AirLink
Communications

Redwing CDMA

User Guide
Version 1.0

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Important Notice

Because of the nature of wireless communications, transmission and reception of data can never be guaranteed. Data may be delayed, corrupted (i.e., have errors) or be totally lost. Although significant delays or losses of data are rare when wireless devices such as the Sierra Wireless modem are used in a normal manner with a well-constructed network, the Sierra Wireless modem should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury, death, or loss of property. AirLink Communications, Inc., accepts no responsibility for damages of any kind resulting from delays or errors in data transmitted or received using the AirLink Communications modem, or for failure of the AirLink Communications modem to transmit or receive such data.

Safety and Hazards

Do not operate the AirLink Communications modem in areas where blasting is in progress, where explosive atmospheres may be present, near medical equipment, near life support equipment, or any equipment which may be susceptible to any form of radio interference. In such areas, the AirLink Communications modem **MUST BE POWERED OFF**. The AirLink Communications modem can transmit signals that could interfere with this equipment. Do not operate the AirLink Communications modem in any aircraft, whether the aircraft is on the ground or in flight. In aircraft, the AirLink Communications modem **MUST BE POWERED OFF**. When operating, the AirLink Communications modem can transmit signals that could interfere with various onboard systems. The driver or operator of any vehicle should not operate the AirLink Communications modem while in control of a vehicle. Doing so will detract from the driver or operator's control and operation of that vehicle. In some states and provinces, operating such communications devices while in control of a vehicle is an offence.

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Table of Contents

Redwing CDMA
User Guide

## WARNING: To satisfy compliance with FCC RF exposure guidelines:

All persons must be at least 20 cm from the antenna when the transmitter is operating to meet FCC RF exposure requirements. This module is limited to operate with an antenna having a gain NOT exceeding 2 dBi.

1   Introduction

The AirLink CDMA modem is designed to operate in CDMA networks. Two services are available in the CDMA networks: 1xRTT, a packet switched connection, and IS-95B, a circuit switched connection.

CDMA IS-95B

The AirLink CDMA modem is capable of making IS-95 connections. The modem first connects to the CDMA network and the network then connects to the call to either the Public System Telephone Network (PSTN), or to the Internet using QNC. These call types use an Interworking Function (IWF) to bridge the CDMA network to the PSTN.
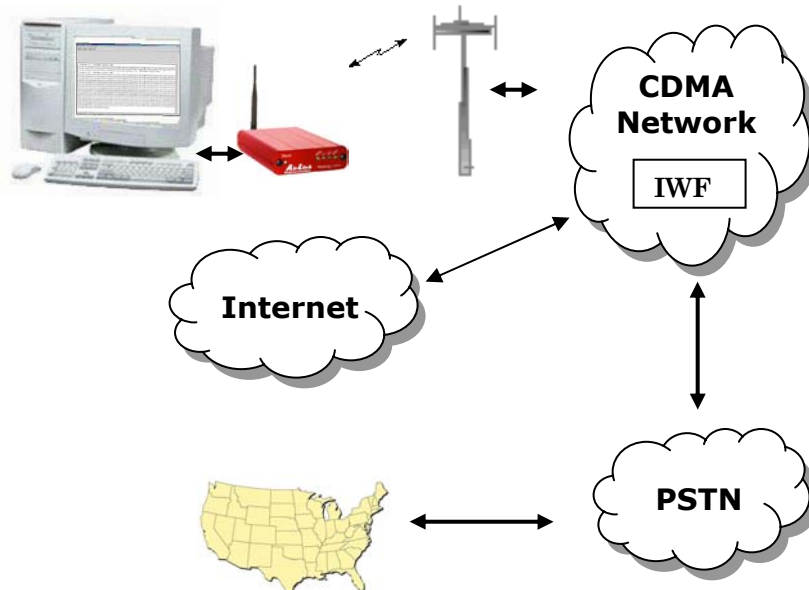
For Internet connections, the Interworking function can use a special feature called QNC (Quick Net Connect). The IWF provides a link to the Internet without going through the PSTN.

Establishing a standard point-to-point call requires the Airlink CDMA to configure a modem at the IWF. It is the IWF modem that actually connects to the PSTN and dials the number. Call progress is not directly available to the local modem, although some information can be exchanged. When the IWF has completed the handshake with the remote modem, the local modem is advised and the connection is complete.

CDMA2000 1X

The AirLink CDMA modem provides data capability into the packet service offered with CDMA2000 1X (1xRTT) technology. CDMA2000 1X offers higher speed data operations than are available with IS-96 service. IS-95 is limited to 14.4 kbps. 1X service uses a fundamental channel at 9600 bps and can add supplemental channels when needed to boost speed to as high as 153.6 kbps on the downlink (network to modem) and 76.8 kbps on the uplink (modem to network).
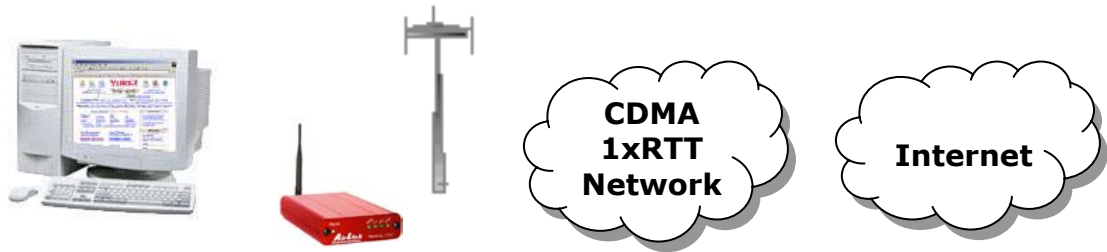
2   Product Overview

The AirLink Redwing CDMA is a rugged, full duplex 1xRTT CDMA modem that provides wireless transport capabilities for fixed and mobile applications. CDMA is an efficient and secure wireless technology that works well for fixed or mobile applications.

The Redwing CDMA is ideally suited for fixed and mobile Industrial or Commercial Applications, including Telemetry, SCADA, Public Safety, Mobile Dispatch, Field Service, Financial Transaction Processing, and Security applications. The CDMA Redwing enables virtually any PC, PDA, or networking device (router, server, etc) to access the CDMA/1xRTT data network. The Redwing CDMA can also be used in installations with many different types of Remote Terminal Units (RTUs), Programmable Logic Controllers (PLC's) or other computers that perform metering and monitoring functions in the oil, gas, water, and transportation industries. The Redwing CDMA can be a low-cost replacement for many existing landline, private radio and circuit-switched cellular installations.

2.1   Technical Overview

2.1.1   Quick Look:

- Support for IS-95 Circuit Switched CDMA, and CDMA2000 1X, and SMS
- Dual-band support for both 800 MHz cellular and 1.9 GHz PCS bands
- Designed for Industrial Applications (SCADA, Telemetry, Remote Monitoring)
- Rugged aluminum case
- Compact size

2.1.2   Physical Characteristics:

- Weight: < 1 lb.
- Size: 3" wide x 1" high x 5.1" long
- Status LEDs
- RF Antenna Connector:
    50 Ohm TNC
- Serial Interface:
    RS232 DB-9F

2.1.3   Power Specifications:

- Advanced Power Management features
- Low power consumption
- Input Voltage: 10 VDC to 28 VDC
- Input Current: 20 mA to 350 mA
- Typical Receive: 120ma at 12VDC
- Typical Transmit: Approximately 120 ma at 12VDC
- Dormant connection [idle for 10-20 seconds] 20 ma at 12 VDC

2.1.4 Environmental:

- Operating ranges: -30°C to +75°C*
- (10%duty cycle limit above 60 °C)
- Humidity: 5%-95%Non-condensing

2.1.5 Local LED Display:

- Registration (REG) LED:
    2 Hz = Scanning for channel
    0.5 Hz = In-coverage
    On = Registered
- Transmit (TX) LED:
    Off = Not transmitting
    On = Transmitting (on RF)
- Receive (RX) LED:
    Off = No incoming data
    On = Receive data (on host)
- Power (PWR):
    Off = Power off
    On = Power on

2.1.6 RF Features:

- 224 mW RF output (+23.5 dBm)
- Full duplex transceiver
- Dual-band support for both 800 MHz cellular and 1.9 GHz PCS bands
- Adheres to CDMA authentication as specified in CDMA2000 1X

2.1.7 IS-95A Circuit-Switched Mode Features:

- V.34 data rates to 14.4 kbps
- G3 facsimile receive and transmit
- Quick Net Connect (QNC) support

2.1.8 Short Message Service (SMS) Features:

- Send and Receive
- Notification of new messages

2.1.9 Packet Mode Features (1xRTT):

- Data rates up to 153.6 kbps (forward channel) and 76.8 kbps (reverse channel)

2.1.10 Application Interface Features:

- RS232, 9600 bps to 230.4 kbps
- AT Commands, PPP

2.1.11 CDMA and Cellular Standards:

- CDMA2000 1X Release 0 (plus ballot resolution version of addendum)
- CDG1, 2, and 3 for CDMA2000 1X
- IS-95A and B: Mobile Station-Base Station Compatibility
- Standard for Wideband Spread Spectrum Cellular Systems
- IS-98C and D: Recommended Minimum Performance
- Standards for Dual-Mode Spread Spectrum Mobile Stations
- Telecommunications Systems Bulletin (TSB2000): Capabilities Requirements Mapping for CDMA2000 Standards (TIA/EIA/TSB2000)

A thermistor inside the modem (monitored by the modem CPU firmware) causes flow control to be activated should the internal temperature reach 75ºC (167ºF) as measured at the radio. Flow control is released when the temperature falls below 75. Should the temperature of the radio reach 80ºC (176ºF), the modem terminates the connection in order to protect components and avoid drifting outside radio specifications.

3   Network Connection Options

The AirLink CDMA Redwing is capable of offering multiple network connection options. This section will illustrate the different network options that are available.

3.1   Internet (TCP/IP) Connections via 1xRTT

When using the Redwing CDMA, remote access to is done via a PPP (TCP/IP) connection to the CDMA network. The CDMA carrier actually provides Internet connectivity, and, therefore, it becomes the ISP for that session. Applications such as web browsing, email, FTP, etc should work as they would normally.
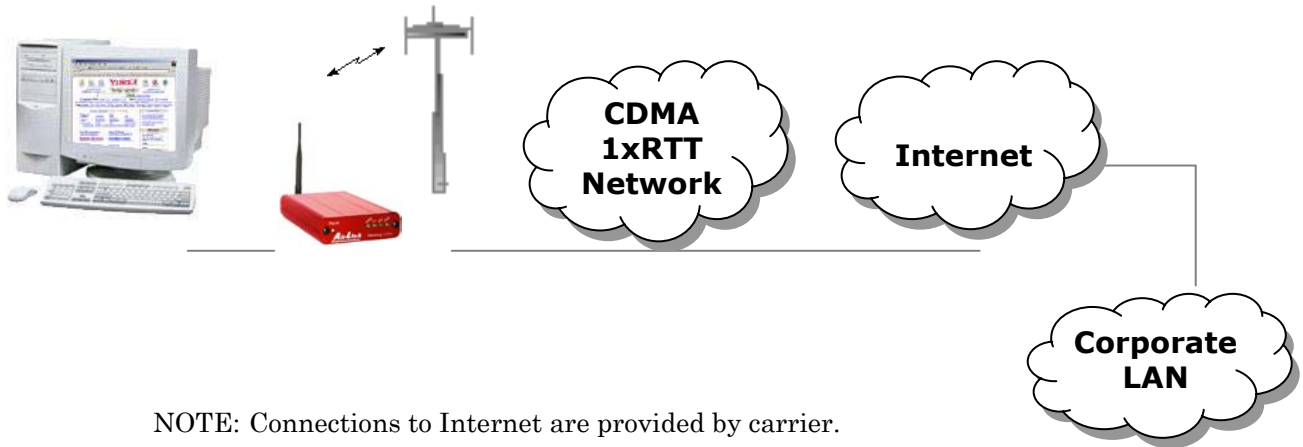

NOTE: Connections to Internet are provided by carrier.

Corporate network connections are unique and not provided as part of service.

3.2 Circuit-Switched CDMA Connections

The Redwing CDMA provides traditional Circuit-Switched 'dial-up' communications. Where you would normally use a landline modem or analog cellular dial-up device, the Redwing CDMA can be a drop-in replacement. The CDMA carrier actually provides basic connectivity to the Public Switched Telephone Network (PSTN), so all that is needed is a CDMA activation (phone number) and connection of the serial cable. For connection to Windows computers, follow the setup profile for a Hayes Compatible or Standard 33600 baud modem. No special drivers or setup is required.
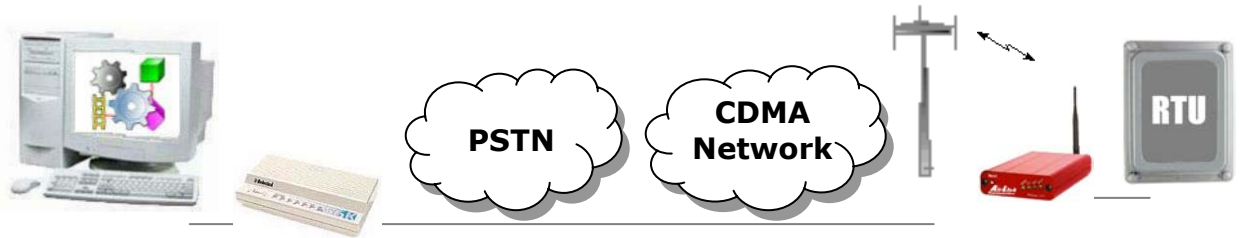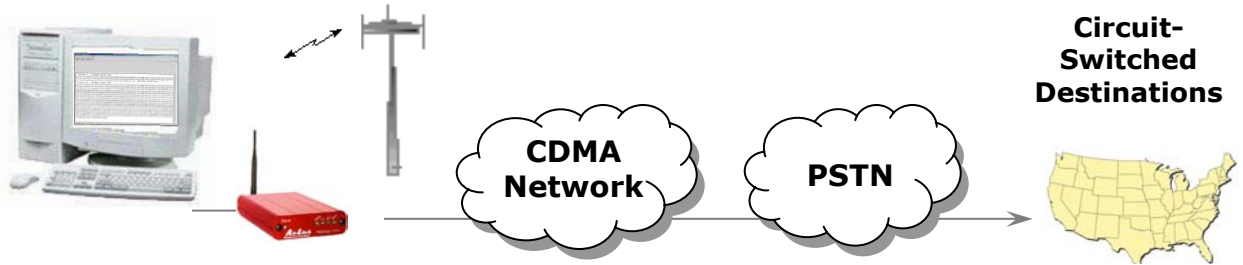
4 Windows 2000 Setup for 1xRTT Communications

This section describes the setup of Windows to enable communications over the CDMA 1xRTT network. Windows 2000 is used as the example because it the one Windows OS revision that carries the most similarity to both previous Windows 9x versions as well as WinXP.

4.1 Windows 2000 Com Port Configuration

- Obtain administrator privileges on your system.
- Select **Start> Settings> Control Panel> System**
- Select the **Hardware** Tab
- Click on **Device Manager**
- Click on **Ports**
- Select the external COM port connected to the Modem, right mouse click and open the menu
- Select **Properties**
- Configure the Com Port as follows:

- Baud Rate: 115200 bps
- Data Bits: 8
- Parity: None
- Stop Bits: 1
- Flow Control: Hardware
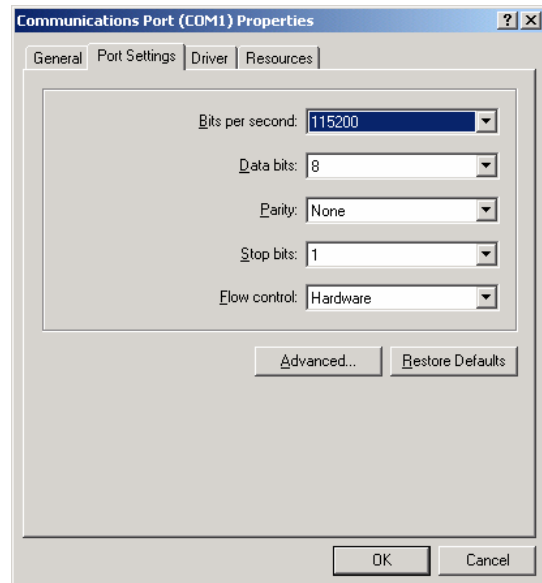
4.2   Windows 2000 Modem Configuration

4.2.1 Prepare the Modem for Installation

- Connect the modem to the computer with the DB9 cable
- Plug in the AC adapter, connect the antenna(s) and power on the modem
- Obtain administrator privileges on your system.
     If you do not know how, check with your system administrator

4.2.2 Adding the Modem

- Select **Start> Settings> Control Pane> Phone and Modems Options**
- You should see be in the **Phone And Modem Options** dialog box. Select the **Modems** tab
- Select **Add**.
- Check "**Don't detect my modem...**" and select **Next**
- Select **(Standard Modem Types)** from the **Manufacturers** and then select **Standard 33600 bps Modem** under "**Models**."
- Select **Next**
- Check **Selected Ports**, then select the **COM** port the modem is connected to and select **Next**
- Select Finish to exit the "**Install New Modem**" wizard
- You should see the modem added to the correct **COM** port
- To set the modem speed on the driver, highlight the modem driver and select **Properties**.
- Ensure the "**Maximum Port Speed**" is set to **115200** or set to the speed you set the modem to.
- Select **OK** to exit.
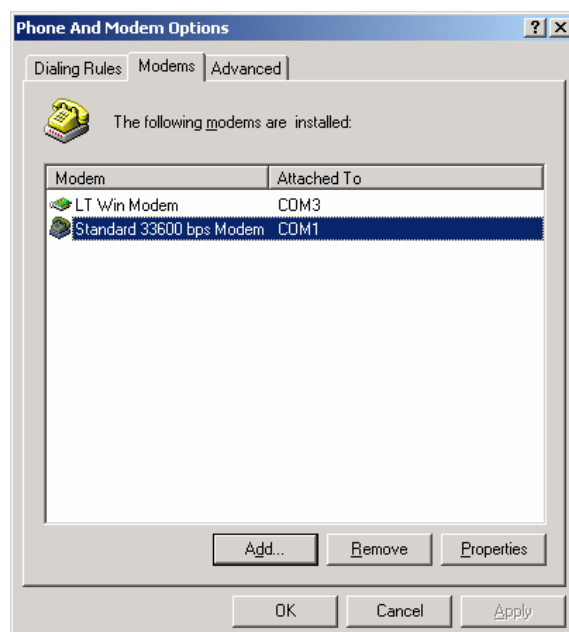
4.3 Windows 2000 PPP Configuration

This section describes how to setup a Windows 2000 Professional Dial-up connection using an AirLink Redwing CDMA Modem. The connection uses PPP to communicate to the modem and gain access the Internet. It is assumed that you have **administrator** privileges on the machine that you're configuring.

Before you start, you need the following:

Administrator privileges to the computer you are configuring or access granted by an administrator on the network to add/remove devices to your computer.

A 1xRTT user account, password, and access number (obtained from your CDMA Service Provider).

Windows COM Port and modem set up for a Standard 33600 Modem (See previous sections)

No other program is to be running that is using the serial (COM) port that your modem is attached to.

> **NOTE:** *If you have an existing LAN connection, then this dial-up connection to your CDMA modem may* **interfere** *with your existing connection. Once the connection is initiated it will take over as the "default route" for the majority of your LAN traffic, specifically Internet access. It's recommended to disconnect your LAN connection before using a PPP connection with your AirLink modem.*
>
> *If however you want the two connections to co-exist, you can de-select* "Use default gateway on remote networ*k" (described later) and you can use the* **route** *command to setup routing through the modem properly. Go to a Command Prompt and type* **route /?** *to find out more, or talk to your administrator.*

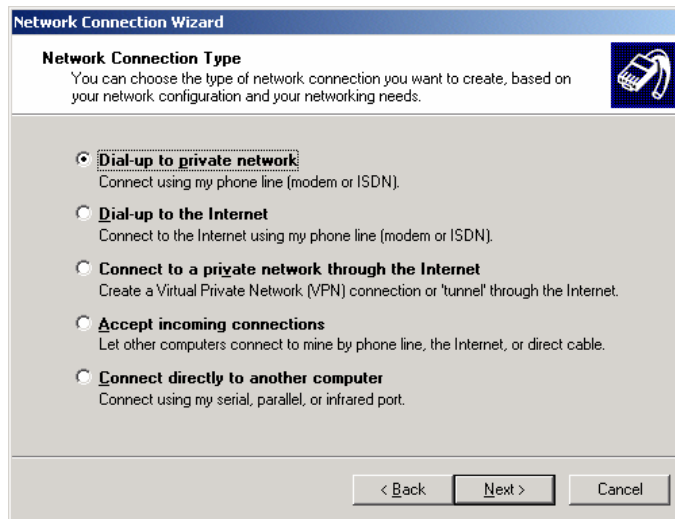Now that the modem has been added, the Dial-up connection must be created.

Select **Start> Settings> Control Pane> Network** and **Dial-Up Connections**
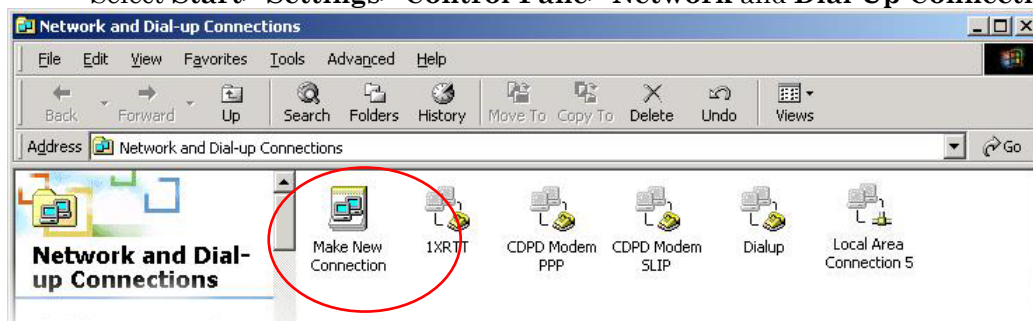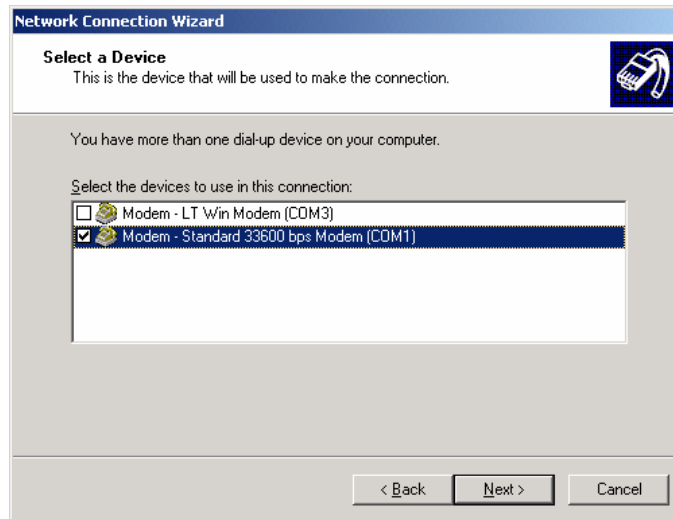

- Double-click on "Make New Connection".
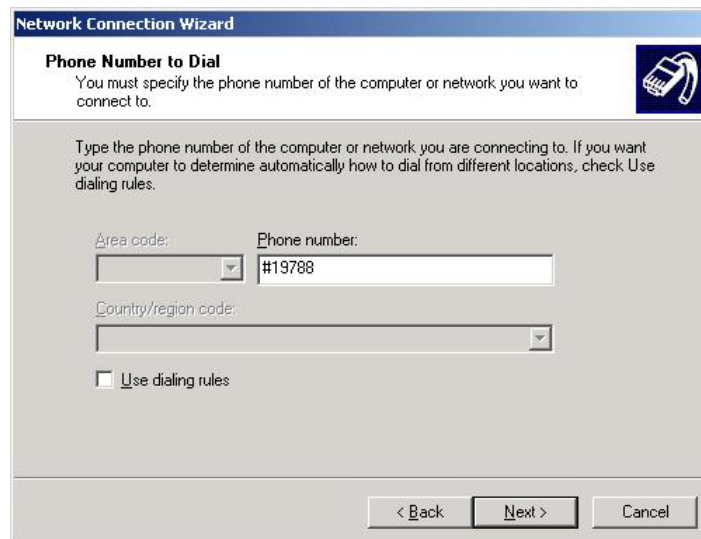- When the Connection Wizard starts - select **Next**


- Select Dial-up to Private Network

If the modem is installed already, check the box next to **"Modem – Standard 33600bps"**

- Select **Nex**t
- Enter the 1xRTT Access number **(#19788)**

- Select **Nex**t
- Select whether you want **all users** or just yourself to have access to this connection.
- Select **Nex**t
- Enter **1xRTT** for the name of the connection. If you want to add an icon for this connection on the desktop, check "**Add a shortcut to my desktop"**
- Select **Finish** to exit the "Network Connection Wizard."

- The **"Connect 1xRTT"** dialog box should come up next.
- Enter the User name and Password provided by the CDMA Service Provider
- Select **Properties**
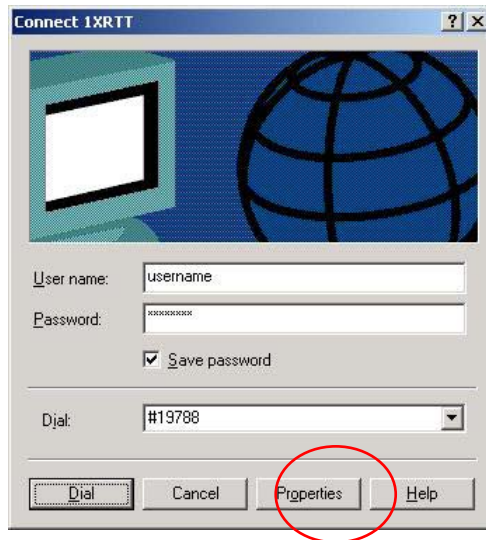
You now need to change some settings so that you can browse websites, send and receive email, etc.

- Examine the **General** Tab settings
- **"Connect Using"** should have a check next to **"Modem – Standard 33600bps Modem (COMx)"**
- **"Phone number"** (The 1xRTT Access Number provided by the carrier)
- Uncheck **"Use dialing rules"** and check **"Show icon in taskbar when connected"**
- Select the **Configure** button
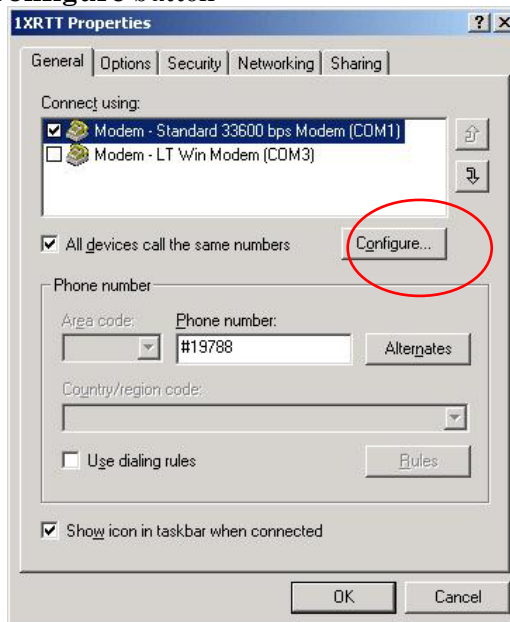
- Maximum Speed: 115200
- Check Enable hardware flow control
- Uncheck all other options
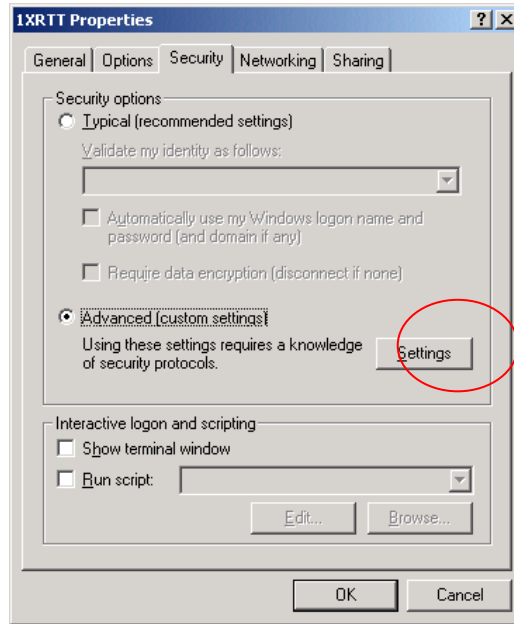- Select OK
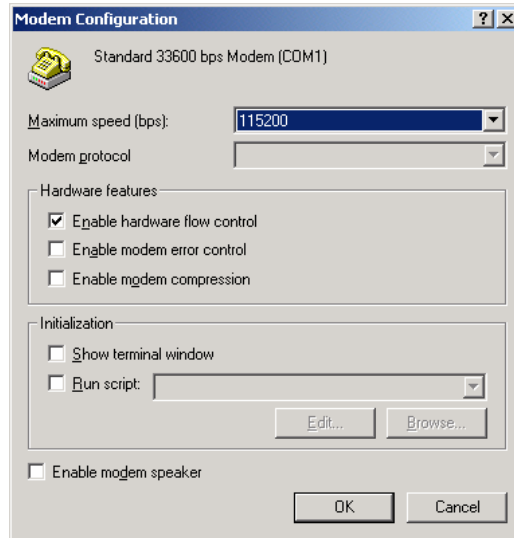

- Select **Options** tab
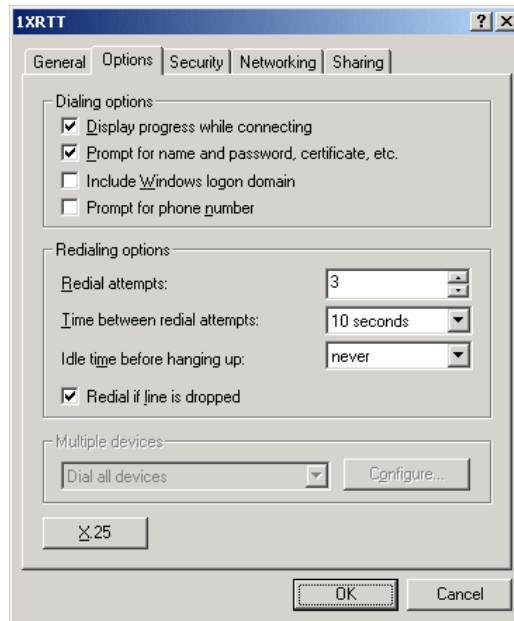
- Check or Uncheck options at your application requires.
- Set the Redialing options that will meet your needs.

*Note: The options shown here should work for most applications.
          Consult your Network Administrator for more help on connection options.*

- Select **Security** tab
- Select "**Advanced (custom settings)**"

- Set Data encryption to "No encryption (server will disconnect if it requires encryption)"
- For Logon Security check "Allow these protocols"
- Unencrypted password (PAP)
- Shiva Password Authentication Protocol (SPAP)
- Challenge Handshake Authentication Protocol (CHAP)
- Microsoft CHAP (MS-CHAP) (Do not check "Allow older MS-CHAP for W95 servers")
- Microsoft CHAP Version 2 (MS-CHAP v2)
- Select OK
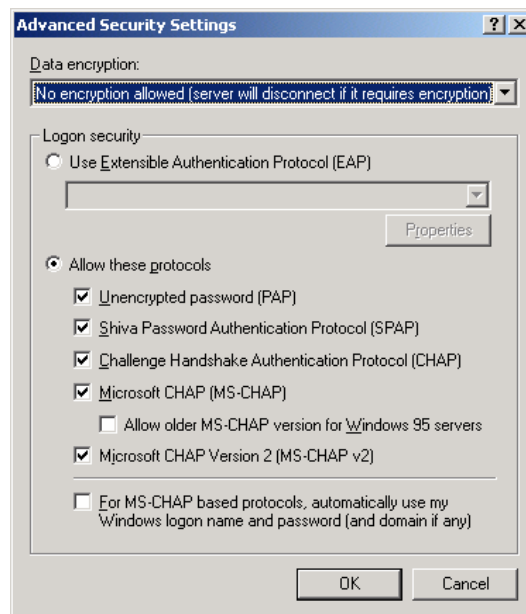
- Select Networking tab
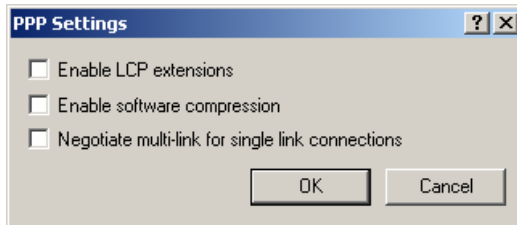- Type of dial-up server should show "PPP: Windows 95/98/NT 4/2000, Internet"
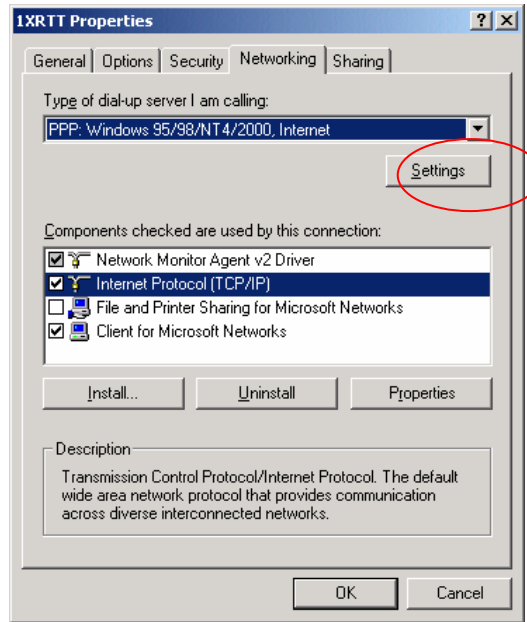
- Select **Settings** button
- Uncheck **Enable LCP extensions, Enable Software Compression** and **Negotiate multi-link for single link connections**

- Select **OK**

- In the Components section of the Networking tab, **Internet Protocol (TCP/IP)** should be checked
- Select **Internet Protocol (TCP/IP)** and then select **Properties**
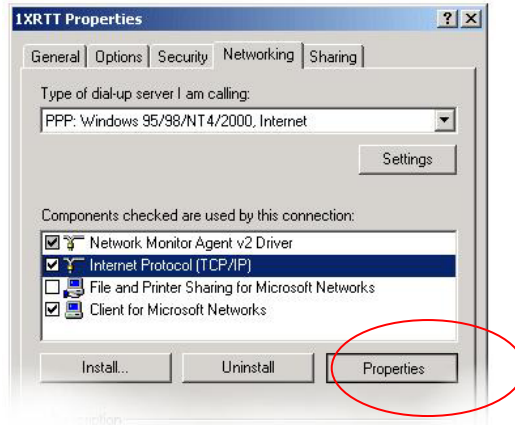
- "Obtain an IP address automatically" should be checked.
- Normally, DNS server addresses are provided during PPP negotiations. If it is necessary for you to enter DNS entries, check/enable "Use the following DNS server addresses" and put in the proper addresses. (*See your carrier or network admin for details*)
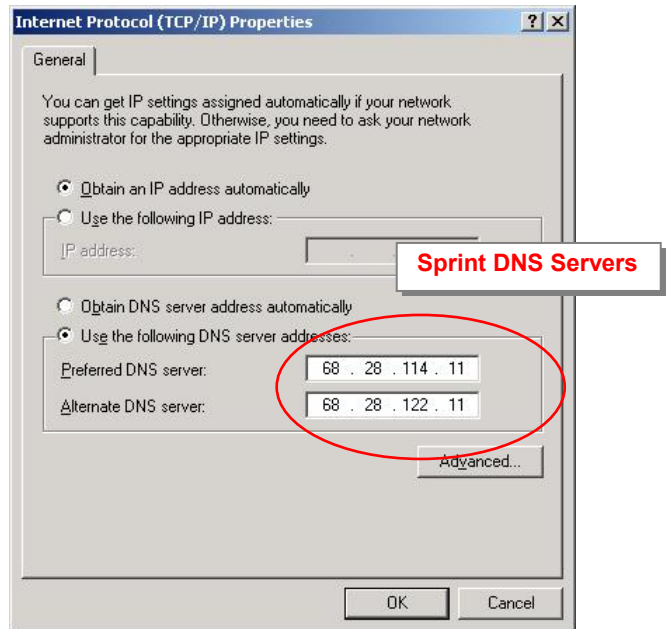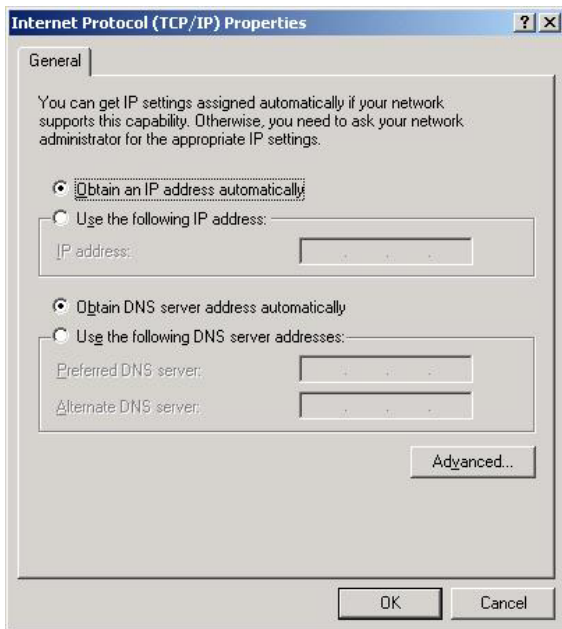
- Select the **Advanced** button
- Check **Use default gateway on remote network** and **Use IP header compression**
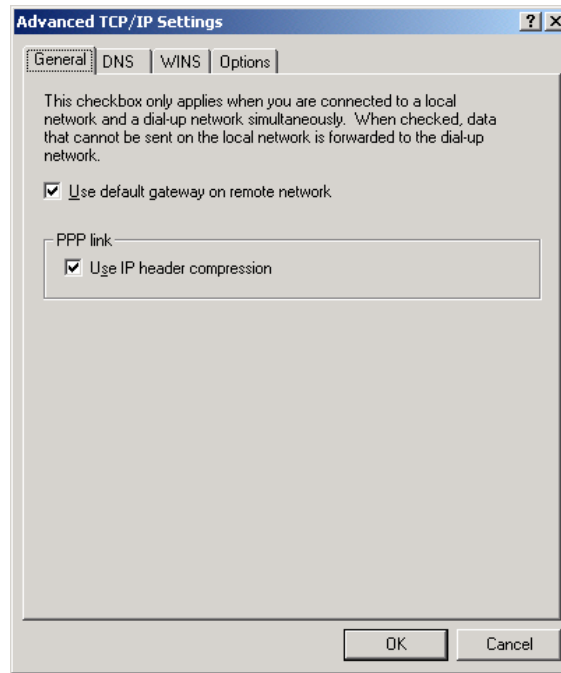
- Select **OK**
- Leave the options in the Sharing tab unchecked
- Select **OK**

4.4 Making a 1xRTT Data Connection

This section shows what to expect when dialing a 1xRTT data connection.

Go to Network and Dial-Up Connections and double-click on the 1xRTT icon
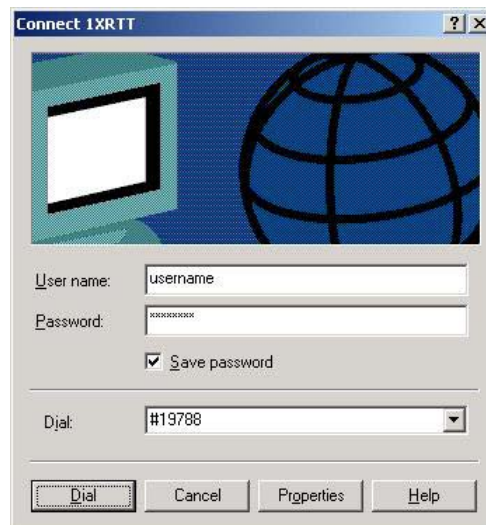
- Enter the user name and password provided by the carrier for the account.
- Click on DIAL. If you have enabled the connection progress display, you will see the connection being made.

Once connected, you will see the connection status displayed in the bottom right corner in the Task Bar.

4.5 Verifying 1xRTT Connection throughput

This section shows what to expect when transferring data over a 1xRTT connection. This test was done using WS-FTP for a BINARY file transfer from Windows 2000 to an Internet hosted FTP server.

Data transfers will start at varying speeds, and may climb or fall based on network load and packet latency. This example shows a high throughput, ranging from 72 Kbps to 97 Kbps. Nominal speeds will most likely be between 40Kbps and 60Kbps. Actual throughput will vary depending on geographic region, time of day, and network capacity – as well as the type of applications being used and whether data compression is being used.
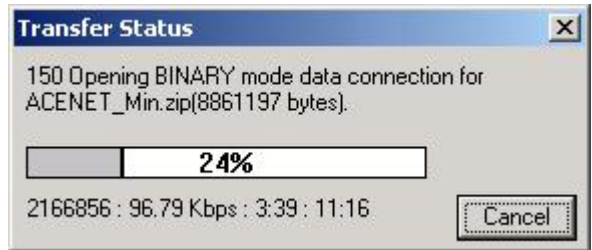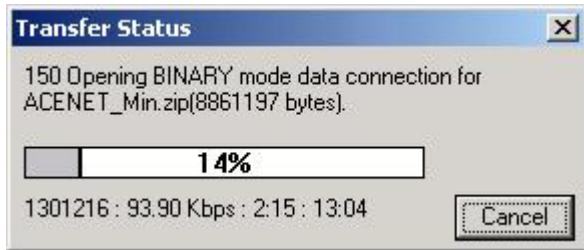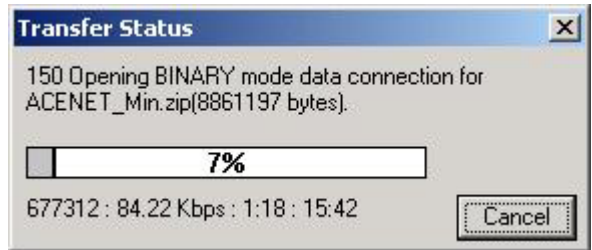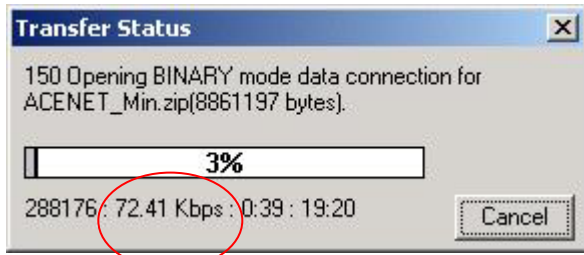
Overall throughput can be determined based upon the size of the file being transferred and the time taken to complete the transfer. In this example, the file transfer of an 8.8 MB file took just under 16 minutes. The Overall throughput was calculated at 93.66 Kbps.
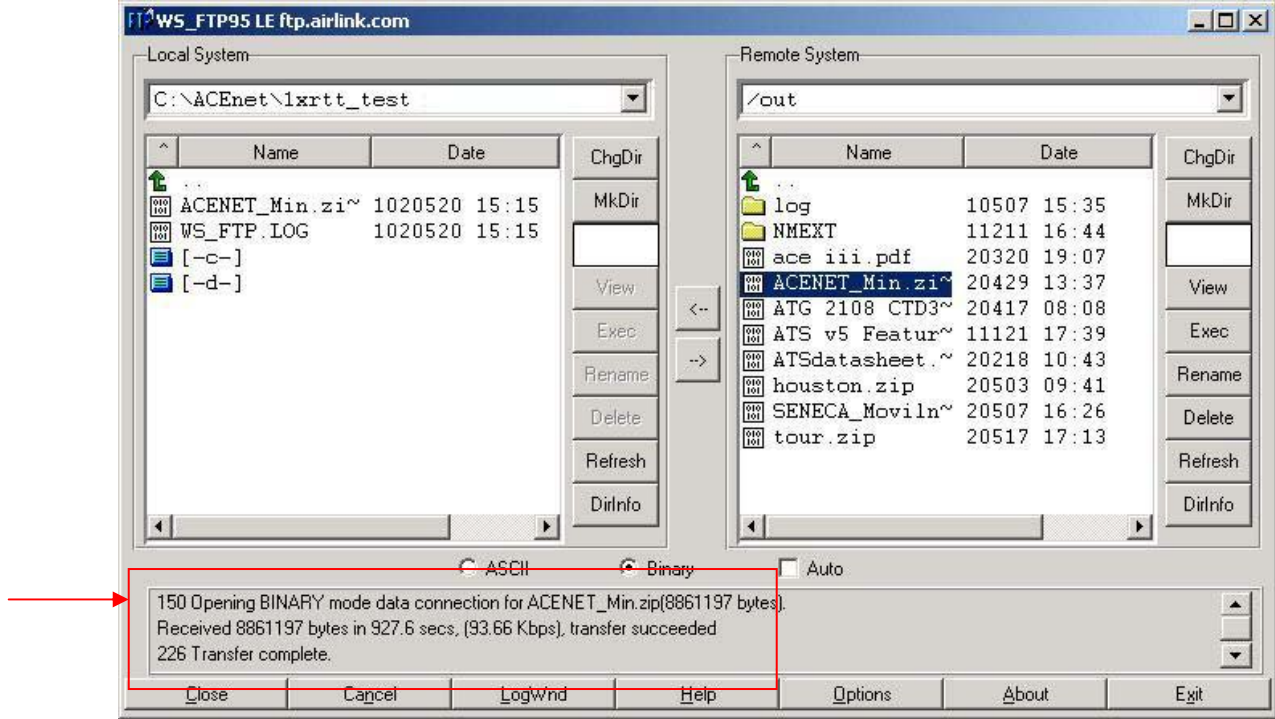
5   Using AT Commands

This document is a quick reference for using AT commands with the AirLink Redwing CDMA modems.

Terminal Emulation - To communicate with the modem using AT commands, you need to have an ASCII terminal emulation program running on a PC (default in Windows is HyperTerminal). If you use HyperTerminal, set it to "Direct to CO*M*x" (where *x* is the COM port the modem is connected to by serial cable), *instead* of using a specific modem driver like "AirLink CDMA Modem" or "Standard 9600 modem."

The terminal emulation program should be configured to operate at 115000 baud, 8 data bits, no parity, and one stop bit (115000, 8N1), and use Hardware Flow Control.

Power On - With the cable connected and the terminal emulation configured, power the modem on. The **ON** LED should illuminate. On the terminal emulation screen, you should see a some characters appear. Send the modem a generic AT command to see if it is responding properly. (See next item for details).

Sample AT Commands

Here is an example of entering AT commands, changing some settings, saving and resetting the modem. (Note that any command you are unsure of is explained in *The AT Commands* section.)

Type **AT** and press Enter <enter>.   AT<enter>

You should get a response of "0" or "OK".

To turn on echo and verbose modes, type the following: ATE1V1<enter>

You should see an "OK" response if Verbose Mode was properly activated (V1)

If you should see a "0" response, your modem is in Terse Mode and the V1 command did not adhere.

Try ATV1 again by itself if that happens. You should see an "OK" response now.

To   set   the   baud   rate   slower,   (like   115200),   type   the   following:
        AT+IPR=115200,8N1<enter>
You should get an "OK" (if in Verbose Mode)

```
AT
OK
ATE1V1
OK
AT+IPR=115200,8N1
OK
```
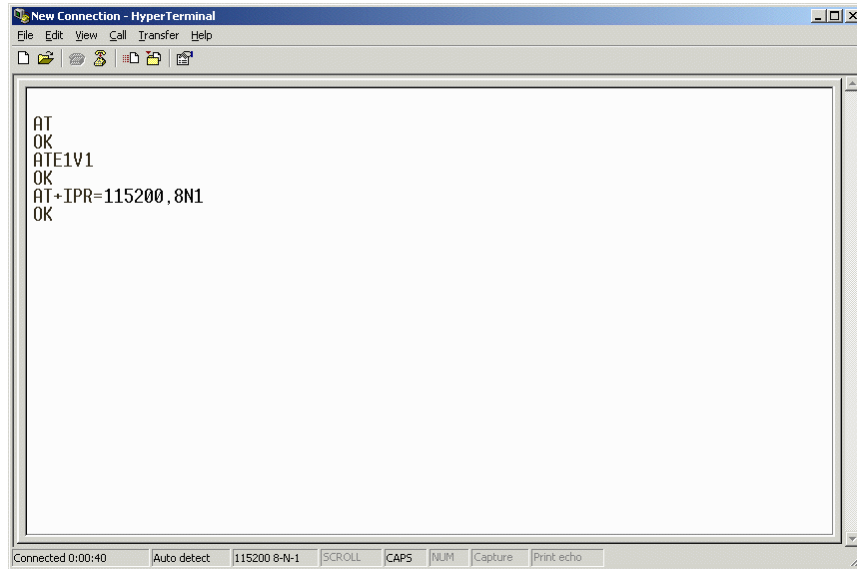
Note:

HyperTerm needs to be disconnected and reconnected after each baud rate change to have it take effect.

5.1 Account Activation Commands

Command	Description
~NAMLCK	**NAMLCK = "NAM Lock"-** The NAM is the "Number Assignment Module". The NAMLCK command unlocks the ability to set the NAM parameters (to provision a an account). The NAMLCK is the modem's 6-digit OTSL (One Time Subsidy Lock), MSL (Master Subsidy Lock), or SPC (Service Provisioning Code). This number is provided to you by the carrier at time of service activation. If the number is accepted by the modem, the OK result code is returned. If the number is rejected, the ERROR result is returned. If three successive ERRORs are returned, the modem must be reset to allow any further attempts. Note: The modem permits 99 failures of this command during its lifetime. After that, the modem becomes permanently disabled. **AT Command Format:** AT~NAMLCK=nnnnnn {Input} (nnnnnn = Lock Code from carrier) OK {Response}

~NAMVAL	**NAMVAL = "NAM Value"**
	The NAMVAL command has (3) functions:
	
	Setting the Active Account index
	The modem supports two accounts. One is always the 'active' account. Using the <nam> parameter followed by a 0 or 1 will set the active account to be used.
	
	Reading the current account information
	The query form of the command will report the details of the active account:
	
	Write account activation data
	Following successful unlocking by ~NAMLCK, this command can be used with all parameters to write the account data to the modem. If ~NAMLCK has not been successfully executed, the modem returns ERROR. The carrier will tell you what numbers to enter for NUM, SID, and NID. The choice of NAMVAL is up to you. Following writing the values, the modem must be reset.
	
	AT Command Formats:
	1. **AT~NAMVAL=0** (Input) - Sets NAM 0 as the active account
	     OK {Response}
	
	2. **AT~NAMVAL?0** (Input) - Queries the active account
	NAM0
	     NAM: 0
	     NUM: 8135551212 (10 digit phone number)
	     SID: 0 (System ID)
	     NID: 65535 (Network ID)
	     OK {Response}
	
	3. **AT~NAMVAL=<nam>[,<num>,<sid>,<nid>]** - Sets the Phone Number

5.2 Basic Modem Setup and Status Commands

Command	Description

+IPR=<n>
+IPR?
	IPR = I/O Port Rate
	
	+IPR =n
	Sets a data rate for the local serial port (DTE - DCE).
	The modem has a default setting of 115200.
	
	Other supported rates include:
	45, 50, 75, 110, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600 & 230400
	
	      AT Command Format:
	      AT+IPR=n {Input} (n= Fixed Port Rate for the DB9 serial port)
	      OK {Response}
	
	      AT+IPR? {Input} (Queries the Fixed Port Rate for the DB9 serial port)
	      +IPR: 115200
	      OK {Response}

$QCVAD=\<n\>** **$QCVAD?	**$QCVAD = Answer Data or Fax** Sets or reads the mode for answering data/fax calls with A (Answer) or AutoAnswer via S0=1. Values 　　　0 Off. 　　　1 Fax for next call, then revert to data 　　　2 Fax for all calls 　　　3 Async data for next call, then revert to fax Async data for all calls (Default) The CDMA network requires the call type to be negotiated BEFORE the call is answered. This command sets the call negotiation prior to answering. NOTE: If connecting modem to a machine (PLC or RTU) for circuit-switched communications, it will be necessary to set the modem to Auto-Answer mode before any call is placed. This can be done by entering the following commands: ATQ1, ATS0=1, AT$QCVAD=4. These can be entered individually or in concatenated format. 　　　**AT Command Format: (Individual)** 　　　ATQ1 {Input} (Enable Quiet mode – Suppresses Result Codes) 　　　OK {Response} 　　　ATQS0=1 {Input} (AutoAnswer On) 　　　OK {Response} 　　　AT$QCVAD=4 {Input} (Answer Data or Fax Calls) 　　　OK {Response} 　　　**AT Command Format: (Concatenated)** 　　　ATQ1S0=1$QCVAD=4 (Input) 　　　OK (Response)

!STATUS	**!STATUS = "Current Modem Status"** The STATUS command reports the modem's status as follows: 　　Current band: \<band> 　　Current channel: \<chan> 　　SID: \<sid> NID: \<nid> Roaming: \<n> 　　Temp: \<temp> 　　Pilot [NOT] acquired 　　Modem has [NOT] registered The defined results values are as follows: 　　\<band> is either PCS or CDMA 　　\<n> for the roaming indicator is 0=home, 1=roaming 　　\<temp> is the radio temperature in degrees C. 　　NOT appears in cases where the pilot has not been found 　　or the modem has not registered. **AT Command Formats:** AT!STATUS (Input) Current band: PCS Sleep Current channel: 350 SID: 5116 NID: 28 Roaming: 0 Temp: 26 Pilot acquired Modem has registered OK

5.3   Device and Service Interrogation Commands

Command	Description
!RSSI	Received Signal Strength Indication
!STATUS	Modem status report
+CBIP?	Base Station IP Address (Read-only)
+CMIP?	Mobile Station IP Address (Read-only)
+CSQ?	Signal Quality (Read-only)
+CSS?	Serving System (Read-only)
+GCAP	Get Capabilities
+GSN	Get ESN
I	Identification
S	S-Register Read

5.4   FAX Operation Commands (Basic)

Command	Description
$QCVAD	Answer as Data or Fax
+CFC	Airlink Fax Compression (Remote)
+FAA	Fax Adaptive Answer (Remote)
+FAP	Fax Addressing and Polling Capabilities (Remote)
+FBO	Fax Data Bit Order (Remote)
+FBS	Fax Buffer Size (Read-only)\

5.5 Alphabetic List of AT Commands

Command	Description
+++	Escape Sequence *(not preceded by A*T) Used to exit data state and enter command state; this is not preceded by AT and does not require <CR>. The escape character is fixed as the plus sign "+" (0x2B). The guard time between normal transmission data and the escape sequence is specified as 1 second and cannot be changed. Therefore, the modem requires a minimum of 1 second of inactivity on the serial input, three plus sign characters, followed by 1 second of inactivity.
A/	Repeat Last command (not preceded by AT) Re-executes the last command string entered. The previously executed command remains in the command buffer until AT is entered or the modem is reset or power-cycled. This command does not require the AT prefix or a <CR> at the end. It executes immediately on entry of the slash character.
A	**Answer – Manual** Instructs the modem to go off-hook and attempt to establish a connection without waiting for a ring. This is used to answer an incoming call if AutoAnswer (S0) is disabled. The command presumes a RING has been received. If the command is issued without a RING, behavior depends on the state. If in command state, the modem replies with OK and remains in command state. Should the modem be in pass-through state without a call pending, the Answer command is sent to the IWF modem. This typically goes off-hook and looks for carrier. When none is detected, the NO ANSWER or NO CARRIER result is returned. This is, however, dependent on the IWF modem. If the incoming call is a fax call, the modem must be configured for answering fax via $QCVAD and set for fax mode using +FCLASS=2.0 prior to the RING being received by the modem. This is due to the method of call setup on the airlink between the IWF and the CMDA modem. The modem looks for carrier to negotiate the connection, and either issues: • CONNECT and enters data state; or, • NO CARRIER and remains in command state.

D [options]	**Dial**
	Initiates a data/fax call. (Use +CDV to dial a voice call.) Because of the options available in this command, another AT command cannot follow it on the same line. All characters following the D command are taken as parameter options. Several types of data and fax calls are possible based on the option(s) entered. Packet Data calls Traditional CDMA data call dialing uses the parameter "#19788". This triggers the modem to try a 1xRTT connection if that service is detected. It is possible that 1xRTT service may be detected in an area that offers 1X voice service, but only IS-95B (QNC) data service. In these situations the call is likely to fail. You can force the modem to attempt one service type or the other by using one of these dedicated parameters:
	      #QNC - Connect to QNC using IS-95B service
	      #19788 - Connect PPP using 1xRTT service
	
	Async (CSC) Data/Fax
	The type of call opened depends on the setting of +FCLASS.
	The modem does not actually dial the number in the string. For an IS-95B call, the dial string is passed to the IWF where a modem there issues the dial over the PSTN. Prior to passing the dial command, the modem sends the IWF modem the string defined in +CFG (Configuration String) to configure the IWF modem for the call. For dialing an async data or fax call, the parameter string options are included on one command line with or without spaces. There is a limit of 35 characters in the dial options string. Upon successful answer and connection, the modem goes into data state. There is a time limit (Register S7 - Wait for Carrier) for the process.
	
	The options listed are commonly supported but specific IWF modem capabilities govern the list of supported parameters.
	      Opt Meaning
	      0 - 9 Any digit (0-9) (*, #, A, B, C, or D are also permitted).
	             The phone number may also include the formatting characters brackets, (), hyphen -, and <space>.
	             These characters are ignored.
	      T Tone (DTMF) dialing - ignored by the modem.
	      P Pulse dialing - ignored by the modem.
	      W Wait for dial tone before processing the remaining characters in the dial string. The duration of the wait is limited by register S7 (Wait for Carrier).
	      , Pause before processing the remaining characters in the dial string. The pause time is set by register S8 (Comma Pause Time).
	      $ Wait for billing (bong) tone before processing balance of string.
	      @ Wait for quiet answer; limited by register S7 (Wait for Carrier).
	      ! Hook flash. Causes the modem to go on-hook briefly and then returns to off-hook. This is used to access certain calling features on the PSTN.
	Result Codes:

	The possible result codes are determined by the call monitoring set by X[n] (Result Code Select).

E[n]	**Echo**
	Controls echoing of characters received from the host (DTE) back to the host when in command state. This also affects framing of responses (see page 33 for details).
	
	Value Setting:
	  Disable echo
	  1 Enable echo (Default)

H[0]	**Hook Control** Go ON-Hook to disconnect a data/fax call. (Use +CHV to end a voice call.) If the modem was already on-hook, no change is made. The only parameter allowed is 0 (zero), which is optional. The modem goes from online condition to offline condition. *See also +CHV (Hang-up Voice)*

I<n>	**Identification Command**
	Requests information about the modem.
	
	Value Response Meaning
	  3 I3: <model> Modem model
	I5: Rn-n-n <filespec> yyyy/mm/dd hh:mm:ss
	
	Control firmware revision
	I7: Options Device option code (none currently present)
	  9 I9: Sierra Wireless Inc. Manufacturer.

L[n]	**Loudness - Speaker Volume** This command is provided for compatibility reasons; no action is taken by the modem. Parameters are ignored..
M[n]	**Mute - Speaker Control** This command is provided for compatibility reasons; no action is taken by the modem. Parameters are ignored.

O	**On-line (Remote)** Causes the modem to go from command state (online condition) to data state. The modem responds with the normal CONNECT response codes (if enabled) as if the connection were new. This command is executed by the IWF modem. If theCDMA modem was in an offline condition and without an airlink, the NO CARRIER and OK result codes are returned. If the modem was offline and the airlink was established (passthrough state) but without a call in place, the IWF modem attempts to process the command. The typical result is either NO ANSWER or NO CARRIER. This is, however, dependent on the IWF modem.
P	**Pulse Dialing** This command is provided for compatibility; no action is taken by the modem.

Q[n]	**Quiet - Result Code Display Option**
	Controls the return or suppression of result codes to the host (DTE).
	
	Value Setting
	    Disables Quiet mode (enables return of result codes.) (Default)
	    Enables Quiet mode (disables return of result codes).
	
	Result Codes:
	        n = 0 OK
	        n = 1 Otherwise the result code is suppressed

S<n>=<x>
S<n>?
	S-Register Set/Query
	Sets (or queries) the contents of the specified S-register (n) to the new value (x). Zeros are assumed where parameter values are omitted.
	Var. Range
	n Valid S-register number (See Table 3-23 on page 103 for values).
	x as determined by the S-register (n).
	
	Result Codes:
	        OK S-register n set to x.
	        ERROR Invalid S-register value (n) or, setting (x)
	                      outside of permitted range.

T	**Tone - Set DTMF Dialing** This command is provided for compatibility reasons; no action is taken by the modem. *For information on DTMF tone generation on the SB555 see ~DTMFB, ~DTMFK, ~TONDUR, and ~TONMUT*

V[n]	**Verbose - Result Code Form**
	Specifies whether the modem displays the result codes in numeric format or as words (verbose). See Table 3-24 on page 106 for a numerical list of the result codes. Note that numeric codes are returned as ASCII character numerals.
	
	This command also affects framing of responses (see page 33 for details).
	    Value Setting
	        Numeric result codes
	        Verbose result codes (Default)
	Result Codes:
	            OK(0) n = 0, 1 (The result code is returned in the *new setting.*)
	            ERROR (4) Otherwise

X <n>	**Result Code Select/Call Progress Control** Enables tone detection options used in the dialing and handshaking process. As options are chosen, the result codes are also affected. The prime function is to control the modem call response capabilities when the D (Dial) command is issued. **Dial tone detection** When disabled, the modem waits for the period set in register S6 (Wait for Blind Dial) and blind dials. When enabled, the modem allows five seconds to receive at least 1 second of dial tone. If none is detected then the result code is NO DIAL TONE. **Busy signal detection** When disabled, the modem waits for the period set in register S7 (Wait for Carrier). If no connection is made then the result code is NO CARRIER. When enabled, the modem can return the result code BUSY if detected. Values enable (√) or disable (✕) tone detection and result codes as indicated in the chart below: Value Dial Tone Busy Signal 1 ✕ ✕ 2 √ ✕ 3 ✕ √ 4 √ √ (Default)
Z	**Profile Restore** The modem goes on-hook (drops any active call) and then resets the command and register parameters to the defaults. *See Table 3-27 on page 109 for information on factory settings.*

6 Default/Stored Profile Settings

The AirLink Redwing CDMA Modem does not support a user-defined profile at this time. Both the ATZ (Reset) or AT&F (Factory Settings Restore) will return the modem to the factory-default settings as follows:

Basic Settings

E Echo (Command State) 1 (enabled)
L Loudness - Speaker Control 0 (ignored)
M Mute - Speaker Control 0 (ignored)
Q Quiet - Result Code Display Option
    0 (Codes returned)
V Verbose - Result Code Form 1 (Words)
X Result Code Select/Call Progress Control
    4 (all codes)
&C DCD Control 2 (UNIX wink)
&D DTR Options 2 (Hang up)
+CDR Data Compression Reporting 0 (Off)
+CDS Data Compression 4 (use IWF setting)
    0 (do not discnct.)
    2048 (max dict.)
    6 (max string)
+CFG Configuration String (null)
+CMUX Multiplex Option C (Forward link)
    (Reverse link)
+CQD Command State Inactivity Timer
    10 (50 seconds)
+CRC Cellular Result Codes 0 (disabled)
+CRM Local (R m) Interface Protocol
    0 (async data)
+CXT Cellular Extension 0 (do not pass)
+ICF Character Framing 3, 3 (ignored)
+IFC Flow Control (Local) 2,2 (ignored)
+ILRR Local Rate Reporting 0 (off)
+IPR Fixed Port Rate 115200 (ignored)
+MA Modulation Automode (null)
+MR Modulation Reporting 0
+MS Modulation Selection (null)
+MV18R V.18 Reporting 0 (disabled)
+MV18S V.18 Sel ect i on 0, 0, 0

S-Registers

S0 Auto-answer mode
0 (disabled)
S3 Carriage Return Character
013 (CR)
S4 Line Feed Character
010 (LF)
S5 Backspace Character
008 (BS)
S6 Wait for Blind Dial (Remote)
002 (2 seconds)
S7 Wait for Carrier (Remote)
050 (50 seconds)
S8 Comma Pause Time (Remote)
002 (2 seconds)
S9 Carrier Detect Response Time
(Remote)
006 (0.6 seconds)
S10 Lost Carrier Hang-up Delay
(Remote)
014 (1.4 seconds)
S11 DTMF Dialing Speed (Remote)
095 (0.095 s)

V.42 bis Commands

+DR Data Compression Reporting
0 (disabled)
+DS Data Compression
    (Both directions)
0 (neg - any)
2048 (max dict)
6 (max string)
+EB Error Control Break Handling
1, 0, 30
+EFCS Frame Check Sequence 1
+ER Error Control Reporting
0 (disabled)
+ES Error Control Selection
3, 0, 2
+ESR Selective Repeat 1
+ETBM Termination Buffer Management
1, 1, 20

FAX Commands

+CFC Airlink Fax Compression
0 (no compression)
+FAA Fax Adaptive Answer 0
+FAP Fax Addressing and Polling
0, 0, 0
+FBO Fax Data Bit Order 0
+FBU Fax HDLC Frame Reporting 0
+FCC Fax DCE Capabilities 0 (VR)
    (BR 4800 bps)
0 (WD)
0 (LN)
0 (DF)
0 (EC)
0 (BF)
0 (ST)
+FCLASS Modem Operating State
0 Data (async)
+FCQ Fax Copy Quality 1, 0
+FCR Fax Capability to Receive 0
+FCT Fax DCE Phase-C Timeout 1E
+FEA Fax EOL Alignment 0
+FFC Fax Format Conversion 0, 0, 0, 0
+FHS Fax Call Termination Status 0
+FIE Fax Procedure Interrupt Enable 0
+FIS Fax Current Session Negotiation
0 (VR)
    (BR 4800 bps)
0 (WD)
0 (LN)
0 (DF)
0 (EC)
0 (BF)
0 (ST)
+FLI Fax Local ID String (Null)
+FLO Fax Flow Control Select 1
+FLP Fax Indicate Document to Poll 0
+FMS Fax Minimum Speed 0
+FNR Fax Negotiation Reporting
0, 0, 0, 0
+FNS Fax Non-standard Frame FIF
(Null)
+FPA Fax Selective Polling Address
(Null)
+FPI Fax Local Polling ID String (Null)
+FPR Fax Serial Port Rate Control 8
+FPS Fax Page Status 1
+FPW Fax Password (Null)
+FRQ Fax Receive Quality Threshold
0, 0
+FRY Fax ECM Retry Value 0
+FSA Fax Sub-address (Null)
+FSP Fax Request to Poll 0