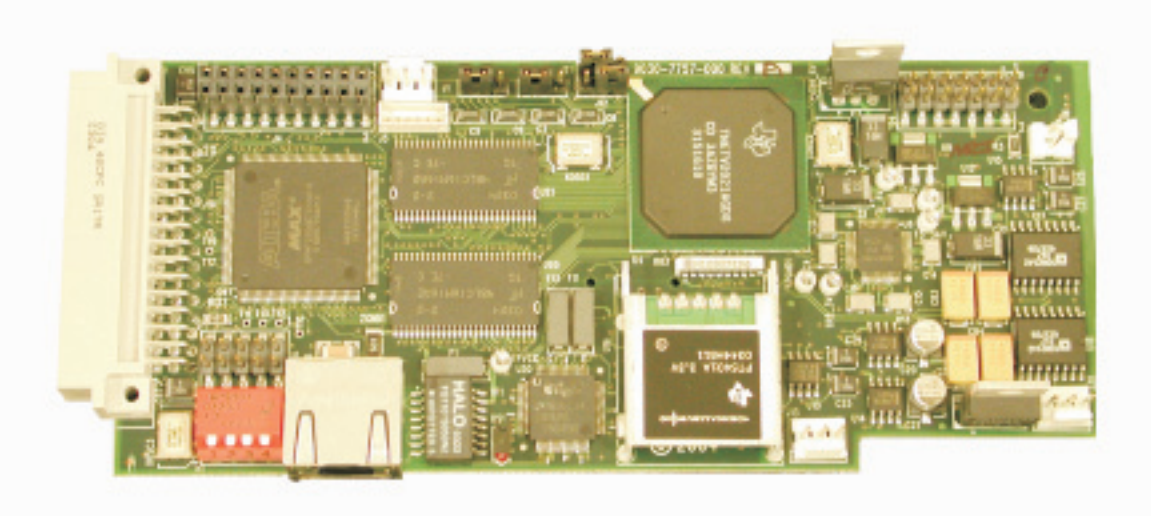
RVON 1

RTS Voice Over Network Interface Card for the KP-32 and KP-812 Family of Keypanels



RTS™

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Unpacking and Inspection
Immediately upon receipt of the equipment, inspect the shipping container and the contents carefully for any discrepancies or damage. Should there be any, notify the freight company and the dealer at once.

Package Contents

Product	Part Number
RVON-1 P.C. Board Assembly	9030-7757-000
Mounting Block, RVON-1	701854-000
Screw, Plastite, 4-20x3/8" LG.	51886-005
RVON-1 User Manual	9350-7757-000
Rear Panel, KP-32, RVON-1 Ready (Optional - if you need to convert an older KP-32 back panel)	9080-7656-002
Standard Flash Software	
KP-32	90157656-002 (U2)
	90157656-003 (U3)
KP-32 (Japan)	9015-7656-042 (U2)
	9015-7656-043 (U3)
KP-632	90157656-202 (U2)
	90157686-203 (U3)
KP-832	90157656-302 (U2)
	90157656-303 (U3)
Note: You will only 1 set of Flash Software for the version of keypanel you have.	

Warranty Information
See the enclosed Warranty card.

Customer Support
Technical questions should be directed to:

Customer Service Department
RTS/Telex
12000 Portland Avenue South
Burnsville, MN 55337 U.S.A.
Telephone: 800-392-3497
Fax: 800-323-0498

Return Shipping Instructions Procedure for Returns
If a repair is necessary, contact the dealer where this unit was purchased.

If repair through the dealer is not possible, obtain a Return Authorization from:

Customer Service Department
Telex Communications, Inc.
Telephone: 800-392-3497
Fax: 800-323-0498

DO NOT RETURN ANY EQUIPMENT DIRECTLY TO THE FACTORY WITHOUT FIRST OBTAINING A RETURN AUTHORIZATION.

Be prepared to provide the company name, address, phone number, a person to contact regarding the repair, the type and quantity of equipment, a description of the problem and the serial number(s).

Shipping to Manufacturer for Repair or Adjustment.
All shipments of RTS products should be made via United Parcel Service or the best available shipper, prepaid. The equipment should be shipped in the original packing carton; if that is not available, use any suitable container that is rigid and of adequate size. If a substitute container is used, the equipment should be wrapped in paper and surrounded with at least four inches of excelsior or similar shock absorbing material. The unit should also be sent in the original Anti-Static bag or a similar anti-static method. All shipments must be sent to the following address:

Factory Service Department
Telex Communications, Inc.
8601 East Cornhusker Hwy
Lincoln, NE 68507
Attn: Service Dept.

Upon completion of any repair the equipment will be returned via United Parcel Service or specified shipper collect.

Contents

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Chapter 1 Introduction

General Description of the RVON-1 Voice Over Network Card

Installed directly into KP-32 or KP-812 keypanels, the RVON-1 provides voice over IP (Internet Protocol) communications for the RTS™ ADAM intercom family. In general, voice over IP means sending voice information in digital form using discrete packets rather than the traditional hardwire connection. The RVON-1 delivers an integrated solution for connecting keypanels to the Intercom matrix over standard IP networks.

The RVON-1 is compatible with any RTS™ Matrix Intercom system equipped with a suitable RVON interface. In conjunction with any new or existing KP-32 or KP-812 keypanel, the RVON-1 brings a new level of enterprise-wide and remote access functionality to your RTS™ Matrix Intercom.

The RVON-1 card is configurable through the keypanel service menu and Telex's AZedit configuration software. It is also fully compatible with internationally recognized standards and supports the following protocols: G.711, G.729 AB, and G.723 (2 bit rates).

The RVON-1 reaffirms RTS' history of providing support for the latest technology in a fully supported backward compatible manner to all its RTS™ products.

Features

Installation:	The RVON-1 provides a single RJ-45 Ethernet connection for use with a 10 BASE-T or 100 BASE-TX network.
1 Channel of Audio In and Out:	The RVON-1 card supports one channel in and out and has configurable network and bandwidth parameters that can be tailored to individual network functions.
Ethernet Compatible:	The RVON-1 card uses standard Ethernet protocols and is compatible with 10 BASE-T and 100 BASE-TX Ethernet compliant devices and networks.
AZedit Configurations:	Users have the ability to adjust the audio parameters of the RVON-1 channel to optimize the available bandwidth.
Swappable Between Ethernet and AIO Connection:	When connected to an Ethernet LAN, audio comes from the RVON 1 card; and, when an Ethernet link is not present, the audio comes from the AIO connection. Note, the user does not need to remove the RVON-1 card to switch to AIO mode.

Specifications

Digital

Compression	Audio Bit Rate	Coding Delay	Playout Delay	IP Bandwidth
G.711	64k	125μs	20-60ms	160-224 kbps
G.729AB	8k	10ms	20-120ms	32-112 kbps
G.723	5.3k/6.3k	30ms	60-120ms	29-45 kbps

* Data depends on CODEC selection

Note: The Playout Delay and Bandwidth depend on the configured amount of audio per packet.

Connections

- RJ-45 Ethernet via backcard
- 14-pin KP Compatible Expansion Connector

Pin 1 ..... 5 Volt Analog
Pin 2 ..... -12 Volt
Pin 3 ..... +12 Volt
Pin 4 ..... 5 Volt Digital
Pin 5 ..... Analog GND
Pin 6 ..... Digital GND
Pin 7 ..... To Matrix Audio L
Pin 8 ..... NC
Pin 9 ..... From Matrix Audio L
Pin 10 ..... RS485L
Pin 11 ..... From Matrix Audio H
Pin 12 ..... NC
Pin 13 ..... To Matrix Audio H
Pin 14 ..... RS485H

Power ..... Powered internally from keypanel motherboard

Physical ..... 2.5”W x 5.75”L (63.5mm W X 146.05mm L)

Dip Switches

Switch 1: Reserved

Switch 2: Disable Telnet Shell
Default Setting: OFF (Telnet Enabled)
Description: The Telnet shell allows you to access configuration options through the use of Telnet. When DIP switch 2 is OFF, you can use Telnet to access configuration options on the RVON-1 card. Turn DIP switch 2 ON to disable the Telnet shell.

Switch 3: Enable Boot Downloader
Default Setting: OFF (Boot Downloader Disabled)
Description: The purpose of the boot downloader is to allow you to recover from having your main application image corrupted (either by bad flash programming or by downloading an invalid image). Turn DIP switch 3 ON to enable the boot downloader.

Switch 4: Debug Only!
Default Setting: OFF
Description: DIP switch 4 should always be left in the OFF position. It is reserved for debugging and can have unintended consequences.

Firmware Compatibility Requirements for the RVON-1 Card

Description	Version
Master Controller	9.19.0 or later
Peripheral Controller	10.10.0 or later
DBX	1.10.1 or later
AZedit	2.06.06 or later
RVON-8	1.1.0 or later
KP-32	2.0.0 or later

Table 1. Compatibility Requirements for the RVON-1 Card

Flash Chip Replacement

The KP32, KP-32J , KP-632, and KP-832 must upgraded to 4MB flash chips that are programmed in the factory. Note, there are two chips for each model (see figure 1). Table 2 shows the respective part numbers for each type of keypanel.

Keypanel	Flash Chip Replacement
KP-32 Standard	9015-7656-002 (U2)
	9015-7656-003 (U3)
KP-32 (Japan)	9015-7656-042 (U2)
	9015-7656-043 (U3)
KP-632	9015-7656-202 (U2)
	9015-7656-203 (U3)
KP-832	9015-7656-302 (U2)
	9015-7656-303 (U3)

Table 2. Flash Chip replacement part numbers.

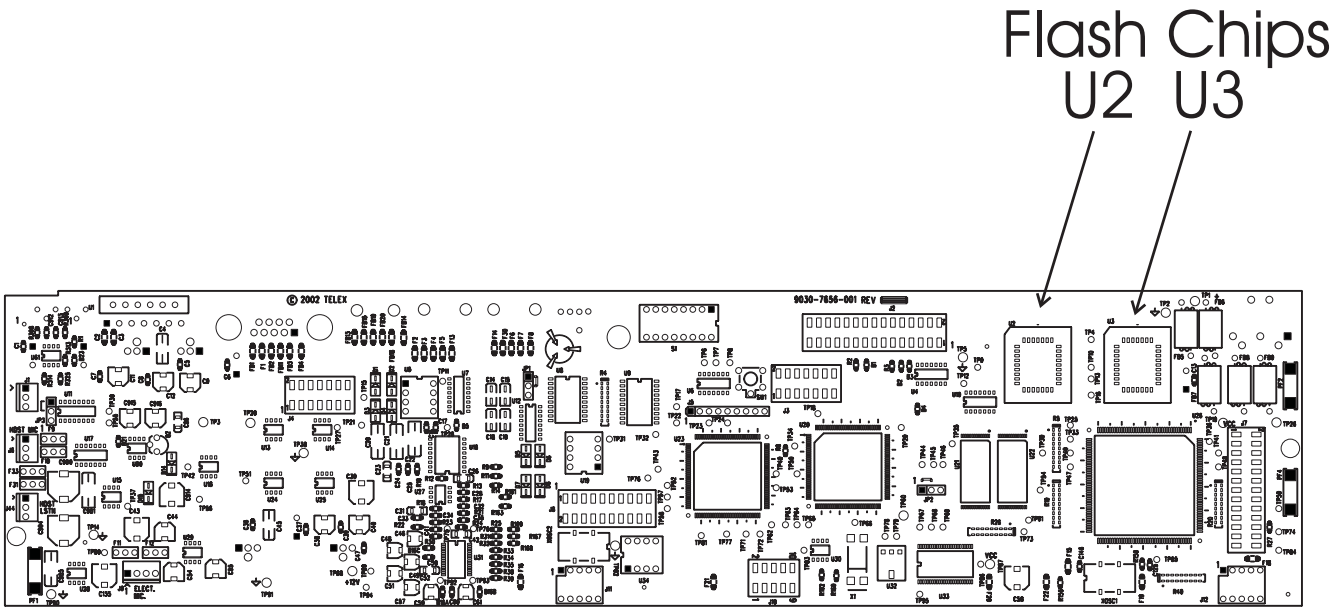


Figure 1. Flash Chip placement on the KP-32 motherboard.

Installation of the RVON-1 Card

Before using the RVON-1 card with the KP-32, a few modifications need to be made to the keypanel. If the serial number on your KP-32 keypanel is **61170**, you will need to update your backpanel with the Ethernet RJ-45 connection (*part number - 9080-7656-002*) knockout present. Also, the KP-32 flash chips need to be replaced with larger flash chips (4MB) (see the chart on page 9 for the flash chip part numbers.

To Install the RVON-1 Card, do the following:

1. Remove the cover from the KP-32 keypanel.

2. If present, remove the GPI/O board.
   The GPI/O board contains the general purpose input and output connections located on the back cover.

3. Using a chip extractor, carefully remove and replace the flash chips located at U2 and U3 on the KP-32 Motherboard. See Figure 1.

4. Using a hammer and screwdriver, remove the specified knockout pieces. See Figure 2.

5. Mount the supplied spacer on the RVON-1 card on the corner of the card near the DIP switch. See figure 3. For more resources concerning the RVON-1 Installation, see Installation of the RVON-1 Card (cont.) on page 11.

6. Securely connect the RVON-1 card to the KP-32 mother board, see page 11 for connector specifics.

7. Replace the GPI/O board.

8. Re-attach the backplate to the KP-32 keypanel. Be sure to secure the spacer with a screw in the back plate. See figure 2 and figure 3.

9. Replace the cover on the KP-32 keypanel.

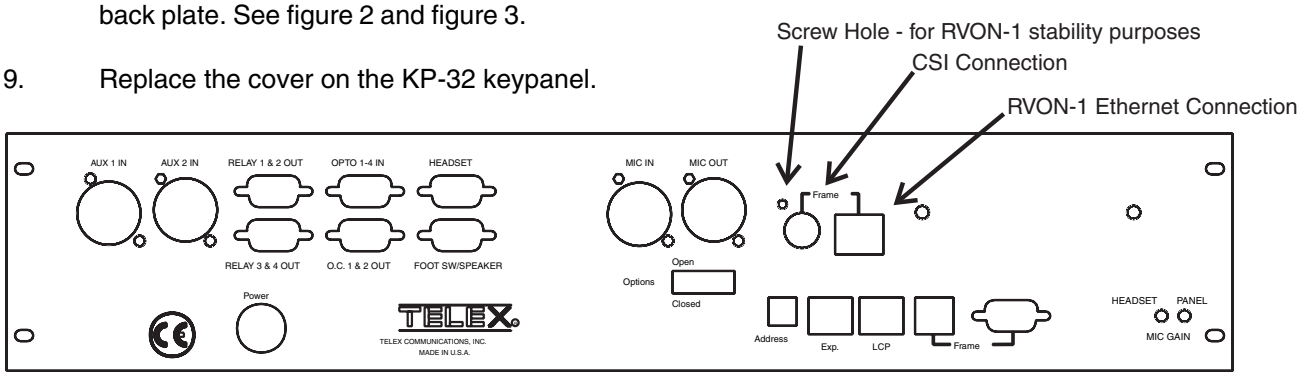


Figure 2. Knock out positions for the RVON-1 card on the KP-32.

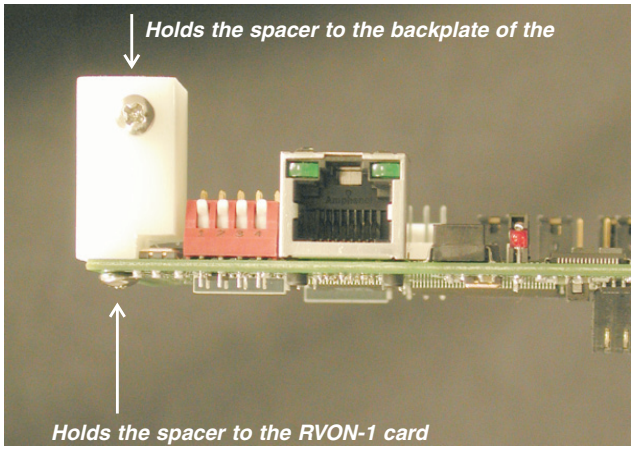


Figure 3. The placement of the spacer and screw position on the RVON-1 card.

Installation of the RVON-1 Card (cont.)

In the KP-32 keypanel, the RVON-1 card connects to the KP-32 by way of the J2 connector on the RVON-1 attached to J4 on the KP-32 header. Gently secure the board in place. See Figure 4.

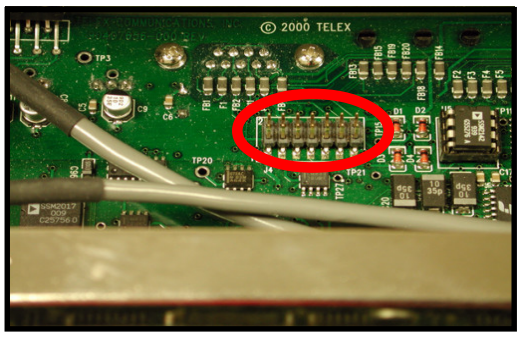


Figure 4. The J4 connector on the KP-32 board.

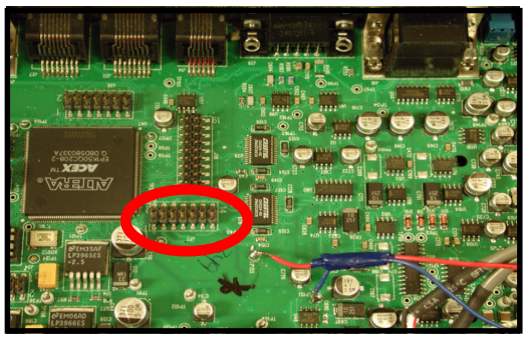


Figure 5. The J37 connector on the KP-812 board.

In the KP-812, the RVON-1 card connects to the KP-812 by way of the J2 connector on the RVON-1 attached to J37 on the KP-812 header. Gently secure the board in place. See Figure 5.

NOTE: Be sure the orientation of the board is correct, otherwise undesirable effects may occur. Make sure the RJ-45 connection is positioned so it will fit through the specified knockout on the back cover. When installing the RVON-1 card in an existing KP-32 or KP-812, each keypanel needs to be upgraded to include the following:

KP-32

- A backplate that allows for the RJ-45 connection (Ethernet).
- Larger flash chips.

KP-812

- A backplate that allows for the RJ-45 connection (Ethernet).
- Extension for the RJ-45 connector.

RVON-1 Relay

When connected to an Ethernet LAN, audio comes from the RVON 1 card; and, when Ethernet is not plugged in, the audio comes from the AIO connection. Note, the user does not need to remove the RVON-1 card to switch to AIO mode.

WARNING!: You cannot have both an Ethernet connection and an AIO connection simultaneously. If the Ethernet and AIO are connected simultaneously, no audio communication will occur.

Addresses and the RVON-1

Because the RVON-1 has an Ethernet interface, it is required to have a MAC (Media Access Control) address. This is a low level address that contains 48 bits. Do not confuse this address with an IP (Internet Protocol) address. In order to be IP compliant, all cards must have a unique MAC ID when shipped from the manufacturer. Typically, the MAC ID of a piece of hardware, such as the RVON-1 card, has a fixed or static address. Where as the RVON-1 card's IP address can change over time.

The MAC address uniquely identifies each node of a network and interfaces directly with the network media. The RVON-1 card has a small 8-pin serial device on the board that the processor can read the unique MAC address from. For more information on MAC IDs, contact technical support.

NOTE: Each RVON-1 Card needs to be programmed with its own IP Address.

Configure the RVON-1 from the KP-32

To use the RVON-1 with the KP-32, the KP-32 firmware must be at V 2.0.0 or higher. In turn, the firmware requires that larger flash chips be used as well. For more information, see page 9.

TOP LEVEL MENU, SERVICE, RVON SETUP

Set the IP Address from the Service Level Menu

The RVON-1 card, when shipped has a default IP Address already configured. This must be changed in order for the RVON-1 card to function properly because the pre-configured IP Address may not work with your network.

To set the IP Address, do the following:

1. On the KP-32, press **Menu**.
   The top level menu appears .
2. Using the ↓↓, scroll to **Service**.
3. Press **PGM**.
   The Service menu appears.
4. Using the ↓↓, scroll to **RVON Setup**.
5. Press **PGM**.
   The IP Address menu item appears.
6. Press **PGM**.
   The actual IP Address appears.
7. Enter the **first number** in the IP Address.
   This activates the first octet of the IP Address and clears the rest of the IP Address.
8. Press **PGM**.
   This confirms the first octet in the IP Address and moves you to the second octet.

NOTE: Press PGM to skip over any octet that does not need modifications.

9. Repeat steps **7** and **8** until the entire IP Address is entered.
10. Press **PGM**.
    The Netmask menu item appears.

NOTE: Once you have entered the IP Address, you will then enter the Netmask. The Netmask is a string of numbers similar to an IP Address, except that it masks or screens out the network part of an IP Address so that only the host computer part of the address remains (for example, 255.255.255.0).

11. Press **PGM**.
    The actual Netmask appears.
12. Enter the **first number** in the Netmask.
    This activates the first octet of the Netmask and clears the rest of the Netmask.
13. Press **PGM**.
    This confirms the first octet in the Netmask and moves you to the second octet.

NOTE: Press **PGM** to skip over any octet that does not need modifications.

14. Repeat steps **13** and **14** until the entire Netmask is entered.
15. Press **PGM**.
    The Gateway IP Address menu item appears.

NOTE: Once you have entered the Netmask, you may need to enter the Gateway IP Address. A **Gateway** is a node (for example, a computer) on a network that serves as an entrance to another network.

16. Press **PGM**.
    The actual Gateway IP Address appears.
17. Enter the **first number** in the Gateway IP Address.
    This activates the first octet of the Gateway IP Address and clears the rest of the address.
18. Press **PGM**.
    This confirms the first octet in the Gateway IP Address and moves you to the second octet.

NOTE: Press **PGM** to skip over any octet that does not need modifications.

19. Repeat steps **19** and **20** until the entire Gateway is entered.
20. Press **PGM**.
21. Press **CLR** to exit the menu.
    The changes are now enabled.

NOTE: You can still set the IP Address without being connected to an Ethernet LAN. Once you have entered the IP information, you will be prompted to perform a **Save Cfg**. The address is saved in the keypanel until the RVON-1 is connected to an Ethernet LAN.

TOP LEVEL MENU, RVON CONN.

Select an RVON Connection from the Top Level Menu

The RVON Conn menu contains a list of connection offers from intercoms. This menu allows the keypanel to dynamically select an intercom and port to which it will connect.

To select a connection offer, do the following:

1. On the KP-32, press **Menu**.
   The top level menu appears in the CWW window.
2. Using the ↓↓, scroll to **RVON Conn**.
3. Press **PGM**.
   The currently selected intercom port appears in the CWW window. If you have not previously selected a connection, you will see "none".
4. Using the ↓↓, scroll to the connection offer that you want to accept.
5. Press **PGM**.
   → *<connection offer> appears. The arrow to left of the connection offer designates which connection offer was chosen.*
6. Press **CLR** to exit.
   The keypanel will now connect to the selected intercom port.

Configure the RVON-1 from the KP-812

TOP LEVEL MENU, SERVICE, RVON SETUP

Set the IP Address from the Service Level Menu

The RVON-1 card, when shipped has a default IP Address already configured. This must be changed in order for the RVON-1 card to function properly because the pre-configured IP Address may not work with your network.

To set the IP Address, do the following:

1. On the KP-812, scroll to **Menu**.
   The top level menu appears .
2. Using the encoder knob, scroll to **Service**.
3. Tap the encoder knob.
   The Service menu appears.
4. Using the encoder knob, scroll to **RVON Setup**.
5. Tap the encoder knob.
   The IP Address menu item appears.
6. Tap the encoder knob.
   The actual IP Address appears.
7. Enter the **first number** in the IP Address.
   This activates the first octet of the IP Address and clears the rest of the IP Address.
8. Tap the encoder knob.
   This confirms the first octet in the IP Address and moves you to the second octet.

NOTE: Tap the encoder knob to skip over any octet that does not need modifications.

9. Repeat steps **7** and **8** until the entire IP Address is entered.
10. Tap the encoder knob.
    The Netmask menu item appears.

NOTE: Once you have entered the IP Address, you will then enter the Netmask. The Netmask is a string of number similar to an IP Address, except that it masks or screens out the network part of an IP Address so that only the host computer part of the address remains (for example, 255.255.255.0).

11. Tap the encoder knob.
    The actual Netmask appears.
12. Enter the **first number** in the Netmask.
    This activates the first octet of the Netmask and clears the rest of the Netmask.
13. Tap the encoder knob.
    This confirms the first octet in the Netmask and moves you to the second octet.

NOTE: Press **PGM** to skip over any octet that does not need modifications.

14. Repeat steps **13** and **14** until the entire Netmask is entered.
15. Tap the encoder knob.
    The Gateway IP Address menu item appears.

NOTE: Once you have entered the Netmask, you may need to enter the Gateway IP Address. A **Gateway** is a node (for example, a computer) on a network that serves as an entrance to another network.

16. Tap the encoder knob.
    The actual Gateway IP Address appears.
17. Enter the **first number** in the Gateway IP Address.
    This activates the first octet of the Gateway IP Address and clears the rest of the address.
18. Tap the encoder knob.
    This confirms the first octet in the Gateway IP Address and moves you to the second octet.

NOTE: Press **PGM** to skip over any octet that does not need modifications.

19. Repeat steps **19** and **20** until the entire Gateway is entered.
20. Tap the encoder knob.
21. Press and hold the encoder knob to exit the menu.
    The changes are now enabled.

NOTE: You can still set the IP Address without being connected to an Ethernet LAN. Once you have entered the IP information, you will be prompted to perform a **Save Cfg**. The address is saved in the keypanel until the RVON-1 is connected to an Ethernet LAN.

TOP LEVEL MENU, RVON CONN.

Select an RVON Connection from the Top Level Menu

The RVON Conn. menu is a list of connection offers from other intercoms. This menu allows the keypanel to dynamically select an intercom and port to which it will connect.

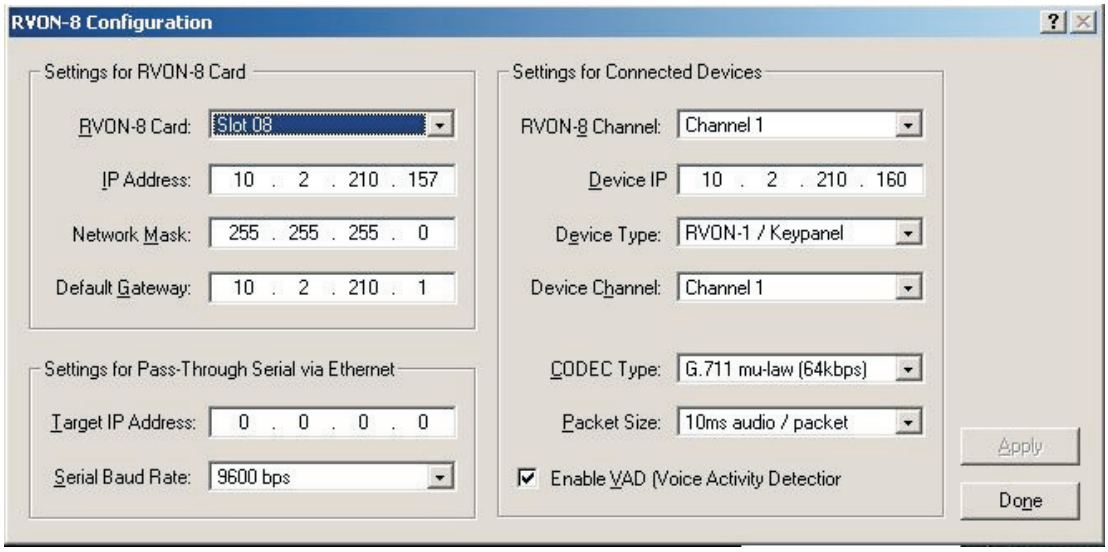
To select the connection offer, do the following:

1. On the KP-812, scroll to **RVON Conn.**, then tap the encoder knob.
   The currently selected connection offer appears in the CWW window. If you have not previously selected the connection, you will see "none".
2. Scroll to the connection offer to which you want to connect, then tap the encoder knob.
   The connection offer begins to flash indicating that it has been selected.
3. Press and hold the encoder knob to exit the menu.
   The keypanel will now connect to the selected port

Configure the RVON-8 using AZedit to contact the RVON-1

To configure the RVON-1 card, do the following:

1. From the Status menu, select **I/O Cards**.
   The I/O Card Status screen appears showing the types of installed cards.
2. Right click on an RVON-8 card and select **RVON-8 Configuration**.
   The RVON-8 Configuration screen appears.



NOTE: The RVON-8 you use should be already configured. If it is not configured, refer to your RVON-8 Card User Manual.

Remember, the RVON-1 has only one channel that can be configured.

3. In the RVON-8 Channel drop down list, select the **channel** that will be used to communicate to the RVON-1 card across the network.
4. In the Device IP field, enter the **IP Address** for the RVON-1 card.
5. From the Device Type drop down list, select **RVON-1/Keypanel**.

6. From the Device Channel drop down list, select **Channel 1**. There may be two channels listed, but the connection can only be made through channel 1.
7. From the CODEC Type drop down list, select the **CODEC type**.
8. From the Packet Size drop down list, select the **size** of each audio packet.

NOTE: A CODEC is an algorithm used to compress audio. Codecs dictate the quality of audio you hear and the network bandwidth used. The packet size determines how much audio data is carried across the network in each transmitted packet. The CODEC type and packet size chosen require different amounts of bandwidth from the network. As with the CODEC type, the packet size you choose for the audio transfer will affect the audio you hear and the bandwidth you use over the network. The larger the audio packet you choose to use, the lower the bandwidth used. However, the larger packet size can result in a higher delay and longer gaps if the packet is lost. On the other hand, smaller packet sizes result in larger bandwidth use, but lower delays and smaller gaps if the packet is lost. The Intercom System Engineer and the Network Designer may want to work together in choosing the CODEC type and packet size suitable for the size of the network, so degradation of network resources does not occur.

9. Select **Enable VAD (Voice Activity Detection)**, if you want to conserve bandwidth when the audio level is below a given threshold.

NOTE: VAD saves network bandwidth by stopping the flow of audio packets when silence is detected. VAD is similar to VOX.

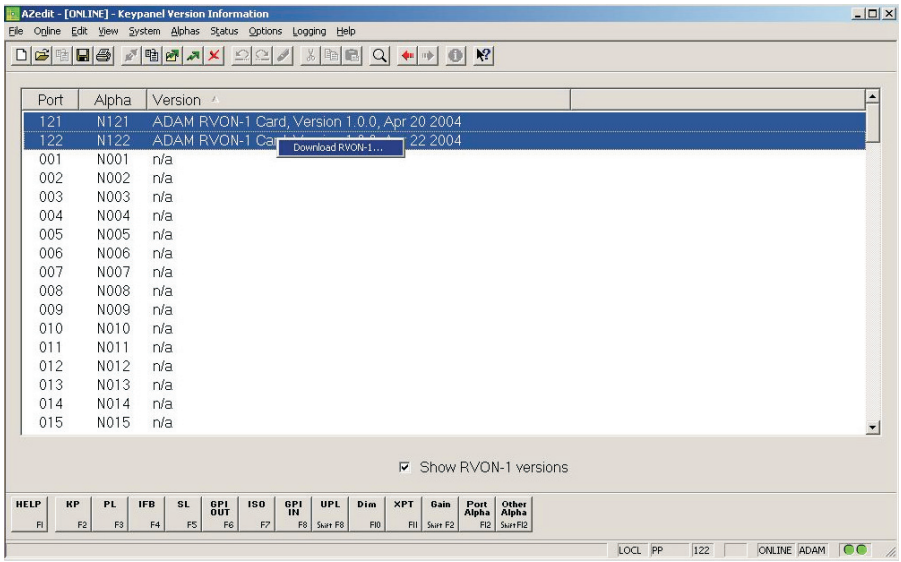
10. Once you are completely finished, click **Apply**.

Download RVON-1 Firmware Through AZedit

NOTE: AZedit sends firmware directly to the RVON-1 card over Ethernet. This is different from other I/O cards (except the RVON-8) that receive the firmware from the Master Controller. For this reason, verify the PC running AZedit is able to contact the RVON-1 card via the network, or is configured with a Gateway IP Address that can contact the RVON card. If it is not, AZedit will not be able to find the RVON-8 card. To test the connection, ping the RVON card from a command line. For more information on how to test for a connection, see Appendix A.

To download the RVON-1 Firmware, do the following:

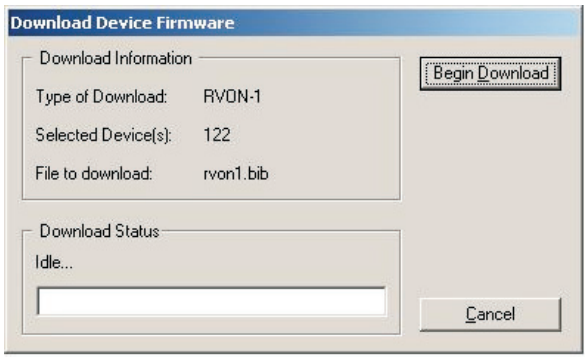
1. Open **AZedit**.
2. From the Status menu, select **Software Versions** and then **Keypanels**.
   The Keypanel Version screen appears.



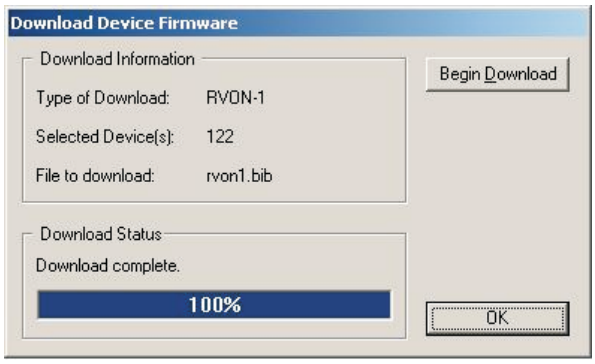
3. On the Keypanel Version screen, select the **Show RVON-1 Versions** check box.
4. Select and right click the **keypanel** which has the RVON-1 installed, and then select **Download RVON-1**.
   The Download Device Firmware screen appears.

5. Using the Browse feature, browse to the file to be downloaded.

6. Click **Open**.
The Download Device Firmware screen appears.



7. Click **Begin Download**.
The download begins.



8. Click **OK**.
The RVON-1 firmware download is complete. This takes a minute or two to occur.

WARNING! - Do **NOT** power down the keypanel until you have verified the new version information from AZedit. If the card loses power while reprogramming the on-board flash memory, the card may become unbootable and may need to have its flash chips reprogrammed at the factory.

9. Verify the correct version is shown on the keypanel version screen.

NOTE: You can also download the RVON-1 firmware through **Status>Ports**. You will not be able to check the version once the download is completed from the Port Status screen.

Appendix A
Basic Network Configuration

This section covers basic network configuration set up and testing. Also covered are basic concepts and operations, including the difference between LAN and WAN networks and how IP Addressing is used.

In a networked environment, such as a company, typically there are many computers connected together using a router or a switch (for more information router or switch in the definitions section). In larger companies, there may be several different routers distributed in buildings and plant locations. A router allows any LAN-side computer to communicate with computers and devices outside the LAN (local area network). Routers send data packets from one place to another place on a network. Routers use network addresses to route packets to the correct destination. For example, in a TCP/IP network, the IP (internet protocol) address of the network interface is used to direct router destinations.

Because routers help computers inside the LAN “talk” with computers outside the LAN, the security of a company’s LAN may be compromised by gaps of open ports in the router. Security measures may have been instituted to compensate for these vulnerabilities. Consult your network administrator to learn more about the security measures taken to protect your network. VPN, or virtual private network, is one such security measure to protect the intelligence of the LAN. A computer outside the LAN must have an address of key known by the VPN to allow access to the LAN. Many companies use a VPN to connect two different LANs, thus allowing the transfer of data between the two networks.

LAN (local area network) vs. WAN (wide area network)

Local Area Network
Simply put, a LAN is a computer network that connects a relatively small area (a single building or group of buildings). Most LANs connect workstations and computers to each other. Each computer (also known as a “node”), has its own processing unit and executes its own programs; however, it can also access data and devices anywhere on the LAN. This means that many users can access and share the same information and devices. A good example of a LAN device is a network printer. Most companies cannot afford the budgetary or hardware expense of providing printers for each of its users. Therefore, one printer (i.e., device) is placed on the LAN where every user can access the same printer.

The LAN users IP addresses to route data to different destinations on the network. An IP Address is a 32-bit numerical address written as four numbers separated by periods (for example, 1.160.10.240).

NOTE: For more information on IP Addresses, consult your local network administrator.

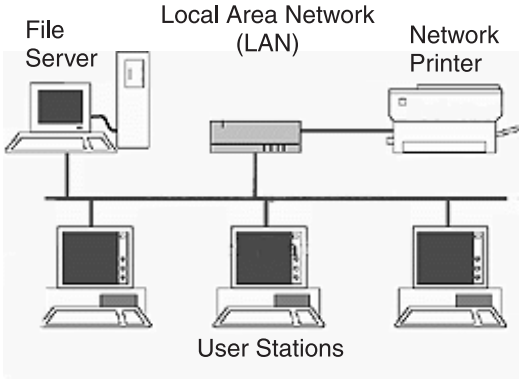


Figure 1. Local Area Network Diagram

Wide Area Network

A wide area network connects two or more LANs and can span a relatively large geographical area. For example, Telex Headquarters in Burnsville, MN is connected to several branch offices in Nebraska and Arkansas over the wide area network. The largest WAN in existence is the Internet.

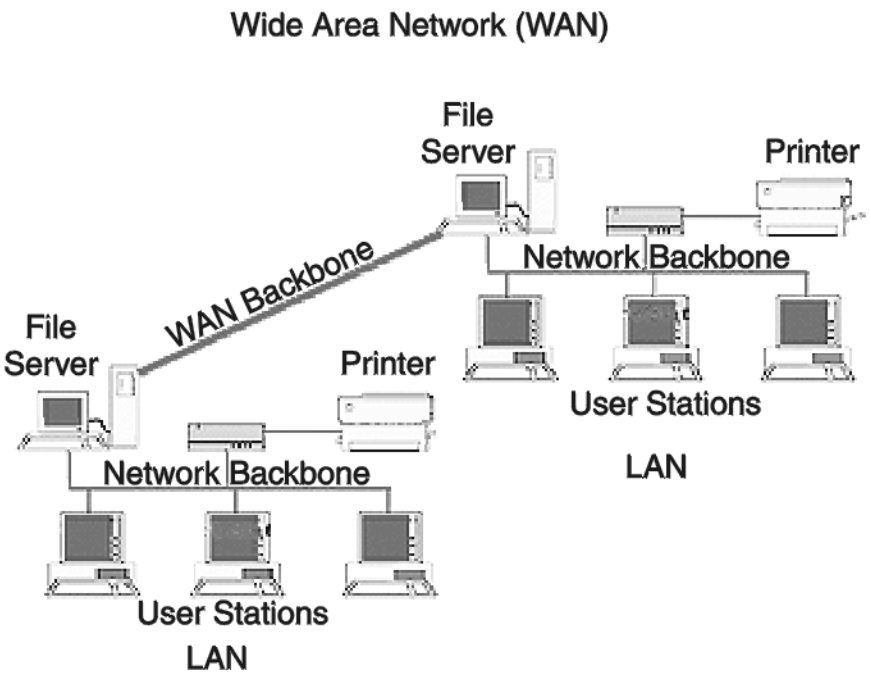


Figure 2. Wide area network diagram

Accessing the Wide Area Network (WAN)

Figure 3 shows LAN IP addresses using a common IP address, 10.2.100.x (192.168.x.x is another common address). Most devices are shipped with these addresses as its default. It is recommended to use these addresses for LANs.

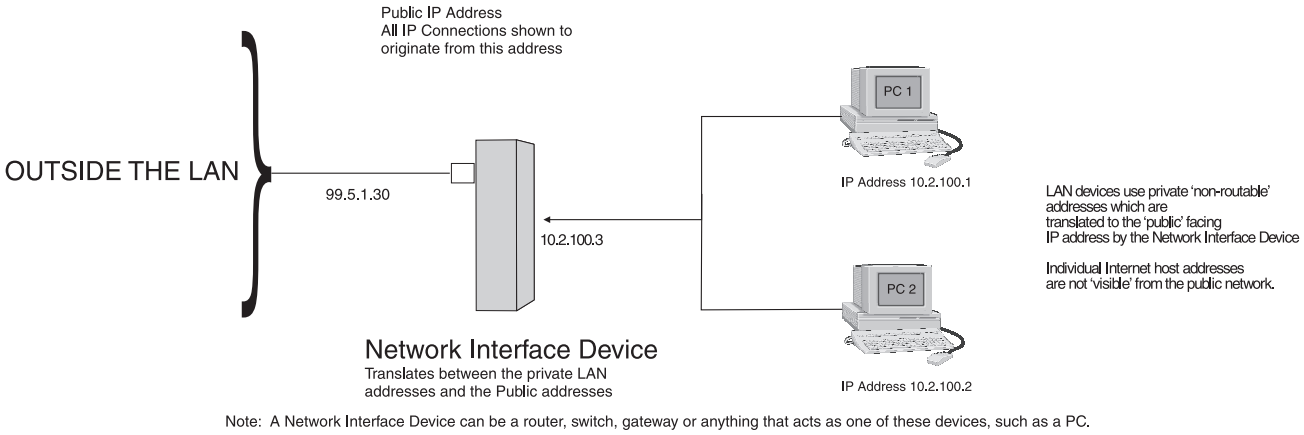


Figure 3. Network Address Translation

Network Address Translating (NAT)

Using the initial IP address, then converting it to a valid WAN IP address is how the network address translation works in theory. Once the IP address is changed, it is up to the network interface device (such as a router, gateway, switch, etc.) to keep track of which computers are talking on which ports. For example, if two local devices (PC1 and PC2 in Figure 3) both wanted to talk via port 1031, then the network interface device would have to change one of the port requests to the next available port, 1032.

Ports

In general, a network port is an endpoint to a logical connection. The port number identifies what type of port it is. For example, port 80 is used for HTTP traffic. When you type an address into the address bar of a web browser, you computer goes to find an IP address for the URL you are requesting (http://www.telex.com). To obtain this address, the computer contact a DNS server (Domain Name Server). Once the IP address is found, it tries to connect to the http port of the network device (port 80). See Table 1 for a list of the more well-known port numbers.

Each network device can be set up to respond or not respond to the various ports. The function of responding or “hosting a service” is called “serving”.

	Packet Before Translation				Packet After Translation			
	Source		Destination		Source		Destination	
	IP Address	Port Number	IP Address	Port Number	IP Address	Port Number	IP Address	Port Number
To Internet	10.2.100.2	1031	192.156.136.22	80	99.5.1.30	1031	192.156.136.22	80
From Internet	192.156.136.22	80	99.5.1.30	1031	192.156.136.22	80	10.2.100.2	1031

Table 1. Packet Translation

If a second work station on the LAN wants to communicate to the same server, and happens to use the same source port number, then the LAN Modem will translate the source port number as well as the source IP address. In Table 2, a second computer wants to access a web page. The NAT device now uses port 1032 for this connection where it used port 1031 in Table 1.

	Packet Before Translation				Packet After Translation			
	Source		Destination		Source		Destination	
	IP Address	Port Number	IP Address	Port Number	IP Address	Port Number	IP Address	Port Number
To Internet	10.2.100.1	1031	192.156.136.22	80	99.5.1.30	1032	192.156.136.22	80
From Internet	192.156.136.22	80	99.5.1.30	1032	192.156.136.22	80	10.2.1001	1031

Table 2. Packet Translation

Amazingly, all the address translation that occurs take place automatically in order to make web browsing and other functions easier. This is also a way for large web hosting services to speed up the network by having different devices perform different functions.

Port Number	Description
1	TCP Port Service Multiplier
5	Remote Job Entry
7	ECHO
18	Message Send Protocol (MSP)
20	FTP-Data
21	FTP - Control
23	Telnet
25	Simple Mail Transfer Protocol (SMTP)
29	MSG ICP
37	Time
42	Host Name Server (Nameserv)
43	Whols
49	Login Host Protocol (Login)
53	Domain Name Server (DNS)
69	Trivial File Transfer Protocol (TFTP)
70	Gopher Service
79	Finger
80	HTTP
103	X.400 Standard
108	SNA Gateway Access Server
109	POP2
110	POP3
115	Simple File Transfer Protocol
118	SQL Services
119	Newsgroup (NNTP)
137	NetBIOS Name Service
139	NetBIOS Datagram Service
143	Interim Mail Access Protocol (IMAP)
150	NetBios Session Service
156	SQL Server
161	SNMP
179	Border Gateway Protocol BGP)
190	Gateway Access Control Protocol (GACP)
194	Internet Relay Chat (IRC)
197	Directory Location Services(DLS)
389	Lightweight Directory Access Protocol (LDAP)
396	Novell Netware over IP
443	HTTPS
444	Simple Network Paging Protocol (SNPP)
445	Microsoft-DS
458	Apple QuickTime
546	DHCP Client
547	DHCP Server
563	SNEWS
569	MSN
1080	SOCKS

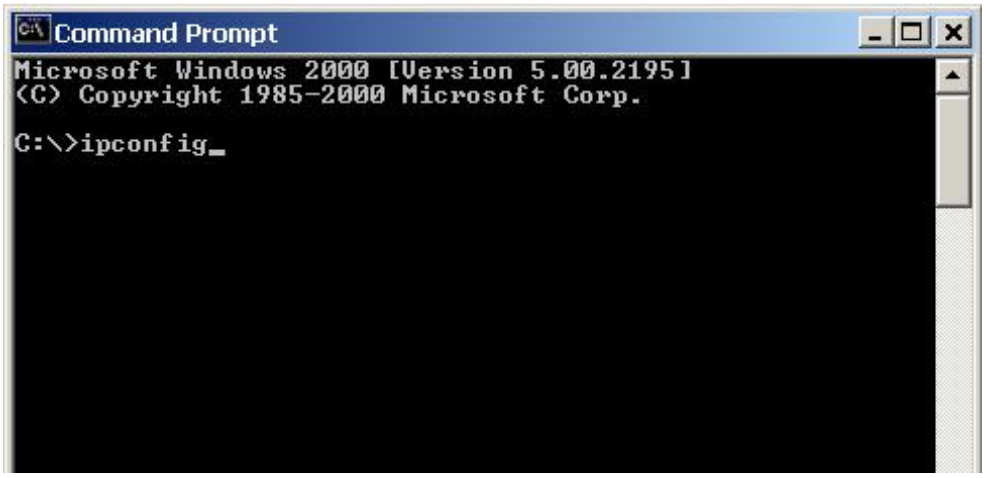
Table 3. Well-Known TCP Port Numbers

IP Addresses

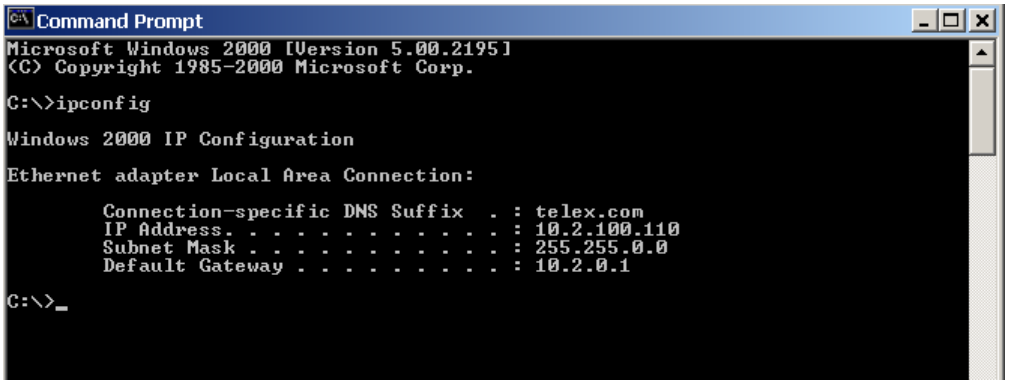
If you do not know your IP Address, you can open a DOS screen in Windows®- based environment and bring up the ipconfig screen.

To find your IP Address using ipconfig, do the following:

1. From the Start Menu, open a **Command Prompt** window.



2. At the prompt, type **ipconfig**, then press **Enter**.
   The IP configurations appear for your machine, such as the DNS suffix, IP Address, Subnet Mask, and Default Gateway.



3. At the prompt, type **Exit** to close the screen.

Note: If you want more detailed parameters for your machine, type **ipconfig/All**. This screen shows the computers network configuration settings.

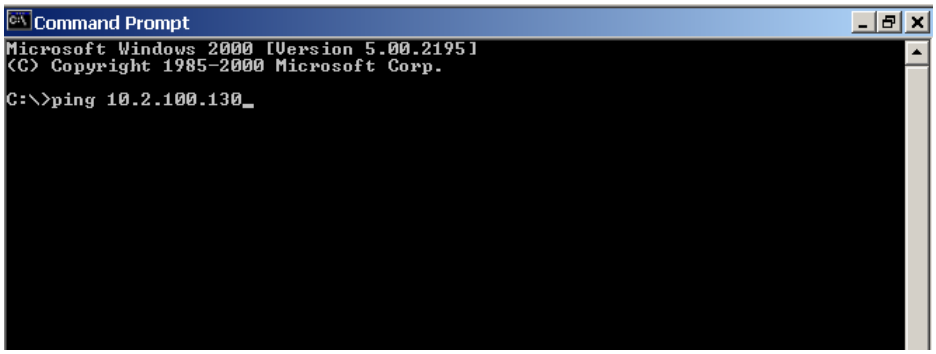
Ping a Computer

Pinging a computer on the network makes sure it is able to be “seen” and receive messages on the network.

> **Note**: You can also ping your RVON-8 card to verify that it is responding over the network by putting the cards IP address in place of the computer IP address.

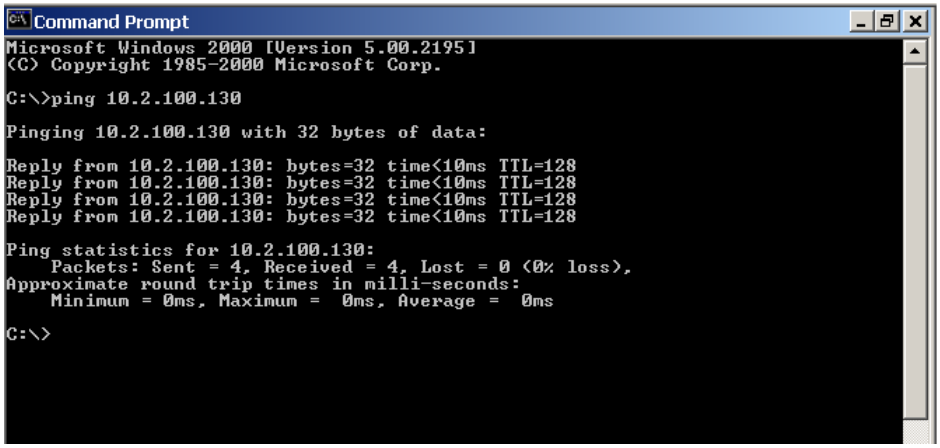
To ping a computer on the network, do the following,

1. From the Start Menu, open a Command Prompt window.



2. At the prompt, type the **IP Address** of the computer you want to ping (for example, 10.2.100.130).

3. Press **Enter**.



Note: If the computer you are pinging is not responding to the ping, you will receive a time out message in the command prompt screen.

Possible Pitfall with Routers, Gateways, and Switches

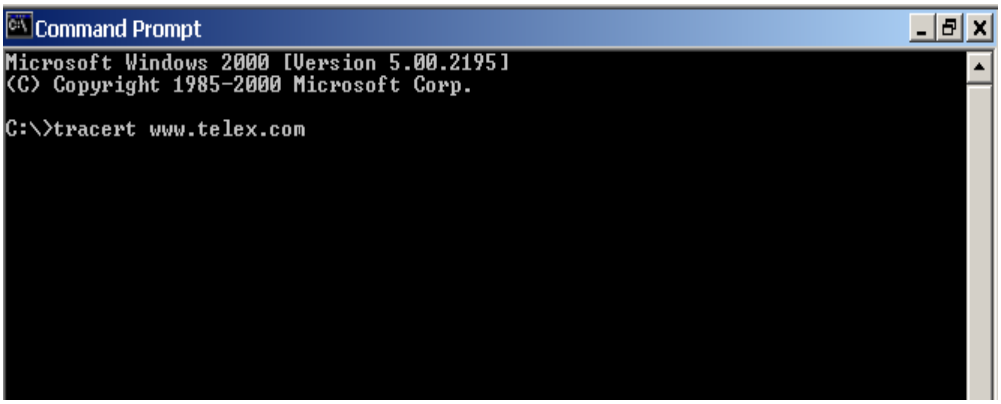
Anytime computers communicate through routers, gateways, and switches, they may be allowed or denied the connection. Network interface devices can be configured to block specific outgoing requests, as well as incoming requests, based on the IP address and/or port. This is one of the security mechanisms of a router. This also happens when broadcast messages are sent and received.

To view the path an IP address takes to retrieve information you can execute a *tracert* from the Command Prompt screen.

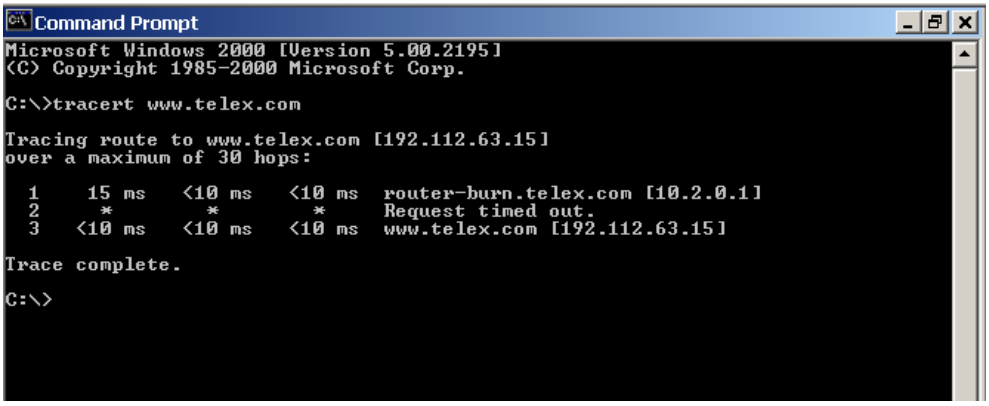
To run tracert, do the following:

1. From the Start Menu, open a **Command Prompt** window.

2. At the prompt, type **tracert** and type the **url** or **IP address** you want to trace.



3. Press **Enter**.
   The details of the tracer route are displayed.



Note: You will see the message “request timed out” if the IP address/port in or out is denied to the outgoing or incoming message.

4. When you are finished, type **exit** to close the Command Prompt window.

RVON-1 Specific Configuration

RVON-1 cards use ports for communication of audio and control packets. Because routers can be configured to block certain incoming and outgoing requests, you will need to open the following ports in your network to allow WAN connections to and from a Network Interface Device. See Table 4 for the ports that need to be opened for the RVON-1 card to operate properly.

Port	Port Description
2076	UDP Call Control Signalling
2077	UDP Audio Packets
2079	UDP Telex Proprietary Signalling
2080	TCP Telex Keypanel Protocol
2081	UDP Pass Through Serial
2082	TCP Firmware Download
2100	Remote Administration
2102	Authentication Server

Table 4. Ports necessary for RVON-1 Card functionality.

Figure 4 is an example of a router configuration screen. Not all routers are configured the same way and may not look exactly like this figure.

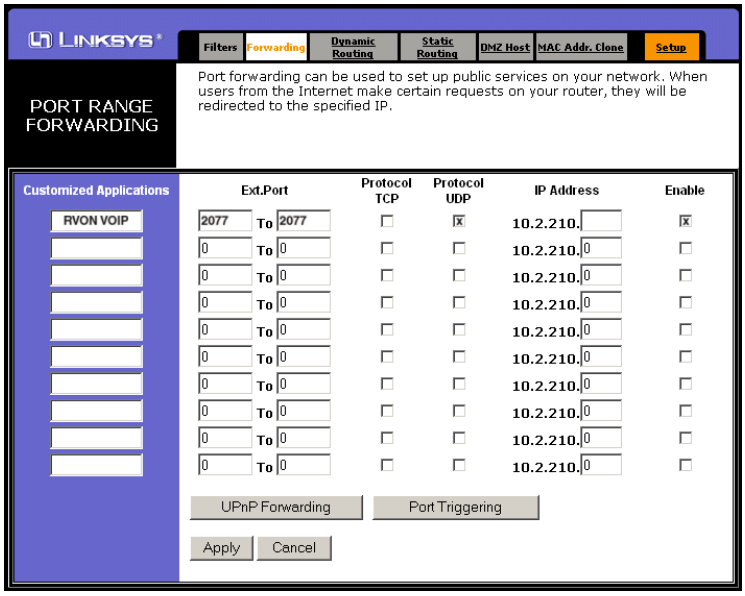


Figure 4. An example of a router configuration screen.

Note: Linksys™ only supports up to 253 nodes on a router. This is why it is called a Router/Switch, because there are WAN functions like a router as well as having a 4-port LAN switch. It also does not support simultaneous forward and DHCP.

Bridges - A **bridge** is a device that connects two LANs, or two segments of the same LAN that use the same protocol. Sometimes called “transparent bridges”, they work at the OSI model Layer 2. Simply put, they are not concerned with protocols. Their main job is to pass data to a destination address that is predetermined in the data packet.

With a bridge, all you computers are on the same network subnet (see Subnet). This means your computers can communicate with each other and have their own Internet connection. If you assign your own IP Addresses be sure to use the same first 3 “octets” of the IP Address (for example, 192.168.0.X).

Domain Name Server - A **DNS Server** is an Internet service that translates domain names (for example, in the URL http://www.telex.com, the domain name is telex.com) into IP Addresses. The Internet is based on IP Addresses which are numeric and since domain names are alphabetic, they are easier to remember. Everytime a domain name is used it must go through the DNS server to be translated into an IP Address.

Gateway - A gateway is a node on a network that serves as an entrance to another network. The gateway routes traffic from a computer to an outside network that is serving the web pages. For example, the gateway for a home computer is the ISP provider that connects the user to the Internet.

In a corporate environment, the gateway often acts as a proxy server and a firewall. Gateways are similar to routers and switches in that they forward data to the destination and provide the path for which the data will travel to the destination.

Hub - A **hub** is a common connection point for devices in a network. A hub has multiple ports. When a data packet arrives at a hub it is copied and distributed to all of its ports so that all nodes on the LAN can see the packets.

These are three types of hubs:

passive hub: this hub serves as a conduit for the data, enabling it to go from one device to another.

intelligent hub (also known as manageable hubs): this hub includes additional fea tures that enable administrators to monitor traffic through the hub.

switching hub: this hub reads the destination address of each packet and then forwards the data packet to the appropriate port.

IP Address (Internet Protocol) - An **IP Address** is an identifier or numerical name for a computer or device on a network. Data between computers is routed over the network using these addresses to identify the computer the message is being sent to and from.

The format of an IP address is a 32-bit numeric address written as four numbers separated by periods. For example, an IP Address looks like 10.100.1.1.

Important: When working within an isolated network (meaning there is no Internet access), IP addresses can be assigned at random just as long as they are unique to each computer and device.

The four numbers in an IP address are used in different ways to identify a particular network and host on that network. There are three classes of Internet addresses:

Class A - supports 16 million hosts on each of 127 networks.
Class B - supports 65,000 hosts on each of 16,000 networks.
Class C - supports 254 hosts on each of 2 million networks.

LAN - A **LAN** is a computer network that connects a relatively small area (a single building or group of buildings). Most LANs connect workstations and computers to each other. Each computer (also know as a “node”), has its own processing unit and executes its own programs; however, it can also access data and devices on the LAN. This means that many users can access and share the same information and devices. A good example of a LAN device is a network printer. Most companies cannot afford the budgetary or hardware expense of providing printers for each of its users. Therefore, one printer (i.e., device) is placed on the LAN where every user can access the same printer.

The LAN uses IP addresses to route data to different destinations on the network. An IP Address is a 32-bit numeric address written as four numbers separated by periods (For example, 1.160.10.240.

Port - A **port**, when referring to TCP and UDP networks, is an endpoint in a logical connection. The port number identifies the type of port it is. For example, port 80 is used for HTTP traffic.

Routers - A **router** is a device that forwards data packets over networks. Most commonly, a router is connected to at least two networks (normally LANs or WANs). Routers are located at gateways, the place where two networks are connected. Routers do little data filtering, they mainly deliver the data.

Subnet - A **subnet** is a portion of a network that shares a common address component. On a TCP/IP network, a subnet is described as all computers or devices whose IP Address have the same prefix.

Switches - A **switch** is a device that filters and forwards data packets between networks. Switches operate at the data layer, and sometimes at the network layer.

WAN - A wide area network connects two or more LANs and can span a relatively large geographical area. For example, Telex Headquarters in Burnsville, MN is connected to several of its branch offices in Nebraska and Arkansas over the wide area network. The largest WAN in existence is the Internet.

Appendix B
Telnet & Serial Port Programming of the RVON-1 Card

RVON Serial and Telnet Commands

RVON-1 card programming can also be done via a direct serial or Telnet connection. There are two physical connections to an RVON-1 board:

- Direct serial through a custom debug cable (J3 6-pin bottom front)
  The custom debug cable always functions as the general-purpose debug tool.

- Backcard RJ-45 J7 (Telnet only)

Setup:

Serial Port:	38,400 baud, No-Flow control
Telnet:	IP Address, port 23

Configure the RVON-1 Using Telnet and Serial Port

IMPORTANT: Because the RVON-1 card is shipped with a default IP Address it may not be accessible on the network. The IP Address should already be configured before attempting to try to connect through TELNET. To set the IP Address, use the keypanel display menu, see pages 10 - 14.

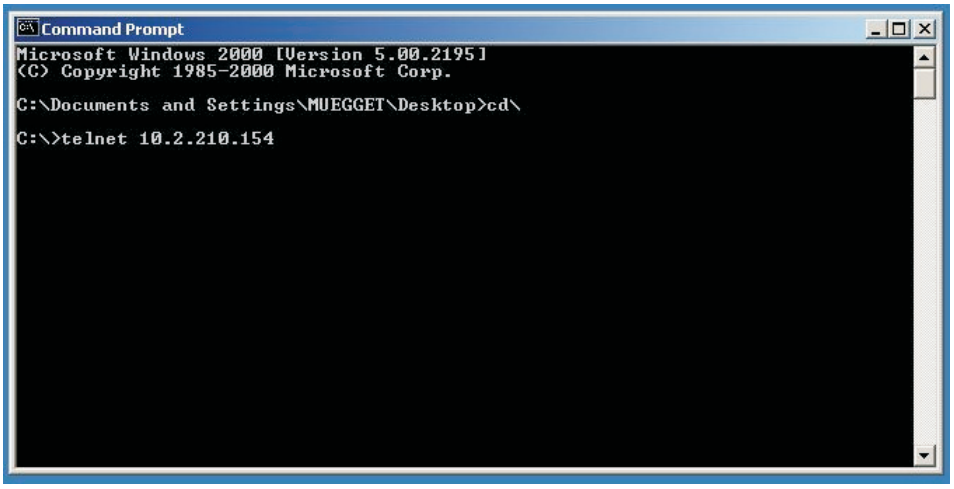
Without access to the physical KP-32 or KP-812 where the RVON-1 is installed, you can still configure the card through the use of Telnet. The following instructions will show you how to access the Telnet screens and show you some of the information you can display and edit.

NOTE: These instructions are intended to help you get to the Telnet screens and give you an overview of what can be done.

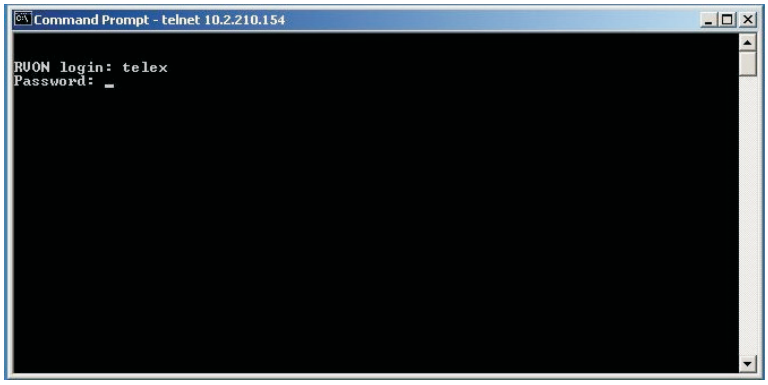
To Display settings for the RVON-1 Card, do the following:

1. Open a command prompt.

2. At the prompt type ***TELNET <IP Address>*** (The IP Address is the IP address assigned to the RVON-1 card.



3. Press **Enter**.
   The RVON login screen appears.



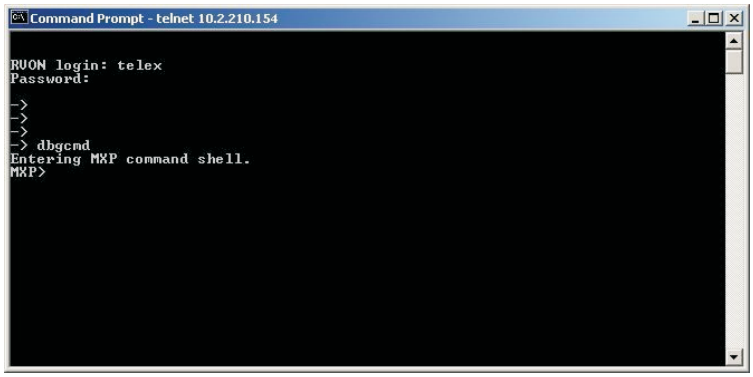
4. In the logon field, type the RVON login (default = Telex).

5. Press **Enter**.

6. In the password field, type the **RVON password** (default = password).

7. Press **Enter**.
   A prompt appears.

8. Type **dbgcmd** to access the debug command screens.



9. Press **Enter**.
   An MXP prompt appears.

Table 1 is a list of commands support from the MXP Shell Prompt.

Command	Parameter 1	Parameter 2	Description
set rvon			Help screen which lists all "set rvon" commands
set rvon	ip_addr	X.X.X.X	Set the IP address for the RVON-1 card
set rvon	netmask	X.X.X.X	Set the Network Mask for the RVON-1 card
set rvon	gateway	X.X.X.X	Set the Gateway IP Address for the RVON-1 card
set rvon	user	abcdefg	Set the RVON-1 user name for Telnet access Default "telex"
set rvon	password	abcdefg	Set the RVON-1 password for Telnet access (8-40 characters) Default "password"
set rvon	vad_threshold	[adaptive | #]	Set the VAD threshold (silence detection) Adaptive refers to autoselect. The # can be -20 to +10 dBm.
set channel [chan]			Help screen which lists all "set chan" commands (CHAN 0-1)
set channel [chan]	dest_ip	X.X.X.X	Set the destination IP address for this particular RVON channel
set channel [chan]	dest_type	X	dest_type X = 0(rvon-8), 1(rvon-1), 2(rvon-I/O)
set channel [chan]	dest_chan	X	Set the destination channel - what port of far-end (0-7)
set channel [chan]	chan_codec	X	Set the profile to use which includes the compression codec, see below (0-27)
activate			Must do an activate command to cause changes to take effect.
set channel [chan]	onhook		Force the channel to disconnect
set channel [chan]	offhook		Force the channel to connect
show rvon			Display current settings
show channel [chan]			Display current settings

Examples:
1. Set RVON ip_addr to 10.3.210.12.

At the command prompt type: **set rvon ip_address 10.3.210.12**

2. Set the destination channel type to RVON-1.

At the command prompt type: **set chan dest_type 0**

3. Set the RVON user to Telex

At the command prompt type: **set rvon user Telex**

Coding Profiles	Codec	Codec Rate	Audio (ms) / Packet	Packets / Second	Encoded Audio (bytes)	IP Overhead (bytes)	Total Packet Size (bytes)	Bandwidth (Bytes/sec)	Bandwidth (kbps/side)	Bandwidth (kbps/channel)
0, 3, 6, 9	G.711	64k	10	100.00	80	60	140	14000	112	224
1, 4, 7, 10	G.711	64k	20	50.00	160	60	220	11000	88	176
2, 3, 8, 11	G.711	64k	30	33.33	240	60	300	10000	80	160
12, 16	G.729	8k	10	100.00	10	60	70	7000	56	112
13, 17	G.729	8k	20	50.00	20	60	80	4000	32	64
14, 18	G.729	8k	40	25.00	40	60	100	2500	20	40
15, 19	G.729	8k	60	16.67	60	60	120	2000	16	32
20, 22	G.723	5.3k	30	33.33	24	60	84	2800	22.4	44.8
24, 26	G.723	6.3k	30	33.33	24	60	84	2800	22.4	44.8
21, 23	G.723	5.3k	60	16.67	48	60	108	1800	14.4	28.8
25, 27	G.723	6.3k	60	16.67	48	60	108	1800	14.4	28.8

NOTE: A channel consists of a transmitting and a receiving side, so the bandwidth is double for a bi-directional audio stream.

NOTE: Bandwidth values are approximate maximums, actual bandwidth used could be considerably lower with VAD enabled.

Codec: Determines how the audio is compressed/decompressed and the name given to the defined algorithm.

Codec Rate: Actual bits per second of the audio in compressed form. This is sent over the network through various data packets. Network efficiency can be calculated with an IP header for each packet of X ms of audio.

DEFAULT SETUP

Every attempt is made to ensure the board is shipped from the factory containing the following:

All are "**set rvon**" commands

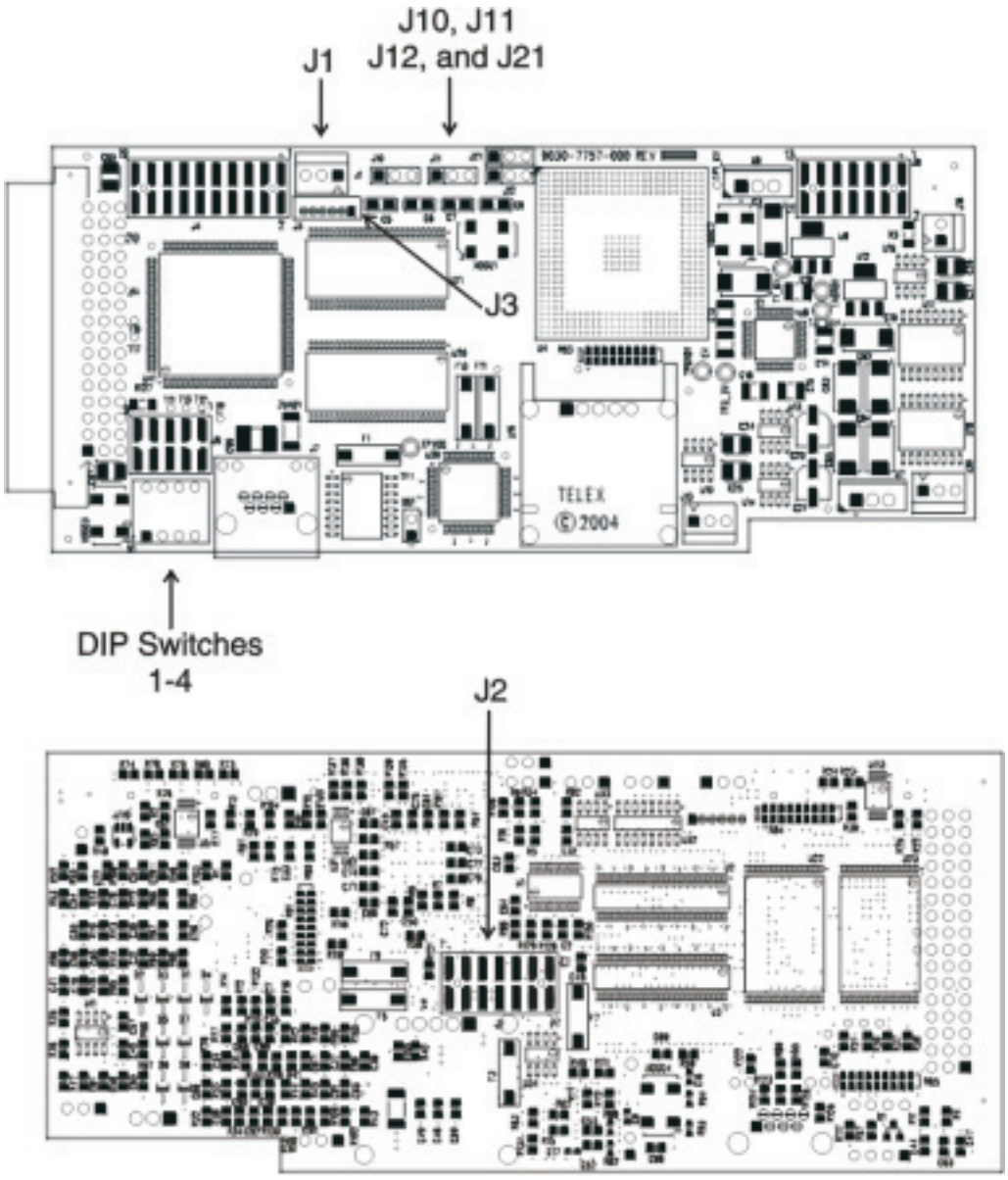
COMMAND	ENVIRONMENT VARIABLE NAME	DEFAULT VALUE	DESCRIPTION
ip_addr	EMACA_IPADDR	192.168.1.1	IP address for the RVON-1 Card
netmask	EMACA_NETMASK	255.255.255.0	Network mask for the RVON-1 Card
gateway	EMACA_GW	none	Gateway IP address for the RVON-1 Card
user	RVON_USER	telex	RVON-1 user name for Telnet access
password	RVON_PASSWORD	password	RVON-1 password for telnet access (8-40 characters)
vad_threshold	RVON_THRESHOLD	adaptive	VAD Threshold

There are more parameters the software will auto-configure if they have not been previously setup.

All are “**set channel #**” commands because they are for each audio channel.

COMMAND	ENVIRONMENT VARIABLE NAME	VALUE	DESCRIPTION
dest_ip	RVON_DEST_IP_# (0,1)	X.X.X.X	Destination IP Address for this particular Channel
dest_type	RVON_DEST_TYPE_# (0,1)	X	Destination Type X = 0 (rvon-8), 1(rvon-1), 2(rvon-I/O)
dest_chan	RVON_DEST_CHAN_# (0,1)	X	Destination Channel - what port of far-end (0-7)
chan_codec	RVON_CHAN_CODEC_# (0,1)	X	Profile to use (previous coding table)

Typing, “sys_printenv” from the “MXP” Debug system prompt shows these settings.



Jumpers and Connections

A selectable RS232/485 serial port is at connector J1. Jumper connections on J10, J11, and J12 select the signal mode on J1.

- When J10, J11, and J12 are jumped from pins 1 to 2 - J1 is configured for RS485.
- When J10, J11, and J12 are jumped from pins 2 to 3 - J1 is configured for RS232.

J21 must be jumped from pins 1 to 2 to select UART B for RS485 RVON-1 keypanel operation.

J2 Connector

The RVON-1 card is designed to be used with either a keypanel or an RVON-IO card. The J2 connector mounts the RVON-1 card onto a keypanel.

RS232 debug serial port via Connector J3.

J3 is a 6-pin header that connects to RS-232 compatible serial ports of the TNETV2020.