Wireless Ethernet Modem 945U-E

Product Overview

The 945U-E forms part of ELPRO Technologies 802.11 based wireless Ethernet modem range. The 945U-E combines the benefits of reliable distance communications at 900MHz with data throughputs to 54Mbps (country regulation dependant).

The 945U-E is an Access Point/ client, bridge/ router and serial server (RS232/485) with AP to AP repeatability (WDS) to increase communications distance. Filtering/security measures include MAC address and IP filtering and encryption to WPA2; 802.11i enterprise level standard. I/O capability can be added when combined with ELPRO's 115S expansion units.

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Features and Benefits

- 902-928MHz, 802.11 DSSS to 54Mbps (country regulation dependent).
- Up to 630mW RF power.
- Access Point/ Client, Bridge/ Router modes reducing inventory costs.
- Serial client/ server/ multicast functionality (point-point; point to multi-point) with simultaneous use of RJ45: RS232/ 485 ports.
- Modbus TCP to Modbus RTU Gateway/ Modbus Master for I/O transfer with additional slave I/O via ELPRO's 115S expansion modules.
- Spanning Tree functionality (self heal).
- AP - AP (WDS) repeatability.
- Encryption to WPA2, 802.11i.
- MAC address/ IP filtering reducing network traffic.
- Online network diagnostics and configuration.
- Onboard DI/O channel for failure status or external status transfer.
- Lifetime Warranty and Global Technical Support.

Applications

- IP/ PTZ cameras
- Roaming vehicle monitoring/ diagnostics
- PLC Communications
- Data logger communications
- Mass notification systems
- Agriculture sprayer control
- Water/ waste water systems
- SCADA networks

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Understanding Practical Ethernet Commissioning

When choosing which type of industrial wireless Ethernet to commission for your application, several aspects should be considered...

Which Wireless Ethernet Is Right For My Application?

Several factors should be considered when choosing which industrial wireless Ethernet is right for your application: country regulatory dependent.

Reliable Communications Distance

Reliable wireless Ethernet communications is fundamentally determined by a few key factors: the amount of Radio Frequency (RF) power emitted from the antenna (government regulated), the lowest level that the receiving module can reliably demodulate (ie receiver sensitivity) and the frequency waveform properties relative to the terrain over the distance required of the application.

Frequency and Terrain

Radio signals are transmitted between the sending and receiving units. The radiated radio signals form an elliptical path of concentric circles known as a Fresnel zone. The radio path may be described as either obstructed or line of sight.

It is the level of obstruction relative to the frequency waveform and its Fresnel zone that determines the success level of communications. Higher frequencies such as 2.4/5GHz have smaller waveforms and can be susceptible to obstructed paths and congestion. 900MHz waveforms are more reliable in non-line of sight distance applications due to greater diffraction (bending), reflection (bouncing) and susceptibility to multipath fading of the waveform (relative to higher frequencies).

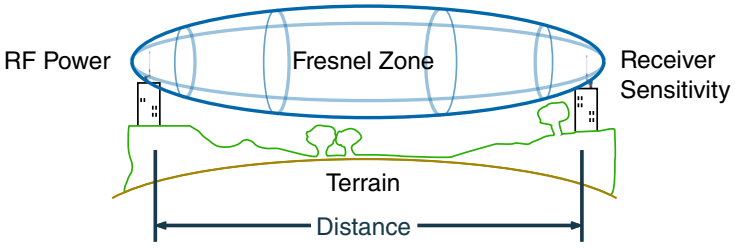


Image demonstrates the Fresnel zone between two antennas over the distance required of the application. It is the amount of obstruction relative to the waveform Fresnel zone (and other factors) that determines success.

The 900MHz Radio Spectrum

The 900MHz radio spectrum is regulated by government communications regulatory authorities. These bodies stipulate both bandwidth size and the number of channels available for use. As such the 945U-E supports up to 4 channels depending on regulations within the country of use. This has an impact on the potential data throughput available to the end user (eg USA up to 54Mbps and Australia up to 13.5Mbps).

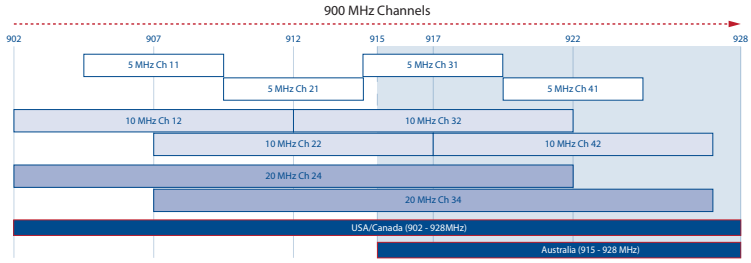
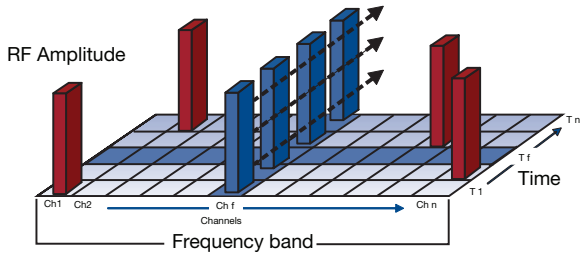


Image depicts bandwidth and channel size as per country regulations.

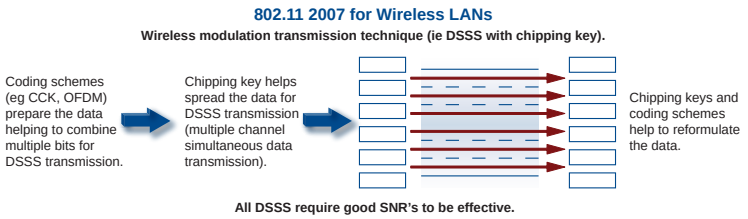
Understanding the 945U-E Advantage

The majority of 900MHz Ethernet products use Frequency Hopping Spread Spectrum (FHSS) as the modulation method in their design. FHSS products hop throughout the channels in the radio spectrum, hopping to the next available channel when communicating and/or experiencing interference. Due to the size and the use of a small number of channels, FHSS products are limited in their data throughput capabilities.



FHSS devices scan the channels within the band hopping channels in communicating and/or when experiencing interference.

ELPRO's 945U-E's innovative design uses Direct Sequence Spread Spectrum (DSSS) modulation allowing significant gains in data throughput compared to traditional FHSS devices. This allows end users to benefit from 900MHz transmission/ propagation and high data throughputs in distance applications.



DSSS devices use both coding schemes and chipping keys to spread the data and reform the same data allowing greater data communications throughput.

Summary

ELPRO's 945U-E innovative design allows distance communications with greater data throughput, providing end users with an alternative option where higher frequency Ethernet products may not be suitable (eg IP/PTZ cameras).

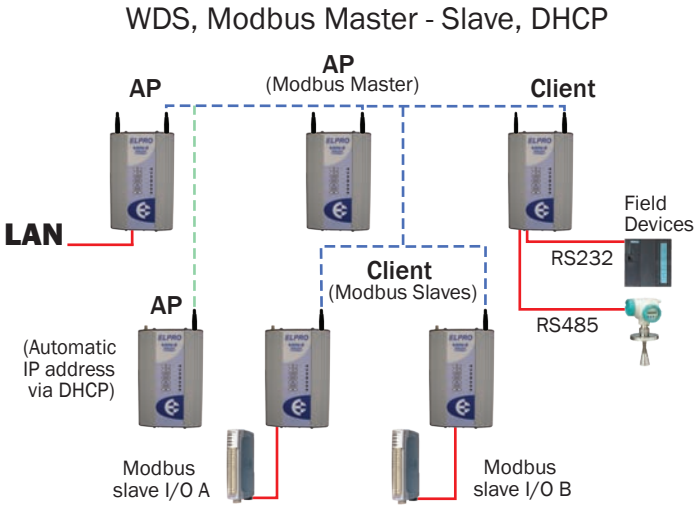
945U-E System Design Advantages

The 945U-E range is feature rich allowing end users to create complex, reliable engineering solutions for process and automation systems.

Access Point Repeating and Serial Server

System advantages of the 945U-E range includes serial client /server /multicast (RJ-45 to simultaneous RS232/485) connections with online diagnostics and configuration capability. The units can provide standalone Modbus Master-Slave functionality within the network and additional modules are readily added to the system with DHCP automatic IP addressing capability.

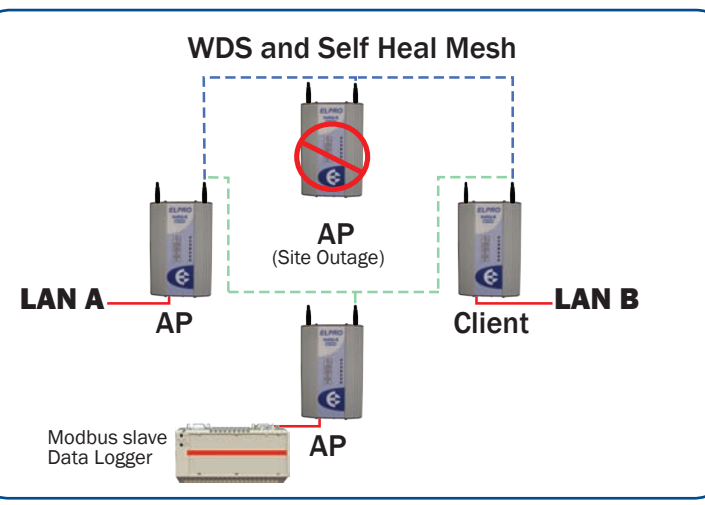
In the diagram top right, the LAN is connected serially to the field devices via an AP using serial server capability. A Modbus Master AP also polls Modbus slave I/O (A -> B).



Access Point Repeating with Self Healing of Network

Using WDS (AP-AP) and Spanning Tree (self-healing) features of the 945U-E allows distance linkage in bridge /router modes and preservation of system communications in the event of a site outage.

In the diagram bottom right, LAN's A and B are connected by the middle AP. Loss of power (site outage) to the middle AP creates a communications failure but traffic is automatically diverted through redundant AP modem to LAN B.



Product comparison and ordering guide (includes existing 240U-E, 245U-E and 905/805U-E products)

	245U-E-G	245U-E-A	945U-E	240U-E	905U-E	805U-E
Frequency	2.412 - 2.472GHz	5.18 - 5.825GHz(1)	902-928MHz (1)	2.412 - 2.462GHz	902 - 928MHz(1)	869MHz (1)
Modulation	802.11b/g	802.11a	802.11 g	802.11b	802.11-FHSS	802.11- FF(4)
TX Power	15 - 400mW(2)	15 - 400mW(2)	15 - 630mW	100 /300mW	100mW - 1W (2)	10,100 - 500mW(3)
Data Rate	108Mbps	108Mbps	54Mbps	11Mbps	200Kbps	72Kbps
WDS (AP-AP)	Yes	Yes	Yes	Yes	No	No
Self Heal (Spanning Tree)	Yes	Yes	Yes	Yes	Yes	Yes
Serial Client /Server /Multicast	Yes	Yes	Yes	Yes	Yes	Yes
Encryption Security Level (Maximum level highlighted)	WPA2 /802.11i	WPA2 /802.11i	WPA2/802.11i	WPA - PSK (TKIP / AES 128 bit)	128 bit AES Encryption	128 bit AES Encryption
MAC / IP Filtering	Yes	Yes	Yes	Yes	Yes	Yes
Network Function	AP /Client Bridge /Router	AP /Client Bridge /Router	AP /Client Bridge /Router	AP /Client Bridge /Router	AP /Client Bridge /Router	AP /Client Bridge /Router
Online Diagnostics	Yes	Yes	Yes	Yes	Yes	Yes
Online Configuration	Yes	Yes	Yes	Yes	Yes	Yes

Footnote:
(1) Frequency availability - country regulatory dependant.
(2) Configurable TX Power option available - country regulations apply.
(3) Model dependant relative to regulatory guidelines.
(4) Fixed Frequency (FF).

945U-E
Wireless Ethernet Modem

ELPRO Technologies is an ISO 9001:2008 Quality Assured Company.

Wireless Specifications	
Frequency band	USA: 902-928MHz; 1 - 54Mbps (configurable) AUS: 915-928MHz; 0.25 - 13.5Mbps (configurable) 'Auto mode' determines fastest rate possible relative to RSSI.
Receiver sensitivity	USA: -95 dBm @ 1 Mbps - 72 dBm @ 54 Mbps AUS: -95 dBm @ 0.25 Mbps; -72dBm @ 13.5Mbps
Channel Spacing	4 x 5MHz; 4 x 10MHz; 2 x 20MHz channels*.
Transmit Power	USA: 1-24 Mbps:630mW (28dBm) - 54Mbps:250mW (24dBm) AUS: 0.25-6Mbps:630mW (28dBm); 13.5Mbps:250mW (24dBm)
Line of sight range	6+ miles/ 10+ km @ 630 mW (Range may be extended using WDS, antenna diversity)
Antenna connector	USA/AUS: 2 x Female SMA (Surge diverter: CSD-SMA-2500) (2 x antennas for signal diversity or high gain receive antenna)
System Configuration Parameters	
System address (ESSID)	1 - 31 character text string
Security	
• Data encryption	To WPA2 PSK - 802.11i - 802.1x
• Password	https accessibility
Bandwidth Protection	
• MAC Address	Whitelist/ Blacklist
• IP Filtering	Whitelist/ Blacklist
• ARP Filtering	Whitelist/ Blacklist
Configurable	Access Point or Client/ Bridge or Router Broadcast or Control. Mode - Point to Point, Point to Multi-point. WDS Wireless Distribution System (AP - AP repeater functionality). Modbus TCP/ RTU Gateway. Serial client/ server/ multicast, simultaneous RS232/ 485 connection. On-board Modbus Master for I/O transfer.
Protocols supported	TCP/ IP, UDP, ARP, SNMP, RADIUS/ 802.1x, DHCP, DNS, PPP, ICMP, HTTP, FTP, TFTP, TELNET.
User Configuration	Embedded web page default URL.
Discrete I/O	
	Input voltage-free contact/ output FET 30VDC 500mA. Used to transfer input/ output status: communications failure output.
Diagnostics	
Diagnostics/ LED indication	Power/OK; RX; TX/Link; RS232; LAN; RS485; Digital I/O status
Reported diagnostics	RSSI measurement in dBm. Connectivity information/ statistics. System Log file.
Ethernet Port Indication	Link/ 100 Mbps

Ethernet Port	
Standard	10/ 100 BaseT; RJ45 - IEEE 802.3
Serial Port	
RS232	DB9 female DCE; RTS/ CTS/ DTR/ DCD (hardware signals provided)
RS485	2 pin terminal block (max distance 4000'/1.2km - non isolated)
Data rate (bps) configurable	1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600, 76800, 115200, 230400. 7 or 8 data bits, Stop/ start/ parity bits configurable.
General	
Compliances	
• EMC	EN 301 489 - 17; FCC Part 15
• Radio	EN 300 328; FCC Part 15.247, RSS 210
• CSA	Class I, Division 2 (pending)
• Safety	EN 60950
Size	4.5 x 6.7 x 1.2"/ 114 x 168 x 30 mm
Housing	Powder-coated, extruded aluminium
Mount	DIN rail
Terminal blocks	Removable; Max conductor 12 AWG (2.5mm²)
Temperature	-40 to +60°C ; -40 to +140°F
Humidity	0 – 99% RH non-condensing
Weight	<0.5kg (<1lb)
Power Supply	
Nominal supply	9 to 30VDC; under/ over voltage protection
Average current draw	Idle 12V - 270mA; Idle 24V - 140mA
Transmit current draw	Full TX (630mW) 12V - 470mA; Full TX (630mW) 24V - 250mA

Note: Specifications subject to change

- * Country Regulation Dependent.

Ordering Information

When ordering, please specify the following:

Order Code	Description	Frequency	RF Power
945U-E	Wireless Ethernet 802.11, 900MHz high speed.	907-922MHz DSSS	630mW

Note: Specifications subject to change.

- Specify country of application on ordering.
- RF power and frequency may vary depending on country of application.

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