

IBM PCjr Internal Modem

The IBM PCjr Internal Modem is a 65 mm (2.5 inch) by 190 mm (7.5 inch) adapter that plugs into the PCjr system board modem connector. The modem connector is an extension of the system I/O bus. All system control signals and voltage requirements are provided through a 2 by 15 position card-edge tab with 0.254 cm (0.100-inch) spacing on the modem adapter.

Functional Description

The Internal Modem consists of two major parts: (1) the INS8250A Asynchronous Communication Element, and (2) the Smart 103 Modem. Therefore, the programming must be considered in two parts. The INS8250A communications protocol is a function of the system ROM BIOS, and is discussed later in this section. All 'pacing' of the interface and control-signal status must be handled by the system software. After the INS8250A is initialized, the modem is controlled by ASCII characters transmitted by the INS8250A.

Key features of the INS8250A used in the modem adapter are:

- Adds or deletes start bits, stop bits, and parity bits to or from the serial data stream
- Full double-buffering eliminates the need for precise synchronization
- Independently-controlled transmit, receive, line status, and data-set interrupts
- Programmable baud-rate-generator allows division of the baud clock by 373 (hex 175) for a 300-bps transmission-speed or 1017 (hex 3F9) for a 110-bps transmission-speed to generate the internal 16 x clock

- Modem-control functions: Clear to Send (CTS), Data Set Ready (DSR), Data Terminal Ready (DTR), Ring Indicator (RI), and Data Carrier Detect (DCD)
- Fully-programmable serial-interface

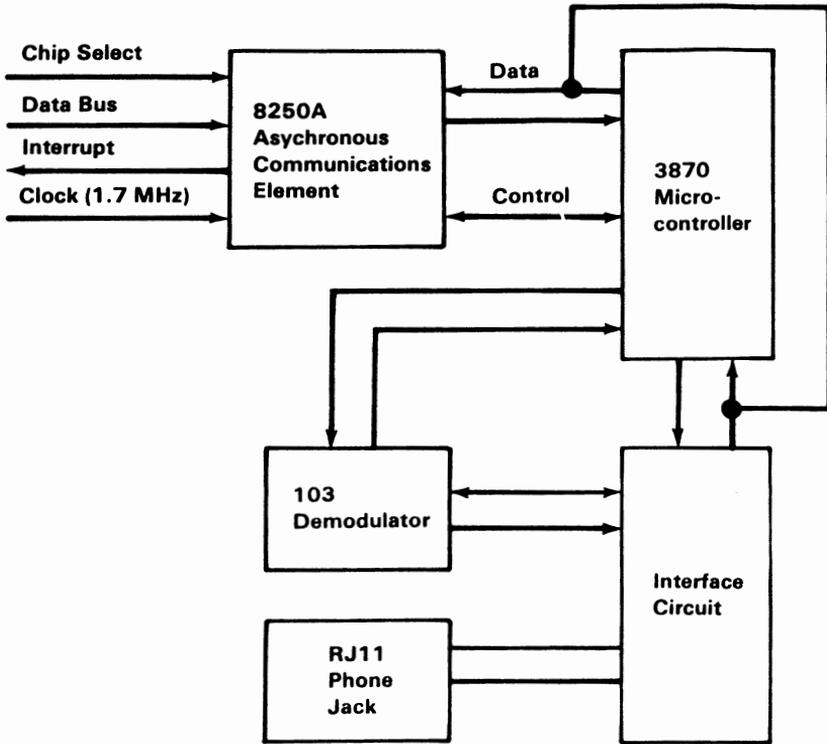
characteristics:

- 7, or 8-bit characters
- Even, odd, or no-parity bit generation and detection
- 1 stop-bit generation
- Baud-rate generation
- False-start bit detection
- Complete status reporting capabilities
- Line-break generation and detection
- Internal-diagnostic capabilities
 - Loopback controls for communications-link fault-isolation
 - Break, parity, overrun, framing-error simulation
- Fully prioritized-interrupt system-controls

Key features of the Smart 103 Modem used on the IBM PCjr Internal Modem are:

- Direct connection to a telephone company line through an FCC Part-68-approved permissive connection
- Compatible to Bell Series 100 originate/answer for modulation and handshaking
- All functions controlled by ASCII characters and INS8250A modem-control lines
- Uses modular phone-jack (USOC RJ11)
- Data rate is either 300 or 110 bits-per-second
- Auto/manual originate
- Auto/manual answer
- Communication mode is full duplex on two-wire, switched-network channels

- Auto dialer; either DTMF ([dual-tone modulated-frequency] touch-tone) or pulse-dialing (rotary dial) by software command
- Tandem dialing
- Call-progress reporting
- Dial-tone, ring-back tone, and busy-tone detection



IBM PCjr Internal Modem Block Diagram

Modem Design Parameters

The following tables describe the design parameters of the Smart 103 Modem.

Dialer Type:	Two modes 1. Forced Touch-Tone (DTMF) dialing 2. Forced pulse dialing
Tandem Dialing:	The ASCII character P (hex 50 or 70) in the dial string causes a delay of up to 10 seconds while the modem is searching for another dial tone. A time out will cause the modem to hang up and post status. The ASCII character W (hex 57 or 77) in the dial string causes a 5-second dead wait before continuing to dial. Multiple ASCII W's will cause multiple waits.
Pulse Dialing:	Rate: 10 + 1, -0 pulses per second Duty Cycle: 60% make, 40% break Interdigit Delay: 800 ms \pm 50 ms
DTMF Dialing:	Tone Duration: 85 ms \pm 10 ms Intertone Duration: 80 ms \pm 10 ms

Dialer Parameters (Part 1 of 2)

Tone Pair Frequencies:		
ASCII Digit Code	Frequency (Hz)	
0	941	1336
1	697	1209
2	697	1336
3	697	1477
4	770	1209
5	770	1336
6	770	1477
7	852	1209
8	852	1336
9	852	1477
*	941	1209
#	941	1477

Dialer Parameters (Part 2 of 2)

Time Out Duration: A data call will time out if an answer tone is not detected within 45 seconds of the last digit dialed.

Failed Call Time Out Parameter

Modulation: Conforms to Bell 103/113 specification using binary phase-coherent frequency shift keying (FSK).

Modulation Parameter

Mode	Originating End	Answering End
Transmit	1070 Space 1270 Mark	2025 Space 2225 Mark
Receive	2025 Hz Space 2225 Hz Mark	1070 Hz Space 1270 Hz Mark

Transmitter/Receiver Frequency Parameters

Receive Sensitivity	More negative or equal to -42 dBm.
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Receive Sensitivity Parameters

Transmitter Level	Fixed at -10 dBm as per FCC Part 68 Permissive connection.
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Transmitter Level Parameter

Programming Considerations

The modem and the IBM PCjr system can communicate commands or data between each other. Any commands sent to the modem from the IBM PCjr are stripped from the data stream and executed but are not transmitted to the receiving station. The data is transparent to the modem. The modem is capable of causing hardware interrupts as the result of certain conditions, and in response to queries for its status.

Commands to the modem are a sequence of characters preceded by a single command character. The command character tells the modem that the following character sequence, until a carriage return, is a command. The carriage return completes the command sequence and causes the modem to execute the commands. The command character (represented by [cc] in the following text) is programmable (with the NEW command) to any ASCII character (hex 00 thru 7F). The default for the command character is Ctrl N (ASCII hex 0E).

Commands can occur anywhere in the data stream if properly formatted but are not to be executed by the modem until a carriage return is received.

Multiple commands are allowed if separated by commas and preceded by a single command character.

Command Format

The following is the command format that all commands must follow.

[cc][command word][delimiter][arguments] [,more][CR]

where:

[cc]	is the single ASCII command character.
[command word]	is the command word or the first letter of the command word.
[delimiter]	is always a space when separating an argument and command word. Any spaces thereafter are ignored until the modem sees a comma, an argument or a carriage return.
[arguments]	is a variable that is replaced by any character allowed by the command definition.
[,more]	is any additional commands preceded by a comma.
[CR]	is a carriage return that completes the command sequence and causes the modem to execute the commands.

The following are two examples of command format.

```
[cc] COUNT 5 [CR]
sample test [cc] VOICE, D (408)
555-1234,QUERY [CR]
```

Format Guidelines

1. Commands can occur anywhere in the data stream if properly formatted but are not be executed by the modem until a carriage return is received.
2. Multiple commands are allowed if separated by commas and preceded by a single command-character.
3. Only the first character of the command word is significant. All remaining characters are ignored up to the first space following the command word. In other words, the **DIAL** command and **DUMMY** are treated identically.

4. The modem does not discriminate between upper-case and lower-case characters.
5. There are three ways to send the current command-character as data to a receiving station:
 - a. Consecutively sending it twice:
 [cc][cc]
 This would send the character a single time.
 - b. Change the command character (with the **NEW** command) to another ASCII character and then transmit the previous command-character.
 - c. Place the modem in the Transparent mode and then transmit the character.

Commands

The commands that are used with the integrated modem are listed on the following pages in alphabetical order.

Each of the commands has its syntax described according to the following conventions:

1. Words in capital letters are keywords. Only the first letter of the keyword is required, the others are optional.
2. You must supply any arguments which are in lower-case letters. Valid characters for arguments are defined as:
 - m - ASCII decimal digits 0 to 9, *, #, I, P, and W
 - n - ASCII hexadecimal digits 0 to F
 - o - ASCII hexadecimal digits 0 to 9
 - p - any ASCII character

3. All arguments are examined for validity. If extra characters are used in an argument, the extra characters are ignored. If the argument is invalid, the command is ignored.
4. An ellipsis (...) indicates an item may be repeated as many times as you wish.
5. All command lines must begin with a command character. The default command-character is (CONTROL N).
6. Multiple commands separated by commas can follow a single command-character.

An example of the **DIAL** command is given below:

Command format - **DIAL m...m**

Command line - **DIAL 1 800 555 1234**

If an invalid argument or no argument is given, the command is not executed. Also, a question mark (?) is given as the error response and the command line is aborted.

The commands are as follows:

Format: ANSWER

A

Purpose: To logically take the phone off the hook and force ANSWER mode. This is logically like a manual answer.

Format: Break n

Purpose: To send a space or break character for a duration equal to a multiple of 100 ms ($n \times 100$ ms).

Format: **COUNT n**

C n

Where **n** is the number of complete rings in the range of hex 0 to hex F.

When answering an incoming call, the modem answers the phone after **n** complete incoming rings, where **n** is any value from hex 0 to F.

A value of zero specifies that the modem not answer an incoming call, but still carry out any instructions from the host.

When dialing, the modem waits **n + 3** complete ringbacks before cancelling the call.

If **n** exceeds 4, the 45-second abort timer cancels an outgoing call with an "UNSUCCESSFUL" response, as more than seven ringbacks exceeds 45 seconds.

Purpose: Sets the ring count when the modem is answering an incoming call or dialing a call.

Default: **0**

Format: DIAL m...m

D m...m

Where m...m is a dial string of ASCII decimal digits 0 through 9, *, #, I, P, and W. A maximum of 33 characters are allowed in the dial string. The first character of the string defaults to P (a 10-second delay while searching for the dial tone). W causes the modem to delay five seconds, then continue dialing.

W or P must start a string, can also occur anywhere within a string, and causes the digits to be tone dialed.

The characters * and # represent the two extra buttons on a push-button phone, but may be used for other things.

I causes the next digits to be pulse dialed. The I stays in effect until a (P,), (W,), or end of command. The modem then searches for line busy, ringing, or incoming carriers while posting the status.

Purpose: To cause the modem to dial.

Default: P (10-second timeout). (If this command is used without an argument, the last number dialed is redialed once.)

Format: **FORMAT n**

F n

Where **n** is one of the following:

n	Parity	Data Length	Stop Bit
0	Mark	7	1
1	Space	7	1
2	Odd	7	1
3	Even	7	1
4	None	8	1
5-7	Reserved		

The 8250A line control register (LCR) must specify the same format as defined in the **FORMAT n** command to 'enable' data/command communication.

Do not combine this command with any other commands except the **SPEED** command on a single command line.

Note: If programming in BASIC, this command must be used in addition to specifying the same parity and data length in the BASIC 'open' statement.

Purpose: To change the parity and number of stop-bits being transmitted at either end, to a new format.

Default: 3

Format: HANGUP

H

Purpose: To perform a clean disconnect and go on-hook.
Logically the same as manually hanging up.

Format: INITIALIZE

I

This command is executed in 10 seconds and is the same as a cold start. An "OK" response is not returned after execution and the integrity test code in the QUERY command is set.

Purpose: Places the modem in the power-up default-state.

Format: LONG RESPONSE o

L o

Where o is one of the following:

o	Mode	Responses
0	Verbose	"BUSY" "CONNECTED" "NO ANSWER" "NO DIAL TONE" "OK" "RING" "UNSUCCESSFUL " "?" (Question Mark)
1	Terse (Hex code)	30 31 32 33 34 35 36 37

System Options

Note: The dial string is not echoed in the terse mode.

Purpose: Modifies message feedback. Information is posted in the status area.

Default: 0 (Verbose mode)

Format: **MODEM**

M

Purpose: Forces the modem into the data state where the carrier is placed on the telephone line and proper connection-protocols are followed.

This command is equivalent to **ANSWER** if the data state started as autoanswer.

Format: **NEW p**

N p

where **p** is any ASCII character.(hex 0E)

Purpose: Changes the command character to an ASCII character.

Default: Ctrl N (ASCII hex 0E)

Format: **ORIGINATE**

O

Purpose: Logically takes the phone off-hook and forces the **ORIGINATE** mode. Logically equivalent to manual originate.

Format: PICKUP

P

Purpose: Logically takes the phone off-hook and puts the modem in the voice state.

Format: QUERY

Q

Purpose: To query the modem for its status information.

Possible characters returned by the modem are as follows:

Responses	Meaning
H0 or H1	Hook status: H0 = on-hook, H1 = off-hook.
S0 to SF	Current ringcount setting in hex.
B	Line busy.
D	Line dead: no dial-tone found or no ring/no busy timeout after dialing.
L	Successful dial and handshake.
N	Dial not recorded: dial tone present after dialing.
X	No answer: ringcount plus 3 exceeded.
T0	Integrity test passed.
T1	Integrity test failed.

The first group of characters is always returned for a **QUERY** command. The second group of characters is returned only after a dialing sequence has been started or a change has occurred in the dialing status. The third group of characters is returned when a **TEST** command has occurred. All characters except the first group are erased by being read and do not appear in response to the next **QUERY** unless the

condition has recurred in the interim. The **QUERY** response overrides any incoming data from the telephone line.

Format: **RETRY**

R

Purpose: When placed after a **DIAL** command, it causes the modem to execute up to 10 redials at a rate of one per 40 seconds. The redials are triggered by a busy detection after dialing.

Format: **SPEED o**

S o

Where **o** is one of the following:

- o** **bps**

- 0 -** **110**
- 1 -** **300**
- 2 -** **Reserved**

Note: Do not combine this command with other commands except the **FORMAT** command on a single command line.

The **SPEED** command must be issued before the 8250A baud rate is changed.

Note: If programming in **BASIC**, this command must be used in addition to specifying the same bps rate in the **BASIC** 'open' statement.

Purpose: Sets the baud rate.

Default: 1 (300 bps)

Format: **TRANSPARENT n...n**

T n...n

Where **n...n** is the number of bytes to transmit in the range of hex 0 to hex FFFF.

Purpose: Places the modem in the transparent mode for the next **n...n** bytes.

The modem does not look for command sequences but instead transmits every character it receives.

The argument can be up to four ASCII-coded hex digits long. This provides a range of 65,536 bytes.

If an argument is not included with the **TRANSPARENT** command, the command is ignored because it has no default.

The transparent mode is terminated when:

1. **n...n** characters have been transmitted.
2. Loss of carrier timeout.
3. INS8250A OUT 1 pin goes 'active.' (The INS8250A -OUT 1 signal should remain 'active' until the transparent mode is requested again.)

The modem exits the transparent mode before processing the next complete character from the host.

To re-enter the transparent mode, the sequence is:

1. The INS8250A -OUT 1 pin changes to, or remains in the 'inactive' state.
2. The command string containing the **TRANSPARENT** command is issued.

An argument of 0 causes a permanent transparent mode which can be exited by the INS8250A -OUT 1 pin going 'active.'

Format: VOICE

V

Purpose: Forces the modem to the voice state where no tones or carriers are placed or searched for on the telephone line.

This state is used for voice communication, when the modem is an autodialer or answering device only. It is also necessary to be in the voice state to transmit DTMF tone-pairs.

This command 'disables' the autoanswer function.

The status responses are:

1. If a busy signal is detected "BUSY OK".
2. Any other condition "OK...(16 dots)....CONNECTED".

Format: **WAIT**

W

Purpose: Causes the modem to take no action, including autoanswer, until the next command is received from the host. All commands following the **WAIT** command in a single command-line are ignored.

Format: **XMIT m...m**

X m...m

Purpose: Instructs the modem to transmit the DTMF tone-pairs found in the argument string **m...m**. This is only valid in the voice state. Delays between digits can be caused by inserting **W**'s in the string.

Each **W** causes a five-second delay.

Format: ZTEST o

Z o

Where o is one of the following:

o Test

0 - Hardware Integrity Test

1 - Analog Loop Back Test

Purpose: Places the modem in the test mode specified by the argument.

For modes other than the integrity test, the modem stays in the test mode until any other command is received.

For the integrity test, the test is performed, status posted, and then the modem returns to service immediately. The integrity test takes eight to 10 seconds to execute and its completion is signaled by an "OK" message.

All commands following the ZTEST command in a single command-line are ignored.

Responses

Autoanswer

If -DTR is 'active', the modem goes off-hook and proper connection protocols including the two-second billing delay are followed. If connection is made, the modem sends "CONNECTED" to the host and posts the status in the status area.

Editing/Changing Command Lines

Corrections to the command line can be performed by aborting current-command lines and typing a new line or by entering the correct command later on in the current-command line.

The last command entered on a single command-line supersedes any previously entered command that performs an opposite function.

A Control X or backspace received by the modem immediately aborts the entire command line.

Opposite Commands

The command line is scanned after its completion (after [CR] is entered). Commands which cause an action during the scan (for example, DIAL) are not candidates for opposite treatment. Only commands which 'preset' a static condition can be opposites.

They include:

Count (n)	two entries, latest are used
Format (n)	two entries, latest are used
New (p)	two entries, latest are used
Speed (n)	two entries, latest are used
Transparent n..n	two entries, latest are used
Modem - Voice	these are opposites only when on-hook

Note: Answer and originate are not opposites; each of these causes an action when scanned.

Status Conditions

The modem sends the host messages as defined in the **LONG RESPONSE** command for dialing success or failure. Hardware interrupts for carrier loss and detecting incoming rings are provided on the 8250A.

Dialing and Loss of Carrier

The dialing process begins with the modem searching for a dial tone if it is not in the blind dialing mode. If a dial tone is not detected, the modem hangs up, the appropriate status characters are posted, and the "NO DIAL TONE" message is returned to the host.

If a dial tone is found, the modem continues to dial. When a P is encountered in the dial string, the modem

delays for up to 10 seconds to search for another dial tone and returns the "NO DIAL TONE" message to the host if a dial tone is not detected. When a W is encountered in the dial string, the modem delays for five seconds before continuing to dial. Consecutive W's are allowed in a dial string.

Anytime a P or W is not followed with an I in a dial string, the next digits are tone-dialed. When an I follows a P or W, all following digits are pulse-dialed until a P, W, or end of command ([CR]) is detected.

The modem ignores any character except 0 through 9, *, #, I, P, or W while dialing. This allows the user to place parentheses and dashes in the dial string for greater legibility.

The modem checks the telephone line again after it has dialed the digits in the dial string. If a dial tone is found immediately, the dialed digits are not recorded and the modem posts this to the status characters, hangs up, and sends the "UNSUCCESSFUL" message to the host. If the line is busy, this is also posted to the status characters and the modem hangs up and returns the "BUSY" message to the host. If the line is ringing, the modem begins counting the number of rings. If this count exceeds the value of COUNT + 3, the modem hangs up and takes the same actions as above. If no answer tone is detected within 45 seconds after completion of dialing, the modem hangs up and takes the same actions as above.

Finally, if the call is answered, the modem either looks for a carrier and begins the handshake sequence (if it is in the data or modem state) or remains silent (if it is in the voice state). In the voice state, the modem looks for busy, and transmits a response (1) when the line is

found not busy, or (2) if it is found busy, in which case it also hangs up and possibly dials again. In voice state, ringback count and abort time out are not used.

If, during the process of establishing the data link after dialing, the modem receives any character from the host or - DTR goes 'inactive', the modem aborts the call with a clean disconnect, clears the balance of the command line, and sends an "OK" message. Also, the modem does not carry out the instruction sent from the host, even if the character is a command character.

In the data state, the modem transmits a message after successful completion of the handshake, or after it has determined that the handshake failed. An unsuccessful handshake is evidenced by absence of carrier at the proper time.

If a carrier drops out for more than two seconds in the data state, the modem begins a timeout lasting approximately 17 seconds. At the end of the timeout, the modem hangs up. Any command received during the 17 seconds resets the timer.

The modem does not automatically reestablish the connection if the carrier returns after this dropout interval. This allows the user or software to intercede by commanding the modem to go into the voice state, to hang up immediately, or to take some other action. The data connection may also be terminated by a **HANGUP** command while carriers are still present. A voice connection is always terminated by a **HANGUP** command.

Default State

Upon power up or after an **INITIALIZE** command is given, the modem returns to the default state as follows:

- A verification of hardware integrity is performed and the result posted to the status characters.
- The remaining status characters cleared.
- The modem is placed in the data state awaiting a dialing request or incoming ring.
- The Transparent mode is cleared.
- All loopback modes are cleared.
- The wait mode is cleared.
- The command character is set to Control-N.
- The data format is set to 7 data bits, even parity, and one stop bit.
- Ringcount is set to 0 (auto answer 'disabled')
- The modem is set to on-hook.
- The message mode is set to verbose.

Programming Examples

Call progress reporting is done in two modes, verbose messages or terse messages as defined in **LONG RESPONSE** command to the Serial In (SIN) pin of the 8250A. The power-up default is the verbose messages mode, and these messages from the modem are in capital letters. Also, in call progress reporting, the status area is updated.

The following examples are representative of real-time call-progress reporting. The italicized entries are user entries.

Example 1:

OK [cc]Dial 555-1234 [CR]
NO DIAL TONE
OK

In this example, no dial tone is detected within the time out period.

Example 2:

OK
[cc]Dial 555-1234 [CR]
5551234.....
RINGCONNECTED OK

In this example, a modem answer tone is detected.

Example 3:

OK
[cc]Dial 1(301)555-1234 [CR]
13015551234..... BUSY
OK

In this example, busy is detected.

Example 4:

```
OK
[cc]Dial 555-1234 [CR]
5551234.....
RING.....
RING.....
RING.....NO ANSWER
OK
```

In this example, ring count is exceeded before ringing stops.

Example 5:

```
OK
[cc]Dial 555-1234 [CR]
5551234.....
RING.....
.....
.....UNSUCCESSFUL
OK
```

In this example, a failed-call time-out occurred because an answer tone was not detected within the allotted time.

Example 6:

```
OK
[cc]Dial 99P555-1234 [CR]
99.....
.....NO DIAL TONE
OK
```

In this example, the second dial-tone is not detected within the time out period.

Example 7:

```
OK
[cc]Dial 99P421-7229 [CR]
99.....BUSY
OK
```

In this example, busy is detected within the time-out period.

Example 8:

OK
[cc]Dial 99WW555-1234 [CR]
99.....
.....
.....
.....
4217229....
RING.....CONNECTED OK

In this example, the access code is dialed and two dead waits are performed. Then, the second number is dialed and a modem answers.

Example 9:

OK
[cc]Dial 555-1234, Retry [CR]
5551234.....BUSY
5551234.....BUSY
5551234.....CONNECTED OK

In this example, the modem dials a number with auto redial. The first two times, the number is busy. The third time, a modem answers.

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Modes of Operation

The different modes of operation are selected by programming the 8250A Asynchronous Communication Element. This is done by selecting the I/O address (hex 3F8 to 3FF) and writing data out to the card.

The 8250A is externally programmed to provide asynchronous, ASCII, 10 bit character length including start, stop, and parity on the serial-output pin (SOUT, pin 11). The data rate is 110 or 300 bits-per-second. The commands can be either upper-case or lower-case characters. See the command, **Format [n]**, earlier in this section for additional information.

For further information refer to "Bibliography."

Hex Address	Register Selected	Input/Output	Mode		Notes
			1	2	
3F8	Transmit Buffer	Write	XX	XX	*
3F8	Receive Buffer	Read	XX	XX	*
3F8	Divisor Latch LSB	Write	75	F9	**
3F9	Divisor Latch MSB	Write	01	03	**
3F9	Interrupt Enable	Write	0F	0F	*
3FA	Interrupt Identification	Read	XX	XX	
3FB	Line Control	Write	1A	03	
3FC	Modem Control	Write	01	01	
3FD	Line Status	Read	XX	XX	
3FE	Modem Status	Read	XX	XX	
3FF	Scratch Pad	Write	XX	XX	

*DLAB = 0 (Bit 7 in line control Register).
 **DLAB = 1 (Bit 7 in line control Register).
 Mode 1 - 300 BPS - 7 Data Bits, 1 Stop Bit, Even Parity.
 Mode 2 - 110 BPS - 8 Data Bits, 1 Stop Bit, No Parity.

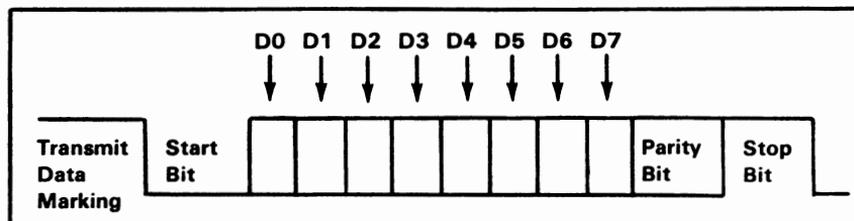
8250A Register Description

Interrupts

One interrupt line is provided to the system. This interrupt is IRQ4 and is 'positive active.' The interrupt enable register must be properly programmed to allow interrupts.

Data Format

The data format is as follows:



Transmitter Output and Receiver Input Data Format

Data bit 0 is the first bit to be transmitted or received. The attachment automatically inserts the start bit, the correct parity-bit if programmed to do so, and the stop bit.

Interfaces

8250A to Modem Interface

The following describes the 8250A to 103 modem interface:

Signal

Description

INS8250A -OUT 1

The 'inactive' state enables entry into the transparent mode using the UNLISTEN command. The 'active' state 'disables' the transparent mode.

-OUT 2

No connection.

SOUT

Serial output from the 8250A.

-RTS

-Request To Send

No connection.

-DTR

-Data Terminal Ready

1. To accept a command, -DTR must be 'active.'
2. If -DTR goes 'inactive', the modem does a clean disconnect sequence.
3. In auto-answer mode, the modem does not go off-hook, but RI on the 8250A will be toggled if the ringing signal is present.

SIN

Serial input to the 8250A.

-RI

The ring indicator pulses with an incoming ring voltage.

-CTS

-Clear To Send

This line is wired 'active' on the modem adapter.

-DSR

-Data Set Ready

This line is wired 'active' on the modem adapter.

-RLSD

-Received Line Signal Detect

When 'low', this line indicates the data carrier has been detected. If the carrier drops out for longer than two seconds, this line goes 'inactive' and starts the timeout timer.

-RESET, +XRESET

These lines are used to reset or initialize the modem logic upon power-up. These lines are synchronized to the falling edge of the clock. Its duration upon power up is 26.5 ms -RESET is 'active low'. +XRESET is 'active high.'

A0,A1,A2,A9

Address bits 0 to 3 and bit 9. These bits are used with -MODEM CS to select a register on the modem card.

**-MODEM CS
DISKETTE CS**

This line is 'active' for addresses hex 0F0 thru 0FF and 3F8 thru 3FF. It is gated with A9 in the 8250A to exclusively decode hex 3F8 thru 3FF.

D0 thru D7

Data bits 0 thru 7:

These eight lines form a bus through which all data is transferred. Bit 0 is the least significant bit (LSB).

-IOR

The content of the register addresses by line A0 thru A2 is gated onto lines D0 thru D7 when this line is 'active', -MODEM CS is 'active', and A9 is 'high.'

-IOW

The content of lines D0 thru S7 is stored in the register addressed by A0 thru A2 at the leading edge of this signal when -MODEM CS is 'active', and A9 is 'high.'

BAUDCLK

This is a 1.7895 MHz clock signal used to drive the Baud Rate Generator.

+MODEM INTR

This line is connected to the +IQRP4 on the 8259A Interrupt Controller.

-CARD INSTALL

This line indicates to the system BIOS that an IBM PCjr Internal Modem is installed in the feature location.

Telephone Company Interface

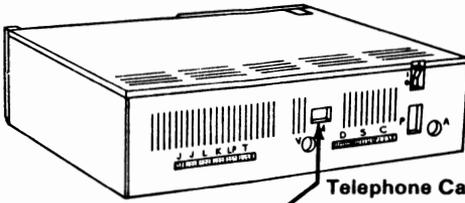
The telephone company interface is a 600 Ohm, balanced, two-wire telephone-interface design that meets the FCC Part 68 rules. A 2.13 meter (7 foot) modular telephone cord is included with the modem adapter.

Line-status detection of dial tone, ringback tone, busy, and incoming ring is provided along with automated routines which react to detected conditions.

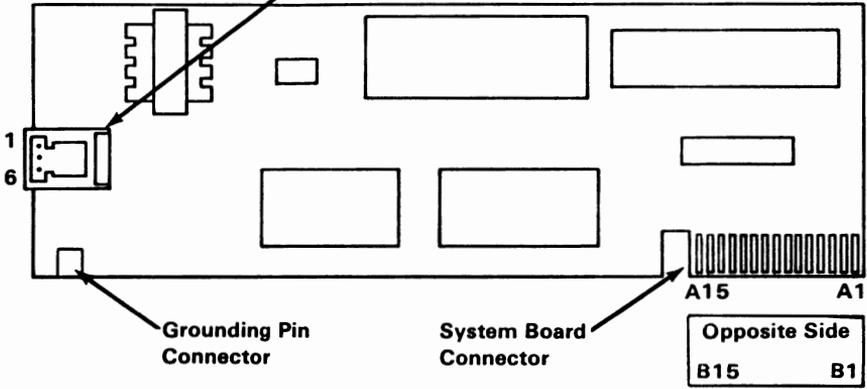
The modem card has one USOC RJ11 jack.

System I/O Channel

The following shows pin assignments for the system board modem connector. Pins A1 to A15 are on the component side.



Telephone Cable Connector



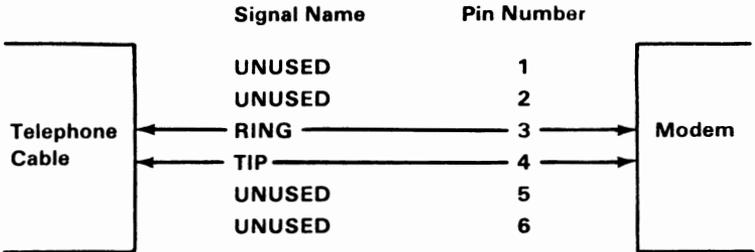
Grounding Pin Connector

System Board Connector

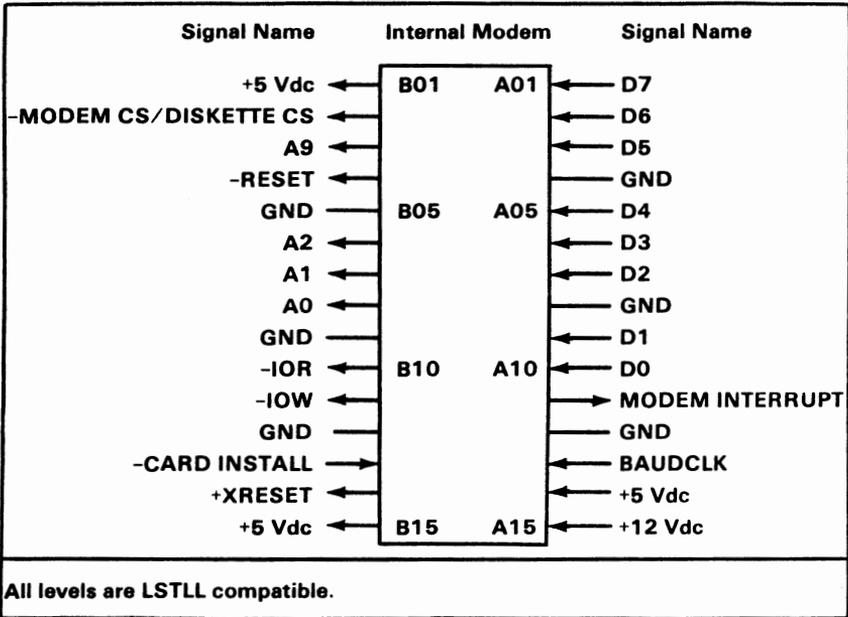
Opposite Side
B15 B1

System Options

Internal Modem Connectors



Connector Specifications (Part 1 of 2)



Connector Specifications (Part 2 of 2)