

# TRE0921 Ethernet Transceiver

## User's Manual



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## Products

TRE0921K	Ethernet Transceiver Basic Kit
	2 Ethernet Transceivers (TRE0921M)
	2 Power Supplies
	2 CAT-5 Ethernet Cables
	1 Cable/DSL Router
TRE0921M	Omni-directional Ethernet Transceiver
TRE0921D	Directional Ethernet Transceiver
TRE0921MF	Omni-directional Ethernet Transceiver with Notch Filter
TRE0921DF	Directional Ethernet Transceiver with Notch Filter
TRE0921B1	Backpack Version
TRE0921BF	Backpack Version with Notch Filter
TRE0921W1	Wall Mount Version
TRE0921WF	Wall Mount Version with Notch Filter



## Plug & Play Quick Start

### *Wireless Internet Access at Your Fingertips*

Thank you for your purchase of the **TRE0921 Ethernet Transceiver Basic Kit**. With this Basic Kit you now have the ability to set up a simple wireless Ethernet network so that you can have remote access to the Internet from anywhere in your home or office. The Basic Kit contains everything you need to set up your own network.

Normally you could create a network by connecting the devices in the network by cable. In an office this could involve stringing yards of cable through walls, ceilings, or floors. But two **TRE0921 Ethernet Transceivers** can be used to create an Ethernet link without the use of cables. Thus, you have more flexibility in where your computers and other devices are located.

The basic Ethernet Transceiver network has two transceivers. One is designated as the Access Point (AP), and other is designated as a Subscriber Unit (SU). The Internet signal is routed through a router to the Access Point, and then the signal is transmitted wirelessly to the Subscriber Unit. A computer may then be plugged into the SU directly, or into a switch that is plugged into the SU.

Each Basic Kit contains the following components:

- 2 TRE0921 Ethernet Transceivers
- 2 power supplies
- 2 CAT-5 Ethernet cables
- 1 Cable/DSL Router

To set up a wireless Internet network, it is assumed that you already have an Internet connection through a cable line, a cable modem, or a DSL modem. If you have a modem, then be sure to follow the instructions below regarding the modem. (*Note: Please follow the order for booting up or attaching devices or you may not be able to achieve connectivity.*)

Set up your network in the following order:

- Turn off your cable or DSL modem to begin.
- Connect the Ethernet cable from your modem to the Router's WAN (Wide Area Network) port.
- Power up your modem and wait until it is ready.
- Plug in the Router to power it up. This allows your modem to detect the Router's IP address.



- To verify that the Router is working properly, you must connect a computer directly to the switch on the Router. Before booting up your computer, connect it to a port on the Router with an Ethernet cable.
- Boot up your computer. This will allow the Router to detect your computer's network card.
- Open your Internet browser to verify that you have Internet access. (If you do not have Internet access, check your connections or repeat the above process. You will not be able to gain access to the Internet through the router unless both the Router and your computer's IP addresses have been detected by each unit.)
- Plug one end of an Ethernet cable into an empty switch port on the Router, and the other end into the Access Point (AP) Ethernet Transceiver. (**Warning: Never plug both an AP and an SU into the same router because they will corrupt the routing table in the Router, requiring it to be reset.**)
- Power up the AP Ethernet Transceiver. (If you wish to test to see if the unit is fully operational, you can use the **AEI Transceiver Discovery Utility** described in the **Basic Configuration** section of this Manual on page 7.)
- Place the Subscriber Unit (SU) where you wish to use it and power it up. (**Caution:** Be sure that the SU is at least 10 feet away from the AP to avoid overloading the receiver.)
- Connect your target computer (or a switch) to the SU with an Ethernet cable before turning on the computer or device.
- Power up the computer or device that you have connected to the SU.

Congratulations! At this point you should be able to access the Internet with your remote computer.

If you wish to disconnect any equipment or devices from your network, please remember to turn off the device before disconnecting it from the network. In addition, be sure to turn off the power to your Ethernet Transceiver before disconnecting any equipment or device that is attached to it.

Now that you have set up a basic Ethernet Transceiver network, you can begin to explore other possibilities, such as a home computer network, sharing printers or other devices. In addition, you can network different types of computers together, such as Windows PCs, Macintoshes, Linux, etc. You can also add additional SU Transceivers to your network. However, to do this you will need to follow the instructions in the rest of this Manual.



## Operational Summary

The TRE0921 Ethernet Transceiver allows a user to create a long-range, wireless Ethernet network with up to 16 Subscriber Units per Access Point. The basic network consists of two transceivers, one of which is designated as the Access Point (AP), and the other as a Subscriber Unit (SU). The **TRE0921 Ethernet Transceiver Basic Kit** contains two transceivers, preconfigured for immediate use.

In order to configure a wireless network using the TRE0921, the following the six elements must be established:

- One transceiver must be designated as an Access Point (AP).
- All other transceivers in the network must be designated as Subscriber Units (SU), and each SU must have a unique ID number.
- The number of Subscriber Units in the network must be indicated in the Access Point.
- The AP and all of the SUs must operate on the same radio frequency. This may be set manually or allowed to change automatically.
- All transceivers in the network must have the same Network Name (which is an 8-digit hexadecimal key).
- All transceivers in the network must share a common 128-bit Encryption Key.

TRE0921 Ethernet Transceivers may be used in multiple wireless networks as long as all of the elements above have been established for each separate network. If two AP units are very close to one another, they may interfere if operating on adjacent frequency channels. Place them at least 10 feet apart, or manually select non-adjacent channels for their operation. Also, any SU should be placed at least 10 feet from the AP to avoid overloading the transceiver's receiver.

The Access Point (AP) can be set to automatically scan for the best of the 12 available radio frequency channels, encrypt Ethernet data received from the network, and transmit it wirelessly to the correct Subscriber Unit (SU). The AP is constantly monitoring the radio link and can automatically change the channel if performance is degraded due to interference. On the other hand, the units may be manually set to a fixed channel.

Any 10/100 BaseT Ethernet client device (ECD) can be connected to a TRE0912 SU. Each SU encrypts Ethernet traffic received from the attached ECD and transmits the data wirelessly to its AP. Each SU can be plugged directly into an ECD without adding drivers or loading software. Essentially, once the AP/SU pair is configured and running, it behaves like a continuous Ethernet cable. The transceivers use standard TCP/IP protocol which performs error checking and correction automatically.

The TRE0921 uses the frequency channels noted on the next page.



*900 MHz Channels*

Channel	Center Frequency
0	Auto Mode
1	903.12500 MHz
2	905.20833 MHz
3	907.29167 MHz
4	909.37500 MHz
5	911.45833 MHz
6	913.54167 MHz
7	915.62500 MHz
8	917.70833 MHz
9	919.79167 MHz
10	921.87500 MHz
11	923.95833 MHz
12	926.04167 MHz

TRE0921 Ethernet Transceivers are normally sold in pairs in a kit. One unit is designated as an Access Point (AP) and the other unit is designated as a Subscriber Unit (SU). Pairs of transceivers may be used without any further configuration because they meet the basic requirements outlined above.

- The SU has a unique ID number.
- The AP has been configured for a single SU.
- Both transceivers are set to operate on the same frequency.
- Both transceivers have the same Network Name.
- Both transceivers share a common 128-bit Encryption Key.

Users of the TRE0921 should follow the directions in the section on *Basic Configuration* in order to change the configuration of an Ethernet Transceiver wireless network. If additional transceivers have been purchased in order to expand the number of units in the network, or to set up multiple networks, the section on *Advanced Configuration* provides details on how this is accomplished (page 10).



## Basic Configuration

A simple network using two TRE0921 Ethernet Transceivers can be set up using a basic configuration. If additional transceivers are added to the network, follow the instructions in the *Advanced Configuration* section of this manual.

Every **TRE0921 Ethernet Transceiver Basic Kit** contains the following units:

- 2 TRE0921 Ethernet Transceivers
- 2 Power cords
- 2 CAT-5 Ethernet cables
- 1 TP-LINK Cable/DSL Router

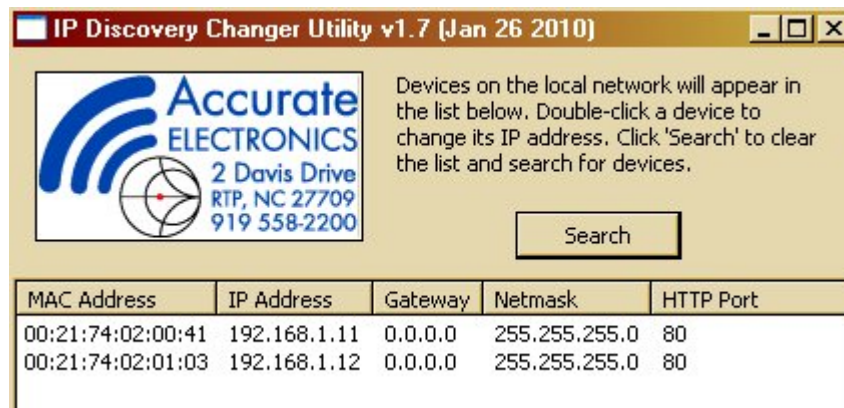
Since basic pairs of Ethernet Transceivers are already preconfigured, with one unit acting as an Access Point (AP) and the other unit configured as a Subscriber Unit (SU), the transceivers can be used to set up a basic network without any additional configuration. (See the Plug & Play section on page 3.) Just remember that the two units must be at least 10 feet apart when they are in operation.

To verify the individual transceivers in your network, or to reconfigure any TRE0921 Ethernet Transceiver, the **AEI Transceiver Discovery Utility** must be used. Download the utility from Accurate Electronic's website at the following address:

[www.aertp.com](http://www.aertp.com)

To verify the configuration of your Ethernet Transceivers, set up the network as directed in the **Plug & Play** section of this Manual. Once the first Ethernet Transceiver has been powered up, proceed as follows:

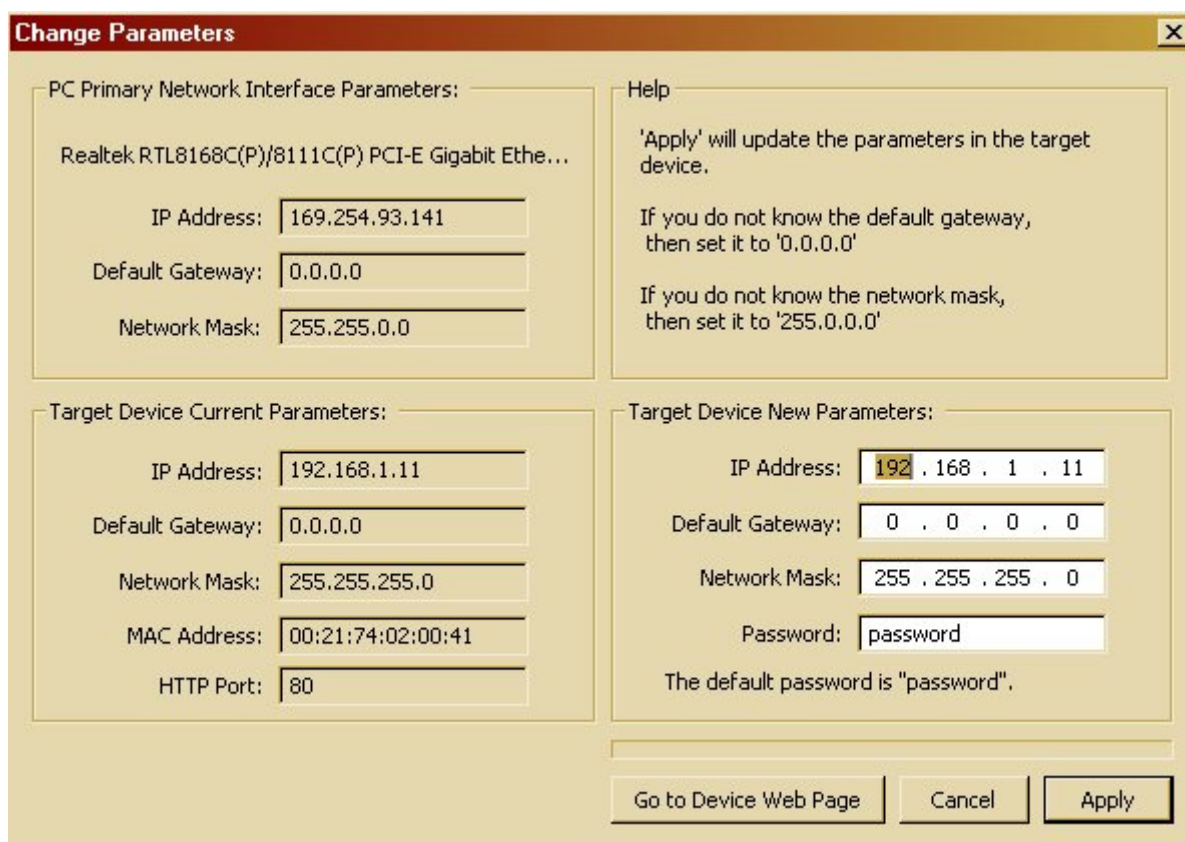
- Double-click on the AEI Transceiver Discovery Utility. The following window should appear.



**Note:** If this is the first time using the Utility, the Windows Firewall may block the utility and the following dialog box may appear. Click on the **Unblock** button to continue.



- Double-click on the device name to open the following dialog box.



Each Ethernet Transceiver is preconfigured with an IP address. You can verify which type of unit is plugged in by checking the IP address. The preconfigured IP addresses are:

Access Point (AP) – 192.168.1.11

Subscriber Unit (SU) – 192.168.1.12

The IP address may be changed if needed to be consistent with a local network. (*Note: It is important that no two devices on a local network have the same IP address.*) For consistency's sake, it is recommended that Access Points on a network have odd-numbered IP addresses and all Subscriber Units should have even-numbered IP addresses. The numbers in the last field may range from 13 to 255.

To change the IP address of the unit, change the number in the last field and click on the **Apply** button. The following dialog box will appear. Click **Yes**.



If the IP address was changed, the message “The device was updated successfully” will appear. Click **OK**.

To make any further changes, go to the *Advanced Configuration* section.

## Advanced Configuration

This section of this User's Manual is needed only if more than two Ethernet Transceivers will be used in a wireless network. Each transceiver in the network must be configured as either an Access Point (AP) or a Subscriber Unit (SU). This process is accomplished using the TRE0921's built-in browser interface.

**(Caution:** Any configuration changes should only be made to one Ethernet Transceiver at a time with the unit plugged into the Router. At no time should two transceivers be plugged in at the same time to the Router.)

The TRE0921's browser interface may be accessed using either Mozilla Firefox or Microsoft Internet Explorer. However, there are certain advanced features of the transceiver that can only be accessed using Firefox, so that is the recommended browser.

To access the TRE0921's built-in browser interface, reopen the **AEI Transceiver Discovery Utility** and proceed as follows:

- Double-click on the device name to open the *Change Parameters* window.
- Click on the **Go to Device Web Page** button. Your browser will automatically open to the device information page. The URL in the address field will contain the transceiver's IP address. (If Firefox is not your default browser, but you have it installed on your computer, copy the address from the address field, open Firefox, paste the address in the address field in Firefox, and press **Enter**.)



Version:	1.55.4068
MAC Address:	00:21:74:02:00:41
Ethernet:	100 Mbps Full Duplex
Uptime:	0 days 01h 32:51

 Password:  
 

 Need help? Online FAQ available at [www.aertp.com](http://www.aertp.com)

### Statistics

Radio RSSI:	-46 dBm
Radio Block Error Rate:	0.0 %
Radio Total Packets:	41462
Radio Failed Packets:	0
Radio Passed Packets:	41462
Radio Broadcast Packets:	3564
Radio Unicast Packets:	37898
Radio Average TX Size:	100 bytes
Radio Average RX Size:	102 bytes

### Device Information

Device Type:	Access Point
# of Subscriber IDs Issued:	1
Current RF Channel:	2
Connected Subscribers:	1
RF Connected:	Yes
Radio Active:	Active
Product Code:	4
Radio Version:	3
Radio Firmware Release:	075

### Network Settings

IP Address:	192.168.1.11
Network Mask:	255.255.255.0
Default Gateway:	0.0.0.0

This is a dynamic window that shows the current status of the TRE0921 Ethernet Transceiver. The refresh rate's default setting is every 10 seconds, but this refresh rate can be changed by the user. For example, the above window shows the status of the Access Point (AP) unit with the default IP address of 192.168.1.11. The operating channel has been preset to channel 2, and the AP is configured for a single Subscriber Unit (SU).

The following section will discuss how to change the above parameters.

- Log into the Administration window by entering the *Password* and clicking **Login**.



## Statistics

Radio RSSI:	-39 dBm
Radio Block Error Rate:	0.0 %
Radio Total Packets:	42828
Radio Failed Packets:	0
Radio Passed Packets:	42828
Radio Broadcast Packets:	3908
Radio Unicast Packets:	38920
Radio Average TX Size:	1 bytes
Radio Average RX Size:	1 bytes

## Device Information

Device Type:	Access Point
# of Subscriber IDs Issued:	1
Current RF Channel:	2
Connected Subscribers:	1
RF Connected:	Yes
Radio Active:	Active
Product Code:	4
Radio Version:	3
Radio Firmware Release:	075

## Device Settings

	Description	Value
Device	Password:	<input type="text" value="password"/>
RF	Channel:	<input type="radio"/> Use DIP 3-8 selection: 0 (auto channel select mode)
		<input checked="" type="radio"/> <input type="text" value="2"/> (overrides the current DIP 3-8 selection)
Network	IP Address:	<input type="text" value="192.168.1.11"/> (###.###.###.###)
	Network Mask:	<input type="text" value="255.255.255.0"/> (###.###.###.###)
	Default Gateway:	<input type="text" value="0.0.0.0"/> (###.###.###.###)
	HTTP Port:	<input type="text" value="80"/> (decimal 1-65535)

Apply

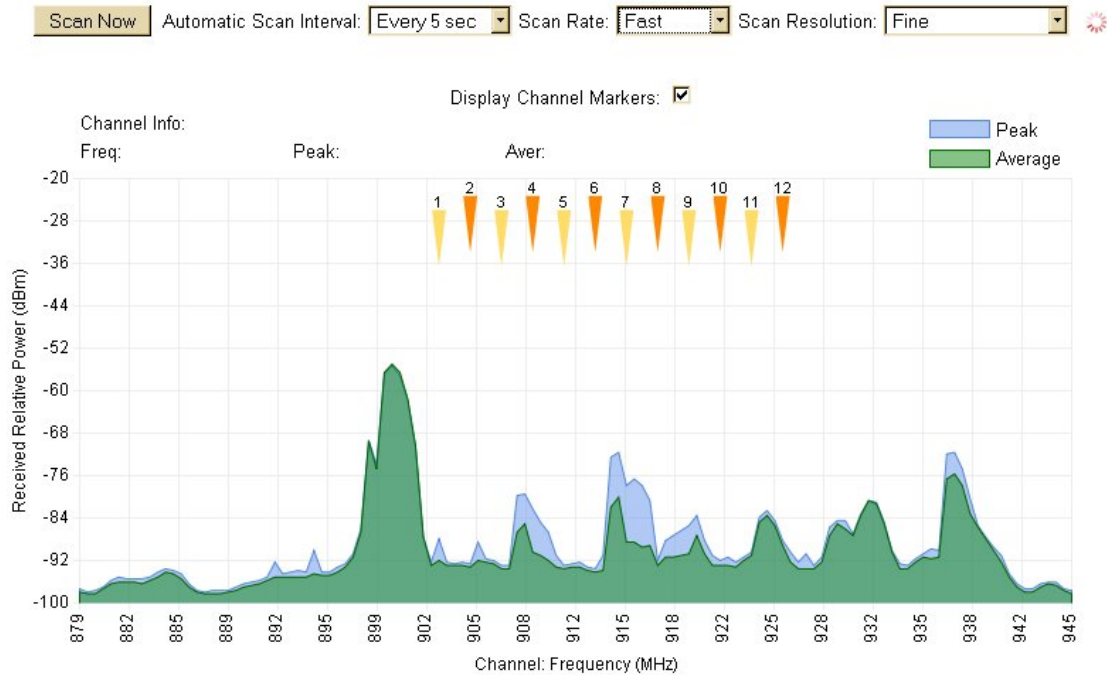
Cancel

This top portion of this window is similar to the Administration window, but in this window the Device Settings can be changed. The *Device Type* is shown above as an Access Point. Therefore the *RF Channel* under the Device Settings has been preset to Channel 2. The channel can be changed by the user depending on circumstances. Setting the channel to 0 (zero) would allow the unit to search for the optimum channel, but this only works with a Subscriber Unit. The Access Point must have a channel setting between 1 and 12. The channel can be set to 0 on a Subscriber Unit.

The Password can also be changed in this window, whereas it cannot be changed in the Change Parameters window. Click **Apply** to finalize any changes in settings.

The next section of the window contains a Spectrum Scanner. (This feature is available only if Firefox is used as the browser.) The scanner displays the activity in the portion of the electromagnetic spectrum being used by the Ethernet Transceivers. The Channel Markers show the channels used by the Ethernet Transceivers. The scan interval, scan rate, and scan resolution can be changed as needed. This scanner can be used to help the user select radio channels that avoid interference.

## Spectrum Scanner



- To change further settings on the device, click on the **Advanced Admin** button at the very bottom of the window.

The following parameters can be set in the Device Settings window:

- Choose the *Device Type*: Access Point (AP) or Subscriber Unit (SU).
- Check the check box for *Enable User Specified Keys*.
- Enter an 8-digit hexadecimal (0-9 and A-F) Network Name that will be common to the AP and its SUs and enter it. The hyphen is required. Make a note of it.
- Choose a 32-digit hexadecimal encryption key and enter it. Again, the hyphens are required. This key must also match between the AP and the SUs, so make a note of it.

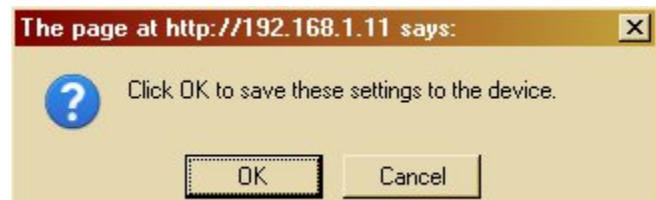
## Device Settings

	Description	Value
Device:	Type:	<input checked="" type="radio"/> Access Point <i>(override DIP 1 selection)</i> <input type="radio"/> Subscriber Unit <i>(DIP 1 selection)</i>
	# of Subscriber IDs Issued:	An AP can issue from 1 to 63 SU IDs. <input type="text" value="1"/> (decimal 1-63)
Encryption:		<input checked="" type="checkbox"/> Enable User Specified Keys
	Network Name (32-bit):	xxxx-xxxx <input type="text" value="ACC6-DF88"/> (hex)
	Encryption Key (128-bit):	xxxx-xxxx-xxxx-xxxx-xxxx-xxxx-xxxx-xxxx <input type="text" value="ED98-23CB-FFA3-7308-EEBC-AAE2-187F-9845"/> (hex)

- If the unit is an AP, the Number of Subscriber IDs Issued must be entered. Since only 16 SUs can be linked to a single AP, enter a number between 1 and 16 to indicate the number of SUs in the network.

	Description	Value
Device:	Type:	<input type="radio"/> Access Point <i>(override DIP 1 selection)</i> <input checked="" type="radio"/> Subscriber Unit <i>(DIP 1 selection)</i>
	Subscriber ID:	Every SU must have a unique ID. Valid IDs are from 1 to 63. <input type="text" value="1"/> (decimal 1-63)

- If the unit is an SU, enter a number between 1 and 16 so that the unit has a unique Subscriber ID. All of the SU units assigned to an AP should be numbered sequentially without any gaps in the sequence.
- Click **Apply** to save the changes.
- Click **OK** in the next dialog box to finalize the changes.



- Click **Logout** to exit the advanced settings window.
- Close the browser window.
- Turn off the power to the Ethernet Transceiver.
- Disconnect the Ethernet Transceiver from the Router.

Repeat the above process with all of the Ethernet Transceivers to be included in the network. When all of the transceivers have been keyed and are operating, connect them to the network and Ethernet devices as desired. Cycle each transceiver's power to begin normal operation. Once all of the transceivers are operational, the **AEI Transceiver Discovery Utility** can be used to access the browser manager for each unit in the network.



## Technical Information

### *Warranty*

This product is warranted to the original purchaser for normal use for a period of 180 days from the date of purchase. If a defect covered under this warranty occurs, Accurate Electronics, Inc. will repair or replace the defective part, at its option, at no cost. This warranty does not cover damage or defects resulting from misuse or modification of the product.

### *Support*

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### *Technical Specifications*

- Ethernet throughput: 768 Kbps
- RF Equivalent Isotropic Radiated Power (EIRP): 23 dBm
- Receiver sensitivity: -99 dBm
- Antenna: Internal circularly polarized antenna, 93% efficiency
- Adjacent band rejection: SAW filter attenuates cellular and pager transmissions
- RF Modulation: Frequency Shift Keying (FSK), 2 MHz spacing, 1.8 MHz bandwidth
- Frequency: 902-928 MHz with 12 discrete channels, automatic frequency agility
- Channel access method: Time domain multiple access (TDMA)
- Multiple units: Maximum of 16 mobile units and 10 base units in a common area
- Range: 1200-feet or more depending on conditions
- Power: 10 to 18 VDC, 1.74 W transmit, 0.82 W receive



- Error correction: CRC error correction and retransmission
- Encryption: AES-128, 128 bit key
- Ethernet buffer: 20 Kbytes
- Enclosure: ABS plastic, 4.8" W x 4.8" D x 2.4" H
- Connectors: 10-100 baseT Ethernet RJ45, 3.5-mm barrel DC jack

## *FCC Certification*

### **Compliance Statement (Part 15.19)**

This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

### **Warning (Part 15.21)**

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### **RF Exposure (OET Bulletin 65)**

To comply with FCC RF exposure requirements for mobile transmitting devices, this transmitter should only be used or installed at locations where there is at least 20cm separation distance between the antenna and all persons.

### **Information to the User – Part 15.105 (b)**

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



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

