

## ARC Modem Low Power Modem LP9624

After 5 seconds of inactivity, the unit automatically goes into power down mode

The LP9624 Modem (300, 1,200, and 2,400bps) runs from 6 to 15 VDC and ultra-compact and easy to install. This rugged little unit is designed for applications where power can be provided at pin 20 (DTR) of the DB-25 connector. Current consumption in active state is less than 70ma and in power down mode, less than 20ma making it ideal for those solar powered applications.

The Modem is ultra-compact and easy to install. The LP2.4 designed to run on extremely low current on pin 20 or **optional power cable**. The other end of the modem connects directly to your RJ-11 telephone cable and has Surge Suppression of 15,000 Volts.

The LP9624 operates at speeds of 300, 1,200, 2,400bps. The modem also features automatic answer and will connect to any speed modern, the modem automatically "falls back" to match the speed of the slower modern. The modem can also be locked to any of the 3 speeds.

The Modern is compatible with all communications software features automatic answer mode, so it can operate unattended in those remote sites.

It will operate over rotary or push-button lines since it works in tone or pulse dialing modes.

The Modem complies fully with the Hayes' Standard AT Command Set and the ITU V22 bis and V.22 standards, as well as Bell 103 and Bell 212A protocols.

The Modem connects directly to your DTE comm. port and operates on all telephone Lines.

Though it's tiny and needs little power, the Modem still supports all the standard Hayes AT commands including basic, dial and register commands. The Modern also uses industry - standard result codes that let you know if the commands worked properly.

This modem can replace the Bell 103, 212ALP, V.22bis modems and yet it is in a small case the size of a DB-25 connector head. This allows the modem to be used where space is at a premium.

# Features

- Hayes " AT " command set compatible - Non Volatile memory
- Data speed 2400, 1200, 300 baud
- Automatic fall back
- RS 232 interface ( Only DTR, TXD, RXD, RTS lines supported )
- FCC ( Part 15B and Part 68 ) approved
- 6 to 15 VDC,
- Low Power and Sleep mode
- -20 to +60 C temp.
- Enclosure size 2 1/4" x 3 1/4" x 7/8"

## **DB25 female modem connector pin out**

2 = TX Transmit to modem  
3 = REC Receive from modem  
7 = Signal ground, **negative** voltage  
20= 8 to 15 DC **positive** voltage 22 to 70 m amps

### **Optional power cable to supply power**

Pin - 7 Green - lead negative  
Pin -20 Red - lead positive 8 to 15 VDC

# ***Specifications***

Standards, ITU V.22, V.22 bis, Bell 103,& 212A

Interface, -RS-232/V.24

Speed - 2,400, 1,200, and 0-300 bps

AT Command Set compatible

Dialing, Tone and Pulse

Transmit Level, -12 dbm

Receive Sensitivity, - 40 dbm

Dropout Level, - 43 dbm

Operating temper, (-20 to +60 C)

Humidity, -10 to 95% noncondensing.

Connector, (1) DB25 female, (1) RJ-11 female

Enhanced AT Commands

Power, - 8 to 15 VDC power supplied on pin 20 of the DB25 or use optional power cable

(NOTE: SEE BACK PAGE)

Load (at turn on)	100 millamps
normal run is at	70 millamps
power down mode runs at	20 millamps.

Surge Suppression - 15,000 Volts

Size, - .9" high by 2.3" wide by 3.4" deep

Weight = 3oz, 0.08 kg

**NOTE: This modem requires more power than most communications ports can supply just using just the standard output of DTR on pin 20 of the RS-232 interface. RS-232 interfaces use a standard UART chip which only outputs 50 milliamps on each output pin.**

**This modem needs 70 milliamps on pin 20 to run properly. You must supply 8 to 15 VDC @ least 100 milliamps on pin 20.**

**This can be done through the connector or via an optional power cable.**

2 = TX Transmit to modem

3 = REC Receive from modem

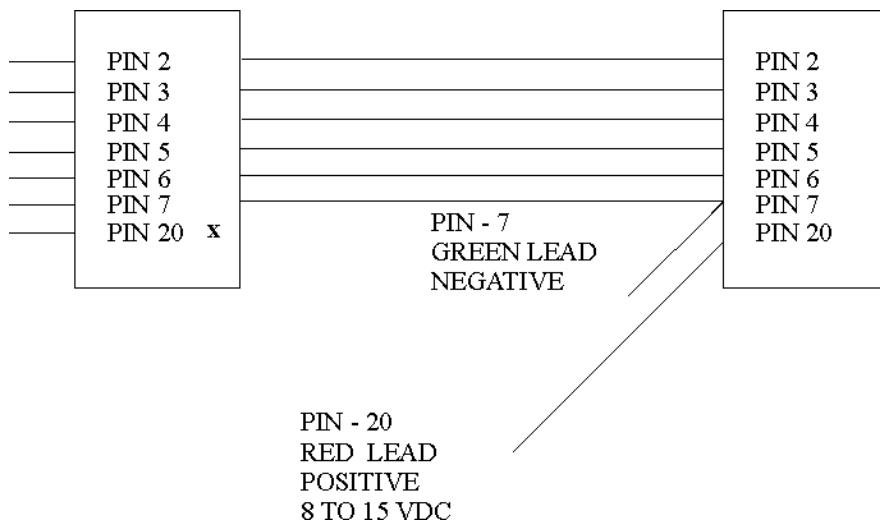
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## SUMMARY OF THE ROCKWELL "AT" COMMAND SET

To communicate using the modem, use an asynchronous communication program. The command set for the modems is compatible with the Hayes command set.

The modem is controlled and configured by the AT (attention command). Each command consists of the following elements (with the exception of the A/and the +++ command that will be discussed later). A command is not entered until a carriage return <ENTER> is entered. Spaces entered are ignored. For example, to enter the command 'Answer', type ATA and <ENTER>.

Some commands do not have parameters. Any missing parameters in a command is assigned the value zero, which may be a valid parameter for the command. The sequence followed by AT command causes the modem to enter a command state. That is, AT without a command serves as a wake up code and an "OK" appears on the screen. The modem queues the commands in a 40-character command line. The command line begins with AT and can have several commands. A separator is not required between the commands.

When a carriage return is received, the commands are performed in the order in which they are sent to the modem. If more than 40 characters are sent to the modem, an error occurs and all commands must be re-entered.

A common configuration for a remote modem is to answer the call and hang up on loss of carrier. To do this the RS232 interface has to be set for the correct configuration.

Option if the Computer uses pins 2, 3, & 7 only - Set the AT commands as follows

AT\$O=1 (modem will answer on the first ring)

AT&DO (modem will ignore DTR)

factory default is AT&D1 which allows the modem to answer only if DTR is high.

AT&V to check the state of the "S" registers use AT&V

AT&WO Don't forget to burn the new codes into E-PROM by AT&WO or W1

To see your typing you made need to turn on E1 for the modem to echo back responses. Some software does not like it's data echoed back so don't forget to check E1/E0 if your software is acting strange.

**Note:** you may want to put the modem into a quiet mode - ATQ1 (ATQ0 is the default) modem does not send result codes - which can confuse the computer.

A good configuration for a dumb mode operation is

**AT&F&C1&DOEOQ1\$O=1&WO or W1**

## **BASIC AT COMMANDS for the 2,400 modem**

### **Command and Data Modes**

When you first start up your communications software, you will be in COMMAND mode. In other words, you have not dialed out and linked up to a remote modem. In COMMAND mode, local commands (called AT Commands) are active. After dialing out and successfully linking-up, you are in DATA mode and AT Commands are no longer active. In DATA mode, you must use the ESCAPE code ( . ) to temporarily suspend transmission to the remote modem and re-enter COMMAND mode. The ATO<CR> command (see below) reenters DATA mode.

### **AT Command Summary**

All of the following commands must be preceded with the characters AT and followed by a carriage return (the <CR>, <<enter>>, or <<return>> key). For example, typing AT<CR> will cause the modem to print "OK" on the screen, and typing

AT&V<CR> will print the current configuration profile on the screen. The one notable exception is the A/ command, which will execute the previous AT Command without a <CR>. Throughout the rest of the manual, we will use the <CR> symbol to represent the enter key.

Be sure to do a AT&W0 that will write the changes you may have made to the 0 register so the modem will not lose it's settings after a power outage

You may want to set the modem up so it will echo your key strokes with the E1 command -

NOTE some software will have problems with an echo so you may need to set it to E1.

If your RS232 interface doesn't supply DTR you will need to set the &D to

## Basic Commands

- AT-Command prefix required before all
- commands except A/ and ESCAPE sequences
- <CR>-Terminates command line
- A/-Repeat last command (does not use
- <CR>)
- + + + Escape code sequence (returns to COMMAND mode from DATA mode)
- A-Answers a telephone call
- Bn-Select Bell or CCITT for 1200 bps
- connection
- B0-CCITT V.22 FOR 1200 bps
- communication
- B1-Bell 212A for 1200 bps communication
- Cn-Carrier Control
- C0-ERROR
- C1-OK
- D-Dial the number which follows (see DIAL commands)
- En-Command set echo control
- E0-Echo off
- E1-Echo on
- Fn-On-line echo
- F0-ERROR
- F1-OK
- Hn-Off-hook control
- H0-Hangup phone line
- H1-Pickup phone line
- In-Identify the modem type
- I0-Report the product code
- I1-Calculate the firmware ROM checksum

- I2-Verify the firmware ROM checksum
- I3-Report the firmware and revision levels
- I4-Report modem capabilities and features
- Ln-Speaker volume control Acknowledged
- Mn-Speaker control Acknowledged
- O-Go back to DATA mode
- P-Use pulse dialing
- Qn-Disables (quiets) command responses
- Q0-Enable results
- Q1-Disable results
- Sn-Select a S register
- Sn=-Set S register to new value
- Sn?-Show value of S register
- T-Use tone dialing
- Vn-Use verbose result codes
- V0-Result codes are numeric
- V1-Result codes are verbose
- Xn-Extended dialing result codes
- X0-Send result codes 0 through 4; BUSY and DIAL TONE detect disabled
- X1-Send result codes 0 through 5, 10; BUSY and DIAL TONE detect disabled
- X2-Result codes 0 through 6, 10 enabled; BUSY detect disabled, DIAL TONE detect enabled
- X3-Result codes 0 through 5, 7, 10 enabled; BUSY detect enabled, DIAL TONE detect disabled
- X4-Result codes 0 through 8, 10 enabled; BUSY and DIAL TONE detect enabled
- Yn-Enable long space disconnect
- Y0-Disable long space disconnect
- Y1-Enable long space disconnect

- Zn-Reset the modem
- Z0-Reset and use stored profile 0
- Z1-Reset and use stored profile 1
- , -Pause for the value (in seconds) stored in register S8

## Dial Commands

- DP-Pulse dial the telephone number
- DS=n-Dial with previously stored number
- DT-Tone dial the telephone number
- DW-Wait for dial tone
- D; - Stop dialing and wait for more commands
- D@ - Wait for 5 seconds of silence
- D! - Hang up for 1/2 of a second (Flash)
- D,-Pause for seconds as determined by register S8
- 0 through 9, A, B, C, D, #, \*- Dial Digits/Characters

When the modem is dialing a phone number, any key will abort the current dialing command.

## Extended Commands

- &Cn-EIA RS-232 DCD control
- &C0-Always on
- &C1-On only when carrier detected
- &Dn-EIA RS-232 DTR control Acknowledged
- &En-Dialing echo control
- &E0-Disable dialing echo
- &E1-Enable dialing echo
- &F-Accept factory settings
- &Gn-Guard tone control
- &G0-Guard tones disabled
- &Gl-Guard tone disabled

- &G2-1800-Hz Guard tone enabled
- &Ln-Leased-line control Acknowledged
- &Pn-Select pulse dial make/break ratio
- &P1-39 through 61 make/break at 10 pps
- &P2-33 through 67 make/break at 10 pps
- &Sn-EIA RS-232 DSR control Acknowledged
- &V-VIEW current configuration profile
- &Wn-Write to stored profile
- &W0-Write settings to stored profile 0
- &W1-Write settings to stored profile I
- &Yn-Select stored profile for power up
- &Y0-Use profile 0 on power up
- &Y1-Use profile I on power up
- &Zn=val-Store dial string (up to 36 characters) in nonvolatile memory location numbers 0 through 3

## Register Commands

\* means value is stored by **&Wn (0 or 1)** command.

- S0\*-Number rings until auto answer S0=1 will answer one the first ring
- S1-Number of rings received
- S2-Escape Character
- S3-Carriage-return character
- S4-Line-feed character
- S5-Backspace character
- S6-Time for dial tone
- S7-Time to wait for connection
- S8-Pause time for comma
- S9-Carrier detect time
- S10-Carrier lost detect time
- S11-Tone dialing speed
- S12-Escape-code guard time

- S14\*-bit-mapped options register
- S21\*-bit-mapped options register
- S22\*-bit-mapped options register
- S23\*-bit-mapped options register
- S27\*-bit-mapped options register

## **Result Code Summary**

- \* OK-Command was executed without error
- \* 1 CONNECT-Modem has detected carrier and has gone DATA
- \* 2 RING-Modem has detected ringing
- \* 3 NO CARRIER-Carrier has been lost and call has been hung up
- \* 4 ERROR-Error in command line
- \* 5 CONNECT 1200-Modem has connected at 1200 bps; Bell 212 or V.22 connection
- \* 6 NO DIALTONE-has been detected
- \* 7 BUSY-A busy signal has been detected
- \* 8 NO ANSWER-Silence was not found
- \* 10 CONNECT 2400-Modem has connected at 2400 bps; V-22 connection

## **Error Diagnostics**

### **Is the computer talking with the modem?**

When you type AT<CR>, "OK" should be displayed. If the modem does not respond:

1. Make sure the modem is firmly connected to the computer.
2. Verify the communication program is configured to the correct communications port (COM L, COM2:, COM3:, or COM4:).
3. Verify the baud rate (2400, 1200, or 300) and check parity (even, odd, none).
4. If the modem still does not respond, type AT&F<CR>. This will reset the modem to the original factory settings.
5. Try unplugging the modem and plugging it back in to ensure clean contact connections.

### **If the modem responds, but...**

---characters are not displayed, type ATE1 <CR>. This tells the modem to echo commands to the screen.

...characters are displayed double, type

ATE<CR>. This turns the echo feature off.

### **Modem does not answer.**

If the modem does not answer an incoming call, type

**ATSO = I < CR>.**

### **Modem will not dial a telephone number.**

If the computer displays **NO DIALTONE**, the modem is not receiving a dial tone. Connect a standard telephone to the telephone line to verify a dial tone. If you do not hear dial tone, something is wrong with either your telephone cable or telephone line. Try another cable or line.

On some telephone lines connected to internal telephone systems, the telephone lines are not standard and will not work with standard telephones. Such lines will not work with this modem. Adapters are available to convert these lines so they may work with standard telephone equipment.

### **Modem can dial but can't communicate.**

If you cannot communicate properly, something may be wrong with the other system. Try calling a different modem.

### **Unusual characters appear on the screen.**

If you can dial, but unusual characters appear on the screen while communicating, check the communications settings of your communications software. The most common settings are 7EI (7 bits, even parity, 1 stop bit) and 8N 1 (8 bits, no parity, 1 stop bit).

### **Modem connects but cannot communicate.**

Another possibility is that your modem and software are set for different speeds. In other words, you will be unable to communicate at 2400 bps with modems linked at 1200 bps. Check your speed settings.

### **Your modem disconnects.**

During communications the modem may disconnect from the phone line if-

1. It fails to connect to the remote modem.
2. It detects a loss of carrier from the remote modem.
3. You enter the escape and Hook command.
4. Turn off power to the computer.

