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PulseLink® Service
Asynchronous Terminal Access

Technical
Reference

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PULSELINK® SERVICE ASYNCHRONOUS TERMINAL ACCESS

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PULSELINK® SERVICE ASYNCHRONOUS TERMINAL ACCESS

1. INTRODUCTION

PulseLink® service is the BellSouth public packet switching network service. PulseLink service is a premises to premises, public data network service, which offers business and residence customers a cost effective solution to their low to medium speed data communication requirements.

NOTE:References to PulseLink service will appear throughout this document. PulseLink service is a registered trademark of BellSouth Corporation.

This technical reference describes the Packet Assembly/Disassembly Facility (PAD) network interface specifications associated with asynchronous terminal access to PulseLink Service. The specifications describe the PAD parameters, the interface to the PAD from an asynchronous terminal, and the interface to the PAD from a packet mode terminal (or another PAD). These three PAD specifications are addressed by CCITT Recommendations X.3, X.28, and X.29 respectively (CCITT Volume VIII − Fascicle VIII.2 and Fascicle VIII.3, 1984). Although PulseLink service generally complies with these CCITT recommendations, not all CCITT sections are supported. Section 2 below lists the differences from the CCITT recommendations, and defines the optional PAD values used for PulseLink service.

PulseLink service supports the Northern Telecom Inc. ITI (Interactive Terminal Interface) for communicating with the PulseLink PAD. There are two categories of ITI supported − CCITT ITI and DPN™ ITI. The PulseLink customer has the option of specifying which version to use when communicating with the PulseLink PAD. This selection is made when the service is ordered, and is implemented in the network from the service order. When CCITT ITI is selected, Section 2 below applies. However, DPN-™ ITI is the normal PulseLink service default ITI selection. The differences between DPN™ ITI and CCITT ITI are explained in Section 3 below.

NOTE:References to DPN will appear throughout this document. DPN is a trademark of Northern Telecom Limited.

Section 4 describes the standard customer profiles available with PulseLink service. The choice of languages available to a PulseLink customer is described in Section 5.

An Appendix to this Technical Reference follows Section 5. This index provides additional information and more fully details the the parameters, options, and procedures associated with asynchronous terminal access to PulseLink service.

Other current BellSouth Technical References that describe PulseLink service network interface specifications include:

TR 73513 “PulseLink X.25 Interface Specification”

TR 73515 “PulseLink X.75 Interface Specification”

TR 73516 “PulseLink Service Physical Interface Specifications”

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2. CCITT X.3, X.28, AND X.29 SUPPORT

This section specifies the CCITT X.3, X.28, and X.29 Recommendation parameters and functions supported by PulseLink service. The specifications in this section are applicable to cases in which the CCITT ITI is selected for PulseLink service access.

2.1 X.3 Parameters

PulseLink service access conforms with CCITT Volume VIII − Fascicle VIII.2, Recommendation X.3 (1984 "Red Book") mandatory selectable parameter values, except as follows:

CCITT X.3 Section	Description
3.11	Currently includes only 300, 1200, 2400,4800, and 9600 bits per second rates (X.3 Parameter 11, options 2, 3, 12, 13, and 14).

Otherwise, all mandatory and optional values of the X.3 parameters are supported.

2.2 X.28 Parameters

Asynchronous PulseLink service access conforms with CCITT Volume VIII − Fascicle VIII.3, Recommendation X.28 (the 1984 "Red Book"), except as follows:

CCITT X.28 Section	Description
2.2.5	Fault Condition is not implemented
3.2.1.7	X timer is not utilized for Incoming Calls
3.2.3.1.1	T timer = 60 seconds; S timer values of 60−120, or infinity
3.2.3.1.2	N=11; Call Setup Timer values of 1−10 min., or infinity
3.2.5	Called DTE Reselection not implemented
3.5.2	Implemented, with addition that if X.28 Parameter 9 is set to 0 and the DTE operates at speeds other than 110, 200, 300, 1200, or 75/1200 bits per second, then four padding characters will be sent.

CCITT X.28 Section	Description
3.5.15.1.1	Implemented, with NUI string consisting of 14 characters.
3.5.15.1.5	Format of the charging information facility request signal is not implemented.
3.5.15.2	Implemented, except no abbreviated addressing is supported, and only one address can be entered.
3.5.16	The Service Request Signal format is not defined by X.28. The Service Request Signal implemented is <.><CR>, repeated as necessary.
3.5.17.2	Format of the called DTE address block is not defined by X.28, and is not implemented.
3.5.17.3	The format of the optional facility block is not implemented.
3.5.18	The standard format of the PAD identification PAD Service Signal is not defined by X.28, but a format effector (<CR>, then <LF>)is sent.
3.5.22.1	The standard format of the calling DTE address block is not defined by X.28.
3.5.26	The standard format of the parity error PAD service signal is not defined by X.28, but ERR is used for PulseLink service.
3.5.29	The format of the reselection PAD service signal is not implemented.
3.6.1.1	The editing buffer size in PAD command state is 200 characters.
3.6.1.2	The input packet is the editing buffer.
3.6.1.3	When a full packet is forwarded and the window closes, no further editing of characters is possible, since there is no editing buffer.
4.5	A <BEL> character is sent from the PAD to the DTE when the PAD is temporarily unable to accept additional information. This procedure is undefined by X.28. If parameter 6 is set to 0, the virtual circuit is reset.
4.6.3	The value of M is undefined by X.28. PulseLink service uses M = 24.

2.3 X.29 Parameters

Asynchronous PulseLink Service access conforms with CCITT Volume VIII − Fascicle VIII.3, Recommendation X.29 (the 1984 “Red Book”), except as follows:

CCITT X.29 Section	Description
3.6	Procedures for inviting the PAD to reselect the called DTE is not implemented.
4.4.5.1	The reference field is implemented as per X.29, except the extension of the field is not implemented.
4.4.5.4	No non−standardized parameters are currently supported.
4.4.9	Reselection PAD message format is not implemented.

3. DPN™ ITI IMPLEMENTATION

As described in Section 1, PulseLink service supports DPN™ ITI as well as CCITT ITI. DPN™ ITI is, in fact, the normal access used by PulseLink customers.

There are four differences between the DPN™ ITI and the CCITT ITI. The following are the differences between the two implementations:

3.1 Parameter 13

CCITT X.3 Parameter 13 specifies the occurrence of a linefeed (<LF>) insertion. CCITT recommendations do not apply X.3 Parameter 13 in the command state. Although CCITT ITI conforms to this procedure, DPN™ ITI does apply Parameter 13 in the command state.

3.2 X.29 Error Code Support

CCITT Recommendation X.29 specifies that errors in the “set” and “set and read PAD” messages be displayed by error codes as listed in Table 3/X.29. CCITT ITI conforms to this recommendation, but DPN™ ITI displays any error in these messages as a value 0.

3.3 “+” Command Terminator

A “+” may be used as a command terminator with CCITT ITI.

3.4 Escape to Command Mode

The PAD will only accept one command before it returns to the data transfer state when CCITT ITI is utilized.

4. STANDARD SYSTEM PROFILE PARAMETERS

The standard system profile X.3 parameter values are listed in Section 7 of the Appendix. These profiles are independent of whether DPN™ ITI or CCITT ITI is chosen. The customer selects a standard system profile at service subscription. The selected profile will be the customer’s default profile during each session. However, the customer can change profiles during any session. In this case, the standard (default) profile is not affected, and is still in effect for all future sessions. The most common standard profile used for PulseLink Service is Profile 7, “U.S. Simple”.

Individual parameters may also be changed during a session via the command mode, but changed parameters are only in effect for the current call (or subsequent call).

5. LANGUAGE

The customer can select the input and output language used during PulseLink service sessions. The two standard default language choices are English and CCITT. During a session, it is possible to change input/output languages to CCITT, French, or German (output only), in addition to English.

The language selected is independent of the system profile or ITI type selected.

APPENDIX 1

PULSELINK ASYNCHRONOUS INTERFACE SPECIFICATION

CONTENTS

APPENDIX 1

PULSELINK ASYNCHRONOUS INTERFACE SPECIFICATION

1. PULSELINK NETWORK OVERVIEW

PulseLink is a packet switched public network based on the CCITT X.25 protocol, using X.75 as the protocol for interLATA connections. PulseLink also provides Packet Assembly/Disassembly (PAD) interface for asynchronous terminals. Asynchronous terminal support is provided via the CCITT 1984 procedures (X.3, X.28, X.29). These procedures define the PAD functions for connection of these terminals to the packet switched network and interaction with other terminals in the network.

PulseLink provides service in the nine state region of BellSouth. This currently includes the following LATAs (Local Area and Transport Areas):

Florida	Georgia	Louisiana
Orlando	Atlanta	New Orleans
Southeast (Miami)	Macon	
Jacksonville	Savannah	
Daytona Beach		
Gainesville		
North Carolina	South Carolina	
Charlotte	Columbia	
Raleigh	Charleston	
Greensboro	Florence	
Greenville		

The physical deployment of the PulseLink network components consists of packet switching nodes with access concentrators distributed throughout the LATA. In addition, network trunks connect, either directly or indirectly, each of the LATAs to Atlanta where the PulseLink Operations Center and Customer Service Center are located.

Access to the network is segmented into two major categories: DIAL−UP and DEDICATED. Dial access is subdivided into two categories, PUBLIC and PRIVATE.

Public dial access is provided using either Bell 103/212A compatible modems in the network, supporting speeds of 300 and 1200 bps, or V.22 bis compatible modems, supporting 2400 bps operation. Through public dial ports, a user can call any host or other user that has ports connected to the network by addressing the specif ic port desired. Network modems, ports, and voice network lines that are part of multi−line groups for receiving public dial calls are provisioned and engineered by BSAN as part of its PulseLink offering.

Private dial ports on the network are provided to meet specific customer's needs. As described above the dial access modem for private dial ports is also Bell 103/212A or V.22 bis compatible.

Direct access arrangements provision facilities to the customer premise where compatible hardware is attached by the customer.

2. PULSELINK ASYNCHRONOUS INTERFACE

2.1 PulseLink Asynchronous Interface Command Language

The commands listed in this section allow you to communicate with the network to set or display terminal parameter values.

The PROFILE, SET and SET AND READ commands are used to set the parameter values.

Multiple use of the same characters must be avoided since the results of such actions cannot be predicted.

The priority assignment of functions to a character are as follows:

(Highest) 1. PAD recall character (parameter 1)
2. PAD command delimiter
3. X−ON, X−OFF
4. Line display (parameter 18)
5. Line delete (parameter 17)
6. Character delete (parameter 16)
(Lowest) 7. Data forwarding character (parameter 3)

The format of each command is provided and explained. The character sequence to be entered is shown along with the expected network response to each command.

Commands are entered at the time the user receives the PulseLink herald or, if the interface allows, while connected to the user's host by escaping to the command mode by pressing the PAD recall character. After adjusting profile or specific parameters, entering a <CR> alone on a line returns the interface to Data Transfer Mode(session).

The asynchronous interface commands allow a terminal to control the PAD (Packet Assembly/Disassembly) and to establish, interrupt, and clear calls. In the data transfer state commands must be preceded by the data link escape signal the PAD recall character.

2.1.1 Parameter and Profile Commands

(1) Square brackets (i.e., []) identify that the information within them is optional; they should be ignored if not applicable.

(2) Items enclosed in angle brackets (< >) are character or function mnemonics.

(3) Capital letters indicate fixed keywords: lower case indicates variables.

(4) If the reference number is INV, then it indicates that the parameter number is invalid.

2.1.1.1 Parameter Command

Function: Allows the terminal user to read the present values of the PAD parameters.

Format: PAR <CR> to read all parameters

PAR par# [,par#...] <CR> to read a specific parameter

Response: PULSELINK PAR ref#:value, ref#:value

Example: PAR <CR>

PULSELINK:par 001:001, 002:001, 003:002, 004:000, 005:000, 006:001, 007:021, 008:000, 009:002, 010:000, 011:003, 012:000, 013:004, 014:000, 015:000, 016:del, 017:can, 018:dc2, 019:002, 020:000, 021:003, 022:000, 118:del, 119:can, 120:dc2, 121:000, 122:000, 123:001, 125:000, 126:004
(Where 001:001 indicates first the parameter number and then the value that is currently in effect.)

Example: PAR 001<CR>

PULSELINK:par 001:001

2.1.1.2 Set Command

Function: Permits the terminal user to set or set and read the values of PAD parameters.

Format: SET ref#:value [, ref#:value] <CR> to set parameter values

SET? ref#:value [, ref#:value]<CR> to set and read parameter values.

SET<CR> to return all parameters to their default values.

Response: PULSELINK:PAR ref#:value [, ref#, value] (to set? command)

PULSELINK:PAR ref#:INV (if reference value is invalid)

Example: SET 001:000 <CR>

Example SET? 001:001 <CR>

PULSELINK:par 001:001

2.1.1.3 Profile Command

Function: Allows the terminal user to select a particular terminal profile or to print the values of the parameter of a particular terminal profile.

Format: PROF n <CR> to select a particular profile

PROF? n <CR> to list the parameter values for that profile where n= may be any one of the following:

0 = user defined
1 = international
2 = simple
3 = transparent
4 = inter−networking
5 = terminal to terminal
6 = interactive transparent host interface
7 = U.S. simple
90 = CCITT simple
91 = CCITT transparent

Profile 7 is the normal network default on all PulseLink public ports.

Response: <CR> <LF> (to set profile command)

PULSELINK: PROF profile# ref#:value [ref#:value...] (to PROF? n command)

Example PROF 7 <CR>

Example: PROF? 7 <CR>

PULSELINK: 7 001:001, 002:001, 003:002, 004:000, 005:000, 006:001, 007:021, 008:000, 009:002, 010:000, 011:003, 012:000, 013:004, 014:000, 015:000, 016:del, 017:can, 018:dc2, 019:002, 020:000, 021:003, 022:000, 118:del, 119:can, 120:dc2, 121:000, 122:000, 123:001, 125:000, 126:004

2.1.1.4 NUI Command

Function: To activate the network user identification facility.

Format: NUI nui password

where:

nui = the NUI to be used

password = the password for the NUI

The password is requested on a separate line after the NUI command is entered. The password is 'blotted' by the network so that it cannot be read, for security reasons.

Response:

PULSELINK: network user identifier xxxxxx active

PULSELINK: network user identifier error

Example: NUI 121212 passwd

PULSELINK: network user identifier 121212 active

2.1.1.5 NUI Cancel Command

Function: To cancel the network user identifier facility. This may be done only while no call is in progress.

Format: NUI OFF

Response:

PULSELINK: network user identifier not active

Example: NUI OFF

PULSELINK: network user identifier not active

2.1.1.6 Query NUI Command

Function: To query the network user identification facility.

Format: NUI ?

Response:

PULSELINK: network user identifier xxxxxx active

PULSELINK: network user identifier not active

Example: NUI ?

PULSELINK: network user identifier 121212 active

2.1.1.7 Language Specification command

Function: To determine which language will be used

Format: LANGUAGE lang [IN/OUT]

Example: LANGUAGE English

2.1.1.8 Language Availability Command

Function: To determine which command and service signals languages are available.

Format: LANGUAGE ?

Response:

PULSELINK: languages available:
lang in out lang in out lang in out

NOTE: lang is either English, CCITT, French, or German

Example: LANGUAGE ?

PULSELINK: languages available: English in out

2.1.2 Call Request Procedures

2.1.2.1 Call Request Command

Function: Call request commands are entered after the network has been accessed to establish a call to a host.

Format: [NF][P/N][R][CUG(cug)][LINE(LINE)][Transit(RPOA)] remote dna,user data

Where,

NF = no−restricted fast select
P = priority service
N = normal service
R = reverse charge
CUG = Closed user group index follows within()
LINE = packet size to be used follows within()
cug = closed user group index to be used
line = packet size to be used
RPOA registered private operating agency to be used

Response: PULSELINK: CALL CONNECTED

PULSELINK: (network error message)

2.1.2.2 Direct Call Command

Function: To establish or re−establish an SVC with direct call option

Format: CALL

Response: PULSELINK: CALL CONNECTED

PULSELINK: (network error message)

2.1.3 Session Commands

2.1.3.1 Escape Signal

Function: Permits terminal users to escape from data transfer and allow commands to be sent to the PAD.

Format: <DLE> or <CTRL P> if parameter number 1 is 001.
<BREAK> if parameter number 7 is 008.

Response: None

Note: To return to data transfer, enter a single <CR>.

2.1.3.2 Reset Command

Function: Allows terminal users to re−initialize a virtual circuit.

Format: RESET <CR>

Response: PULSELINK: RESET−LOCAL DIRECTIVE

Note: A RESET issued on an SVC does not clear the call.

2.1.3.3 Status Command

Function: Permits the terminal user to determine the status of a virtual circuit.

Format: STAT or STATUS <CR>

Response:

PULSELINK: ENGAGED (local DNA)
[nfast][rfast][;]
([I][P/N][R] packet−size: (128 or 256)]
[NUI (nui)charging]
[CUG:<cug#>] remote DNA)
where:

DNA = data network address
CUG = closed user group
NUI = network user ID
I = inter−exchange carrier.
P = priority
N= normal
R = remote charging
nfast = nonrestricted fast access
rfast = restricted fast access

PULSELINK:FREE <address>
[cugs:(cug# [IN] [OUT] [PRIVILEGED])...]
OUTGOING OPTIONS:

[not allowed]
[remote charging [−default]]
[nui <nui> charging −default
/local charging[−default] NUI required]
[local charging [−default]
[normal [−default][−all networks]]
[priority[−default][−all networks]]
[not allowed]
[nonrestricted fast]
[restricted fast]
[no preselect rpoa/preselect rpoa = dnic]
[no select rpoa/select rpoa allowed]

INCOMING OPTIONS:

[not allowed]
[NUI <nui> charging]
[local charging − NUI required]
[local charging]
[−normal [priority]]
[priority][−all networks]
[incoming access]
[ITI call]

Example: STAT <CR>

PULSELINK: ENGAGED 4042385008−4049935450
(n, remote charging, packet size: 128)

2.1.3.4 Interrupt Command

Function: Allows the terminal user to send an interrupt packet to the destination.

Format: INT <CR>

Response: <CR> <LF>

2.1.3.5 Interrupt and Discard Output Command

Function: Permits the terminal user to send an interrupt packet to the destination and discard the output for the terminal.

Format: INTD <CR>

Response: <CR> <LF>]

2.1.3.6 Clear Request Command

Function: Allows the terminal user to terminate a call on an SVC.

Format: CLEAR <CR> or CLR <CR>

Response: PULSELINK: CALL CLEARED − LOCAL DIRECTIVE

2.1.3.7 Halting and Resuming Output

Function: Parameter 12, if set to 001, permits the use of <XOFF> to temporarily stop the output of data to the terminal, and of <XON> to resume output.

Format: <XOFF> <CTRL S> to halt output.

<XON> <CTRL Q> to resume output.

Note: These are control characters and not commands.

2.1.3.8 Exit Command

Function: Allows the terminal user to return to the data transfer state from the command state.

Format: <CR> on a blank input line.

2.2 Explanation of Network Messages

2.2.1 The PulseLink+ Call Connected message

If service signals are enabled once the call is completed a message is transmitted to the originating DTE. All or some of the following messages may be identified depending on the type of call, options used for the call, and the type of destination.

Example:

PULSELINK: call connected to XXXXXXXX remote (DNA)
[hunted] [backed up] [back up & hunted]
(lcn) ([p/n packet−size: (128 or 256)]
[nui (6 to 8 char)charging]
[CUG: (CUG#)] [REVERSE CHARGE])

MESSAGE	EXPLANATION
Call connected to:	
XXXXXXX	A virtual circuit has been established between the originating DTE and a remote (called) DTE.
Hunted	The remote logical channel is part of a hunt group.
Backed Up	The call attempt to the remote DTE has failed. The network has re−directed the call to another predetermined DTE that has been optioned as backup.
i	The call has been placed through an inter−exchange carrier.
N	Normal service. Packet size: 128 or 256.
DNA	Data Network Address of the remote DTE.
LCN	Logical Channel Number of the recipient DTE.
NUI	The call will be billed to the 6 to 8 character Network User Identifier.
CUG	The recipient DTE is part of a closed user group.
Reverse Charge	The recipient DTE has accepted the charge associated with the established call.

There are numerous messages which may appear when one is accessing the PulseLink network. All of these network−generated messages, which are sent to a terminal, are written as “PULSELINK: text”. The “text” will be one of the following messages:

[N] NXXNXXXXXX−NYYNYYYYYY (aaa)

This is the PulseLink herald message for a PVC terminal showing that the terminal (address NXXNXXXXXX) is connected to the network and the host (address NYYNYYYYYY) through logical channel aaa. Continue with the sign−on procedure.

INVALID ADDRESS
or
MORE THAN 13 DATA CHARACTERS
or
COMMA REQUIRED BEFORE DATA CHARACTERS
or
INVALID LINE SIZE — These messages indicate an error in the Call Request command. Re−enter the command correctly.

CALLED BY [N] [R] [I]

NYYNYYYYXX — This message indicates that a host or another terminal has called your terminal (address NYYNYYYYXX). Proceed with the sign−on procedure. N specifies normal service. R specifies the charging option, if applicable. I specifies international call.

CALL CONNECTED TO (DNA) — This message indicates that the SVC connection between the terminal and the destination has been established successfully. Continue with the sign−on procedure to the host.

CALL CONNECTED TO BACKED UP (DNA) — This message indicates that the call attempt has failed. The call has been redirected by the network to another preassigned data network address. Continue with the sign−on procedure to the host.

CALL CONNECTED TO (DNA) HUNTED — This message indicates that the called address is in a Hunt Group. The call has been connected to the specified data network address. Continue with the sign−on procedure to the host.

CALL CONNECTED TO (DNA) BACKED UP AND HUNTED — This message indicates that the back−up data network address of the called data network address is in a Hunt Group DNA. The call was backed up to the Hunt Group and hunted to the specified DNA. Continue with the sign−on procedure to the host.

REENTER — This message indicates that a transmission error has occurred in the current input line. Reenter the line correctly. If the message occurs during a call request, the terminal maybe set to wrong parity. Reset the parity and reenter the command. If the problem persists, report the trouble to BellSouth Advanced Networks Customer Service.

INPUT DATA LOST — This message indicates that a transmission error has occurred. Since part of the input line has already been transmitted to the destination, enter a “line delete” character and a carriage return <CR>. When the destination replies, reenter the line.

PARITY ERROR — This message indicates that a parity error has occurred in the current input line from a terminal which is operating in the echo mode. The character containing the error is not echoed. Reenter the character and continue normal input. If the problem persists, report the trouble to BSAN Customer Service.

INPUT ERROR	This message indicates that there is a network problem. If the problem occurs often, contact BSAN Customer Service.
PVC DISCONTINUED – TEMPORARY NETWORK PROBLEM	This message indicates that a network problem is preventing the requested call from continuing. Wait for the PulseLink herald message, then continue. If the condition persists, contact BSAN Customer Service.
PVC DISCONTINUED – DESTINATION NOT RESPONDING	This message indicates that either the access line to the destination, or the destination itself is down. Try again later. If the condition persists, contact BSAN Customer Service.
PVC DISCONTINUED – REMOTE REQUEST	This message indicates that the destination has asked that the connection be discontinued. No action is required.
INVALID COMMAND	This message indicates that there is a syntax error in the command. Reenter the command and continue normal input.
COMMAND NOT ALLOWED	This message indicates that the command which was entered, although syntactically correct, cannot be implemented either due to the PAD state, or because it violates and/or conflicts with the service options selected (e.g., a Call Request command is transmitted when the SVC is already established.) If you have additional questions, contact BSAN Customer Service.
CALL CLEARED – DESTINATION BUSY	This message indicates that the destination computer cannot accept another call. Try again later by entering the call request.
CALL CLEARED – INCOMPATIBLE CALL OPTIONS	This message indicates that the Call Request command includes facilities which are not available at the destination or are incompatible with it. Verify the requested facilities with the called address and try the call again. If the problem persists, contact BSAN Customer Service.
CALL CLEARED – TEMPORARY NETWORK PROBLEM	This message indicates that a network problem has occurred. Try again later. If the problem persists, report it to BSAN Customer Service.
CALL CLEARED – DESTINATION NOT RESPONDING	This message indicates that the destination is either not acknowledging the terminal's request to connect or it is inoperable. Try again later. If the problem persists, contact BSAN Customer Service.
CALL CLEARED – ACCESS BARRED	This message indicates that the network has blocked the terminal's call because of a Closed User Group violation. Verify the call establishment procedures with the destination.

CALL CLEARED– ADDRESS NOT IN SERVICE	This message indicates that the network address in the Call Request command identifies a non–existent destination (e.g., the address is not yet or no longer assigned). Verify the address and reenter the Call Request command. If the condition persists, contact BSAN Customer Service.
CALL CLEARED– COLLECT CALL REFUSED	This message indicates that the destination is not willing to accept the charges for the connection (e.g., it does not accept calls from PulseLink public dial ports). Verify the call establishment procedures and try the call again. If the condition persists, contact BSAN Customer Service.
CALL CLEARED– LOCAL PROCEDURE ERROR	This message indicates that a network protocol error has occurred. Try the call again. If the condition persists, report the trouble to BSAN Customer Service. Data may have been lost.
CALL CLEARED– REMOTE PROCEDURE ERROR	This message indicates that a destination protocol error has occurred. Try the call again. If the condition persists, contact the destination. Data may have been lost.
CALL CLEARED– LOCAL DIRECTIVE	This message indicates that a virtual circuit has been cleared in response to a Clear Request command from a terminal user. No action is required.
CALL CLEARED– REMOTE DIRECTIVE (OR REMOTE REQUEST)	This message indicates that a virtual circuit has been cleared in response to a Clear Request packet from the destination.
CALL CLEARED	This message indicates that a virtual REMOTE Request circuit has been cleared in response to an invitation from the destination to clear the call. No action is required.
CALL CLEARED– INCOMPATIBLE DESTINATION	This message indicates that a virtual circuit has been cleared because the source and destination have incompatible packet (line) sizes or throughput classes. On PVCs, this could indicate that two masters are trying to connect. Verify the packet sizes and throughput classes, then try the call again.
Reset – TEMPORARY NETWORK PROBLEM	This message indicates that a network problem has occurred on the connection. Wait for the PulseLink herald message, then continue. If the condition persists, report the trouble to BSAN Customer Service.
Reset – DESTINATION NOT RESPONDING	This message indicates that the destination end of the PVC connection is

	not responding (i.e., either the access line to the destination, or the destination itself is down). Try again later. If the condition persists, contact BSAN Customer Service.
Reset − LOCAL PROCEDURE ERROR	This message indicates that the virtual circuit has been reset because of a network protocol error. Wait for the PulseLink herald message, then continue. If the condition persists, report the trouble to BSAN Customer Service.
Reset − REMOTE PROCEDURE ERROR	This message indicates that the virtual circuit has been reset because of a destination protocol error. Wait for the PulseLink herald message, then continue. If the condition persists, contact BSAN Customer Service. Also, this message could indicate that data has been disregarded due to the host not reacting to flow control conditions sent by the PAD.
Reset − LOCAL DIRECTIVE	This message is the network's response to a reset command from the terminal user. Continue.
Reset − BY DESTINATION	This message indicates that the destination has reset the virtual circuit. Data may have been lost. Continue. If the condition persists, report it to BSAN Customer Service.
Reset − TEMPORARY NETWORK PROBLEM or Reset − LOCAL PROCEDURE ERROR	These messages indicate that the network has reset the SVC. Data may have been lost. Continue. If the problem persists, report it to BSAN Customer Service.
SERVICE OPTION NOT SUBSCRIBED	This message indicates that an error has been made in the Call Request command due to an attempt to use an non−subscribed service option. Reenter the command without the non−subscribed service option.
EXCESS USER DATA	This message indicates that too much user data was sent during the establishment of a non−fast select call. Continue. This message could also indicate that too much user data was transmitted during an established fast select call.
CLOSED USER GROUP ERROR	This message indicates that there is an error in the Call Request command. The CUG requested is invalid. Determine if the CUG is available, then reenter the command correctly.
CALL CLEARED−OPTION NOT AVAILABLE	This message indicates the virtual circuit has been cleared because the destination does not support some optional facility in the incoming packet. Try again without optional facility.

2.2.2 Gateway Identification

There are several messages which may appear when you are accessing packet switching networks located in other LATAs through the PulseLink X.75 gateways. All of these network−generated messages which are sent to a terminal, are displayed as:

PULSELINK: TEXT — These messages may originate from within any interLATA or interstate network that is involved in the call or call attempt.

The network generated messages sent to PulseLink ITI terminals include a four−digit field to identify the gateway involved. This field is shown as (XXYY) for the network messages listed in this section.

If the call has not been established, then XXYY = 0000. If the call has been established, then XX = The two−digit PulseLink Service exchange of the gateway node used for the call and YY = The Gateway ID of the gateway used for the call.

The TEXT will be one of the following messages:

TEXT	EXPLANATION
CALL CLEARED− TEMPORARY NETWORK PROBLEM (XXYY)	A network problem within an interLATA or interstate network prevents either the requested call from being established or the established call from being continued. Try again later. If the problem persists, contact BSAN Customer Service.
CALL CLEARED− ADDRESS NOT IN SERVICE (XXYY)	Either the interLATA or interstate network requested is not accessible from PulseLink, or the interLATA interstate network address specified identifies a nonexistent destination (i.e., the address is not yet assigned or no longer assigned). Verify with the destination that the interLATA or interstate network is accessible from PulseLink and that the desired address is assigned.
CALL CLEARED− ACCESS BARRED (XXYY)	The calling terminal is not permitted to establish an interLATA or interstate call to the called destination address because of a Closed User Group violation. Verify the network address with the destination.
CALL CLEARED− COLLECT CALL REFUSED (XXYY)	Either the interLATA or interstate network or the destination address is not willing to accept collect calls. Verify the call establishment procedures with the destination.

CALL CLEARED– INCOMPATIBLE CALL OPTIONS (XXYY) — The call request is considered invalid by the interLATA or interstate network mainly because of the incorrect number of digits in the desired network address. Verify the interLATA or interstate network address with the destination. If the problem persists, contact BSAN Customer Service.

CALL CLEARED– DESTINATION NOT RESPONDING (XXYY) — The destination is out of order, possibly because the destination's network access link is inoperative. Verify with the destination and try again later. If the problem persists, contact BSAN Customer Service.

CALL CLEARED– DESTINATION BUSY (XXYY) — The destination address is fully engaged (i.e., no logical channels are available) and cannot accept another call at this time. Try again later. If the problem persists, contact BSAN Customer Service.

CALL CLEARED– REMOTE PROCEDURE ERROR (XXYY) — This message indicates a protocol error at the remote DTE interface. Check with remote DTE (destination). If the problem persists, contact BSAN Customer Service.

2.3 Network User Identification

In order to operate in the local charging mode, a Network User ID (NUI) is required. Once the NUI is entered and accepted by the port, all calls made from that port will be billed to the NUI. The NUI is "turned off" with a command or when the user disconnects from the port. A NUI may not be entered or turned off while a packet call is in progress.

The following procedure is required to use the NUI facility:

Access the network.

Enter:	NUI XXXXXXXX <CR> where the NUI is 8 characters.
network response:	PULSELINK: PASSWORD
Enter:	password <CR>
network response:	PULSELINK: Network User Identifier nui active

The system automatically masks the user's password with XXXXX. The NUI facility is now established. Proceed with the call sequence.

A NUI can only be changed or cancelled when there is no call in progress. The active NUI can be cancelled using the NUI OFF command or by hanging up.

Enter: NUI OFF <CR>

network response: PULSELINK: NETWORK USER IDENTIFIER NOT ACTIVE

A user can check the existence of an active NUI by the NUI? command.

network response: PULSELINK: NETWORK USER IDENTIFIER nui ACTIVE
or
PULSELINK: NETWORK USER IDENTIFIER NOT ACTIVE

3. PULSELINK PUBLIC DIAL PORT INFORMATION

3.1 Voice Network Attributes

All modem pools established are provisioned with a main hunt number.

3.2 Packet Network Attributes All BSAN Public Ports support:

Auto speed (300/1200) and parity detection via the SRS signal
Network Profile 7 as the default profile
Packet Size of 128 as the default with 128, 256, and 512 allowed
Outgoing calls only
Reversed Bill calls as the default
Network User Identifier (NUI) calls
RPOA selection on a per call basis (NO pre−selection)
Inter−network (International) calls
Fast Select (restricted and unrestricted)

3.2.1 Async Profile 7 Description

PAR:VALUE	PAR:VALUE	PAR:VALUE	PAR:VALUE
001:001	002:001	003:002	004:000
005:000	006:001	007:021	009:002
010:000	012:000	013:004	014:000
015:000	016:del	017:can	018:dc2
019:002	020:000	021:003	022:000
118:del	119:can	120:dc2	121:000
122:000	123:001	125:000	126:004

This profile provides for Escape to command mode (CTRL P), PAD ECHO, Carriage Return as the data forwarding character, Padding with 2 (NULLS) after each line feed, PAD Service signals, Line Feed (LF) after carriage return by terminal or PAD.

This profile is consistent with CCITT X.28 International Simple.

3.3 Customer Service Procedures

If you experience any difficulties using the PulseLink Plus Network, please report the problem to our Customer Service Department by dialing toll−free **1−800−622 BSAN (2726)**. To facilitate resolution please have the following information available when you call:

The name and telephone number of the person to be contacted regarding the inquiry.

The name and telephone number of the person actually experiencing the situation.

If the situation is being experienced by Dial−in user:

The telephone number dialed by the user.

The host network address with which the user connected or attempted to connect.

The host port through which the user achieved connection, if available.

If the situation is being experienced by a directly connected user, then only the host port or terminal port, DTN (network address), needs to be provided.

A description of the situation(s) encountered.

The Customer Service Representative will record all of the above information and incorporate it in a trouble ticket. You should note this trouble ticket number and use it when inquiring as to the status of the inquiry.

4. SESSION ESTABLISHMENT PROCEDURES

To make the network operate, a link is established with the network (dial or dedicated). The user then issues a call message (either manually or automatically by specification at subscription time) and the network then attempts to connect the two ports.

4.1 Dedicated Port − Auto−Connect

Dedicated Port − Auto−Connect ports are normally used in applications where a terminal is on−line to a single host continuously. This type connection should be transparent to the user, in that no commands are entered to establish or disconnect the call.

4.1.1 Establish Link

To establish the link, the user should present the carrier signal to the PulseLink circuit. Upon reception of carrier, the circuit will activate and begin call request procedures automatically.

4.1.2 Call Connected/Rejected

Once a call has been placed, two categories of responses can be expected, successful or unsuccessful connection.

4.1.2.1 Successful Connection

Upon a successful connection, the network will respond:

PulseLink: CALL CONNECTED

4.1.2.2 Unsuccessful Connection

Upon an unsuccessful connection, the network will respond:

PulseLink: (network error message)

4.1.3 Disconnect Link

4.2 Dedicated Port − Manual Connect

Dedicated Port − Manual Connect ports are normally used in situations where a terminal will be continuously connected to one or more hosts. This type service requires that the user will manually issue the connect sequences necessary for activation of the call.

4.2.1 Establish Link

To establish the link, the user should present carrier to the PulseLink circuit. Upon reception of carrier, the circuit will activate and begin call request procedures automatically.

If the port is not configured for a single speed / parity, then the Service Request Signal (SRS) must be sent. The SRS consists of one period and a carriage return as follows:

.<CR>PULSELINK:

4.2.2 Initiate Connection

To initiate a call, enter the address of the port at the PulseLink prompt:

PulseLink: T(RPOA)1DNICXXXYYYZZZZ <CR>

SEE ALSO FOLLOWING SECTION ON ADDRESS SPECIFICATION

4.2.3 Call Connected/Rejected

Once a call has been placed, two categories of responses can be expected, successful or unsuccessful connection.

4.2.3.1 Successful Connection

Upon a successful connection, the network will respond:

PulseLink: CALL CONNECTED

4.2.3.2 Unsuccessful Connection

Upon an unsuccessful connection, the network will respond:

PulseLink: (network error message)

4.2.4 Disconnect Link

To disconnect the link and call, remove carrier from link.

4.3 Private Dial Port − Auto−Connect

Private Port − Auto−Connect ports are normally used in applications where a terminal is on−line to a single host. This service is typically used for POS terminals or dumb terminal applications in which the user does not want to enter network addresses.

This type connection should be transparent to the user, in that no commands are entered to establish or disconnect the call. The user must, however dial (through the PSTN) the number of the Private Port.

4.3.1 Establish Link

To establish the link, the user should call the Private Port's telephone number, and upon reception of carrier, present carrier to the PulseLink circuit. Upon reception of carrier, the circuit will activate and begin call request procedures automatically.

4.3.2 Call Connected/Rejected

Once a call has been placed, two categories of responses can be expected, successful or unsuccessful connection.

4.3.2.1 Successful Connection

Upon a successful connection, the network will respond:

PulseLink: CALL CONNECTED

4.3.2.2 Unsuccessful Connection

Upon an unsuccessful connection, the network will respond:

PulseLink: (network error message)

4.3.3 Disconnect Link

4.4 Private Dial Port − Manual Connect

Private Dial Port − Manual Connect ports are normally used in situations where a terminal will be continuously connected to one or more hosts. This type service requires that the user will manually issue the connect sequences necessary for activation of the call.

This type of service is normally used by intelligent devices wishing to connect to multiple hosts.

4.4.1 Establish Link

To establish the link, the user should call the Private Port's telephone number, and upon reception of carrier, present carrier to the PulseLink circuit. Upon reception of carrier, the circuit will activate.

If the port is not configured for a single speed / parity, then the Service Request Signal (SRS) must be sent. The SRS consists of one period and a carriage return as follows:

.<CR>
PULSELINK:

4.4.2 Initiate Connection

To initiate a call, enter the address of the port at the PulseLink prompt:

PulseLink: T(RPOA)1DNICXXXYYYZZZZ <CR>

SEE ALSO FOLLOWING SECTION ON ADDRESS SPECIFICATION

4.4.3 Call Connected/Rejected

Once a call has been placed, two categories of responses can be expected, successful or unsuccessful connection.

4.4.3.1 Successful Connection

Upon a successful connection, the network will respond:

PulseLink: CALL CONNECTED

4.4.3.2 Unsuccessful Connection

Upon an unsuccessful connection, the network will respond:

PulseLink: (network error message)

4.4.4 Disconnect Link

To disconnect the link and call, remove carrier from link.

4.5 Public Dial Port − Manual Connect

Public Dial Port − Manual Connect ports are normally used in situations where a terminal will connect to one or more hosts. This type service requires that the user will manually issue the connect sequences necessary for activation of the call.

This type of service is normally used by intelligent devices wishing to connect to multiple hosts.

4.5.1 Establish Link

To establish the link, the user should call the Public Port's telephone number, and upon reception of carrier, present carrier to the PulseLink circuit. Upon reception of carrier, the circuit will activate.

The Service Request Signal (SRS) must now be sent. The SRS consists of one period and a carriage return as follows:

.<CR>
PULSELINK:

4.5.2 Initiate Connection

To initiate a call, enter the address of the port at the PulseLink prompt:

PulseLink: T(RPOA)1DNICXXXYYYZZZZ <CR>

SEE ALSO FOLLOWING SECTION ON ADDRESS SPECIFICATION

4.5.3 Call Connected/Rejected

Once a call has been placed, two categories of responses can be expected, successful or unsuccessful connection.

4.5.3.1 Successful Connection

Upon a successful connection, the network will respond:

PulseLink: CALL CONNECTED

4.5.3.2 Unsuccessful Connection

Upon an unsuccessful connection, the network will respond:

PulseLink: (network error message)

4.5.4 Disconnect Link

To disconnect the link and call, remove carrier from link.

4.6 Address Specification

To connect to another port on the network, the address of the port has to be entered. This address follows the following form:

T(RPOA)1DNICXXXYYYZZZZ

T(RPOA) is an optional field required only when performing an interLATA call to a non−directly connected network. RPOA is the DNIC of the inter−exchange carrier and the embedded DNIC is the DNIC of the destination network.

1DNIC is an optional field indicating the inter−exchange carrier.

XXXYYYZZZZ is a required field indicating the address of the port. XXX represents the area code, YYYZZZZ represents the "telephone number" of the port (in the form NNX−XXXX).

Example: 1 3150 305 665 0341<CR>

An example of a call request to a destination to which an interLATA carrier is required. (i.e., Charlotte to Miami)

Example: 305 665 0341<CR>

An example of a call request to a destination to which PulseLink may carry the call. (i.e., Charlotte to Charlotte)

Example: T(3125) 1 3150 305 665 0341<CR>

An example of a call request to a destination to which a non−directly connected interLATA carrier is required. (i.e., Charlotte to Rome, Italy)

4.7 Terminal to Terminal Communication

From the terminal operator's point of view the service operation is no different from setting up a call to a host on then network. In this service the called party must have dedicated access, however, the calling access can be via public or private dial or dedicated access. The only requirement on a terminal−to−terminal service is that one end of the call must pay for the call. For example, if the originator of the call uses a public dial port which generates collect calls then the destination must accept collect calls. Also there is no "out−dial" capability on the network.

The choice of profile may be different at each end. The decision is based on what profile is required to support the terminal at each end. For example, a block mode device at one end may use Profile 3, the transparent profile, while the teletypewriter at the other end might use Profile 2.

5. PAD PARAMETERS

5.1 Ability to escape from data transfer state.

This parameter indicates whether or not the character <DLE> <CTRL P> transmitted from the terminal is recognized as an escape from data transfer state to command mode.

5.1.1 Parameter Number: 1

5.1.2 Possible Values:

0 = Not Possible
1 = Possible <DLE>
32 − 126 = ASCII code of PAD recall characteristics

NOTE: Escape from data transfer state is also possible using the <BREAK> signal if parameter 7 is set to 8.

5.2 Echo

The parameter indicates to the PAD whether or not the terminal input data must be echoed.

5.2.1 Parameter Number: 2

5.2.2 Possible Values:

0 = No Echo
1 = Echo

Echo will also be affected by the setting of parameter 20.

5.3 Selection of Data Forwarding Signal

This parameter indicates to the PAD the set of terminal generated characters or conditions that will cause data to be forwarded to the destination.

5.3.1 Parameter Number: 3

5.3.2 Possible Values:

0 = No Data Forwarding Signals
2 = Carriage Return
6 = <CR>, <ESC7>, <BEL>, <ENQ>
18 = <CR>, <EOT>, <ETX>
126 = All characters in columns 0 and 1 of International Alphabet No. 5, the character DEL of alphabet #5 and a network command.

5.4 Selection of Idle Timer Delay

This parameter is used to determine the idle timer limit value when data forwarding is based on time−outs between reception of characters from the DTE.

5.4.1 Parameter Number: 4

5.4.2 Possible Values:

0 = No Data Forwarding on Time−out is Required
1−255 = Indicates the value of the delay in 1/25's of a second

In the 1984 software level, setting both editing and idle timer (P4) is not allowed. Although the value of parameter 4 does not change the idle timer will only be activated if editing (P15) is off. This operation is according to CCITT 1984 standards.

5.5 Auxiliary Device Control

This parameter is set to 1 to indicate to the PAD that the data is to be read from the auxiliary I/O device. The PAD must exert flow control.

5.5.1 Parameter Number: 5

5.5.2 Possible Values:

0 = No Use of DC1/DC3
1 = Use of DC1 and DC3 for auxiliary devices (data transfer state only)
2 = Use of DC1 and DC3 for intelligent terminals (data transfer and command mode)

5.6 Suppress Network Messages (service signals)

This parameter indicates to the PAD whether or not network generated messages are to be transmitted to the terminal.

5.6.1 Parameter Number: 6

5.6.2 Possible Values:

0 = Suppress Network Messages
1 = Transmit Message
5 = PAD Prompt follows service signals (parameter value is introduced as part of the upgrade of ITI service from CCITT 1976/80 Standard to 1984 Standard.)
8 = Network specific service signal (e.g., BOC)

5.7 Procedure on BREAK

This parameter is used to indicate how the PAD should process a BREAK signal that is received from the terminal while the terminal is in data transfer state.

5.7.1 Parameter Number: 7

5.7.2 Possible Values:

0 = Do Nothing
1 = Interrupt forward characters and transmit interrupt to remote host
2 = Call is Reset; data may be lost
5 = Interrupt or Break
8 = Escape from data transfer state (i.e., enter command state)
21 = Discard output to terminal (i.e., set parameter 8 to 1) Interrupt packet and indication of BREAK are transmitted to remote DTE

NOTE: The BREAK signal is ignored if the virtual circuit is not established. The BREAK is the line delete signal in the command state.

5.8 Discard Output

This parameter is used in conjunction with parameter 7. Depending upon the BREAK procedure selected, this parameter may be set by the PAD when the terminal user requests that terminal data be discarded. This parameter must then be reset by the destination computer to allow normal delivery. The PAD will discard all packets destined for the terminal from the time the PAD sets this parameter (i.e., it receives a BREAK signal when parameter 7 is set to 21) and the time the parameter is reset by the destination.

5.8.1 Parameter Number: 8

5.8.2 Possible Values:

0 = Normal Delivery to Terminal
1 = Discard Output to Terminal

5.9 Padding after Carriage Return

The functionality of this parameter is changed as part of the upgrade of ITI service from CCITT 1976/80 Standard to 1984 Standard.

This parameter specifies the number of padding characters (NULLS) to be inserted by the PAD following <CR> transmitted to the terminal in data transfer mode. In command mode, the number of padding characters specified are inserted by the PAD after the format effects <CR> <LF> insertion is controlled by P13/126 LF 13/126=0, P14 will be ignored and P9 will be executed.

5.9.1 Parameter Number: 9

5.9.2 Possible Values:

0−255 = Number of padding characters to be inserted.

5.10 Line Folding

This parameter indicates the maximum number of printable characters that can be displayed on the terminal before the PAD must sent a format sequence (i.e., <CR> <LF>).

5.10.1 Parameter Number: 10

5.10.2 Possible Values:

0 = No Line Folding
1−255 = Number of characters per Line

5.11 Transmission Speed (read only)

This parameter is set by the PAD as a result of transmission speed detection if terminal access is to an auto−baud port. When a private port with fixed speed is used, this parameter is set based on information selected at subscription time.

5.11.1 Parameter Number: 11

5.11.2 Possible Values:

2 = 300 bps
3 = 1200 bps
12 = 2400 bps
13 = 4800 bps
14 = 9600 bps

5.12 Flow Control

This parameter enables the terminal user to signal the PAD that a situation has occurred such that the terminal cannot receive any more data. When this parameter is set to 1, the terminal user can request that the PAD stop sending data by transmitting a DC3 character. The PAD then suspends transmission of data until a DC1 character is received.

5.12.1 Parameter Number: 12

5.12.2 Possible Values:

0 = No Use of DC1/DC3 for Flow Control
1 = Use DC1/DC3 for Flow Control

5.13 Linefeed Insertion

This parameter is introduced as part of the upgrade of ITI service from CCITT 1976/80 Standard to 1984 Standard.

This parameter specifies when the PAD should insert LF upon receipt of carriage return from the terminal, PAD or the destination host. As the parameter value is bit−encoded, any combination of options is permissible.

5.13.1 Parameter Number: 13

5.13.2 Possible Values:

0 = Insert no linefeed
1 = Insert linefeed to terminal on <CR> from host
4 = Insert linefeed to terminal on a <CR> from terminal or PAD (or after echo of <CR>)
5 = Insert linefeed to the terminal on <CR> from PAD, terminal or host
6 = Insert linefeed to the terminal on <CR> from PAD or host. Insert linefeed in data to host on <CR> from terminal
7 = Insert linefeed to terminal on <CR> from PAD, terminal or host. Insert linefeed in data to host on <CR> from terminal (applies only to data transfer state)
16 = Insert linefeed to the terminal after a PAD generated <CR>
17 = Insert linefeed to the terminal after a PAD or host generated <CR>
20 = Insert linefeed to the terminal on a <CR> from terminal
21 = Insert linefeed to the terminal on <CR> from terminal or host
22 = Insert linefeed to terminal on <CR> from terminal and insert linefeed in data to host on <CR> from terminal
23 = Insert linefeed to terminal on <CR> from terminal, or host, or insert linefeed in data to host on <CR> from terminal

5.14 Padding Characters after Linefeed

This parameter is introduced as part of the upgrade of ITI service from CCITT 1976/80 Standard to 1984 Standard.

This parameter specified the number of padding characters to be inserted by the PAD following LF transmitted to the terminal in data transfer mode only.

5.14.1 Parameter Number: 14

5.14.2 Possible Values:

0−255 = Number of padding characters <NUL> sent to the terminal after transmission of a <LF> to the terminal.

5.15 Control of Editing Functions

This parameter is introduced as part of the upgrade of ITI service from CCITT 1976/80 Standard to 1984 Standard.

This parameter specifies whether or not editing is allowed in data transfer mode.

5.15.1 Parameter Number: 15

5.15.2 Possible Values:

0 = Editing Only in Command Mode
1 = Editing in Command and Data Transfer Mode

Setting parameter 15 to 1 will cause the operation of the idle timer (parameter 4) to become disabled.

5.16 Character Deletion

This parameter is introduced as part of the upgrade of ITI service from CCITT 1976/80 Standard to 1984 Standard.

This parameter specifies the ASCII character to be used as a “character delete” character for local editing by the PAD.

5.16.1 Parameter Number: 16

5.16.2 Possible Values:

0−127 = ASCII Code of Character Delete Character

5.17 Line Deletion

This parameter is introduced as part of the upgrade of ITI service from CCITT 1976/80 Standard to 1984 Standard.

This parameter specifies the ASCII character to be used as a “line delete” character for local editing by the PAD.

5.17.1 Parameter Number: 17

5.17.2 Possible Values:

0−127 = ASCII Code of Line Delete Character

5.18 Line Display

This parameter is introduced as part of the upgrade of ITI service from CCITT 1976/80 Standard to 1984 Standard.

This parameter specifies the ASCII character to be used as a “line display” character for local editing by the PAD.

5.18.1 Parameter Number: 18

5.18.2 Possible Values:

0−127 = ASCII Code of Line Display Character

5.19 Editing Service Signals

This parameter is introduced as part of the upgrade of ITI service from CCITT 1976/80 Standard to 1984 Standard.

This parameter defines the format of the service signal sent to the terminal upon execution of the editing functions.

5.19.1 Parameter Number: 19

5.19.2 Possible Values:

0 = No echo of editing characters
1 = <\> is displayed for each character deleted; 'xxx' is displayed for each line deleted (used for printing terminals)
2 = <BS> <SP> <BS> is displayed for each character deleted; <BS> <SP> <BS> is repeated for each character line deleted.
8,32−126 = ASCII character of editing signal.

NOTE:Value 1 is recommended for printing terminals and value 2 for video display terminals.

5.20 Echo Mask

This parameter is introduced as part of the upgrade of ITI service from CCITT 1976/80 Standard to 1984 Standard.

This parameter specifies a set of characters not to be echoed to the terminal.

5.20.1 Parameter Number: 20

5.20.2 Possible Values:

0 = All characters echoed (except <X−ON> and <X−OFF> which depends on the setting of P12 and P22
1 = No echo of <CR>
2 = No echo of <LF>
4 = No echo of <VT>, <HT>, <FF>
8 = No echo of <BEL>, <BS>
16 = No echo of <ESC>, <ENQ>
32 = No echo of <ACK>, <NAK>, <STX>, <SOH>, <EDT>, <ETB>, <ETX>
64 = No echoing of editing character as designated by parameter 16/118, 17/119 or 18/120
128 = No echoing of all other characters in column 0 and 1 not mentioned above and <DEL>

This parameter is only active when echo is on (P2:1).

5.21 Parity Detected or Checked

This parameter is introduced as part of the upgrade of ITI service from CCITT 1976/80 Standard to 1984 Standard.

This parameter specifies whether or not the PAD should detect, check and generate parity.

5.21.1 Parameter Number: 21

5.21.2 Possible Values:

0 = Not detected or checked
1 = Parity checked
2 = Parity Generated
3 = Parity checked and detected

5.22 Page Wait

This parameter is introduced as part of the upgrade of ITI service from CCITT 1976/80 Standard to 1984 Standard.

This parameter controls the ability to set a terminal page size which when reached causes the PAD to stop all further output to the terminal.

5.22.1 Parameter Number: 22

5.22.2 Possible Values:

0 = No page wait
1−255 = Page wait size

The PAD will resume normal transmission when any of the following occurs:

Receipt of the page wait cancellation character (X−ON); or resetting parameter 22 to 0.

5.23 Character Deletion

Description and functionality of this parameter is same as international parameter 16 (see note).

5.23.1 Parameter Number: 118

5.23.2 Possible Values: same as 16

The above national parameter is specific to the PulseLink interactive terminal interface.

Setting any of parameter 118, 119 or 120 will also set parameter 15 to 1 when parameter 4 is 0.

5.24 Line Deletion

Description and functionality of this parameter is same as international parameter 17 (see note).

5.24.1 Parameter Number: 119

5.24.2 Possible Values: same as 17

The above national parameter is specific to the PulseLink interactive terminal interface.

Setting any of parameter 118, 119 or 120 will also set parameter 15 to 1 when parameter 4 is 0.

5.25 Line Display

Description and functionality of this parameter is same as international parameter 18 (see note).

5.25.1 Parameter Number: 120

5.25.2 Possible Values: same as 18

The above national parameter is specific to the PulseLink interactive terminal interface.

Setting any of parameter 118, 119 or 120 will also set parameter 15 to 1 when parameter 4 is 0.

5.26 Additional Data Forwarding Signals

National parameters 121 and 122 allow the definition of one or two additional data forwarding signals. These signals are in addition to any that are specified by parameter 3 and 4.

5.26.1 Parameter Number: 121, 122

5.26.2 Possible Values:

0 = None
1−127 = ASCII code of additional data forwarding signal

The above national parameter is specific to the PulseLink interactive terminal interface.

5.27 Parity Treatment

This parameter specifies whether or not the PAD should detect and check parity.

5.27. Parameter Number: 123

5.27.2 Possible Values:

0 = Parity not detected
1 = Parity detected and checked

The above national parameter is specific to the PulseLink interactive terminal interface.

5.28 Output Pending Timer

This parameter specifies the length of time, if any, that terminal output will be blocked by terminal input.

5.28.1 Parameter Number: 125

5.28.2 Possible Values:

0 = Output
1−255 = Value of delay in seconds

The above national parameter is specific to the PulseLink interactive terminal interface.

5.29 Linefeed Insertion

Description and functionality of this parameter is same as international parameter 13.

5.29.1 Parameter Number: 126

5.29.2 Possible Values: same as 13

The above national parameter is specific to the PulseLink interactive terminal interface.

6. SUBSCRIPTION OPTIONS

6.1 Subscription Options for Dedicated Access

OPTION	VALUES/RANGE
Type Jack	
	RJ11C
	RJ41X
	RJ26X
	RJ45S
Parity	
	mark
	space
	odd
	even
	auto*(1)
	no
Speed	
	300 bps
	1200 bps
	2400 bps
	auto*(2)
Packet Size	
	16 bytes
	32
	64
	128
	256
	512
Initial Profile	
	Prof 0 User Defined (4)
	Prof 1 International simple
	Prof 2 Canadian Simple*
	Prof 3 Transparent
	Prof 4 Canadian Inter−networking
	Prof 5 Terminal to Terminal
	Prof 6 Transparent Host
	Prof 7 Simple, Echo On
	Prof 80 BOC Profile
	Prof 90 International Simple
	Prof 91 International Transparent
Closed User Group (5)	
	no*
	yes, with no outgoing or incoming access
	yes, with outgoing access but no incoming access
	yes, with incoming access but no outgoing access
	yes, with incoming and outgoing access

Virtual Circuit Type
- switched virtual circuit*
- permanent virtual circuit (3)

ITHI (Interactive Terminal Host Interface)
- yes
- no*

Direct Call (3)
- yes
- no*

Charging (Out) (6)
- normal charging, non−enforced
- normal charging, enforced
- reverse charging, enforced*

Outgoing Calls Blocked
- yes
- no*

Incoming Calls Blocked
- yes*
- no

Reverse Charge Calls Blocked (In)
- refuse all reverse charge calls
- accept normal service collect calls within PulseLink
- not accepted
- no (off) accept all collect calls within PulseLink
- accept collect calls from all networks

Default RPOA (Inter−exchange carrier)
- (Chosen from those available)

NOTES: (1) If parity is not specified at subscription time, then the PAD will determine the parity from the service request signal. If Parameter 123 is set to 1 (i.e., detect and check parity), then the parity checked will be the value of this option. The parity specified by the subscription option may be overridden by the parity detected from the service request signal.

(2) If speed is not specified at subscription time, then the PAD will determine the speed from the service request signal. The speed specified by the subscription option cannot be overridden by the service request signal.

(3) This option is not available with ITHI option.

(4) When this profile is selected, the settings of the parameters must be specified at subscription time.

(5) A Closed User Group (CUG) permits the DTEs belonging to the group to communicate with each other but precludes communication with all other DTEs. The CUG options are on a per DTE basis and can be different for each DTE. CUG with outgoing access allows the DTE to be a member of the CUG but allows the DTE to place calls to DTEs outside the CUG. CUG with incoming access allows the DTE to be a member of the CUG but allows the DTE to receive calls from DTEs outside the CUG.

(6) Non−enforced service and charging options may be overridden at call set−up time by the "call request" command; whereas, enforced values cannot be overridden.

6.2 Subscription Options for Private Dial Access

OPTION	**VALUES/RANGE**
Parity	
	mark
	space
	odd
	even
	auto*(1)
	no
Speed	
	300 bps
	1200 bps
	2400 bps
	auto*(2)
Initial Profile	
	Prof 0 User Defined (4)
	Prof 1 International simple
	Prof 2 Canadian Simple*
	Prof 3 Transparent
	Prof 4 Canadian Inter−networking
	Prof 5 Terminal to Terminal
	Prof 6 Transparent Host
	Prof 7 Simple, Echo On
	Prof 90 International Simple
	Prof 91 International Transparent
Closed User Group (5)	
	no*
	yes, with no outgoing or incoming access
	yes, with outgoing access but no incoming access
	yes, with incoming access but no outgoing access
	yes, with incoming and outgoing access
Virtual Circuit Type	
	switched virtual circuit*
	permanent virtual circuit (3)
ITHI (Interactive Terminal Host Interface)	
	yes
	no*

Direct Call (3)

yes
no*

Charging (Out) (6)

normal charging, non−enforced
normal charging, enforced
reverse charging, enforced*

Incoming Calls Blocked

yes*
no

Reverse Charge Calls Blocked (In)

refuse all reverse charge calls
accept normal service collect calls within PulseLink
not accepted
no (off) accept all collect calls within PulseLink
accept collect calls from all networks

Default RPOA (Inter−exchange carrier)

(Chosen from those available)

NOTES: (1) If parity is not specified at subscription time, then the PAD will determine the parity from the service request signal. If Parameter 123 is set to 1 (i.e., detect and check parity), then the parity checked will be the value of this option. The parity specified by the subscription option may be overridden by the parity detected from the service request signal.

(2) If speed is not specified at subscription time, then the PAD will determine the speed from the service request signal. The speed specified by the subscription option cannot be overridden by the service request signal.

(3) This option is not available with ITHI option.

(4) When this profile is selected, the settings of the parameters must be specified at subscription time.

(5) A Closed User Group (CUG) permits the DTEs belonging to the group to communicate with each other but precludes communication with all other DTEs. The CUG options are on a per DTE basis and can be different for each DTE. CUG with outgoing access allows the DTE to be a member of the CUG but allows the DTE to place calls to DTEs outside the CUG. CUG with incoming access allows the DTE to be a member of the CUG but allows the DTE to receive calls from DTEs outside the CUG.

(6) Non−enforced service and charging options may be overridden at call set−up time by the "call request" command; whereas, enforced values cannot be overridden.

7. TYPICAL ITI TERMINAL PROFILES

PARAMETER	PROFILE NUMBER								
1	1	2	3	4	5	6	7	90	91
1	1	1	0	1	1	0	1	1	0
2	0	0	0	0	0	0	1	1	0
3	126	2	0	2	2	0	2	126	0
4	0	0	20	0	0	4	0	0	20
5	1	0	0	0	0	0	0	1	0
6	1	1	0	1	1	0	1	1	0
7	2	21	2	21	2	0	21	2	2
8	0	0	0	0	0	0	0	0	0
9	0	2	0	2	2	0	2	0	0
10	0	0	0	0	0	0	0	0	0
11	Terminal Speed ---------- Terminal Speed								
12	1	0	0	0	1	0	0	1	0
13	16	4	0	16	5	0	4	16	0
14	0	0	0	0	0	0	0	0	0
15	0	0	0	0	1	0	0	0	0
16	127	127	127	127	127	127	127	127	127
17	24	24	24	24	24	24	24	24	24
18	18	18	18	18	18	18	18	18	18
19	2	2	2	2	2	2	2	1	1
20	0	0	0	0	0	0	0	0	0
21	0	3	0	0	3	3	3	0	0
22	0	0	0	0	0	0	0	0	0
118	127	127	127	127	127	127	127	127	127
119	24	24	24	24	24	24	24	24	24
120	18	18	18	18	18	18	18	18	18
121/122	0	0	0	0	0	0	0	0	0
123	0	1	0	0	1	1	1	0	0
125	0	0	0	0	60	0	0	0	0
126	16	4	0	16	5	0	4	16	0

8. 1984 IMPLEMENTATION OF X.3, X.28, X.29

PulseLink service was upgraded from 1976/1980 level of CCITT Recommendation X.3, X.28, and X.29 to the 1984 level.

The implementation of ITI (84) on PulseLink included the introduction of five new parameters. Five existing national parameters have taken five new CCITT defined names. Three new standard profiles have been added to the existing six standard profiles and three of the existing parameters have new parameter values. With this change, the functionality of P9 (Padding−character−insertion) has been changed to reflect the new definition as is defined in CCITT Recommendations X.3 and X.28.

The changes to the service are summarized in the following section.

8.1 P9 and P14 Padding Function

The setting of P9 or P14 to a value between 0−255 inclusively, forces the PAD to insert the number of <NULLS>s after a <CR> <LF> insertion controlled by P126 (renamed under ITI (84) to P13), respectively, is sent to the terminal.

8.2 Service Signals (Command Mode)

In the implementation of ITI(84), there is no change in the handling of <CR> and <LF> in command mode from the 1976/80 software level.

In the case of service signals, P14 will be ignored and the nulls will be generated by P9. If the user sets P9:3, P14:2, and P13:4 and hit <CR> in command mode, the terminal will receive:

<CR> <LF> <NU> <NU> <NU>
<LF> is controlled by P13
<NU>s controlled by P9 and P14 is ignored

Data Transfer Mode

The difference in the functionality of P9, P13 and P126 in data transfer mode at ITI (84) and ITI(76/80) is detailed below:

When the PAD received a <CR> while in data transfer mode at ITI 76 software level, the PAD would:

Handle the <CR>
Insert a <LF> as stated by P126
Insert <NU>s as stated by P9

For example, with P9:2 and P126:5, the <CR> sequence received by an asynchronous DTE would be:

<CR> <LF> <NU > <NU>

When the PAD receives a <CR>, while in data transfer mode at the ITI 1984 software level, the PAD will

Handle the <CR>
Insert <NU>s as stated by P9
Insert a <LF> as stated by P13
Insert <NU> as stated by P14

For example, with P9:2, P13:5, and P14:3 the <CR> sequence received by an asynchronous DTE would be

<CR> <NU> <NU> <LF> <NU> <NU> <NU>

Where the:

<NU> <NU> are controlled by P9
<LF> is controlled by P13
<NU> <NU > <NU> are controlled by P14

If no <LF>, the P14 is ignored, i.e., when P13:0, P14 is ineffective.

Even with the change in P9 at the 1984 software level, the printed screen formats of the service signals will not be affected. Users will notice no difference in the service signals.

8.3 Editing Parameters P16/118, P17/119, P18/120

In standard profiles, the value of the editing parameters have been changed to the default recommended by the CCITT. The parameters are defaulted according to the following table.

	OLD VALUE (76/80)	NEW VALUE (84)
P16/P118 (CHAR DELETE)	000	<DEL>
P17/119 (LINE DELETE)	000	<DEL>
P18/120 (LINE DISPLAY)	000	<DEL>

The setting of one of the parameters will automatically set the other two to default values as well as activate parameter 15 when parameter 4 is turned off.

8.4 Duplicate National/International Parameters

National P118 (character delete), P119 (line delete), P120 (line display), P123 (parity detection) and P126 (linefeed insertion) have been adopted as CCITT standards with parameter P16, P17, P18, P21 and P13 respectively. If the user sets P16, P17 and/or P18, P13 to certain defined values, then P118, P119, P120 and/or P126 will be set to the same value.

When P21 is set to three (3), P123 will take the value of one (1) automatically where both of these values, one (1) for P123 and three (3) for P21, means parity is detected and checked.

8.5 Command Signals and Service Signals

For ITI (84) service, the PAR, SET and PROFILE command at the local DTE will display the new ITI (84) parameter values in addition to the existing ITI (76/80) parameters. This will result in longer service signals.

8.6 P19 − Service Signal Upon Editing

At the 1976/80 software level, service signal editing is performed as follows:

For a character delete − no service signal

For a line delete xxx

At the 1984 software level, this parameter defines the service signals sent to the terminal on execution of the editing functions (P16/118, P17/119 and P18/120) when

P19:0 no service signal upon editing
P19:1 for character delete − \ for line delete − xxx
P19:2 for character delete − BS SP BS is displayed for each character deleted \ for line delete − A series of BS SP BS is repeated for each character deleted on the line
P19=2 is the default for all profiles including profile 0 users.

8.7 P20 Echo Mask

This parameter specifies a set of characters which will not be echoed to the terminal. The effect of this parameter is only visible when echo is on (P2:1).

P20:0 All characters are echoed with exception of <XON> and <XOFF>
P20:1 No echo of <CR>
P20:2 No echo of <LF>
P20:4 No echo of <VT>, <HT>, <FF>
P20:8 No echo of <BEL>, <BS>
P20:16 No echo of <ESC>, <ENQ>
P20:32 No echo of <ACK>, <NAK>, <STX>, <SOH>, <EDT>, <ETB>, <ETX>
P20:64 No echoing of editing characters as designated by P16/P118, P17/119 or P18/120
P20:128 No echoing of all other characters not mentioned above

When this parameter is set to 0, the functionality is the same as to when it is received at the 1976/80 software level.

8.8 P22 Page Wait

This parameter allows the PAD to suspend transmission of additional characters to DTE after N(P22:N, where N=1−255) number of <LF> characters transmitted by the PAD.

The PAD will resume normal transmission when any of the following occurs:

On receipt of the page wait cancellation character (X−ON); or on resetting parameter 22 to 0.

9. ASCII CHARACTER CHART

Dec	Hex	ASCII	Dec	Hex	ASCII	Dec	Hex	ASCII	Dec	Hex	ASCII
0	00	NUL	32	20	SP	64	40	@	96	60	
1	01	SOH	33	21	!	65	41	A	97	61	a
2	02	STX	34	22	”	66	42	B	98	62	b
3	03	ETX	35	23	#	67	43	C	99	63	c
4	04	EOT	36	24	$	68	44	D	100	64	d
5	05	ENQ	37	25	%	69	45	E	101	65	e
6	06	ACK	38	26	&	70	46	F	102	66	f
7	07	BEL	39	27	′	71	47	G	103	67	g
8	08	BS	40	28	(	72	48	H	104	68	h
9	09	HT	41	29	)	73	49	I	105	69	i
10	0A	LF	42	2A	*	74	4A	J	106	6A	j
11	0B	VT	43	2B	+	75	4B	K	107	6B	k
12	0C	FF	44	2C	′	76	4C	L	108	6C	l
13	0D	CR	45	2D	−	77	4D	M	109	6D	m
14	0E	SO	46	2E	.	78	4E	N	110	6E	n
15	0F	SI	47	2F	/	79	4F	O	111	6F	o
16	10	DLE	48	30	0	80	50	P	112	70	p
17	11	DC1	49	31	1	81	51	Q	113	71	q
18	12	DC2	50	32	2	82	52	R	114	72	r
19	13	DC3	51	33	3	83	53	S	115	73	s
20	14	DC4	52	34	4	84	54	T	116	74	t
21	15	NAK	53	35	5	85	55	U	117	75	u
22	16	SYN	54	36	6	86	56	V	118	76	v
23	17	EYB	55	37	7	87	57	W	119	77	w
24	18	CAN	56	38	8	88	58	X	120	78	x
25	19	EM	57	39	9	89	59	Y	121	79	y
26	1A	SUB	58	3A	:	90	5A	Z	122	7A	z
27	1B	ESC	59	3B	;	91	5B	[	123	7B	
28	1C	FS	60	3C	>	92	5C		124	7C	|
29	1D	GS	61	3D	=	93	5D	]	125	7D	
30	1E	RS	62	3E	>	94	5E		126	7E	
31	1F	US	63	3F	?	95	5F	_	127	7F	DEL