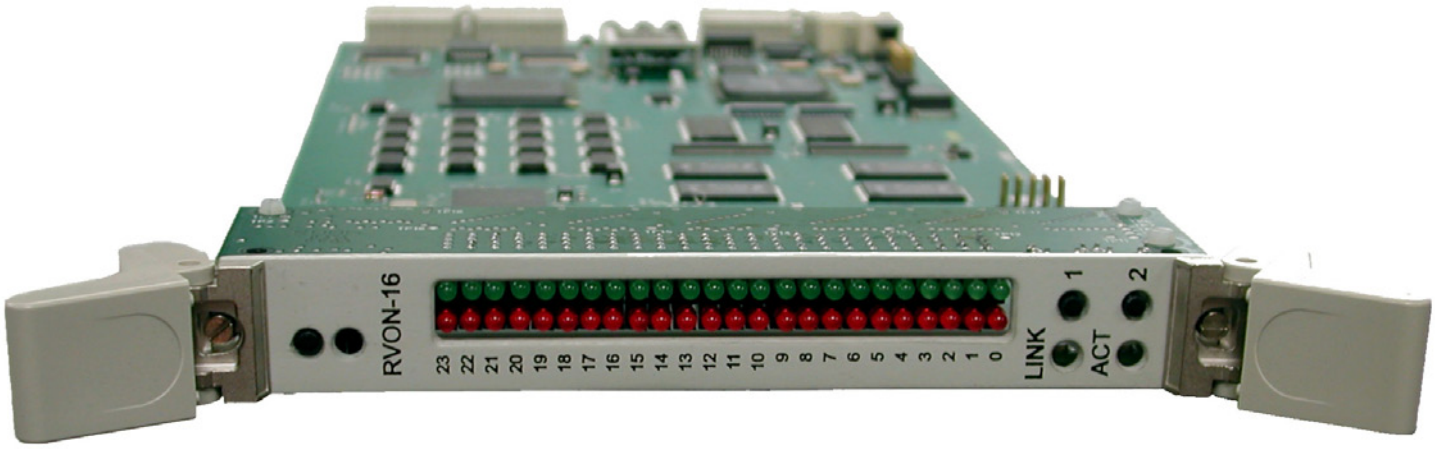
RTS Digital Matrix Intercom
Innovating the Future of Communications

# *RVON-16*
# *RTS Voice Over Network*



## Proprietary Notice



## Copyright Notice



## Warranty Notice

See the enclosed warranty card for further details.

## Customer Support

Technical questions should be directed to:

Customer Service Department
Bosch Security Systems, Inc.
12000 Portland Avenue South
Burnsville, MN 55337 USA
Telephone: 800-392-3497
Fax: 800-323-0498

## Return Shipping Instructions

Customer Service Department
Bosch Security Systems, Inc. (Lincoln, NE)
Telephone: 402-467-5321
Fax: 402-467-3279
Factory Service: 800-553-5992

Please include a note in the box which supplies 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 the Manufacturer

All shipments of product should be made via UPS Ground, prepaid (you may request from Factory Service a different shipment method). Any shipment upgrades will be paid by the customer. The equipment should be shipped in the original packing carton. If the original carton 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 (4) inches of excelsior or similar shock-absorbing material. All shipments must be sent to the following address and must include the Proof of Purchase for warranty repair. Upon completion of any repair the equipment will be returned via United Parcel Service or specified shipper, collect.

Factory Service Department
Bosch Security Systems, Inc.
8601 East Cornhusker Hwy.
Lincoln, NE 68507 U.S.A.
Attn: Service

This package should include the following:

| Qty | Description | Part Number |
|---|---|---|
| 1 | RVON-16 Front Card | 90207848000 |
| 1 | RVON-16 Back Card | 90207848100 |
| 4 | Screw, Panhead, m2.5 x 10.0 | 59000-240 |
| 1 | RVON-16 User Manual | 93507848000 |
| 1 | Warranty Statement | 38110-387 |
| 1 | Wind River EULA | LIT000028000 |

# Table of Contents

CHAPTER 1

# Introduction

## Description of the RVON-16 Voice Over Network Card

Like the RVON-8, the RVON-16 is installed into the ADAM intercom frame, the RVON-16 provides voice over IP communications for the RTS ADAM intercom family of products. Voice over IP technology sends voice (audio) information in digital form using discrete packets rather than the traditional telephone network. The RVON-16 is an integrated solution for connecting custom keypanels to the Intercom Matrix over standard IP networks by supporting 16 channels (ports) of Audio IN and OUT.

The RVON-16 supports all standard, hot-swappable and configurable options through Bosch's RVONedit VoIP configuration software, as well as support for remote keypanels and virtual keypanels via **VoIP** (voice over internet protocol).

RVON-16 also supports Bosch Intelligent Trunking over IP. Trunking is a method of using minimal audio paths for a large number of users. Because it is flexible, a trunked system can expand along with your business, to accommodate a growing number of users. RTS' Intelligent Trunking is a proven technology, which provides the same capabilities and ease of use for intercoms and the seamless routing of communications between facilities, regardless of distance.

RVON-16 is fully compatible with internationally recognized standards and supports the following protocols: G.711, G.729A. and G.723 (2 speeds).

## Requirements

| Application | Version |
|---|---|
| RVON-1 | v 2.1.0 or higher |
| RVON-8 | v 2.1.0 or higher |
| RVON-C | v 2.1.0 or higher |
| RVON-IO | v 2.1.0 or higher |
| AZedit | v 3.3.1 or higher |
| RVONedit | v 2.0.0 or higher |
| VKP | v 2.0.0 or higher |

## *Features*

*Installation*: The RVON-16 is hot-swappable and installs into any available slot in an ADAM intercom system. It provides a single RJ-45 Ethernet connection for use with a 10 BASE-T or 100 BASE-TX network. It also has two DB-9 connections for RS-232 or RS-485 pass-thru port.

*16 channels of Audio*

*IN and OUT*: Expands the connectivity of the ADAM intercom by supporting 16 channels or ports of audio IN and OUT. Each channel has configurable network and bandwidth parameters that can be tailored to individual network functions, as well as ancillary data for keypanels and trunking control.

*Ethernet Compatible*: Fully Ethernet capable. The RVON-16 uses standard Ethernet protocols and is compatible with 10 BASE-T or 100 BASE-TX Ethernet compliant devices and networks.

*RVONedit Configuration*: Users have the ability to adjust the audio parameters of each RVON-16 channel to optimize the available bandwidth on the network.

*Trunk Capable*: The RVON-16 supports ancillary data control or use with Telex® Intelligent Trunking.

*Addressing*: 16 individually addressable audio channels. The RVON-16 can simultaneously feed VoIP capable keypanels, as well as various other matrix intercom systems.

*Pass-Through Serial Port*: Provides two (2) virtual serial connections via an IP connection. Which, if used while trunking, may eliminate the need for multiple IP resources.

## *Specifications*

### Digital

| COMPRESSION | BIT RATE | CODING DELAY | PLAYOUT DELAY | BANDWIDTH | SAMPLE RATE |
|---|---|---|---|---|---|
| G.711 | 64 K | 125 µs | 20-60 ms | 160-224 kbps | 8k |
| G.729A | 8 K | 10 ms | 20-120 ms | 32 112 kbps | 8k |
| G.723 | 5.3 K / 6.3 K | 30 ms | 60-120 ms | 29-45 kbps | 8k |
| *Data Rate depends on Codec Selection | | | | | |

**NOTE:** The Playout Delay and Bandwidth depends on the configured amount of audio per packet.

### Connections

1- RJ-45 Sheilded Ethernet via backcard
2- DB-9 Serial Port via backcard
High-density keyed ADAM compatible backplane connector

Power.....10.2 Watts

Physical .....5.687” W x 11.024” L

## *Default Ethernet IP Addresses*

**TABLE 1.** Default Address for the RVON Product Line

| Product | Default IP Address | Default Subnet Mask |
|---|---|---|
| RVON-I/O | 192.168.0.1 | 255.255.0.0 |
| RVON-8 | 192.168.0.2 | 255.255.0.0 |
| RVON-1 | 192.168.0.3 | 255.255.0.0 |
| RVON-C | 192.168.0.4 | 255.255.0.0 |
| RVON-16 | 192.168.0.5 | 255.255.0.0 |
| GPIO-16 | 192.168.0.6 | 255.255.0.0 |
| MCII-e | 192.168.0.7 | 255.255.0.0 |
| Cronus | 192.168.0.8 | 255.255.0.0 |
| Zeus III | 192.168.0.9 | 255.255.0.0 |

CHAPTER 2

# RVON-16 Card Channel Assignment

## RVON-16 Channels

With the introduction of RVON-16 cards into the ADAM system, the number of channels available doubles from 136 to 272 channels. This is because instead of the 8 channels of audio per RVON-8 card, you now have 16 channels of audio per RVON-16 card. To be backwards compatible with the RVON-8, the RVON-16 channels have been split in to two groups of eight channels; an upper group and a lower group. The channel numbering sequence follows the lower group channels before numbering the upper group channels. For example, if you have an RVON-16 card in slot one of an ADAM frame, the bottom group of eight channels will have channels 1-8 assigned to them, while the top group of eight (8) channels will have channels 137 to 144 assigned to them (see Figure 1).

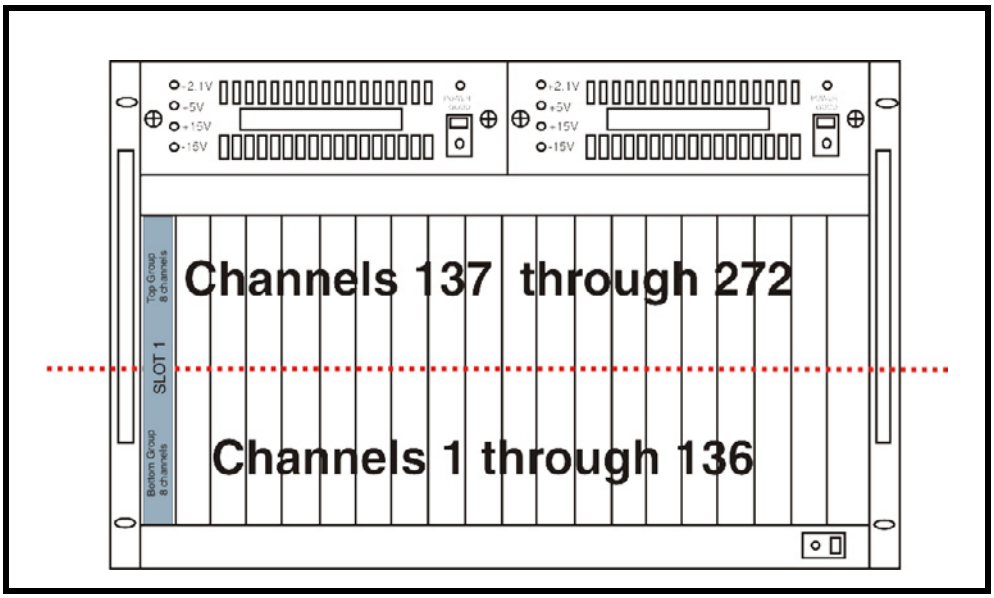



**FIGURE 1.** ADAM frame with RVON-16 cards only and the port numbering scheme

The ADAM Intercom System can run both the RVON-8 and RVON-16 card in the same frame. You can position your RVON-8 and RVON-16 cards in any slot or in any sequence within the ADAM frame. However, when mixing the RVON cards, it is important to consider that the channel numbering is consistent with the two-tier channel systems. For example, in slots 1, 2, and 3, you have RVON-8 cards and in slot 4 you have a RVON-16 card. The channel numbering scheme assigns 8 channels per card for the first four slots. When assigning ports to slot 4, the bottom group of channels are assigned in sequence with the RVON-8 cards; however, the top group of ports associated with the RVON-16 card are assigned the corresponding channels with the card position. This means that channels 137 through 160 are not used and the top group of channels used by the RVON-16 card starts with channel 161 (see Figure 2 on page 8).

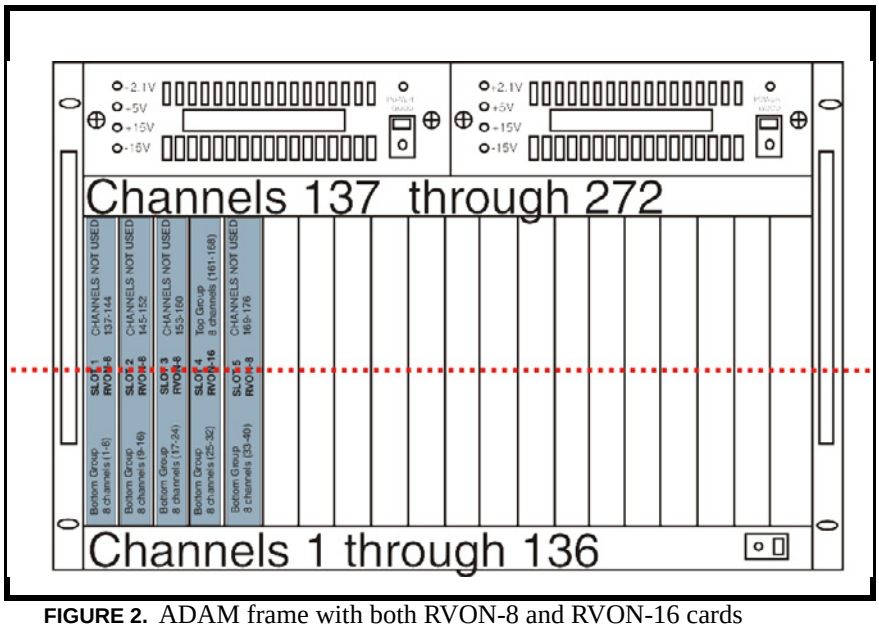



**FIGURE 2.** ADAM frame with both RVON-8 and RVON-16 cards

Essentially, the channel numbering is static, in that the channel numbers used do not change whether you are using an RVON-8 or an RVON-16 card. Rather, it is a question of whether the channels shall or shall not exist.

**NOTE:** You can only hot-swap similar cards in a slot to achieve proper reconnection. If you swap different types of RVON cards (RVON-8 and RVON-16), reconnection at the destination does not occur. You will have to reconfigure the destination device to point to the newly swapped RVON device.

## *Resize your ADAM frame to accomodate AIO-16 cards and RVON-16 cards*

For information on how to upgrade your ADAM frame to high density, go to http://www.rtsintercoms.com, seach Upgrading your ADAM to High Density.

CHAPTER 3

# *Installation*

## *Installation of the RVON-16 Card into the ADAM System*

**CAUTION:** The RVON-16 front card works with either an RVON-16 backcard or an RVON-8 backcard. However, if the RVON-16 is used with an RVON-8 backcard, the second of the two RS-232 ports on the RVON-16 will not be available. Similarly, an RVON-8 card will work with an RVON-16 backcard, but the second RS-232 port will be unavailable. The second serial port is only available when an RVON-16 front card is used with an RVON-16 backcard.

The following firmware versions are the minimum required for RVON-16 support:

- MC V9.28.0
- MCII-e V1.6.0
- DBX V1.19.0 (w/PC V10.19.0 or w/PCII-e V1.19.0)

When inserting the RVON-16 in the ADAM system, the following considerations need to be made:

- Gently insert the RVON-16 into the correct slot. If the card is forced or twisted while inserting, a pin on the backplane could short or break causing the card to become inoperable.
- When inserting the RVON-16 into the ADAM system, make sure to insert it into a compatible backcard. If the card is inserted into an incompatible backcard, undesirable results can occur.
- DO NOT FORCE MATING CARDS

### Color Key Code

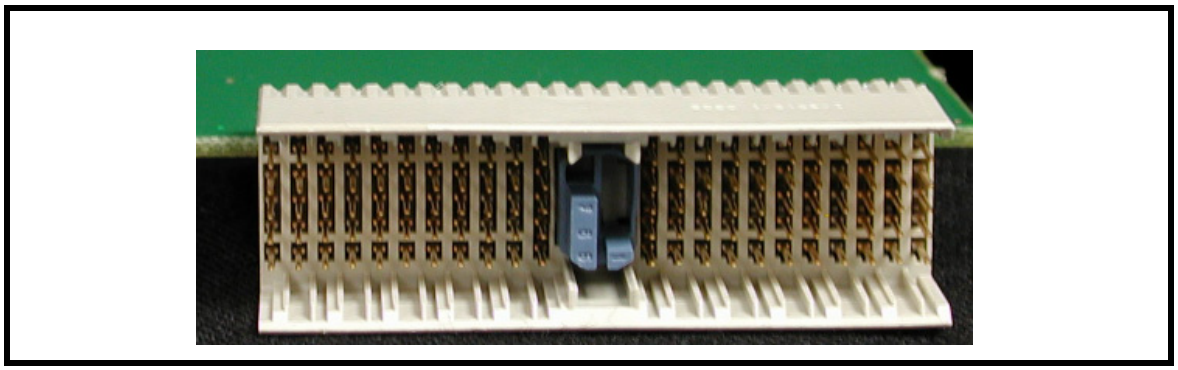


**FIGURE 3.** The RVON-16 Color Key Code. This Key Code allows only the RVON-8 or RVON-16 to plug into a blue coded, compatible backcard.

On the RVON-16 card, Telex has provided a color key code and knock-outs for digits 1-8 to ensure a compatible connection between cards. The RVON-16 card color is blue, and will only insert into a blue coded backcard.

### Addresses and the RVON-16 Card

Because the RVON-16 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-16 card, has a fixed or static address. Whereas, the RVON-16 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-16 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.

## *Switches and Connections*

**IMPORTANT**: You must remove the card from the frame in order to change any DIP switch settings.

The RVON-16 card, unlike the RVON-8 card has two banks of eight DIP Switches.

**DIP Switch 1** **AZedit Configuration Disable**

*CLOSED*: Configuration via AZedit is disabled.

*OPEN* (Default): Configuration via AZedit is enabled.

*Description*: Disables configuration changes via AZedit. AZedit will still be able to view the RVON configuration and status. The configuration can be changed via the serial and Telnet connections.

**DIP Switch 2** **Configuration File Save Location**

*CLOSED*: The RVON card holds the definitive configuration file.

*OPEN* (Default)*:* The Master Controller holds the definitive configuration file.

*Description*: Assigns where the configuration file for the RVON products is to be stored, either on the Master Controller or on the RVON card.

**DIP Switch 3** **Not Used.**

Keep in **Open** position.

**DIP Switch 4** **Inhibit Reset**

*CLOSED*: When enabled, the card is prevented from resetting after 30 seconds of no communication with the system controller.

*OPEN* (Default): When disabled, the card resets after 30 seconds of no communication with the system controller.

*Description*: Allows pass-through serial data to continue when the intercom is otherwise down (i.e., upgrades). Mainly used to keep trunking connections open when disruptions in communication on the card occur.

**DIP Switch 5** **Password Reset**

*CLOSED*: Resets the Telnet user name and password to their default values. The password is case sensitive:

User: telex

Password: password

Also, this setting disables RVONedit and resets the authentication table in RVONedit.

*OPEN* (Default): Uses current username and password.

*Description*: Enables the user to reset the Telnet username and password.

**DIP Switch 6** **Serial Monitor Enable**

*CLOSED*: Enables a serial monitor on back card DB9 via Serial Port 1.

*OPEN* (Default): Enables pass-through serial port via the back card DB9 on both serial port 1 and serial port 2.

**NOTE:** Serial Port 2 is always seen as the pass-through port.

*Description*: Selects DB9 serial configuration.

**DIP Switch 7** **Boot Download Enable**

*CLOSED*: Runs the boot download

*OPEN* (Default): Runs the native flash program.

*Description*: Switches to the boot download flash program. This program is sent with the RVON-16 card in case the native flash program becomes corrupt.

**DIP Switch 8** **DEBUG ONLY!**

*CLOSED*: Debug mode.

*OPEN* (Default): Normal operation mode.

**WARNING**: DIP Switch 8 must be left in the OPEN position. It is reserved for debugging and can have unintended consequences.

**DIP Switch 9** **Serial Port Select A**

*CLOSED*: Select RS-485 (for serial port 1)
*OPEN* (Default): Select RS-232 (for serial port 1)

*Description*: Selects either RS-485 or RS-232 operation on the debug/serial pass through port.

**DIP Switch 10** **Serial Port Select B**
*CLOSED*: Select RS-485 (for serial port 2)
*OPEN* (Default): Select RS-232 (for serial port 2)

*Description*: Selects either RS-485 or RS-232 on the second debug/serial pass through port.

**DIP Switches 11-15** Not Used.
Keep in **Open** position.

**DIP Switch 16** **Not Available**
*CLOSED*: Not Connected
*OPEN* (Default): Not Connected

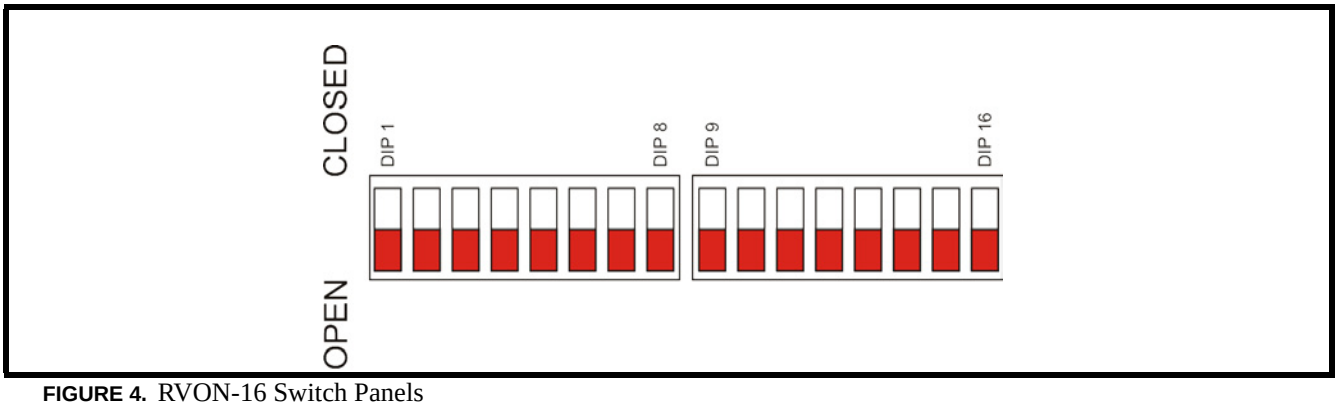



**FIGURE 4.** RVON-16 Switch Panels

## *Configuring the RVON-16 Card with AZedit*

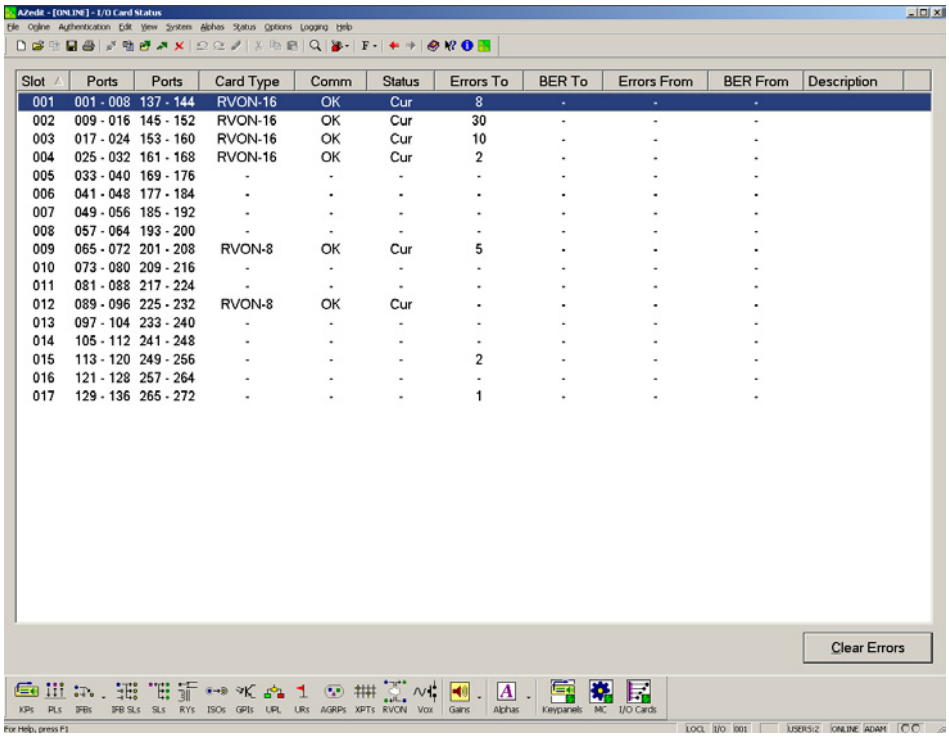
**NOTE:** RVONedit version 2.0.0 has more extensive configuration options for the RVON-16 card. For more information on purchasing RVONedit 2.0.0, contact customer service at 1-800-392-3497.

Once the RVON-16 card is inserted into the intercom, AZedit will automatically recognize the card.

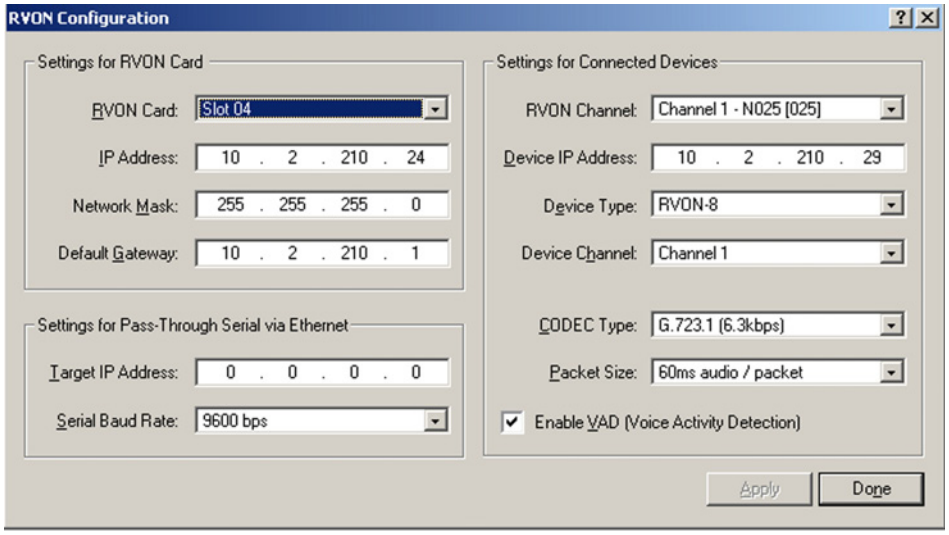
**NOTE:** Requires intercom firmware and AZedit software that supports RVON cards.

To configure the RVON-16 card, do the following:

1. From the Status menu, select **I/O Cards**.
   *The I/O Card Status screen appears showing a list of installed cards.*




2. Right click an RVON-16 card, and select **RVON Configuration**.
   *The RVON Configuration screen appears.*




3. From the RVON drop down list, select the **slot** in which the RVON-16 card resides, if it is not already selected.
4. In the IP Address field, enter the **IP Address** you have assigned to the RVON-16.
5. In the Network Mask field, enter the **Network Mask** of the network to which the RVON-16 is connected.

6. In the Default Gateway field, enter the **Default Gateway Address**, if applicable, of the network to which the RVON-16 card is connected.
   *A Default Gateway is only required if the RVON-16 connections are between LANs.*

Under Settings for Pass-Through Serial via Ethernet

7. In the Target IP Addr field, enter the **Target IP Address** of the device you want to connect to over Ethernet.
8. From the First Serial Baud Rate drop down list, select the **baud rate** at which the data is transmitted for the first serial port.

**NOTE:** Configuration of the 2nd pass-through port via AZedit is not supported.

Under Settings for Connected Devices

**NOTE:** You MUST configure the channels settings on each end of a connection to ensure the same codec and packet size are selected at each end. Remember, the RVON-16 card has more channels which can be configured.

9. From the RVON Channel drop down list, select the **channel** you want to use to communicate to another device across the network.
10. In the Device IP Addr: field, enter the **IP Address** of the device to which you want to connect.
11. From the Device Type drop down list, select the **type of device** to which the RVON-16 card is connecting.
12. From the Device Channel drop down list, select the **channel** on the device to which the RVON-16 will communicate.
13. From the CODEC type drop down list, select the **CODEC type** you want to use for this channel.
14. From the Packet Size drop down list, select the **size** of each audio packet.

**NOTE:** A CODEC is an algorithm used to compress audio. There are 5 Codices supported by Telex: G.711 μs law, G.711A, G.729AB, G.723 (5.3k), and G.723 (6.3k). The type of CODEC will dictate the quality of audio you hear and the network bandwidth used. The packet size determines how much audio is carried across the network in each transmitted packet. The CODEC type and packet size chosen will require different amounts of bandwidth from the network see “Specifications” on page 4. 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 sized 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 Administrator may want to work together in choosing the CODEC type and packet size suitable for the size of the network, so degradation of the network resources does not happen.

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

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

At this point you may choose another channel to configure or choose another card to configure.

16. Once you are completely finished, click **Apply**.
    *Apply sends all of the changes to all the cards in the intercom, or click Cancel to discard all changes you have made.*

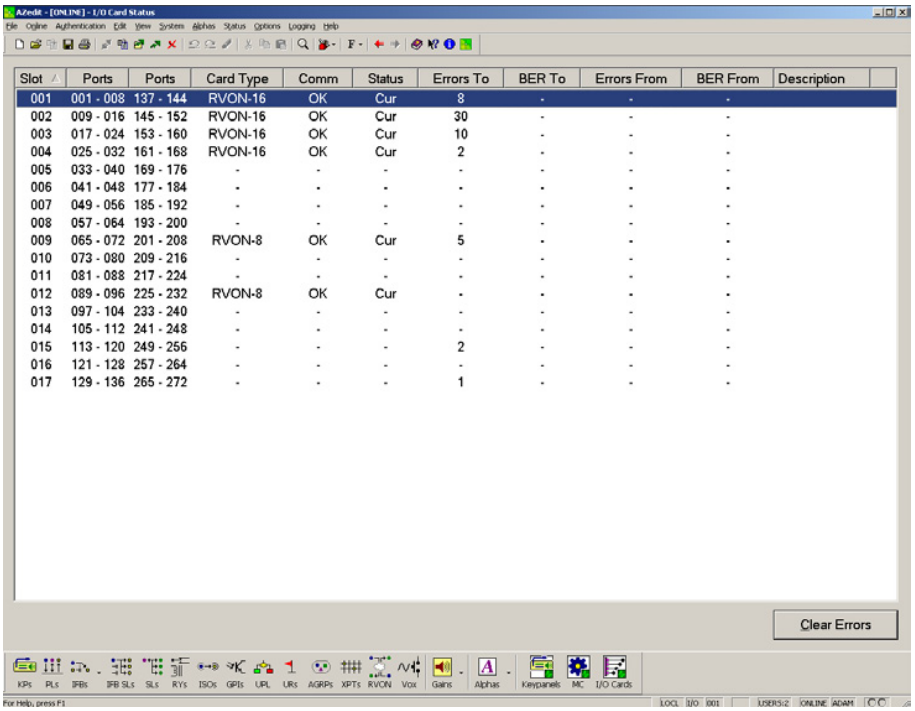
## *RVON Connection Status Screen*

The RVON-16 connection status screen displays information pertaining to RVON channel connections. You can only show statistics for one channel on a card at a time.

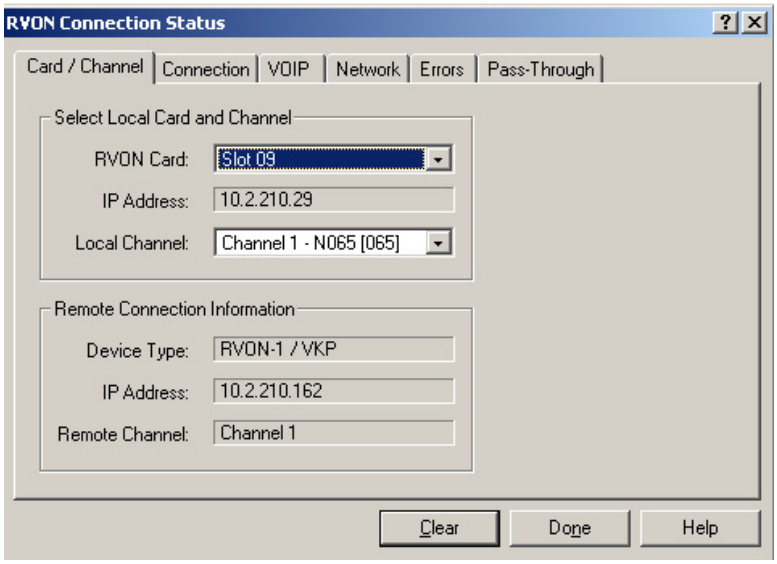
**NOTE**: To view the RVON Connection Status screens, make sure both AZedit and the RVON-16 card are on the same Ethernet network. The reason this is important is because the statistics are updated once per second. At this rate of dynamic update, a serial port could not pass the data effectively.

To view the RVON Connection Status screen, do the following:

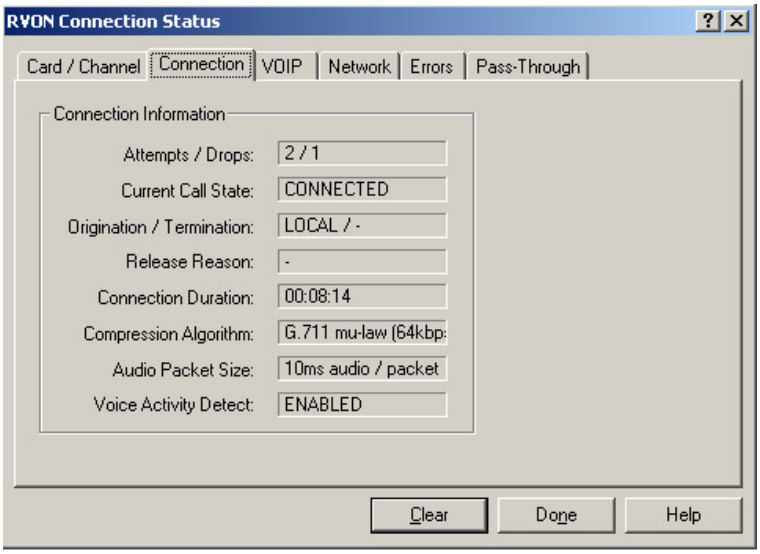
1. From the Status menu, select **I/O Cards**.
   *The I/O Card Status screen appears showing the types of installed cards.*



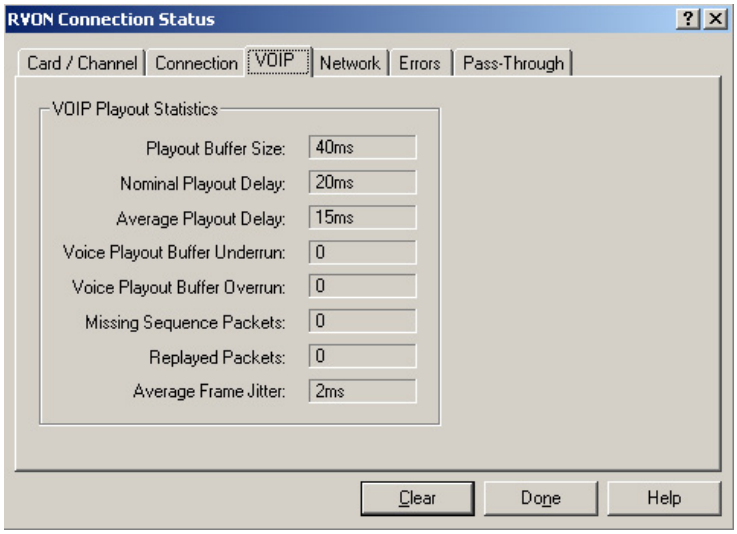

2. Right click the **card** with which you want to work.
   *A context menu appears.*
3. Select **RVON Connection Status**.
   *The RVON Connection Status screen appears. The connection screen contains five (5) pages of information about the selected channel and are described in detail on the following pages.*



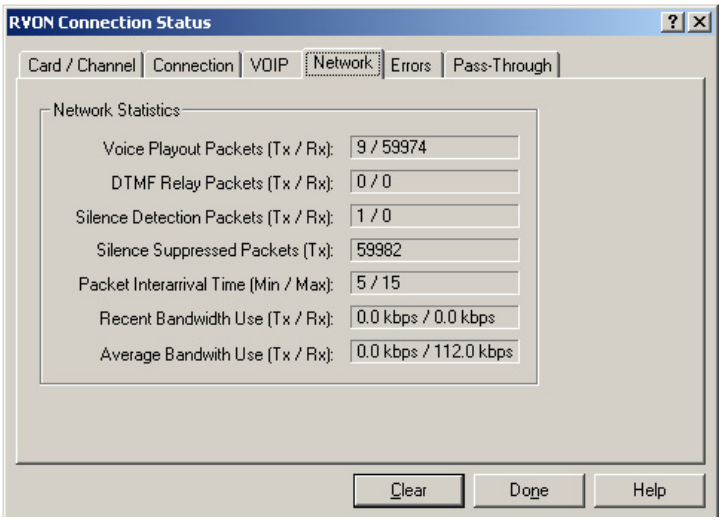

| Screen Item | Description |
|---|---|
| Select Local Card and Channel | |
| RVON Card | The card for which you want to view the status<br>From the RVON drop down list, select the card you want to view. |
| IP Address | Displays the IP (Internet Protocol) Address of the card you select |
| Local Channel | One of sixteen (16) channels supported by the RVON card.<br>From the Channel drop down list, select the channel for which you want to view the status |
| Remote Connection Information | |
| Device Type | Displays the type of device the RVON card is connected to on the other end of the channel. |
| IP Address | Displays the IP Address of the device connected at the other end of the channel. |
| Remote Channel | Displays the channel at the other end of the connection that the device is using. |



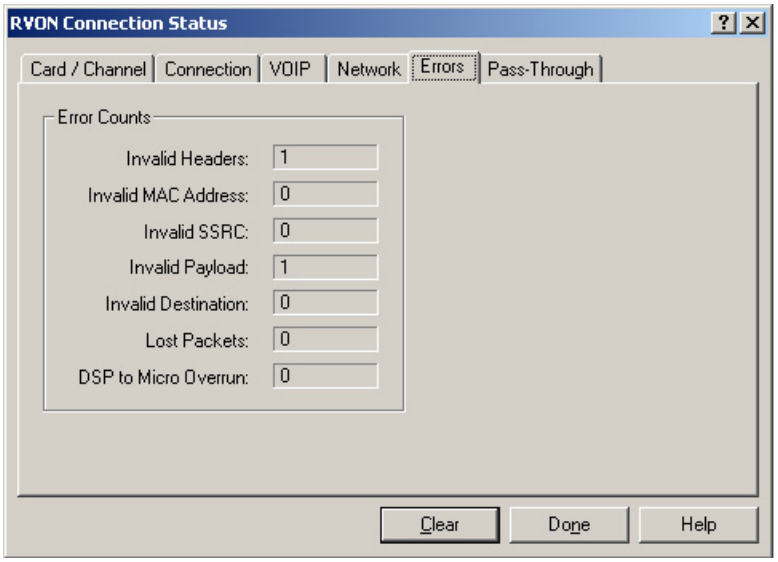

| Screen Item | Description |
|---|---|
| Attempts/Drops | The number of times a call attempt has been made and dropped.<br><br>**NOTE:** The number of attempts should always be one greater than the number of drops. |
| Current Call State | The state of the connection. There are two connection states: Connected or Idle. |
| Origination/Termination | Displays which end of the connection originated or terminated the call.<br>Local: RVON device<br>Remote: Device at the other end of the connection |
| Release Reason | Displays why the connection was terminated, for example, congestion, network error, local release, remote release. |
| Connection Duration | Displays the duration of the connection. This is shown in hh/mm/ss. |
| Compression Algorithm<br>Audio Packet Size<br>Voice Activity Detect (VAD) | Displays what type of configuration the connection is using. This can be different than the original configuration if both ends of the channel are not configured the same. If the configuration is different, these fields will be in red. |



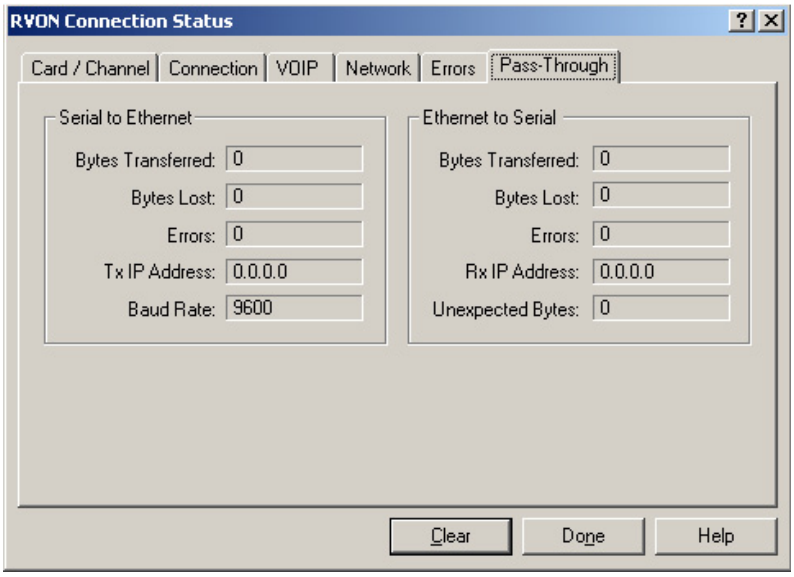

| Screen Item | Description |
|---|---|
| **VOIP Playout Statistics** | |
| Playout Buffer Size | Displays how much audio can be received from the network before packets are lost. This is four times bigger than configured packet size. This is a static system setting. |
| Nominal Playout Delay | Displays how much audio is collected before playout begins. Playout begins at half the Playout Buffer Size, which is two times the configured packet size. This is a static system setting. |
| Average Playout Delay | Displays the actual average audio collected before packets are played out. This is measured over the length of the connection. |
| Voice Playout Buffer Underrun | Displays the number of times that packets were not played because the Playout Buffer was empty.<br><br>**NOTE:** If VAD is enabled, there will be playout buffer runs because there are no packets being received during silence. |
| Voice Playout Buffer Overrun | Displays the number of packets that were discarded because the Playout Buffer was full. |
| Missing Sequence Packet | Displays how many audio packets were missed in the sequence. |
| Replaced Packets | Displays how many audio packets were replayed. |
| Average Frame Jitter | Displays the measure of consistency of packet arrival times. Lower jitter is better. |




| Screen Item | Description |
|---|---|
| | Network Statistics |
| Voice Playout Packets (Tx/Rx) | Displays the number of voice packets transmitted and received from the other side of the connection. |
| DTMF Relay Packets (Tx/Rx) | Displays the number of DTMF (dual tone multiple frequency) relay packets transmitted and received. DTMF relay packets are a bandwidth and quality saving feature within the RVON devices. |
| Silence Detection Packets (Tx/Rx) | Displays the number of times a silence detection packet has been sent or received. VAD (voice activity detection) must be enabled. |
| Silence Suppressed Packets (Tx) | Displays the number of packets never sent because the packets contained silence. |
| Packet Interarrival Time (Min/Max) | Displays the minimum and maximum time elapsed between packets being sent. |
| Recent Bandwidth Use (Tx/Rx) | Displays the amount of bandwidth used in Kbytes/sec over the length of the call.<br>This is calculated by the number of voice packets transmitted and received over the last 10 seconds. |
| Average Bandwidth Use (Tx/Rx) | Displays the amount of bandwidth used in Kbytes/sec over the length of the call.<br>This is calculated by the number of voice packets transmitted and received and the length of the connection. |




| Screen Item | Description |
|---|---|
| | Error Counts |
| Invalid Headers | Displays how many IP packets could not be parsed. |
| Invalid MAC Address | Displays how many invalid MAC addresses tried to connect. |
| Invalid SSRC | Displays the number of packets with an invalid SSRC. |
| Invalid Payload | Displays how many incorrectly formatted packets were received. |
| DSP to Micro Overrun | Displays the number of packets that were lost because the Micro was too busy to receive. |
| Invalid Destination | Displays how many invalid destinations were received. |
| Lost Packets | Displays how many packets were lost. |



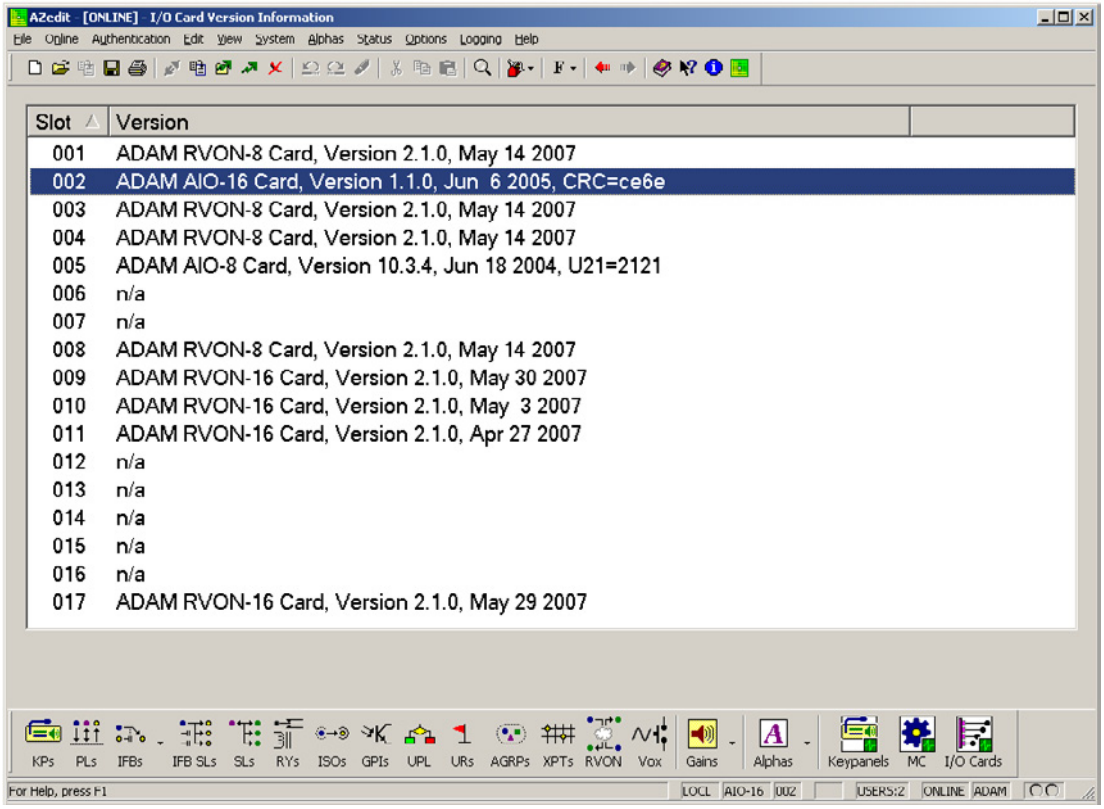

| Screen Item | Description |
|---|---|
| **SERIAL TO ETHERNET** | The Serial to Ethernet information shows the serial data that is received on the serial connection and transferred to the Ethernet address of the card to which the serial data is sent. |
| Bytes Transferred | Displays the number of bytes transferred from the serial connection to Ethernet. |
| Bytes Lost | Displays the number of bytes that could not be transferred. |
| Errors | Displays the number of errors that occurred during transfer. |
| Tx IP Address | Displays the IP Address of the card the serial data is sent. |
| Baud Rate | Displays the baud rate of the serial connection. |
| **ETHERNET TO SERIAL** | The Ethernet to Serial information shows the serial data that is received on the Ethernet connection and transferred to the serial connection. |
| Bytes Transferred | Displays the number of bytes that have been transferred to the serial port. |
| Bytes Lost | Displays the number of bytes that could not be transferred. |
| Errors | Displays the number of errors that occurred during transfer. |
| Rx IP Address | Displays the IP Address from which data was last received via Ethernet (this address should match the Tx IP Address). |
| Unexpected Bytes | Displays the number of unexpected bytes of data.<br>Unexpected bytes is data that has come from any IP address that is not the Tx IP Address. The bytes of data are considered unexpected bytes and are not transferred. |

## *Download RVON-16 Firmware through AZedit*

**NOTE**: AZedit sends the program directly to the RVON-16 card over Ethernet. This is different from other I/O cards that receive the firmware from the Master Controller. For this reason, verify the PC running AZedit is on the same network as the RVON-16 card. If it is not, AZedit will not be able to find the card. To test the connection, ping the RVON card from a command line. For more information on testing for a connection, see “Ping a Computer” on page 42.

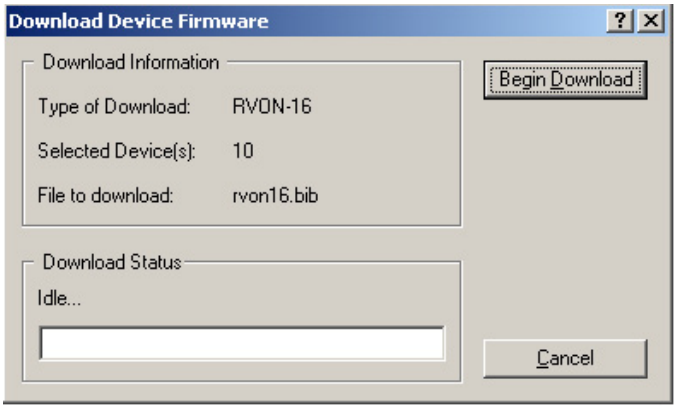
To download firmware to the RVON-16 card from AZedit, do the following:

1. Open **AZedit**.
2. From the Status menu, select **Software Versions**, then **I/O Cards**.
   *The I/O Card Version Information screen appears showing the occupied slots in the system.*

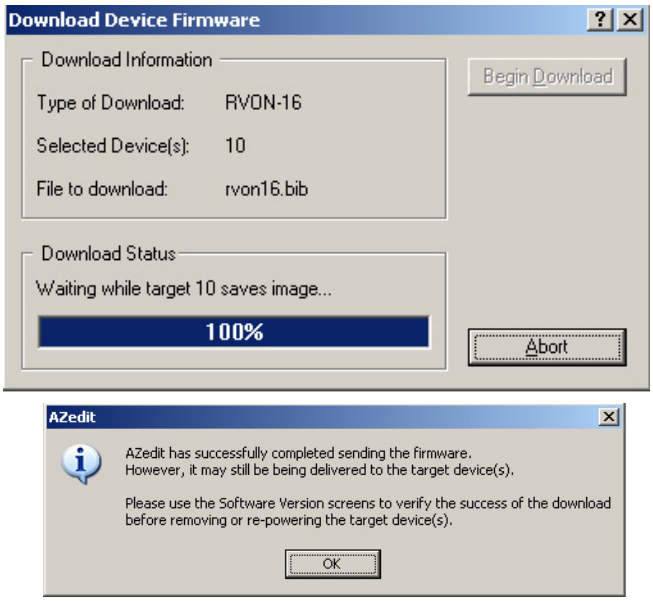



3. Highlight the **Version** to be updated.
   *You may select more than one version at a time by holding the Ctrl key down while you select.*
4. Right click the high-lighted selections and select **Download Firmware**.
   *The Firmware Download window appears.*
5. Using the browse feature, browse to the **file** to be downloaded.

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




7. Click **Begin Download**.
*The download begins. Once the download shows 100% a message (shown below) appears.*




8. Click **OK**.
*The RVON-16 firmware download is complete. This takes a minute or two to occur.*
9. Verify the version upgrade in the I/O Card Version Information Window.

**WARNING!!!** Do NOT power down the frame or pull the RVON-16 card (s) from the frame 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 replaced.

## *Configuring RVON-16 using RVONedit*

**NOTE:** If you are using RVON-16 with RVONedit, you must use RVONedit version 2.0.0. Please contact your customer service representative for ordering details.

RVONedit is a windows®-based, GUI (graphical user interface) application designed exclusively for Telex RVON/VoIP-based products. It can be used to display or configure RVON (VoIP) options associated with the different devices. RVONedit is to the VoIP products as AZedit is to ADAM, Cronus, and Zeus. There are five (5) RVON devices in the RVON family:

- RVON-8
- RVON-I/O
- RVON-1
- RVON-C
- RVON-16

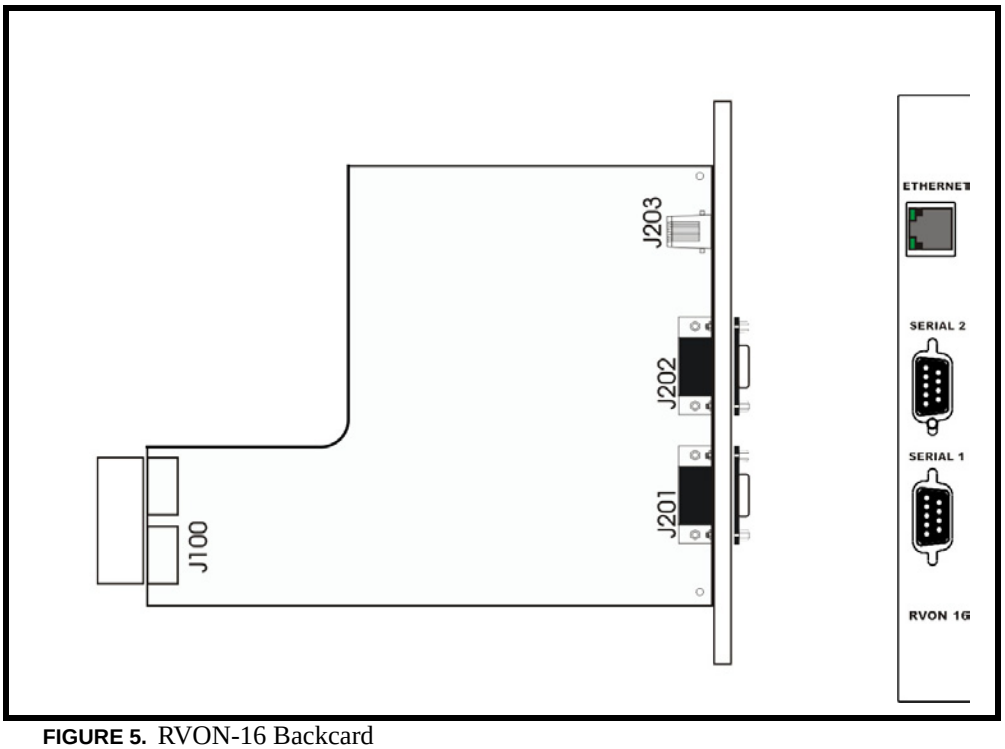


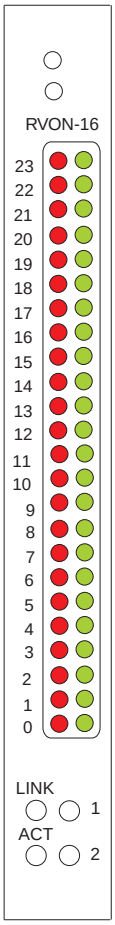

**FIGURE 5.** RVON-16 Backcard

| ***RJ-45 PIN*** | ***Function*** |
|---|---|
| 1 | Ethernet TPO+ |
| 2 | Ethernet TPO- |
| 3 | Ethernet TPI+ |
| 4 | TPO+ |
| 5 | TPO- |
| 6 | Ethernet TPO- |
| 7 | TPI+ |
| 8 | TPI- |

| ***DB-9PIN*** | ***Function*** |
|---|---|
| 1 | N/A |
| 2 | RXD, RVON-16 Received Data |
| 3 | TXD, RVON-16 Received Data |
| 4 | N/A |
| 5 | GND |
| 6 | N/A |
| 7 | N/A |
| 8 | N/A |
| 9 | N/A |

## *LED Explanation*

| | ***RED LED*** | ***GREEN LED*** |
|---|---|---|
| 23 | VOIP not connected - Channel 1 | VOIP connected - Channel 1 |
| 22 | VOIP not connected - Channel 2 | VOIP connected - Channel 2 |
| 21 | VOIP not connected - Channel 3 | VOIP connected - Channel 3 |
| 20 | VOIP not connected - Channel 4 | VOIP connected - Channel 4 |
| 19 | VOIP not connected - Channel 5 | VOIP connected - Channel 5 |
| 18 | VOIP not connected - Channel 6 | VOIP connected - Channel 6 |
| 17 | VOIP not connected - Channel 7 | VOIP connected - Channel 7 |
| 16 | VOIP not connected - Channel 8 | VOIP connected - Channel 8 |
| 15 | VOIP not connected - Channel 9 | VOIP connected - Channel 9 |
| 14 | VOIP not connected - Channel 10 | VOIP connected - Channel 10 |
| 13 | VOIP not connected - Channel 11 | VOIP connected - Channel 11 |
| 12 | VOIP not connected - Channel 12 | VOIP connected - Channel 12 |
| 11 | VOIP not connected - Channel 13 | VOIP connected - Channel 13 |
| 10 | VOIP not connected - Channel 14 | VOIP connected - Channel 14 |
| 9 | VOIP not connected - Channel 15 | VOIP connected - Channel 15 |
| 8 | VOIP not connected - Channel 16 | VOIP connected - Channel 16 |
| 7 | Pass-Through Serial TX 1 | Pass-Through Serial RX1 |
| 6 | Pass-Through Serial TX 2 | Pass-Through Serial RX2 |
| 5 | | RS-232 Enabled - Channel 1 |
| 4 | Shell Log Message (TX) | RS-232 Enabled - Channel 2 |
| 3 | Ethernet Half Duplex | Ethernet Full Duplex |
| 2 | Ethernet 10Mbps | Ethernet 100Mbps |
| 1 | Ethernet Not 'AUTO' | Ethernet Link Good |
| 0 | Control Bus TX | Control Bus RX |




The VOIP Red and Green LEDs 8-23 display different states of the VOIP connection:

Green LED on, Red LED Off ..... VOIP Connection Connected

Green LED winks on and off; Red LED off..... VOIP Connected to keypanel

Green LED off; Red LED on..... VOIP Configured but not connected

Green LED off; Red LED off ..... VOIP Connection Not Configured

APPENDIX A

# *Basic Network Configuration*

## *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**. 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 other 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 of 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 you network administrator to learn 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 or 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 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 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 (or 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 consisting of four numbers separated by periods (for example, 1.160.10.240).

**NOTE:** For more information on IP Addresses, see you local network administrator.

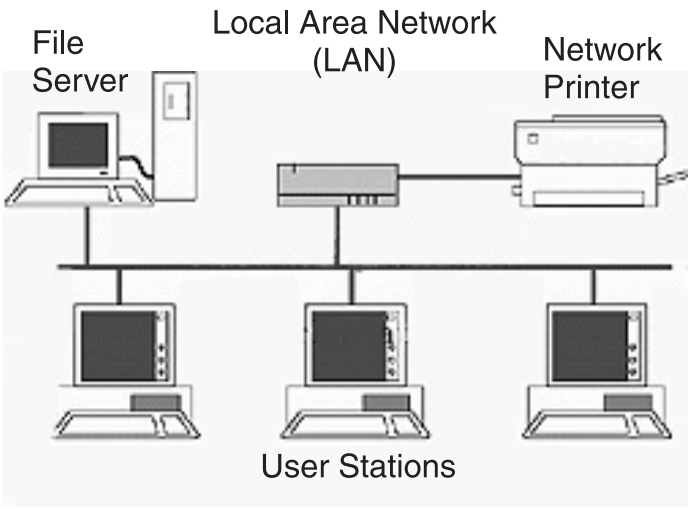



**FIGURE 5.** Local Area Network Diagram

***WIDE AREA NETWORK***

A wide area network (WAN) 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 a WAN. The largest WAN in existence is the Internet.

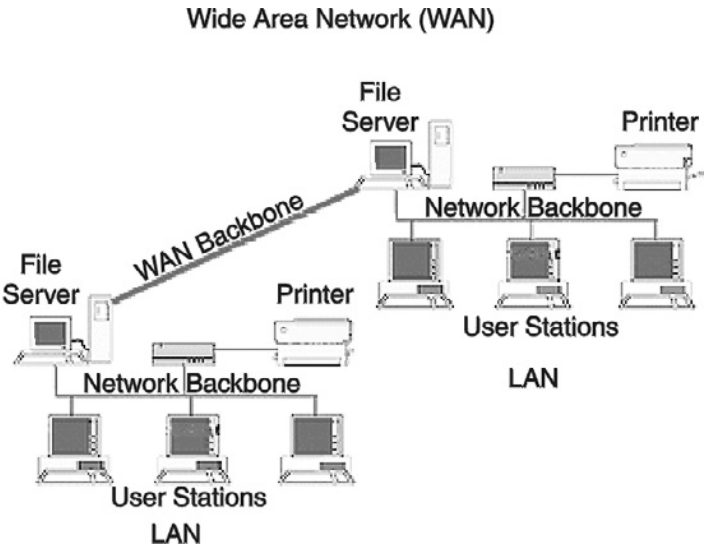



**FIGURE 6.** Wide Area Network Diagram

## 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.

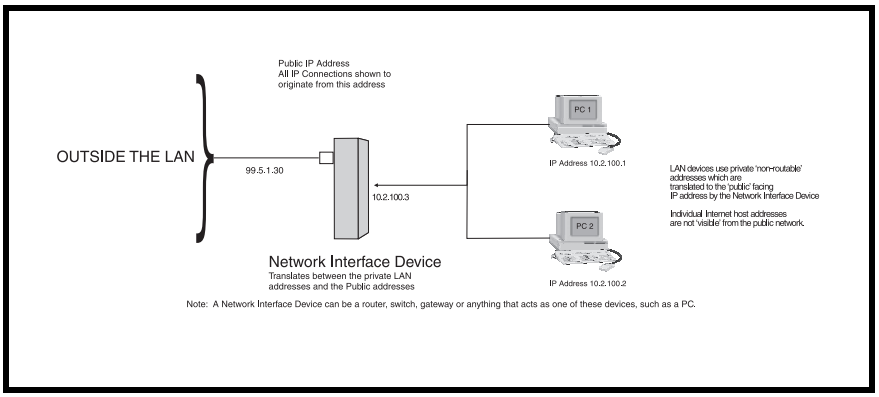



**FIGURE 7.** Network Address Translation

## NETWORK ADDRESS TRANSLATION (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, your computer goes to find an IP Address for the url you are requesting (http://www.telex.com). To obtain this address, the computer contacts 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”.

**TABLE 4.** Packet Translation

| | **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 |

If a second workstation 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 LAN 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.

**TABLE 5.** Packet Translation

| | 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 | 10.2.100.1 | 1031 |

Amazingly, all the address translation that occurs takes 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.

**TABLE 6.** Well-known TCP Port Numbers

| Port Number | Description |
|---|---|
| 1 | TCP Port Service Multiplexer (TCPMUX) |
| 5 | Remote Job Entry (RJE) |
| 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 |

**TABLE 6.** Well-known TCP Port Numbers

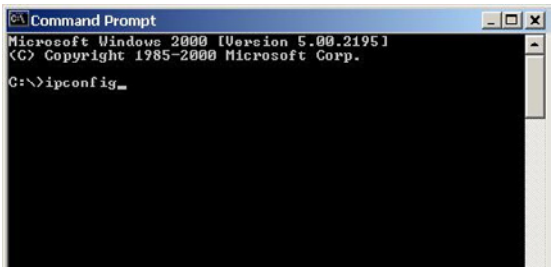
| Port Number | Description |
|---|---|
| 119 | Newsgroup (NNTP) |
| 137 | NetBIOS Name Service |
| 139 | NetBIOS Datagram Service |
| 143 | Interim Mail Access Protocol (IMAP) |
| 150 | NetBIOS Session Service |
| 156 | SQL Server |
| 161 | SNMP |
| 179 | Border Gateway Protocol (BGP) |
| 190 | Gateway 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 Quick Time |
| 546 | DHCP Client |
| 547 | DHCP Server |
| 563 | SNEWS |
| 569 | MSN |
| 1080 | Socks |

## IP ADDRESSES

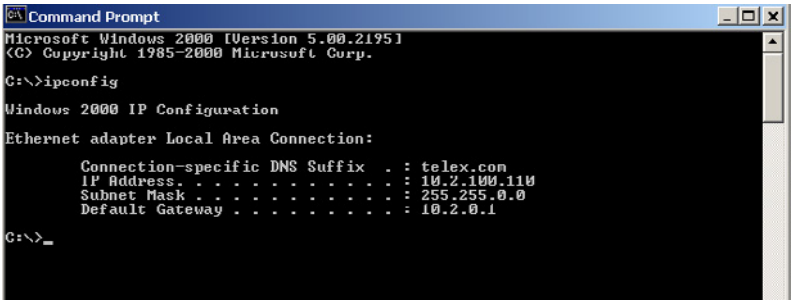
If you do not know your IP Address, you can open a DOS screen in a Windows®- based environment and bring up the ipconfig screen.

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

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




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.

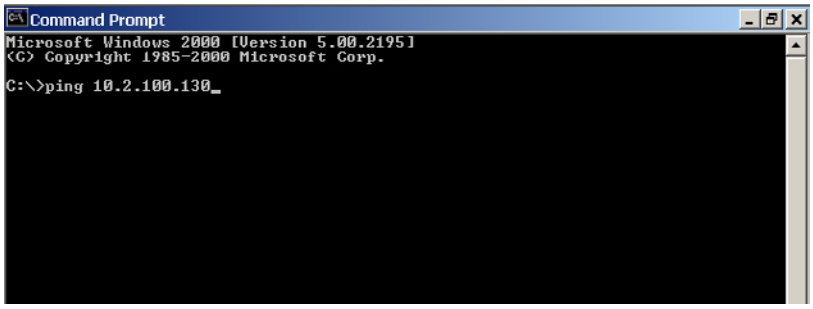
### Ping a Computer

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

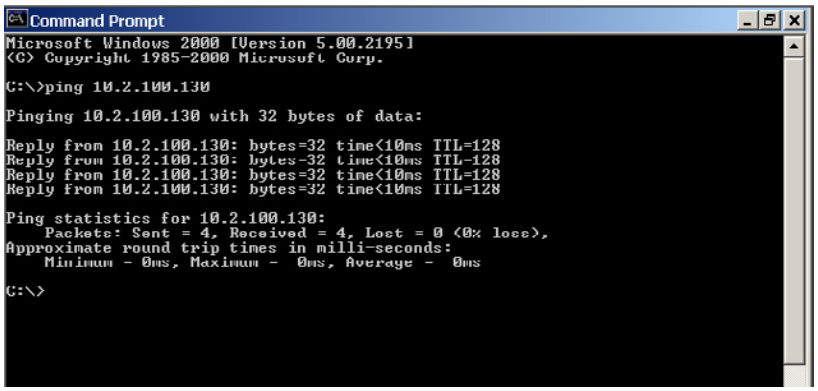
**NOTE:** You can also ping your RVON-8 card to verify that it is responding over the network by putting the cards IP Address in place of the computer IP Address.

To **Ping a computer on the network**, do the following:

1. From the Start menu, select **Run...**.
2. At the Run command, type **CMD** to open a **Command Prompt** screen.




3. At the prompt, type the **IP Address** of the computer you wish to ping (for example, 10.2.100.130).
4. 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.

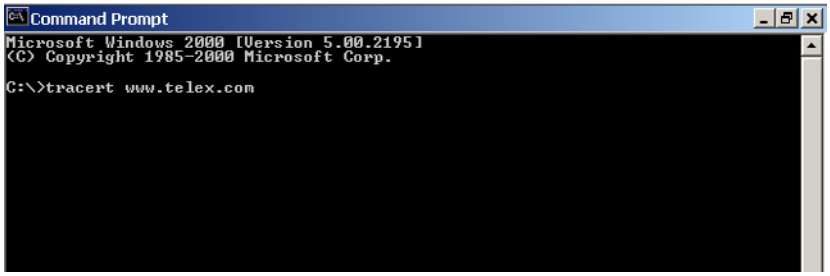
## POSSIBLE PITFALL WITH ROUTERS, GATEWAYS, AND SWITCHES

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.

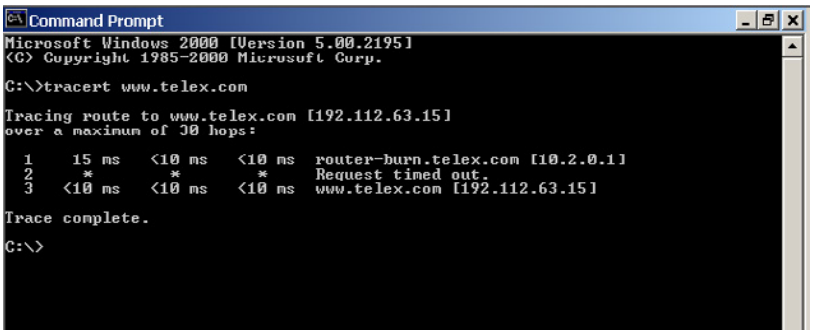
To **view the path an IP Address takes to retrieve information**, do the following:

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

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 the message “request timed out” if the IP Address/ port IN or OUT is denied to the incoming or outgoing message.

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

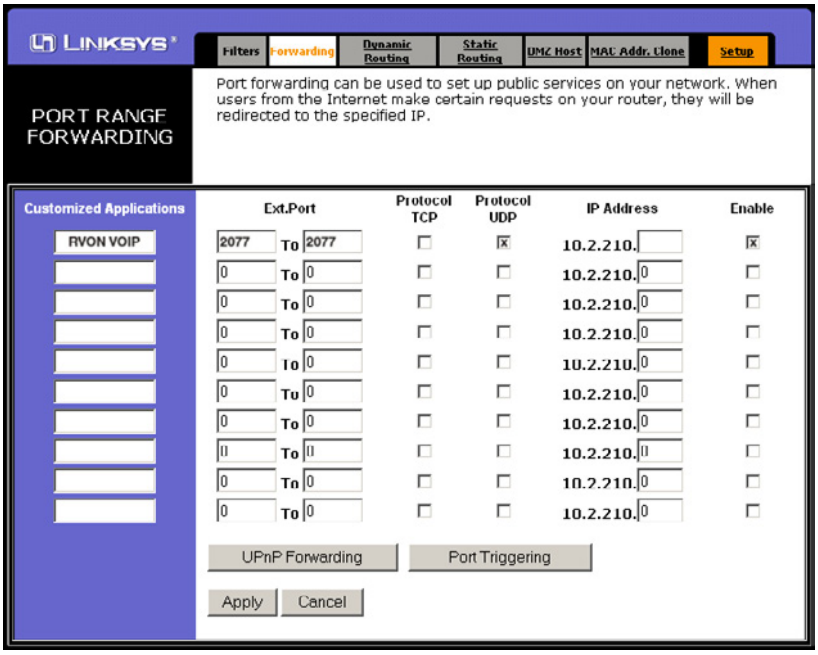
## *RVON Configuration*

RVON 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 X for the ports that need to be opened for the RVON cards to operate properly.

**TABLE 7.** Ports necessary for RVON card functionality.

| 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 |

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




**NOTE:** Linksys™ 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.

**Bridge**

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 of your computers are on the same network subnet (see Subnet). This means your computers can communicate with each other an have their own internet connection. If you assign your own IP addresses be sure to use the same first three (3) octets of the IP address (for example, 192.168.0.X).

**Domain Name Server (DNS)**

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 address which are numeric, and since domain names are alphabetic, they are easier to remember. Every time a domain name is used it must go through the DNS server to be translated.

**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.

There 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 features 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 pack to the appropriate port.

**IP Address (Internet Protocol Address)**

An IP Address is an identifier or numerical name for a coputer or device on a network. Data between computers are routed over the network using these addresses to identify the computer the message being sent to and the computer the message is being set from.

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

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. When the isolated netwrok is connected to the INternet, registered Internet Addresses must be obtained. This is to prevent duplication of addresses.

The four numbers in an IP Address are used in different ways to identify a particular network and host on the network. There are three (3) 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 work stations 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.<br>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 networs, 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 (2) 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.<br>Subnetting a network is useful because it provides security for the network, as well as, increases performance of the network. IP networksare divided using subnet masks. |
| **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 branch offices in Nebraska and Arkansas over the wide are anetwork. The largest WAN is the Internet. |

APPENDIX A

# *RVON Trunking Connections*

In this chapter you will find the following drawings:

- AZedit Via RVON-8 RS-232 Mode
- CS9500 Trunking Via RVON-I/O To RVON-8
- ADAM Trunking Via RVON-8
- Zeus II Trunking Via RVON-I/O To RVON-C
- Cronus Trunking Via RVON-I/O To RVON-8

**Figure 8: AZedit Via RVON-8 RS-232 Mode**

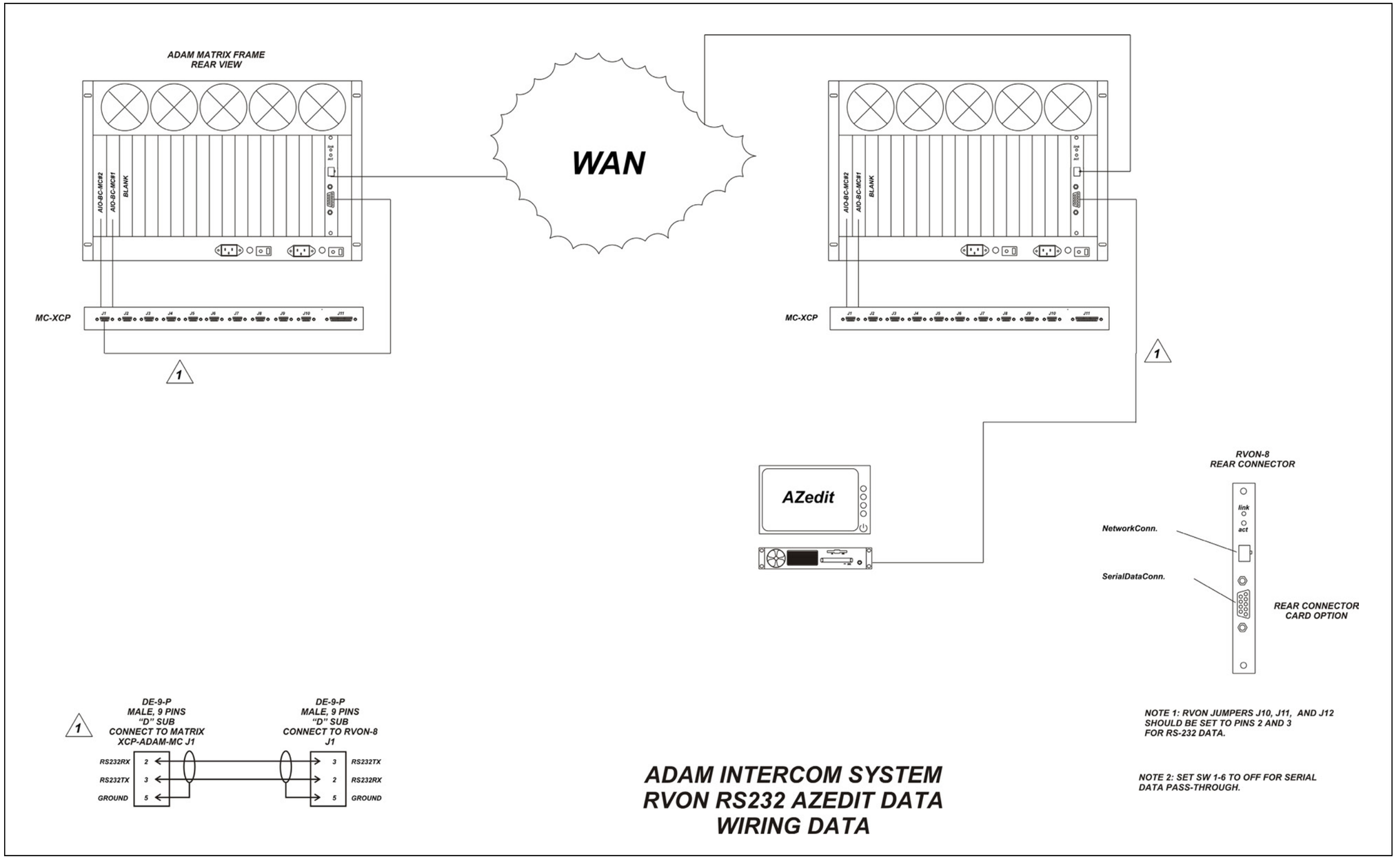


**Figure 9: CS9500 Trunking Via RVON-I/O To RVON-8**

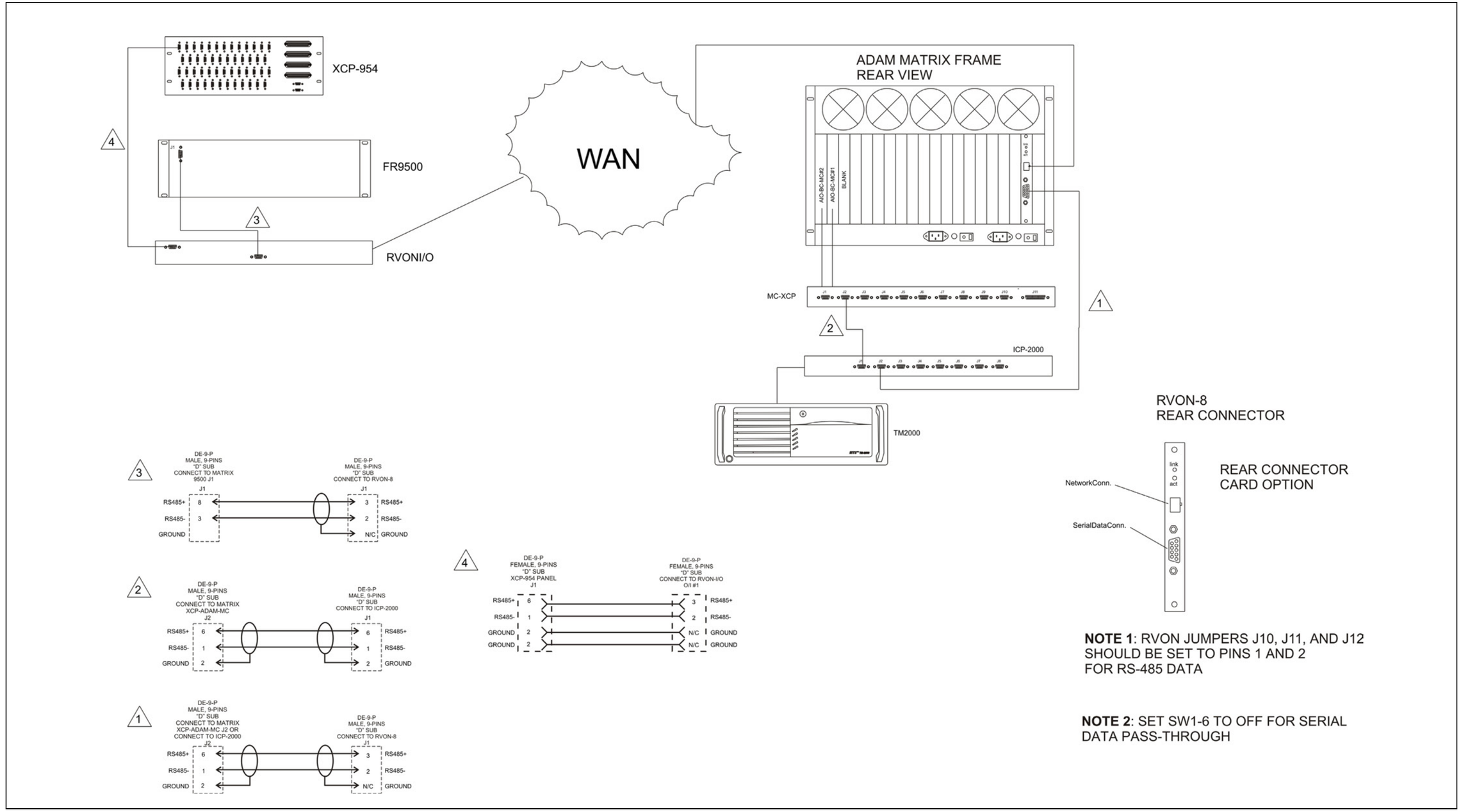


**Figure 10: ADAM Trunking Via RVON-8**

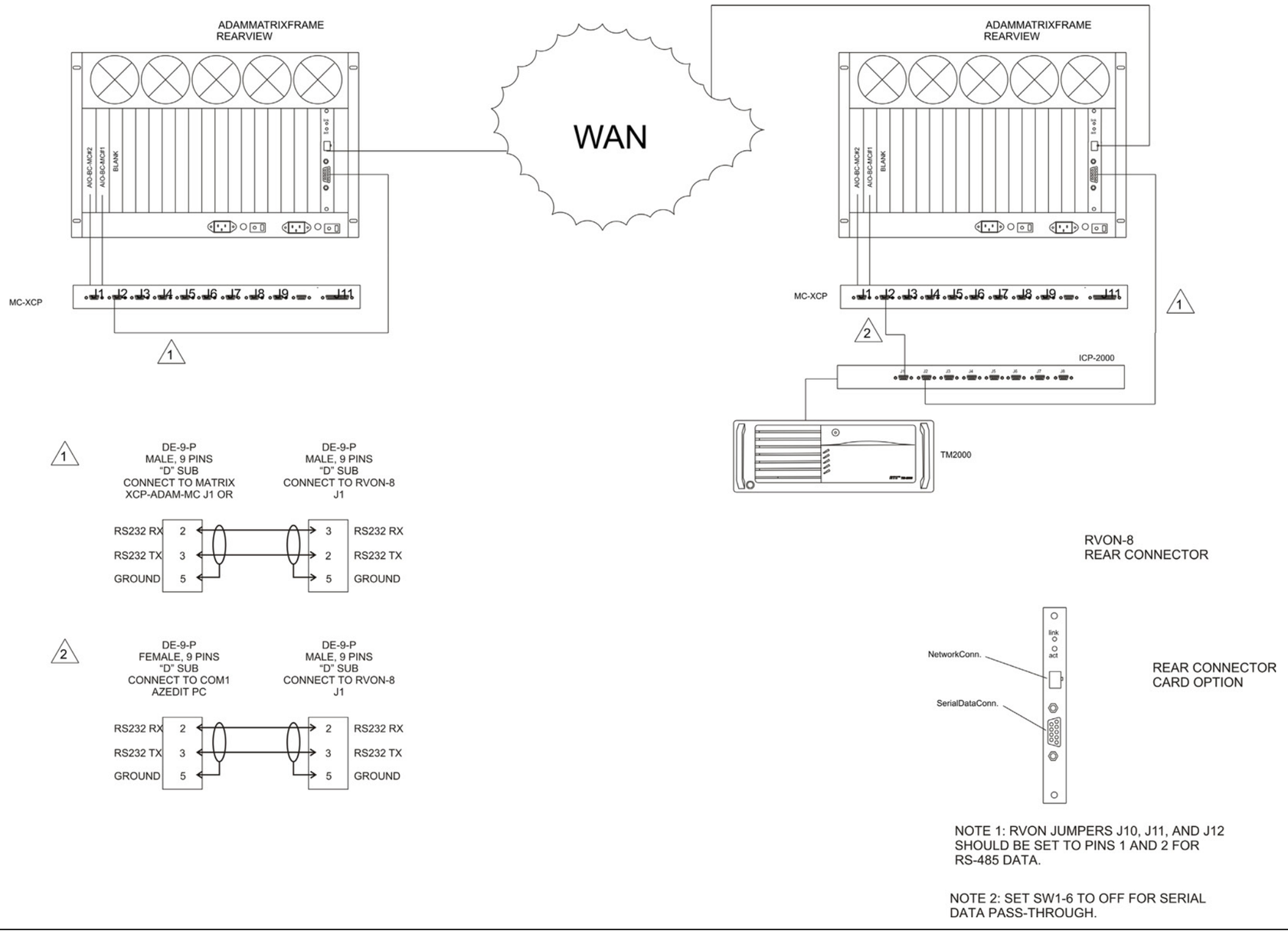


**Figure 11: Zeus II Trunking Via RVON-I/O to RVON-C**

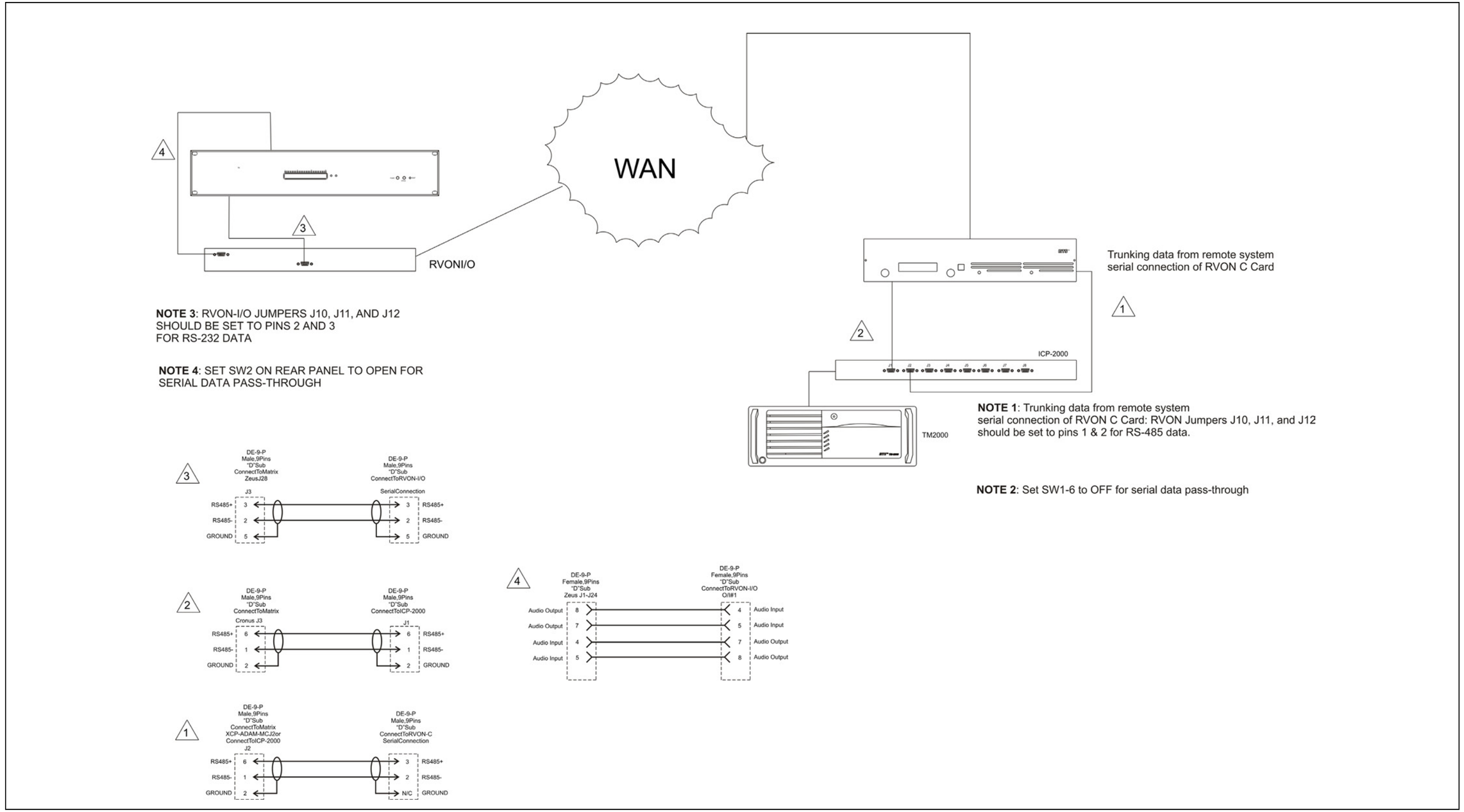


**Figure 12: Cronus Trunking Via RVON-I/O To RVON-8**

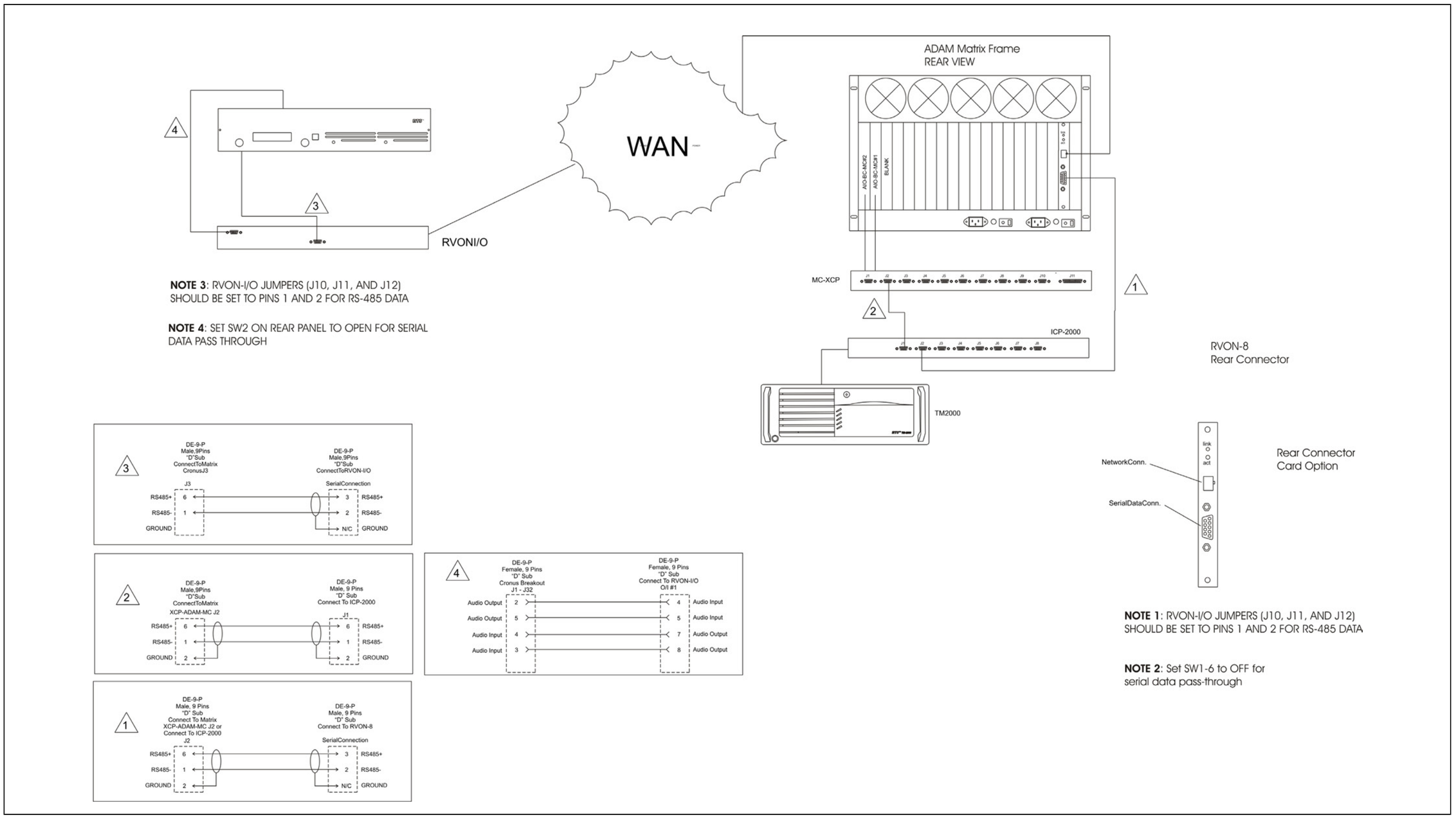
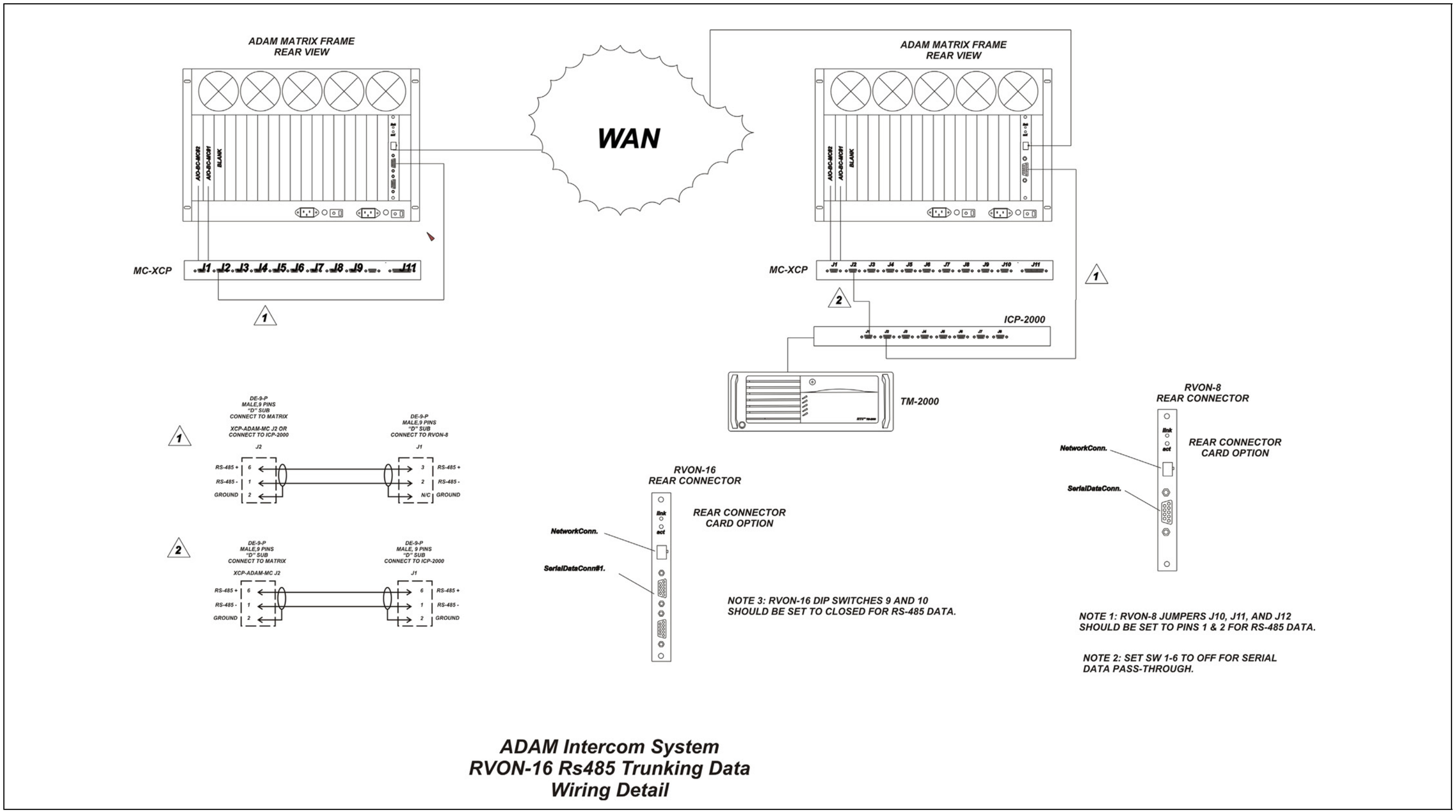


**Figure 13: RVON-16 Trunking**



**Notes**