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## OVERVIEW

This documentation describes the features, functions and the interfacing of the CDS-902X products to other DTE (Data Terminal Equipment) devices. This manual was written for people who have a basic understanding of DCE (Data Communications Equipment) and DTE products. Refer to the glossary for terms used in this User Guide.

## CDS-902X DESCRIPTION

The CDS-902X is a cost-effective, self-contained Cellular/PCS (Personal Communication Services) system for remote telemetry, meter reading, data communication and the basic building block for the CDS-905X AVL (Automatic Vehicle Location) modem. The CDS-9020 is a complete digital cellular or PCS standalone modem. It operates at 800 or 1900MHz, and with the model CDS-9022 option, standard analog cellular (AMPS) is included. The CDS-90XX series is designed to communicate with a throughput of from 1200 bps to a maximum of 19,200 bps.

The CDS-902X DCE functions just like a standard landline modem and is compatible with 95 percent of the host modems on the market today, since it uses IS-95A, IS-95B, IS-707 and IS-683 CDMA (Code Division Multiple Access) data and voice standards. Using CDMA for remote wireless data retrieval applications, one will experience a much more reliable connection rate than using an analog circuit switch at faster download speeds.

The CDS-902X is much more than just a standalone wireless modem. Integrated menu features permit configuring the unit locally or remotely. Its four programmable windows permit turning the unit off to conserve power at specified times of day. With the step-by-step menu embedded in the firmware, programming the phone, NAM, and various other options can be accomplished without assistance from the cellular provider.

The CDS-9020 is a CDMA only unit, while the CDS-9022 has added features including an analog cellular modem module with voice capability. The CDS-905X series has the addition of a GPS (Global Positioning System) module along with a second RS-232 port, 6 logic outputs and 512kb of memory for data logging. Since approximately 97 percent of the United States is covered by either CDMA or analog cellular, the CDS-90XX series ensures coverage in most areas.

Analog or memory/RS-232 port upgrade modules can be purchased and installed at your location, or you can send your unit to DataRemote to get upgraded at any time for a nominal charge. If the CDMA coverage footprint does not adequately cover the area in which the CDS-9020 will be used, you should order the CDS-9022 dual mode CDMA/analog modem, order the analog upgrade module, or send the CDS-9020 for an upgrade. The analog feature enables the CDS-9022 to operate in either analog or digital mode, **at the same low rates as digital service**, with most wireless providers. (Check with your wireless provider for rate structure)

For GPS-AVL applications, the CDS-9052 provides nationwide coverage. This unit includes a CDMA modem, GPS module and 512kb of memory for downloading and archiving data, as well as an analog modem module for tracking vehicles anywhere and at

anytime, and is compatible with most tracking software.

## **What is CDMA?**

CDMA, or Code Division Multiple Access, is a digital alternative to the analog AMPS (Advanced Mobile Phone System). Qualcomm introduced CDMA three months after TDMA was accepted as a standard. After two years of testing, CDMA was finally accepted as a second standard. CDMA works under a principle that has been used in military satellites for decades. Each conversation is granted a certain code. Many conversations can be sent over the same spectrum at the same time with the receiving units decoding which information is directed to them. This is often compared to discerning a conversation in one's native language in a jumble of conversations in other languages. CDMA allows 4.4 trillion of these codes, assuring that many different callers on different systems can use the same spectrum at the same time. CDMA utilizes spread-spectrum technology, meaning that conversations are spread across wide segments of the cellular broadcast spectrum. This helps avoid problems in busy areas and in hilly areas where reflected signals can cause problems.

Spread spectrum technology is also the means by which codes can be attached to the communication. Each bit is expanded into some number of "chips." Thus, data transmission requires much more bandwidth, requiring much of the available spectrum. However, many conversations can be transmitted over the same spectrum. The transmitter multiplies each bit by a "key" and transmits the multi-chip result. The receiver receives these chips as well as those of all other conversations transmitted over the spectrum. The receiver multiplies this combined signal by the appropriate key, takes the sum, and is able to determine which bit is appropriate. Because different signals can be transmitted over the same spectrum, CDMA allows 10 to 20 times as many conversations to occur on a system than AMPS. CDMA technology nearly eliminates many common cellular problems related to overcrowding, such as busy signals, dropped calls, and cross talk. Also, CDMA's voice encoding allows for the reduction of background noise. CDMA transmission occurs at power levels 1/25 to 1/1000 those of AMPS or TDMA. This allows lighter portable phones with longer battery life. CDMA's digital control channel allows the demands for mobile fax, data transmission, and caller-ID as well.

## **How the Technology Works**

### **Introduction**

CDMA is one of three 2nd generation cellular network technologies: CDMA, TDMA and GSM.

- GSM uses 200 KHz channels divided into eight time slots. A single handset uses one slot in two channels for sending and receiving.
- TDMA standard IS-136 uses 30 KHz channels, with each channel divided into six time slots. A single handset uses one time slot for sending and the other for receiving.
- CDMA uses 1.25 MHz signal bands that are shared simultaneously by all users. Power control is of paramount importance to CDMA, rather than the management of

alternating time slots.

CDMA is available for both the cellular (800 MHz) and the PCS (Personal Communications Services) (1900 MHz) frequency bands in North America. Measured by cellular subscribers, analysts report that CDMA has the fastest percentage growth rate. Today, there are more than 110 million CDMA subscribers worldwide. CDMA has long term potential to change the direction of telecommunications. It is conveniently similar to the way in which data networking functions. CDMA is paving the way for the telecom industry to move toward a model in which data plays a much more significant role.

### **CDMA Network Providers in North America**

#### Verizon Wireless

- Operates the largest of all digital networks
- Serves a majority of cities and communities in the US
- Provides service in all 50 states
- Approximately 18 million customers today
- Operates at both 800MHz and 1900MHz

#### Sprint Wireless

- Operates at 1900MHz
- Serves over 8,000 cities and communities in the US
- Provides service in all 50 states
- Approximately 11 million customers today

#### Alltel Wireless

- Operates at 800MHz CDMA and 800MHz Analog
- Serves over 1,500 cities and communities in the US

### **Equipment Manufacturers**

Qualcomm pioneered the development of CDMA technology, and holds many of the essential patents needed to build CDMA based devices. Infrastructure equipment manufacturers that provide CDMA systems include Nortel Networks, Lucent, Motorola, and Ericsson (through its acquisition of Qualcomm's infrastructure business).

### **Data Deployment and Services**

The CDMA specifications provide for both voice and data capabilities. To date, however, the primary focus of infrastructure equipment manufacturers and service providers deploying CDMA has been to deploy voice services to improve capacity and quality for their voice subscribers. A full roll out of data deployment momentum and service

availability is expected to increase significantly.

### **Data Capabilities**

CDMA specifications provide for three types of data services: short message service (SMS), circuit switched data, and packet switched data. SMS provides two-way pager-like functionality, allowing short text messages to be sent, received, and acknowledged. Circuit-switched data allows dialup modem connections over the cellular network. Circuit-switched support will initially be available at speeds up to 14.4 Kbps. Packet-switched data will provide Internet Protocol connectivity, initially at speeds of 14.4 Kbps, increasing to 2 Mbps in coming years. As of September 1, 2001 the providers are using circuit switch data for CDMA connectivity and the Analog side of the System for Analog data. Qualcomm states that IS-95B is backwards compliant for the upcoming packet data protocol. In other parts of the world, including Japan, Korea, China, Australia, New Zealand, and some parts of South America, CDMA networks have been deployed. Today, these networks use the IS-95A / IS-95B protocols.

### **Wireless Data Modems**

Dataremote Wireless data modems will support circuit-switched data and packet-switched data as well as SMS messaging. Packet-switched connectivity will appear LAN-like: always on, always connected. Mobile and remote data communications, including Internet and intranet access, are the primary applications of wireless data modems, while voice capabilities may add some secondary utility. For more information on CDMA, visit the CDMA Development Group website at [www.cdg.org](http://www.cdg.org)

### **SAFETY PRECAUTIONS FOR THE USER**

The following notes are for OEM's who incorporate the CDS-902X series modem and applications based on the CDS-902X modem into their final product. These safety precautions must be incorporated into the instruction manual supplied to the end user.

#### **Electrical Safety**

The lowest input voltage that can be applied to the CDS-902X is 10.5 VDC; the highest voltage that can be applied is 18 VDC.

#### **Aircraft Safety**

Cellular modems can interfere with an aircraft's navigation system. Use of CDS-902X modem on board an aircraft is forbidden by federal law.

#### **Safety on the Road**

- It is not permitted to signal incoming calls by sounding the vehicle's horn or flashing the lights.
- In case of emergency, use the hands-free option to speak only if it does not divert the driver's attention from the road conditions.
- Let the person you are speaking to know that you are driving. If necessary, suspend the call in heavy traffic or in hazardous weather conditions.
- Do not take notes or look up phone numbers while driving.
- Turn off your phone in dangerous areas such as fueling stations, areas where

concentrations of grain or dust are present, or areas where blasting operations are taking place or warning signs are posted.

- Dial sensibly and assess traffic situations. If at all possible, place calls when not moving or prior to entering traffic.
- Do not engage in stressful or emotional conversations that are distracting.
- Use your wireless phone to call for help for yourself or to help others in emergency situations.

### **Electronics in Medical Equipment**

Radio transmitters, including cellular phones, can interfere with the operation of inadequately protected medical devices. Address all questions to a physician or to the manufacturer of the medical device.

### **Precautions in the Event of Loss/Theft of the CDS-902X**

If the CDS-902X Modem is missing, notify the cellular network operator immediately in order to prevent misuse.

## **CDS-9020 FEATURES**

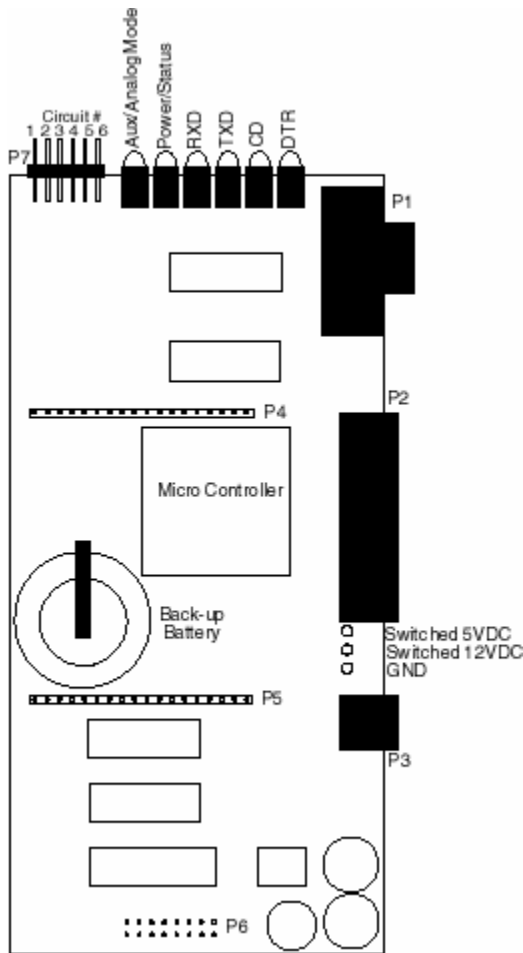
### **CDS-9020 Standard Features**

- Standard DB-9 female, RS-232C interface (DCE)
- RS-232 modem block DCE connector for wire attachment
- Auto answer/auto dial
- Real time clock (supports polling)
- User-programmable on site
- Site name/ID number
- Call progress monitor for trouble-free cellular calls
- Cellular/PCS network monitoring
- Polling windows to reduce power consumption
- Remote DCE COM settings (baud rate)
- Antenna connector: TNC style 50 Ohm female
- Hayes AT-Commands
- Reboots automatically if a problem is detected
- Remotely programmable (windows, alarm number, AT-String, NAM/phone number, baud rate, time and site ID)
- 9.5-18 VDC input voltage range
- Low voltage shutoff (Shuts down if voltage drops to 9.3 VDC; turns back on when voltage reaches 10.5 VDC.) Note: this feature is for solar/battery and telemetry applications to prevent full discharge of battery.

### **Optional Features**

- Analog modem module
- GPS module
- Second RS-232 port with 512kb or one megabyte of memory and 6 control outputs
- Programming of I/O ports
- Antennas for various applications
- Solar panel systems
- NEMA-4x (all-weather) enclosure
- 12 VDC power supplies
- Host modems, cellular ready

## CDS-902X Layout (Fig. 1)



### Connector Assignments

- P1 – RS-232 DB-9 female standard DCE port (use any straight through cable)
- P2 - RS-232 terminal block (you cannot use P1 & P2 at the same time)
- P3 - Input power connector, 10.5 to 18VDC (2 position terminal block)
- P4 & P5 - Analog Modem option header
- P6 – Bus connection to radio module
- P7 - Cry-out alarm activation input, voice dial input, Data call input and SMS or alarm input.

### LED Functions

- D1 – Data Terminal Ready (DTR)
- D2 – Carrier Detect (CD)
- D3 – Transmit Data (TXD)
- D4 – Receive Data (RXD)
- D5 – Power/Status Indicates mode: digital, analog, or no signal:
  - 1 blink/sec= CDMA mode with CDMA data available
  - 2 blinks/sec= CDMA voice mode only, no CDMA data available
  - 3 blinks/sec= Analog mode only
  - 4 blinks/sec or solid = No service detected
- D6 – Operational mode: Forced analog/Aux.

### P2 Connections

- 1 – Signal Ground
- 2 - TXD
- 3 - RXD
- 4 - RTS
- 5 - CTS
- 6 - DSR
- 7 - DTR
- 8 – Carrier Detect

### SWITCHED VOLTAGE ACCESS (solder connections)

- 1 - Switched 5VDC out 1.5A max.
- 2 - Switched 12VDC out 1.5A max.
- 3 – GND

### P3 Connections

- 1 - +12 VDC nominal
- 2 - power supply GND

### Current Requirements

	Transmit (worst case)	idle	sleep mode
CDS-9020 =	800 mA	23 mA	1.2mA
CDS-9022 =	1.5 A	23 mA	1.2mA
CDS-905X =	2.0 A	250 mA	1.2mA

### P1 Connection

- Female DB-9 standard RS-232 DCE connection
  - Modem I/O to DTE device
  - Programming input, Etc.

### P7 Connections

- 6-station header for cry-out alarm activation (circuit 3), outbound voice dial input (circuit 2), outbound data call input (circuit 1), SMS/alarm input (circuit 3), and other programmable I/O. See Pg. 41

## SPECIFICATIONS

### Physical

CDS-902X measures 3.2" W x 2.75" H x 6" L.

CDS-902X with power supply mounted in a weatherproof NEMA-4X enclosure measures 6" W x 8" H x 4.5" D.

### Cellular Transceiver 800MHz

Transmission frequency	824 to 848.970MHz
Reception frequency	869 to 893.970MHz
RF digital output power	CDMA 200 mW to 600 mW
RF analog output power	AMPS 600 mW
Vocoder	8 to 16 kbps and EVRC
Modulation/demodulation	Voice: PM with COPANDER Data: FM
Antenna impedance	50 OHM
Antenna connector	External Mini TNC

### CDMA 800 and 1.9GHz/Analog Modem

Error correction/compression	MNP 10 EC, TX-CELL and V.42/V.42 bis
Cellular throughput	Up to 16,000 bps
Serial interface	Buffered EIA RS-232C (DB-9 or terminal block)
Flow control	XON/XOFF, RTS/CTS or HP ENQ/ACK
Modulation techniques	CCITT V.32 bis (14.400 bps) CCITT V.32 (9600 bps) CCITT V.22 bis (2400 bps) CCITT V.22 (1200 bps) CCITT V.21 (300 bps) BELL 212A (1200 bps)

### CDMA PCS 1.9GHz

Current	680 mA max
Transmitter power	200 mW
Transmit	1850 to 1.910GHz
Receive	1930 to 1.990GHz
Channel spacing	50 kHz
Frequency stability	±1.0 ppm

### Power Consumption

Standby current, window on	25 mA
Quiescent standby, window off	3.2 mA
Online transmit current (transmitting data)	210 to 680 mA (the greater the signal level, the less current drawn; the lower the signal level, the more current drawn)

### Temperature

Operational range	-30° C to 60° C (-22° F to +140° F)
Humidity	95%, non-condensing

## GETTING STARTED

Inspect shipment for damage and to be sure package was shipped complete. Please contact Dataremote, Inc. within 15 days for any damage or components that may be missing.

### Standard Package Contents

1. CDS-902X CDMA modem (mounted in powder-coated box with mounting holes)
2. TNC flexible right angle or mini-mag type antenna
3. RS-232 programming cable
4. Modem software (Terminal Program) used for setting up configuration menu
5. User manual
6. Two terminal blocks (2 position for power, 8 position for RS-232)



## CELLULAR / PCS DATA SERVICE SETUP OR DIGITAL / PCS MODEM / PHONE ACTIVATION

**You will need to ascertain the following data prior to calling your Cellular Provider for activation:**

1. Name of the CDMA carrier in the area where the modem will be used. Verizon Wireless and Sprint PCS are the two largest CDMA carriers/providers. Both have CDMA and analog technologies on their systems and between the two, have coverage exceeding 97 percent of the United States.
2. Identify the frequency band of the chosen carrier. Sprint Wireless: 1.9GHz (PCS); Verizon Wireless: 800MHz or 1.9 GHz.
3. Locate the ESN (Electronic Serial Number) and the FCC ID# (RF deck type) of the CDS-902X unit. These numbers will be found on the unit label. *You will need to give this information to your provider.* Each piece of cellular/PCS equipment has its own unique ESN. CDS-902X uses a Qualcomm radio module built by Kyocera, with the ESN prefix of 159, 179 or 254.
4. Area code desired.
5. Local prefix, to ensure that calls will not be billed at a long distance rate, even if the phone is used outside the local calling area.

### **What to Ask your Cellular Provider**

1. What is the provider's SID (System I.D.) number?
2. What is the system Select or preferred service? The choices being Automatic, A auto, B auto, A only, B only, and no roaming.
3. If you intend to use a pre-paid or calling card account, check with your provider to see if you will have access to "Data Only" capability, as it is required.
4. Note: DataRemote will need to load a PRL file (Preferred Roaming List) in the Modem. DataRemote does have PRL files for most major U.S. wireless providers. If you are going to be roaming, and DataRemote does not have the carriers PRL file, it's a good idea to ask your provider for their PRL file. Be sure to ask DataRemote to load the desired Wireless Carrier PRL file when ordering.

### **What to tell your Cellular Provider that you do not want!**

1. *No voice mail*
2. *No caller I.D.*
3. *No three-way calling*

### **CONNECTING TO THE CDS-902X AND LOCAL CONFIGURATION MENU PROGRAMMING**

1. Plug power into P3 (12 VDC nominal. See Fig. 1, p. 9)
2. On initial power up, the CDS-902X LED's will blink.
3. The CDS-902X has completed the boot-up procedure (approximately 20-30 seconds) when the DTR (if DTR is active) LED is on, the blinking PWR/Status LED is flashing, and the TX and RX LED's are blinking every couple of seconds.
4. Turn on your computer or laptop.
5. Connect the DB-9 RS-232 cable to your computer or laptop.
6. Launch a terminal program. (Supplied terminal program, HyperTerminal, ProComm, etc.)
7. Select the correct COM port in software (COM 1 in most settings).
8. Set baud rate to 19200 bps (default for CDS-902X series). Note: if setting is changed, DTE must be set to same baud rate speed as the previous configuration of the CDS-902X.
9. Press CTRL-W three times quickly. (Hold down Control key and press W three times within one to two seconds.)
10. The Configuration Menu will display. To check for proper communication between the CDS-902X and your host computer, type ATI3. You should see "ERROR" on the host display. If there is no response, check that the DTR LED is illuminated verifying that you are connected to the correct COM port on the host.

## EXAMPLE: CDS-902x CONFIGURATION MENU

\*\*\*\*\* CONFIGURATION MENU Tri-M \*\*\*\*\*

A Set Receive Window 1 00:00 to 00:00  
B Set Receive Window 2 00:00 to 00:00  
C Set Receive Window 3 00:00 to 00:00  
D Set Receive Window 4 00:00 to 00:00  
E Set Time: 00:05:46  
F Reprogram Telephone Information  
G Display Signal Strength  
H Remote Comms Baud Rate: 19200  
I Program Alarm Number:  
J Modem Init:  
K Site Name: 9025\_A\_C  
L Auto Answer Mode: ON  
M Max Call Time: 20  
N Exit to Terminal Mode

Battery voltage: 12.9 Phone #: xxxxxxxxxx System ID: 2  
Select Option:

### Programming the Phone Number

1. Set-up your CDS-902X as previously described on page 12.
2. When the Configuration Menu displays, select Option "F", Reprogram Telephone Information.
3. The Programming menu will now display. (see below)
4. Select option "A", Mobile Phone Number and press enter.
5. Enter the phone number including area code and press enter.
6. Answer, "yes" to 'Are you sure'.
7. Select option "I" to program the phone.
8. Select option "J" to return to the main menu.
9. Assure that Auto Answer Mode, option "L", in the Configuration Menu is turned "ON" before proceeding or the CDS-902X will not answer when called in the next section.

### Example: Programming Menu

\*\*\*\*\* PROGRAMMING MENU \*\*\*\*\*

Equipment Serial Number: 17903349157  
A. Mobile Phone Number: 8053906754  
B. CDMA System ID: 2  
C. AMPS System ID: 2  
D. Slot Cycle Index: 1  
E. Preferred Mode Automatic  
F. Preferred Service Automatic  
G. PRL Enable ON  
H. Dial \*18 every 4 hours: OFF  
I. Program Phone  
J. Return to Main Menu

Select Option

Note: Options B and C are normally set the same and are usually the CDMA SID. Check with your

provider.

### **Dialing Into The CDS-902x Programming Menu**

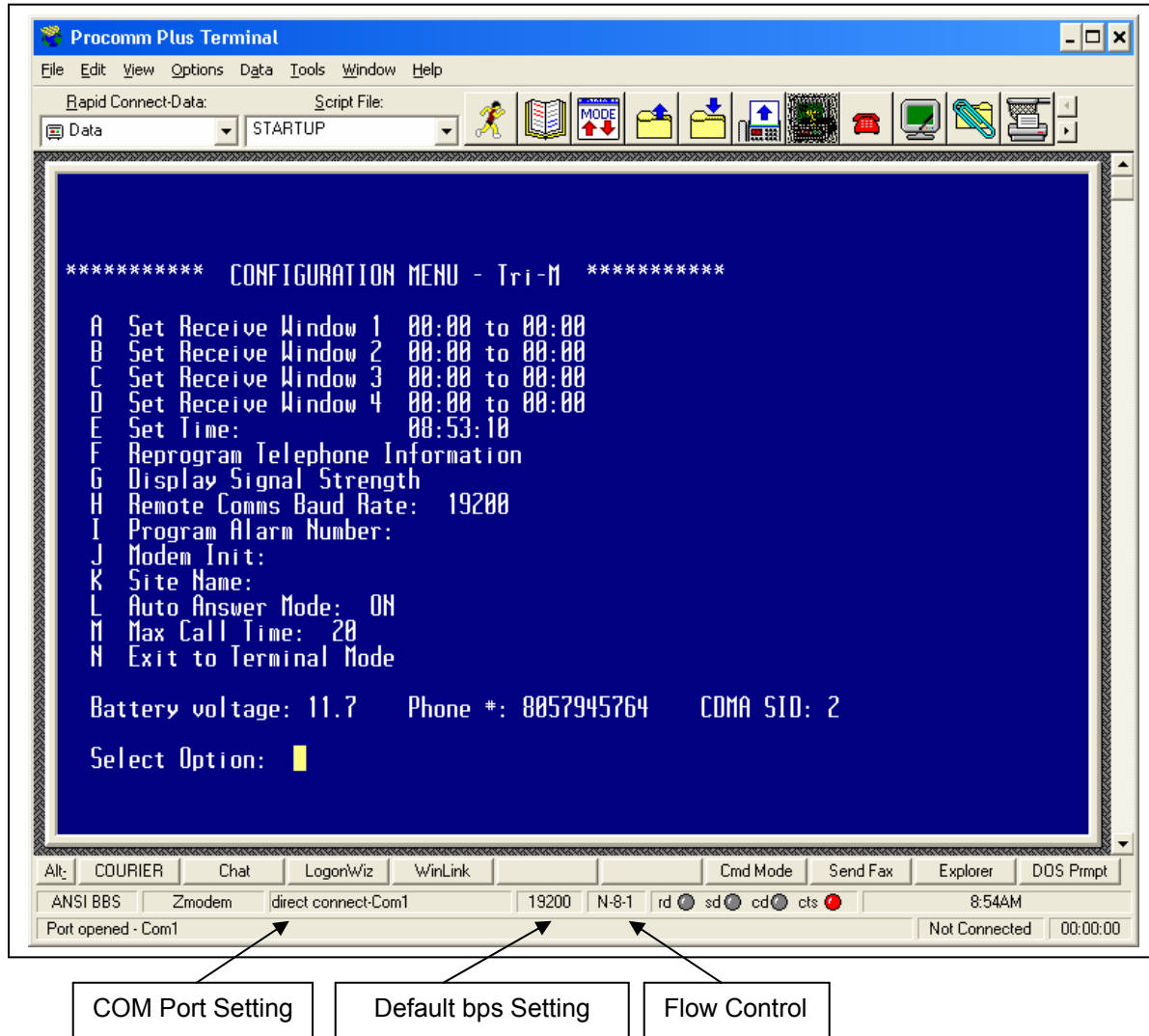
Note: Before dialing into the CDS-902X programming menu, a phone number and valid system I.D. number must be programmed into the unit and your wireless provider must activate the modem.

1. Launch a Terminal Program from your host computer connected to a Hayes compatible modem.
2. Set up the terminal program to dial the CDS-902X. Set the baud rate (19,200bps default), COM port, parity (None), and flow control (8,1).
3. Type AT into the terminal software.
4. The modem will respond OK.
3. Clear the buffer in host modem before dialing
4. Type AT&F, Enter.
5. To dial into the CDS-9020, use the standard ATDT command. (ATDTXXXXXXX)
6. After the CONNECT message displays or CD goes high; enter CTRL-W three times within 2 seconds.
7. Main configuration menu will display.
8. Choose an Option or press Option "N" to exit the menu and go back to your DTE device.

Notes: You can press CTRL-W to disconnect the TXD and RXD from DTE device and talk directly to CDS-9020 controller.

While you are in the configuration menu, you can hit return key at any time to return back to the previous page or enter "X" to exit the Configuration Menu.

Setup Screen for Local Dialing (FIG. 2)



### Displaying Signal Strength

For local or remote connections, follow the steps below:

1. Enter configuration menu locally or remotely. (See above)
2. Press Option G.
3. After a few seconds, signal strength will display on the screen. (Example: RSSI, Error Rate = 21, 99. The first reading is the signal strength. The maximum signal strength reading is 31, error rate is always 99). Signal strength of 15 or higher is functional. If the signal strength is lower than 15, an optional Dataremote high gain antenna may be installed to increase the received signal strength. Visit [www.dataremote.com](http://www.dataremote.com) to view antenna options.

## Example of RSSI

Received Signal Strength Indicator (RSSI)

No signal=0, Maximum signal=31

RSSI, Error rate: 31, 99

CDS-9025, Rev 3.6C\_W 10/28/02

Copyright 2000,1,2 Dataremote, Inc.

Press a key to continue.

## Local COM PORT Baud Rate Setup:

1. Enter configuration menu locally or remotely.
2. Press Option H.

The CDS-902X DCE speed is defaulted at 19,200 bps; therefore the (CDS-902X) DCE speed must be matched to the DTE speed.

If the DTE device (RTU, PLC, PC, data logger, etc.) communicates at 28,800 bps or some other speed above 19,200 bps, its speed must be lowered to 19,200 bps.

If the DTE device communicates at 9600 bps, the CDS-9020's speed must be matched to the DTE and lowered to 9600 bps

**Note:** Assure that the DTE (RTU, PLC, Traffic Counter, etc.) is set to the same baud rate as that of the CDS-902X. If the baud rates do not match, the units will not be able to communicate with one another.

**Do not change speed unless DTE and DCE baud rates are fully understood.**

## Example of Option H

Current baud rate is: 19200

1. 1200 bps
2. 2400 bps
3. 4800 bps
4. 9600 bps
5. 19200 bps (default)
6. 1200,7,E,1 bps
7. 2400,7,E,1 bps
8. C1200 bps CDMA

Select Option: 6

New baud rate is: C1200,7,E,1

Are you sure? (Y or N): y

Baud rate has been RESET

Press a key to continue.

+++

When the setup option is complete, the display will return to the main menu.

Enter "N" to exit main configuration menu.

Don't forget to change the corresponding baud rate of your DTE to match the newly programmed value.

Note: When modem is set to "7,E,1", you must use "ATH" (CAPS) to hang up a call.

### **Programming Alarm Number**

This option is for cry out alarms controlled by the CDS-902X. It can be programmed to call the host computer to report any alarm conditions. (P7, circuit 1)

### **Exiting From the Configuration Menu**

Enter Option "N" or enter "X" and wait for the screen to go blank. (Entering the letter X will exit from any menu).

Hang up the Telco Line by entering +++ATH (or Drop DTR).

Note: If there is no activity in the configuration menu for five minutes, the CDS-902X will hang up or and reset into Data mode/Command Mode automatically.

### **CUSTOM OPTIONAL FEATURES**

Dataremote digital inputs or outputs can be utilized for many different alarms such as send an e-mail, SMS message, Voice message, Alarm Cry-out, etc. We can also support up to 12 I/O, add an additional COM port and store data into memory for data logging by using the DRM-9021 add on module.

Contact Dataremote for custom application information.

### **CDS-902X MODEM INITIAL STRING SETUP**

Note: For analog connections using the CDS-9022, please see the CDS-9022 User Guide.

The factory default settings leave the Modem Initial String blank.

### **Customizing Modem Initialization String if Required**

For local connections: (Contact DataRemote technical support for remote connections)

1. Test initialization string in the terminal mode (blank screen) to check for errors prior to entering it into the configuration by typing in the desired init string and pressing enter. If the init string is correct the response will be "OK", if there is an error the response will be "ERROR".
2. To enter configuration locally selection option "J" (Modem initialize)
3. At the prompt, enter the AT-String.
4. To correct an error in typing press ESC or ENTER and begin again. *Do NOT use the backspace key.*
5. Press ENTER.
6. When you exit to the configuration menu, the new string will be sent to the modem chipset.

### **Example:**

1. Select Option "J".
2. Enter the NEW modem initialization string (50 characters max): (a semicolon (;) is used after every new command in the string)
3. Press ENTER. The configuration menu will appear with the new AT-String.

**Note: When typing in the Initial String remotely or locally, DO NOT BACK SPACE. Press ESC or ENTER to start over.**

## Site Name

This option is not required to complete the setup, however it is convenient for keeping track of remote sites.

### Steps for Customizing the Site Name (for local or remote connections)

1. Enter the configuration menu locally or remotely.
2. Select Option "K".
3. At the prompt, enter a site name.  
*To correct an error, press ESC or ENTER and begin again. Do NOT use the backspace bar.*  
Type in lower case or upper case, 12 characters maximum. If more than 12 characters are entered, INVALID ENTRY will display. (See example below.)
4. Press ENTER.
5. Main menu will refresh and display site name.

### Example of an invalid entry

1. Enter new site name.
2. Key in Dataremote, Inc. (This is in excess of 12 chars. max.)
3. Display indicates INVALID ENTRY.
4. Press any key to continue.

### Auto Answer Mode Setup

Auto answer comes from the factory in the ON position. Some host software prefers to answer calls personally, but if the DTE device requires that the modem answer the call this option may be turned on. When the CDS-902X rings, the word RING prints out on terminal program screen. The CDS-902X automatically answers after the sixth ring when auto answer is disabled and on the second or third ring when it is enabled.

1. Enter the configuration menu.
2. Select Option "L".
3. New Auto Answer mode is ON.
4. At Y/N prompt, press Y to accept.

Note: The Hayes AT-COMMAND ATSO=1 does not function with the CDS-902X. This command must be setup in the configuration menu as a default if auto answer is off.

## **CLOCK AND RECEIVE WINDOWS SETUP**

### **Why Set Up Receive Windows?**

If the CDS-902X is running from a battery source, it is advisable to maximize the battery life. This is done by setting up Receive or Polling windows. Four individual windows are available. You can choose to set up from 0-4 time periods that the CDS-902X can be polled. Determine the times of day when the CDS-9020 will be called, and set the polling windows to correspond with those times.

For example, if the CDS-9020 is used for billing collections and will never be polled between the hours of 11:00 A.M. and midnight, the CDS-9020 can be turned off to conserve power during this period. Thus, the CDS-9020 will only be able to receive calls between 24:01 a.m. and 10:59 a.m.

If the DTE device has the capability of dialing into the host, the CDS-902X may call out, since it is always searching for activity on the RS-232 lines. If an ATDT string is sent to the CDS-902X during a power down cycle or window, (sleep mode), it will activate and report the alarm or communicate its data.

### **Programming the Clock**

Clock must be programmed before time windows are programmed.

1. Enter the configuration menu locally or remotely.
2. Select Option "E" and follow the prompts.
3. Current time is HH:MM:SS (The current time setting will be displayed)
4. Enter new time in military time (HH:MM): Note: Time must be programmed in military time (24-hour clock).

### **Receive (Start/Stop Time) Windows Setup**

It is important to know what time the unit is to be active, since once programmed, it can only be called during the preset window time. The CDS-902X features four start/stop windows so that more than one start/stop time can be programmed.

1. Enter the configuration menu locally or remotely.
2. Press Option A.
3. Follow the prompts.

### **Sample Configuration Menu:**

\*\*\*\*\* CONFIGURATION MENU \*\*\*\*\*

- A Set Receive Window 1 00:00 to 00:00
- B Set Receive Window 2 00:00 to 00:00
- C Set Receive Window 3 00:00 to 00:00
- D Set Receive Window 4 00:00 to 00:00
- E Set Time: 00:05:46
- F Reprogram Telephone Information
- G Display Signal Strength
- H Remote Comms Baud Rate: 19200
- I Program Alarm Number:
- J Modem Init:

K Site Name:  
L Auto Answer Mode: ON  
M Max Call Time: 20  
N Exit to Terminal Mode  
Battery voltage: 12.9 Phone #: xxxxxxxxxx System ID: 2  
Select Option: A

Window 1 start time is 00:00.  
Enter new time in military time (HH:MM): 23:59 (Unit activates at midnight.)

Window 1 stop time is 00:00.  
Enter new time in military time (HH:MM): 11:00 (Unit shuts down at 11:00 a.m.)

### **Sample Configuration Menu after Receive Window 1 change**

\*\*\*\*\* CONFIGURATION MENU \*\*\*\*\*

A Set Receive Window 1 23:59 to 11:00  
B Set Receive Window 2 00:00 to 00:00  
C Set Receive Window 3 00:00 to 00:00  
D Set Receive Window 4 00:00 to 00:00  
E Set Time: 00:05:46  
F Reprogram Telephone Information  
G Display Signal Strength  
H Remote Comms Baud Rate: 19200  
I Program Alarm Number:  
J Modem Init:  
K Site Name:  
L Auto Answer Mode: ON  
M Max Call Time: 20  
N Exit to Terminal Mode  
Battery voltage: 12.9 Phone #: xxxxxxxxxx System ID: 2  
Select Option:

### **REMOTE PROGRAMMING NOTES**

#### **Remote Programming of Cellular Phone Number**

Be extremely cautious when programming this option remotely. The site can be hundreds of miles from your location. **If this option is set incorrectly, someone will have to travel to the remote site to make corrections.**

#### **Making the Remote Connection**

1. Enter the Terminal Program at the Host computer.
2. Enter ATDT XXXXXXXX (the current phone number)
3. CONNECT 19200 will display
4. The Configuration Menu will display
5. Select Option "F".
6. The Reprogram Telephone Information Menu will display as shown below.

## REPROGRAM TELEPHONE INFORMATION PROGRAMMING MENU

### Reprogram Telephone Information Programming Menu

Equipment Serial Number: 17903349157

A. Mobile Phone Number: 8053906754

B. CDMA System I.D.: 2

C. AMPS System ID: 2

D. Slot Cycle Index: 1

E. Preferred Mode: Automatic

F. Preferred Service: Automatic

G. PRL Enable: ON

H. Dial \*18 every 4 hours: OFF

I. Program Phone

J. Return to Main Menu

Select Option A

#### To change option A: Mobile Phone Number

1. Select option "A" to change the mobile phone number
2. At the prompt enter the new 10-digit phone number.
3. If the number entered is correct, select "I" (Program Phone)

#### To change options B and C: CDMA and AMPS System ID

1. Select option "B" and enter the CDMA SID as provided by the wireless provider.
2. Select option "C" and enter the AMPS SID as provided by the wireless provider.
3. After entries, select option "I" (Program Phone)

#### To change option D: Slot Cycle Index

1. Select option "D", you will be prompted to enter the new Slot Cycle 0-7
2. This option selects how often the RF transceiver communicates with the cell site to assure that the modem is able to communicate immediately when needed. 1 setting registers the ESN to the cell site approximately every 30 seconds, 0 setting never registers, and 7 is the longest interval. Set the Slot cycle index to 0 and option "H" to ON for solar and power conserving applications.
3. After entries, select option "I" (Program Phone)

#### To change option E: Preferred Mode

1. Select Option "E" to change preferred mode.
2. Press "E" repeatedly until desired selection displays. Choices are; Automatic, PCS CDMA only, Cellular CDMA only, CDMA ten Analog, Digital only, Analog then CDMA, and Analog only.
3. After proper selection, select "I" (Program Phone).

#### To change option F: Preferred Service

1. Select Option "F" to change preferred service.
2. Press "F" repeatedly until desired selection displays. Choices are; Automatic, A auto, B auto, A only, B only, and No Roaming. Your service provider can inform you of the appropriate choice.
3. After proper selection, select "I" (Program Phone).

### **To change option G: PRL enable**

1. Select option "G" to enable or disable the PRL. The selection will toggle with each press of option "G". The PRL may be disabled if the PRL file is incorrect as supplied, (You may use the DataRemote PRL Loader to install the desired PRL file, contact DataRemote technical support.) or to test inbound 800MHz analog calls, or if you are having difficulties connecting to your provider. This ability to disable the PRL is a good troubleshooting tool. Do **NOT** disable the PRL if you are using the modem in a PCS or 1900MHz environment or if the modem is in a mobile environment where it may travel out of the setup area.
2. After proper selection, select "I" (Program Phone).

### **To change option H: Dial \*18 every 4 hours**

1. Select option "H" to turn on or off the "Dial \*18 every 4 hours" option. The selection will toggle with each press of option "H". This option is used in place of option "D", Slot Cycle Index when the modem is used in solar applications or for power saving applications. Set option "D" to OFF when enabling this option.
2. After proper selection, select "I" (Program Phone).
3. Press "J" to return to the main menu.

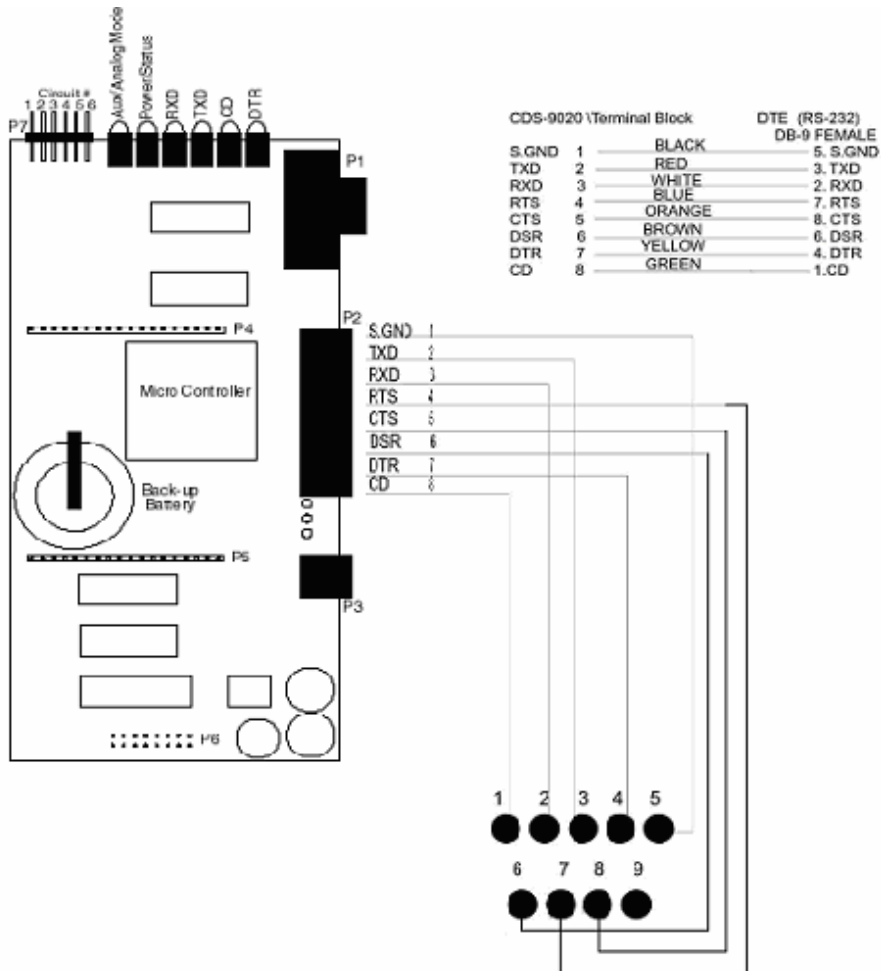
### **Disconnecting the Remote Connection**

Enter +++  
OK  
Enter AT#  
OK

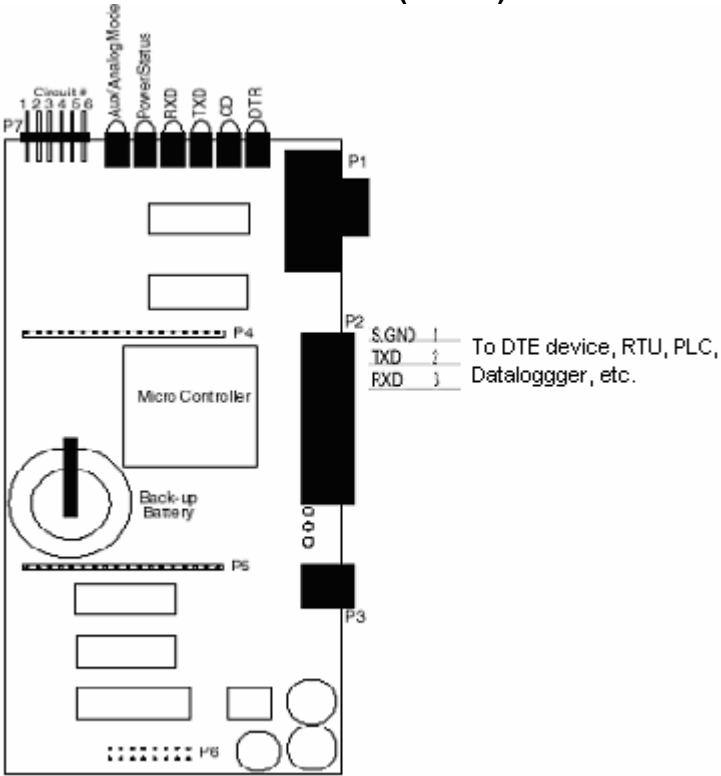
## RS-232 SETUP

For information about RS-232 characteristics, see RS-232 Signals Functional Description, pg. 32.

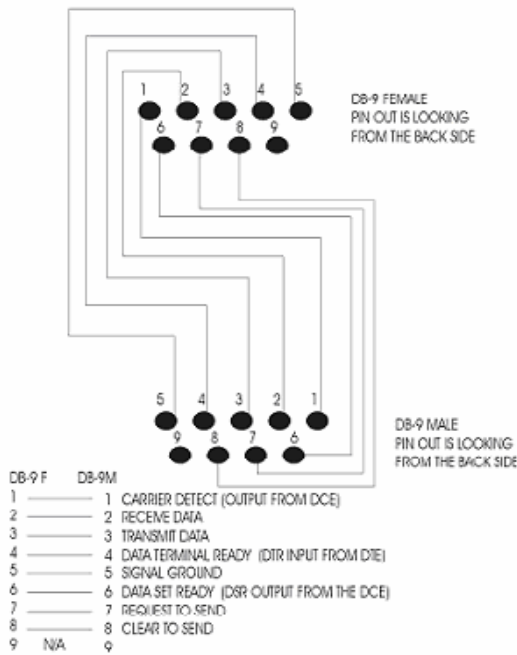
### CDS-9020 DB-9 Female to Terminal Block Connections (Fig. 3)



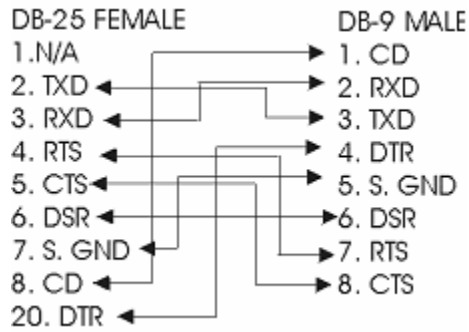
### 3-Wire RS-232 Connection (FIG. 4)



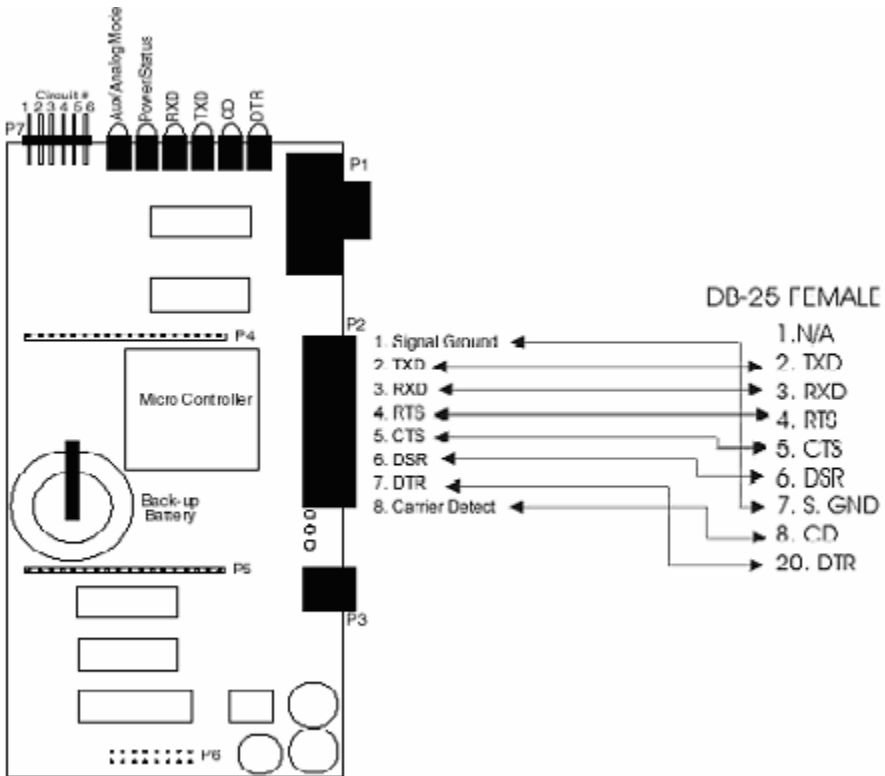
### CDS-902X Programming & Modem Cable (FIG. 5)



**CDS-902X DB-9 to DB-25 Female (FIG. 6)**



**CDS-902X Terminal Block to DB-25 Female (FIG. 7)**



## **HOST PC MODEM SETUP**

The CDS-9020 is a V.32 bis modem. (V.32 bis range is 1200 bps to 14,400 bps.) The host modem must be forced down to V.32 bis.

Although there many modem manufacturers, there are only a few modem chipset manufacturers. Many indicate they are Hayes compatible, but the same command from a USR modem, for example, may have a different result when used on a ZOOM modem.

Setting DTE speed to 14,400 bps may not be sufficient to force a V.90 modem to V.32 bis mode. The AT-Strings section of the manufacturer's manual will indicate how to force the modem to search/carrier for a v.32 bis mode only. This makes for a faster handshake and a much more reliable connection.

### **Generic AT-Strings for Host Modem**

The following procedure may not be necessary, but may make for a more reliable connection. The standard modem setup is usually sufficient. However, if the area that the unit is on fringe of the provider's coverage or the communication software package communicates remotely with meters or a DTE device, the following procedure must be added to the host modem setup procedure.

Courier V-Everything, USR models

```
AT&F1S54=192S56=192S58=33S34=7s27=16&W&W1
```

Rockwell or Conexant chipsets (Zoom, Best Data, Diamond and most WIN modems)

```
AT&W;+MS=V32,1,4600,14400, 9600, 14400;\N2;&W
```

Some newer modems you need to enter these commands separately or after each command enter (;)

```
Example: AT&W;+MS=V32,1,4600,14400, 9600, 14400;\N2;&W
```

See your host modem manual.

For older Rockwell chipsets use

```
AT&F+MS=9,1,4600,14400\N2&W
```

### **Host Modem Manufacturers**

All modems sold in the U.S. are required to have an FCC I.D. number, and it is stamped somewhere on the modem. To find the FCC I.D. on an internal modem, open the CPU and remove the modem card. There may be additional markings or a model number to indicate the identity of the manufacturer.

After finding the FCC I.D. number, access the FCC website ([www.fcc.gov](http://www.fcc.gov)) and enter the first three characters of the I.D. number to find the manufacturer.

Example: To find the manufacturer of the LT WinModem in the IBM Aptiva (2140-L61):

1. Turn off power.
2. Unplug AC cord.
3. Open cover.
3. Remove phone cable.
4. Remove screw holding modem card.
5. Remove modem card. On the back of the modem is an FCC I.D. sticker, which reads: DK4TAI-24427-M5-E.
6. Enter DK4 in first search field.
7. Manufacturer information received: GVC Corp., Taiwan
8. Additional information found:
  - DF-1156HV/R2B (GVC's model number and board revision number on component side).
  - LUCENT 1643 (Apollo) chip.
  - 3Com/USR Courier's FCC I.D. number begins with CJE. FCC query returned manufacturer's name: US Robotics Access Corp.

## **COMMAND REFERENCE**

### **Introduction to Commands**

The modem functions of the CDS-90XX are controlled using the same industry standard AT commands as those used to control landline modems. Knowledge of these commands is not required by most users, but is provided here for reference.

The parameters set by the various AT commands are remembered by the CDS-90XX, and are transmitted to the modem at the carrier's site each time a call is made. Settings will continue until the unit is powered down, and then are lost on power down.

The CDS-90XX also gives automatic support of all AT commands unknown to the modem, but that are supported by the cellular or PCS carrier. Since the carrier may charge for air time used for this connection, the phone's auto connect ability is disabled by default. (Use the AT+CXT command to enable auto connect.)

The modem has two operational states:

Command state (when accepting industry standard AT commands)

Online state (when instructed to dial out or answer a data call)

The "Asynchronous mode" is used to transfer information between two computers.

## CDS-90XX Cellular and PCS CDMA AT-Commands

(QUALCOMM PROPRIETARY COMMANDS)

### Default AT-String Profile:

AT&Y

&C: 2; &D: 2; &F: 0; E: 1; L: 0; M: 0; Q: 0; V: 1; X: 4; Z: 0; S0: 0  
S10: 14; S11: 95; S3: 13; S4: 10; S5: 8; S6: 2; S7: 50; S8: 2; S9: 6  
+FCLASS: 0; +CFG: ""; +FCC: 0,1,0,0,0,0,0,0; +FIS: 0,1,0,0,0,0,0,0  
+CDR: 0; +CDS: 0,1,2048,6; +CFC: 0; +CQD: 10; +CRC: 0; +CRM: 0; +CTA: 0  
+CXT: 0; +DR: 0; +DS: 3,0,2048,6; +EB: 1,0,30; +EFCS:1; +ER: 0  
+ES: 3,0,2; +ESR: 1; +ETBM: 1,1,20; +FAA: 0; +FAP: 0,0,0; +FBO:0  
+FBU: 0; +FCQ: 1,0; +FCR: 0; +FCT: 1E; +FEA: 0; +FFC: 0,0,0,0; +FHS: 0  
+FIE: 0; +FIP: 0; +FLI: ""; +FLO: 1; +FLP: 0; +FMS: 0; +FNR: 0,0,0,0  
+FNS: ""; +FPA: ""; +FPI: ""; +FPP: 0; +FPR: 8; +FPS: 1; +FPW: ""  
+FRQ: 0,0; +FRY: 0; +FSA: ""; +FSP: 0; +ICF: 3,3; +IFC: 2,2; +ILRR: 0

## CDS-9022 AT-Commands for Analog Data Calls

### Default AT-String Profile:

\*ATI3 (Note: the (\*) command is an extended AT-COMMAND. For more information about AT-COMMANDS for the CDS-9022 Dual Mode Modem, see the CDS-9022 user guide.)

V3.500-V34\_2M\_DLP

OK

at&v

ACTIVE PROFILE:

B1 E1 L1 M1 N0 Q0 T V1 W0 X4 Y0 &C1 &D2 &G0 &J0 &K3 &Q5 &R1 &S0 &T5 &X0 &Y0  
S00:000 S01:000 S02:043 S03:013 S04:010 S05:008 S06:002 S07:050 S08:002 S09:006  
S10:014 S11:095 S12:050 S18:000 S25:005 S26:001 S36:007 S38:020 S46:138 S48:007  
S95:000

STORED PROFILE 0:

B1 E1 L1 M1 N0 Q0 T V1 W0 X4 Y0 &C1 &D2 &G0 &J0 &K3 &Q5 &R1 &S0 &T5 &X0  
S00:000 S02:043 S06:002 S07:050 S08:002 S09:006 S10:014 S11:095 S12:050 S18:000  
S36:007 S40:104 S41:195 S46:138 S95:000

STORED PROFILE 1:

B1 E1 L1 M1 N0 Q0 T V1 W0 X4 Y0 &C1 &D2 &G3 &J0 &K3 &Q5 &R1 &S0 &T4 &X0  
S00:000 S02:043 S06:002 S07:050 S08:002 S09:006 S10:014 S11:095 S12:050 S18:000  
S36:007 S40:168 S41:195 S46:138 S95:000

TELEPHONE NUMBERS:

0= 1=  
2= 3=

## Qualcomm Proprietary Commands

### Command:

\$QCCNC=<value>

### Description:

Packet call behavior:

0: Enable IS-707 packet data.

1: Enable Quick Net Connect packet data.

\$QCPKND=<value>

Packet Auto Detect Behavior:

0: Do not bring up packet calls unless preceded by ATDT

#777.



## S-Registers

The value of an S-register may be set by using the syntax Sn=xxx where n is the register number and xxx is a decimal value. For example, to set the register S0 to 3, use the command S0=3. r1b reads register S0, therefore the command S0? is used.

Register:	Value:	Description:
S0	0	Disable automatic answering.
	[1 to 255]	Enable automatic answering after <i>After what?</i>
S3	13	Carriage Return character.
S4	10	Line Feed character.
S5	8	Backspace character.
S6	2 to 10	Pause before blind dialing.
	2	
S7	1 to 255	Number of seconds to establish end-to-end data connection.
	[50]	
S8	0 to 255	Number of seconds to pause when “,” is encountered.
	2	
[S9]	0 to 255	Carrier detect threshold in increments of 0.1 seconds.
	6	
S10	1 to 254	Number of tenths of a second from carrier loss to disconnect.
	[14]	
[S11]	50 to 255	DTMF tone duration and spacing in milliseconds.
	[95]	

## Basic Action Commands

Command:	Description:
A	Go off hook. Answer any incoming call.
D <dial string>	Dial. Dial string may contain the following characters: digits 0 to 9, *, #, A, B, C and D. Dial string may contain the following modifiers:
T	Tone dialing.
P	Pulse dialing.
,	Pause during dialing.
W	Wait for dial tone.
@	Wait for quiet answer.
!	Hook flash.
\$	Wait for billing tone (for credit card calls).
;	After dialing, phone remains in command state.
H0	Disconnect and return to command state.
00	Return to online data state from

## CDMA AT Parameter Commands

<b>Command:</b>	<b>Description:</b>
+CXT=<value>	Cellular Extension. 0 Do not pass unrecognized commands to the IWF. 1 When detecting an unrecognized AT command, open transport layer connection and pass unrecognized command to the IWF.
+CFG="<string>"	Configuration String. The string (up to and including the termination character) will be stored by the MT2 and sent to the base station prior to dialing. Each transmission of an AT+CFG command from the TE2 replaces the contents of the previous string. The string may contain up to 248 characters.
+CAD?	Query Analog or Digital Service. 0: if no service available. 1: if CDMA digital service available. 2: if TDMA digital service available. 3: if Analog service available. (Values 4-255 reserved.)
+CDR	Um Interface Data Compression Reporting. This extended format numeric parameter controls whether or not the extended format "+CDR:" intermediate result code is transmitted by the MT2. The result code is the same as for the TIA/EIA/IS-131 +DR: result code.
+CBIP?	Base station IP Address.
+CSS?	Read-only. Returns the base station's IP address. Serving System. Read-only. Returns <AB>, <SID>. AB: A: Mobile station is registered with an A-band system. B: Mobile station is registered with a B-band system. Z: Mobile station is not registered. SID: 0-16383: Mobile station is registered with the system indicated. 99999: Mobile station is not registered.
+CSQ?	Query Received Signal Quality. Returns the Signal Quality Measure <SQM> and the Frame Error Rate as follows: Signal Quality Measure <SQM>: 0-31 Signal Quality Measurement 99SQM is not known or is not detectable. All other values are reserved. Frame Error Rate: 0<0.01% 10.01% to less than 0.1%

	20.1% to less than 0.5%
	30.5% to less than 1.0%
	41.0% to less than 2.0%
	52.0% to less than 4.0%
	64.0% to less than 8.0%
	7?8.0%
	99 <FER> is not known or is not detectable.
	All other values are reserved.
+CFC=<value>	Um Interface Fax Compression.
	0: No compression
	1: V.42 bis compression with parameters as set by the +CDS command.
	2: Modified Read compression.

**Cellular AT-Commands for Packet Data Services**

Refer to Analog commands in CDS-9022 User Guide

<b>Command:</b>	<b>Description:</b>
+CTA=<value>	Set/Read/Test Um packet data inactivity timer. 0: Traffic Channel not released during inactivity periods. 1-255 Release the Traffic Channel after <value> one-second intervals have elapsed since last sending or receiving RLP data frames on the Um interface. 20 (default)
+CPTC =<value>	0: Release Traffic Channel 1: Originate Traffic Channel

**CDMA AT-Command for DTE devices that will not handle packet data**

AT+DS=0,1,512,6

## RS-232 CHARACTERISTICS

### RS-232 signals functional description

The first letter of the EIA signal name categorizes the signal into one of five groups, each representing a different “circuit”:

- A: Ground
- B: Data
- C: Control
- D: Timing
- E: Secondary channel

#### Pin 1. Protective Ground:

Name: AA  
Direction: --  
CCITT: 101

This pin is usually connected to the frame of one of the devices, either the DCE or the DTE, which is properly grounded. The sole purpose of the connection is to protect against accidental electric shock and usually this pin should not be tied to the Signal Ground.

This pin should connect the chassis (shields) of the two devices, but this connection is made only when the common connection of both chassis grounds is safe and is considered optional.

Ground loops are low impedance closed electric loops composed of ground conductors.

When two grounded devices are connected, for example by a RS-232 cable, the difference of potential of alternating current on the devices may induce an electric potential across the ends of the grounding conductor of the cable, either the Protective Ground or Signal Ground conductor, resulting in electric current flow across this line between the two pieces of equipment.

Since the loop’s impedance is low, this current can be quite high and easily burn out circuitry. Electrical storms can also cause a burst of destructive current across such a loop. Therefore, connection of the Protective Ground pin at both ends is potentially hazardous. Furthermore, not all signal grounds are necessarily isolated from the chassis ground, and using this ground path in an RS-232 interface, especially across a long distance, is unreliable and could be hazardous. Thirty meters is considered the maximum distance at which the grounding signals can be connected safely.

#### Pin 2. Transmit Data:

Name: BA  
Direction: DTE → DCE  
CCITT: 103

Serial data (primary) are sent on this line from the DTE to the DCE. The DTE holds this line at logic “1” when no data are being transmitted. A logic “0” condition must be present on the following signals, where implemented, before data can be transmitted on this line: CA (Request to Send), CB (Clear to Send), CC (Data Set Ready) and CD (Data Terminal Ready).

#### Pin 3. Receive Data:

Name: BB  
Direction: DTE ← DCE  
CCITT: 104

Serial data (primary) are sent on this line from the DCE to the DTE. This pin is held at logic 1 (Mark) when no data are being transmitted, and is held OFF for a brief interval after an ON to OFF transition on the Request to Send line, in order to allow the transmission to complete.

**Pin 4. Request to Send:**

Name: CA  
Direction: DTE → DCE  
CCITT: 105

Enables transmission circuits. The DTE uses this signal when it wants to transmit to the DCE. This signal, in combination with the Clear to Send signal, coordinates data transmission between the DTE and the DCE.

A logic 0 on this line keeps the DCE in transmit mode. The DCE will receive data from the DTE and transmit it on to the communication link.

The Request to Send and Clear to Send signals relate to a half-duplex telephone line, which is capable of carrying signals on both directions, but only one at a time. When the DTE has data to send, it raises Request to Send, then waits until the DCE changes from receive to transmit mode. This ON to OFF transition instructs the DCE to move to transmit mode. When a transmission is possible, the DCE sets Clear to Send and transmission can begin.

On a full duplex line, such as a hard-wired connection where transmission and reception can occur simultaneously, the Clear to Send and Request to Send signals are held to a constant ON level.

An ON to OFF transition on this line instructs the DCE to complete the transmission of data that is in progress, and to move to a receive (or no transmission) mode.

**Pin 5. Clear to Send:**

Name: CB  
Direction: DTE ← DCE  
CCITT: 106

An answer signal to the DTE. When this signal is active, it tells the DTE that it can now begin transmitting (on Transmitted Data line). When this signal is ON and the Request to Send, Data Set Ready and Data Terminal Ready are all ON, the DTE is assured that its data will be sent to the communications link. When OFF, it is an indication to the DTE that the DCE is not ready, therefore data should not be sent.

When the Data Set Ready and Data Terminal Ready signals are not implemented in a local connection, which does not involve the telephone network, the Clear to Send and Request to Send signals are sufficient to control data transmission.

**Pin 6. Data Set Ready:**

Name: CC  
Direction: DTE ← DCE  
CCITT: 107

On this line, the DCE tells the DTE that the communication channel is available. That is, in an automatic calling system, the DCE (modem) is not in the dial, test, or talk modes, and therefore is available for transmission or reception. This line reflects the status of the local data set and does not indicate that an actual link has been established with any remote data equipment.

**Pin 7. Signal Ground:**

Name: AB  
Direction: --  
CCITT: 102

This pin is the reference ground for all of the other signals, data and control.

**Pin 8. Receive Line Signal Detect or Data Carrier Detect:**

Name: CF  
Direction: DTE ← DCE  
CCITT: 109

The DCE uses this line to tell the DTE that a good signal is being received. Good signal means a good analog carrier, one that can ensure demodulation of received data.

**Signal Travel Direction**

The pin names are the same for the DCE and the DTE. Transmit Data (pin no. 2) is a transmit line on the DTE and a receive line on the DCE. Data Set Ready (pin no. 6) is a receive line on the DTE and a transmit line on the DCE. (See directional arrows, for each pin, above.)

**Electrical Signal Characteristics**

Voltage Levels as Defined in the Standard:

Data signals:	"0", "Space"	"1", "Mark"
Driver (required)	5 to 15	-5 to -1 Volts
Terminator (expected)	3 to 25	-3 to -2 Volts
Control signals:	"Off"	"On"
Driver (required)	-5 to -15	5 to 1 Volts
Terminator (expected)	-3 to -25	3 to 2 Volts

**DESIGNATION FOR THE 25-PIN AND 9-PIN DB CONNECTOR\* (Table 1)**

DB-25 Pin no.	DB-9 Pin no.	Common Name	EIA Name	CCITT	DTE-DCE	Formal Name	
1		FG	AA	101	--	Frame Ground	
2	3	TD	BA	103	→	Transmitted Data, TxD	
3	2	RD	BB	104	←	Received Data, RxD	
4	7	RTS	CA	105	→	Request to Send	
5	8	CTS	CB	106	←	Clear to Send	
6	6	DSR	CC	107	←	Data Set Ready	
7	5	SG	AB	102	--	Signal Ground, GND	
8	1	DCD	CF	109	←	Data Carrier Detect	
9	9						Not used

\*Includes equivalent CCITT V.24 identification and signal direction

## **TROUBLESHOOTING TIPS AND FAQ'S**

### **If the signal is weak, will data transmission slow down?**

Generally, the speed at which data moves is not affected by signal strength. However, there may be times when signal interference requires data to be re-sent, which will increase overall transfer time. Data transmission at the highest signal strength levels will be no faster than at lower levels.

### **How strong of a signal do I need to use CDS-902X Modem?**

A signal strength of 15 or greater will usually allow satisfactory communications and data transfer. (Refer to Signal Strength Measurement on Pg. 15)

### **How can I tell what's going on with my connection while my modem is operating?**

LED diagnostic indicators are provided for visual diagnostics and connection information with both the host and the wireless network. Refer to Pg. 9, LED functions.

### **Why will my computer say 'Connected at 19200 bps' when the CDS-902X is only capable of 14400 bps?**

When your computer reports a speed of 19200 bps, it is referring to the speed across the cable that connects your computer, data logger, RTU, DTE, etc. with your CDS-90XX (DCE). The speed between your CDS-902X and the Nationwide CDMA Network, and thus the overall system speed, is limited to 14400 bps.

### **When I type an AT-STRING using a Terminal program, the AT-STRING does not display after the unit is powered down then powered back up. Why?**

The CDS-90XX will only store an AT-string using the Config Menu option "J" (Modem Init). You can input up to 50 characters. Every time the unit powers up it sends this command to MSM3000 chip and in turn tells the IWF. If you're running the CDS-9022 Analog modem, it also gets updated.

### **Why do current requirements vary at different times and with different connections?**

Several factors can affect current requirements. Low signal strength will increase your current requirements because your modem must use more power to transmit and receive signals. Also, transmitting data uses more power than receiving data.

### **What are the current considerations for Solar Applications?**

The CDS-902x series modem will not exceed 53ma during idle time, (waiting for a call). The current requirements during normal data communications are 300ma to 650ma.

### **The CDS-90XX does not seem to be making or receiving calls. What should I do?**

Make sure you have adequate signal strength. Double check that auto-answer is ON in the Configuration Menu. Check the phone number settings. Call the wireless provider to make sure the phone number is active. Ask them to check the ESN to make sure it matches yours, and also get the System ID Number and make sure it is entered in the configuration menu correctly. Verify that the CDS-902X can dial-out by calling a phone number to see if it rings. (Use the ATDT command from a terminal program). If all of the above fail, refer to the AT commands below.

## **Other Tips – AT Commands for Trouble Shooting**

### **Type AT Command:**

**AT+CAD?** = 1 unit is registered to a CDMA provider

**AT+CAD?** = 3 unit is registered on a Analog Signal

**AT+CAD?** = 4 unit is out of range of provider or unit is not programmed correctly

### **AT+CSS?**

+CSS: 1,B,2

1 = Index slot 1 – 800MHz

B = Analog provider side

2 = What System ID you are roaming on or your SID.

### **AT+CSS?**

+CSS: 1,A,27

1 = Index slot 1 – 800MHz

A = Analog provider side (A = NON-WIRELINE IN MOST PARTS OF THE WORLD)

2 = What System ID you are roaming on or your SID.

## **For PCS System Analog Side Not Activated On System**

### **Example of an Activated PCS on 1900MHz HOME System**

#### **AT+CSS?**

+CSS: 2,A,4145

1 = Index slot 1 – 800MHz Dual mode goes into analog mode 800MHz (slot = 1)

A = Analog provider side (A = NON-WIRELINE IN MOST PARTS OF THE WORLD)

2 = What System ID your roaming on or your SID. (System ID it's roaming on)

## **Example of an Activated PCS on a 800MHz Provider**

#### **AT+CSS?**

+CSS: 1,B,2

(Check with your Wireless Provider if you are Roaming on another system.)

## **Example of a Non-Activated PCS on 1900MHz HOME System**

#### **AT+CSS?**

+CSS: 1,Z,99999

1 = Index slot 1 – 800MHz Dual mode goes into analog mode 800MHz (slot = 1)

A = Analog provider side (A = NON-WIRELINE IN MOST PARTS OF THE WORLD)

2 = What System ID your roaming on or your SID. (System ID it's roaming on)

99999 = The mobile station is not registered

99 = SQM is not known or is not detectable

Z = The Wireless provider is not recognizing you in the Switch

#### **AT+CSS?**

+CSS: 0,Z,99999

1 = Index slot 1 – 800MHz Dual mode goes into analog mode 800MHz (slot = 1)  
In Most Countries the 800 Index = 1. In the PCS/1900MHz = 1 to 9  
A = Analog provider side (A = NON-WIRELINE IN MOST PARTS OF THE WORLD)  
B = Wireline wireless network  
2 = What System ID you are roaming on or your HOME SID. (System ID it's roaming on)  
999999 = Not Activated

Note: WHEN INDEX SLOT is 0, you are not picking up any Wireless provider. Three things can cause this:

- PRL file is wrong or not disabled in the PROGRAMMING MENU. If the unit is not going to be roaming on other Wireless Providers, it should not care about the PRL. (This is up to the Wireless Provider. Some providers set their switch so that you have to have the correct file). Call Dataremote, Inc. We do have couple of good contacts that may help if you are having problems activating. Please feel free to call Dataremote for help.
- If the computer reports a speed of 19,200 bps, it is referring to the speed across the cable that connects the computer, data logger, RTU or other device with the CDS-902X. The speed between the CDS-902X and the Nationwide CDMA Network (thus the overall system speed) is limited to 14,400 bps.
- The CDS-9020 will store AT-Strings using configuration menu Option "J". Up to 50 characters can be entered at one time. Each time the unit powers up it sends this command to the MSM3000 chip.

## **SMS FOR THE CDS-902X and 905X SERIES**

To initiate from 1 to 20 SMS messages:

AT+CMGS=(enter e-mail address here), enter

This will switch the modem from data mode to SMS mode and enter the e-mail address. Note that after a 15 to 20 second pause, D6, the FAM MODE-AUX LED, will start blinking signifying that you have entered SMS mode and a > prompt will appear on the screen. At the < prompt enter the desired SMS message. The message length may be up to 170 characters/bytes long. This total includes the previously entered e-mail address.

After delivery of the SMS message you will see the prompt:

+CMGS:11  
OK

To send more messages re-enter:

AT+CMGS=<enter e-mail address or phone number here>  
<enter>

You can deliver up to 20 SMS messages in one session without going back to data

mode. After prolonged inactivity of approximately 120 seconds, the modem will automatically switch back to data mode. This transition normally takes about 20 seconds.

To leave the SMS mode and return to data mode, enter

AT, <enter>

There will be a 20 second delay during mode reset before you return to data mode and receive the OK prompt.

The following are the commands that may be used in conjunction with SMS. They are based on the standard GSM command set.

+CMGD Delete message from storage

```
AT+CMGD=<index><CR>
```

This command deletes the stored message at location <index>. Note that the index values change whenever a new message is received, sent or deleted. A valid way to perform a series of deletes is to delete the highest numbered index first.

+CMGL Read several messages from storage

```
AT+CMGL=<stat><CR>
```

```
+CMGL: <index>,<stat>,<oa/da>,,<scts><CR><LF>  
<data><CR><LF>[...]
```

This command will read back all messages in storage that match the <stat> parameter. Response will be generated for each stored message.

+CMGR Read a single message from storage

```
AT+CMGR=<index><CR>
```

```
+CMGR: <index>,<stat>,<oa/da>,,<scts><CR><LF><data><CR><LF>
```

This command reads back the message at location <index>.

+CMGS Send a message (directly)

```
AT+CMGS=<da><CR>  
><data><^Z/ESC>
```

This command sends the message <data> to the telephone number or URL <da>.

+CMGW Write a message to storage

```
AT+CMGW<CR>  
><data><^Z/ESC>
```

```
+CMGW:<index>
```

This command stores the message <data>. No address <da> information is saved with the message.

+CMSS Send a message from storage

```
AT+CMSS=<index>,<da><CR>
```

This command sends the message stored at location <index> to the telephone number or URL <da>.

## SMS SYMBOLS

<index>	Storage location (1-30) 1-10: REC UNREAD and RED READ messages 11-20: STO SENT messages 21-30: STO UNSENT messages
<da>	Destination address Either a telephone number or internet URL
<oa>	Origin address Either a telephone number or internet URL
<scts>	Service center time stamp TIME/DATE
<data>	Message text content ASCII content terminated with any control character
<stat>	0 – Received unread message <u>CMGL</u> 1 – Received read message        “REC UNREAD” 2 – Stored unsent message        “REC READ” 3 – Stored send message         “STO UNSENT” 4 – All messages                  “STO SENT” “ALL”

## “FORCED” SMS MESSAGING / CRY-OUT ALARMS

To enter SMS data for remote “forced” message transmission follow the following procedure:

- Enter the configuration menu (Type control-WWW within 2 seconds)
- Select option “1” (Program Alarm Number)
- Enter “0” to disable the alarm
- Enter the new alarm number: (the e-mail address) (up to 58 characters maximum)
- Select option “K” (Site Name)
- Enter SMS message (up to 74 characters maximum)
- Enter option “O” to exit the terminal mode

When P7, the I/O connector, circuit “3” is momentarily shorted for at least 2 seconds, the modem automatically switches to SMS mode and delivers the message, and then switches back to data mode. Please note that there are time durations of approximately 20 seconds that occur while switching from data to SMS modes and back again. (Refer to figure 8)

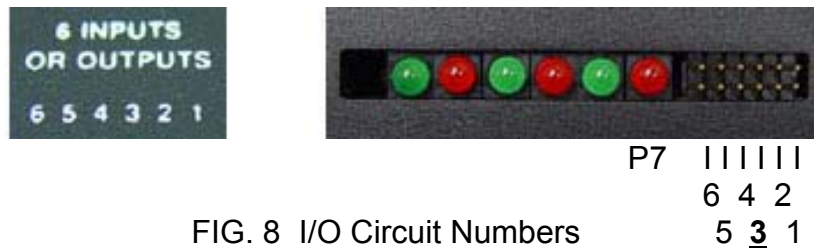


FIG. 8 I/O Circuit Numbers

- Circuit 1.... Outbound Data Call Input, continuous contact closure for duration of call
- Circuit 2.... Outbound Voice Dial Input, momentary contact closure to initiate and hang-up call
- Circuit 3.... SMS / Alarm Input, continuous contact closure for duration of call
- Circuit 4-6.... Reserved for DRIP Command set in conjunction with DRM-9021 memory module.

**ALARM CRY OUT**

The alarm function will dial out when circuit 3 is shorted on P7. After a connection has been established (CD high), the contact closure must remain throughout the entire call to maintain the connection. The call will be originated in the current connection mode: Digital, Analog or forced analog. There must be data in the “Alarm Phone Number” field to enable this function. (See figure 8)

**CUSTOM APPLICATIONS FOR I/O OR MEMORY STORAGE**

For any Custom applications for I/O or memory storing data please call or see the DRIP Commands Manual by visiting [www.cdg.com](http://www.cdg.com) or [www.cita.org](http://www.cita.org) for details.

**CDS-902X DIAL-UP NETWORK RAS (REMOTE ACCESS SERVER) FOR PPP & TCPIP CONNECTION**

**Setting up Dial-up network RAS**

1. In Windows 98, Me, 2000, or XP, go to the Network Connections Wizard.
2. Select “Connect to the Internet”, and “Next”.
3. Select “Set up my connection manually”, and “Next”.

4. Select "Connect using a dial-up modem", and "Next".
5. Select "Modem-Standard 19200 bps Modem (COM X)" (the modem you are using for this connection), and "Next". Make sure you select the correct COM port, the same one you set-up in your modem configuration. This is very important so TAPI standard, a Microsoft Modem standard, will work correctly.
6. Enter the name of your wireless provider for this connection in the text box provided and "Next".
7. Enter a user name and password. For Verizon Wireless, Alltel and Sprint Wireless the user name is "qnc" and the password is also "qnc". You may want to add a shortcut to your desktop in this window. Select "next" and "finish".
8. The new connection phone numbers will be "#777" for Verizon Wireless and Alltel, and "#WEB" for Sprint Wireless.

## ITU-T DATA TRANSFER RATE DEFINITIONS (TABLE 2)

Standard	Definition
V.22	Provides 1200 bits per second at 600 <b>baud</b> (state changes per second)
V.22bis	The first true world standard, it allows 2400 bits per second at 600 baud
V.32	Provides 4800 and 9600 bits per second at 2400 baud
V.32bis	Provides 14,400 bits per second or fallback to 12,000, 9600, 7200, and 4800 bits per second
V.32turbo	Provides 19,200 bits per second or fallback to 12,000, 9600, 7200, and 4800 bits per second; can operate at higher data rates with compression; was not a CCITT/ITU standard
V.34	Provides 28,800 bits per second or fallback to 24,000 and 19,200 bits per second and backwards capability with V.32 and V.32bis
V.34bis	Provides up to 33,600 bits per second or fallback to 31,200 or V.34 transfer rates
V.35	The trunk interface between a network access device and a packet network at data rates greater than 19.2 Kbps. V.35 may use the bandwidths of several telephone circuits as a group. There are V.35 Gender Changers and Adapters.
V.42	Same transfer rate as V.32, V.32bis, and other standards but with better error correction and therefore more reliable
V.90	Provides up to 56,000 bits per second downstream (but in practice somewhat less). Derived from the <b>x2</b> technology of 3Com (US Robotics) and Rockwell's <b>K56flex</b>

## GLOSSARY OF WIRELESS TERMS

### A

Actual Traffic Channels	Effective traffic channels plus soft handoff channels
ACCOLC	ACCess Overload Classes
AMPS	Advanced Mobile Phone Service
AVL	GPS \ Automatic Vehicle Location

### B

Baud	state changes per second
bis	Modem handshaking protocol
bps	DTE\DCE data Rate (bits per second)
BSS	Base Station System
BTS	Base Transceiver System

### C

CDG	CDMA Development Group
CDMA	Code Division Multiple Access
CDPD	Cellular Digital Packet Data
CELP	Code Excited Linear Predictive
C/I	Carrier to Interface ratio
CODEC	Coder-decoder. An electronic device that converts analog signals, such as video and voice signals, into digital form, and then compresses them to conserve bandwidth on a transmission
CTS	Clear To Send

### D

DCE	Data Communications Equipment
DS CDMA	Direct Sequence CDMA
DSR	Data Set Ready
DTE	Data Terminal Equipment

### E

Eb/No	Energy to bit Noise ratio
Effective Traffic Channels	Number of traffic-carrying channels less soft handoff channels. Equivalent to an FDMA or TDMA traffic channel.
EIA	Electronics Industry Association
EVRC	Enhanced Variable Rate Coder

### F

FDMA	Frequency Division Multiple Access
FER	Frame Erasure Rate

**G**

GPS Global Positioning System  
GSM Global System for Mobile communication

**I**

IS Interface Standard  
IS-54 TIA TDMA air Interface Standard  
IS-95 TIA spread-spectrum digital cellular standard IS-95B, which is a packet-based network that combines 8 channels and is expected to offer data transmission rates up to 64 kbps.  
ITU International Telecommunications Union

IS-131

IS-687

IS-707

IWU

TIA CDMA data standard

IS-95\I95A

Inter-Working Unit

**K**

kbps kilobits per second

**M**

MCC Multi-Channel CDMA Controller card

MOS Mean Opinion Scores

MS Mobile Station

MSC Mobile Switching Center

MTBF Mean Time Between Failures

**N**

NAM Number Analog Mobile Number

NAMPS Narrowband AMPS

NCSA National Center for Supercomputing Applications

**O**

Overhead Channels Sync, paging and access channels

**P**

PCM Pulse Code Modulation

PCS Personal Communications Services

PDC Personal Digital Cellular

Physical Channel Total number of traffic elements; actual traffic channels plus overhead channels

PM Pulse Modulation

PN Pseudorandom Noise

PSTN Public Switched Telephone Network

PW Pulse Width

**Q**

QPSK                      Quadrature Phase Shift Keying

**R**

RF                      Radio Frequency  
RLP                      Radio Link Protocol  
RSSI                      Received Signal Strength Indication  
RTS                      Request to send  
RX                      Receive  
RXD                      Receive

**S**

SAC                      Subscriber Access Control (CDMA)  
SMS                      Short Message Service

**T**

TACS                      Total Access Communications system  
TCH                      Traffic CHannel  
TDMA                      Time Division Multiple Access  
TIA                      Telecommunications Industry Association  
TTL                      5 VDC signal true or false  
TRU                      Cellular or PCS Radio  
TX                      Transmit  
TXD                      Transmit

**U**

UARTS                      COM Port Integrated Circuit Technology

**V**

VDC                      Volts Direct Current

**W**

WiLL                      Motorola's Wireless Local Loop system for fixed wireless applications

**X**

XCVR                      Transceiver