

# EAP-E and EAP-E-PA Ethernet Access Point PRODUCT MANUAL







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#### 1 Introduction

The EAP-E Ethernet access point allows access to an ETRX2 or ETRX2-PA wireless mesh networking module via Ethernet using the Lantronix® XPort® Direct<sup>TM</sup> serial to Ethernet bridge device. The Telegesis AT-Command interface - based on the EmberZNet meshing stack - can be easily accessed by the application software using telnet or by creating a virtual COM port using the supported Lantronix® CPR (COM Port Redirector) software for windows.

By default the EAP-E is set up to use DHCP for easy integration into most networks. Depending on the network and firewall configuration it is possible to connect to one or more local EAP-Es via the internet allowing remote interaction with local ZigBee® networks.

Using the Ember bootloader custom firmware and firmware upgrades can be downloaded via Ethernet or over the air. The SIF interface also allows the EAP-E to be used as a platform for firmware development and debugging.

The EAP-E access points also support the use of Ember's EZSP (Ember ZigBee® Serial Protocol) instead of the Telegesis AT Command interface.

#### **1.1 Installation Requirements**

- 5V-6V Power Supply (supplied separately)
- Cat5 Ethernet Cable
- 10/100 MBit Ethernet connectivity (ideally with DHCP server)
- Mains Socket

#### 1.2 LEDs

The EAP-E has two LEDs situated on the RJ45 Ethernet connector:

- 1. Green Link LED
  - off: No link
  - on: Link established
- 2. Yellow Activity Led
  - off: No activity
  - on: Activity



# 2 Absolute Maximum Ratings

Parameter	Min.	Max.	Units	Condition
Supply Voltage Vdd	-0.3	20 <sup>1</sup>	V	
Storage Temperature range	-40	85	°C	

Table 1. Absolute Maximum Ratings

The absolute maximum ratings given above should under no circumstances be violated. Exceeding one or more of the limiting values may cause permanent damage to the device.

## **3** Operating Conditions

Typical values at 25°C.

Parameter	Min.	Тур.	Max.	Units	Condition
Supply Voltage, Vdd	4.5	5	6	V	
Supply Current		235	275	mA	TX +3dBm
EAP-E		235	275	mA	RX
Supply Current		300	400	mA	TX +17dBm
EAP-E-PA		235	275	mA	RX
Operating ambient	0	25	70	°C	
temperature range					

Table 2. Operating Conditions

For radio features please refer to the ETRX2 and ETRX2-PA product manuals.

Dimensions: 114mm x 74mm x 25mm

Weight: 95g

<sup>&</sup>lt;sup>1</sup> Thermal shutdown may occur when exceeding the operating conditions. The unit will become operational again after allowing it to cool down.



## 4 Device Installation and Operation

In order to install the device connect the EAP-E to a suitable power supply with the positive supply in the centre of the plug. After that connect it to your network hub.

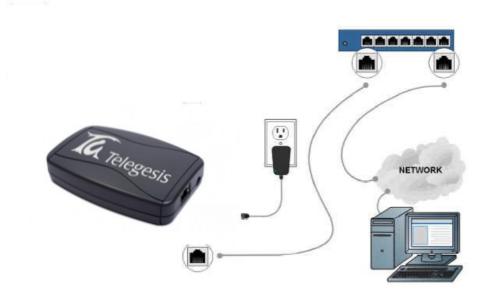


Figure 1: EAP-E Installation

If a DHCP server is connected to your network the EAP-E will automatically acquire an IP address. In most cases the IP address obtained by the EAP-E can be found out by accessing the DHCP server, but there is also an easier way to do that.

The Lantronix® DeviceInstaller tool downloadable from <u>www.lantronix.com</u> or included on a CD-ROM with your EAP-E can be used to identify EAP-E devices on the local network either with or without DHCP.

To do this simply follow these steps:

- 1. Install and execute the Lantronix® DeviceInstaller
- 2. If your PC has more than a single network adapter a message will prompt at start-up requiring you to specify which adapter connects to the local network to which the EAP-E is connected.
- 3. Click the Search button to find the EAP-E device on your network
- 4. If required a fixed IP address can now be assigned by pressing the "Assign IP" button and following the displayed wizard.
- 5. To test the communication with the EAP-E select the unit from the main window list and click **Tools->Ping**.



Once the IP address of the EAP-E is known it is possible to open a telnet session connecting to the built-in ETRX2. By default the port connecting to the ETRX2 is port number 10001 as shown in Figure 3. Please note that Figure 3 also shows a local command echo, which is why the characters of the command ATI are repeated.

ile Edit View Device Tools Help				
P 😪 🦃 iearch Assign IP Upgrade				
Lantronix Devices - 1 device(s)     Section 2 (192.168.0.44)     Contemporation 2 (192.168.0.44)	Device Details Static Web Pages	Telnet Configuration		
	2			
XPort Direct - firmware v6.3.0.3	Property	Value		
132.168.0.42	Name			
	Group			
	Comments			
	Device Family	XPort		
	Туре	XPort Direct		
	ID	87		
	Hardware Address	00-20-44-97-04-77		
	Firmware Version	6.30		
	Extended Firmware Version	6.3.0.3		
	Online Status	Online		
	Telnet Enabled	True		
	Telnet Port	3999		
	Web Enabled	False		
	Maximum Baud Rate Supported	230400		
	Firmware Upgradable	True		
	IP Address	192,168.0.42		
	Number of COB partitions suppo			
	Supports Dynamic IP	True		
	DHCP	True		
	BOOTP	True		
	BABP	False		
	Auto IP	True		
	Subnet Mask	255.0.0.0		
	Gateway	255.0.0		
	Number of Ports	1		
	TCP Keepalive	45		
	Supports Configurable Pins	45 True		
	Supports Email Triggers	False		
	Supports AES Data Stream	False		
	Supports 485	True		
	Supports 920K Baud Rate	False		
	Supports HTTP Server	False		
	Supports HTTP Server	False		
	Supports 230K Baud Rate	True		
	Supports GPI0	True		
	27/0			

Figure 2: The Lantronix DeviceInstaller

The default Port number of 10001 can be changed to any port number in order to allow multiple EAP-Es to be addressed via the internet. To do this the local router/firewall needs to be set up to forward incoming ports to the respective port of the corresponding local EAP-Es. All you need now to connect to your ZigBee® network via the internet is the remote IP address and the port number.



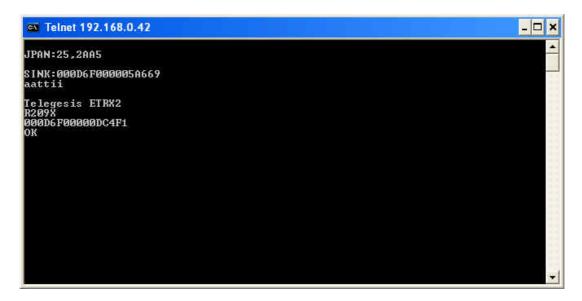


Figure 3: A Telnet Session to the EAP-E

In order to change the configuration data, such as the port number simply open a telnet connection to port number 9999, which is the configuration port and follow the setup menu. Alternatively you can use the Lantronix® DeviceInstaller to do this as shown in Figure 4.

Lantronix DeviceInstaller 4.1.0.10	
File Edit View Device Tools Help	
Search Assign IP Upgrade	
Search Assign IP Upgrade	Device Details Static Web Pages Telnet Configuration  IP Address 192.168.0.42 Pot 9999 Disconnect Clear  TFTP Download is enabled Port 77FEh is enabled ECHO is disabled Enhanced Password is disabled Port 77FOh is enabled *** Channel 1 Baudrate 19200, I/F Mode 4C, Flow 00 Port 10001 Connect Mode : C0 Send '+++' in Modem Mode enabled Auto increment source port disabled Remote IP Adr: none, Port 00000 Disconn Mode : 00 Flush Mode : 00 *** Expert TCP Keepalive : 45s ARP cache timeout: 600s Monitor Mode § bootup : enabled MTU Size: 1400 Alternate MAC: disabled Ethernet connection type: auto-negotiate Change Setup: 0 Server 1 Channel 1 5 Expert 6 Security 7 Defaults 8 Exit without save 9 Save and exit Your choice 2
🍠 Ready	

Figure 4: EAP-E setup using Telnet to port 9999



For example if you want to change the settings of the serial port speed press '1' followed by <enter>. Following on you are asked to specify the baudrate (19200), I/F Mode (4C), Flow (00), port number (10001), and other parameters. To enter a value for a parameter, type the value and press <enter>, or to confirm a current value, just press enter. When you are finished, save the new configuration (option 9). The unit reboots.

Please note: When changing the default serial port settings (baudrate, flow control, parity, data bits), identical settings must be used for the Lantronix® XPort® Direct<sup>™</sup> and the ETRX2, otherwise communication will not be possible.

For a detailed description of the menu settings please consult the XPort® Direct<sup>™</sup> user guide available from <u>www.lantronix.com</u>.

The DeviceInstaller is used to change the configuration of the EAP-E on the Ethernet side. In most cases there is no need to alter any of the Ethernet settings and so the DeviceInstaller can usually be ignored.



#### 4.1 Creating Virtual COM Ports

If accessing the serial port of the remote ETRX2 using Telnet is inconvenient for your application, potentially because you want your application to work with either the Telegesis ETRX2USB, ETRX2CF or the EAP-E in the same way, you can map the EAP-E to a virtual COM port in the same way as you can do with the USB and CF devices.

For this purpose Lantronix® provides a COM port redirector (CPR) software for use with their products. The Lantronix® CPR tool can be downloaded from <u>www.lantronix.com</u> or is included on a CD-ROM with your EAP-E and supports Windows XP, Windows 2000 and Windows 2003 Server.

To create a virtual COM port follow these simple steps:

- 1. Download and Install the Lantronix® CPR
- 2. Make sure your EAP-E is installed and correctly configured
- 3. Execute the "CPR Manager".
- 4. Select **Device -> Search**. All EAP-Es in the local network will show up.
- 5. Select COM Port -> Add and Remove.
- 6. Select an available COM port number from 1 to 256 (or 1 to 63 if you use Telegesis Terminal).
- 7. Click on the new COM port in the left hand side of the window.
- 8. Double click on a Device on the bottom of the window
- 9. Make sure Use RFC 2217 is NOT checked
- 10. Click the Save icon.

During the installation and setup process you will be prompted whether to install a driver, which has not been signed by Microsoft. Select Yes.



e <u>C</u> om Port <u>D</u> evice <u>Ti</u> P 🖬 🔎 🖻	ools <u>H</u> elp						
om Ports		Settings					
All Com Ports (16)		Com 11 (New)					
Com 1 - 28     Com 1 (Inaccessible)     Com 2 (Inaccessible)     Com 3 (Inaccessible)     Com 4 (Inaccessible)		Window's Port N Window's Device Window's Service	e Name:		Com Stati Network S	100 C	Error Disconnected
Com 5 (Inaccessible)		Reset to Defaults Cancel Edits					
<ul> <li>Com 6 (Inaccessible)</li> <li>Com 7 (Inaccessible)</li> </ul>		Buffer Writes (Keep checked for better write performance)			mance) 7 Connection Timeout (in seconds)		
Com 8 (Inaccessible) Com 9 (Inaccessible) Com 10 (Inaccessible)		Server Reco	nnect		-		nnect  Reconnect Limit (0 = forever)
Com 11 (New) Com 12 (Inaccessible) Com 13 (Inaccessible)		Listen Mode	Normal - por	t closed after disconnect	) (   •	TC	CP Port Add To Firewall
- Com 22 (Inaccessible) Com 27 (Inaccessible)		TCP KeepAli	ve 7200000 0	KeepAlive Time (msec)	1000 0	КеерА	Nive Interval (msec)
E. Com 28 (Inaccessible)	κ.	RFC 2217 (TruPort)		DCD, DSR always active nit Buffer Empty	× ×		
		Service Host 1 [192.]	TCP Po 168.204.100 10001	then UDP ports	30718, 432 on list. You	82 and 1 may e	other side of a router or a remote firewall, 43283 may need to be added to the experience trouble opening this com port if
		3 4 5 6 7		unable to conne this machine is b port to the Firew	ct to a devi blocking this all. If the been adde	ce serv s port. button d and c	espond on UDP port 43283. If you are ver, one possible cause is the Firewall on Press the 'Add Rx Port' button to add this caption reads 'Remove Rx Port' then the can be removed by pressing this button.
		8		L	Add Rx F	Port	The Firewall is turned OFF
evices							
		ice Name	Port Name	HW Address		ID	Product
92.168.204.100 (1) 10	0001			00:20:4A:9	V:08:EE	X7	XPort Direct

Figure 5. The Lantronix® CPR

After this process any application can access the embedded ETRX2 as though it was connected to the local machine's COM port as shown in Figure 6.



🕼 Telegesis Terminal - V 1.2.5 (COM6)

•	Disconnect

Connection COM Port: COM8	Baud Rate:	19200 💌	Disconnect	1
Flow-Control: Disable	Parity:	None	Data Bits:	÷
Status: Connected to COM	6			
ati Felegesis ETRX2 A209X DOOD6F00000DC4F1 DK				0
				8
Command: Enter the param	eter in the Command box,		Send & Device	List 📫
		Join any PAN	Send & Device	List
Enter the param	xx	Join any PAN RemoteSN		List
Enter the param Network Management - R2 Configure	×× Establish PAN		Scan for PANs	List

Figure 6: Telegesis Terminal accessing a EAP-E using CPR



## 5 Firmware changes and upgrades

The firmware which is loaded onto the integrated ETRX2 Module can be upgraded over the air or via Ethernet using a virtual COM port as described in the Development Kit Manual. The procedure for bootloading is described in section 12 of the Telegesis Development Kit Product Manual (available from our website). If you want to bootload new firmware via the COM port, you must take care to follow this procedure, because the Telegesis firmware and the Ember bootloader run at different baud rates:

- 1. Start Lantronix DeviceInstaller, CPR Manager and Telegesis Terminal
- 2. Set up a normal serial COM port connection from Telegesis Terminal to the EAP
- 3. Execute AT+BLOAD
- 4. Disconnect Telegesis Terminal
- 5. Use DeviceInstaller to change Lantronix Ethernet module to 115200 baud, as described in section 4
- 6. Connect Telegesis Terminal but stay at 19200 baud
- 7. Hit <cr> and get the usual bootloader prompts
- 8. Download new firmware at 19200
- 9. Disconnect Telegesis Terminal
- 10. Use DeviceInstaller to change Lantronix module back to 19200 baud
- 11. Connect Telegesis Terminal
- 12. Resume normal operation with new firmware

Alternatively access to the SIF programming interface is possible by removing the cover of the EAP-E access point. You can also use this interface for custom firmware development and real time debugging of your custom firmware.

Finally with the advent of EmberZNet3.x it is now possible to download the Ember EZSP (Ember ZigBee® Serial Protocol) as described in section 6 of the EM260 manual to the EAP-E. In case you require an EAP-E with pre-loaded EZSP firmware please contact zigbeesupport@telegesis.com.

#### 5.1 Device Reset and manually Entering the Bootloader

In case the embedded ETRX2 needs to be reset manually the reset pin of the ETRX2 is connected to the CP1 pin of the Lantronix® XPort® Direct<sup>TM</sup> module in the same way as the A/D2 pin is connected to the CP2 pin. This allows hardware triggering of the Ember standalone bootloader, which can be used for firmware upgrades.

To learn how to access the CP1 and CP2 Pin of the Lantronix® XPort® Direct<sup>™</sup> module please refer to the Lantronix® XPort® Direct<sup>™</sup> user guide.



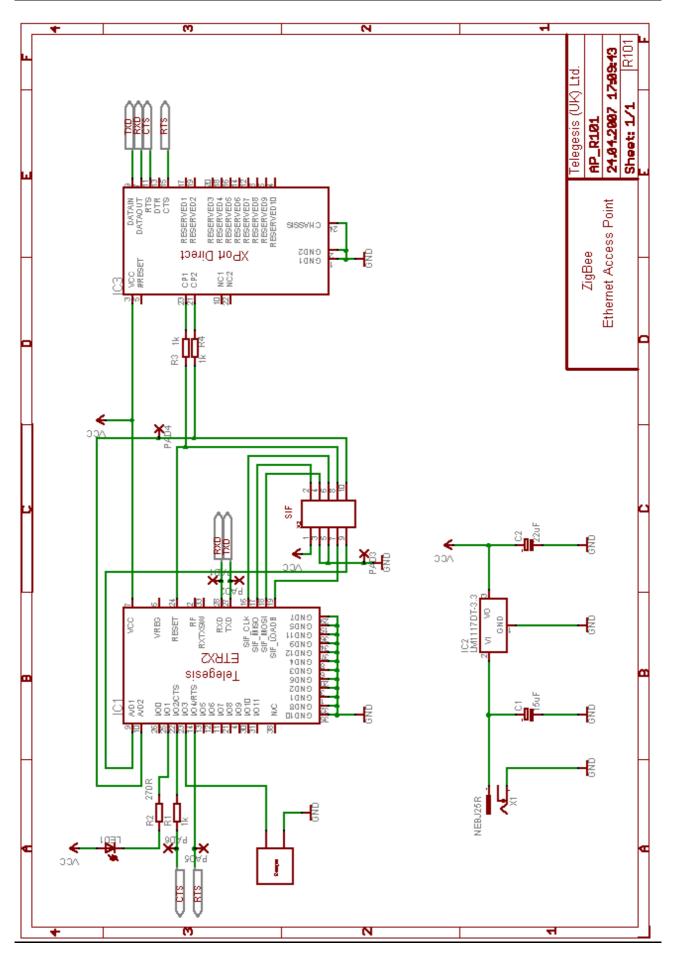
## 6 Schematics

The schematic of the EAP-E is shown on the next page for reference.

LED1 and the beeper are future options, which are not fitted. The serial port including the handshaking lines as well as the reset and A/D2 lines can be accessed via labelled pads.

X2 is the SIF connector, which allows programming and custom firmware development and real time debugging in conjunction with the Ember InSight Adaptors and the accompanying development toolchain.







# 7 Ordering Information

Ordering/Product Code	Description
Ordering/Product Code	Description
EAP-E	Access Point based on standard ETRX2
	AT Style Command Interpreter
	<ul> <li>Integrated 2.4GHz Antenna</li> </ul>
	<ul> <li>Integrated 2.40112 Antenna</li> </ul>
EAP-E-PA	Access Point based on ETRX2-PA
	AT Style Command Interpreter
	Integrated 2.4GHz Antenna
ETRX2DVKA	Development Kit with:
	<ul> <li>1 x ETRX2HW Module with Board to Board Connector</li> </ul>
	<ul> <li>1 x ETRX2DV Development Board</li> </ul>
	<ul> <li>2 x ETRX2 Modules soldered to</li> </ul>
	2 x ETRX2MCB Module Carrier Boards
	<ul> <li>2 x AA Battery Holders with Leads &amp; Connector Plugs</li> </ul>
	1 x USB Cable
ETRX2DVKA-Plus	Telegesis Development Kit with:
	1 x ETRX2DV Development Board
	1 x ETRX2HW Module with a fitted Harwin
	• 1 x ETRX2MCB Carrier Boards fitted with ETRX2 modules
	• 1 x ETRX2-PA MCB with ETRX2-PA Module
	1 x AA Battery Holders with leads
	• 1 x USB cable
	1 x ETRX2USB USB stick
	• 1 x ETRX2HRHW-PA Module with Hirose connector for
	external antenna and Harwin
	• 1 x ½ Wave antenna
	<ul> <li>1 x 100mm cable to connect module to antenna</li> </ul>
ETRX2	Telegesis Wireless Mesh Networking Module with Ember
	ZigBee® Technology:
	Telegesis AT Style Command Interpreter and
	<ul> <li>Ember's EmberZNet2.x stack</li> </ul>
	<ul> <li>Integrated 2.4GHz Antenna</li> </ul>
Notos:	

#### Notes:

- Customers' PO's must state the Ordering/Product Code.
- There is <u>no</u> "blank" version of the ETRX2 Module available. All Modules carry both the EmberNet Stack and the Telegesis AT style Command Layer. Where customers wish to program custom firmware they can simply overwrite the existing firmware
- Please contact Telegesis if you require additional AT style commands or specific integration assistance.

Table 3. Ordering Information



## 8 Trademarks

All trademarks, registered trademarks and products names are the sole property of their respective owners.

## 9 Disclaimer

Product and Company names and logos referenced may either be trademarks or registered trademarks of their respective companies. We reserve the right to make modifications and/or improvements without prior notification. All information is correct at time of issue. Telegesis (UK) Ltd does not convey any license under its patent rights or assume any responsibility for the use of the described product

## **10 Contact Information**

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#### **11 References**

- Telegesis <u>www.telegesis.com</u>
- Ember <u>www.ember.com</u>
- Lantronix <u>www.lantronix.com</u>