

X.3 PAD Parameters

A PAD is a packet assembler/disassembler, which is a device that collects data from a group of terminals and periodically outputs the data in packets (data organized in a special format). A PAD also does the reverse. That is, it can take data packets from a host and return them into a character stream that can be transmitted to the terminals. A PAD is defined by CCITT Recommendations X.3, X.28, and X.29.

CCITT Recommendation X.3 specifies the parameters for terminal-handling functions such as baud rate, flow control, character echoing, and other functions, for a connection to an X.25 host. The X.3 parameters are similar in function to the Telnet options.

CCITT Recommendation X.29 specifies a protocol for setting the X.3 parameters via a network connection. When a connection is established, the destination host can request that the PAD or terminal change its parameters using the X.29 protocol. A PAD can refuse to do this, in which case a terminal user can change the parameter later. A PAD cannot tell the destination host to change its X.3 parameters, but it can communicate that its own parameters were changed.

Along with Recommendations X.3 and X.29, the CCITT also provides Recommendation X.28 to specify the user interface for locally controlling a PAD; however, the protocol translator is not a PAD and this recommendation is not supported.

This appendix discusses the X.3 PAD parameters. The *Remote Access Server Connection Guide* explains how to make PAD connections and how to switch between connections.

The following sections provide descriptions of the X.3 parameters. Default values are noted in the descriptions. The default value for any parameter not so noted is zero for outgoing connections or not set for incoming PAD connections. For incoming PAD connections, the protocol translator sends an X.29 SET PARAMETER packet to set the noted defaults.

Because the X.3 parameters describe the user's terminal, which exists on only one side of the connection, the PAD protocols are not always symmetric.

Some of the commands described in this section require ASCII decimal values, which are listed in the appendix "ASCII Character Set," earlier in this publication.

Parameter 1: Escape from Data Transfer (Not Supported)

Parameter 1 determines whether or not the protocol translator will be allowed to escape from data transfer mode in order to send PAD command signals. Since the EXEC uses a two-character escape sequence, and there is no way to set the escape character on a Telnet connection, this parameter is refused on translation sessions as well.

Parameter 2: Local Echo Mode

Parameter 2 determines whether or not PAD is required to perform local echo of characters. This parameter can be negotiated end-to-end on translation sessions. On incoming PAD connections, software turns local echo off on the remote PAD to support the Cisco user interface. See Table E-1 for local echo mode values and their descriptions.

Table E-1 PAD Local Echo Mode Values

| Value | Description |
|-------|-------------------------------------------------|
| 0 | No local echo (incoming PAD connection default) |
| 1 | Local echo on (outgoing connection default) |

Parameter 3: Data Forward Character

Parameter 3 sets up a packet forwarding mask; that is, it selects which character causes PAD to forward a packet either before expiration of the Idle Timer (see parameter 4) or when in local editing mode. See Table E-2 for data forward character values and their descriptions.

Table E-2 PAD Data Forward Character Values

| Value | Description |
|-------|-----------------------------------------------------------------------|
| 0 | None—full packet |
| 1 | Forward packet upon receipt of an alphanumeric character |
| 2 | Forward packet upon receipt of a RETURN (outgoing connection default) |
| 4 | Forward packet upon receipt of ESCAPE, BEL, ENQ, or ACK |
| 8 | Forward packet upon receipt of DEL, CAN, OR DC2 |
| 16 | Forward packet upon receipt of ETX or EOT |
| 32 | Forward packet upon receipt of HT, LT, VT, or FF |
| 64 | All other characters in the ASCII chart |

Because X.3 supports a wider variety of dispatch characters than does Telnet, parameter changes to or from the default cause a translation session to negotiate in or out of line mode on the Telnet connection.

A forwarding mask can be statically set using the **terminal dispatch-character** terminal parameter-setting EXEC command. This command can set any character or characters as the forwarding mask, and overrides (when logical) any values set by parameter 3.

Parameter 4: Idle Timer

Parameter 4 sets the length of time the software waits for new data before sending a packet in the absence of a data forwarding character. See Table E-3 for idle timer values and their descriptions.

Table E-3 PAD Idle Timer Values

| Value | Description |
|-------|--------------------------------------------------------------------------------|
| 0 | No timer |
| 1-255 | Delay value in twentieths of a second (default for both connection types is 1) |

Parameter 5: Device Control (Not Supported)

Parameter 5 selects whether PAD can transmit flow control (ASCII XON/XOFF) characters during data transfer to the terminal to control the terminal and data flow. Flow control is not directly supported on routers because data must make network hops to travel to its final destination. However, depending on the type of incoming connection, setting this parameter can cause similar negotiations to be sent over the connection, thereby attempting to change the state of the flow control option at the device closest to the user.

Parameter 6: PAD Service Signals (Not Supported)

Parameter 6 selects whether or not PAD is required to transmit service signals. Because the router does not use Recommendation X.28 for its user interface, this parameter is ignored.

Parameter 7: Action upon Receipt of a BREAK Signal

Parameter 7 defines the action of the PAD after receiving a BREAK signal from the terminal. See Table E-4 for PAD BREAK signal values and their descriptions.

Table E-4 PAD BREAK Signal Values

| Value | Description |
|-------|-----------------------------------------------------------------------------------------------------------------|
| 0 | Ignore the BREAK signal. |
| 1 | Transmit an interrupt packet to notify the remote host or another PAD that the BREAK signal has been generated. |
| 2 | Transmit a Reset packet to reset the virtual circuit. |
| 4 | Transmit an X.29 Break indication to the remote host, or to a PAD (outgoing connection default). |
| 8 | Escape from data transfer mode. |
| 16 | Discard output to the terminal by setting parameter 8 to a value of 1. |
| 21 | Combination of values 1, 4 and 16 (incoming connection default). |

The PAD protocols allow you to send a special X.29 Indication of Break packet, send an Interrupt packet, perform a Reset operation, act as if the Recall character had been typed, or begin discarding output to the user. Combinations of these options are also allowed, as long as they make sense. Common options are to begin discarding output and send both an X.25 Interrupt packet and an X.29 Indication of Break packet, and these options are supported. All other options are not supported and are silently ignored.

Parameter 8: Discard Output

Parameter 8 indicates to the PAD whether to discard received packets rather than disassemble and transmit them. This parameter works in conjunction with parameter 7. If value 16 is chosen for parameter 7, all output is discarded after reception of the BREAK signal. Setting parameter 8 to zero restores normal data delivery to the terminal. See Table E-5 for PAD discard output values and their descriptions.

Table E-5 PAD Discard Output Values

| Value | Description |
|-------|-----------------------------------------------------------------------------------|
| 0 | Normal data delivery to the terminal (outgoing connection default). |
| 1 | Discard all output to the terminal. Set by parameter 7; see previous description. |

This parameter can also be set and unset manually using the PAD **resume EXEC** command.

Parameter 9: Return Padding (Not Supported)

Parameter 9 determines whether or not PAD should provide padding (insert filler characters) upon receipt of a Return character from the terminal.

Parameter 10: Line Folding (Not Supported)

Line folding means inserting a LINE FEED at a certain point which places subsequent characters on the next line. Parameter 10 determines selection of this function and specification of the line length.

Parameter 11: Baud Rate

Parameter 11 is a read-only value that determines the baud rate transmitted across the interface between PAD and the terminal. See Table E-6 for PAD baud rate values and their descriptions.

Table E-6 PAD Baud Rate Values

| Value | Description (in bits per second) |
|-------|----------------------------------|
| 10 | 50 |
| 5 | 75 |
| 9 | 100 |
| 0 | 110 |
| 1 | 134.5 |
| 6 | 150 |
| 8 | 200 |
| 2 | 300 |
| 4 | 600 |
| 3 | 1200 |
| 7 | 1800 |
| 11 | 75/1200 |
| 12 | 2400 |

| Value | Description (in bits per second) |
|-------|----------------------------------|
| 13 | 4800 |
| 14 | 9600 |
| 15 | 19200 |
| 16 | 48000 |
| 17 | 56000 |
| 18 | 64000 |

Parameter 12: Input Flow Control (Not Supported)

Parameter 12 determines whether or not the terminal can transmit ASCII XON/XOFF (transmission on and off) characters to PAD during the data transfer mode. Flow control is not directly supported on protocol translators because data must make network hops to travel to its final destination. However, depending on the type of incoming connection, setting this parameter can cause similar negotiations to be sent over the connection, thereby attempting to change the state of the flow control option at the device closest to the user.

Parameter 13: LINE FEED Insertion

Parameter 13 determines the procedure for inserting the LINE FEED character upon receipt of a RETURN character. The PAD also responds to a value that results from the addition of any of the values in Table E-7.

Table E-7 PAD LINE FEED Signal Values

| Value | Description |
|-------|----------------------------------------------------------------------|
| 0 | Do not insert the LINE FEED character (outgoing connection default). |
| 1 | Insert a LINE FEED after transmitting RETURN to the terminal. |
| 2 | Insert a LINE FEED after echoing RETURN to the terminal. |
| 4 | Insert a LINE FEED after echoing RETURN to the remote host. |

Parameter 14: LINE FEED Padding (Not Supported)

Parameter 14 determines whether or not PAD should provide padding (insert filler characters) upon receipt of a LINE FEED character from the terminal. This function is generally provided by the end user's operating system.

Parameter 15: Local Editing

Parameter 15 enables or disables a PAD editing function for the terminal in data transfer mode. Enabling the editing function disables the Idle Timer (see parameter 4). The user at the terminal can make corrections and display the line buffer containing the characters to be transmitted when the forwarding character (see parameter 3) is received. See Table E-8 for PAD local editing function values and their descriptions.

Table E-8 PAD Local Editing Function

| Value | Description |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0 | Disables editing capabilities in data transfer mode. Any characters entered become part of the data stream and are transmitted (default for both connection types). |
| 1 | Enables editing capabilities in the data transfer mode, which suspends the following PAD operations: <ul style="list-style-type: none"> • Full packet data forwarding until the edit buffer is full. • Forwarding of DATA packets upon expiration of the Idle Timer. |

Parameters 16, 17, and 18 provide the editing functions.

Parameter 16: Character Delete

Parameter 16 allows you to select a character that will delete characters while in PAD editing mode. This character is valid only if parameter 15 is set to one. See Table E-9 for PAD line display editing function values and their descriptions.

Table E-9 PAD Line Display Editing Function

| Value | Description |
|-------|------------------------------------------------------------------------------------------------------------------------|
| 0-127 | Select one character from the ASCII character set to represent the delete character. Default is character 18 (CTRL-R). |

Parameter 17: Line Delete

Parameter 17 allows you to select a character that will delete a line while in PAD editing mode. This character is valid only if parameter 15 is set to one. See Table E-10 for PAD line delete editing function values and their descriptions.

Table E-10 PAD Line Delete Editing Function

| Value | Description |
|-------|------------------------------------------------------------------------------------------------------------------------|
| 0-127 | Select one character from the ASCII character set to represent the delete character. Default is character 21 (CTRL-U). |

Parameter 18: Line Display

Parameter 18 allows you to select a character that will display a line while in PAD editing mode. This character is valid only if parameter 15 is set to one. See Table E-11 for PAD line display editing function values and their descriptions.

Table E-11 PAD Line Display Editing Function

| Value | Description |
|-------|------------------------------------------------------------------------------------------------------------------------|
| 0-127 | Select one character from the ASCII character set to represent the delete character. Default is character 18 (CTRL-R). |