

Redwing CDMA

User Guide

Models C3110, C3111

Version 2.01

AirLink Communications, Inc.

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The antenna connection is intended for indoor use only. It is not intended to be connected to an outdoor antenna.

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Table of Contents

1	Introduction	1
1.1	Product Overview.....	2
2	Network Connection Options.....	3
2.1	Internet (TCP/IP) Connections via 1xRTT	3
2.2	Circuit-Switched CDMA Connections.....	4
3	Modem Configuration	5
3.1	Local Configuration	5
3.2	Modem Activation [Model C3111].....	7
3.3	Modem Activation [Model C3110].....	7
4	Windows Dial-Up Networking Setup.....	10
4.1	Add Windows Modem Driver	10
4.1.1	Setup Modem	10
4.1.2	Add Modem Driver	10
4.2	Windows Dial-Up Networking (PPP) Configuration.....	13
4.3	Making a 1xRTT Data Connection	21
5	Using AT Commands	23
5.1	Account Activation Commands	24
5.2	Basic Modem Setup and Status Commands.....	25
5.3	Device and Service Interrogation Commands	27
5.4	FAX Operation Commands (Basic).....	27
5.5	Alphabetic List of AT Commands	28
6	Using SMS Messaging [Model C3110]	33
7	Default/Stored Profile Settings.....	35
8	Technical Specifications.....	36
8.1	Physical Characteristics:	36
8.2	Power Specifications:	36
8.3	Environmental:	36
8.4	Status LED Display:.....	37
8.5	RF Features:.....	37
8.6	Application Interface Features:	37

8.7 CDMA and Cellular Standards 37

Redwing CDMA User Guide

WARNING

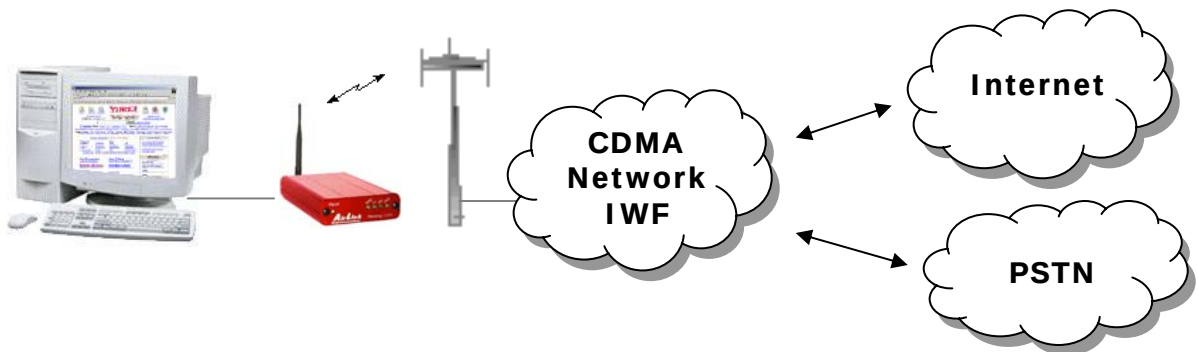
The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

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 calls 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).

1.1 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.

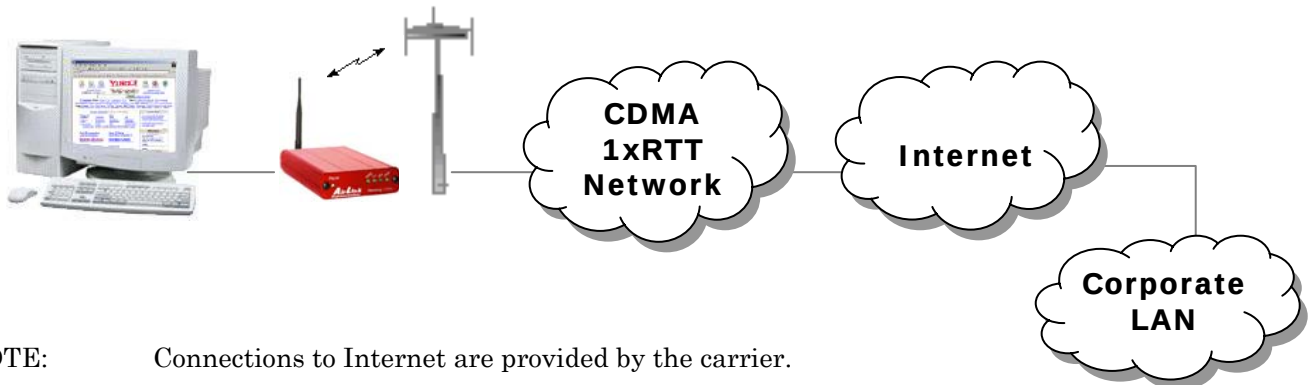


2 Network Connection Options

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

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

2.2 Circuit-Switched CDMA Connections

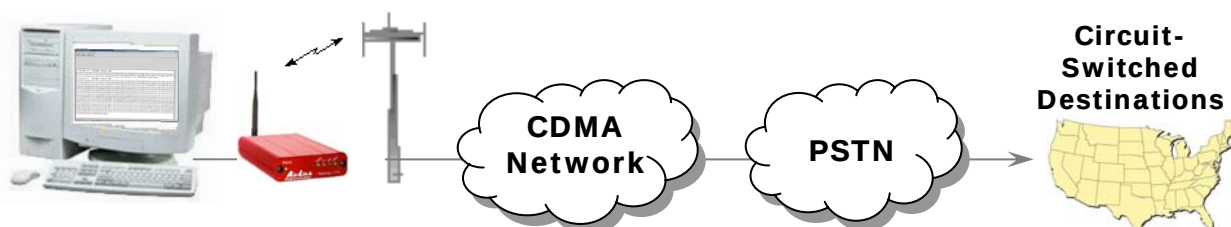
Where there is carrier support for circuit-switched connectivity, the Redwing CDMA is capable of providing traditional Circuit-Switched 'dial-up' communications.

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.

Practical Applications

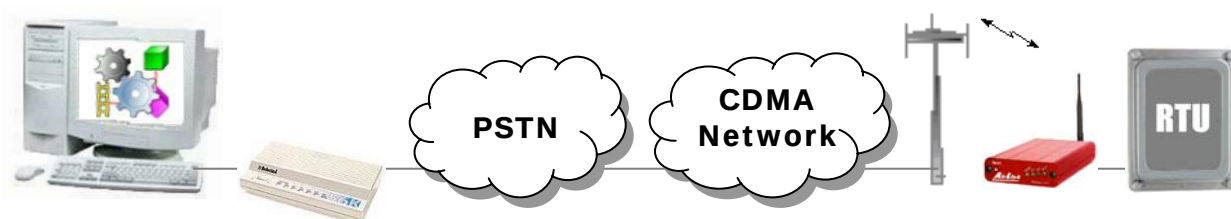
Host Modem

The Redwing CDMA can be used as a modem connected to a host PC (or other device) and provide dial-up connectivity to the Public Switched Telephone Network (PSTN). Using the Hayes Compatible 'ATD+Phone Number' dialing sequence, the modem can dial any landline telephone modem. The diagram below shows how the application may be used.



Remote Modem

The Redwing CDMA can be used as a modem connected to a remote PC (or other device) and provide two-way dial-up connectivity to the Public Switched Telephone Network (PSTN). Using the Hayes Compatible 'ATD+Phone Number' dialing sequence, the modem can dial or receive landline connections. The diagram below shows how the application may be used as a remote device.



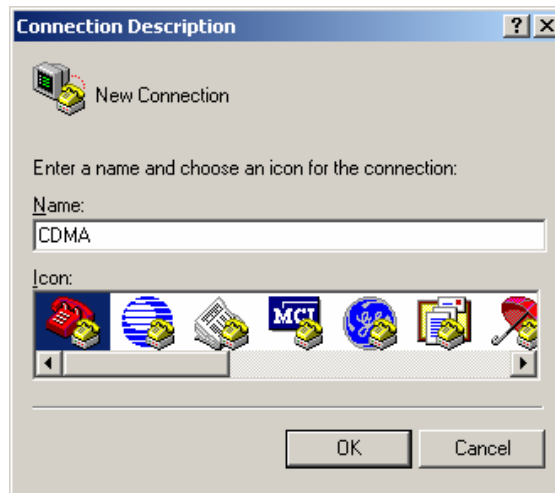
3 Modem Configuration

Modem configuration of the Redwing CDMA modem is done using a terminal emulation program like HyperTerminal in Windows.

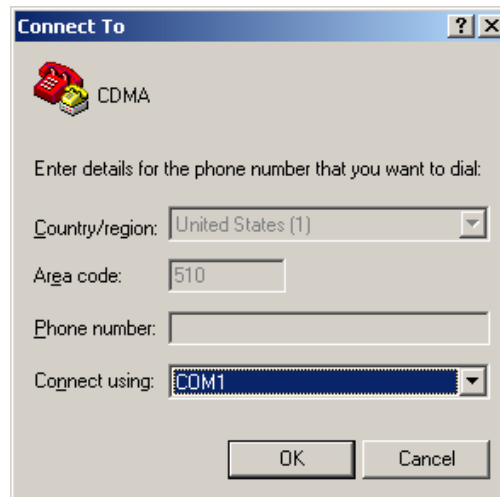
IMPORTANT NOTE: Wireless ACE *cannot* be used to configure the Redwing CDMA modem from a Windows computer. Only a terminal emulation application may be used.

3.1 Local Configuration

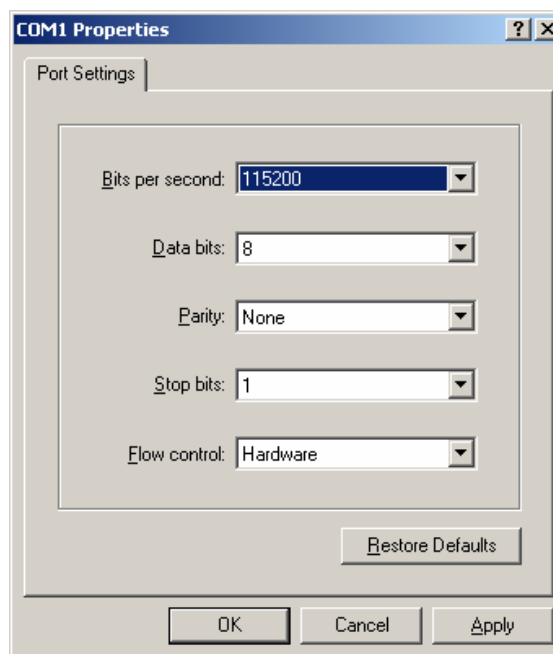
1. Attach the antennas, DB-9 cable and power to the back of the modem.
2. Power on the modem, and ensure the **On** light is lit.
3. Attach the modem to the back of the PC with the provided DB-9 cable.
(Note, if you did not order a cable with your modem, you need a straight-thru RS-232 cable to attach to the modem.)
4. Select **Start→ Programs→ Accessories→ Communications→ HyperTerminal**.



5. Enter the name of the connection and select **OK**.

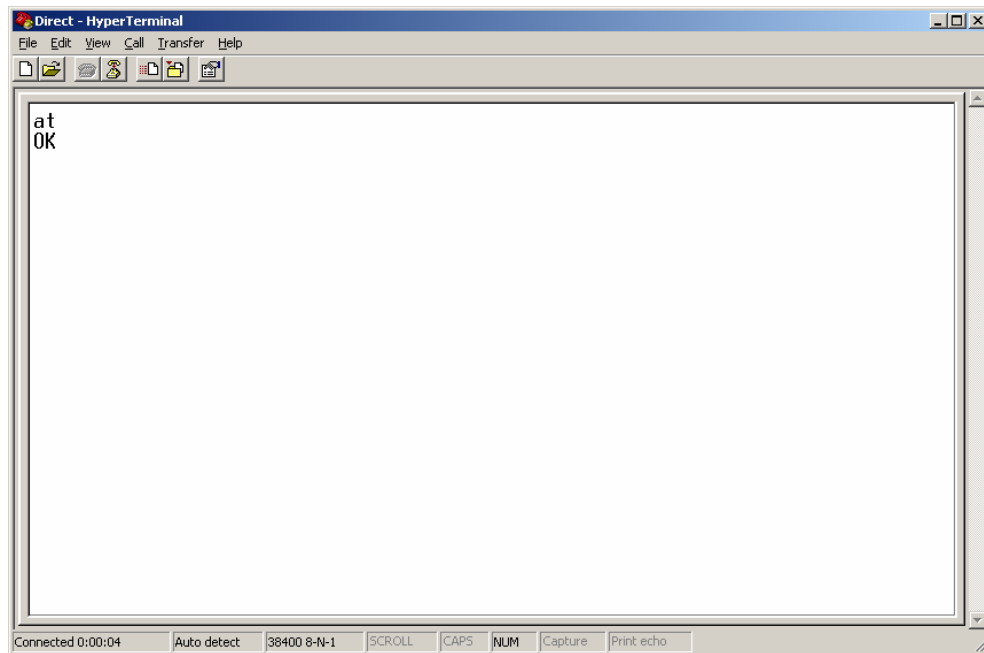


6. For "Connect using" select the COM port that the modem is on (do *not* select a modem driver), then select **OK**.



7. Select **115200** for the "Bits per second." Ensure Data Bits: **8**, Parity: **None**, Stop bits: **1** and Flow control: **Hardware**. Then select **OK**.

(These are the factory default settings for a Redwing CDMA modem. If you get garbled characters when typing AT commands, change these settings and reconnect to the modem. For example, change the baud rate to 57,600 bits per second and connect again, etc.)



8. Type **AT** followed by **[Enter]**. You should receive an "OK" in response.

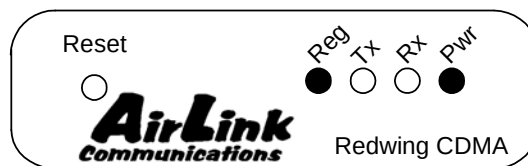
Other AT commands may now be issued to the modem. See Section 5 for a list of AT commands

3.2 Modem Activation [Model C3111]

The activation process is unique for each carrier. See the appropriate **CDMA Setup Wizard** on AirLink's web site: www.airlink.com > Support > Downloads and Support Documents > Modem Utilities.

3.3 Modem Activation [Model C3110]

The Redwing CDMA modem may be already set up to register online with a phone number, etc. pre-configured into it (by AirLink Communications, Inc.). When a modem is registered on the network and working, the lights will look like the following:



Note that the **Reg** light may be flashing at first. When it is registered on the network, it will go solid. Also the **Tx** (transmit) and **Rx** (receive) lights will flash as data is transferred to and from the modem on the network.

If your modem lights look like the above when the modem is powered on, you do NOT need to configure the phone number, etc. into the phone and may *skip* this section.

If however the **Reg** light does not go solid after a few minutes, your modem may need to be configured with a phone number and other parameters. Or if you have service ordered and a phone number for your modem, you may add these parameters yourself by doing the following:

- Connect up to configure the modem as in Section 3.1.
- If you are unfamiliar with using AT commands, please review Section 5 first.
- Enter the Lock code from your provider using **AT~NAMLCK** (as described below).
- Enter the phone number, System ID and Network ID with the **AT~NAMVAL** command (described below). The parameters are *saved automatically* once entered.
- Reset the modem by pressing the Reset button on the front of the modem, or power-cycle it.

The modem should now come online registered.

~NAMLCK	NAMLCK ("NAM Lock") AT~NAMLCK=nnnnnn (nnnnnn = Lock Code from carrier) Example: AT~NAMLCK=123456 - uses 123456 for the NAM Lock value 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). The carrier provides this number to you 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.
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~NAMVAL	NAMVAL ("NAM Value") AT~NAMVAL=<nam>[,<num>,<sid>,<nid>] Examples: 1. AT~NAMVAL=0 - Sets NAM 0 as the active account OK {Response} 2. AT~NAMVAL?0 - Queries the active account NAM0 NAM: 0 NUM: 8135551212 (10 digit phone number) SID: 40 (System ID) NID: 65535 (Network ID) OK {Response} 3. AT~NAMVAL=0,8135551212,40,65535 - Assigns phone number 813-555-1212, a SID and NID to account 0. 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.
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4 Windows Dial-Up Networking Setup

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 Windows 98 as well as Windows XP.

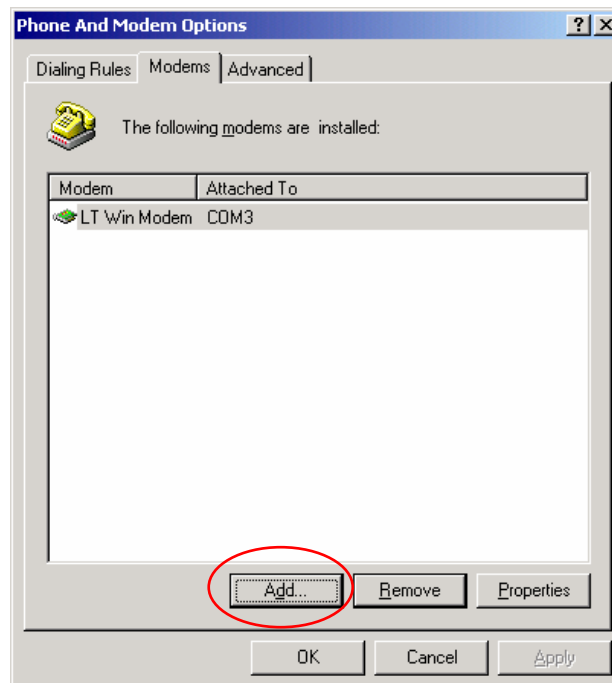
4.1 Add Windows Modem Driver

4.1.1 Setup Modem

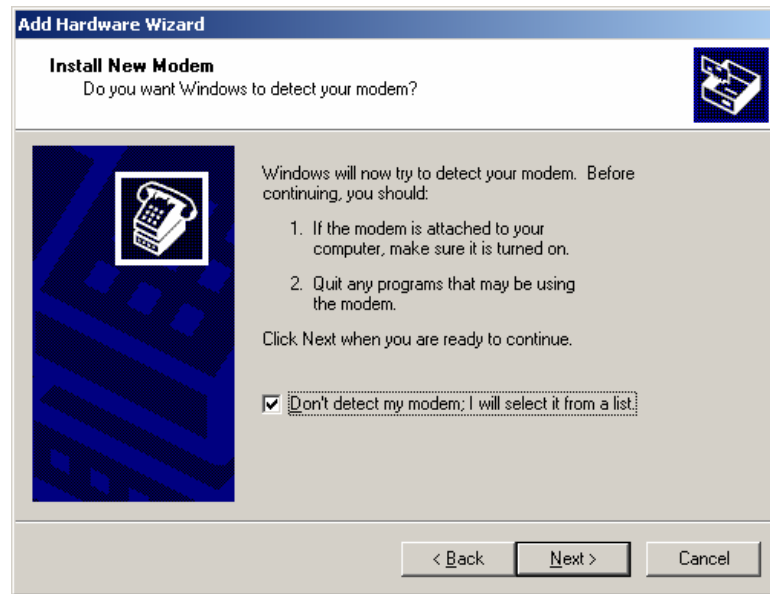
- Connect the modem to the computer with the DB-9 cable.
- Plug in the AC adapter, connect the antenna(s) and power on the modem.
- Obtain administrator privileges on your system.
If you do not know how, check with your system administrator.

4.1.2 Add Modem Driver

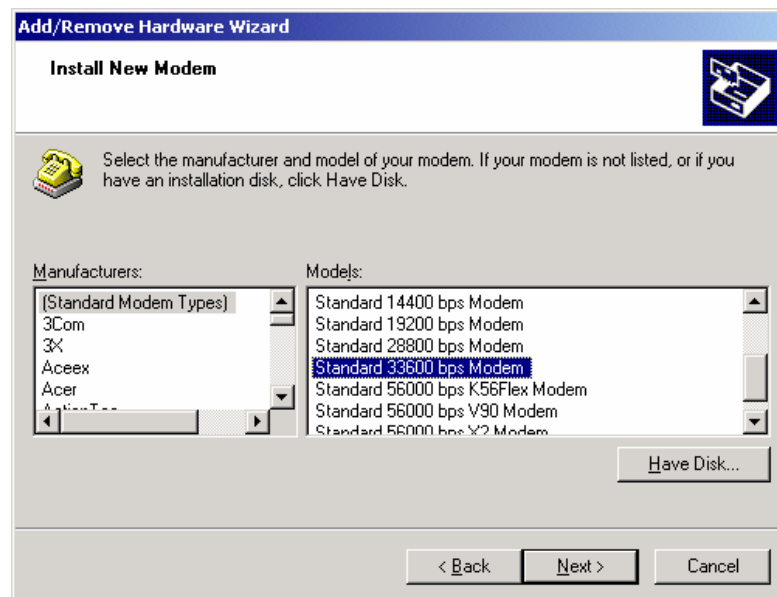
1. Select **Start→ Settings→ Control Panel→ Phone and Modems Options**.
2. You should see be in the Phone And Modem Options dialog box. Select the "Modems" tab.



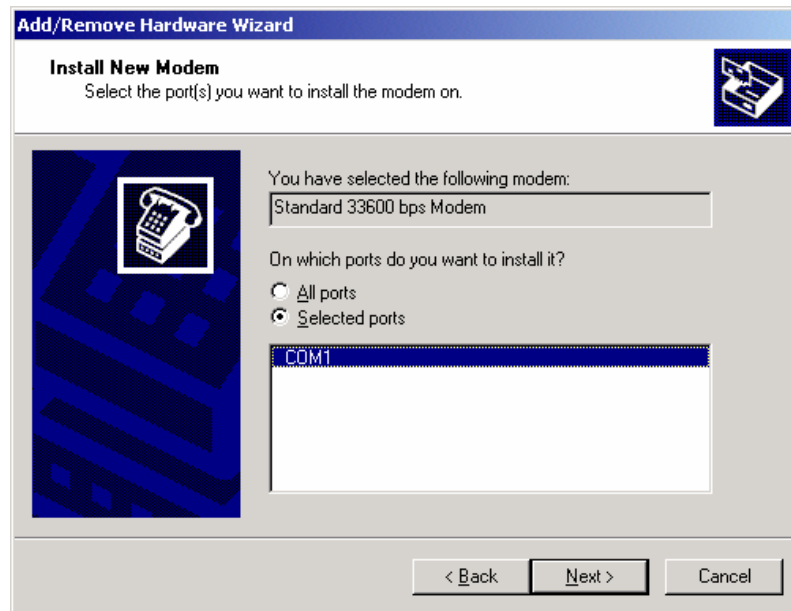
3. Select **Add**.



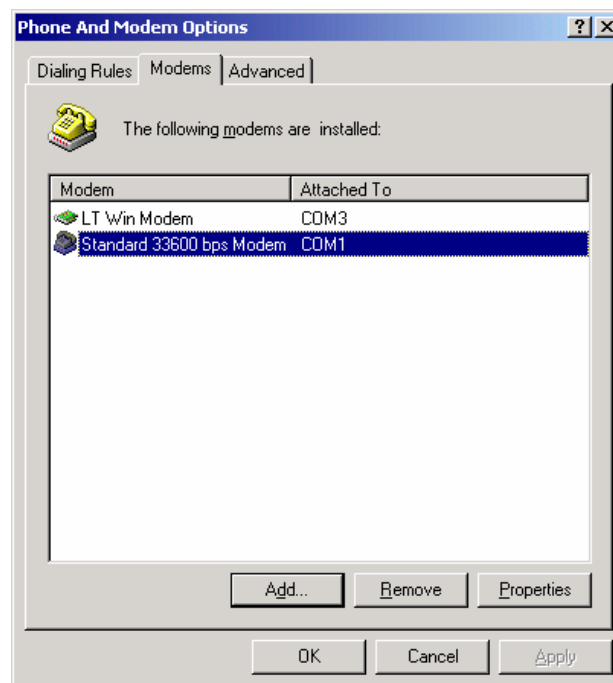
4. Check "Don't detect my modem..." and select **Next**.



5. Select "(Standard Modem Types)" from the Manufacturers and then select "Standard 33600 bps Modem" under Models.
6. Select **Next**.



7. Check Selected Ports, then select the COM port the modem is connected to and select **Next**.
8. Select **Finish** to exit the "Install New Modem" wizard.



9. You should see the modem added to the correct COM port.
10. To set the modem speed on the driver, highlight the modem driver and select **Properties**.
11. Ensure the "Maximum Port Speed" is set to **115200**, which is the default value of the Redwing CDMA.
12. Select **OK** to exit.

4.2 Windows Dial-Up Networking (PPP) Configuration

This section describes how to setup a Windows Dial-up Networking connection using an AirLink Redwing CDMA Modem. Windows 2000 Professional was used in this example. The connection uses PPP to communicate to the modem and gain access the Internet.

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. (Not necessary on Windows 98/ME.)

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 Section 4.1).

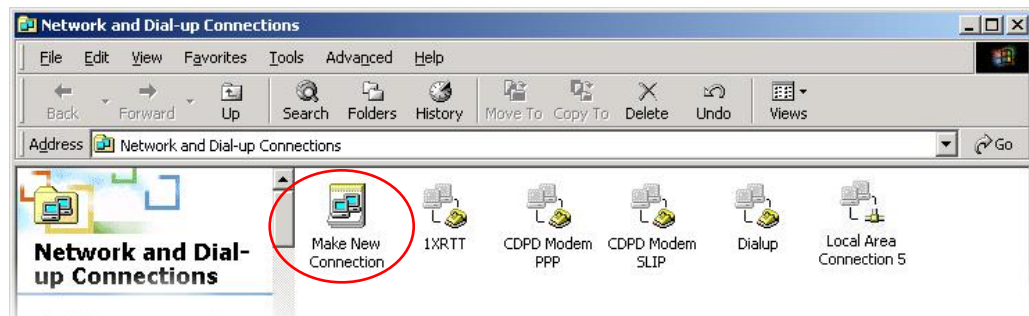
No other program is to be running that is using the serial (COM) port that your modem is attached to.

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 network" (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.

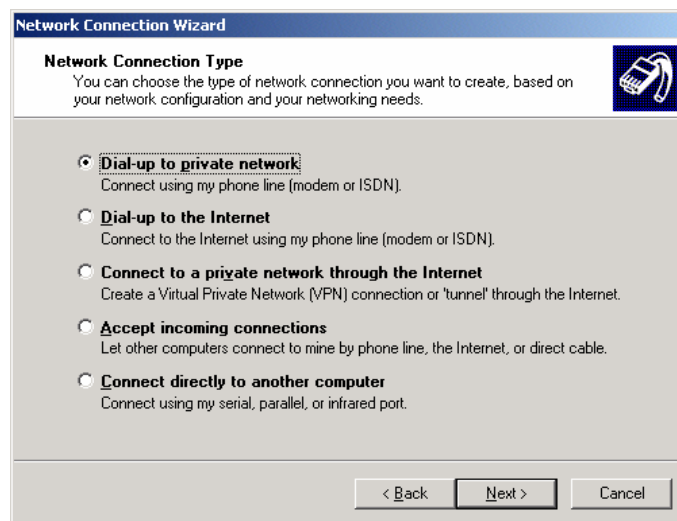
1. Select **Start→ Settings→ Control Panel→ Network and Dial-Up Connections**.



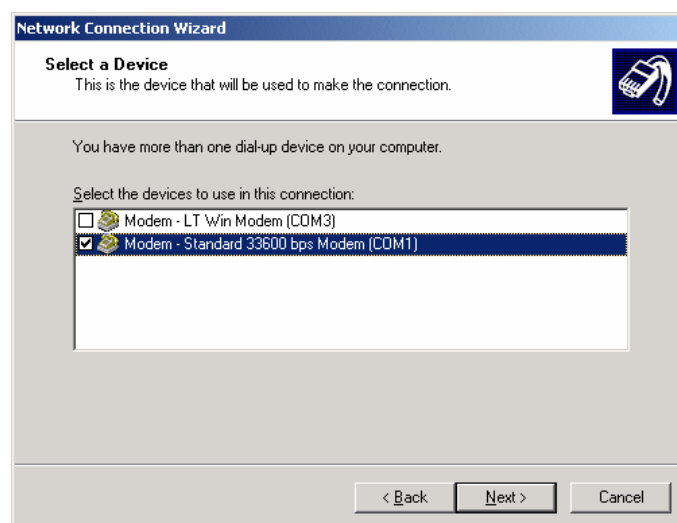
2. Double-click on the "Make New Connection" icon.



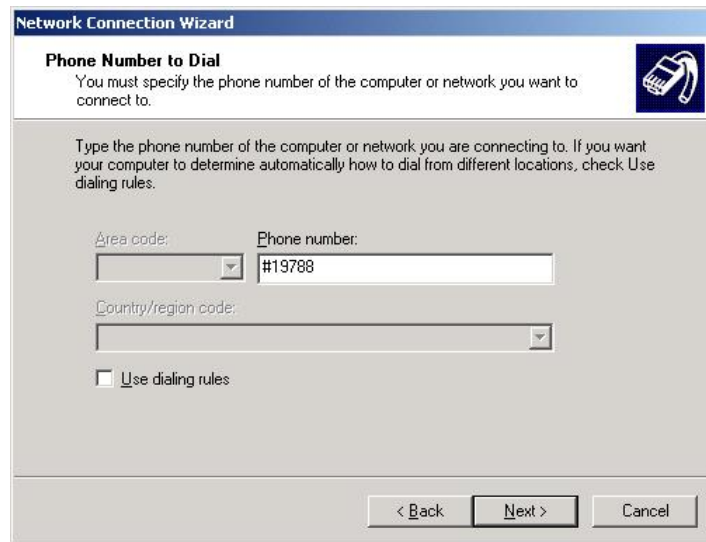
3. When the Connection Wizard starts, select **Next**.



4. Select "Dial-up to private network" and select **Next**.



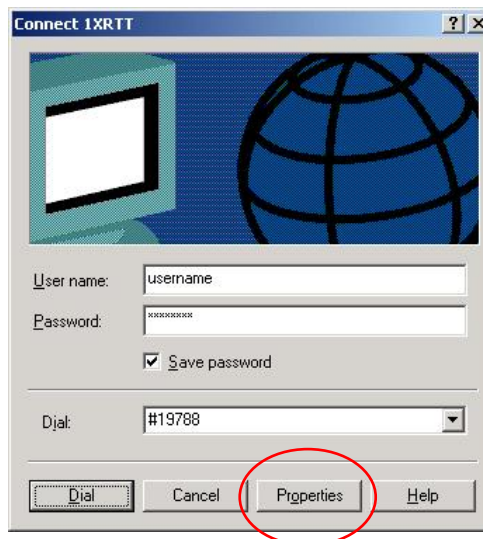
5. Check the box next to "**Modem – Standard 33600bps**" and select **Next**.



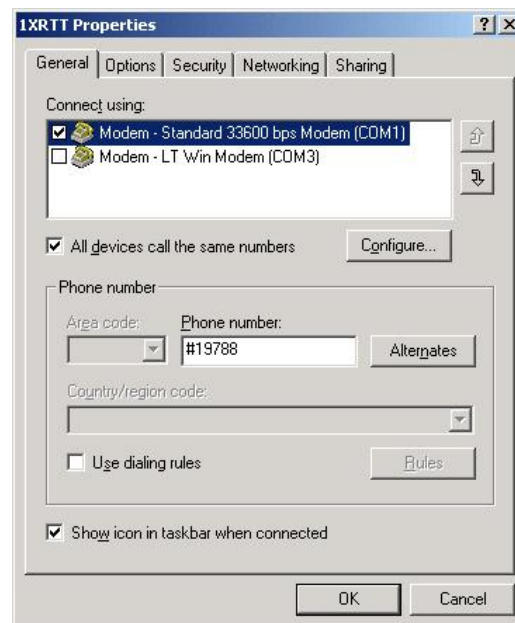
6. Enter the 1xRTT Access number: **#19788** (or **#777** -- depending on your carrier) and then select **Next**.
7. Select whether you want **all users** or just yourself to have access to this connection, and select **Next**.
8. Enter **1xRTT** for the name of the connection. If you want to add an icon for this connection on the desktop, check "**Add a shortcut to my desktop.**"
9. Select **Finish** to exit the "Network Connection Wizard."

Note: Now some manual configuration changes need to be made to the connection before it can be used.

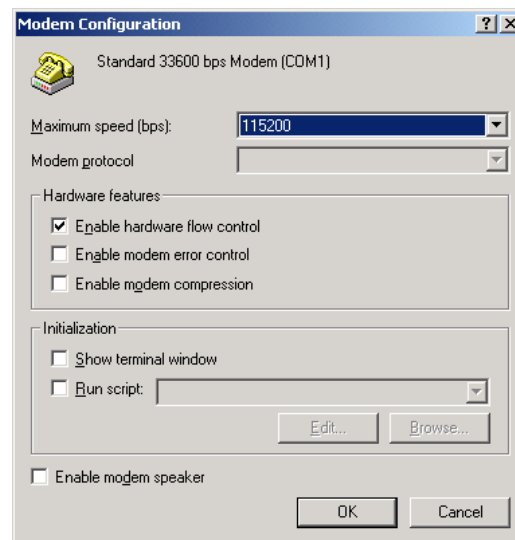
10. The "**Connect 1xRTT**" dialog box should come up next.
11. Select **Properties**.



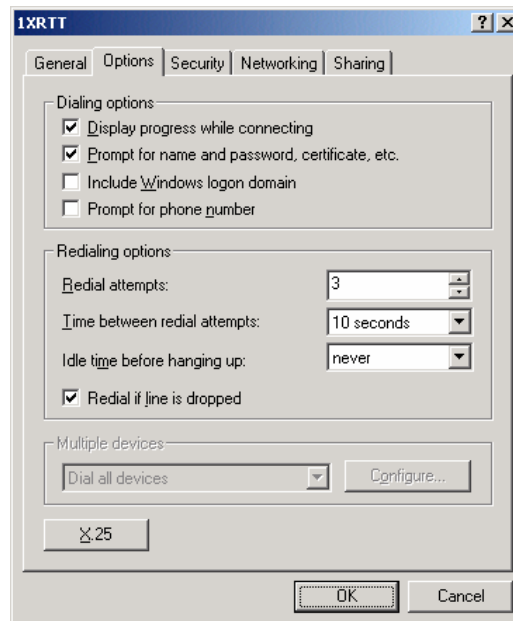
12. Examine the **General** tab settings.



13. “**Connect using**” should have a check next to “**Modem – Standard 33600bps Modem (COMx).**”
14. “**Phone number**” should equal the 1xRTT Access Number provided by the carrier.
15. Uncheck “**Use dialing rules**” and check “**Show icon in taskbar when connected.**”
16. Select the **Configure** button.



17. Maximum Speed: **115200**.
18. Check **Enable hardware flow control**.
19. Uncheck all other options.
20. Select **OK**.
21. Select the **Options** tab.

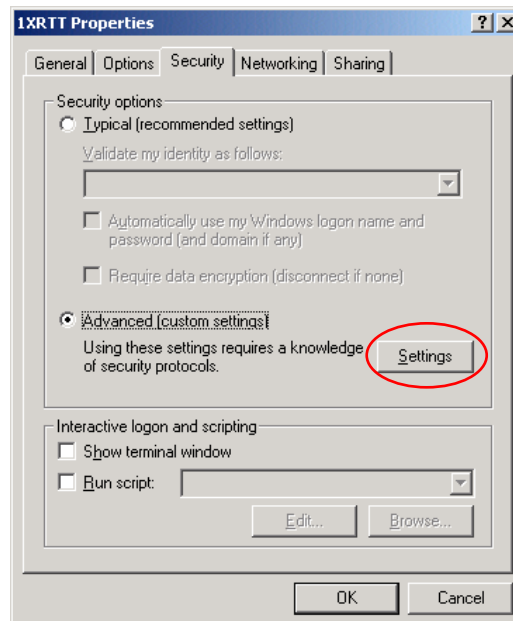


22. Check or Uncheck options as your application requires.

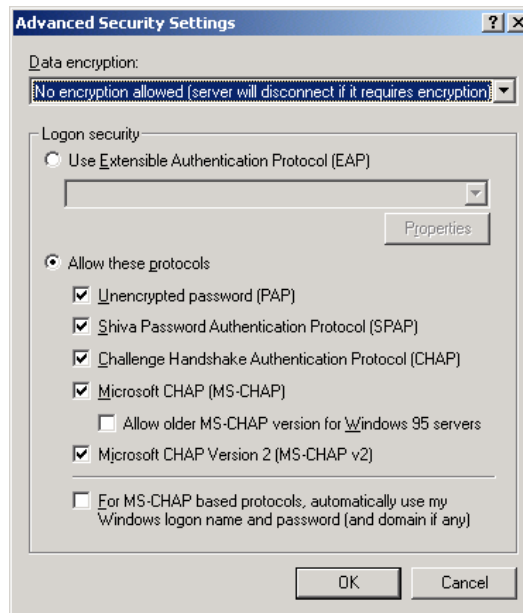
23. Set the "Redialing options" that will meet your needs.

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

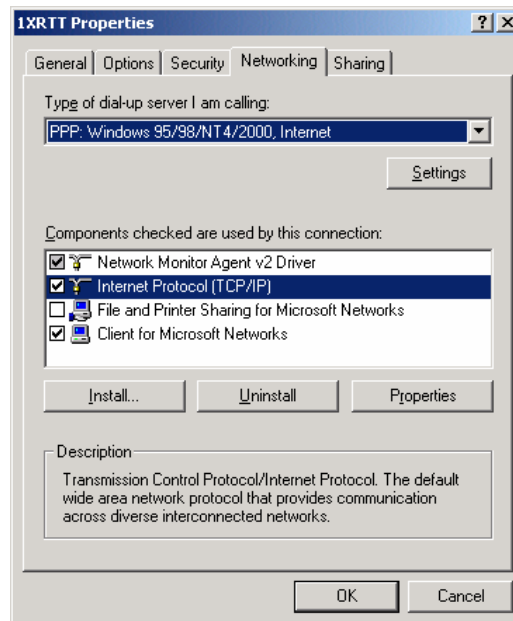
24. Select the **Security** tab.



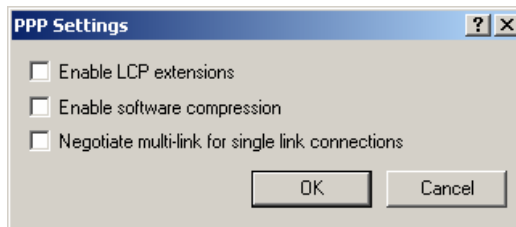
25. Select "Advanced (custom settings)."



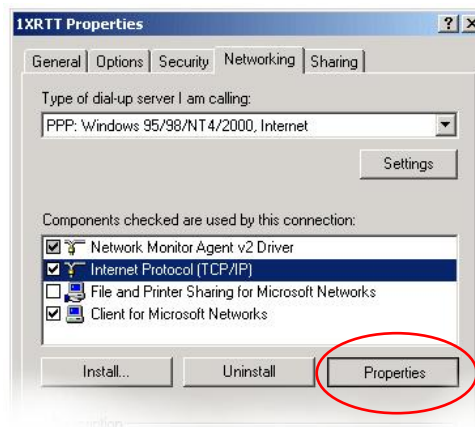
26. Set "Data encryption" to "**No encryption (server will disconnect if it requires encryption).**"
27. For "Logon security" check "**Allow these protocols.**"
28. Check the following options:
 - Unencrypted password (PAP)
 - Shiva Password Authentication Protocol (SPAP)
 - Challenge Handshake Authentication Protocol (CHAP)
 - Microsoft CHAP (MS-CHAP) (*Do not check "Allow older MS-CHAP for W95 servers."*)
 - Microsoft CHAP Version 2 (MS-CHAP v2)
29. Select **OK**.
30. Select the **Networking** tab.

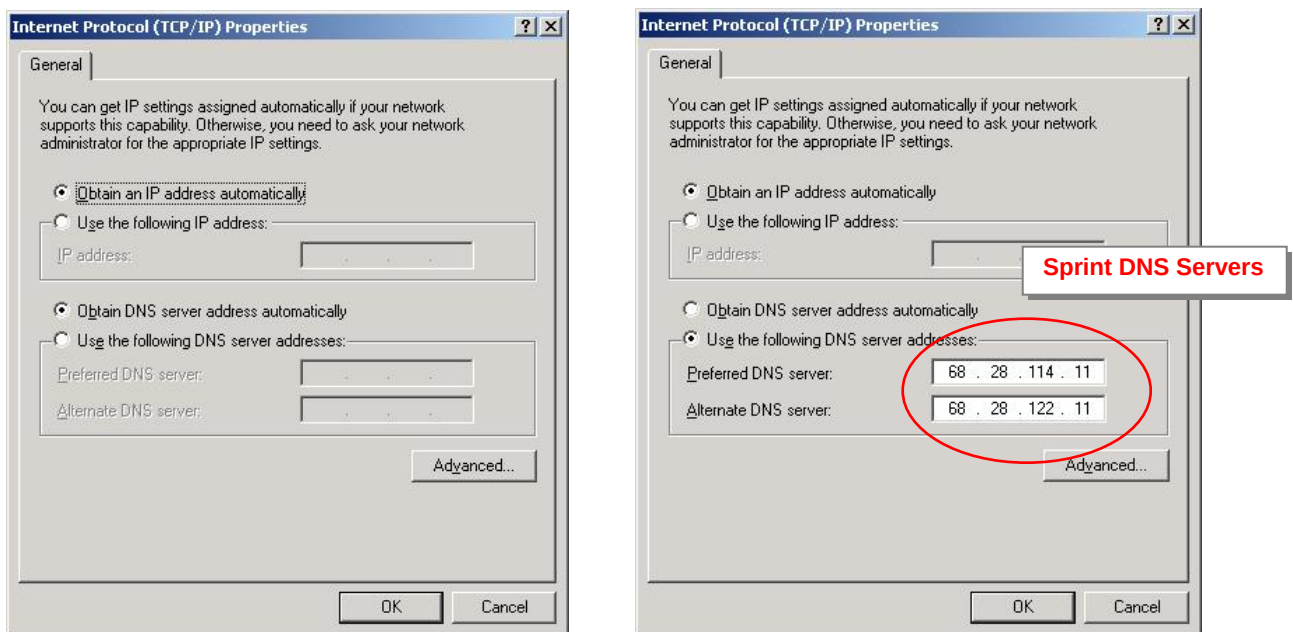


31. Type of dial-up server should show “**PPP: Windows 95/98/NT 4/2000, Internet.**”
32. Select the **Settings** button.



33. Uncheck all three of the PPP Settings options.
34. Select **OK**.
35. In the Components section of the Networking tab, **Internet Protocol (TCP/IP)** should be checked.
36. Select (highlight) **Internet Protocol (TCP/IP)** and then select **Properties**.

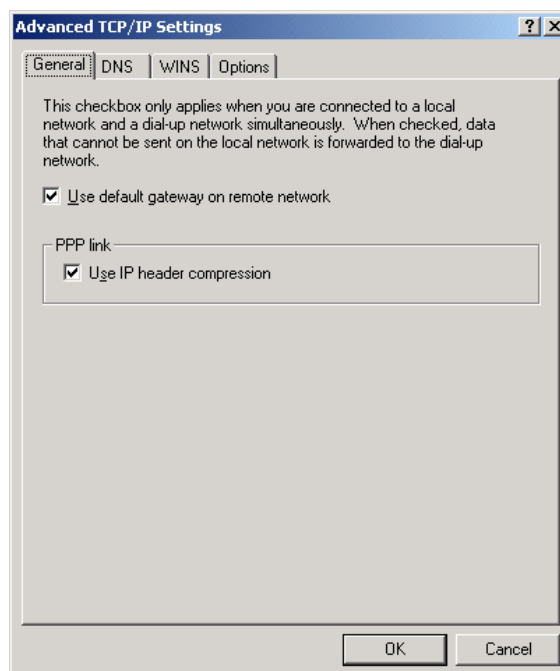




37. "Obtain an IP address automatically" should be checked.

38. 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.)

39. Select the **Advanced** button.



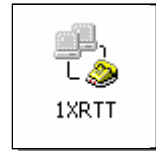
40. Check **Use default gateway on remote network** and **Use IP header compression**.

41. Select **OK**.
42. Leave the options under the **Sharing** tab unchecked.
43. Select **OK**.

4.3 Making a 1xRTT Data Connection

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

1. Go to Network and Dial-Up Connections and double-click on the 1xRTT icon.



2. For non-Sprint service, enter the User name and Password provided by the carrier for the account.
3. 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 System Tray on the Task Bar.



5 Using AT Commands

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

Use a terminal emulation program to connect up to the modem either locally (via the serial port of a computer) or remotely (over an existing internet connection on a pc to the modem at a remote location). Set up to connect to the modem by either method described in Section 3.

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>

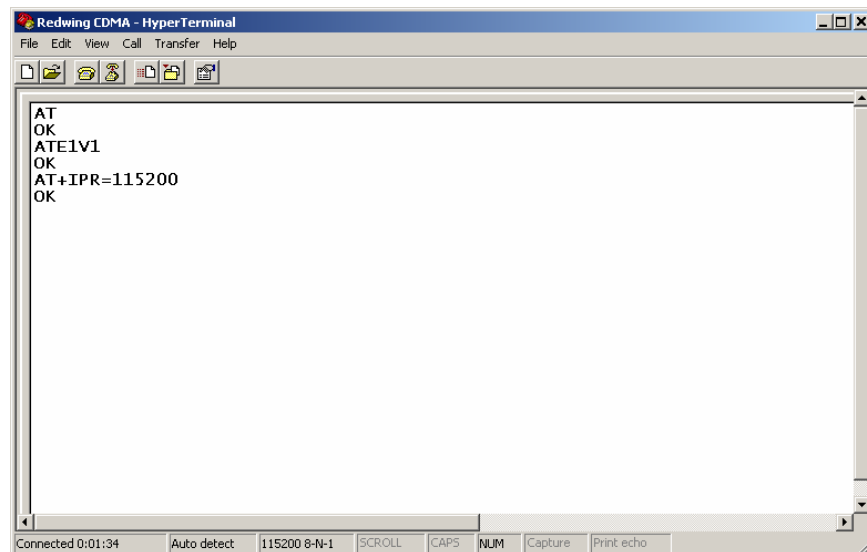
You should see an "OK" response if Verbose Mode was properly activated (V1)

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.

To set the baud rate, use the +IPR command:

AT+IPR=115200<enter>

You should get an "OK" (if in Verbose Mode)



Note: HyperTerminal needs to be disconnected & reconnected after a baud rate change.

5.1 Account Activation Commands

Command	Description
~NAMLCK	NAMLCK ("NAM Lock") AT~NAMLCK=nnnnnn (nnnnnn = Lock Code from carrier) Example: AT~NAMLCK=123456 - uses 123456 for the NAM Lock value 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). The carrier provides this number to you 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.
~NAMVAL	NAMVAL ("NAM Value") AT~NAMVAL=<nam>[,<num>,<sid>,<nid>] Examples: AT~NAMVAL=0 - Sets NAM 0 as the active account OK {Response} AT~NAMVAL?0 - Queries the active account NAM0 NAM: 0 NUM: 8135551212 (10 digit phone number) SID: 40 (System ID) NID: 65535 (Network ID) OK {Response} AT~NAMVAL=0,8135551212,40,65535 - Assigns phone number 813-555-1212, a SID and NID to account 0. 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.

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
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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 (<i>not preceded by AT</i>) 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. <table border="0"> <thead> <tr> <th>Opt</th><th>Meaning</th></tr> </thead> <tbody> <tr> <td>0 - 9</td><td>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.</td></tr> <tr> <td>T</td><td>Tone (DTMF) dialing - ignored by the modem.</td></tr> <tr> <td>P</td><td>Pulse dialing - ignored by the modem.</td></tr> <tr> <td>W</td><td>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).</td></tr> <tr> <td>,</td><td>Pause before processing the remaining characters in the dial string. The pause time is set by register S8 (Comma Pause Time).</td></tr> <tr> <td>\$</td><td>Wait for billing (bong) tone before processing balance of string.</td></tr> <tr> <td>@</td><td>Wait for quiet answer; limited by register S7 (Wait for Carrier).</td></tr> <tr> <td>!</td><td>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.</td></tr> </tbody> </table> Result Codes:	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.
Opt	Meaning																		
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	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. <i>See also +CHV (Hang-up Voice)</i>
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 the CDMA 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. <i>For information on DTMF tone generation on the SB555 see ~DTMFB, ~DTMFK, ~TONDUR, and ~TONMUT</i>

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: <table><tr><td>OK(0)</td><td>n = 0, 1 (The result code is returned in the <i>new</i> setting.)</td></tr><tr><td>ERROR (4)</td><td>Otherwise</td></tr></table>	OK(0)	n = 0, 1 (The result code is returned in the <i>new</i> setting.)	ERROR (4)	Otherwise											
OK(0)	n = 0, 1 (The result code is returned in the <i>new</i> 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: <table><tr><td>Value</td><td>Dial Tone</td><td>Busy Signal</td></tr><tr><td>1</td><td>✕</td><td>✕</td></tr><tr><td>2</td><td>√</td><td>✕</td></tr><tr><td>3</td><td>✕</td><td>√</td></tr><tr><td>4</td><td>√</td><td>√ (Default)</td></tr></table>	Value	Dial Tone	Busy Signal	1	✕	✕	2	√	✕	3	✕	√	4	√	√ (Default)
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 Using SMS Messaging [Model C3110]

Command	Description
!CNTSMS	!CNTSMS = <u>Count message</u> Reports the number of messages stored in the modem as follows: New Urgent Msg {Index = 1}: <n> New Regular Msg {Index = 2}: <r> Voice Messages {Index = 3}: <v> The Index number corresponds to the SMS list index used to retrieve messages. The counters n, r, and v indicate the number of messages in each list. When retrieving (!GSMS) or deleting (!DSMS), the message number is base 0, so the highest message number in any list is the reported count minus one.
!GSMS	!GSMS = <u>Get SMS</u> !GSMS?<i,m> Read an SMS message from the modem. The message read is determined by the parameters: i index list (0, 1, 2) m message number (base 1) The message number is a base 0 index into the list, where 0 is the oldest message, and the number reported by !CNTSMS minus one, is the most recent message.
!SSMS	!SSMS = <u>Send SMS</u> !SSMS=<opt>,<p>,<dest>,[cb], "<text>" Send SMS Sends an SMS message using these parameters: opt service option 6 = send rate set 1, 14 = send rate set 2 p priority 0 = normal 1 = interactive 2 = urgent dest destination # phone number of destination cb callback # phone number for reply (this is optional) text message body up to 160 bytes of data The service option used depends on the carrier. The text is enclosed in quotations. The quote character cannot appear in the body text. Messages with over 160 bytes of body text will be truncated by the modem and sent anyway.

	!SMS? - The query form reports the progress of the last message sent. Possible responses are: pending message has not left the modem (an attempt to use !SSMS= again yields an ERROR result code.) sent successfully sent to the network delivered successfully delivered by the network failed sending failed and should be retried If you send a second message after receiving the "sent" response, subsequent queries will report the status of the second message. Delivery status of the first message becomes unavailable.
!DASMS	!DASMS = <u>Delete All SMS</u> Deletes <i>all</i> SMS messages from all three index lists. There is no confirmation required. Use this command with care.
!DSMS	!DSMS = <u>Delete SMS (selective)</u> !DSMS =<i>[,m] Deletes one or all messages from one of the index lists (see !CNTSMS). i index list (0, 1, 2) m message number (base 0) The message number is a base 0 index into the list, where 0 is the oldest message, and the number reported by !CNTSMS minus one, is the most recent message. If the message number parameter is omitted, then all messages in the index list are deleted.

7 Default/Stored Profile Settings

The Redwing does not support a user-defined default profile at this time. Both the **ATZ** and **AT&F** commands will return the modem to these factory-default settings:

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 disconnect.) 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 Selection 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
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8 Technical Specifications

8.1 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

8.2 Power Specifications:

- Advanced Power Management features
- 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

8.3 Environmental:

- Operating ranges: -30°C to +70°C*
- (10%duty cycle limit above 60 °C)
- Humidity: 5%-95%Non-condensing

Model C3110

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

8.4 Status 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

8.5 RF Features:

Models C3110

- Supports CDMA2000 1X, IS-95 Circuit Switched CDMA and SMS
- 250 mW RF output (+24 dBm)
- Full duplex transceiver
- Dual-band support for both 800 MHz cellular and 1.9 GHz PCS bands
- Data rates up to 153.6 kbps

Models C3111

- Supports CDMA2000 1X, IS-95 Circuit Switched CDMA and SMS
- 250 mW RF output (+24 dBm)
- Full duplex transceiver
- Dual-band support for both 800 MHz cellular and 1.9 GHz PCS bands
- Data rates up to 153.6 kbps

8.6 Application Interface Features:

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

8.7 CDMA and Cellular Standards

- Supports CDMA2000 1X, IS-95 Circuit Switched CDMA and SMS
- Dual-band support for both 800 MHz cellular and 1.9 GHz PCS bands

- Adheres to CDMA authentication as specified in CDMA2000 1X
- CDG1, 2, and 3 for CDMA2000 1X
- IS-95B: Mobile Station-Base Station Compatibility
- IS-98C and D: Recommended Minimum Performance
- Telecommunications Systems Bulletin (TSB2000): Capabilities Requirements Mapping for CDMA2000 Standards (TIA/EIA/TSB2000)

