

CD 2400 EXTERNAL MODEM
300/1200/2400 BAUD MODEM
CD 2400 PC INTERNAL MODEM

COMPUTER DIRECT
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INTRODUCTION

This manual describes the procedures required for establishing data communications between two compatible computer/ terminal systems, using our modems.

The instructions are task-oriented for easy reference. You can go directly to a particular section and quickly find the answers. Also, the step-by-step installation, startup, and operating instructions, with examples, are easy to follow.

Be sure to fill out and return the Warranty Registration Card furnished with your modem. In addition to product protection, it helps us to keep you informed about new advancements which can improve your communications system.

CAPABILITIES

Our Modems uses several powerful VLSI processors to provide extremely high quality performance, plus maximum flexibility and speed. These are important considerations today, especially for long distance lines where charges can skyrocket.

New software technology permits easy and inexpensive UPDATING to provide higher throughput and data security.

DIAL COMPATIBILITY

Our modem is fully compatible with the "AT" command and register set at all speeds. It is compatible with Bell 103 and 212A, plus CCITT V.22 and V.22 bis standards.

The modem has also been successfully tested and used with Smartcom II & III (R) Crosstalk (R), PC-Talk (R), and several other popular communications packages.

An internal speaker, with software selectable volume control is included to monitor call progress.

START UP PROCEDURES

This modem uses the standard full "AT" Attention command set. This "AT" Command Code can be entered either in UPPER or LOWER CASE without intermixing the upper & lower cases for the same command.

So, to start your modem, simply type;

AT <ENTER>
Responds with an OK

At this time your modem will read all your terminal/computer parameters and set itself up to communicate accordingly.

Here's a simple example of a command sequence:

To call the phone number: (800) 555-1212, simply type:

ATDT8005551212 <ENTER>

The "D" Command specifies a DIALING FUNCTION. The "T" command specifies TONE DIAL, which will default to "P" (PULSE) dial, if you don't specify.

For better readability, spaces, parenthesis and hyphens are allowed in the command line:

ATDT (800) 555-1212

COMMAND CODES for all functions are defined in the OPERATING PROCEDURES section.

	RESULT CODE ACKNOWLEDGEMENTS	
--	------------------------------	--

Your modem will generate different "RESULT CODES" or messages which will appear on your Computer/Terminal Screen. These messages represent or carry a specific meaning which are thoroughly explained below:

- OK: No errors are detected, so everything is OK so far. (Code 0)
- CONNECT: Your modem has just established a connection with a remote modem. (Code 1)
- RING: Incoming Ring Signal is detected. (Code 2)
- NO CARRIER: DATA CARRIER Signal is no longer present on telephone line. (Code 3)
- ERROR: You have typed an invalid command sequence. (Code 4)
- CONNECT 1200: Your modem has established a 1200 BPS connection with a remote modem. (Code 5)
- NO DIALTONE: Your modem has not received a valid dial tone within 5 seconds after going off the hook. (Code 6)
- BUSY: Your modem is indicating that the remote site devices are busy. You should try calling again. (Code 7)
- NO ANSWER: Your modem tried to make a connection with the remote device (Remote Modem), but after several rings the connection was not made (within 5 seconds). (Code 8)
- CONNECT 2400: Your modem has established a 2400 BPS connection with a remote modem. (Code 10)

THE DIALING COMMAND LANGUAGE

The following commands are used after typing <AT> to establish a connection with a remote modem. This listing represents asynchronous commands only.

<A> MANUAL ANSWER

The <A> command causes the modem to go off-hook immediately and answer an incoming call.

" AT" ATTENTION/START COMMAND SET

The "AT" prefix must be entered on a command line before any other commands, except when using the repeat command.

<A/>-REPEAT LAST COMMAND

Tells the modem to Re-Execute last Command (In the Command Buffer).
The <ENTER> key is not required.

 BELL/CCITT ANSWER TONES

The command is used to select between Bell (U.S.A. & Canada) or CCITT (International) standards for 1200 BPS communication.

To set up under the International CCITT V.22 specification type:

<ATB0>

To set up as BELL 212A specification, then type:

ATB1

<D> - DIAL COMMAND

The <D> command will dial a phone number typed after it on the command lines. The phone number can also contain the following special Dial Commands;

<P> - Pulse dialing

Causes the modem to use pulse dialing.

<T> - TONE DIALING

Causes the modem to use DTMF tone dialing.

<@> - WAIT FOR AN ANSWER BEFORE DIALING.

<ATD 555 1212 @999>

This command functions in conjunction with register S7 (number of seconds to wait for carrier). It waits for a ring followed by 5 seconds of silence before accepting the next command if any. The factory default setting for register S7 is 50 seconds. (Response level must be X3 or higher).

<W> - WAIT FOR SECOND DIAL TONE

<ATDT 9 W 1234567> <RETURN>

A number of business offices use phone systems where before dialing OUT, you must first dial 9. So in order for your modem to recognize & wait for the dial tone you must use <W> symbol as indicated in the above example, where your modem will dial 9 (First) then wait up to 30 seconds for dial tone or as specified time of your modems S7 register, then dial the remaining numbers. (1234567 in this example).

<R> - ORIGINATE IN ANSWER MODE

<ATDR5551212> <RETURN>

Above you see two different examples on **ORIGINATING** a call while the modem is in answer mode, also called **REVERSE DIALING**.

<, > = PAUSE or DELAY

<ATDT1234, 567> <RETURN>

In this example your modem will dial the first 4 numbers, then it will "PAUSE" according to S Register 8 for 2 seconds at **FACTORY SETTING** or as modified setting, then it will continue dialing the last 3 numbers.

<! > = HANG UP (GO OFF HOOK)

<ATDT12345!> <RETURN>

Typically this command is used to transfer a call to another extension, it is just like depressing the flash (**OFF HOOK**) for 1/2 second.

< ; > = RETURN TO COMMAND STATE AFTER DIALING

<ATDT1234567; > <RETURN>

The semicolon <;> could be used for instance, to call a number and after you get your <OK> response you could send some more numbers without disconnecting your original line.

<S> = DIAL STORED NUMBER

<ATDS> <RETURN>

You can have a stored number in memory that you would like to dial, where it represents the location of the number you stored in memory.

<Z> - TELEPHONE NUMBER STORING COMMAND

<AT&Z1234567> <RETURN>

To store phone number in the NON VOLATILE MEMORY for future use.

<E> - LOCAL ECHO

This command has two settings:

E0 = Echo "OFF"
E1 = Echo "ON"

This setting has to be in conjunction with your terminal setting (set-up). Every terminal can be set for local echo where everything typed & transmitted will display on the screen (Full Duplex).

If you receive double character on the screen then disable (OFF) your Echo Command <ATE0>, but if you don't see any typed characters on the screen at this time, enable your modem Echo Command <ATE1> FACTORY DEFAULT.

<H> - ON/OFF HOOK - Connect/Disconnect

<ATH> or <ATH0>

This command will HANG UP the phone and the modem will go on hook

<ATH1>

This command takes the phone OF THE HOOK.

<I> - PRODUCT CODE INQUIRY

<ATI0>

This command will display the latest revision level of your product. FACTORY DEFAULT

<I> - PRODUCT CODE INQUIRY

<ATI0>

This command will display the latest revision level of your product. **FACTORY DEFAULT**

<ATI1>

This command will display the checks of your ROM (Read Only Memory).

<ATI>

Finally, this setup will test the ROM.

<L> SPEAKER VOLUME

To set at low speaker volume simply type:

<ATL1>

To set the speaker at medium volume:

<ATL2>

Finally, to set it at high volume:

<ATL3>

This is **FACTORY SETTING**.

<M> - SPEAKER CONTROL

<ATM0>

Under the above command the modem speaker will be off.

<ATM1>

At this time the speaker is ON during dialing sequence.
FACTORY DEFAULT

<ATM2>

The speaker is always "ON" during dialing and thereafter.

<O> - RETURN TO ON LINE STATE

<ATO>

Go on line again after you typed +++ (stands for disconnect), since the modem has not hung up yet.

<P> - PULSE DIALING COMMAND

<ATP>

Also indicated earlier, this command will place the modem in pulse dialing sequence.

<Q> - QUIET COMMAND

<ATQ0>

This command controls the display of result codes on your terminal/computer display screen.

The above command setting indicates that all result codes will be displayed on your screen. FACTORY DEFAULT

<ATQ1>

However, this command when activated will stop sending any result codes to your display screen.

NOTE: Result codes are:

OK
BUSY
RING
ERROR
CONNECT
NO CARRIER
NO ANSWER
ETC.

<SZ=n> - SETS REGISTERS (See S registers)

<T> - TO NE DIALING COMMAND

<ATDT>

Also indicated earlier, this command will place the modem in touch tone dialing sequence.

<V> - ENABLE VERBAL & NUMERIC RESULT CODES

<ATV0>

Your modem can display result codes on your screen for your convenience either in Verbose messages or numeric codes.

The above command indicates that your modem will display verbal messages only.

<ATV1>

Under this command your modem will display numeric result codes.

Below you will find a listing of result codes in the Verbose or numeric form.

VERBAL (VERBOSE)	NUMERIC (TERSE)
OK	0
CONNECT	1
RING	2
NO CARRIER	3
ERROR	4
CONNECT 1200	5
NO DIAL TONE	6
BUSY	7
NO ANSWER	8
CONNECT 2400	10

<X> - ENABLE RESULT CODE

<AT01> or <ATX>

By using this command you set the modem not to recognize a busy signal or a dial tone at which time the modem will automatically "BLIND DIAL" and will pause according to your S6 Register Preset. FACTORY DEFAULT for S6 Register is set to 2 seconds pause.

<ATX1>

Sets the modem to a CONNECT 1200 or CONNECT 2400 mode. Similar to <ATX> command the modem will "BLIND DIAL" & will pause according to your S6 register setting. FACTORY DEFAULT for S6 Register is set to 2 seconds pause.

<ATX2>

Sets the modem to CONNECT 1200 or CONNECT 2400 modes, but this time your modem waits for a dial tone before dialing. NO DIAL-TONE result code will appear on your screen if no dial tone is detected within 5 seconds. During this mode your modem will not recognize BUSY signal.

<ATX3>

During this mode your modem does not recognize the DIAL TONE, however sends the CONNECT 1200 or CONNECT 2400 message to your screen after a connection has been made through a "BLIND DIAL" sequence. It is important to note that under the above command mode the BUSY signal is detected and displayed on your screen.

<ATX4>

During this command your modem sends a CONNECT 1200 or CONNECT 2400 message to your screen. Here your modem will wait for a "DIAL TONE" before dialing. "NO DIALTONE" message will appear on your screen if a dial tone is not detected within 5 seconds. "BUSY" message is displayed on your screen if detected.

<Z> - SOFT RESET

<ATZ>

Instead of turning your modem ON & OFF with the rear ON/OFF switch, you can "SOFT RESET" (clear) by simply typing <ATZ> <RETURN>

<+++> - ESCAPE TO COMMAND MODE

<+++>

When you need to return your modem to command status without hanging up, perhaps to change any of your parameter settings since you might be getting garbled data, so use this command without using <RETURN>, but if you like to disconnect your modem completely then wait for the OK result code to appear then send the ATH command.

EXTENDED COMMANDS

These commands are used to "ENABLE" or "DISABLE" some of the RS232C control signals.

<&C> - (DCD) CARRIER DETECT SIGNAL CONTROL (Pin 8)

<AT & C0> or <AT & C>

During this mode the "CARRIER DETECT" (DCD) signal is always "ON", regardless of the remote modem status.

<AT & C1>

When this mode is selected the "CARRIER DETECT" (DCD) signal is turned "ON". When your modem has made the connection with the remote device, it is ready to send data. FACTORY DEFAULT

<AT & C2>

This mode indicates that the "CARRIER DETECT" (DCD) signal is normally "ON", but it could be disconnected for 3 seconds when the modem disconnects.

<&D> - (DTR) DATA TERMINAL READY SIGNAL CONTROL (Pin 20)

<AT&D> or <AT & D0>

This command sets your modem to ignore the "DTR" signal.

<AT & D1>

This command sets your modem to return to command state after an ON to OFF function has been executed.

<AT & D2>

When this command is used, your modem disconnects and disables the auto answer mode plus ON to OFF function on DTR. **FACTORY DEFAULT.**

<AT & D3>

By using this command, your modem goes back to "INITIALIZATION" state if it detects a "ON to "OFF" of DTR. Please remember that by using this command you are resetting your modems parameter, just like doing an ATZ function.

<&S0> = "DSR", DATA SET READY CONTROLS (Pin 6)

<AT&S0>

When this command is set it indicates that "DSR" data set ready signal is turned "ON".

<AT&S1>

Using this function will enable the DSR signal to follow the RS232 signal.

<AT\D3>

When this command is used it will enable "CTS" clear to send signal to stay always "ON", while "DSR" (Date Set Ready Signal) will indicate the presence of an answer tone from the answering modem. FACTORY DEFAULT

<&F> - RESTORE FACTORY DEFAULTS

<AT & F>

This command will restore all factory default configurations back to the ROM (Read Only Memory).

<&G> - GUARD TONE SETTING

<AT & G0> or <AT & G>

This command controls the supply of the correct guard tone signal according to the country where this modem has to be set up. The above setting represents "NO GUARD TONE" signal.

<AT & G1>

This command represents a 550HZ guard tone signal.

<AT & G2>

Finally, this command represents a guard tone of 1800HZ signal (Used Overseas).

<&L> - DIAL UP SELECTION

<AT & L0>

When this command is set your modem is ready to be used as a "DIAL UP" device using the "PTSN" public switched telephone network service FACTORY DEFAULT.

<M> - ASYNC MODE SELECTION

<AT & M0>

When this command is enabled, your modem is set to communicate "ASYNCRONOUSLY" FACTORY DEFAULT.

<R> - "RTS" REQUEST TO SEND (Pin 4)
"CTS" CLEAR TO SEND (Pin 5) CONTROL

<AT & R0>

When this function is enabled the "CTS" signal will follow the RTS signal. FACTORY DEFAULT

<AT & R1>

On the other hand this function will ignore RTS signal while the CTS signal will always be "ON".

<T> - TERMINATE TEST IN PROGRESS

<AT & T>

When this command is selected will terminate any tests that were in progress.

<T1> - LOCAL ANALOG LOOPBACK

<AT & T1>

In order to isolate any problems that might exist in your installation, when you enable this command your modem will enter an automatic "LOCAL ANALOG LOOPBACK" test.

<AT & T 2>

NOT USED AT THIS TIME

<&T3> - DIGITAL LOOPBACK

<AT & T3>

When selected you will initiate a digital loopback test, which will test the digital (RS232) connection of your modem to your computer and indicate any problems that might exist.

<&T4> - GRANT REQUEST FOR REMOTE DIGITAL LOOPBACK

<AT & T4>

This test will grant request for a Remote Digital Loopback, which means that you will test the link between your modem to the remote modem and the remote digital device connected to that remote modem.

<&T5> - DENY REQUEST FOR REMOTE DIGITAL LOOPHOLE

<AT & T5>

This command will deny request for remote digital loopback for remote digital loopback test.

<&T6> - INITIATE REMOTE DIGITAL LOOPBACK

<AT & T6>

When selected your modem will initiate a remote digital loopback test & isolate any problems they might exist.

<T7> - INITIATE REMOTE DIGITAL LOOPBACK WITH SELF TEST.

<AT & T7>

This command will initiate a remote digital loopback with self test.

<T8> - INITIATE LOCAL ANALOG LOOPBACK WITH SELF TEST

<AT & T8>

When this test is selected, it will initiate local analog loopback with self test.

IMPORTANT

Your modem runs through a self-test when powered ON for 1 second

		S-REGISTERS	
REGISTER	FUNTION	TO VIEW REGISTER CONTENT	FACTORY DEFAULT
S0*	Allows number of rings before AUTO ANSWER. (SO=0 is NOT Auto answer).	ATS0?	ATS0=0
S1	Counts number of rings.	ATS1?	ATS1=0
S2	Escape Code character	ATS2?	ATS2=43
S3	ASCII character for carriage return.	ATS3?	ATS3=13
S4	ASCII character for line feed.	ATS4?	ATS4=10
S5	ASCII character for backspace.	ATS5?	ATS5=8
S6	Number of seconds to wait for dialtone.	ATS6?	ATS6=2
S7	Number of seconds to wait for carrier.	ATS7?	ATS7=50
S8	Duration of pause (,) in seconds.	ATS8?	ATS8=2
S9	Carrier Detect duration before connect, in 1/10 seconds.	ATS9?	ATS9=6
S10	Loss of carrier duration before hanging up, in 1/10 seconds.	ATS10?	ATS10=30
S11	Not Used		
S12	Escape code guard time in 50th seconds.	ATS12?	ATS12=50
S13	Bit mapped options	ATS13?	ATS13=0
S14*	Bit mapped options	ATS14?	ATS14=(HEX)
S15	Flag register.	ATS15?	ATS15=0

S - REGISTERS CONTINUED			
S16	Modem Test Option	ATS16?	ATS16=00
S17	Not used.		
S18	Test Timer, in seconds.	ATS18?	ATS18=00
S19	Not used.		
S20	Not used.		
S21 *	Bit mapped options	ATS21?	ATS21=30 (HEX)
S22 *	Bit mapped options	ATS22?	ATS22=76
S24	Not used.		
S25 *	Delay to DTR, in seconds.	ATS25?	ATS25=5
S26 *	RTS to CTS delay, in 100th sec.	ATS26?	ATS26=1
S27 *	Bit mapped options register.	ATS27?	ATS27=0

NOTE

All the REGISTERS with the STAR "*" sign may be stored in the NON VOLATILE MEMORY>

IMPORTANT

S - REGISTER CONFIGURATIONS/SETTING

Your modem uses 28 S-Registers S0 through S27. Each register contains 8 bits. These registers provide the opportunity to STORE certain operating parameters used to monitor and control various modem operations.

HOW TO VIEW THE CONTENT OF A REGISTER

<ATS0?>

In the above example you are checking the content of REGISTER 0.

HOW TO CHANGE THE CONTENT OF A REGISTER

<ATS0=0>

First you view the content then change the Register setting from 0 (zero) to 1 (one) in the following manner;

<ATS0=1> <RETURN>

IMPORTANT

All numeric values are base 10, except Registers S14 & S22.

HOW TO VIEW MULTIPLE REGISTER CONTENT

<ATS22?S0>

Response 060

Response 002

Response OK

As you can see the response will be in a multiple format.

S-REGISTERS SUMMARY

<S0> - ON/OFF AUTO ANSWER

You can indicate if you want your modem to either "AUTO ANSWER" or not "ANSWER" at all. The range could be from 0 to 255 rings. FACTORY DEFAULT is 0.

<S1> - COUNTS NUMBER OF RINGS

This register when set will count the number of rings. FACTORY DEFAULT is 0.

<S2> - ESCAPE CODE CHARACTER

When the ASCII value for the escape code is greater than 127 then the escape code will be disabled until the remote modem will hang up. FACTORY DEFAULT is 43.

<S3> - ASCII CHARACTER FOR CARRIAGE RETURN

This register represents the ASCII value of a carriage return character. The range to set this register will be 0-255. At power up or when used with the reset command ATZ, this register will default to 13. FACTORY DEFAULT is 13.

<S4> - ASCII CHARACTER FOR LINE FEED

This register represents the ASCII value of a LINE FEED character. This register can accept any value between 0 and 255, but cannot save it on the NON-VOLATILE MEMORY. FACTORY DEFAULT is 10.

<S5> - ASCII CHARACTER FOR BACKSPACE

ASCII character for BACKSPACE. This register can be set @ any value between 0 and 32, but again cannot be saved in the NON VOLATILE MEMORY. FACTORY DEFAULT is 8.

<S6> - WAIT FOR DIAL TONE

Number of seconds to wait for a dialtone. This register will assist you to get a delayed dialtone, just by simply utilizing any value between 0 - 255 seconds. FACTORY DEFAULT is 2.

<S7> - NUMBER OF SECONDS TO WAIT FOR CARRIER

Sometimes your modem may not detect a carrier fast enough to make a connection. So you can tell your modem to wait 1-55 seconds for CARRIER before disconnecting. FACTORY DEFAULT is 30 SECONDS.

<S8> - DURATION OF PAUSE (,) IN SECONDS

Every PAUSE "character" represents a 2 second delay. You can select a pause character at any value between 0-255 seconds.

<S9> - CARRIER DETECT RESPONSE TIME

This register sets the length of time of the CARRIER DETECT character to be present during a connection attempt. The delay time could be set 1 thru 255 seconds. The W command works better for this purpose. FACTORY DEFAULT IS 6 SECONDS.

<S10> - LOSS OF CARRIER BEFORE HANGING UP

The amount of time it will take to hang up after losing Carrier Detect signal. Delay time could be set 1 thru 255 seconds, FACTORY DEFAULT IS 7 SECONDS.

<S11> - NOT USED.

<S12> - ESCAPE CODE GUARD TIME

Using this register will provide the time which will be required to identify & execute the escape sequence. Time is measured in 20 to 255 millisecond range. FACTORY DEFAULT IS MILLISECONDS.

<S13> - BIT MAPPED OPTION

USED INTERNALLY BY THE MODEM. NOT FOR USER USE.
FACTORY DEFAULT is 0.

<S14> - BIT MAPPED OPTION

USED INTERNALLY BY THE MODEM. NOT FOR USER USE.
FACTORY DEFAULT IS AA (In HEX).

<S15> - BIT MAPPED OPTION

NOT USED. FACTORY DEFAULT 00.

<S16> - MODEM TEST OPTION

This register is used by Hayes to set various loopback tests. We sue &T commands to perform various tests. FACTORY DEFAULT IS 00.

<S17> - NOT USED

<S18> - TEST TIMER IN SECONDS

This register will establish the amount of time that a particular test should take place which could be selected anywhere between 1 to 255 seconds.
FACTORY DEFAULT IS 00 SECONDS.

<S19> - NOT USED.

<S20> - NOT USED.

<S21> - BIT MAPPED REGISTER. FACTORY DEFAULT 30 (HEX)

<S22> - BIT MAPPED REGISTER. FACTORY DEFAULT 76 (HEX)

<S23> - BIT MAPPED REGISTER. FACTORY DEFAULT 07 (HEX)

<S24> - NOT USED.

<S25> - DELAY TO DTR.

This register will control the amount in synchronous mode DTR delay before disconnect occurs. Select value range from 0 to 255 seconds. FACTORY DEFAULT IS 5 SECONDS.

<S26> - RTS TO CTS DELAY

When using this register your modem will be able to control the amount of RTS to CTS delay setting. Select value range from 0 to 2550 in milliseconds. FACTORY DEFAULT IS 001.

<S27> - BIT MAPPED.

S-REGISTER FACTORY SETTING TABLE

REGISTER	DECIMAL VALUE	HEXADECIMAL VALUE
S0	000	00H
S1	000	00H
S2	043	2BH
S3	013	0DH
S4	010	0AH
S5	008	08H
S6	002	02H
S7	030	1EH
S8	002	02H
S9	006	06H
S10	030	1EH
S11	000	00H
S12	050	32H
S13	000	00H
S14	170	AAH
S15	000	00H
S16	000	00H
S17	000	00H
S18	000	00H
S19	000	00H
S20	000	00H
S21	048	30H
S22	118	76H
S23	007	07H
S24	000	00H
S25	005	05H
S26	001	01H
S27	000	00H

NOTE

To display S-Register FACTORY DEFAULT setting type <AT&F%R><RETURN>

OTHER FACTORY DEFAULTS

<ATE1>	Echo Enabled
<ATL3>	Speaker Volume Setting
<ATM1>	Speaker is "ON" during Dialing
<ATQ0>	Result Codes enabled
<AT&C1>	DCD Signal is "ON".
<AT&D2>	ON to OFF function on DTR & Auto Answer Disabled.
<AT\ D3>	CTS enable while DSR will indicate answer tone.
<AT&L0>	Dial up mode
<AT&M0>	Asynchronous mode
<AT&R0>	CTS follows RTS

RS-232 PIN ASSIGNMENTS

Pin No.	Signal Designation	RS-232 Designation	Direction (from modem)
2	TD	BA	IN
3	RD	BB	OUT
4	RTS	CA	IN
5	CTS	CB	OUT
6	DSR	CC	OUT
7	SG	AB	GND
8	DCD	CD	OUT
12	HS	CI	OUT
15	TDCLK	DB	OUT
17	RDCLK	DD	OUT
20	DTR	CD	IN
22	RI	CE	OUT
23	HS2	CI	OUT
24	XTCLK	DA	IN

ASCII CHARACTER TABLE

CODE DEC HEX	CODE DEC HEX	CODE DEC HEX	CODE DEC HEX
NUL 0 00	SP 32 20	@ 64 40	~ 96 60
^A 1 01	! 33 21	A 65 41	a 97 61
^B 2 02	" 34 22	B 66 42	b 98 62
^C 3 03	# 35 23	C 67 43	c 99 63
^D 4 04	\$ 36 24	D 68 44	d 100 64
^E 5 05	% 37 25	E 69 45	e 101 65
^F 6 06	& 38 26	F 70 46	f 102 66
^G 7 07	' 39 27	G 71 47	g 103 67
^H 8 08	(40 28	H 72 48	h 104 68
^I 9 09) 41 29	I 73 49	i 105 69
^J 10 0A	* 42 2A	J 74 4A	j 106 6A
^K 11 0B	+ 43 2B	K 75 4B	k 107 6B
^L 12 0C	, 44 2C	L 76 4C	l 108 6C
^M 13 0D	- 45 2D	M 77 4D	m 109 6D
^N 14 0E	. 46 2E	N 78 4E	n 110 6E
^O 15 0F	/ 47 2F	O 79 4F	o 111 6F
^P 16 10	0 48 30	P 80 50	p 112 70
^Q 17 11	1 49 31	Q 81 51	q 113 71
^R 18 12	2 50 32	R 82 52	r 114 72
^S 19 13	3 51 33	S 83 53	s 115 73
^T 20 14	4 52 34	T 84 54	t 116 74
^U 21 15	5 53 35	U 85 55	u 117 75
^V 22 16	6 54 36	V 86 56	v 118 76
^W 23 17	7 55 37	W 87 57	w 119 77
^X 24 18	8 56 38	X 88 58	x 120 78
^Y 25 19	9 57 39	Y 89 59	y 121 79
^Z 26 1A	: 58 3A	Z 90 5A	z 122 7A
ESC 27 1B	; 59 3B	[91 5B	{ 123 7B
FS 28 1C	< 60 3C	\ 92 5C	124 7C
GS 29 1D	= 61 3D] 93 5D	} 125 7D
RS 30 1E	> 62 3E	^ 94 5E	~ 126 7E
US 31 1F	? 63 3F	_ 95 5F	DEL 127 7F

GLOSSARY

- AM** -AMPLITUDE MODULATION: Modulation where the magnitude of the data carrier signal is varied to represent binary values. This is when one amplitude represents a binary "1" and a different amplitude represents a binary "0".
- ANSWER MODE** -A particular arrangement of the frequency bands required by a modem in order to transmit and receive modulated information via specific frequency carriers. This arrangement is reverse for the originating party.
- ASCII** AMERICAN STANDARD CODE FOR INFORMATION INTERCHANGE. A standard code used to represent symbols via binary numbers. Standard ASCII code contains 128 symbols, or characters, represented by 7 bit binary code.
- ASYNCHRONOUS TRANSMISSION** - Transmission in which each information character is individually synchronized, usually by the use of start and stop elements. The gap between each character is not necessarily of a fixed length.
- AUTOMATIC CALLING UNIT (ACU)** - A device that automatically places a telephone call by receiving control signals from data terminal equipment.
- BAND** -A range of frequencies between two defined limits.
- BAUD** -A unit of signaling speed equal to the number of discrete conditions or signals per second.
- BINARY NUMBER SYSTEM** - The number system consisting of the digits zero and one. The position of the digit determines the exponential power of two to which that digit is raised.
- BIT** - A contraction of binary digit. One of the two elements of the Binary Number System.
- BIT MAPPING** -Refers to when individual bits are used by themselves, or in groups, as indicators to allow monitoring and control of specific functions.
- BYTE** -A group of adjacent bits treated as a unit. Eight bits are typically considered as one byte.

CARRIER -A continuous frequency capable of being modulated or impressed with information-bearing signals suitable for transmission in a particular medium (data channel).

CCITT -INTERNATIONAL CONSULTATIVE COMMITTEE FOR TELEGRAPHY AND TELEPHONY. A committee, reporting to the United Nations' International Telecommunications Union (ITU), that recommends specifications regarding the use of wire networks.

CRT -CATHODE RAY TUBE. A high-speed device, similar to a television picture tube, which provides a non-permanent visual display of system input-output data.

DAA - DATA ACCESS ARRANGEMENT. An arrangement within the modem for isolation of the control circuitry of the modem from the telephone equipment.

DCE -DATA COMMUNICATIONS EQUIPMENT. The equipment that provides the functions required to establish, maintain, and terminate a connection and perform the signal conversion and coding required for communication between data terminal equipment and data circuit.

DECIMAL NUMBER SYSTEM - The number system consisting of ten digits, zero through nine. The position of each digit determines the exponential power of ten to which that digit is to be raised.

DEMODULATION - The process of retrieving modulated information from a carrier signal.

DIP -DUAL IN-LINE PACKAGE. A component package in which there are two rows of connecting leads or pins for component connection to the circuit.

DTE -DATA TERMINAL EQUIPMENT. Equipment usually comprising the following functional units: control logic, buffer memory storage, and one or more input or output devices or computers.

DTMF -DUAL-TONE-MULTI-FREQUENCY. The use of two voice frequency tones for telephone system dialing purposes. Each tone pair represents one dialing character.

EIA -ELECTRONIC INDUSTRIES ASSOCIATION. An association whose members are of the various electronics fields and set standards for the US industry.

EMULATION -A software and system with a base of 16. In hexadecimal notation the first ten values are represented with 0 through 9 and the last six with the letters A through F.

DECIMAL	HEXADECIMAL	DECIMAL	HEXADECIMAL
0	0	8	8
1	1	9	9
2	2	10	A
3	3	11	B
4	4	12	C
5	5	13	D
6	6	14	E
7	7	15	F

LINK (COMMUNICATION) - The means of connecting equipment at one location to equipment at another location for the purpose of transmitting and receiving information.

MARK -The signal condition indicating a binary or logical "1". This condition represents one of the two states of a binary data bit, in opposition to a "SPACE" condition. During asynchronous transmission, a steady mark is transmitted when there is no data being transmitted.

MODEM -A contraction of modulator-demodulator. A data-set that transmits and receives data, control, and clock signals utilizing modulation and demodulation processes.

MODULATION -The process of modifying a single frequency (the carrier signal) to carry information, or data, through a specific medium.

OFF-HOOK -This is the active state when the telephone line is used. A modem or telephone set is then on-line. When the telephone is used, the handset is lifted OFF from the telephone's HOOK-switch.

ON-HOOK -The condition when a telephone line is not being used. A modem or telephone set is then off-line. When the telephone is not being used, the handset is resting ON the HOOK-switch.

ORIGINATE MODE - A particular arrangement of the frequency bands required of a modem in order to receive and transmit modulated information via select carrier frequencies. This arrangement is reverse for the answer party.

PROTOCOL -A formal set of rules governing the sequence, timing, format, and error control of data exchanged within a data network.

PARITY CHECK - The addition of non-information bits to data that makes the number of "one bits always even or odd. This permits detection of bit groupings that contain errors.

WHEN DATA TERMINAL PARITY IS ENABLED:

EVEN PARITY is when the number of data bits is detected as having an odd number of logical "1" bits, another "1" bit is appended to the data word to make the number of "1" bits an even value. If the number of "1" bits was even to start with, then a "0" bit is appended to allow the number of "1" bits to remain an even value.

ODD PARITY is similar to even parity except that the "1" or "0" bit is appended to make the number of "1" bits and value.

MARK PARITY is when the parity bit is always set to a logical "1".

SPACE PARITY is when the parity bit is always set to a logical "0".

QAM -**QUADRATURE AMPLITUDE MODULATION.** Modulation using a combination of Differential Phase Shift Keying and Amplitude Modulation. This combination of modulation schemes offers a higher data transfer rate at the same modulation rate than either of the two used alone.

QDPSK -**QUATERNARY DIFFERENTIAL PHASE SHIFT KEYING.** Modulation where the difference in the phase from one carrier frequency cycle to the next is interpreted as representing multiple data bits.

- RS-232-C** -ELECTRONIC INDUSTRIES ASSOCIATION'S (EIA) Recommended Standard number 232 revision C.
- SPACE** -The signal condition indicating a binary or logical "0". This condition represents one of the two states of a binary data bit, in opposition to MARK condition.
- TERMINAL** -(1) A point in a system or communication network where data information can either enter or leave. (2) An input output device capable of transmitting.

LIMITED FIVE WARRANTY

That equipment manufactured and sold is free from defects in parts, materials and workmanship. Our obligation under this warranty is limited to repairing or replacing equipment or parts not already carrying a separate warranty.

We warrant this equipment for five (5) years. The first twelve months of the warranty covering parts and labor, and the balance of the period covering parts only.

This warranty shall not apply to equipment which has been subject to misuse, negligent handling, an accident, tampering, misapplication, changes to the product, or attempted repair of the product. Under these conditions the warranty is void.

It is expressly agreed that this warranty is in lieu of any and all other warranties and liabilities, expressed or implied, including, but not limited to any warranty of merchantability, fitness for any purpose, infringements and any liability for consequential damages arising out of the use of the products sold hereunder.

RETURN POLICY

To return a product for repair, contact the Customer Service Department, and request a Return Authorization Number (RMA). This number MUST be displayed on your shipping label.

FCC NOTICE

WARNING: Computing devices that connect to this device must employ shielded interface cables.

WARNING: This equipment generates and uses radio frequency energy and if not installed and used in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient the receiving antenna. Relocate the equipment with respect to the receiver. Move the equipment away from the receiver. Plug the equipment into a different outlet so that equipment and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

"How to Identify and Resolve Radio-TV Interference Problems".

This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4.

This equipment complies with Part 68 of the FCC Rules. Located on the bottom (solder) side of this equipment is a label that contains, among other information, the FCC Registration Number and Ringer Equivalence Number (REN) for this equipment. If requested, this information must be given to the telephone company.

The REN is useful to determine the quantity of devices you may connect to your telephone line and still have those devices ring when your telephone number is called. In most, but not all areas, the sum of the REN's of all devices connected to one line should not exceed five (5.0). To be certain of the number of devices you may connect to your line, as determined by the REN, you should contact your local telephone company to determine the maximum REN for your calling area.

If your telephone equipment causes harm to the telephone network, the telephone company may discontinue your service temporarily. If possible, they will notify you in advance. But if advance notice isn't practical, you will be notified as soon as possible. You will be informed of your right to file a complaint with the FCC.

Your telephone company may make changes in its facilities, equipment, operations or procedures that could affect the proper functioning of your equipment. If they do, you will be notified in advance to give you an opportunity to maintain uninterrupted telephone service.

If you experience trouble with this telephone equipment, please contact us for information on obtaining service or repairs. The telephone company may ask that you disconnect this equipment from the network until the problem has been corrected or until you are sure that the equipment is not malfunctioning. There are no user-serviceable components on this equipment.

This equipment may not be used on coin service provided by the telephone company. Connection to party lines is subject to state tariffs.

INSTALLATION PROCEDURES 2400 EXTERNAL MODEM

YOUR MODEM IS FURNISHED WITH THE FOLLOWING PARTS:

1. Your modem unit
2. One telephone cord with RJ11C jacks at both ends.
3. One power transformer (110VAC for U.S.A. & Canada) for External Modems Only.
4. Installation Card.

ADDITIONAL HARDWARE & SOFTWARE NEEDED PARTS

1. One each RS-232 Interface shielded Modem Cable (Male connector for the modem side...). (Ask your Reseller for Proper Cable Configuration).

Your modem cable must supply connections for all 25 pins.

NOTE

The RS-232 interface is an industry standard for data communications. For uniformity, it defines a 25-pin (DB25) connector and some of the signals required to interface a terminal with a modem.

2. Either a terminal (Asynchronous) or a Microcomputer with serial modem interface and a communications software package that will enable your computer to emulate (look like) an Asynchronous Terminal.

CAUTION

BE CERTAIN THAT THE POWER SWITCH IS IN THE OFF POSITION WHILE INSTALLING YOUR MODEM.

CONNECTING YOUR MODEM TO THE PHONE LINE

1. Plug one side of the modem phone cable to the wall jack and the other side to the modem (indicated as "LINE" jack behind the modem).

FIRST: Make certain that the power switch is in the "OFF" position.

SECOND: Connect the RS-232 cable.

NOTE

Your PC must have a SERIAL COMMUNICATION PORT which to be used to connect your modem. (NOT NEEDED FOR TERMINALS.)

THIRD: Connect the male end of the cable into the female connector indicated (RS-232) on the back panel of your modem.

FOURTH: Connect the other end of the cable into RS-232 plug of your terminal or your microcomputer.

CAUTION

TIGHTEN ALL THE SCREWS ON BOTH SIDES OF THE CONNECTORS, SINCE ANY LOOSE CONNECTION WILL RESULT IN MISCOMMUNICATION.

FIFTH: Connect your modem to your power transformer.

SIXTH: Plug the other end of the transformer into a standard 110 VAC WALL PLUG. (For 220VAC wall plug call factory).

NOTE

Before turning power "ON" to your modem make sure that your Microcomputer or your Terminal is turned "OFF". Since when you turn your modem "ON" it will read & store all the parameters which are provided by your computer or your terminal.

SEVEN: Turn your Modem "ON" (flip the ON/OFF switch to "ON").

IMPORTANT

Throughout your manual, commands entered at the terminal or computer keyboard will be shown in all CAPITAL LETTERS. The CARRIAGE RETURN/ENTER KEY will be indicated by the following SYMBOL: <ENTER>.

FAMILIARIZATION/START UP

In order for you to use this product to its fullest capability, it is important that you familiarize yourself with some of the basic aspects of your modem.

FRONT PANEL LED'S

- AA (AUTO ANSWER):** This LED is lit when the modem is set up to automatically answer any incoming calls.
- RI (RING INDICATOR):** Indicates an incoming call.

- OH (OFF HOOK):** When this LED is lit, the modem is attempting to initiate or receive a call.
- CD (CARRIER DETECT):** When this LED is lit, your modem is receiving a carrier signal from the other modem. (Pin 8, DB25)
- RD (RECEIVE DATA):** When this LED is lit, it is indicating that your local device is sending data (Communicating) to the other modem. (Pin 3, DB25)
- TD (TRANSMIT DATA):** When this LED is lit it is indicating that your modem is receiving the data from the other remote device. (Pin 2, DB25)
- DTR (DATA TERMINAL) READY:** When this LED is lit, indicates that your Terminal or computer is ready to receive & transmit data. (Pin 20, DB25)

SIDE PANEL SWITCH OPTIONS

There are FOUR (4) DIP SWITCHES on the side of your modem. They are easily accessible and could be set by using a sharp object (pen or pencil). These switches are designed with hardware override options to your software commands, therefore when you activate any of these switches, they will override your software settings.

Following are definitions of the available DIPSWITCH "ON" functions. Normally, the switches (located on the side panel) are in the "OFF" position.

SWITCH NUMBER	"ON" POSITION FUNCTION
1	The modem is in DUMB MODE which disables the modems ability to recognize commands or send result codes to the screen. When this switch is open the modem operates as a Hayes(R) compatible modem.
2	The modem IGNORES DTR. When this switch is open an ON to OFF transition of DTR causes the modem to hang up and go into command mode.
3	The CARRIER DETECT signal is always ON. When this switch is open the CARRIER DETECT signal is ON while the modem is connected and ready to transfer data.
4	FOR FUTURE USE.

NOTE

The programmed default is to have the modem AUTO ANSWER on the FIRST RING to aid in DUMB MODE operation.

IMPORTANT: These DIPSWITCHES are read on POWER UP Only.

IMPORTANT

IF YOU NEED ANY ASSISTANCE ON COMPLETING THIS INSTALLATION PLEASE CALL OUR TECHNICAL DEPARTMENT FOR TECHNICAL SUPPORT. (Check your Manual for the correct phone number and location.