Introduction

This report describes interfacing the IPCS VoIP Gateway Model EGW-902 to an ESTeem Model 192E Wireless Ethernet radio modem in a demonstration configuration. This equipment configuration will show the wireless remote capabilities of this type of network, but it is not intended to provide information on all the possible network configurations. Please consult the EGW-902 and Model 192E User's Manual for complete information.

Voice over Internet Protocol (VoIP) allows voice grade telephone communication to be used over an Ethernet network. With the implementation of the ESTeem Model 192E wireless Ethernet radio modem, a VoIP network can be made available to remote locations without the cost of cabling. VoIP networks can replace standard phone lines to remote locations or link multiple phone systems together within the same company without paying for a commercial phone line. The primary advantages to this network can be realized in cost, speed and system up-time. You can own and control the phone network without any residual costs.

By using the ESTeem Model 192E, 11 MBps, Wireless Ethernet radio modem, a VoIP network can be used to provide telephone communication to remote or inaccessible areas (Figure 1). The high bandwidth capabilities of the Model 192E will allow the VoIP hardware to function at the same time as other Ethernet hardware for data and Ethernet Video communications.

System Description

The equipment seen in Figure 2 will be needed at each end of a working demonstration of a VoIP network. This VoIP network will allow voice communication between two phones plugged into the VoIP Gateway. The two (2) EGW-902 VoIP Gateways will communicate using two (2) ESTeem Model 192Es for the wireless Ethernet link. The VoIP Gateway modules will provide the standard phone handset with a dial tone and accept the numbers pressed from the keypad.

This demonstration equipment will show that two phone systems can connect through a wireless Model 192E Ethernet connection and provide a quality voice network over Ethernet. This VoIP equipment can also be used while other Ethernet devices are also using the Ethernet link (Figure 3). This is a great way of demonstrating the high bandwidth of the ESTeem 11 Mbps system. The VoIP equipment can be used at any distance within the range of the two Ethernet radio modems.
VoIP Equipment Configuration

The IPCS VoIP Gateway Model EGW-902 (Figure 4) is a simple VoIP module available with either 2 FXS (Phone) ports or 1 FXS (Phone) port and 1 FXO (Line) port.

The configuration of the VoIP equipment was very simple. You first connected the Gateway to your computer through a serial port and use terminal emulation software such as Microsoft® Hyper Terminal to set the IP address in the Gateway to match your network. Once the IP address of the Gateway is set, you configure all the parameters through your web browser.

Configuring Through a Serial Cable

1. Connect the EGW-902’s Console (Serial) Port (Figure 4) to your PC with the supplied serial cable.

2. Open Microsoft® Hyper Terminal and configure the port connection for “Direct to Comm(X) (Where X is the connected Port Number)”. Configure the port for a Baud Rate to 38,400, Data Bits to 8, Parity to None, Stop Bits to 1 and Handshaking to None (Figure 5). Press the Enter Key and the “Login Password:” prompt will be displayed.

3. If this is your first configuration of the VoIP Gateway Enter the Default Password “Gateway” at the prompt and press
Enter. The VoIP configuration screen will be displayed (Figure 6).

4. Select “Set the Network Parameters” by entering 1 and pressing Enter.

5. Configure the IP address, Default Router IP address (if necessary) and the Network Mask to match your Ethernet network parameters (Figure 7). When complete, press the ESC key to return to the Main Menu.

6. To save the information you must first select “Save Current Configurations to Rom” and then select “Restart the System”.

Configuring Through Web Browser

1. Once the IP address has been set through the serial port, the remaining parameters can be configured through a web browser. Open your web browser (such as Microsoft Explorer® or Netscape®) and input the IP address for the VoIP gateway.
2. On the left side of the screen select “Gateway Configuration” by pressing on the plus sign (+) next to the name. You will be prompted for a Username and Password. Enter the default Username “gateway” and the default Password “gateway”.

3. Select “Phone/Line Dialing Plan” to set the phone number for the phone ports (Figure 9). These can be set with any number of digits, but for the evaluation equipment select a three-digit number to configure the port. This number is what will be input when you want the phone attached to that port to ring. Press OK to continue.

4. Select “Direct Call” to configure the VoIP Gateways to communicate with each other. You will need to input the Phone Port addresses and the IP address of the opposite Gateway Module. For example, the phone port addresses configured in Gateway #1 (172.16.4.100) were Port 1 = 101 and Port 2 = 102. Gateway #2 (172.16.4.101) phone ports were configured for Port 1 = 201 and Port 2 = 202. (Figure 10). For this example we are programming Gateway #2. Input the Leading Number (1st phone number) for Gateway #1 as 101, Min and Max Len to 3, Strip Len 0, Prefix Number as None, the IP address of Gateway #1 (172.16.4.100) and press ADD. This should create a line item as seen in Figure 11. When configuring Gateway #1 all the addresses will be the opposite.

5. Select “Show All Numbering Plans” to verify all input information from steps 3 and 4. If any numbers to not match with what was input, return to that step and try again.
6. Select “Voice Processing Control” from the Gateway Configuration Menu. The best voice quality can be obtained by selecting G.711_A (Figure 12). Select this option and press OK.

7. Select “System Maintenance”. Press the Save Button to save all changes to Flash memory. Once returned to the “System Maintenance” directory, press the Restart button to operate the VoIP Gateway.

8. Complete the configuration of the second VoIP gateway.

**ESTeem Configuration**

The ESTeem Model 192E will provide the wireless Ethernet communications to link all Ethernet hardware in the system. Multiple Ethernet devices are usually attached in a VoIP configuration so the ESTeem will need to be configured for Bridging Mode.

**Configuring The ESTeem Through The RS-232 Port**

The ESTeem Model 192E is configured in almost the same sequence as the VoIP Gateway. You will need to configure the IP address of the ESTeem through the serial port and then all remaining programming can be completed through the web page in the ESTeem. The following steps should be completed before any modifications are made to the network operating parameters for the ESTeem Model 192E.

1. Connect the antenna to the antenna connector on the ESTeem Model 192E (Figure 13).

2. Connect the serial cable (EST P/N: AA062) between the RS-232 connector on the ESTeem to the serial port on the computer.
3. Any terminal emulation program can be used for the configuration of the ESTeem. Most Windows users use HyperTerminal. Configure your RS-232C port for a Baud Rate to 38,400, Data Bits to 8, Parity to None, Stop Bits to 1 and Handshaking to None.

4. Plug the ESTeem Model AA174 power supply into a wall socket and connect the Molex power connector to the ESTeem. The power light (PWR) on the front of the ESTeem should be illuminated.

5. If your computer is configured properly, you will see the ESTeem Model 192E booting sequence on your Terminal Emulation program. See Figure 14.

Once the ESTeem boot sequence is complete (approximately 1 minute) you will receive this message:

”Please press Enter to activate this console."

If you don’t see this message press the Reset button on the front panel of the ESTeem and/or check the programming of your RS-232 port.

6. Press the Enter key and you will be at the Configuration Menu login prompt 192E login. See Figure 15.
7. To enter the Model 192E Main Menu you will need to log into the system with a login name and password.

8. If this is not the first time configuration of the ESTeem, see your network systems administrator for the password.

9. At the 192E login prompt type **admin** for the login name and press the **Enter key** (<Enter>). The login name is defined at the factory and is not changeable by the user. **Note that all characters are lower case.**

10. If this is the first time the ESTeem has been programmed or the login was not changed from the factory default values, the factory default password is also **admin**. Enter **admin** for the password and press the Enter key (<Enter>). **Note: All characters are lower case.**

11. The ESTeem Configuration Menu (Figure 16) will now be displayed.

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**Figure 15: RS-232 Log-In Prompt**

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**Figure 16: RS-232 Configuration Page**
12. Enter 5 for ETHONLY (this stands for Ethernet only configuration mode. You will see the screen in Figure 16. Program the basic operating parameters such as assigning the ESTeem an IP Address, IP Net Mask, Gateway IP Address, Domain Name, or DNS IP Address. When you have completed entering the basic operating parameters as required for your application, answer Yes, to save your changes to flash memory.

After the basic parameters have been entered into the ESTeem and the changes saved to flash memory you can use the higher level programming features in the ESTeem Web Page to configure the unit for your application.

Programming Through the ESTeem Web Page

Figure 17 shows a typical hardware configuration if you are accessing the ESTeem Web page from a computer over a hardwired LAN. The ESTeem Model 192E is interfaced to the LAN from a Hub or Switch. Figure 18 shows a typical hardware configuration if you are accessing the ESTeem Web page from a computer interfaced directly to the ESTeem Ethernet port.

1. Connect the antenna to the antenna connector on the Model 192E.

2. Plug the ESTeem Model AA174 power supply into a wall socket and connect the Molex power connector to the ESTeem. The power light (PWR) on the front of the ESTeem should be illuminated.

3. Connect the Ethernet cable to the LAN or computer.

Notes:

- There is no Power On/Off switch on the Model 192E.
- Please attach an antenna to the Model 192E before power up.
- When powering up the ESTeem for the first time you must use the ESTeem RS-232C Configuration Menu described in Section 3 to setup the basic operating parameters such as assigning the IP Address, IP Net Mask, Gateway IP Address, Domain Name, and DNS IP Address.

Logging On To the ESTeem Web Page

1. Using your Web Browser connect to the Model 192E Web Page with the IP Address that you have assigned through the serial port.
2. You will now see the Log-on Menu on Figure 19. To enter the Model 192E Status Menu you will need to log into the system with a login name and password.

3. For the login name enter **admin** and press the Enter key (Enter). The login name is defined at the factory and is not changeable.

4. Enter your password and press the Enter key (Enter).

   If this is the first time the ESTeem has been programmed and password was not changed from the factory default values, proceed with the steps below to access the Configuration Menu.

   - The factory default password is also **admin**. Enter admin for the password and press the Enter key (Enter).

   - Note: All characters are lower case.

5. After Log-in the following screen in Figure 20 will be displayed. If you select Electronic Systems Technology, Inc. (EST) you will go to the company web site. If you select Configuration Utility you will go the Model 192E Status Menu page.
6. After clicking on the Configuration Utility you will see ESTTeem Web Page Status Menu. Figure 21 shows an example of the status screen for the Ethernet Only Mode.

**Master Bridge**

All ESTTeem Ethernet bridging applications require one (1) Model 192E configured as a Master Bridge. For this demonstration there will be one Model 192E configured as the Master Bridge and the second as the Client Bridge. The location of the Master or Client Bridge in the demonstration is not critical. Either can be connected to Gateway #1 or Gateway #2.

1. Program the Master Bridge ESTTeem first. From the ESTTeem Status Screen select Mode Setup. From the Mode pull down box select Master Bridge and push the select button below the pull down box. You will now see the screen shown in Figure 22. Configure the parameters for the ESTTeem. The Ethernet and Wireless IP Addresses must be on separate
2. Set the on Channel (Frequency) and Data Rate adjustment. See Appendix D of the ESTeem Model 192E User’s Manual for detailed information on the Channel and Data Rate adjustment.

3. Push the Submit button. If you have set WEP Enabled to True then you will get the screen shown in Figure 23. Enter in the respective Key values and press the Submit button and select Status. You will return to the Master Bridge Status Screen shown in Figure 24.

4. If you have set the WEP Enabled to false then press the Submit button and select Status you will return to the Master Bridge Status screen shown in Figure 24.
5. From the Status Screen select Apply Changes and answer Yes. You have now completed programming the ESTeem in the Master Bridge Mode.

**Client Bridge ESTeem**

Once you have completed the configuration for the Master Bride you will need to configure the other Model 192E in the demo kit as the Client Bridge. If you have not defined the IP address of the Client Bridge ESTeem and logged into the web page, proceed to ESTeem Configuration to begin. Proceed with the following once logged into the web page.

1. From the ESTeem Status Screen select Mode Setup. From the Mode pull down box select Client Bridge and push the select button below the pull down box. You will now see the screen shown in Figure 25.

2. Configure the parameters for the ESTeem. The Ethernet and Wireless IP Addresses must be on separate subnets as shown in Figure 25. Set the Master Bridge IP Address to match the Wireless IP Address of the Master Bridge.

3. Set the on Channel (Frequency) and Data Rate adjustment. See Appendix D of the ESTeem Model 192E User’s Manual for detailed information on the Channel and Data Rate adjustment.
4. Push the Submit button. If you have set WEP Enabled to True then you will get the screen shown in Figure 26. Enter in the respective Key values and press the Submit button and select Status. You will return to the Client Bridge Status Screen shown in Figure 27.

5. If you have set the WEP Enabled to false then press the Submit button and select Status you will return to the Client Bridge Status screen shown in Figure 27.

6. From the Status Screen select Apply Changes and answer Yes. You have now completed programming the ESTeem in the Client Bridge Mode.

**VoIP Demo Operation**

The operation of the IPCS VoIP Gateway and Model 192E demonstration is as simple as using a normal phone. To operate the system, dial the phone number of the phone port (Number Set in the VoIP Configuration) of the opposite Gateway and talk normally. To demonstrate use of the VoIP hardware in heavy network use conditions, multiple Ethernet devices such as an Ethernet camera and Ethernet PLC were run simultaneously.

The laptop computer was reading data from an Allen-Bradley SLC 5/05 through its Ethernet port. At the same time the PLC programming software, RSLogix, was on-line programming the PLC through the Ethernet interface. The laptop computer was also viewing the ESTeem configuration web pages in both Model 192E radio modems and displaying a live video image from an Ethernet camera.

With the IPCS Gateway configured for maximum bandwidth utilization (best telephone quality), no delay will noticed in any of the Ethernet equipment. This will demonstrate the capabilities of the high bandwidth Model 192E.