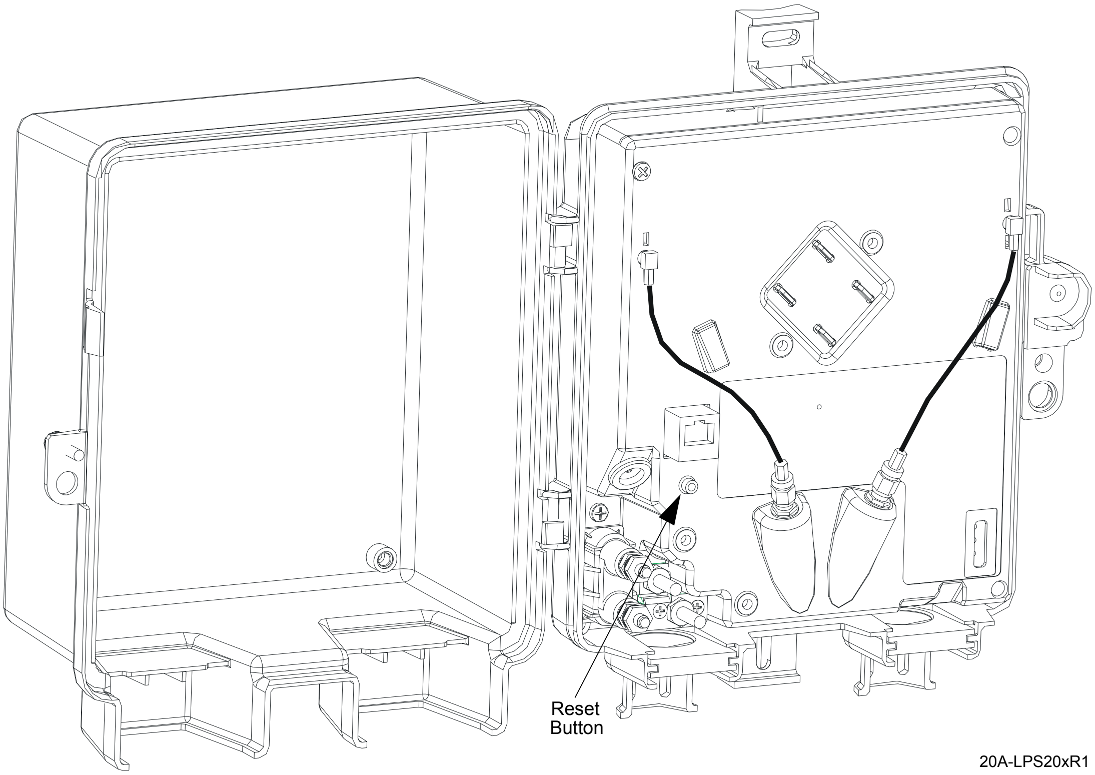


Figure 9. Reset Button

Restarting

WARNING ***Do not press the reset button for more than 5 seconds. Doing so will cause the LPS-20x to revert to the factory defaults.***

Restarting will drop all active connections.

Press and release the button from 1 to <5 seconds to restart the LPS-20x. This is equivalent to cycling the power. The LPS-20x will restart immediately.

Resetting to Factory Defaults

CAUTION ***Resetting the LPS-20x deletes all your configuration settings, resets the Administrator username and password to 'admin' , and sets the Wireless port and LAN port IP address to 192.168.1.1.***

The management tool can also be used to restart or reset the LPS-20x.

To reset the LPS-20x to its factory default settings, do the following:

Step	Action
1	Press and hold the reset button for more than 5 seconds. All the lights on the LPS-20x front panel will light up.
2	When the lights begin to flash (after about five seconds), release the button.
3	The LPS-20x will restart with factory default settings. When the xDSL LED stops flashing, the LPS-20x is fully operational.

Close the Unit

Failure to close the access door leaves the interior exposed to the environment. This shortens the life span of the components.

To close the unit:

Step	Action
1	Close the front cover.
2	Tighten the tamper proof screw on the front cover until it is completely seated.

Introduction to the Wireless Access Point

The LPS-20x wireless Access Point (AP) series are remote units that are designed to work in conjunction with Remote Authenication Dial-In User Service (RADIUS) Servers, access controllers or similar products (Figure 10). The role of the LPS-20x is to extend the wireless network and provide intelligent data forwarding to maintain the security of the network.

The LPS-20xs are interconnected using a backbone LAN or are daisy-chained together. This makes it easy to add more wireless coverage to service additional floor space or an increasing number of users.

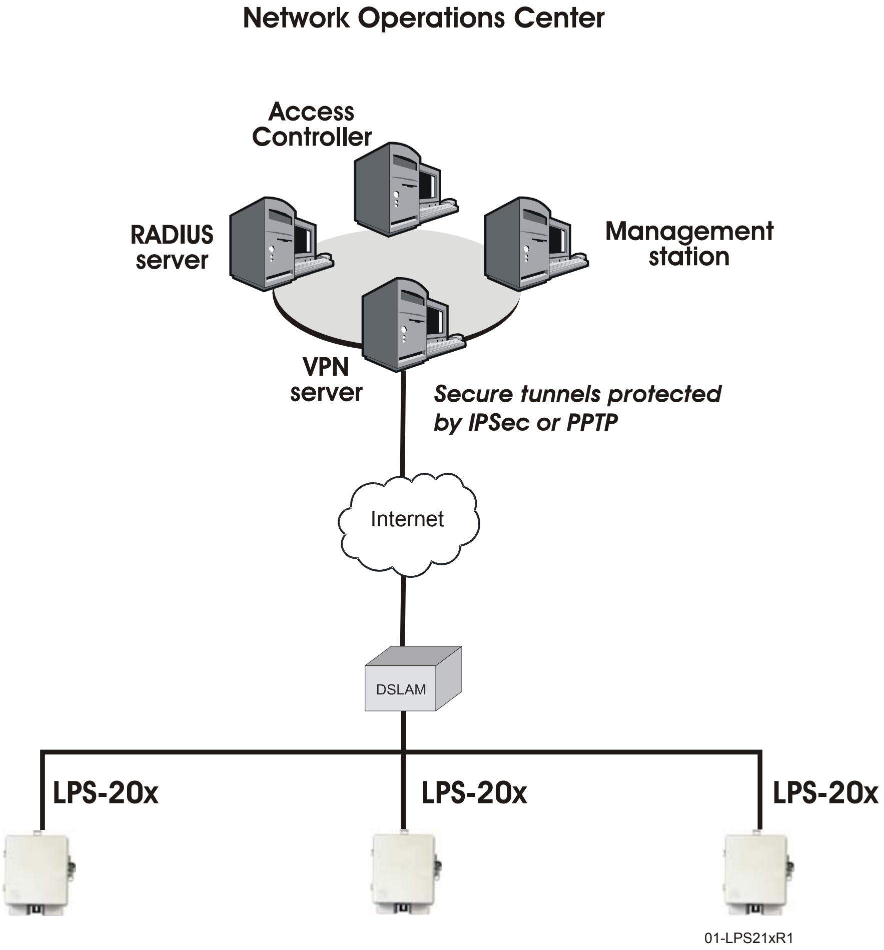


Figure 10. LPS-20x

The LPS-20x provides wireless network coverage in a radius of up to 100 meters (300 feet). It uses radio waves in the 2.4 Ghz band to communicate with client stations. To maintain the security of individual client stations on the wireless network, the LPS-20x does not forward data between wireless client stations by default.

Intelligent Bridge

Unlike a traditional bridge which automatically forwards all traffic between ports, the LPS-20x can apply security filters to maintain the security of the network. When enabled, these filters essentially block all traffic that is not addressed to or received from the access controller.

Service Sensor

The service sensor enables the LPS-20x to determine if access to the network or a particular server is available. If not, the LPS-20x automatically shuts off its radio transmitter taking down the wireless cell. The service sensor polls the target device approximately every half second. For more details, refer to Service Sensor on page 94.

Roaming

Client computers are able to move between wireless cells (called roaming) without losing contact with the network (Figure 11). This is possible because the wireless network adapters in the client computers automatically switch to the best available device. Authentication and billing (if used) are maintained. Figure 11 shows roaming across several LPS-20xs.

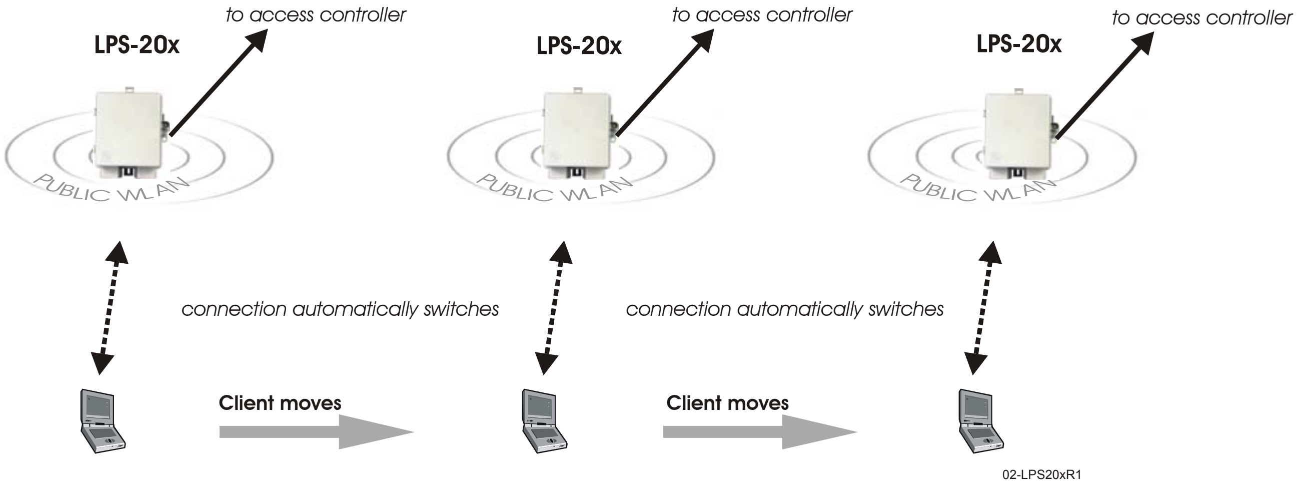


Figure 11. Roaming

MAC-Level Filtering

When enabled, this option enables you to control access to the wireless network based on the MAC address of client stations. You can either block access or allow access depending on your requirements.

Location-Aware Authentication

This feature enables you to control logins to the public access network based on the wireless access point a customer is connected to. This feature works when you use the LPS-20x in conjunction with an LPS-21x or a Colubris access controller (e.g., CN3000) that also supports the Location-Aware Authentication. If you enable this option, when a customer attempts to login to the public access network, the access controller sets the Called-Station-ID in the RADIUS access request to the MAC address of the wireless port the customer is associated with. Server-side code can be written to manage access based on this information.

Wireless Bridging

The LPS-20x wireless bridging feature enables you to use the wireless radio to create point-to-point wireless links with other access points (Figure 12). This feature can be used to extend the reach of a network without additional wiring.

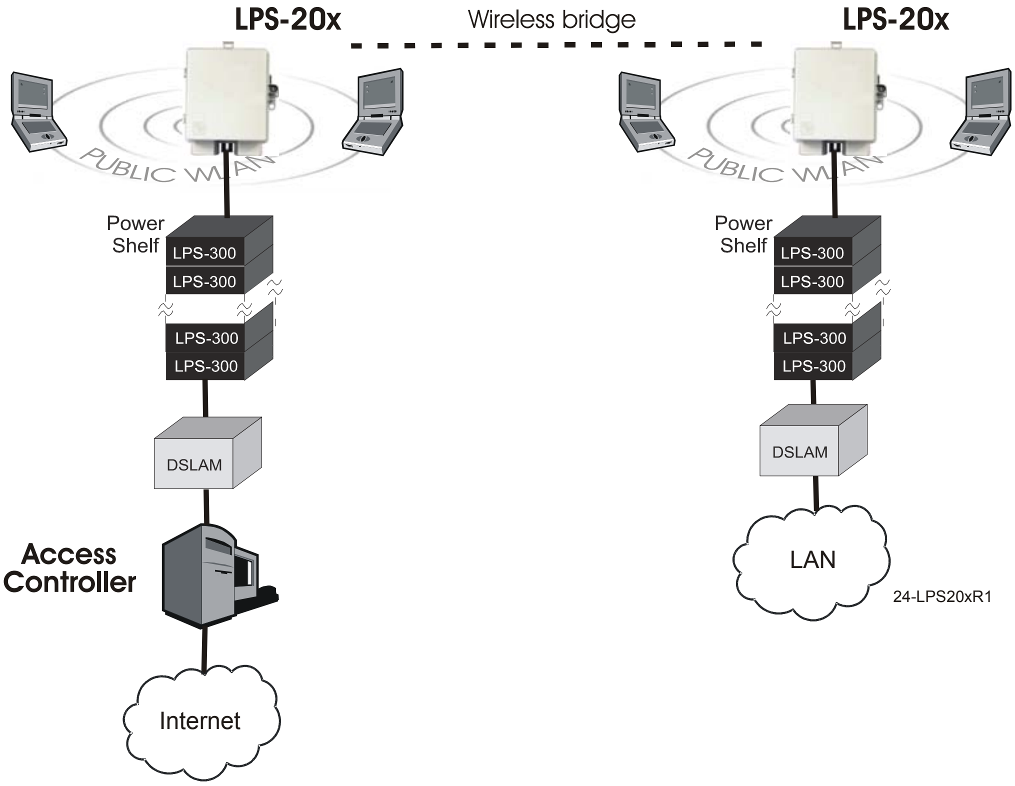


Figure 12. Wireless Bridging

Multiple SSID and VLAN Support

The LPS-20x provides support for multiple Service Set Identifiers (SSIDs) (Figure 13). This allows the wireless network to be segmented into multiple distinct entities, each with its own SSID. This feature is very useful when combined with Virtual Local Area Network (VLAN) support. For example, in this scenario public and private users share the same infrastructure with complete security.

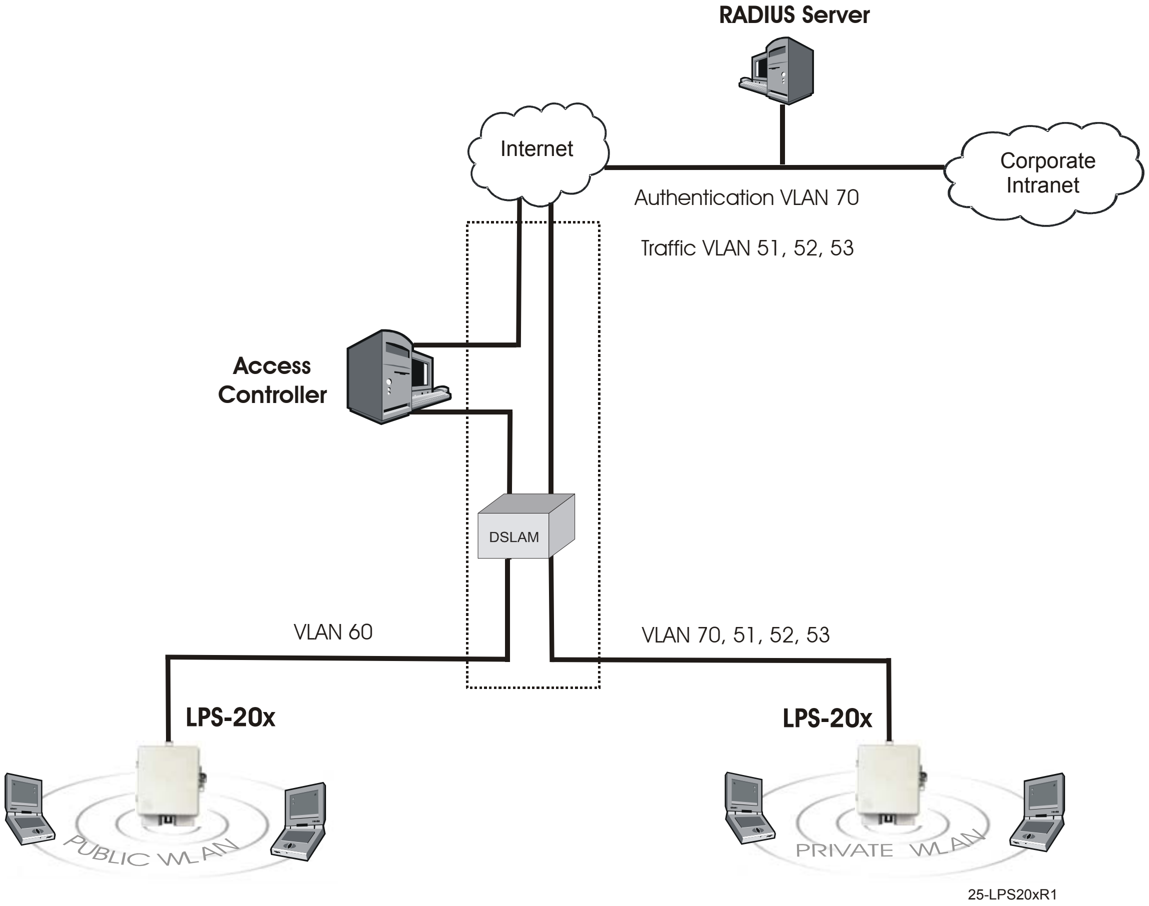


Figure 13. Multiple SSID amd VLAN Support

The wireless network is split into two WLANs: public and private:

- The Public WLAN maps authentication traffic between the LPS-20x and the Access Controller on VLAN 60. Once a user is authenticated, traffic to the Internet does not use a VLAN.
- The Private WLAN maps authentication traffic between the LPS-20x and the RADIUS Server on VLAN 70. Once a user is authenticated, traffic to the Internet or Corporate Intranet is mapped across VLANs 51, 52, 53.

Planning your Installation

Overview

The LPS-20x enables you to extend the coverage of a public access network. One or more LPS-20xs can be installed in conjunction with an access controller (Figure 14).

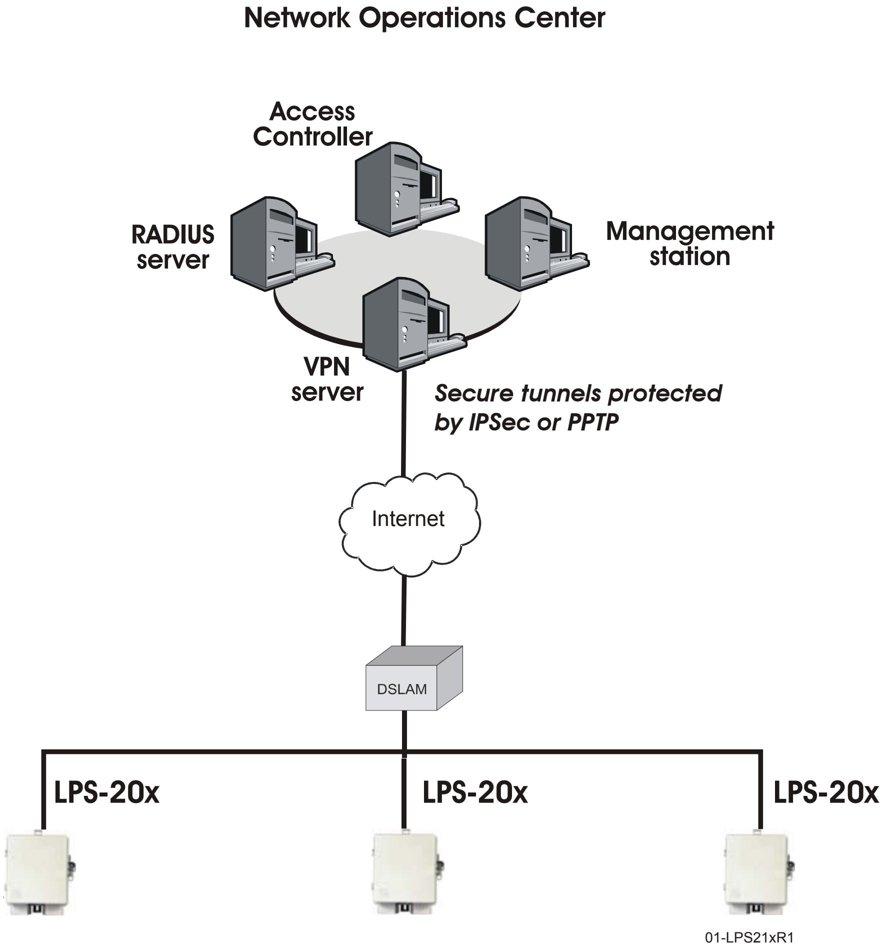


Figure 14. Access Controller

Access Controller

The access controller provides user authentication and accounting support for the wireless customers and manages the security of the network. This means ensuring that only authorized traffic is permitted to reach the protected network resources. If connected to the Internet, its integrated firewall provides protection from hackers.

LPS-20x

The LPS-20x (and the access controller) provide wireless network coverage in a radius of up to 100 meters (300 feet). This is called a *wireless cell*. To maximize coverage of the cell, the LPS-20x is best installed in an open area with as few obstructions as possible. Try to choose a location that is central to the area being served.

The LPS-20x uses radio waves in the 2.4 Ghz band to communicate with client stations. Radio waves cannot penetrate metal, instead they are reflected. This means that the LPS-20x is able to transmit through wood or plaster walls, and closed windows. However, the steel reinforcing found in concrete walls and floors may block transmissions or reduce signal quality by creating reflections. This can make it difficult for a single LPS-20x to serve users on different floors in a concrete building. Such installations will require a separate LPS-20x on each floor.

Client computers are able to move between cells (called roaming) without loosing contact with the network. This is possible because wireless adapters automatically switch to the best available LPS-20x.

Installation steps

1. Install the LPS-20x (Installation and Test on page 19).
2. Establish a connection to the management tool (Management Tool on page 35).
3. Define management tool security settings (Management Tool Security on page 46).
4. Configure and deploy the wireless network (Configuration – Setting up the Wireless LAN on page 62).
5. Configure the connection to the access controller (Configuring the Connection to the Access Controller on page 79).
6. Configure the service sensor (optional) (Service Sensor on page 94).
7. Configure MAC-level filtering (optional) (MAC-Level Filtering on page 96).
8. Configure location-aware authentication (optional) (Location-Aware Authentication on page 97).

MANAGEMENT TOOL

The management tool is a Web-based interface to the LPS-20x that provides easy access to all configuration functions via WLAN, LAN, or Internet Port.

IMPORTANT ***Only one administrator can be logged into the management tool at a given time. If a second administrator logs in while the first is connected, the first administrator may be logged out depending on system configuration (refer to Management|Management Tool|Login override).***

MANAGEMENT STATION

The management station is the computer that you will use to connect to the management tool. To act as a management station, a computer must:

- have a JavaScript-enabled Web browser installed (Netscape 7.1 or higher, or Internet Explorer 6.0 or higher)
- be able to establish an IP connection with the LPS-20x

Although there are several ways to manage the LPS-20x after installation (see Management scenarios below), the first time you configure the LPS-20x you should do so from a computer equipped with a wireless LAN card. If it is impossible to install a wireless LAN card in your computer, you can use a computer equipped with an Ethernet card instead. This requires a cross-over Ethernet cable.

CONFIGURING THE MANAGEMENT STATION FOR WIRELESS ACCESS

Install and configure the wireless adapter in the management station according to the directions that came with it. During installation make sure that:

- encryption is disabled
- TCP/IP is installed and configured. The IP address of the wireless station must be on the same subnet as the access point.

A static IP address must be used when configuring the LPS-20x for the first time. Refer to Connecting to the LPS-20x for the First Time on page 37.

- Set the SSID to be “ADC”.

CONFIGURING THE MANAGEMENT STATION FOR WIRED ACCESS

Install and configure a network adapter in the management station according to the directions that came with it. During installation make sure that TCP/IP is installed and configured.

Management Scenarios

The LPS-20x can be managed both locally and remotely for complete flexibility. The following management scenarios are supported:

Local Management

- A computer connected to the wireless AP via a wireless network card.
- A computer directly connected to the LAN port on the LPS-20x. A cross-over Ethernet cable is required.
- A computer on the wired LAN that is connected to the LPS-20x.

IMPORTANT ***When the intelligent bridge function is enabled, wireless stations can only communicate with the LPS-20x they are directly connected to. Managing other LPS-20xs is not possible. For more details, refer to Intelligent Bridge on page 80.***

Remote Management

Remote management of the LPS-20x is possible. For more details, refer to Configuring Remote Management Support on page 51.

Wireless Port

- IP address: 192.168.1.1 (bridged with the other ports)
- Wireless network name: ADC
- Operating frequency: Channel 10
- ESSID broadcast: On
- Relay between wireless station: Off
- Security: None

Upstream Port

- IP address: 192.168.1.1 (bridged with the other ports)

Downstream Port

- IP address: 192.168.1.1 (bridged with the other ports)
- Firewall: High security

Management Tool

- Allow access via LAN port and downstream port
- Login name: admin
- Password: admin

Connecting to the LPS-20x for the First Time

Your LPS-20x is factory configured with a static IP address assignment. The address is 192.168.1.1. In order to connect to the LPS-20x, a computer with a WLAN or LAN NIC card is required.

It is recommended that you access the LPS-20x via a wireless connection. However, you may also connect via the wired LAN port located on the electronics enclosure.

Assumptions

It is assumed that the LPS-20x has already been installed and wired to the xDSL as noted in section Installation and Test on page 19. You cannot perform any configuration on this device until power has been applied.

Setup

1. Configure your computer with the following static IP address: **192.168.1.2**. This puts your computer on the same logical network segment as the LPS-20x. This is required so that you can gain access to the management tool.
2. Establish a wireless connection with the LPS-20x or connect the wired LAN connector on the LPS-20x to your computer using a cross-over Ethernet cable.
3. You are now ready to start the management tool and configure the LPS-20x.

AP Static IP Configuration

Please refer to Setting a Static IP Address on page 84 if you are going to install this access point into your network with a static IP address.

AP DHCP Configuration

Please refer to Network Port Configuration on page 81 if you are going to install this access point into your network as a DHCP client.

Starting the Management Tool

Most of the screens in this software section were captured using the LPS-202. However, the content of screens remain the same for all LPS-20x (unless otherwise noted).

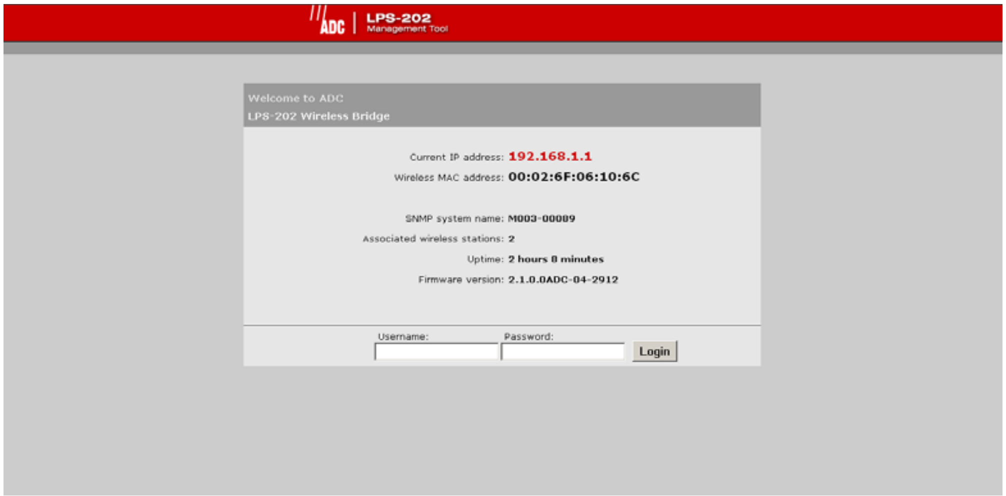
1. Start your Web browser.
2. In the address box, specify: `HTTPS://192.168.1.1`.

Make sure that you specify HTTPS and not HTTP.

3. Press **Enter**. You will be prompted to accept an ADC security certificate. Do so to continue. To eliminate this warning message, you can install your own certificate as described in SSL Certificates on page 139.

To safeguard the security of the LPS-20x, access to the management tool must occur via a secure connection. Before this connection can be established, you must accept an ADC security certificate. The procedure for accepting the certificate varies depending on the browser you are using.

4. After you accept the ADC certificate, the management tool login page opens. By default, the username is set to **admin** and the password is set to **admin**.



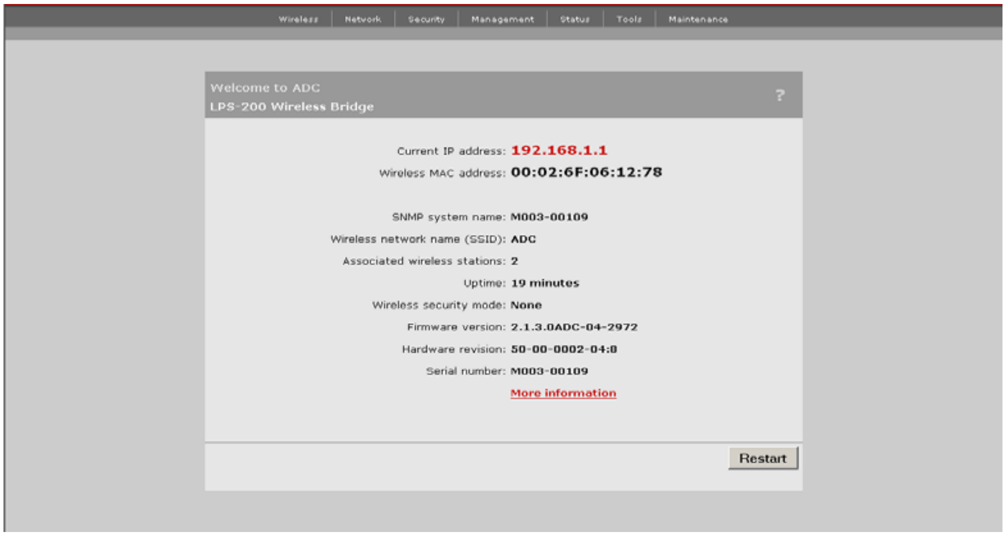
Welcome to ADC
LPS-202 Wireless Bridge

Current IP address: 192.168.1.1
Wireless MAC address: 00:02:6F:06:10:6C

SNMP system name: M003-00009
Associated wireless stations: 2
Uptime: 2 hours 8 minutes
Firmware version: 2.1.0.0ADC-04-2912

Username:
Password:

5. You will see the home page after you have successfully logged into the system.



Welcome to ADC
LPS-200 Wireless Bridge

Current IP address: 192.168.1.1
Wireless MAC address: 00:02:6F:06:12:78

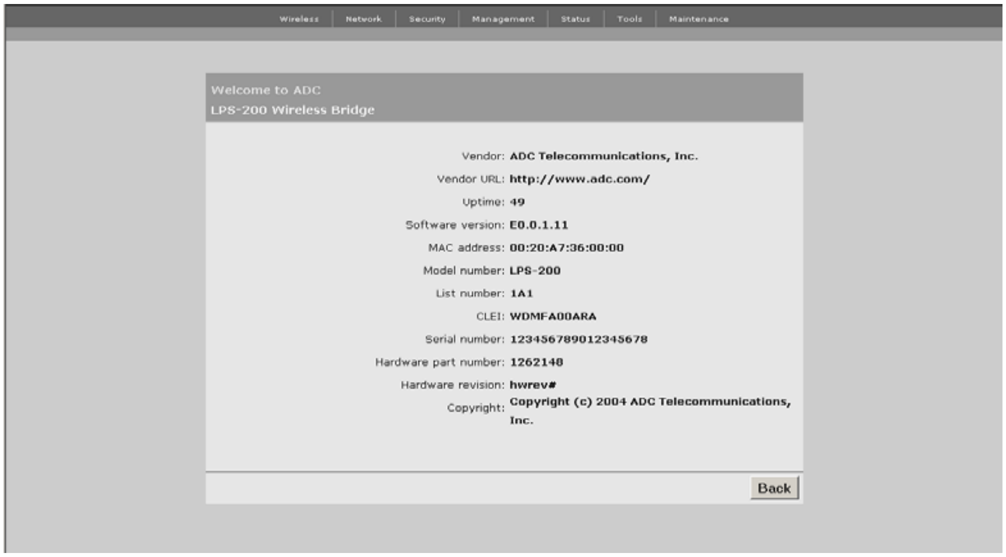
SNMP system name: M003-00109
Wireless network name (SSID): ADC
Associated wireless stations: 2
Uptime: 19 minutes
Wireless security mode: None
Firmware version: 2.1.3.0ADC-04-2972
Hardware revision: 50-00-0002-04:0
Serial number: M003-00109
More information

If this is the first time the AP has been powered up from the factory, a pop-up window will appear asking you to change your password.

It is highly recommended that you change your password at this time.

You may also change your password under Management|Management Tool.

6. For more information about the LPS-20x, click on **More information**. The following screen appears.



Welcome to ADC
LPS-200 Wireless Bridge

Vendor: ADC Telecommunications, Inc.
Vendor URL: http://www.adc.com/
Uptime: 49
Software version: E0.0.1.11
MAC address: 00:20:A7:36:00:00
Model number: LPS-200
List number: 1A1
CLEI: WDMFA00ARA
Serial number: 123456789012345678
Hardware part number: 1262148
Hardware revision: hwrev#
Copyright: Copyright (c) 2004 ADC Telecommunications, Inc.

Home Page Parameters

The LPS-20x does not require day-to-day management for successful, efficient operation.The most you will want to do is inquire about status and statistics.

Current IP Address

This is the IP assigned to all ports of the LPS-20x.

Wireless MAC Address

This is the MAC address associated with the LPS-20x.

SNMP System Name

Identifies the LPS-20x on your network. To set this, go to Management|SNMP.

Wireless Network Name (SSID)

Identifies the wireless network. Each client that wants to connect to the LPS-20x must use this name (unless the broadcast WLAN name option is enabled, in which case no name needs to be specified on the client station).To set this value, go to the Wireless>Wi-Fi page.

The SSID is case-sensitive.

Up Time

Indicates the amount of time that has passed since the LPS-20x was powered on or reset.

Wireless Security Mode

Inidcates the protocol being used to secure the wireless network. By default, this is set to None.

Firmware Version

Indicates the version number of the firmware currently loaded on the LPS-20x. To upgrade the firmware, go to the Maintenance>Firmware>Updates page.

Hardware Revision

Indicates the version number of the LPS-20x hardware.

Serial Number

Indicates the serial number of the LPS-20x hardware.

Logout

Click this button to log out. If you do not log out, the LPS-20x continues to maintain your connection as active until it times out (after 10 minutes of inactivity).

RESTART

Click on this button to restart the LPS-20x. It may take up to 60 seconds for the LPS-20x to become fully operational again. When the DSL light stops flashing, the LPS-20x is fully operational. Resetting does not affect your configuration.

Restarting will drop all active connections.

Main Menu Tree

Figure 15 shows the main menu tree of the management tool.

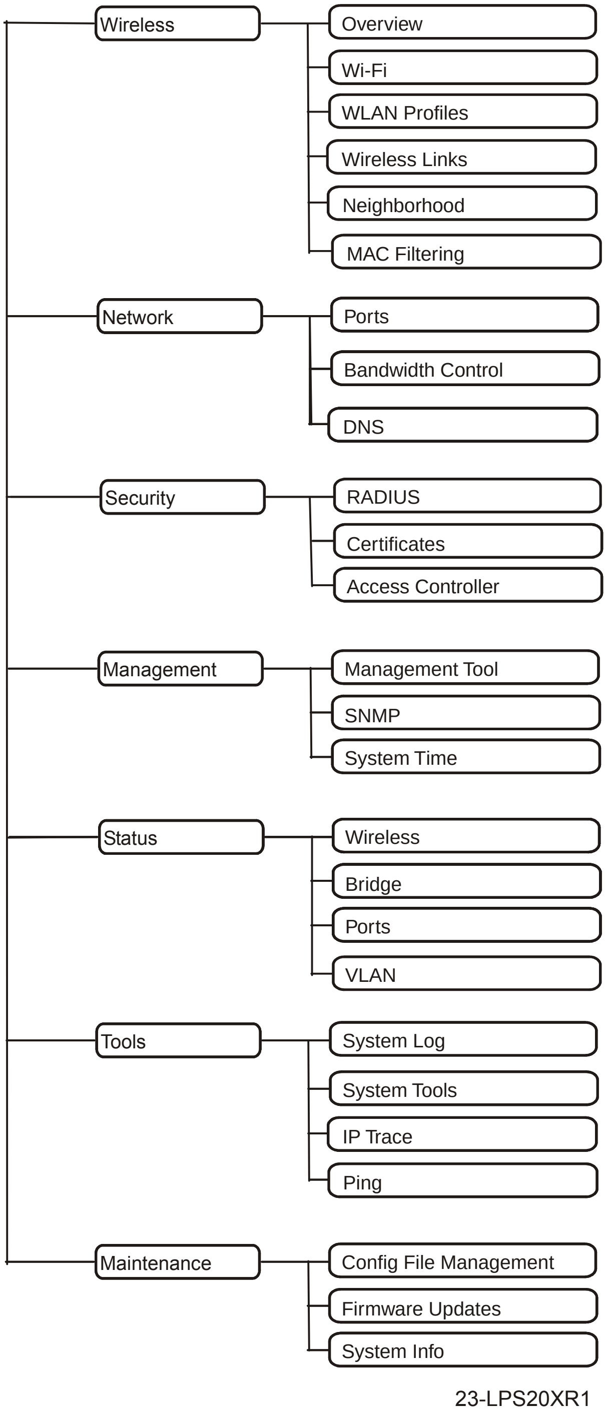


Figure 15. Management Tool Main Menu Tree

Main Menu Tree Parameters

The following information is a brief overview of the management tool menu options. For detailed information on each option and its parameters, consult the online **help,** which is available by clicking the help icon [?] that appears in the top right corner of most boxes.

Home

Displays basic status information on the operation of the LPS-20x. For a description of the information on the Home page, refer to Home Page Parameters on page 40.

Wireless

Displays basic status information on the operation of the wireless network. Included in this menu are:

Overview

Provides a summary of important wireless settings.

Wi-Fi

Use this page to configure the operating characteristics of the wireless network.

WLAN Profiles

Use this page to define multiple SSIDs.

Wireless Links

Use this page to define point-to-point links to other access points.

Neighborhood

Use this page to do site surveys and discover other wireless access points that are operating nearby.

MAC Filtering

This option enables you to control access to the LPS-20x based on the MAC address of client stations. You can either block access or allow access depending on your requirements.

Network

The network menu contains all the options you need to fine tune the networking operation of the LPS-20x. Included in this menu are:

Ports

Configures the settings for the upstream, downstream and wireless ports. This is where you define the settings for your Internet connection, your connection via a broadband modem, and your connection to a wired LAN.

Bandwidth Control

Enables you to limit the flow of data traffic through the LPS-20x by controlling the outgoing bandwidth allocated to each port.

DNS

Enables you to set the DNS servers assigned to the LPS-20x.

Security

The security menu lets you define all security-related settings. Included in this menu are:

RADIUS

This is where you define the settings the LPS-20x uses to communicate with external RADIUS servers.

Certificates

Use this option to manage the SSL certificates used by the LPS-20x.

Access Controller

This is where you specify the address of the access controller the LPS-20x will communicate with and enable the service sensor and location-aware authentication features.

Management

The management menu enables you to configure the operation of the management tool and its SNMP implementation. Included in this menu are:

Management Tool

Use this page to set the admin name and password and define security parameters that control access to the management tool.

SNMP

Configures SNMP properties and security settings.

System Time

Configures system time.

Status

Use this option to view the status of the various components on the LPS-20x.

Wireless

Operational status of the LPS-20x.

Bridge

Current status of the bridge.

Ports

Determines the status of the upstream and downstream ports.

VLAN

Determines the status of the virtual LAN.

Tools

Provides diagnostic tools that can be used to investigate anomalies. Generally, you will use these only under the direction of ADC. These tools also enable you to view the system log. The system log contains a record of all significant events that occur on the LPS-20x. This information is useful when troubleshooting the LPS-20x with the assistance of ADC. If needed, the system log can be configured to forward entries to a remote syslog server on the LAN or via the Internet.

System Log

System log includes date, time, level, process and message.

System Tools

Runs different tools (e.g., interface information).

IP Trace

Trace upstream/downstream port.

Ping

Ping an IP address.

Maintenance

Lets you manage configuration and firmware files and save system information for troubleshooting purposes.

Configuration File Management

Manual and automated updates of the configuration file.

Firmware Updates

Allows for manual and automated updates of the firmware file.

System Information

Save system information to your computer’s hard drive (using download command). After downloading, you restart the LPS-20x (using restart command).

Management Tool Security

The management tool is protected by the following security features.

Administrator Password

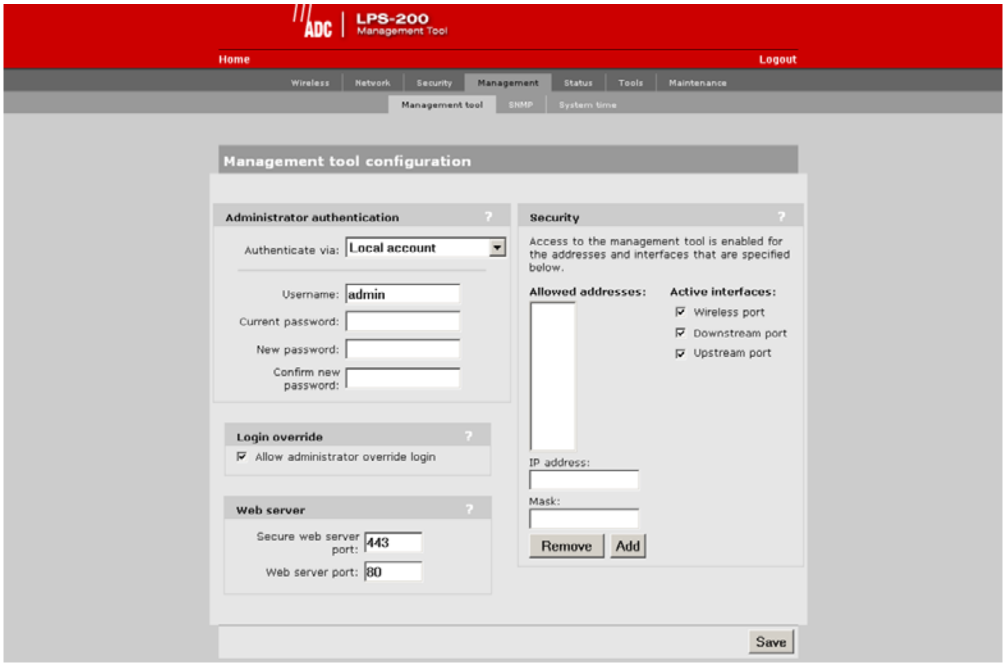
WARNING ***Failure to change the user name and password will leave your network at an increased risk of attack.***

WARNING ***If you forget the administrator password, the only way to gain access to the management tool is to reset the LPS-20x to factory default settings*** *(refer to Resetting to Factory Defaults on page 28)****.***

Access to the LPS-20x management tool is protected by a username and password to safeguard configuration settings. The factory default setting for username is **admin** and password is **admin**. It is strongly recommended that you change both.

To change the username and/or password, do the following:

1. On the main menu, click **Management**. The *Management tool configuration* page opens.



Management tool configuration

Administrator authentication

Authenticate via: Local account

Username: admin

Current password:

New password:

Confirm new password:

Login override

☑ Allow administrator override login

Web server

Secure web server port: 443

Web server port: 80

Security

Access to the management tool is enabled for the addresses and interfaces that are specified below.

Allowed addresses:

Active interfaces:

☑ Wireless port

☑ Downstream port

☑ Upstream port

IP address:

Mask:

2. In the **Administrator authentication** box, enter the new username, current password, the new password, and then repeat the new password for confirmation.
3. Click **Save** when you are done.

Administrator Authentication Parameters

Authentication Via

Choose how the administrator’s username and password are verified. You can choose to store this information on the LPS-20x (local account) or remotely on a RADIUS Server. Using a RADIUS Server enables you to have multiple administrators, each with a unique name and password. To use a RADIUS Server, you must define a RADIUS profile in Security>RADIUS.

Username

Login name for the administrator. The default login is “admin”.

Current Password

Current administrator password. New passwords must be at least six characters long and contain at least four different characters. The default password is “password#1”.

New Password

Specify the new administrator password.

Confirm New Password

Retype the new administrator password.

Login Override

Allow administrator override login

When this option is enabled, an active administrator’s session will be terminated by the login of another administrator. This prevents the management tool from being locked by an idle session until the timeout expires.

Web Server Parameters

Secure Web Server Port

Specify the port number the LPS-20x will use to provide secure access to the managment tool (HTTPS). By default, this parameter is set to port 443.

Web Server Port

Specify the port number the LPS-20x will use to provide standard HTTP access to the management tool. HTTP connections made to this port are met with a warning and the browser is redirected to the secure web server port. By default, this parameter is set to port 80.

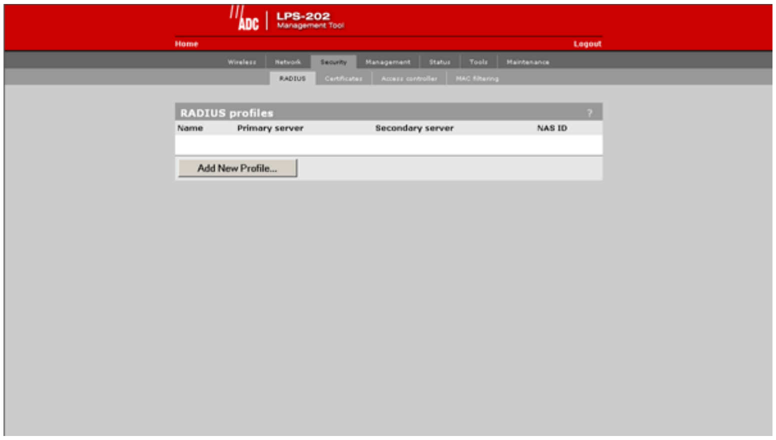
Validating Administrator Logins using a RADIUS Server

You can use a RADIUS server to authenticate logins to the management tool. One advantage of this is that it enables you to create several administrator accounts, each with its own username and password.

IMPORTANT ***Make sure that the RADIUS profile you select is configured and that the administrator account is defined on a functioning RADIUS server. If not, you will not be able to log back into the LPS-20x because the administrator password cannot be authenticated.***

To setup RADIUS authentication, do the following:

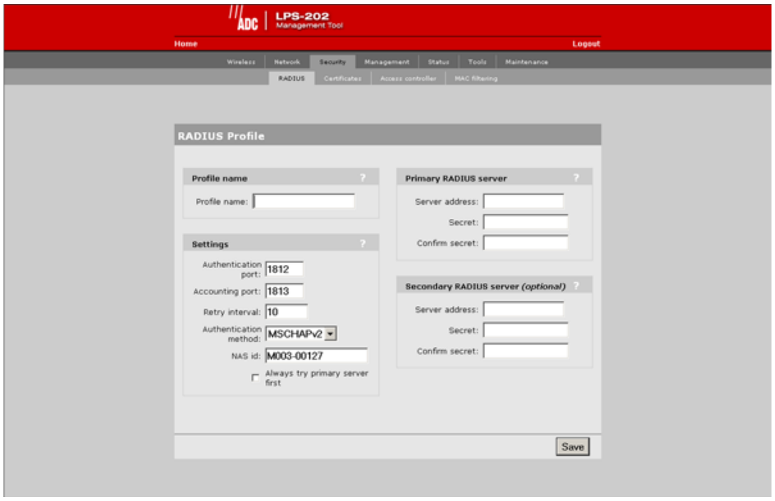
1. On the main menu, click **Security** then click **RADIUS.** The *Radius profiles* page opens.



RADIUS profiles

Name	Primary server	Secondary server	NAS ID

2. Click **Add New Profile**. The Add *Radius profiles* page opens.



RADIUS Profile

Profile name
Profile name:

Settings
Authentication port: 1812
Accounting port: 1813
Retry interval: 10
Authentication method: MSCHAPv2
NAS id: M003-00127
□ Always try primary server first

Primary RADIUS server
Server address:
Secret:
Confirm secret:

Secondary RADIUS server *(optional)*
Server address:
Secret:
Confirm secret:

3. Define the settings for the RADIUS profile you want to use to validate administrator logins. Either use an existing profile or add a new one.
4. Click **Save**.
5. On the main menu, click **Management**. The *Management tool configuration* page opens.
6. In the **Administrator authentication** box, select the RADIUS server you defined in Step 2.
7. Click **Save**.

Connection Security

To maintain the integrity of the configuration settings, only one user can be connected to the management tool at a given time. To prevent the management tool from being locked up by an idle user, two mechanisms are in place:

- If a user's connection to the management tool remains idle for more than ten minutes, the LPS-20x automatically logs the user out.
- If a second user connects to the management tool and logs in with the correct username and password, the first user's session may be terminated depending on system configuration. Refer to Management|Management Tool|Login override.

IMPORTANT ***If you do not log out, the LPS-20x continues to maintain your connection as active until it times out (after 10 minutes of inactivity). During this period, no other user can connect to the management tool unless Login override under Management|Management Tool is checked.***

HTTPS

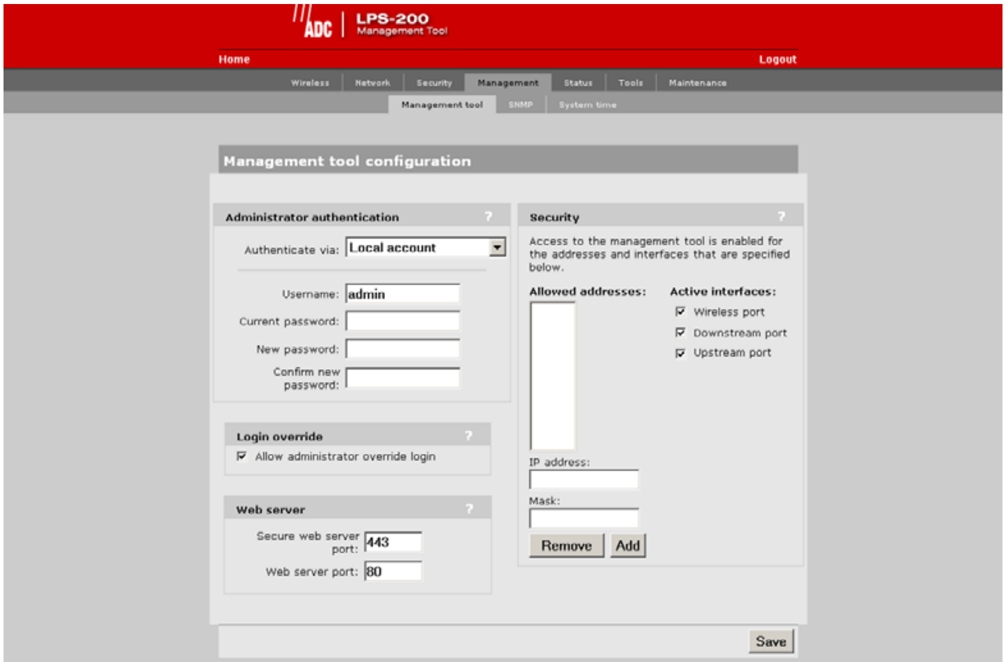
Communications between the management station and the LPS-20x occurs via HTTPS. Before logging into the management tool, users must accept an ADC certificate. You can replace this certificate with your own. For more information, refer to SSL Certificates on page 139.

Security Settings

The LPS-20x can be managed both locally and remotely for complete flexibility. Management occurs via the Web-based management tool which resides on the LPS-20x. For details, refer to Management Scenarios on page 36.

To Configure Security Options

1. On the main menu, click **Management**. The *Management tool configuration* page opens.



Management tool configuration

Administrator authentication

Authenticate via: Local account

Username: admin

Current password:

New password:

Confirm new password:

Login override

☑ Allow administrator override login

Web server

Secure web server port: 443

Web server port: 80

Security

Access to the management tool is enabled for the addresses and interfaces that are specified below.

Allowed addresses:

Active interfaces:

☑ Wireless port

☑ Downstream port

☑ Upstream port

IP address:

Mask:

2. In the **Security** box, enable the management options you require. The options are described in the section that follows.
3. Click **Save**.

Security Parameters

Allowed Addresses

Lets you define a list of IP addresses from which access to the management tool is permitted. To add an entry, specify the IP address and appropriate mask and click **Add**. When the list is empty, access is permitted from any IP address.

Active Interfaces

Choose the interfaces through which client stations will be able to access the management tool.

Upstream/Downstream

Choose this option to allow access to the management tool via the upstream or downstream ports. These options are enabled by default.

Wireless Port

Choose this option to allow access to the management tool via the wireless port. This option is enabled by default.

Configuring Remote Management Support

If the LPS-20x is installed behind an access controller or RADIUS server, enabling remote access to the management tool requires configuration settings to be defined on the access controller, RADIUS server, and the LPS-20x. This section explains how to accomplish this for the following two scenarios (Figure 16):

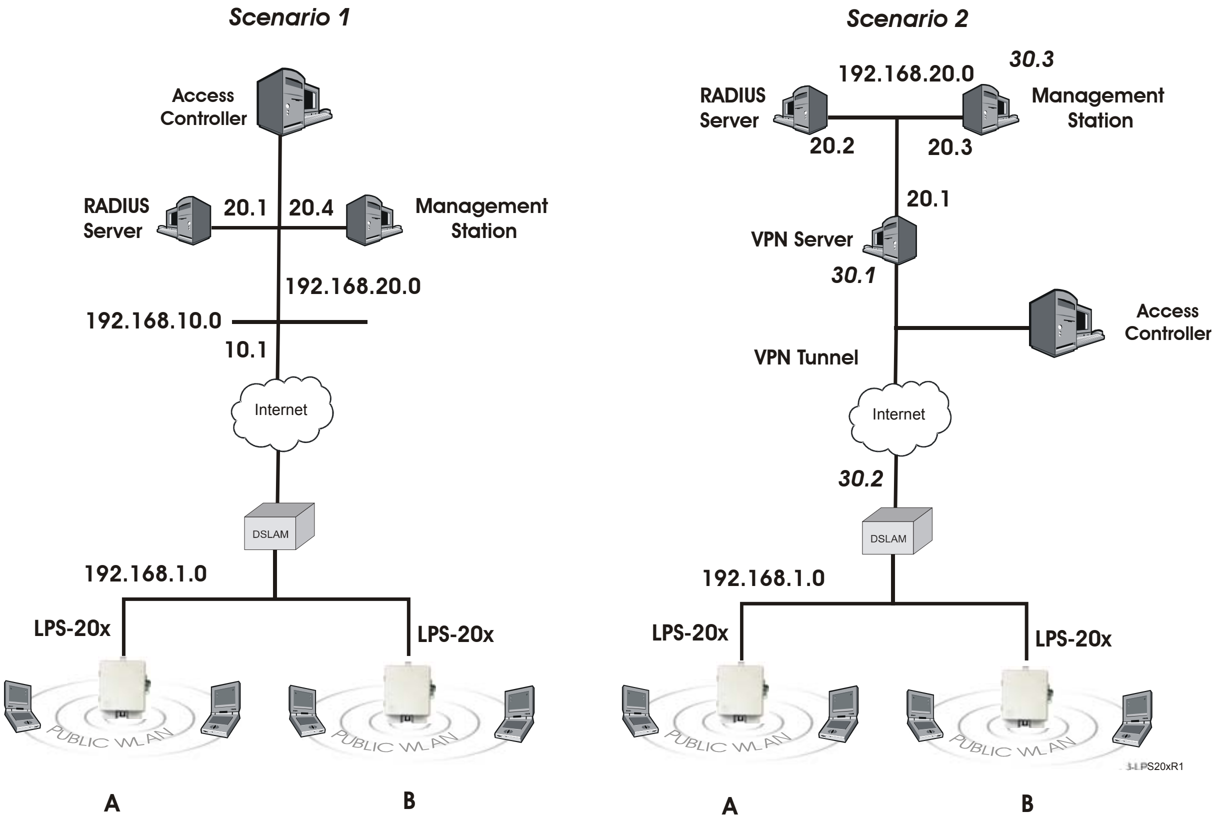


Figure 16. Configuring Remote Management Support

To reach the management tool, the management stations specify the following addresses in their web browsers:

Scenario 1

- To reach LPS-20x A: HTTPS://192.168.10.1:5002
- To reach LPS-20x B: HTTPS://192.168.10.1:5003

Scenario 2

- To reach LPS-20x A: HTTPS://192.168.30.2:5002
- To reach LPS-20x B: HTTPS://192.168.30.2:5003

Static NAT mappings are used on the access controller to direct traffic to the proper LPS-20x. MAC address authentication enables the LPS-20xs to log into the public access network. Access list definitions allow traffic to be sent from the LPS-20xs to the management stations.

The following sections explain these configuration settings in more detail.

On The Access Controller

Create static NAT mappings

To direct management traffic to the proper LPS-20x, you need to create static NAT mappings to redirect HTTPS traffic to the new ports you defined on the LPS-20xs.

- Map traffic on port 5002 to IP address 192.168.1.2 and port 443.
- Map traffic on port 5003 to IP address 192.168.1.3 and port 443.

On The RADIUS Server

Configure the access controller profile

MAC address authentication

For the LPS-20x to communicate with the remote management station, it must log into the public access network. To accomplish this, use the MAC address attribute when creating the RADIUS profile for the access controller. This attribute enables the access controller to authenticate devices based on their MAC address. For details, see the access controller's administrator's guide.

Access list

In both scenario 1 and 2, it makes sense to protect access to the RADIUS server and management station. This is done with an access list definition that blocks all traffic to 192.168.20.0 for scenario 1, and 192.168.30.0 for scenario 2.

However, to enable the LPS-20xs and the management station to communicate, you must create an additional access list definition as follows:

- Scenario 1: Create an access list that permits HTTPS traffic to address 192.168.20.4. This is the IP address of the management station. For example:

  ```
  access-list=LPS-20x,ACCEPT,tcp,192.168.20.4,443
  ```

- Scenario 2: The list should permit HTTPS traffic to address 192.168.30.3. This is the IP address of the management station inside the VPN tunnel.

  ```
  access-list=LPS-20x,ACCEPT,tcp,192.168.30.3,443
  ```

Create a LPS-20x profile

Define a RADIUS profile for the LPS-20xs. The profile should activate the access list that was defined in the access controller profile. For example:

```
use-access-list=LPS-20x
```

Create a user account for each LPS-20x

Define a RADIUS user account for each LPS-20x. Define a unique username and password for each device.

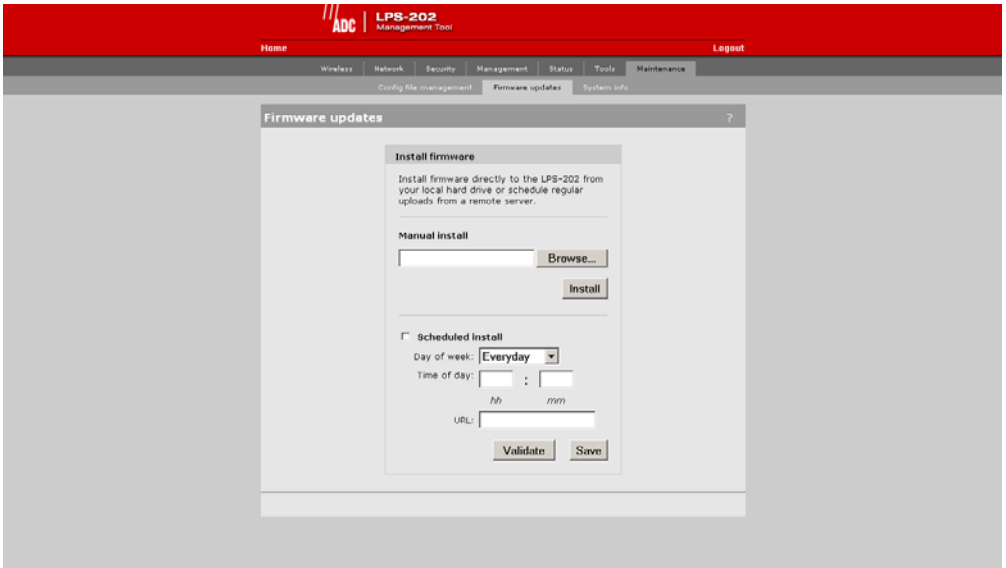
Firmware Management

Firmware updates can be handled manually, automatically, or with a tool like cURL.

IMPORTANT *When an LPS-20x is restarted, it automatically initializes itself to the default address 192.168.1.1. If the DHCP client is enabled on the Internet port, it takes about 30 seconds after the restart for the DHCP client to request an address. Therefore, for a short period of time after restarting, the LPS-20x may conflict with another device on the network. This will usually not be an issue. However, if you are using an automated tool (like cURL) to update the configuration/firmware on several LPS-20xs at the same time, you may experience difficulties. It is recommended that you schedule your updates to occur in succession, leaving a three minute interval between each device.*

Manual Update

1. On the **Maintenance** menu, click **Firmware updates**.



Install firmware directly to the LPS-202 from your local hard drive or schedule regular uploads from a remote server.

□ Scheduled install

Day of week: Everyday

Time of day: : (hh mm)

URL:

2. In the **Install firmware** box, click the **Browse** button and select the .cim file you just unzipped.

This procedure assumes you have already loaded and unzipped the .cim file to your local hard drive.

3. Click **Install**.

The LPS-20x will automatically restart after the firmware has been installed. This will disconnect all client stations. Once the LPS-20x resumes operation, all client stations will have to reconnect. Configuration settings are preserved during firmware upgrades.

Firmware Update Parameters

Firmware Updates

The firmware is special software that controls the operation of the LPS-20x. Periodically, ADC will make new versions of the firmware available.

All configuration settings are preserved during the update unless stated otherwise in the release notes for the firmware.

Install Firmware

Two options are available: Manual and Scheduled.

Manual

Click the Browse button and then locate a firmware file. Select it, and then click Install to upload it to the LPS-20x. When installation is complete, the LPS-20x will automatically restart.

Scheduled

The LPS-20x can automatically retrieve and install firmware from a local or remote URL at preset times. By placing LPS-20x firmware on a web or ftp server, you can automate the update process for multiple units.

Click the validate button to check if the URL you specified points to a valid firmware file.

When the update process is triggered, the LPS-20x retrieves the first 2K of the firmware file to determine if it is different than the active version. If different (older or newer version), the entire firmware file is then downloaded and installed. This enables you to return to other firmware version, if required.

Configuration settings are preserved during the update unless stated otherwise in the release notes for the firmware. However, all active connections will be terminated. Customers will have to log in again after the LPS-20x restarts.

Using cURL

It is possible to automate management tasks using a tool like cURL. cURL is a software client that can be used to get/send files to/from a server using a number of different protocols (HTTP, HTTPS, FTP, GOPHER, DICT, TELNET, LDAP or FILE).

cURL is designed to work without user interaction or any kind of interactivity. It is available for Windows and LINUX at: http://curl.haxx.se/. You must use version 7.9.8 or higher.

The following cURL commands illustrate how to update the firmware. The following setup is assumed:

- IP address of the LPS-20x's Internet port is 24.28.15.22.
- Management access to the Upstream port is enabled.
- Firmware is located in LPS2xx.CIM.

Login to the management interface.

```
curl --dump-header cookie.txt -s -m 60 "https://24.28.15.22/goform/
Logout?username=admin&pw=admin"
```

Prepare the LPS-20x to receive the firmware update.

```
curl --cookie cookie.txt -m 60 "https://24.28.15.22/script/firmware_init.asp"
```

Upload the firmware. Once the upload is complete, the LPS-20x will automatically restart.

```
curl --cookie cookie.txt -s -m 600 -F firmware=@LPS20x.cim -F backup=Install
"https://24.28.15.22/goform/ScriptUploadFirmware"
```

Configuration File Management

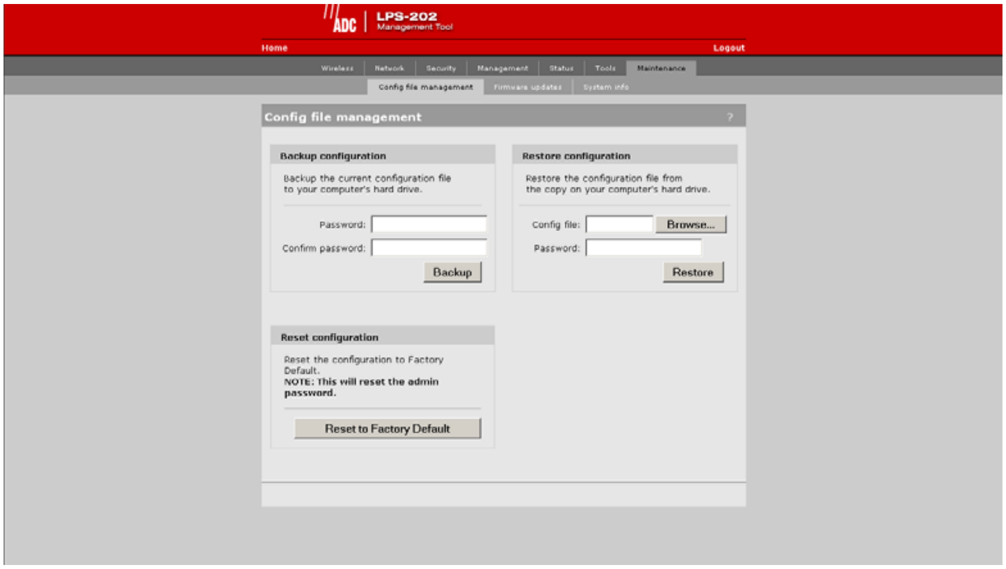
The configuration file contains all of the settings that customize the operation of the LPS-20x.

You can save and restore the configuration file manually, automatically, or with a tool like cURL.

IMPORTANT ***When an LPS-20x is restarted, it automatically initializes itself to the current address (default is 192.168.1.1). If the DHCP client is enabled on the Internet port, it takes about 30 seconds after the restart for the DHCP client to request an address. Therefore, for a short period of time after restarting, the LPS-20x may conflict with another device on the network. This will usually not be an issue. However, if you are using an automated tool (like cURL) to update the configuration/ firmware on several LPS-20xs at the same time, you may experience difficulties. It is recommended that you schedule your updates to occur in succession, leaving a three minute interval between each device.***

Manual Updates

Use the **Config file management** option on the **Maintenance** menu to manage your configuration files.



Config file management

Backup configuration

Backup the current configuration file to your computer's hard drive.

Password:

Confirm password:

Restore configuration

Restore the configuration file from the copy on your computer's hard drive.

Config file:

Password:

Reset configuration

Reset the configuration to Factory Default.
NOTE: This will reset the admin password.

The following three options are available:

Backup Configuration File

This option enables you to backup your configuration settings so they can be easily restored in case of failure. This option is also used when you want to directly edit the configuration file (refer to WPA Security on page 110).

Reset Configuration

Use this option to return the configuration of the LPS-20x to its factory default settings.

WARNING Resetting to factory defaults sets the administrator password to 'admin' and resets all configuration settings.

Restore Configuration File

Enables you to restore a configuration from a previously saved backup. This feature enables you to maintain several configuration files with different settings, which can be useful if you frequently need to alter the configuration of the LPS-20x or if you are managing several LPS-20xs from a central site.

USING cURL

It is possible to automate management tasks using a tool like cURL. cURL is a software client that can be used to get/send files to/from a server using a number of different protocols (HTTP, HTTPS, FTP, GOPHER, DICT, TELNET, LDAP or FILE).

cURL is designed to work without user interaction or any kind of interactivity. It is available for Windows and LINUX at: http://curl.haxx.se/. You must use version 7.9.8 or higher.

The following cURL commands illustrate how to manage the configuration file. The following setup is assumed:

- IP address of the LPS-20x's Internet port is 24.28.15.22.
- Management access to the Upstreaam port is enabled.
- Configuration file is located in LPS2xx.CFG.

Uploading the Configuration File

1. Login to the management interface.

```
curl --dump-header cookie.txt -s -m 60 "https://24.28.15.22/goform/
Logout?username=admin&pw=admin"
```

2. Prepare the LPS-20x to receive the configuration update.

```
curl --cookie cookie.txt -m 60 "https://24.28.15.22/script/ config_init.asp"
```

3. Upload the configuration file.

```
curl --cookie cookie.txt -s -m 600 -F config=@LPS2xx.cfg -F backup=Restore
"https://24.28.15.22/goform/ScriptUploadConfig"
```

4. Reset the LPS-20x to activate the new configuration.

```
curl --cookie cookie.txt -s -m 60 "https://24.28.15.22/script/reset.asp"
```

Downloading the Configuration File

1. Login to the management interface.

```
curl --dump-header cookie.txt -s -m 60 "https://24.28.15.22/goform/
Logout?username=admin&pw=admin"
```

2. Download the configuration file.

```
curl --cookie cookie.txt "https://24.28.15.22/download/config.cfg"
-o config.cfg
```

3. Logout.

```
curl --cookie cookie.txt -s -m 4 "https://24.28.15.22/goform/
Logout?logout=Logout"
```

Resetting the Configuration to Factory Defaults

CAUTION ***Resetting the LPS-20x deletes all your configuration settings, resets the Administrator username and password to 'admin' , and sets the Wireless port and LAN port IP address to 192.168.1.1.***

The management tool can also be used to restart or reset the LPS-20x.

1. Login to the management interface.

```
curl --dump-header cookie.txt -s -m 60 "https://24.28.15.22/goform/
Logout?username=admin&pw=admin"
```

2. Reset configuration to factory defaults.

```
curl --cookie cookie.txt -m 5 "https://24.28.15.22/goform/
ScriptResetFactory?reset=Reset+to+Factory+Default"
```

3. Reset the LPS-20x to activate the new configuration.

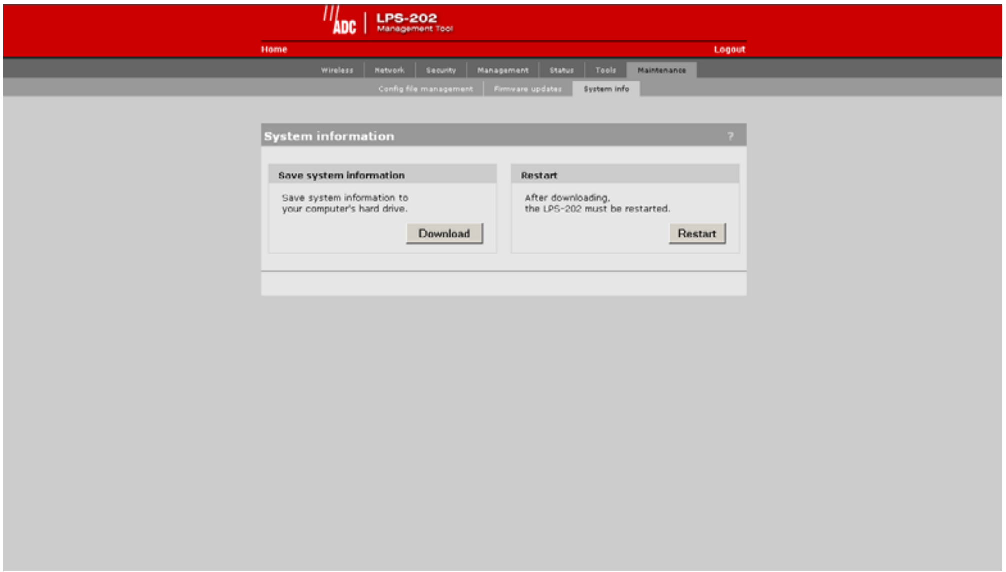
```
curl --cookie cookie.txt -s -m 60 "https://24.28.15.22/script/reset.asp"
```

SYSTEM INFORMATION

Restarting will drop all active connections.

Use this screen to save troubleshooting information to your computer's hard drive. The information in this file can only be decoded by ADC. After you save system information, you must restart the LPS-20x to resume proper operation.

1. On the **Maintenance** menu, click **System info**.



System information

Save system information

Save system information to your computer's hard drive.

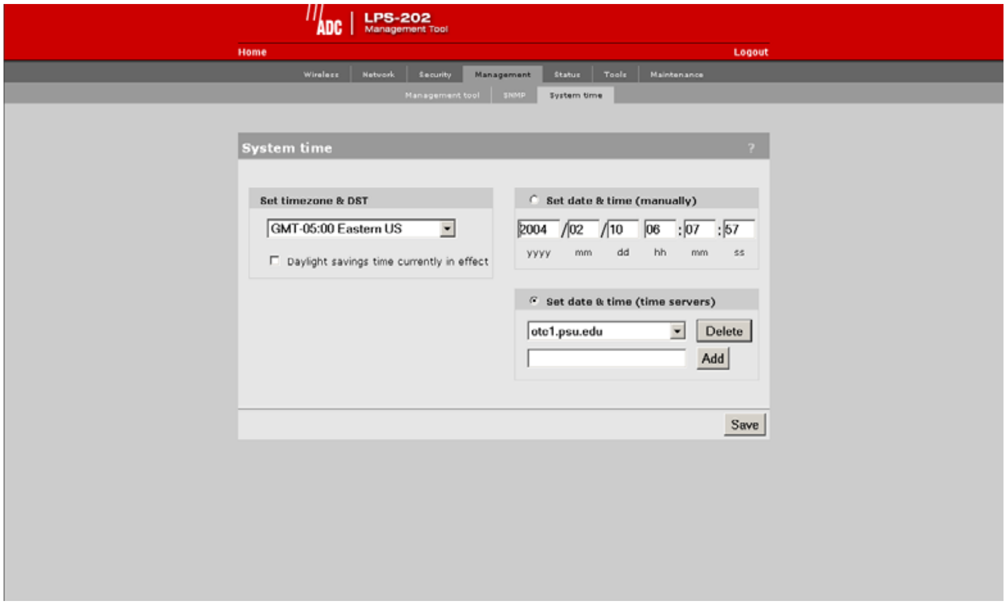
Restart

After downloading. the LPS-202 must be restarted.

2. In the **save system information** box, click the **Download** button to save the system information to your computer's hard drive.
3. In the **Restart** box, click the **Restart** button. You will be asked to log back into the system (refer to Starting the Management Tool on page 38).

System Time

1. On **Management** menu, click **System time**. The *System time* configuration page opens.



System time

Set timezone & DST

GMT-05:00 Eastern US

□ Daylight savings time currently in effect

○ Set date & time (manually)

2004 / 02 / 10 06 : 07 : 57
yyyy mm dd hh mm ss

● Set date & time (time servers)

otc1.psu.edu

System Time Parameters

Set Time Zone and DST

Choose the time zone the LPS-20x is located in. You may also enable support for daylight savings time.

Set Date and Time (Manually)

Use this option to manually set the system date and time.

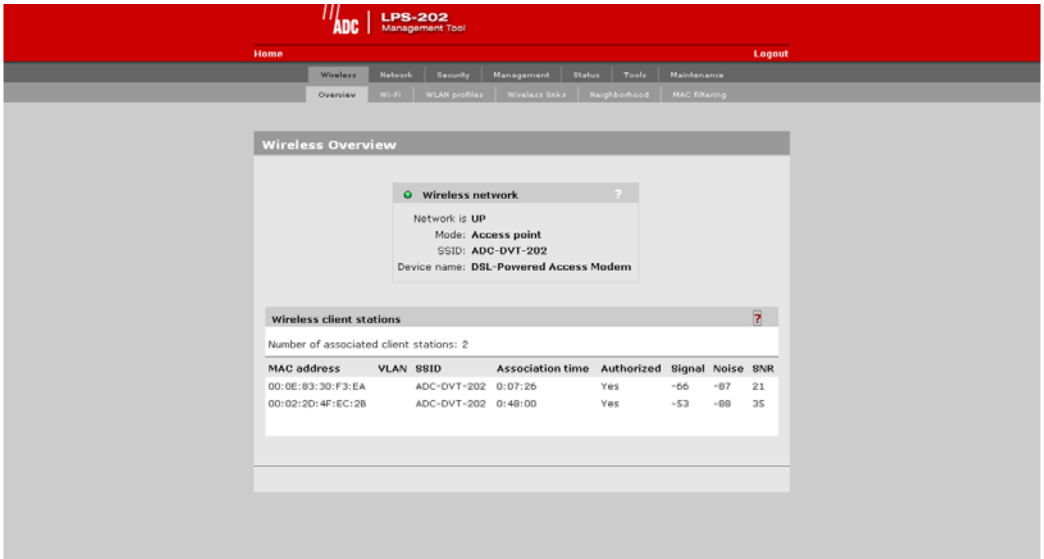
Set Date and Time (Time Server)

Choose this option to have the LPS-20x periodically contact a network time server to update its internal clock. Time servers are checked in the order they appear in the list. Use the Add and Delete buttons to define new servers or remove existing servers.

Wireless Overview

Use this screen to gather information on your wireless system.

1. On the **Wireless** menu, click **Overview**.



Wireless Overview

Wireless network

Network is **UP**
Mode: **Access point**
SSID: **ADC-DVT-202**
Device name: **DSL-Powered Access Modem**

Wireless client stations

Number of associated client stations: 2

MAC address	VLAN	SSID	Association time	Authorized	Signal	Noise	SNR
00:0E:83:30:F3:EA		ADC-DVT-202	0:07:26	Yes	-66	-87	21
00:02:2D:4F:EC:2B		ADC-DVT-202	0:48:00	Yes	-53	-88	35

Wireless Network Parameters

Network is up or down

Indicates the status of the wireless network.

Mode

Indicates if the LPS-20x is operating in Access Point or in Point-to-Point mode.

SSID

Name assigned to the wireless network.

Device name

The name that identifies the LPS-20x on the wireless network (for information purposes only).

Wireless client station Parameters

Mac address

The Ethernet address of client station(s) that are associated to the AP.

SSID

The SSID that the client station(s) is associated with.

Association time

Indicates how long the client station has been associated with the LPS-20x.

Authorized

Applies to client stations using 802.1x only. A value of “Yes” indicates that 802.1x authentication was successful. A value of “No” indicates that 802.1x authentication was unsuccessful. If 802.1x support is not enabled on the LPS-20x, this field shows “yes”.

Signal

Indicates the strength of the radio signal received from the client stations. Signal strength is expressed in dBm. The higher the number, the stronger the signal.

Noise

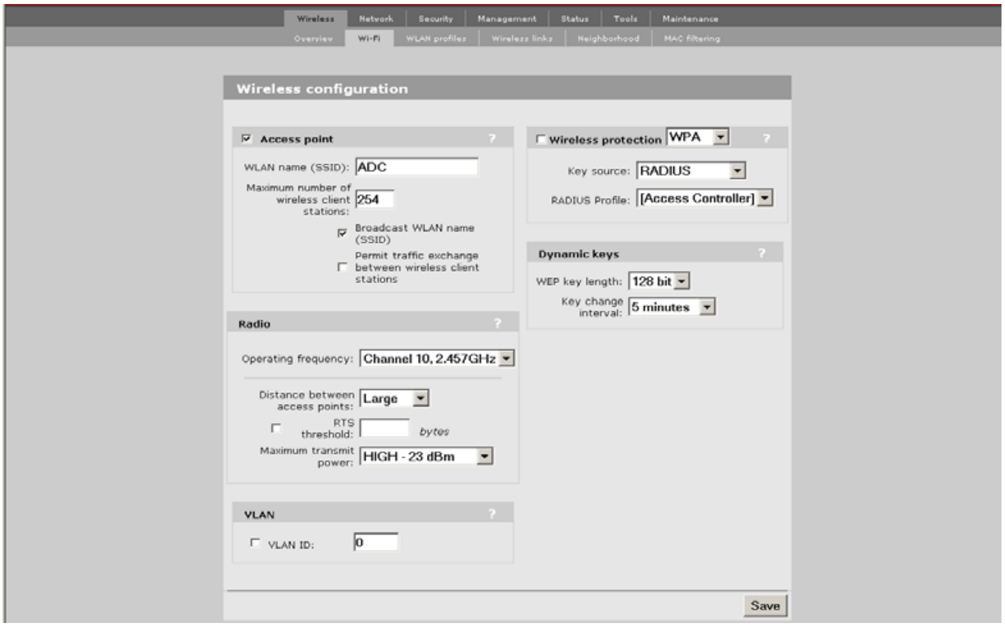
Indicates how much background noise exists in the signal path between client stations and the LPS-20x. Noise is expressed in dBm. The lower (more negative) the value, the weaker the noise.

SNR

Indicates the relative strength of client station radio signals versus the radio interference (noise) in the radio signal path. In most environments, SNR is a good indicator for the quality of the radio link between the client stations and the LPS-20x. A higher SNR value means a better quality radio link.

Configuration – Setting up the Wireless LAN

1. On the main menu, click **Wireless**, then click **Wi-Fi**. The *Wireless configuration* page opens.



Wireless configuration

☑ Access point

WLAN name (SSID): ADC

Maximum number of wireless client stations: 254

☑ Broadcast WLAN name (SSID)

☐ Permit traffic exchange between wireless client stations

Radio

Operating frequency: Channel 10, 2.457GHz

Distance between access points: Large

☐ RTS threshold: bytes

Maximum transmit power: HIGH - 23 dBm

VLAN

☐ VLAN ID: 0

☐ Wireless protection WPA

Key source: RADIUS

RADIUS Profile: [Access Controller]

Dynamic keys

WEP key length: 128 bit

Key change interval: 5 minutes

2. Configure the parameters as described in the sections that follow.
3. Click **Save** when you are done.

Access Point Parameters

Enable this option to activate the wireless access point (default). When this option is disabled, wireless client stations will not be able to connect.

IMPORTANT

If you turn this feature off while provisioning the LPS-20x via a wireless connection, you will lose communication to the device.

WLAN name (SSID)

Specify a name to uniquely identify your wireless network. Each client computer that wants to connect to the LPS-20x must use this name.

The name is case-sensitive.

Maximum number of wireless client stations

Specify the maximum number of wireless client stations that can be associated with this SSID at the same time.

IMPORTANT

The total number of wireless client stations that can be connected to the LPS-20x at the same time across all WLAN profiles is 254.

Broadcast WLAN name (SSID)

When this option is enabled, the LPS-20x will broadcast its wireless network name (SSID) to all client stations. Most wireless adapter cards have a setting that enables them to automatically discover access points that broadcast their names and automatically connect to the one with the strongest signal. If you disable this option, client stations will have to specify the network name you enter for **WLAN name** when they connect.

Permit traffic exchange between wireless client stations

Enable this option to allow wireless client stations to exchange data with one another. By default, the LPS-20x blocks all traffic between wireless client stations.

Radio Parameters

Wireless Mode

The transmission speed and frequency band is 802.11b: 11 Mbps in the 2.4 GHz frequency band.

Operating Frequency

Select the correct frequency for the LPS-20x to operate in. The frequencies that are available are determined by the radio installed in the LPS-20x and the regulations that apply in your country.

For optimum performance when operating in 802.11b mode, choose a frequency that differs from other wireless access points operating in neighboring cells by at least 25 MHz. Consult the **Wireless > Neighborhood** page to view a list of access points currently operating in your area.

Distance Between Access Points

Use this parameter to adjust the receiver sensitivity of the LPS-20x. This parameter should only be changed if:

- you have more than one wireless access point installed in your location
- you are experiencing throughput problems

In all other cases, use the default setting of **Large**. If you have installed multiple LPS-20xs, reducing the receiver sensitivity of the LPS-20x from its maximum level will help to reduce the amount of crosstalk between the wireless stations to better support roaming clients. By reducing the receiver sensitivity, client stations will be more likely to connect with the nearest access point.

RTS Threshold

Use this parameter to control collisions on the link that can reduce throughput. If the **Status -> Wireless** page shows increasing values for **Tx multiple retry frames** or **Tx single retry frames**, you should adjust this value until the errors clear up. Start with the largest value and slowly decrease until errors are minimized. Note that using a small value for **RTS threshold** can affect throughput.

If a packet is larger than the threshold, the LPS-20x will hold it and issue a *request to send* (RTS) message to the client station. Only when the client station replies with a *clear to send* (CTS) message will the LPS-20x send the packet. Packets smaller than the threshold are transmitted without this handshake.

Transmit Power

Use this parameter to set the transmission power of the wireless radio.

- HIGH: Sets the maximum transmission power the wireless card is capable of. It will be either 100 mW (20 dBm) or 200 mW for North America (23 dBm).
- MEDIUM: 17 dBm
- LOW: 13 dBm

VLAN Parameters

VLAN ID

Assigns a VLAN ID to the wireless network. The LPS-20x bridges all wireless traffic to the matching VLAN connected to the Internet port.

IMPORTANT

Enabling this feature bypasses all security features that are active on the LPS-20x. Make sure that your VLAN has the appropriate security installed to protect access to the network.

Wireless Protection Parameters

Select the type of protection you want to use for the wireless network.

WPA

This option enables support for users with Wi-Fi Protected Areas (WPA) client software.

Key Source

This option determines how the Temporary Key Integrity Protocol (TKIP) keys are generated.

- RADIUS: The LPS-20x obtains the Microsoft Point-to-Point Encryption (MPPE) protocol key from the RADIUS server. This is a dynamic key that changes each time the user logs in and is authenticated. The MPPE key is used to generate the TKIP keys that encrypt the wireless data stream. Select the appropriate RADIUS server.

- Preshared Key: The LPS-20x uses the key you specify in the **Key** field to generate the TKIP keys that encrypt the wireless data stream. Since this is a static key, it is not as secure as the RADIUS option. Specify a key that is between 8 and 64 characters in length. It is recommended that the preshared key be at least 20 characters long, and be a mix of letters and numbers.

Key/Confirm key

Specify a key that is between 8 and 64 characters in length.

802.1x

This option enables support for users with 802.1x client software. The LPS-20x supports 802.1x client software that uses EAP-TLS, EAP-TTLS, and PEAP.

RADIUS profile

Communications with the RADIUS server is handled via the access controller. This setting cannot be changed.

WEP encryption

Enable the use of dynamic WEP keys for all 802.1x sessions. Dynamic key rotation occurs on key 1, which is the broadcast key. Key 0 is the pairwise key. It is automatically generated by the LPS-20x. Key length and key change interval are set in the **Dynamic keys** box.

WEP

Key 1, 2, 3, 4

The number of characters you specify for a key determines the level of encryption the LPS-20x will provide.

- For 40-bit encryption, specify 5 ASCII characters or 10 HEX digits
- For 128-bit encryption, specify 13 ASCII characters or 26 HEX digits

When encryption is enabled, wireless stations that do not support encryption cannot communicate with the LPS-20x. The definition for each encryption key must be the same on the LPS-20x and all client stations. Keys must also be in the same position. For example, if you are using key 3 to encrypt transmissions, then each client station must also define key 3 to communicate with the LPS-20x.

Transmission key

Select the key the LPS-20x will use to encrypt transmitted data. All four keys are used to decrypt received data.

Key format

Select the format you used to specify the encryption keys:

ASCII

ASCII keys are much weaker than carefully chosen HEX keys. You can include ASCII characters between 32 and 126, inclusive in the key. However, note that not all client stations support non-alphanumeric characters such as spaces, punctuation, or special symbols in the key.

HEX

Your keys should only include the following digits: 0-9, a-f, A-F

Dynamic Keys Parameters

WEP key length

This setting determines the level of encryption the LPS-20x will provide for 802.1x and WPA.

Key Change Interval

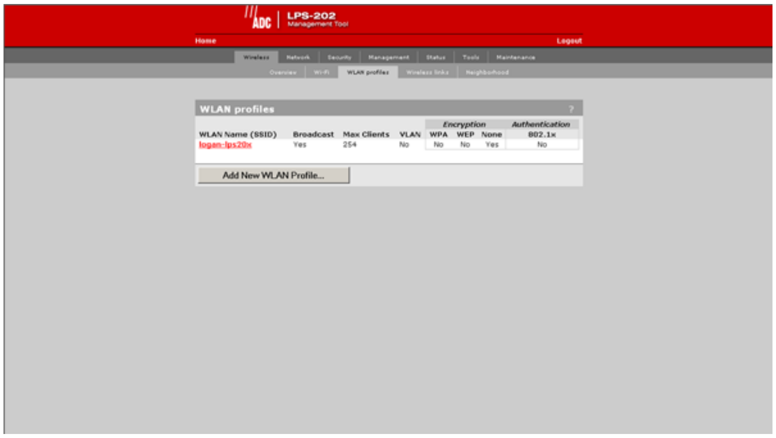
Specifies how often key rotation occurs for 802.1x and WPA.

WLAN Profiles

The LPS-20x enables you to create multiple wireless networks all sharing the same wireless port. Each network has its own SSID (network name) and configuration settings that are defined in a profile. Up to 16 profiles can be created.

To create a wireless profile

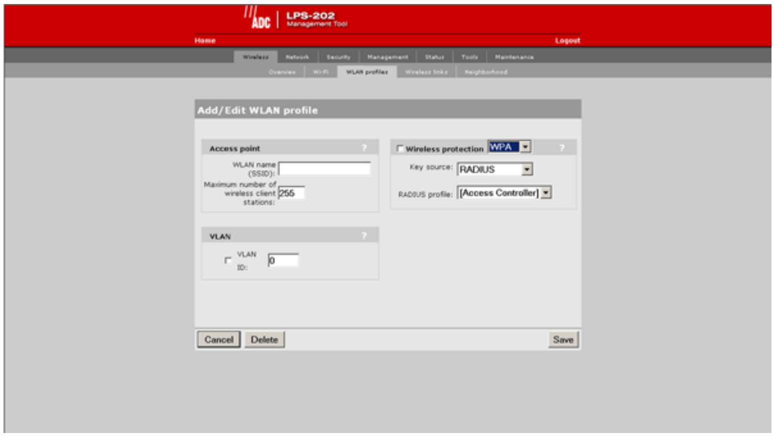
1. On the main menu, click **Wireless,** and then click **WLAN profiles**. The *WLAN profiles* page opens. Initially, it displays the default WLAN profile.



WLAN profiles

				Encryption			Authentication
WLAN Name (SSID)	Broadcast	Max Clients	VLAN	WPA	WEP	None	802.1x
logan-lps20x	Yes	254	No	No	No	Yes	No

2. Click **Add New Profile**.
3. Specify the settings for the profile. Refer to the sections that follow for details.



Add/Edit WLAN profile

Access point

WLAN name (SSID):

Maximum number of wireless client stations: 255

☐ Wireless protection WPA

Key source: RADIUS

RADIUS profile: [Access Controller]

VLAN

☐ VLAN ID: 0

4. Click **Save** when you are done.

Access Point Parameters

Enable this option to activate the wireless access point. When this option is disabled, wireless client stations will not be able to connect.

WLAN name (SSID)

Specify a name to uniquely identify your wireless network. Each client computer that wants to connect to this profile must use this name. The name is case-sensitive.

Maximum number of wireless client stations

Specify the maximum number of wireless client stations that can be associated with this SSID at the same time.

IMPORTANT

The total number of wireless client stations that can be connected to the LPS-20x at the same time across all WLAN profiles is 254.

Only 100 customers can be logged into the public access interface at one time. Customers that are not logged in can still make use of the wireless network to access public resources (i.e., those resources specified in the white list or with an access list "accept").

Broadcast WLAN name (SSID)

When this option is enabled, the LPS-20x will broadcast its wireless network name (SSID) of this profile to all client stations. Most wireless adapter cards have a setting that enables them to automatically discover access points that broadcast their names and automatically connect to the one with the strongest signal.

If you disable this option, client stations will have to specify the network name you enter for **WLAN name** when they connect.

VLAN Parameters

VLAN ID

Assigns a VLAN ID to the wireless network. The LPS-20x bridges all wireless traffic with the matching VLAN on the Internet port.

IMPORTANT

Enabling this feature bypasses all security features enabled on the LPS-20x. Make sure that your VLAN has the appropriate security installed to protect access to the network.

The LPS-20x also provides per-user VLAN support.

Wireless Protection Parameters

Select the type of protection you want to use for the wireless network.

WPA

This option enables support for users with WPA client software.

Key Source

This option determines how the TKIP keys are generated.

- RADIUS: The LPS-20x obtains the MPPE key from the RADIUS server. This is a dynamic key that changes each time the user logs in and is authenticated. The MPPE key is used to generate the TKIP keys that encrypt the wireless data stream. Select the appropriate RADIUS server.

  WPA sessions are terminated by the LPS-20x. This means that the LPS-20x handles all authentication tasks and must communicate with the RADIUS server or access controller to validate login credentials. The LPS-20x sends this authentication traffic on the downstream port. Therefore, the RADIUS server or access controller must be reachable via this port.
- Preshared Key: The LPS-20x uses the key you specify in the **Key** field to generate the TKIP keys that encrypt the wireless data stream. Since this is a static key, it is not as secure as the RADIUS option. Specify a key that is between 8 and 64 characters in length. It is recommended that the preshared key be at least 20 characters long, and be a mix of letters and numbers.

RADIUS Profile

Only valid value is Access Controller.

802.1x

This option enables support for users with 802.1x client software. The LPS-20x supports 802.1x client software that uses EAP-TLS, EAP-TTLS, and PEAP.

Note that all authentication tasks are handled by the LPS-20x and not the wireless client station. This means that the RADIUS server must be reachable via the downstream port.

RADIUS profile

Communications with the RADIUS server is handled via the access controller. This setting cannot be changed.

Dynamic WEP encryption

Enable the use of dynamic WEP keys for all 802.1x sessions. Dynamic key rotation occurs on key 1, which is the broadcast key. Key 0 is the pairwise key. It is automatically generated by the LPS-20x.

Key length and key change interval are set in the **Dynamic keys** box.

WEP

Key 1, 2, 3, 4

The number of characters you specify for a key determines the level of encryption the LPS-20x will provide.

- For 40-bit encryption, specify 5 ASCII characters or 10 HEX digits
- For 128-bit encryption, specify 13 ASCII characters or 26 HEX digits

When encryption is enabled, wireless stations that do not support encryption cannot communicate with the LPS-20x. The definition for each encryption key must be the same on the LPS-20x and all client stations. Keys must also be in the same position. For example, if you are using key 3 to encrypt transmissions, then each client station must also define key 3 to communicate with the LPS-20x.

Transmission Key

Select the key the LPS-20x will use to encrypt transmitted data. All four keys are used to decrypt received data.

Key format

Select the format you used to specify the encryption keys:

ASCII

ASCII keys are much weaker than carefully chosen HEX keys. You can include ASCII characters between 32 and 126, inclusive, in the key. However, note that not all client stations support non-alphanumeric characters such as spaces, punctuation, or special symbols in the key.

HEX

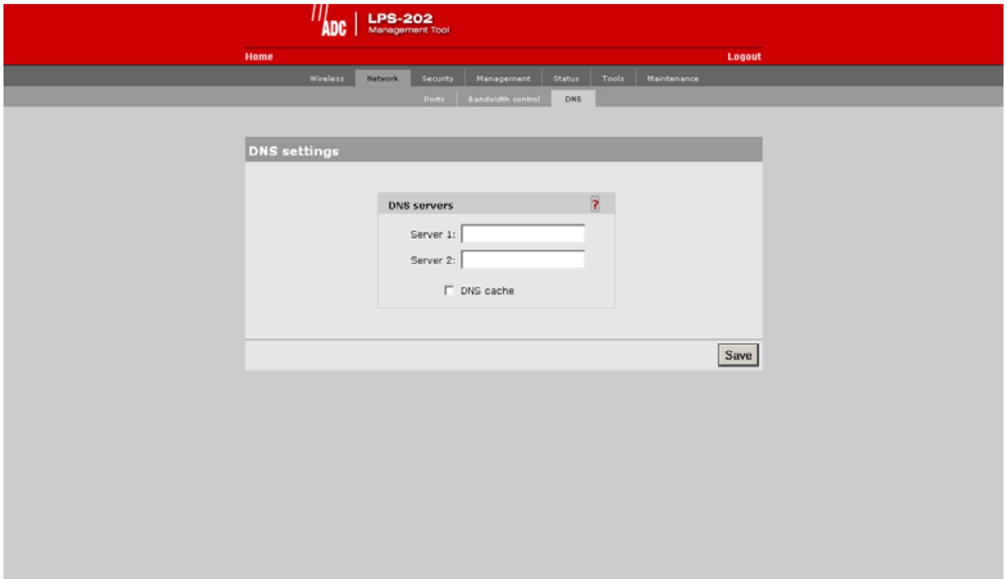
Your keys should only include the following digits: 0-9, a-f, A-F

DNS Management

Overriding Dynamically Assigned DNS Servers

If required, you can override the DNS servers dynamically assigned by PPPoE or DHCP as follows:

1. In the management tool, click **Network**, then click **DNS**. The *DNS configuration* page opens.



2. Specify the addresses of **Server 1** and **Server 2**.
3. Click **Save** when you are done.

DNS Server Parameters

Server 1

Specify the IP address of the first DNS server that the LPS-20x will use.

Server 2

Specify the IP address of the second DNS server that the LPS-20x will use.

DNS cache

Enables the DNS cache. Once the host name has been successfully resolved to an IP address by a remote DNS server, it is stored in the cache. This speeds up network performance as the remote DNS server now does not have to be queried for subsequent requests for this host.

The entry stays in the cache until:

- an error occurs when connecting to the remote host
- the time to live (TTL) of the DNS request expires
- the LPS-20x is restarted

Setting up a Multi-Cell Wireless Network

Multiple LPS-20xs are installed in conjunction with a RADIUS Server to provide multiple wireless cells for coverage of large locations. Client computers are able to move between cells (called roaming) without losing contact with the network. This is possible because wireless adapters automatically switch to the best available wireless access point.

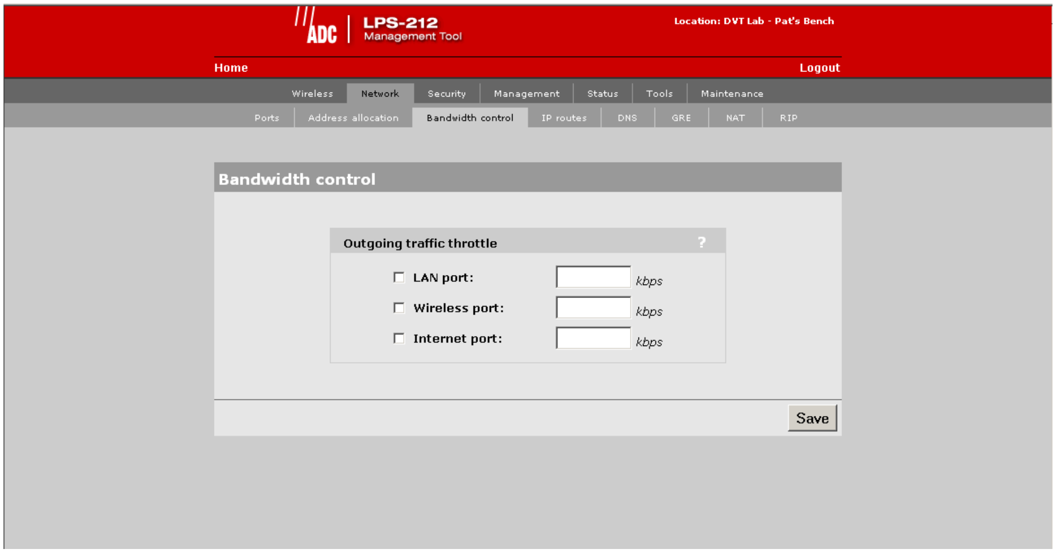
Operating Frequency

When using multiple units, it is important that each pair of wireless cells that overlap be set to operate on a different channel. This helps to eliminate crosstalk and increase performance. For information on selecting operating frequencies, refer to Configuring Overlapping Wireless Cells on page 72.

Network Bandwidth Control

These parameters enable you to limit the flow of data traffic through the LPS-20x by controlling the outgoing bandwidth allocated to each port.

1. On the **Network** menu, click **Bandwidth control**.



Bandwidth control

Outgoing traffic throttle

□ LAN port: kbps

□ Wireless port: kbps

□ Internet port: kbps

Outgoing Traffic Throttle Parameters

These parameters enable you to limit the data traffic through the LPS-20x by controlling the outgoing bandwidth allocated to each port. Note that the LPS-212 is shown, but the LPS-20x screen is identical to the LPS-212.

- If outgoing traffic arrives at the port at the defined bandwidth limit (or less), it is processed without delay.
- If outgoing traffic arrives at the port at a rate that is greater than the defined bandwidth limit, it causes the LPS-20x to throttle the traffic for that port.
- If the traffic rate is over-limit for just a short burst, the data will be queued and forwarded without loss. If the traffic rate is over-limit for sustained period, the LPS-20x will drop data to bring the rate down to the bandwidth limit that is set.

Examples:

- If you want to limit the traffic that wireless client stations can download from the Internet to 500 kbps, set a value of 500 for the wireless port.
- If you want to limit the traffic that LAN client stations can download from the Internet to 1000 kbps, set a value of 1000 for the LAN port.
- If you want to limit the traffic that wireless and LAN client stations can upload to the Internet to 800 kbps, set a value of 800 for the Internets port.

These are aggregate values per port and not per user values.

Configuring Overlapping Wireless Cells

Overlapping wireless cells are caused when two or more access points are within transmission range of each other. This may be under your control (when setting up multiple cells to cover a large location) or out of your control (when your neighbors set up their own wireless networks.). In either case, the problems you face are similar.

Performance Degradation and Channel Separation

When two wireless cells operating on the same frequency overlap, it can cause a reduction in throughput in both cells. This occurs because a wireless station that is attempting to transmit will defer (delay) its transmission if another station is currently transmitting. On a network with many clients and a lot of traffic, this can severely affect performance as stations defer multiple times before the channel becomes available. If a station is forced to delay its transmission too many times, data may be lost.

Delays and lost transmissions can severely reduce throughput on a network. Use the **Wireless** option on the **Status** menu to view this information on your network.

Figure 17 shows two overlapping wireless cells operating on the same frequency. Since both access points are within range of each other, the number of deferred transmissions will be large.

Overlapping wireless cells can cause transmission delays.

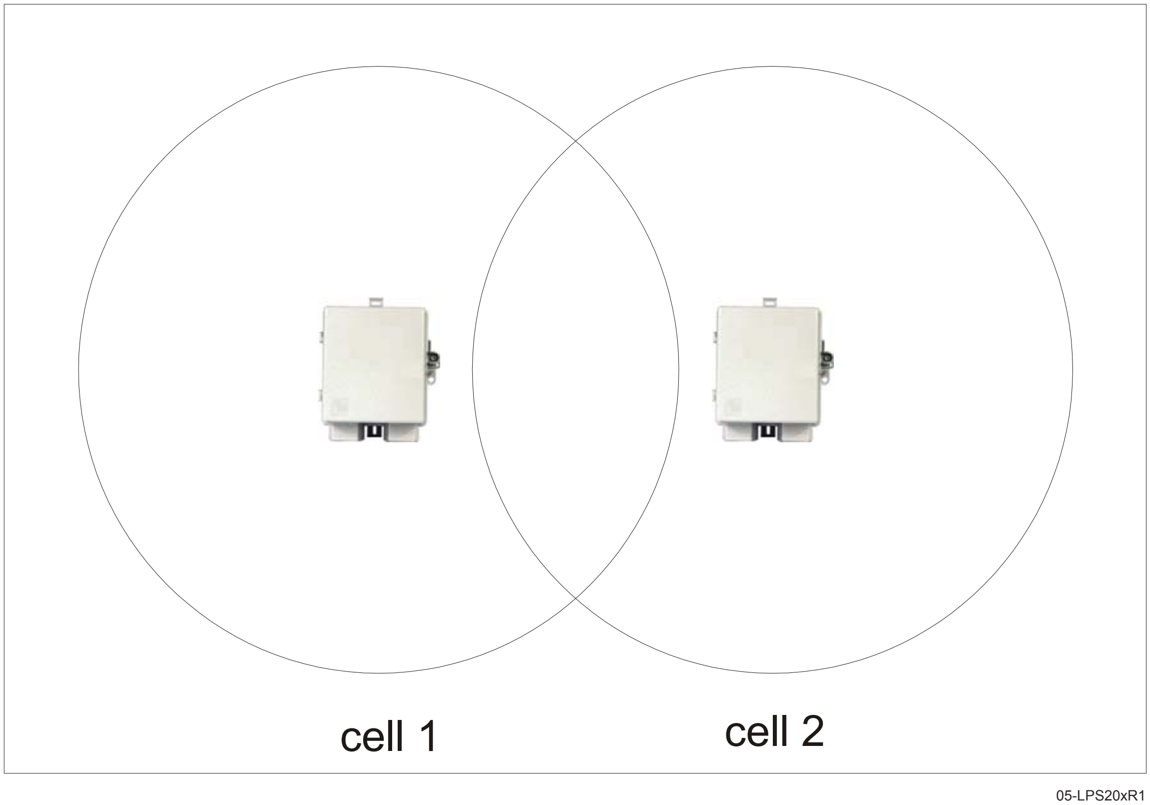


Figure 17. Overlapping Wireless Cells on Same Frequency

The solution to this problem is to set the two networks to different channels with as great a separation as possible in their operating frequencies. This reduces cross-talk and enables client stations connected to each access point to transmit at the same time.

Choosing Channels

For optimum performance when operating in 802.11b mode, choose a frequency that differs from other wireless access points operating in neighboring cells by at least 25 MHz. (Note that this is the recommended minimum. Two channels with this separation will always perform *worse* than two channels using the maximum separation. So it is always best to use the greatest separation possible between overlapping networks.)

Consult the **Wireless > Neighborhood** page to view a list of access points currently operating in your area.

With the proliferation of wireless networks, it is very possible that the wireless cells of access points outside your control may overlap your intended area of coverage. To generate a list of all access points operating near you and view their operating frequencies, go to **Wireless > Neighborhood**.

The set of available channels is automatically determined by the LPS-20x, based on the Country setting that has been programmed into the firmware. Available channels can be viewed on the Wi-Fi page. This means that the number of non-overlapping channels available to you will vary. This will affect how you set up your multi-cell network.

Channel Availability

The LPS-20x supports the following 14 channels in the 2.4 GHz band (Table 11).

Table 11. Supported Channels

Channel	Frequency
1	2412
2	2417
3	2422
4	2427
5	2432
6	2437
7	2442
8	2447
9	2452
10	2457
11	2462
12	2467
13	2472
14	2477

Different regions have specified maximum transmit power and channel availability (Table 12). The number of channels available in a particular country are determined by the regulations defined by the local governing body.

Table 12. Maximum Transmit Power and Channel Availability

Region	Maximum Transmit Power	Channel Availability
North America	200 mW	1-11
ETSI	100 mW	1-13
France	100 mW	10-13
Japan	100 mW	1-14
Spain	100 mW	10-11

Since the minimum recommended separation between overlapping channels is 25 MHz (five cells), then the recommended maximum number of overlapping cells you can have in most regions is three (Table 13).

Table 13. Channel Availability

North America	Europe	Japan
cell 1 on channel 1	cell 1 on channel 1	cell 1 on channel 1
cell 2 on channel 6	cell 2 on channel 7	cell 2 on channel 7
cell 3 on channel 11	cell 3 on channel 13	cell 3 on channel 14