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Getting started, and understanding how the analog modem in the CDS-9022A CDMA and Analog Modem works.

This User Guide is an addendum to the CDS-9020 User Guide, and assumes the reader has a basic understanding of Data Communications Equipment (DCE) and Data Terminal Equipment (DTE) products.

The Basics

The standard landline modem is analog to analog via your local telephone company.

When switching from a non-CDMA network to an Analog-only network, the call will be dropped if you are moving.

The CDS-9022A comes preprogrammed with a Cellular default string for a V.32 connection using a Conexant/Rockwell V.34 chipset.

The CDS-9022A default AT-STRING *AT&F;+MS=V32,1, 1200, 9600,1200,9600;-SEC=1,12;\N2;)M1;X0&W* is best for fixed sites and stationary units, and works best with a host modem that uses a Conexant\Rockwell Chip Set.

Suggested AT-String for a V.22 Analog Connection
AT&F+MS=V22,1,1200,2400,1200,2400;\N2;X0;&W

The CDS-90xx product lines all default to CDMA if there is CDMA coverage in the area.

CDS-9022A Setup Steps and AT-Commands

The following are extended AT-Commands for the CDS-9022 used in its setup.

To talk to the Analog modem when you are in CDMA mode you need to TYPE *AT <enter>   (Note: in most terminal programs the * command will not echo)

Example 1
ATI3 <enter> (note there is no asterisk)
ERROR

This command tells you that you are talking to the CDMA modem.

Example 2
*ATI3 <enter>
V3.500-V34_2M_DLP

This response tells you that you are communicating with the Analog Modem. By using the asterisk key, <shift> 8, at the beginning of the command, the Analog modem will power up when you are in a CDMA area. If the unit is already getting an analog signal it will default to the Analog modem. If you are in a CDMA area the (*)

only powers the Analog modem up for 20 seconds after the last keystroke. When programming or making changes to the program, make sure you store the new profile (AT&W).

Host AT-Commands and setting up the host PC Modem
For the host modem side connecting to a fixed CDS-9022A in analog mode, we suggest leaving the Default String for the cleanest connections, but cellular sites differ. In most Metropolitan Service Areas (MSA) they may have newer equipment at their cell site. Connections in Rural Service Areas (RSA) can be a little more difficult as the noise levels might be high or they may use N-AMP's, etc.

The CDS-9022A Analog connection is via a V.34 modem chipset (V.32Bis range = 1200bps to 14,400bps). Over analog cellular systems, the best data speed you can expect is 7200bps to 12,000bps.

For a reliable connection using the Analog modem in the CDS-9022A, you will need to force your host modem down to V.32. There are many modem manufactures but there are only a handful of modem chipset manufactures.
Many claim to be Hayes compatible, but one command for a USR modem might mean something entirely different to a ZOOM modem.

For those of you that are not too familiar with modem AT-STRING and DCE to DTE speed protocols, setting the DTE speed to 19,200bps will not always force the modem into V.32 mode. Most V.90 modems will need to be forced into V.32 mode. Refer to the manufacturers manual for the proper AT-STINGS to force it to V.32 mode. This will make your data connect much faster, and result in cleaner data throughput.

For AVL and moving vehicles that only grab small files like 2K or less, use 2400bps or 1200bps, and you will handshake faster as V.22 is much more forgiving.

Generic strings

Courier V-Everything, USR models
If you are running a communication software package in your host device that communicates with your meters or DTE device remotely, you will need to add this to your AT-STRING setup.

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

Rockwell or Conexant Chipsets (Zoom, Best Data, Diamond and most WIN MODEMS)

AT&F+MS=V32,1,4800,9600,4800,9600&W
OR
AT&F+MS=9,0,4800,9600,4800,9600&W

Suggested AT-STRING for the host modem calling a CDS-9022A Modem for a V.32 connection
AT&F;+MS=V32,1,4800,9600,4800,9600;-SEC=1,12;)M1;\N5;&W <enter >

This is a CONEXANT chipset command. It is the fastest way to connect to the CDS-9022 fixed or mobile units that have files bigger than 50K plus.

Note: In the past few years since Rockwell merged with CONEXANT, the AT-STRING commands conform to the above. Older ROCKWELL/CONEXANT chipset's at-commands are as follows:

AT&F+MS=9,1,4800,9600)M1\N5-SEC=1,12&W <enter>

If your ROCKWELL/CONEXANT chipset does not accept these commands see your manufacturers manual.

If you don't have a CONEXANT chipset, see the following commands for other manufactures chipsets:

Us Robotics COURIER V-EVERYTHING

AT&F1S54=192S56=192S58=33S34=7S26=16M2&W1 <enter>

For slower and more consistent analog connections, or if your CDS-9022 will be mounted in a vehicle and running in mostly analog coverage areas, try entering the following string on the CDS-9022 remote side:

AT&F;S37=5;+MS=V22,1,1200,1200,1200,1200;X0&C1;&W <enter>

Note: The CDS-9020 can only be set to one DCE rate. This command may slow down your CDMA connection speed.

Local CDS-9022/9022A commands and setup
CDS-9020/22 default AT-String extended commands used to force the modem to V.32 (+MS) and MMP10EC

 = AT&F;+MS=V32,1, 1200, 9600,1200,9600;-SEC=1,12;\N2;)M1;&W

To query Modem default settings
Use the ? command examples

 AT+MS?
+MS: V32,1,1200,9600,1200,9600

AT-SEC?
1,12
OK

Default AT-STRING for CDS-9022A Modem setup
Note: This command string is for V.32 4800bps to 9600bps

AT&F;+MS=V32,1,4800,9600,4800,9600;- SEC=1,12;)M1;\N2;S7=58;X0;S24=
40;S30=150&W <enter>

The above String will prefer a MNP10EC connect, but will also accept an LAPM
V42bis.

For optimum communications performance with your Analog landline to the CDS-
9022 in Analog Mode, you should be using a CONEXANT/ROCKWELL HOST
modem chipset, or other cellular ready modem. For further information, see the
suggested modem list at www.dataremote.com, in the products, landline modem
section.

Required AT-STRINGS for the CDS-902X
ATX0, AT&C1

Do not change these commands, and assure that your DTE device does not initialize
the modem with different values for this AT-COMMAND. If your DTE device
requires additions to the above modem initialization string, please call our Technical
Support line for help.

We can provide you with customized firmware which offers options that our standard
object code does not offer, such as; DTR ALWAYS ON, DISPLAY MODIFY
RESULT CODES, PASSWORD, or only accept certain Caller ID #'s by checking
with a lookup table database of allowed incoming phone #'s before answering,
callback numbers, and various other applications.

**Saving AT-strings into the CDS-9022A Analog modem via a host terminal,
laptop, etc.**
Use any type of recommended terminal program and set the Terminal to N,8,1, NO
FLOW CONTROL. Default DCE speed = 19,200pbs. If you have changed the DCE
speed in the Config Menu make sure you use that DCE speed.

 TYPE:
*ATI3 <enter>
Modem will echo
V3.500-V34_2M_DLP
OK

This echo verifies that you've selected the Analog modem. This Command is for
modifying the CDS-9022A's Default modem string.

NOTE: Some Terminal programs will not echo back the * character. The CDS will
still see it. LED D6 will also indicate that the Analog modem is selected.

D6 = ON   Analog Mode - CDS-9022A is in analog mode.
(*) Command is only used for testing Outbound calls from the CDS-9022A

Refer to CDS-902X User Guide Configuration Menu section regarding DTE speed for clarification.

MNP 10EC Command Set
Note: These extended commands are for CDS-9022A setup only. Refer to the section concerning programming the analog modem profile in the CDS-902X User Guide.

AT)Mn Automatic Level Adjustment Controls
This command is included only for compatibility and performs no function.
AT)M0   AT)M0 command.
AT)M1   AT)M1 command.
AT)M2   AT)M2 command.

AT*Hn Link Negotiation Speed
This command is included only for compatibility and performs no function.
*H0 *H0 command.
*H1 *H1 command.
*H2 *H2 command.

AT-Kn MNP Extend Services
Enables or disables conversion of a V.42 LAPM connection to an MNP 10 connection. The parameter value, if valid, is written to S40 bits 0 and 1.
AT-K0 Disables V.42 LAPM to MNP 10 conversion. (Default.)
AT-K1 Enables V.42 LAPM to MNP 10 conversion.
AT-K2 Enables V.42 LAPM to MNP 10 conversion; inhibits MNP Extended Services initiation during V.42 LAPM answer mode detection phase.

AT-Qn Enable Fallback to V.22bis/V.22
This command is included only for compatibility and performs no function.
AT-Q0   AT-Q0 command.
AT-Q1 AT-Q1 command.

AT@Mn Initial Cellular Power Level Setting
This command is included only for compatibility and performs no function.
@M0 @M0 command.
.
.
.
@M30 @M30 command.

AT-SEC=n Enable/Disable MNP10-EC

Enables or disables MNP10-EC operation. The command format is:
AT-SEC=n, [<tx level>] where <tx level> is the optional transmit level sub parameter.

   AT-SEC=0 Disable MNP10-EC; the transmit level is that defined in S91.

   AT-SEC=1, [<tx level>] Enable MNP10-EC; the transmit level will be defined by the sub parameter <tx level> range 0 to 30 (0 dBm to -30 dBm), the default <tx level> (<tx level> not specified) is the S91 value.

ATX0   Disables monitoring of busy tones unless forced otherwise by country requirements; send only OK, CONNECT, RING, NO CARRIER, ERROR, and NO ANSWER result codes. Blind dialing is enabled/disabled by country parameters. If busy tone detection is enforced and busy tone is not detected, NO CARRIER will be reported. If dial tone detection is enforced or selected and dial tone is not detected, NO CARRIER will be reported instead of NO DIAL TONE. The value 000b is written to S22 bits 6, 5, and 4, respectively.

ATN1   Auto mode detection is enabled (equivalent to setting the +MS<automode> sub parameter to 1). A subsequent handshake will be conducted according to the auto mode algorithm supported by the modem, e.g., according to the contents of S37 or, if S37 is zero, starting at 28800 bps V.34 (RC288). This command is also equivalent to F0 (RC144). (Default.)

ATOn   Return to On-Line Data Mode
This command determines how the modem will enter the on-line data mode. If the modem is in the off-line command mode (no connection), ERROR is reported.

ATO0   Enters on-line data mode without a retrain. Handling is determined by the Call Establishment task. Generally, if a connection exists, this command connects the DTE back to the remote modem after an escape(+++).
ATO1   Enters on-line data mode with a retrain before returning to on-line data mode.

ATP   Set Pulse Dial Default
This command forces pulse dialing until the next T dial modifier or T command is received. It also sets S14 bit 5. As soon as a dial command is executed which explicitly specifies the dialing mode for that particular call (e.g.,ATDT...), this command is overridden so that all future dialing will be tone dialed. This command may not be permitted in some countries.

ATQn   Quiet Results Codes Control
This command enables or disables the sending of result codes to the
DTE according to the parameter supplied. The parameter value, if valid,
is written to S14 bit 2.
ATQ0   Enables result codes to the DTE (Default.)
ATQ1   Disables result codes to the DTE.

AT+MS Commands Select Modulation
This extended-format command selects the modulation and, optionally enables
or disables auto mode, specifies the lowest and highest connection rates, selects
M-Law or A-Law codec type, and enables or disables robbed bit signaling
generation (server modem) or detection (client modem) using one to five sub
parameters. The command format is:

+MS= <mod> [,[<automode>][,[<min_rate>][,[<max_rate>][,[<x_law>][,[<
rb_signaling>]]]]]]<CR>

Notes:
1. For 14400 bps and lower speeds, the Nn command and S37 register can
alternatively be used, in which case the +MS sub parameters will be modified to
reflect the Nn and S37=x settings. Use of the Nn and S37=x commands is not
recommended but is provided for compatibility with existing communication
software.

Some advanced Rockwell HCF commands
ATZ- This command resets the modem to the stored settings. If the settings have
been changed by software or changed manually, this INIT string may not work
correctly. If you want to custom configure your stored profiles, we suggest that you
always start out with an **AT&F&C1** before customizing other commands. This string
will reset the modem to the factory defaults as well as reset some other basic
settings.
If modem performance suffers after modifying settings, send the default AT string
(*AT&F;+MS=V32,1, 1200, 9600,1200,9600;-SEC=1,12;\N2;)M1;X0&W*) to the
modem.

Performance issues
To get optimum performance from your CDS-90XX MODEM, the phone line quality
over which you are transmitting and receiving must be reliable and relatively free of
"noise". If you have very noisy lines you may be able to get a better connection by
forcing the modem to connect at a lower speed. Refer to the AT+MS command.

Limiting the Modem's top speed
If you experience problems connecting to slower modems (2400 or 1200bps), you
may need to instruct your modem to limit the attempted top speed to something less
than 19,200bps, due to the line noise in your area. If you don't, you may experience
noise interference and a "NO CARRIER" message will be displayed.

This should not be necessary in most cases, but, there are some 2400bps, 1200bps, or even 9600bps modems you may not be able to connect to without using the following method:

Using the +MS= command. AT+MS=V32,1,4800,9600,4800,9600 <enter> will set the modem to use V.32 modulation, auto mode detection, with 9,600bps as the lowest transmit connection rate acceptable and the highest transmit connection rate attempted. See "Setting up DTE bps" in the CDS-9020 User Manual.

Analog Testing the CDS-902X Modem
Refer to the Analog Testing section in the CDS-902X User Guide for details.
To test inbound Data calls in Analog mode the user must go into the configuration menu. Turn on option (N), Enable FAM (Forced Analog Mode).   Be sure to turn this command off after testing.   If you forget to turn it off, you can call the unit remotely and turn it off.

Trouble Shooting Analog Connections
The AT&V1 Command displays your analog Receive levels, etc. (Your actual speed, DCE to DCE is displayed). These tests must be done in the analog mode, and the connection must be from the Host Computer into the CDS-9022A, or call into a BBS type of Host, or from the CDS-9022A into the Host.

Time required between dialing retries
(Redialing when you use the *ATDT11111111 command)
If you are in a CDMA coverage area the CDS-9022A will take anywhere from 5 to 7 seconds before it is ready for next inbound or outbound data call.
Note: when making an analog call, and the unit does not connect (CD does not go TRUE), the CDS-9022A will reboot. This process can take up to 60 seconds in most wireless provider's systems. This time may be different if your PRL file is larger than that in your wireless provider's system.

Example:
************** CONFIGURATION MENU **************
  A Set Receive Window 1 00:01 to 23:59
  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: 22:27:08
  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 Remote Control Mode
O Force ANALOG Mode: ON   This is only for testing DO NOT LEAVE ON
P Exit to Terminal Mode

Battery voltage: 13.3   Phone #: xxxxxxxxxx   System ID:

Slow speed connect for a more reliable connection in AVL applications
Slow speed AT_STRING
CDS-9022 Side (RC336 Chipset)

LAND LINE SIDE: Connecting @ V.22 MODE 1200bps to 2400bps for AVL
applications and poor RSSI readings, Older style Cellular tower, Traffic, Handoffs
and back ground noise on the Analog Line.

Older Rockwell String
2,1,1200,2400,0,0,33600

Conexant Chipset
AT+MS=v22,1,1200,2400,1200,2400

CDS-9022
AT+MS=v32,1,4800,9600,4800,9600;-SEC=1,12;\N2;X0;&W

OK

LAND LINE SIDE NO CARRIER
at+ms=11,1
OK
at+ms?
11,1,9600,14400,0,0,33600

OK
at+ms=9,1,4800,14400
OK
at&w
OK

 Example of a clean connection, *CDS-9022A Side*   (RC336 chipset)

AT&V1
TERMINATION REASON.......... NONE
LAST TX rate................ 9600 BPS
HIGHEST TX rate............. 9600 BPS
LAST RX rate................ 9600 BPS
HIGHEST RX rate............. 9600 BPS
PROTOCOL.................... CELLULAR

COMPRESSION.................. V42Bis
Line QUALITY................ 006
Rx LEVEL.................... 022
Highest Rx State............ 00
Highest TX State............ 00
EQM Sum..................... 0000
RBS Pattern................. FF
Rate Drop................... FF
Digital Loss................ None
Local Rtrn Count............ 00
Remote Rtrn Count........... 00
Flex fail

OK

Host Side

Older Rockwell Firmware
at+ms?
9,1,4800,9600,0,0,33600

Conexant New External Modem, *Host Side*
at+ms?
+MS: V32B,1,300,14400,9600,14400

See below for *Host Side* AT-STRING

AT&V1
TERMINATION REASON.......... NONE
LAST TX rate................ 28800 BPS
HIGHEST TX rate............. 28800 BPS
LAST RX rate................ 9600 BPS
HIGHEST RX rate............. 9600 BPS
PROTOCOL.................... CELLULAR
COMPRESSION................. V42Bis
Line QUALITY................ 027
Rx LEVEL.................... 040
Highest Rx State............ 00
Highest TX State............ 00
EQM Sum..................... 0000
RBS Pattern................. FF
Rate Drop................... FF
Digital Pad................. None
Local Rtrn Count............ 00
Remote Rtrn Count........... 00
V8bis K56Flex not successful

t+ms=10,1
OK
at+ms?
10,1,1200,2400,0,0,33600

OK
at&w
OK
at\n5)m1
OK
at&w
OK

RING

RING

RING
ata
CARRIER 2400

PROTOCOL: ALT

COMPRESSION: V.42BIS

CONNECT 19200/ARQ
yyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyy
+++
NO CARRIER
at+ms=10,1,9600,14400,9600,14400
ERROR
at+ms?
10,1,1200,2400,0,0,33600

OK
at+ms=10,1,9600,14400,10,1,4600,9600
ERROR
at+ms=10,1,9600,14400
OK
at&w

Examples of tests with various modems and the CDS-9022A analog modem
The following tests must be conducted on site with the CDS-9022A.

+++ = Enters the command state while you are connected to the Host computer.

ZOOM V.92 Lucent chipset   Firmware = Zoom V.92 Serial #s 1117d00 -C Z207

Landline to 9022A stationary Modem with maximum signal = 31
ATI11 In Command Mode Online

```
   Description                  Status
   ---------------           ------------
   Last Connection              V32
   Initial Transmit Carrier Rate    9600
   Initial Receive  Carrier Rate    9600
   Final   Transmit Carrier Rate     9600
   Final   Receive  Carrier Rate     9600
   Protocol Negotiation Result       LAPM
   Data Compression Result          V42bis
   Estimated Noise Level            822
   Receive  Signal Power Level  (-dBm) 34
   Transmit Signal Power Level  (-dBm) 10
   Round Trip Delay          (msec) 18
 Press any key to continue; ESC to quit.

   Description                  Status
   ---------------           ------------
   Near Echo Level          (-dBm) 22
   Far  Echo Level          (-dBm) 62
   Transmit Frame Count          969
   Transmit Frame Error Count       0
   Receive  Frame Count          233
   Receive  Frame Error Count       8
   Retrain by Local  Modem        4
   Retrain by Remote Modem          0
   Rate Renegotiation by Local Modem   0
   Rate Renegotiation by Remote Modem  1
   Call Termination Cause          0
   Robbed-Bit Signaling          NA
   Digital Loss          (dB) NA
   Remote Server ID              NA
   Last PCM S PTR              00
```

OK

ATIi11 Redisplay
OR use A/   AT-Command

```
       Description                Status
       ---------------            ------------
       Last Connection            V32
       Initial Transmit Carrier Rate      9600
       Initial Receive  Carrier Rate      9600
       Final   Transmit Carrier Rate      9600
       Final   Receive  Carrier Rate      9600
       Protocol Negotiation Result        LAPM
       Data Compression Result            V42bis
       Estimated Noise Level              823
       Receive  Signal Power Level  (-dBm) 43
       Transmit Signal Power Level  (-dBm) 10
       Round Trip Delay           (msec) 18
Press any key to continue; ESC to quit.

       Description                Status
       ---------------            ------------
       Near Echo Level            (-dBm) 22
       Far  Echo Level            (-dBm) 62
       Transmit Frame Count               969
       Transmit Frame Error Count         0
       Receive  Frame Count               233
       Receive  Frame Error Count         8
       Retrain by Local  Modem            5
       Retrain by Remote Modem            0
       Rate Renegotiation by Local Modem   0
       Rate Renegotiation by Remote Modem  1
       Call Termination Cause             0
       Robbed-Bit Signaling               NA
       Digital Loss           (dB) NA
       Remote Server ID               NA
       Last PCM S PTR                 00


CDS-9022A @ 4800BPS   This is a very clean and reliable connection with poor
signal = 12
OK
AT&V1
TERMINATION REASON.......... LINK DISCONNECT
LAST TX rate................ 4800 BPS
HIGHEST TX rate............. 4800 BPS
LAST RX rate................ 4800 BPS
HIGHEST RX rate............. 4800 BPS
PROTOCOL.................... LAPM
COMPRESSION................. V42Bis
Line QUALITY................ 001
Rx LEVEL.................... 025
```

Highest Rx State............ 00
Highest TX State............ 00
EQM Sum..................... 0000
RBS Pattern................. FF
Rate Drop................... FF
Digital Loss................ None
Local Rtrn Count............ 00
Remote Rtrn Count........... 00
Flex fail

ZOOM V.92 Lucent chipset OUTBOUND FROM Landline
ATI11
   Description   Status
   ---------------   ------------
   Last Connection   V32
   Initial Transmit Carrier Rate   4800
   Initial Receive Carrier Rate   4800
   Final   Transmit Carrier Rate   4800
   Final   Receive Carrier Rate   4800
   Protocol Negotiation Result   LAPM
   Data Compression Result   V42bis
   Estimated Noise Level   817
   Receive Signal Power Level (-dBm) 4
   Transmit Signal Power Level (-dBm) 10
   Round Trip Delay   (msec) 19
Press any key to continue; ESC to quit.

   Description   Status
   ---------------   ------------
   Near Echo Level   (-dBm) 0
   Far Echo Level   (-dBm) 0
   Transmit Frame Count   325
   Transmit Frame Error Count   0
   Receive Frame Count   472
   Receive Frame Error Count   49
   Retrain by Local Modem   0
   Retrain by Remote Modem   0
   Rate Renegotiation by Local Modem   0
   Rate Renegotiation by Remote Modem 0
   Call Termination Cause   0
   Robbed-Bit Signaling   NA
   Digital Loss   (dB) NA
   Remote Server ID   NA
   Last PCM S PTR   9513

Voice Mode for the CDS-9022A and CDS-9052 Cellular Modems

Using voice mode requires DataRemote headset model DRH-HDST for proper operation. To initiate voice mode from data mode, enter:

AT
OK (response from modem)
AT+CDV<phone number you wish to dial>

You will hear a faint beep over the headset after a few seconds and then ringing. When called party answers go ahead and talk. If an extension number or other numerical input is required to complete the connection enter:

ATDT<desired number>

To end the conversation and return to data mode, enter:

ATH

If the landline side hangs up during or at the end of a voice call, the DataRemote modem will disconnect within 20 seconds and return to data mode automatically.

Important Notice

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